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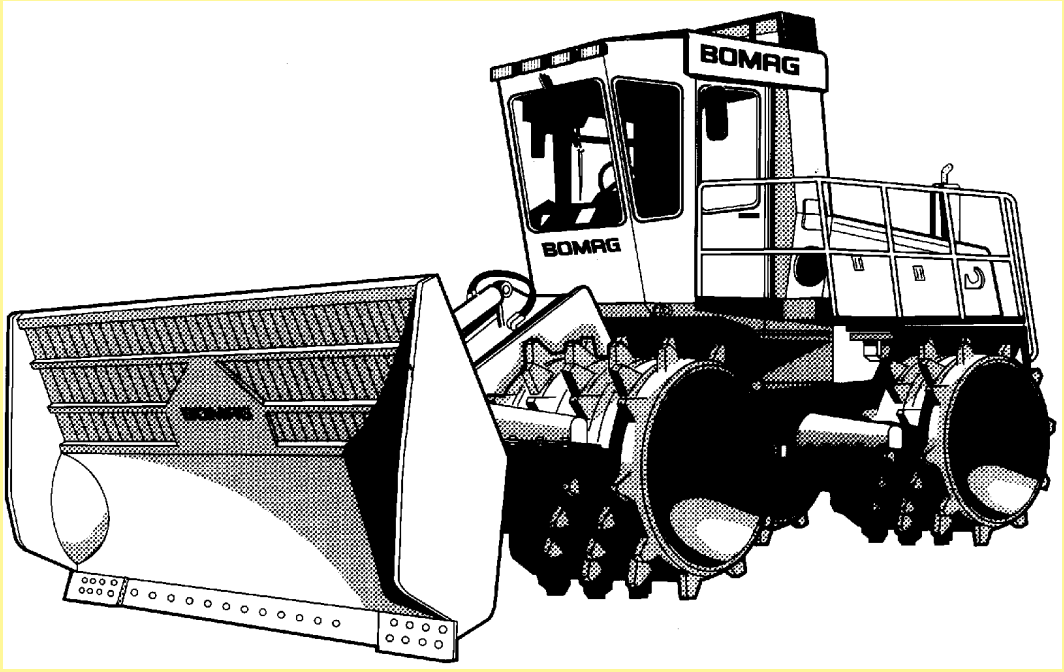
FAYAT GROUP

Service - Manual

BC 672 RB-2 / BC 772 RB-2 / BC 772 RS-2

BC 672 EB-2 / BC 772 EB-2

S/N 101 570 59 .... S/N 101 570 58 .... S/N 101 570 57 ....
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Sanitary landfill compactor

Fast moving soil compactor

Catalogue number.
008 911 53

10/2010

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1 General

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1.1 Introduction

This manual addresses the professionally qualified personnel or the after sales service of BOMAG, and should be of help and assistance in correct and efficient repair and maintenance work.

This manual describes the disassembly, dismantling, assembly, installation and repair of components and assemblies. The repair of components and assemblies is only described as this makes sense under due consideration of working means and spare parts supply.

Documentation

For the BOMAG machines described in this manual the following documentation is additionally available:

1. **Operating and maintenance instructions**
2. **Spare parts catalogue**
3. **Wiring diagram***
4. **Hydraulic diagram***
5. **Service Information**

Use only genuine BOMAG spare parts.

Spare parts needed for repairs can be taken from the spare parts catalogue for the machine.

These repair instructions are not subject of an updating service; for this reason we would like to draw your attention to our additional "Technical Service Bulletins".

In case of a new release all necessary changes will be included.

In the course of technical development we reserve the right for technical modifications without prior notification.

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⚠ Danger

These safety regulations must be read and applied by every person involved in the repair /maintenance of this machine. The applicable accident prevention instructions and the safety regulations in the operating and maintenance instructions must be additionally observed.

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Important notes

These safety regulations must be read and applied by every person involved in the repair /maintenance of this machine. The applicable accident prevention instructions and the safety regulations in the operating and maintenance instructions must be additionally observed.

Repair work shall only performed by appropriately trained personnel or by the after sales service of BOMAG.

Workshop equipment and facilities as well as the use and waste disposal of fuels and lubricants, cleaning agents and solvent as well as gases and chemicals are subject to legal regulations, which are intended to provide a minimum on safety. It is obviously your own responsibility to know and adhere to these regulations.

This manual contains headers like "Note", "Attention", "Danger" and "Environment", which must be strictly complied with in order to inform about and avoid dangers to persons, property and the environment.

i Note

Paragraphs marked like this contain technical information for the optimal economical use of the machine.

⚠ Caution

Paragraphs marked like this highlight possible dangers for machines or parts of the machine.

⚠ Danger

Paragraphs marked like this highlight possible dangers for persons.

Environment

Paragraphs marked like this point out practices for safe and environmental disposal of fuels and lubricants as well as replacement parts.

Observe the regulations for the protection of the environment.

General

- For repair and maintenance work move the machine on a firm base and shut it down.
- Always secure the machine against unintended rolling.
- Secure the engine reliably against unintentional starting.
- Mark a defective machine and a machine under repair by attaching a clearly visible warning label to the dashboard.
- Block the articulated joint with the articulation lock.
- Use protective clothes like hard hat, safety boots and gloves.
- Keep unauthorized persons away from the machine during repair work.
- Tools, lifting gear, lifting tackle, supports and other auxiliary equipment must be fully functional and in safe condition.
- Use only safe and approved lifting gear of sufficient load bearing capacity to remove and install parts or components from and to the machine.
- Do not use easily inflammable or harmful substances, such as gasoline or paint thinners for cleaning.
- Do not smoke or use open fire and avoid sparks when cleaning or repairing a tank.
- When performing welding work strictly comply with the respective welding instructions.

Transport work with cranes and lifting tackle

i Note

Cranes must only be operated by instructed persons who had been trained in handling cranes.

- Follow the operating instructions of the manufacturer when working with cranes.
- Follow the operating instructions of the operator when working with cranes.
- Always comply with the applicable accident prevention instructions when working with cranes and lifting tackle.

Precautions and codes of conduct for welding work

Welding work must only be carried out by properly trained personnel.

⚠ Danger

Electric shock!

Sparks, fire hazard, burning of skin!

Infrared or ultraviolet radiation (arc), flashing of eyes!

Health hazard caused by welding work on highly alloyed work pieces, metal coatings, paint coatings, plastic coatings, oil containing dirt deposits, grease or solvent residues, etc.!

- Check welding equipment and cables for damage before use (also the validity of inspection stickers).
- Ensure good conductivity between ground cable and workpiece, avoid joints and bearings.

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- Start the extraction fan before starting work and guide with the progressing work as required.
- Always isolate the burner when laying it down (remove possible electrode residues).
- Protect cables from being damaged, use cables with insulated couplings.
- Ensure sufficient fire protection, keep a fire extinguisher at hand.
- Welding work in areas where there is a risk of fire or explosion, must only be carried out with welding permission.
- Remove any combustible materials from the welding area or cover such items appropriately.
- Name a fire watch during and after welding work.
- Place welding rod holders and inert gas welding guns only on properly insulated bases.
- Place the inert gas bottles in a safe place and secure them against falling over.
- Use a protective screen or hand shield with welding filter, wear welding gloves and clothes.
- Switch the welding unit off before connecting welding cables.
- Check electrode holders and electric cables at regular intervals.

Behaviour in case of faults

- In case of faults on the welding unit switch of the welding unit immediately and have it repaired by expert personnel.
- In case of failure of the extraction system switch the system off and have it repaired by expert personnel.

Maintenance; waste disposal

- Replace damaged insulating jaws and welding rod holders immediately.
- Replace the welding wire reels only in de-energized state.

What to do in case of accidents; First Aid

- Keep calm.
- Call first air helpers.
- Report the accident.
- In case of an electric accident: Interrupt the power supply and remove the injured person from the electric circuit. If breathing and heart have stopped apply reactivation measures and call for an emergency doctor.

Old oils

Prolonged and repetitive contact with mineral oils will remove the natural greases from the skin and causes dryness, irritation and dermatitis. Moreover, used engine oils contain potentially hazardous contaminants, which could cause skin cancer. Appropriate skin protection agents and washing facilities must therefore be provided.

- Wear protective clothes and safety gloves, if possible.
- If there is a risk of eye contact you should protect your eyes appropriately, e.g. chemistry goggles or full face visor; a facility suitable for rinsing the eyes should also be available.
- Avoid longer and repetitive contacts with oils. In case of open incisions and injuries seek medical advice immediately.
- Apply protective cream before starting work, so that oil can be easier removed from the skin.
- Wash affected skin areas with water and soap (skin cleansers and nail brushes will help). Lanolin containing agents will replace natural skin oils that were lost.
- Do not use gasoline, kerosene, diesel, thinner or solvents to wash the skin.
- Do not put oil soaked cloths into your pockets.
- Avoid clothes getting soiled by oil.
- Overalls must be washed at regular intervals. Dispose of non-washable clothes environmentally.
- If possible degrease components before handling.

Environment

It is strictly prohibited to drain off oil into the soil, the sewer system or into natural waters. Old oil must be disposed of according to applicable environmental regulations. If in doubt you should consult your local authorities.

Hydraulics

- Always relieve the pressure in the hydraulic system before disconnecting any lines. Hydraulic oil escaping under pressure can penetrate the skin and cause severe injury.
- Always make sure that all screw fittings have been tightened properly and that hoses and pipes are in mint condition before pressurizing the system again.
- Hydraulic oil leaking out of a small opening can hardly be noticed, therefore please use a piece of cardboard or wood when checking for leaks. When injured by hydraulic oil escaping under pressure consult a physician immediately, as otherwise this may cause severe infections.
- Do not step in front of or behind the drums, wheels or crawler tracks when performing adjustment work in the hydraulic system while the engine is running. Block drums, wheels or crawler tracks with wedges.

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Reattach all guards and safety installations after all work has been completed.

Environment

It is strictly prohibited to drain off oil into the soil, the sewer system or into natural waters. Oil oil must be disposed of according to applicable environmental regulations. If in doubt you should consult your local authorities.

Fuels

Danger

Repair work shall only performed by appropriately trained personnel or by the after sales service of BOMAG.

Follow the valid accident prevention instructions when handling fuels.

The following notes refer to general safety precautions for danger free handling of fuel.

Fuel vapours not only are easily inflammable, but also highly explosive inside closed rooms and toxic; dilution with air creates an easily inflammable mixture. The vapours are heavier than air and therefore sink down to the ground. Inside a workshop they may easily become distributed by draft. Even the smallest portion of spilled fuel is therefore potentially dangerous.

- Fire extinguishers charged with FOAM, CO^2 GAS or POWDER must be available wherever fuel is stored, filled in, drained off, or where work on fuel systems is performed.
- The vehicle battery must always be disconnected, BEFORE work in the fuel system is started. Do not disconnect the battery while working on the fuel system. Sparks could cause explosion of the fuel fumes.
- Wherever fuel is stored, filled, drained off or where work on fuel systems is carried out, all potential ignition sources must be extinguished or removed. Search lights must be fire proof and well protected against possible contact with running out fuel.

Hot fuels

Please apply the following measures before draining of fuel to prepare for repair work:

- Allow the fuel to cool down, to prevent any contact with a hot fluid.
- Vent the system, by removing the filler cap in a well ventilated area. Screw the filler cap back on, until the tank is finally emptied.

Synthetic rubber

Many O-rings, hoses, etc. are made of synthetic material, a so-called fluorocarbon elastomer. Under normal operating conditions this material is safe and does not impose any danger to health.

However, if this material becomes damaged by fire or extreme heat, it may decompose and form highly caustic hydrofluoric acid, which can cause severe burns in contact with skin.

- If the material is in such a state it must only be touched with special protective gloves. The protective gloves must be disposed of according to applicable environmental regulations immediately after use.
- If the material has contacted the skin despite these measures, take off the soiled clothes and seek medical advice immediately. In the meantime cool and wash the affected area of skin over a sufficient time with cold water or lime water.

Poisonous substances

Some of the fluids and substances used are toxic and must under no circumstances be consumed.

Skin contact, especially with open wounds, must be avoided.

These fluids and substances are, amongst others, anti-freeze agents, hydraulic oils, fuels, washing additives, refrigerants, lubricants and various bonding agents.

Engine

Danger

Do not work on the fuel system while the engine is running. (Danger to life!)

Once the engine has stopped wait approx. 5 minutes for the system to depressurize. The systems are under high pressure. (Danger to life!)

Keep out of the danger zone during the initial test rung. Danger caused by high pressure in case of leaks. (Danger to life!)

When performing work on the fuel system make sure that the engine cannot be started unintentionally during repair work. (Danger to life!)

- Maintenance and cleaning work on the engine must only be performed with the engine stopped and cooled down. Make sure that the electric system is switched off and sufficiently secured against being switched on again (e.g. pull off ignition key, attach a warning label).
- Observe the accident prevention regulations for electric systems (e.g. -VDE-0100/-0101/-0104/-

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0105 Electric precautions against dangerous contact voltages).

- Cover all electric components properly before wet cleaning.

Air conditioning system

⚠ Caution

Work on air conditioning systems must only be carried out by persons who can provide sufficient evidence of their ability (proof of professionalism) and only with the appropriate technical equipment.

- Always wear goggles and protective clothing when performing maintenance and repair work on air conditioning systems. Refrigerant withdraws heat from the environment when evaporating, which can cause injury by freezing when in contact with skin (boiling point of R134a -26,5 °C at normal pressure).
- Perform maintenance and repair work on air conditioning systems only in well ventilated rooms! Escaping refrigerant vapours will mix with the ambient air and displace the oxygen required for breathing (danger of suffocating).
- Smoking is prohibited when performing maintenance and repair work on air conditioning systems! Toxic breakdown products may be generated if refrigerant comes into contact with heat.
- Refrigerant should always be extracted and removed by flushing with nitrogen before starting welding or soldering work near components of the air conditioning system. The development of heat may cause the refrigerant to develop toxic and highly corrosive breakdown products.
- Pungent smell! The toxic substances, which are responsible for the pungent smell, must not be inhaled, since this may cause damage to the respiratory system, the lung and other organs. Extract toxic breakdown products with a suitable extraction system (workshop extraction system).
- When blowing out components with compressed air and when flushing with nitrogen the gas mixture escaping from the components must be extracted via suitable extraction facilities (workshop extraction systems).

Handling pressure vessels

- Since the fluid container is pressurized, the manufacture and testing of these pressure vessels is governed by the pressure vessel directive. The pressure vessels must be repetitively tested by an expert as specified in TRB 532 Inspection by Experts, Repetitive Tests. In this case periodically recurring inspections consist of external examinations, normally on containers in operation. In combination with the inspection, the refrigerant collector must be visually examined two times per year. Special attention must thereby be paid to signs of corrosion and mechanical damage. If the container is in no good condition, it should be replaced for safety reasons, in order to protect the operator or third parties against the dangers when handling or operating pressure vessels.
- Secure pressure vessels against tipping over or rolling away.
- Do not throw pressure vessels! Pressure vessels may thereby be deformed to such an extent, that they will crack. The sudden evaporation and escape of refrigerant releases excessive forces. This applies also when snapping off valves on bottles. Bottles must therefore only be transported with the safety caps properly installed.
- Refrigerant bottles must never be placed near heating radiators. Higher temperatures will cause higher pressures, whereby the permissible pressure of the vessel may be exceeded.
- Do not heat up refrigerant bottles with an open flame. Excessive temperatures can damage the material and cause the decomposition of refrigerant.
- Do not overfill refrigerant bottles, since any temperature increase will cause enormous pressures.

Environment

It is strictly prohibited to release refrigerant into the atmosphere during operation, maintenance and repair work and when taking air conditioning systems into or out of service.

Battery

- Always wear goggles and protective clothing to service or clean batteries! Battery acid can cause severe injury by cauterization when coming in contact with skin.
- Work only well ventilated rooms (formation of oxyhydrogen gas).
- Do not lean over the battery while it is under load, being charged or tested (danger of explosion).
- Keep ignition sources away from the battery. Burning cigarettes, flames or sparks can cause explosion of the battery
- Use battery chargers etc. only in strict compliance with the operating instructions.
- After an accident with acid flush the skin with a sufficient amount of water and seek medical advice.
- Do not allow children access to batteries.
- When mixing battery fluid always pour acid into water, never vice-versa.

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Special safety regulations

- Use only genuine BOMAG spare parts for repair and maintenance work. Genuine spare parts and original accessories were specially developed, tested and approved for the machine.
- The installation and use of non-genuine spare parts or non-genuine accessories may therefore have an adverse effect on the specific characteristics of the machine and thereby impair the active and/or passive driving safety. The manufacturer explicitly excludes any liability for damage caused by the use of non-original parts or accessories.
- Unauthorized changes to the machine are prohibited for safety reasons.
- Do not perform any cleaning work while the engine is running.
- If tests on the articulated joint need to be performed with the engine running, do not stand in the articulation area of the machine (danger of crushing!).
- If tests must be performed with the engine running do not touch rotating parts of the engine (danger of injury!).
- Always ensure an adequate supply of fresh air when starting in closed rooms. Exhaust gases are highly dangerous!
- Refuel only with the engine shut down. Ensure strict cleanliness and do not spill any fuel.
- Always ensure an adequate supply of fresh air when refuelling in closed rooms.
- Dispose of used filters in accordance with applicable environmental regulations.
- When performing repair and maintenance work collect oils and fuels in suitable containers and dispose of in compliance with applicable environmental regulations.
- Do not heat up oils higher than 160 °C because they may ignite.
- Wipe off spilled or overflown oil using suitable cleaning means and dispose of in accordance with applicable environmental regulations.
- Dispose of old batteries according to applicable environmental regulations.
- There is a danger of scalding when draining off engine or hydraulic oil at operating temperature! Allow engine and hydraulic system to cool down to a sufficient level.
- Do not exceed the max. permissible tire pressure.

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General

- Before removing or disassembling parts, assemblies, components or hoses mark these parts for easier assembly.
- Before assembling and installing parts, assemblies or components oil or grease all movable parts or surfaces as required and in compliance with the compatibility of materials.

Electrics

General

Due to the fast technical development electric and electronic vehicle systems become more intelligent and more comprehensive day by day, and can hardly be dispensed with in hydraulic and mechanical vehicle systems.

Diagnostics according to plan

Well structured trouble shooting procedures can save time and money.

Random tests have revealed that purely electronic components or control units only very rarely are the actual cause of failures:

- In approx. 10 % of the examined cases the problems were caused by control units.
- In approx. 15 % sensors and actuators were the cause of the problems.

By far the highest proportion of all faults could be traced back to wiring and connections (plugs, etc.).

General:

- Before changing any expensive components, such as control units, you should run a systematic trouble shooting session to eliminate any other possible fault sources. Knowledge in basic electrics is required for this purpose. If a fault was diagnosed without having pulled the plug of the control unit or inspected the wiring, this should be done before changing any parts.
- Check for good cable and ground contacts, therefore keep all mechanical transition points between electric conductors (terminals, plugs) free of oxide and dirt, as far as this is possible.
- Always use the machine related wiring diagram for testing. If one or more faults were detected, these should be corrected immediately.
- Do not disconnect or connect battery or generator while the engine is running.
- Do not operate the main battery switch under load.
- Do not use jump leads after the battery has been removed.
- Sensors and electric actuators on control units must never be connected individually or between external power sources for the purpose of testing, but only in connection with the control unit in question.
- It is not permitted to pull plugs off while the voltage supply is switched on (terminal 15 "ON")! Switch the voltage supply "OFF" first and pull out the plug.
- Even with an existing polarity reversal protection incorrect polarity must be strictly avoided. Incorrect polarity can cause damage to control units!

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- Plug-in connectors on control units are only dust and water tight if the mating connector is plugged on! Control units must be protected against spray water, until the mating connector is finally plugged on!
- Unauthorized opening of control electronics (Microcontroller MC), modifications or repairs in the wiring can cause severe malfunctions.
- Do not use any radio equipment or mobile phones in the vehicle cab without a proper aerial or in the vicinity of the control electronics!

Electrics and welding

⚠ Caution

Before starting welding work you should disconnect the negative battery pole or interrupt the electric circuit with the main battery switch, disconnect the generator and pull the plugs off all control units in order to protect the electrical system of the machine.

- Disconnect the minus pole of the battery or interrupt the electric circuit with the main battery switch.
- Isolate the generator and all control units from the electric circuit.
- Always fasten the earth clamp of the welding unit in the immediate vicinity of the welding location.
- When choosing the location for the earth clamp make sure that the welding current will not pass through joints or bearings.

Battery

Rules for the handling of batteries

When removing a battery always disconnect the minus pole before the plus pole. When installing the battery connect the minus pole after the plus pole to avoid short circuits.

Fasten the terminal clamps with a little force as possible.

Always keep battery poles and terminal clams clean to avoid high transition resistances when starting and the related development of heat.

Make sure the battery is properly fastened in the vehicle.

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Generator

Before removing the generator you must disconnect the ground cable from the minus pole of the battery while the ignition is switched off. Do not disconnect the generator while the engine is running, because this may cause extremely high voltage peaks in the vehicle wiring system ("Load Dump"), which could possibly damage control units, radios or other electronic equipment.

When disassembling the battery cable, the B+-nut underneath on the generator side may also be loosened. This nut must in this case be retightened.

When connecting e.g. the battery cable to the terminal of the generator you must make sure that the polarity is correct (generator B+ to the + pole of the battery). Mixing up the polarities by mistake causes short circuit and damage to the rectifier elements - the generator will be out of function.

The generator can only be operated with the battery connected. Under special conditions emergency operation without battery is permitted, the lifetime of the generator is in such cases especially limited.

Plus and minus cables must be disconnected during rapid charging of the battery or electric welding on the vehicle.

When cleaning the generator with a steam or water jet make sure not to direct the steam or water jet directly on or into the generator openings or ball bearings. After cleaning the generator should be operated for about 1 - 2 minutes to remove any deposits of water from the generator.

Starter motor

So-called jump starting (using an additional external battery) without the battery connected is dangerous. When disconnecting the cables from the poles high inductivities (arcs, voltage peaks) may occur and destroy the electrical installation.

For purposes like e.g. purging the fuel systems, starters may be operated for maximum 1 minute without interruption. Then you should wait for at least 30 minutes (cooling down) until trying again. During the 1 minute starting period this process should not be interrupted.

Starter motors must not be cleaned with high pressure steam cleaning equipment.

The contacts on starter terminals 30, 45, 50 must be protected against unintended shorting (jump protection).

When replacing the starter the ring gear on the engine flywheel must be checked for damage and its number of teeth - if necessary replace the ring gear.

Always disconnect the battery before starting assembly work in the starter area of the engine or on the starter itself.

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Hydraulic system

⚠ Caution

Repair work on hydraulic elements shall only performed by appropriately trained personnel or by the after sales service of BOMAG.

Please note

i Note

Cleanliness is of utmost importance. Dirt and other contaminations must strictly be kept out of the system.

- Connections and screw fittings, filler neck covers and their immediate surrounding areas must be cleaned before removal.
- Before loosening hoses, pipe lines etc. relieve all pressure from the system.
- During repair work keep all openings closed with clean plastic plugs and caps.
- Never run pumps, motors and engines without oil or hydraulic oil.
- When cleaning hydraulic components take care not to damage any fine machine surfaces.
- Chemical and rubber soluble cleansing agents may only be used to clean metal parts. Do not let such substances come in contact with rubber parts.
- Rinse of cleaned parts thoroughly, dry them with compressed air and apply anti-corrosion oil immediately. Do not install parts that show traces of corrosion.
- Avoid the formation of rust on fine machined caused by hand sweat.
- Use new O-rings or seal rings for reassembly.
- Use only hydraulic oil as sliding agent when reassembling. Do not use any grease!
- Use only the specified pressure gauges. Risk of damaging the pressure gauges under too high pressure.
- Check the hydraulic oil level before and after the work.
- Fill in only clean oil as specified in the maintenance instructions.
- Check the hydraulic system for leaks, if necessary find and rectify the cause.
- Before taking new hydraulic components into operation fill these with hydraulic oil as specified in the operating and maintenance instructions.
- After changing a hydraulic component thoroughly flush, refill and bleed the complete hydraulic system.
- Perform measurements at operating temperature of the hydraulic oil (approx. 40 °C).
- After changing a component perform a high and charge pressure test, if necessary check the speed of the exciter shaft.
- The operating pressure of the exciter shaft to a great extent depends on the base under the vibrating drum. On hard ground place the drums on a suitable base and check the drum pressure. Do not activate the vibration on a hard, concreted base, danger of bearing damage.
- After the completion of all tests perform a test run and then check all connections and fittings for leaks with the engine still stopped and the hydraulic system depressurized.

Before commissioning

- Fill the housings of hydraulic pumps and motors with hydraulic oil. Use only hydraulic oils according to the specification in the maintenance instructions.
- After changing a component flush the hydraulic system as described in the flushing instructions.

Taking into operation

- Bleed the hydraulic circuits.
- Start up the hydraulic system without load.
- Check the hydraulic oil level in the tank, if necessary top up with hydraulic oil as specified in the operating and maintenance instructions or drain oil off into a suitable container.

After taking into operation

- Check fittings and flanges for leaks.
- After each repair check all adjustment data, system pressures, rotational speeds and nominal values in the hydraulic system, adjust if necessary.
- Do not adjust pressure relief valves and control valves to values above their specified values.

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Air conditioning system

Chemicals/ozone layer regulation

The chemicals/ozone layer regulation, which became effective on 01.12.2006, supplements the still directly applicable regulation (EG) no. 2037/2000 from 29.06.2000 concerning substances, which cause decomposition of the ozone layer and at the same time replaces the previously valid German CFC-halon 0prohibition from 06.05.1991.

Work on air conditioning systems must only be carried out by persons who:

- have proven to have sufficient expert knowledge,
- have the necessary equipment to undertake such tasks,
- are reliable and
- are not any directives regarding their activities when carrying out inspection and maintenance work acc. to § 4 section 2 of the chemical/ozone layer regulation.

The inspection and maintenance tasks, including leak tests and possible repair activities, must be recorded in the operating instructions together with information about the refrigerant quantities used and regained, whereby the operator is obliged to keep these records over a period of at least five years.

i Note

Cleanliness is of utmost importance. Dirt and other contaminations must strictly be kept out of the system.

- Tools used on refrigeration circuits must be of excellent condition, thus to avoid the damage of any connections.
- During repairs on refrigerant lines and components, these must be kept closed, as far as this is possible, to prevent the system from being contaminated by air, moisture and dirt. The operational safety of the system can only be assured as long as all components in the refrigerant circuit are kept internally clean and dry.
- Connections, screw fittings and their immediate surrounding areas must be cleaned before removal.
- Before loosening hoses, pipe lines etc. relieve all pressure from the system.
- During repair work keep all openings closed with clean plastic plugs and caps.
- All parts to be reused should be cleaned with a gasoline free solvent and blow-dried with clean compressed air or dried with a lint-free cloth.
- Before opening all components should have warmed up to ambient temperature, to avoid that damp air is drawn into the component by the difference in temperatures.
- Damaged or leaking parts of the air conditioning must not be repaired by welding or soldering, but must generally be replaced.
- Do not fill up refrigerant, but extract existing refrigerant and refill the system.
- Different types of refrigerant must not be mixed. Only the refrigerant specified for the corresponding air conditioning system must be used.
- Refrigerant circuits with refrigerant type R134a must only be operated with the compressor oil / refrigeration oil approved for the compressor.
- Used compressor oil/refrigeration oil must be disposed of in strict compliance with applicable environmental regulations.
- Due to its chemical properties compressor oil / refrigeration oil must never be disposed of together with engine or transmission oil.
- Compressor oil / refrigeration oil is highly hydroscopic. Oil cans must strictly be kept closed until use. Oil rests should not be used, if the can had been opened over a longer period of time.
- All O-rings/seal rings as well as pipe/ hose fittings must be oiled with compressor/refrigeration oil bfore assembly.
- When replacing a heat exchanger, e.g. evaporator or condenser, any compressor oil/refrigeration oil lost by exchanging the components, must be replaced with fresh oil.
- A too high compressor oil / refrigeration oil level adversely affects the cooling performance and a too low oil level has a negative effect on the lifetime of the compressor.
- Use new O-rings or seal rings for reassembly.
- Always used 2 spanners to work on pipes/hoses to avoid damages .
- Tighten screw fittings with the specified torque.
- Check all pipes/hoses, screw fittings or components for damage, replace if necessary.
- Do not leave the refrigerant circuit unnecessarily open to the atmosphere.
- In case of a repair on the refrigeration system you should first evacuate the air conditioning system for at least 45 minutes to remove any moisture from the system, before you start to refill. Moisture bonded in the compressor oil / refrigeration oil (PAG oil) can only be removed from the system by changing the oil.
- Compressor valves must only be opened after the system has been properly sealed.
- The use of leak detection spray is not permitted. If such substances are used the WARRANTY will become null and void.

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- If the air conditioning system had been opened for repair work, a new drier should be installed in the refrigerant circuit.
- After completion of repair work screw locking caps (with seals) on all valve connections service connections.
- Before start up of the air conditioning system after a new filling: - Turn the compressor approx. 10 revolutions by hand using the clutch or V-belt pulley of the magnetic clutch. - Start the engine with the compressor/control valve switched off. - Once the idle speed of the engine has stabilized switch on the compressor and run it for at least 10 minutes at idle speed and maximum cooling power.
- Never run the compressor with an insufficient amount of refrigerant.

Notes on cleanliness for Common Rail engines

Special requirements with respect to cleanliness in the fuel system do apply for commissioning, maintenance and repair work, particularly for TEIRIII engines with the DEUTZ Common Rail System. Contamination like dirt, welding residues or similar can lead to the failure of individual components and adversely affect engine operation.



Fig. 1

- Spare parts should be left in their original packaging as long as possible and should only be unpacked just before use.
- When parts are unpacked any connections must be closed with suitable plugs or caps, in order to prevent (Fig. 1) contamination of hose connections. If e.g. fuel hoses are connected to one side, while the second side cannot yet be connected, there is a danger of dirt entering into the system. The free connection must in this case also be appropriately closed.

Notes and measures to be applied before starting work in the fuel system

- The fuel system must be closed. Visual examination for leaks / damage in the fuel system.
- Before starting work in the fuel system clean the complete engine and the engine compartment with the system still closed.
- The engine should be dry before work is started in the fuel system.

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- Blow drying with compressed air is only permitted while the fuel system is still closed.
- When using steam cleaning equipment cover control unit, cable plugs, all other electrical connections and the generator beforehand and do not expose these items to the direct steam jet.
- Electrical plug connections must be plugged in during jet cleaning.
- Remove loose parts (e.g. paint scales that may have come off during assembly work) with an industrial vacuum cleaner or any means of extraction.
- Vacuum cleaning equipment must generally be used for cleaning when the fuel system is open.
- Perform work on the fuel system only in a clean environment (no dust, no grinding or welding work). Avoid draughts (dust). The workshop floor must be cleaned at regular intervals. No brake or power test stand should be present or operated in the same room.
- Air movements, which could swirl up dust, such as brake repairs or starting of engines, must be strictly avoided.
- For work, such as disassembly and assembly of defective hydraulic components in the Common Rail System, it is strongly recommended to set up a separate workshop area, i.e. an area which is spatially separated from all other areas (general vehicle repairs, brake repairs).
- No general machine tools should be operated in this room.
- Periodic cleaning of this workshop area is obligatory, draughts, ventilation system and heating blowers must be minimized.
- Engine compartment area where dirt particles could come loose, should be covered with new, clean foil.
- Working means and tools must be cleaned before being used for work. Use only tools without damaged chromium coating, or tools without chromium coating.

Notes and measures to be applied during work in the fuel system

- Wear clean working clothes.
- Use only lint-free cleaning cloths for work in the fuel system.
- Remove loose parts (e.g. paint scales that may have come off during assembly work) with an industrial vacuum cleaner or any means of extraction. Vacuum cleaning equipment must generally be used for cleaning when the fuel system is open.
- Working means and tools must be cleaned before being used for work. Use only tools without damaged chromium coating, or tools without chromium coating.
- Do not use any previously used cleaning or testing fluids for cleaning.
- Compressed air should never be used for cleaning when the fuel system is open.
- Work on disassembled components must only be carried out at a specially furnished work place.
- When disassembling or assembling components you should not use any materials from which particles or fibres could flake off (cardboard, wood, towels).
- Dismantled parts must only be wiped off with clean, lint-free cloths if required. No dirt particles must be wiped into the components.
- Close openings on components and engine immediately with suitable plugs/caps.
- Plugs/caps must only be removed just before the installation.
- Keep plugs/caps in their original packaging, where they are protected against dust and dirt, dispose of after one time use.
- Take new parts out of their original packaging just before installation.
- Disassembled components must be stored in new, sealable bags or – if available – in the packaging material of the new components.
- Always use the original packaging material of the new part to return the disassembled old component.

Notes and measures concerning the workshop area

- For work, such as disassembly and assembly of defective hydraulic components in the Common Rail System, it is strongly recommended to set up a separate workshop area, i.e. an area which is spatially separated from all other areas (general vehicle repairs, brake repairs).
- The workshop floor must be sealed or tiled.
- No welding equipment, grinding machines, general machine tools, brake or power test benches must be operated in this room.
- Periodic cleaning of this workshop area is obligatory, draughts, ventilation system and heating blowers must be minimized.

Notes and measures for work place and tools in the workshop

- A special work place must be set up for work on disassembled components.
- Clean disassembly and assembly tools at regular intervals and keep these in a closed tool cabinet.

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- Remove loose parts (e.g. paint scales that may have come off during assembly work) with an industrial vacuum cleaner or any means of extraction.
- Working means and tools must be cleaned before being used for work. Use only tools without damaged chromium coating, or tools without chromium coating.

Fuel hoses

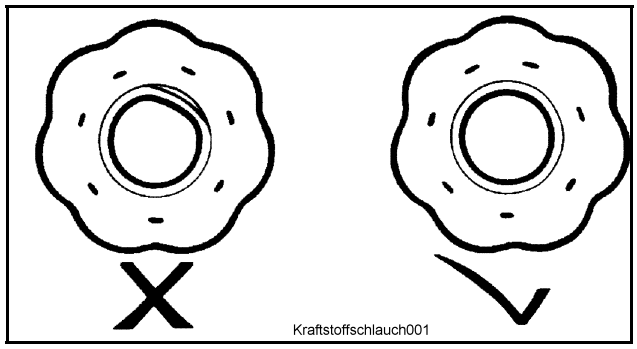


Fig. 2

⚠ Caution

All fuel hoses have two layers of material, a reinforced rubber coating outside and an internal Viton hose. If a fuel hose has come loose one must make absolutely sure that the internal Viton layer has not been separated from the reinforced outer layer. In case of a separation the hose needs to be replaced.

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Gaskets and mating surfaces

Leaking sealing faces can mostly be traced back to incorrect assembly of seals and gaskets.

- Before assembling a new seal or gasket make sure that the sealing surface is free of pitting, flutes, corrosion or other damage.
- Inappropriately stored or handled seals (e.g. hanging from hooks or nails) must under no circumstances be used.
- Assemble seals and gaskets only with sealing compound, grease or oil, if this is specifically specified in the repair instructions.
- If necessary remove any old sealing compound before assembling. For this purpose do not use any tools that could damage the sealing surfaces.
- Sealing compound must be applied thin and evenly on the corresponding surfaces; take care that the compound does not enter into oil galleries or blind threaded bores.
- Examine the contact faces for scratches and burrs, remove these with a fine file or an oilstone; take care that no grinding dust and dirt enters into tapped bores or enclosed components.
- Blow out lines, ducts and gaps with compressed air, replace any O-rings and seals that have been dislodged by the compressed air.

Assembly of radial seals

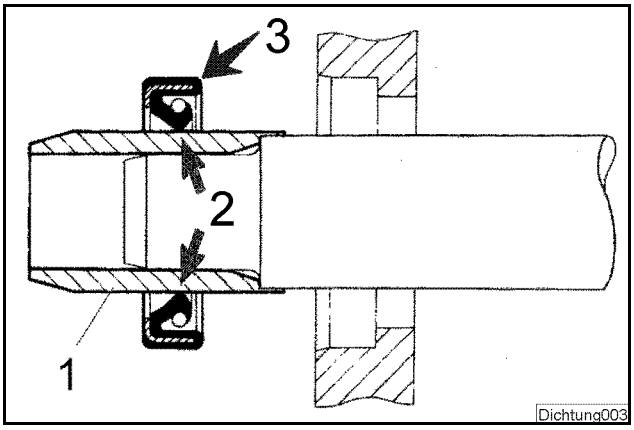


Fig. 3

- Lubricate the sealing lips (2) (Fig. 3) with clean grease; in case of double seals fill the space between the sealing lips with a generous amount of grease.
- Slide the seal over the shaft, with the lip facing towards the fluid to be sealed.

i Note

If possible, use an assembly sleeve (1 (Fig. 3)), ***to protect the lip from being damaged by sharp edges, threads or splines.*** *If no assembly sleeve is available, you should use a plastic tube or adhesive tape to prevent the sealing lip from being damaged.*

- Lubricate the outer rim (arrow 3 (Fig. 3)) of the seal and press it flat on the housing seat.

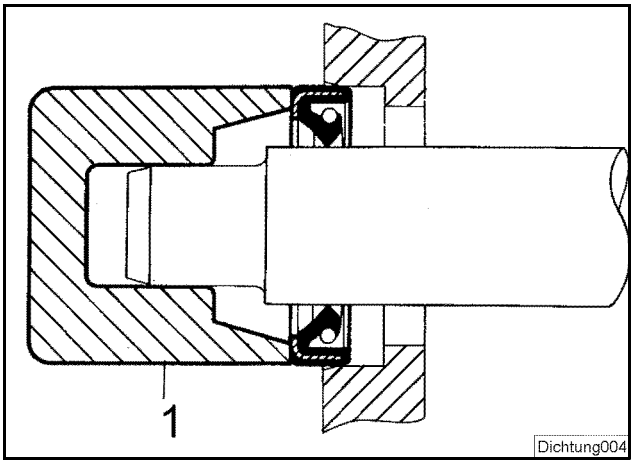


Fig. 4

- Press or knock the seal into the housing, until it is flush with the housing surface.

i Note

If possible, use a "bell" (1 (Fig. 4)), to make sure ***that the seal will not skew.*** *In some cases it may be advisable to assemble the seal into the housing first, before sliding it over the shaft. Under no circumstances should the full weight of the shaft rest on the seal.*

If you have no proper service tools at hand, use a suitable drift punch with a diameter which is about 0,4 mm smaller than the outer diameter of the seal. Use VERY LIGHT blows with the hammer if no press is available.

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Feather keys and keyways

⚠ **Caution**

Feather keys may only be reused if they are free of damage.

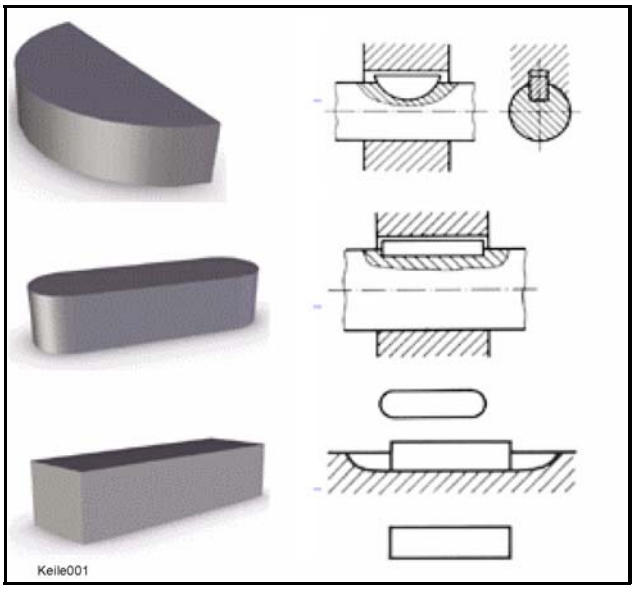


Fig. 5

- Clean and thoroughly examine the feather key.
- Deburr and thoroughly clean the edges of the keyway with a fine file before reassembling.

Ball and roller bearings

⚠ **Caution**

Ball and roller bearings may only be reused if they are free of damage and do not show any signs of wear.



Fig. 6

- If a ball or roller bearing of a bearing pair shows defects, both ball or roller bearings need to be replaced.
- Remove any lubricant residues from the ball or roller bearing to be examined by washing it with gasoline or any other appropriate degreasing agent. Ensure strict cleanliness.
- Check balls or rollers, running surfaces, outer faces of outer races and inner faces of inner races for visible damage. Replace the ball or roller bearing if necessary.
- Check the ball or roller bearing for clearance and resistance between the inner and outer races, replace if necessary.
- Lubricate the ball or roller bearing with the recommended type of grease before assembly or reassembly.
- On greased bearings (e.g. wheel bearings) fill the space between ball or roller bearing and outer seal with the recommended type of grease before assembling the seal.

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- Check shaft and bearing housing for discolouration or other signs of movement between ball or roller bearing and seats.
- Make sure that shaft and housing are free of burrs before assembling the ball or roller bearing.
- Always mark the individual parts of separable ball or roller bearings (e.g. taper roller bearings) to enable correct reassembling. Never assemble the rollers to an outer race that has already been used, replace the complete ball or roller bearing instead.

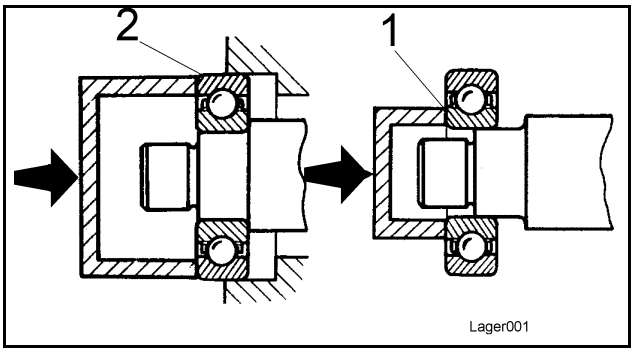


Fig. 7

⚠ Caution

When assembling the ball or roller bearing to the shaft load must only be applied to the inner race 1 (Fig. 7).

When fitting the bearing into the housing load must only be applied to the outer race (2).

Screws and nuts

Tightening torque

⚠ Caution

Tighten nuts or screws with the tightening torques specified in the following tables of tightening torques. Tightening torques deviating from the ones in the table are specially mentioned in the repair instructions.

Damaged screws must under no circumstances be used any longer. Recutting threads with thread cutters or taps adversely affects the strength and leak tightness of the screw joint. Damaged or corroded thread pitches can cause incorrect torque value readings.

Self-locking nuts must generally be replaced after disassembly.

The use of screws with too high strength can cause damage!

- Nut of a higher strength can generally be used instead of nuts of a lower strength classification.
- When checking or retightening screw joints to the specified tightening torque you should first relieve by a quarter turn and then tighten to the correct torque.
- Before tightening you should lightly oil the thread, in order to ensure low friction movement. **The same applies for self-locking nuts.**
- Make sure that no oil or grease will enter into blind tapped bores. The hydraulic power generated when turning in the screw could cause breakage of the effected part.

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Strength classes, metric screws

The strength classes (from 3.6 to 12.9) are specified for all strength classes from a nominal diameter of 5mm. The corresponding identification can be found where allowed for by the shape of the screw.

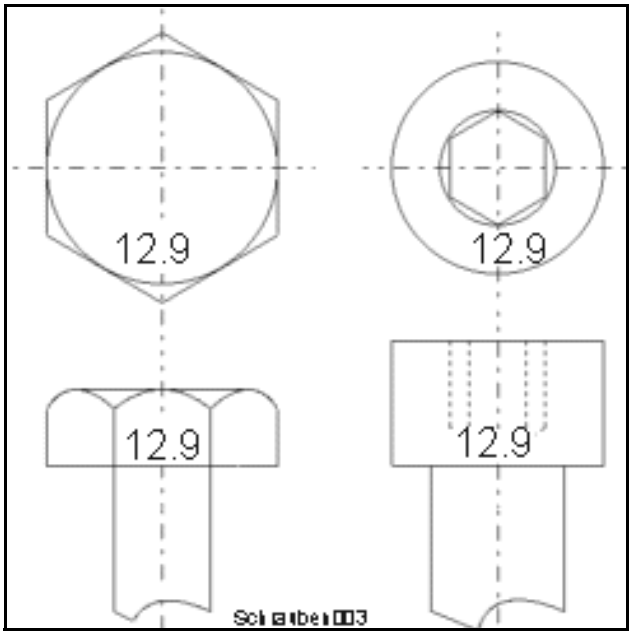


Fig. 8 Identification of screws

Example: A screw is identified with 12.9.

The first number corresponds with 1/100 of the nominal tensile strength (minimum tensile strength) in N/mm^2.

- The nominal tensile strength is 12 X 100 N/mm^2 = 1200 N/mm^2.

The second number specifies 10-times the ration between lower yield point and nominal tensile strength (yield point ratio).

i Note

When exceeding the lower yield point, the material will return to its original shape when being relieved (plastic deformation).

When exceeding the upper yield point the material will not restore its original shape after being relieved.

- The lower tensile strength is 9/10 X 1200 N/mm^2 = 1080 N/mm^2.

i Note

However, these values are by no means identical with the tightening torques, which are to be set on a torque wrench. The corresponding calculation requires a higher effort and, in the end, depends on the materials to be bolted together.

Strength classes of metric nuts

Nuts are differentiated by three load groups. Each load group has a special designation system for the strength class assigned, so that the load group can be clearly identified.

Nuts for screw joints with full load capability (4, 5, 6, 8, 10, 12)

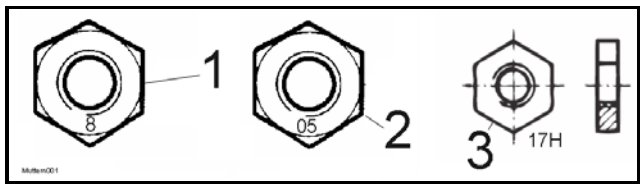


Fig. 9 Identification of nuts

In a connection with a screw, these nuts 1 (Fig. 9) must be able to bear the full pre-load at the yield point.

Nut height above 0.8 d (d = nominal dimension).

Strength class of nut	Strength class of associated screw
4	3.6, 4.6, 4.8
5	3.6, 4.6, 4.8 5.6, 5.8
6	6.8
8	8.8
9	9.8
10	10.8
12	12.8

Nuts for screw joints with limited load factor (04, 05)

The preceding "0" indicates that, due to their low height, nuts 2 (Fig. 9) in this group are only able to withstand the force of a screw to a limited extent.

Nut height below 0,8 d (d = nominal dimension).

Nuts for screw joints without specified load factor (11H, 14H, 17H, 22H)

This standard contains strength classes (hardness classes) for nuts 3 (Fig. 9), for which no load values can be specified, e.g. because of their shape and dimensions, but which can only be classified by their hardness.

Nut height below 0,5 d (d = nominal dimension).

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Identification in clock system

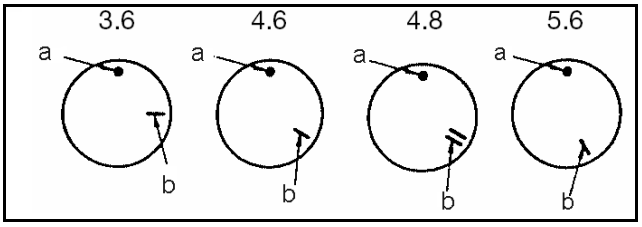


Fig. 10 Identification of nuts in clock system

For small nuts (Fig. 10) the clock system can be used for identification.

- The 12 o'clock position is identified by a dot or the manufacturer's symbol.
- The strength class is identified by a dash (b).

Identification of UNF-threads

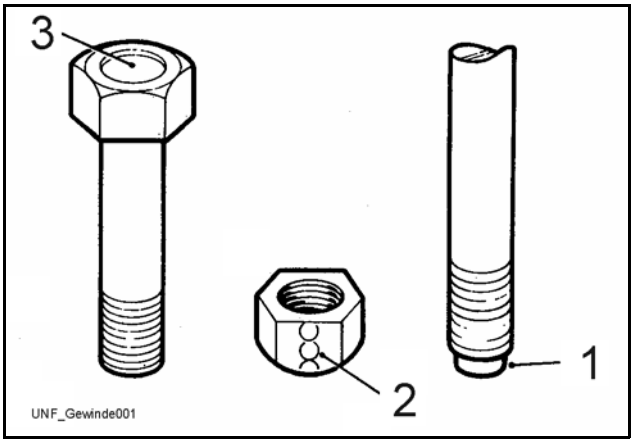


Fig. 11

Screws

The screw head is marked with a stamped in, round cavity 3 (Fig. 11).

Nuts

An uninterrupted series of stamped in circles parallel to the axis of the nut on a hexagon area (2).

Studs and brake rods

At the outmost end a short end of the component is reduced to its core diameter (1).

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Cotter pins

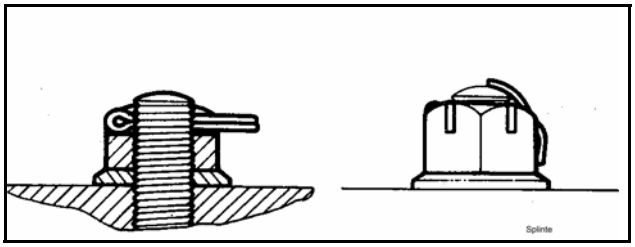


Fig. 12

In places where cotter pins are used, these must be reassembled. Cotter pins must generally be renewed after disassembly.

Cotter pins must be assembled as shown in the illustration, unless specified differently.

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The values specified in the table apply for screws:

- black oiled
- with surface protection A4C
- with surface protection DACROMET

i Note

DACROMET is a surface protection that mainly consists of zinc and aluminium in a chromium oxide matrix. DACROMETIZATION provides excellent corrosion protection for metal surfaces by applying a mineral coating with metallic-silver appearance.

Tightening torques for screws with metric unified thread[1]

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
M4	3	5	5
M5	6	9	10
M6	10	15	18
M8	25	35	45
M10	50	75	83
M12	88	123	147
M14	137	196	235
M16	211	300	358
M18	290	412	490
M20	412	578	696
M22	560	785	942
M24	711	1000	1200
M27	1050	1480	1774
M30	1420	2010	2400

1 Coefficient of friction μ tot. = 0,14

Tightening torques for screws with metric unified fine thread[1]

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
M8 x 1	26	37	48
M10 x 1.25	52	76	88
M12 x 1,25	98	137	126
M12 x 1.5	93	127	152
M14 x 1.5	152	216	255
M16 x 1.5	225	318	383
M18 x 1.5	324	466	554
M20 x 1.5	461	628	775
M22 x 1.5	618	863	1058
M24 x 2	780	1098	1294
M27 x2	1147	1578	1920
M30 x 2	1568	2254	2695

1 Coefficient of friction μ tot. = 0,14

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Tightening torques for screws treated with anti-seizure paste OKS 240[1] (copper paste)

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
M16	169	240	287
M16 x 1.5	180	255	307
M18	232	330	392
M18 x 1.5	260	373	444
M20	330	463	557
M20 x 1.5	369	502	620
M22	448	628	754
M22 x 1.5	495	691	847
M24	569	800	960
M24 x 2	624	879	1036
M27	840	1184	1520
M27 X 2	918	1263	1536
M30	1136	1608	1920
M30 x 2	1255	1804	2156
3/4“ - 10 UNC	276	388	464
3/4“ - 16 UNC	308	432	520

1 Anti-seizure paste (copper paste) is used for the assembly of screw connections, which are exposed to high temperatures and corrosive effects. Prevents seizure and corrosion.

Tightening torques for wheel nuts (fine thread) [1] [2]

Thread diameter	Tightening torques Nm
	10.9
M12x1.5	100
M14x1.5	150
M18x1.5	300 - 350
M20x1.5	400 - 500
M22x1.5	500 - 600

1 Coefficient of friction μ tot. = 0,14

2 These values result in a 90% utilization of the yield point

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The values specified in the table apply for screws:

- black oiled
- with surface protection A4C
- with surface protection DACROMET

i Note

The difference between Withworth and UNF/UNC threads is the fact that UNF and UNC threads have 60° flanks, as the metric ISO-thread, whereas Withworth has a flank of only 55°.

DACROMET is a surface protection that mainly consists of zinc and aluminium in a chromium oxide matrix. DACROMETIZATION provides excellent corrosion protection for metal surfaces by applying a mineral coating with metallic-silver appearance.

Tightening torques for screws with UNC thread, [1] UNC Unified Coarse Thread Series, American Unified Coarse Thread

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
1/4“ - 20	11	15	19
5/16“ - 18	23	32	39
3/8“ - 16	39	55	66
7/16“ - 14	62	87	105
1/2“ - 13	96	135	160
9/16“ - 12	140	200	235
5/8“ - 11	195	275	330
3/4“ - 10	345	485	580
7/8“ - 9	560	770	940
1“ - 8	850	1200	1450
1 1/8“ - 7	1200	1700	2000
1 1/4“ - 7	1700	2400	2900
1 3/8“ - 6	2200	3100	3700
1 1/2“ - 6	3000	4200	5100

1 Coefficient of friction μ tot. = 0,14

Tightening torques for screws with UNF thread, [1] UNF Unified National Fine Thread Series, American Unified Fine Thread

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
1/4“ - 28	13	18	22
5/16“ - 24	25	35	42
3/8“ - 24	45	63	76
7/16“ - 20	70	100	120
1/2“ - 20	110	155	185
9/16“ - 18	155	220	260
5/8“ - 18	220	310	370
3/4“ - 16	385	540	650
7/8“ -14	620	870	1050

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Tightening torques for screws with UNF thread, [1] UNF Unified National Fine Thread Series, American Unified Fine Thread

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
1“ - 12	930	1300	1600
1 1/8“ - 12	1350	1900	2300
1 1/4“ - 12	1900	2700	3200
1 3/8“ - 12	2600	3700	4400
1 1/2“ - 12	3300	4600	5600

1 Coefficient of friction μ tot. = 0,14

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2 Technical data

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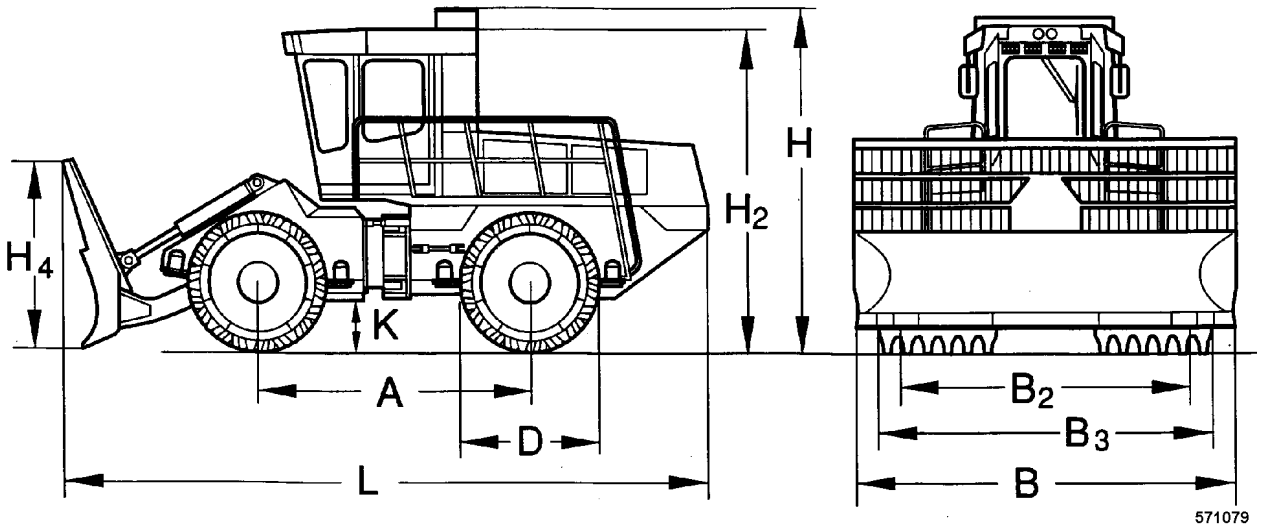


Fig. 13

Dimensions in mm	A	B	B_2	B_3	D	H	H_2	H_4	K	L
BC 672 RB-2	3500	3800	3550	3775	1660	4120	3820	1950	600	8120
BC 772 RB-2	3500	3800	3550	3775	1660	4120	3820	1950	600	8120

1		**BC 672 RB-2**	**BC 772 RB-2**
Weights			
Operating weight (CECE)	kg	32100	36500
Front axle load (CECE)	kg	15300	17400
Rear axle load (CECE)	kg	16800	19100
Travel characteristics			
Travel speed range I (forward/reverse)	km/h	0 - 4,5	0 - 4,5
Travel speed range II (forward/reverse)	km/h	0 - 12	0 - 12
Max. gradability (depending on soil)	%	100	100
Engine			
Engine manufacturer		Deutz	Deutz
Type		TCD 2015 V06	TCD 2015 V06
Cooling		Water	Water
Number of cylinders		6	6
Rated power ISO 9249	kW	330	330
Rated power acc. to SAE J 1349	hp	442	442
Rated speed	rpm	2100	2100
Electrical equipment	V	24	24
Drive system		hydrostatic	hydrostatic
Driven compactor wheels		4	4
Compactor wheels			
Width, front	mm	1350	1350
Width, rear	mm	1125	1125
Number of teeth, front		60	60
Number of teeth, rear		50	50
Brake			
Service brake		hydrostatic	hydrostatic

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1		BC 672 RB-2	BC 772 RB-2
Parking brake		mechanical	mechanical
Emergency brake		hydro-mechanical	hydro-mechanical
Steering			
Type of steering		Oscill.-articul.	Oscill.-articul.
Steering operation		hydraulic	hydraulic
Steering angle	± °	40	40
Oscillation angle	± °	15	15
Inner track radius	mm	3090	3090
Dozer blade			
Height adjustment above ground level	mm	1200	1200
Height adjustment below ground level	mm	120	120
Filling capacities			
Fuel (diesel)	l	500	500
Engine oil	l	36	36
Coolant	l	approx. 50	approx. 50
Hydraulic oil	l	350	350

1 Subject to technical alterations.

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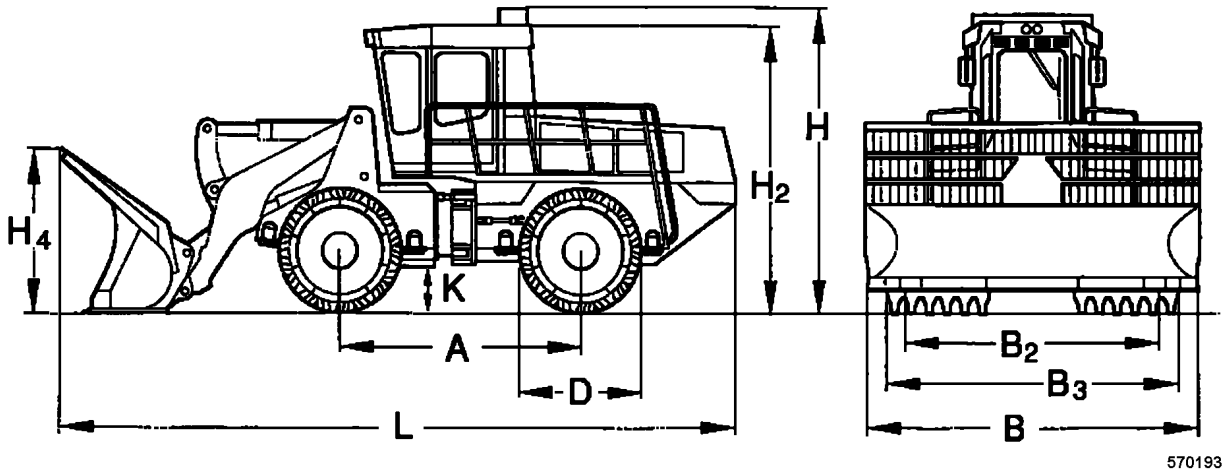


Fig. 14

Dimensions in mm	A	B	B_2	B_3	D	H	H_2	H_4	K	L
BC 772 RS-2	3875	3800	3550	3775	1660	4120	3820	1800	600	9275

1		**BC 772 RS-2**
Weights		
Operating weight (CECE)	kg	37300
Front axle load (CECE)	kg	20800
Rear axle load (CECE)	kg	16500
Travel characteristics		
Travel speed range I (forward/reverse)	km/h	0 - 4,5
Travel speed range II (forward/reverse)	km/h	0 - 12
Max. gradability (depending on soil)	%	75
Drive		
Engine manufacturer		Deutz
Type		TCD 2015 V06
Cooling		Water
Number of cylinders		6
Rated power ISO 9249	kW	330
Rated power acc. to SAE J 1349	hp	442
Rated speed	rpm	2100
Electrical equipment	V	24
Drive system		hydrostatic
Driven compactor wheels		4
Compactor wheels		
Width, front	mm	1350
Width, rear	mm	1125
Number of teeth, front		60
Number of teeth, rear		50

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[1]		BC 772 RS-2
Brake		
Service brake		hydrostatic
Parking brake		mechanical
Emergency brake		hydro-mechanical
Steering		
Type of steering		Oscill.-articul.
Steering operation		hydraulic
Steering angle	± °	30
Oscillation angle	± °	15
Inner track radius	mm	3750
Dozer blade		
Height adjustment above ground level	mm	5350
Height adjustment below ground level	mm	50
Filling capacities		
Fuel (diesel)	l	750
Engine oil	l	36
Hydraulic oil	l	350
Coolant	l	approx. 50

1 Subject to technical alterations.

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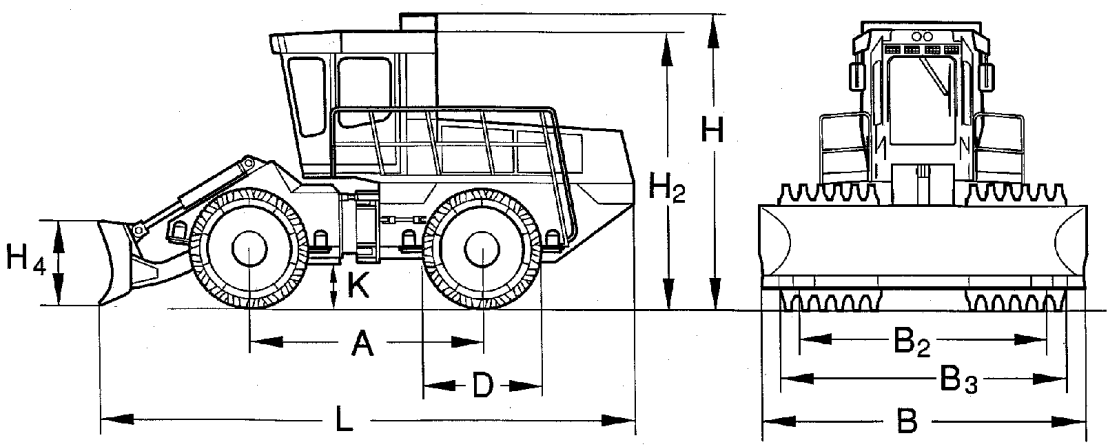


Fig. 15

Dimensions in mm	A	B	B_2	B_3	D	H	H_2	H_4	K	L
BC 672 EB-2	3500	3800	3550	3425	1580	4120	3820	1050	600	8120
BC 772 EB-2	3500	3800	3550	3775	1580	4120	3820	1050	600	8120

1		**BC 672 EB-2**	**BC 772 EB-2**
Weights			
Operating weight (CECE)	kg	28900	35300
Front axle load (CECE)	kg	14100	17300
Rear axle load (CECE)	kg	14800	18000
Travel characteristics			
Travel speed range I (forward/reverse)	km/h	0 - 4,5	0 - 4,5
Travel speed range II (forward/reverse)	km/h	0 - 12	0 - 12
Max. gradability (depending on soil)	%	100	100
Engine			
Engine manufacturer		Deutz	Deutz
Type		TCD 2015 V06	TCD 2015 V06
Cooling		Water	Water
Number of cylinders		6	6
Rated power ISO 9249	kW	330	330
Rated power acc. to SAE J 1349	hp	442	442
Rated speed	rpm	2100	2100
Electrical equipment	V	24	24
Drive system		hydrostatic	hydrostatic
Driven compactor wheels		4	4
Compactor wheels			
Width, front	mm	1175	1350
Width, rear	mm	1125	1125
Number of teeth, front		50	60
Number of teeth, rear		50	50
Brake			

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1		BC 672 EB-2	BC 772 EB-2
Service brake		hydrostatic	hydrostatic
Parking brake		mechanical	mechanical
Emergency brake		hydro-mechanical	hydro-mechanical
Steering			
Type of steering		Oscill.-articul.	Oscill.-articul.
Steering operation		hydraulic	hydraulic
Steering angle	± °	40	40
Oscillation angle	± °	15	15
Inner track radius	mm	3265	3090
Dozer blade			
Height adjustment above ground level	mm	1200	1200
Height adjustment below ground level	mm	120	120
Filling capacities			
Fuel (diesel)	l	500	500
Engine oil	l	36	36
Coolant	l	approx. 50	approx. 50
Hydraulic oil	l	350	350

1 Subject to technical alterations, technical data may deviate for optional equipment

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Additional engine data

Combustion principle		4-stroke diesel
Low idle speed	rpm	800 - 850
High idle speed	rpm	2100 - 2160
Specific fuel consumption	g/kWh	225
Valve clearance intake	mm	0,25
Valve clearance exhaust	mm	0,3
Injection valves opening pressure	bar	Pump/nozzle
Starter power	kW	6,6

Transfer box

Reduction ratio of travel pump drive		1,12
Reduction ratio of working pump drive		1,12
Pressure setting PRV coolant circuit (high idle)	bar	25

Travel pump

Manufacturer		Bosch-Rexroth
Type front		A4 VG 71 DA
Type rear		A4 VG 71 DG
System		Axial piston/swash plate
Max. displacement	cm^3/rev.	71
Max. flow capacity	l/min	156,2
High pressure limitation	bar	480 - 20
Pressure override valve	bar	420 ± 10
Charge pressure, high idle	bar	30 ± 2
Pilot pressure control start at engine speed		6 bar at 1025 rpm
_Absolute pressure at control start		50 bar at 1025 rpm
__Corresponds with pump speed	rpm	1150 ± 50
Pilot pressure at control end		14 bar at 1700 rpm
_Absolute pressure at control end		400 bar at 1700 rpm

Travel motors

Manufacturer		Bosch-Rexroth
Type		A6VM 160 HA 2T
Quantity		4
System		Axial piston – bent axle
Displacement (stage 1)	cm^3/rev.	160
Displacement (stage 2)	cm^3/rev.	50
Control start change-over	bar	280 ± 5
Control end change-over	bar	380 ± 10
Perm. leak oil rate	l/min	7

Wheel drive

Manufacturer		Bosch-Rexroth
Type		GFT 110 R3
Reduction ratio		83

Wheel drive

from serial number	101 570 591 019 BC 672 RB-2	
Manufacturer		Bonfiglioli
Type		716 C 3B

Steering/working pump

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Type		A10VO 71 DFR
System		Axial piston/swash plate
Max. displacement	cm^3/rev.	71
Max. dozer plate pressure	bar	230 + 10
Max. steering pressure	bar	200 + 10
Stand-by pressure	bar	30 ± 2

Valve block, working hydraulics

Type		2M6-22
Max. steering pressure	bar	230 + 10
Max. dozer plate pressure	bar	230 + 10
LS-pressure limitation	bar	210 + 10
Tank pre-loading valve	bar	18
Charge circuit filter	micron	12
Return flow filter	micron	80

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The following noise and vibration values according to the EC-directive for machines, edition (98/37/EEC) and the noise emission regulation 2000/14/EC were measured at nominal engine speed and with the vibration switched on. The machine was standing on an elastic base.

During operation these values may vary because of the existing operating conditions.

Noise value

The sound level according to enclosure 1, paragraph 1.7.4. f of the EC-machine regulation is

sound pressure level at the work place of the operator (with cabin):

L_{pA} =71,4 dB(A)

The nose emission value for the machine according to the noise emission regulation 2000/14/EG is

guaranteed sound capacity level of the machine:

L_{WA} = 110 dB(A)

L_{WA} = 111 dB(A), BC 772 RS-2

These sound values were determined according to ISO 3744 for the sound capacity level (L_{wA}) and ISO 11204 for sound pressure level (L_{pA}) at the place of the operator.

Vibration value

The vibration values according to enclosure 1, paragraph 3. 6. 3. a of the EC-machine regulation are:

Vibration of the entire body (driver's seat)

The weighted effective acceleration value determined according to ISO 7096 is <= 0.5 m/sec^2.

Hand-arm vibration values

The weighted effective acceleration value determined according to EN 500/ISO is <= 2.5 m/sec^2.

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3 Maintenance

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3.1 General notes on maintenance

When performing maintenance work always comply with the appropriate safety regulations.

Thorough maintenance of the machine guarantees far longer safe functioning of the machine and prolongs the lifetime of important components. The effort needed for this work is only little compared with the problems that may arise when not observing this rule.

The terms right/left correspond with travel direction forward.

- Always clean machine and engine thoroughly before starting maintenance work.
- For maintenance work stand the machine on level ground.
- Always remove the main battery switch for all maintenance work.
- Perform maintenance work only with the motor switched off.
- Relieve hydraulic pressures before working on hydraulic lines.
- Before working on electric parts of the machine disconnect the battery and cover it with insulation material.
- When working in the area of the articulated joint attach the articulation lock (transport lock).

Environment

During maintenance work catch all oils and fuels and do not let them seep into the ground or into the sewage system. Dispose of oils and fuels environmentally.

Keep used filters in a separate waste container and dispose of environmentally.

Catch biodegradable oils separately.

Notes on the fuel system

The lifetime of the diesel engine depends to a great extent on the cleanliness of the fuel.

- Keep fuel free of contaminants and water, since this will damage the injection elements of the engine.
- Drums with inside zinc lining are not suitable to store fuel.
- When choosing the storage place for fuel make sure that spilled fuel will not harm the environment.
- Do not let the hose stir up the slurry at the bottom of the drum.
- The fuel drum must rest for a longer period of time before drawing off fuel.
- The rest in the drum is not suitable for the engine and should only be used for cleaning purposes.

Notes on the performance of the engine

On diesel engines both combustion air and fuel injection quantities are thoroughly adapted to each other and determine power, temperature level and exhaust gas quality of the engine.

If your engine has to work permanently in "thin air" (at higher altitudes) and under full load, you should consult the customer service of BOMAG or the customer service of the engine manufacturer.

Notes on the cooling system

Prepare and check coolant with highest care, since otherwise the engine may be damaged by corrosion, cavitation and freezing.

Coolant is prepared by adding an ethylene-glycol based anti-freeze agent with corrosion inhibiting properties to the cooling water.

Mixing with cooling system protection agent is necessary in all climatic zones. It prevents corrosion, lowers the freezing point and raises the boiling point of the coolant.

Notes on the hydraulic system

During maintenance work on the hydraulic system cleanliness is of major importance. Make sure that no dirt or other contaminating substances can enter into the system. Small particles can produce flutes in valves, cause pumps to seize, clog nozzles and pilot bores, thereby making expensive repairs inevitable.

- If, during the daily inspection of the oil level the hydraulic oil level is found to have dropped, check all lines, hoses and components for leaks.
- Seal external leaks immediately. If necessary inform the responsible customer service.
- Do not store drums with hydraulic oil outdoors, or at least under a cover. Water can be drawn in through the bunghole when the weather changes.
- Always use the filling and filtering unit (BOMAG part-no. 007 610 01) to fill the hydraulic system. This unit is fitted with a fine filter to clean the hydraulic oil, thereby prolonging the lifetime of the filter.
- Clean fittings, filler covers and the area around such parts before disassembly to avoid entering of dirt.
- Do not leave the tank opening unnecessarily open, but cover it so that nothing can fall in.

Welding work on the refuse compactor

- Disconnect the main battery switch
- Pull the plugs off all control units, engine control unit (EMR), travel control (ESX) and additional control (DIOS).

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3.2 Fuels and lubricants

Engine oil

Quality

For use in DEUTZ engines the lubrication oils are classified in DEUTZ Lubrication Oil Quality Classes (DQC).

Use only oils complying with DQC III-05 or DQC IV-05.

The list of approved lubrication oils is also available in the Internet under the following address:

www.deutz.com	
de	>>SERVICE >> Fuels and lubricants and diagnostics >> DeutzQualityClass >> DQC-Release list
en	>>SERVICE >> Fuels and lubricants and diagnostics >> DeutzQualityClass >>DQC-release list

Consult your local service station if in doubt.

- Use winter grade engine oil for winter operation!

Oil viscosity

Since lubrication oil changes its viscosity with the temperature, the ambient temperature at the operating location of the engine is of utmost importance when choosing the viscosity class (SAE-class) .

Too high viscosity can cause starting difficulties, too low ´viscosity can jeopardize the lubrication effect and result in a high lubrication oil consumption.

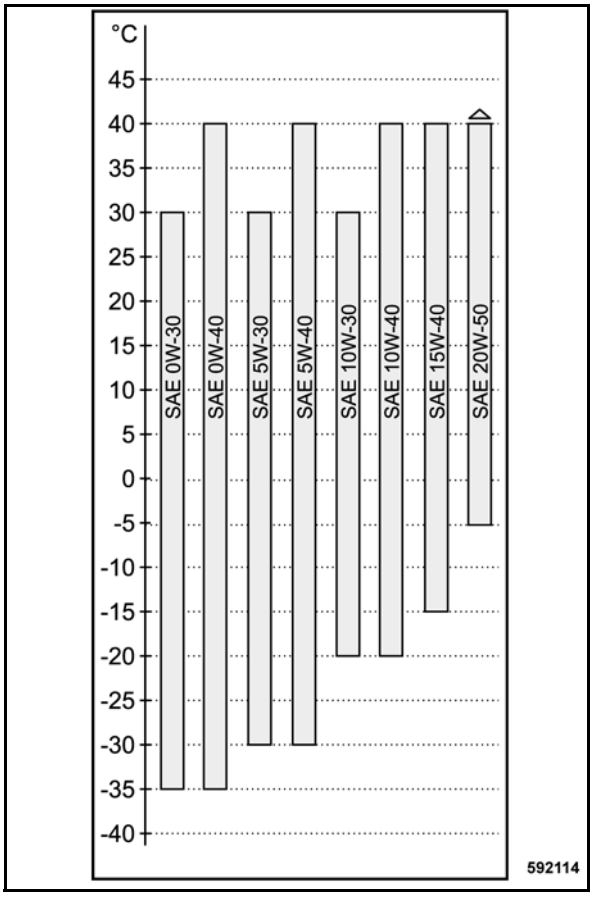


Fig. 16

Optimal operating conditions can be achieved by using the oil viscosity chart (Fig. 16) as a reference.

At ambient temperatures below -40 °C the lubrication oil must be pre-heated (e.g. by parking the machine indoors).

The viscosity is classified acc. to SAE. Multi-purpose oils should generally be used.

Oil change intervals

The longest permissible time a lubrication oil should remain in an engine is 1 year. If the following oil change intervals are not reached over a period of 1 year, the oil change should be performed at least once per year, irrespective of the operating hours reached.

DQC III, DQC IV = 500 operating hours

⚠ Caution

When using fuels with a sulphur content of more than 0,5% to 1% or under permanent ambient temperatures below -10°C and when using biodegradable diesel fuel the oil change intervals must be halved.

Fuels

You should only use commercially available brand diesel fuel with a sulphur content of less than 0.5% and ensure strict cleanliness when filling in. A higher

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sulphur content has a negative effect on the oil change intervals.

The fuel level should always be topped up in due time so that the fuel tank is never run dry, as otherwise filter and injection lines need to be bled.

Quality

The following fuel specifications are permitted:

- EN 590
- DIN 51628
- ASTM D975 Grade-No. 1-D and 2-D.
- JIS K 2204 Grade Fuel 1 and Grade Fuel 2 with lubrication properties acc. to EN 590

Winter fuel

For winter operation use only winter diesel fuel, to avoid clogging because of paraffin separation. At very low temperatures disturbing paraffin separation can also be expected when using winter diesel fuel.

In most cases a sufficient cold resistance can also be achieved by adding flow enhancing fuel additives. Consult the engine manufacturer.

Coolant

For fluid cooled engines the cooling fluid must be prepared by admixing a cooling system protection agent to the fresh water and should be checked within the specified maintenance intervals.

This prevents damage caused by corrosion, cavitation, freezing and overheating.

Fresh water quality

The correct quality of water is highly important when preparing coolant. Clear and clean water within the boundaries of the following analysis values should generally be used.

Fresh water analysis values	
pH-value at 20 °C	6.5 - 8.5
Chloride ion content (mg/l) (ppm)	max. 100
Sulphate ion content (mg/l) (ppm)	max. 100
Total hardness [°dGH]	3 - 12
corresponds with a potash ion content (mmol/l) of	0.54 - 3.56
Carbon hardness proportion of the total hardness (°d)	min. 3
corresponds with a content of $CaCO_3$ (mg/l) (ppm)	min. 53.4

Information concerning the water quality can be obtained from the waterworks.

If the fresh water analysis values are unknown, these must be determined with the help of a water analysis.

If the values of the analysis deviate, the water must be treated accordingly.

- pH-value too low
  Adding of caustic lye of soda or caustic potash solution.
- Total hardness or chlorides and/or sulphates too high:
  Mixing with dehardened water (e.g. distilled water).
- Total hardness or carbonate hardness too low:
  Mixing with hardened water (harder water is in most cases available in the form of drinking water).

⚠ Caution

Another analysis must be made after the fresh water has been prepared.

Cooling system protection agent

As a protection against frost, corrosion and boiling point anti-freeze agents must be used under any climatic conditions.

Coolant for fluid cooled engines is prepared by adding an ethylene-glycol based anti-freeze agent with corrosion inhibiting properties to the cooling water.

We therefore highly recommend our BOMAG cooling system protection agent (BOMAG part-no. 009 940 08)..

If our cooling system protection agent is not available for any important reasons, you may, in exceptional cases, use products that have been approved by the engine manufacturer.

The list of approved cooling system protection agents can be found in the internet under www.deutz.com >>SERVICE >> Fuels and lubricants and diagnostics >> Collig system protection >>Technical circular Cooling System Protection Agents.

Products of the same product group (see Deutz Technical Circular Cooling System Protection Agents) can be mixed with each other.

The BOMAG cooling system protection agent corresponds with product group A.

⚠ Caution

Do not mix different coolants and additives of any other kind.

Before changing the product you must clean the entire cooling system.

Consult your local service station if in doubt.

To ensure proper corrosion protection you must use the cooling system protection agent all year around, whereby the following concentration must not be fallen short of or exceeded.

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Mixing ratio		
Cooling system protection agent	**Fresh water**	**Cold protection down to**
min. 35%	65%	-22 °C
40%	60%	-28 °C
max. 45%	55%	-35 °C

⚠ Caution

A proportion of more than 45% of cooling system protection agent causes a drop in cooling power.

The use of corrosion protection oils as cooling system protection agents is not permitted.

i Note

When working at temperature below -35 °C you should consult our local service representative.

Environment

Coolant must be disposed of environmentally.

Mineral oil based hydraulic oil

The hydraulic system is operated with hydraulic oil HV 46 (ISO) with a kinematic viscosity of 46 mm^2/s at 40 °C. For topping up or for oil changes use only high-quality hydraulic oil, type HVLP according to DIN 51524, part 3, or hydraulic oils type HV according to ISO 6743/3. The viscosity index (VI) should be at least 150 (observe information of manufacturer).

Bio-degradable hydraulic oil

The hydraulic system can also be operated with a synthetic ester based biodegradable hydraulic oil.

The biologically quickly degradable hydraulic oil Panolin HLP Synth.46 meets all demands of a mineral oil based hydraulic oil according to DIN 51524.

In hydraulic systems filled with Panolin HLP Synth.46 always use the same oil to top up.

When changing from mineral oil based hydraulic oil to an ester based biologically degradable oil, you should consult the lubrication oil service of the oil manufacturer for details.

⚠ Caution

Check the filter more frequently after this change.

Perform regular oil analyses for content of water and mineral oil.

Replace the hydraulic oil filter element every 500 operating hours.

Gear oil

Quality

For the gearboxes use only ,ulti-purpose gear oils ISO VG 220 of API-GL5-class with a minimum viscosity of 20 mm^2/s at 100 °C. We recommend BOMAG SAE 80W-140, TN 00992507.

This is a hypoid lubricant of highest quality class for extremely loaded transmissions.

The additives in this oil ensure low wear lubrication under all operating conditions.

Lubrication grease

For lubrication purposes use an EP-high pressure grease, lithium saponified (penetration 2), acc. to DIN 51502 KP 2G.

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3.3 Table of fuels and lubricants

Assembly	Fuel or lubricant		Quantity
	Summer	Winter	Attention Observe the level marks
Engine			
- Engine oil	DQC III or IV SAE 10W-40 (-20 °C to +40 °C) SAE 10W/40 (-15 °C to +40 °C) SAE 5W-40 (-30 °C to +40 °C) SAE 5W-30 (-30 °C to +30 °C)		approx. 36 litres
- Fuel	Diesel	Winter diesel fuel	approx. 500 litres
- Coolant	Mixture of water and anti-freeze agent (see "Fuels and Lubricants - Colant")		approx. 50 litres
Hydraulic system	Hydraulic oil (ISO), HV46, kinem. Viscosity 46 mm^2/s at 40 °C with viscosity index (VI) >150 or biodegradable ester based hydraulic oil		approx. 350 litres
Transfer box	Gear oil SAE 80W-140, API GL-5		approx. 4.5 litres
Travel gear	Gear oil SAE 80W-140, API GL-5 Gear oil SAE 80W-140, API GL-5		approx. 7,7 litres each (Bonfiglioli) approx. 6,5 Liter each (L + S)
Central lubrication system	High pressure grease (lithium saponified)		approx. 2.0 kg, automatic lubrication
Bucket	High pressure grease (lithium saponified)		as required
Air conditioning system	Refrigerant R134a		approx. 1850 g
Cabin heater (diesel) - Oil bath air filter	SAE 15W/40 (above 0 °C)	SAE 10W/30 (down to approx. -10 °C) SAE 5W/30 (down to approx. -30 °C)	as required

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3.4 Running-in instructions

The following service work must be performed when taking new machines into operation.

⚠ Caution

Up to approx. 250 operating hours check the engine oil level twice every day.

Depending on the load the engine is subjected to, the oil consumption will drop to the normal level after approx. 100 to 250 operating hours.

After a running time of 15 minutes retighten the V-belts for generator and air conditioning compressor.

Maintenance after 50 operating hours

- Changing engine oil and oil filter
- Change the oil in the drive gears.
- Retighten bolted connections on intake and exhaust tubes, oil sump and engine mounts.
- Retighten all bolted connections on the machine.

Maintenance after 500 operating hours

- Change the oil in splitter gear and oil filter.
- Change the oil in the drive gears.

Special intervals

- Switch the air conditioning on every month for about 10 minutes.

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3.5 Maintenance table

No.	Maintenance work	Comment	every 10 operating hours, daily	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 4000 oper. hours	every 6000 oper. hours	as required
5.6	Checking the engine oil level	Dipstick mark	X						
5.7	Check the fuel level	Instrument cluster	X						
5.8	Check the hydraulic oil level	Inspection glass	X						
5.9	Check the coolant level	Instrument cluster	X						
5.10	Check the oil level in the transfer box	Inspection glass	X						
5.11	Visual inspection of the machine for damage and leaks		X						
5.12	Lubricate joints and bearings on the bucket (RS).		X						
5.13	Change engine oil and oil filter[1]	min. 1x per year see foot note		X					
5.14	Check, clean the water separator	when the "water in fuel" warning light lights up		X					
5.15	Service the generator V-belt			X					
5.16	Check the V-belt for the air conditioning compressor			X					
5.17	Service the fan V-belt			X					
5.18	Battery service, checking the main battery switch	pole grease		X					
5.19	Check the engine mounts			X					
5.20	Servicing the air conditioning			X					
5.21	Check the condition of radiator, intercooler and hydraulic oil cooler, clean, clean the engine	also if the engine temperature or hydraulic oil temperature warning lights light up		X					
5.22	Check the fastening of the scrapers			X					
5.23	Check the oil level in the travel gear			X					
5.24	Check the central lubrication system, fill up			X					

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No.	Maintenance work	Comment	every 10 operating hours, daily	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 4000 oper. hours	every 6000 oper. hours	as required
5.25	Replace the fresh air and circulation air filters			X					
5.26	Check, adjust the valve clearance	Intake: 0.25 mm Exhaust: 0.30 mm			X				
5.27	Replace the fuel filter cartridges				X				
5.28	Replacing the fuel pre-filter cartridge, bleed the fuel system				X				
5.29	Check the anti-freeze concentration and the condition of the coolant				X				
5.30	Intercooler, draining off oil/condensation water	min. 1x per year			X				
5.31	Check fastening of engine/turbo charger/combustion air hoses				X				
5.32	Oil change in travel gear[2]	see foot note			X				
5.33	Replace the fuel filter for the cabin heater (diesel)				X				
5.34	Check, clean the oil bath air filter for the cabin heater				X				
5.35	Change the hydraulic oil fine filter[3]	see foot note			X				
5.36	Change hydraulic oil and breather filter **	at least every 2 years see foot note				X			
5.37	Change the coolant					X			
5.38	Change oil and filter in the transfer box[4]	see foot note				X			
5.39	Check condition of oscillating articulated joint					X			
5.40	Change the injection valves	only by authorized service personnel					X		
5.41	Change the crankcase ventilation valve							X	
5.42	Replace the coolant pump	only by authorized service personnel						X	
5.43	Replace the pressure retaining valve on the injection pump	only by authorized service personnel						X	

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No.	Maintenance work	Comment	every 10 operating hours, daily	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 4000 oper. hours	every 6000 oper. hours	as required
5.44	Replace the glow plugs	only by authorized service personnel						X	
5.45	Clean, change the dry air filter cartridge	when the air filter warning light lights up min. 1x per year							X
5.46	Clean the condenser								X
5.47	Adjust scrapers and edge cutters								X
5.48	Replace the wheel caps								X
5.49	Check the condition of the cutting blades, replace the cutting blades if necessary								X
5.50	Fill the provision tank for the windscreen washer system								X
5.51	Drain off dirty fluids from front and rear frame								X
5.52	Tighten all bolted connections								X
5.53	Conservation								X

1 Running-in instructions: after 50 operating hours change the oil; oil change intervals depend on fuel quality (sulphur content); with a fuel consumption of > 50 l/h the oil must be changed every 250 operating hours
2 Running-in instructions: oil change after 50, 500 and 1000 operating hours, then every 1000 operating hours
3 also after repairs in the hydraulic system.
4 oil change after 500 and 2000 operating hours, then every 2000 operating hours

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4 Electrics

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4.1 Understanding circuit diagrams

Wiring diagrams are graphical representations of circuitry conditions, related to the electrical system. They do not contain any information about the actual type of wiring, they only serve the purpose of visualizing the circuitry logics.

The wiring diagram is indispensable for effective and systematic trouble shooting in the vehicle wiring system. This plan provides the following information:

- Number and type of individual elements in the examined electric circuit, such as plug connectors, fuses, switches, consumers, relays, ...
- The sequence in which current flows through the individual elements in the electric circuit.
- Connections between the examined, faulty electric circuit and other circuits in the vehicle wiring system.
- Pin assignment of plug-and-socket connections.

Structure

- Table of contents (Fig. 17)
- Function groups (Fig. 18)
- List of components (Fig. 20)

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Table of contents (Fig. 17)

The table of contents lists all function groups.

Standardverkabelung: dicke Linien — Platinenverdrahtung: dünne Linien
standard wireing: thick lines — connection on printed circuit board: thin lines

Inhaltsverzeichnis:
table of contents:

Blatt Nr.: sheet no.:	Zeichnungsnummer drawing - no.	Funktionsgruppe	function unit
001		Stromlaufplan	curcuit diagram
002		Versorgung	supply
003		Starten	starting unit
004		Überwachung	monitoring unit
006		Bremse	brake
007		Vibration	vibration
008	XXX XX	Warneinrichtungen	warning equipment
013		Arbeitsbeleuchtung StVZO	working head lights (road traffic)
014		Blinkbegrenzung	illumination
015		Kabine	cab
016		Heizung	heating unit
101		Bauteilliste	component listing
201		Kontrollmodul	monitoring board

1 2 3 4 5 6 7 8 9 10

Datum: Name: | Stromlaufplan circuit diagram | E0001 | Seite: page: von: 001 from: 001 | Ers.f.: Replaces: | Blatt Nr.: sheet no.: 001

Fig. 17 Table of contents

Example:

Function group "Warning systems“, drawing number XXX XX can be found on page no. 8.

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Function groups (Fig. 18)

On the individual pages the electric circuits are combined to function groups.

Arrangement of current paths

The individual current paths must be read as follows:

- From top (plus potential) to bottom (minus potential).
- From left to right.
- From function group to function group.
- Via cross references for potentials and relays.

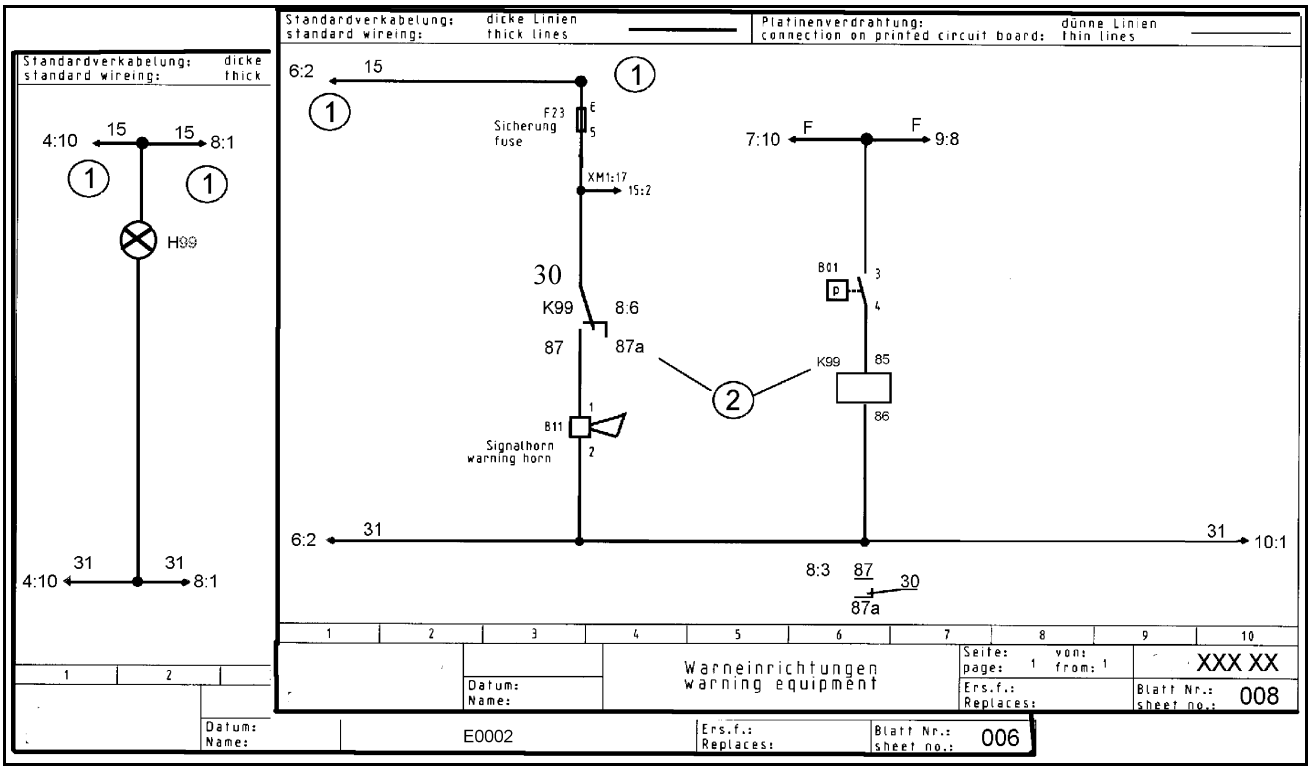


Fig. 18 Function groups

Potential cross references

Potential cross references serve the purpose of tracking signals, which are transmitted from one function group to another.

Example:

Potential "15" on page no. 6 is continued to the left on page no. 4 in current path "10" and to the right on page no. 8 in current path "1“.

Relay cross reference

Relay cross references serve the tracking of signals, which need to be tracked for components with outgoing contacts.

A mimic diagram with information about the contact types of a relay and their positions in the wiring diagram is additionally attached to the bottom of each contactor coil.

Example:

The coil of relay (K99) is located on page no. 8 in current path "6".

The mimic diagram under the relay informs that a change-over switch with contact types 30, 87 and 87a is triggered.

The changeover contact can be found on page no. 8 in current path "3".

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Current paths

The pages of a circuit diagram are sub-divided into current paths (Fig. 19) (0 ..... 20).

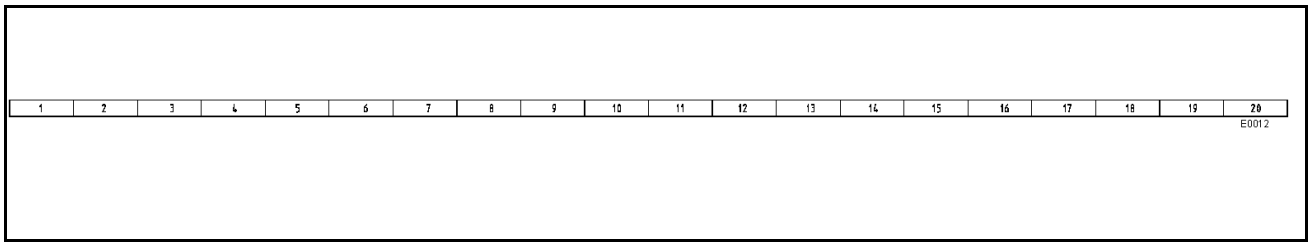
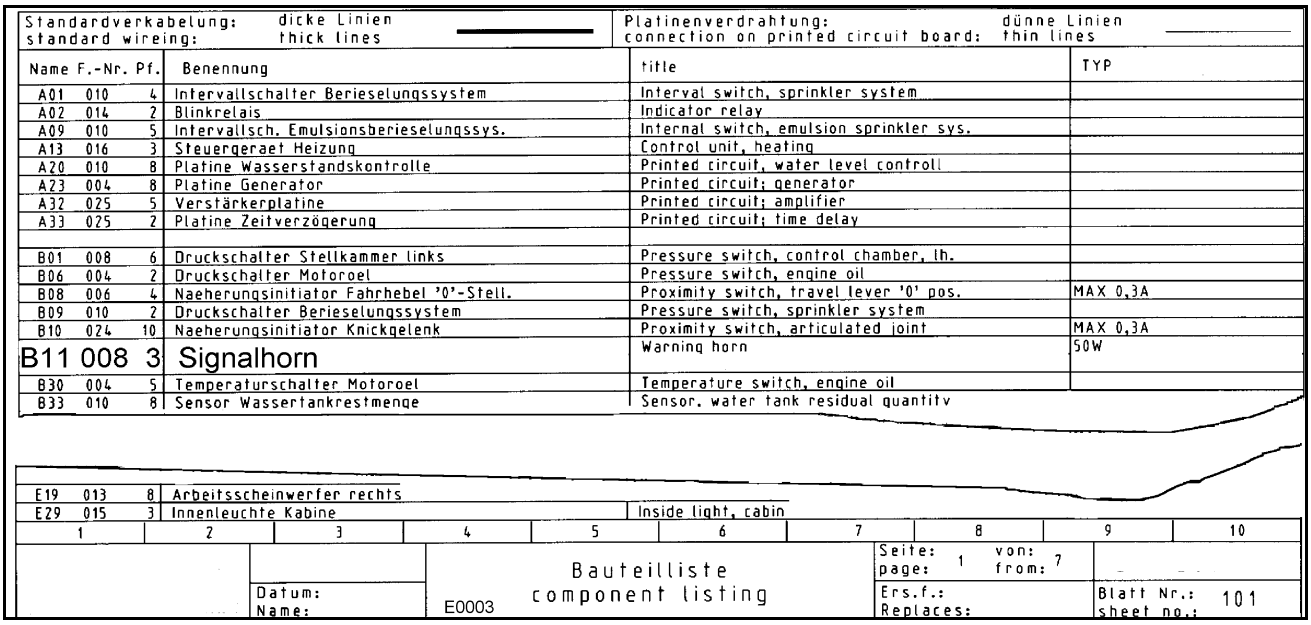


Fig. 19 Current paths

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List of components (Fig. 20)

Here you find all components used in alphabetical order, related to the name of the component (A01, A02....).



Standardverkabelung: standard wireing: dicke Linien thick lines				Platinenverdrahtung: connection on printed circuit board: dünne Linien thin lines	
Name	F.-Nr.	Pf.	Benennung	title	TYP
A01	010	4	Intervallschalter Berieselungssystem	Interval switch, sprinkler system	
A02	014	2	Blinkrelais	Indicator relay	
A09	010	5	Intervallsch. Emulsionsberieselungssys.	Internal switch, emulsion sprinkler sys.	
A13	016	3	Steuergeraet Heizung	Control unit, heating	
A20	010	8	Platine Wasserstandskontrolle	Printed circuit, water level controll	
A23	004	8	Platine Generator	Printed circuit; generator	
A32	025	5	Verstärkerplatine	Printed circuit; amplifier	
A33	025	2	Platine Zeitverzögerung	Printed circuit; time delay	
B01	008	6	Druckschalter Stellkammer links	Pressure switch, control chamber, lh.	
B06	004	2	Druckschalter Motoroel	Pressure switch, engine oil	
B08	006	4	Naeherungsinitiator Fahrhebel '0'-Stell.	Proximity switch, travel lever '0' pos.	MAX 0,3A
B09	010	2	Druckschalter Berieselungssystem	Pressure switch, sprinkler system	
B10	024	10	Naeherungsinitiator Knickgelenk	Proximity switch, articulated joint	MAX 0,3A
B11	008	3	Signalhorn	Warning horn	50W
B30	004	5	Temperaturschalter Motoroel	Temperature switch, engine oil	
B33	010	8	Sensor Wassertankrestmenge	Sensor, water tank residual quantity	
E19	013	8	Arbeitsscheinwerfer rechts		
E29	015	3	Innenleuchte Kabine	Inside light, cabin	

1	2	3	4	5	6	7	8	9	10

Datum: Name: — Bauteilliste component listing — E0003 — Seite: page: 1 von: from: 7 — Ers.f.: Replaces: — Blatt Nr.: sheet no.: 101

Fig. 20 List of components

Component cross references

Example:

The warning horn "B 11" is located on page no. 8 in current path 3.

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4.2 Designation of components in the wiring diagram

The designation of components in the wiring diagram groups several electrical parts of the machine in one group. The components can be identified by the following table.

Component designation	Meaning
A	Interval switch, indicator relay, modules, electronic component
B	Pressure, pressure differential, temperature switches and sensors, transducers
C	Capacitor
E	Headlights, heater, air conditioning condenser
F	Fuses
G	Battery, generator
H	Control lights, warning buzzer, warning light
K	Relays
M	Starter, pumps, motors
P	Operating hour meter, general gauges
R	Transducers, resistors
S	Switches, momentary contact switches
V	Diode
X	Terminal
Y	Solenoid valves

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4.3 Terminal designations in wiring diagram

- For easier connection work almost every connection on a consumer or switch used in a motor vehicle has a terminal designation. In Germany the designation of the individual connection terminals is determined by the standard DIN 72552. The following table shows some examples from this DIN standard.

Terminal designation	Meaning
15	Switch plus (after battery) : Output of ignition switch
15a	Output from dropping resistor to ignition coil and starter
17	Preheating starter switch, preheating
19	Preheating starter switch, starting
30	Battery plus direct
30a	Battery changeover relay 12V / 24V, input from battery 2 plus
31	Battery minus direct or ground
31a	Battery changeover relay 12V / 24V return line to battery 2 minus
31b	Return line to battery minus or ground via switch or relay (switched minus)
31c	Battery changeover relay 12V / 24V return line to battery 1 minus
49	Input flasher relay
49a	Output flasher relay
49b	Flasher relay output 2nd flasher circuit
49c	Flasher relay output 3rd flasher circuit
50	Starter, starter control
50a	Battery changeover relay, output for starter control
53	Wiper motor input (+)
53a	Wiper motor (+) end limit shut down
53b	Wiper shunt winding
56	Head light
56a	Head light, travel light and travel light control
56b	Head lights, dimmed head light
56d	Head lights, flash light
57	Parking light for motor cycles (abroad also for cars and trucks)
57a	Parking light
57L	Parking light left
57R	Parking light right
58	Side lights, tail light, number plate light, dashboard light
58b	Tail light changeover for single axle trailers
58c	Trailer plug for single core wired and trailer fused tail light
58d	Adjustable dashboard light, tail light and side light
58L	Side light, left
58R	Side light, right
61	Generator control
75	Radio, cigarette lighter
76	Loudspeaker
87	Relay contact on breaker and two-way contact, input

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Terminal designation	Meaning
87a	Relay contact on breaker and two-way contact, output 1 (breaker side)
87b	Relay contact on breaker and two-way contact, output 2
87c	Relay contact on breaker and two-way contact, output 3
87z	Relay contact on breaker and two-way contact, input 1
87y	Relay contact on breaker and two-way contact, input 2
87x	Relay contact on breaker and two-way contact, input 3
88	Relay contact for maker
88a	Relay contact on maker and two-way contact, (maker side) output 1
88b	Relay contact on maker and two-way contact, (maker side) output 2
88c	Relay contact on maker and two-way contact, (maker side) output 3
88z	Relay contact on maker, input 1
88y	Relay contact on maker, input 2
88x	Relay contact on maker, input 3
B+	Battery positive
B-	Battery minus
D+	Dynamo Plus
D-	Dynamo Minus
DF	Dynamo field (generator excitation current)
DF1	Dynamo field 1 (generator excitation current)
DF2	Dynamo field 2 (generator excitation current)

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4.4 Circuit symbols in the circuit diagram

Circuit symbol

- Circuit symbols are standardized representations for electrical appliances. They serve the purpose of a simplified representation of complete systems, from which, however, the function can be clearly identified. This standardization is in compliance with the globally valid regulations of the IEC (International Electrical Commission). The standardization serves the purpose of global understanding and fault free connection of appliances, especially in automobile repairs. Since the wiring diagram is intended to show only the most essential aspects, the circuit symbol only shows as much of the function, as is needed for easy recognition and for the avoidance of mistakes.

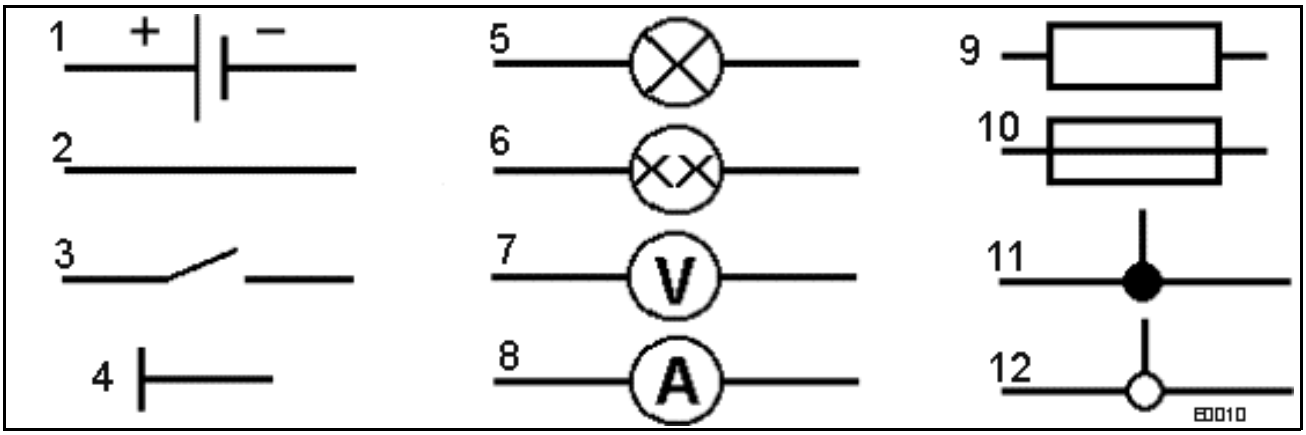


Fig. 1 Example: Circuit symbol

1 Current source
2 Conductor
3 Switch
4 Ground
5 Filament lamp
6 Filament lamp with two luminous elements
7 Voltmeter
8 Amperemeter
9 Resistance
10 Backup
11 Line connection (fixed)
12 Line connection (separable)

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4.5 Battery ground and analog ground

GND, battery ground

The term "ground" (abbreviated GND) describes a conductive body which is normally defined with the potential of "Zero" Volt and represents the reference potential for operating voltages.

The positive pole of the supply voltage (symbol +) and all other electric voltages and electical signals in an electrical circuitry refer to the ground potential.

On motor vehicles and also on motorbikes and bicycles the ground potential is represented by the chassis or the frame. As a conductive part, which covers the entire vehicle, it also serves a return conductor for the vehicle wiring system - the consumers only need to be wired up.

Terminal designation for GND = terminale 31

AGND, analog ground

Apart from the "normal" battery ground there is also the analog ground, which is solely reserved for sensors.

4.6 Current and voltage

General

If one wants to describe electric current, this can most simply be accomplished by means of a comparison:

One simply compares electric current with water.

Voltage

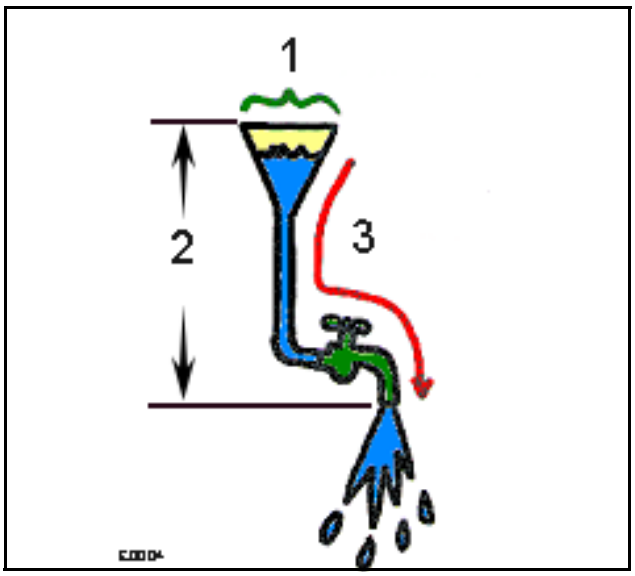


Fig. 1

1 (Fig. 1) Charge

2 Voltage

3 Current

The equalization attempt between different electric charges is referred to as electric voltage.

Voltage sources have two poles of different charge. On the one side we have the plus pole with a lack of electrons, on the opposite side the minus pole with a surplus of electrons. This electric "pressure" is known as electric voltage.

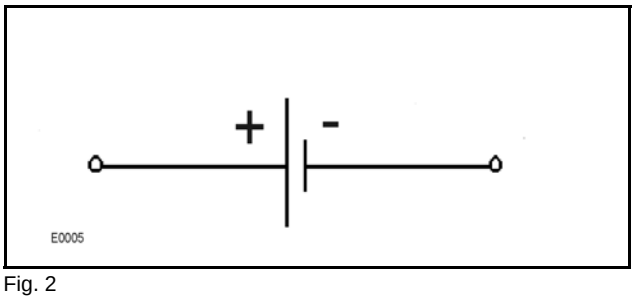


Fig. 2

If there is a connection between these two poles a discharge will take place, resulting in the flow of an electric current.

Plus pole= lack of electrons

Minus pole = excess of electrons

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The following statements concerning electric voltage can be made

- electric voltage is the pressure or force applied to free electrons.
- the electric voltage is the cause of electric current
- electric voltage is a result of the equalization attempt of electric charges.

Voltage is measured with a Voltmeter.

Unit, Volt

The electric voltage (U) is measured in Volt (V).

Current

Electric current generally describes the directed movement of charge carriers.

- The charge carriers may either be electrons or ions.
- Electric current can only flow if there is a sufficient amount of free moving charge carriers.
- The higher the number of electrons flowing through a conductor per second, the higher the amperage.

Current is measured with an ammeter.

Unit, Ampere

The electric amperage (I) is measured in Ampere (A).

The technical flow direction is specified from PLUS to MINUS.

i Note

Current actually flows from minus to plus, because the current flow is made up of negatively charged electrons.

But since this was only discovered after the poles of a current source had already been designated, the assumption that current flows from plus to minus was maintained for historic reasons.

Circuit

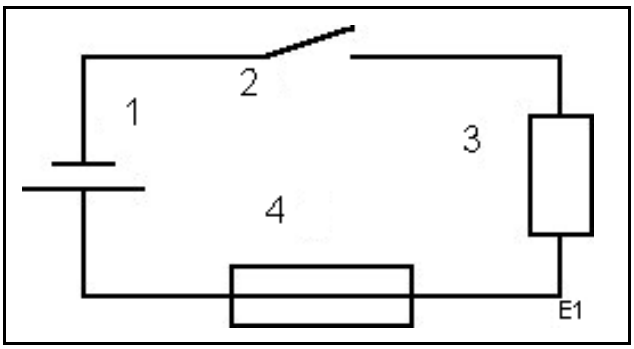


Fig. 3 Circuit

A simple circuit consists of a current source 1 (Fig. 3), a consumer (3) and the connecting wiring.

When the circuit is closed, current can flow.

The circuit can be interrupted or closed with a switch (2).

The system is protected by a fuse (4).

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Types of current

Direct current (D.C.)

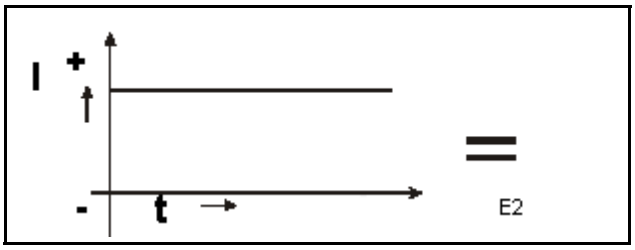


Fig. 1 Direct current (D.C.)

Direct current flows with steady voltage and amperage from the plus to the minus pole.

Pure D.C.-voltages are only delivered by accumulators or batteries.

The voltage in the vehicle wiring system is no pure D.C.-voltage. Even without the generator running, but the consumers switched on, the voltage is not constant, but drops gradually according to the battery charge condition.

The internal resistance of the battery also causes permanent changes in the vehicle voltage, as soon as consumers are switched on or off.

Alternating current (A.C.)

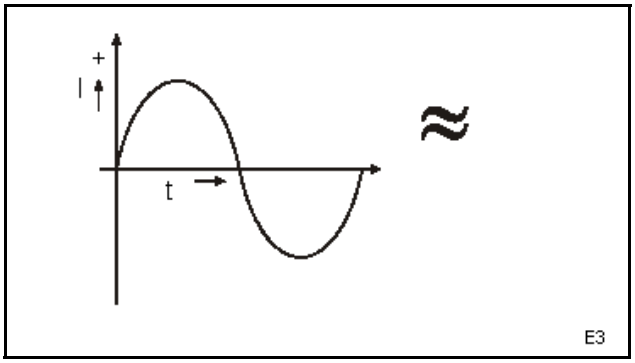


Fig. 2 Alternating current (A.C.)

Alternating current not only changes its direction, but also its amperage.

4.7 Resistance

Resistance and voltage drop

While current flows through a conductor the current flow is more or less inhibited by the conductor, this inhibitation is referred to as Resistance.

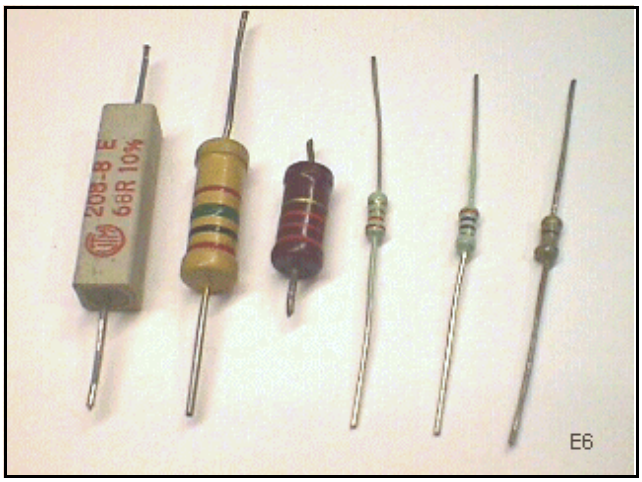


Fig. 1 Various size resistors

Each conductor has its specific resistance, which is characteristic for the corresponding material. A good conductor has a low resistance, a poor conductor has a high resistance.

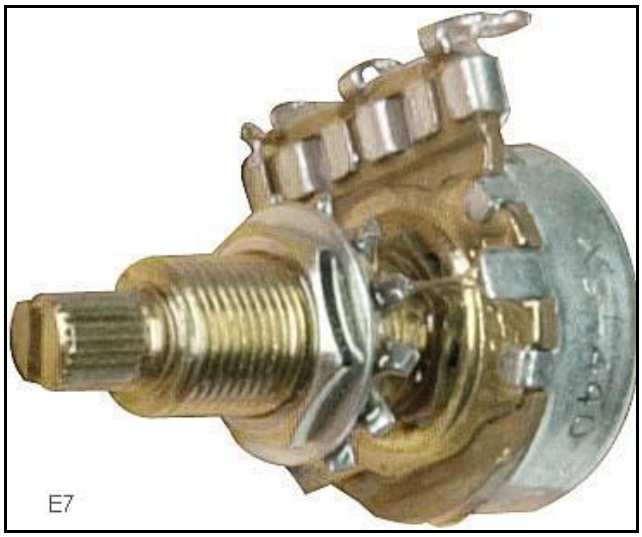


Fig. 2 Potentiometer, infinitely adjustable resistor

The resistance can only be measured with a Multimeter.

Symbol, R

Unit, Ohm Ω

The electric resistance (R) is measured in Ohm Ω.

Rule of thumb:

- The thicker the cable cross-section, the lower the voltage loss.
- The shorter the cable, the better the current.

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- The cleaner the contacts, the better the current.
- The quality of the ground cable is of the same importance as the supply line.

Unnecessary resistances

Unnecessary resistances are frequently caused by mechanical connections, even clean ones, but mainly soiled and oxidizes terminals, too thin cables, material with poor conductivity or bent open cable lugs.

Bad

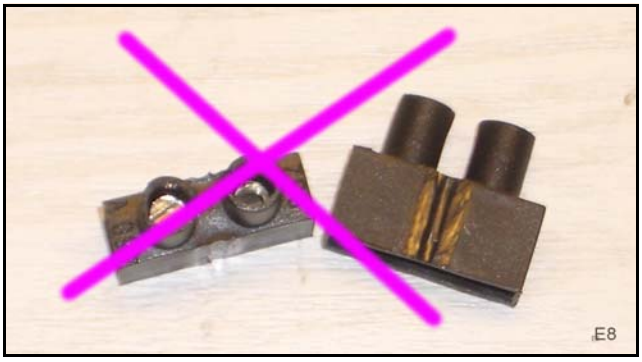


Fig. 1 Screw-type terminals

Copper wires are squashed and thus become faulty.

Better



Fig. 2 Spring clamps

Connecting clamps for flexible conductors

BOMAG No. 057 565 72

Ampacity up to 20 Amp.

Cable cross-section 0.08 to 2.5 qmm



Fig. 3

In many cases it is better to replace the contact. Soiled or oxidized contacts should be cleaned with Ballistol (Fig. 4) and subsequently wetted with copper paste.

Copper paste is a heat resistant grease, which has been mixed with copper powder. The paste protects electric contacts against oxidation. Copper paste keeps water away.



Fig. 4 Balistol oil

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Sometimes the flanks of flat plugs bend open. If these are closed again with the help of pliers the flanks will be excessively strained at the bend and will definitely break sooner or later. It is better to place a small nail under the bottom of the cable lug before bending.

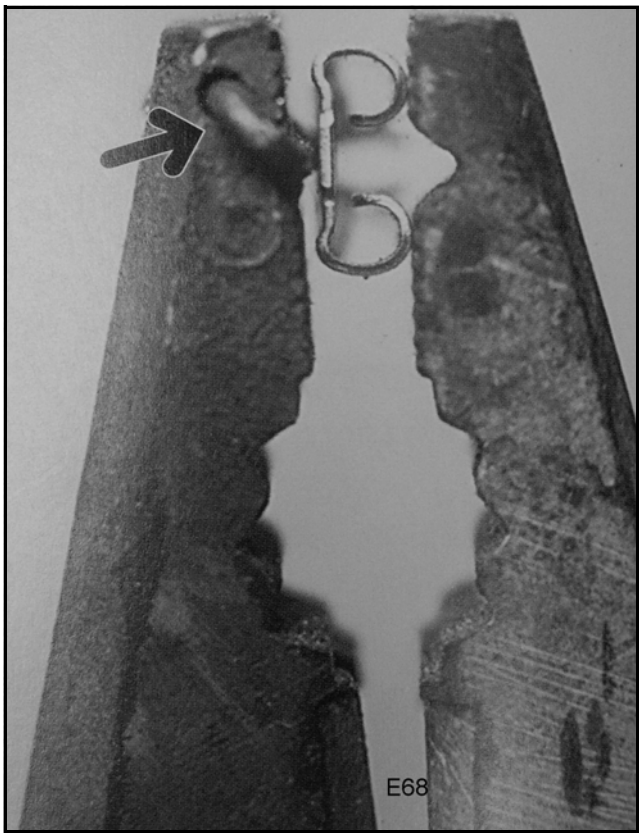


Fig. 5

Hint for practice:

A tool you cannot buy. The pliers were converted, the nail is permanently present.

4.8 Series / parallel connection

Series connection

In a series circuit the resistors (consumers) are lined up one after the other and the same current (I) passes through each of the consumers However, series connection of consumers is not suitable in practice, as each resistance causes a voltage drop. In the vehicle wiring system all consumers are designed for the same vehicle voltage (e.g. 12 Volt).

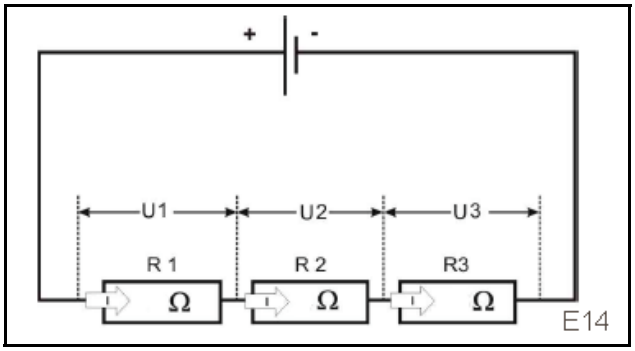


Fig. 1 Series connection

Current

In series connection the current is identical at every point.

Itotal = I1 = I2 = I3

Voltage

The sum of all partial voltages is identical with the total voltage.

Utotal = U1 + U2 + U3

Resistance

The sum of all partial resistances is identical with the total resistance.

Rtotal = R1 + R2 + R3

Series connection of batteries

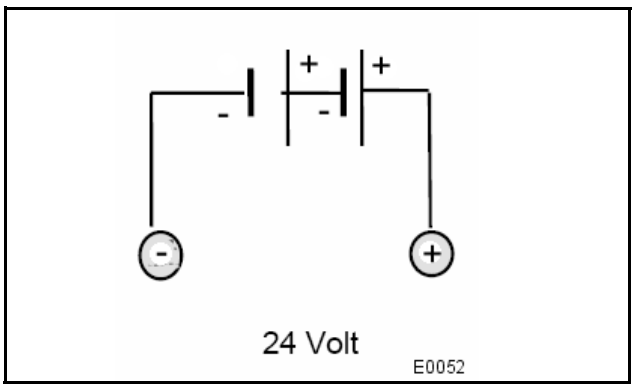


Fig. 2

In order to achieve a vehicle voltage of 24 V two batteries of the same type and capacity must be connected in series mode.

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- In series connection the plus pole of the first battery must be connected with the minus pole of the second battery.
- The sum of all individual voltages is applied to the free poles.
- The total capacity (Ah) is identical with the capacity of the individual battery.

Parallel connection

In parallel connection all resistances (consumers) are connected between feed and return line.

- All resistances (consumers) are supplied with the same voltage.
- Each of the resistances (consumers) draws as much current as required.

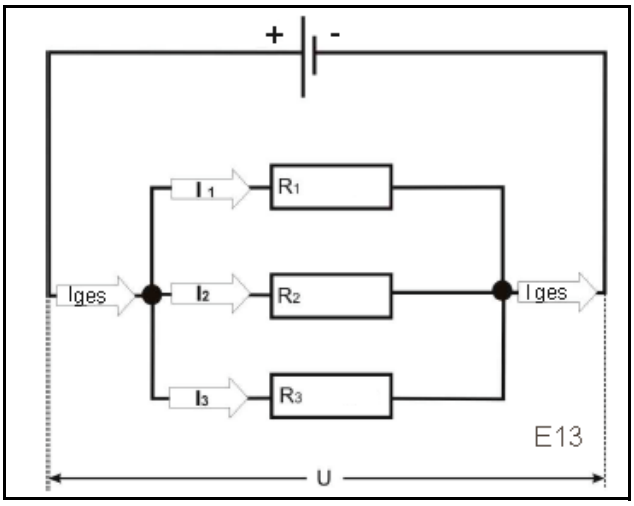


Fig. 3 Parallel connection

Current

The total current is the sum of all currents.

Itotal = I1 + I2 + I3

Voltage

The voltage values are identical at every resistance (consumer).

Utotal = U1 = U2 = U3

Resistance

The total resistance is less than the lowest individual resistance.

Parallel connection of batteries

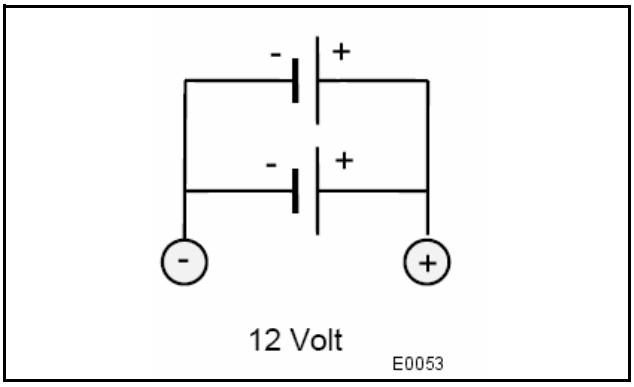


Fig. 4

By connecting 2 batteries of same type and capacity in parallel mode the capacity can be doubled, because the individual capacities add up to the total capacity.

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- In parallel connection the plus pole of the first battery is connected with the plus pole of the second battery and the minus pole of the first battery with the minus pole of the second battery.
- Plus and minus poles have the voltage of the single battery applied.
- The total capacity (Ah) is identical with the sum of all battery capacities.

The disadvantage of a parallel connection becomes apparent, by equalizing currents flowing between parallel batteries, if the batteries have different states of charging.

4.9 Ohm's law

In a closed electric circuit voltage, current and resistance must always be considered in close relation. This relation is represented by Ohm's Law.

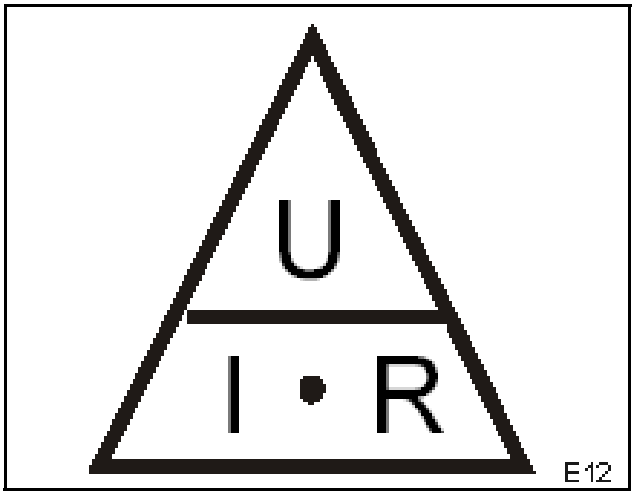


Fig. 1

According to this law a voltage of 1V is required to let 1A (ampere) flow through a conductor with a resistance of 1 (Ohm Ω).

Advice

By means of this triangle the formula can be easily rearranged, the value you are looking form must just be blanked off with a finger.

Voltage U = I multiplied with R

Resistance R = U divided by I

Amperage I = U divided by R

U = Voltage in Volt

I = Current in Ampere

R = Resistance in OHM Ω

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4.10 Electrical energy

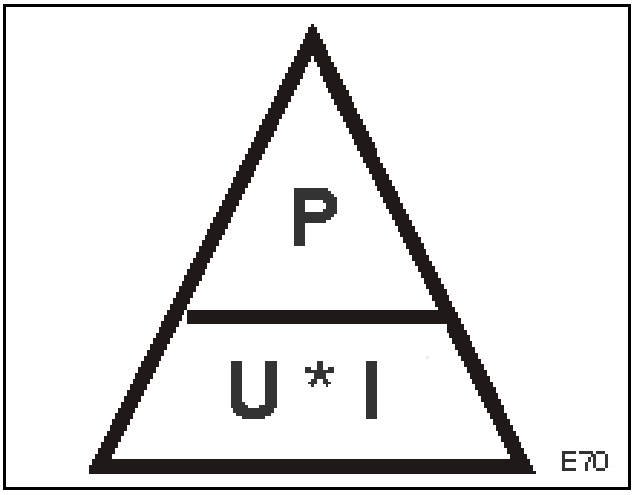


Fig. 1

In a closed electric circuit current and voltage generate energy.

If a current of 1 Ampere flows at a voltage of 1 Volt, energy of 1 Watt is produced.

Advice

By means of this triangle the formula can be easily rearranged, the value you are looking form must just be blanked off with a finger.

Energy P = I multiplied with U

Amperage I = P divided by U

Voltage U = P divided by I

U = Voltage in Volt

I = Current in Ampere

P = Power in Watt

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4.11 Formula diagram

Description:

- Select the desired value from the inner circle.
- Determine the formula variables in the quarter circle
- Calculate

Example:

P = 150 Watt

U = 24 Volt

Sought for = Current in Ampere

I = P : U = 150 W : 24 Volt = 6.25 Ampere

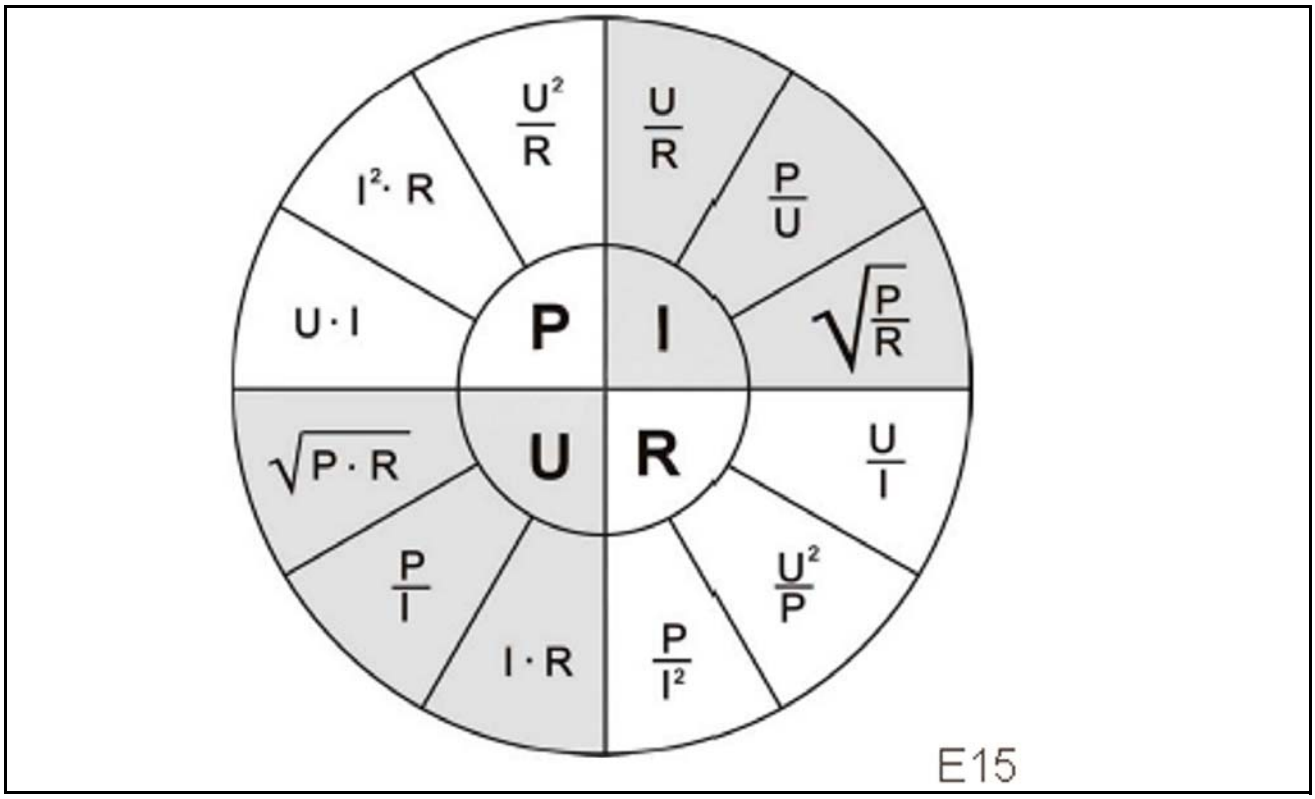


Fig. 1 Formula diagram

Resistance, R Ohm Ω

Voltage, U Volt

Current, I Ampere

Power, P Watt

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4.12 Metrology

Test lamps

Test lamp

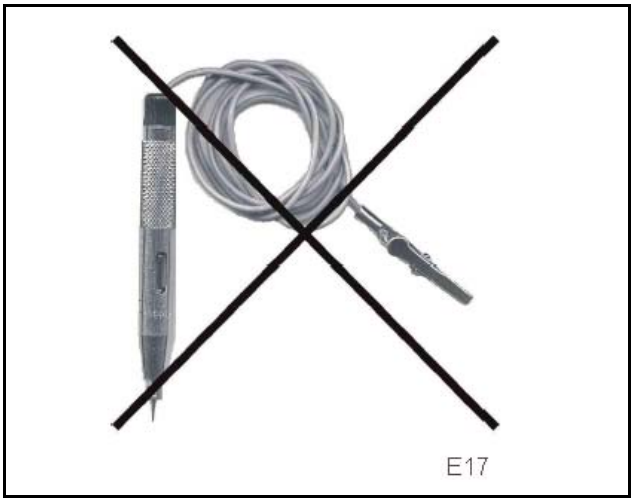


Fig. 1 Test lamp

⚠ Caution

This type of tester must not be used for testing on electronic components. The high power consumption of the test lamp may destroy electronic components in the control units.

Diode test lamp

This instrument is used for simple voltage measurements. The test lamp consists of two test points. The negative measuring cable is connected to ground and the positive measuring cable to the corresponding measuring location.



Fig. 2 Diode test lamp

If voltage is present, the corresponding light emitting diode will light up.

Multimeter

This tester is a multimeter and can be used to measure e.g. current, voltage and resistance. Depending on the design it may also be suitable for transistor and frequency.

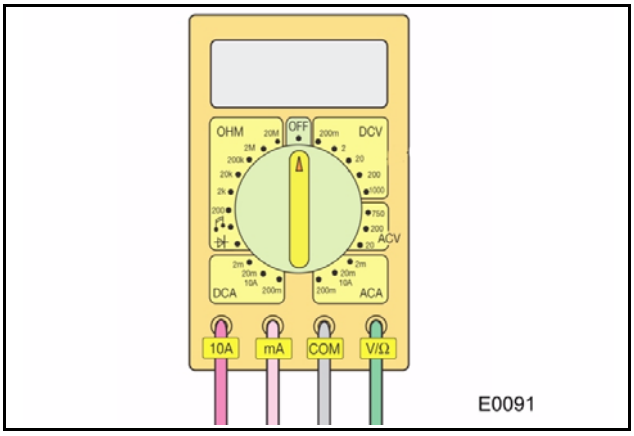


Fig. 1 Multimeter

In order to avoid damage:

- the range selector switch must be correctly set for the corresponding measurement.
- the test cable must be plugged into the correct socket.
- the voltage type (AC/DC) must be set.
- In case of direct voltage the correct polarity must be assured.
- the measuring range should be chosen higher at the beginning of the test.
- In order to avoid any influence on the circuitry to be measured, the internal resistance of the voltage tester should be as high as possible.

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Resistance and continuity measurement with multimeter

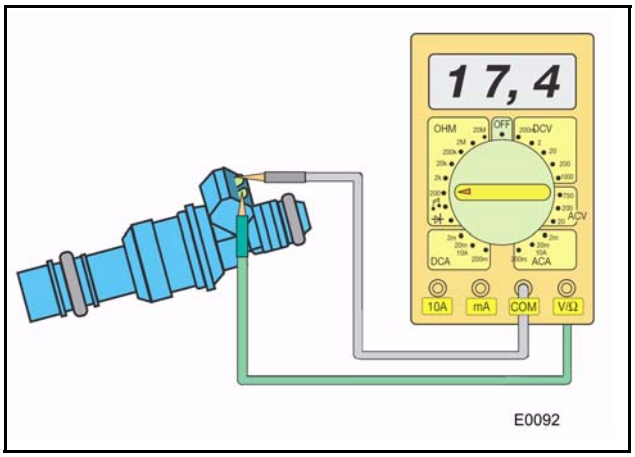


Fig. 2

The continuity tester of the multimeter can be used to measure whether there is a connection between 2 measuring points.

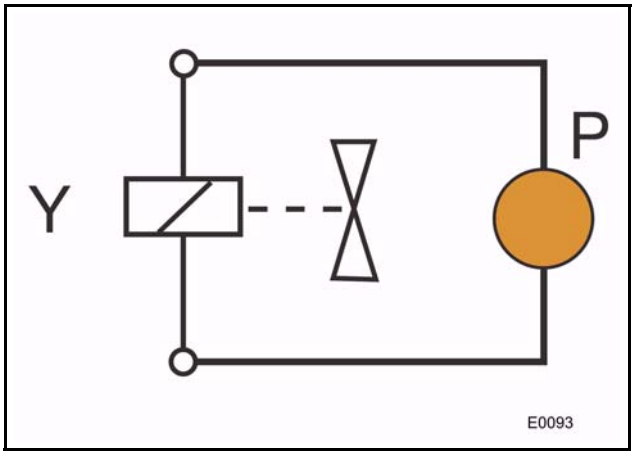


Fig. 3

The following information should be observed when measuring resistance and continuity:

- The component to be measured must not be connected to the power supply during the measurement.
- At least one side of the component to be measured must be disconnected from the circuitry, as otherwise the measuring result may be influenced by parallel components.
- Polarity is of no significance.

Voltage and voltage drop measurement with multimeter

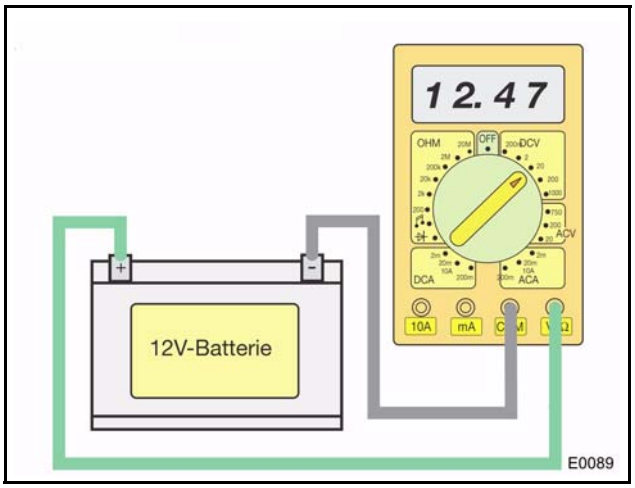


Fig. 4 Measuring voltage

- Measurement at the voltage source measures the currently available Voltage.
- The meter is always connected parallel to consumer, component or power source.

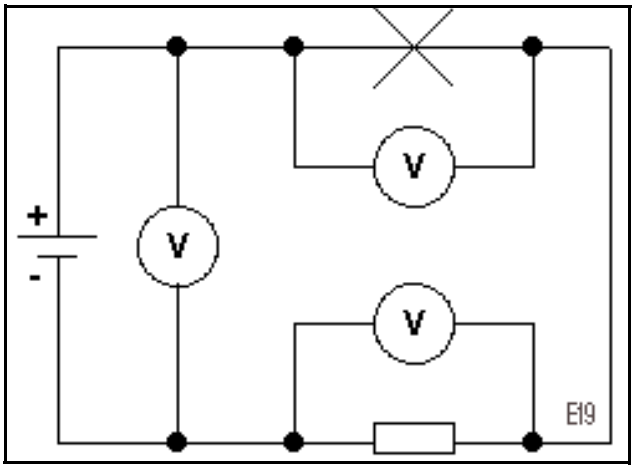


Fig. 5 Voltage measurement

- A measurement at the consumer measures the voltage drop at this component.

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Current measurement with the multimeter

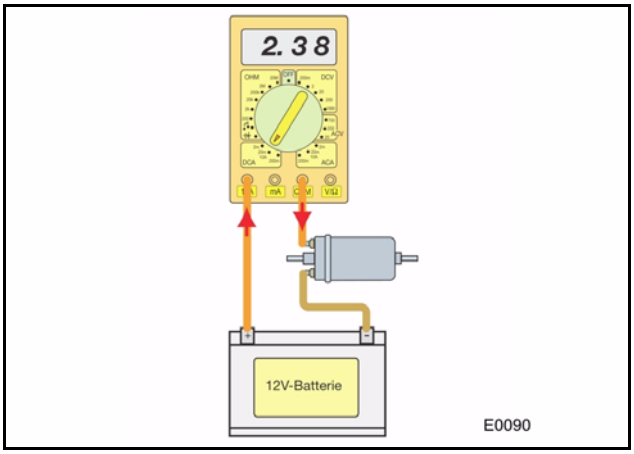


Fig. 6 Measuring current

- The meter is connected in series with the consumer.
- During the measurement the current must be able to flow through the meter, i.e. the electric circuit must be opened.

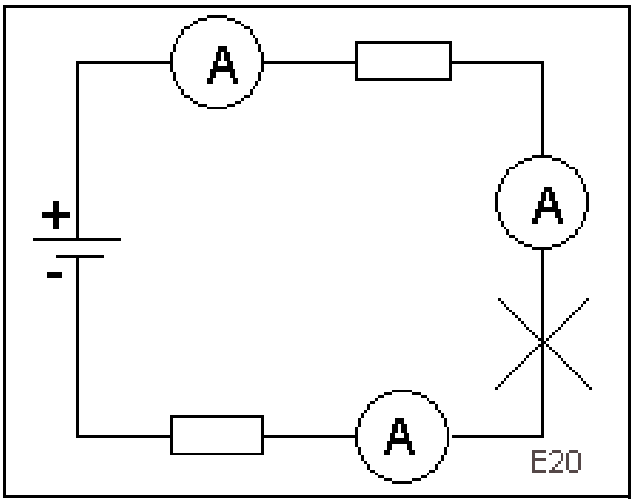


Fig. 7 Current measurement

Advice

If the electric circuit is difficult to access and the internal resistance of the consumer is known, the voltage may also be measured at the consumer.

The current value can then be calculated with the help of Ohm's law.

Clip-on measuring instrument

The clip-on measuring instrument can be used to measure current, voltage and resistance.

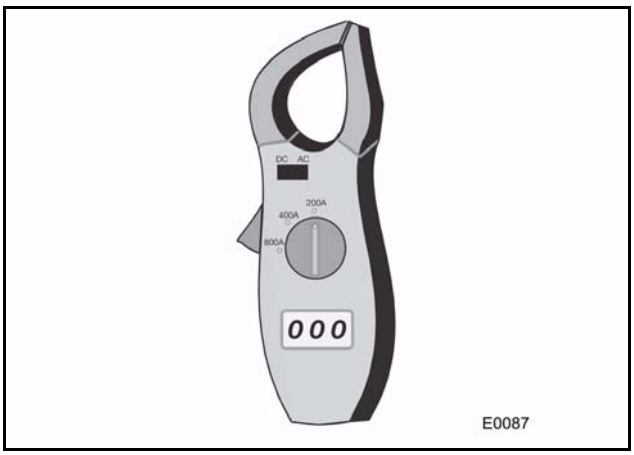


Fig. 1 Clip-on measuring instrument

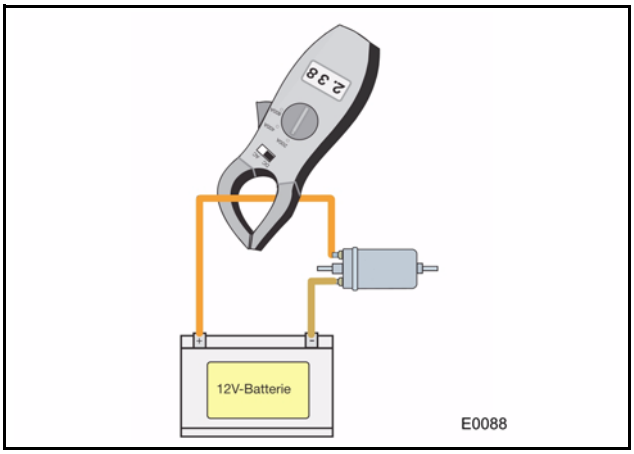


Fig. 2

- For measuring current the individual conductor must be fully enclosed by the measuring tongs, the actual measurement takes place without contact.

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Magnet tester



Fig. 1 Magnet tester

The magnet tester is used to test solenoid valves and magnetic coils.

The test lamp responds to the magnetic fields of A.C-voltage, D.C.-voltage and permanent magnets.

- The component to be tested does not need to be removed.
- The magnetic coil can also be tested under a protective cap.

Power measurement

The electric power of a module within a circuit can be indirectly determined (calculated) by separate measuring of current and voltage.

However, there are also pure power meters with 4 connections available. The power meter has a electrodynamic measuring mechanism. The current circuit must be opened for measuring. Take care when performing power measurements: Voltage or current path may already be overloaded during the measurement, even though the end stop in the meter has not yet been reached.

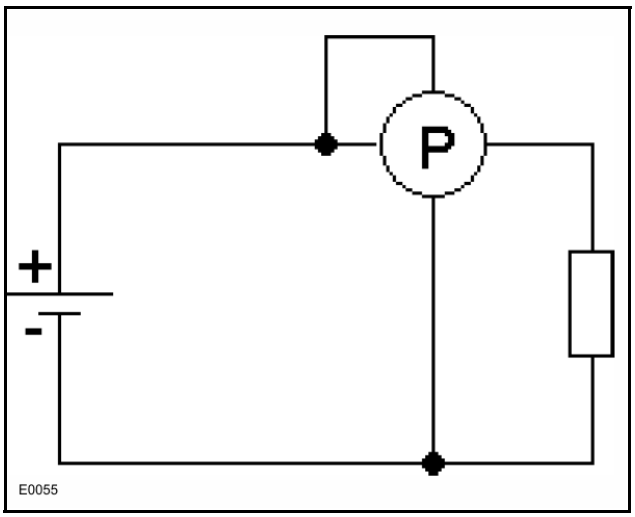


Fig. 2

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4.13 Diodes, relays, fuses

Diodes

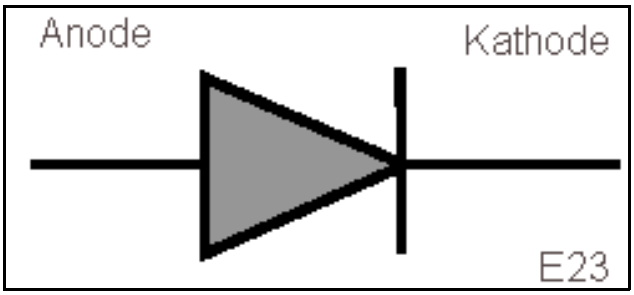


Fig. 1

A diode consists of two different semi-conductors, which are connected by a separating layer. The max. conducting state current must not be exceeded.

Plus-voltage on diode:

- At 0.6 – 0.7 Volt (silicium diode) the diode becomes conductive.

Negative voltage on diode:

- The diode does not allow current to pass through.



Fig. 2 Marking of the cathode

Diodes are used:

- For rectifying A.C. voltage.
- For absorbing voltage peaks (free-wheeling diode).
- For construction of logical circuits.

Diode logics and free-wheeling diode

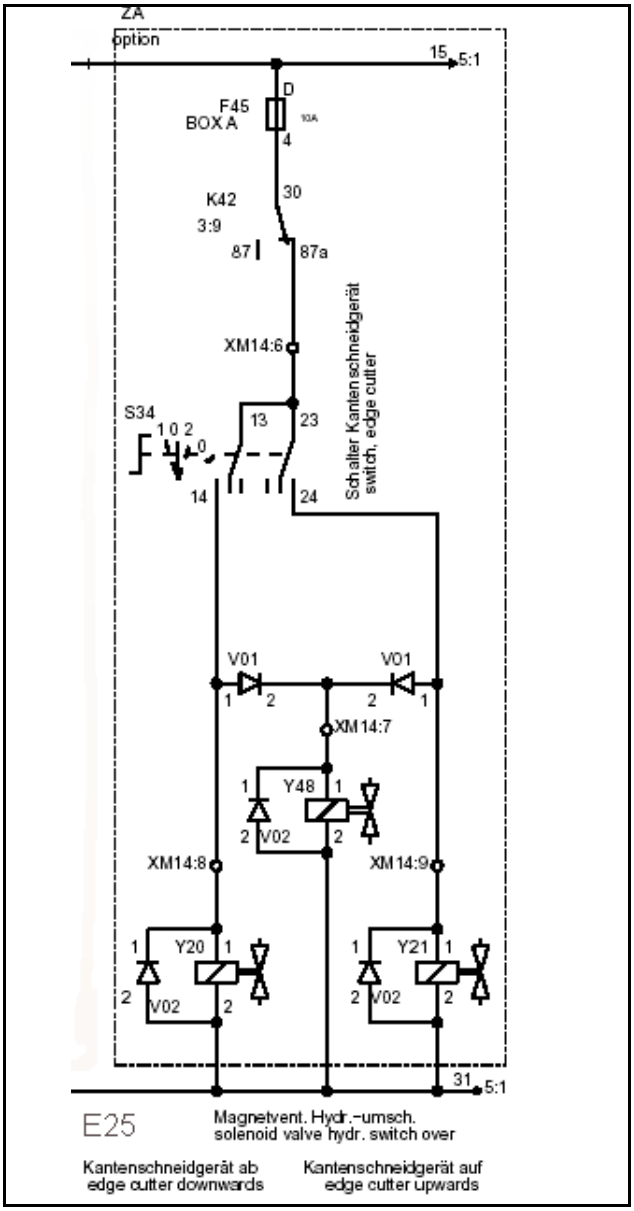


Fig. 3 Diode circuitry

- The solenoid valve Y48 (Fig. 3) is supplied with electric current when switch S34 is switched to position "1" or "2".
- Solenoid valve Y20 is supplied, if the switch is in position "1".
- Solenoid valve Y21 is supplied, if the switch is in position "2".

The three diodes V02 serve as free-wheeling diodes with the function of of eliminating voltage peaks.

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Light emitting diodes

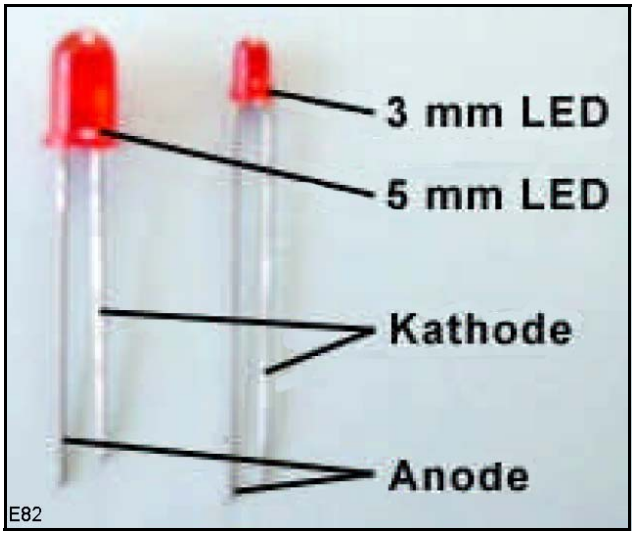


Fig. 4 LED

The light emitting diode, also referred to as LED, is a semi-conductor diode, which generates (emits) light during operation in forward direction. A semi-conductor crystal thereby emits a light signal, which is converged or scattered by the lenticular shape of the head. Light emitting diodes are available in various colours, sizes and shapes. They are for this reason used as signal lamps. This component is constructed of different semi-conductor crystals, depending on its colour. It works like any other semi-conductor diode.

Relays

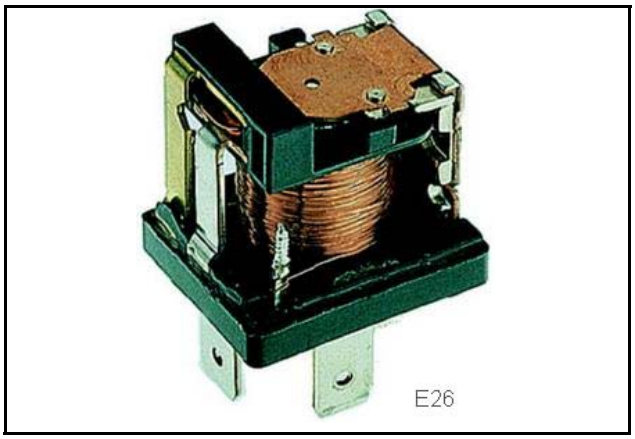


Fig. 1 Relays

Relays are commonly used to realize switching processes.

A free-wheeling diode prevents induction voltage from flowing back from the coil into the vehicle wiring system, which would cause interference with electronic components (control units).

With the possibility of using breaker - maker contacts the effect of an information can be reversed.

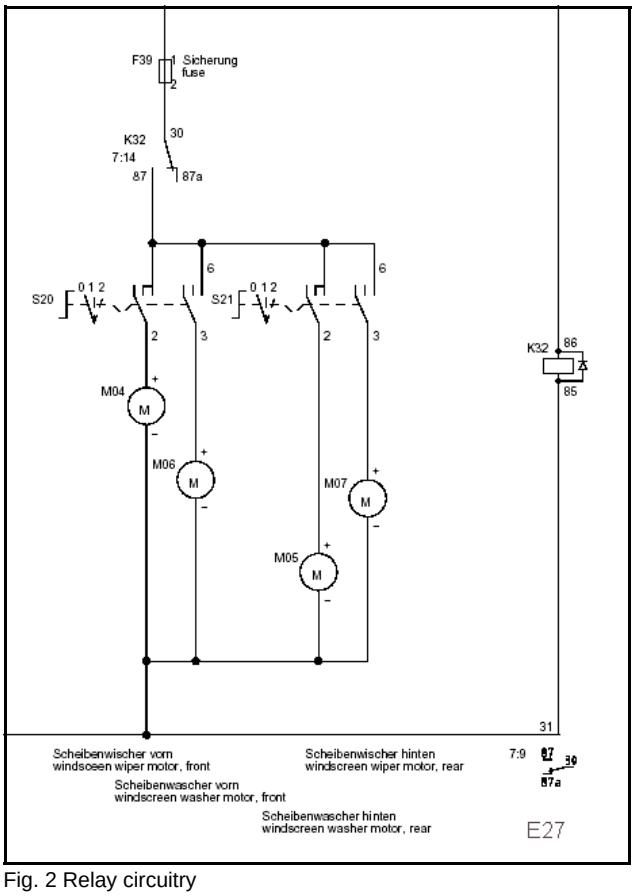


Fig. 2 Relay circuitry

The windscreen wiper and washer motors can only be operated via switches S20 and S21, when relay K32 is supplied with electric current (Fig. 2).

86 = Positive supply for coil

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85 = Ground supply for coil

30 = Supply voltage

87 = Normally open contact

87a= Normally closed contact

Fuses



Fig. 1

Fuses are used to protect lines and equipment against overloads and short circuit. If the fuse is overloaded the fusible wire heats up with increasing current, until it finally melts.

⚠ Caution

Fuses must not be repaired or bridged.

The melting time at 23 °C is:

- approx. 1 hour with 1.5 times the rated current
- approx. 1 minute with 2.5 times the rated current.

A 5 Amp fuse loaded with 1.5 times the rated current (7.5 Amp) will finally melt after approx. 1.5 hours.

Yellow = 5 A

Brown = 7.5 A

White = 8 A

Red = 16 A

Blue = 25 A

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4.14 Telemecanique switch

Example of terminal designations

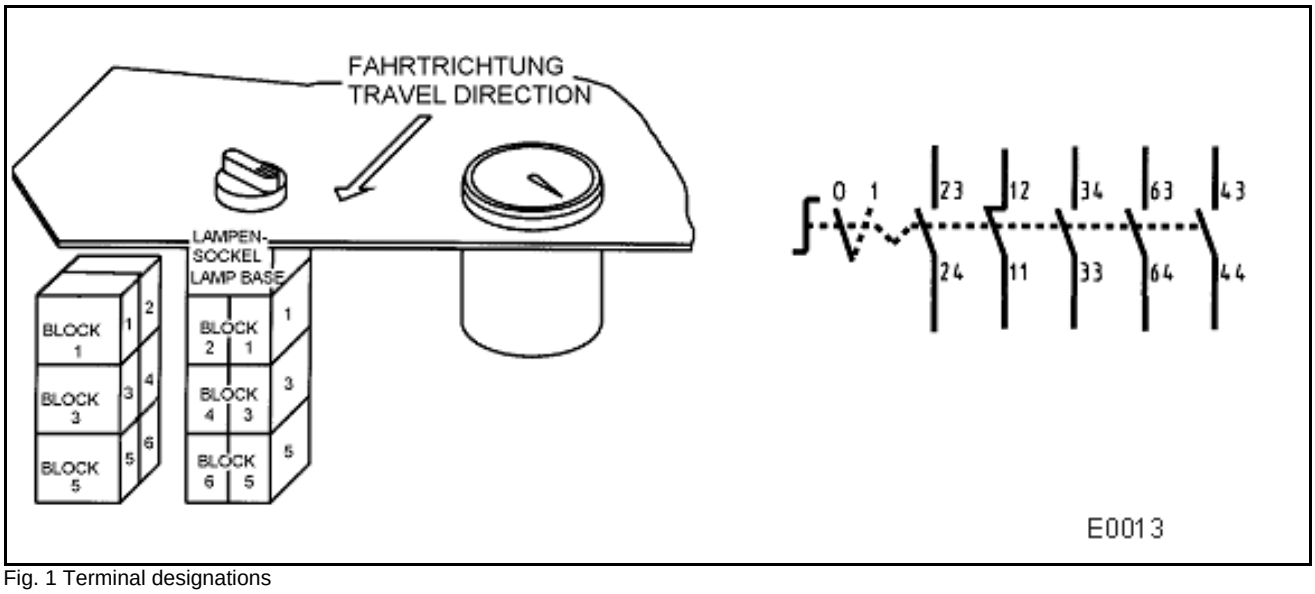


Fig. 1 Terminal designations

- Normally open contact 23 located on block 2
- Normally open contact 24 located on block 2
- Normally closed contact 12 located on block 1
- Normally closed contact 11 located on block 1
- Normally open contact 34 located on block 3
- Normally open contact 33 located on block 3
- Normally open contact 63 located on block 6
- Normally open contact 64 located on block 6
- Normally open contact 43 located on block 4
- Normally open contact 44 located on block 4

i Note

If e.g. block 5 is not needed to design a switch, the numbering for blocks 1,2,3,4 and 6 remains unchanged.

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Disassembly

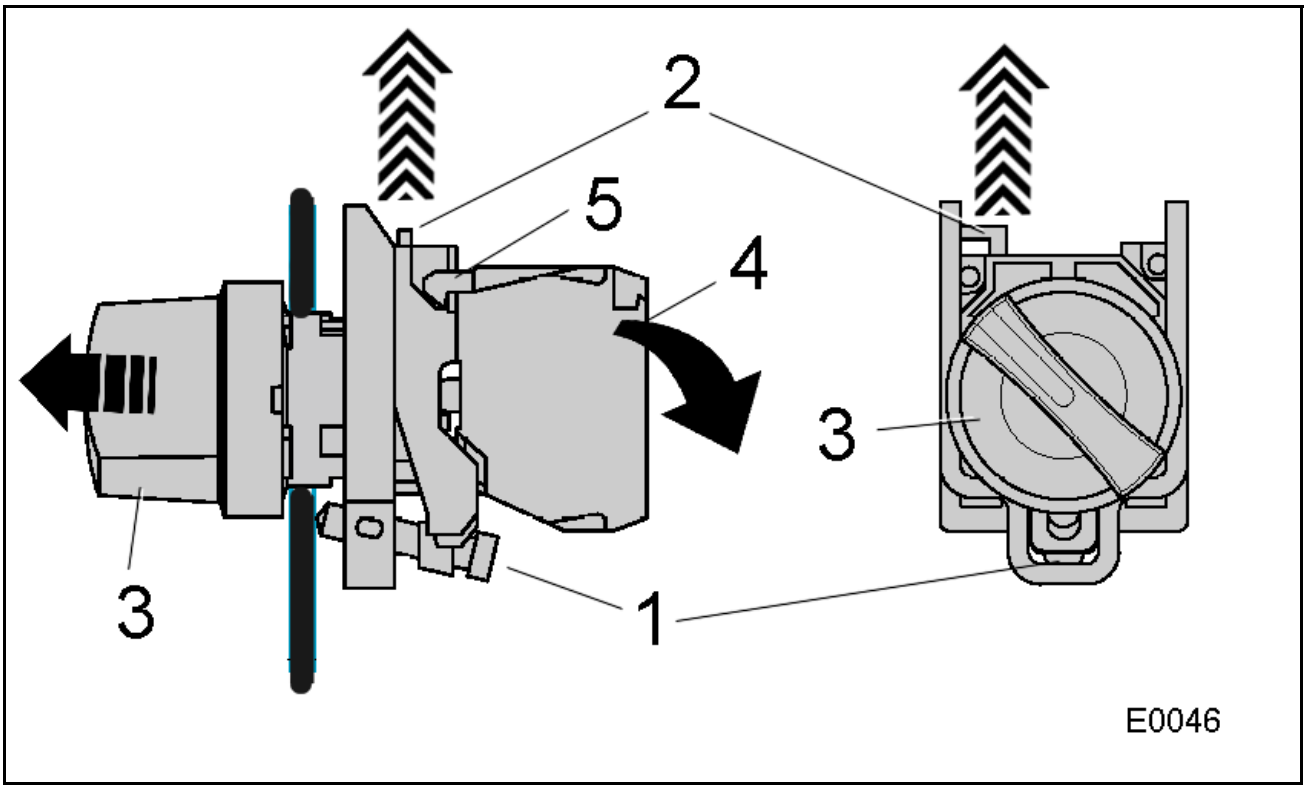


Fig. 2 Disassembly

- Lift up the interlock (5).

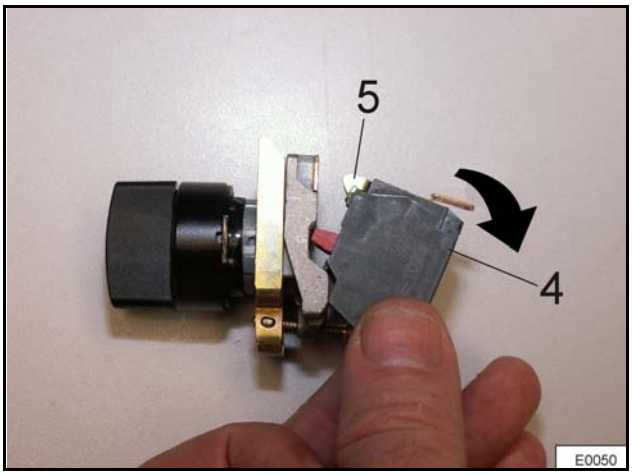


Fig. 3 Folding down the switch block

- Fold down the switch block (4).
- Loosen screw (1).

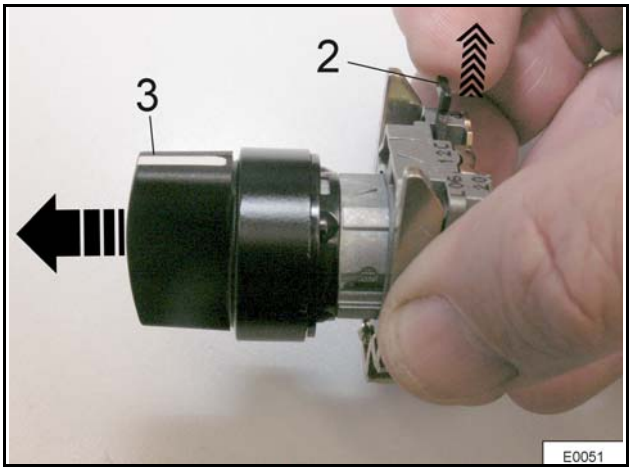


Fig. 4 Pulling out the front element

- Lift up the interlock (2) and pull out the front element (3).

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Assembly

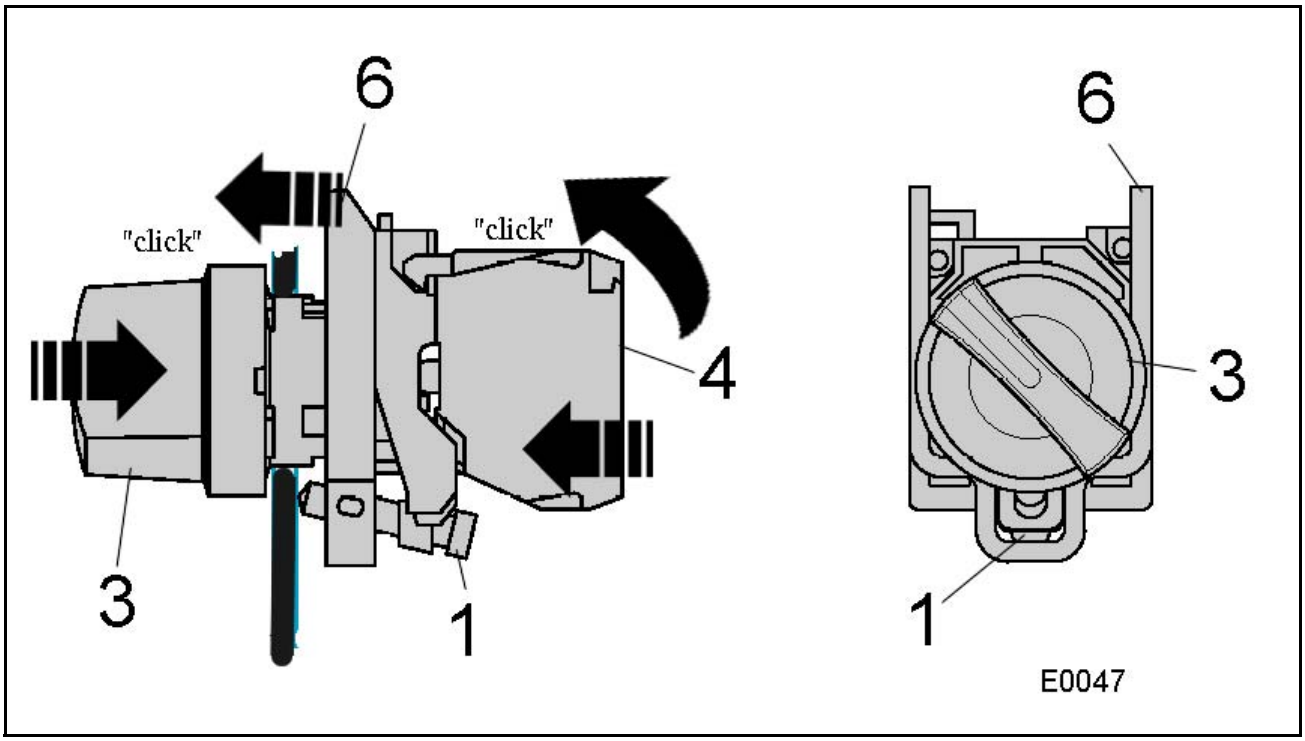


Fig. 5 Assembly

- Insert the front element (3) into the bore in the control panel.

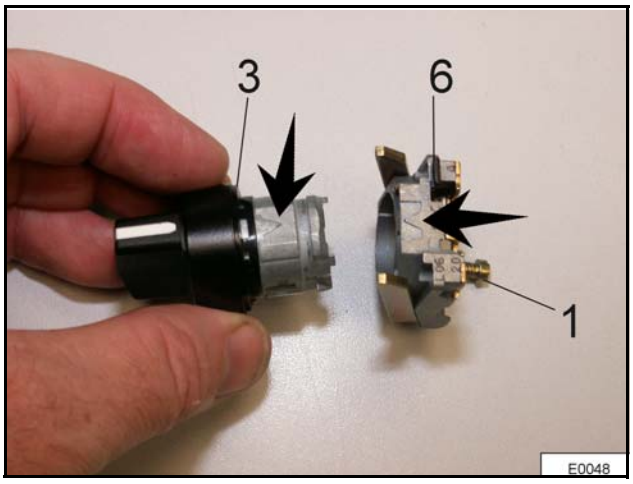


Fig. 6 Observe the marks.

- Clip the fastening adapter (6) onto the front element (3).

i Note

Watch the marls on front element (Fig. 6) and fastening flange.

- Tighten the screw (1) with a tightening torque of 0.6 Nm.

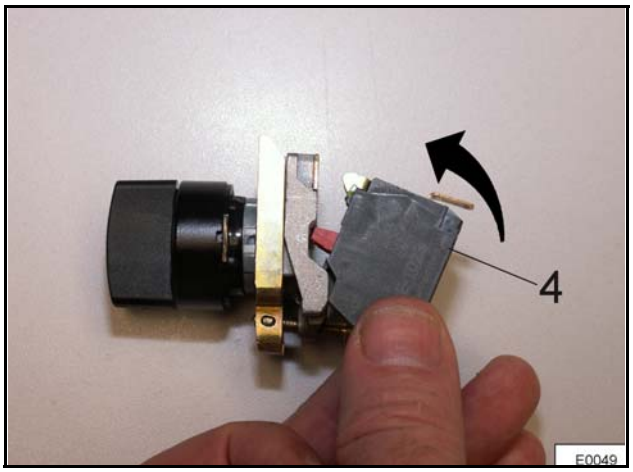


Fig. 7 Assemble the switch block

- Clip on the switch block (4).

i Note

Hook in the switch block at the bottom first (Fig. 7).

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4.15 Plug connectors

Duties and requirements

Electric plug connectors must provide a reliable connection between different system components and thus ensure the safe function of the systems under any operating condition. There design ensures that they will withstand the applied loads throughout the lifetime of the machine.

Examples for these loads are:

- Vibration acceleration
- Temperature fluctuations, high and low temperatures
- Dampness
- Micro movements of the contact with resulting friction corrosion.

These loads may increase the transition resistances of the contacts, up to total interruption. Even the insulation resistances may drop and thus cause short circuits in neighbouring lines. Electric plug connectors must therefore have the following properties:

- Low transition resistances of the conductive parts.
- High insulation strength between conductive parts with different voltage potentials.
- Excellent leak tightness against water and moisture.

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Magnetic coil plug with LED and suppressor diode

The plug is equipped with a polarized function display and a suppressor diode as protection against overvoltages.

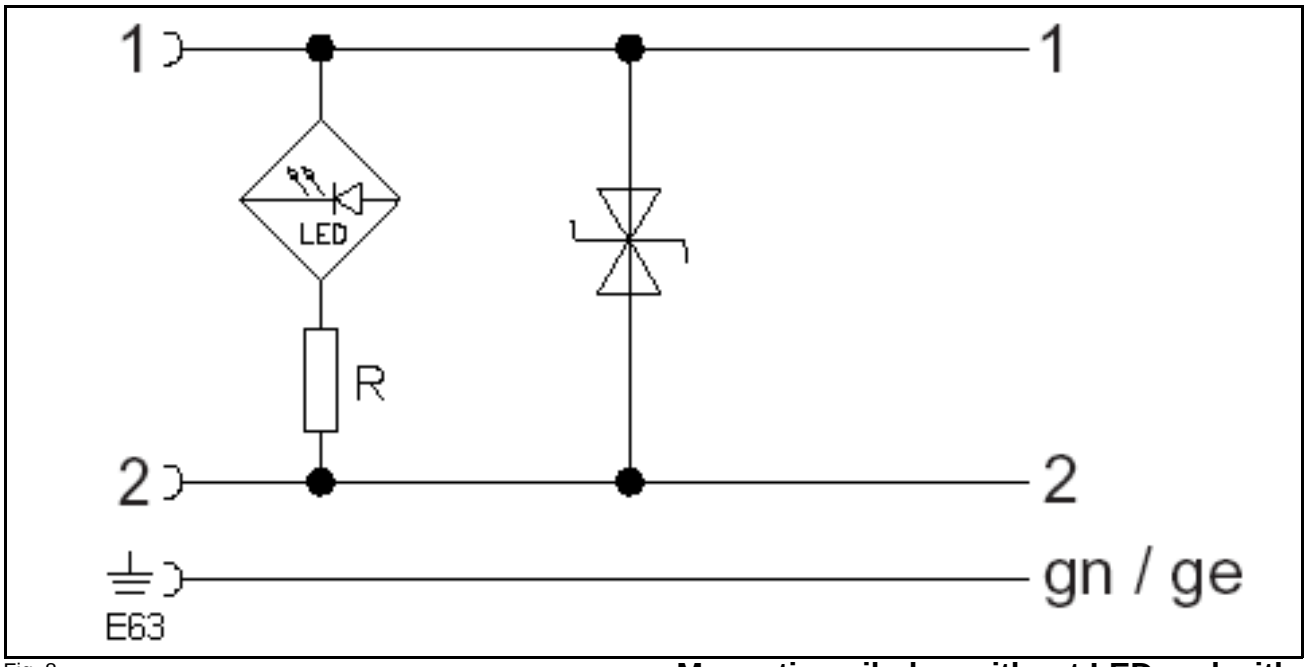


Fig. 8

The plug is polarized, it does not matter whether Pin1 or Pin 2 is supplied with current, Pin 3 is not used. The LED lights if voltage is applied to the solenoid valve.

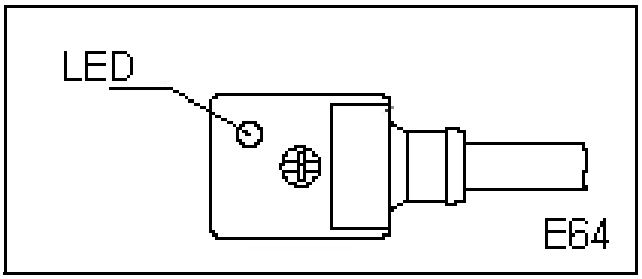


Fig. 9

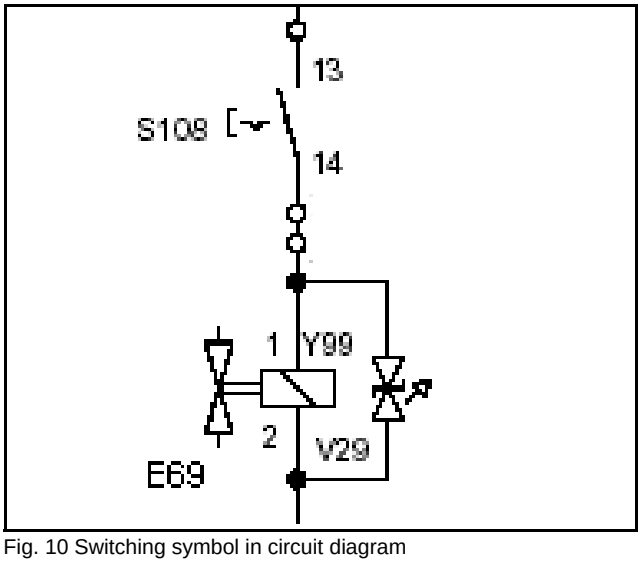


Fig. 10 Switching symbol in circuit diagram

Magnetic coil plug without LED and without supressor diode

The plug has no LED and no suppressor diode as protection against overvoltages.

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Assembly of magnetic coil plugs

These instructions are intended to explain the correct installation of the magnetic coil plug. The objective of the instructions is the correct installation of the plug and to avoid malfunctions in the field caused by moisture and any related corrosion damage.



Fig. 11 Solenoid valve plug with pointed cable



Fig. 12

- Connect the plug with the coil connection and press it firmly onto the connecting housing.

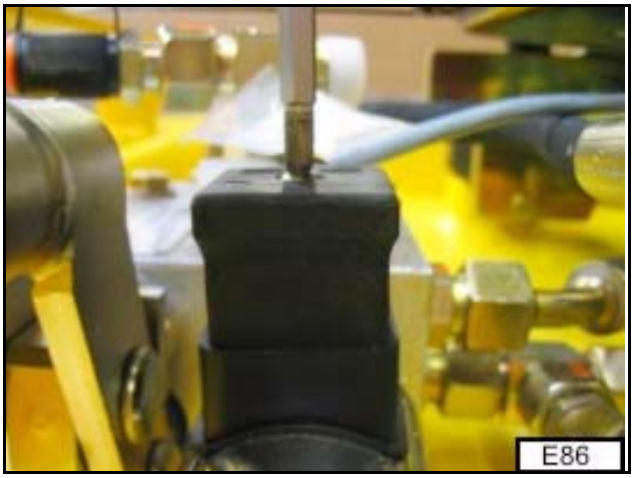


Fig. 13

- Fasten the screw with a suitable screwdriver.



Fig. 14

- Press the plug firmly on again.

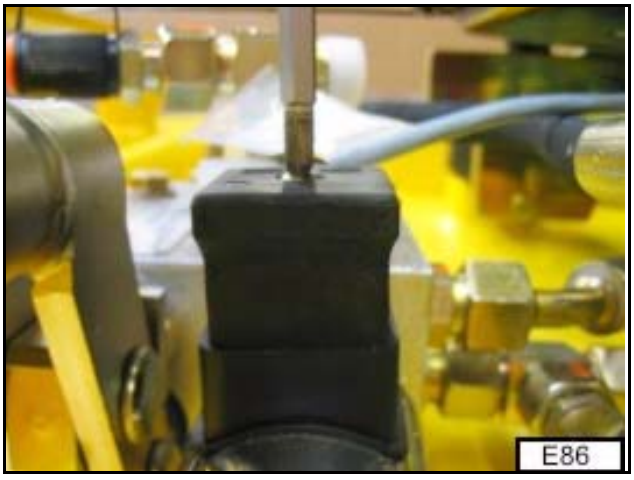


Fig. 15

- Retighten the screw.

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Fig. 16

⚠ Caution

There should be no gap between plug and solenoid coil!



Fig. 17 Correctly installed plug without gap

4.17 Deutsch plug, series DT and DTM

General

Plug connectors DT and DTM have a wedge to hold the pins and sockets in their position. This wedge can be removed and replaced, without having to cut any leads.

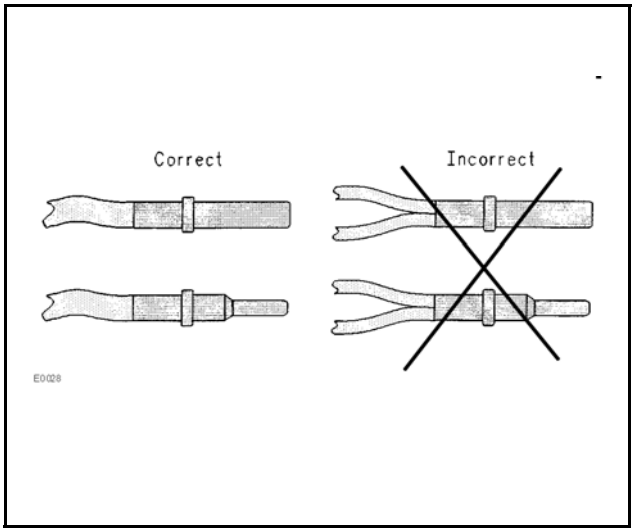


Fig. 18 Crimp connections

⚠ Caution

Do not crimp more than one lead per pin or per socket.

Sockets and pins must not be soldered to leads, they may only be crimped (see special tools for electrics).

When connecting sockets and plugs these must engage with a noticeable click when both halves interlock.

The plug connection should not be separable (without loosening the interlock).

Pulling test

This pulling test ensures that the lead is perfectly crimped and the contact has correctly engaged in the housing.

- Perform a pull test on each lead, each of the terminals and connections must withstand a pulling force of 45 N without any difficulties.

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DT Series



Fig. 1 DT plug connection

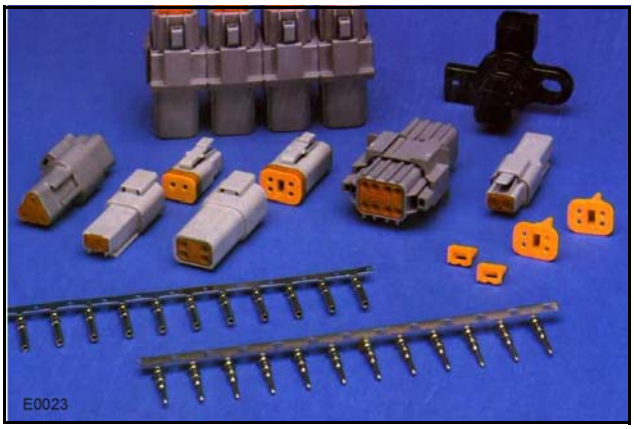


Fig. 2 DT Series

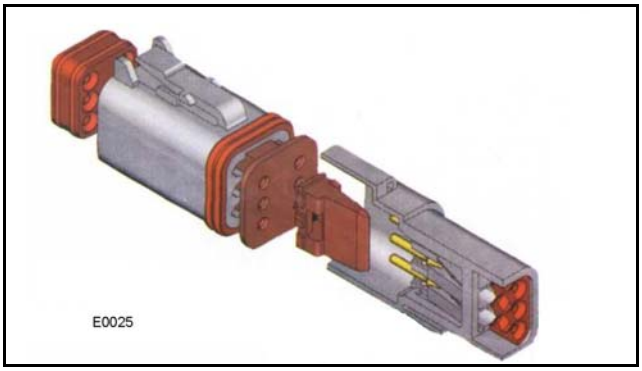


Fig. 3 Sectional drawing

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Installing DT contacts

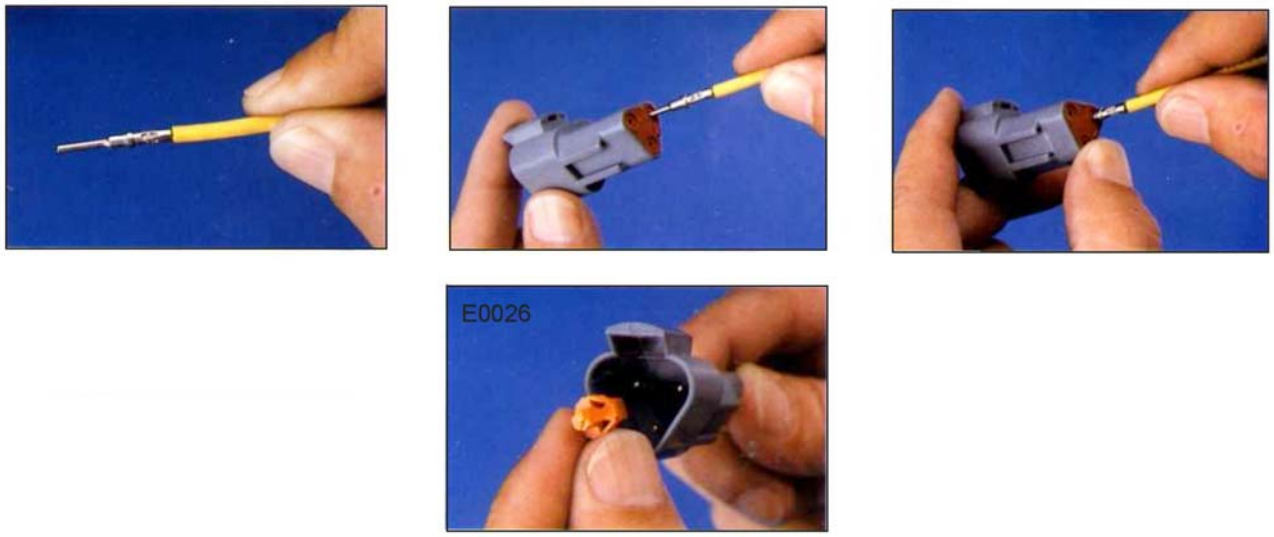


Fig. 4

- Insert the contacts through the rubber grommet until they click into place.
- Insert the orange wedge in direction of arrow.

⚠ Caution

Perform a pull test on each lead, each of the terminals and connections must withstand a pulling force of 45 N without any difficulties.

i Note

Use the same method when assembling the socket.

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Disassembling DT contacts



Fig. 5

- Pull the orange wedge out with long nose pliers.
- Slightly pull the lead and unlock the interlocking hook with a screw driver.
- Pull the contact out of the socket.

i Note

Use the same method when assembling the socket.

In this case the interlock disassembly tool (see special tools for electrics) serves as an aid to remove the wedges.

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DTM Series

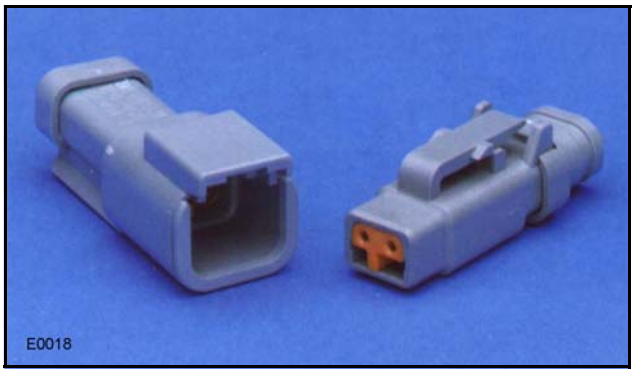


Fig. 1 DTM plug connection

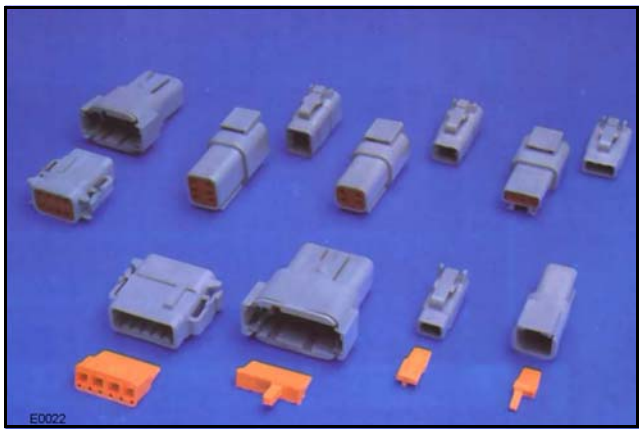


Fig. 2 DTM Series

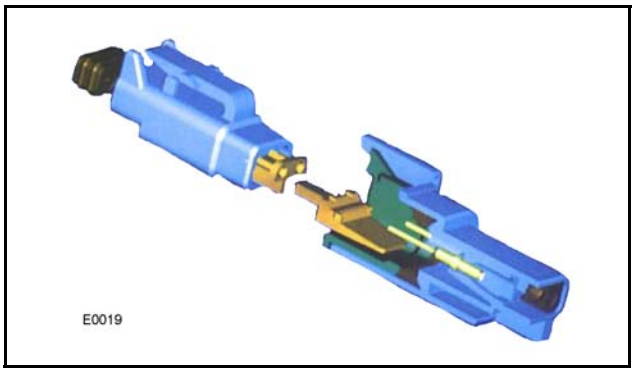


Fig. 3 Sectional drawing

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Installing DTM contacts

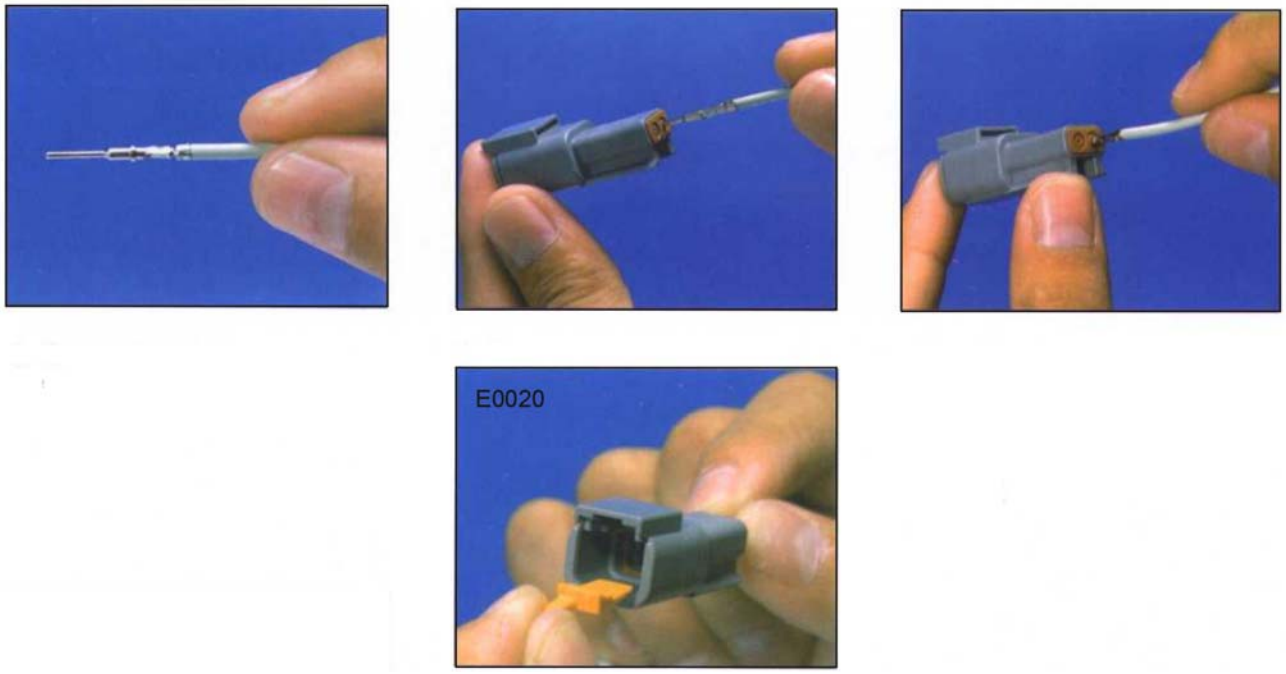


Fig. 4

- Insert the contacts through the rubber grommet until they click into place.
- Insert the orange wedge, until it clicks into place.

⚠ Caution

Perform a pull test on each lead, each of the terminals and connections must withstand a pulling force of 45 N without any difficulties.

i Note

Use the same method when assembling the socket.

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Disassembling DTM contacts

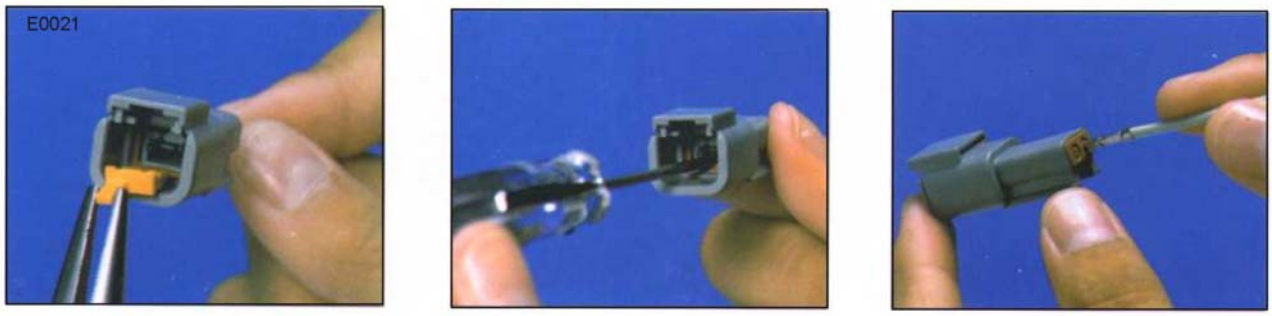


Fig. 5

- Pull the orange wedge (interlock) out with long nose pliers.
- Slightly pull the lead and unlock the interlocking hook with a screw driver.
- Pull the contact out of the socket.

i Note

Use the same method when assembling the socket.

In this case the interlock disassembly tool (see special tools for electrics) serves as an aid to remove the wedges.

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4.18 Plugs and terminals in spring clamping technology

General

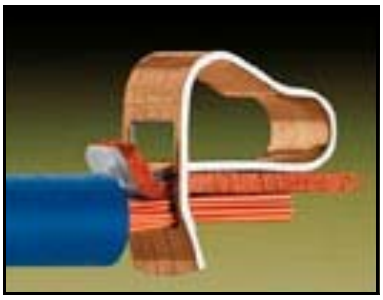


Fig. 1

⚠ Caution

The spring clamp technology is not suitable for extra fine conductors. Extra fine conductors can be easily pulled out of the spring clamp!

Spring clamp technology (Fig. 1) for quick, vibration resistant and maintenance-free connection of all conventional copper conductors (single, multiple or fine stranded) with or without wire and ferrule.

Connecting terminal for quick repairs

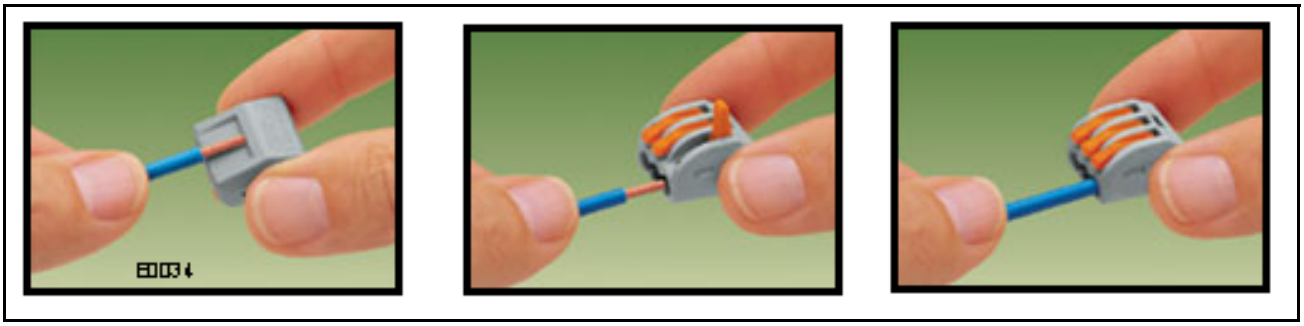


Fig. 2 That's how it works

BOMAG part-no.: 057 565 72

The connecting clamp clamps up to 3 or 5 stripped fine conductors of 0.08 mm^2 to 4 mm^2, single or multiple strand up to 2.5 mm^2. And this even without tools (Fig. 2).

That's how it works

- Strip 9-10 mm of the lead.
- Open the actuating lever and insert the strand.
- Return the actuating lever to initial position.

⚠ Caution

Perform a pull test on each lead, each of the terminals must withstand a pulling force of 45 N without any difficulties.

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Series clamp

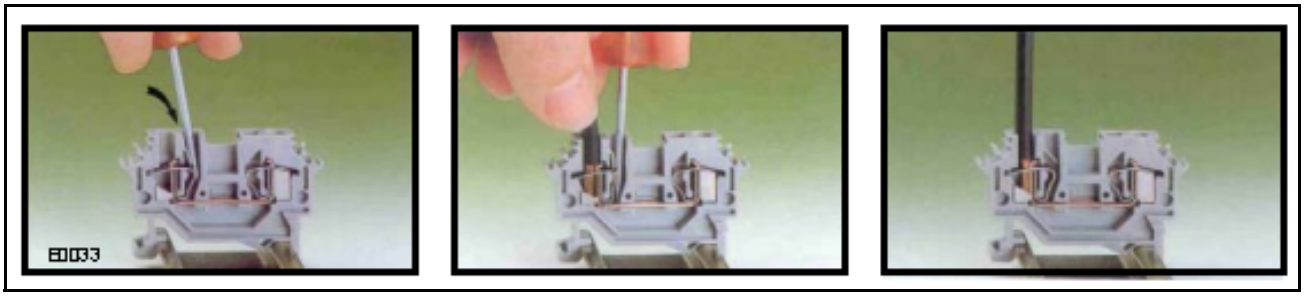


Fig. 3 That's how it works

That's how it works

- Insert a screw driver into the actuating opening until it bottoms.
- Strip 9-10 mm of the lead and insert it into the clamp.
- Pull out the screw driver.

⚠ Caution

Perform a pull test on each lead, each of the terminals must withstand a pulling force of 45 N without any difficulties.

Measuring signals

On these terminal blocks the bridge slot is most suitable for tapping off and measuring signals. Here you may directly insert a 4 mm test adapter (see special tools for electrics) for connecting a measuring lead. This test adapter is standard in the central electrics of heavy equipment machines.

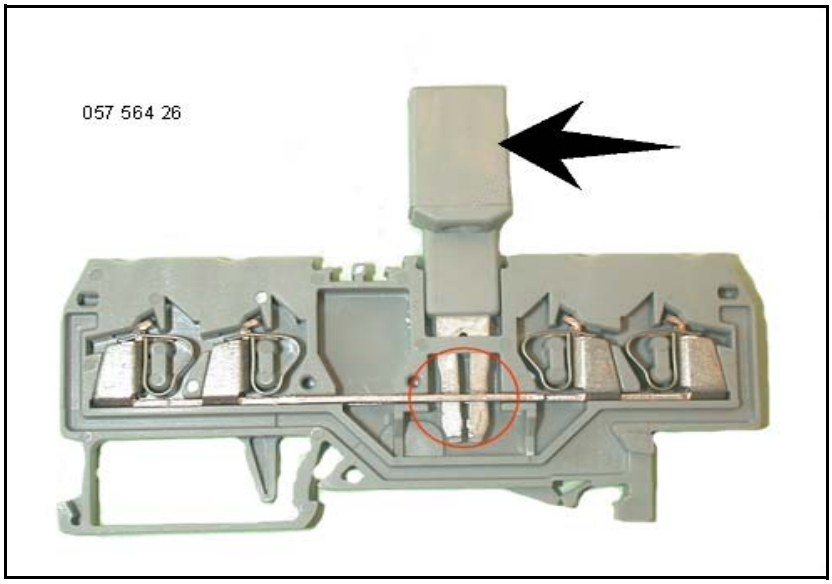


Fig. 4 Test adapter

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X-COM System

The X-COM-SYSTEM, a synthesis of plug connector and series clamp, has grown up to a construction kit for universal system wiring, ever since it was introduced in 1997. All the familiar series clamping functions have thus become pluggable.

X-COM plug clamp

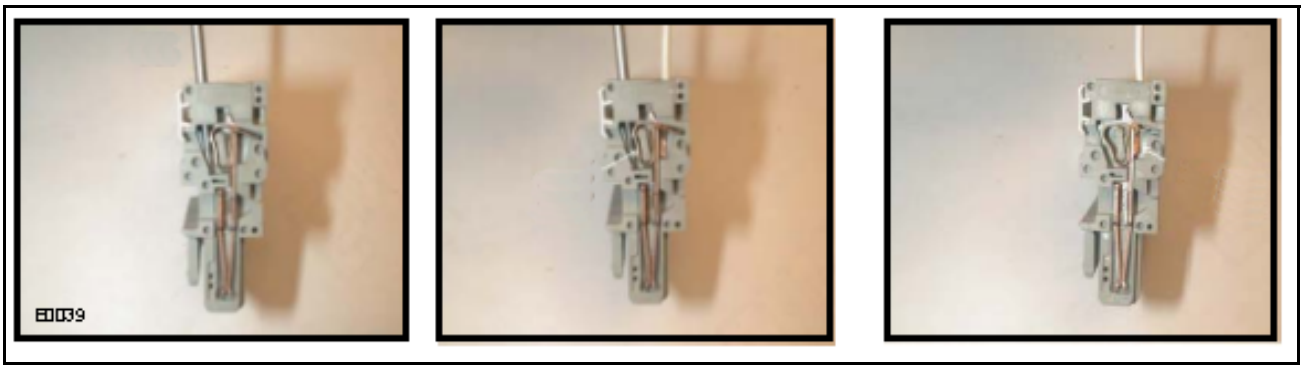


Fig. 5 That's how it works

That's how it works

- Insert a screw driver into the actuating opening until it bottoms.
- Strip 9-10 mm of the lead and insert it into the plug.
- Pull out the screw driver.

⚠ Caution

Perform a pull test on each lead, each of the terminals must withstand a pulling force of 45 N without any difficulties.

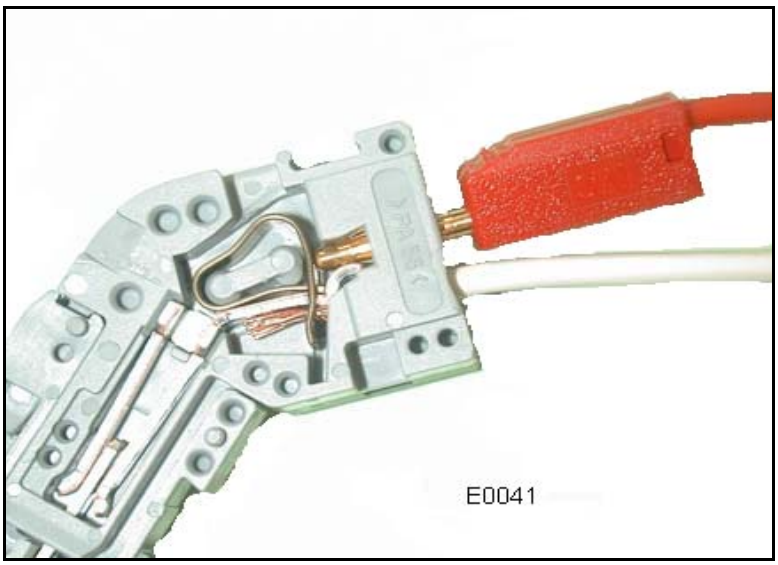


Fig. 6 X-COM plug with measuring cable

- The most reliable measurements on the plug can be made when using the measuring and connecting cable with 2mm plug (see special tools for electrics).

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Measuring signals

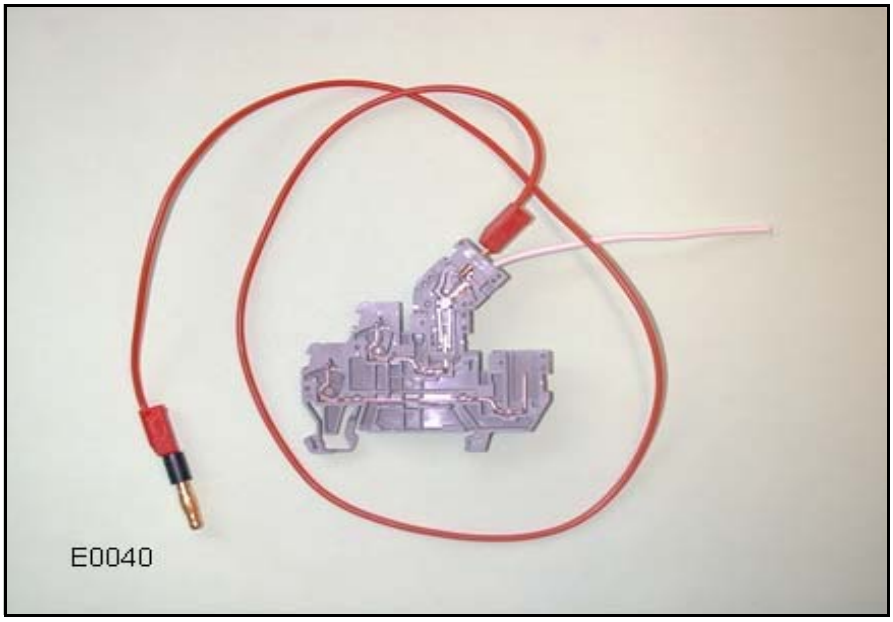


Fig. 7 X-COM plug plugged onto the series clamp

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4.19 Batteries

Battery – accumulator

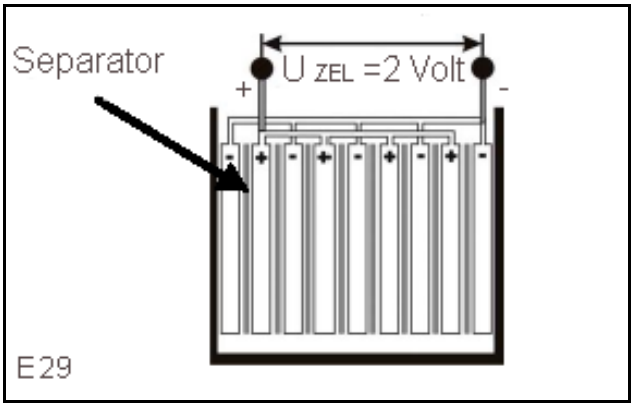


Fig. 1

In vehicles batteries are used to start the engine. The ability to start the engine depends on the charge condition of the batteries.

Lead collectors or accumulators are secondary elements, i.e they can be recharged after discharging electric current.

The basic element of a lead accumulator is the cell. It contains the plate blocks consisting of positive and negative plates. These plates are separated from each other by separators.

All positive plates are arranged parallel to the plus pole, the negative plates parallel to the minus pole of the cells.

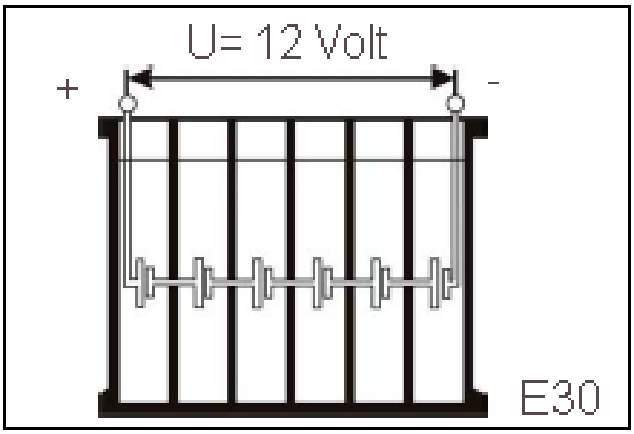


Fig. 2

All cells are filled with a conductive fluid, the electrolyte. For a 12 Volt battery 6 cells are connected in series.

Capacity

is a synonym for the amount of current taken up and discharged by a battery over a specified period of time.

Battery maintenance

i Note

Maintenance free batteries are gaining more and more significance, this freedom from maintenance, however, is only limited to the fact that no water needs to be added.

If the battery is not charged and discharged over a longer period of time, the battery will slowly discharge by itself.

The accumulator may only be discharged down to a final discharging voltage of 10.5 Volt, as otherwise there is a risk of sulphation, i.e. the generated lead sulphate forms increasingly coarser crystals, which will finally not react at all or only very sluggishly during a subsequent charging process.

In the worst case the accumulator can only be disposed of after such an exhaustive discharge.

The following therefore applies for longer downtimes:

- Remove the battery and store it in a cool, dry and frost protected room.
- Check the open circuit voltage on the battery at regular intervals (at least once every month).
- Recharge immediately if the open circuit voltage has dropped to 12.25 Volt (no rapid charging).

i Note

The open circuit voltage of batteries occurs approx. 10 h after the last charging or approx. 1 h after the last discharge.

Battery test in general

- Is the battery leaking? Can traces of impact, shock or compression be found in the leaking area?
- Check for e.g. incorrect fastening, foreign bodies on the battery mounting surface and similar.

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Batteries with screw plugs

Checking the electrolyte level

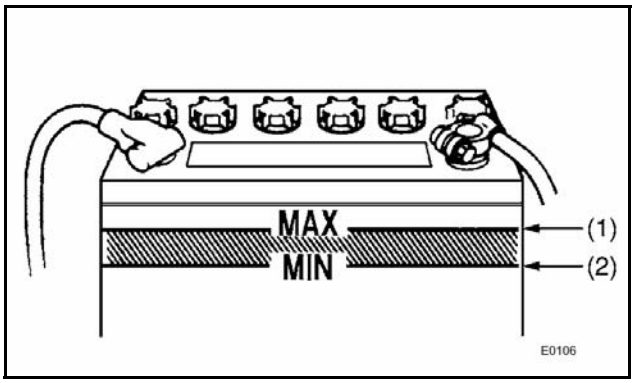


Fig. 3

1 Upper filling level mark

2 Lower filling level mark

- If the electrolyte level only reaches up to the lower filling level mark (2), fill distilled water into the corresponding cells.

Checking the electrolyte density

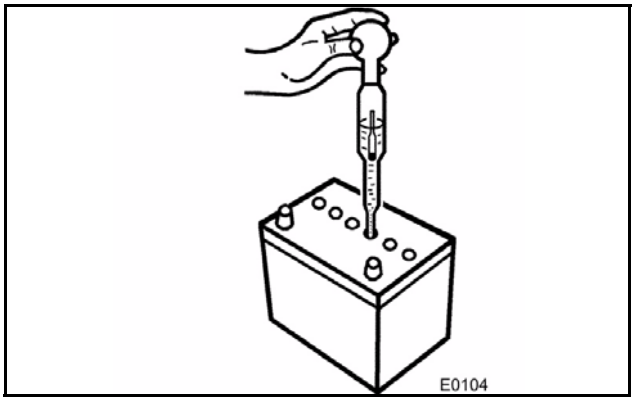


Fig. 4

The cells are filled with diluted sulphuric acid as electrolyte (approx. 25 Vol% sulphuric acid in distilled water), also referred to as accumulator acid, which has a density of 1.285 kg/dm^3 at a temperature of +27° Celsius. This means that one litre of electrolyte has a weight of 1.285 kg. As the cell is being discharged lead sulphate (PbSO4) will form on both electrodes and the electrolyte will increasingly change to water. Since water has a lower specific weight than diluted sulphuric acid, the density of the electrolyte will also drop during the discharge and with a fully discharged cell and a temperature of 27°C it will only be 1.18 kg/dm^3.

With a lead cell the acid density is therefore a measure for the charge condition. This characteristic is used to determine the charge condition of a lead battery. The so-called electrolyte tester (densimeter) is used for this purpose.

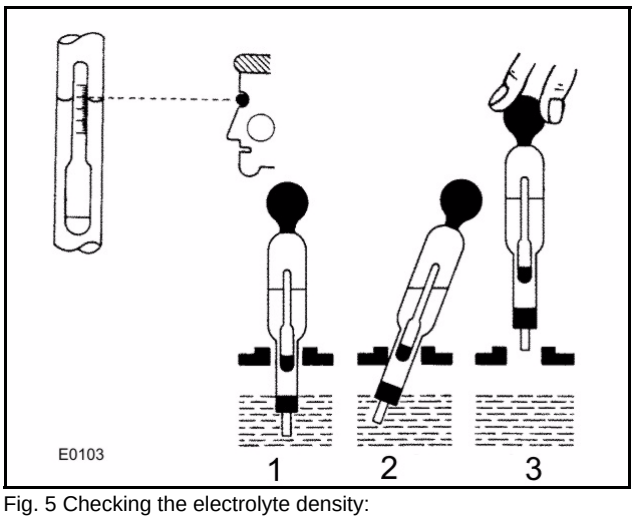


Fig. 5 Checking the electrolyte density:

1) correct

2) poor

3) poor

i Note

(Hold the pipe of the electrolyte tester vertically, without taking it out of the electrolyte.

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Do not draw too much electrolyte into the pipe.

Make sure that the float is not obstructed in its movement and hold the electrolyte tester at eye level.

The electrolyte tester must be read at the highest electrolyte level.

- If the electrolyte temperature deviates from the electrolyte tester calibration temperature, the indicated value for the specific electrolyte weight must be corrected acc. to the formula **(reference)** below.

Reference

The specific weight varies slightly with temperature. To be exact, the specific weight drops by 0.0007 per 1 °C temperature increase (by 0.0004 per 1 °F) and increases by 0,0007 per 1 °C temperature reduction (by 0,0004 per 1 °F) . If e.g. a temperature of 20 °C (68 °F) is used as reference, the indicated value of the specific weight must be corrected acc. to the following formula.

- Specific weight at 20 °C = measuring value + 0,0007 × (electrolyte temperature: 20 °C)
- Specific weight at 68 °F = measuring value + 0,0004 × (electrolyte temperature: 68 °F)

Acid density at 27 °C in kg/dm^3

- 1.25 -1.28, open-circuit voltage approx. 12.7 Volt. Battery is charged.
- 1.20 -1.24, open circuit voltage approx.12.4 to 12.5 Volt, is 50% discharged. Charging is necessary.
- 1.19 and less, open circuit voltage less than 12.3 Volt. Battery is insufficiently charged. The battery needs to be recharged immediately.
- If there is a deviation of the specific weight of more than 0.05 between any of the cells, the battery needs to be replaced.
- If the current consumption during charging is not 1/20 of the nominal capacity (example 100 Ah battery: 100Ah x 1/20 = 5 A) or full recharging of the battery results in a final electrolyte density of only 1.24 kg/dm3 or less, the battery shows normal wear by aging. The battery was insufficient charging or exhaustive discharge.

4.20 Battery service, check the main battery switch

⚠ Danger

Danger of cauterisation ! Danger of explosion!

When working on the battery do not use open fire, do not smoke!

The battery contains acid. Do not let acid come in contact with skin or clothes!

Wear protective clothing!

Do not lay any tools on the battery!

For recharging remove the plugs from the battery to avoid the accumulation of highly explosive gases.

Environment

Dispose of the old batteries environmentally.

i Note

Maintenance free batteries also need care. Maintenance free only means that the fluid level does not need to be checked. Each battery suffers under self-discharge, which may, in not checked occasionally, even cause damage to the battery as a result of exhaustive discharge.

The following therefore applies for the service life:

- Switch off all consumers (e.g. ignition, light, inside light, radio).
- Check open-circuit voltage of the battery at regular intervals. At least once per month.

Reference values: 12.6 V = fully charged; 12.3 V = 50% discharged.

- Recharge the battery immediately after an open-circuit voltage of 12.25 V or less is reached. Do not perform quick charging.

The open-circuit voltage of the battery occurs approx. 10 hours after the last charging process or one hour after the last discharge.

- After each charging process allow the battery to rest for one hour before taking it into service.
- For resting periods of more than one month you should always disconnect the battery. Do not forget to perform regular open-circuit voltage measurements.

⚠ Caution

Exhausted batteries (batteries with formation of sulphate on the plates are not covered under warranty!

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Charging voltage recommendation

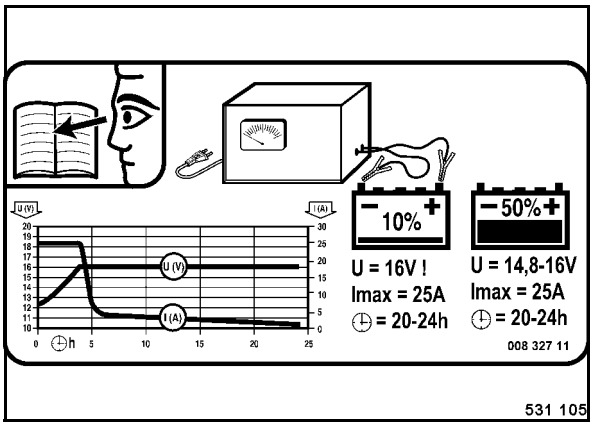


Fig. 6

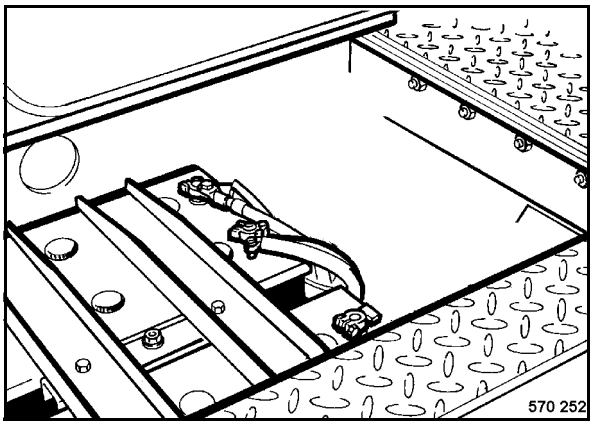


Fig. 7

- Open the access cover in the floor in front of the cabin door (Fig. 7).
- Clean battery poles and pole clamps and grease them with pole grease (Vaseline).
- Retighten the pole clamps.
- Check the fastening of the battery.
- On serviceable batteries check the acid level, if necessary top up to the filling mark with distilled water.

Checking the main battery switch

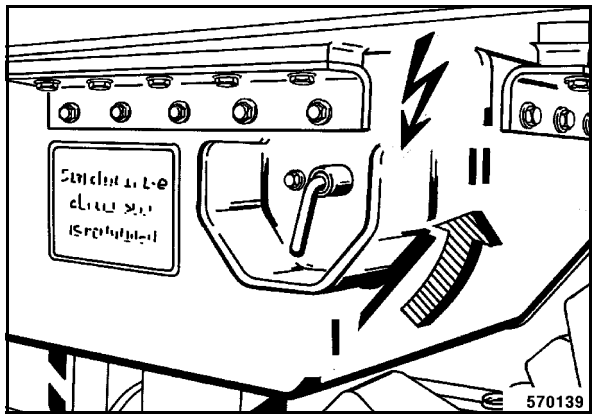


Fig. 8

⚠ Caution

Pull out the main battery switch at the earliest 40 seconds after switching off the ignition, except in cases of emergency.

With engine-independent air heating systems[1] allow the heating to run for another 2 minutes.

- Turn the main battery switch (Fig. 8) to position "II" and check by voltage measurement (ignition key test) whether the batteries are disconnected from the electric system of the machine.

1 Optional equipment

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4.21 Starting the engine with jump leads

⚠ Caution

When using external starting aid two external batteries are required, one for each on-board battery.

- Open the maintenance door to the battery compartment.

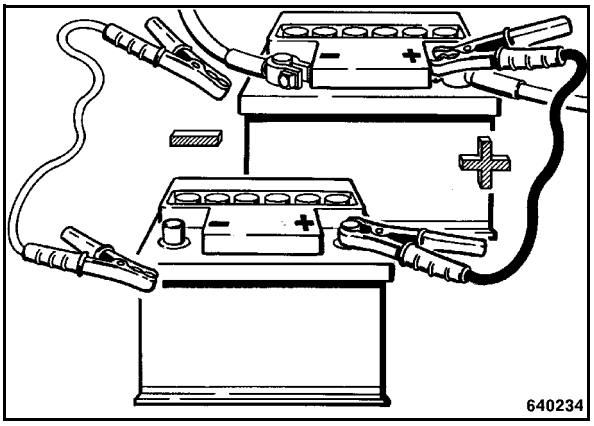


Fig. 9

⚠ Caution

A wrong connection will cause severe damage in the electric system.

- When starting with external batteries connect the positive poles (Fig. 9) first and the negative poles (ground cable) after.
- Start as described under "Starting the engine".

i Note

The ignition switch is designed with a re-start lock. For a new starting attempt the ignition key must first be turned back to position "0".

⚠ Caution

If no powerful consumer is switched on voltage peaks may occur when separating the connecting cables between the batteries, which could damage electrical components.

- Once the engine is running switch on a powerful consumer (working light, etc.).
- After starting disconnect the negative poles (ground cable) first and the positive poles after.
- Switch off the consumer.

⚠ Caution

Run the engine warm for a short while before starting work. Do not rev up a cold engine to high idle speed/full load speed.

4.22 Main battery switch

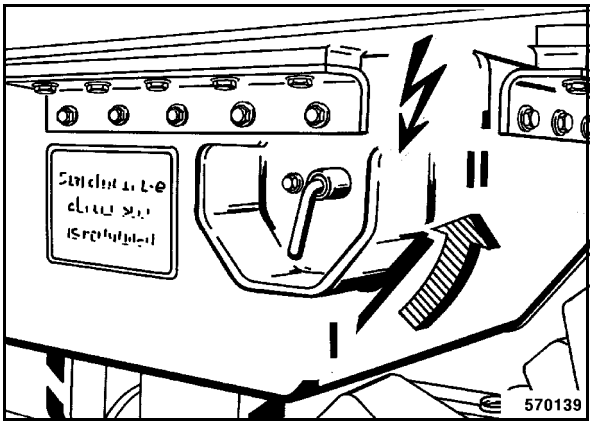


Fig. 10

Main battery switch

Position "I" = Normal position, operation

Position "II" = Separates batteries from the on-board electrics in case of cable fire and fire in the engine compartment as well as protection against unauthorized use.

⚠ Caution

Pull out the main battery switch at the earliest 40 seconds after switching off the ignition, except in cases of emergency.

With engine-independent air heating systems[1] allow the heating to run for another 2 minutes.

1 Optional equipment

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4.23 Main fuse

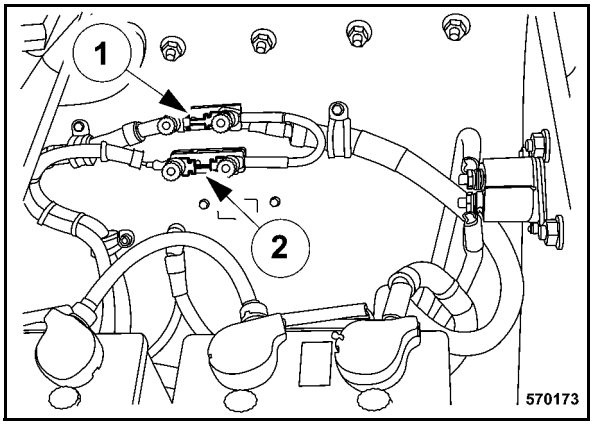


Fig. 11

Main fuses for battery

(1) 250A = (F00) main fuse for battery

(2) 80A = (F48) Main fuse for pre-heating system

i Note

The batteries with the main fuses are located inside the battery compartment under the cover in front of the driver's door.

4.24 Hydraulic oil temperature

Temperature sensor, R04

The sensor is installed inside the hydraulic oil tank. The analog sensor is a variable resistance to ground.

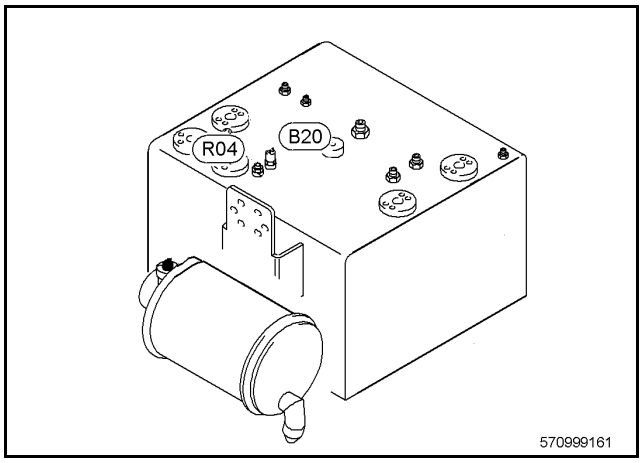


Fig. 12 Hydraulic oil tank

Temperature gauge, P02

This gauge shows the temperature of the hydraulic oil.

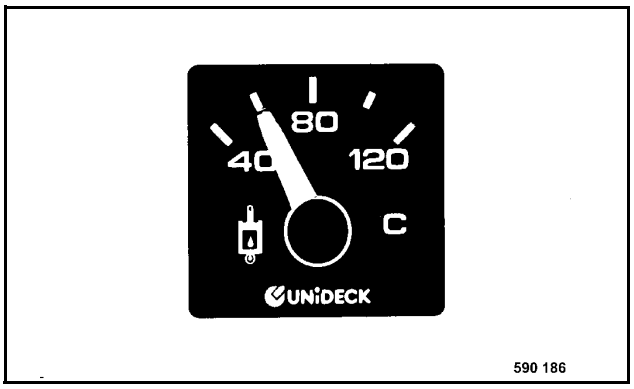


Fig. 13 Temperature gauge, old design

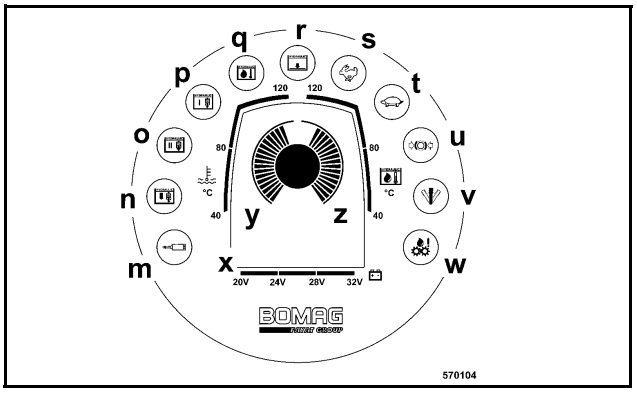


Fig. 14 Temperature gauge (z), new design

i Note

291 OHM ⇒40°C

36 OHM ⇒120°C

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New version: If no temperature sensor is connected or the cable is broken, the temperature gauge will go out.

Temperature switch, B20

The temperature switch is installed in the hydraulic oil tank, it switches on at 96°C$^{\pm 3°C}$ and off at 92°C$^{\pm 3°C}$.

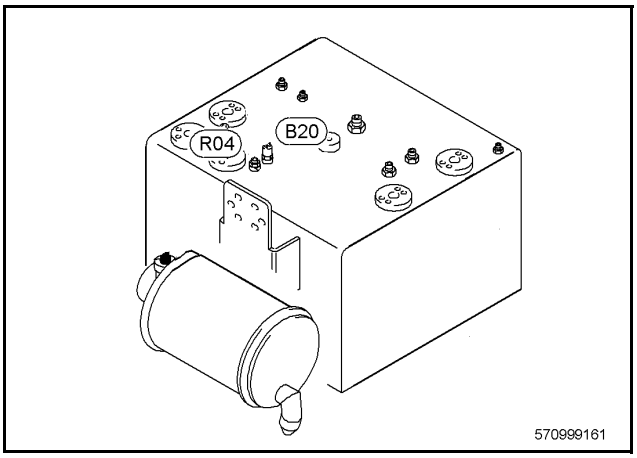


Fig. 15 Hydraulic oil tank

Monitoring by ESX-control

i Note

The signal is evaluated by the ESX-control (Pin X0:50) and displayed 10 seconds later in the display module (Fig. 16) with code "574".

Code "575" appears after 2 minutes, the engine is shut down and the wrning buzzer sounds.

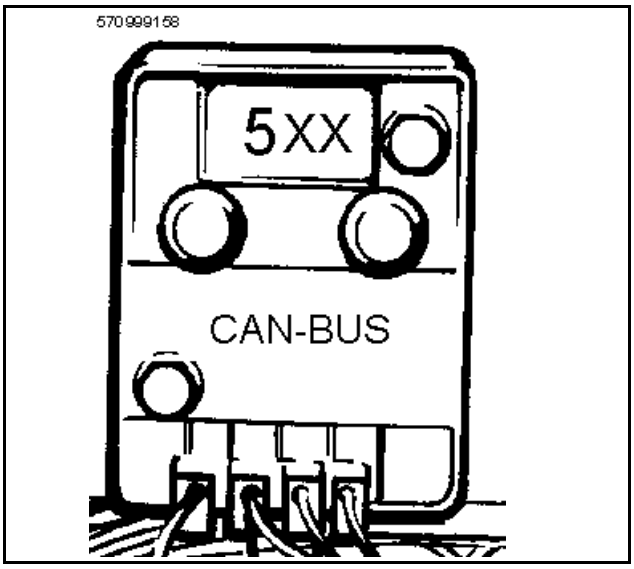


Fig. 16 Display module in central electrics

https://truckmanualshub.com/

Hydraulic oil temperature warning light

The switch contact connects the monitoring board (A15, terminal X1:117) to ground. The hydraulic oil temperature warning light **14** (Fig. 17) or **q** (Fig. 18) lights up.

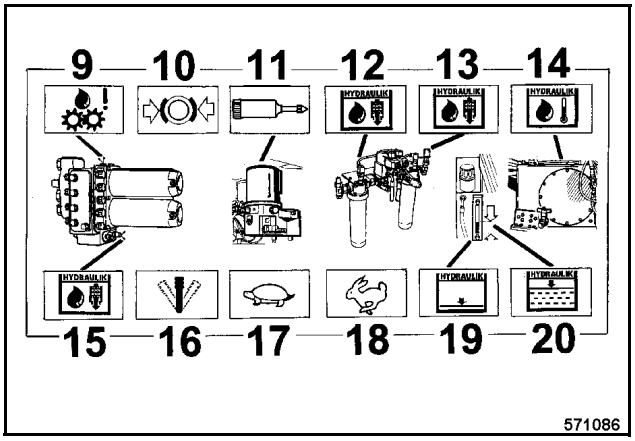


Fig. 17 Monitoring module, old design

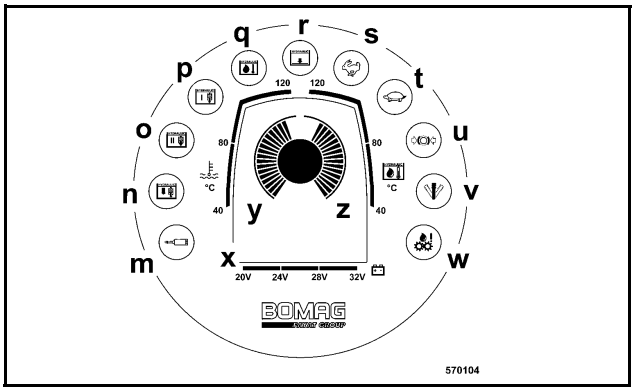


Fig. 18 Monitoring module, new design

4.25 Pressure switch, hydraulic oil filter

Differential pressure switches, B21, B22, B121, B122 and B42

The differential pressure switches B21, B22, B121 and B122 are installed in the charge circuit filters.

i Note

Differential pressure switches B121 and B122 are only used in BC 972 RB-2.

The pressure switch B42 is installed in the filter of the intermediate gearbox (ground switching).

The pressure switches B21, B22, B121 and B122 are parallel connected with the monitoring board (A15) (ground switching). The differential pressure switches switch at a pressure differential of Δ 3.6 bar.

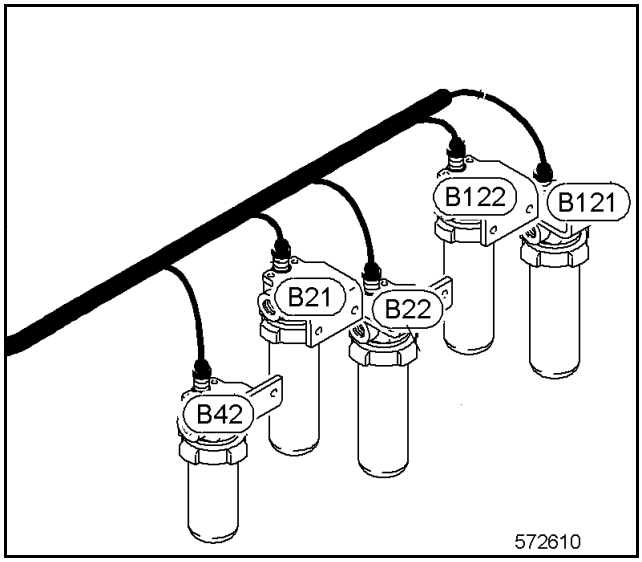


Fig. 1

Monitoring by ESX-control

i Note

The signals are evaluated by the ESX-control and displayed 10 seconds later in the display module (Fig. 2) with code "572".

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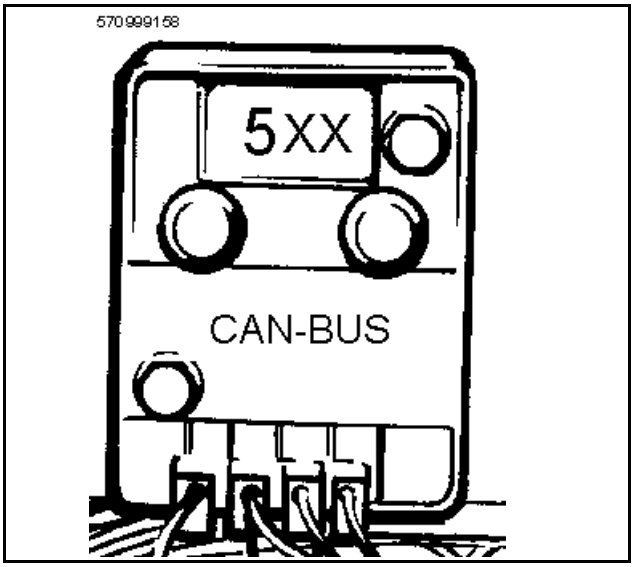


Fig. 2 Display module in central electrics

Warning lamp for differential pressure switches, B21, B22, B121 and B122

The switch contacts connect the monitoring board (A15, terminal X1:119) to ground. The warning light for the differential pressure switches **13** (Fig. 3) or **u** (Fig. 18) lights up.

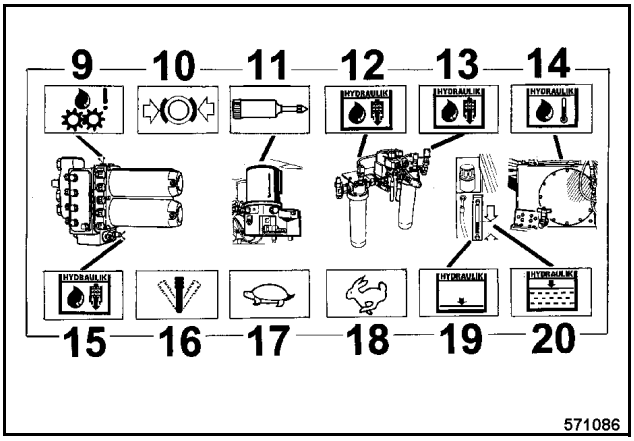


Fig. 3 Monitoring module, old design

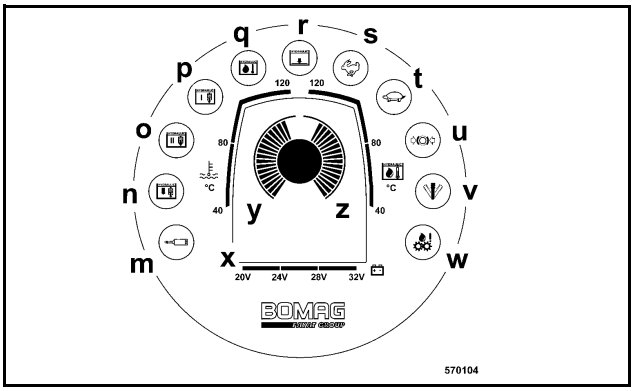


Fig. 4 Monitoring module, new design

https://truckmanualshub.com/

Warning light for differential pressure switch, B42

The switch contact connects the monitoring board (A15, terminal X1:120) to ground. The warning light for the differential pressure switches **12** (Fig. 5) or **p** (Fig. 6) lights up.

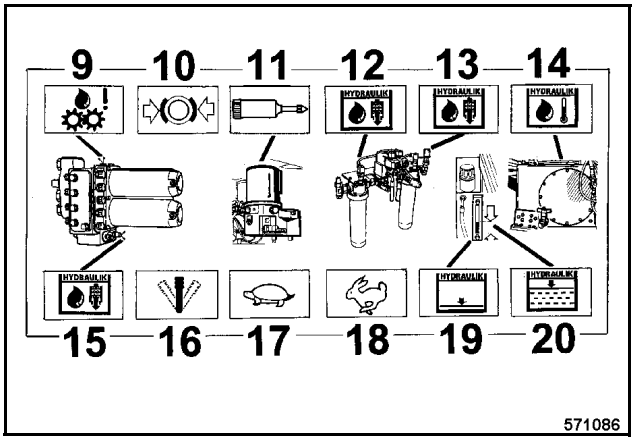


Fig. 5 Monitoring module, old design

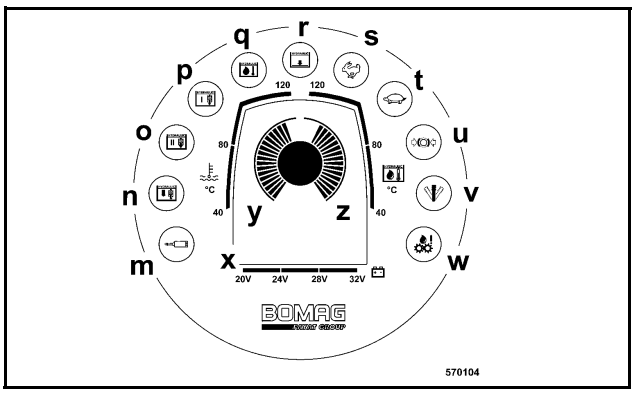


Fig. 6 Monitoring module, new design

Pressure switch in return flow filter block, B25

Pressure switch 1(Fig. 7) is set to $3.5^{\pm 0.5}$ bar and reports excessive dynamic pressure before the primary filter.

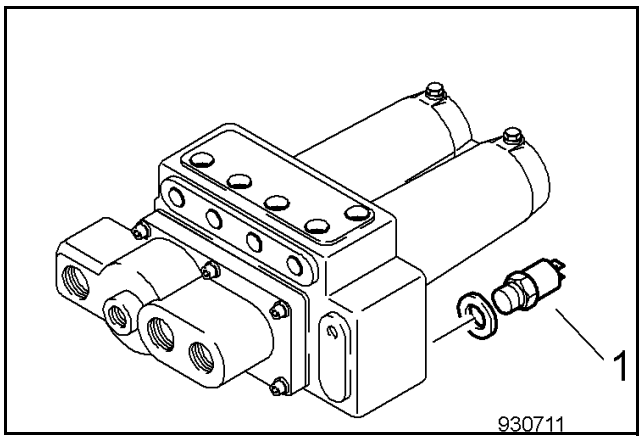


Fig. 7

Monitoring by ESX-control

i Note

The signals are evaluated by the ESX-control with a delay of 120 seconds (timing relay K113) and displayed 10 seconds later in the display module (Fig. 8) with code "580". The warning buzzer is activated at the same time.

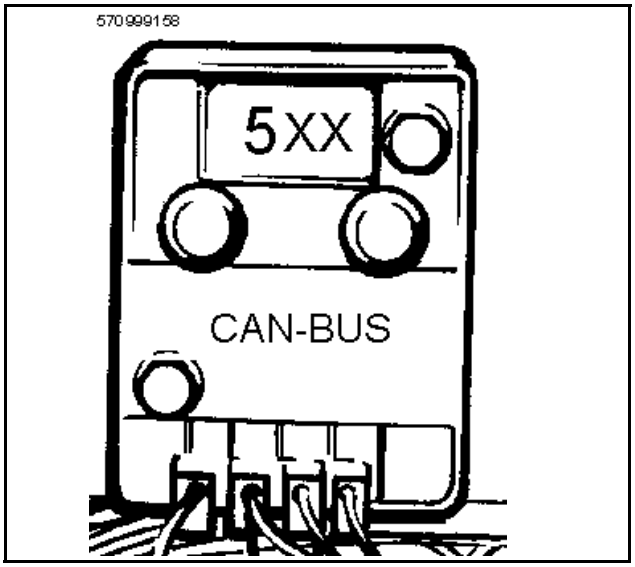


Fig. 8

https://truckmanualshub.com/

Warning lamp for return flow filter block, B25

The timer relay (K113) is activated via the switch contact (ground switching).

The monitoring board (A15, terminal X1:118) is connected to ground 120 seconds later. The return flow filter warning light **15** (Fig. 9) or **n** (Fig. 10) lights up.

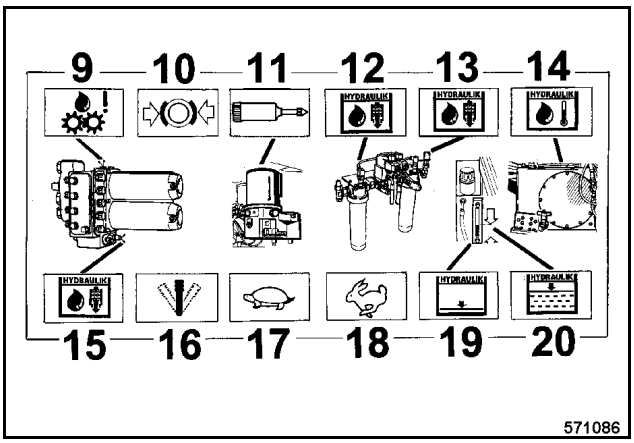


Fig. 9 Monitoring module, old design

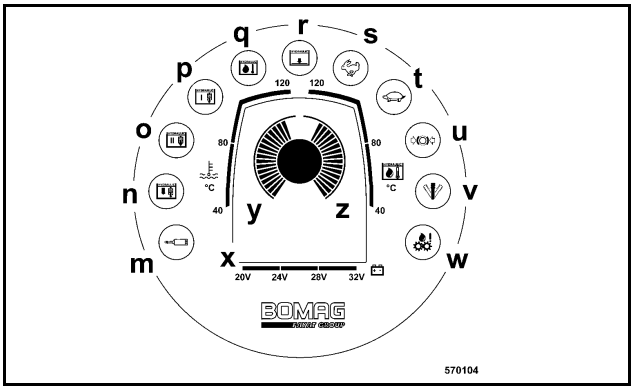


Fig. 10 Monitoring module, new design

4.26 Magnetic sensor, hydraulic oil

Magnetic sensor, B19

The magnetic sensor is in the return flow filter block. The sensor switches when sensor has picked up metal chips.

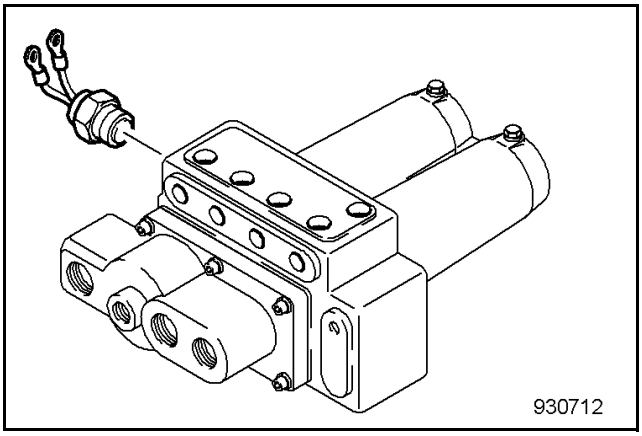


Fig. 1

Monitoring by ESX-control

i Note

The signal is evaluated by the ESX-control and displayed 10 seconds later in the display module (Fig. 2) with code "570".

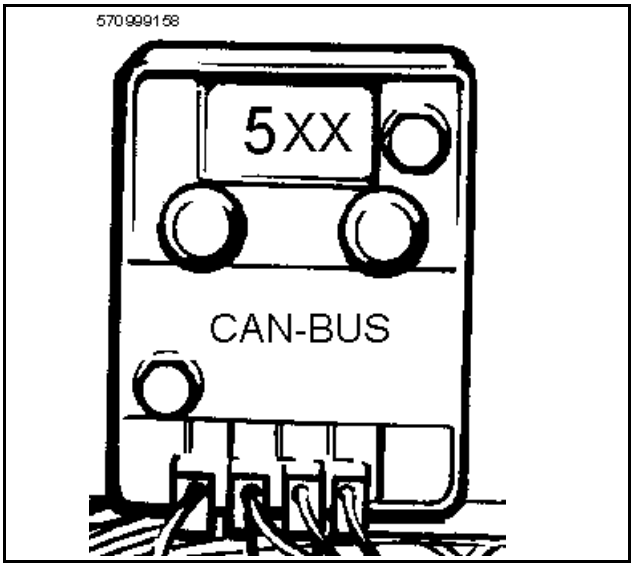


Fig. 2 Display module in central electrics

https://truckmanualshub.com/

Warning light for magnetic sensor, B19

The switch contact connects the monitoring board (A15, terminal X1:121) to ground. The warning light for the magnetic sensor **9** (Fig. 3) or **w** (Fig. 4) lights up.

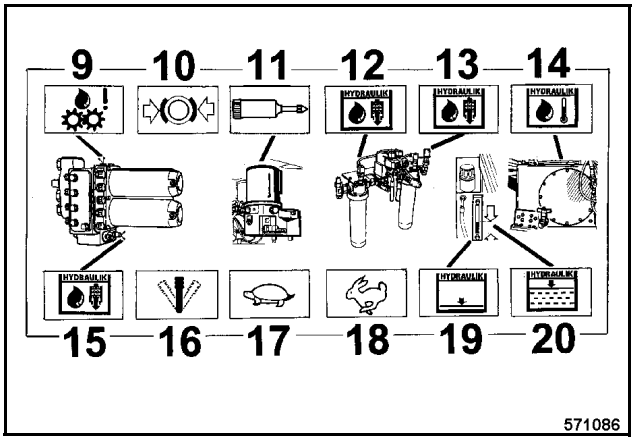


Fig. 3 Monitoring module, old design

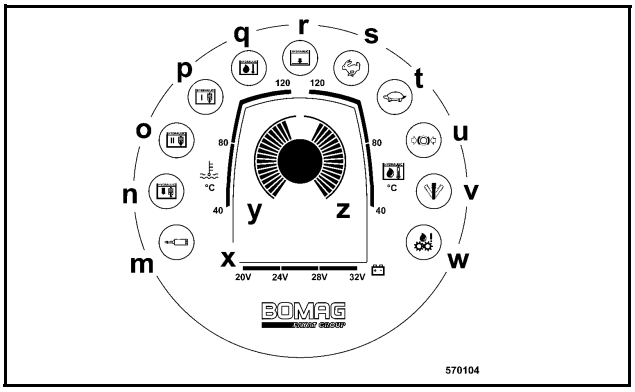


Fig. 4 Monitoring module, new design

4.27 Pressure switch for brake

Pressure switch, B05

At a pressure of less than$15^{\pm 1.5}$ bar the pressure switch switches to ground.

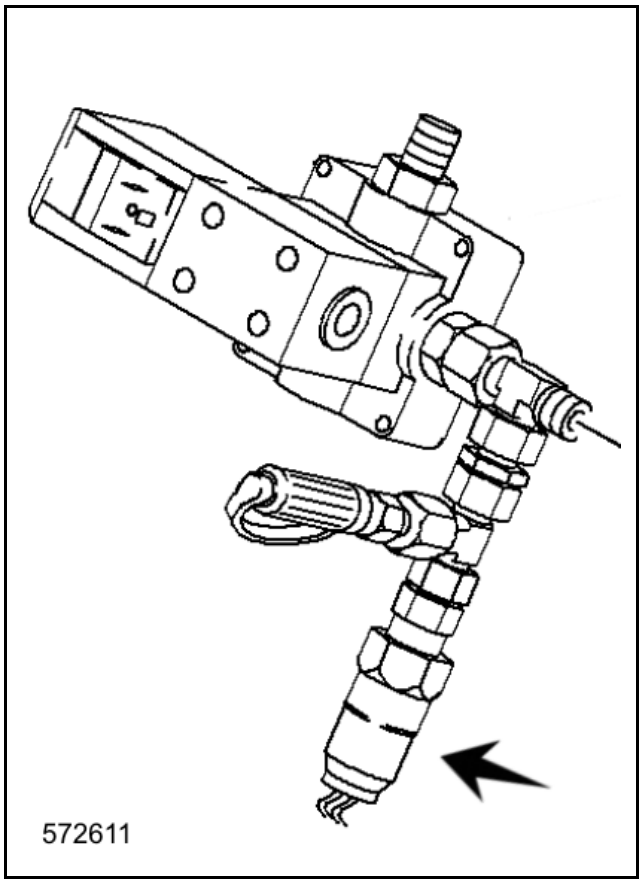


Fig. 1

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Parking brake warning light

The switch contact connects the monitoring board (A15, terminal X1:122) to ground. The parking brake warning light **10** (Fig. 2) or **u** (Fig. 3) lights up.

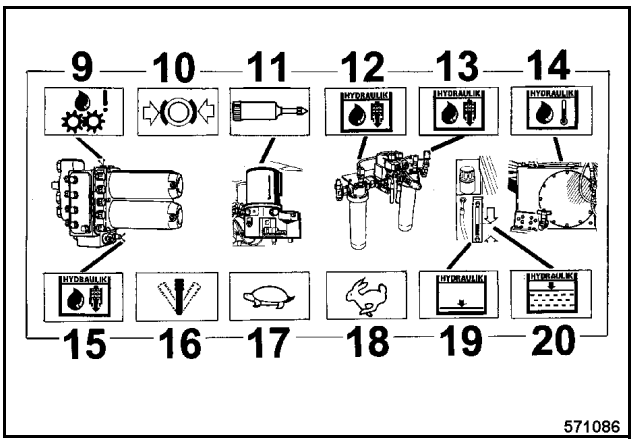


Fig. 2 Monitoring module, old design

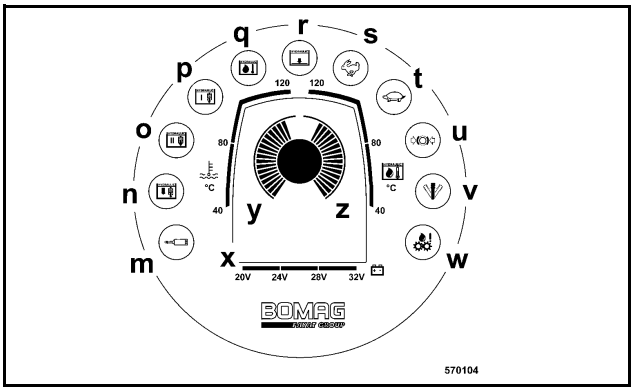


Fig. 3 Monitoring module, new design

4.28 Level sensor in diesel tank (R03)

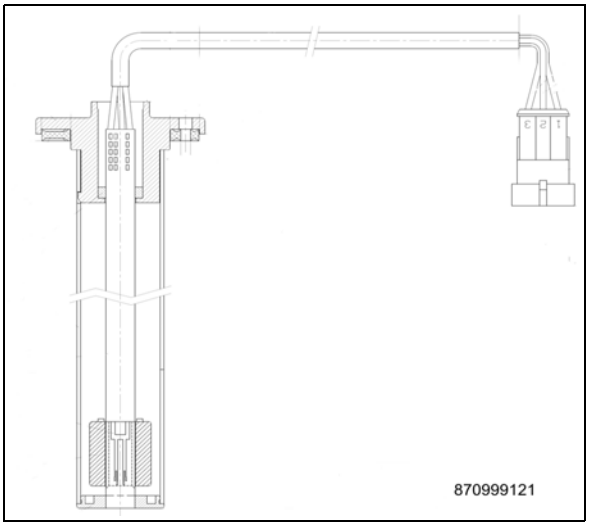


Fig. 1

The fluid of the level to be measured carries a float, which lowers or rises with the fluid level. Contact springs mounted on the float thereby slide along two resistor wires arranged parallel to the movement of the float and generate a resistance value, which is proportionate to the fluid filling level. The corresponding resistance value is measured by an electric meter and displayed as fluid level value.

Fuel level gauge

The gauge shows the fuel level.

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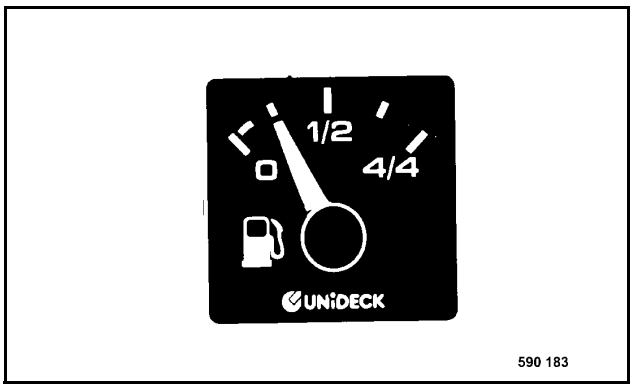


Fig. 2 Fuel level gauge, old design

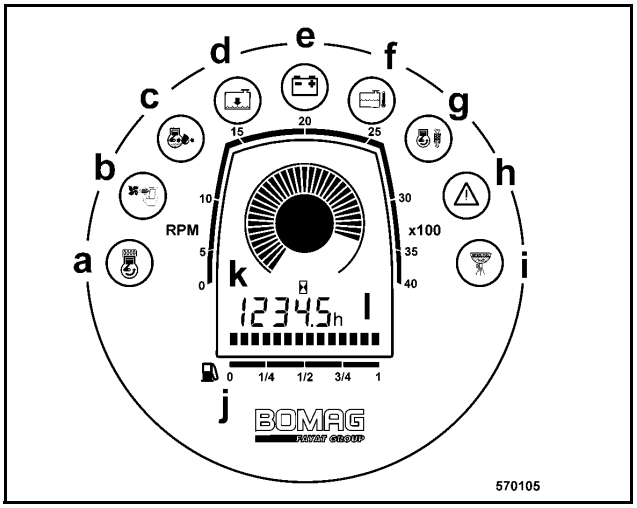


Fig. 3 Fuel level gauge (j), new design

i Note

0 OHM ⇒ Tank full

81 OHM ⇒ Tank empty

New version: If no level switch is connected or the cable is broken, the fuel level gauge will go out.

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4.29 Blower monitoring module A53

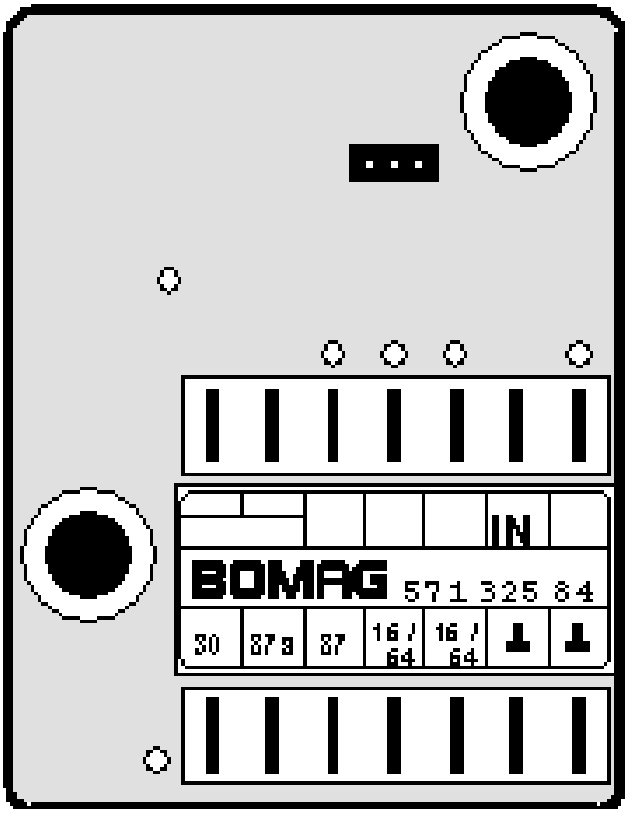


Fig. 1 Blower monitoring module

Module description blower monitoring

This module protects the fresh air blower in case of overloads (contamination) against damage and thus the machine against subsequent damage.

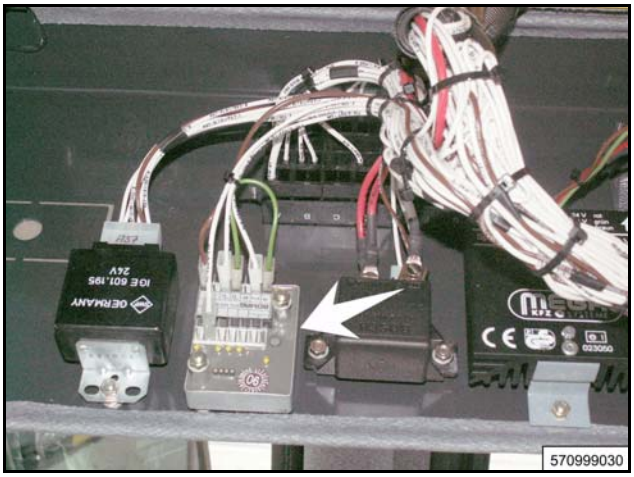


Fig. 1

The module is located in the right hand cabin flap.

The module has the function:

To make a connection from terminal 30 to terminal 87a after 20 seconds if the blower speed drops below a certain limit (1300 rpm) and after 8 seconds if the speed signal fails.

i Note

In deenerized condition there is no connection between Pins 30 and 87a.

Switch position	Dropping resistor	Signal frequency	Blower speed
Low speed	22 Ohm	73 Hz	2190 rpm
Mean speed	10 Ohm	89 Hz	2670 rpm
Max.speed	No dropping resistor	113 Hz	3390 rpm

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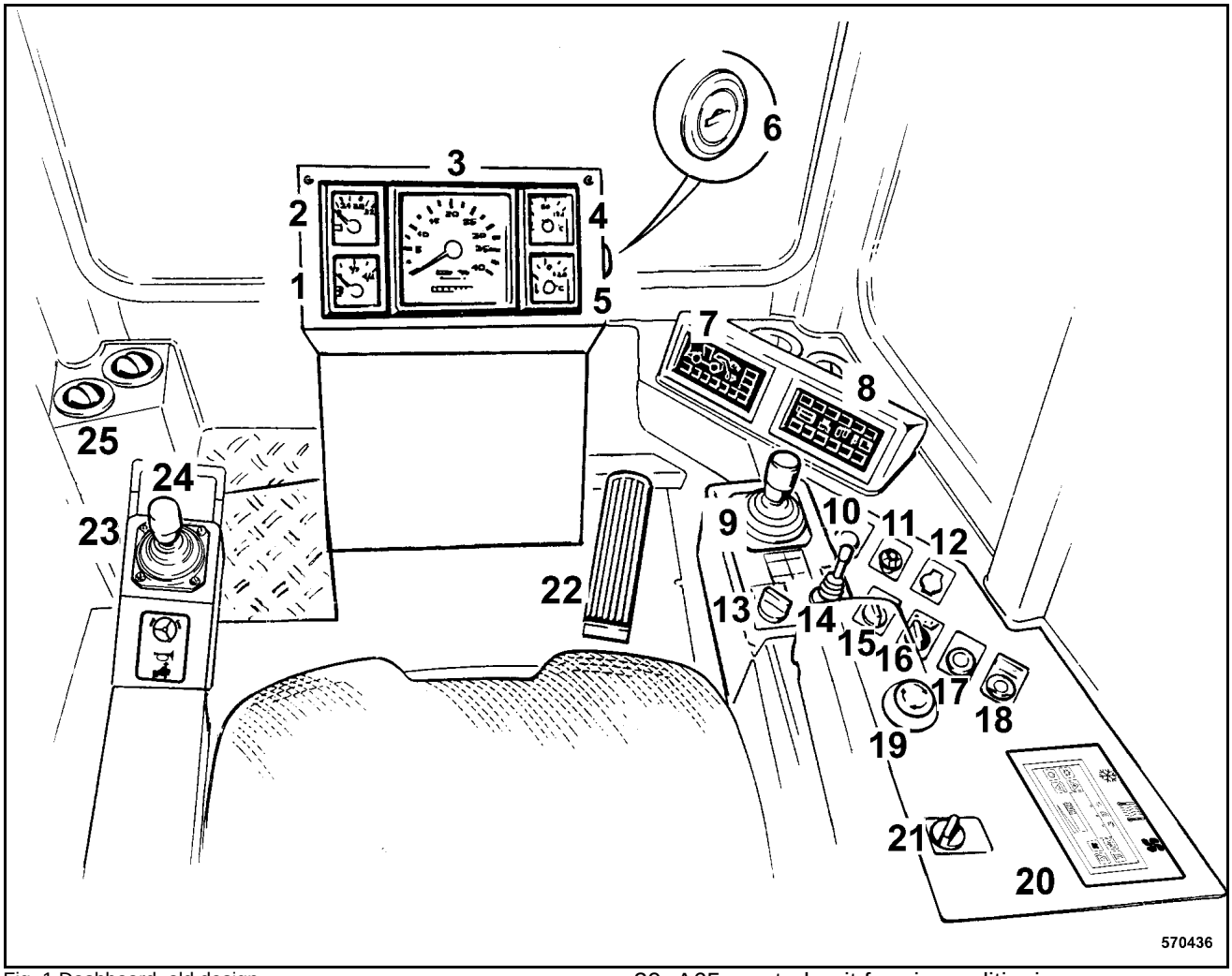


Fig. 1 Dashboard, old design

1 P00, fuel gauge
2 P12, Volt meter 24V
3 P03, engine RPM-meter with (P00) operating hour meter
4 P14, coolant temperature gauge
5 P02, hydraulic oil temperature gauge
6 S00, ignition switch
7 A15, fault indicator, engine functions
8 A15, fault indicator, machine functions
9 S70, lever for dozer blade / bucket control control
10 H04, warning light for engine control
11 H70, control light for water separator in fuel pre-filter
12 XS, socket 24V
13 S02, rotary switch, travel speed ranges
14 S31, travel lever (forward/0/reverse)
15 S04, rotary switch for parking brake
16 S25, rotary switch for seat heating
17 E20, cigarette lighter
18 S27, push button for central lubrication system
19 S01, Emergency stop switch
20 A65, control unit for air conditioning
21 S44, rotary switch for cabin fresh air ventilator
22 S119, travel pedal for throttle control
23 S71, steering lever
24 S03, push button for warning horn
25 Air distribution nozzles

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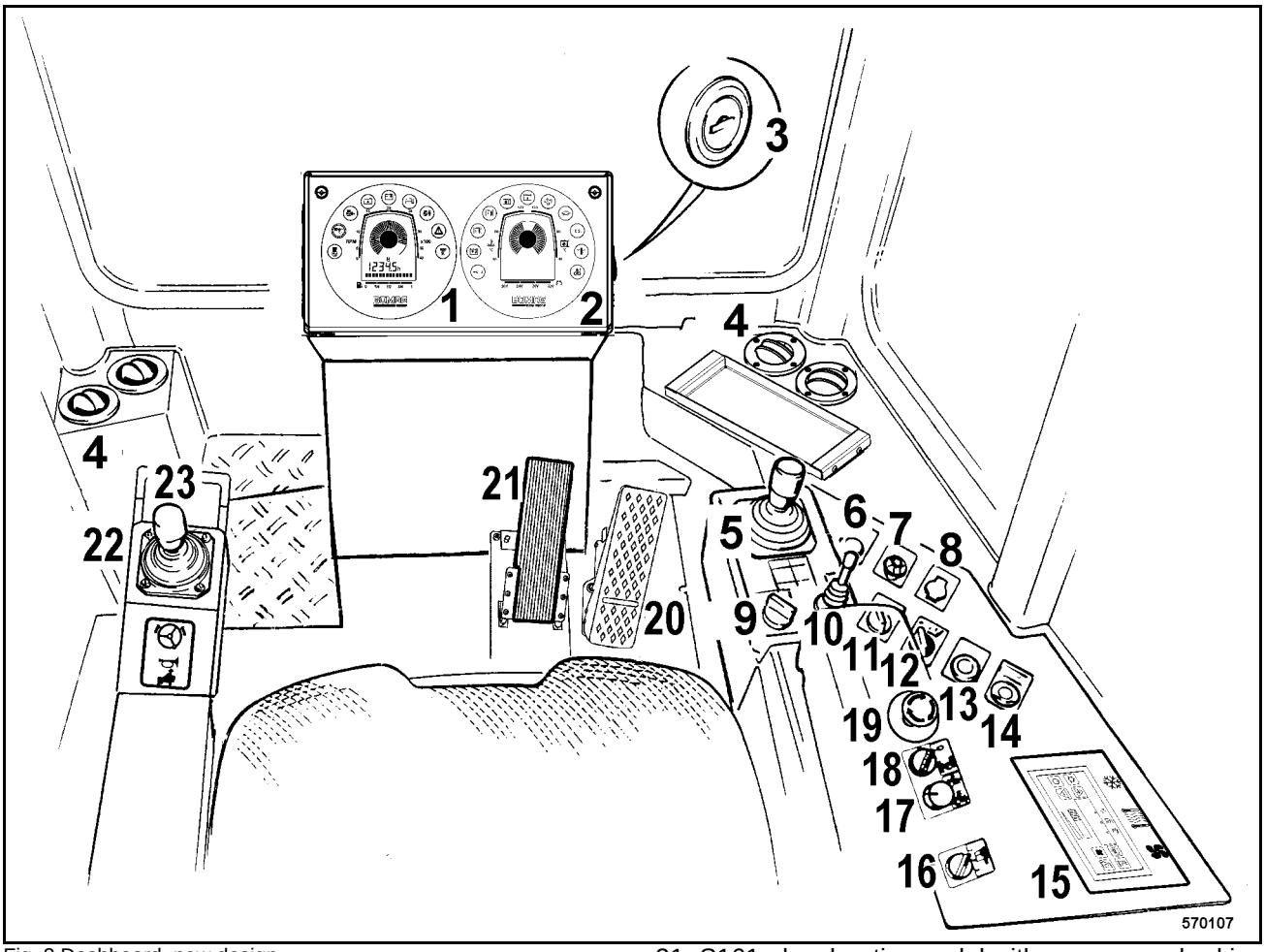
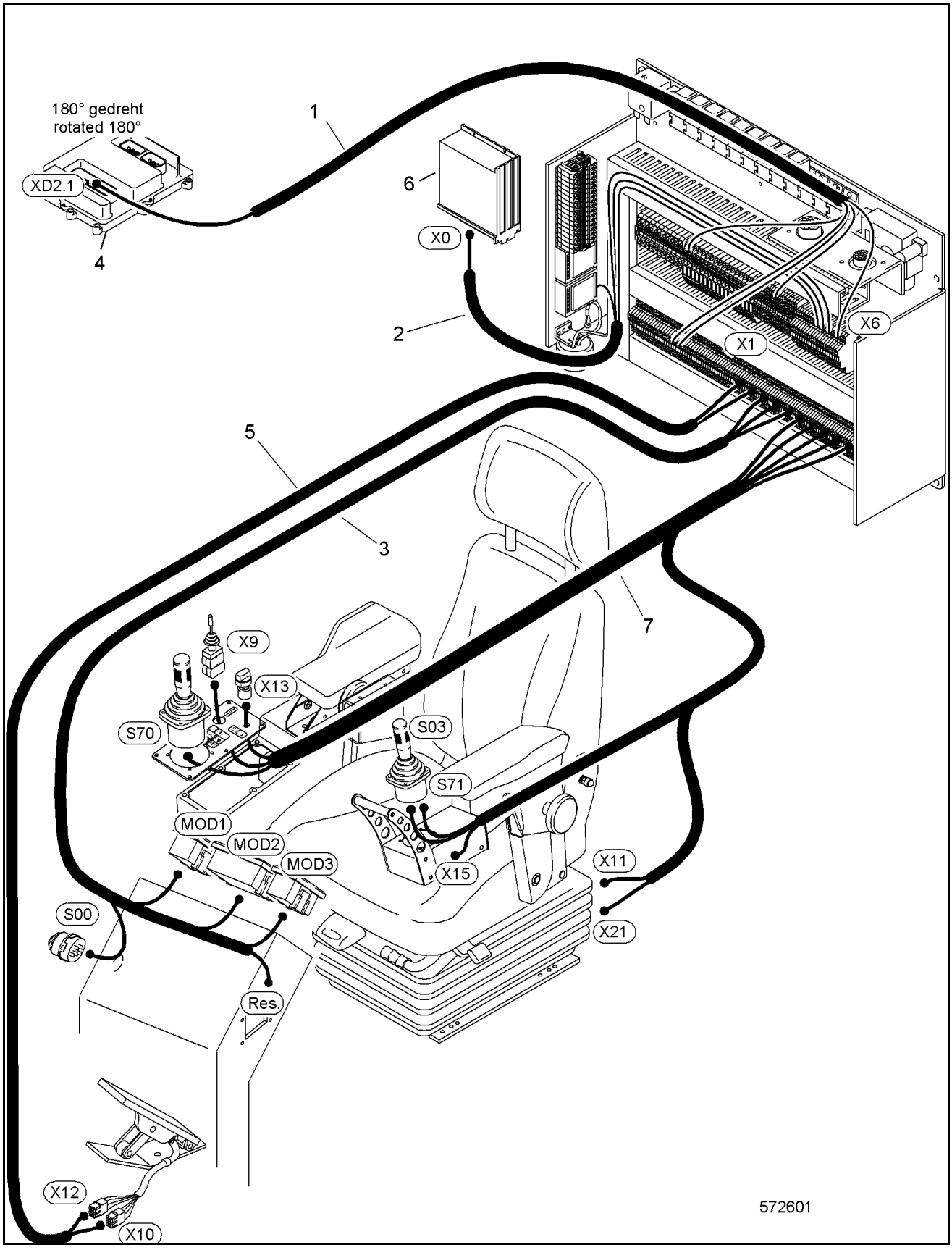


Fig. 2 Dashboard, new design

1 A15, instrument cluster left
2 A15, instrument cluster right
3 S00, ignition switch
4 Air distribution nozzles
5 S70, lever for dozer blade control
6 H04, warning light and diagnostic push button for engine control
7 H70, warning light water in fuel filter
8 XS, socket 24V
9 S02, rotary switch, travel speed ranges
10 S31, travel lever
11 S04, rotary switch for parking brake
12 S25, rotary switch for seat heating
13 Cigarette lighter
14 S27, push button for central lubrication system
15 A65, control unit for air conditioning[1]
16 S44, rotary switch for cabin ventilator
17 S120, potentiometer for throttle control*
18 S160, rotary switch for activation of manual throttle/deceleration pedal ON/OFF with indicator light*
19 S01, Emergency Stop switch
20 S119, travel pedal for throttle control
21 S161, deceleration pedal with emergency braking kick-down*
22 S71, steering lever
23 S03, push button for warning horn

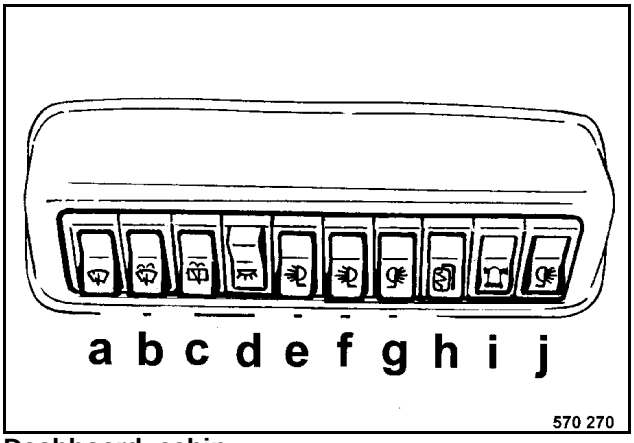
1 Optional equipment

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1 Wiring loom, electrics box - engine control unit (A48)
2 Wiring loom, electrics box - ESX control
3 Wiring loom, electrics box - module cockpit
4 A48, engine control unit
5 Wiring loom, electrics box - throttle pedal
6 ESX, electronic control
7 Wiring loom, electrics box - driversseat'

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Dashboard, cabin

a = S20, toggle switch for front windscreen wipers

b = S22, toggle switch for front washer

c = S21, toggle switch/push button for rear windscreen wiper/washer

d = S45, toggle switch for inside lights

e = S16, toggle switch for front working head lights

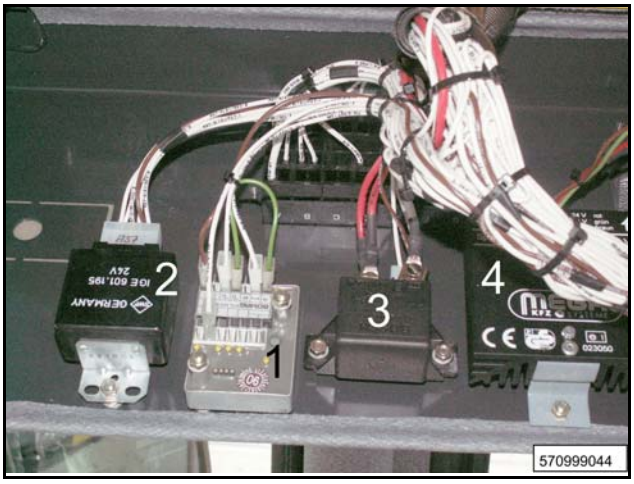
f = S53, toggle switch for working head lights, sides

g = S26, toggle switch for working head lights, rear

h = S128, toggle switch for rear view mirror heating

i = S38, toggle switch for flashing beacon

j = S137, toggle switch for engine compartment illumination

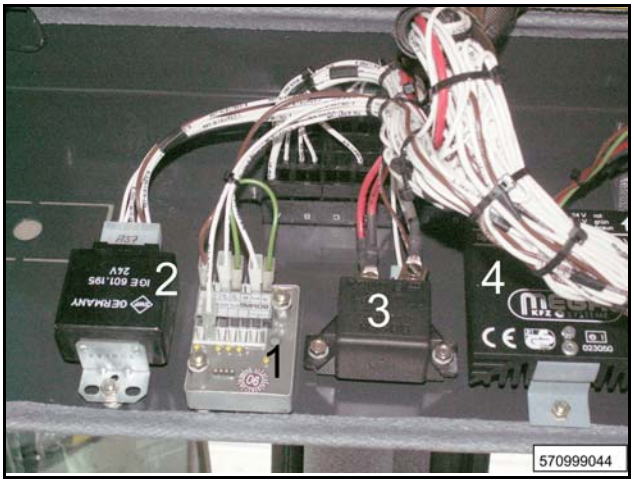


1 A53, fan module

2 A57, pulse generator for windscreen wiper

3 K32, relay for cabin

4 U01, voltage transformer 24/12 Volt

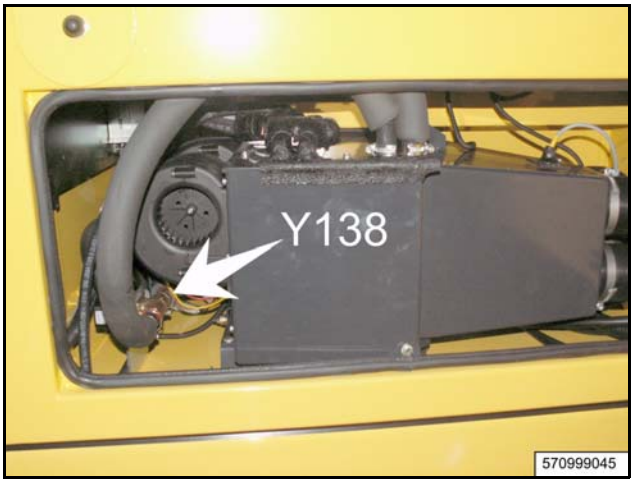


1 A53, fan module for fresh air fan

2 A57, pulse generator for windscreen wiper

3 K32, relay for cabin

4 U01, voltage transformer 24/12 Volt



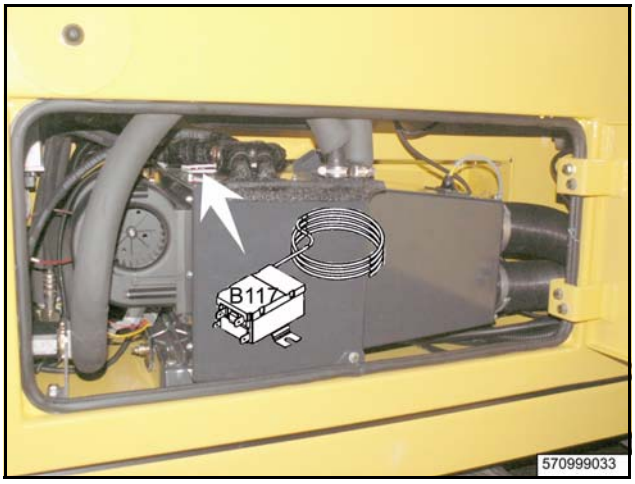
Y138, solenoid valve for heating



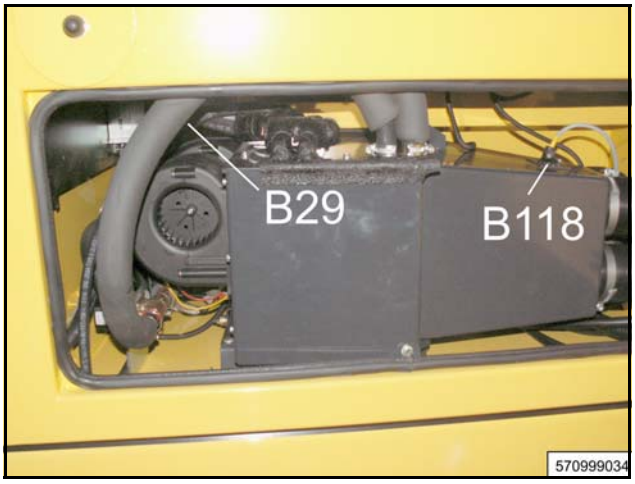
E37, radial twin blower

A53, blower module for radial twin blower

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B117, thawing thermostat



B29, room temperature sensor

B118, blow-off temperature sensor

4.31 Fuses

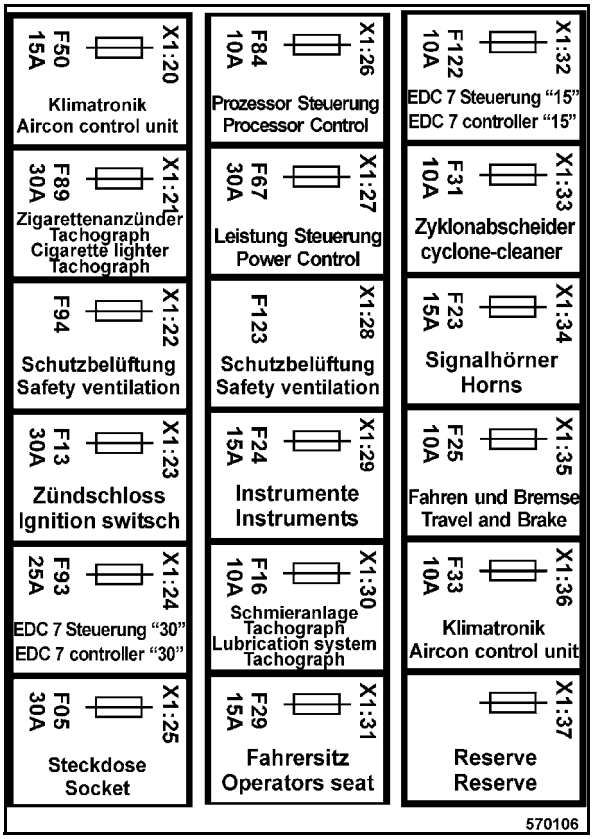


Fig. 3

Fuses

Terminal

X1:20 (15A) = (F50) Climatronic[1]
X1:21 (30A) = (F89) Cigarette lighter
X1:22 = (F94) Spare, safety ventilation system
X1:23 (30A) = (F13) Ignition switch
X1:24 (25A) = (F93) EDC 7 Control, potential 30
X1:25 (30A) = (F05) Socket
X1:26 (10A) = (F84) Processor control
X1:27 (30A) = (F67) Power control
X1:28 = (F123) Spare, safety ventilation system
X1:29 (15A) = (F24) Instruments
X1:30 (10A) = (F16) Central lubrication system
X1:31 (15A) = (F29) Driver's seat
X1:32 (10A) = (F122) EDC 7 Control, potential 15
X1:33 (20A) = (F31) Cyclone separator
X1:34 (15A) = (F23) Warning horns
X1:35 (10A) = (F25) Driving and braking
X1:36 (10A) = (F33) Climatronic (option)

1 Optional equipment

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X1:37 = Spare

4.32 Fuse, cabin

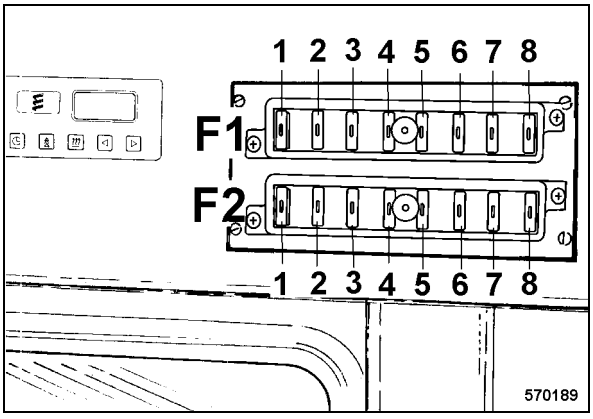


Fig. 4

No. 1 = Fuse boxes, cabin

⚠ Danger

Fire hazard!

Do not use fuses with higher ampere ratings and do not bridge fuses.

Fuse box F1 (top)

(1) 10A = (F27) Windscreen wiper, washer, front

(2) 10A = (F28) Windscreen wiper, washer, rear

(3) 10A = Spare

(4) 20A = (F85) 4 working headlights, front

(5) 15A = (F86) 2 working headlights, rear

(6) 10A = (F02) Fresh air fan

(7) 15A = (F99)2 headlight, engine compartment light

(8) 15A = (F66) 2 working head lights left, right

Fuse box F2 (bottom)

(1) 10A = Spare

(2) 10A = (F125) Reversing camera[1]

(3) 10A = (F98) Mirror heater

(4) 10A = (F41) Flashing beacon

(5) 10A = (F42) Cabin lights

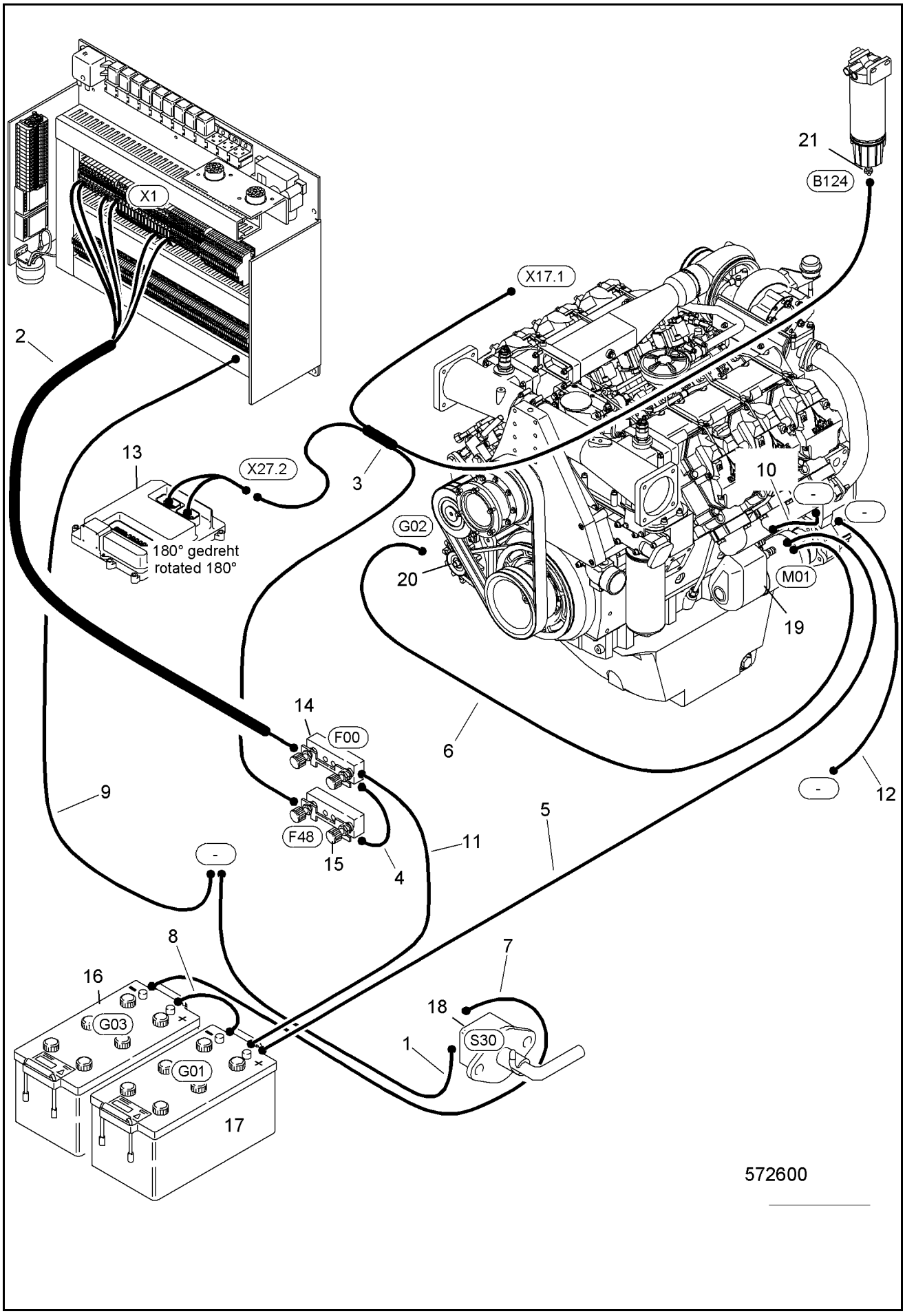
(6) 5A = (F90) Timer for cabin heater

(7) 25A = (F40) cabin heater*

(8) 10A = (F49) Transformer for radio

1 Optional equipment

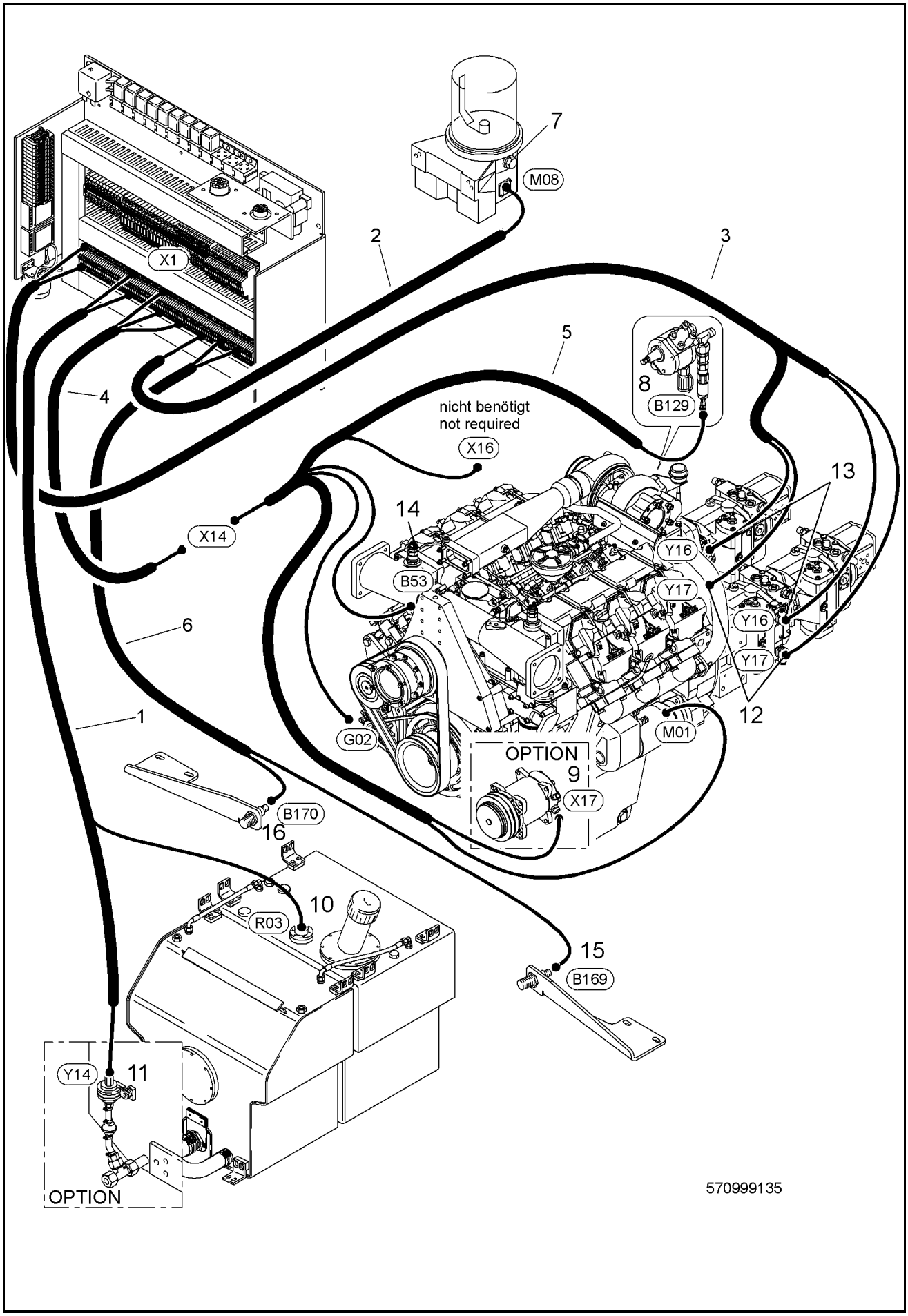
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1 Wiring loom, main battery switch - vehicle ground
2 Wiring loom, main fuse (F00) - electrics box
3 Wiring loom, fuse (F48) - engine control unit (A48)
4 Wiring loom, main fuse (F00) - fuse (F48)
5 Wiring loom, battery - starter
6 Wiring loom, starter - generator
7 Wiring loom, main battery switch - battery
8 Wiring loom, battery (G01) - battery (G03)
9 Wiring loom, central electrics ground - vehicle ground
10 Ground cable
11 Wiring loom, battery - main battery fuse
12 Wiring loom, engine ground - vehicle ground
13 A48, engine control unit
14 F00, main battery fuse
15 F48, fuse for preheating system
16 G03, battery
17 G01, battery
18 S30, main battery switch
19 M01, starter
20 G02, generator
21 B124, sensor for water separator

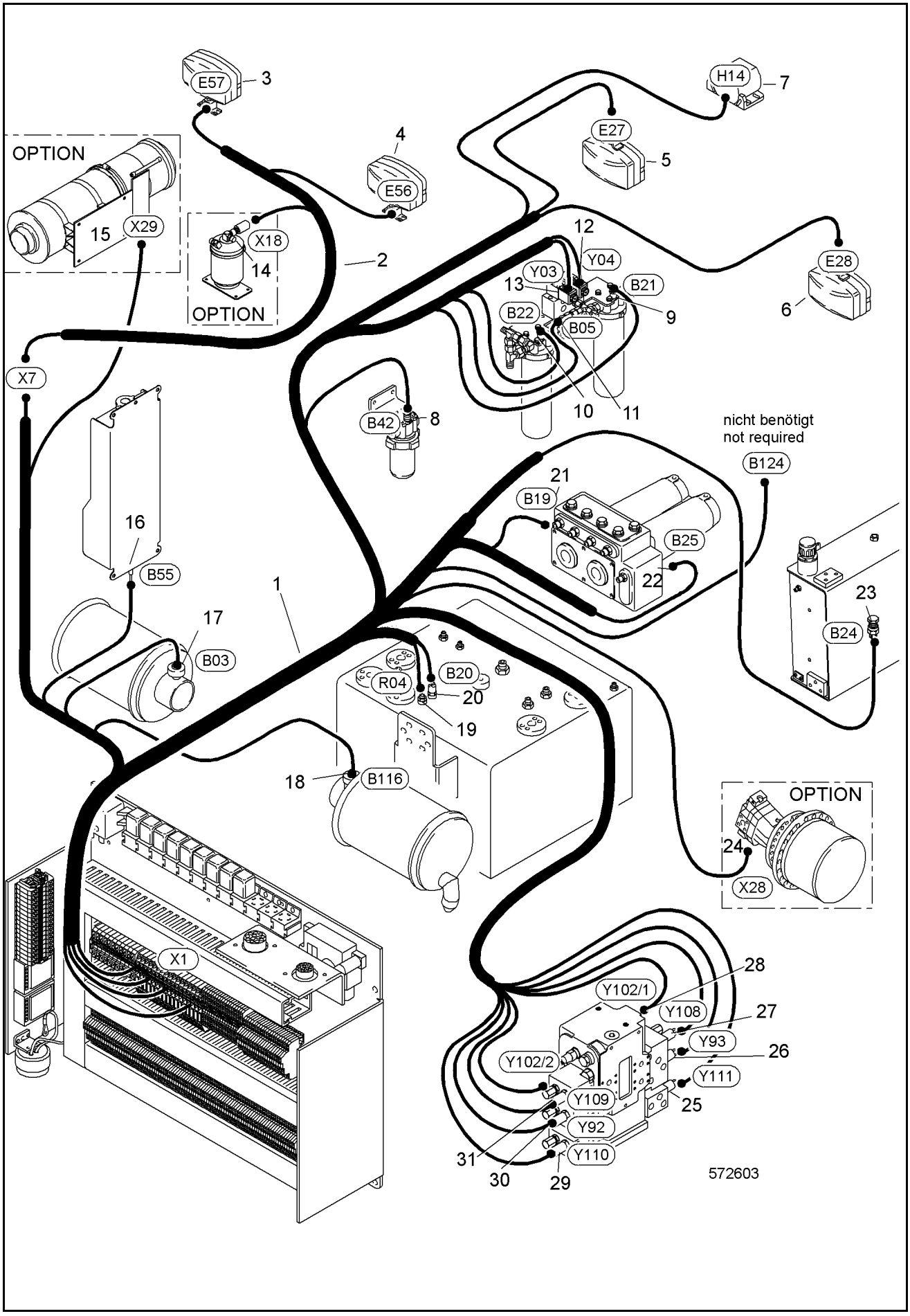
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1 Wiring loom, electrics box - front frame
2 Wiring loom, electrics box -central lubrication system
3 Wiring loom, electrics box - solenoid valves for travel
4 Wiring loom, electrics box - engine interface
5 Wiring loom, engine
6 Wiring loom, steering end position damping
7 M08, central lubrication system
8 B129, push button for transfer box
9 Y15, magnetic clutch for air conditioning system
10 R03, tank sensor
11 Y14, fuel pump for heating unit
12 Y17, solenoids for reverse travel
13 Y16, solenoid valves for forward travel
14 B53, coolant temperature sensor
15 B169, proximity switch steering stop left
16 B170, proximity switch steering stop right

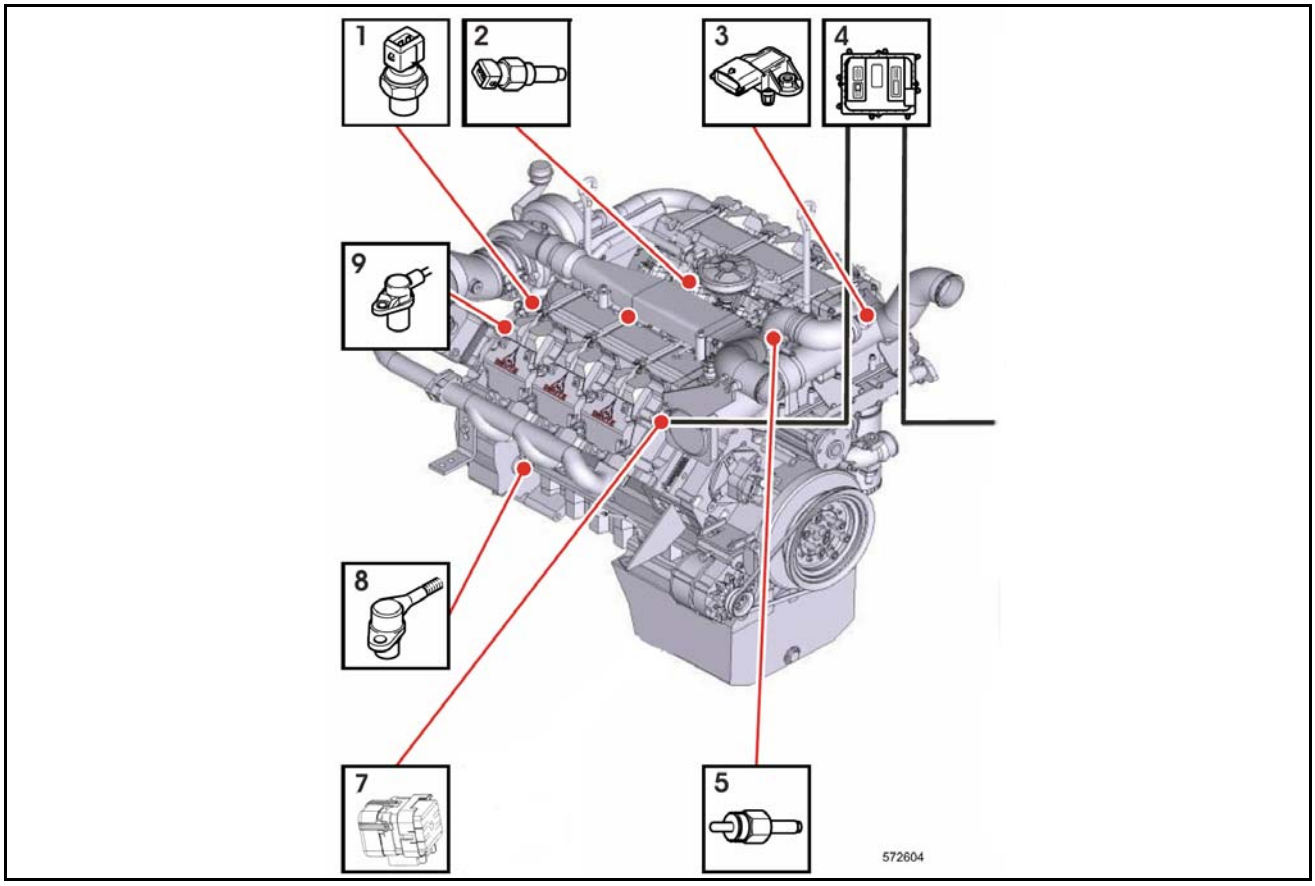
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1 Wiring loom, electrics box - rear frame
2 Wiring loom for light system
3 E57, headlight engine compartment left
4 E56, headlight engine compartment right
5 E27, working light rear left
6 E28, working light rear right
7 H14, backup alarm buzzer
8 B42, hydraulic oil differential pressure switch
9 B21, hydraulic oil filter differential pressure switch
10 B22, hydraulic oil filter differential pressure switch
11 B05, pressure switch for brake
12 Y04, brake solenoid valve
13 Y03, solenoid valve for travel speed range selection
14 B75, pressure switch for refrigerant in air conditioning
15 M26, cyclone separator
16 B55, coolant level sensor
17 B03, air filter vacuum switch
18 B116, air filter vacuum switch
19 R04, hydraulic oil temperature sensor
20 B20, hydraulic oil temperature switch
21 B19, magnetic dirt sensor
22 B25, pressure switch in return flow filter
23 B24, hydraulic oil float switch
24 B15, sensor wheel motor rear left
25 Y111, solenoid valve to close bucket
26 Y93, solenoid valve steering front left
27 Y108, solenoid valve bucket up
28 Y102, solenoid valve for float position
29 Y110, solenoid valve to open bucket
30 Y92, solenoid valve steering front right
31 Y109, solenoid valve bucket down

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1 B88, oil pressure sensor
2 B126, fuel temperature sensor
3 B133, sensor for charge air temperature and charge air pressure
4 A48, engine control unit
5 B113, coolant temperature sensor
6 not used
7 X27.1, central engine plug
8 B114, crankshaft rotation speed sensor
9 B130, camshaft rotation speed sensor

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4.34 Electronic control units

Control units

Control units (ECU = electronic control unit or ECM = electronic control module) are electronic modules which are mainly installed in places where something needs to be controlled or regulated. Control units are used in almost any electronic sector in the automotive industry, but also to control machines, plants and other technical processes.

Control units generally work according to the IPO-principle. IPO stands for Input-Processing-Output. Sensors are available for input. Sensors determine a physical characteristic like e.g. rotary speed, pressure, temperature, etc. This value is compared with a setpoint entered into or calculated in the control unit. If the measured value does not match the stored value, the control unit regulates the physical process by means of actors, so that the measured actual values match the setpoint again. This means that the actors correctively interfere with the ongoing process.

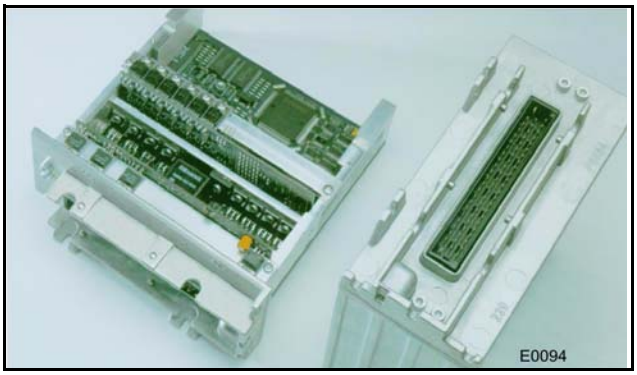


Fig. 1 Electronic control (ESX)

In current vehicles control units are linked via various system buses (CAN, LIN, MOST, Flexray). The units exchange information about operating states and other relevant data in vehicle across the system. Furthermore, the on-board diagnostic or the diagnostic system of the vehicle is connected via such busses (and possible K-lines). Furthermore, external diagnostic devices (alternatively Personal Computers or Notebooks plus matching Interface) can communicate with the control units. In this case the system will be interrogated to find out whether the permanent self tests of the control unit has revealed and registered any faults in itself or on the connected sensors.

Modules

In the latest generation of machines BOMAG uses machine programmable modules. A module mainly consists of a programmable microprocessor with additional circuitry for inputs and outputs.

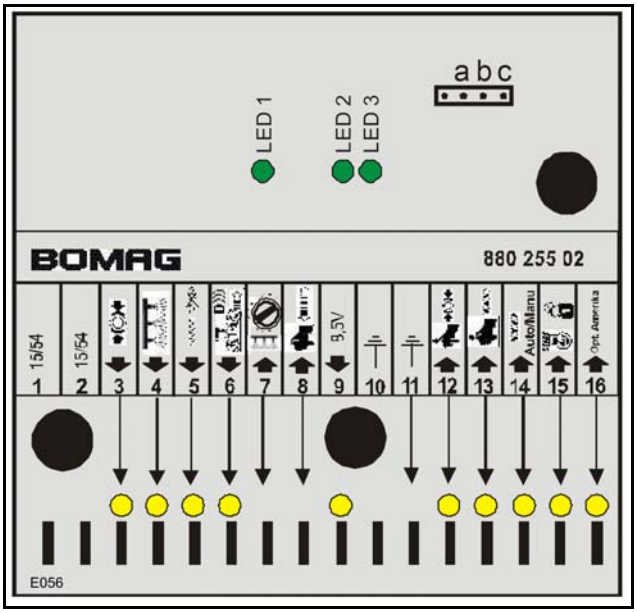


Fig. 2 Module

The modules have control lights on inputs and outputs to monitor the applied signals.

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Signals

Analog signals

Process states are continuous (analog) when they can be mapped by means of a real number, e.g. temperature = 65.5 °C. The sensor converts a continuous process status into an analog signal. If the control unit needs the numerical value of the analog signal, an analog-digital conversion is required.

Analog signals are needed to control, display or monitor limit values. Checking the limit values of physical quantities leads to the binary information: limit value reached/not reached.

Binary signals

Process states are bivalent (binary) if they have only 2 possible states of truth, such as e.g. button pressed/ not pressed, object present/not present. The two states of truth are mapped by means of defined states of an information carrier, e.g. 'not pressed' equals 0 V, 'pressed' equals 24 V. These states are described with {0,1} or {false, true}

CAN-bus, Controller Area Network

created by Bosch at the end of the eighties for automobile applications.

Development objectives:

Real-time critical, robust and low price communication of control units, such as transmission and engine control, but also less time critical applications in the field of convenience electronics, such as air conditioning.

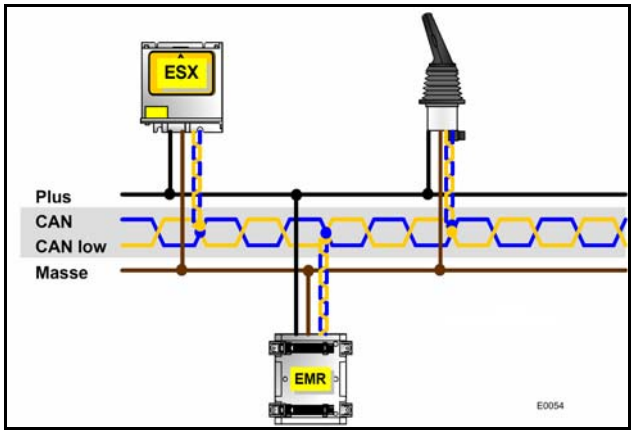


Fig. 3

Why CAN?

- Networking of control units for the realization of complex functions.
- Reduction of the extend of wiring and plug connections.
- Better diagnostic possibilities (central diagnostics socket).

Characteristics of CAN

It is a kind of serial data transmission. The individual bits are transmitted one after the other, only 2 lines are required.

CAN lines are twisted together 30 to 40 times per metre. Electromagnetic interferences therefore always occur simultaneously in both lines, the software is thus able to filter out interfering signals more easily.

Wire (+) = cable colour blue

Wire (-) = cable colour yellow

Measuring on the CAN

Signals transmitted through the bus line can generally not be measured with simple measuring instruments. Testing is therefore quite complicated for the user. Correct connection of lines can only be checked by means of a continuity test. BOMAG display modules are connected to the BUS to give engineers and user the possibility to detect faults or to receive information from the BUS.

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4.35 Checking the voltage supply for the control unit

Power supply for a control unit, general

All electronic switching and control units require an electric power supply to be able to work. If the plus or minus supply is faulty, the control unit will work incorrectly or fail.

i Note

The following describes the electric power supply for the ESX-control.

(Fig. 4) shows a simplified representation of how the control unit (ESX, 68 pole) is connected. The complete representation can be found in the wiring diagram of the machine.

The procedure can also be used for other controls. Pin assignment and voltage supply may be different, but the procedures for line testing are generally the same.

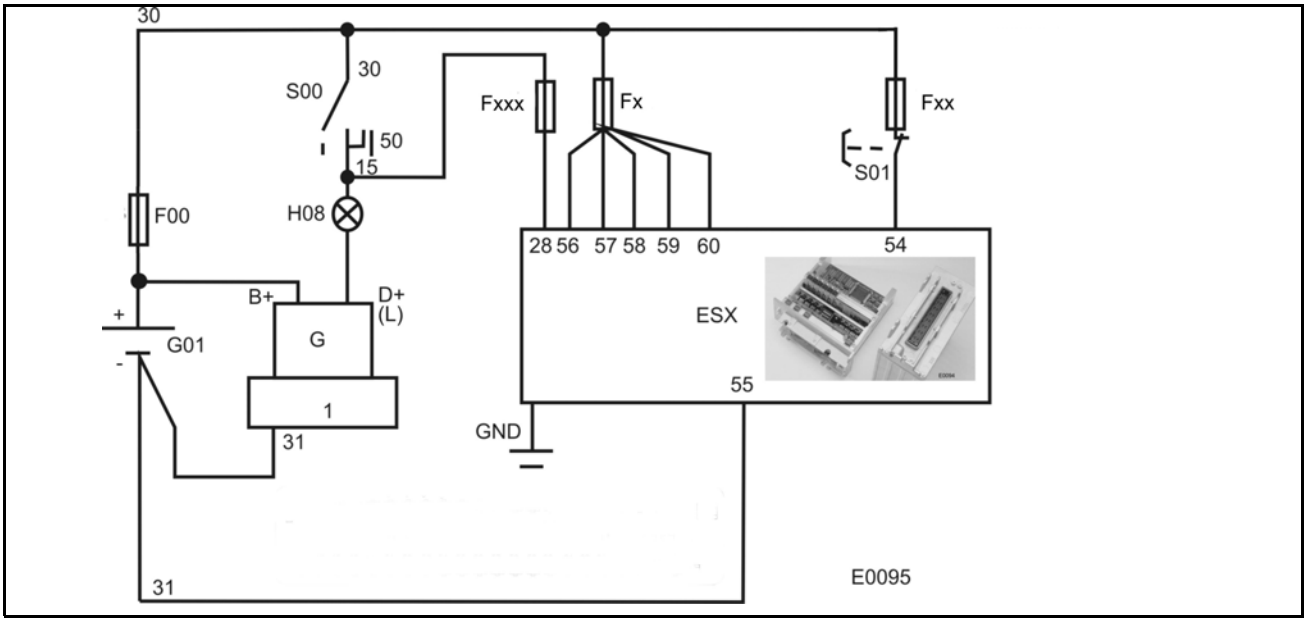


Fig. 4 Circuitry example

1 = Engine block
ESX = Control unit
F00 = Main fuse
Fx,Fxx = Fuses potential 30
Fxxx = Fuses potential 15
G = Generator
G01 = Battery
GND = Housing earth
H08 = Charge control light
S00 = Ignition switch
S01 = Emergency stop switch
Pin 28 = Voltage supply for control
Pin 54 = if the signal (12/24 Volt) is applied, the control is switched on
Pin 55 = Ground supply for control
Pin 56 to 60 = Voltage supply for outputs
GND = Housing earth

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Fault in current supply, general

Clear interruptions in the plus or minus supply are relatively easy to detect. However, the plus and minus sides of control units are in most cases connected to the vehicle mains supply via several cables, so that several parallel current branches exist. Checking the power supply is therefore slightly more difficult than expected. Another point is the fact that every current branch has several plug connections, which could corrode over the years. Corroded points are transition resistances and thus cause undesired voltage drops. In case of undesired voltage drops the control unit is supplied with a lower voltage. This can lead to faulty reactions or even failure of the control unit.

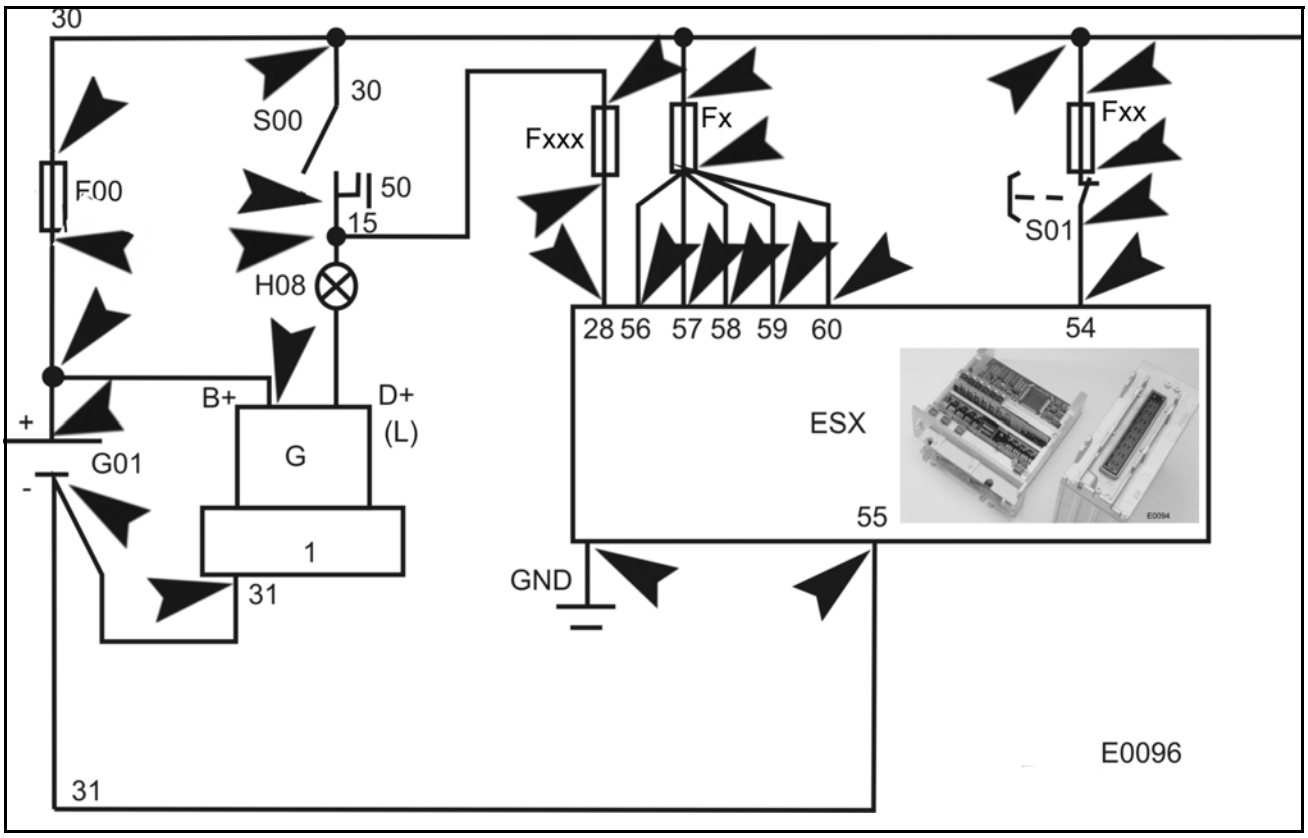


Fig. 5 Circuitry example

The arrows point to the contact locations, which may be the cause if a control unit only receives a reduced supply voltage.

The following faults may occur:

- Line interruption in a plus supply line
- high voltage drop in a plus supply line
- line interruption on the minus side

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Measuring principle for line testing

When a line conducts an electric current, a voltage drop will occur in the line (U_V). The size of this voltage drop U_V depends on:

- the available amperage (I) and
- the electric resistance (R_{line}) of the current branch being checked.

In order to have reliable comparison possibilities at hand one should always work with the same amperage. Identical marginal conditions are therefore used in all of the following examples:

12 Volt – vehicle battery as voltage source or 24 Volt in a 24 Volt vehicle network.

12 V / 21 W – lamp as load in a 12 Volt vehicle network.

24 V / 21 W - lamp as load in a 24 Volt vehicle network.

Test steps

1. Switch off the ignition.

2. Unplug the control unit from wiring loom.

3. If available connect the Pinbox (Fig. 6) to the plug of the wiring loom, do not connect the control unit with the Pinbox. If no Pinbox is available, provide measuring cables with appropriate plug-in contacts, e.g. spade-type plugs.

4. Check with multimeter. If a setpoint is not reached, proceed step by step to identify the weak spot. Repair as necessary. Repeat the measurement.

⚠ Caution

The plug must not be pulled off or plugged on while the ignition is switched on. Switch off the ignition first and then pull off or plug on the plug.

Only plug the wiring loom onto the control unit, when the actual value corresponds with the setpoint.



Fig. 6 Pinbox for 68 pole ESX control

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General measuring setup to check a supply line (plus side)

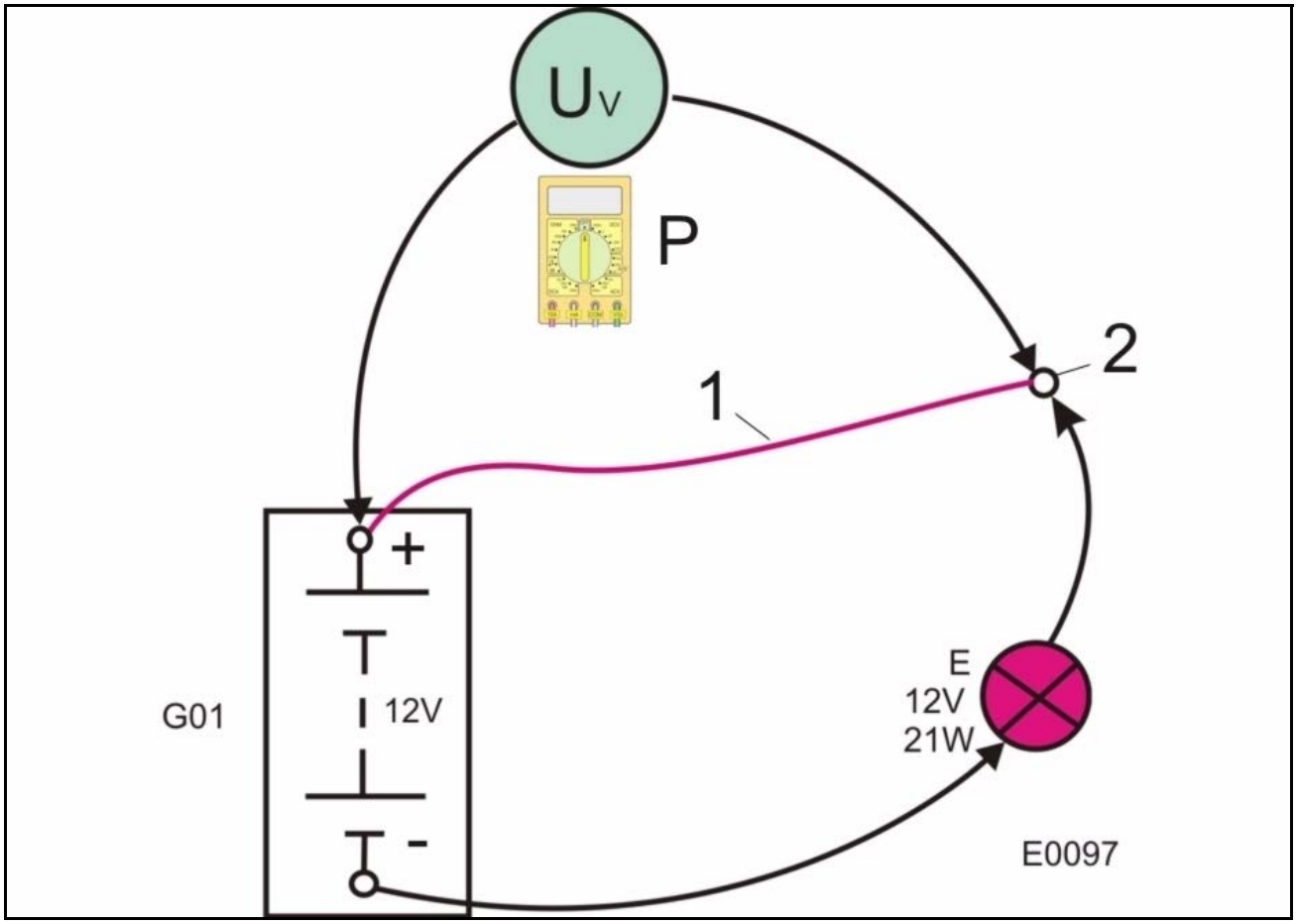


Fig. 7 Measuring arrangement 12 Volt

1 = Supply line, plus side

2 = Plug contact in wiring loom plug on control or Pinbox (Fig. 6)

E = Lamp, 12V / 21 Watt

P = Multimeter

G01 = Battery as voltage source, 12V

U_V = Voltage drop caused by the lamp current

Setpoint

The voltage drop U_V should not exceed 0.5 V => $U_{Setpoint} \leq$ 0.5 V.

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General measuring setup to check a return line (minus side)

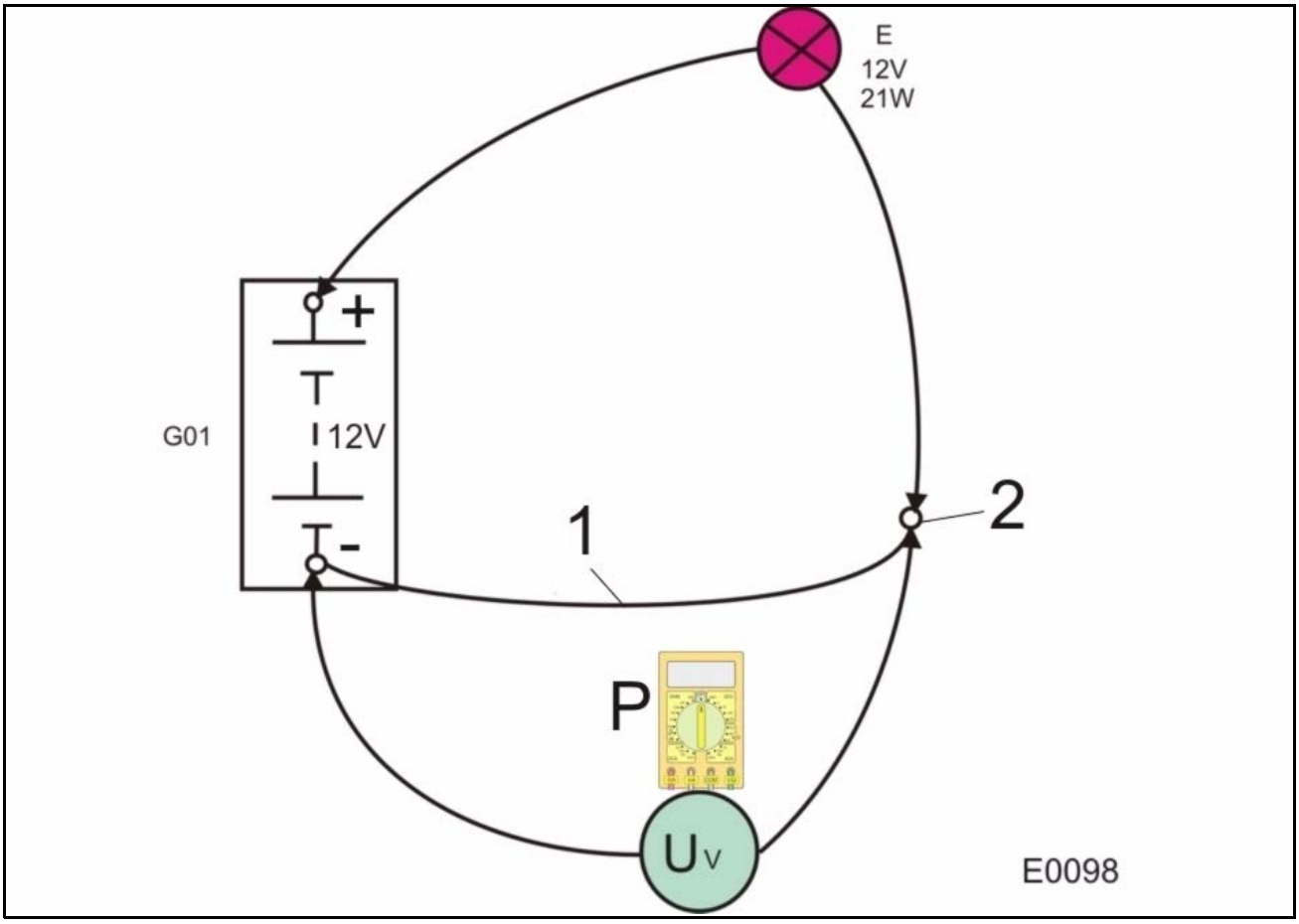


Fig. 8 Measuring arrangement 12 Volt

1 = Return line, minus side

2 = Plug contact in wiring loom plug on control or Pinbox (Fig. 6)

E = Lamp, 12V / 21 Watt

P = Multimeter

G01 = Battery as voltage source, 12V

U_V = Voltage drop caused by the lamp current

Setpoint

The voltage drop U_V should not exceed 0.5 V => $U_{Setpoint} \leq$ 0.5 V.

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Connection example to check the plus line between battery and plug pin 28

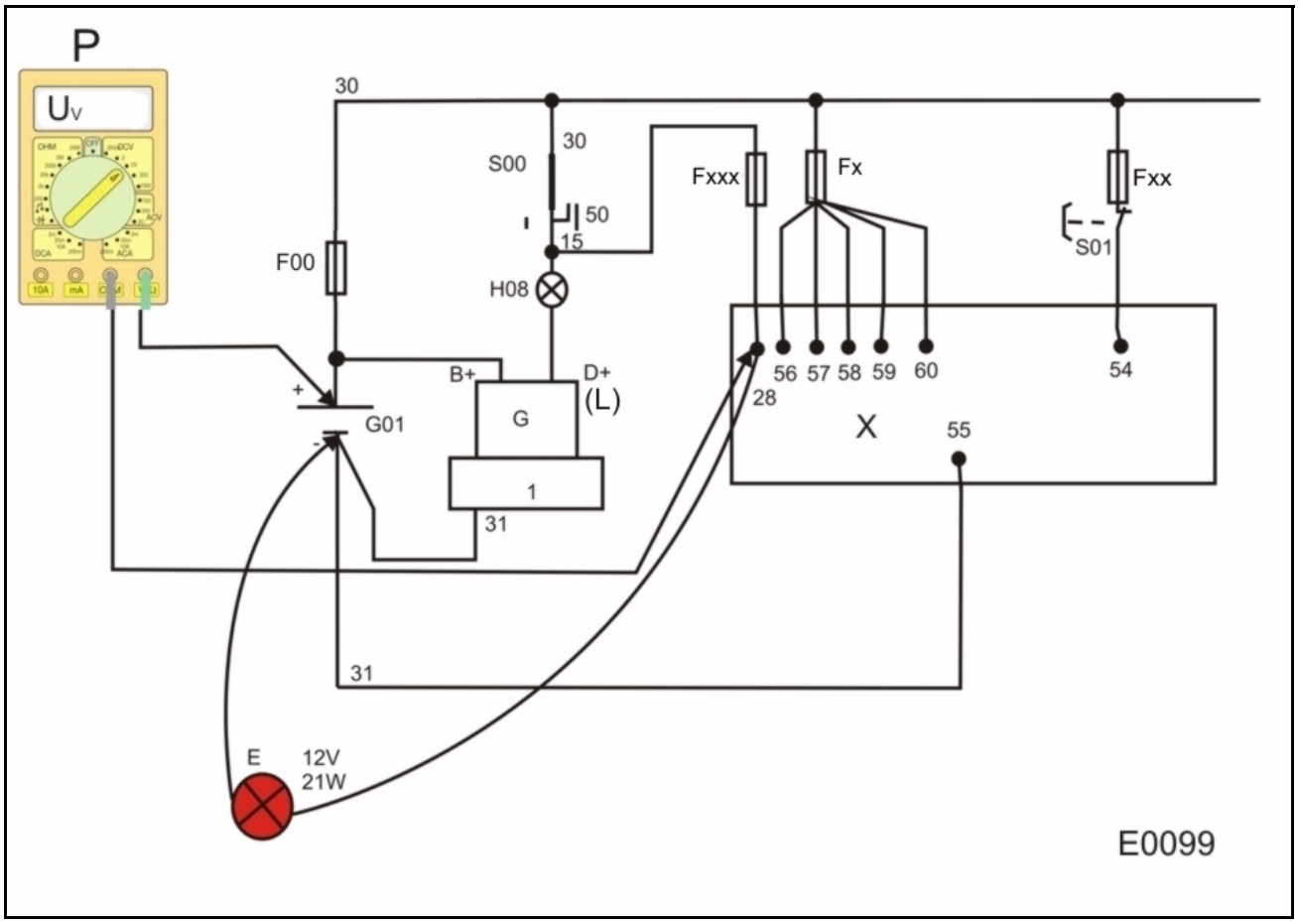


Fig. 9

X = Wiring loom plug disconnected from control unit or Pinbox (Fig. 6)

P = Multimeter

S00 = Ignition switched on. Setpoint : E is bright. U_V max. 0.5 Volt

S00 = Ignition switched off. Setpoint : E is dark. U_V = 0.0 Volt

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Connection example to check the minus line between battery and plug pin 55

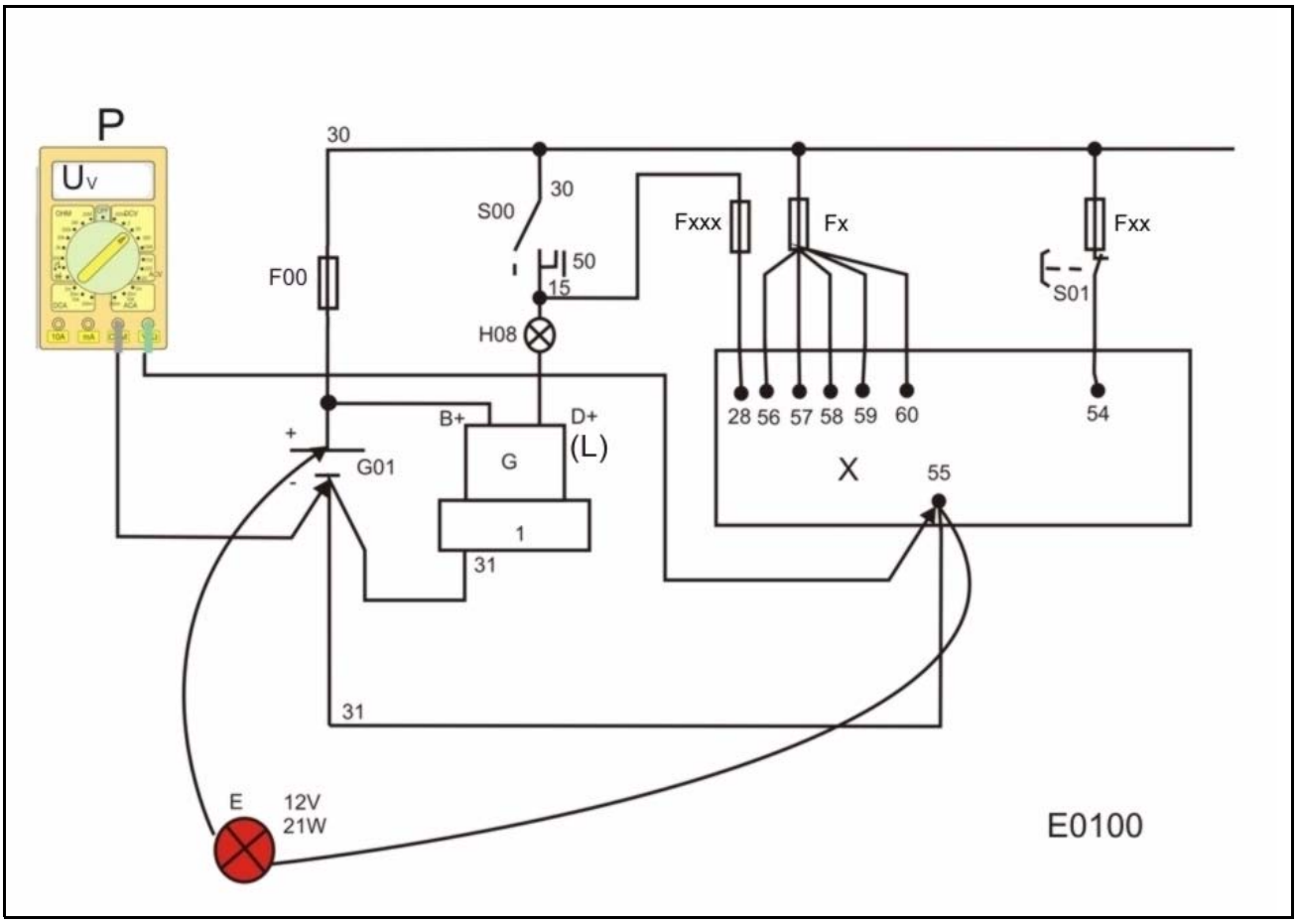


Fig. 10

P = Multimeter

X = Wiring loom plug disconnected from control unit or Pinbox (Fig. 6)

E = Setpoint : E is bright. U_V max. 0.5 Volt

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Test protocol for ESX

E lamp 12V / 21W in 12V vehicle network, to load the current branches.

E lamp 24V / 21W in 24V vehicle network, to load the current branches.

G01, battery

P multimeter, measuring range: DC

Plug pin	Note	Setpoints
28	Ignition ON	
	E between plug pin 28 and battery minus	E is bright,
	P between battery plus and plug pin 28	U_V max. 0.5 Volt
28	Ignition OFF	
	E between plug pin 28 and battery plus	E is dark,
	P between battery minus and plug pin 28	U_V = 0 Volt
54	Ignition OFF, emergency stop not operated	
	E between plug pin 54 and battery minus	E is bright,
	P between battery plus and plug pin 54	U_V max. 0.5 Volt
54	Ignition OFF, emergency stop operated	
	E between plug pin 54 and battery minus	E is dark,
	P between battery plus and plug pin 54	U_V = 0 Volt
55	Ignition OFF	
	E between plug pin 55 and battery minus	E is bright,
	P between battery plus and plug pin 55	U_V max. 0.5 Volt
56, 57, 58, 59, 60	Ignition OFF	
	E between plug pin 56, 57, 58, 59, 60 and battery minus	E is bright,
	P between battery plus and plug pin 56, 57, 58, 59, 60	U_V max. 0.5 Volt

i Note

If one or several setpoint(s) is (are) exceeded, one must make considerations which are related to the wiring diagram.

Example 1:

In all supply lines to the pins 56, 57, 58, 59 and 60 the voltage drop is too high. There are two possible reasons. Either all contacts are corroded, or the supply line between battery and fuse Fxx has poor contact.

Example 2:

Only one measuring value exceeds the setpoint. In this case the fault must be located between the last branch and the corresponding plug pin.

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4.36 Diagnostics concept

Introduction

A correct and reliable diagnose is a general prerequisite for the detection of faults in system. For this to count as a rule several points must be fulfilled. One of these points is the ability of the engine to run a systematic trouble shooting procedure. However, this is only possible when a diagnostics concept is available and in practice. Trouble shooting can generally be performed in various ways.

Fault description and questioning of the customer

After the customer has explained his complaint(s) the engineer has to ask further questions to track down the cause of the fault. If the complaint is additionally related to electric/electronic components, the visual examination and a possible test drive must be subsequently followed by an interrogation of the error log. The further procedure in this case depends on the outcome of this interrogation.

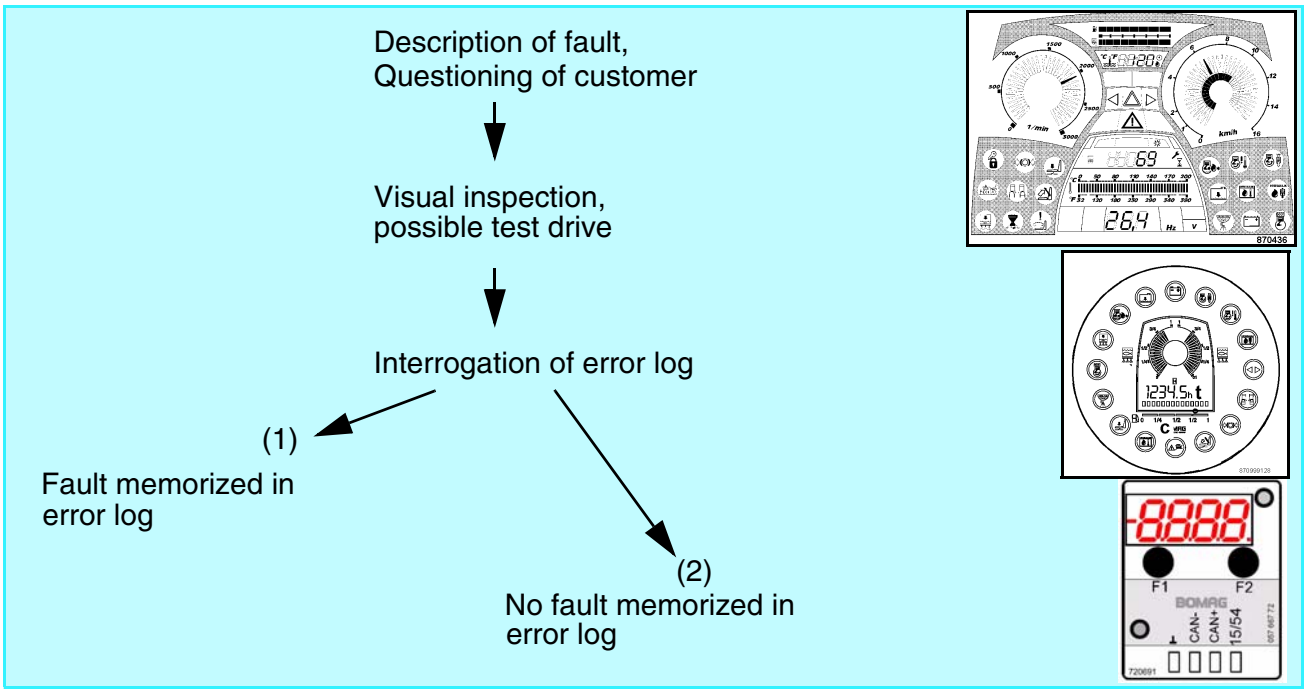


Fig. 11

(1) Fault memorized in error log

Clear cause?

- If the fault message leaves no doubt, repair work may be started immediately.

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Line or component?

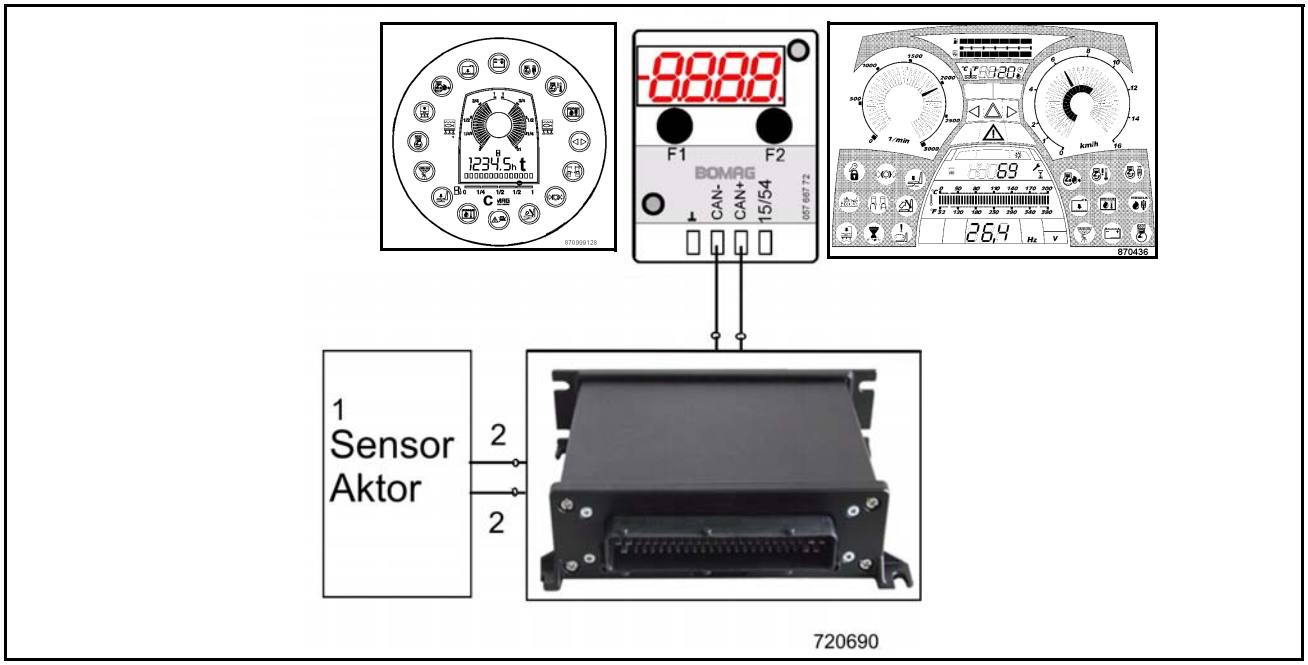


Fig. 12

- In most cases the fault message does not clarify whether the fault is in the sensor or actor, or in one of the connecting lines (2) between control unit and the mentioned component (1). For this purpose it makes sense to check the component and the connecting lines between control unit and component separately.
- Checking the voltage supply for the control unit
- Checking the sensor lines
- Checking the actor lines

Sequence after the fault is found

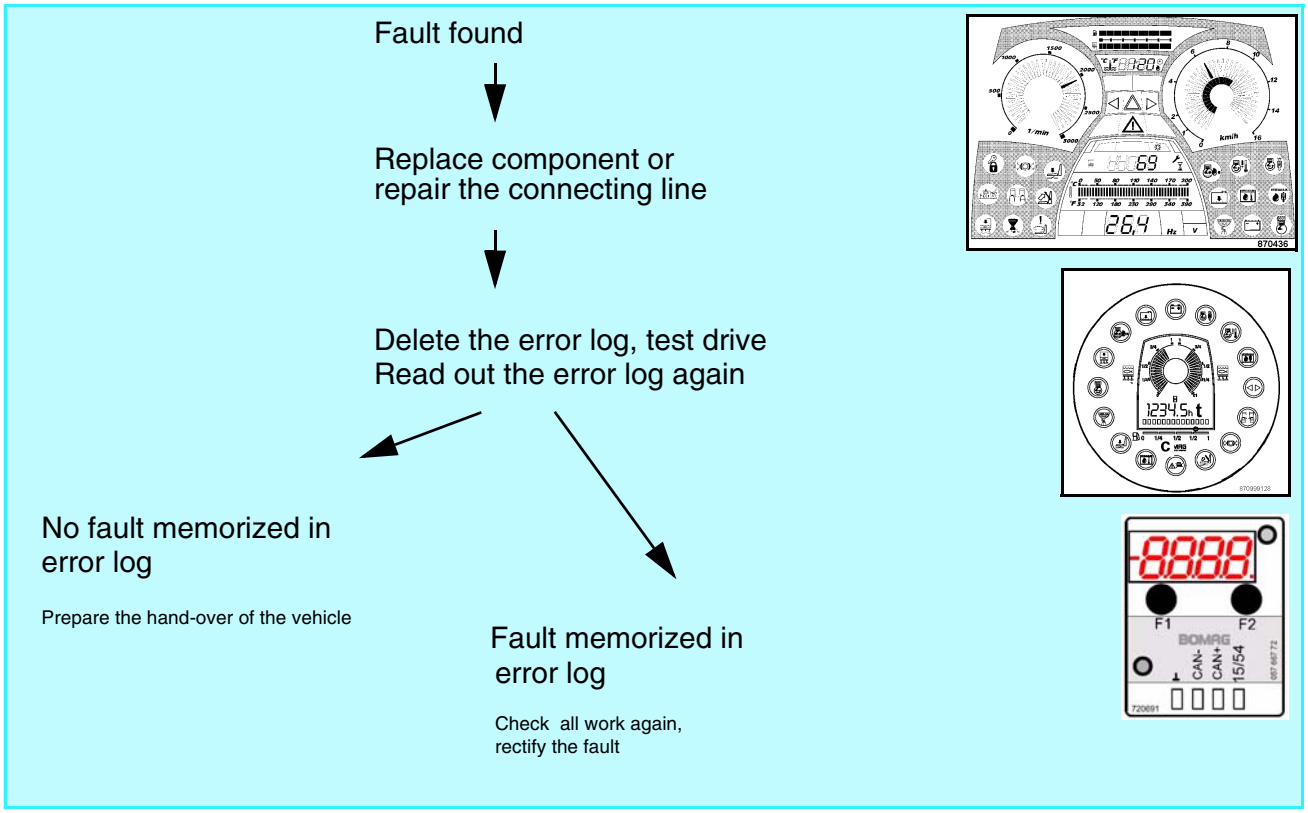


Fig. 13

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(2) No fault memorized in the error log at the time of initial questioning

Even if the fault is in the electric/electronic part of the vehicle, a control unit will very often not detect a fault. Right from the start you should be aware of the fact that a high proportion of faults is caused by contacts. This even gets worse in case of older and neglected vehicles.

In order to examine the electric/electronic part of an electronic system it is recommended to check the incoming sensor information and outgoing command values on a control unit. This requires profound knowledge of system and components.

Consideration, when the error log has not recorded a fault

- What could be the cause of the complaint?
- Which measuring possibilities are available?

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5 Engine electrics

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5.1 Engine control unit

⚠ Caution

Pulling off the plug connectors of the control unit while the control unit is working (i.e. with the power supply to terminal 15switched on) is not permitted. Correct procedure: Switch off the electric power supply (normally with the ignition key), wait until the main relay has switched off (with a delay of up to 15 seconds, listen for clicking sound), then pull off the plugs from the control unit.

Sensors and actuators must not be connected to external power sources for the purpose of testing, but must only be operated on the EMR3. Otherwise components may be permanently damaged.

The engine control unit is the central component of the EMR3-system. It has the function of ensuring optimal performance of the engine with the following goals

- excellent exhaust gas characteristics,
- low fuel consumption,
- smooth running of engine,
- long lifetime of engine,
- efficient servicing

under all operating conditions. For this purpose the engine control unit uses the recorded measuring values and the parameters stored in its data memory to run a number of calculations, which form the basis or all the available functions. The most important functions include:

- exact control of the injection process (among others the number, start and duration of injections),
- idle speed regulation,
- regulation of exhaust gas recirculation,
- optimization of smooth running (by means of injection quantity correction),
- engine monitoring,
- system diagnose.

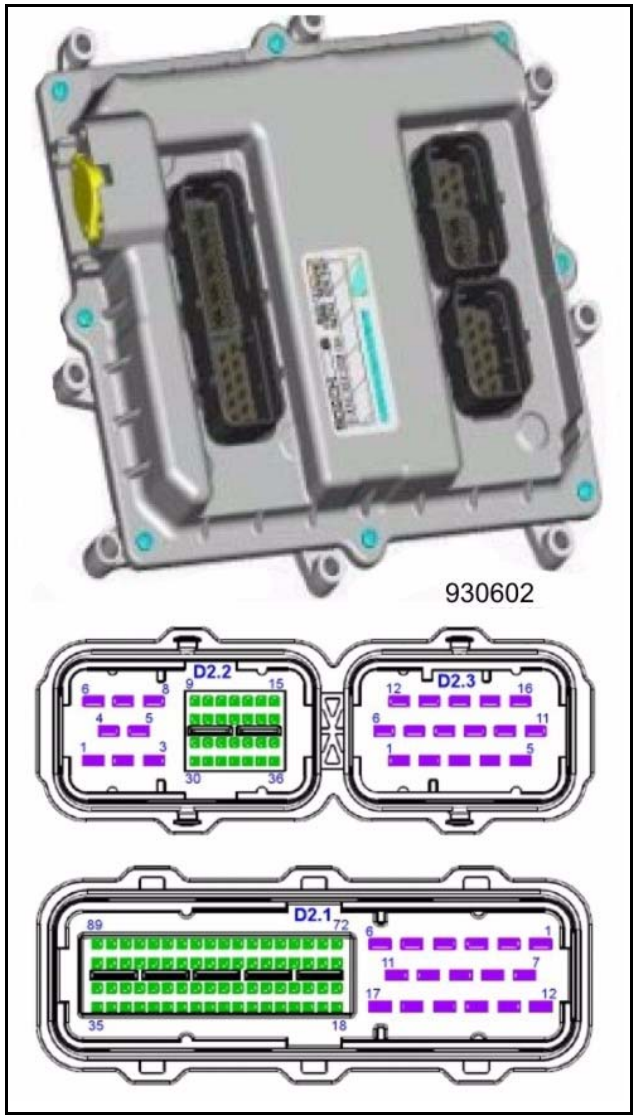


Fig. 14

The EMR3-E (TCD 2015) (Fig. 14) engine control unit is fitted with three sockets on the upper side of the housing:

- socket D2.1 to connect the vehicle wiring loom,
- socket D2.2 to connect the engine wiring loom for sensors and actuators,
- socket D2.3 to connect the engine wiring loom for fuel metering unit and injection valves.

Main relay

When shutting down the engine, the ignition switch isolates the electronic system from terminal 15. Meter readings are saved in the non-volatile memory. After approx. 10 seconds the internal main relay switches off and disconnects the control unit from the power supply. During this time the system must not be disconnected from terminal 30 ($+U_{batt}$).

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Replacing the control unit

⚠ Caution

It is not permitted to interchange control units from one manufacturing series or against another engine number. In this case the warranty will become null and void.

Each control unit is clearly designated to the engine, in accordance with the respective application. In case of a replacement the control unit therefore needs to be completed with the engine specific data set. When ordering a new control unit you must not only specify the part-number, but also the engine serial number (see sticker on EMR-control unit).

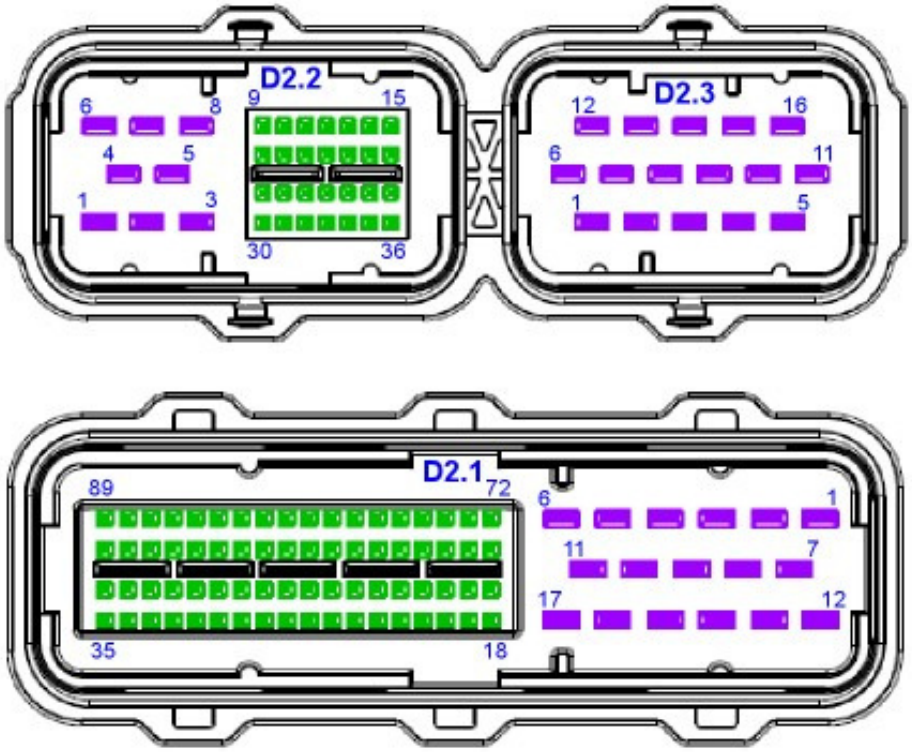
i Note

The Deutz part-number specified on the EMR-control unit is the part number without software specific for the engine. The correct part number can be found in the spare parts catalogue.

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5.2 Pin assignment

Pin assignment



Max. cable cross section: **2,5 mm²**, **0,75 mm²**

Pinbelegung für das Steuergerät EMR3-EDC7

Pin	Pinart / Signalart	Funktion / Komponente	Bemerkungen / Technische Daten
D2.1.2	Power supply (+)	Power supply ECU	U_{Bat} (terminal 30)
D2.1.3	Power supply (+)		
D2.1.8	Power supply (+)		
D2.1.9	Power supply (+)		
D2.1.5	Power supply (–)	Power supply ECU	U_{Gnd} (terminal 31)
D2.1.6	Power supply (–)		
D2.1.10	Power supply (–)		
D2.1.11	Power supply (–)		
D2.1.40	signal input, digital	Operating signal for ECU	U_{Bat} switched (terminal 15) U > 3,35 V: ECU switched on U < 2,81 V: ECU switched off
D2.1.77	Power supply (+)	footpedal (setpoint)1	U_{Out} = 5 V
D2.1.78	Power supply (–)	footpedal (setpoint)1	Internal with U_{Gnd} connected

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Pin	Pinart / Signalart	Funktion / Komponente	Bemerkungen / Technische Daten
D2.1.79	signal input, analog, with Pulldown resistance	footpedal (setpoint)1	U_{in} = 0...5 V, R_{down} = 100 kΩ
D2.1.48	signal input, digital, with Pullup resistance	idle switch footpedal 1	external switch to U_{Gnd}, R_{up} = 100 kΩ, U_{low} = 2,4 V, U_{high} = 3,6 V
D2.1.60	Power supply (+)	handthrottle (setpoint) 2	U_{Out} = 5 V
D2.1.59	Power supply (–)	handthrottle (setpoint) 2	internal with U_{Gnd} connected
D2.1.61	signal input, analog, with Pulldown resistance	handthrottle (setpoint) 2	U_{in} = 0...5 V, R_{down} = 100 kΩ
D2.1.80	signal input, digital, with Pullup resistance	idle switch footpedal 2	external switch to U_{Gnd}, R_{up} = 100 kΩ, U_{low} = 2,4 V, U_{high} = 3,6 V
D2.1.50	Power supply (–)	multiple state switch for speed	internal with U_{Gnd} connected
D2.1.43	signal input, analog, with Pullup resistance	multiple state switch for speed	U_{in} = 0...5 V, R_{up} = 3,4 kΩ
D2.1.65	Power supply (–)	multiple state switch for droop	internal with U_{Gnd} connected
D2.1.62	signal input, analog, with Pullup resistance	multiple state switch for droop	U_{in} = 0...5 V, R_{up} = 1,4 kΩ
D2.1.76	Power supply (–)	multiple state governor mode switch	internal with U_{Gnd} connected
D2.1.44	signal input, analog, with Pullup resistance	multiple state governor mode switch	U_{in} = 0...5 V, R_{up} = 3,4 kΩ
D2.1.29	Power supply (–)	Common potential for switch	internal with U_{Gnd} connected
D2.1.32	signal input, digital, with Pullup resistance	Override switch	external switch to U_{Gnd}, R_{up} = 4,1 kΩ, U_{low} = 2,2 V, U_{high} = 3,8 V
D2.1.55	signal input, digital, with Pullup resistance	coolant temperature switch	external switch to U_{Gnd}, R_{up} = 100 kΩ, U_{low} = 2,3 V, U_{high} = 3,6 V
D2.1.86	signal input, digital, with Pullup resistance	droop switch	external switch to U_{Gnd}, R_{up} = 5 kΩ, U_{low} = 4,6 V, U_{high} = 8,7 V
D2.1.21	Power supply (+)	Common potential for switch	U_{Out} = U_{Bat}, I_{max} = 10 A
D2.1.41	signal input, digital, with Pulldown resistance	Engine stop switch	external switch to U_{Bat}, R_{down} = 4,1 kΩ, U_{low} = 2,2 V, U_{high} = 3,8 V
D2.1.49	signal input, digital, with Pulldown resistance	break switch	external switch to U_{Bat}, R_{down} = 4,1 kΩ, U_{low} = 2,2 V, U_{high} = 3,8 V
D2.1.42	signal input, digital, with Pulldown resistance	air differential pressure switch	external switch to U_{Bat}, R_{down} = 4,1 kΩ, U_{low} < 0,28 x U_{Bat}, U_{high} > 0,68 x U_{Bat}
D2.1.47	signal input, digital, with Pulldown resistance	exhaust gas break switch	external switch to U_{Bat}, R_{down} = 4,1 kΩ, U_{low} = 2,2 V, U_{high} = 3,8 V
D2.1.74	signal input, digital, with Pulldown resistance	engine start switch	external switch to U_{Bat}, R_{down} = 4,1 kΩ, U_{low} < 0,28 x U_{Bat},

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Pin	Pinart / Signalart	Funktion / Komponente	Bemerkungen / Technische Daten
			U_{high} > 0,68 x U_{Bat}
D2.1.85	signal input, digital, with Pulldown resistance	switch (customer-specific)	external switch to U_{Bat}, R_{down} = 4,1 kΩ, U_{low} < 0,28 x U_{Bat}, U_{high} > 0,68 x U_{Bat}
D2.1.21	Power supply (+)	Common potential for switch	U_{Out} = U_{Bat}, I_{max} = 10 A
D2.1.70	Power supply (–)	velocity sensor	internal with U_{Gnd} connected
D2.1.71	signal input, digital, with comparator	velocity sensor	R_i = 3,1 kΩ, U_{low} = 1,0 V, U_{high} = 5,42 V f_{max}= 5 kHz
D2.1.33	signal output, digital (PWM), with Pullup resistance, minus-switched	Engine speed	I_{max} = 50 mA, f_{max} = 5 kHz, Standard: 60 Impulse/Rotation
D2.1.22	Power supply (+)	diagnosis lamp	0,3 A at 12 V, 4 W at 24 V 0,9 A
D2.1.30	Power supply (–), switched	diagnosis lamp	
D2.1.13	Power supply (+)	Common potential for alarm lamp	U_{Out} = U_{Bat}, I_{max} = 10 A
D2.1.20	Power supply (–), switched	Oil pressure/oil level alarm lamp	0,3 A at 12 V, 4 W at 24 V switch-on current 0,9 A
D2.1.38	Power supply (–), switched	fuel filter/air filter/ fuel pressure alarm lamp	0,3 A at 12 V, 4 W at 24 V switch-on current 0,9 A
D2.1.39	Power supply (–), switched	coolant temperature/coolant level alarm lamp	0,3 A at 12 V, 4 W at 24 V switch-on current 0,9 A
D2.1.54	Power supply (–), switched	Heater control lamp	0,3 A at 12 V, 4 W at 24 V switch-on current 0,9 A
D2.1.56	Power supply (–), switched	engine running or boost temp lamp	0,3 A at 12 V, 4 W at 24 V switch-on current 0,9 A
D2.1.17	Power supply (–), switched	Start relay	L_{max} = 130 mH I_{max} = 2 A
D2.1.37	Power supply (+), switched	Start relay	
D2.1.68	Power supply (+)	Fan speed sensor	U_{Out} = 5 V
D2.1.67	Power supply (–)	Fan speed sensor	Intern with U_{Gnd} connected
D2.1.69	signal input, digital	Fan speed sensor	f_{max} = 1 kHz
D2.1.14	Power supply (+)	fan control	R > 30 Ω at 24 V R > 10,6 Ω at 12 V L = 15...80 mH switch-on current 1,9 A at 16 V (15 Minutes) f_{max} = 300 Hz, f_{min} = 15 Hz
D2.1.15	Power supply (–), switched	fan control	
D2.1.24	Power supply (–)	exhaust gas temperature sensor or cylinder temperature sensor	Intern with U_{Gnd} connected
D2.1.25	signal input, analog, with Pullup resistance	exhaust gas temperature sensor	U_{in} = 0...5 V, R_{up} = 1,4 kΩ
D2.1.28	Power supply (–)	Oil temperature sensor	Intern with U_{Gnd} connected
D2.1.27	Power supply (+) and signal input, analog, with multiplier	Oil temperature sensor	U_{in} = 0...5 V, R_{up} = 1,35 kΩ
D2.1.26	Power supply (+) and signal input, analog	Oil level sensor	constant current source 247mA
D2.1.72	Power supply (–)	Oil level sensor	Intern with U_{Gnd} connected
D2.1.23	Power supply (–), switched	PDM-output torque (customer-specific)	I_{max} = 50 mA, f_{max} = 300 Hz
D2.1.51	Power supply (–), switched	PDM-output (customer-specific)	I_{max} = 50 mA, f_{max} = 1 kHz
D2.1.57	Power supply (+)	actuator (customer-specific)	U_{Out} = U_{Bat}, I_{max} = 2,4 A, L_{max} = 130 mH
D2.1.16	Power supply (–), switched	actuator (customer-specific)	

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Pin	Pinart / Signalart	Funktion / Komponente	Bemerkungen / Technische Daten
D2.1.81	signal input, analog, with voltage divider	Sensor (customer-specific)	U_{in} = 0...5 V, R_{in} = 100 kΩ
D2.1.82	Power supply (+)	Sensor (customer-specific)	U_{Out} = 5 V
D2.1.83	Power supply (–)	Sensor (customer-specific)	Intern with U_{Gnd} connected
D2.1.34	communication, CAN low	CAN-Bus 2, for customer applications	
D2.1.35	communication, CAN high		
D2.1.52	communication, CAN low	CAN-Bus 1, for diagnosis tasks	
D2.1.53	communication, CAN high		
D2.1.89	communication, K-Line	ISO-9141-Bus	
D2.2.3	Power supply (+), switched	Common potential for components	U_{Bat}
D2.2.7	Power supply (–), switched	pre-heater relay or flame glow plug	L_{max} = 130 mH R > 6 Ω at 12 V R > 16 Ω at 24 V
D2.2.8	signal input, digital, with Pullup resistance	sense for heater relay	external switch depending on mass, R_{up} = 5 kΩ
D2.2.4	Power supply (+), switched	fuel valve flame starting	I_{Nenn} = 0,75 A at 24 V L = 14,5...15 mH at 24 V
D2.2.5	Power supply (–)	fuel valve flame starting or external EGR (optional)	Intern with U_{Gnd} connected
D2.2.3	Power supply (+), switched	Common potential for components	U_{Bat}
D2.2.6	Power supply (–), switched	exhaust gas break valve control	R > 42 W at 24 V R > 14 W at 12 V L < 480 mH at 12 V
D2.2.10	Power supply (–) and Shield	cam shaft speed sensor	Intern with U_{Gnd} connected
D2.2.9	signal input (+), digital, with Schmitt-Trigger with Threshold-Application	cam shaft speed sensor	Inductive sensor, U_{in} = 0,2...80 V~
D2.2.19	Power supply (–) and Schirm	crank shaft speed sensor	Intern with U_{Gnd} connected
D2.2.23	signal input (+), digital, with Schmitt-Trigger with Threshold-Application	crank shaft speed sensor	Inductive sensor, U_{in} = 0,2...80 V~
D2.2.12	Power supply (–)	Rail pressure sensor or crankshaft housing pressure sensor	Intern with U_{Gnd} connected
D2.2.13	Power supply (+)	Rail pressure sensor or crankshaft housing pressure sensor	U_{Out} = 5V, I_{max} = 50 mA
D2.2.14	signal input, analog, with Pullup resistance	Rail pressure sensor or crankshaft housing pressure sensor	U_{in} = 0...5 V, R_{up} = 5,6 kΩ
D2.2.15	signal input, analog, with Pullup resistance	coolant temperature sensor	U_{in} = 0...5 V, R_{up} = 1,36 kΩ
D2.2.26	Power supply (–)	coolant temperature sensor	Intern with U_{Gnd} connected
D2.2.16	Power supply (+)	fuel low pressure sensor	U_{Out} = 5 V
D2.2.18	Power supply (–)	fuel low pressure sensor	Intern with U_{Gnd} connected
D2.2.22	signal input, analog, with Pullup resistance	fuel low pressure sensor	U_{in} = 0...5 V, R_{up} = 6,81 kΩ
D2.2.18	Power supply (–)	fuel temperature sensor	Intern with U_{Gnd} connected
D2.2.35	signal input, analog, with Pullup resistance	fuel temperature sensor	U_{in} = 0...5 V, R_{up} = 1,3 kΩ
D2.2.17	Power supply (–)	Temperature sensor 1 (customer-specific)	Intern with U_{Gnd} connected
D2.2.29	signal input, analog, with Pullup resistance	Temperature sensor 1 (customer-specific)	U_{in} = 0...5 V, R_{up} = 1,3 kΩ

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Pin	Pinart / Signalart	Funktion / Komponente	Bemerkungen / Technische Daten
D2.2.32	Power supply (+)	oil pressure sensor	U_{Out} = 5 V
D2.2.27	signal input, analog, with Pullup resistance	oil pressure sensor	U_{in} = 0...5 V, R_{up} = 6,81 kΩ
D2.2.24	Power supply (–)	oil pressure sensor	Intern with U_{Gnd} connected
D2.2.24	Power supply (–)	Fuel filter water level sensor	Intern with U_{Gnd} connected
D2.2.28	signal input, analog, with Pullup resistance	Fuel filter water level sensor	U_{in} = 0...5 V, R_{up} = 120 kΩ
D2.2.33	Power supply (+)	boost pressure sensor/boost temperature sensor	U_{Out} = 5V
D2.2.25	Power supply (–)	boost pressure sensor/boost temperature sensor	Intern with U_{Gnd} connected
D2.2.34	signal input, analog, with Pullup resistance	boost pressure sensor	U_{in} = 0...5 V, R_{up} = 680 kΩ
D2.2.36	signal input, analog, with Pullup resistance	boost temperature sensor	U_{in} = 0...5 V, R_{up} = 1,3 kΩ
D2.2.3	Power supply (+), switched	Common potential for components	U_{Bat}
D2.2.5	Power supply (–)	fuel valve flame starting or external EGR (optional)	Intern with U_{Gnd} connected
D2.2.11	signal output, ddigital (PWM), minus-switched	External EGR (optional)	I_{max} = 50 mA, f = 200 Hz
D2.2.2	Power supply (–)	Engine stop switch (optional) or customer-specific switch	Intern with U_{Gnd} connected
D2.2.21	signal input, analog, with Pullup resistance	Engine stop switch (optional) or customer-specific switch	U_{in} = 0...5 V, R_{up} = 1,1 kΩ
D2.2.20	Power supply (–) and shield	Speed sensor (customer-specific)	Intern with U_{Gnd} connected
D2.2.30	signal input (+), digital, with Schmitt-Trigger with Threshold-Application	Speed sensor (customer-specific)	Inductive sensor, U_{in} = 0,2...50 V~
D2.2.1	Power supply (–), switched	Internal exhaust gas break or internal EGR	for 12-V-applications: I_{Out} = 1,7 A at V_{bat} = 14,4 V, L = 160 mH, f = 300 Hz, I_{Out} = 3,1 A at V_{bat} = 14,4 V, L = 10 mH, f = 1 Hz, for 24-V-applications: I_{Out} = 0,9 A at V_{bat} = 28,8 V, L = 600 mH, f = 300 Hz, I_{Out} = 1,7 A at V_{bat} = 28,8 V, L = 44 mH, f = 1 Hz
D2.3.4	Power supply (+)	injector 1 (Y15.1), 3 (Y15.3), 5 (Y15.5) and 7 (Y15.7) = Y15.1/3/5/7 Bank 1	DCR 4 and 6 cylinder, DMV 6 and 8 cylinder
D2.3.3	Power supply (+)	injector 2 (Y15.2), 4 (Y15.4) 6 (Y15.6) and 8 (Y15.8) = Y15.2/4/6/8 Bank 2	DCR 4 and 6 cylinder, DMV 6 and 8 cylinder
D2.3.13	Power supply (–)	injector 1 Y15.1	DCR 4 and 6 cylinder, DMV 6 and 8 cylinder
D2.3.15	Power supply (–)	injector 2 Y15.2	DCR 4 and 6 cylinder, DMV 6 and 8 cylinder
D2.3.6	Power supply (–)	injector 3 Y15.3	DCR 4 and 6 cylinder, DMV 6 and 8 cylinder
D2.3.14	Power supply (–)	injector 4 Y15.4	DCR 4 and 6 cylinder, DMV 6 and 8 cylinder
D2.3.12	Power supply (–)	injector 5 Y15.5	DCR 6 cylinder, DMV 6 and 8 cylinder
D2.3.16	Power supply (–)	injector 6 Y15.6	DCR 6 cylinder, DMV 6 and 8 cylinder
D2.3.7	Power supply (–)	injector 7 Y15.7	DMV 8 cylinder

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Pin	Pinart / Signalart	Funktion / Komponente	Bemerkungen / Technische Daten
D2.3.8	Power supply (–)	injector 8 Y15.8	DMV 8 cylinder
D2.3.9	Power supply (+)	fuel control unit (FCU, MPROP)	$U_{Out} = U_{Bat}$, I_{max} = 1,3 A
D2.3.10	Power supply (–), switched	fuel control unit (FCU, MPROP)	

The table above illustrates the maximum assignment of the control unit pins. However, in practice, not all the named pins are actually assigned. Pins which are not listed are generally not used by the EMR3 system.(See Circuit diagram)

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5.3 System faults indicated by flashing code

Engine protection function of the electric engine controller EMR3

Depending on the design of the monitoring function the EMR3in certain fault situations is able to protect the engine against damages by simply monitoring the compliance with important limit values during operation and by checking the correct function of system components. Depending on the severity of the fault the engine may continue its operation with certain restrictions, with the fault warning light permanently on, or the fault warning light will be flashing to indicate a severe system fault. In this case the engine should be shut down, as soon as this is possible without risk.

Depending on the engine configuration the flashing fault lamp can have the following meaning:

- Shut-down request for the operator
- Attention: Loss of warranty if disregarded!
- Automatic engine shut-down after a short pre-warning time, possibly in connection with a restarting prevention.
- Forced engine operation at low idle speed to cool the engine, possible in connection with automatic shut-down.
- Start prevention.

Indication of system fault

The diagnostic button provides the possibility to read out existing faults in form of flashing codes. The diagnostics button and the fault lamp are located on the operatorsstandofthemachine.'

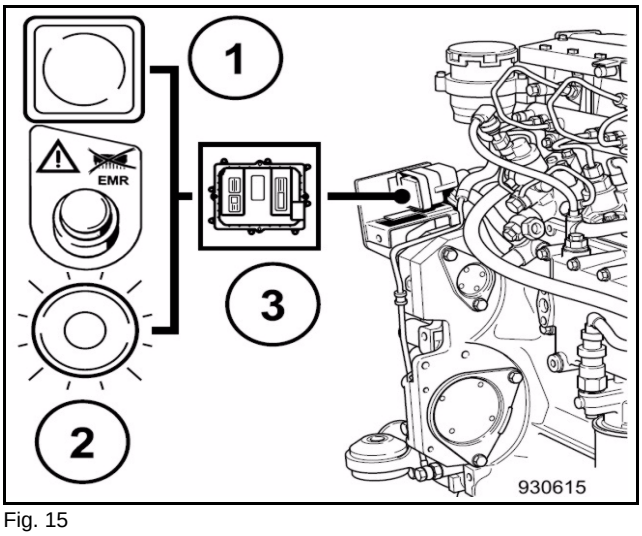


Fig. 15

1 Diagnostics button, S118

2 Fault lamp, H04

3 EMR3 control unit

If the fault log of the EMR3 engine control unit holds at least one active system fault, an uniformly flashing (in case of severe system faults) or a permanent light (in case of minor system faults) will automatically inform about this condition. In this case the output of the nature of the fault in the form of flashing codes (flashing sequences in the pattern i x short flashing, j x long flashing, k x short flashing) can be started. The table of system faults shows which flashing codes exist and what they mean.

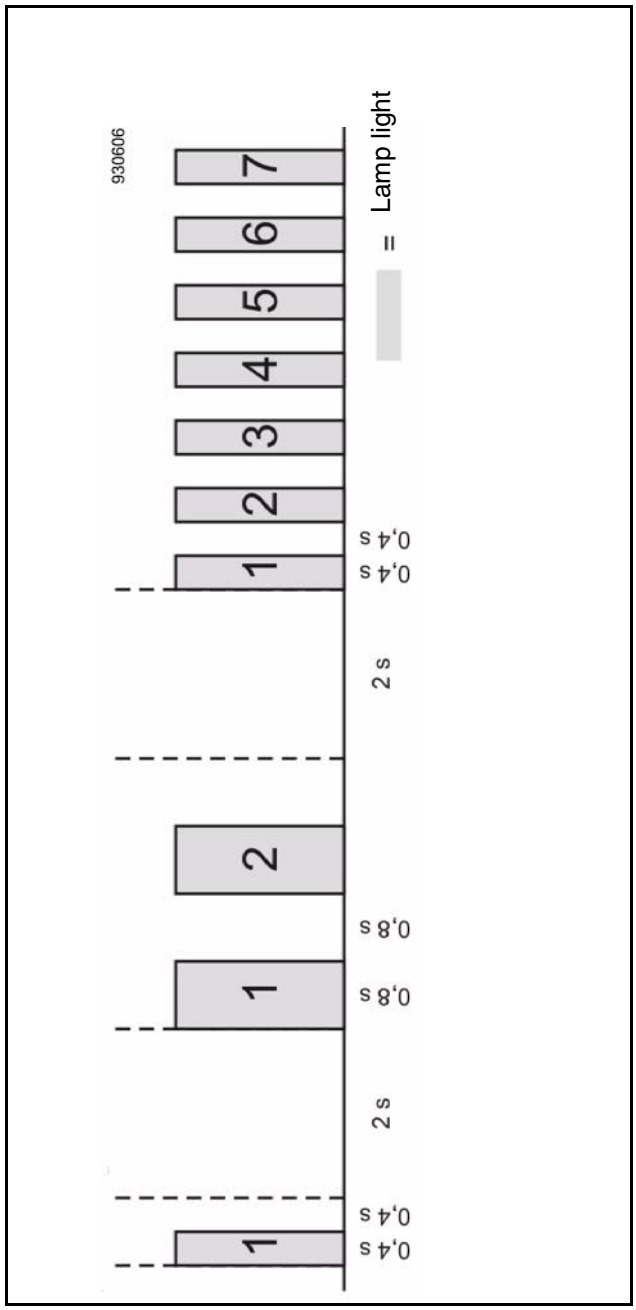


Fig. 16

The following steps are required to read out the flashing codes for saved system faults:

- Hold the diagnostics button depressed (1 to 3 seconds), until the flashing light or the permanent light of the fault lamp goes out.

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- After approx. 2 s watch the flashing code or the first or the next active fault.
- Wait until the fault lamp shows the original flashing or permanent light again after about 5 seconds.

Example: 1x short flashing, **2**x long flashing, **8** x short flashing = flashing code **1-2-8**; this flashing code indicates an interruption or short circuit in the wiring of the charge air temperature sensor. The following illustration (Fig. 16) shows the temporal sequence of the flashing signals:

All active and passive system faults can be invoked by repetitive execution of these steps. If this read-out process is continued after the last fault, the output will be restarted with the first fault.

i Note

The light will go out after the fault has been rectified. With some faults it is necessary to switch off the ignition, then wait for 30 seconds before switching the ignition back on.

Deleting the fault log

The EMR3 engine control unit has two fault logs.Each system fault is simultaneously saved in both logs. However, fault log 2 is only transmitted after switching off the voltage via terminal 15 and the associated afterrunning. Earlier switching off may result in the loss of fault messages.

The diagnostics button enables you to delete passive faults from the first fault log. The second fault log can only be cleared with SERDIA.

The following describes the steps for clearing fault log 1:

- Ignition OFF, press and hold the diagnostics button.
- Switch the ignition on.
- Only release the diagnostics button after approx. 10 seconds.
- All passive faults in fault log 1 will be deleted.
- The deleting process is confirmed by three short flashing pulses.

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Flashing code			Function / component	Fault
Short (0.4s)	Long (0.8s)	Short 0.4s		
1	2	3	Output to coolant temperature indicator lamp	Signal faulty, control unit overheating
1	2	6	Manual throttle control	Signal faulty / implausible
1	2	8	Intake air temperature sensor	Signal faulty
1	3	3	Gear oil temperature sensor	Signal faulty
1	3	4	Rail pressure monitoring	Signal implausible, pressure/ pressure deviation beyond permissible range
1	3	5	Output to lubrication oil pressure warning lamp	Signal faulty, control unit overheating
			Output to valve of fuel metering unit	Signal faulty, control unit overheating
1	3	6	Air filter monitoring	Air pressure after filter too low
1	3	7	Output to actuators	Short-circuit to battery
1	3	8	Output to actuators	Short-circuit against ground
1	4	2	Output to engine operation lamp	Signal faulty, control unit overheating
1	4	3	Multiple stage switch 1 / 2 / 3	Signal faulty / implausible
1	4	4	Lubrication oil temperature sensor	Signal faulty / implausible
			Monitoring of lubrication oil temperature	Temperature outside nominal range
1	4	5	Monitoring of override switch	Signal implausible
1	4	6	Rail pressure limiting valve	Valve open / pressure surge required / no opening after pressure surge
1	4	7	Rail pressure sensor	Signal implausible, pressure deviation beyond permissible range
2	1	2	Monitoring of camshaft / crankshaft	No camshaft signal, no crankshaft signal
2	1	3	Monitoring of camshaft / crankshaft	Discrepancy between camshaft and crankshaft signals
2	1	4	Motor protection	Status of overspeed/override implausible
2	1	6	Fuel low pressure sensor	Signal faulty
			Fuel low pressure monitoring	Fuel low pressure outside nominal range
2	1	9	Output to actuator for exhaust damper engine brake	Signal faulty, control unit overheating
2	2	2	Throttle pedal input 1 (PWM)	PWM signal faulty
2	2	3	Charge air pressure sensor	Signal faulty
			Charge air pressure monitoring	Charge air pressure outside nominal range
2	2	4	Oil pressure sensor	Signal faulty / implausible
2	2	5	Coolant temperature sensor	Signal faulty / implausible in comparison to oil temperature, CAN-signal invalid
2	2	6	Input throttle pedal 1 (analog)	Signal faulty / implausible
2	2	7	Fuel temperature sensor	Signal faulty
2	2	8	Water level sensor in fuel filter	Signal faulty
			Fuel filter water level monitoring	Max. water level exceeded
2	3	1	Monitoring of lubrication oil pressure	Pressure outside the nominal range
2	3	2	Monitoring of coolant temperature	Temperature above nominal range

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Flashing code			Function / component	Fault
Short (0.4s)	Long (0.8s)	Short 0.4s		
2	3	3	Monitoring of intake air temperature	Temperature above nominal range
2	3	5	Monitoring of coolant level	Level below nominal range
2	3	7	Monitoring of fuel temperature	Temperature outside nominal range
2	3	8	Output to fan actuator 1 / 2	Signal faulty, control unit overheating
			Monitoring of fan speed	Speed outside nominal range
2	4	1	Monitoring of combustion	Misfiring detected in one or several cylinders
2	6	1	Monitoring of output to actuators	Relay does not open or is delayed, short circuit to ground
2	6	3	Output to cold starting aid	Signal faulty, relay defective, jammed or incorrectly connected, short circuit
2	7	1	CAN-Bus	Time-Out for one or several sent messages, bus inactive
2	8	2	Sensor supply voltage 1 / 2 / 3	Voltage outside nominal range
2	9	2	Atmospheric pressure sensor	Signal faulty / implausible
3	1	4	Hydraulic oil temperature sensor	Signal faulty
			Hydraulic oil temperature monitoring	Temperature outside nominal range
3	1	8	Battery monitoring	Voltage outside nominal range
3	2	8	Output to cold starting aid control lamp	Signal faulty, control unit overheating
4	1	4	Output to external exhaust gas recirculation actuator	Signal faulty
4	1	5	Output to external exhaust gas recirculation actuator	Signal faulty, control unit overheating
4	1	6	Output to external exhaust gas recirculation actuator	Signal faulty
4	1	7	Lubrication oil wear time meter	Critical time reached
5	1	2	Output to start relay	Signal faulty, control unit overheating
5	1	3	Output to fault lamp	Signal faulty, control unit overheating
5	1	4	Monitoring of terminal 15	No signal detected
5	1	5	Monitoring of terminal 50	Permanent signal detected
5	2	1	Speed measurement	Travel speed implausible
5	2	8	Output to internal engine brake	Signal faulty

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5.5 Diagnose with SERDIA

SERDIA

With the diagnostics tool SERDIA and a hardware interface one can read out / delete and save the error log of the control unit.

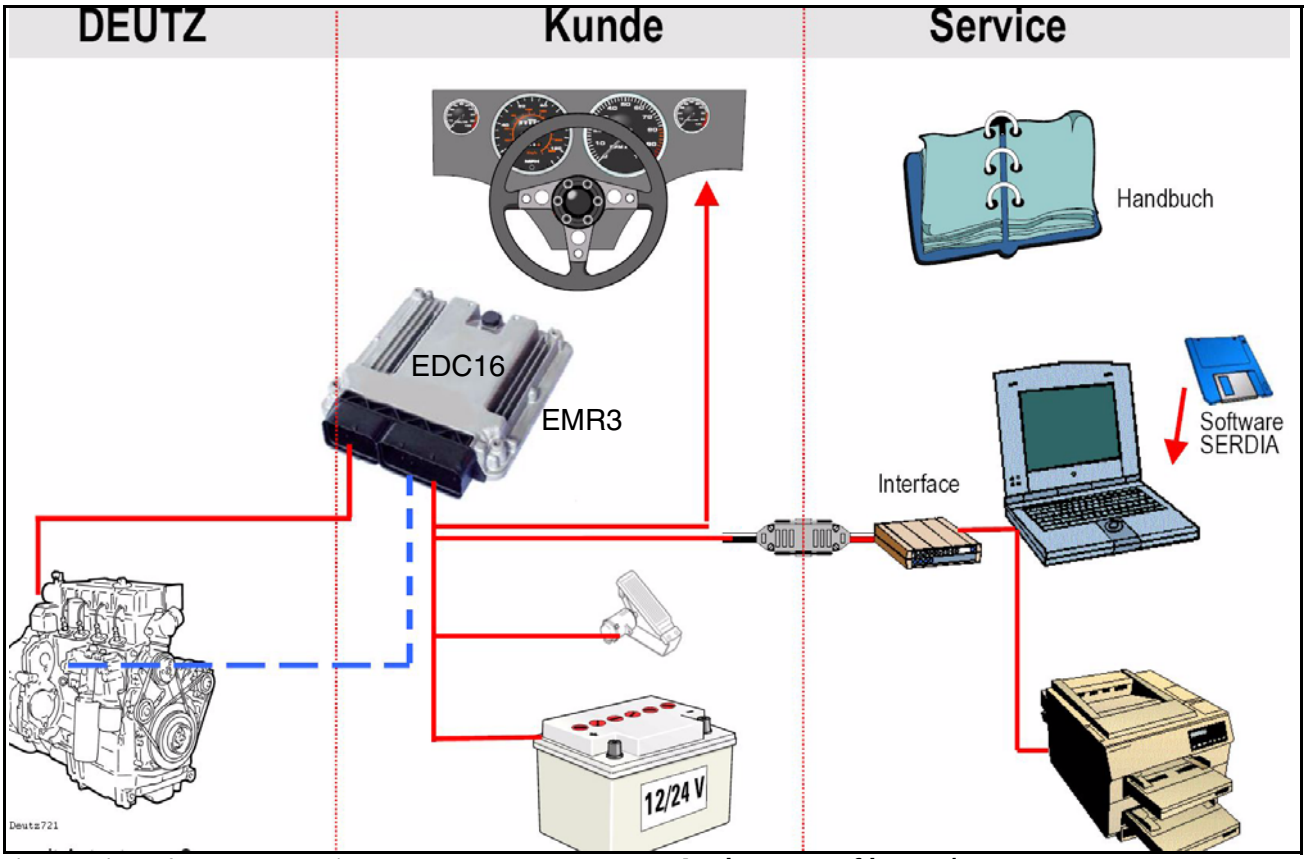


Fig. 1 Service-Software TCD 2012 / 2013

The SERDIA software is first choice for any diagnostics task.

SERDIA is a software program from Deutz which can be used in connection with a laptop computer to perform more detailed fault analyses, especially reading out of the error log.

This displays information on

- Location of fault (e.g. 'coolant temperature sensor')
- Nature of fault (e.g. 'fallen short of bottom limit value', 'sporadic fault')
- Environmental data / operating data (speed and operating hours at the time of the last fault occurrence)
- Number of fault locations and frequency of fault
- Fault status (active – fault present / passive- fault no longer present)
- Fault messages for non-present / rectified faults can be deleted with SERDIA.

Function test

The control outputs can be activated with the engine shut down.

Assignment of inputs/outputs

Display of the current input and output assignment of the EMR-control.

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Representation of measuring values

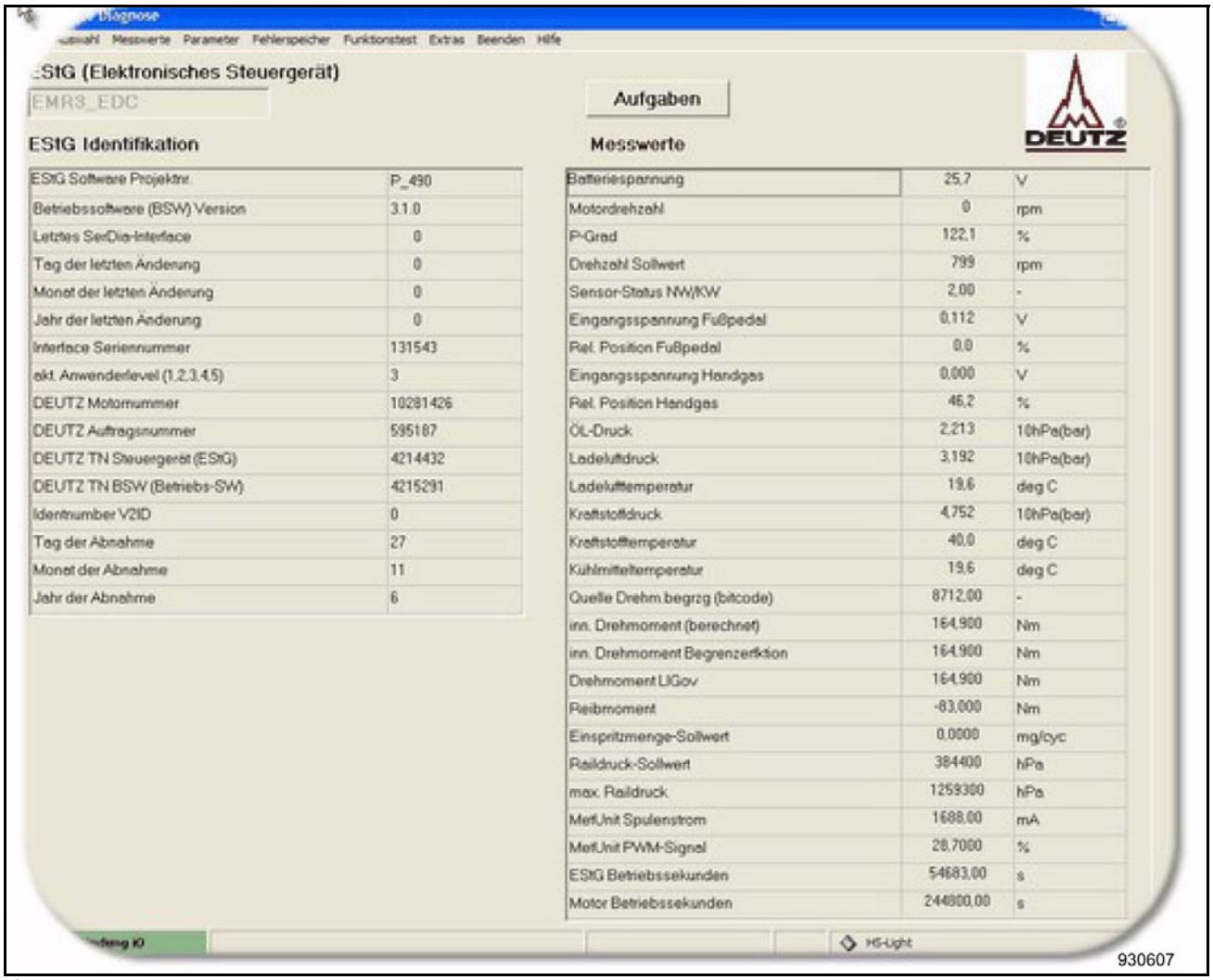


Fig. 2

There is a vast variety of measuring values available for selection which can even be used if no EMR-fault is present (start behaviour, engine sawing, lack of power).

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Representation of fault log

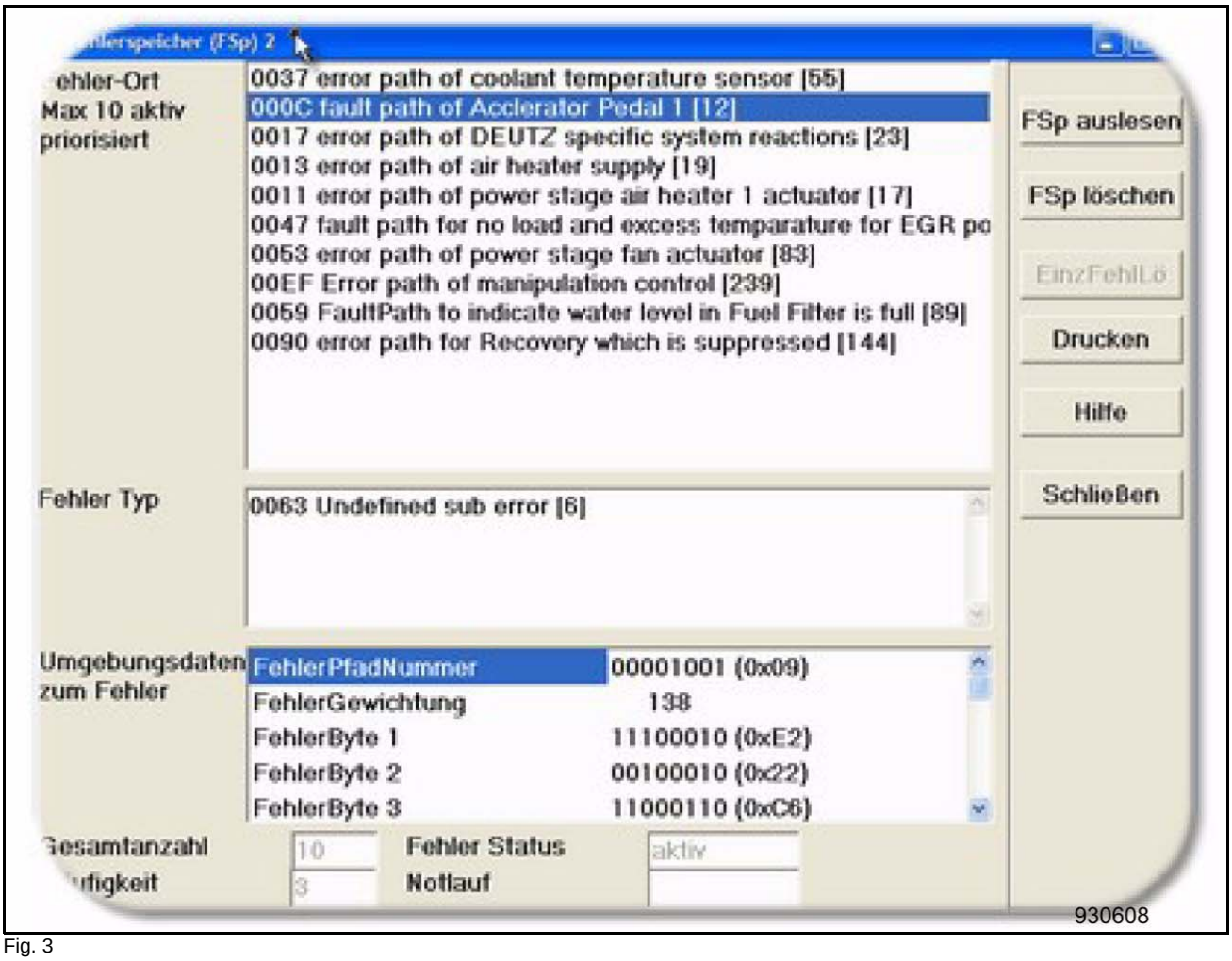


Fig. 3

When looking for the cause of a fault in the EMR3-system examining the fault log of the engine control unit usually provides useful information.

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5.6 Diagnose with CAN-bus

The CAN-bus is used to transfer standard messages of the SAE J 1939.

The display is a compact, robust and integratable modules which enables the user to invoke engine data and to display these in the following formats:

- Analog display
- Digital data
- Multi data (a combination of analog and digital data)
- Alarm messages currently present

The different diagnostic screens enable detailed examination of the engine data flow



Fig. 1

Display for EMR control (Fig. 1).

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5.7 Diagnostics interface

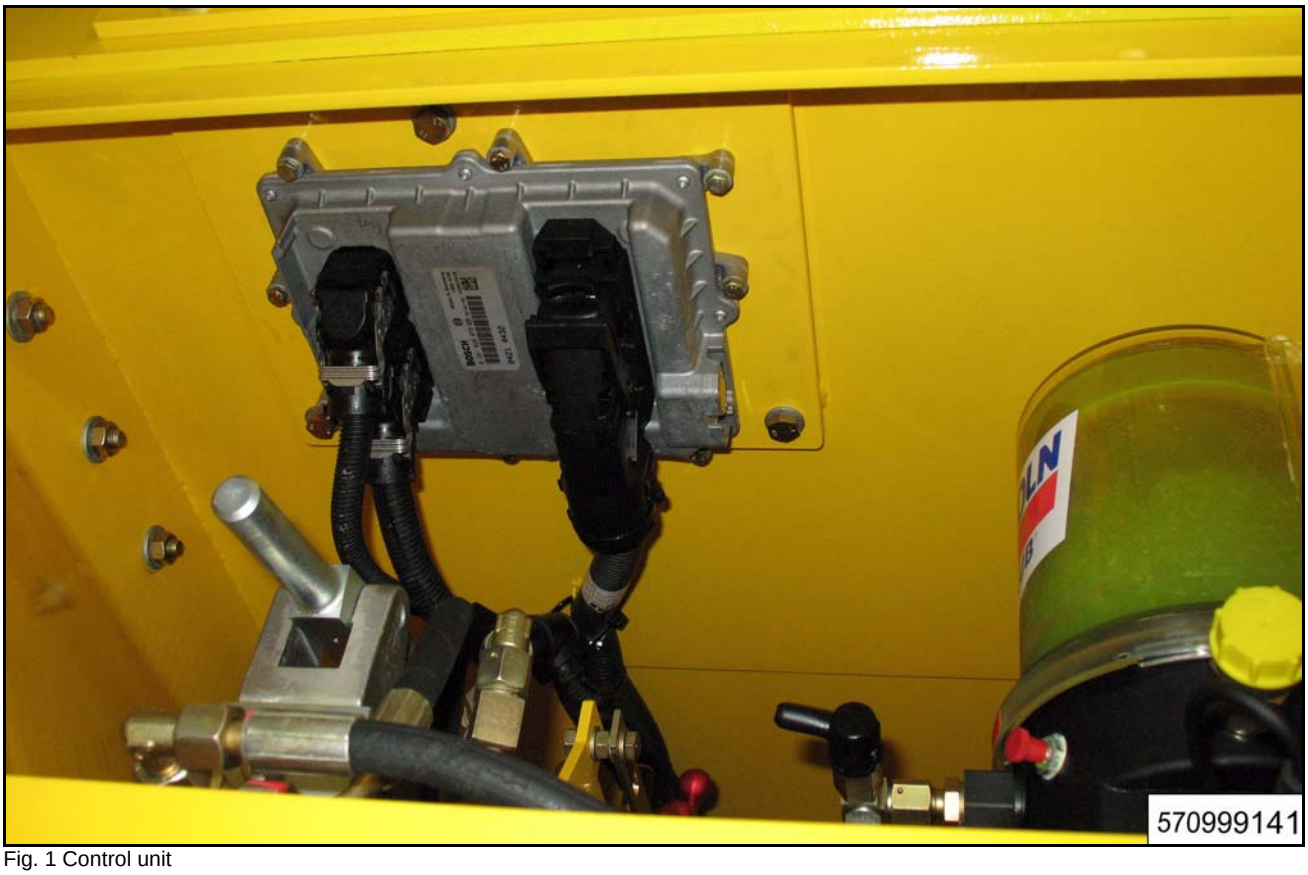


Fig. 1 Control unit

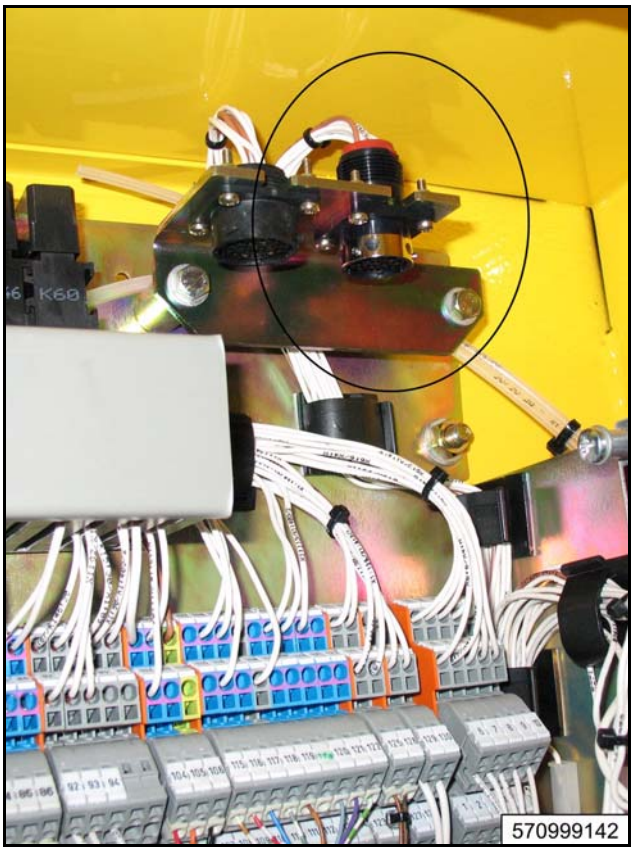


Fig. 2 Diagnostic interface in electric switchbox

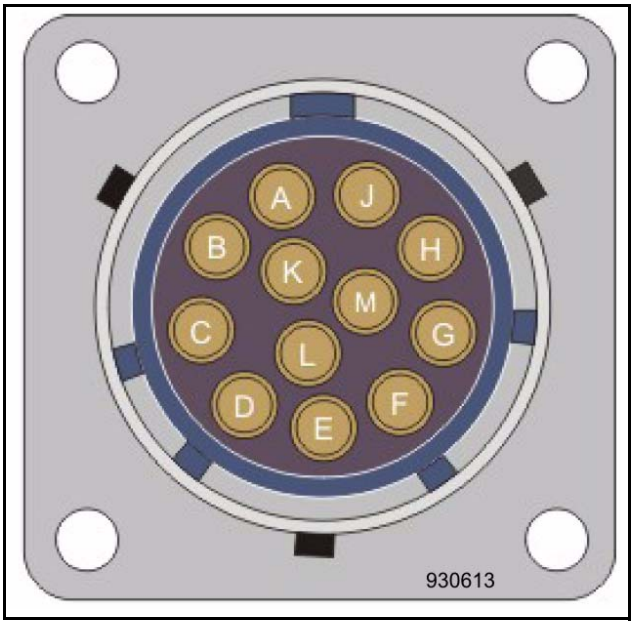


Fig. 3 Diagnostic link

A	=	Battery plus (+)
B	=	Battery minus (-)
F	=	CAN2 low
G	=	CAN1 low
H	=	CAN1 high
K	=	K-Line
M	=	CAN2 high

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SERDIA connection

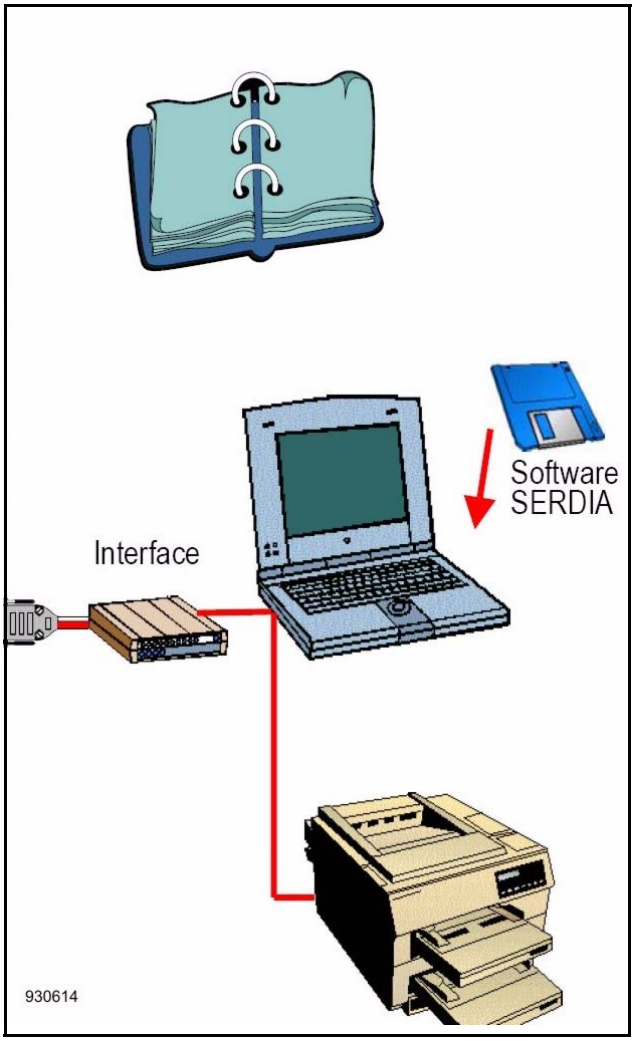


Fig. 4

The KWP-protocol with encrypted dataflow is used via the K-line. For this purpose the PC or laptop (Fig. 4) is connected to the diagnostic interface by means of a special interface cable.

Operation of SERDIA is described in a separate operation manual.

CAN-bus display connection

Operation of the display is described in a separate operation manual.



Fig. 5

Display for EMR control (Fig. 5).

BOMAG part-no.: 057 189 94



Fig. 6

The display is connected to the diagnostic interface by means of a special cable.

Wiring loom for display (Fig. 6)

BOMAG part-no.: 079 900 19

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
11	Air filter condition	Pressure loss above target range with system reaction	●	●	AirFltSysReac	1-3-6	107	0, 11	●
12	Accelerator pedal	Cable break or short circuit, signal implausible compared to signal of idle sensor (analog pedal)	●	●	APP1	2-2-6	91	2, 3, 4, 11	
14	Accelerator pedal	Cable break or short circuit, bad PWM signal range or frequency (digital pedal)	●	●	APPPwm	2-2-2	91	2, 8	●
15	Accelerator pedal	Bad PWM pulse-width repetition rate (digital pedal)	●	●	APPPwmPer	2-2-2	91	8, 11	●
16	ECU internal error	Ambient pressure sensor defective	●	●	APSCD	2-9-2	108	2, 3, 4, 11	●
17	Air heater relay	Cable break or short circuit	●	●	ArHt1	2-6-3	729	3, 4, 5, 11	●
18	Air heater magnetic valve	Cable break or short circuit	●	●	ArHt2	2-6-3	730	3, 4, 5, 11	●
19	Air heater relay	Cable break or wrong connection	●	●	ArHtCD_NoLd	2-6-3	676	4, 11	
20	Air heater relay	Inoperable during shut-off	●	●	ArHtCD_RlyErr	2-6-3	676	2, 5, 11	
22	Battery	Voltage below target range	●	●	BattCD	3-1-8	168	0, 1, 11	●
23	Battery voltage	Above target range with system reaction	●	●	BattCDSysReac	3-1-8	168	2, 11	●
24	Begin of injection period	Outside target range or missing (cylinder 1)		●	BIPCyl1	5-3-1	523561	2	●
25	Begin of injection period	Outside target range or missing (cylinder 2)		●	BIPCyl2	5-3-2	523562	2	●
26	Begin of injection period	Outside target range or missing (cylinder 3)		●	BIPCyl3	5-3-3	523563	2	●
27	Begin of injection period	Outside target range or missing (cylinder 4)		●	BIPCyl4	5-3-4	523564	2	●
28	Begin of injection period	Outside target range or missing (cylinder 5)		●	BIPCyl5	5-3-5	523565	2	●
29	Begin of injection period	Outside target range or missing (cylinder 6)		●	BIPCyl6	5-3-6	523566	2	●
30	Begin of injection period	Outside target range or missing (cylinder 7)		●	BIPCyl7	5-3-7	523567	2	●
31	Begin of injection period	Outside target range or missing (cylinder 8)		●	BIPCyl8	5-3-8	523568	2	●
32	Charge air pressure sensor	Cable break or short circuit	●	●	BPSCD	2-2-3	102	2, 3, 4	●
33	Charge air pressure	Outside target range with system reaction	●	●	BPSCDSysReac	2-2-3	102	2, 11	●
37	Coolant level	Outside target range with system reaction	●	●	CLSCDSysReac	2-3-5	111	1, 11	
38	Single cylinder	Misfire detected (cylinder 1)	●	●	CmbChbMisfire1	2-4-1	1323	11, 12	
39	Single cylinder	Misfire detected (cylinder 2)	●	●	CmbChbMisfire2	2-4-1	1324	11, 12	
40	Single cylinder	Misfire detected (cylinder 3)	●	●	CmbChbMisfire3	2-4-1	1325	11, 12	
41	Single cylinder	Misfire detected (cylinder 4)	●	●	CmbChbMisfire4	2-4-1	1326	11, 12	
42	Single cylinder	Misfire detected (cylinder 5)	●	●	CmbChbMisfire5	2-4-1	1327	11, 12	
43	Single cylinder	Misfire detected (cylinder 6)	●	●	CmbChbMisfire6	2-4-1	1328	11, 12	
44	Single cylinder	Misfire detected (cylinder 7)		●	CmbChbMisfire7	2-4-1	1450	11, 12	
45	Single cylinder	Misfire detected (cylinder 8)		●	CmbChbMisfire8	2-4-1	1451	11, 12	
46	Multiple cylinders	Misfire detected	●	●	CmbChbMisfireMul	2-4-1	1322	11, 12	
47	Misfire	Misfire detected with system reaction	●		CmbChbSysReac	2-4-1	1346	0, 11	

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
48	Shut-off request	Shut-off request ignored by operator	●	●	CoEngShOffDemIgr	3-4-1	1109	2, 11	
52	Engine brake (internal)	Internal engine brake: cable break or short circuit	●	●	CRERCD	5-2-8	1072	3, 4, 5, 11	
53	Preheating signal lamp	Cable break or short circuit	●	●	CSLpCD	3-2-8	1081	2, 3, 4, 5	
54	Coolant temperature warning lamp	Cable break or short circuit	●	●	CTLpCD	1-2-3	704	11	
55	Coolant temperature sensor	Cable break or short circuit	●	●	CTSCD	2-2-5	110	2, 3, 4	●
56	Coolant temperature	Outside target range with system reaction	●	●	CTSCDSysReac	2-3-2	110	0, 11	●
57	Reserve output	Short circuit to Ubatt (output 1)	●	●	Dummy1CD_Max	-	701	11	
58	Reserve output	Short circuit to ground (output 1)	●	●	Dummy1CD_Min	-	701	11	
59	Reserve output	Cable break or ECU internal error (output 1)	●	●	Dummy1CD_SigNpl	-	701	11	
60	Reserve output	Short circuit to Ubatt (output 2)	●	●	Dummy2CD_Max	-	702	11	
61	Reserve output	Short circuit to ground (output 2)	●	●	Dummy2CD_Min	-	702	11	
62	Reserve output	Cable break or ECU internal error (output 2)	●	●	Dummy2CD_SigNpl	-	702	11	
69	EGR actuator (external)	Short circuit to Ubatt	●	●	EGRCD_Max	4-1-4	2791	3, 11	
70	EGR actuator (external)	Short circuit to ground	●	●	EGRCD_Min	4-1-4	2791	4, 11	
71	EGR actuator (external)	Cable break or ECU internal error	●	●	EGRCD_SigNpl	4-1-5	2791	2, 5, 11	
72	EGR actuator (external)	Cable break or short circuit	●	●	EGRCDIntEGR	4-1-6	2791	2, 3, 4, 5	
74	Engine power output	Engine Power output: cable break or short circuit	●	●	EngCDTrqCalcOut	5-5-5	923	2, 3, 4, 5	
75	Engine speed sensor	Engine running with cam-shaft speed signal only	●	●	EngMBackUp	2-1-2	190	11, 12	●
76	Engine speed sensor	Speed signal from cam-shaft bad or missing	●	●	EngMCaS1	2-1-2	190	8, 11, 12	●
77	Engine speed sensor	Speed signal from crank-shaft bad or missing	●	●	EngMCrS1	2-1-2	190	8, 11, 12	●
78	Engine speed sensor	Speed signals of crank-shaft and cam-shaft are phase-shifted	●	●	EngMOfsCaSCrS	2-1-3	190	2, 11	
79	Overspeed	Engine overspeed with system reaction	●	●	EngPrtSysReacFOC	2-1-4	190	0, 11	
80	Overrun conditions	Overrun conditions with system reaction	●	●	EngPrtSysReacORC	2-1-4	190	11, 14	●
81	Engine operating signal lamp	Cable break or ECU internal error	●	●	ESLpCD	1-4-2	703	2, 3, 4, 5	
82	Engine brake flap actuator	Engine brake flap actuator: cable break or short circuit	●	●	ExFlCD	2-1-9	1074	3, 4, 5, 11	
83	Fan actuator	Fan actuator: cable break or short circuit	●	●	FanCD	2-3-8	975	2, 3, 4, 5	
86	Fan speed	Above target range with system reaction	●	●	FanCDSysReac	2-3-8	523602	2, 11	●
87	Fuel filter water level sensor	Cable break or short circuit	●	●	FlFCD	2-2-8	97	3, 4, 11	●
89	Water level in fuel filter	Above target range	●	●	FlFCD_WtLvl	2-2-8	97	11, 12	
90	Fuel low pressure sensor	Cable break or short circuit	●	●	FlPSCD	2-1-6	94	3, 4, 11	●
91	Fuel low pressure	Below target range with system reaction	●	●	FlPSCDSysReac	2-1-6	94	2, 11	●
94	CAN message	Missing or value above target range (message "DecV1" = pseudo pedal)	●	●	FrmMngDecV1	5-2-6	523239	2, 12	●
95	CAN message	Missing (message "FunModCtl" = function mode control)	●	●	FrmMngFunModCtl	5-2-7	523240	11, 12	●
106	CAN message	Missing (message "EngPrt" = engine protection)	●	●	FrmMngTOEngPrt	3-3-3	523212	11, 12	●

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
110	CAN message	Missing (message "PrHtEnCmd" = preheat and engine command)	●	●	FrmMngTOPrHtEnCmd	3-3-7	523216	11, 12	●
112	CAN message	Missing (message "RxCCVS" = cruise control)	●	●	FrmMngTORxCCVS	1-1-1	523218	11, 12	●
113	CAN message	Missing (message "RxEngTemp" = engine temperature)	●	●	FrmMngTORxEngTemp	1-1-2	523604	11, 12	●
117	CAN message	Missing (message "SwtOut" = switch outputs)	●	●	FrmMngTOSwtOut	1-1-5	523238	11, 12	●
118	CAN message	Missing (message "TCO1" = speedo signal)	●	●	FrmMngTOTCO1	1-1-6	523222	11, 12	●
120	CAN message	Missing (message "TSC1-AE")	●	●	FrmMngTOTSC1AE	1-1-8	523605	11, 12	
121	CAN message	Missing (message "TSC1-AR")	●	●	FrmMngTOTSC1AR	1-1-9	523606	11, 12	
122	CAN message	Missing (message "TSC1-DE")	●	●	FrmMngTOTSC1DE	1-1-8	523607	11, 12	
123	CAN message	Missing (message "TSC1-DR")	●	●	FrmMngTOTSC1DR	1-1-9	523608	11, 12	
124	CAN message	Missing (message "TSC1-PE")	●	●	FrmMngTOTSC1PE	1-1-8	523609	11, 12	
125	CAN message	Missing (message "TSC1-TE")	●	●	FrmMngTOTSC1TE	1-1-8	898	11, 12	
126	CAN message	Missing (message "TSC1-TR")	●	●	FrmMngTOTSC1TR	1-1-9	520	11, 12	
127	CAN message	Missing (message "TSC1-VE")	●	●	FrmMngTOTSC1VE	1-1-8	523610	11, 12	
128	CAN message	Missing (message "TSC1-VR")	●	●	FrmMngTOTSC1VR	1-1-9	523611	11, 12	
131	CAN message	Time-out of at least one sended message	●	●	FrmMngTxTO	2-7-1	523500	11, 12	●
133	Fuel temperature sensor	Fuel temp. sensor: cable break or short circuit	●	●	FTSCD	2-2-7	174	3, 4, 11	●
134	Fuel temperature	Above target range with system reaction	●	●	FTSCDSysReac	2-3-7	174	0, 11	●
136	Customer-specific sensor	Cable break or short circuit (sensor 1)	●	●	GOTSCD	1-3-3	-	2, 3, 4, 11	●
137	Customer-specific temperature	Outside target range with system reaction (temperature 1)	●	●	GOTSCDSysReac	1-3-3	-	2, 11	●
138	Hand throttle	Cable break or short circuit, signal implausible compared to signal of idle sensor	●	●	HdThrt	1-2-6	29	2, 3, 4, 11	
139	Customer-specific sensor	Cable break or short circuit (sensor 2)	●	●	HOTSCD	3-1-4	1638	3, 4, 11, 12	●
140	Customer-specific temperature	Outside target range with system reaction (temperature 2)	●	●	HOTSCDSysReac	3-1-4	1638	2, 11	●
141	ECU internal error	Communication with chip CJ 940 disturbed	●	●	HWEMonCom	5-5-5	523617	11, 12	
142	ECU internal error	EEPROM memory access	●	●	HWEMonEEPROM	2-8-1	630	11, 12	
143	ECU internal hardware monitoring	A recovery occurred which is stored as protected	●	●	HWEMonRcyLocked	5-5-5	523612	11, 14	
144	ECU internal hardware monitoring	A recovery occurred which is not stored	●	●	HWEMonRcySuppres-sed	5-5-5	523612	11, 14	
145	ECU internal hardware monitoring	A recovery occurred which is visible in the error memory	●	●	HWEMonRcyVisible	5-5-5	523612	11, 14	
146	ECU internal hardware monitoring	Overvoltage	●	●	HWEMonUMaxSupply	5-5-5	523612	3, 11	
147	ECU internal hardware monitoring	Undervoltage	●	●	HWEMonUMinSupply	5-5-5	523612	4, 11	
149	Charge air temperature sensor	Cable break or short circuit	●	●	IATSCD	1-2-8	105	2, 3, 4, 11	●
150	Charge air temperature	Above target range with system reaction	●	●	IATSCDSysReac	2-3-3	105	0, 11	●
153	Multiple injectors	Short circuit (cylinder bank 1)	●	●	InjVlvBnk1A	1-5-1	523350	3, 4, 11, 13	●
154	Multiple injectors	Cable break (cylinder bank 1)	●	●	InjVlvBnk1B	1-5-1	523351	5, 13	●

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
155	Multiple injectors	Short circuit (cylinder bank 2)	●	●	InjVlvBnk2A	1-5-2	523352	3, 4, 11, 13	●
156	Multiple injectors	Cable break (cylinder bank 2)	●	●	InjVlvBnk2B	1-5-2	523353	5, 13	●
157	ECU internal error	Injector power stage A	●	●	InjVlvChipA	1-5-3	523354	2, 3, 12, 14	
158	ECU internal error	Injector power stage B	●	●	InjVlvChipB	1-5-3	523355	12	
159	Single injector	Short circuit (injector 1)	●	●	InjVlvCyl1A	1-5-4	651	3, 4, 11, 13	●
160	Single injector	Cable break (injector 1)	●	●	InjVlvCyl1B	1-5-4	651	5, 13	●
161	Single injector	Short circuit (injector 2)	●	●	InjVlvCyl2A	1-5-5	652	3, 4, 11, 13	●
162	Single injector	Cable break (injector 2)	●	●	InjVlvCyl2B	1-5-5	652	5, 13	●
163	Single injector	Short circuit (injector 3)	●	●	InjVlvCyl3A	1-5-6	653	3, 4, 11, 13	●
164	Single injector	Cable break (injector 3)	●	●	InjVlvCyl3B	1-5-6	653	5, 13	●
165	Single injector	Short circuit (injector 4)	●	●	InjVlvCyl4A	1-6-1	654	3, 4, 11, 13	●
166	Single injector	Cable break (injector 4)	●	●	InjVlvCyl4B	1-6-1	654	5, 13	●
167	Single injector	Short circuit (injector 5)	●	●	InjVlvCyl5A	1-6-2	655	3, 4, 11, 13	●
168	Single injector	Cable break (injector 5)	●	●	InjVlvCyl5B	1-6-2	655	5, 13	●
169	Single injector	Short circuit (injector 6)	●	●	InjVlvCyl6A	1-6-3	656	3, 4, 11, 13	●
170	Single injector	Cable break (injector 6)	●	●	InjVlvCyl6B	1-6-3	656	5, 13	●
171	Single injector	Short circuit (injector 7)		●	InjVlvCyl7A	1-6-4	657	3, 4, 11, 13	●
172	Single injector	Cable break (injector 7)		●	InjVlvCyl7B	1-6-4	657	5, 13	●
173	Single injector	Short circuit (injector 8)		●	InjVlvCyl8A	1-6-5	658	3, 4, 11, 13	●
174	Single injector	Cable break (injector 8)		●	InjVlvCyl8B	1-6-5	658	5, 13	●
175	Rail pressure	Compression test active: rail-pressure monitoring is going to be disabled	●	●	InjVlvErrDet	5-5-5	523370	11, 14	
176	Metering unit valve	Flow rate outside target range	●		MeUnCD_ADC	1-3-5	523615	3, 4, 11	
177	Metering unit valve	Not connected or output disabled	●		MeUnCDNoLoad	1-3-5	523615	5, 11, 12	
178	Metering unit valve	Short circuit to Ubatt	●		MeUnCDSCBat	1-3-5	523615	11, 12	
179	Metering unit valve	Short circuit to ground	●		MeUnCDSCGnd	1-3-5	523615	11, 12	
182	Main relay	Short circuit to Ubatt (relay 1)	●	●	MnRly1_SCB	1-3-7	2634	3, 11	
183	Main relay	Short circuit to ground (relay 1)	●	●	MnRly1_SCG	1-3-8	2634	4, 11	
184	ECU internal error	Watchdog counter exceeds maximum	●	●	Montr	1-3-9	523420	11, 14	
186	Main relay	Short circuit to ground or emergency shut-off (relay 2)	●	●	MRlyCD	2-6-1	2634	7, 11, 12	
187	Main relay	Short circuit to ground or emergency shut-off (relay 3)	●	●	MRlyCDMnRly2	2-6-1	563	7, 11, 12	
188	Main relay	Short circuit to ground or emergency shut-off (relay 3)	●	●	MRlyCDMnRly3	2-6-1	2634	7, 11, 12	
189	Multi state switch	Cable break or short circuit, input voltage outside target range (switch 1)	●	●	MSSCD1	1-4-3	523450	2, 3, 4, 11	●
190	Multi state switch	Cable break or short circuit, input voltage outside target range (switch 2)	●	●	MSSCD2	1-4-3	523451	2, 3, 4, 11	●
191	Multi state switch	Cable break or short circuit, input voltage outside target range (switch 3)	●	●	MSSCD3	1-4-3	523452	2, 3, 4, 11	●

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
192	CAN bus off-state	Cable break or short circuit, off-state (CAN bus A)	●	●	NetMngCANAOff	2-7-1	639	11, 14	●
193	CAN bus off-state	Cable break or short circuit, off-state (CAN bus B)	●	●	NetMngCANBOff	2-7-1	1231	11, 14	●
194	CAN bus off-state	Cable break or short circuit, off-state (CAN bus C)	●	●	NetMngCANCOff	2-7-1	1235	11, 14	●
195	Oil pressure warning lamp	Cable break or short circuit	●	●	OPLpCD	1-3-5	705	2, 3, 4, 5	
196	Oil pressure sensor	Cable break or short circuit	●	●	OPSCD	2-2-4	100	0, 2, 3, 4	●
197	Oil pressure sensor	Pressure value implausible low	●	●	OPSCD1	2-3-1	100	1, 11	●
198	Oil pressure	Above target range	●	●	OPSCDSysReacHi	2-3-1	100	0, 11	●
199	Oil pressure	Below target range	●	●	OPSCDSysReacLo	2-3-1	100	1, 11	●
200	Override switch	Switch hangs	●	●	OSwCD	1-4-5	1237	2, 11	●
201	Oil temperature sensor	Cable break or short circuit	●	●	OTSCD	1-4-4	175	2, 3, 4	●
203	Oil temperature	Below target range with system reaction	●	●	OTSCDSysReac	1-4-4	175	0, 11	●
208	Rail pressure limiting valve	Opening failure	●		PRVMon	1-4-6	523470	2, 11, 12, 14	
209	Rail pressure sensor	Cable break or short circuit	●		RailCD	1-4-7	157	3, 4, 11	
210	Rail pressure sensor	Deviation of signal during start or after-run above target range	●		RailCDOfsTst	1-4-7	157	0, 1, 11	●
211	Rail pressure	Positive deviation (speed dependent) outside target range	●		RailMeUn0	1-3-4	523613	0, 11	●
212	Rail pressure	Positive deviation (flow dependent) outside target range (⇨ leakage!)	●		RailMeUn1	1-3-4	523613	0, 11	●
213	Rail pressure	Negative deviation (flow dependent) outside target range	●		RailMeUn2	1-3-4	523613	0, 11	●
214	Rail pressure	Negative deviation (speed dependent) outside target range	●		RailMeUn3	1-3-4	523613	1, 11	●
215	Rail pressure	Pressure above target range	●		RailMeUn4	1-3-4	523613	0, 11	●
216	Rail pressure	Implausible (leakage, injector needle blocked in open position)	●		RailMeUn7	1-3-4	523613	2, 11	●
218	ECU internal error	Redundant shut-off conditions detected	●	●	SOPTst	1-4-9	523490	3, 4, 11, 12	
219	ECU internal error	Wrong voltage of internal 5V reference source 1	●	●	SSpMon1	2-8-2	1079	3, 4, 11	●
221	ECU internal error	Wrong voltage of internal 5V reference source 2	●	●	SSpMon2	2-8-2	1080	3, 4, 11	●
222	ECU internal error	Wrong voltage of internal 5V reference source 3	●	●	SSpMon3	2-8-2	523601	3, 4, 11	●
223	Start relay	Start relay (high side): short circuit	●	●	StrtCDHS	5-1-2	677	3, 4, 11	
224	Start relay	Start relay (low side): cable break or short circuit, disabled by ECU	●	●	StrtCDLS	5-1-2	677	3, 4, 5, 11	
225	Diagnostic lamp	Cable break or short circuit, disabled by ECU	●	●	SysLamp	5-1-3	624	2, 3, 4, 5	
226	Terminal 15	Ignition ON not detected	●	●	T15CD	5-1-4	158	11, 12	
227	Terminal 50	Engine start switch hangs	●	●	T50CD	5-1-5	523550	11, 12	
228	ECU internal error	Time processing unit (TPU) defective	●	●	TPUMon	5-5-5	523550	2, 11	
232	Vehicle speed signal	Speed above target range, signal missing or implausible	●	●	VSSCD1	5-2-1	84	0, 8, 12, 14	●
235	ECU internal error	Serial communication interface defective	●	●	WdCom	5-5-5	523600	11, 12	
236	Rail pressure limiting valve	Opening failure with system reaction	●		PRVMonSysReac	1-4-6	523470	11, 12	

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P513_: 214, 300

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P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

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P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

11 / 107 / AirFltSysReac

Error description AIR FILTER COND.
Air filter differential pressure: the pressure difference of the intake air between the filter inlet and outlet calculated by ECU is above the target range and the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 11
BlinkCode (short-long-short): 1 - 3 - 6
SPN: 107
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Pressure loss above target range with system reaction, air filter clogged or defective, sensor not working, connection cable demaged

Take actions for error repair
Check airfilter and if necessary clean or renew it, check cabling, check air filter and if necessary replace the filter component, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: actual value

12 / 91 / APP1

Error description THROTTLE 1
Analog accelerator pedal sensor 1 or double accelerator pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of the second pedal

Error codes
DEUTZ-Errorcode: 12
BlinkCode (short-long-short): 2 - 2 - 6
SPN: 91
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Voltage outside target range, signal implausible compared to signal of redundant pedal (analog pedal 1), sensor defective, connection cable demaged

Take actions for error repair
Check cabling, check accelator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, switching to substitute value correspond to Priority-Chain or Limp Home
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

14 / 91 / APPPwm

Error description THROTTLE 1
Digital accelerator pedal sensor (PWM): the signal received by ECU is defective or implausible or the pulse-duty factor is out of the target range

Error codes
DEUTZ-Errorcode: 14
BlinkCode (short-long-short): 2 - 2 - 2
SPN: 91
possible FMI:
8: unusual frequency, pulse or period.
8: unusual frequency, pulse or period.
2: data stream is defective
8: unusual frequency, pulse or period.

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Duty cycle outside target range, signal erroneous or implausible (pedal 1), sensor defective, onnection cable demaged

Take actions for error repair
Check cabling, check accelator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, switching to substitute value correspond to Priority-Chain or Limp Home
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

15 / 91 / APPPwmPer

Error description THROTTLE 1
digital accelerator pedal sensor (PWM): the frequence of the signal received by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 15
BlinkCode (short-long-short): 2 - 2 - 2
SPN: 91
possible FMI:
8: unusual frequency, pulse or period.
8: unusual frequency, pulse or period.
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Pulse frequency outside target range (pedal 1), sensor defective, connection cable demaged

Take actions for error repair
Check cabling, check accelator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, switching to substitute value correspond to Priority-Chain or Limp Home
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

16 / 108 / APSCD

Error description BAROMETRIC PRESS.
Ambient air pressure sensor (in ECU): the voltage measured by ECU is out of the target range or the calculated ambient air pressure is implausible compared with the charge air pressure

Error codes
DEUTZ-Errorcode: 16
BlinkCode (short-long-short): 2 - 9 - 2
SPN: 108
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Ambient air pressure sensor defective, ECU defective

Take actions for error repair
Change ECU

other error properties
System reaction: Warning, substitute value (0,85bar)
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

17 / 729 / ArHt1

Error description AIR HEATER RELAY
Air heater relay: the current drain measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 17
BlinkCode (short-long-short): 2 - 6 - 3
SPN: 729
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit at EDC output, relay defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check relay and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: shut off value

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referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

18 / 730 / ArHt2

Error description AIR HEATER VALVE
Air heater magnet valve: the current drain measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 18
BlinkCode (short-long-short): 2 - 6 - 3
SPN: 730
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, valve defective, connection cable demaged

Take actions for error repair
Check valve and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: shut off value

19 / 676 / ArHtCD_NoLd

Error description AIR HEATER
Air heater relay: the ECU detects no switching operation at the input of a readback process

Error codes
DEUTZ-Errorcode: 19
BlinkCode (short-long-short): 2 - 6 - 3
SPN: 676
possible FMI:
12. Errormode not identifiable
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Relay energized, but no feedback on sense line, relay defective or wrong wired, preheat component defective, connection cable demaged

Take actions for error repair
Check cabling of preheat component, if relay not working,check relay and if necessary replace it, check preheat component and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: setpoint for output status

20 / 676 / ArHtCD_RlyErr

Error description AIR HEATER
Air heater relay: the ECU detects an implausible signal at the input of a readback process

Error codes
DEUTZ-Errorcode: 20
BlinkCode (short-long-short): 2 - 6 - 3
SPN: 676
possible FMI:
5: current to low or broken wire
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Relay not energized, but working voltage on sense line, relay defective (can not disconnect or switch off), preheat component defective, connection cable demaged

Take actions for error repair
Check cabling of preheat component, if relay not working,check relay and if necessary replace it, check preheat component and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: setpoint for output status

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P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

22 / 168 / BattCD

Error description BATTERY VOLTAGE
Battery voltage: the voltage measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 22
BlinkCode (short-long-short): 3 - 1 - 8
SPN: 168
possible FMI:
0: data valid, but above normal working area
1: data valid, but below normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Voltage below target range, battery defective, too high power supply voltage, too high contact resistance, wiring demaged, energie system overloaded, parametering inaccurate, ECU defective

Take actions for error repair
Check LIMA?, ECU, cabling, contact resistance, safety fuses, too high load in energy system, check battery and if necessary replace it, check battery pole and if necessary clean it, check connection cable and if necessary repair or replace it, check volta

other error properties
System reaction: Warning, substitute value, dependent upon supply voltage (12V, 24V)
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

23 / 168 / BattCDSysReac

Error description BATTERY VOLTAGE
Battery voltage: the voltage measured by ECU is out of the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 23
BlinkCode (short-long-short): 3 - 1 - 8
SPN: 168
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Above target range with system reaction, too high power supply voltage, parametering inaccurate, ECU defective

Take actions for error repair
Check dataset of calibration of working voltage for application, check LIMA? Check voltage of generator, check the parameters and if necessary correct them, replace ECU

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

24 / 523561 / BIPCyl1

Error description INJECT. PERIOD ZYL.1
Begin of injection of cylinder 1: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 24
BlinkCode (short-long-short): 5 - 3 - 1
SPN: 523561
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 1), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

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P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

25 / 523562 / BIPCyl2

Error description INJECT. PERIOD ZYL.2
Begin of injection of cylinder 2: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 25
BlinkCode (short-long-short): 5 - 3 - 2
SPN: 523562
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 2), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

26 / 523563 / BIPCyl3

Error description INJECT. PERIOD ZYL.3
Begin of injection of cylinder 3: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 26
BlinkCode (short-long-short): 5 - 3 - 3
SPN: 523563
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 3), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

27 / 523564 / BIPCyl4

Error description INJECT. PERIOD ZYL.4
Begin of injection of cylinder 4: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 27
BlinkCode (short-long-short): 5 - 3 - 4
SPN: 523564
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 4), magnet valve or injection pump defective

Take actions for error repair
d

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

28 / 523565 / BIPCyl5

Error description INJECT. PERIOD ZYL.5
Begin of injection of cylinder 5: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 28
BlinkCode (short-long-short): 5 - 3 - 5
SPN: 523565
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 5), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

29 / 523566 / BIPCyl6

Error description INJECT. PERIOD ZYL.6
Begin of injection of cylinder 6: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 29
BlinkCode (short-long-short): 5 - 3 - 6
SPN: 523566
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 6), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

30 / 523567 / BIPCyl7

Error description INJECT. PERIOD ZYL.7
Begin of injection of cylinder 7: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 30
BlinkCode (short-long-short): 5 - 3 - 7
SPN: 523567
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 7), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

31 / 523568 / BIPCyl8

Error description INJECT. PERIOD ZYL.8
Begin of injection of cylinder 8: the ECU can not identify the magnet valve or the injection pump with the measured value of current drain at the begin of the injection

Error codes
DEUTZ-Errorcode: 31
BlinkCode (short-long-short): 5 - 3 - 8
SPN: 523568
possible FMI:
2: data stream is defective
2: data stream is defective
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Value outside target range or missing (cylinder 8), magnet valve or injection pump defective

Take actions for error repair
Check magnetic valve or injection pump and if necessary change them

other error properties
System reaction: No function at the moment/ Allocation check cylinder!
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

32 / 102 / BPSCD

Error description CHARGE AIR PRESS.
Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range; the calculated charge air pressure is implausible or the received value via CAN is defective

Error codes
DEUTZ-Errorcode: 32
BlinkCode (short-long-short): 2 - 2 - 3
SPN: 102
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, sensor defective, onnection cable demaged

Take actions for error repair
Check cabling, if LDF6T sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

33 / 102 / BPSCDSysReac

Error description CHARGE AIR PRESS.
Charge air pressure: the charge air pressure calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 33
BlinkCode (short-long-short): 2 - 2 - 3
SPN: 102
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Outside target range with system reaction, air system demaged, sensor defective, onnection cable demaged

Take actions for error repair
Check air system, inspect air system and if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: BPSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

37 / 111 / CLSCDSysReac

Error description ENG COOLANT LEVEL
Coolant level: the coolant level calculated by ECU is underneath the allowed minimum

Error codes
DEUTZ-Errorcode: 37
BlinkCode (short-long-short): 2 - 3 - 5
SPN: 111
possible FMI:
1: data valid, but below normal working area
1: data valid, but below normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Outside target range with system reaction, cooling system untight, sensor defective, onnection cable demaged

Take actions for error repair
Check coolant level, check cabling, inspect cooling system and if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: CLSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

38 / 1323 / CmbChbMisfire1

Error description MISFIRE CYL. 1
Misfire at cylinder 1: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 38
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1323
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 1), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

39 / 1324 / CmbChbMisfire2

Error description MISFIRE CYL. 2
Misfire at cylinder 2: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 39
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1324
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 2), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

40 / 1325 / CmbChbMisfire3

Error description MISFIRE CYL. 3
Misfire at cylinder 3: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 40
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1325
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 3), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

41 / 1326 / CmbChbMisfire4

Error description MISFIRE CYL. 4
Misfire at cylinder 4: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 41
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1326
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 4), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

42 / 1327 / CmbChbMisfire5

Error description MISFIRE CYL. 5
Misfire at cylinder 5: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 42
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1327
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 5), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

43 / 1328 / CmbChbMisfire6

Error description MISFIRE CYL. 6
Misfire at cylinder 6: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 43
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1328
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 6), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

44 / 1450 / CmbChbMisfire7

Error description MISFIRE CYL. 7
Misfire at cylinder 7: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 44
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1450
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 7), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

45 / 1451 / CmbChbMisfire8

Error description MISFIRE CYL. 8
Misfire at cylinder 8: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 45
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1451
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected (cylinder 8), magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

46 / 1322 / CmbChbMisfireMul

Error description MULTIPL. CYL. MISFIRE
Misfire at more cylinders: the number of the misfire detected by ECU is out of the allowed limit value

Error codes
DEUTZ-Errorcode: 46
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1322
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected, magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

47 / 1346 / CmbChbSysReac

Error description MISFIRE SYST. REACT
Misfire at more cylinders: the number of the misfire detected by ECU is out of the allowed limit value; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 47
BlinkCode (short-long-short): 2 - 4 - 1
SPN: 1346
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Misfire detected with system reaction, magnet valve or injection pump defective, fuel system defective, motor engineering demaged

Take actions for error repair
Check magnetic valve or injection pump and if necessary replace them, check fuel system and if necessary repair it, check motor engineering and if necessary repair it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 0
Measurement @ errortime: actual value

48 / 1109 / CoEngShOffDemIgr

Error description SHUT OFF REQUEST
Request of engine off: the operator ignors the engine off request within an allowed period.

Error codes
DEUTZ-Errorcode: 48
BlinkCode (short-long-short): 3 - 4 - 1
SPN: 1109
possible FMI:
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Shut-off request ignored by operator

Take actions for error repair
Warranty relevant

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

52 / 1072 / CRERCD

Error description ENGINE BRAKE INT.
Engine brake actuator (internal): the current drain measured by ECU is out of the target range or the maximum permissble temperature of the ECU component for power supply of the actuator is exceeded.

Error codes
DEUTZ-Errorcode: 52
BlinkCode (short-long-short): 5 - 2 - 8
SPN: 1072
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check actuator and if necessary replace it, check connection cable and if necessary repaire or replace it

other error properties
System reaction: Warning, shutoff output, capacity reduction via second topcurve?
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 2
Measurement @ errortime: setpoint for output status

53 / 1081 / CSLpCD

Error description PREHEAT LAMP
Indicator lamp of air heater relay: the current drain measured by ECU is out of the target range or the maximum permissble temperature of the ECU component for power supply of the lamp is exceeded

Error codes
DEUTZ-Errorcode: 53
BlinkCode (short-long-short): 3 - 2 - 8
SPN: 1081
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling and load, check lamp and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: setpoint for output status

54 / 704 / CTLpCD

Error description TEMP. LAMP
Warning lamp for coolant temperature: the current drain measured by ECU is out of the target range or the maximum temperature of the ECU component for power supply of the lamp is exceeded

Error codes
DEUTZ-Errorcode: 54
BlinkCode (short-long-short): 1 - 2 - 3
SPN: 704
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling and load, check lamp and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: setpoint for output status

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

55 / 110 / CTSCD

Error description ENG COOLANT TEMP.
Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range; the coolant temperature calculated by ECU is implausible compared with the oil temperature or the received value via CAN is defective

Error codes
DEUTZ-Errorcode: 55
BlinkCode (short-long-short): 2 - 2 - 5
SPN: 110
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

56 / 110 / CTSCDSysReac

Error description ENG COOLANT TEMP.
Coolant temperature: the coolant temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 56
BlinkCode (short-long-short): 2 - 3 - 2
SPN: 110
possible FMI:
0: data valid, but above normal working area
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Outside target range with system reaction, cooling system not enough to be filled, clogged or demaged, cooling compressor dropped out, sensor defective, onnection cable demaged

Take actions for error repair
Check cycle cooling system and compressor, inspect cooling system and if necessary repair it, check cooling compressor and if necessary replace it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: CTSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

57 / 701 / Dummy1CD_Max

Error description RESERVE 2
Reserve output 1: the ECU detects a short circuit to battery

Error codes
DEUTZ-Errorcode: 57
BlinkCode (short-long-short): 1 - 0 - 0
SPN: 701
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to Ubatt (output 1), connection cable demaged

Take actions for error repair
Check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

58 / 701 / Dummy1CD_Min

Error description RESERVE 2
Reserve output 1: the ECU detects a short circuit to ground
Error codes
DEUTZ-Errorcode: 58
BlinkCode (short-long-short): 1 - 0 - 0
SPN: 701
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
Errordetection
Errorlamp shows permanent light. Entry in errormemory.
Possible reason for error
Short circuit to ground (output 1), connection cable demaged
Take actions for error repair
Check connection cable and if necessary repair or replace it
other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

59 / 701 / Dummy1CD_SigNpl

Error description RESERVE 2
Reserve output 1: the ECU detects no load or excess temperature of the ECU component for power supply of the connected components
Error codes
DEUTZ-Errorcode: 59
BlinkCode (short-long-short): 1 - 0 - 0
SPN: 701
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
Errordetection
Errorlamp shows permanent light. Entry in errormemory.
Possible reason for error
Cable break or ECU internal error (output 1), connection cable demaged, connected components defective, parametering of the output inaccurate, ECU defective
Take actions for error repair
Check connection cable and if necessary repair or replace it, check parameters and if necessary correct it, replace ECU
other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

60 / 702 / Dummy2CD_Max

Error description THRUST MODE
Reserve output 2: the ECU detects a short circuit to battery
Error codes
DEUTZ-Errorcode: 60
BlinkCode (short-long-short): 1 - 0 - 0
SPN: 702
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
Errordetection
Errorlamp shows permanent light. Entry in errormemory.
Possible reason for error
Short circuit to Ubatt (output 2), onnection cable demaged
Take actions for error repair
Check connection cable and if necessary repair or replace it
other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

61 / 702 / Dummy2CD_Min

Error description THRUST MODE
Reserve output 2: the ECU detects a short circuit to ground

Error codes
DEUTZ-Errorcode: 61
BlinkCode (short-long-short): 1 - 0 - 0
SPN: 702
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to ground (output 2), connection cable demaged

Take actions for error repair
Check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

62 / 702 / Dummy2CD_SigNpl

Error description THRUST MODE
Reserve output 2: the ECU detects no load or excess temperature of the ECU component for power supply of the connected components

Error codes
DEUTZ-Errorcode: 62
BlinkCode (short-long-short): 1 - 0 - 0
SPN: 702
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or ECU internal error (output 2), connection cable demaged, connected components defective, parametering of the output inaccurate, ECU defective

Take actions for error repair
Check connection cable and if necessary repair or replace it, check parameters and if necessary correct it, replace ECU

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

69 / 2791 / EGRCD_Max

Error description EGR ACTUATOR
Actuator of the external EGR valve: the ECU detects a short circuit to battery

Error codes
DEUTZ-Errorcode: 69
BlinkCode (short-long-short): 4 - 1 - 4
SPN: 2791
possible FMI:
3: Voltage to high or short circuit to +Ubatt
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to Ubatt, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output, power reduction via second topcurve?
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: shut off value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

70 / 2791 / EGRCD_Min

Error description EGR ACTUATOR
Actuator of the external EGR valve: the ECU detects a short circuit to ground

Error codes
DEUTZ-Errorcode: 70
BlinkCode (short-long-short): 4 - 1 - 4
SPN: 2791
possible FMI:
12. Errormode not identifiable
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to ground, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output, power reduction via second topcurve?
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: shut off value

71 / 2791 / EGRCD_SigNpl

Error description EGR ACTUATOR
Actuator of the external EGR valve: the ECU detects no load or excess temperature of the ECU component for power supply of the connected components

Error codes
DEUTZ-Errorcode: 71
BlinkCode (short-long-short): 4 - 1 - 5
SPN: 2791
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or excess temperature, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output, power reduction via second topcurve?
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: shut off value

72 / 2791 / EGRCDIntEGR

Error description EGR ACTUATOR
Actuator of the internal EGR valve: the ECU detects no load or excess temperature of the ECU component for power supply of the actuator

Error codes
DEUTZ-Errorcode: 72
BlinkCode (short-long-short): 4 - 1 - 6
SPN: 2791
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break, short circuit or excess temperature, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output, power reduction via second topcurve?
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: shut off value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

74 / 923 / EngCDTrqCalcOut

Error description ENGINE POWER OUT
Output with PWM signal of the engine power: the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component to control the output is exceeded

Error codes
DEUTZ-Errorcode: 74
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 923
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Engine Power output: cable break or short circuit, output defective, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

75 / 190 / EngMBackUp

Error description ENGINE SPEED
Crankschaft speed sensor: the ECU receives no signal and uses the signal from camschaft speed sensor as alternative to calculate the engine speed

Error codes
DEUTZ-Errorcode: 75
BlinkCode (short-long-short): 2 - 1 - 2
SPN: 190
possible FMI:
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Engine running only with cam-shaft speed signal, transmitter defective, connection cable demaged

Take actions for error repair
Check cabling of crankschaft sensor, check crankschaft sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, calculation of injektion initation point will be incorrect
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: -

76 / 190 / EngMCaS1

Error description ENGINE SPEED
Camschaft speed sensor: the ECU receives no signal or the signal is defective

Error codes
DEUTZ-Errorcode: 76
BlinkCode (short-long-short): 2 - 1 - 2
SPN: 190
possible FMI:
12: Defective component
8: unusual frequency, pulse or period.
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Speed signal from cam-shaft defectiveiv or missing, transmitter defective, connection cable demaged, parametering of the sensor wheel inaccurate

Take actions for error repair
Check cabling, check camschaft sensor and if necessary replace it, check configuration of sensor wheel, check connection cable and if necessary repair or replace it, check parameters and if necessary correct them

other error properties
System reaction: Warning, difficult start
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: 0

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

77 / 190 / EngMCrS1

Error description ENGINE SPEED
Crankschaft speed sensor: the ECU receives no signal or the signal is defective

Error codes
DEUTZ-Errorcode: 77
BlinkCode (short-long-short): 2 - 1 - 2
SPN: 190
possible FMI:
12: Defective component
8: unusual frequency, pulse or period.
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Speed signal from crankshaft defectiveiv or missing, transmitter defective, connection cable demaged, sensor wheel installed inaccurately

Take actions for error repair
Check cabling, check camschaft sensor and if necessary replace it, check configuration of sensor wheel, check connection cable and if necessary repair or replace it, check the position of sensor wheel and if necessary correct it

other error properties
System reaction: Warning, power reduction via second topcurve
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: 0

78 / 190 / EngMOfsCaSCrS

Error description ENGINE SPEED
Speed sensor of crankschaft and camschaft: the received signals are out of phase

Error codes
DEUTZ-Errorcode: 78
BlinkCode (short-long-short): 2 - 1 - 3
SPN: 190
possible FMI:
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Speed signals of crank-shaft and cam-shaft are phase-shifted, sensor wheel installed in wrong position, sensor wrong wired

Take actions for error repair
Check position from crankschaft sensor wheel to camschaft sensor wheel, polarisation crankschaft or camschaft sensor, check position of sensor wheel and if necessary correct it, check cabling and if necessary correct it

other error properties
System reaction: Warning, not possible to start engine
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: -

79 / 190 / EngPrtSysReacFOC

Error description ENGINE SPEED
Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 79
BlinkCode (short-long-short): 2 - 1 - 4
SPN: 190
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
Engine overspeed detected with system reaction, maximum engine speed exceeded

Take actions for error repair

other error properties
System reaction:
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

80 / 190 / EngPrtSysReacORC

Error description ENGINE SPEED
Engine speed: under overrun conditions, the engine speed calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 80
BlinkCode (short-long-short): 2 - 1 - 4
SPN: 190
possible FMI:
14: Special Instructions
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Overrun conditions detected with system reaction, maximum engine speed exceeded

Take actions for error repair

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

81 / 703 / ESLpCD

Error description ENG. RUNNING LAMP
Indicator lamp for engine running: the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component for power supply of the lamp is exceeded

Error codes
DEUTZ-Errorcode: 81
BlinkCode (short-long-short): 1 - 4 - 2
SPN: 703
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or internal ECU error, lamp defective, connection cable demaged

Take actions for error repair
Check cabling and load, check lamp and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: shut off value

82 / 1074 / ExFlCD

Error description BRAKE FLAP ACTUATOR
Engine brake flap actuator: the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component for power supply of the actuator is exceeded

Error codes
DEUTZ-Errorcode: 82
BlinkCode (short-long-short): 2 - 1 - 9
SPN: 1074
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Engine brake flap actuator: cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 2
Measurement @ errortime: shut off value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

83 / 975 / FanCD

Error description FAN ACTUATOR
Fan power stage: the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component for power supply of the actuator is exceeded

Error codes
DEUTZ-Errorcode: 83
BlinkCode (short-long-short): 2 - 3 - 8
SPN: 975
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 2
Measurement @ errortime: Sollwert

85 / 1639 / FanCDEval

Error description
Fan speed sensor: the current drain measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 85
BlinkCode (short-long-short): 2 - 3 - 8
SPN: 1639
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Sensor defective, connection cable demaged, fan speed outside the target range

Take actions for error repair
Check sensor and if necessary replace it, check connectionn cable and if necessary repair or replace it, check fan

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: actual value

86 / 523602 / FanCDSysReac

Error description FAN SPEED
Fan speed: the fan speed calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 86
BlinkCode (short-long-short): 2 - 3 - 8
SPN: 523602
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Above target range with system reaction

Take actions for error repair

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

87 / 97 / FIFCD

Error description WATER IN FUEL
Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 87
BlinkCode (short-long-short): 2 - 2 - 8
SPN: 97
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default value

89 / 97 / FIFCD_WtLvl

Error description WATER IN FUEL
Water in fuel: the water level calculated by ECU is above the allowed limit value

Error codes
DEUTZ-Errorcode: 89
BlinkCode (short-long-short): 2 - 2 - 8
SPN: 97
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Above target range, excess of maximum permissible water level in fuel filter

Take actions for error repair
flush water seperator

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

90 / 94 / FIPSCD

Error description FUEL PRE PRESS.
Low fuel pressure sensor: the voltage of sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 90
BlinkCode (short-long-short): 2 - 1 - 6
SPN: 94
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

91 / 94 / FlPSCDSysReac

Error description FUEL PRE PRESS.
Low fuel pressure: the low fuel pressure calculated by ECU is underneath the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 91
BlinkCode (short-long-short): 2 - 1 - 6
SPN: 94
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Below target range with system reaction, interruption in cycling process of low fuel pressure (for example, fuel pump defective), sensor defective, connection cable demaged

Take actions for error repair
Check low fuel pressure loop system, Check fuel pump, inspect fuel system and if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: FLPSCD_stSysReacReq
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

94 / 523239 / FrmMngDecV1

Error description CAN ERROR DEC-V1
CAN message DecV1 (Pseudo Pedal): the message can not be received by ECU or the received value is above the target range

Error codes
DEUTZ-Errorcode: 94
BlinkCode (short-long-short): 5 - 2 - 6
SPN: 523239
possible FMI:
12: Defective component
12: Defective component
12: Defective component
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing or value above target range (message "DecV1" = pseudo pedal), CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to customers configuration.
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default value

95 / 523240 / FrmMngFunModCtl

Error description CAN ERROR FUNMODCTL
CAN message FunModCtl (Function Mode Control): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 95
BlinkCode (short-long-short): 5 - 2 - 7
SPN: 523240
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "FunModCtl" = function mode control, CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to customers configuration.
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default valuee

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

106 / 523212 / FrmMngTOEngPrt

Error description CAN ERROR ENGPRT
CAN message EngPrt (Engine Protection): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 106
BlinkCode (short-long-short): 3 - 3 - 3
SPN: 523212
possible FMI:
12: Defective component
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "EngPrt" = engine protection, CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning. Hold last value.
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default value

110 / 523216 / FrmMngTOPrHtEnCmd

Error description CAN ERROR PRHTENCMD
CAN message PrHtEnCmd (Preheat and Engine Command): the message received can not be received by ECU

Error codes
DEUTZ-Errorcode: 110
BlinkCode (short-long-short): 3 - 3 - 7
SPN: 523216
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "PrHtEnCmd" = preheat and engine command; CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to customers configuration.
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default valuee

112 / 523218 / FrmMngTORxCCVS

Error description CAN ERROR RXCCVS
CAN message RxCCVS (Cruise Control): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 112
BlinkCode (short-long-short): 1 - 1 - 1
SPN: 523218
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "RxCCVS" = cruise control; CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default valuee

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

113 / 523604 / FrmMngTORxEngTemp

Error description CAN ERROR RxEngTemp
CAN message RxEngTemp (Engine Temperature): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 113
BlinkCode (short-long-short): 1 - 1 - 2
SPN: 523604
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "RxEngTemp" = engine temperature, CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default value

117 / 523238 / FrmMngTOSwtOut

Error description CAN ERROR SWTOUT
CAN message SwtOut (Switching Output): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 117
BlinkCode (short-long-short): 1 - 1 - 5
SPN: 523238
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "SwtOut" = switch outputs, CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default valuee

118 / 523222 / FrmMngTOTCO1

Error description CAN ERROR TCO1
CAN message "TCO1" (Speedo Signal): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 118
BlinkCode (short-long-short): 1 - 1 - 6
SPN: 523222
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TCO1" = speedo signal, CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

120 / 523605 / FrmMngTOTSC1AE

Error description CAN ERROR TSC1-AE
CAN message TSC1-AE (Torque/Speed Control #1 from Automatic Traction Control to Engine): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 120
BlinkCode (short-long-short): 1 - 1 - 8
SPN: 523605
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-AE", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

121 / 523606 / FrmMngTOTSC1AR

Error description CAN ERROR TSC1-AR
CAN message TSC1-AR (Torque/Speed Control #1 from Automatic Traction Control to Retarder): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 121
BlinkCode (short-long-short): 1 - 1 - 9
SPN: 523606
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-AR", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

122 / 523607 / FrmMngTOTSC1DE

Error description CAN ERROR TSC1-DE
CAN message TSC1-DE (Torque/Speed Control #1 from Driveline to Engine): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 122
BlinkCode (short-long-short): 1 - 1 - 8
SPN: 523607
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-DE", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

123 / 523608 / FrmMngTOTSC1DR

Error description CAN ERROR TSC1-DR
CAN message TSC1-DR (Torque/Speed Control #1 from Driveline to Retarder): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 123
BlinkCode (short-long-short): 1 - 1 - 9
SPN: 523608
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-DR", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

124 / 523609 / FrmMngTOTSC1PE

Error description CAN ERROR TSC1-PE
CAN message TSC1-PE (Torque/Speed Control #1 from Power Take Off to Engine): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 124
BlinkCode (short-long-short): 1 - 1 - 8
SPN: 523609
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-PE", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

125 / 898 / FrmMngTOTSC1TE

Error description CAN ERROR TSC1-TE
CAN message TSC1-TE (Torque/Speed Control #1 from Traction Control to Engine): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 125
BlinkCode (short-long-short): 1 - 1 - 8
SPN: 898
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-TE", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

126 / 520 / FrmMngTOTSC1TR

Error description CAN ERROR TSC1-TR
CAN message TSC1-TR (Torque/Speed Control #1 from Traction Control to Retarder): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 126
BlinkCode (short-long-short): 1 - 1 - 9
SPN: 520
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-TR", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

127 / 523610 / FrmMngTOTSC1VE

Error description CAN ERROR TSC1-VE
CAN message TSC1-VE (Torque/Speed Control #1 from Vehicle Control to Engine): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 127
BlinkCode (short-long-short): 1 - 1 - 8
SPN: 523610
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-VE", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

128 / 523611 / FrmMngTOTSC1VR

Error description CAN ERROR TSC1-VR
CAN message TSC1-VR (Torque/Speed Control #1 from Vehicle Control to Retarder): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 128
BlinkCode (short-long-short): 1 - 1 - 9
SPN: 523611
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Missing message "TSC1-VR", CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, changing to substitute values according to priority chain.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

131 / 523500 / FrmMngTxTO

Error description CAN MESS. TIMEOUT
CAN message: the ECU detects a timeout for one or more posted message

Error codes
DEUTZ-Errorcode: 131
BlinkCode (short-long-short): 2 - 7 - 1
SPN: 523500
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Timeout for sent messages

Take actions for error repair

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: -

133 / 174 / FTSCD

Error description FUEL TEMP. SENSOR
Fuel temperature sensor: the voltage measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 133
BlinkCode (short-long-short): 2 - 2 - 7
SPN: 174
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Fuel temp. sensor: cable break or short circuit, sendor defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

134 / 174 / FTSCDSysReac

Error description FUEL TEMP. SENSOR
Fuel temperature: the fuel temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 134
BlinkCode (short-long-short): 2 - 3 - 7
SPN: 174
possible FMI:
0: data valid, but above normal working area
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Above target range with system reaction, interruption of fuel loop (for example, rail pressure relief valve defective), sensor defective, connection cable demaged

Take actions for error repair
Check fuel system and if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: FTSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

136 / 523618 / GOTSCD

Error description CUSTOMER TEMPSENS 1
Customer specific temperature sensor 1: the voltage of sensor measured by ECU is out of the target range or the received value of temperature via CAN is defective

Error codes
DEUTZ-Errorcode: 136
BlinkCode (short-long-short): 1 - 3 - 3
SPN: 523618
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit (sensor 1), sensor defective, connection cable demaged, CAN bus wrong cabled, wiring demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Customer specific bugfixing, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it, Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN fun

other error properties
System reaction: Warning, substitute value (customer specific)
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: default value

137 / 523619 / GOTSCDSysReac

Error description
Customer specific temperature 1: the temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 137
BlinkCode (short-long-short): 1 - 3 - 3
SPN: 523619
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Outside target range with system reaction (temperature 1), dependant on the application

Take actions for error repair
Customer specific bugfixing, denpendant on application

other error properties
System reaction: Advice: GOTSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

138 / 29 / HdThrt

Error description THROTTLE 2
Hand throttle pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of accelerator pedal 1

Error codes
DEUTZ-Errorcode: 138
BlinkCode (short-long-short): 1 - 2 - 6
SPN: 29
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, signal implausible compared to signal of idle sensor, transmitter defective, connection cable demaged

Take actions for error repair
Check cabling, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, changing to substitute values according to priority chain or limp home
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

139 / 1638 / HOTSCD

Error description CUSTOMER TEMPSENS 2
Customer specific temperature sensor 2: the voltage of sensor measured by ECU is out of the target range or the received value of temperature via CAN is defective

Error codes
DEUTZ-Errorcode: 139
BlinkCode (short-long-short): 3 - 1 - 4
SPN: 1638
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit (sensor 2), sensor defective, connection cable demaged, CAN bus wrong cabled, wiring demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Customer specific bugfixing, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it, Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN fun

other error properties
System reaction: Warning, substitute value (customer specific)
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: default value

140 / 1638 / HOTSCDSysReac

Error description CUSTOMER TEMPSENS 2
Customer specific temperature 2: the temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 140
BlinkCode (short-long-short): 3 - 1 - 4
SPN: 1638
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Outside target range with system reaction (temperature 2), dependant on the application

Take actions for error repair
Customer specific bugfixing, denpendant on application

other error properties
System reaction: Advice: HOTSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

141 / 523617 / HWEMonCom

Error description INTERNAL COMM. ERROR
Internal hardware monitoring: the ECU detects a communication distrubance

Error codes
DEUTZ-Errorcode: 141
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523617
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Communication with chip CJ 940 disturbed, ECU defective

Take actions for error repair
If cannot delete the error, change ECU

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: -

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

142 / 630 / HWEMonEEPROM

Error description EEPROM MEM. ACCESS
Internal hardware monitoring: the ECU finds an error during the access to ist EEPROM memory or works with an alternative value

Error codes
DEUTZ-Errorcode: 142
BlinkCode (short-long-short): 2 - 8 - 1
SPN: 630
possible FMI:
12. Errormode not identifiable
12: Defective component
12: Defective component
12: Defective component

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Error during EEPROM memory access or EEPROM works with substitute value, programming error, ECU defective

Take actions for error repair
If not programmed, EEPROM is defect --> ECU is defect, reprogram ECU and if necessary replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: -

143 / 523612 / HWEMonRcyLocked

Error description INT. RECOVERY
Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory

Error codes
DEUTZ-Errorcode: 143
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523612
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
14: Special Instructions

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
A recovery occurred which is stored as protected

Take actions for error repair
Recoverey occured which is stored as protected
With parameter HWEMon_numRexxxxxxx the recovery nummer and the subsequent position can be identified. See especially SW-Doku _rcy_auto.pdf

other error properties
System reaction: Recovery of ECU
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: -

144 / 523612 / HWEMonRcySuppressed

Error description INT. RECOVERY
Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory

Error codes
DEUTZ-Errorcode: 144
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523612
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
14: Special Instructions

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
A recovery occurred which is not stored

Take actions for error repair
Recoverey occured which is stored as protected
With parameter HWEMon_numRexxxxxxx the recovery nummer and the subsequent position can be identified. See especially SW-Doku _rcy_auto.pdf

other error properties
System reaction: Warning, shown at error path
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: -

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

145 / 523612 / HWEMonRcyVisible

Error description INT. RECOVERY
Internal hardware monitoring: the CPU of the ECU is reset and an item will be created in error memory

Error codes
DEUTZ-Errorcode: 145
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523612
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
14: Special Instructions

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
A recovery occurred which is visible in the error memory

Take actions for error repair
Recoverey occured which is stored as protected
With parameter HWEMon_numRexxxxxxx the recovery nummer and the subsequent position can be identified. See especially SW-Doku _rcy_auto.pdf

other error properties
System reaction: Recovery of ECU
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: -

146 / 523612 / HWEMonUMaxSupply

Error description INT. RECOVERY
Internal hardware monitoring: the ECU detects an excess of the target range for the power supply of ist communication module

Error codes
DEUTZ-Errorcode: 146
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523612
possible FMI:
3: Voltage to high or short circuit to +Ubatt
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Overvoltage at CJ940, power supply voltage too high, ECU defective

Take actions for error repair
Check working voltage and if necessary correct it, Check ECU and if necessary replace it

other error properties
System reaction: Power stage shut off
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: -

147 / 523612 / HWEMonUMinSupply

Error description INT. RECOVERY
Internal hardware monitoring: the ECU detects an undershooting of the target range for the power supply of ist communication module

Error codes
DEUTZ-Errorcode: 147
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523612
possible FMI:
12. Errormode not identifiable
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Undervoltage at CJ940, power supply voltage too low, ECU defective

Take actions for error repair
Check working voltage and if necessary correct it, Check ECU and if necessary replace it

other error properties
System reaction: Power stage shut off
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: -

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

149 / 105 / IATSCD

Error description CHARGE AIR TEMP.
Charge air temperature sensor: the voltage of sensor measured by ECU is out of the target range or the received value of temperature via CAN is defective

Error codes
DEUTZ-Errorcode: 149
BlinkCode (short-long-short): 1 - 2 - 8
SPN: 105
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, sensor defective, connection cable demaged, CAN bus wrong cabled, wiring demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check cabling, LDF6T-sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it, Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, c

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

150 / 105 / IATSCDSysReac

Error description CHARGE AIR TEMP.
Charge air temperature: die charge air temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 150
BlinkCode (short-long-short): 2 - 3 - 3
SPN: 105
possible FMI:
0: data valid, but above normal working area
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Above target range with system reaction, air system demaged, sensor defective, connection cable demaged

Take actions for error repair
Check construction of LDF6T , check suction parts, check air system and if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: IATSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

153 / 523350 / InjVlvBnk1A

Error description INJECTOR BANK A
Injector cylinder bank 1: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 153
BlinkCode (short-long-short): 1 - 5 - 1
SPN: 523350
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
13: out of calibrated range
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder bank 1), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, cylinder shut off
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

154 / 523351 / InjVlvBnk1B

Error description INJECTOR BANK A
Injector cylinder bank 1: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 154
BlinkCode (short-long-short): 1 - 5 - 1
SPN: 523351
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder bank 1), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, cylinder shut off
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

155 / 523352 / InjVlvBnk2A

Error description INJECTOR BANK B
Injector cylinder bank 2: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 155
BlinkCode (short-long-short): 1 - 5 - 2
SPN: 523352
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
13: out of calibrated range
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder bank 2), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, cylinder shut off
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

156 / 523353 / InjVlvBnk2B

Error description INJECTOR BANK B
Injector cylinder bank 2: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 156
BlinkCode (short-long-short): 1 - 5 - 2
SPN: 523353
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder bank 2), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, cylinder shut off
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

157 / 523354 / InjVlvChipA

Error description PWR. INJ. BANK B
Internal hardware monitoring: the ECU detects an error of ist injector high current output

Error codes
DEUTZ-Errorcode: 157
BlinkCode (short-long-short): 1 - 5 - 3
SPN: 523354
possible FMI:
3: Voltage to high or short circuit to +Ubatt
2: data stream is defective
14: Special Instructions
12: Defective component

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
High power stage Injector A, ECU defective

Take actions for error repair
If error is not removable, change ECU

other error properties
System reaction: Warninig, outputs shut off
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: actual value

158 / 523355 / InjVlvChipB

Error description PWR. INJ. BANK B
Internal hardware monitoring: the ECU detects a disturbance in its injector high current output

Error codes
DEUTZ-Errorcode: 158
BlinkCode (short-long-short): 1 - 5 - 3
SPN: 523355
possible FMI:
12: Defective component
12: Defective component
12: Defective component
12: Defective component

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
High power stage Injector B, ECU defective

Take actions for error repair
If error is not removable, change ECU

other error properties
System reaction: Warninig, outputs shut off
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: actual value

159 / 651 / InjVlvCyl1A

Error description INJECTOR 1
Injector 1: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 159
BlinkCode (short-long-short): 1 - 5 - 4
SPN: 651
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 1), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

160 / 651 / InjVlvCyl1B

Error description INJECTOR 1
Injector 1: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 160
BlinkCode (short-long-short): 1 - 5 - 4
SPN: 651
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 1), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

161 / 652 / InjVlvCyl2A

Error description INJECTOR 2
Injector 2: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 161
BlinkCode (short-long-short): 1 - 5 - 5
SPN: 652
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 2), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

162 / 652 / InjVlvCyl2B

Error description INJECTOR 2
Injector 2: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 162
BlinkCode (short-long-short): 1 - 5 - 5
SPN: 652
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 2), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

163 / 653 / InjVlvCyl3A

Error description INJECTOR 3
Injector 3: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 163
BlinkCode (short-long-short): 1 - 5 - 6
SPN: 653
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 3), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

164 / 653 / InjVlvCyl3B

Error description INJECTOR 3
Injector 3: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 164
BlinkCode (short-long-short): 1 - 5 - 6
SPN: 653
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 3), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

165 / 654 / InjVlvCyl4A

Error description INJECTOR 4
Injector 4: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 165
BlinkCode (short-long-short): 1 - 6 - 1
SPN: 654
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 4), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

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166 / 654 / InjVlvCyl4B

Error description INJECTOR 4
Injector 4: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 166
BlinkCode (short-long-short): 1 - 6 - 1
SPN: 654
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 4), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

167 / 655 / InjVlvCyl5A

Error description INJECTOR 5
Injector 5: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 167
BlinkCode (short-long-short): 1 - 6 - 2
SPN: 655
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 5), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

168 / 655 / InjVlvCyl5B

Error description INJECTOR 5
Injector 5: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 168
BlinkCode (short-long-short): 1 - 6 - 2
SPN: 655
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 5), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

169 / 656 / InjVlvCyl6A

Error description INJECTOR 6
Injector 6: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 169
BlinkCode (short-long-short): 1 - 6 - 3
SPN: 656
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 6), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

170 / 656 / InjVlvCyl6B

Error description INJECTOR 6
Injector 6: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 170
BlinkCode (short-long-short): 1 - 6 - 3
SPN: 656
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 6), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

171 / 657 / InjVlvCyl7A

Error description INJECTOR 7
Injector 7: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 171
BlinkCode (short-long-short): 1 - 6 - 4
SPN: 657
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 7), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

172 / 657 / InjVlvCyl7B

Error description INJECTOR 7
Injector 7: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 172
BlinkCode (short-long-short): 1 - 6 - 4
SPN: 657
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 7), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

173 / 658 / InjVlvCyl8A

Error description INJECTOR 8
Injector 8: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 173
BlinkCode (short-long-short): 1 - 6 - 5
SPN: 658
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 8), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

174 / 658 / InjVlvCyl8B

Error description INJECTOR 8
Injector 8: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 174
BlinkCode (short-long-short): 1 - 6 - 5
SPN: 658
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 8), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

175 / 523370 / InjVlvErrDet

Error description RAIL PRESS. MON. DISABLED
Rail pressure monitoring: the monitoring of the rail pressure will be deactivated by ECU because of the activation of the function "compression test" by user

Error codes
DEUTZ-Errorcode: 175
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523370
possible FMI:
14: Special Instructions
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows . Entry in errormemory.

Possible reason for error
Compression test active: rail-pressure monitoring is going to be disabled

Take actions for error repair
not correct

other error properties
System reaction: Rail pressure monitoring disabled
Behaviour error lamp:
Selfhealing: -
Signal Priority: 1
Measurement @ errortime:

176 / 523615 / MeUnCD_ADC

Error description METERING UNIT
Fuel volume flow rate: the fuel volume rate calculated by ECU at outlet of the fuel metering unit is out of the target range

Error codes
DEUTZ-Errorcode: 176
BlinkCode (short-long-short): 1 - 3 - 5
SPN: 523615
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Flow rate outside target range

Take actions for error repair

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

177 / 523615 / MeUnCDNoLoad

Error description METERING UNIT
Valve at outlet of the fuel metering unit: the ECU detects no load or temperature excess of the ECU component for power supply of the valve

Error codes
DEUTZ-Errorcode: 177
BlinkCode (short-long-short): 1 - 3 - 5
SPN: 523615
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
5: current to low or broken wire
12: Defective component

Errordetection
Errorlamp shows permanent light, 15s before shut off. Entry in errormemory.

Possible reason for error
wiring error or ECU output is switched off because of overtemperature, fuel metering unit defective, connection cable demaged

Take actions for error repair
Check cabling , if necessary check FCU, check fuel metering unit and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, max.extraction of FCU --> open rail pressure relief valve --> shut the engine off in about 5 minutes
Behaviour error lamp: permanent light, 15s before shut off
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

178 / 523615 / MeUnCDSCBat

Error description METERING UNIT
Valve at outlet of the fuel metering unit: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 178
BlinkCode (short-long-short): 1 - 3 - 5
SPN: 523615
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light, 15s before shut off. Entry in errormemory.

Possible reason for error
Short circuit to Ubatt, fuel metering unit defective, connection cable demaged

Take actions for error repair
Check cabling , if necessary check FCU, check fuel metering unit and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, rail pressure relief valve will open
Behaviour error lamp: permanent light, 15s before shut off
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

179 / 523615 / MeUnCDSCGnd

Error description METERING UNIT
Valve at outlet of the fuel metering unit: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 179
BlinkCode (short-long-short): 1 - 3 - 5
SPN: 523615
possible FMI:
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light, 15s before shut off. Entry in errormemory.

Possible reason for error
Short circuit to ground, fuel metering unit defective, connection cable demaged

Take actions for error repair
Check cabling , if necessary check FCU, check fuel metering unit and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, rail pressure relief valve will open
Behaviour error lamp: permanent light, 15s before shut off
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

182 / 2634 / MnRly1_SCB

Error description MAIN RELAY
Main relay 1: the current drains measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 182
BlinkCode (short-long-short): 1 - 3 - 7
SPN: 2634
possible FMI:
3: Voltage to high or short circuit to +Ubatt
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to Ubatt (relay 1), relay defective, connection cable demaged

Take actions for error repair
Check cabling, check ECU, check relay and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff the outputs MPROP
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

183 / 2634 / MnRly1_SCG

Error description MAIN RELAY
Main relay 1: the current drains measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 183
BlinkCode (short-long-short): 1 - 3 - 8
SPN: 2634
possible FMI:
12. Errormode not identifiable
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to ground (relay 1), relay defective, connection cable demaged

Take actions for error repair
Check cabling, check ECU, check relay and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff the outputs MPROP
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

184 / 523420 / Montr

Error description WATCHDOG COUNTER
Internal hardware monitoring: the ECU detects an disturbance in ist monitoring module (Wachtdog)

Error codes
DEUTZ-Errorcode: 184
BlinkCode (short-long-short): 1 - 3 - 9
SPN: 523420
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
14: Special Instructions

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
Watchdog counter exceeds maximum, ECU defective

Take actions for error repair
If error is not removable, change ECU

other error properties
System reaction: Recovery of ECU
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: -

186 / 2634 / MRlyCD

Error description MAIN RELAY
Main relay: during the switching off, main relay does not switch on within an allowed time

Error codes
DEUTZ-Errorcode: 186
BlinkCode (short-long-short): 2 - 6 - 1
SPN: 2634
possible FMI:
7: Mechanical system not OK
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
EDC16: main relay not open in allowed time or main relay open too early; EDC7: main relay not open in allowed time or short circuit of main relay to ground; EDC16: main relay defective, connection cable demaged; generally: rapid shut-off of the ECU (witho

Take actions for error repair
EDC16: check external main relay, check cabling
EDC7: if error is not removable, change ECU, EDC16: Check main relay and if necessary replace it, check connection cable and if necessary repair or replace it; both: if error is not removable, change ECU

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

187 / 563 / MRlyCDMnRly2

Error description MAIN RELAY 2
Main relay 2 (in ECU): during the switching off, main relay does not switch on within an allowed time

Error codes
DEUTZ-Errorcode: 187
BlinkCode (short-long-short): 2 - 6 - 1
SPN: 563
possible FMI:
7: Mechanical system not OK
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
rapid shut-off of the ECU (without waiting till the end of the afterrun), ECU defective

Take actions for error repair
If error not removable, change ECU

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

188 / 2634 / MRlyCDMnRly3

Error description MAIN RELAY
Main relay 3 (in ECU): during the switching off, main relay does not switch on within an allowed time

Error codes
DEUTZ-Errorcode: 188
BlinkCode (short-long-short): 2 - 6 - 1
SPN: 2634
possible FMI:
7: Mechanical system not OK
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit to ground or emergency shut-off (relay 3 internal), rapid shut-off of the ECU (without waiting till the end of the afterrun), ECU defective

Take actions for error repair
Check cabling, check ECU, if error not removable, change ECU

other error properties
System reaction: Warning, shutoff the outputs MPROP (see BOSCH-Electricity operating plan)
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

189 / 523450 / MSSCD1

Error description MULTISTATE SWITCH 1
Multi state switch 1: the voltage measured by ECU is out of the target range or the swith setting is not plausible

Error codes
DEUTZ-Errorcode: 189
BlinkCode (short-long-short): 1 - 4 - 3
SPN: 523450
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, input voltage outside target range (switch 1), switch defective, connection cable demaged

Take actions for error repair
Check cabling and sensor, check switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: default value

https://truckmanualshub.com/

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

190 / 523451 / MSSCD2

Error description MULTISTATE SWITCH 2
Multi state switch 2: the voltage measured by ECU is out of the target range or the swith setting is not plausible

Error codes
DEUTZ-Errorcode: 190
BlinkCode (short-long-short): 1 - 4 - 3
SPN: 523451
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, input voltage outside target range (switch 2), switch defective, connection cable demaged

Take actions for error repair
Check cabling and sensor, check switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: default value

191 / 523452 / MSSCD3

Error description MULTISTATE SWITCH 3
Multi state switch 3: the voltage measured by ECU is out of the target range or the swith setting is not plausible

Error codes
DEUTZ-Errorcode: 191
BlinkCode (short-long-short): 1 - 4 - 3
SPN: 523452
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, input voltage outside target range (switch 3), switch defective, connection cable demaged

Take actions for error repair
Check cabling and sensor, check switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: default value

192 / 639 / NetMngCANAOff

Error description CAN A BUS OFF
CAN bus A: the ECU is not allowed to send messages, because the status "BusOff" is detected

Error codes
DEUTZ-Errorcode: 192
BlinkCode (short-long-short): 2 - 7 - 1
SPN: 639
possible FMI:
14: Special Instructions
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, off-state (CAN bus A), CAN bus deactivated, connection cable demaged

Take actions for error repair
Check cabling of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime:

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

193 / 1231 / NetMngCANBOff

Error description CAN B BUS OFF
CAN bus B: the ECU is not allowed to send messages, because the status "BusOff" is detected

Error codes
DEUTZ-Errorcode: 193
BlinkCode (short-long-short): 2 - 7 - 1
SPN: 1231
possible FMI:
14: Special Instructions
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, off-state (CAN bus B), CAN bus deactivated, connection cable demaged

Take actions for error repair
Check cabling of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime:

194 / 1235 / NetMngCANCOff

Error description CAN C BUS OFF
CAN bus C: the ECU is not allowed to send messages, because the status "BusOff" is detected

Error codes
DEUTZ-Errorcode: 194
BlinkCode (short-long-short): 2 - 7 - 1
SPN: 1235
possible FMI:
14: Special Instructions
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, off-state (CAN bus C), CAN bus deactivated, connection cable demaged

Take actions for error repair
Check cabling of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime:

195 / 705 / OPLpCD

Error description OIL PRESS LAMP
Warning lamp for oil level: the current drain measured by ECU is out of the target range or the maximum temperature of the ECU component for power supply of the lamp is exceeded

Error codes
DEUTZ-Errorcode: 195
BlinkCode (short-long-short): 1 - 3 - 5
SPN: 705
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling and load, check lamp and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

196 / 100 / OPSCD

Error description ENG OIL PRESS.
Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range or the received value of oil pressure via CAN is implausible (Oil pressure is above the target range with higher oil temperature at the same time)

Error codes
DEUTZ-Errorcode: 196
BlinkCode (short-long-short): 2 - 2 - 4
SPN: 100
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
0: data valid, but above normal working area

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, sensor defective, connection cable demaged, CAN bus wrong cabled, wiring demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it, Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, chec

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

197 / 100 / OPSCD1

Error description ENG OIL PRESS.
Oil pressure: the oil pressure calculated by ECU is implausibly low

Error codes
DEUTZ-Errorcode: 197
BlinkCode (short-long-short): 2 - 3 - 1
SPN: 100
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
1: data valid, but below normal working area

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Oil pressure implausible low, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: actual value

198 / 100 / OPSCDSysReacHi

Error description ENG OIL PRESS.
Oil pressure: the oil pressure calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 198
BlinkCode (short-long-short): 2 - 3 - 1
SPN: 100
possible FMI:
0: data valid, but above normal working area
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Above target range, oil volume too large, sensor defective, oil pump defective, connection cable demaged

Take actions for error repair
Check oil level and if necessary correct it, check oil pump and if necessary replace it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: OPSCD_stSysReacReqHi
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

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199 / 100 / OPSCDSysReacLo

Error description ENG OIL PRESS.
Oil pressure: the oil pressure calculated by ECU is underneath the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 199
BlinkCode (short-long-short): 2 - 3 - 1
SPN: 100
possible FMI:
1: data valid, but below normal working area
1: data valid, but below normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Below target range, oil volume too small, sensor defective, oil pump defective, connection cable demaged

Take actions for error repair
Check oil level and if necessary correct it, check oil pump and if necessary replace it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: OPSCD_stSysReacReqLo
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

200 / 1237 / OSwCD

Error description OVERRIDE SWITCH
Bridgeover switch: the ECU receives a permanent signal

Error codes
DEUTZ-Errorcode: 200
BlinkCode (short-long-short): 1 - 4 - 5
SPN: 1237
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Switch is blocked, taster locked, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: actual value

201 / 175 / OTSCD

Error description OIL TEMP. SENSOR
Oil temperature sensor: the voltage of sensor measured by ECU is out of the target range; the oil temperature calculated by ECU is implausible compared with coolant temperature or the received value via CAN is defective

Error codes
DEUTZ-Errorcode: 201
BlinkCode (short-long-short): 1 - 4 - 4
SPN: 175
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
2: data stream is defective

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

203 / 175 / OTSCDSysReac

Error description OIL TEMP. SENSOR
Oil temperature: the oil temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 203
BlinkCode (short-long-short): 1 - 4 - 4
SPN: 175
possible FMI:
0: data valid, but above normal working area
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
Above target range with system reaction, oil volume too small, oil loop disturbed, sensor defective, connection cable demaged

Take actions for error repair
Check cycle cooling system and compressor, check oil level and if necessary correct it, check sensor and if necessary replace it, check oil loop and if necessary repair it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: OTSCD_stSysReacReq
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

208 / 523470 / PRVMon

Error description RAIL PRESS. LIM. VALVE
Rail pressure relief valve: is open, will be forced to open, the forced-open failed

Error codes
DEUTZ-Errorcode: 208
BlinkCode (short-long-short): 1 - 4 - 6
SPN: 523470
possible FMI:
14: Special Instructions
2: data stream is defective
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light, 15s before shut off. Entry in errormemory.

Possible reason for error
Rail pressure relief valve open or forced open abortive (interpretation of the rail pressure gradient), operating voltage too low, rail pressure sensor defective, fuel metering unit defective, rail pressure relief valve defective, air in fuel system

Take actions for error repair
Check working voltage and if necessary correct it, check rail-pressure sensor and if necessary replace it, check FCU and if necessary replace it, check rail pressure relief valve and if necessary replace it, bleed the fuel-system

other error properties
System reaction: Warning, shut the engine off in about 5 minutes
Behaviour error lamp: permanent light, 15s before shut off
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

209 / 157 / RailCD

Error description RAIL PRESS. SENSOR
Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 209
BlinkCode (short-long-short): 1 - 4 - 7
SPN: 157
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light, 15s before shut off. Entry in errormemory.

Possible reason for error
Cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, check rail pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, max.extraction of FCU --> open rail pressure relief valve --> shut the engine off in about 5 minutes
Behaviour error lamp: permanent light, 15s before shut off
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: default value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300



210 / 157 / RailCDOfsTst

Error description RAIL PRESS. SENSOR
Rail pressure sensor: the change of the voltage measured by ECU during the engine start or the after-run is out of the target range

Error codes
DEUTZ-Errorcode: 210
BlinkCode (short-long-short): 1 - 4 - 7
SPN: 157
possible FMI:
0: data valid, but above normal working area
1: data valid, but below normal working area
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Deviation of signal during start or after-run above target range, sensor defective

Take actions for error repair
Replace sensor

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: actual value

211 / 523613 / RailMeUn0

Error description RAIL PRESSURE
Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the engine speed

Error codes
DEUTZ-Errorcode: 211
BlinkCode (short-long-short): 1 - 3 - 4
SPN: 523613
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
1) Leakage in high pressure system (external) ,
2) Leakage at rail pressure relief valve (internal),
3) Needle clampt in open position,
4) Abrasion at injector,
5) Abrasion at high pressure pump,
6) Too low primary pressure on low pressure side, sensor d

Take actions for error repair
(A) Check for leakage
(B) Chek fuel-primary pressure
(C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

212 / 523613 / RailMeUn1

Error description RAIL PRESSURE
Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the volume flow rate

Error codes
DEUTZ-Errorcode: 212
BlinkCode (short-long-short): 1 - 3 - 4
SPN: 523613
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
1) Leakage in high pressure system (external) ,
2) Leakage at rail pressure relief valve (internal),
3) Needle clampt in open position,
4) Abrasion at injector,
5) Abrasion at high pressure pump,
6) Too low primary pressure on low pressure side, sensor d

Take actions for error repair
(A) Check for leakage
(B) Chek fuel-primary pressure
(C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

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213 / 523613 / RailMeUn2

Error description RAIL PRESSURE
Rail pressure: the fuel pressure in rail calculated by ECU is underneath the target range which is dependant on the engine speed

Error codes
DEUTZ-Errorcode: 213
BlinkCode (short-long-short): 1 - 3 - 4
SPN: 523613
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
1) No power supply in FCU,
2) ZME clamped in open position,
3) Too high pressure nach Nullförderdrossel (FCU),
4) Nullförderdrossel clogged,
5) Too high primary pressure on low pressure side, sensor defective, fuel system disturbed

Take actions for error repair
(A) Check return-pressure FCU
(B) Check flow-pressure
(C) Change FCU, check sensor and if necessary replace it, check fuel system and if necessary repair it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

214 / 523613 / RailMeUn3

Error description RAIL PRESSURE
Rail pressure: the fuel pressure in rail calculated by ECU is underneath the target range which is dependant on the volume flow rate

Error codes
DEUTZ-Errorcode: 214
BlinkCode (short-long-short): 1 - 3 - 4
SPN: 523613
possible FMI:
1: data valid, but below normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
1) Leakage in high pressure system (external) ,
2) Leakage at rail pressure relief valve (internal),
3) Needle clampt in open position,
4) Abrasion at injector,
5) Abrasion at high pressure pump,
6) Too low primary pressure on low pressure side, sensor d

Take actions for error repair
(A) Check for leakage
(B) Chek fuel-primary pressure
(C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

215 / 523613 / RailMeUn4

Error description RAIL PRESSURE
Rail pressure: the fuel pressure in rail calculated by ECU is above the absolute target range

Error codes
DEUTZ-Errorcode: 215
BlinkCode (short-long-short): 1 - 3 - 4
SPN: 523613
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
1) No power supply in FCU,
2) ZME clamped in open position,
3) Too high pressure nach Nullförderdrossel (FCU),
4) Nullförderdrossel clogged,
5) Too high primary pressure on low pressure side, sensor defective, fuel system disturbed

Take actions for error repair
(A) Check return-pressure FCU
(B) Check flow-pressure
(C) Change FCU, check sensor and if necessary replace it, check fuel system and if necessary repair it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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216 / 523613 / RailMeUn7

Error description RAIL PRESSURE
Rail pressure: the fuel pressure in rail calculated by ECU is implausible compared with the setpoint setting of the fuel metering unit

Error codes
DEUTZ-Errorcode: 216
BlinkCode (short-long-short): 1 - 3 - 4
SPN: 523613
possible FMI:
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light
oder
blinking. Entry in errormemory.

Possible reason for error
1) Leakage in high pressure system (external) ,
2) Leakage at rail pressure relief valve (internal),
3) Needle clampt in open position,
4) Abrasion at injector,
5) Abrasion at high pressure pump,
6) Too low primary pressure on low pressure side, sensor d

Take actions for error repair
(A) Check for leakage
(B) Chek fuel-primary pressure
(C) Change components, check sensor and if necessary replace it, check fuel system and if necessary repair it

other error properties
System reaction: Warning or Warning and power reduction
Behaviour error lamp: permanent light
oder
blinking
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

218 / 523490 / SOPTst

Error description REDUNDANT SHUT OFF DET.
Internal hardware monitoring: the ECU finds an disturbance in the redundant switch off path through a test during the ramp up phase

Error codes
DEUTZ-Errorcode: 218
BlinkCode (short-long-short): 1 - 4 - 9
SPN: 523490
possible FMI:
12. Errormode not identifiable
12: Defective component
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Test of redundant shut-off paths

Take actions for error repair
Could be triggered by over/undervoltage or external Watchdog

other error properties
System reaction: Test will only be executed with ECU Initialisation. Warning, dependent upon application.
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: -

219 / 1079 / SSpMon1

Error description 5V SUPPLY 1 FAIL.
Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor 1

Error codes
DEUTZ-Errorcode: 219
BlinkCode (short-long-short): 2 - 8 - 2
SPN: 1079
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
5V sensor supply voltage 1 outside target range, operating voltage too high or to low, connection cable demaged, ECU defective

Take actions for error repair
If error not removable, change ECU, check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

221 / 1080 / SSpMon2

Error description 5V SUPPLY 2 FAIL.
Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor 2

Error codes
DEUTZ-Errorcode: 221
BlinkCode (short-long-short): 2 - 8 - 2
SPN: 1080
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
5V sensor supply voltage 2 outside target range, operating voltage too high or to low, connection cable demaged, ECU defective

Take actions for error repair
If error not removable, change ECU, check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

222 / 523601 / SSpMon3

Error description 5V SUPPLY 3 FAIL.
Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor 3

Error codes
DEUTZ-Errorcode: 222
BlinkCode (short-long-short): 2 - 8 - 2
SPN: 523601
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Wrong voltage of internal 5V reference source 3, operating voltage too high or too low, connection cable demaged, ECU defective

Take actions for error repair
If error not removable, change ECU, check cabling of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

223 / 677 / StrtCDHS

Error description START RELAY
Start relay (high side power stage): the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 223
BlinkCode (short-long-short): 5 - 1 - 2
SPN: 677
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Start relay (high side): short circuit, relay defective, conncection cable defective

Take actions for error repair
Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

224 / 677 / StrtCDLS

Error description START RELAY
start relay (low side power stage): the current drain measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 224
BlinkCode (short-long-short): 5 - 1 - 2
SPN: 677
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Start relay (low side): cable break or short circuit, disabled by ECU, relay defective, connection cable demaged

Take actions for error repair
Check cabling and start relay and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, shutoff output
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: default value

225 / 624 / SysLamp

Error description DIAGNOSTIC LAMP
Error lamp (diagnositic lamp): the current drain measured by ECU is out of the target range or the maximum permissble temperature of the ECU component for power supply of the lamp is exceeded

Error codes
DEUTZ-Errorcode: 225
BlinkCode (short-long-short): 5 - 1 - 3
SPN: 624
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
5: current to low or broken wire
2: data stream is defective

Errordetection
Errorlamp shows -. Entry in errormemory.

Possible reason for error
Cable break or short circuit, disabled by ECU, lamp defective, connection cable demaged

Take actions for error repair
Check cabling and load, check lamp and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: only error memory item
Behaviour error lamp: -
Selfhealing: no
Signal Priority: 2
Measurement @ errortime: setpoint Diagnosticlamp

226 / 158 / T15CD

Error description TERMINAL 15
Terminal 15: ECU receives no signal

Error codes
DEUTZ-Errorcode: 226
BlinkCode (short-long-short): 5 - 1 - 4
SPN: 158
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Ignition ON not detected, ignition switch defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check ignition switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, engine can not start
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 2
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

227 / 523550 / T50CD

Error description TERMINAL 50
Terminal 50: ECU receives a permanent signal
Error codes
DEUTZ-Errorcode: 227
BlinkCode (short-long-short): 5 - 1 - 5
SPN: 523550
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
Errordetection
Errorlamp shows permanent light. Entry in errormemory.
Possible reason for error
Engine start switch stuck, start switch clamped, connection cable demaged
Take actions for error repair
Check cabling, if sensor not working, check start switch and if necessary replace it, check connection cable and if necessary repair or replace it
other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 1
Measurement @ errortime: actual value

228 / 523550 / TPUMon

Error description TERMINAL 50
Internal hardware monitoring: ECU detects a deviation between the signal of time module and the system time
Error codes
DEUTZ-Errorcode: 228
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523550
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
2: data stream is defective
Errordetection
Errorlamp shows blinking. Entry in errormemory.
Possible reason for error
Time processing unit (TPU) defective, ECU defective
Take actions for error repair
If error not removable, change ECU
other error properties
System reaction: Recovery of ECU
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: -

232 / 84 / VSSCD1

Error description VEHICLE SPEED
Vehicle speed: over the maximum, signal invalid or implausible compared with the injection quantity and the engine speed, offset factors unlearned
Error codes
DEUTZ-Errorcode: 232
BlinkCode (short-long-short): 5 - 2 - 1
SPN: 84
possible FMI:
0: data valid, but above normal working area
12: Defective component
8: unusual frequency, pulse or period.
14: Special Instructions
Errordetection
Errorlamp shows permanent light. Entry in errormemory.
Possible reason for error
Speed above target range, signal invalid or implausible compared to injection volume and engine speed, distance factor not learned, sensor defective, connection cable demaged
Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

235 / 523600 / WdCom

Error description SERIAL INTERFACE DEF.
Internal hardware monitoring: the ECU detects a disturbance in internal communication

Error codes
DEUTZ-Errorcode: 235
BlinkCode (short-long-short): 5 - 5 - 5
SPN: 523600
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component

Errordetection
Errorlamp shows blinking. Entry in errormemory.

Possible reason for error
Communication disturbed, ECU defective

Take actions for error repair
If error not to removable, change ECU

other error properties
System reaction: Recovery of ECU
Behaviour error lamp: blinking
Selfhealing: no
Signal Priority: 5
Measurement @ errortime: -

236 / 523470 / PRVMonSysReac

Error description RAIL PRESS. LIM. VALVE
Rail pressure relief valve: is open, will be forced to open, the forced-open failed; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 236
BlinkCode (short-long-short): 1 - 4 - 6
SPN: 523470
possible FMI:
12: Defective component
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light, 15s before shut off. Entry in errormemory.

Possible reason for error
Rail pressure relief valve open or forced open abortive (interpretation of the rail pressure gradient), power supply voltage too low, rail pressure sensor defective, fuel metering unit defective, rail pressure relief valve defective, air in fuel system

Take actions for error repair
Check working voltage and if necessary correct it, check rail-pressure sensor and if necessary replace it, check FCU and if necessary replace it, check rail pressure relief valve and if necessary replace it, bleed the fuel-system

other error properties
System reaction: Warning, shut the engine off in about 5 minutes
Behaviour error lamp: permanent light, 15s before shut off
Selfhealing: no
Signal Priority: 4
Measurement @ errortime: actual value

237 / 523006 / APPCDSwtnSel

Error description CONTR. MODE SWITCH
Controller mode switch: the signal received by ECU is defective or implausible.

Error codes
DEUTZ-Errorcode: 237
BlinkCode (short-long-short): 2 - 4 - 2
SPN: 523006
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break, signal implausible, switch defective, connection cable demaged

Take actions for error repair
Check switch and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 2
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

238 / 523007 / FrmMng_TORxEngPress

Error description CAN ERROR RxEngPress.

Error codes

DEUTZ-Errorcode: 238
BlinkCode (short-long-short): 2 - 1 - 5
SPN: 523007
possible FMI:
12: Defective component
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection

Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error

Take actions for error repair

other error properties

System reaction:
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 1
Measurement @ errortime: default value

239 / 523008 / MpICtl

Error description MANIPULATION CONTROL

Data monitoring: the torque curve does not match the specification

Error codes

DEUTZ-Errorcode: 239
BlinkCode (short-long-short): 4 - 2 - 4
SPN: 523008
possible FMI:
1: data valid, but below normal working area
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection

Errorlamp shows . Entry in errormemory.

Possible reason for error

Manipulation of Topcurve detected, data manipulation, too slow changed curve

Take actions for error repair

other error properties

System reaction:
Behaviour error lamp:
Selfhealing: -
Signal Priority: 3
Measurement @ errortime:

240 / 98 / OLSCD

Error description OIL LEVEL SWITCH

Oil level sensor: the voltage of sensor measured by ECU is out of the target range or the received value of oil level via CAN is defective or the signal value is implausible

Error codes

DEUTZ-Errorcode: 240
BlinkCode (short-long-short): 2 - 1 - 1
SPN: 98
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
2: data stream is defective
2: data stream is defective

Errordetection

Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error

Voltage outside target range, CAN signal error, signal implausible, sensor defective, connection cable demaged, CAN bus wrong cabled, wiring demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair

Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it, Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, chec

other error properties

System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

241 / 98 / OLSCDSysReacHi

Error description OIL LEVEL SWITCH
Oil level: the oil level calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 241
BlinkCode (short-long-short): 2 - 5 - 1
SPN: 98
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Oil level too high with system reaction, oil volume too large, sensor defective, connection cable demaged, CAN data error

Take actions for error repair
Check oil level and if necessary correct it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: OLSCD_stSysReacReq
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

242 / 107 / ADPSCDAna

Error description AIR FILTER COND.
Air filter differential pressure sensor: the voltage of sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 242
BlinkCode (short-long-short): 1 - 3 - 6
SPN: 107
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Voltage outside target range, sensor defective, connection cable demaged

Take actions for error repair
Check cable harness, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

243 / 98 / OLSCDSysReacLo

Error description OIL LEVEL SWITCH
Oil level: the oil level calculated by ECU is underneath the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 243
BlinkCode (short-long-short): 2 - 5 - 2
SPN: 98
possible FMI:
1: data valid, but below normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Oil level too low with system reaction, oil volume too small, sensor defective, connection cable demaged, CAN data error

Take actions for error repair
Check oil level and if necessary correct it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Advice: OLSCD_stSysReacReq
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

244 / 523009 / PrvMonWear

Error description REPL. RAIL PRESS. VALVE
Rail pressure relief valve: is open more frequently or for a longer time than what the technical specification allows

Error codes
DEUTZ-Errorcode: 244
BlinkCode (short-long-short): 2 - 5 - 3
SPN: 523009
possible FMI:
9: Abnormal update rated
10: Abnormal rate of change
14: Special Instructions
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Rail pressure relief valve open more frequently than the technical specification allowed, rail pressure relief valve open longer than the technical specification allowed, rail pressure relief valve defective

Take actions for error repair
Change rail pressure relief valve and remove the error through Serdia command

other error properties
System reaction: permanent error message, unerasable by "Clear EM"
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

245 / 523010 / RailMeUn8

Error description LEAKAGE DETECTION
Wenn the engine is in idle running, the metering unit compares its output and rail pressure with the default value (Parameter) and calculates a correction factor-it calibrates itself then

Error codes
DEUTZ-Errorcode: 245
BlinkCode (short-long-short): 2 - 5 - 4
SPN: 523010
possible FMI:
0: data valid, but above normal working area
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error

Take actions for error repair

other error properties
System reaction:
Behaviour error lamp: permanent light
Selfhealing: no
Signal Priority: 3
Measurement @ errortime: actual value

246 / 523650 / FlSys_FLPFMSysReac

Error description
Low fuel pressure Diesel: the low fuel pressure calculated by ECU is underneath the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 246
BlinkCode (short-long-short): 5 - 4 - 1
SPN: 523650
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Diesel fuel pressure below target range with system reaction, interruption in cycling process of low fuel pressure (for example, fuel pump defective), sensor defective, connection cable demaged

Take actions for error repair
Check Diesel low fuel pressure loop system, Check electrical fuel pump, inspect fuel system and if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

247 / 523651 / FlSys_FTSFMSysReac

Error description
Rape Oil Fuel temperature: the fuel temperature calculated by ECU is above the target range; the ECU activates a system reaction

Error codes
DEUTZ-Errorcode: 247
BlinkCode (short-long-short): 5 - 4 - 2
SPN: 523651
possible FMI:
2: data stream is defective
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Rape oil fuel temperature above target range with system reaction, interruption of rape oil fuel loop (for example, heat exchanger not working properly), sensor defective, connection cable demaged

Take actions for error repair
Check rape oil fuel system as well as heat exchanger and heat exchanger valve, if necessary repair it, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning and switchover to Diesel operation mode
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

248 / 523652 / FlSys_FlushStateEngineOff

Error description
Engine shut off without flushing or flushing was not already completed. ECU stores every shutoff with uncompleted or missing flushing process

Error codes
DEUTZ-Errorcode: 248
BlinkCode (short-long-short): 5 - 4 - 3
SPN: 523652
possible FMI:
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Engine shut off without flushing of the fuel system in Diesel operation mode, Shutoff before flushing in Diesel operation mode was finished

Take actions for error repair
Awaiting complete flushing of the fuel system everytime before engine shut off

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: -

249 / 523653 / FlSys_RapeOilHeatEx

Error description RAPEOILSYSTEM
Awaited temperatur rise with opened heat exchanger valve did not occur. Error in fuel heating system.

Error codes
DEUTZ-Errorcode: 249
BlinkCode (short-long-short): 5 - 4 - 4
SPN: 523653
possible FMI:
2: data stream is defective
12. Errormode not identifiable
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Fuel heating system (heat exchanger) not working correctly

Take actions for error repair
Check Heat exchanger and heat exchanger valve, check cooling system going to the heat exchanger, check rape oil system going to the heat exchanger

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: -

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

250 / 523654 / FrmMngDieselLvl

Error description RAPEOILSYSTEM
Status DieselLvl (Diesel tank level): the voltage of the sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 250
BlinkCode (short-long-short): 5 - 4 - 5
SPN: 523654
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, sensor defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

251 / 523655 / FrmMngFuelTemp

Error description RAPEOILSYSTEM
Status FuelTemp (Fuel Temperature): the voltage of the sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 251
BlinkCode (short-long-short): 5 - 4 - 6
SPN: 523655
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

252 / 523656 / FrmMngLowPressureDiesel

Error description RAPEOILSYSTEM
Status LowPressureDiesel (Low fuel pressure diesel): the voltage of the sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 252
BlinkCode (short-long-short): 5 - 4 - 7
SPN: 523656
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

253 / 523657 / FrmMngRapeOilIn

Error description RAPEOILSYSTEM
CAN messageRapeOilIn (Rape oil input): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 253
BlinkCode (short-long-short): 5 - 6 - 1
SPN: 523657
possible FMI:
12: Defective component
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, substitute values
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

254 / 523658 / FrmMngRapeOilLvl

Error description RAPEOILSYSTEM
Status RapeOilLvl (Rape oil tank level): the voltage of the sensor measured by ECU is out of the target range

Error codes
DEUTZ-Errorcode: 254
BlinkCode (short-long-short): 5 - 6 - 2
SPN: 523658
possible FMI:
3: Voltage to high or short circuit to +Ubatt
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, lamp defective, connection cable demaged

Take actions for error repair
Check cabling, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, substitute value
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

255 / 523659 / FrmMngRapeOilVlv1

Error description RAPEOILSYSTEM
Status RapeOilVlv1 (Valve 1): the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component is exceeded

Error codes
DEUTZ-Errorcode: 255
BlinkCode (short-long-short): 5 - 6 - 3
SPN: 523659
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, valve defective, connection cable demaged

Take actions for error repair
Check cabling, if valve not working, check valve and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning and switchover to Diesel operation mode
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

256 / 523660 / FrmMngRapeOilVlv2

Error description RAPEOILSYSTEM
Status RapeOilVlv2 (Valve 2): the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component is exceeded

Error codes
DEUTZ-Errorcode: 256
BlinkCode (short-long-short): 5 - 6 - 4
SPN: 523660
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, valve defective, connection cable demaged

Take actions for error repair
Check cabling, if valve not working, check valve and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning and switchover to Diesel operation mode
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

257 / 523661 / FrmMngRapeOilVlv3

Error description RAPEOILSYSTEM
Status RapeOilVlv3 (Valve 3): the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component is exceeded

Error codes
DEUTZ-Errorcode: 257
BlinkCode (short-long-short): 5 - 6 - 5
SPN: 523661
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, valve defective, connection cable demaged

Take actions for error repair
Check cabling, if valve not working, check valve and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning and switchover to Diesel operation mode
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

258 / 523662 / FrmMngRapeOilVlv4

Error description RAPEOILSYSTEM
Status RapeOilVlv4 (Valve 4): the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component is exceeded

Error codes
DEUTZ-Errorcode: 258
BlinkCode (short-long-short): 5 - 6 - 6
SPN: 523662
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, valve defective, connection cable demaged

Take actions for error repair
Check cabling, if valve not working, check valve and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

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DTC-List
Diagnosis- and Errorcodes

referrenced ECU-Software
P490_: 220, 310, 501
P491_: 220, 310, 400, 501
P492_: 213
P513_: 214, 300

259 / 523663 / FrmMngRapeOilVlv5

Error description RAPEOILSYSTEM
Status RapeOilVlv5 (Valve 5): the current drain measured by ECU is out of the target range or the maximum permissible temperature of the ECU component is exceeded

Error codes
DEUTZ-Errorcode: 259
BlinkCode (short-long-short): 5 - 6 - 7
SPN: 523663
possible FMI:
12. Errormode not identifiable
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break or short circuit, valve defective, connection cable demaged

Take actions for error repair
Check cabling, if valve not working, check valve and if necessary replace it, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

260 / 523664 / FrmMngSTIN1RX

Error description RAPEOILSYSTEM
CAN message STIN1 (State Inputs 1): the message can not be received by ECU

Error codes
DEUTZ-Errorcode: 260
BlinkCode (short-long-short): 5 - 6 - 8
SPN: 523664
possible FMI:
12: Defective component
12. Errormode not identifiable
12: Defective component
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
CAN bus wrong cabled, wiring is demaged, receiver (sender of the message) work inaccurately, parametering inaccurate

Take actions for error repair
Check CAN Bus cabling (Bus sheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range

other error properties
System reaction: Warning, substitute values
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: default value

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5.9 Sensors

⚠ Caution

Sensors and actuators must not be connected to external power sources for the purpose of testing, but must only be operated on the EMR3. Otherwise components may be permanently damaged.

Sensors must under no circumstances be repaired, but must be replaced if they are defective.

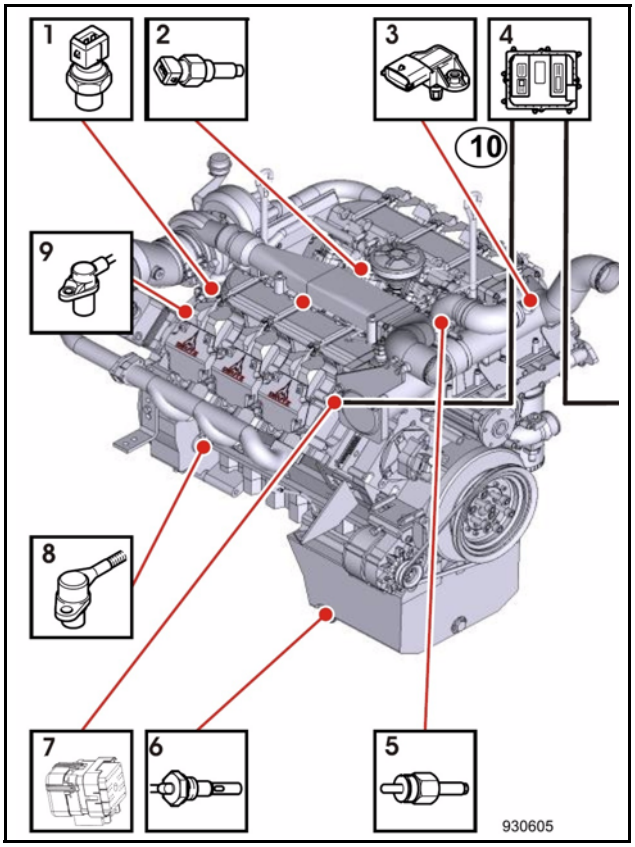


Fig. 1

1 Oil pressure sensor
2 Fuel temperature sensor
3 Sensor for charge air temperature and charge air pressure
4 Engine control unit
5 Coolant temperature sensor
6 Oil level sensor, option
7 Central plug
8 Rotary speed sensor for crankshaft
9 Rotary speed sensor for camshaft
10 Wiring loom connecting cable

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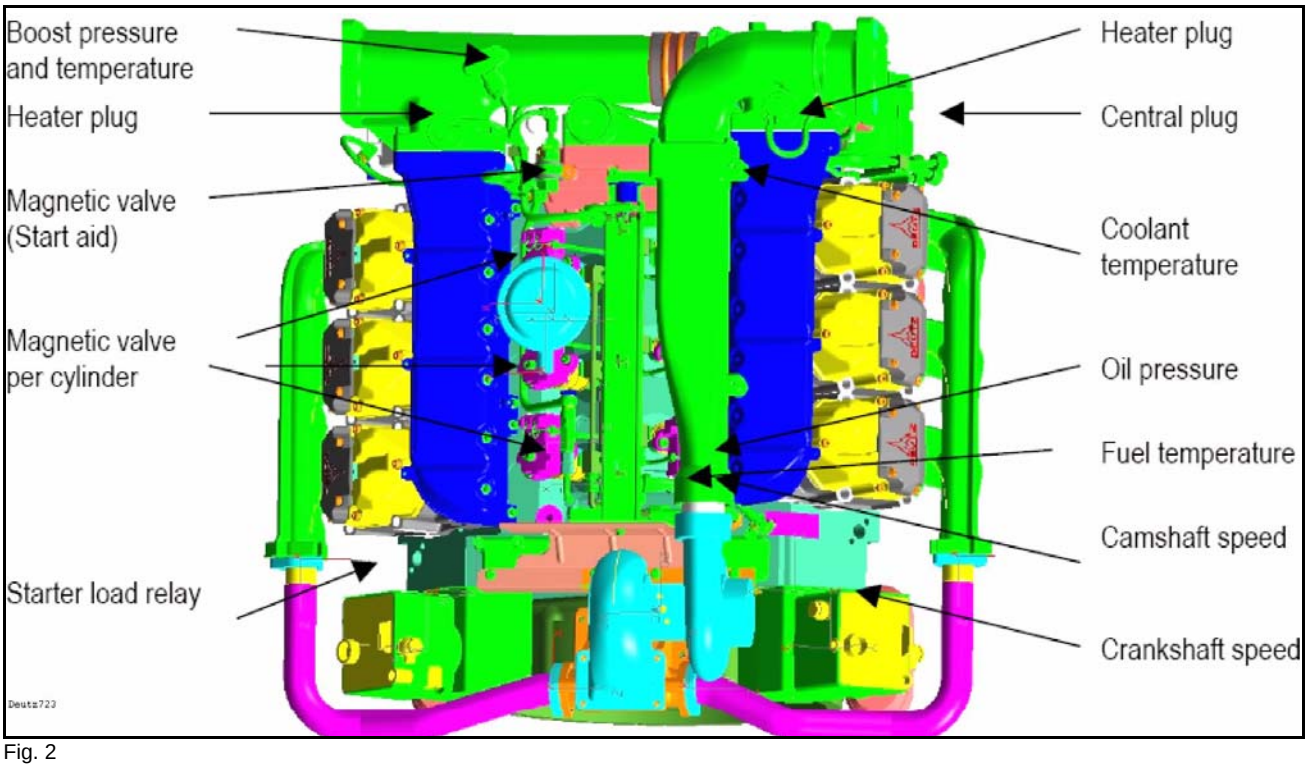


Fig. 2

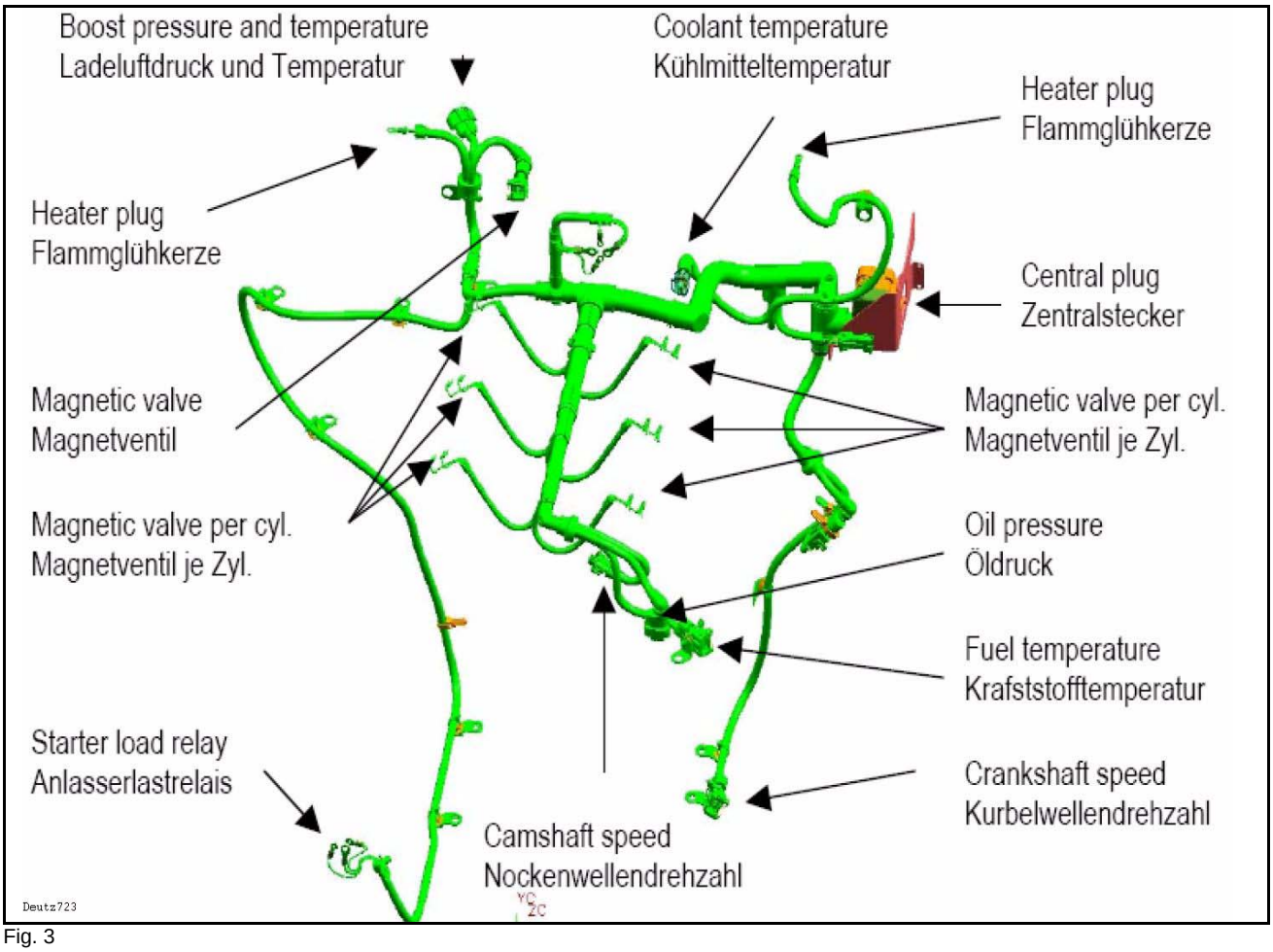


Fig. 3

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5.10 Oil pressure sensor

Pressure sensor, B88

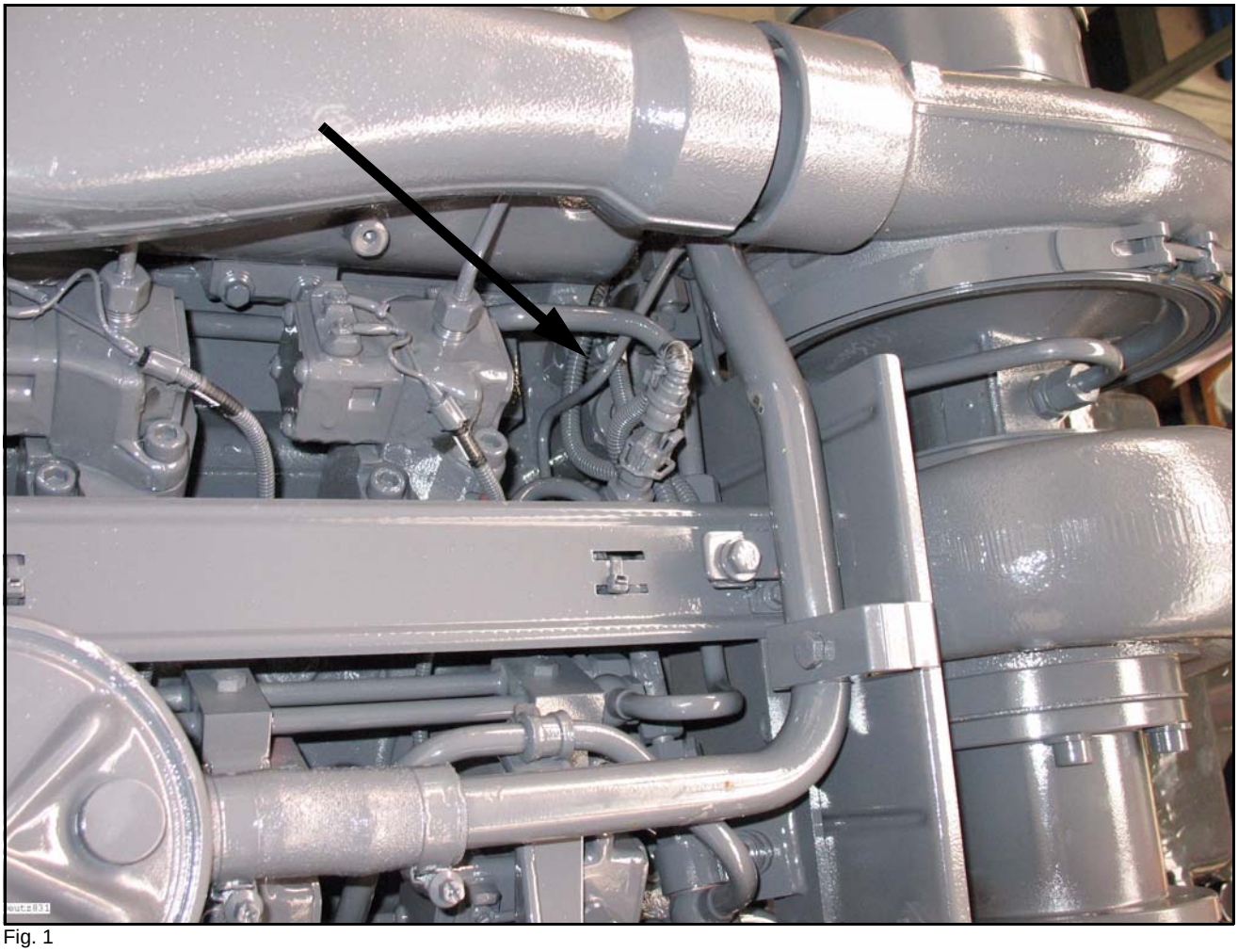


Fig. 1



Fig. 2 Oil pressure sensor

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Oil pressure monitoring

EMR fault code

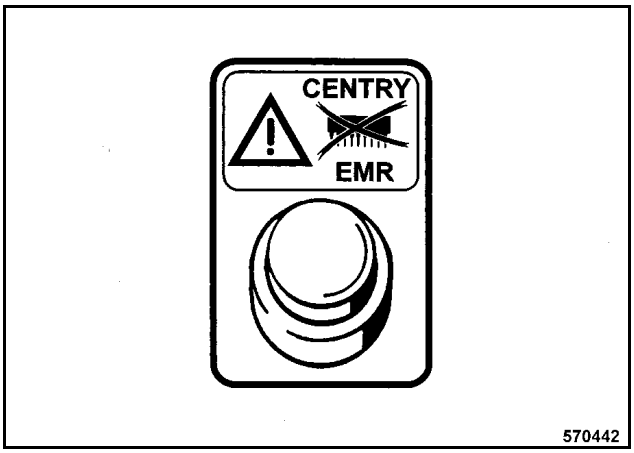


Fig. 3

The operator is warned if

- the oil pressure falls short of the warning limit and/or
- the power is reduced by the EMR after a pre-warning time, or
- the oil pressure falls short of the shut-down limit and the engine is shut down after a pre-warning time.

permanent light = A fault message is present, the engine can be started and the refuse compactor is still operable with limitations.

the control light flashes after 2 seconds= Severe fault, the engine cannot be started.

Monitoring by ESX-control

i Note

The signal is evaluated by the ESX-control (Pin X0:52) and displayed 2 seconds later in the display module (Fig. 4) with code "520".

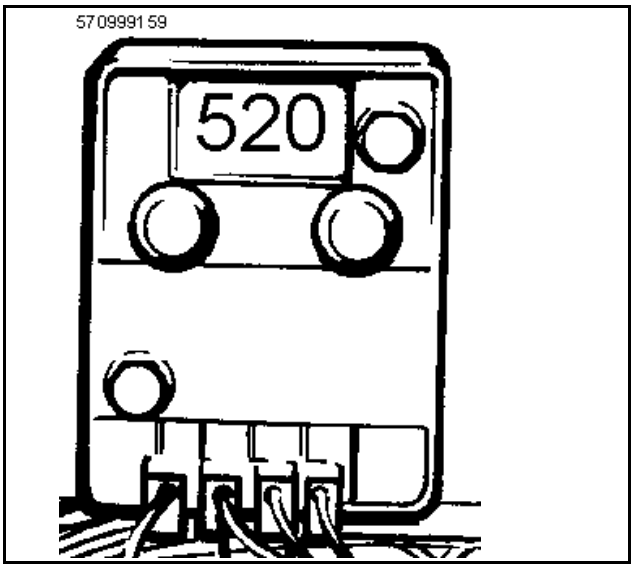


Fig. 4 Display module in central electrics

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Warning light, engine oil pressure

If there is no oil pressure, the EMR-control (PIN XD2.1.20, ground switching) switches, whereby the coil of relay (K60) is excited. The switch contact of relay (K60) supplies the monitoring board (A15, terminal X1:88) with ground potential. The engine pressure warning light **3** (Fig. 5) or **c** (Fig. 6) flashes.

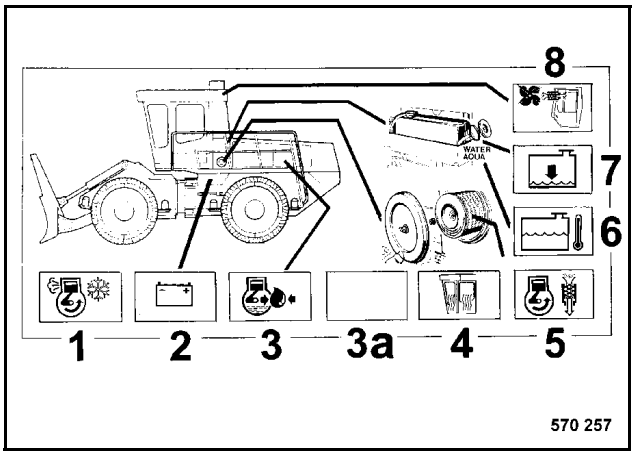


Fig. 5 Monitoring module, old design

3 red = Engine oil pressure too low.

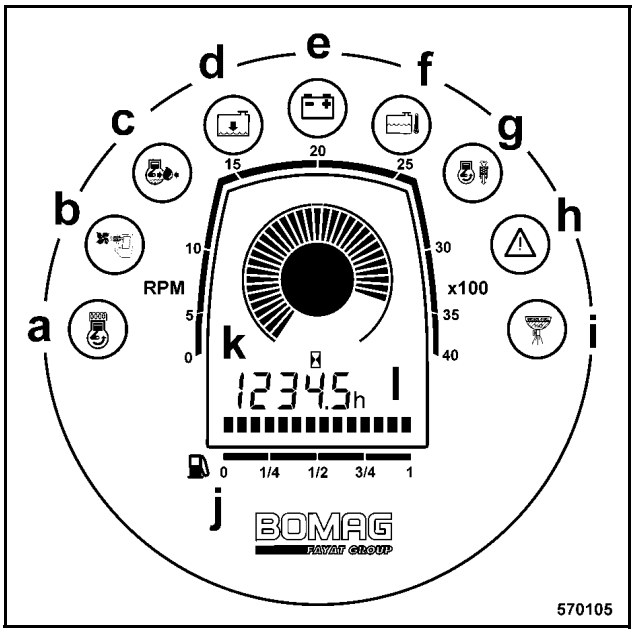


Fig. 6 Monitoring module, new design

c red = Engine oil pressure too low.

Removing and installing the pressure sensor

⚠ Caution

Ensure absolute cleanliness when working in the lubrication oil system.

Thoroughly clean the area around the affected component. Dry off wet locations with compressed air.

Immediately close all connections and openings with new and clean plugs/caps.

Only remove plugs/caps just before assembling.

Environment

Catch engine oil and dispose of environmentally.

Disassembling the pressure sensor

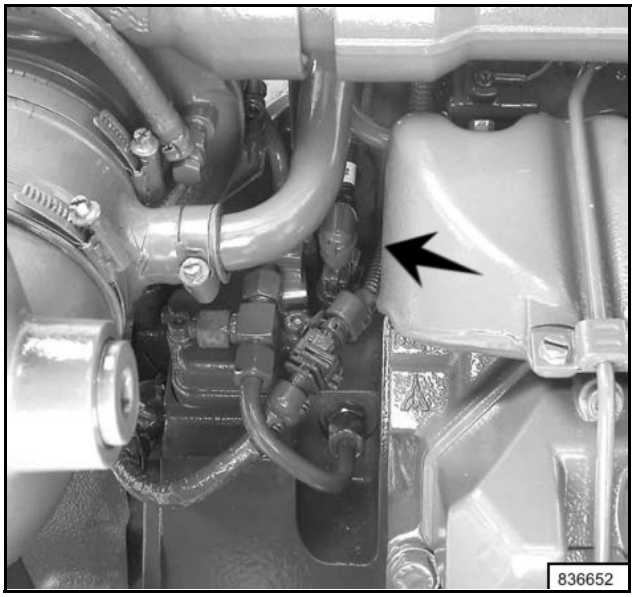


Fig. 7

- Unlock and pull out the cable plug (Fig. 7).
- Unscrew the oil pressure sensor with a socket spanner.
- Check the component visually.

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Installing the pressure sensor

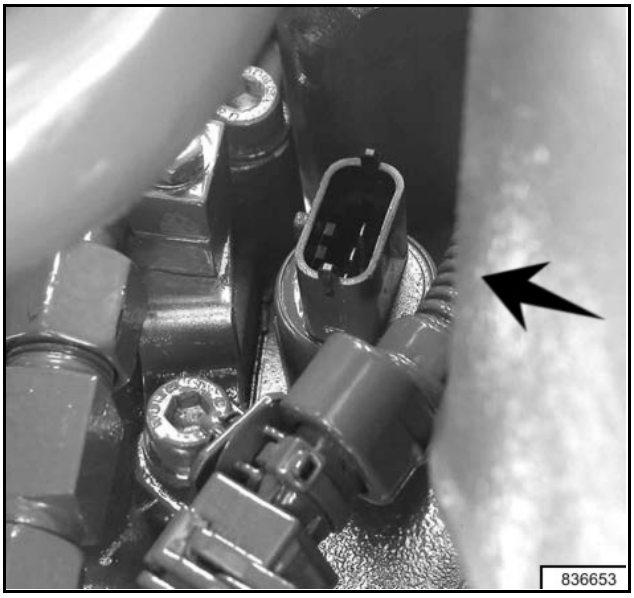


Fig. 8

- Insert the oil pressure sensor with a new seal ring and tighten.

i Note

Tightening torque: 20Nm

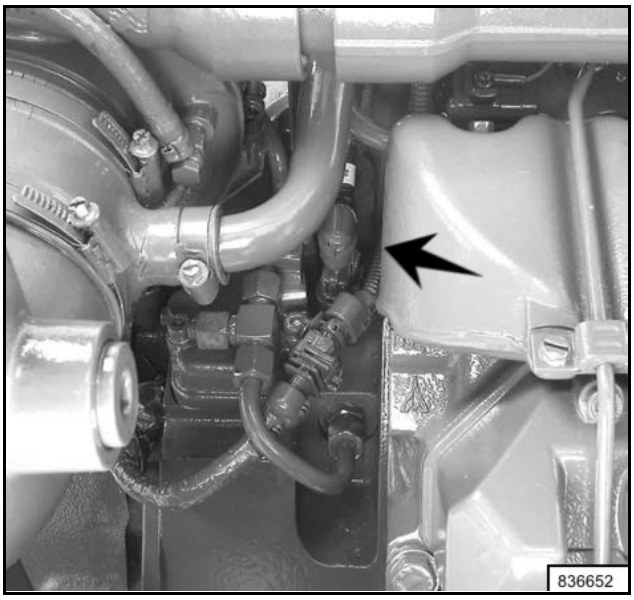


Fig. 9

- Plug in the cable plug.

i Note

Delete the fault entry in the fault log of the engine control unit.

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Temperature senor, B126

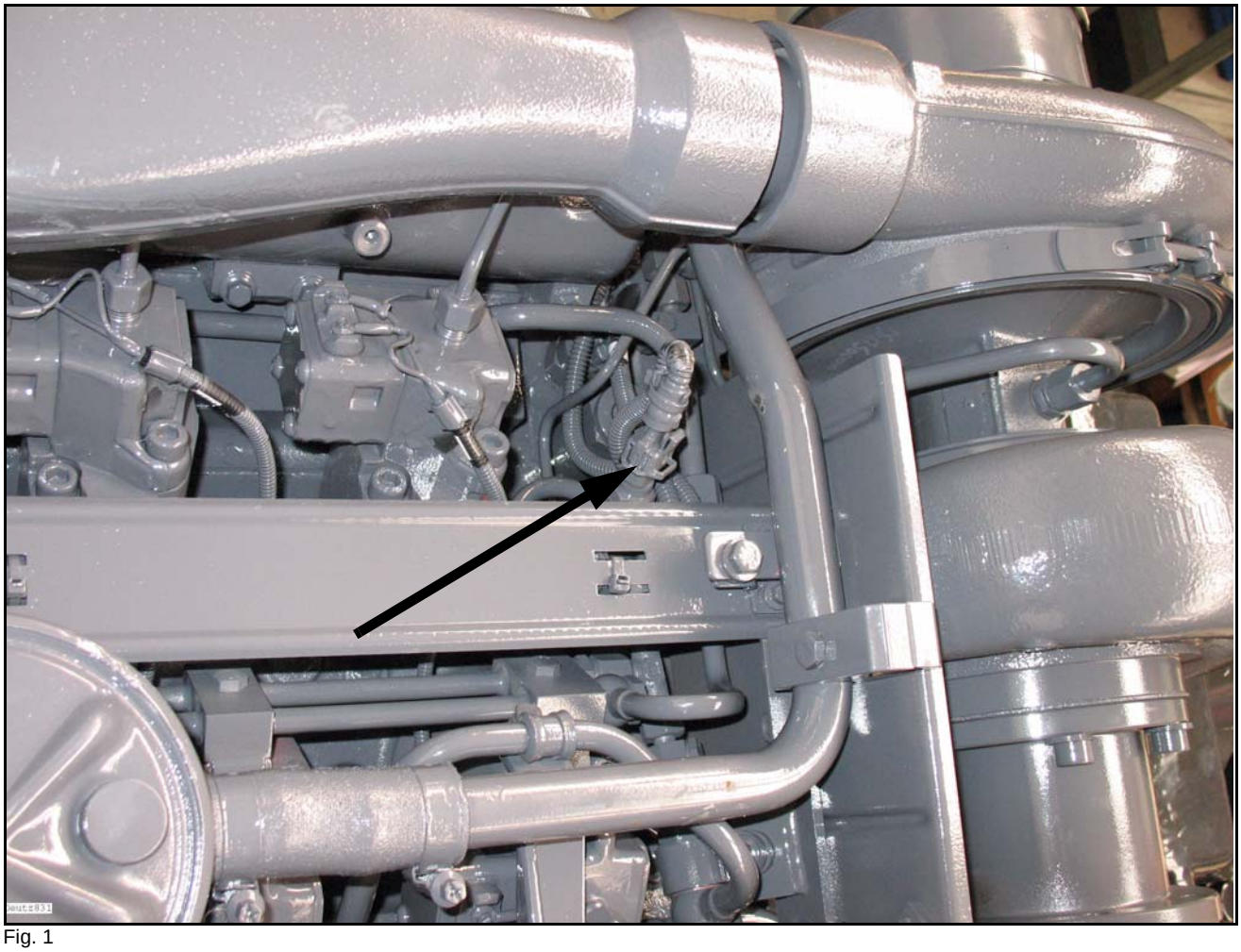


Fig. 1

- Temperature correction for injection quantity



Fig. 2

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Charge air temperature - charge air pressure sensor, B133

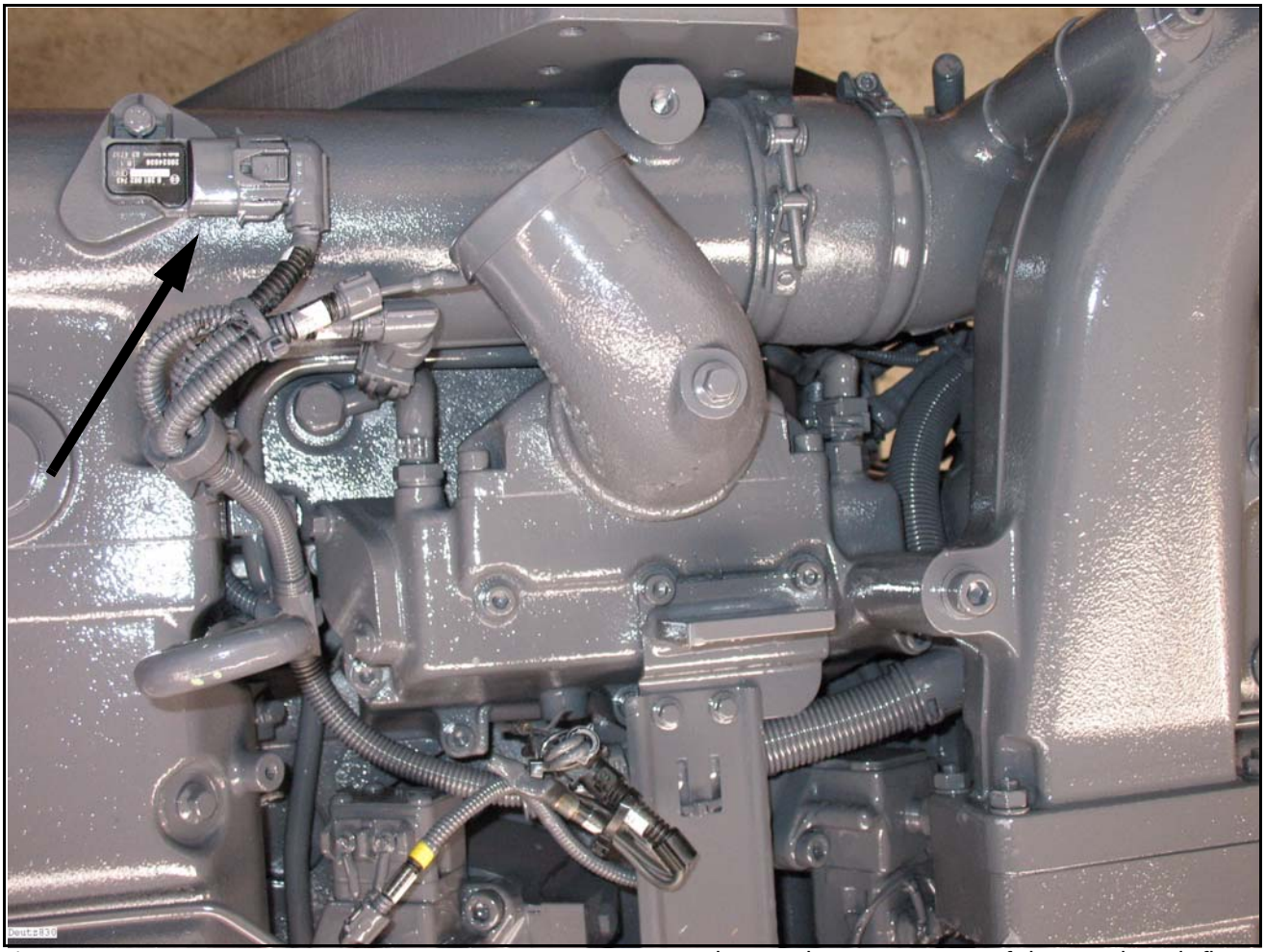


Fig. 1

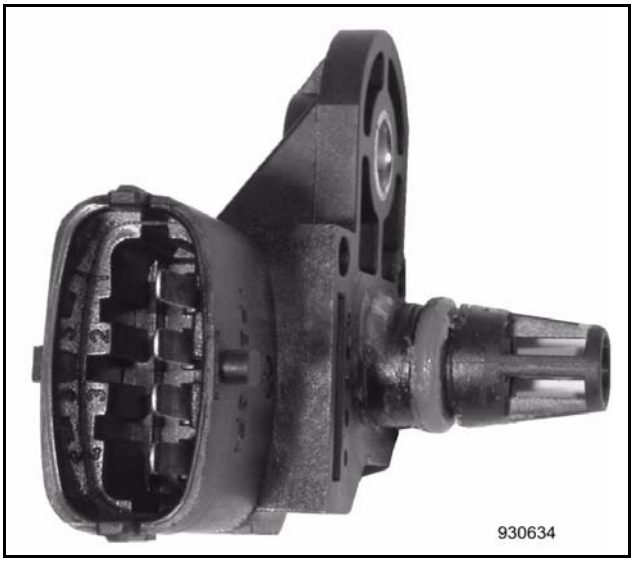


Fig. 2

This sensor unites two functions in one housing. The one function measures the charge air pressure in the and adapts the injection quantity in dependence on the measured pressure. On the other hand the EMR now detects the temperature of the passing air flow. This is used for the smoke limitation.

i Note

With a faulty pressure sensor the engine continues to run with charge pressure simulation.

With a defective temperature sensor the engine also carries on running.

Charge air temperature monitoring

The operator is warned if

- the temperature exceeds the warning limit and/or
- the power is reduced by the EMR 3 after a pre-warning time, or
- the temperature exceeds the shut-down limit and the engine is shut down after a pre-warning time.

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Disassembling and assembling the sensor

Disassembling the sensor

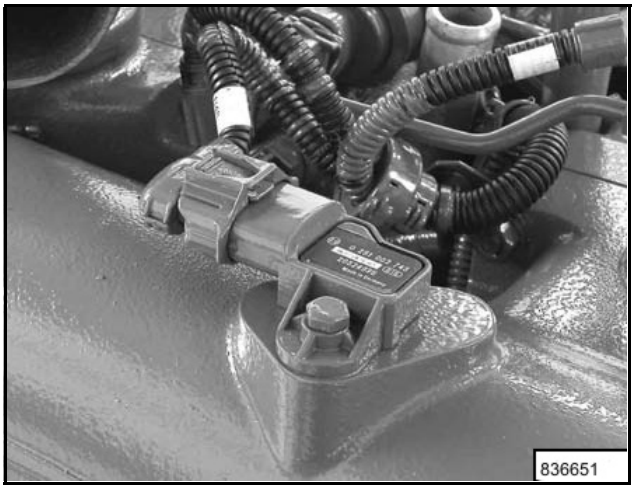


Fig. 3

- Unlock and pull out the cable plug (Fig. 3).
- Unscrew the screw.
- Remove the pressure/temperature sensor.
- Check the component visually.

Installing the sensor

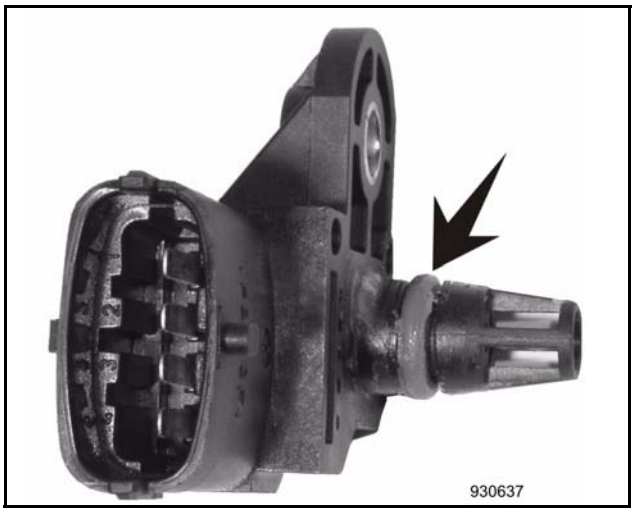


Fig. 4

- Assemble a new O-ring (Fig. 4).
- Slightly cover the O-ring with grease.

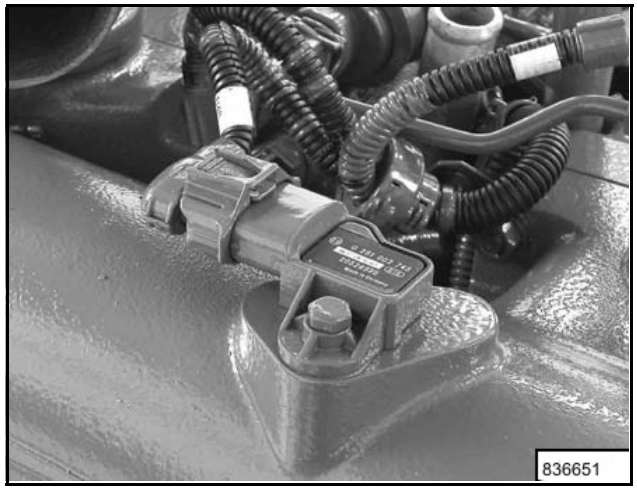


Fig. 5

- Carefully insert the pressure/temperature sensor (Fig. 5).
- Plug on the cable plug and engage the lock.
- Tighten the screw (1).

i Note

Delete the fault entry in the fault log of the engine control unit.

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5.13 EMR coolant temperature sensor

Temperature sensor, B113

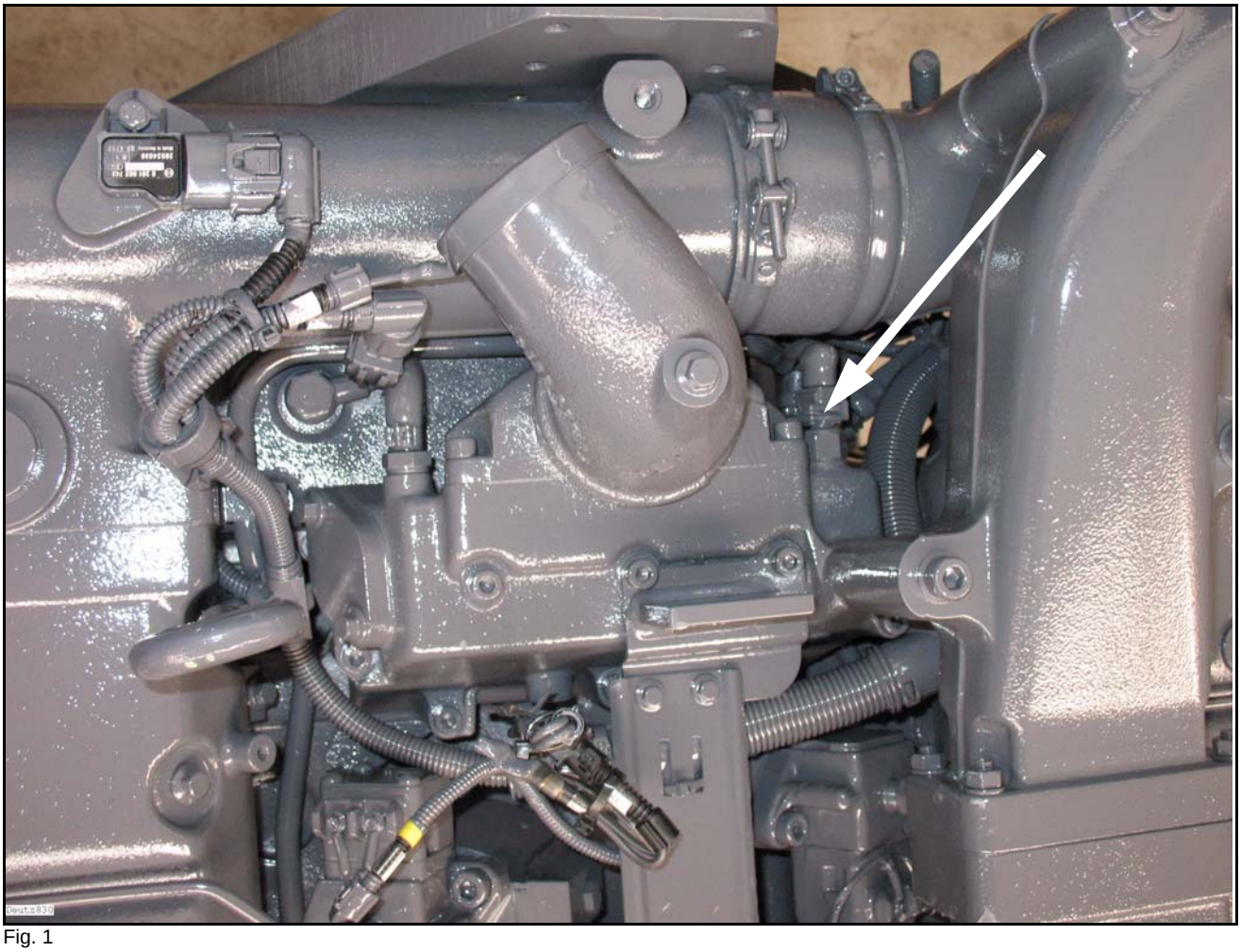


Fig. 1



Fig. 2

The coolant temperature has an effect on the calculated injection quantity and the preheating behaviour of the glow plugs.

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Coolant temperature monitoring

EMR fault code

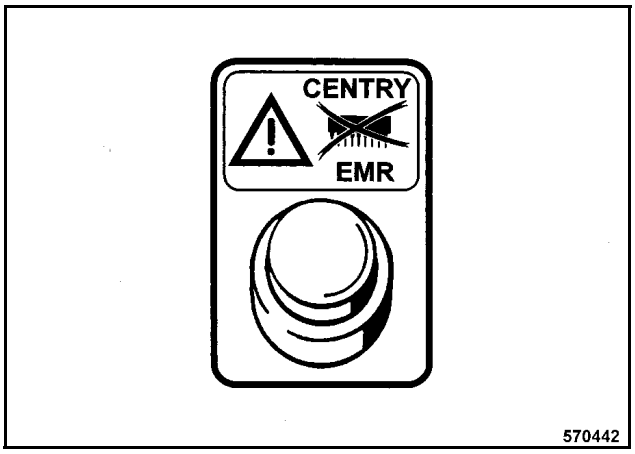


Fig. 3

The operator is warned if

- the temperature exceeds the warning limit and/or
- the power is reduced by the EMR after a pre-warning time, or
- the temperature exceeds the shut-down limit and the engine is shut down after a pre-warning time.

permanent light = A fault message is present, the engine can be started and the refuse compactor is still operable with limitations.

the control light flashes after 2 seconds= Severe fault, the engine cannot be started.

Monitoring by ESX-control

i Note

The signal is evaluated by the ESX-control (Pin X0:18) and displayed 30 seconds later in the display module (Fig. 4) with code "522".

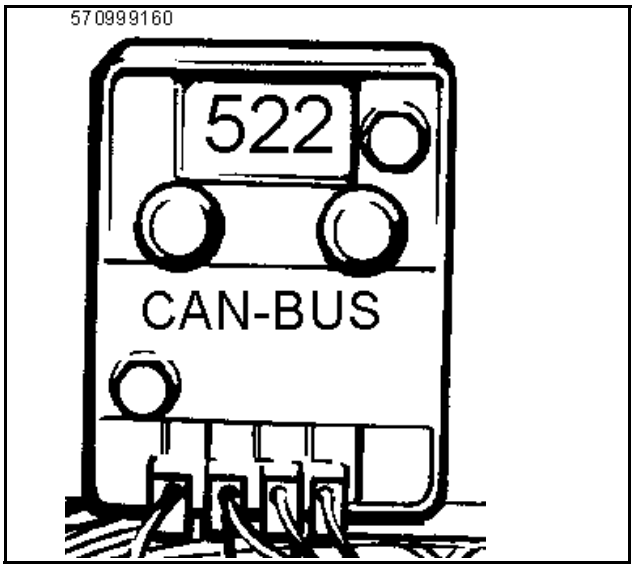


Fig. 4 Display module in central electrics

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Warning light, overheating of engine

If the coolant temperature is exceeded the EMR-control (PIN XD2.1.39, ground switching) switches, whereby the coil of relay (K146) is excited. The switch contact of relay (K146) supplies the monitoring board (A15, terminal X1:87) with ground potential. The engine overheating warning light **6** (Fig. 5) or **f** (Fig. 6) flashes.

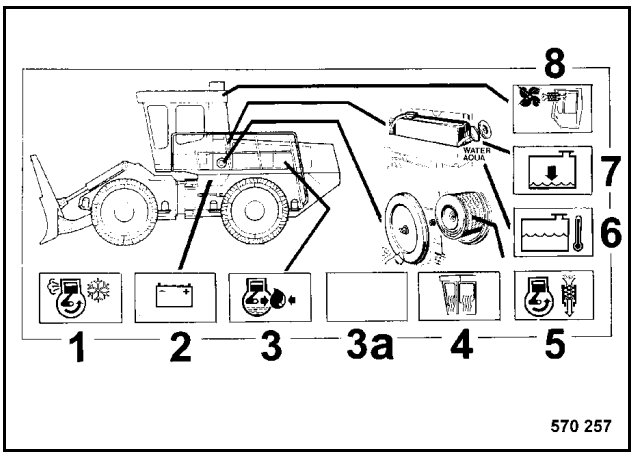


Fig. 5 Monitoring module, old design

6 red = Coolant temperature too high.

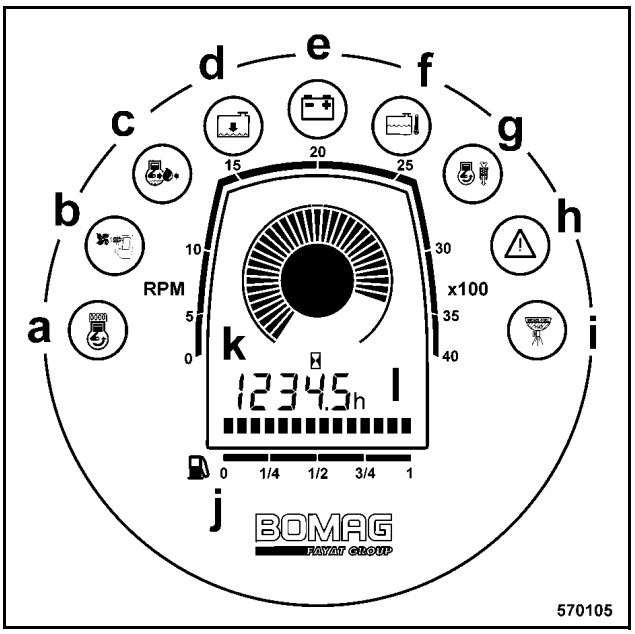


Fig. 6 Monitoring module, new design

f red = Coolant temperature too high.

Removing and installing the temperature sensor

Environment

Catch running out fluids in a suitable vessel and dispose of environmentally.

Note

Follow the corresponding documentation in the operating instructions to drain and fill the cooling system.

Disassembling the temperature sensor

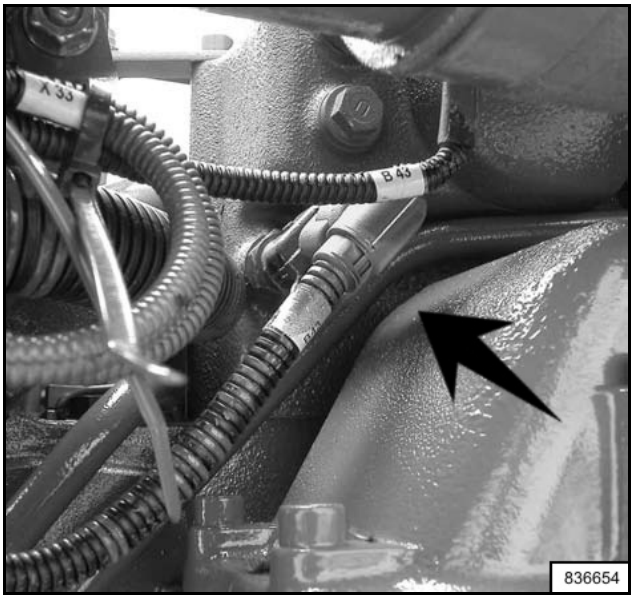


Fig. 7

- Unlock and pull out the cable plug (Fig. 7).

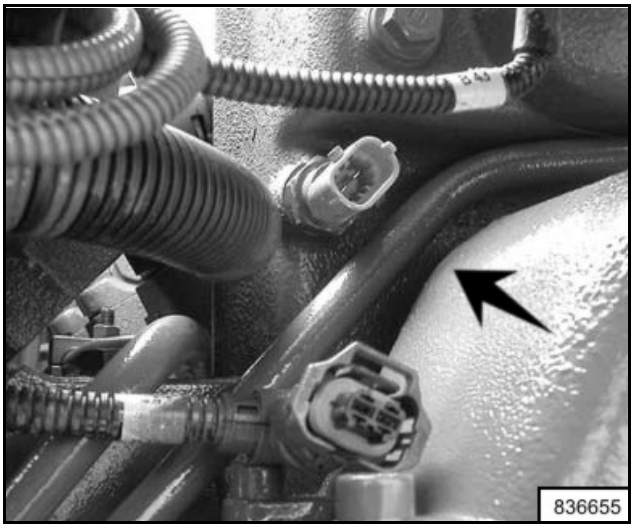


Fig. 8

- Unscrew the coolant temperature sensor (Fig. 8).
- Check the component visually.

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Installing the temperature sensor

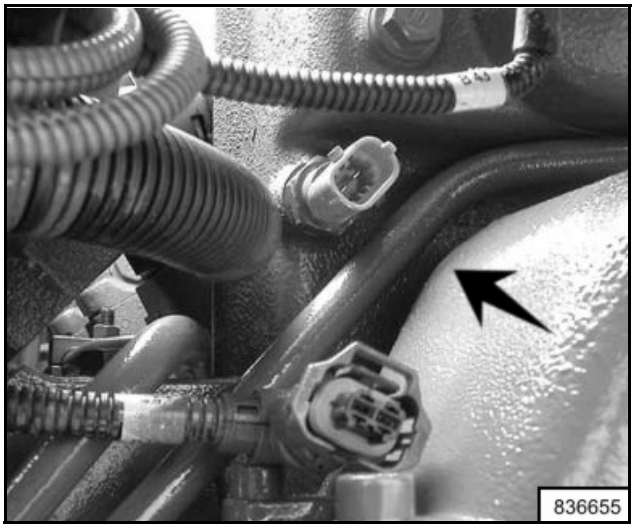


Fig. 9

- Tighten the coolant temperature sensor (Fig. 9).

i Note

Make sure that the seal rings are present .

Tightening torque: $22^{\pm 2}$ Nm.

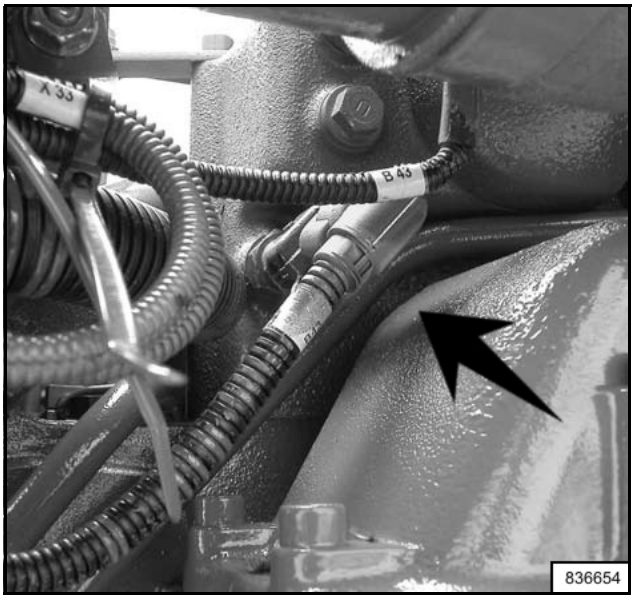


Fig. 10

- Push on the cable plug (Fig. 10).

i Note

Delete the fault entry in the fault log of the engine control unit.

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Rotary speed sensor, B130

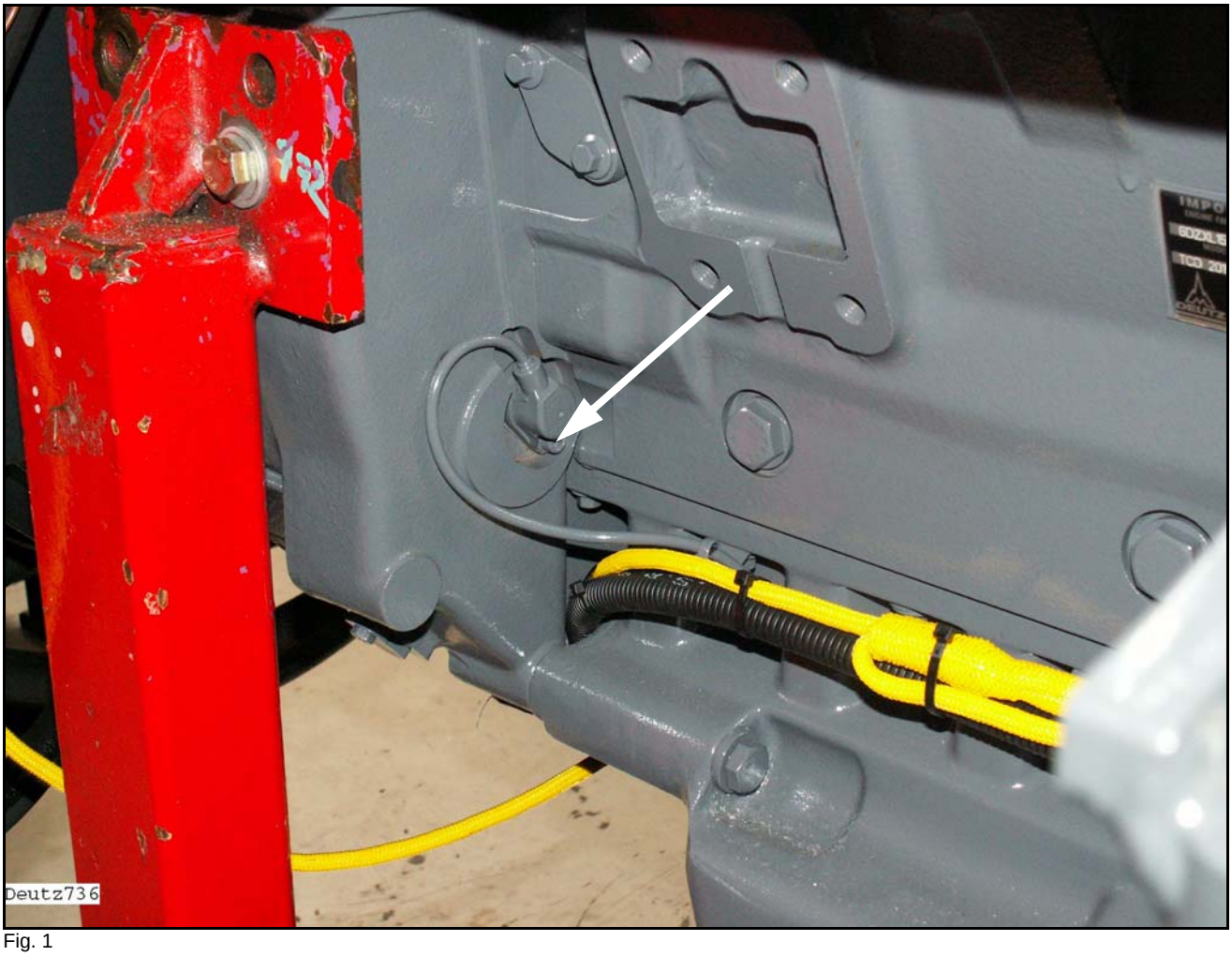


Fig. 1

- Inductive sensor
- Exact determination of engine speed
- Limp-home function in case of camshaft sensor failure

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Rotary speed sensor, B114



Fig. 1

- Inductive sensor
- Determination of TDC
- Limp-home function in case of crankshaft sensor failure

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5.16 Preheating system

Glow plugs, R02

The engines are fitted with glow plugs as cold starting aids by standard.



Fig. 1 Glow plug R02

Once the preheating temperature is reached, a solenoid valve (Y02) directs fuel into the evaporation zones of the glow plug. This generates a flame which sustainably heats up the intake air and thus enables reliably, comfortable and environmentally friendly starting, also at low temperatures.

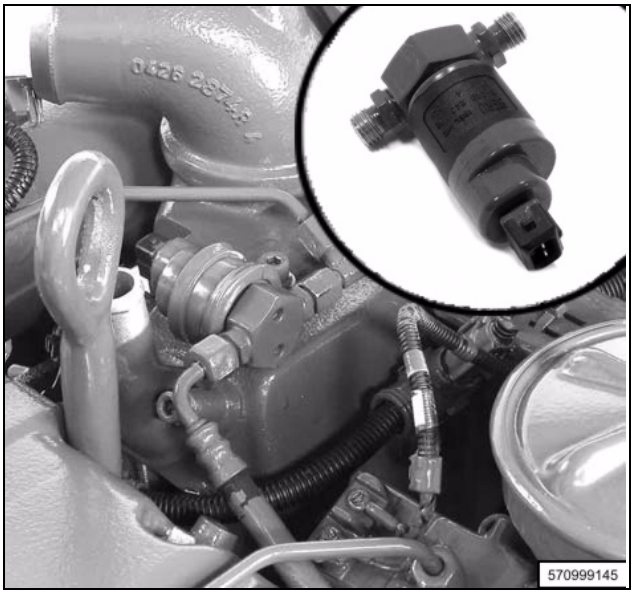


Fig. 2 Solenoid valve Y02

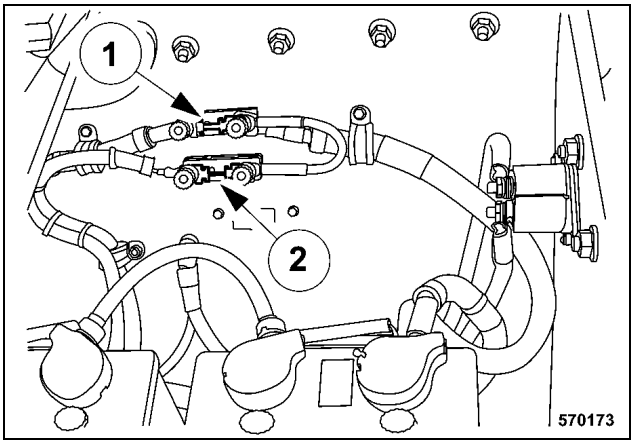


Fig. 3

1 Main battery fuse (F00), 250A

2 Fuse for preheating system (F48), 80A

Removing and installing the glow plug

⚠ Caution

Follow the safety regulations and country specific regulations concerning the handling of fuel.

Ensure absolute cleanliness when working in the fuel system. Remove any existing paint and dirt particles before disassembling. Thoroughly clean the area around the affected component. Dry off wet locations with compressed air.

Immediately close all connections and openings with new and clean plugs/caps. Only remove plugs/caps just before assembling.

Environment

Catch running out fluids in a suitable vessel and dispose of environmentally.

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Disassembling the glow plug



Fig. 4

- Remove the fuel lines 1 (Fig. 4).

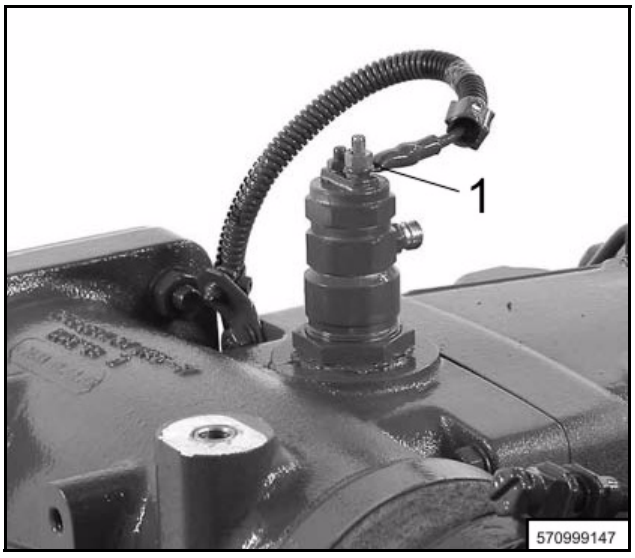


Fig. 5

- Unscrew the nut 1 (Fig. 5).
- Disconnect the cable.

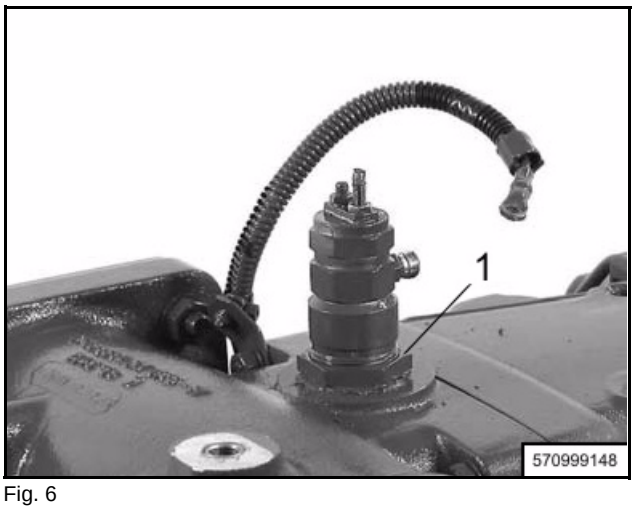


Fig. 6

- Loosen counter nut 1 (Fig. 6).
- Unscrew the glow plug.



Fig. 7

- Remove the seal 1 (Fig. 7).
- Check the component visually.

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Installing the glow plug

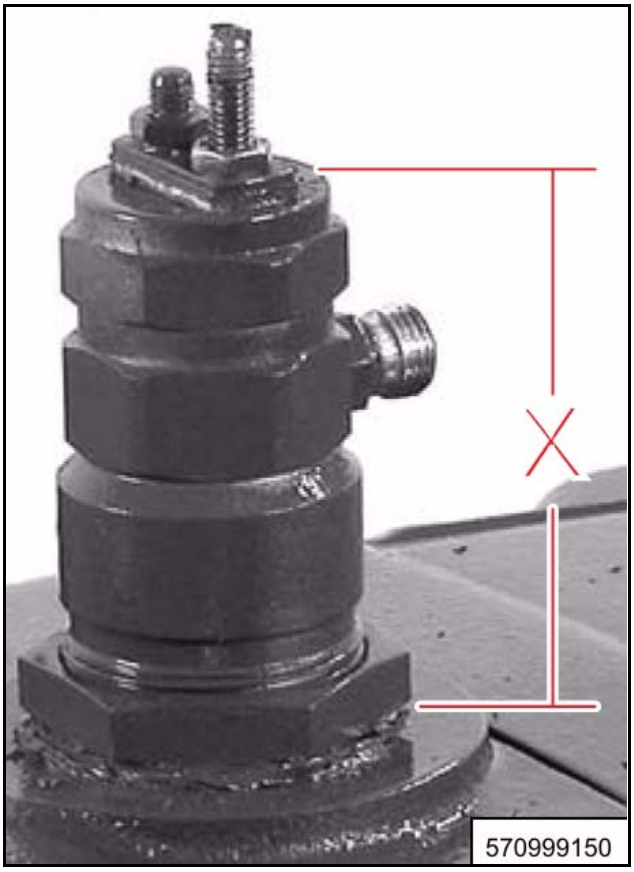


Fig. 8

- Install the new gasket.
- Screw in the glow plug.

i Note

Observe measurement (X) (Fig. 8).

Measurement (X) = 60 $_{-3}$ mm

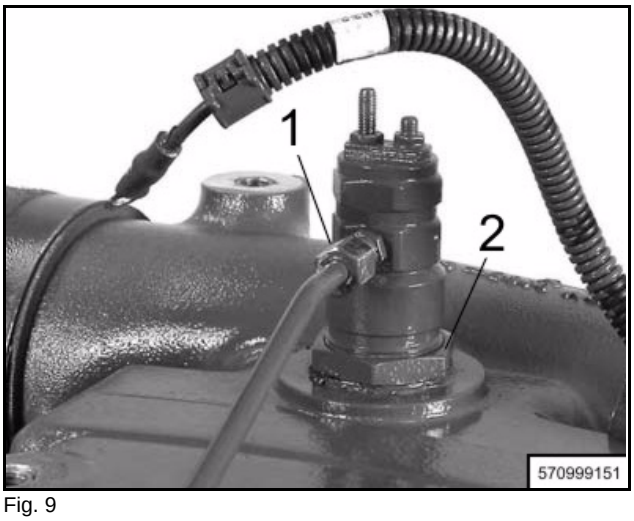


Fig. 9

- Install the fuel lines 1 (Fig. 9).
- Tighten the counter nut (2).

i Note

Tightening torque of counter nut 25 Nm



Fig. 10

- Push on the cable lug (Fig. 10).
- Install the washer.
- Tighten the nut.

i Note

Tightening torque of nut = 5 Nm.

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5.17 Checking the preheating system. Maintenance in case of frost.

⚠ Danger

Fire hazard!

When working on the fuel system do not use open fire, do not smoke, do not spill any fuel.

Environment

Catch running out fuel.

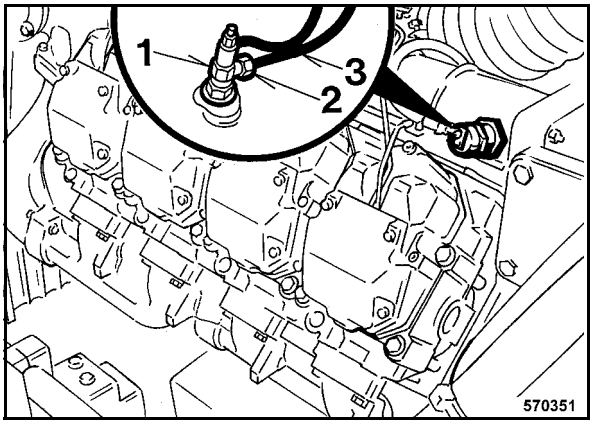


Fig. 11

i Note

If the system works correctly suction pipe 3 (Fig. 11) must become hand-warm near the glow plug (1) during preheating. Otherwise perform the test in the following sequence:

Test step 1

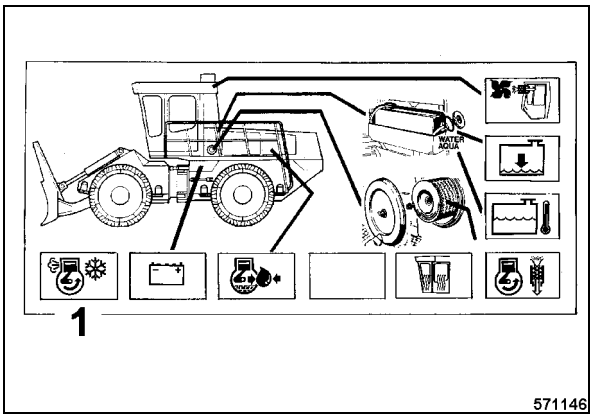


Fig. 12

- Turn the ignition key to position "I", the control light "preheating" 1 (Fig. 12) mus flash.

Otherwise the glow plug is defective or the line is interrupted.

Test step 2

⚠ Danger

Danger of injury!

Keep clear of rotating parts.

- Loosen the pipe fitting (2) on the glow plug for a few turns.

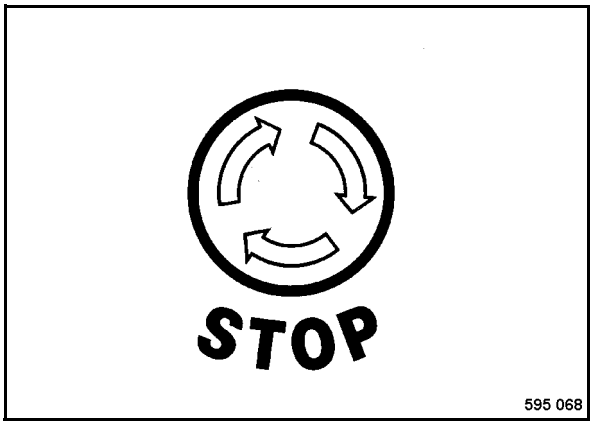


Fig. 13

- Press the button of the emergency stop switch in (Fig. 13).
- Hold the ignition key in position „I“, until the „preheating“ control light goeas out.
- Turn the ignition key further to position "II" against the resistance and crank the engine with the starter.
- Fuel must run out of the loosened pipe fitting. Otherwise have the system (solenoid valve) checked.

Test step 3

- Remove the glow plug and connect the fuel line.
- Crank the engine with the starter, see test step 2.
- Fuel must run out of the glow plug. Otherwise replace the clogged glow plug.
- Reinstall the disassembled parts.

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5.18 Sensor, water in fuel

Sensor, B124

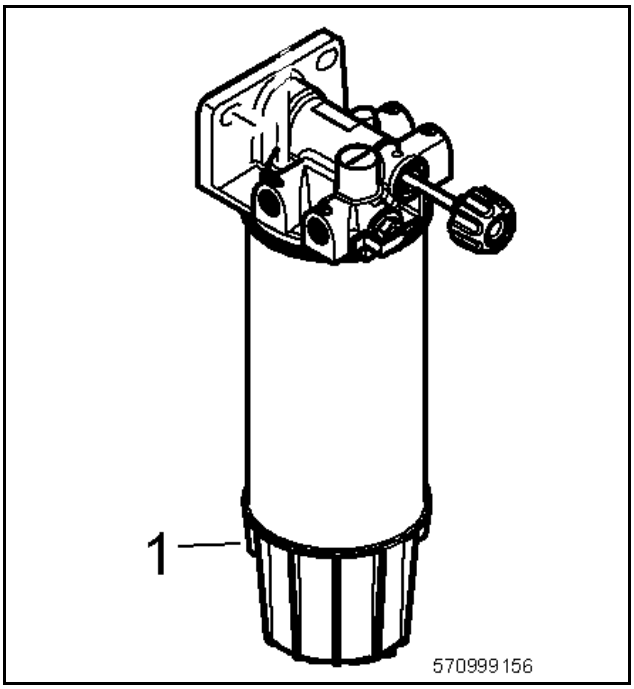


Fig. 14

1 Water separator sensor (B124)

Warning light water in fuel filter

In case of water in the fuel, the EMR-control will switch (Pin XD2.1.38 ground) The water in fuel warning light (Fig. 15) lights up.

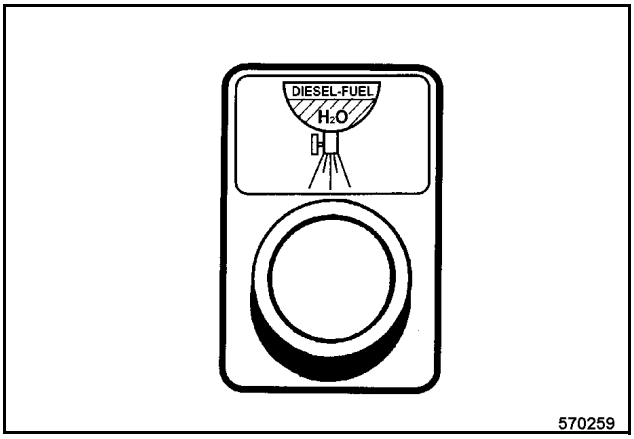


Fig. 15

lights = Lights when the water content in the fuel pre-cleaner reaches the sensor contacts.

EMR fault code

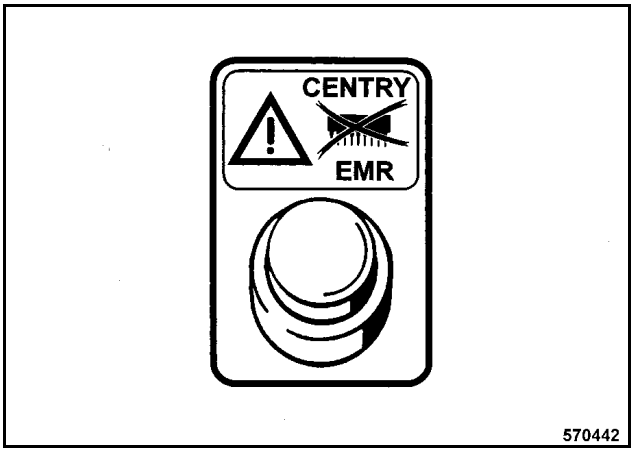


Fig. 16

i Note

Fault light is permanently on.

permanent light = A fault message is present, the engine can be started and the refuse compactor is still operable with limitations.

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5.19 Air filter vacuum switch

Vacuum switches, B03 and B116

i Note

The signal is not monitored by the engine control unit.

The signal is monitored by the ESX-control.

The pressure switches are connected in parallel.

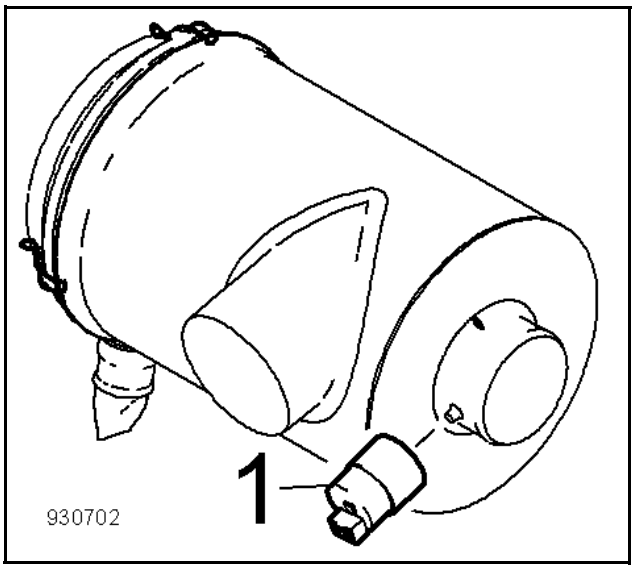


Fig. 17

Monitoring by ESX-control

i Note

The signal is evaluated by the ESX-control (Pin X0:11) and displayed 2 seconds later in the display module (Fig. 18) with code "526".

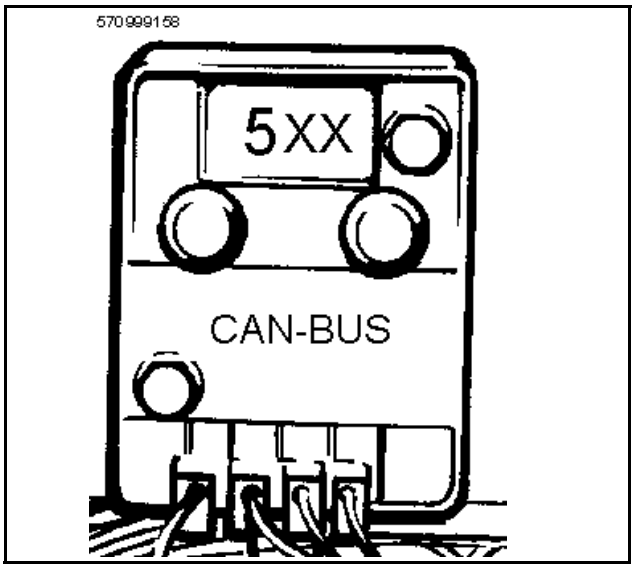


Fig. 18 Display module in central electrics

Air filter warning light

The vacuum switches operate at a vacuum of > 50 mbar.

The switch contacts connect the monitoring board (A15, terminal X1:86) to ground. The air filter warning light **5** (Fig. 19) or **g** (Fig. 20) lights up.

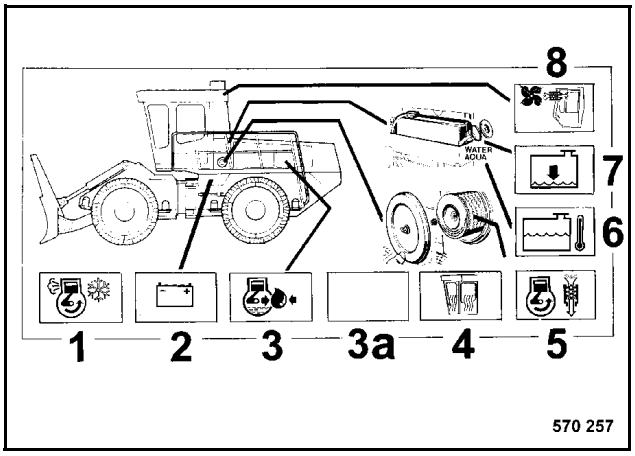


Fig. 19 Monitoring module, old design

5 yellow = Air filter warning light
Lights when the combustion air filter is contaminated.
Clean or replace, as necessary.

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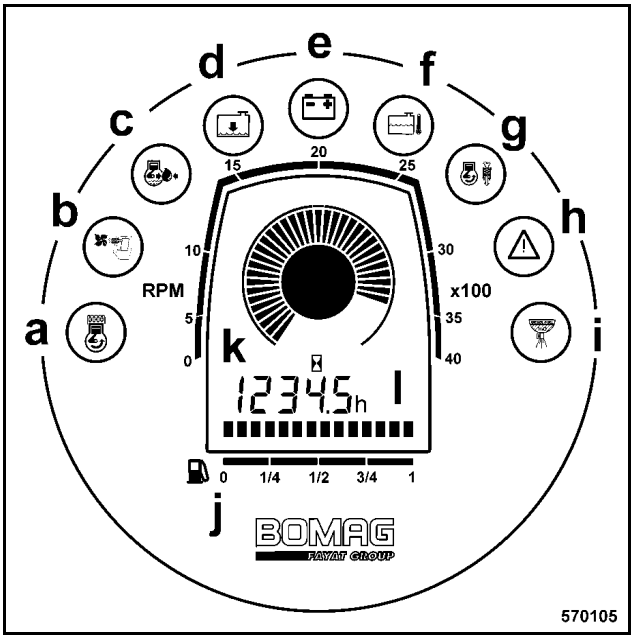


Fig. 20 Monitoring module, new design

g yellow = Air filter warning light
Lights when the combustion air filter is contaminated.
Clean or replace, as necessary.

5.20 Coolant temperature sensor

Temperature sensor, B53

i Note

The temperature sensor is not monitored by the engine control unit.

The temperature sensor is installed inside the engine. The analog sensor is a variable resistance switched rto ground.

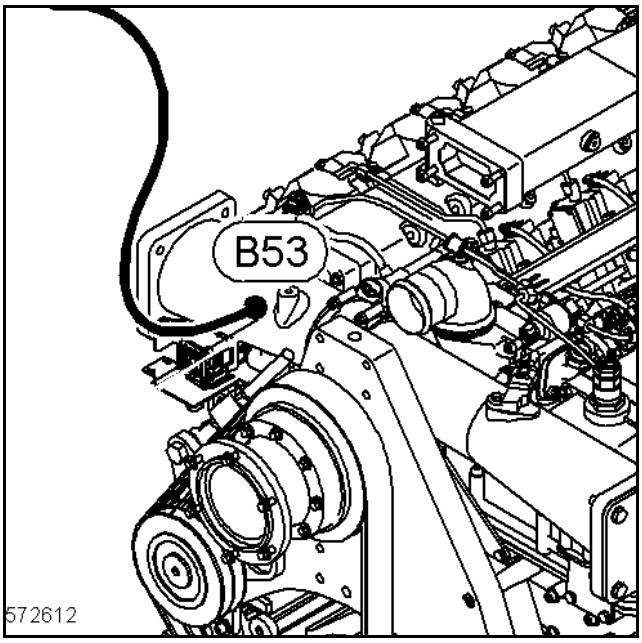


Fig. 21 Diesel engine

Temperature gauge, P14

This gauge shows the temperature of the coolant.

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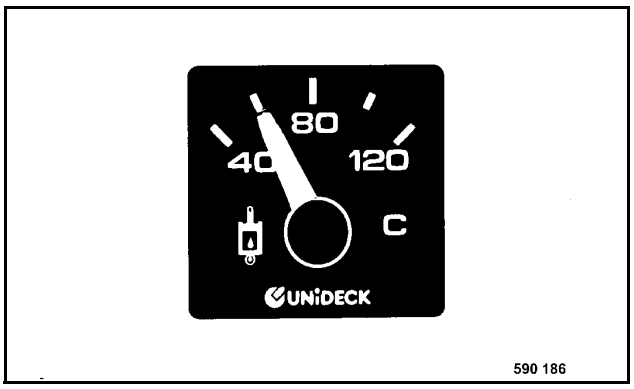


Fig. 22 Temperature gauge, old design

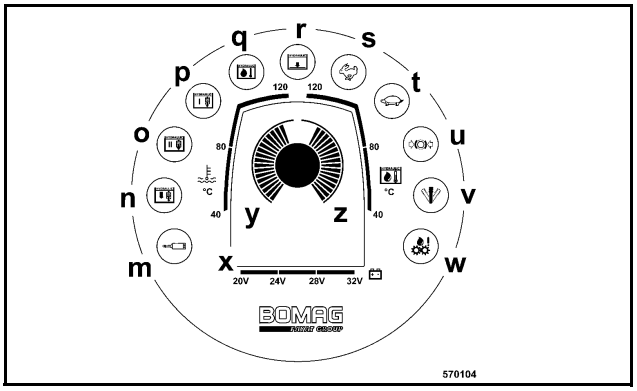


Fig. 23 Temperature gauge (y), new design

i Note

480 OHM ⇒40°C

36 OHM ⇒120°C

New version: If no temperature sensor is connected or the cable is broken, the temperature gauge will go out.

5.21 Float switch, coolant tank

Float switch, B55

i Note

The signal is not monitored by the engine control unit.

The signal is monitored by the ESX-control.

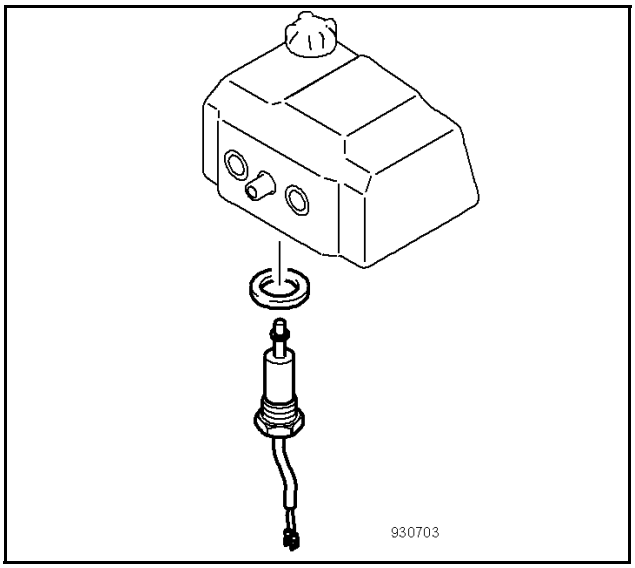


Fig. 1

Monitoring by ESX-control

i Note

The signal is evaluated in the ESX-control (Pin X0:19).

After 2 seconds the display module (Fig. 2) shows the code "524".

Code "525" appears after 20 seconds, the engine is shut down and the warning buzzer sounds.

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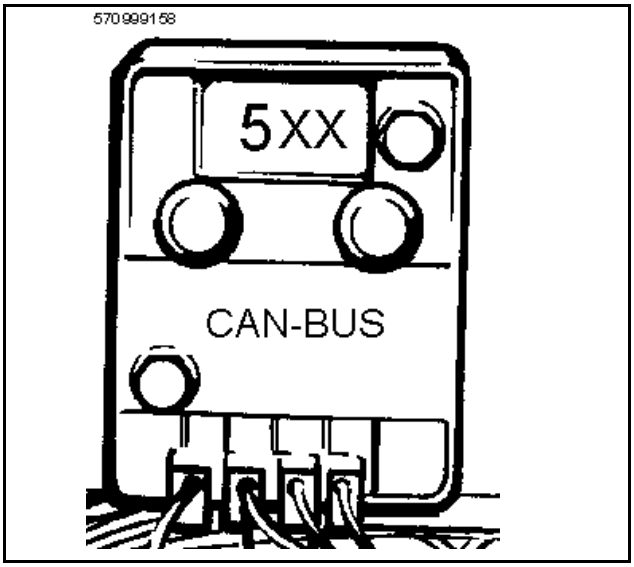


Fig. 2 Display module in central electrics

Coolant level warning light

The float switch switches if the coolant level is too low. The switch contact connects the monitoring board (A15, terminal X1:85) to ground. The coolant level warning light **7** (Fig. 3) or **d** (Fig. 4) flashes.

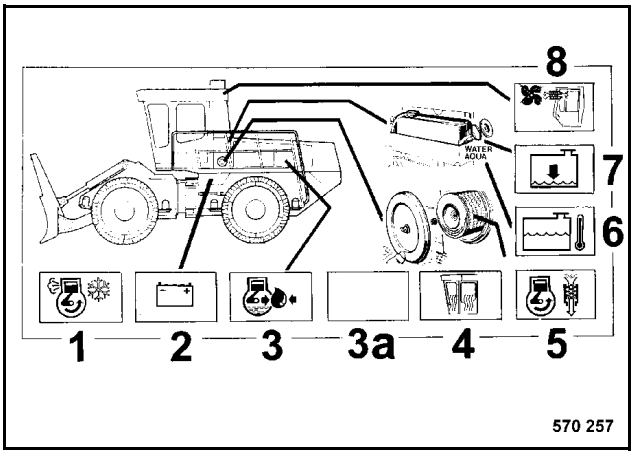


Fig. 3 Monitoring module, old design

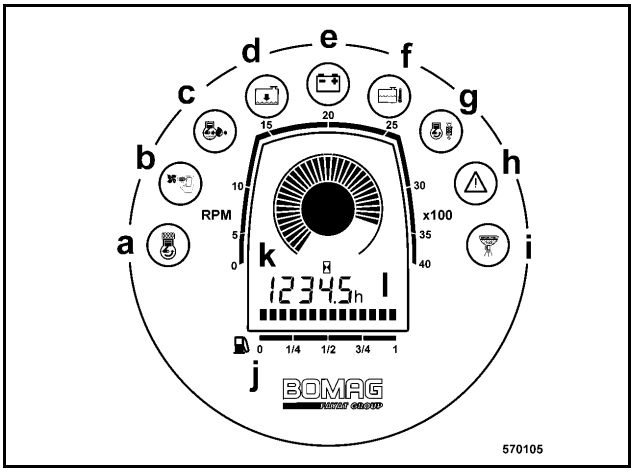


Fig. 4 Monitoring module, new design

5.22 Charge control light, engine RPM-meter

i Note

The generator is not monitored by the engine control unit.

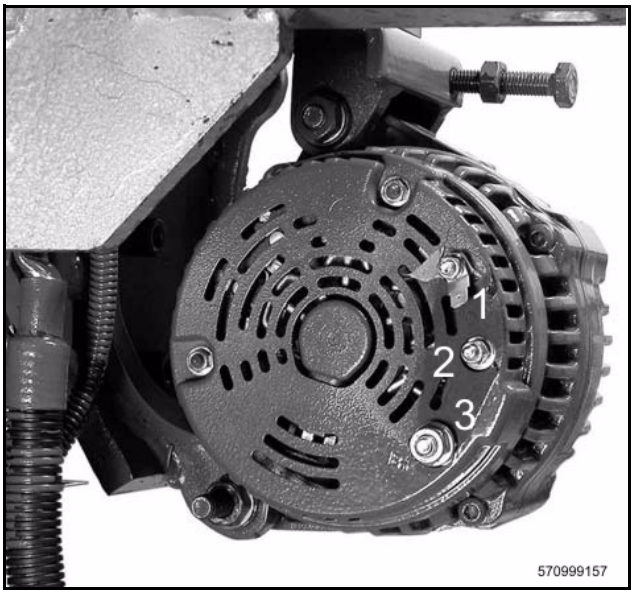


Fig. 1 Generator

1 Terminal W
2 Terminal D+
3 Terminal B+

Charge control light

Charge control light, old design

If the battery is not being charged, a ground signal is applied to D+ terminal 2 (Fig. 1). Current flows from the monitoring board (A15) through the charge control light to the D+ terminal. The charge control light **2, yellow** (Fig. 2) lights up.

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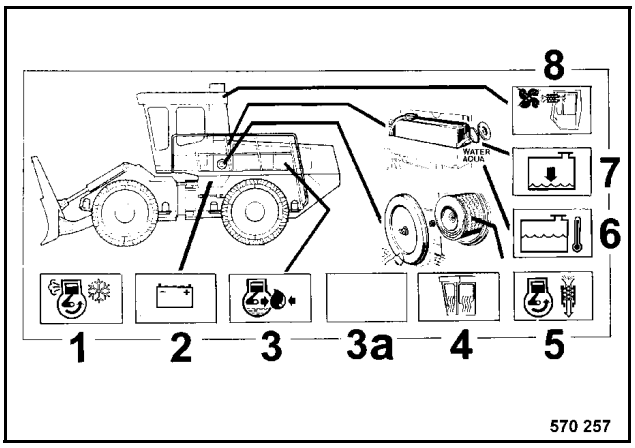


Fig. 2 Monitoring module, old design

Charge control light, new design

If the battery is not being charged, a ground signal is applied to D+ terminal 2 (Fig. 1). The coil of relay (K61) is excited. Current flows from the monitoring board (A15, Pin 10) through the coil of relay (K62) to ground. The charge control light **e, yellow** (Fig. 3) lights up.

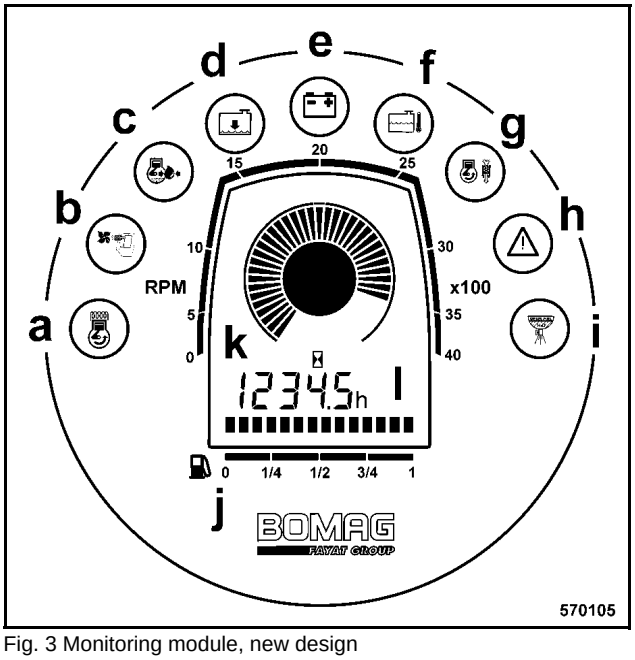


Fig. 3 Monitoring module, new design

Engine PRM-meter

Terminal "W" on the generator delivers a pulsating direct voltage, which is utilized to determine the rotary speed of the engine.

5.23 Generator

General

The generator should be of light weight, have a high rate of efficiency and supply all consumers in the vehicle with electric current at a steady voltage already at idling speed.

Terminal designations

- B61, L = charge control
- B+, B = battery plus, also with the designation "30"
- B- = battery minus, also with the designation "31"
- D+ = dynamo plus corresponds with terminal "61" and "L"
- D- = dynamo minus (this designation is only found on D.C. generators or A.C. generators with regulator removed)
- DF = dynamo field (this designation is only found on D.C. generators or A.C. generators with regulator removed). Note: The designation DF is also found on older alternators with externally arranged regulator on the connection of the exciting coil to the regulator or on the regulator itself
- DF1 = dynamo field 1
- DF2 = dynamo field 2
- IG = "15" ignition switch

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Three-phase generator

The AC-generator first of all produces AC-voltage / AC-current.

Why does AC-current need to be rectified?

There are a few components for which can either be operated with alternating current or direct current, because they work independently from the current flow direction.

This includes :

- Incandescent lamps
- Fluorescent lamps
- Glow lamps
- Electric heating elements.

There are also a few components that could be operated either with alternating current, direct current or three-phase current, if the components were designed accordingly.

This includes :

- Electric motors
- Relays.

Finally, a variety of important components solely require direct current. These will under no circumstances work with alternating or three-phase current.

This includes :

- Accumulators
- Control units
- All electronics
- Communication equipment.

Design and function

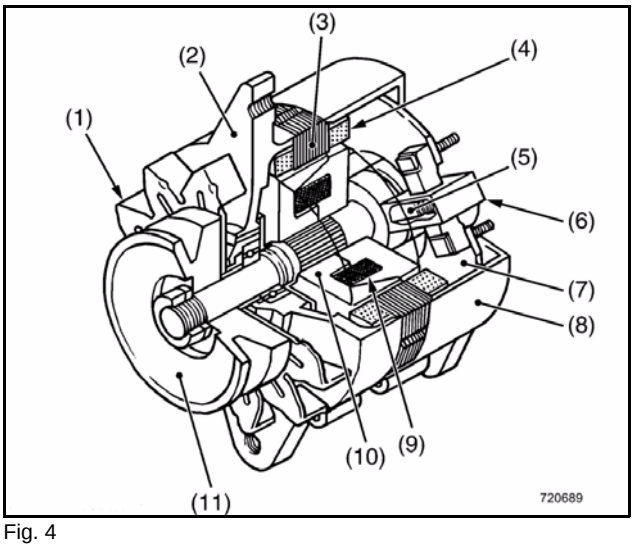


Fig. 4

1 Fan
2 Holding plate
3 Stator core
4 Stator winding
5 Brush
6 Brush holder
7 Rectifier
8 Bearing cover
9 Rotor winding
10Rotor
11V-belt pulley



Fig. 5 Rotor with claw poles

In the generator the armature windings are located inside the stationary stator (Fig. 6), whereas the exciter winding is arranged on the internally revolving rotor (Fig. 5).



Fig. 6 Stator

The three stator windings (Fig. 6) are electrically offset to each other by 120°. The excitation of the magnetic field requires direct current, which is fed to the rotor via two carbon brushes and slip rings.

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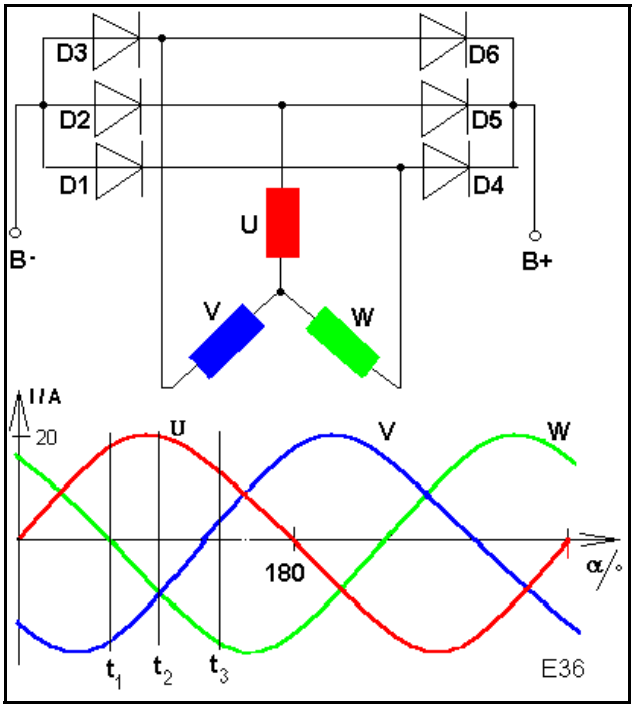


Fig. 7 3-phase current

The wiring diagram (Fig. 7) shows the 3 windings in Y-connection and the 6 associated rectifier diodes (D1 to D6).

The diodes D1, D2, D3 are also referred to as minus diodes, because they have B- as common connection (minus plate). The other diodes are the plus diodes.

The rectifier diodes have the effect that the negative half-wave is suppressed and only the positive section of the wave is allowed to pass, resulting in a pulsating D.C. voltage.

Charge control light

The charge control light has two duties:

- Indication of the correct generator function
- External excitation of the generator during the starting phase

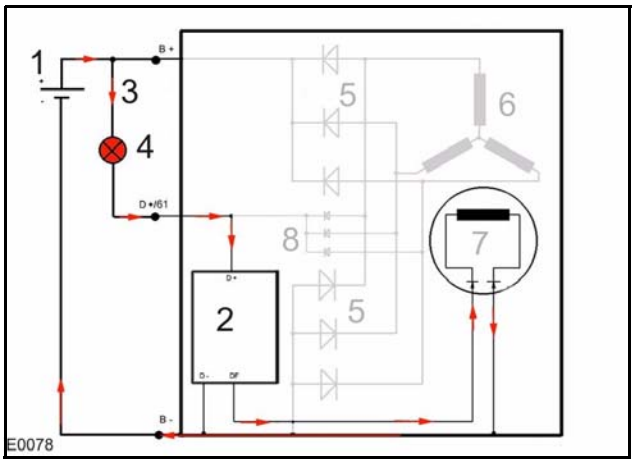


Fig. 8 plus controlled charging regulator

(Fig. 8) shows the current flow with the ignition switched on, engine stopped.

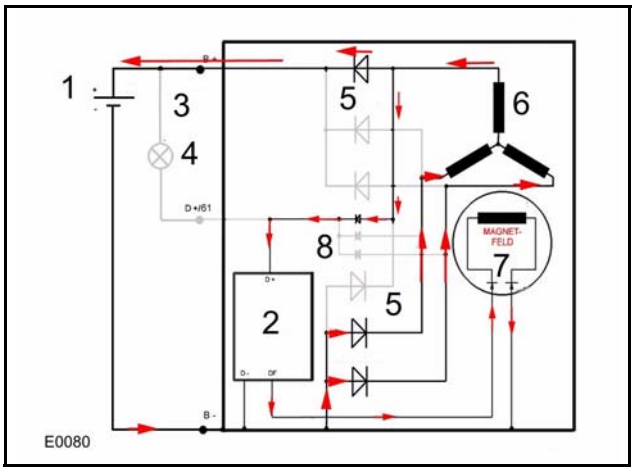


Fig. 9 plus controlled charging regulator

(Fig. 9) shows the current flow with the ignition switched on, engine running.

1 Battery
2 Charge controller
3 Ignition switch
4 Charge control light
5 Rectifier
6 Rotor
7 Sliprings / carbon brush
8 Auxiliary rectifier

Normally the charge control light lights with the engine stopped and the ignition switched on and goes out at low engine speed, but at the latest after a single, short-term increase in engine speed from idle speed, because there is no longer a voltage difference on the lamp.

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Any other behaviour would indicate a defect on the generator (rectifier, carbon brushes, regulator) or a defect on the lamp, presumed the on-board battery is not discharged.

A far more important function of the lamp is the transition and provision of field current. At standstill there is no magnetic field in the de-energized generator. Since this is necessary for the generation of electric current, the rotor must be supplied with current, so that a weak field can build up.

The current flows from the ignition switch via the charge control light through the generator winding against ground (terminal 31) and is limited to approx. 300 mA by the light bulb (4 W) (without the lamp the current flow would be 2 to 5 A). While the rotor is rotating current is induced into the stator winding, whereby a small part (2–5 A, depending on speed) flows through the charge regulator into the field winding of the rotor and the major part flows to the output terminals (B+), where it can be tapped as useful current. If the charge control light is defective or no battery is available or the battery is discharged, external excitation is no longer possible at standstill and no voltage will be generated, even when the generator is running.

With used, older generators a weak permanent magnetic field may have developed over the lifetime, which does even exist when no voltage is applied. This type of machines can even start without charge control light and produce current during operation. However, this is an unintended effect and you should not presume that a generator without charge control light or external excitation can be started up.

Charge controller

The charge controller has the following functions

- To regulate the voltage generated by the generator
- To protect against overloads caused by too high output current
- Protection against reverse current

If the output voltage or the output current of the generator exceeds the determined maximum values, the field current and thus the electric power is reduced.

Electronic charge regulator

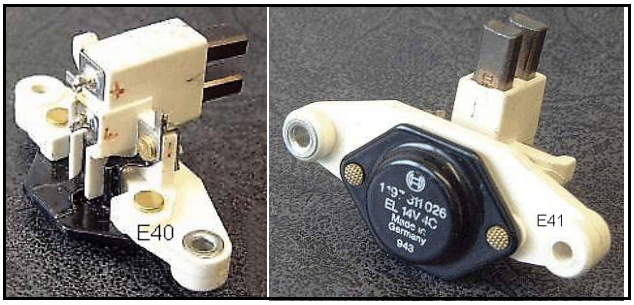


Fig. 10

In AC-generators the electrically generated exciter field of the generator rotor is influenced by an attached electronic charge regulator. Together with the holder for the carbon brushes this regulator forms a unit, which transfers the field current to the sliprings of the rotor.

The regulator compares the rectified actual current of the generator with the a stable reference voltage in the regulator and matches the strength of the exciter field (field current) by increasing or reducing the current flow (PWM, switching controller) in such a way, that the actual voltage of the generator remains constant, irrespective of load and speed. The generator voltage is thereby regulated, the generator current, however, is not measured, but limited by the construction dependent internal resistance of the stator coils or thermal monitoring.

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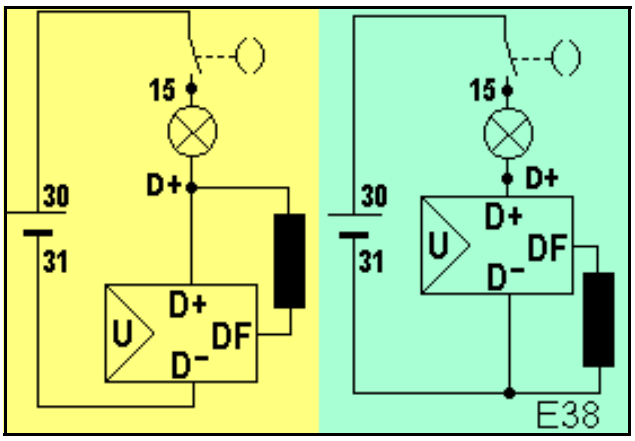


Fig. 11 plus controlled regulator

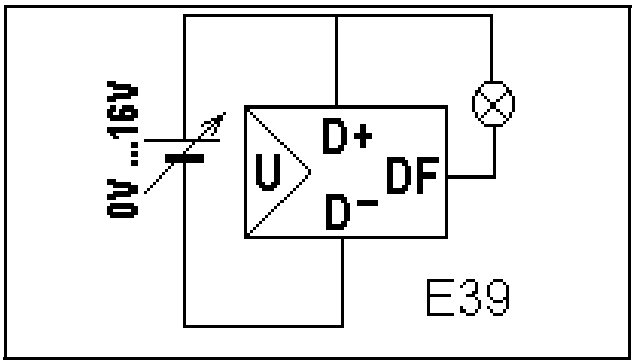


Fig. 12 minus controlled regulator

Checking the generator

First one must check whether the generator is actually defective.

- This can be easily found out by checking whether the charge control light in the dashboard lights up. If the light does not go out, even at higher speeds, there must be a defect on the generator, the regulator, the wiring or the V-belt.
- When the engine is at rest, the charge control light must light up. If not, the lamp may probably be defective. Defects on generator or wiring are obviously also possible.

The following points allow to contain faults in the voltage supply within certain limits.

- Cable connections on the generator OK?
- V-belt OK?
- Generator ground (engine ground) OK?
- Pre-excitation from vehicle electronics OK?

Only if all criteria mentioned above are OK, the fault must be in the generator itself. In this case it must be replaced or the following trouble shooting procedure must be performed.

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Checking the pre-exciter circuit, D+ generator

The most common reason for a 3-phase alternator not charging is a too low pre-excitation current. The pre-excitation current through connection D+ depends on the connected consumer (resistance), e.g. charge control light or relay of a MD+ engine control.

The pre-excitation current should be approx. 250 mA at 12 Volt. This corresponds with a 3 Watt light bulb or an equivalent combination of light bulb + resistance or an LED + resistance.

The total resistance of the disconnected dead supply line D+ max. should not exceed 48 Ohm.

In case of faults like

- charge control light stays on
- no voltage increase, e.g. from 12 V to 14 V

one should check that the correct resistance is assured.

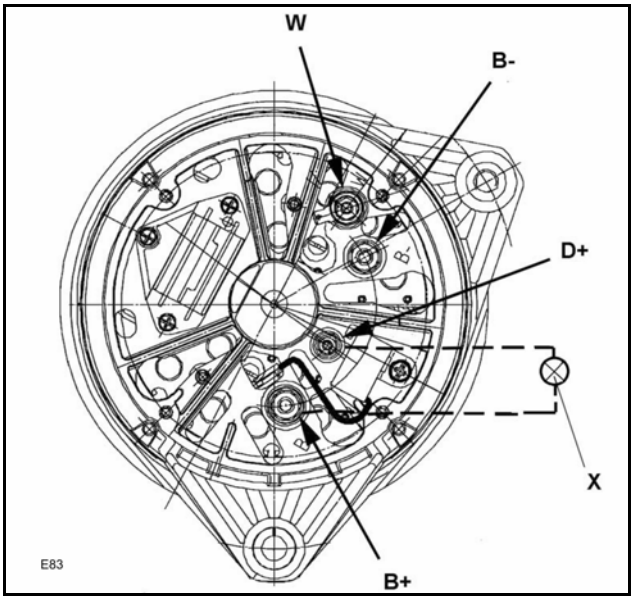


Fig. 13 Connections on the three-phase alternator (exemplary design)

If the charge control light or LED stays on when the engine is running, you should proceed as follows:

- Temporarily bridge connections D+ and B+ on the three-phase alternator (Fig. 13). The bridging must be made using an insulated cable with a cross-section of approx. 1.0 mm, which is stripped for approx. 5 mm on either end. This cable must be fitted with a consumer (X), e.g. a light bulb of 21 W, 12 V, in case of a 12 V system.

If this measure does not clear the fault, the alternator must be defective.

Measuring the charge current

- All plug-and-socket connectors must be free of corrosion and intermittent contact.
- The generator ground connection must be OK.
- During the measurement switch on as many consumers as possible.

1 Attach the clip-on ammeter around the B+ line.

2 Gradually increase the engine speed.

3 The generator current must be at least as high as the total current of all switched on consumers.

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Checking the rotor

i Note

The rotor coils can only be measured in disassembled state.

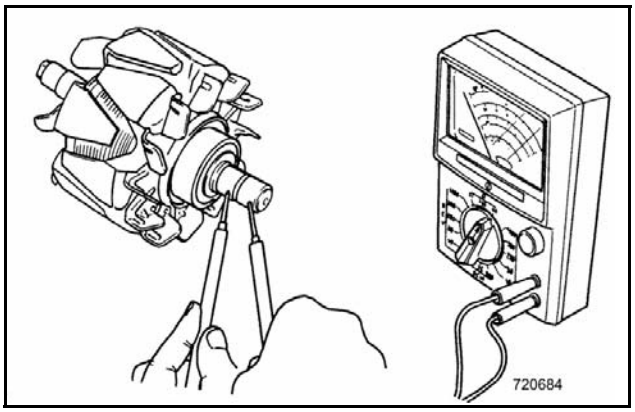


Fig. 14

- Measure the resistance between the sliprings.
- If the resistance does not comply with the factory specification, replace the rotor.
- Use the resistance range of the continuity tester to check the continuity between slipring and core.
- Replace the rotor if no infinite value is indicated.

i Note

Factory specification for resistance: 2.8 to 5 OHM.

Checking the stator

i Note

The stator coils can only be measured in disassembled state.

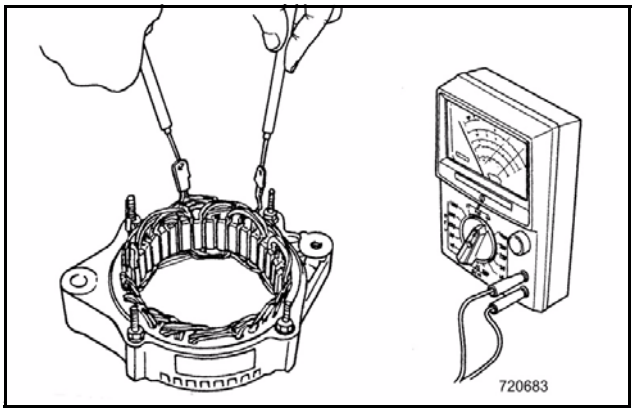


Fig. 15

- Use the resistance range of the continuity tester to measure the resistance between the individual lines of the stator winding.
- If the measuring value does not comply with the factory specification, replace the stator.
- Use the resistance range of the continuity tester to check the continuity between the individual stator windings and the core.
- Replace the stator if no infinite value is indicated.

i Note

Factory specification for resistance: Less than 1 OHM.

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Checking the bearings

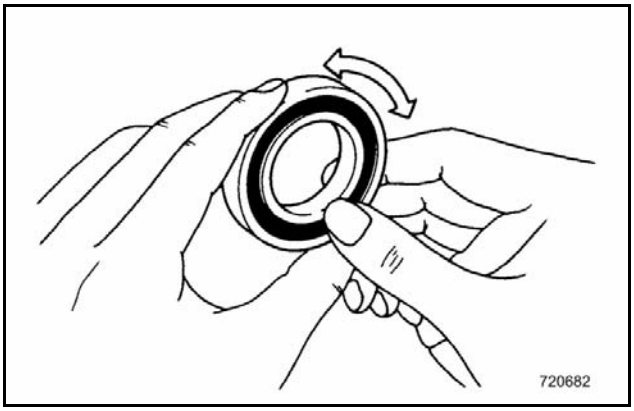


Fig. 16

- Check whether the bearing rotates without obstruction.
- Replace the bearing if it does not rotate properly.

Checking the regulator voltage with the generator tester

The battery and generator tester comes with an 8-line LC display with background illumination and is able to print out test results via an (optional) thermal printer.



Fig. 17

The generator test assesses the regulator voltage and the ripple factor of the generator voltage.

- All plug-and-socket connectors must be free of corrosion and intermittent contact.
- The generator ground connection must be OK.
- The battery should be in good condition – the idle voltage of the battery should be at least 12.6 Volt.
- If possible switch off all consumers.
- Perform the measurement at raised engine speed.

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Checking the regulator voltage with the multimeter

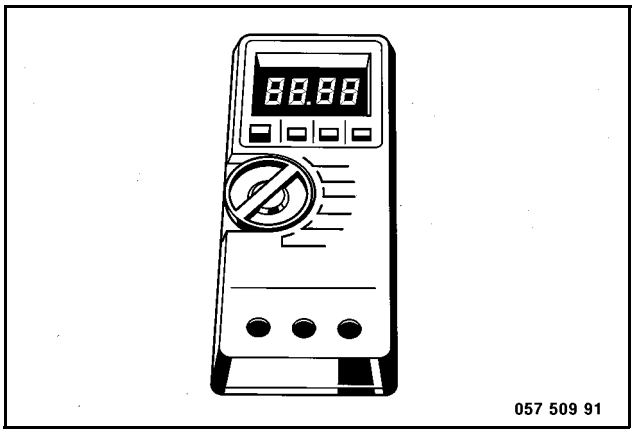


Fig. 18

- All plug-and-socket connectors must be free of corrosion and intermittent contact.
- The generator ground connection must be OK.
- The battery should be in good condition – the idle voltage of the battery should be at least 12.6 Volt.
- If possible switch off all consumers.
- Perform the measurement at raised engine speed.
- The voltage (B+) should adjust itself at 13 to 14 Volt.

Checking the regulator in disassembled state

On a **Bosch generator** unscrew two fastening screws for the regulator and lift the regulator off. For this work the generator does not need to be removed.

The **Delco-Remy generator** needs to be removed and partly dismantled, if the regulator needs to be disassembled. Unscrew the housing screws to do so. Pull rotor with drive bearing and V-belt pulley out of the stator. Unscrew the ends of the stator winding from the diode carrier and separate the stator from the collector ring bearing. Disassemble exciter diodes and brush holders and remove also the regulator.

i Note

When testing the regulator one should be aware that there are 2 different types of regulators:

- If the carbon brush is not connected to ground the regulator is a so-called minus controlled regulator. The exciter winding is positioned between D+ and DF, the regulator therefore regulates the exciter winding on the ground side. The other carbon brush is connected with the cathodes of the exciter diodes, terminal D+. This leaves one further terminal, this is DF.

D+ (vehicle wiring system)

D- (ground contact, mostly located on one of the fastening screws)

DF (Dynamo Field)

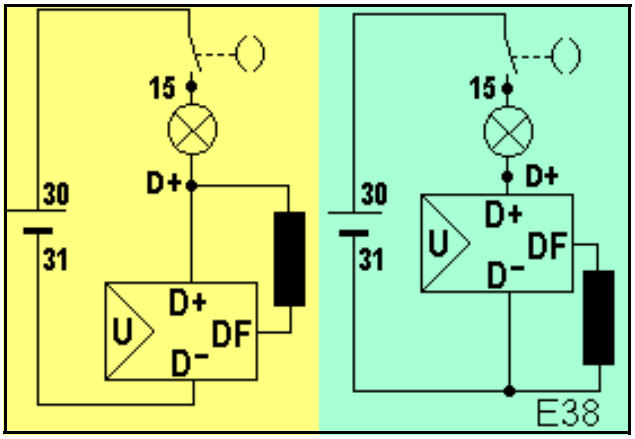


Fig. 19

- If the carbon brush is connected to ground the regulator is a so-called plus controlled regulator. The exciter winding is positioned between DF and D-, the regulator therefore regulates the exciter winding on the plus side. The other carbon brush is then connected with terminal DF. This leaves one further terminal, this is D+.

The basic function of a disassembled regulator can be easily tested with a 12V lamp and an adjustable D.C. power supply unit (0V ... 20V).

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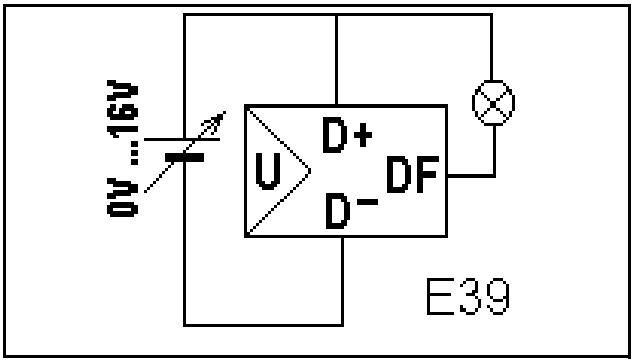


Fig. 20

E.g minus controlled regulator

One connects the regulator (Fig. 20) with D+ and D- to the power source, as shown in the illustration, and the lamp to both carbon brushes, instead of the exciter winding. When slowly increasing the voltage the lamp will first become brighter, because the regulator allows all lamp current (= exciter current) to flow at voltage values up to 14.4V. Once the regulator voltage is reached, the regulator switches the lamp current off. When returning the voltage back below the control voltage, the regulator will switch the lamp back on.

With this test the major difficulty is the problem to remove the regulator an identify terminals D+, DF and D-.

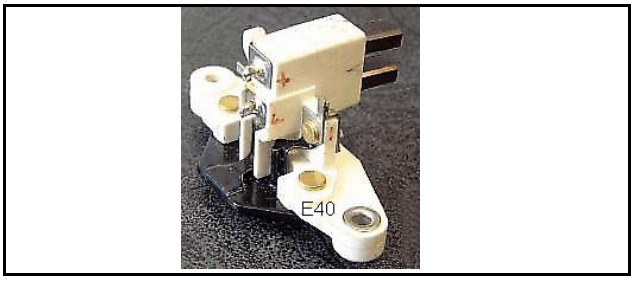


Fig. 21



Fig. 22

The illustrations (Fig. 21) and (Fig. 22) show two different regulator types.

Replacing carbon brushes

- On a **Bosch generator** unscrew two fastening screws for the regulator and lift the regulator off. Pull out the carbon brushes from underneath. Their minimum length is **5 mm**, shorter carbon brushes need to be replaced, unsolder both connection litz wires. Solder the litz wires of the new carbon brushes, insert these and fasten the regulator again. For this work the generator does not need to be removed.
- For replacing the carbon brushes in the **Delco-Remy generator** the generator needs to be disassembled and partly dismantled. The carbon brush holder is located inside the collector ring bearing.

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5.24 Replacing the voltage regulator

Disassembling the regulator

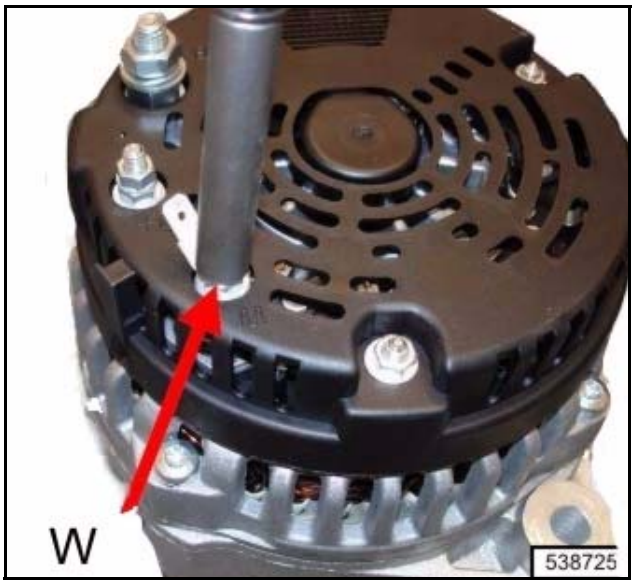


Fig. 1

- Unscrew the hexagon nut M5 from terminal W (Fig. 1).
- Remove hexagon nut, washer and flat-pin plug.

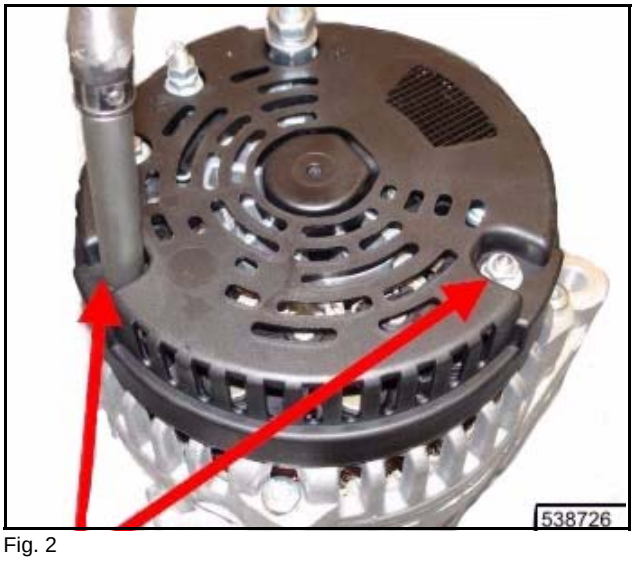


Fig. 2

- Unscrew the fastening nuts M5 from the protective cover (Fig. 2).

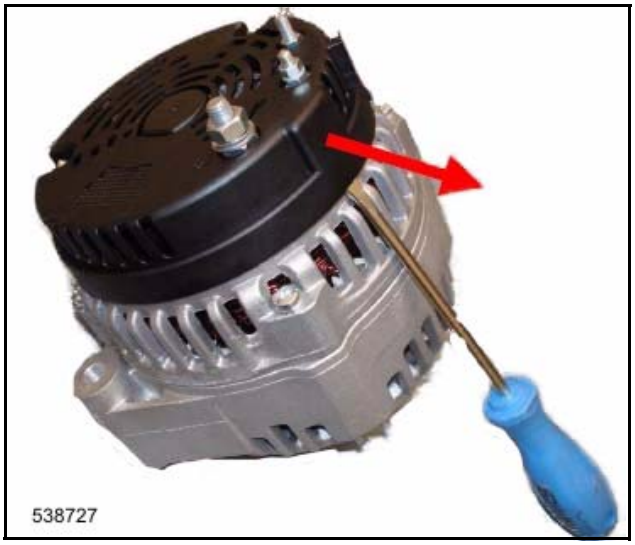


Fig. 3

- Lift off the plastic protective cover using a screwdriver (Fig. 3).
- Remove the protective cover.

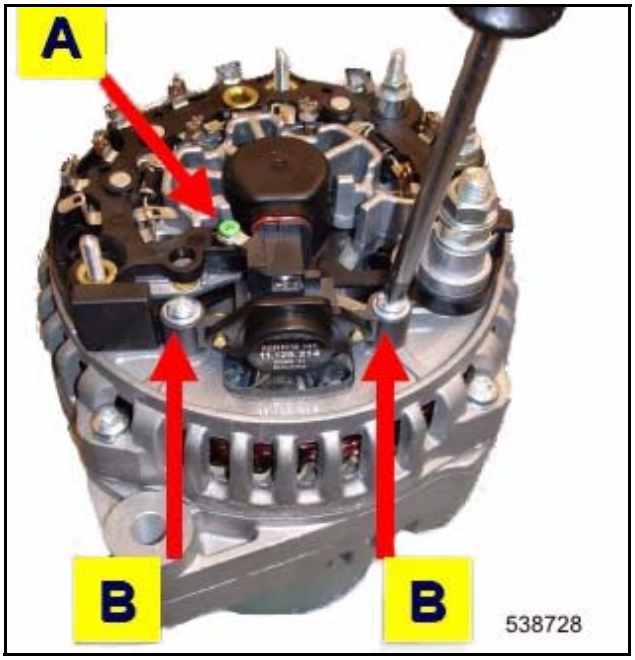


Fig. 4

- Slacken the screws M3 (A) (Fig. 4).
- Loosen the screws M5 (B).
- Remove the screws, lift off the voltage regulator.

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Assembling the voltage regulator

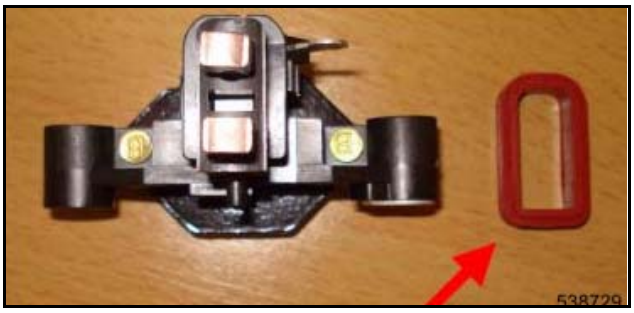


Fig. 1

i Note

Check the correct alignment of the gasket before placing it on the brush holder (Fig. 1).

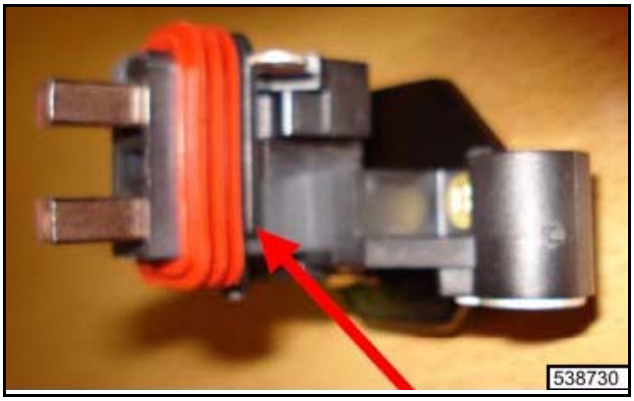


Fig. 2

i Note

The gasket must be pushed fully against the brush holder (Fig. 2). For easy assembly of the regulator the gasket ribs may be wetted.

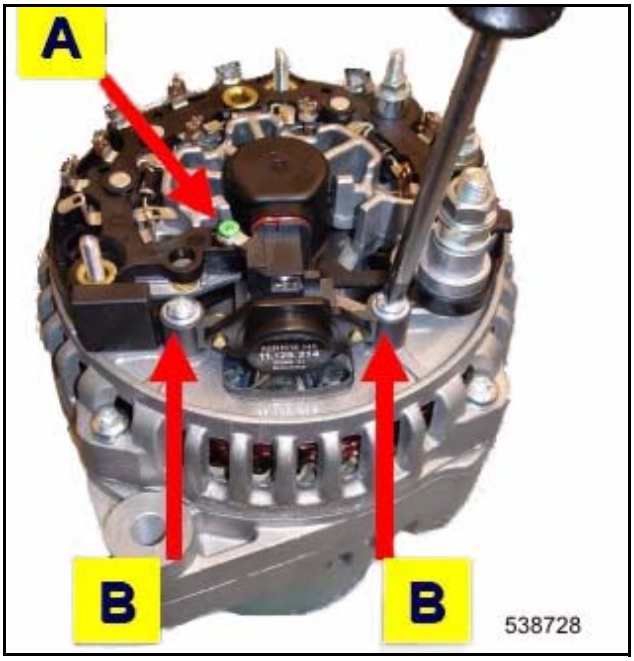


Fig. 3

- Attach the voltage regulator (Fig. 3).

i Note

The gasket must be inserted into the rectifier plate.

- Tighten the screw M3 (A).- Tightening torque 0.7-1.0 Nm.
- Tighten the screw M5 (B).- Tightening torque 3.5-4.5 Nm.

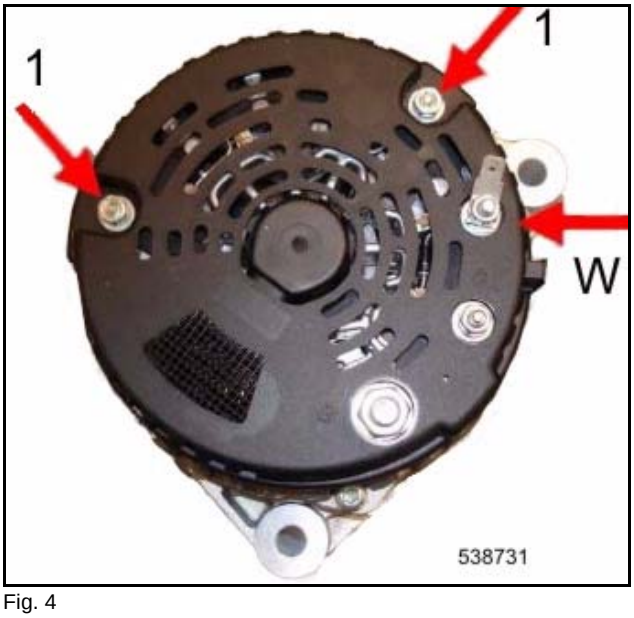


Fig. 4

- Attach the protective cover and fasten it with washers and hexagon nuts 1(Fig. 4). Tightening torque 4.0-5.0 Nm.
- Attach flat-pin plug, washer and hexagon nut to terminal (W) and tighten.- Tightening torque 2.7-3.8 Nm.

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5.25 Electric starter

General

Combustion engines need to be started by means of a special device, because they are not able to start by themselves. Considerable resistances caused by compression and friction must thereby be overcome.

The starter converts the electric energy stored in the battery into mechanical energy. The starter can only generate its power when a battery with appropriate capacity is available.

Duties of the starter:

- to accelerate the combustion engine to start speed with lowest possible current consumption.
- establish the gear connection between starter and combustion engine.
- to maintain this connection.
- to switch on the starter current.

After starting the engine:

- to return the starter pinion to initial position.
- to switch off the starter current.

Directly acting electric starter

This shows the design of this starter. It consists of a starter motor and a magnetic switch.

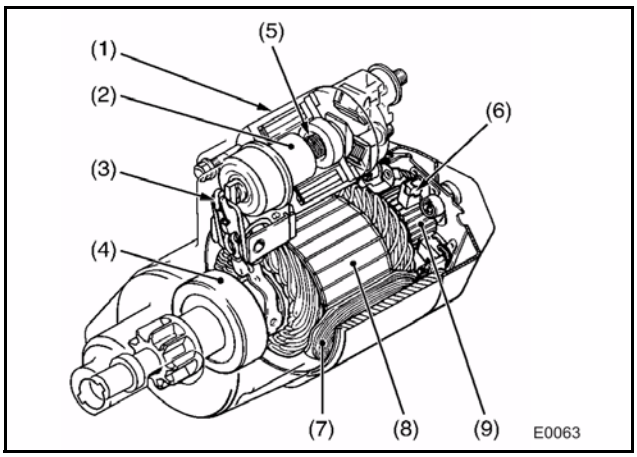


Fig. 5

1 Magnetic switch
2 Armature
3 Actuating lever
4 Freewheeling clutch
5 Resetting spring
6 Brush
7 Exciting winding
8 Armature
9 Collector

Ignition switch in position "START"

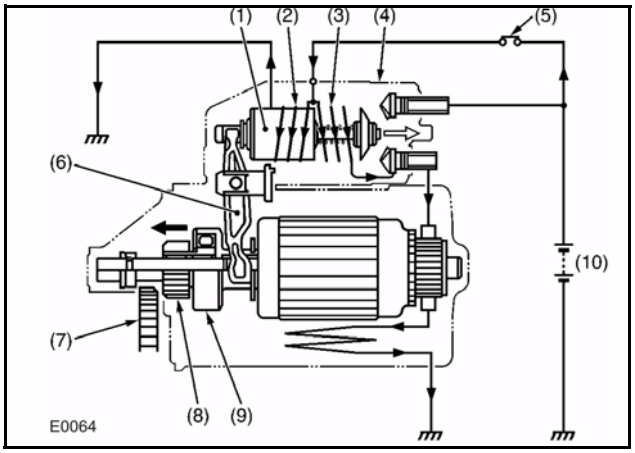


Fig. 6 Magnetic switch open

With the ignition switch (5) in "START" position current flows from the battery (10) through the holding winding (2) and the pick-up winding (3).

The armature (1) is magnetically picked up and forces the pinion (8) with the actuating lever (6) to engage with the ring gear (7).

1 Armature
2 Holding winding
3 Pick-up winding
4 Magnetic switch

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5 Ignition switch
6 Actuating lever
7 Ring gear
8 Pinion
9 Freewheeling clutch
10(Battery

Pinion meshes with the ring gear

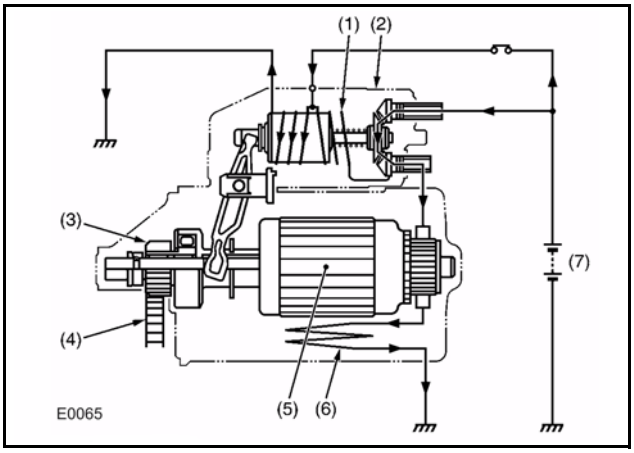


Fig. 7 Magnetic switch closed

When the pinion (3) meshes with the flywheel mounted ring gear (4) and the magnetic switch (2) is closed, a strong current flows from the battery (7) directly into the exciting winding (6) and the armature winding, but not into the pick-up winding.

This causes the armature (5) to rotate with high speed and drives the pinion, which in turn drives the ring gear (4) with a speed of 200 to 300 rpm.

1 Pick-up winding
2 Magnetic switch
3 Pinion
4 Ring gear
5 Armature
6 Exciting winding
7 Battery

Engine running

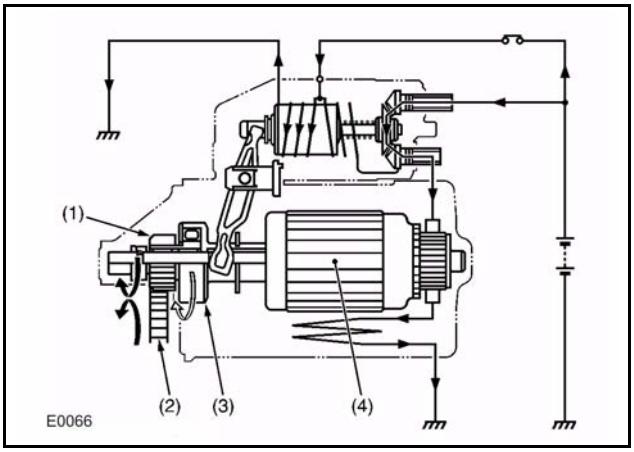


Fig. 8

Once the engine is running and drives the pinion (1) via the ring gear (2), the freewheeling clutch (3) will open and prevent the armature (4) from being driven by the engine.

1 Pinion
2 (Ring gear
3 Freewheeling clutch
4 Armature

Ignition switch released

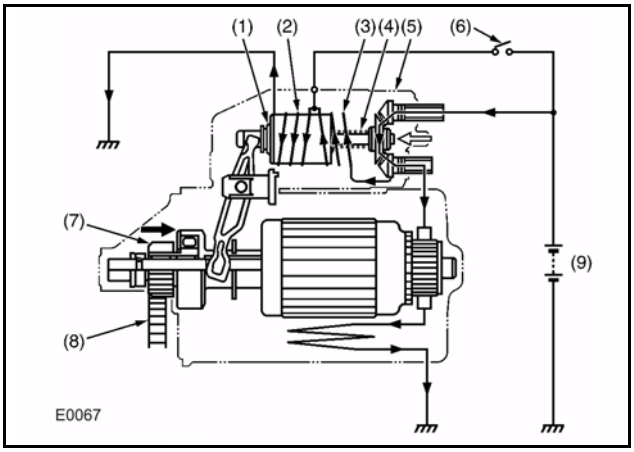


Fig. 9

When releasing the ignition switch (6) it will return from position "START" to "ON" and interrupt the starter current circuit. Current will now flow from the battery (9) through the contact plate in the pick-up winding (3) and the holding winding (2). Since both coils generate opposed magnetic fields, the magnetic field will collapse and the resetting spring (4) takes the armature (1) back to its initial position.

This opens the current circuit on the contact plate and the pinion (7) is pulled back from the ring gear (8) and stops.

1 Armature
2 Holding winding
3 Pick-up winding

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4 Resetting spring
5 Magnetic switch
6 Ignition switch
7 Pinion
8 Ring gear
9 Battery

Magnetic switch

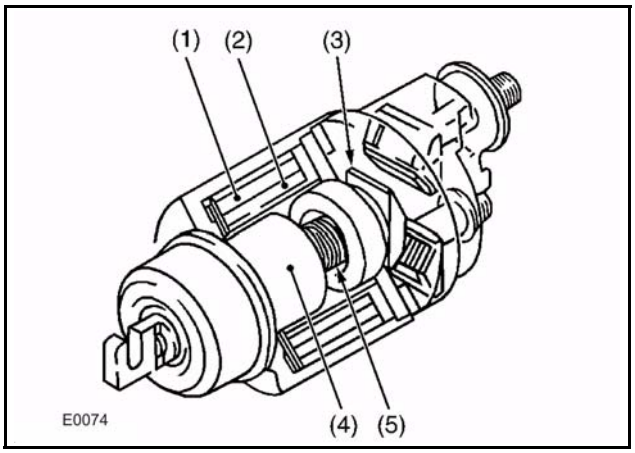


Fig. 10 Direct acting electric motor

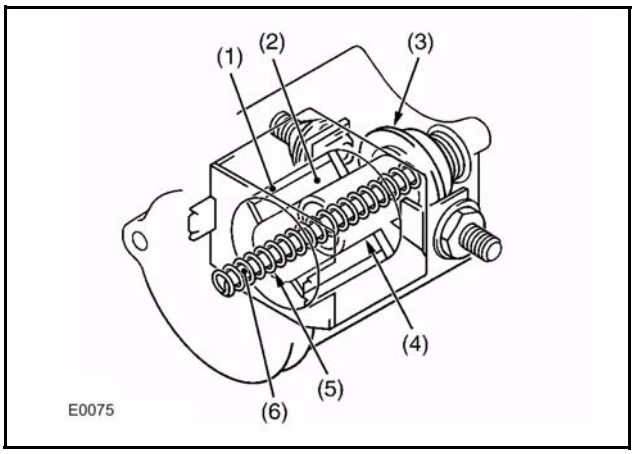


Fig. 11 Geared motor

Armature (4), contact plate (3) and armature guide (6) form a closed unit. When the ignition switch is turned to "START", the armature is picked up and causes the pinion of the clutch to disengage.

This causes the pinion and the ring gear to mesh, while the contact plate establishes a connection between the contacts, which enable the main current to flow into the armature. Once the ignition switch is opened, the resetting spring (5) will pull the armature back to initial position.

1 Holding winding
2 Pick-up winding
3 Contact plate
4 Armature
5 Resetting spring
6 Armature guide

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Freewheeling clutch

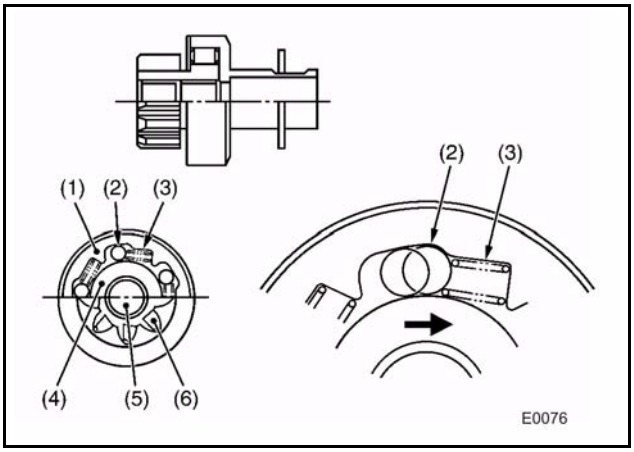


Fig. 12 Freewheeling clutch

The freewheeling clutch is designed in such a way, that the flow of force is automatically interrupted if the pinion (5) of the clutch rotates faster than the freewheeling ring (1) at higher engine speeds.

This makes sure that the armature will only drive the ring gear, but can never be driven by the engine.

1 Freewheeling ring
2 Roller
3 Roller spring
4 Splined shaft
5 Pinion
6 Pinion

Trouble shooting "Starter"

i Note

The most frequent fault is definitely a fully discharged battery.

If the starter rotates too slowly, either the brushes are partly worn off, or parts of the exciter or armature winding is shorted. In some cases oxidized electric contacts or a soiled ground connection causing extremely high voltage losses in the overall starter system are the cause of problems.

If the starter only emits a clicking sound,- either the magnetic switch is defect / soiled (dismantle and clean))- the main contacts on the magnetic switch are worn off / soiled (scrape off carefully with a file and clean)- the starter motor is defective / soiled (remove armature and clean), cover cleaned, moveable parts with grease.

Frequently a jammed return mechanism is the reason for a starter failure.

Occasionally worn contacts are found on the magnetic return switch

Defects on the actual starter motor including pinion and carbon brushes are very rare.

With a trouble shooting chart the faults in the starter system can be narrowed down. The starter system can only work when many conditions are fulfilled at the same time.

- Immobilizer deactivated?
- Ignition switch OK?
- Travel lever in correct position?
- Emergency stop not actuated?
- Battery sufficiently charged?
- Battery poles OK?
- Main battery fuse OK?
- Main battery switch closed?
- Main starter cable (terminal 30) OK?
- Starter control cable (terminal 50) OK, voltage drop?
- Ground cable OK?
- Switching of magnetic switches OK?

The sequence of these tests is generally of no significance. It mainly depends on:

- the experience of the specialist
- the failure probability of the component to be tested and the testing effort for the respective part.

Only if all criteria mentioned above are OK, the fault must be in the starter itself. In this case it can be repaired or replaced.

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Testing and measuring the starter

Function control with the starter removed

⚠ Caution

Fasten the starter to make sure that it will not come loose during the test.

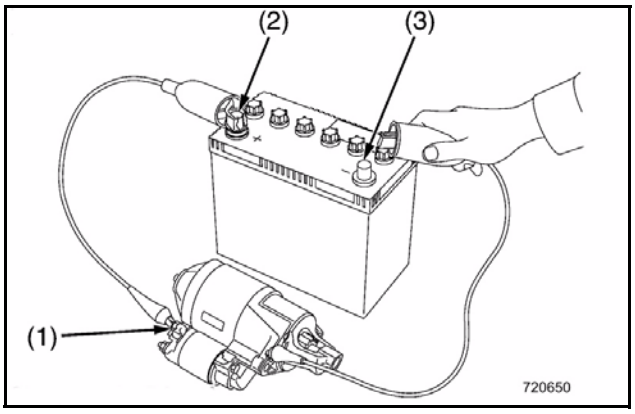


Fig. 13

- Connect a jumper lead between start terminal (1) and battery plus (2).
- Connect a jumper cable instantaneously between starter housing and battery minus (3).

i Note

If the motor does not start, the starter is defective. Repair or replace the starter.

Checking the magnetic switch

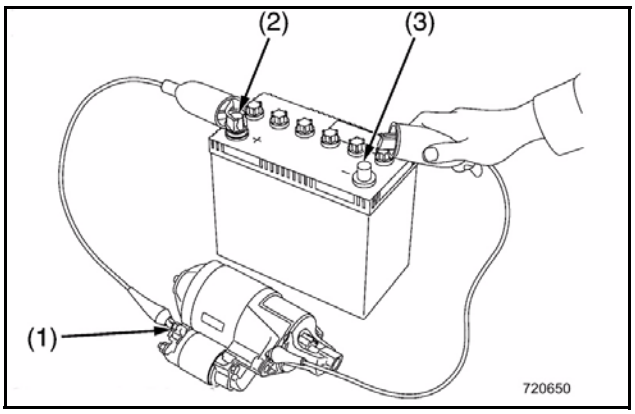


Fig. 14

- Connect a jumper lead between start terminal (1) and battery plus (2).
- Connect a jumper cable instantaneously between starter housing and battery minus (3).

i Note

If the pinion does not disengage, the magnetic switch is defective. Repair or replace the starter.

Continuity test for the magnetic switch

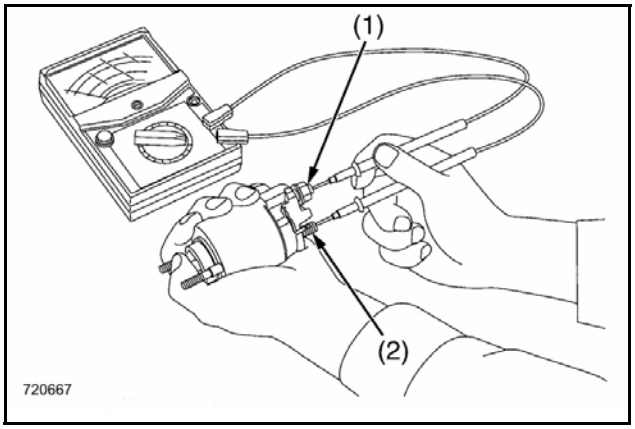


Fig. 15

- Use a continuity tester to check for continuity between terminal (1) and terminal (29 while holding the pin depressed.
- Replace the magnetic switch if no continuity is detected.

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6 Electronic control

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Installation location ESX-control

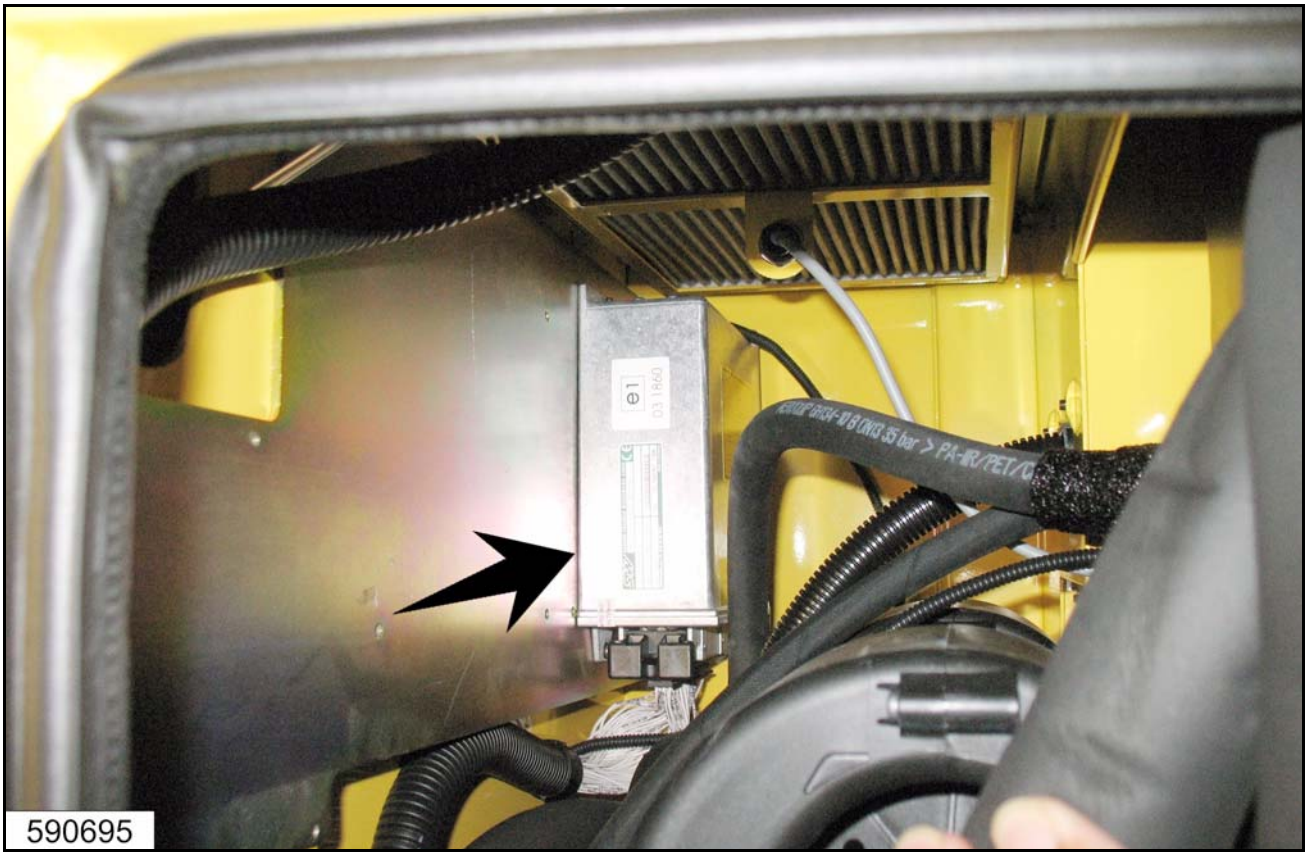


Bild 16 BC 972/1172

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6.1 ESX control

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Installation location ESX-control

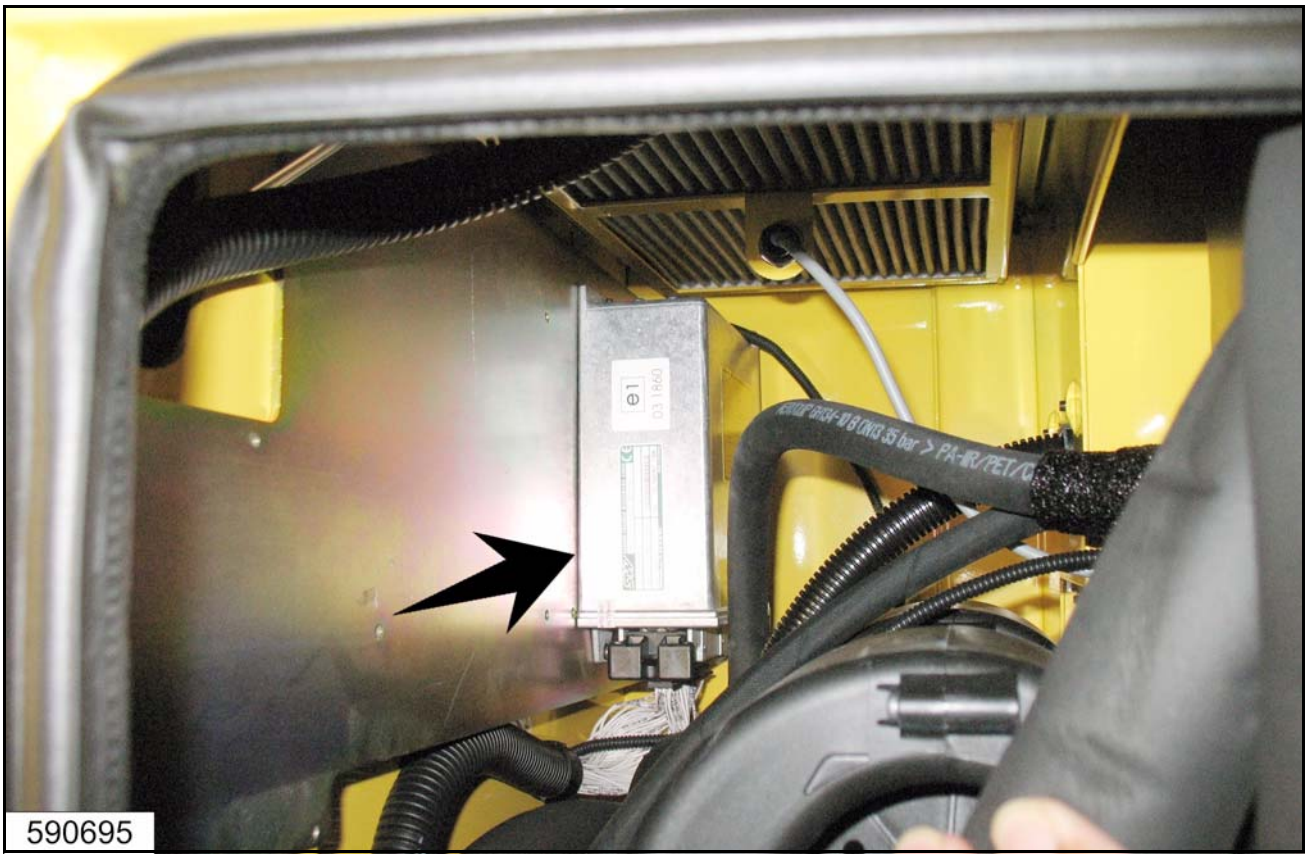


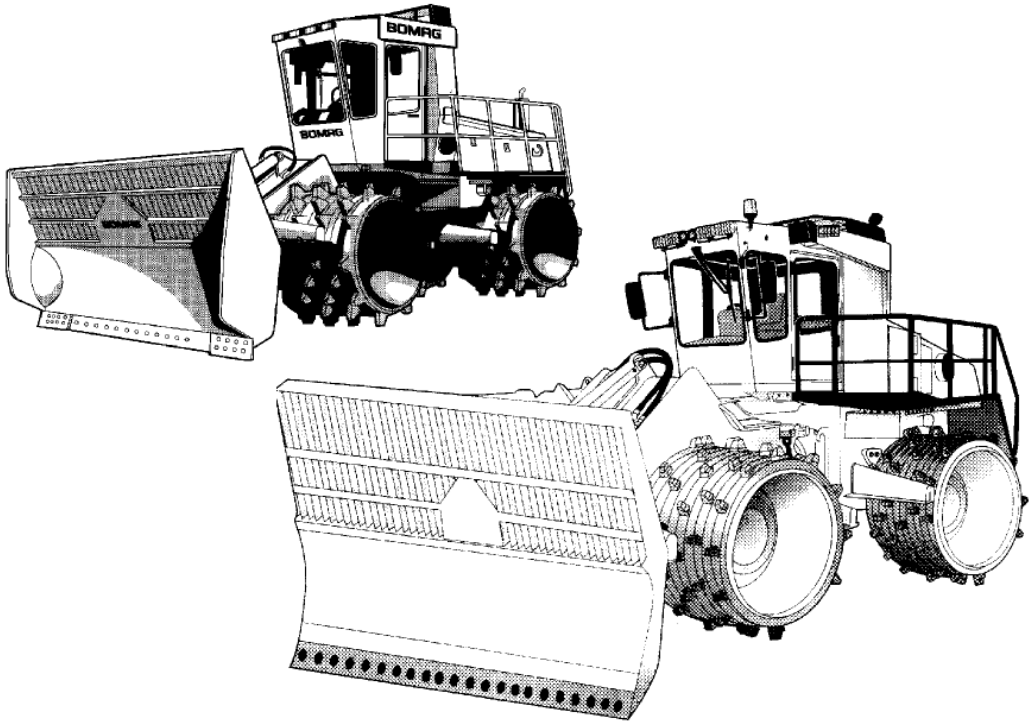
Bild 17 BC 972/1172

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BOMAG

Service Training
Electrics

BC572, 672, 772
BC972 ,1172



00809729 **Version 7.00**

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Author: T.Löw / TE
Dateiname: c:\dokumente und einstellungen\nickb\lokale einstellungen\temp\schulung elektrik bc972_v7.00_gb.doc

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Service Training Refuse Compactor BOMAG

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1 Document alteration list

No.	Date	Description of changes	resp.
1	25.04.01	**Creation of version 1.00**	Löw
2	29.06.01	**Creation of version 2.00:** Pin assignment for dozer blade joystick changed Fault "Hydr.Level1" eliminated Fault and display codes changed	Löw
3	02.07.01	Pin 10 (open bucket) and Pin 17 (pressure differential switch) exchanged.	Löw
4	22.08.01	Inclusion of column "known faults"	Löw
5	23.08.01	**Creation of version 3.00:** Parameter input "variable speed specification" eliminated Code input "enter machine type" added Block diagrams BC772 added Fault description "travel speed range valve" added Input codes "travel speed range valve" added Cross references to wiring diagram deleted.	Löw
6	27.08.01	Voltage limits for bucket joystick changed. actuated to left: high voltage, actuated to right: low voltage PIN 17 open bucket, PIN 34 close bucket	Löw
7	13.09.01	Input code for "enable float position“ added	Löw
8	01.10.01	Further point added under "known faults"	Löw
9	09.10.02	Fault 475 "Fault when initializing the DIOS module" added	Löw
10	25.02.02	Fault and input codes for travel pedal monitoring added (530..534), "Travel pedal monitoring parameter setting" added, list of known faults extended.	Löw
11	18.03.02	Description of input code 452 adapted: max. closing = 1000 max. opening = -1000	Löw
12	10.06.02	**Creation of version 4.00:** Input codes for machine type BC572 added Default setting 2nd gear changed to "FAST"	Löw
13	10.07.04	**Creation of version 5.00** Input codes 271 / 272 changed to "steering valve right" Input codes 276 / 277 changed to "steering valve left" Comment concerning saving faults on page 29 added. Explanation for input code 515 corrected (factor 10 added) Number of pulses / engine revolutions on page 20 corrected Speed data for 2nd gear on page 13 changed Fault codes 053 and 063 added Fault codes 052 and 062 added Fault codes 045 and 046 deleted Fault codes 045 and 046 deleted Further point added under "known faults"	Löw
14	26.10.04	**Creation of version 5.01** Machine codes 766 and 767 added Description "Parameter setting for dozer blade characteristics" added Input codes 650..654 added	Löw

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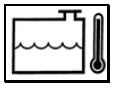
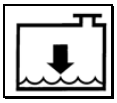
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No.	Date	Description of changes	resp.
15	24.01.06	**Creation of version 6.0** Fault code 540 added Input codes 540, 541, 685, 686, 687 added Description "Parameter setting for engine speed signal" added	Löw
16	07.11.06	**Creation of version 7.0** Item "4.10 Parameter setting steering system" extended, Input codes 251, 252, 647, 648, 649 added, Signal description X0:14 and X0:15 changed	Löw

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2 selected fault reactions of the ESX control

Reaction / Signal	Symbol in fault message display	**Warning** Code output without buzzer	**Warning** Code output with buzzer	**Engine stop** Code output with buzzer
Engine oil pressure (from EMR)		**520** after 2s	–	–
Coolant temperature (from EMR)		**522** after 30s	–	–
Coolant level (B55)		**524** after 2s	–	**525** after 20s
Engine air filter right or left (B03 or B116)		**526** after 2min	–	–
Contamination sensor (B19)		**570** after 10s	–	–
Pressure differential switch filter charge pump 1..4[1] (B121, B122, B21, B22) or filter intermediate gear (B42)		**572** after 10s	–	–
Hydraulic oil Excessive temperature (B20)		**574** after 10s	–	**575** after 2min
Filling level hydraulic oil (B24)		**578** after 2s	–	**579** after 20s
Return flow filter (B25)		–	**580** after 10s	–
Brake pressure (B05)		–	–	–

[1] BC572/772: only 2 pressure differential switches

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3 Known faults

Despite the fault monitoring of inputs and outputs on the ESX control, the ESX control is not able to detect all faults. The following list contains a selection of known fault reactions of the control, which mostly have a different cause to the one described in this documentation.

Behaviour of machine	**Possible cause**
The ESX control detects several faults of engine and hydraulic system monitoring at the same time (**524, 526, 570,...**). However, the control lights in the two fault indicators do not light. The lamp test of the fault indicators is also out of function.	Fault indicators without voltage supply (F24 tripped). The ESX inputs are drawn to ground through the LEDs of the fault indicators. For the control this is the same as when a sensor (e.g. oil pressure) delivers a ground signal. ☞ Check the voltage supply for the fault indicators.
The control detects line breakage on all 4 wheel drive motors (**100, 105, 110, 115**) (only on BC972). Steering is very jerky, but no fault is detected.	Missing / poor ground connection on ESX housing. ☞ Check ground connection, renew if necessary.
All control lights in both fault indicators are permanently on. The engine can be started, but the machine will not move. The fault display of the central electrics does not show a fault code.	Terminal 15 signal for control and override relay missing: ☞ Check fuse F25
The fault code **514** (Input engine speed: no pulses from the resolver, even though the engine is running) is already displayed while the engine is at rest.	Voltage is applied to input MD+ (PIN 36) on the ESX control, even though the engine is not running. This may occur when the link between generator and central electrics is interrupted, because in this case the potential at input MD+ will be raised to +24V through the resistor R10 or the coil K61. The control then assumes that the engine is running and thus expects pulses from the speed sensor.
Machine is in override state and indicates fault **934**.	Up to software version 2.01 this fault was displayed in addition to fault code **514** (see above). This means, that the machine has switched to override state when a fault occurred at the rotation sensor. This fault is a software fault, that has been eliminated with version 3.00.
Machine is in override state and indicates fault **960, 962**.	Intermittent contact on Pin 20, 42 or 43 Fault has been eliminated with software version 4.03

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4 Functions of the ESX control

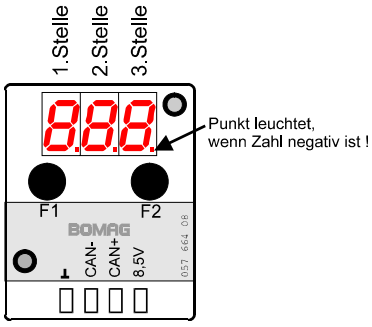
4.1 Description of the Display Module

The display module consists of a 3-digit display and two keys, F1 and F2.
It is used for the output of fault codes and display values as well as for the input of code numbers.

Faults and warnings are displayed by flashing. If several faults are detected, the displayed fault codes will change in a 3 second cycle.

Display values are permanently displayed, whereby values from 0 0 0 ...9 9 9 are possible. Higher values lead to the display "– – –", negative values are indicated by the "minus dot" lighting up (see illustration).

The following description describes the input of code numbers.



4.2 Input of code numbers

For the diagnostics of control inputs and outputs various code numbers can be entered via the display module of the control. The input of a code number is performed as follows:

1. Press both keys (F1 and F2) on the instrument cluster for 2 seconds.
   ☞The value 0 0 0 0 will be displayed, whereby the 1st digit is flashing.
2. The value of the flashing digit can be increased by pressing the left hand key (F1). When the figure 9 is displayed and the left hand key (F1) is pressed again, the display will return to the value 0 .
3. When pressing the right hand key (F2) the flashing digit will move one digit to the right. When the 3rd digit is flashing, the right hand key (F2) is pressed once again to confirm the input. The desired function is then executed or the desired value is displayed respectively.

In order to terminate a display function you must either enter code number 0 0 0 or switch the ignition off.

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4.3 Driving against the closed brake

After entering code number **5 0 0** the brake will not be released. When opening the rotary switch "Parking Brake" and actuating the travel lever, the travel pumps will be actuated in accordance with the selected travel direction. At the same time a warning (fault code **5 0 0**) appears on the display and the warning buzzer is triggered, in order to keep the operator informed about the condition.

In order to terminate this function and release the brake you must either enter code number **5 0 I** or switch the ignition off.

Note:	**This function can only be activated / deactivated when the travel lever is in neutral position.**

4.4 Enabling without the engine running

The input of code number **5 0 2** simulates operation of the diesel engine, i.e. certain functions are enabled which are normally only possible when the engine is running (power supply to brake valve, wheel motors, steering valves etc.). For safety reasons the floating position cannot be enabled. For this purpose an additional input code is required (see "Enabling floating position")

For safety reasons relay K22 (engine shut down) is energized when activating this function. This results in the engine control unit (EMR) being switched off. The displays "Fault EMR", "Oil Pressure" and "Excessive Temperature" will therefore light permanently.

Note:	**This function can only be activated / deactivated when the travel lever is in neutral position.**

NOTE!	**After the input of this function the starter can still be operated! However, the engine will not start!**

When actuating the travel lever a warning (fault code **5 0 2**) appears on the display and the warning buzzer is triggered, in order to keep the operator informed about the condition.

To terminate this function the ignition must be switched off.

NOTE!	**If the starter is to be actuated without starting the engine (e.g. during commissioning of the hydraulic system), this can be accomplished by pressing the EMERGENCY STOP button. In this condition the engine control unit EMR is not supplied with voltage.**

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4.5 Enabling floating position

This function is only available from software version 3.00!

NOTE:	**Since the dozer blade / bucket may drop down by its own weight when activating the float position, the activation is only possible in normal operation with the engine running.**

By entering code **5 0 4** the float position can also be activated for testing without the engine running. However, the input of this code is only possible after the input "Enable without engine running" (double interlock).

ATTENTION:	**After the input of this code the dozer blade can be lowered, but not raised any more (no hydraulic pressure without the engine running)! You must therefore make sure that there are no persons in the vicinity of dozer blade or bucket!**

Entercode number **5 0 2** . This code number activates the function "Enabling without engine running“.

Entercode number **5 0 4** . This code number activates the function "Enabling float position“.

The display module now shows the flashing code **5 0 4 .**

When float position is now activated (move joystick forward and press button), the two float position valves will be energized and the warning buzzer will sound.

In order to cancel this function you must either enter code number **5 0 5** or switch the ignition off.

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4.6 Showing stored faults

Switch on function "Show stored faults":
Entercode number **7 0 0** . This code number enables the function „Show stored faults“.

The faults stored in the ESX are displayed in flashing mode. If several faults are stored, these are successively displayed in cycles of 3 second. After the last fault has been displayed, the first fault will appear again. If no faults are stored in the ESX the display remains dark.

Switch off function "Show stored faults":
Enter code number **7 0 I** . This code number disables the function „Show stored faults“.

Note: Apart from the stored faults the current faults are also displayed.

4.7 Delete all stored faults

Execute the function "Delete all stored faults":
The engine must not be running!
Entercode number **7 1 0** .
Switch the ignition off and on again.

All stored faults are now deleted.

Note: The stored faults can only be deleted when the engine is not running.

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4.8 Setting the machine type

This function is only available from software version 3.00!

Since the same control is used for all refuse compactors with electronically controlled engine (EPA II), it is necessary to adjust the machine type after installing a new control.
This is necessary during first time commissioning as well as in case of a spare parts installation. This type adjustment is necessary, because these machines e.g. are fitted with different wheel drive motors or are designed with different numbers of speed ranges, or are equipped with dozer blade or bucket.

For simple checking the currently adjusted machine type is displayed for approx. 3 seconds on the display module of the central electrics when switching the ignition on. It can also be checked by entering code **720**.

The following machine types can be adjusted:

Machine type	*Machine type code*	*Available from software*
BC972/1172 with dozer blade	760	1.00
BC672/772 with dozer blade	761	1.00
BC972 with bucket	762	Not available
BC672/772 with bucket	763	1.00
BC572 with dozer blade	764	4.00
BC572 with bucket	765	4.00
BC672 EB	766	5.00
BC672 EB with tilt function	767	5.00

Note: Parameter adjustments can only be performed when the engine is not running!

Enter code number **725** . This code number activates the function "Adjusting machine type".

The display module now permanently shows the code **725** .

Select and enter the machine from the table above.

The display module now permanently shows the entered code. (e.g. **761**)

Enter code number **726** . This code number confirms the entered machine type.

After confirming the machine type the control switches off, the display module shows the flashing code **726** .

Switch the ignition off and on again.

The display module shows the reading **888** for approx. 10 seconds. The new parameters are loaded according to the machine type setting. Do not switch the ignition off during this time!

After this the newly adjusted machine type will be displayed for approx. 3 seconds.

Attention: A machine must not be operated with a wrong type setting, because in such a case the correct function of the control cannot be assured!

New controls are delivered with the default machine type setting 760 .

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4.9 Parameter adjustment 2nd speed range (only BC972)

This function enables to choose from three different final speeds for the second travel range.

Note:	**Parameter adjustments can only be performed when the engine is not running! This parameter adjustment is only possible on machines of type BC972**

Enter code number **6 6 0** . This code number activates the function "Parameter input 2nd gear“.

The display module now permanently shows the code **6 6 0 .**

At this point the input of following codes is possible:

Code number **6 6 1**	☞	Speed in speed range 2	SLOW (approx. 5 km/h)
Code number **6 6 2**	☞	Speed in speed range 2	MEDIUM (approx. 6 km/h)
Code number **6 6 3**	☞	Speed in speed range 2	FAST (approx. 7 km/h)

Upon delivery of the machine the final speed is preset to 6 km/h.

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4.10 Parameter setting steering system

This function enables the setting of various parameters for the steering system. A differentiation can be made between e.g. electronic and mechanical end position damping.

Note:	Parameter adjustments can only be performed when the engine is not running!

Enter code number **6 4 0** . This code number activates the function "Parameter input steering".

The display module now permanently shows the code **6 4 0 .**

At this point the input of following codes is possible:

Code number **6 4 1**	☞	Steering joystick	ON
Code number **6 4 2**	☞	Steering joystick	OFF
Code number **6 4 3**	☞	Steering wheel	ON
Code number **6 4 4**	☞	Steering wheel	OFF
Code number **6 4 5**	☞	Arms rest contact	ON
Code number **6 4 6**	☞	Arms rest contact	OFF
Code number **6 4 7**	☞	mechanical end position damping	OFF
Code number **6 4 8**	☞	mechanical end position damping	ON
Code number **6 4 9**	☞	electronic end position damping	OFF (see note!)

Note:	The electronic end position damping is inactive after entering code 649. End position damping is automatically reactivated when switching the ignition the next time, in order to prevent the steering cylinders from being damaged!

ATTENTION	During input make sure that at least one of the functions (steering wheel or joystick) is active. If both are deactivated the control is no longer able to steer the machine. This is indicated by the fault code 290. The control will then switch to override condition. In this case enter one of the two code numbers (for joystick or for steering wheel) and switch the ignition off and on again.

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4.11 Travel pedal monitoring parameter setting

This function is only available from software version 3.00!

This function provides the possibility to set the reaction to a cable breakage in the travel pedal. In case of a cable breakage the engine is operated with a fixed speed of 1500 rpm, so that the machine can still be moved.

If the fault monitoring system is active, the engine will be shut down when this engine fault occurs for the first time while the travel lever is not in neutral position. This assures that the machine will not start to move by itself.

Note:	**Parameter adjustments can only be performed when the engine is not running!**

Enter code number **6 9 0** . This code number activates the function "Parameter input for travel pedal monitoring“.

The display module now permanently shows the code **6 9 0 .**

At this point the input of following codes is possible:

Code number **6 9 1** ☞ Monitoring ON Engine is shut down (see above)
Code number **6 9 2** ☞ Monitoring OFF Engine is not shut down (see above)

The machine is delivered with this function enabled.

4.12 Dozer blade characteristics parameter setting

With this function one can pre-select one of three characteristics for the dozer blade function, or to deactivate this characteristics function.

Note:	**Parameter adjustments can only be performed when the engine is not running!** **This parameter adjustment is only possible on machines of type EB!**

Enter code number **6 5 0** . This code number activates the function "Parameter input for dozer blade characteristics“.

The display module now permanently shows the code **6 5 0 .**

At this point the input of following codes is possible:

Code number **6 5 1** ☞ Characteristic 1 (slightly progressive)
Code number **6 5 2** ☞ Characteristic 2 (more progressive)
Code number **6 5 3** ☞ Characteristic 3 (highly progressive)
Code number **6 5 4** ☞ No characteristic

On machines of type BC672EB and BC772 EB no characteristic is selected by default!

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4.13 Engine speed signal parameter setting

This function is only available from software version 6.00!

On engines of TIER III and higher the speed signal from the engine control unit (EMR III) is evaluated. On machines with EMR I and EMR II the signal from an additional BOMAG speed sensor was evaluated instead. These two signals have different pulses per engine revolution.

The function described next will enable you to switch between the two signals.

Note:	**Parameter adjustments can only be performed when the engine is not running!**

Enter code number **6 8 5** . This code number activates the function "Parameter input for travel pedal monitoring“.

The display module now permanently shows the code **6 8 5 .**

At this point the input of following codes is possible:

Code number **6 8 6** ☞ Evaluation of EMR III sensor signal
Code number **6 8 7** ☞ Evaluation of BOMAG sensor signal

Upon delivery of the machine evaluation of the EMR III sensor is enabled.

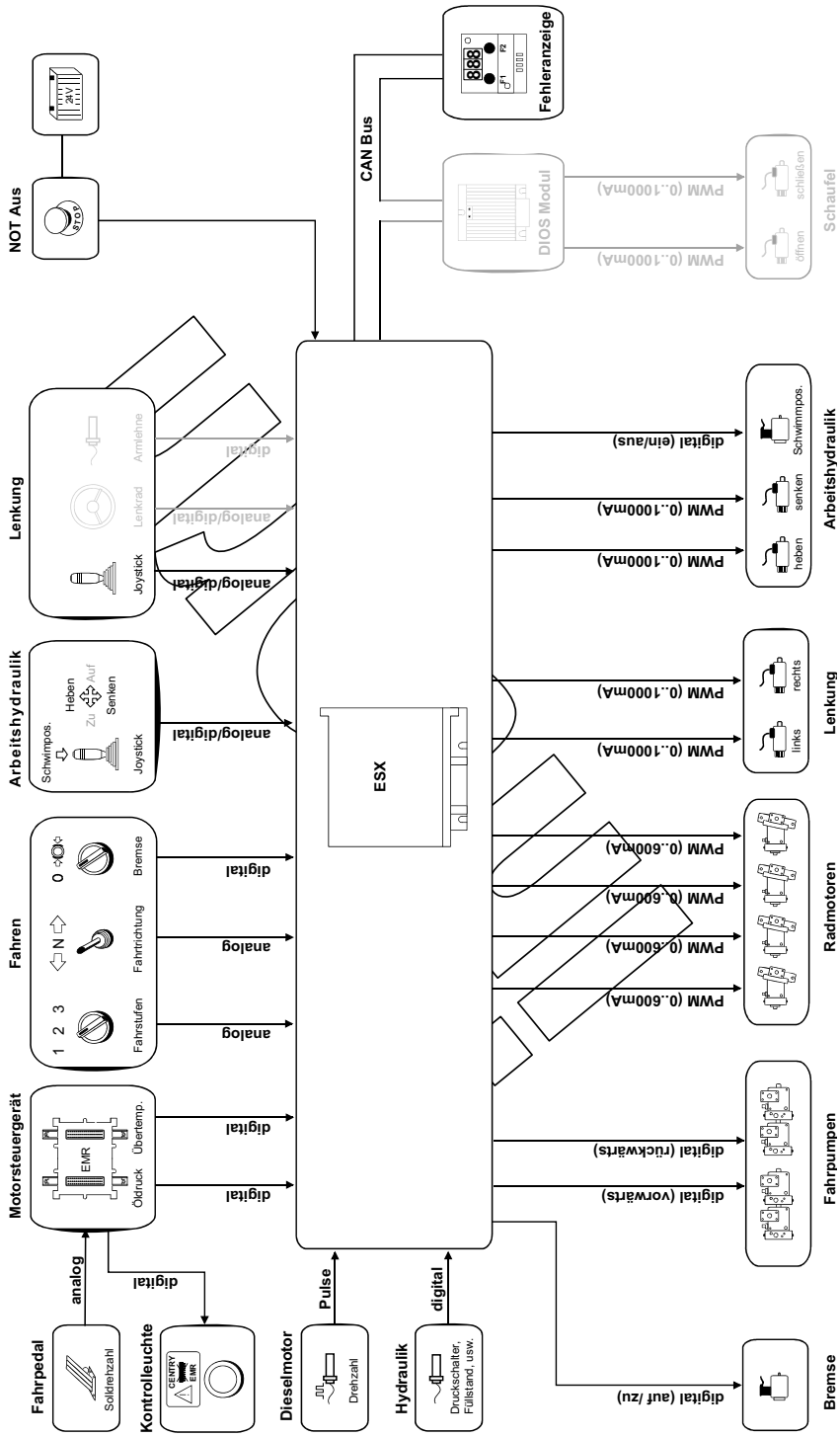
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5 Block diagram normal operation BC972, 1172



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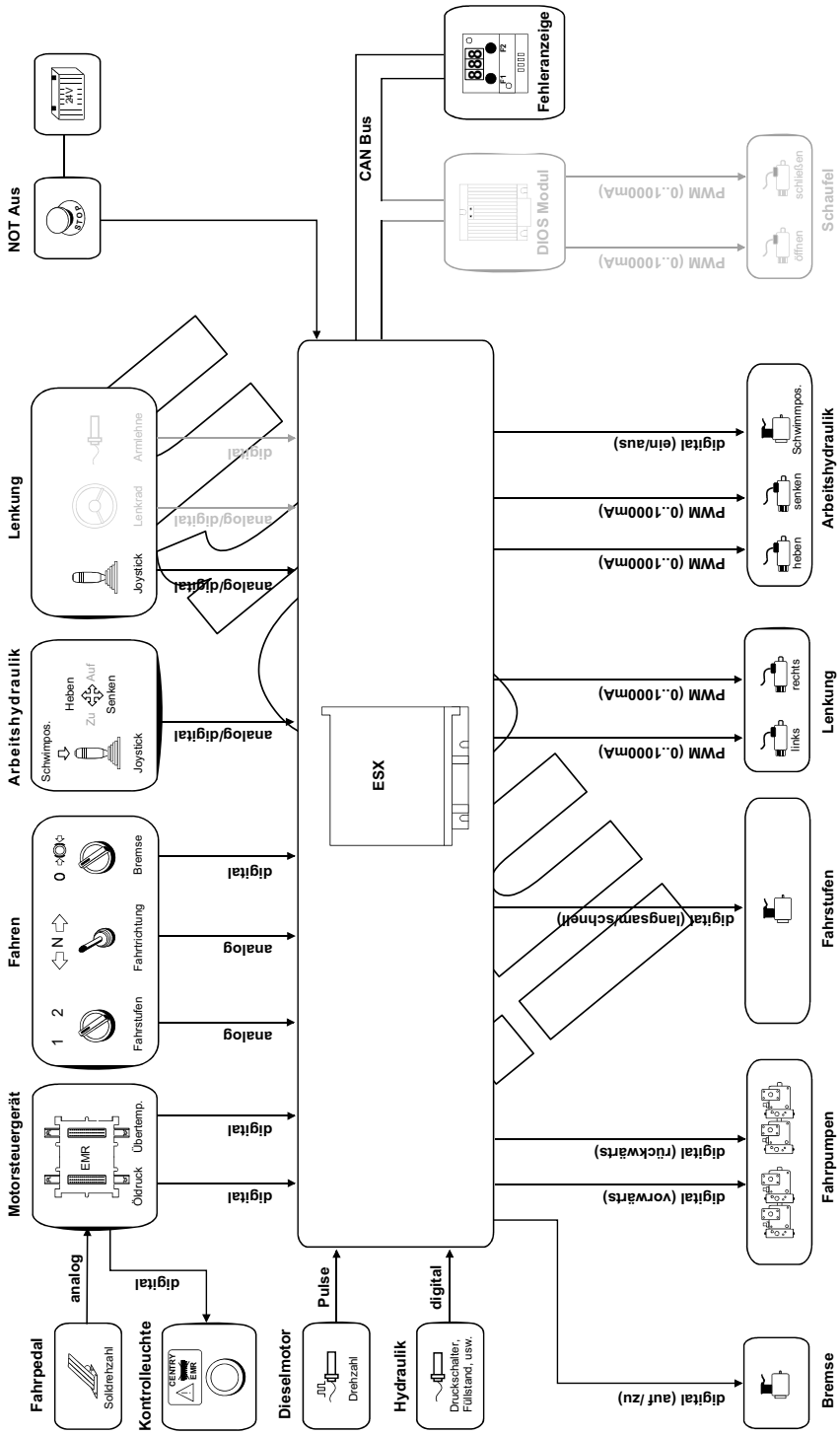
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Service Training Refuse Compactor — Block diagram

6 Block diagram normal operation BC 572/672/772



Block diagram

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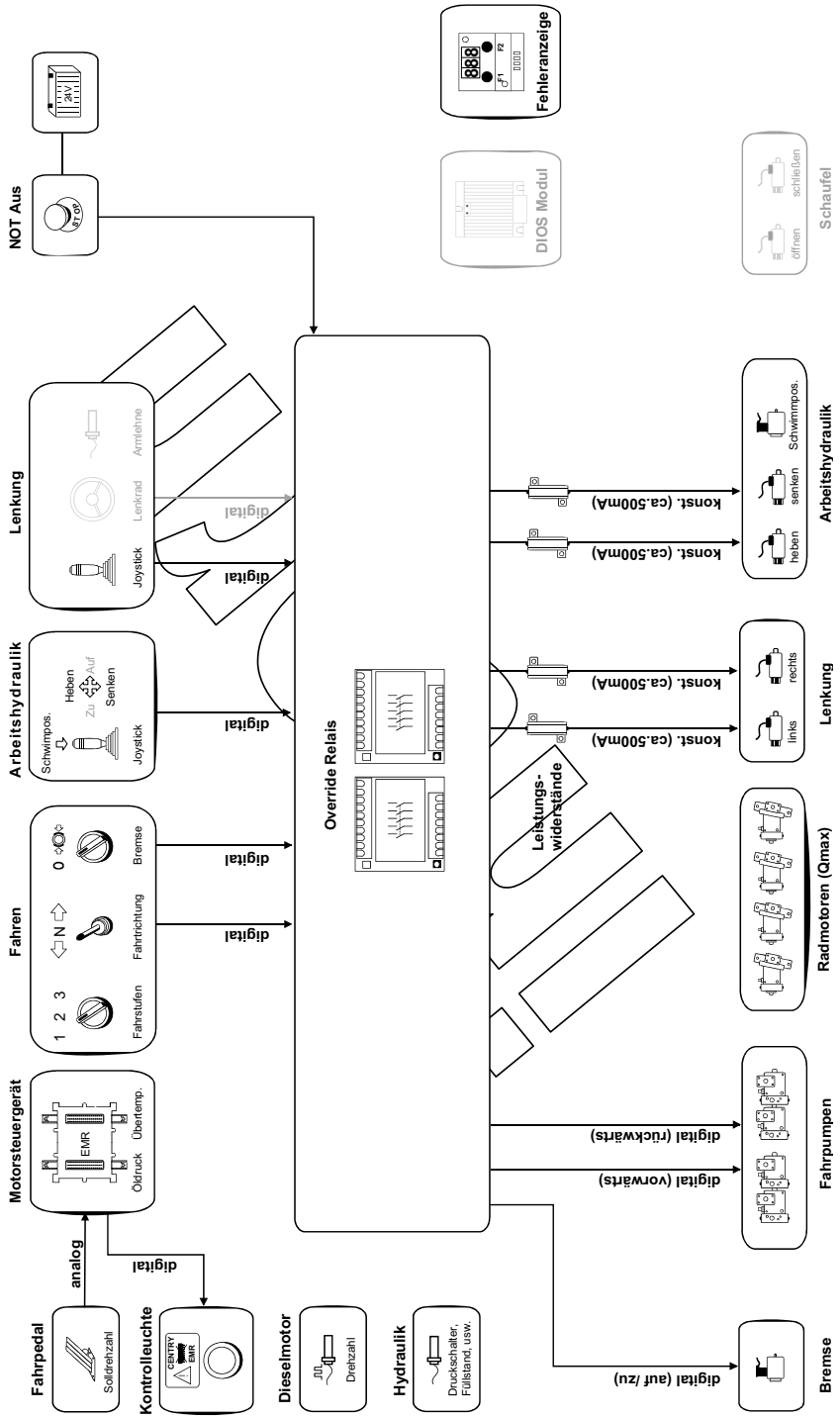
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Service Training Refuse Compactor — Block diagram

7 Block diagram override operation BC972, 1172



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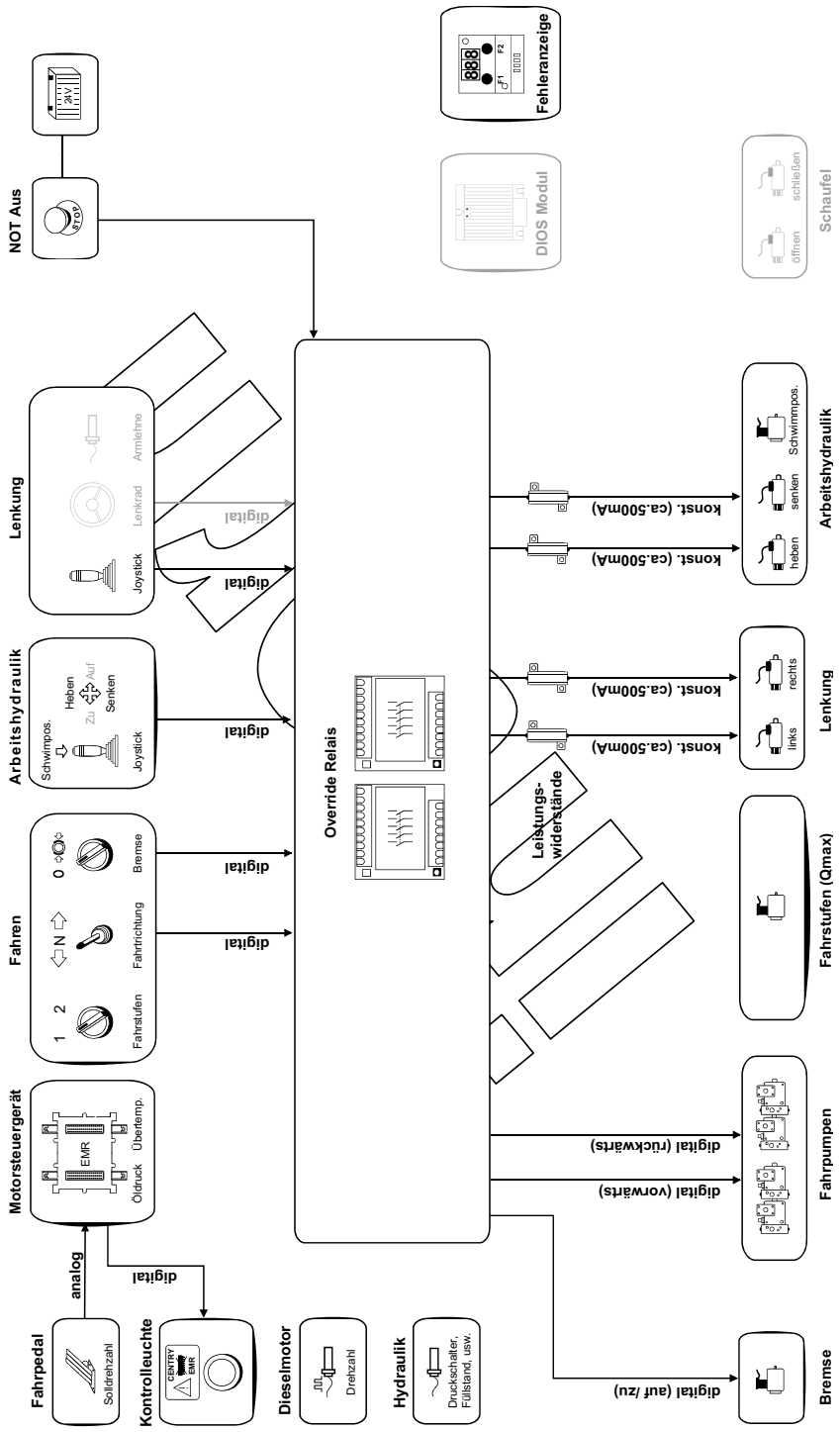
Block diagram

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Service Training Refuse Compactor — Block diagram

8 Block diagram override operation BC 572/672/772



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9 Description of the signals on the ESX-control

Notes:
1. Wherever the value of 24 V is mentioned in the following text it refers to the current battery voltage under due consideration of voltage drops in the lines.

ESX terminal	Signal description	Nominal values (voltage / current)
X0:1	**AGND** = Analogue ground: Ground potential for sensors (steering joystick, speed range switch etc.)	approx. 0 V measured against ground (terminal 31)
X0:2	Output **Override** (emergency operation) Digital output (max. 2,5 A)	Control in operation, emergency operation not active ☞ 24 V Control not in operation, emergency operation active ☞ approx.0 V
X0:3	Output **indicator light 2nd gear** Digital output (max. 2,5 A)	Indicator light ON ☞ 24 V Indicator light OFF ☞ approx.2 V
X0:4	Interface **RS 232 RxD**, not used for normal operation.	Measurement not possible!
X0:5	Interface **RS 232 TxD**, not used for normal operation.	Measurement not possible!
X0:6	Input drive pedal position Analog input / voltage input 0..5 V	Travel pedal not operated: ☞ approx. 0.5 V Travel pedal operated: ☞ Voltage > 0,5 V
X0:7	Input selector switch **Speed ranges** **BC972/1172:** (Step switch, 3 steps) **BC572/672/772:** (Step switch, 2 steps) Analogue input / voltage input 0..8.5 V	Position speed range selector switch (measured against **AGND)** **BC972/1172:** 1st speed range ☞ 1,80..2,40 V 2nd speed range ☞ 3,70..4,70 V 3rd speed range ☞ 5,60..7,00 V **BC572/672/772:** 1st speed range ☞ approx. 0 V 2nd speed range ☞ 7,65..9,35 V
X0:8	Input **steering joystick** Analogue input / voltage input 0..8.5 V	Position steering joystick (measured against **AGND)** maximum left ☞ 6,70..8,60 V Neutral position ☞ 3,60..4,60 V maximum right ☞ 0,50..1,00 V
X0:9	Input **steering wheel (option)** Analogue input / voltage input 0..8.5 V	Position steering wheel (measured against **AGND)** maximum left ☞ 5,70..7,10 V Neutral position ☞ 3,70..4,60 V maximum right ☞ 1,70..2,20 V

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ESX terminal	Signal description	Nominal values (voltage / current)
X0:10	Input **Pressure differential switch filter charge pump 1..4, or 2 and filter transfer box** Digital input active low	all filters ok ☞approx.5 V at least 1 filter soiled ☞ 0 V
X0:11	Input **pressure differential switch engine air filter** Digital input active low	all air filters ok ☞approx.5 V at least 1 filter soiled ☞ 0 V
X0:12	Input **push button float position** Digital input active high	Push button actuated ☞ 24 V Push button not actuated ☞approx.2 V
X0:13	Input **hydraulic oil return flow filter** Digital input active low	Return flow filter ok ☞approx.5 V Return flow filter soiled ☞ 0 V
X0:14	Input **steering stop left** Digital input active high	Stop not reached ☞ 24 V Stop reached ☞approx.2 V
X0:15	Input **steering stop right** Digital input active high	Stop not reached ☞ 24 V Stop reached ☞approx.2 V
X0:16	Input **Diesel engine speed** Digital input active high	Transducer delivers square-wave pulses 167 pulse / revolution or 129 pulses / revolution on BC572
X0:17	Input **joystick bucket close (optional)** Digital input active high	Joystick actuated to the left ☞ 24 V Joystick not actuated ☞approx.2 V
X0:18	Input **excessive coolant temperature (from EMR)** Digital input active low	Temperature ok ☞approx.5 V Temperature too high ☞ 0 V
X0:19	Input **coolant filling level** Digital input active low	Filling level ok ☞approx.5 V Filling level too low ☞ 0 V
X0:20	Output **dozer blade up** PWM digital output (max. 4 A)	Dozer blade is moved ☞ 0,3..1 A Dozer blade is not moved ☞ 0 A
X0:21	Output **travel pumps forward** PWM digital output (max. 4 A)	Travel pumps triggered ☞ 24 V Travel pumps not triggered ☞ 0 V
X0:22	Output **travel pumps reverse** PWM digital output (max. 4 A)	Travel pumps triggered ☞ 24 V Travel pumps not triggered ☞ 0 V
X0:23	Output **voltage supply for sensors** This output supplies steering joystick, travel speed range switch, etc. Without this voltage the control cannot work correctly and will switch to override mode (emergency function).	Nominal voltage = 8,5 V Permissible range: approx. 7,65..9,35 V **This voltage must be measured against AGND.**
X0:24	Output **engine shut down** Digital output (max. 2,5 A)	Engine shut down inactive ☞ 0 V Engine shut down active ☞ 24 V

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ESX terminal	Signal description	Nominal values (voltage / current)
X0:25	Output **indicator light 1st speed range** Digital output (max. 2,5 A)	Indicator light OFF ☞approx.2 V Indicator light ON ☞ 24 V
X0:26	Interface CAN-Bus Wire -, is used to trigger the fault display module. On bucket option also to trigger the DIOS module.	Measurement not possible!
X0:27	Interface CAN-Bus Wire +, is used to trigger the fault display module. On bucket option also to trigger the DIOS module.	Measurement not possible!
X0:28	Input **potential terminal 15** Digital input active high This signal **must** be present, so that the control can work.	Control switched on ☞ 24 V Control switched off ☞approx.2 V
X0:29	Input **potentiometer speed range 2nd gear** (optional) Analogue input / voltage input 0..8.5 V	Position potentiometer (measured against **AGND**) right hand stop ☞ 0,50..1,00 V (max. speed) left hand stop ☞ 6,80..8,70 V (min. speed)
X0:30	Input **joystick dozer blade up/down** Analogue input / voltage input 0..8.5 V	Position potentiometer (measured against **AGND**) maximum up ☞ 6,70..8,60 V Neutral position ☞ 3,60..4,60 V maximum down ☞ 0,50..1,00 V
X0:31	Input **joystick bucket open/close (optional)** Analogue input / voltage input 0..8.5 V	Position potentiometer (measured against **AGND**) maximum close ☞ 6,70..8,60 V Neutral position ☞ 3,60..4,60 V maximum open ☞ 0,50..1,00 V
X0:32	Input **selector switch travel direction** Analogue input / voltage input 0..8.5 V	Position selector switch (measured against **AGND**) forward ☞ 4,10..5,20 V neutral ☞ 5,70..7,20 V reverse ☞ 3,20..4,10 V
X0:33	not used	
X0:34	Input **joystick bucket open (optional)** Digital input active high	Joystick actuated to the right ☞ 24 V Joystick not actuated ☞approx.2 V
X0:35	Input **joystick dozer blade up** Digital input active high	Joystick pulled back ☞ 24 V Joystick not actuated ☞approx.2 V

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ESX terminal	Signal description	Nominal values (voltage / current)
X0:36	Input **D+ generator** Digital input active high	Engine running / engine is started ☞ 24 V Engine stopped ☞ 0 V
X0:37	Input **position arm rest** (optional) Digital input active high	Arm rest bottom position ☞ 24 V Arm rest up ☞ approx.2 V
X0:38	Input **steering joystick left** Digital input active high	Joystick actuated to the left ☞ 24 V Joystick not actuated ☞ approx.2 V
X0:39	Input **steering joystick right** Digital input active high	Joystick actuated to the right ☞ 24 V Joystick not actuated ☞ approx.2 V
X0:40	Input **switch brake** Digital input active high	Open brake ☞ 24 V Close brake ☞ approx.2 V
X0:41	Input **joystick dozer blade down** Digital input active high	Joystick pushed forward ☞ 24 V Joystick not actuated ☞ approx.2 V
X0:42	Output **dozer blade down** PWM digital output (max. 4 A)	Dozer blade is moved ☞ 0,3..1 A Dozer blade is not moved ☞ 0 A
X0:43	Output **wheel motor rear right** PWM digital output (max. 4 A)	permissible current range: approx. 0.. 0,6 A
X0:44	Output **warning buzzer** PWM digital output (max. 4 A)	Warning buzzer ON ☞ 24 V Warning buzzer OFF ☞ approx.2 V
X0:45	Input **hydraulic oil level float** Digital input active low	Oil level ok ☞ approx.5 V Oil level too low ☞ 0 V
X0:46	Output **wheel motor front left** PWM digital output (max. 4 A)	permissible current range: approx. 0..0,6 A
X0:47	Output **wheel motor front right** PWM digital output (max. 4 A)	permissible current range: approx. 0..0,6 A
X0:48	Output **wheel motor rear left** PWM digital output (max. 4 A)	permissible current range: approx. 0..0,6 A
X0:49	Output **steering left** PWM digital output (max. 4 A)	Steering active ☞ 0,3..1 A Steering not active ☞ 0 A
X0:50	Input **excessive hydraulic oil temperature** Digital input active low	Temperature ok ☞ approx.5 V Temperature too high ☞ 0 V
X0:51	Input **contamination sensor** Digital input active low	Filter ok ☞ approx.5 V Filter soiled ☞ 0 V
X0:52	Input **oil pressure (from EMR)** Digital input active low	Oil pressure ok ☞ approx.5 V Oil pressure too low ☞ 0 V

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ESX terminal	Signal description	Nominal values (voltage / current)
X0:53	not used	-
X0:54	Voltage supply for electronics	Emergency stop not actuated ☞ 24 V Emergency stop actuated ☞ 0 V
X0:55	Ground connection electronics	0 V measured against ground
X0:56	Voltage supply for outputs	approx. 24 V measured against ground
X0:57	Voltage supply for outputs	approx. 24 V measured against ground
X0:58	Voltage supply for outputs	approx. 24 V measured against ground
X0:59	Voltage supply for outputs	approx. 24 V measured against ground
X0:60	Voltage supply for outputs	approx. 24 V measured against ground
X0:61	Output **brake** Digital output (max. 4 A)	Open brake ☞ 24 V Close brake ☞ 0 V
X0:62	Output **travel ranges** (only BC772) Digital output (max. 4 A)	Travel speed range: 2nd gear ☞ 24 V Travel speed range: 1st gear ☞ 0 V
X0:63	Output **float position** Digital output (max. 4 A)	Float position active ☞ 24 V Float position not active ☞ 0 V
X0:64	Output **steering right** PWM digital output (max. 4 A)	Steering active ☞ 0,3..1 A Steering not active ☞ 0 A
X0:65	Mouse port Baby Boards	approx. 0 V
X0:66	Mouse port Baby Boards	approx. 0 V
X0:67	Mouse port Baby Boards	approx. 0 V
X0:68	Mouse port Baby Boards	approx. 0 V

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10 Description of signals on the DIOS module (only with optional bucket)

DIOS terminal	Signal description	Nominal values (voltage / current)
X0/1:1	Interface CAN-Bus Wire +, is used to communicate with the ESX-control.	Measurement not possible!
X0/1:2	Interface CAN-Bus Wire -, is used to communicate with the ESX-control.	Measurement not possible!
X0/1:3	Voltage supply for electronics	Ignition ON: ☞ 24 V Ignition OFF: ☞ 0 V
X0/1:4	Ground connection (Coding node address)	0 V measured against ground
X0/1:5	Output **close valve** PWM digital output (max. 1 A)	Close bucket active ☞ 0,3..1 A Bucket not active ☞ 0 A
X0/1:6	Output **open valve** PWM digital output (max. 1 A)	Open bucket active ☞ 0,3..1 A Bucket not active ☞ 0 A
X0/1:7	not used	
X0/1:8	not used	
X0/1:9	Voltage supply for outputs	Ignition ON: ☞ 24 V Ignition OFF: ☞ 0 V
X0/1:10	Voltage supply for outputs	Ignition ON: ☞ 24 V Ignition OFF: ☞ 0 V
X0/1:11	Ground connection	0 V measured against ground
X0/1:12	not used	
X0/1:13	not used	
X0/1:14	not used	
X0/1:15	not used	
X0/1:16	not used	

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11 Fault codes of the ESX control

11.1 Overview

Fault code	Fault description
001 - 199	Fault in travel system
200 - 299	Fault in steering system
300 - 499	Fault in working hydraulics
500 - 509	Warning messages input codes
510 - 549	Fault diesel engine
560 - 562	Fault sensor voltage supply / override relays
570 - 599	Fault hydraulic system
800 - 899	Fault message „severe software fault"
900 - 919	Error message "Communication via CAN bus disturbed"
920 - 999	Fault message "Severe internal fault in control"

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11.2 Description of fault reactions

Fault reaction	Description of fault reaction
1	Warning. Fault code is displayed. Audible signal in 5 second intervals.[2] Signal light in monitoring board lights in 5 second intervals.
2	Function affected, the faulty function is replaced by an emergency function. Fault code is displayed. Audible signal in 5 second intervals. Signal light in monitoring board lights in 5 second intervals.
3	Partial function faulty, the partial function cannot be overridden by an emergency function. After the occurrence of the fault the machine is stopped, after returning the travel lever to neutral the machine can move again. The machine can still be driven to a limited extent, but must be repaired by the service department as soon as possible. Fault code is displayed. Audible signal in 5 second intervals. Signal light in monitoring board lights in 5 second intervals.
4	Partial function faulty, the partial function cannot be overridden by an emergency function. The machine is no longer able to drive, e.g. because parts of the travel system are defective ☞ the diesel engine is shut down. Fault code is displayed. Audible signal in 1 second intervals. Signal light in monitoring board lights in 1 second intervals.
5	Fatal fault. The function of the control can no longer be guaranteed. Control is switched off. The fault code is displayed, the signal light in the monitoring board is permanently on. **No** audible signal!

Note:	**Errors with error reaction 1 are only warning messages and are NOT stored in the error log!**

[2] audible signal not with all faults (see page 3: "selected fault reactions of the ESX control")

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11.3 Detailed description of fault codes and their possible causes

Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
0 0 1	Output brake No or too low current flow out of this output	☞ Wire breakage in current path ☞ Current path connected to +24 V	X0:61	0 0 1	5
0 0 2	Output brake The current flow from this output is too high ☞ output was switched off!	☞ Short circuit to ground in the current path ☞ Coil from brake valve burned out	X0:61	0 0 1	5
0 0 3	Output brake Although the output is switched off, voltage is present	☞ Current path connected to +24 V	X0:61	0 0 1	5
0 0 4	Output brake The output switch was switched off because of a too high temperature. As soon as the switch has cooled down the output will be switched on again.	☞ Excessive current flow in current path, probably because of a defective coil or a short circuit to ground	X0:61	-	5

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
0 2 1	Input travel direction switch The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to switch ☞ Fuse FM 6 has tripped or wire breakage in voltage supply current path ☞ Switch defective	X0:32	0 2 1	5
0 2 2	Input travel direction switch The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +8,5 V ☞ Switch not connected to ground ☞ Switch defective	X0:32	0 2 1	5
0 2 5	Input travel direction switch The voltage applied to the input is excessively fluctuating.	☞ Poor contact of plug-in connection (intermittent contact) in current path or in supply lines ☞ Switch defective	X0:32	0 2 1	5
0 4 0	Input travel range switch (only BC972) The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to switch ☞ Fuse FM 1 has tripped or wire breakage in voltage supply current path ☞ Switch defective	X0:7	0 4 0	2
0 4 1	Input travel range switch (only BC972) The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +8,5 V ☞ Switch not connected to ground ☞ Switch defective	X0:7	0 4 0	2
0 4 2	Input travel range switch (only BC972) The voltage applied to the input is excessively fluctuating.	☞ Poor contact of plug-in connection (intermittent contact) in current path or in supply lines ☞ Switch defective	X0:7	0 4 0	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
0 5 0	Output travel pumps forward The voltage on this output is too low	☞ Current path connected to ground	X0:21	0 5 0	2
0 5 1	Output travel pumps forward The voltage on this output is too high	☞ Current path connected to +24 V	X0:21	0 5 0	2
0 5 2	Output travel pumps forward No current flow out of this output	☞ Line breakage in current path	X0:21	0 5 2	2
0 5 3	Output travel pumps forward Too high current flow out of this output	☞ Current path connected to ground ☞ Magnetic coil defective	X0:21	0 5 2	2
0 6 0	Output travel pumps reverse The voltage on this output is too low	☞ Current path connected to ground	X0:22	0 6 0	2
0 6 1	Output travel pumps reverse The voltage on this output is too high	☞ Current path connected to +24 V	X0:22	0 6 0	2
0 6 2	Output travel pumps reverse No current flow out of this output	☞ Line breakage in current path	X0:22	0 6 2	2
0 6 3	Output travel pumps reverse Too high current flow out of this output	☞ Current path connected to ground ☞ Magnetic coil defective	X0:22	0 6 2	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
0 7 0	Output valve speed ranges (only BC772) The voltage on this output is too low	☞ Current path connected to ground	X0:62	0 7 0	2
0 7 1	Output valve speed ranges (only BC772) The voltage on this output is too high	☞ Current path connected to +24 V	X0:62	0 7 0	2
0 7 2	Output valve speed ranges (only BC772) No current flow out of this output	☞ Line breakage in current path	X0:62	0 7 0	2
0 7 3	Output valve speed ranges (only BC772) The output switch was switched off because of a too high temperature. As soon as the switch has cooled down the output will be switched on again.	☞ Excessive current flow in current path, probably because of a defective coil or a short circuit to ground	X0:62	-	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
1 0 0	Output proportional solenoid (only BC972) Wheel motor front left The specified current value is not reached	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted ☞ Interturn fault in proportional solenoid (measure resistance)	X0:46	1 0 0 1 2 0	2
1 0 5	Output proportional solenoid (only BC972) Wheel motor front right The specified current value is not reached	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted ☞ Interturn fault in proportional solenoid (measure resistance)	X0:47	1 0 5 1 2 0	2
1 1 0	Output proportional solenoid (only BC972) Wheel motor rear left The specified current value is not reached	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted ☞ Interturn fault in proportional solenoid (measure resistance)	X0:48	1 1 0 1 2 0	2
1 1 5	Output proportional solenoid (only BC972) Wheel motor rear right The specified current value is not reached	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted ☞ Interturn fault in proportional solenoid (measure resistance)	X0:43	1 1 5 1 2 0	2

inhalt

Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
230	Input steering joystick Switch left / switch right Plausibility problem on the switches; the signals right and left were detected at the same time.	☞ One of the two switches is defective (permanently closed) ☞ Connection between both switches or inputs (probably a chafed through cable)	X0:38, X0:39	230	2
231	Input potentiometer steering joystick Input steering joystick switch right The signal from the steering joystick switch right was not detected, although the potentiometer is actuated to the right	☞ Steering joystick switch right defective (does not close) ☞ Wire breakage in current path for steering joystick switch right	X0:8, X0:39	230 231	2
232	Input potentiometer steering joystick Input steering joystick switch left The signal from the steering joystick switch left was not detected, although the potentiometer is actuated to the left	☞ Steering joystick switch left defective (does not close) ☞ Wire breakage in current path for steering joystick switch left	X0:8, X0:38	230 231	2
233	Input potentiometer steering joystick The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +8,5 V ☞ Potentiometer not connected to ground ☞ Potentiometer defective	X0:8	231	2
234	Input potentiometer steering joystick The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to potentiometer ☞ Fuse FM 4 has tripped or wire breakage in voltage supply current path ☞ Potentiometer defective	X0:8	231	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
240	Input steering wheel (optional) Switch left / switch right Plausibility problem on the switches; the signals right and left were detected at the same time.	☞ One of the two switches is defective (permanently closed) ☞ Connection between both switches or inputs (probably a chafed through cable)	X0:14, X0:15	240	2
241	Input steering wheel potentiometer (optional) Input steering wheel switch right The signal from the steering wheel switch right was not detected, although the potentiometer is actuated to the right	☞ Steering wheel switch right defective (does not close) ☞ Wire breakage in current path steering wheel switch right	X0:9, X0:15	240 241	2
242	Input steering wheel potentiometer (optional) Input steering wheel switch left The signal from the steering wheel switch left was not detected, although the potentiometer is actuated to the left	☞ Steering wheel switch left defective (does not close) ☞ Wire breakage in current path for steering wheel switch left	X0:9, X0:14	240 241	2
243	Input steering wheel potentiometer (optional) The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +8,5 V ☞ Potentiometer not connected to ground ☞ Potentiometer defective	X0:9	241	2
244	Input steering wheel potentiometer (optional) The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to potentiometer ☞ Fuse FM 3 has tripped or wire breakage in voltage supply current path ☞ Potentiometer defective	X0:9	241	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
271	Output proportional solenoid Steering right Output current too low.	☞ Current path has short circuit to voltage supply ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted	X0:64	271 272	2
272	Output proportional solenoid Steering right Output current too high.	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path	X0:64	271 272	2
273	Output proportional solenoid Steering right Fault when calibrating the valve	☞ Current path is interrupted ☞ Current path has impermitted connection to another current path / ground	X0:64	271 272	2
276	Output proportional solenoid Steering left Output current too low.	☞ Current path has short circuit to voltage supply ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted	X0:49	276 277	2
277	Output proportional solenoid Steering left Output current too high.	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path	X0:49	276 277	2
278	Output proportional solenoid Steering left Fault when calibrating the valve	☞ Current path is interrupted ☞ Current path has short circuit to ground ☞ Current path has impermitted connection to another current path / ground	X0:49	276 277	2
290	Incorrect parameter setting for steering	☞ Steering wheel **AND** steering joystick were both deactivated. see description "parameter setting steering" (page 13)	-	–	5

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
400	Input dozer blade joystick Switch up / switch down Plausibility problem on the switches; the signals up and down were detected at the same time.	☞ One of the two switches is defective (permanently closed) ☞ Connection between both switches or inputs (probably a chafed through cable)	X0:35, X0:41	400	2
401	Input potentiometer for dozer blade joystick Input dozer blade joystick switch up The signal from the dozer blade joystick switch up was not detected, although the potentiometer is actuated to direction up	☞ Dozer blade joystick switch up defective (does not close) ☞ Wire breakage in current path dozer blade joystick switch up	X0:30, X0:35	400 401	2
402	Input potentiometer for dozer blade joystick Input dozer blade joystick switch down The signal from the dozer blade joystick switch down was not detected, although the potentiometer is actuated to direction down	☞ Dozer blade joystick switch down defective (does not close) ☞ Wire breakage in current path dozer blade joystick switch down	X0:30, X0:41	400 401	2
403	Input potentiometer for dozer blade joystick The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +8,5 V ☞ Potentiometer not connected to ground ☞ Potentiometer defective	X0:30	401	2
404	Input potentiometer for dozer blade joystick The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to potentiometer ☞ Fuse FM 5 has tripped or wire breakage in voltage supply current path ☞ Potentiometer defective	X0:30	401	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
411	Output proportional solenoid Dozer blade up Output current too low.	☞ Current path has short circuit to voltage supply ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted	X0:20	411 412	2
412	Output proportional solenoid Dozer blade up Output current too high.	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path	X0:20	411 412	2
413	Output proportional solenoid Dozer blade up Fault when calibrating the valve	☞ Current path is interrupted ☞ Current path has impermitted connection to another current path / ground	X0:20	411 412	2
421	Output proportional solenoid Dozer blade down Output current too low.	☞ Current path has short circuit to voltage supply ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted	X0:42	421 422	2
422	Output proportional solenoid Dozer blade down Output current too high.	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path	X0:42	421 422	2
423	Output proportional solenoid Dozer blade down Fault when calibrating the valve	☞ Current path is interrupted ☞ Current path has impermitted connection to another current path / ground	X0:42	421 422	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
430	Output float position valve No or too low current flow out of this output	☞ Wire breakage in current path ☞ Current path connected to +24 V	X0:63	430	2
431	Output float position valve The current flow from this output is too high ☞ output was switched off!	☞ Short circuit to ground in the current path ☞ Coil from brake valve burned out	X0:63	430	2
432	Output float position valve Although the output is switched off, voltage is present	☞ Current path connected to +24 V	X0:63	430	2
433	Output float position valve The output switch was switched off because of a too high temperature. As soon as the switch has cooled down the output will be switched on again.	☞ Excessive current flow in current path, probably because of a defective coil or a short circuit to ground	X0:63	-	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
450	Input bucket joystick (optional) Switch open / switch close Plausibility problem on the switches; the signals open and close were detected at the same time.	☞ One of the two switches is defective (permanently closed) ☞ Connection between both switches or inputs (probably a chafed through cable)	X0:17, X0:34	450	2
451	Input potentiometer bucket joystick (optional) Input bucket joystick switch open The signal from the bucket joystick switch open was not detected, although the potentiometer is actuated to direction open	☞ Bucket joystick switch open defective (does not close) ☞ Wire breakage in current path bucket joystick switch open	X0:31, X0:34	450 451	2
452	Input potentiometer bucket joystick (optional) Input bucket joystick switch close The signal from the bucket joystick switch close was not detected, although the potentiometer is actuated to direction close	☞ Bucket joystick switch close defective (does not close) ☞ Wire breakage in current path bucket joystick switch close	X0:31, X0:17	450 451	2
453	Input potentiometer bucket joystick (optional) The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +8,5 V ☞ Potentiometer not connected to ground ☞ Potentiometer defective	X0:31	451	2
454	Input potentiometer bucket joystick (optional) The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to potentiometer ☞ Fuse FM 7 has tripped or wire breakage in voltage supply current path ☞ Potentiometer defective	X0:31	451	2

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
461	Output proportional solenoid Open bucket (optional) Output current too low.	☞ Current path has short circuit to voltage supply ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted	DIOS X0/1:6	461 462	2
462	Output proportional solenoid Open bucket (optional) Output current too high.	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path	DIOS X0/1:6	461 462	2
463	Output proportional solenoid Open bucket (optional) Fault when calibrating the valve	☞ Current path is interrupted ☞ Current path has impermitted connection to another current path / ground	DIOS X0/1:6	461 462	2
471	Output proportional solenoid Close bucket (optional) Output current too low.	☞ Current path has short circuit to voltage supply ☞ Current path has non-permitted connection to another current path ☞ Current path is interrupted	DIOS X0/1:5	471 472	2
472	Output proportional solenoid Close bucket (optional) Output current too high.	☞ Current path has short circuit to ground ☞ Current path has non-permitted connection to another current path	DIOS X0/1:5	471 472	2
473	Output proportional solenoid Close bucket (optional) Fault when calibrating the valve	☞ Current path is interrupted ☞ Current path has impermitted connection to another current path / ground	DIOS X0/1:5	471 472	2
475	DIOS module dozer blade Fault when initializing the module	☞ Wire breakage in CAN bus lines ☞ Short circuit between CAN bus lines ☞ One or both CAN bus line(s) has (have) connection to +12V or ground ☞ DIOS module without voltage supply ☞ DIOS module defective		-	2

Viton

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
500	Warning „Drive against brake“	With the input of code 500 the function „Driving against brake“ was activated. This messages is intended to remind you of this condition. The function „Driving against brake“ can be disabled by switching the ignition off and entering code 501.	-	-	1
502	Warning “Enable without the engine running”	With the input of code 502 the function „Enable without engine running” was activated. This messages is intended to remind you of this condition. The function „Enable without engine running“ can be disabled by switching the ignition off.	-	-	4
504	Warning „Enable float position“	With the input of code 504 the function „Enable float position” was activated. This messages is intended to remind you of this condition. The function „Enable float position“ can be disabled by switching the ignition off and entering code 505.	-	-	1

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
510	Output engine shut down Although the output is switched off, voltage is present	☞ Current path connected to +24 V	X0:24	510	2
511	Output engine shut down Although the output is switched on, no voltage is present	☞ Short circuit to ground in the current path	X0:24	510	2
512	Output engine shut down Although the output is switched off, a voltage of approx. 0.8 V is present.	☞ Wire breakage in current path	X0:24	510	2
513	Engine stalled or shut down by engine control unit (EMR)	☞ Engine overloaded	-	–	2
514	Engine speed input: Although the engine is running, no pulses from the rotation sensor	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ Wire breakage in current path for voltage supply ☞ Engine speed sensor B92 defective / incorrectly assembled ☞ see also under : "Known faults" on page 6	X0:16	514 515 516	1
517	Input D+ generator Although the engine is running there is no voltage present at input D+	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ V-belt broken ☞ Connections on generator faulty ☞ Generator defective	X0:36	517	1

inOn

Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
5 2 0	Input engine oil pressure Engine control unit (EMR) delivers signal „no engine oil pressure“	☞ The engine control unit has measured a too low oil pressure. The engine may be shut down. Should this message be displayed even though the engine is not running, the following faults should be examined: ☞ Current path has short circuit to ground ☞ No voltage supply to EMR	X0:52	**5 2 0**	1
5 2 1	Input engine oil pressure Fault **5 2 0** is present longer than 10 seconds ☞ Engine is shut down	☞ see fault code **5 2 0**	X0:52	5 2 0	4
5 2 2	Input coolant temperature Engine control unit (EMR) delivers signal „excessive coolant temperature“	☞This message shows that the coolant temperature is too high. The diesel engine control unit may reduce the engine power in order to avoid a further temperature increase or may even shut the engine down. Should this message be displayed even though the coolant temperature is in a non-critical range (e.g. machine is cold), you should check the following faults: ☞ Current path has short circuit to ground ☞ No voltage supply to EMR	X0:18	**5 2 2**	1
5 2 3	Input coolant temperature Fault **5 2 2** is present longer than 120 seconds ☞ Engine is shut down	☞ see fault code **5 2 2**	X0:18	5 2 2	4

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
5 2 4	Input coolant level float	☞ This message shows that the coolant level is too low. Should this message be displayed even though the coolant level is not critical, the following faults should be examined: ☞ Current path has short circuit to ground ☞ Float defective	X0:19	**5 2 4**	1
5 2 5	Input coolant level float Fault **5 2 4** is present longer than 20 seconds ☞ Engine is shut down	☞ see fault code **5 2 4**	X0:19	**5 2 4**	4
5 2 6	Input pressure differential switch air filter diesel engine	☞ This message indicates that at least one of the two air filters is dirty. (time delay 2 minutes) Should this message be displayed even though both filters are clean, the following faults should be examined: ☞ Current path has short circuit to ground ☞ Pressure switch defective	X0:11	**5 2 6**	1

interim

Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
530	Input travel pedal potentiometer The voltage applied to the input is below the specified range (see signal description).	☞ Wire breakage in current path ☞ Current path has short circuit to ground ☞ No voltage supply to potentiometer ☞ No voltage supply for engine control unit (EMR) ☞ Potentiometer defective	X0:06	530	1
531	Input travel pedal potentiometer The voltage applied to the input is above the specified range (see signal description).	☞ Current path connected to +24 V / +5 V ☞ Potentiometer not connected to ground ☞ Potentiometer defective	X0:06	530	1
532	Input travel pedal potentiometer A travel pedal fault has occurred and the engine runs with a speed of more than 1000 rpm, i.e. in emergency mode the engine runs with a fixed speed. Apart from that, the travel lever was NOT in Neutral when the fault occurred. ☞ Engine is shut down	see Fault 530 / 531	X0:06	530	4
533	Input travel pedal potentiometer A travel pedal fault has occurred and the engine runs with a speed of more than 1000 rpm, i.e. in emergency mode the engine runs with a fixed speed.	see Fault 530 / 531	X0:06	530	1
540	Engine speed signal The engine speed is outside the permissible range	☞ Selection of incorrect parameter for "Engine speed signal source" ☞ Speed sensor incorrectly installed ☞ Intermittent contact in current path ☞ Speed sensor defective	X0:16	540	1

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
560	Output sensor voltage supply The voltage applied to the output is higher than 10V.	☞ Current path connected to +24 V	X0:23	560	5
561	Output sensor voltage supply The voltage applied to the output is lower than 5V.	☞ Current path connected to ground	X0:23	560	5
562	Output Override (emergency operation) A voltage of 24V should be present at the output, however, the measured voltage is lower than 5V.	☞Fuse F67 has tripped or wire breakage in current path for voltage supply to control (56 - 60) ☞ Current path has short circuit to ground	X0:2	562	5

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
570	Input hydraulic oil contamination sensor	☞ This message shows that the hydraulic oil is contaminated. (Time delay 10 seconds) Should this message be displayed even though this is not true, the following faults should be examined: ☞ Current path has short circuit to ground ☞ Sensor defective	X0:11	570	1
571	Input hydraulic oil contamination sensor Fault 570 is present longer than 120 seconds ☞ Engine is shut down	see fault code 570	X0:11	570	4
572	Input pressure differential switch hydraulic filter charge pumps and intermediate gears	☞ At least one of the pressure differential switches shows a pressure differential Should this message be displayed even though no differential pressure has been measured, the following faults should be examined: ☞ Current path has short circuit to ground ☞ one of the pressure switches are defective	X0:10	572	1

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
573	Input pressure differential switch hydraulic filter charge pumps and intermediate gears Fault 572 is present longer than 120 seconds ☞ Engine is shut down	see fault code 572	X1:13	572	4
574	Input excessive hydraulic oil temperature	☞ This message is a warning, giving the operator enough time to move the machine out of the danger area before the engine is automatically shut down after 120 seconds. Should this message be displayed even though the hydraulic oil temperature is ok (e.g. machine is cold), you should check the following faults: ☞ Current path has short circuit to ground ☞ one of the 5 pressure switches is defective	X0:50	**574**	1
575	Input excessive hydraulic oil temperature Fault **574** is present longer than 120 seconds ☞ Engine is shut down	see fault code **574**	X0:50	**574**	4
578	Input hydraulic oil filling level	☞ This message shows that the hydraulic oil level is too low. ☞ This message is a warning, giving the operator enough time to move the machine out of the danger area before the engine is automatically shut down after 20 seconds. Should this message be displayed even though the hydraulic oil level is ok, the following faults should be examined: ☞ Current path has short circuit to ground ☞ Float defective	X0:45	**578**	1

Inactive

Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
579	Input hydraulic oil filling level Fault 579 is present longer than 20 seconds ☞ Engine is shut down	see fault code 579	X0:45	578	4
580	Input hydraulic oil return flow filter	☞ The return flow filter is dirty Should this message be displayed even though no pressure has been measured, the following faults should be examined: ☞ Current path has short circuit to ground ☞ Pressure switch defective	X0:13	580	1
581	The warning 580 was present for longer than 120 seconds, the engine was then automatically shut down.	☞This message indicates that a pressure differential was detected at the filter which lasted longer than 120 seconds (see message 580) and the engine was therefore automatically shut down.	X0:13	580	4

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Fault code	Fault description	Possible cause	Terminal on ESX	Input - code for diagnose	Fault - reaction
800 – 899	Fault message "severe software fault in control" The machine can only be moved in emergency mode. The control has automatically switched off. This fault cannot be rectified on the machine. The control must be immediately replaced.	-	-	-	5
900 – 919	Error message "Communication via CAN bus disturbed" The modules (DIOS module for bucket control) controlled via the CAN bus cannot be addressed by the main control (ESX). The respective machine functions (e.g. bucket control) are not available	☞ Wire breakage in CAN bus lines ☞ Short circuit between CAN bus lines ☞ One or both CAN bus line(s) has (have) connection to +12V or ground ☞ DIOS module without voltage supply ☞ DIOS module defective	X0:26 X0:27	-	2
920 – 999	Fault message "Severe internal fault in control" The machine can only be moved in emergency mode. The control has automatically switched off. This fault cannot be rectified on the machine. The control must be immediately replaced.	-	-	-	5
Ct0	Display module has no connection to ESX-control.	☞ Wire breakage in CAN bus lines ☞ Short circuit between CAN bus lines ☞ One or both CAN bus line(s) has (have) connection to +12V or ground	X0:26 X0:27	-	-

intern

12 Input Codes for ESX Control

12.1 Travel system

Input code	Description of display function	Display values
0 0 0	All display functions disabled.	-
0 0 I	**brake** Show voltage on brake output.	Display value / 10 = voltage in V
0 0 3	**brake** Shows condition of brake switch	0 0 0 ☞ Switch position "brake OPEN" 0 0 I ☞ Switch position "brake CLOSED"
0 2 0	**Selector switch travel direction** Shows the travel direction.	1 0 0 ☞ actuated forward 0 0 0 ☞ Neutral position 0 0 I ☞ actuated to backward
0 2 1	**Selector switch travel direction** Shows the potentiometer voltage.	Display value / 100 = voltage in V
0 4 0	**Selector switch travel speed range** Shows the voltage on the input.	Display value / 100 = voltage in V
0 4 1	**Selector switch travel speed range** Shows the travel speed range.	0 0 I ☞ 1st gear 0 0 2 ☞ 2nd speed range 0 0 3 ☞ 3rd speed range (only BC972)
0 5 0	**Travel pump** Show voltage on output “travel pump forward”	Display value / 10 = voltage in V
0 5 2	**Travel pump** Show voltage on output “travel pump forward”	Display value *10 = current in mA[1]
0 6 0	**Travel pump** Show voltage on output “travel pump reverse”	Display value / 10 = voltage in V
0 6 2	**Travel pump** Show current on output “travel pump reverse”	Display value / 10 = current in mA[1]

[1] Current measurement with factor 10 only available from software version 4.03

(Up to and incl. version 4.02 the current output took place without this factor, i.e. only max. 999mA could be displayed)

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Input code	Description of display function	Display values
0 7 0	**Speed range selector valve (only BC772)** Shows the voltage on the output.	Display value / 10 = voltage in V
1 0 0	**Wheel motor front left [3](only BC972)** Shows actual current value of proportional solenoid.	Display value = current in mA
1 0 5	**Wheel motor front right [1] (only BC972)** Shows actual current value of proportional solenoid.	Display value = current in mA
1 1 0	**Wheel motor front left [1] (only BC972)** Shows actual current value of proportional solenoid.	Display value = current in mA
1 1 5	**Wheel motor rear right [1] (only BC972)** Shows actual current value of proportional solenoid.	Display value = current in mA
1 2 0	**Wheel motors (only BC972)** Shows the current values.	Display value = current in mA

12.2 Steering

Input code	Description of display function	Display values
2 3 0	**Steering joystick** Shows the condition of the switches.	I 0 0 ☞ Switch left actuated 0 0 0 ☞ no switch actuated; neutral position 0 0 I ☞ Switch right actuated I 0 I ☞ Switches left and right actuated fault ☞ Fault
2 3 1	**Steering joystick** Shows the potentiometer voltage.	Display value / 100 = voltage in V
2 3 2	**Steering joystick** Shows the standardized position	Value range: 1000...-1000 1000 = max. actuation left 0 = zero position -1000 = max. actuation right Note: Due to the abilities of the display module only values from 9 9 9 . . . – 9 9 9 can be displayed. (See also description of display module)

[3] due to measuring inaccuracies the display values fluctuate slightly, e.g. actual current value 1st speed range: 0..15 mA

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Input code	Description of display function	Display values
240	**Steering wheel (optional)** Shows the condition of the switches.	I 0 0 ☞ Switch left actuated 0 0 0 ☞ no switch actuated; neutral position 0 0 I ☞ Switch right actuated I 0 I ☞ Switches left and right actuated fault ☞ Fault
241	**Steering wheel (optional)** Shows the potentiometer voltage.	Display value / 100 = voltage in V
242	**Steering wheel (optional)** Shows the standardized position	Value range: 1000...-1000 1000 = max. actuation left 0 = zero position -1000 = max. actuation right Note: Due to the abilities of the display module only values from 999 . . . – 999 can be displayed. (See also description of display module)
250	**Arm rest (optional)** Shows position determined by position switch	0 0 0 ☞ Arm rest top position (joystick steering inactive) 0 0 1 ☞ Arm rest bottom position
251	**Limit switch steering left (only electronic end position damping)** Shows position determined by position switch	0 0 0 ☞ End position reached 0 0 1 ☞
252	**Limit switch steering right (only electronic end position damping)** Shows position determined by position switch	0 0 0 ☞ End position reached 0 0 1 ☞
271	**Steering valve right** Shows specified current value of proportional solenoid left.	Display value = current in mA
272	**Steering valve right** Shows actual current value of proportional solenoid left.	Display value = current in mA
276	**Steering valve left** Shows specified current value of proportional solenoid right.	Display value = current in mA
277	**Steering valve left** Shows actual current value of proportional solenoid right.	Display value = current in mA

Entwurf

12.3 Working hydraulics

Input code	Description of display function	Display values
400	**Dozer blade joystick** Shows the condition of the switches.	I00 ☞ Switch up actuated 000 ☞ no switch actuated; neutral position 00I ☞ Switch down actuated I0I ☞ Switches up and down actuated ☞ Fault
401	**Dozer blade joystick** Shows the potentiometer voltage.	Display value / 100 = voltage in V
402	**Dozer blade joystick** Shows the standardized position	Value range: 1000...-1000 1000 = max. actuation up 0 = zero position -1000 = max. actuation down Note: Due to the abilities of the display module only values from 999 . . . – 999 can be displayed. (See also description of display module)
411	**Valve up** Shows specified current value of proportional solenoid for lifting.	Display value = current in mA
412	**Valve up** Shows actual current value of proportional solenoid for lifting.	Display value = current in mA
421	**Valve down** Shows specified current value of proportional solenoid for lowering.	Display value = current in mA
422	**Valve down** Shows actual current value of proportional solenoid for lowering.	Display value = current in mA
425	**Push button float position** Shows condition of push button	000 ☞ joystick not operated 001 ☞ operated
426	**Status float position**	000 ☞ not active 001 ☞ active
430	**Valve float position** **Shows the voltage** on the output “float position”.	Display value / 10 = voltage in V

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Input code	Description of display function	Display values
4 5 0	**Bucket joystick** Shows the condition of the switches.	I 0 0 ☞ Switch closing actuated 0 0 0 ☞ no switch actuated; neutral position 0 0 I ☞ Opening switch actuated I 0 I ☞ Switches open and close actuated ☞ Fault
4 5 1	**Bucket joystick** Shows the potentiometer voltage.	Display value / 100 = voltage in V
4 5 2	**Bucket joystick** Shows the standardized position	Value range: 1000...-1000 1000 = max. actuation close 0 = zero position -1000 = max. actuation open Note: Due to the abilities of the display module only values from 9 9 9 . . – 9 9 9 can be displayed. (See also description of display module)
4 6 1	**Valve open** Shows specified current value of proportional solenoid open.	Display value = current in mA
4 6 2	**Valve open** Shows actual current value of proportional solenoid open.	Display value *100 = current in mA
4 7 1	**Valve close** Shows specified current value of proportional solenoid close.	Display value = current in mA
4 7 2	**Valve close** Shows actual current value of proportional solenoid close.	Display value *100 = current in mA

12.4 Test functions

Input code	Description of display function	Display values
5 0 0	Switch on function „Against brake“	see adjustment instructions (page 8)!
5 0 I	Switch off function „Drive against brake“	see adjustment instructions (page 8)!
5 0 2	Function “Enable without engine running”	see adjustment instructions (page 8)!
5 0 4	Switch on function „Enable float position"	see adjustment instructions (page 9)!
5 0 5	Switch off function „Enable float position"	see adjustment instructions (page 9)!

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12.5 Diesel engine

Input code	Description of display function	Display values
5 1 0	**Engine shut down** Shows the voltage on the output engine shut down.	Display value / 10 = voltage in V
5 1 1	**Status diesel engine** Shows the status of the diesel engine. Status is derived from MD+, oil pressure and engine speed. Running of engine is sensed if at least 2 signals are present.	0 0 0 ☞ Engine OFF 0 0 I ☞ Engine ON
5 1 4	**Engine speed sensor** Shows the engine speed.	Display value x 10 = engine speed in rpm
5 1 5	**Engine speed sensor** Shows the frequency at engine speed input.	Display value x 10 = frequency in Hz
5 1 6	**Engine speed sensor** Shows number of pulses on engine speed input.	Number of pulses; display jumps from 9 9 9 back to 0 0 0
5 1 7	**D+ generator** Shows status of input MD+.	0 0 0 ☞ MD+ not applied (input to ground) 0 0 I ☞ MD+ present (input connected to +24 V)
5 2 0	**Engine oil pressure** Shows status of input engine oil pressure.	0 0 0 ☞ No engine oil pressure 0 0 I ☞ Engine oil pressure OK
5 2 2	**Coolant temperature** Shows status of input coolant temperature.	0 0 0 ☞ Coolant temperature too high 0 0 I ☞ Coolant temperature OK
5 2 4	**Coolant filling level** Shows status of input coolant level.	0 0 0 ☞ Filling level too low 0 0 I ☞ Filling level OK
5 2 6	**Air filter soiled** Shows status of input air filter pressure differential switch.	0 0 0 ☞ at least 1 filter soiled 0 0 I ☞ both filters OK
5 3 0	**Travel pedal potentiometer** Shows the potentiometer voltage.	Display value / 100 = voltage in V
5 3 1	**Travel pedal potentiometer** Shows the standardized potentiometer voltage.	Value range: 0..1000 Display value / 10 = voltage in % of the reference voltage from EMR control unit (5 V)
5 3 2	**Travel pedal potentiometer** Shows status.	0 0 I ☞ ok 0 0 2 ☞ Fault

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Input code	Description of display function	Display values
5 4 0	**Engine speed measuring source** You may either evaluate the speed signal provided by the DEUTZ engine control unit, or the signal from the BOMAG speed sensors.	0 0 0 ☞ Evaluation of DEUTZ speed signal 0 0 I ☞ Evaluation of BOMAG speed signal
5 4 1	**Pulses / revolution engine speed signal** Number of pulses per revolution of the evaluated speed signal.	0 6 0 ☞DEUTZ speed signal 1 2 9 I ☞BOMAG speed signal (only BC572) 1 6 7 ☞BOMAG speed signal

12.6 System information

Input code	Description of display function	Display values
5 5 5	**Software Version** Shows the software version number.	3-digit version number
5 6 0	**Supply voltage 8.5V** Shows the voltage value	Display value / 100 = voltage in V
5 6 I	**Supply voltage 24 V** Shows the voltage value	Display value / 10 = voltage in V
5 6 2	**Override** Shows the voltage on the output “override”.	Display value / 10 = voltage in V

12.7 Hydraulics

Input code	Description of display function	Display values
5 7 0	**Hydraulic contamination sensor** Shows status of input contamination sensor.	0 0 0 ☞ Hydraulic oil contaminated 0 0 I ☞ Hydraulic oil OK
5 7 2	**Hydraulic oil filter** Shows the condition of input hydraulic oil filter for charge pumps and intermediate gear.	0 0 0 ☞ at least 1 hydraulic filter soiled 0 0 I ☞ all hydraulic oil filters OK
5 7 4	**Hydraulic oil temperature** Shows status of input oil temperature.	0 0 0 ☞ Temperature too high 0 0 I ☞ Temperature OK
5 7 8	**Hydraulic oil filling level**	0 0 0 ☞ Filling level too low

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Input code	Description of display function	Display values
	Shows status of input hydraulic oil level float.	0 0 I ☞ Filling level OK
5 8 0	**Hydraulic return flow filter** Shows status of input hydraulic return flow filter.	0 0 0 ☞Hydraulic oil filter soiled 0 0 I ☞ Hydraulic oil filter OK

intern

12.8 Parameter change

Input code	Description of display function	Display values
640	Activates function "parameter input steering"	Display value 640
641	Activation of option "steering joystick"	see adjustment instructions (page 13)!
642	Deactivation of option "steering joystick"	see adjustment instructions (page 13)!
643	Activation of option "steering wheel"	see adjustment instructions (page 13)!
644	Deactivation of option "steering wheel"	see adjustment instructions (page 13)!
645	Activation of the arm rest initiator	see adjustment instructions (page 13)!
646	Deactivation of the arm rest initiator	see adjustment instructions (page 13)!
647	Deactivation of mechanical end position damping	see adjustment instructions (page 13)!
648	Activation of mechanical end position damping	see adjustment instructions (page 13)!
649	Deactivation of electronic end position damping	see adjustment instructions (page 13)!
650	Switch on function "parameter input setting dozer blade function" (only EB machines).	Display value 650
651	Activation "characteristic 1 (slightly progressive)"	see adjustment instructions (page 14)!
652	Activation "characteristic 2 (more progressive)"	see adjustment instructions (page 14)!
653	Activation "characteristic 3 (highly progressive)"	see adjustment instructions (page 14)!
654	Activation "no characteristic 1"	see adjustment instructions (page 14)!
660	Activates „parameter input 2nd speed range" (only BC972)	Display value 660
661	Activation "slow speed" for 2nd speed range (only BC972).	see adjustment instructions (page 12)!
662	Activation "medium speed" for 2nd speed range (only BC972).	see adjustment instructions (page 12)!
663	Activation "high speed" for 2nd speed range (only BC972).	see adjustment instructions (page 12)!
685	Activation of "Parameter input diesel engine speed signal"	see adjustment instructions (page 15)!
686	Activation "DEUTZ engine speed signal"	see adjustment instructions (page 15)!
687	Activation "BOMAG engine speed signal"	see adjustment instructions (page 15)!
690	Activation "parameter input travel pedal monitoring"	see adjustment instructions (page 14)!
691	Activation "Monitoring ON"	see adjustment instructions (page 14)!
692	Activation "Monitoring OFF"	see adjustment instructions (page 14)!

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12.9 Fault log

Input code	Description of display function	Display values
7 0 0	Switch on function „Show stored faults“	see adjustment instructions (page 10)!
7 0 1	Switch off function „Show stored faults“	see adjustment instructions (page 10)!
7 1 0	Delete all stored faults	see adjustment instructions (page 10)!

intern

12.10 Setting the machine type

Input code	Description of display function	Display values
7 2 5	Switches on function „Set machine type“	see adjustment instructions (page 11)!
7 2 6	Confirms entered machine type	see adjustment instructions (page 11)!
7 6 0	Pre-select machine type BC 972 dozer blade version	see adjustment instructions (page 11)!
7 6 1	Pre-select machine type BC 672/772 dozer blade version	see adjustment instructions (page 11)!
7 6 2	Pre-select machine type BC 972 bucket version	see adjustment instructions (page 11)!
7 6 3	Pre-select machine type BC 672/772 bucket version	see adjustment instructions (page 11)!
7 6 4	Pre-select machine type BC 572 dozer blade version	see adjustment instructions (page 11)!
7 6 5	Pre-select machine type BC 572 bucket version	see adjustment instructions (page 11)!
7 6 6	Pre-select machine type BC 672 EB	see adjustment instructions (page 11)!
7 6 7	Pre-select machine type BC 672 EB with tilt function	see adjustment instructions (page 11)!

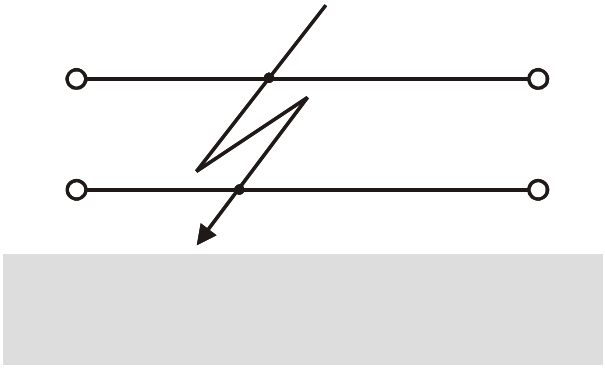
internal

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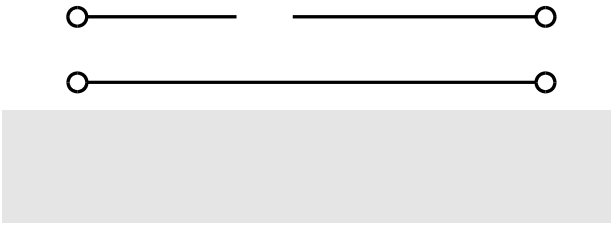
13 Terminology in connection with ESX

Short circuit
A direct, unwanted connection between two different cables or between machine and cables.
Examples:
Two lines rub against each other until the insulation has worn off.
A conductive line rubs off the insulation at the vehicle ground.



Wire breakage
This generally means that a connection is interrupted. Possible reasons may be:

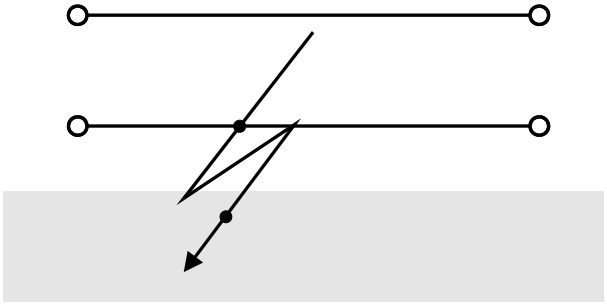
Line:
torn (not necessarily visible from outside)
chafed
chafed mostly in connection with a *short circuit to ground*



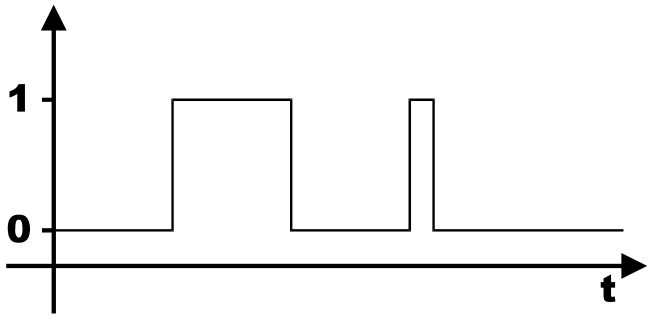
Terminal, cable lug
loosened, slipped off
broken off,
corroded,
socket / plug faulty

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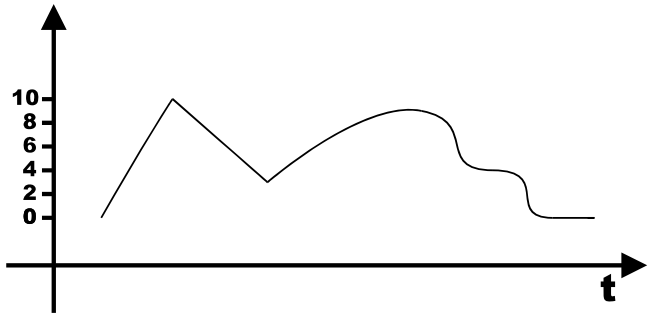
Short circuit to ground
Line, terminal has direct connection to vehicle ground, often in connection with *wire breakage*



Digital
There are only two permissible states, e.g. switched on or off; lamp on / off; current flows / does not flow; valve open / closed (black-white valve)

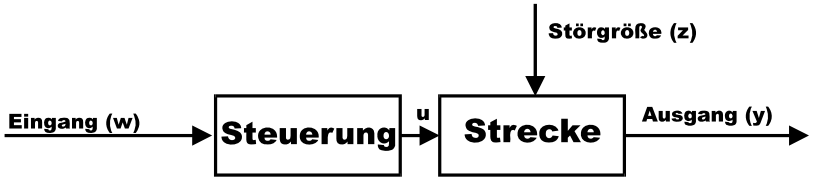


Analogue
In contrast to *Digital*, many states are permitted within a certain range. E.g. room temperature 0° **to** 40°; current 4mA **to** 20mA; voltage 0V **to** 8,5V; resistance 100 **to** 300 ; valve 0% **to** 100% opened (proportional valve)

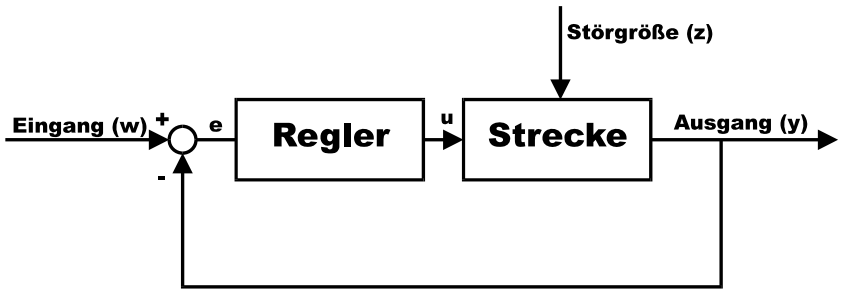


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Control
Controlling describes the process during which an input value influences a distance (the value to be controlled), following a fixed command. For this purpose all possible interfering factors (e.g. temperature, humidity ...) must be known.



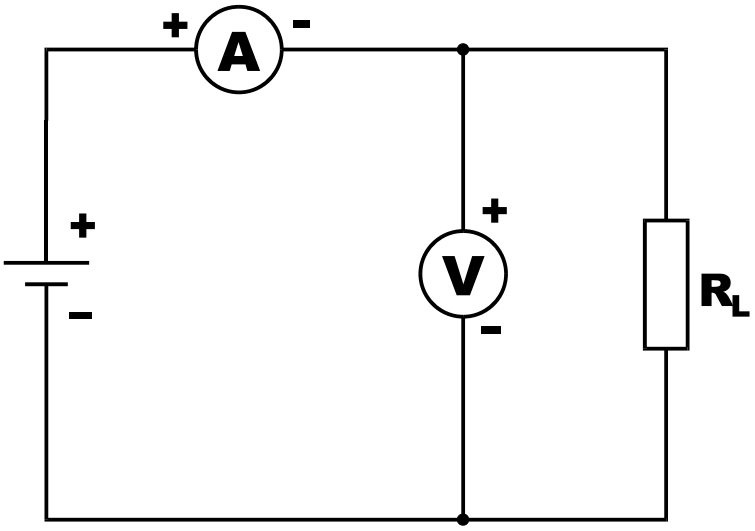
Closed loop control
Closed loop control is a process during which a value, the closed loop control value (e.g. pressure), is continually measured and compared with a nominal value (guide value). The result of this comparison will affect the closed loop control value, thereby adapting the closed loop control value to the guide value.
This sequence occurs in a closed circuit, the co-called closed loop control circuit.



Marking	Closed loop control	Control
Operating path:	closed (closed loop control circuit)	open (control chain)
Measurement and comparison of value to be adjusted:	Value to be adjusted is measured and compared.	Values to be controlled are not measured and compared.
Reaction to faults (generally):	Counteracts to all faults targeting the system to be controlled.	Does not respond to unknown faults
Technical expense:	Low effort: Measurement of the value to be controlled, comparison of nominal and actual value, power amplification	High expense if many faults have to be considered, low expense if not faults occur.
Performance in unstable systems	For unstable systems closed loop controls must be used.	In unstable systems controls cannot be used.

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Current and voltage measurement



Ohm's law:

U = Voltage
R = Resistance
I = Current

$$U = R * I$$

$$I = \frac{U}{R}$$

$$R = \frac{U}{I}$$

Plausibility check
The control (ESX) runs a plausibility check on all inputs. This means the control checks permanently whether certain state combinations are permitted; e.g. travel lever position forward **and** reverse will cause an fault message, because this condition is normally not possible.

Override / emergency operation
In the event of a major fault the control will switch off and the override function will take over. This has the effect that the machine can still be moved and steered with reduced speed. Steering and dozer blade movements are only possible with a constant speed.
(see also: page 18, "")

GND - AGND
Besides the "normal" battery ground (terminal 31) in the vehicle there is an additional analogue ground, which is only to be used for sensors. (see description of the signals on the ESX-control)

PWM – digital output
Certain outputs on the ESX are designed as so-called PWM – digital outputs. This means that these outputs are special current outputs. Here it is possible to measure a current, but **no** voltage. These outputs are used to trigger proportional valves.

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7 Trouble shooting

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General notes on trouble shooting in hydraulic systems

The following description of trouble shooting steps contains a small selection of possible faults that may occur during the operation of the machine. The fault lists are by no means complete, but the fault tables were compiled according to the experience gathered by our central customer service, i.e. faults that have occurred in the past have almost all been included.

Procedure:

On machines with electronic control (ESX) you should first of all check the CAN-Bus module, to find out if there is a error code and thus an electric fault present. If a fault code is present, continue trouble shooting by following the description of the ESX-control.

If no fault code is present, the fault may still be caused by an electrical problem or an operating error. The control will only report a fault if the current/voltage values are out of the nominal range. If e.g. a contact in a switch is defective, the control will not always recognize this. For this reason one can have the incoming and outgoing signals for the control displayed by the CAN-Bus module to compare these with the table of nominal values.

Important points for trouble shooting and fault rectification

⚠ Danger

Danger of injury!

Do not touch rotating parts of the engine.

When working on the travel pump and performing tests in the travel circuit block the wheels with suitable wheel chocks.

Hydraulic oil escaping under pressure can penetrate the skin and cause severe injury. You should therefore relieve the pressure in the system before disconnecting any lines. Before repressurizing the system make sure that all line connections and ports are in perfect condition.

When being injured by hydraulic oil consult a physician immediately, as otherwise this may cause severe infections.

⚠ Caution

It is not recommended to open or repair hydraulic units and components without comprehensive knowledge.

Risk of damage to pressure gauges if incorrectly connected.

When performing trouble shooting it is assumed that the machine is correctly equipped and connected, that connections and hoses are free of faults and that setscrews have not been deadjusted without permission.

Progressive tests drawn up in the trouble shooting diagram lead to the detection of faults and their rectification by trained personnel.

- Ensure strict cleanliness, clean ports and fittings before disconnecting.
- Cover all openings and ports or close with plugs.
- Check the hydraulic oil level before and after the work.
- Use only clean oil according to specification.
- Check the hydraulic system for leaks, find and rectify the cause.
- Ensure strict cleanliness, clean ports and fittings before disconnecting.
- Fill new hydraulic units with hydraulic oil before starting operation.
- After changing a component thoroughly flush and bleed the hydraulic system.
- As far as possible conduct all measurements at operating temperature 40 ... 50 °C.
- After changing a component check charge and high pressure, if necessary check the rotational speed.

Hydraulic hoses

⚠ Danger

Danger of injury

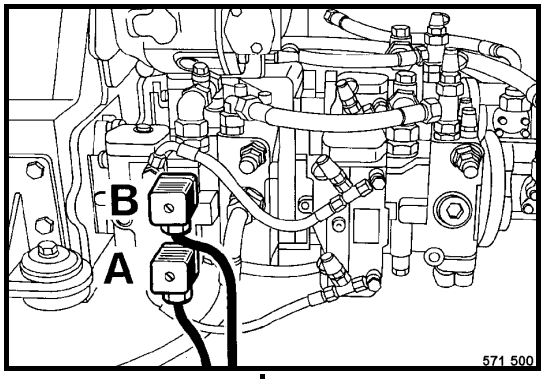
Hydraulic hoses must be visually inspected at regular intervals.

Hydraulic hoses must be immediately replaced if:

- the outer layer is damaged down to the inlay (e.g. chafing, cuts, cracks, etc.)
- the outer layer is brittle (formation of cracks in the hose material)
- the hose shows deformations in pressurized and depressurized condition, which do not comply with the genuine shape of the hydraulic hose
- the hose shows deformations in bends, e.g. squeezing, buckling, layer separation, formation of blisters
- the hose is leaking
- the hydraulic hose has separated from the fitting
- the fitting shows corrosion that impairs both function and strength
- the fitting is deformed in a way that both function and strength are affected
- the storage time and utilization period has expired.

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The machine drives with the travel lever in „NEUTRAL“



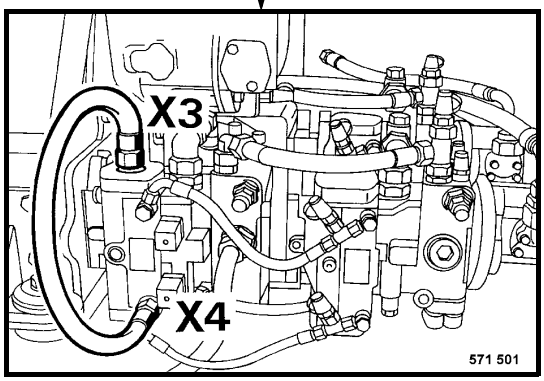
Check the control current to the solenoids

- Pull the plugs off the magnets on the control, one after the other

Machine stops?

yes → Perform trouble shooting in the electrical system

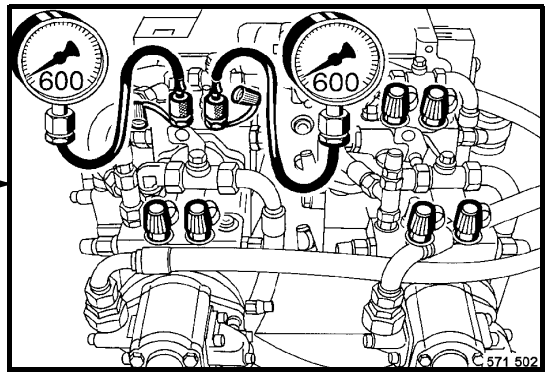
no



Check the zero position of the pump

- Connect control chamber ports X3 and X4 on one pump with a hose
- Start the engine
- Repeat this test on all other pumps

Machine stops?

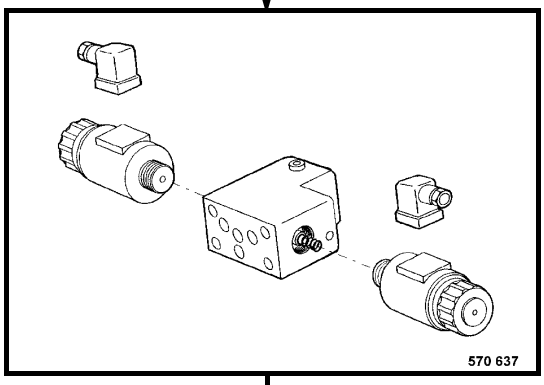
no → 

yes

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Adjust the mechanical 0-position

- Connect control chamber ports X3 and X4 with a hose
- Connect 600 bar pressure gauges to MA and MB.
- Check which pump is delivering
- On this pump adjust the 0-position so that the pressure reading is below 60 bar
- Repeat this test until the lowest pressure value is reached
- Remove the connecting hose, repeat the pressure test



Check the control unit

- Remove the control unit
- Check the smooth movement of the control piston

Control unit OK?

no

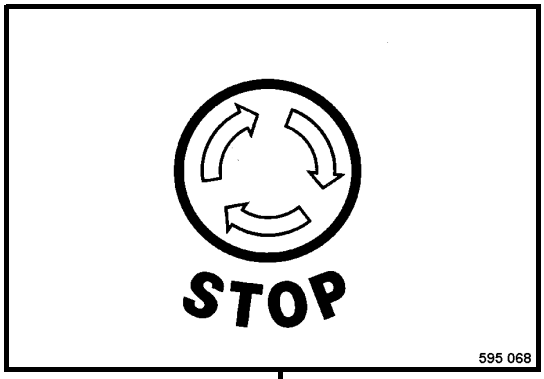
Replace the control unit

yes

Replace/repair the travel pump

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The machine does not drive



Read fault code and proceed appropriately
Check the emergency stop switch

- Check whether the emergency stop switch was pressed

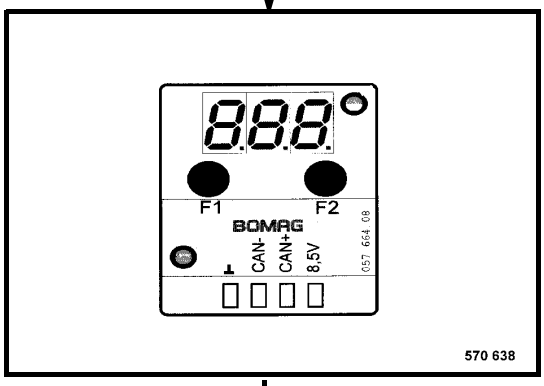
Note:
If necessary select the travel direction again after unlocking or operate the brake

Emergency stop switch OK?

no

Unlock the emergency stop switch, replace if necessary

yes



Check the electric control

- Input module, enter PIN-CODE.
- Switch the ignition on and select the desired travel direction
- Check the voltage

Nominal value:
24V

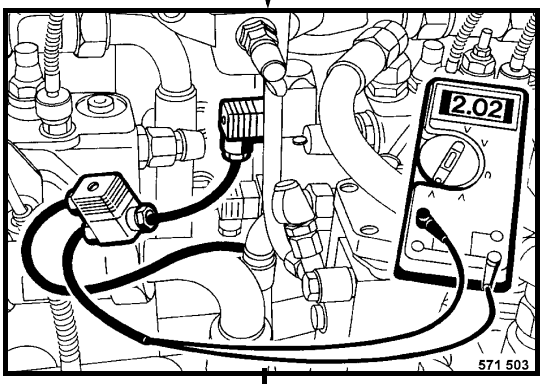
Voltage OK?

no

Perform trouble shooting in electric system

yes

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Check the solenoid

- Pull the plug off the solenoid
- Connect the adapter cable and measure the current draw

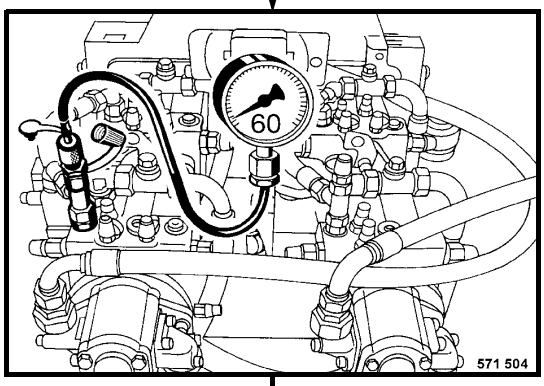
Nominal value: approx. 2A

Current draw OK?

no

Replace the magnet

yes



Charge pressure OK?

no

Check the charge pump, search for cause of pressure drop

yes

Check the coupling on the engine

- Loosen the charge pump from the travel pump and pull it off.

ATTENTION:
Do not loosen the hoses!

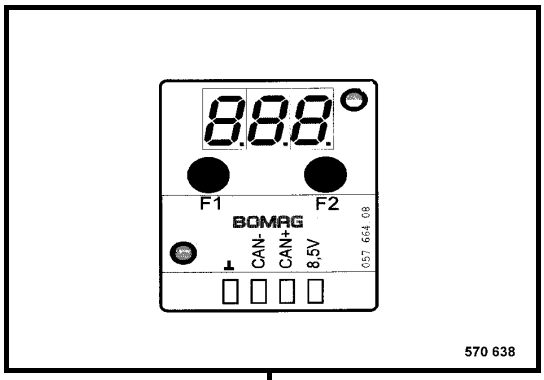
- Loosen the charge pump from the travel pump and pull it off.

Nominal value:

- The drive shaft must turn, otherwise the coupling is defective

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Machine travels to one direction only or to one travel direction with reduced power



Read fault code and proceed appropriately
Check the electric control

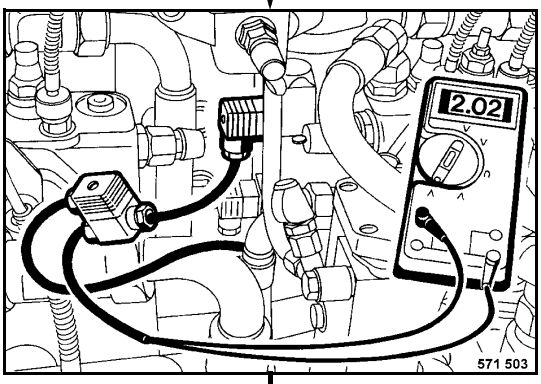
- Input module, enter PIN-CODE.
- Switch the ignition on and select the desired travel direction Check the voltage

Nominal value:
24V

Voltage OK?

no → Perform trouble shooting in the electric system

yes



Check the solenoid

- Pull the plug off the solenoid
- Connect the adapter cable and measure the current draw

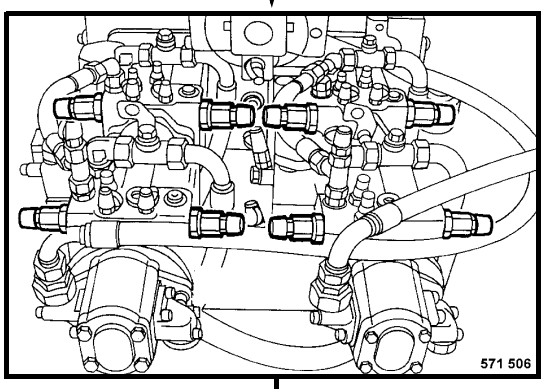
Nominal value: approx. 2A

Current draw OK?

no → Replace the magnet

yes

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Check the high pressure relief valve

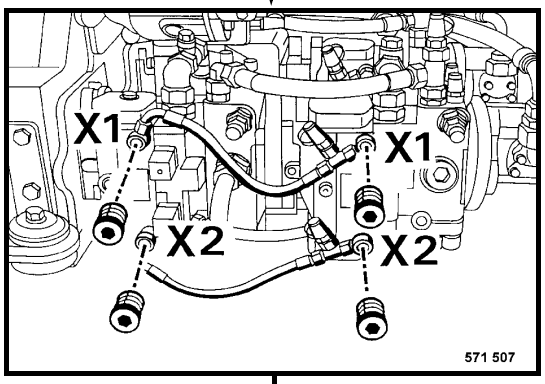
- Interchange the high pressure relief valves

Travel direction changes

yes

Replace the corresponding high pressure relief valve

no



Checking the swash time nozzles

- Unscrew the nozzles from ports X1 and X2 and check for blockage

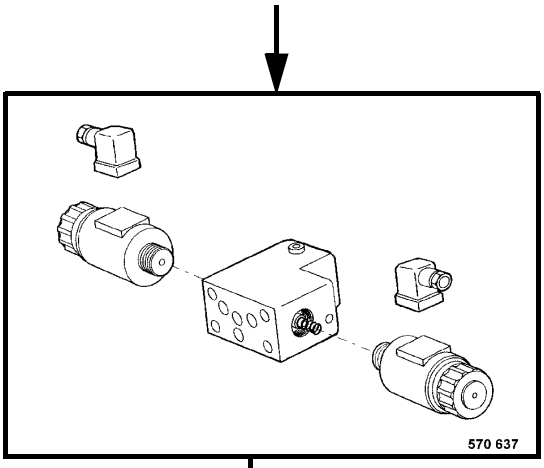
Nozzles OK?

no

Clean/replace the nozzles

yes

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Replace the control

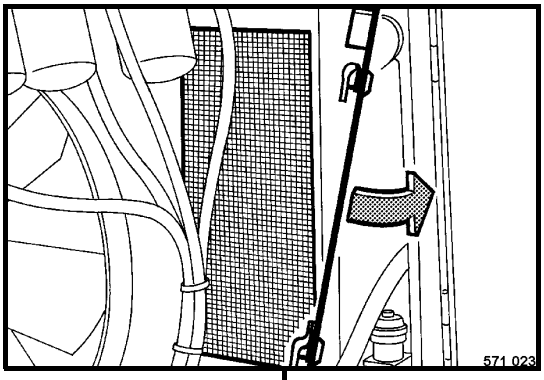
Travel direction changes?

no

Replace/repair the travel pump

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Hydraulic oil overheating



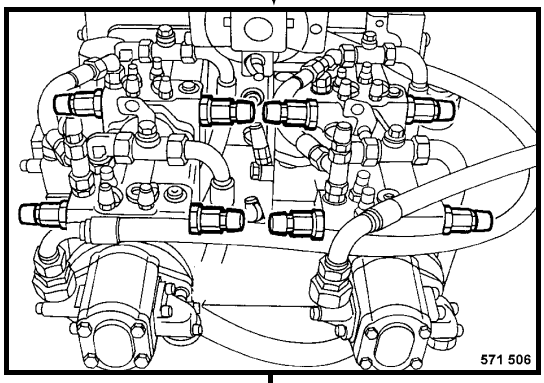
Check the engine cooling system

- Check the hydraulic oil cooler for dirt
- Check the engine cooling fan
- Inspect the air intake box on the cabin roof for dirt

Cooler OK?

no → Clean the radiator or repair the cooling system

yes



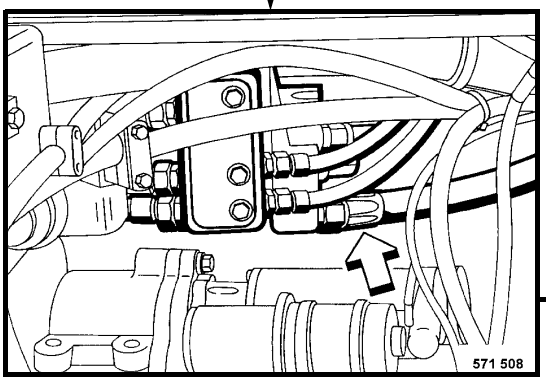
Check the high pressure limitation

- Pull the plug off the brake solenoid valve
- Start the engine
- Actuate the travel lever
- Select 2nd travel speed range
- Start the engine and run it with max. speed
- Check whether the high pressure relief valves heat up
- Repeat this test to the opposite direction.

Valve heating up?

no → Check the pressure setting of high pressure relief valves and pressure override, adjust or replace as necessary

yes



Check the thermostat

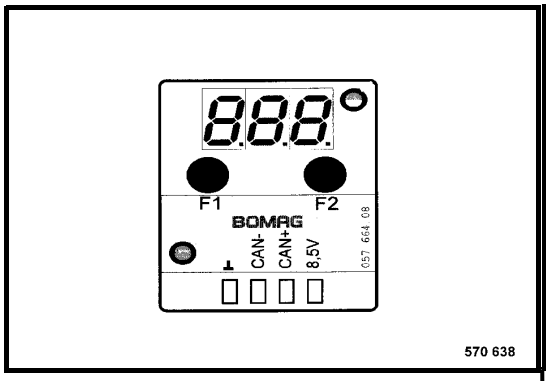
- Run the machine up to operating temperature (hydraulic oil temperature55°C).
- Check, whether the hose to the hydraulic oil cooler warms up at an hydraulic oil temperature of more than 70°C or becomes warmer than the direct hose from the thermostat to the tank

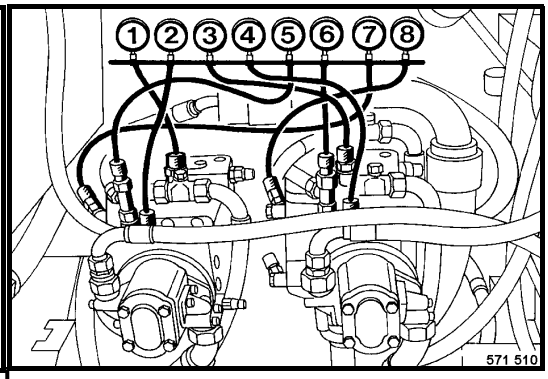
Thermostat OK?

no → Replace the thermostat

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Insufficient travel power, max speed is not reached



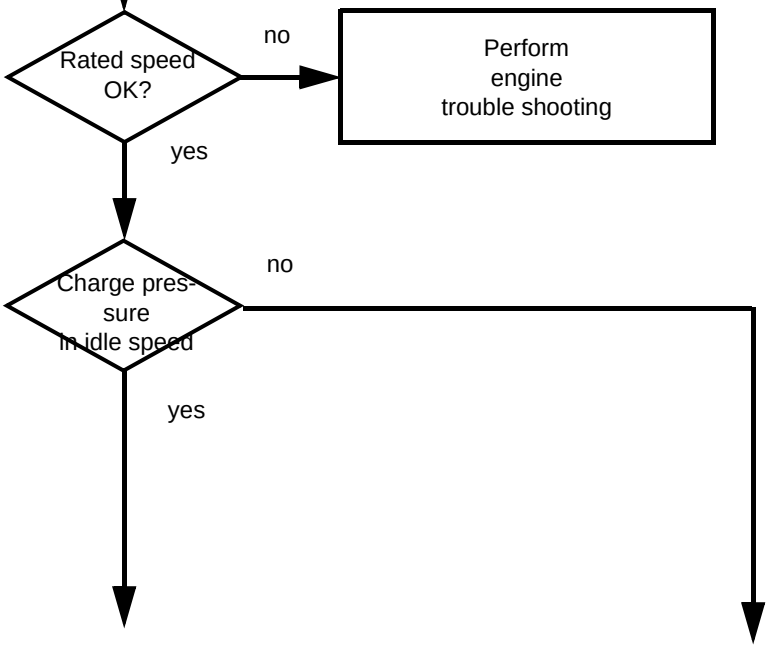


Pressure and speed test

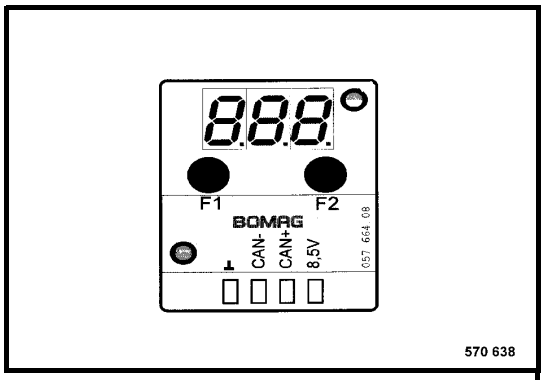
- Run the machine warm to operating temperature (approx. 50°C hydraulic oil temperature)
- Input module, enter PIN-CODE.
- Connect 600 bar pressure gauges high pressure sides of the travel pumps (pos. 1 to 4)
- Connect 60 bar pressure gauges for pilot pressure (Pos.7 and 8)
- Connect 60 bar pressure gauges for charge pressure (Pos. 5 and 6)
- Start the engine, select 2nd speed range and switch to the desired travel direction
- Watch the pressure gauges and accelerate the engine slowly up to maximum speed

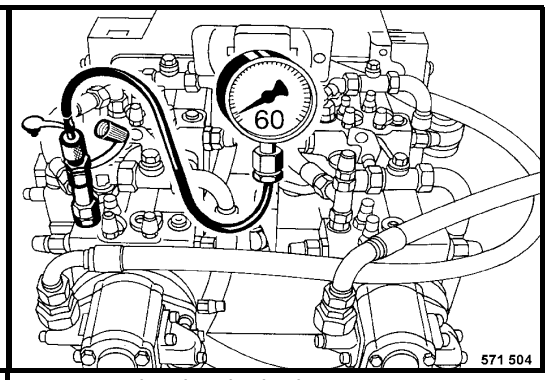
Nominal values:

Engine speed min. 2100 rpm; charge pressures must not drop, min. 25 bar in idle speed, increasing to 30 bar; control chamber pressures must increase evenly; high pressure must increase evenly up to approx. 430 bar.



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Check the brake

- (only if pressure of left hand pump drops below 10 bar)
- Input module, enter PIN-CODE.

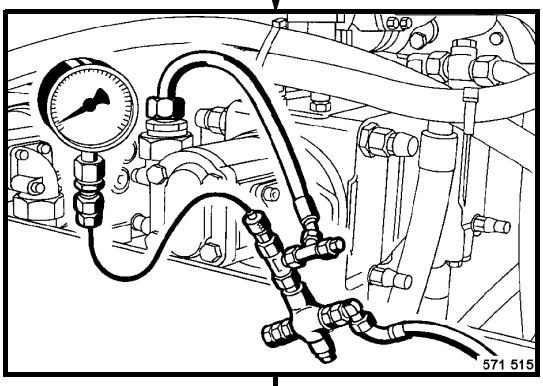
- Releasing the brake
- Check charge pressure at idle speed

Charge pressure OK?

yes*

no*

- * Inform the service department of BOMAG



Check the charge pump

- Close the outlet port of the respective pump with a 200 bar pressure relief valve
- Connect a 600 bar pressure gauge
- Crank the engine with the starter (pull the plug off the engine shut-down solenoid)

Nominal value: 200 bar

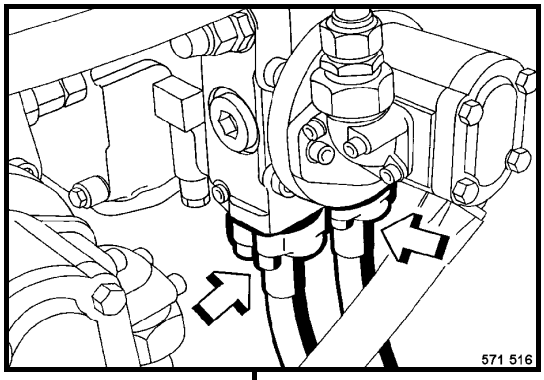
Pressure OK?

yes

Replace charge pump

no*

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Check the individual components

- Disconnect the high pressure hoses from one pump
- Close the pump ports with plugs
- Repeat the pressure test
- Perform this test also on the other pump

Charge pressure

yes

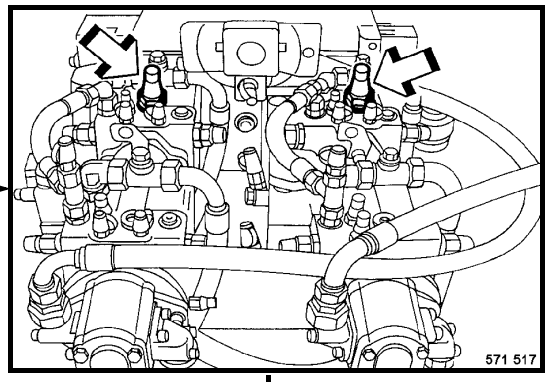
Replace/repair the corresponding travel motor

no

Replace/repair the corresponding travel pump

Pilot pressure OK?

no



yes

Check and adjust the DA-control valve

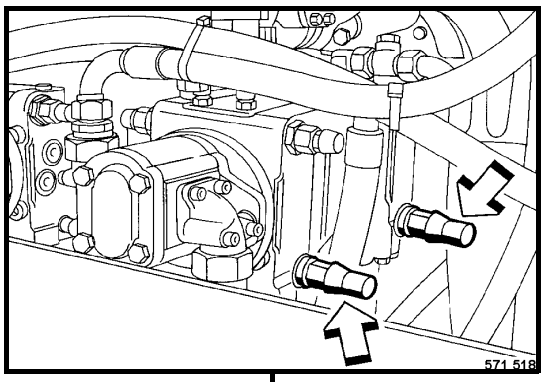
- Unscrew and check the DA-control valve, replace it if necessary
- Adjust the DA-control valve

Nominal value: 1220 rpm engine speed
150 bar high pressure
1890 rpm engine speed
390 bar high pressure
Pilot pressure evenly increasing

Pilot pressure OK?

no

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Checking the pressure override

- Turn the adjustment screw completely in (block).
- Repeat the pressure test

Attention: Operate against high pressure relief valves for max. 3 seconds!

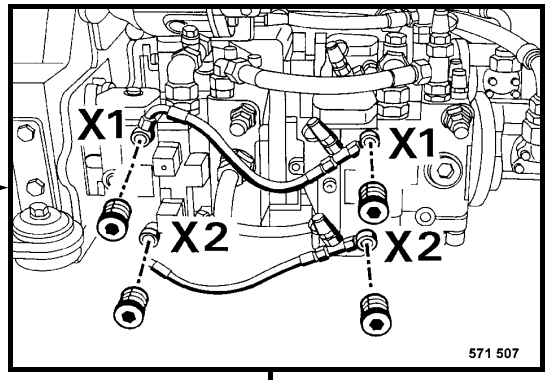
Pilot pressure OK?

no

Replace/repair the travel pump

High pressure OK?

no



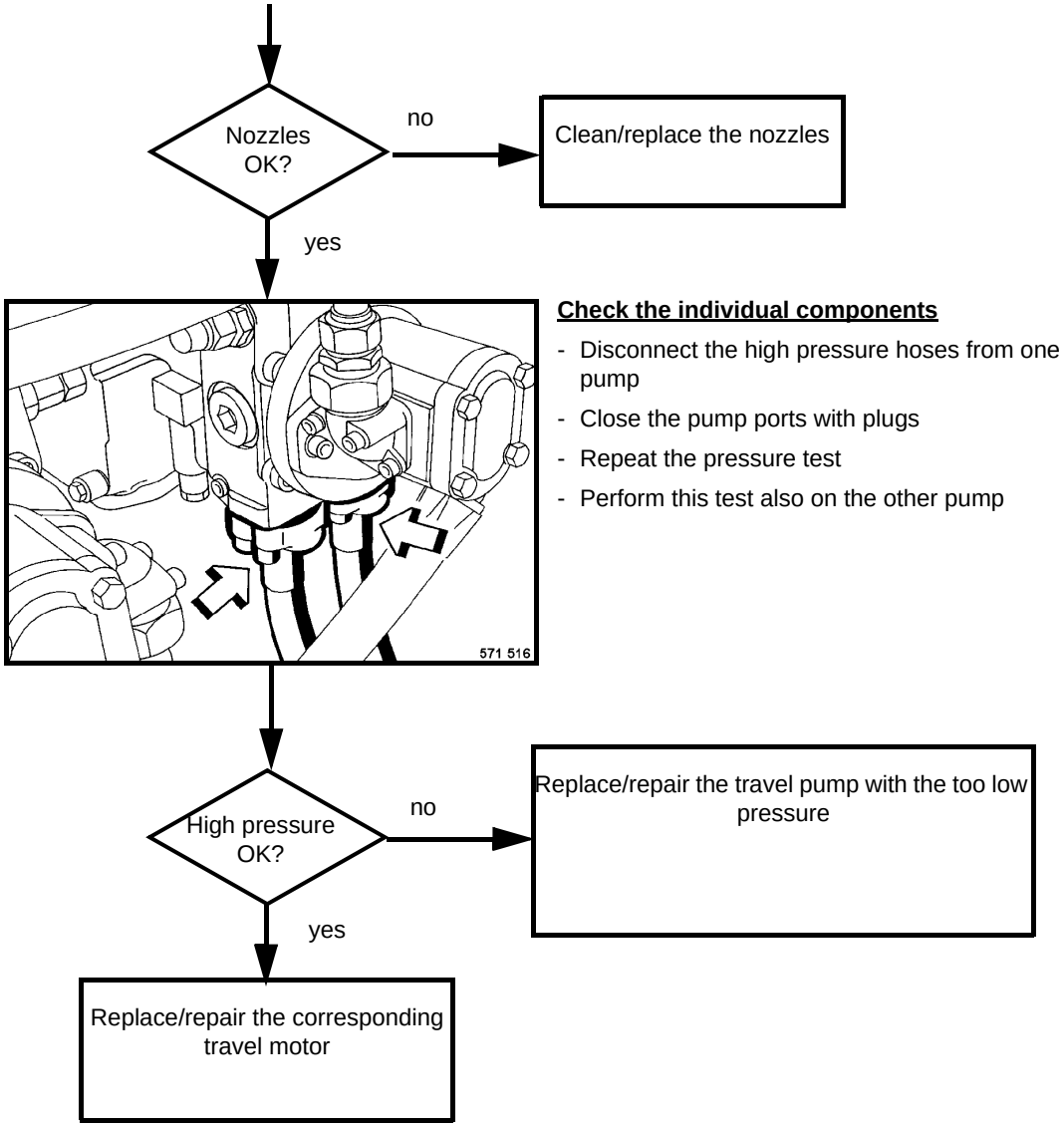
yes

- Mechanical damage in travel motors
- Engine power too low

Checking the swash time nozzles

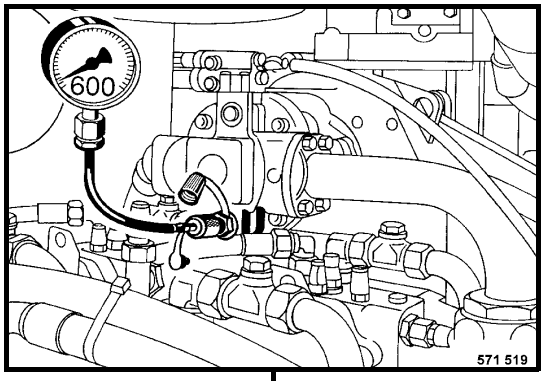
- Unscrew the swash time nozzles from X1 and X2 and check them

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No steering function / steering stiff, end stops are not reached



Read fault code and proceed appropriately
Check the steering/dozer blade pump

- Connect a 600 bar pressure gauge to the high pressure test port.
- Start the diesel engine and turn the steering wheel against an end stop
- Read the pressure gauge

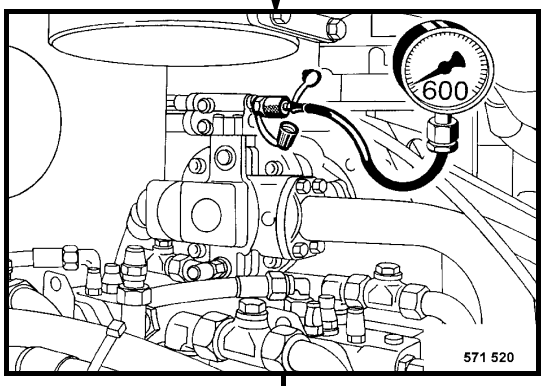
Nominal value:
230 bar

Stand-by:
30 bar

High pressure OK?

yes → Replace the flow booster

no



Check the load signal to the steering/dozer blade pump

- Connect a 600 bar pressure gauge to pressure test port X on the pump
- Operate the steering while the engine is running and read the pressure gauge. Depending on the load the pressure should increase up to 210 bar

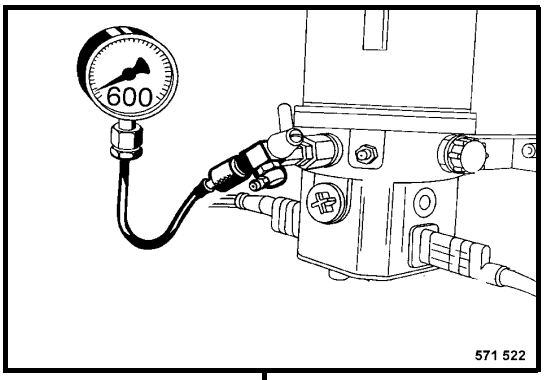
LS-signal OK?

yes → Replace/repair the steering/dozer blade pump

no → Replace/repair the valve block

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Central lubrication system not working (lubricant emerging from the relief valve)



Check the grease pump

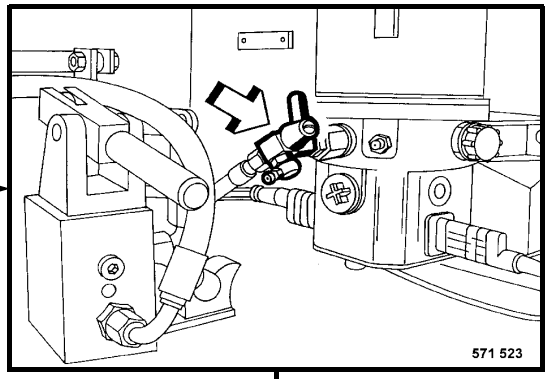
- Remove the lubrication hose
- Connect a 600 bar pressure gauge
- Close the lubrication hose with a plug
- Switch the pump on and press the push button several times

Nominal value:
Raise the pressure to approx. 350 bar, grease emerging from the relief valve

Pressure OK?

no

yes



Check the pressure relief valve

valve OK?

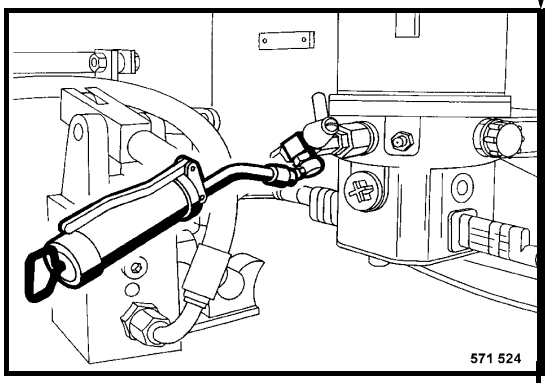
no

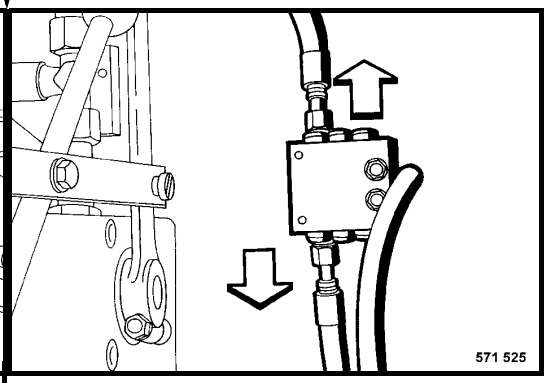
Replace the pressure relief valve

yes

Replace the lubrication pump

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Check the main distributor

- Reconnect the lubrication hose
- Connect a grease gun to the grease nipple and apply a pressure of 200 bar

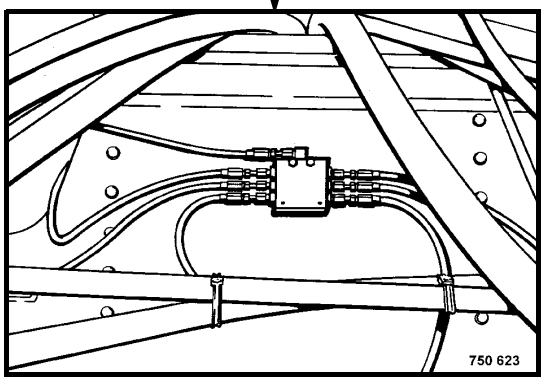
- Loosen the top and bottom lubrication hoses, one after the other
- The hose from which grease comes flowing out indicates in which branch the blockage can be found
- Reconnect the hoses

Grease emerging

none → Changing/cleaning the main distributor

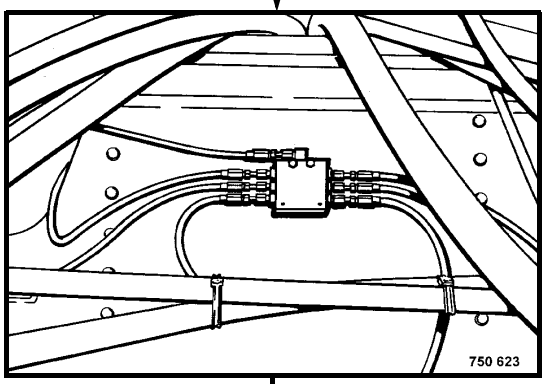
top

bottom



Check the sub-divider in the front frame

- Generate a pressure of 200 bar with the grease gun and loosen the lubrication hoses one after the other. The hose from which grease comes flowing out indicates the blockage.



Check the sub-distributor in the rear frame

- Generate a pressure of 200 bar with the grease gun and loosen the lubrication hoses one after the other. The hose from which grease comes flowing out indicates the blockage.

Grease emerging

no → Replace, clean the respective sub-distributor

yes → Repair the respective bearing location

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Travel drive

The following trouble shooting chart lists electrical, but also mechanical and hydraulic faults.

The specified numbers in the table indicate the probability of the fault cause and thus the recommended trouble shooting sequence, based on our previous experience.

Trouble shooting **Travel drive**	**Symptoms**	Machine does not travel (forward and reverse)	Machine travels to one direction only	Left or right hand side blocked in 1 direction	1 wheel blocked	Machine moves with travel direction switch in neutral	Max. travel speed is not reached	Hydraulic oil overheating					
Possible cause													
Emergency stop push button		1											
Brake switch open/defective/wiring (fault code?)		1											
ESX-control / electrics defective/wiring (fault code?)		2	2			3	2						
Travel direction switch defective/wiring (fault code?)		1	1			3							
Travel speed range selector switch position/defective/wiring (fault code?)							1						
Pump control (electric (fault code?) / hydraulic)		2	1	1		2							
Control start / DA-valve cartridge dirty/deadjusted/defective		3				2	1						
Pressure override / high pressure relief valves in travel pump dirty/deadjusted/defective							2	2					
Charge pump(s) / charge pressure relief valve(s) dirty/seized/defective		3					3						
Travel pump(s) defective		3		2	1	1	2						
Coupling / transfer box defective		3											
Control start of travel motor deadjusted							2						
Travel motor flushing valve stuck							3						
Travel motor(s) defective					1		2						
Brake (mechanical/hydraulic)		2			3		2						
Planetary wheel drive defective					2								
Hydraulic oil cooler soiled (internally/externally)								1					
Thermostat (hydraulics) dirty/seized/defective								3					
Diesel engine							1						

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7.10 Trouble shooting working hydraulics

Working hydraulics

The following trouble shooting chart lists electrical, but also mechanical and hydraulic faults.

The specified numbers in the table indicate the probability of the fault cause and thus the recommended trouble shooting sequence, based on our previous experience.

Trouble shooting **Working hydraulics**	**Symptoms**	No steering function (dozer blade/bucket function OK)	No dozer blade/bucket function (steering OK)	No steering and dozer blade/bucket function	Steering function only to one side	Dozer blade/bucket function only to one direction	all work functions too slow / fast / jerky	individual work functions too slow / fast / jerky					
Possible cause													
Steering joystick defective/wiring (fault code?)		1		3	1			2					
Dozer blade/bucket control lever defective/wiring (fault code?)			1	3		1		2					
ESX-control defective/wiring (fault code?)		3	3	1	2	2	1*	2					
Valve block defective/spool seized/ wiring (fault code?)		2	2	3	1	1	1	1					
Steering cylinders defective		3			3			3					
Dozer blade/bucket cylinder defective			3			3		3					
Pressure/flow control valve out of adjustment/dirty/defective				1			2						
Working pump(s) defective				2			3						
*Control in override mode													

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8 Installed components / connection overview

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BC 672/772 RB-2

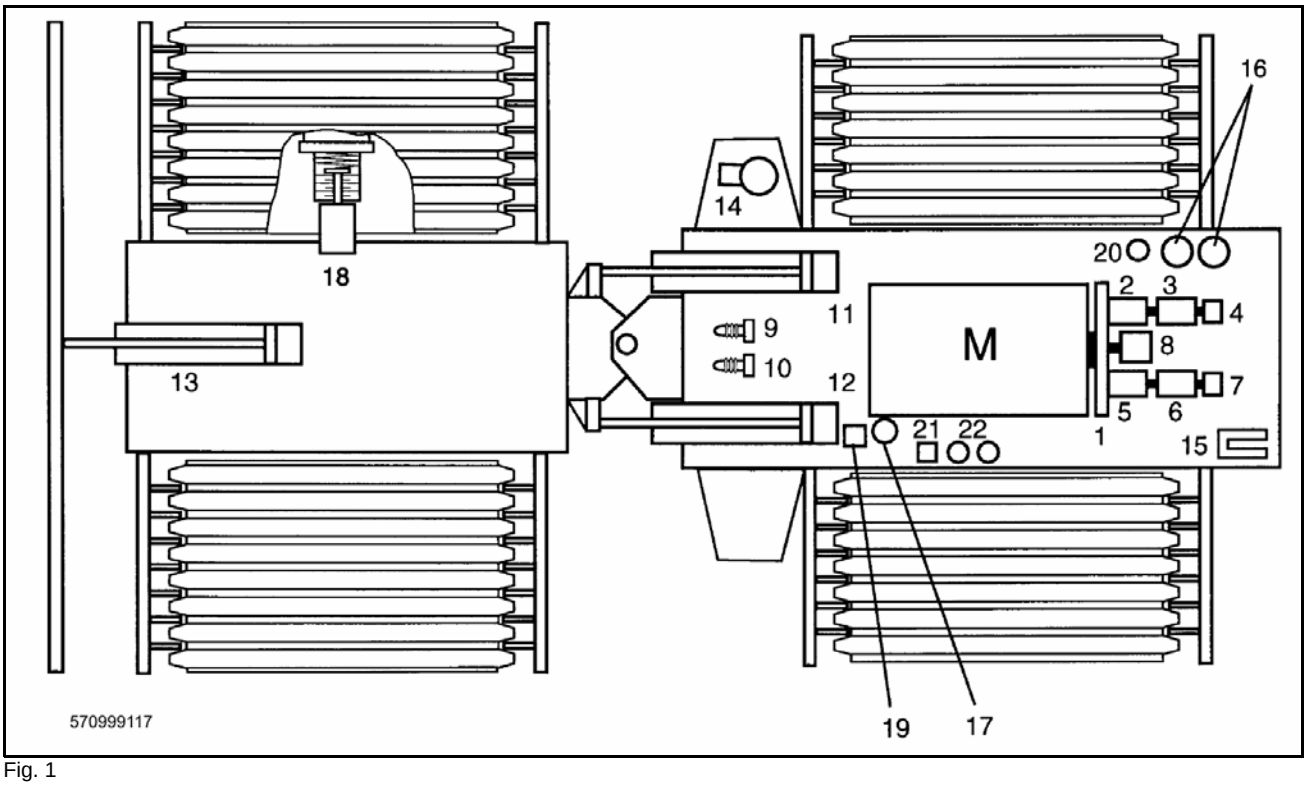


Fig. 1

(M) Diesel engine

1 Transfer box
2 Travel pump front right
3 Travel pump rear right
4 Charge pump right
5 Travel pump front left
6 Travel pump rear left
7 Charge pump left
8 Working pump
9 Control valve block for dozer blade
10 electric steering unit
11 Steering cylinder, right
12 Steering cylinder, left
13 Dozer blade cylinder
14 Central lubrication system
15 Hydraulic return flow filter
16 Hydraulic charge oil filter
17 Engine oil filter
18 Travel motor front right with planetary gear
19 Priority valve (steering priority over dozer blade)
20 Return flow filter from transfer case
21 Fuel pre-filter
22 Fuel pre-filter

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BC 772 RS-2

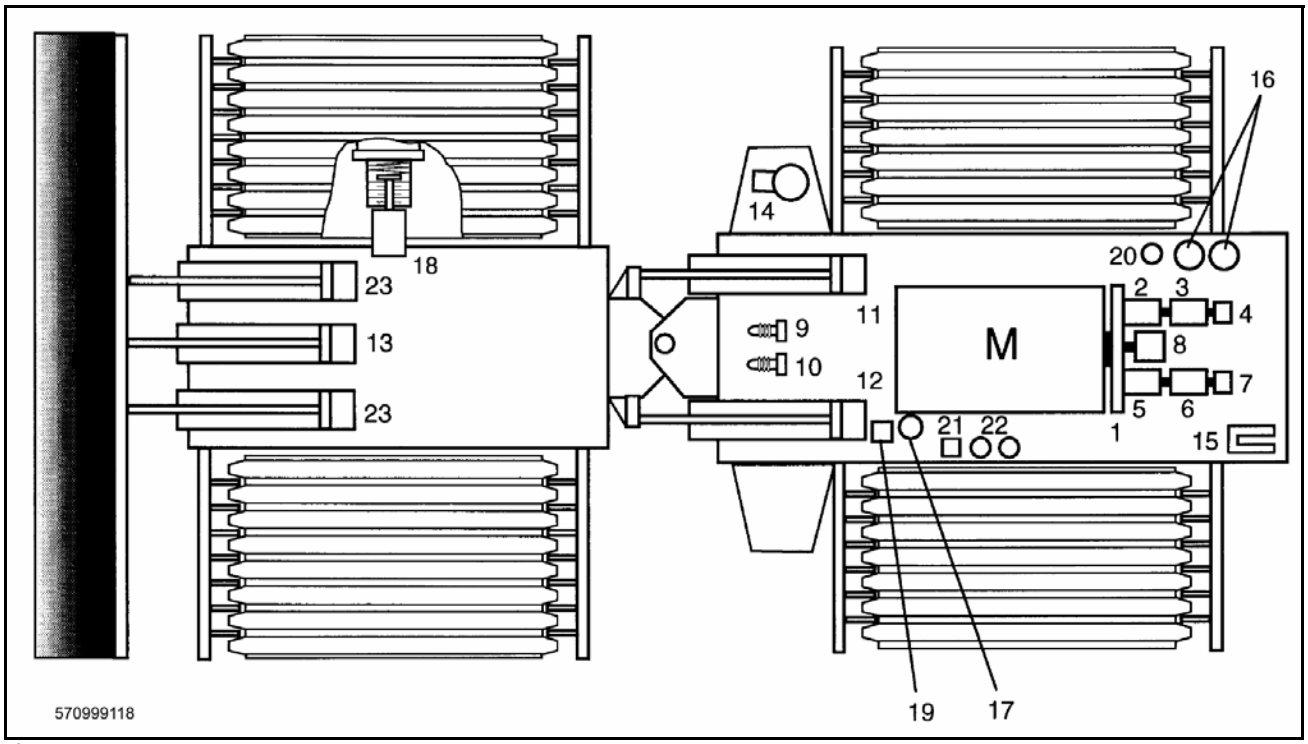


Fig. 2

(M) Diesel engine
1 Transfer box
2 Travel pump front right
3 Travel pump rear right
4 Charge pump right
5 Travel pump front left
6 Travel pump rear left
7 Charge pump left
8 Working pump
9 Valve block steering / bucket
10 Electric steering unit
11 Steering cylinder, right
12 Steering cylinder, left
13 Bucket tipping cylinder
14 Central lubrication system
15 Hydraulic return flow filter
16 Hydraulic charge oil filter
17 Engine oil filter
18 Travel motor front right with planetary gear
19 Dozer blade lifting cylinder
20 Return flow filter from transfer case
21 Fuel pre-filter
22 Fuel filter

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Measuring and adjustment points

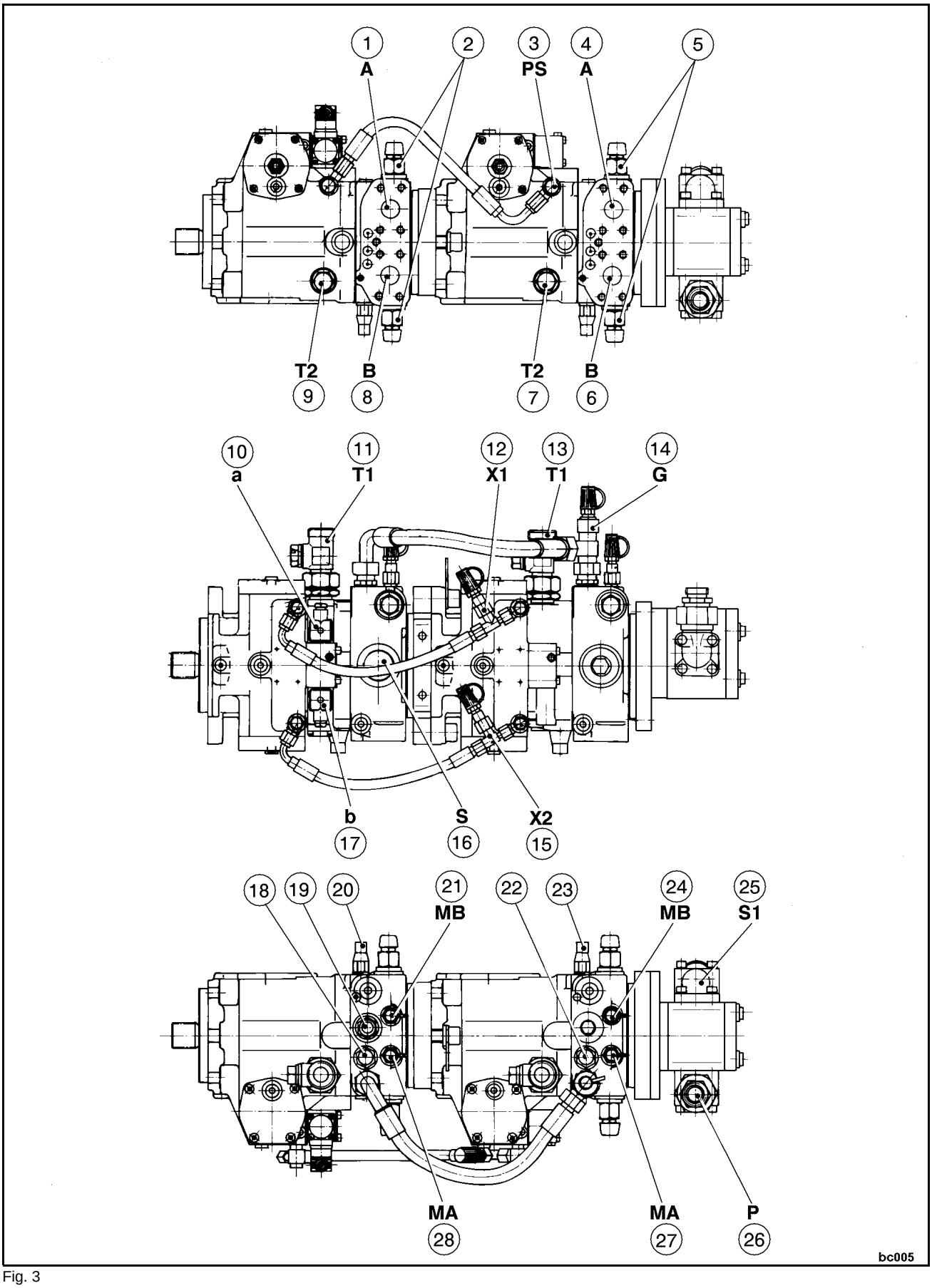


Fig. 3

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Pos.	Designation	Pos. in electric wiring diagram	Pos. in hydraulic diagram	Measuring value
1	Port A, high pressure reverse, driven pump		08A, 11A	
2	High pressure relief valves, driven pump			480 -20 bar
3	PS-line, pilot pressure supply to pressure override			
4	Port A, high pressure reverse, dragged pump		09A, 12A	
5	High pressure relief valves, dragged pump			480 -20 bar
6	Port B, high pressure forward, dragged pump			
7	Plug T2, dragged pump		T2	
8	Port B, high pressure forward, driven pump		B	
9	Plug T2, driven pump		T2	
10	Plug a, solenoid valve forward	Y 16	a	0 / 24V
11	Port T1, leak oil to return flow filter, driven pump, with magnetic plug		T1	
12	Test port X1, control chamber pressure reverse		M6, M16, X1	0 - 14 bar, **)
13	Port T1, leak oil to return flow filter, dragged pump, with magnetic plug		T1	
14	Test port G, charge pressure		M7, M17, G3	0 ± 2 bar in high idle speed***)
15	Test port X2, control chamber pressure forward		M5, M15, X2	0 - 14 bar **)
16	Port S, charge pressure from hydraulic oil filter			
17	Plug b, solenoid valve reverse	Y 17	b	0 / 24V
18	Charge pressure relief valve, driven pump			30 ± 2 bar in high idle speed***)
19	DA-control valve			*)
20	Pressure override, driven pump			430 +10/-20 bar
21	Test port MB, high pressure forward, driven pump		M2, M12, MB	430 +10/-20 bar
22	Charge pressure relief valve, dragged pump			30 ± 2 bar in high idle speed***)
23	Pressure override, dragged pump			430 +10/-20 bar
24	Test port MB, high pressure forward, dragged pump		M4, M14, MB	430 +10/-20 bar
25	Port S1, suction connection charge pump from tank			
26	Port P, charge pump pressure port to filter			
27	Test port MA, high pressure reverse, dragged pump		M3, M13, MA	430 +10/-20 bar
28	Test port MA, high pressure reverse, driven pump		M1, M11, MA	430 +10/-20 bar

*), **), ***); see adjustment instructions

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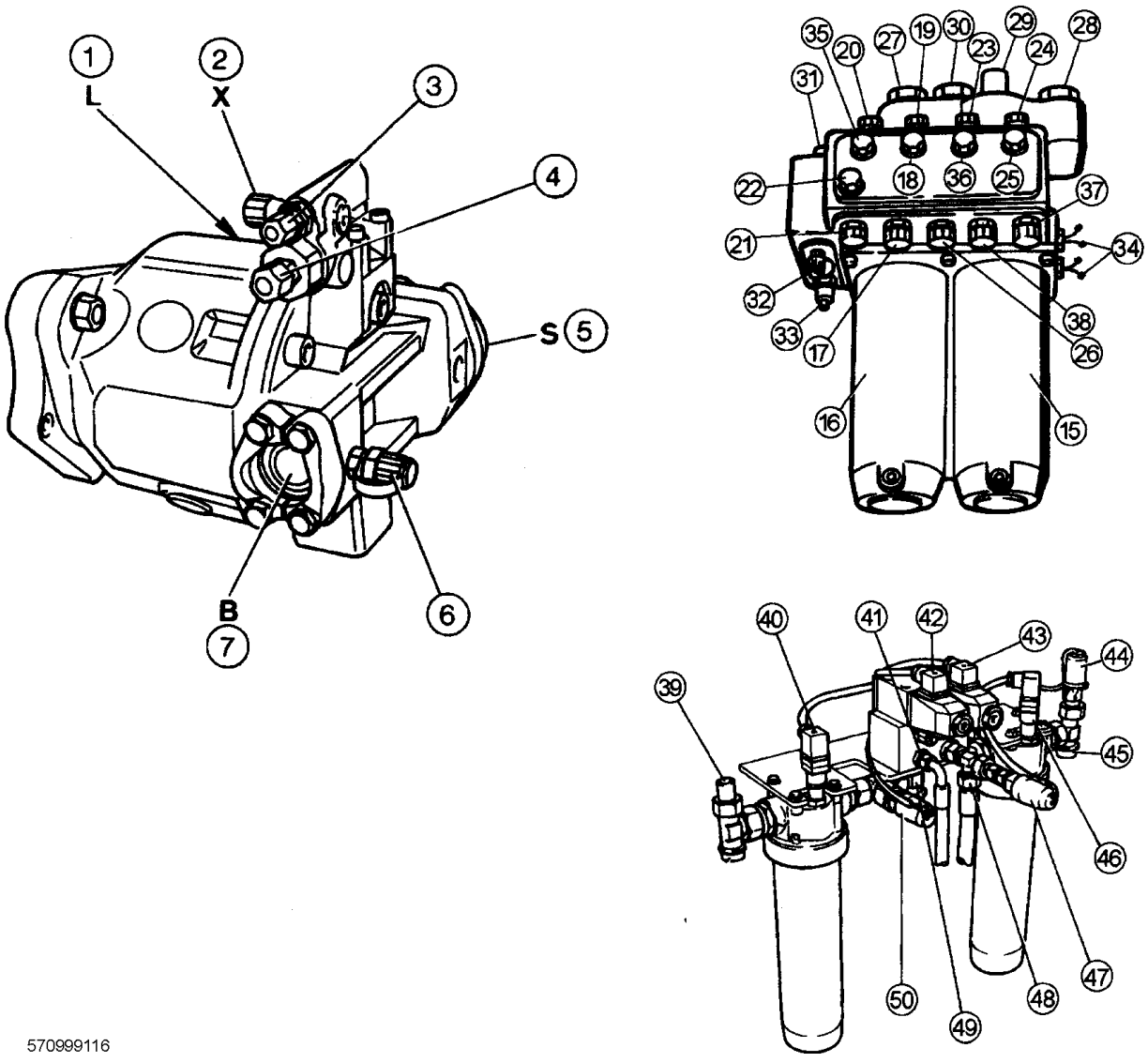


Fig. 1

1 Port L, leak oil to return flow filter
2 Port X, load signal to control valve block
3 Setscrew for flow control valve (88 l/min)
4 Setscrew for pressure control valve (230 bar)
5 Port S, suction line from tank
6 Test port for stand-by pressure, 18 bar; high pressure 200 bar
7 Port B, high pressure
8
9
10
11
12
13
14
15 Active filter element
16 By-pass filter element
17 Leak oil port from travel pump, front left
18 Magnetic plug, wheel motor, rear right
19 Leak oil port, wheel motor, rear right
20 Leak oil port, wheel motor, rear left
21 Leak oil port, steering/working pump
22 Magnetic plug, steering/working pump
23 Leak oil port, wheel motor, front left
24 Leak oil port, wheel motor, front right
25 Magnetic plug, wheel motor, front right
26 Leak oil port from travel pump, rear left
27 Non-return valve (3 bar), to tank
28 Connection to cooler
29 Thermostat (55°C...70°C)
30 Connection to tank
31 Connection from solenoid valve for brake/travel direction selector

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32 Test port for case pressure
33 Pressure switch (3 bar), normally open
34 Contamination sensor
35 Magnetic plug, wheel motor, rear left
36 Magnetic plug, wheel motor, rear right
37 Leak oil port from travel pump, rear right
38 Leak oil port from travel pump, front right
39 Filter outlet, to solenoid valve
40 Pressure switch, filter contamination indicator (2.5 bar)
41 Pilot pressure connection, travel range selector
42 Plug, travel range selector
43 Plug, brake
44 Charge pressure switch (5 bar), right hand tandem pump, normally closed
45 Connection from left hand charge pump
46 Charge pressure switch (5 bar), left hand tandem pump, normally closed
47 Filter outlet, to the charge oil supply port on left hand tandem pump
48 Port X, pilot pressure
49 Port G, synchronous control
50 Port T, leak oil

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Measuring and adjustment points

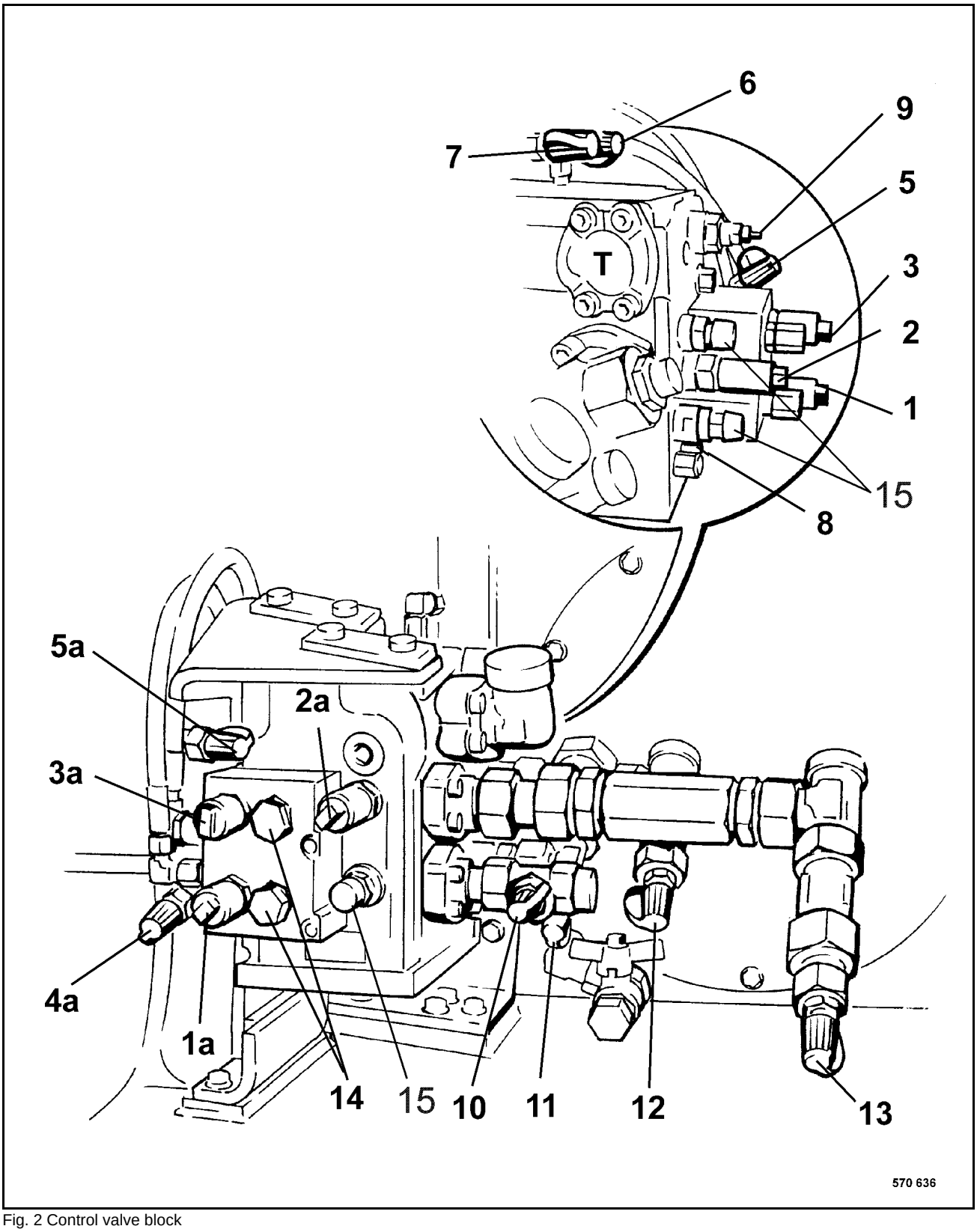


Fig. 2 Control valve block

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Pos.	Designation	Pos. ii electric wiring diagram	Pos. in hydraulic diagram	Measuring value
1	Proportional solenoid, steering right	Y92		0 - 1000 mA
1a	Proportional solenoid, steering left	Y93		0 - 1000 mA
2	Switching solenoid, float position	Y102		0 / 24V
2a	2. Switching solenoid, float position	Y102		0 / 24V
3	Proportional solenoid, blade down	Y109		0 - 1000 mA
3a	Proportional solenoid, blade up (on opposite side)	Y108		0 - 1000 mA
4	Pressure test port, pilot pressure steering left		Ma	20 -30 bar
4a	Proportional solenoid, pilot pressure steering right (on opposite side)		Mb	20 -30 bar
5	Pressure test port, pilot pressure blade up		Ma	10 -30 bar
5a	Proportional solenoid, pilot pressure blade down (on opposite side)		Mb	10 -30 bar
6	Pressure test port, tank pre-tensioning valve		Mt	10 -15 bar
7	Pressure test port, working pressure		Mp	0 -230 +10 bar
8	LS-pressure limitation			0-210 + 10 bar
9	Tank pre-loading valve			15 bar (dozer blade in top position, drop with floating position)
10	Pressure test port, steering left		M18	0 -230 +10 bar
11	Pressure test port, steering right		M19	0 -230 +10 bar
12	Pressure test port, blade down		M31	0 -230 +10 bar
13	Pressure test port, blade up		M32	0 -230 +10 bar
14	mechanical endstop			
15	Shock valve			260 bar

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9 Air conditioning system

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9.1 Physical basics

In order to understand the working principle of an air conditioning system one must first become familiar with the physical basics of such a system.

The four well known physical conditions of water apply also for the refrigerant in the air conditioning system.

1. gaseous (invisible)

2. vaporous

3. liquid

4. solid

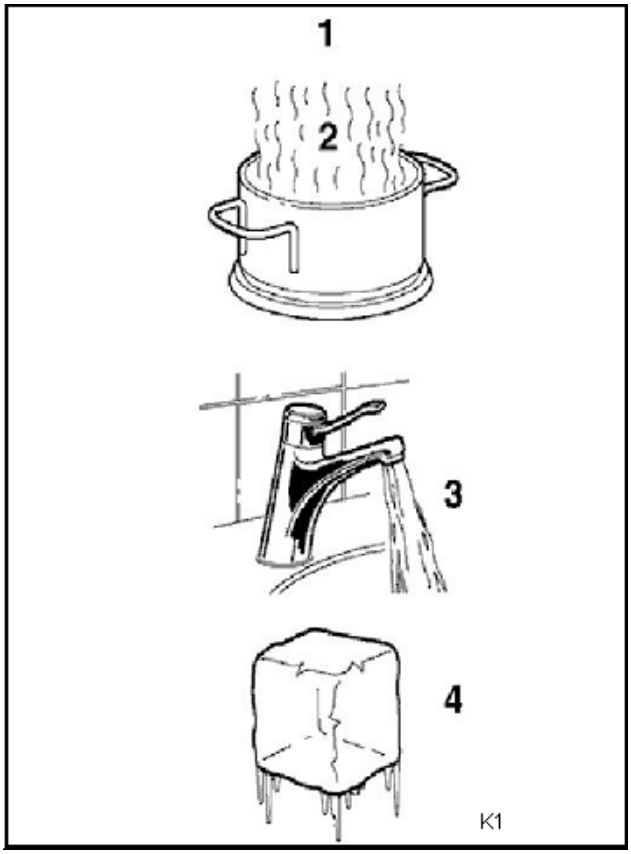


Fig. 1

If the water in a container is heated up (absorption of heat), the rising steam is visible. If the steam is heated up further, due to the absorption of heat, the visible steam will turn into invisible gas. This process is reversible. When withdrawing the heat contained in gaseous water, the gas will turn into steam, then into water and finally into ice.

A - heat absorption

B- Heat dissipation

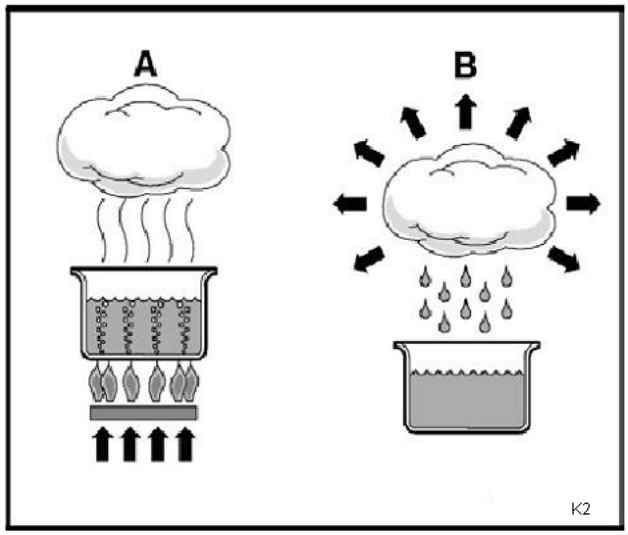


Fig. 2

Heat always flows from the warmer to the colder matter. Any matter consists of a mass of moving molecules. The rapidly moving molecules or a warmer matter dissipate part of their energy to the slower moving molecules with less heat. The movement of the molecules in the warmer matter becomes slower and the molecules in the cooler matter are accelerated. This process continued, until all molecules in the two matters move with identical speed. The matters have then reached an identical temperature and the transfer of heat stops.

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Pressure and boiling point

The boiling point is the temperature at which fluid changes to gaseous state.

Changing the pressure above a fluid also changes the boiling point. It is a well known fact, that e.g. the lower the pressure applied to water, the lower the boiling point.

When looking at water, the following values do apply:

- Atmospheric pressure, boiling point 100°C
- Overpressure 0.4 bar, boiling point 126°C
- Vacuum -0.6 bar, boiling point 71°C

For an optimal exchange of heat, liquid refrigerants must have a low boiling point, so that they can absorb and dissipate heat quickly.

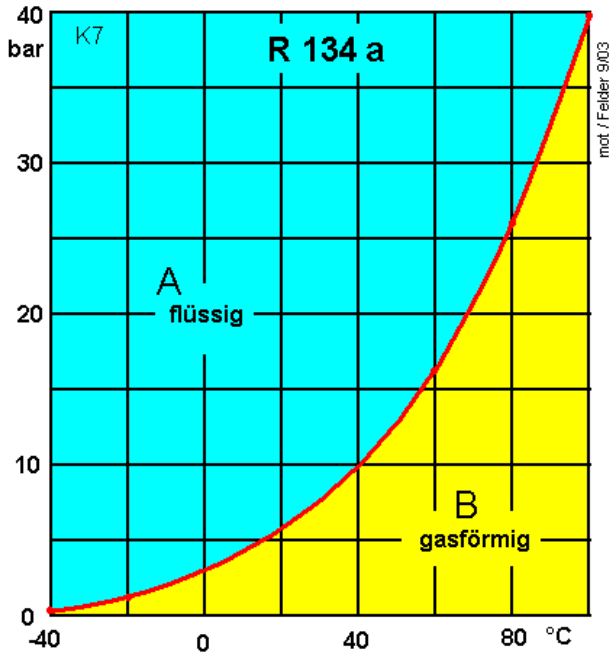


Fig. 3 Steam pressure curve

Steam pressure curve for refrigerant R134a

The steam pressure curve is a means for explaining the operation principle of an air conditioning system.

A- liquid

B- gaseous

The diagram shows the evaporation curve of R134a. The diagram for example shows, that R134a is liquid at 0°C and a pressure of 5 bar, but becomes gaseous at 40°C and 5 bar.

For better understanding one must also be aware of the following:

1. A gas heats up when being compressed (e.g. air pump, turbo charger, ...).

2. When relieving gas it will cool down (e.g. white frost forms on the valve when relieving air pressure from a car tire).

3. Condensing gas dissipates a lot of heat energy.

4. If a fluid evaporates it requires a lot of heat, i.e. the fluid thereby cools down the surrounding environment (e.g. alcohol on skin)

i Note

At absolute pressure 0 bar correspond with an absolute vacuum. The normal ambient pressure (overpressure) corresponds with 1 bar absolute pressure. On the scales of most pressure gauges 0 bar corresponds with an absolute pressure of 1 bar (indicated by the statement -1 bar below the 0).

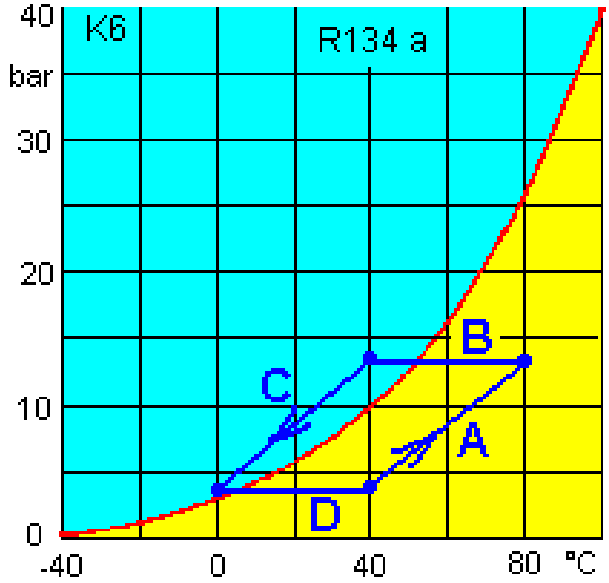


Fig. 4 Pressure - Temperature Diagram

In the pressure - temperature diagram for the refrigerant the drawn in closed curve shows the cycle of the refrigerant. This cycle permanently continues in direction of the arrow.

The characters A, B, C, D stand for:

A - compression

B- condensation

C- relaxation

D- evaporation.

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Excerpt from the wet steam table [1] R134a

1 This table is used for the determination of evaporation and condensation temperature.

Saturation temperature	Overpressure (pressure gauge reading Pe in bar)	Absolute pressure (pamb = 1 bar P in bar)
-20	0,33	1,33
-10	1,01	2,01
0	1,93	2,93
10	3,15	4,15
20	4,72	5,72

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9.2 Refrigerant R134a

General

The evaporation and condensation process is the method commonly used in mobile air conditioning systems. The system in this case works with a substance that boils at low temperature, a substance referred to a refrigerant. The refrigerant used is tetrafluoroethane R134a, which boils at a temperature of -26.5°C and under a steam pressure of 1 bar.

Although the refrigerant circuit is a hermetically closed loop, the system loses approx. 100g of refrigerant over the course of 1 year by diffusion through hoses, pipes and seals, even though the system is free of leaks. If too much refrigerant is lost the cooling power of the system will drop.

Physical data of the refrigerant R134a

Chemical formula:

CH2F-CF3 or CF3-CH2F

Chemical designation:

Tetrafluoroethane

Boiling point at 1 bar:

- 26.5 °C

Solidification point:

-101.6 °C

Critical temperature:

100,6 °C

Critical pressure:

40.56 bar (absolute)

Critical point:

Critical point (critical temperature and critical pressure) means that above this point there is no separating interface between liquid and gas. Above its critical point any substance is gaseous. At temperatures below the critical point all refrigerant types in pressure containers have a liquid and a gaseous phase, i.e. a gas cushion is above the liquid. As long as gas is in the container, besides the liquid, the pressure depends on the ambient temperature.

Characteristics of the refrigerant R134a:

Refrigerant R134a is currently available under the following trade marks.
H-FKW 134a
SUVA 134a
KLEA 134a

Colour:

Refrigerant in form of vapour or liquid is colourless as water. The gas is invisible. Only the bordering layer between gas and liquid is visible. (Fluid level in rising pipe of filling cylinder or bubbles in inspection glass). In the inspection glass the liquid refrigerant R134a may appear coloured (milky). This turbidity results from partially dissolved refrigeration oil and is no indicator for a fault.

Steam pressure:

In an incompletely filled, closed container, vaporous refrigerant will volatilize from the surface in the same quantity that will turn liquid in combination with steam particles. This state of equilibrium occurs under pressure and is frequently referred to as steam pressure. The steam pressure is independent from the temperature.

Physical properties of R134a:

The steam pressure curves of R134a and other refrigerants are partly very similar, making a clear differentiation solely by pressure impossible. With R 134a the compressor is lubricated by special synthetic refrigeration oils, e.g. PAG-oils (polyalkylene glycol oils).

Behaviour with metals:

In pure condition refrigerant R134a is chemically stable and does not attack iron and aluminium. However, contamination of the refrigerant, e.g. with chlorine compounds, leads to aggressiveness against certain metals and plastics. This can cause clogging, leaks or deposits on the pistons of the compressor.

Critical temperature / critical pressure:

Up to a gas pressure of 39.5 bar overpressure (this corresponds with a temperature of 101 °C) the refrigerant R134a remains chemically stable, above this temperature the refrigerant decomposes (see combustibility).

Water content:

In liquid refrigerant water can only be dissolved in very low quantities. In contrast to this refrigerant steam mixes with water steam at any ratio. If the dryer in the

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liquid container has absorbed approx. 8 gr. of water, the refrigerant circuit transports possibly existing water in form of droplets. This water flows to the nozzle of the expansion valve and turns to ice. The air conditioning system stops cooling. Water destroys the air conditioning system, because under high pressures and temperatures and in connection with other contaminants it forms acids.

Inflammability:

Refrigerant is not inflammable. On the contrary, it has fire inhibiting or fire extinguishing properties. Refrigerant is decomposed by flames or glowing surfaces. Ultraviolet light also cracks refrigerant (caused by electric welding). This results in toxic fission products, these must not be inhaled. However, irritation of the mucous membranes is an early and in-time warning.

Filling factor:

In a container there must be a steam space above the liquid space. The liquid expands with increasing temperature. The steam filled space becomes smaller. From a certain time on the container will be filled with just liquid. After this only a minor temperature increase is enough to generate very high pressures in the container, because the liquid would like to expand, but there is no more room. The related forces are high enough to cause the container to burst. In order to avoid overfilling of a container the pressure gas directive clearly specifies how many kilograms of refrigerant may be filled into the container per litre volume. Multiplied with the internal volume this "filling factor" determines the permissible filling capacity For refrigerants used in motor vehicles it is 1.15 kg/l.

Environmental aspects

The contribution of R134a to the greenhouse effect is by factor 10 smaller than the contribution of R12.

Since approx. 1992 the air conditioning systems for newly produced construction equipment were successively converted to refrigerant R134a. This refrigerant does not contain any chlorine and is thus harmless for the ozone layer. Until approx. 1992 air conditioning systems were filled with refrigerant R12. Due to its chlorine atoms this CFC has a high ozone decomposition potential and also a potential to amplify the greenhouse effect. Conversion programs for existing old systems with the ozone damaging R12 are in effect. For reasons of protecting the environment refrigerant must not be discharged into the atmosphere.

9.3 Compressor oil / refrigeration oil

The compressor oil lubricates the movable parts in the compressor, seals e.g. the gap between piston and cylinder inside the compressor to prevent refrigerant loss and prevents other seals in the system from drying up.

Part of the compressor oil dissolves in the refrigerant until saturation is reached, so that a gas mixture of refrigerant, water steam, compressor oil and contrast agent circulates through the system.

Compressor oil (the oil quantity should be 10 % of the refrigerant weight) mixes with the refrigerant and circulates permanently through the system.

In connection with R134a- air conditioning systems special synthetic compressor oils, e.g. polyalkylene glycol (PAG) oils, are used. This is necessary, because e.g. mineral oil does not mix with R134a. Apart from this, the materials in the R134a air conditioning system may be attacked when the mixture is flowing through the refrigerant circuit under high pressure and at high temperatures or if the lubrication film in the compressor tears off. The use of non-permitted oils can cause damage to the air conditioning system, you should therefore only used the approved oils.

Properties of compressor oil / refrigeration oil:

The most important properties are high solvency in connection with refrigerants, good lubrication characteristics, that they are free of acids and their low water content. For this purpose only certain oils can be used. PAG-oils suitable for use with refrigerant R134a are highly hygroscopic and will not mix with other oil. As a protection against the invasion of moisture drums must immediately be closed again after they had been opened. Compressor oil ages under the effect of moisture and acids, becomes dark, viscous and aggressive against metals.

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9.4 Working principle of the air conditioning system

All air conditioning systems are based on the same principle. They extract heat from the surrounding environment. Everybody knows the effect: if a sweating body is exposed to wind it will cool down, because heat is extracted. For this purpose a refrigerant circulates in a closed circuit inside the vehicle. This refrigerant thereby continuously changes its physical state between liquid and gaseous.

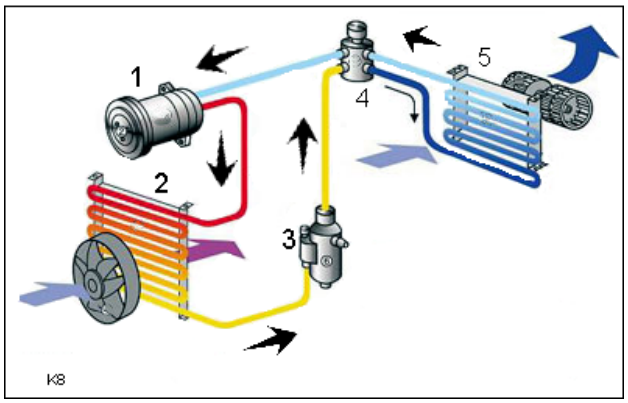


Fig. 1 Principle sketch of an air conditioning system

An engine driven compressor (1) draws in gaseous refrigerant from the evaporator (5) and compresses it. During this process the temperature of the refrigerant increases tremendously.

The refrigerant vapour is then pumped to the condenser (2). This condenser is arranged directly in front of the vehicle radiator, so that a sufficient air flow is assured. In the condenser (2) the gas is cooled down and consequently liquefied.

In the dryer / liquid container (3) the refrigerant is then collected and freed of moisture and contaminants.

The expansion valve (4) regulates the flow rate from the dryer / liquid container (3) back to the evaporator (5) and the circuit starts again.

9.5 Monitoring devices

Pressure switch

The pressure switch (8) is used as monitoring feature for too high and too low pressures. The switching contacts (4 and 5) effect the magnetic clutch of the compressor via a relay (6).

If the system pressure increases excessively, e.g. because of a excessively soiled condenser, a failed fan or a defective expansion valve, the high pressure contact (5) will cut off the electric power supply to the magnetic clutch when the set pressure is reached. When the system pressure drops below the cut-off pressure by the set differential pressure, the magnetic clutch of the compressor is switched on again.

The low pressure contact (4) interrupts the electric power supply to the magnetic clutch when the set pressure is fallen short of (possible causes: lack of refrigerant, defective expansion valve, too low heat load, defective evaporator fan, ...). Since the refrigerant R134a has an evaporation temperature of 0 °C at an overpressure of 2 bar, the low pressure contact (4) is set to approx. 1.5 bar to avoid icing. The switch on pressure is 0.5 to 2 bar higher than the shut-off pressure (depending on system, see description of components.)

Thermostat

A frost protection thermostat (3) protects the evaporator against icing. Similar to the pressure switch, the thermostat activates or deactivates the magnetic clutch for the compressor. Depending on the design, the feeler of the temperature control is mounted between the fins of the evaporator or attached to the evaporator outlet (suction side). With fixed temperature controls the control switches the compressor off at about 1 °C and back on again at about 2.5°C to 5.5 °C (depending on system, see description of components.)

With adjustable temperature regulators the switching point can be changed so that the compressor is already shut down at higher temperatures. This enables regulation of the air temperature.

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Monitoring chain

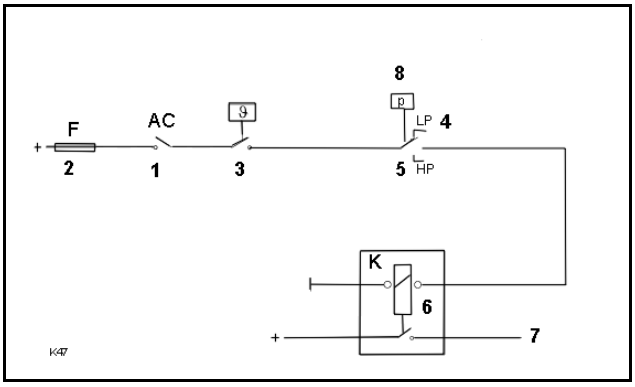


Fig. 2 Monitoring chain consisting of:

- 1 Switch
- 2 Fuse
- 3 Thermostat
- 4 Low pressure switch contact
- 5 High pressure switch contact
- 6 Relay
- 7 Connection for magnetic clutch
- 8 Pressure switch

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9.6 Description of components

Compressor

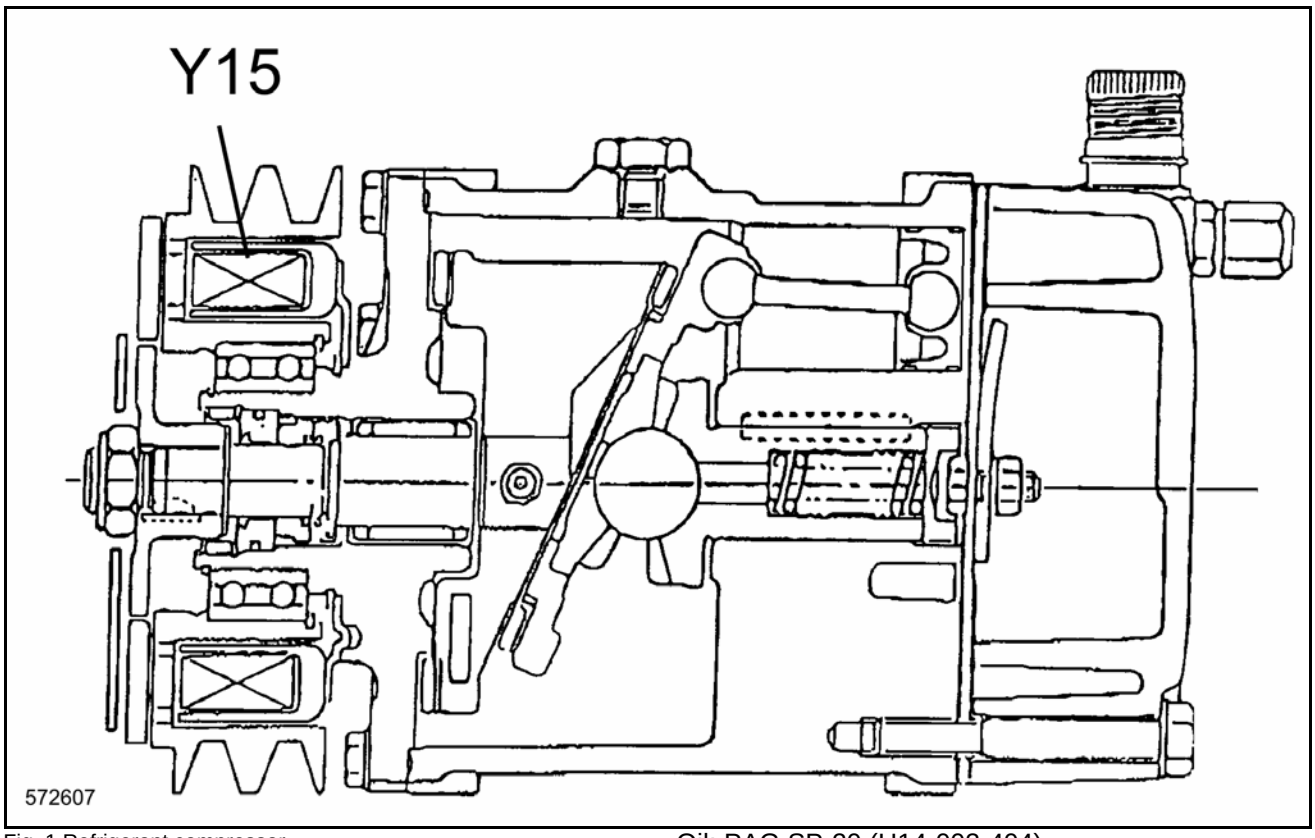


Fig. 1 Refrigerant compressor

The compressor is mounted to the engine and has the duty to build up the refrigerant pressure required for the function of the system. Coupling and decoupling is accomplished by an electromagnetically controlled mechanical clutch (Y15), which is integrated in the V-belt pulley of the compressor.

The refrigerant compressor is a 7-cylinder compressor in swash plate design.

The gaseous refrigerant enters into the compressor through the cylinder heads at the end of the compressor and is delivered to the condensers in desnified state.

The oil sump of the compressor is filled with refrigeration oil up to level of the filler and level inspection bore. An internal gear pump at the end of the drive shaft delivers this oil to the bearing locations inside the compressor for lubrication.

Compressor data

Displacement: 155 cm²

Weight: 6,9 kg

max. rpm: 6000

Sense of rotation: cw

Refrigerant: R134a

Oil quantity (scope of delivery): 207 gr

Oil: PAG SP-20 (H14-003-404)

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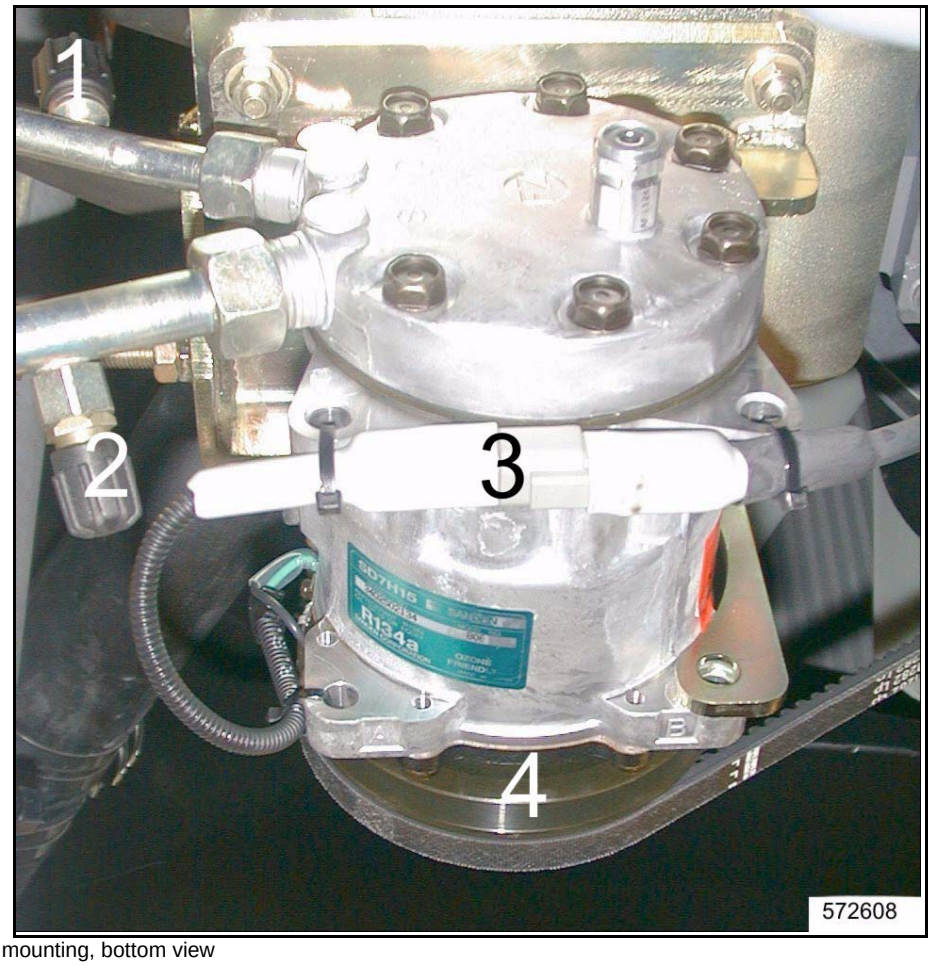


Fig. 2 Compressor mounting, bottom view

Pos.	Designation	Pos. ii electric wiring diagram	Measuring value
1	Pressure side filling port		
2	Suction side filling port		
3	Plug connection	X14	0-24 Volt
4	Magnetic clutch	Y15	24 Volt, 1.75 Amp.

The service valves are installed directly on the compressor. These are used to e.g. evacuate and fill the system.

Two manual shut-off valves are also installed here. These valves can be used e.g. in case of a compressor failure. The compressor can be replaced after closing the valves. After completion of all repair work the valves must be reopened, so that the system is ready for operation without the need of refilling.

⚠ Caution

The compressor oil level must be checked after replacing a system component or if a leak in the system is suspected. Use only refrigeration oil PAG SP-20 (H14-003-404).

When replacing a heat exchanger, e.g. evaporator or condenser, any compressor oil / refrigeration oil lost by exchanging the components, must be replaced with fresh oil.

The actual quantity depends on the amount of oil that may have been lost in connection with the possible replacement of other components.

Environment

Used compressor oil / refrigeration oil must be disposed of as hazardous waste.

The following table shows how much compressor oil / refrigeration oil will be lost in connection with various types of work on the air conditioning system.

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Reason of oil loss	Amount of oil lost
Loss when emptying	approx. 15 gr
Defective A/C hose	approx. 30 gr
Hose change	approx. 15 gr
Replacement of condenser	approx. 30 gr
Replacement of evaporator	approx. 30 gr
Replacement of liquid container	approx. 30 gr
Replacement of expansion valve	approx. 15 gr

⚠ Caution

Please bear in mind, that the new compressor is delivered with a filling of 207 gr. compressor oil. To avoid excessive oil in the A/C-system and thus a poor cooling effect, the oil level in the A/C-system must be adjusted accordingly.

The quantity depends on the amount of oil that may have been lost in connection with the possible replacement of other components.

The compressor oil quantity must be 10% of the refrigerant quantity in the complete system.

With a refrigerant filling of 1100 gr. the system requires a compressor oil / refrigerant oil filling of 100 gr.

Procedure:

Drain and measure the compressor oil from the old compressor.

Drain the compressor oil from the new compressor and only fill in the exact quantity that had been drained out of the old compressor. The compressor oil from the new compressor can be used for this purpose.

i Note

Topping up compressor oil / refrigeration oil is possible on a pressureless compressor directly into the oil pan, in a pressureless refrigeration system directly into the pressure side, but it is also possible to draw it into the pressure side of the refrigeration system during the evacuation process.

Condenser

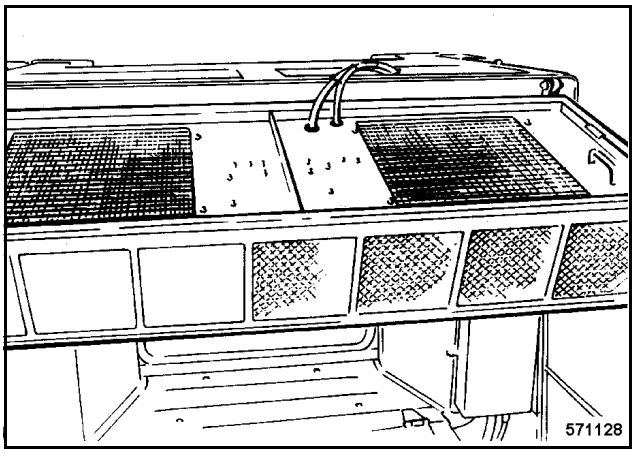


Fig. 1 Condensers

The 2 condensers are mounted on a foldable frame in front of the combustion air intake opening on the ROPS. They dissipate heat energy from the system into the surrounding air and liquefiy the gaseous refrigerant.

i Note

The fins must be free of dirt and damage.

⚠ Caution

When replacing a heat exchanger, e.g. evaporator or condenser, any compressor oil lost by exchanging the components, must be replaced with fresh oil.

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Dryer / filter / fluid container / inspection glass

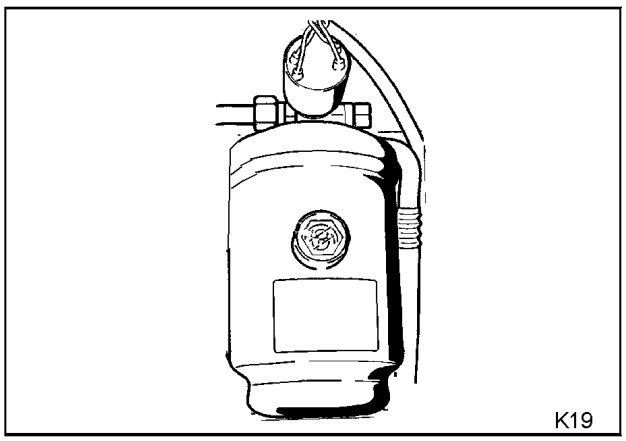


Fig. 1

Dryer / filter

The fluid container collects the fluid drops and passes these then as a constant flow to the expansion valve. Moisture that has entered during assembly of the refrigerant circuit is absorbed by a dryer in the fluid container.

At evaporation temperatures below zero the refrigerant will deposit previously absorbed moisture on the expansion valve, where this water turns into ice and thus adversely affects the controllability of the expansion valve. Moreover, moisture in the refrigerant circuit causes corrosion, forms acids and enters into chemical compositions.

Inside the refrigerant container the heavy liquid refrigerant collects in the lower part of the container, flows through a rising pipe to the outlet marked "A" and thus ensures bubble free operation of the expansion valve.

i Note

Since the absorbing capacity of this filter/dryer is limited, it must be changed within certain service intervals. We recommend to replace it 1 x per years, before the start of the season.

⚠ Caution

The filter/dryer must generally be replaced whenever opening the refrigerant circuit, because moisture will enter in such a case.

This requires emptying the air conditioning system!

Installation position:

The arrow marks on the filter/dryer must point in flow direction, i.e. towards the expansion valve.

Filter/dryer cannot be treated for further use!

Safety valve

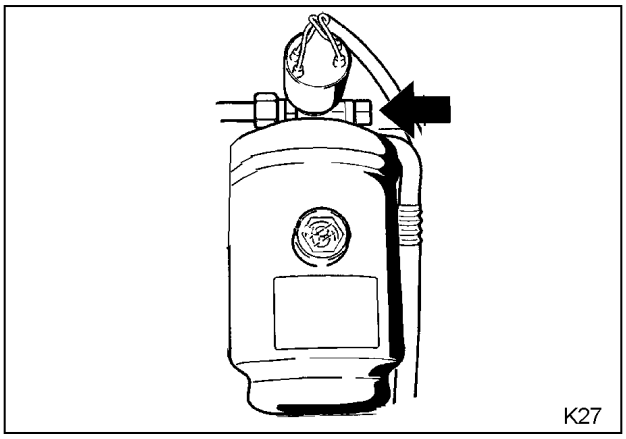


Fig. 2

The fluid container is equipped with a safety valve.

Response pressure 32 +/- 4 bar

Tightening torque 10 - 15 Nm

Inspection glass

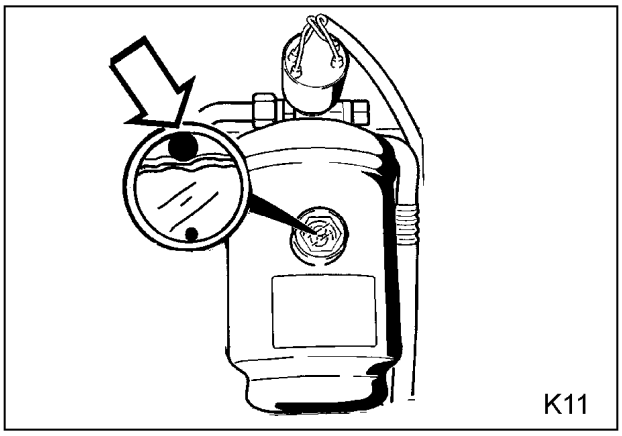


Fig. 3

During operation the refrigerant must flow through the inspection glass without air bubbles. In most cases the presence of air bubbles is a sign for a too low refrigerant level in the system. Apart from this, the refrigerant may not sufficiently condense as a result of a soiled evaporator or a defective condenser fan and the fluid level in the refrigerant container may drop down to a level, at which gaseous refrigerant could flow through the rising tube to the inspection glass. This results in abnormally high temperatures in and on the fluid lines (between refrigerant container and expansion valve), as well as very high pressures in the pressure side.

However, incorrect evacuation or filling may also be the reason for air entering into the system and since air cannot be condensed, one will not be able to get rid of these bubbles by topping up refrigerant. In this case the air conditioning system needs to be evacuated and refilled.

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i Note

Air in the system is characterized by high pressures and temperatures.

On R134a refrigeration systems from KONVEKTA the inspection glasses are equipped with moisture indicators. In addition to the float, the dryer/collector/inspection glass combination has an indicator pearl integrated in the inspection glass, which changes its colour when absorbing moisture.

The refrigerant level should be inside the inspection glass and should only be checked after approx. 5 minutes continuous operation, because the refrigerant must first evenly distribute all over the system.

⚠ Danger

In case of mechanical damage or corrosion on this pressure container this collector unit must be replaced, to avoid bursting and further damage.

Pressure switch

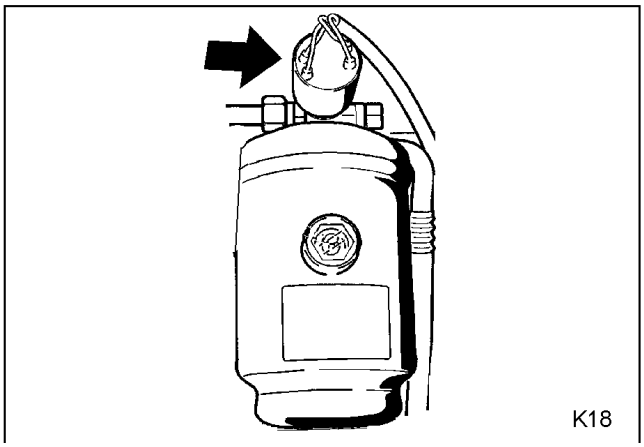


Fig. 1

After a minimum pressure is reached in the low pressure side or a maximum pressure in the high pressure side, the pressure switch (B75) will switch of the magnetic clutch of the compressor, thus to avoid destruction of system components by excessive pressure or drawing in external gases and foreign matter as a result of too low pressure.

Working pressure:

Low pressure off: 1,5 ±0,5 bar

Low pressure on: 3.5 bar

Overpressure off: 25,0 ±1,5 bar

Overpressure on: 18,0 ±1,5 bar

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Expansion valve

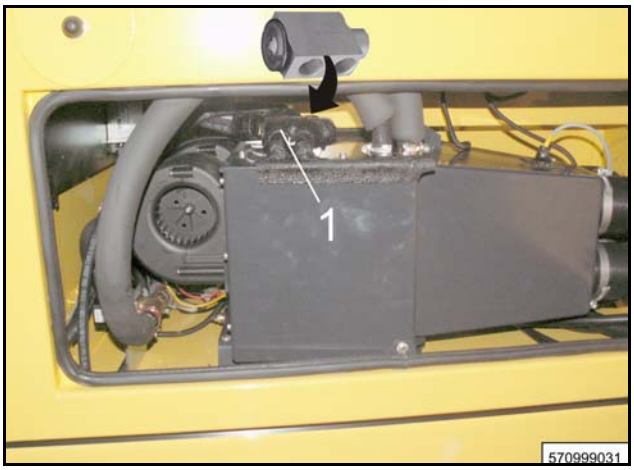


Fig. 1 Expansion valve

The expansion valve (1) is located inside the cab on the blower box. The expansion valve always allows a small amount of the high pressure liquefied refrigerant to flow into the evaporator, which has a much lower pressure. This lower pressure causes these liquid refrigerant to expand and to evaporate to gaseous state. The heat required for this evaporation process is taken from the ambient air through the lamellas and supplied to the refrigerant. This is the so-called cooling effect.

The thermostatic expansion valve operates with an external pressure compensation. This type of expansion valve works with high accuracy, because it uses pressure and temperature at the evaporator outlet and adjusts and overheating of approx. 7 K. The already installed expansion valves and the ones delivered as spare parts have this overheating value pre-set. In order to prevent a loss in performance or compressor damage you should only use original expansion valves, because adjusting expansion valves takes a lot of time and care.

i Note

In case of dirt in the refrigerant system you should also check or clean the screen at the expansion valve inlet.+

Evaporator

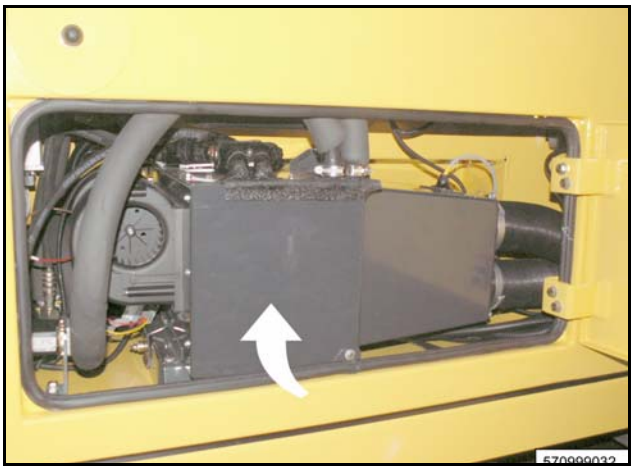


Fig. 1 Evaporator

The evaporator is located inside the cab in the blower box. It consists of a heat exchanger (inside air - refrigerant), with refrigerant flowing to a pipe system with cooling flanges.

As with the condenser, correct operation of all fans and cleanliness of the fins must be assured.

Air conditioning systems have a circulation air filter mounted in the air flow in front of the evaporator, which should be cleaned or changed by the operator, depending on the amount of dirt.

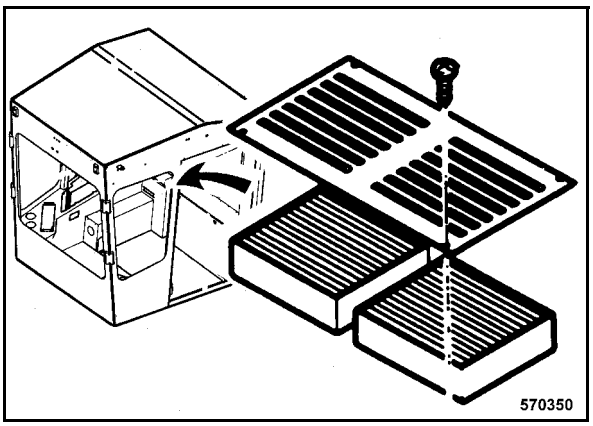


Fig. 2 Changing the circulation air filter

- Remove the slotted cover from the console behind the driver's seat.
- Remove both circulation air filters and insert the new circulation air filters (Fig. 2) .
- Fasten the slotted cover to the console.

A condensation water filter is mounted in the air flow after the evaporator. This filter has the function to collect the water that has condensed from the air in the evaporator block and to discharge this water into the water pan With a defective condensation water filter condensation water may flow into the inside of the vehicle.

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⚠ Caution

When replacing a heat exchanger, e.g. evaporator or condenser, any compressor oil lost by exchanging the components, must be replaced with fresh oil.

Defroster thermostat

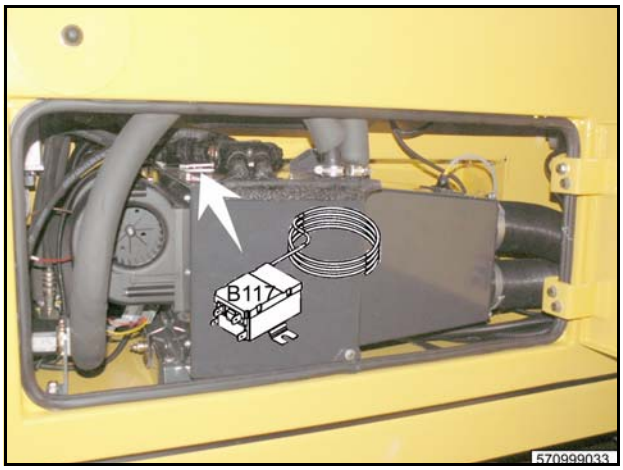


Fig. 1 Defroster thermostat

The feeler of a defroster thermostat (B117) to switch off the magnetic clutch in case of icing up or to switch the clutch back on after defrosting, is mounted on the evaporator. The correct adjustment of the defroster thermostat as well as the correct feeler assembly should be checked during maintenance.

Switching point on: + 1°C (± 1°C)

Switching point off: + 5,5°C (± 1°C)

i Note

It is very important that the feeler is mounted downstream of the evaporator, but before the pressure sensor, in countercurrent direction, with full length and insulated against the outside temperature.

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Blower with rotary speed module



Fig. 1 Radial twin blower

The radial twin blower (E37) draws in air from inside the cabin through the circulation air filter. The drawn in air is cooled down in the evaporator fins and guided through air ducts and nozzles back into the cabin.

The rotary speed module (blower module, A53) is mounted on the blower housing. This module serves the purpose of converting the PWM current signals from the Climatronic control into corresponding voltage signals for the blower motor. The fan voltage complies with the fan speed shown in the display.

Solenoid valve, heating

The heating valve (Y138) is a black/white valve and is opened by the Climatronic control with 24V. When the voltage supply is switched off, the applied water pressure will close the valve as a pilot controlled valve. It is thus very important to maintain the prescribed flow direction (arrow on housing).

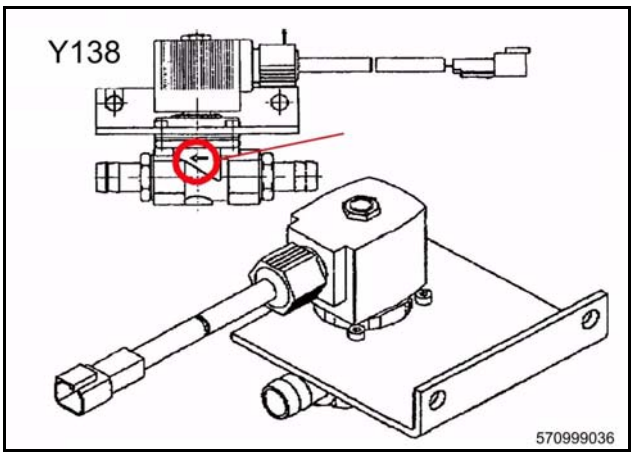


Fig. 2

Intended intermediate positions are realized via temporal cycling. The length of the total interval is approx. 10 seconds. The temporal proportion of "open" is between 30-100%.

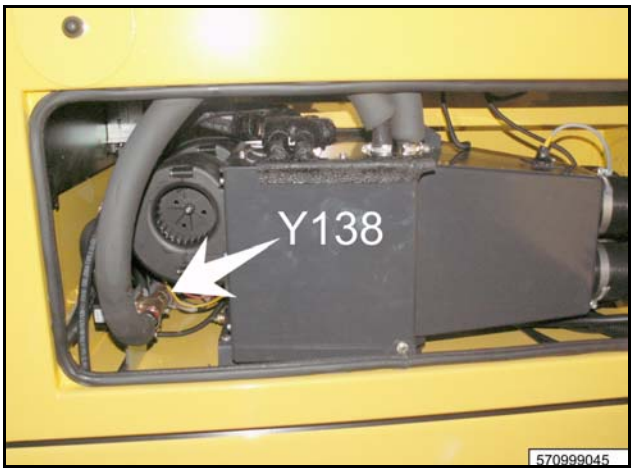


Fig. 3 Solenoid valve for heating Y138

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Pipes and hoses

Pipes and hoses in air conditioning systems must meet very high requirements with respect to resistance against heat and pressure. The requirements concerning leak tightness and, in case of hoses, against diffusion, i.e. seepage of refrigerant through the hose material, are very high. Pipes and hoses to be used must therefore be specially made for air conditioning purposes. For this reason the hoses have an inside lining of butyl rubber and an outside coating of EDPM rubber. Hose sections exposed to heat are provided with a special heat insulation.

O-rings are made of a special type of chloroprene rubber (neoprene). Before assembly of the air conditioning system these O-rings must be lubricated with compressor oil / refrigeration oil. The O-rings must always be replaced when assembling A/C-components.

Recommended tightening torques for O-ring sealed fittings

Thread	Spanner width	Torque
5/8“	17 or 19	13,6 - 20,3 Nm
3/4“		32,5 - 39,3 Nm
7/8“	27	35,3 - 42,0 Nm
1 1/16“	32	40,7 - 47,5 Nm
M30X2	36	105,0 - 115,0 Nm
M36X2	41	165,0 - 175,0 Nm

Bending radii for air conditioning hoses

Hose type	Nominal width	Bending radius
GH 134	NW8	min. 50 mm
GH 134	NW10	min. 65 mm
GH 134	NW12	min. 75 mm
GH 134	NW16	min. 100 mm
GH 494	NW20	min. 160 mm
GH 494	NW25	min. 194 mm
GH 494	NW32	min. 225 mm

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9.7 Climatronic control

The Climatronic control is integrated in the housing of the control unit.

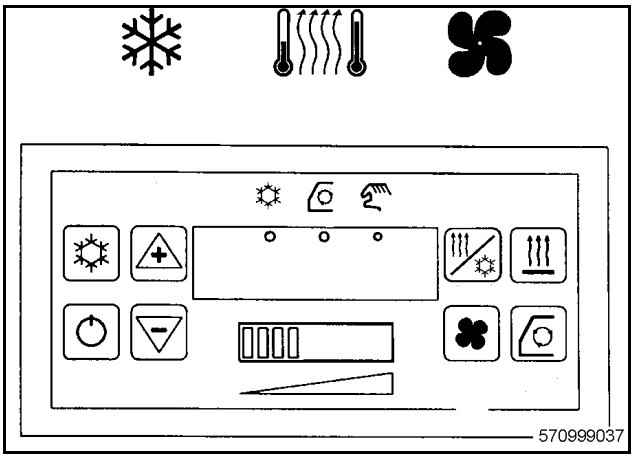


Fig. 1 Front view of Climatronic control

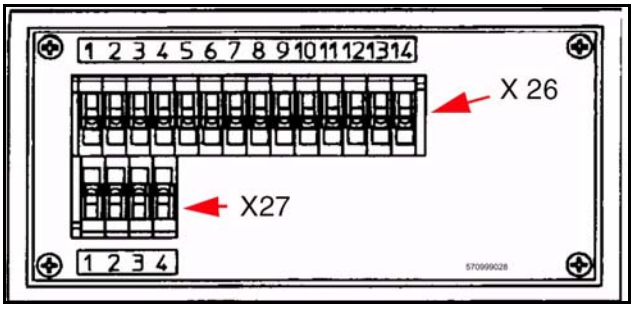


Fig. 2 Backside with connection terminal

When the ignition is switched on the Climatronic control is supplied with vehicle voltage via terminal X26:1 and can be switched on.

As long as the engine is not running, no signal is applied to terminal X26:4 on the control. After a period of 10 minutes without the engine running the Climatronic limits the blower speed to 30% to prevent unnecessary discharging of the battery.

In automatic mode the control regulates the cabin temperature. This is accomplished with the help of the two sensors:

- Room temperature sensor B29 (Fig. 3) under the circulation filters.
- Blow out temperature sensor B118 (Fig. 3).

The two sensor signals are fault monitored, i.e. in case of cable breakage, short circuit or disconnected sensors a fault will be displayed and the Climatronic will be out of servise.

The digital output signals for:

- the magnetic clutch of the compressor (Y15) and
- the solenoid valve for heating (Y138)

as well as the analog PWM-signal

- for the blower speed module

are generated from the sensor signals.



Fig. 3 Sensors

The two sensors are technically identical, they only differ by their colour identification:

Room temperature sensor (B29): blue colour mark,

Blow out temperature sensor (B119): yellow colour mark.

These sensors are NTC-elements, i.e. the electric resistance drops with increasing temperature.

Designation		Measuring value
Blow out temperature sensor	B118	55kΩ at -10°C 32kΩ at 0°C 19kΩ at +10°C 12kΩ at +20°C 10kΩ at +25°C
Room temperature sensor	B29	55kΩ at -10°C 32kΩ at 0°C 19kΩ at +10°C 12kΩ at +20°C 10kΩ at +25°C

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Various functions of control logic

This point deals with special control steps, which are not self explanatory, and with technical backgrounds of Climatronic functions, which are worth knowing.

Automatic operation

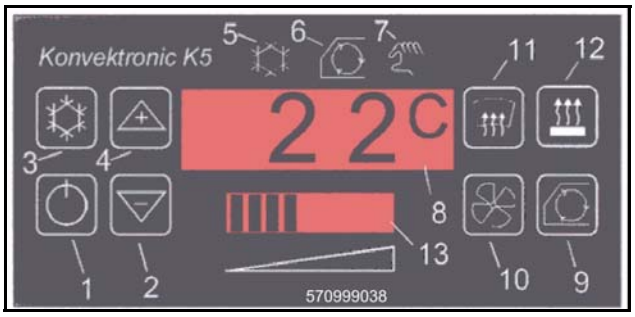


Fig. 4

(LED under the hand 7 (Fig. 4) off, nominal temperature in display). In this position the Climatronic control regulates the blower speed in dependence on the temperature difference between nominal and actual room temperature. Furthermore, heating valve and compressor clutch (only in air conditioning operation) are automatically switched on or off as required, in order to achieve the desired room temperature. If the engine is still cold while heating is required, the control recognizes this fact by the blow out temperature on the heater box; the control will then limit the blower speed until the engine is warm, thus preventing that too much cold air is blown into the cabin.

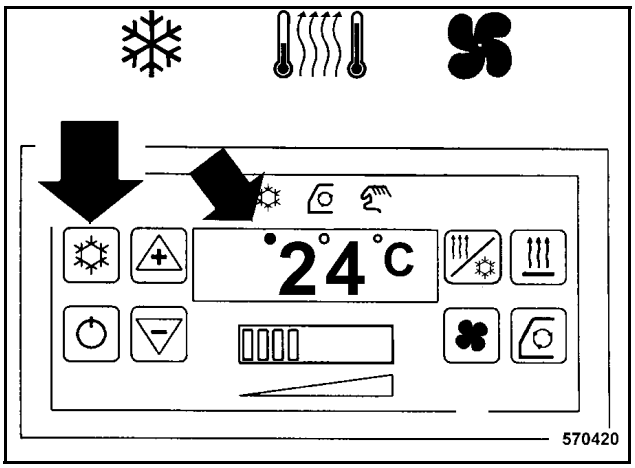


Fig. 5

Air conditioning operation: In order to achieve a cooling effect, the compressor outlet of the control must be manually released also in automatic operation by pressing button 3 (Fig. 5). (LED below crystal (5) on!). The compressor outlet is in this case not permanently supplied with current (except REHEAT operation), but only when the control supplies the output (X26:8) due to the difference between nominal and actual temperature. The compressor can only start running when the thermostat (B117) and the pressure switch (B75) are closed.

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Manual operation of heating

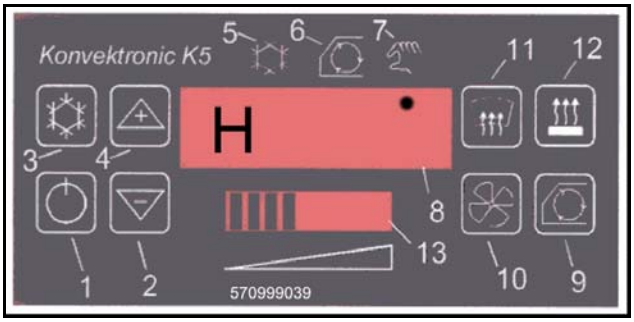


Fig. 6

The automatic control of the heating valve can be switched off with push button 12 (Fig. 6) (manual heater operation, the display shows 'H' and the LED below the hand lights). The automatic blower control is switched off at the same time. In manual heater operation the heating valve is set to a opening interval as shown in the bar graph (13), which can be changed with the +/- buttons (2,4). The number of displayed bars indicates the opening time in percent (e.g. 4 bars = 40%: approx. 4 seconds valve energized/ open, approx. 6 seconds valve dead/closed etc). When operating the blower button (10) the 'H' will disappear in the display, the nominal temperature will appear, the LED below the hand stays on (as with manual blower speed setting, see below), however, the manual heating operation remains active. Manual heater operation can only be switched over to automatic heater operation by pressing the button (12) again. In manual heater operation the compressor control remains active, i.e. in summer the system will continue to try to achieve the nominal temperature.

Manual blower speed setting

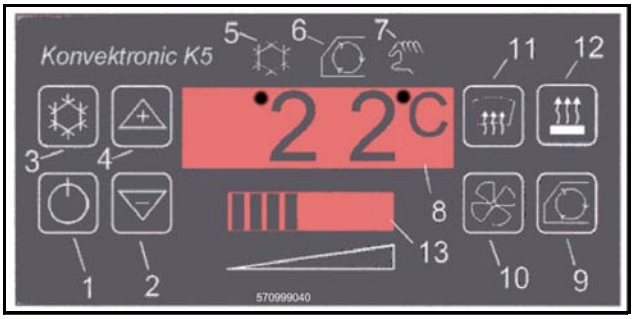


Fig. 7

Automatic blower speed control can be disabled with button 10 (Fig. 7) (LED below hand (7) lights), temperature is still displayed). However, the temperature control remains active as long as air conditioning operation and heater operation remain switched on. In this operating mode the +/- buttons are used to set the blower speed manually.

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REHEAT function (dehumidification function)

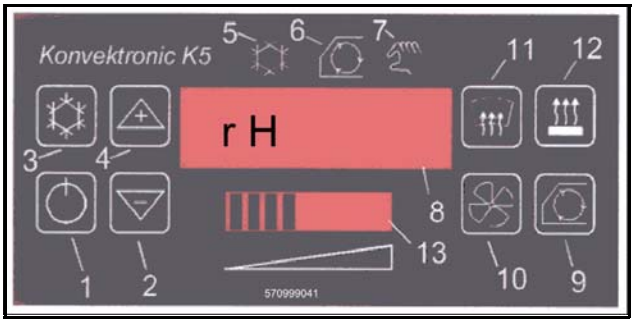


Fig. 8

When pressing button 11 (Fig. 8), the blower is fixed to maximum speed and the compressor output is permanently switched (however, the compressor is switched off by the thermostat if there is a risk of the evaporator icing up). The display shows 'rH'. However, the heater control function remains active in order to maintain the previously set nominal temperature, if this should be necessary. The REHEAT function is mainyl used to dehumidify the cabin (steamed up windows).

Circulation air operation

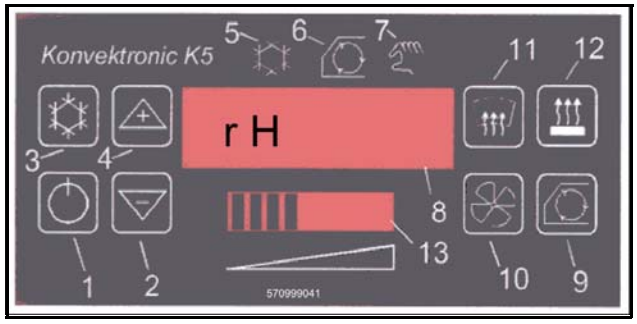


Fig. 9

Button 9 (Fig. 9) can theoretically be used to toggle between circulation and fresh air operation, the button is - except the LED display - ineffective, the machines are only prepared for this function electrically, but not the air guidance.

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Error messages

Faulty room temperature sensor

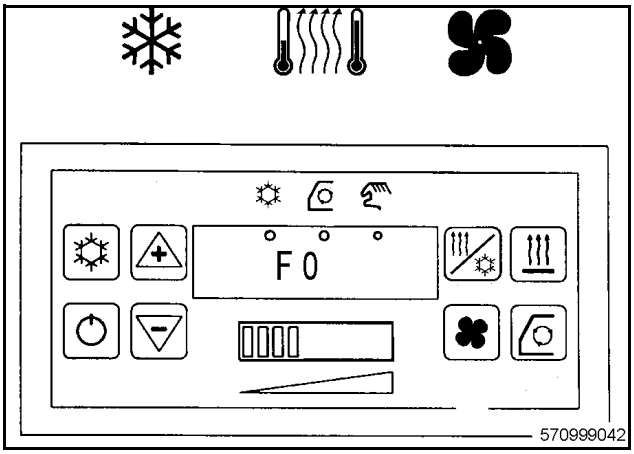


Fig. 10

'F0' flashes in display. The Climatronic is unable to work without the actual temperature value and is therefore out of function when this error message is displayed. The Climatronic is only operable again after this fault (cable breakage, short circuit, sensor not connected) has been rectified.

Faulty blow out temperature sensor

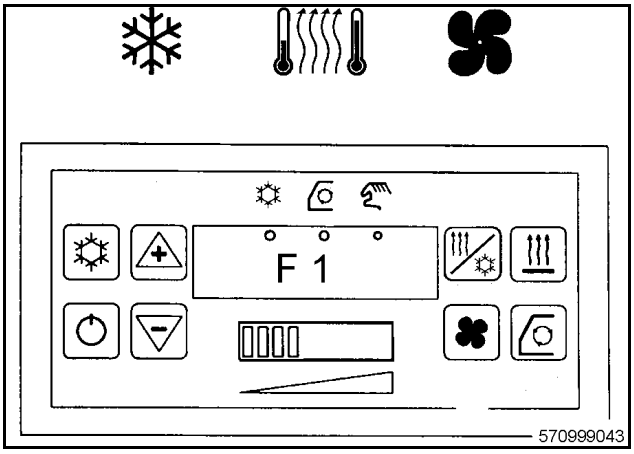


Fig. 11

'F1' flashes in the display. The Climatronic is unable to work without the blow out temperature value and is therefore out of function when this error message is displayed. The Climatronic is only operable again after this fault (cable breakage, short circuit, sensor not connected) has been rectified.

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9.8 Measuring the compressor oil level

⚠ Caution

The compressor oil level must be checked after replacing a system component or if a leak in the system is suspected. Use only compressor oil / refrigeration oil PAG SP-20 (H14-003-404).

- Run the compressor for 10 minutes at engine idle speed.
- remove the refrigerant from the air conditioning system.

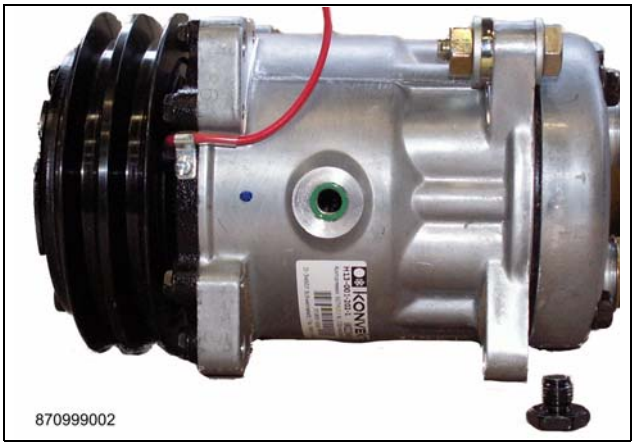


Fig. 1

- Turn the compressor, as shown in (Fig. 1), if necessary remove V-belt and hoses.
- Remove the oil plug.

i Note

The oil level must reach the bottom edge of the bore, top up or drain off oil if necessary.

- Close the oil plug again.

⚠ Caution

The contact area must be clean and should be free of damage.

Tightening torque 15 to 25 Nm

- Refill the air conditioning system.

9.9 Checking the magnetic clutch

- Measure the voltage.

i Note

Nominal value = vehicle voltage

- Check the magnetic coil locking ring for secure fit.
- Check the current consumption.

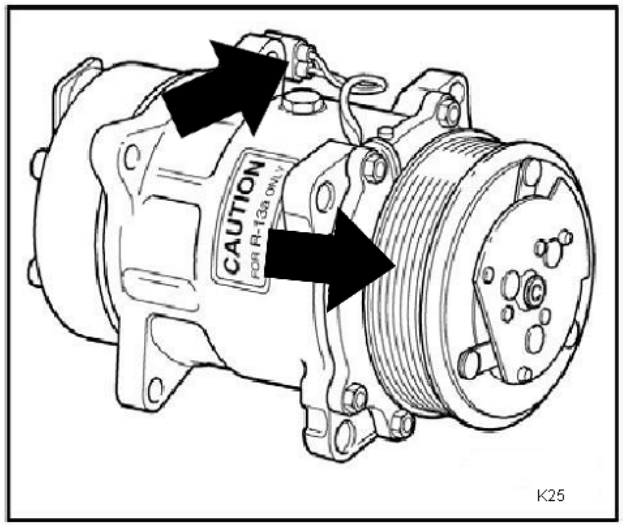


Fig. 1

i Note

at 12 Volt vehicle voltage approx. 3.5 Amp.

at 24 Volt vehicle voltage approx. 1.75 Amp.

Overcurrent indicates a short circuit inside the magnetic coil.

No current indicates an interrupted electric circuit.

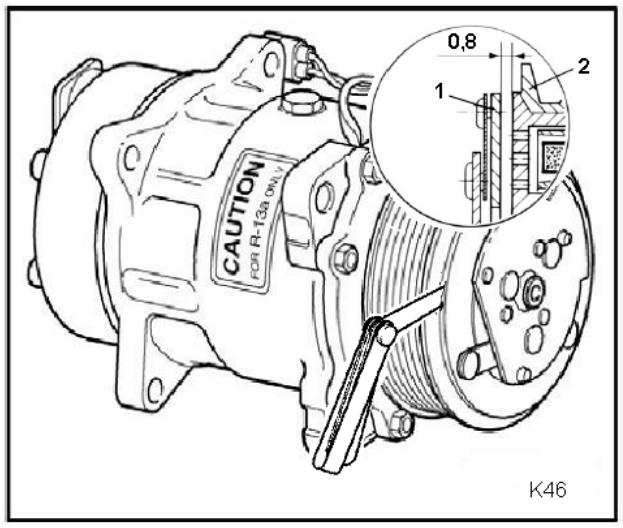


Fig. 2 Measuring the air gap

- Measure the air gap on the magnetic clutch between V-belt pulley (2) and thrust plate (1).

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i Note

The gap should be 0.4 to 0.8 mm.

- Take off the drive V-belt and rotate the V-belt pulley by hand while the magnetic clutch is disengaged.

i Note

In case of excessive flatness faults or deviations the magnetic clutch needs to be replaced.

Cross-section of magnetic clutch

Fig. 3 shows a cross-section of the magnetic clutch. If the coil (7) is not supplied with operating voltage, there is no contact between the front plate of the clutch (1) and the V-belt pulley (2). A spring presses the front plate away from the belt pulley. The V-belt pulley rotates with the bearing (3) in idle speed, the compressor does not work. When the coil is supplied with operating voltage (12 or 24 V), a magnetic field is generated and pulls the front plate of the clutch. Both front plate and compressor shaft (8) are then driven by the V-belt pulley, the compressor works.

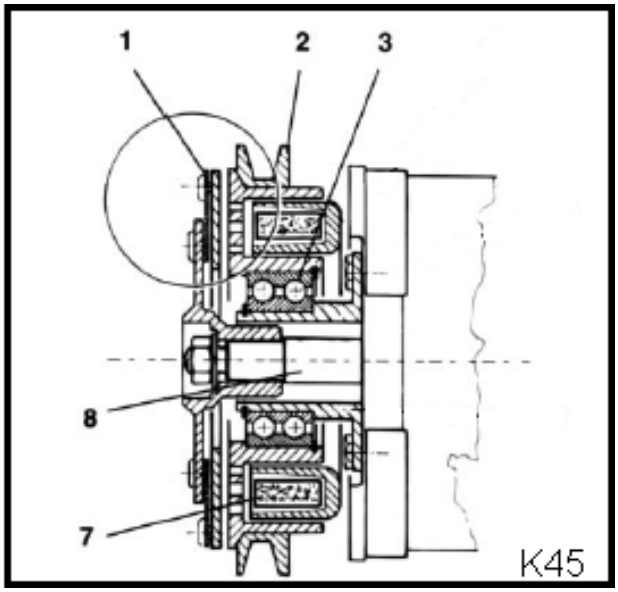


Fig. 3 Cross-section of magnetic clutch

9.10 Inspection and maintenance work

- Visual inspection of the complete system for damage.
- Check the compressor mounting bracket on the vehicle engine for tight fit and damage.
- Check the condition, alignment and tightness of the V-belt.
- Check the routing of refrigerant hoses and cables in the area of the vehicle engine and transmission, as well as on the chassis for chafing and rectify any detected faults. Ensure sufficient clearance to hot parts, such as the exhaust; install a protective shield, if necessary.
- Check the routing of hoses and hoses on the attachment box or in the cabin.
- Check all hose and screw fittings for leaks.
- Check the fastening of the condenser unit.
- Clean the condenser fins, replace the condenser block if damaged fins are found.
- Check the fastening of the evaporator unit.
- Check the function of evaporator and condenser fans.
- Check the electric control panel. If discolorations on conductors are found, these should be replaced and possibly also the corresponding relays.
- Switch on the cooling system and check the refrigerant level.
- Filter/dryer and filter/dryer/fluid container combinations must always be replaced after opening the refrigerant circuit. If these are in service for more than 1 year, there is a risk that they may be clogged by excessive absorption of moisture! The filter/dryer should be replaced in regular intervals.
- Measure the temperature on the evaporator: Measure the intake air temperature - Measure the blow out air temperature - The temperature difference should be at least 8-10 K.
- Measuring the pressure in the refrigerant circuit

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9.11 Servicing the air conditioning

The air conditioning unit is attached to the ROPS and can be access from outside for service work.

⚠ Caution

Under very dusty conditions clean every day in order to maintain the cooling power of the air conditioning system.

⚠ Danger

Danger of accident!

Do not clean with a hot water jet. Heat will cause extreme overpressure, which could cause damage or explosion of the system.

Clean the condenser

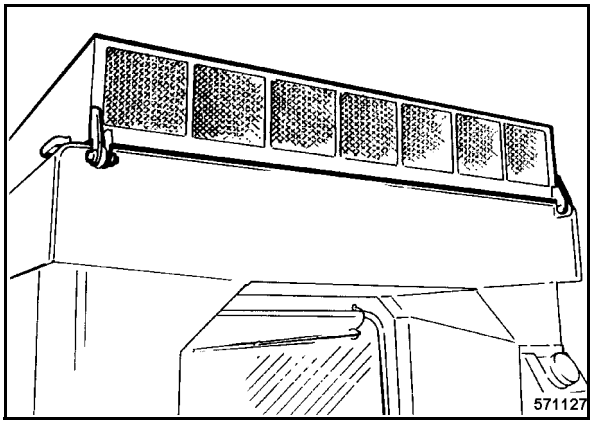


Fig. 4

- Fold the air intake grid (Fig. 4) back.

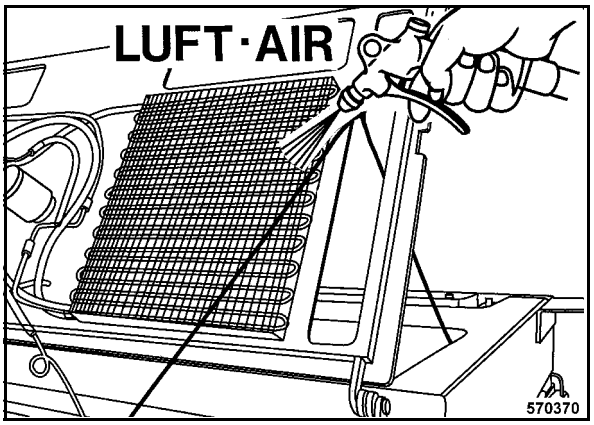


Fig. 5

- Clean the condenser fins on front and back with compressed air or cold water (Fig. 5).

⚠ Caution

During cleaning work do not damage the cooling fins and realign bent fins.

Checking the refrigerant level

- Start the engine.

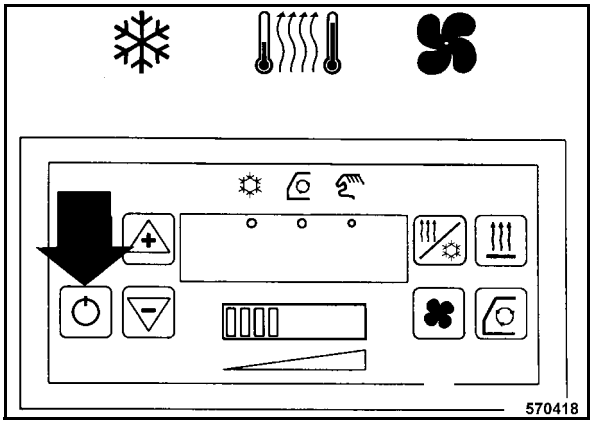


Fig. 6

- Switching on the control unit (Fig. 6).

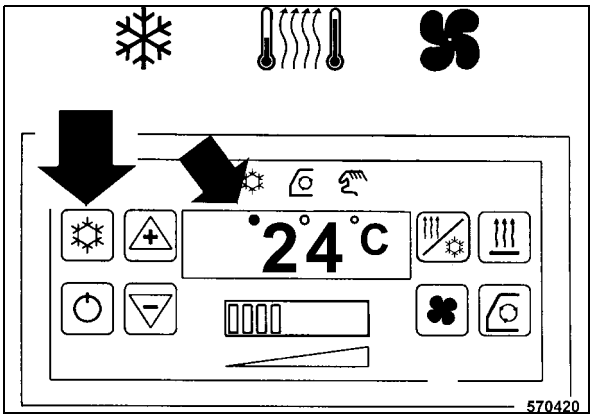


Fig. 7

- Start operation of the air conditioning (Fig. 7).

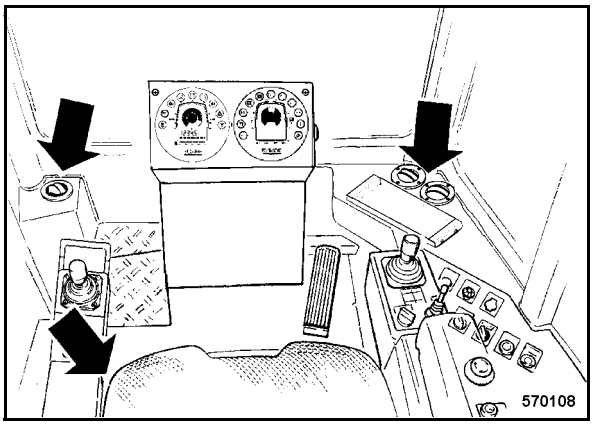


Fig. 8

- Open the air outlet nozzles (Fig. 8).
- Check, whether the out flowing air is noticeably cooler.

i Note

The adjusted temperature must be below the actual temperature inside the cabin, so that the compressor will be switched on.

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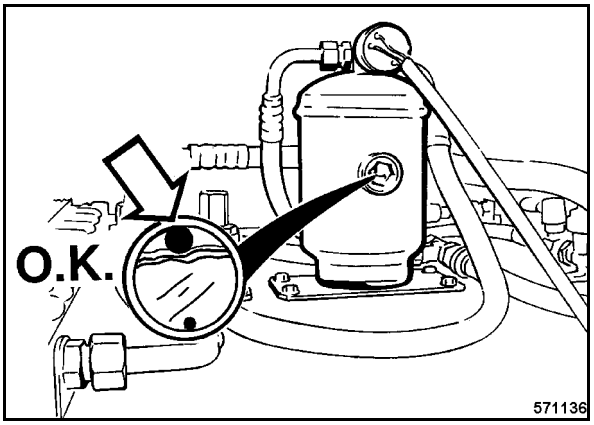


Fig. 9

- Check whether the white float (Fig. 9) inside the inspection glass of the drier/collector unit floats right at the top.

i Note

The refrigerant level is correct.

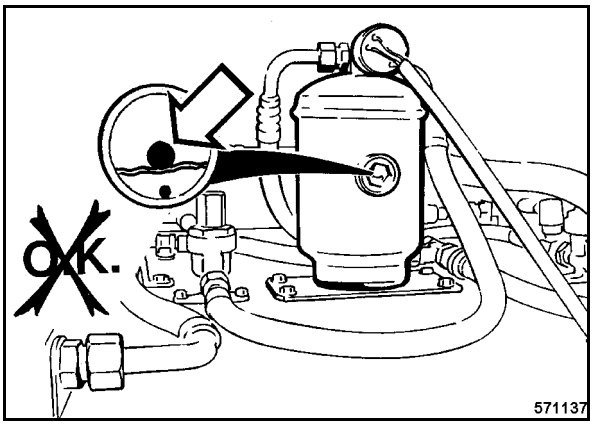


Fig. 10

- If the white float (Fig. 10) inside the inspection glass of the drier/collector unit floats at the bottom, inform the service department.

i Note

The refrigerant level is not correct.

- Refrigerant must be filled up, if necessary check the air conditioning system for leaks.

Checking the moisture level of the drying agent

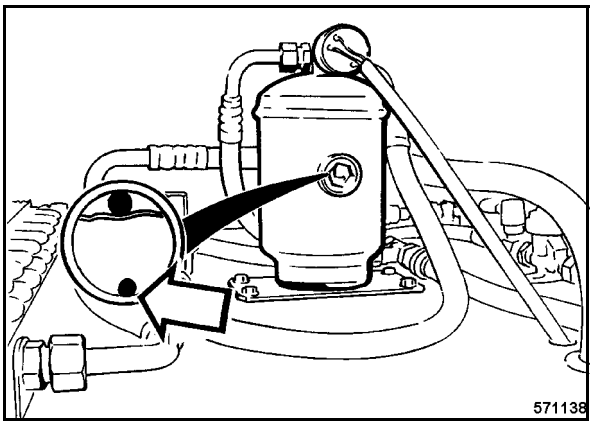


Fig. 11

- Check the moisture indication pearl (Fig. 11) inside the inspection glass of the drier/collector unit.

orange = Drying agent o.k.

colourless= moisture level of drying agent too high.

- Inform the service department. Replace drier/collector unit, check air conditioning system.

⚠ Caution

Have the drier/collector unit replaced by the service department every year before the operating season.

Checking the condition of the drier/collector unit

⚠ Caution

According to the regulation for pressure reservoirs all pressure reservoirs must be repeatedly inspected by a specialist. In this sense repeated inspections are external examinations, normally on pressure reservoirs in operation. In connection with this inspection the drier/collector unit must be visually examined twice every year. During these inspections special attention must be paid to corrosion and mechanical damage. If the reservoir is not in proper condition it must be replaced for safety reasons, as a precaution to protect operators and third parties against any danger arising from the handling and operation of pressure reservoirs.

⚠ Danger

Danger of injury!

In case of mechanical damage or corrosion on this drier/collector unit this unit must be replaced, to avoid bursting and further damage.

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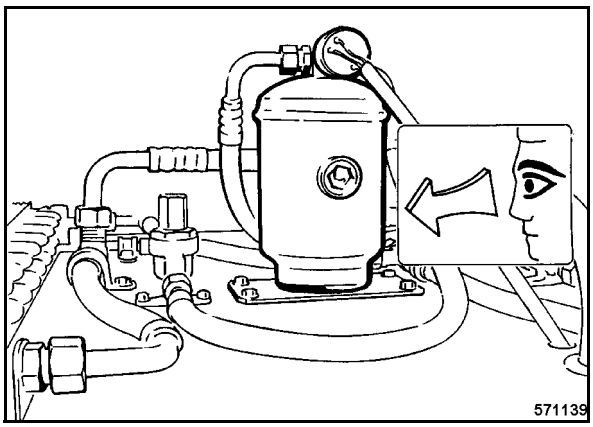


Fig. 12

- Check the drier/collector unit (Fig. 12) for mechanical damage or rust.

9.12 Check condition and tension of refrigerant compressor V-belt, replace the V-belt

⚠ Danger

Danger of injury!

Work on the V-belt must only be performed with the engine shut down.

Checking the V-belt

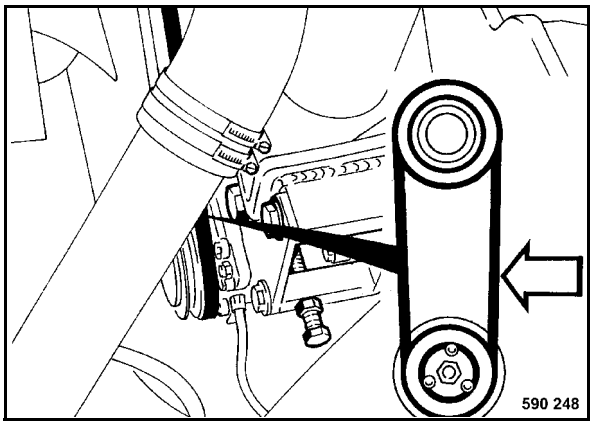


Fig. 13

- Inspect the entire circumference of the V-belt (Fig. 13) visually for damage and cracks. Replace damaged or cracked V-belts.
- Check with thumb pressure whether the V-belt can be depressed more than 10 to 15 mm (0.4 – 0.6 inches) between the V-belt pulleys, retighten if necessary.

Retightening the V-belt

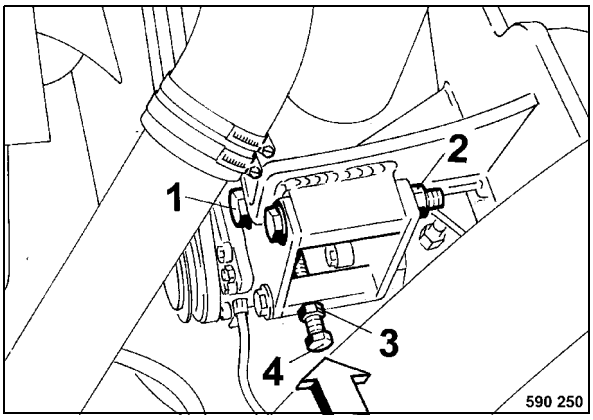


Fig. 14

- Slacken the bearing screw 2 (Fig. 14) for the compressor bracket.
- Slightly loosen the hexagon screw (1) on the slot for the compressor bracket.
- Loosen the counter nut (3).

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- Turn down tensioning screw (4) in direction of arrow, until the correct V-belt tension is reached.
- Retighten screws and counter nut.

Changing the V-belt

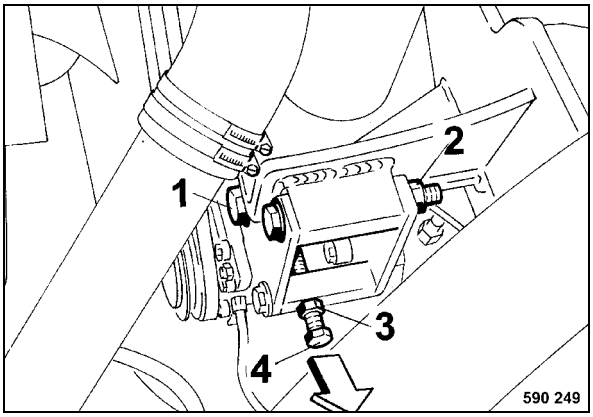


Fig. 15

- Remove the V-belt of the fan drive.
- Slacken the bearing screw 2 (Fig. 15) for the compressor bracket.
- Slightly loosen the hexagon screw (1) on the slot for the compressor bracket.
- Loosen the counter nut (3).
- Turn tensioning screw (4) in direction of arrow to the stop.
- Take the old V-belt off the V-belt pulley.
- Fit the new V-belt to the V-belt pulleys.
- Tension the V-belt as previously described.
- Reinstall and tension the fan drive V-belt.

i Note

Retighten new V-belts after a running time of 15 minutes.

9.13 Drying and evacuation

Evacuation of air conditioning systems using R-type refrigerants not only has the purpose of emptying the system of all air before filling in refrigerant, but also to verify the leak tightness over a longer lifetime in the achieved vacuum. However, the most important factor in this work step is the drying of the system.

Any water residues in the refrigerant circuit will combine with the refrigerant, which will lead to the previously described consequential damage.

Vacuum pumps with a capacity of more than 100 l/min and a final pressure of less than 30 micron, i.e. 0.039 mbar should be used to evacuate the refrigeration system.

The refrigerant compressor is not suitable for the purpose of evacuation, because it is not able to achieve a sufficient final vacuum and, apart from this, may be mechanically damaged because of a lack of lubrication when running empty during evacuation.

It is common practice to evacuate the refrigeration system to a final vacuum of 1 Torr, i.e. 1.33 mbar.

An exact time for evacuation and drying cannot be predicted. It can only be determined by means of a vacuum meter. However, if there is no vacuum meter at hand it is generally better to evacuate 1 hour longer than 1 hour too less.

Function drying:

Under normal ambient pressure (1.013 mbar) evaporates absolute at 100° C. If the pressure is reduced, water will already evaporate, e.g. under a pressure of 10 mbar, at an ambient temperature of almost 7°C, but the water will not evaporate all at once. Since it is very difficult to separate the steam from the vacuum in the system, the evacuation process is supported by the co-called vacuum breaking (filling the circuit with dried nitrogen). With vacuum breaking the filled in dried nitrogen absorbs the moisture in the refrigerant circuit, which can then be easily discharged together with the nitrogen.

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9.14 Emptying in case of repair

For repair work the air conditioning systems must very often be emptied of all refrigerant.

Especially with expensive refrigerants and larger amounts of oil it may be necessary to keep the refrigerant for later use.

For later use these refrigerants must be drawn out with suitable equipment and intermediately stored in collecting containers.

Environment

Contaminated refrigerant must be disposed of environmentally

Releasing refrigerant into the atmosphere is prohibited (see restrictive injunction concerning CFC, day of enforcement 01. 08. 1991, § 8)

Danger

For draining refrigeration systems you should not simply use any delivery containers, but only appropriate pressure bottles, which must be specially marked and should comply with the pressure gas directive.

When transferring refrigerant you must make sure that the bottle does not contain more than the permitted amount of refrigerant in litres and has sufficient gas space for expansion (filling factor: 0,7).

In order to reduce the evacuation period in case of short repairs, you may fill the refrigerant circuit with approx. 0.5 bar nitrogen when opening. This ensures that nitrogen will flow out of the refrigerant circuit while it is open and no air or moisture can enter. However, the necessity for vacuum generation and a dryer change remains.

9.15 Leak test

Caution

The use of leak detection colouring matter is not permitted, because its chemical composition is unknown and its effect on compressor oil and rubber elements is not predictable. The use of leak detection colouring matter makes any warranty claims null and void.

Before starting the evacuation process, the refrigerant circuit is filled with nitrogen through a pressure reducer valve (approx. 22 bar). After this all connections in the air conditioning system are checked with the help of a suitable leak detection spray. A leak is thereby indicated by means of foam bubbles.

A leak test is required if a pressure drop is noticed.

The leak test must be repeated after filling the air conditioning system with refrigerant.

Leak test with electronic leak tester



Fig. 1 Electronic leak tester

Small leaks with only very low amounts of refrigerant escaping can be detected, e.g. with an electronic leak tester. Such equipment is able to detect leaks of less than 5 gr. per year.

The leak tester used must be specially designed for the refrigerant composition in the air conditioning system. For example, leak detectors for refrigerant R12 are not suitable for R134a, because the refrigerant R134a is free of chlorine atoms, meaning that this leak detector will not respond.

Leak test with soap bubbles

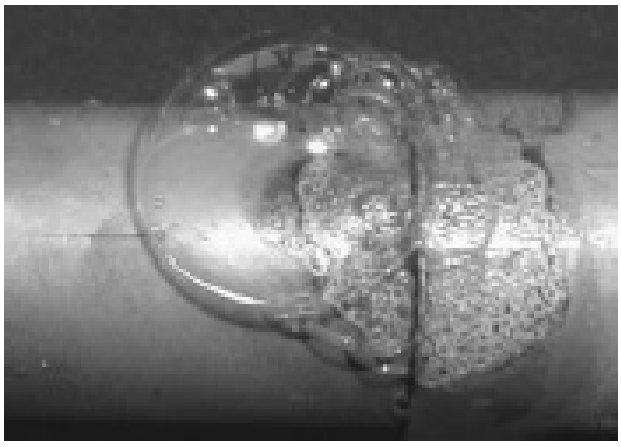


Fig. 2 Soap bubble test

Points susceptible for leakage are sprayed with a soapy solution. Bubbles indicate the leak. The detection limit for R 134a is 250 g/year.

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9.16 Filling instructions

Filling of refrigerant into the dried, vented and oil filed machines takes place under various conditions.

In most large series production facilities highly complicated equipment is available for this purpose, whereas individual machines at the place of installation must be filled directly from the refrigerant container.

Liquid refrigerant is only used to pre-fill the pressure side of the evacuated refrigeration system (protective filling).

After switching the refrigeration system on and watching the inspection glass, gaseous refrigerant can be filled into the system while the engine is running, if the refrigerant level is found to be too low (gas bubbles in the inspection glass).

⚠ Caution

Liquid refrigerant in the suction side of the compressor should generally be avoided during filling and operation of the refrigeration system, since this could damage the compressor..

When filling the air conditioning system directly from the refrigerant bottle care must be taken not to overfill the system. As an additional control and for statistical purposes, e.g. for refilling, it is important to write down the weight of the filled in refrigerant.

With correct operation of the air conditioning the refrigerant container should be about 1/3 filled with liquid refrigerant, the evaporator should be maximally filled at the calculated evaporation temperature, i.e. the suction line should only be a few degrees warmer than the evaporation temperature indicated by the pressure gauge.

i Note

White frost on the suction line is no measure for assessing the filling.

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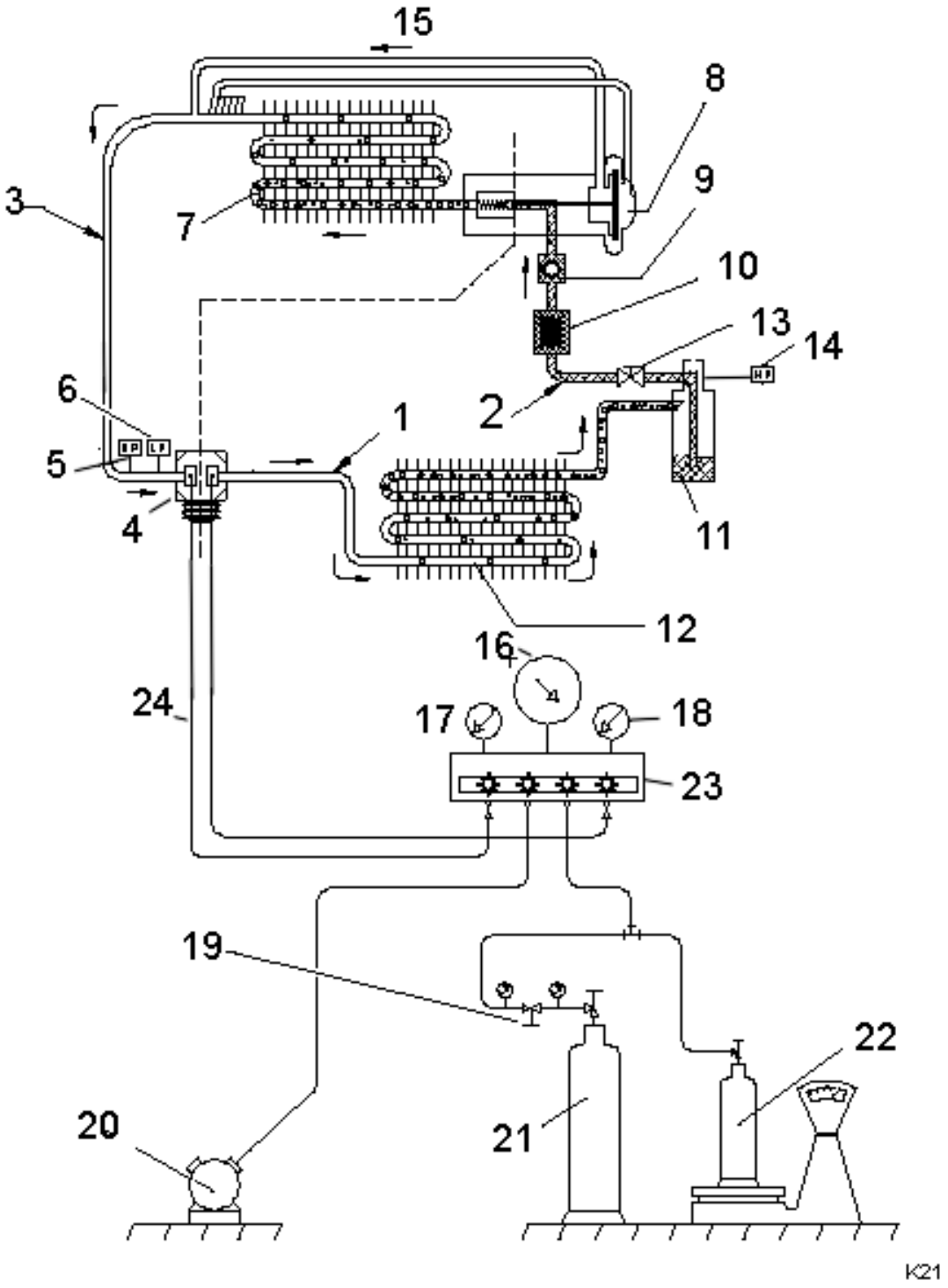


Fig. 1

1 High pressure - gaseous
2 High pressure - liquid
3 Low pressure - gaseous
4 Compressor
5 Compressor pressure switch (not used)
6 not used
7 Evaporator
8 Expansion valve
9 Inspection glass
10 Filter dryer
11 Fluid container
12 Condenser
13 Manual shut-off valve (not used)
14 Pressure switch with high and low pressure contacts
15 Defroster thermostat
16 Vacuum meter
17 Low pressure gauge
18 High pressure gauge

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19 Pressure reducing valve
20 Vacuum pump
21 Nitrogen bottle
22 Refrigerant bottle
23 Pressure gauge bar

Filling instructions

1 Connect the service adapter with the blue hand wheel in the suction side.
2 Connect the service adapter with the red hand wheel in the pressure side (the hand wheels on the service adapters must be fully backed out - left hand stop)
3 Connect the blue suction hose below the blue hand wheel on the pressure gauge bar to the blue service adapter.
4 Connect the red pressure hose below the red hand wheel on the pressure gauge bar to the red service adapter.
5 Connect the yellow hose below the yellow hand wheel on the manometer bar to the 2-stage vacuum pump.
6 Connect the last hose below the black hand wheel on the nitrogen bottle via the pressure reducing valve.
7 Check on the pressure gauge bar that all hand wheels are closed.
8 Turn the hand wheels on both service adapter clockwise. This opens the valves (right hand stop).
9 Open the valve on the nitrogen bottle (only via pressure reducer); pressure approx. 20 bar.
10 Open the black and red hand wheels on the pressure gauge bar and fill nitrogen into the system, until a pressure of approx. 3.5 to 5.0 bar is indicated on the suction side.
11 Then open the blue hand wheel and raise the pressure in the suction side (max. 10 bar). Check for leaks with a leak detection fluid or soapsuds.
12 If the system is leak tight, release the nitrogen from the system. For this purpose disconnect the hose from the nitrogen bottle and open the red, blue and black hand wheels on the pressure gauge bar.
13 Then connect the hose to the refrigerant bottle.
14 Switch on the vacuum pump and open all hand wheels on the pressure gauge bar. In case of a leak no or only an insufficient vacuum will be reached. In this case proceed as described under point 9-12. Once the leak is sealed continue with point 14.
15 Once a sufficient vacuum is reached, both pressure gauges show -1, close all hand wheels on the pressure gauge bar.
16 Switch off the vacuum pump, watch the pressure gauges to see whether the vacuum is maintained.
17 Open the valve on the refrigerant bottle and open the black and red hand wheels on the pressure gauge bar. Fill refrigerant into the system, until a pressure equilibrium between suction and pressure side is reached (reading of pressure gauges).
18 Close the red hand wheel.
19 Perform a leak test with the electronic leak detector.
20 Start the engine and switch on the system.
21 Open the blue hand wheel and continue filling in refrigerant until the inspection glass is free or air bubbles (in fluid container/dryer combinations the white pearl should float in the upper third of the inspection glass). Then close the refrigerant bottle.
22 Close the blue hand wheel on the pressure gauge bar.
23 Preparing the test run: -Close windows and doors -Fan on full speed stage -Mount measuring feelers to air discharge and air intake.
24 Run the system for approx. 20 minutes with medium engine speed.
25 The temperature difference between air discharge and air intake should be (depending on type of air condition) 8-10°C. The ambient temperature thereby is approx. 20°C. (These data are only reference values, which may be influenced by possible insolation)
26 Switch off system and engine and check for leaks again.
27 Turn out (left hand stop) and remove the hand wheels on both service adapters.
28 Fit all valves with dust caps.
29 Perform a leak test.
30 Mark the system with the corresponding type plates and information decals, such as type of oil and refrigerant.

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9.17 Trouble shooting in refrigerant circuit, basic principles

Basic principles

Requirements

For trouble shooting two requirements must be fulfilled:

- Expert knowledge
- technical equipment

Technical equipment

The most important aids for trouble shooting are pressure gauges and thermometer. The refrigerant conditions, like overheating and excessive cooling provide important Information when searching for faults. Even your own senses are important aids for trouble shooting. Bubbles in the sight glass, dirt and white frost can be visibly perceived. If the compressor draws in wet steam, this can be noticed by the suction line and it may also be audibly detectable. An overloaded compressor can even be smelled.

The following tools and auxiliary materials should be available for trouble shooting:

- Service station
- Pressure gauge
- Thermometer
- dry nitrogen
- Refrigerant bottle for new refrigerant
- Container for old oil
- Vacuum pump
- Hoses
- Scales
- Suction station
- Leak detector

The measuring equipment must be checked at regular intervals. Calibration can only be made by an approved testing authority.

Pressure gauge

Most pressure gauges used in practice are (for cost reasons) excess pressure gauges. These pressure gauges measure the excess pressure in relation to the ambient pressure (air pressure). In order to achieve the absolute (actual) pressure the ambient pressure must be added to the pressure gauge reading. The absolute pressure is needed for the calculation and determination of material data.

$P_{abs} = P_{amb} + P_e$

P_{abs} = absolute pressure

P_{amb} = atmospheric air pressure (ambient pressure)

P_e = excess pressure (pressure gauge reading)

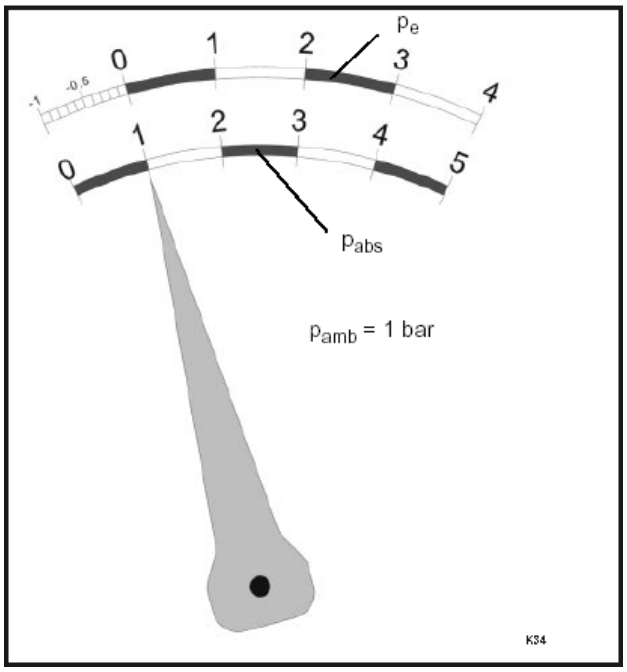


Fig. 2 Pressure gauge

Example:

A totally empty air conditioning system holds an atmospheric pressure of approx. P_{amp} = 1 bar.

Filling the system with refrigerant causes an excess pressure of P_e = 3 bar.

$P_{abs} = P_{amb} + P_e$ = 1 bar + 3 bar = 4 bar

Evacuating the system down to P_e = -0.6 bar, creates a "vacuum" (negative excess pressure).

$P_{abs} = P_{amb} + P_e$ = 1 bar +(- 0,6) bar = 0,4 bar

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Pressure gauge with saturation temperature scale

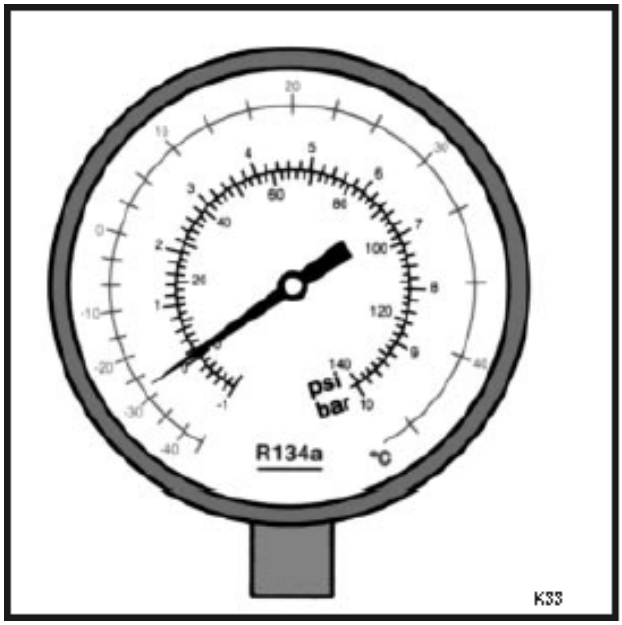


Fig. 3 Absolute pressure gauge

Temperature scales on the pressure gauges always refer to the absolute pressures Pabs. Please note that it is not possible to measure a temperature directly with a pressure gauge. The indicated temperatures are just reference values. Only the saturation temperature is assigned to the measured pressure.

If the refrigerant is fluid, the temperature is below the saturation temperature.

If the refrigerant is gaseous, the temperature is above the saturation temperature.

Pressure gauges must indicate 0 bar when not connected to the system.

Low pressure gauges have a blue, high pressure gauges a red border.

Thermometer

Normally digital thermometers with surface or contact feelers are used. Especially for high temperature differences excellent heat insulation of the measuring location is of utmost importance. The sparing use of a heat conducting paste is highly recommended. If the measuring location is soiled, it needs to be cleaned and probably treated with a fine emery cloth. Only the temperature of the feeler is measured. Due to missing heat insulation and insulating oxide layers on the line, temperature differences of a few degrees Kelvin between the measured and the actual values may arise.

Overheating

Due to its design a refrigerant compressor can only deliver gaseous or vaporous substances. Fluids are not compressible and must therefore not enter into the compression chamber of the compressor.

If the suction condition of the compressor is directly on the dew line, an e.g. incorrect evaporator load can cause "wet suction". This can lead to two processes, which are destructive for the compressor. The liquid refrigerant washes off the lubricating film between piston and cylinder wall, and insufficient lubrication will cause extreme wear. Liquid refrigerant remaining in the cylinder causes a direct energy transfer from piston to cylinder cover during compression. The valve plate may then be damaged by so-called fluid strokes.

Apart from protecting the compressor against fluid, overheating has further advantages. Since the fluid proportions in the drawn in steam reduces the flow rate of the compressor, it may be increased by a overheating. Overheating also improves the oil recirculation.

Common overheating values

The optimal overheating value is approx. 5 - 8 Kelvin. With this overheating the maximum system power is reached. However, the thermostatic expansion valve is unable to regulate this value exactly. Depending on design and operating conditions overheating fluctuates within a range between 4 and 12 Kelvin. The influence of the ambient air on the suction line causes an additional overheating effect.

Overheating is calculated as follows:

$\Delta\, t_{o2h} = t_{o2h} - t_o$

$\Delta\, t_{o2h}$, overheating at evaporator outlet in K

t_{o2h}, temperature at evaporator outlet in °C

t_o, evaporation temperature in °C

„h“ represents "overheated"

Supercooling

It is the function of the expansion valve to reduce the refrigerant to a lower pressure level (evaporation pressure) after it has been liquefied. For an optimal function of the valve pure fluid must be applied to its inlet port.

The refrigerant must "squeeze" (literally speaking) through a throttle gap inside the expansion valve. When comparing a certain mass of refrigerant in fluid and in vaporous state (with constant pressure), the vaporous refrigerant requires a much higher volume. That's why the vaporous refrigerant needs a much longer time to "squeeze" through the throttle gap.

Vaporous refrigerant in front of the expansion valve reduces the flow rate and results in an undersupply of the evaporator with refrigerant. Evaporation pressure and evaporator power will drop.

If the refrigeration system is operated with the "expansion valve inlet" condition directly on the boiling curve, slightest fluctuations in operating condition may cause

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a formation of bubbles in front of the expansion element.

For this reason one shifts the condition "Expansion Valve Inlet" away from the boiling curve into the fluid area and refers to this condition as Supercooling. This supercooling ensures a fluid supply in front of the expansion valve.

Common supercooling values

In systems with fluid container the supercooling at the fluid container outlet is approx. Zero "0" Kelvin (assumed that the system is filled with the correct refrigerant quantity). In this case the fluid container provides the required fluid supply.

Supercooling is calculated as follows:

Δ $\mathbf{t_{c2u} = t_c - t_{c2u}}$

Δ t_{c2u}, supercooling at evaporator outlet in K

t_{c2u}, temperature at evaporator outlet in °C

t_c, evaporation temperature in °C

„$_u$“ represents "supercooled"

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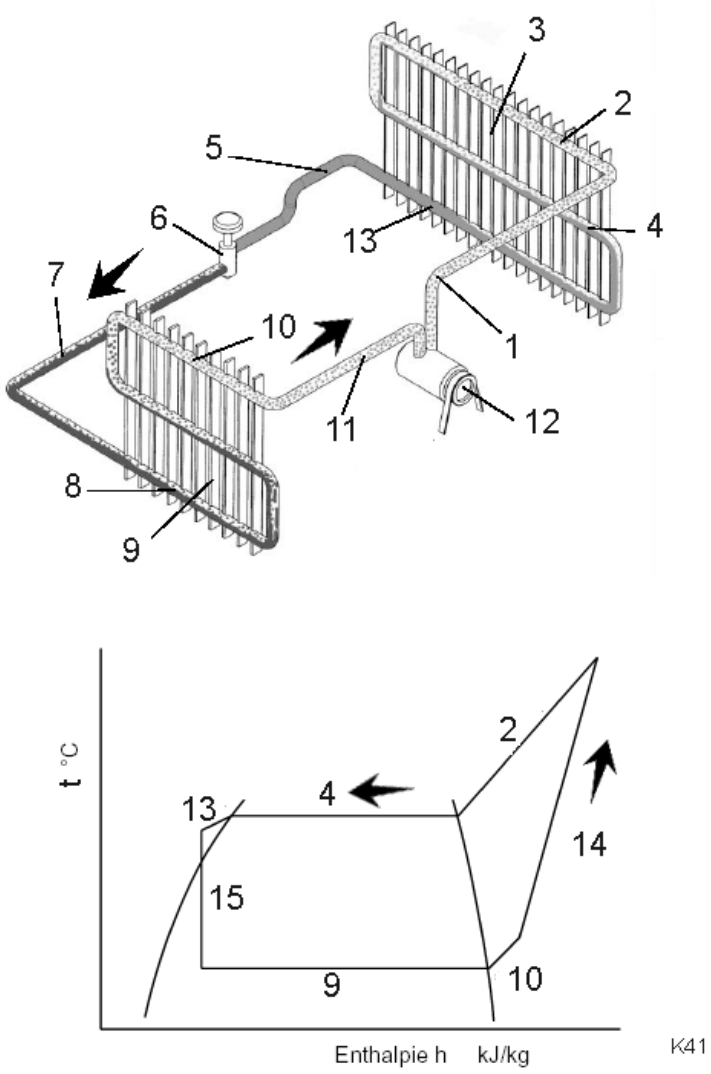


Fig. 1 Refrigerant circuit with t, h- diagram

1 Hot gas line (overheated steam)
2 Deheating (overheated steam)
3 Condenser / liquefier
4 Condensation (wet steam)
5 Fluid line (supercooled fluid)
6 Expansion valve
7 Injection line (wet steam)
8 Evaporation (wet steam)
9 Evaporator
10 Overheating (overheated steam)
11 Suction steam line (overheated steam)
12 Compressor
13 Supercooling (fluid)
14 Compression
15 Expansion

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9.18 Trouble shooting, refrigerant circuit diagram

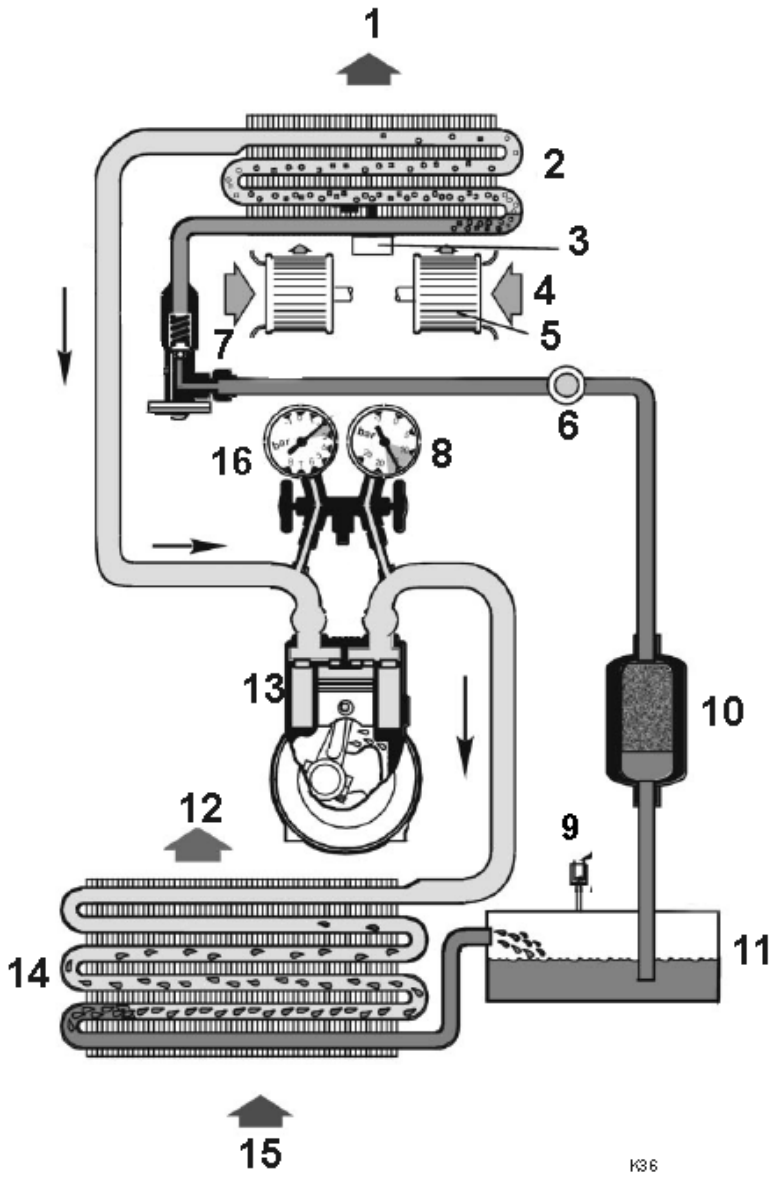


Fig. 1 Refrigerant circuit diagram

1 Cold air
2 Evaporator
3 Thermostat
4 Warm air
5 Fan
6 Inspection glass
7 Expansion valve
8 Pressure gauge, high pressure
9 Pressure switch with high and low pressure contacts
10 Dryer
11 Fluid container
12 Hot air
13 Compressor
14 Condenser
15 Cooling air
16 Pressure gauge, low pressure

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9.19 Trouble shooting procedure

Procedure

Knowledge

Trouble shooting is not possible with exact knowledge about the system design, the installed components and their function in the system trouble shooting is not possible:

Visual inspection

With the appropriate experience some faults can be visually detected or felt. Frequently occurring condenser soiling or formation of steam bubbles in the inspection glass can be quickly detected.

In case of unusual formation of hoarfrost on the evaporator the hoarfrost pattern provides useful information. Hoarfrost only occurring at the inlet side is a clear indication of insufficient refrigerant feed, which in turn indicates an incorrectly working expansion valve or a lack of refrigerant.. Complete hoarfrost covering indicates load problems, i.e. no or insufficient air flow.

Even overheating can sometimes be detected with the naked eye. At the end of the evaporator there should be an area which is dry or at least drier at evaporator temperatures above -2 °C.

The fluid line in the refrigeration system is warm. If a local cooling can be felt or if condensation develops, this is a clear indicator for an extreme pressure drop in the line. Similar phenomena can be noticed in case of blocked filters.

Unusually cold pressure lines indicate "wet" intake of the compressor.

The oil level in the compressor sight glass provides information about the oil quantity and the oil recirculation in the system. However, the oil level may also be considerably influenced by condensing refrigerant. Discoloration informs about the state of the oil.

Water in the system can simply be detected through the inspection glass with moisture indicator.

i Note

The dangerous part of common rules is that they apply in most, but not in all cases. The refrigerant states in the individual piping sections or components must therefore be exactly determined by means of pressure and temperature measurements.

Test prerequisites

- Cooler and condenser are clean, clean if necessary.
- The ribbed belt for compressor and generator is correctly tightened.
- All air ducts, covers and seals are OK and correctly fitted. Flaps reach their end positions.
- The engine has operating temperature.
- Evaporator and heating (with highest fresh air fan speed) do not draw leak air.
- The fresh air fan runs when the engine is running and the air conditioning system is set to max. cooling power.
- Ambient temperature above 15 °C.
- The thermostat is correctly installed and the switching temperatures are correct.

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Measuring points and measurements

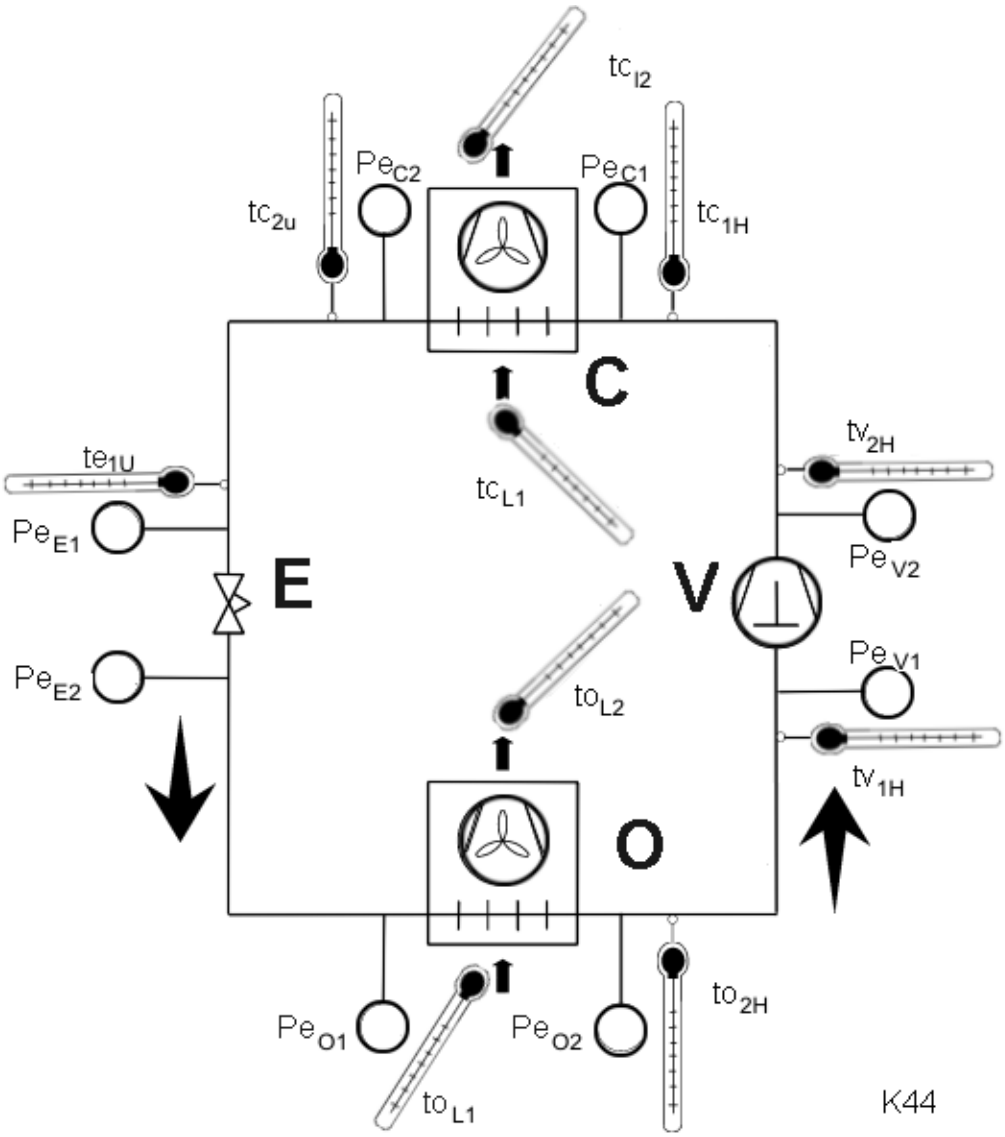


Fig. 2 Flow diagram with measuring points

- C, condenser measuring points
- E, expansion valve measuring points
- O, evaporator measuring points
- V, compressor measuring points

The flow diagram contains "Minimum Requirements" which must be fulfilled to be able to check the system or perform trouble shooting.

Temperature and pressure at the evaporator outlet can be used to derive the overheating of the evaporator. Overheating is a clear indicator for the evaporator filling level. In case of excessive overheating the refrigerant quantity fed into the evaporator is too low, in case of insufficient overheating it is too high. In individual cases one must then check if this situation is caused by the expansion element or by insufficient filling. A differentiation is only possible if there is a clear indicator for the refrigerant filling quantity.

Pressure and temperature at the condenser outlet can be used to derive the supercooling. This can be used to assess the filling quantity. In systems with fluid container the inspection glass is most suitable to check the minimum filling quantity. Supercooling is in this case the between indicator for overfilling.

The hot gas temperature can be used to check whether the compressor runs in the permissible operating range.

Example: Measurement of overheating

- a) Which measuring equipment is required?
- b) Where to measure with which size?
- c) A pressure gauge connected to the evaporator indicates "P_{eo2} = 1.7 bar". How high is the evaporator pressure "P_o" ?
- d) How high is the evaporator temperature "t_o" ?
- e) A thermal sensor attached to the evaporator outlet measures the temperature "t_{o2h} = +3 °C". How high is the overheating „Δt_{o2h}“ ?
- f) Evaluation of the measured overheating.

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Solution:

- a) Pressure gauge, thermometer, steam table
- b) Evaporation pressure "P_{eo2}" and temperature "t_{o2h}" are measured at the same point on the evaporator outlet.
- c) $P_o = P_{eo2} + P_{amb}$, "Evaporation pressure = pressure on evaporator + atmospheric pressure" = 1.7 bar + 1 bar = 2.7 bar.
- d) "P_c" = 2,7 bar can then be used to derive an condensing temperature "t_o" of -2,2 °C from the steam table for R134a.
- e) $\Delta t_{o2h} = t_{o2h} - t_o$, „Overheating at evaporator outlet = evaporator outlet temperature - evaporation temperature" = 3 °C - (-2.2 °C) = 5.2 Kelvin.
- f) The determined overheating is within the usual range of 4 - 12 Kelvin.

Example: Measuring supercooling

- a) Which measuring equipment is required?
- b) Where to measure with which size?
- c) A pressure gauge connected to the condenser indicates "P_{ec2} = 15 bar". How high is the condensing pressure "P_c" ?
- d) How high is the condensing temperature "t_c" ?
- e) A thermal sensor attached to the condenser outlet measures the temperature "t_{c2u} = 58 °C". How high is the supercooling "Δt_{c2u}" ?
- f) Evaluation of the measured supercooling.

Solution:

- a) Pressure gauge, thermometer, steam table
- b) Condensing pressure "P_{ec2}" and temperature "t_{c2u}" are measured at the same point on the condenser.
- c) $P_c = P_{ec2} + P_{amb}$, "Evaporation pressure = pressure on evaporator + atmospheric pressure" = 15 bar + 1 bar = 16 bar.
- d) "P_cc = 16 bar can then be used to derive an condensing temperature "t_c" of 57.9 °C from the steam table for R134a.
- e) $\Delta t_{c2u} = t_c - t_{c2u}$, "Supercooling at condenser outlet = condensing temperature - condenser outlet temperature" = 57.9°C - 58 °C) = -0.1 Kelvin.
- f) The determined overheating is within the usual range of approx. "0" Zero Kelvin.

Typical faults and possible causes

Most faults in the refrigerant side of the system can be clearly assigned with the help a checklist. r Occurring faults frequently have a similar appearance, but different causes. An evaporator showing hoarfrost may be quite normal. However, there may also be a defect in the expansion valve or problems in the oil recirculation.

The following list contains pressure values in a system, that can be expected at various ambient temperatures (measured at medium speeds).

Suction pressure (low pressure gauge)

Ambient temperature in °C	Excess pressure in bar
25	approx. 2,0
30	approx. 2,5
35	approx. 3

High pressure (high pressure gauge)

Ambient temperature in °C	Excess pressure in bar
25	approx. 8,0
35	approx. 13
40	approx. 16
45	approx. 18

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Values effecting the operating pressures

Since the pressures occurring in a refrigeration system are highly dependent on environmental conditions, it is mandatory to know these dependencies. The following table contains some of these dependencies.

Measuring value		**Suction pressure**		**High pressure**	
		increases	drops	increases	drops
Compressor speed	increases		**X**	**X**	
	drops	**X**			**X**
Vehicle interior temperature	increases	**X**		**X**	
	drops		**X**		**X**
Ambient temperature	increases	**X**		**X**	
	drops		**X**		**X**
Humidity	increases	**X**		**X**	
	drops		**X**		**X**

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Suction pressure too low (1), high pressure too low to normal (2)

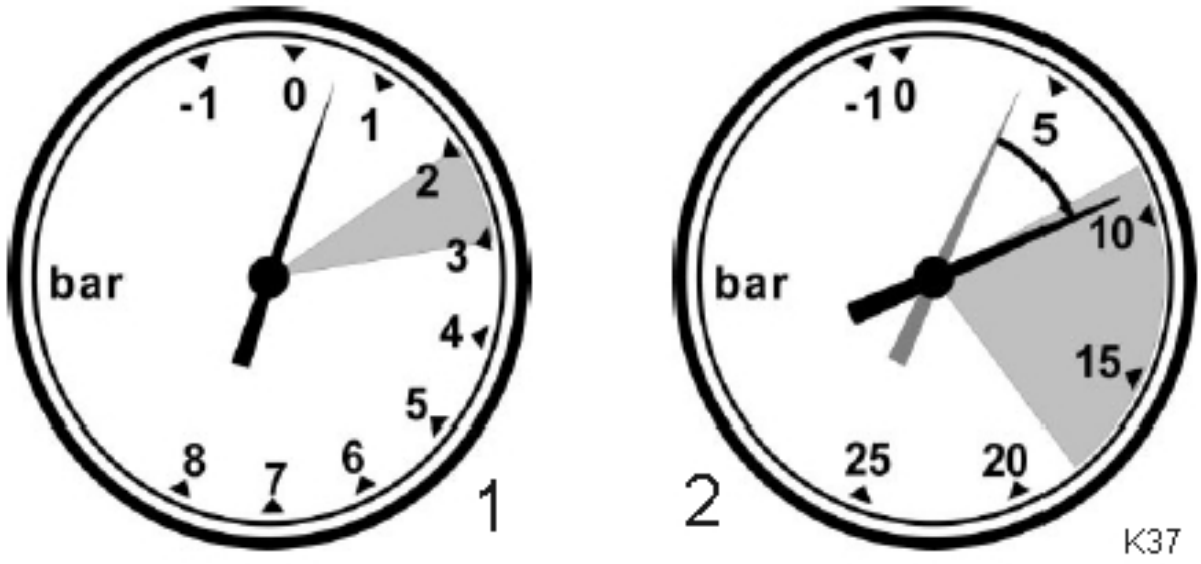


Fig. 3

Cause	Possible effect	Remedy
Lack of refrigerant	no supercooling, bubbles in inspection glass, high overheating, hoarfrost on evaporator	Check for leaks, refill
Evaporator fins or air filter soiled	Cooling power too low	clean
Evaporator fan failed	Low pressure shut off	Repair the fan
Expansion valve defective	Suction pressure gauge shows vacuum, because the valve has closed	Replace the valve
Screen or nozzle in expansion valve clogged	high overheating	clean
Filter dryer clogged	Bubbles in inspection glass, high overheating, filter dryer cold	Change filter dryer
Heat power too low	Frequent low pressure shut off, thawing thermostat / rotary thermostat switching too frequently	Check the control

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Suction pressure normal (1), high pressure too high (2)

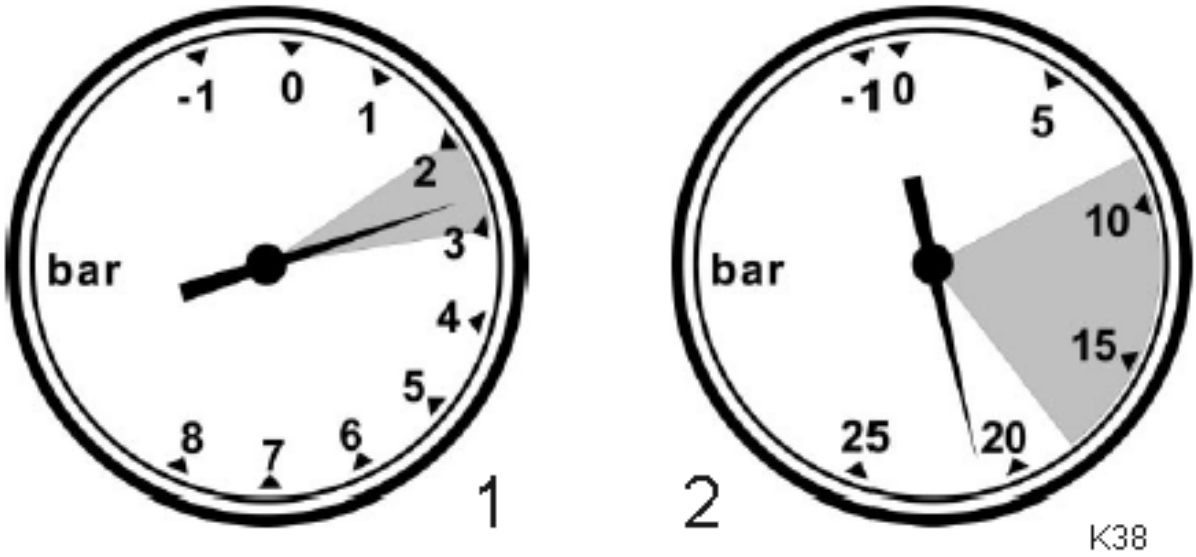


Fig. 4

Cause	Possible effect	Remedy
Condenser dirty	high hot gas temperature, low cooling power	clean
Condenser fan failed	high hot gas temperature, high pressure shut down	repair
overfilled	high hot gas temperature, low supercooling, low cooling power	Correct the filling capacity
Leak gas (air)	high hot gas temperature, low measured supercooling, low cooling power	renew filling
Restriction between compressor and condenser	high hot gas temperature, low cooling power	Check lines and valves

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Suction pressure too high (1), high pressure too low to normal (2)

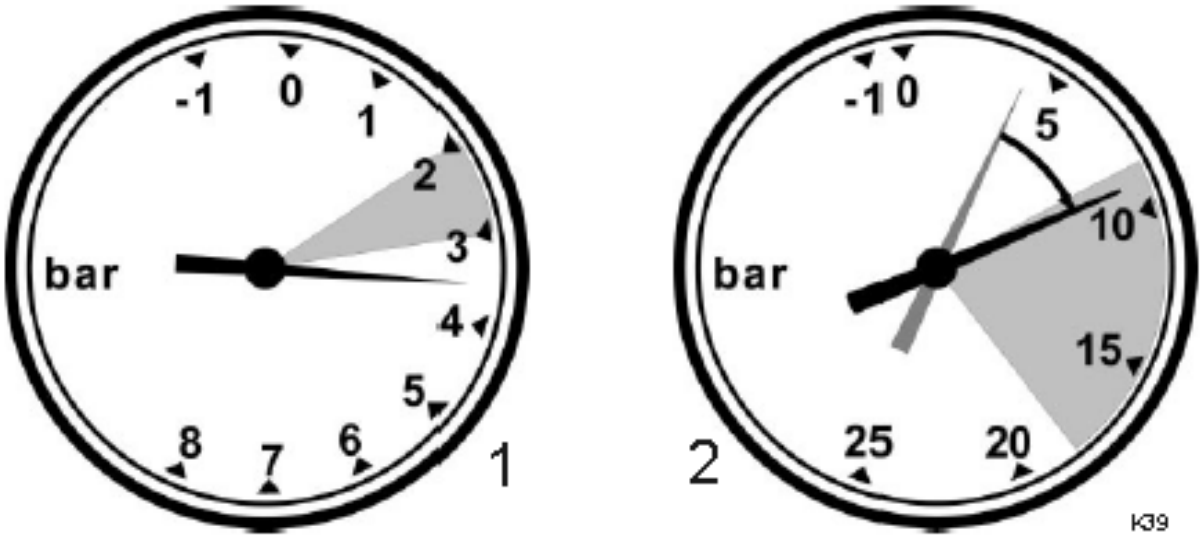


Fig. 5

Cause	Possible effect	Remedy
Compressor defective	Cooling power too low	Replace the compressor

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Suction pressure too high (1), high pressure too high (2)

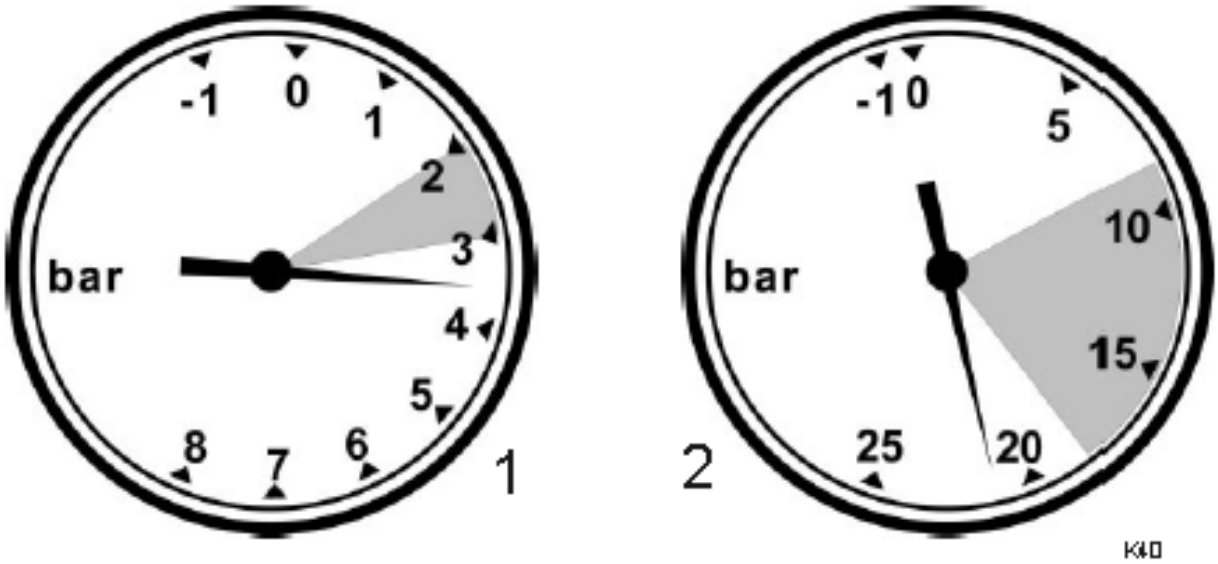


Fig. 6

Cause	Possible effect	Remedy
Expansion valve defective	overheating too low, wet operation of compressor	Replace the valve

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Other faults

Symptom	Cause	Possible effect	Remedy
Hot gas temperature too high, the hot gas line becomes so hot that it cannot be touched long with a hand	Lack of refrigeration oil	increased compressor wear	Refill refrigeration oil
Compressor does not start	Pressure switch or any other safety feature has triggered, electrical fault, cylinder filled with liquid refrigerant	System stopped	Check the control units, check cause for switching and rectify
Compressor switches continuously	Switching difference too small, triggering of a switching element (overpressure switch, low pressure switch), lack of refrigerant, fan defective, overfilled	Cycling of compressor, increased wear, too low cooling power	Check the control units, check cause for switching and rectify
Excessive overheating	Expansion valve deadjusted or screen blocked, lack of refrigerant	low cooling power, hot gas temperatures too high	Replace the expansion valve, clean the screen, fill in refrigerant, leak test
Hoarfrost on inlet side of evaporator	incorrectly working expansion valve, lack of refrigerant	too low infeed of refrigerant into the evaporator	Check the expansion valve, check the refrigerant filling
Evaporator fully covered with hoarfrost	Load problem, too low air flow volume	low cooling power of system	Clean the evaporator, check the evaporator fan
Fluid line is warm and shows condensation	Pressure drop in fluid line, filter dryer clogged	low cooling power	Eliminate the pressure drop, replace the filter dryer
Exceptionally cold pressure lines	"Wet intake" of the compressor due to insufficient overheating of evaporator	low cooling power, excessive wear of compressor	Clean the compressor, replace if necessary, replace the expansion valve if necessary

Noise in system

Faults	Possible cause	Remedy
V-belt loose or excessively worn	V-belt slips and generates noise	Retention or renew the V-belt
Magnetic clutch loud	Magnetic clutch runs until high pressure builds up, then the clutch starts to slip	Repair or replace the magnetic clutch
Refrigerant compressor is loud	Mounting bracket is loose, internal parts worn, low oil level in compressor	Repair the mounting bracket, replace the compressor, renew the refrigeration oil
Fan is loud, fan motor excessively worn		Replace the fan motor
Whistling and rattling noise in operation, noticeable unevenness when turning by hand	V-belt pulley and bearing worn	Replace the bearing, check V-belt pulley for wear
Rattling noise or vibration of high pressure line, knocking noise in compressor, ball in inspection glass floating at the top	System overfilled	Draw out refrigerant
Expansion valve loud	excessive moisture in system	Replace the dryer
Hissing noise in evaporator housing, on expansion valve, turbidity in inspection glass or ball does not float	refrigerant level in system too low	Perform a leak test, fill up the system

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Inspection glass

Faults	Possible cause	Remedy
Steam bubbles in inspection glass	No supercooling before expansion valve, lack of refrigerant in system, pressure loss in system, supercooling caused by excessively soiled filter dryer	Fill up the system, replace the filter dryer, perform a leak test
Discolouration of inspection glass (black from inside)	Lubricant destroyed by excessive operating temperatures	Replace the refrigeration oil, examine the temperature increase
Moisture indicator changes to pink	Moisture level of drying agent too high	Replace the filter dryer
Ball floats at bottom	lack of refrigerant	Fill the system

Monitoring devices

Faults	Possible cause	Remedy
The high pressure contact has switched off the magnetic clutch	System pressure exceeded, condenser excessively soiled, condenser fan defective, expansion valve defective	Clean the condenser, replace the expansion valve, check the condenser fan
The low pressure contact has switched off the magnetic clutch	System pressure fallen short of, refrigerant level too low, expansion valve defective, evaporator fan defective, heat load too low, ambient temperature below 1.5 °C	Clean the evaporator, replace the expansion valve, check the evaporator fan
The thermostat has switched off the magnetic clutch	Ambient temperature below 1°C, expansion valve defective, thermostat defective, air flow volume too low	Check the thermostat switching point, replace the expansion valve, clean the evaporator, check the evaporator fan

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Temperature	Pressure	Density		spec. volume		spec. enthalpy		Evaporation heat
		of the fluid	of the steam	of the fluid	of the steam	of the fluid	of the steam	

Temperatur	Druck	Dichte		spez. Volumen		spez. Enthalpie		Verdampfungswärme
t °C	p bar	der Flsskt. ρ′ kg/dm³	des Dampfes ρ″ kg/m³	der Flsskt. v′ dm³/kg	des Dampfes v″ dm³/kg	der Flsskt. h′ kJ/kg	des Dampfes h″ kJ/kg	r kJ/kg
-60	0,16	1,469	0,92	0,681	1082,60	123,17	359,85	236,68
-55	0,22	1,456	1,24	0,687	803,83	129,49	362,99	233,50
-50	0,29	1,443	1,65	0,693	606,45	135,75	366,14	230,39
-45	0,39	1,429	2,15	0,700	464,29	141,98	369,28	227,30
-40	0,51	1,415	2,78	0,707	360,30	148,21	372,41	224,19
-35	0,66	1,401	3,53	0,714	283,08	154,47	375,52	221,05
-30	0,84	1,387	4,45	0,721	224,97	160,78	378,61	217,84
-25	1,06	1,373	5,53	0,728	180,67	167,14	381,68	214,55
-24	1,11	1,370	5,78	0,730	173,12	168,42	382,29	213,88
-23	1,16	1,367	6,03	0,732	165,95	169,70	382,90	213,20
-22	1,22	1,364	6,28	0,733	159,14	170,98	383,51	212,53
-21	1,27	1,361	6,55	0,735	152,66	172,27	384,12	211,85
-20	1,33	1,358	6,83	0,736	146,50	173,56	384,72	211,16
-19	1,39	1,355	7,11	0,738	140,64	174,86	385,33	210,47
-18	1,45	1,352	7,40	0,740	135,06	176,15	385,93	209,78
-17	1,51	1,349	7,71	0,741	129,75	177,45	386,53	209,08
-16	1,57	1,346	8,02	0,743	124,68	178,75	387,13	208,38
-15	1,64	1,343	8,34	0,745	119,86	180,06	387,73	207,67
-14	1,71	1,340	8,68	0,746	115,26	181,37	388,33	206,96
-13	1,78	1,337	9,02	0,748	110,87	182,68	388,93	206,25
-12	1,85	1,334	9,37	0,750	106,68	183,99	389,52	205,53
-11	1,93	1,331	9,74	0,752	102,68	185,31	390,11	204,80
-10	2,01	1,328	10,12	0,753	98,86	186,63	390,71	204,07
-9	2,09	1,324	10,50	0,755	95,21	187,96	391,30	203,34
-8	2,17	1,321	10,90	0,757	91,73	189,28	391,88	202,60
-7	2,26	1,318	11,31	0,759	88,39	190,61	392,47	201,86
-6	2,34	1,315	11,74	0,760	85,21	191,94	393,06	201,11
-5	2,43	1,312	12,17	0,762	82,16	193,28	393,64	200,36
-4	2,53	1,309	12,62	0,764	79,24	194,62	394,22	199,60

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Tempe-ratur	Druck	Dichte		spez. Volumen		spez. Enthalpie		Verdamp-fungs-wärme
		der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	
t °C	p bar	ρ´ kg/dm^3	ρ´´ kg/m^3	v´ dm^3/kg	v´´ dm^3/kg	h´ kJ/kg	h´´ kJ/kg	r kJ/kg
-3	2,62	1,305	13,08	0,766	76,44	195,96	394,80	198,84
-2	2,72	1,302	13,56	0,768	73,77	197,30	395,38	198,08
-1	2,82	1,299	14,04	0,770	71,20	198,65	395,96	197,31
0	2,93	1,296	14,55	0,772	68,75	200,00	396,53	196,53
1	3,04	1,292	15,06	0,774	66,39	201,35	397,10	195,75
2	3,15	1,289	15,59	0,776	64,13	202,71	397,68	194,97
3	3,26	1,286	16,14	0,778	61,96	204,07	398,24	194,18
4	3,38	1,282	16,70	0,780	59,88	205,43	398,81	193,38
5	3,50	1,279	17,27	0,782	57,89	206,79	399,38	192,58
6	3,62	1,276	17,87	0,784	55,97	208,16	399,94	191,78
7	3,75	1,272	18,47	0,786	54,13	209,53	400,50	190,97
8	3,88	1,269	19,10	0,788	52,36	210,90	401,06	190,16
9	4,01	1,265	19,74	0,790	50,66	212,28	401,62	189,34
10	4,15	1,262	20,40	0,792	49,03	213,66	402,17	188,51
11	4,29	1,259	21,07	0,795	47,45	215,04	402,72	187,68
12	4,43	1,255	21,77	0,797	45,94	216,42	403,27	186,85
13	4,58	1,252	22,48	0,799	44,49	217,81	403,82	186,01
14	4,73	1,248	23,21	0,801	43,08	219,20	404,36	185,17
15	4,89	1,245	23,96	0,804	41,74	220,59	404,91	184,32
16	5,04	1,241	24,73	0,806	40,44	221,99	405,45	183,46
17	5,21	1,237	25,52	0,808	39,19	223,38	405,98	182,60
18	5,37	1,234	26,33	0,811	37,98	224,78	406,52	181,73
19	5,54	1,230	27,16	0,813	36,82	226,19	407,05	180,86
20	5,72	1,226	28,01	0,815	35,70	227,60	407,58	179,98
21	5,90	1,223	28,89	0,818	34,62	229,01	408,11	179,10
22	6,08	1,219	29,78	0,820	33,58	230,42	408,63	178,21
23	6,27	1,215	30,70	0,823	32,57	231,83	409,15	177,32
24	6,46	1,212	31,65	0,825	31,60	233,25	409,67	176,41
25	6,66	1,208	32,61	0,828	30,66	234,68	410,18	175,51
26	6,86	1,204	33,60	0,831	29,76	236,10	410,69	174,59
27	7,06	1,200	34,62	0,833	28,88	237,53	411,20	173,67

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Tempe-ratur	Druck	Dichte		spez. Volumen		spez. Enthalpie		Verdamp-fungs-wärme
		der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	
t °C	p bar	ρ´ kg/dm^3	ρ´´ kg/m^3	v´ dm^3/kg	v´´ dm^3/kg	h´ kJ/kg	h´´ kJ/kg	r kJ/kg
28	7,27	1,196	35,66	0,836	28,04	238,96	411,71	172,75
29	7,48	1,192	36,73	0,839	27,22	240,40	412,21	171,81
30	7,70	1,189	37,83	0,841	26,44	241,83	412,71	170,87
31	7,93	1,185	38,95	0,844	25,67	243,28	413,20	169,92
32	8,16	1,181	40,10	0,847	24,94	244,72	413,69	168,97
33	8,39	1,177	41,28	0,850	24,22	246,17	414,18	168,00
34	8,63	1,173	42,49	0,853	23,53	247,63	414,66	167,03
35	8,87	1,169	43,74	0,856	22,86	249,08	415,14	166,05
36	9,12	1,164	45,01	0,859	22,22	250,55	415,61	165,07
37	9,37	1,160	46,31	0,862	21,59	252,01	416,08	164,07
38	9,63	1,156	47,65	0,865	20,99	253,48	416,55	163,07
39	9,90	1,152	49,02	0,868	20,40	254,96	417,01	162,05
40	10,17	1,148	50,43	0,871	19,83	256,44	417,47	161,03
41	10,44	1,143	51,87	0,875	19,28	257,92	417,92	160,00
42	10,72	1,139	53,35	0,878	18,74	259,41	418,37	158,96
43	11,01	1,135	54,87	0,881	18,23	260,90	418,81	157,90
44	11,30	1,130	56,42	0,885	17,72	262,40	419,24	156,84
45	11,60	1,126	58,02	0,888	17,24	263,91	419,68	155,77
46	11,90	1,121	59,65	0,892	16,76	265,42	420,10	154,68
47	12,21	1,117	61,33	0,895	16,30	266,94	420,52	153,58
48	12,53	1,112	63,06	0,899	15,86	268,46	420,93	152,47
49	12,85	1,108	64,82	0,903	15,43	269,99	421,34	151,35
50	13,18	1,103	66,64	0,907	15,01	271,53	421,74	150,21
51	13,51	1,098	68,50	0,910	14,60	273,07	422,14	149,06
52	13,85	1,094	70,41	0,914	14,20	274,62	422,52	147,90
53	14,20	1,089	72,38	0,919	13,82	276,18	422,90	146,72
54	14,55	1,084	74,39	0,923	13,44	277,75	423,28	145,53
55	14,91	1,079	76,47	0,927	13,08	279,32	423,64	144,32
56	15,28	1,074	78,59	0,931	12,72	280,91	424,00	143,09
57	15,66	1,069	80,78	0,936	12,38	282,50	424,35	141,85
58	16,04	1,064	83,03	0,940	12,04	284,10	424,69	140,58

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Tempe-ratur	Druck	Dichte		spez. Volumen		spez. Enthalpie		Verdamp-fungs-wärme
		der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	
t °C	p bar	ρ´ kg/dm^3	ρ´´ kg/m^3	v´ dm^3/kg	v´´ dm^3/kg	h´ kJ/kg	h´´ kJ/kg	r kJ/kg
59	16,42	1,059	85,34	0,945	11,72	285,71	425,02	139,30
60	16,82	1,053	87,72	0,949	11,40	287,34	425,34	138,00
61	17,22	1,048	90,16	0,954	11,09	288,97	425,65	136,68
62	17,63	1,043	92,68	0,959	10,79	290,61	425,95	135,34
63	18,04	1,037	95,27	0,964	10,50	292,26	426,24	133,97
64	18,47	1,032	97,94	0,969	10,21	293,93	426,51	132,58
65	18,90	1,026	100,69	0,975	9,93	295,61	426,78	131,17
66	19,34	1,020	103,53	0,980	9,66	297,30	427,03	129,74
67	19,78	1,014	106,45	0,986	9,39	299,00	427,27	128,27
68	20,24	1,009	109,46	0,992	9,14	300,72	427,50	126,78
69	20,70	1,003	112,58	0,997	8,88	302,45	427,71	125,26
70	21,17	0,996	115,79	1,004	8,64	304,19	427,90	123,71
71	21,65	0,990	119,11	1,010	8,40	305,95	428,08	122,13
72	22,14	0,984	122,55	1,016	8,16	307,73	428,25	120,52
73	22,63	0,977	126,11	1,023	7,93	309,52	428,39	118,87
74	23,13	0,971	129,79	1,030	7,70	311,33	428,51	117,19
75	23,65	0,964	133,60	1,037	7,48	313,15	428,62	115,46
76	24,17	0,957	137,56	1,045	7,27	315,00	428,70	113,70
77	24,70	0,950	141,67	1,052	7,06	316,86	428,76	111,90
78	25,23	0,943	145,95	1,060	6,85	318,74	428,79	110,05
79	25,78	0,936	150,40	1,069	6,65	320,64	428,80	108,15
80	26,34	0,928	155,03	1,078	6,45	322,57	428,77	106,21
81	26,90	0,920	159,87	1,087	6,26	324,51	428,72	104,21
82	27,48	0,912	164,92	1,096	6,06	326,48	428,63	102,15
83	28,06	0,904	170,22	1,106	5,87	328,47	428,50	100,04
84	28,66	0,895	175,77	1,117	5,69	330,48	428,34	97,86
85	29,26	0,887	181,60	1,128	5,51	332,52	428,12	95,61
86	29,88	0,878	187,75	1,140	5,33	334,58	427,86	93,29
87	30,51	0,868	194,25	1,152	5,15	336,67	427,55	90,88
88	31,14	0,858	201,14	1,165	4,97	338,78	427,17	88,39
89	31,79	0,848	208,48	1,179	4,80	340,92	426,72	85,80

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Tempe-ratur	Druck	Dichte		spez. Volumen		spez. Enthalpie		Verdamp-fungs-wärme
		der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	der Flsskt.	des Dampfes	
t °C	p bar	ρ´ kg/dm^3	ρ´´ kg/m^3	v´ dm^3/kg	v´´ dm^3/kg	h´ kJ/kg	h´´ kJ/kg	r kJ/kg
90	32,45	0,837	216,31	1,195	4,62	343,09	426,20	83,10
91	33,12	0,826	224,73	1,211	4,45	345,29	425,58	80,29
92	33,80	0,813	233,84	1,229	4,28	347,53	424,86	77,33
93	34,49	0,801	243,77	1,249	4,10	349,79	424,00	74,21
94	35,19	0,787	254,71	1,271	3,93	352,08	422,99	70,91
95	35,91	0,771	266,92	1,296	3,75	354,41	421,78	67,37
96	36,64	0,755	280,84	1,325	3,56	356,77	420,30	63,53
97	37,39	0,736	297,17	1,359	3,37	359,17	418,44	59,27
98	38,14	0,714	317,43	1,400	3,15	361,60	415,97	54,37
99	38,92	0,687	346,24	1,455	2,89	364,07	412,16	48,09
100	39,71	0,650	636,32	1,537	1,57	366,58	375,04	8,46
101,06	40,56	0,515	515,30	1,941	1,94	390,05	390,05	0,00

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10 Central lubrication system

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10.1 System layout

The sanitary landfill compactors are equipped with an automatically working central lubrication system.

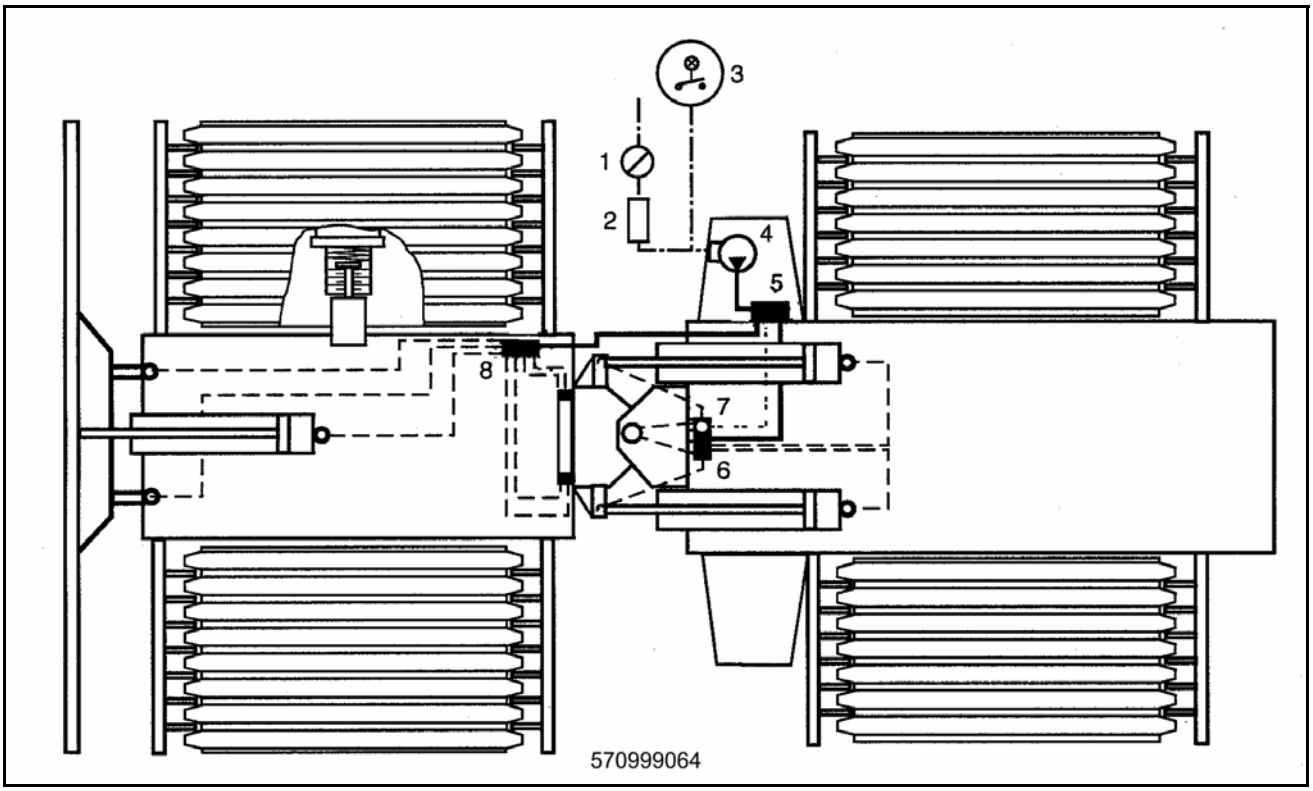


Fig. 1 Lubrication system RB machine

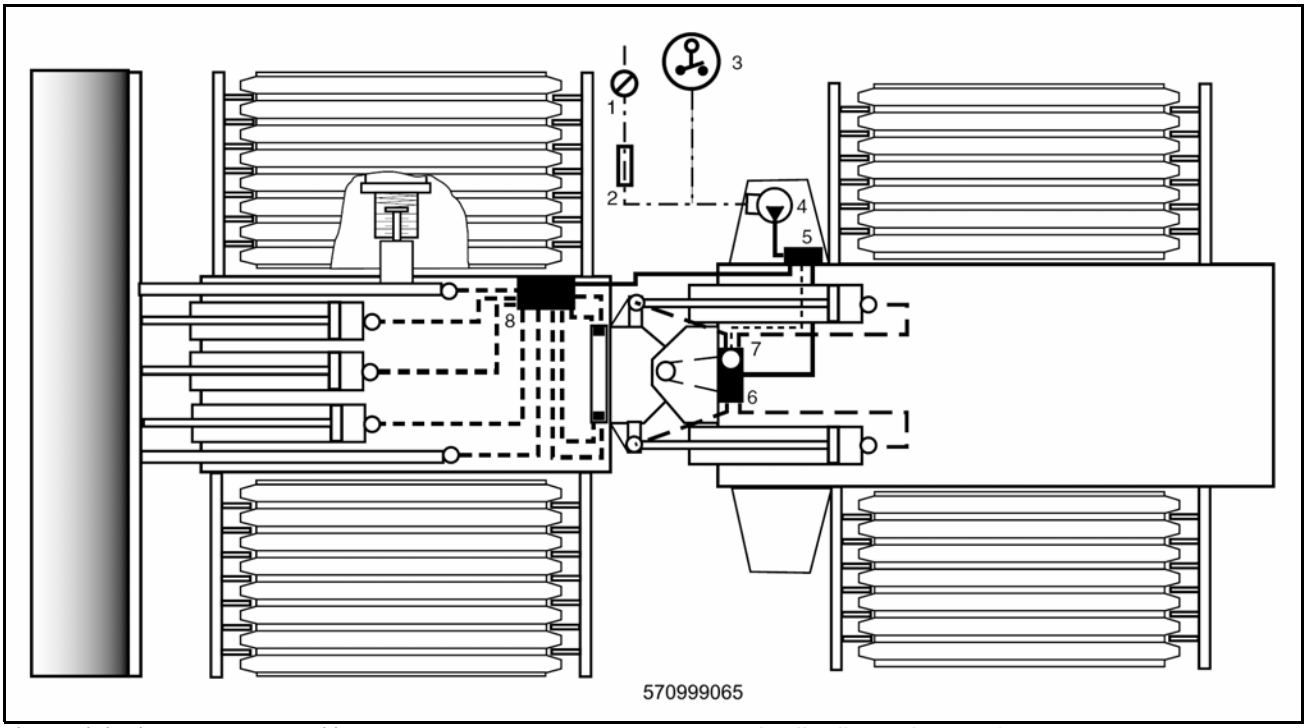


Fig. 2 Lubrication system RS machine

1 Ignition switch
2 Fuse F16
3 Push button with control light
4 Lubrication pump with integrated control
5 Main distributor
6 Main distributor in rear frame
7 Piston detector, monitors and ends duty cycle
8 Sub-distributor in front frame

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10.2 Technical description

The system is equipped with an electronic control and a monitoring device for the function of the lubricant distributor. The electronic control is integrated in the pump case and controls the lubrication cycle automatically.

When switching the ignition on, the automatic lubrication system is supplied with voltage via fuse (F16) At the same time the system performs a function test for drive motor and control light.

During this function test the motor is activates for 1 seconds (short movement of stirring blade), at the same time a 2 second voltage pulse is sent to the monitoring board.

Control lights for central lubrication system

The control light 11 (Fig. 3) or (m) (Fig. 4) informs about the operating status of the central lubrication system.

Faults are indicated by flashing frequencies of different lengths.

Old design

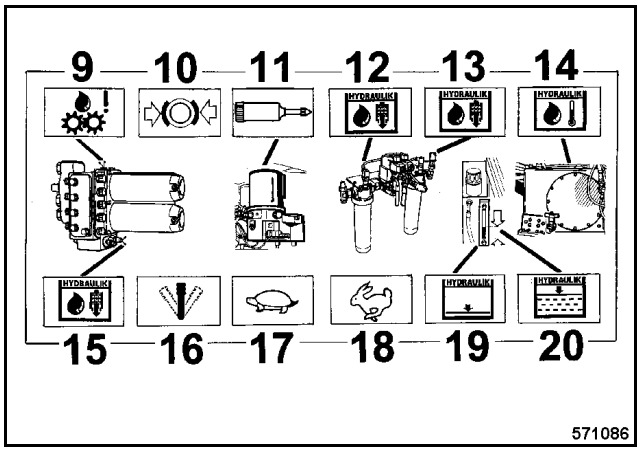


Fig. 3 Monitoring module, old design

11 yellow= lights during the lubrication process and flashes in case of functional disturbances.

New version

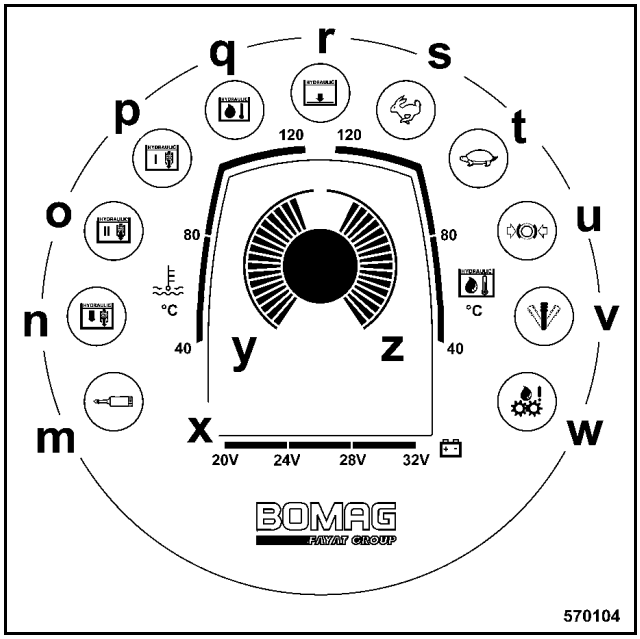


Fig. 4 Monitoring module, new design

m yellow = lights during the lubrication process and flashes in case of functional disturbances.

i Note

The control light indicates the same operating states as the function display (Fig. 5) on the control board.

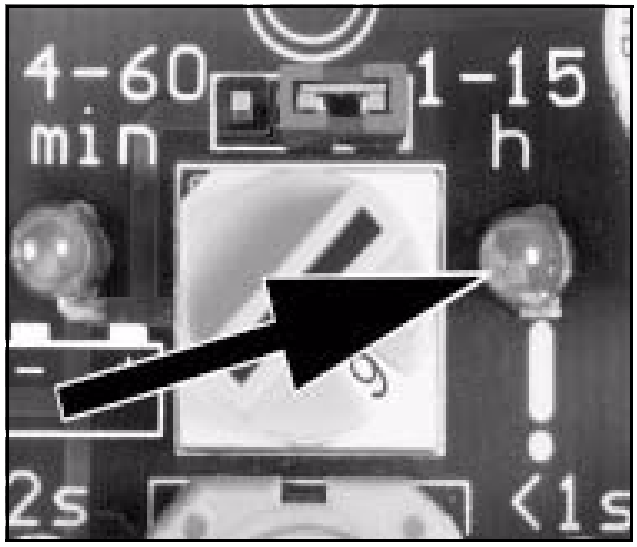


Fig. 5 Function display on control board

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Function control

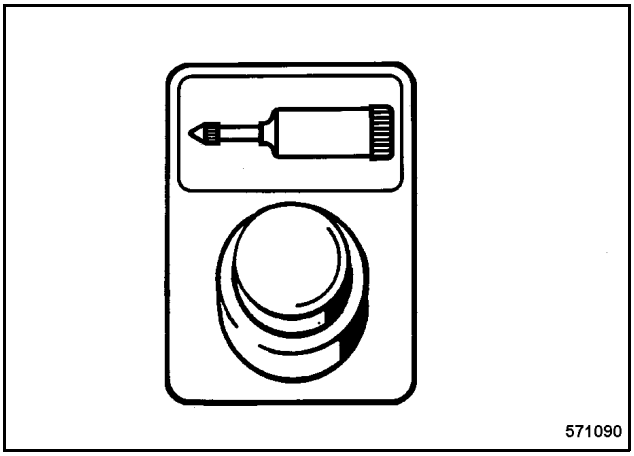


Fig. 6 Push button

To check the function of the system you can perform a test run. For this purpose press the push button (Fig. 6) longer than 2 seconds after switching the ignition on. This triggers a normal lubrication cycle.

Start an additional lubrication cycle. = Press the push button longer than 2 seconds (> 2 s).

Short pressing of button acknowledges the fault signal, i.e the flashing control lamp changes to a permanent light.

Acknowledging a fault = Press the push button for short moment (< 1 s).

i Note

An acknowledged fault also remains stored after switching off the ignition. When switching on again the control lamp flashes again, according to the respective fault.

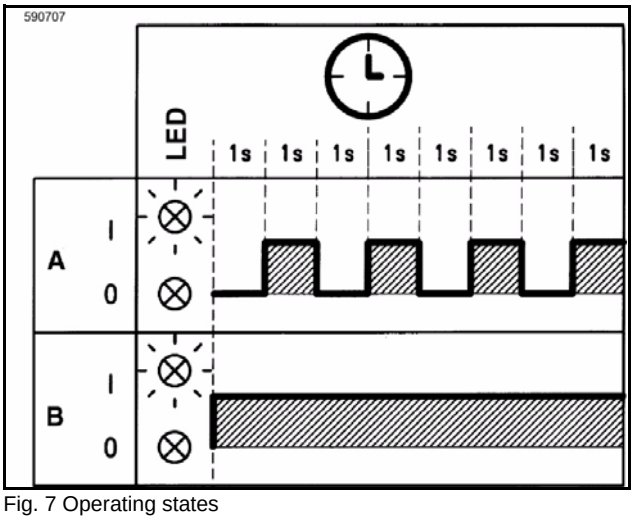


Fig. 7 Operating states

A = Fault indicator

B = Function display or acknowledged fault

in case of a fault= Switch the pump on again by pressing the button (> 2 s).

i Note

The fault can also be acknowledge or reset by triggering an additional lubrication cycle by pressing push button 4 (Fig. 8) on the control board.

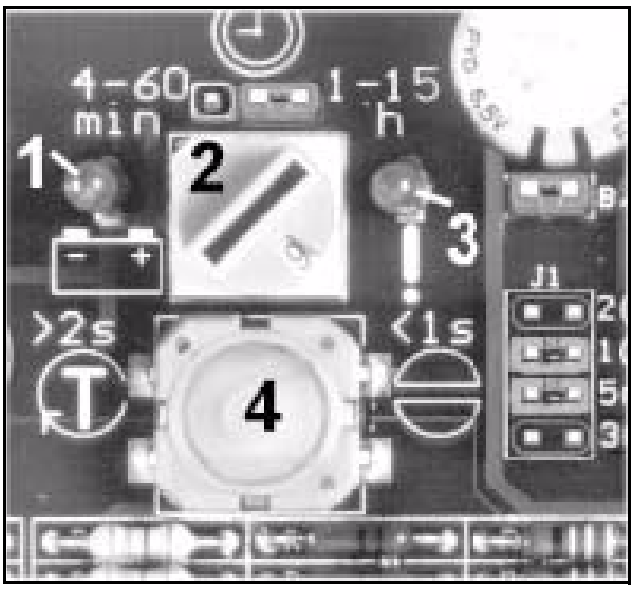


Fig. 8 Control board

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10.3 Control

Control board

The control board is integrated in the pump housing.

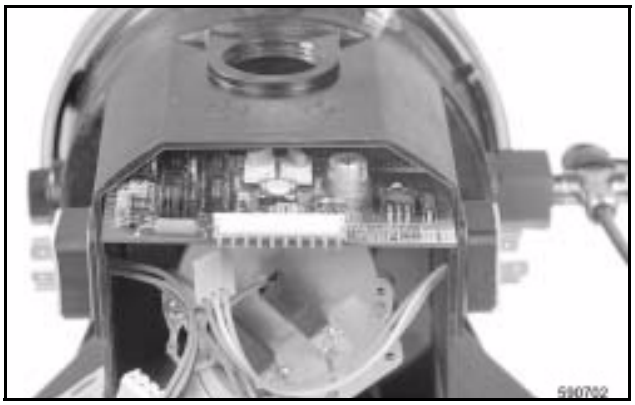


Fig. 9 Control board installed in the housing

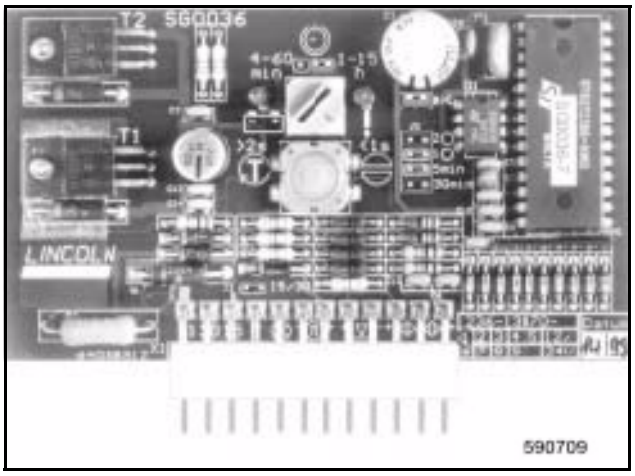


Fig. 10 Control board

Intermittent flashing signal (Fig. 11)

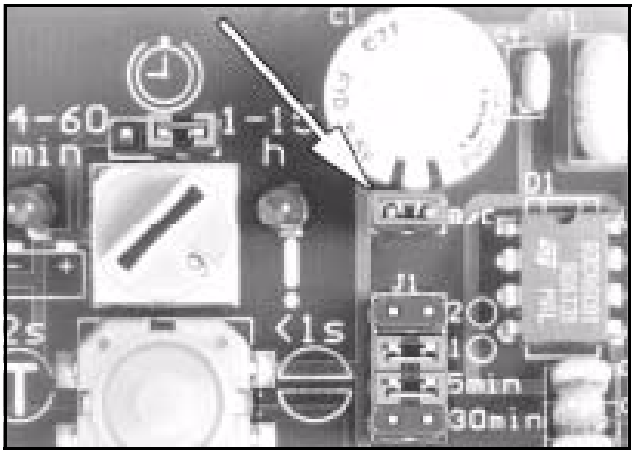


Fig. 11 Jumper B/D plugged on

Voltage supply (Fig. 12)

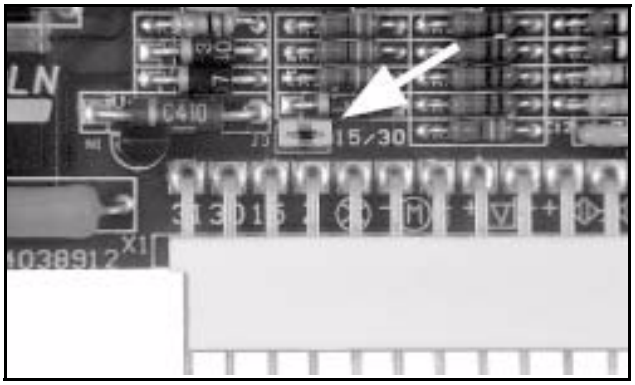


Fig. 12 Jumper 15/30 plugged on

With jumper 39/15 plugged on the connections 15 and 30 are bridged within the control board.

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Function display

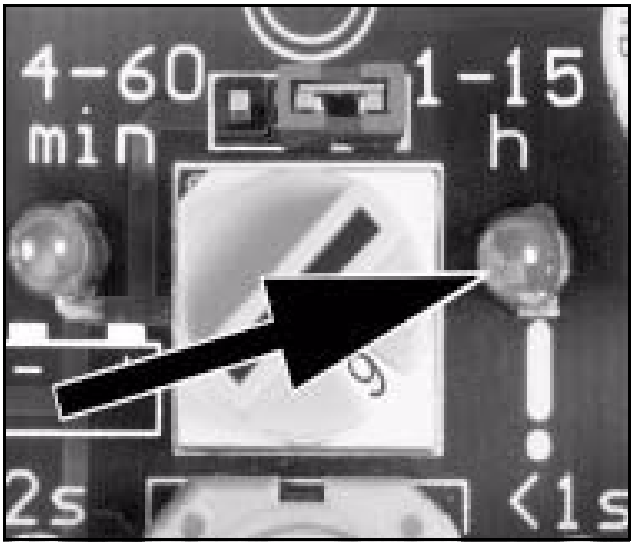


Fig. 13 Function display on circuit board

i Note

The function display indicates the same operating states as the control light in the LCD group display.

- The control board (Fig. 13) automatically controls the sequence of pause and work cycles for the central lubrication pump, in dependence on the operating hours of the machine.

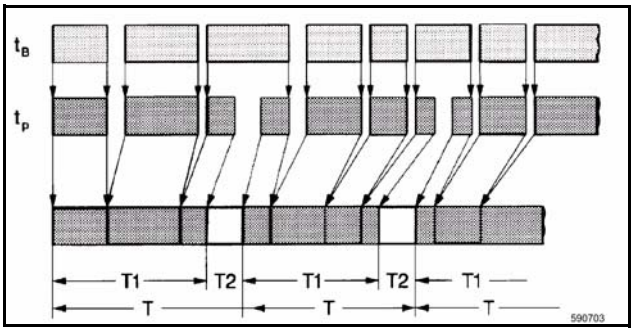


Fig. 14 Time diagram

tB	Operating hours
tP	individual pause times
T	Lubrication cycle
T1	saved pause times
T2	Duty times

- The lubrication cycle consists of a pause and a duty time. The duty time starts after the pause time has finished. After the machine has been started, the lubrication cycle will continue repeating itself.
- During the duty time the pump element delivers lubricant through the progressive distributors to the lubrication points.

Pause time P (Fig. 15)

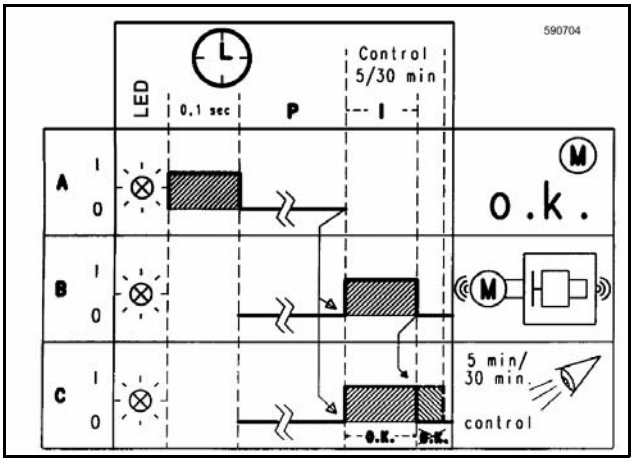


Fig. 15 Sequence of a lubrication cycle

A	Monitoring of motor and control light
B	Sequence of time
C	Sequence of monitoring time
I	Duty cycle
P	Pause

The pause time P(Fig. 15)

- determines the frequency of lubrication cycles within the time of use
- is started and stopped with the ignition switch
- can be changed

When switching the ignition off, all pause times that have expired as well as the present operating states (faults) are saved and added up. This takes place, until the time set by the blue rotary switch (Fig. 20) has been reached.

When switching the ignition back on, the control will start exactly at the same point where it stopped before the ignition was switched off.

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Duty cycle I (Fig. 16)

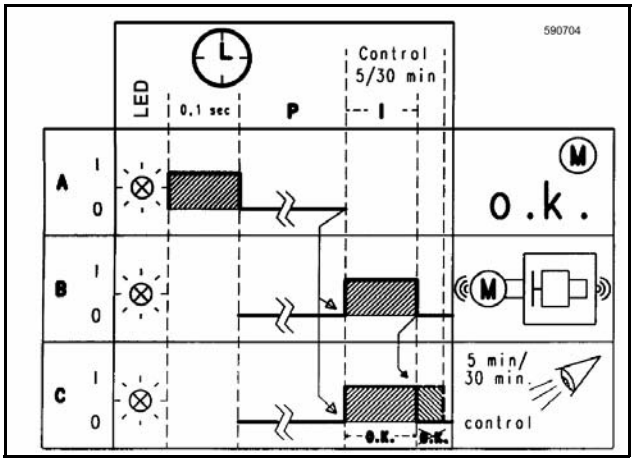


Fig. 16 Sequence of a lubrication cycle

A Monitoring of motor and control light
B Sequence of time
C Sequence of monitoring time
I Duty cycle
P Pause

The duty cycle A(Fig. 16) is approx. 45 seconds. It depends on the grease used for lubrication and the operating temperature. It is monitored by a piston detector mounted to the sub-distributor. The piston detector (initiator, B52 (Fig. 17)) terminates the duty time after all pistons in the sub-distributors have ejected their quantity of grease. The duty cycle is indicated by the control light in the cabin lighting up.

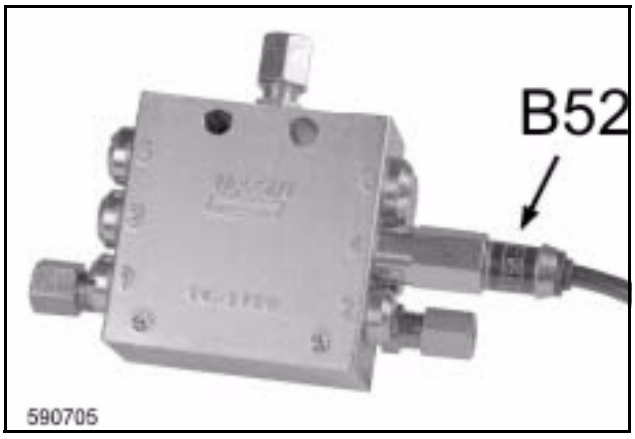


Fig. 17 Piston detector, B52

If the duty time is interrupted by switching of the ignition switch, it will be eresrated from the beginning when switched on again.

Monitoring time C (Fig. 18)

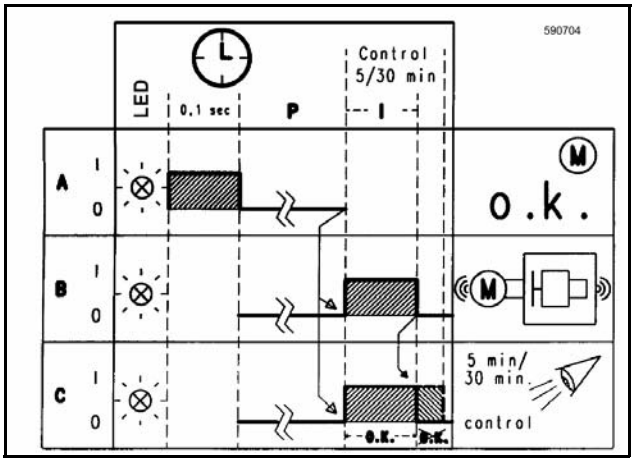


Fig. 18 Sequence of a lubrication cycle

A Monitoring of motor and control light
B Sequence of time
C Sequence of monitoring time
I Duty cycle
P Pause

A fixed monitoring time of max. 5 or 30 minutes (depending on jumper setting) runs parallel to the duty time (Fig. 19).

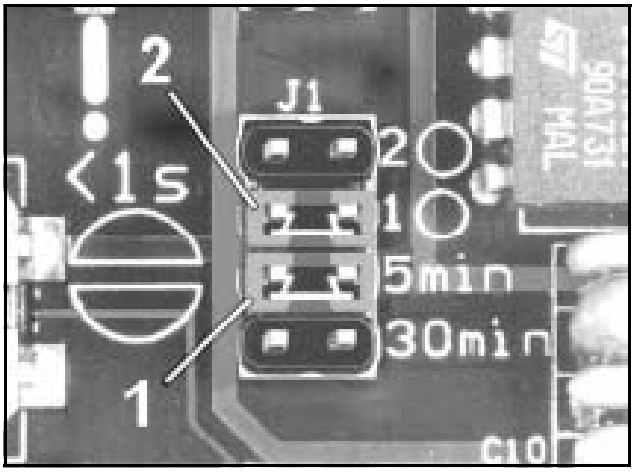


Fig. 19 Jumper for monitoring ranges

1 - Jumper for monitoring time, 5 minutes (5min) or 30 minutes (30min).

2 - Jumper for 1st lubrication circuit (1 O) or for 2nd lubrication circuit (2 O).

i Note

The monitoring time normally ends with the end of the duty time.

- If no shut-down signal from the piston detector (initiator, B52) is received by the control board within 5 or 30 minutes, a fault message will be displayed.

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i Note

The indicator lamp will flash with the corresponding frequency and the pump will stop.

- If the work cycle takes longer than 5 minutes, the monitoring time must be changed from 5 minutes (5 min) to 30 minutes (30 min) by simply replugging the jumper,
- If two monitored lubrication circuits are available, the jumper must be replugged for two lubrication circuits (2 O).

Time setting

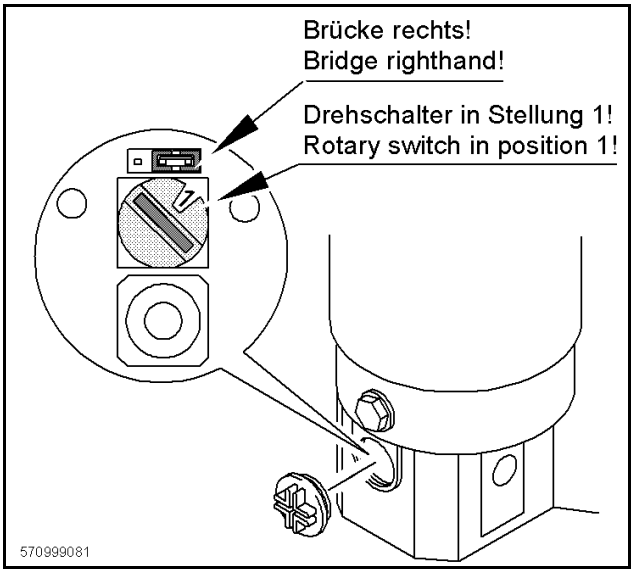


Fig. 20 Setting the pause time

- Open the cover.

i Note

The pause time can be set in 15 stages by the blue rotary switch.

⚠ Caution

Set the pause time to position (1).

i Note

The time ranges (hours or minutes) can be changed by replugging the jumper on the control board.

Replugging the jumper requires removal of the circuit board.

⚠ Caution

Plug the jumper for the time range hours (1 - 15h, right).

⚠ Caution

After setting the pause time close the cover again.

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10.4 Lubrication process

Main and sub-distributor

Lubrication points

The sub-distributor in the rear frame supplies the following points in the rear frame with grease:

- the rocker bearings (4 pieces) on both steering cylinders
- top and bottom bearings on the articulated joint

The sub-distributor in the front frame supplies the following points in the rear frame with grease:

- the live ring bearing in the oscillating joint
- all bucket bearings
- the upper rocker bearing on the bucket cylinder

Main distributor and sub-distributors are connected by a main grease line. This results in a positive connection between the pump and the downstream progressive system.

If a piston in a distributor does not move or is not able to displace any lubricant through its outlet ports, this distributor will block itself.

If one of the sub-distributors is blocked, the positive connection of the system will also block the main distributor. The complete progressive system will stop.

The fundamental internal structure of the progressive distributor ensures self-monitoring of the working cycle in the distributor.

The cross-linking of this system enables monitoring of the complete system.

Due to the use of the piston detector functional faults are immediately detected and indicated by a flashing sequence of the control light.

The complete system can be visually monitored by the pressure relief valve of the pump. If grease emerges from this pressure relief valve during the pumping process, there must be a blockage in the system.

10.5 Progressive distributor

Components

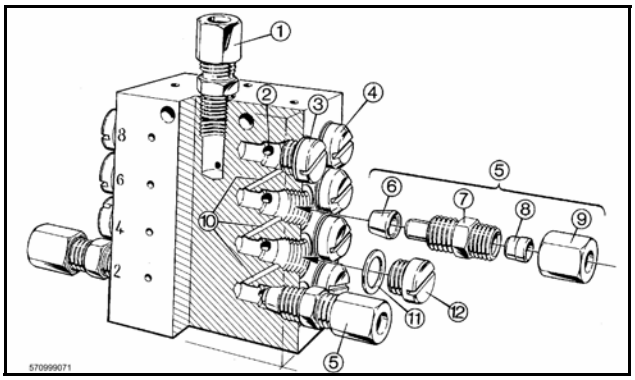


Fig. 21

1 Inlet fitting
2 Delivery bore from piston
3 Fitting, assembled
4 Plug, piston
5 Check valve, complete
6 Clamping ring (brass)
7 Valve body
8 Cutting ring
9 Spigot nut
10 Connecting channel
11 Copper seal ring
12 Plug

Features of a progressive distributor

The expression “Progressive” hints to a speciality that occurs during the lubricant supply inside the distributor, such as

- successive movement of the individual pistons in the distributor caused by the supplied pressurized lubricant.
- The pistons move in a preset sequence and in constantly repeated cycles.
- Each piston must have fully completed its movement before the movement of the next piston can take place, irrespective of whether the supply of lubricant is constant or intermittent.
- The pistons work in dependence on each other.

None of the connected lubrication points will be missed out.

Progressive distributors of type SSV are piston distributors.

- They control the distribution of the lubricant (progressively) to the connected lubrication points.
- Per outlet and piston stroke a quantity of 0.2 cm^3 of lubricant is supplied.

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- By closing single outlets it is possible to deliver the double or multiple amounts of lubricant.
- This distributor provides the possibility to connect several lubrication points to one central lubrication point.

Description of function

The following five illustrations show how the individual outlets are supplied with the proper amount of lubricant.

i Note

For simplification we only show the delivery details for the outlets 2, 7, 5, 3 and 1. All other processes result from the logic pumping sequence.

Phase 1

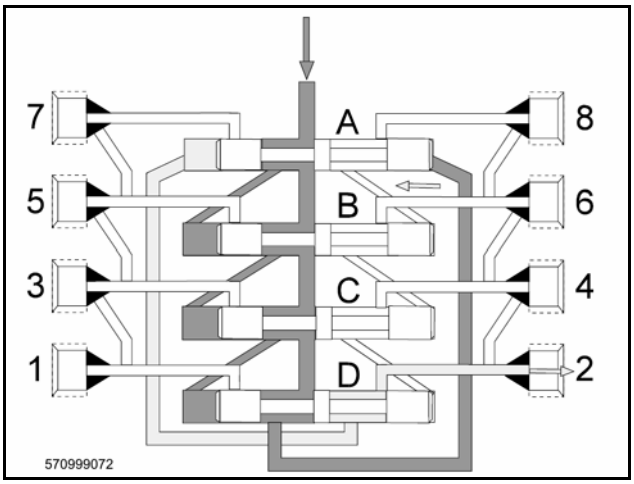


Fig. 22 Phase 1

The lubricant enters from above (vertical arrow) into the lubricant distributor and flows to the right end of piston A (Fig. 22).

The lubricant pressure moves piston A (horizontal arrow) to the left and presses the confined lubricant from the left hand end of piston A to outlet 2.

Phase 2

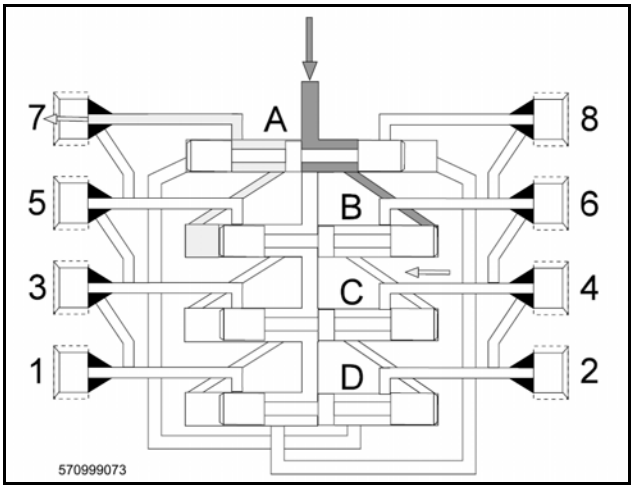


Fig. 23 Phase 2

When piston A (Fig. 23) reaches its left hand stop position it opens the connecting passage at the right hand end of channel B.

The lubricant flowing in from above (vertical arrow) likewise moves piston B (horizontal arrow) to the left and presses the confined lubricant from the left hand end of piston B to outlet 7.

Phase 3

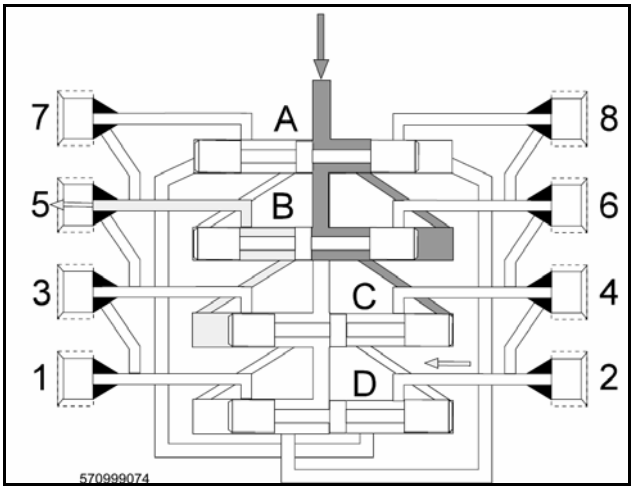


Fig. 24 Phase 3

When piston B (Fig. 24) reaches its left hand stop position it opens the connecting passage at the right hand end of piston C.

The lubricant flowing in from above (vertical arrow) likewise moves piston C (horizontal arrow) to the left and presses the confined lubricant from the left hand end of piston C to outlet 5.

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Phase 4

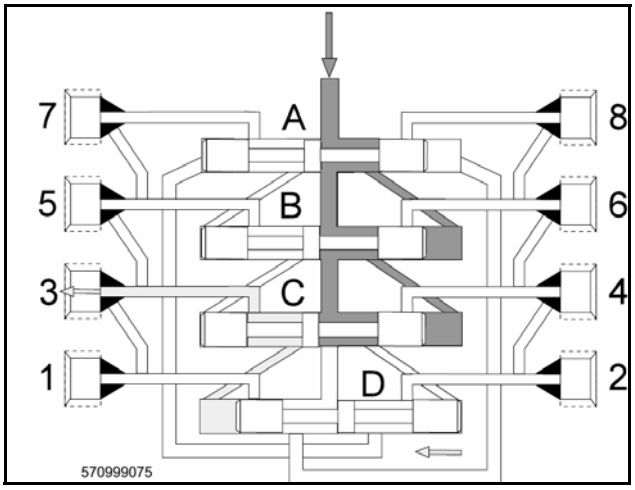


Fig. 25 Phase 4

The connecting passage at the right hand end of piston D (Fig. 25) is now open (bottom horizontal arrow).

Lubricant flowing in from above (vertical arrow) presses piston D to the left hand side, thus the confined lubricant from the left hand end of piston D leaves the distributor through outlet 3.

Phase 5

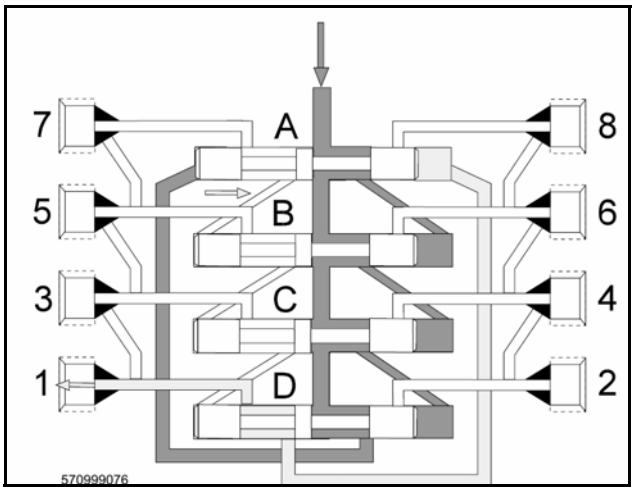


Fig. 26 Phase 5

In phase 4 piston D (Fig. 26) opens the connecting passage to the left end of piston A.

The flowing lubricant (vertical arrow) pushes piston A to the right (upper horizontal arrow) and conveys the confined lubricant to outlet 1.

During the continuing delivery sequence the pistons B - D move from left to right, one after the other.

Thus one complete revolution has come to an end and a new cycle can start.

If the flow of lubricant is interrupted the piston will stop. In this case no lubricant is conveyed to the lubrication points.

When lubricant flows through the distributor again, the cycle starts exactly at the point where it was interrupted.

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10.6 Lubrication oil pump

During the lubrication cycle the pump delivers lubricant to the connected lubrication points via several distributors.

i Note

Despite an existing fault monitoring feature the visual inspections and function checks of the lubrication system must be performed at regular intervals.

Components

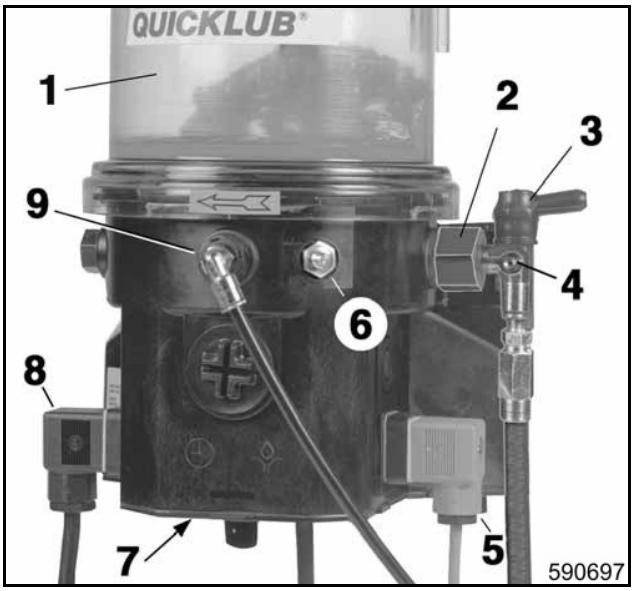


Fig. 27 Pump components:

1 Tank

2 Pump element

3 Pressure relief valve

4 Filling nipple, for emergency lubrication

5 Connection plug 2A1 (only for industrial applications), on BOMAG machines with fixed cable

6 Filling nipple, pump

7 Control board

8 Connection plug 1A1 (only for industrial applications)

9 Return flow connection, not used

The pump is a compact multiple-line pump and consists of:

- Container with agitator wing
- housing with built-in motor
- Control unit
- Pump element with pressure relief valve
- Filling facility

Hydraulic diagram

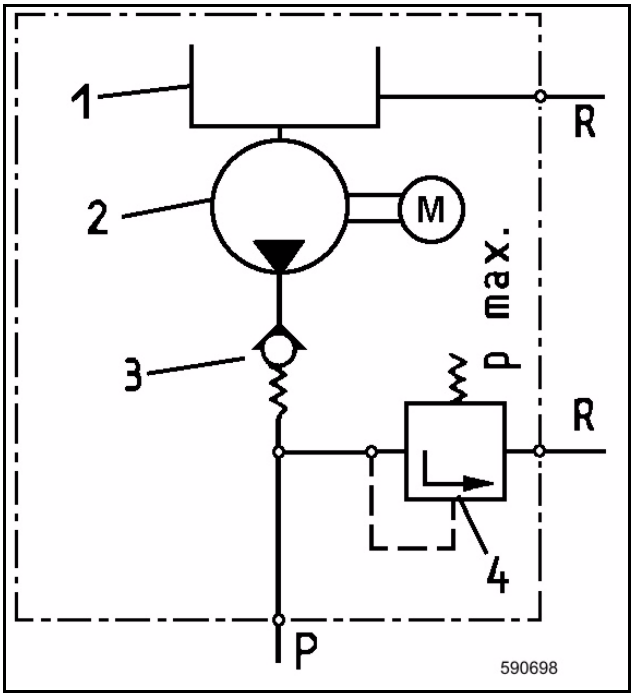


Fig. 28 Hydraulic diagram of pump

1 Container with agitator wing

2 Pump

3 Check valve, spring loaded

4 Pressure relief valve

R = Return line

P = Pressure line

(3) (Fig. 28) Check valve

The check valve serves the function of the pump element. It prevents the back flow of lubricant to the housing, i.e. to the container.

(4) (Fig. 28) and (Fig. 29) pressure relief valve

The pressure relief valve limits the pressure in the system to the adjusted value.

The valve opens at a pressure of **305 bar**.

Lubricant escaping from the pressure relief valve indicates a fault in the system.

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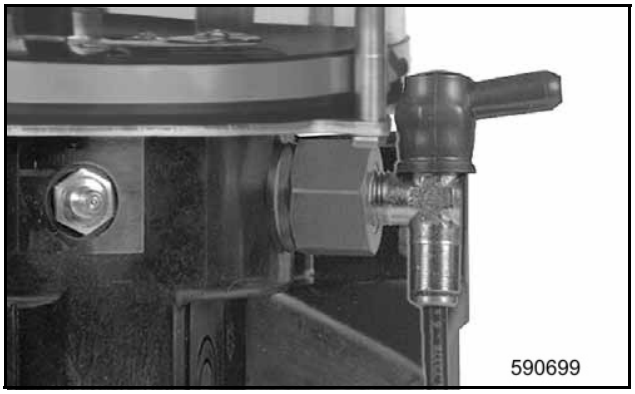


Fig. 29 Pressure relief valve

Checking the pressure relief valve

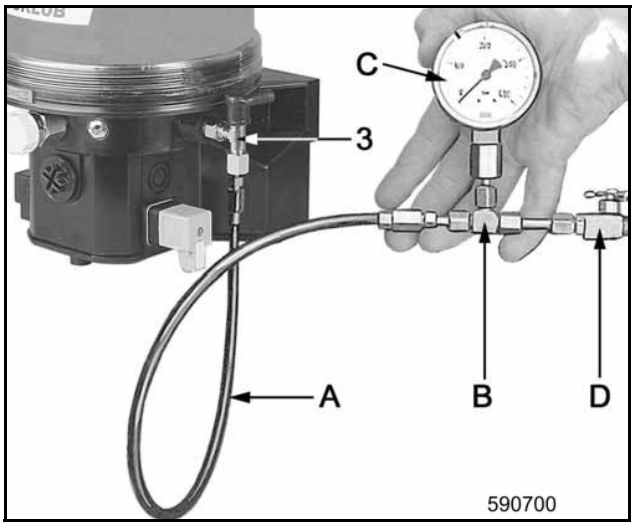


Fig. 30 Checking the pressure relief valve

3 Pressure relief valve
A Hose, at least 1 m long
B T-piece
C Pressure gauge (0-600 bar / 0-8708 psi)
D Relieve cock

- Connect the pressure gauge C (Fig. 30) to the valve.

i Note

Do not connect the pressure gauge (C) directly to the pump element (3). Use a hose (A) with a length of at least 1 m. Very high pressure peaks, exceeding the above measuring range, will occur. In such cases the pump motor may stop. It can be blocked for up to 30 minutes without any harm.

- Start an additional lubrication cycle.

Pump element

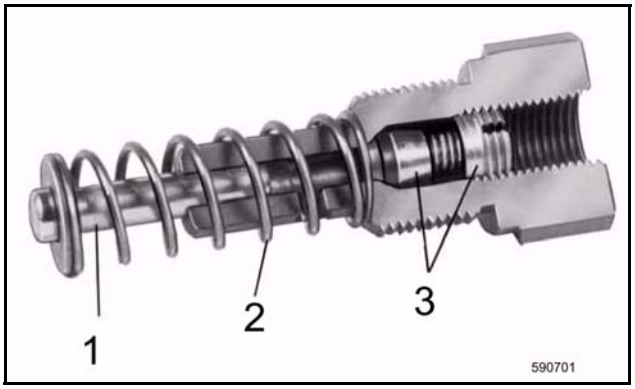


Fig. 31 Pump element

1 Piston
2 Resetting spring
3 Check valve

The electric motor drives the eccentric 1 (Fig. 32).

During operation the piston 2 (Fig. 31) draws lubricant out of the grease container and delivers it via the distributor to the connected lubrication points in front and rear frames.

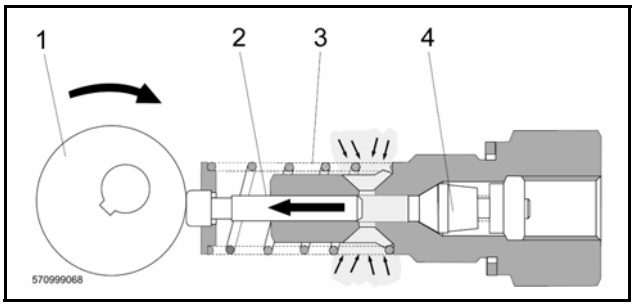


Fig. 32 Pump element drawing in grease

1 Eccentric
2 Piston
3 Spring
4 Check valve

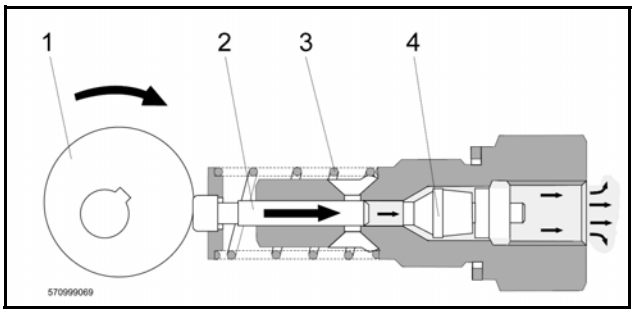


Fig. 33 Pump element pumping

1 Eccentric
2 Piston
3 Spring
4 Check valve

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10.7 Check the central lubrication system, topping up

⚠ Caution

When using an external heavy duty lubrication device lubricate slowly and with interruptions.

The following lubrication points are effectively and reliably supplied with lubricant by the central lubrication system.

- 2 x on bearing block at bottom of dozer blade,
- 1 x eye for dozer blade cylinder,
- 4 x steering cylinder eyes,
- 2 x articulated joint,
- 4 x live ring of articulated joint

A differentiation is made between the time cycles for pause and duty.

Pause: No lubrication over a period of 60 minutes.

Duty cycle: Factory set.

Check

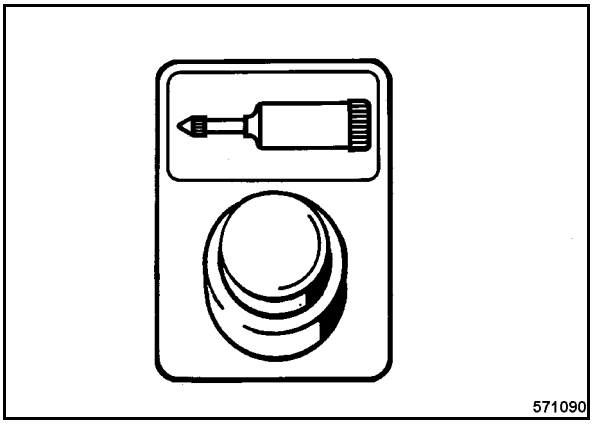


Fig. 34

- Switch on the ignition.
- Actuate push button (Fig. 34) for 2 seconds.

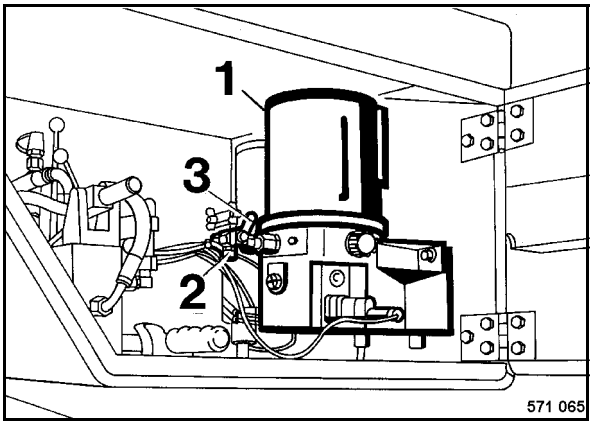


Fig. 35

- The agitator in the transparent container 1 (Fig. 35) moves and presses the grease to the lubrication points.

i Note

Use the push button only to check the system.

Failure of a lubrication point

(e.g. a clogged lubrication point)

- Grease emerging from opening 3 (Fig. 35) indicates that one of the lubrication points is clogged.
- Identify and rectify the cause.

Filling through the grease nipple

⚠ Caution

Ensure strict cleanliness, as otherwise the distributors may seize.

Do not fill the grease container by removing the cover.

Fill the grease container if it is only 1/4 filled.

- Clean the grease nipple.
- Fill the grease container through the grease nipple (2) up to the "Max"-mark.

For quality and quantity of grease refer to the table of fuels, lubricants and filling capacities.

- Switch on the ignition, actuate the push button (Fig. 34) for two seconds, the system will start.

Filling with the hand pump

⚠ Caution

Ensure strict cleanliness, as otherwise the distributors may seize.

For quality and quantity of grease refer to the table of fuels, lubricants and filling capacities.

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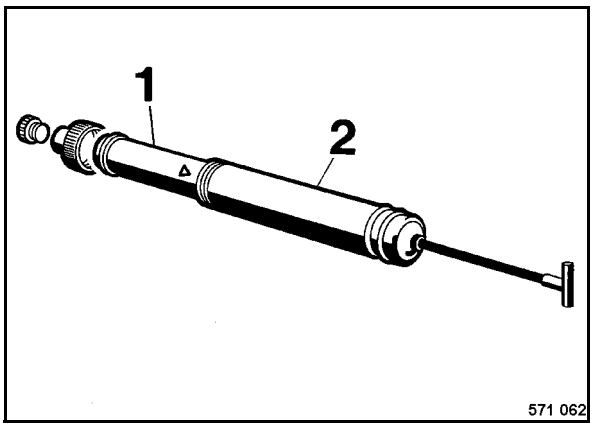


Fig. 36

- Remove both lids from the cartridge 1 (Fig. 36).
- Unscrew the connecting fitting from the hand pump (2).
- Pull the actuator rod completely out.
- Slide the cartridge into the hand pump with the triangle mark to the front.
- Check whether the seal ring has been inserted into the connecting fitting.
- Screw the connecting fitting onto the hand pump.

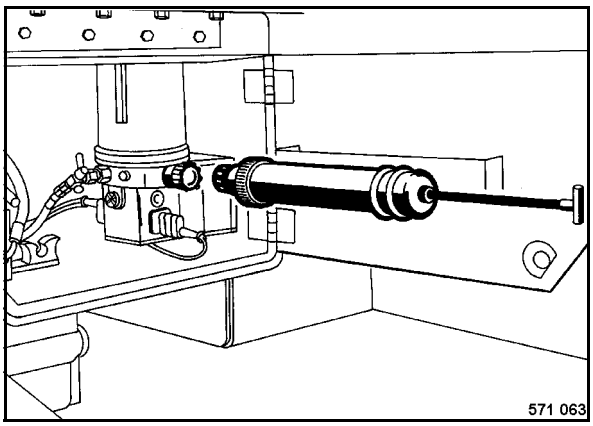


Fig. 37

- Clean the area around the locking cap on the central lubrication system.
- Unscrew the locking cap from the central lubrication system and the locking plug from the hand pump (Fig. 37).
- Screw the hand pump onto the socket on the central lubrication system.
- Push the grease into the transparent container by operating the actuating rod.
- Unscrew the hand pump, insert a new cartridge and repeat the pumping procedure until the transparent container is filled up to the "Max"-mark.

⚠ Caution

After filling screw locking cap and locking plug back on.

10.8 Faults and causes

Indication of faults

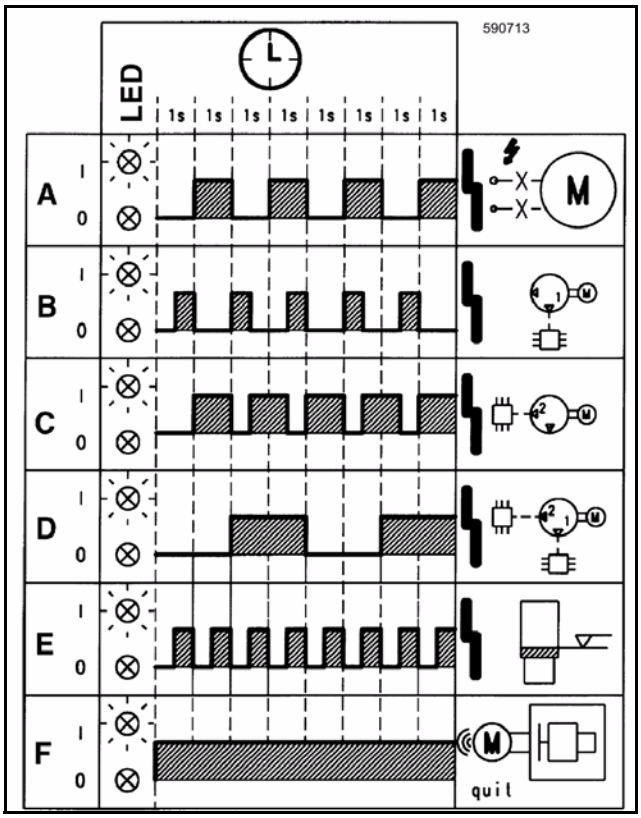


Fig. 38 Flashing frequencies in case of faults

A = Motor defective

Faults

If the motor does not start when operating the starter switch or the machine contact, or if the cable of the motor is defective, the control lamp will flash after 2 seconds as follows:

- A= 1 second ”ON” - 1 second ”OFF”

B = Fault in lubrication circuit 1

e.g.:

- blocked lubrication point(s)
- blocked distributor
- main hose to distributor with piston detector interrupted
- air in system.

The above faults mean that the piston in the monitored distributor cannot move any more.

The control lamp shows the following flashing sequence:

- 0.5 seconds ”ON” - 1 second ”OFF”

C = Fault in lubrication circuit 2 (not applicable)

D = Fault in lubrication circuits 1 and 2 (not applicable)

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E = **Empty signal:** Container empty

The control lamp shows the following flashing sequence:

- 0.5 seconds ”ON” - 0.5 seconds ”OFF”

i Note

After 6 motor revolutions the empty signal will be converted to a flashing signal with the above mentioned frequency.

In case of a malfunction the piston detector (initiator) is not able to detect a piston movement and therefore cannot switch the pump off.

With the help of the parallel running monitoring time the controls switch the pump off at the end of the monitoring time (5 minutes).

- This is followed by a fault signal
- The contact lamp flashes
- The pump does no longer start automatically.

F = **Acknowledged fault** (permanent light)

Short pressing of button (< 1 second) acknowledges the fault signal, i.e the flashing of the control lamp changes to a permanent light.

i Note

An acknowledged fault also remains stored after switching the drive switch or the machine contact off. When switching on again the control lamp flashes again, according to the respective fault.

Rectify the fault and release additional lubrication

- In the event of a fault check the central lubrication pump and the connected system for faults.

Rectify the cause of the fault.

- Switch the pump on again by triggering an additional lubrication cycle. Keep the button slightly longer depressed (> 2 seconds). If the fault is eliminated, the control lamp will go out at the end of the lubrication process.

⚠ Caution

In case of a malfunction the pump will not automatically start to run again after rectification of the fault. The pump must be switched on.

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10.9 Fault - Cause - Remedy

Fault	Cause	Remedy
Pump does not work	Electric line interrupted	Replace the electric line
	Pump defective	Replace the pump
Pump works, but does not deliver	Air cushion in pumping piston	Vent the pump
	Min. filling level fallen short of	Fill up the provision container
	Pump element defective	Replace the pump element
No grease collar at the lubrication points	Pump does not work	See "Pump does not work"
	Pause time too long or lubrication period too short	Reduce pause time or extend lubrication time
	System blocked	See "Grease emerging from pressure relief valve"
No grease collars at various lubrication points	Supply line to secondary distributor burst or leaking	Replace the line
	Screw fittings leaking	Retighten or replace screw fitting
No grease collar on one lubrication point	Corresponding grease line burst or leaking	Replace the line
	Screw fitting leaking	Retighten or replace screw fitting
Pump speed too low	High system pressure or low ambient temperature	Check system / bearing point No damage (perform 1 or 2 intermediate lubrication cycles)
Grease emerging from pressure relief valve	System pressure too high	Check system
	Progressive distributor blocked	Replace the distributor
	System blocked	Repair blocked / seized bearing points

Cause for a blockage in the system

- A crushed or blocked lubricant line
- A bearing overfilled with lubricant or blocked
- An unsuitable lubricant for central lubrication systems
- A blocked distributor outlet
- A blocked distributor

Indication of a blockage

- Grease emerging from pressure relief valve

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Identify the location of the blockage

⚠ Caution

All repair work must be carried out with utmost cleanliness.

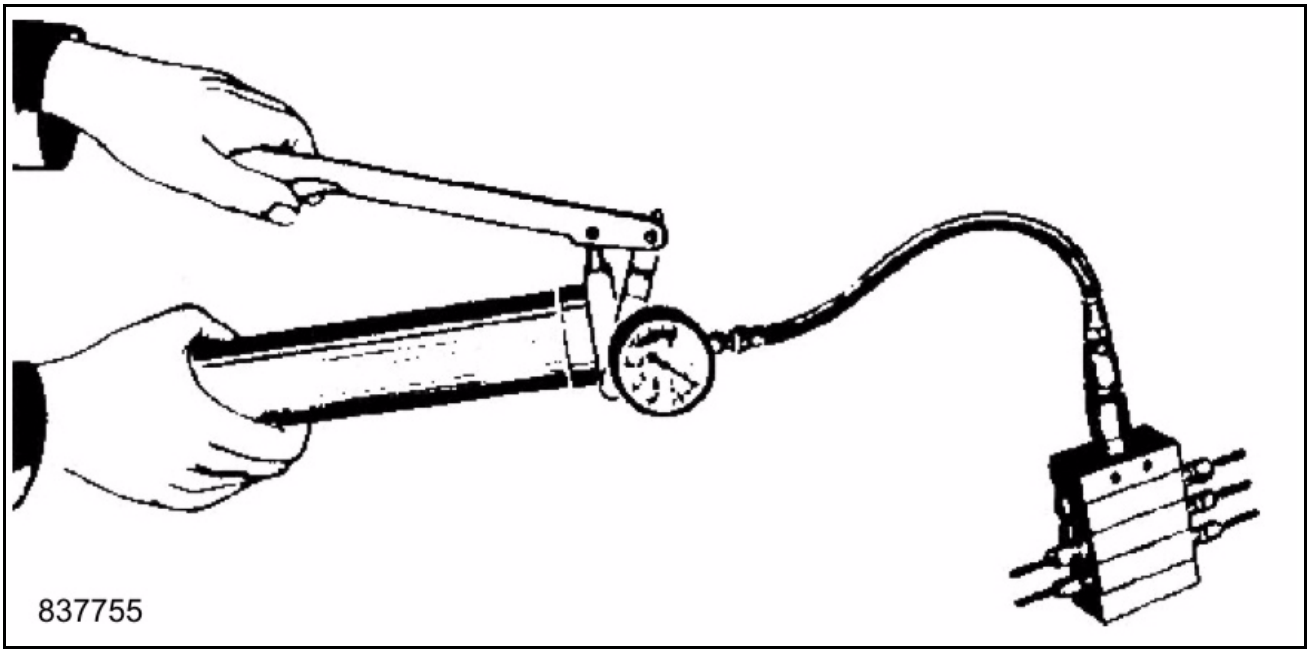


Fig. 39

- 1.) Unscrew the main line from the main distributor, operate the pump and check whether lubricant is delivered properly.
- 2.) Unscrew the cap screws on the distributor one after the other and operate the pump each time a cap screw is removed. The line (cap screw) at which the pressure drops, is the blocked line or lubrication point.
- 3.) Follow the same principle when checking the associated secondary distributor all the way to the lubrication point.

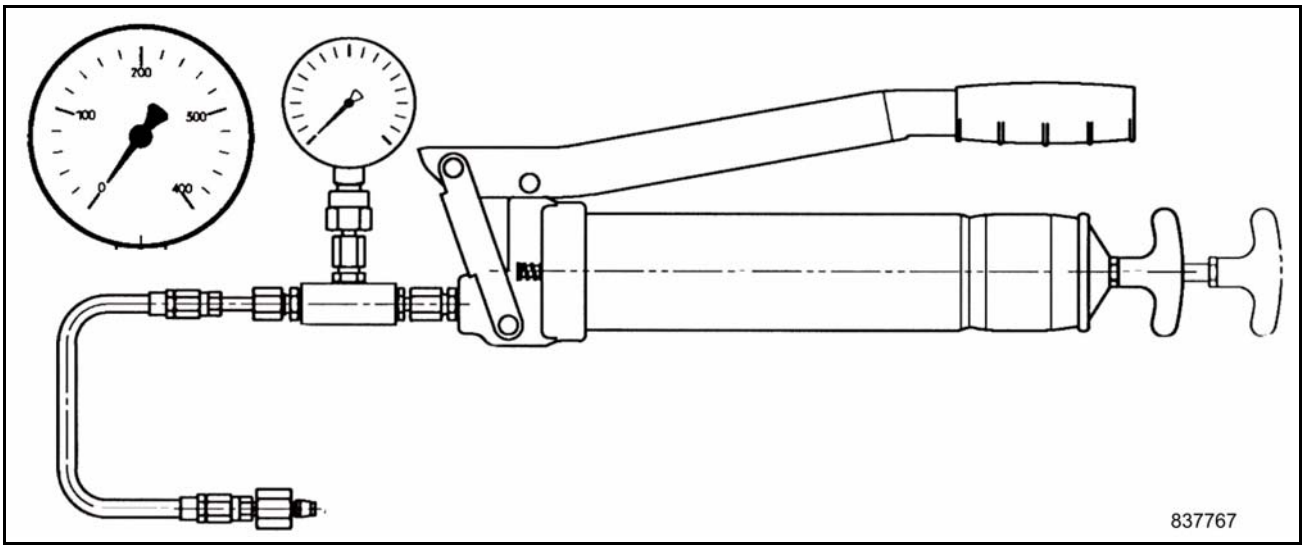
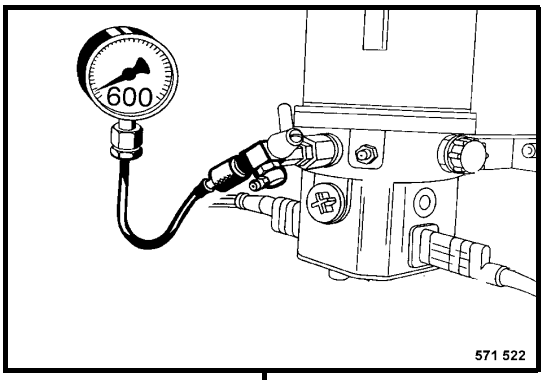


Fig. 40 KIT to check central lubrication systems

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Central lubrication system not working (lubricant emerging from the relief valve)



Check the grease pump

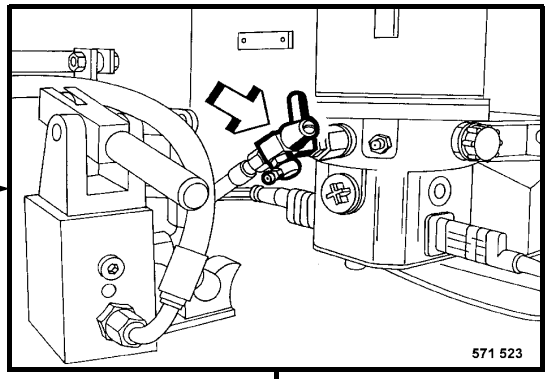
- Remove the lubrication hose
- Connect a 600 bar pressure gauge
- Close the lubrication hose with a plug
- Switch the pump on and press the push button several times

Nominal value:
Raise the pressure to approx. 350 bar, grease emerging from the relief valve

Pressure OK?

no

yes



Check the pressure relief valve

valve OK?

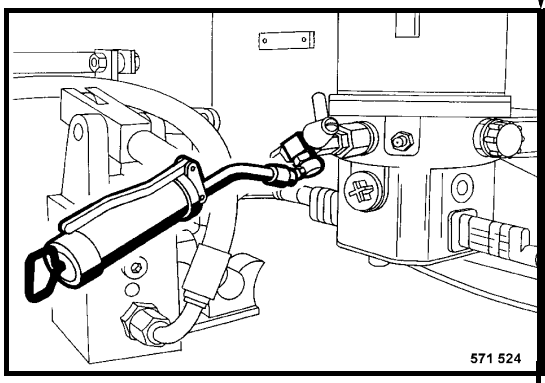
no

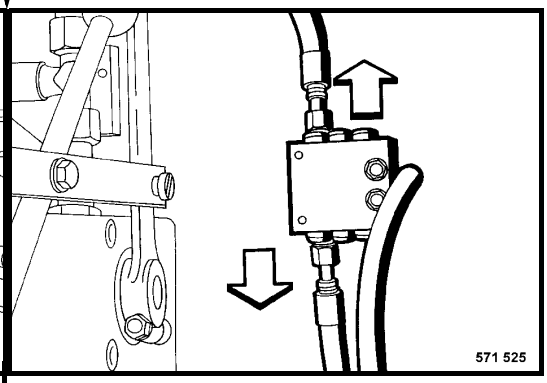
Replace the pressure relief valve

yes

Replace the lubrication pump

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Check the main distributor

- Reconnect the lubrication hose
- Connect a grease gun to the grease nipple and apply a pressure of 200 bar

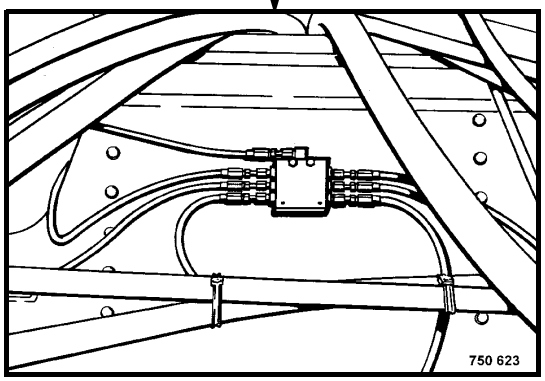
- Loosen the top and bottom lubrication hoses, one after the other
- The hose from which grease comes flowing out indicates in which branch the blockage can be found
- Reconnect the hoses

Grease emerging

none → Changing/cleaning the main distributor

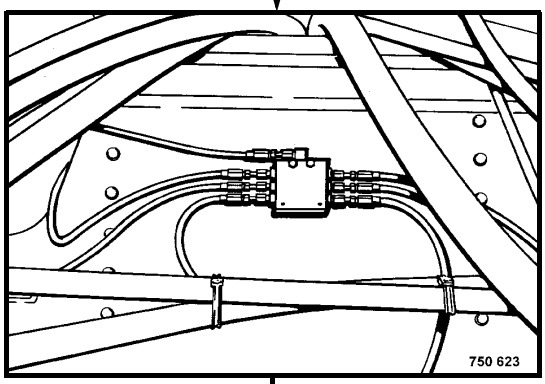
top

bottom



Check the sub-divider in the front frame

- Generate a pressure of 200 bar with the grease gun and loosen the lubrication hoses one after the other. The hose from which grease comes flowing out indicates the blockage.



Check the sub-distributor in the rear frame

- Generate a pressure of 200 bar with the grease gun and loosen the lubrication hoses one after the other. The hose from which grease comes flowing out indicates the blockage.

Grease emerging

no → Replace, clean the respective sub-distributor

yes → Repair the respective bearing location

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11 Engine

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11.1 Diesel engine

Refuse compactors of series BC 772 RB-2 are powered by 6-cylinder Deutz diesel engines type TCD 2015 and the BC 972/1172 RB-2 by an 8-cylinder engine type TCD 2015.

These engines are V-type engines with water cooling, whereby the cylinder banks are arranged to each other under a 90° angle.

The engines are designed in four-valve technology with turbo charging and intercooler. They are extremely compact and are fitted with a solenoid valve controlled electronic injection system (MVS).

Emission limit values acc. to EPA/ COM/ Tier/ stage lll

The engines are characterized by the following positive features:

- compact design
- low noise level
- almost vibration free operation
- low fuel consumption
- low exhaust emission EPA/COM III
- high power density
- excellent access to all service locations.
- high reliability
- low running costs,
- long lifetime

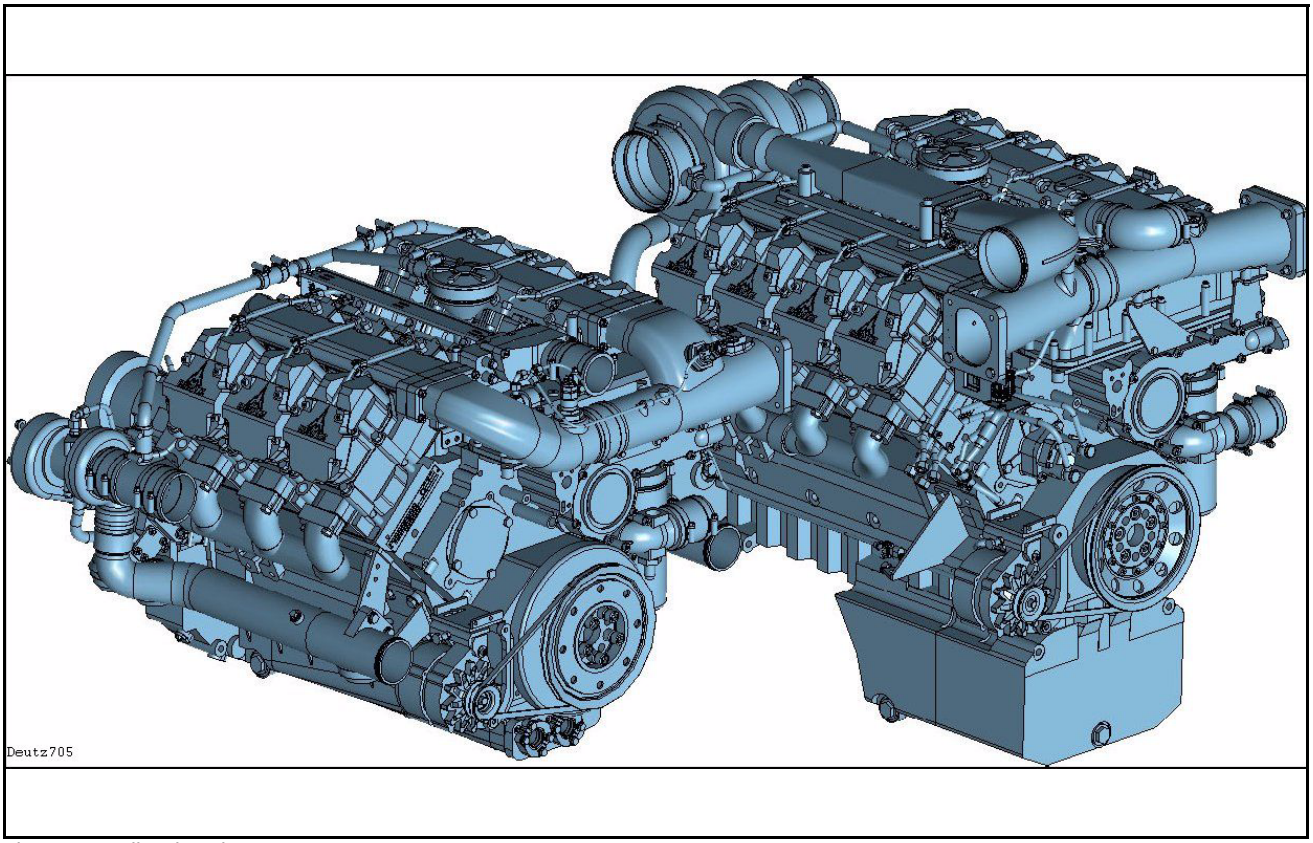


Fig. 1 Deutz diesel engine TCD 2015

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11.2 Engine description TCD 2015 V 6 cylinder

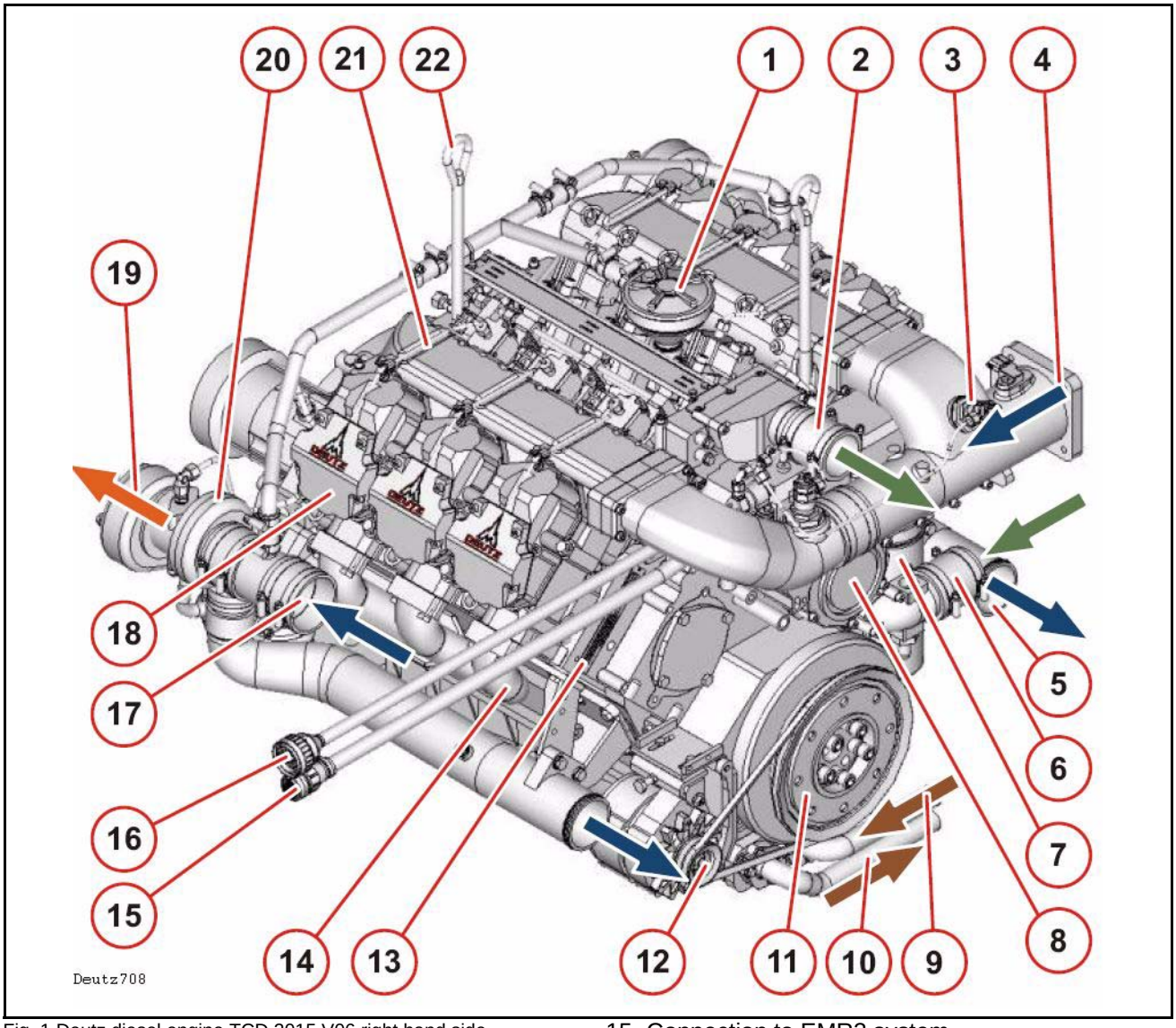


Fig. 1 Deutz diesel engine TCD 2015 V06 right hand side

1 Crankcase ventilation
2 Connection to coolant heat exchanger
3 Pre-heating plug
4 Connection from intercooler
5 Connection to intercooler
6 Connection from coolant heat exchanger
7 Lubrication oil filter cartridge
8 Coolant pump
9 Connection from separate lubrication oil tank
10 Connection to separate lubrication oil tank
11 Vibration damper / V-belt pulley
12 Generator
13 Engine type plate (company plate)
14 Exhaust manifold
15 Connection to EMR3 system
16 Connection to MVS system
17 Connection from air filter
18 Cylinder head cover
19 Connection to exhaust silencer
20 Exhaust turbo charger
21 Charge air suction line
22 Transport device

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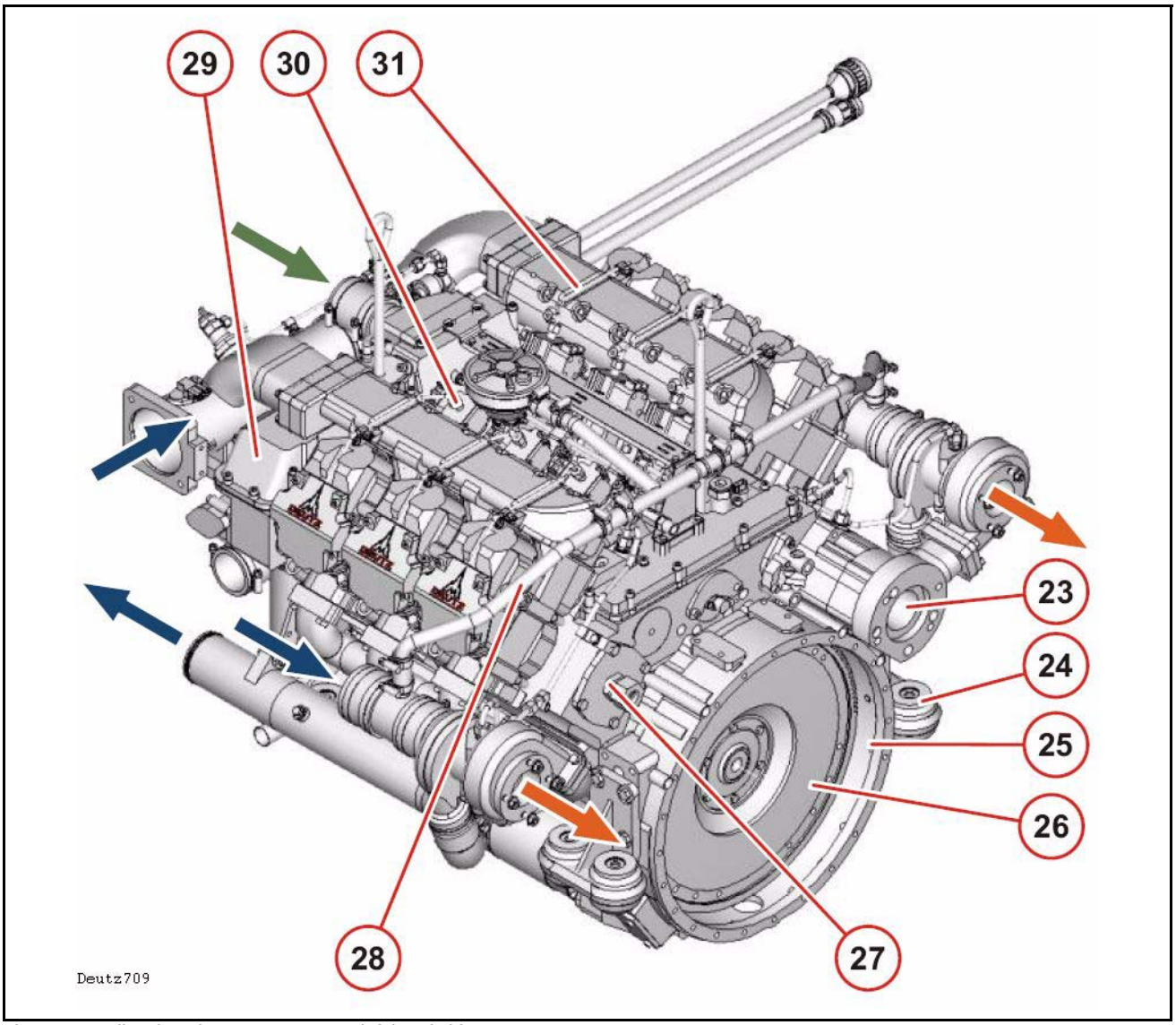


Fig. 2 Deutz diesel engine TCD 2015 V06 left hand side

23. Auxiliary drive
24. Engine suspension
25. Transmission connection (SAE)
26. Flywheel
27. free auxiliary drive
28. Crankcase ventilation line
29. Lubrication oil cooler
30. Injection pump (plug-type pump)
31. Injection line

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11.3 Lubrication oil circuit TCD 2015

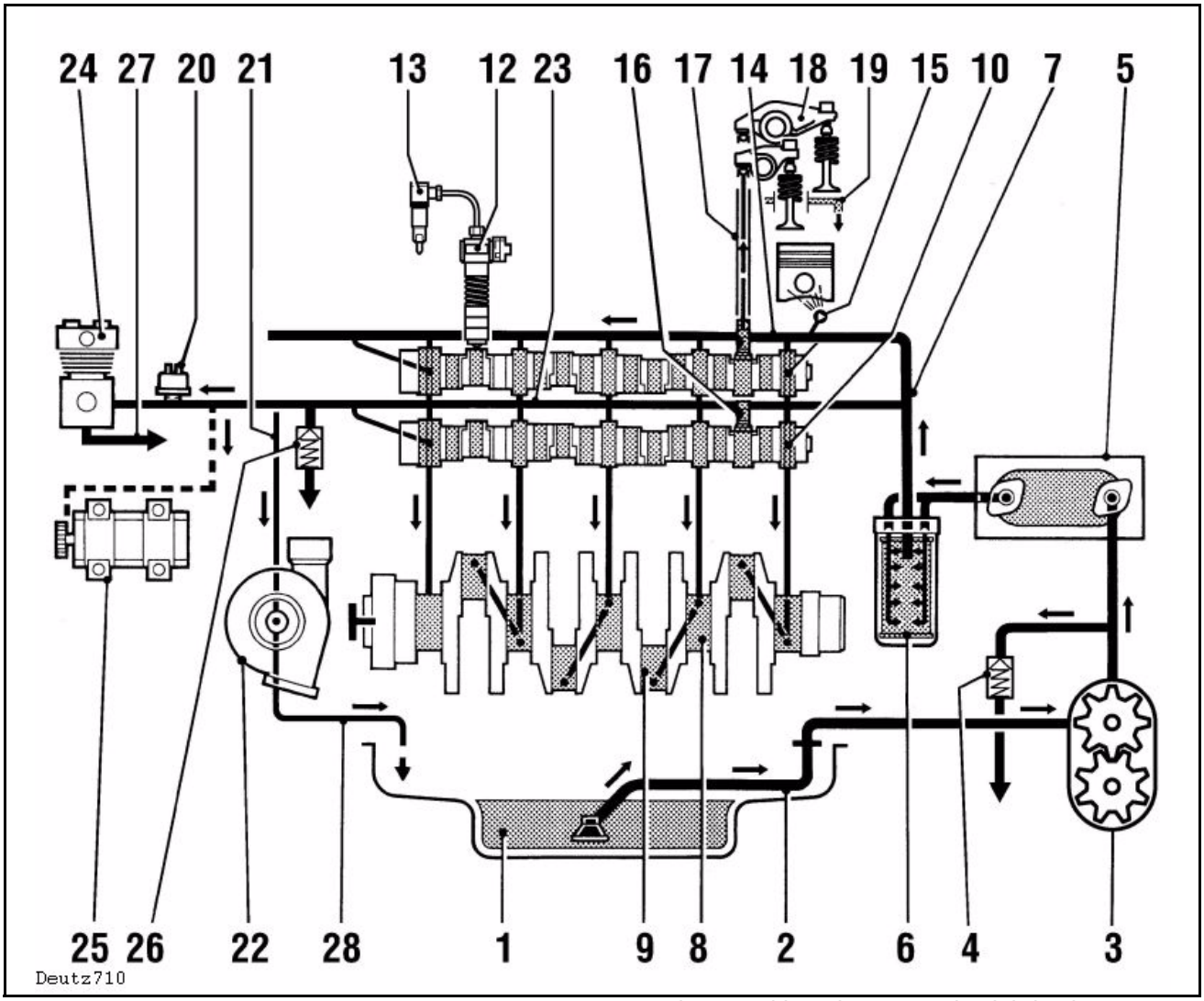


Fig. 1 Lubrication oil schematic

1 Lubrication oil sump
2 Lubrication oil suction pipe
3 Lubrication oil pump
4 Pressure relief valve
5 Lubrication oil cooler
6 Lubrication oil filter
7 Main oil galleries
8 Crankshaft bearings
9 Conrod bearings
10 Camshaft bearings
11 Oil flow to individual injection pumps
12 Injection pump with injection valve
13 Camshaft lubrication
14 Line to spray nozzle
15 Spray nozzle with pressure retaining valve for piston cooling
16 Plunger with rocker arm pulse lubrication
17 Push rod, oil supply to rocker arm lubrication
18 Rocker arm
19 Oil return bore in cylinder head leading to crankcase
20 Oil pressure sensor / oil pressure switch
21 Oil line to exhaust turbo charger
22 Exhaust turbo charger
23 Oil line to crankshaft and camshaft, compressor / hydraulic pump
24 Compressor (optional)
25 Hydraulic pump (optional)
26 Pressure retaining valve (adjustable)
27 Return flow from compressor / hydraulic pump to crankcase
28 Return flow from exhaust turbo charger

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11.4 Coolant circuit TCD 2015

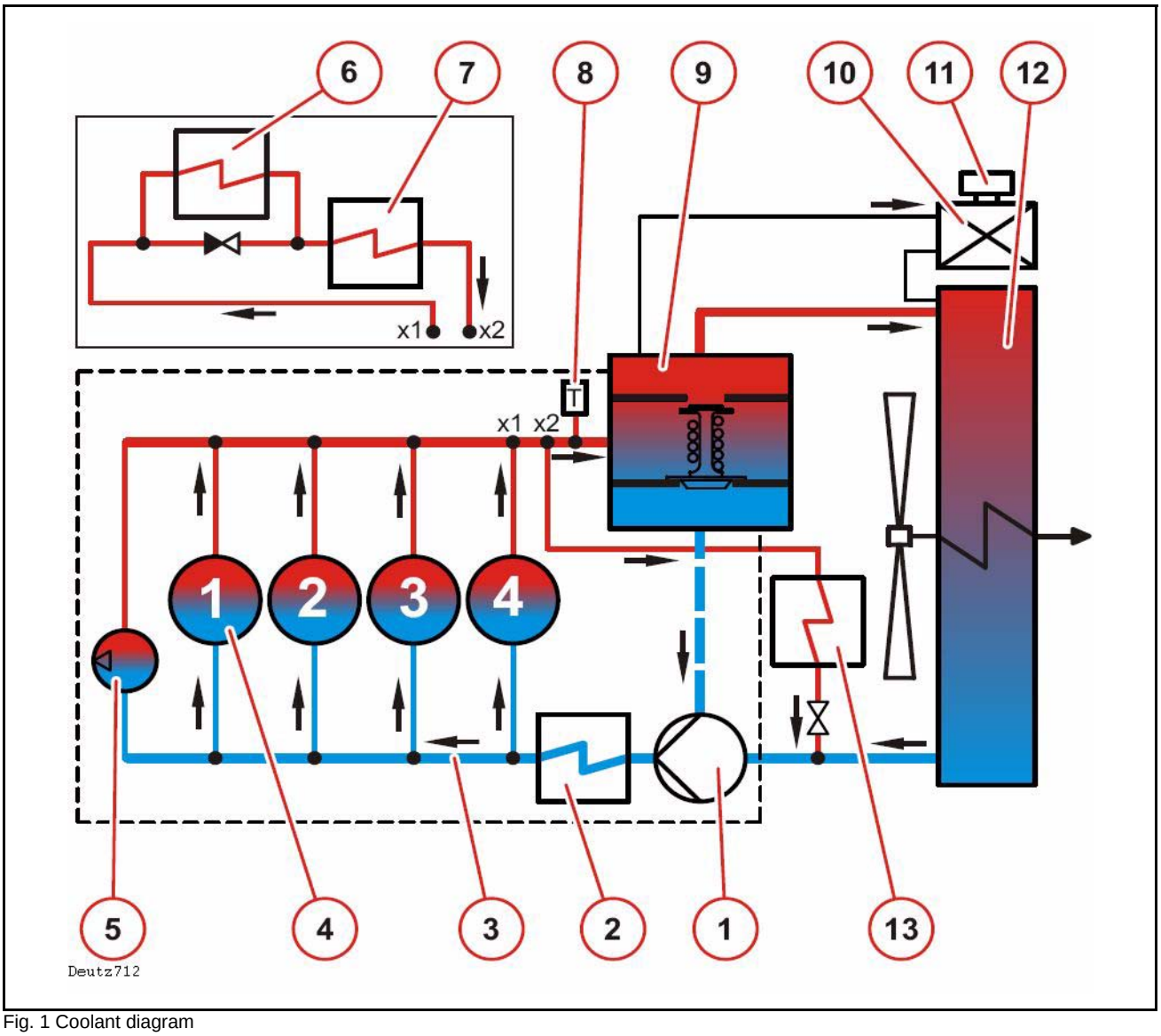


Fig. 1 Coolant diagram

1 Coolant pump
2 Lubrication oil cooler
3 Coolant channel
4 Cooling of cylinder liner/cylinder head (numbering/arrangement of cylinders depending on engine series)
5 Compressor (optional)
6 Transmission oil cooler (optional)
7 Additional cooler (optional)
8 Temperature sensor
9 Thermostat
10 Compensation tank
11 Filler socket
12 Heat exchanger
13 Cabin heater (optional)

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11.5 Fuel circuit TCD 2015

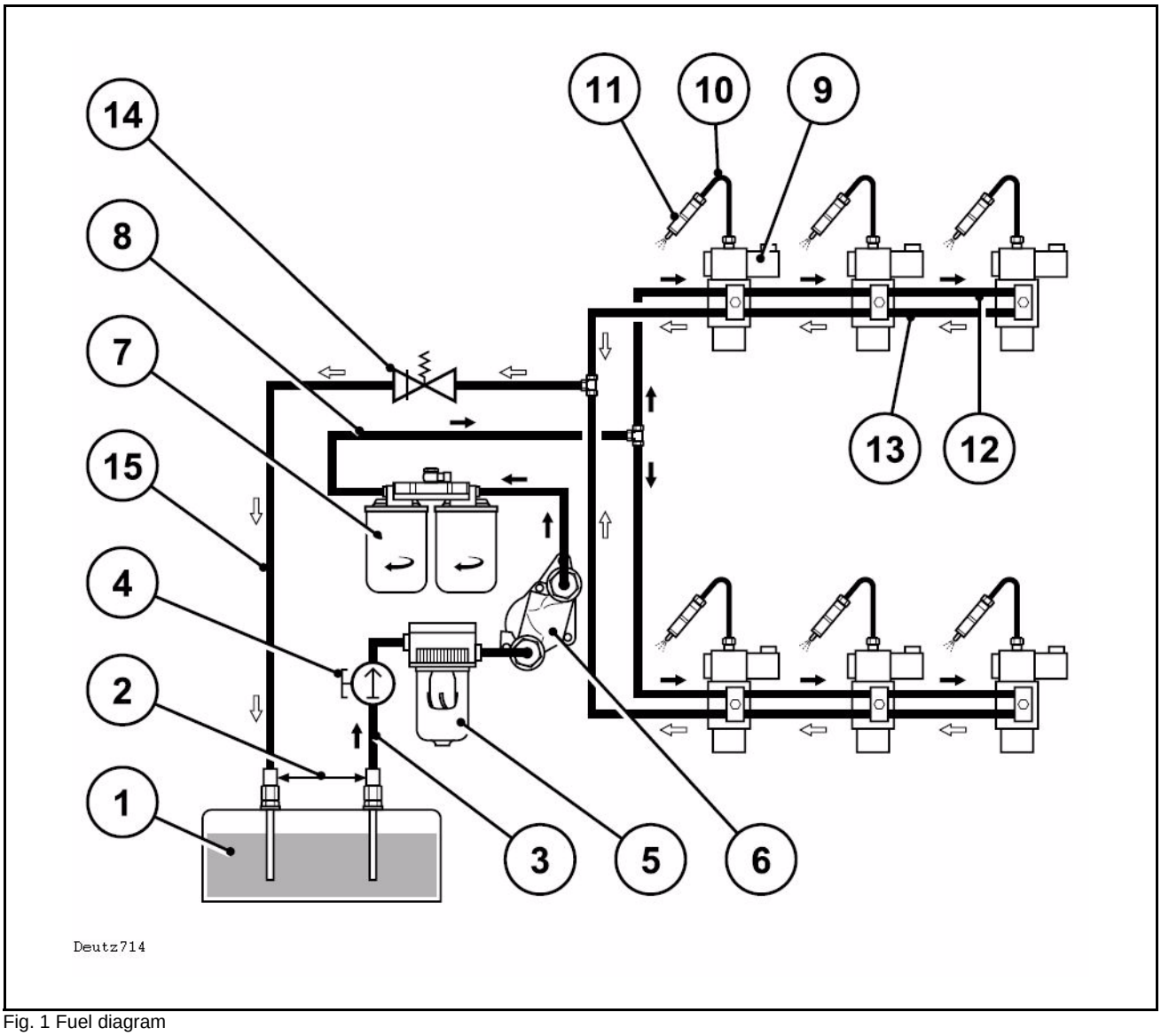


Fig. 1 Fuel diagram

1 Fuel tank
2 min. distance 500 mm
3 Fuel supply line from tank
4 Manual priming pump for bleeding
5 Fuel pre-filter (example)
6 Fuel priming pump
7 Fuel twin filter
8 Fuel supply line to injection pumps
9 Injection pump
10 Injection line
11 Injection valves
12 Fuel supply line to injection pumps
13 Fuel return line from injection pumps
14 Pressure retaining valve
15 Fuel return line to fuel tank

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Fuel pre-filter

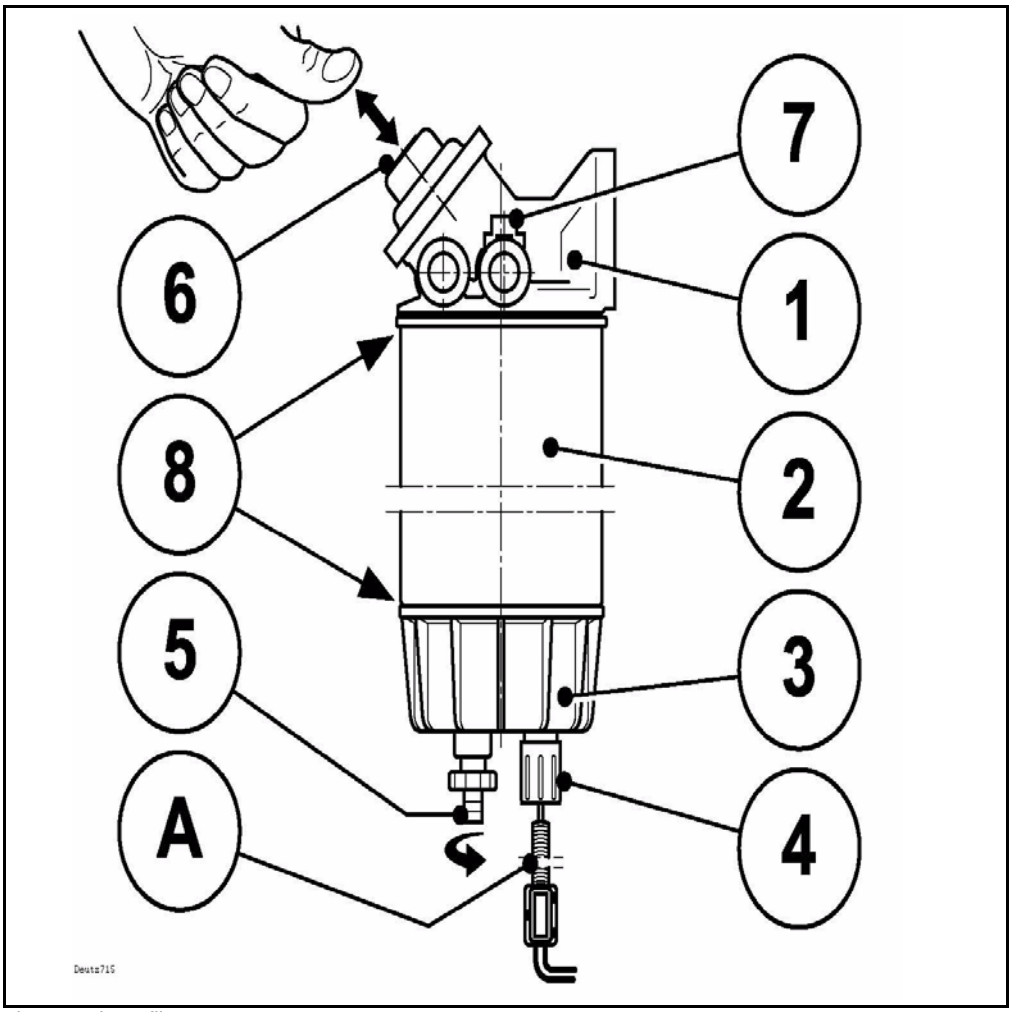


Fig. 2 Fuel pre-filter

1 Filter bracket
2 Filter cartridge
3 Water collecting bowl
4 Electric connection
5 Drain plug
6 Manual fuel pump
7 Bleeding screw
8 Sealing face
A Electric water level sensor

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Fuel filter system

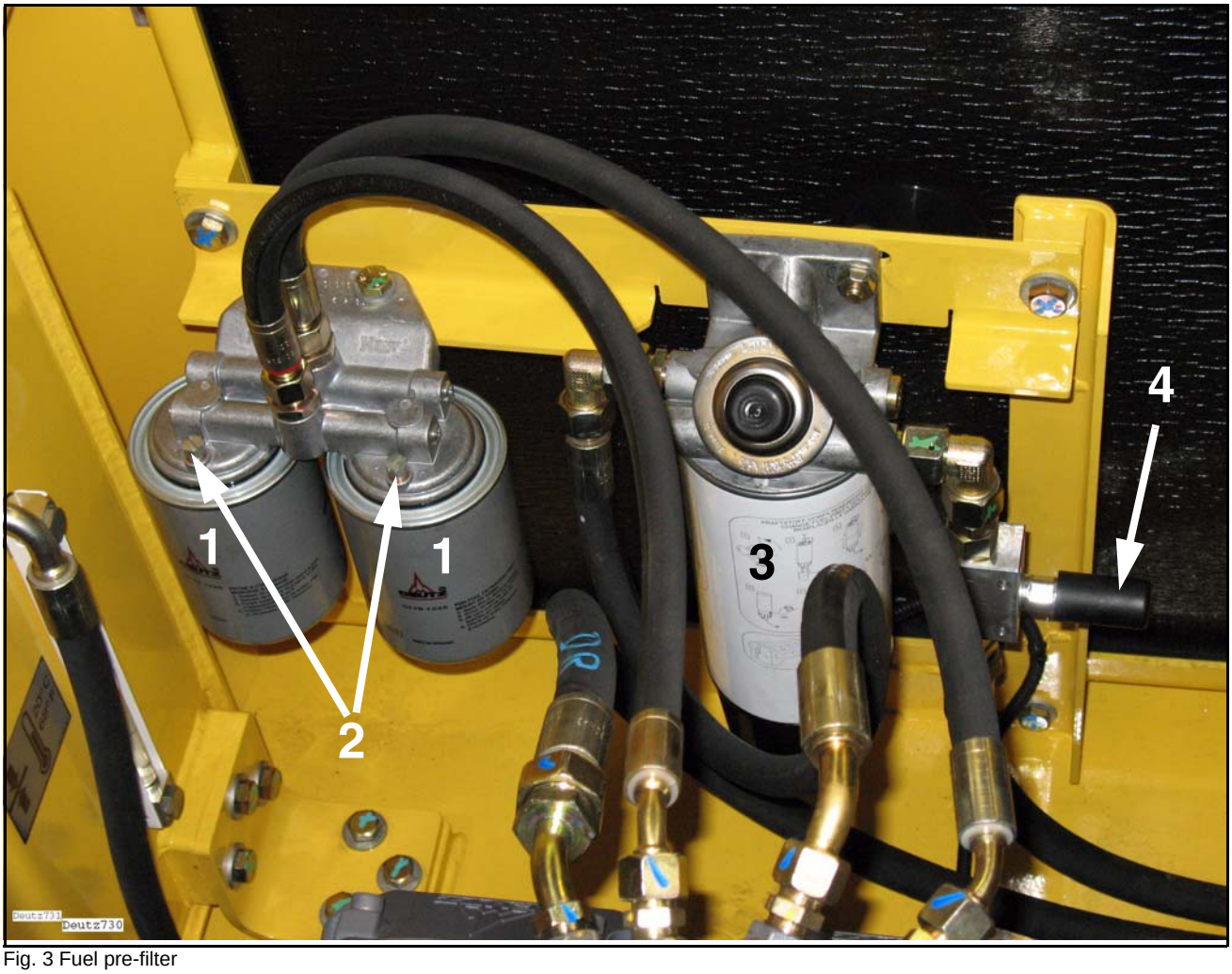


Fig. 3 Fuel pre-filter

1 Fuel pressure filter min. 3µm
2 Bleeding screws
3 Fuel pre-filter
4 additional hand pump

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11.6 Injection system (MVS) TCD 2015

The solenoid valve system (MVS) is a new fully electronically controlled diesel injection system without mechanical link to the operator (no governor rod). In contrast to conventional injection systems the MVS enables an absolutely unrestricted control of delivery period (injection quantity) and start of delivery (injection timing) and thus ensures reliable compliance with current emission regulations.

The MVS consists of a pump with solenoid valve and injection nozzle for each individual cylinder.

The solenoid valve closes the fuel bypass in the plunger chamber, thus causing an increase in injection pressure and finally triggers the injection when the nozzle opening pressure is reached. If injection is to be ended, the valve will open the bypass, the system pressure drops and the spring force closes the nozzle needle.

The solenoid valves are triggered by the electronic control unit in dependence on the operatig parameters. The system is capable of providing a wide range of limp-home functions, should any of the sensors fail. This ensures a reliable and safe completion of travel and work.

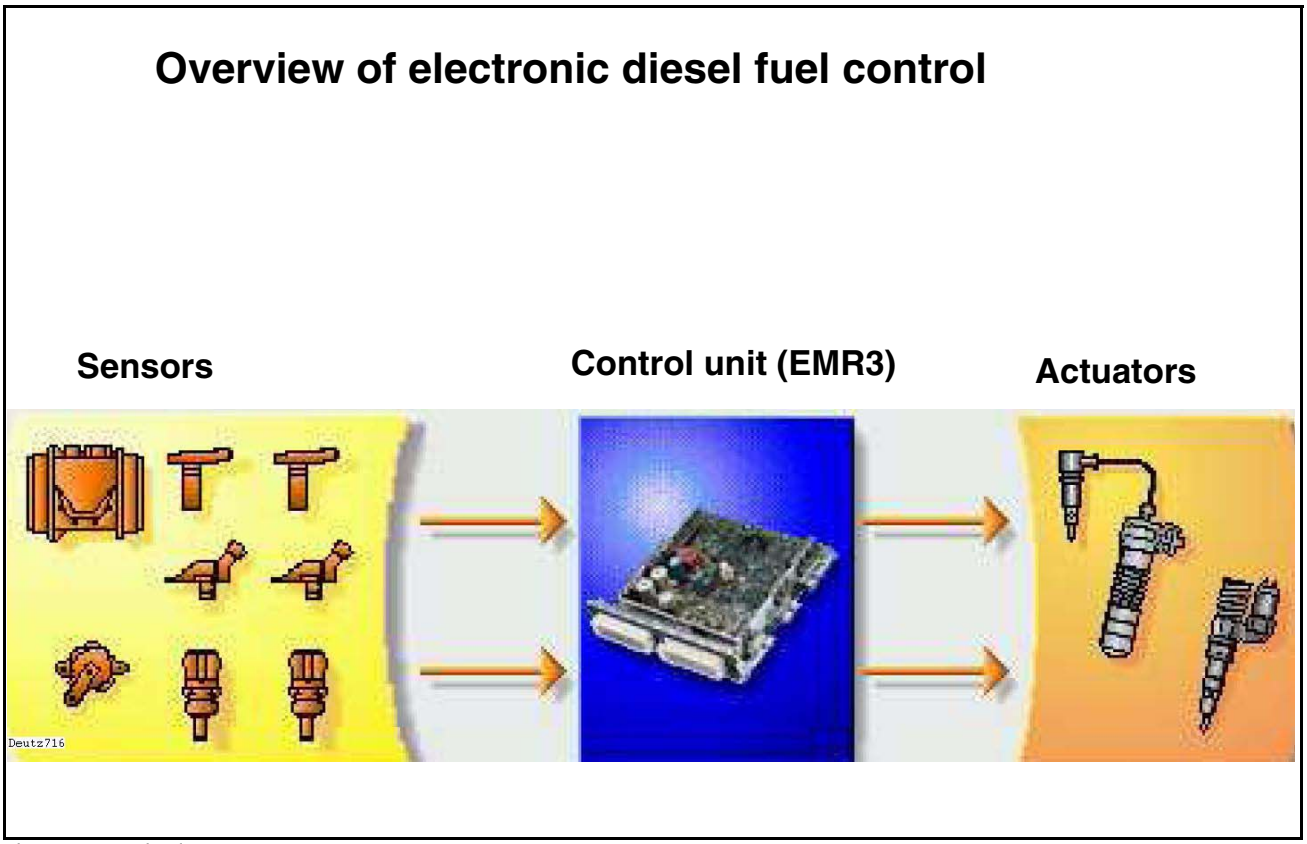


Fig. 1 MVS - Injection system TCD 2015

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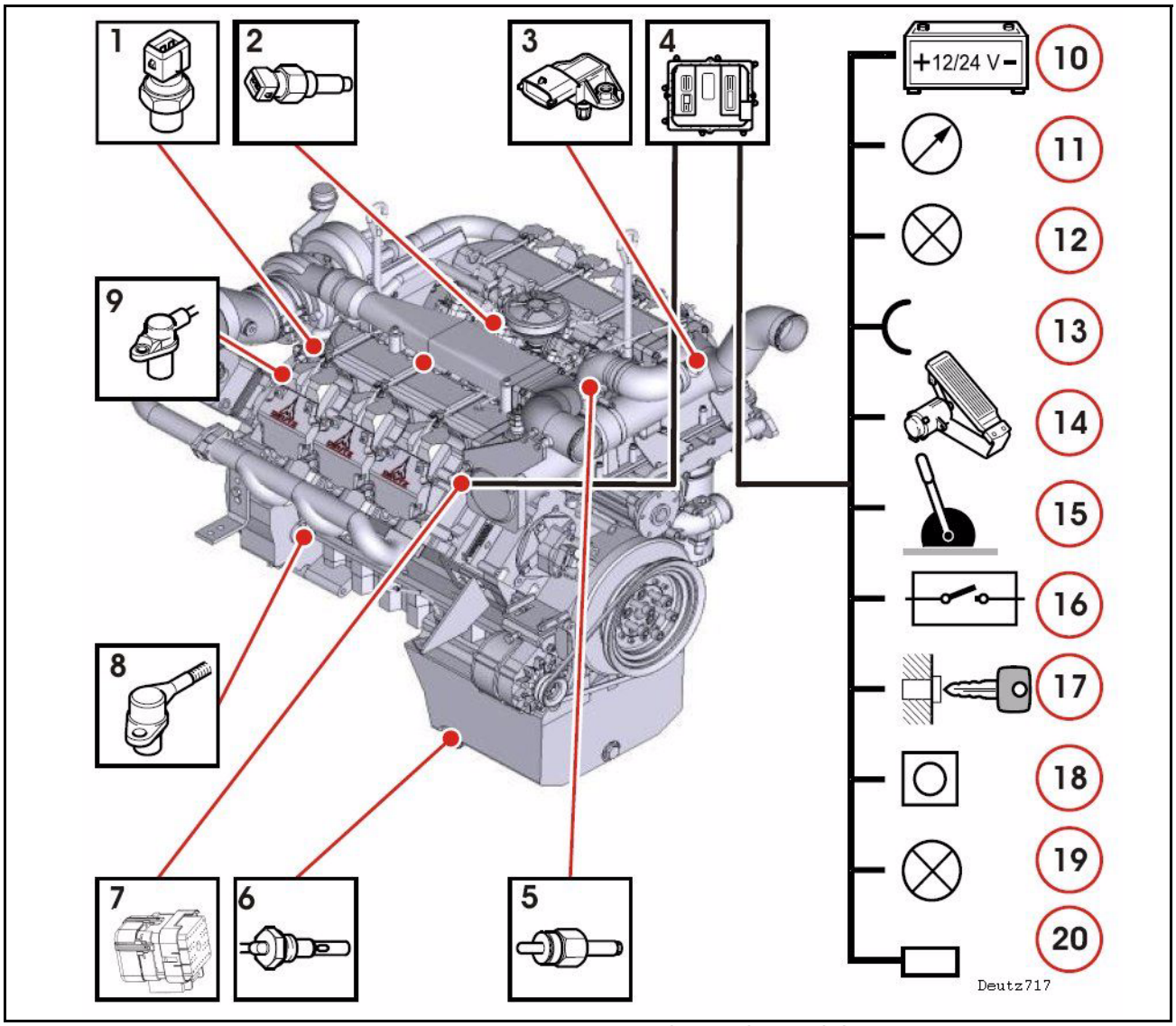


Fig. 2 Electrics of TCD 2015

1 Oil pressure sensor
2 Fuel temperature sensor
3 Sensor for charge air temperature and charge air pressure
4 Engine control unit
5 Coolant temperature sensor
6 Oil level sensor
7 Central plug
8 Rotary speed sensor for crankshaft
9 Rotary speed sensor for camshaft
10 Power supply
11 Multi-function display
12 Outputs (configurable)
13 Inputs (configurable) (PWM/Digital/Analog)
14 Travel pedal
15 Manual throttle (optional)
16 Changeover function
17 Key switch Start/Stop
18 Diagnostics push button
19 Fault lamp with flashing code
20 Diagnostics interface/CAN-Bus

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Injection pump with solenoid valve

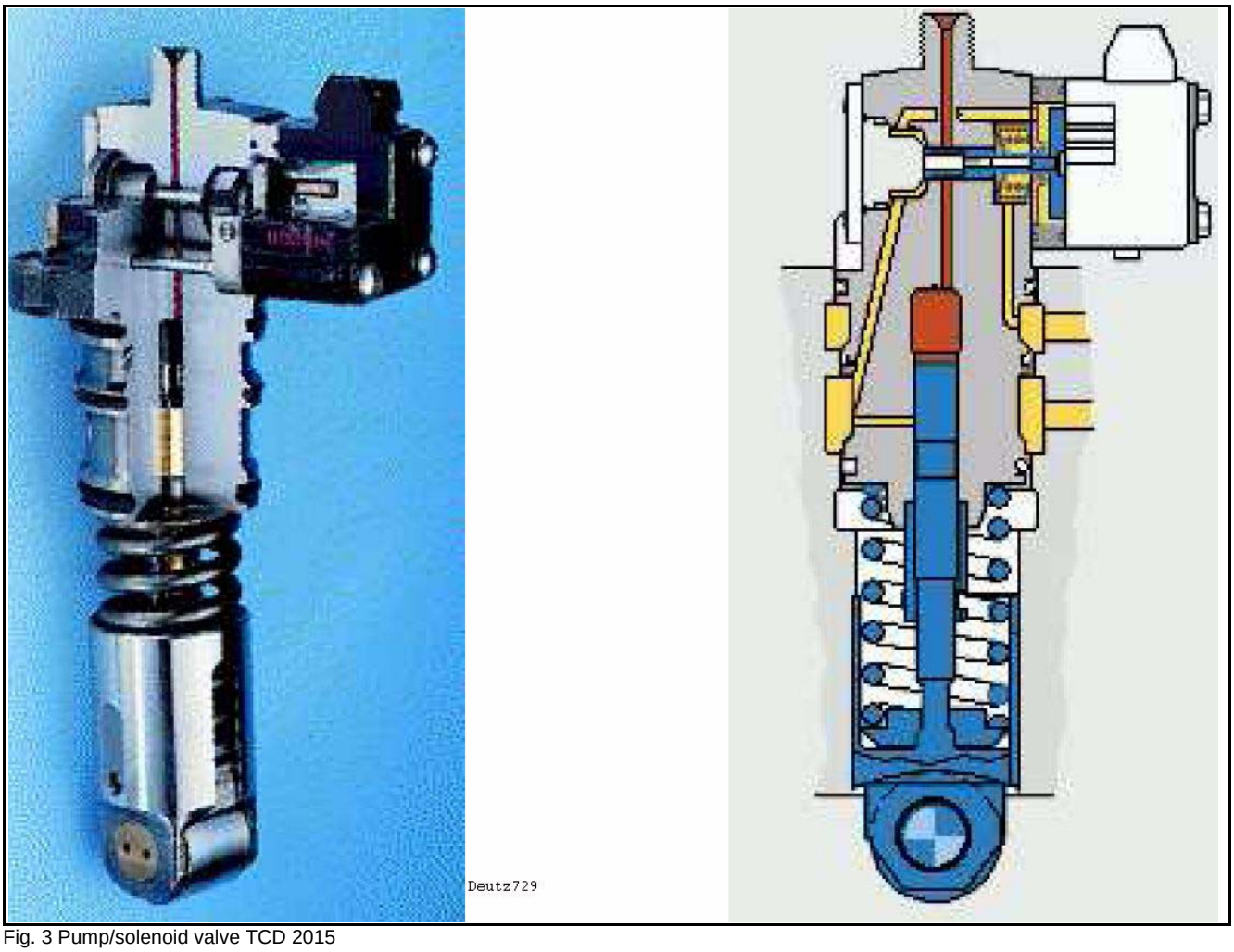


Fig. 3 Pump/solenoid valve TCD 2015

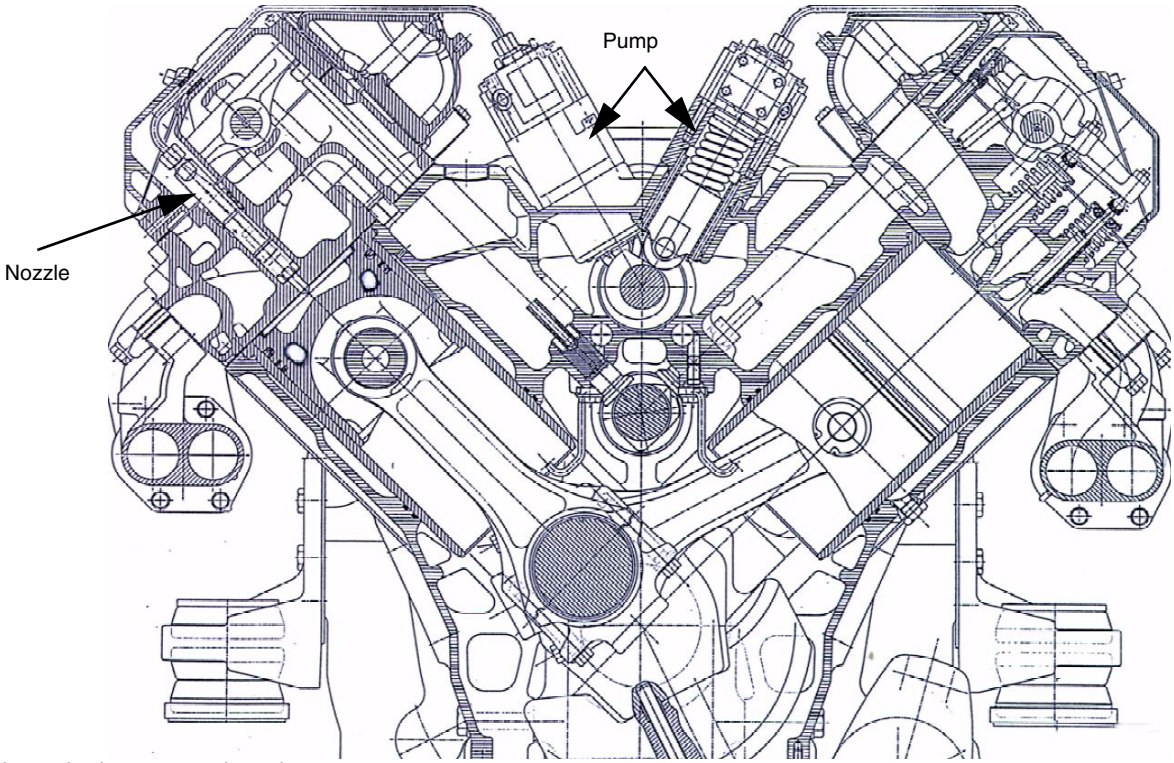


Fig. 4 Injection pump and nozzle

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11.7 Exhaust gas recirculation TCD 2015

In order to be able to meet the exhaust gas standards EC and stage/Tier3, all engines are designed with exhaust gas recirculation.

On 6 and 8 cylinder engines TCD 2015 the exhaust gas recirculation has been realized internally through the exhaust valves. For this purpose the camshaft has been manufactured with an additional cam for short-term opening of the exhaust valve

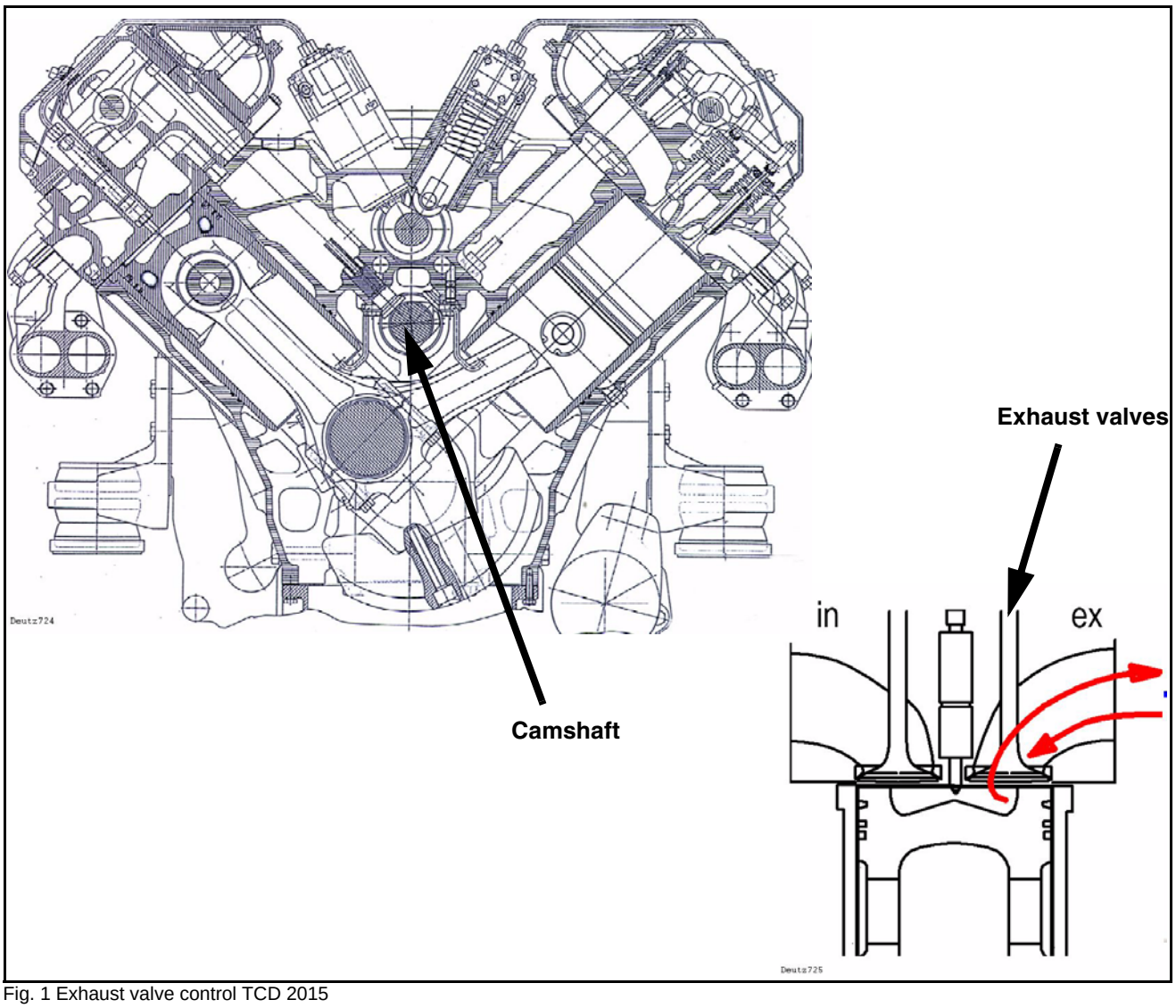


Fig. 1 Exhaust valve control TCD 2015

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11.8 Wastegate - charge pressure controller on TCD-engines

The Wastegate is a exhaust gas bypass valve and is located on or in the exhaust turbocharger

The Wastegate (exhaust gas bypass valve) is used to control the charge pressure

The charge pressure control takes place by means of a charge pressure triggered pressure valve in connection with the exhaust gas bypass valve. Depending on this bypass valve hot exhaust gases flow past the exhaust gas turbine into the exhaust without the available energy being utilized

The bypass valve is normally closed

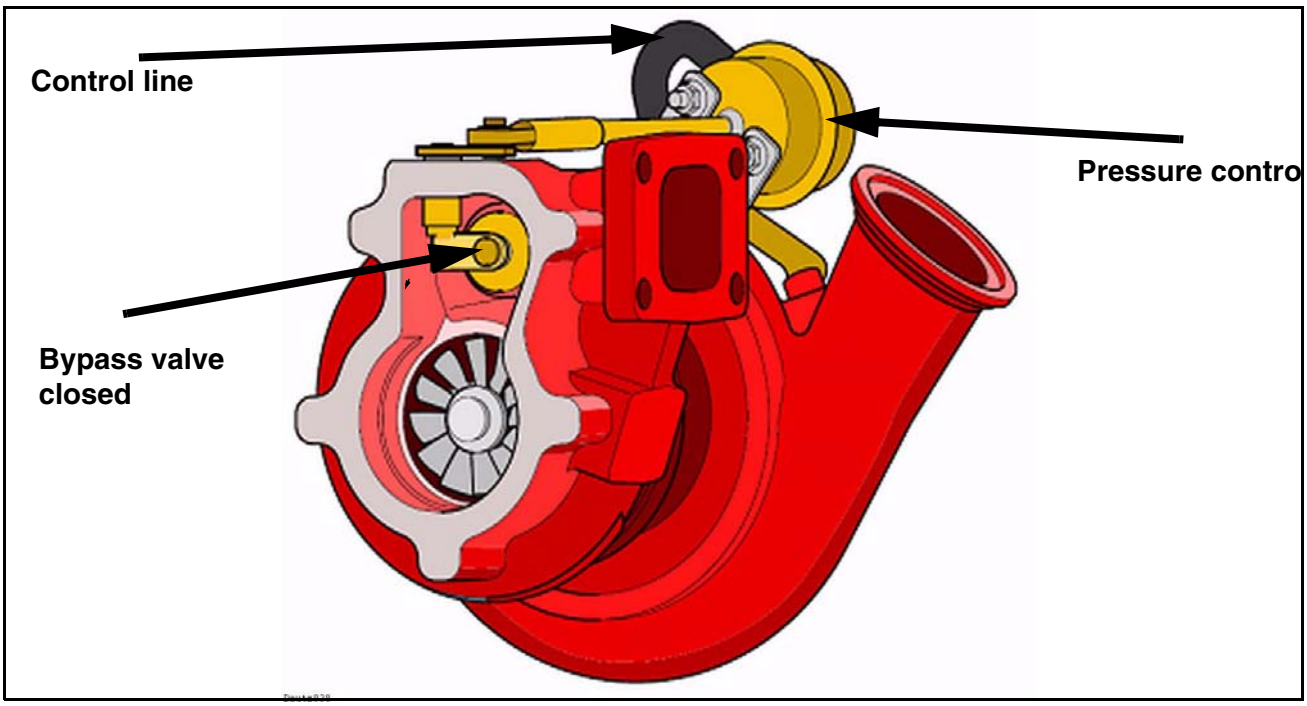


Fig. 1 Exhaust gas turbocharger with Wastegate

Wastegate active, charge pressure control, i.e. bypass valve open

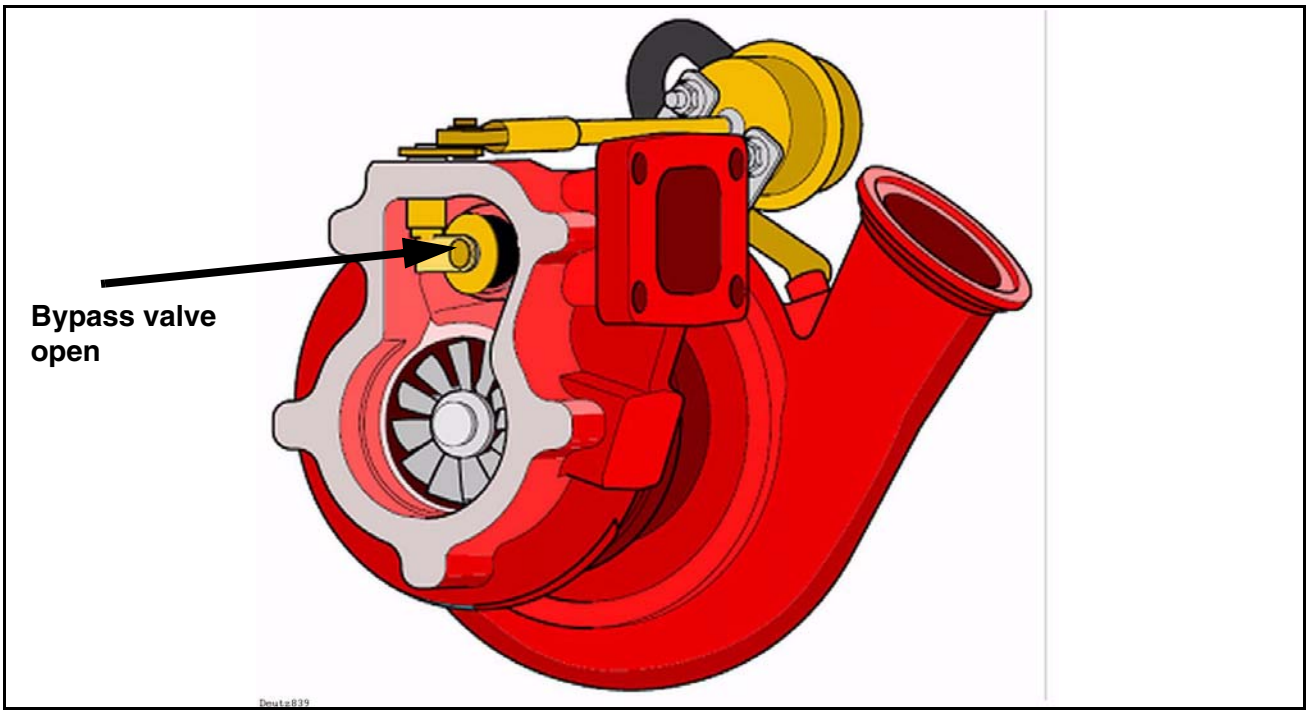


Fig. 1 Exhaust gas turbocharger with Wastegate

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Wastegate on TCD 2013

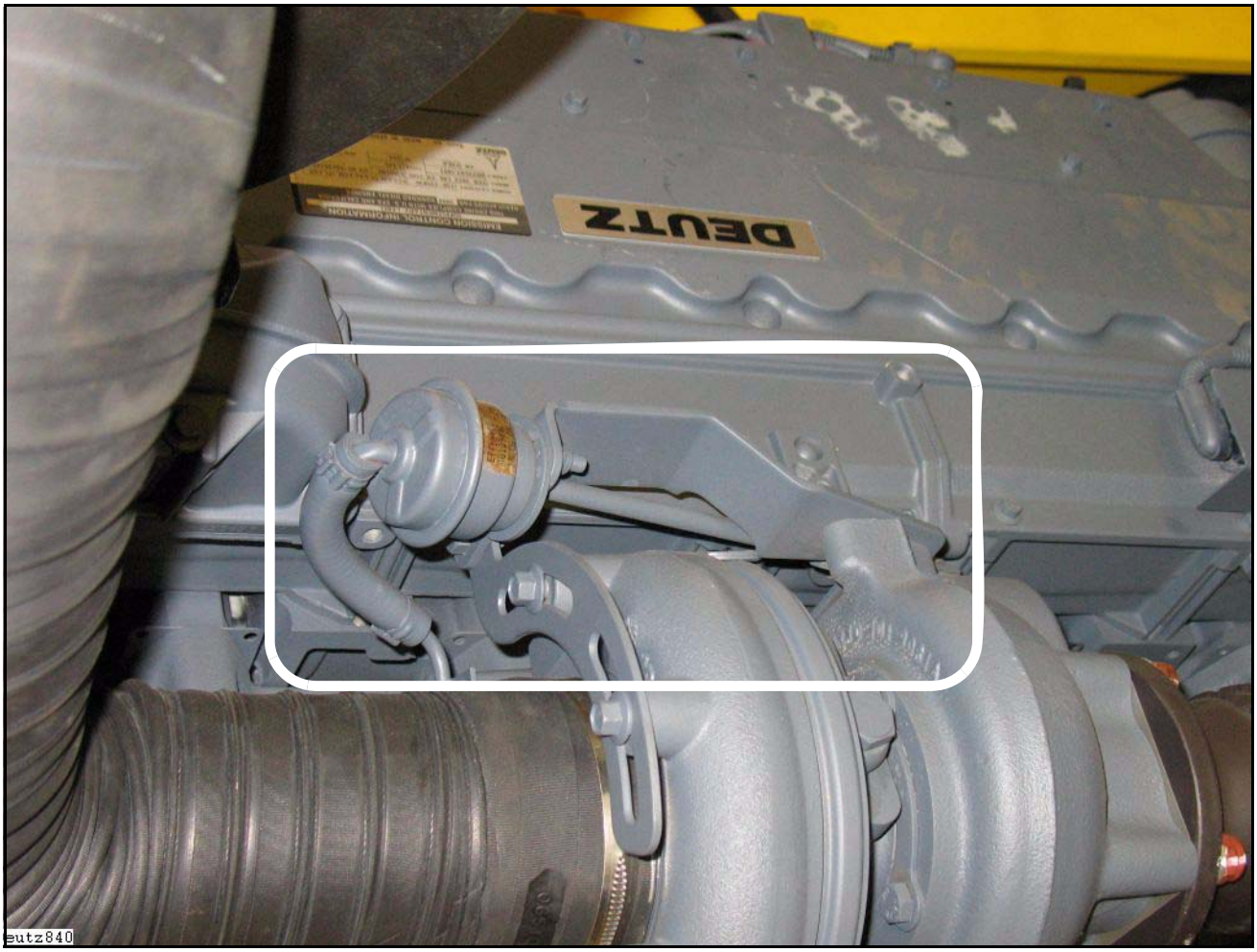


Fig. 2 Exhaust gas turbocharger with Wastegate

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11.9 Check, adjust the valve clearance

⚠ Caution

We recommend to have this work carried out by trained personnel or our after sales service.

Before checking the valve clearance let the engine cool down for at least 30 minutes. The engine oil temperature must be less than 80 °C.

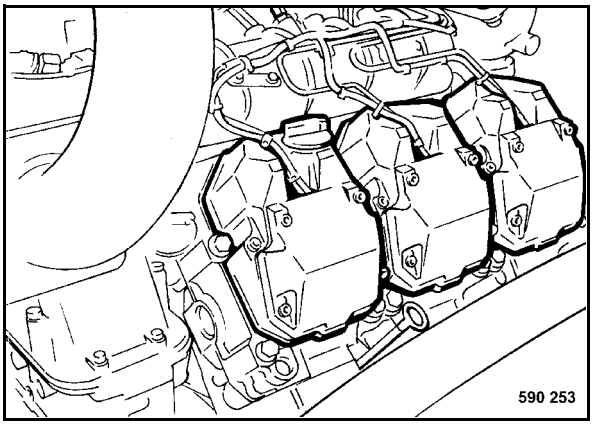


Fig. 3

- Remove all valve covers (Fig. 3).

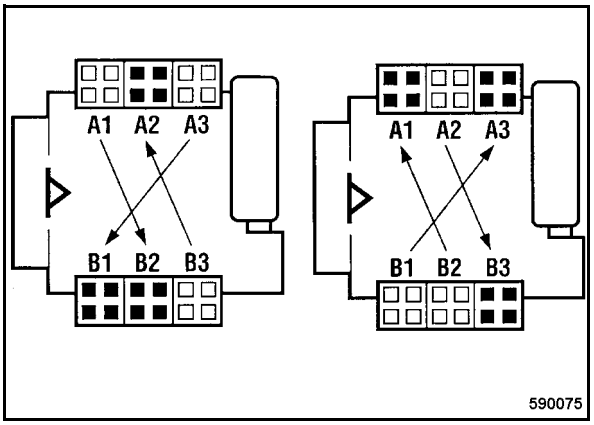


Fig. 4

Adjustment diagram (Fig. 4)

Valves	Cylinder					
overlapping	A1	B3	A3	B2	A2	B1
adjustment	B2	A2	B1	A1	B3	A3

- Turn the crankshaft until the valves are overlapping.

⚠ Caution

This engine is equipped with an internal exhaust recirculation system. During the intake cycle the exhaust valve opens for a short moment.

This must not be mistaken as overlapping of valves!

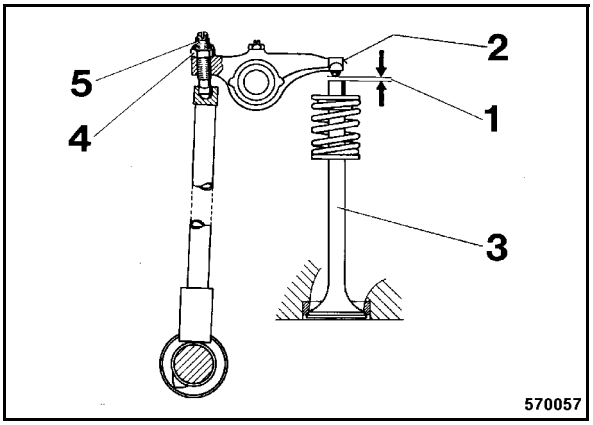


Fig. 5

Check the valve clearance

- Intake valves 0,25 mm
- Exhaust valves 0,30 mm
- A feeler gauge of appropriate thickness (1) must fit with little resistance between rocker arm (2) (Fig. 5) and valve (3).
- If the gap is too narrow or too wide for the feeler gauge, the valve must be adjusted.

Adjusting the valve clearance

- Loosen counter nut (4) (Fig. 5) for 2 to 3 turns.
- Adjust the setscrew (5) with a screwdriver, until the feeler gauge can be inserted and pulled out with little resistance after retightening the counter nut.
- Repeat the adjustment procedure on each cylinder.

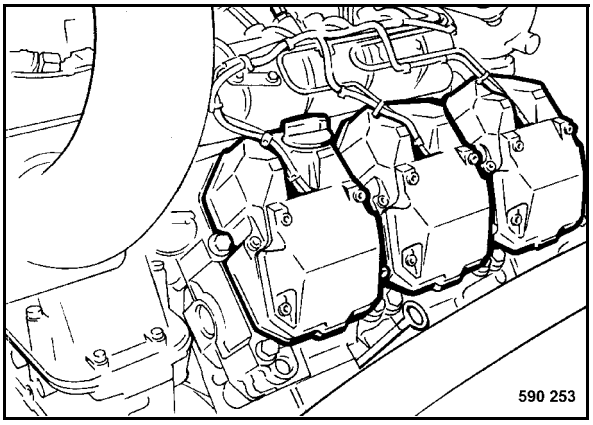


Fig. 6

- Assemble all cylinder nead covers with new gaskets (Fig. 6), tightening torque: 22 Nm.

⚠ Caution

After a short test run check the engine for leaks.

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11.10Check the engine oil level

i Note

The machine must be in horizontal position. Just before testing run the engine approx. 2 minutes with idle speed. Shut the engine down.

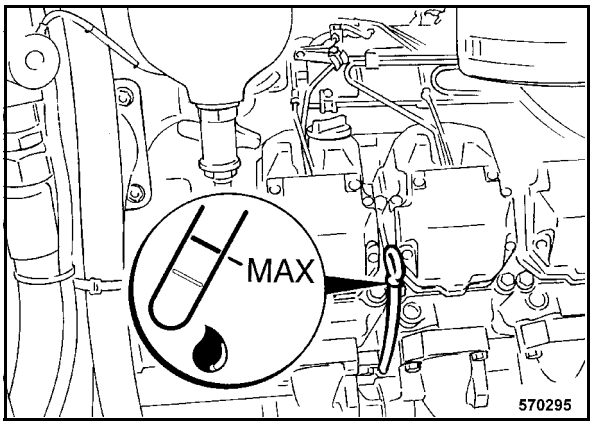


Fig. 7

- Pull the dipstick (Fig. 7) out, wipe it off with a lint-free, clean cloth and reinsert it until it bottoms.
- Pull the dipstick back out again.
- The oil level must be near the ”Max”-mark.
- If the oil level is too low top up oil immediately.

For quality of oil refer to the table of fuels, lubricants and filling capacities.

11.11Change the engine oil

i Note

Drain the engine oil only when the engine is warm. Preferably use oils of ACEA-classification E4-99/E6-04. This allows the utilisation of the longest oil change intervals.

Oil change intervals (operating hours) for ACEA quality:

E4-99/E6-04 = 500 operating hours

⚠ Caution

With a fuel consumption of >50l/h the oil change must be performed every 250 operating hours

⚠ Danger

Danger of scalding!

Danger of scalding when draining off hot oil!

Environment

Environmental damage!

Do not let old oil seep into the ground, but dispose off environmentally.

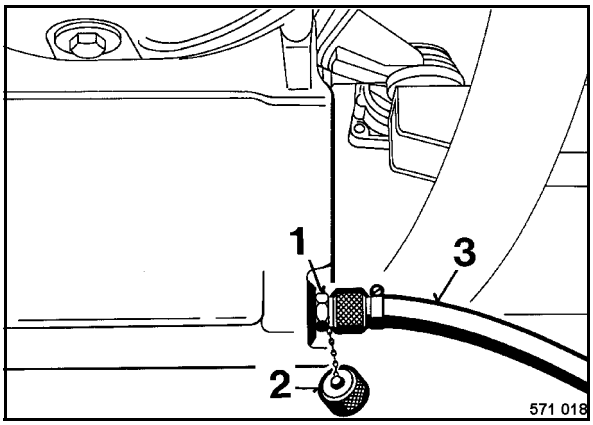


Fig. 8

- Remove the rear service door.
- Unscrew the safety cap 2 (Fig. 8) from the oil drain socket (1).
- Take the oil drain hose (3) out of the right hand storage compartment and screw it on, drain the engine oil off and collect it.
- Once the old oil has run out remove the drain hose and screw the safety cap back on.

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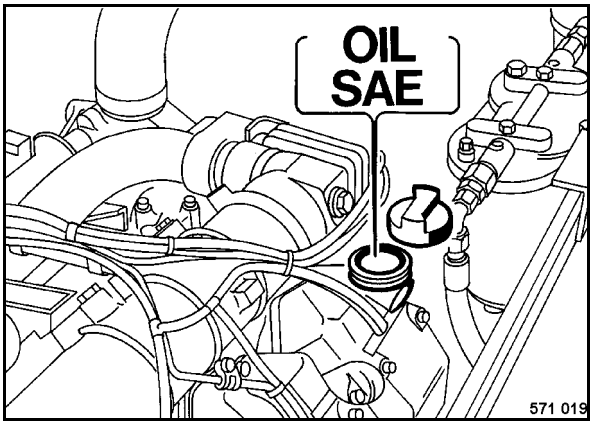


Fig. 9

- Fill in new engine oil (Fig. 9) through the oil filler neck.

For quality and quantity of oil refer to the table of fuels, lubricants and filling capacities.

- Screw the cap back on again.

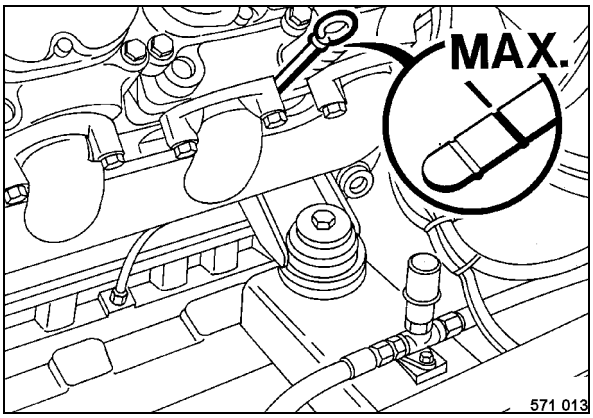


Fig. 10

- After a short test run check the oil level on the dipstick (Fig. 10), if necessary top up to the top mark ("Max").

11.12Changing the engine oil filter

⚠ Danger

Danger of scalding!

There is a danger of scalding by hot oil when unscrewing the engine oil filter.

Environment

Environmental hazard!

Catch running out oil and dispose of environmentally together with the engine oil filter cartridge.

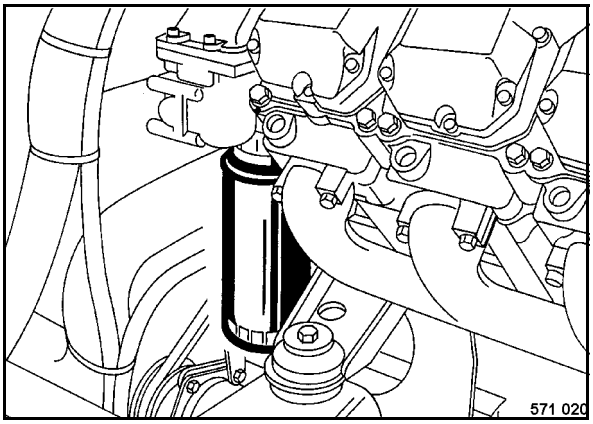


Fig. 11

- Loosen the engine oil filter (Fig. 11) with a suitable filter wrench and screw it off.
- Wipe the sealing face clean.
- Apply a thin film of clean oil to the rubber seal of the new engine oil filter.
- Screw the new engine oil filter on hand-tight.
- Perform a short test run, inspect the engine for leaks and check the oil level, top up oil if necessary.

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11.13 Replacing the fuel pre-filter cartridge, bleeding the fuel system

⚠ Danger

Fire hazard!

When working on the fuel system do not use open fire, do not smoke and do not spill any fuel.

⚠ Danger

Health hazard!

Do not inhale any fuel fumes.

⚠ Caution

Ensure strict cleanliness! Thoroughly clean the area around the fuel filters.

After work on the fuel system bleed the system, perform a test run and check for leaks.

Additional bleeding of the fuel system by a 5 minute test run in idle speed or low load is mandatory.

Environment

Catch running out fuel and dispose of environmentally.

Change the fuel pre-filter cartridge

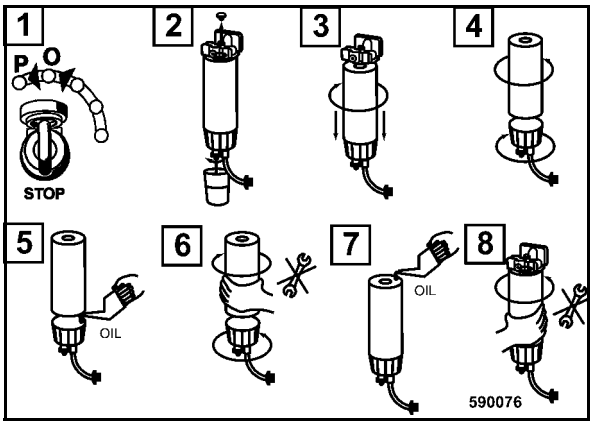


Fig. 12

- (1) Shut down the engine (Fig. 12).
- (2) Pull the cable off the water separator. Loosen the bleeding screw and drain off fuel from the bleeding screw.
- (3) Loosen and unscrew the fuel pre-filter cartridge using an appropriate filter wrench.
- (4) Unscrew the water separator from the filter cartridge.
- (5) Apply a thin coat of oil to the rubber seal of the water separator.
- (6) Turn the water separator on by hand, until the seal contacts, then tighten hand-tight.
- (7) Apply a thin coat of oil to the rubber seal of the filter element.
- (8) Turn the filter cartridge on by hand, until the seal contacts, then tighten hand-tight. Plug the cable of the water sensor back on.

Bleed the fuel system

i Note

Air in the fuel system causes irregular running of the engine, a drop in engine power, stalls the engine and makes starting impossible.

Therefore bleed the fuel system after changing the fuel pre-filter or working on the fuel system.

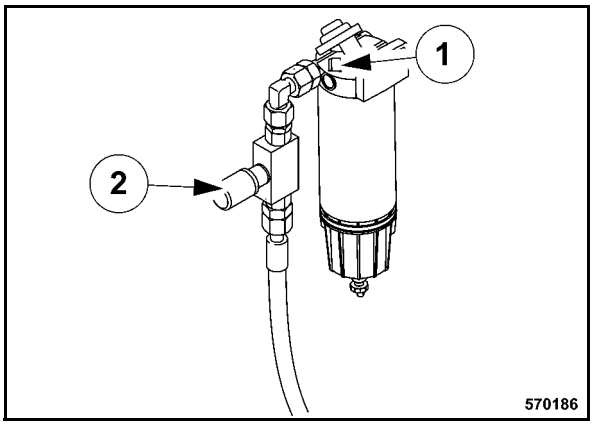


Fig. 13

- Slacken the bleeding screw (1) (Fig. 13) on the fuel pre-filter for 2 to 3 turns.
- Operate the fuel hand pump (2) manually, until fuel flows out of the loosened bleeding screw without air bubbles.
- Then tighten the bleeding screw while pumping.
- Slacken the bleeding screws on the fuel pre-filters for 2 to 3 turns.
- Operate the fuel hand pump (2) manually, until fuel flows out of the loosened bleeding screws without air bubbles.
- Then tighten the bleeding screws while pumping.
- Start the engine and run it 5 minutes with idle speed.

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11.14 Changing the fuel filter cartridge

⚠ Danger

Fire hazard!

No open fire, do not smoke, do not spill any fuel.

Do not inhale any fuel fumes.

Environment

Catch running out fuel, do not let it seep into the ground.

- Open the left hand engine compartment doors.

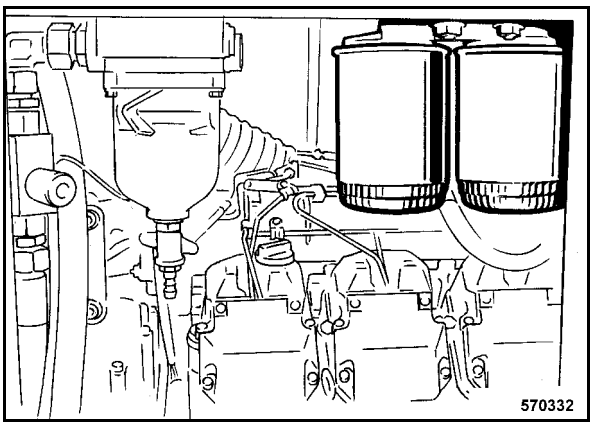


Fig. 14

- Loosen both fuel filters (Fig. 14) using a suitable filter wrench and screw it off.
- Clean the sealing face on the filter carriers from any dirt.

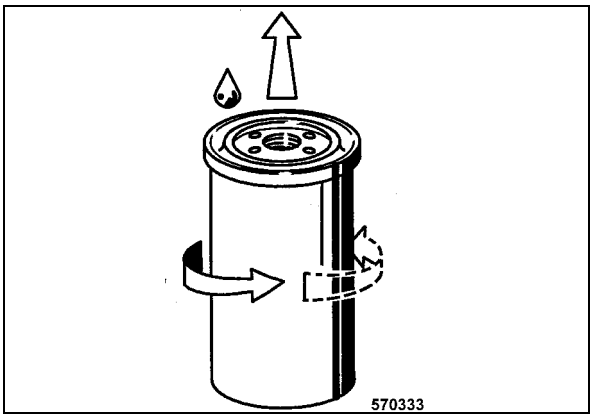


Fig. 15

- Slightly oil the rubber seal on the new filter cartridge (Fig. 15).
- Fill the filter cartridge with clean diesel fuel.
- Turn the new filter cartridge on by hand, until the seal contacts.
- Then tighten hand-tight.
- Check for leaks after a short test run.

11.15 Checking condition of radiator, intercooler and hydraulic oil cooler, clean, cleaning the engine

i Note

Dirty operating conditions, particularly lubrication oil and fuel deposits on the cooling fins reduce the cooling effect. You should therefore immediately seal any oil or fuel leaks near cooling fan, cylinder or oil cooler and subsequently clean the cooling fins.

⚠ Danger

Danger of injury!

Perform cleaning work only after the engine has cooled down and with the engine stopped!

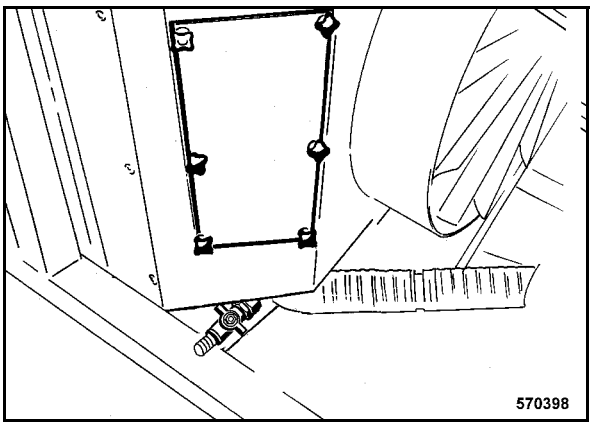


Fig. 16

- Remove the service covers on left (Fig. 16) and

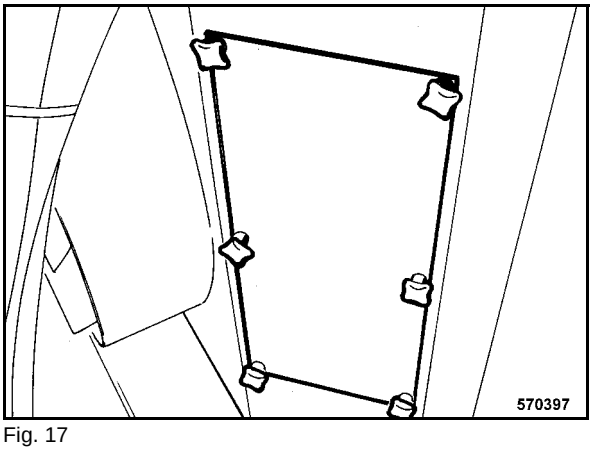


Fig. 17

- right hand side (Fig. 17) of the air duct housing.

⚠ Caution

During cleaning take care not to damage the fins on hydraulic oil cooler, intercooler and radiator. Keep a safe distance with the spray nozzle.

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i Note

Clean the coolers in the correct sequence.

- Clean hydraulic oil cooler, intercooler and radiator from the air duct side first.

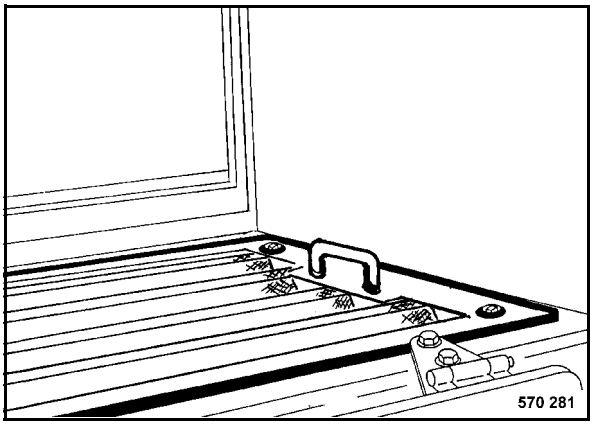


Fig. 18

- Remove the service door (Fig. 18).
- Clean all coolers from the air intake side.
- Remove dried on dirt with a suitable brush.
- Blow the cooling air channels out with compressed air.
- In case of oily contamination spray the parts with cold cleansing agent and spray it off with a water jet after s sufficient soaking time.
- If steam cleaning equipment is available, this should preferably be used.

Cleaning the engine

⚠ Caution

After cleaning the coolers it is mandatory to clean the engine.

Cover all parts of the electrical system, do not subject to the direct water jet.

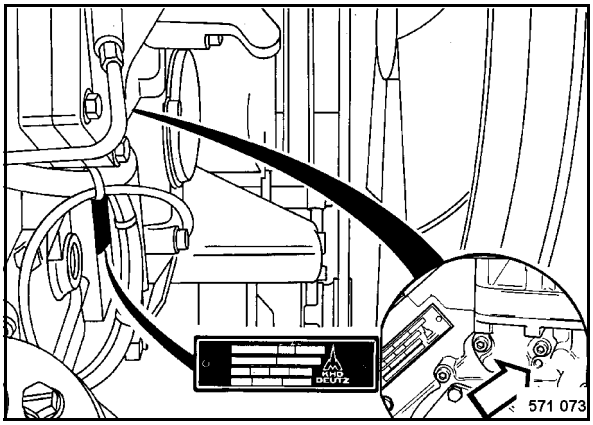


Fig. 19

- Blow the engine dry with compressed air. Flush lose dirt with a water jet out of the V-shaped space between the cylinders.
- The drain bore (Fig. 19) must be free, remove blockage if necessary.

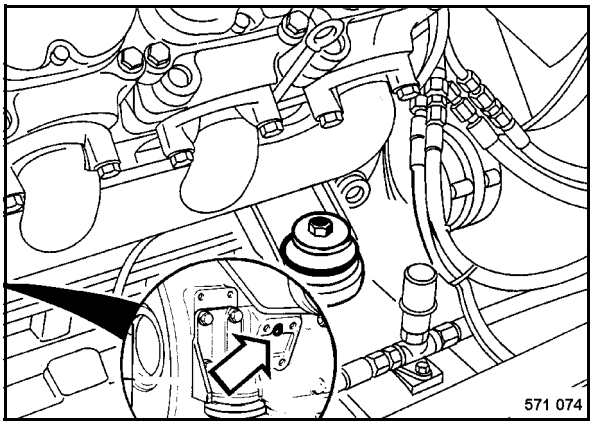


Fig. 20

- In case of oily contamination spray the engine with cold cleansing agent and spray it off with a water jet after s sufficient soaking time.
- Drain bores (Fig. 20) and (Fig. 19) must be free, remove blockage if necessary.
- After wet cleaning run the engine warm to evaporate all water residues and to avoid corrosion.
- Reinstall the service covers.

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11.16Changing the coolant, venting the cooling system

⚠ Danger

Danger of scalding!

Change the coolant only when the engine is cold.

⚠ Caution

Do not start the engine after draining off the coolant.

When changing the coolant without any signs of contamination, cleaning of the cooling system is not necessary.

Environment

Catch coolant and dispose of environmentally.

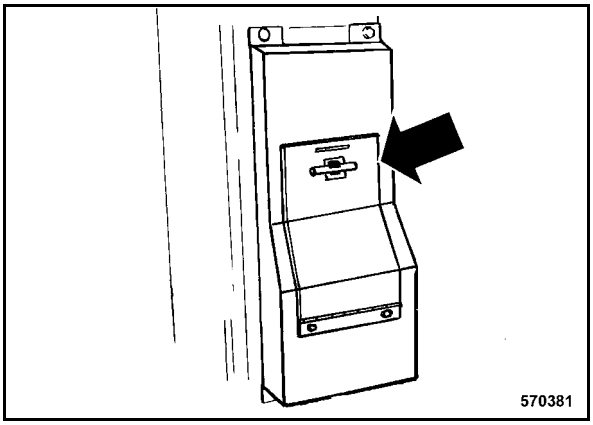


Fig. 21

- Open the safety flap (Fig. 21).

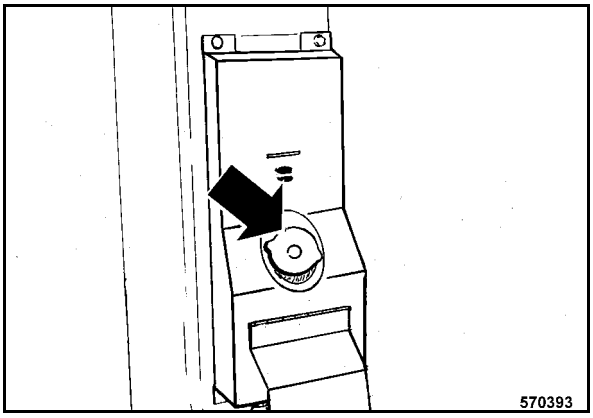


Fig. 22

- Unscrew the cap (Fig. 22).

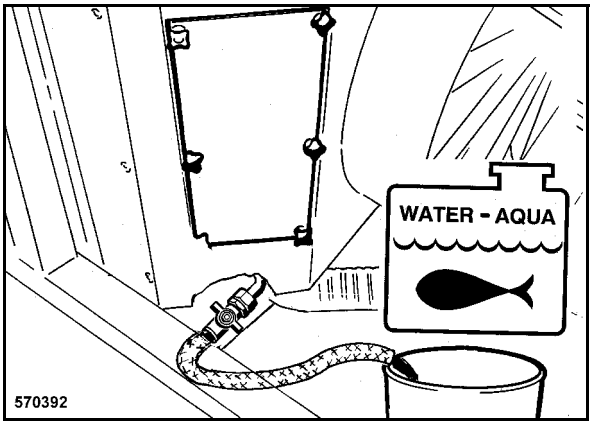


Fig. 23

- Connect the drain hose to the drain cock (Fig. 23).
- Guide the drain hose into a vessel of appropriate size.
- Open the drain cock and let the coolant run out.
- Once all coolant has run out close the drain cock, remove the drain hose and screw the plug back on.

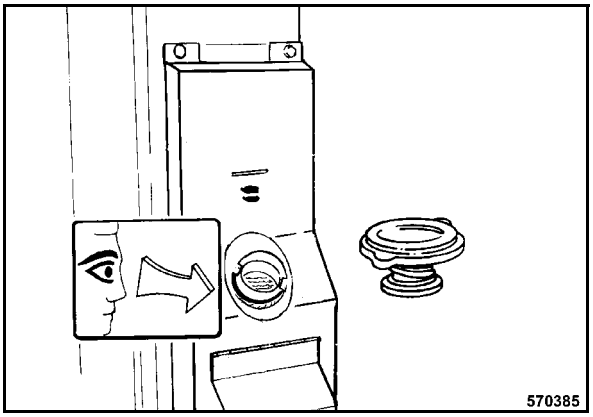


Fig. 24

- Fill coolant in through the opening in the compensation tank (Fig. 24).

For coolant quantity refer to the table of fuels, lubricants and filling capacities.

- Close the compensation tank. For bleeding start the engine and run it warm.
- Check the coolant level, top up if necessary.

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11.17Checking the anti-freeze concentration

⚠ Caution

In order to avoid damage to the engine e.g. by corrosion, cavitation and freezing, particular attention must be paid to the inspection of the coolant.

⚠ Danger

Danger of scalding!

Check the anti-freeze concentration only when the engine is cold.

- Perform the inspection with conventional test equipment.
- The anti-freeze concentration (additive) must be at least 35 Vol% and maximum 45 Vol%.

⚠ Danger

Health hazard!

The mixing of nitrite based anti-freeze agents with amine based agents results in the formation of health affecting nitrosamines.

Environment

Catch all anti-freeze agent and dispose of environmentally.

11.18Checking the thermostat in disassembled state

The thermostat serves the optimal temperature control of the coolant, in order to promote efficient combustion and to bring the engine quickly to operating temperature after starting. At temperatures below approx. 83°C the thermostat is closed. Once the coolant temperature has reached about 83°C, the thermostat will start to open, at about 95° C it is fully open. In this condition the full coolant flow is guided through the radiator.

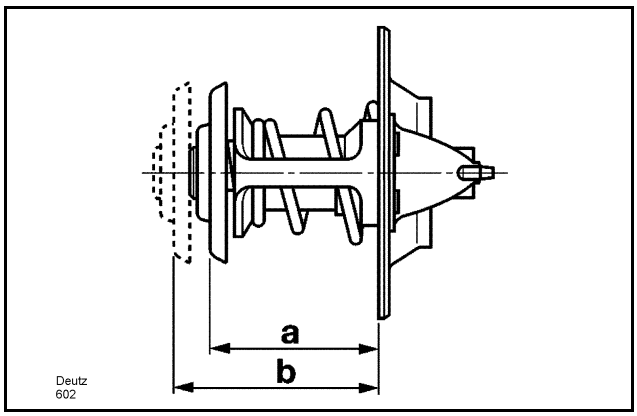


Fig. 1

- Measure and write down the measurement "a" on the thermostat (Fig. 1).

⚠ Caution

Take note of different opening temperatures (Fig. 2) (arrows) of the thermostats.

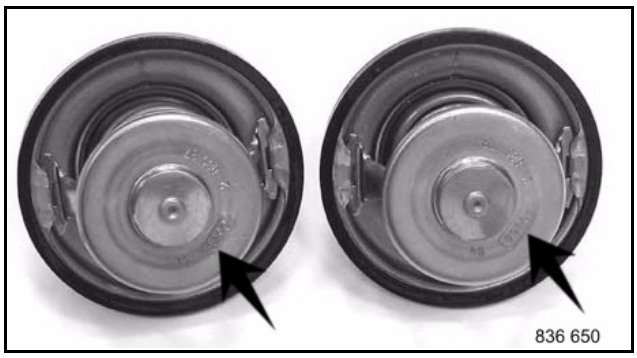


Fig. 2

i Note

"a" = Start of stroke (A-Bank, colour mark black ventilation groove at top) at approx. 79°C

"a" = Start of stroke (B-Bank, ventilation groove at top) at approx. 87°C

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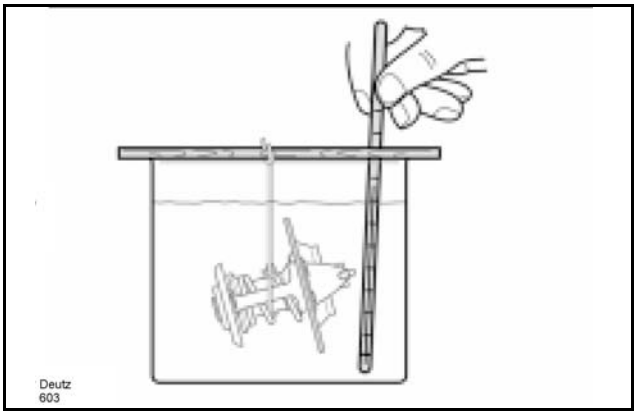


Fig. 3

- Warm up the thermostat in a water bath (Fig. 3).

i Note

In order to determine the exact start of opening the temperature should be measured as close to the thermostat as possible, but without touching it.

The water must thereby be stirred continuously, to ensure even temperature distribution.

The temperature increase should not exceed 1°C/ min, as otherwise the start of opening will be delayed accordingly.

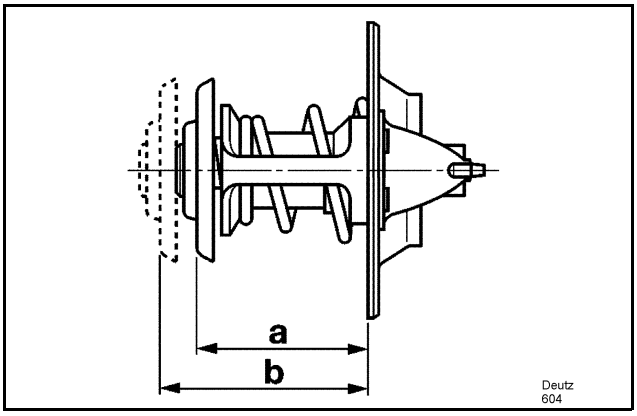


Fig. 4

- Measure and write down the measurement "b" on the thermostat . (Fig. 4).
- Calculate the stroke.

Stroke = b - a

i Note

Stroke length min. 8 mm.

11.19Servicing the fan V-belt

⚠ Danger

Danger of injury!

Work on the fan V-belt must only be performed with the engine shut down.

Checking the fan V-belt

⚠ Caution

A belt tension meter is required to check the V-belt tension.

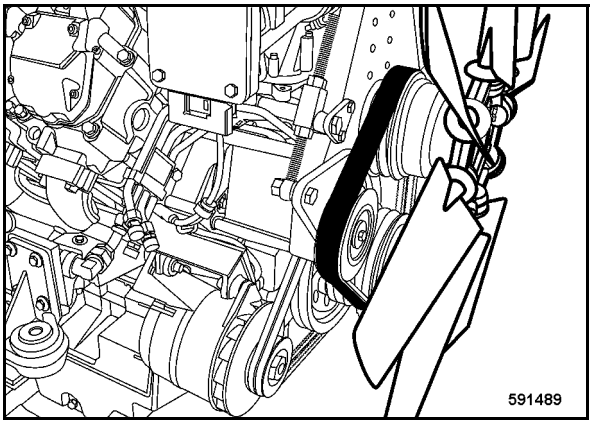


Fig. 5

- Inspect the entire circumference of the V-belt (Fig. 5) visually for damage and cracks.
- Replace damaged or cracked V-belts.

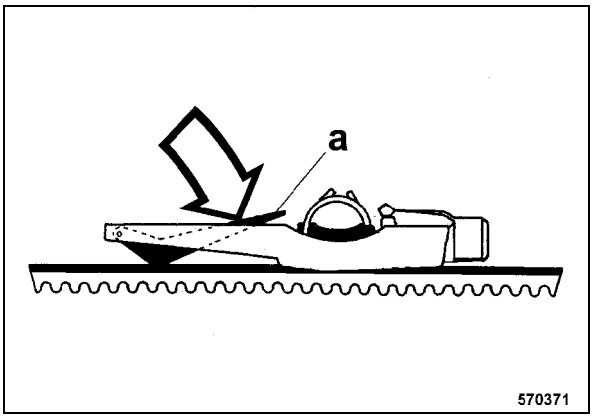


Fig. 6

- Press the indicator arm (a) of the tester (Fig. 6) into the gap of the measuring scale.
- Place the meter in the middle between the V-belt pulleys on the back of the fan V-belt.

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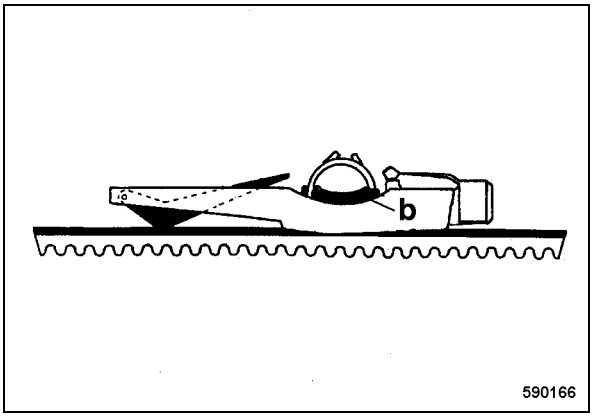


Fig. 7

- Actuate the push button (b) (Fig. 7) evenly with a finger under a right angle to the V-belt, until the pressure spring disengages audibly and noticeably.

i Note

The indicator arm remains in the measured position.

- Take the measuring unit carefully off, without moving the indicating arm.

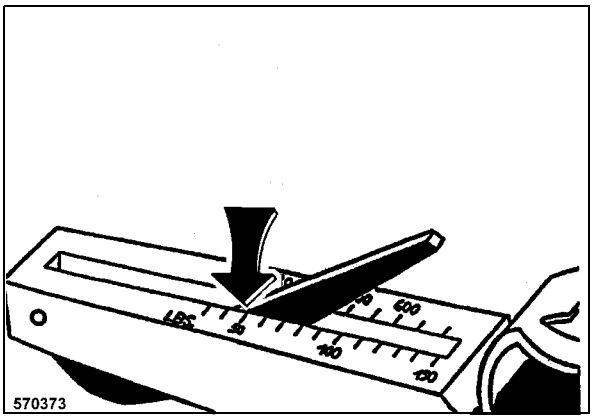


Fig. 8

- Read the V-belt tension where the upper edge of the indicating arm intersects with the measuring scale (Fig. 8).

First installation = approx. 1900 N

after approx. 30 - 60 minutes running-in time = approx. 1400 N

Min. 1100 N = tension to approx. 1400 N

Tensioning the fan V-belt

⚠ Caution

Do not tighten the V-belt excessively, since this would damage the V-belt which in turn could lead to damage on V-belt drive and engine.

Never tighten the new V-belt a second time to the value of 1900 N, even after only a brief engine operation!

With a new V-belt check the tension after approx. 50 operating hours and tighten it to approx. 1400 N.

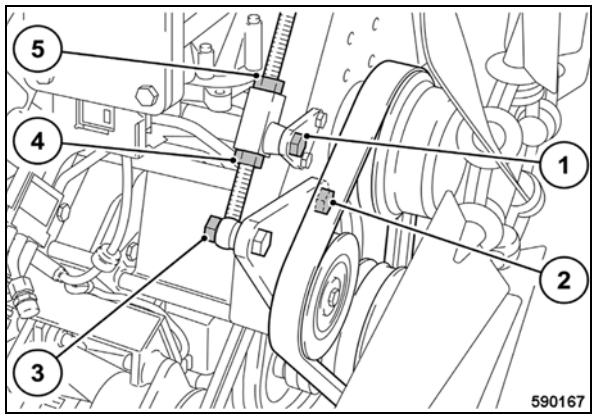


Fig. 9

- Slightly loosen screws (1) and (2) (Fig. 9) as well as nut (3), so that there is still friction between the components.
- Loosen the nut (4) for a few turns.
- Turn the nut (5) clockwise and tension the V-belt.
- Tighten the screw (2).
- Measure the V-belt tension, tighten if necessary.
- Slightly slacken the nut (5).
- Tighten the nut (3).
- Screw both nuts (4) and (5) to contact, then counter both nuts against each other.
- Tighten the screw (1).

Change the fan V-belt

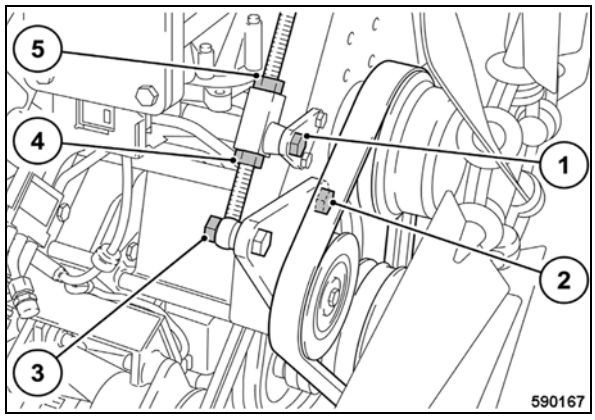


Fig. 10

- Slightly loosen screws (1) and (2) (Fig. 9) as well as nut (3), so that there is still friction between the components.
- Loosen the nut (4) for a few turns.
- Turn the nut (5) back so that the idler pulley is able to swing back far enough.
- Take off the old V-belt and install a new one.

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- Turn the nut (5) clockwise and tension the V-belt.
- Tighten the screw (2).
- Start the engine for a moment or crank it once by hand.
- Measure the V-belt tension, tighten if necessary.

11.20 Checking the condition and tension of the generator V-belt, replacing the V-belt

⚠ Danger

Danger of injury!

Work on the generator V-belt must only be performed with the engine shut down.

Checking the V-belt

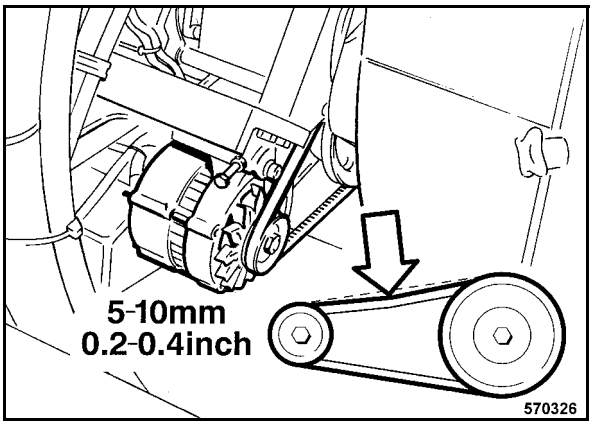


Fig. 11

- Inspect the entire circumference of the V-belt (Fig. 11) visually for damage and cracks. Replace damaged or cracked V-belts.
- Check with thumb pressure whether the V-belt can be depressed more than 5 to 10 mm between the V-belt pulleys, retighten if necessary.

Retightening the V-belt

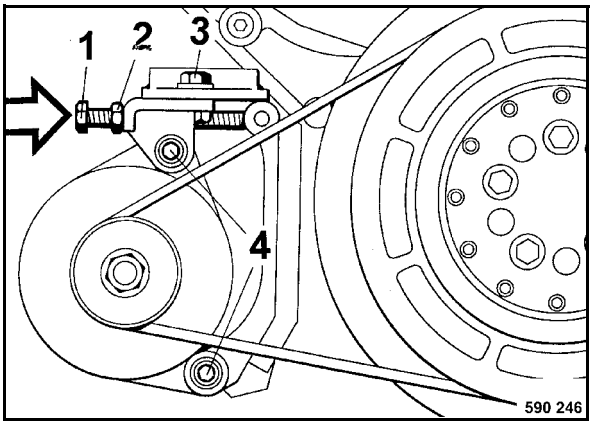


Fig. 12

- Slacken the fastening screws 3 and 4 (Fig. 12) slightly.
- Loosen the counter nut (2).
- Turn down tensioning screw (1) in direction of arrow, until the correct V-belt tension is reached.
- Retighten hexagon screws and counter nut.

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Changing the V-belt

- Remove the V-belt of the fan drive.

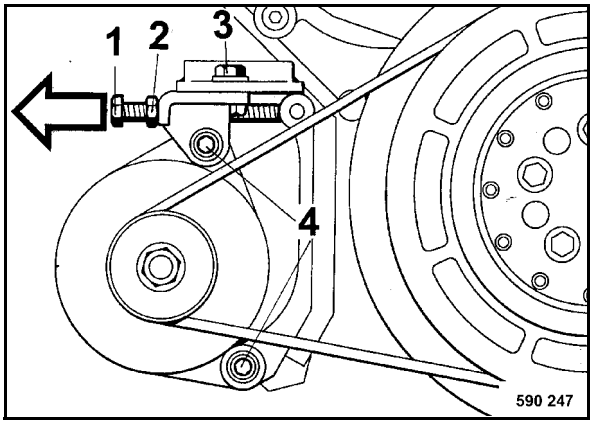


Fig. 13

- Slacken the fastening screws 3 and 4 (Fig. 13) slightly.
- Loosen the counter nut (2).
- Turn tensioning screw (1) in direction of arrow to the stop.
- Take the old V-belt off the V-belt pulley.
- Fit the new V-belt to the V-belt pulleys.
- Tension the V-belt as previously described.
- Reinstall and tension the fan drive V-belt.

i Note

Retighten new V-belts after a running time of 15 minutes.

11.21Check the engine mounts

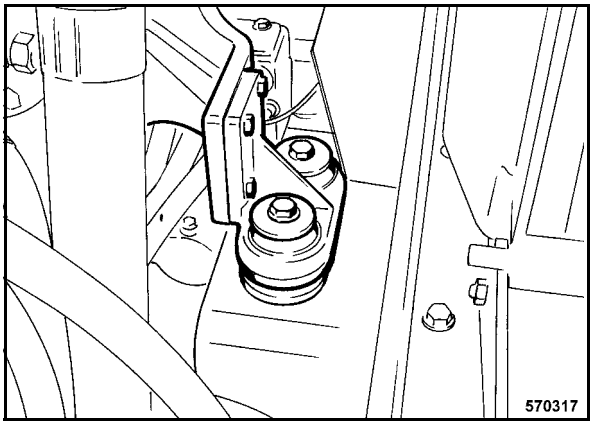


Fig. 14

- Check all fastening screws on the engine mounts for tight fit, tighten if necessary (Fig. 14).

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11.22 Checking the fastening of engine / turbo charger / combustion air hoses

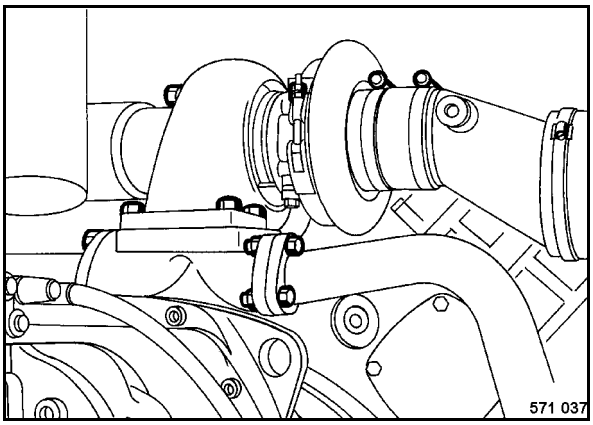


Fig. 15

- Check charge air pipe (Fig. 15) and intercooler for tight fit and leaks.
- Check the exhaust gas pipe and the lubrication oil line to and from the exhaust gas turbo charger for tight fit and leaks.
- Check the connecting sleeves for tight fit.

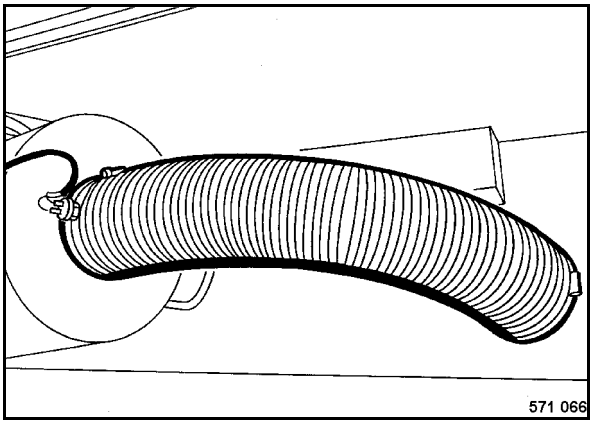


Fig. 16

- Open the maintenance flap on the ROPS.
- Check the combustion air hose for tight fit and leaks (Fig. 16).

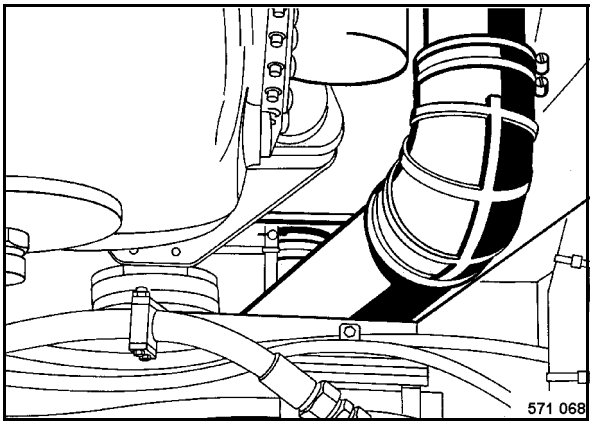


Fig. 17

- Check combustion air tube and connecting sleeves for tight fit (Fig. 17).

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11.23General trouble shooting chart TCD 2015

Faults	Causes	Action
Engine does not start or starts poorly	Temperature below starting limit	
	Engine oil with wrong SAE viscosity class	Change the lubrication oil
	Fuel quality not as specified in the operating instructions	Change the fuel
	Air in the fuel system	Bleed the fuel system
	Battery defective or not charged	Check the battery
	Cable to starter loose or oxidized	Check cable connection
	Starter defective or pinion does not engage	Check starter
Engine does not start and diagnostic lamp flashing	Engine electronics prevent starting	Check fault by fault code, repair as necessary
Engine starts, but runs irregularly or misfires	Fuel quality not as specified in the operating instructions	Change the fuel
	Injection line leaking	Check the injection line
	Injection valve defective	Check the injection valve / replace if necessary
Speed changes are possible and diagnostic lamp lights	Engine electronics detected a system fault and activates a substitute speed	Check fault by fault code, repair as necessary
Engine overheating. Temperature warning system responds	Oil level too low	Fill up lubrication oil
	Engine oil level too high	Check oil level, drain off if necessary
	Air filter clogged / exhaust turbocharger defective	Check / replace if necessary
	Air filter service switch / indicator defective	Check / replace if necessary
	Fan defective / V-belt torn or loose	Check fan / V-belt, replace if necessary
	Short circuit of heat in cooling system	Check the cooling system
	Resistance in cooling system too high / flow quantity too low	Check the cooling system
Insufficient engine power	Engine oil level too high	Check the oil level
	Fuel quality not as specified in the operating instructions	Change the fuel
	Air filter clogged / exhaust turbocharger defective	Check / replace if necessary
	Air filter service switch / indicator defective	Check / replace if necessary
	Charge air pipe leaking	Check the charge air pipe
	Injection line leaking	Check the injection line
	Injection valve defective	Check the injection valve
Insufficient engine power and diagnostic lamp lights	Engine electronics reducing the output power	Check fault by fault code, repair as necessary
Engine does not work with all cylinders	Injection line leaking	Check the injection valve / replace if necessary
	Injection valve defective	Check the injection valve / replace if necessary

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Faults	Causes	Action
Engine has to low or no oil pressure	Oil level too low	Fill up lubrication oil
	Extremely slanted position of engine	Check engine pillow blocks / reduce the engine inclination
	Engine oil of wrong SAE class or quality	Change the lubrication oil
Engine has excessive oil consumption	Engine oil level too high	Check oil level, drain off if necessary
	Extremely slanted position of engine	Check engine pillow blocks / reduce the engine inclination
Blue engine exhaust smoke	Engine oil level too high	Check oil level, drain off if necessary
	Extremely slanted position of engine	Check engine pillow blocks / reduce the engine inclination
White engine exhaust smoke	Temperature below starting limit	
	Fuel quality not as specified in the operating instructions	Change the fuel
	Injection valve defective	Check the injection valve / replace if necessary
Black engine exhaust smoke	Air filter clogged / exhaust turbocharger defective	Check / replace if necessary
	Air filter service switch / indicator defective	Check / replace if necessary
	Charge air pipe leaking	Check the charge air pipe
	Injection valve defective	Check the injection valve / replace if necessary

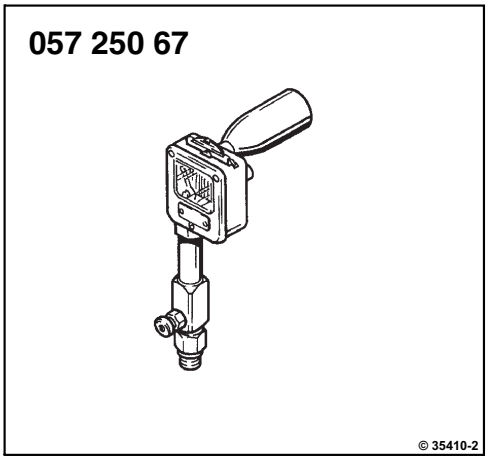
https://truckmanualshub.com/

11.24Special tools, Deutz engine (TCD 2015)

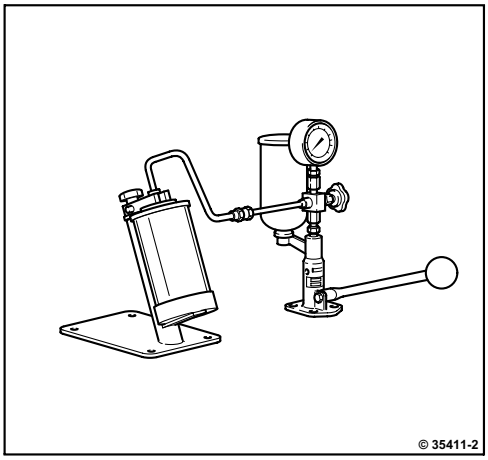
DEUTZ

TCD 2015 — Standard tools

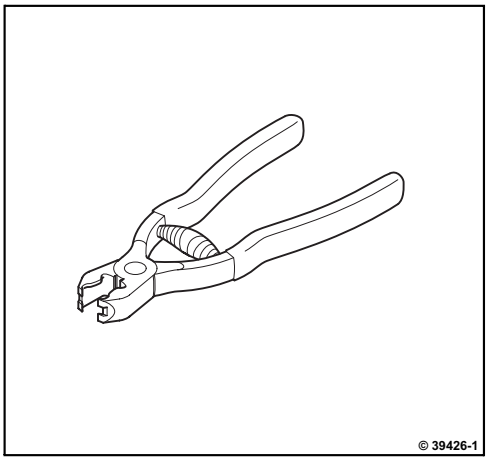
8005
Compression pressure tester
for diesel engines
10 - 40 bar
Checking compression pressure



8008
Nozzle tester
with spray mist collecting vessel
Check injection nozzles



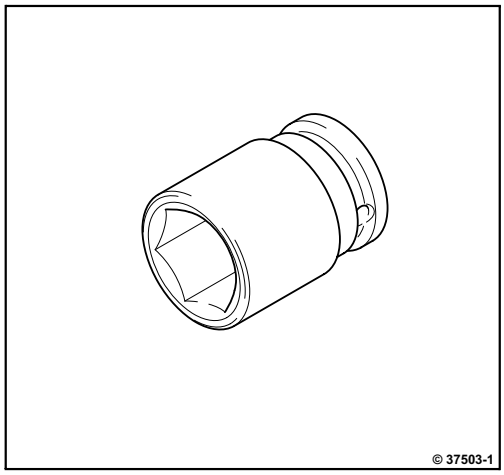
8011
Hose clip pliers
Loosen and fasten hose clips
e. g. fuel return pipe



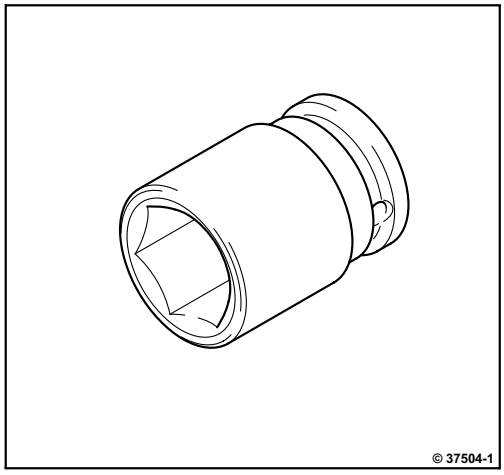
https://truckmanualshub.com/

Standard tools TCD 2015

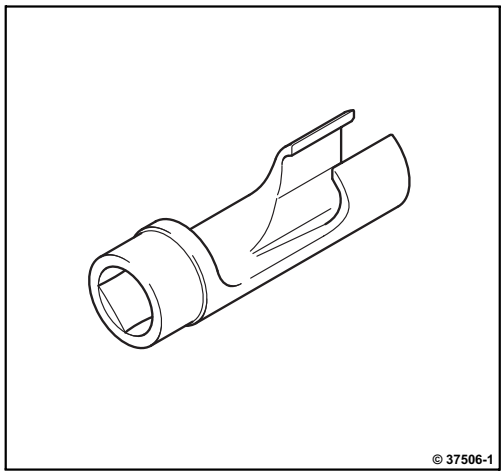
8015
Socket wrench insert
SW 14, reinforced
Unscrew and tighten big end bearing screws.



8016
Socket wrench insert
SW 17, reinforced
Unscrew and tighten flywheel screws.



8018
Claw wrench
SW 17, reinforced
Unscrew and tighten union nuts of the injection pipes.

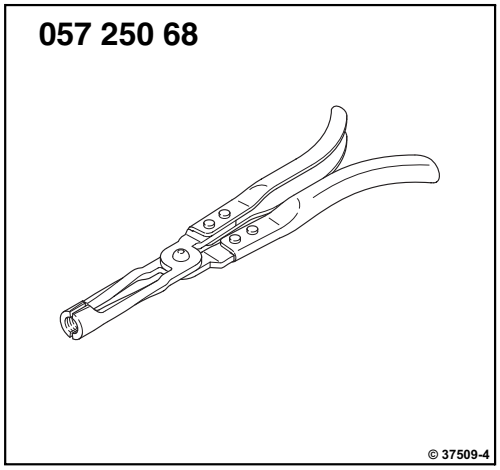


https://truckmanualshub.com/

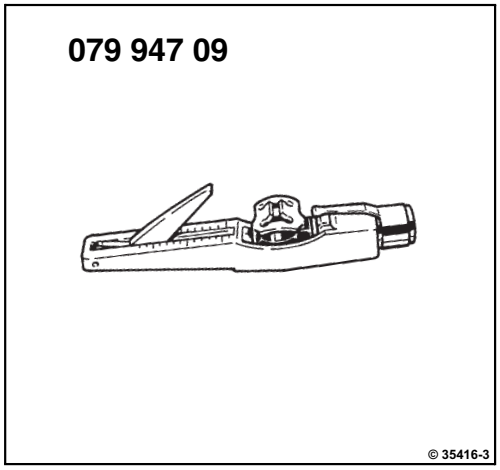
DEUTZ

TCD 2015 Standard tools

8024
Assembly pliers
e. g. removing valve stem seals



8115
V-belt tension measuring device
150 to 600 N
Check V-belt tension



8189
Pricker
Removing rotary shaft lip seal

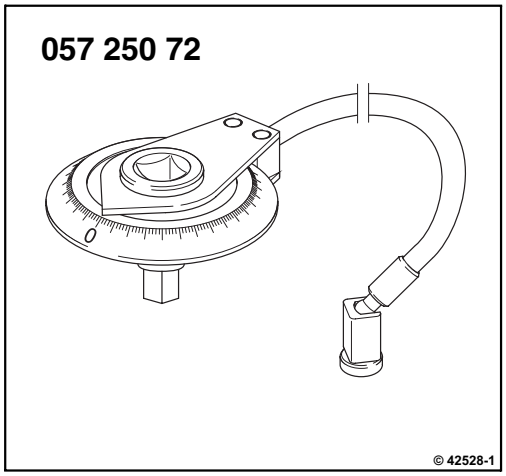


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Standard tools TCD 2015

7

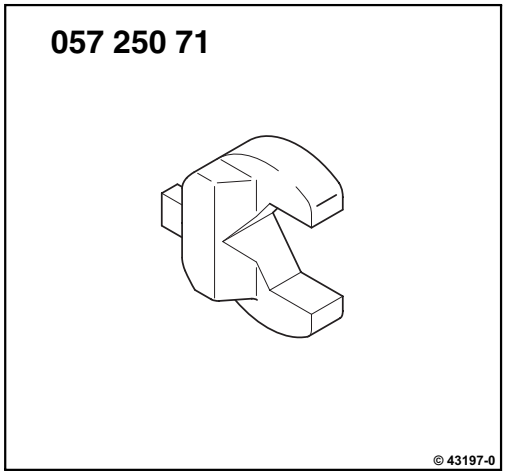
8190
Rotation angle disc
with magnet (e. g. setting valve clearance)



8191
Socket wrench insert
with slotted screwdriver insert (8x1.6)
(e. g. setting valve clearance)



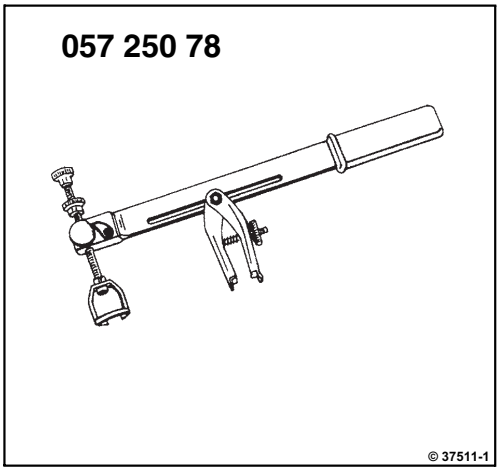
8196
Open end wrench adapter
Size 13,
for torque wrench
Tighten lock nut of the valve clearance setting screw.



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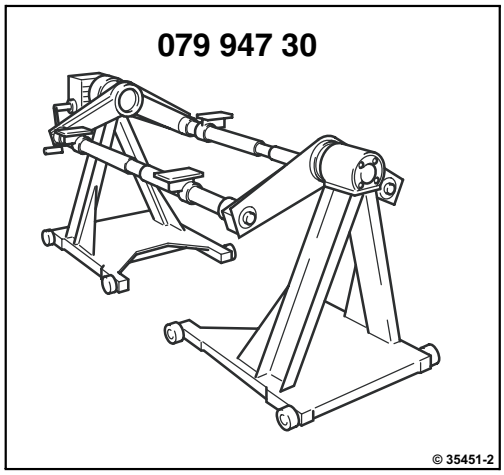
9017
Assembly lever
e. g. removing and installing valves



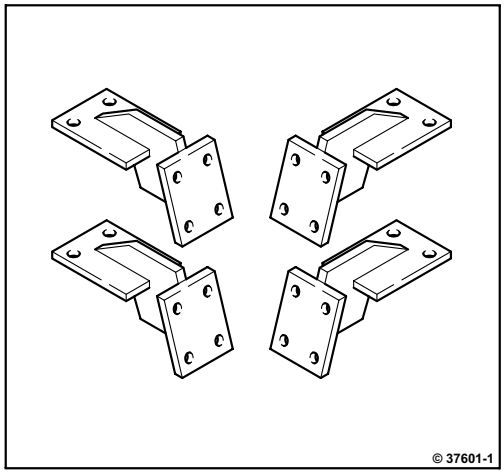
https://truckmanualshub.com/

TCD 2015 Special tools

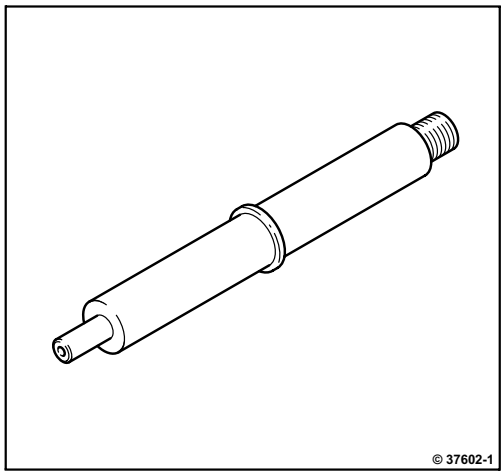
6066
Assembly block
Engine clamping, double-sidedmaximum load capacity at middle centre of gravity approx. 1200 kg



6066/151
Clamping bracket
(in conjunction with assembly block 6066)
Engine clamping, double-sided



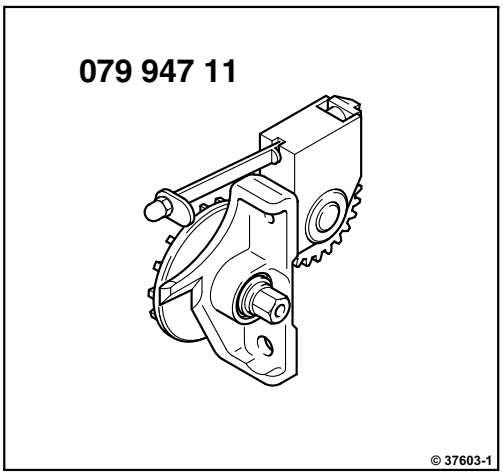
100130
Connector
(in conjunction with compression pressure tester 8005)



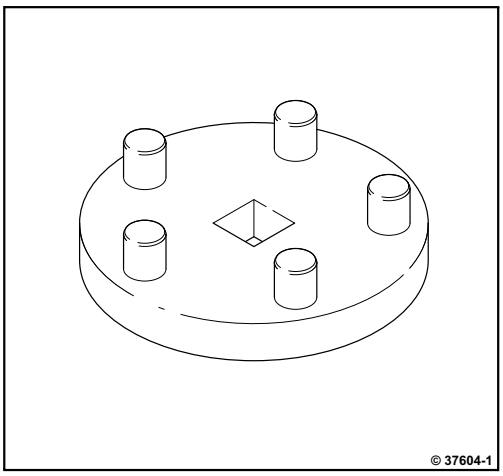
https://truckmanualshub.com/

Special tools TCD 2015

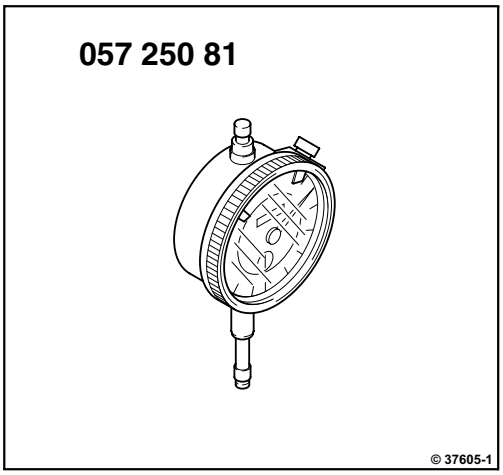
100300
Turning gear
with mechanical TDC transmitter and degree scale for start of pumping check
Turn crankshaft,
block engine



100350
Turning gear
Turn crankshaft on the V-belt pulley.



100400
Dial gauge with fixing wheel
Measuring range 0 - 10 mm / 0.01 mm

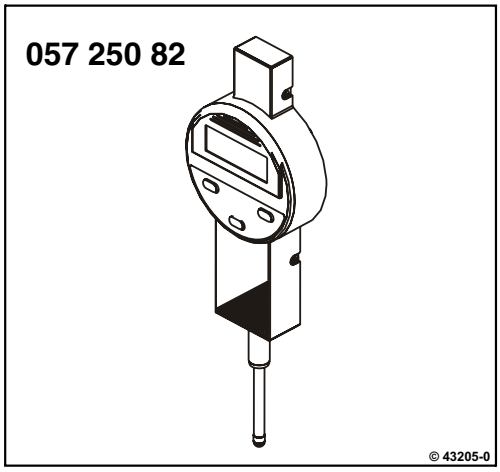


https://truckmanualshub.com/

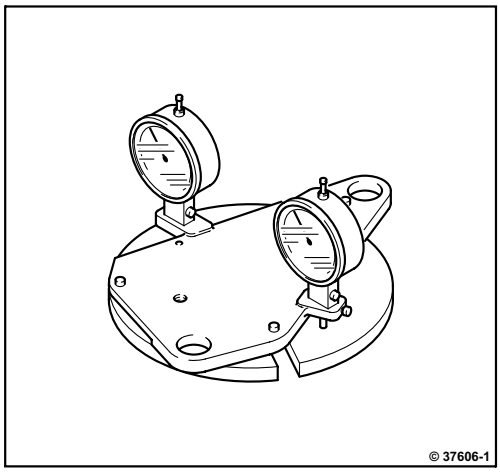
DEUTZ

TCD 2015 Special tools

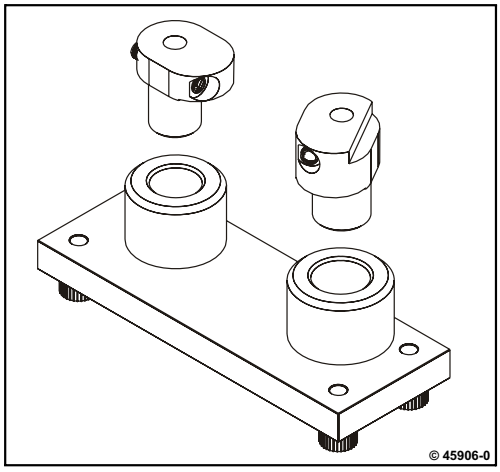
100410
Digital gauge
Measuring range 0 - 30 mm / 0.01 mm



100850
Measuring instrument with measuring plate
Checking piston overhang



101830
Dial gauge adapter
Measuring installation depth for impulse transmitter

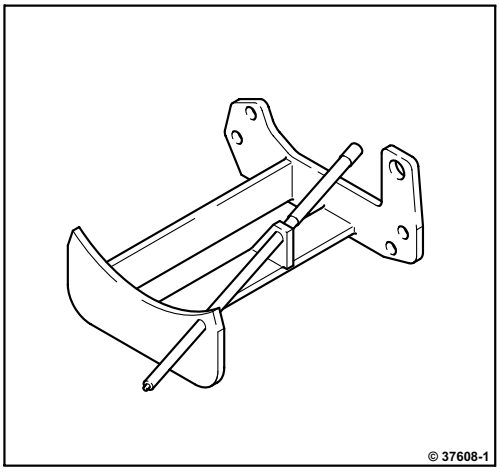


8

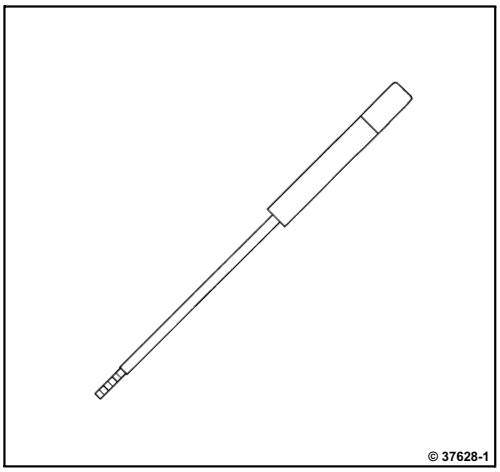
https://truckmanualshub.com/

Special tools TCD 2015

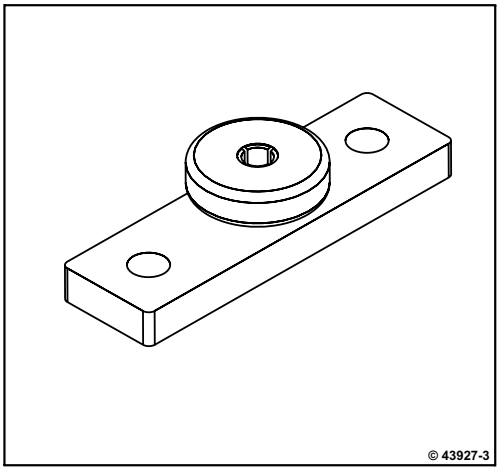
102560
Tester
Basic device with two dipsticks
Check radiation position of the piston cooling nozzle (old version)



102565
Dipstick
(in connection with tester 102560)
Check radiation position of the piston cooling nozzle (new version)

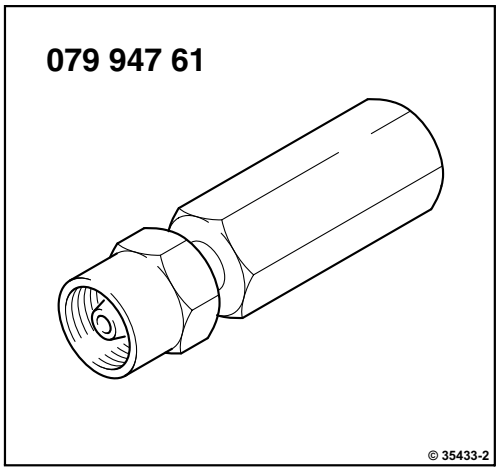


103240
Dial gauge holder
with stylus extension (diameter 5/95 mm)
Checking plunger lift of injection pumps

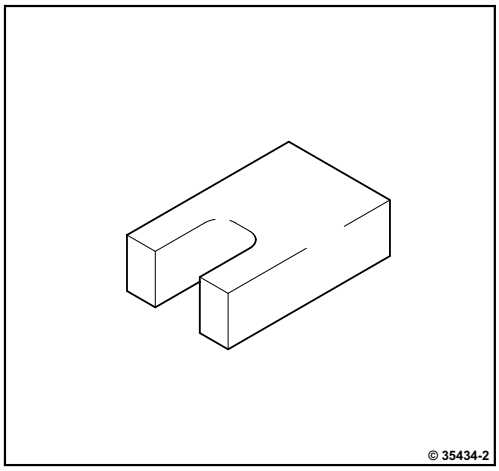


https://truckmanualshub.com/

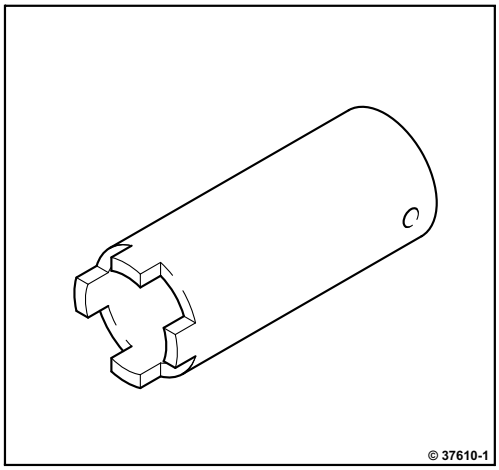
110030
Puller
(in connection with sliding hammer 150800)
Removing fuel injector



110110
Holder
SW11,
Clamp fuel injector in the vice



110130
Slotted nut wrench
Unscrew and tighten union screw on the fuel injector.

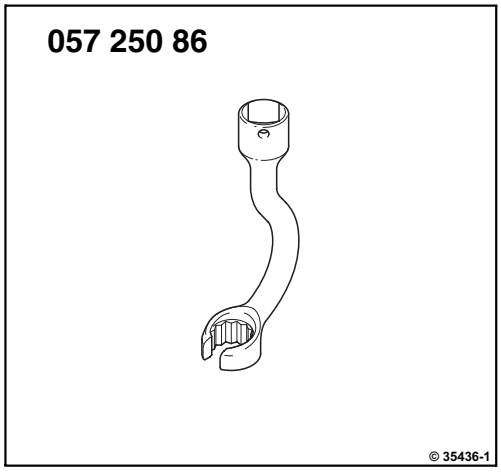


https://truckmanualshub.com/

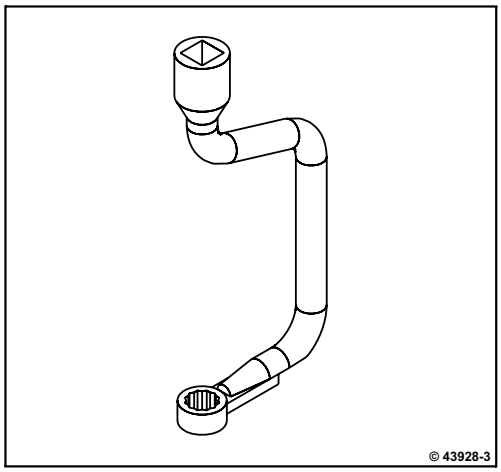
Special tools

TCD 2015

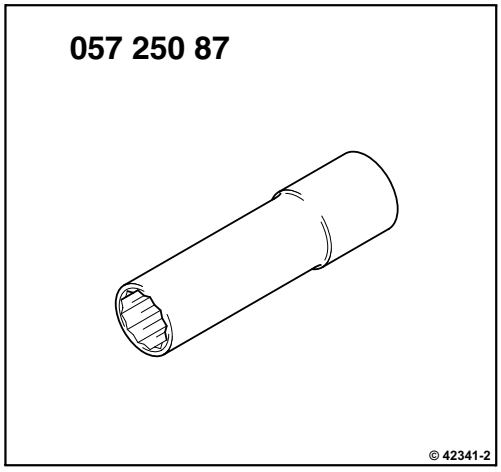
110500
Special wrench
Size 17
Removing and installing injection pipes



110510
Special wrench
Removing and installing charge air pipe



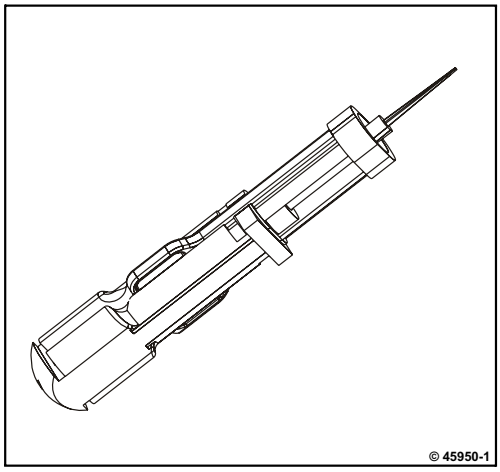
110700
Socket wrench insert
Size 27
long
Removing and installing oil pressure transmitter



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TCD 2015 Special tools

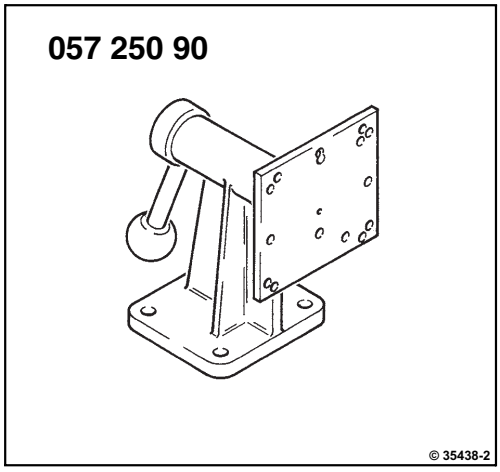
110901
Disassembly tool
Removing O-ring



120660
Puller
(in connection with sliding hammer 150800)
Removing jammed fuel injector sealing ring



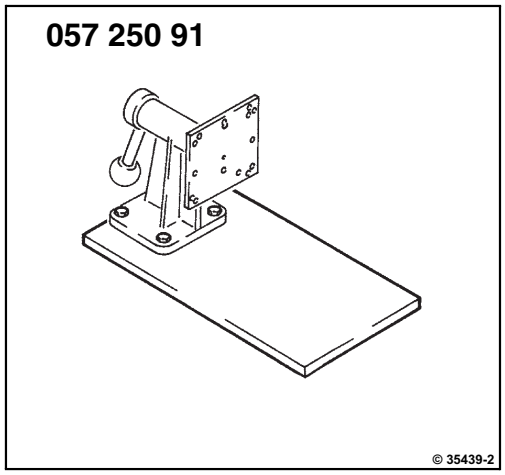
120900
Support bracket
pivoting
Clamping cylinder head



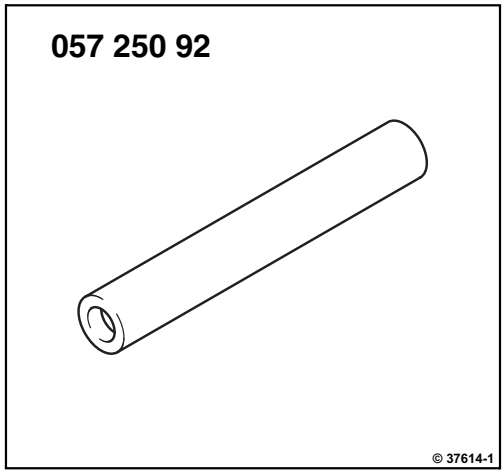
https://truckmanualshub.com/

Special tools TCD 2015

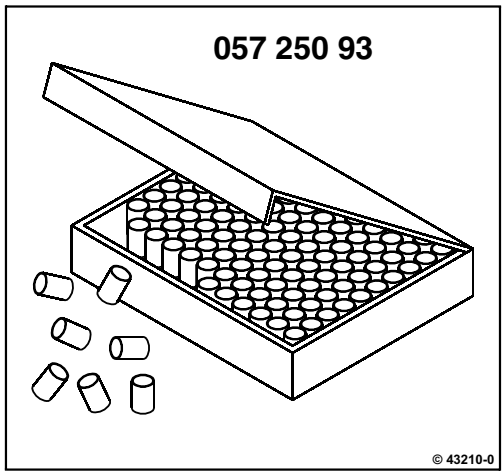
120910
Base plate
(in conjunction with support bracket 120900 if support bracket is not screwed tightly)



121410
Assembly tool
Assembling valve stem gasket



121420
Assembly sleeves
Set of assembly sleeves for valve stem gasket

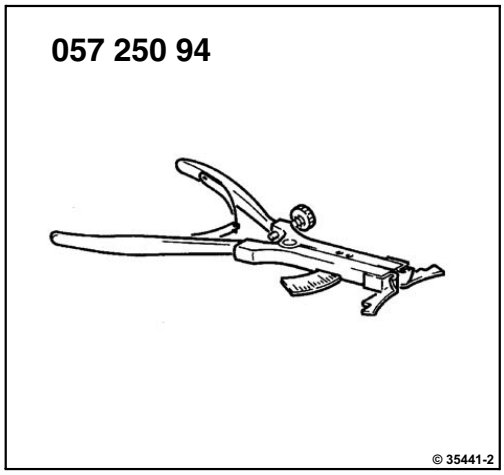


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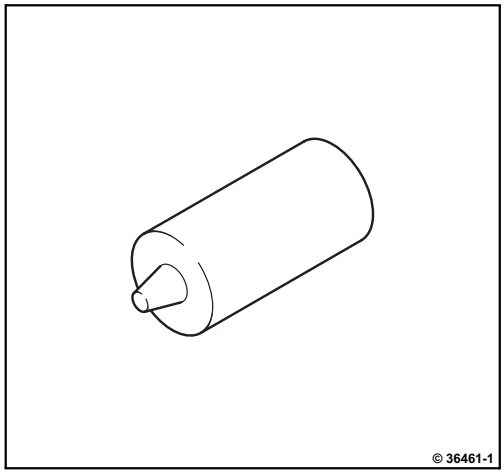
DEUTZ

TCD 2015 Special tools

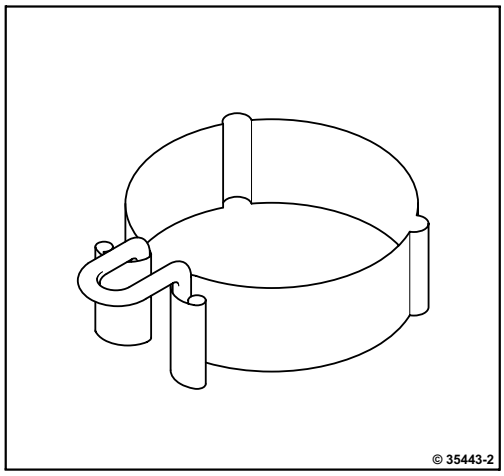
130300
Universal piston ring pliers
Removing and installing the piston rings



130400
Trapezoidal groove wear gauge
Testing piston ring groove



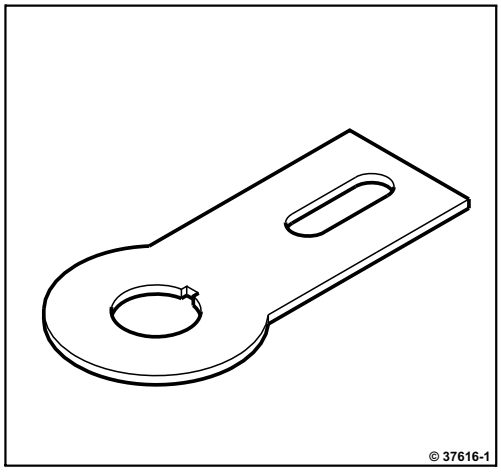
130650
Piston ring compressor
Removing and installing the piston rings



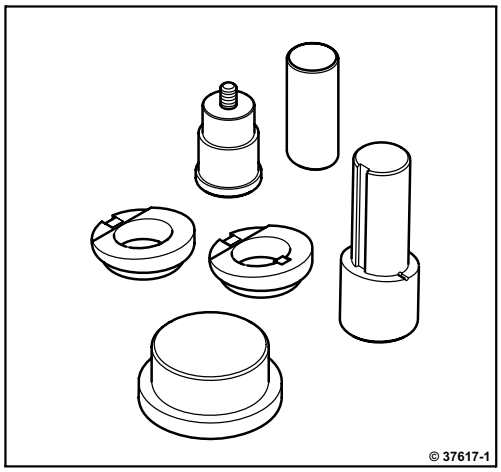
https://truckmanualshub.com/

Special tools TCD 2015

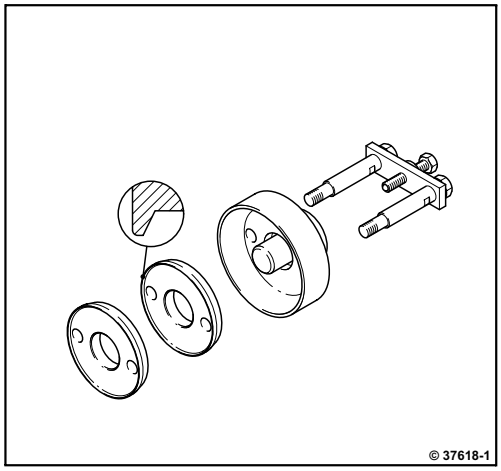
131200
Base plate
(in connection with assembly tool kit 131210)
Pressing small end bush out and in



131210
Assembly tool kit
(in connection with base plate 131200)
Pressing small end bush out and in



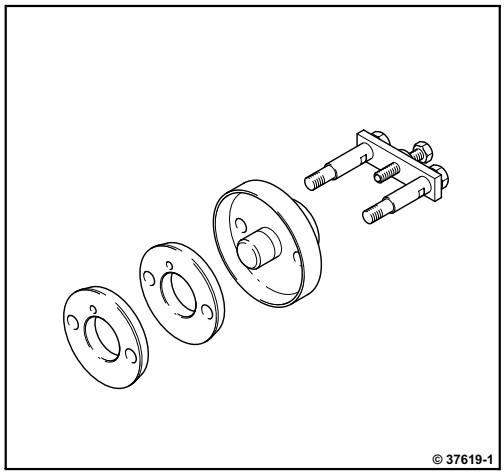
142640
Assembly tool
Installing crankshaft sealing ring
(opposite side to flywheel)



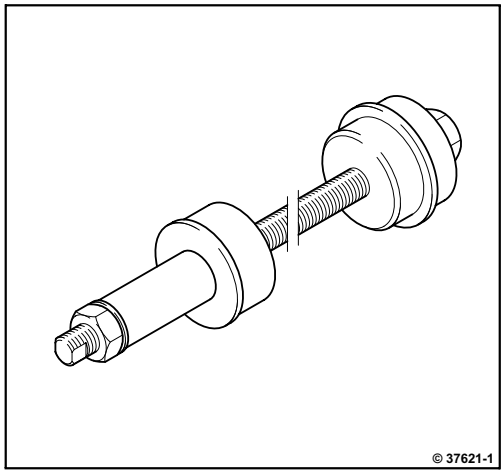
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TCD 2015 Special tools

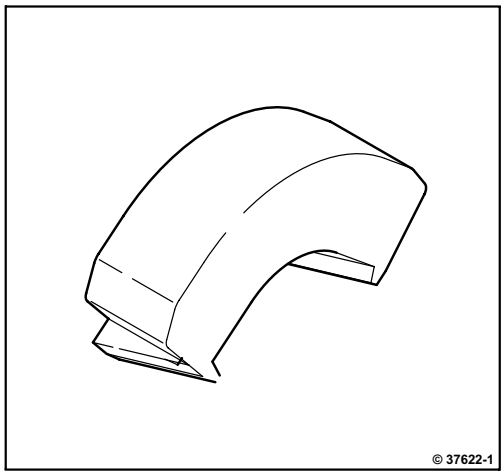
142650
Assembly tool
Installing crankshaft sealing ring (flywheel side)



143830
Assembly tool
Removing and installing camshaft bearing



144150
Counter support
Blocking camshaft gear wheel



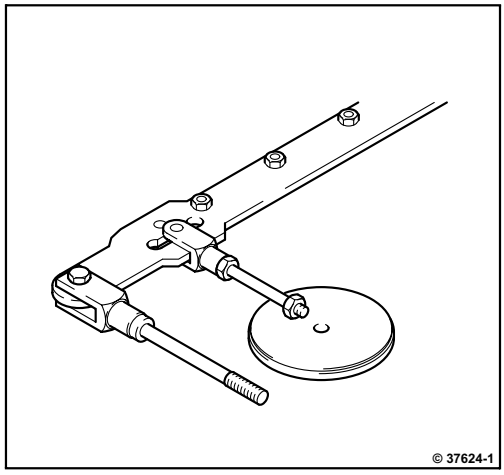
https://truckmanualshub.com/

Special tools TCD 2015

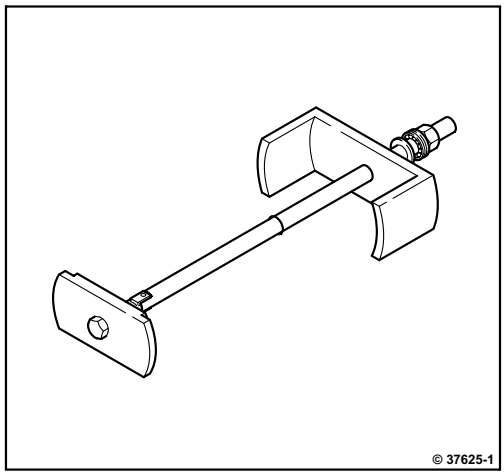
150030
Tool kit
Repairing the collar rest of the cylinder liner



150120
Assembly device
Installing cylinder liner



150130
Puller
Removing cylinder liner

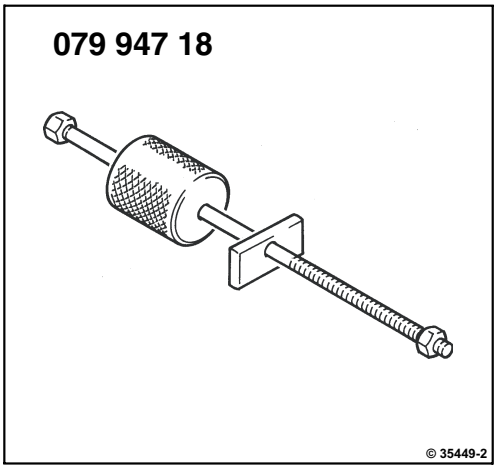


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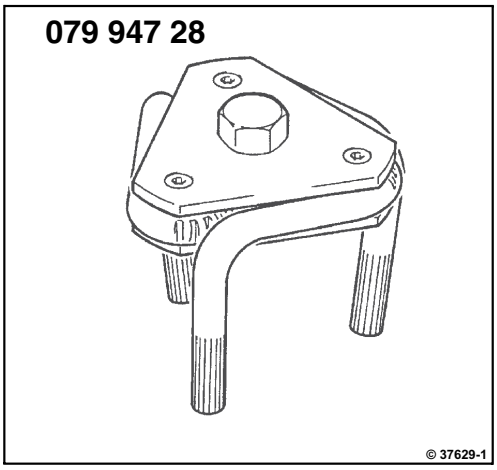
DEUTZ

TCD 2015 Special tools

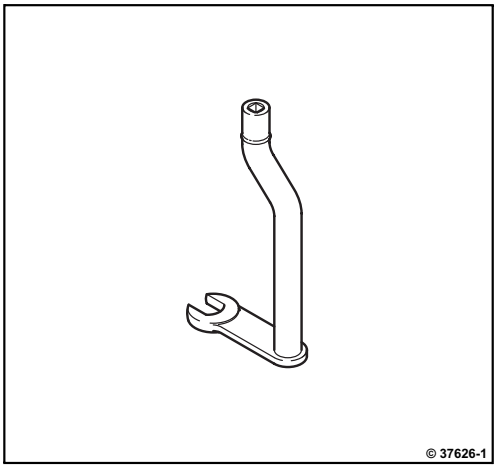
150800
Slide hammer
Removing fuel injector



170050
Special wrench
Unscrewing the filter cartridges



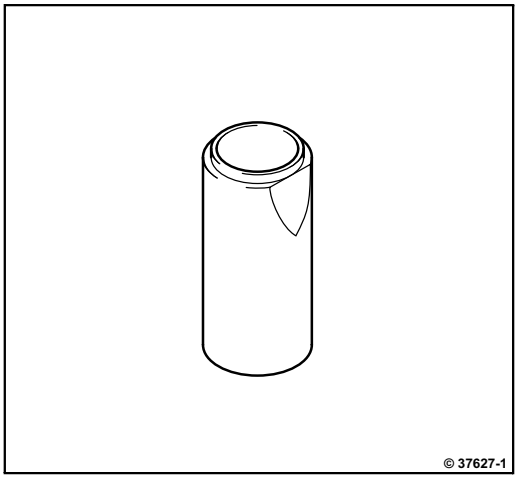
170100
Special wrench
Removing and installing lubricating oil pipe turbocharger



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Special tools TCD 2015

170120
Disassembly and assembly tool
Pressing the ball stud of the rocker arm shaft out and in



170160
Stoppers/caps
1 set of differently-sized stoppers and caps
Sealing openings on the fuel system



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12 Working hydraulics

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Hydraulic system

Travel system as well as steering and dozer blade on these machines are hydraulically operated.

This guarantees an almost loss-free transfer of engine output power to compactor wheels, steering cylinders and dozer blade/bucket control.

The pumps for the corresponding circuits are driven by the engine via a transfer box and convert the mechanical energy provided by the engine into hydraulic energy.

Inside the motors or the cylinders for steering or dozer blade actuation this hydraulic energy is then converted back to mechanical energy.

Since the medium oil is used for this transfer of power, any losses in power are only of minor significance.

All hydraulic circuits are protected against contamination by charge oil filters and a hydraulic oil return flow filter.

Safety elements in pumps and hydraulic control units protect the hydraulic system and the drive engine against overloads and damage resulting from such excessive loads.

To ensure quick heating of the hydraulic oil up to operating temperature the return flow from the hydraulic system flows directly back to the hydraulic oil tank, until the operating temperature is reached. When the oil temperature comes close to operating temperature a thermostat valve will start to open and guide the oil flow through the hydraulic oil cooler back to the tank.

This ensures that the operating temperature is quickly reached, particularly during the cold season, and that the hydraulic system can be operated without any risks.

12.2 Working hydraulics

The working hydraulics on the sanitary landfill compactors BC 672-772 RB/RS (EPA II) cover the hydraulic systems for steering and dozer blade/bucket controls.

The working hydraulics mainly consist of the axial piston pump, the control valve block for the function dozer blade/bucket up / down, steering and on RS-machines also tipping of bucket, the 2 steering and the dozer blade cylinder (RS: additional tipping cylinder) and the electrical parts (control potentiometer for steering and dozer blade/bucket control and ESX-control).

A swash plate type axial piston pump supplies the system with pressure oil.

The movement of the dozer blade or bucket is controlled via a joystick next to the driver’s seat. The control is extremely light moving and sensitive.

When shifting the control lever forward and pressing the top push button at the same time the dozer blade/bucket can be held in floating position (piston and piston rod sides of the lift cylinders are open to the tank). In this operating mode the dozer blade/bucket can be used to level the landfill site surface while driving in reverse.

The electro-hydraulic operation of the working hydraulics is similar to the system used in machines of series BC 671/771-RS and identical with the machines of range BC 972. The joystick units are potentiometers, the signals of which are converted to dedicated current pulses in the ESX-control, to operate the corresponding valves in the valve block.

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Steering and working pump

The tandem pump for the working hydraulics consists of two identical swash-plate operated axial piston pumps with variable displacement. However, the pumps deliver oil only to one direction, i.e. the swash plate moves out of neutral position only to one direction. They are therefore particularly suitable for the use in open hydraulic circuits.

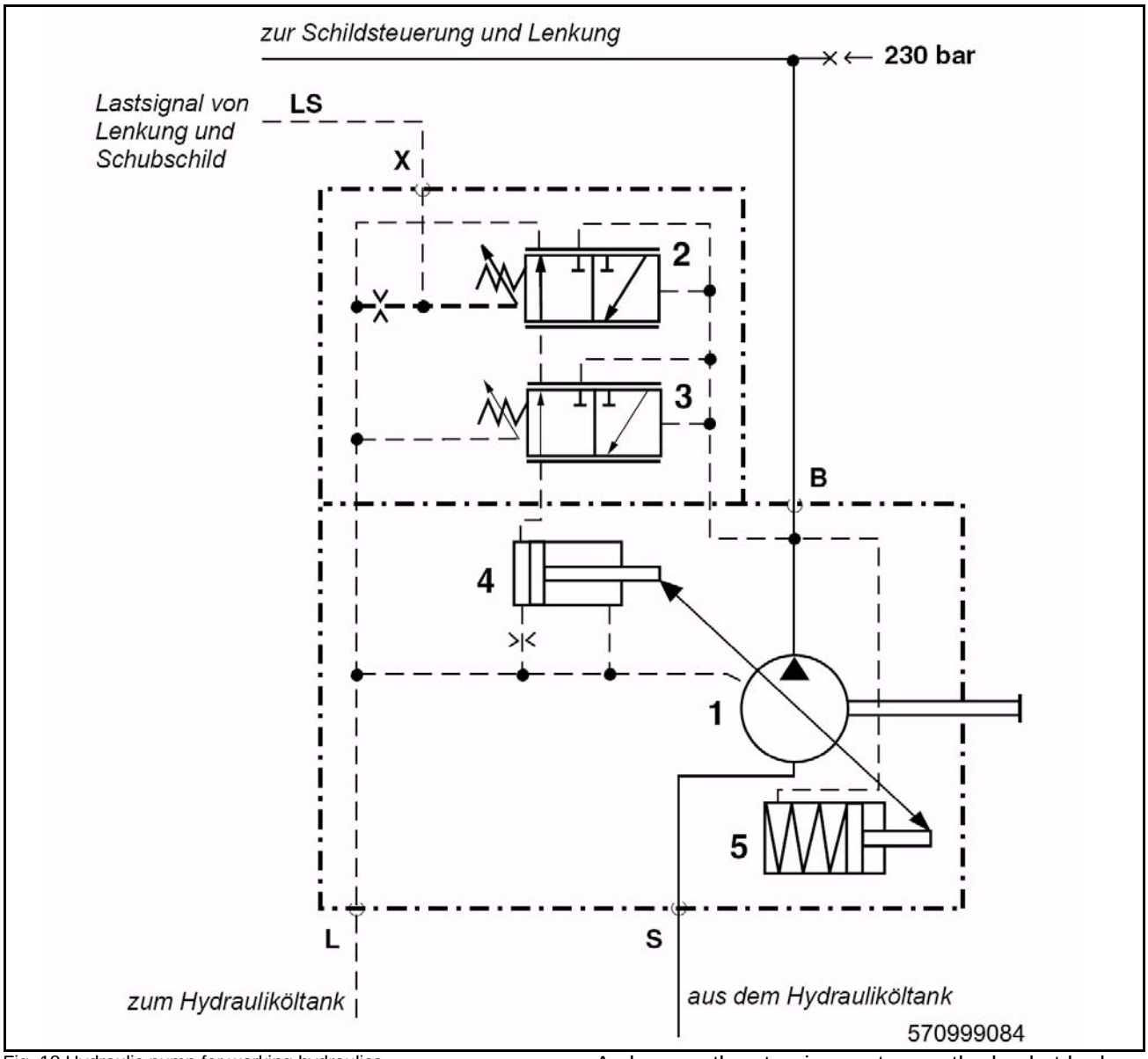


Fig. 18 Hydraulic pump for working hydraulics

1 Working pump

2 Flow control valve

3 Pressure control valve

4 Resetting piston

5 Control piston

(B) to dozer blade control and steering

(L) to hydraulic oil tank

(S) from hydraulic oil tank

(X) LS, load signal from steering and dozer blade

When the engine is not running the swash plate is in max. displacement position, however, when starting the engine the swash plate will move immediately back towards zero, until the stand-by pressure adjusted on valve 2 (Fig. 18) is reached.

As long as the steering system or the bucket hydraulics do not require any oil, the pumps will maintain the so-called ”Stand-by pressure” (30 ±1 bar). Due to the flow control in the working hydraulics the engine has to supply power only when it is actually needed.

Working principle

When looking at the working hydraulics, for better understanding one must always consider two different operating conditions:

- Engine not running
- Engine running

When the engine is not running the swash plate in the steering and working pump is at maximum displacement position. The spring of the smaller control piston in the pump holds the swash plate in this position.

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When starting the engine pressure builds up between the outlet on the steering and working pump and the inlet ”P” (front pump) and "P2" (rear pump) on the valve block. These two ports are connected inside the control block. This pressure increase is possible, because all three 8/3-way valves in the valve block are closed in neutral position (all consumers in neutral position).

The now increasing pressure moves the flow control valve spools on the pumps and opens a connection between the pump flow and the bigger control piston (reversing piston) for the pump swash plate.

Since the effective area of this piston is much bigger than the area of the counter piston, the increasing pressure moves the swash plates towards zero (despite the spring force supporting the counter piston).

The setting of the flow control valves ensures a so-called ”stand-by pressure” in the system.

The pressure control valve on the working pump limits the high pressure in the working hydraulics to 230 bar. If the system pressure increases up to the adjusted value because of steering or dozer blade operation, this pressure will move the spool inside the pressure control valve. This guides high pressure on the piston area of the reversing pistons inside the pumps and the swash plates are thereby moved towards zero position.

If the pressure drops below the adjusted value, the spring is able to close the pressure control valve and the pumps return to the previous displacement.

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Control valve block

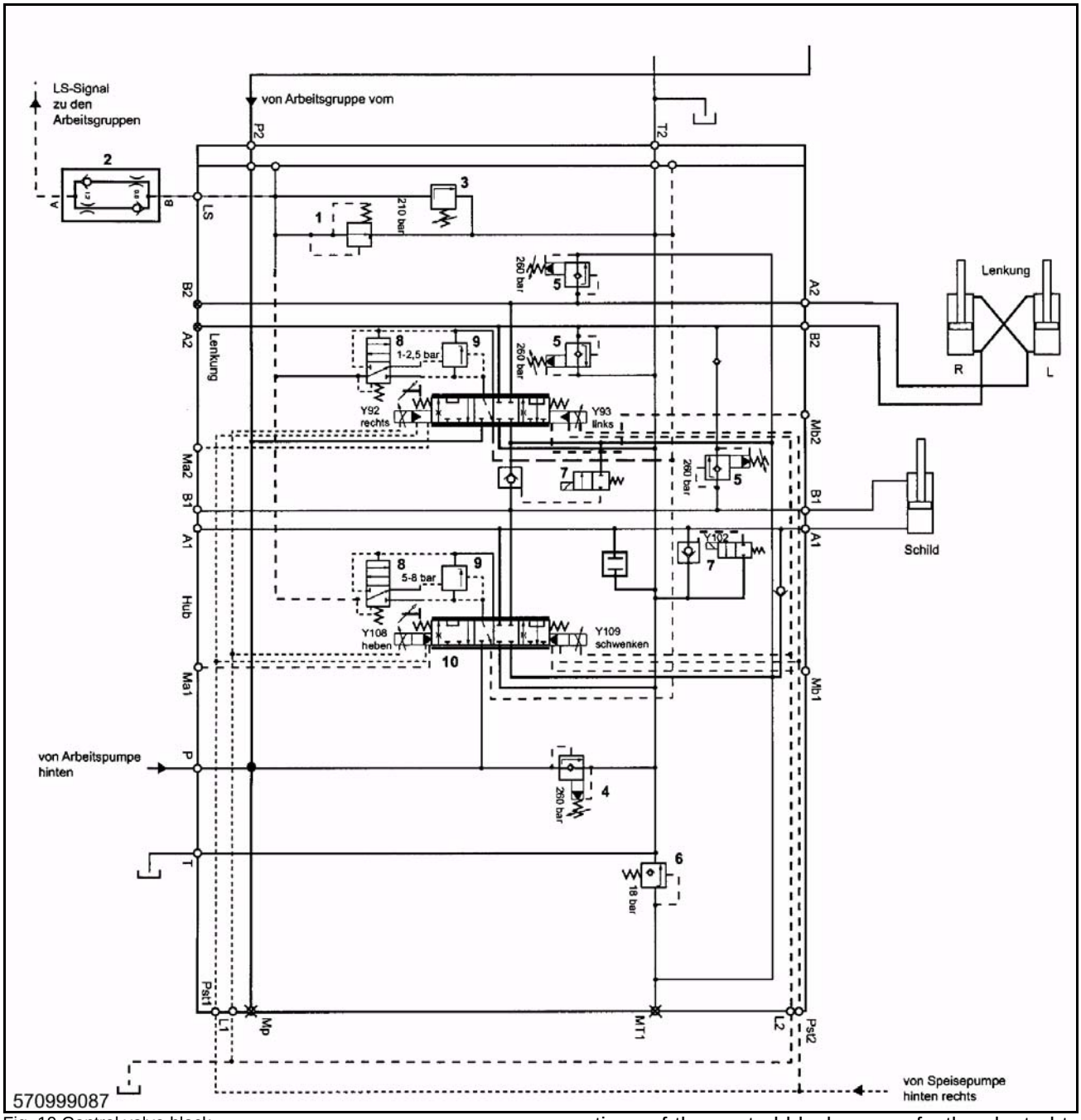


Fig. 19 Control valve block

(A) LS signal to the working pumps

(P) from rear working pump

(P2) from front working pump

Pst1, Pst2) from rear right hand charge pump

The function of the control valve block is based on the principle of load pressure independent flow distribution. This concept enables quick and precise working with overlapping movements of several consumers under different load pressures.

The operator controls the speed for steering and dozer blade proportional to the deflection of the joystick or the dozer blade control lever, irrespective of the load pressure. The control valve spools in the individual sections of the control block are perfectly adapted to the individual requirements for steering or dozer blade control by the geometry of their measuring orifices.

The control valve block is located in the hydraulic connection from steering and working pump to the consumers (steering and dozer blade cylinders). Both work functions are integrated in the control block housing.

Pump, tank and LS-lines are internally linked and combined as central connections on the control block. In the control block all consumers are arranged in parallel mode.

The geometry of the fine control grooves in the control pistons is specially adapted to the characteristics of

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the corresponding consumer. The control pistons for the individual axes can thus be interchanged. The pistons must not be turned by 180°.

Besides the piston axes to control the consumer movements, the control block also contains components serving necessary system functions:

- Stabilizing the system
- Securing the primary and secondary pressure
- Limiting the permissible LS-pressure
- Avoiding cavitation caused by external loads or deceleration

The optimal adjustment of pump and control block ensures quick response with high stability.

Load-Sensing

If the working hydraulics (steering and dozer blade control) does not demand any power, the load signal (load sensing line ”LS”) for all consumers is dumped into the tank, in this case the load signal is 0 bar.

If one of the consumers requires hydraulic oil, the actuation of the steering or bucket hydraulics will generate a load signal.

Example steering

In neutral position the steering valve is ”closed”, i.e. there is no connection between the valve inlet ”P” and one of the outlets ”A2” or ”B2” to the steering cylinders. The load signal line is directly connected with the tank return line.

When operating the steering joystick the valve inlet port ”P” is connected with one of the outlets ”A2” or ”B2” and with the load sensing line ”LS”.

The pressure, which is now increasing because of the load resistance, is applied to the back of the flow control valve on the steering and working pump through the ”LS”-line. The spool in the flow control valve moves and interrupts the oil flow to the reversing piston for the swash plate.

The spring loaded counter piston actuates the swash plate and the pump delivers oil to the steering system.

When stopping the steering joystick movement after this steering operation, the 8/3-way valve in the steering valve block will automatically return to neutral position. The connection between valve inlet port ”P” and the valve outlets ”A2” or ”B2” and the load signal line ”LS” is interrupted again. The LS-drain valve in the valve block connects the load signal line ”LS” with the return flow to the tank, the pump returns immediately towards zero and the pressure drops to the stand-by pressure value.

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Steering control

The steering movements are controlled by means of the "steering joystick" in the left hand arm rest of the operator's seat. The steering speed is proportional to the displacement of the joystick.

Due to the electronic control via the ESX-control the solenoid valves of the steering valve are triggered in pulses. With each pulse a minimum oil quantity is guided to the control piston of the steering spool (increase of steering angle) or relieved. This increases the opening cross-sections of the 8/3-way valve in both positions ”left” and ”right” very sensitively proportional to the actuation of the steering joystick. This enables very sensitive steering of the machine.

Dozer blade control

The dozer blade movements (up, down and float position) are controlled by means of a ”joystick” on the right hand side of the driver’s seat.

With this joystick the ESX-control is electrically proportionally triggered via a potentiometer.

The lowering speed is proportional to the displacement of the joystick.

When operating the joystick forward and pressing the push button at the same time, the 2/2-way valve for float position will switch to ”float position”, i.e. both piston and piston rod sides of the lifting cylinders are connected with the tank. This position is particularly suitable for levelling the landfill site surface during reverse travel.

When the joystick is pulled back, the valve is switched to position ”up”. Oil flows from the working pump through the valve block to the piston rod sides of the lifting cylinders and the dozer blade moves up.

The lifting speed is proportional to the displacement of the joystick.

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Description of individual components

LS drain valve

The LS drain valve relieves the LS line to the tank, when all work functions are in neutral position (no function operated). When operating steering / dozer blade, the flow control valve will regulate the flow volume from the LS line to the tank, irrespective of the load pressure.

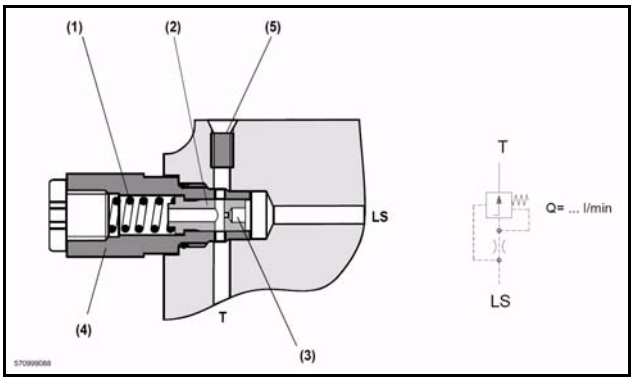


Fig. 20 LS drain valve

1 Spring

2 Control piston

3 Control orifice

The 2-way flow limiting valve in cartridge design consists of housing, control piston with control orifice and spring. The control piston maintains the pressure drop across the orifice constant, irrespective of the LS pressure and the outflowing LS flow volume.

LS shuttle valve

The LS signal reported by the pressure balance with the highest pressure reaches the pump control through orifice 1 (Fig. 21). In neutral position the LS pump control is relieved to the tank through orifice (2) and the LS drain valve.

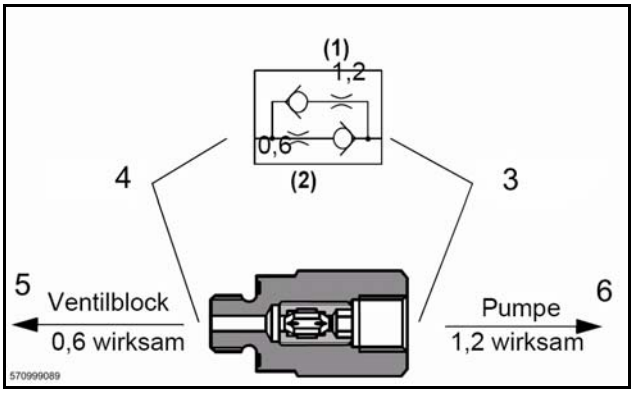


Fig. 21 LS shuttle valve

1 Orifice

2 Orifice

3 LS signal to pump control

4 LS signal in control block

5 effective to the valve block

6 effective to the pump

The cooperation of various orifices in the LS shuttle valve with the capacity of the LS hose between control block and pump (defined oil volume / line cross-section) leads to the damping of excessive pressure pulses in the system. Short and strong pressure pulses in the system will thus not cause immediate undesired reactions of the pump.

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LS-pressure limitation

The LS pressure limitation limits the maximum LS pressure in the system. Once the LS pressure reaches the value set by the spring, the valve seat will open a connection to the tank and maintain the max. LS pressure at a constant level.

The cartridge type valve is screwed into the control block and factory set to a specific value.

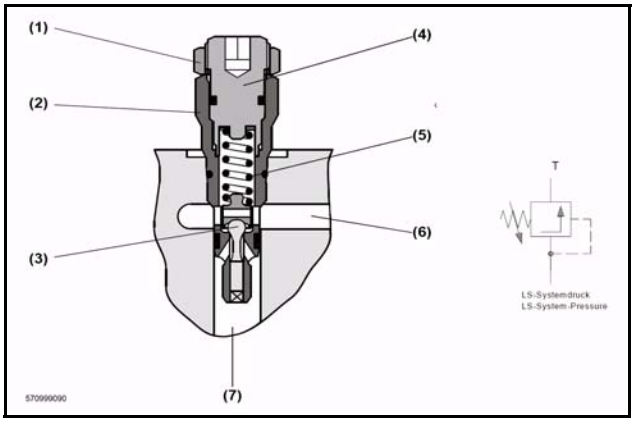


Fig. 22 LS-pressure relief valve

1 Counter nut
2 Basic housing
3 Valve seat
4 High pressure setting
5 Spring
6 Tank
7 LS system pressure

Primary pressure relief valve

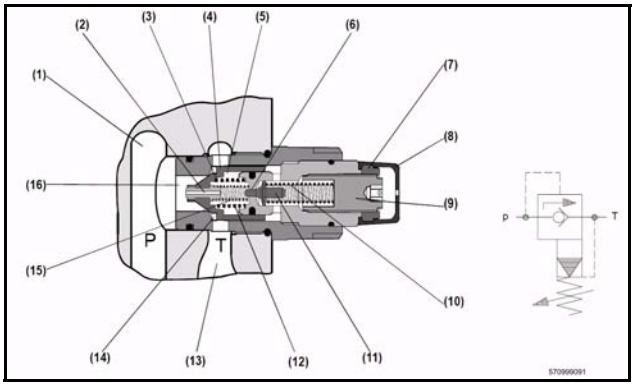


Fig. 23 Primary pressure relief valve

1 Consumer port
2 Orifice D1
3 Spring 1
4 Main taper
5 Area A2
6 Orifice D2
7 Counter nut
8 Protective cap
9 Adjustment spindle
10 Adjustment spring
11 Pilot control taper
12 Spring 2
13 Tank port
14 Area A3
15 Volume C
16 Area A1

The pilot controlled primary pressure relief valve is screwed into the side of the control block and, in its function of a safety valve, it limits the maximum pump pressure to the adjusted value (approx. 260 bar). Pressure peaks may be experienced in the pump line, e.g. if the pump does not regulate the flow volume down quick enough or a malfunction occurs in the system. The supplier of the valve block has set the pressure and sealed the block. Primary pressure relief valve (pump side) and secondary relief valves (cylinder side) are identical in design and function. System pressure p is applied to chamber C through orifice D1. As the area A2 is bigger than the area A1, the main taper remains closed. Spring 1 in chamber C ensures a stable installation position.

As long as the system pressure p is lower than the value adjusted with the adjustment spindle, the valve will remain closed. If pressure p exceeds the adjusted value, the pilot control taper will open and allow oil to flow from chamber C through orifice D2 into the tank. The pressure in chamber C collapses, because the flow through the smaller cross-section of orifice D1 is smaller than the drain through the opened pilot control taper. The higher pressure p on the area A1 opens the

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main taper against the spring 1 and links the pump line with the tank. The feed function is not used on the primary side.

Secondary / consumer valves

Shock valve

The cartridge type pilot controlled pressure/feed valves in the individual consumer ports A and B are screwed into the individual sections, above the control pistons. The valve protects the consumer circuit against overloads or damage caused e.g. by external forces or sudden decelerations (control piston in neutral), by relieving pressure peaks to the tank.

As a safety valve it limits the maximum pressure in the consumer and in the connecting line to the way valve to the adjusted value. The pressure has been adjusted and the blocked sealed by the manufacturer before delivery.

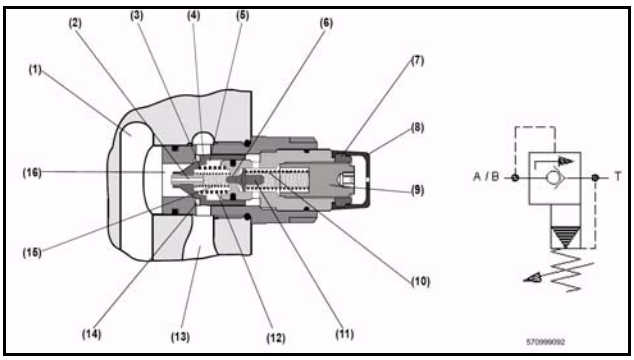


Fig. 24 Shock valve

1 Consumer port
2 Orifice D1
3 Spring
4 Main taper
5 Area A2
6 Orifice D2
7 Counter nut
8 Protective cap
9 Adjustment spindle
10 Adjustment spring
11 Pilot control taper
12 Spring 2
13 Tank port
14 Area A3
15 Volume C
16 Area A1

Function

The corresponding load pressure of the consumer port is applied to chamber C through orifice D1. Spring 1 in chamber C only ensures a stable installation position. As long as the consumer pressure p is lower than the value adjusted with the adjustment spindle, the valve will remain closed. If pressure in the consumer port A or B exceeds the adjusted value, the pilot control taper will open and allow oil to flow from chamber C through orifice D2 into the tank. The pres-

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sure in chamber C collapses, because the flow through the smaller cross-section of orifice D1 is smaller than the drain through the opened pilot control taper. The higher pressure p on area A1 opens the main taper and links the pump line with the tank.

Pre-tensioning valve

The valve block has two internal tank channels. The first one connects the shock valve for steering to the right and the outlet of a floating position valve directly with the tank. The second tank line is pre-tensioned by a 18 bar valve. Here all consumer outlets are closed. This protects the cylinders against cavitation, which could be caused e.g. by abrupt lowering of the. Furthermore, the shock valve for steering to the left and for lifting the dozer blade as well as the other float position valve, are connected to this pre-tensioned channel for reasons of design.

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Float position valves

When switching the solenoids Y102, the float position valves connect both sides of the hydraulic cylinder with the tank return line.

Function of the control valve block

(General description, the components may vary in detail from the BOMAG version. For better understanding the pressure balances, in particular, are shown as 3/3-way proportional valves, instead of 2 individual valves, as shown in the original hydraulic diagram. However, the function is absolutely identical).

Neutral position

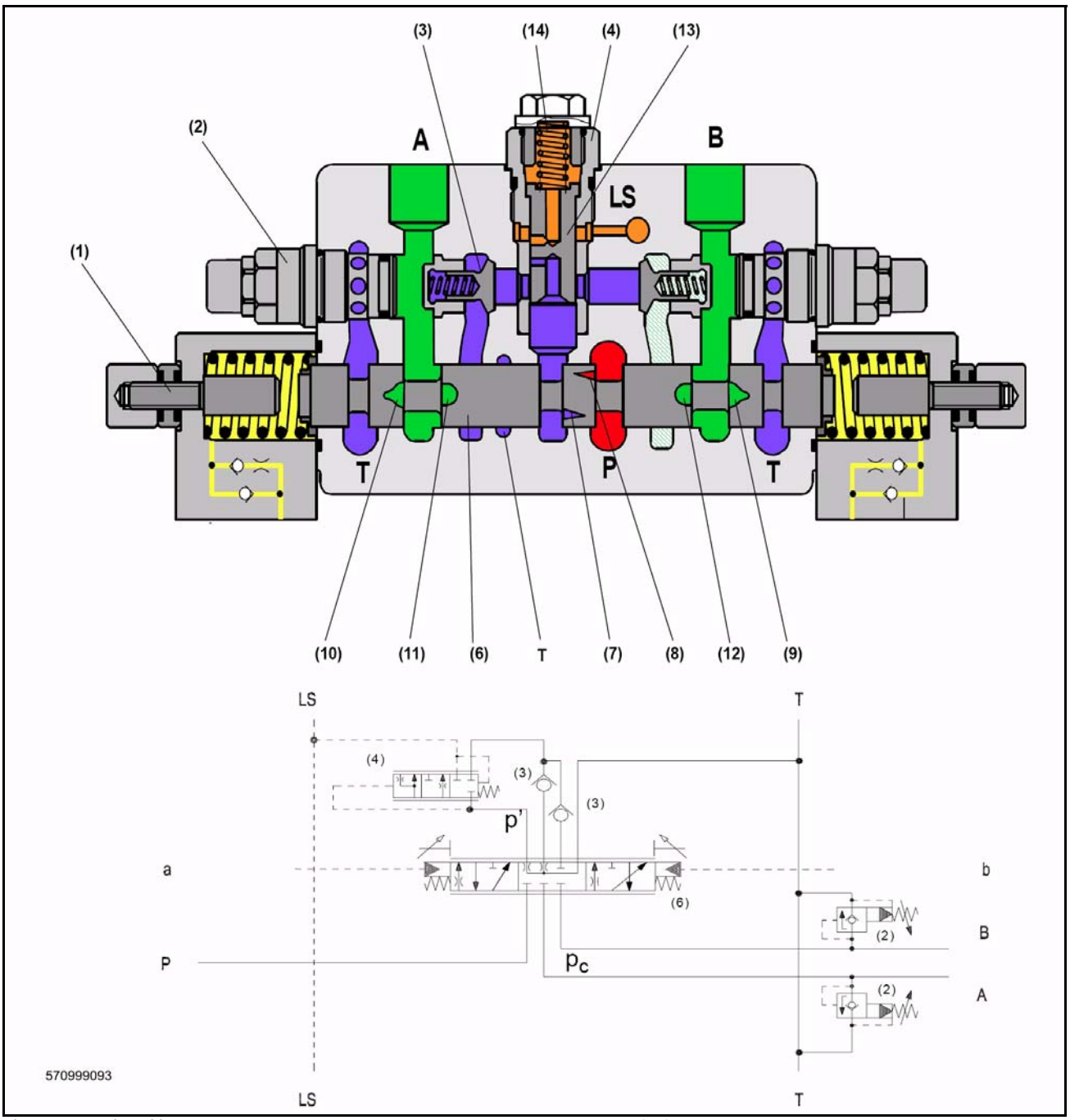


Fig. 25 Neutral position

1 Lift limitation
2 Secondary pressure relief/boost check valve
3 Load retaining valve
4 LUDV- pressure balance
5
6 Control piston
7 Infeed measuring orifice p –› A
8 Infeed measuring orifice p –› B
9 Outlet orifice B –› T
10Outlet orifice A –› T
11Passage p –› A

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12Passage p → B

13Control piston

14Pressure balance

15Pressure spring, pressure balance

With the control piston in neutral position (no control current applied to the proportional solenoids connections a or b) the connection between pump and p'-channel (after measuring orifice) is blocked by the spool. Load retaining valves and pressure balance are closed. The pressure in the p'- channel and behind the load retaining valves is in this situation relieved to tank pressure through the piston clearance. The consumer ports are blocked by the overlapping of the control piston in the housing. The consumer is thus locked and fixed between two oil columns.

The pressure balances for the individual functions (steering / dozer blade) are arranged downstream of the control piston measuring orifice. They consists of a control piston (13) and a pressure spring (15), which ensures a stable initial position.

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Individual operation or consumer with highest load

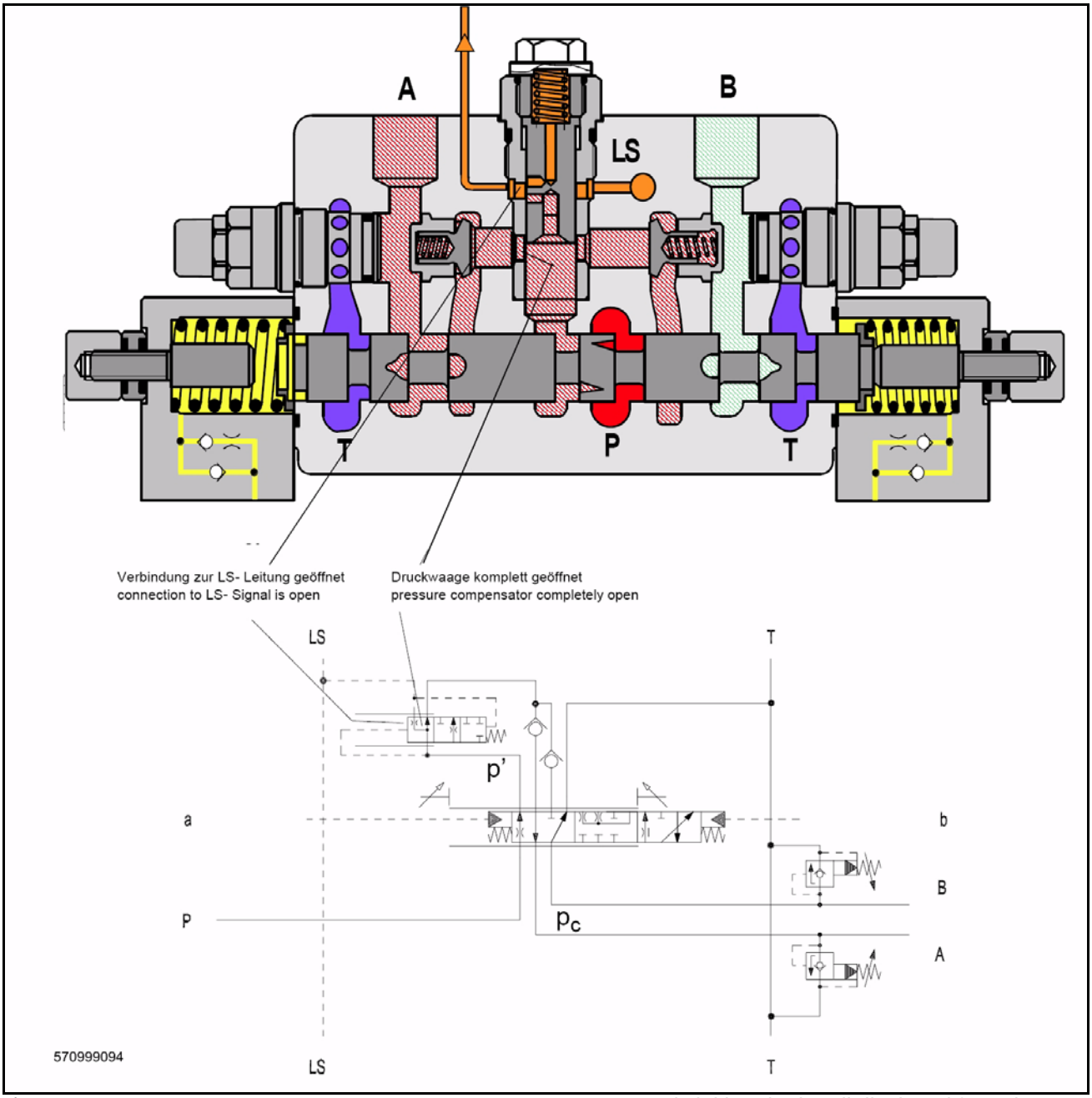


Fig. 26

The force of the pilot pressure, which is released by the control solenoids, shifts the control piston (6) proportionally against spring pressure. In this illustration the solenoid on connection "a" shifts the piston to the right against the spring in the control cover on side B. The inlet orifice (7) of the control piston opens a passage from pump port P to channel p'. The pressure in this chamber opens the pressure balance (14) and is applied up to the load retaining valves (3).

The consumer pressure p_c in port A keeps the left hand load retaining valve (3) closed through the passages in control piston (11). As p' increases higher than p_c, the non-return valve will open. The connection between pump and consumer is opened and the movement is initiated. The oil displaced from the consumer flows from B through the outlet orifice (9) back to the tank. The secondary pressure relief valves (2) remain closed as long as the pressure in the consumer connection is lower than the adjusted pressure. In case of cavitation in the consumer connection the main taper of the combined pressure relief/boost check valve in the infeed line (side A) opens, e.g. caused by extern negative forces, and enables the infeed from the pre-tensioned tank channel into the block.

In case of individual movements or if the load pressure of the consumer p_c is the highest in the system, the LS pressure is generated from the p'-channel through the bore in the pressure balance and fed back

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to the pump control and to the section pressure balances with lower load pressure.

Feeding the LS-signal from the p'-channel, before the load retaining valves, ensures blocking of the consumer port, until the required working pressure is reached. This prevents short-term dropping of the consumer by removing oil volume from the consumer lines to feed the LS-system.

The pressure balance is completely open and the p'-channel is connected with the consumer port p_c without any pressure drop.

Overlapping of movements

System saturated

In saturated operation of the system the quantity requested through the measuring orifices is smaller than or identical with the pump flow.

Σ Q consumer <= maximum Q_{pump} (within the output control)

$\Delta p_{measuring\ orifice}$ approximately corresponds with the $\Delta p_{LS\ control}$ adjusted on the pump flow control.

The difference between both values results from the losses in the supply line between pump and measuring orifices.

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Overlapping with a consumer with higher load pressure

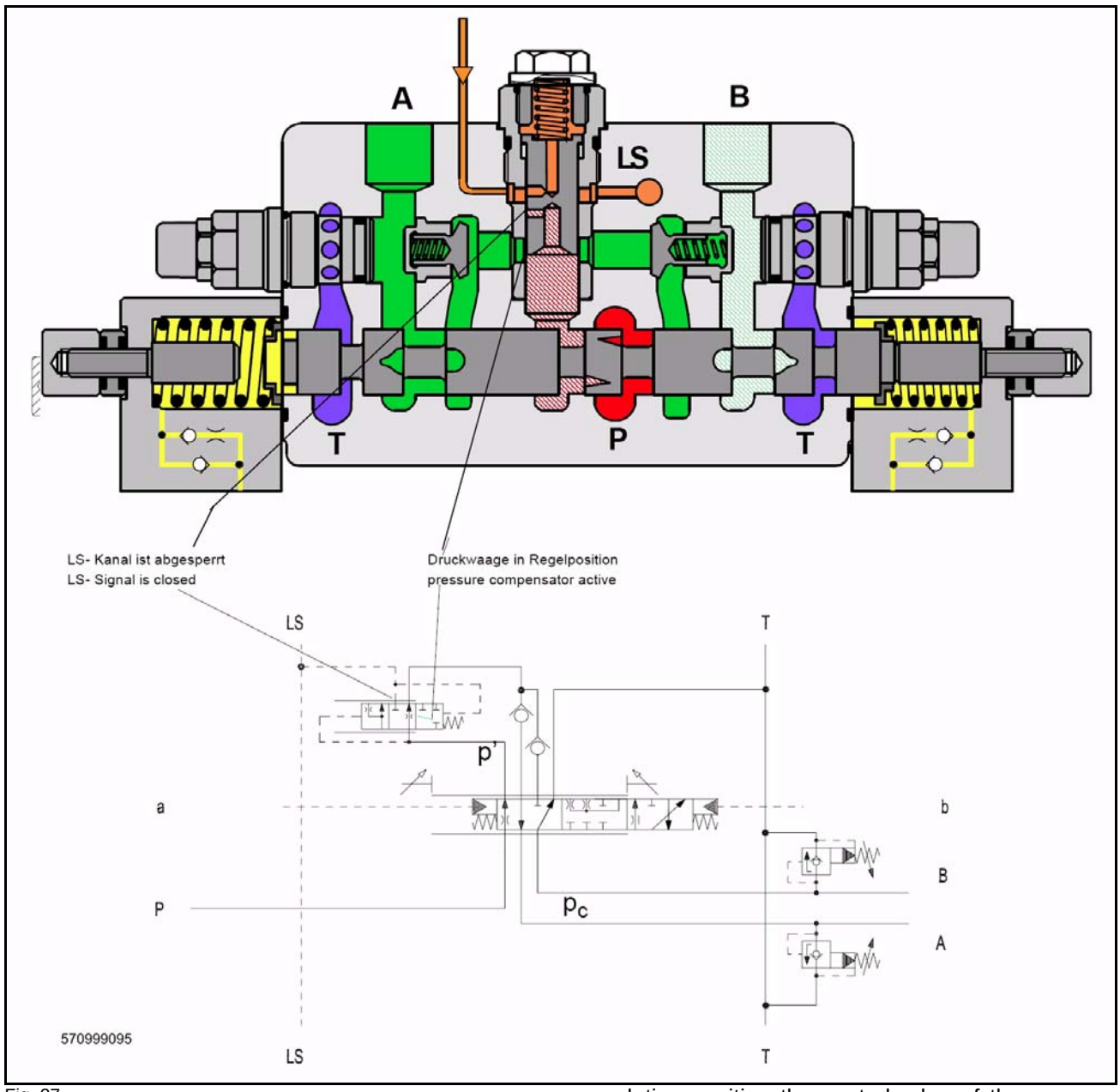


Fig. 27

A typical example for this is lifting the dozer blade while steering. The higher load pressure in the dozer blade circuit reduces the cross-section of the orifice in the pressure balance for the steering section. In this regulating position the control edge of the pressure balance generates a pressure drop from channel p' to p_c of the consumer port. The Δp across the measuring orifice (7) is identical and the consumer speed thus depends on the difference of the load pressures.

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Subsaturation / priority function

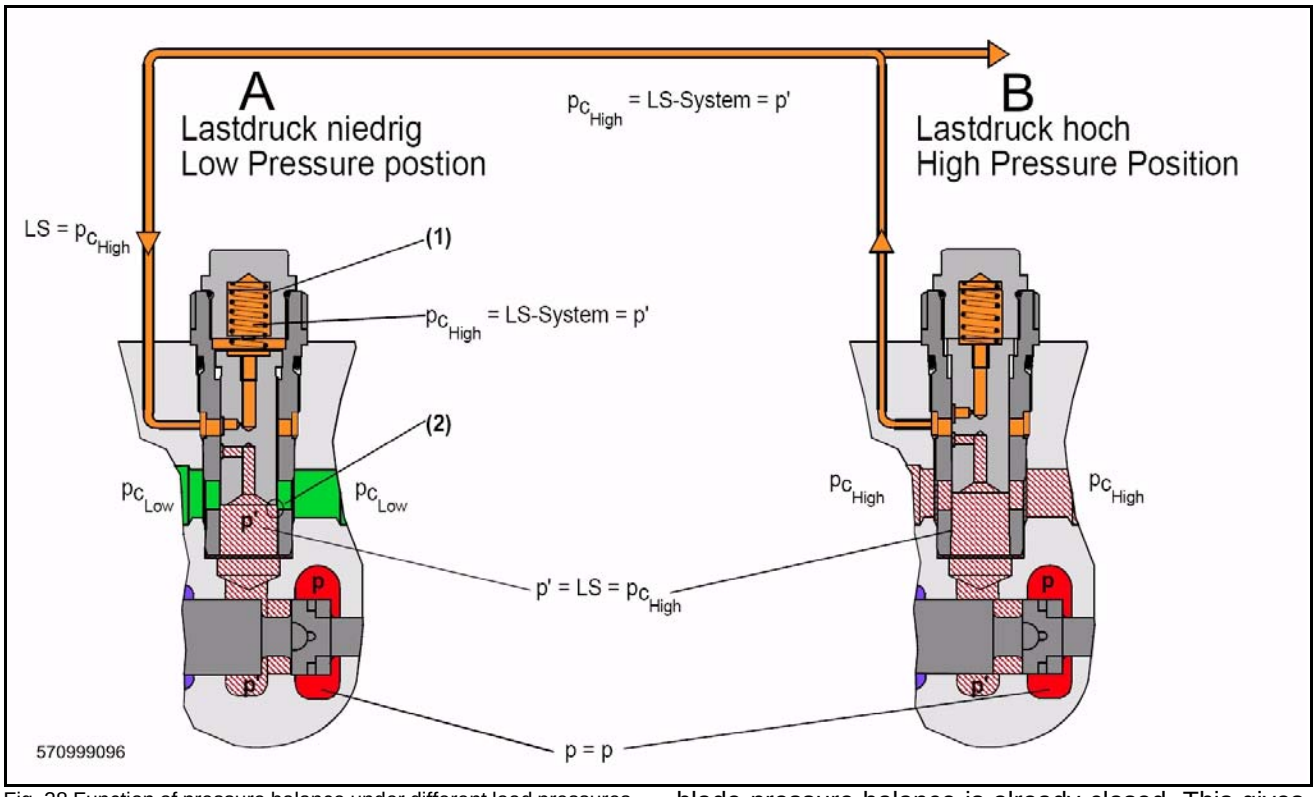


Fig. 28 Function of pressure balance under different load pressures

(A) Load pressure low

(B) Load pressure high

1 Spring chamber

2 Control orifice

In case of subsaturation of the system the oil quantity demanded by the sum of the open measuring orifice cross-sections exceeds the maximum flow rate of the pump. The flow control valve no longer is able to generate the required system pressure by operating the pump to a higher displacement. The pump pressure drops, because the pump has already reached its maximum displacement, as specified by the performance characteristic.

In case of subsaturation the pump flow rate is solely determined by the power controller.

$\Sigma Q_{Consumer} >$ Maximum Q_{Pump}

In case of subsaturation of the system the pressure balances of both consumers are wide open and the LS pressure corresponds with the pressure p' behind the measuring orifice. However, the system/pump pressure drops with every degree of subsaturation and this applies also for the $\Delta p_{measuring\ orifice}$ and the section quantity.

The pressure springs in the pressure balances for steering and dozer blade are of different designs (steering 1-2.5 bar, dozer blade 58 bar). This has the effect, that the steering pressure balance will stay open in case of subsaturation, whereas the dozer blade pressure balance is already closed. This gives the steering function priority.

If the speed of one consumer is reduced during the overlapping of movements in subsaturation, i.e. the measuring orifice is closed, the degree of subsaturation will drop. The $\Delta p_{measuring\ orifice}$ of the still actuated section will increase and the speed of the corresponding movement will follow proportionally.

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13 Tests and adjustments in working hydraulics

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Measuring and adjustment points

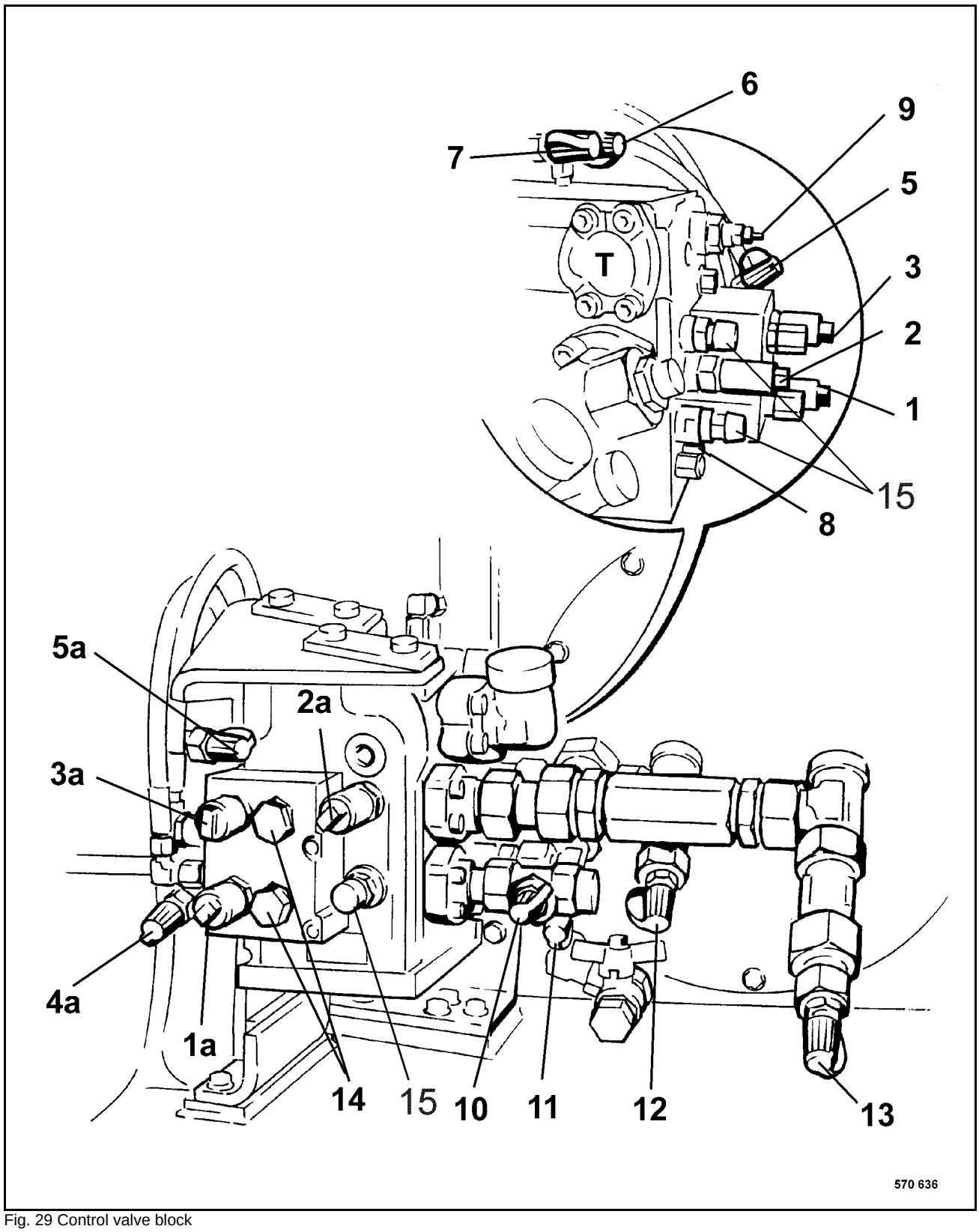


Fig. 29 Control valve block

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Pos.	Designation	Pos. ii electric wiring diagram	Pos. in hydraulic diagram	Measuring value
1	Proportional solenoid, steering right	Y92		0 - 1000 mA
1a	Proportional solenoid, steering left	Y93		0 - 1000 mA
2	Switching solenoid, float position	Y102		0 / 24V
2a	2. Switching solenoid, float position	Y102		0 / 24V
3	Proportional solenoid, blade down	Y109		0 - 1000 mA
3a	Proportional solenoid, blade up (on opposite side)	Y108		0 - 1000 mA
4	Pressure test port, pilot pressure steering left		Ma	20 -30 bar
4a	Proportional solenoid, pilot pressure steering right (on opposite side)		Mb	20 -30 bar
5	Pressure test port, pilot pressure blade up		Ma	10 -30 bar
5a	Proportional solenoid, pilot pressure blade down (on opposite side)		Mb	10 -30 bar
6	Pressure test port, tank pre-tensioning valve		Mt	10 -15 bar
7	Pressure test port, working pressure		Mp	0 -230 +10 bar
8	LS-pressure limitation			0-210 + 10 bar
9	Tank pre-loading valve			15 bar (dozer blade in top position, drop with floating position)
10	Pressure test port, steering left		M18	0 -230 +10 bar
11	Pressure test port, steering right		M19	0 -230 +10 bar
12	Pressure test port, blade down		M31	0 -230 +10 bar
13	Pressure test port, blade up		M32	0 -230 +10 bar
14	mechanical endstop			
15	Shock valve			260 bar

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Measuring and adjustment points

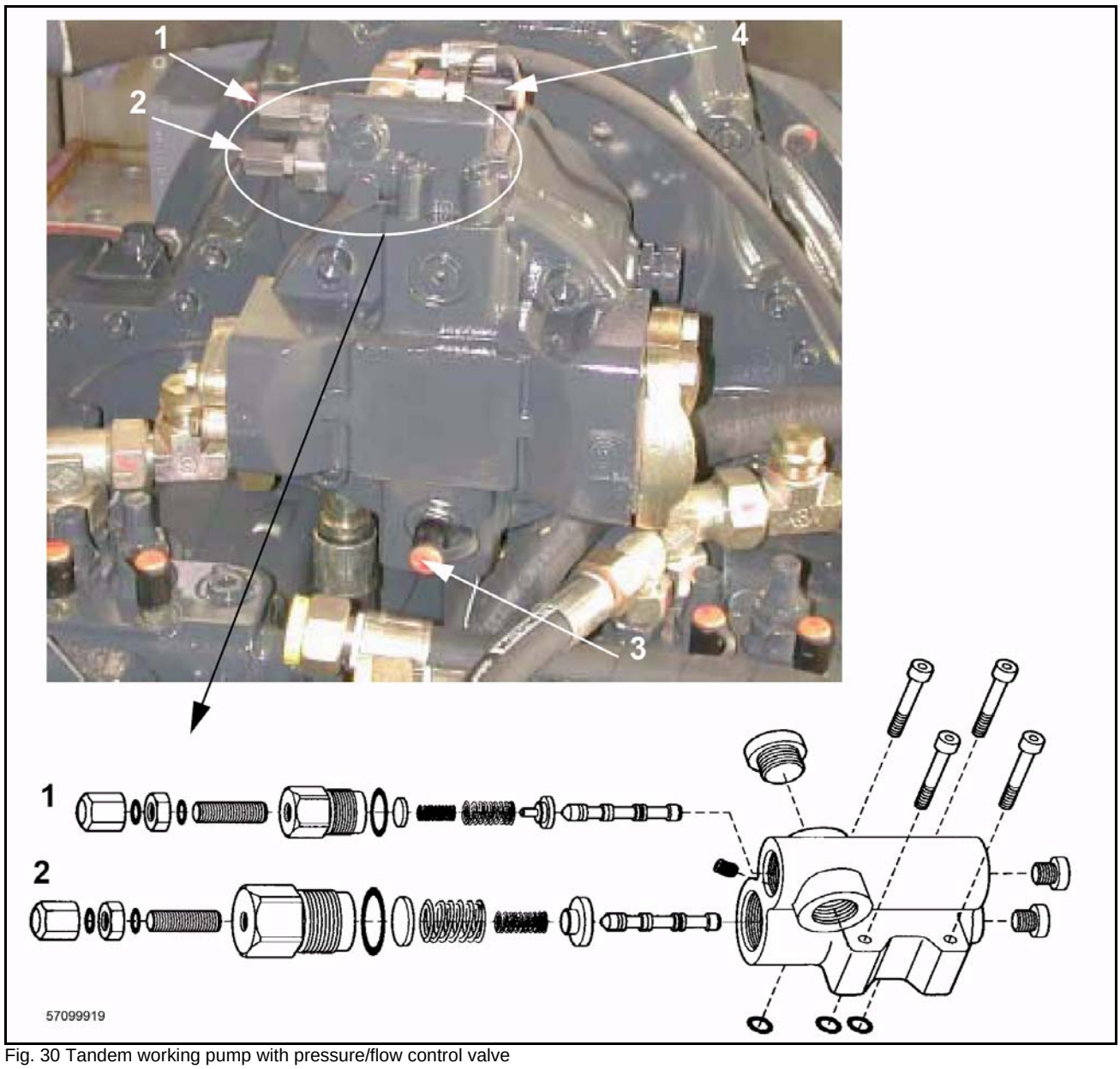


Fig. 30 Tandem working pump with pressure/flow control valve

Pos.	Designation	Pos. in hydraulic diagram	Measuring value
1	Stand-by pressure adjustment screw		30 ± 1 bar at Pos. 3
2	High pressure adjustment screw		230 +10 bar at Pos. 3
3	High pressure test port		0 - 230 +10 bar
4	LS-pressure test port	X	0 - 210 +10 bar

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Tests and adjustments

Checking/adjusting stand-by pressure

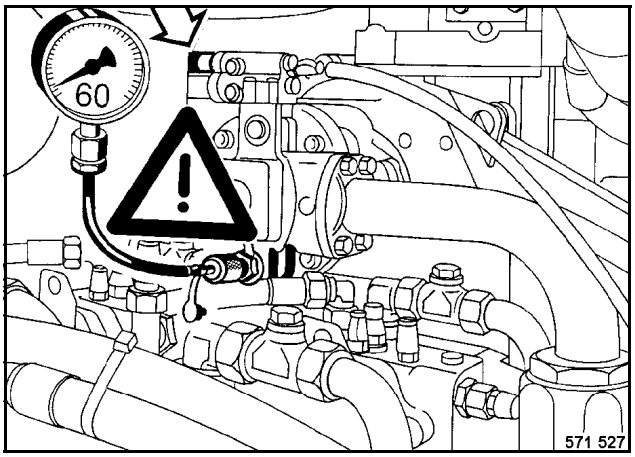


Fig. 31

- Connect a 60-bar pressure gauge to high pressure test port (Fig. 31).
- Connect a 60-bar pressure gauge to LS pressure test port 4 (Fig. 29).

⚠ Caution

Do not operate the steering and the dozer blade, since this would destroy the pressure gauge.

- Start the engine and run it at low idle speed.
- Read high and LS pressure values in non-operated state.

Nominal value:

30 ± 2 bar high pressure (stand-by pressure)

approx. 0 bar LS-pressure

Adjustment procedure

- If necessary correct the standby pressure on the flow control valve (upper setscrew 1 (Fig. 29)).

Checking/adjusting high pressure

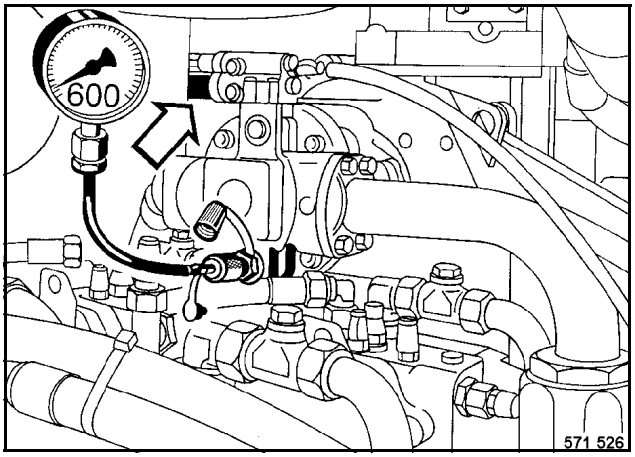


Fig. 32

- Connect a 600-bar pressure gauge to high pressure test port (Fig. 32).
- Connect a 600-bar pressure gauge to LS pressure test port 4 (Fig. 29).

⚠ Caution

Danger of squashing!

Make sure nobody is near the dozer blade.

- Start the engine and run it with high idle speed.
- Raise the dozer blade and hold the control lever against the end stop.

Nominal value:

230 +10 bar on the high pressure test port

LS-pressure 210 + 10 bar.

Adjustment procedure

- If necessary correct high pressure on the lower set-screw 2 (Fig. 29).

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Checking/adjusting the LS-pressure for the working pumps

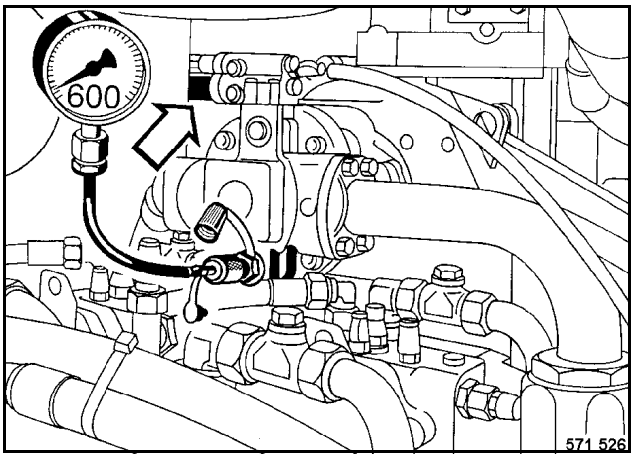


Fig. 33

- Connect a 600-bar pressure gauge to high pressure test port (Fig. 33).
- Connect a 600-bar pressure gauge to LS pressure test port (4) (Fig. 29).
- Operate the steering/dozer blade slowly from neutral to end stop, read both pressure gauges.

Nominal value:

As long as the working cylinders are moving the LS-value should always be approx. 30 bar lower than the actual high pressure. When holding the control levers against the end stop the LS-pressure should increase to 210 + 10 bar.

- If there is no or a too low LS-signal, you should first check the electric triggering of the control valves. If the electrical system is Ok, you should check the LS-system (valve block, hoses).
- If both pressures are too low at the same level, the fault is caused by the pump. The pump high pressure can be corrected on the lower adjustment screw. Should this not be possible, either the pressure/flow control valve or the pump itself is defective.

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14 Travel hydraulics

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Hydraulic system

Travel system as well as steering and dozer blade on these machines are hydraulically operated.

This guarantees an almost loss-free transfer of engine output power to compactor wheels, steering cylinders and dozer blade/bucket control.

The pumps for the corresponding circuits are driven by the engine via a transfer box and convert the mechanical energy provided by the engine into hydraulic energy.

Inside the motors or the cylinders for steering or dozer blade actuation this hydraulic energy is then converted back to mechanical energy.

Since the medium oil is used for this transfer of power, any losses in power are only of minor significance.

All hydraulic circuits are protected against contamination by charge oil filters and a hydraulic oil return flow filter.

Safety elements in pumps and hydraulic control units protect the hydraulic system and the drive engine against overloads and damage resulting from such excessive loads.

To ensure quick heating of the hydraulic oil up to operating temperature the return flow from the hydraulic system flows directly back to the hydraulic oil tank, until the operating temperature is reached. When the oil temperature comes close to operating temperature a thermostat valve will start to open and guide the oil flow through the hydraulic oil cooler back to the tank.

This ensures that the operating temperature is quickly reached, particularly during the cold season, and that the hydraulic system can be operated without any risks.

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Travel drive

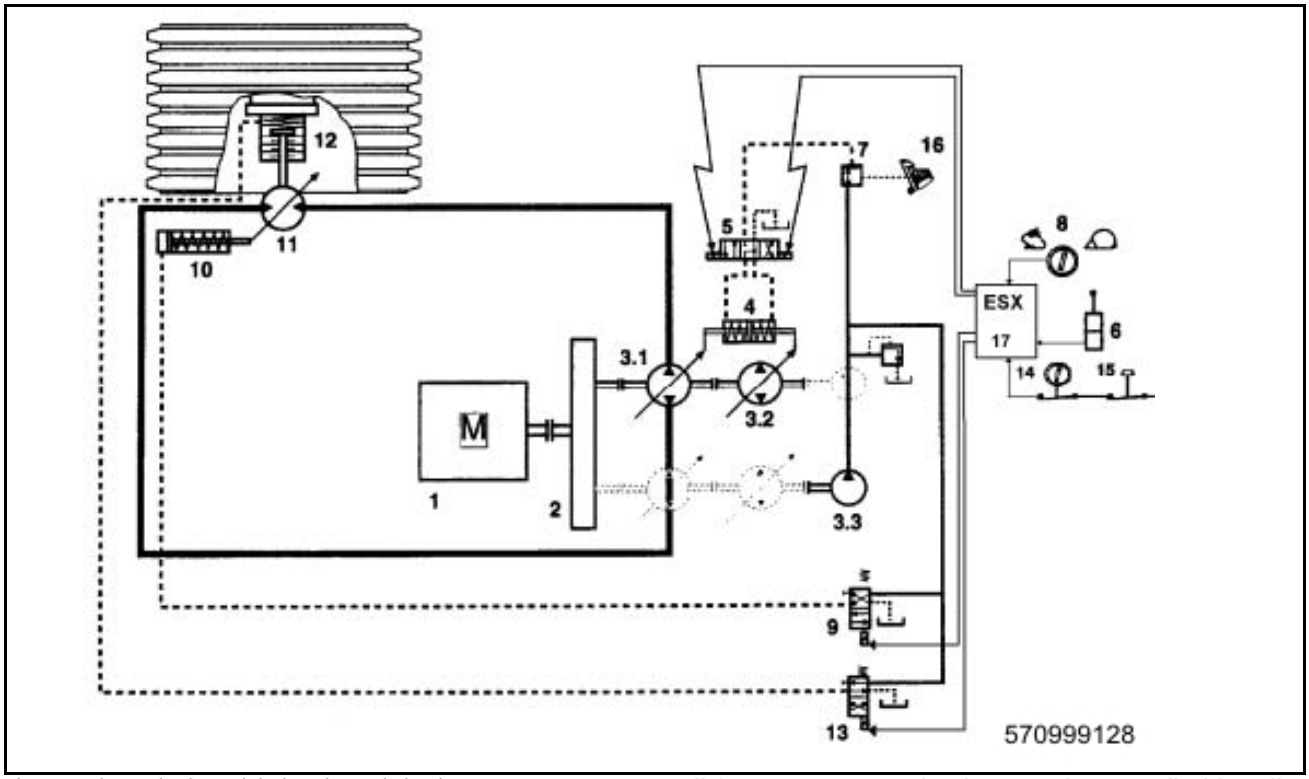


Fig. 34 Schematic, front right hand travel circuit

1 Diesel engine

2 Transfer box

3 3.1 travel pump front right, 3.2 travel pump rear right, 3.3 charge pump left

4 Control piston

5 Travel direction valve

6 Travel direction switch

7 DA-control valve

8 Speed range selector switch

9 Solenoid valve for travel speed ranges

10 Control piston

11 Travel motor

12 Planetary drive

13 Solenoid valve for brake

14 Brake switch

15 Emergency stop

16 Throttle pedal

17 ESX control

The travel system of the sanitary landfill compactor works with four closed hydraulic circuits. Each of these circuits consists of a travel pump (variable displacement pump) and a travel motor (variable displacement motor). Always two travel pumps are joined together to a tandem unit.

Both tandem units are driven by the diesel engine via a transfer box. This transfer box is flanged to the flywheel side of the engine.

All four pumps are simultaneously controlled by pilot pressure. The pilot oil needed to control the travel pumps is supplied by four charge pumps. The pump flow from the charge pumps is also used to feed the closed travel circuits and to compensate leak oil and flushing quantities.

The end of each tandem pump unit carries a charge pump. The charge pumps are gear pumps which are driven by through-shafts with the output speed of the transfer box.

The charge pumps draw the hydraulic oil out of the hydraulic oil tank and deliver it through a 12 µ fine filters to serve the individual functions (control of travel pumps, boost check valves). The charge oil flow from the rear right charge pump (when looking in travel direction forward) is additionally used to open the multidisc parking brakes in the planetary gears on the compactor wheels. All leak oil and flushing oil quantities are returned to the hydraulic oil tank through a central return flow filter block, a temperature controlled 3/2-way valve and the hydraulic oil cooler.

The travel pumps are equipped with all control and safety elements needed for operation in a closed hydraulic circuit, such as servo control unit, combined high pressure relief and boost check valves, charge pressure relief valve and pressure override valve. At this point it must be mentioned that each of the pumps is fitted with a pressure override valve.

All travel motors can be operated with two different displacements and therefore with two different travel speed ranges. The highest speed range is used as transport speed, whereas the slow speed range is

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used as working speed. Since the travel motors have the possibility to adjust themselves towards the slow travel speed range whenever demanded by the load, it is possible to operate the machine solely in high speed range. However, in such a case it must be noted that the motors will immediately change back to the higher speed range when the load is relieved (when pushing the refuse over the tipping edge).

All planetary gears are equipped with integrated multi-disc brakes.

These multi-disc brakes are opened by charge pressure and will close automatically when the charge pressure supply is interrupted. This can be accomplished by shutting the engine down, by a fault in the hydraulic system (travel system), by the brake switch or the emergency stop via one of the 4/2-way valves.

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Travel pump

The travel pumps are swash plate controlled HYDROMATIK axial piston pumps with variable displacement. Always one pump of series A4VG 71 DA (driven pump) and one pump of series A4VG 71 DG (dragged pump) are connected. The end of each tandem pump unit carries a charge pump. The charge pump is a gear pump with fixed displacement.

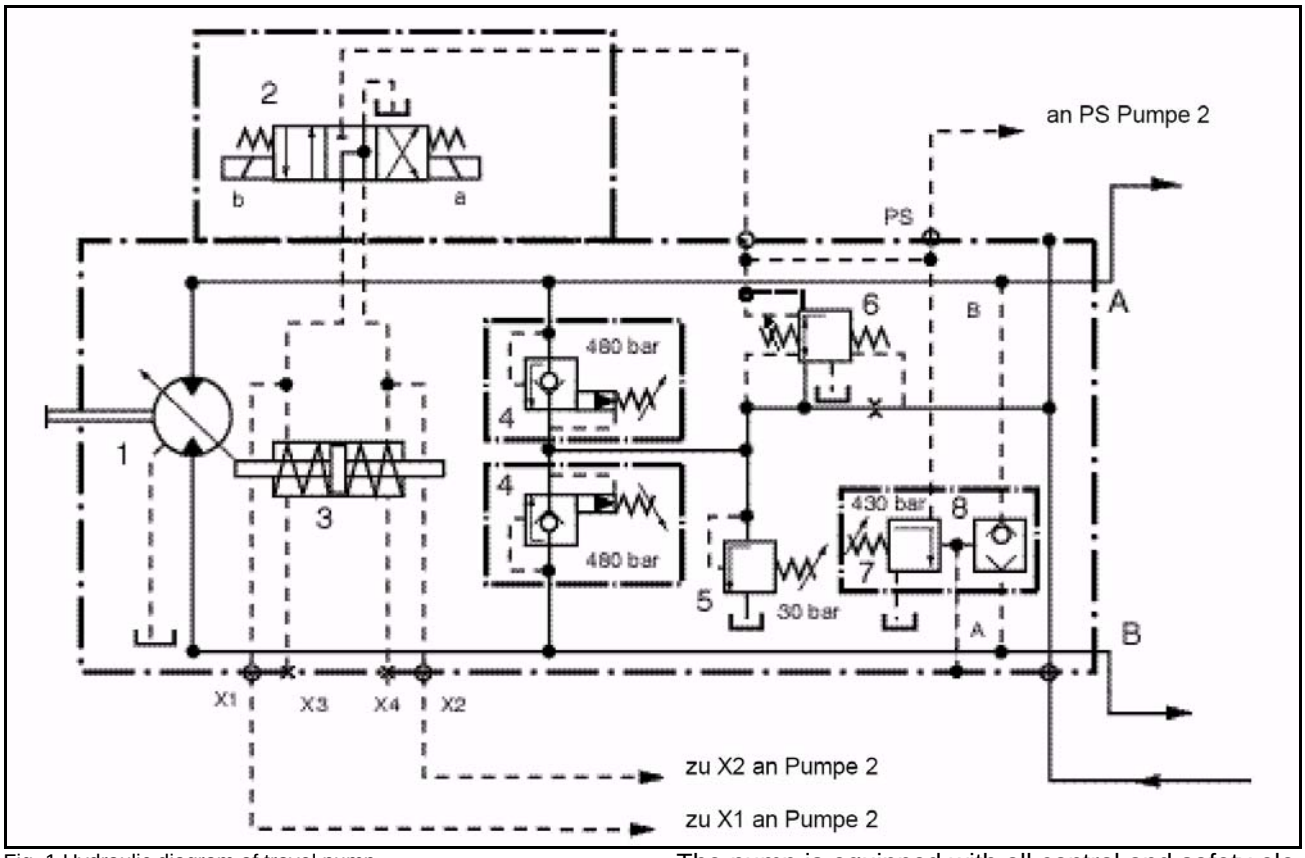


Fig. 1 Hydraulic diagram of travel pump

1 Travel pump
2 4/3-way valve (travel direction)
3 Control piston
4 High pressure relief valves with boost check valves
5 Charge pressure relief valve
6 DA-control valve
7 Pressure override valve
8 Shuttle valve

(A) to / from travel motor

(B) to / from travel motor

(PS) to PS pump 2

(X1) to X1 on pump 2

(X2) to X2 on pump 2

The flow rate of the travel pump is determined by the displacement and the actual drive speed of the pump. It is proportional to drive speed and displacement. The possibility of the infinite swash plate adjustment enables an infinite alteration of the pump flow rate and therefore an infinite adjustment of the travel speed within the chosen travel speed range.

The pump is equipped with all control and safety elements needed for operation in a closed hydraulic circuit, such as

- High pressure relief valves
- Boost check valves
- Charge pressure relief valve
- Pressure override valve and
- Servo control

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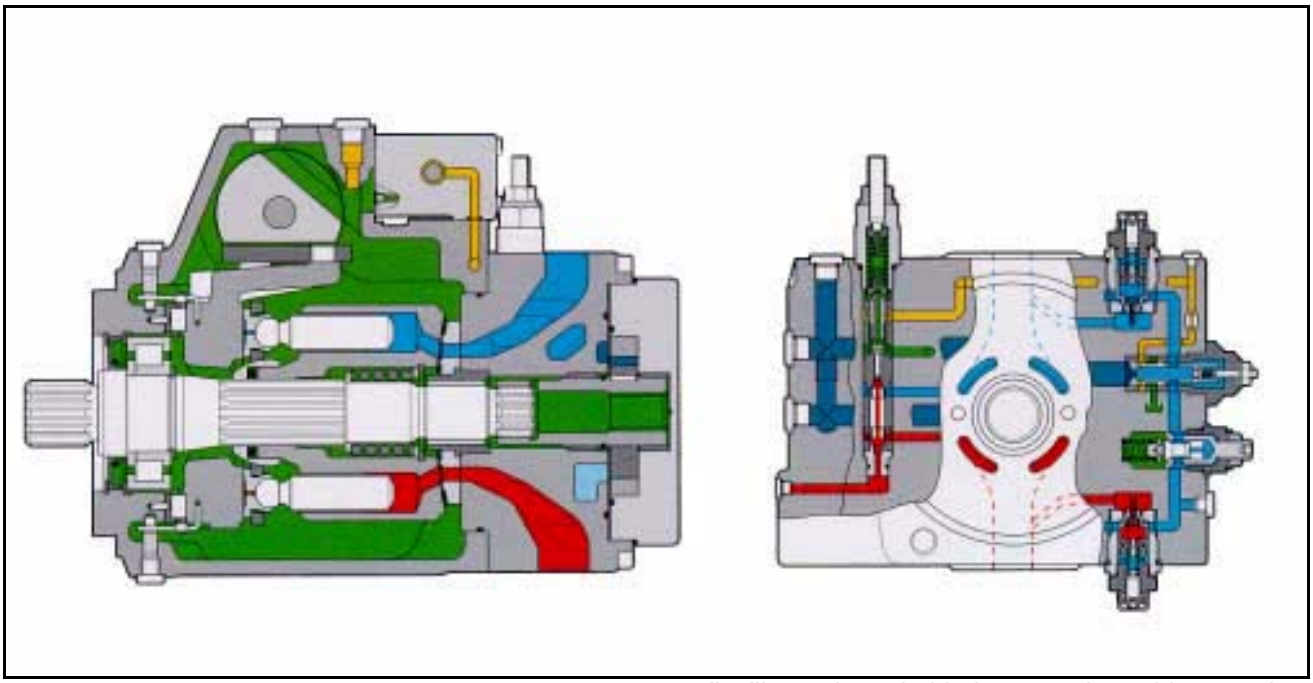


Fig. 2 Cross-section of travel pump

The spherical valve plate centres the cylinder block, which is tightly connected with the drive shaft, and avoids the appearance of unwanted transverse forces.

Belleville springs hold the complete drive section (valve plate, cylinder block, swash plate) together and eliminate appearing wear in axial direction immediately. Due to this design principle the pump has a very high rate of efficiency over the entire lifetime.

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Pump control

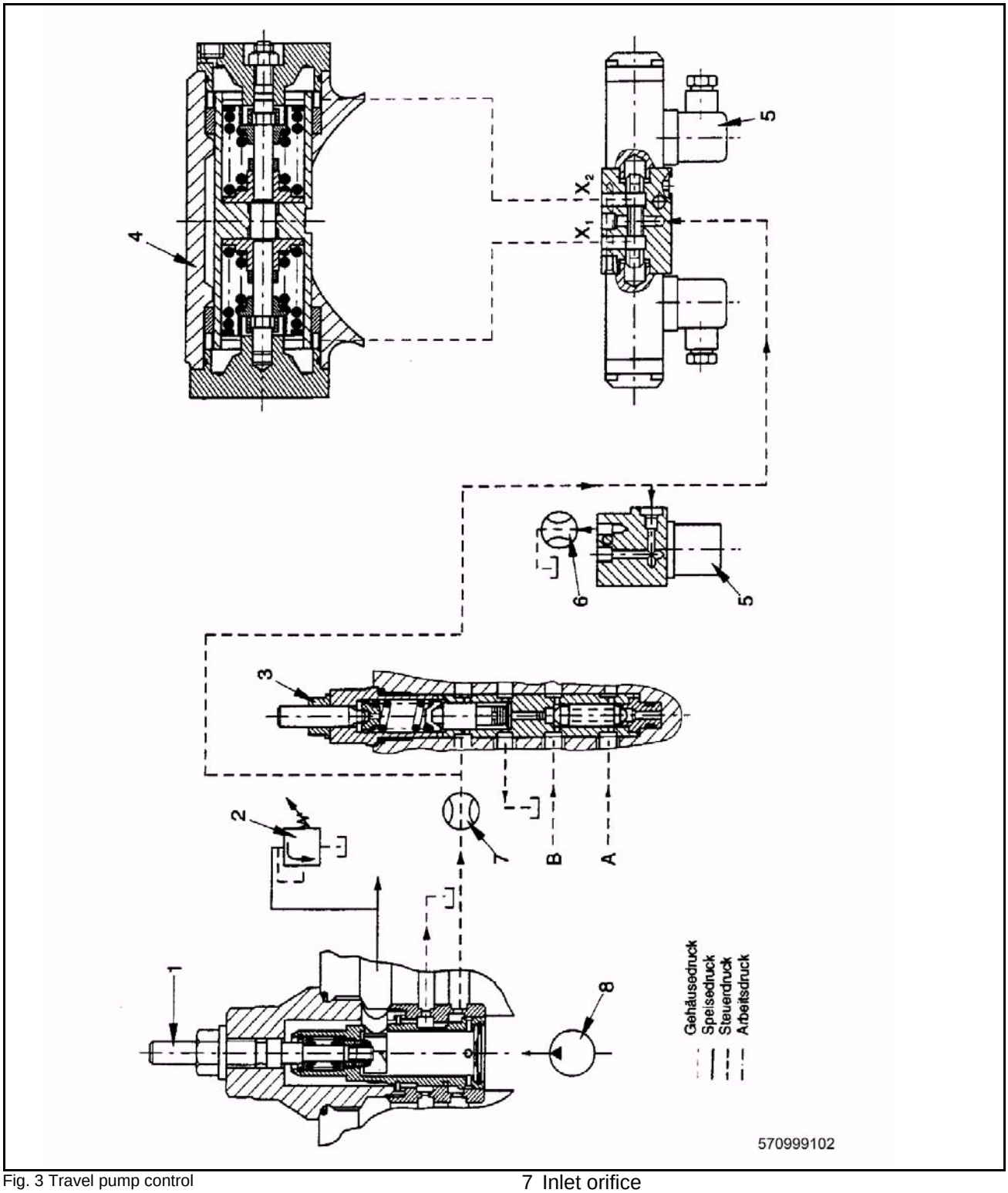


Fig. 3 Travel pump control

1 Control valve cartridge
2 Charge pressure relief valve
3 Pressure override valve
4 Control
5 4/3-way valve (travel direction)
6 Outlet orifice
7 Inlet orifice
8 Charge pump
(A) High pressure port
(B) High pressure port

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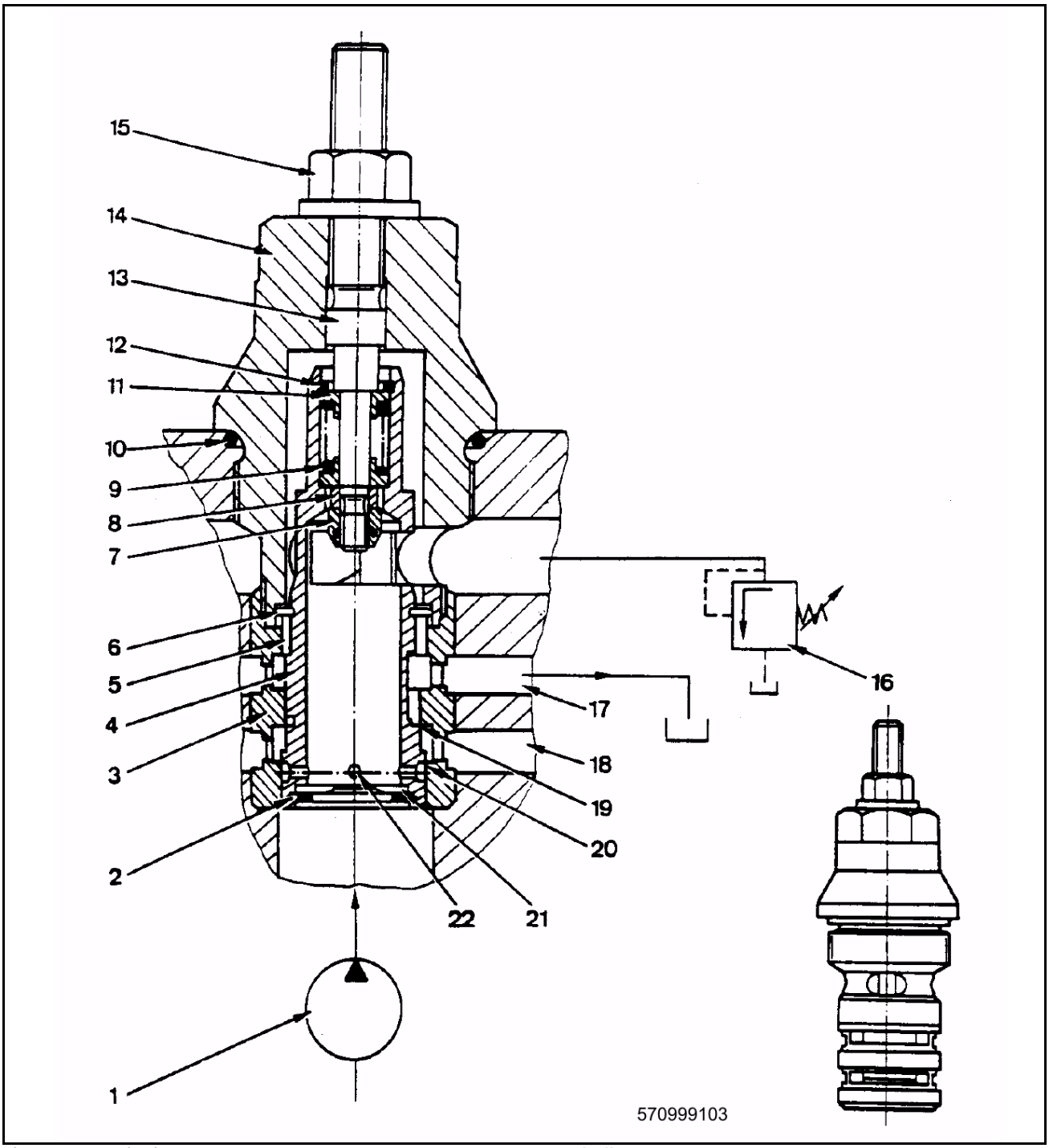


Fig. 4 DA-control valve

1 Charge pump
2 Circlip
3 Controller tube
4 Stepped piston
5 Ring
6 Circlip
7 Nut
8 Washer
9 Pressure spring
10 O-ring
11 Spring cup
12 Circlip
13 Threaded pin
14 Controller screw
15 Locking nut
16 Charge pressure valve
17 Housing channel
18 Pilot pressure channel
19 Control edge
20 Control edge
21 Measuring orifice
22 Bore

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The pump is infinitely controlled with pilot pressure from neutral position to the desired flow direction and to the desired displacement.

The necessary hydraulic oil for the pump control is provided by the charge circuit of the respective tandem pump. The oil supplied by the charge pump flows to the DA-control valve.

At an engine speed between low idle speed and control start (for values refer to the technical data) the pump flow rate is so low, that almost all oil can flow through the inside of the control valve cartridge to the charge system for the travel pumps. The static pressure in front of the orifice (ø 7,9 mm) in the control valve cartridge is not yet high enough to be able to displace the inner spool against the spring force.

When raising the engine speed beyond the control start, the flow rate from the charge pump will also increase. This higher oil flow rate causes a far higher pressure drop at the orifice and pushes the inner spool against the spring. The movement of the spool opens four bores, which are arranged in a ring around the circumference of the spool, and connects them with the ¾-way solenoid valve on the pump control. The opening cross-section of these bores depends on the pressure drop at the inlet orifice on the control valve cartridge and therefore from the rotary speed of the engine. It increases with raising engine speed or with increasing oil flow.

At control end (for values refer to the technical data) the bores are fully open.

Since the bores have a considerable throttle effect even when they are fully open, the pilot pressure will never be higher than max. 14 bar.

At control start (bores are beginning to open) the static pressure is approx. 6 bar.

If the solenoid valve is now actuated to one of the two possible directions, the pilot pressure is high enough to actuate the pump slowly out of neutral position. The pump starts to deliver oil to the respective travel motor.

Raising the engine speed will also increase the oil flow from the charge pump, the bores around the control valve spool (orifice) will open further and the pilot pressure will gradually increase. The displacement increases and the pump delivers a larger oil volume to the motor per unit of time. The machine drives faster.

The rest of the oil flows through the DA-control valve to the charge pressure relief valves in the travel pumps. The setting of these valves (see technical data) determines the charge pressure.

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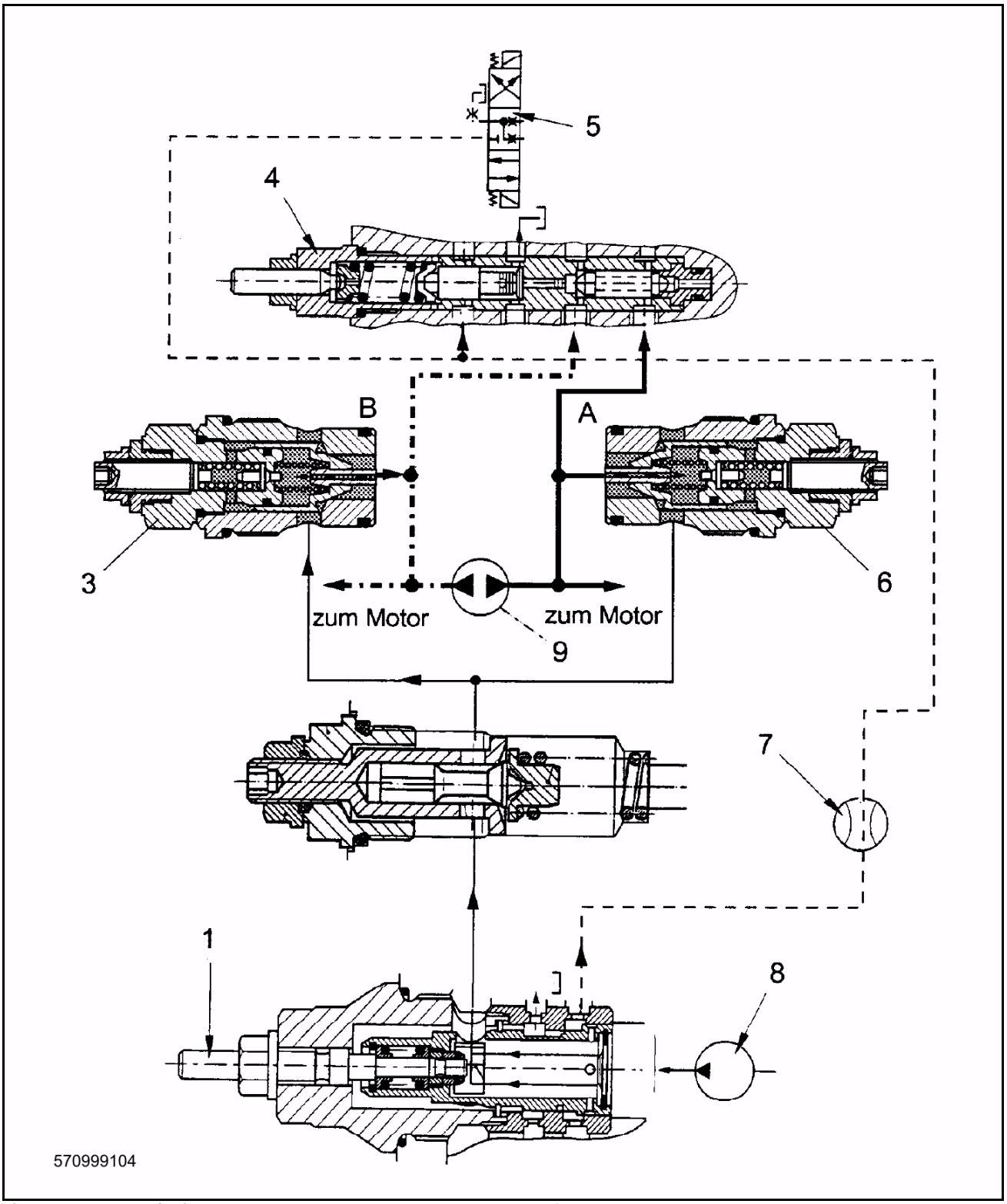


Fig. 5 Arrangement of valves

1 DA-control valve
2 Charge pressure valve
3 High pressure relief valve
4 Pressure override valve
5 Travel direction valve
6 High pressure relief valve
7 Inlet orifice
8 Charge pump
9 Travel pump
(A) High pressure port
(B) High pressure port

The charge circuit is necessary for the compensation of leaks and flushing quantities in a closed hydraulic circuit and for controlling the pump.

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Pilot controlled high pressure relief valve

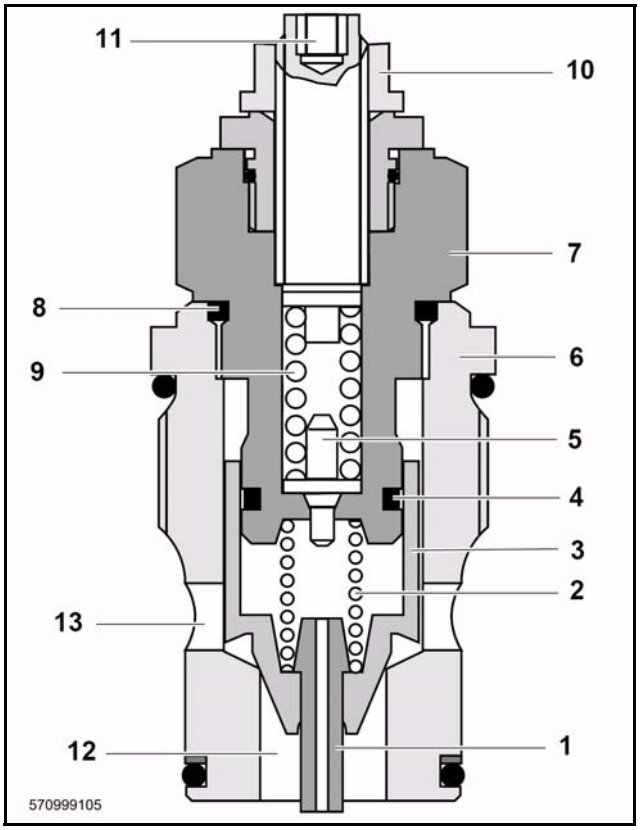


Fig. 6 Pilot controlled high pressure relief valve

1 Valve sleeve
2 Pressure spring
3 Piston
4 O-ring
5 Pilot valve
6 Valve body
7 Valve body
8 O-ring
9 Pressure spring (high pressure)
10 Locking nut
11 Setscrew
12 High pressure circuit
13 Charge circuit

The charge oil flow is now available at the boost check valves for the closed hydraulic circuit. The boost check valves are non-return valves, which are integrated in the high pressure relief valves. Their back is always loaded with the actual pressure in the closed circuit (high pressure or low pressure). Since the charge pressure is not able to open the boost check valve against the high pressure, fresh oil can only be fed in through the boost check valve in the low pressure side.

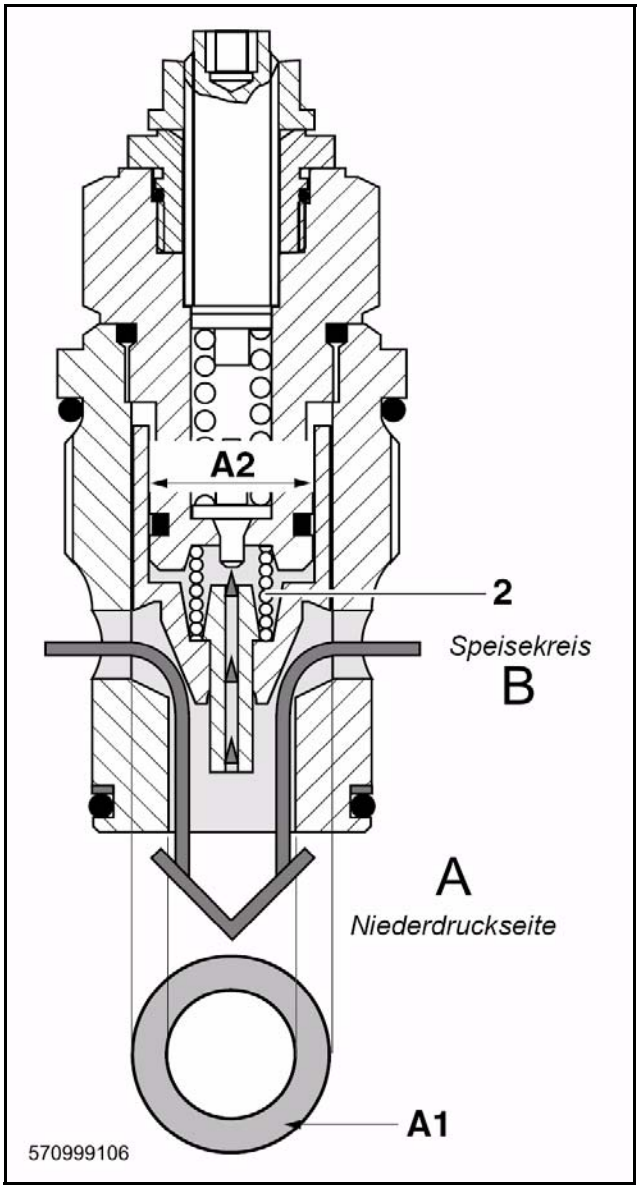


Fig. 7 High pressure relief valve, boost check valve function

(A) Low pressure side

(B) Charge circuit

Boost check valve function

The charge oil (charge oil circuit) from the charge pressure relief valve acts on the ring area A1 of piston (3).

The piston is lifted off because the force (P x A1) is higher than the sum of spring force (2) and counteracting force (P x A2).

Charge oil can now flow into the low pressure side of the closed hydraulic circuit.

This ensures permanent filling of the closed circuit.

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High pressure relief valve

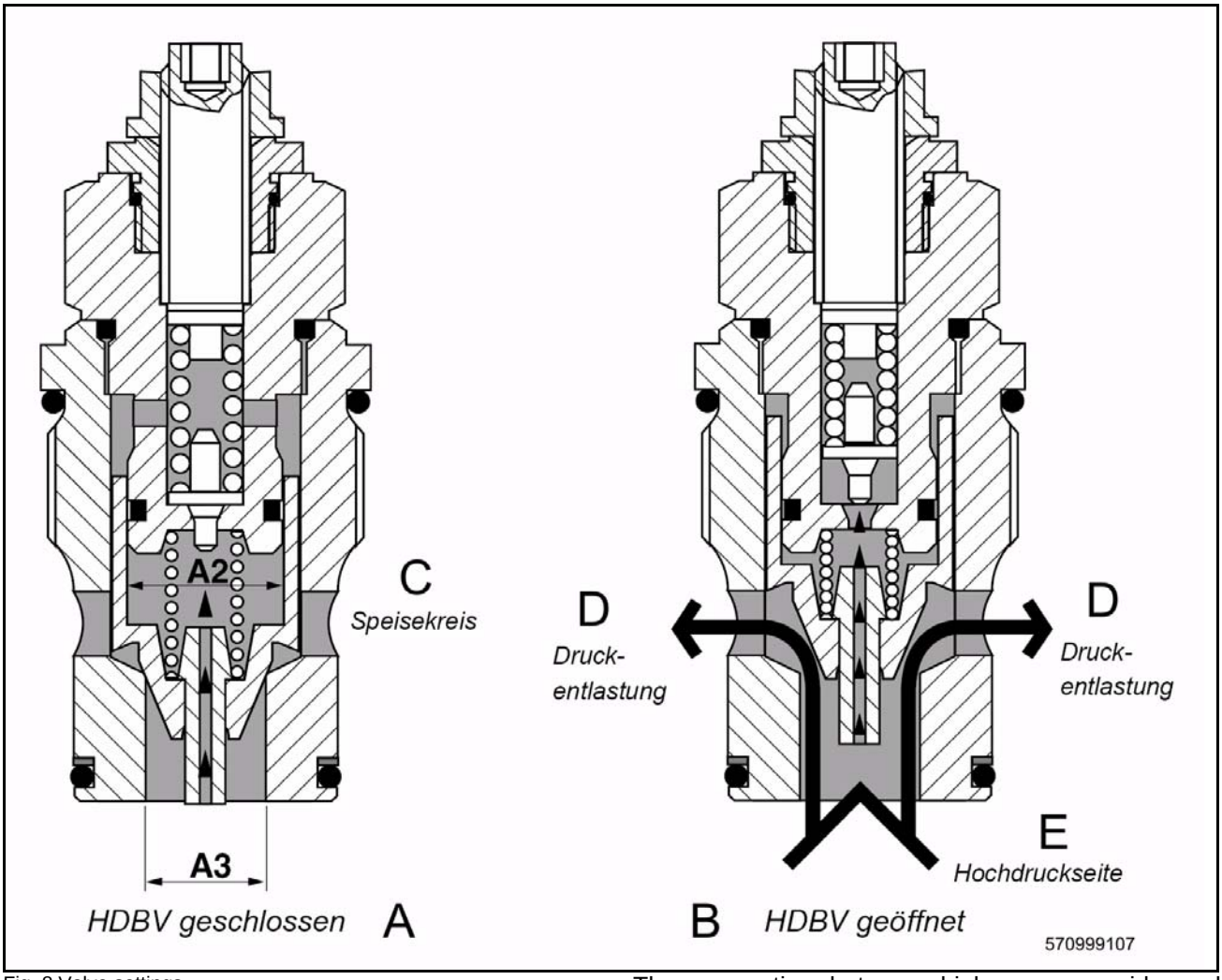


Fig. 8 Valve settings

(A) HPRV closed

(B) HPRV open

(C) Charge circuit

(D) Pressure relief

(E) High pressure side

High pressure relief valve closed (A)

High pressure acts on area A3 and tries to lift the piston (3) of its seat. High pressure is guided through valve sleeve (1) to the back of piston (3). The effective area A2 is bigger than A3, the piston is therefore pressed down in its seat and seals the high pressure side to the charge pressure side.

High pressure relief valve open (B)

If the high pressure exceeds the value adjusted on pilot (5) with the high pressure spring (9), the pilot will open against the high pressure spring (9). Oil will now flow through valve sleeve (1) and pilot (5) to the charge pressure side.

This causes a pressure drop at piston (3) and the piston is lifted off its seat.

The connection between high pressure side and charge pressure side opens, whereby the high pressure value set by the high pressure spring (9) is maintained.

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Charge pressure relief valve

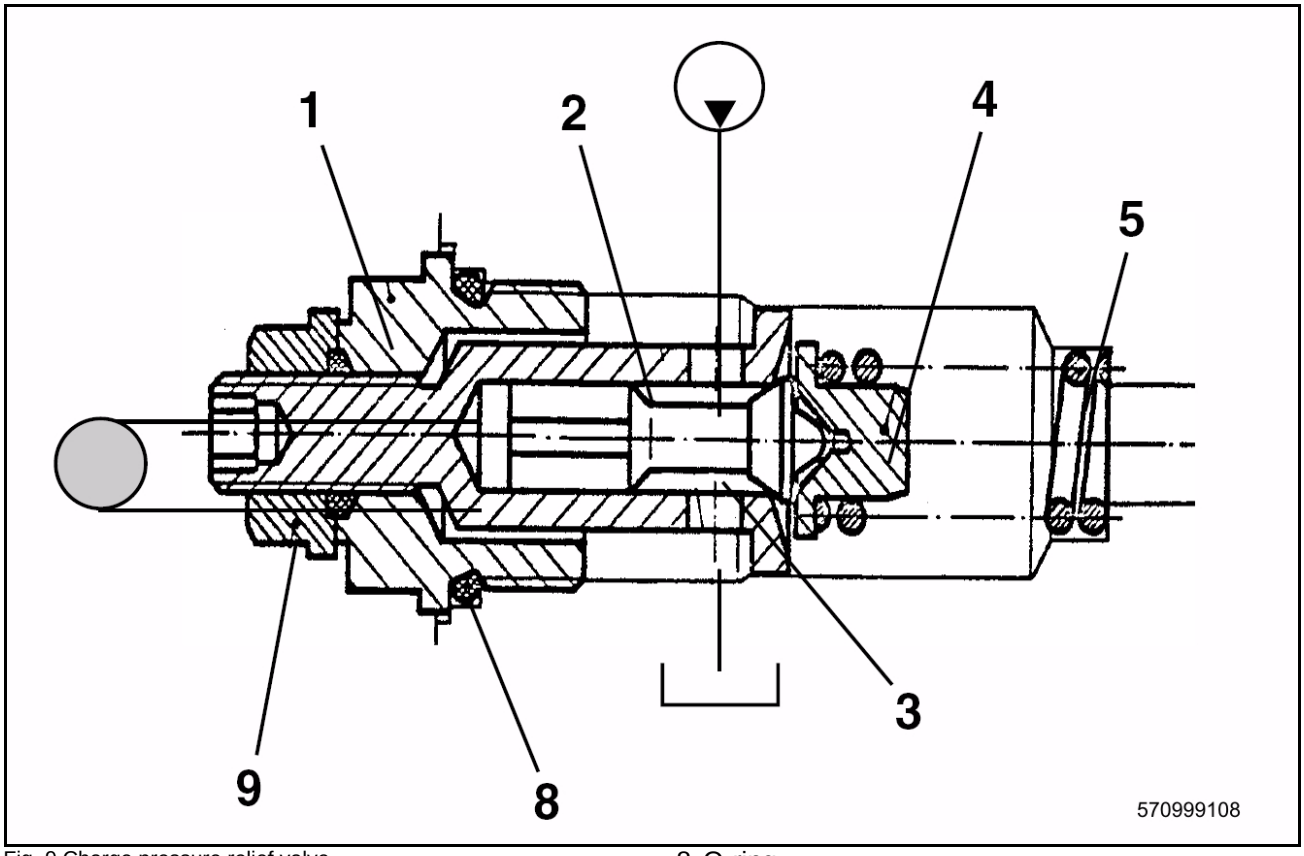


Fig. 9 Charge pressure relief valve

1 Plug

2 Setscrew

3 Valve piston

4 Spring cup

5 Pressure spring

6

7

8 O-ring

9 Collar nut

The charge oil coming from the DA-control valve enters the charge pressure relief valve through the charge oil channel and acts against area A1 on the valve cone.

If the force acting against the valve cone exceeds the force of the pressure spring, the valve cone will be lifted off its seat in the valve body and charge oil can flow into the housing channel.

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The closed circuit

As soon as the swash plate inside the travel pump is displaced out of neutral position, the pump will start to deliver oil to the respective travel motor.

In dependence on the speed of the diesel engine the swash plate can be infinitely displaced out of neutral position up to maximum displacement position.

Immediately after the swash plate has been moved out of neutral the pressure in the hoses from pump to motor will increase. This pressure is higher than the pressure in the hose from the motor to the pump. The pressure in the hose from pump to motor depends on the actual load condition of the motor. Under normal conditions this pressure may increase up to the setting of the pressure override (for pressure values refer to the technical data).

The high pressure relief valves protect the closed hydraulic circuit and the combustion engine against overloads (e.g. short pressure peaks). In such a case the valve on the high pressure side will open and relieve oil through the boost check valve into the low pressure side.

Since permanent responding of the high pressure relieve valves would cause extreme overheating of the hydraulic oil and quickly lead to serious damage, this system is protected by another kind of primary pressure limitation, the pressure override. Each of the travel pumps is equipped with a pressure override valve.

The high pressure in the system is permanently reported to the pressure override valve via a shuttle valve between both sides of the closed hydraulic travel circuit. The pressure override valve itself is connected with the pilot oil flow from the DA-control valve to the 4/3-way valve for the travel direction.

If the high pressure in the travel system increases up to the setting of the pressure override, this high pressure will push the valve spool in the pressure override against the pressure spring. This guides part of the pilot oil flow between DA-control valve and 4/3-way solenoid valve through the now open spool to the valve.

The pressure drop in the pilot oil supply reduces the force acting on the control piston and the pump swashes back towards neutral. This reduces the pump displacement, until the pump pressure is in accordance with the value adjusted with the pressure spring.

If the pressure drops below the setting of the pressure override, the pilot oil flow is opened again and the pump will return to the previously chosen displacement.

As a measure to avoid any reaction of the high pressure relief valves, the pressure override is adjusted to a lower value than the high pressure relief valves.

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Pressure override valve

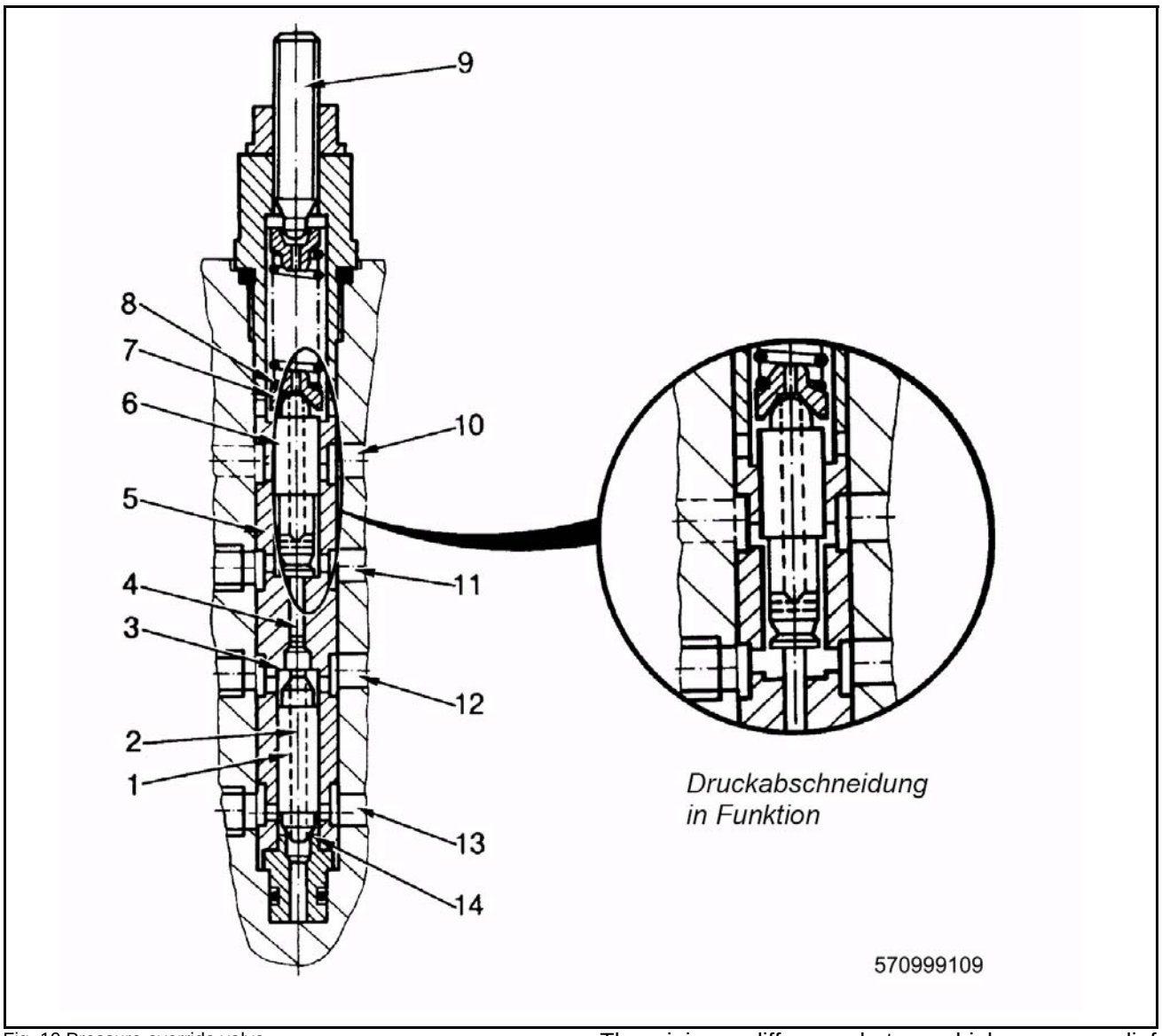


Fig. 10 Pressure override valve

1 Valve piston
2 Bore
3 Valve seat
4 Piston
5 Valve bushing
6 Control piston
7 Spring cup
8 Pressure spring
9 Setscrew
10 Pilot pressure channel
11 Housing channel
12 High pressure circuit
13 High pressure circuit
14 Valve seat

Adjustment values see next page.

The minimum difference between high pressure relief valve and pressure override is 30 bar.

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Travel motors

Each wheel of the sanitary landfill compactor is driven by a HYDROMATIK bent axle motor A6VM 160 HA 2T. These motors are designed with two different displacements an can therefore be operated in two different travel speed ranges, as desired.

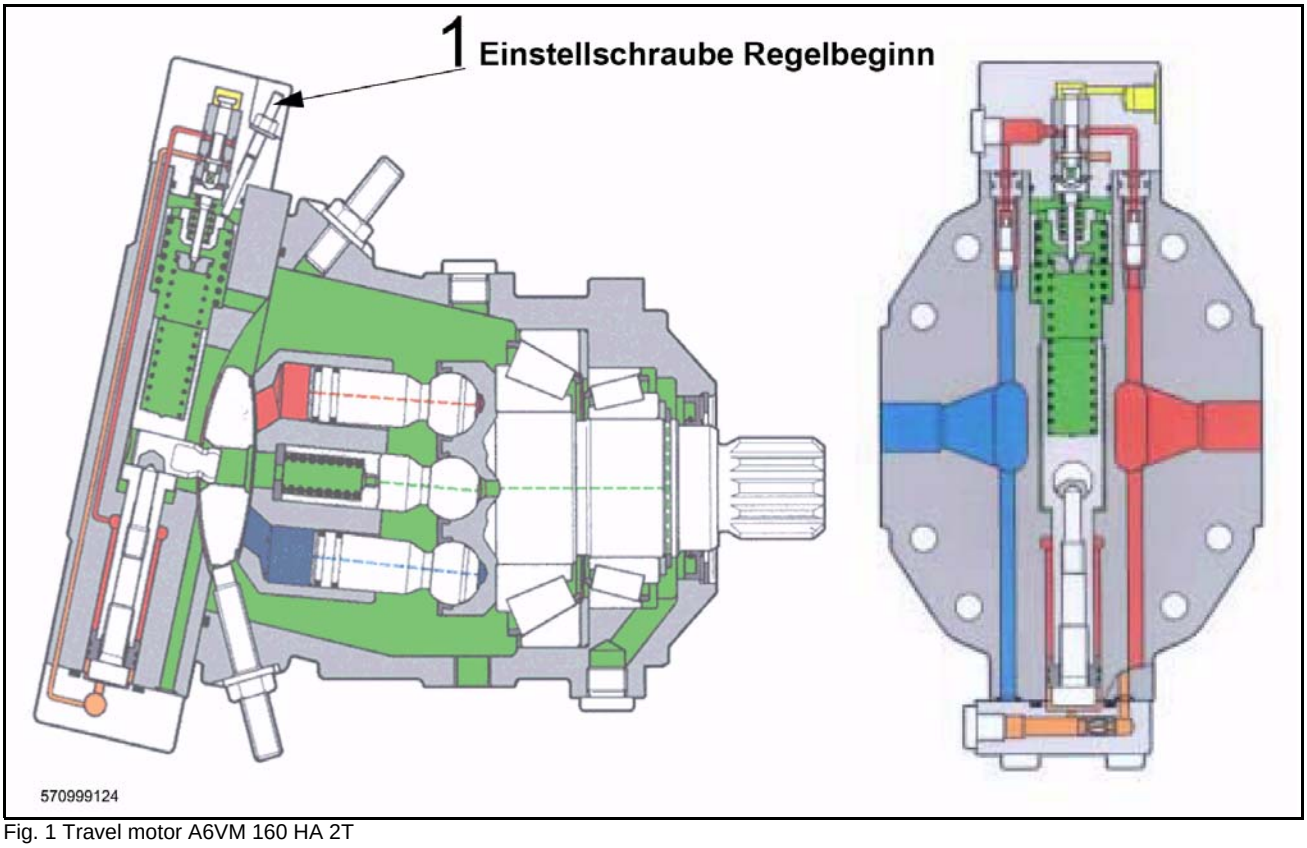


Fig. 1 Travel motor A6VM 160 HA 2T

1 Control start setscrew

The motors are connected to the associated travel pumps via the high pressure ports A and B. The high pressure hydraulic oil flows through the respective high pressure port to the back of the working pistons. Since these pistons are arranged under an angle to the output shaft, the pressurized pistons perform an axial movement, thereby generating the rotary movement of the connected output shaft.

Once a piston has passed through its dead centre (max. extension), the piston will change to the low pressure side. The continuing rotation presses the piston back into the cylinder. This forces the hydraulic oil from the cylinder chamber through the low pressure side back into the pump.

Charge pressure can be applied to the control unit on the travel motor via a solenoid valve. This changes the angle between piston drum and output shaft.

In this context a large angle means high displacement. In low speed range the motor works with a high torque. With a small angle these conditions are exactly opposite.

When driving the refuse compactor in high speed range, he travel motors will automatically start to adjust towards high displacement once a certain pressure level is reached. At the same time the torque increases accordingly.

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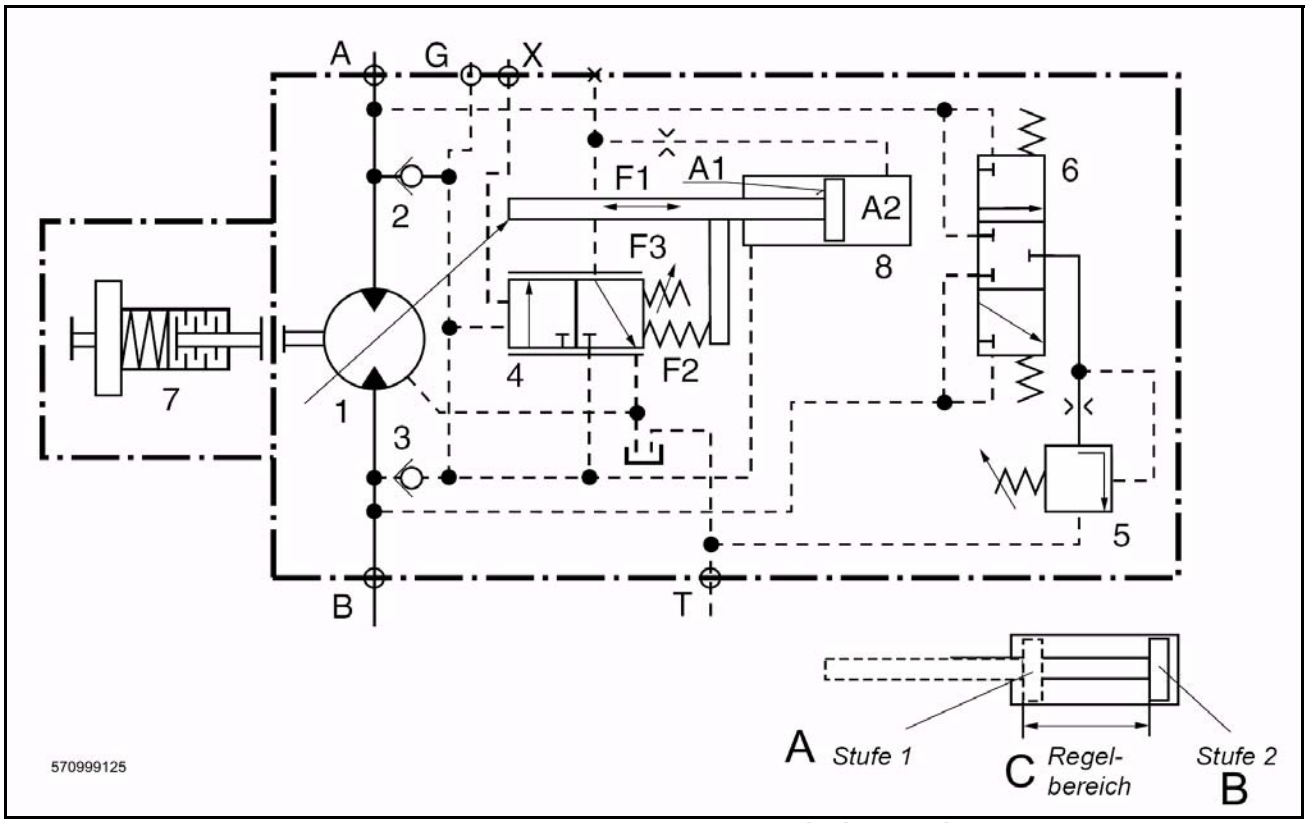


Fig. 2 Hydraulic diagram travel motor

(A) Stage 1

(B) Stage 2

(C) Control range

1 Engine

2 Check valve

3 Check valve

4 Pre-control piston

5 Pressure relief valve

6 Flushing valve

7 Planetary drive

8 Control piston

Motor works in speed range 1

If speed range 1 (slow) is selected, charge pressure is applied to port X. This pressure causes reversing of the pilot control piston (4) against the spring forces F2 and F3. The high pressure in A or B is guided through the corresponding non-return valve via the pilot control piston to the control piston area A2. High pressure is also applied to control piston area A1. The resulting force F1 (F1 = (A2-A1) x P) has the effect, that the motor changes to high displacement (max. torque and slowest speed).

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Motor works in speed range 2 or 3

Pilot pressure below control start

The high pressure in A or B is guided through the corresponding non-return valves to the pilot control piston. With pressures up to control start of the travel motors (pressure values see technical data) the adjustable spring force F3 of the control start spring is higher than the force applied by the pressure. The connection to control piston area A2 is interrupted. High pressure is only applied to control piston area A1. In this case the control piston force is F1 = A1 x P and holds the motor at the small swashing angle (min. torque and high speed).

Operating pressure within the control range

With the automatic displacement control (high pressure dependent), the adjustment of the displacement (proportional swashing angle) is accomplished automatically in dependence on the operating pressure. The control start is pre-set by the adjustment of spring force F3. Once the operating pressure reaches the adjusted value, pressure is also applied to control piston area A2 via the control piston.

The pressure increase spring F2 prevents the pilot control piston from opening completely. Due to the ”restrictor effect” of the slightly opened control piston, the pressure applied to A2 is lower than the operating pressure. Only when the operating pressure reaches the control end (for value refer to the technical data), the force of the pressure increase spring is exceeded and the pilot control piston enables operating pressure to flow to the control piston area A2.

The two motors on one side of the machine are linked via the ports ”G”. Through these ports the pressure in the travel circuit with the highest pressure is reported to the other motor. The motor with the lower pressure thereby responds exactly in the same way as the motor with the higher pressure. This installation synchronizes the motor controls of the two motors on one side of the machine.

This type of control ensures that both motors on one machine side work with almost the same displacement / speed. This prevents the unloaded motor from changing to max. speed, if one of the wheels is unloaded (e.g. when raising the wheels with the dozer blade).

Since the output speed of the motors is too high for direct driving of the wheels, the motor output speed is reduced to final working speed by planetary gears.

Each wheel unit therefore consists of a hydraulic motor with a planetary gear.

The motors are directly connected to the planetary gears via splined shafts.

The housings of the planetary gears also contain the multi-disc brakes. The brakes run in an oil bath and are therefore almost wear-free. The brakes are released by charge pressure and close automatically when the charge pressure drops below the brake releasing pressure (when shutting the engine down, when actuating the parking brake etc.).

i Note

The brake is designed and intended as a parking and emergency brake. Unnecessary use of the emergency stop during travel operation reduces the lifetime of the brake discs and should therefore be avoided!

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Filtration

Function and lifetime of a hydraulic system depend decisively on the cleanliness of the power transmission medium (hydraulic oil).

For this reason it is mandatory to filter the hydraulic oil permanently while the machine is working. In closed hydraulic circuits the full flow filtration of the charge circuit and the return flow from the individual components has been found very beneficial.

Charge circuit filtration

Both charge circuits are fitted with one 12 µm fine filter each. The oil flows through these filters to the individual consumers and functions.

The filters are fitted with by-pass valves. These open at a pressure differential (pressure difference between filter inlet and filter outlet) of 3.5 bar. This pressure differential depends on the filter contamination and the viscosity of the hydraulic oil.

Pressure differential switches on the filters report any increase of the pressure differential into the cabin. These switches are designed for a pressure differential of 2.5 bar. The respective information will therefore already be available before the by-pass valve opens.

Return flow filter block

As a second measure to keep the oil free of any impurities, all leaks, flushing quantities and return flows are guided back to the tank through a central return flow filter block.

The return flow filter block contains two 80 µ filters, two dirt sensors, one pressure switch and a temperature controlled 3/2-way valve.

All return flows pass through the primary filter, followed by a temperature controlled valve (thermostat). This valve guides the oil flow directly back to the tank, until the operating temperature is reached. At an oil temperature of 55 °C the valve starts to switch over and at 70 °C the total amount of oil will flow through the hydraulic oil cooler.

If the primary filter is dirty, the oil flow is guided through the secondary filter. The oil can only pass through this filter when the static pressure in front of the primary filter is higher than 2 bar. In this case the oil is no longer cooled. The pressure switch reports a too high static pressure in front of the primary filter and informs the operator via the fault indicator module.

In addition to this the dirt sensor (permanent magnet) reports any metallic contamination in the oil via a visual indicator in the cabin.

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Oil circuit

A pump inside the transfer box pumps the oil in the transfer box through a cooling circuit and finally through a filter.

A pressure relief valve is installed in front of the filter inlet. It limits the pressure to 12 bar in low and 25 bar in high idle speed of the engine, at a gear oil temperature of min. 40°C.

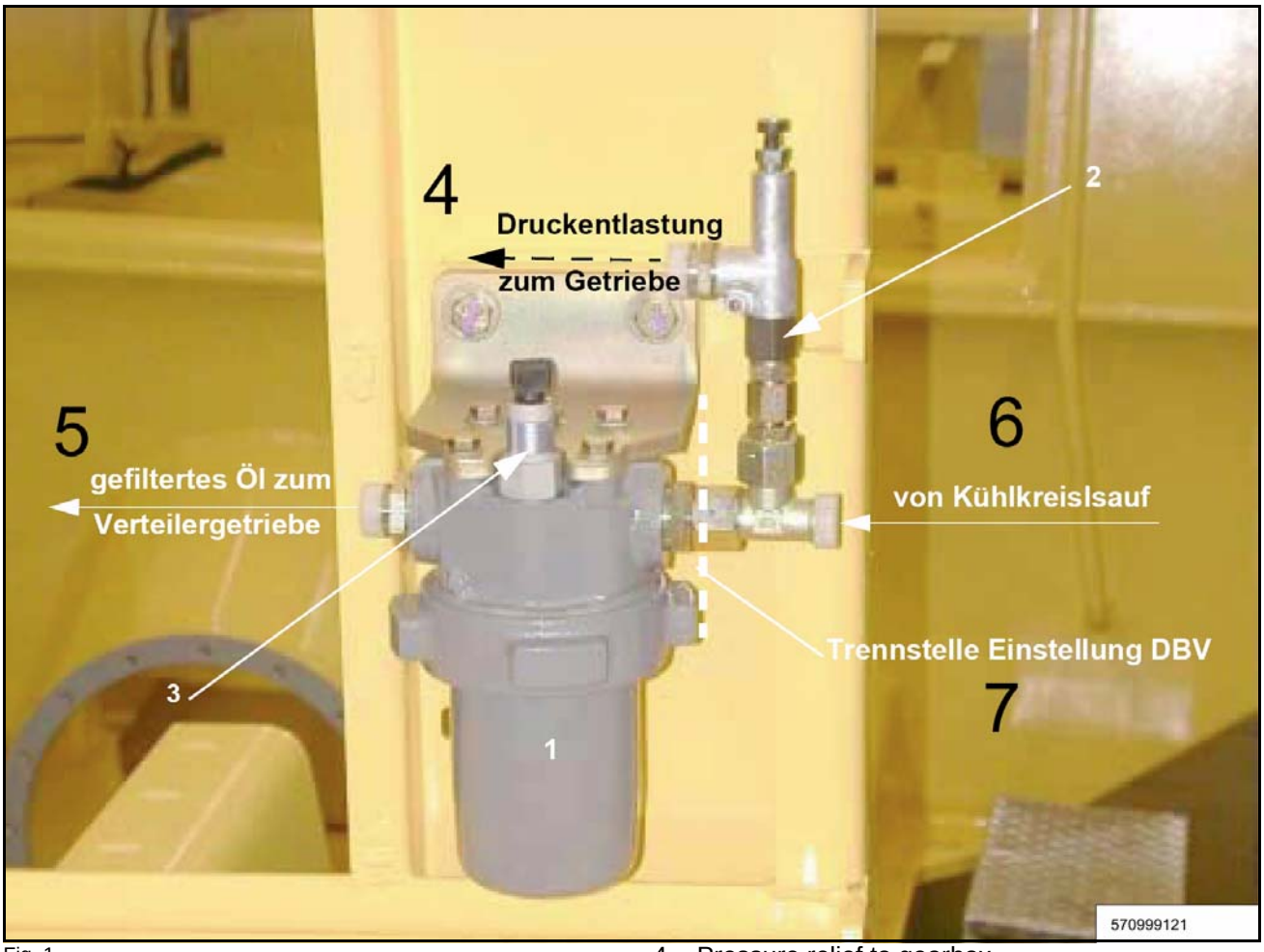


Fig. 1

1 Filter unit
2 Pressure relief valve
3 Differential pressure switch
4 Pressure relief to gearbox
5 filtered oil to transfer box
6 from cooling circuit
7 Separation PRV-setting

Pos.	Designation	Measuring value
1	Filter unit	
2	Pressure relief valve	25 bar in high idle and min. 40°C oil temperature
3	Differential pressure switch	2.4 bar

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15 Tests and adjustments in travel hydraulics

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Measuring and adjustment points

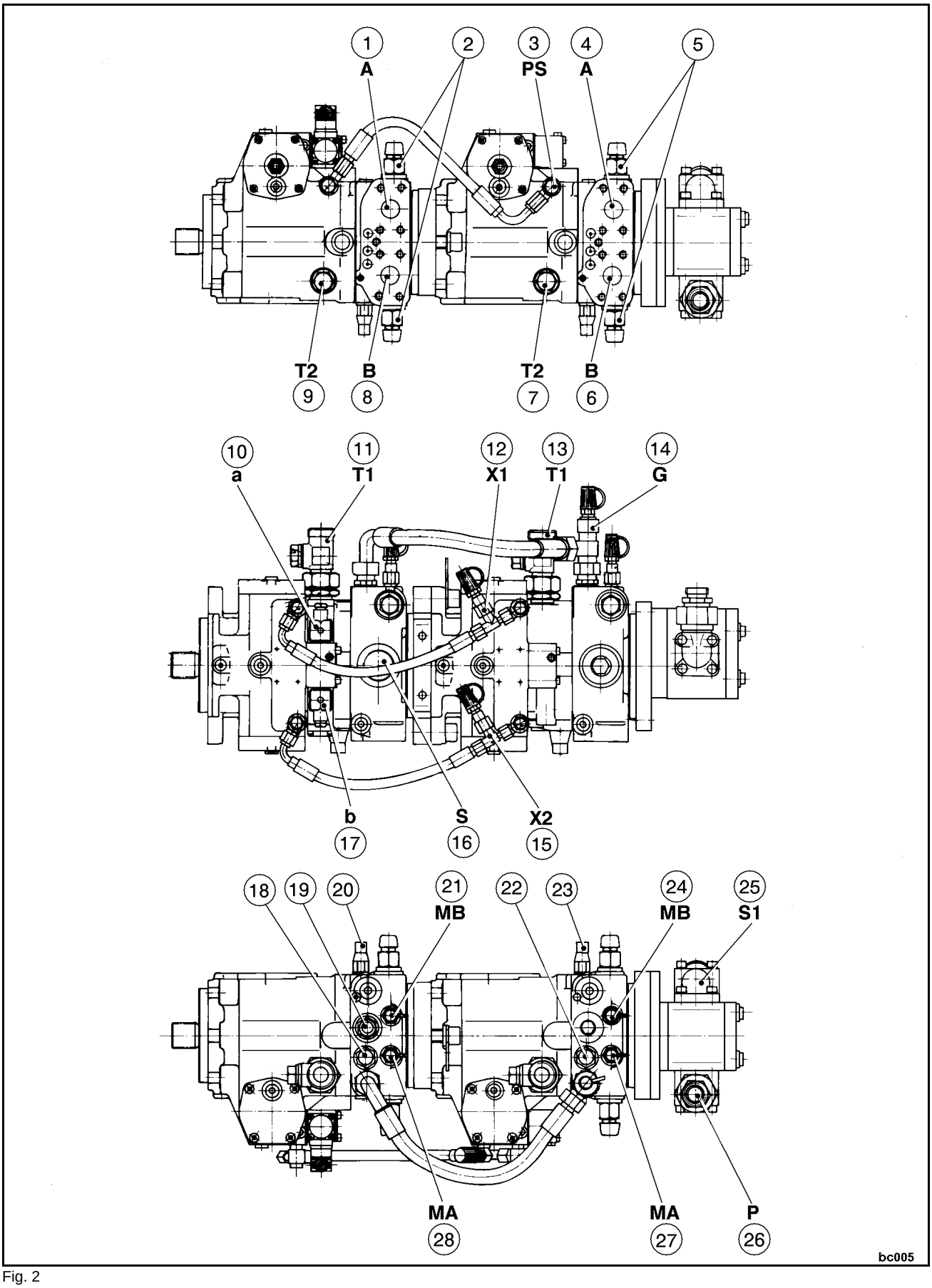


Fig. 2

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Pos.	Designation	Pos. in electric wiring diagram	Pos. in hydraulic diagram	Measuring value
1	Port A, high pressure reverse, driven pump		08A, 11A	
2	High pressure relief valves, driven pump			480 -20 bar
3	PS-line, pilot pressure supply to pressure override			
4	Port A, high pressure reverse, dragged pump		09A, 12A	
5	High pressure relief valves, dragged pump			480 -20 bar
6	Port B, high pressure forward, dragged pump			
7	Plug T2, dragged pump		T2	
8	Port B, high pressure forward, driven pump		B	
9	Plug T2, driven pump		T2	
10	Plug a, solenoid valve forward	Y 16	a	0 / 24V
11	Port T1, leak oil to return flow filter, driven pump, with magnetic plug		T1	
12	Test port X1, control chamber pressure reverse		M6, M16, X1	0 - 14 bar, **)
13	Port T1, leak oil to return flow filter, dragged pump, with magnetic plug		T1	
14	Test port G, charge pressure		M7, M17, G3	0 ± 2 bar in high idle speed***)
15	Test port X2, control chamber pressure forward		M5, M15, X2	0 - 14 bar **)
16	Port S, charge pressure from hydraulic oil filter			
17	Plug b, solenoid valve reverse	Y 17	b	0 / 24V
18	Charge pressure relief valve, driven pump			30 ± 2 bar in high idle speed***)
19	DA-control valve			*)
20	Pressure override, driven pump			430 +10/-20 bar
21	Test port MB, high pressure forward, driven pump		M2, M12, MB	430 +10/-20 bar
22	Charge pressure relief valve, dragged pump			30 ± 2 bar in high idle speed***)
23	Pressure override, dragged pump			430 +10/-20 bar
24	Test port MB, high pressure forward, dragged pump		M4, M14, MB	430 +10/-20 bar
25	Port S1, suction connection charge pump from tank			
26	Port P, charge pump pressure port to filter			
27	Test port MA, high pressure reverse, dragged pump		M3, M13, MA	430 +10/-20 bar
28	Test port MA, high pressure reverse, driven pump		M1, M11, MA	430 +10/-20 bar

*), **), ***); see adjustment instructions

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15.2 Pressure tests in the travel circuit

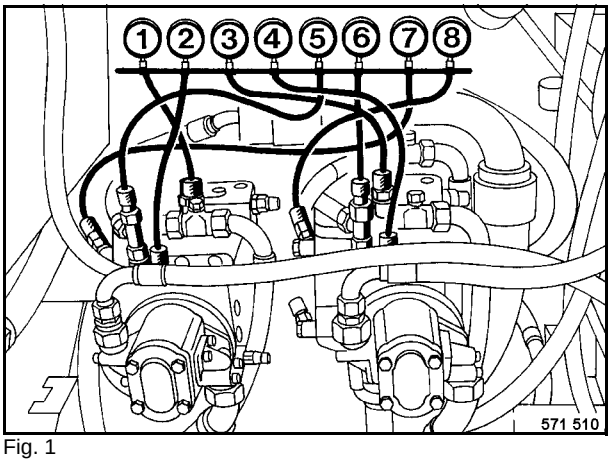


Fig. 1

⚠ Danger

Whenever performing tests make sure you direct visual contact with the driver.

1. Run the machine warm to operating temperature (approx. 40°C hydraulic oil temperature).
2. Connect the following pressure gauges (Fig. 1):
   - 1 High pressure, travel pump rear left, 600 bar.
   - 2 High pressure, travel pump front left, 600 bar.
   - 3 High pressure, travel pump front right, 600 bar.
   - 4 High pressure, travel pump rear right, 600 bar.
   - 5 Charge pressure, left hand tandem pump 60 bar.
   - 6 Charge pressure, right hand tandem pump 60 bar.
   - 7 Control chamber pressure, left hand tandem pump 60 bar.
   - 8 Control chamber pressure, right hand tandem pump 60 bar.

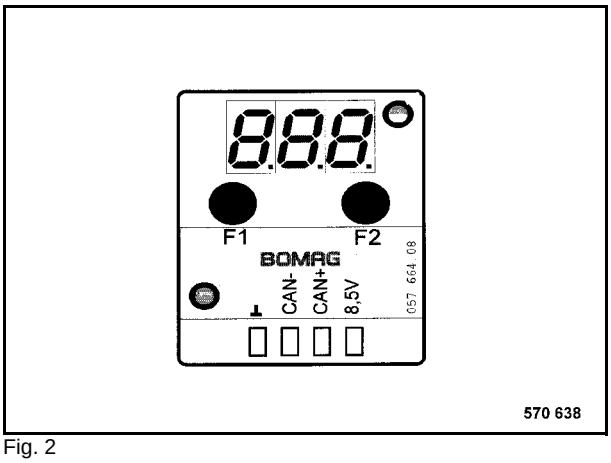


Fig. 2

⚠ Danger

Make sure there are no persons in front of or behind the machine.

3. Input module (Fig. 2) enter PIN-CODE.
4. Start the engine, select 2nd speed range and switch to travel direction reverse.

i Note

Do not actuate the emergency stop.

5. Accelerate the engine slowly up to full speed and watch the pressure gauges.

   Nominal values:

   High pressures must increase evenly to 430 +10/ -20 bar. The charge pressures must not drop considerably (<28 bar). At least 28 bar at idle speed, increasing to 30 bar.

   Control chamber pressures must increase evenly to approx. 14 bar.

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15.3 Checking high pressure relief valves and pressure override

1. Run the machine up to operating temperature (40°C hydraulic oil temperature).
2. Input module (Fig. 1) enter PIN-CODE.

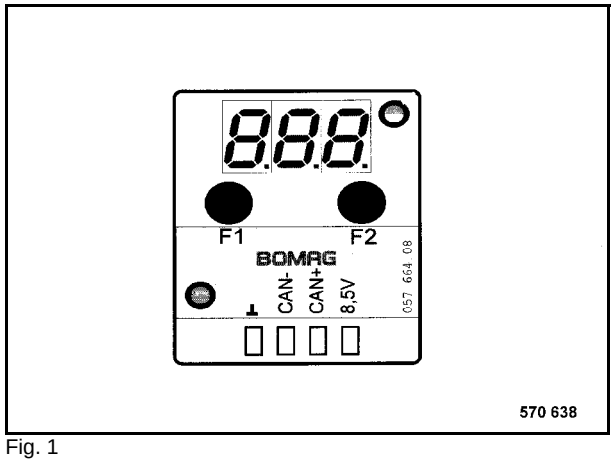


Fig. 1

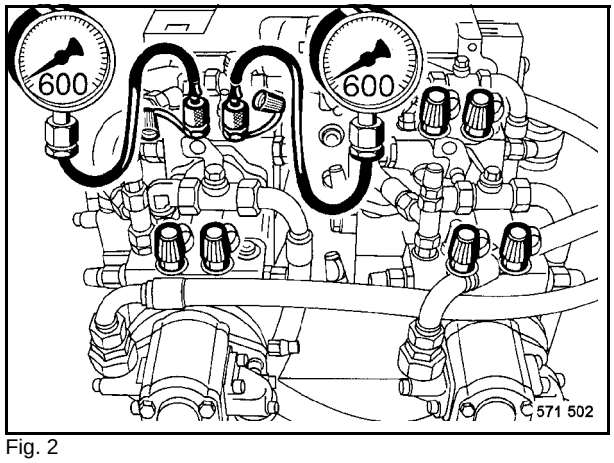


Fig. 2

3. Connect a 600 bar pressure gauge to both high pressure ports (Fig. 2) of a tandem pump.

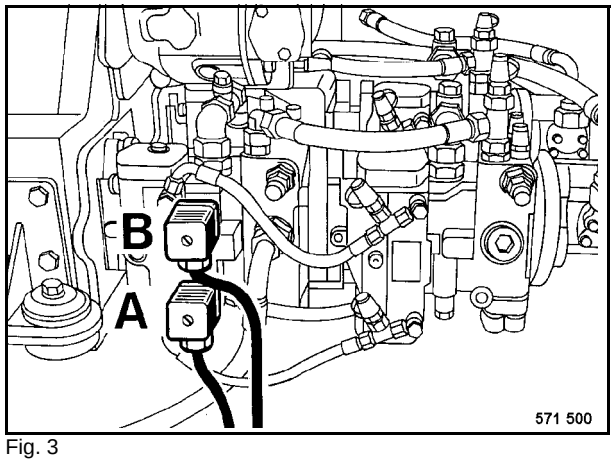


Fig. 3

4. Pull the electric plugs A and B (Fig. 3) off the magnets on the other pump, since the machine might drive through the brake.

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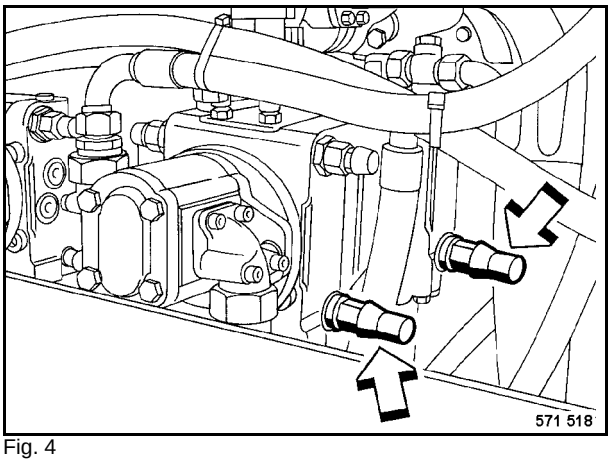


Fig. 4

5. Turn the adjustment screw of the pressure override (Fig. 4) completely in (block).

⚠ Danger

Make sure there are no persons in front of or behind the machine.

6. Start the engine, select 2nd speed range and shift the travel lever to the desired travel direction

i Note

Do not actuate the emergency stop.

⚠ Caution

Perform the following test for max. 3 seconds, as otherwise the pump may be destroyed by overheating!

7. Accelerate for a moment (max. 3 seconds) to full speed and read the pressure gauges.

   Nominal value:

   480 -20 bar

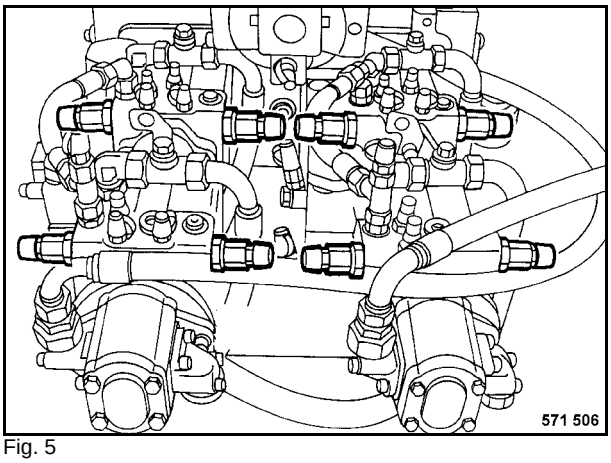


Fig. 5

8. If necessary adjust the high pressure relief valves (Fig. 5).
9. Repeat this test to the opposite travel direction.
10. Repeat these tests for the rear pump.

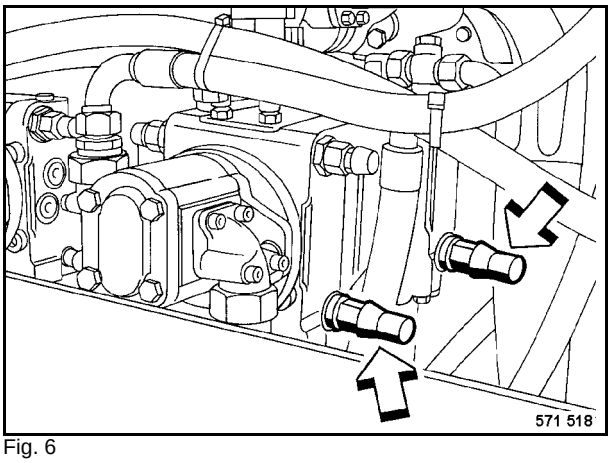


Fig. 6

11. Adjust the pressure override (Fig. 6) on the front pump to 430 bar (high pressure measurement on front pump!).
12. Adjust the pressure override on the rear pump to 430 bar (high pressure measurement on rear pump).

⚠ Caution

If the pressure override is not correctly adjusted on one of the pumps (remains blocked) the high pressure in the respective circuit may increase up to the setting of the high pressure relief valves.

13. Perform the same tests for the second tandem pump.

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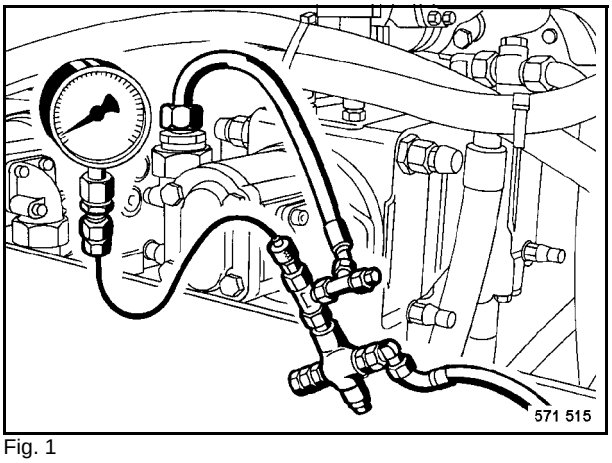


Fig. 1

15.4 Charge pump high pressure test

Special tools:

Gear pump testing device, 600 bar pressure gauge.

1. Close the pump outlet port with a 200 bar pressure gauge (Fig. 1) fitted with a pressure gauge. Hold the open end of the hose into a collecting vessel.
2. Crank the engine with the starter (pull the plug off the solenoid valve or keep the engine shut-down depressed).
3. Read the pressure gauge.

   Nominal value:

   200 bar
4. If the nominal value is not reached, replace the charge pump.

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15.5 Travel pump high pressure test (individual test)

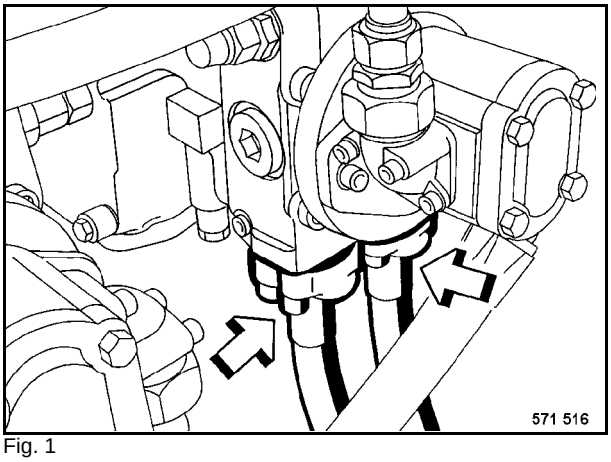


Fig. 1

1. Close the high pressure ports (Fig. 1) on one travel pump with plugs.

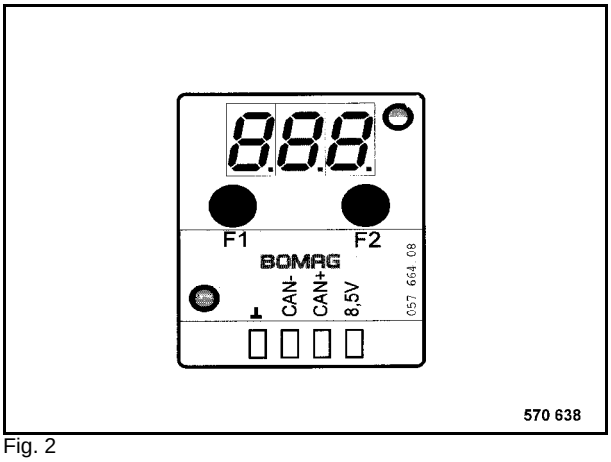


Fig. 2

2. Input module (Fig. 2) enter PIN-CODE.

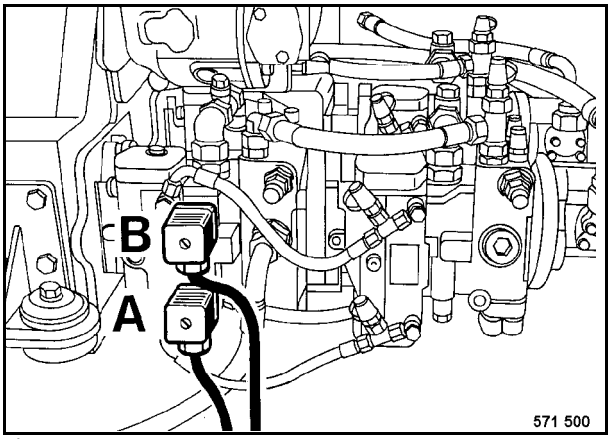


Fig. 3

⚠ Danger

Pull the electric plugs A and B (Fig. 3) off the magnets on the other pumps, because the machine might drive through the brake.

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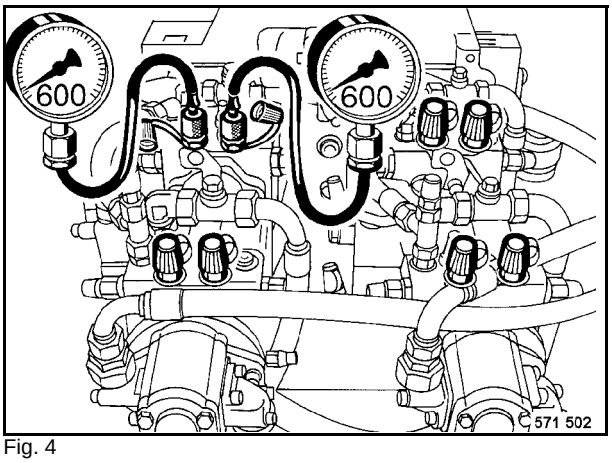


Fig. 4

3. Connect a 600 bar pressure gauge to the high pressure test port of the pump (Fig. 4).

i Note

Do not actuate the emergency stop.

4. Start the engine, select 2nd speed range and shift the travel lever to the desired travel direction
5. Raise the engine speed for a moment and read the pressure gauge.

   Nominal value:

   410 to 440 bar
6. If the nominal value is not reached, check pressure override and high pressure relief valves. If the valves are o.k., replace or repair the travel pump.

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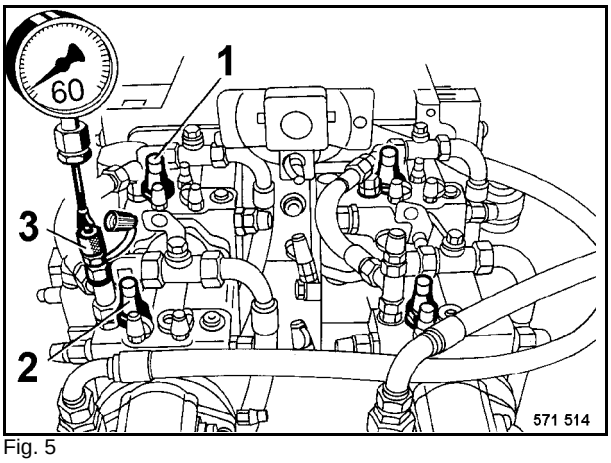


Fig. 5

15.6 Checking charge pressure

1. Run the machine until operating temperature is achieved, then shut down the engine.
2. Block the front charge pressure relief valve 1 (Fig. 5) on a tandem pump, turn the setscrew completely in to do so.
3. Connect a 60 bar pressure gauge to the charge pressure test port (3).
4. Start the engine and run it with half speed.
5. Set the rear charge pressure relief valve (2) to 30 bar.
6. Run the engine with maximum speed (the charge pressure increases).
7. Loosen the blocked valve until the charge pressure of 30 bar is reached again.
8. Check the charge pressure again at idle speed.

   Nominal value:

   min. 28 +/- 2 bar
9. Should the pressure of 28 bar not be reached, repeat the basic adjustment with a pressure higher than 30 bar, but on both valves identical.
10. Check and adjust the other tandem pump accordingly.

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15.7 Adjusting the DA-control valve

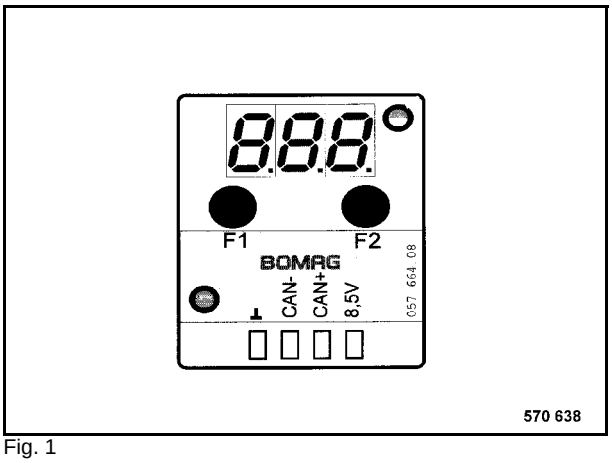


Fig. 1

1. Warm the machine up to operating temperature.
2. Input module (Fig. 1) enter PIN-CODE.
3. Select 2nd speed range.

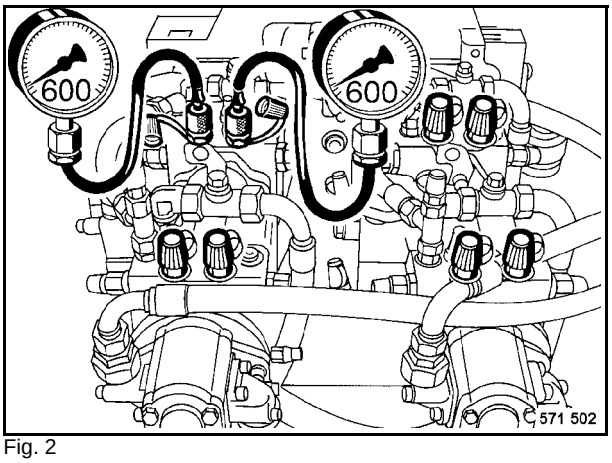


Fig. 2

4. Connect 600 bar pressure gauges to both high pressure test ports (MA or MB) of both tandem pumps (1) / (2) and (3) / (4) (Fig. 2).
5. Start the engine and raise the engine speed to 950 ± 50 rpm (1025 ± 50 rpm on BC572RB-2).
6. Select the travel direction in accordance with the chosen high pressure test port (in this illustration reverse) and read the pressure gauge.

i Note

Do not operate foot brake and emergency stop.

Nominal value:

High pressure 50 bar as mean value

7. Raise the engine speed to 1700 rpm.

Nominal value:

High pressure 400 bar

8. If deviations from the nominal value for control start are found the pressure must be adjusted on the corresponding DA-control valve (Fig. 3).

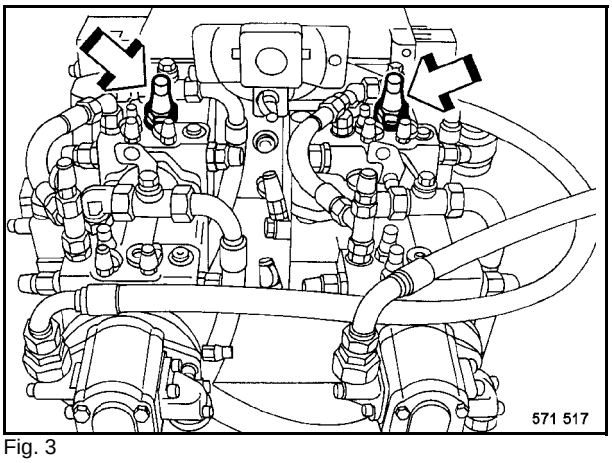


Fig. 3

i Note

Turn clockwise = control start at higher engine speed.

Turn anti-clockwise = control start at lower engine speed.

Both tandem pumps must be equalized, i.e. for a synchronous operation the adjustment values of right and left hand pumps should be almost identical.

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15.8 Stellkammerdrück prüfen

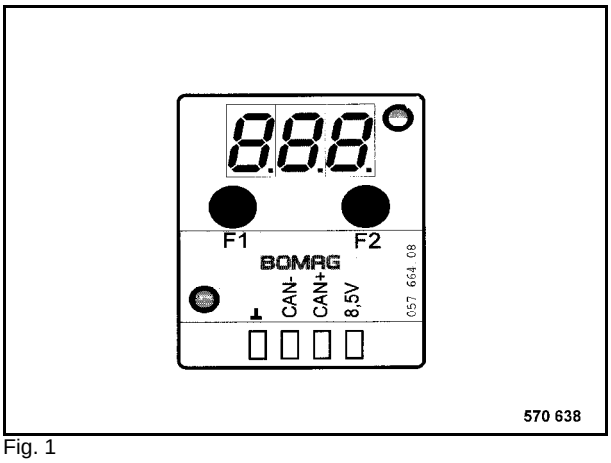


Fig. 1

1. Maschine betriebwarm fahren.
2. Eingabemodul (Fig. 1) PIN-CODE eingeben.
3. Zweite Fahrstufe einlegen.

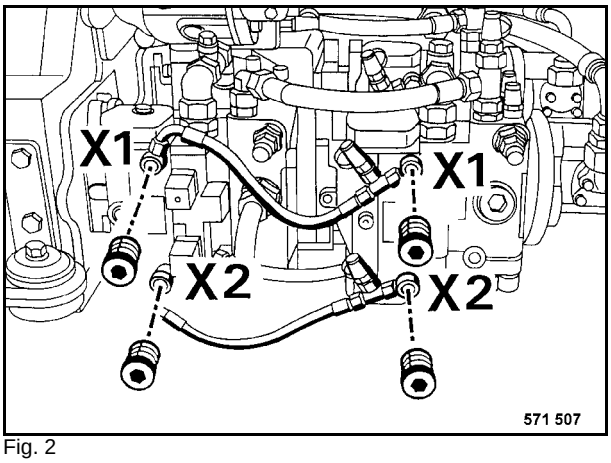


Fig. 2

4. Je ein 60 bar Manometer Messanschluss (X1 und X2) (Fig. 2) Stellkammerdruck anschließen.
5. Dieselmotor starten.

i Note

Fußbremse und Not-Aus-Schalter nicht betätigen.

Sollwert:

Motordrehzahl 950 ± 50 1/min (1025 ± 50 1/min bei BC572RB-2): ca. 6 bar

Motordrehzahl 1700 ± 50 1/min: ca. 12...14 bar

i Note

Die Messungen vom Regelbeginn und Regelende sind im Hochdruck aussagekräftiger als Stellkammerdruck, da hier der effektive, zu den Rädern geführte Druck gemessen wird.

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15.9 Measuring and adjustment points on travel motors

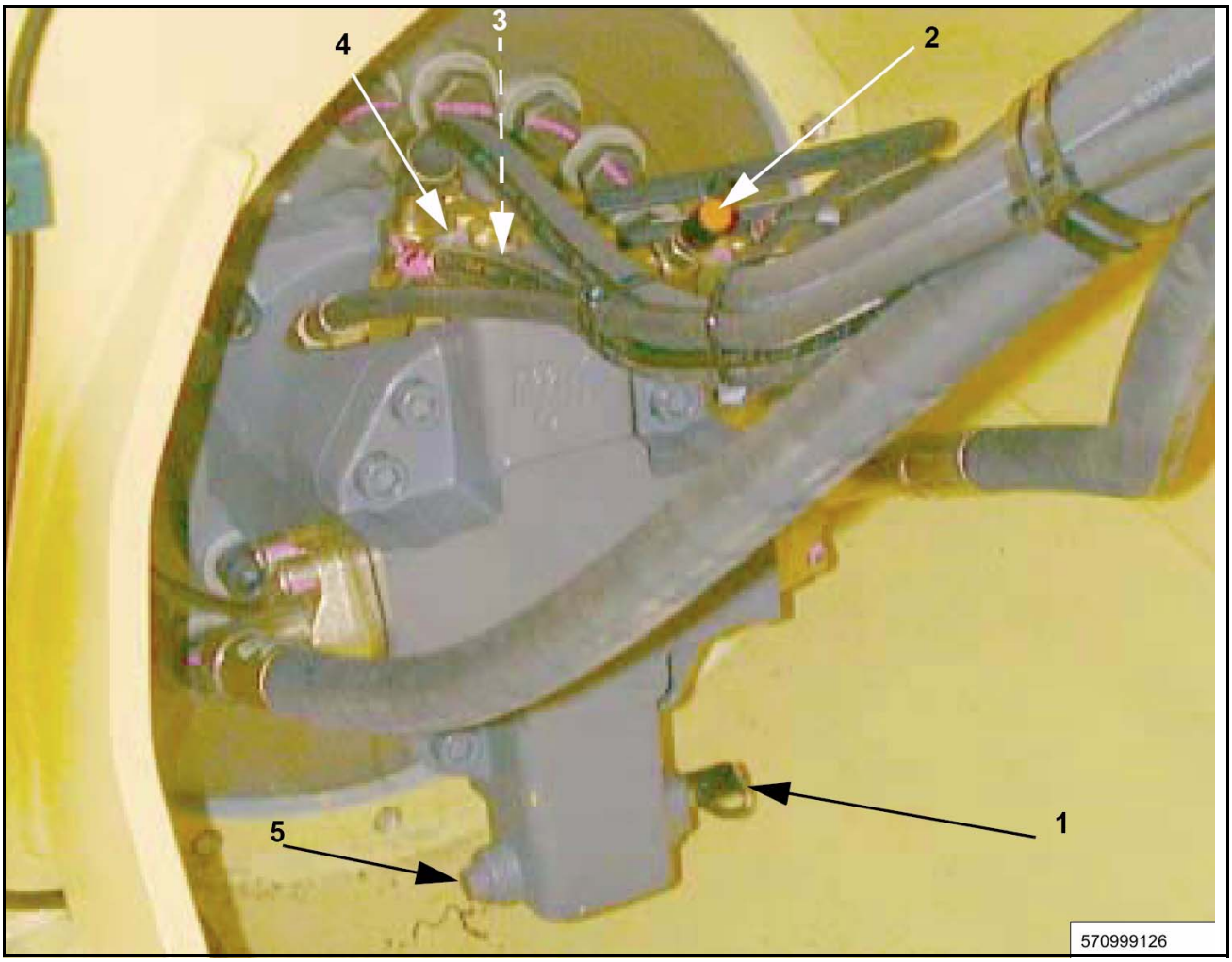


Fig. 1 Travel motor front right

Pos.	Designation	Pos. in electric wiring diagram	Pos. in hydraulic diagram	Measuring value
1	Control pressure test port		M23, M24, M25, M26	0 - 430 bar
2	High pressure test port		M27, M28; M29, M30, G	0-430 bar (actual high pressure)
3	Setscrew for control start			
4	Setscrew for Qmax		G	do not turn!
5	Flushing valve			

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Adjusting the control start of the travel motors

- Run the machine up to operating temperature (min. 40°C hydraulic oil temperature).
- Install 600 bar pressure gauges to both test ports on the corresponding travel motor.
- Use input code 500 on the CAN-Bus input module to block the brake.
- Choose 2nd speed range and any travel direction and slowly increase the engine speed while keeping an eye on the pressure gauges.

Nominal value:

up to 280 bar high pressure can be read on the lower test port (G) actual high pressure, the upper test port (M1) approx. 0 bar.

from a high pressure of approx. 280 bar the pressure at M1 must increase together with the high pressure, so that full high pressure is also indicated here when approx. 380 bar is reached.

- If necessary correct the adjustment on the setscrew. Turning in reduces and turning out increases the control start.

i Note

1 revolution of the control start adjustment screw results in a 100 bar change!

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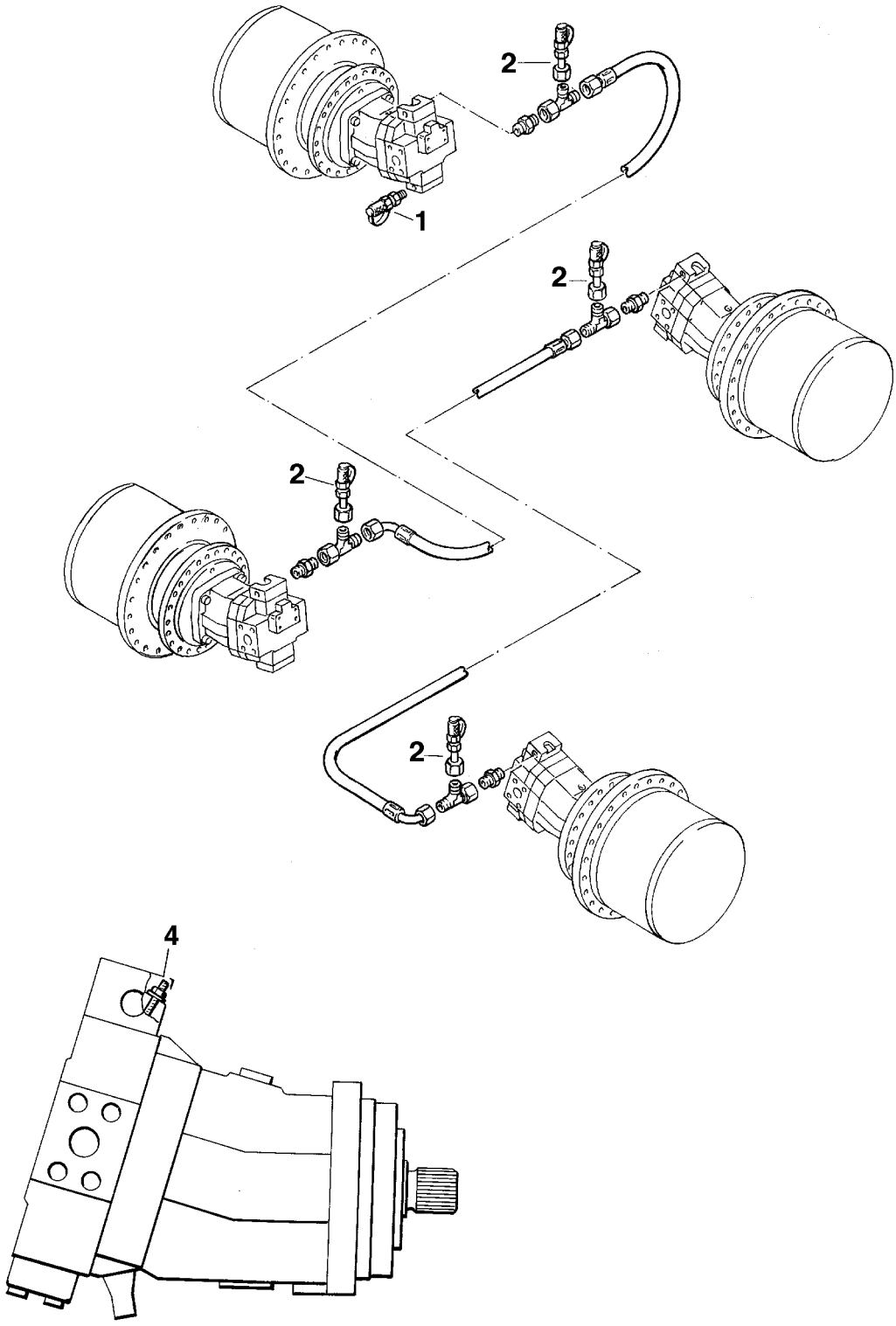


Fig. 1

1 Pilot pressure port (pressure in swashing cylinder)
2 High pressure port „G“
3 Electric plug, brake solenoid valve
4 Setscrew, displacement adjustment

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Special tools:

2 x 600 bar pressure gauges

2 pressure test hoses

i Note

Always perform this test after replacing one or several motors.

If a new motor was installed, fill, bleed and, if necessary, flush the hydraulic system as described.

1. Run the machine warm in the first speed range, until the hydraulic oil has a reached a temperature of approx. 50 °C.
2. Connect a high pressure gauge 2 (Fig. 1) to port “G“ on the respective motor.

i Note

This pressure gauge shows the load dependent high pressure in travel operation.

3. Connect a high pressure gauge (1) to the corresponding pilot pressure test port on the motor to be tested.

i Note

This pressure gauge shows the pressure in the swashing cylinder.

⚠ Danger

Input module, enter PIN-CODE.

Secure all wheels with wedges.

i Note

The adjustments can be made in any travel direction.

4. Start the engine and let it run in idle speed, select second speed range and the respective travel direction.

⚠ Caution

Do not actuate the emergency stop switch.

5. Slowly raise the engine speed, read both pressure gauges.

   Nominal value:

   As the engine speed increases, the pressure on pressure gauge (2) port “G“ will increase.

   The pressure on pressure gauge (2) increases from approx. 29 bar to 280 bar, while pressure gauge (1) does not indicate any pressure.

   Once the pressure on pressure gauge (2) exceeds 280 bar, the pressure on pressure gauge (1) also starts to increase.

   When pressure gauge (2) reaches 380 bar, pressure gauge (1) must also reach 380 bar.

   At pressure above 380 bar both pressure gauges (2 and 1) must have identical readings.

   Evaluation of test:

   If the specified values are not reached adjust the pilot pressure on screw (4).

i Note

If pressure gauge (2) shows 380 bar, while pressure gauge (1) shows less than 380 bar, turn the adjustment screw in anti-clockwise direction.

If pressure gauges (2) and (1) show identical pressure values before reaching 380 bar, turn the adjustment screw in clockwise direction.

6. Repeat this test on all other travel motors.

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15.11Filter unit for transfer box / pressure relief valve

Filter unit

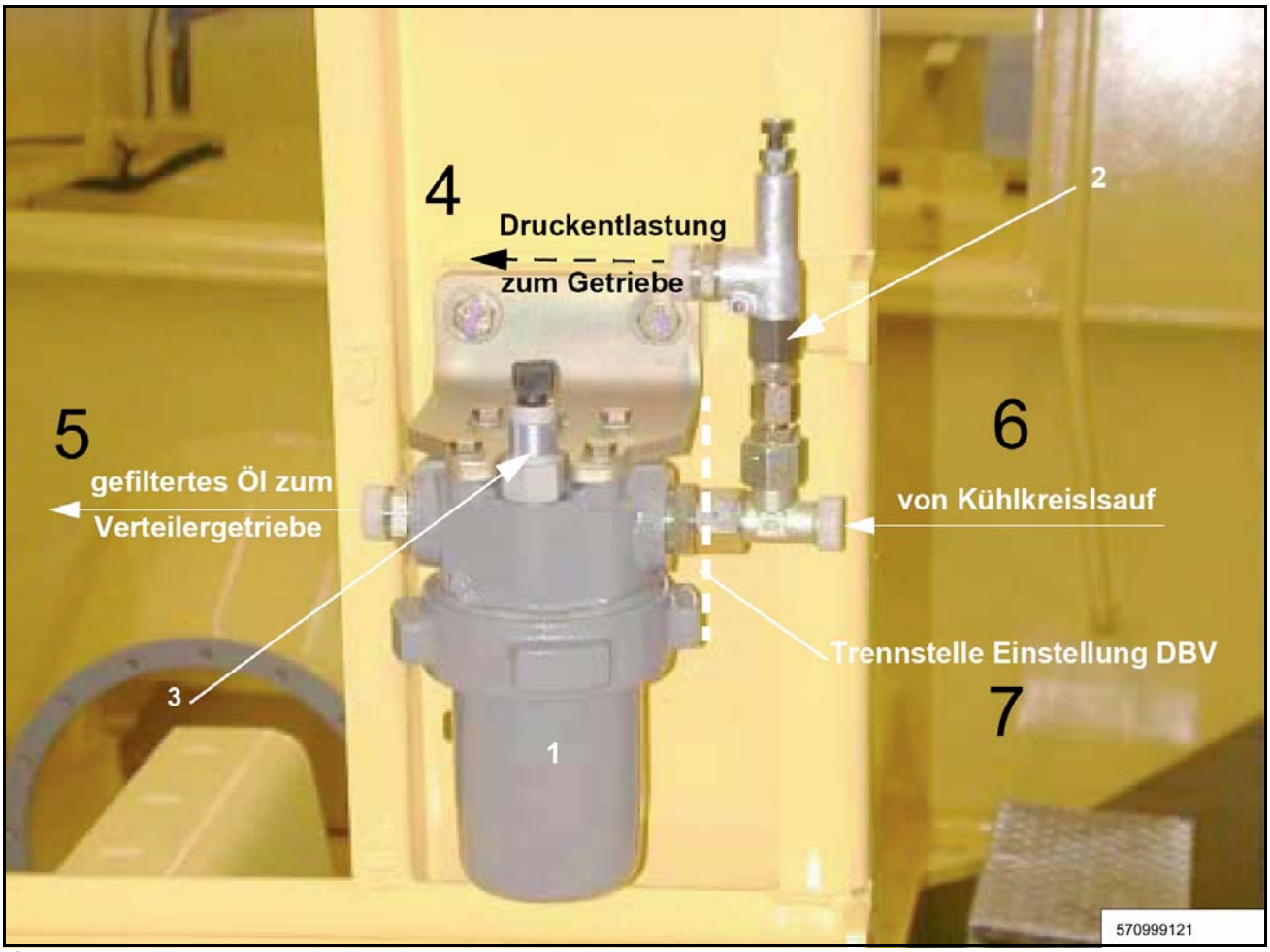


Fig. 1

1 Filter unit
2 Pressure relief valve
3 Pressure differential switch
4 Pressure relief to gearbox
5 filtered oil to transfer box
6 from cooling circuit
7 Separation PRV-setting

Pos.	Designation	Measuring value
1	Filter unit	
2	Pressure relief valve	25 bar in high idle and min. 40°C oil temperature
3	Pressure differential switch	2.4 bar

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Adjusting the pressure relief valve

- Run the machine warm (min. 40°C gear oil temperature) and shut the engine down.
- Unscrew the pressure relief valve from the filter inlet port (Fig. 1).
- Close the outlet towards the filter on the disconnected T-fitting with a plug (P/N 055 427 05).
- Close the filter inlet port with plug (P/N 055 427 05) and nut (P/N 055 450 25).
- Start the engine and adjust the pressure relief valve to 25 bar in high idle speed / 12 bar in low idle speed; then shut the engine down again.
- Reconnect the pressure relief valve to the filter.

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16 Special tools, tests and adjustments

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16.1 Special tools, tests and adjustments

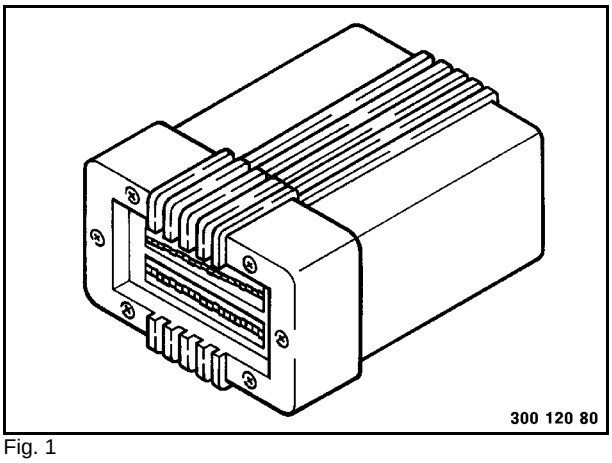


Fig. 1

1. Vibration reed frequency meter

   1000 - 4000 rpm

   17 - 67 Hz

   BOMAG part-no.: 300 120 80



Fig. 2

2. Sirometer (frequency meter)

   800 - 50.000 rpm

   14 - 750 Hz

   BOMAG part-no.: 059 710 02



Fig. 3

3. Anti-freeze tester, quick and accurate measuring, sturdy plastic housing, automatic temperature correction, no after-dripping, instructions for use on unit, reading down to -40 °C. Material: Plastic, Temperature range: down to -40 °C

   BOMAG part-no.: 050 100 75

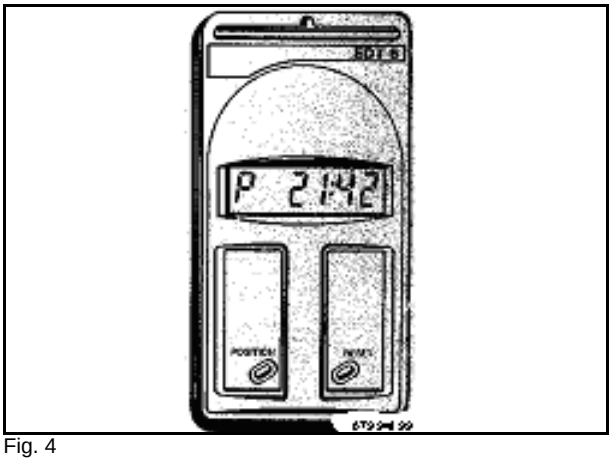


Fig. 4

4. Digital rpm-meter for petrol engines

   BOMAG part-no.: 079 948 99

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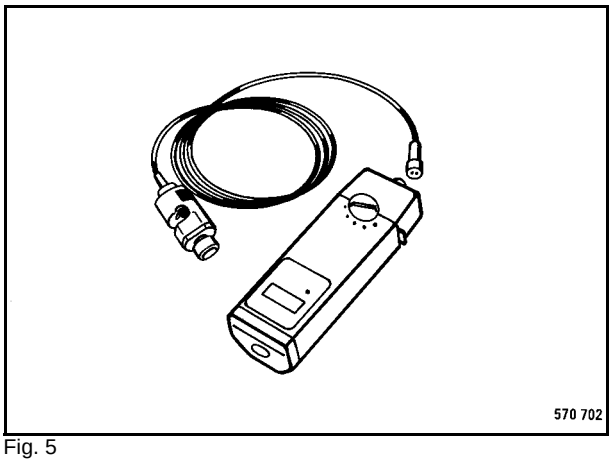


Fig. 5

5. Digital rpm-meter for petrol engines

   BOMAG part-no.: 059 711 12


Fig. 6

6. Digital rpm-meter, optical/mechanical, universal use

   BOMAG part-no.: 079 948 98


Fig. 7

7. Infrared manual thermometer, -18 to 275°C

   BOMAG part-no.: 057 668 06

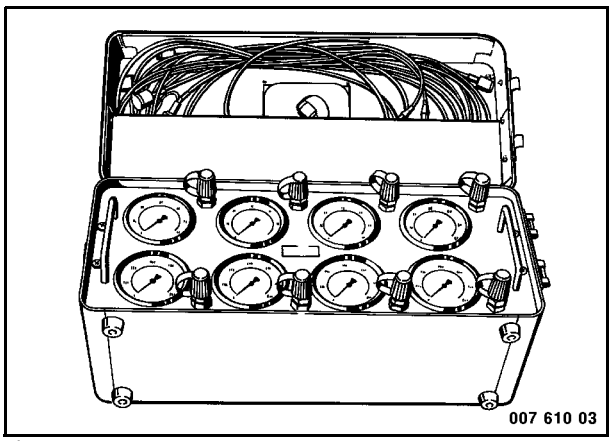


Fig. 8

8. Hydraulic test case, large

   BOMAG part-no.: 007 610 03

i Note

4 X 600 bar pressure gauges

4 X 60 bar pressure gauges

8 pressure test hoses

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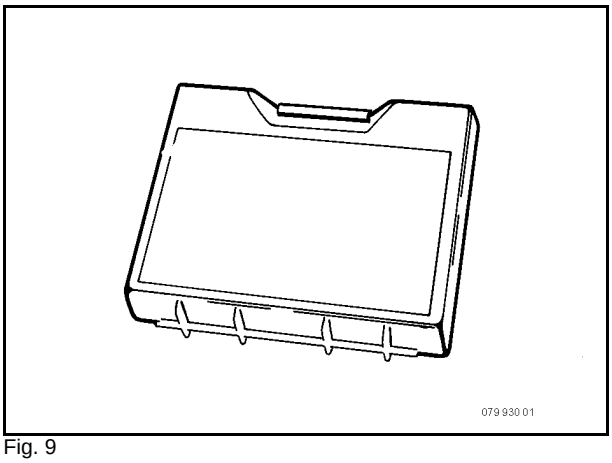


Fig. 9

9. Hydraulic test case, small

BOMAG part-no.: 079 930 01

i Note

2X 60 bar pressure gauge

2X 600 bar pressure gauges

4 pressure test hoses

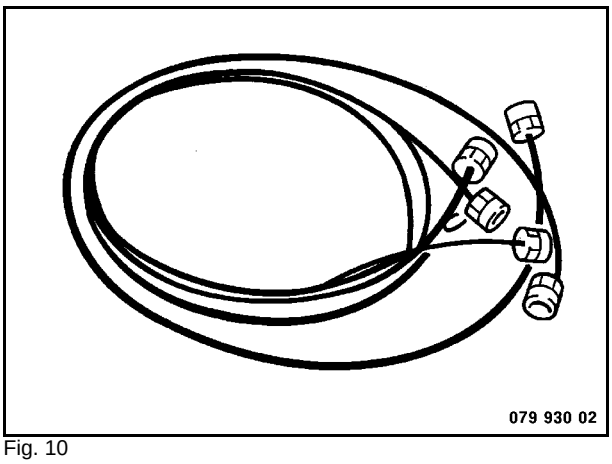


Fig. 10

10. Pressure test hoses

1000 mm BOMAG part-no.: 079 930 02

2500 mm BOMAG part-no.: 079 930 03

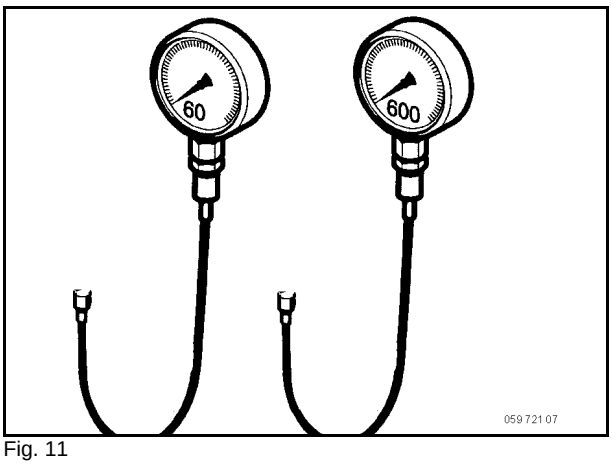


Fig. 11

11. Pressure gauge

60 bar BOMAG part-no.: 059 721 07

600 bar BOMAG part-no.: 059 721 04

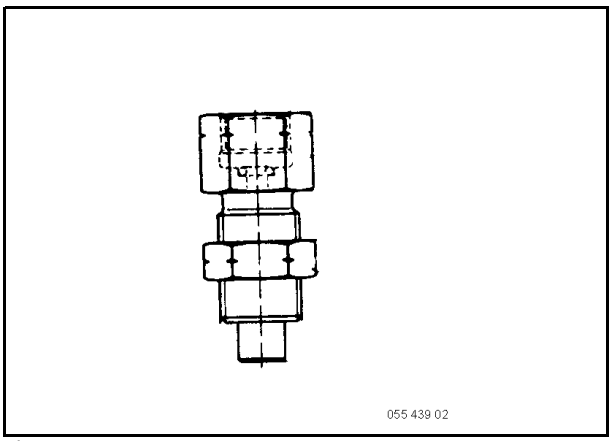


Fig. 12

12. Adapter for pressure test hose

BOMAG part-no.: 055 439 02

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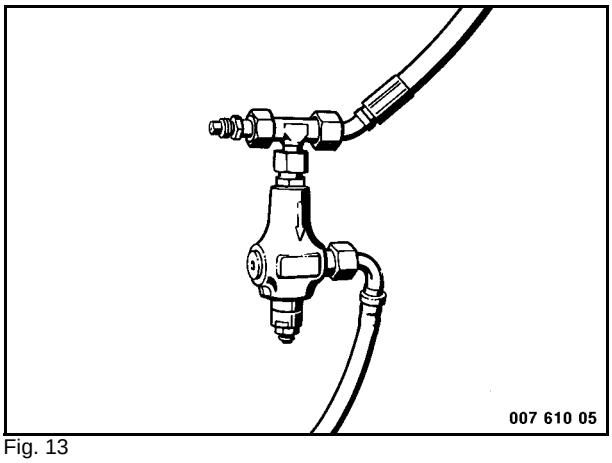


Fig. 13

13. Gear pump testing device

    BOMAG part-no.: 007 610 05

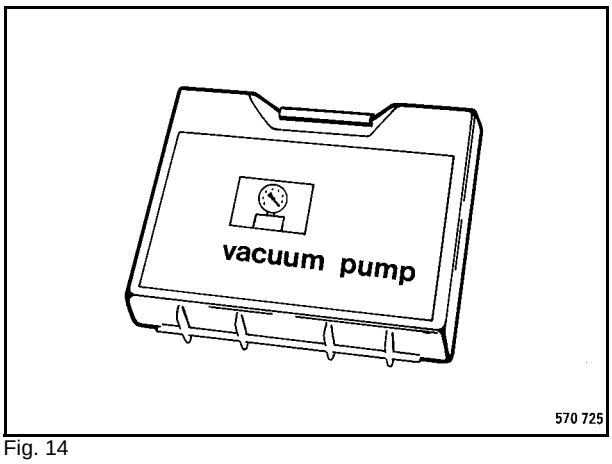


Fig. 14

14. Vacuum pump for hydraulic oil tank

    BOMAG part-no.: 007 610 04 (12 Volt)

    BOMAG part-no.: 007 610 24 (24 Volt)

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17 Oscillating articulated joint

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17.1 Removing and installing live ring, oscillating articulated joint

Disassembling the live ring

⚠ Danger

Safely support front and rear frames as well as oscillating articulated joint.
Danger of squashing!

1. Remove the front cover 1 (Fig. 1), remove the rear cover

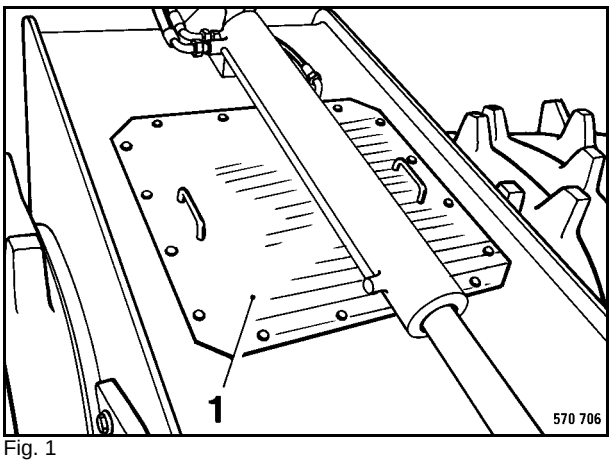


Fig. 1

2. Disassemble the cover 1(Fig. 2) from above the hoses.

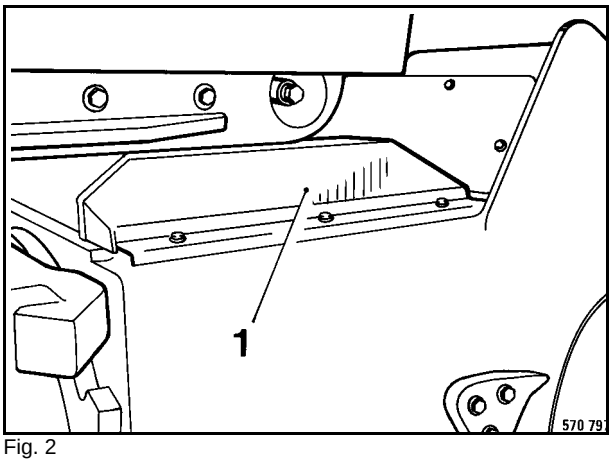


Fig. 2

3. Remove cover 1 (Fig. 3) from the front frame.

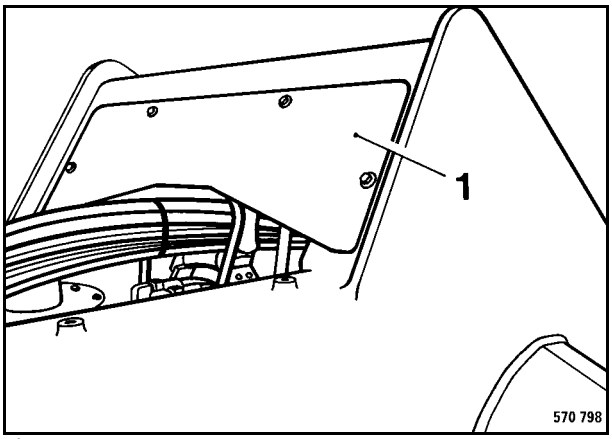


Fig. 3

https://truckmanualshub.com/

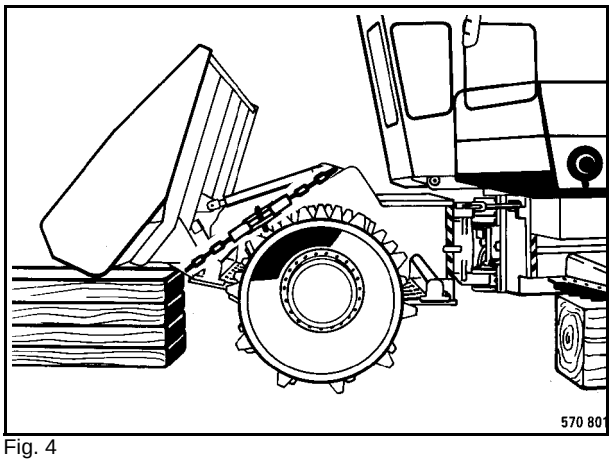


Fig. 4

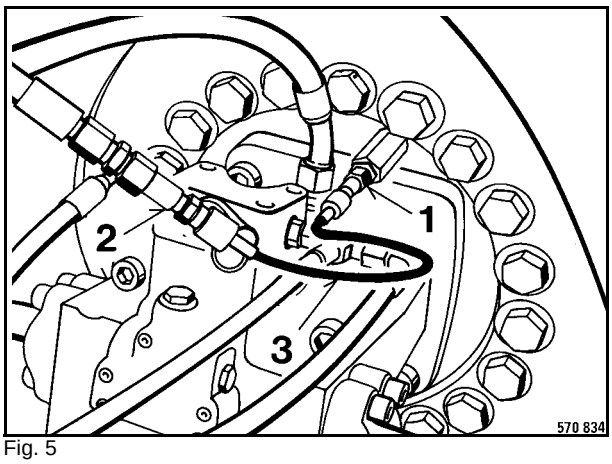


Fig. 5

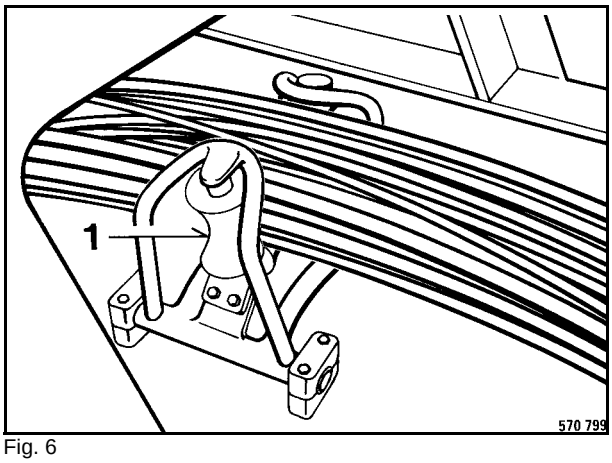


Fig. 6

4. Raise the dozer blade to end position and tie it to the front frame in this position (Fig. 4). Support the raised dozer blade with wooden blocks so that the front frame can be moved forward.
5. Release the brakes on both front final drives.

⚠ Danger

Before releasing the multi-disc brake secure the machine against unintended rolling.

6. Remove the brake lines.
7. Install measuring adapters 1 and 2 (Fig. 5) to the disconnected brake line and the free port on the final drive. Connect the installed measuring adapters with a pressure test hose (3).
8. Start the engine, the multi-disc brake will open automatically.
9. After releasing the brake shut down the engine. Disconnect the pressure test hose from the measuring adapter fitted to the port on the final drive.

⚠ Danger

Front drive without brake, secure the front frame against rolling.

10. Connect the vacuum pump and generate vacuum in the hydraulic oil tank.
11. Mark all hydraulic lines, hoses and electrical lines from the front to the rear frame, disconnect them from the connection points in the front frame, remove the hose clamps and lay the hoses down. Close all connections immediately with plugs.

i Note

Ensure correct routing of hoses and lines in the roller guide 1 (Fig. 6).

12. Drain or pump the fuel from the fuel tank.

⚠ Caution

Fire hazard! Do not smoke, do not use open fire!

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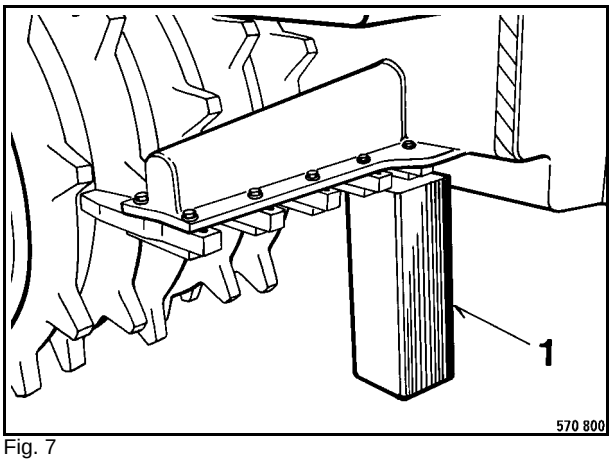


Fig. 7

13. Safely support the rear end of the rear frame on both sides 1 (Fig. 7).

⚠ Danger
Danger of squashing!

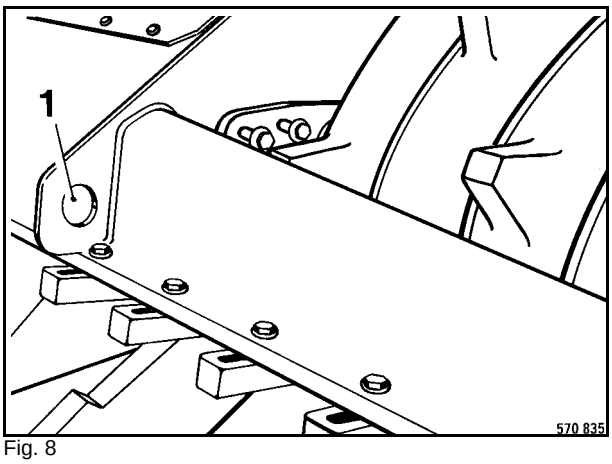


Fig. 8

14. Fasten the lifting tackle to the front frame.
15. Front lifting points 1 (Fig. 8).

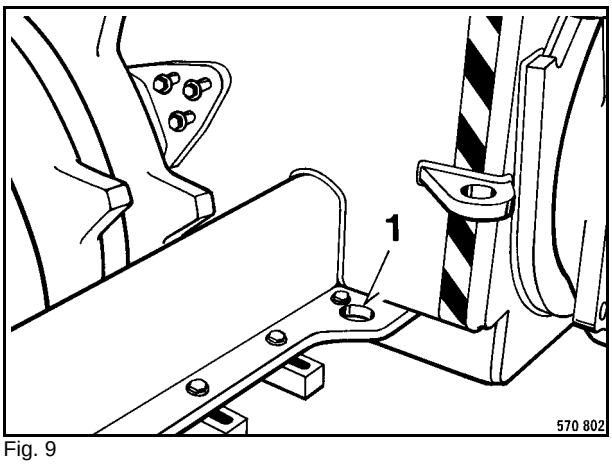


Fig. 9

16. Rear lifting points 1 (Fig. 9).

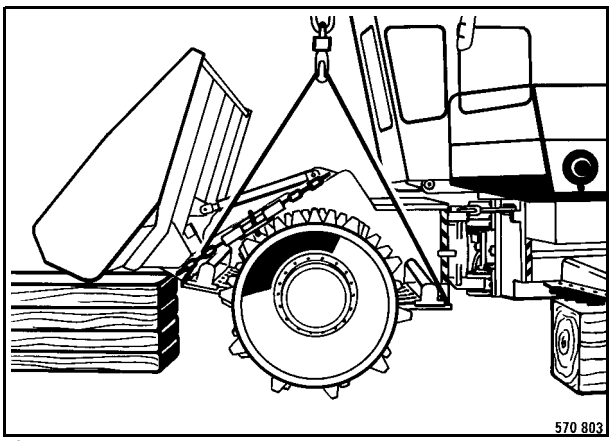


Fig. 10

17. Front frame safely suspended by lifting gear (Fig. 10).

⚠ Danger
Do not stand or step under loads being loaded.
Danger of squashing!

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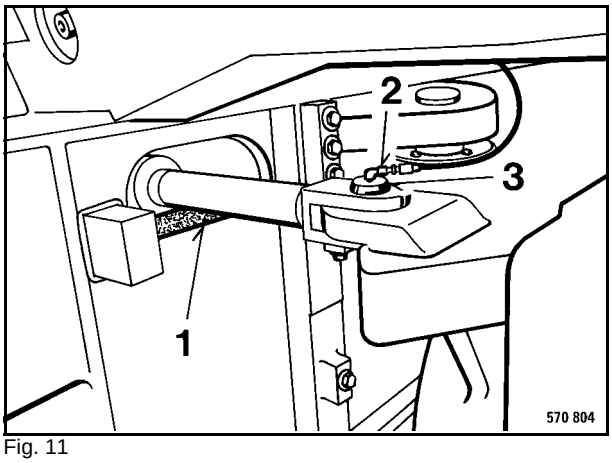


Fig. 11

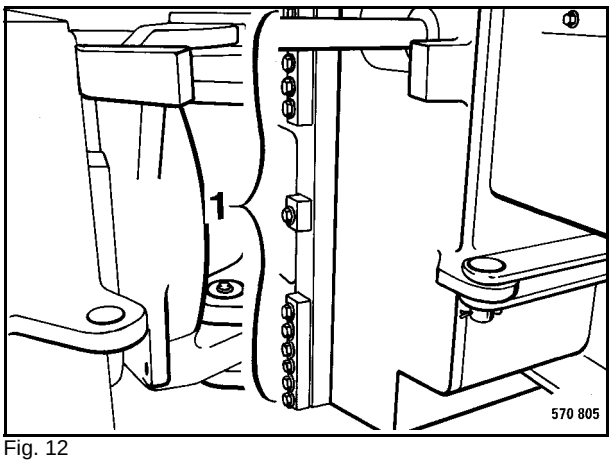


Fig. 12

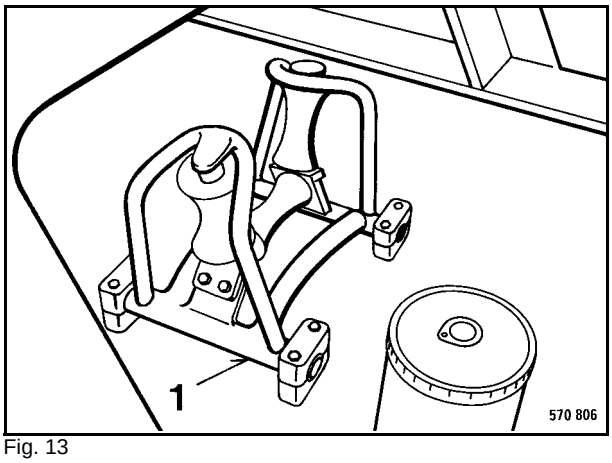


Fig. 13

18. Place a plastic pad 1 (Fig. 11) under the steering cylinder rod.
19. Disconnect the lubrication hoses from connections (2).
20. Remove the bars and knock out the bolts (3).

i Note
Grease the parts.

21. Unscrew all hexagon screws 1 (Fig. 12) from the console

i Note
Cover the threads with copper paste OKS 240.

Tightening torque: 463 Nm.

22. Move the front frame carefully forward for approx. 2 m, until the oscillating articulated joint is free.

⚠ Danger
Secure dozer blade or front frame against turning over.
Danger of squashing!
Do not step or work under suspended loads.
Danger of squashing!

23. Support front frame and dozer blade in a safe manner.
24. Disassemble roller guide 1 (Fig. 13) from the tank
25. Attach the lifting tackle to the fuel tank.

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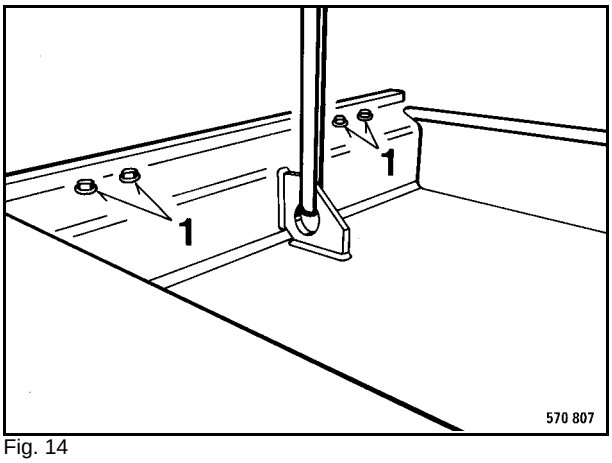


Fig. 14

26. Unscrew the rear hexagon screws from fuel tank 1 (Fig. 14).

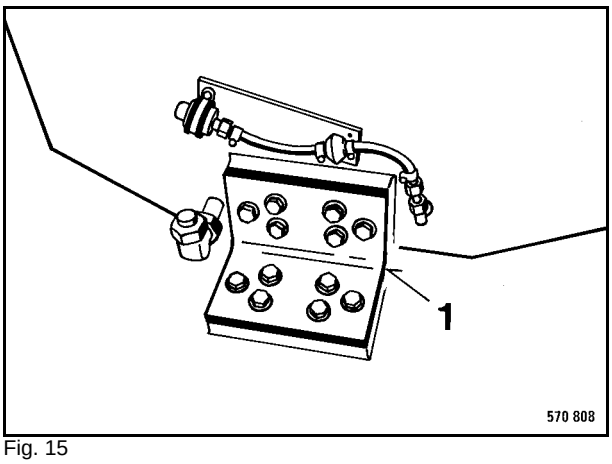


Fig. 15

27. Remove the front bracket (Fig. 15) from the tank
28. Lift the fuel tank out of the front frame.

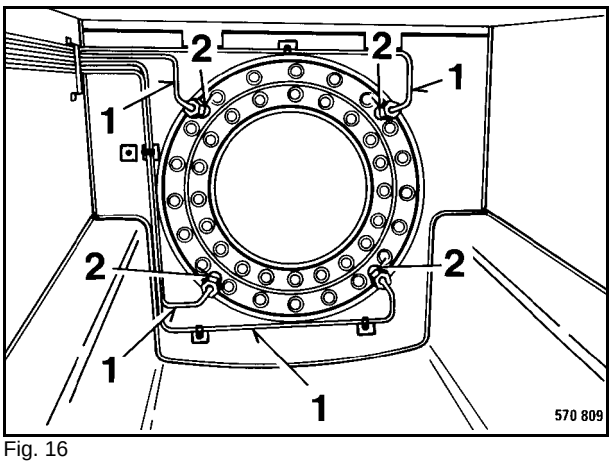


Fig. 16

29. Disconnect lubrication hoses 1 (Fig. 16) from the connections on the live ring. Unscrew socket (2).
30. Attach the lifting tackle to the oscillating articulated joint.

⚠ Danger

Danger of squashing!

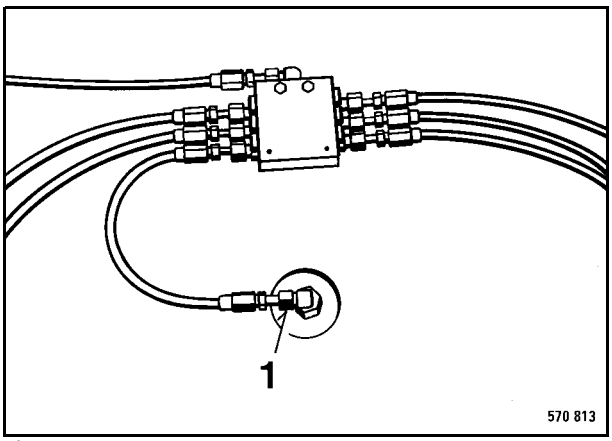


Fig. 17

31. Disconnect the top and bottom grease hoses 1 (Fig. 17) from the connections on the bearings from the inside.

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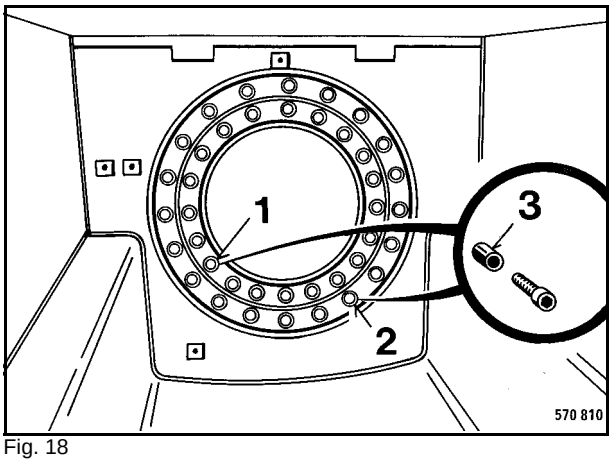


Fig. 18

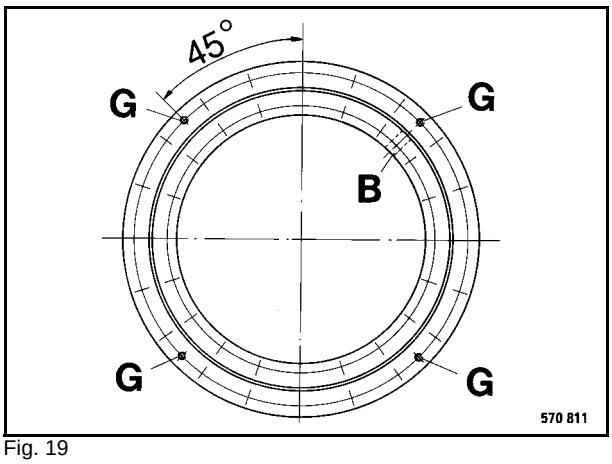


Fig. 19

32. Unscrew the socket head cap screws 1 and 2 (Fig. 18) from the live ring.
33. Take the live ring off completely.

i Note

Tighten the outer socket head cap screws first, then lubricate the live ring. During the lubrication process keep turning the live ring and lubricate until the grease emerges from the sealing lip.

34. Align and fasten the live ring accordingly (Fig. 19).
    G = position of lubrication bores
    B = position of filler plug

i Note

Cover the threads with copper paste OKS 240.

Tightening torque: 463 Nm.

35. Extract the oscillating articulated joint completely.
36. Replace screws and sleeves.
37. Use a sleeve for each screw.

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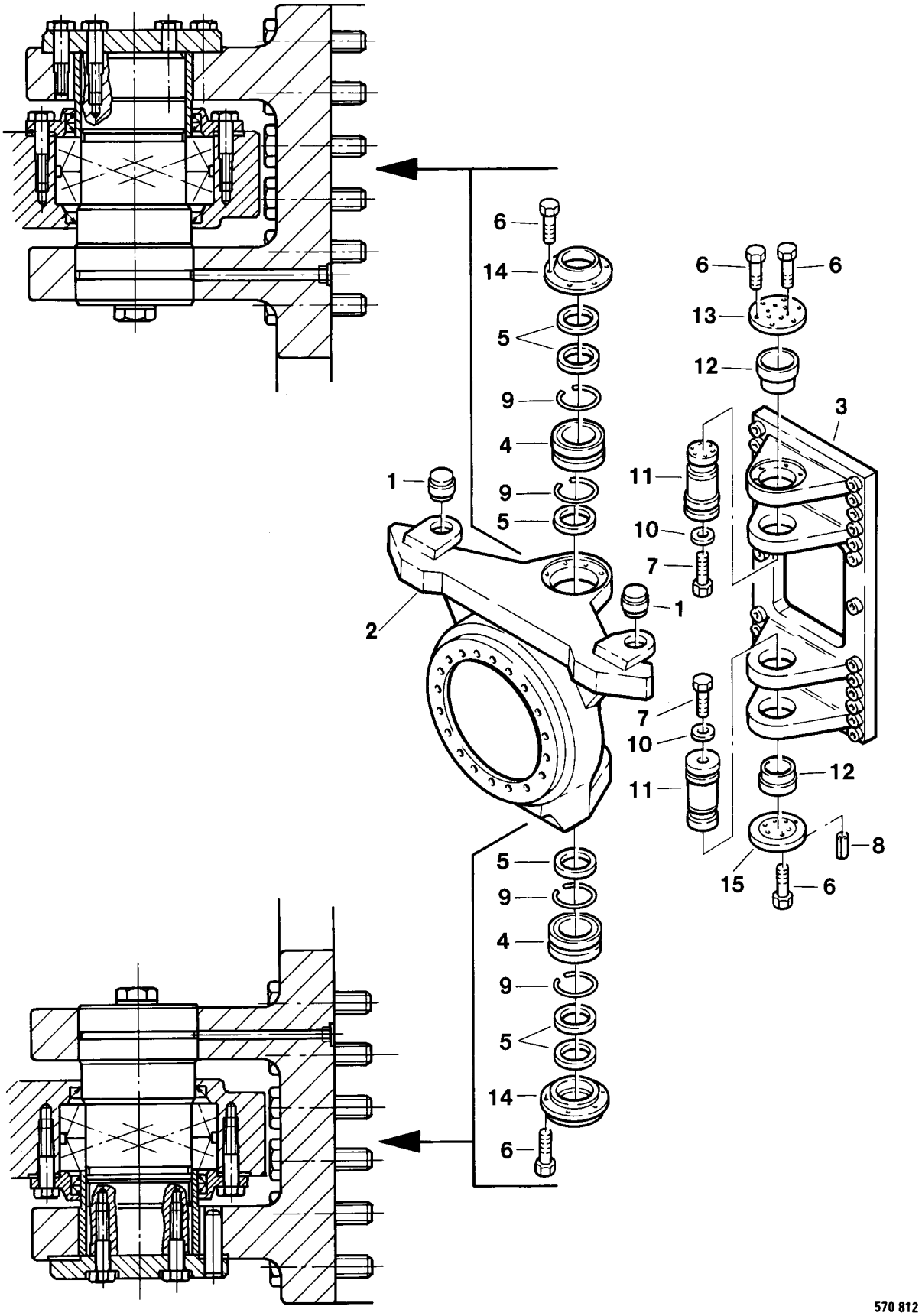


Fig. 1

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1 Self-aligning bearing
2 Central block
3 Console
4 Taper roller bearing
5 Dirt scraper
6 Hexagon screw
7 Hexagon screw
8 Roll pin
9 Snap ring
10 Seal ring
11 Bolt
12 Sleeve
13 Cover
14 Flanged cover
15 Washer

1. Store the disassembled oscillating articulated joint safely.

⚠ Danger
Danger of squashing!

2. Unscrew the hexagon screw 6 (Fig. 1).
3. Take off cover (13) and disc (15).

i Note
Insert roll pin (8) into the bore of the disc.

4. Attach the lifting tackle to the console (3).

⚠ Danger
Danger of squashing!

5. Drive bolt (11) with a mandrel.

i Note
Grease the bolt.

6. Knock sleeves (12) out of the console.
7. Unscrew hexagon screws (6) from the flanged cover (14).
8. Take off the flanged cover (14).
9. Remove the dirt scraper (5).

i Note
Assemble the new dirt scraper with grease.

10. Take out the snap ring (9)..
11. Knock out taper roller bearing (4), take out inner dirt scrapers (5).

i Note
Assemble the new dirt scraper with grease.
Use new taper roller bearings.

12. Check the pivot bearings (1) for the steering cylinders, if necessary assemble new ones.

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17.3 Removing and installing the steering cylinders

Securing the machine

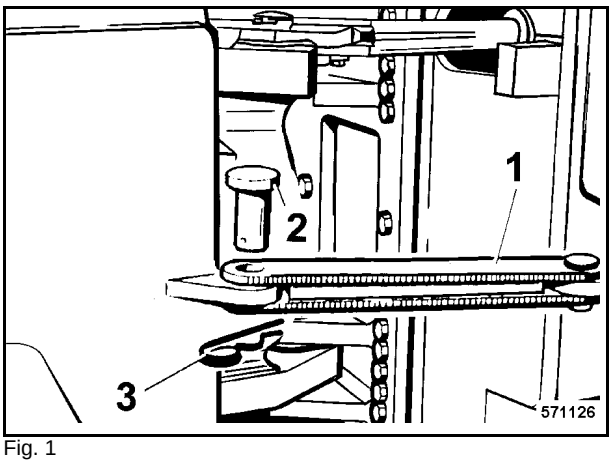


Fig. 1

1. Drive the machine on a level base of sufficient load bearing capacity.
2. Swing the articulation lock 1 (Fig. 1) forward out of its holding bracket and fasten with bolt (2) to the eye on the front frame. Secure the bolt with the cotter pin (3).

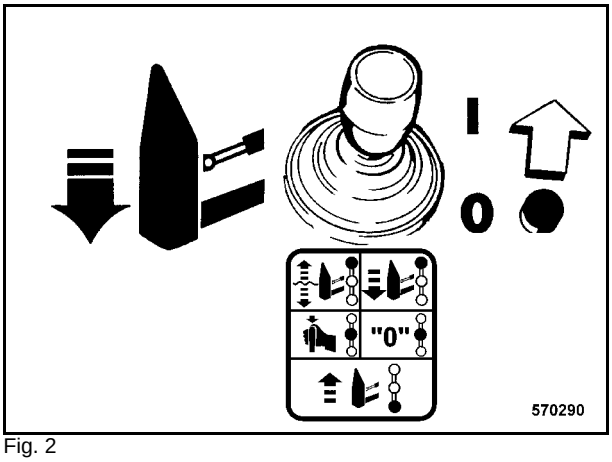


Fig. 2

3. Push the lever for dozer blade control (Fig. 2) forward to position "I" and lower the dozer blade slowly .....

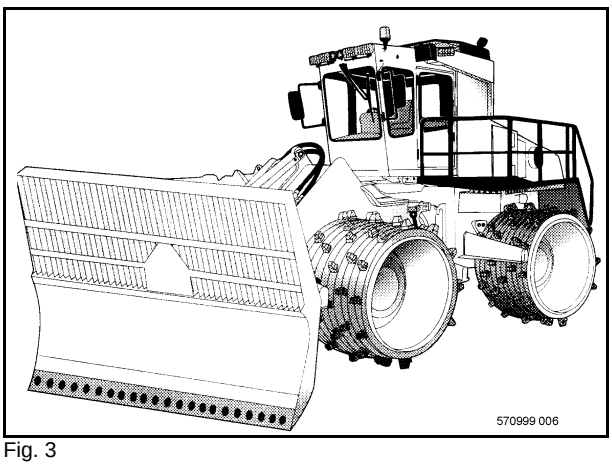


Fig. 3

4. .... and rest it on the ground (Fig. 3).

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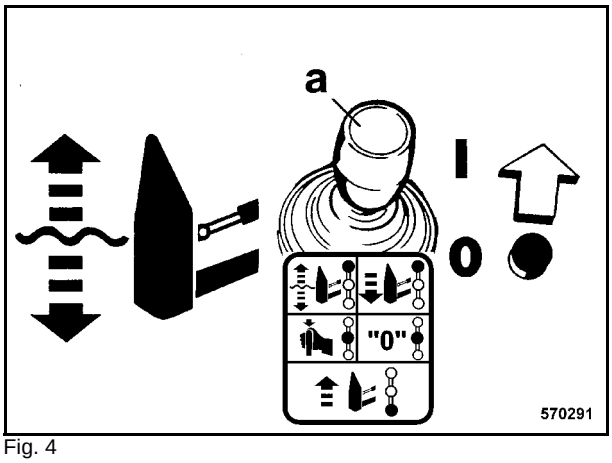


Fig. 4

5. Press button "a" (Fig. 4).
6. Shift the dozer blade control lever to float position "I".
7. Shut down the engine.

Removing the steering cylinders



Fig. 1

1. Open the rear access door (Fig. 1).

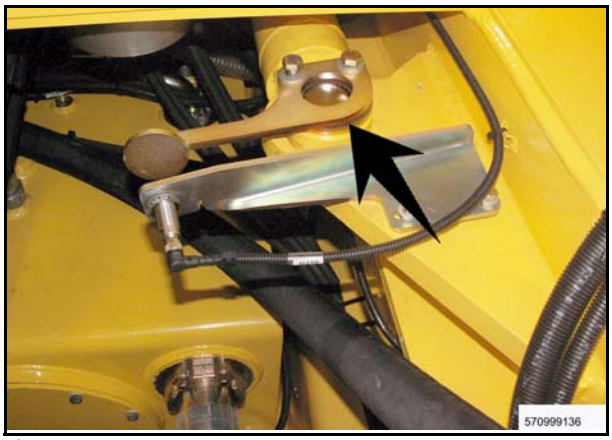


Fig. 2

2. Remove the plates for the electric end position damping (Fig. 2).

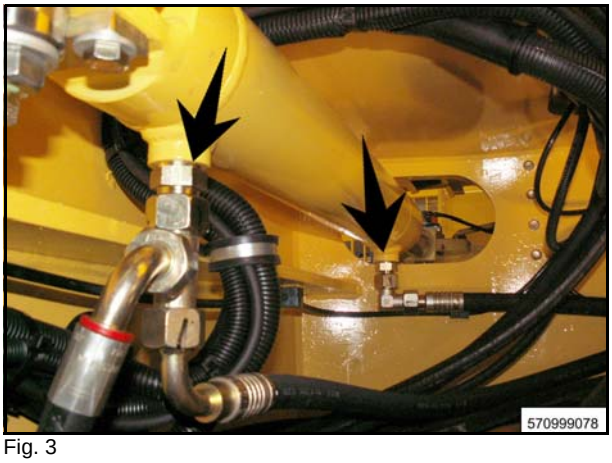


Fig. 3

Environment

Catch running out hydraulic oil and dispose of environmentally.

Danger

Before disconnecting any hydraulic connections you must make sure that the engine has been shut down and the system pressure has been relieved.

3. Disconnect the hydraulic hoses (Fig. 3).
4. Close connections and hoses with plugs.

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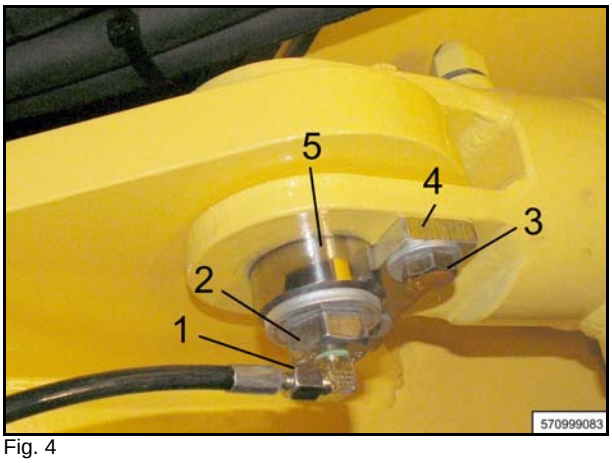


Fig. 4

5. Disassemble lubrication grease hose 1 (Fig. 4), screw (2) and lock washer.
6. Unscrew the screws (3) and remove the flat steel bar (4).

⚠ Danger

Danger of squashing!

The steering cylinder has a weight of approx. 45 kg.

7. Knock out steering bolts (5).



Fig. 5

Old design lubrication grease hose (Fig. 5)

8. Disassemble lubrication grease hose 1 (Fig. 5), screw (2) and lock washer.
9. Unscrew the screws (3) and remove the flat steel bar (4).
10. Knock out steering bolts (5).
11. Lift the steering cylinders out of the machine and lay them down safely.

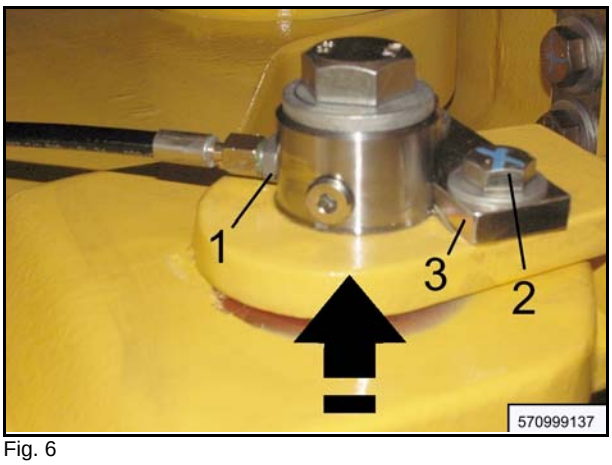


Fig. 6

New design lubrication grease hose (Fig. 6)

12. Remove the lubrication grease hose 1 (Fig. 6).
13. Unscrew the screws (3) and remove the flat steel bar (3).
14. Knock out steering bolts (5).
15. Lift the steering cylinders out of the machine and lay them down safely.

Assembling the steering cylinders

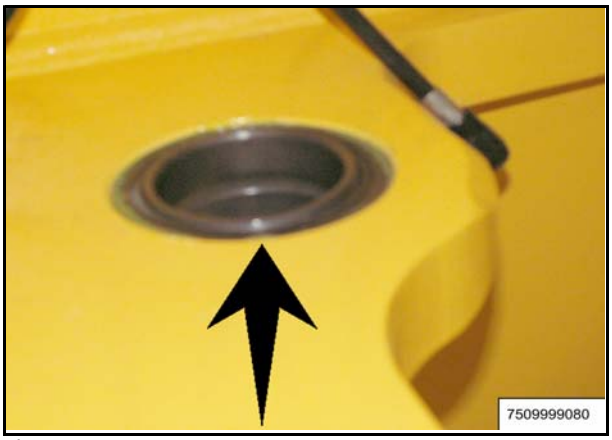


Fig. 1

1. Reassemble in reverse order.
2. Check the rocker bearing, replace if necessary (Fig. 1).

i Note

The cylinders may be carefully retracted and extended with compressed air or by pressing manually.

Assemble the bearing bolt with some grease

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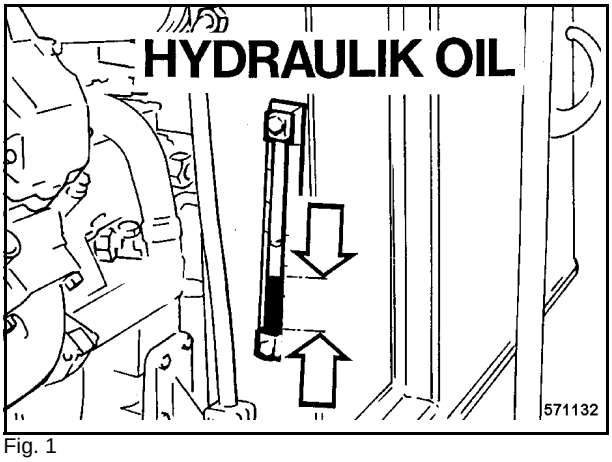


Fig. 1

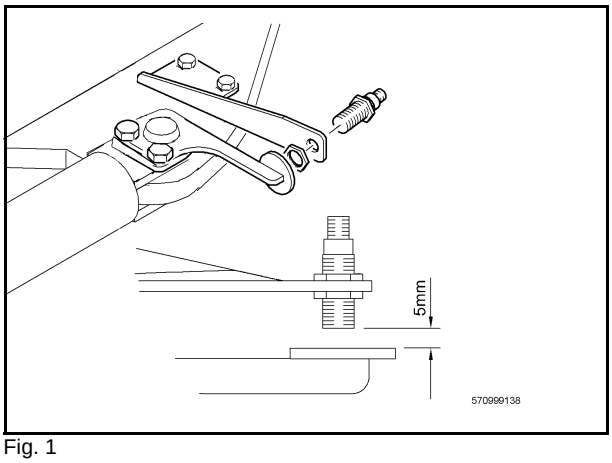


Fig. 1

Bleeding

1. Check the hydraulic oil level (Fig. 1).

⚠ Danger

Do not step or stand in the articulation area of the machine when the engine is running.

i Note

Steer the machine several times to right and left with the engine running at idle speed.

Due to trapped air hydraulic cylinders may initially perform erratically, but normally vent themselves after a few stroked

2. Check hydraulic connections for leaks.
3. Check the hydraulic oil level once again.

Adjust the electric end position damping

i Note

Steer the machine fully to the left to adjust the right hand initiator.

Steer the machine fully to the right to adjust the left hand initiator.

1. Turn the initiators (Fig. 1) completely back.
2. Steer the machine against the end stop.
3. Adjust the space between initiator and contact face to 5mm.
4. Tighten the counter nut.

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18 Suppliers documentation

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18.1 Travel pump

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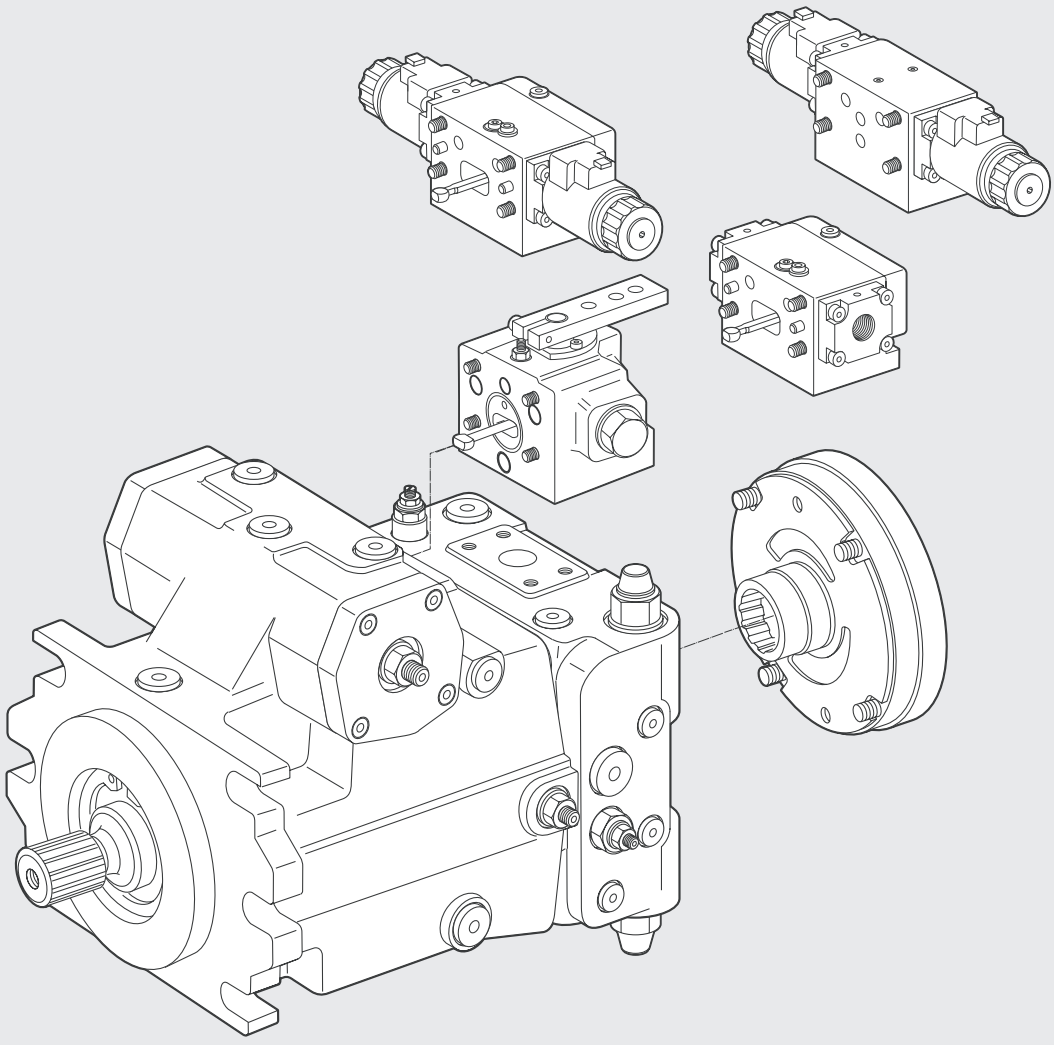
Rexroth
Bosch Group

Verstellpumpe A4VG 71–180
Variable Pump A4VG 71–180
Baureihe/Series 32

RDE 92 003-21-R/01.06

R1

Reparaturanleitung / Repair Manual
Baugruppen / Assembly Groups



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Vermeidung von Gefahren

Für einen sicheren Betrieb und um Schäden bei der Reparatur zu vermeiden, lesen Sie diese Reparaturanleitung sorgfältig und aufmerksam durch!

Für Personen- oder Maschinenschäden, die durch Nichtbeachtung dieser Reparaturanleitung entstehen, verfällt jegliche Gewährleistung von Bosch Rexroth AG.

1 Zu dieser Anleitung

Diese Anleitung unterstützt Sie bei der Reparatur, den Überprüfungen und der Wiederinbetriebnahme von Rexroth A4VG Verstellpumpen, NG 71–180. Diese Anleitung umfasst die folgenden Kapitel:

- „Sicherheit“ auf Seite 7

  Hier erhalten Sie grundsätzliche Hinweise zum sicheren Umgang mit Verstellpumpen und zu deren Betrieb.

  Lesen Sie dieses Kapitel bevor Sie anfangen zu arbeiten.
- „Produktbeschreibung“ auf Seite 11

  Hier erfahren Sie, wie Sie den Typ einer Verstellpumpe feststellen. Ferner finden Sie hier eine Übersicht über die Funktionsweise und Informationen zur bestimmungsgemäßen Verwendung der Verstellpumpe.

  Lesen Sie dieses Kapitel, um Ihr Grundwissen über die Verstellpumpe aufzufrischen.
- „Austausch externer Baugruppen“ auf Seite 15

  Dieses Kapitel erklärt Ihnen, wie Sie Baugruppen einer Verstellpumpe austauschen.
- „Überprüfungen“ auf Seite 33

  Dieses Kapitel erklärt Ihnen, wie Sie die Einstellarbeiten an einer Verstellpumpe vornehmen.

Avoiding Dangers

To ensure safe operations and avoid damages during repairs, read this complete repair manual carefully and attentively.

Bosch Rexroth AG accepts no responsibility for personal injuries or damages to the machine that arise from disregarding this repair manual.

1 About this Manual

This manual supports you in the repair, adjustment and recommissioning of Rexroth A4VG variable pumps, sizes 71–180. The manual is structured as follows:

- “Safety” on page 7

  This chapter provides you with basic hints and tips regarding working with and operating variable pumps.

  Read this chapter before you start working.
- “Product Description” on page 11

  This chapter explains how you identify the variable pump. Addtionally, it provides you an overview of the how the variable pump and information regarding the correct usage.

  Read this chapter to refresh your knowledge of the variable pumps.
- “Exchanging Extermnal Assembly Groups” on page 15

  Rexroth provides various replacement parts for repairs. This section provides you an overview of the available spare parts subassemblies.
- “Checking” on page 33

  Read this chapter to be able to restore the settings on an variable pump after a repair.

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1.2 Gültigkeitsbereich dieser Anleitung

Diese Reparaturanleitung gilt für die Axialkolben-Verstellpumpe A4VG NG 71–180 der Bosch Rexroth AG. Informationen zu zugelassenen Druckflüssigkeiten entnehmen Sie den Angaben des Anlagenherstellers.

Diese Reparaturanleitung richtet sich an:

- Anlagenbetreiber,
- den autorisierten Fachbetrieb bzw. Händler,
- den Anlagenhersteller.

  Für den Anlagenhersteller sind zusätzlich auch die jeweilige Einbauzeichnung, das technische Datenblatt, die Betriebsanleitung und die Auftragsbestätigung der Bosch Rexroth AG verbindlich.

1.2 Validity of this Manual

This manual is valid for the Bosch Rexroth axial piston variable pump A4VG NG 71–180. Refer to the system manufacturer for information about the allowed hydraulic fluids.

This repair manual is directed at:

- the system operator
- authorized dealers
- the system manufacturer

  For the system manufacturer, the installation drawing, the catalog sheet, the manual, and the confirmation of order from the Bosch Rexroth AG are also obligatory.

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1.3 Wichtige Unterlagen

Bevor Sie mit den in dieser Anleitung beschriebenen Arbeiten anfangen, stellen Sie sicher, dass Sie folgende Unterlagen griffbereit haben:

- **Auftragsbestätigung**

  Die Auftragsbestätigung enthält die voreingestellten technischen Daten. Die Axialkolbenmaschine darf nur unter den in der Auftragsbestätigung angegebenen Werten und Bedingungen betrieben werden.
- **Einbauzeichnung**

  Die Einbauzeichnung der Axialkolbenmaschine enthält die Außenabmessungen, sämtliche Anschlüsse und den Schaltplan.
- **Technisches Datenblatt**

  Das technische Datenblatt RD 92 003 enthält u.a. die zulässigen technischen Daten für die Axialkolbenmaschine.
- **Gesamtschaltplan der Maschine bzw. Anlage**

  Der Hydraulikschaltplan und der elektrische Schaltplan der Maschine bzw. Anlage enthalten die Informationen zu den hydraulischen bzw. elektrischen Anschlüssen. Diese Daten brauchen Sie, um mit der Axialkolbenmaschine als Teil der Maschine bzw. Anlage zu arbeiten. Die Unterlagen erhalten Sie vom Maschinen- bzw. Anlagenhersteller.
- **RD 90 300-B: Allgemeine Betriebsanleitung für Axialkolbenmaschinen**

  Die allgemeine Betriebsanleitung unterstützt Sie bei Installation, Inbetriebnahme und Betrieb von Rexroth-Axialkolbenmaschinen.
- **Produktspezifische Betriebsanleitung**

  Die produktspezifische Betriebsanleitung enthält spezielle, für die Axialkolbenmaschine gültige Informationen. Informieren Sie sich bei Rexroth, ob es zu Ihrer Axialkolbenmaschine eine produktspezifische Betriebsanleitung gibt.

Folgende Rexroth-Druckschriften geben Ihnen weitere Informationen zu Installation und Betrieb der Axialkolbenmaschine:

- **RD 90 220: Druckflüssigkeiten auf Mineralölbasis**

  Beschreibt die Anforderungen an eine Druckflüssigkeit auf Mineralölbasis für den Betrieb mit Rexroth-Axialkolbenmaschinen und unterstützt Sie bei der Wahl einer Druckflüssigkeit für Ihre Anlage.
- **RD 90 221: Umweltfreundliche Druckflüssigkeiten HEES, HEPG, HETG für Axialkolbenmaschinen**

  Beschreibt die Anforderungen an eine umweltfreundliche Druckflüssigkeit für den Betrieb mit Rexroth-Axialkolbenmaschinen und unterstützt Sie bei der Wahl einer Druckflüssigkeit für Ihre Anlage.
- **RD 90 223: Axialkolbenmaschinen für den Betrieb mit HF-Druckflüssigkeiten**

  Enthält zusätzliche Informationen zum Einsatz von Rexroth-Axialkolbenmaschinen mit HF-Druckflüssigkeiten.
- **RD 90 300-03-B: Hinweise zum Einsatz von hydraulischen Antrieben bei tiefen Temperaturen**

  Enthält zusätzliche Informationen zum Einsatz von Rexroth-Axialkolbenmaschinen bei tiefen Temperaturen.

1.3 Important Documents

Before you start any of the procedures described in this manual, make sure you have the following documents:

- **Confirmation of order**

  The confirmation of order contains the values set during the commissioning by Rexroth. Before you can recommission the axial piston unit after a repair, you have to restore the values originally set by Rexroth.
- **Installation drawing**

  The installation drawing of the axial piston unit contains the sizes of all connections.
- **Technical data sheet**

  The technical data sheet RE 92 003 contains the maximum allowed performance data.
- **Hydraulic diagram** / **Wiring diagram**

  The hydraulic diagram and the wiring diagram of the unit or system contain the information related to the respective machine.You need this data to work with the axial piston as part of the machine or system. You can get this information from the unit or system manufacturer.
- **RE 90 300-B: General Manual for Axial Piston Units**

  The general manual supports you during the installation, initiation, and operation of Rexroth axial piston units.
- **Product Specific Manual**

  The product-specific manual contains information specially designed for the axial piston unit. Get in touch with Rexroth to find out if there is any product-specific information on your specific axial piston unit.

The following Rexroth publications provide additional information to the installation and operation of axial piston units:

- **RE 90 220: Mineral-oil Based Pressure Fluids**

  This publication describes the requirements on a hydraulic fluid for operation in an axial piston unit and supports you in the selection of a hydraulic fluid for your installation.
- **RE 90 221: Environmentally Acceptable Hydraulic Fluids HEES, HEPG, HETG for Axial Piston Units**

  Describes the demands on environmentally compatible, readily biodegradeable hydraulic fluids HEPG, HEES that can be used in Rexroth axial piston units and supports you by the choice of a hydraulic fluid for your system.
- **RE 90 223: Axial Piston Units for Use with HF Fluids**

  Provides additional information for the use of Rexroth axial piston units with HF hydraulic fluids.
- **RE 90 300-03-B: Instructions on the Use of Hydrostatic Drives at Low Temperatures**

  Provides additional information for the use of Rexroth axial piston units for low temperatures.

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1.4 Gefahrenkennzeichnungen und Piktogramme

Diese Anleitung unterscheidet zwischen Kategorien von Gefahren gemäß ISO Guide 37:

⚠ GEFAHR

Weist auf hohes Risiko und die Gefahr von Tod oder schweren Verletzungen hin.

⚠ WARNUNG

Weist auf mittleres Risiko und die Gefahr von Verletzungen und schweren Sachschäden hin.

⚠ VORSICHT

Weist auf geringes Risiko und Sachschäden hin.

Hinweis

Kennzeichnet Informationen, die zum besseren Verständnis der Maschinenabläufe beitragen oder weist auf einen besonderen bzw. wichtigen Sachverhalt hin.

Tipp

Kennzeichnet Informationen, die zum effizienteren Arbeiten beitragen.

1.4 Danger Labels and Pictograms

This manual differentiates between the following categories of danger according to ISO Guide 37:

⚠ DANGER

Indicates high risk, mortal danger and serious injuries.

⚠ WARNING

Indicates middle risk, injuries or serious material damage.

⚠ CAUTION

Indicates low risk or material damage.

Note

Indicates information that contributes to a better understanding of the machine processes or indicates important information.

Tip

Indicates information that contributes to more efficient work.

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2 Sicherheit

Lesen Sie dieses Kapitel sorgfältig durch, bevor Sie mit Arbeiten an der Verstellpumpe beginnen.

Die Rexroth-Verstellpumpen sind im Sinne der Maschinenrichtlinie 98/37/EG Komponenten, die zum Einbau in eine Anlage bestimmt sind. Die Sicherheitsrichtlinien in dieser Anleitung beziehen sich nur auf die Verstellpumpe. Beachten Sie zusätzlich die Sicherheitsrichtlinien des Anlagenherstellers.

Informieren Sie sich an Hand der allgemeinen Betriebsanleitung für Axialkolbenmaschinen über die bestimmungsgemäße Verwendung und die Sorgfaltspflicht des Betreibers und Bedieners.

2.1 Grundlegende Sicherheitshinweise

Befolgen Sie die folgenden Sicherheitshinweise und die des Anlagenherstellers genau, um Verletzungen und Gesundheitsschäden sowie Sach- und Umweltschäden auszuschließen.

⚠ GEFAHR

Lebensgefahr

Das Arbeiten an nicht stillgelegten Maschinen bzw. Anlagen stellt eine Gefahr für Leib und Leben dar.

Die in diesem Dokument beschriebenen Arbeiten dürfen nur an **stillgelegten Maschinen bzw. Anlagen** vorgenommen werden. Bevor Sie mit den Arbeiten beginnen:

- Stellen Sie sicher, dass der Antriebsmotor nicht eingeschaltet werden kann.
- Stellen Sie sicher, dass sämtliche kraftübertragenden Komponenten und Anschlüsse (elektrisch, pneumatisch, hydraulisch) gemäß den Herstellerangaben ausgeschaltet sind und nicht eingeschaltet werden können. Falls möglich, entfernen Sie die Hauptsicherung der Maschine bzw. Anlage.
- Stellen Sie sicher, dass die Maschine bzw. Anlage komplett hydraulisch entlastet ist (drucklos). Folgen Sie hierzu den Angaben des Maschinen- bzw. Anlagenherstellers.

⚠ WARNUNG

Verletzungsgefahr

Um Verletzungen zu vermeiden, beachten Sie bitte folgende Empfehlungen betreffend **Sicherheitskleidung**:

- Tragen Sie bei Arbeiten an Maschine bzw. Anlage Sicherheitsschuhe mit Stahlkappen.
- Tragen Sie bei Arbeiten mit gefährlichen Stoffen (beispielsweise Druckflüssigkeiten) Schutzhandschuhe und Schutzbrille.

2 Safety

Read through this chapter carefully before you start any work on the variable pump.

The Rexroth variable pump are in the sense of the machine guideline 98/37/EG components of a larger machine or system. The safety guidelines in this manual only cover the variable pump. You must additionally follow the system manufacturer's safety guidelines.

Read the general manual for axial piston units to get more information on the designated use and the operator‘s obligation to exercise dilligence.

2.1 Basic Safety Information

Pay exact attention to the following safety information and that of the system manufacturer to eliminate injuries and health damages as well as damages to material or the environment.

⚠ DANGER

Danger to Life

Working on systems that have not been shut down is life-threatening.

The work described in this document can only be carried out on a **shut down system**. Before you start any of the tasks:

- Make sure that the engine / motor cannot be switched on.
- Make sure that all components and connections that carry energy (electrical, pneumatic, hydraulic) have been shut down according to the manufacturer's instructions and cannot be switched on. If possible, disable the main fuse.
- Make sure that the system is completely unloaded. Follow the instructions of the the system manufacturer.

⚠ WARNING

Danger of injuries

To avoid injuries, pay attention to the following regarding **safety clothing**.

- When working on the system, wear steel-toed safety shoes.
- When working with dangerous substances (for example, certain hydraulic fluids), wear protective gloves and protective glasses.

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⚠ GEFAHR

Vergiftungs- und Verletzungsgefahr

Der Kontakt mit Drückflüssigkeiten ruft Gesundheitsschäden hervor (z.B. Augenverletzungen, Haut- und Gewebeschädigungen, Vergiftungen beim Einatmen).

- Überprüfen Sie vor jeder Inbetriebnahme die Leitungen auf Verschleiß bzw. Beschädigungen.
- Tragen Sie dabei Schutzhandschuhe und Schutzbrille.
- Wenn dennoch Druckflüssigkeit in die Augen gelangt oder in die Haut eindringt, konsultieren Sie unmittelbar einen Arzt.
- Beachten Sie beim Umgang mit Druckflüssigkeiten unbedingt die Sicherheitsangaben des Druckflüssigkeitsherstellers.

⚠ DANGER

Danger of poisoing or injuries

Contact with hydraulic fluids can cause health damage (eye injuries, skin damage, poisoning due to inhalation).

- Always check the hydraulic lines for wear and damage prior to putting the unit into operation.
- Always wear protective gloves and safety glasses.
- Should pressure fluid come into contact with your eyes or skin: Get medical help immediately!
- When handling hydraulic fluids, pay exact attention to the manaufacturer's safety instructions.

⚠ WARNUNG

Verbrennungsgefahr

Die Axialkolbenmaschine erwärmt sich während des Betriebs. Auch die Magnete an der Axialkolbenmaschine werden im laufenden Betrieb heiß. Bei Berührung der Axialkolbenmaschine oder der Magnete können schwere Brandverletzungen entstehen.

- Lassen Sie die Axialkolbenmaschine vor jedem Kontakt abkühlen.
- Schützen Sie sich mit hitzebeständigen Handschuhen und Schutzkleidung.

⚠ WARNING

Danger of burns

The variable pump heats up during operation. The unit's solenoids get hot during operation. Touching the variable pump or solenoids can lead to severe injuries.

- Let the variable pump cool down prior to any contact.
- Protect yourself from burns by wearing safety gloves and protective clothing.

⚠ GEFAHR

Vergiftungs- und Verletzungsgefahr

Beim Suchen nach Leckstellen kann entweichende Druckflüssigkeit in die Haut eindringen und schwerste Vergiftungen und Verletzungen hervorrufen.

- Suchen Sie nur bei abgestellter und druckloser Maschine nach Leckstellen.

⚠ DANGER

Danger of poisoning

When looking for leaks, escaping hydraulic fluid can break into the skin and cause serious poisoning.

- Always use a piece of cardboard or paper to look for leaks.

⚠ WARNUNG

Verletzungs- und Beschädigungsgefahr

Durch falsch angeschlossene Komponenten können erhebliche Fehlfunktionen entstehen.

- Achten Sie auf korrekte Verrohrung gemäß Schaltplan.
- Führen Sie komponentenorientierte Funktionstests durch.

⚠ WARNING

Danger of injuries or damage

Incorrectly connected components can considerably impair the functionality of a hydraulic system.

- Make sure that the hydraulic lines are connected properly.
- Check the correct functioning of all components.

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⚠ GEFAHR

Feuergefahr

Hydraulische Druckflüssigkeit ist brennbar.

- Halten Sie offenes Feuer von der Verstellpumpe fern.

⚠ DANGER

Danger of fire

Hydraulic fluid is inflammable.

- Keep open fires away from the variable pump.

⚠ WARNUNG

Gehörschäden

Die Geräuschemission von Axialkolbenmaschinen ist u.a. von Drehzahl, Betriebsdruck und Einbauverhältnissen abhängig. Es ist damit zu rechnen, dass der Schalldruckpegel bei normalen Einsatzbedingungen über 70 dBA steigt. Dies kann zu Gehörschäden führen.

- Schützen Sie sich stets mit Gehörschutz bei Arbeiten in der Nähe der Axialkolbenmaschine während des laufenden Betriebs.

⚠ WARNING

Danger of hearing loss

The noise emission produced by axial piston units depends on speed, operating pressure, and installation. During normal application conditions, over 70 dBA can be anticipated. This can lead to hearing damage.

- Always wear hearing protection when working in the vicinity of the variable pump during operation.

⚠ WARNUNG

Umweltschäden

Druckflüssigkeiten sind wassergefährdende Flüssigkeiten. Das Austreten von Druckflüssigkeiten kann zu Grundwasservergiftung und Bodenverseuchung führen.

- Bringen Sie unter der Axialkolbenmaschine eine Auffangwanne an.
- Beseitigen Sie Leckstellen unverzüglich.
- Es sind stets die nationalen Gesetze und Vorschriften zu beachten. In Deutschland sind hydraulische Maschinen bzw. Anlagen „Anlagen zum Umgang mit wassergefährdenden Stoffen im Sinne des Wasserhaushaltsgesetzes (WHG)“. Beachten Sie in diesem Zusammenhang besonders §1 und §19 WHG (§19g, 19i, 19l).
- Weitere Informationen zum richtigen Umgang mit Rexroth-Hydraulikprodukten finden Sie in unseren Druckschriften „Allgemeine Produktinformationen für Hydraulikprodukte“, RD 90 220 und „Umweltschonende, biologisch schnell abbaubare Druckflüssigkeiten HEPG, HEES für Axialkolbenmaschinen“, RD 90 221.

⚠ WARNING

Risk of damage to the environment

Hydraulic fluid leakage leads to contamination of the ground and ground water.

- A basin for catching any hydraulic fluid must be placed under the variable pump.
- Leaks must be cleaned up immediately.
- In Europe, hydraulic systems are considered “Systems using water-threatening substances” in the sense of the Water Management Law (WHG).Therefore, pay special attention to §1 and §19 WHG(§19g, 19i, 19l). Additionally pay attention to any national regulations and norms.
- For further information regarding the correct use of Bosch Rexroth hydraulic products, see the publications RE 90 220 “Mineral-oil Based Pressure Fluids” and RE 90 221 “Environmentally Acceptable Hydraulic Fluids HEES, HEPG, HETG for Axial Piston Units“, RD 90 221.

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2.2 Anforderungen an das Personal

Diese Reparaturanleitung richtet sich an **Fachkräfte mit Hydraulik-Fachwissen**, die an einer Service-Schulung bei Rexroth teilgenommen haben.

Als **Fachkraft** gilt, wer aufgrund seiner fachlichen Ausbildung und Erfahrung ausreichende Kenntnisse hat, sowie mit den einschlägigen Bestimmungen so weit vertraut ist, dass er

- die ihm übertragenene Arbeiten beurteilen kann,
- mögliche Gefahren erkennen kann,
- die notwendigen Maßnahmen zur Beseitigung von Gefahren ergreifen kann,
- Kenntnisse über die möglichen Gesundheitsgefahren von Druckflüssigkeiten hat
- und die erforderlichen Reparatur- und Montagekenntnisse hat.

Hydraulik-Fachwissen bedeutet, das Personal muss,

- in der Lage sein, die Hydraulikpläne zu lesen und vollständig zu verstehen,
- insbesondere die Zusammenhänge bezüglich der eingebauten Sicherheitseinrichtungen vollständig verstehen
- und Kenntnisse über Funktion und Aufbau von hydraulischen Bauteilen haben.

2.2 Requirements on the Personnel

This repair manual is directed at **qualified personnel with specialized hydraulics know-how** who have taken part at a service training at Rexroth.

Qualified personnel is defined as persons who have sufficient knowledge on the basis of specialized training and experience, and are familiar with the relevant regulations, so that they are able to

- judge the delegated tasks,
- recognize possible dangers,
- take the necessary measures for the elimination of dangers,
- judge the possible health risks from hydraulic fluids,
- and have the required repair and installation know-how.

Specialized hydraulics know-how means that these persons must:

- be able to read and completely understand hydraulic plans,
- especially understand the connections regarding the installed safety equipment,
- and are familiar with the function and structure of hydraulic components.

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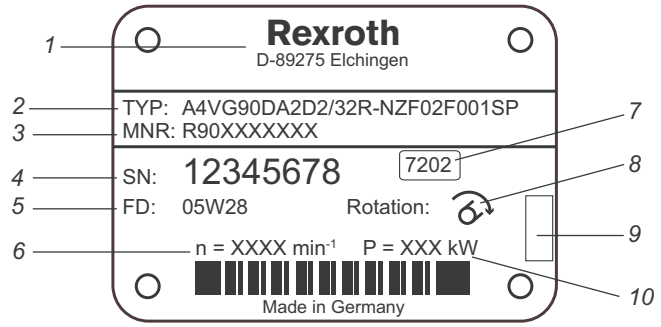
3 Produktbeschreibung

Dieses Kapitel gibt Ihnen einen allgemeinen Überblick über die Funktionalität der Rexroth A4VG Verstellpumpe.

Machen Sie sich mit den Inhalten dieses Kapitels vertraut, bevor Sie mit Arbeiten an einer Verstellpumpe beginnen.

3.1 Typschild

Die Verstellpumpe ist am Typschild zu identifizieren:



Folgende Informationen finden Sie auf dem Typschild:

1 Hersteller
2 Typschlüssel
3 Materialnummer der Axialkolbenmaschine
4 Seriennummer
5 Fertigungsdatum
6 Drehzahl
7 interne Werksbezeichnung
8 Drehrichtung (bei Blick auf die Welle; hier: rechts)
9 vorgesehener Platz für Prüfstempel
10 Leistung

Stellen Sie sicher, dass Typ und Nenngröße der zu reparierenden Verstellpumpe mit dieser Anleitung übereinstimmen.

3.2 Funktionsbeschreibung

Damit Sie in der Lage sind, Probleme an der Verstellpumpe zu identifizieren und gezielt Reparaturen durchzuführen, sind Kenntnisse der Funktionsweise und des Aufbaus erforderlich. Dieser Abschnitt gibt Ihnen eine grobe Übersicht.

Die A4VG Verstellpumpe ist eine Axialkolben-Verstellpumpe in Schrägscheibenbauart für hydrostatische Antriebe im geschlossenen Kreislauf. Der Volumenstrom ist proportional zu der Antriebsdrehzahl und dem Verdrängungsvolumen. Durch die Verstellung der Schrägscheibe ist eine stufenlose Volumenstromänderung möglich.

3 Product Description

This chapter provides a general overview of the functionality of the A4VG variable pump.

You should be familiar with the contents of this chapter before starting any work on the variable pump.

3.1 Name Plate

The variable pump can be identified on its name plate:

The following information can be found on the name plate:

1 Manufacturer
2 Ordering code
3 Material number of the axial piston unit
4 Serial number
5 Date of manufacturing
6 Speed
7 Internal manufacturing code
8 Direction of rotation (when facing the shaft; here: clockwise)
9 Designated space for certification stamp
10 Power

Ensure that the variable pump to be repaired is of the type and size covered by this manual.

3.2 Functional Description

To make sure that you are able to identify problems with a variable pump and to carry out specific repairs, familiarity with how the unit functions and its assembly are required. This section provides you with a rough overview.

The variable displacement axial piston pump type A4VG in swashplate design is designed for closed circuit hydrostatic drives. The flow is proportional to the input drive speed and displacement. By adjusting the swashplate, it is possible to infinitely vary the flow.

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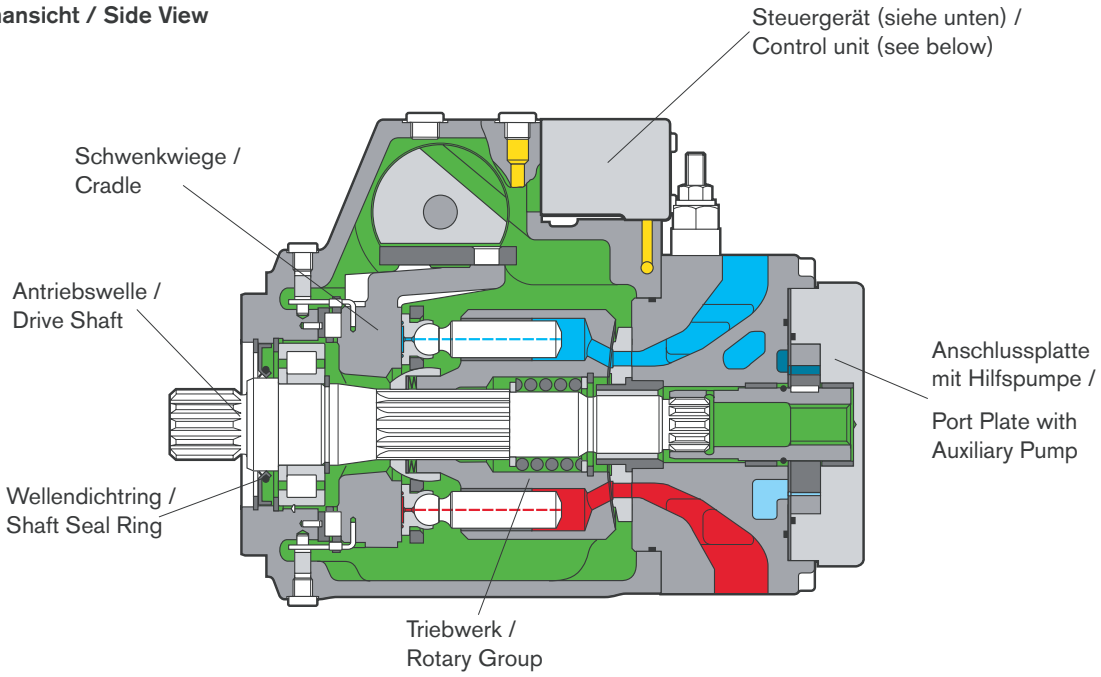
3.2.1 Schnittzeichnung

Die folgenden Schnittzeichnungen zeigen das Zusammenspiel der Komponenten der A4VG Verstellpumpe.

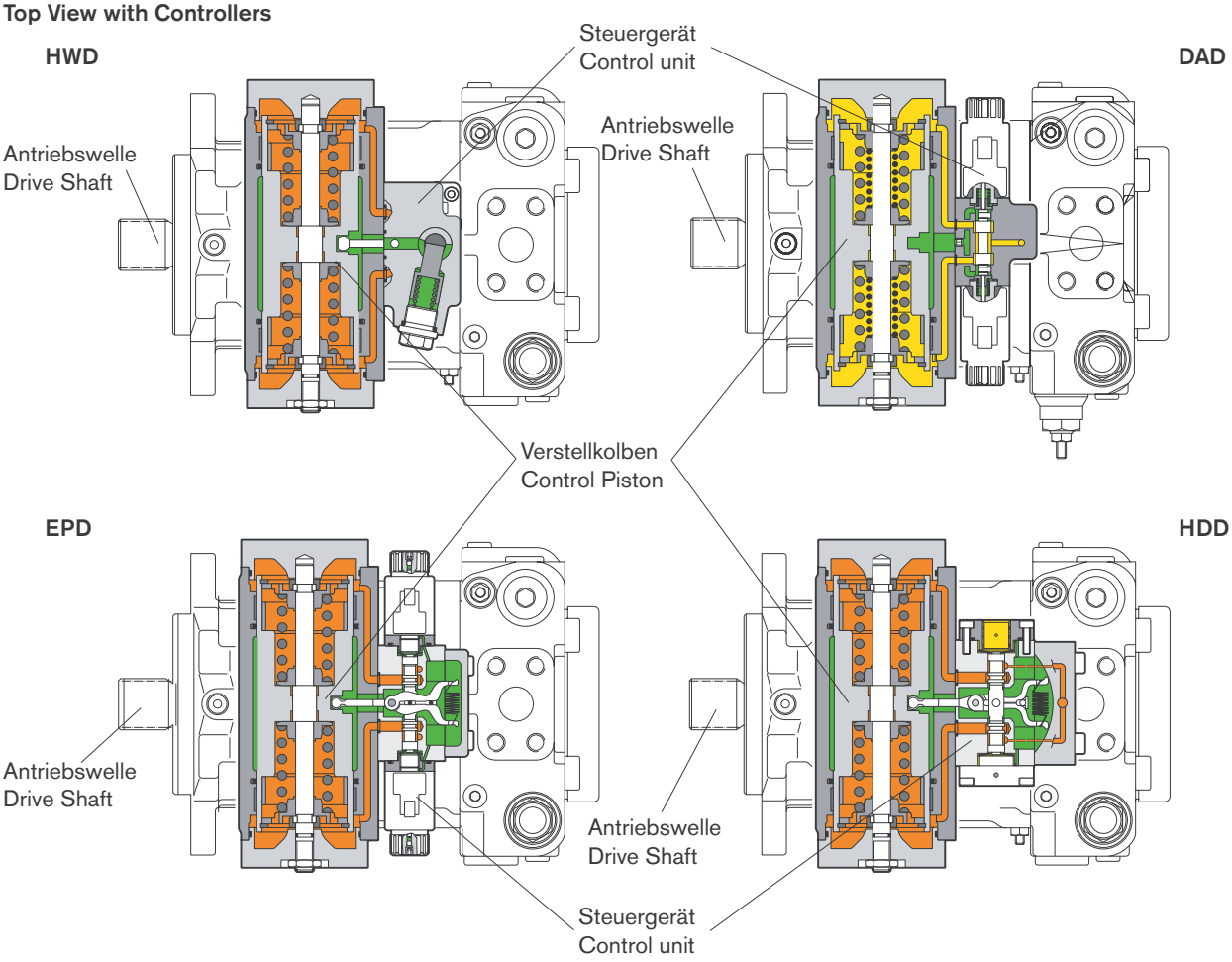
3.2.1 Sectional Drawing

The following drawings show the interrelation of the components of the A4VG variable pump.

Seitenansicht / Side View



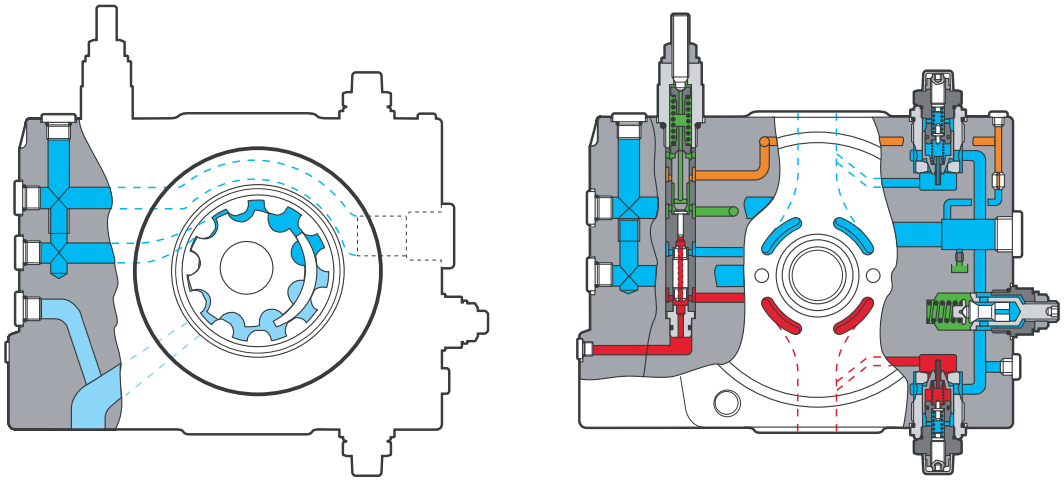
Draufsicht Verstellungen/
Top View with Controllers



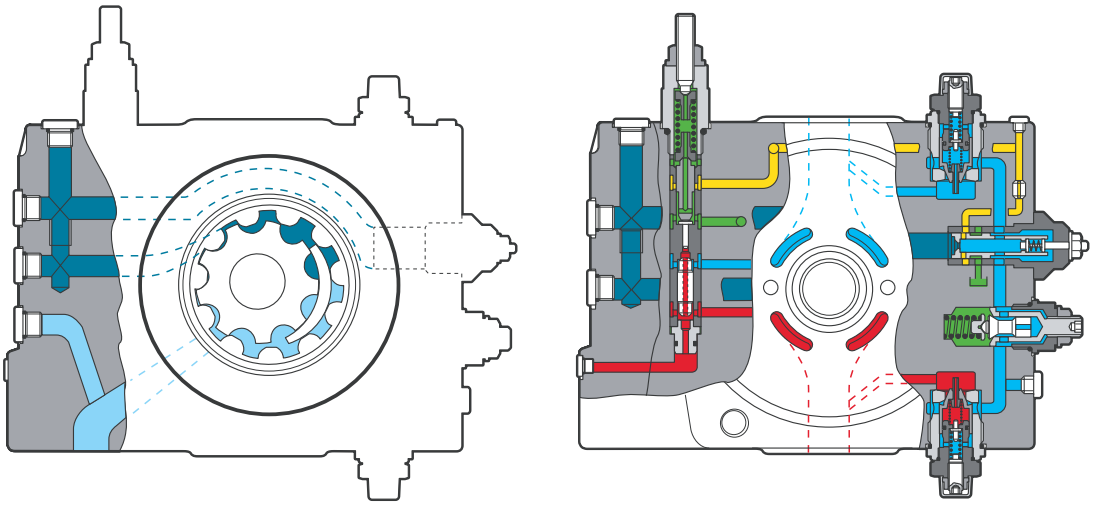
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Ansicht Anschlussplatte /
View Port Plate

HWD / EPD / HDD



DAD



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3.3 Technische Daten

Die technischen Daten der Verstellpumpe finden Sie in der Auftragbestätigung. Ergänzend dazu ist das jeweilige technische Datenblatt. Für die A4VG Verstellpumpe gilt das technische Datenblatt RD 92 003.

3.3 Technical Data

You can find the technical data for the variable pump in the Confirmation of Order. This is supplemented by the unit‘s data sheet. For the A4VG variable pump, the valid data sheet is RE 92 003.

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4 Austausch externer Baugruppen

Dieses Kapitel beschreibt den Austausch von extern zugänglichen Baugruppen der Verstellpumpe A4VG.

Der Austausch folgender Baugruppen wird beschrieben:

- Wellendichtring
- Dichtungen
- Hilfspumpe
- Steuergerät

Hinweis

Alle in nachfolgenden Zeichnungen dargestellten Steuergeräte sind nur stellvertretend und müssen nicht der Konfiguration Ihrer Axialkolbenmaschine entsprechen.

⚠ WARNUNG

Gefahr von Verschleiß und Funktionsstörungen

Die Sauberkeit der Druckflüssigkeit und die Lebensdauer der Hydraulikanlage stehen in unmittelbarem Zusammenhang. Verschmutzung der Druckflüssigkeit führt zu Verschleiß und Funktionsstörungen. Insbesondere harte Fremdkörper in den Hydraulikleitungen, wie z.B. Schweißperlen und Metallspäne, können die Axialkolbenmaschine beschädigen.

Beachten Sie daher unbedingt folgende Hinweise:

- Achten Sie auf äußerste Sauberkeit. Die Axialkolbenmaschine muss schmutzfrei eingebaut werden. Verunreinigungen in der Druckflüssigkeit können die Funktion und Lebensdauer der Axialkolbenmaschine erheblich beeinträchtigen.
- Achten Sie besonders bei der Installation darauf, dass Anschlüsse, Hydraulikleitungen und Anbauteile (z.B. Messgeräte) sauber sind. Reinigen Sie diese gründlich, bevor Sie Anschlüsse öffnen. Stellen Sie sicher, dass auch beim nachfolgenden Verschließen der Anschlüsse keine Verunreinigungen eindringen.
- Verwenden Sie für die Beseitigung von Schmiermitteln und anderen starken Verschmutzungen geeignete flüssige Reinigungsmittel. Es darf kein Reinigungsmittel in das Hydrauliksystem eindringen.
- Verwenden Sie zur Reinigung keine Putzwolle oder faserende Putzlappen.
- Verwenden Sie als Dichtungsmittel keinesfalls Hanf oder Kitt.

4 Exchanging External Assembly Groups

This chapter describes the replacement of the externally accessible assembly groups of the variable pump A4VG.

The exchange of the following assembly groups is described:

- Shaft seal
- Seals
- Auxiliary pump
- Control unit

Note

All the following illustrations are only examples and do not have to completely correspond with the configrations of your axial piston unit.

⚠ WARNING

Danger of wear and malfunction

The durability of the hydraulic unit depends to a great extent on how clean the unit is kept. Dirt in the hydraulic fluid can lead to malfunctions. Especially hard foreign matter in the hydraulic conduits, for example, welding beads and cuttings, can damage the axial piston unit.

Therefore you should observe the following instructions:

- Make sure everything is kept extremely clean. The axial piston unit must be installed in a dirt-free environment. Contamination of the hydraulic fluid can lead to considerable wear and malfunctions of the axial piston unit.
- Espacially during the istallation, you should make sure that ports, hydraulic conduits, and mounting components (for example, gauges) are clean. Clean these thoroughly before you open connections. After that, when sealing the ports, make sure that contaminating elements cannot enter the system.
- When removing grease and other dirt you should use appropriate liquid cleaning agents. Cleaning agents must not enter the hydraulic system.
- Do not use cotton waste or rags which lose threads.
- Never use hemp or putty as a sealant.

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4.1 Wellendichtring austauschen

Dieser Abschnitt erklärt, wie Sie den Wellendichtring austauschen.

Benötigtes Sonderwerkzeug:

- Montagehülse

  Die Materialnummern sind je nach Pumpenmodell verschieden:
  - A4VG71: Mat.-nr. R909877509
  - A4VG90: Mat.-nr. R909877510
  - A4VG125: Mat.-nr. R909877511
  - A4VG180: Mat.-nr. R909877512

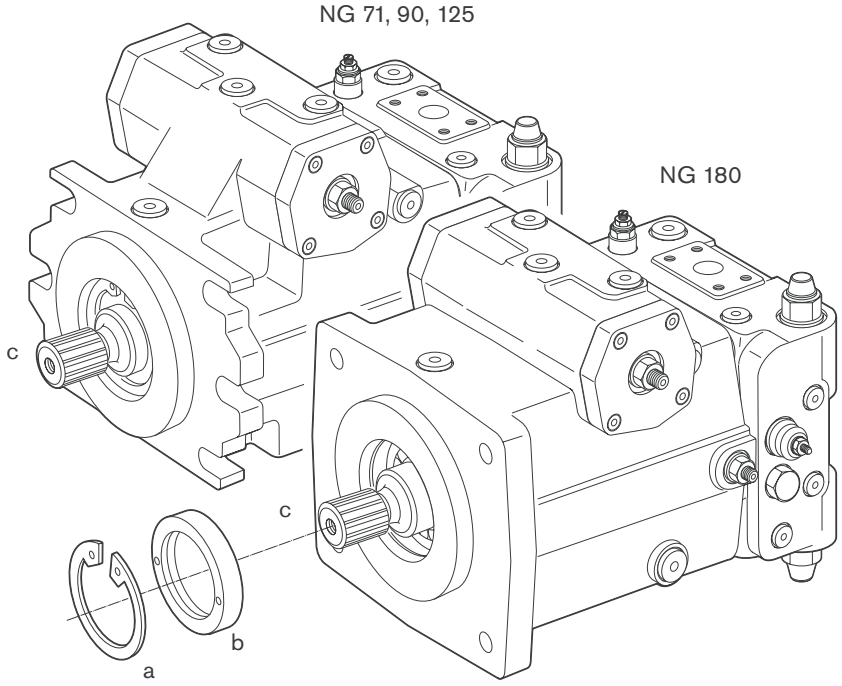
4.1 Exchanging the Shaft Seal

This section explains how you can replace the shaft seal.

Required Special Tools:

- Mounting sleeve

  The material number depends on the pump model.
  - A4VG71: Mat. no. R909877509
  - A4VG90: Mat. no. R909877510
  - A4VG125: Mat. no. R909877511
  - A4VG180: Mat. no. R909877512



a:	Sicherungsring	Circlip
b:	Wellendichtring	Shaft Seal
c:	Triebwelle	Drive Shaft

Um den Wellendichtring auszutauschen:

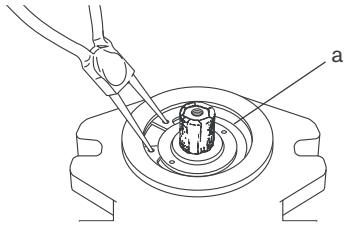
1 Kleben Sie die Triebwelle (c) ab, um Beschädigungen am Wellendichtring (b) zu vermeiden.

2 Entfernen Sie den Sicherungsring (a).

To exchange the shaft seal:

1 Mask the drive shaft (c) for protection against damage of the shaft seal (b).

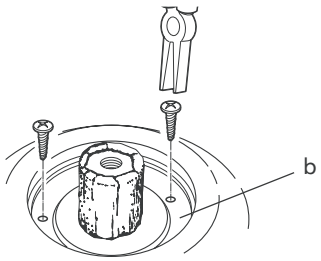
2 Remove the safety ring (a).



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3 Drehen Sie Blechschrauben in die mit Gummi gefüllten Löcher des Wellendichtrings (b) und ziehen Sie den Wellendichtring mit einer Zange heraus.

3 Screw the tapping screw into the rubber lined holes of the shaft seal (b), and use pliers to pull the shaft seal out.

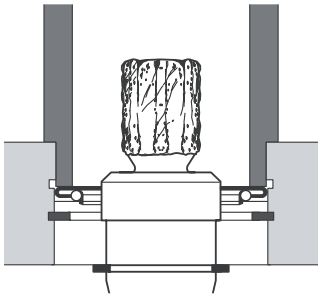


4 Fetten Sie den Wellendichtring zwischen Dicht- und Staublippe leicht ein, um Trockenlauf zu vermeiden.

5 Pressen Sie den Wellendichtring mit Hilfe der Montagehülse (Sonderwerkzeug) auf Anschlag ein.

4 Grease the shaft seal between the seal and dust lip to avoid a dry run.

5 Using the mounting sleeve (special tool), press the shaft seal until it is in stop position.



6 Führen Sie den Sicherungsring so ein, dass er in die dafür vorgesehene Nut einrastet.

7 Entfernen Sie die Abklebung an der Triebwelle.

6 Place the safety ring so that it locks into place in the respective slot.

7 Remove the mask on the drive shaft.

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4.2 Dichtungen austauschen

Die Baugruppe „Dichtungssatz komplett“ enthält Dichtungen für folgende Komponenten:

- Stellkolbendeckel
- Ventile
- Druckabschneidung
- Hilfspumpe (siehe „Hilfspumpe austauschen“)
- Steuerung (siehe „Steuergerät austauschen“)

Benötigtes Sonderwerkzeug: Keines

Dichtung an den Stellkolbendeckeln austauschen

Die beiden Seiten des Stellkolbens sind mit zwei unterschiedlichen Deckeln abgedeckt. Die nötigen Schritte zum Austausch der Deckeldichtungen unterscheiden sich daher.

4.2 Exchanging Seals

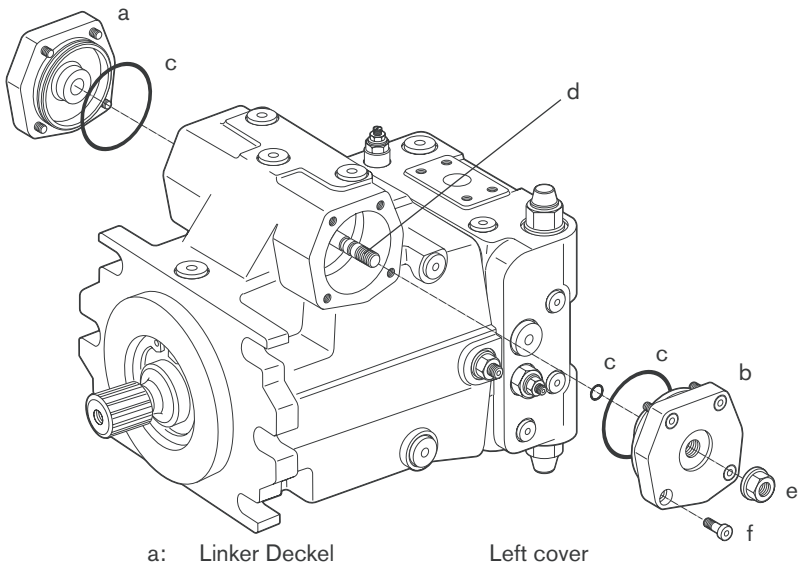
The assembly group "complete seal set" contains seals for the following components:

- Positioning piston covers
- Valves
- Pressure cut-off
- Auxiliary pump (refer to "Exchanging the Auxiliary Pump")
- Control unit (refer to "Exchanging the Control Unit")

Required Special Tools: none

Exchanging the valve positioning piston covers

Both sides of the positioning piston have their own different covers. The required steps to exchange the covers are threrefore different.



a:	Linker Deckel	Left cover
b:	Rechter Deckel	Right cover
c:	O-Ring	O-ring
d:	Stellschraube	Adjustment screw
e:	Kontermutter	Counter nut
f:	Befestigungsschrauben	Fastening screw

Um die Dichtung an den Stellkolbendeckeln auszutauschen:

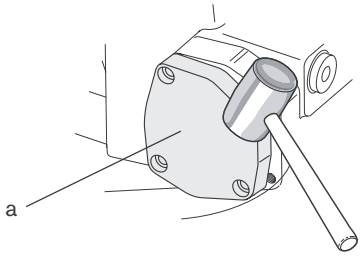
1 Kennzeichnen Sie die Lage des linken Deckels (a) und entfernen Sie die Befestigungsschrauben (f).

2 Verdrehen Sie den Deckel (a) und lösen Sie ihn vorsichtig mit leichten Hammerschlägen (Gummihammer).

To exchange the valves of the positioning pistons:

1 Mark the position of the left cover (a) and remove the fastening screws (f).

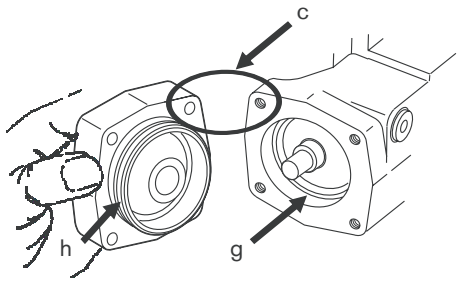
2 Twist the cover (a) and carefully loosen it by tapping it with a (rubber) hammer.



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3 Entfernen Sie den alten O-Ring (c). Kontrollieren Sie die Nut (h) und das Gehäuse (g) auf Verschleiß und Verunreinigungen.

3 Remove the old o-ring (c). Check the slot (h) and the housing (g) for wear and dirt.



4 Setzen Sie einen neuen O-Ring ein und schrauben Sie den linken Deckel fest.

4 Install a new o-ring and screw the cover shut.

5 Markieren Sie die Lage des rechten Deckels (b), damit Sie ihn nach dem Abdichten wieder lagerichtig aufsetzen können.

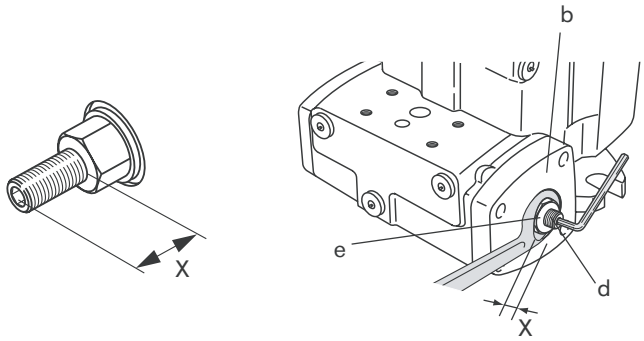
Messen und notieren Sie das Maß X der Kontermutter (e) für die spätere Montage.

Entfernen Sie die Kontermutter (e). Halten Sie dazu die Stellschraube (d) fest.

5 Mark the position of the right cover (b) so that you can set it back to its original position after sealing.

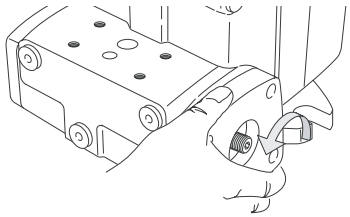
Measure and write down the dimension X of the counter nut (e). You need this for the subsequent assembly.

Remove the counter nut (e). To do so, grip the positioning screw (d).



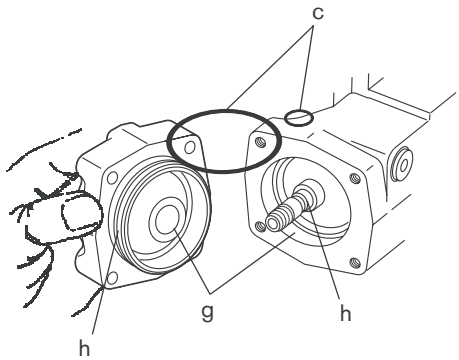
6 Schrauben Sie den Deckel von der Stellschraube durch Drehen ab.

6 Unscrew the cover from the positioning screw.



7 Entfernen Sie die beiden O-Ringe (c). Kontrollieren Sie die Nuten (h) und das Gehäuse (g) auf Verschleiß und Verunreinigungen.

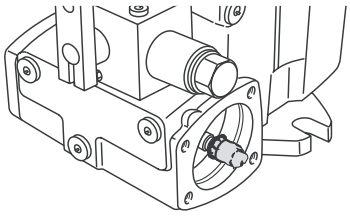
7 Remove the two o-rings (c). Check the slots (h) and housing (g) for wear and dirt.



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8 Kleben Sie das Gewinde ab, um Beschädigungen des O-Rings zu vermeiden, und schieben Sie den kleinen O-Ring bis zur vorgesehenen Nut auf.

8 Mask the screw thread to avoid damaging the o-ring, and push the smaller o-ring up to the designated slot.



9 Setzen Sie den großen O-Ring ein, entfernen Sie die Abklebung und schrauben Sie den Deckel fest.

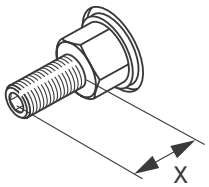
10 Schrauben Sie die Kontermutter (e) per Hand ein. Blockieren Sie die Stellschraube (d) während Sie die Kontermutter festziehen.

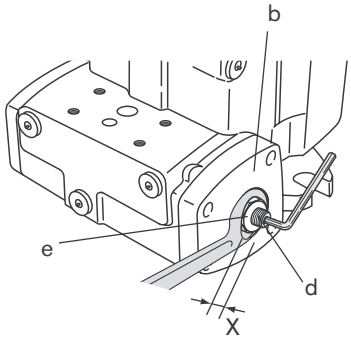
Kontrollieren Sie das Maß X nach der Montage.

9 Insert the larger o-ring, remove the masking and screw the cover back on.

10 Screw in the counter nut (e) manually. Block the adjusting screw (d) while you tighten the counter nut.

Check the dimension X after assembly.





Hinweis

Nach dem Einbau im Gerät bzw. Prüfstand muss die korrekte mechanische Nulllagen-Einstellung erfolgen, siehe „Überprüfungen“ auf Seite 29.

Note

After the installation of the unit or the test rig, the correct mechnical zero stroke must be adjusted, refer to "Checking", page 29.

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Ventildichtungen austauschen

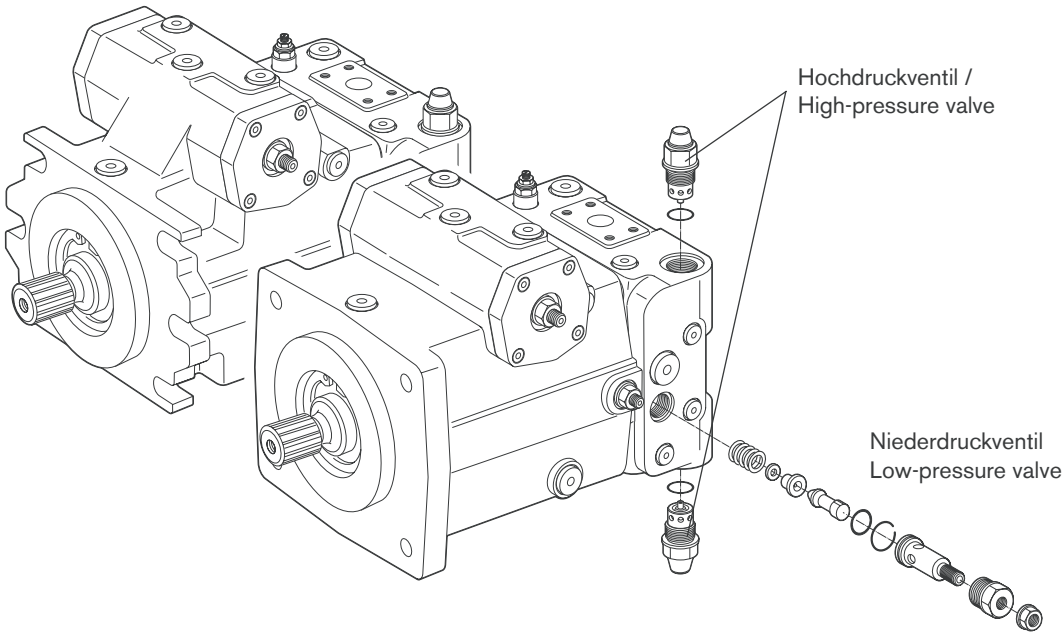
Hinweis

Möglicherweise sind nicht alle in den Zeichnungen gezeigten Ventile an Ihrer Einheit vorhanden.

Exchanging the valve seals

Note

It is possible that the valves displayed in these illustrations are not all present in your unit.



Um die Ventildichtungen auszutauschen:

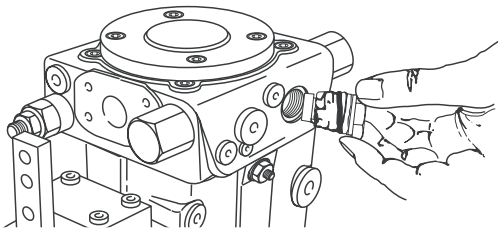
1 Schrauben Sie das Niederdruckventil heraus.

2 Kleben Sie die Gewinde der Niederdruckventile ab, um Beschädigungen der O-Ringe zu vermeiden.

To exchange the valve seals:

1 Unscrew the low pressure valve.

2 Mask the screw thread to avoid damage to the o-rings.



3 Setzen Sie die neuen O-Ringe ein, entfernen Sie die Abklebungen an den Gewinden und schrauben Sie das Niederdruckventil wieder ein.

Ziehen Sie es mit einem Drehmoment von 70 Nm fest.

4 Schrauben Sie die Hochdruckventile heraus.

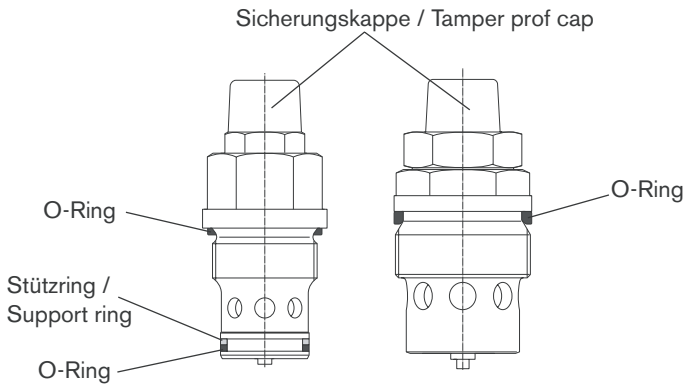
Beachten Sie: Bei NG 71–90 gibt es zwei O-Ringe und einen Stützring, bei NG 125 und 180 nur einen O-Ring.

3 Insert the new o-rings, remove the masking from the screw thread, and screw the low pressure valve back in.

Tighten it with a torque of 70 Nm.

4 Unscrew the high-pressure valves.

Note: NG 71–90 have two o-rings and one There are two types of this valve: with or without bypass function.



NG 71–90 **NG 125, 180**

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5 Entfernen Sie die O-Ringe und den Stützring (NG 71–90) und kontrollieren Sie das Gehäuse auf Verschleiß und Verunreinigungen.

6 Bauen Sie das Hochdruck-Ventil ein und ziehen Sie es mit einem Drehmoment von 150 Nm (NG 71–90) bzw. 200 Nm (NG 125, 180) fest.

Hinweis

Nach dem Einbau muss eine Überprüfung des Hochdrucks erfolgen, siehe „Überprüfungen“ auf Seite 29.

5 Remove the o-rings and the supprot ring (NG 71–90) and check the housing for wear and dirt.

6 Install the high-pressure valve and tighten it with a torque of 150 Nm (NG 71–90) or 200 Nm (NG 125, 180).

Hinweis

Nach dem Einbau muss eine Überprüfung des Hochdrucks erfolgen, siehe „Überprüfungen“ auf Seite 29.

Dichtung der Druckabschneidung austauschen

Um die Dichtung der Druckabschneidung auszutauschen:

1 Notieren Sie das Einstellmaß X der Dichtmutter für die spätere Montage.

2 Bauen Sie die Dichtmutter (a) und die Verschlussschraube (b) aus.

Entfernen Sie den O-Ring (c).

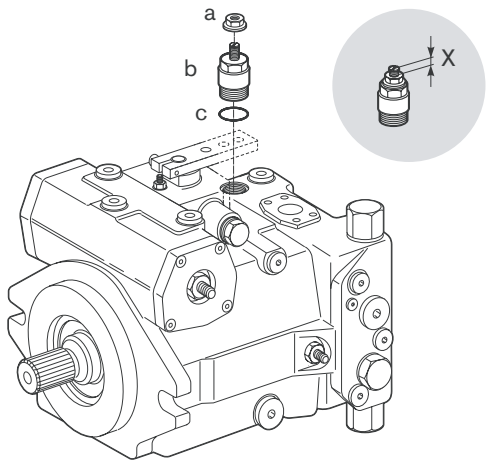
Exchanging the seals of the pressure cut-off

To exchange the seal of the pressure cut-off:

1 Write down the sealing nut's setting dimension X for the subsequent assembly.

2 Extract the sealing nut (a) and the locking screw (b).

Remove the o-ring (c).



3 Setzen Sie einen neuen O-RIng (c) ein.

4 Setzen Sie die Verschlussschraube (b) ein und ziehen Sie sie mit einem Drehmoment von 35 Nm fest.

5 Bauen Sie eine neue Dichtmutter (a) ein und stellen Sie das notierte Einstellmaß X ein.

Ziehen Sie die Dichtmutter mit 25 Nm fest.

3 Install a new o-ring (c).

4 Install the locking screw (b) and tighten it with a torque of 35 Nm.

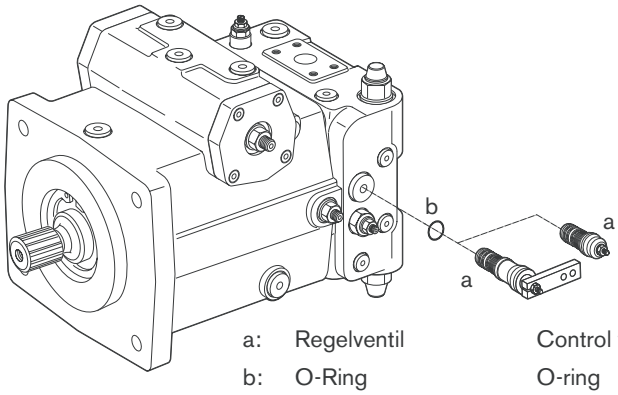
5 Install the new sealing nut (a) and adjust to the setting measure X that you wrote down previously.

Tighten it with a torque of 25 Nm.

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Dichtung des Regelventils austauschen

Exchanging the control valve



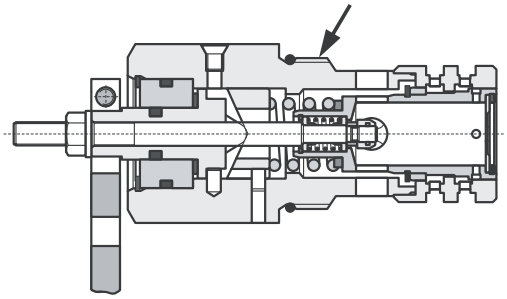
a: Regelventil — Control valve
b: O-Ring — O-ring

Um die Dichtung am Regelventil auszutauschen:

1 Schrauben Sie das Regelventil (a) aus.
2 Kleben Sie das Gewinde zur Vermeidung von Beschädigungen des O-Rings ab.

To exchange the control valve:

1 Unscrew the control valve (a).
2 Mask the screw thread to avoid damaging the o-ring.



3 Schieben Sie den neuen O-Ring auf.
4 Entfernen Sie die Abklebung und schrauben Sie das Regelventil ein.

   Ziehen Sie sie mit einem Drehmoment von 50 Nm fest.

3 Slide the new o-ring on.
4 Remove the masking and screw the control valve back on.

   Tighten them with a torque of 50 Nm.

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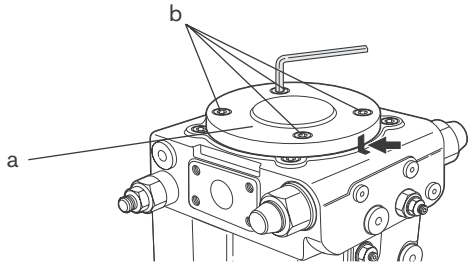
4.3 Hilfspumpe austauschen

Die nachfolgenden Schritte gelten sowohl für den Austausch einer Hilfspumpe als auch für den Austausch eines O-Rings.

Benötigtes Sonderwerkzeug: Keines

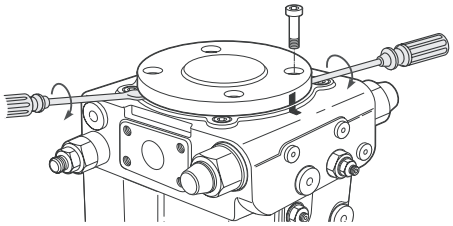
Um die Hilfspumpe auszutauschen:

1 Markieren Sie die Lage des Deckels (a), damit Sie ihn nach dem Abdichten wieder lagerichtig aufsetzen können.



2 Entfernen Sie die vier Befestigungsschrauben (b).

3 Drücken Sie den Deckel wie gezeigt ab.

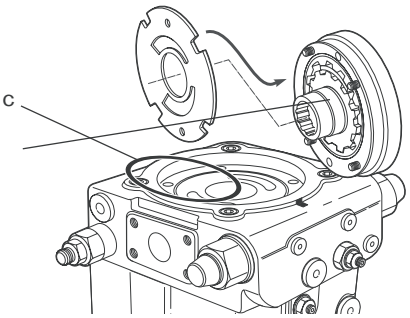


4 Entfernen Sie die Hilfspumpe und untersuchen Sie die Teile der Hilfspumpe auf Verschleiß und Verunreinigungen.

Markieren Sie vorher die Lage der Hilfspumpe, damit Sie sie später wieder lagerichtig einbauen können (sofern Sie die alte Hilfspumpe weiter verwenden).

Hinweis

Die Hilfspumpe kann nur komplett ausgetauscht werden.



5 Setzen Sie zwei neue O-Ringe (c) ein.

4.3 Exchanging the Auxiliary Pump

The following steps apply to the exchange of an auxiliary pump as well as to the exchange of an o-ring.

Required Special Tools: none

To exchange the auxiliary pump:

1 Mark the position of the cover (a), so that you can replace it in its original position after the sealing.

2 Remove the four fastening screws (b).

3 Press the cover off as illustrated.

4 Remove the auxiliary pump and check the part for wear and dirt.

Mark the position of the auxiliary pump beforehand, so that you can return it to its original position afterwards (if you keep the old auxiliary pump in use).

Note

The auxiliary pump can only be exchanged as a whole.

5 Install two new o-rings (c).

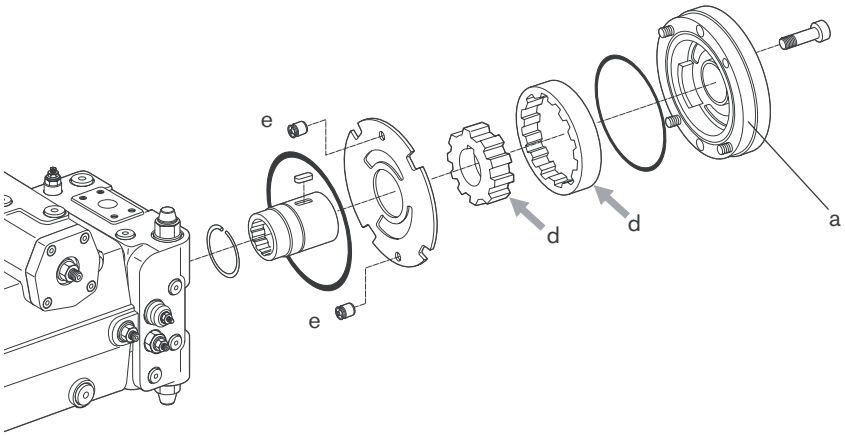
https://truckmanualshub.com/

6 Setzen Sie die (neue) Hilfspumpe ein.

Achten Sie darauf, dass die angefaste „Seite“ (d) zum Deckel (a) montiert wird.

6 Install the (new) auxiliary pump.

Pay attention that the chamfered "side" (d) is assembled facing the cover (a).



Hinweis

Die Hilfspumpe wird mit Haltestopfen (e) geliefert. Diese werden bei der Montage auf die Anschlussplatte in die entsprechenden Bohrungen eingepresst.

Note

The auxiliary pump is delivered with fixing plugs (e). These are pressed into the bore of the port plate during assembly.

7 Schrauben Sie den Deckel (a) fest. Beachten Sie dabei die vorher angebrachte Markierung.

7 Screw the cover (a) back on. Pay attention to the marking made previously.

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4.4 Steuergerät austauschen

Die nachfolgenden Schritte gelten sowohl für den Austausch des ganzen Steuergeräts als auch für den Austausch eines O-Rings am Steuergerät.

Benötigtes Sonderwerkzeug:

- NG 71: Keines
- NG 90–180: 2 Hilfsschrauben (Mat.-nr. R02774871)

Hinweis

Es gibt eine Vielzahl von Steuergeräten (siehe Abbildung).

Bitte beachten Sie, dass hier exemplarisch nur der Austausch eines HW Steuergeräts gezeigt wird.

4.4 Exchanging the Control Unit

The following steps apply to the exchange of the whole control unit as well as to the exchange of an o-ring.

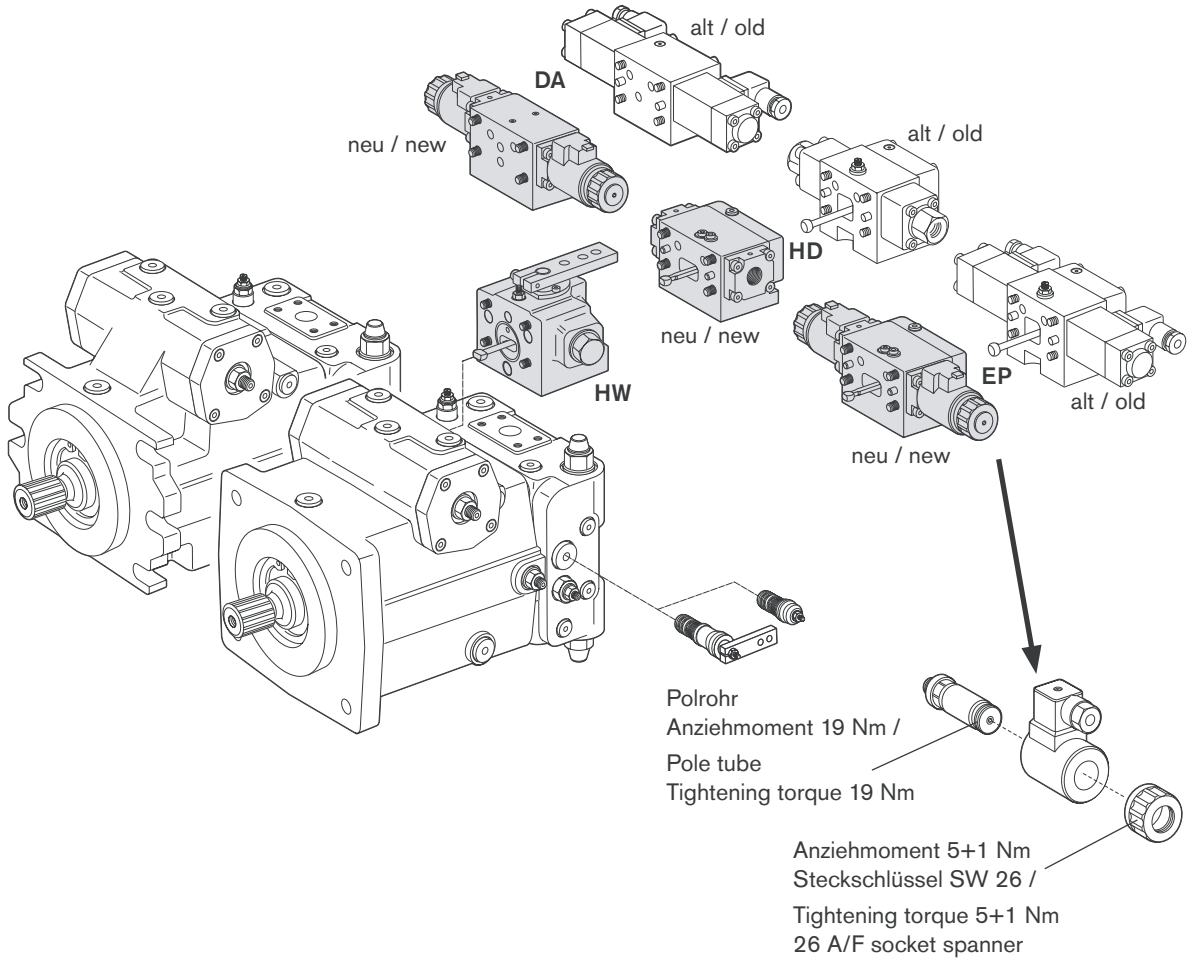
Required Special Tools:

- NG 71: none
- NG 90–180: 2 auxiliary screws (Mat. no. R02774871)

Note

There exists a multitude of control units (as illustrated).

Please pay attention to the fact that only the example of an HW controller is described here.

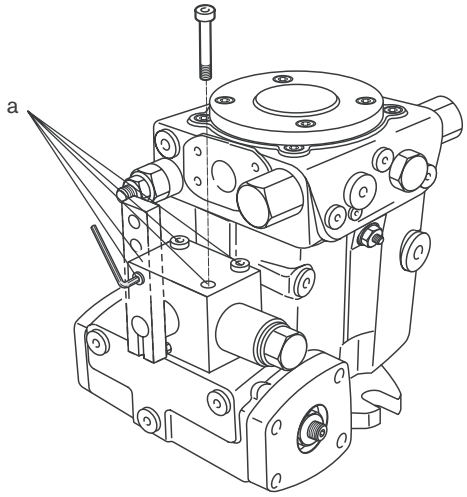


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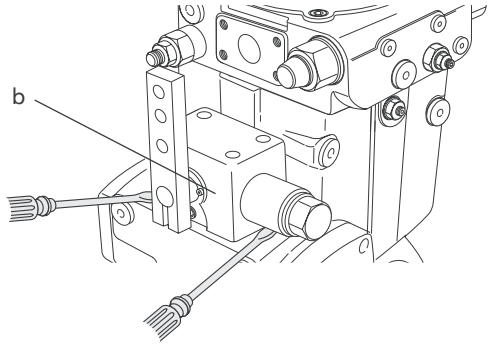
Austausch des Steuergeräts bei NG 71

Um das Steuergerät bei NG 71 auszutauschen:

1 Entfernen Sie die fünf Befestigungsschrauben (a).



2 Drücken Sie das Steuergerät (b) wie gezeigt ab.



3 Entfernen Sie den O-Ring (c) und die Flachdichtung (e). Kontrollieren Sie die Dichtflächen (d) auf Beschädigungen und Verunreinigungen.

Tauschen Sie das Steuergerät bei Bedarf aus.

Hinweis

Das Steuergerät kann nur komplett ausgetauscht werden.

Exchanging the Control Unit with NG 71

To exchange the control unit:

1 Remove all five fastening screws (a).

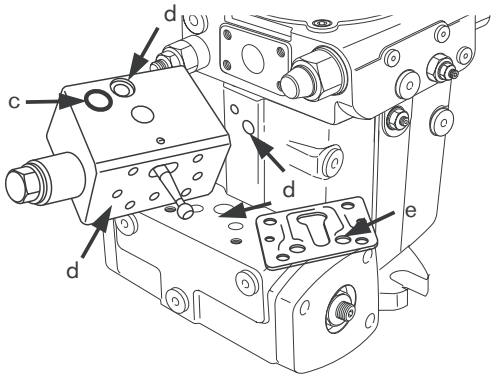
2 Press the control unit (b) off as illustrated.

3 Remove the o-ring (c) and the gasket (e). Check the sealing surfaces (d) for wear and dirt.

Exchange the control unit if required.

Note

The control unit can only be exchanged as a whole.



4 Setzen Sie einen neuen O-Ring (c) und eine neue Flachdichtung (e) ein.

4 Insert the new o-ring (c) and the new gasket (e).

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5 Setzen Sie das (neue) Steuergerät ein.

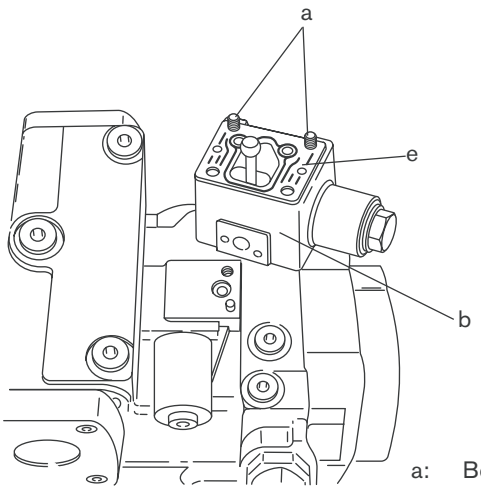
6 Zentrieren Sie die Dichtung (e) mit zwei Befestigungsschrauben (a) und bauen Sie das Steuergerät ein.

Ziehen Sie alle vier Befestigungsschrauben mit halbem Drehmoment an.

5 Insert the new control unit.

6 Center the seal (e) with two fastening screws (a) and install the control unit.

Screw all four fastening screws tight with half the torque.



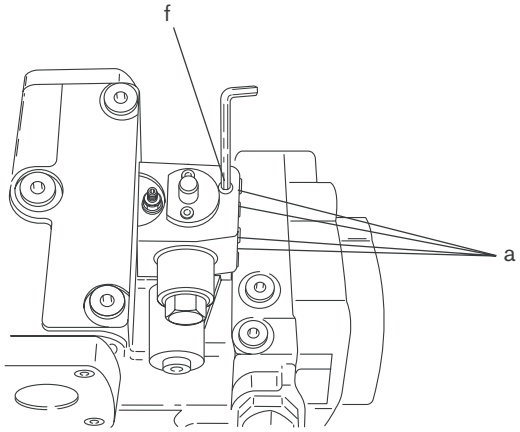
a:	Befestigungsschraube	Fixing screw
b:	Steuergerät	Control unit
e:	Dichtung	Seal

7 Setzen Sie die fünfte Schraube (f) ein und ziehen Sie sie mit einem Drehmoment von 10,4 Nm fest.

Ziehen Sie die anderen vier Schrauben (a) nach Drehmoment über Kreuz fest.

7 Insert the fifth screw (f) and tighten it with a torque of 10.4 Nm.

Tighten the other four screws (a) crosswise and according to torque.



Hinweis

Nach der Montage des Steuergeräts muss die hydraulische Nulllage neu eingestellt werden (gilt nicht für DA-Regelung), siehe „Überprüfungen“ auf Seite 33.

Note

After installing the control unit, the hydraulic zero stroke must be re-established. This does not apply to DA-control. Please refer to "Checking", page 33.

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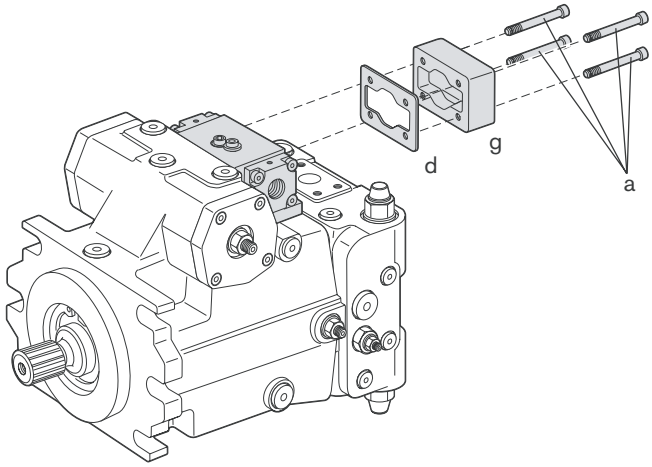
Austausch des Steuergeräts bei NG 90–180

Hinweis

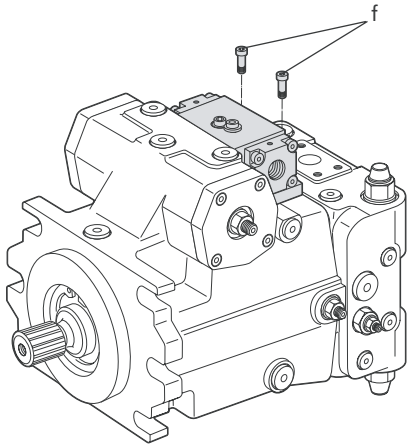
Die folgende Handlungsanweisung behandelt exemplarisch den Austausch eines HD-Steuergeräts.

Um das HD-Steuergerät bei NG 90–180 auszutauschen:

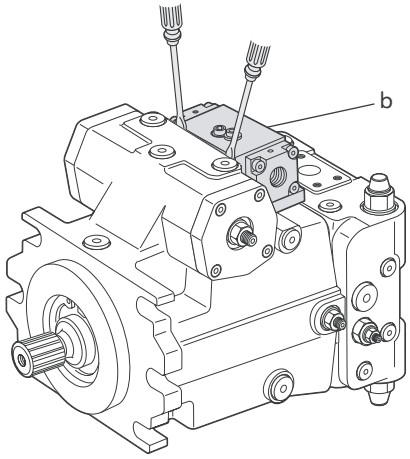
1 Entfernen Sie die vier Befestigungsschrauben (a).
Entfernen Sie den Deckel (g) und die Flachdichtung (d).



2 Entfernen Sie die zwei Zylinderschrauben (f).



3 Drücken Sie das Steuergerät (b) wie gezeigt ab.



Exchanging the Control Unit with NG 90–180

Note

The following instructions show how to exchange an HD control unit, exemplarily.

To exchange the HD control unit with NG 90–180:

1 Remove all four fastening screws (a).
Remove the cover (g) and the gasket (d).

2 Remove the two assembly screws (f).

3 Press the control unit (b) off as illustrated.

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4 Entfernen Sie die O-Ringe (c). Kontrollieren Sie die Dichtflächen auf Beschädigungen und Verunreinigungen.

Tauschen Sie Steuergerät bei Bedarf aus.

Hinweis

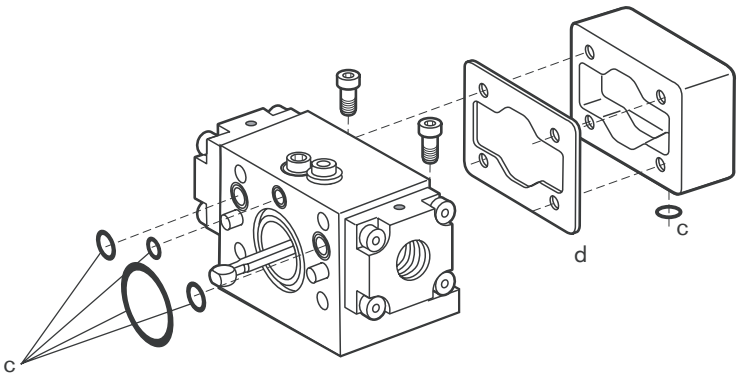
Das Steuergerät kann nur komplett ausgetauscht werden.

4 Remove the o-rings (c). Check the sealing surfaces for wear and dirt.

Exchange the control unit if required.

Note

The control unit can only be exchanged as a whole.



5 Setzen Sie neue O-Ringe (c) und eine neue Flachdichtung (d) ein.

6 Setzen Sie das (neue) Steuergerät (b) ohne Deckel auf.

Schrauben Sie das Steuergerät diagonal mit zwei Hilfsschrauben (e) (Sonderwerkzeug) an (mit 7 Nm).

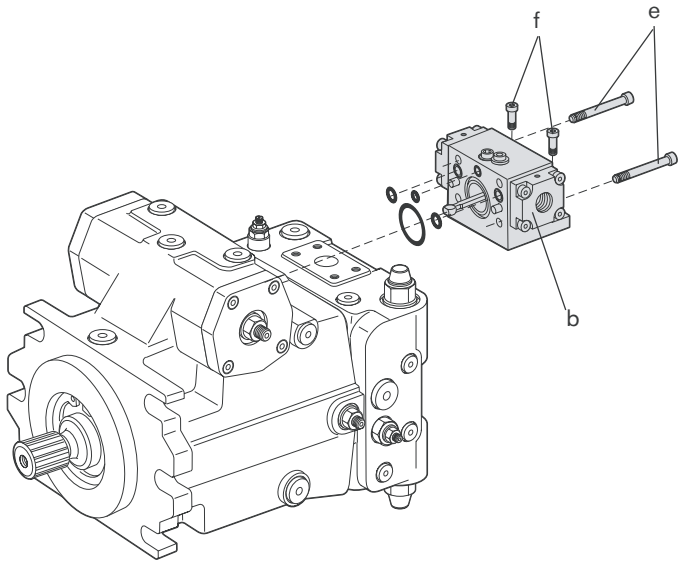
Schrauben Sie es mit zwei Zylinderschrauben (f) an (mit 10,4 Nm).

5 Insert the new o-rings (c) and the new gasket (d).

6 Insert the (new) control unit (b) without cover.

Tighten the control unit with two auxiliary screws (e) (special tools) diagonally (with a torque of 7 Nm).

Fix it with two assembly screws (f) (with a torque of 10,4 Nm).



7 Entfernen Sie die Hilfsschrauben (e) wieder.

8 Kontrollieren Sie, ob die Zugfedern richtig in den Kerben des Hebelpaares eingehängt sind.

7 Remove the auxiliary screws (e).

8 Make sure that both spring catches are hooked to the pair of leavers.

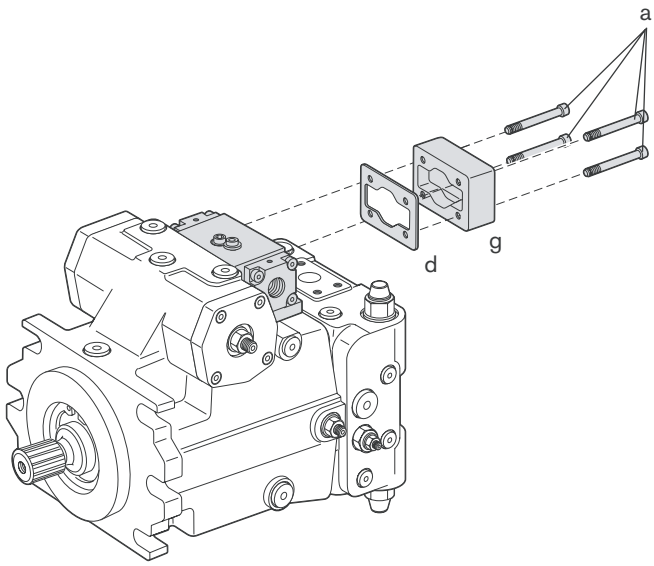
https://truckmanualshub.com/

9 Setzen Sie den Deckel (g) mit der Dichtung (d) auf und schrauben Sie ihn mit den vier Befestigungsschrauben fest.

Ziehen Sie die schrauben mit 10,4 Nm fest.

9 Put on the cover (g) with the gasket (d) and fix it with the four fastening screws.

Tighten the screws with a torque of 10,4 Nm.



Hinweis

Nach der Montage des Steuergeräts muss die hydraulische Nulllage neu eingestellt werden (gilt nicht für DA-Regelung), siehe „Überprüfungen“ auf Seite 33.

Note

After installing the control unit, the hydraulic zero stroke must be re-established. This does not apply to DA-control. Please refer to "Checking", page 33.

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5 Überprüfungen

Bei der ersten Inbetriebnahme nach einer Reparatur müssen Sie die ursprünglichen Einstellungen der Verstellpumpe kontrollieren. Dieses Kapitel erklärt folgende Überprüfungen:

- Niederdruck
- Hochdruck
- Mechanische Nulllage
- Hydraulische Nulllage

Hinweis

Führen Sie alle Überprüfungen bei Betriebstemperatur durch.

Hinweis

Wenn die überprüften Werte von den ursprünglichen Einstellungen abweichen, setzen Sie sich bezüglich der Einstellung bitte mit dem Rexroth-Service in Verbindung.

⚠ WARNUNG

Verletzungsgefahr

Arbeiten an der Verstellpumpe bei Betriebstemperatur sind gefährlich.

- Beachten Sie die Sicherheitshinweise (siehe „Sicherheit“ auf Seite 7).

⚠ WARNUNG

Gefahr von Verschleiß und Funktionsstörungen

Die Sauberkeit der Druckflüssigkeit und die Lebensdauer der Hydraulikanlage stehen in unmittelbarem Zusammenhang.

- Achten Sie bei Überprüfungen darauf, dass Messanschlüsse, Schläuche und Messgeräte sauber sind. Reinigen Sie diese gründlich bevor Sie die Messpunkte öffnen und mit den Einstellarbeiten beginnen.
- Stellen Sie sicher, dass auch beim nachfolgenden Verschließen der Messpunkte keine Verunreinigungen eindringen.

5 Checking

When starting up for the first time after a repair, you must check the original settings of the variable pump. This chapter describes the following checkings:

- Low pressure
- High pressure
- Mechanical zero stroke
- Hydraulic zero stroke

Note

Carry out checkings at operating temperature.

Note

If the checked values differ from the original settings, please contact Rexroth in terms of adjusting the settings.

⚠ WARNING

Danger of injuries

Working on the variable pump at operating temperature is dangerous.

- Pay exact attention to the safety advice (refer to "Safety", page 7).

⚠ WARNING

Danger of wear and malfunction

The durability of the hydraulic unit depends to a great extent on how clean the unit is kept.

- When checking settings, you should make sure that gauge ports, hydraulic conduits, and und gauges are clean. Clean these thoroughly before you open gauge ports and begin adjusting settings.
- After that, when sealing the ports, make sure that contaminating elements cannot enter the system.

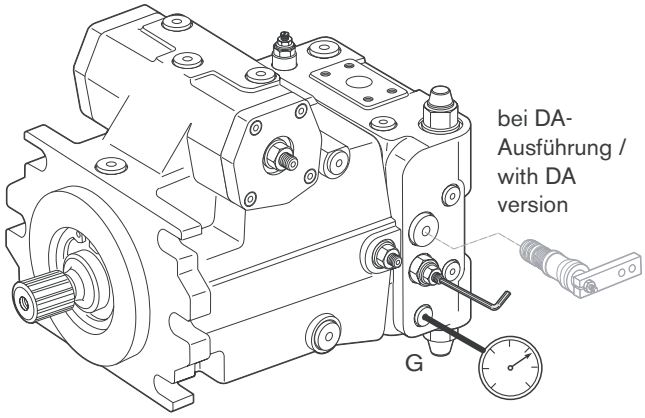
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5.1 Niederdruck (Speisedruck) überprüfen

Dieser Abschnitt erklärt, wie Sie ND-Ventile überprüfen.

Um den Niederdruck zu überprüfen:

1 Schließen Sie wie gezeigt ein Manometer an Anschluss G an.



2 Überprüfen Sie den Niederdruck (G).

Hinweis

Die genauen Einstelldaten entnehmen Sie dem Technischen Datenblatt RD 92 003 und Ihrer Spezifikation.

5.1 Checking Low Pressure (Charge Pressure)

This section describes how to check the low pressure valves.

To check the low pressure:

1 Connect a manometer to connection G as displayed.

2 Check the low pressure (G):

Note

Refer to the catalog sheet RE 92 003 and your specification for the detailed setting data.

5.2 Hochdruck überprüfen

Die Begrenzung des Hochdrucks erfolgt über die Druckabschneidung. Zusätzlich ist ein Hochdruckbegrenzungsventil (Sicherheitsventil) überlagert. Der Druckwert der Druckabschneidung liegt ca. 10 % unter dem Wert des Hochdruckbegrenzungsventils.

Es kann also nur der Druckwert der Druckabschneidung überprüft werden.

Hinweis

Die genauen Einstelldaten entnehmen Sie Ihrer Spezifikation.

5.2 Checking the High Pressure

The limitation of the operating pressure is performed by a high pressure relief valve. Additionally, a high pressure relief valve (safety valve) is in superposition. The pressure value of the pressure cut-off is 10 % below that of the high pressure relief valve.

Therefore, only the pressure value of the pressure cut-off can be measured.

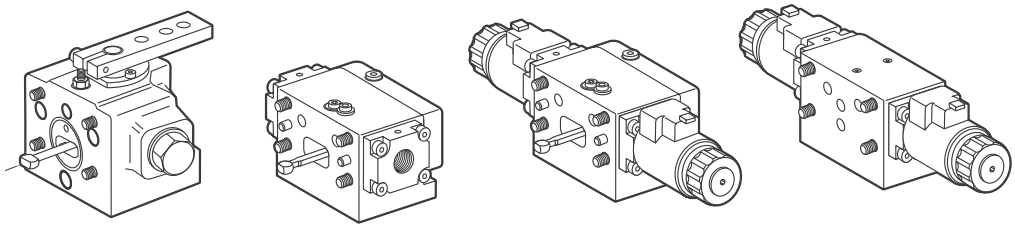
Note

Refer to your specification for the detailed setting data.

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5.3 Mechanische Nulllage überprüfen

Dieser Abschnitt erklärt, wie Sie die mechanische Nulllage bei HW-, HD-, EP- und DA-Steuergeräten überprüfen.



HW HD EP DA

⚠ WARNUNG

Verletzungsgefahr

Die im Folgenden beschriebenen Arbeiten an der Verstellpumpe sind gefährlich.

- Beachten Sie die Sicherheitshinweise (siehe „Sicherheit“ auf Seite 7).
- Blockieren Sie das Fahrzeug bzw. entlasten Sie die Anlage bevor Sie die Einstellarbeiten durchführen.

5.3 Checking the Mechanical Zero Stroke

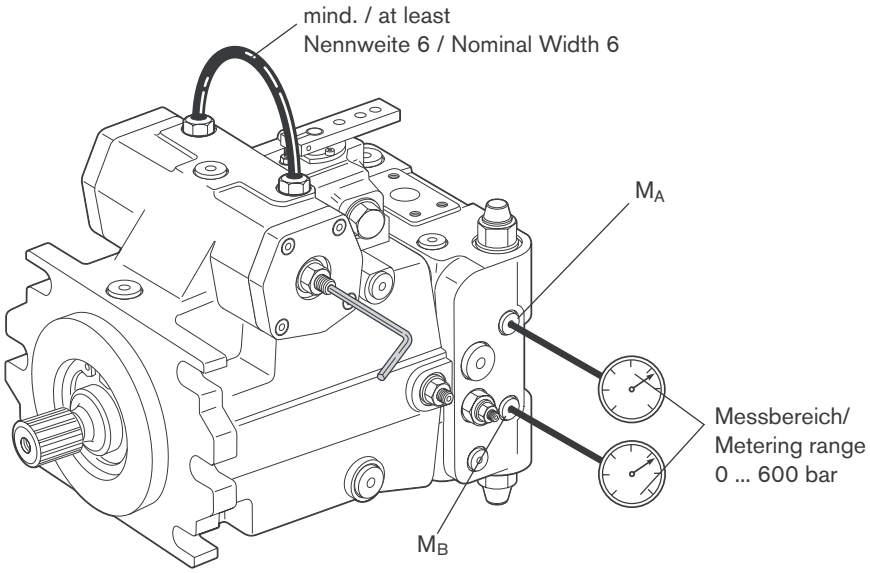
This section describes how to check the mechanical zero stroke for HW, HD, EP, and DA controllers.

⚠ WARNING

Danger of injuries

The following procedures carried out on the variable pump are dangerous.

- Please pay attention to the safety advice (refer to "Safety", page 7).
- Block the machinery or unit before you carry out the installation.



Um die mechanische Nulllage zu überprüfen:

1 Verbinden Sie beide Stellkammern über einen Schlauch mit mindestens Nennweite NW6.

  Dadurch stellen Sie sicher, dass ein Restsignal aus dem Steuergerät keine Auswirkung auf die Einstellung der mechanischen Nullage hat.

2 Schließen Sie an die Messanschlüsse M_A und M_B Manometer an.

3 Überprüfen Sie, ob bei blockiertem Antrieb beide Manometer den gleichen Druckwert anzeigen.

To check the mechanical zero stroke:

1 Connect the two position chambers with a hose (with at least nominal width NW6).

  Thus, you ensure that a residual signal from the controller has no influence on the setting of the hydraulic zero stroke.

2 Connect manometers to the measuring ports M_A and M_B.

3 Check if both manometers show the same pressure value when the unit is blocked.

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5.4 Hydraulische Nulllage überprüfen

Dieser Abschnitt erklärt, wie Sie die hydraulische Nulllage bei HW-, HD- und EP-Steuergeräten überprüfen.

⚠ WARNUNG

Verletzungsgefahr

Die folgenden Arbeiten an der Verstellpumpe sind gefährlich.

- Beachten Sie die Sicherheitshinweise (siehe „Sicherheit“ auf Seite 7).
- Blockieren Sie das Fahrzeug bzw. entlasten Sie die Anlage bevor Sie die Einstellarbeiten durchführen.

5.4 Checking the Hydraulic Zero Stroke

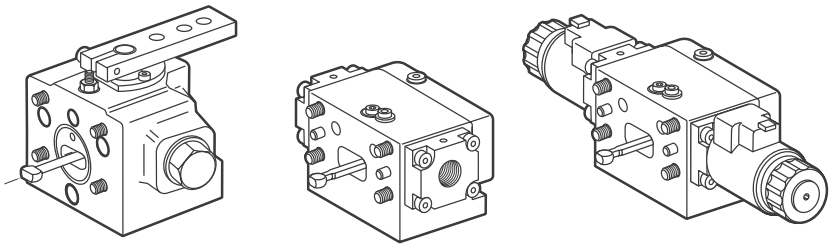
This section describes how to check the hydraulic zero stroke for HW, HD, and EP controllers.

⚠ WARNING

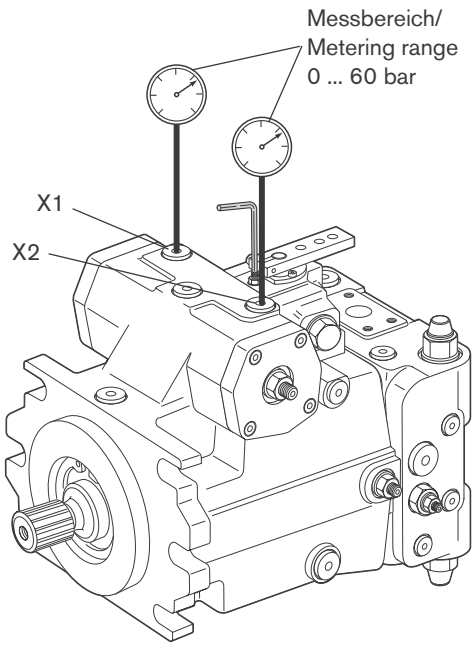
Danger of injuries

The following procedures carried out on the variable pump are dangerous.

- Pay attention to the safety advice (refer to "Safety", page 7).
- Block the machinery or unload the unit before you procede with the installation.



HW HD EP



Um die hydraulische Nulllage zu überprüfen:

1 Schließen Sie an die Anschlüsse X1 und X2 Manometer an.
2 Überprüfen Sie, ob bei blockiertem Antrieb beide Manometer den gleichen Druckwert anzeigen.

Hinweis

Verdrehen Sie die Exzenterjustierung (a) am Steuergerät nicht über ±90°.

To check the hydraulic zero stroke:

1 Connect manometers to the ports X1 und X2.
2 Check if both manometers show the same pressure value when the unit is blocked

Note

Never turn the eccentric calibration (a) of the controller over ±90 degrees.

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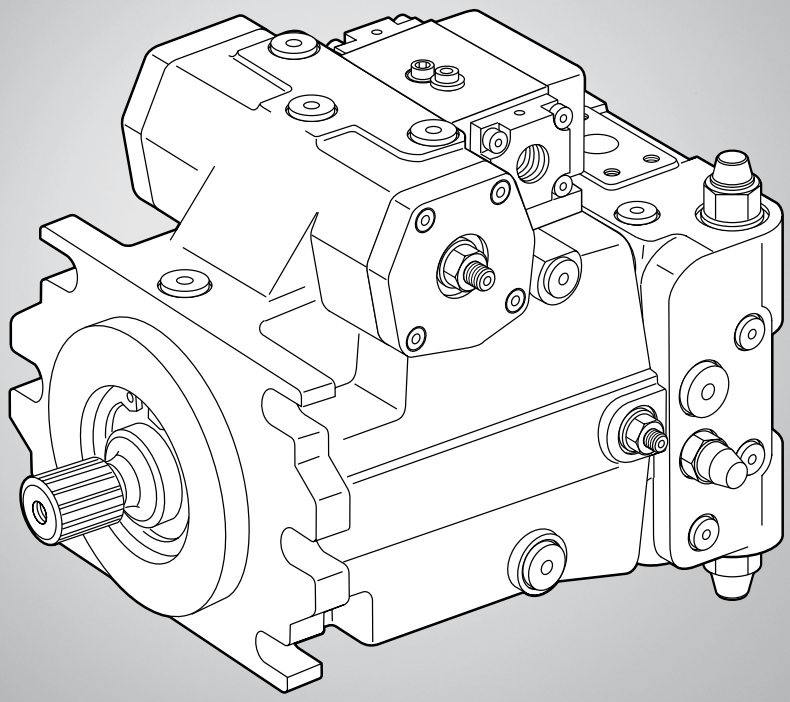
Axial Piston Variable Pump A4VG

Series 32

RE 92003-01-B/04.08

Replaces:
RE 92003-11-B/06.06
RE 92003-21-B/05.06
English

Operating Instructions



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An example configuration is shown on the title page. The delivered product may, therefore, differ from the product which is pictured.

The original operating instructions were created in the German language.

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1 About this document

These instructions contain important information on the safe and appropriate assembly, transport, commissioning, maintenance, disassembly and simple troubleshooting of the A4VG series 32 axial piston variable pump.

- Read these instructions completely, especially chapter "2 General safety instructions" on page 6, before working with the A4VG axial piston variable pump.

1.1 Related documents

The A4VG axial piston variable pump is a system component. Also observe the instructions for the other system components.

Further information on the A4VG axial piston variable pump, its installation and operation can be found in the Rexroth documents listed in the following table.

Table 1: Related documents

Related documents	Contents
Order confirmation	Contains the preset technical data of your A4VG axial piston variable pump.
Installation drawing	Contains the outer dimensions, all connections and the hydraulic circuit diagram for your A4VG axial piston variable pump.
Data sheet RE 92003	Contains the permissible technical data for the A4VG series 32 axial piston variable pump.
Data sheet RE 90220	Describes the requirements for a mineral-oil based hydraulic fluid for operation with Rexroth axial piston units and assists you in selecting a hydraulic fluid for your system.
Data sheet RE 90221	Describes the requirements for an environmentally acceptable hydraulic fluid for operation with Rexroth axial piston units and assists you in selecting a hydraulic fluid for your system.
Data sheet RE 90223	Contains additional information on the use of Rexroth axial piston units with HF hydraulic fluids.
Data sheet RE 90300-03-B	Contains additional information on the use of Rexroth axial piston units at low temperatures.

Also observe the generally applicable, legal or otherwise binding regulations of the European and national legislation and the rules for the prevention of accidents and for environmental protection applicable in your country.

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1.2 Abbreviations used

As umbrella term for "A4VG axial piston variable pump", the designation "axial piston unit" will be used in the following.

Table 2: Abbreviations

Abbreviation	Meaning
A4VG	Axial piston variable pump, closed circuits
DA	Automatic control, hydraulic, speed related
EP	Proportional control, electric
HD	Proportional control, hydraulic, pilot-pressure related
HW	Proportional control, hydraulic, mechanical servo
RE	Rexroth document in the English language

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2 General safety instructions

The axial piston unit has been manufactured according to the accepted rules of current technology. There is, however, still a danger of personal injury or damage to equipment if the following general safety instructions and the warnings before the steps contained in these instructions are not complied with.

- Read these instructions completely and thoroughly before working with the axial piston unit.
- Keep these instructions in a location where they are accessible to all users at all times.
- Always include the operating instructions when you pass the axial piston unit on to third parties.

2.1 Intended use

Axial piston units are components in terms of the EU machine directive 98/37/EC (sub units). Axial piston units are not ready-to-use machines for the purpose of the EU machine directive. The product/component is exclusively intended for being integrated in a machine or system or for being assembled with other components to form a machine or system. The product may only be commissioned after it has been installed in the machine/system for which it is intended.

The axial piston variable pump generates, controls and regulates a hydraulic-fluid flow. It is approved for use as a hydraulic pump in hydrostatic drives in closed circuits.

- Observe the technical data, operating conditions and performance limits as specified in the data sheet and order confirmation.

The axial piston unit is not designed for private use.

Intended use includes having read and understood these instructions, especially chapter "2 General safety instructions".

2.2 Improper use

The axial piston unit may not be used in explosive environments.

In addition, any use of the axial piston unit other than described in chapter "2.1 Intended use" is considered to be improper.

2.3 Personnel qualifications

Assembly, commissioning and operation, disassembly, maintenance and repair require basic mechanical, hydraulic and electrical knowledge, as well as knowledge of the appropriate technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with a crane and the corresponding attachment equipment. In order to ensure operating safety, these activities may therefore only be carried out by qualified personnel or an instructed person under the direction and supervision of qualified personnel.

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Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant conditions pertaining to the work to be done. Qualified personnel must observe the rules relevant to the subject area.

2.4 Safety instructions in this document

In this manual, there are safety instructions before the steps whenever there is a danger of personal injury or damage to equipment. The measures described to avoid these hazards must be observed.

Safety instructions are set out as follows:

SIGNAL WORD!



Type of danger!

Consequences

► Precautions

- **Safety sign:** (warning triangle): draws attention to the danger
- **Signal word:** identifies the degree of the danger
- **Type of danger:** identifies the type or source of the danger
- **Consequences:** describes what occurs if the safety instructions are not complied with
- **Precautions:** states how the danger can be avoided.

The signal words have the following meaning:

Signal word	Application
DANGER! 	Indicates an **imminently** hazardous situation which, if not avoided, will certainly result in death or serious injury.
WARNING! 	Indicates a **potentially** hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION! 	Indicates a **potentially hazardous** situation which, if not avoided, could result in minor or moderate injury or damage to equipment.
	If this information is disregarded, the operating procedure may be impaired.

2.5 Adhere to the following instructions

General instructions

- Observe the regulations for accident prevention and environmental protection for the country where the product is used and at the workplace.
- Only use Rexroth axial piston units in good technical order and condition.
  - Inspect the product for obvious defects.
- Do not modify or retrofit the axial piston unit.
- Only use the product within the performance range provided in the technical data.
- Persons who assemble, commission, operate, disassemble or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.

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General safety instructions

- The warranty only applies to the delivered configuration.
- The warranty is rendered void if the product is incorrectly assembled, commissioned or operated, as well as if not used as intended and/or handled improperly.
- Do not expose the product to any mechanical loads under any circumstances. Never use the product as a handle or step. Do not place/lay any objects on it.
- The noise emission of axial piston units depends on speed, operating pressure and installation conditions. The sound pressure level may rise above 70 dBA during normal operating conditions. This can cause hearing damage.
  - Always wear hearing protection while working in the vicinity of the operating axial piston unit.
- The axial piston unit heats up considerably during operation. The solenoids of the axial piston unit get so hot during operation that you may burn yourself:
  - Allow the axial piston unit to cool down sufficiently before touching it.
  - Wear heat-resistant protective clothing, e.g. gloves.

During transport

- Make certain that the lifting gear has adequate lifting capacity. The weight can be found in chapter "5 Transport and storage".

During assembly

- Before assembling, make sure that all fluids have been completely removed from the axial piston unit to prevent mixing with the hydraulic fluid used in the system.
- Make sure the relevant system component is not under pressure or voltage before assembling the product or when connecting and disconnecting plugs. Protect the system against being switched on.
- Lay cables and lines so that they cannot be damaged and no one can trip over them.
- Before commissioning, make sure that all hydraulic connections are tight and that all the connection seals and plugs are installed correctly to ensure that they are leakproof and fluids and contaminants are prevented from penetrating the product.
- When assembling, provide for absolute cleanliness in order to prevent contaminants such as welding beads or metal cuttings from getting into the hydraulic lines and causing product wear or malfunctions.

During commissioning

- Ensure that all electrical and hydraulic connections and ports are occupied or plugged. Only commission a completely installed product.

During cleaning

- Plug all openings with the appropriate protective equipment in order to prevent detergents from penetrating the system.
- Never use solvents or aggressive detergents. Use only water and, if necessary, a mild detergent to clean the axial piston unit.
- Do not point a high-pressure cleaner at sensitive components such as, e.g. shaft seal ring, electrical connections and electrical components.

During maintenance and repair

- Perform the prescribed maintenance work at the intervals specified in the operating instructions (see chapter "9.3 Maintenance").
- Make sure that no lines, connections or components are disconnected as long as the system is under pressure. Protect the system against being switched on.

During disposal

- Dispose of the product and the hydraulic fluid in accordance with the currently applicable national regulations in your country.

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2.6 Operator's obligations

The operator of the axial piston unit from Rexroth must provide personnel training on a regular basis regarding the following subjects:

- Observation and use of the operating instructions and the legal regulations.
- Intended use and operation of the axial piston unit.
- Observation of the instructions from the factory security offices and of the work instructions from the operator.



Rexroth offers training support for special fields.
You can find an overview of the training contents on the Internet at:
`http://www.boschrexroth.de/didactic.`

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3 Delivery contents

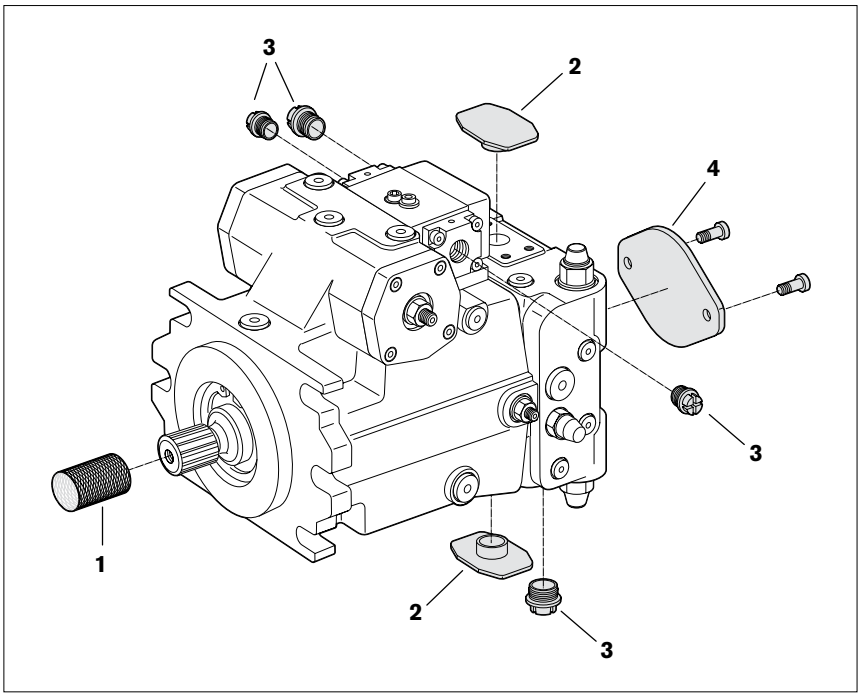


Fig. 1: Axial piston unit

Included in the delivery contents are:

- 1 Axial piston unit

The following parts are also assembled on delivery:

- Transport protection for drive shaft end (**1**).
- Protective covers (**2**).
- Plastic plugs / locking screws (**3**).
- Flange cover and fixing screws (**4**) (optional for versions with through drive).

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4 Product description

4.1 Performance description

The axial piston variable pump generates, controls and regulates a hydraulic-fluid flow. It is designed for mobile applications such as construction machinery.

Refer to the data sheet and order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

4.2 Device description

The A4VG is an axial piston variable pump with swashplate design for hydrostatic drives in closed circuits. Flow is proportional to drive speed and displacement. The flow can be steplessly changed by controlling the swashplate (**11**).

Closed circuit

A hydraulic system is considered to be closed if the hydraulic fluid which flows back from the consumer is directed directly back to the pump. Here, there is a high-pressure side and a low-pressure side depending on the load direction (output torque on the consumer).

4.2.1 Assembly of the axial piston unit

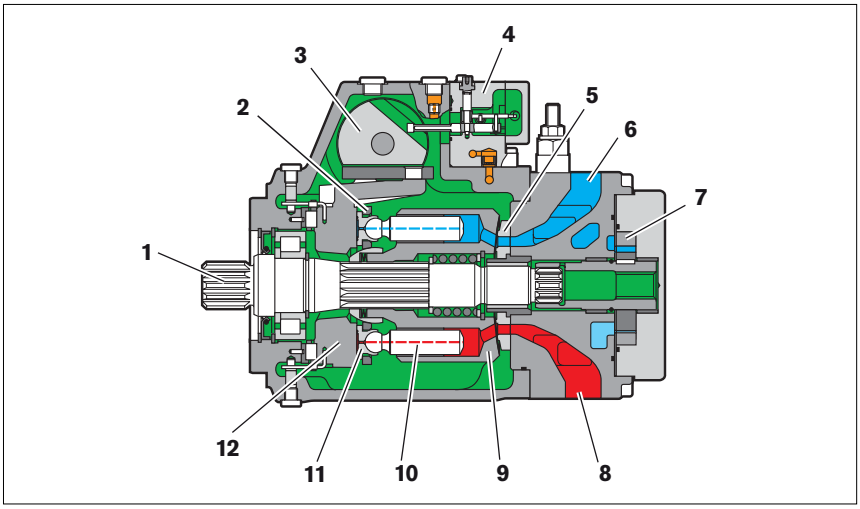


Fig. 2: Assembly of the A4VG series 32

1 Drive shaft
2 Retaining plate
3 Stroke piston
4 Controller (using the EP as an example here)
5 Control plate
6 Low-pressure side
7 Auxiliary pump
8 High-pressure side
9 Cylinder
10 Piston
11 Slipper pad
12 Swashplate

For axial piston units with swashplate design, the pistons (**10**) are arranged axially with respect to the drive shaft (**1**). They are guided in the rotating cylinder (**9**) and support themselves with the slipper pads (**11**) on the non-rotating swashplate (**12**). The drive shaft (**1**) and cylinder (**9**) are connected to one another by means of gearing.

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4.2.2 Functional description

Pump

Torque is applied to the drive shaft (**1**) by an engine. The cylinder (**9**) turns with the drive shaft, turning with it the pistons (**10**). On each rotation, the pistons perform a stroke movement which is defined by the pitch of the swashplate (**12**). The slipper pads (**11**) are held on and guided along the glide surface of the swashplate by the retaining plate (**2**). During a rotation, each piston moves over the bottom and top dead centers back to its initial position. During this action, the fluid volume defined by the piston surface and the stroke is fed in or removed through the two control slits in the control plate (**5**). On the low-pressure side, (**6**) fluid flows into the enlarging piston chamber – in a closed circuit this is supported by the return and boost pressures. At the same time, on the high-pressure side (**8**) the fluid is pushed out of the cylinder chamber into the hydraulic system by the pistons.

Pressure cut-off

The operating pressure is limited by the pressure cut-off.

The pressure cut-off corresponds to a pressure regulator which reduces the pump capacity once the set specified pressure value is reached so that the set pressure is maintained but not exceeded.

High-pressure safeguarding

The pressure spikes which occur during very rapid swiveling operations as well as the maximum pressure are safeguarded by the superordinate high-pressure relief valves. These valves open if the set value is exceeded, thereby depressurizing the low-pressure side. The fluid quantity remains constant in the closed circuit. The leakage at the pump and motor is replaced by the auxiliary pump (**7**).

Auxiliary pump

The auxiliary pump continuously supplies a sufficient volume of fluid (boost volume) from a small tank to the low-pressure side of the closed circuit via a check valve to replenish the internal leakage of the variable pump and consumer.

Neutral valve (optional)

The optional neutral valve interrupts the active control pressure and joins the two positioning chambers for pressure equalization. The springs in the positioning chambers move the stroke piston (**3**) towards the middle position (neutral position). The reset function is influenced by the current operating pressure and the speed.

Switching off the control pressure and a bypass function for the two positioning chambers does not ensure that the pump moves to the middle position (neutral position).

Use an appropriate emergency-off device to ensure that the drive can be brought to a safe position at any time. The device or system operator is responsible for the installation of a proper emergency-off device.

The following warning notice applies to all axial piston units with the HD and EP control units:

CAUTION!



The spring return in the control unit is not a security device.

The slide valve of the control unit can be blocked in an undefined position by internal contamination (impure hydraulic fluid, abrasion or residual contamination from system components). As a result, the axial piston unit can no longer supply the flow specified by the operator.

- Properly install an emergency-off function to ensure that the driven consumer can be brought to a safe position (e.g. immediate stop).
- Maintain the specified cleanliness level 20/18/15 (< 90 °C) or 19/17/14 in accordance with ISO 4406.

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Control The swivel angle of the swashplate (**12**) is infinitely variable. By changing the swivel angle, the piston stroke and, therefore, the displacement change. The swivel angle is controlled hydraulically via the stroke piston (**3**). The swashplate is mounted for easy motion in swivel bearings and the neutral position spring centered. Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.

If the swashplate is not swiveled out, the displacement is equal to zero. Various controllers are available depending on requirements.



Additional information on the control devices, such as the circuit diagram or characteristics, can be found in technical data sheet RE 92003.

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4.2.3 Control units

NV – version without control unit

The mounting surface for the control unit is machined and is sealed with the standard seal for control units and a cover plate. This version is ready for retrofitting to control units (HD, HW, EP, EZ). When used directly for "DA" control and in combinations with "DA" control, the appropriate adjustments must be made to the spring assembly of the control cylinder and control plate.

DG – hydraulic control, direct operated

The stroke cylinder of the pump is directly supplied with control pressure by switching a pilot pressure on or off at ports **X_1** or **X_2**. In this way, the swashplate and thus the displacement can be adjusted between $V_g = 0$ and $V_{g\ max}$. A different flow direction is associated with each port.

EZ – electric two-point control, with switching solenoid

By energizing or de-energizing a control current to either switching solenoid a or b, the stroke cylinders of the pump are supplied with control pressure by the EZ control unit. In this way, the swashplate and thus the displacement is adjustable without intermediate settings between $V_g = 0$ and $V_{g\ max}$. A different flow direction is associated with each switching solenoid.

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HD – proportional control, hydraulic, pilot-pressure related

Depending on the pressure difference of the pilot pressure p_{St} in the two control lines (ports **Y_1** and **Y_2**), the stroke cylinder of the pump is supplied with control pressure via the HD control unit. Thus, the swashplate – and, therefore, the displacement – are infinitely adjustable. A different flow direction is associated with each control line.

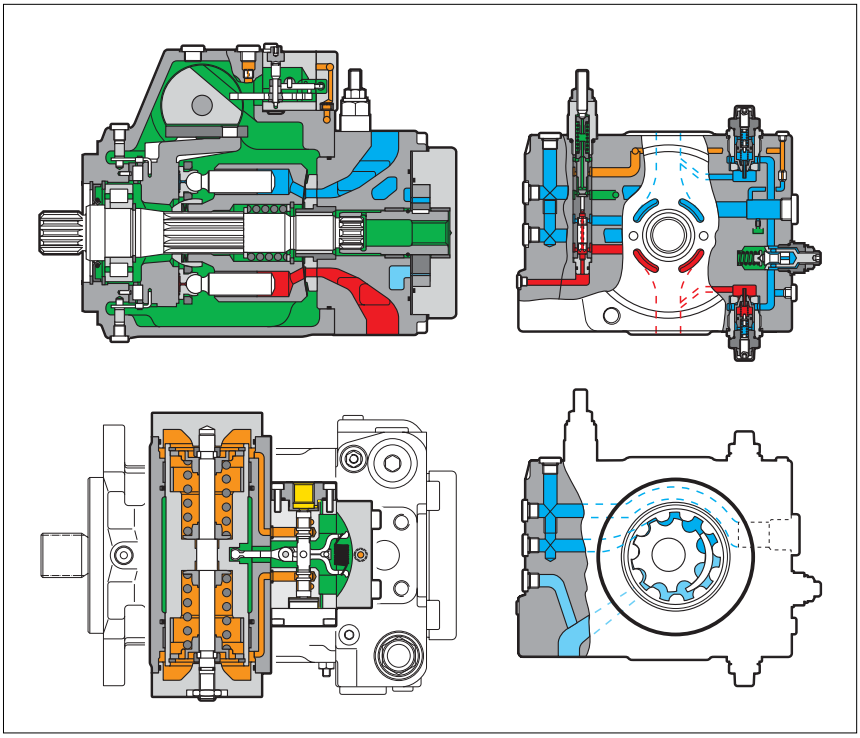


Fig. 3: Cut-away view of A4VG with hydraulic proportional control, pilot-pressure related (shown is size 71–180)

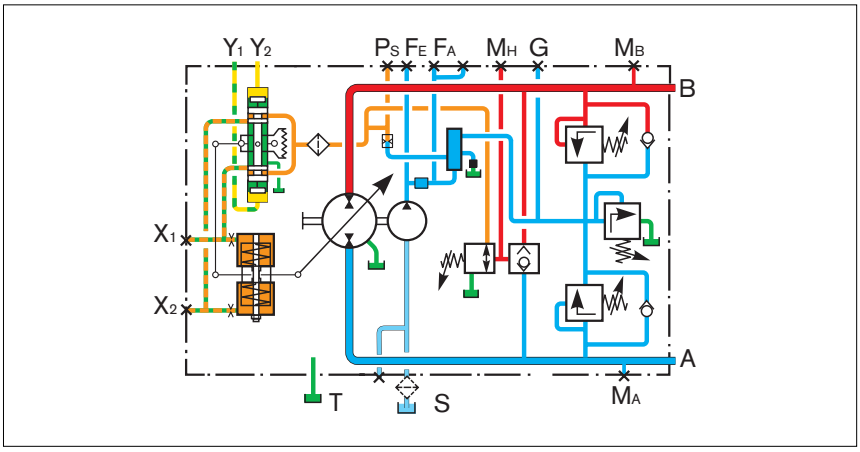


Fig. 4: Hydraulic circuit diagram of A4VG with hydraulic proportional control

High pressure
Suction pressure
Control pressure
Low pressure
Case drain pressure
Pilot pressure

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HW – proportional control, hydraulic, mechanical servo

Depending on the swivel angle of the control lever and the actuating direction, the stroke cylinder of the pump is supplied with control pressure via the HW control unit. Thus, the swashplate – and, therefore, the displacement – are infinitely adjustable. A different actuating direction is associated with each direction of control lever actuation.

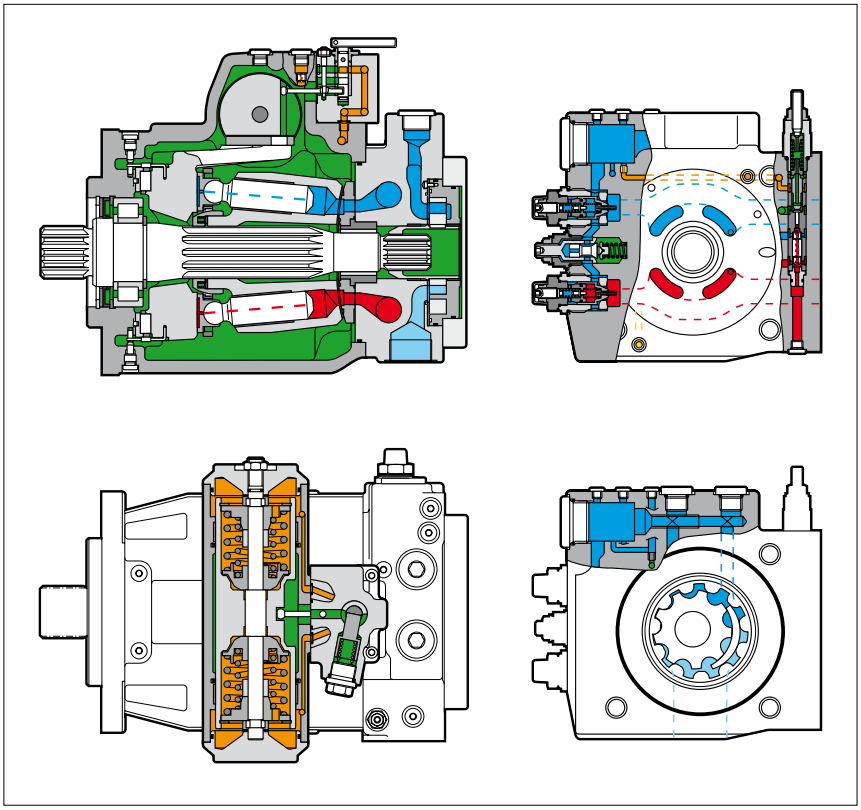


Fig. 5: Cut-away view of A4VG with hydraulic proportional control, mechanical servo (shown is size 250)

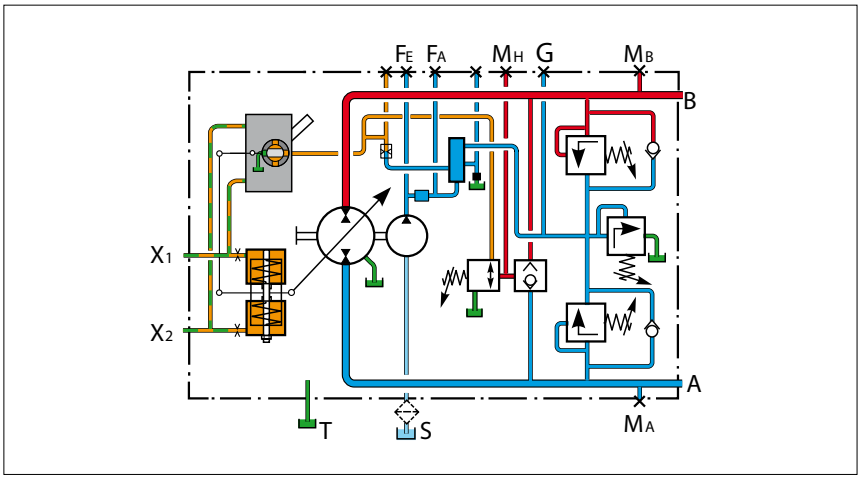


Fig. 6: Hydraulic circuit diagram of A4VG with hydraulic proportional control

High pressure
Suction pressure
Control pressure
Low pressure
Case drain pressure

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EP – proportional control, electric

Depending on the preselected current "**I**" at the two proportional solenoids, the stroke cylinder of the pump is supplied with control pressure via the EP controller. Thus, the swashplate – and, therefore, the displacement – are infinitely adjustable. A different flow direction is associated with each proportional solenoid.

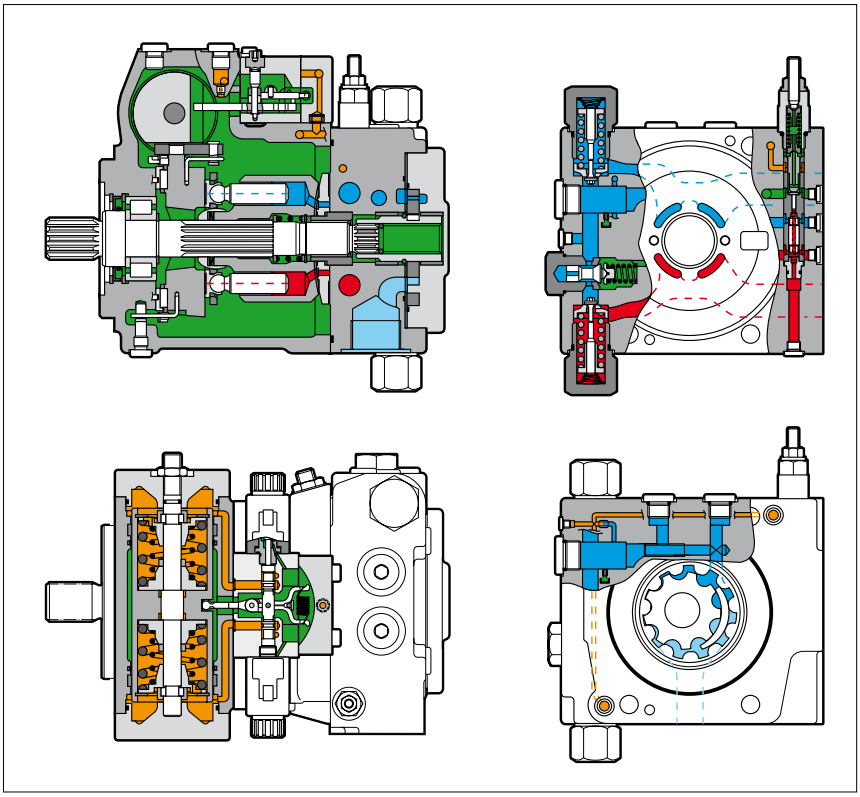


Fig. 7: Cut-away view of A4VG with electric proportional control (shown is size 28)

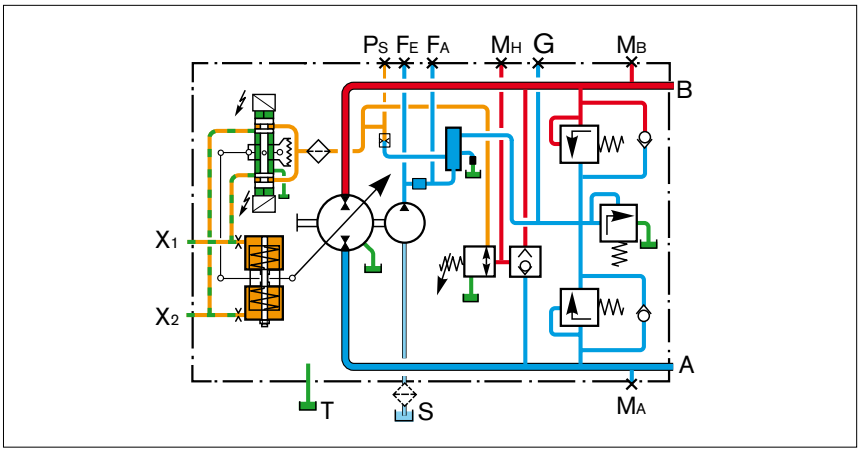


Fig. 8: Hydraulic circuit diagram of A4VG with electric proportional control

High pressure
Suction pressure
Control pressure
Low pressure
Case drain pressure

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DA – automatic control, hydraulic, speed related

Depending on the drive speed, the DA control unit generates a pilot pressure which charges the stroke cylinder of the pump with control pressure via a 4/3-directional valve, allowing the swashplate – and, therefore, the displacement – to be infinitely adjusted. Each flow direction is assigned a switching solenoid on the 4/3-directional valve.

You can find details on DA closed loop control in operating instructions "Hydrostatic travel drive with DA closed loop control" – RE 90 330-01-B and in RE 90 330-03-B (functional description and project planning notes).

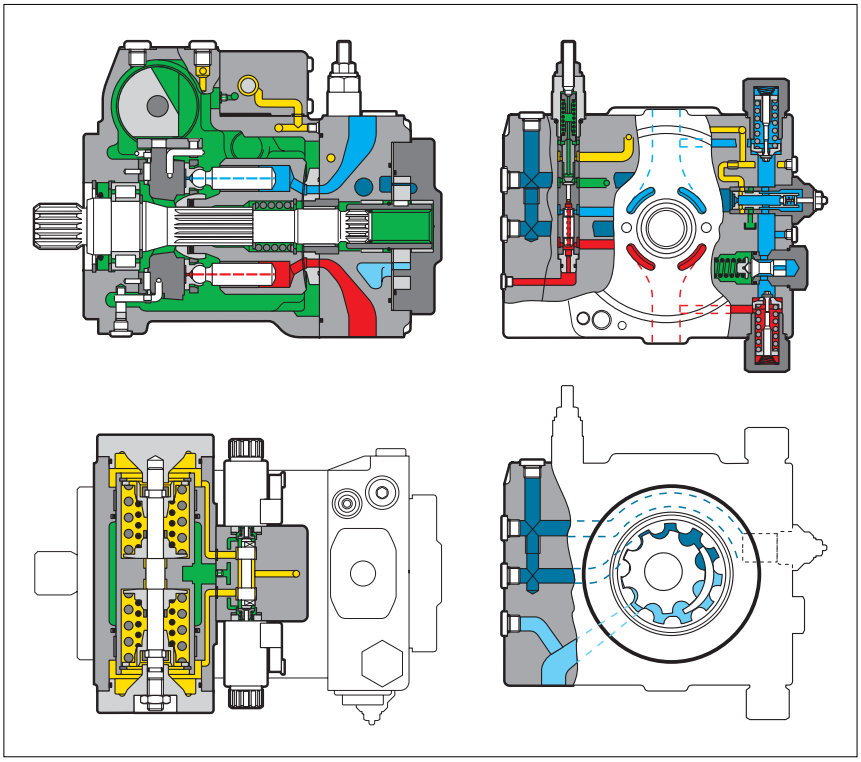


Fig. 9: Cut-away view of A4VG with automatic control, hydraulic, speed related (shown is size 40/56)

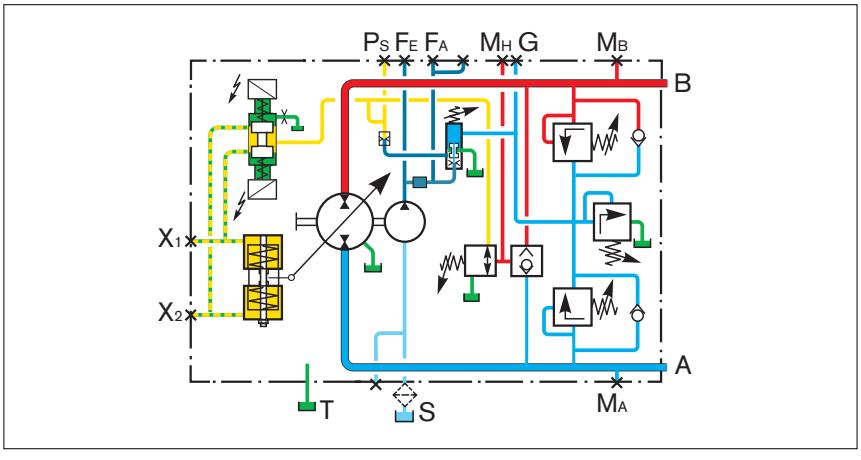


Fig. 10: Hydraulic circuit diagram of A4VG with automatic control, hydraulic, speed related

High pressure
Low pressure
Suction pressure
Case drain pressure
Pilot pressure

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4.3 Bypass function

For vehicles with hydrostatic travel drive, as long as there is no downstream mechanical interruption of the drive train (switch to idle/free running), the flow can be altered using a bypass function in order to tow the vehicle out of the immediate danger zone.

Turning the corresponding screw allows the hydraulic fluid to flow freely.

4.3.1 Bypass function, sizes 28 to 56

The standard version of the A4VG variable pump, sizes 28–56, has **no** high-pressure relief valves with bypass function. If necessary, this must be specified when ordering.

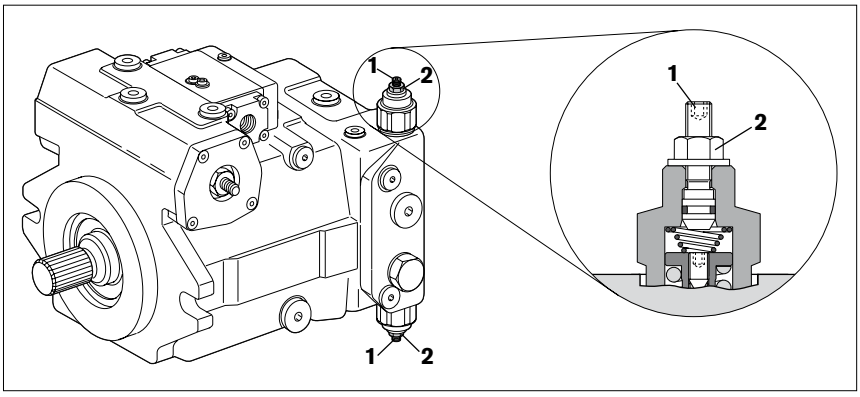


Fig. 11: Activating the bypass function, sizes 28 to 56

Activating the bypass function

To activate the bypass function:

1. Switch off the combustion engine.
2. Loosen the lock nut (**2**) by turning counter-clockwise one half rotation with a hex wrench (WAF 13).
3. Use an Allen key (WAF 4) to screw in the screw (**1**) clockwise until the screw (**1**) is against the spring disc. This is apparent by the increased resistance. Then screw the screw (**1**) one half turn into the spring disc.
4. Tighten the lock nut (**2**) clockwise with a torque of 22 Nm.

Towing speed

The maximum towing speed is dependent on the gear ratio in the vehicle and must be calculated by the vehicle manufacturer. The corresponding flow of Q = 30 l/min must not be exceeded.

Towing distance

The vehicle may only be towed out of the immediate danger zone.

CAUTION!

Risk of damage!

Higher towing speeds and longer towing distances result in impermissible heat generation and insufficient lubrication. This damages the axial piston unit.

- Only tow the vehicle out of the immediate danger zone.

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CAUTION!



Risk of damage!

During and after towing, the axial piston units are hot.

- Wear protective clothing.

Deactivating the bypass function

To deactivate the bypass function:

1. Immediately following towing, switch off the bypass function.
2. Restore the function of the high-pressure relief valve. To do this, perform the settings made under item "Activating the bypass function" in the reverse order: Loosen the lock nut (**2**) with a hex wrench (WAF 13), then turn the screw (**1**) counter-clockwise with an Allen key (WAF 4) to the stop.
3. Retighten the lock nut (**2**), turning clockwise with a torque of 22 Nm

CAUTION!



Risk of damage!

While towing with the bypass function activated, the closed hydraulic circuit empties itself. This can result in unintended functions when restarting the travel drive.

- Start the travel drive only after completely filling and air bleeding the hydraulic circuit (see "7.1 First commissioning").

4.3.2 Bypass function, sizes 71, 90

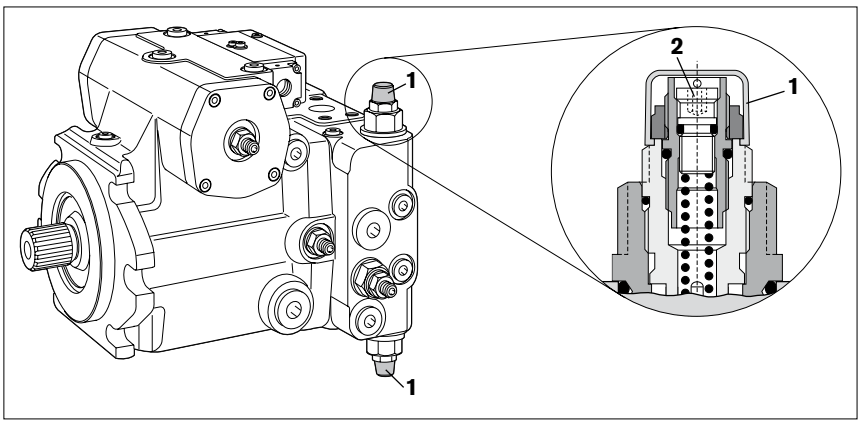


Fig. 12: Activating the bypass function, sizes 71, 90

Activating the bypass function

To activate the bypass function:

1. Switch off the combustion engine.
2. Remove the plastic protective cap (**1**) on the high-pressure relief valve with a suitable tool (e.g. gripper).
3. Loosen the one screw (**2**) by turning counter-clockwise two rotations with an Allen key (WAF 5).



The plastic protective cap is destroyed when removing.

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Towing speed The maximum towing speed is dependent on the gear ratio in the vehicle and must be calculated by the vehicle manufacturer. The corresponding flow of Q = 50 l/min must not be exceeded.

Towing distance The vehicle may only be towed out of the immediate danger zone.

CAUTION!



Risk of damage!

Higher towing speeds and longer towing distances result in impermissible heat generation and insufficient lubrication. This damages the axial piston unit.

- Only tow the vehicle out of the immediate danger zone.

CAUTION!



Risk of damage!

During and after towing, the axial piston units are hot.

- Wear protective clothing.

Deactivating the bypass function To deactivate the bypass function:

1. Immediately following towing, switch off the bypass function.
2. Restore the function of the high-pressure relief valve. To do this, tighten the screw (**2**) with an Allen key (WAF 5) by turning clockwise with a torque of 10 ± 1 Nm.
3. Refit the screw (**2**) with a protective cap to prevent unauthorized changes to the position of the pressure-relief valve.

CAUTION!



Risk of damage!

While towing with the bypass function activated, the closed hydraulic circuit empties itself. This can result in unintended functions when restarting the travel drive.

- Start the travel drive only after completely filling and air bleeding the hydraulic circuit (see "7.1 First commissioning").

4.3.3 Bypass function, sizes 125 to 250

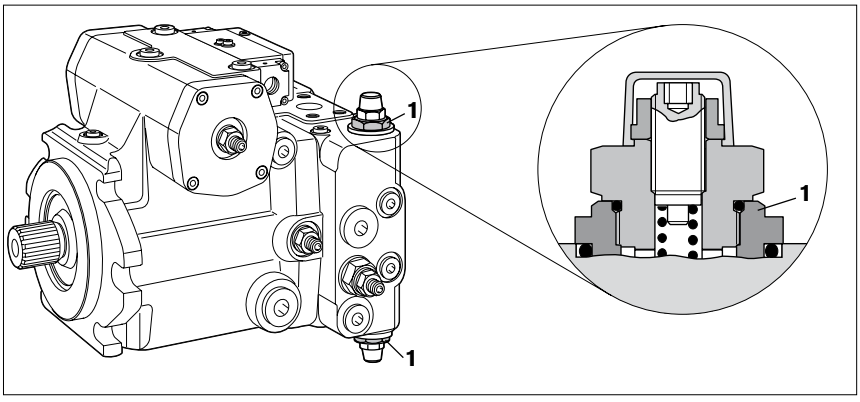


Fig. 13: Activating the bypass function, sizes 125 to 250

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Activating the bypass function

To activate the bypass function:

1. Switch off the combustion engine.
2. Loosen the screw (**1**) by turning counter-clockwise one rotation with a hex wrench (WAF 36).

An optimal seal is not ensured if the high-pressure relief valve is loosened. If hydraulic fluid leaks from the high-pressure relief valve, clear away the fluid immediately and clean the valve.

Towing speed

The maximum towing speed is dependent on the gear ratio in the vehicle and must be calculated by the vehicle manufacturer. The corresponding flow of Q = 100 l/min must not be exceeded.

Towing distance

The vehicle may only be towed out of the immediate danger zone.

CAUTION!

Risk of damage!

Higher towing speeds and longer towing distances result in impermissible heat generation and insufficient lubrication. This damages the axial piston unit.

- ► Only tow the vehicle out of the immediate danger zone.

CAUTION!

Risk of damage!

During and after towing, the axial piston units are hot.

- ► Wear protective clothing.

Deactivating the bypass function

To deactivate the bypass function:

1. Immediately following towing, switch off the bypass function.
2. Restore the function of the high-pressure relief valve. To do this, tighten the screw (**1**) with a hex wrench (WAF 36) by turning clockwise with a torque of 200 ± 10 Nm.

CAUTION!

Risk of damage!

While towing with the bypass function activated, the closed hydraulic circuit empties itself. This can result in unintended functions when restarting the travel drive.

- ► Start the travel drive only after completely filling and air bleeding the hydraulic circuit (see "7.1 First commissioning").

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4.4 Product identification

The axial piston unit can be identified with the name plate. The following example shows an A4VG name plate:

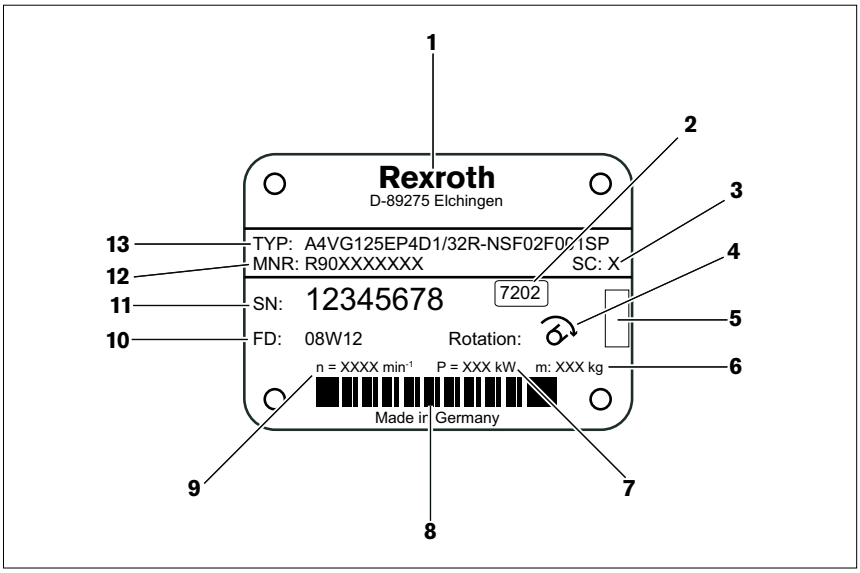


Fig. 14: Name plate A4VG

1 Manufacturer
2 Internal plant designation
3 Sample category (optional)
4 Direction of rotation (looking at drive shaft) – here: clockwise
5 Specified area for test stamp
6 Weight (optional)
7 Power
8 Barcode
9 Rotational speed
10 Production date
11 Serial number
12 Material number of the axial piston unit
13 Ordering code

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5 Transport and storage

5.1 Transporting the axial piston unit

CAUTION!



Risk of damage!

Hitting or impulsive forces on the drive shaft can damage the axial piston unit.

- Do not hit the coupling or drive shaft of the axial piston unit.
- Do not set/place the axial piston unit on the drive shaft.
- Details on the permissible axial and radial forces can be found in the data sheet.

Axial piston units can be transported with a forklift truck or with a lifting device.

- Make certain that the forklift truck or lifting device has adequate lifting capacity.

Dimensions and weights

Table 3: Dimensions and weights

Size		28	40	56	71	90	125	180	250
Weight	kg	29	31	38	50	60	80	101	156
Width	mm	The dimensions vary with the unit type. The values applicable to your axial piston unit can be found in the installation drawing.							
Height	mm								
Depth	mm								

The weight specifications may vary depending on the unit type. The exact weight can be found on the name plate.

5.1.1 Transporting with lifting device

For transporting, the axial piston unit can be connected to a lifting device via a ring screw or a lifting strap.

Transport with ring screw

The drive shaft can be used to transport the axial piston unit as long as only outward axial forces occur. Thus, you can suspend the axial piston unit from the drive shaft.

- To do this, screw a ring screw completely into the thread on the drive shaft. The size of the thread is stated in the installation drawing.
- Make sure that each ring screw can bear the total weight of the axial piston unit plus approx. 20 %.

You can hoist the axial piston unit as shown in Fig. 15 with the ring screw screwed into the drive shaft without any risk of damage.

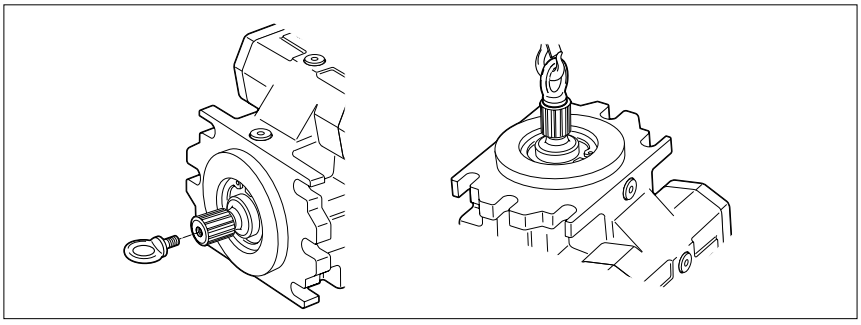


Fig. 15: Fixing the ring screw

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Transport with lifting strap

- Place the lifting strap around the axial piston unit in such a way that it passes over neither the attachment parts (e.g. valves) nor such that the axial piston unit is hung from attachment parts (see Fig. 16).

WARNING!



Risk of injury!

During transport with lifting device, the axial piston unit can fall out of the lifting strap and cause injuries.

- Hold the axial piston unit with your hands to prevent it from falling out of the lifting strap.
- Use the widest possible lifting strap.

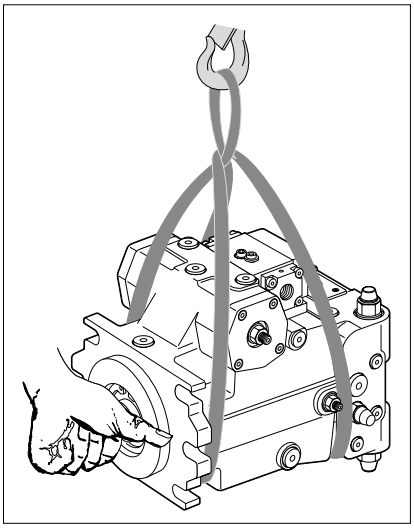


Fig. 16: Transport with lifting strap

5.2 Storing the axial piston unit

Requirement

- The storage areas must be free of corrosive materials and gasses.
- The storage areas must be dry.
- The ideal temperature for storage lies between +5 °C and +20 °C.
- Avoid intense lights.
- Do not stack axial piston units and store them shock-proof.
- For other storage conditions, see Table 4.

- Check the axial piston unit monthly to ensure proper storage.

After delivery

The axial piston units are provided ex-works with a corrosion protection packaging (corrosion protection film).

Listed in the following table are the maximum permissible storage times for an originally packed axial piston unit.

Table 4: Storage time with factory corrosion protection

Storage conditions	Standard corrosion protection	Long-term corrosion protection
Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film.	Maximum 12 months	Maximum 24 months

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The warranty is rendered void if the requirements and storage conditions are not adhered to or after expiration of the maximum storage time (see Table 4).

Procedure after expiration of the maximum storage time:

1. Check the entire axial piston unit for damage and corrosion prior to installation.
2. Check the axial piston unit for proper function and leaks during a test run.
3. Replace the shaft seal ring if the storage time of 24 months is exceeded.

After expiration of the maximum storage time, we recommend that you have the axial piston unit inspected by your responsible Rexroth Service partner.

In the event of questions regarding spare parts, contact your responsible Rexroth Service partner or the service department of the manufacture's plant for the axial piston unit, see chapter "9.5 Spare parts" for further information.

After disassembly

If a dismounted axial piston unit is to be stored, it must be conserved against corrosion for the duration of the storage.

The following instructions only refer to axial piston units which are operated with a mineral-oil based hydraulic fluid. Other hydraulic fluids require conservation methods that are specifically designed for them. In such a case, consult with Rexroth Service (see chapter "9.5 Spare parts" for address).

Rexroth recommends the following procedure:

1. Clean the axial piston unit, see chapter "9.1 Cleaning and care" for further information.
2. Completely empty the axial piston unit.
3. For storage time up to 12 months: Moisten the inside of the axial piston unit with mineral oil and fill with approx. 100 ml mineral oil.
   For storage time up to 24 months: Fill the axial piston unit with corrosion protection VCI 329 (20 ml).
   Fill via case drain port $\mathbf{T_1}$ or $\mathbf{T_2}$, see chapter "6.4 Assembling the axial piston unit", Fig. 22 to 25.
4. Seal all ports airproof.
5. Moisten the unpainted surfaces of the axial piston unit with mineral oil.
6. Package the axial piston unit airproof together with desiccant in corrosion protection film.
7. Store the axial piston unit so that it is protected against jolts.
   See "Requirement" in this chapter for further conditions.

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6 Assembly

Prior to assembly, the following documents must be available:

- Installation drawing for the axial piston unit (available from Rexroth),
- Hydraulic circuit diagram for the axial piston unit (in the installation drawing),
- Hydraulic circuit diagram for the system (available from the system manufacturer),
- Order confirmation (contains the preset data of the axial piston unit),
- Data sheet for the axial piston unit (contains the technical data).

6.1 Unpacking

The axial piston unit is delivered in a corrosion protection film made of polyethylene material.

▶ Dispose of the packaging according to the national regulations of your country.

CAUTION!



Risk of parts falling out!

If the packaging is not opened correctly, parts may fall out and damage the parts or even result in injury.

▶ Place the packaging on a flat and solid surface.

▶ Only open the packaging from the top.

6.2 Installation conditions

- The installation location and position of the axial piston unit essentially determine the procedures during installation and commissioning (such as when filling the axial piston unit).
- Note that you can expect certain installation positions to affect the control device. Because of gravity, dead weight and case pressure, minor characteristic displacements and actuating time changes may occur.

▶ Adhere to all limits specified in the data sheet regarding temperature, viscosity, cleanliness of the hydraulic fluid.

▶ Make certain that the case of the axial piston unit is filled with hydraulic fluid during commissioning and operation. This is also to be observed following relatively long standstill periods as the axial piston unit may empty via the hydraulic lines.

▶ The case drain fluid in the case interior must be directed to the tank via the highest case drain port. Use the line size which is appropriate for the port.

▶ Avoid using a check valve in the case drain line (exception: see "Above-tank installation" in chapter "6.3 Installation position").

▶ To achieve favorable noise values, decouple all connecting lines from all vibration-capable components (e.g. tank) using elastic elements.

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- Make certain that the suction line, case drain line, and return line flow into the tank below the minimum fluid level in all operational states.

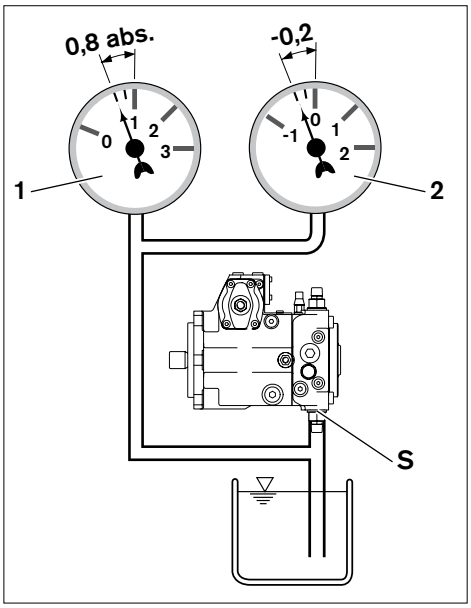


Fig. 17: Suction pressure

1 Absolute pressure gauge

2 Standard pressure gauge

- Make certain that a minimum suction pressure of 0.8 bar absolute is present at port "**S**" during operation and on cold starts in all installation positions and installation locations for the axial piston pump, see Fig. 17. See data sheet for additional values.
- Absolute cleanliness is required. The axial piston unit must be installed in a clean condition. Contamination of the hydraulic fluid can have a considerable impact on the service life of the axial piston unit.
- Do not use any cotton waste or linty cloths for cleaning.
- Use suitable liquid detergents to remove lubricants and other difficult-to-remove contamination. Detergents must not penetrate the hydraulic system.

CAUTION!



Risk of damage by air inclusions!

An air pocket in the area near the bearings will damage the axial piston unit.

- Make certain that the case is completely filled with hydraulic fluid during commissioning and during operation with the "drive shaft upward" installation position.
- During commissioning and during operation, the suction line must be filled with hydraulic fluid.

CAUTION!



Risk of damage by hydraulic fluid loss!

With above-tank installation, the case interior may drain via the case drain line after longer standstill periods (air enters via the shaft seal ring) or via the service line (gap leakage). The bearings are thus insufficiently lubricated when the pump is restarted.

- Check the hydraulic fluid level in the case interior regularly; if necessary, recommission.

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6.3 Installation position

The following installation positions are permissible. The shown piping layout illustrates the basic layout.

"Shaft upward" installation position (positions 4 and 8):
For the "shaft upward" installation position, you will also need the additional R_1 air bleed port in the flange area for sizes 71-180. This port is not included in the standard version and **must** be specified in plain text when ordering.

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6.3.1 Below-tank installation (standard)

Below-tank installation is when the axial piston unit is installed outside of the tank below the minimum hydraulic fluid level.

Recommended installation positions: 1 and 2.

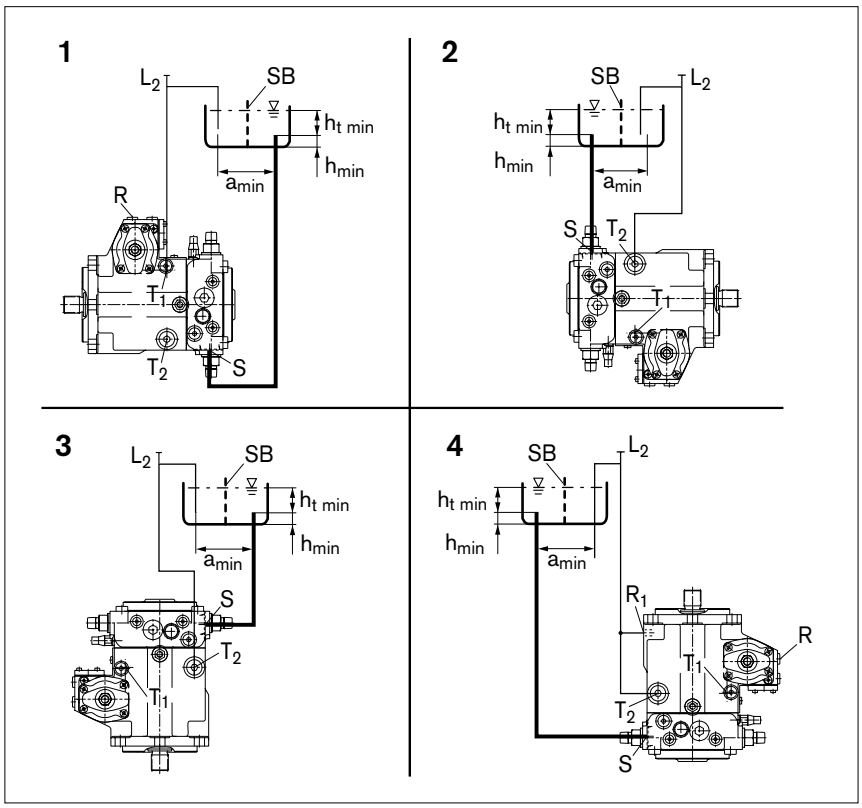


Fig. 18: Below-tank installation with installation positions 1–4

L_2	Filling / air bleeding	**SB**	Baffle (baffle plate)
R	Air bleed port	**$h_{t\ min}$**	Min. permissible immersion depth (200 mm)
S	Suction port	**h_{min}**	Min. permissible spacing from suction port to tank base (100 mm)
T_1	Case drain port	**a_{min}**	Minimum spacing from suction line to return line (200 mm)
T_2	Case drain port		

Table 5: Below-tank installation

Installation position	Air bleeding	Filling
1 (drive shaft, horizontal)	R	S + T_1(L_2)
2 (drive shaft, horizontal)	L_2	S + T_2 (L_2)
3 (drive shaft, downward)	L_2	S + T_2 (L_2)
4 (drive shaft, upward)	R + L_2 (sizes 28–56)[1)] R_1 + L_2 (sizes 71–250)	S + T_2 (L_2)

[1)] For sizes 28–56, R must be connected instead of R1.

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6.3.2 Above-tank installation

Above-tank installation is when the axial piston unit is installed above the minimum fluid level of the tank.

CAUTION!



Risk of damage to the product!

An air pocket in the area near the bearings will damage the axial piston unit.

- Make certain that the pump case is completely filled with hydraulic fluid during commissioning and during operation with the "drive shaft upward" installation position.
- Check the hydraulic fluid level in the case interior regularly; if necessary, recommission. With above-tank installation, the case interior may drain via the case drain line after longer standstill periods (air enters via the shaft seal ring) or via the service line (gap leakage). The bearings are thus insufficiently lubricated when the pump is restarted.
- Make certain that the suction line is always filled with hydraulic fluid during commissioning and operation.

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Assembly

Observe the maximum permissible suction height $\mathbf{h_{Smax}}$ = 800 mm.

Recommendation for installation position 8 (drive shaft upward): A check valve in the case drain line (opening pressure 0.5 bar) can prevent draining of the case interior.

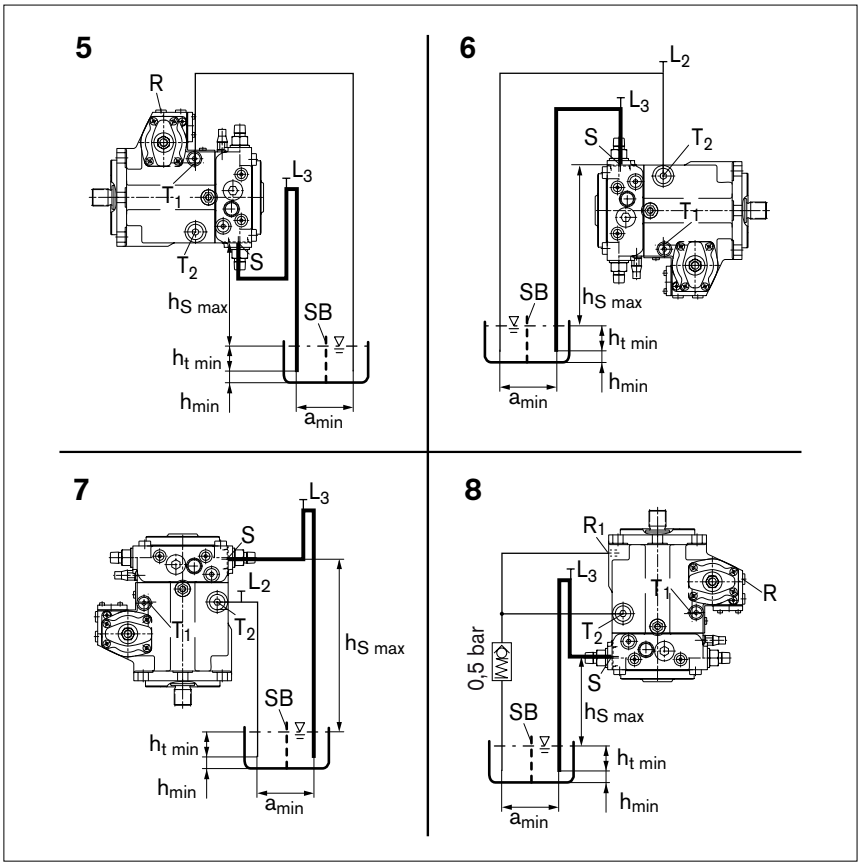


Fig. 19: Above-tank installation with installation positions 5–8

$L_{2/3}$	Filling / air bleeding	**SB**	Baffle (baffle plate)
R	Air bleed port	**h_{tmin}**	Min. permissible immersion depth (200 mm)
S	Suction port	**h_{min}**	Min. permissible spacing from suction port to tank base (100 mm)
T_1	Case drain port	**h_{Smax}**	Maximum permissible suction height (800 mm)
T_2	Case drain port	**a_{min}**	Minimum spacing from suction line to return line (200 mm)

Table 6: Above-tank installation

Installation position	Air bleeding	Filling
5 (drive shaft, horizontal)	R	T_1 + S (L_3)
6 (drive shaft, horizontal)	L_2	S (L_3) + T_2 (L_2)
7 (drive shaft, downward)	L_2 + L_3	S (L_3) + T_2 (L_2)
8 (drive shaft, upward)	R + L_3 (sizes 28–56)[1)] R_1 + L_3 (sizes 71–250)	S (L_3) + T_2

1) For sizes 28–56, R must be connected instead of R1.

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6.4 Assembling the axial piston unit

DANGER!



Systems which are in operation pose a risk of injury!

Working on operating systems poses a danger to life and limb. The work steps described in this chapter must only be performed on systems which are at a standstill. Before beginning work:

- Ensure that the engine cannot be switched on.
- Ensure that all power-transmitting components and connections (electric, pneumatic, hydraulic) are switched off according to the manufacturer's instructions and are secured against being switched on again. If possible, remove the main fuse for the system.
- Ensure that the system is completely hydraulically relieved and depressurized. Please follow the system manufacturer's instructions.
- Only qualified personnel (see chapter "2.3 Personnel qualifications" on page 6) are authorized to assemble the axial piston unit.

6.4.1 Preparation

1. Check the delivery contents for completeness and transport damages.
2. Compare the material number and designation (ordering code) with the details in the order confirmation.



If the material number for the axial piston unit does not correspond to the one in the order confirmation, contact Rexroth Service for clarification, see chapter "9.5 Spare parts" for address.

3. Before assembling, completely empty the axial piston unit to prevent mixing with the hydraulic fluid used in the system.
4. Check the direction of rotation of the axial piston unit (on the name plate) and make sure that this corresponds to the direction of rotation of the engine.

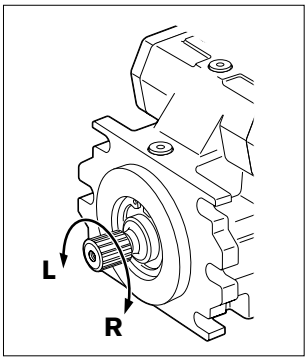


Fig. 20: Direction of rotation

L Counter-clockwise

R Clockwise



The direction of rotation as specified on the name plate determines the direction of rotation of the axial piston unit as viewed on the drive shaft. For information on the direction of rotation of the engine, please refer to the engine manufacturer's operating instructions.

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6.4.2 Dimensions

The installation drawing contains the dimensions for all ports on the axial piston unit. Also observe the instructions provided by the manufacturers of the other components when selecting the required tools.

6.4.3 General instructions

During assembly and disassembly of the axial piston unit, observe the following general instructions and handling instructions:

- After a short operating time, toothed belts lose a major portion of their pre-tension and thus cause speed variations and torsional vibrations.
  Torsional vibrations may cause leakages on the shaft seal ring or increased rotary angle accelerations of the rotary group of the driven axial piston unit. Particularly at risk are diesel drives with a small number of cylinders and low flywheel mass.
- V-belt drives without automatic tensioning device are also critical with regard to speed variations and torsional vibrations. These can also lead to leakages on the shaft seal ring.
  An automatic tensioning device can lessen the speed variations and vibrations and thus avoid consequential damage.
- When driving an axial piston unit with the aid of a cardan shaft, vibrations may occur which result in leakages on the shaft seal ring of the axial piston unit depending on the temperature and frequency.

- ▶ When driving with toothed belts or v-belts, always use an automatic tensioning device.
- ▶ Fix the axial piston unit so that the expected forces and torques can be transferred without any danger.
- ▶ The permissible axial and radial loading of the drive shaft, the permissible torsional vibrations, the optimum direction of load force, as well as the limit speeds can be found in the data sheet.
- ▶ Observe the permissible radial forces on the drive shaft when driving with radial loading (belt drives). If necessary, the belt disc must be separately mounted.

WARNING!



Risk of damage!

Hitting or impulsive forces on the drive shaft can damage the axial piston unit.

- ▶ Do not hit the coupling or drive shaft of the axial piston unit.
- ▶ Do not set/place the axial piston unit on the drive shaft.
- ▶ Details on the permissible axial and radial forces can be found in the data sheet.

How to assemble the axial piston unit depends on the connecting elements to the drive side. The following descriptions explain the installation of the axial piston unit:

- with a coupling
- on a gearbox

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6.4.4 Installation with coupling

How to assemble the axial piston unit with a coupling is described in detail in the following:

1. Assemble the specified coupling half onto the drive shaft of the axial piston unit according to the instructions of the coupling manufacturer.



The drive shaft end of the axial piston unit is provided with a threaded bore. Use this threaded bore to pull the coupling element onto the drive shaft. Refer to the installation drawing for the dimensions of the threaded bore.

2. Make sure that the installation location is clean and free from dirt and contaminants.
3. Clamp the coupling hub onto the drive shaft or ensure permanent lubrication of the drive shaft. This prevents the formation of frictional corrosion and the associated wear.
4. Transport the axial piston unit to the installation location.
5. Assemble the coupling onto the drive according to the instructions of the coupling manufacturer.



The axial piston unit must not be tightened down until the coupling has been correctly assembled.

6. Fix the axial piston unit at the installation location.
7. If necessary, details on the required tools and tightening torques for the fixing screws are available from the machine or system manufacturer.
   - For bell housing installation, check the coupling axial play through the bell window according to the manufacturer's instructions.
   - For flange installation, align the support for the axial piston unit with the drive.
8. When using flexible couplings, check that the drive is free of resonance after completing the installation.

6.4.5 Installation on a gearbox

How to assemble the axial piston unit on a gearbox is described in detail in the following:

After installing on a gearbox, the axial piston unit is covered and is difficult to access:

- Therefore, before installing, make sure that the centering diameter centers the axial piston unit (observe tolerances) and that no impermissible axial or radial forces act on the drive shaft of the axial piston unit (installation length).
- Protect the plug connections of the drive shaft from frictional corrosion by providing permanent lubrication.

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6.4.6 Completing assembly

1. Remove any mounted transport screws.
2. Remove the transport protection.
   The axial piston unit was delivered with protective covers and plastic plugs or locking screws. These must be removed before connecting. Use appropriate tools.
3. Make certain that the sealing and functional surfaces are not damaged.

Ports which are intended for connecting lines are provided with plastic plugs or locking screws, which serve as transport protection. If no connection is made, these ports must be plugged with a suitable metal locking screw since the plastic plugs are not pressure-proof.

CAUTION!

Risk of personal injury or damage to equipment!

Operating the axial piston unit with plastic plugs can result in injuries or damage to the axial piston unit.

- Before commissioning, remove all plastic plugs and replace them with suitable, pressure-proof, metal locking screws.

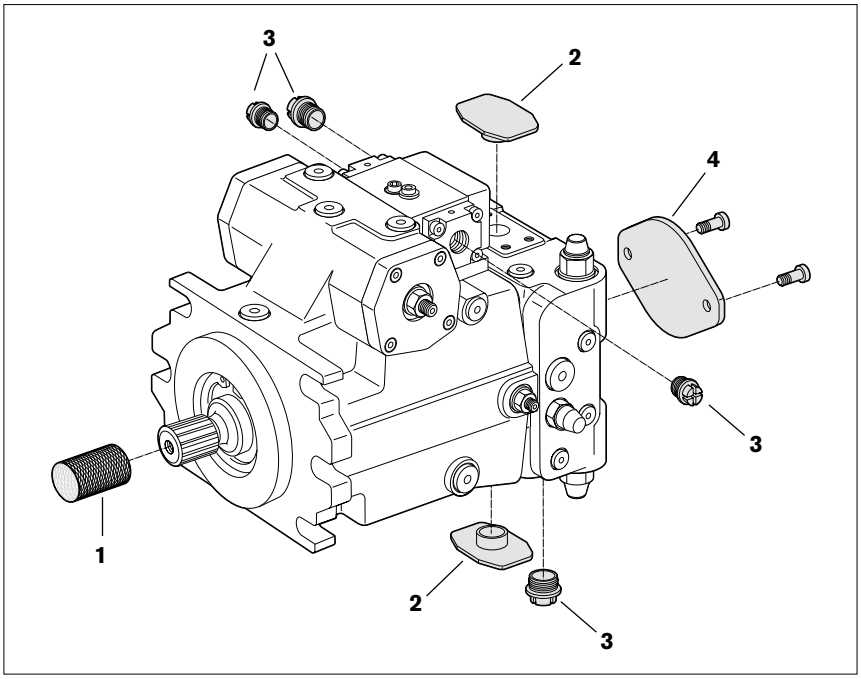


Fig. 21: Removing transport protection

1 Transport protection for shaft end
2 Protective covers
3 Plastic plugs / locking screws
4 Flange cover and fixing screws (optional for versions with through drive)

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The adjusting screws are protected against unauthorized resetting by means of protective caps. Removal of the protective caps will void the warranty. If you need a modification of the setting, please contact your responsible Rexroth Service (address as to chapter "9.5 Spare parts").

4. For versions with through drive, assemble the auxiliary pump according to the pump manufacturer's instructions.

6.4.7 Hydraulically connecting the axial piston unit

The machine or system manufacturer is responsible for dimensioning the lines. The axial piston unit must be connected to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine or system manufacturer.

CAUTION!

Damage to the axial piston unit!

When assembling hydraulic lines and hoses under mechanical stress, they are exposed to additional mechanical forces during operation which reduce the service life of the axial piston unit and the entire machine or system.

- Assemble hydraulic lines and hoses without mechanical stress.

CAUTION!

Risk of damage!

Generally, a minimum permissible suction pressure at port "S" is specified for axial piston pumps in all installation positions. If the pressure at port "S" drops below the specified values, damage may occur which may lead to destruction of the axial piston pump.

- Make certain that the necessary suction pressure is achieved.
  This is influenced by:
  - appropriate piping of the suction cross-section
  - appropriate pipe diameters
  - appropriate position of the tank
  - appropriate viscosity of the hydraulic fluid
  - filter cartridge in the suction line (regularly check the level of soiling of the filter cartridge)

Only connect hydraulic lines to the service and function ports.

CAUTION!

Wear and malfunctions!

The cleanliness of the hydraulic fluid has a considerable impact on the cleanliness and service life of the hydraulic system. Any contamination of the hydraulic fluid leads to wear and malfunctions. In particular, contaminants like e.g. welding beads or metal cuttings in the hydraulic lines may damage the axial piston unit.

- Absolute cleanliness is required.
- The axial piston unit must be installed in a clean condition.
- Make sure that all ports, hydraulic lines and add-on units (e.g. testers) are clean.
- Make sure that no contaminants may penetrate when sealing the ports.
- Take care that no detergents enter the hydraulic system.
- Do not use any cotton waste or linty cloths for cleaning.
- Do not use hemp as sealant under any circumstances.

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Notes on routing the lines

Observe the following notes when routing the suction, pressure and case drain lines.

- Make certain that the suction line (pipe or hose) is as short and straight as possible.
- The line cross section of the suction line is to be measured so that the minimum permissible pressure at the suction port is not dropped below and the maximum permissible pressure is not exceeded.
- Observe the air tightness of the junctions and the pressure resistance of the hose, also with respect to the external air pressure.
- With the pressure lines, make certain that the pipes, hoses and connecting elements are approved for the operating pressure range.
- Always route the case drain lines so that the housing is constantly filled with hydraulic fluid and to ensure that no air gets through the shaft seal ring even during extended standstill periods. The case internal pressure must not exceed the limit values listed for the axial piston unit in the data sheet under any operating conditions. The case drain line in the tank must end up below the minimum fluid level under all conditions (see chapter "6.3 Installation position").



The ports and fixing threads are designed for the operating pressures specified in the data sheet. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

Procedure

To connect the axial piston unit to the hydraulic system:

1. Remove the locking screws at the ports at which the connections are to be made according to the hydraulic circuit diagram.
2. Use only clean hydraulic lines.
3. Connect the lines according to the hydraulic circuit diagram.
   Either pipes or hoses must be connected to all ports according to the installation drawing and machine or system circuit diagram or the ports plugged using suitable locking screws.



The installation drawing contains the dimensions for all connections and ports on the axial piston unit. Also observe the instructions provided by the manufacturers of the other hydraulic components when selecting the required tools.

4. Make sure
   - that the cap nuts are correctly tightened on the fittings and flanges (observe tightening torques!). Mark all checked fittings using e.g. a permanent marker.
   - that the pipes and hose lines and every combination of connecting piece, coupling or connecting point with hoses or pipes have been inspected by a technically qualified person for safe working condition.

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Port overview

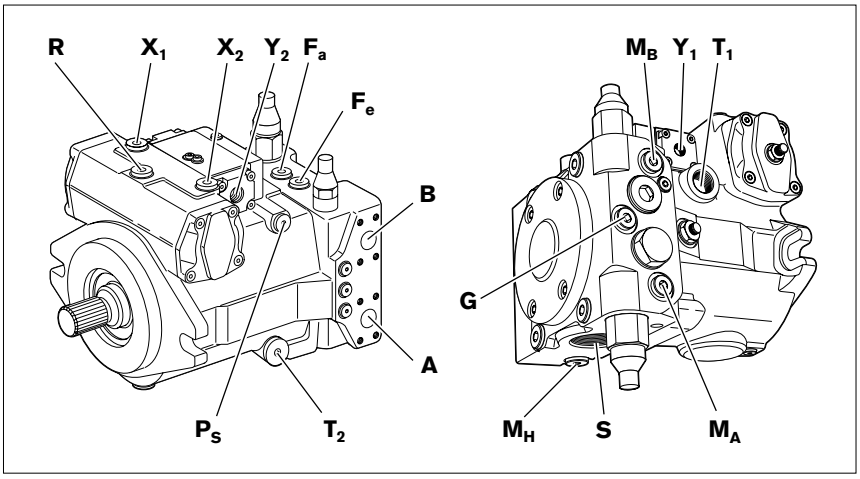


Fig. 22: Port overview, size 28

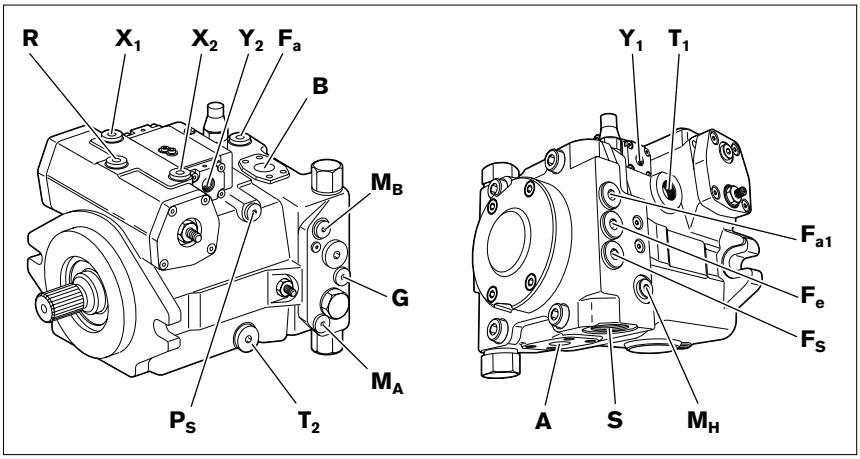


Fig. 23: Port overview, sizes 40/56

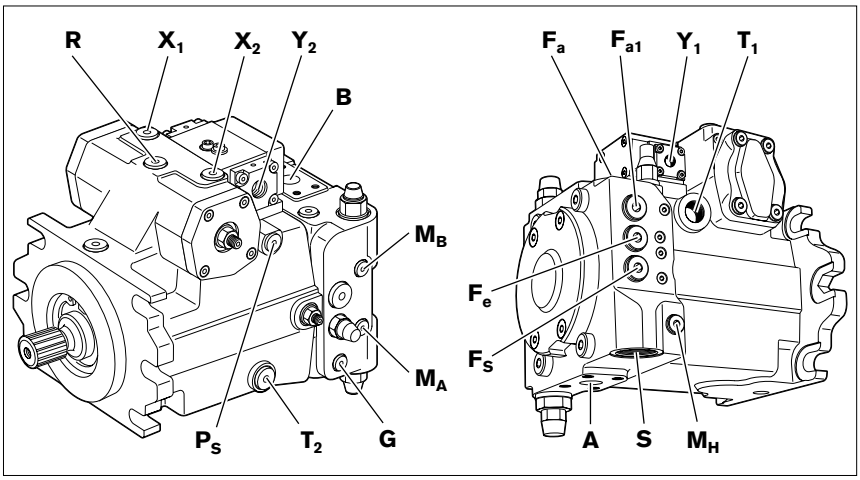


Fig. 24: Port overview, sizes 71 to 180

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Assembly

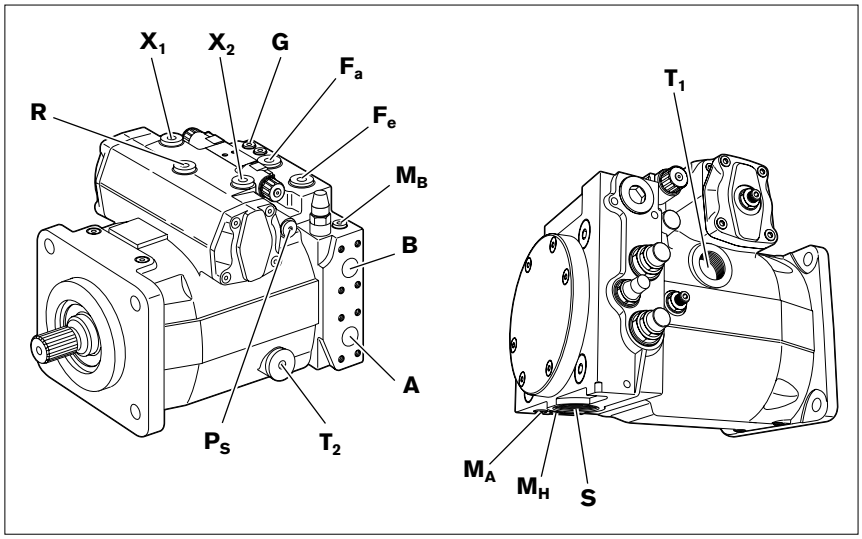


Fig. 25: Port overview, size 250

Table 7: Ports for A4VG series 32

Designation	Port for	Standard	Peak pressure (bar) [1]	State
A, B	Service line Fixing threads	SAE J518 [2] DIN 13	450	O
S	Suction	DIN 3852	5	O [3]
T_1	Tank	DIN 3852	3	O [4]
T_2	Tank	DIN 3852	3	X [4]
R	Air bleed	DIN 3852	3	X
X_1, X_2	Control pressure (upstream the throttle)	DIN 3852	40	X
G	Boost pressure	DIN 3852	40	X
P_S	Pilot pressure inlet	DIN 3852	40	X
M_A, M_B	Measuring pressure A, B	DIN 3852	450	X
M_H	Measuring high pressure	DIN 3852	450	X
F_a	Boost pressure inlet	DIN 3852	40	X [6]
F_{a1}	Boost pressure, inlet (mountable filter)	DIN 3852	40	X
F_e [5]	Boost pressure outlet	DIN 3852	40	X [6]
F_S	Connection of filter to suction line (cold start)	DIN 3852	5	X
Y_1, Y_2	Control signal (HD only)	DIN 3852	18	O
Z	Inching signal (DA4/8 only)	DIN 3852	70	O
Y	Pilot pressure port (DA7 only)	DIN 3852	40	O

[1] Brief pressure spikes may occur depending on the application. Keep this in mind when selecting testers and armatures.

[2] Only dimensions according to SAE J518

[3] Plugged for external supply

[4] Depending on installation position, either T_1 or T_2 must be connected (see also chapter "6.3 Installation position")

[5] Optional

[6] Must be connected for filtration in the pressure line

O = Must be connected (plugged with plastic plugs on delivery)

X = Plugged (in normal operation)

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Tightening torques The following tightening torques apply:

- Threaded hole in the axial piston unit: The maximum permissible tightening torques M_{Gmax} are the maximum values of the threaded holes and must not be exceeded. For values, refer to the following table.
- Armatures:
  Observe the manufacturer's instruction regarding tightening torques for the used armatures.
- Fixing screws:
  For fixing screws according to DIN 13/ISO 68, we recommend checking the tightening torque in individual cases as per VDI 2230.
- Locking screws:
  For the metal locking screws supplied with the axial piston unit, the required tightening torques of locking screws M_V apply. For values, refer to the following table.

Table 8: Tightening torques of the threaded holes and locking screws

Threaded size of the ports		Max. permissible tightening torque of the threaded holes M_{Gmax}	Required tightening torque of the locking screws M_V	WAF hexagon socket
M10x1	DIN 3852	30 Nm	12 Nm	5 mm
M12x1.5	DIN 3852	50 Nm	25 Nm	6 mm
M14x1.5	DIN 3852	80 Nm	35 Nm	6 mm
M16x1.5	DIN 3852	100 Nm	50 Nm	8 mm
M18x1.5	DIN 3852	140 Nm	60 Nm	8 mm
M22x1.5	DIN 3852	210 Nm	80 Nm	10 mm
M26x1.5	DIN 3852	230 Nm	120 Nm	12 mm
M27x2	DIN 3852	330 Nm	135 Nm	12 mm
M33x2	DIN 3852	540 Nm	225 Nm	17 mm
M42x2	DIN 3852	720 Nm	360 Nm	22 mm
M48x2	DIN 3852	900 Nm	400 Nm	24 mm
5/16-24 UNF-2B	ISO 11926	10 Nm	7 Nm	1/8 in
3/8-24 UNF-2B	ISO 11926	20 Nm	7 Nm	5/32 in
7/16-20 UNF-2B	ISO 11926	40 Nm	15 Nm	3/16 in
9/16-18 UNF-2B	ISO 11926	80 Nm	25 Nm	1/4 in
3/4-16 UNF-2B	ISO 11926	160 Nm	62 Nm	5/16 in
7/8-14 UNF-2B	ISO 11926	240 Nm	127 Nm	3/8 in
1 1/16-12 UN-2B	ISO 11926	360 Nm	147 Nm	9/16 in
1 5/16-12 UN-2B	ISO 11926	540 Nm	198 Nm	5/8 in
1 5/8-12 UN-2B	ISO 11926	960 Nm	320 Nm	3/4 in
1 7/8-12 UN-2B	ISO 11926	1200 Nm	390 Nm	3/4 in

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Risk of mix-ups with threaded connections

The axial piston units are used in application areas with metric as well as with Imperial systems of units.

Both the system of units as well as the size of threaded hole and threaded plug (e.g. locking screw) must match.

Due to the lack of options for visually detecting differences, there is a risk of mix-ups.

WARNING!



Risk of damage to persons and property!

If a threaded plug which is of a different measurement system and size with respect to the threaded hole is pressurized, the threaded plug may loosen itself or even be ejected from the hole in a projectile-like manner.
This can result in serious injury and damage to equipment. Hydraulic fluid can be discharged from this leakage point.

- ► Use the drawings (installation drawing/data sheet) to determine the required threaded plug for each fitting.
- ► Make certain that there are no mix-ups when assembling armatures, fixing screws and locking screws.
- ► For all threaded holes, use a threaded plug from the same system of units and of the correct size.

6.4.8 Electrical connection of the axial piston unit

The machine or system manufacturer is responsible for the layout of the electric control.

For electrically controlled axial piston units, the electric control must be connected according to the circuit diagram of the system manufacturer.

CAUTION!



Short circuit in event of penetrating hydraulic fluid!

Fluid can penetrate the product and cause a short circuit.

- ► Do not install electrically controlled axial piston units in a tank below the tank fluid level (tank installation).

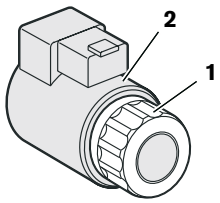
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1. Switch off power supply to the relevant system component.
2. Electrically connect the axial piston unit (12 or 24 V).

Changing plug position

If necessary, you can change the position of the plug by turning the solenoid.

To do this, proceed as follows:



1. Loosen the fixing nut (**1**) of the solenoid. To do this, turn the fixing nut (**1**) one turn counter-clockwise.
2. Turn the solenoid body (**2**) to the desired position.
3. Retighten the fixing nut. Tightening torque of the fixing nut: 5+1 Nm.

For further details and technical data, e.g. regarding the selection of a suitable mating connector, please refer to data sheet RE 92003.

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7 Commissioning

WARNING!



Danger while working in the danger zone of a machine or system!

It is not permissible to work in the danger zone of a machine or system.

- The machine or system must only be operated if safe working is ensured.
- Pay attention to and rectify potential danger sources before operating the machine or system.
- Nobody may stand in the danger zone of the machine or system.
- The emergency stop button for the machine or system must be within the operator's reach.
- Always follow the instructions of the machine or system manufacturer during commissioning.

CAUTION!



Risk of damage to persons and property!

Commissioning of the axial piston unit requires basic mechanical and hydraulic knowledge.

- Only qualified personnel (see chapter "2.3 Personnel qualifications" on page 6) are authorized to commission the axial piston unit.

WARNING!



Risk of toxication and injury!

Contact with hydraulic fluids may damage your health (e.g. eye injuries, skin damage, toxication upon inhalation).

- Always check the lines for wear and damage before each commissioning.
- While performing these checks, wear safety gloves, safety glasses and suitable working clothes.
- If hydraulic fluid should, nevertheless, come into contact with your eyes or penetrate your skin, consult a doctor immediately.
- When working with hydraulic fluids, strictly observe the safety instructions provided by the hydraulic fluid manufacturer.

WARNING!



Fire hazard!

Hydraulic fluid is easily flammable.

- Keep open flames and ignition sources from the axial piston unit.

CAUTION!



Missing seals and connections lead to noncompliance with the protection class!

Fluids and contaminants may penetrate and damage the product.

- Prior to assembly, make sure that all seals and connectors are tight.

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7.1 First commissioning

CAUTION!



Risk of damage to the product!

Any contamination of the hydraulic fluid leads to wear and malfunctions.
In particular, contaminants like e.g. welding beads or metal cuttings in the hydraulic lines may damage the axial piston unit.

- Ensure utmost cleanliness during commissioning.
- Make sure that no contaminants may penetrate when sealing the gauge ports.

CAUTION!



Risk of damage to the product!

If you commission the axial piston unit without or with insufficient hydraulic fluid, the axial piston unit is damaged immediately or even destroyed.

- When commissioning or recommissioning a machine or system, make sure that the case interior and the suction and service lines of the axial piston unit are filled with hydraulic fluid and remain filled during operation.



When commissioning the axial piston unit, observe the basic safety instructions and intended use provided in chapter "2 General safety instructions".

7.1.1 Filling the axial piston unit

You will require an approved hydraulic fluid:

The machine or system manufacturer can provide you with precise details on the hydraulic fluid. Details on minimum requirements for mineral-oil based hydraulic fluids, environmentally acceptable hydraulic fluids or HF hydraulic fluids for the axial piston unit are available in the Rexroth publications RE 90220, RE 90221 and RE 90223, respectively.

To ensure the functional reliability of the axial piston unit, cleanliness level 20/18/15 according to at least ISO 4406 is necessary for the hydraulic fluid.
At very high hydraulic fluid temperatures (+90 °C to maximum +115 °C), cleanliness level 19/17/14 according to at least ISO 4406 is necessary.
For permissible temperatures, see the data sheet.

CAUTION!



Risk of damage to the product!

An air pocket in the area near the bearings will damage the axial piston unit.

- Make certain that the pump case is completely filled with hydraulic fluid during commissioning and during operation with the "drive shaft upward" installation position.
- Check the hydraulic fluid level in the case interior regularly; if necessary, recommission. With above-tank installation, the case interior may drain via the case drain line after longer standstill periods (air enters via the shaft seal ring) or via the service line (gap leakage). The bearings are thus insufficiently lubricated when the pump is restarted.
- Make certain that the suction line is always filled with hydraulic fluid during commissioning and operation.

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The axial piston unit should be filled with a filling unit (10 μm filter grade). The axial piston unit must not be operated while it is being filled.

CAUTION!

Danger of environmental contamination!

The discharge or spillage of hydraulic fluid while filling the axial piston unit can lead to environmental pollution and contamination of the groundwater.

- When filling and changing the hydraulic fluid, always place a catch pan under the axial piston unit.
- Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

1. Fill and air bleed the axial piston unit via the appropriate ports, see chapter "6.3 Installation position". The hydraulic lines of the system must also be filled.
2. Test the direction of rotation of the engine. To do this, rotate the engine briefly at the lowest rotational speed (inching). Make sure that direction of rotation of the axial piston unit matches the details on the name plate, see also chapter "4.4 Product identification", Fig. 14: Name plate.
3. Operate the axial piston pump at a lower speed (starter speed for internal combustion engines or inching operation for electric motors) until the pump system is completely filled and bled. To inspect, drain the hydraulic fluid at the case drain port and wait until it drains without bubbles.
4. Make certain that all ports are either connected to pipes or plugged according to the general circuit diagram.

7.1.2 Testing the hydraulic fluid supply

The axial piston unit must always have a sufficient supply of hydraulic fluid. For this reason, the supply of hydraulic fluid must be ensured at the start of the commissioning process.

When you test the hydraulic fluid supply, constantly monitor the noise development and check the hydraulic fluid level in the tank. If the axial piston unit becomes louder (cavitation) or the case drain fluid is discharged with bubbles, this is an indication that the axial piston unit is not being sufficiently supplied with hydraulic fluid.

Notes on troubleshooting can be found in chapter "14 Troubleshooting".

To test the hydraulic fluid supply:

1. Allow the engine to run at the slowest speed. The axial piston unit must be operated without load. Pay attention to leakage and noise.
2. Check the axial piston unit's case drain line during the test. The case drain fluid should not contain any bubbles.
3. Check the suction pressure at port "S" of the axial piston pump. Refer to data sheet RE 92003 for the permissible value.
4. Check the case drain pressure at connected port "**T_1**" or "**T_2**". Refer to data sheet RE 92003 for the permissible value.

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7.1.3 Performing functional test

WARNING!



Risk of injury in case of incorrectly connected machine or system!

Any change of the connections will lead to malfunctions (e.g. lift instead of lower) and thus represents a corresponding danger to persons and equipment.

- ► When connecting hydraulic components, observe the specified piping according to the hydraulic circuit diagram of the machine or system manufacturer.

Once you have tested the hydraulic fluid supply, you must perform a functional test on the machine or system. The functional test should be performed according to the instructions of the machine or system manufacturer.

The axial piston unit is checked for functional capability before delivery according to the technical data. During commissioning, it must be ensured that the axial piston unit was installed in accordance with the design of the machine or system.

7.1.4 Performing flushing cycle

In order to remove foreign bodies from the system, Rexroth recommends a flushing cycle for the entire system.



During the flushing cycle, the axial piston unit must be operated without load. The flushing cycle can be performed, e.g. by using an additional flushing unit. Follow the instructions of the flushing unit's manufacturer for the exact procedure during the flushing cycle.

7.2 Recommissioning after downtime

Depending on the installation conditions and ambient conditions, changes may occur in the system which make recommissioning necessary.

Among others, the following criteria may make recommissioning necessary:

- Air in the hydraulic system
- Water in the hydraulic system
- Old hydraulic fluid
- Other contamination

- ► Before recommissioning, proceed as described in chapter "7.1 First commissioning".

7.3 Running-in phase

The bearings and sliding surfaces are subject to a running-in phase. The increased friction at the start of the running-in phase results in increased heat development which decreases with increasing operating hours. The volumetric and mechanical-hydraulic efficiency increases as well through the conclusion of the running-in phase of approx. 10 operating hours.

CAUTION!



Risk of damage by insufficient viscosity!

The increased temperature of the hydraulic fluid during the running-in phase can cause the viscosity to drop to impermissible levels.

- ► Monitor the operating temperature during the running-in phase.
- ► Reduce the loading (pressure, rpm) of the axial piston unit if impermissible operating temperatures and/or viscosities occur.

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8 Operation

The product is a component which requires no settings or changes during operation. For this reason, this chapter of the manual does not contain any information on adjustment options. Only use the product within the performance range provided in the technical data. The machine or system manufacturer is responsible for the proper project planning of the hydraulic system and its control.

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9 Maintenance and repair

9.1 Cleaning and care

CAUTION!



Damage to the surface caused by solvents and aggressive detergents!

Aggressive detergents may damage the seals on the axial piston unit and cause them to age faster.

- Never use solvents or aggressive detergents.

CAUTION!



Damage to the hydraulic system and the seals!

A high-pressure cleaner's water pressure could damage the electronics and the seals of the axial piston unit.

- Do not point a high-pressure cleaner at sensitive components such as, e.g. shaft seal ring, electrical connections and electrical components.

For cleaning and care of the axial piston unit, observe the following:

- Plug all openings with suitable protective caps/devices.
- Check whether all seals and plugs of the plug connections are securely seated to ensure that no moisture can penetrate into the axial piston unit during cleaning.
- Use only water and, if necessary, a mild detergent to clean the axial piston unit.
- Remove coarse dirt from the outside of the machine and keep sensitive and important components, such as solenoids, valves and displays, clean.

9.2 Inspection

In order to enable long and reliable operation of the axial piston unit, Rexroth recommends testing the hydraulic system and axial piston unit on a regular basis and to document the following operating conditions:

Table 9: Inspection schedule

Task to be carried out		Interval
Hydraulic system	Check level of hydraulic fluid in the tank.	daily
	Check operating temperature (comparable load state).	weekly
	Check quality of the hydraulic fluid.	yearly or every 2000 h (which ever occurs first)
Axial piston unit	Check axial piston unit for leakage. Early detection of hydraulic fluid loss can help to find faults on the machine or system and to rectify them. For this reason, Rexroth recommends that the axial piston unit and system always be kept in a clean condition.	daily
	Check axial piston unit for noise development.	daily
	Check fixing elements for tight seating. All fixing elements have to be checked when the system is switched off, depressurized and cooled down.	monthly

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9.3 Maintenance

The axial piston unit is low maintenance when used as intended.

The service life of the axial piston unit is heavily dependent on the quality of the hydraulic fluid. For this reason, we recommend changing the hydraulic fluid at least once per year or every 2000 operating hours (which ever occurs first) or having it analyzed by the hydraulic fluid manufacturer or a laboratory to determine its suitability for further use.

The service life of the axial piston unit is limited by the service life of the built-in bearings. The service life can be requested from the responsible Rexroth Service partner, see "9.5 Spare parts" for address. Based on these details, a maintenance period is to be determined by the system manufacturer for the replacement of the bearings and included in the maintenance schedule of the hydraulic system.

9.4 Repair

Rexroth offers a comprehensive range of services for the repair of Rexroth axial piston units.

Repairs of the axial piston unit may only be performed by authorized, skilled and instructed personnel.

- Only use genuine spare parts from Rexroth for repairing the Rexroth axial piston units.

Tested and pre-assembled original Rexroth assembly groups allow for successful repair requiring only little time.

9.5 Spare parts

CAUTION!



Damage to persons and property due to faulty spare parts!

Spare parts that do not meet the technical requirements specified by Rexroth may cause damage to persons or property.

- Use only original spare parts from Rexroth.

The list of spare parts for axial piston units are order specific. When ordering spare parts, please quote the material and serial number of the axial piston unit as well as the material numbers of the spare parts.

Please address all questions regarding spare parts to your responsible Rexroth Service partner or the service department of the manufacture's plant for the axial piston unit.

Bosch Rexroth AG
Hydraulics
Product Unit Axial Piston Units
Elchingen Plant
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89275 Elchingen, Germany
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service.elchingen@boschrexroth.de

For the addresses of foreign subsidiaries, please refer to
`www.boschrexroth.com/addresses`

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10 Decommissioning

The axial piston unit is a component that does not require decommissioning. For this reason, this chapter of the manual does not contain any information

For details about how to disassemble or replace your axial piston unit, please refer to chapter "11 Disassembly and replacement".

11 Disassembly and replacement

11.1 Required tools

Disassembly can be performed with standard tools.
No special tools are necessary.

11.2 Preparing for disassembly

WARNING!



Risk of injuries due to disassembling under pressure and voltage!

If you do not switch off pressure and power supply before disassembling the product, you may get injured or the device or system components may be damaged.

- ► Make sure that the relevant system components are not under pressure or voltage.

1. Decommission the entire system as described in the overall manual for the machine or system.
2. Relieve the hydraulic system according to the instructions of the machine or system manufacturer.

11.3 Disassembling the axial piston unit

Proceed as follows to disassemble the axial piston unit:

1. Make sure that the hydraulic system is depressurized.
2. Check whether the axial piston unit has cooled down far enough so that it can be disassembled without danger.
3. Place a catch pan under the axial piston unit to collect any hydraulic fluid that may escape.

CAUTION!



Danger of environmental contamination!

The discharge or spillage of hydraulic fluid while filling the axial piston unit can lead to environmental pollution and contamination of the groundwater.

- ► When filling and changing the hydraulic fluid, always place a catch pan under the axial piston unit.
- ► Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

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4. Loosen the lines and collect the escaping hydraulic fluid in the collector.
5. Remove the axial piston unit. Use an appropriate lifting device.
6. Completely empty the axial piston unit.
7. Plug all openings.

11.4 Preparing the components for storage or further use

▶ Proceed as described in section "5.2 Storing the axial piston unit".

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12 Disposal

Observe the following points when disposing of the axial piston unit:

1. Completely empty the axial piston unit.
2. Dispose of the hydraulic fluid according to the national regulations of your country.
3. Disassemble the axial piston unit into its individual parts and properly recycle these parts.
4. Separate parts by:
   - Cast parts
   - Steel
   - Nonferrous metal
   - Electronic waste
   - Plastic
   - Seals.

12.1 Environmental protection

Careless disposal of the axial piston unit, the hydraulic fluid and the packaging material could lead to pollution of the environment.

- ▶ Therefore, dispose of the axial piston unit, the hydraulic fluid and the packaging material in accordance with the currently applicable regulations in your country.
- ▶ Dispose of hydraulic fluid residues according to the applicable safety data sheets for these hydraulic fluids.

13 Extension and conversion

The axial piston unit must not be converted. This also includes a modification of the adjusting screws.



The warranty from Rexroth only applies to the delivered configuration. In case of extensions or conversions, the warranty will become void.



Adjusting screws are protected against unauthorized resetting by means of protective caps. Removal of the protective caps will void the warranty. If you need a modification of the setting, please contact your responsible Rexroth Service (for address, see chapter "9.5 Spare parts").

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14 Troubleshooting

The following table may assist you in troubleshooting. The table makes no claim for completeness.

In practical use, problems which are not listed here may also occur.

14.1 How to proceed for troubleshooting

- Always act systematically and targeted, even under pressure of time. Random and imprudent disassembly and readjustment of settings might result in the inability to ascertain the original error cause.
- First obtain a general overview of how your product works in conjunction with the entire system.
- Try to find out whether the product has worked properly in conjunction with the entire system before the troubles occurred first.
- Try to determine any changes of the entire system in which the product is integrated.
  - Were there any changes to the product's operating conditions or operating range?
  - Were there any changes or repair works on the complete system (machine / system, electrics, control) or on the product? If yes, which?
  - Was the product or machine used as intended?
  - How did the malfunction appear?
- Try to get a clear idea of the error cause. Directly ask the (machine) operator.
- If you cannot rectify the error, contact one of the contact addresses which can be found under:
  `www.boschrexroth.com/addresses`.

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14.2 Malfunction table

Table 10: Malfunction table for variable pumps

Fault	Possible cause	Remedy
Unusual noises	Drive speed too high.	Machine or system manufacturer.
	Wrong direction of rotation.	Ensure correct direction of rotation.
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.	Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
		Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
		Remove contaminants from the suction line.
	Improper fixing of the axial piston unit.	Check fixing of the axial piston unit according to the specifications of the machine or system manufacturer. Observe tightening torques.
	Improper fixing of the attachment parts, e.g. coupling and hydraulic lines.	Fix attachment parts according to the information provided by the coupling or armature manufacturer.
	Pressure-relief valve of the axial piston unit (boost pressure, high pressure, pressure cut-off).	Air bleed axial piston unit Check viscosity of the hydraulic fluid Contact Rexroth Service.
	Mechanical damage to the axial piston unit.	Exchange axial piston unit, contact Rexroth Service.
No or insufficient flow	Faulty mechanical drive (e.g. defective coupling).	Machine or system manufacturer.
	Drive speed too low.	Machine or system manufacturer.
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.	Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
		Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
		Remove contaminants from the suction line.
	Hydraulic fluid not in optimum viscosity range.	Use suitable hydraulic fluid (machine or system manufacturer).
	External control of the control device defective.	Check external control (machine or system manufacturer).
	Insufficient pilot pressure.	Check pilot pressure, contact Rexroth Service.
	Malfunction of the control device or controller of the axial piston unit.	Contact Rexroth Service.
	Wear of axial piston unit.	Exchange axial piston unit, contact Rexroth Service.
	Mechanical damage to the axial piston unit.	Exchange axial piston unit, contact Rexroth Service.

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Table 10: Malfunction table for variable pumps

Fault	Possible cause	Remedy
No or insufficient pressure	Faulty mechanical drive (e.g. defective coupling).	Machine or system manufacturer.
	Drive power too low.	Machine or system manufacturer.
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.	Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
		Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
		Remove contaminants from the suction line.
	Hydraulic fluid not in optimum viscosity range.	Use suitable hydraulic fluid (machine or system manufacturer).
	External control of the control device defective.	Check external control (machine or system manufacturer).
	Insufficient pilot pressure.	Check pilot pressure, contact Rexroth Service.
	Malfunction of the control device or controller of the axial piston unit.	Contact Rexroth Service.
	Wear of axial piston unit.	Exchange axial piston unit, contact Rexroth Service.
	Mechanical damage to the axial piston unit.	Exchange axial piston unit, contact Rexroth Service.
	Output unit defective (e.g. hydraulic motor or cylinder).	Machine or system manufacturer.
Pressure/flow fluctuations	Axial piston unit not or insufficiently air bled.	Completely air bleed axial piston unit.
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.	Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
		Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
		Remove contaminants from the suction line.
Hydraulic fluid temperature too high	Excessive inlet temperature at the axial piston unit.	Machine or system manufacturer: inspect system, e.g. malfunction of the cooler, insufficient hydraulic fluid in the tank.
	Malfunction of the pressure control valves (e.g. high-pressure relief valve, pressure cut-off, pressure controller).	Contact Rexroth Service.
	Malfunction of the flushing valve.	Contact Rexroth Service.
	Wear of axial piston unit.	Exchange axial piston unit, contact Rexroth Service.

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15 Technical data

The technical data of your axial piston unit can be found in data sheet "RE 92003".

The data sheet can be found on the Internet under

www.boschrexroth.com/axial-piston-pumps

The preset technical data of your axial piston unit can be found in the order confirmation.

16 Appendix

16.1 Address directory

For the addresses of foreign subsidiaries, please refer to
www.boschrexroth.com/addresses

https://truckmanualshub.com/

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18.2 Steering/working pump

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MANNESMANN
REXROTH

Brueninghaus Hydromatik

R

Reparaturanleitung
Repair Instructions

A10VSO*

Baureihe 31 / Series 31
Nenngrößen 18...140
Sizes 18...140



* auch für
A10 VO (s. S.2)/
if its A10 VO see
page 2

RDE 92 711-02-R 01.95

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HINWEIS

Teilgeprüfte und vormontierte Original Brueninghaus Hydromatik, Werk Horb-Baugruppen ermöglichen bei kürzestem Zeitaufwand erfolgreiche Reparaturen.

Besonders rasch erhalten Sie die richtigen Ersatzteile, wenn Sie uns bei der Bestellung Typ- und Fabriknummer mit angeben. (Für den A 10-Ersatzteilservice wurde ein Schnellversand eingeführt, bitte ggf RD 90124 anfordern.)

Die Reparaturarbeiten sind einfach, trotzdem sollten Sie unser Angebot zur Schulung nutzen und sich bei uns das notwendige Spezialwissen aneignen.

Die vorliegende Rep.Anleitung kann auch als Grundlage für die A10VO (Mobilanwendungen) verwendet werden. Sie unterscheidet sich nicht in den Einstellwerten von der im Stationärsektor verwendeten A10VSO.

NOTE

Pretested and preassembled Original Brueninghaus Hydromatik, plant Horb - subassemblies make quick and successful repairs possible

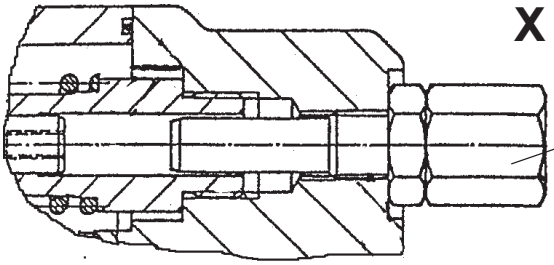
Delivery of the correct spare parts will be especially quick if you state the type and the serial number when orderring. (We created a A 10-spare part - quick shipping - service, order RE 90 124 if necessary.)

Although repairs are simple, you are encouraged to enroll in the repair training classes offered by Brueninghaus Hydromatik, plant Horb. This will give you the proper experience and specialized knowledge to make your own repairs.

This repairing manual also can be used to repair the mobile A 10 VO. Adjustments of the mobile pump are the same like the adjustments of the stationary units A 10 VSO.

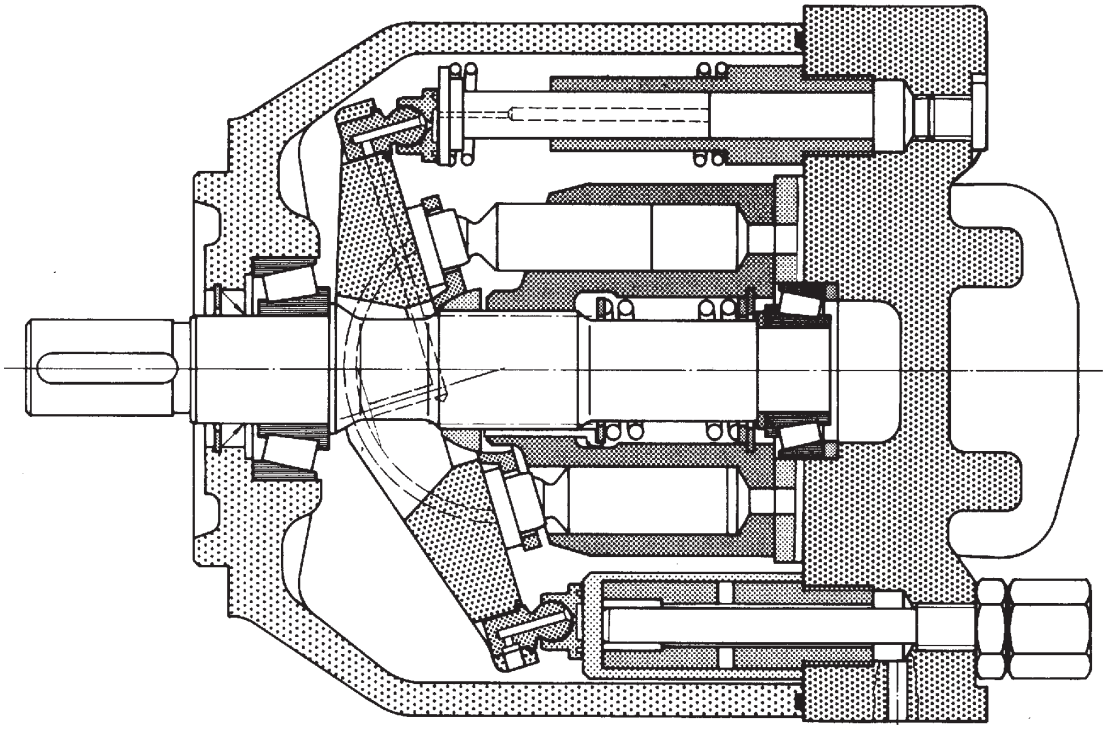
INHALT	Seite Page	**CONTENTS**
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Ersatzteil kits	4 - 5	spare parts kits
Abtriebswelle abdichten	6 - 7	Sealing the drive shaft
Demontage und Montage der kompletten Einheit	8 - 14	Disassembly and re-assembly of the complete unit
Hinweise zum Steuerventil	15 - 17	control valve instructions
Zerlegen und Reinigen des Steuerventils	18 - 21	Disassembling and cleaning the control valve
Montage-Abstimmung	22	Specification tolerance lists
Einstellhinweise und Prüfung	23	set up and testing instruction
Werkzeuge und Anziehdrehmomente	24	Tools and tightening torques

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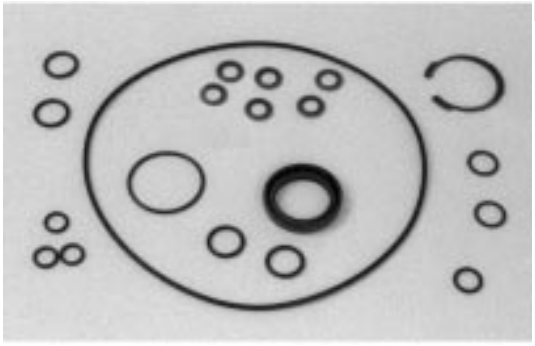


NG 100 und 140 mit mechan. einstellbarem Q min - Anschlag

Size 100 and 140 with stopper
min flow adjustable mechanically



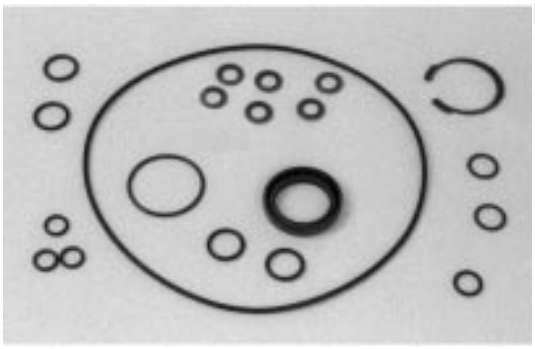
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K1

Kompletter Dichtsatz (Dichtsätze sind typenbezogen festgelegt, Foto z. B. A 10 VSO 28 DFR, ohne Steuerventildichtelemente), Werkstoff der Dicht-elemente: Wellendichtring in FPM übrige in NBR

Sealing set complelely(sealing sets are based on the type of the pump, picture shows for example A 10 VSO DFR, without pilot valve seals). Sealing material: drive shaft sealing ring FPM, others NBR.



K2

Wie K 1, s. o., jedoch Werkstoff aller Dichtelemente in FKM.

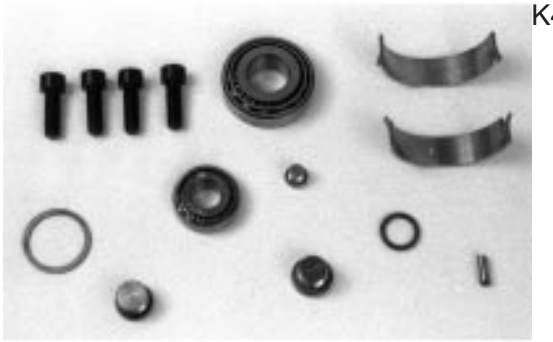
Same like K 1, see picture on top. Only difference: all material FKM



K3

Antriebswelle: im Ersatzteilverkauf werden folgende Ausführungen angeboten:
ISO - Paßfeder, SAE - Paßfeder, SAE - Zahnwelle

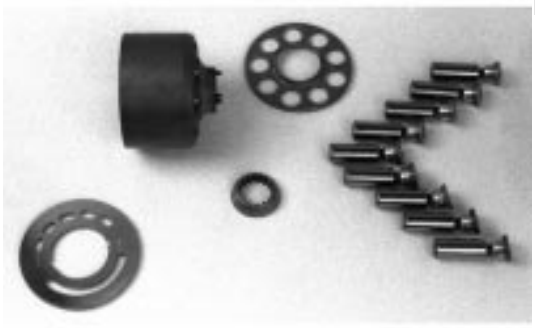
Drive shaft: our spare part supply offers you the following drive shaft types:
ISO - key design, SAE - key design, SAE - splined design



K4

Die Gruppe "Lagersatz Kleinteile" beinhaltet: 2 Kegelrollenlager, 2 Gleitlagerschalen, Abstimm-scheibe, Distanzscheibe, Befestigungsschrauben, diverse Stopfen und Zy-linderstift für Fixierung der Verteilerplatte.

Contents of kit "bearing set / miscellaneous parts": 2 tapered roller bearings, 2 bearing shells, adjustment shim, spacer shim, plugs, cylindric pin to fix the valve plate.



K5

Die komplette Rotationsgruppe mit montierten Hakenstiften im Zylinder wird für Drehrichtung rechts oder links angeboten.

We offer the rotary group completely with its cylinder with mounted pressure - pins for cw or ccw rotating units (pls order your direction of rotation).

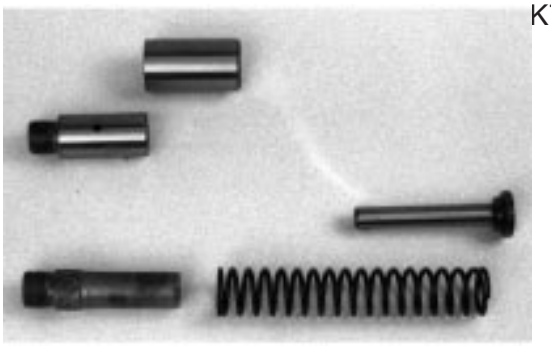
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K6

Schwenkwiegen in Standard - Ausführung stehen für rechte oder linke Antriebsdrehrichtung zur Verfügung. Ebenso wird zusätzlich für leistungsgeregelte Pumpen die rechte und linke Schwenkwiege angeboten.

We offer swash plates for cw or ccw rotating units in the serial design or for horse power controlled pumps by our spare part service.(Order your direction of rotation)



K7

Die Abb. li zeigt die Verstellteile ohne Anschläge. Ggf können auch Verstellteile mit Anschlägen bezogen werden (s. dazu auch RD 90 124)

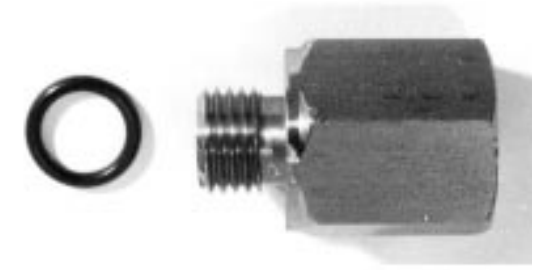
Picture lefft shows the control device parts without the stopper parts. Order with stopper parts if necessary (see RE 90 124).



K8

Als geprüftes und voreingestelltes Ventil kann das Steuerventil für p- und Q-Regelung bezogen werden. Wenige Handgriffe ermöglichen ggf. Modifikationen in der Steuerventilausführung. (Abb. li zeigt Steuerventil für A10 NG 18 bis100; NG 140 mit Ventil-NG 6 - s. Titelbild bzw. Abb 10* S. 5)

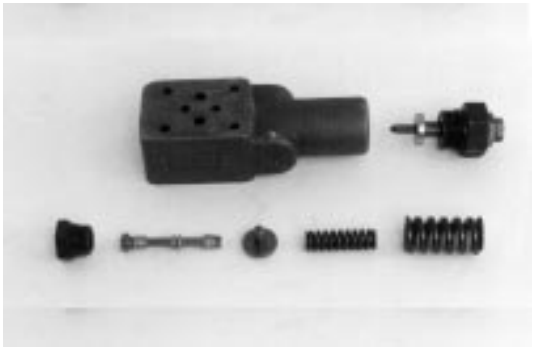
*Order a checked and preadjusted pilot valve to control the pump for pressure compensator and flow control. Easy handling is possible to convert the design of the pilot valve. (Picture left shows valve of pump size 18 ..100; size 140 must have valve size 6 - see cover picture or 10*this page)*



9*

Steuerventilausführung für NG 18 bis 100:
X-Adapter am DFR-Steuerventil für metrische Verrohrung des Steueranschlußes X (ohne Blende).

Pilot valve design 18 to 100:
Adapter without orifice of the DFR - pilot valve, if you use a metric pilot pipe connection X.



10*

Die Abb. zeigt den zerlegten Druckregler als Zwischenplat-tenventil (NG 140). Als zweite Ventilachse wird der Förder-stromregler außen am Druckregler angeflanscht.

Picture left shows the pressure compensator disassembled as a sandwich valve (of pump size 140). Mount on top of the pressure compensator housing the valve housing for the flow control.

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Hinweis !

Note !

1

Die hier beschriebene Möglichkeit zum Wechsel der Antriebswellen - Abdichtung stellt nicht die serienmäßige Montage dar. Für sicheres Dichtungsverhalten ist eine Montage des Dichtringes gemeinsam mit dem Kegelrollenlager von innen her durch das Pumpengehäuse durchzuführen. Soll aus Gründen der Vereinfachung im Reparaturfall die folgend beschriebene Vorgehensweise durchgeführt werden, so ist beim Ausbau der Dichtung besonders darauf zu achten, daß die Antriebswelle nicht beschädigt wird.

2

This discription showes how to change the drive shaft sealing ring but it isn`t the way of serial assembly. The sealing ring is assembled together with the taper roller bearing from inside the pump housing normally to get a secure sealing condition. If you decide to repair the pump in the shown way be very careful while handling so that the drive shaft wouldn`t be damaged during disassembly of the shaft sealing ring.



3

Entfernen der Paßfeder.

Disassemble of the key.



4

Sicherungsring ausbauen.

Remove the retaining ring.

o. Abb.

no picture

5

Ausbau des WDR mit spitz angeschliffenem Schraubendreher. Achtung: Beschädigung der Welle führt zur Undichtheit.

Grind screwdriver to disassemble the shaft sealing ring carefully. Pay attention: Damages of the drive shaft indicate leakage.

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6

Bevor der neue eingefettete WDR montiert wird ist eine Kontrolle der Lauffläche, Welle und Gehäuse vorzunehmen.

Change the shaft seal and check the contact surfaces (drive shaft and housing), grease sealing ring before mounting.



7

Einführhülse für die Montage des WDR aufsetzen:

Hülse 74.0.0655	(NG 18)	Angaben für ISO - Wellen / List shows ISO-drive shaft standard only
Hülse 74.0.0656	(NG 28)	
Hülse 74.0.0657	(NG 45)	
Hülse 74.0.0658	(NG 71)	
Hülse 74.0.0659	(NG 100)	
Hülse 74.0.0660	(NG 140)	

Use installation tool for the sealing ring (see tool list on top).



8

Mit geeignetem Rohr oder größerem Verstellkolben wird über die Einführhülse der WDR nur so tief montiert, daß der Sicherungsring montierbar ist (zu tiefes Montieren führt zum Ausfall: Berührung mit dem Wellenlager !)
Use a suitable pipe or use the control piston of a bigger pump size to mount the shaft seal ring via the installation tool, but don't push it too deap. If the shaft seal ring touches the bearing ring you will damage the seal ring.



9

Sicherungsring einsetzen.

Assemble the retaining ring.

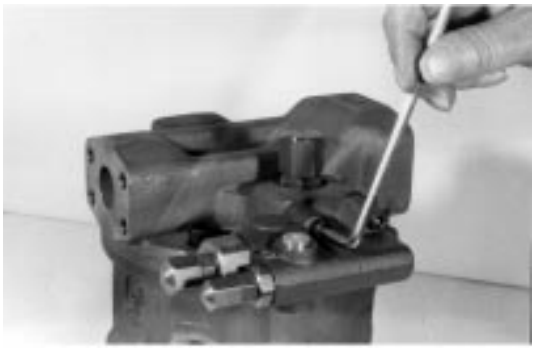


10

Sicherungsring ganz einrasten. Anschließend Montierender Paßfeder mit Hilfe eines Kunststoffhammers. (o. Abb.)

Assemble the retaining ring. Assemble the key next by using a plastic hammer. This handling isn't shown in pictures.

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11

Die folgenden Arbeiten sind beispielhaft an einer NG 45 durchgeführt. Abweichungen für andere NG sind im Bedarfsfall extra angeführt.
Abbau des Steuerventils.

This manual shows the handling of size 45. If necessary changes to the other pump sizes are shown separately.
Disassemble the pilot valve.



12

Markieren der Anschlußplatte zum Pumpengehäuse und Lösen der Befestigungsschrauben.

Mark position of the port plate to pump housing and remove socket screws of the port plate.



13

Abheben der Anschlußplatte und Verteilerplatte mit Verstellteilen (Herunterfallen der Verteilerplatte durch Festhalten vermeiden).

Remove the port plate together with the valve plate and control device parts (hold the valve plate so that the plate can´t fall down).



14

Abheben des Kegelrollenlagers und Abstimmscheibe.

Disassemble taper roller bearing and adjustment shim.



15

Triebwerk herausziehen.

Disassemble the rotary group.

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16

O - Ring entfernen.

Remove the O - ring.



17

Lagerschalen herausheben.

Disassemble beaaring shells.



18

Kugellager Ab- und Auszieher (handelsüblich) für Kegelrollenlager - Außenring (antriebswellenseitig).

Use bearing puller to remove outer bearing race of front bearing.



19

Steuerplatte abheben.

Remove the control plate.



20

Kugellager Ab- und Auszieher (handelsüblich) des Kegelrollenlager - Außenringes (anschlußplattenseitig)

Use bearing puller to remove outer bearing race of rear bearing.

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21

O - Ringe entfernen.

Remove the O - rings



22

Demontage der Hutmutter für Gewindestift.

Disassemble the head nut of threaded pin.



23

Demontage der Fixiermutter und des Gewindestiftes.

Disassemble the hexagon fixing nut and the threaded pin.



24

Kolbenführung des Verstellkolbens (Einbau "ventilseitig") ausbauen.

Disassemble the guide of control piston (Mounting position: pilot valve side).



25

Kolbenführung des Gegenkolbens ausbauen.

Disassembly the guide of opposite piston.

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26

Antriebswelle aus der Rotationsgruppe herausziehen.

Pull out the drive shaft.



27

Kolben und Rückzugplatte entfernen.

Remove the pistons and the retaining plate.



28

Rückzugkugel entfernen.

Remove the retaining ball.



29

Vorspannung der Feder für Ausbau des Sicherungsrings erhöhen (mit Hilfsschraube und Scheiben).

Compress the center spring in order to disassemble the retaining ring (easy handling by a helping bolt and shims).



30

Sicherungsring ausbauen.

Disassemble the retaining ring.

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31

Restliche Einzelteile des Zylinders:Zylinderstifte, Zylinder, Scheibe, Feder und Sicherungsring.

Remaining parts of the cylinder: pins, cylinder, shim, spring and retaining ring.

Hinweis !

Note !

32

Beim Zusammenbau der Pumpe in umgekehrter Reihenfolge ist auf die folgeden Punkte zu achten (33 - 42).

Assemble the pump in reverse order and note the following (33 - 42).



33

Im Graugußgehäuse werden die Kegelrollenlager mit einer Vorspannung von 0.....0,05 abgestimmt s.a. S 22.

Taper roller bearing in the cast iron pump housing must have a initial tension with 0.....0,05 mm (see page 22).



34

Drehrichtung: rechts
Vorbereiten der Anschlußplatte : Führung für Verstell- und Gegenkolben mit Loctite einkleben.

- Lagerichtiges Verdrillen der Verteilerplatte in Drehrichtung 4 ° .(Verteilerplatte bei BR 31 nur noch in Originallage montierbar)
- Befetten der O - Ringe.

See picture 34

35

Port plate (direction of rotation clockwise) : Both piston guides are glued with Loctite.

- Correct position of the valve plate (clockwise 4°): In case of series 31 the valve plate only can be installed into the correct position.
- Grease O - rings prior assembly.

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36

Drehrichtung: links
Vorbereiten der Anschlußplatte: Führung für Verstell- und Gegenkolben mit Loctite einkleben.

- Lagerichtiges Verdrillen der Verteilerplatte in Drehrichtung 4°. (Verteilerplatte bei BR 31 nur noch in Originallage montierbar)
- Befetten der O - Ringe

37

See picture 36

Port plate (direction of rotation anti-clockwise): Both piston guides are glued with Loctite.

- Correct position of the valve plate (anti-clockwise 4°): In case of series 31 the valve plate only can be installed into the correct position.
- Grease O - rings prior assembly



38

Lagerichtiger Einbau der Schwenkwiege mit großer Schmiertasche auf der Hochdruckseite, Schwenkwiege für Drehrichtung rechts oder Schwenkwiege für Drehrichtung links verwenden.

Correct position of cradle (lubrication bore relief on the high pressure side), use cradle for clockwise rotation, if counter clockwise use cradle for counter clockwise rotation (two different sub - assemblies).



39

U. U. Nacharbeit der Schwenkwiege im Laufbereich durch Läppen möglich(Läppdorn zentriert), jedoch Auspressen der Anschläge (Kugelzapfen mit Gleitschuh) nicht zulässig (Riefenbildung beim Wiedereinbau).
If it is possible to lap the cradle (sliding area of the piston shoes) it can be possible to use the cradle again. Notice: It isn't allowed to press out the piston connection parts out of the cradle (scorings while fitting !).



40

Falls Zylinder u. Verteilerplatte wiederverwendet werden ggf. Kontaktstelle Verteilerplatte / Zylinder nachläppen mit anschließendem Abziehen auf ebener Unterlage mit 1000er Läpp-Papier.

Connection surfaces between valve plate and cylinder: if lapping is possible use parts again, but after lapping procedure use a lapping paper No.1000 to plan the cylinder and valve plate (plain underground totally is a must).

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41

Überprüfung der Laufeigenschaft des Verstellkolbens.

Check running conditions of the control piston.



42

Überprüfung der Laufeigenschaft des Gegenkolbens.

Check running conditions of the opposite piston.

43

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Vorderseite des Beipackzettels aus dem Ersatzteilpäckchen Steuerventil:
(für NG 18... 100)

Cover page of the pamphlet out of the spare part kit control valve:
(pump size 18 to 100)

1. Allgemeine Hinweise

Zur wesentlichen Erleichterung der Ersatzteilbeschaffung hat Brueninghaus den Ersatzteildienst für A10-Produkte modernisiert . Hinweise dazu finden Sie in der Druckschrift RD 90124 " A10-Ersatzteilversorgung " . Der vorliegende Beipackzettel aus dem Ersatzteil-Päckchen des DFR Steuerventils zeigt auf seiner Rückseite wie die ausgelieferte Ausführung **einfach** umgebaut werden kann, in andere , gängige Ausführungen .
Bitte beachten : bei Änderung der Ausführung muß das Ventil umgestempelt werden .
Die gelieferte Ausführung mit der Teile Nr.**942 581** wird **nur in Viton-Ausführung** verschickt .

Voreinstelldaten :

DR: ca. 280 bar
FR: Δp ca. 14 bar

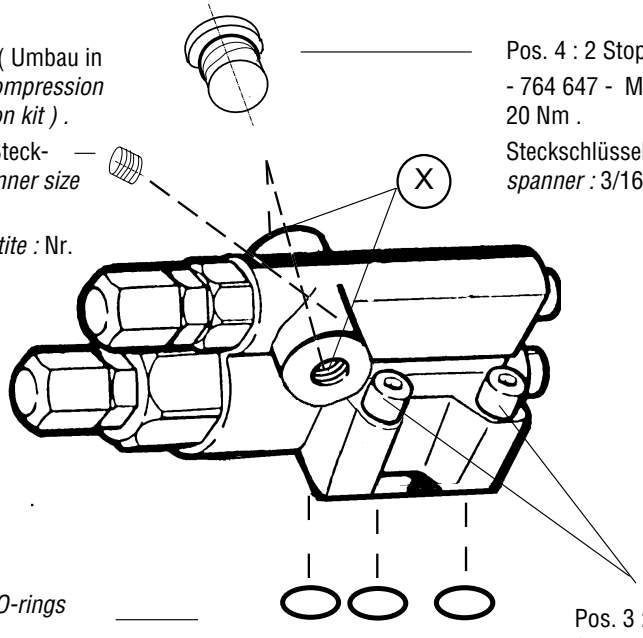
1. General directions

*Brueninghaus modernized the spare parts service of A10 products so that you will get spare parts much more easyly . The advertizing folder RD 90124 " A10-spare part-service " gives you more information . This pamflet out of the spare part kit " control valve : pressure compensator and flow control DFR " show on its backside: how to change the design to the most commen typs of the control valve **in an easy way** .*
Please note :*The valve must be marked with the original number after its change .*
*This valve will be delivered **only in the Viton-execution (spare part No.942 581)** .*

Pre-adjustments :

DR-pressure compenator: approx 280 bar
FR-flow control: Δp approx 14 bar

2. Ersatzteil - Lieferung / *spare part kit*



Pos. 5 : Stopfen für Bypaßdüse (Umbau in DFR1) / *plug in front of the decompression orifice if its type DFR1 (reversion kit) .*
M4x4 DIN 913 - 914 741 - 2er Steckschlüssel / *off set hex. box spanner size 2mm .*
(Mit Loctite gesichert / *use Loctite :* Nr. 242)

Pos. 4 : 2 Stopfen / *plugs* 7/16-20 UNF - 764 647 - MA / *tightening torque :* 20 Nm .
Steckschlüssel / *off set hex. box spanner :* 3/16" .

Pos. 2 : 3 O-Ringe / *O-rings*
PRP 011-19459
- 514 497 -

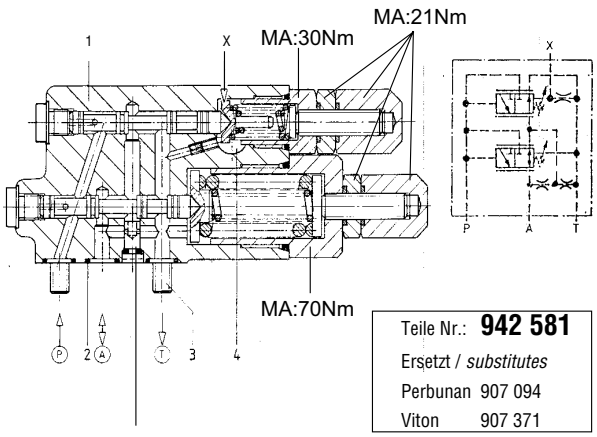
Pos. 3 : 4 Befestigungsschrauben / *screws*
M 6x30 DIN 912 - 900 443 - MA / *tightening torque :* 12 Nm .
Steckschlüssel / *off set hex. box spanner :* 5mm

Werkzeuge gehören nicht zum Lieferumfang / *The tools are not included in the supply .*

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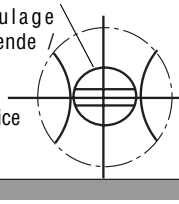
Montagehinweise für die Steuerventilausführungen
Fitting note of the control valve - devices

gelieferte Ausführung / *supply*

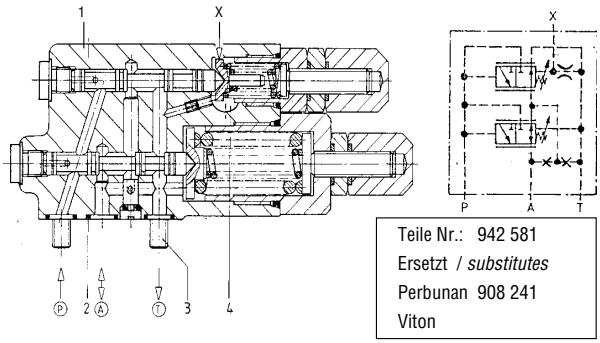


Teile Nr.: **942 581**
Ersetzt / *substitutes*
Perbunan 907 094
Viton 907 371

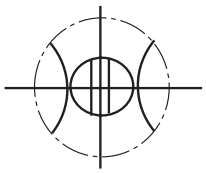
Blende / *orifice 0,6mm*
Einbaulage der Blende / position of the orifice



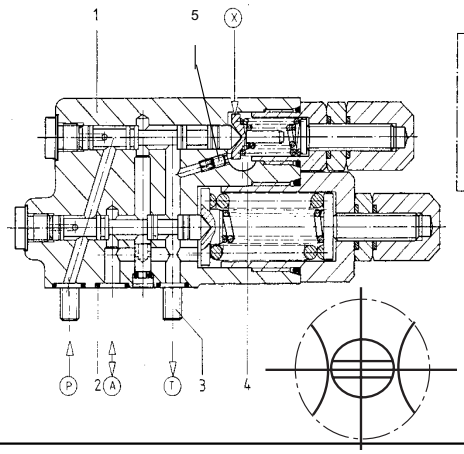
Steuerventil DFR
pressure compensator and flow control DFR
Ein X - Anschluß mitPos. 4 verschließen.
One X - port is pluged by Pos. 4 .



Teile Nr.: 942 581
Ersetzt / *substitutes*
Perbunan 908 241
Viton

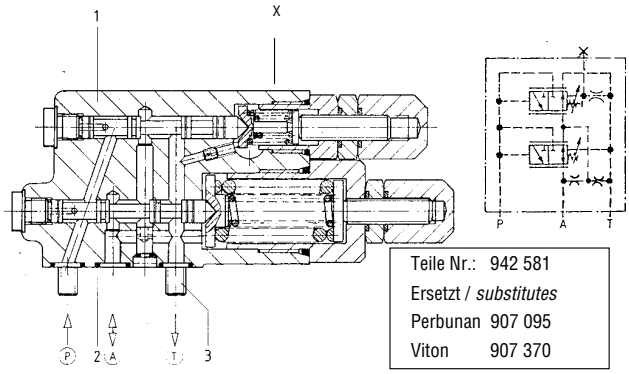


Steuerventil DFR-SO74
pressure compensator and flow control DFR-SO74
Ein X - Anschluß mit Pos. 4 verschließen .
Blende 0,6 mm um 90° verdrehen .
One X - port is pluged by Pos. 4 . Orifice 0,6mm in closed position .

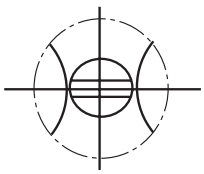


Teile Nr.: 942 581
Ersetzt :/*substitutes*
Perbunan 907 096
Viton 908 384

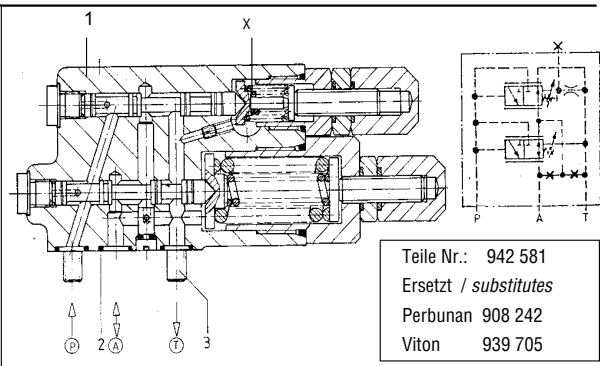
Steuerventil DFR 1
pressure compensator and flow control DFR 1
Ein X - Anschluß mit Pos. 4 verschließen .
Bypaßdüse X - T mit Pos. 5 verschließen .
One X - port is pluged by Pos. 4 . De-compression orifice X-T is pluged by Pos.5.



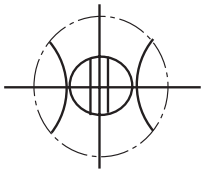
Teile Nr.: 942 581
Ersetzt / *substitutes*
Perbunan 907 095
Viton 907 370



Steuerventil DR
pressure compensator DR
Beide X - Anschlüsse mit Pos. 4 verschließen
Förderstromregler blockieren .
Both X- ports are pluged by Pos. 4 . Flow control blocked.



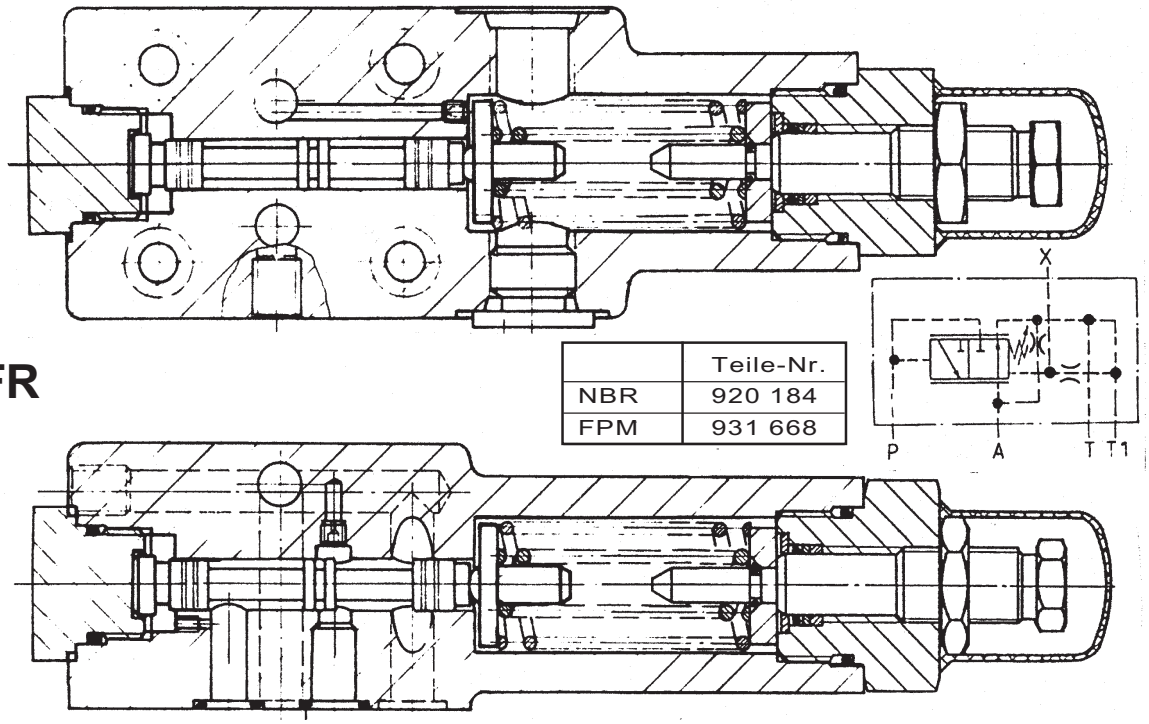
Teile Nr.: 942 581
Ersetzt / *substitutes*
Perbunan 908 242
Viton 939 705



Steuerventil DR-SO74
pressure compensator DR-SO74
Beide X - Anschlüsse mit Pos. 4 verschließen ; FR blockieren, Blende 0,6 mm um 90° verdrehen .
Both X - ports are pluged by Pos. 4 ; Flow control blocked, orifice 0,6 mm in closed position (turn 90°)

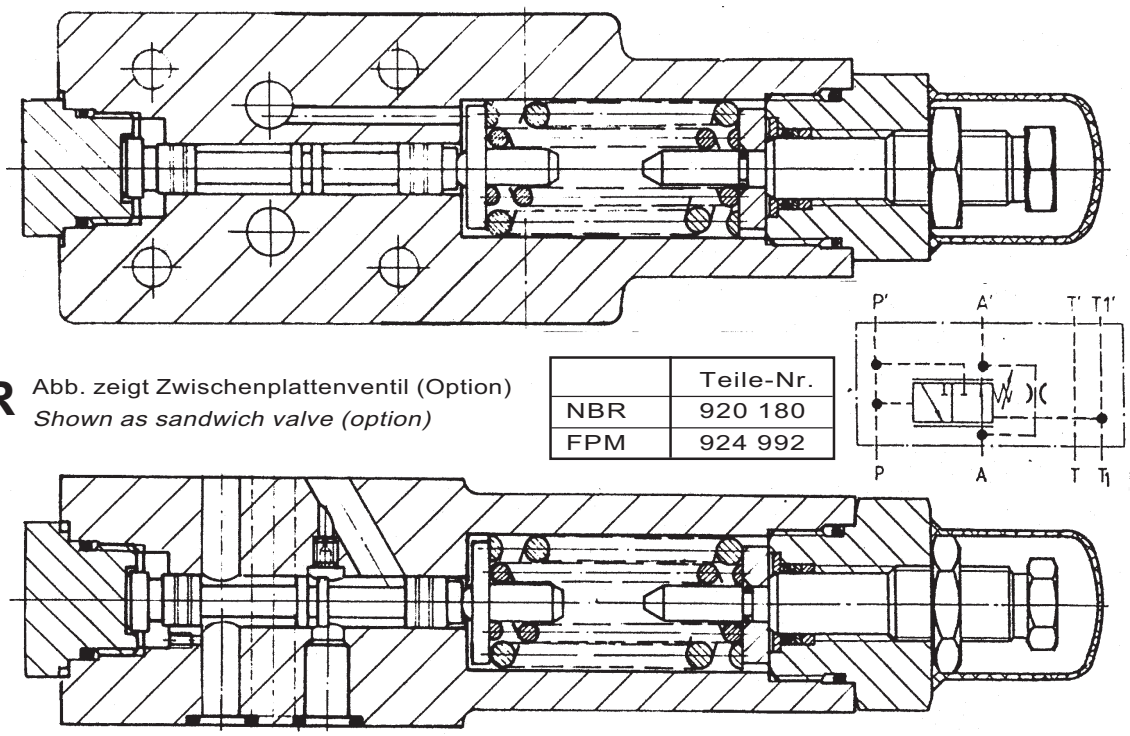
https://truckmanualshub.com/

FR



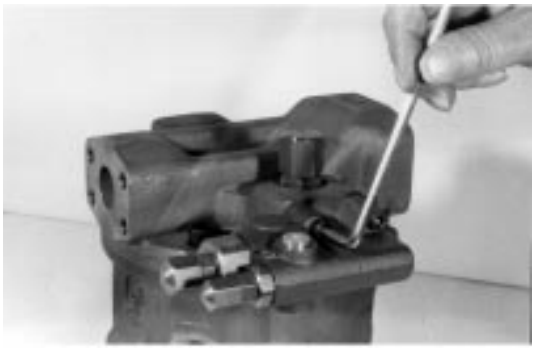
	Teile-Nr.
NBR	920 184
FPM	931 668

DR Abb. zeigt Zwischenplattenventil (Option)
Shown as sandwich valve (option)



	Teile-Nr.
NBR	920 180
FPM	924 992

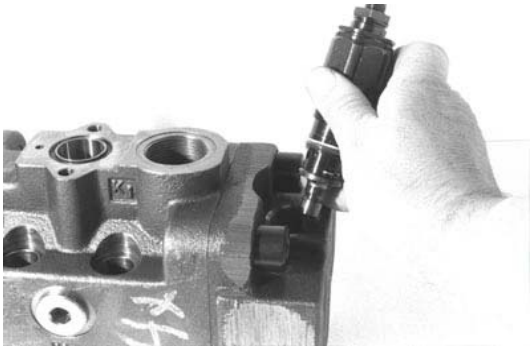
https://truckmanualshub.com/



46

Lösen der Befestigungsschrauben (siehe S. 15).

Loosen socket screws (see page 15).



47

Entfernen der O - Ringe.

Remove the O - rings.



48

Am komplett montierten Ventil wird mit Hilfe der Druckluft die Puls.-Blende herausgeblasen: Druckluft über Bohrung A, T verschlossen. Zur Vermeidung von Hautkontakt Bewegungsrichtung der Blende vorher beachten!
Blow out the pulsations orifice by air pressure out of the complete valve: pressure at drilling A, close drilling T. Note that there is no skin connection during blowing,look how the orifice comes out before blowing!



49

Entfernen der Hutmuttern. Die folgenden Arbeiten werden erst beim Druckregler, dann beim Förderstromregler durchgeführt.

Remove the hexagon nuts. First disassemble pressure control, afterwards flow control.



50

Kontermutter lösen und Gewindestift herausdrehen.

Loosen the lock nut and unscrew threaded pin.

https://truckmanualshub.com/



51

Verschlußschraube demontieren.

Disassemble the plug.



52

Herausnehmen des Federtellers.

Remove the spring collar.



53

Herausnehmen der Federn.

Remove the springs.



54

Herausnehmen des Federtellers.

Remove the spring cup.



55

Verschlußschraube entfernen.

Disassemble the plug.

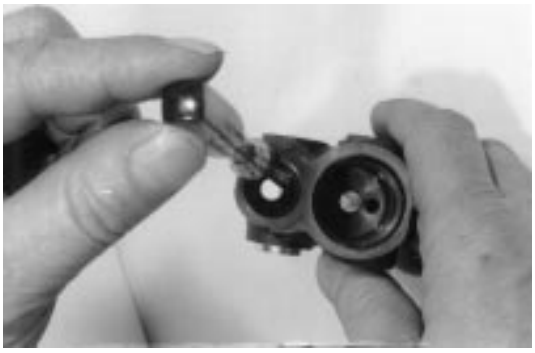
https://truckmanualshub.com/



56

Sorgfältiger Ausbau des Kolbens.

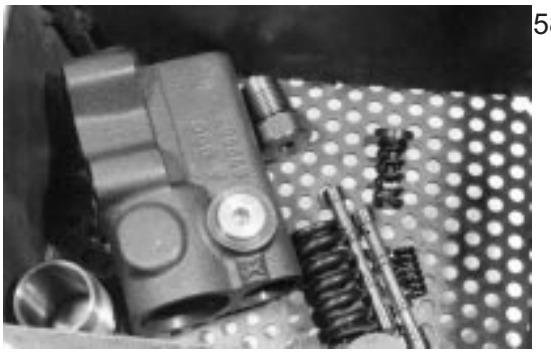
Be careful while disassembling the piston.



57

Demontage des Stopfens bzw. der Entlastungsdüse (im Förderstromregler - Federraum).

Disassemble the plug or orifice (spring area of flow control).



58

Auswaschen des Steuerventilgehäuses und Einzelteile mit gründlichem Beseitigen des Waschmittels durch Ausblasen.

Clean housing and parts with clean fluid and dry with air carefully.

Hinweis !

Note !

59

Zusammenbau des Steuerventils in umgekehrter Reihenfolge. Dabei ist auf folgende Punkte zu achten (60 bis 63).

Assemble pilot valve in reverse order and note the following (60 to 63).

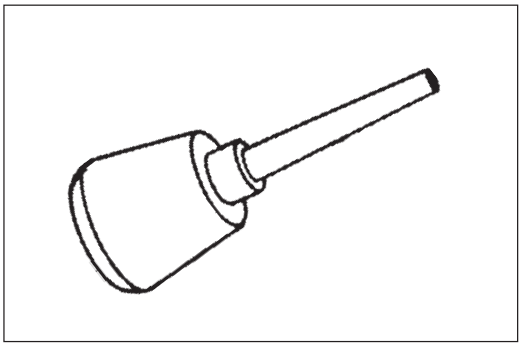


60

Kontrolle der Düsendurchlässigkeit.

Check the opening of the orifice.

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61

Einkleben der Düse (auf verstopfte Düse ist beim Klebevorgang zu achten).

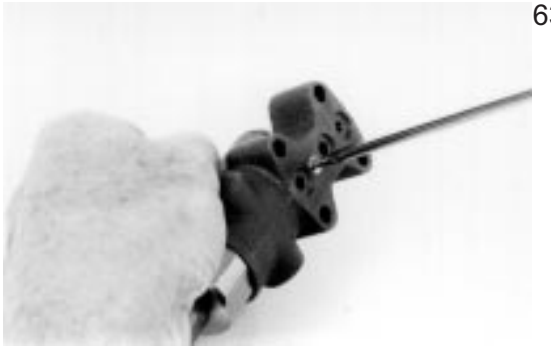
Be careful when loctiting the orifice.



62

Laufeigenschaft der Reglerkolben prüfen, keine Beschädigungen der Kolben und der Bohrungen.

Check the movement of the pilot valve spools, and drillings should not be damaged.



63

Einstellungen der Bypaßblende (s. auch S. 16):

1) Schlitz in Längsrichtung (entspr. der Abb.): Blende geöffnet.
2) Schlitz quergestellt: Blende geschlossen

Adjustments of the bypass orifice (see page 16, too):

1) open position of the orifice: like shown on the picture
2) turn the orifice 90° to close it.



64

Einstellen des Steuerventils siehe Einstellhinweise (s. S. 23).

For adjustment of the pilot valve see set up instructions (page 23).

Siehe S. 17.

see page 17.

65

Für die Steuerventilausführung der Pumpen NG 140 sind keine weiteren Angaben gemacht. Sinngemäß sind die o. a. Hinweise zu beachten.

Pilot valve of pump size 140 doesn't have own instructions. However see the given hints on top.

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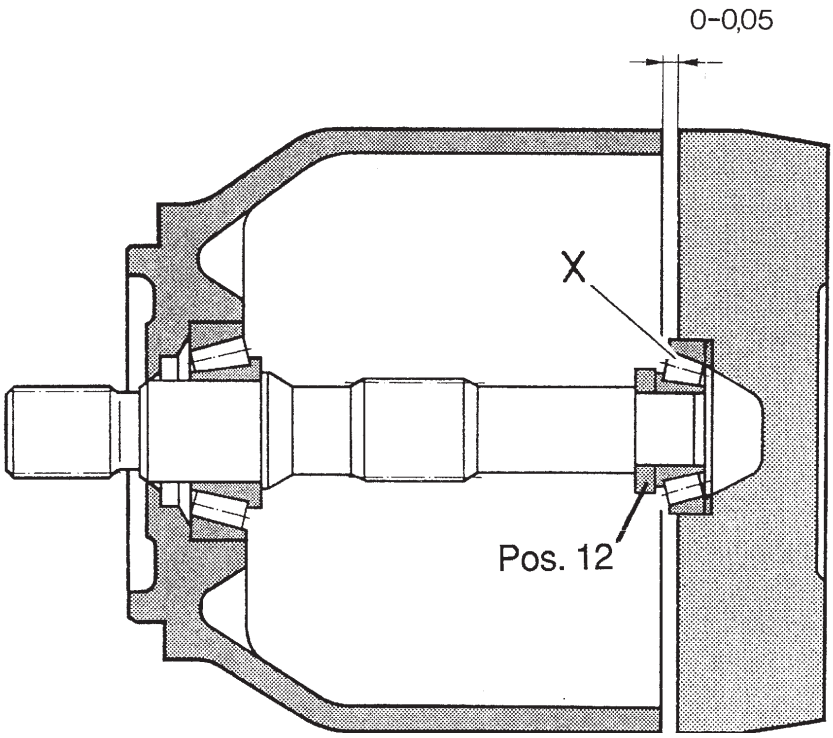
T a b e l l e " mechanische Förderstrombegrenzung" (gültig für Anschlag Q_{min} und Q_{max})
L i s t mechanical flow limiter (both stopper max. and min. flow)

NG / *Size*	18	28	45	71	100*	140*
	1,09	1,58	3,23	4,69	6,16	7,06
Volumenänderung (in cm3) pro Gewindestiftumdrehung / *Differential volume (cm3) if you are rotating the threaded pin - each rotation.*						

* mit vorhandenem einstellbaren Anschlag Q_{min} /
mech. stopper min. flow adjustable

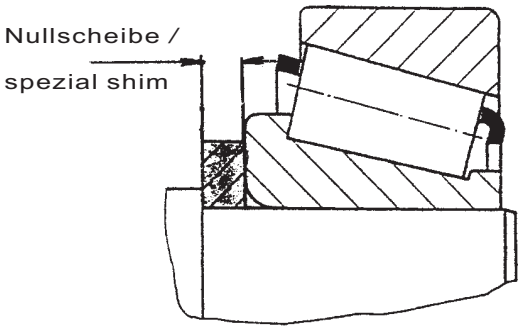
Montage - Abstimmung (Kegelrollenlager) / *taper roller bearing initial tension*

A10VSO Baureihe 31
A10VSO series 31



Hinweis zu den NG 18 und 28/
Note for size 18 and 28:

Die Ausmessung muß mit einer Nullscheibe -Pos. 12- (1,5 ± 0,01 breit) erfolgen, s. u. Einzelheit X. Diese Scheibe wird nach der Messung entnommen. Meßwert, Scheibenstärke der Nullscheibe und erforderliche Vorspannung ergibt die Stärke der Abstimmscheibe (Pos. 12).
The smal pump sizes have to be measured by using a spezial shim -Pos. 12- with its tolerance of 1,5 ± 0,01, see detail X. This shim will be disassembled after the measurement. Measurement, thickness of the spezial shim and necessary pretention all together makes the thickness of the adjustment shim (Pos. 12).



Einzelheit X/ *detail X*

Abstimmung der Triebwerkslagerung
Die Vorspannung der Triebwerkslagerung muß im Gußgehäuse von 0 bis 0,05 mm durch Abschleifen der Abstimmscheibe Pos. 12 hergestellt werden.
Cast iron housing must have initial tension of the bearings : 0.....0,05 mm , grind Pos. 12 if necessary.

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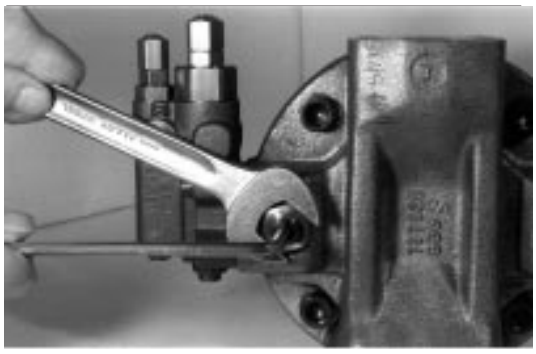
DR: bei geschlossener Verbraucherleitung wird der Regler auf Sollwert eingestellt (bei DFR einstellbare Drossel offen, FR-Feder vorgespannt)

DR: When pressure line is closed adjust the pressure of the controller (if it's DFR design then open the adjustable orifice and increase force of the FR - spring).



FR: Differenzdruck 14 bar wird eingestellt bei halbem Schwenkwinkel der Pumpe (einstellbare Drossel in der Systemdruckleitung teilweise geschlossen).

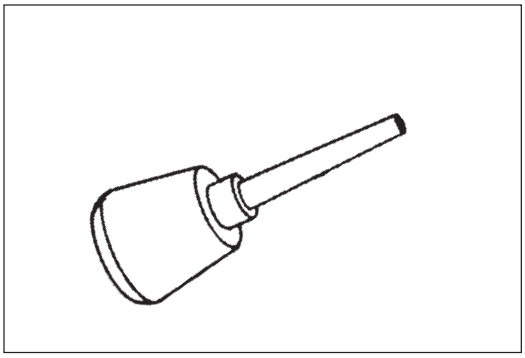
FR: If swivel angle is in the mid position adjust differential pressure 14 bar (adjustable orifice in the system pressure line is partly closed).



Mechanische Förderstrombegrenzung: Durch Drehen am Gewindestift kann der Förderstrom der Pumpe abhängig von der NG um min. 35% von V_{gmax} reduziert werden. (Soll jedoch eine größere Reduzierung des Förderstromes erforderlich werden, kann auf den Einbau der Kontermutter verzichtet werden. Bemerkung: Einstellung der Gewindespindel **ohne** Kontermutter erfolgt unter Betriebsdruck) Einstellwerte siehe Tabelle Seite 22.

*Mechanical flow limiter: While screwing in the threaded pin you will be able to reduce the flow from Vg max to 35% reduction of V_{gmax} dependent on the size of the pump (If you need more reducton of the flow, don´t mount the fixing hexagon nut. Note: to adjust the threaded pin **without** the fixing hexagon nut do it by the existence of the working pressure.) Adjustment list see page 22.*

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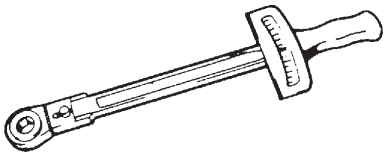


Verwendete Loctite-Sorten/*Loctite used*:

alle Abreißstopfen/*for break-off plugs* Nr. 601
sonst / *normaly* Nr. 242

Anziehdrehmomente / *Tightening torques*

Festigkeitsklassen / *bolt hardness grade*: 8,8; 10,9; 12,9



		M4	M5	M6	M8	M10	M12	M14	M16	M18	M20	M24	M30
M_a	8,8	2,3	5,0	8,5	21	41	72	115	176	240	350	600	1220
	10,9	3,2	7,2	12	29	58	100	165	250	350	490	840	1670
	12,9	4,1	8,5	14,5	35	70	121	195	300	410	590	990	2000

Ma (Nm) = max. Anziehdrehmoments (geölte Schrauben μ = 0,125)
Ma (Nm) = max. tightening torques (screws lubricated μ = 0,125)

https://truckmanualshub.com/

18.3 Travel motor

https://truckmanualshub.com/

This repair manual describes the fixed displacement motor A6VM, which is identical with the travel motor A6VE, which differs only by a different housing design.

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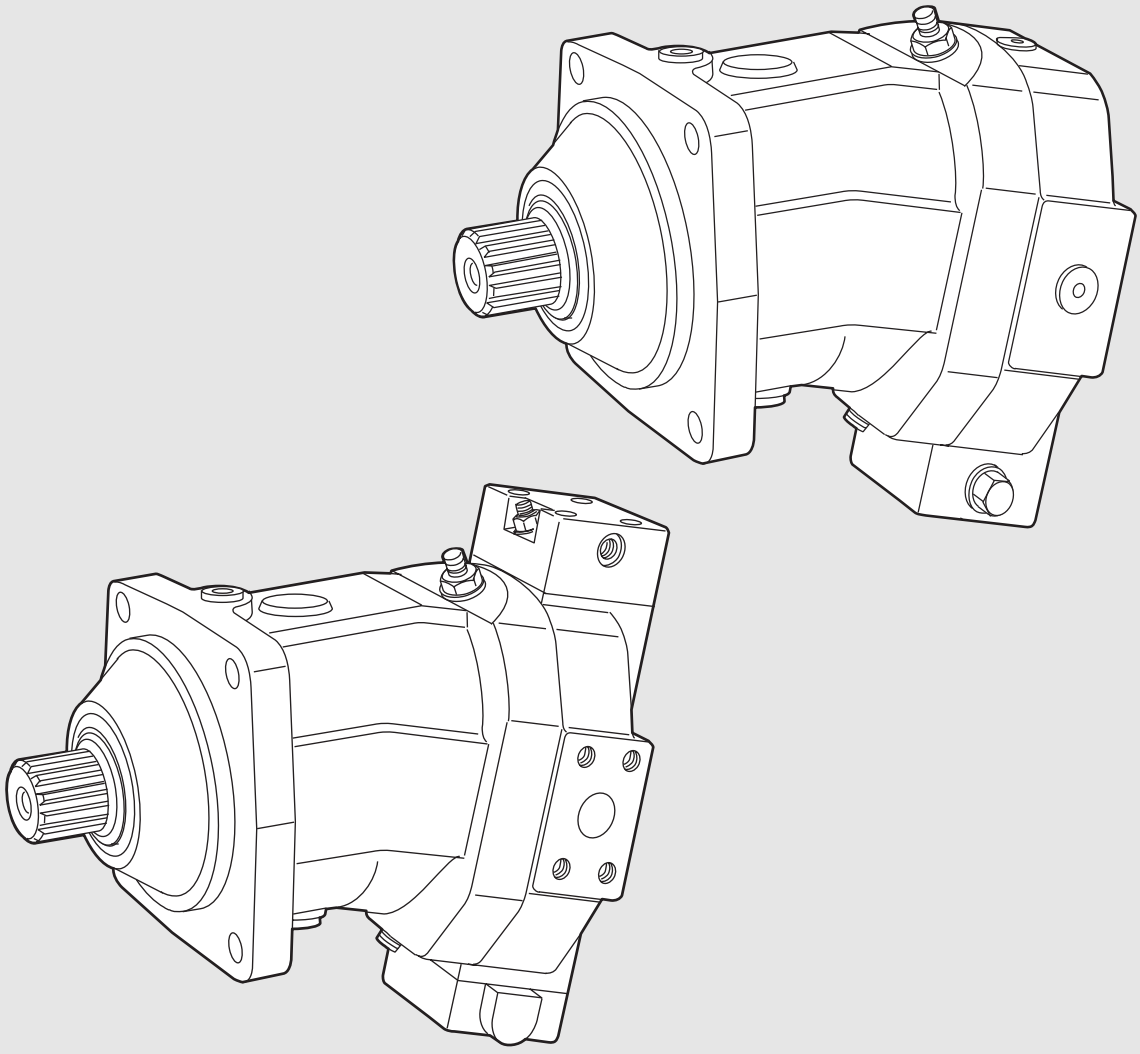
Rexroth
Bosch Group

Verstellmotor A6VM 28...200
Variable Displ. Motor A6VM 28...200

RDE 91 604-01-R/03.03
ersetzt/replaces 08.01

R

Reparaturanleitung / Repair Instructions



https://truckmanualshub.com/

Typschlüssel

Typschlüssel | A6V | M | | | / | 6 | 3 | W |

Axialkolbenmaschine

Schrägachsenbauart, verstellbar	A6V

Betriebsart

Motor (Einschubmotor A6VE siehe RD 91606)	M

Nenngröße

≅ Schluckvolumen $V_{g\,max}$ (cm³)	28	55	80	107	140	160	200

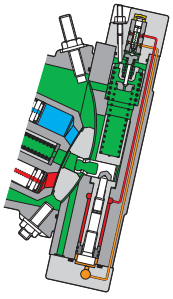
NG 28...200: Fertigung Werk Elchingen

Regel- und Verstelleinrichtung				28	55	80	107	140	160	200		
Hydraulische Verstellung steuerdruckabhängig	Steuerdruckanstieg	10 bar	HD1								HD1	*
		25 bar	HD2	●	●	●	●	●	●	●	HD2	*
		35 bar	HD3	–	–	–	–	–	–	–	HD3	*
Hydraulische Zweipunktverstellung			HZ	–	–	–	–	–	–	–	HZ	.
			HZ1		–	–	–				HZ1	*
			HZ3	–				–	–	–	HZ3	○
Elektrische Verstellung, mit Proportionalmagnet	Steuerspannung	12 V	EP1					●	●	●	EP1	*
		24 V	EP2	●	●	●					EP2	*
Elektrische Zweipunktverstellung, mit Schaltmagnet	Steuerspannung	12 V	EZ1	●	–	–	–	●	●	●	EZ1	*
		24 V	EZ2	●	–	–	–	●	●	●	EZ2	*
		12 V	EZ3	–	●	●	●	–	–	–	EZ3	○
		24 V	EZ4	–	●	●	●	–	–	–	EZ4	○
Automatische Verstellung, hochdruckabhängig	ohne Druckanstieg		HA1								HA1	*
	mit Druckanstieg Δp = 100 bar		HA2	●	●	●	●	●	●	●	HA2	*
Hydraulische Verstellung, drehzahlabhängig			DA	–	–	–	–	–	–	–	DA	*
p_{St}/p_{HD} = 5/100,	hydraulisches Fahrtrichtungsventil		DA1								DA1	*
	elektrisches Fahrtrichtungsventil + elektrische $V_{g\,max}$-Schaltung	12 V	DA2					●	●	●	DA2	*
		24 V	DA3	●	●	●	●				DA3	*
p_{St}/p_{HD} = 8/100,	hydraulisches Fahrtrichtungsventil		DA4	●	●	●	●	●	●	●	DA4	*
	elektrisches Fahrtrichtungsventil + elektrische $V_{g\,max}$-Schaltung	12 V	DA5	●	●	●	●	●	●	●	DA5	*
		24 V	DA6	●	●	●	●	●	●	●	DA6	*

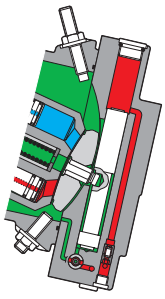
Druckregelung (nur für HD, EP)		28	55	80	107	140	160	200	
ohne Druckregelung (kein Zeichen)		●	●	●	●	●	●	●	
Druckregelung,	direktgesteuert	●	●	●	●	●	●	●	D
	direktgesteuert, mit 2. Druckeinstellung	●	●	●	●	●	●	●	E
	fernsteuerbar	–	–	–	–	–	–	–	G

Übersteuerung der HA-Verstellung (nur für HA1, HA2)			28	55	80	107	140	160	200	
ohne Übersteuerung (kein Zeichen)			●	●	●	●	●	●	●	
hydraulische Übersteuerung			●	●	●	●	●	●	●	T
elektrische Übersteuerung	Steuerspannung	12 V	●	●	●	●	●	●	●	U1
		24 V								U2
elektrische Übersteuerung + elektrisches Fahrtrichtungsventil	Steuerspannung	12 V	●	●	●	●	●	●	●	R1
		24 V								R2

∗ **Differentialkolben**



○ **Gleichgangkolben**



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Type code

Type code A6V M _ _ / 6 3 W

Axial piston unit

Bent axis design, variable displacement	A6V

Mode of operation

Motor (plug-in motor A6VE see RE 91606)	M

Size

≅ Displacement $V_{g\,max}$ (cm³)	28	55	80	107	140	160	200		

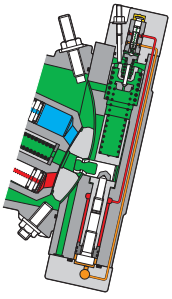
Sizes 28...200: production plant Elchingen

Control device				28	55	80	107	140	160	200		
Hydraulic control pilot pressure related	pilot pressure increase	10 bar	HD1	●	●	●	●	●	●	●	HD1	*
		25 bar	HD2	●	●	●	●	●	●	●	HD2	*
		35 bar	HD3	–	–	–	–	–	–	–	HD3	*
Hydraulic two-position control			HZ	–	–	–	–	–	–	–	HZ	.
			HZ1	●	–	–	–	●	●	●	HZ1	*
			HZ3	–	●	●	●	–	–	–	HZ3	○
Electrical control, with proportional solenoid	control voltage	12 V	EP1	●	●	●	●	●	●	●	EP1	*
		24 V	EP2	●	●	●	●	●	●	●	EP2	*
Electrical two-position control, with switching solenoid	control voltage	12 V	EZ1	●	–	–	–	●	●	●	EZ1	*
		24 V	EZ2	●	–	–	–	●	●	●	EZ2	*
		12 V	EZ3	–	●	●	●	–	–	–	EZ3	○
		24 V	EZ4	–	●	●	●	–	–	–	EZ4	○
Automatic control, high pressure related	without pressure increase		HA1	●	●	●	●	●	●	●	HA1	*
	with pressure increase $\Delta p = 100$ bar		HA2	●	●	●	●	●	●	●	HA2	*
Hydraulic control, speed related			DA	–	–	–	–	–	–	–	DA	*
$p_{St}/p_{HD} = 5/100$,	hydraulic valve for travel direction		DA1	●	●	●	●	●	●	●	DA1	*
	electrical valve for travel direction + electrical $V_{g\,max}$-switch	12 V	DA2	●	●	●	●	●	●	●	DA2	*
		24 V	DA3	●	●	●	●	●	●	●	DA3	*
$p_{St}/p_{HD} = 8/100$,	hydraulic valve for travel direction		DA4	●	●	●	●	●	●	●	DA4	*
	electrical valve for travel direction + electrical $V_{g\,max}$-switch	12 V	DA5	●	●	●	●	●	●	●	DA5	*
		24 V	DA6	●	●	●	●	●	●	●	DA6	*

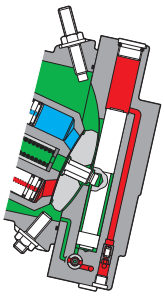
Pressure control (only for HD, EP)	28	55	80	107	140	160	200	
without pressure control (no code)	●	●	●	●	●	●	●	
Pressure control, direct control	●	●	●	●	●	●	●	D
direct control, with 2nd pressure setting	●	●	●	●	●	●	●	E
remote control	–	–	–	–	–	–	–	G

Override of HA-control (only for HA1, HA2)			28	55	80	107	140	160	200	
without override (no code)			●	●	●	●	●	●	●	
Hydraulic override			●	●	●	●	●	●	●	T
Electrical override	control voltage	12 V	●	●	●	●	●	●	●	U1
		24 V	●	●	●	●	●	●	●	U2
Electrical override + el. valve for travel direction	control voltage	12 V	●	●	●	●	●	●	●	R1
		24 V	●	●	●	●	●	●	●	R2

* Differential pis



○ Synchronizing pi



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Hinweis / Inhalt
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HINWEIS

Bezeichnungen, Beschreibungen und Darstellungen entsprechen dem Informationsstand zum Zeitpunkt der Drucklegung dieser Unterlage.

Änderungen können den Service am Produkt beeinflussen, Verpflichtungen entstehen uns daraus nicht.

Methoden und Vorrichtungen sind Empfehlungen, für deren Resultat wir keine Haftung übernehmen können.

BRUENINGHAUS HYDROMATIK-Baugruppen, mit Angabe der Fabrik-Nr. bestellt, sind die Basis guter Reparaturen.

Einstell- und Prüfarbeiten sind bei Betriebstemperatur auf dem Teststand vorzunehmen.

Schutz von Personen und Eigentum ist durch Vorkehrungen sicherzustellen.

Sachkenntnis, die Voraussetzung für jede Service-arbeit, vermitteln wir in unseren Schulungskursen.

NOTICE

Specifications, descriptions and illustrative material shown here in were as accurate as known at the time this publication was approved for printing.

BRUENINGHAUS HYDROMATIK reserves the right to discontinue models or options at any time or to change specifications, materials, or design without notice and without incurring obligation.

Optional equipment and accessories may add cost to the basic unit, and some options are available only in combination with certain models or other options.

For the available combinations refer to the relevant data sheet for the basic unit and the desired option.

Adjustment and tests have to be carried out on the test bench under operating temperatures.

Protection of personnel and property has to be guar-anteed by appropriate measures.

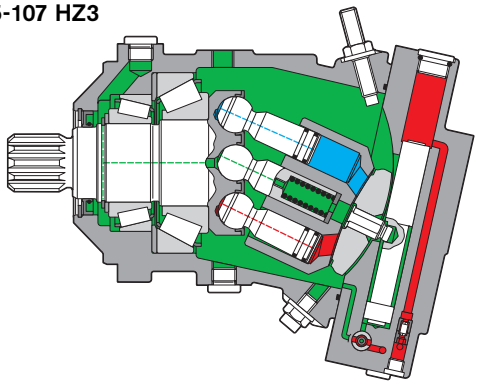
Expert knowledge, the precondition of any service work, can be obtained in our training courses.

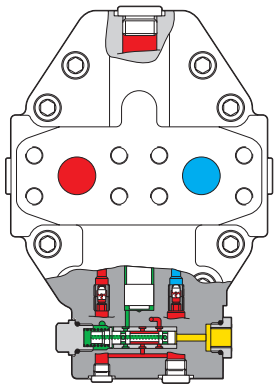
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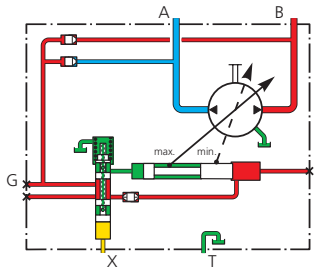
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Schnittbild
Sectional drawing

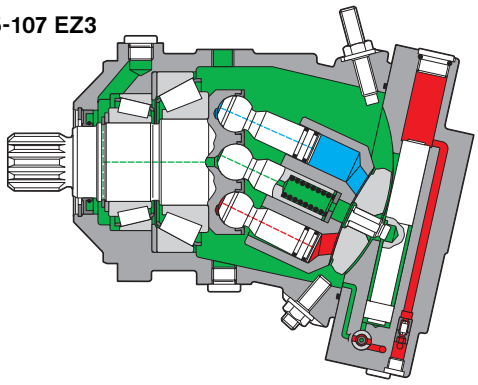
A6VM 55-107 HZ3

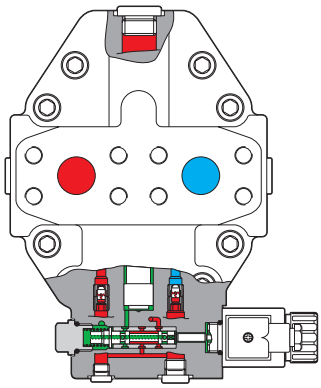


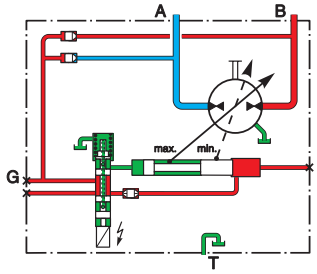




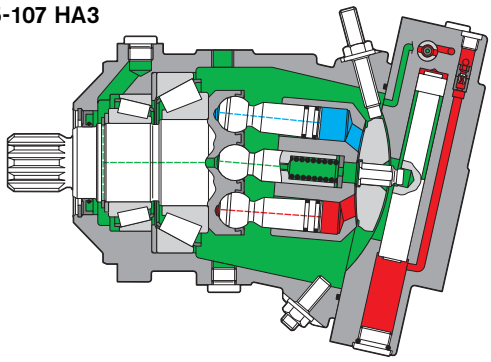
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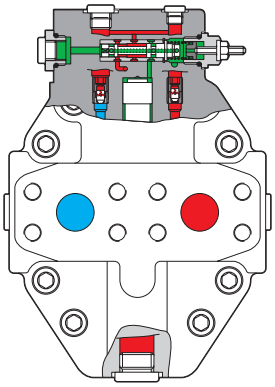


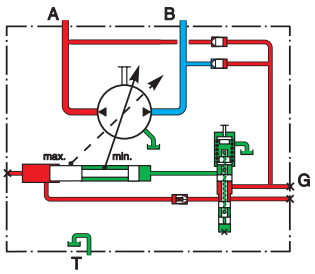




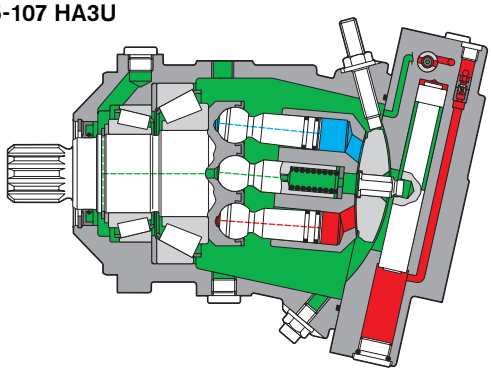
A6VM 55-107 HA3

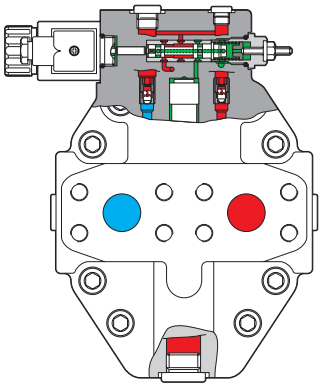


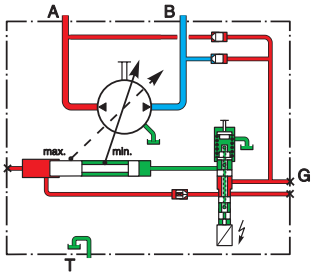




A6VM 55-107 HA3U



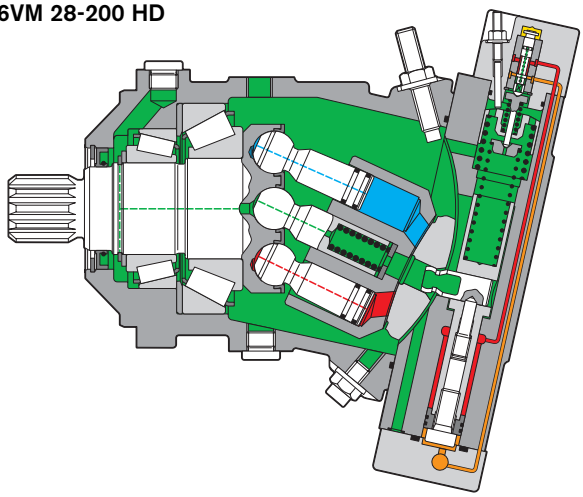


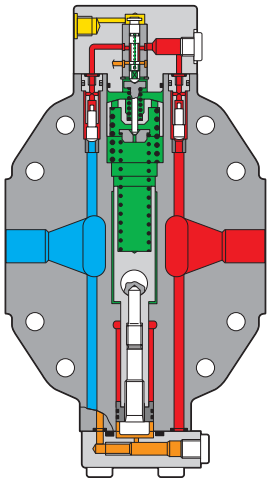


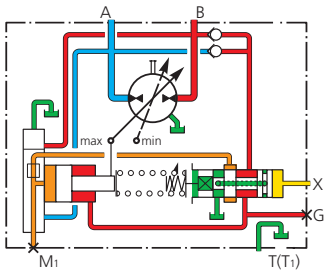
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Schnittbild
Sectional drawing

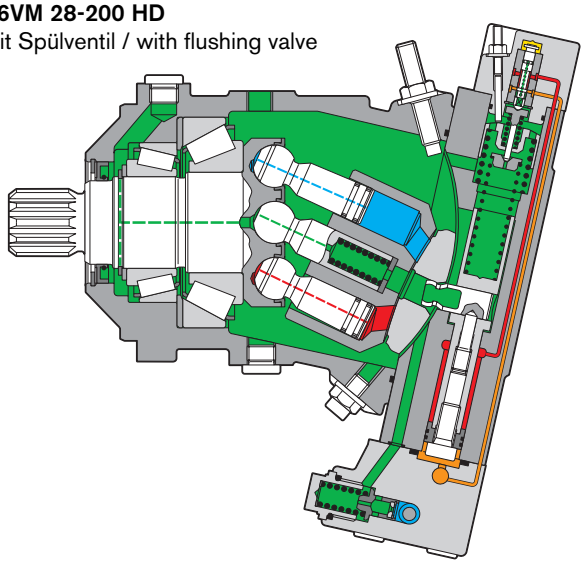
A6VM 28-200 HD

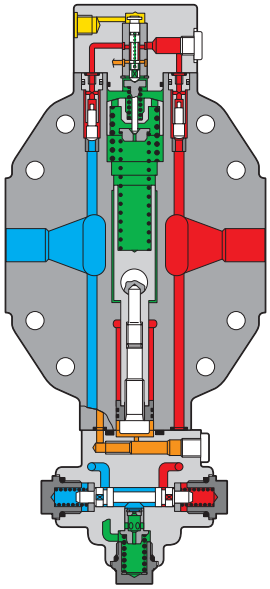


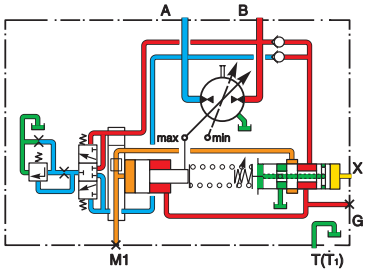




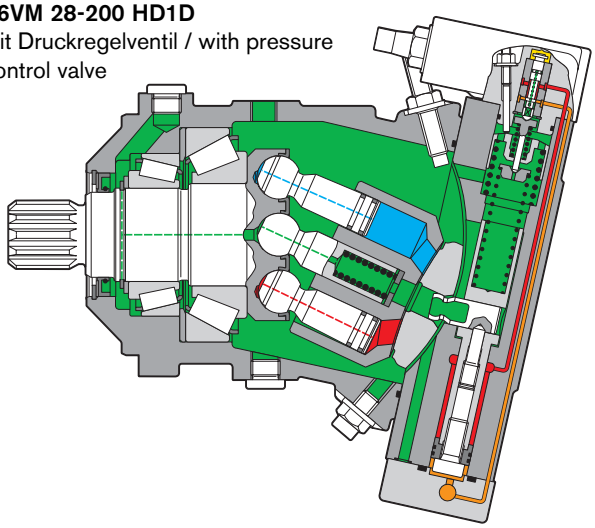
A6VM 28-200 HD
mit Spülventil / with flushing valve

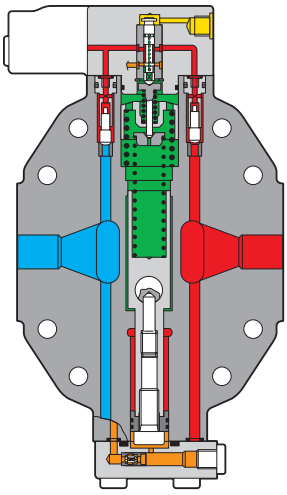


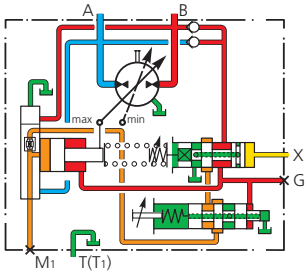




A6VM 28-200 HD1D
mit Druckregelventil / with pressure control valve



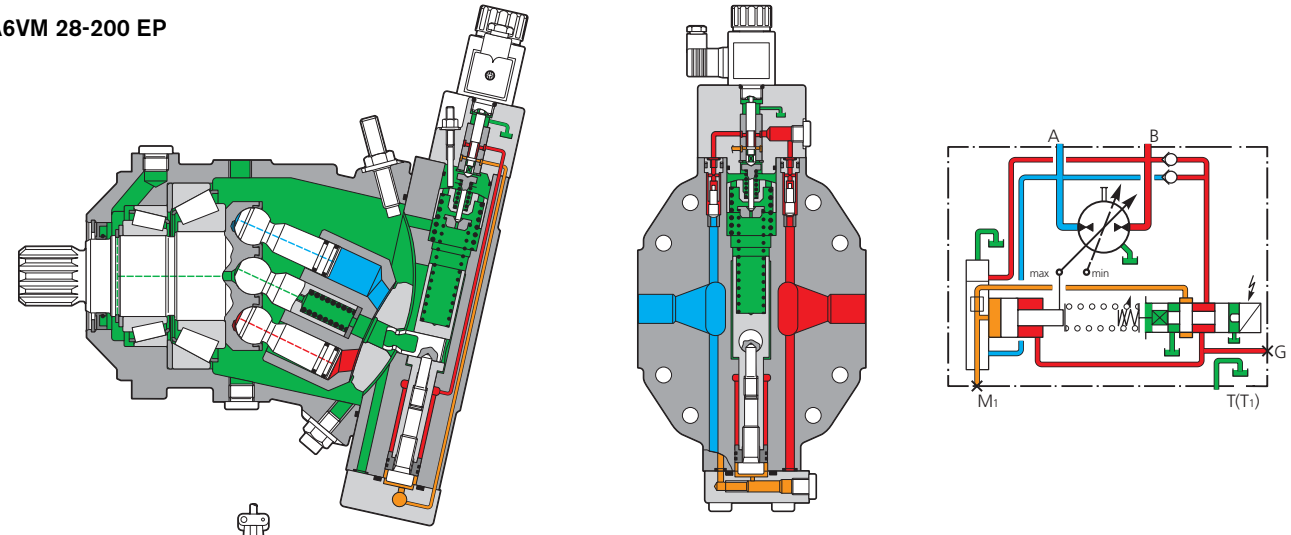




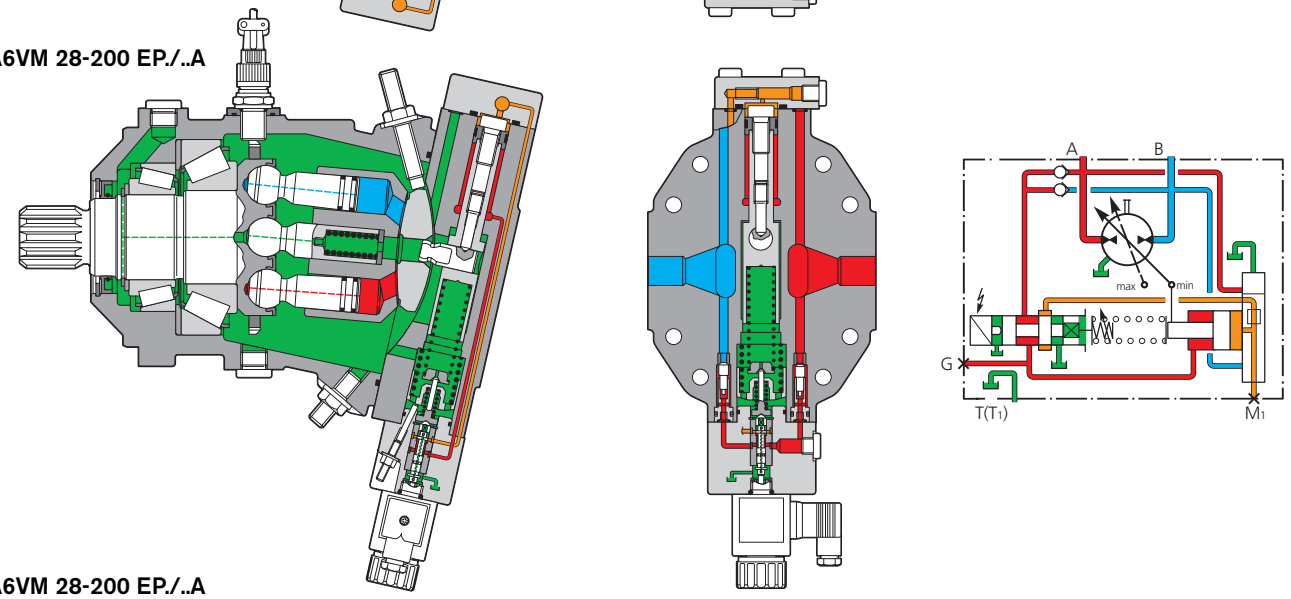
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Schnittbild
Sectional drawing

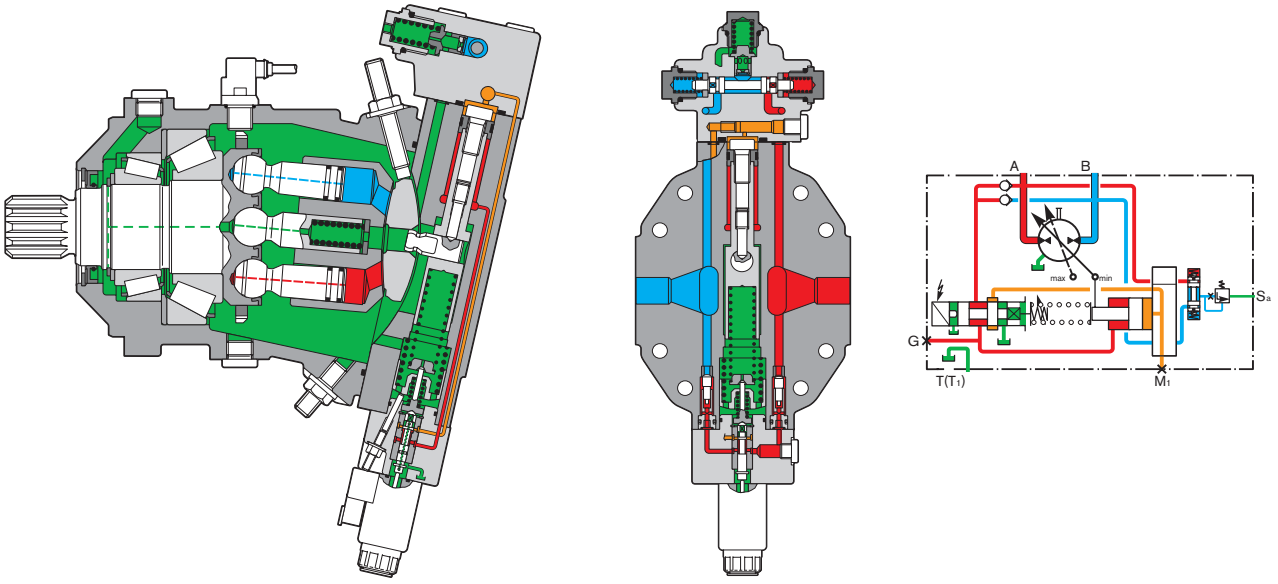
A6VM 28-200 EP



A6VM 28-200 EP./..A



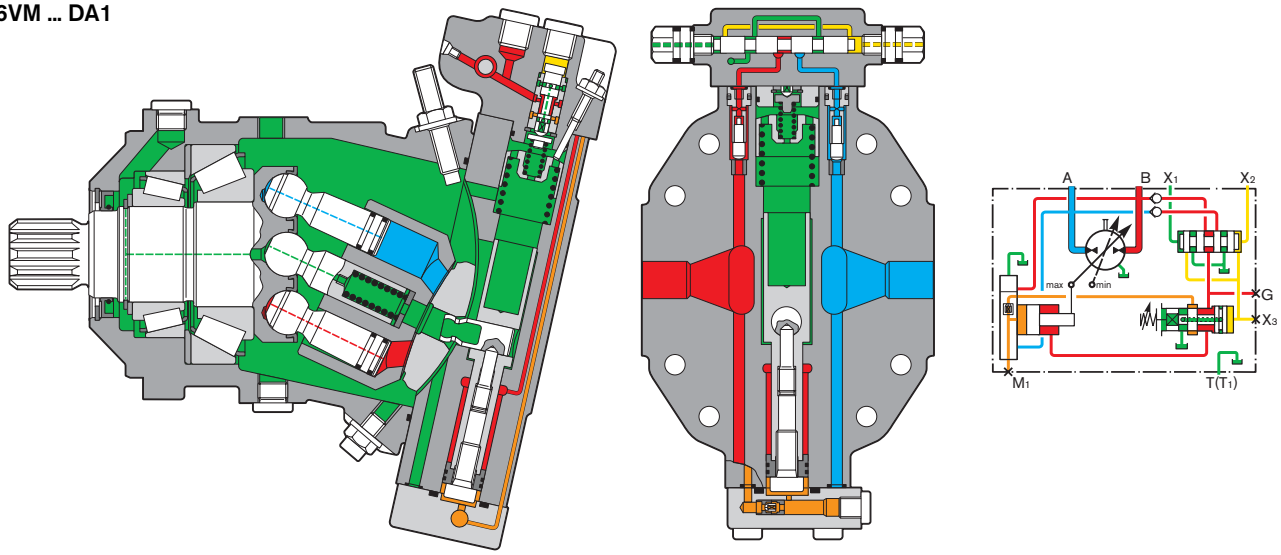
A6VM 28-200 EP./..A



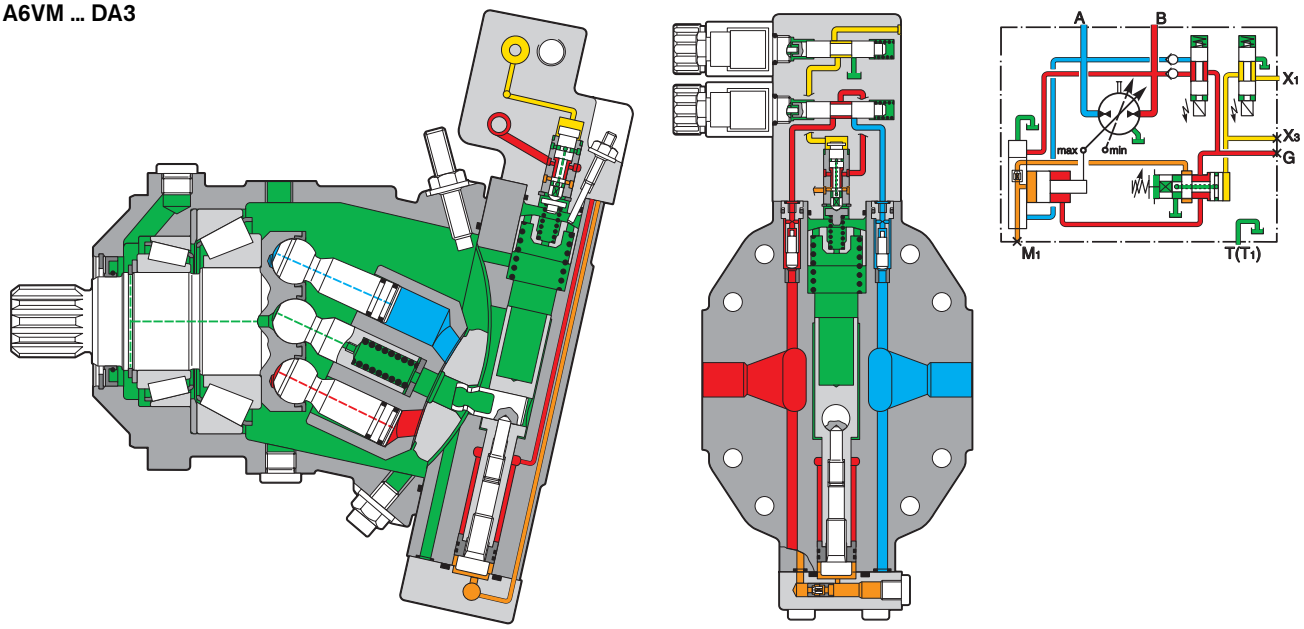
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Schnittbild
Sectional drawing

A6VM ... DA1



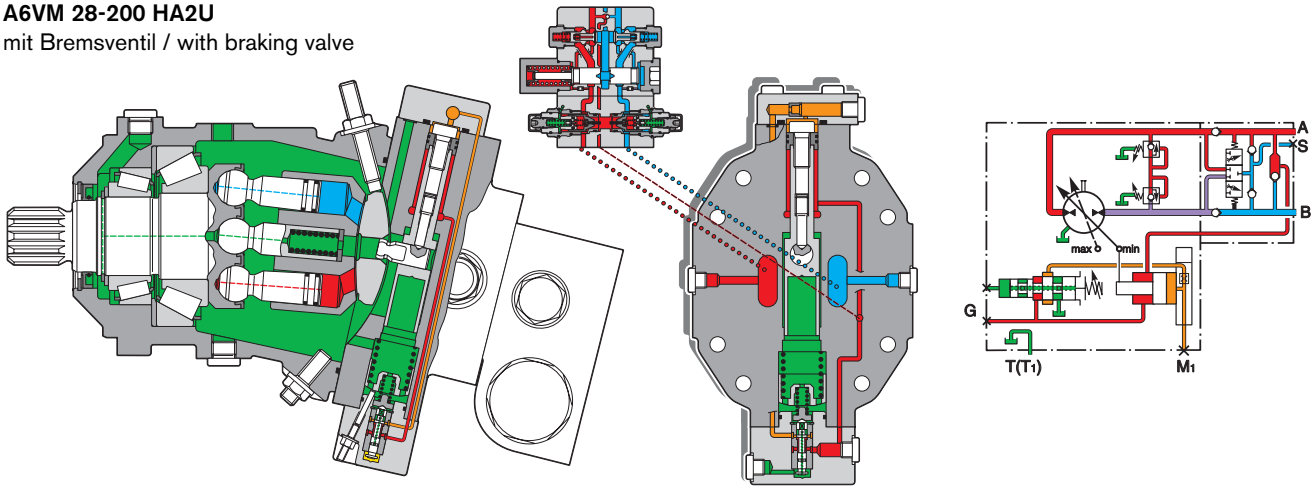
A6VM ... DA3



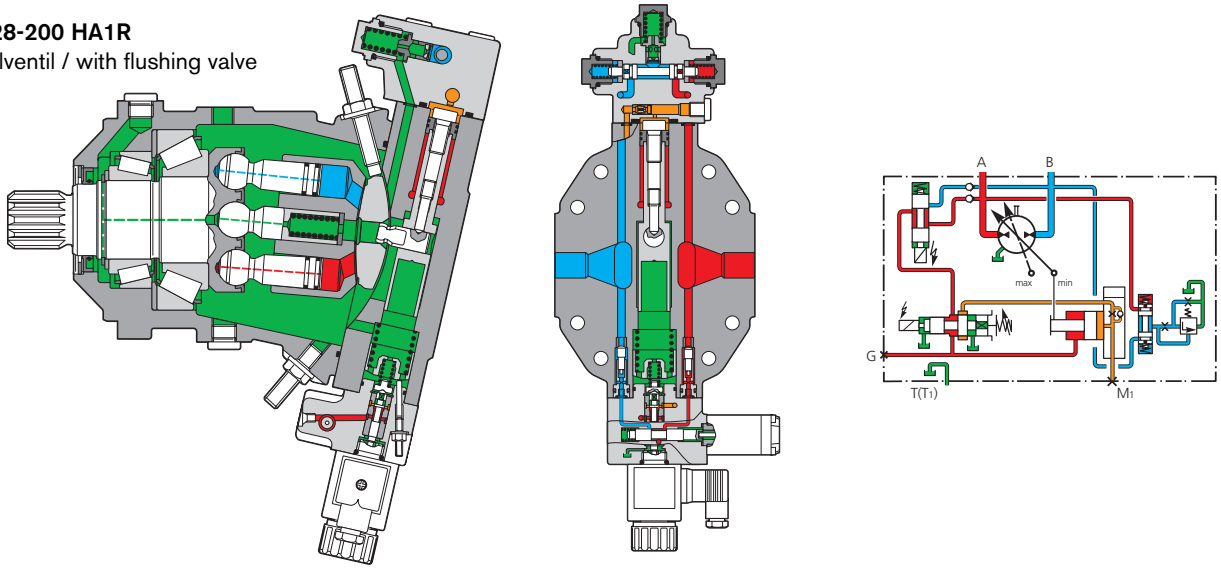
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Schnittbild
Sectional drawing

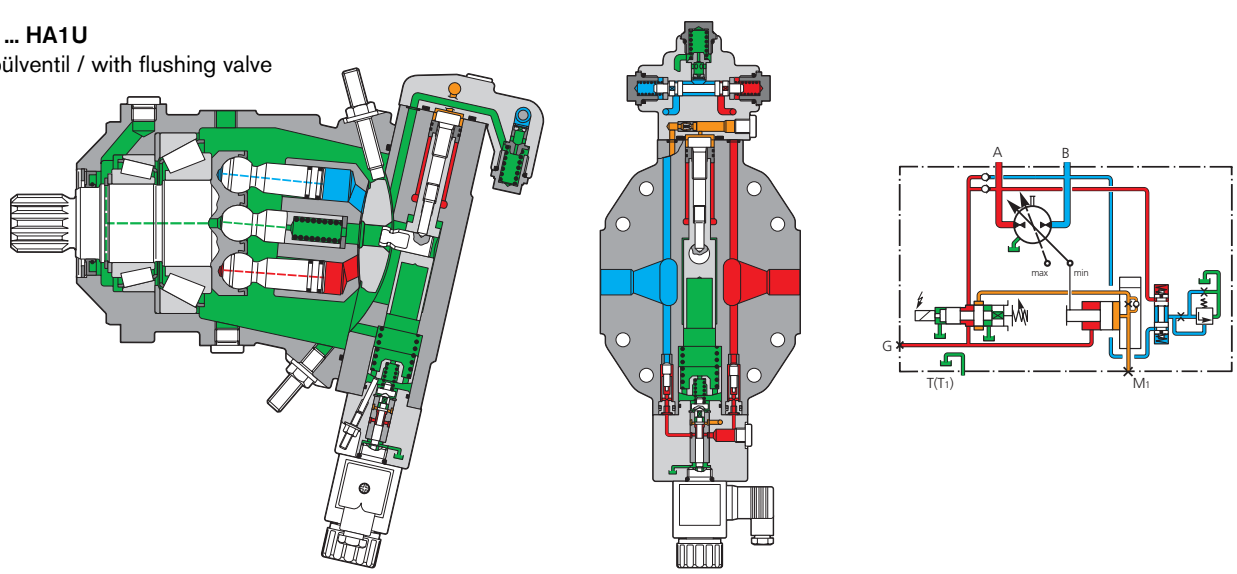
A6VM 28-200 HA2U
mit Bremsventil / with braking valve



A6VM 28-200 HA1R
mit Spülventil / with flushing valve



A6VM ... HA1U
mit Spülventil / with flushing valve



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Allgemeine Reparaturhinweise
General repair instructions

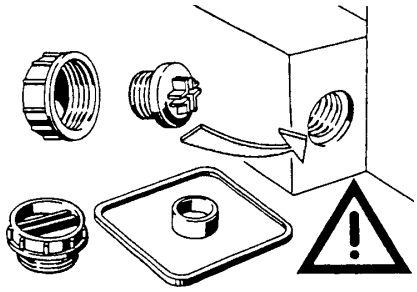


Achtung!

Nachfolgende Hinweise bei allen Reparaturarbeiten an Hydraulikaggregaten beachten!

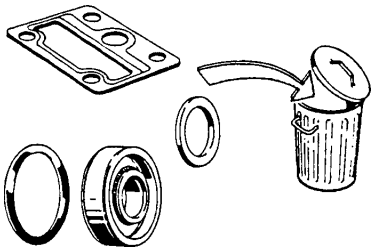
Attention!

Observe the following notices when carrying out repair work at hydraulic aggregates!



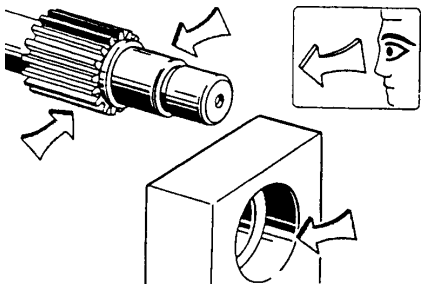
Alle Öffnungen der Hydraulikaggregate verschließen.

Close all ports of the hydraulic aggregates.



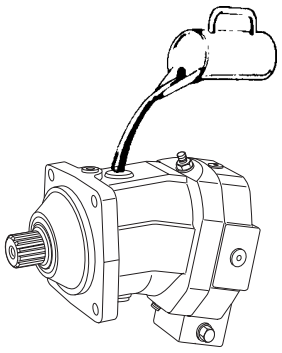
Alle Dichtungen erneuern.
Nur ORIGINAL BRUENINGHAUS HYDROMATIK -Ersatzteile verwenden.

Replace all seals.
Use only ORIGINAL BRUENINGHAUS HYDROMATIK spare parts.



Alle Dicht- und Gleitflächen auf Verschleiß prüfen.
Achtung: Nacharbeiten an Dichtflächen z.B. durch Schleifpapier kann die Oberfläche beschädigen.

Check all seal and sliding surfaces for wear.
Attention: Rework of sealing area f. ex. with abrasive paper can damage surface.

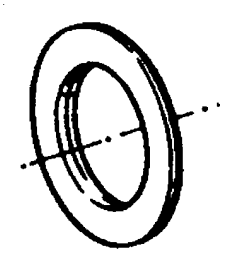


Hydraulikaggregate vor Inbetriebnahme mit Betriebsmedium befüllen.

Fill up hydraulic aggregates with medium before start- up.

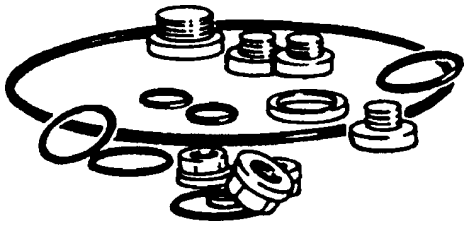
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Dichtsätze und Baugruppen
Seal kits and sub assembly groups



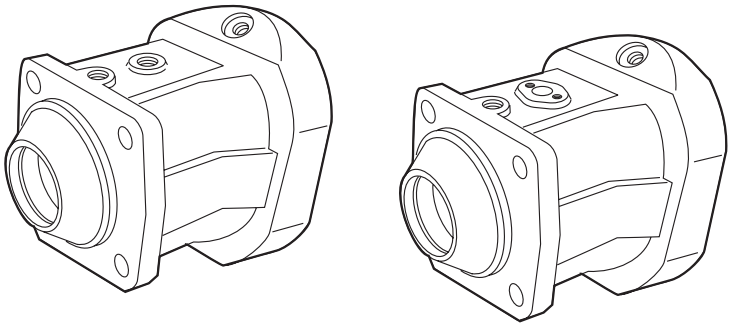
Dichtsatz für Triebwelle.

Seal kit for drive shaft.



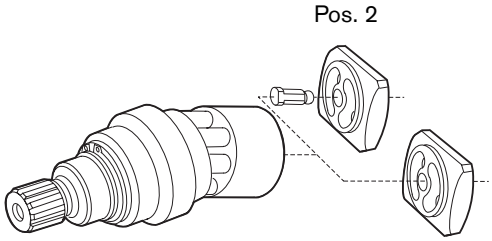
Äußerer Dichtsatz.

External seal kit.



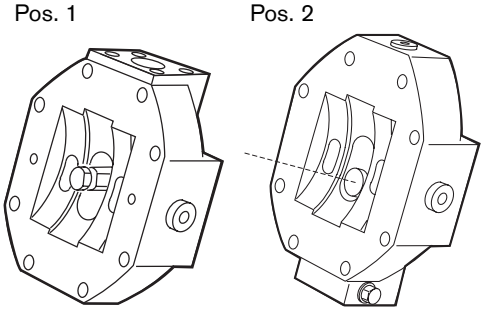
Gehäuse

Housing



Triebwerk komplett
Hinweis: Pos. 1 - Für Anschlußplatte mit Differentialkolben
Pos. 2 - Für Anschlußplatte mit Gleichgangkolben

Complete rotary group
Note: Pos. 1 - For port plate with differential piston
Pos. 2 - For port plate with synchronizing piston

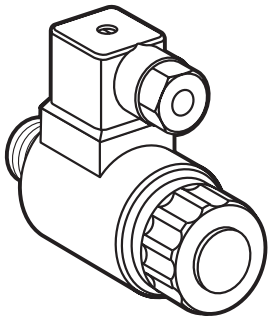


Anschlußplatte mit Stellkolben
Hinweis: Pos. 1 - Für Anschlußplatte mit Differentialkolben
Pos. 2 - Für Anschlußplatte mit Gleichgangkolben

Port plate with control piston
Note: Pos. 1 - For port plate with differential piston
Pos. 2 - For port plate with synchronizing piston

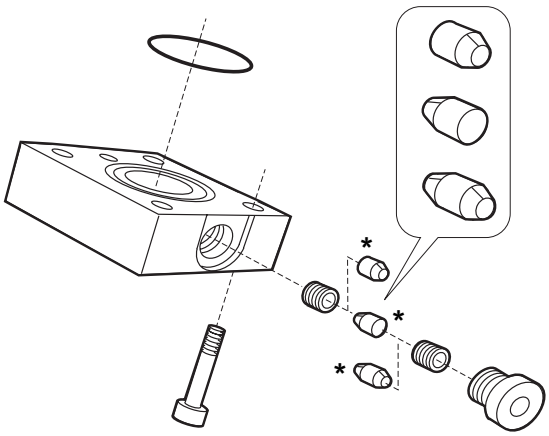
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Dichtsätze und Baugruppen
Seal kits and sub assembly groups



Schaltmagnet / Proportionalmagnet

Solenoid

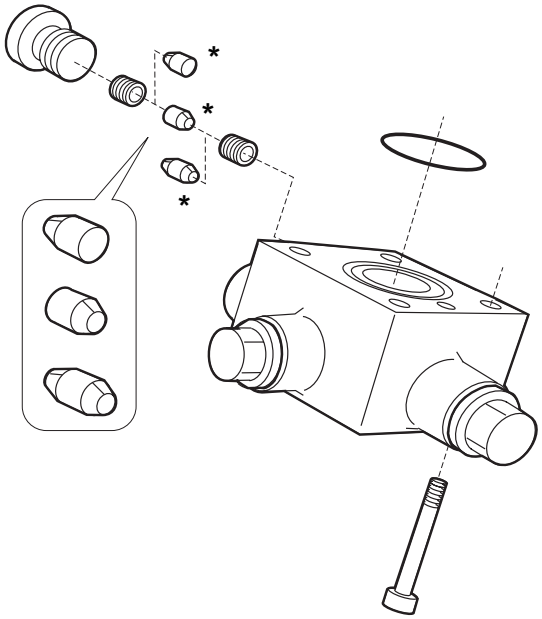


Deckel mit * Drosselstift.

* Drosselstift "Auftragsbezogen".

Cover with * throttle pin.

* Throttle pin "as to order requirement".



Deckel mit Spül- und Speisedruckventil und * Drosselstift

* Drosselstift "Auftragsbezogen".

Cover with flushing and boost pressure valve and * throttle pin.

* Throttle pin "as to order requirement".

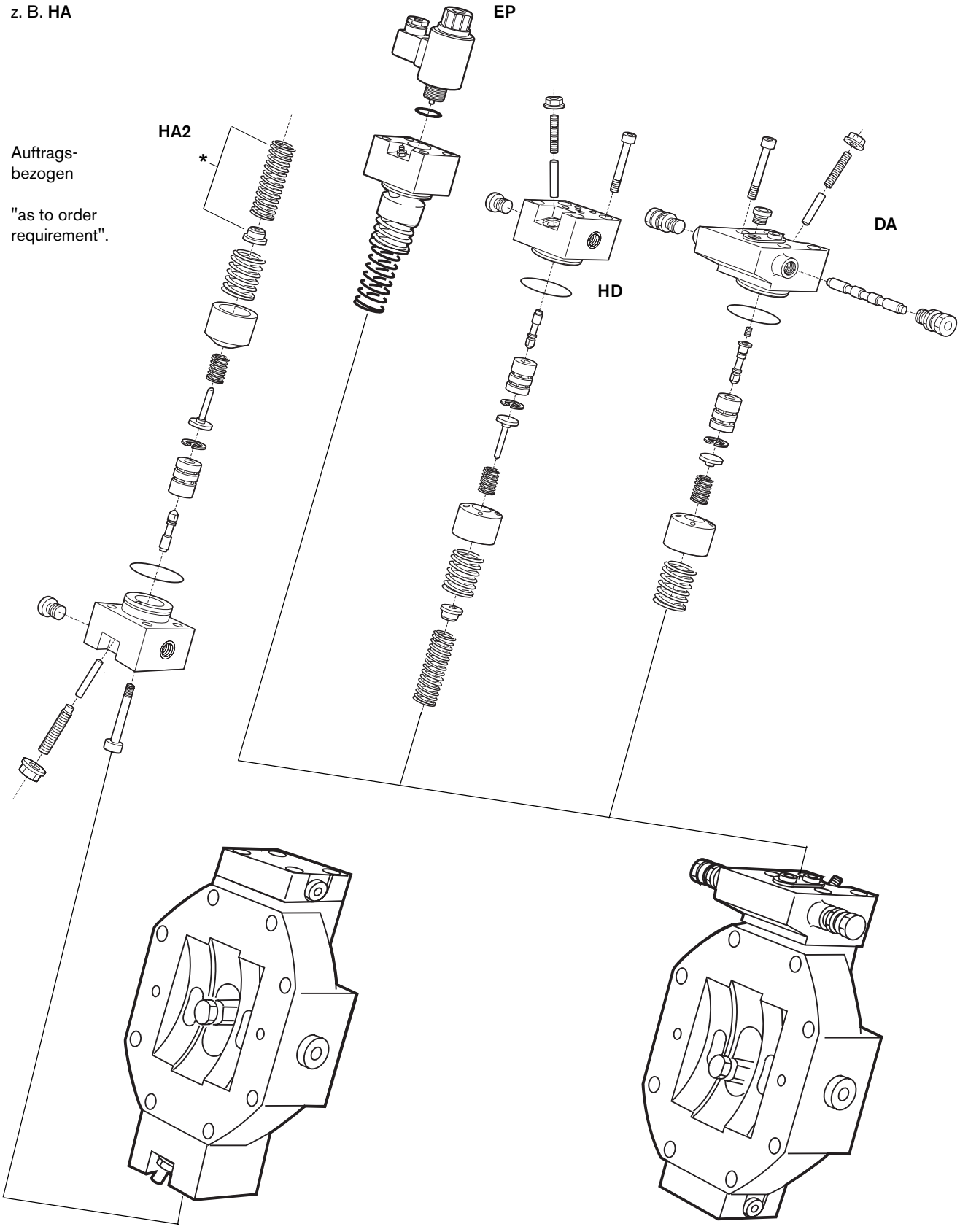
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Baugruppen / Steuerteile
Component groups / Control components

z. B. **HA**

Auftrags-
bezogen

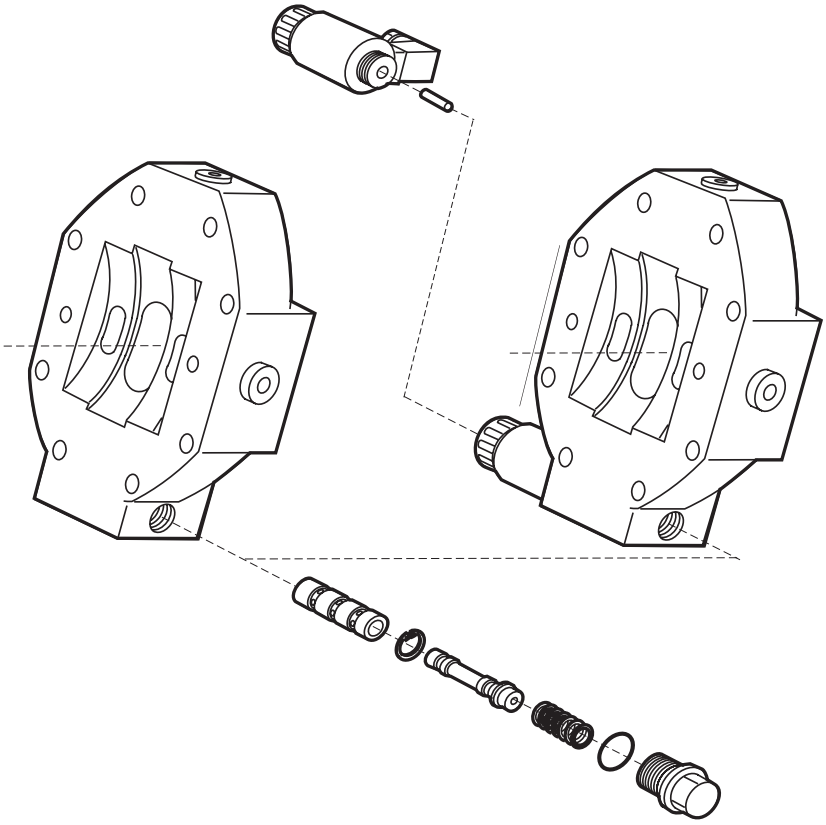
"as to order
requirement".



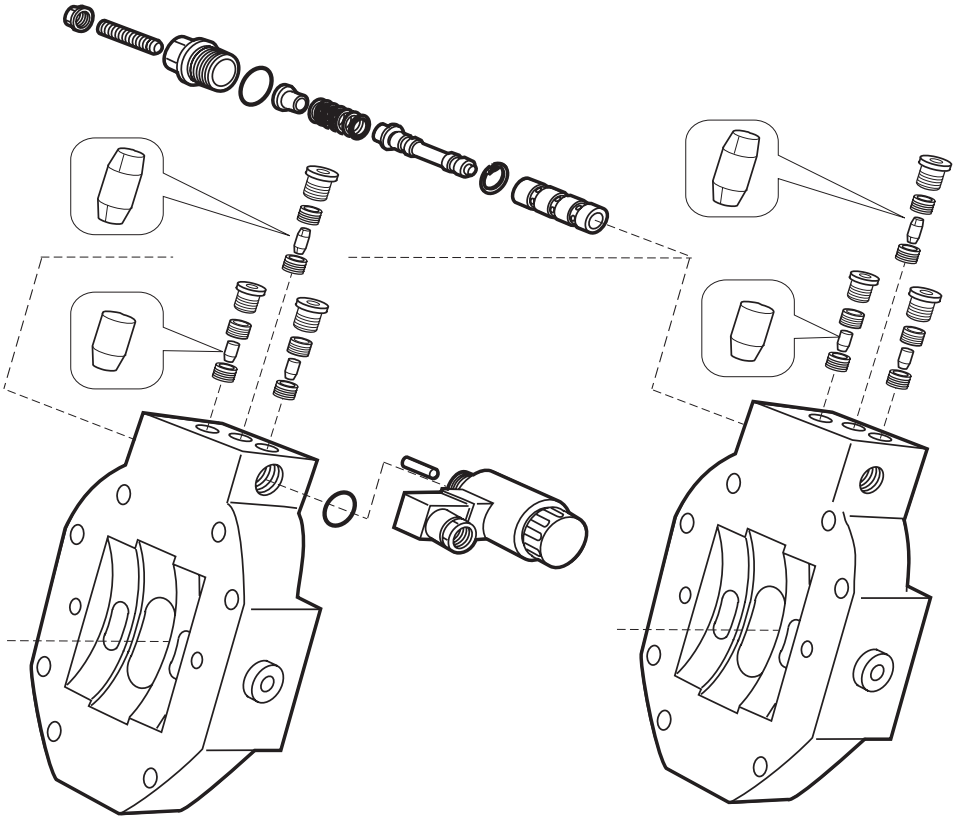
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Baugruppen / Steuerteile
Component groups / Control components

z. B. **HZ3 / EZ3**

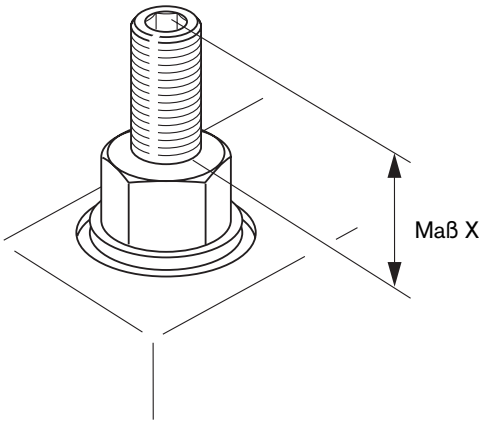


HA3 / HA3U



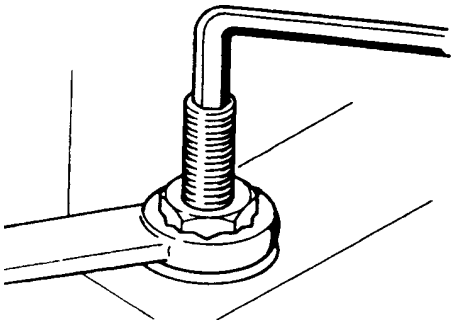
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Dichtmutter austauschen
Replace seal nut



Dichtmutter austauschen.
Zuerst Maß X messen und festhalten.

Replace seal nut.
First measure and record setting height.

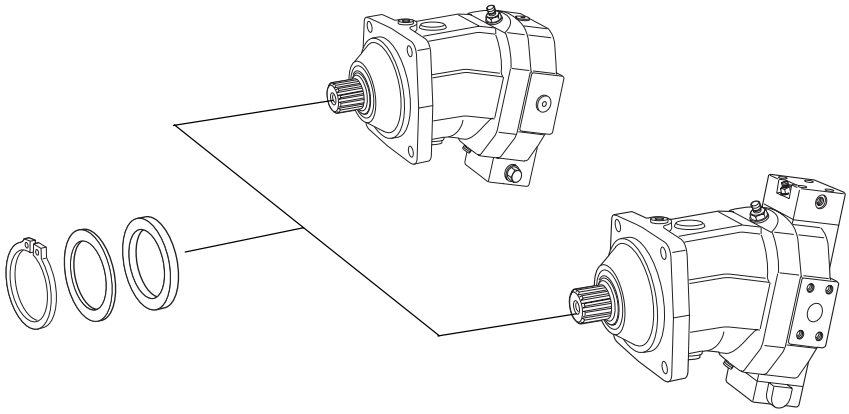


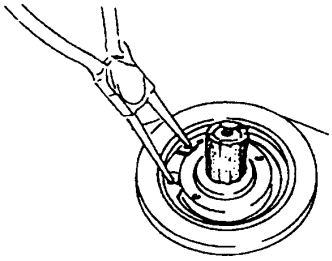
Beim Anziehen Einstellschraube gegenhalten, anschließend Einstellhöhe kontrollieren.

When tightening, counterhold setting screw, then check setting height.

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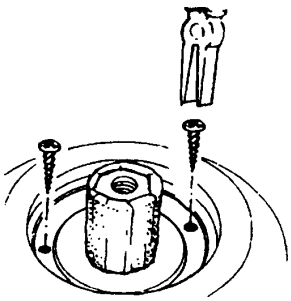
Triebwelle abdichten
Sealing of the drive shaft





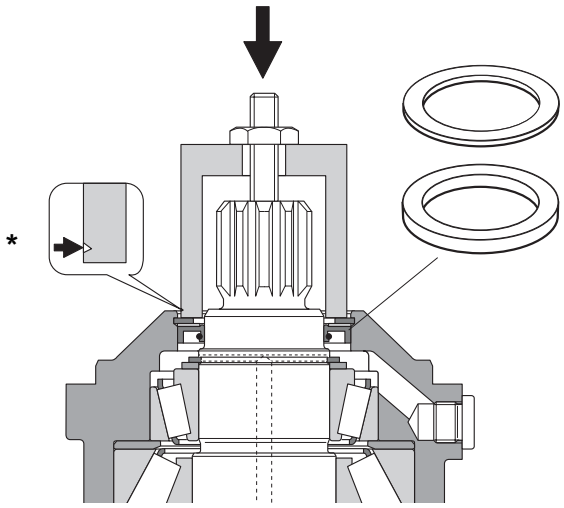
Triebwelle abkleben.
Sicherungsring und Scheibe ausbauen.

Protecting the drive shaft.
Remove retaining ring and shim.



Blechschraube in die mit Gummi gefüllten Löcher eindrehen.
Mit Zange WDR herausziehen.

Screw in sheet metal screw into the holes fitted with rubber.
Pull out seal with pliers.

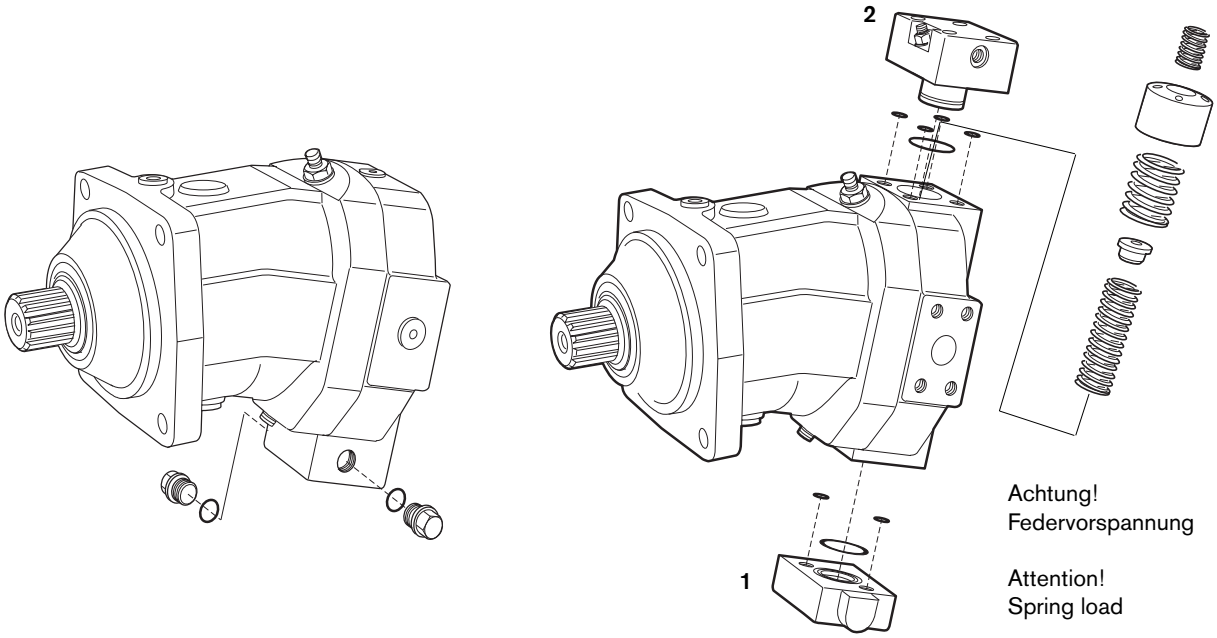


Wellendichtring und Scheibe mit Montagehülse einpressen.
Zwischen Dicht- und Staublippe, Wellendichtring leicht einfetten
⚠ Einpresstiefe beachten! * Marke für Einpresstiefe.
Sicherungsring einbauen.

Press in shaft seal ring and shim with bush to stop.
Take note of press-in depth!
Lightly grease the seal, dust lips and shaft seal ring.
⚠ Install * mark for press-in depth of safety ring.

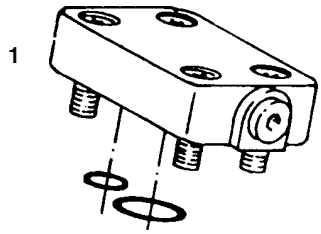
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Steuerteile abdichten
Sealing of the control parts



Achtung!
Federvorspannung

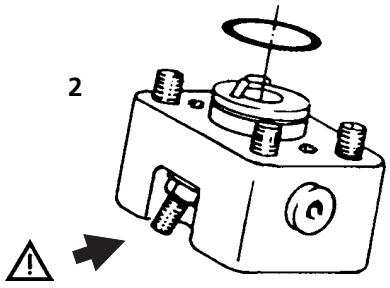
Attention!
Spring load



1. Deckel / Cover
2. Steuerteil / Control part

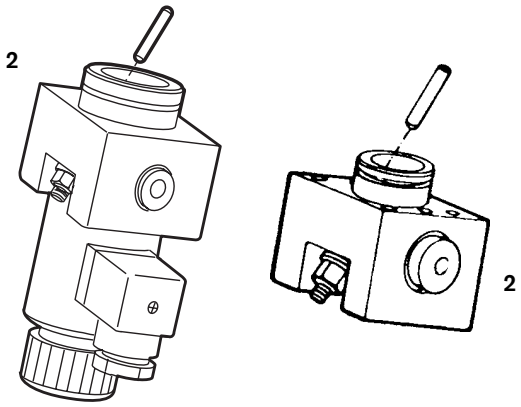
Kontrolle
Bohrung im Gehäuse, O-Ring, Nut.

Inspect
Drilling in housing, O-ring, groove.



Einstellschraube nicht ausbauen.
Kontrolle
O-Ring, O-Ring-Nut, Gehäuse

Do not remove adjustment screw.
Inspect
O-ring, O-ring groove, housing

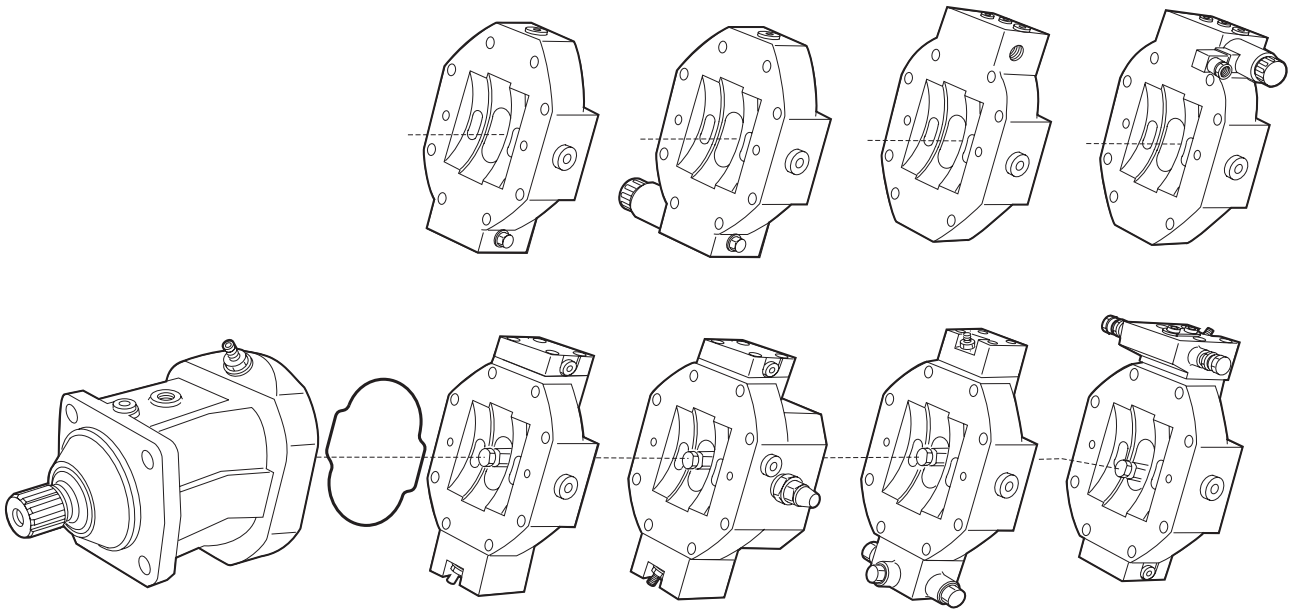


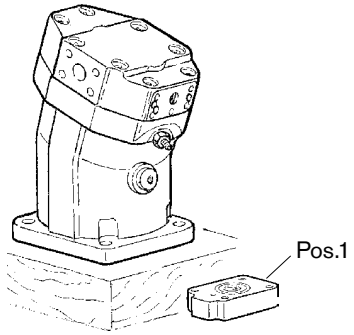
Montagehilfe
Stift mit Fett einkleben.

Assembly aid
Insert pin with grease.

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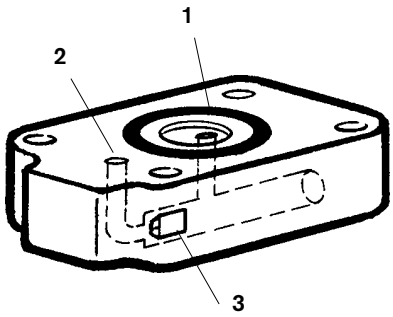
Verstellung abdichten
Sealing the hydraulic control





Beispiel: A6VM ... HD Verstellung
Demontageposition:
Deckel Pos. 1 abbauen.

Example: A6VM ... HD control
Disassembly position:
Remove cover pos. 1

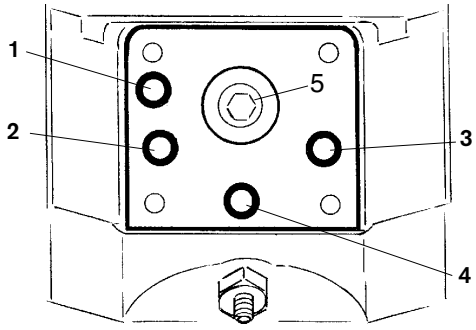


1. O-Ring
2. Stellölzulauf
3. Drosselstift

⚠ Einbaulage je nach Steuerteil verschieden.

1. O-ring
2. Input flow of oil control
3. Throttle pin

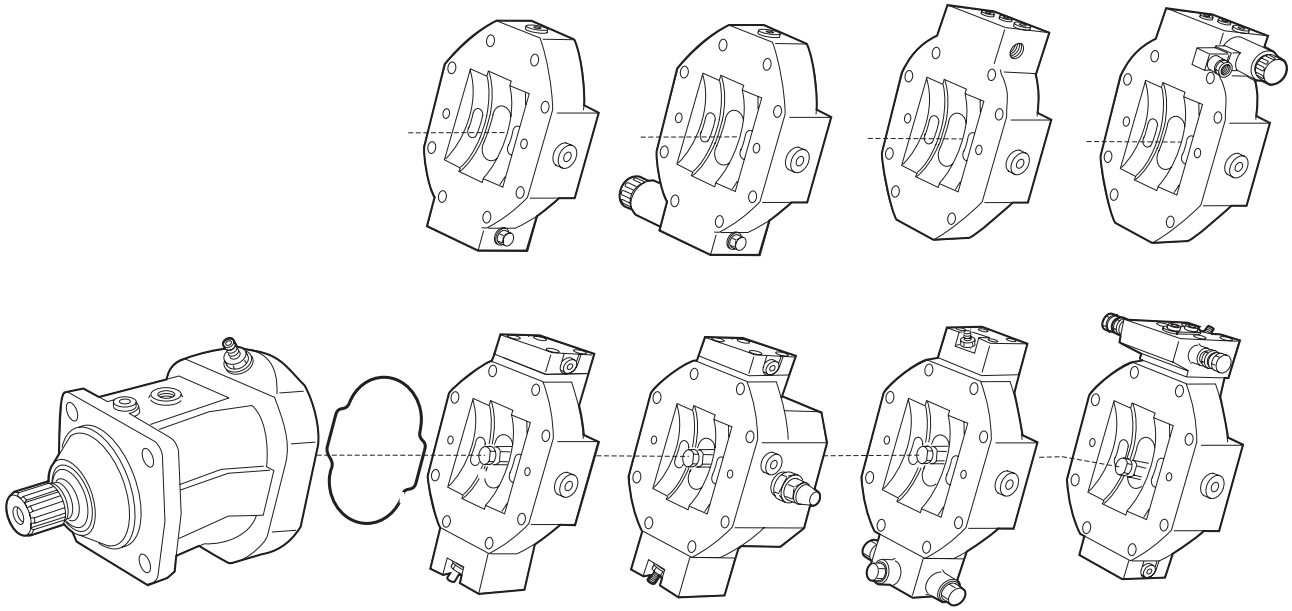
⚠ Installation position differs according to the control components

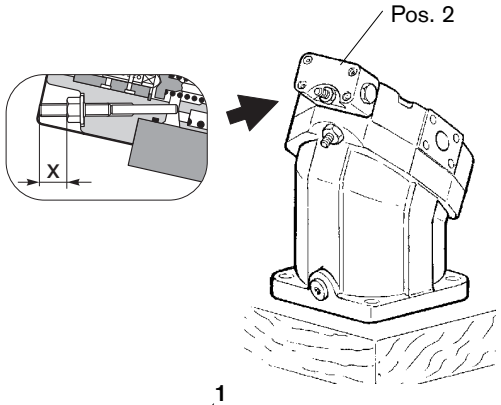


1. Stellölzulauf / Input flow of oil control
2. Hochdruck bzw. Niederdruck / High pressure / low pressure
3. Hochdruck bzw. Niederdruck / High pressure / low pressure
4. Lecköl / Leckage oil
5. Stellkolben / Control piston

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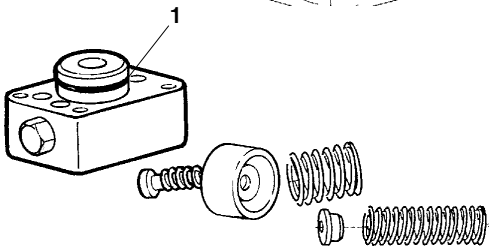
Verstellung abdichten
Sealing the hydraulic control





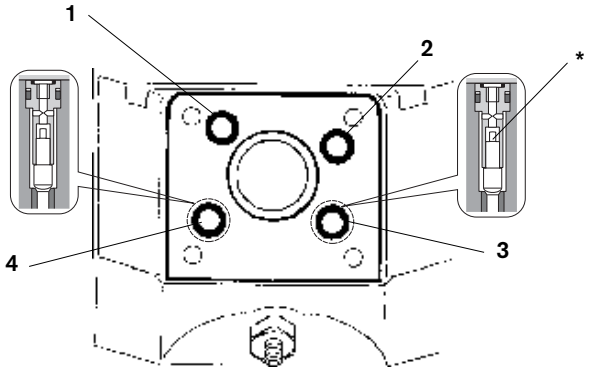
Beispiel: A6VM ... Verstellung - **Differentialkolben**
Demontageposition: Deckel Pos. 2 abbauen.
⚠ Achtung! Federvorspannung.
Maß x: Maß festhalten (Regelbeginn).

Example: A6VM... control - **differential piston**
Disassembly position: Remove cover pos. 2.
⚠ Attention! Spring load.
Dimension x: Note dimension (begin of regulation).



1. O-Ring Kontrolle

1. Check of O-ring

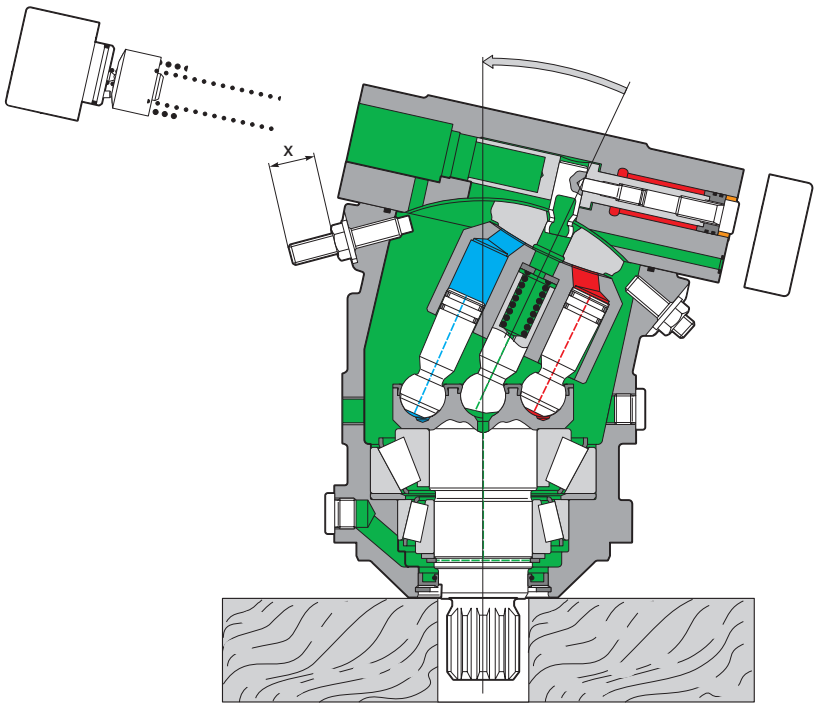


1. Hochdruck - kleine Stellkolbenseite
2. Stelldruck
3. Hochdruck - Rückschlagventil
4. Hochdruck - Rückschlagventil
* siehe Serviceinfo

1. High pressure - small control piston side
2. Control pressure
3. High pressure - check valve
4. High pressure - check valve
* see serviceinfo

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Abschlußplatte demontieren
Disassembly of the port plate



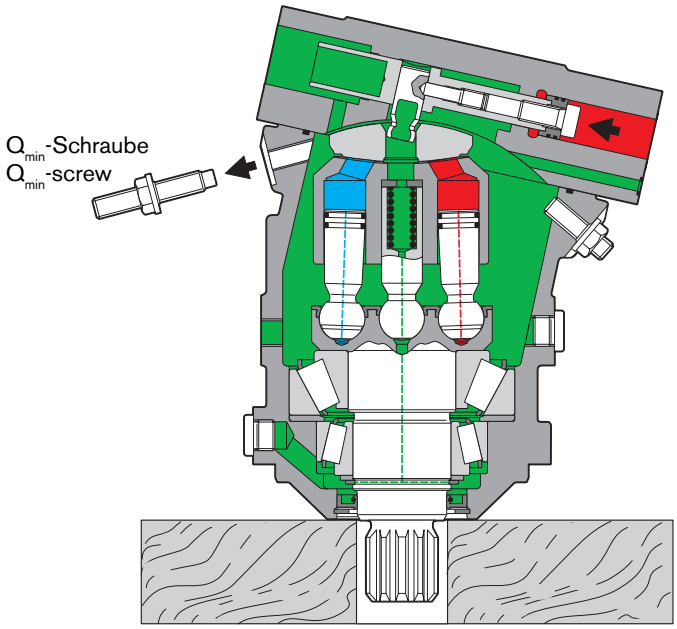
Differentialkolben:
Maß X festhalten.

Differential piston:
Note dimension x

⚠

Bei "Demontage" der Anschlußplatte "Triebwerk" immer auf Null schwenken. Kolbenringe hängen aus der Zylinderbohrung aus.

For disassembly of the port plate, swivel always rotary group to zero position. Piston rings to hang out of the cylinder boring.

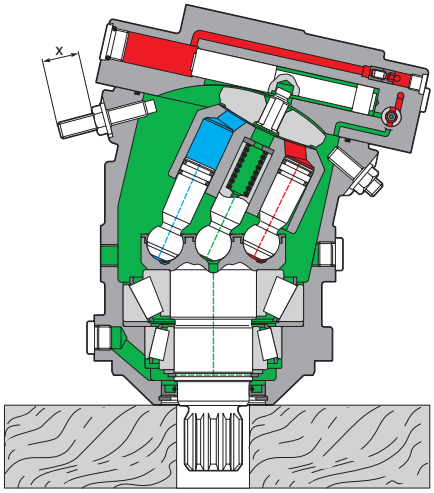


Q_{min}-Schraube ausbauen.
Triebwerk auf 0° schwenken.

Remove Q_{min}-screw.
Swivel rotary group to 0°.

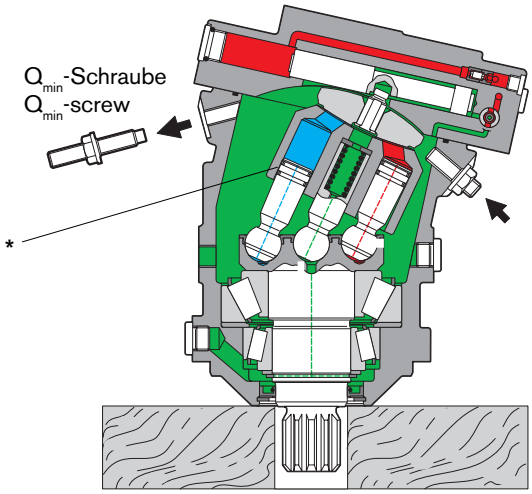
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Abschlußplatte demontieren
Disassembly of the port plate



Gleichgangkolben:
Maß X festhalten.

Synchronizing piston:
Note dimension x.



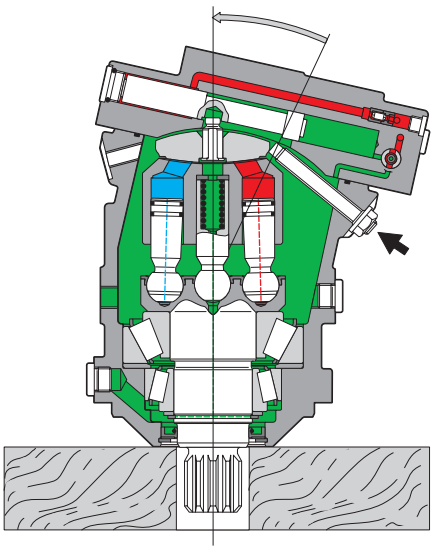
⚠

Bei "Demontage" der Anschlußplatte "Triebwerk" immer auf Null schwenken.
* Kolbenringe hängen sonst aus der Zylinderbohrung aus.

For disassembly of the port plate, swivel always rotary group to zero position.
* Piston rings to hang out of the cylinder boring.

Q$_{min}$-Schraube und Verschlußschraube ausbauen.

Remove Q$_{min}$-screw and plug.

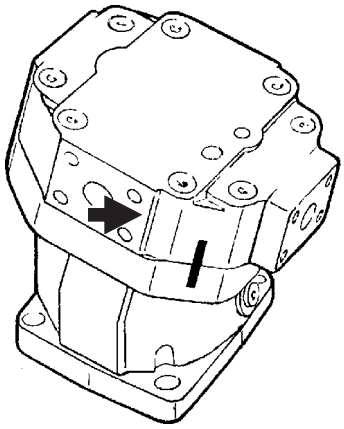


Mit Schraube Q$_{min}$ Triebwerk auf 0° schwenken.

Swivel rotary group to zero position with screw Q$_{min}$
.

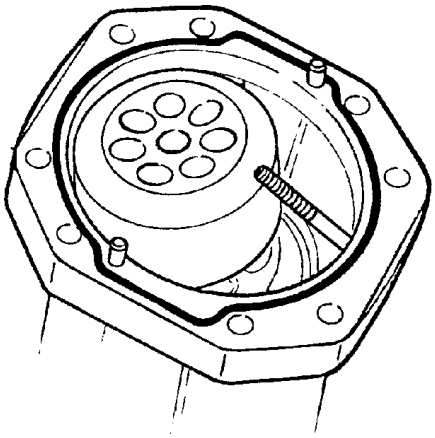
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Abschlußplatte demontieren
Disassembly of the port plate



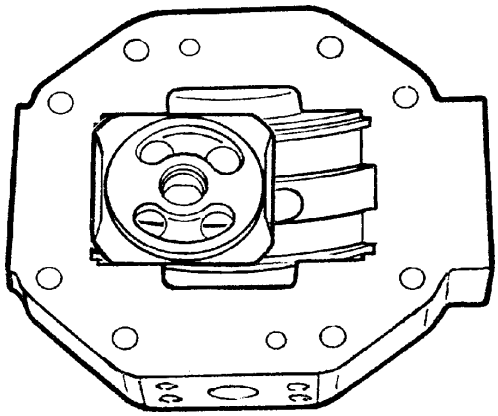
Anschlußplatte
Lage markieren. Schrauben lösen.
Abbauen

Port plate
Mark position. Loosen screws.
Removal



O-Ring austauschen.
⚠ Neuer O-Ring mit etwas Fett einkleben.
Triebwerk nicht ausschwenken.
Kolbenringe hängen aus der Zylinderbohrung aus.

Check O-ring.
⚠ Stick new O-ring with some grease.
Do not swivel rotary group.
Piston rings to hang out from the cylinder boring.



⚠ Steuerlinse in Gleitbahn mit Fett einkleben.
Fertigmontage in umgekehrter Reihenfolge.
Anschlußplatte aufsetzen.
⚠ Triebwerk senkrecht.

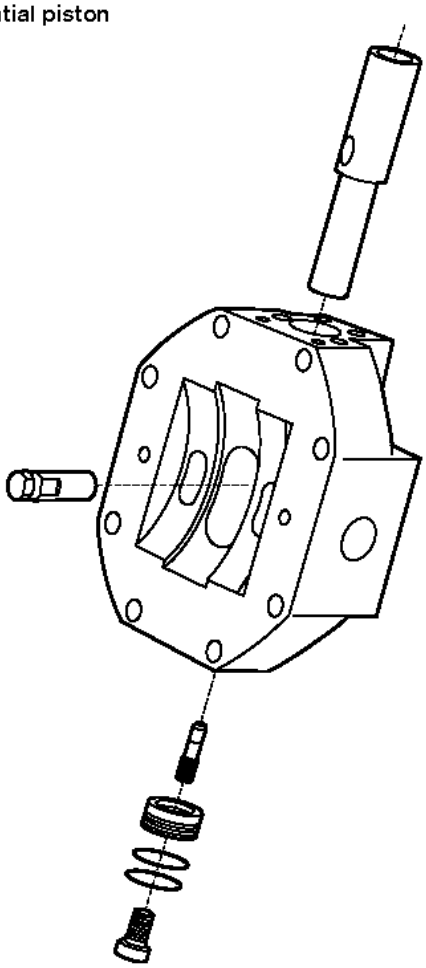
⚠ Stick control lens in sliding surface with grease.
Assembly in reversal order.
Mount port plate.
⚠ Rotary group vertical.

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Stellkolben ausbauen
Remove of the positioning piston

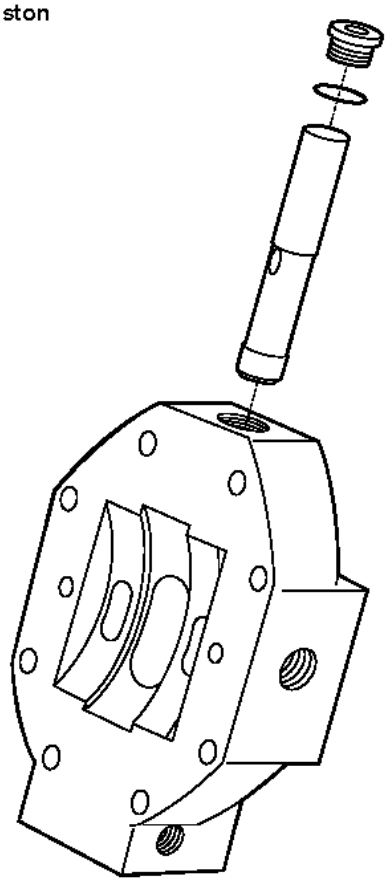
Differentialkolben

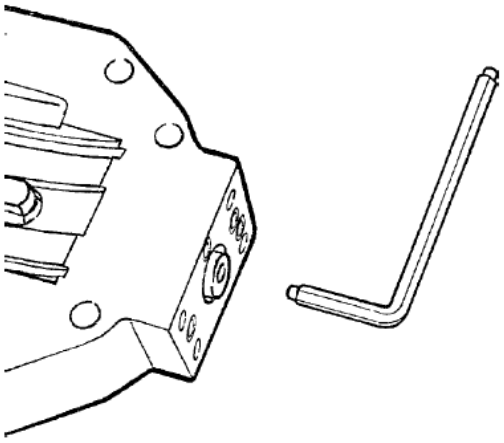
Differential piston



Gleichgangkolben

Synchronizing piston





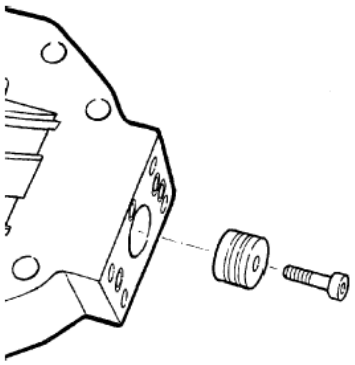
Befestigungsschraube lösen.
Nur Zapfenschlüssel verwenden.

Loosen fixing screw.
Use only socket wrench.

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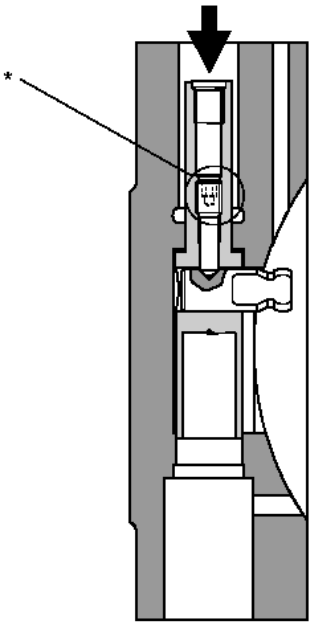
Stellkolben ausbauen

Remove of the positioning piston



Kolben mit Kolbenring ausbauen.

Remove piston with piston ring



Differentialkolben

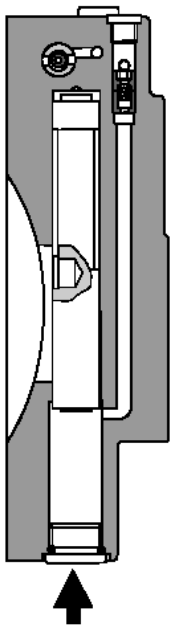
* Befestigungsschraube für Stellzapfen über Bohrung erwärmen. (Schraube geklebt - heraus-drehen)

⚠ Neue Schraube verwenden
Precote Beschichtung
Anziehdrehmomente beachten! (siehe Seite 43).

Differential piston

* Warm up fixation screw for positioning plug via boring (screw glued - to turn out).

⚠ Use new screw.
Precote coating.
Note tightening torque! (see page 43).



Gleichgangkolben

Schraube ausbauen.
Kolben ausbauen.

⚠ Einbaulage beachten.

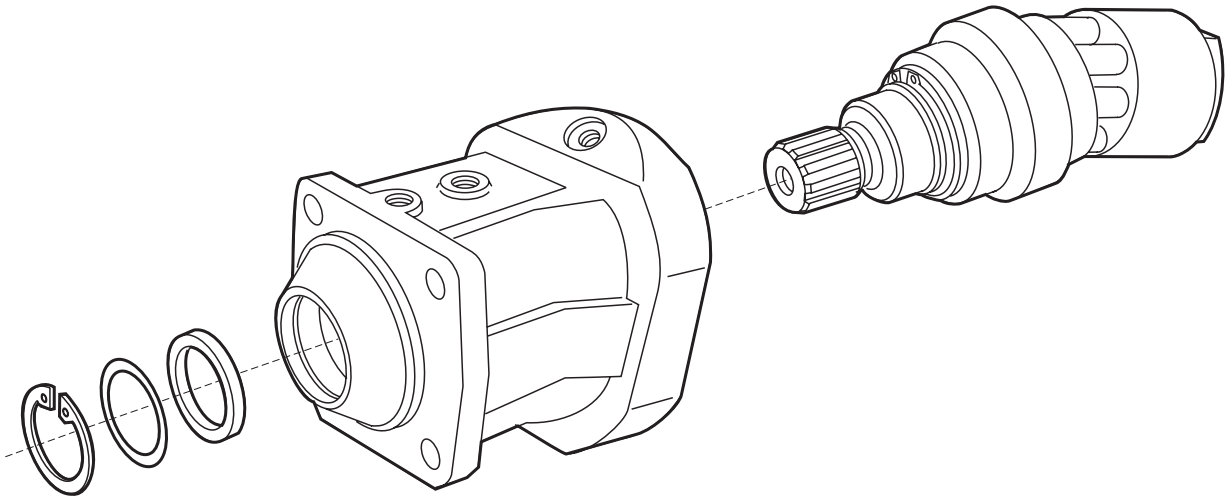
Synchronizing piston

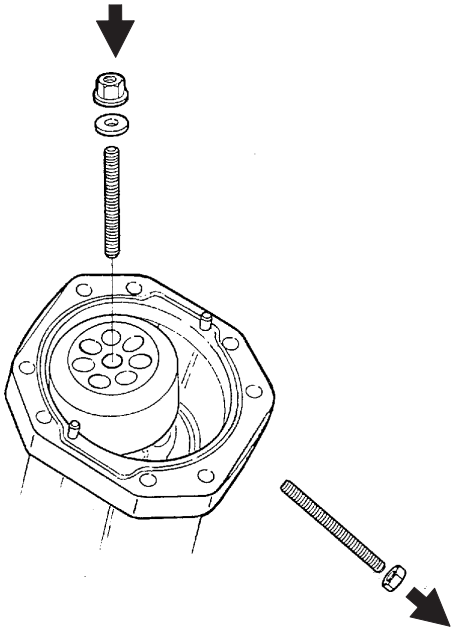
Remove screw.
Remove piston.

⚠ Note installation position.

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Triebwerk ausbauen
Remove rotary group

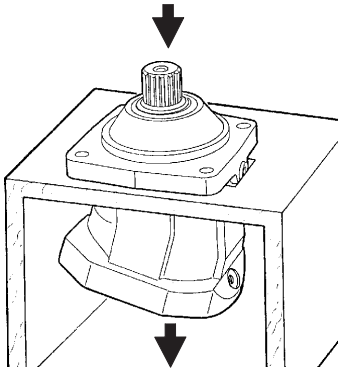




Gewindestift in Mittelzapfen einschrauben,
mit Schutzscheibe und Mutter Zylinder befestigen.
Q_{max} - Anschlagschraube ausbauen.

Screw in threaded pin into center pin.
Fix the cylinder with disc and locknut.
Remove Q_{max} -stop screw.

Nenngröße / Size	28 :	M4 x 60 mm
	55 :	M5 x 80 mm
	80 :	M6 x 90 mm
	107 :	M6 x 100 mm
	140 :	M8 x 110 mm
	160 :	M8 x 110 mm
	200 :	M8 x 110 mm

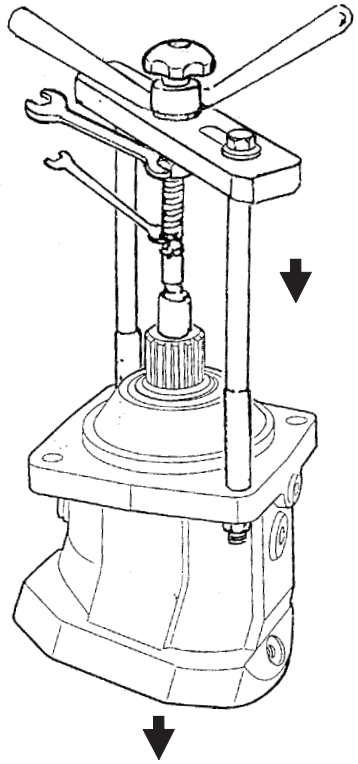


⚠ Triebwerk auspressen!
Bei Wiederverwendung der Lager nicht schlagen.

⚠ Press out rotary group!
If the bearings are used again do not hit on the drive shaft.

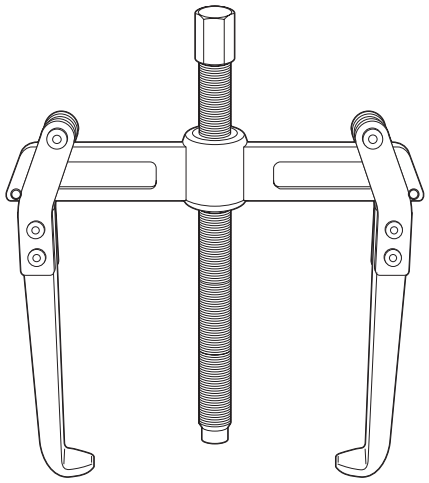
https://truckmanualshub.com/

Triebwerk ausbauen
Remove rotary group



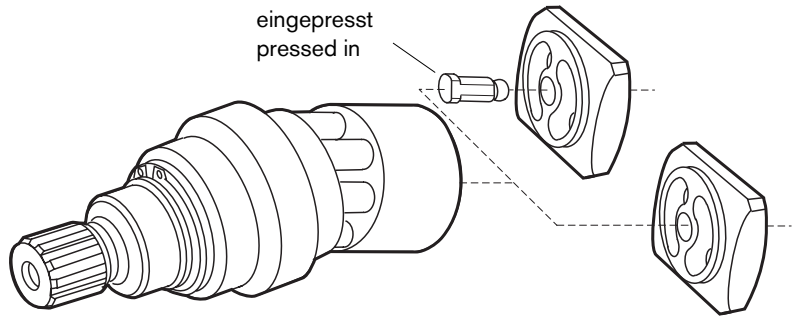
Oder mit Abziehvorrichtung ausdrücken.

Or press-out with extraction device.



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Triebwerk austauschen
Exchanging of the rotary group

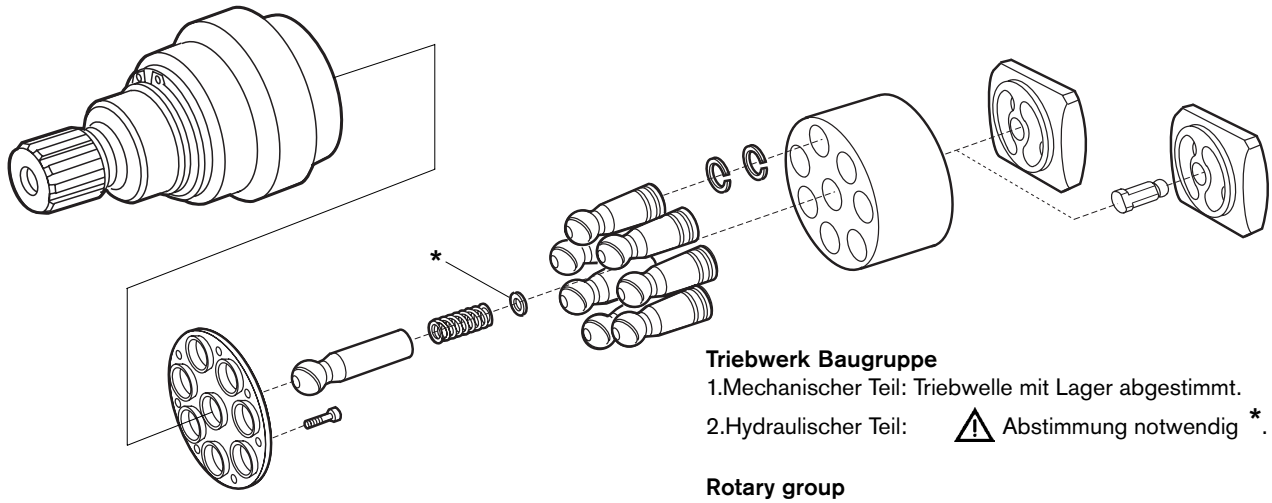


Triebwerk komplett

⚠ Abstimmung hydraulischer Teil notwendig.

Complete rotary group

⚠ Setting of hydraulic part necessary.



Triebwerk Baugruppe

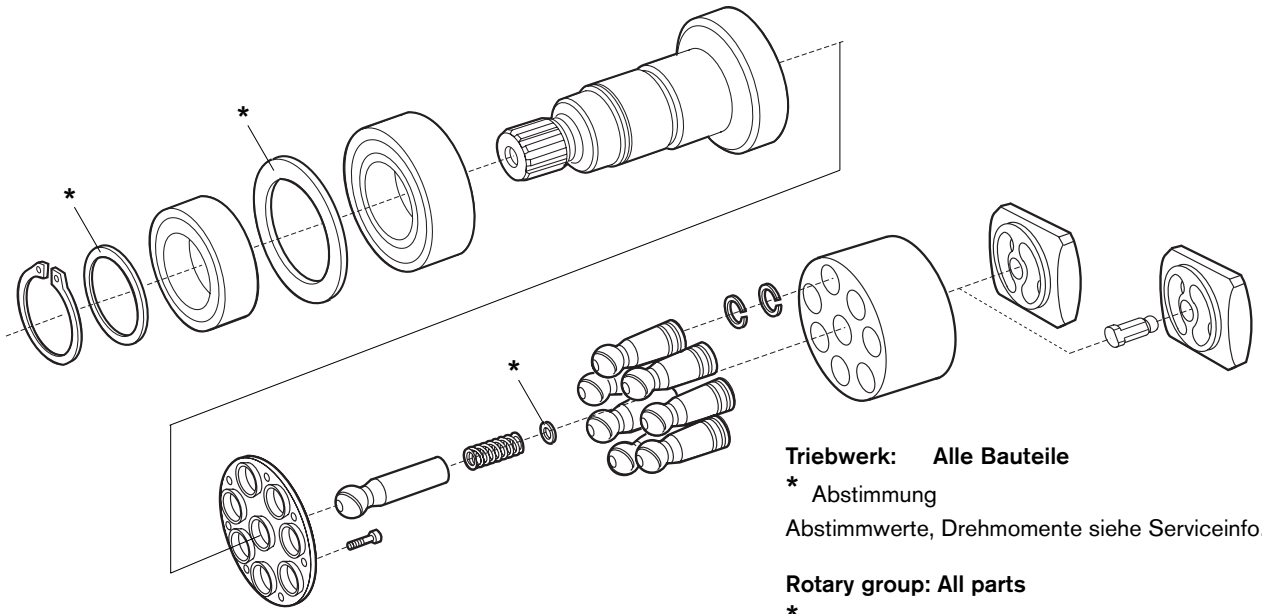
1.Mechanischer Teil: Triebwelle mit Lager abgestimmt.

2.Hydraulischer Teil: ⚠ Abstimmung notwendig *.

Rotary group

1. Mechanical part: Adjust drive shaft with bearing.

2. Hydraulic part: ⚠ Adjustment necessary *.



Triebwerk: Alle Bauteile

* Abstimmung

Abstimmwerte, Drehmomente siehe Serviceinfo.

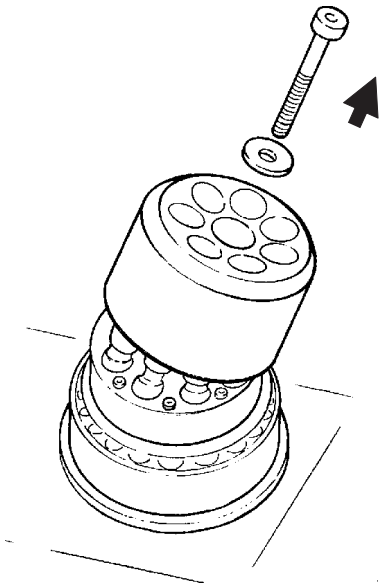
Rotary group: All parts

* Setting

Setting value, torque see service information.

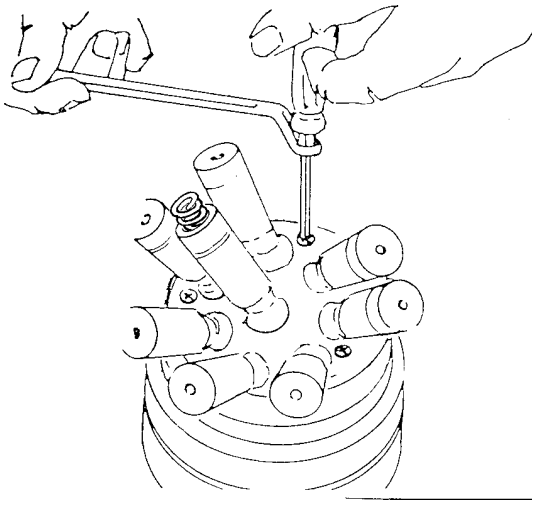
https://truckmanualshub.com/

Triebwerk austauschen
Exchanging of the rotary group



Befestigungsschraube (Zylinder) ausbauen.
Zylinder abheben.

Remove fixing screw (cylinder).
Remove cylinder.

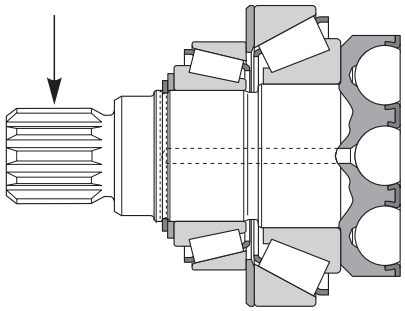


⚠ Rückzugplatte demontieren.
Schrauben sind eingeklebt. Nach Erwärmen auf max 120° C mit Torx-Werkzeug demontieren.

⚠ Disassemble retaining plate.
Screws are glued. Warm it up to max. 120° C and remove with Torx-tools.

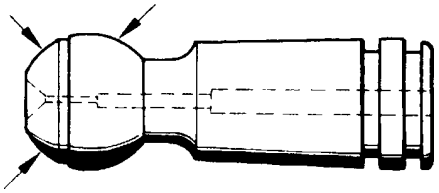
https://truckmanualshub.com/

Überprüfungshinweise
Inspection notes



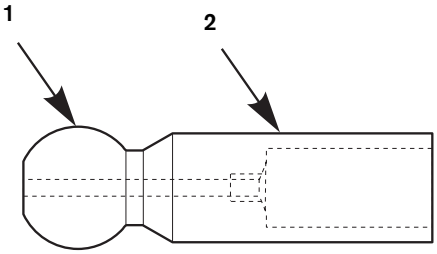
Kein Passungsrost, nicht ausgeschlagen.

Free of corrosion, erosion or fretting;
no damage to splines or keyways.



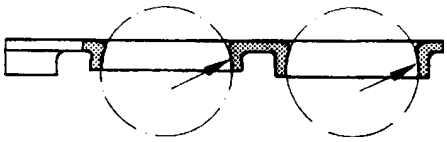
Kolben
Riefenfrei und keine Pittings.

Pistons
No scoring and no pittings.



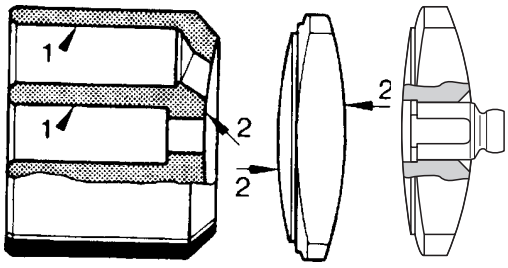
Mittelzapfen
Riefenfrei und keine Pittings.

Center pin
No scoring and no pittings.



Rückzugplatte
Riefenfrei und keine Ausbrüche.

Retaining plate
No scoring and no evidence of wear



Zylinder / Steuerlinse

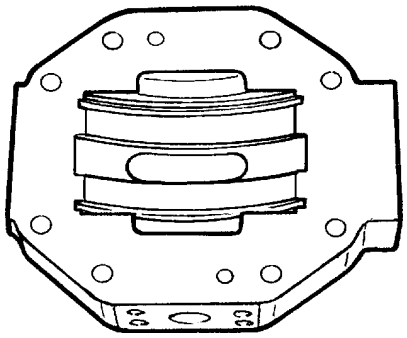
1 Bohrungen riefenfrei, nicht ausgelaufen.
2 Gleichmäßiges Tragbild, riß- und riefenfrei.

Cylinder block / control lens

1 Bores free of scoring, no evidence of wear.
2 Faces smooth and even, free of cracks and scoring.

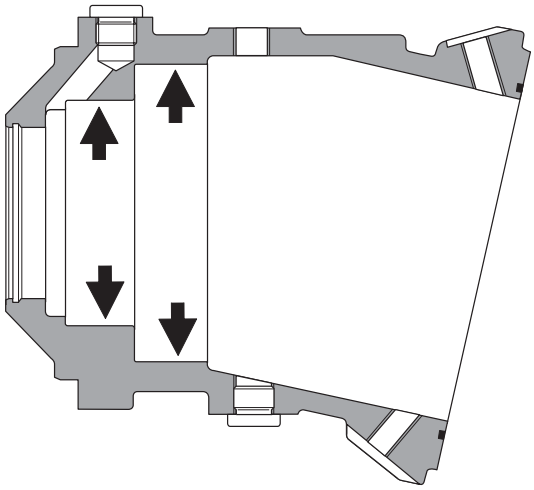
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Überprüfungshinweise
Inspection notes



Reglergehäuse
Gleitbahn und Seitenführung riefenfrei, nicht ausgelaufen.

Control housing
Sliding surface and side guides free of scoring and no wear.



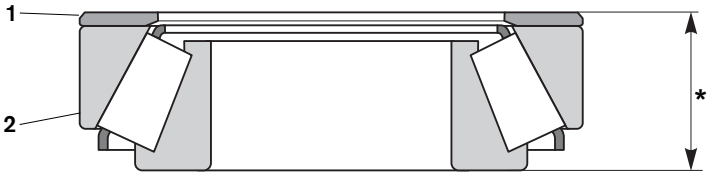
Sichtkontrolle:
Im Lagerbereich riefenfrei und keine Einlaufspuren.

Visual check:
Bearing areas free of scoring and no evidence of wear.

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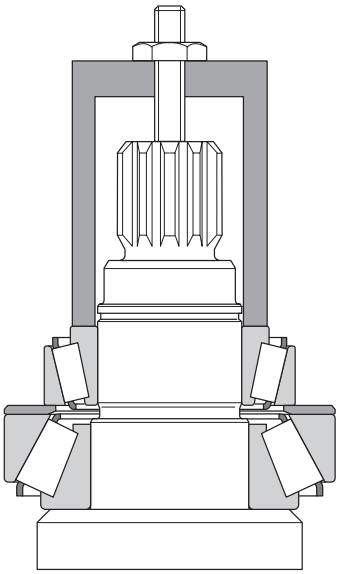
Triebwerk montieren / siehe Serviceinformation
Rotary group assembly / see service information

Triebwelle: mechanischer Teil
Rotary group: mechanical part



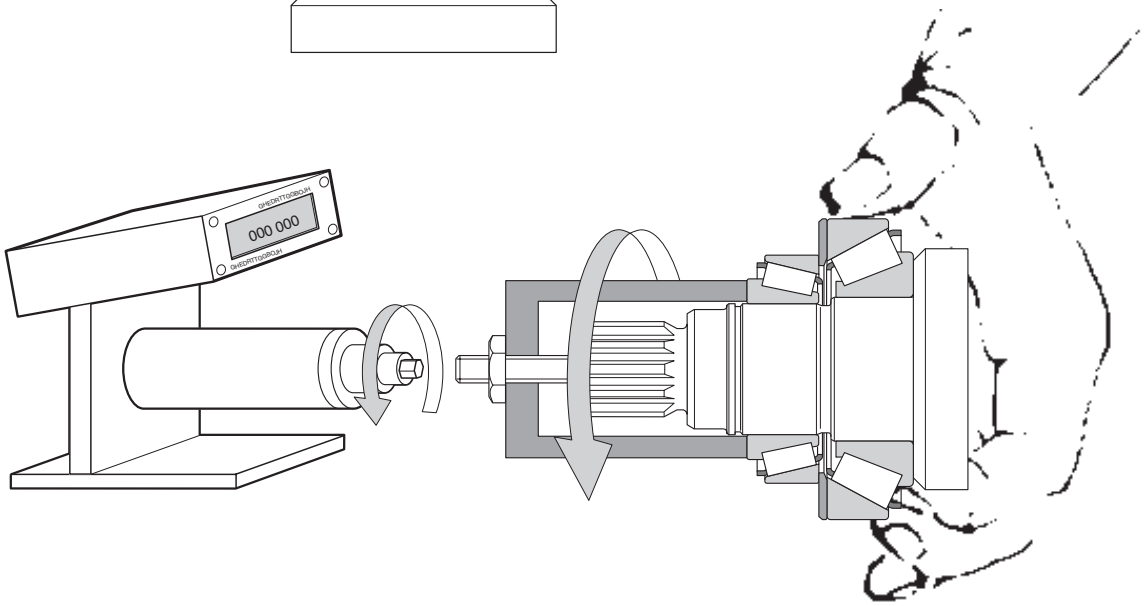
Abstimmung Maß * und Lagerdrehmomente siehe Serviceinfo.

Adjustment dimension * and bearing torque see service infoprmation.



Lager aufpressen.
Beim Aufpressen Lagerdrehmoment nicht überschreiten.

Press on bearing.
Do not exeed bearing torque during press-on.

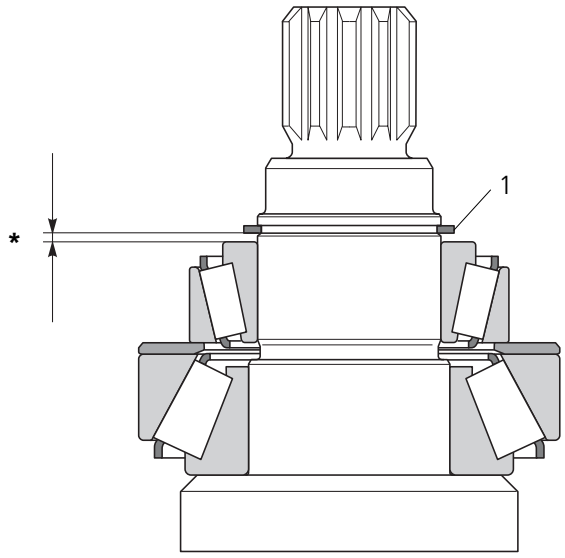


Lager mit Montagehülse vorspannen und laufende Drehmomentenkontrolle.

Preload bearing with assembly sleeve and steady control of the torque.

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Triebwerk montieren
Rotary group assembly

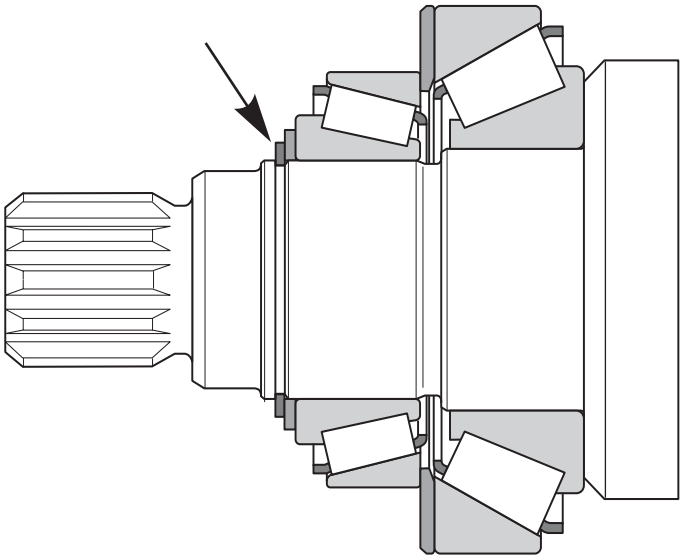


Sicherungsring 1 montieren.
Maß * für Abstimmscheibe mit Endmaß ermitteln (überkreuz).

Abstimmscheibe einbauen.
Sicherungsring montieren.

Assemble safety ring.
Determine dimension * for adjustment disc with final dimensions (crossover)

Install adjustment shim.
Assemble safety ring.

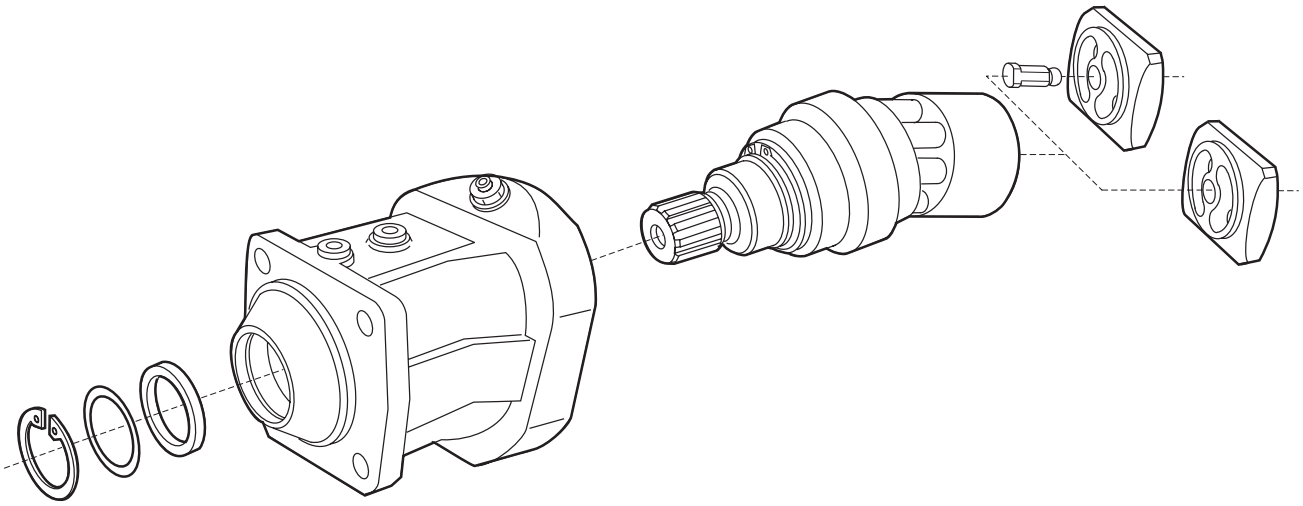


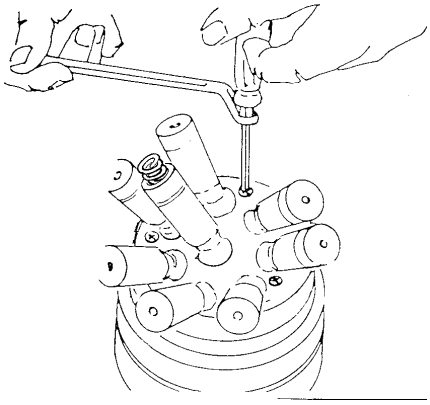
Triebwelle einbaufertig.

Drive shaft ready for assembly.

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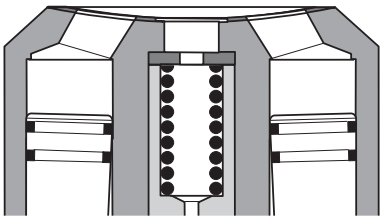
Triebwerk montieren
Rotary group assembly





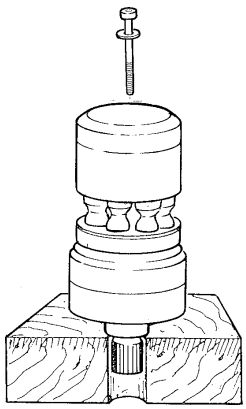
Rückzugplatte mit Kolben und Mittelzapfen einsetzen.
Schrauben mit Precote-Beschichtung verwenden.
(Anziehdremoment siehe Seite 42).

Insert retaining plate with piston and center pin.
Use screw with Precote-coating.
(Tightening torque see page 42).



Auf richtige Schichtung aller Teile achten.

Make sure all parts are fitted in correctly.

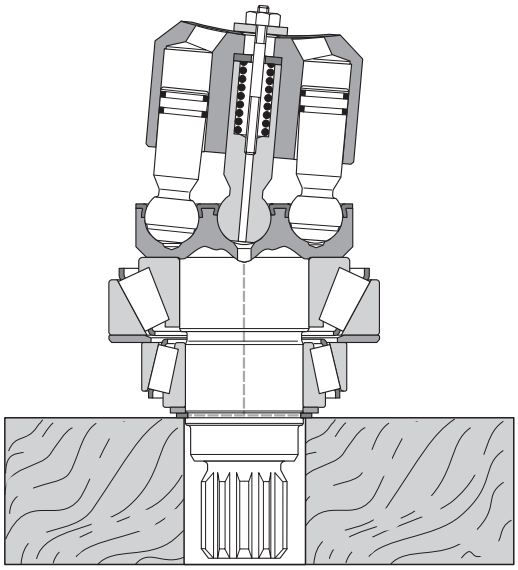


Triebwerk auf Null schwenken und Zylinder mit Gewindestift befestigen. (siehe Seite 25)

Swivel cylinder block to zero position and fix the cylinder with a threaded pin (see page 25)

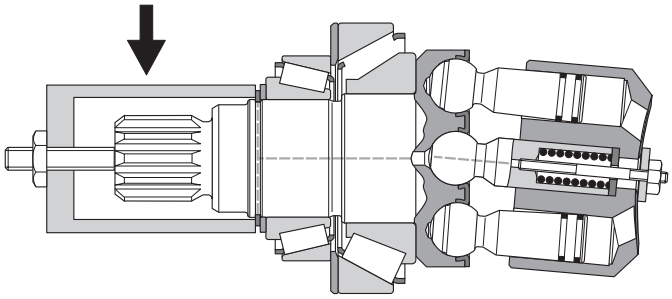
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Triebwerk montieren
Rotary group assembly



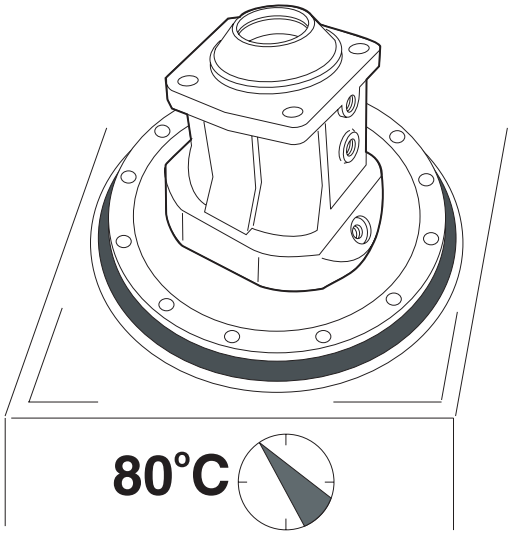
Triebwerk komplett zum Einbau fertig.

Rotary group completely assembled ready for assembly.



Montagehülse montieren.

Place assembly sleeve.

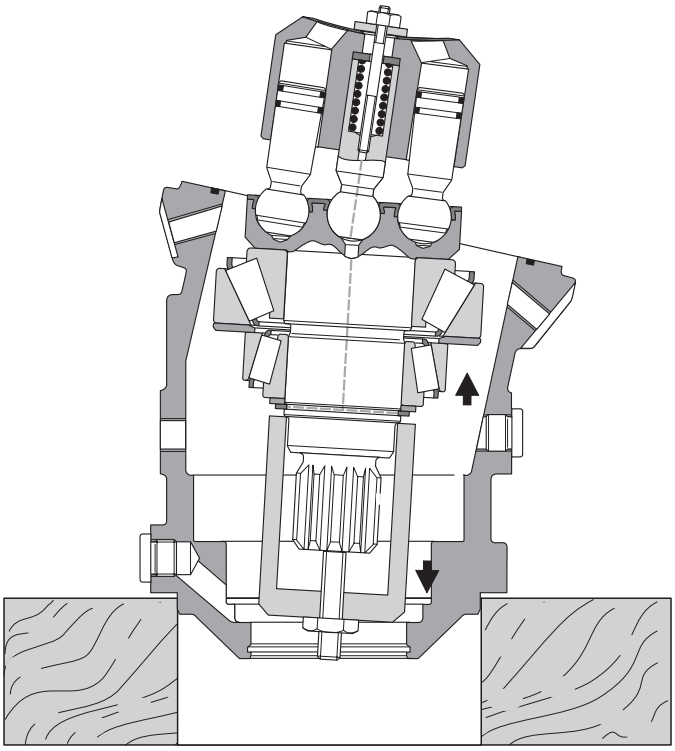


Gehäuse auf 80°C erwärmen.

Warm up housing to 80°C.

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Triebwerk montieren
Rotary group assembly

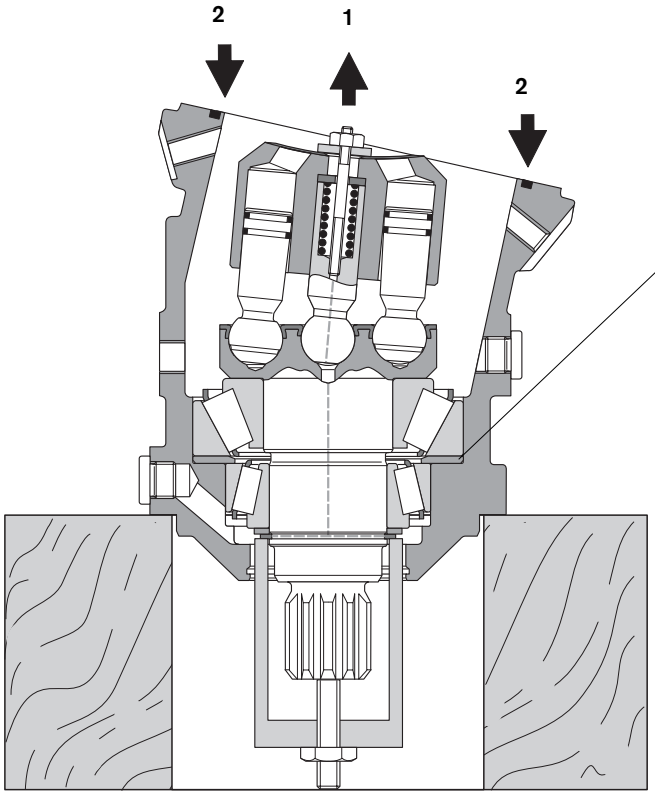


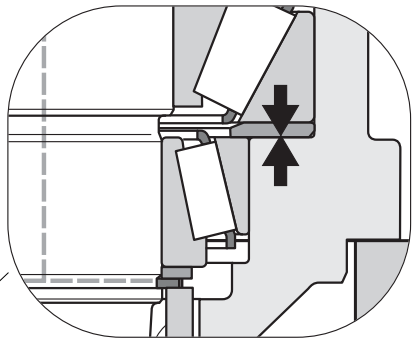
Triebwerk ins Gehäuse auf Anschlag einsetzen.

Insert rotary group into housing to seat position.

Nach Einbau des Triebwerks im Gehäuse ist die Triebwelle bis auf Anschlag nach vorne zu ziehen.

Pull the drive shaft after rotary groupassembly into housing to seat position.



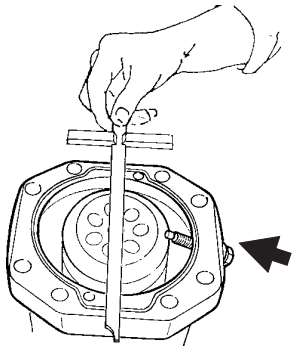


Zylinder in Nullposition ausrichten.
1. Zylinderbefestigungsschraube demontieren.
2. O-Ring einsetzen.

Fix zero position of cylinder with Q_{max}-screw.
1. Disassemble cylinder fixing screw.
2. Insert O-ring.

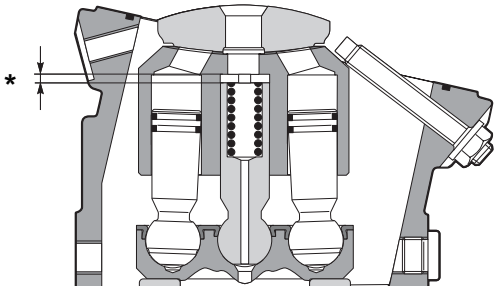
https://truckmanualshub.com/

Triebwerksabstimmung (siehe Serviceinfo)
Rotary group adjustment (see service information)



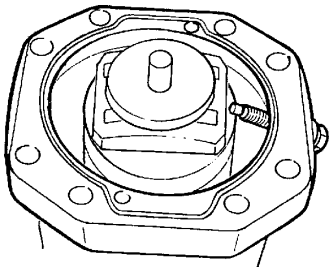
Mit Schraube Zylinderausschwenkung vermitteln.

Determine cylinder swivel range to max. angle with screw.



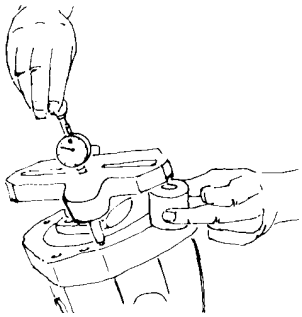
* Scheibe

* Disc



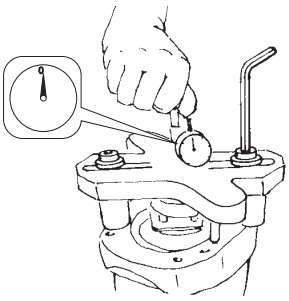
Zentrierscheibe aufsetzen.

Place centering disc.



Meßvorrichtung aufbauen.

Mount measuring device.

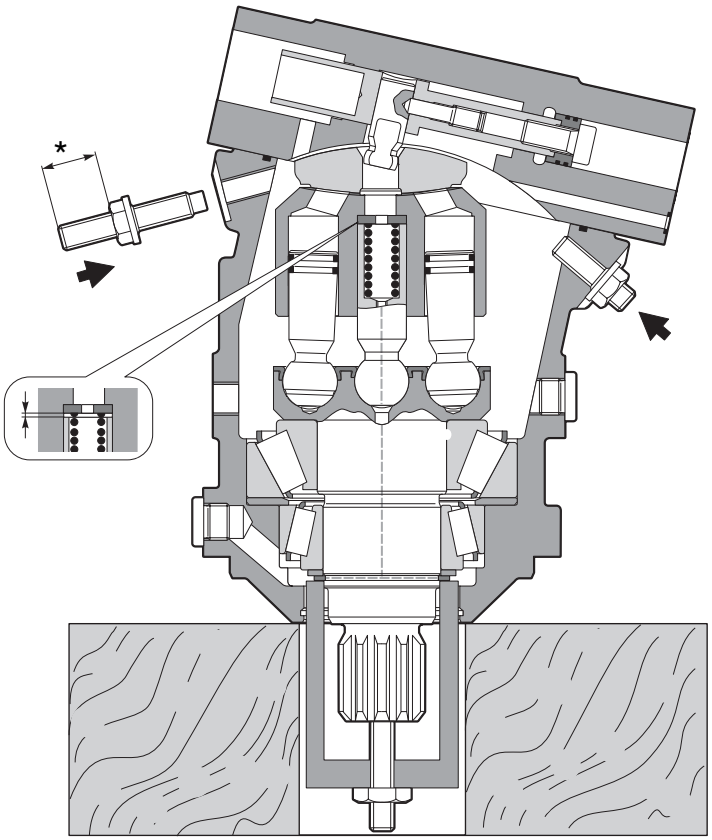


Maß X überprüfen.

Check dimension X.

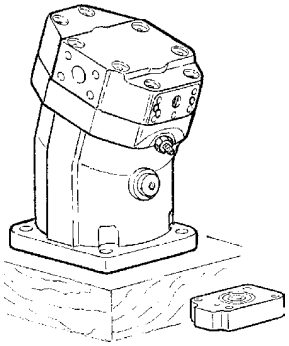
https://truckmanualshub.com/

Abschlußplatte montieren
Assembly of the port plate



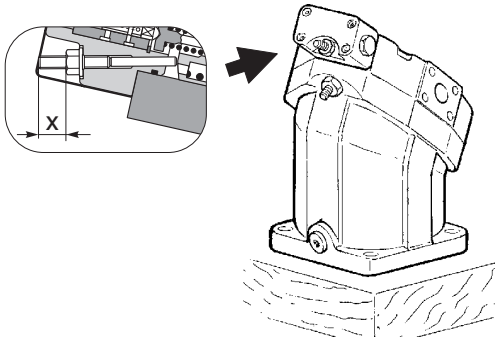
1. Anschlußplatte mit Differentialkolben montieren.
   Montageausführung beachten!
   Befestigungsschrauben mit Drehmoment anziehen.
2. Triebwerk in "Ausgangsstellung" schwenken.
3. Q_{min}-Schraube auf Maß * einstellen.
4. Verschlußschraube einbauen.
5. Montagehülse demontieren.

1. Assemble port plate with differential piston.
   Take care of assembly design!
   Tighten fixing screws with torque.
2. Swivel rotary group to "starting position".
3. Set Q_{min}-screw to dimension*.
4. Assemble plug.
5. Remove assembly sleeve.



Deckel montieren.

Assemble cover.

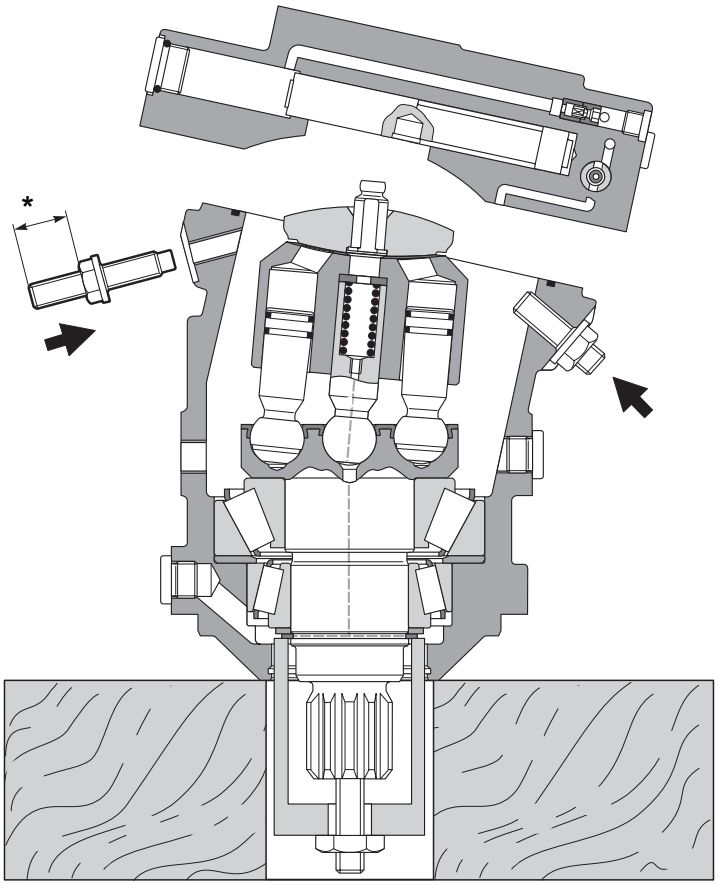


Steuerteil montieren.

Assemble control components.

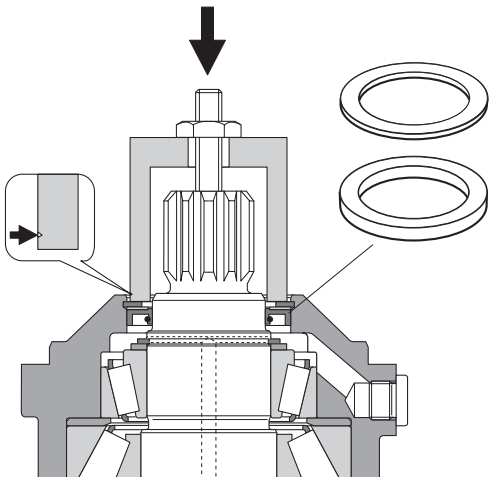
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Anschlußplatte montieren
Assembly of the port plate



1. Anschlußplatte mit Gleichgangkolben montieren.
⚠ Montageausführung beachten!
⚠ Befestigungsschrauben mit Drehmoment anziehen.
2. Triebwerk in "Ausgangsstellung" schwenken.
3. Q_{min}-Schraube auf Maß * einstellen.
4. Verschlußschraube einbauen.
5. Montagehülse demontieren.

1. Assemble port plate with synchronizing piston.
⚠ Take care of assembly design!
⚠ Tighten fixing screws with torque.
2. Swivel rotary group to "starting position".
3. Set Q_{min}-screw to dimension*.
4. Assemble plug.
5. Remove assembly sleeve.



Wellendichtring, Scheiben und Sicherungsring montieren.
Mit Montagehülse einpressen.
Dicht- und Staublippe, Wellendichtring leicht einfetten.

⚠ Einpresstiefe beachten!

Assemble shaft seal, disc and safety ring.
Press-in with assembly sleeve.
Lightly grease the seal, dust lips and shaft seal ring.

⚠ Take care of press-in depth.

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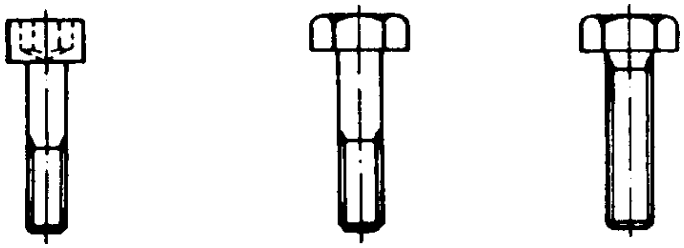
Montageanweisung für Anziehdrehmomente
Assembly guidelines for tightening torques

1. **Schaftschrauben** (nach N 08.001)

   Die Werte gelten für Schaftschrauben mit metrischen ISO-Gewinde nach DIN 13 Teil 13, sowie Kopfauflagemaßen nach DIN 912 Zylinderschrauben, DIN 931 Sechskantschrauben mit Schaft bzw.
   DIN 933 Sechskantschrauben mit Gewinde bis Kopf.

1. **Bolts** (to N 08.001)

   The values stated are valid for bolts with metric ISO threads to DIN 13 part 13, as well as head areas to DIN 912 socked head cap screws, DIN 931 hexagon bolt or
   DIN 933 hexagon bolts with threads up to the head.



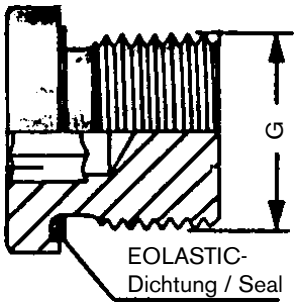
Gewinde / Thread	Festigkeitsklassen / Tensile strength class		
	8.8	10.9	12.9
	Anziehdrehmoment / Tightening torque M_A in Nm		
M3	1,1	1,6	1,9
M4	3,1	4,5	5,3
M5	6,1	8,9	10,4
M6	10,4	15,5	18
M8	25	37	43
M10	51	75	87
M12	87	130	150
M14	140	205	240
M16	215	310	370
M18	300	430	510
M20	430	620	720
M22	580	830	970
M24	740	1060	1240

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Montageanweisung für Anziehdrehmomente
Assembly guidelines for tightening torques

2. **Verschlußschrauben** mit Innensechskant und Profildichtring (nach N 02.009).

2. **Plugs** with internal hexagon and profile seal ring (to N 02.009).



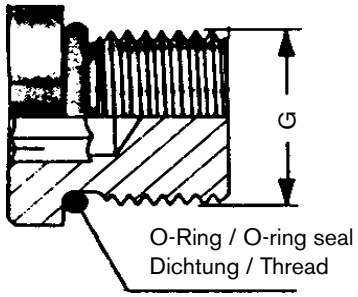
Gewinde / Thread	Anziehdrehmoment / Tightening torque M_A in Nm	Gewinde / Thread	Anziehdrehmoment Tightening torque M_A in Nm
M8 x 1	5	G 1/8 A	10
M10 x 1	10	G 1/4 A	30
M12 x 1,5	20	G 3/8 A	35
M14 x 1,5	30	G 1/2 A	60
M16 x 1,5	35	G 3/4 A	90
M18 x 1,5	40	G 1 A	140
M20 x 1,5	50	G 1 1/4 A	240
M22 x 1,5	60	G 1 1/2 A	300
M26 x 1,5	70		
M27 x 2	90		
M30 x 1,5	100		
M33 x 2	140		
M42 x 2	240		
M48 x 2	300		

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Montageanweisung für Anziehdrehmomente
Assembly guidelines for tightening torques

5. **Verschlußschrauben** mit Innensechskant, O-Ring und UNF-, UN-Gewinde nach SAE J 514 (nach N 02.106)

5. **Plugs** with internal hexagon, O-ring and UNF-, UN- threads to SAE J 514 (nach N 02.106)



Gewinde / Thread	Anziehdrehmoment / Tightening torque M_A in Nm	Gewinde / Thread	Anziehdrehmoment Tightening torque M_A in Nm
7/16 - 20 UNF	15	M12 x 1,5	20
1/2 - 20 UNF	20	M14 x 1,5	30
9/16 - 18 UNF	25	M27 x 1,5	90
3/4 - 16 UNF	72		
7/8 - 14 UN	127		
1 1/16 -12 UN	147		
1 3/16 -12 UN	173		
1 5/16 -12 UN	198		
1 5/8 -12 UN	320		
1 7/8 -12 UN	390		

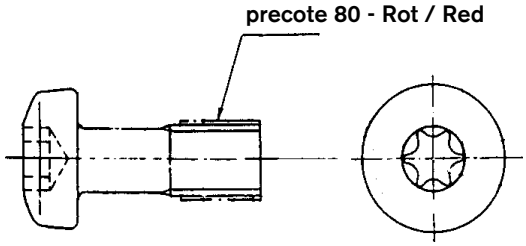
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Montageanweisung für Anziehdrehmomente
Assembly guidelines for tightening torques

6. Linsenschrauben mit Innen-TORX, Gewindevorbeschichtung mit "precote"

6. Oval head screw with inner TORX, thread precoated with "precote"

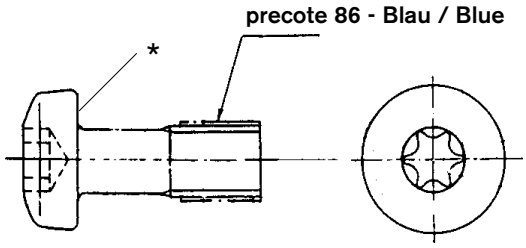
Standard / Standard



Variante / Variant

I **2602493 M5 x 16**
I **2602395 M6 x 20**

siehe Stückliste / as to parts list



* mit Unterkopfbeschichtung - farblos

* with head bottom coating - colorless

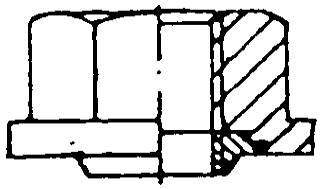
Gewinde / Thread	Festigkeitsklassen / Tensile strength class
	10.9
	Anziehdrehmoment / Tightening torque M_A in Nm
M3	2,1
M4	4,7
M5	9,1
M6	15,8
M8	37,7

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7. SEAL-LOCK-Dichtmuttern (nach N 02.100)

7. SEAL-LOCK - sealing nuts (to N 02.100)

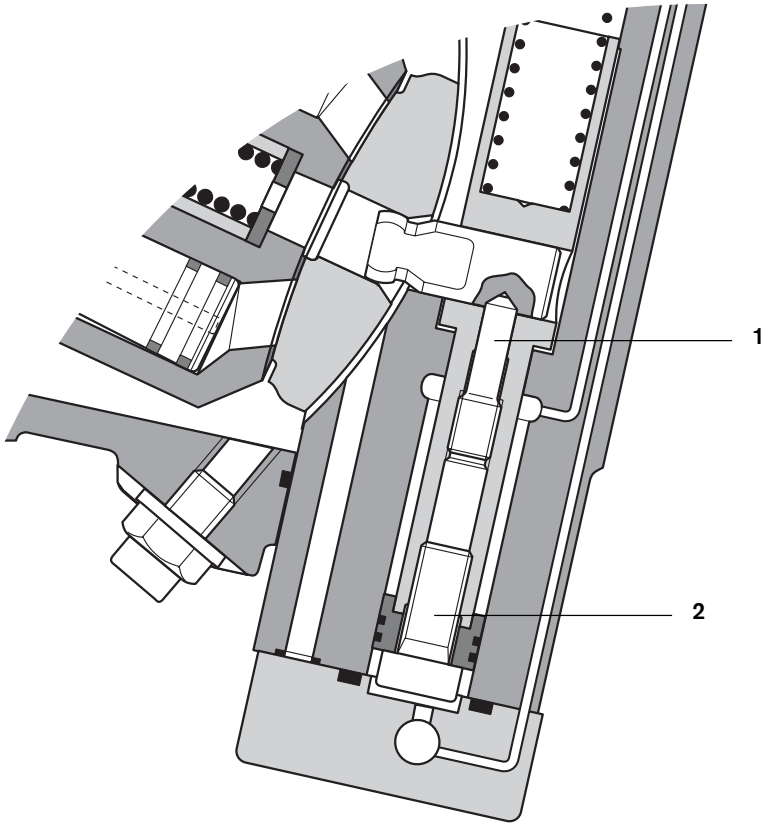
Gewinde / Thread	Anziehdrehmoment M_A in Nm Tightening torque M_A in Nm
M6	10
M6 x 0,5	11
M8	22
M8 x 1	24
M10	40
M10 x 1	44
M12	69
M12 x 1,5	72
M14	110
M14 x 1,5	120
M16	170
M16 x 1,5	180



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Montageanweisung für Anziehdrehmomente
Assembly guidelines for tightening torques

A6V - Stellkolben / positioning piston
für / for A6V / A7V / A7F / A8V)



Anziehdrehmoment MA für Gewindestift (1) /
Tightening torque MA for threaded pin (1)

(Verbindung: Stellkolben und Stellzapfen /
Connection: Positioning piston and positioning trunnion

M6	**:**	**8,5 Nm**
M8	**:**	**14,0 Nm**
M10	**:**	**30,0 Nm**
M12	**:**	**52,0 Nm**

Anziehdrehmoment MA für Schraube (2) /
Tightening torque MA for shaft bolts (2)

(Verbindung: Stellkolben und Stellzapfen für A6V
Connection: Positioning piston and piston for A6V

M14 x 1,5	**:**	**120 Nm**

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Sicherheitsbestimmungen
Safety regulations

Allgemein

- Machen Sie sich mit der Ausstattung der Maschine vertraut.
- Fahren Sie die Maschine nur, wenn Sie sich völlig mit den Bedien- und Steuerelementen sowie der Arbeitsweise der Maschine vertraut gemacht haben.
- Benutzen Sie Ihre Schutzausrüstung wie Schutzhelm, Sicherheitsschuhe und Gehörschutz.
- Machen Sie sich mit Ihrem Arbeitsgebiet vertraut.
- Benutzen Sie die Maschine nur für den ihr zugedachten Zweck.

General advice

- Make yourself familiar with the equipment of the machine.
- Only operate the machine if your are completely familiar with the operating and control elements as well as the functioning of the machine.
- Use your safety equipment like helmet, safety shoes and hearing protection.
- Make yourself familiar with your working field.
- Only operate the machine for its intended purpose.

Beachten Sie bitte die Richtlinien der Berufsgenossenschaft und des Maschinenherstellers



Please observe the guidelines of the Professional Association and the machine manufacturer.



Vor dem Start

- Beachten Sie die Bedienungshinweise vor dem Starten.
- Prüfen Sie die Maschine auf auffällige Fehler.
- Fahren Sie die Maschine nicht mit defekten Instrumenten, Kontrolleuchten oder Steuerorganen.
- Alle Schutzvorrichtungen müssen fest auf ihrem Platz sein.
- Nehmen Sie keine losen Gegenstände mit bzw. befestigen Sie diese an der Maschine.
- Halten Sie die Maschine von öligem und zündfähigem Material frei.
- Prüfen Sie vor dem Besteigen der Maschine, ob sich Personen oder Hindernisse neben oder unter der Maschine befinden.
- Vorsicht beim Besteigen der Maschine, benützen Sie Treppen und Griffe.
- Stellen Sie vor dem Start Ihren Sitz ein.

Before starting

- Observe the operating instructions before starting.
- Check the machine for remarkable faults.
- Do not operate the machine with defective instruments, warning lights or control elements.
- All safety devices must be in a secure position.
- Do not carry with you movable objects or secure them to the machine.
- Keep oily and inflammable material away from the machine.
- Before entering thc driver's cabin, check if personsor obstacles are beside or beneath the machine.
- Be careful when entering the driver's cabin, use stairs and handles.
- Adjust your seat before starting.

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Sicherheitsbestimmungen
Safety regulations

Starten

- Beim Starten müssen alle Bedienhebel in “Neutralstellung” stehen.
- Die Maschine nur vom Fahrersitz aus Starten.
- Prüfen Sie die Anzeigeinstrumente nach dem Start, um sicher zu gehen, daß alles ordnungsgemäß funktioniert.
- Lassen Sie die Maschine nicht unbewacht, während der Motor läuft.
- Beim Start mit Batterieverbindungskabeln verbinden Sie Plus mit Plus und Minus mit Minus. Massekabel (Minus) immer zuletzt anschliesen und zuerst abtrennen.

Vorsicht

- Auspuffgase sind lebensgefährlich. Bei Start in geschlossenen Räumen für ausreichende Luftzufuhr sorgen!

Hydraulikanlage

1. Hydraulikanlage steht unter hohem Druck!

⚠ Unter hohem Druck austretende Hochdruck- Flüssigkeiten (Kraftstoff, Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen. Daher sofort einen Arzt aufsuchen, da anderenfalls schwere Infektionen entstehen können!

2. Bei der Suche nach Leckstellen wegen Verletzungsgefahr geeignete Hilfsmittel verwenden!
3. Vor Arbeiten an der Hydraulikanlage diese unbedingt drucklos machen und angebaute Geräte absenken!
4. Bei Arbeiten an der Hydraulikanlage unbedingt Motor abstellen und Traktor gegen Wegrollen sichern (Feststellbremse, Unterlegkeil)!
5. Beim Anschließen von Hydraulikzylindern und -motoren ist auf vorgeschriebenen Anschluß der Hydraulikschläuche zu achten!
6. Bei Vertauschen der Anschlüsse umgekehrte Funktionen (z.B. Heben/Senken) - Unfallgefahr!
7. Hydraulikschlauchleitungen regelmäßig kontrollieren und bei Beschädigung und Alterung austauschen! Die Austauschschlauchleitungen müssen den technischen Anforderungen des Geräteherstellers entsprechen!

⚠ Öle, Kraftstoffe und Filter ordnungsgemäß entsorgen!

Start

- When starting all operating levers must be in “neutral position”.
- Only start the machine from the driver’s seat.
- Check the indicating instruments after start to assure that all functions are in order.
- Do not leave the machine unobserved when the motor is running.
- When starting with battery connection cables connect plus with plus and minus with minus. Always connect mass cable (minus) at last and cut off at first.

Attention

- Exhaust gas is dangerous. Assure sufficient fresh air when starting in closed rooms!

Hydraulic equipment

1. Hydraulic equipment is standing under high pressure.

⚠ High pressure fluids (fuel, hydraulic oil) which escape under high pressure can penetrate the skin and cause heavy injuries. Therefore immediately consult a doctor as otherwise heavy infections can be caused.

2. When searching leakages use appropriate auxiliary devices because of the danger of accidents.
3. Before working at the hydraulic equipment, lower pressure to zero and lower working arms of the rnachine.
4. When working at the hydraulic equipment, absolutely stop motor and secure tractor against rolling away (parking brake, shim)!
5. When connecting hydraulic cylinders and motor pay attention to correct connection of hydraulic flexible hoses.
6. In case of exchanging the ports, the tunctions are vice versa (f. ex. lift-up/lower) - danger of accidents!
7. Check hydraulic flexible hoses regularly and replace them in case of dammage or wear! The new hose pipes must comply with the technical requirements of the machine manufacturer!

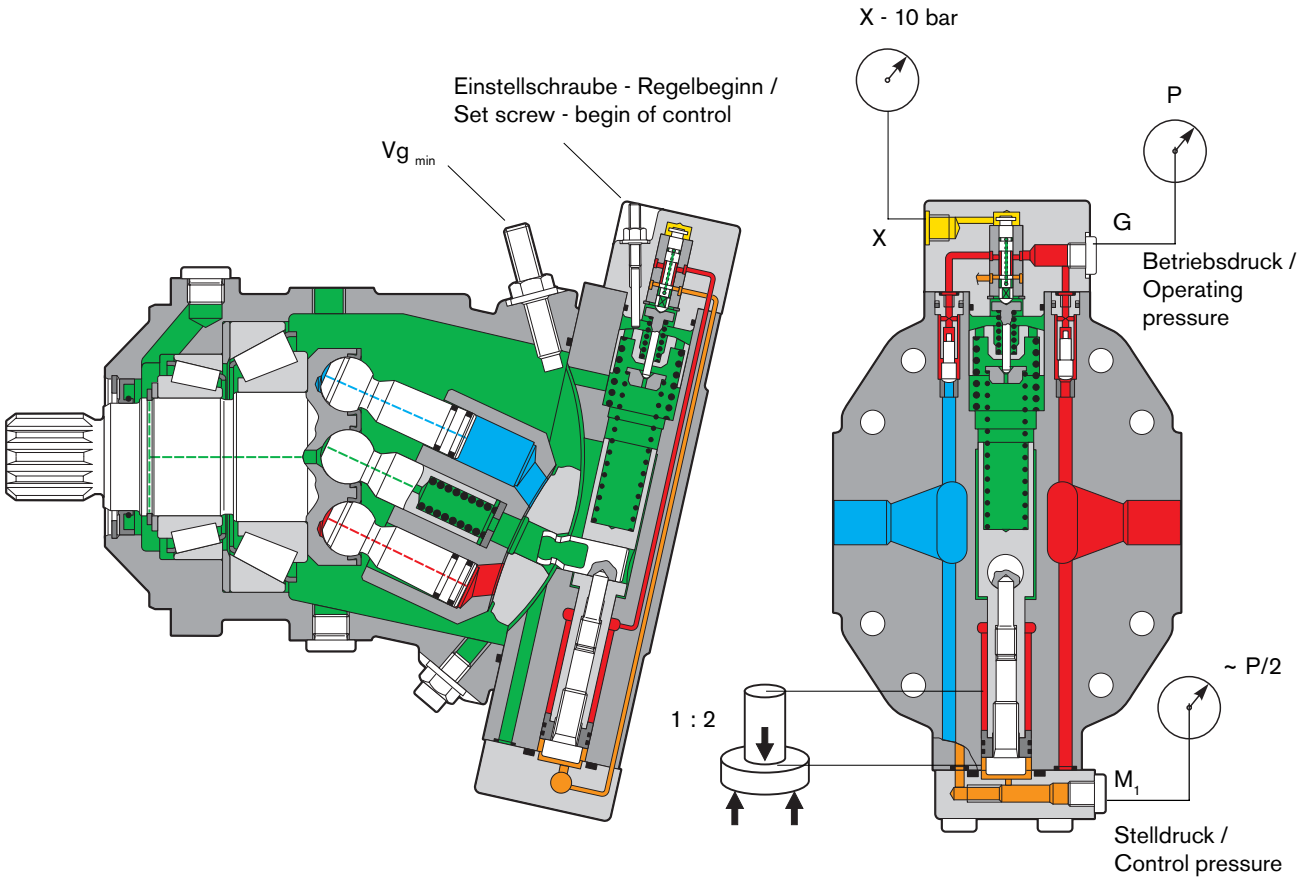
⚠ Orderly disposal or recycling of oil, fuel and filters!

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Inbetriebnahme
Operating instruction

Einstellüberprüfung
(Regelbeginn von Vg_{max} - Vg_{min})
z.Beispiel **HD**

Setting test
(Begin of regulation of Vg_{max} - Vg_{min})
e.g **HD**



Sicherheitsbestimmungen beachten!
Einstelldaten nach Werksauftrag!
Blockzustand (Straßengang und festgebremst).

A6VM - HD **$V_{g\,max}$ - $V_{g\,min}$**

- Manometer "G" = 600 bar
- Manometer "M_1" = 600 bar
- Manometer "X" = 60 bar

Regelbeginn / Einstellung

Beispiel: 10 bar Steuerdruck an X

Manometer an M_1 beachten!
Druckwert an X erhöhen bis an M_1 die Hälfte des Druckes von G ansteht ♦ **Regelbeginn**

Einstellschraube **im Uhrzeigersinn** ♦ **Regelbeginn früher**

Einstellschraube **gegen Uhrzeigersinn** ♦ **Regelbeginn später**

Observe safety regulations!
Setting data as to production order
Blocked condition (travel mode and manual brake).

A6VM - HD **$V_{g\,max}$ - $V_{g\,min}$**

- Pressure gauge "G" = 600 bar
- Pressure gauge "M_1" = 600 bar
- Pressure gauge "X" = 60 bar

Begin of regulation / Setting

Example: 10 bar pilot pressure at X

Observe pressure gauge at M_1!
Increase pressure value at X till half the pressure is generated from G ♦ **Begin of regulation**

Setscrew turned **clockwise** ♦ **Begin of regulation earlier**

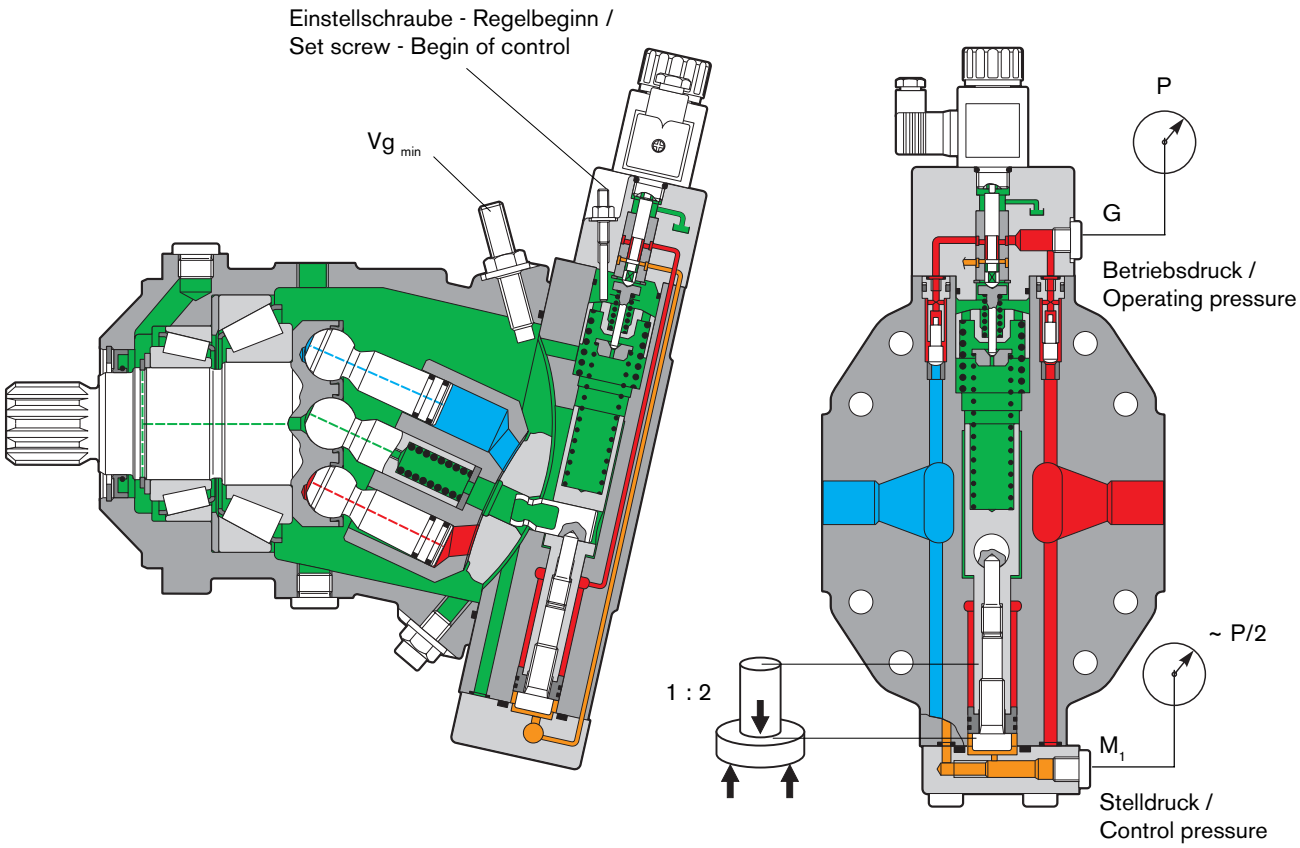
Setscrew turned **anti-clockwise** ♦ **Begin of regulation later**

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Inbetriebnahme
Operating instruction

Einstellüberprüfung
(Regelbeginn von Vg_{max} - Vg_{min})
z.Beispiel **EP**

Setting test
(Begin of regulation of Vg_{max} - Vg_{min})
e.g **EP**



Sicherheitsbestimmungen beachten!
Einstelldaten nach Werksauftrag!
Blockzustand (Straßengang und festgebremst).

A6VM - EP **$V_{g\,max}$ - $V_{g\,min}$**

- Manometer "G" = 600 bar
- Manometer "M_1" = 600 bar
- Magnet = Multimessgerät

Regelbeginn / Einstellung

Beispiel: 200/400 mA

Manometer an M_1 beachten!
Strom erhöhen bis an M_1 die Hälfte
des Druckes von G ansteht ♦ **Regelbeginn**

Einstellschraube **im Uhrzeigersinn** ♦ **Regelbeginn früher**

Einstellschraube **gegen Uhrzeigersinn** ♦ **Regelbeginn später**

Observe safety regulations!
Setting data as to production order
Blocked condition (travel mode and manual brake).

A6VM - HD **$V_{g\,max}$ - $V_{g\,min}$**

- Pressure gauge "G" = 600 bar
- Pressure gauge "M_1" = 600 bar
- Solenoid = multi measuring device

Begin of regulation / Setting

Example: 200/400 mA

Observe pressure gauge at M_1!
Increase current till half the pressure is generated
from G ♦ **Begin of regulation**

Setscrew turned **clockwise** ♦ **Begin of regulation earlier**

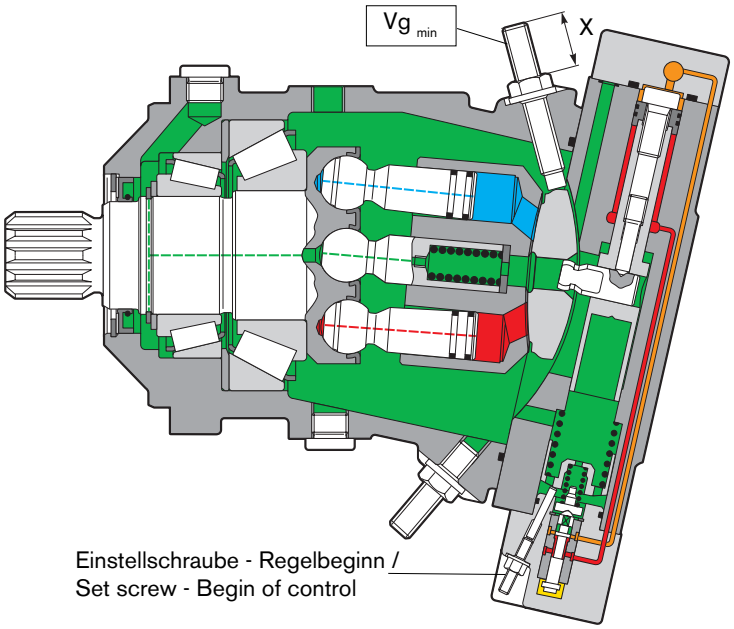
Setscrew turned **anti-clockwise** ♦ **Begin of regulation later**

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Inbetriebnahme
Operating instruction

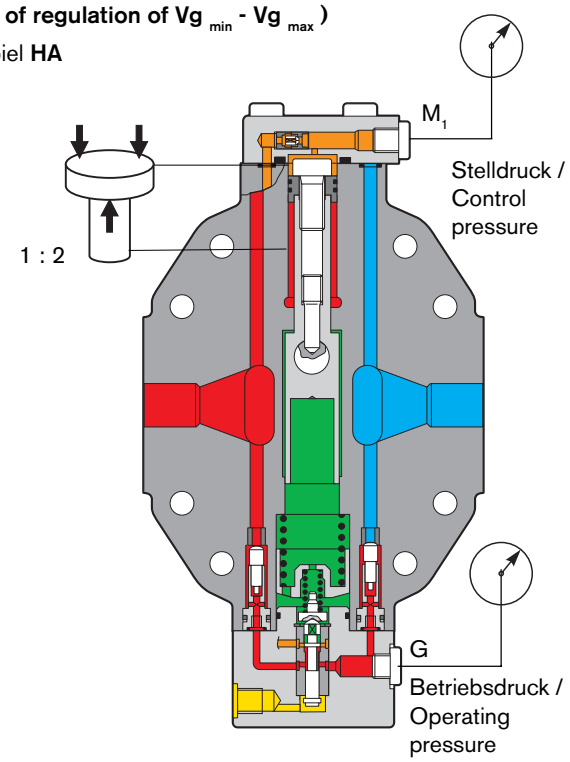
Einstellüberprüfung
(Regelbeginn von Vg $_{min}$ - Vg $_{max}$)

z.Beispiel **HA**



Setting test
(Begin of regulation of Vg $_{min}$ - Vg $_{max}$)

z.Beispiel **HA**



Sicherheitsbestimmungen beachten!
Einstelldaten nach Werksauftrag!
Blockzustand (Straßengang und festgebremst).
Manometer 600 bar an G und M_1 anschließen.

Beispiel 1:
Regelbeginn 200 bar,
Betriebsdruck langsam erhöhen bis Manometer an G 200 bar
Stelldruck Manometer M_1
1 /2 des Betriebsdruckes = ca. 100 bar

♦ **Regelbeginn**
Nachjustierung des Stelldruckes an
Einstellschraube - Regelbeginn

⚠ **Hinweis:**
Drehen im Uhrzeigersinn - Regelbeginn früher.
Drehen gegen Uhrzeigersinn - Regelbeginn später.

Beispiel 2:
Bei Anlagen mit zwei oder mehr Motoren z. B. Raupenfahrzeuge kann folgende Einstellung zusätzlich erfolgen.
Kontermutter von Einstellschraube Vg_{min} lösen - Einstellschraube nicht verdrehen. Maß X festhalten.

Betriebsdruck langsam erhöhen bis Manometer an G 200 bar anzeigt.
Kontrolle: Einstellschraube Vg $_{min}$ **"fest"** (Steuerlinse wird gegen die Einstellschraube gedrückt).
Ab 200 bar Betriebsdruck wird die Schraube **"lose"** (Steuerlinse schwenkt Richtung Vg $_{max}$).

♦ **Regelbeginn**

Achtung!
Einstellwert Vg $_{min}$ -Schraube nicht verändern.
Hinweis: Nachjustierung an Einstellschraube- Regelbeginn

Observe safety regulations!
Setting data as to production order
Blocked condition (travel mode and manual brake)
Connect pressure gauge 600 bar at G and M_1

Example 1:
Begin of regulation 200 bar
Increase service pressure slowly till pressure gauge at G = 200 bar
Positioning pressure gauge M_1
1/2 of the sevice pressure = approx. 100 bar.

♦ **Begin of control**
Readjust positioning pressure at set screw - start of control

⚠ **Note:**
Clockwise turning - begin of regulation earlier
Anti-clockwise turning - begin of regulation later

Example 2:
In systems with two or more motors, e.g. tracked vehicles, the following setting may be carried out additionally.
Remove safety cap from the setscrew Vg $_{min}$ - do not disturb setscrew.

Increase service pressure slowly till pressure gauge is indicating 200 bar at G.
Verification: Vg $_{min}$ **"fixed"** (lens plate is pressed against setscrew).
Up from 200 bar service pressure the screw is becoming **"movable"**.
(lens plate is stroking to direction Vg $_{max}$).

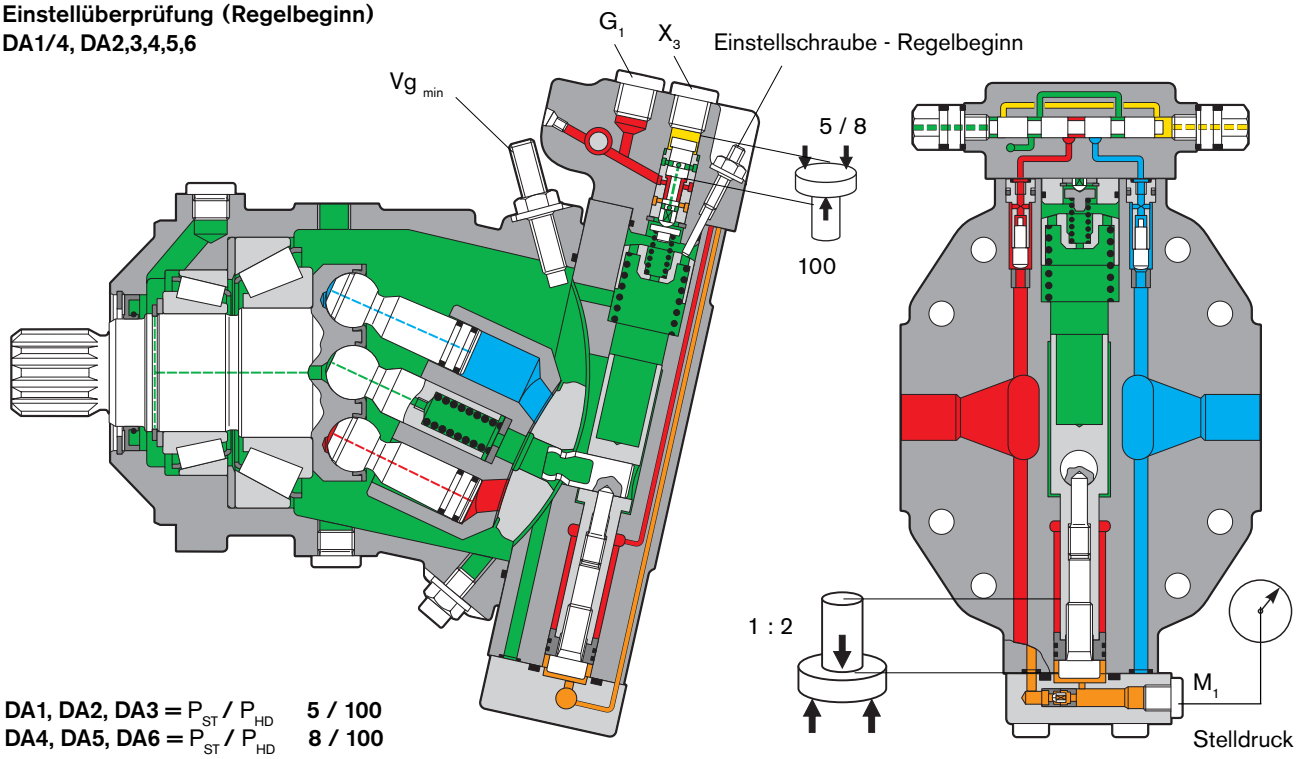
♦ **Begin of control**

Attention
Do not modify setting data of Vg $_{min}$ screw.
Note: Readjustment at the set screw - begin of regulation

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Inbetriebnahme
Operating instruction

Einstellüberprüfung (Regelbeginn)
DA1/4, DA2,3,4,5,6

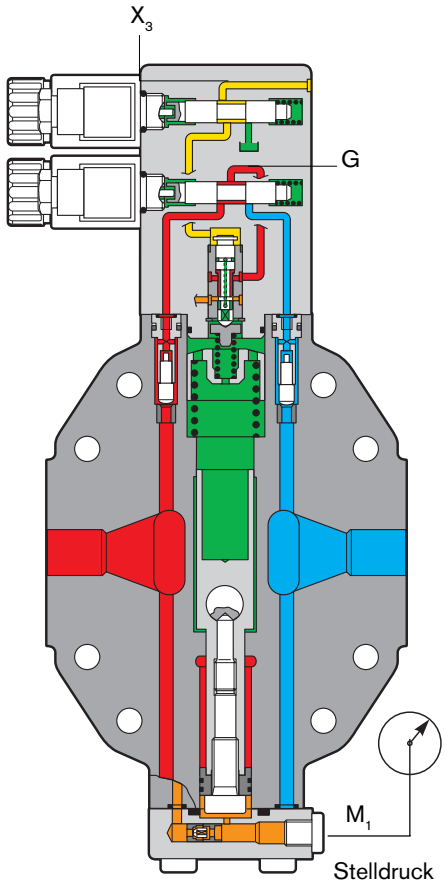


DA1, DA2, DA3 = P_{ST} / P_{HD} 5 / 100
DA4, DA5, DA6 = P_{ST} / P_{HD} 8 / 100

Beispiel: Betriebsdaten nach Geräteblatt
Verstellbeginn Vg_{min} - Vg_{max} bei 20 bar Steuerdruck und 220 bar Betriebsdruck

- Manometer **G** = 600 bar Betriebsdruck
- Manometer **X_3** = 60 bar Steuerdruck
- Manometer **M_1** = 600 bar Stelldruck

Fahrzeug beladen, Straßengang, Fahren (max. Geschwindigkeit = max. Steuerdruck)
Manometer M_1 beobachten, anbremsen für Druckaufbau an "G", ab 220 bar Betriebsdruck baut sich Druck an M_1 ab.
♦ Regelbeginn P/2.



DA1, DA2, DA3 P_{St} / P_{St} 5/100

X_3	G	M_1	
20 bar	200 bar	200 bar	= Vg_{min}
20 bar	220 bar	110 bar	= Regelbeginn Vg_{min} ♦ Vg_{max}
20 bar	240 bar	0-50 bar	= Vg_{max}

* Einstellschraube - Regelbeginn - Drehen im Uhrzeigersinn - Regelbeginn später

⚠ nur 1/8 Umdrehung verstellen ♦ kontrollieren

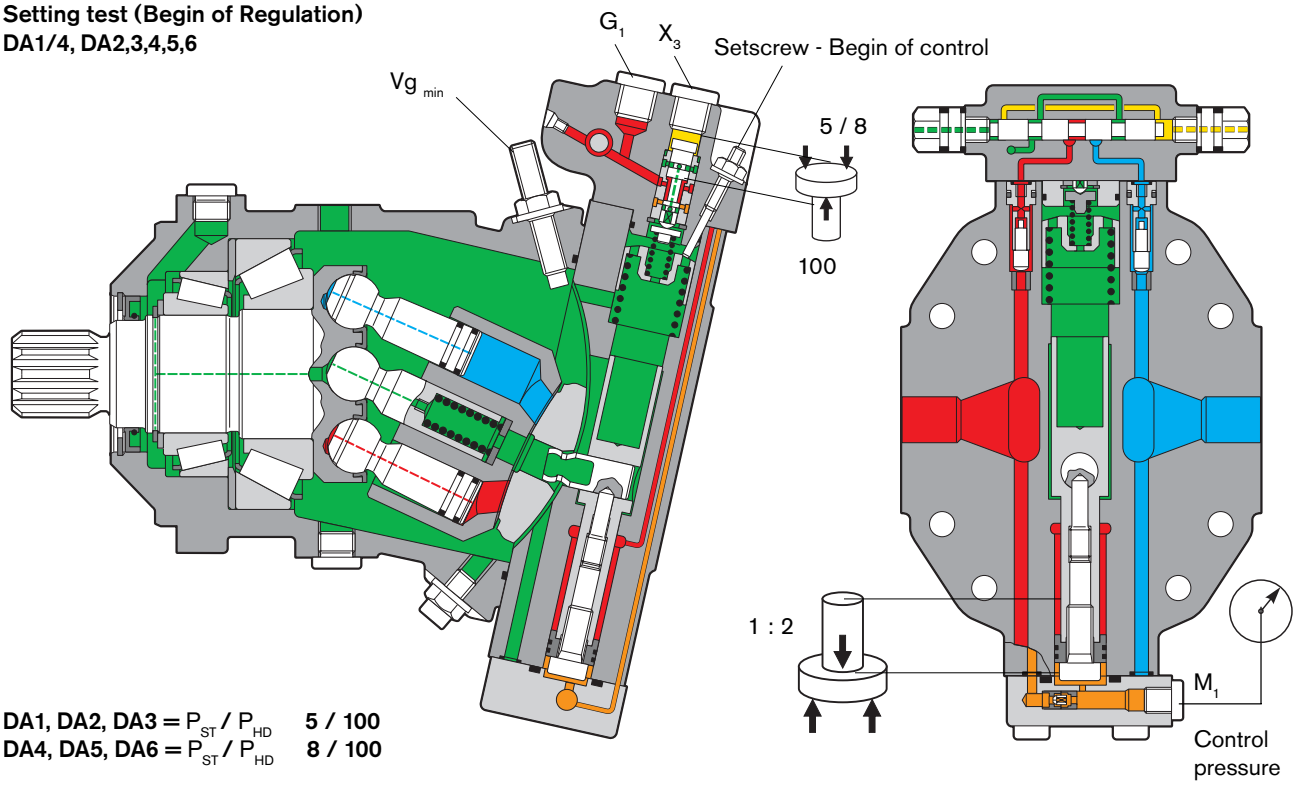
DA4, DA5, DA6 P_{St} / P_{St} 8/100

X_3	G	M_1	
20 bar	207,5 bar	207,5 bar	= Vg_{min}
20 bar	220 bar	110 bar	= Vg_{min} ® Vg_{max}
20 bar	225 bar	0 bar	= Vg_{max}

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Inbetriebnahme
Operating instruction

Setting test (Begin of Regulation)
DA1/4, DA2,3,4,5,6



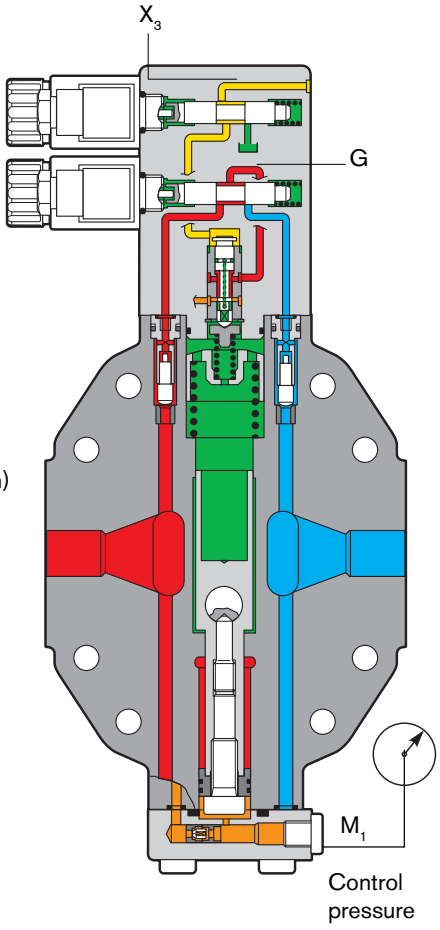
DA1, DA2, DA3 = P_{ST} / P_{HD} 5 / 100
DA4, DA5, DA6 = P_{ST} / P_{HD} 8 / 100

Example: Operation data as to machine specification sheet
Begin of regulation Vg_{min} - Vg_{max} at 20 bar pilot pressure and 220 bar service pressure

- Pressure gauge **G** = 600 bar service pressure
- Pressure gauge **X_3** = 60 bar pilot pressure
- Pressure gauge **M_1** = 600 bar positioning pressure

Load vehicle, travel mode, travel (max. speed = max. pilot pressure
Observe pressure gauge M_1, declarate at "G" for pressure generation, up from 220 bar service pressure pressure at M_1 is dropping.

♦ begin of regulation P/2.



DA1, DA2, DA3 P_{St} / P_{St} 5/100

X_3	G	M_1		
20 bar	200 bar	200 bar	=	Vg_{min}
20 bar	220 bar	110 bar	=	begin of regulation Vg_{min} ♦ Vg_{max}
20 bar	240 bar	0-50 bar	=	Vg_{max}

* Setscrew - begin of regulation - turn clockwise - begin of regulation later

⚠ displace by 1/8 turn only ♦ verification

DA4, DA5, DA6 P_{St} / P_{St} 8/100

X_3	G	M_1		
20 bar	207,5 bar	207,5 bar	=	Vg_{min}
20 bar	220 bar	110 bar	=	Vg_{min} ♦ Vg_{max}
20 bar	225 bar	0 bar	=	Vg_{max}

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Bosch Group

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18.4 Wheel drive

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Rexroth
Bosch Group

Demontage- Montageanleitung
Disassembly- Assembly Instructions
Planetengetriebe / Planetary Gearbox
HYDROTRAC

RDE 77977-01-R/01.08
05.02.2008

GFT 110 R3 9279



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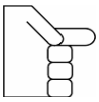
Verkauf Ersatzteile / *Sales Spare Parts*	**Kundendienst / *Service***
Bosch Rexroth AG PO Box 18 60 D - 58408 Witten Tel. (02302) 877-170 Telefax (02302) 887-300	Bosch Rexroth AG PO Box 18 60 D - 58408 Witten Tel. (02302) 877-183 Telefax (02302) 877-409 Hotline +49 173-2569948

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1.1 Einführung



Mit diesem Symbol sind Gefahren für das Produkt und die Gesamtanlage gekennzeichnet.



Dieses Symbol kennzeichnet Hinweise.



Zur Demontage; Montage des Getriebes werden die Ersatzteilzeichnung und die Teileliste der entsprechenden Getriebeausführung benötigt.

Beachten Sie unbedingt die Sicherheitsbestimmungen und die einschlägigen Unfallverhütungsvorschriften!

Bauen Sie nur Originalersatzteile ein.

Lassen Sie das Öl ab.
Verwenden Sie dabei geeignete Auffanggefäße.

Achten Sie darauf, dass kein Schmutz oder Fremdkörper in das Getriebe gelangt.

Beschädigte Teile, sowie Dichtringe, durch neue Bosch Rexroth Teile ersetzen.

Vor dem Einbau sind alle beweglichen Teile sowie Dichtringe einzuölen.

Unter Umständen ist der Farbanstrich des Getriebes durch das Zerlegen und Zusammenbauen beschädigt. Erneuern Sie deshalb den Farbanstrich, um das Getriebe gegen Korrosion zu schützen.

Führen Sie einen Probelauf des Getriebes durch.

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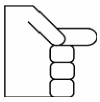
Hinweis!

Die verwendeten Bilder müssen nicht der beschriebenen Getriebetype entsprechen.

1.1 Introduction



This symbol signifies danger to the product and the overall plant.



This symbol calls attention to notes.



For disassembly, assembly procedure of the gearbox, spare parts drawing and parts list of the respective gearbox-type is required.

The safety instructions and the appropriate accident prevention instructions have absolutely to be observed!

Exclusively install original spares.

Drain the oil from the gearbox.
For this purpose use suitable containers.

Make sure that no dirt or foreign bodies are allowed to enter the gearbox.

Replace damaged parts and all seals by new Bosch Rexroth parts.

Oil all moving parts and seals prior to assembly.

In the event the paint coat of the gear-box has been damaged as a result of disassembly / assembly work touch up or renew the paint coat as necessary to protect the gear against corrosion.

Carry out a test run of the gearbox.

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Note!

The photos may show other drive types than the described one.

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1.2 Anziehdrehmomente

1.2 Tightening Torques

Standard-Anziehdrehmomente M_A in Nm für ungeschmierte Schaftschrauben (m = 0,13 bis 0,17) mit Regelgewinde ohne zusätzliche Einzelangaben (s. LSN 945 0201)

Standard-tightening torque M_A in Nm for unlubricated shoulder stud (m = 0,13 - 0,17) with standard thread without additional details (LSN 945 0201)

Schraube screw		**M 6**	**M 8**	**M 10**	**M 12**	**M 14**	**M 16**	**M 20**	**M 24**	**M 27**	**M 30**	**M 33**	**M 36**	**M 39**	**M 42**
8.8	**Dr.**	8,5	21,1	42,2	73,6	114,8	176,6	358	618	903	1216	1687	2129	2757	3394
10.9	**Dr.**	12,4	30,4	60,8	104,0	166,8	255,1	510	873	1285	1736	2364	3021	3924	4836

Dr. = Drehmomentschlüssel (torque wrench)

1.3 Schmieröl; Gewicht

1.3 Lube Oil; Weight

Gewicht	ca.	460 kg	*Weight*	*approx.*	*460 kg*
Getriebeölmenge	ca.	6,5 Liter	*Gear lube oil volume*	*approx.*	*6,5 litres*
Schmieröl		CLP 220 oder SAE 85 W-90 API GL-4	*Lube oil*		*CLP 220 or* *SAE 85 W-90 API GL-4*

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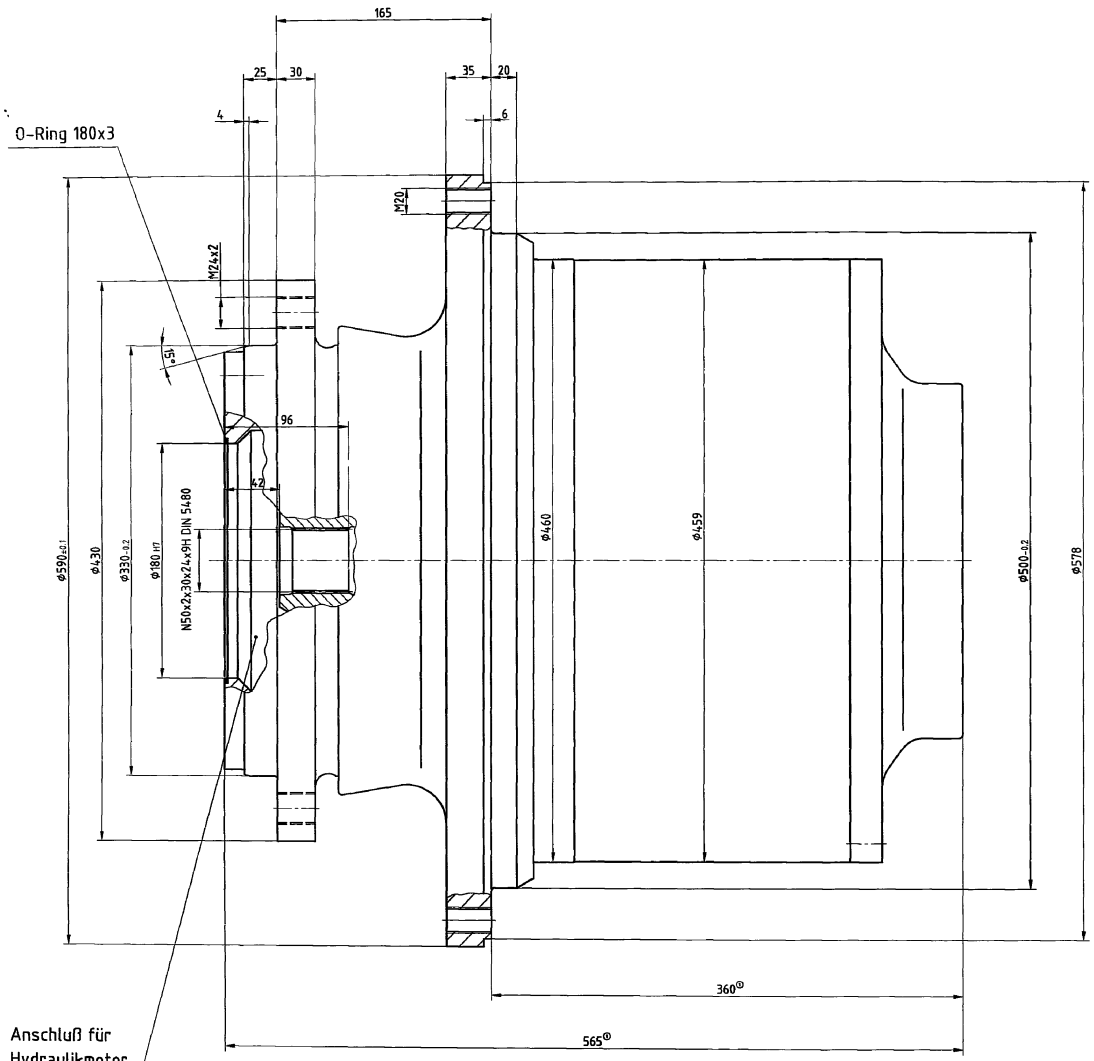
2. Zeichnungen • *2. Drawings*

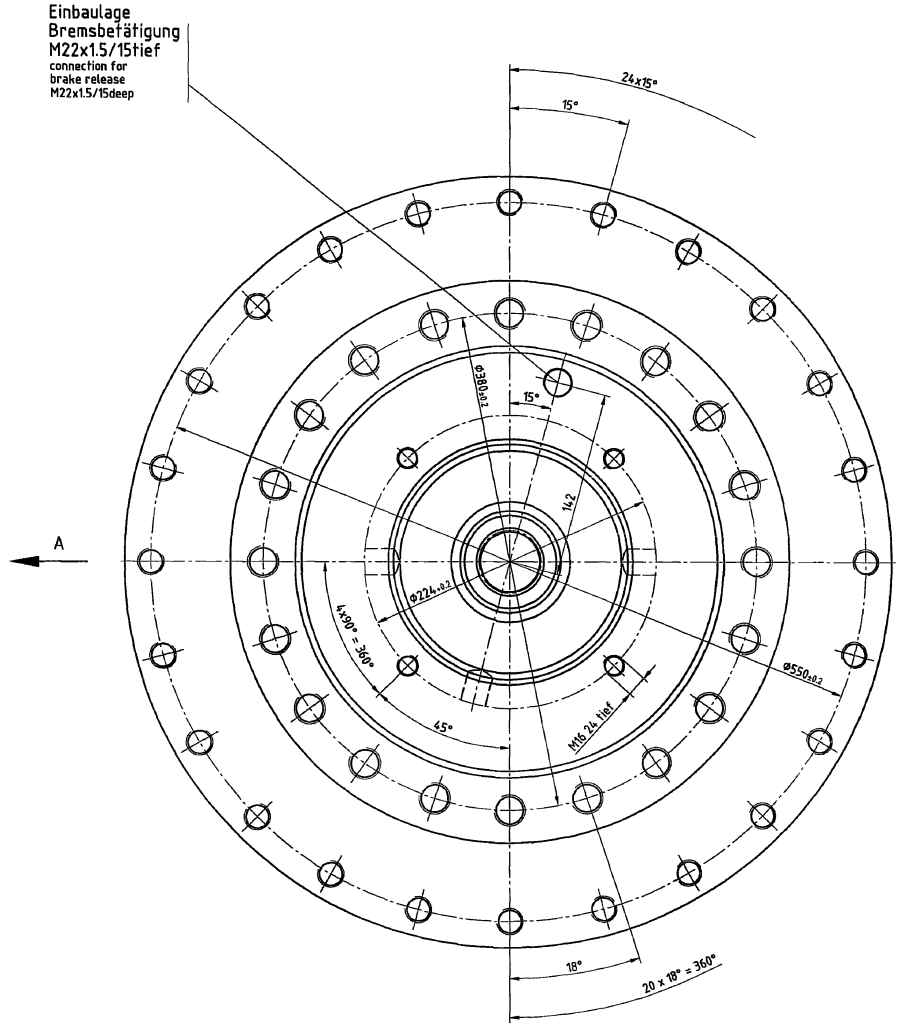
Zeichnungen

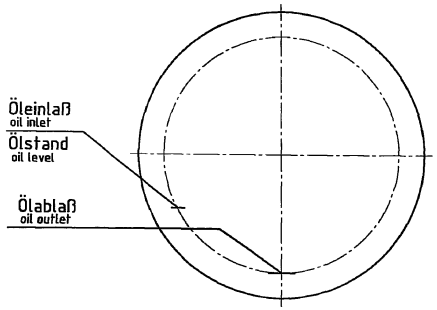
Einbauzeichnung	1/6158/5279/1
Ersatzteilzeichnung	0/6158/1279/3

Drawings

Installation Drawing	1/6158/5279/1
Spare Parts Drawing	0/6158/1279/3







Ansicht A
view A

Technische Daten		technical data	
Antriebsdrehmoment T1	1017 Nm	input torque T1	750.5 ft.lbs
Antriebsdrehzahl n1 max.	3054 min^{-1}	input speed n1 max.	3054 rpm
Übersetzung	83	ratio	83
Abtriebsdrehmoment T2 max.	84460 Nm	output torque T2 max.	62289 ft.lbs
Abtriebsdrehzahl n2	40 min^{-1}	output speed n2	40 rpm
Federdruck Lamellenbremse		spring applied,multi disk brake	
Bremsmoment statisch	1300 Nm	static brake torque	959 ft.lbs
Lüftdruck p	18	release pressure p	261
max.Lüftdruck p.max	50 bar	max.release pressure p.max	725 psi

Nr.	Änderung	Tag	geänd.	gepr.
1	2x	01.09.99	Schöner	

Rohteil :
Werkstoff :
Fertiggewicht :
Maße ohne Toleranzangaben : ISO 2768-mH

Ursprung (Typ): GFT 110 R3 9279

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	Tag	Name
gez.	13.07.1999	Makalla
bearb.	13.07.99	
gepr.		

Benennung: Fahrgetriebe propel drive

Maßstab 1:2

Lohmann + Stolterfoht

Zeichng.-Nr. 1/6158/5279/1

ACAD

Ursprr.-Zeichng.-Nr.

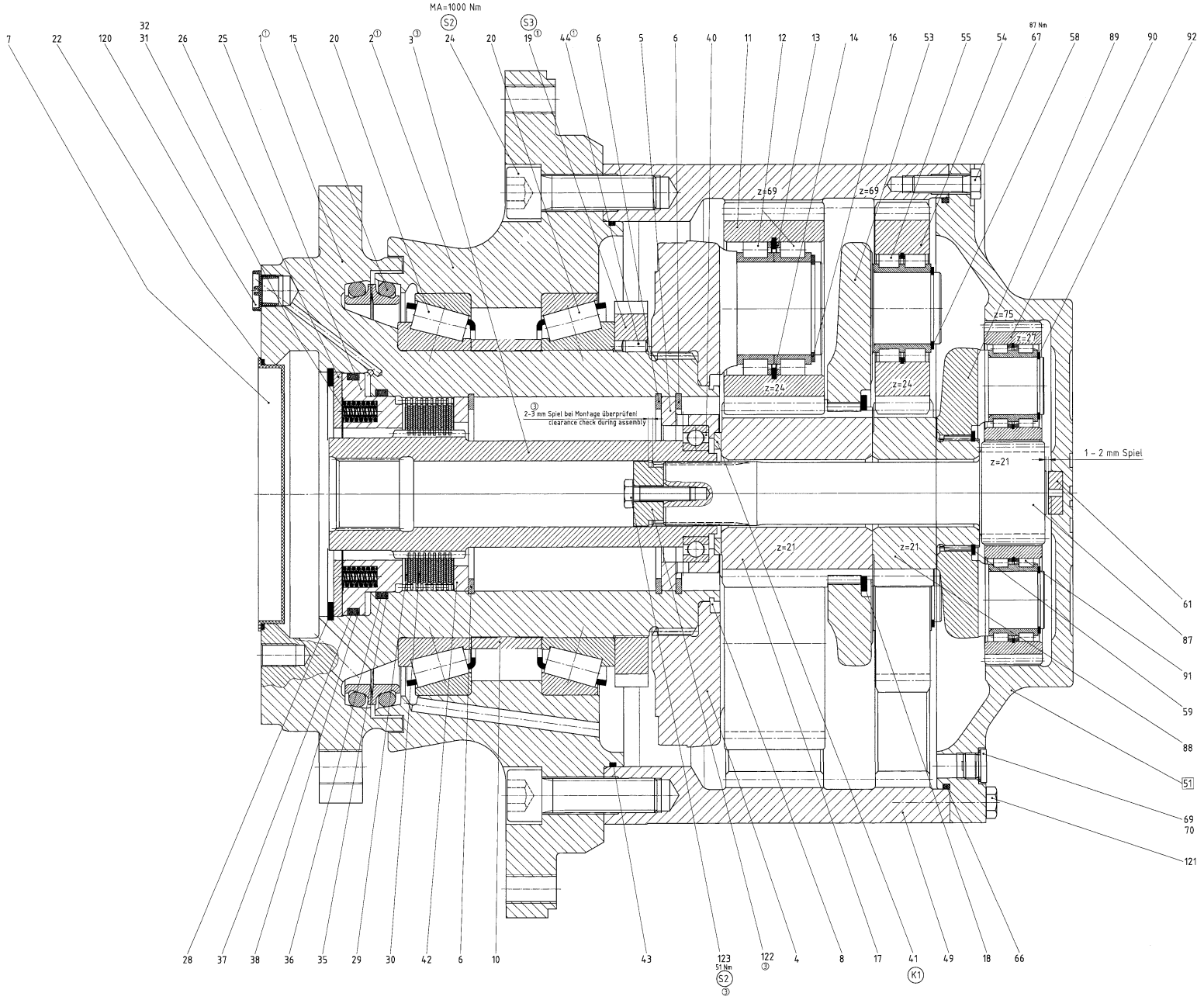
Bl.

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Montageanweisung

1. Kegelrollenlager im Stützring montieren.
2. Stützring auf Montageplatte aufsetzen.
3. Gewicht von 100 kp auf Lager aufsetzen.
4. Lagerung durch 20 Drehungen in einer Richtung eindrehen.
5. Maß zwischen Innenring mittels Meßvorrichtung messen.
6. Innenring auf Maß schleifen, d.h. ermitteltes Maß -0.25 mm.
7. Komplette Lagerung auf Tragache montieren.
8. Gewinde und Wellenmutter entfetten und Wellenmutter auf der gesamten Höhe und rundum mit Loctite 638 einstreichen.
9. Wellenmutter bis Lager herunterdrehen, dabei Hohlrad drehen.
10. Wellenmutter mit Kraftschrauber HLS 1650 bis 280 bar = 660daNm anziehen, Hohlrad dabei drehen (eine Richtung).
11. Stellung der Wellenmutter zur Tragachse markieren. ("0" -Markierung)
12. Reibmoment am Hohlrad, mit Vorrichtung messen (ca. 12 daNm).
13. Anzugsmoment bis auf 520 bar = 1225 daNm hochfahren.
14. Reibmoment messen, gleicher Wert wie unter Pkt. 12 muß erreicht werden.
15. Verdrehung der Wellenmutter (s.Pkt.11) messen (ca. 25-30 mm). Wellenmutter verstemmen. (auf Durchmesser 200 gemessen) Verdrehwinkel = 14,°
16. Zur aushärtung von Loctite ist eine Wartezeit von 24 Stunden einzuhalten, bevor der Probelauf stattfindet.
17. Alle festgelegten Werte sind in einem Protokoll festzuhalten.

Motoranschluß für A6 VM 160
motor connection



Typenschild an dem gekennzeichneten Bauteil angebracht.
Name plate fixed to the marked component.

S2	=	mit LOCTITE 270 gesichert secured with LOCTITE 270
S3	=	mit LOCTITE 638 gesichert secured with LOCTITE 638
D2	=	mit LOCTITE 586 gedichtet sealed with LOCTITE 586
D3/D4	=	mit LOCTITE 573/574 gedichtet sealed with LOCTITE 573/574
D5	=	mit LOCTITE 518 gedichtet sealed with LOCTITE 518
K1	=	mit LOCTITE 640 geklebt glued on with LOCTITE 640
K2	=	mit LOCTITE 480 geklebt glued on with LOCTITE 480
K3	=	mit LOCTITE 329 geklebt glued on with LOCTITE 329

i=83

Nr.	Änderung	Tag	gepr.
4			
3	4x	02.09.97	Gezer
2	Pos.121	24.8.01	Albers
1	5x	16.11.09	Fülker

Zustell :
Werkstoff :
Fertiggewicht :
Maße ohne Toleranzangaben: ISO 2768-mH

	Tag	Name
gez.	25.11.2004	Pfandl
bearb.	05.10.15	Gregor
gepr.		

Bemerkung

Lohmann + Stolterfoht

Benennung (Typ)
Umgang

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GFT 110 R3 9279 i=83,0

Zeichnungs-Nr.
0/6158/1279/3

Index
1:1

ACAD

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3. Teileliste • *3. Parts List*

Teileliste

Teileliste 16218391

Partslist

Parts List *16218391*

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3. Teileliste • *3. Parts List*

01.02.2008 Teileliste / Parts List

Matnr./Material No : 16218391
Auftrag/Order :
Produkt/Product : GFT 110 R3 9279 i=83,0 KDN-K
Zeichnungs-Nr./Drawing No : 0 6158/1279 3

Menge Quantity	Pos. Item	Benennung Designation
1,000	001	Tragachse GFT 110 R3 9279 Spindle
1,000	002	Stuetzring GFT 110 R3 9279 Supporting ring
1,000	003	Mitnehmer GFT 110 Coupler
1,000	004	Planetensteg 1wg GFT 110 Planet carrier
1,000	005	Lagerring * GFT 80/110 Bearing ring
3,000	006	Sicherungsring 135x4 Snap ring DIN 472
1,000	007	Verschlussstopfen KAS00119 (D=180) Cap plug
1,000	008	Sprengring SP 150 Snap ring DIN 5417
1,000	010	Zwischenring GFT 102 R2** Spacer ring
5,000	011	Planetenrad GFT 110 Planet gear
10,000	012	Zylinderrollenlager RSL 183013 Cylindrical roller bearing DIN 5412
10,000	013	Anlaufscheibe F 91809 Locating ring
5,000	014	Sicherungsring 95x3 Snap ring DIN 472
1,000	015	Gleitringdichtung 265x293x38 A Face seal 76.97H-26NB60

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3. Teileliste • *3. Parts List*

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Produkt/Product : GFT 110 R3 9279 i=83,0 KDN-K
Zeichnungs-Nr./Drawing No : 0 6158/1279 3

Menge Quantity	Pos. Item	Benennung Designation
5,000	016	Sicherungsring 65x2,5 Snap ring DIN 471
1,000	017	Sonnenrad GFT 110 Sun gear
1,000	018	Sicherungsring 120x4 Snap ring DIN 471
1,000	019	Wellenmutter M 200 x 2,5 Shaft nut
2,000	020	Kegelrollenlager 32940 J Tapered roller bearing DIN 720
24,000	024	Zylinderschraube M 24x2x80 Socket head cap screw DIN 912
1,000	025	Kolben GFT 60 / 80 Piston
1,000	026	Scheibe * GFT60 / 80 Disk
1,000	028	Sicherungsring 170x4 Snap ring DIN 472
10,000	029	Aussenlamelle 3070-636-33-001 Outer disk
9,000	030	Innenlamelle 3002-740-32-001 Inner disk
18,000	031	Druckfeder 2,5x11,5x37 Pressure spring DIN 2098
18,000	032	Druckfeder 1,6x6,5x37 Pressure spring DIN 2098
2,000	035	Stuetzring 136x145,4x1,4 P Supporting ring

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3. Teileliste • *3. Parts List*

01.02.2008 Teileliste / Parts List

Matnr./Material No : 16218391
Auftrag/Order :
Produkt/Product : GFT 110 R3 9279 i=83,0 KDN-K
Zeichnungs-Nr./Drawing No : 0 6158/1279 3

Menge Quantity	Pos. Item	Benennung Designation
1,000	036	Quadring 4356 446 A Piston seal
1,000	037	Quadring 4362 446 A Piston seal
2,000	038	Stuetzring 159x168,4x1,4 P Supporting ring
1,000	040	Rillenkugellager 6012 J Ball bearing DIN 625
1,000	041	Gehaeusescheibe GS 81112 Housing washer
1,000	042	Scheibe GFT 110 R3 9279 Disk
1,000	043	O-Ring 367x3,5 O-ring DIN 3771
2,000	044	Zylinderstift 8 m6x18 B Cylindrical dowel pin ISO 8734
1,000	049	Hohlrad GFT 110 Ring gear
1,000	051	Hohlraddeckel GFT 110 R3 9279 Ring gear cover
1,000	053	Planetensteg 1wgGFT110W6x Planet carrier
3,000	054	Planetenrad GFT 110 W 6xx Planet gear
3,000	055	Zylinderrollenlager F-212543 Cylindrical roller bearing DIN 5412
3,000	058	Sicherungsring 50x2 Snap ring DIN 471

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3. Teileliste • *3. Parts List*

01.02.2008 Teileliste / Parts List

Matnr./Material No : 16218391
Auftrag/Order :
Produkt/Product : GFT 110 R3 9279 i=83,0 KDN-K
Zeichnungs-Nr./Drawing No : 0 6158/1279 3

Menge Quantity	Pos. Item	Benennung Designation
1,000	059	Sicherungsring 75x2,5 Snap ring DIN 471
1,000	061	Gehaeusescheibe GFT 36/50 Housing washer
1,000	066	O-Ring 395x4 O-ring DIN 3771
12,000	067	6kt-Schraube M 12x40 Hex head bolt DIN 933
2,000	069	Verschlussschraube M 18x1,5 m. Mag. Screw plug
2,000	070	Dichtring A 18x22x1,5 Seal ring DIN 7603
1,000	087	Sonnenradwelle GFT 110 R3 9279 Sun gear shaft
1,000	088	Sonnenradwelle GFT 110 Sun gear shaft
1,000	089	Planetensteg GFB 17 T2 Planet carrier
4,000	090	Planetenrad GFT 13 T2 z=27 m=3 Planet gear
4,000	091	Zylinderrollenlager F-208099 Cylindrical roller bearing DIN 5412
4,000	092	Sicherungsring 40x1,75 Snap ring DIN 471
1,000	120	Stopfen GPN 700 B M22-1,5 Plug
2,000	121	6kt-Schraube M 12x20 Hex head bolt DIN 933

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3. Teileliste • *3. Parts List*

01.02.2008 Teileliste / Parts List

Matnr./Material No	:	16218391
Auftrag/Order	:	
Produkt/Product	:	GFT 110 R3 9279 i=83,0 KDN-K
Zeichnungs-Nr./Drawing No	:	0 6158/1279 3

Menge Quantity	Pos. Item	Benennung Designation
1,000	122	Scheibe GFT 110 R3 Disk
1,000	123	6kt-Schraube M 10x40 Hex head bolt DIN 931
1,000	022	O-Ring 180x3 O-ring DIN 3771

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4. Demontage • *4. Disassembly*

4.1 Demontage Allgemein

Getriebe nur im ausgebauten Zustand demontieren.

Für die Demontage des Getriebes sind folgende Vorarbeiten erforderlich:

Beachten Sie hierzu auch Kapitel 8 der entsprechenden Betriebsanleitung für die Getriebetype.

- **Getriebeöl ablassen. Lösen Sie dafür Verschlussschrauben (Pos. 69). Verwenden Sie dabei geeignete Auffanggefäße.**
  Ölinhalt:
  ca. 6,5 Liter

Achten Sie beim Transport auf eine ausreichende Tragkraft des Kranes.

Getriebegewicht: ca. 460 kg.

- **Stellen Sie sicher, dass das abgesetzte Getriebe seine Lage nicht ändern kann.**

4.1 Disassembly General

Make sure to remove the gearbox from the machine frame before disassembling it.

Prior to disassembly prepare the drive as follows:

Also observe chapter 8 „Operating Instructions" in according of the gearbox type.

- ***Remove screw plugs (items 69) and drain oil. Use suitable oil drain pan.***

  Gear lube oil volume:
  Approx. 6,5 liters

When handling the equipment make sure the carrying capacity of the crane is adequate.
***Gearbox Weight approx* 460 kg.**

- ***Make sure the set down gearbox rests immovably.***

4.2 Demontage Bremse

4.2 Disassembly Brake



Bild / fig. 1

Lassen Sie das Öl ab. Entfernen Sie die Ölablassschraube Pos. 69, 70.
Fangen Sie Altöl in geeigneten Behältern auf und entsorgen Sie es unter Beachtung der entsprechenden Vorschriften.

Remove screw plugs item69, 70 and drain oil.
Collect spent oil in suitable containers and dispose of the oil line with the respective regulations.



Bild / fig. 2

Demontieren Sie die Schraube Pos. 123 aus dem Mitnehmer Pos. 3.

Disassemble the screws item 123.

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4. Demontage • *4. Disassembly*



Bild / fig. 3

Demontieren Sie die Scheibe Pos. 122 aus dem Mitnehmer Pos. 3.

Disassemble the disk item122.





Bild /fig. 4

Pressen Sie mit geeigneter Vorrichtung die Bremse gegen die Federn Pos. 31, 32 und entfernen Sie den Sicherungsring Pos. 28.

Press gearbox with suitable fixture against springs item 31, 32 and remove snap ring item 28.



Bild / fig. 5

Entfernen Sie die Scheibe Pos. 26.

Remove pressure springs item 26.



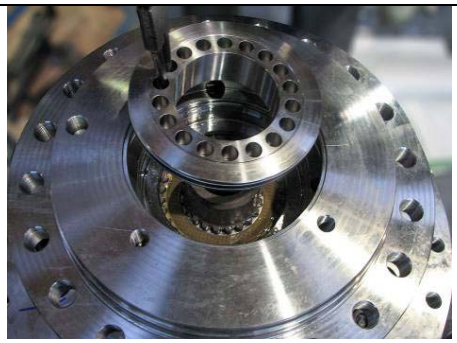
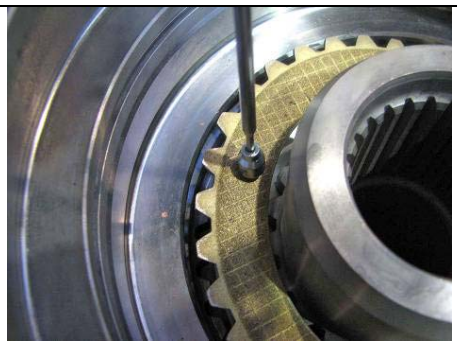
Bild / fig. 6

Entfernen Sie die Federn Pos. 31, 32.

Remove pressure springs item 31, 32.

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4. Demontage • *4. Disassembly*

 Bild / fig. 7		Entfernen Sie den Kolben Pos. 25 mit Quad- und Stützringen. Entfernen Sie die Quad- und Stützringe Pos. 25 aus Tragachse Pos. 1. *Remove piston item 25 with piston seals and supporting rings.* *Remove piston seals as well as supporting rings out off spindle item 1.*
 Bild / fig. 8		Entfernen Sie die Lamellen Pos. 29, 30. *Remove brake disks item 29, 30.*
 Bild / fig. 9		Entfernen Sie den Mitnehmer Pos. 3. *Remove coupler item 3.*

4.3 Demontage Abtrieb

4.3 Disassembly Output

4.3.1 Demontage Planetenstufen/ Planetenstege

4.3.1 Disassembly Planet Stage/ Planet Carrier




Bild /fig. 10

Lösen Sie die Schrauben Pos. 67 und entfernen Sie den Deckel Pos. 51 mit O-Ring Pos. 66.

Remove bolts item 67 and remove cover item 51 with o-ring item 66.

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4. Demontage • *4. Disassembly*




Bild /fig. 11

Entfernen Sie die Sicherungsringe Pos. 92 von den Planetenrädern Pos. 90. Entfernen Sie die Planetenräder Pos. 90 mit Hilfe einer Vorrichtung.

Remove snap rings item 92.Pull planet wheels item 90. Use fixture



Bild / fig. 12

Entfernen Sie den Sonnenradwelle Pos. 87.

Remove sun gear shaft item 87.



Bild / fig. 13

Heben Sie den Planetensteg Pos. 89 mit Sonnenrad Pos. 88 aus dem Getriebe.

Remove planet carrier item 89 with sun gear shaft item 88.



Bild / fig. 14

Heben Sie die komplette Planetenstufe (Pos. 54, 53, 55, 17) aus dem Getriebe.

Remove complete planet stage (item 54, 53, 55, 17).

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4. Demontage • *4. Disassembly*

 Bild / fig. 15			Drücken Sie den Sprengring Pos.8 aus der Nut des Planetenstegs Pos. 4 und entfernen ihn. (Siehe Bild 15.) Lösen Sie den Sprengring Pos. 8. *Press snap ring item 8 from the nut of planet stage and loose the ring. (see fig. 15)*
 Bild / fig. 16			Heben Sie den kompletten Planetensteg (Pos. 4, 11, 12) aus dem Getriebe. *Remove complete planet stage (item 4, 11, 12).*

4.3.2 Demontage Wellenmutter

4.3.2 Disassembly Shaft Nut

 Bild / fig. 17			Entfernen Sie den Sicherungsring Pos. 6 und entfernen Sie den Lagerring Pos. 5. *Remove snap ring item 6 and disassemble bearing ring item 5.*
 Bild / fig. 18			Entfernen Sie den Sicherungsring Pos. 6. *Remove snap ring item 6.*

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4. Demontage • *4. Disassembly*



Bild / fig. 19

Entfernen Sie den Sicherungsring Pos. 6 und die Scheibe Pos. 42.

Remove snap ring item 6 and disk item 42.

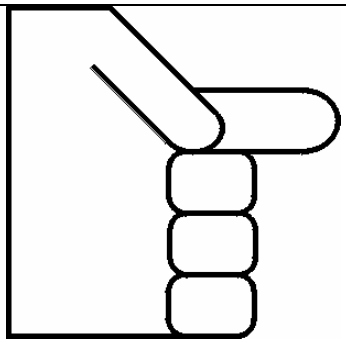


Bild / fig. 20

Entfernen Sie die Wellenmutter Pos. 19.
Hierzu sind folgende Arbeitsschritte erforderlich:
ACHTUNG!
Schutzbrille tragen.

Remove shaft nut item 19. To accomplish this you would do the following:
ATTENTION!
Wear suitable protective goggles.

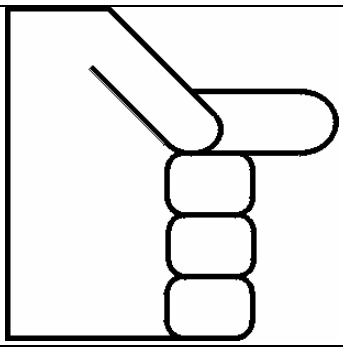


Bild / fig.. 21

Decken Sie den Bauraum zum Kegelrollenlager Pos. 20 hin ab. Entfernen Sie während des Bohrvorganges die Metallspäne um sicherzustellen, dass keine Metallreste im Getriebe verbleiben.

Cover the area towards to the tapered roller bearing item 20. Clean away metal scrap from drilling as you drill to ensure no material gets lost within drive.

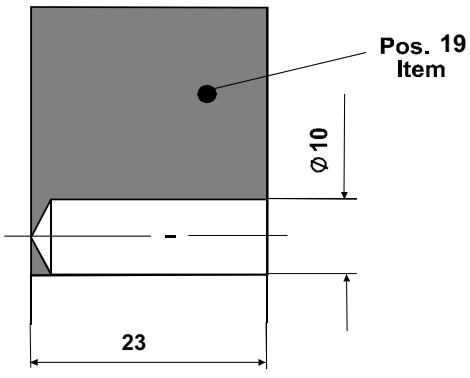


Bild / fig.. 22

1.)
Bohren Sie im Bereich der Zylinderstifte Pos. 44 entsprechend der beiliegenden Skizze Bild 22 ein Loch in die Wellenmutter Pos. 19.
ACHTUNG!
Nicht den Innenring des Kegelrollenlagers Pos. 22 beschädigen! Späne entfernen!

Start drilling one side of the shaft nut item 19 close to one of the dowel pins item 44 according to the attached sketch fig.. 19.
ATTENTION!
Do not damage the bearing inner ring of tapered roller bearing item 20, carefully remove metal scraps!

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4. Demontage • *4. Disassembly*

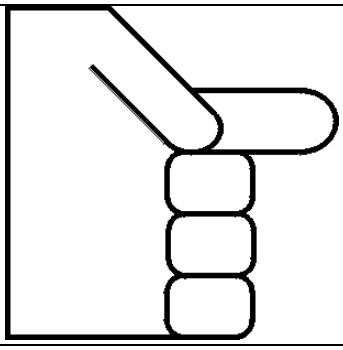


Bild / fig.. 23

2.)
Setzen Sie neben diese Bohrung eine weitere und wiederholen Sie den Vorgang zum Außen Ø der Wellenmutter Pos. 19 hin, bis diese Seite ausgebohrt ist.

Drill another hole next to the one you just completed and keep working your way towards the shaft nut item 19 outside diameter until that side is drilled out.

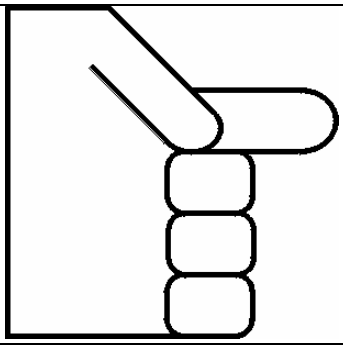


Bild / fig.. 24

Wiederholen Sie die Arbeitsschritte 1.) und 2.) um 180° versetzt an der Wellenmutter.

Go 180° degrees around the shaft nut and start the process over again.

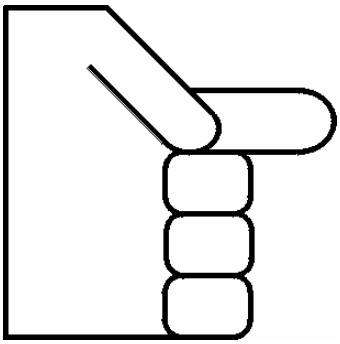


Bild / fig.. 25

Wellenmutter Pos. 19 mit Hilfe eines Meißels im Bereich der beiden Bohrungen sprengen und von der Tragachse Pos. 1 entfernen.
ACHTUNG!
Nicht den Lagerkäfig. des Lagers Pos. 20 beschädigen!
ACHTUNG!
Die Wellenmutter darf sich hierbei nicht drehen!

Use a chisel to open up the shaft nut item 19 where you completed your drilling and remove it from the spindle item 1.
ATTENTION!
Do not damage the bearing cage of bearing item 20!
ATTENTION!
Do not turn the shaft nut – possibility of spindle thread damage!

4.3.3 Demontage Abtriebslagerung

4.3.3 Disassembly Output Bearings



Bild / fig.. 26

Heben Sie das Hohlrad Pos. 49, 2 ab.

Remove ring gear item 49, 2.

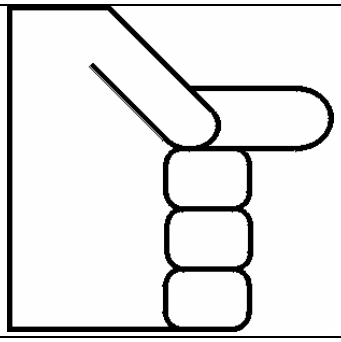
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4. Demontage • *4. Disassembly*

Bild / fig. 27  Abb. ähnlich/ similar in design			Entfernen Sie das Rollenlager Pos.20 aus Getriebe. *Remove bearing cage of upper tapered roller bearing item 20.*
Bild / fig. 28 			Lösen Sie die Schrauben Pos. 24 und demontieren Sie den Stützring Pos. 2 vom Hohlrad Pos. 49. *Loose the screws item 24 and disassemble the supporting ring item 2.*
Bild / fig. 29 			Demontieren Sie die Lageraußenringe Pos. 20. *Remove rings of tapered roller bearing item 20.*
Bild / fig. 30 			Demontieren Sie den Zwischenring Pos. 10 von der Tragachse Pos. 1. *Disassemble spacer ring item 10 from spindle item 1.*

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4. Demontage • *4. Disassembly*

Bild / fig. 31 		Entfernen Sie das Rollenlager Pos. 20 von der Tragachse Pos. 1. *Remove roller bearing item 20 from spindle item 1.*
Bild / fig. 32 		Demontieren Sie die Gleitringdichtungen Pos. 51 von der Tragachse Pos. 1. **Achtung!** **Keine scharfkantigen Werkzeuge benutzen.** *Remove the axial face seal half item 51 out of the spindle item 1.* ***Attention!*** ***Do not use a tool with a sharp edge!***
Bild / fig. 33 		Deformiertes Gewinde der Tragachse Pos. 50 im Bereich der Zylinderstifte mit Hilfe einer Gewindefeile - Steigung 3mm nacharbeiten. *Repair deformed threads on the spindle item 50 in the area of cylindrical dowel pins with a thread file of 3mm pitch.*

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5. Montage • *5. Assembly*

5.1 Montage Allgemein

Vor der Montage sind folgende Verschleißprüfungen erforderlich:

- **Prüfen Sie auf Verschleiß:**
  - **axiale Anlaufflächen**
  - **Passsitze**
  - **Gewindebohrungen**
- **Prüfen Sie alle Dichtflächen auf:**
  - **Beschädigung**
- **Prüfen Sie die Lager auf:**
  - **Verwendbarkeit (Spiel übermäßig)**
  - **visuelle Prüfung**
- Prüfen Sie die Verzahnung auf:
  - **Zahnausbrüche**
  - **Pittings**
  - **Rissbildung**
  - **Gratbildung**
  - **Verschleiß**

MET-L-CHEK / Rissprüfung:

1. **Entfetten und reinigen der Prüfteile (z.B. Spezialreiniger NPU).**
2. **Aufbringen des Eindringmittel (z.B. DYE VP 30). Einwirkzeit ca. 5-30 Min. je nach Temperatur und Werkstoff.**
3. **Werkstück von Eindringmittel reinigen. (z.B. mit Spezialreiniger NPU oder Wasser) Oberfläche trocknen lassen.**
4. **Den Entwickler „weiß“, hauchdünn auftragen. Nach einer kurzen Trockenzeit tritt aus den Fehlstellen das Eindringmittel (z.B. DYE VP 30) aus und bildet mit dem weißen Entwickler einen roten Kontrast.**
5. **Inspektion – rote Linien im weißen Entwicklerfeld zeigen Risse oder Überlappungen an, während punktförmige Farbaustritte als Poren zu werten sind.**

5.1 Assembly General

Prior to assembly the following inspections of wear and tear are required:

- *Check for wear:*
  - ***axial contact faces***
  - ***machined seats***
  - ***threaded holes***
- ***Check all sealing faces for:***
  - ***damage***
- *Check the bearings for:*
  - ***usability (excessive clearance)***
  - ***visual appearance***
- *Check the gear teeth for:*
  - ***tooth breakage***
  - ***pitting***
  - ***cracks***
  - ***burrs***
  - ***wear***

MET-L-CHEK / check for cracks

1. ***Degrease and clean the parts to be checked (e.g. special cleaner NPU).***
2. ***Apply penetrant fluid (e.g. DYE VP 30). Reaction time approx. 5-30 minutes depending on temperature and material.***
3. ***Clean off penetrant fluid from work piece (e.g. with special cleaner NPU or water). Allow surface to dry.***
4. ***Apply a very thin layer of developer „white“. After a short drying time, the penetrant fluid (e.g. DYE VP 30) emerges from the defective spots and creates a red contrast to the white developer.***
5. ***Inspection – red lines on the white developer field indicate cracks or overlapping, while point shaped color patterns can be rated as blowholes and pores.***

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5. Montage • *5. Assembly*

5.1 Montage Allgemein

5.1 *Assembly General*

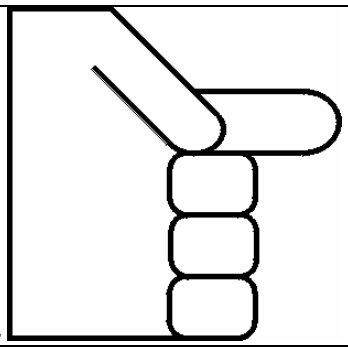


Bild / fig. 34

Entfetten Sie die Aufnahmebohrung für die Gleitringdichtung Pos. 15 in Tragachse Pos. 1. (z.B. LOCTITE 7061)

Degrease and dry the cavities for the face seal item 15 in the spindle item 1 (e.g. with LOCTITE 7061).

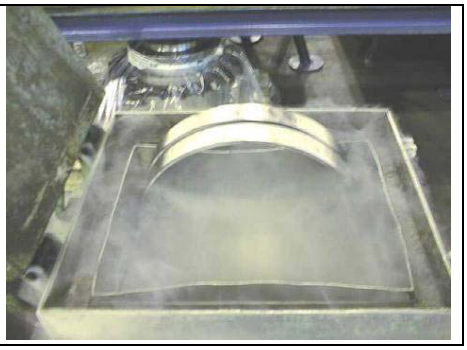


Bild / fig.. 35

Kühlen Sie die Außenringe der Kegelrollenlager Pos. 20 in flüssigem Stickstoff auf –180°C ab.

Use nitrogen to cool down the outer rings of tapered roller bearings item 20 to approx. –180°C.

5.2 Montage Abtrieb

5.2 *Assembly Output*

5.2.1 Montage Abtriebslagerung

5.2.1 *Assembly Output Bearings*



Bild / fig. 36

Setzen Sie die in Stickstoff abgekühlten Außenringe von den Kegelrollenlagern Pos. 20 in den Stützring Pos. 2 ein. (Prüfen Sie auf richtige axiale Anlage).

After cooling-off with nitrogen, insert outer rings of tapered roller bearings item 20 into supporting ring item 2. (Check for proper axial seat).



Bild / fig. 37

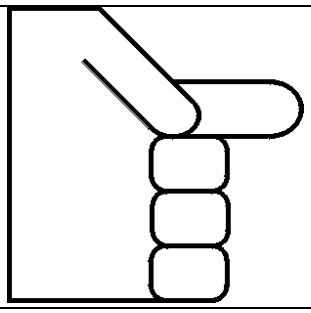
Abb. ähnlich/ similar in design

Montieren Sie die beiden Kegelrollenlager (Pos. 20) in den Stützring (Pos. 3).

Mount both tapered roller bearing (item 20) into the supporting ring (item 3).

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5. Montage • *5. Assembly*

Bild / fig. 38  Abb. ähnlich/ similar in design		Belasten Sie die beiden Kegelrollenlager Pos. 20 axial mit Hilfe einer Vorrichtung mit 100 kp. Lagerung durch 20 Drehungen in einer Richtung eindrehen. *Apply axial load of 100 kp to both bearings item 20. Make use of a device.*
Bild / fig. 39  Abb. ähnlich/ similar in design		Messen Sie das Maß zwischen den beiden Innenringen der Kegelrollenlager Pos. 20 mittels einer Messvorrichtung. *Determine dimensions between inner rings of bearing item 20 with measuring device.*
Bild / fig. 40 		Schleifen Sie den Zwischenring Pos. 10 auf Maß. (Ermitteltes Maß -0,25 mm). Grind spacer ring item 10 to measure, i.e. calculated dimension -0,25 mm.
Bild / fig. 41 		Benetzen Sie die Gleitringdichtungs – O-Ringe Pos. 15 und die Aufnahmebohrung der Tragachse Pos. 1 mit Spiritus. *Wet axial face seal o- rings item 15 and cavity spindle item 1 with spirit of wine cleaner.*
Bild / fig. 42 		Drücken Sie die untere Gleitringsichtungshälfte Pos. 15 in die entsprechende Aufnahmebohrung der Tragachse Pos. 1. **Achtung!** **Keine scharfkantigen Werkzeuge benutzen.** *Install face seal ring halfs item 1 into spindle item 1 under even pressure on the seal surface.* ***Attention!*** ***Do not use a tool with a sharp edge***

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5. Montage • *5. Assembly*

Bild / fig. 43			Versehen Sie die Gleitflächen der Gleitringdichtung Pos. 15 mit einem Ölfilm. *Wet the sliding surfaces of the face seal item 15 with oil.*
Bild / fig. 44			Setzen Sie die obere Gleitringdichtungshälfte Pos. 15 auf die untere Gleitringdichtungshälfte. *Mount the upper face seal ring half item 15 onto lower face seal ring half.*
Bild / fig. 45			Montieren Sie den unteren Innenring mit Rollenkranz von Kegelrollenlager Pos. 20 auf Tragachse Pos. 1. *Mount upper inner ring with roller cage of double tapered roller bearing item 20 onto spindle item 1.*
Bild / fig. 46			Setzen Sie den auf Maß geschliffenen Zwischenring Pos. 10 auf die Tragachse Pos. 1auf. *Mount the grounded spacer ring item 10 on the spindle item 1.*
Bild / fig. 47			Setzen Sie den gefetteten O-Ring Pos. 43 in die entsprechende Nut im Stützring Pos. 2 ein. *Insert chord item 43 into the o-ring groove of supporting ring item 2.* *Grease chord.*

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5. Montage • *5. Assembly*



Bild / fig. 48

Setzen Sie den Stützring Pos. 2 auf das Hohlrad Pos. 49.

Mount supporting ring item 2 onto ring gear item 49.



Bild / fig. 49

Bestreichen Sie das Gewinde der Zylinderschrauben Pos. 24 gleichmäßig mit LOCTITE 270 bestreichen.

Evenly apply coat of LOCTITE 270 to threads of socket head cap screws item 24.



Bild / fig. 50

Zylinderschrauben Pos. 24 in entsprechende Gewindebohrungen von Hohlrad Pos. 49 einsetzen und mit einem Anzugsdrehmoment von 1000 Nm anziehen.

Install socket head cap screws item 24 into threaded holes of ring gear item 49 and tighten them to a required torque of 1000 Nm.



Bild / fig. 51

Montieren Sie das vormontierte Hohlrad mit Stützring Pos. 49, 2 auf die vormontierte Tragachse Pos. 1.

Install pre-assembled the ring gear with supporting ring item 49, 2 on spindle item 1.



Bild / fig. 52

Montieren Sie den oberen Innenring mit Rollenkranz des Kegelrollenlagers Pos. 20 in das Hohlrad Pos. 49.

Mount upper inner ring with roller cage of double tapered roller bearing item 20 into ring gear item 49.

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5.2.2 Montage Wellenmutter

5.2.2 Assembly Shaft Nut



Bild / fig. 53

Bestreichen Sie das Gewinde der Wellenmutter Pos. 19 gleichmäßig mit LOCTITE 638.

Evenly apply coat of LOCTITE 638 to thread of shaft nut item 19.



Bild / fig. 54

Montieren Sie die Wellenmutter Pos. 19 mit Ringkerbe nach oben (sichtbar).

Mount shaft nut item 19 with groove on upper side (visible).



Bild / fig. 55

ACHTUNG!
Beim Einstellen der Kegelrollenlager ist der Stützring mehrfach in eine Richtung zu drehen.
- Wellenmutter Pos. 19 – mittels einer Vorrichtung mit einem Anziehdrehmoment von 1225 daNm anziehen.

ATTENTION!
Rotate the supporting ring repeatedly in one direction only when setting the tapered roller bearing
Tighten shaft nut item 19 – by using an adequate device with a tightening torque of 1225 daNm.



Bild / fig. 56

Setzen Sie die Zylinderstifte Pos. 44 ein.

Insert cylindrical dowel pins item 44.

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5. Montage • *5. Assembly*

5.2.3 Montage Planetenstufen/ Planetenstege

5.2.3 Assembly Planet Stage/ Planet Carrier



Bild / fig. 57

Montieren Sie die Scheibe Pos. 42 und den Sicherungsring Pos. 6.

Mount the disk item 42 and the snap ring item 6.



Bild / fig. 58

Montieren Sie den Sicherungsring Pos.6.

Mount the snap ring item 6.





Bild /fig. 59

Kühlen Sie den Lagerring Pos. 5 in flüssigem Stickstoff auf –180°C ab. Montieren Sie den Lagerring in die Tragachse

Use nitrogen to cool down outer ring of tapered roller bearings item 5 to approx. –180°C and mount outer ring into spindle.



Bild / fig. 60

Sichern Sie den Lagerring Pos. 5 mit dem Sicherungsring Pos. 6.

Secure the bearing ring item 5 with the snap ring item 6.

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5. Montage • *5. Assembly*

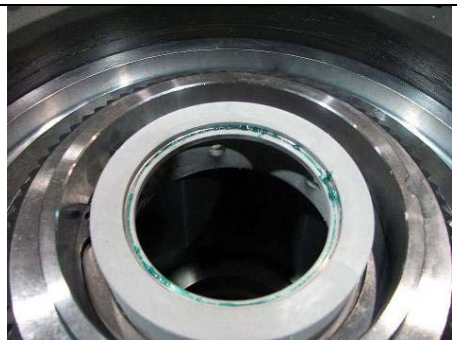


Bild / fig. 61

Bestreichen Sie die Aufnahmebohrungen der Scheibe Pos. 41 mit LOCTITE 640.

Evenly apply coat of LOCTITE 640 to the location hole of disc item 41.



Bild / fig. 62

Montieren Sie die Scheibe Pos. 41.

Mount the disc item 41.



Bild / fig. 63

Drücken Sie das Zylinderrollenlager Pos. 12 aus der Transportverpackung direkt in die Aufnahmebohrung von Planetenrad Pos. 11.

Push cylindrical roller bearing item 12 directly out of transport packing into the locating hole of the planet gear (item 11).



Bild / fig. 64

Setzen Sie die Anlaufscheibe Pos. 13 ein.

Insert locating ring item 13.



Bild / fig. 65

Setzen Sie den Sicherungsring Pos. 14 ein.

Insert a new snap ring item 14.

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5. Montage • *5. Assembly*



Bild / fig. 66

Setzen Sie die zweite Anlaufscheibe Pos. 13 ein.

Insert 2nd locating ring item 13.



Bild / fig. 67

Drücken Sie das zweite Zylinderrollenlager Pos. 12 aus der Transportverpackung direkt in die Aufnahmebohrung von Planetenrad Pos. 11.

Push 2nd cylindrical roller bearing item 12 directly out of transport packing into the locating hole of the planet gear item 11.





Bild /fig. 68

Erwärmen Sie vormontiertes Planetenrad Pos. 11 auf ca. 120°-130°C. Montieren Sie den Sprengring Pos. 8 auf den Planetensteg Pos. 4. Montieren Sie die Planetenräder Pos. 11 auf die Planetenbolzen von Planetensteg Pos. 4.

Heat pre-assembled planet gear item 11 to approx. 120°-130°C. Mount the snap ring item 8 onto the planet stage item 4. Mount pre-assembled planet gear onto the planetary pin of planet carrier item 4.



Bild / fig. 69

Sichern Sie die Planetenräder mit den Sicherungsringen Pos. 16.

Secure the planet gears with snap ring item 16.

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5. Montage • *5. Assembly*

 **Bild / fig. 70**		Setzen Sie den komplett montierten Planetensteg Pos. 4 in das Getriebe ein. Install completely pre-assembled planet stage item 4 into gear box.
 **Bild / fig. 71**		Beachten Sie das die Öffnung des Sprengringes Pos. 8 gegenüber der Nut Tragachse liegt. *Make sure that of the opening of the snap ring item 8 is is across from the groove of the spindle.*
 **Bild / fig. 72** Abb. ähnlich/ similar in design		Setzen Sie den Planetensteg Pos. 53 auf die Verzahnung des Sonnenrades Pos. 17. *Insert planet carrier item 53 into internal teeth of sun gear item 17.*
 **Bild / fig. 73** Abb. ähnlich/ similar in design		Sichern Sie das Sonnenrad mit dem Sicherungsring Pos. 18. *Secure sun gear with snap ring item 18.*

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5. Montage • *5. Assembly*

Bild / fig. 74  Abb. ähnlich/ similar in design			Drücken Sie das Zylinderrollenlager Pos. 55 aus der Transportverpackung direkt in die Aufnahmebohrung von Planetenrad Pos. 54. *Push cylindrical roller bearing item 55 directly out of transport packing into the locating hole of the planet gear item 54.*
Bild / fig. 75  Abb. ähnlich/ similar in design			Erwärmen Sie die vormontierten Planetenräder Pos. 54 auf ca. 120°-130°C. Montieren Sie das vormontierte Planetenrad auf den Planetenbolzen von Planetensteg Pos. 53. *Heat pre-assembled planet gear item 54 to approx. 120°-130°C. Mount pre-assembled planet gear onto the planetary pin of planet carrier item 53.*
Bild / fig. 76  Abb. ähnlich/ similar in design			Sichern Sie die Planetenräder mit den Sicherungsringen Pos. 58. *Secure the planet gears with snap ring item 58.*
Bild / fig. 77 			Setzen Sie den komplett montierten Planetensteg Pos. 53 in das Getriebe. *Lift in the mounted planet carrier item 53 into the gearbox.*

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5. Montage • *5. Assembly*

Bild / fig. 78  Abb. ähnlich/ similar in design			Drücken Sie das Zylinderrollenlager Pos. 91 aus der Transportverpackung direkt in die Aufnahmebohrung von Planetenrad Pos. 90. *Push cylindrical roller bearing item 91 directly out of transport packing into the locating hole of the planet gear item 90.*
Bild / fig. 79 			Setzen Sie den Planetensteg Pos. 89 auf die Verzahnung der Sonnenradwelle Pos. 88. *Insert planet carrier item 89 into internal teeth of sun gear shaft item 88.*
Bild / fig. 80 			Sichern Sie die Sonnenradwelle Pos. 88 mit dem Sicherungsring Pos. 59. *Secure sun gear shaft item 88 with snap ring item 59.*
Bild / fig. 81 			Setzen Sie den vormontierten Planetensteg Pos. 89 in das Getriebe. *Lift in the preassembled planet carrier item 89 into the gearbox.*
Bild / fig. 82 			Setzen Sie die Sonnenradwelle Pos. 87 in das Getriebe ein. *Install sun gear shaft item 87.*

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5. Montage • *5. Assembly*



Bild / fig. 83

Erwärmen Sie die vormontierten Planetenräder Pos. 90 auf ca. 120°-130°C. Montieren Sie das vormontierte Planetenrad auf den Planetenbolzen von Planetensteg Pos. 89.

Heat pre-assembled planet gears item 90 to approx. 120°-130°C. Mount pre-assembled planet gear onto the planetary pin of planet carrier item 89.



Bild / fig. 84

Sichern Sie die Planetenräder mit den Sicherungsringen Pos. 92.

Secure the planet gears with snap ring item 92

5.5.4 Montage Deckel

5.5.4 Assembly Cover



Bild / fig. 85

Zylinderrolle Pos. 61 in Deckel Pos. 51 einsetzen.

Install cylindrical roller item 61 into cover item 51.

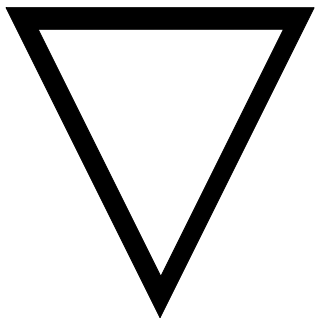


Bild / fig. 86

Axialspiel prüfen:

Spiel zwischen Anlauffläche der Sonnenradwelle Pos. 87 und der Zylinderrolle Pos. 61 vor der Montage des Deckels Pos. 51 prüfen. (Sollwert 1-2 mm).

Checking of axial clearance:

Determine clearance between contact face of sun gear shaft item 87 and cylindrical roller item 61 by measuring parts prior to assembly of cover item 51. (Recommended clearance 1-2 mm).

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5. Montage • *5. Assembly*



Bild / fig. 87

Montieren Sie den O-Ring Pos. 66 in die entsprechende Nut des Deckels Pos. 51.
Fetten Sie den O- Ring ein.

Insert o-ring item 66 into the o-ring groove of cover item 51.
Grease o-ring.



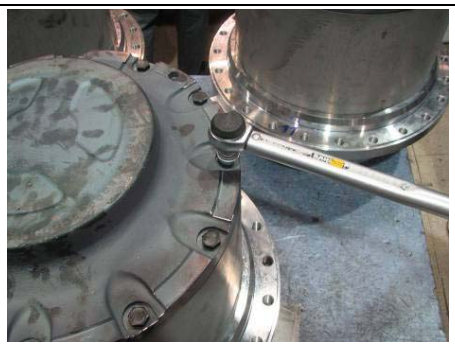


Bild /fig. 88

Setzen Sie den vormontierten Deckel Pos. 51 mit O-Ring Pos. 66 in den Einpass des Hohlrades Pos. 49 ein und befestigen ihn mit den Schrauben Pos. 67. Ziehen Sie die Schrauben mit erforderlichem Anzugsmoment von 87 Nm an.

Mount the cover item 51 with o-ring item 66 to the ring gear item 49. Tighten screws to a proper torque. of 87 Nm.





Bild /fig. 89

Schrauben Sie die Verschlussschrauben Pos. 69, 70 und 6kt-Schrauben Pos. 121 in den Deckel Pos. 51ein.

Screw the screw plugs item 69, 70 and hex heat bolts item 121 into the cover item.

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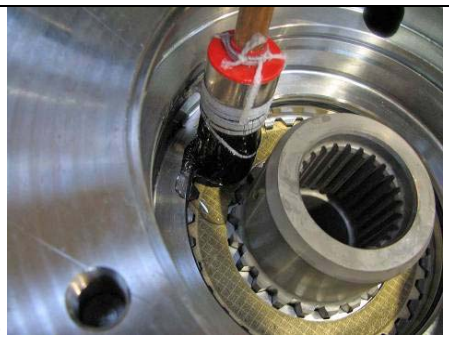
5.5.4 Montage Bremse

5.5.4 Assembly Brake

 Bild / fig. 90		Pressen Sie das Rillenkugellager Pos. 40 auf den Mitnehmer Pos. 3. *Press in the ball bearing item 40 onto the coupler.*
 Bild / fig. 91		Setzen Sie den Mitnehmer Pos. 3 ein. *Mount coupler item 3.*
 Bild / fig. 92		Legen Sie die Lamellen Pos. 29, 30 in richtiger Reihenfolge ein. (siehe Ersatzteilzeichnung0/6158/1279/3) *Insert brake disks item 29, 30 in correct order.* *(note spare part drawing* 0/6158/1279/3)
 Bild / fig. 93		Montieren Sie die Quad- und Stützringe Pos. 37, 38 in den Kolben Pos. 25. *Mount supporting rings and piston seal Pos, 37, 38 into the piston item 25.*

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5. Montage • *5. Assembly*

Bild / fig. 94			Montieren Sie die Quad- und Stützringe Pos. 35, 36 in die Tragachse Pos. 1. *Mount supporting rings and piston seal Pos, 35, 36 into spindle item 1.*
Bild / fig. 95			Ölen Sie die Dichtfläche ein. *Lubricate the sealing surface.*
Bild / fig. 96	 Abb. ähnlich/ similar in design		Setzen Sie den Kolben Pos. 25 in die Tragachse Pos. 1 ein. *Mount the piston item 25 into the spindle item 1.*
Bild / fig. 97			Setzen Sie die Federn Pos. 31, 32 ein. *Mount pressure springs item 31, 32.*
Bild / fig. 98			Setzen Sie die Scheibe Pos. 26 ein. *Mount the disk item 26.*

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5. Montage • *5. Assembly*




Bild /fig. 99

Pressen Sie mit geeigneter Vorrichtung den vormontierten Kolben Pos. 25 gegen die Federn Pos. 31, 32 und montieren Sie den Sicherungsring Pos. 28.

Press piston item 25 with suitable fixture against springs item 31, 32 and mount snap ring item 28.



Bild / fig. 100

Axialspiel prüfen:

Überprüfen Sie vor dem Einbau der Scheibe Pos. 122 das Axialspiel zwischen Scheibe Pos. 122 und Mitnehmer Pos. 3 (Siehe Ersatzteilzeichnung 0/6158/1279/3).

Checking of axial clearance:

Determine clearance between disc item 122 and coupler item 3 by measuring parts prior to assembly of disc item 122. (See installation drawing 0/6158/1279/3).




Bild /fig. 101

Abb. ähnlich/ similar in design

Setzen Sie die Scheibe Pos. 122 in den Mitnehmer Pos. 3 ein. Bestreichen Sie die Schraube Pos. 123 mit LOCTITE 270. Ziehen Sie die Schraube Pos. 123 mit einem Anziehdrehmoment von 51 Nm an. (Siehe Ersatzteilzeichnung 0/6158/1279/3).

Mount the disc item 122 into the coupler item 3. Evenly apply coat of LOCTITE 270 to thread of screws item 123. Tighten the screws item 123 to the torque 51 Nm. (See spare part drawing 0/6158/1279/3*).*

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6. Probelauf • *6. Test Run*

6.1 Prüfstandsaufbau

Das Getriebe wird in der vorgesehenen Einbaulage aufgebaut und mit einem geeigneten Antriebsmotor angetrieben. Wenn das Betriebsverhalten des Getriebetyps bekannt ist, kann eine andere Prüflage gewählt werden, wobei die Radialwellendichtringe, bzw. Gleitringdichtungen unter Öl stehen müssen (Luftkammerbildung beachten!).

6.2 Ölversorgung

Die Getriebe werden wie in der Einbauzeichnung vorgesehen mit Öl gefüllt. Bremsen mit separater Ölfüllung sind vor dem Probelauf gemäß Einbauzeichnung ebenfalls mit Öl zu befüllen.
Zur Ölbefüllung verwenden Sie bitte die in der Betriebsanleitung angebenden Schmierstoffe.

6.3 Drehzahl, Laufzeit und Prüflast

Die Getriebe sind mit Höchstdrehzahl (n_{max} Getriebe bzw. n_{max} Prüfstand) über 1 Stunde (je ½ Stunde pro Drehrichtung bei Getrieben mit wechselnder Drehrichtung) ohne Last zu fahren.
Hierbei ist die Ölsumpftemperatur am Außendurchmesser des Hohlrades nach 30, 45 und 60 Minuten zu messen und zu protokollieren.

6.4 Thermische Werte

Die Ölsumpftemperatur soll nach Abschluss des 1-stündigen Probelaufs 70°C nicht übersteigen. Die Temperatur nach 30 Minuten bei reduzierter Laufzeit soll die Temperatur der Temperaturaufschreibung des ersten Getriebes um nicht mehr als 4°C überschreiten.
Die Temperaturen an außenliegenden Lagerstellen (soweit zutreffend) sollen die Ölsumpftemperaturen um nicht mehr als 10°C übersteigen.

6.5 Laufgeräusch

Das Laufgeräusch soll weich und gleichmäßig sein.
Es dürfen keine harten, schlagenden oder pfeifende Geräusche vorhanden sein.

6.6 Dichtigkeitsprüfung

Während des Probelaufs sind alle Dichtungen auf Undichtigkeiten hin zu beobachten, z.B.:
- Ein- und Auslassschrauben
- Entlüfter
- Dichtflächen an Hohlrädern und Deckeln
- Wellendichtungen

6.1 Test set up

The gearbox shall be mounted in its intended installation position and connected to a suitable driving motor. If the operating performance of the gearbox type is known, it is possible to mount the gearbox in another test position under the condition that the radial face seals and the axial seal are submerged in oil (check for air chambers!).

6.2 Lubrication

The gear units are to be filled with oil as shown on the installation drawing. Brakes, which have separate oil fillings, shall be filled with oil before test run.
For oil fill, please use the lubricants listed in the operating instructions.

6.3 Speed, Running Time, Test Load

The gear units are to be operated at max. speed (n_{max} of gearbox or n_{max} test bed) under no load for one hour (half an hour in each direction of rotation in case of reverse gears).
Measure oil sump temperatures at outside diameter of ring gear and note them down after 30, 45 and 60 minutes of operation.

6.4 Thermal Parameters

The oil sump temperature measured after the 1-hour test run shall not exceed 70°C.
The temperature measured after 30 minutes reduced operating time shall not exceed the temperature records of the first gearbox by more than 4°C.
The temperatures measured at the external bearing areas (if applicable) must be not exceed the oil sump temperature by more than 10°C.

6.5 Running Noise

The running noise under test conditions should be smooth and steady.
Hard, knocking or howling noise produced by the unit is inadmissible.

6.6 Leakage Testing

During the test run, make sure to check all seals for leakages, e.g.:
- *Inlet and drain plugs*
- *Vent*
- *Sealing faces at ring gears and covers*
- *Shaft seals*

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6.7 Funktionsprüfung der Bremsen

Rexroth Bremsen werden durch eine pulsierende Prüfung auf Funktion und Dichtigkeit geprüft:
- Prüfdruck: 60-80 bar
- Lüftzeit: 6-10 sek pro Kolbenhub
- Prüfdauer: min. 15 Minuten

Die hier beschriebene Funktionsprüfung gilt nicht für in Motoren integrierte Bremsen.

6.8 Fremdkörper

Nach Durchführung des Probelaufs ist das ablaufende Getriebeöl auf Späne, Zunder, übermäßigen Abrieb zu beobachten. Auf Fremdkörper an Magnetstopfen und ggf. am Ölfilter ist zu achten.

6.7 Functional Test of Hydraulic Brakes

A pulsating pressure test shall be performed on the Rexroth brakes to check the tightness and function:
- *Test pressure: 60-80 bar*
- *Releasing time: 6-10 sec. per piston stroke*
- *Testing time: 15 minutes minimum*

The described functional test of hydraulic brakes is not valid for motor integrated brakes.

6.8 Oil Contamination Test

After completing the test run, the oil shall be inspected for scraps, scales and wear particles and other impurities. The magnetic plug and, if necessary, the oil filter shall be checked.

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engineering mannesmann Rexroth

LOHMANN + STOLTERFOHT
D 58455 Witten - Germany

Ident.-Nr. / ident.-no.	05901308
Type / product	GFT 110 R3 9279
Fabrikat Nr. / product no.	3607 - 3613
Auftrag Nr. / order no.	3 3298.010
Baujahr / produced in	1999
Abtriebsmoment / output torque	max. 84460 Nm
Antriebsdrehzahl / input speed	max. 3054 min^{-1}
Übersetzung / ratio	83
Schmiergruppe / lubr.group	siehe / note 2.5

Betriebsanleitung
Planetengetriebe

Operating Instructions
Planetary Gearbox

HYDROTRAC GFT 110 R3 9279

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1.1 Einführung

In der vorliegenden Betriebsanleitung finden Sie Informationen zum Einbau, zur Inbetriebnahme, zur Pflege und Wartung und zur Ersatzteilbestellung.

Beachten Sie unbedingt die Sicherheitshinweise dieser Dokumentation.

- Allgemeine Sicherheitshinweise finden Sie in diesem ersten Kapitel.
- Besondere Hinweise finden Sie jeweils am Anfang eines Kapitels.
- Auf eine Handlung bezogene Sicherheitshinweise finden Sie vor der Beschreibung des Handlungsschrittes.

Die Seitenzahl finden Sie am äußeren Seitenrand. Die Angabe 01-1/24 z.B. bedeutet:
Kapitel 1, Seite 1, die Betriebsanleitung umfaßt 24 Seiten.

Die Bereiche des Anhanges sind durch Zwischenblätter voneinander getrennt und ggf. versehen mit Hinweisen auf den angesprochenen Leserkreis.

1.2 Sicherheitshinweise

Die Produkte von LOHMANN+STOLTERFOHT sind nach dem aktuellen Stand der Technik ausgelegt und hergestellt. Dennoch können Gefahren auftreten für:
- Körper und Gesundheit,
- das Produkt und die Gesamtanlage,
- sonstige Werte.



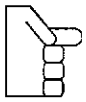
Mit diesem Symbol sind Gefahren für Körper und Gesundheit gekennzeichnet.



Mit diesem Symbol sind Gefahren für das Produkt und die Gesamtanlage gekennzeichnet.



Mit diesem Symbol sind Gefahren für sonstige Werte gekennzeichnet.



Dieses Symbol kennzeichnet Hinweise.

1.1 Introduction

The present operating instructions contain information on installation, start-up, care and maintenance as well as spare parts ordering.

Make sure the safety instructions in this documentation are carefully observed.

- General notes on safety are listed in this first chapter.
- Special instructions are given at the beginning of the individual chapter.
- Safety instructions referring to actions are given before the action itself is described.

Page numbers are shown at the outer bottom margin. For example, 01-1/24 means:
chapter 1, page 1, the operating manual has 24 pages.

The various areas of the Appendix have been separated by sheets and, where considered expedient, provided with notes on the relevant persons.

1.2 Notes on Safety

The products of LOHMANN+STOLTERFOHT have been designed and manufactured so as to reflect the technological state of the art. Nevertheless, it cannot be ruled out that danger may arise to:
- life and limb,
- the product and overall plant,
- other assets.



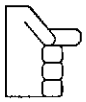
This symbol signifies danger to life and limb.



This symbol signifies danger to the product and the overall plant.



This symbol signifies danger to other assets.



This symbol calls attention to notes.

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Gefahren können insbesondere dann auftreten:
- wenn unzureichend ausgebildetes Personal am Produkt tätig ist,
- wenn das Produkt unsachgemäß installiert, bedient und instand gehalten wird,
- wenn das Produkt zu nicht bestimmungsgemäßem Gebrauch eingesetzt wird.

Alle Personen, die mit dem Betrieb der Anlage oder des Produktes befaßt sind, müssen:
- unbedingt das Kapitel "Sicherheitshinweise" gelesen und verstanden haben,
- diese Betriebsanleitung zumindest in den Teilen kennen, in denen die jeweilige Tätigkeit und zugehörige Gefahrenhinweise beschrieben sind.
- mit Abschaltprozeduren, z.B. "NOT-AUS", der ganzen Anlage oder den für die jeweilige Tätigkeit wichtigen Teilen der Anlage vertraut sein,
- technisch ausreichend ausgebildet und zu der jeweiligen Tätigkeit befugt sein,
- ihre Aufgaben und Befugnisse kennen.

Sie müssen unbedingt:
- alle Handlungen unterlassen, die Gefahren für Körper und Gesundheit, Gefahren für das Produkt oder Gefahren für andere Werte bedeuten könnten,
- alle an dem Produkt vorgenommenen Veränderungen dem zuständigen Vorgesetzten oder Betreiber mitteilen,
- alle Veränderungen beim Betrieb des Produkts, z.B. unübliche Laufgeräusche, dem zuständigen Vorgesetzten oder Betreiber mitteilen.

An dem Produkt dürfen keine Veränderungen vorgenommen werden, die nicht zuvor von LOHMANN+STOLTERFOHT genehmigt worden sind.

Der Anwender verpflichtet sich:
- am und um das Produkt für Sauberkeit und Ordnung zu sorgen,
- das Produkt nur in einwandfreiem Zustand zu betreiben,
- das Produkt nur zum bestimmungsgemäßen Gebrauch einzusetzen,
- das Produkt nur im Rahmen der unter 2.5 aufgeführten technischen Daten einzusetzen,
- umlaufende Teile durch geeignete Schutzvorrichtungen abzusichern,
- das Personal soweit wie nötig zum Tragen von Schutzkleidung zu verpflichten,
- dem zuständigen Personal diese Betriebsanleitung auszuhändigen.

In particular, hazards may occur:
- if insufficiently trained personnel manipulates the product,
- if the product is inexpertly installed, operated and serviced,
- if the product is used for other than the intended purposes.

All persons responsible for the operation of the plant or product must:
- have definitely read and understood the chapter "Notes on Safety"
- know these Operating Instructions or at least be familiar with those parts where the respective *activity and* associated dangers are described,
- be familiar with shut-down procedures, e.g. "Emergency-OFF", relating to the entire plant or to plant items important to the relevant activity,
- have adequate technical qualifications and be authorized to perform the relevant activity,
- know their specific duties and authority.

Moreover, it is mandatory that these persons:
- refrain from doing anything that might cause bodily harm or constitute a danger to health, the product or other assets,
- inform their superiors in charge or the Operator of any modifications made to the product,
- inform their superiors in charge or the Operator of any changes detected in the operational behaviour of the product, e.g. unusual running noise.

No modifications to the product are permitted unless the prior approval of LOHMANN+STOLTERFOHT has been obtained.

The User shall undertake to:
- ensure that the product and its surroundings are kept clean and in good order,
- operate the product only when in perfect condition,
- use the product exclusively for the intended purpose,
- use the product only in the framework of the technical characteristics listed under 2.5,
- safeguard rotating parts by means of suitable protective systems,
- instruct the personnel to wear protective clothing, to the extent deemed necessary,
- distribute these operating instructions among the personnel in charge.

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Zum bestimmungsgemäßen Gebrauch gehört auch die Beachtung aller Angaben dieser Betriebsanleitung.
Beachten Sie ergänzend zur Betriebsanleitung alle allgemein gültigen gesetzlichen und sonstigen Regelungen zur Unfallverhütung.

Using the equipment for the intended purpose as set out above also includes observing the instructions given in this operating manual.
In addition to the procedures and instructions outlined in this operating manual all generally applicable statutory and other accident prevention rules and provisions must be observed.

Die Gewährleistung durch
LOHMANN+STOLTERFOHT erlischt:
- wenn das Produkt ohne unsere Zustimmung geöffnet oder verändert wird,
- bei Nichtbeachtung der Instruktionen dieser Betriebsanleitung,
- bei Ein- und Anbau nicht von uns gelieferter oder genehmigter Ersatzteile und Zusatzgeräte,
- bei Überlastung des Produktes von besonderer Art, wie z.B. Drehschwingungen, Drehmomentstößen, Fundamentverwindungen oder sonstigen unzulässigen Einflüssen,
- wenn die in Kapitel 2.5 aufgeführten technischen Daten über- oder unterschritten werden,
- bei unsachgemäßer Handhabung des Produktes.

The warranty obligations of
LOHMANN+STOLTERFOHT will become void:
- if the product is opened or modified without our consent,
- in the event the instructions in this manual are disregarded,
- if spare parts and auxiliary items are built in or attached which have not been supplied or approved by us,
- if the product is subjected to overloads caused for example by torsional vibrations, torque impacts, distorted or deformed foundations or other impermissible influences,
- if the technical characteristics specified under pt. 2.5 are exceeded or fallen short of,
- if the product is improperly handled or manipulated.

Technische Änderungen, die der Verbesserung des Produktes dienen, behalten wir uns vor.

We reserve the right to implement technical changes for product improvement purposes.

Die Abbildungen in dieser Betriebsanleitung können von der tatsächlichen Ausführung geringfügig abweichen.

The photos and figures shown in this manual may slightly deviate from the actual design.

Soweit vertraglich nichts anderes vereinbart ist, richten sich die Gewährleistungsansprüche nach den zum Zeitpunkt des Vertragsabschlusses geltenden "Allgemeinen Bedingungen für Lieferungen und Leistungen" von
LOHMANN+STOLTERFOHT.

Unless otherwise stipulated in the contract, any warranty claims shall be dealt with in accordance with LOHMANN+STOLTERFOHT`s "General Terms and Conditions of Supplies and Services" applicable at the time the contract has been concluded.

Urheberrecht
Das Urheberrecht an Zeichnungen verbleibt bei uns. Eine Zeichnung darf nur zu den Zwecken benutzt werden, zu denen sie dem Empfänger anvertraut ist. Ohne unsere ausdrückliche schriftliche Genehmigung dürfen Zeichnungen nicht an Dritte weitergegeben oder diesen zugänglich gemacht werden.
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LOHMANN+STOLTERFOHT wird im folgenden mit L+S bezeichnet.

LOHMANN+STOLTERFOHT is referred to in this manual as L+S.

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2.1 Einführung

In diesem Kapitel finden Sie eine Beschreibung des Getriebes **GFT 110 R3 9279**. Diese wird ergänzt durch Angaben zum Lieferumfang, durch eine Auflistung der technischen Daten und durch Angaben zu den Betriebsmitteln.

2.1 Introduction

This chapter contains a description of the propel gear **GFT 110 R3 9279**. The description is supplemented by information on the scope of supply, a list of technical data and details of operating media.

2.2 Beschreibung

Das Getriebe **HYDROTRAC GFT 110 R3 9279** ist ein dreistufiges Planetengetriebe. Zur Ausstattung gehört eine integrierte, hydraulisch lüftbare Lamellenhaltebremse.

Um einen optimalen Lastausgleich zu gewährleisten, enthält jede Planetenstufe satzweise sortierte Planetenräder. Die außenverzahnten Räder sind einsatzgehärtet.
Das komplett wälzgelagerte Getriebe ist mit einer Öltauchschmierung ausgestattet.
Eine spezielle Gleitringdichtung sorgt für den optimalen Schmutz und Staubschutz der Felgen- bzw. der Turaslagerung.

Der mitgelieferte O-Ring (motorseitig) ermöglicht eine statische Abdichtung des Hydromotors.

Das Getriebe ist ausschließlich zum Einsatz als Fahrgetriebe für einen Müllverdichter vorgesehen.

Für Schäden, die aus nicht bestimmungsgemäßem Gebrauch entstehen, haftet L+S nicht. Das Risiko trägt in einem solchem Fall ausschließlich der Anwender.

2.2 Description

The planetary gearbox **HYDROTRAC GFT 110 R3 9279** is of 3-stage design complete with an integrated, hydraulically released multi-plate parking brake.

To ensure an optimum balancing of loads, each planetary stage comprises of planet gears in sets. The externally toothed wheels are case-hardened.

The gearbox runs in antifriction bearings exclusively and has a splash lubrication system.
A special mechanical seal reliably protects the rim- resp. the tumbler bearing system against the ingress of dirt and dust.

The O-ring (motor side) included in the supply enables the unit to be reliably sealed statically.

The gearbox is exclusively intended for use as a propel drive in a refuse compactor.

L+S shall not be liable for any damage arising as a result of the gearbox being used for purposes other than originally intended. In such a case, the risk lies solely with the User.

2.3 Beschreibung der Bremse

Die im Getriebe integrierte, naßlaufende, hydraulisch lüftbare Lamellenbremse ist eine Haltebremse. Sie ist durch Federkraft ständig geschlossen und wird durch Zufuhr von Drucköl geöffnet.

2.3 Description of Brake

The hydraulically released, wet-running, multi-plate brake, integrated in the gearbox, is a parking brake. It is normally closed by spring force and released when pressurized by hydraulic oil.

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2.4 Lieferumfang

Zum Lieferumfang gehört:
- Getriebe mit integrierter Lamellenhaltebremse.
- Technische Dokumentation.

Der gesetzlich vorgeschriebene Berührungsschutz an umlaufenden Teilen gehört nicht zum Lieferumfang.

Überprüfen Sie alle Anlieferungen nach Erhalt unverzüglich auf Vollständigkeit. Teilen Sie Abweichungen und Transportschäden sofort L+S mit.

Bestätigen Sie die Mitteilung schriftlich.

2.4 Scope of Supply

The supply scope includes:
- Gearbox with integrated multiple disk holding brake.
- Technical documentation.

Means of protection against accidental contact with rotating parts as prescribed by statutory provisions do not form part of the supply scope.

Please check all equipment supplies for completeness immediately upon receipt. Any deviations and transit damage must be reported to L+S right away.
A written conformation of such a report is also required.

2.5 Technische Daten

Antriebsdrehzahl	max.	3054 min $^{-1}$
Antriebsdrehmoment	max.	1017 Nm
Übersetzung		83
Abtriebsdrehzahl	max.	40 min^{-1}
Abtriebsdrehmoment	max.	84460 Nm
Bremsmoment	statisch	1300 Nm
Lüftdruck Bremse		18 bar
max. Lüftdruck Bremse		50 bar
Betriebstemperatur	max.	90 °C
Gewicht	ca.	445 kg
Getriebeölmenge	ca.	6,5 Liter
Schmieröl		CLP 220 LS2
oder BP Energear Hypo SAE 90		00-21/27
Konservierung	innen:	ARAL Degol LS SAE 40 / 50
	oder	Shell S. 7294 SAE 40 / 50
Konservierung	außen:	TECTYL 502 C

2.5 Technical Data

Input speed	max.	3054 rpm
Input torque	max.	750,5 ft.lbs
Transmission ratio		83
Output speed	max.	40 rpm
Output torque	max.	62289 ft.lbs
Static brake torque		959 ft.lbs
Release pressure	brake	261 psi
max. release pressure	brake	725 psi
Operating temperature	max.	90 °C
Weight	approx.	981 lbs
Gear lube oil volume	approx.	1,72 gall
Lube oil		CLP 220 LS2
or BP Energear Hypo SAE 90		00-21/27
Preservation	inside:	ARAL Degol LS SAE 40 / 50
	or	Shell S. 7294 SAE 40 / 50
Preservation	outside:	TECTYL 502 C

2.6 Zeichnungen und Listen

Einbauzeichnung	1/6158/5279/1
Ersatzteilzeichnung	0/6158/1279/1
Teileliste	16218391

2.6 Drawings and Lists

Installation drawing	1/6158/5279/1
Spare parts drawing	0/6158/1279/1
Parts lists	16218391

2.7 Betriebsmittel

Beachten Sie die Auflistung der ausgewählten Schmieröle im Anhang B.

2.7 Operating Media

The list of recommended lube oils given in Appendix B shall be observed.

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3.1 Einführung

Dieses Kapitel gibt Ihnen Hinweise auf die sichere Vorbereitung und Durchführung von Transport und Lagerung der Produkte von L+S.

3.2 Hinweise zu Transport und Lagerung



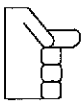
Achten Sie beim Transport auf eine ausreichende Tragkraft des Kranes.

- **Benutzen Sie nur zugelassene Transportelemente.**
- **Befestigen Sie das Getriebe sorgfältig am Kranhaken und benutzen Sie in Abhängigkeit von der Getriebegröße vorgesehene Anhängevorrichtungen.**



Stellen Sie sicher, daß beim Anheben des Getriebes Anbauteile durch Transportelemente nicht beschädigt werden können.

- **Lagern Sie die Getriebe nur in trokkenen und temperierten Räumen.**
- **Lagern Sie Getriebe nur in Einbaulage.**
- **Stellen Sie sicher, daß abgesetzte Getriebe ihre Lage nicht ändern können.**



L+S entsorgt mitgeliefertes Verpakkungsmaterial, wenn dies kostenfrei zurückgesandt wird.

3.3 Konservierung

L+S liefert Getriebe **ohne Ölfüllung** aus. Die Getriebe sind innenkonserviert mit Aral Degol LS SAE 40 / 50 oder mit Shell S. 7294 SAE 40 / 50.

Außenliegende Flansche, Wellenenden und Anflanschflächen sind flächenkonserviert mit TECTYL 502 C.

3.1 Introduction

This chapter describes how the handling and storing of the products of L+S are safely prepared and carried through.

3.2 Notes on Handling and Storing



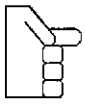
When handling the equipment make sure the carrying capacity of the crane is adequate.

- **Use exclusively approved handling equipment.**
- **Carefully attach the gearbox to the crane hook, using the lifting points provided.**



When lifting the gearboxes make sure that the handling elements do not cause damage to attachment parts.

- **Store the gearboxes in dry and moderately heated rooms only.**
- **Store the gearboxes only in their intended mounting position.**
- **Make sure that set down gearboxes rest immovably.**



L+S will dispose of any packing material supplied with the gearboxes when this is returned to the Factory free of charge.

3.3 Preservation

Gearboxes supplied by L+S are **not filled with oil.** The interior of the gearboxes has been protected with Aral Degol LS SAE 40 / 50 or with Shell S. 7294 SAE 40 / 50.
The surfaces of external flanges, ends of shafts and flange attachment faces are preserved with TECTYL 502 C.

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3.3.4 Lagerung in gelüfteten Räumen

Ein konserviertes und verpacktes Getriebe ist in gelüfteten Räumen bis zu max. 24 Monaten ab Werklieferung rostgeschützt.
Wird die Verpackung am Bestimmungsort entfernt, so ist die Außenkonservierung zu überprüfen und bei Bedarf zu erneuern.

3.3.5 Lagerung im Freien

Bei Lagerung im Freien muß sichergestellt sein, daß kein Spritzwasser o.ä. die äußere Konservierung beschädigen bzw. ins Getriebe eindringen kann (Getriebe abgeplant; Spritzwasser geschützt; unter Schleppdach).
In diesen Fällen ist die Innen- und Außenkonservierung regelmäßig alle 6 Monate zu überprüfen und evtl. zu erneuern. Unter diesen Bedingungen bleibt der Rostschutz bis zu max. 24 Monate ab Werklieferung bestehen.

Überprüfen Sie alle Anlieferungen nach Erhalt unverzüglich auf Vollständigkeit. Teilen Sie Abweichungen und Transportschäden sofort L+S mit. Bestätigen Sie die Mitteilung schriftlich.

3.3.4 Storage in Ventilated Rooms

A gearbox preserved and packed is protected against rust formation for a maximum period of 24 months after delivery from the Factory when stored in ventilated rooms. If the packing is removed at the place of destination the external preservation must be checked and renewed, if necessary.

3.3.5 Storage Outdoors

When stored in the open, it must be ensured that splash water or similar media cannot damage the external preservation coat or enter the gearbox (gearbox covered by tarpaulin; protected against splash water; located under shed roof).
In this case the internal and external preservation coats have to be regulary checked at 6 months´ intervals and if necessary renewed. If all these measures are properly applied, corrosion protection will remain effective for a maximum period of 24 months after delivery from the factory.

Please check all equipment supplies for completeness immediately upon receipt. Any deviations and transit damage must be reported to L+S right away. A written confirmation of such a report is also required.

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4.1 Einführung

Das Kapitel beschreibt den Einbau der Fahrgetriebe in den Fahrwerksrahmen.

Beachten Sie unbedingt die vorangestellten Sicherheitshinweise.

Beachten Sie die Hinweise in der Einbauzeichnung: 1/6158/5279/1

4.2 Handlungschritte zum Einbau

Achtung!
Beim Abbau des Hydromotors kann je nach Ausführung des Getriebes der Mitnehmer aus dem Eingriff der Lamellenverzahnung gezogen werden. Achten Sie beim Einbau des Mitnehmers auf dessen richtige Einbaulage.

Siehe Ersatzteilzeichng.: 0/6158/1279/1

Befestigen Sie das Getriebe sicher am Fahrwerksrahmen, bevor Sie die Anschlagmittel entfernen.

- **Vermeiden Sie beim Einbau unbedingt grobe Schläge.**

Vermeiden Sie unbedingt Axialkräfte.

- **Vermeiden Sie unbedingt hohe Druckkräfte auf das Getriebegehäuse.**
- **Beachten Sie die Einbauzeichnung und die zugehörigen Daten.**

Hängen Sie das Getriebe an den Kran.

Heben Sie das Getriebe in den Fahrwerksrahmen.

Ziehen Sie die Befestigungsschrauben mit einem Drehmomentschlüssel an. Entnehmen Sie die Anzugsmomente der Rahmenzeichnung.

Entfernen Sie die Transportmittel.

Entfernen Sie den Schutzstopfen ((Pos. 7) motorseitig) am Getriebe vor dem Anschrauben des Hydromotors.

4.1 Introduction

This chapter describes the installation of the gearboxes.

The preceding safety notes must be carefully observed.

Carefully follow the instructions given on the installation drawing: 1/6158/5279/1

4.2 Mounting Work to be Performed

Caution!
Depending on the gearbox design, the coupler can be disengaged from the inner gearing of the disks when disassembling the hydraulic motor!
Make sure to observe ist correct installation position when mounting the coupler.
See spare part drawing: 0/6158/1279/1

Secure the gearbox safely before removing the lifting straps or ropes.

- **Avoid heavy blows when mounting the equipment.**

Make sure that axial forces are not exerted during mounting.

- **Make sure high compressive forces do not act on the gearbox housing.**
- **During this work observe installation drawing as well as pertinent data.**

Attach the gearbox to a crane.

Lift the gear into the bogie frame.

Tighten the screws using a torque wrench. The relevant tightening torques shall be taken from the frame drawing.

Remove the lifting straps or ropes.

Remove the plug ((item 7) motor side) at the gearbox before connecting the hydraulic motor.

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Achten Sie darauf, daß kein Schmutz oder Fremdkörper in das Getriebe gelangt.

Bauen Sie den Hydromotor an. Beachten Sie unbedingt die Angaben des Herstellers.

- **Achten Sie beim Anbau des Motors auf sorgfältige Abdichtung (O-Ring Pos. 22).**

Beachten Sie unbedingt die Sicherheitshinweise des Herstellers.

Entfernen Sie die Schutzstopfen vor dem Anschrauben der Hydraulikölleitungen.

Achten Sie darauf, daß kein Schmutz oder Fremdkörper in die Hydraulikanlage gelangen.

- **Schließen Sie den Hydromotor an.**

Beachten Sie unbedingt die Sicherheitshinweise des Herstellers.

- **Schließen Sie die Lamellenhaltebremse an.**

Die Lamellenhaltebremse ist eine Sicherheitseinrichtung des Getriebes.

- **Schließen Sie die Bremslüftleitung an. Entfernen Sie dafür den Schutzstopfen (Pos. 120).**

Achten Sie darauf, daß kein Schmutz oder Fremdkörper in den Bremslüftanschluß gelangt.

Sorgfältige Abdichtung des Bremslüftanschlusses beachten.

- **Es darf kein Staudruck in der Bremsleitung vorhanden sein.**

Überprüfen Sie noch einmal den ordnungsgemäßen Sitz und die Festigkeit aller Verbindungselemente.

Make sure that no dirt or foreign bodies are allowed to enter the gearbox.

Mount the hydraulic motor. Carefully observe the respective instructions given by the manufacturer.

- **When mounting the hydraulic motor make sure that it is properly sealed off (o-ring item 22).**

The preceding safety notes of customer must be carefully observed.

Remove the plugs before connecting the hydraulic oil lines.

Make sure that no dirt or foreign bodies are allowed to enter the hydraulic system.

- **Connect the hydraulic motor.**

The preceding safety notes of customer must be carefully observed.

- **Connect the multi-plate parking brake.**

The multi-plate parking brake is a safety device of the gearbox.

- **Connect the brake release line after removing the plug (item 120).**

Make sure that no dirt or foreign bodies are allowed to enter the brake release port.

Make sure that the brake release port is properly sealed.

- **Back pressure is not allowed in the brake release line.**

Check once again tight fit of all joining elements.

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5.1 Einführung

Dieses Kapitel beschreibt die Handlungsschritte zur Inbetriebnahme des Getriebes. Beachten Sie die entsprechenden Sicherheitshinweise.

5.2 Handlungsschritte zur Inbetriebnahme

Betätigen Sie im Gefahrenfall NOT-AUS.

- **Berühren Sie keine umlaufenden Teile.**

Bei der Befüllung dürfen keine Schmierstoffe in die Umwelt gelangen.

Führen Sie die Ölwechsel nur im betriebswarmen Zustand unmittelbar nach dem Stillstand des Getriebes durch.
Hierdurch ist sichergestellt, daß kein Absetzen der Feststoffpartikel stattgefunden hat.

Befüllen Sie gemäß der Schmierölangabe das Getriebe mit sauberem Öl.
Bei der Erstölbefüllung können Ölmenge und Ölmengenangabe durch im Getriebe vorhandenes Konservierungsöl voneinander abweichen.

Vermeiden Sie Verunreinigungen des Getriebes.

Eine Liste der von L+S zugelassenen Öle finden Sie im Anhang B.
Oder verwenden Sie BP Energear Hypo SAE 90 00-21/27.

Füllen Sie das Öl durch die in der Einbauzeichnung gekennzeichnete Schraube ein.

Überprüfen Sie den Ölstand, bevor Sie das Getriebe anfahren.
Den korrekten Ölstand erkennen Sie bei Stillstand des Getriebes durch die Öffnung im Getriebegehäuse.

Die max. Betriebstemperatur beträgt 90°C.

5.1 Introduction

This chapter describes the course of action to be followed when taking the gearbox into service. The respective notes on safety shall be duly observed.

5.2 Commissioning Activities

In cases of emergency actuate EMERGENCY-OFF.

- **Do not touch any rotating parts.**

When filling the gearbox take care that lubricants are not allowed to pollute the environment.

Make sure to perform oil changes immediately after standstill with the gearbox still being warm, to avoid any setting of solid particles.

Fill the gearbox with clean oil as specified under the heading lubrication.
At first oil fill, actual oil volume and specified oil volume may vary due to preservation oil remains in the gearbox.

Ensure that no dirt or other contaminants are allowed to enter the gearbox.

A list of oils approved by L+S is given in Appendix B.
Or use BP Energear Hypo SAE 90 00-21/27.

Fill in oil through the screw indicated in the installation drawing.

Check the oil level before starting up the gearbox.
The correct oil level can be ascertained through the opening in the gearbox housing, when the gearbox is not operating.

The maximum operating temperature is 90°C.

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Überprüfen Sie nach Erreichen der Betriebstemperatur das Getriebe auf Dichtigkeit.
Diese Prüfung können Sie während des Betriebes durchführen.

Die folgenden Überprüfungen dürfen Sie nur bei Stillstand des Getriebes durchführen.

Überprüfen Sie nach ca. 10 Stunden Vollastbetrieb sämtliche Befestigungsschrauben auf festen Sitz.

Überprüfen Sie den festen Sitz aller Schrauben des Getriebes.

Erster Ölwechsel nach ca. 50 Betriebsstunden durch BOMAG - Personal.

Weitere Ölwechsel sind entsprechend den im Wartungsplan (Kapitel 7.3) angegebenen Intervallen durchzuführen.

Bei jedem Ölwechsel sind die Magnetverschlußschrauben zu reinigen.

When the operating temperature has been reached, check the entire gearbox for tightness.
This check can be performed while the gearbox is running.

The following checks must only be carried out when the gearbox is at a standstill.

After 10 hours of full load operation check all fastening screws and boltings for tightness.

Check whether all bolts of the gearbox are tight as required.

First oil change is to be made after approx. 50 operating hours, by BOMAG - personnel.

Further oil changes are to be made at intervals as per the Maintenance Schedule given in Chapter 7.3.

Make sure that the magnetic screw plugs must be cleaned at each oil change.

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7.1 Einführung

Dieses Kapitel zeigt Wartungsschritte und die zugehörigen Sicherheitsmaßnahmen auf.



Berühren Sie keine umlaufenden Teile.

- **Setzen Sie zu Wartungsarbeiten das Getriebe still.**

7.2 Handlungsschritte zu Pflege und Wartung

Durch entsprechende Pflege und Wartung können Sie die Lebensdauer von Maschinen und Anlagen wesentlich verlängern.

Führen Sie wöchentlich Sichtkontrollen durch. Überprüfen Sie dabei insbesondere die Dichtigkeit des Getriebes.

Führen Sie regelmäßig Geräuschkontrollen durch.

Führen Sie regelmäßig Ölstandskontrollen durch (Ölstandskontrolleinrichtung, Markierungen, Ölstandskontrollschrauben).



Führen Sie die Ölwechsel nur im betriebswarmen Zustand unmittelbar nach dem Stillstand des Getriebes durch.
Hierdurch ist sichergestellt, daß kein Absetzen der Feststoffpartikel stattgefunden hat.

Führen Sie nach Angaben des Wartungsplanes Ölwechsel durch.



Fangen Sie Altöl in geeigneten Behältern auf und entsorgen Sie es unter Beachtung der entsprechenden Vorschriften.

Erster Ölwechsel nach ca. 50 Betriebsstunden durch BOMAG - Personal.

Zweiter Ölwechsel nach 500 Betriebsstunden.

Führen Sie weitere Ölwechsel nach jeweils 1000 Betriebsstunden durch, spätestens jedoch nach 12 Monaten.

7.1 Introduction

This chapter indicates maintenance routines and related safety measures.



Do not touch rotating components.

- **If you intend to perform maintenance work shut down the unit.**

7.2 Maintenance and Care Activities

The service life of machinery and equipment can be considerably increased by taking appropriate maintenance and care steps.

Perform visual inspections on a daily basis. In particular, check the tightness of the gear.

Check the equipment regularly for unusual noise.

Make oil level checks at regular intervals(oil level monitoring device, markers, oil level plug).



Make sure to perform oil changes immediately after standstill with the gearbox still being warm, to avoid any setting of solid particles.

Make oil changes as prescribed in the Maintenance Schedule.



Collect spent oil in suitable containers and dispose of the oil in line with the respective regulations.

First oil change is to be made after approx. 50 operating hours, by BOMAG - personnel.

Second oil change is to be made after 500 operating hours.

Change the oil every 1000 operating hours or after 12 months wichever is earlier.

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Bei jedem Ölwechsel sind die Magnetverschlußschrauben zu reinigen.

Überprüfen Sie mindestens einmal monatlich den festen Sitz aller Schrauben.

7.3 Wartungsplan Getriebe

Nach 50 Betriebsstunden	- erster Ölwechsel durch BOMAG - Personal Magnetverschlußschraube reinigen
Nach 500 Betriebsstunden	- zweiter Ölwechsel Magnetverschlußschrauben reinigen
Wöchentlich:	- Sichtkontrolle - Geräuschkontrolle - Ölstandskontrolle
Monatlich:	- Schraubenverbindungen kontrollieren*
Halbjährlich:	- Ölqualitätskontrolle
Jährlich: (spätestens jedoch nach jeweils 1000 Betriebsstunden)	- Ölwechsel Magnetverschlußschrauben reinigen

* Beachten Sie unbedingt die in der Einbauzeichnung angegebenen Anzugsdrehmomente.

7.4 Wartungsplan Bremse

Die Bremse ist wartungsfrei.

Bei Funktionsstörungen, thermischer Überlastung und bei sämtlichen Reparaturarbeiten an der Lamellenhaltebremse müssen immer:

- Lamellen
- Federn
- Dichtelemente

ausgetauscht werden.

Make sure that the magnetic screw plugs must be cleaned at each oil change.

Check the tightness of all screws and bolts at least once a month.

7.3 Maintenance Schedule Gearbox

After 50 operating hours	- First oil change by BOMAG - personnel Clean the magnetic screw plug
After 500 operating hours	- Second oil change Clean the magnetic screw plugs
Weekly:	- Inspect visually - Check for unusual noise - Check oil level
Monthly:	- Check the tightness of all screws and bolts*
Semi-annually:	- Check oil quality
Annually: (or after 1000 operating hours whichever is earlier)	- Change oil Clean the magnetic screw plugs

* Observe the tightening torques indicated in the installation drawing.

7.4 Maintenance Schedule Brake

The brake is maintenance-free.

In case of malfunctions, excessive thermal stress and all repair works on the multi-plate parking brake, make sure to always replace:

- disks
- springs
- seals.

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8.1 Einführung

Dieses Kapitel beschreibt den Ausbau des Getriebes aus dem Fahrwerksrahmen. Beachten Sie unbedingt die Sicherheitshinweise. *Der Einbau* ist im Kapitel 4 beschrieben.



Die Anlage ist nicht in Betrieb.

- **Sichern Sie die Anlage zuverlässig gegen unbeabsichtigtes Einschalten.**
- **Stellen Sie sicher, daß die Tragkraft des Kranes zur Aufnahme des Getriebes ausreicht.**



Sichern Sie das Getriebe gegen unkontrollierte Bewegungen, z.B. Verrutschen.

- **Vermeiden Sie beim Ausbau grobe Schläge.**
- **Vermeiden Sie Axialkräfte.**

8.2 Handlungsschritte zum Ausbau

Lassen Sie das Öl ab.
Verwenden Sie dabei geeignete Auffanggefäße.



Fangen Sie evtl. auslaufendes Öl in geeigneten Gefäßen auf.



Achten Sie beim Transport auf eine ausreichende Tragkraft des Kranes.

- **Benutzen Sie nur zugelassene Transportelemente.**
- **Befestigen Sie das Getriebe *sorgfältig* am Kranhaken.**

Straffen Sie die Anschlagmittel, ohne jedoch das Getriebe anzuheben.

8.1 Introduction

In this chapter the procedure of dismantling the gearbox is described. It is mandatory to observe the safety notes. A gearbox mounting description is given in Chapter 4.



The plant has been taken out of service.

- **Make sure reliable measures are taken to prevent the plant from being activated inadvertently.**
- **Make sure the crane carrying capacity is adequate for gearbox lifting.**



Safeguard the gearbox against uncontrolled movements, e.g. sliding.

- **Avoid heavy blows when dismantling the equipment.**
- **Make sure that axial forces are not exerted.**

8.2 Dismantling Work to be Performed

Drain the oil from the gearbox.
For this purpose use suitable containers.



Any oil spillage must be collected in suitable containers.



For gearbox handling make sure that the carrying capacity of the crane is sufficient.

- **Use approved handling elements only.**
- **Attach the gearbox carefully to the lifting hook.**

Tighten the lifting straps or ropes without lifting up the gearbox.

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Stellen Sie sicher, daß das Getriebe nicht verkantet.

Lösen Sie die Versorgung des Hydromotors.

Verschließen Sie die Hydraulikleitungen mit Stopfen.

Achten Sie darauf, daß kein Schmutz oder Fremdkörper in die Hydraulikanlage gelangen.

Achtung!
Beim Abbau des Hydromotors kann je nach Ausführung des Getriebes der Mitnehmer aus dem Eingriff der Lamellenverzahnung gezogen werden. Achten Sie beim Einbau des Mitnehmers auf dessen richtige Einbaulage.

Siehe Ersatzteilzeichng.: 0/6158/1279/1

Lösen Sie die Bremslüftleitung.

Verschließen Sie den Bremslüftanschluß mit einem Stopfen.

Achten Sie darauf, daß kein Schmutz oder Fremdkörper in den Bremslüftanschluß gelangt.

Lösen Sie die Befestigungsschrauben des Getriebeflansches.

Das Getriebe hängt nun am Kran.

Führen Sie das Getriebe vorsichtig aus dem Fahrwerksrahmen und legen Sie es ab.

Make sure that the gearbox is not canted.

Disconnect the hydraulic motor from the supply system.

Close off the hydraulic lines by means of plugs.

Make sure that no dirt or foreign bodies are allowed to enter the hydraulic system.

Caution!
Depending on the gearbox design, the coupler can be disengaged from the inner gearing of the disks when disassembling the hydraulic motor! Make sure to observe its correct installation position when mounting the coupler.
See spare part drawing: 0/6158/1279/1

Disconnect the brake release line.

Close off the brake release port by means of a plug.

Make sure that no dirt or foreign bodies are allowed to enter the brake release port.

Remove the fastening screws of the gearbox flange.

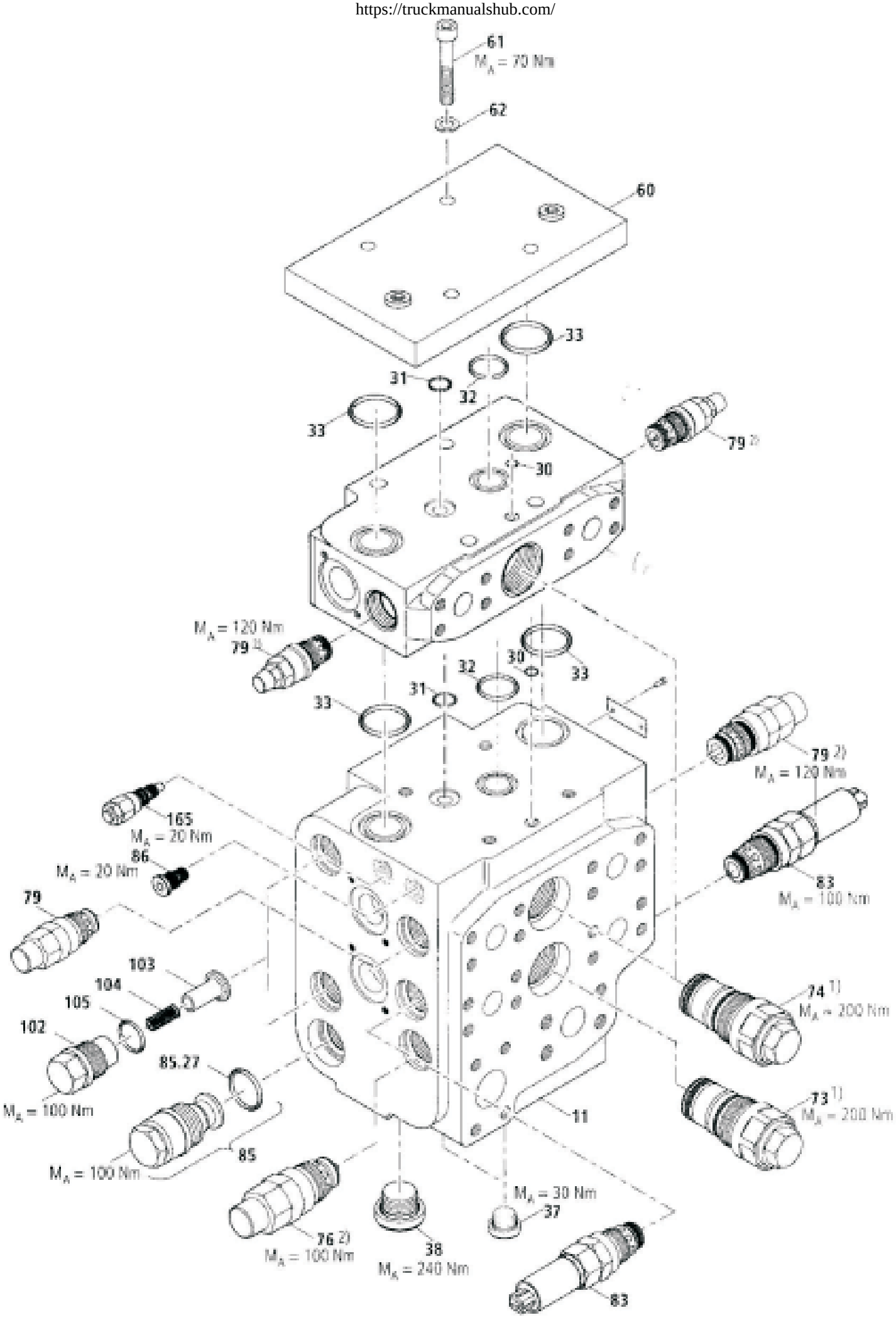
The gearbox is now suspended from the crane.

Move the gearbox carefully out of the bogie frame and lay it down.

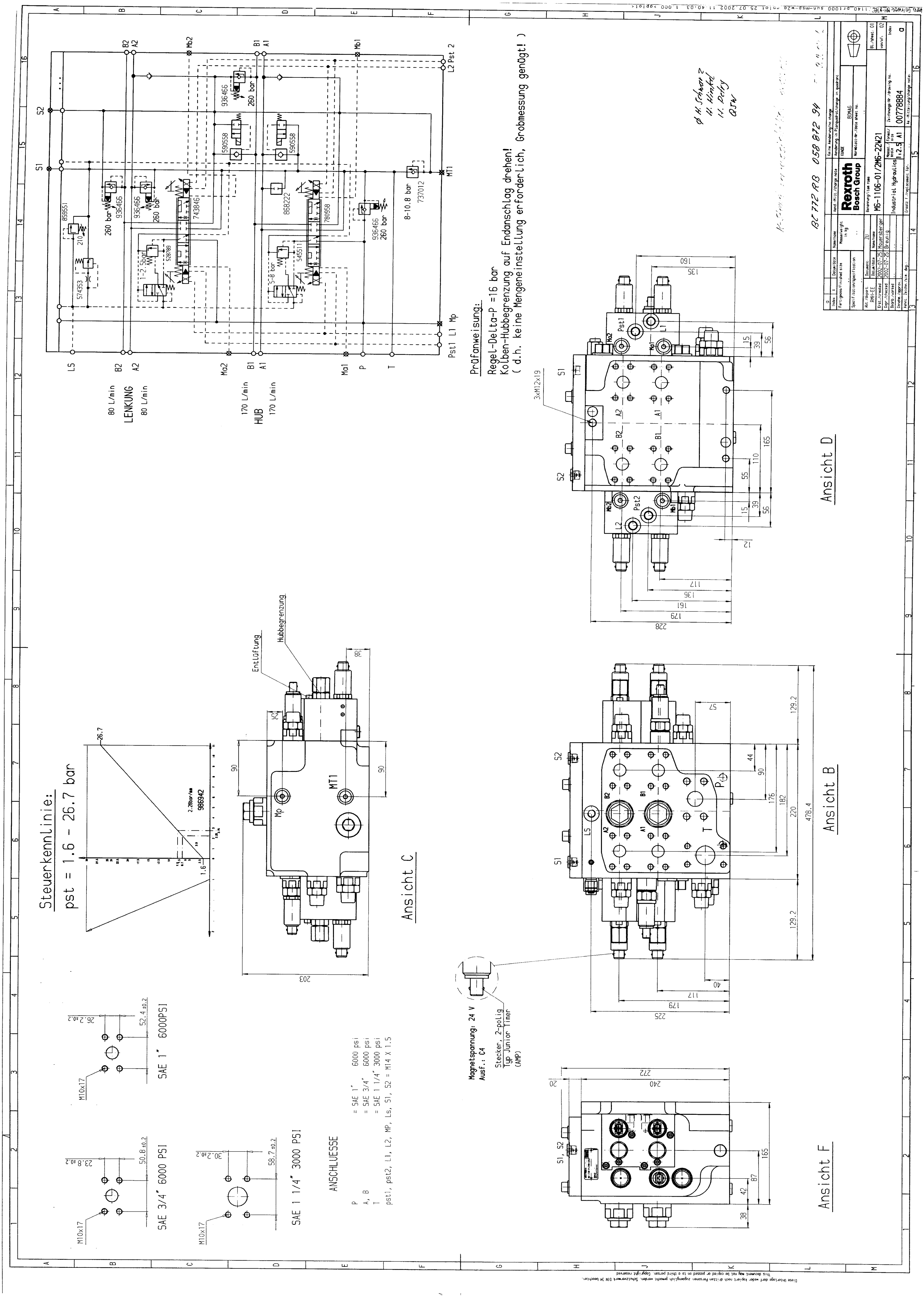
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18.5 Control valve block

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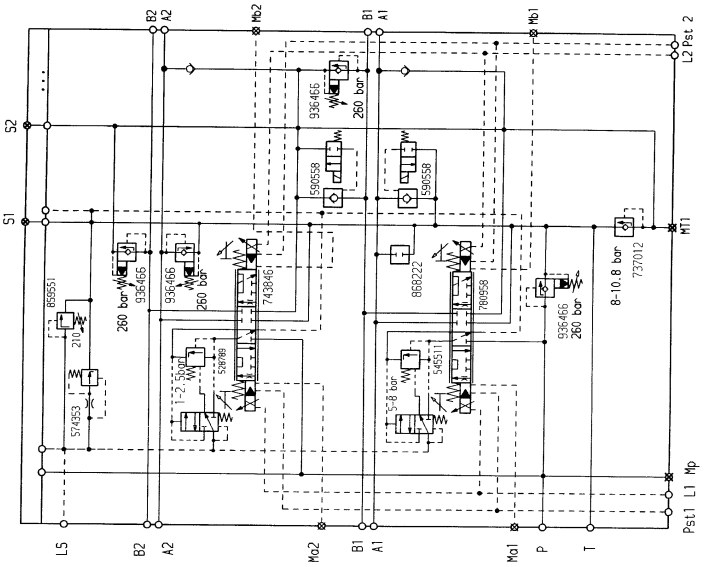


BC 772 RB

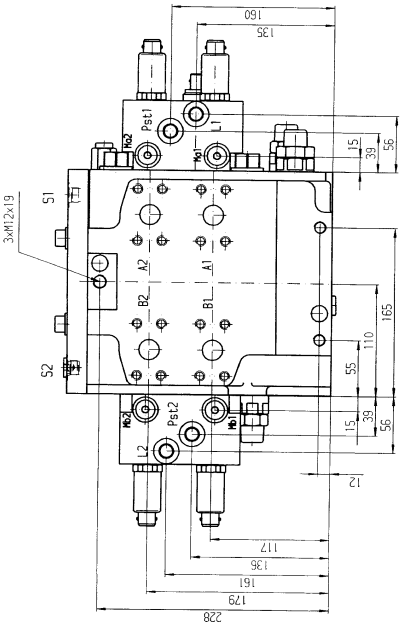


Prüfanweisung:
Regel-Delta-P =16 bar
Kolben-Hubbegrenzung auf Endanschlag drehen!
(d.h. keine Mengeneinstellung erforderlich, Grobmessung genügt!)
LENKUNG
80 L/min
HUB
170 L/min
Steuerkennlinie:
pst = 1.6 - 26.7 bar
Entlüftung
Hubbegrenzung
Ansicht B
Ansicht C
Ansicht D
Ansicht F
Magnetspannung: 24 V
Ausf.: C4
Stecker, 2-polig
Typ Junior Timer
(AMP)
SAE 1" 6000PSI
SAE 3/4" 6000 PSI
SAE 1 1/4" 3000 PSI
ANSCHLUESSE
P = SAE 1" 6000 psi
A, B = SAE 3/4" 6000 psi
T = SAE 1 1/4" 3000 psi
pst1, pst2, L1, L2, MP, Ls, S1, S2 = M14 X 1.5
Rexroth
Bosch Group
BOMAG
MG-1106-01/2MG-22W21
00778884
Industrial Hydraulics
BC 772 RB 058 872 94

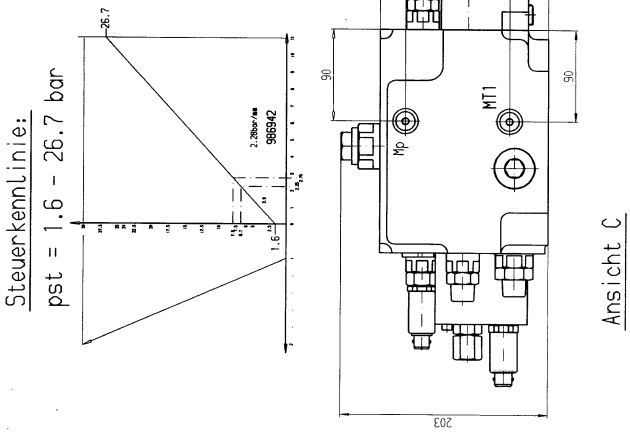
https://truckmanualshub.com/

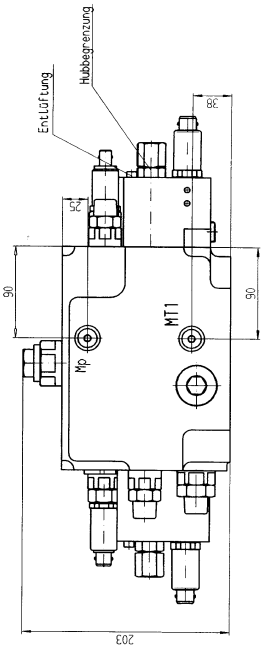


Prüfanweisung:
Regel-Delta-P =16 bar
Kolben-Hubbegrenzung auf Endanschlag drehen!
(d.h. keine Mengeneinstellung erforderlich, Grobmessung genügt!)

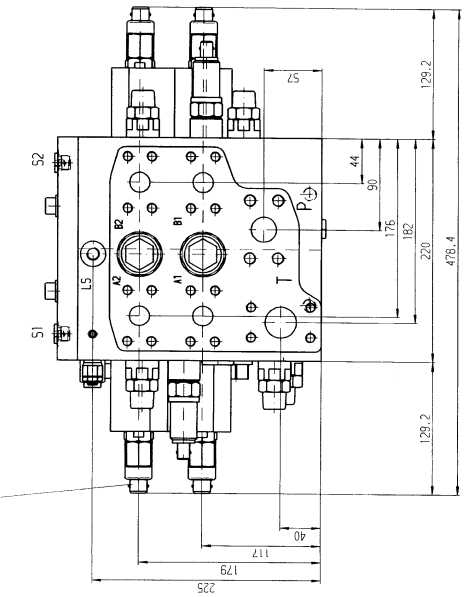


Ansicht D



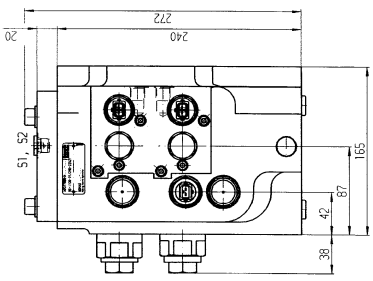


Ansicht C

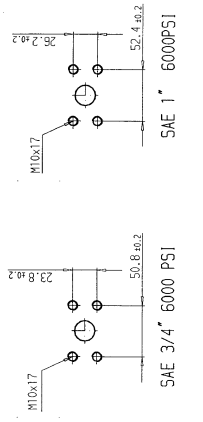


Ansicht B

Magnetspannung: 24 V
Ausf.: C4
Stecker, 2-polig
Typ Junior Timer
(AMP)



Ansicht F



ANSCHLUESSE

P = SAE 1" 6000 psi
A, B = SAE 3/4" 6000 psi
T = SAE 1 1/4" 3000 psi
pst1, pst2, L1, L2, MP, Ls, S1, S2 = M14 X 1.5

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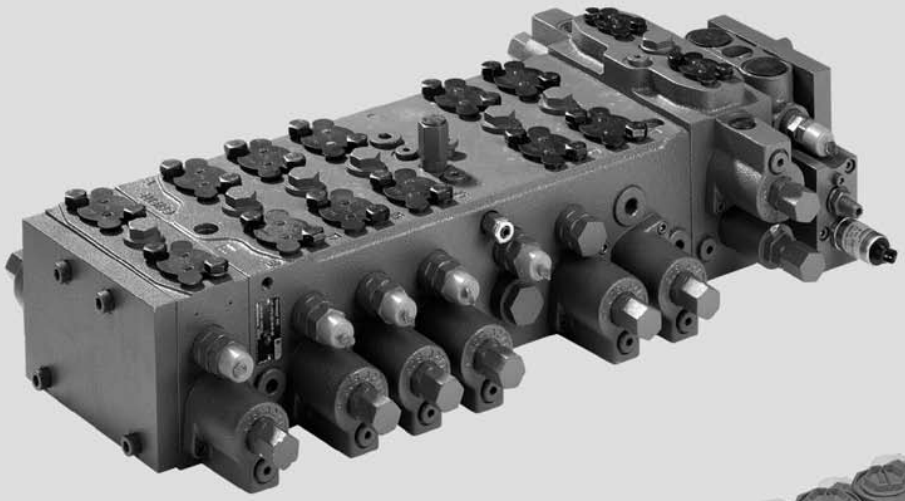
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Steuerblöcke für mobile Anwendungen

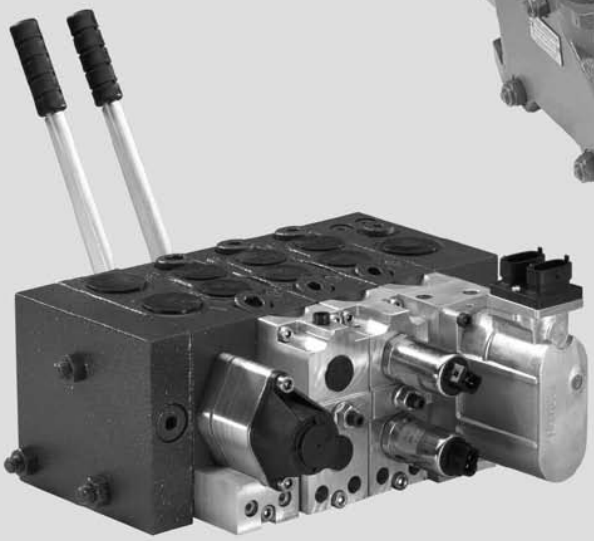
MO, M1, M4, M6, M7, M8, M9, SM, SP, SX

RD 64025-B/06.2010
Ersetzt: 02.2008
Deutsch

Betriebsanleitung







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Auf der Titelseite ist eine Beispielkonfiguration abgebildet. Das ausgelieferte Produkt kann daher von der Abbildung abweichen.

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1 Zu dieser Anleitung

1.1 Gültigkeit der Dokumentation

Diese Anleitung enthält wichtige Informationen, um die Steuerblöcke der Baureihen MO, M1, M4, M6, M7, M8, M9, SM, SP und SX sicher und sachgerecht zu transportieren, zu montieren und demontieren, in Betrieb zu nehmen, zu bedienen, instand zu halten und einfache Störungen selbst zu beseitigen.

Diese Dokumentation richtet sich an Monteure, Bediener und Servicetechniker.

- Lesen Sie diese Anleitung vollständig und insbesondere das Kapitel 2 „Sicherheitshinweise“ auf Seite 9, bevor Sie mit den Steuerblöcken arbeiten.



Die von Bosch Rexroth gelieferte Betriebsanleitung – in allen ihren Teilen und mit allen gegebenenfalls mitgeltenden Dokumenten – enthält sicherheitsrelevante Informationen, die vom Maschinenhersteller in die für sein Endprodukt zu erstellende Betriebsanleitung übernommen werden müssen.

Diese Betriebsanleitung gilt für alle Steuerblöcke der genannten Baureihen unabhängig von deren Fertigungsdatum bis zu einer Neuauflage dieses Dokuments.

1.2 Zusätzliche Dokumentationen

Die Steuerblöcke vom Typ MO, M1, M4, M6, M7, M8, M9, SM, SP und SX sind Anlagenkomponenten.

- Nehmen Sie das Produkt erst in Betrieb, wenn Ihnen die mit Buchsymbol 🕮 gekennzeichneten Dokumentationen vorliegen und Sie diese verstanden und beachtet haben.

Tabelle 1: Zusätzliche Dokumentation

	Titel	Dokumentnummer	Dokumentart
🕮	Open-Center-Steuerblock MO	RD 64354	Techn. Datenblatt
🕮	Open-Center-Steuerblock MO	RDE 64354-E	Ersatzteilliste
🕮	Open-Center-Steuerblock M1	RD 64263	Techn. Datenblatt
🕮	Open-Center-Steuerblock M1	RDE 64263-01-E (NG 16) RDE 64263-02-E (NG 32)	Ersatzteillisten
🕮	Open-Center-Steuerblock M8	RD 64294	Techn. Datenblatt
🕮	Open-Center-Steuerblock M8	RDE 64294-01-E (NG 16) RDE 64294-02-E (NG 18) RDE 64294-03-E (NG 22) RDE 64294-04-E (NG 25) RDE 64294-05-E (NG 32)	Ersatzteillisten
🕮	Open-Center-Steuerblock SM	RD 64122	Techn. Datenblatt
🕮	Open-Center-Steuerblock SM	RDEF 64122-E	Ersatzteilliste
🕮	Load-Sensing-Steuerblock M4-12	RD 64276	Techn. Datenblatt
🕮	Load-Sensing-Steuerblock M4-12	RD 64276-E	Ersatzteilliste
🕮	Load-Sensing-Steuerblock M4-15	RD 64283	Techn. Datenblatt

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Zu dieser Anleitung

	Titel	Dokumentnummer	Dokumentart
🕮	Load-Sensing-Steuerblock M4-15	RD 64283-E	Ersatzteilliste
🕮	Load-Sensing-Steuerblock M4-22	RD 64279	Techn. Datenblatt
🕮	Load-Sensing-Steuerblock M4-22	RJE 64279-E	Ersatzteilliste
🕮	Load-Sensing-Steuerblock SP-08	RD 64139	Techn. Datenblatt
🕮	Load-Sensing-Steuerblock SP-08	RDEF 64139-E	Ersatzteilliste
🕮	LUDV-Steuerblock M6-15	RD 64284	Techn. Datenblatt
🕮	LUDV-Steuerblock M6-15	RDE 64284-E	Ersatzteilliste
🕮	LUDV-Steuerblock M6-22	RD 64286	Techn. Datenblatt
🕮	LUDV-Steuerblock M7-22	RD 64295	Ersatzteilliste
🕮	LUDV-Steuerblock SX 10	RD 64132	Techn. Datenblatt
🕮	LUDV-Steuerblock SX 10	RDEF 64132-E	Ersatzteilliste
🕮	LUDV-Steuerblock SX 12	RD 64128	Techn. Datenblatt
🕮	LUDV-Steuerblock SX 12	RDEF 64128-E	Ersatzteilliste
🕮	LUDV-Steuerblock SX 14	RD 64125	Techn. Datenblatt
🕮	LUDV-Steuerblock SX 14	RDEF 64125-E	Ersatzteilliste
🕮	LUDV-Steuerblock SX 14 NGE	RD 64130	Ersatzteilliste
🕮	Anlagendokumentation des Maschinenherstellers		Betriebsanleitung
🕮	Auftragsbestätigung		
🕮	Gesamtschaltplan der Maschine		
🕮	mitgelieferte Einbauzeichnung/ Hydraulikplan		
🕮	Druckflüssigkeiten auf Mineralölbasis	RD 90220	Techn. Datenblatt
🕮	Druckflüssigkeiten auf Mineralölbasis für Axialkolbenmaschinen	RD 90220-1	Techn. Datenblatt



Weitere Dokumentation können Sie bei Bedarf über Bosch Rexroth beziehen.

Unterlagen zum Gesamtschaltplan der Maschine erhalten Sie vom Maschinenhersteller.

Beachten Sie außerdem allgemein gültige, gesetzliche und sonstige verbindliche Regelungen der europäischen bzw. nationalen Gesetzgebung sowie die in Ihrem Land gültigen Vorschriften zur Unfallverhütung und zum Umweltschutz.

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1.3 Darstellung von Informationen

Damit Sie mit dieser Dokumentation schnell und sicher mit Ihrem Produkt arbeiten können, werden einheitliche Sicherheitshinweise, Symbole, Begriffe und Abkürzungen verwendet. Zum besseren Verständnis sind diese in den folgenden Abschnitten erklärt.

1.3.1 Sicherheitshinweise

In dieser Dokumentation stehen Sicherheitshinweise vor einer Handlungsabfolge, bei der die Gefahr von Personen- oder Sachschäden besteht. Die beschriebenen Maßnahmen zur Gefahrenabwehr müssen eingehalten werden.

Sicherheitshinweise sind wie folgt aufgebaut:

⚠ SIGNALWORT

Art der Gefahr

Folgen bei Nichtbeachtung

- ▶ Gefahrenabwehr

- **Warnzeichen:** macht auf die Gefahr aufmerksam
- **Signalwort:** gibt die Schwere der Gefahr an
- **Art der Gefahr:** benennt die Art oder Quelle der Gefahr
- **Folgen:** beschreibt die Folgen bei Nichtbeachtung
- **Abwehr:** gibt an, wie man die Gefahr umgehen kann

Tabelle 2: Gefahrenklassen nach ANSI Z535.6-2006

Warnzeichen, Signalwort	Bedeutung
⚠ GEFAHR	kennzeichnet eine gefährliche Situation, in der Tod oder schwere Körperverletzung eintreten werden, wenn sie nicht vermieden wird
⚠ WARNUNG	kennzeichnet eine gefährliche Situation, in der Tod oder schwere Körperverletzung eintreten können, wenn sie nicht vermieden wird
⚠ VORSICHT	kennzeichnet eine gefährliche Situation, in der leichte bis mittelschwere Körperverletzungen eintreten können, wenn sie nicht vermieden wird
HINWEIS	Sachschäden: Das Produkt oder die Umgebung können beschädigt werden.

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1.3.2 Symbole

Die folgenden Symbole kennzeichnen Hinweise, die nicht sicherheitsrelevant sind, jedoch die Verständlichkeit der Dokumentation erhöhen.

Tabelle 3: Bedeutung der Symbole

Symbol	Bedeutung
	Wenn diese Information nicht beachtet wird, kann das Produkt nicht optimal genutzt bzw. betrieben werden.
▶	einzelner, unabhängiger Handlungsschritt
1. 2. 3.	nummerierte Handlungsanweisung: Die Ziffern geben an, dass die Handlungsschritte aufeinander folgen.

1.3.3 Bezeichnungen

In dieser Dokumentation werden folgende Bezeichnungen verwendet:

Tabelle 4: Bezeichnungen

Bezeichnung	Bedeutung
Monoblock	Steuerblock, der aus einem Stück gegossen wird. Optional können weitere Wegeventilelemente zur Funktionserweiterung angebaut werden.
Wegeventilelement	Steuerblockelement mit 1 Schieberachse, im Folgenden auch „Steuerblockscheibe“ genannt.
Hauptschieber	Steuerschieber
Betätigung	Art der Ansteuerung des Hauptschiebers

1.3.4 Abkürzungen

In dieser Dokumentation werden folgende Abkürzungen verwendet:

Tabelle 5: Abkürzungen

Abkürzung	Bedeutung
DB	Druckbegrenzungsventil
DIN	Deutsche Industrie Norm
ISO	International Organization for Standardization (Internationale Normierungsorganisation)
RD	Rexroth-Dokument in deutscher Sprache
RE	Rexroth-Dokument in englischer Sprache
RDE	Rexroth-Dokument in deutsch/englischer Sprache
RDEF	Rexroth-Dokument in deutsch/englisch/französischer Sprache

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2 Sicherheitshinweise

2.1 Zu diesem Kapitel

Das Produkt wurde gemäß den allgemein anerkannten Regeln der Technik hergestellt. Trotzdem besteht die Gefahr von Personen- und Sachschäden, wenn Sie dieses Kapitel und die Sicherheitshinweise in dieser Dokumentation nicht beachten.

- Lesen Sie diese Dokumentation gründlich und vollständig, bevor Sie mit dem Produkt arbeiten.
- Bewahren Sie die Dokumentation so auf, dass sie jederzeit für alle Benutzer zugänglich ist.
- Geben Sie das Produkt an Dritte stets zusammen mit den erforderlichen Dokumentationen weiter.

2.2 Bestimmungsgemäße Verwendung

Der Steuerblock ist ausschließlich dazu bestimmt, in eine Maschine eingebaut oder mit anderen Komponenten zu einer Maschine zusammengefügt zu werden. Der Steuerblock darf erst in Betrieb genommen werden, wenn er in die Maschine, für die er bestimmt ist, eingebaut ist.

Dieses Produkt kann als sicherheitsbezogenes Teil einer Steuerung eingesetzt werden. Es beinhaltet aber keine Sicherheitsfunktion, da es eine solche nicht eigenständig ausgeben oder realisieren kann. Bei Einsatz des Produktes zur Realisierung von Sicherheitsfunktionen sind zusätzliche Maßnahmen in der Steuerung bzw. dem sicherheitsbezogenem Teil der Steuerung vom Systemhersteller oder Systemplaner festzulegen. Angaben hierzu liefern Standards zur funktionalen Sicherheit wie etwa ISO 13849, IEC 62061 oder fachspezifische Leitfäden.

Halten Sie die in den technischen Daten genannten Betriebsbedingungen und Leistungsgrenzen ein.

Ein Steuerblock ist ein technisches Arbeitsmittel und nicht für die private Verwendung bestimmt.

Die bestimmungsgemäße Verwendung schließt auch ein, dass Sie diese Anleitung und insbesondere das Kapitel 2 „Sicherheitshinweise“ auf Seite 9 vollständig gelesen und verstanden haben.



Die Steuerblöcke sind ausschließlich für den im „Technischen Datenblatt“ angegebenen Einsatzzweck vorgesehen. Wollen Sie den Steuerblock für andere als im „Technischen Datenblatt“ angegebene Zwecke einsetzen, dann nehmen Sie bitte vorher Kontakt mit Bosch Rexroth auf.

2.3 Nicht bestimmungsgemäße Verwendung

Jeder andere Gebrauch als in der bestimmungsgemäßen Verwendung beschrieben ist nicht bestimmungsgemäß und deshalb unzulässig.

Es dürfen keine über das in dieser Betriebsanleitung beschriebene Maß hinausgehenden Umbauten vorgenommen werden.

Das Ventil ist zum Betrieb in explosionsfähiger Umgebung nicht geeignet.

Für Schäden bei nicht bestimmungsgemäßer Verwendung übernimmt Bosch Rexroth keine Haftung. Die Risiken bei nicht bestimmungsgemäßer Verwendung liegen allein beim Benutzer.

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2.4 Qualifikation des Personals

Die in dieser Dokumentation beschriebenen Tätigkeiten erfordern grundlegende Kenntnisse der Mechanik, Elektrik und Hydraulik sowie Kenntnisse der zugehörigen Fachbegriffe. Um die sichere Verwendung zu gewährleisten, dürfen diese Tätigkeiten daher nur von einer entsprechenden Fachkraft oder einer unterwiesenen Person unter Leitung einer Fachkraft durchgeführt werden.

Eine Fachkraft ist, wer aufgrund seiner fachlichen Ausbildung, seiner Kenntnisse und Erfahrungen sowie seiner Kenntnisse der einschlägigen Bestimmungen die ihm übertragenen Arbeiten beurteilen, mögliche Gefahren erkennen und geeignete Sicherheitsmaßnahmen treffen kann. Eine Fachkraft muss die einschlägigen fachspezifischen Regeln einhalten.

2.5 Allgemeine Sicherheitshinweise

- Beachten Sie die gültigen Vorschriften zur Unfallverhütung und zum Umweltschutz.
- Beachten Sie die Sicherheitsvorschriften und -bestimmungen des Landes, in dem das Produkt eingesetzt/angewendet wird.
- Verwenden Sie Rexroth-Steuerblöcke nur in technisch einwandfreiem Zustand.
- Prüfen Sie den Steuerblock auf offensichtliche Mängel, wie beispielsweise Risse im Gehäuse oder fehlende Plomben, Schrauben, Abdeckkappen oder Dichtungen.
- Beachten Sie alle Hinweise auf dem Produkt.
- Personen, die Rexroth-Produkte montieren, bedienen, demontieren oder warten dürfen nicht unter dem Einfluss von Alkohol, sonstigen Drogen oder Medikamenten, die die Reaktionsfähigkeit beeinflussen, stehen.
- Verwenden Sie nur vom Hersteller zugelassene Zubehör- und Ersatzteile.
- Halten Sie die in der Produktdokumentation angegebenen technischen Daten und Umgebungsbedingungen ein.
- Wenn in sicherheitsrelevanten Anwendungen ungeeignete Produkte eingebaut oder verwendet werden, können unkontrollierte Betriebszustände in der Anwendung auftreten, die Personen- und/oder Sachschäden verursachen können. Setzen Sie daher ein Produkt nur dann in sicherheitsrelevante Anwendungen ein, wenn diese Verwendung ausdrücklich in der Dokumentation des Produkts spezifiziert und erlaubt ist.
- Sie dürfen das Produkt erst dann in Betrieb nehmen, wenn festgestellt wurde, dass das Endprodukt (beispielsweise eine Maschine oder Anlage), in das die Rexroth-Produkte eingebaut sind, den länderspezifischen Bestimmungen, Sicherheitsvorschriften und Normen der Anwendung entspricht.

2.6 Produkt- und technologieabhängige Sicherheitshinweise

- Verwenden Sie den Steuerblock ausschließlich im Leistungsbereich, der in den technischen Daten angegeben ist.
- Stellen Sie sicher, dass alle zum Steuerblock gehörenden Sicherheitseinrichtungen vorhanden, ordnungsgemäß installiert und voll funktionsfähig sind. Sie dürfen Sicherheitseinrichtungen nicht in ihrer Position verändern, umgehen oder unwirksam machen.
- Der Steuerblock ist keine Sicherheitseinrichtung.
- Der Steuerblock kann durch innere Verschmutzung – wie z. B. unreine Hydraulikflüssigkeit, Abrieb oder Restschmutz aus Anlagenbauteilen – in nicht definierter Stellung blockieren. Dadurch folgt der angetriebene Verbraucher nicht mehr den Vorgaben des Bedieners.

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- Sorgen Sie durch eine sachgerechte Not-Aus-Funktion dafür, dass der angetriebene Verbraucher in eine sichere Lage (z. B. sofortiger Stopp) gebracht werden kann.
- Halten Sie die vorgeschriebene Reinheitsklasse der Druckflüssigkeit gemäß „Technischem Datenblatt“ ein.
- Ist es notwendig, dass Sie, beispielsweise für Inbetriebnahme- oder Wartungsarbeiten, Sicherheitseinrichtungen außer Betrieb setzen, müssen Sie Maßnahmen durchführen, die gewährleisten, dass für Personen und Sachwerte keine gefährlichen Situationen entstehen können. Beachten Sie dazu die übergeordnete Betriebsanleitung der Maschine.
- Entfernen oder beschädigen Sie niemals von Bosch Rexroth angebrachte Plomben.
- Belasten Sie den Steuerblock unter keinen Umständen in unzulässiger Weise mechanisch. Verwenden Sie den Steuerblock niemals als Griff oder Stufe. Stellen Sie keine Gegenstände darauf ab.
- Die Gewährleistung gilt ausschließlich für die ausgelieferte Konfiguration. Die Gewährleistung erlischt bei fehlerhafter Montage, bei nicht bestimmungsgemäßer Verwendung und/oder unsachgemäßer Handhabung.

2.6.1 Spezielle Restgefahren und Schutzmaßnahmen

Tabelle 6: Spezielle Restgefahren und Schutzmaßnahmen

Gefahrenbereich	Restgefahr	Schutzmaßnahme(n), Sicherheitshinweise
Scharfe Kanten am Ventilgehäuse, an Gewinden am Ventil, am Ventil-Steuerschieber	Schneidgefahr für Gliedmaßen	Ventil nur mit Schutzhandschuhen anfassen.
Zwischenraum zwischen Schaltelement und Ventilgehäuse	Quetschgefahr für Gliedmaßen	Gliedmaßen nicht in den Zwischenraum zwischen Schaltelement und Ventilgehäuse bringen.
Ventilgehäuse	Verletzungsgefahr durch mit Federkraft herausgeschleuderte Teile beim Entfernen von Verschlussschrauben am Ventil bei Demontage	Verschlussschrauben vorsichtig entfernen. Beim Lösen von Verschlussschrauben grundsätzlich kräftig gegenhalten! Schutzbrille tragen! Die Wiederholverschraubbarkeit von Verschlussschrauben und Verschlussmuttern darf fünf Instandsetzungen nicht überschreiten.
Ventilgehäuse, Ventilmagnet, Steckverbinder	Verbrennungsgefahr an heißen Oberflächen bei Betrieb	Ventil nur mit Schutzhandschuhen anfassen. Vor Arbeiten am Ventil, Ventil ausser Betrieb nehmen und abkühlen lassen.
Verstellmöglichkeiten und Instandsetzungsarbeiten	Ölaustritt	Ggf. austretendes Öl sofort beseitigen, Auffangwanne verwenden, Schutzhandschuhe verwenden
Spannungsführende Leiter, metallische Konstruktionsteile	Verletzungs- oder Lebensgefahr durch elektrische Körperdurchströmung	Arbeiten Sie an elektrischen Bauteilen nur in spannungslosem Zustand. Schalten Sie den elektrischen Anschluss vor Montage und Demontage spannungsfrei.
Gewicht des Steuerblocks	Verletzungsgefahr durch Herabfallen	Verwenden Sie ein geeignetes Hebezeug. Nutzen Sie die Hebevorrichtungen am Steuerblock.

2.7 Pflichten des Betreibers/Maschinenherstellers

Der Betreiber/Maschinenhersteller des Steuerblockes von Bosch Rexroth muss sein Personal regelmäßig zu folgenden Themen schulen:

- Beachtung und Gebrauch der Betriebsanleitung sowie der gesetzlichen Bestimmungen
- Bestimmungsgemäßer Betrieb des Rexroth-Produkts

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- Beachtung der Anweisungen des Werkschutzes und der Betriebsanweisungen des Betreibers
- Verhalten im Notfall.



Bosch Rexroth bietet Ihnen schulungsunterstützende Maßnahmen auf speziellen Gebieten an. Eine Übersicht über die Schulungsinhalte finden Sie im Internet unter `http://www.boschrexroth.de/didactic`.

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3 Lieferumfang

Im Lieferumfang ist enthalten:

- Produktspezifische Dokumentation
- Steuerblock gemäß Auftragsbestätigung.

- ▶ Prüfen Sie den Lieferumfang auf Vollständigkeit.
- ▶ Prüfen Sie den Lieferumfang auf mögliche Transportschäden.

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4 Produktbeschreibung

4.1 Leistungsbeschreibung

Siehe „Technisches Datenblatt“



Die Zuordnung der Ventile zu den Technischen Datenblättern finden Sie im Kapitel 1.2 „Zusätzliche Dokumentationen“ auf Seite 5.

4.2 Gerätebeschreibung

Siehe „Technisches Datenblatt“



Die Zuordnung der Ventile zu den Technischen Datenblättern finden Sie im Kapitel 1.2 „Zusätzliche Dokumentationen“ auf Seite 5.

4.3 Identifikation des Produkts

4.3.1 Angaben auf den Typschildern



Die Angaben auf dem Typschild gelten für den Steuerblock im Auslieferungszustand. Wenn am Steuerblock gegenüber dem Auslieferungszustand Umbauten vorgenommen worden sind, treffen die Typschildangaben unter Umständen nicht auf den Ihnen vorliegenden Steuerblock zu.

Änderungen am Steuerblock führen zum Erlöschen der Gewährleistungs- und Haftungspflicht von Bosch Rexroth.

Werden Änderungen, Anbauten, Umbauten vorgenommen, sind diese zu dokumentieren und auf dem Typschild dauerhaft, z. B. mit Schlagstempel, zu vermerken.

Stellen Sie durch Vergleich der auf dem jeweiligen Typschild angegebenen Materialnummer des Steuerblockes mit den Angaben auf der Einbauzeichnung sicher, dass diese Betriebsanleitung auf das Ihnen vorliegende Produkt zutrifft. Wenden Sie sich in Zweifelsfällen an Bosch Rexroth.

Außer der Herstellermarke (Bosch oder Rexroth), der 10-stelligen Materialnummer (R 9 ... ...) und dem Herkunftsland befinden sich auf dem Typschild von vor April 2005 gefertigten Bosch- oder Rexroth-Steuerblöcke lediglich Angaben, die internen Zwecken von Bosch Rexroth dienen. Bei ab April 2005 gefertigten Steuerblöcken sind auf dem Typschild Fertigungsjahr und -woche nach folgendem Schema angegeben:

YY w XX

YY = Fertigungsjahr, XX = Kalenderwoche

Beispiel:

05 w 15 = Fertigungsjahr 2005, Kalenderwoche 15

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Abb. 1: Typschild auf vor Januar 2004 hergestellten Steuerblöcken

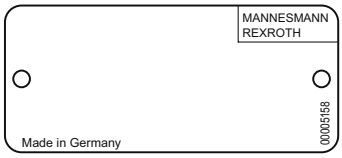


Abb. 2: Typschild auf ab Januar 2004 hergestellten Steuerblöcken

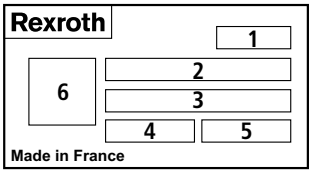


Abb. 3: Typschilder auf ab April 2005 hergestellten Steuerblöcken mit Angabe zu Fertigungsjahr und -woche, ggf. mit Strichcode für interne Zwecke von Bosch Rexroth





Abb. 4: Typschilder für Steuerblöcke SM, SX



1 Produktionslinie
2 Materialnummer
3 Kunden-Materialnummer
4 Fertigungsdatum
5 Seriennummer
6 Datenmatrix

Auftragsbedingt kann es zu Abweichungen bei den oben abgebildeten Typschildern kommen. Z. B. bei kundenspezifischen Typschildern kann das Rexroth-Logo durch das Kundenlogo ersetzt werden.

4.3.2 Weitere Typschilder am Steuerblock

Sonstige am Produkt vorhandene Beschriftungen dienen lediglich internen Zwecken von Bosch Rexroth.

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5 Transport und Lagerung

Halten Sie bei Lagerung und Transport in jedem Fall die Umgebungsbedingungen ein, siehe Tabelle 7.

5.1 Steuerblock transportieren

Abmessungen und Gewicht (Masse) der Steuerblöcke finden Sie im „Technischen Datenblatt“.

- Stellen Sie sicher, dass die Tragkraft des Hebezeuges ausreicht.

5.2 Steuerblock lagern

5.2.1 Lagerungsbedingungen

Der Rexroth-Steuerblock darf nur in trockener, staubfreier Atmosphäre gelagert werden, die frei von Ätzstoffen und Dämpfen ist und die niedrige Luftfeuchtigkeit und keine großen Temperaturschwankungen aufweist.

Folgende Lagerbedingungen sind einzuhalten, zu überwachen und zu dokumentieren:

Tabelle 7:

Ideale Lagertemperatur	+ 5 °C bis + 20 °C
Relative Luftfeuchtigkeit (keine Kondensation)	max. 65%
UV-Schutz	100%
Kondensation	keine
Zusätzliche Ozonbildung in Lagernähe	keine

- Prüfen Sie monatlich die fachgerechte Lagerung des Steuerblockes.

5.2.2 Korrosionsschutz

Rexroth-Steuerblöcke werden werksseitig mit Mineralöl geprüft, das bei verschlossenen Steuerblöcken für inneren Korrosionsschutz sorgt.

Nicht lackierte oder mit einem galvanischen Überzug versehene Steuerblöcke sind nicht vor Korrosion geschützt.

Verzögerte Inbetriebnahme, lange Fracht- und Lagerzeiten oder eine längere Außerbetriebnahme von Rexroth-Steuerblöcken führen zur Rostbildung. Um dies zu verhindern, müssen zusätzliche Korrosionsschutzmaßnahmen ergriffen werden.

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5.2.3 Alterung bei Lagerung und längerem Stillstand

Lange Lagerzeit oder eine längere Außerbetriebnahme von Rexroth-Steuerblöcken führt zu Schäden an Dichtungen und Kunststoffteilen.

- Außen liegende Dichtungen von Steuerblöcken, die länger als 12 Monate gelagert wurden, sind vor der Montage auf Beschädigungen zu prüfen und müssen gegebenenfalls ausgetauscht werden.
- Nach drei Jahren Lager- oder Stillstandszeit sind nach außen wirkende Dichtungen auszutauschen.



Dichtungssätze können Sie bei Bosch Rexroth beziehen.

Bei Inbetriebnahme ist in jedem Fall zu prüfen, ob die Steuerblöcke nach außen dicht sind, siehe Kapitel 7 „Inbetriebnahme“ auf Seite 24. Bei auftretender Leckage sind die Dichtungen zu erneuern

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6 Montage

⚠ WARNUNG

Unter Druck stehende Leitungen!

Lebensgefahr, Verletzungsgefahr, schwere Körperverletzung oder Sachschaden durch herausspritzendes Öl oder Bauteilen!

- Schalten Sie immer den relevanten Anlagenteil drucklos, bevor Sie das Produkt montieren bzw. Stecker anschließen oder ziehen.
- Sichern Sie den Anlagenteil gegen unbeabsichtigtes Wiedereinschalten.

Hohe elektrische Spannung!

Lebensgefahr, Verletzungsgefahr, schwere Körperverletzung oder Sachschaden durch elektrischen Schlag!

- Schalten Sie den relevanten Anlagenteil spannungsfrei, bevor Sie das Produkt montieren bzw. Stecker anschließen oder ziehen.
- Steuerblockmagnete nur in spannungslosem Zustand anschließen.
- Sichern Sie den Anlagenteil gegen unbeabsichtigtes Wiedereinschalten.

⚠ VORSICHT

Stolpergefahr durch Kabel und Leitungen

Verletzungsgefahr

- Verlegen Sie die Kabel und Leitungen so, dass diese nicht beschädigt werden und niemand darüber stolpern kann.

Gefahr von Personenschäden durch fehlerhafte Energieversorgung

Verletzungsgefahr durch unkontrollierte Ventilstellungen! Diese können ein Fehlverhalten oder einen Ausfall des Steuerblocks bewirken.

- Verbinden Sie immer den Erdungsanschluss des Steuerblocks mit dem entsprechenden Erdungssystem Ihrer Installation.
- Verwenden Sie ausschließlich ein Netzteil mit sicherer Trennung.
- Berücksichtigen Sie immer die länderspezifischen Vorschriften.

Gefahrbringende Bewegungen der hydraulischen Verbraucher!

Verletzungsgefahr durch falsche Anschlussbelegung oder vertauschte Kabelstecker wegen ungewollter Verbraucherbewegung!

- Stellen Sie sicher, dass alle Rohre und/oder Schläuche am richtigen Steuerblockanschluss angebracht sind und unter keinen Umständen vertauscht werden.
- Nach Abschluss der Anschlussarbeiten die korrekte Zuordnung der Kabelstecker zu den jeweiligen Steuerblockmagneten prüfen.

HINWEIS

Verlust der Schutzklasse IP67 und Gefahr von Kurzschluss durch fehlende Dichtungen und Verschlüsse

Flüssigkeiten und Fremdkörper können in den Steuerblock eindringen und ihn zerstören.

- Stellen Sie vor der Montage sicher, dass alle Dichtungen und Verschlüsse der Steckverbindungen dicht sind.

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HINWEIS

Beschädigung durch falsche Montage!

Hydraulikleitungen und -schläuche, die Sie unter Spannung einbauen, erzeugen während des Betriebs zusätzliche mechanische Kräfte, was die Lebensdauer des Steuerblocks und der gesamten Maschine verringert.

- Montieren Sie Leitungen und Schläuche ohne Verspannung.

Verschleiß und Funktionsstörungen durch verunreinigte Druckflüssigkeit

Die Sauberkeit der Druckflüssigkeit beeinflusst die Sauberkeit und die Lebensdauer der Hydraulikanlage. Verschmutzung der Druckflüssigkeit führt zu Verschleiß und Funktionsstörungen. Insbesondere Fremdkörper, wie z. B. Schweißperlen und Metallspäne, in den Hydraulikleitungen können den Steuerblock beschädigen.

- Achten Sie auf äußerste Sauberkeit.
- Bauen Sie den Steuerblock schmutzfrei ein.
- Achten Sie darauf, dass Anschlüsse, Hydraulikleitungen und Anbauteile (z. B. Messgeräte) sauber sind.
- Stellen Sie sicher, dass auch beim Verschließen der Anschlüsse keine Verunreinigungen eindringen.
- Achten Sie darauf, dass kein Reinigungsmittel in das Hydrauliksystem eindringt.
- Verwenden Sie zur Reinigung keine Putzwolle oder fasernde Putzlappen.
- Verwenden Sie als Dichtungsmittel nur geeignetes und zulässiges Dichtungsmaterial.
- Entfernen Sie ggf. noch vorhandene Öl-Rückstände von der Werkserprobung restlos.
- Entfernen Sie ggf. Verharzungen, die durch falsche Lagerung entstanden sind.

Funktionsbeeinträchtigung durch falsche Steckverbindungen!

Für den elektrischen Anschluss dürfen nur die im „Technischen Datenblatt“ genannten Steckverbindungen verwendet werden.

- Montagevorschriften des Herstellers der Steckverbindung beachten!
- Stromversorgung vor Inbetriebnahme daraufhin überprüfen, ob die Spannung mit den Angaben der „Einbauzeichnung“ übereinstimmt und ob die Summe der zu erwartenden Magnetströme kleiner oder gleich der Belastbarkeit der Stromversorgung ist.
- Die Steckverbindungen dürfen nur im spannungslosen Zustand kontaktiert werden. Der Montagevorgang darf höchstens 10 mal wiederholt werden.

Fehlerhafte Anschlussbeschaltung!

Der Steuerblock darf nur durch eine Elektrofachkraft oder unter deren Aufsicht angeschlossen werden. Die verwendeten Leitungen müssen für Betriebstemperaturen von −20 °C bis +100 °C geeignet sein.

- Anschlussleitung vor Montage spannungsfrei schalten.
- Verhindern, dass die Anschlussleitung und Litzen scharf abgeknickt werden, um Kurzschlüsse und Unterbrechungen zu vermeiden.
- Anschlussleitung(en) zugentlastet verlegen. Der erste Befestigungspunkt darf höchstens 15 cm von der Kabeleinführung entfernt sein.
- Feindrähtige Leiter nur mit aufgepressten Adernendhülsen verwenden.

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6.1 Auspacken

- Entsorgen Sie die Verpackung entsprechend den nationalen Bestimmungen Ihres Landes.

6.2 Lackieren des Steuerblocks

Wenn der Steuerblock vor der Montage lackiert werden soll, dann

- Schützen Sie die Hydraulik-Anschlüsse zuvor durch Einschrauben von Kunststoff-Schraubstopfen vollständig gegen Farbauftrag.
- Schützen Sie die Befestigungsgewinde durch Eindrehen von Schrauben gegen Farbauftrag.
- Kleben Sie Flanschflächen der Steuerblöcke sowie Anschluss- und Endplatten vor dem Lackieren sorgfältig ab, so dass kein Schmutz und kein Lack eindringen kann.
- Verhindern Sie Lackauftrag auf die Kontakte der elektrischen Anschlüsse und achten Sie darauf, am Stecker keinerlei Beschädigung irgendwelcher Art zu verursachen.
- Achten Sie beim Entfernen der Kunststoff-Schraubstopfen nach dem Lackieren darauf, dass keine Lacksplitter in den Steuerblock gelangen.

Typschilder sind ab Werk mit einer nach dem Lackieren abziehbaren Folie gegen Farbauftrag geschützt.

6.3 Einbaubedingungen

- Halten Sie beim Einbau in jedem Fall die Umgebungsbedingungen, die in den Technischen Daten angegeben sind, ein. (Siehe „Technisches Datenblatt“.)

6.3.1 Einbaulage

Falls in den technischen Unterlagen nicht anders angegeben, ist die Einbaulage der Steuerblöcke beliebig.

6.4 Notwendiges Werkzeug

Um den Steuerblock zu montieren, benötigen Sie nur handelsübliches Werkzeug passend zu den auf der Einbauzeichnung angegebenen Befestigungen.

6.5 Steuerblock montieren

6.5.1 Steuerblock befestigen

Der Steuerblock ist zur Befestigung mit Befestigungsbohrungen versehen, die aus der „Einbauzeichnung“ ersichtlich sind. Entnehmen Sie die Lagetoleranzen der Befestigungsbohrungen an der Maschine der „Einbauzeichnung“. Die Anziehmomente sind entsprechend den für die jeweilige Bohrungsgrößen und Schraubenfestigkeitsklassen üblichen Normwerten zu wählen. Ein zu hohes Anziehmoment kann unter Umständen zum Klemmen des Ventilschiebers führen. In einem solchen Fall ist das Befestigungsmoment entsprechend zu reduzieren. Dabei auf ausreichende Restklemmkraft der Schrauben achten.

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- Anforderungen an die Auflagefläche aus der „Einbauzeichnung“ beachten.
- Prüfen Sie die Ebenheit der Flanschfläche in der Maschine (Toleranz: 0,5 mm)
- Befestigungsschrauben mit dem in der Norm angegebenen jeweiligen Anziehdrehmoment anziehen.
- Befestigen Sie den Steuerblock stets an allen dafür vorgesehenen Befestigungspunkten und ausschließlich mit Schrauben einer der in Tabelle 8 angegebenen Festigkeitsklassen gemäß EN ISO 4762 oder EN ISO 4014.

Bosch Rexroth empfiehlt eine Verschraubung mit folgenden Parametern:

Tabelle 8: Befestigungsschrauben

Baureihe	Abmessung	Festigkeitsklasse	Anziehmoment [Nm]	Einschraubtiefe [mm]
M1-16	M8	8.8 / 10.9	27 / 40	[1]
M1-25	M10	8.8 / 10.9	54 / 79	10
M1-32	M12	8.8 / 10.9	93 / 37	[1]
M4-12	M10	8.8 / 10.9	41 / 60	12 … 15
M4-15	M10	8.8 / 10.9	54 / 79	10
M4-22	M16	8.8 / 10.9	230 / 338	[1]
M6-15	M10	8.8 / 10.9	54 / 79	10
M6-22	M12	8.8 / 10.9	93 / 137	12
M7-20	M12	8.8 / 10.9	93 / 137	12
M7-22	M16	8.8 / 10.9	230 / 338	16
M8-16	M16	8.8 / 10.9	230 / 338	16
M8-18	M16	8.8 / 10.9	230 / 338	16
M8-22	M16	8.8 / 10.9	230 / 338	16
M8-25	M16	8.8 / 10.9	230 / 338	16
M8-32	M20	8.8 / 10.9	464 / 661	20
M8-35	M16	8.8 / 10.9	230 / 338	[1]
M9-20	M16	8.8 / 10.9	230 / 338	16
M9-25	M16	8.8 / 10.9	230 / 338	16
MO-10	M10	8.8 / 10.9	54 / 79	[1]
MO-16	M8	8.8 / 10.9	27 / 40	[1]
MO-22	M10	8.8 / 10.9	54 / 79	[1]
MO-32	M12	8.8 / 10.9	93 / 137	[1]
MO-40	M16	8.8 / 10.9	230 / 338	[1]
MO-52	M20	8.8 / 10.9	464 / 661	20
SP-08	M8	8.8 / 10.9	25 / 30	10 … 14; [1]
SM 12	M8			
SX 10	M8			
SX 12	M8			
SX 14	M10			
SX 14 NGE	M10			

[1] Durchgangsbohrung im Gehäuse; die Einschraubtiefe hängt vom Mutterngewindewerkstoff ab.

6.6 Steuerblock mechanisch anschließen

Der Anschluss der Betätigungselemente inkl. der Toleranzen ist aus der „Einbauzeichnung“ ersichtlich. Die Anzugsmomente sind entsprechend der Betätigungselemente zu wählen. Die Betätigung muss frei von Querkräften sein!

- Vergewissern Sie sich, dass bei Inbetriebnahme die Zunge in der Null-Position (Schieber in Mittelstellung) steht.

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6.7 Steuerblock hydraulisch anschließen

Auf der „Einbauzeichnung“ und im „Technischen Datenblatt“ ist das für den hydraulischen Anschluss notwendige Verbindungssystem und das Anziehmoment angegeben. Der Anschluss ist entsprechend der zugehörigen Normen auszuführen. Normen können bei den von den Normungsgremien mit dem Normenvertrieb beauftragten Vertriebsorganisationen bezogen werden.

- Verwenden Sie an jedem Hydraulikanschluss die vorgesehene Dichtung.

6.8 Elektrische Versorgung anschließen

Schalten Sie den relevanten Anlagenteil spannungsfrei.



Informationen zur richtigen Zuordnung der Anschlüsse finden Sie in der „Angebots- /Einbauzeichnung“. Den vorgeschriebenen Steckertyp und seine Spezifikation entnehmen Sie dem „Technischen Datenblatt“.

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6.9 Vor der Erstinbetriebnahme

- Überzeugen Sie sich, dass die Schnittstellen der Maschine sowie die Einbauverhältnisse einen sicheren Betrieb des Rexroth-Steuerblockes gewährleisten.
  Konsultieren Sie im Zweifelsfall Bosch Rexroth.
- Prüfen Sie anhand der Betriebsanleitung für die Maschine, in welche der Rexroth-Steuerblock eingebaut werden soll und per Augenschein, ob die Inbetriebnahme der Hydraulik zu unkontrollierten gefährlichen Bewegungen führen kann. Beachten Sie ggf. auch die Gefahrenanalyse/Risikobeurteilung der Maschine.
- Treffen Sie bei zu erwartenden Gefährdungen entsprechende Vorkehrungen, z. B.: stellen Sie sicher, dass die Zylinderkolbenstange ohne Gefahr ausfahren kann.
- Sichern Sie eine zu hebende Last zusätzlich mit einem Hebezeug/ Lastaufnahmemittel.
- Prüfen Sie, ob mit der elektrischen Steuerung der Maschine während der Inbetriebnahme eine Handschaltung der Steuerblockmagneten möglich ist. Wenn eine Handschaltung nicht oder nur unter schwierigen Bedingungen möglich ist, sollten Sie für die interne Funktionsprobe der Hydraulikanlage eine Fremdsteuerung vorbereiten.
- Arbeiten Sie ein Ablaufprogramm für die Inbetriebnahme aus und archivieren dieses in den technischen Unterlagen als Anlage zur Betriebsanleitung.
- Teilen Sie den Funktionsschaltplan in Teilkreisläufe ein, die schrittweise in Betrieb genommen werden können.
- Lesen Sie den Funktionsschaltplan und klären Sie unklare Aussagen und Darstellungen ab.
- Legen Sie fest, in welche Schaltstellung die Steuerblöcke zu schalten sind bzw. wie die Steuerblöcke einzustellen sind.
- Bringen Sie notwendige Gebots-, Verbots- und Hinweisschilder an und prüfen Sie, ob die Bedeutung dieser Schilder in der Betriebsanleitung erklärt ist.
- Gehen Sie bei der Inbetriebnahme in folgender Reihenfolge vor:
  - Pumpenkreis
  - Teile der Steuerung: z. B. Druckabschaltung und Umschaltung, freier Umlauf, Druckreduzierung usw.
- Stellen Sie sicher, dass an allen Anschlüssen Rohre bzw. Schläuche angeschlossen sind, bzw. dass die Anschlüsse mit Verschlussschrauben verschlossen sind.
- Stellen Sie sicher, dass an Rohrverschraubungen und Flanschen Überwurfmuttern und Flansche korrekt angezogen sind.
- Stellen Sie Druck- und Stromventile, Pumpenregler, Signalglieder wie Druckschalter, Grenztaster und Temperaturregler auf die im Ablaufprogramm festgelegten Schaltstellungen und Einstellwerte.

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7 Inbetriebnahme

⚠ VORSICHT

Verletzungsgefahr durch eingeschlossene Luft

In hydraulischen Anlagen eingeschlossene Luft kann beim Betrieb dazu führen, dass Bauteile zum Schwingen angeregt werden, hart an den Anschlägen anschlagen und beschädigt werden. Unerwartete Ausschläge von Aktuatoren können zu Verletzungen führen.

- Hydraulik vor Beginn von Instandhaltungsarbeiten drucklos machen, ggf. vorhandene Druckspeicher entlasten.
- Vor Inbetriebnahme muss sichergestellt werden, dass ggf. eingeschlossene Luft vollständig aus dem System entfernt wird. Dies kann durch Durchströmen mit kleinem Druckflüssigkeitsstrom $q \leq 20\ \%\ q_{Pumpe}$ in allen Schaltstellungen geschehen.
- Beachten Sie auf jeden Fall die Angaben zur Entlüftung in der Betriebsanleitung der Maschine.

HINWEIS

Produktbeschädigung durch zu wenig Druckflüssigkeit

Wenn Sie den Steuerblock ohne oder mit zu wenig Druckflüssigkeit in Betrieb nehmen, wird der Steuerblock sofort beschädigt oder sogar zerstört.

- Achten Sie bei der Inbetriebnahme oder Wiederinbetriebnahme einer Maschine bzw. Anlage darauf, dass der Gehäuseraum sowie die Saug- und Arbeitsleitungen des Steuerblocks mit Druckflüssigkeit gefüllt sind und auch während des Betriebs gefüllt bleiben.

7.1 Erstmalige Inbetriebnahme

- Lassen Sie den Steuerblock vor der Inbetriebnahme einige Stunden akklimatisieren, da sich ansonsten im Gehäuse Kondenswasser niederschlagen kann.
- Stellen Sie sicher, dass alle elektrischen und hydraulischen Anschlüsse belegt oder verschlossen sind. Nehmen Sie nur einen vollständig installierten Steuerblock in Betrieb.
- Vermeiden Sie Temperaturschocks. Temperaturdifferenzen von mehr als 20 °C zwischen Steuerblock und Druckflüssigkeit dürfen nicht überschritten werden. Andernfalls besteht die Gefahr von Schieberklemmern.
  Bei Temperaturen unter – 20 °C muss der Steuerblock warm gefahren werden.

Um den Steuerblock erstmalig in Betrieb zu nehmen, gehen Sie wie folgt vor:

- Steuerblock vollständig mit zulässiger Druckflüssigkeit (siehe „Technisches Datenblatt“) befüllen.
- Vor Inbetriebnahme muss das Gehäuse des Steuerblockes und falls vorhanden der Vorsteuerkreis vollständig mit Druckflüssigkeit gefüllt sein und entlüftet werden (siehe unten).
- Hydraulische Versorgung einschalten
- Elektrische Versorgung einschalten
- Elektrische Anschlüsse überprüfen
  Elektrische Anschlüsse vor Erst- oder Wiederinbetriebnahme durch eine

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Elektrofachkraft oder unter Leitung und Aufsicht einer Elektrofachkraft auf ordnungsgemäßen Zustand überprüfen.



Beachten Sie die Betriebsanleitung der Maschine worin der Steuerblock eingesetzt ist.

- Hydraulisches System entlüften
  Schalten Sie vor dem eigentlichen Betrieb den Steuerblock einige Male unter Betriebsdruck in jeder Betätigungsrichtung und mit reduzierter Geschwindigkeit. Dadurch wird die im Steuerblock verbliebene Luft herausgepresst. Mechanische Beschädigungen durch unzulässig hohe Beschleunigung der Druckflüssigkeit und des Steuerblockschiebers werden so vermieden und die Lebensdauer des Steuerblockes wird erhöht.
- Dichtheitsprüfung durchführen
  Überprüfen Sie, ob im Betrieb am Steuerblock und an den Anschlüssen keine Druckflüssigkeit austritt.
- Funktionstest durchführen.
  Der Funktionstest hat gemäß der Angaben des Maschinenherstellers zu erfolgen, siehe Betriebsanleitung der Maschine.
  In jedem Fall gilt: Druck stets langsam steigern, bei Leckage Funktionstest sofort abbrechen!
- Steuerblock in Betrieb nehmen.



Details zur Feinabstimmung finden Sie in der Betriebsanleitung der jeweiligen Maschine.

- Kontrollieren Sie die Betriebstemperatur, nachdem die Maschine mehrere Stunden im Dauerbetrieb gelaufen ist. Zu hohe Betriebstemperaturen weisen auf Fehler hin, die analysiert und beseitigt werden müssen.
- Lassen Sie nach der Erstinbetriebnahme eine Druckflüssigkeitsprobe analytisch auf die erforderliche Reinheitsklasse prüfen. Wechseln Sie die Druckflüssigkeit, wenn die erforderliche Reinheitsklasse nicht erreicht wird. Wenn nach der Erstinbetriebnahme keine labortechnische Prüfung erfolgt dann gilt: Druckflüssigkeit wechseln.

7.2 Wiederinbetriebnahme

Um den Steuerblock wieder in Betrieb zu nehmen, gehen Sie wie folgt vor:

- Folgen Sie sinngemäß den Anweisungen im Kapitel
  7.1 „Erstmalige Inbetriebnahme“ auf Seite 24.

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8 Betrieb

Das Produkt ist eine Komponente, bei der während des Betriebs keine Einstellungen oder Veränderungen notwendig sind.

- Verwenden Sie das Produkt ausschließlich im Leistungsbereich, der in den technischen Daten gemäß „Technischem Datenblatt“ angegeben ist.

Für die richtige Projektierung des Hydrauliksystems und dessen Steuerung ist der Maschinenhersteller verantwortlich.



Siehe Betriebsanleitung der Maschine, in die der Steuerblock eingebaut ist.

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9 Instandhaltung und Instandsetzung

⚠ VORSICHT

Gefahren durch verminderte Sicherheit bei Instandhaltungsarbeiten

Erfahrungsgemäß ist die Anzahl von Unfällen bei Instandhaltungsarbeiten höher als bei Normalbetrieb. Bitte beachten Sie daher im Interesse Ihrer Sicherheit stets alle nachfolgend aufgeführten Sicherheitshinweise.

- Prüfen Sie – sofern vorhanden – regelmäßig die Sicherheitseinrichtungen auf ordnungsgemäße Funktion.
- Führen Sie alle Instandhaltungsarbeiten fristgerecht, ordnungsgemäß und vollständig durch und dokumentieren Sie diese.
- Sichern Sie den Instandhaltungsbereich vor Beginn der Arbeiten ausreichend ab.
- Achten Sie auf Sauberkeit um Fehlfunktion durch Verschmutzungen zu vermeiden. Lackreste auf Dichtflächen müssen vor der Montage entfernt werden. Lackreste dürfen nicht in Öffnungen des Blockes gelangen, da sonst Fehlfunktionen auftreten können.
- Betreiben Sie das Hydraulikprodukt im Instandhaltungsbetrieb, der u. U. eine temporäre Entfernung bestimmter Schutzvorrichtungen bedingt, mit erhöhter Wachsamkeit. Schalten Sie das Hydraulikprodukt ab und sichern Sie es gegen unbeabsichtigtes Wiedereinschalten.
- Die Einstellwerte von Sicherheitsventilen dürfen vom Anwender nicht verändert werden, das Neujustieren bleibt ausschließlich autorisierten Prüfstellen vorbehalten.
- Legen Sie Schutzbrille, Schutzhandschuhe und Sicherheitsschuhe an. Machen Sie das Hydraulikprodukt drucklos, entlasten Sie ggf. vorhandene Druckspeicher fachgerecht.
- Lassen Sie zu öffnende Systemabschnitte und Druckleitungen vor Beginn von Instandhaltungsarbeiten abkühlen.
- Öffnen Sie notwendigerweise noch unter Druck stehende Segmente langsam.
- Beachten Sie, dass das hydraulische System auch nach der Trennung von der eigentlichen Druckversorgung noch unter Druck stehen kann, wenn sich in den Druckleitungen über den Pumpen Rückschlagventile befinden. Fahren Sie alle Zylinder in die sichere Endlage.
- Senken Sie alle Lasten ab. Sorgen Sie für eine externe Absicherung, wenn ein Absenken der Last nicht möglich ist. An angehobenen Einheiten dürfen Sie ohne externe Absicherung keinesfalls Instandhaltungsarbeiten durchführen.
- Schalten Sie alle Pumpen ab.
- Stützen Sie Vertikalzylinder mechanisch gegen Absinken ab.
- Zum Austausch/Einsatz zugelassen sind nur neue, baugleiche und geprüfte Komponenten, Ersatzteile und Schmierstoffe in Erstausrüsterqualität.
- Stellen Sie sicher, dass alle Schutzvorrichtungen und insbesondere alle Schutzfunktionen die die Sicherheitsabschaltstrategie beeinträchtigen können vor jeder Wiederinbetriebnahme ordnungsgemäß installiert und auf Funktionstüchtigkeit geprüft sind.
- Entfernen Sie nach Ende der Arbeiten alle Werkzeuge und Geräte vom Hydraulikprodukt, die zur Instandhaltung nötig waren.

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⚠ VORSICHT

Personenschäden durch nicht funktionierende Ersatzteile

Ersatzteile, die nicht den von Bosch Rexroth festgelegten technischen Anforderungen genügen, können Personenschäden verursachen.

- Verwenden Sie nur Originalersatzteile von Bosch Rexroth.

HINWEIS

Eindringender Schmutz und Flüssigkeiten führen zu Störungen!

Die sichere Funktion des Steuerblocks ist dadurch nicht mehr gewährleistet.

- Achten Sie bei allen Arbeiten am Steuerblock auf größte Sauberkeit.
- Verschließen Sie alle Öffnungen mit geeigneten Schutzeinrichtungen, damit kein Reinigungsmittel ins System eindringen kann.
- Überprüfen Sie, ob alle Dichtungen und Verschlüsse der Steckverbindungen fest sitzen, damit bei der Reinigung keine Feuchtigkeit in den Steuerblock eindringen kann.
- Staubablagerungen auf dem Steuerblock sind in regelmäßigen Abständen zu entfernen.

Beschädigung der Oberfläche durch Lösemittel und aggressive Reinigungsmittel!

Aggressive Reinigungsmittel können die Dichtungen des Steuerblocks beschädigen und lassen sie schneller altern.

- Verwenden Sie niemals Lösemittel oder aggressive Reinigungsmittel.
- Reinigen Sie den Steuerblock ausschließlich mit einem feuchten Tuch aus nicht faserndem Gewebe. Verwenden Sie dazu ausschließlich Wasser und ggf. ein mildes Reinigungsmittel.

Beschädigung der Hydraulik und Dichtungen!

Der Wasserdruck eines Hochdruckreinigers kann die Hydraulik und die Dichtungen des Steuerblocks beschädigen. Das Wasser verdrängt das Öl aus der Hydraulik und den Dichtungen.

- Verwenden Sie zur Reinigung keinen Hochdruckreiniger.

9.1 Begriffsdefinition

Der Begriff Instandhaltung bezeichnet nach DIN 31051:2003-6 die Kombination aller technischen und administrativen Maßnahmen sowie Maßnahmen des Managements während des Lebenszyklus einer Betrachtungseinheit zur Erhaltung des funktionsfähigen Zustandes oder der Rückführung in diesen, so dass sie die geforderte Funktion erfüllen kann.

Diese Maßnahmen gliedern sich auf in:

- **Wartung** (Maßnahmen zur Verzögerung des Abbaus des vorhandenen Abnutzungsvorrats)
- **Inspektion** (Maßnahmen zur Feststellung und Beurteilung des Istzustandes einer Betrachtungseinheit einschließlich der Bestimmung der Ursachen der Abnutzung und dem Ableiten der notwendigen Konsequenzen für eine künftige Nutzung)
- **Instandsetzung** (Maßnahmen zur Rückführung einer Betrachtungseinheit in den funktionsfähigen Zustand, mit Ausnahme von Verbesserungen)
- **Verbesserung** (Kombination aller technischen und administrativen Maßnahmen sowie Maßnahmen des Managements zur Steigerung der

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Funktionssicherheit einer Betrachtungseinheit, ohne die von ihr geforderte Funktion zu ändern).

9.2 Inspektion und Wartung

Ziel von Inspektion und Wartung ist es

- die Funktionalität des Systems mit seinen Ausgangskenngrößen zu erhalten
- die ständige Verfügbarkeit des Systems zu sichern
- Schwachstellen zu erkennen
- die geforderte Lebensdauer des Systems zu erreichen.

Grundsätzlich empfehlen wir, ein Inspektions- und Wartungsbuch zu führen, in welchem alle Anlagen- und standortspezifischen Arbeiten sowie Inspektions- und Wartungsintervalle definiert sind und dokumentiert werden.

Die Steuerblöcke sind bei Einhaltung der vorgeschriebenen Betriebs- und Umgebungsbedingungen wartungsfrei. Regelmäßige Inspektions- und Wartungsarbeiten fallen daher nicht an.

Kontrollieren Sie mindestens jedoch alle drei Jahre (gerechnet ab Herstelldatum des Steuerblockes):

- ▶ den Steuerblock auf äußere Leckage.
- ▶ alle Schrauben und Anschlüsse auf festen Sitz.
- ▶ alle Anschlussleitungen auf Beschädigungen. Sollten Beschädigungen sichtbar sein, Anschlussleitung erneuern.



Bestellinformationen für Dichtungssätze finden Sie im Kapitel 9.4 „Ersatzteile“ auf Seite 31.

9.2.1 Druckflüssigkeiten

Die Gebrauchseigenschaften von Druckflüssigkeiten verschlechtern sich mit zunehmender Alterung (chemischer Veränderung). Es bilden sich Säuren und harzige Rückstände, die zum Verkleben von beweglichen Teilen im Innern des Steuerblockes führen können.

Folgende Faktoren beschleunigen den Alterungsprozess:

- hohe Temperaturen
- Luft in der Druckflüssigkeit
- Luftfeuchtigkeit
- Wasser
- metallische Katalysatoren
- hoher Betriebsdruck
- Verschmutzung.



Beachten Sie folgende Faustregel:
Ab einer Druckflüssigkeitstemperatur >70 °C verdoppelt sich die Alterungsgeschwindigkeit pro 10 °C.

- Weitere, auch für Rexroth-Steuerblöcke geltende Informationen zu Druckflüssigkeiten auf Mineralölbasis finden Sie in unseren Druckschriften
  - RD 90220 Druckflüssigkeiten auf Mineralölbasis
  - RD 90220-1 Druckflüssigkeiten auf Mineralölbasis.

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9.2.2 Fehlfunktion durch Verunreinigung der Druckflüssigkeit

Verunreinigungen der Druckflüssigkeit führen nicht nur zu erhöhtem Verschleiß und kürzerer Lebensdauer des Steuerblockes sondern auch zu Fehlfunktionen. Diese können die Sicherheit und Zuverlässigkeit des Steuerblockes negativ beeinflussen.

Führen Sie deshalb regelmäßig die in der Betriebsanleitung der Maschine festgelegten Instandhaltungsmaßnahmen durch und achten Sie bei Arbeiten am Steuerblock auf größte Sauberkeit.

Verunreinigungen der Druckflüssigkeit können entstehen durch:

- Verschleiß beim Betrieb der Maschine (metallischer und nichtmetallischer Abrieb)
- Undichtigkeiten des Steuerblockes
- Verschmutzungen, die während der Wartung/Instandsetzung eingebracht werden
- Verwendung von verschmutzter (ungefilterter) Druckflüssigkeit beim Austausch.

9.2.3 Nachfüllen/Wiederbefüllen

Achten Sie beim Nachfüllen / Wiederbefüllen Ihrer Hydraulikanlage darauf, dass Sie eine zulässige Druckflüssigkeit (siehe „Technisches Datenblatt“) der gleichen Sorte, des gleichen Typs und des selben Herstellers verwenden.

Bei starker Schmutzeinwirkung bzw. bei vorzeitiger Alterung der Druckflüssigkeit muss das System inkl. Tank vor der Wiederbefüllung gereinigt und gespült werden. Neue Druckflüssigkeit muss vor dem Einfüllen immer entsprechend der geforderten Reinheitsklasse gefiltert werden, da sie im Lieferzustand in der Regel der geforderten Reinheitsklasse nicht entspricht. Leitungen und Schläuche sind vor dem Einbau zu spülen.

Verwenden Sie zum Befüllen des Druckflüssigkeitsbehälters ein Filteraggregat. Das Filterelement muss sauber sein. Entfernen Sie vor dem Befüllen des Druckflüssigkeitsbehälters keinesfalls Filtersiebe am Einfüllstutzen bzw. den Filtereinsatz von Filtern.



Die Filterfeinheit muss mindestens der erforderlichen Reinheitsklasse des Gesamtsystems entsprechen, möglichst aber noch feiner sein. Die eingesetzte Filtereinheit muss die Anforderungen an Funktionssicherheit und Standzeit erfüllen.

Den maximal zulässigen Verschmutzungsgrad der Druckflüssigkeit erfahren Sie im „Technischen Datenblatt“ im Kapitel „Technische Daten“.

Befüllen Sie den Druckflüssigkeitsbehälter wenn möglich über eine Befüllkupplung, möglichst am Rücklauffilter.

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9.3 Instandsetzung

Instandsetzungsarbeiten dürfen ausschließlich ausgeführt werden durch von Bosch Rexroth autorisierten

- Werkstätten
- Maschinenherstellern.



Bosch Rexroth bietet Ihnen ein umfassendes Serviceangebot für die Instandsetzung des Steuerblockes an.

- Verwenden Sie zur Instandsetzung des Rexroth-Produktes ausschließlich Original-Ersatzteile von Bosch Rexroth. Teilgeprüfte und vormontierte Original-Rexroth-Baugruppen ermöglichen erfolgreiche Reparaturen bei kleinstmöglichem Zeitaufwand.
- Die Ersatzteillisten der Steuerblöcke sind produktspezifisch. Bitte geben Sie bei der Bestellung von Ersatzteilen die Material- und die Seriennummer des Steuerblockes sowie die Materialnummern der Ersatzteile an.

9.3.1 Ansprechpartner für Instandsetzung

Ansprechpartner für Instandsetzung ist

- der Maschinenhersteller, siehe Betriebsanleitung der Maschine, in welches der Rexroth-Steuerblock eingebaut ist
- Ihre autorisierte Bosch Rexroth Fachwerkstatt.

9.3.2 Hinweise zur Instandsetzung

Der Steuerblock darf für die Reparatur nur soweit zerlegt werden, wie dies in dieser Betriebsanleitung dargestellt ist.

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10 Demontage und Austausch

⚠ WARNUNG

Verletzungsgefahr durch Demontage unter Druck

Wenn Sie den Druck vor Demontagebeginn nicht abschalten, können Sie sich verletzen und den Steuerblock zerstören oder Anlagenteile beschädigen.

- ▶ Schalten Sie immer den relevanten Anlagenteil drucklos, bevor Sie das Produkt montieren bzw. Stecker anschließen oder ziehen.
- ▶ Sichern Sie den Anlagenteil gegen unbeabsichtigtes Wiedereinschalten.

Verletzungsgefahr durch Demontage unter Spannung

Wenn Sie die Spannungsversorgung vor Demontagebeginn nicht abschalten, können Sie sich verletzen und den Steuerblock zerstören oder Anlagenteile beschädigen.

- ▶ Schalten Sie den relevanten Anlagenteil spannungsfrei, bevor Sie das Produkt montieren.

10.1 Notwendiges Werkzeug

- Werkzeug passend zu den auf der „Einbauzeichnung“ angegebenen Befestigungen
- Reinigungsmittel: Abziehstein oder Ölstein
- Permanentmarker zur Kennzeichnung der Steuerblockscheiben
- Saubere Auffangwanne zum Sammeln von auslaufender Druckflüssigkeit.

10.2 Demontage vorbereiten

Nehmen Sie die Gesamtanlage so außer Betrieb, wie es in der Gesamtanleitung der Maschine beschrieben ist. Bereiten Sie anschließend die Demontage des Steuerblockes wie folgt vor:

10.3 Demontage des Steuerblockes aus der Maschine

1. Antriebsmotor ausschalten und alle Ventile des Steuerblockes zur Druckentlastung bis in die Endstellungen durchschalten.
2. Auffangwanne zum Sammeln von auslaufender Druckflüssigkeit unter den Steuerblock stellen.
3. Alle Lasten absenken.



Im Steuerblock befindet sich noch Druckflüssigkeit!

4. Steuerblock entsprechend der Angaben des Maschinenherstellers aus der Maschine ausbauen.
5. Ausgebauten Steuerblock auf eine saubere, stabile und sichere Unterlage stellen.
6. Offene Bohrungen und Anschlüsse der Blockelemente vor Schmutzeintrag schützen, beispielsweise durch Verschließen mit Kunststoffstopfen.

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Den Steuerblock im ausgebauten Zustand keinesfalls mit einem Hochdruckreiniger reinigen.

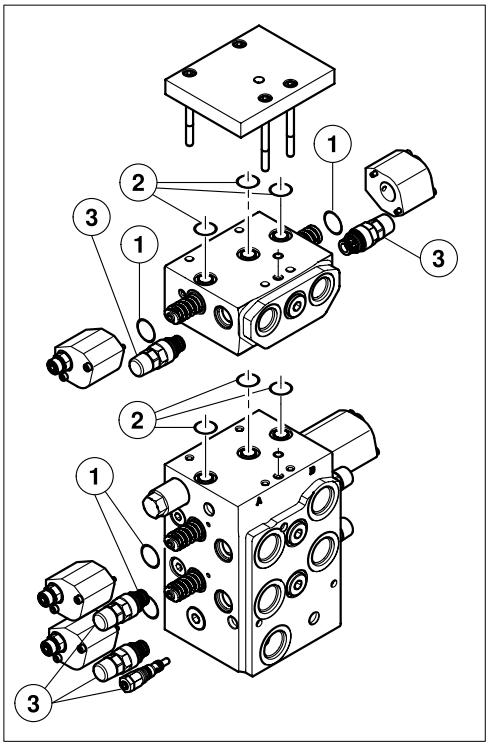
7. Steuerblock von Schmutz und Fremdkörpern befreien, dabei keine Reinigungsmittel benutzen, die Kunststoffe angreifen oder deren Eigenschaften verändern können, Metalle angreifen oder mit ihnen reagieren können oder Rückstände hinterlassen können.

10.4 Komponenten des Steuerblockes tauschen

Um den Steuerblock zu demontieren gehen Sie wie folgt vor:

1. Blockelemente mit Permanentmarker, beginnend beim Monoblock oder Eingangselement, durchnummerieren.
2. Steuerblock in saubere Auffangwanne stellen um Reste herauslaufender Druckflüssigkeit aufzufangen.

Abb. 5: Steuerblockelemente demontieren



Folgende Elemente dürfen ausgetauscht werden:

1. Dichtungen zwischen Betätigung und Gehäuse
2. Dichtungen zwischen Monoblock und Steuerblockscheiben (optional)
3. Druckventile

3. Falls vorhanden, Muttern an Zugankern bzw. Zylinderschrauben lösen und Scheiben demontieren.

Zwischen den einzelnen Blocksegmenten können Adhäsionskräfte wirken.

4. Alle Dichtelemente entfernen.
5. Alle Flanschflächen von Anschlussplatte, Endplatte und Steuerblockscheiben von Verunreinigungen, Schmutz, Farbresten und Rost befreien.
   Beim Säubern der Flanschflächen Schmutzeintrag in die Bohrungen vermeiden.

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6. Dichtflächen für O-Ringe an der Flanschfläche und am Freistich der Flanschfläche prüfen ob sie unbeschädigt sind. Bei Beschädigungen muss das jeweilige Blockelement durch ein neues ersetzt werden!
7. O-Ringe entsprechend der „Ersatzteilliste“ installieren.
8. Montage der einzelnen Blockelemente gemäß der zuvor angebrachten Nummerierung.
9. Ziehen Sie die Muttern der Zuganker/die Zylinderchrauben im Uhrzeigersinn fest. Anziehmomente entsprechend „Ersatzteilliste“.
10. Soll der Steuerblock zur Instandsetzung an den Hersteller zurückgeschickt werden, Steuerblockanschlussflächen mit den mitgelieferten Schutzplatten verschließen oder durch gleichwertige Verpackung schützen, um Verschmutzungen und Beschädigungen zu vermeiden.

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11 Entsorgung

11.1 Umweltschutz

Achtloses Entsorgen des Steuerblockes und der Druckflüssigkeit kann zu Umweltverschmutzungen führen.

- Steuerblock restentleeren und als Metallschrott entsorgen.

  Restentleeren bedeutet, dass der Steuerblock soweit ordnungsgemäß entleert wird, dass keine Druckflüssigkeit mehr heraustropfen kann.

  Beim Restentleeren muss der Steuerblock nicht gereinigt werden.

- Entsorgen Sie den Steuerblock und die Druckflüssigkeit daher nach den nationalen Bestimmungen Ihres Landes.
- Entsorgen Sie Druckflüssigkeitsreste entsprechend den jeweils gültigen Sicherheitsdatenblättern für diese Druckflüssigkeiten.
- Elektronische Produkte ordnungsgemäß entsprechend den geltenden Bestimmungen entsorgen.

11.2 Recycling

Durch den hohen Metallanteil können die Produkte überwiegend stofflich wiederverwertet werden. Um eine optimale Metallrückgewinnung zu erreichen, ist eine Demontage in einzelne Baugruppen erforderlich. Die Metalle, die in den elektrischen und elektronischen Baugruppen enthalten sind, können mittels spezieller Trennverfahren ebenfalls zurück gewonnen werden. Sofern die Produkte Batterien oder Akkumulatoren enthalten, sind diese vor dem Recycling zu entfernen und möglichst dem Batterie-Recycling zuzuführen.

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12 Erweiterung und Umbau

Den Steuerblock dürfen Sie nicht umbauen.

12.1 Nach- und Umrüstung

Für bestimmte Anwendungen kann eine Nach- bzw. Umrüstung des Steuerblockes erforderlich werden.

► Stimmen Sie die Vorgehensweise mit Bosch Rexroth ab.



Die Gewährleistung von Bosch Rexroth gilt nur für die ausgelieferte Konfiguration und Erweiterungen, die bei der Konfiguration berücksichtigt wurden. Nach einem Umbau oder einer Erweiterung, die über die hier beschriebenen Umbauten bzw. Erweiterungen hinausgeht, erlischt die Gewährleistung.



Wenn am Steuerblock Änderungen gegenüber dem Auslieferungszustand vorgenommen werden, dann müssen diese dokumentiert werden, gegebenenfalls müssen die Angaben auf dem Typschild an den neuen Bauzustand des Steuerblockes angepasst werden.

12.2 Optionales Zubehör

Lieferbares Zubehör finden Sie im „Technischen Datenblatt“ sowie in der „Ersatzteilliste“, siehe Tabelle 1 auf Seite 5.

12.2.1 Ansprechpartner für Zubehör

Zubehör erhalten Sie

- beim Maschinenhersteller (Fachhändler), siehe Betriebsanleitung der Maschine, in welches der Rexroth-Steuerblock eingebaut ist
- bei Ihrem Rexroth-Fachhändler.

12.2.2 Bestelladresse für Zubehör

Die Adressen unserer Landesvertretungen finden Sie unter `www.boschrexroth.com` und im 15.6 „Anschriftenverzeichnis“ auf Seite 42.

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13 Fehlersuche und Fehlerbehebung

13.1 So gehen Sie bei der Fehlersuche vor:

- Gehen Sie auch unter Zeitdruck systematisch und gezielt vor. Wahlloses, unüberlegtes Demontieren und Verstellen von Einstellwerten können dazu führen, dass die ursprüngliche Fehlerursache nicht mehr ermittelt werden kann.
- Verschaffen Sie sich einen Überblick über die Funktion des Steuerblockes im Zusammenhang mit der Gesamtanlage.
- Klären Sie, ob der Steuerblock vor Auftreten des Fehlers die geforderte Funktion in der Gesamtanlage erbracht hat.
- Erfassen Sie Veränderungen der Gesamtanlage, in welche der Steuerblock eingebaut ist:
  - Wurden die Einsatzbedingungen oder der Einsatzbereich des Steuerblockes verändert?
  - Wurden Veränderungen (z. B. Umrüstungen) oder Reparaturen am Gesamtsystem (Maschine, Elektrik, Steuerung) oder am Steuerblock ausgeführt? Wenn ja: welche?
  - Wurde der Steuerblock bzw. die Maschine bestimmungsgemäß betrieben?
  - Wie zeigt sich die Störung?
- Bilden Sie sich eine klare Vorstellung über die Fehlerursache. Befragen Sie ggf. den unmittelbaren Bediener oder Maschinenführer.

13.1.1 Störungstabelle

Der Steuerblock ist störungsunempfindlich, wenn die vorgeschriebenen Einsatzbedingungen, insbesondere die Qualität der Druckflüssigkeit, eingehalten werden.

Tabelle 9: Störungstabelle

Störung	Mögliche Ursache	Abhilfe
Am Steuerblock bzw. den Steuerblockscheiben tritt Druckflüssigkeit aus	Steuerblock undicht	Befestigungsschrauben mit vorgeschriebenem Anziehmoment anziehen.
	Verschlussschrauben undicht	Verschlussschrauben mit vorgeschriebenem Anziehmoment anziehen, evtl. Kupfer-Dichtringe erneuern. Bei O-Ring Dichtungen: Verschlussschraube nicht nachziehen, Dichtungen erneuern und Verschlussschraube mit vorgeschriebenem Drehmoment anziehen. Bei bleibenden Undichtigkeiten: Dichtflächen/Dichtung auf Beschädigungen prüfen. Ggf. Verschlussschraube erneuern.
	Steuerblockgehäuse bzw. Steuerblockscheibe undicht	Steuerblock bzw. Steuerblockscheibe ausbauen und durch neuen ersetzen.
	Zum Aktuator führende Anschlüsse (Schraubstutzen, Verschraubungen) undicht	Dichtungen überprüfen, ggf. Verschraubungen erneuern. Anziehmomente überprüfen, siehe Angaben des Herstellers der Verschraubung.
	Ventilgehäuse am Sekundärventil/ Verschlussschraube undicht	Sekundärventil/Verschlussschraube erneuern.

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Störung	Mögliche Ursache	Abhilfe
An den Zuleitungen zum Steuerblock tritt Druckflüssigkeit aus	Rohr- oder Schlauchleitungen beschädigt	Rohr- oder Schlauchleitungen erneuern.
	Rohr- oder Schlauchleitungen haben sich gelöst	Verschraubungen und Fittinge entsprechend der für die Fittinge geltenden Montagevorschrift anziehen. Die entsprechenden Montagevorschriften sind beim Maschinenhersteller erhältlich.
Zwischen den Steuerblockscheiben tritt Druckflüssigkeit aus	Dichtungen in der Flanschfläche beschädigt	Dichtungen erneuern, siehe „Einbauzeichnung“.
	Schmutzeintrag bei der Montage des Steuerblockes	Steuerblock demontieren, Flanschfläche reinigen.
	Steuerblockgehäuse an der Flanschfläche undicht	Beschädigte Steuerblockscheibe erneuern.
	Anziehmoment der Zuganker zu gering	Anziehmomente überprüfen, siehe „Technisches Datenblatt“.
	Restöl aus Montage/Test des Steuerblocks	Steuerblock von Öl und Schmutz befreien, dabei keine Reinigungsmittel benutzen, die Kunststoffe angreifen oder deren Eigenschaften verändern können, Metalle angreifen oder mit ihnen reagieren können oder Rückstände hinterlassen können.
Arbeitsbewegung ungleichmäßig	Luft in der Druckflüssigkeit	Hydraulisches System entlüften, siehe „Hydraulisches System entlüften“ auf Seite 25.
Ausführung: mechanische Betätigung Steuerschieber lässt sich mechanisch nicht auslenken	Zuganker wurden mit zu großem/ unterschiedlichem Anziehmoment verschraubt	Muttern der Zuganker lösen und mit vorgeschriebenem Anziehmoment anziehen.
	Öltemperatur zu hoch bzw. zu große Temperaturdifferenz zwischen Druckflüssigkeit und Steuerblock, dadurch Blockierung wegen unterschiedlicher Wärmeausdehnung von Steuerschieber und Steuerblock	Kühlerfunktion, Ölvorrat und Pumpendruck in Neutralstellung überprüfen. Temperaturschock vermeiden, für Informationen dazu siehe „Technisches Datenblatt“ .
	Schmutz oder Fremdteile, die bei der Montage der zum Aktuator führenden Anschlüsse eingebracht wurden, klemmen den Steuerschieber	Mehrfach versuchen, das Ventil durch Betätigen des Handhebels bzw. der Vorsteuerung zu schalten. Anschlüsse zum Aktuator visuell prüfen, Fremdteile mit Magnet, Pinzette entfernen. Bei verklemmten Fremdteilen Ventilgehäuse erneuern.
Steuerschieber stellt nicht oder zu langsam zurück	Steuerschieber klemmt	Siehe bei Störung „Steuerschieber lässt sich mechanisch nicht auslenken“ oben.
	Steuerschieber wird von durch großen Ölstrom verursachter Strömungskraft festgehalten	Ölstrom vom Verbraucher zum Tank reduzieren.
Ausführung: elektrohydraulische Betätigung: Steuerschieber reagiert nicht oder verzögert auf elektrische Ansteuerung	Kein oder zu niedriger Magnetstrom, falscher Betriebspunkt (Magnetstrom nicht korrekt an Ölstrom angepasst)	Spannungsversorgung und Betriebspunkt Q/I überprüfen, siehe „Technisches Datenblatt“. Steckverbindung überprüfen.
	Vorsteuerventil bzw. Magnetventil funktioniert nicht	Vorsteuerventil bzw. Magnetventil erneuern.
	Unterversorgung (Pumpendruck zu gering). Für Mindestpumpendruck sorgen, siehe „Technisches Datenblatt“.	Unterversorgung (Pumpendruck zu gering). Für Mindest-Pumpendruck sorgen, siehe „Technisches Datenblatt“.
	Steuerölversorgung klemmt	Steuerölversorgung ausbauen und durch neue ersetzen.
	Vorsteuerventile sind verschmutzt	Vorsteuerventil erneuern.
Ausführung: hydraulische Betätigung	Unterversorgung (Pumpendruck zu gering)	Für Mindest-Pumpendruck sorgen, siehe „Technisches Datenblatt“.
	Kein Steuerdruck vorhanden	Steuerölversorgung überprüfen
Bei Ventilen im Parallelbetrieb: Kein Druck bzw. kein Ölstrom am Verbraucher bei ausgelenktem Hauptschieber, stark verzögerter Druckaufbau	Ölstrom fließt zum Verbraucher mit Minimaldruck wegen Unterversorgung	Pumpenölstrom durch höhere Drehzahl oder größere Pumpe erhöhen, bzw. Verbrauchermenge durch Mengendrossel reduzieren.

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Fehlersuche und Fehlerbehebung

Störung	Mögliche Ursache	Abhilfe
Neutralumlaufdruck zu hoch	Keine Load-Sensing-Entlastung (gilt nur für M4, M6, M7, SP, SX)	
	Steuerschieber nicht in Neutralstellung	Bei Zunge: Vorstehmaß prüfen, siehe „Technisches Datenblatt“. Druck in den Steuerdeckeln zu hoch (Ansteuerung überprüfen).
	Rücklaufdruck zu hoch	Rücklauf von gemeinsamer Rücklaufleitung trennen, separate Rücklaufleitung verwenden oder Leitungsquerschnitt vergrößern.
	Eingangsdruckwaage klemmt	Eingangselement erneuern.
Bewegung am Verbraucher trotz Neutralstellung	Steuerschieber steht nicht in Neutralstellung	Druck in den Steuerdeckeln zu hoch (Ansteuerung überprüfen).
	Sekundär-DB undicht bzw. zu niedrig eingestellt	Einstelldruck am Sekundär-DB prüfen.
	Steuerschieber hat zu große Leckage	Leckagewerte siehe „Technisches Datenblatt“. Leckagefreies Senkbremsventil einbauen.
Keine Rastfunktion	Rückstellkraft in der Betätigungseinrichtung gegenüber der Rastkraft (Feder) zu groß	Raste demontieren und reinigen.
	Rasteinheit verschlissen	Rasteinheit erneuern.
Entrastkraft zu groß	Steuerschieber klemmt	Siehe unter „Steuerschieber lässt sich nicht auslenken“ unter „Steuerschieber klemmt“ in dieser Tabelle oben.
	Rasteinheit beschädigt	Rasteinheit erneuern.
	Rastkraft zu hoch	Rasteinheit reinigen und fetten. Bei Misserfolg Rasteinheit erneuern.

Bei Störungen durch Verschmutzung ist zusätzlich zur Instandsetzung unbedingt die Ölqualität zu überprüfen und gegebenenfalls durch geeignete Maßnahmen, wie Spülen oder zusätzlichen Einbau von Filtern, zu verbessern.

Falls Sie den aufgetretenen Fehler nicht beheben konnten, wenden Sie sich bitte an eine der Kontaktadressen, die Sie im Internet unter `www.boschrexroth.com` oder im 15.6 „Anschriftenverzeichnis“ auf Seite 42.

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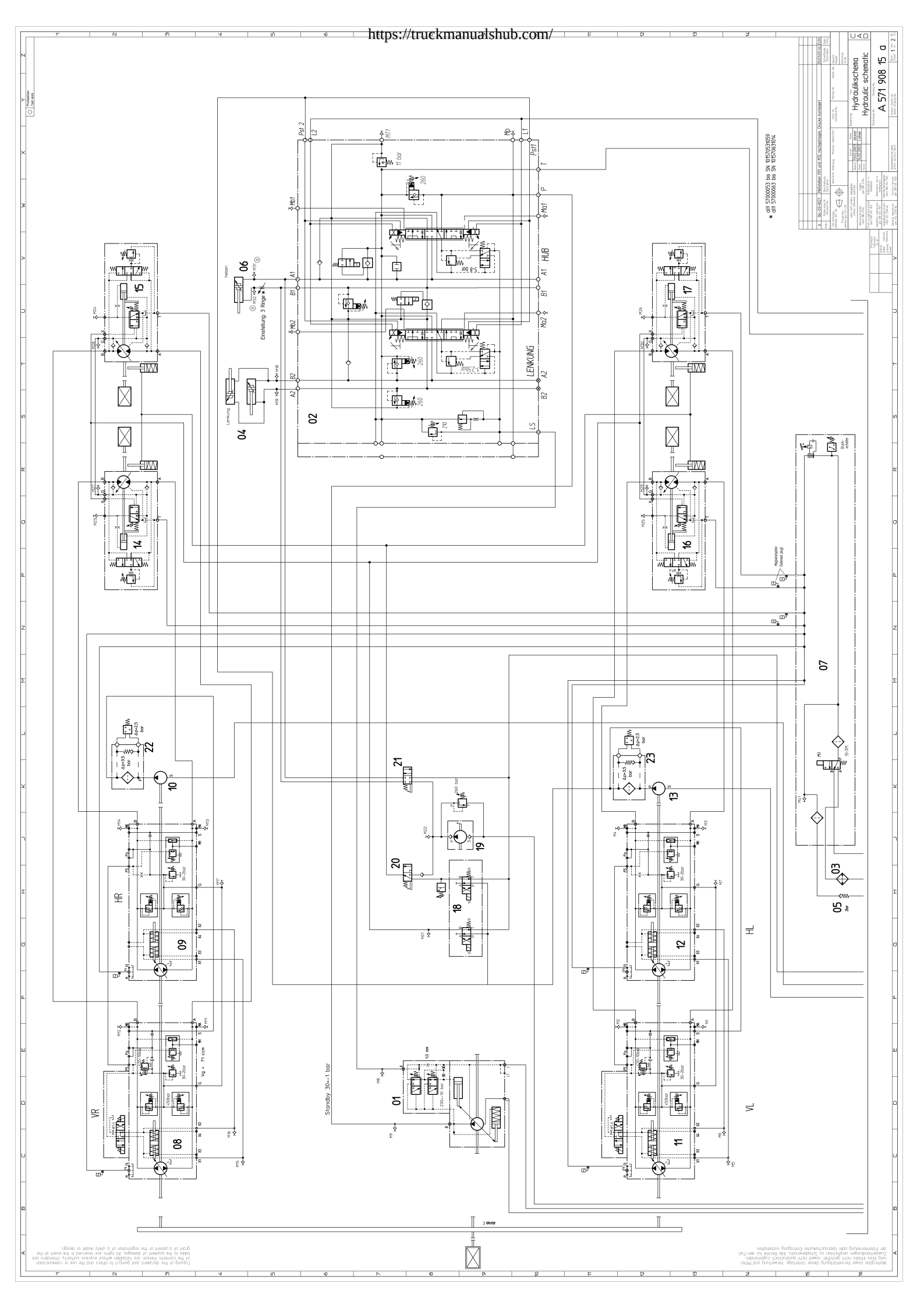
19 Circuit diagrams

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19.1 Hydraulic diagram 571 908 15

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Pos.	Benennung	Designation
01	Arbeitspumpe Lenkung/Schild	Operat.pump steering/dozer blade
02	Arbeitsventil	Power valve
03	Hydraulikölkühler	Hydraulic oil cooler
04	Lenkzylinder	Steering cylinder
05	Rückschlagventil	Check valve
06	Schubschildzylinder	Dozer blade cylinder
07	Rücklauffiltereinheit	Return filter unit
08	Fahrpumpe vorne rechts	Travel pump front rh.
09	Fahrpumpe hinten rechts	Travel pump rear rh.
10	Speisepumpe Fahrantrieb rechts	Charge pump travel sys. rh.
11	Fahrpumpe vorne links	Travel pump front lh.
12	Fahrpumpe hinten links	Travel pump rear lh.
13	Speisepumpe Fahrantrieb links	Charge pump travel sys. lh.
14	Fahrmotor und Getriebe vo. re.	Travel motor + transmiss. front rh.
15	Fahrmotor und Getriebe hi. re.	Travel motor + transmiss. rear rh.
16	Fahrmotor und Getriebe vo. li.	Travel motor + transmiss. front lh.
17	Fahrmotor und Getriebe hi. li.	Travel motor + transmiss. rear lh.
18	Wegeventil	Way valve
19	Handpumpe Bremslösevorrichtung	Handlever pump brake loosing dev
20	3-Wegehahn Bremslösevorrichtung	Cock valve brake loosing divice
21	4-Wegeventil Schild Notbetätigung	Cock Valve dozer blade
22	Speisefilter rechts	Charge circuit filter rh.
23	Speisefilter links	Charge circuit filter lh.

	alle Drücke gemessen bei einer Öltemperatur von ca. 50°C Verbrennungsmotor im hohen Leerlauf	all pressuresmeasured by an oiltemperature of ca. 50°C Engine at high idling speed
Pos.	Beschreibung	Description
M1	Fahrdruck vorne links rückwärts 430 +10/-20 bar	Travel pressure in front left backwards 430 +10/-20 bar
M2	Fahrdruck vorne links vorwärts 430 +10/-20 bar	Travel pressure in front left forward 430 +10/-20 bar
M3	Fahrdruck hinten links rückwärts 430 +10/-20 bar	Travel pressure in the back left backwards 430 +10/-20 bar
M4	Fahrdruck hinten links vorwärts 430 +10/-20 bar	Travel pressure in the back left forward 430 +10/-20 bar
M5	Stellkammerdruck links vorwärts 0-max. 14 bar	Placing chamber pressure left forward 0-max. 14 bar
M6	Stellkammerdruck links rückwarts 0-max. 14 bar	Placing chamber pressure left backwards 0-max. 14 bar
M7	Speisedruck links 30 +/-2 bar	Supply pressure left 30 +/-2 bar
M8	LS-Druck Arbeitspumpe 210 +10 bar	LS-pressure work pump 210 +10 bar
M9	Arbeitsdruck 230 +10 bar	Operating pressure 230 +10 bar
M11	Fahrdruck vorne rechts rückwärts 430 +10/-20 bar	Travel pressure in front right backwards 430 +10/-20 bar
M12	Fahrdruck vorne rechts vorwärts 430 +10/-20 bar	Travel pressure in front right forward 430 +10/-20 bar
M13	Fahrdruck hinten rechts rückwärts 430 +10/-20 bar	Travel pressure in the back right backwards 430 +10/-20 bar
M14	Fahrdruck hinten rechts vorwärts 430 +10/-20 bar	Travel pressure in the back right forward 430 +10/-20 bar
M15	Stellkammerdruck rechts vorwärts 0-max. 14 bar	Placing chamber pressure right forward 0-max. 14 bar
M16	Stellkammerdruck rechts rückwarts 0-max. 14 bar	Placing chamber pressure right backwards 0-max. 14 bar
M17	Speisedruck rechts 30 +/-2 bar	Supply pressure right 30 +/-2 bar
M18	Lenkdruck links 0-230 +10 bar	Guidance pressure left 0-230 +10 bar
M19	Lenkdruck rechts 0-230 +10 bar	Guidance pressure right 0-230 +10 bar
M21	Umschaltung 2. Gang 30 bar	Change-over 2. course 30 bar
M22	Druck manuelle Bremslösevorrichtung 30 bar	Pressure manual brake release device 30 bar
M23	Stelldruck Fahrmotor vorne rechts 0-430 bar	Placing chamber pressure drive motor in front right 0-430 bar
M24	Stelldruck Fahrmotor hinten rechts 0-430 bar	Placing chamber pressure drive motor in the back right 0-430 bar
M25	Stelldruck Fahrmotor vorne links 0-430 bar	Placing chamber pressure drive motor in front left 0-430 bar
M26	Stelldruck Fahrmotor hinten links 0-430 bar	Placing chamber pressure drive motor in the back left 0-430 bar
M27	Fahrdruck vorne rechts 0-430 +10 bar	Driving pressure in front right 0-430 +10 bar
M28	Fahrdruck hinten rechts 0-430 +10 bar	Driving pressure in the back right 0-430 +10 bar
M29	Fahrdruck vorne links 0-430 +10 bar	Driving pressure in front left 0-430 +10 bar
M30	Fahrdruck hinten links 0-430 +10 bar	Driving pressure in the back left 0-430 +10 bar
(a) M31	Schild heben 0-230 bar	Blade lift 0-230 bar
(a) M32	Schild senken 0-230 bar	Blade lower 0-230 bar
M41	Rücklauffilter 0-3 bar	Return flow filter 0-3 bar
(a) Ma1	Steuerdruck Schild heben 0-30 bar	Actuating pressure blade lift 0-30 bar
(a) Ma2	Steuerdruck Lenken links 0-30 bar	Actuating pressure steering left 0-30 bar
(a) Mb1	Steuerdruck Schild senken 0-30 bar	Actuating pressure blade lower 0-30 bar
(a) Mb2	Steuerdruck Lenken rechts 0-30 bar	Actuating pressure steering right 0-30 bar
MT1	Tankvorspannventil 0-15 bar	Tank linking up valve 0-15 bar
Mp	Arbeitsdruck 0-230 +10 bar	Operating pressure 0-230 +10 bar

Prüfzeichen
Test mark

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Index	Änderungs-Nr. Revision-No.	Beschreibung Description	Datum/Name Date/Name	Gepr. Chkd.
a	tbc-03-0021	Meßstellen M31 und M32 nachgetragen, Drücke korriegiert	20.02.03/Jä.	Echt.

Darstellungsmethode ISO 128 — Projection-method per ISO 128

Werkstoff, Halbzeug Material, Semifin.Part | Stoff-Nr. Standard-No. | Rohteil-Nr. Blank-No. | Gewicht Weight | Maßstab Scale

wenn nicht anders angegeben unless otherwise specified

Werkstückkanten nach DIN 6784 — Edges per DIN 6784

Form-u.Lagetoleranzen nach DIN ISO 1101 — Geometric tolerances per DIN ISO 1101

Maßangaben in Millimeter — Dimensions are in millimeters

Allgemeintoleranzen nach ISO 2768-mL — General tolerances per ISO 2768-mL

Oberflächenangaben nach DIN ISO 1302 — Surface texture per DIN ISO 1302

Paßmaß Tolerance on fit

oberes upper Abmaß unteres lower Tolerance

	Datum	Name
Bearb.	13.02.2003	Jäckel
Gepr.	14.02.2003	Lohse
Norm		

Benennung Title: Hydraulikschema / Hydraulic schematic

CAD

Zeichnungs-Nr. Drawing-No.: C 571 908 15 a

Gesamtoberfläche [dm2] entire surface [dm2]

ähnlich Zeichn.-Nr. similar Drawing-No.

Blatt Sheet 2 von of 2 Bl. Sh.

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19.2 Wiring diagram 570 700 35

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S/N Wiring diagram 570 700 35

S/N 101 570 571 001 ⇔ 101 570 571 006 BC 772 RS-2
S/N 101 570 581 001 ⇔ 101 570 581 020 BC 772 RB-2
S/N 101 570 591 001 ⇔ 101 570 591 006 BC 672 RB-2
S/N 101 570 821 001 ⇔ 101 570 821 004 BC 972 RB-2
S/N 101 570 831 001 ⇔ 101 570 831 014 BC 1172 RB-2
S/N 101 570 921 001 ⇔ 101 570 921 001 BC 772 EB-2
S/N 101 570 931 001 ⇔ 101 570 931 001 BC 672 EB-2

Standardverkabelung: standard wireing:	dicke Linien thick lines	Platinenverdrahtung: connection on printed circuit board:	dünne Linien thin lines

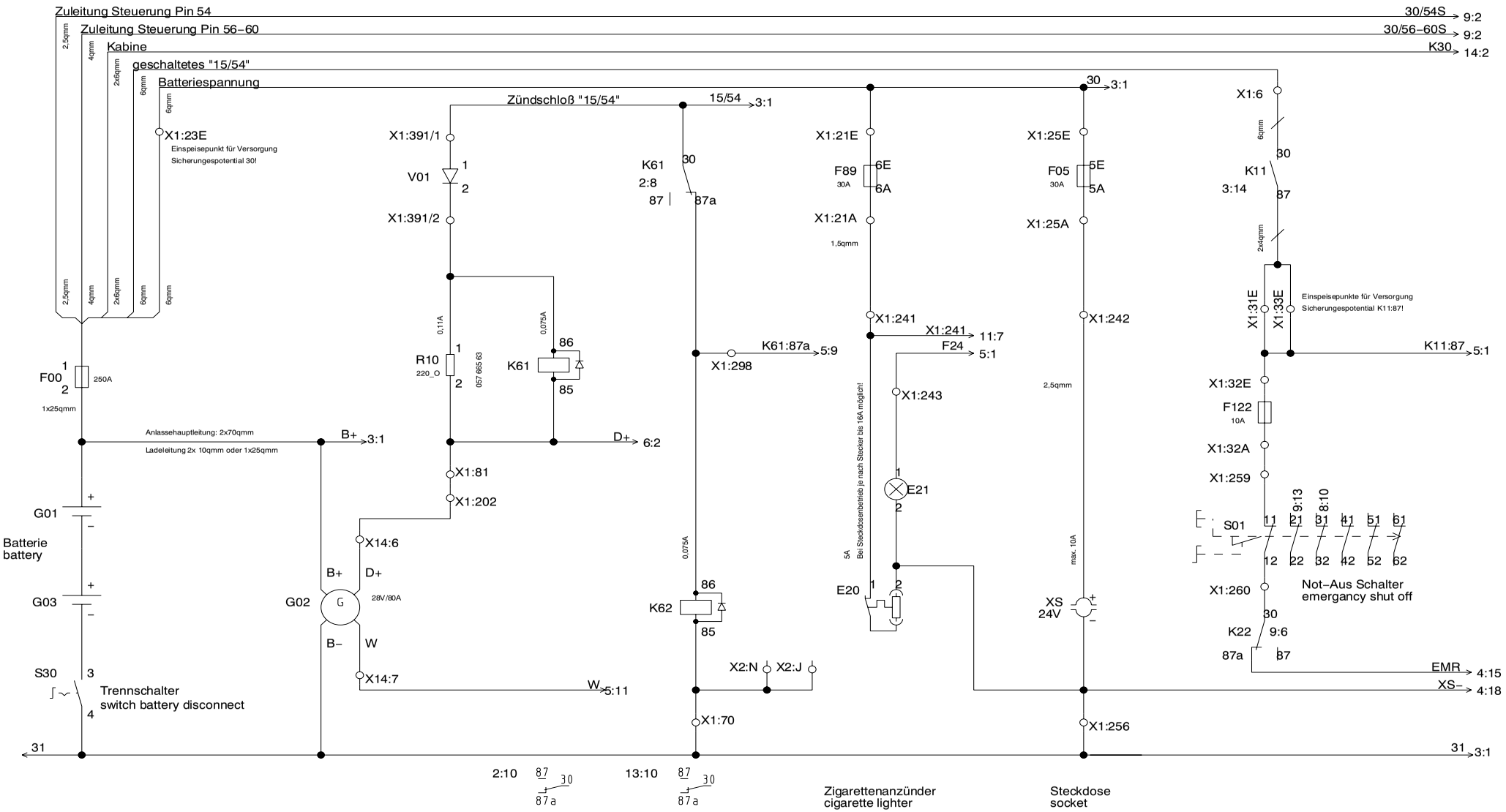
Inhaltsverzeichnis: table of contents: BC 772...1172 RB / TIER III

Blatt Nr.: sheet no.:	Zeichnungsnummer drawing – no.	Funktionsgruppe	function unit
001	vorläufig	Stromlaufplan	Circuit Diagram
002	vorläufig	Versorgung, Zigarettenanzünder	supply, cigarette lighter
003	vorläufig	Zündschloß, Starter	ignition switch, starter
004	vorläufig	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot.	DEUTZ controller EDC 7 for 6– and 8–zylinder engine
005	vorläufig	Instrumente	indicators
006	vorläufig	Anzeigen, Störmeldungen	monitoring, failure indication
007	vorläufig	Fahrpumpen, Radmotoren, Startfreigabe	driving pumps, weehl motors, starting release
008	vorläufig	Fahrstufen, Bremse, Verzögerungspedal	speed ranges, brakes, decelerator device
009	vorläufig	Versorgung Steuerung, Warnsummer, Override	supply controllers, warning buzzers, override
010	vorläufig	Lenkung und Arbeitshydraulik	steering and working hydraulic system
011	vorläufig	Hupe, Schmieranlage, Tachograph, Sitzfunktionen	horn, lubrication systhem, tachograph, seat funktions
012	vorläufig	Heizung und Belüftung	heating and ventilation
013	vorläufig	Schutzbelüftung, Zyklon Abscheider, Klimatronik	protected vent. system, cyclone separator, air cond.
014	vorläufig	Kabine und Anbauteile	cabin and attachment–parts
101	vorläufig	Bauteilliste	component listing
201	vorläufig	Schaltkasten	e–box
301	vorläufig	Lokalisierungsgrafik Steckverbinder Draufsicht	localization graphic connectors top view

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	Gez.: 03.04.2006 Name: Werner Gepr.: 03.04.2006 Name: Seis	Stromlaufplan circuit diagram	Seite: page: 001 von: from: 001 Ers.f.: Replaces:	570 700 35 Blatt Nr.: sheet no.: 001

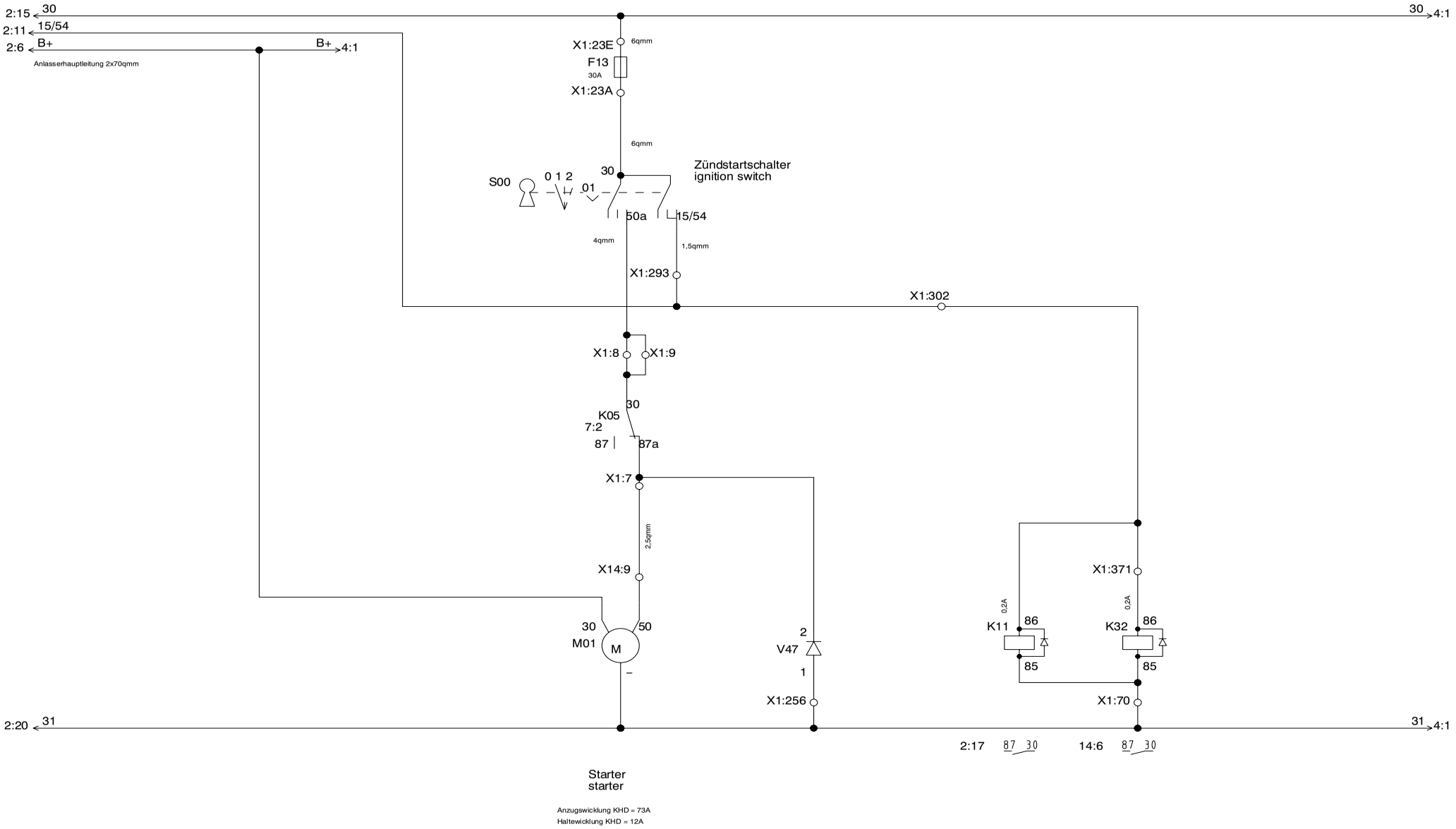
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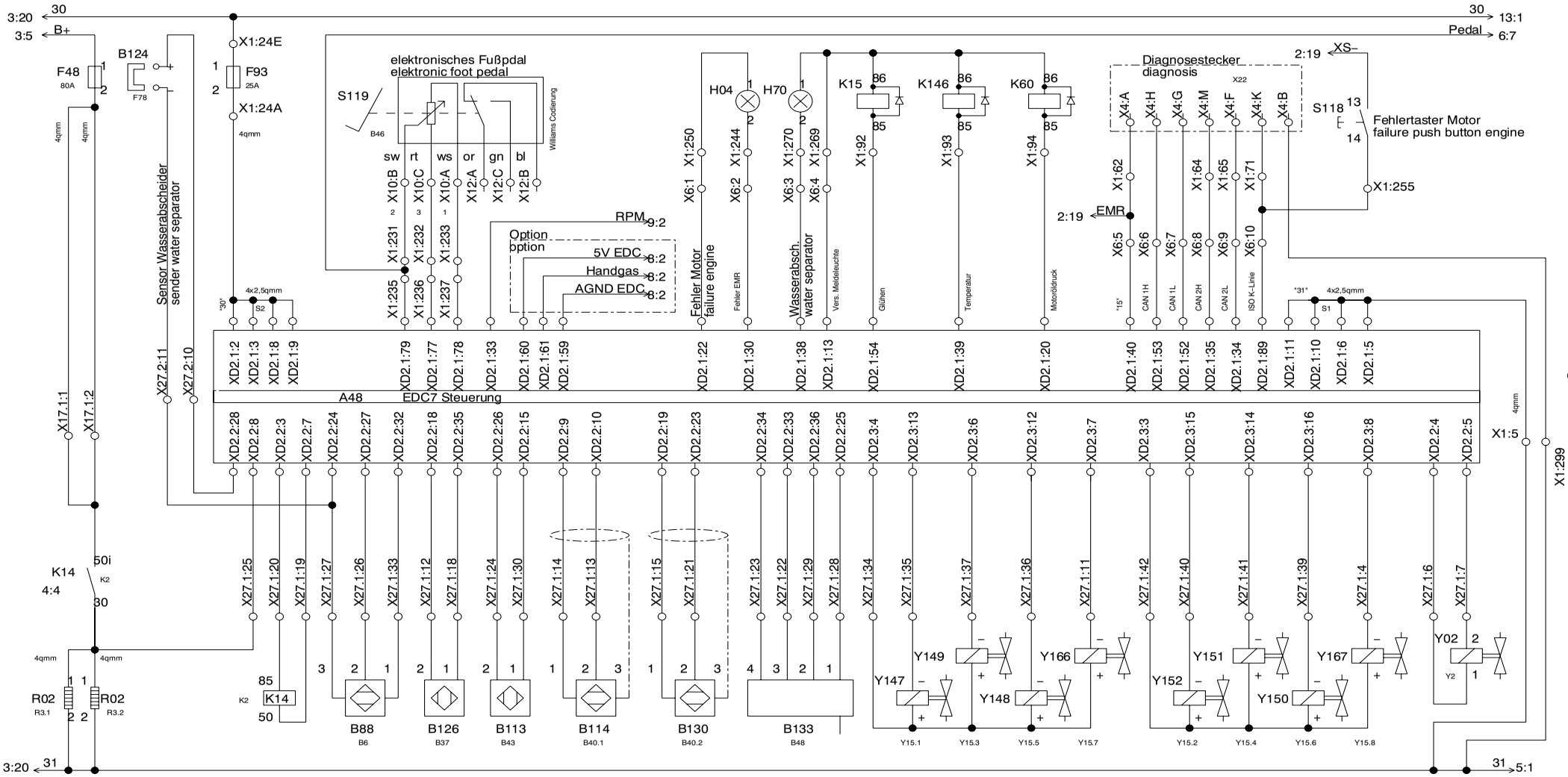
	Gez.: 03.04.2006 Name: Werner	Versorgung, Zigarettenanzünder supply, cigarette lighter	Seite: 1 von: 1 page: 1 from: 1	570 700 35	
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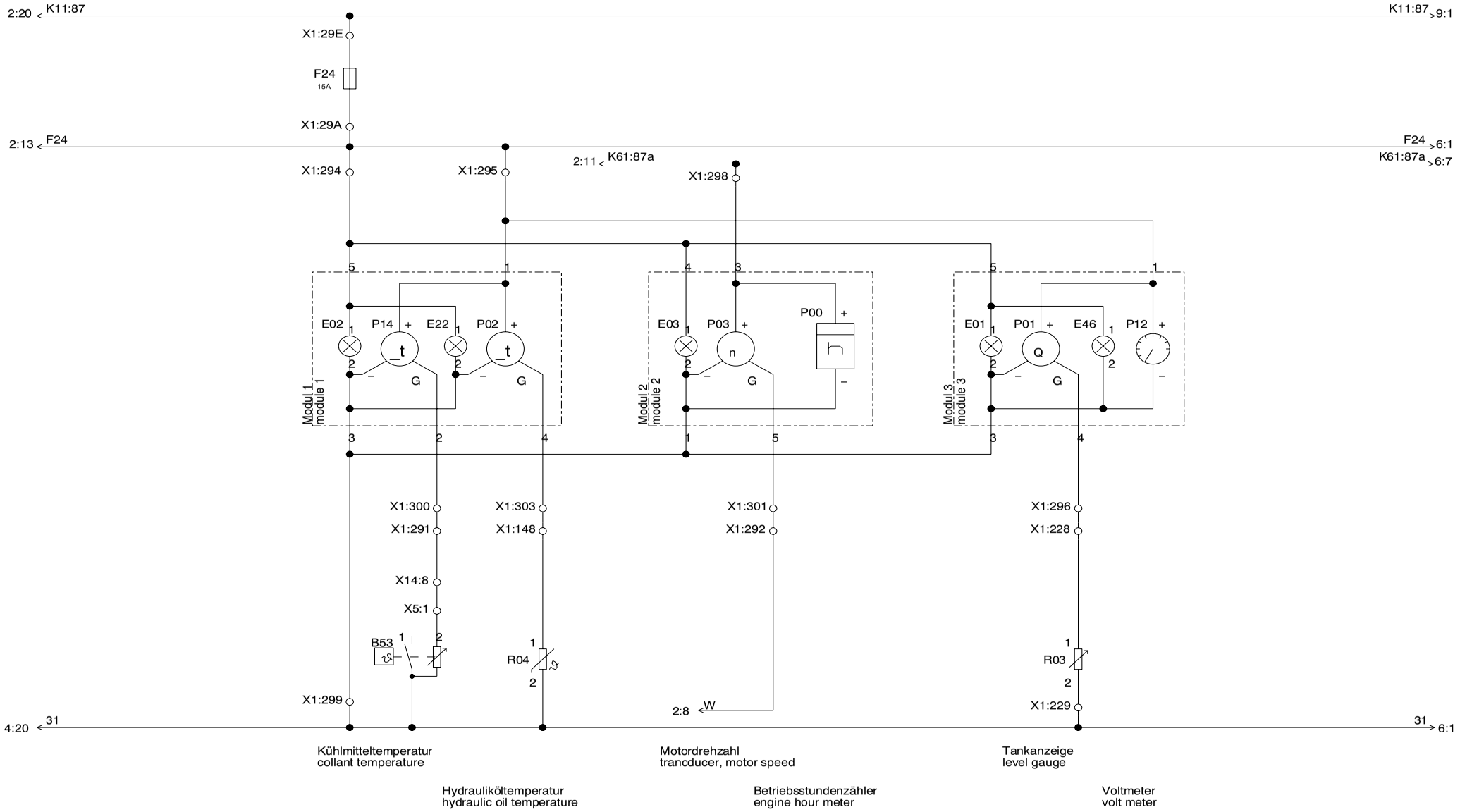
	Gez.: 03.04.2006 Name: Werner	Zündschloß, Starter ignition switch, starter	Seite: 1 von: 1 page: from:	570 700 35	
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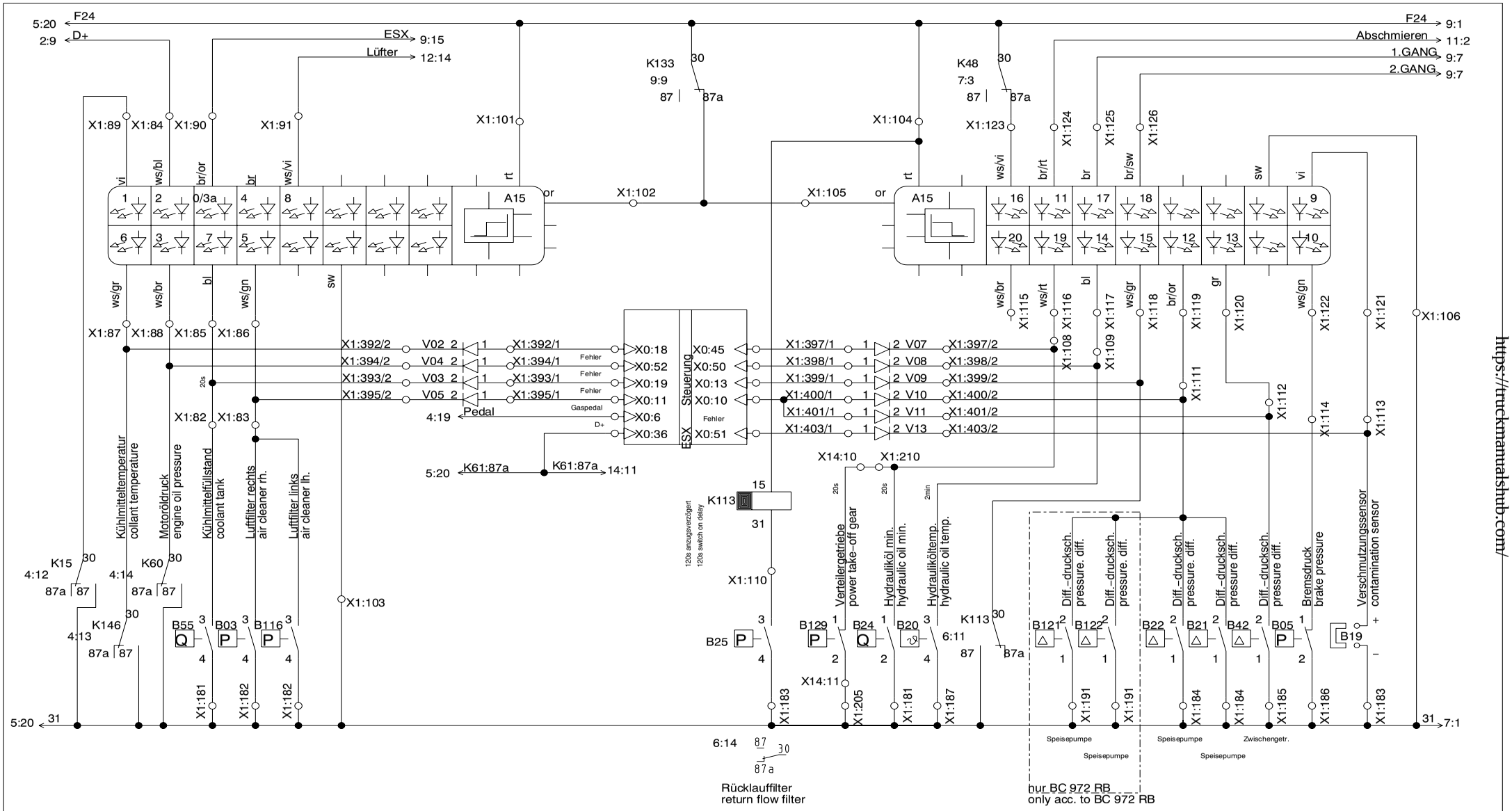
	Gez.: 03.04.2006 Name: Werner		DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot. DEUTZ controller EDC 7 for 6– and 8–zylinder engine	Seite: 1 von: 1 page: from:	570 700 35		
	Gepr.: 03.04.2006 Name: Seis	066_5		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 004		

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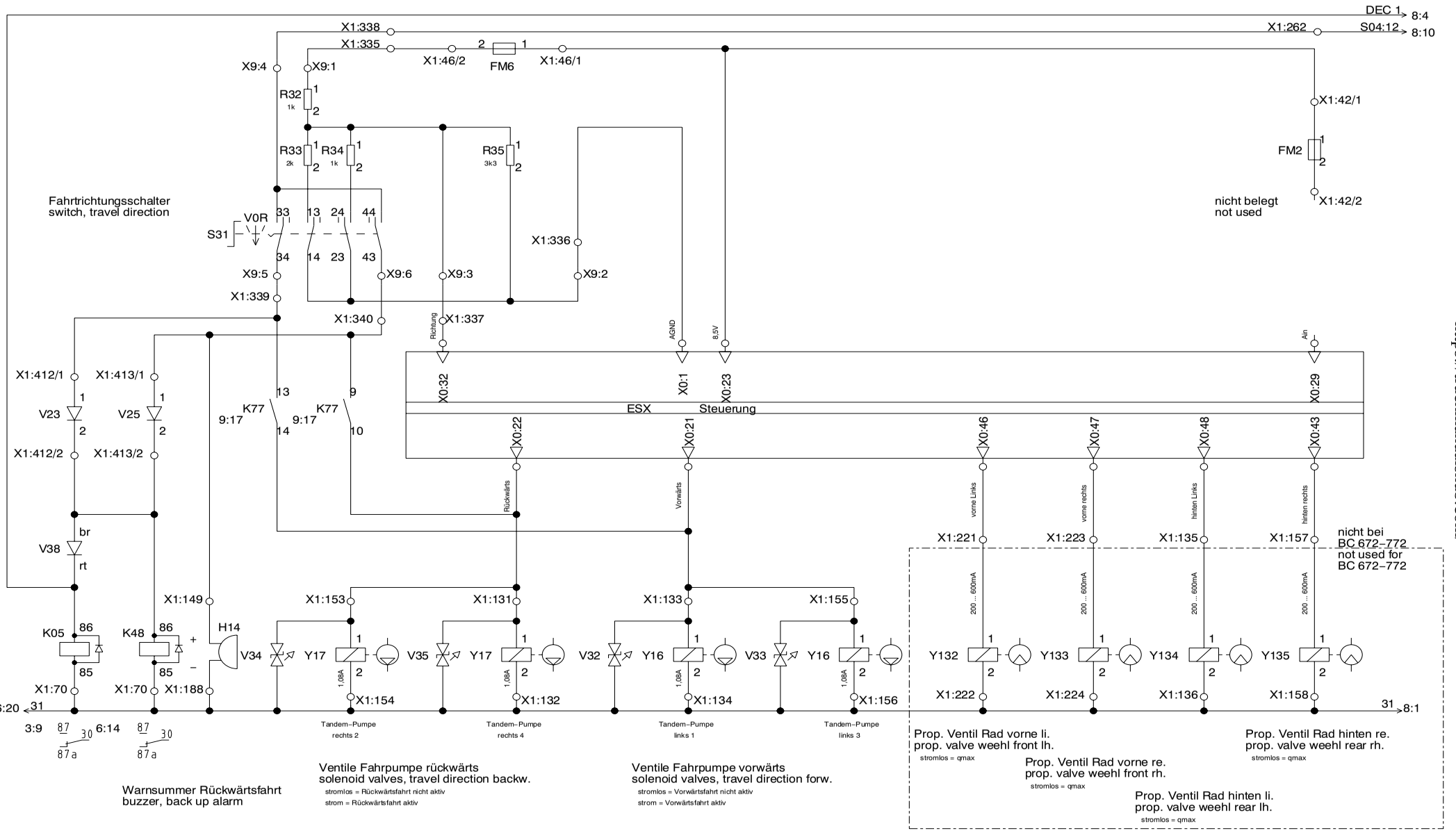
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		Gez.: 03.04.2006 Name: Werner		Instrumente indicators												Seite: 1 von: 1 page: 1 from: 1		570 700 35	
		Gepr.: 03.04.2006 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 005	



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	Gez.: 19.04.2006 Name: Werner	Anzeigen, Störmeldungen monitoring, failure indication	Seite: 1 von: 1 page: 1 from: 1	570 700 35	
	Gepr.: 19.04.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	006

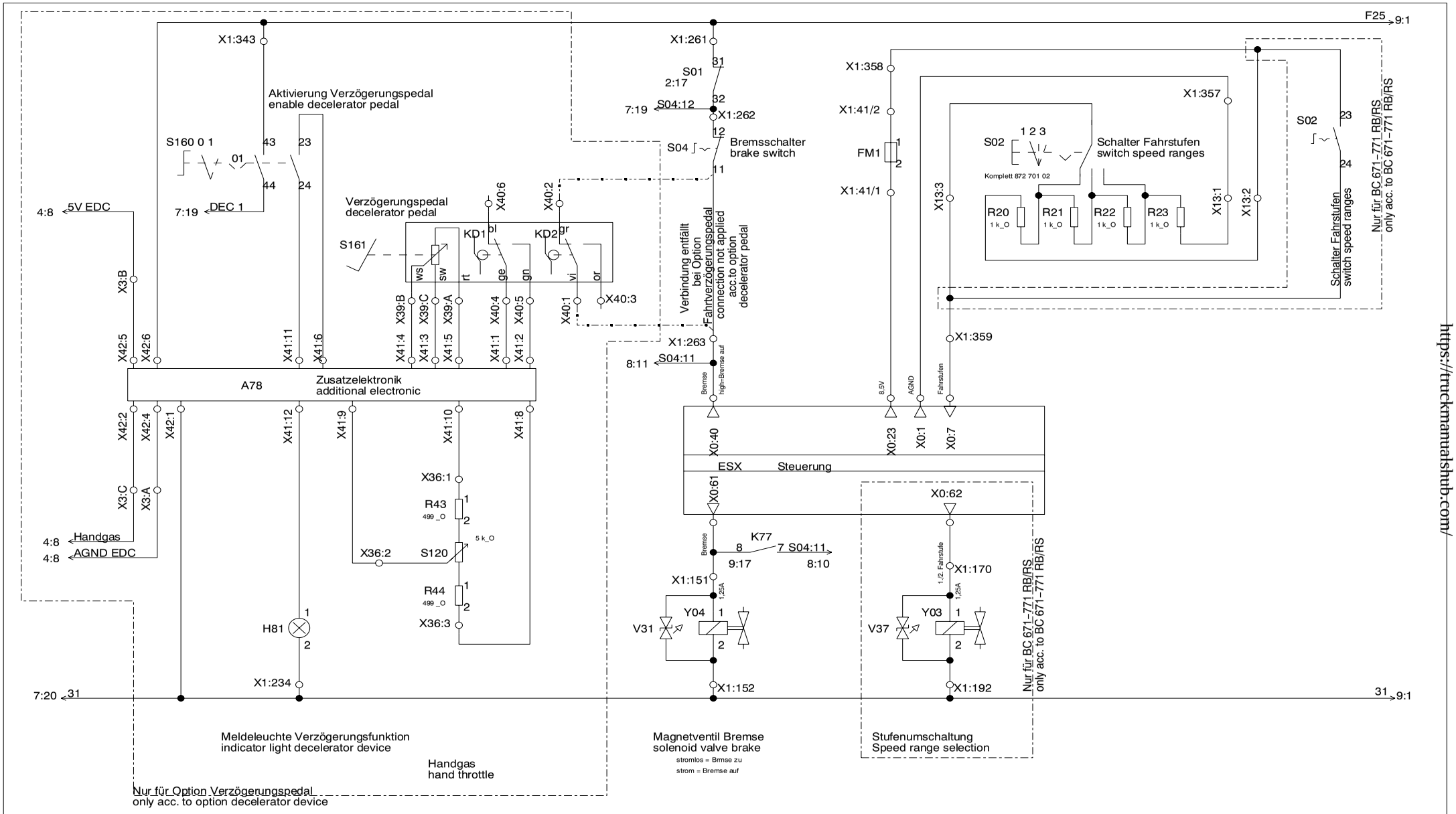
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	Gez.: 03.04.2006 Name: Werner	Fahrpumpen, Radmotoren, Startfreigabe driving pumps, weehl motors, starting release	Seite: 1 von: 1 page: from:	570 700 35
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 007

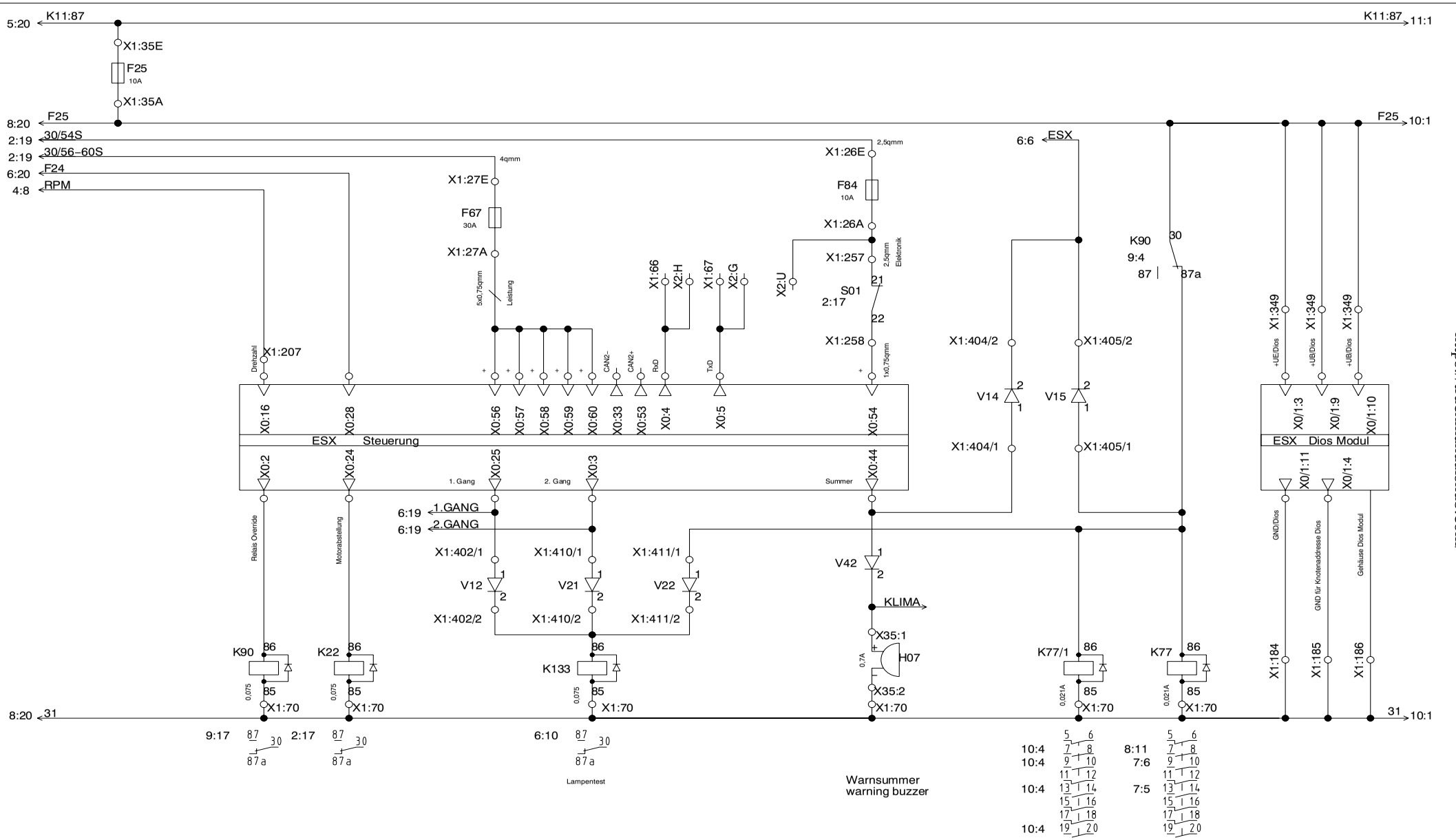
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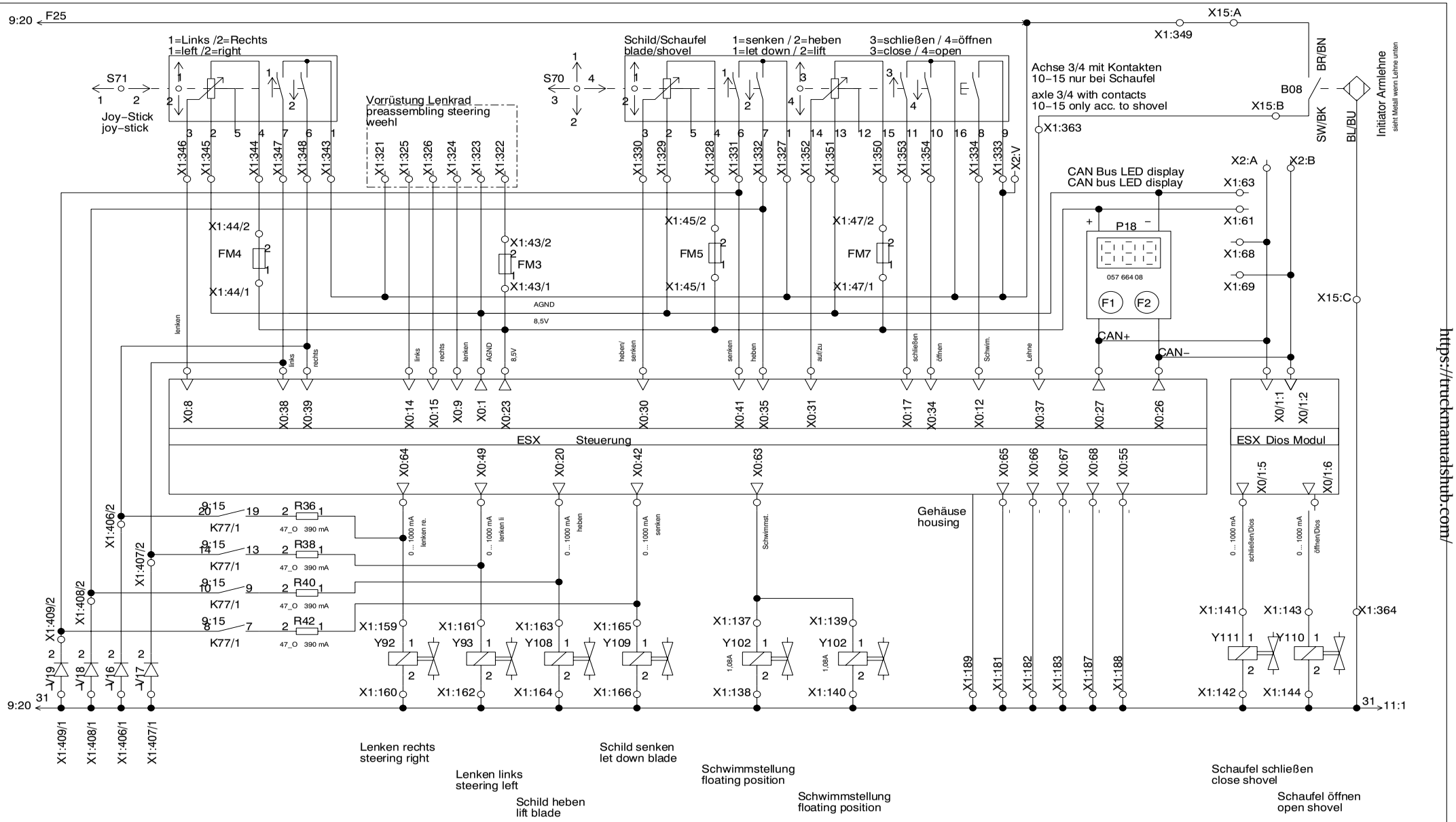
	Gez.: 03.04.2006 Name: Werner	Fahrstufen, Bremse, Verzögerungspedal speed ranges, brakes, decelerator device	Seite: page: 1 von: from: 1	570 700 35	
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 008	



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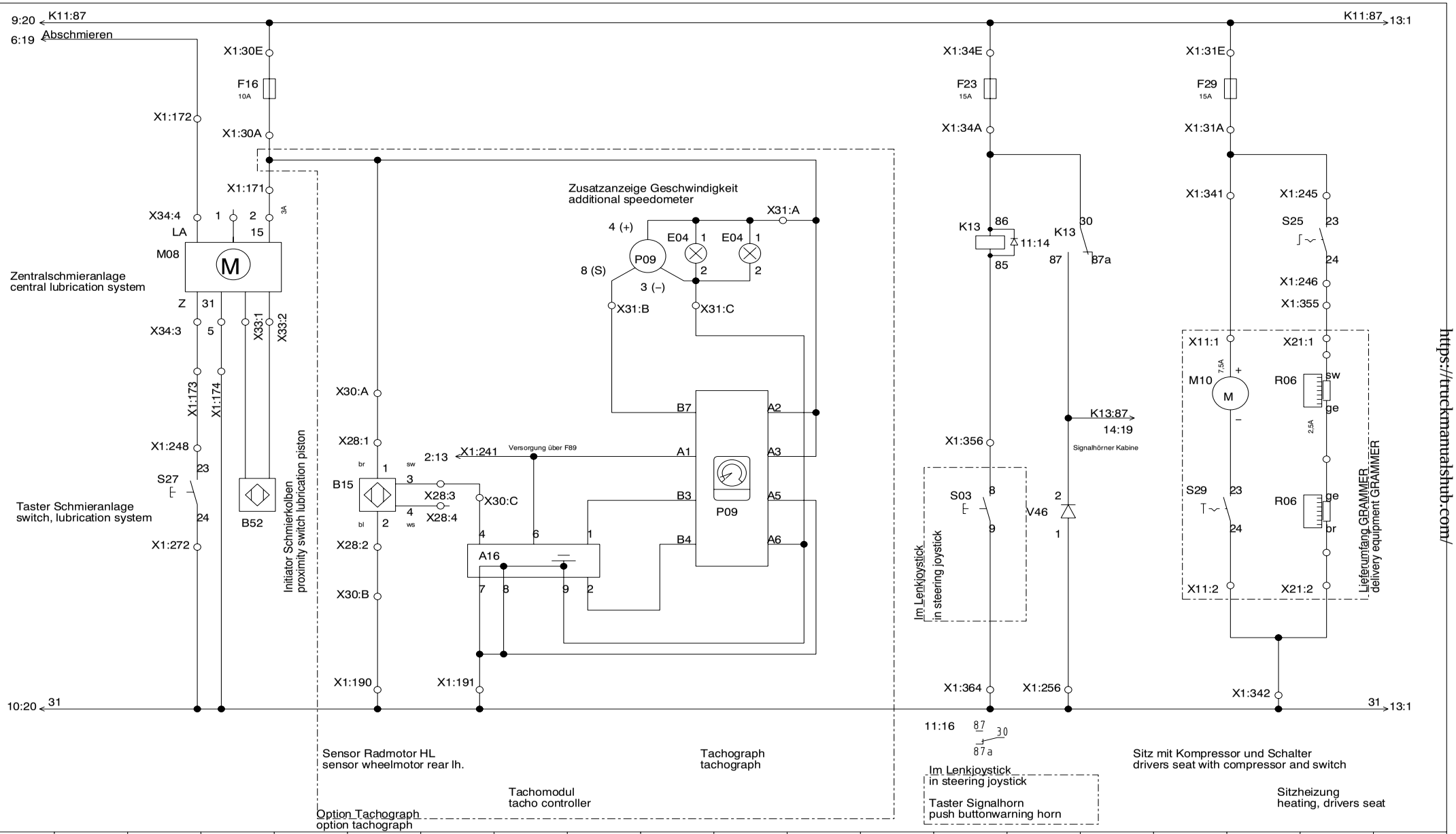
	Gez.: 03.04.2006 Name: Werner	Versorgung Steuerung, Warnsummer, Override supply controllers, warning buzzers, override	Seite: 1 von: 1 page: 1 from: 1	570 700 35
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 009



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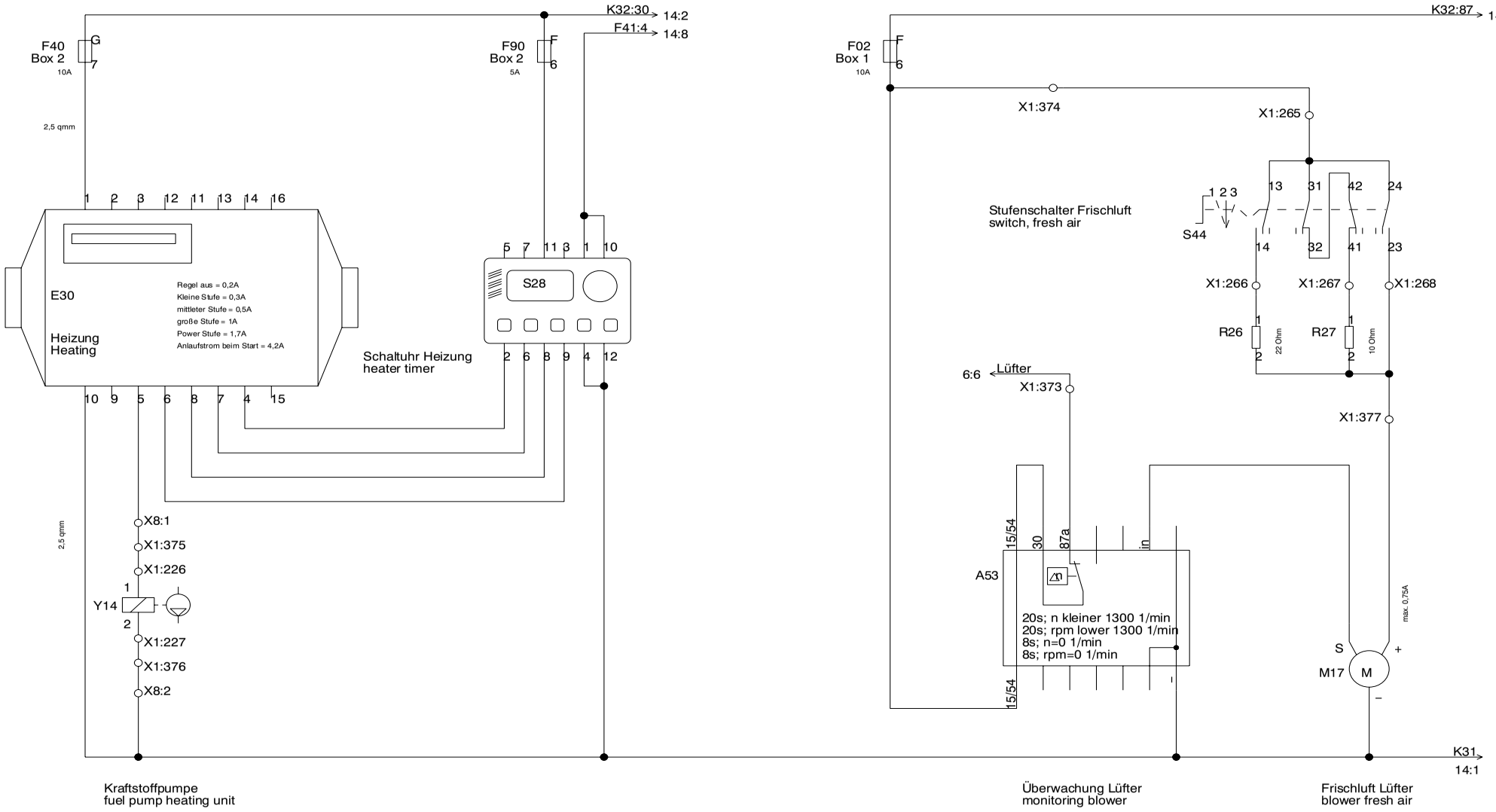
	Gez.: 03.04.2006 Name: Werner	Lenkung und Arbeitshydraulik steering and working hydraulic system	Seite: 1 von: 1 page:	570 700 35	
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	010



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

	Gez.: 03.04.2006 Name: Werner	Hupe, Schmieranlage, Tachograph, Sitzfunktionen horn, lubrication systhem, tachograph, seat funktions	Seite: 1 von: 1 page: 1 from: 1	570 700 35
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 011 sheet no.:

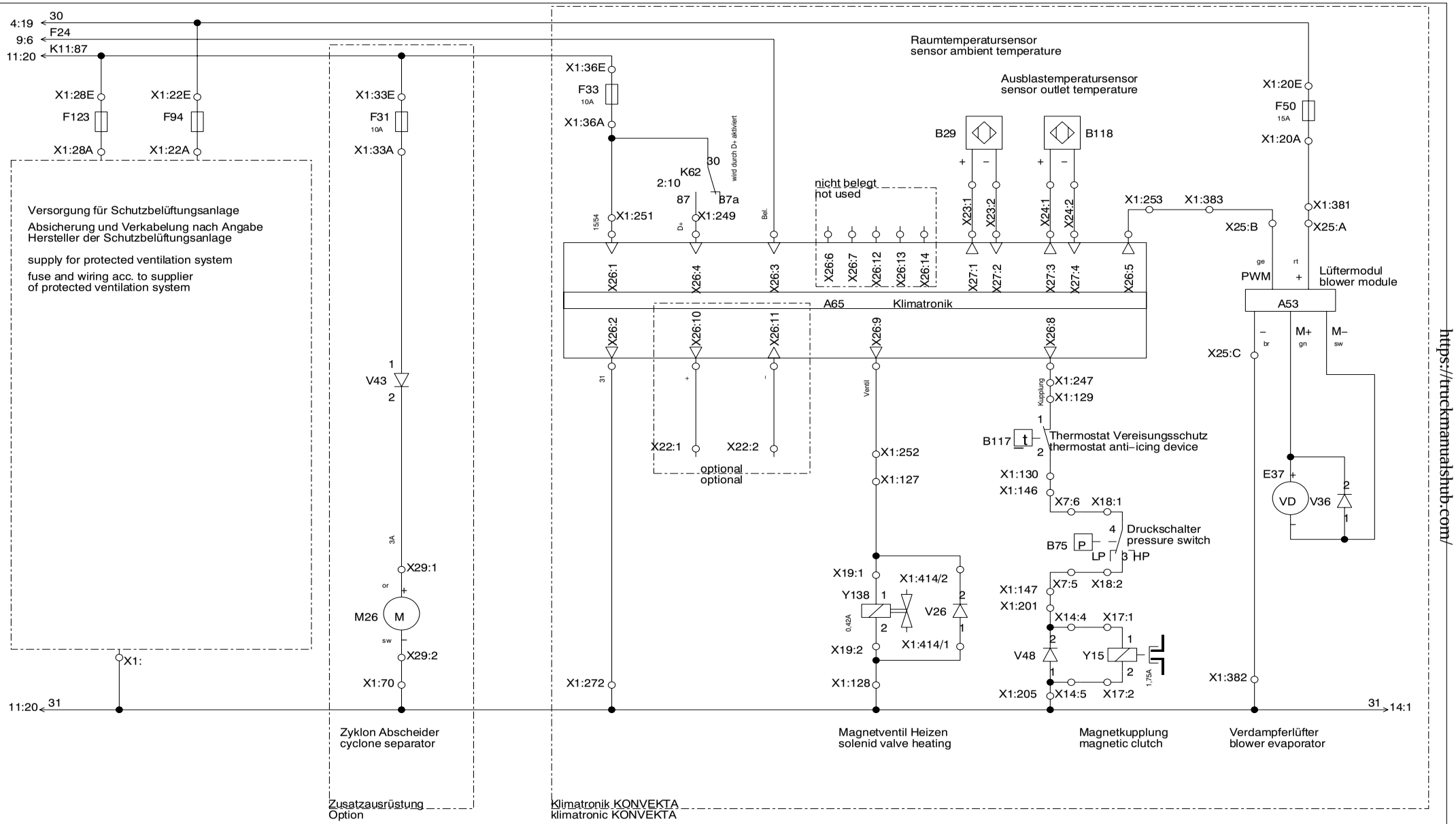
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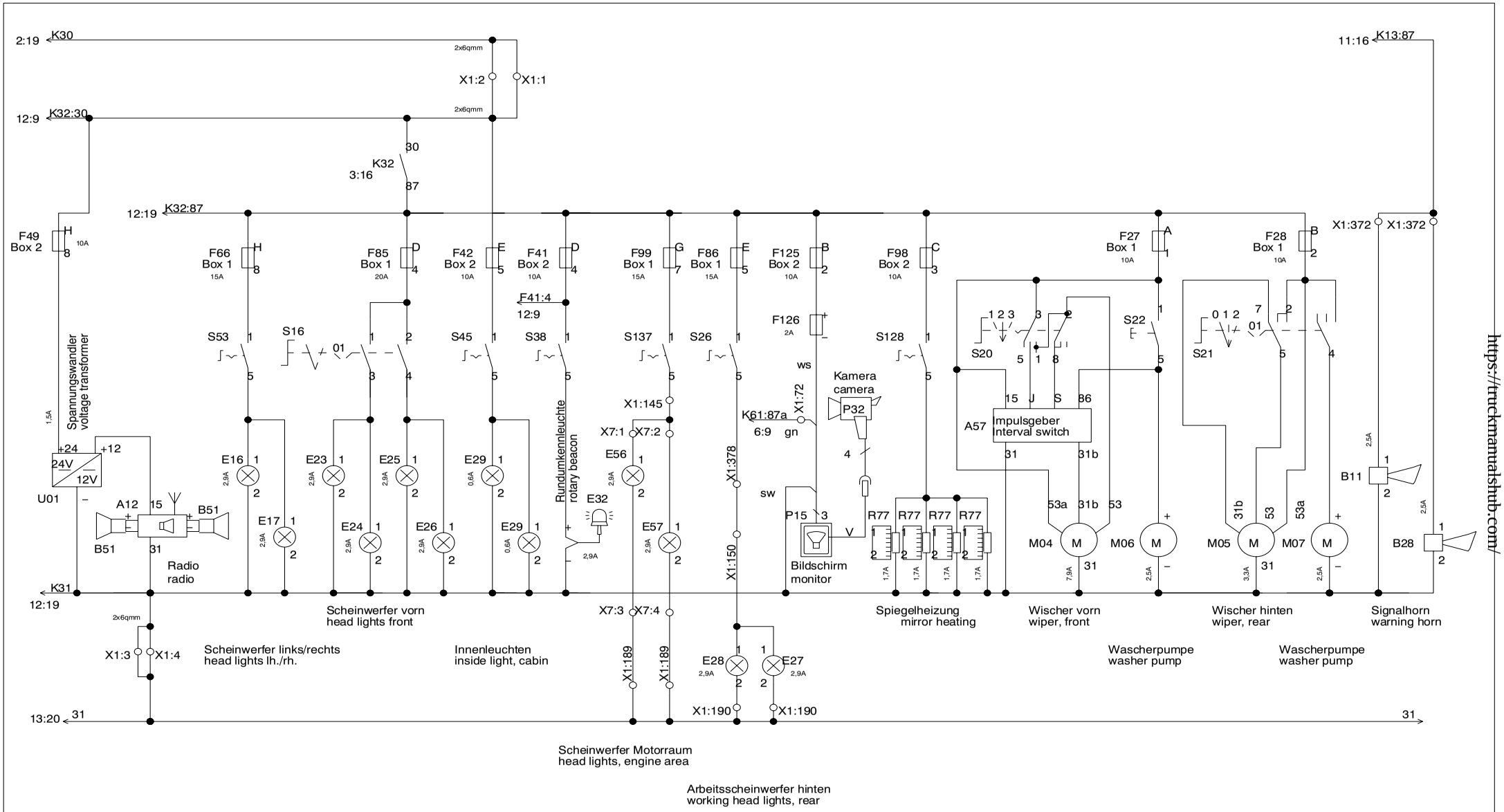
	Gez.: 03.04.2006 Name: Werner	Heizung und Belüftung heating and ventilation	Seite: 1 von: 1 page: from:	570 700 35
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 012 sheet no.:



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		Gez.: 03.04.2006 Name: Werner		Schutzbelüftung, Zyklon Abscheider, Klimatronik protected vent. system, cyclone separator, air cond.												Seite: 1 von: 1 page: 1 from: 1		570 700 35	
		Gepr.: 03.04.2006 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.:	013



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	Gez.: 03.04.2006 Name: Werner	Kabine und Anbauteile cabin and attachment–parts	Seite: page: 1 von: from: 1	570 700 35	
	Gepr.: 03.04.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 014	

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Name	Bl.	Pf.	Benennung	Title	TYP
A12	014	2	Radio	Radio	
A15	006	7	Ueberwachungsmodul	monitoring module	
A15	006	13	Ueberwachungsmodul	monitoring module	
A16	011	9	Elektronik Tachograph	Electronic system, tachograph	
A48	004	9	Elektronische Motorsteuerung	Electronic engine management	
A53	012	14	Modul Luefterueberwachung	Modul blower monitoring	
A53	013	18	Modul Luefterueberwachung	Modul blower monitoring	
A57	014	14	Intervallschalter Scheibenwischer	Interval switch, wiper	
A65	013	14	Steuerung Klimatronik	Controller klimatronic	
A78	008	3	Zusatzelektronik	Additional control unit	
B03	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B05	006	18	Druckschalter Bremse	Pressure switch, brake	
B08	010	19	Naeherungsinitiator Fahrhebel '0'-Stell.	Proximity switch, travel lever '0' pos.	max. 1,08A
B11	014	19	Signalhorn	Warning horn	2,5A
B15	011	6	Aufnehmer Geschwindigkeit	Transducer, speed	
B19	006	19	Magnetsensor Verschmutzung	Magnetic sensor, contamination	
B20	006	13	Temperaturschalter Hydraulikoel	Temperature switch, hydraulic oil	
B21	006	17	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B22	006	16	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B24	006	12	Schwimmerschalter Hydraulikoel	Float switch, hydraulic oil	
B25	006	11	Druckschalter Ruecklauffilter	Pressure switch, return flow filter	
B28	014	20	Signalhorn	Warning horn	2,5A
B29	013	14	Raumthermostat	Room thermostat	
B42	006	17	Differenzdruckschalter Hydraulikoel	Hydraulic oil pressure differential switch	
B51	014	2	Lautsprecher Radio	Speaker radio	
B51	014	3	Lautsprecher Radio	Speaker radio	
B52	011	4	Naeherungsinitiator Schmierkolben	Proximity switch, lubrication piston	
B53	005	6	Temperaturgeber Kuehlmittel	Temperature switch, collant	
B55	006	3	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B75	013	16	Kuehlmitteldruck	coolant pressure	
B88	004	5	Druckgeber Motoroel	Sender, engine oil pressure	
B113	004	7	EMR Temperaturgeber Kuehlmittel	EMR Temperature switch, collant	
B114	004	8	EMR Aufnehmer, Motordrehzahl 1	EMR Trancducer, engine speed 1	
B116	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B117	013	15	Thermostat Klimaanlage	Thermostar, air conditioning	
B118	013	15	Temperaturfühler Auslaß	Temperature sender outlet	
B121	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B122	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B124	004	3	Geber Wasserstandsabscheider Diesel	Sender, water separator fuel	
B126	004	6	EMR Temperaturgeber Kraftstoff	EMR fuel temperature sender	
B129	006	12	Druckschalter Verteilergetriebe	pressure switch power take-off gear	
B130	004	9	EMR Aufnehmer, Motordrehzahl 2	EMR Trancducer, engine speed 2	
B133	004	11	Sensor Ladeluftdruck / -temperatur	sesnor charging air prssure / temperature	
E01	005	14	Beleuchtung Tankanzeige	Illumination, level gauge	
E02	005	5	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	
E03	005	10	Beleuchtung Drehzahlmesser	Illumination, rpm meter	
E04	011	10	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E04	011	11	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E16	014	4	Scheinwerfer links	Head light, lh.	55W
E17	014	4	Scheinwerfer rechts	Head light, rh.	55W
E20	002	12	Zigarettenanzuender	Cigarette lighter	
E21	002	12	Beleuchtung Zigarettenanzuender	Illumination, cigarette lighter	
E22	005	7	Beleuchtung Temperaturanzeige Hydr.-oel	Illumination, temp. gauge, hydraulic oil	
E23	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E24	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E25	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E26	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E27	014	11	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	55W
E28	014	10	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	55W
E29	014	7	Innenleuchte Kabine	Inside light, cabin	15W
E29	014	8	Innenleuchte Kabine	Inside light, cabin	15W
E30	012	3	Heizgeraet	Heating unit	
E32	014	8	Kennleuchte	Warning light	70W
E37	013	18	Klimaverdampfer	Air conditioning, evaporator	
E46	005	15	Beleuchtung Voltmeter	Illumination volt meter	
E56	014	9	Scheinwerfer Motorraum rechts	Head light, engine area rh.	55W
E57	014	9	Scheinwerfer Motorraum links	Head light, engine area lh.	55W
ESX	006	9	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	007	12	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	008	10	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	5	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	18	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	010	8	Elektronisches Steuergeraet	Electronic system, control unit	max. 1,08A
ESX	010	18	Elektronisches Steuergeraet	Electronic system, control unit	0,2A
F00	002	2	Hauptsicherung Batterie	Fuse, main, battery	250A
F02	012	12	Ersatzsicherung	Fuse, spare	10A
F05	002	15	Sicherung Steckdose	Fuse, socket	30A
F13	003	9	Sicherung Startschalter	Fuse, starter switch	30A
F16	011	4	Sicherung Zentralschmieranlage	Fuse, central lubrication system	10A
F23	011	14	Sicherung Signalhorn	Fuse, warning horn	15A
F24	005	5	Sicherung Ueberwachungsmodul	Fuse, monitoring module	15A
F25	009	2	Sicherung Magnetv. Fahren u. Bremse	Fuse, sol. valve, travel and brake	10A
F27	014	16	Sicherung Wischer u. Wascher vorne	Fuse, windscr. wiper and washer, fr.	10A
F28	014	18	Sicherung Wischer u. Wascher hinten	Fuse, windscr. wiper and washer, re.	10A
F29	011	18	Sicherung Kompressor Sitzverstell.	Fuse, compr., seat height adjustm.	15A
F31	013	6	Sicherung Kabinenluefter	Fuse, cabin ventilator	10A
F33	013	9	Sicherung Klimageraet	Fuse, air conditioning	10A
F40	012	3	Sicherung Kabinenheizung	Fuse, heating unit cab	10A
F41	014	8	Sicherung Rundumkennleuchte	Fuse, rotary beacon	10A
F42	014	7	Sicherung Kabineninnenleuchte	Fuse, inside light cab	10A
F48	004	2	Sicherung Gluehanlage	Fuse, glow plug system	80A
F49	014	1	Sicherung Spannungswandler	Fuse, voltage transformer	10A
F50	013	19	Sicherung Klimageraet	Fuse, air conditioning	15A
F66	014	4	Sicherung Scheinwerfer vorne	Fuse, head light front	15A
F67	009	7	Sicherung Steuerung (Potential 30)	Fuse, controller (pot.30)	30A
F84	009	13	Sicherung Steuerung (Klemme 54)	Fuse, controller (Pin 54)	10A

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Name	Bl.	Pf.	Benennung	Bemerkung	TYP
F85	014	6	Sicherung, Scheinwerfer vorne	Fuse, head light front	20A
F86	014	10	Sicherung, Scheinwerfer hinten	Fuse, head lights rear	15A
F89	002	12	Sicherung, Zigarettenanzuender	Fuse, cigarette lighter	30A
F90	012	8	Sicherung, Ansteuerung	Fuse, actuation	5A
F93	004	4	Sicherung Steuerung (Potential 30)	Fuse, controller (pot. 30)	25A
F94	013	3	Sicherung Schutzbelueftung	Fuse, protected ventilation syst.	
F98	014	13	Sicherung Spiegelheizung	fuse,mirror heating	10A
F99	014	9	Sicherung Motorraumbeleuchtung	fuse, illumination engine area	15A
FM1	008	13	Platinensicherung	Multifuse	0,2A
FM2	007	19	Platinensicherung	Multifuse	0,2A
FM3	010	8	Platinensicherung	Multifuse	0,2A
FM4	010	4	Platinensicherung	Multifuse	0,2A
FM5	010	11	Platinensicherung	Multifuse	0,2A
FM6	007	7	Platinensicherung	Multifuse	0,2A
FM7	010	13	Platinensicherung	Multifuse	0,2A
F122	002	17	Sicherung EMR	Fuse, EMR	10A
F123	013	2	Sicherung Schutzbelüftungsanlage	Fuse, protected ventilation system	
F125	014	11	Vorsicherung	pre-fusing	10A
F126	014	11	Sicherung Rückfahrkamera	Fuse, back up camera system	2A
G01	002	2	Batterie	Battery	
G02	002	5	Generator	Generator	28V/80A
G03	002	2	Batterie	Battery	
H04	004	10	Meldeleuchte Betriebsstoerung	Indicator light, breakdown	
H07	009	13	Warnsummer Betriebsstoerung	Warning buzzer, breakdown	0,2A
H14	007	4	Warnsummer Rueckwaertsfahrt	Back-up alarm buzzer	max. 2,5A
H70	004	11	Anzeige Wasser im Diesel	Indicator water in fuel	
H81	008	5	Meldeleuchte Verzögerungsfunktion	Indicator light, decelerator device	
K05	007	2	Relais Startstrom	Relay, starting current	BOSCHW
K11	003	14	Relais Klemme 30 auf 15	Relay, terminal 30 to 15	BOSCHL
K13	011	14	Relais Signalhorn	Relay, warning horn	BOSCHW
K14	004	4	Relais Vorgluehen	Relay, glow plug system	K2DEUTZ
K15	004	12	Relais Gluehen beim Start	Relay, glowing during starting	BOSCHW
K22	009	6	Relais Hubmagnet Motor	Relay, shut off solenoid, engine	BOSCHW
K32	003	16	Relais Kabine	Relay, cabin	BOSCHL
K48	007	3	Relais Fahrhebel 0-Stellung	Relay, travel lever 0-position	BOSCHW
K60	004	14	Relais Motoroeldruck	Relay, engine oil pressure	BOSCHW
K61	002	8	Relais Ladekontrolle	Relay, charge control	BOSCHW
K62	002	10	Relais D+	Relay, D+	BOSCHW
K77	009	17	Relais Override	Relay, override	SDS/SF4
K90	009	4	Relais, Meldeleuchte Stoerung SPS	Relay, indicat.light brake down SPS	BOSCHW
K113	006	11	Zeitrelais	Timing relay	BOSCHW
K133	009	9	Relais Test	Relay, test	BOSCHW
K146	004	13	Relais Kühlmitteltemperatur	relay, coolant temperature	BOSCHW
K77/1	009	15	Relais Override	Relay, override	SDS/SF4
M01	003	9	Starter	Starter	
M04	014	15	Scheibenwischermotor vorne	Windscreen wiper motor, front	190W
M05	014	17	Scheibenwischermotor hinten	Windscreen wiper motor, rear	max 3,3A
M06	014	16	Scheibenwaschermotor vorne	Windscreen washer motor, front	60W
M07	014	18	Scheibenwaschermotor hinten	Windscreen washer motor, rear	60W
M08	011	3	Zentralschmieranlage	Central lubrication system	max. 3A
M10	011	18	Kompressor Fahrersitzhoehenverstellung	Compr., operator's seat height adjustm.	7,5A
M17	012	18	Zusatzluefter	Additional blower	max. 0,75A
M24	013	10	Stellmotor Luftklappe	adjusting motor air inlet flap	
M26	013	6	Zyklon Abscheider	cyclone separator	3A
P00	005	12	Betriebsstundenzaehler	Operating hour meter	
P01	005	15	Tankanzeige	Level gauge	
P02	005	7	Temperaturanzeige Hydraulikoel	Temperature gauge, hydraulic oil	
P03	005	11	Drehzahlmesser	Rpm meter	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P12	005	16	Voltmeter	Volt meter	
P14	005	6	Anzeige Kuehlmitteltemperatur	Temperature gauge, coolant	
P15	014	11	BCM 03 Bildschirm	BCM 03 terminal	
P18	010	16	Diagnose	Diagnostics	max. 1,08A
P32	014	12	Kamera Rückraumüberwachung	Camera, back up monitoring	
R02	004	2	Gluehkerze	Glow plug	
R02	004	2	Gluehkerze	Glow plug	
R03	005	15	Geber Tankanzeige	Sender, level gauge	
R04	005	8	Geber Hydraulikoeltemperatur	Sender, hydraulic oil temp.	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R10	002	7	Parallelwiderstand	Parallel resistor	220 OHM
R20	008	15	Widerstand	Resistor	1 KOHM
R21	008	15	Widerstand	Resistor	1 KOHM
R22	008	16	Widerstand	Resistor	1 KOHM
R23	008	17	Widerstand	Resistor	1 KOHM
R26	012	17	Widerstand	Resistor	22 OHM
R27	012	18	Widerstand	Resistor	10 OHM
R32	007	5	Widerstand	Resistor	1 kOhm
R33	007	5	Widerstand	Resistor	2 kOhm
R34	007	6	Widerstand	Resistor	1 kOhm
R35	007	8	Widerstand	Resistor	3,3 kOhm
R36	010	5	Widerstand	Resistor	47 OHM
R38	010	5	Widerstand	Resistor	47 OHM
R40	010	5	Widerstand	Resistor	47 OHM
R42	010	5	Widerstand	Resistor	47 OHM
R43	008	7	Widerstand	Resistor	499Ohm
R44	008	7	Widerstand	Resistor	499Ohm
R77	014	12	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	14	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W

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Name: Werner
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Name: Seis

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Name	Bl.	Pf.	Benennung	Designation	TYP
S00	003	9	Startschalter	Starter switch	MERIT
S01	002	17	Schalter NOT AUS	Switch, emergency off	NOTAUSH
S01	002	17	Schalter NOT AUS	Switch, emergency off	
S02	008	16	Fahrstufenschalter	Switch, speed range selector	
S02	008	19	Fahrstufenschalter	Switch, speed range selector	
S03	011	14	Taster Signalhorn	Push button, warning horn	
S04	008	10	Bremsschalter	Switch, brake	
S16	014	5	Schalter Arbeitsbeleuchtung vorne	Switch, working head lights, front	
S20	014	14	Schalter Scheibenwischer vorne	Switch, windscreen wiper, front	
S21	014	18	Schalter Scheibenwischer hinten	Switch, windscreen wiper, rear	
S22	014	16	Schalter Scheibenwascher vorne	Switch, windscreen washer, front	
S25	011	19	Schalter Fahrersitzheizung	Switch, heating, operator's seat	
S26	014	10	Schalter Arbeitsbeleuchtung hinten	Switch, working head lights, rear	
S27	011	3	Taster Zentralschmieranlage	Push botton, central lubrication system	
S28	012	8	Schalter Kabinenheizung	Switch, cabin heating	
S29	011	18	Schalter Fahrersitz Hoehenverstellung	Switch, operator's seat height adjustm.	
S30	002	2	Batterietrennschalter	Switch, battery disconnect	
S31	007	5	Schalter Fahrtrichtung	Switch, travel direction	
S38	014	8	Schalter Kennleuchte	Switch, warning light	
S44	012	17	Schalter Kabinenluefter	Switch, cabin ventilator	
S45	014	7	Schalter Kabineninnenleuchte	Switch, cabin inside light	
S53	014	4	Schalter Arbeitsbeleuchtung	Switch, working lights	
S70	010	10	Schalter Schubsschild	Switch, dozer blade	WAGO
S71	010	3	Schalter Lenkung	Switch, steering	max. 1,08A
S118	004	18	Schalter Fehlerdiagnose	Switch, fault diagnosis	
S119	004	6	Elektronisches Fusspedal	Electronic foot pedal	
S120	008	7	Schalter Motordrehzahl	Switch, engine speed	5 kOhm
S128	014	13	Schalter Spiegelheizung	Switch, mirror heating	
S137	014	9	Schalter Motorraumbeleuchtung	Switch, illumination engine area	
S160	008	4	Schalter Aktivierung Verzögerungspedal	Switch, enable decelerator pedal	
S161	008	6	Verzögerungspedal	decelerator pedal	
U01	014	1	Spannungswandler	Voltage transformer	
V01	002	7	Diode	Diode	WAGO
V02	006	7	Diode	Diode	WAGO
V03	006	7	Diode	Diode	WAGO
V04	006	7	Diode	Diode	WAGO
V05	006	7	Diode	Diode	WAGO
V07	006	12	Diode	Diode	WAGO
V08	006	12	Diode	Diode	WAGO
V09	006	12	Diode	Diode	WAGO
V10	006	12	Diode	Diode	WAGO
V11	006	12	Diode	Diode	WAGO
V12	009	7	Diode	Diode	WAGO
V13	006	12	Diode	Diode	WAGO
V14	009	14	Diode	Diode	Wago
V15	009	15	Diode	Diode	Wago
V16	010	2	Diode	Diode	WAGO
V17	010	3	Diode	Diode	WAGO
V18	010	2	Diode	Diode	WAGO
V19	010	2	Diode	Diode	WAGO
V21	009	9	Diode	Diode	WAGO
V22	009	10	Diode	Diode	WAGO
V23	007	2	Diode	Diode	WAGO
V25	007	3	Diode	Diode	WAGO
V26	013	14	Diode	Diode	WAGO
V31	008	10	Diode	Diode	Lütze
V32	007	9	Diode	Diode	Lütze
V33	007	11	Diode	Diode	Lütze
V34	007	5	Diode	Diode	Lütze
V35	007	7	Diode	Diode	Lütze
V36	013	19	Diode	Diode	FE5B
V37	008	13	Diode	Diode	Lütze
V38	007	2	Diode	Diode	FE5B KabeldiodeDiode
V42	009	13	Diode (A2)	Diode (A2)	Diodenmodul
V43	013	6	Diode (A3)	Diode (A3)	Diodenmodul
V46	011	15	Diode (A6)	Diode (A6)	Diodenmodul
V47	003	12	Diode (A7)	Diode (A7)	Diodenmodul
V48	013	15	Diode (A8)	Diode (A8)	Diodenmodul
X0/1:1	010	18	DIOS STECKER	Dios connector	
X0/1:2	010	18	DIOS STECKER	Dios connector	
X0/1:3	009	18	DIOS STECKER	Dios connector	
X0/1:4	009	19	DIOS STECKER	Dios connector	
X0/1:5	010	18	DIOS STECKER	Dios connector	
X0/1:6	010	19	DIOS STECKER	Dios connector	
X0/1:9	009	19	DIOS STECKER	Dios connector	
X0/1:10	009	19	DIOS STECKER	Dios connector	
X0/1:11	009	18	DIOS STECKER	Dios connector	
X0:1	007	10	ESX STECKER	esx connector	
X0:1	008	13	ESX STECKER	esx connector	
X0:1	010	7	ESX STECKER	esx connector	
X0:2	009	4	ESX STECKER	esx connector	
X0:3	009	9	ESX STECKER	esx connector	
X0:4	009	10	ESX STECKER	esx connector	
X0:5	009	11	ESX STECKER	esx connector	
X0:6	006	9	ESX STECKER	esx connector	
X0:7	008	14	ESX STECKER	esx connector	
X0:8	010	3	ESX STECKER	esx connector	
X0:9	010	7	ESX STECKER	esx connector	
X0:10	006	10	ESX STECKER	esx connector	
X0:11	006	9	ESX STECKER	esx connector	
X0:12	010	14	ESX STECKER	esx connector	
X0:13	006	10	ESX STECKER	esx connector	
X0:14	010	6	ESX STECKER	esx connector	
X0:15	010	7	ESX STECKER	esx connector	
X0:16	009	4	ESX STECKER	esx connector	
X0:17	010	13	ESX STECKER	esx connector	

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Name	Bl.	Pf.	Benennung	als	TYP
X0:18	006	9	ESX STECKER	esx connector	
X0:19	006	9	ESX STECKER	esx connector	
X0:20	010	8	ESX STECKER	esx connector	
X0:21	007	10	ESX STECKER	esx connector	
X0:22	007	8	ESX STECKER	esx connector	
X0:23	007	11	ESX STECKER	esx connector	
X0:23	008	13	ESX STECKER	esx connector	
X0:23	010	8	ESX STECKER	esx connector	
X0:24	009	6	ESX STECKER	esx connector	
X0:25	009	7	ESX STECKER	esx connector	
X0:26	010	17	ESX STECKER	esx connector	
X0:27	010	16	ESX STECKER	esx connector	
X0:28	009	6	ESX STECKER	esx connector	
X0:29	007	19	ESX STECKER	esx connector	
X0:30	010	10	ESX STECKER	esx connector	
X0:31	010	12	ESX STECKER	esx connector	
X0:32	007	7	ESX STECKER	esx connector	
X0:33	009	9	ESX STECKER	esx connector	
X0:34	010	13	ESX STECKER	esx connector	
X0:35	010	11	ESX STECKER	esx connector	
X0:36	006	9	ESX STECKER	esx connector	
X0:37	010	15	ESX STECKER	esx connector	
X0:38	010	5	ESX STECKER	esx connector	
X0:39	010	5	ESX STECKER	esx connector	
X0:40	008	10	ESX STECKER	esx connector	
X0:41	010	11	ESX STECKER	esx connector	
X0:42	010	9	ESX STECKER	esx connector	
X0:43	007	19	ESX STECKER	esx connector	
X0:44	009	13	ESX STECKER	esx connector	
X0:45	006	10	ESX STECKER	esx connector	
X0:46	007	14	ESX STECKER	esx connector	
X0:47	007	16	ESX STECKER	esx connector	
X0:48	007	17	ESX STECKER	esx connector	
X0:49	010	7	ESX STECKER	esx connector	
X0:50	006	10	ESX STECKER	esx connector	
X0:51	006	10	ESX STECKER	esx connector	
X0:52	006	9	ESX STECKER	esx connector	
X0:53	009	9	ESX STECKER	esx connector	
X0:54	009	13	ESX STECKER	esx connector	
X0:55	010	16	ESX STECKER	esx connector	
X0:56	009	7	ESX STECKER	esx connector	
X0:57	009	8	ESX STECKER	esx connector	
X0:58	009	8	ESX STECKER	esx connector	
X0:59	009	8	ESX STECKER	esx connector	
X0:60	009	9	ESX STECKER	esx connector	
X0:61	008	10	ESX STECKER	esx connector	
X0:62	008	14	ESX STECKER	esx connector	
X0:63	010	11	ESX STECKER	esx connector	
X0:64	010	6	ESX STECKER	esx connector	
X0:65	010	14	ESX STECKER	esx connector	
X0:66	010	15	ESX STECKER	esx connector	
X0:67	010	15	ESX STECKER	esx connector	
X0:68	010	16	ESX STECKER	esx connector	
X1:	013	2	Wago Zentralelektrik	Wago e-box	
X1:1	014	7	Wago Zentralelektrik	Wago e-box	
X1:2	014	7	Wago Zentralelektrik	Wago e-box	
X1:3	014	2	Wago Zentralelektrik	Wago e-box	
X1:4	014	2	Wago Zentralelektrik	Wago e-box	
X1:5	004	20	Wago Zentralelektrik	Wago e-box	
X1:6	002	17	Wago Zentralelektrik	Wago e-box	
X1:7	003	9	Wago Zentralelektrik	Wago e-box	
X1:8	003	9	Wago Zentralelektrik	Wago e-box	
X1:9	003	9	Wago Zentralelektrik	Wago e-box	
X1:61	010	18	Wago Zentralelektrik	Wago e-box	
X1:62	004	15	Wago Zentralelektrik	Wago e-box	
X1:63	010	18	Wago Zentralelektrik	Wago e-box	
X1:64	004	16	Wago Zentralelektrik	Wago e-box	
X1:65	004	16	Wago Zentralelektrik	Wago e-box	
X1:66	009	10	Wago Zentralelektrik	Wago e-box	
X1:67	009	11	Wago Zentralelektrik	Wago e-box	
X1:68	010	18	Wago Zentralelektrik	Wago e-box	
X1:69	010	18	Wago Zentralelektrik	Wago e-box	
X1:70	002	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	003	16	Wago Zentralelektrik	Wago e-box	
X1:70	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	009	4	Wago Zentralelektrik	Wago e-box	
X1:70	009	6	Wago Zentralelektrik	Wago e-box	
X1:70	009	9	Wago Zentralelektrik	Wago e-box	
X1:70	009	13	Wago Zentralelektrik	Wago e-box	
X1:70	009	15	Wago Zentralelektrik	Wago e-box	
X1:70	009	17	Wago Zentralelektrik	Wago e-box	
X1:70	013	6	Wago Zentralelektrik	Wago e-box	
X1:71	004	17	Wago Zentralelektrik	Wago e-box	
X1:72	014	11	Wago Zentralelektrik	Wago e-box	
X1:81	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:82	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:83	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:84	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:85	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:86	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:87	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:88	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:89	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:90	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:91	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:92	004	12	Wago Zentralelektrik	Wago e-box	
X1:93	004	13	Wago Zentralelektrik	Wago e-box	
X1:94	004	14	Wago Zentralelektrik	Wago e-box	

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	Name	Bl.	Pf.	Benennung	Ablage	TYP
1	X1:101	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:102	006	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:103	006	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
2	X1:104	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:105	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:106	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:108	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:109	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
3	X1:110	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:111	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:112	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:113	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:114	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
4	X1:115	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:116	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:117	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:118	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:119	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
5	X1:120	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:121	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:122	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:123	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:124	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
6	X1:125	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:126	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:127	013	13	Wago Zentralelektrik	Wago e-box	
	X1:128	013	13	Wago Zentralelektrik	Wago e-box	
	X1:129	013	15	Wago Zentralelektrik	Wago e-box	
	X1:130	013	15	Wago Zentralelektrik	Wago e-box	
7	X1:131	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:132	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:133	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:134	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:135	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
8	X1:136	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:137	010	11	Wago Zentralelektrik	Wago e-box	
	X1:138	010	11	Wago Zentralelektrik	Wago e-box	
	X1:139	010	12	Wago Zentralelektrik	Wago e-box	
	X1:140	010	12	Wago Zentralelektrik	Wago e-box	
9	X1:141	010	18	Wago Zentralelektrik	Wago e-box	
	X1:142	010	18	Wago Zentralelektrik	Wago e-box	
	X1:143	010	19	Wago Zentralelektrik	Wago e-box	
	X1:144	010	19	Wago Zentralelektrik	Wago e-box	
	X1:145	014	9	Wago Zentralelektrik	Wago e-box	
10	X1:146	013	15	Wago Zentralelektrik	Wago e-box	
	X1:147	013	15	Wago Zentralelektrik	Wago e-box	
	X1:148	005	8	Wago Zentralelektrik	Wago e-box	
	X1:149	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
11	X1:150	014	10	Wago Zentralelektrik	Wago e-box	
	X1:151	008	10	Wago Zentralelektrik	Wago e-box	
	X1:152	008	10	Wago Zentralelektrik	Wago e-box	
	X1:153	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:154	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:155	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
12	X1:156	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:157	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:158	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:159	010	6	Wago Zentralelektrik	Wago e-box	
	X1:160	010	6	Wago Zentralelektrik	Wago e-box	
13	X1:161	010	7	Wago Zentralelektrik	Wago e-box	
	X1:162	010	7	Wago Zentralelektrik	Wago e-box	
	X1:163	010	8	Wago Zentralelektrik	Wago e-box	
	X1:164	010	8	Wago Zentralelektrik	Wago e-box	
	X1:165	010	9	Wago Zentralelektrik	Wago e-box	
14	X1:166	010	9	Wago Zentralelektrik	Wago e-box	
	X1:170	008	14	Wago Zentralelektrik	Wago e-box	
	X1:171	011	4	Wago Zentralelektrik	Wago e-box	
	X1:172	011	3	Wago Zentralelektrik	Wago e-box	
	X1:173	011	3	Wago Zentralelektrik	Wago e-box	
	X1:174	011	4	Wago Zentralelektrik	Wago e-box	
15	X1:181	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:181	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:181	010	14	Wago Zentralelektrik	Wago e-box	
	X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
16	X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:182	010	15	Wago Zentralelektrik	Wago e-box	
	X1:183	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:183	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:183	010	15	Wago Zentralelektrik	Wago e-box	
17	X1:184	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:184	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:184	009	18	Wago Zentralelektrik	Wago e-box	
	X1:185	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:185	009	19	Wago Zentralelektrik	Wago e-box	
18	X1:186	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:186	009	19	Wago Zentralelektrik	Wago e-box	
	X1:187	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:187	010	16	Wago Zentralelektrik	Wago e-box	
	X1:188	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
19	X1:188	010	16	Wago Zentralelektrik	Wago e-box	
	X1:189	010	14	Wago Zentralelektrik	Wago e-box	
	X1:189	014	9	Wago Zentralelektrik	Wago e-box	
	X1:189	014	9	Wago Zentralelektrik	Wago e-box	
	X1:190	011	6	Wago Zentralelektrik	Wago e-box	
20	X1:190	014	10	Wago Zentralelektrik	Wago e-box	
	X1:190	014	11	Wago Zentralelektrik	Wago e-box	
	X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:191	011	7	Wago Zentralelektrik	Wago e-box	

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X1:192	008	14	Wago Zentralelektrik	Wago e-box	
X1:201	013	15	Wago Zentralelektrik	Wago e-box	
X1:202	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:205	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:205	013	15	Wago Zentralelektrik	Wago e-box	
X1:207	009	4	Wago Zentralelektrik	Wago e-box	
X1:20A	013	19	Sika – Klemme	fuse terminal	
X1:20E	013	19	Sika – Klemme	fuse terminal	
X1:210	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:21A	002	12	Sika – Klemme	fuse terminal	
X1:21E	002	12	Sika – Klemme	fuse terminal	
X1:221	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:222	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:223	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:224	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:226	012	3	Wago Zentralelektrik	Wago e-box	
X1:227	012	3	Wago Zentralelektrik	Wago e-box	
X1:228	005	15	Wago Zentralelektrik	Wago e-box	
X1:229	005	15	Wago Zentralelektrik	Wago e-box	
X1:22A	013	3	Sika – Klemme	fuse terminal	
X1:22E	013	3	Sika – Klemme	fuse terminal	
X1:231	004	6	Wago Zentralelektrik	Wago e-box	
X1:232	004	6	Wago Zentralelektrik	Wago e-box	
X1:233	004	7	Wago Zentralelektrik	Wago e-box	
X1:234	008	5	Wago Zentralelektrik	Wago e-box	
X1:235	004	6	Wago Zentralelektrik	Wago e-box	
X1:236	004	6	Wago Zentralelektrik	Wago e-box	
X1:237	004	7	Wago Zentralelektrik	Wago e-box	
X1:23A	003	9	Sika – Klemme	fuse terminal	
X1:23E	002	3	Sika – Klemme	fuse terminal	
X1:23E	003	9	Sika – Klemme	fuse terminal	
X1:241	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:242	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:243	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:244	004	10	Wago Zentralelektrik	Wago e-box	
X1:245	011	19	Wago Zentralelektrik	Wago e-box	
X1:246	011	19	Wago Zentralelektrik	Wago e-box	
X1:247	013	15	Wago Zentralelektrik	Wago e-box	
X1:248	011	3	Wago Zentralelektrik	Wago e-box	
X1:249	013	10	Wago Zentralelektrik	Wago e-box	
X1:24A	004	4	Sika – Klemme	fuse terminal	
X1:24E	004	4	Sika – Klemme	fuse terminal	
X1:250	004	10	Wago Zentralelektrik	Wago e-box	
X1:251	013	9	Wago Zentralelektrik	Wago e-box	
X1:252	013	13	Wago Zentralelektrik	Wago e-box	
X1:253	013	17	Wago Zentralelektrik	Wago e-box	
X1:255	004	18	Wago Zentralelektrik	Wago e-box	
X1:256	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:256	003	12	Wago Zentralelektrik	Wago e-box	
X1:256	011	15	Wago Zentralelektrik	Wago e-box	
X1:257	009	13	Wago Zentralelektrik	Wago e-box	
X1:258	009	13	Wago Zentralelektrik	Wago e-box	
X1:259	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:25A	002	15	Sika – Klemme	fuse terminal	
X1:25E	002	15	Sika – Klemme	fuse terminal	
X1:260	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:261	008	10	Wago Zentralelektrik	Wago e-box	
X1:262	007	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:262	008	10	Wago Zentralelektrik	Wago e-box	
X1:263	008	10	Wago Zentralelektrik	Wago e-box	
X1:265	012	18	Wago Zentralelektrik	Wago e-box	
X1:266	012	17	Wago Zentralelektrik	Wago e-box	
X1:267	012	18	Wago Zentralelektrik	Wago e-box	
X1:268	012	19	Wago Zentralelektrik	Wago e-box	
X1:269	004	11	Wago Zentralelektrik	Wago e-box	
X1:26A	009	13	Sika – Klemme	fuse terminal	
X1:26E	009	13	Sika – Klemme	fuse terminal	
X1:270	004	11	Wago Zentralelektrik	Wago e-box	
X1:272	011	3	Wago Zentralelektrik	Wago e-box	
X1:272	013	9	Wago Zentralelektrik	Wago e-box	
X1:27A	009	7	Sika – Klemme	fuse terminal	
X1:27E	009	7	Sika – Klemme	fuse terminal	
X1:28A	013	2	Sika – Klemme	fuse terminal	
X1:28E	013	2	Sika – Klemme	fuse terminal	
X1:291	005	7	Wago Zentralelektrik	Wago e-box	
X1:292	005	11	Wago Zentralelektrik	Wago e-box	
X1:293	003	10	Wago Zentralelektrik	Wago e-box	
X1:294	005	5	Wago Zentralelektrik	Wago e-box	
X1:295	005	7	Wago Zentralelektrik	Wago e-box	
X1:296	005	15	Wago Zentralelektrik	Wago e-box	
X1:298	002	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:298	005	11	Wago Zentralelektrik	Wago e-box	
X1:299	004	20	Wago Zentralelektrik	Wago e-box	
X1:299	005	5	Wago Zentralelektrik	Wago e-box	
X1:29A	005	5	Sika – Klemme	fuse terminal	
X1:29E	005	5	Sika – Klemme	fuse terminal	
X1:300	005	7	Wago Zentralelektrik	Wago e-box	
X1:301	005	11	Wago Zentralelektrik	Wago e-box	
X1:302	003	13	Wago Zentralelektrik	Wago e-box	
X1:303	005	8	Wago Zentralelektrik	Wago e-box	
X1:30A	011	4	Sika – Klemme	fuse terminal	
X1:30E	011	4	Sika – Klemme	fuse terminal	
X1:31A	011	18	Sika – Klemme	fuse terminal	
X1:31E	002	17	SIKA KLEMME	fuse terminal	
X1:31E	011	18	Sika – Klemme	fuse terminal	
X1:321	010	6	Wago Zentralelektrik	Wago e-box	
X1:322	010	8	Wago Zentralelektrik	Wago e-box	
X1:323	010	7	Wago Zentralelektrik	Wago e-box	
X1:324	010	7	Wago Zentralelektrik	Wago e-box	

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Name	Bl.	Pf.	Benennung	als	TYP
X1:325	010	6	Wago Zentralelektrik	Wago e-box	
X1:326	010	7	Wago Zentralelektrik	Wago e-box	
X1:327	010	11	Wago Zentralelektrik	Wago e-box	
X1:328	010	11	Wago Zentralelektrik	Wago e-box	
X1:329	010	10	Wago Zentralelektrik	Wago e-box	
X1:32A	002	17	Sika – Klemme	fuse terminal	
X1:32E	002	17	Sika – Klemme	fuse terminal	
X1:330	010	10	Wago Zentralelektrik	Wago e-box	
X1:331	010	11	Wago Zentralelektrik	Wago e-box	
X1:332	010	11	Wago Zentralelektrik	Wago e-box	
X1:333	010	14	Wago Zentralelektrik	Wago e-box	
X1:334	010	14	Wago Zentralelektrik	Wago e-box	
X1:335	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:336	007	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:337	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:338	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:339	007	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:33A	013	6	Sika – Klemme	fuse terminal	
X1:33E	002	17	SIKA KLEMME	fuse terminal	
X1:33E	013	6	Sika – Klemme	fuse terminal	
X1:340	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:341	011	18	Wago Zentralelektrik	Wago e-box	
X1:342	011	18	Wago Zentralelektrik	Wago e-box	
X1:343	008	4	Wago Zentralelektrik	Wago e-box	
X1:343	010	5	Wago Zentralelektrik	Wago e-box	
X1:344	010	4	Wago Zentralelektrik	Wago e-box	
X1:345	010	4	Wago Zentralelektrik	Wago e-box	
X1:346	010	3	Wago Zentralelektrik	Wago e-box	
X1:347	010	5	Wago Zentralelektrik	Wago e-box	
X1:348	010	5	Wago Zentralelektrik	Wago e-box	
X1:349	009	18	Wago Zentralelektrik	Wago e-box	
X1:349	009	19	Wago Zentralelektrik	Wago e-box	
X1:349	009	19	Wago Zentralelektrik	Wago e-box	
X1:349	010	17	Wago Zentralelektrik	Wago e-box	
X1:34A	011	14	Sika – Klemme	fuse terminal	
X1:34E	011	14	Sika – Klemme	fuse terminal	
X1:350	010	13	Wago Zentralelektrik	Wago e-box	
X1:351	010	12	Wago Zentralelektrik	Wago e-box	
X1:352	010	12	Wago Zentralelektrik	Wago e-box	
X1:353	010	13	Wago Zentralelektrik	Wago e-box	
X1:354	010	13	Wago Zentralelektrik	Wago e-box	
X1:355	011	19	Wago Zentralelektrik	Wago e-box	
X1:356	011	14	Wago Zentralelektrik	Wago e-box	
X1:357	008	17	Wago Zentralelektrik	Wago e-box	
X1:358	008	13	Wago Zentralelektrik	Wago e-box	
X1:359	008	14	Wago Zentralelektrik	Wago e-box	
X1:35A	009	2	Sika – Klemme	fuse terminal	
X1:35E	009	2	Sika – Klemme	fuse terminal	
X1:363	010	15	Wago Zentralelektrik	Wago e-box	
X1:364	010	19	Wago Zentralelektrik	Wago e-box	
X1:364	011	14	Wago Zentralelektrik	Wago e-box	
X1:36A	013	9	Sika – Klemme	fuse terminal	
X1:36E	013	9	Sika – Klemme	fuse terminal	
X1:371	003	16	Wago Zentralelektrik	Wago e-box	
X1:372	014	19	Wago Zentralelektrik	Wago e-box	
X1:372	014	20	Wago Zentralelektrik	Wago e-box	
X1:373	012	15	Wago Zentralelektrik	Wago e-box	
X1:374	012	15	Wago Zentralelektrik	Wago e-box	
X1:375	012	3	Wago Zentralelektrik	Wago e-box	
X1:376	012	3	Wago Zentralelektrik	Wago e-box	
X1:377	012	19	Wago Zentralelektrik	Wago e-box	
X1:378	014	10	Wago Zentralelektrik	Wago e-box	
X1:381	013	19	Wago Zentralelektrik	Wago e-box	
X1:382	013	18	Wago Zentralelektrik	Wago e-box	
X1:383	013	17	Wago Zentralelektrik	Wago e-box	
X1:391/1	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:391/2	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:392/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:392/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:393/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:393/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:394/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:394/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:395/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:395/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:397/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:397/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:398/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:398/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:399/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:399/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:400/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:400/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:401/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:401/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:402/1	009	7	Wago Zentralelektrik	Wago e-box	
X1:402/2	009	7	Wago Zentralelektrik	Wago e-box	
X1:403/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:403/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:404/1	009	14	Wago Zentralelektrik	Wago e-box	
X1:404/2	009	14	Wago Zentralelektrik	Wago e-box	
X1:405/1	009	15	Wago Zentralelektrik	Wago e-box	
X1:405/2	009	15	Wago Zentralelektrik	Wago e-box	
X1:406/1	010	2	Wago Zentralelektrik	Wago e-box	
X1:406/2	010	2	Wago Zentralelektrik	Wago e-box	
X1:407/1	010	3	Wago Zentralelektrik	Wago e-box	
X1:407/2	010	3	Wago Zentralelektrik	Wago e-box	
X1:408/1	010	2	Wago Zentralelektrik	Wago e-box	
X1:408/2	010	2	Wago Zentralelektrik	Wago e-box	

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1	X1:409/1	010	2	Wago Zentralelektrik	Wago e-box	
	X1:409/2	010	2	Wago Zentralelektrik	Wago e-box	
	X1:41/1	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
2	X1:41/2	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:410/1	009	9	Wago Zentralelektrik	Wago e-box	
	X1:410/2	009	9	Wago Zentralelektrik	Wago e-box	
	X1:411/1	009	10	Wago Zentralelektrik	Wago e-box	
	X1:411/2	009	10	Wago Zentralelektrik	Wago e-box	
3	X1:412/1	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:412/2	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:413/1	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:413/2	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:414/1	013	14	Wago Zentralelektrik	Wago e-box	
4	X1:414/2	013	14	Wago Zentralelektrik	Wago e-box	
	X1:42/1	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:42/2	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:43/1	010	8	Wago Zentralelektrik	Wago e-box	
	X1:43/2	010	8	Wago Zentralelektrik	Wago e-box	
5	X1:44/1	010	4	Wago Zentralelektrik	Wago e-box	
	X1:44/2	010	4	Wago Zentralelektrik	Wago e-box	
	X1:45/1	010	11	Wago Zentralelektrik	Wago e-box	
	X1:45/2	010	11	Wago Zentralelektrik	Wago e-box	
	X1:46/1	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
6	X1:46/2	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:47/1	010	13	Wago Zentralelektrik	Wago e-box	
	X1:47/2	010	13	Wago Zentralelektrik	Wago e-box	
	X2:A	010	18	Datenschnittstelle	data interface	
	X2:B	010	18	Datenschnittstelle	data interface	
7	X2:G	009	11	Datenschnittstelle	data interface	
	X2:H	009	10	Datenschnittstelle	data interface	
	X2:J	002	11	Datenschnittstelle	data interface	
	X2:N	002	11	Datenschnittstelle	data interface	
	X2:U	009	11	Datenschnittstelle	data interface	
8	X2:V	010	15	Datenschnittstelle	data interface	
	X3:A	008	3	Stecker Handgas	connector hand throttle	
	X3:B	008	2	Stecker Handgas	connector hand throttle	
	X3:C	008	2	Stecker Handgas	connector hand throttle	
9	X4:A	004	15	EMR – Diagnose	EMR-diagnosis	
	X4:B	004	17	EMR – Diagnose	EMR-diagnosis	
	X4:F	004	16	EMR – Diagnose	EMR-diagnosis	
	X4:G	004	16	EMR – Diagnose	EMR-diagnosis	
	X4:H	004	15	EMR – Diagnose	EMR-diagnosis	
10	X4:K	004	17	EMR – Diagnose	EMR-diagnosis	
	X4:M	004	16	EMR – Diagnose	EMR-diagnosis	
	X5:1	005	7	Deutsch Stecker Senso	Deutsch Connector sensor	
	X6:1	004	10	Wago Zentralelektrik	Wago e-box	
	X6:2	004	10	Wago Zentralelektrik	Wago e-box	
11	X6:3	004	11	Wago Zentralelektrik	Wago e-box	
	X6:4	004	11	Wago Zentralelektrik	Wago e-box	
	X6:5	004	15	Wago Zentralelektrik	Wago e-box	
	X6:6	004	15	Wago Zentralelektrik	Wago e-box	
	X6:7	004	16	Wago Zentralelektrik	Wago e-box	
12	X6:8	004	16	Wago Zentralelektrik	Wago e-box	
	X6:9	004	16	Wago Zentralelektrik	Wago e-box	
	X6:10	004	17	Wago Zentralelektrik	Wago e-box	
	X7:1	014	9	Stecker Rops	connector on rops	
	X7:2	014	9	Stecker Rops	connector on rops	
13	X7:3	014	9	Stecker Rops	connector on rops	
	X7:4	014	9	Stecker Rops	connector on rops	
	X7:5	013	16	Stecker Rops	connector on rops	
	X7:6	013	16	Stecker Rops	connector on rops	
14	X8:1	012	3	Pumpenstecker Kabine	connector pump cabin;	
	X8:2	012	3	Pumpenstecker Kabine	connector pump cabin;	
	X9:1	007	5	Stecker Schalter Rich	connector direction switch	
	X9:2	007	9	Stecker Schalter Rich	connector direction switch	
	X9:3	007	7	Stecker Schalter Rich	connector direction switch	
15	X9:4	007	5	Stecker Schalter Rich	connector direction switch	
	X9:5	007	5	Stecker Schalter Rich	connector direction switch	
	X9:6	007	6	Stecker Schalter Rich	connector direction switch	
	XS	002	15	Steckdose	Socket	
	X10:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
16	X10:B	004	6	AMP Stecker Gaspedal	AMP connector throttle	
	X10:C	004	6	AMP Stecker Gaspedal	AMP connector throttle	
	X11:1	011	18	Schnittstelle Sitz	connector drivers seat	
	X11:2	011	18	Schnittstelle Sitz	connector drivers seat	
17	X12:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
	X12:B	004	8	AMP Stecker Gaspedal	AMP connector throttle	
	X12:C	004	7	AMP Stecker Gaspedal	AMP connector throttle	
	X13:1	008	17	Stecker Stufenschalte	connector speed range switch	
18	X13:2	008	18	Stecker Stufenschalte	connector speed range switch	
	X13:3	008	14	Stecker Stufenschalte	connector speed range switch	
	X14:4	013	15	Stecker Motor	connector engine	
	X14:5	013	16	Stecker Motor	connector engine	
19	X14:6	002	6	Motorschnittstelle	engine interface	
	X14:7	002	6	Motorschnittstelle	engine interface	
	X14:8	005	7	Motorschnittstelle	engine interface	
	X14:9	003	9	Motorschnittstelle	engine interface	
20	X14:10	006	12	Stecker Motor	connector engine	
	X14:11	006	12	Stecker Motor	connector engine	
	X15:A	010	18	Stecker Lehne links	connector arm rest lh.	
	X15:B	010	18	Stecker Lehne links	connector arm rest lh.	
	X15:C	010	19	Stecker Lehne links	connector arm rest lh.	
	X17:1	013	16	Stecker Klimakupplung	connector clima clutch	
	X17:2	013	16	Stecker Klimakupplung	connector clima clutch	
	X18:1	013	16	Stecker Druckschalter	connector pressure switch	
	X18:2	013	16	Stecker Druckschalter	connector pressure switch	
	X19:1	013	13	Stecker Heizventil	connector heating valve	
	X19:2	013	13	Stecker Heizventil	connector heating valve	
	X21:1	011	19	Schnittstelle Sitz	connector drivers seat	

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X21:2	011	19	Schnittstelle Sitz	connector drivers seat	
X22:1	013	10	Stecker Luftklappe	connector air flap	
X22:2	013	11	Stecker Luftklappe	connector air flap	
X23:1	013	14	Stecker Sensor	connector sensor	
X23:2	013	14	Stecker Sensor	connector sensor	
X24:1	013	15	Stecker Sensor	connector sensor	
X24:2	013	15	Stecker Sensor	connector sensor	
X25:A	013	19	Stecker Lüfter	connector blower	
X25:B	013	18	Stecker Lüfter	connector blower	
X25:C	013	18	Stecker Lüfter	connector blower	
X26:1	013	9	Stecker Klimasteuerun	connector climacontrol	
X26:2	013	9	Stecker Klimasteuerun	connector climacontrol	
X26:3	013	11	Stecker Klimasteuerun	connector climacontrol	
X26:4	013	10	Stecker Klimasteuerun	connector climacontrol	
X26:5	013	16	Stecker Klimasteuerun	connector climacontrol	
X26:6	013	12	Stecker Klimasteuerun	connector climacontrol	
X26:7	013	12	Stecker Klimasteuerun	connector climacontrol	
X26:8	013	15	Stecker Klimasteuerun	connector climacontrol	
X26:9	013	13	Stecker Klimasteuerun	connector climacontrol	
X26:10	013	10	Stecker Klimasteuerun	connector climacontrol	
X26:11	013	11	Stecker Klimasteuerun	connector climacontrol	
X26:12	013	13	Stecker Klimasteuerun	connector climacontrol	
X26:13	013	13	Stecker Klimasteuerun	connector climacontrol	
X26:14	013	13	Stecker Klimasteuerun	connector climacontrol	
X27:1	013	14	Stecker Klimasteuerun	connector climacontrol	
X27:2	013	14	Stecker Klimasteuerun	connector climacontrol	
X27:3	013	15	Stecker Klimasteuerun	connector climacontrol	
X27:4	013	15	Stecker Klimasteuerun	connector climacontrol	
X28:1	011	6	Stecker Radsensor	connector wheel sensor	
X28:2	011	6	Stecker Radsensor	connector wheel sensor	
X28:3	011	7	Stecker Radsensor	connector wheel sensor	
X28:4	011	7	Stecker Radsensor	connector wheel sensor	
X29:1	013	6	Stecker Zyklon	Connector cyclone	
X29:2	013	6	Stecker Zyklon	Connector cyclone	
X30:A	011	6	Verbindungsstecker Se	connector sensor	
X30:B	011	6	Verbindungsstecker Se	connector sensor	
X30:C	011	7	Verbindungsstecker Se	connector sensor	
X31:A	011	11	Verbindungsstecker An	connector gauge	
X31:B	011	9	Verbindungsstecker An	connector gauge	
X31:C	011	10	Verbindungsstecker An	connector gauge	
X33:1	011	4	Schmieranlage	lubrication system	
X33:2	011	4	Schmieranlage	lubrication system	
X34:1	011	4	Schmieranlage	lubrication system	
X34:2	011	4	Schmieranlage	lubrication system	
X34:3	011	3	Schmieranlage	lubrication system	
X34:4	011	3	Schmieranlage	lubrication system	
X34:5	011	4	Schmieranlage	lubrication system	
X35:1	009	13	Stecker Warnsummer	connector warning buzzer	
X35:2	009	13	Stecker Warnsummer	connector warning buzzer	
X36:1	008	7	Stecker Poti	connector potentiometer	
X36:2	008	6	Stecker Poti	connector potentiometer	
X36:3	008	7	Stecker Poti	connector potentiometer	
X39:A	008	7	Stecker Deceleratorpe	connector decelerator pedal	
X39:B	008	6	Stecker Deceleratorpe	connector decelerator pedal	
X39:C	008	6	Stecker Deceleratorpe	connector decelerator pedal	
X40:1	008	8	Stecker Deceleratorpe	connector decelerator pedal	
X40:2	008	8	Stecker Deceleratorpe	connector decelerator pedal	
X40:3	008	9	Stecker Deceleratorpe	connector decelerator pedal	
X40:4	008	7	Stecker Deceleratorpe	connector decelerator pedal	
X40:5	008	8	Stecker Decelelratorp	connector decelerator pedal	
X40:6	008	7	Stecker Deceleratorpe	connector decelerator pedal	
X41:1	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:2	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:3	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:4	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:5	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:6	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:8	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:9	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:10	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:11	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:12	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X42:1	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:2	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:4	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:5	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:6	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X17.1:1	004	2	2-pol SPT	2-pole SPT	
X17.1:2	004	2	2-pol SPT	2-pole SPT	
X27.1:4	004	18	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:6	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:7	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:11	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:12	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:13	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:14	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:15	004	9	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:18	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:19	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:20	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:21	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:22	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:23	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:24	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:25	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:26	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:27	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:28	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:29	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	

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Name: Seis

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X27.1:30	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:33	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:34	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:35	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:36	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:37	004	13	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:39	004	17	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:40	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:41	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:42	004	15	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.2:10	004	3	12-pol EPC	12-pole EPC	
X27.2:11	004	3	12-pol EPC	12-pole EPC	
XD2.1:2	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:3	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:5	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:6	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:8	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:9	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:10	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:11	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:13	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:20	004	14	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:22	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:30	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:33	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:34	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:35	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:38	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:39	004	13	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:40	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:52	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:53	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:54	004	12	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:59	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:60	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:61	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:77	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:78	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:79	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:89	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.2:3	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:4	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:5	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:7	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:8	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:9	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:10	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:15	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:18	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:19	004	9	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:23	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:24	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:25	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:26	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:27	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:28	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:32	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:33	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:34	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:35	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:36	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.3:3	004	15	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:4	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:6	004	13	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:7	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:8	004	18	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:12	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:13	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:14	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:15	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:16	004	17	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
Y02	004	19	Magnetventil Flammgluehanlage	Solenoid valve, glow plug system	18W
Y03	008	14	Magnetventil Fahrstufenumschaltung	Solenoid valve, speed range selector	
Y04	008	10	Magnetventil Bremse	Solenoid valve, brake	1,25A
Y14	012	3	Kraftstoffpumpe Heizgeraet	Fuel pump, heating unit	
Y15	013	16	Magnetkupplung Klimakompressor	Magnetic clutch, air conditioning compr.	1,75A
Y16	007	10	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y16	007	12	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y17	007	6	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y17	007	8	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y92	010	6	Magnetventil Lenkung vorne rechts	Solenoid valve, steering, front rh.	max. 1,1A
Y93	010	7	Magnetventil Lenkung vorne links	Solenoid valve, steering, front lh.	max. 1,1A
Y102	010	11	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y102	010	12	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y108	010	8	Magnetventil Schaufel Heben	solenoid valve, lifting shovel	max. 1,1A
Y109	010	9	Magnetventil Schaufel Senken	solenoid valve, let down shovel	max. 1,1A
Y110	010	19	Magnetventil Schaufel oeffnen	solenoid valve, open shovel	max. 1,1A
Y111	010	18	Magnetventil Schaufel Schließen	solenoid valve, close shovel	max. 1,1A
Y132	007	14	Magnetventil Radmotor vorn links	Solenoid valve, wheel motor front lh.	max. 0,6A
Y133	007	16	Magnetventil Radmotor vorn rechts	Solenoid valve, wheel motor front rh.	max. 0,6A
Y134	007	17	Magnetventil Radmotor hinten links	Solenoid valve, wheel motor rear lh.	max. 0,6A
Y135	007	19	Magnetventil Radmotor hinten rechts	Solenoid valve, wheel motor rear rh.	max. 0,6A
Y138	013	13	Magnetveentil Heizung	Solenoid valve, heating unit	0,42A
Y147	004	12	Injektor A1	jet pump A1	
Y148	004	14	Injektor A2	jet pump A2	
Y149	004	13	Injektor A3	jet pump A3	
Y150	004	17	Injektor B1	jet pump B1	
Y151	004	16	Injektor B2	jet pump B2	

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Name: Seis

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Name	Bl.	Pf.	Benennung	als	TYP
Y152	004	16	Injektor B3	jet pump B3	
Y166	004	14	Injektor A4	jet pump A4	
Y167	004	18	Injektor B4	jet pump B4	

Gez.: 19.04.2006
Name: Werner

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Name: Seis

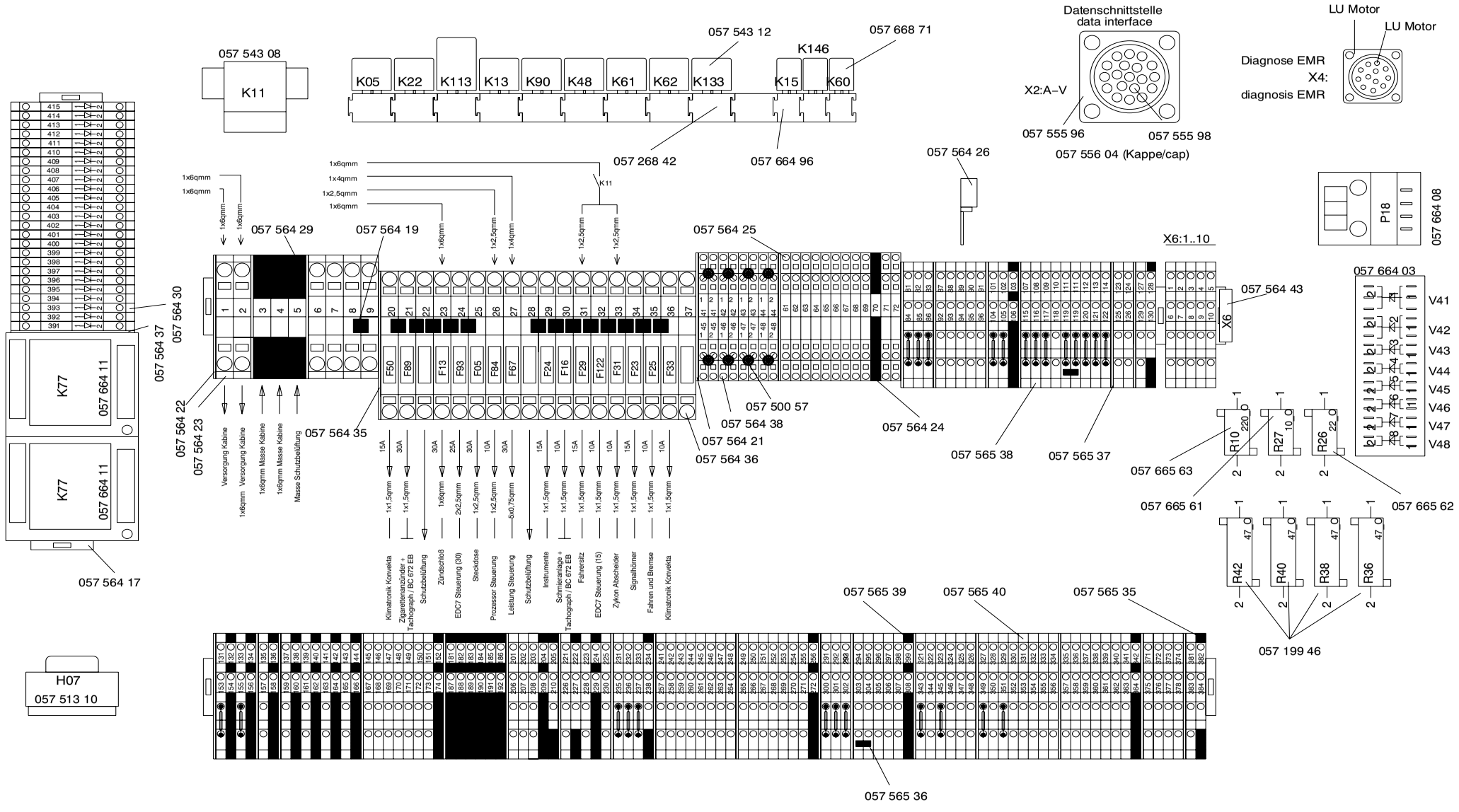
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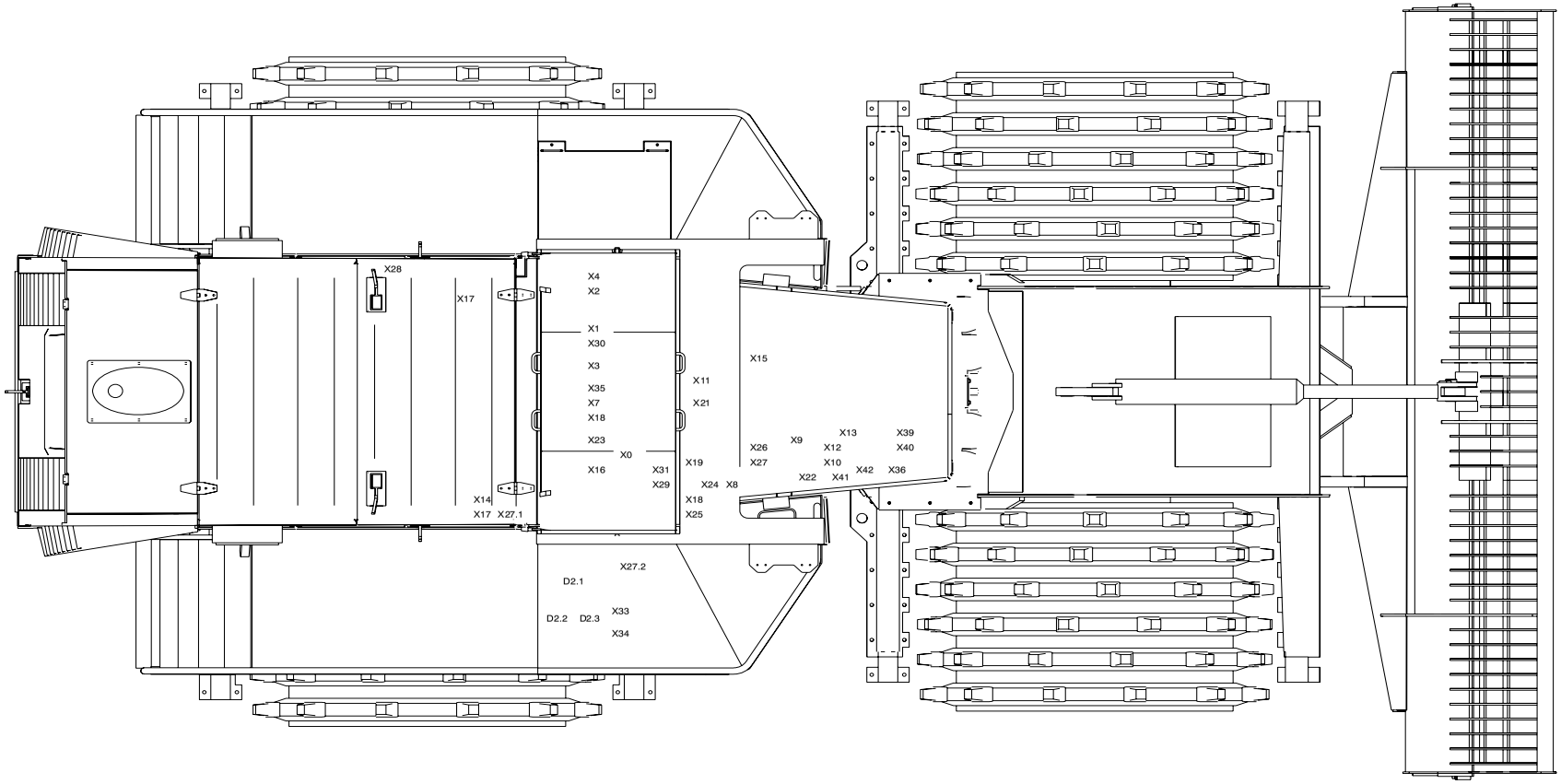
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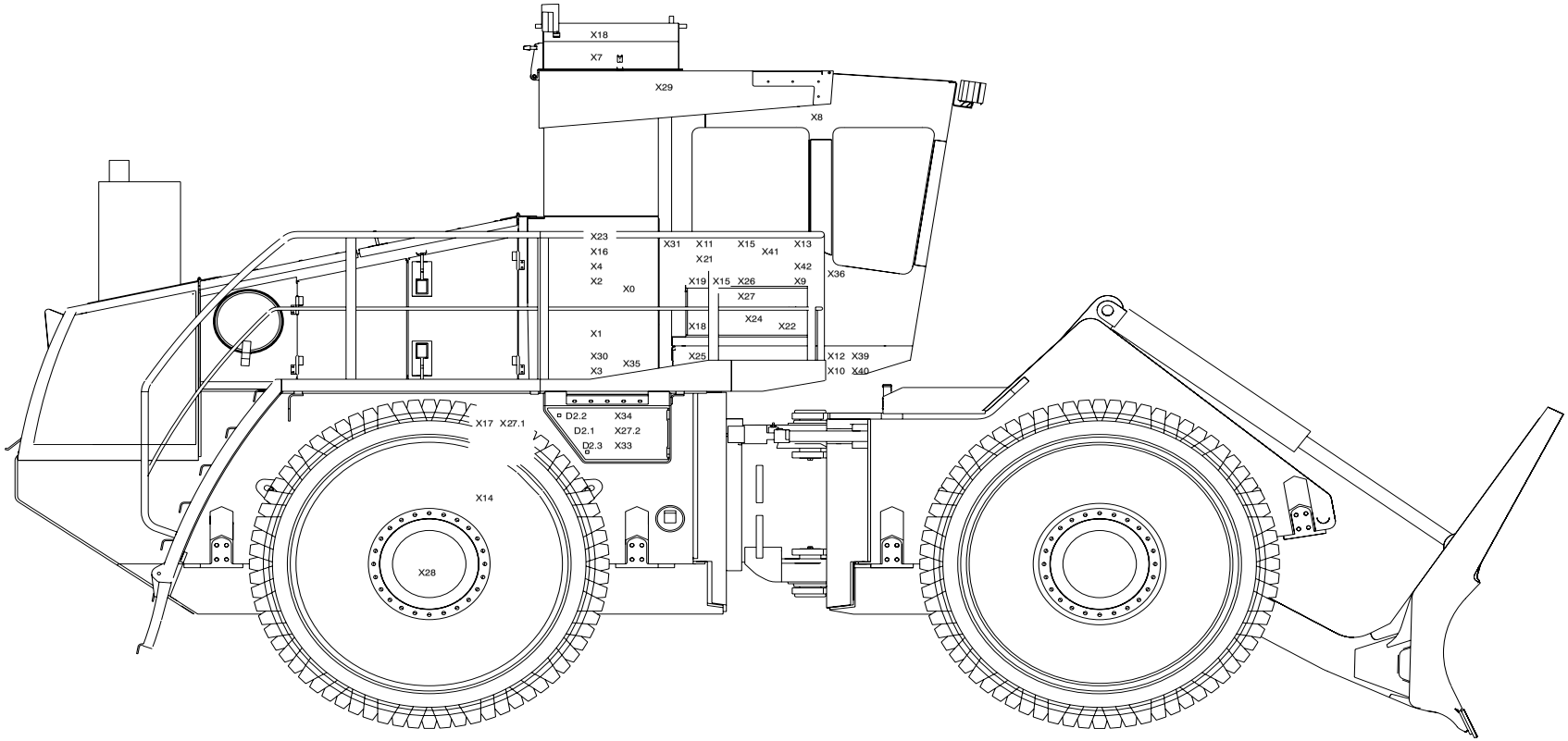
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Lokalisierungsgrafik Steckverbinder Draufsicht
localization graphic connectors top view



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		Gez.: 03.04.2006 Name: Werner		Lokalisierungsgrafik Steckverbinder Seitenansicht localization graphic connectors side view												Seite: 1 von: 1 page: 1 from: 1		570 700 35	
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19.3 Wiring diagram 570 700 37

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S/N Wiring diagram 570 700 37

S/N 101 570 571 007 ⇔ 101 570 571 011 BC 772 RS-2
S/N 101 570 581 021 ⇔ 101 570 581 034 BC 772 RB-2
S/N 101 570 591 007 ⇔ 101 570 591 008 BC 672 RB-2
S/N 101 570 821 005 ⇔ 101 570 821 007 BC 972 RB-2
S/N 101 570 831 015 ⇔ 101 570 831 021 BC 1172 RB-2
S/N 101 570 921 002 ⇔ 101 570 921 002 BC 772 EB-2

Standardverkabelung: standard wireing:	dicke Linien thick lines	Platinenverdrahtung: connection on printed circuit board:	dünne Linien thin lines

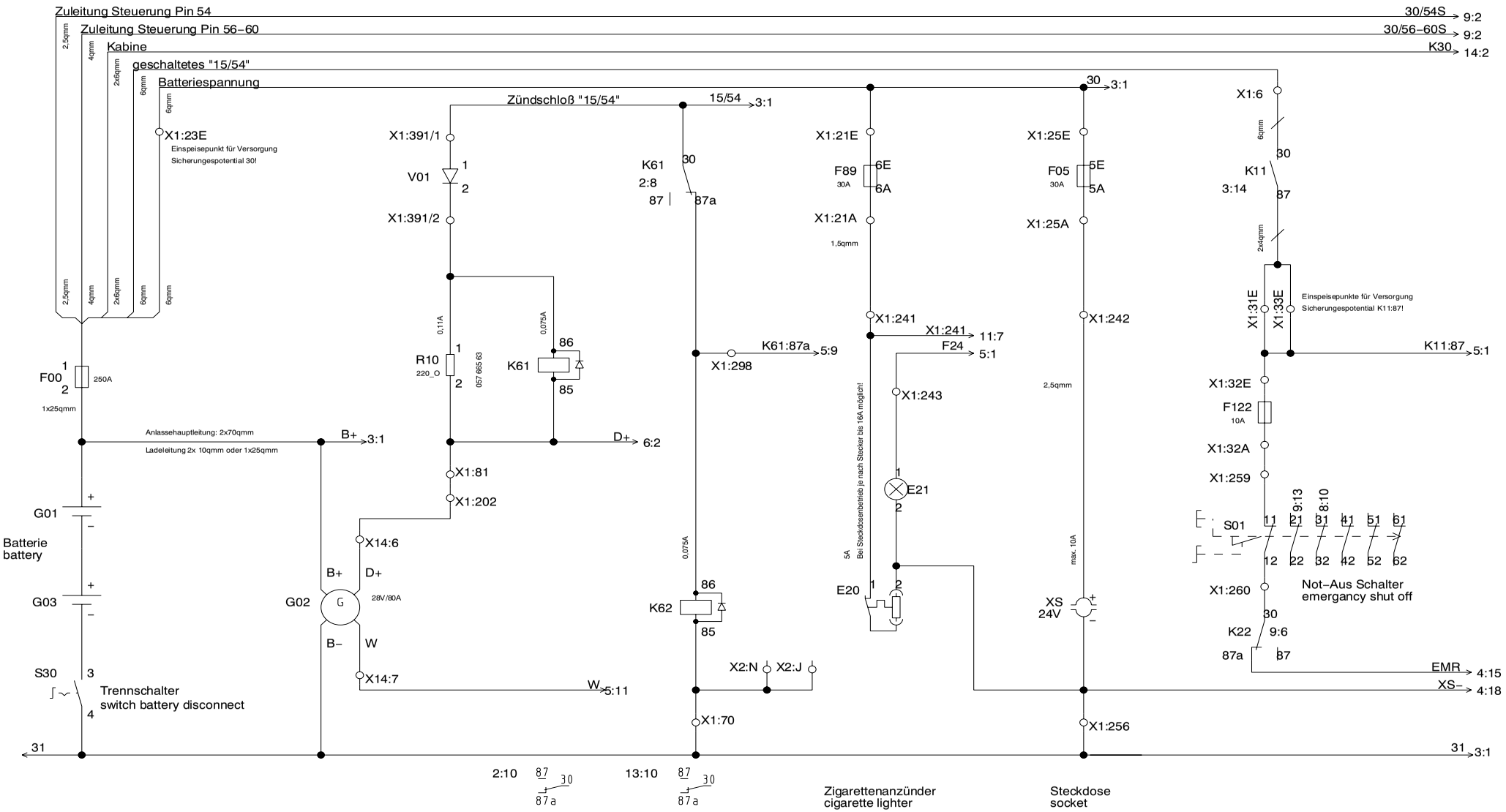
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002	vorläufig	Versorgung, Zigarettenanzünder	supply, cigarette lighter
003	vorläufig	Zündschloß, Starter	ignition switch, starter
004	vorläufig	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot.	DEUTZ controller EDC 7 for 6– and 8–zylinder engine
005	vorläufig	Instrumente	indicators
006	vorläufig	Anzeigen, Störmeldungen	monitoring, failure indication
007	vorläufig	Fahrpumpen, Radmotoren, Startfreigabe	driving pumps, weehl motors, starting release
008	vorläufig	Fahrstufen, Bremse, Verzögerungspedal	speed ranges, brakes, decelerator device
009	vorläufig	Versorgung Steuerung, Warnsummer, Override	supply controllers, warning buzzers, override
010	vorläufig	Lenkung und Arbeitshydraulik	steering and working hydraulic system
011	vorläufig	Hupe, Schmieranlage, Tachograph, Sitzfunktionen	horn, lubrication systhem, tachograph, seat funktions
012	vorläufig	Heizung und Belüftung	heating and ventilation
013	vorläufig	Schutzbelüftung, Zyklon Abscheider, Klimatronik	protected vent. system, cyclone separator, air cond.
014	vorläufig	Kabine und Anbauteile	cabin and attachment–parts
101	vorläufig	Bauteilliste	component listing
201	vorläufig	Schaltkasten	e–box
301	vorläufig	Lokalisierungsgrafik Steckverbinder Draufsicht	localization graphic connectors top view

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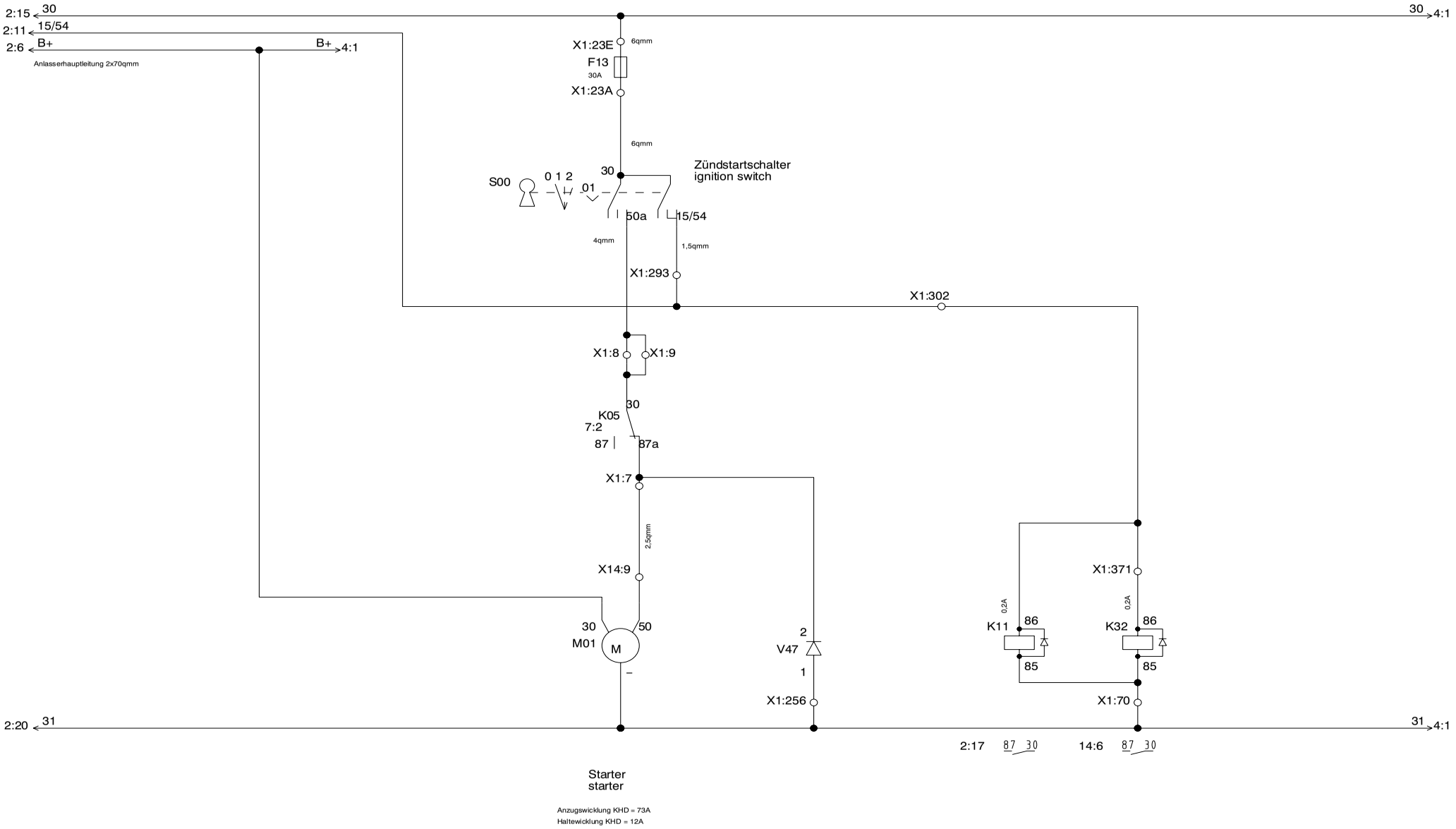
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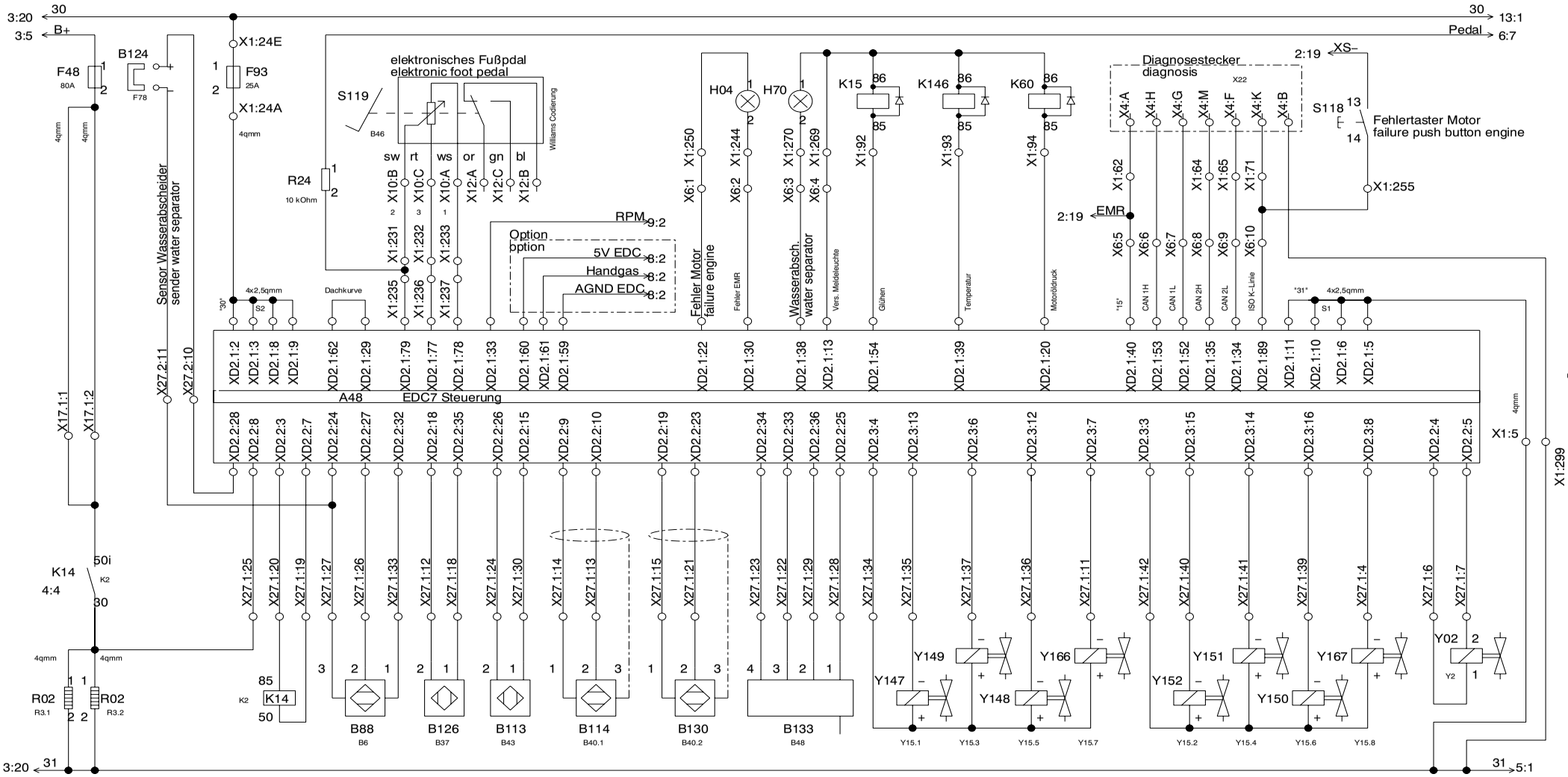
	Gez.: 28.08.2006 Name: Werner	Versorgung, Zigarettenanzünder supply, cigarette lighter	Seite: 1 von: 1 page: 1 from: 1	570 700 37
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 002



https://truckmanualshub.com/

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 28.08.2006 Name: Werner	Zündschloß, Starter ignition switch, starter	Seite: 1 von: 1 page: 1 from: 1	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 003	



Glühkerze 1
glow plug 1

Glühkerze 2
glow plug 2

Kraftstofftemperatur
fuel temperature

EMR Motoröldruck
EMR engine oil pressure

Kühlmitteltempratur
coolant temperature

Motordrehzahlsensor1
sender engine rpm 1

Motordrehzahlsensor 2
sender engine rpm 2

Sensor Ladeluftdruck / Temperatur
sensor charging air pressure / temperature

Injektor A1
jet pump A1

Injektor A3
jet pump A3

Injektor A4
jet pump A4

Injektor A2
jet pump A2

Injektor B3
jet pump B3

Injektor B2
jet pump B2

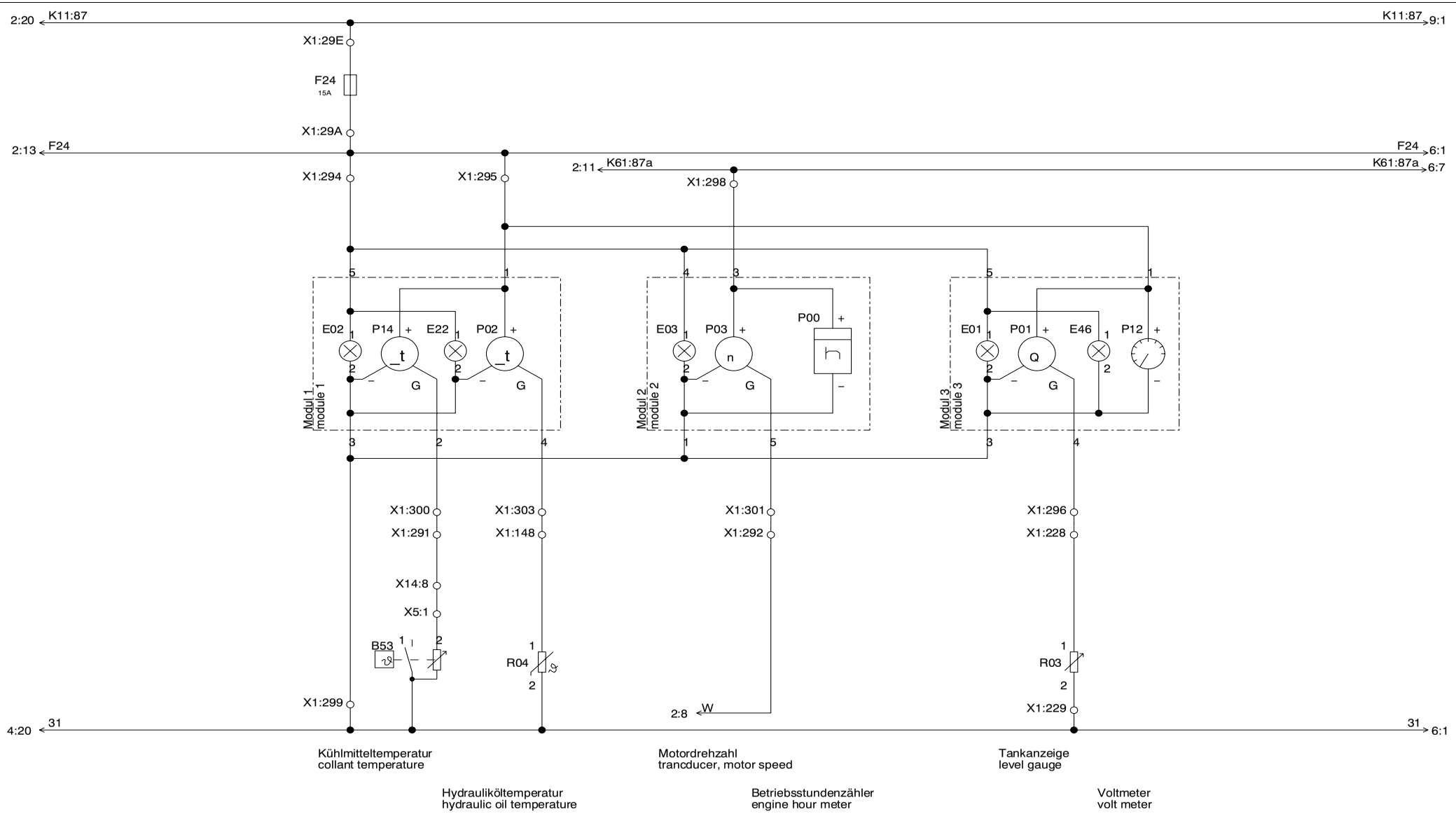
Injektor B1
jet pump B1

Injektor B4
jet pump B4

Mag.vent. Flammglühanlage
solenoid valve glow plug system

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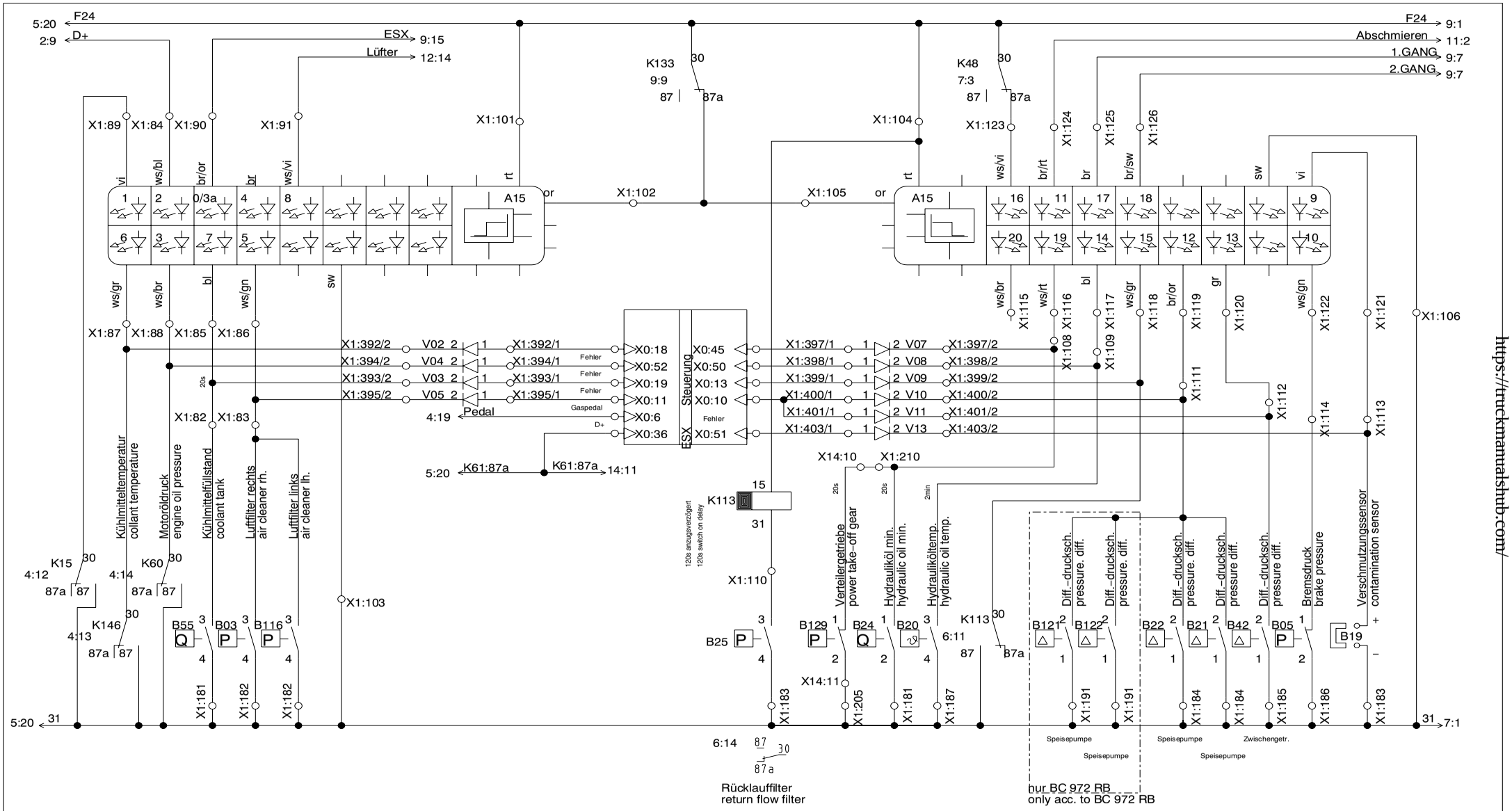
	Gez.: 28.08.2006 Name: Werner	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot. DEUTZ controller EDC 7 for 6– and 8–zylinder engine	Seite: 1 von: 1 page:	570 700 37
	Gepr.: 28.08.2006 Name: Seis 066_7		Ers.f.: Replaces:	Blatt Nr.: 004 sheet no.:



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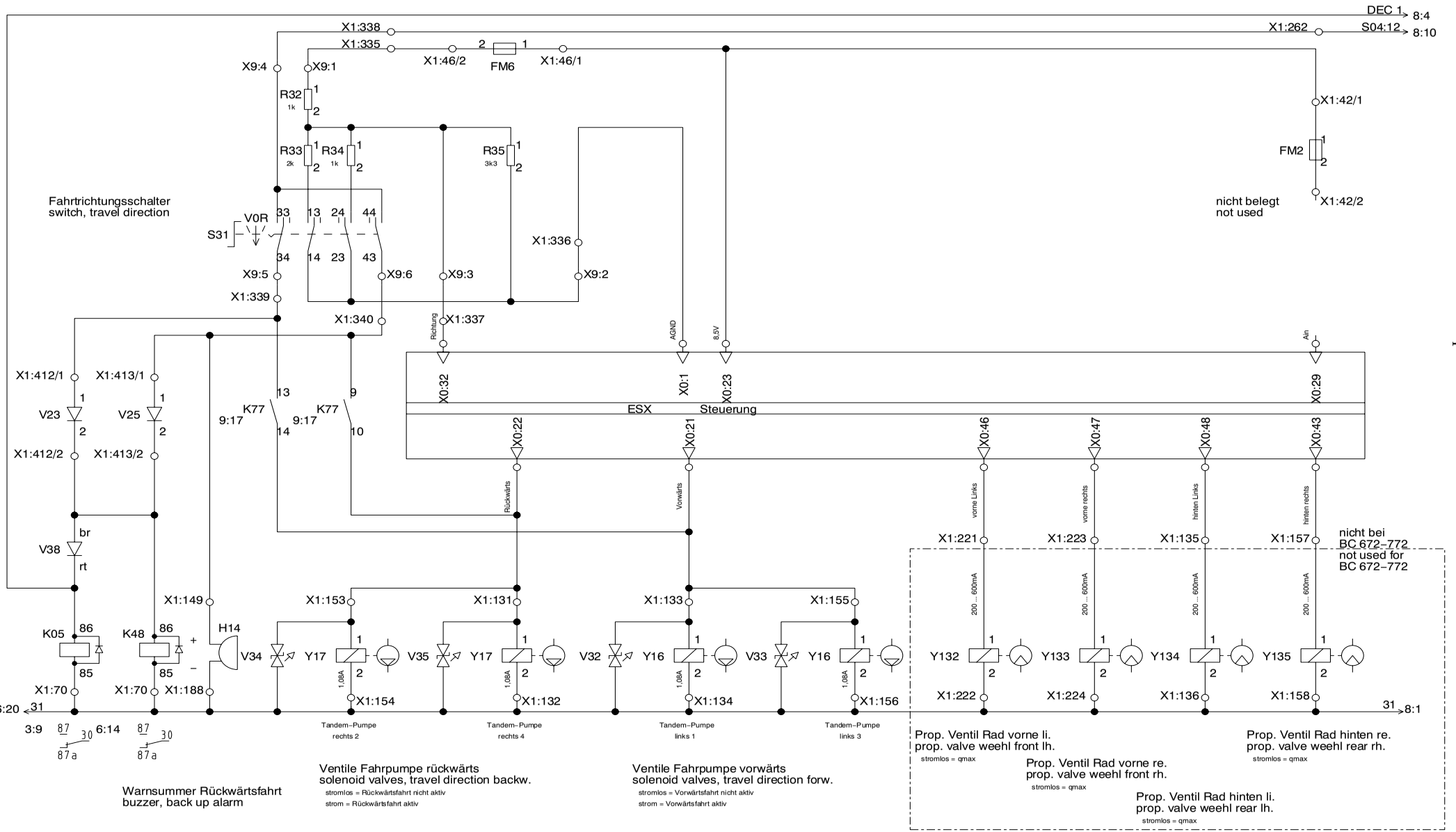
	Gez.: 28.08.2006 Name: Werner	Instrumente indicators	Seite: 1 von: 1 page: 1 from: 1	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 005	



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

	Gez.: 28.08.2006 Name: Werner	Anzeigen, Störmeldungen monitoring, failure indication	Seite: 1 von: 1 page:	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	006

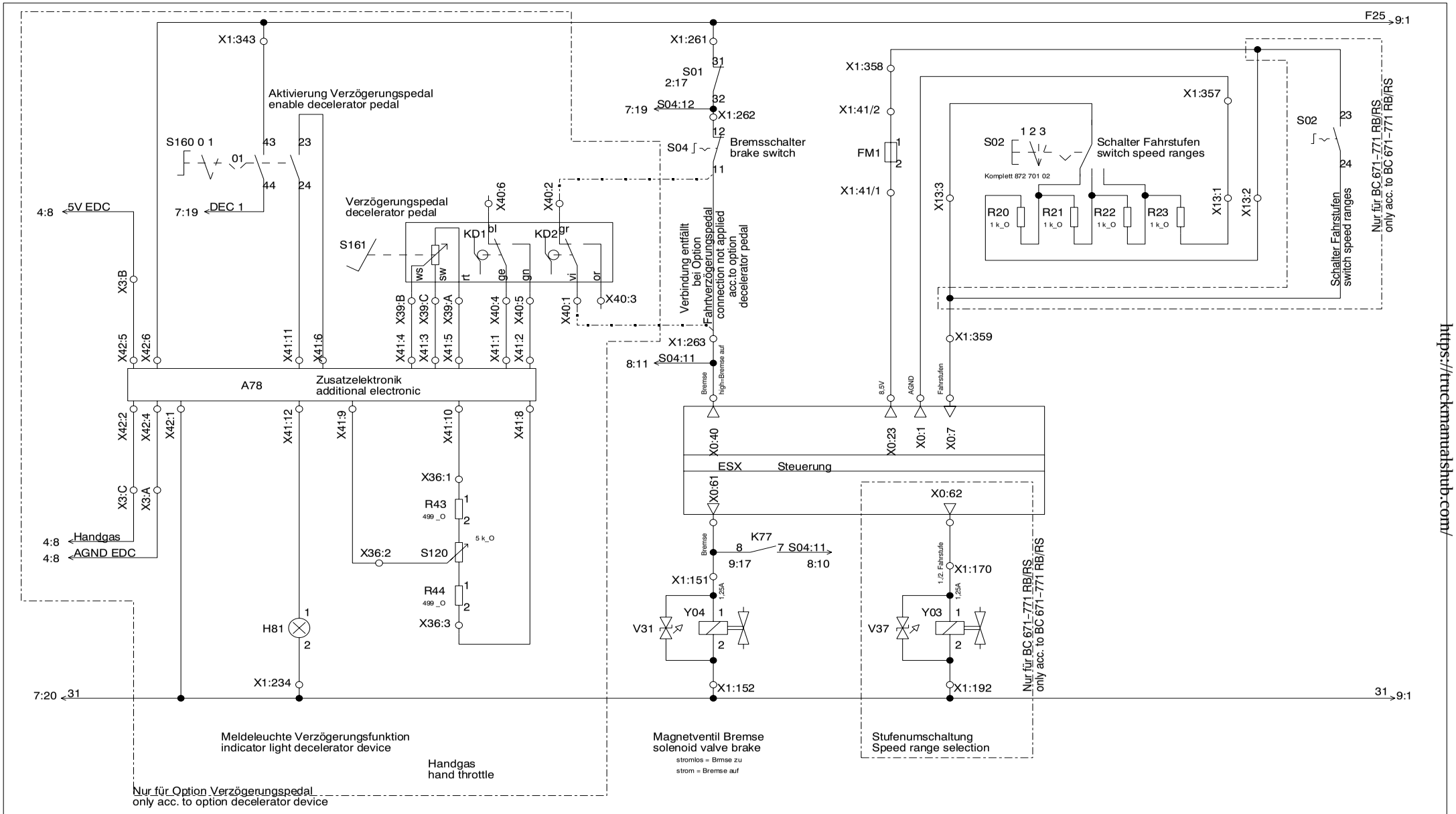
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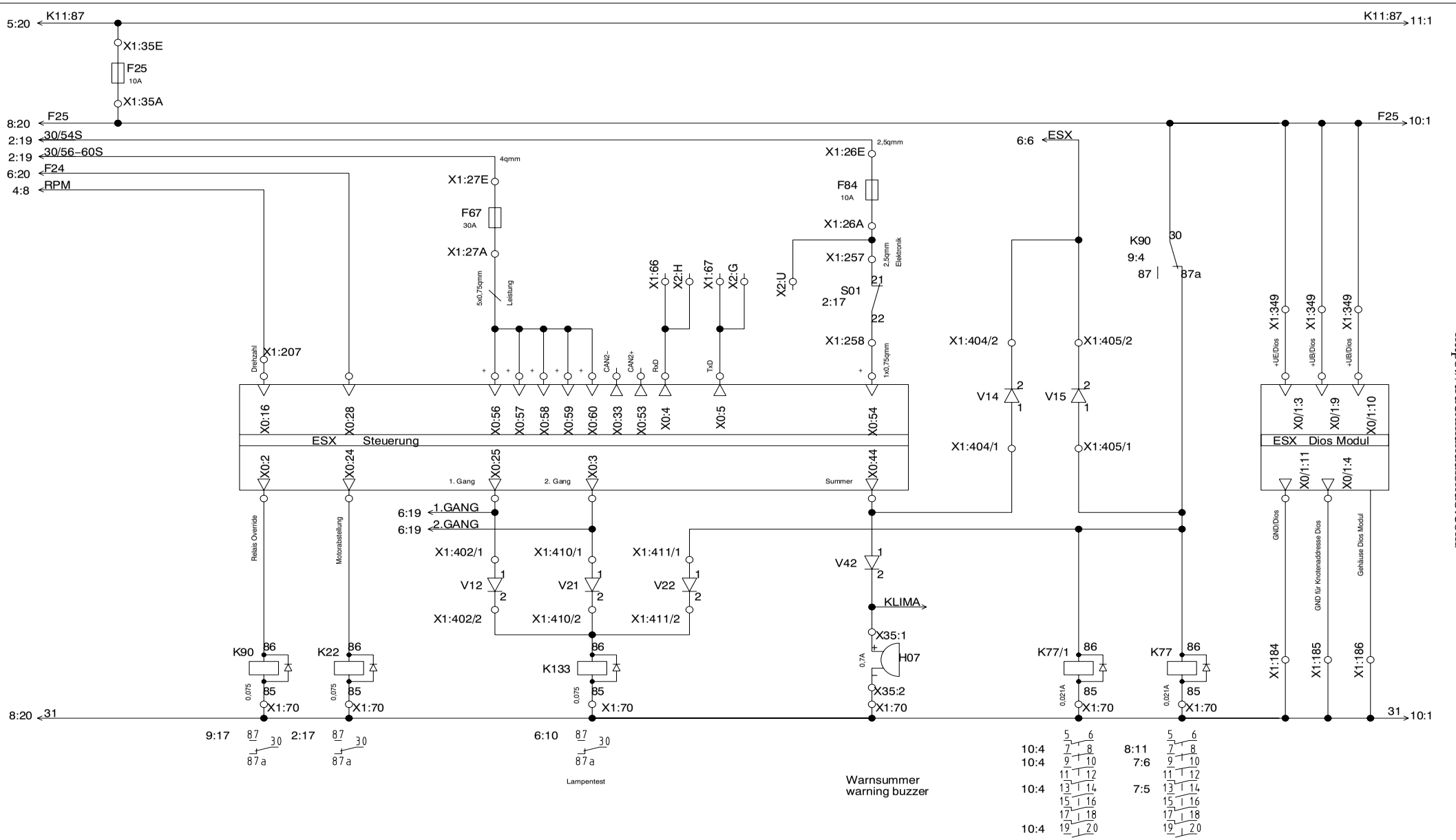
	Gez.: 28.08.2006 Name: Werner	Fahrpumpen, Radmotoren, Startfreigabe driving pumps, weehl motors, starting release	Seite: 1 von: 1 page: from:	570 700 37
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: 1 Replaces:	Blatt Nr.: 007 sheet no.:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 28.08.2006 Name: Werner	Fahrstufen, Bremse, Verzögerungspedal speed ranges, brakes, decelerator device	Seite: 1 page: von: 1 from:	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: 1 Replaces:	Blatt Nr.: 008 sheet no.:	

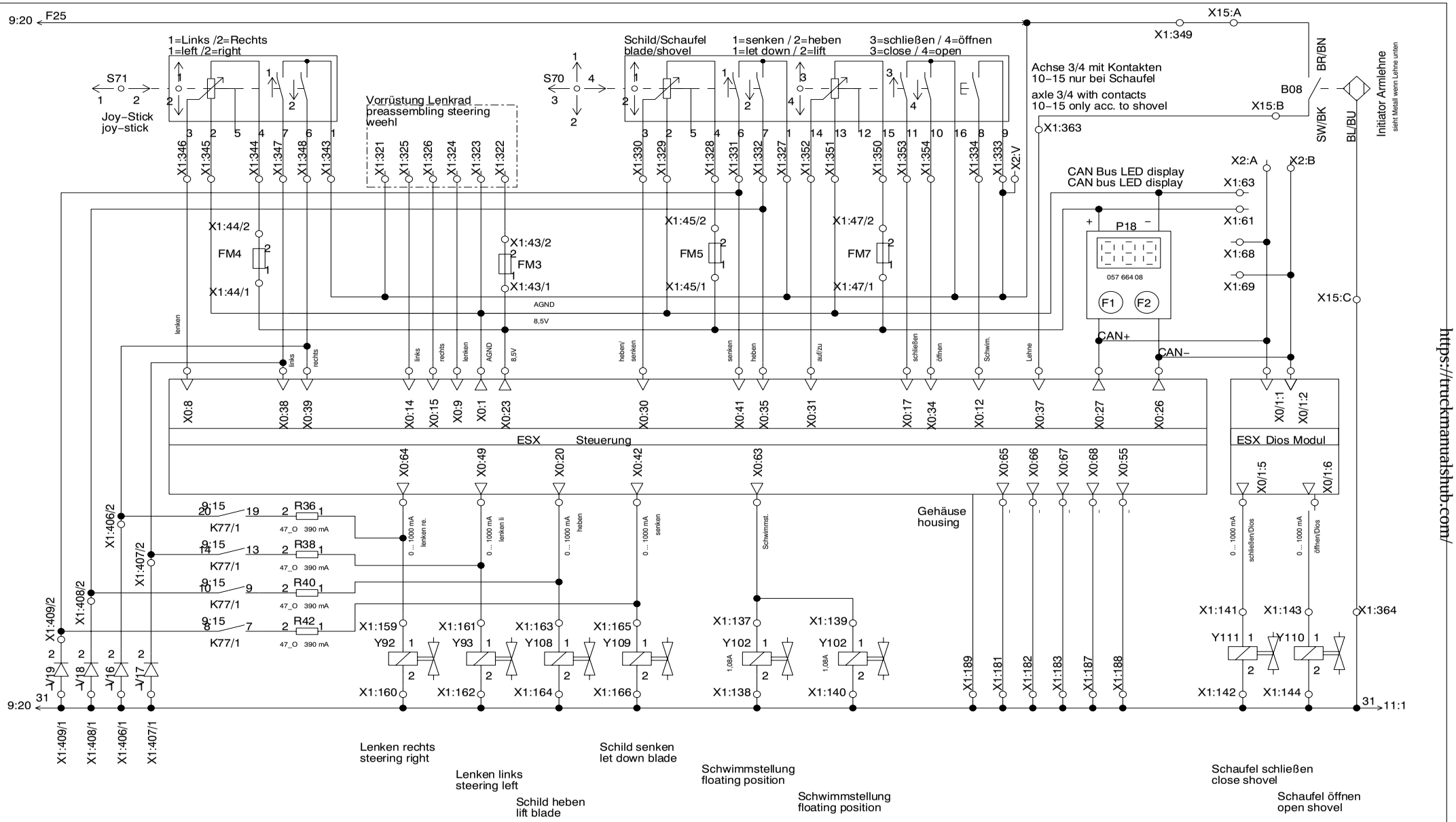
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	Gez.: 28.08.2006 Name: Werner	Versorgung Steuerung, Warnsummer, Override supply controllers, warning buzzers, override	Seite: 1 von: 1 page: 1 from: 1	570 700 37
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 009

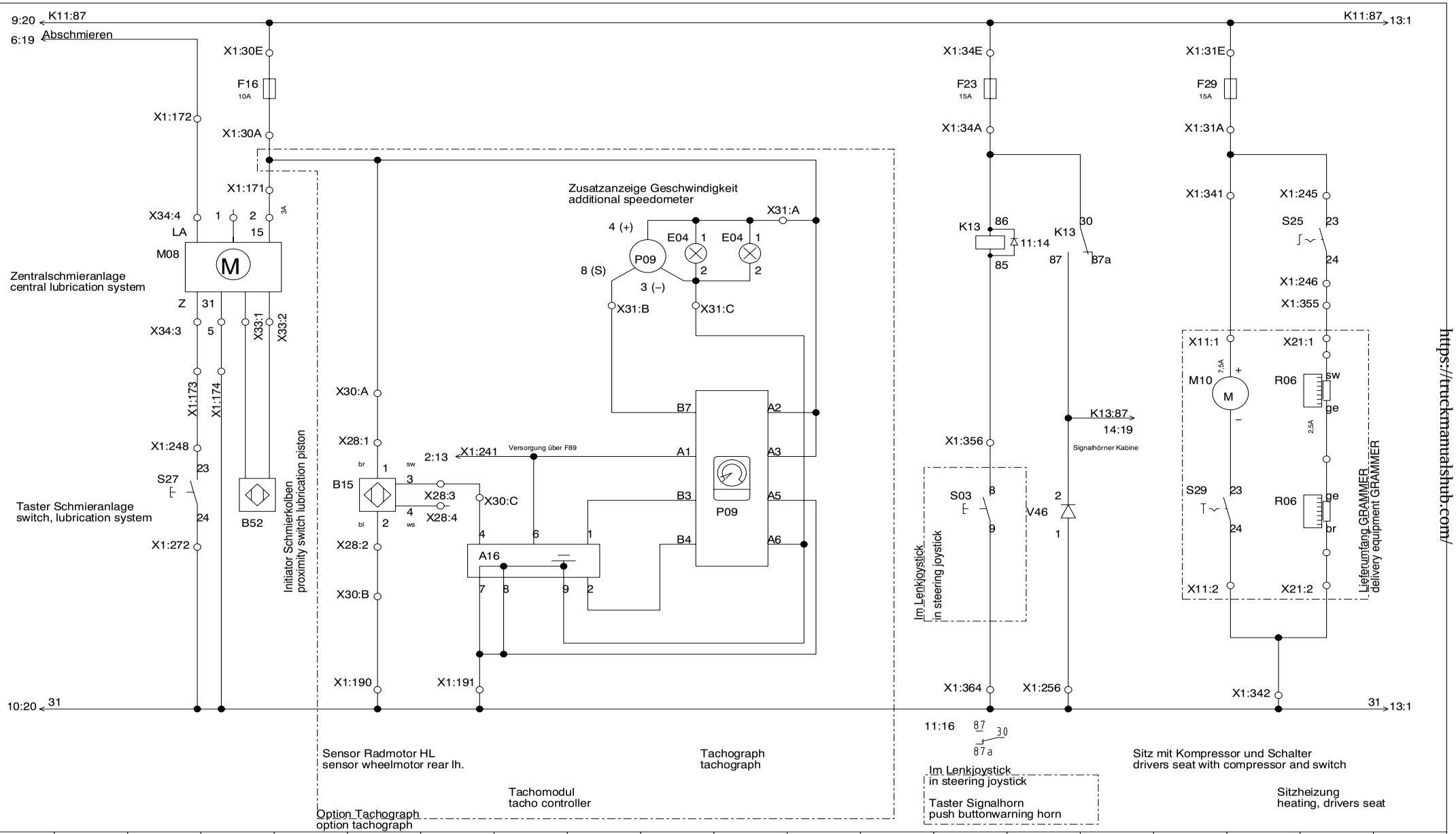
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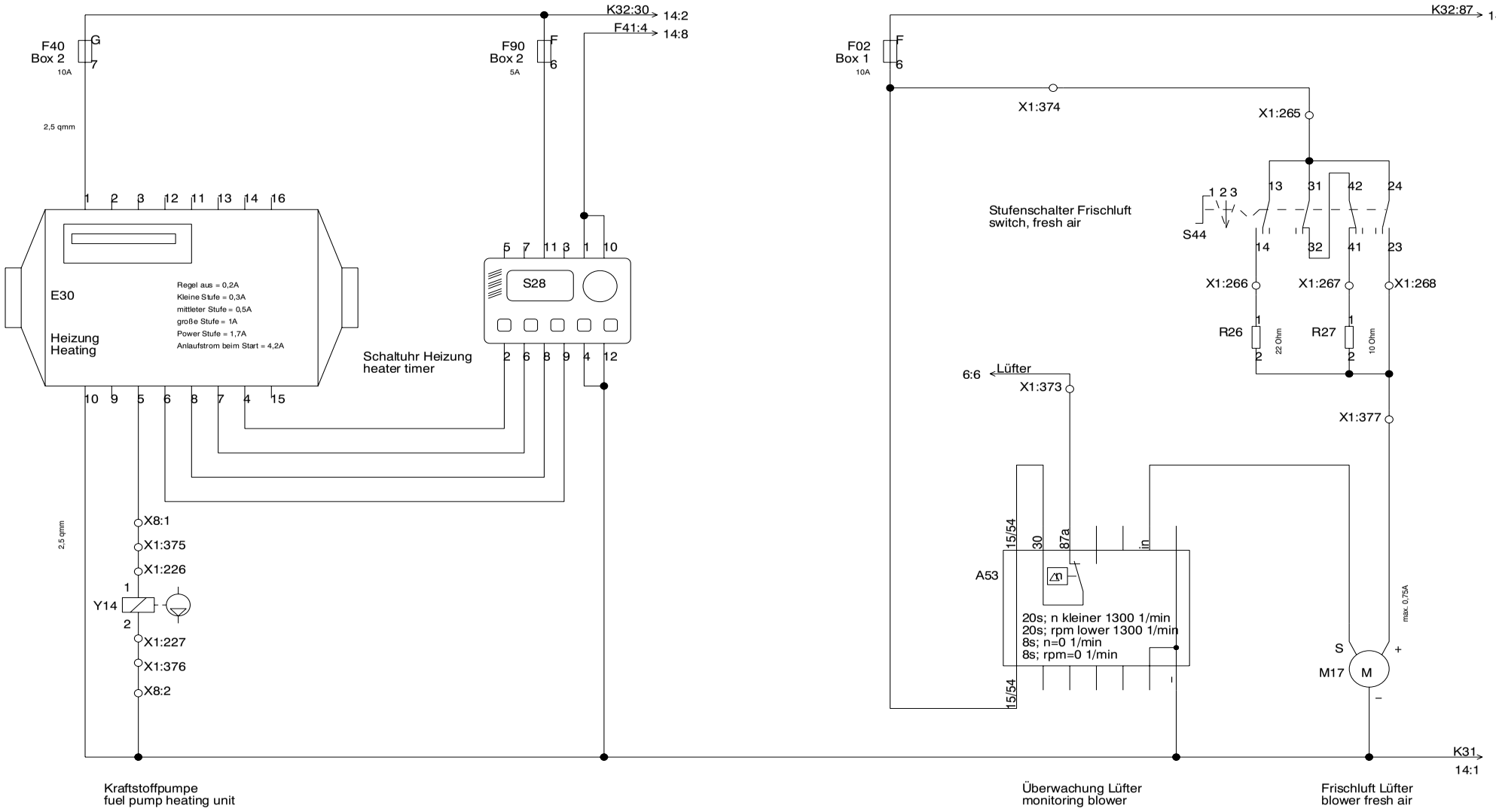
	Gez.: 28.08.2006 Name: Werner	Lenkung und Arbeitshydraulik steering and working hydraulic system	Seite: 1 von: 1 page:	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	010



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 28.08.2006 Name: Werner Gepr.: 28.08.2006 Name: Seis	Hupe, Schmieranlage, Tachograph, Sitzfunktionen horn, lubrication systhem, tachograph, seat funktions	Seite: 1 von: 1 page: 1 from: 1 Ers.f.: Replaces:
			570 700 37 Blatt Nr.: 011 sheet no.: 011

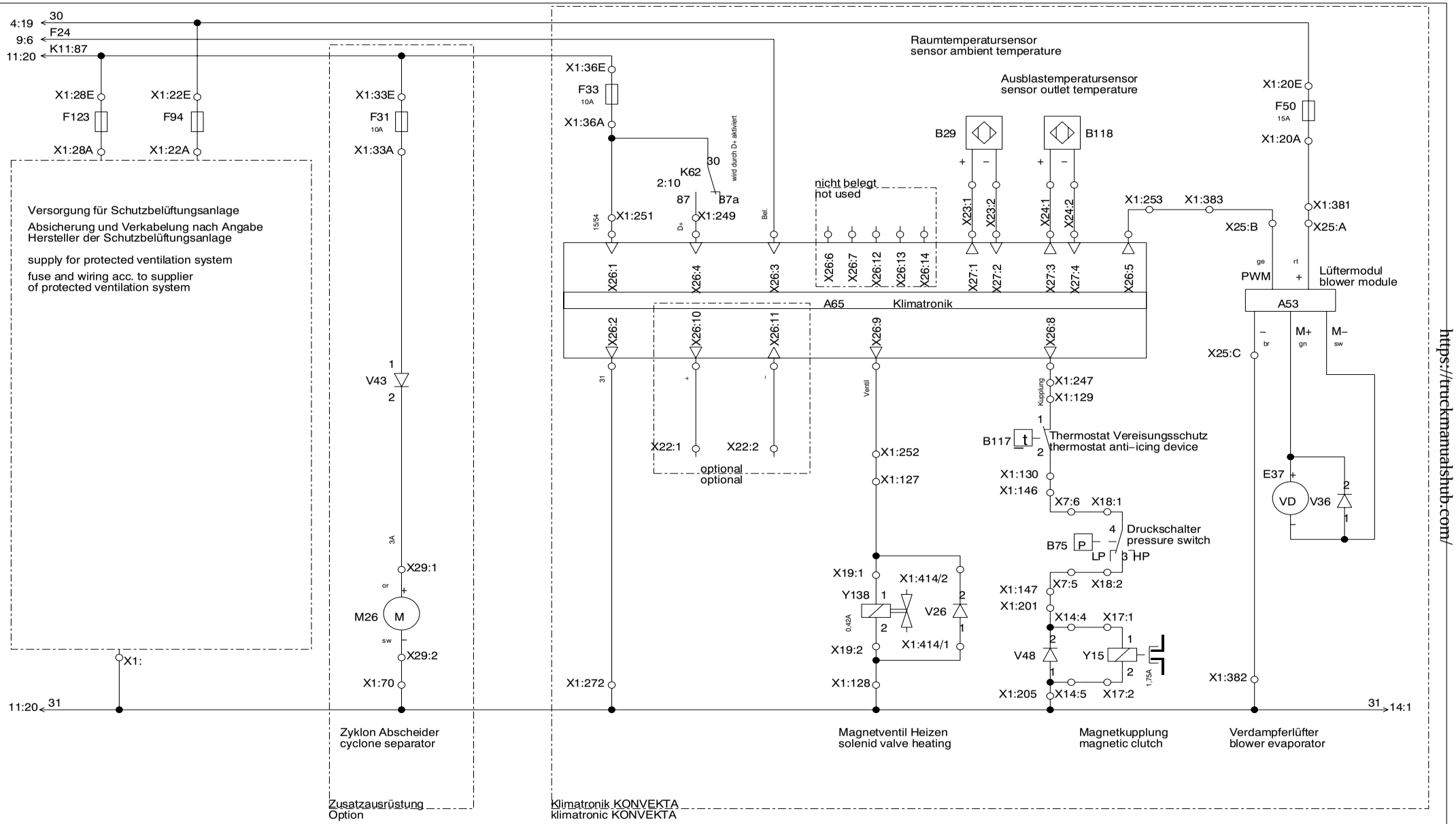
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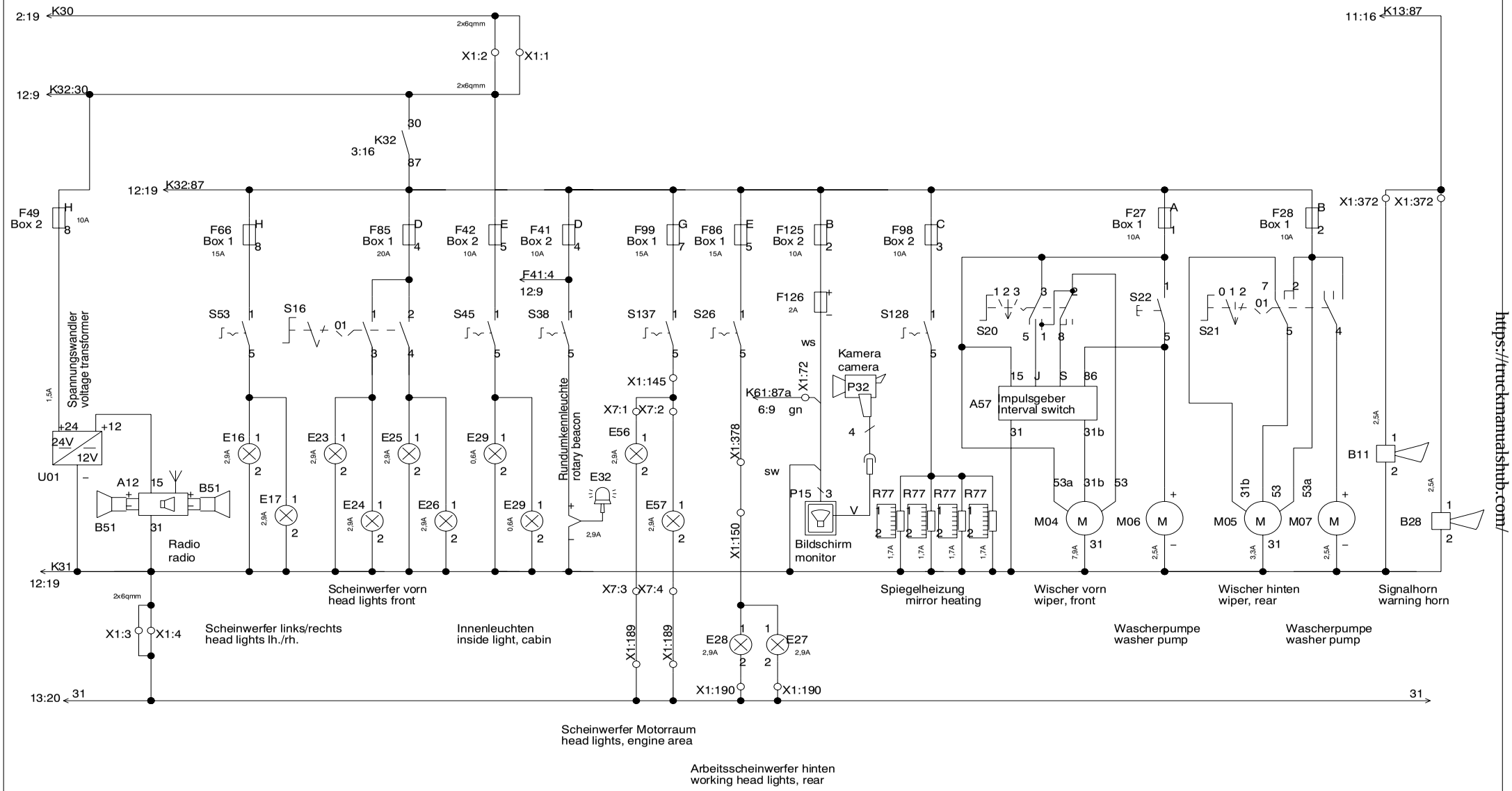
	Gez.: 28.08.2006 Name: Werner	Heizung und Belüftung heating and ventilation	Seite: 1 von: 1 page: from:	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	012



https://truckmanualshub.com/

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

		Gez.: 28.08.2006 Name: Werner		Schutzbelüftung, Zyklon Abscheider, Klimatronik protected vent. system, cyclone separator, air cond.												Seite: 1 von: 1 page:		570 700 37	
		Gepr.: 28.08.2006 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.:	013



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 28.08.2006 Name: Werner	Kabine und Anbauteile cabin and attachment-parts	Seite: page: 1 von: from: 1	570 700 37	
	Gepr.: 28.08.2006 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 014	

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Name	Bl.	Pf.	Benennung	Title	TYP
A12	014	2	Radio	Radio	
A15	006	7	Ueberwachungsmodul	monitoring module	
A15	006	13	Ueberwachungsmodul	monitoring module	
A16	011	9	Elektronik Tachograph	Electronic system, tachograph	
A48	004	9	Elektronische Motorsteuerung	Electronic engine management	
A53	012	14	Modul Luefterueberwachung	Modul blower monitoring	
A53	013	18	Modul Luefterueberwachung	Modul blower monitoring	
A57	014	14	Intervallschalter Scheibenwischer	Interval switch, wiper	
A65	013	14	Steuerung Klimatronik	Controller klimatronic	
A78	008	3	Zusatzelektronik	Additional control unit	
B03	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B05	006	18	Druckschalter Bremse	Pressure switch, brake	
B08	010	19	Naeherungsinitiator Fahrhebel '0'-Stell.	Proximity switch, travel lever '0' pos.	max. 1,08A
B11	014	19	Signalhorn	Warning horn	2,5A
B15	011	6	Aufnehmer Geschwindigkeit	Transducer, speed	
B19	006	19	Magnetsensor Verschmutzung	Magnetic sensor, contamination	
B20	006	13	Temperaturschalter Hydraulikoel	Temperature switch, hydraulic oil	
B21	006	17	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B22	006	16	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B24	006	12	Schwimmerschalter Hydraulikoel	Float switch, hydraulic oil	
B25	006	11	Druckschalter Ruecklauffilter	Pressure switch, return flow filter	
B28	014	20	Signalhorn	Warning horn	2,5A
B29	013	14	Raumthermostat	Room thermostat	
B42	006	17	Differenzdruckschalter Hydraulikoel	Hydraulic oil pressure differential switch	
B51	014	2	Lautsprecher Radio	Speaker radio	
B51	014	3	Lautsprecher Radio	Speaker radio	
B52	011	4	Naeherungsinitiator Schmierkolben	Proximity switch, lubrication piston	
B53	005	6	Temperaturgeber Kuehlmittel	Temperature switch, collant	
B55	006	3	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B75	013	16	Kuehlmitteldruck	coolant pressure	
B88	004	5	Druckgeber Motoroel	Sender, engine oil pressure	
B113	004	7	EMR Temperaturgeber Kuehlmittel	EMR Temperature switch, collant	
B114	004	8	EMR Aufnehmer, Motordrehzahl 1	EMR Trancducer, engine speed 1	
B116	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B117	013	15	Thermostat Klimaanlage	Thermostar, air conditioning	
B118	013	15	Temperaturfühler Auslaß	Temperature sender outlet	
B121	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B122	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B124	004	3	Geber Wasserstandsabscheider Diesel	Sender, water separator fuel	
B126	004	6	EMR Temperaturgeber Kraftstoff	EMR fuel temperature sender	
B129	006	12	Druckschalter Verteilergetriebe	pressure switch power take-off gear	
B130	004	9	EMR Aufnehmer, Motordrehzahl 2	EMR Trancducer, engine speed 2	
B133	004	11	Sensor Ladeluftdruck / -temperatur	sesnor charging air prssure / temperature	
E01	005	14	Beleuchtung Tankanzeige	Illumination, level gauge	
E02	005	5	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	
E03	005	10	Beleuchtung Drehzahlmesser	Illumination, rpm meter	
E04	011	10	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E04	011	11	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E16	014	4	Scheinwerfer links	Head light, lh.	55W
E17	014	4	Scheinwerfer rechts	Head light, rh.	55W
E20	002	12	Zigarettenanzuender	Cigarette lighter	
E21	002	12	Beleuchtung Zigarettenanzuender	Illumination, cigarette lighter	
E22	005	7	Beleuchtung Temperaturanzeige Hydr.-oel	Illumination, temp. gauge, hydraulic oil	
E23	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E24	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E25	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E26	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E27	014	11	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	55W
E28	014	10	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	55W
E29	014	7	Innenleuchte Kabine	Inside light, cabin	15W
E29	014	8	Innenleuchte Kabine	Inside light, cabin	15W
E30	012	3	Heizgeraet	Heating unit	
E32	014	8	Kennleuchte	Warning light	70W
E37	013	18	Klimaverdampfer	Air conditioning, evaporator	
E46	005	15	Beleuchtung Voltmeter	Illumination volt meter	
E56	014	9	Scheinwerfer Motorraum rechts	Head light, engine area rh.	55W
E57	014	9	Scheinwerfer Motorraum links	Head light, engine area lh.	55W
ESX	006	9	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	007	12	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	008	10	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	5	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	18	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	010	8	Elektronisches Steuergeraet	Electronic system, control unit	max. 1,08A
ESX	010	18	Elektronisches Steuergeraet	Electronic system, control unit	0,2A
F00	002	2	Hauptsicherung Batterie	Fuse, main, battery	250A
F02	012	12	Ersatzsicherung	Fuse, spare	10A
F05	002	15	Sicherung Steckdose	Fuse, socket	30A
F13	003	9	Sicherung Startschalter	Fuse, starter switch	30A
F16	011	4	Sicherung Zentralschmieranlage	Fuse, central lubrication system	10A
F23	011	14	Sicherung Signalhorn	Fuse, warning horn	15A
F24	005	5	Sicherung Ueberwachungsmodul	Fuse, monitoring module	15A
F25	009	2	Sicherung Magnetv. Fahren u. Bremse	Fuse, sol. valve, travel and brake	10A
F27	014	16	Sicherung Wischer u. Wascher vorne	Fuse, windscr. wiper and washer, fr.	10A
F28	014	18	Sicherung Wischer u. Wascher hinten	Fuse, windscr. wiper and washer, re.	10A
F29	011	18	Sicherung Kompressor Sitzverstell.	Fuse, compr., seat height adjustm.	15A
F31	013	6	Sicherung Kabinenluefter	Fuse, cabin ventilator	10A
F33	013	9	Sicherung Klimageraet	Fuse, air conditioning	10A
F40	012	3	Sicherung Kabinenheizung	Fuse, heating unit cab	10A
F41	014	8	Sicherung Rundumkennleuchte	Fuse, rotary beacon	10A
F42	014	7	Sicherung Kabineninnenleuchte	Fuse, inside light cab	10A
F48	004	2	Sicherung Gluehanlage	Fuse, glow plug system	80A
F49	014	1	Sicherung Spannungswandler	Fuse, voltage transformer	10A
F50	013	19	Sicherung Klimageraet	Fuse, air conditioning	15A
F66	014	4	Sicherung Scheinwerfer vorne	Fuse, head light front	15A
F67	009	7	Sicherung Steuerung (Potential 30)	Fuse, controller (pot.30)	30A
F84	009	13	Sicherung Steuerung (Klemme 54)	Fuse, controller (Pin 54)	10A

Gez.: 28.08.2006
Name: Werner
Gepr.: 28.08.2006
Name: Seis

Bauteilliste
component listing

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Blatt Nr.: 101
sheet no.:

570 700 37

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Name	Bl.	Pf.	Benennung	Benennung	TYP
F85	014	6	Sicherung, Scheinwerfer vorne	Fuse, head light front	20A
F86	014	10	Sicherung, Scheinwerfer hinten	Fuse, head lights rear	15A
F89	002	12	Sicherung, Zigarettenanzuender	Fuse, cigarette lighter	30A
F90	012	8	Sicherung, Ansteuerung	Fuse, actuation	5A
F93	004	4	Sicherung Steuerung (Potential 30)	Fuse, controller (pot. 30)	25A
F94	013	3	Sicherung Schutzbelueftung	Fuse, protected ventilation syst.	
F98	014	13	Sicherung Spiegelheizung	fuse,mirror heating	10A
F99	014	9	Sicherung Motorraumbeleuchtung	fuse, illumination engine area	15A
FM1	008	13	Platinensicherung	Multifuse	0,2A
FM2	007	19	Platinensicherung	Multifuse	0,2A
FM3	010	8	Platinensicherung	Multifuse	0,2A
FM4	010	4	Platinensicherung	Multifuse	0,2A
FM5	010	11	Platinensicherung	Multifuse	0,2A
FM6	007	7	Platinensicherung	Multifuse	0,2A
FM7	010	13	Platinensicherung	Multifuse	0,2A
F122	002	17	Sicherung EMR	Fuse, EMR	10A
F123	013	2	Sicherung Schutzbelüftungsanlage	Fuse, protected ventilation system	
F125	014	11	Vorsicherung	pre-fusing	10A
F126	014	11	Sicherung Rückfahrkamera	Fuse, back up camera system	2A
G01	002	2	Batterie	Battery	
G02	002	5	Generator	Generator	28V/80A
G03	002	2	Batterie	Battery	
H04	004	10	Meldeleuchte Betriebsstoerung	Indicator light, breakdown	
H07	009	13	Warnsummer Betriebsstoerung	Warning buzzer, breakdown	0,2A
H14	007	4	Warnsummer Rueckwaertsfahrt	Back-up alarm buzzer	max. 2,5A
H70	004	11	Anzeige Wasser im Diesel	Indicator water in fuel	
H81	008	5	Meldeleuchte Verzögerungsfunktion	Indicator light, decelerator device	
K05	007	2	Relais Startstrom	Relay, starting current	BOSCHW
K11	003	14	Relais Klemme 30 auf 15	Relay, terminal 30 to 15	BOSCHL
K13	011	14	Relais Signalhorn	Relay, warning horn	BOSCHW
K14	004	4	Relais Vorgluehen	Relay, glow plug system	K2DEUTZ
K15	004	12	Relais Gluehen beim Start	Relay, glowing during starting	BOSCHW
K22	009	6	Relais Hubmagnet Motor	Relay, shut off solenoid, engine	BOSCHW
K32	003	16	Relais Kabine	Relay, cabin	BOSCHL
K48	007	3	Relais Fahrhebel 0-Stellung	Relay, travel lever 0-position	BOSCHW
K60	004	14	Relais Motoroeldruck	Relay, engine oil pressure	BOSCHW
K61	002	8	Relais Ladekontrolle	Relay, charge control	BOSCHW
K62	002	10	Relais D+	Relay, D+	BOSCHW
K77	009	17	Relais Override	Relay, override	SDS/SF4
K90	009	4	Relais, Meldeleuchte Stoerung SPS	Relay, indicat.light brake down SPS	BOSCHW
K113	006	11	Zeitrelais	Timing relay	BOSCHW
K133	009	9	Relais Test	Relay, test	BOSCHW
K146	004	13	Relais Kühlmitteltemperatur	relay, coolant temperature	BOSCHW
K77/1	009	15	Relais Override	Relay, override	SDS/SF4
M01	003	9	Starter	Starter	
M04	014	15	Scheibenwischermotor vorne	Windscreen wiper motor, front	190W
M05	014	17	Scheibenwischermotor hinten	Windscreen wiper motor, rear	max 3,3A
M06	014	16	Scheibenwaschermotor vorne	Windscreen washer motor, front	60W
M07	014	18	Scheibenwaschermotor hinten	Windscreen washer motor, rear	60W
M08	011	3	Zentralschmieranlage	Central lubrication system	max. 3A
M10	011	18	Kompressor Fahrersitzhoehenverstellung	Compr., operator's seat height adjustm.	7,5A
M17	012	18	Zusatzluefter	Additional blower	max. 0,75A
M24	013	10	Stellmotor Luftklappe	adjusting motor air inlet flap	
M26	013	6	Zyklon Abscheider	cyclone separator	3A
P00	005	12	Betriebsstundenzaehler	Operating hour meter	
P01	005	15	Tankanzeige	Level gauge	
P02	005	7	Temperaturanzeige Hydraulikoel	Temperature gauge, hydraulic oil	
P03	005	11	Drehzahlmesser	Rpm meter	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P12	005	16	Voltmeter	Volt meter	
P14	005	6	Anzeige Kuehlmitteltemperatur	Temperature gauge, coolant	
P15	014	11	BCM 03 Bildschirm	BCM 03 terminal	
P18	010	16	Diagnose	Diagnostics	max. 1,08A
P32	014	12	Kamera Rückraumüberwachung	Camera, back up monitoring	
R02	004	2	Gluehkerze	Glow plug	
R02	004	2	Gluehkerze	Glow plug	
R03	005	15	Geber Tankanzeige	Sender, level gauge	
R04	005	8	Geber Hydraulikoeltemperatur	Sender, hydraulic oil temp.	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R10	002	7	Parallelwiderstand	Parallel resistor	220 OHM
R20	008	15	Widerstand	Resistor	1 KOHM
R21	008	15	Widerstand	Resistor	1 KOHM
R22	008	16	Widerstand	Resistor	1 KOHM
R23	008	17	Widerstand	Resistor	1 KOHM
R24	004	5	Widerstand	Resistor	10 kOHM
R26	012	17	Widerstand	Resistor	22 OHM
R27	012	18	Widerstand	Resistor	10 OHM
R32	007	5	Widerstand	Resistor	1 kOhm
R33	007	5	Widerstand	Resistor	2 kOhm
R34	007	6	Widerstand	Resistor	1 kOhm
R35	007	8	Widerstand	Resistor	3,3 kOhm
R36	010	5	Widerstand	Resistor	47 OHM
R38	010	5	Widerstand	Resistor	47 OHM
R40	010	5	Widerstand	Resistor	47 OHM
R42	010	5	Widerstand	Resistor	47 OHM
R43	008	7	Widerstand	Resistor	499Ohm
R44	008	7	Widerstand	Resistor	499Ohm
R77	014	12	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	14	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W

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Name	Bl.	Pf.	Benennung		TYP
S00	003	9	Startschalter	Starter switch	MERIT
S01	002	17	Schalter NOT AUS	Switch, emergency off	NOTAUSH
S01	002	17	Schalter NOT AUS	Switch, emergency off	
S02	008	16	Fahrstufenschalter	Switch, speed range selector	
S02	008	19	Fahrstufenschalter	Switch, speed range selector	
S03	011	14	Taster Signalhorn	Push button, warning horn	
S04	008	10	Bremsschalter	Switch, brake	
S16	014	5	Schalter Arbeitsbeleuchtung vorne	Switch, working head lights, front	
S20	014	14	Schalter Scheibenwischer vorne	Switch, windscreen wiper, front	
S21	014	18	Schalter Scheibenwischer hinten	Switch, windscreen wiper, rear	
S22	014	16	Schalter Scheibenwascher vorne	Switch, windscreen washer, front	
S25	011	19	Schalter Fahrersitzheizung	Switch, heating, operator's seat	
S26	014	10	Schalter Arbeitsbeleuchtung hinten	Switch, working head lights, rear	
S27	011	3	Taster Zentralschmieranlage	Push botton, central lubrication system	
S28	012	8	Schalter Kabinenheizung	Switch, cabin heating	
S29	011	18	Schalter Fahrersitz Hoehenverstellung	Switch, operator's seat height adjustm.	
S30	002	2	Batterietrennschalter	Switch, battery disconnect	
S31	007	5	Schalter Fahrtrichtung	Switch, travel direction	
S38	014	8	Schalter Kennleuchte	Switch, warning light	
S44	012	17	Schalter Kabinenluefter	Switch, cabin ventilator	
S45	014	7	Schalter Kabineninnenleuchte	Switch, cabin inside light	
S53	014	4	Schalter Arbeitsbeleuchtung	Switch, working lights	
S70	010	10	Schalter Schubsschild	Switch, dozer blade	WAGO
S71	010	3	Schalter Lenkung	Switch, steering	max. 1,08A
S118	004	18	Schalter Fehlerdiagnose	Switch, fault diagnosis	
S119	004	6	Elektronisches Fusspedal	Electronic foot pedal	
S120	008	7	Schalter Motordrehzahl	Switch, engine speed	5 kOhm
S128	014	13	Schalter Spiegelheizung	Switch, mirror heating	
S137	014	9	Schalter Motorraumbeleuchtung	Switch, illumination engine area	
S160	008	4	Schalter Aktivierung Verzögerungspedal	Switch, enable decelerator pedal	
S161	008	6	Verzögerungspedal	decelerator pedal	
U01	014	1	Spannungswandler	Voltage transformer	
V01	002	7	Diode	Diode	WAGO
V02	006	7	Diode	Diode	WAGO
V03	006	7	Diode	Diode	WAGO
V04	006	7	Diode	Diode	WAGO
V05	006	7	Diode	Diode	WAGO
V07	006	12	Diode	Diode	WAGO
V08	006	12	Diode	Diode	WAGO
V09	006	12	Diode	Diode	WAGO
V10	006	12	Diode	Diode	WAGO
V11	006	12	Diode	Diode	WAGO
V12	009	7	Diode	Diode	WAGO
V13	006	12	Diode	Diode	WAGO
V14	009	14	Diode	Diode	Wago
V15	009	15	Diode	Diode	Wago
V16	010	2	Diode	Diode	WAGO
V17	010	3	Diode	Diode	WAGO
V18	010	2	Diode	Diode	WAGO
V19	010	2	Diode	Diode	WAGO
V21	009	9	Diode	Diode	WAGO
V22	009	10	Diode	Diode	WAGO
V23	007	2	Diode	Diode	WAGO
V25	007	3	Diode	Diode	WAGO
V26	013	14	Diode	Diode	WAGO
V31	008	10	Diode	Diode	Lütze
V32	007	9	Diode	Diode	Lütze
V33	007	11	Diode	Diode	Lütze
V34	007	5	Diode	Diode	Lütze
V35	007	7	Diode	Diode	Lütze
V36	013	19	Diode	Diode	FE5B
V37	008	13	Diode	Diode	Lütze
V38	007	2	Diode	Diode	FE5B KabeldiodeDiode
V42	009	13	Diode (A2)	Diode (A2)	Diodenmodul
V43	013	6	Diode (A3)	Diode (A3)	Diodenmodul
V46	011	15	Diode (A6)	Diode (A6)	Diodenmodul
V47	003	12	Diode (A7)	Diode (A7)	Diodenmodul
V48	013	15	Diode (A8)	Diode (A8)	Diodenmodul
X0/1:1	010	18	DIOS STECKER	Dios connector	
X0/1:2	010	18	DIOS STECKER	Dios connector	
X0/1:3	009	18	DIOS STECKER	Dios connector	
X0/1:4	009	19	DIOS STECKER	Dios connector	
X0/1:5	010	18	DIOS STECKER	Dios connector	
X0/1:6	010	19	DIOS STECKER	Dios connector	
X0/1:9	009	19	DIOS STECKER	Dios connector	
X0/1:10	009	19	DIOS STECKER	Dios connector	
X0/1:11	009	18	DIOS STECKER	Dios connector	
X0:1	007	10	ESX STECKER	esx connector	
X0:1	008	13	ESX STECKER	esx connector	
X0:1	010	7	ESX STECKER	esx connector	
X0:2	009	4	ESX STECKER	esx connector	
X0:3	009	9	ESX STECKER	esx connector	
X0:4	009	10	ESX STECKER	esx connector	
X0:5	009	11	ESX STECKER	esx connector	
X0:6	006	9	ESX STECKER	esx connector	
X0:7	008	14	ESX STECKER	esx connector	
X0:8	010	3	ESX STECKER	esx connector	
X0:9	010	7	ESX STECKER	esx connector	
X0:10	006	10	ESX STECKER	esx connector	
X0:11	006	9	ESX STECKER	esx connector	
X0:12	010	14	ESX STECKER	esx connector	
X0:13	006	10	ESX STECKER	esx connector	
X0:14	010	6	ESX STECKER	esx connector	
X0:15	010	7	ESX STECKER	esx connector	
X0:16	009	4	ESX STECKER	esx connector	

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X0:17	010	13	ESX STECKER	esx connector	
X0:18	006	9	ESX STECKER	esx connector	
X0:19	006	9	ESX STECKER	esx connector	
X0:20	010	8	ESX STECKER	esx connector	
X0:21	007	10	ESX STECKER	esx connector	
X0:22	007	8	ESX STECKER	esx connector	
X0:23	007	11	ESX STECKER	esx connector	
X0:23	008	13	ESX STECKER	esx connector	
X0:23	010	8	ESX STECKER	esx connector	
X0:24	009	6	ESX STECKER	esx connector	
X0:25	009	7	ESX STECKER	esx connector	
X0:26	010	17	ESX STECKER	esx connector	
X0:27	010	16	ESX STECKER	esx connector	
X0:28	009	6	ESX STECKER	esx connector	
X0:29	007	19	ESX STECKER	esx connector	
X0:30	010	10	ESX STECKER	esx connector	
X0:31	010	12	ESX STECKER	esx connector	
X0:32	007	7	ESX STECKER	esx connector	
X0:33	009	9	ESX STECKER	esx connector	
X0:34	010	13	ESX STECKER	esx connector	
X0:35	010	11	ESX STECKER	esx connector	
X0:36	006	9	ESX STECKER	esx connector	
X0:37	010	15	ESX STECKER	esx connector	
X0:38	010	5	ESX STECKER	esx connector	
X0:39	010	5	ESX STECKER	esx connector	
X0:40	008	10	ESX STECKER	esx connector	
X0:41	010	11	ESX STECKER	esx connector	
X0:42	010	9	ESX STECKER	esx connector	
X0:43	007	19	ESX STECKER	esx connector	
X0:44	009	13	ESX STECKER	esx connector	
X0:45	006	10	ESX STECKER	esx connector	
X0:46	007	14	ESX STECKER	esx connector	
X0:47	007	16	ESX STECKER	esx connector	
X0:48	007	17	ESX STECKER	esx connector	
X0:49	010	7	ESX STECKER	esx connector	
X0:50	006	10	ESX STECKER	esx connector	
X0:51	006	10	ESX STECKER	esx connector	
X0:52	006	9	ESX STECKER	esx connector	
X0:53	009	9	ESX STECKER	esx connector	
X0:54	009	13	ESX STECKER	esx connector	
X0:55	010	16	ESX STECKER	esx connector	
X0:56	009	7	ESX STECKER	esx connector	
X0:57	009	8	ESX STECKER	esx connector	
X0:58	009	8	ESX STECKER	esx connector	
X0:59	009	8	ESX STECKER	esx connector	
X0:60	009	9	ESX STECKER	esx connector	
X0:61	008	10	ESX STECKER	esx connector	
X0:62	008	14	ESX STECKER	esx connector	
X0:63	010	11	ESX STECKER	esx connector	
X0:64	010	6	ESX STECKER	esx connector	
X0:65	010	14	ESX STECKER	esx connector	
X0:66	010	15	ESX STECKER	esx connector	
X0:67	010	15	ESX STECKER	esx connector	
X0:68	010	16	ESX STECKER	esx connector	
X1:	013	2	Wago Zentralelektrik	Wago e-box	
X1:1	014	7	Wago Zentralelektrik	Wago e-box	
X1:2	014	7	Wago Zentralelektrik	Wago e-box	
X1:3	014	2	Wago Zentralelektrik	Wago e-box	
X1:4	014	2	Wago Zentralelektrik	Wago e-box	
X1:5	004	20	Wago Zentralelektrik	Wago e-box	
X1:6	002	17	Wago Zentralelektrik	Wago e-box	
X1:7	003	9	Wago Zentralelektrik	Wago e-box	
X1:8	003	9	Wago Zentralelektrik	Wago e-box	
X1:9	003	9	Wago Zentralelektrik	Wago e-box	
X1:61	010	18	Wago Zentralelektrik	Wago e-box	
X1:62	004	15	Wago Zentralelektrik	Wago e-box	
X1:63	010	18	Wago Zentralelektrik	Wago e-box	
X1:64	004	16	Wago Zentralelektrik	Wago e-box	
X1:65	004	16	Wago Zentralelektrik	Wago e-box	
X1:66	009	10	Wago Zentralelektrik	Wago e-box	
X1:67	009	11	Wago Zentralelektrik	Wago e-box	
X1:68	010	18	Wago Zentralelektrik	Wago e-box	
X1:69	010	18	Wago Zentralelektrik	Wago e-box	
X1:70	002	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	003	16	Wago Zentralelektrik	Wago e-box	
X1:70	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	009	4	Wago Zentralelektrik	Wago e-box	
X1:70	009	6	Wago Zentralelektrik	Wago e-box	
X1:70	009	9	Wago Zentralelektrik	Wago e-box	
X1:70	009	13	Wago Zentralelektrik	Wago e-box	
X1:70	009	15	Wago Zentralelektrik	Wago e-box	
X1:70	009	17	Wago Zentralelektrik	Wago e-box	
X1:70	013	6	Wago Zentralelektrik	Wago e-box	
X1:71	004	17	Wago Zentralelektrik	Wago e-box	
X1:72	014	11	Wago Zentralelektrik	Wago e-box	
X1:81	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:82	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:83	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:84	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:85	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:86	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:87	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:88	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:89	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:90	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:91	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:92	004	12	Wago Zentralelektrik	Wago e-box	
X1:93	004	13	Wago Zentralelektrik	Wago e-box	

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Name	Bl.	Pf.	Benennung	Ablage	TYP
X1:94	004	14	Wago Zentralelektrik	Wago e-box	
X1:101	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:102	006	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:103	006	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:104	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:105	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:106	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:108	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:109	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:110	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:111	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:112	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:113	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:114	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:115	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:116	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:117	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:118	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:119	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:120	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:121	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:122	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:123	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:124	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:125	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:126	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:127	013	13	Wago Zentralelektrik	Wago e-box	
X1:128	013	13	Wago Zentralelektrik	Wago e-box	
X1:129	013	15	Wago Zentralelektrik	Wago e-box	
X1:130	013	15	Wago Zentralelektrik	Wago e-box	
X1:131	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:132	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:133	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:134	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:135	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:136	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:137	010	11	Wago Zentralelektrik	Wago e-box	
X1:138	010	11	Wago Zentralelektrik	Wago e-box	
X1:139	010	12	Wago Zentralelektrik	Wago e-box	
X1:140	010	12	Wago Zentralelektrik	Wago e-box	
X1:141	010	18	Wago Zentralelektrik	Wago e-box	
X1:142	010	18	Wago Zentralelektrik	Wago e-box	
X1:143	010	19	Wago Zentralelektrik	Wago e-box	
X1:144	010	19	Wago Zentralelektrik	Wago e-box	
X1:145	014	9	Wago Zentralelektrik	Wago e-box	
X1:146	013	15	Wago Zentralelektrik	Wago e-box	
X1:147	013	15	Wago Zentralelektrik	Wago e-box	
X1:148	005	8	Wago Zentralelektrik	Wago e-box	
X1:149	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:150	014	10	Wago Zentralelektrik	Wago e-box	
X1:151	008	10	Wago Zentralelektrik	Wago e-box	
X1:152	008	10	Wago Zentralelektrik	Wago e-box	
X1:153	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:154	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:155	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:156	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:157	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:158	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:159	010	6	Wago Zentralelektrik	Wago e-box	
X1:160	010	6	Wago Zentralelektrik	Wago e-box	
X1:161	010	7	Wago Zentralelektrik	Wago e-box	
X1:162	010	7	Wago Zentralelektrik	Wago e-box	
X1:163	010	8	Wago Zentralelektrik	Wago e-box	
X1:164	010	8	Wago Zentralelektrik	Wago e-box	
X1:165	010	9	Wago Zentralelektrik	Wago e-box	
X1:166	010	9	Wago Zentralelektrik	Wago e-box	
X1:170	008	14	Wago Zentralelektrik	Wago e-box	
X1:171	011	4	Wago Zentralelektrik	Wago e-box	
X1:172	011	3	Wago Zentralelektrik	Wago e-box	
X1:173	011	3	Wago Zentralelektrik	Wago e-box	
X1:174	011	4	Wago Zentralelektrik	Wago e-box	
X1:181	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:181	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:181	010	14	Wago Zentralelektrik	Wago e-box	
X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:182	010	15	Wago Zentralelektrik	Wago e-box	
X1:183	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:183	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:183	010	15	Wago Zentralelektrik	Wago e-box	
X1:184	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:184	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:184	009	18	Wago Zentralelektrik	Wago e-box	
X1:185	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:185	009	19	Wago Zentralelektrik	Wago e-box	
X1:186	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:186	009	19	Wago Zentralelektrik	Wago e-box	
X1:187	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:187	010	16	Wago Zentralelektrik	Wago e-box	
X1:188	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:188	010	16	Wago Zentralelektrik	Wago e-box	
X1:189	010	14	Wago Zentralelektrik	Wago e-box	
X1:189	014	9	Wago Zentralelektrik	Wago e-box	
X1:189	014	9	Wago Zentralelektrik	Wago e-box	
X1:190	011	6	Wago Zentralelektrik	Wago e-box	
X1:190	014	10	Wago Zentralelektrik	Wago e-box	
X1:190	014	11	Wago Zentralelektrik	Wago e-box	
X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	

Gez.: 28.08.2006
Name: Werner
Gepr.: 28.08.2006
Name: Seis

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Replaces:

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sheet no.: 105

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Name	Bl.	Pf.	Benennung	Info	TYP
X1:191	011	7	Wago Zentralelektrik	Wago e-box	
X1:192	008	14	Wago Zentralelektrik	Wago e-box	
X1:201	013	15	Wago Zentralelektrik	Wago e-box	
X1:202	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:205	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:205	013	15	Wago Zentralelektrik	Wago e-box	
X1:207	009	4	Wago Zentralelektrik	Wago e-box	
X1:20A	013	19	Sika – Klemme	fuse terminal	
X1:20E	013	19	Sika – Klemme	fuse terminal	
X1:210	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:21A	002	12	Sika – Klemme	fuse terminal	
X1:21E	002	12	Sika – Klemme	fuse terminal	
X1:221	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:222	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:223	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:224	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:226	012	3	Wago Zentralelektrik	Wago e-box	
X1:227	012	3	Wago Zentralelektrik	Wago e-box	
X1:228	005	15	Wago Zentralelektrik	Wago e-box	
X1:229	005	15	Wago Zentralelektrik	Wago e-box	
X1:22A	013	3	Sika – Klemme	fuse terminal	
X1:22E	013	3	Sika – Klemme	fuse terminal	
X1:231	004	6	Wago Zentralelektrik	Wago e-box	
X1:232	004	6	Wago Zentralelektrik	Wago e-box	
X1:233	004	7	Wago Zentralelektrik	Wago e-box	
X1:234	008	5	Wago Zentralelektrik	Wago e-box	
X1:235	004	6	Wago Zentralelektrik	Wago e-box	
X1:236	004	6	Wago Zentralelektrik	Wago e-box	
X1:237	004	7	Wago Zentralelektrik	Wago e-box	
X1:23A	003	9	Sika – Klemme	fuse terminal	
X1:23E	002	3	Sika – Klemme	fuse terminal	
X1:23E	003	9	Sika – Klemme	fuse terminal	
X1:241	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:242	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:243	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:244	004	10	Wago Zentralelektrik	Wago e-box	
X1:245	011	19	Wago Zentralelektrik	Wago e-box	
X1:246	011	19	Wago Zentralelektrik	Wago e-box	
X1:247	013	15	Wago Zentralelektrik	Wago e-box	
X1:248	011	3	Wago Zentralelektrik	Wago e-box	
X1:249	013	10	Wago Zentralelektrik	Wago e-box	
X1:24A	004	4	Sika – Klemme	fuse terminal	
X1:24E	004	4	Sika – Klemme	fuse terminal	
X1:250	004	10	Wago Zentralelektrik	Wago e-box	
X1:251	013	9	Wago Zentralelektrik	Wago e-box	
X1:252	013	13	Wago Zentralelektrik	Wago e-box	
X1:253	013	17	Wago Zentralelektrik	Wago e-box	
X1:255	004	18	Wago Zentralelektrik	Wago e-box	
X1:256	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:256	003	12	Wago Zentralelektrik	Wago e-box	
X1:256	011	15	Wago Zentralelektrik	Wago e-box	
X1:257	009	13	Wago Zentralelektrik	Wago e-box	
X1:258	009	13	Wago Zentralelektrik	Wago e-box	
X1:259	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:25A	002	15	Sika – Klemme	fuse terminal	
X1:25E	002	15	Sika – Klemme	fuse terminal	
X1:260	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:261	008	10	Wago Zentralelektrik	Wago e-box	
X1:262	007	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:262	008	10	Wago Zentralelektrik	Wago e-box	
X1:263	008	10	Wago Zentralelektrik	Wago e-box	
X1:265	012	18	Wago Zentralelektrik	Wago e-box	
X1:266	012	17	Wago Zentralelektrik	Wago e-box	
X1:267	012	18	Wago Zentralelektrik	Wago e-box	
X1:268	012	19	Wago Zentralelektrik	Wago e-box	
X1:269	004	11	Wago Zentralelektrik	Wago e-box	
X1:26A	009	13	Sika – Klemme	fuse terminal	
X1:26E	009	13	Sika – Klemme	fuse terminal	
X1:270	004	11	Wago Zentralelektrik	Wago e-box	
X1:272	011	3	Wago Zentralelektrik	Wago e-box	
X1:272	013	9	Wago Zentralelektrik	Wago e-box	
X1:27A	009	7	Sika – Klemme	fuse terminal	
X1:27E	009	7	Sika – Klemme	fuse terminal	
X1:28A	013	2	Sika – Klemme	fuse terminal	
X1:28E	013	2	Sika – Klemme	fuse terminal	
X1:291	005	7	Wago Zentralelektrik	Wago e-box	
X1:292	005	11	Wago Zentralelektrik	Wago e-box	
X1:293	003	10	Wago Zentralelektrik	Wago e-box	
X1:294	005	5	Wago Zentralelektrik	Wago e-box	
X1:295	005	7	Wago Zentralelektrik	Wago e-box	
X1:296	005	15	Wago Zentralelektrik	Wago e-box	
X1:298	002	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:298	005	11	Wago Zentralelektrik	Wago e-box	
X1:299	004	20	Wago Zentralelektrik	Wago e-box	
X1:299	005	5	Wago Zentralelektrik	Wago e-box	
X1:29A	005	5	Sika – Klemme	fuse terminal	
X1:29E	005	5	Sika – Klemme	fuse terminal	
X1:300	005	7	Wago Zentralelektrik	Wago e-box	
X1:301	005	11	Wago Zentralelektrik	Wago e-box	
X1:302	003	13	Wago Zentralelektrik	Wago e-box	
X1:303	005	8	Wago Zentralelektrik	Wago e-box	
X1:30A	011	4	Sika – Klemme	fuse terminal	
X1:30E	011	4	Sika – Klemme	fuse terminal	
X1:31A	011	18	Sika – Klemme	fuse terminal	
X1:31E	002	17	SIKA KLEMME	fuse terminal	
X1:31E	011	18	Sika – Klemme	fuse terminal	
X1:321	010	6	Wago Zentralelektrik	Wago e-box	
X1:322	010	8	Wago Zentralelektrik	Wago e-box	
X1:323	010	7	Wago Zentralelektrik	Wago e-box	

Gez.: 28.08.2006
Name: Werner
Gepr.: 28.08.2006
Name: Seis

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Name	Bl.	Pf.	Benennung	Ident	TYP
X1:324	010	7	Wago Zentralelektrik	Wago e-box	
X1:325	010	6	Wago Zentralelektrik	Wago e-box	
X1:326	010	7	Wago Zentralelektrik	Wago e-box	
X1:327	010	11	Wago Zentralelektrik	Wago e-box	
X1:328	010	11	Wago Zentralelektrik	Wago e-box	
X1:329	010	10	Wago Zentralelektrik	Wago e-box	
X1:32A	002	17	Sika – Klemme	fuse terminal	
X1:32E	002	17	Sika – Klemme	fuse terminal	
X1:330	010	10	Wago Zentralelektrik	Wago e-box	
X1:331	010	11	Wago Zentralelektrik	Wago e-box	
X1:332	010	11	Wago Zentralelektrik	Wago e-box	
X1:333	010	14	Wago Zentralelektrik	Wago e-box	
X1:334	010	14	Wago Zentralelektrik	Wago e-box	
X1:335	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:336	007	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:337	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:338	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:339	007	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:33A	013	6	Sika – Klemme	fuse terminal	
X1:33E	002	17	SIKA KLEMME	fuse terminal	
X1:33E	013	6	Sika – Klemme	fuse terminal	
X1:340	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:341	011	18	Wago Zentralelektrik	Wago e-box	
X1:342	011	18	Wago Zentralelektrik	Wago e-box	
X1:343	008	4	Wago Zentralelektrik	Wago e-box	
X1:343	010	5	Wago Zentralelektrik	Wago e-box	
X1:344	010	4	Wago Zentralelektrik	Wago e-box	
X1:345	010	4	Wago Zentralelektrik	Wago e-box	
X1:346	010	3	Wago Zentralelektrik	Wago e-box	
X1:347	010	5	Wago Zentralelektrik	Wago e-box	
X1:348	010	5	Wago Zentralelektrik	Wago e-box	
X1:349	009	18	Wago Zentralelektrik	Wago e-box	
X1:349	009	19	Wago Zentralelektrik	Wago e-box	
X1:349	009	19	Wago Zentralelektrik	Wago e-box	
X1:349	010	17	Wago Zentralelektrik	Wago e-box	
X1:34A	011	14	Sika – Klemme	fuse terminal	
X1:34E	011	14	Sika – Klemme	fuse terminal	
X1:350	010	13	Wago Zentralelektrik	Wago e-box	
X1:351	010	12	Wago Zentralelektrik	Wago e-box	
X1:352	010	12	Wago Zentralelektrik	Wago e-box	
X1:353	010	13	Wago Zentralelektrik	Wago e-box	
X1:354	010	13	Wago Zentralelektrik	Wago e-box	
X1:355	011	19	Wago Zentralelektrik	Wago e-box	
X1:356	011	14	Wago Zentralelektrik	Wago e-box	
X1:357	008	17	Wago Zentralelektrik	Wago e-box	
X1:358	008	13	Wago Zentralelektrik	Wago e-box	
X1:359	008	14	Wago Zentralelektrik	Wago e-box	
X1:35A	009	2	Sika – Klemme	fuse terminal	
X1:35E	009	2	Sika – Klemme	fuse terminal	
X1:363	010	15	Wago Zentralelektrik	Wago e-box	
X1:364	010	19	Wago Zentralelektrik	Wago e-box	
X1:364	011	14	Wago Zentralelektrik	Wago e-box	
X1:36A	013	9	Sika – Klemme	fuse terminal	
X1:36E	013	9	Sika – Klemme	fuse terminal	
X1:371	003	16	Wago Zentralelektrik	Wago e-box	
X1:372	014	19	Wago Zentralelektrik	Wago e-box	
X1:372	014	20	Wago Zentralelektrik	Wago e-box	
X1:373	012	15	Wago Zentralelektrik	Wago e-box	
X1:374	012	15	Wago Zentralelektrik	Wago e-box	
X1:375	012	3	Wago Zentralelektrik	Wago e-box	
X1:376	012	3	Wago Zentralelektrik	Wago e-box	
X1:377	012	19	Wago Zentralelektrik	Wago e-box	
X1:378	014	10	Wago Zentralelektrik	Wago e-box	
X1:381	013	19	Wago Zentralelektrik	Wago e-box	
X1:382	013	18	Wago Zentralelektrik	Wago e-box	
X1:383	013	17	Wago Zentralelektrik	Wago e-box	
X1:391/1	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:391/2	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:392/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:392/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:393/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:393/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:394/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:394/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:395/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:395/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:397/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:397/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:398/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:398/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:399/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:399/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:400/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:400/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:401/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:401/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:402/1	009	7	Wago Zentralelektrik	Wago e-box	
X1:402/2	009	7	Wago Zentralelektrik	Wago e-box	
X1:403/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:403/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:404/1	009	14	Wago Zentralelektrik	Wago e-box	
X1:404/2	009	14	Wago Zentralelektrik	Wago e-box	
X1:405/1	009	15	Wago Zentralelektrik	Wago e-box	
X1:405/2	009	15	Wago Zentralelektrik	Wago e-box	
X1:406/1	010	2	Wago Zentralelektrik	Wago e-box	
X1:406/2	010	2	Wago Zentralelektrik	Wago e-box	
X1:407/1	010	3	Wago Zentralelektrik	Wago e-box	
X1:407/2	010	3	Wago Zentralelektrik	Wago e-box	
X1:408/1	010	2	Wago Zentralelektrik	Wago e-box	

Gez.: 28.08.2006
Name: Werner
Gepr.: 28.08.2006
Name: Seis

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component listing

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Name	Bl.	Pf.	Benennung	Benennung	TYP
X1:408/2	010	2	Wago Zentralelektrik	Wago e-box	
X1:409/1	010	2	Wago Zentralelektrik	Wago e-box	
X1:409/2	010	2	Wago Zentralelektrik	Wago e-box	
X1:41/1	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:41/2	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:410/1	009	9	Wago Zentralelektrik	Wago e-box	
X1:410/2	009	9	Wago Zentralelektrik	Wago e-box	
X1:411/1	009	10	Wago Zentralelektrik	Wago e-box	
X1:411/2	009	10	Wago Zentralelektrik	Wago e-box	
X1:412/1	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:412/2	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:413/1	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:413/2	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:414/1	013	14	Wago Zentralelektrik	Wago e-box	
X1:414/2	013	14	Wago Zentralelektrik	Wago e-box	
X1:42/1	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:42/2	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:43/1	010	8	Wago Zentralelektrik	Wago e-box	
X1:43/2	010	8	Wago Zentralelektrik	Wago e-box	
X1:44/1	010	4	Wago Zentralelektrik	Wago e-box	
X1:44/2	010	4	Wago Zentralelektrik	Wago e-box	
X1:45/1	010	11	Wago Zentralelektrik	Wago e-box	
X1:45/2	010	11	Wago Zentralelektrik	Wago e-box	
X1:46/1	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:46/2	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:47/1	010	13	Wago Zentralelektrik	Wago e-box	
X1:47/2	010	13	Wago Zentralelektrik	Wago e-box	
X2:A	010	18	Datenschnittstelle	data interface	
X2:B	010	18	Datenschnittstelle	data interface	
X2:G	009	11	Datenschnittstelle	data interface	
X2:H	009	10	Datenschnittstelle	data interface	
X2:J	002	11	Datenschnittstelle	data interface	
X2:N	002	11	Datenschnittstelle	data interface	
X2:U	009	11	Datenschnittstelle	data interface	
X2:V	010	15	Datenschnittstelle	data interface	
X3:A	008	3	Stecker Handgas	connector hand throttle	
X3:B	008	2	Stecker Handgas	connector hand throttle	
X3:C	008	2	Stecker Handgas	connector hand throttle	
X4:A	004	15	EMR – Diagnose	EMR-diagnosis	
X4:B	004	17	EMR – Diagnose	EMR-diagnosis	
X4:F	004	16	EMR – Diagnose	EMR-diagnosis	
X4:G	004	16	EMR – Diagnose	EMR-diagnosis	
X4:H	004	15	EMR – Diagnose	EMR-diagnosis	
X4:K	004	17	EMR – Diagnose	EMR-diagnosis	
X4:M	004	16	EMR – Diagnose	EMR-diagnosis	
X5:1	005	7	Deutsch Stecker Senso	Deutsch Connector sensor	
X6:1	004	10	Wago Zentralelektrik	Wago e-box	
X6:2	004	10	Wago Zentralelektrik	Wago e-box	
X6:3	004	11	Wago Zentralelektrik	Wago e-box	
X6:4	004	11	Wago Zentralelektrik	Wago e-box	
X6:5	004	15	Wago Zentralelektrik	Wago e-box	
X6:6	004	15	Wago Zentralelektrik	Wago e-box	
X6:7	004	16	Wago Zentralelektrik	Wago e-box	
X6:8	004	16	Wago Zentralelektrik	Wago e-box	
X6:9	004	16	Wago Zentralelektrik	Wago e-box	
X6:10	004	17	Wago Zentralelektrik	Wago e-box	
X7:1	014	9	Stecker Rops	connector on rops	
X7:2	014	9	Stecker Rops	connector on rops	
X7:3	014	9	Stecker Rops	connector on rops	
X7:4	014	9	Stecker Rops	connector on rops	
X7:5	013	16	Stecker Rops	connector on rops	
X7:6	013	16	Stecker Rops	connector on rops	
X8:1	012	3	Pumpenstecker Kabine	connector pump cabin;	
X8:2	012	3	Pumpenstecker Kabine	connector pump cabin;	
X9:1	007	5	Stecker Schalter Rich	connector direction switch	
X9:2	007	9	Stecker Schalter Rich	connector direction switch	
X9:3	007	7	Stecker Schalter Rich	connector direction switch	
X9:4	007	5	Stecker Schalter Rich	connector direction switch	
X9:5	007	5	Stecker Schalter Rich	connector direction switch	
X9:6	007	6	Stecker Schalter Rich	connector direction switch	
XS	002	15	Steckdose	Socket	
X10:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X10:B	004	6	AMP Stecker Gaspedal	AMP connector throttle	
X10:C	004	6	AMP Stecker Gaspedal	AMP connector throttle	
X11:1	011	18	Schnittstelle Sitz	connector drivers seat	
X11:2	011	18	Schnittstelle Sitz	connector drivers seat	
X12:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X12:B	004	8	AMP Stecker Gaspedal	AMP connector throttle	
X12:C	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X13:1	008	17	Stecker Stufenschalte	connector speed range switch	
X13:2	008	18	Stecker Stufenschalte	connector speed range switch	
X13:3	008	14	Stecker Stufenschalte	connector speed range switch	
X14:4	013	15	Stecker Motor	connector engine	
X14:5	013	16	Stecker Motor	connector engine	
X14:6	002	6	Motorschnittstelle	engine interface	
X14:7	002	6	Motorschnittstelle	engine interface	
X14:8	005	7	Motorschnittstelle	engine interface	
X14:9	003	9	Motorschnittstelle	engine interface	
X14:10	006	12	Stecker Motor	connector engine	
X14:11	006	12	Stecker Motor	connector engine	
X15:A	010	18	Stecker Lehne links	connector arm rest lh.	
X15:B	010	18	Stecker Lehne links	connector arm rest lh.	
X15:C	010	19	Stecker Lehne links	connector arm rest lh.	
X17:1	013	16	Stecker Klimakupplung	connector clima clutch	
X17:2	013	16	Stecker Klimakupplung	connector clima clutch	
X18:1	013	16	Stecker Druckschalter	connector pressure switch	
X18:2	013	16	Stecker Druckschalter	connector pressure switch	
X19:1	013	13	Stecker Heizventil	connector heating valve	
X19:2	013	13	Stecker Heizventil	connector heating valve	

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	Name	Bl.	Pf.	Benennung	Benennung	TYP
1	X21:1	011	19	Schnittstelle Sitz	connector drivers seat	
	X21:2	011	19	Schnittstelle Sitz	connector drivers seat	
	X22:1	013	10	Stecker Luftklappe	connector air flap	
2	X22:2	013	11	Stecker Luftklappe	connector air flap	
	X23:1	013	14	Stecker Sensor	connector sensor	
	X23:2	013	14	Stecker Sensor	connector sensor	
	X24:1	013	15	Stecker Sensor	connector sensor	
	X24:2	013	15	Stecker Sensor	connector sensor	
3	X25:A	013	19	Stecker Lüfter	connector blower	
	X25:B	013	18	Stecker Lüfter	connector blower	
	X25:C	013	18	Stecker Lüfter	connector blower	
	X26:1	013	9	Stecker Klimasteuerun	connector climacontrol	
4	X26:2	013	9	Stecker Klimasteuerun	connector climacontrol	
	X26:3	013	11	Stecker Klimasteuerun	connector climacontrol	
	X26:4	013	10	Stecker Klimasteuerun	connector climacontrol	
	X26:5	013	16	Stecker Klimasteuerun	connector climacontrol	
	X26:6	013	12	Stecker Klimasteuerun	connector climacontrol	
	X26:7	013	12	Stecker Klimasteuerun	connector climacontrol	
5	X26:8	013	15	Stecker Klimasteuerun	connector climacontrol	
	X26:9	013	13	Stecker Klimasteuerun	connector climacontrol	
	X26:10	013	10	Stecker Klimasteuerun	connector climacontrol	
	X26:11	013	11	Stecker Klimasteuerun	connector climacontrol	
	X26:12	013	13	Stecker Klimasteuerun	connector climacontrol	
6	X26:13	013	13	Stecker Klimasteuerun	connector climacontrol	
	X26:14	013	13	Stecker Klimasteuerun	connector climacontrol	
	X27:1	013	14	Stecker Klimasteuerun	connector climacontrol	
	X27:2	013	14	Stecker Klimasteuerun	connector climacontrol	
	X27:3	013	15	Stecker Klimasteuerun	connector climacontrol	
7	X27:4	013	15	Stecker Klimasteuerun	connector climacontrol	
	X28:1	011	6	Stecker Radsensor	connector wheel sensor	
	X28:2	011	6	Stecker Radsensor	connector wheel sensor	
	X28:3	011	7	Stecker Radsensor	connector wheel sensor	
	X28:4	011	7	Stecker Radsensor	connector wheel sensor	
8	X29:1	013	6	Stecker Zyklon	Connector cyclone	
	X29:2	013	6	Stecker Zyklon	Connector cyclone	
	X30:A	011	6	Verbindungsstecker Se	connector sensor	
	X30:B	011	6	Verbindungsstecker Se	connector sensor	
	X30:C	011	7	Verbindungsstecker Se	connector sensor	
9	X31:A	011	11	Verbindungsstecker An	connector gauge	
	X31:B	011	9	Verbindungsstecker An	connector gauge	
	X31:C	011	10	Verbindungsstecker An	connector gauge	
	X33:1	011	4	Schmieranlage	lubrication system	
	X33:2	011	4	Schmieranlage	lubrication system	
10	X34:1	011	4	Schmieranlage	lubrication system	
	X34:2	011	4	Schmieranlage	lubrication system	
	X34:3	011	3	Schmieranlage	lubrication system	
	X34:4	011	3	Schmieranlage	lubrication system	
	X34:5	011	4	Schmieranlage	lubrication system	
11	X35:1	009	13	Stecker Warnsummer	connector warning buzzer	
	X35:2	009	13	Stecker Warnsummer	connector warning buzzer	
	X36:1	008	7	Stecker Poti	connector potentiometer	
	X36:2	008	6	Stecker Poti	connector potentiometer	
	X36:3	008	7	Stecker Poti	connector potentiometer	
12	X39:A	008	7	Stecker Deceleratorpe	connector decelerator pedal	
	X39:B	008	6	Stecker Deceleratorpe	connector decelerator pedal	
	X39:C	008	6	Stecker Deceleratorpe	connector decelerator pedal	
	X40:1	008	8	Stecker Deceleratorpe	connector decelerator pedal	
	X40:2	008	8	Stecker Deceleratorpe	connector decelerator pedal	
13	X40:3	008	9	Stecker Deceleratorpe	connector decelerator pedal	
	X40:4	008	7	Stecker Deceleratorpe	connector decelerator pedal	
	X40:5	008	8	Stecker Decelelratorp	connector decelerator pedal	
	X40:6	008	7	Stecker Deceleratorpe	connector decelerator pedal	
	X41:1	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
14	X41:2	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:3	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:4	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:5	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:6	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
15	X41:8	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:9	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:10	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:11	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:12	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
16	X42:1	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:2	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:4	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:5	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:6	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
17	X17.1:1	004	2	2-pol SPT	2-pole SPT	
	X17.1:2	004	2	2-pol SPT	2-pole SPT	
	X27.1:4	004	18	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:6	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:7	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
18	X27.1:11	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:12	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:13	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:14	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:15	004	9	Motor / 42-pol EPC	engine / 42-pole EPC	
19	X27.1:18	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:19	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:20	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:21	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:22	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
20	X27.1:23	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:24	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:25	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:26	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:27	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:28	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	

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X27.1:29	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:30	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:33	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:34	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:35	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:36	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:37	004	13	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:39	004	17	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:40	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:41	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:42	004	15	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.2:10	004	3	12-pol EPC	12-pole EPC	
X27.2:11	004	3	12-pol EPC	12-pole EPC	
XD2.1:2	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:3	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:5	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:6	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:8	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:9	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:10	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:11	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:13	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:20	004	14	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:22	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:29	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:30	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:33	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:34	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:35	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:38	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:39	004	13	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:40	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:52	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:53	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:54	004	12	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:59	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:60	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:61	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:62	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:77	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:78	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:79	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:89	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.2:3	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:4	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:5	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:7	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:8	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:9	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:10	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:15	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:18	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:19	004	9	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:23	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:24	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:25	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:26	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:27	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:28	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:32	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:33	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:34	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:35	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:36	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.3:3	004	15	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:4	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:6	004	13	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:7	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:8	004	18	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:12	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:13	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:14	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:15	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:16	004	17	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
Y02	004	19	Magnetventil Flammgluehanlage	Solenoid valve, glow plug system	18W
Y03	008	14	Magnetventil Fahrstufenumschaltung	Solenoid valve, speed range selector	
Y04	008	10	Magnetventil Bremse	Solenoid valve, brake	1,25A
Y14	012	3	Kraftstoffpumpe Heizgeraet	Fuel pump, heating unit	
Y15	013	16	Magnetkupplung Klimakompressor	Magnetic clutch, air conditioning compr.	1,75A
Y16	007	10	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y16	007	12	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y17	007	6	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y17	007	8	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y92	010	6	Magnetventil Lenkung vorne rechts	Solenoid valve, steering, front rh.	max. 1,1A
Y93	010	7	Magnetventil Lenkung vorne links	Solenoid valve, steering, front lh.	max. 1,1A
Y102	010	11	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y102	010	12	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y108	010	8	Magnetventil Schaufel Heben	solenoid valve, lifting shovel	max. 1,1A
Y109	010	9	Magnetventil Schaufel Senken	solenoid valve, let down shovel	max. 1,1A
Y110	010	19	Magnetventil Schaufel oeffnen	solenoid valve, open shovel	max. 1,1A
Y111	010	18	Magnetventil Schaufel Schließen	solenoid valve, close shovel	max. 1,1A
Y132	007	14	Magnetventil Radmotor vorn links	Solenoid valve, wheel motor front lh.	max. 0,6A
Y133	007	16	Magnetventil Radmotor vorn rechts	Solenoid valve, wheel motor front rh.	max. 0,6A
Y134	007	17	Magnetventil Radmotor hinten links	Solenoid valve, wheel motor rear lh.	max. 0,6A
Y135	007	19	Magnetventil Radmotor hinten rechts	Solenoid valve, wheel motor rear rh.	max. 0,6A
Y138	013	13	Magnetveentil Heizung	Solenoid valve, heating unit	0,42A
Y147	004	12	Injektor A1	jet pump A1	
Y148	004	14	Injektor A2	jet pump A2	

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Y149	004	13	Injektor A3	jet pump A3	
Y150	004	17	Injektor B1	jet pump B1	
Y151	004	16	Injektor B2	jet pump B2	
Y152	004	16	Injektor B3	jet pump B3	
Y166	004	14	Injektor A4	jet pump A4	
Y167	004	18	Injektor B4	jet pump B4	

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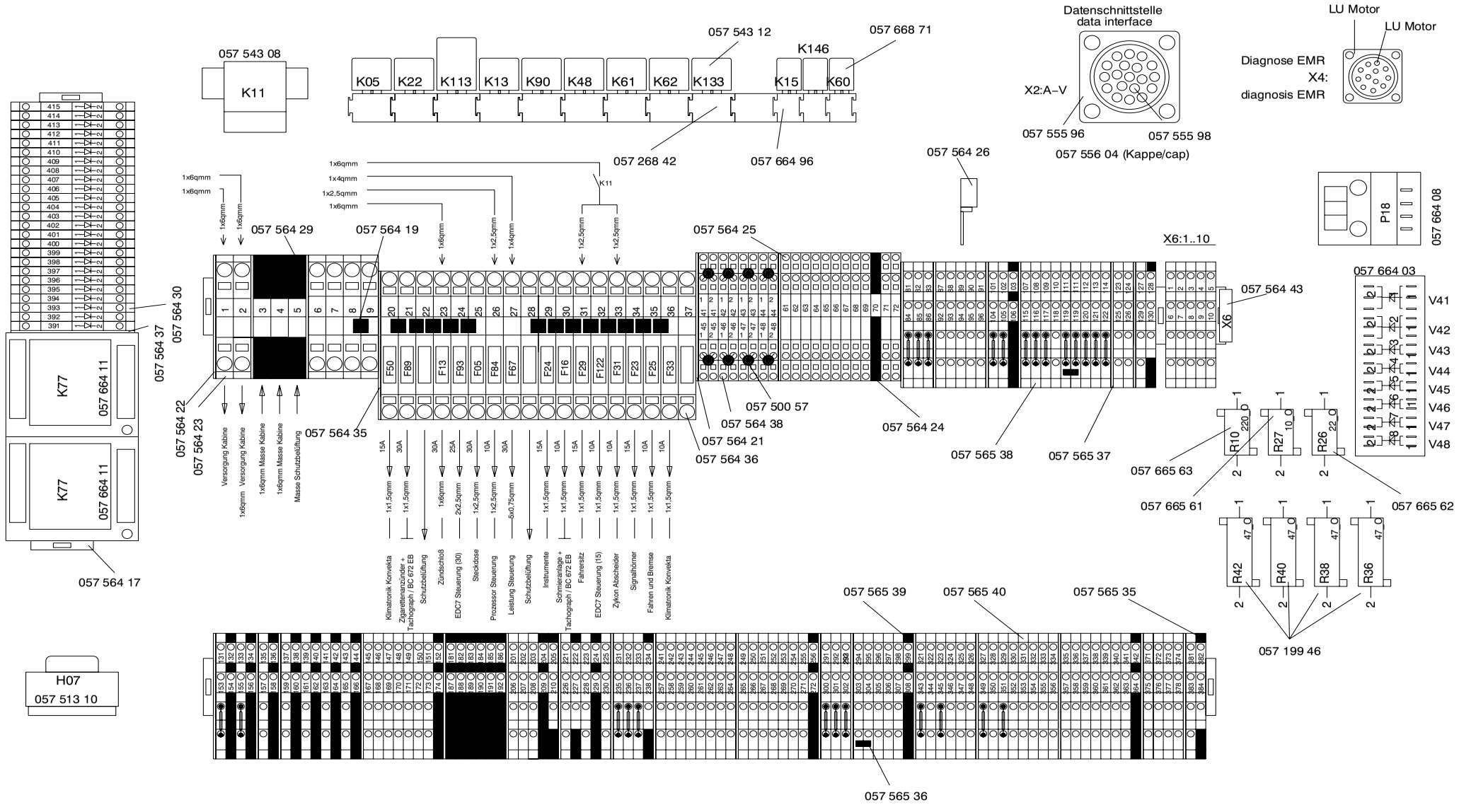
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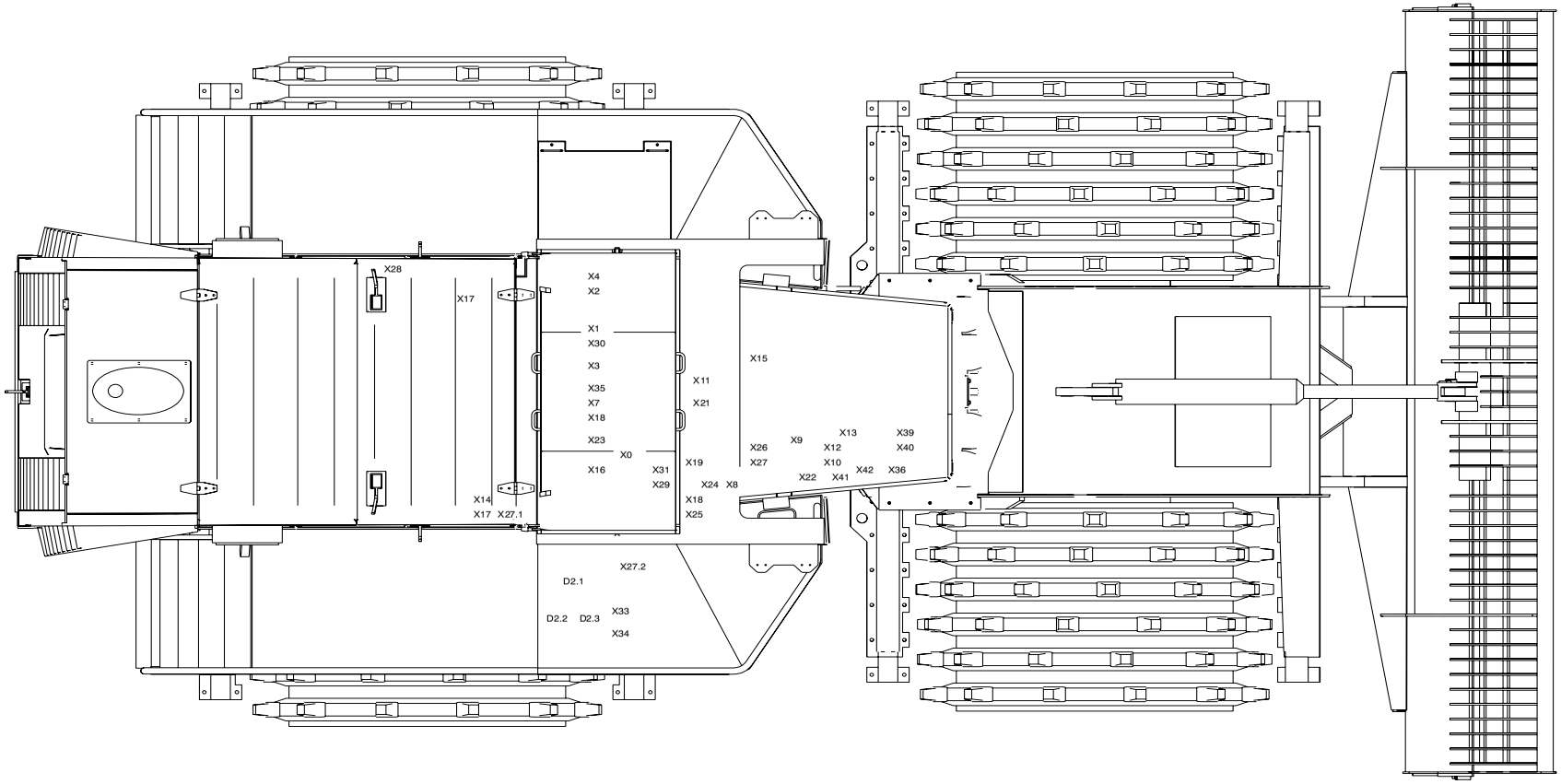
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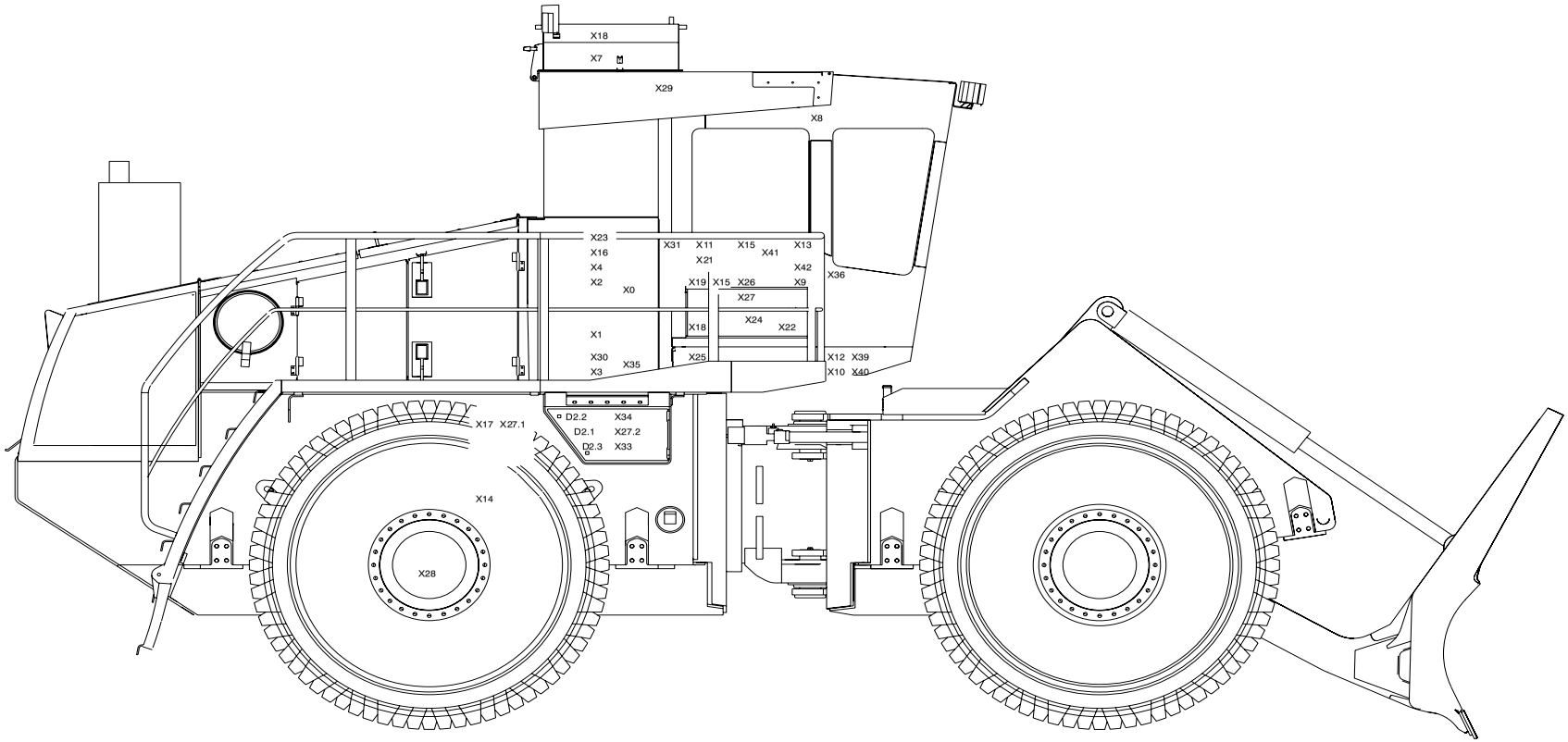
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Lokalisierungsgrafik Steckverbinder Draufsicht
localization graphic connectors top view



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19.4 Wiring diagram 570 700 39

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S/N Wiring diagram 570 700 39

S/N 101 570 571 012 ⇔ 101 570 571 025 BC772 RS-2
S/N 101 570 581 035 ⇔ 101 570 581 074 BC772 RB-2
S/N 101 570 591 009 ⇔ 101 570 591 018 BC672 RB-2
S/N 101 570 821 008 ⇔ 101 570 821 025 BC972 RB-2
S/N 101 570 831 022 ⇔ 101 570 831 040 BC1172 RB-2

Standardverkabelung: standard wireing:	dicke Linien thick lines	Platinenverdrahtung: connection on printed circuit board:	dünne Linien thin lines

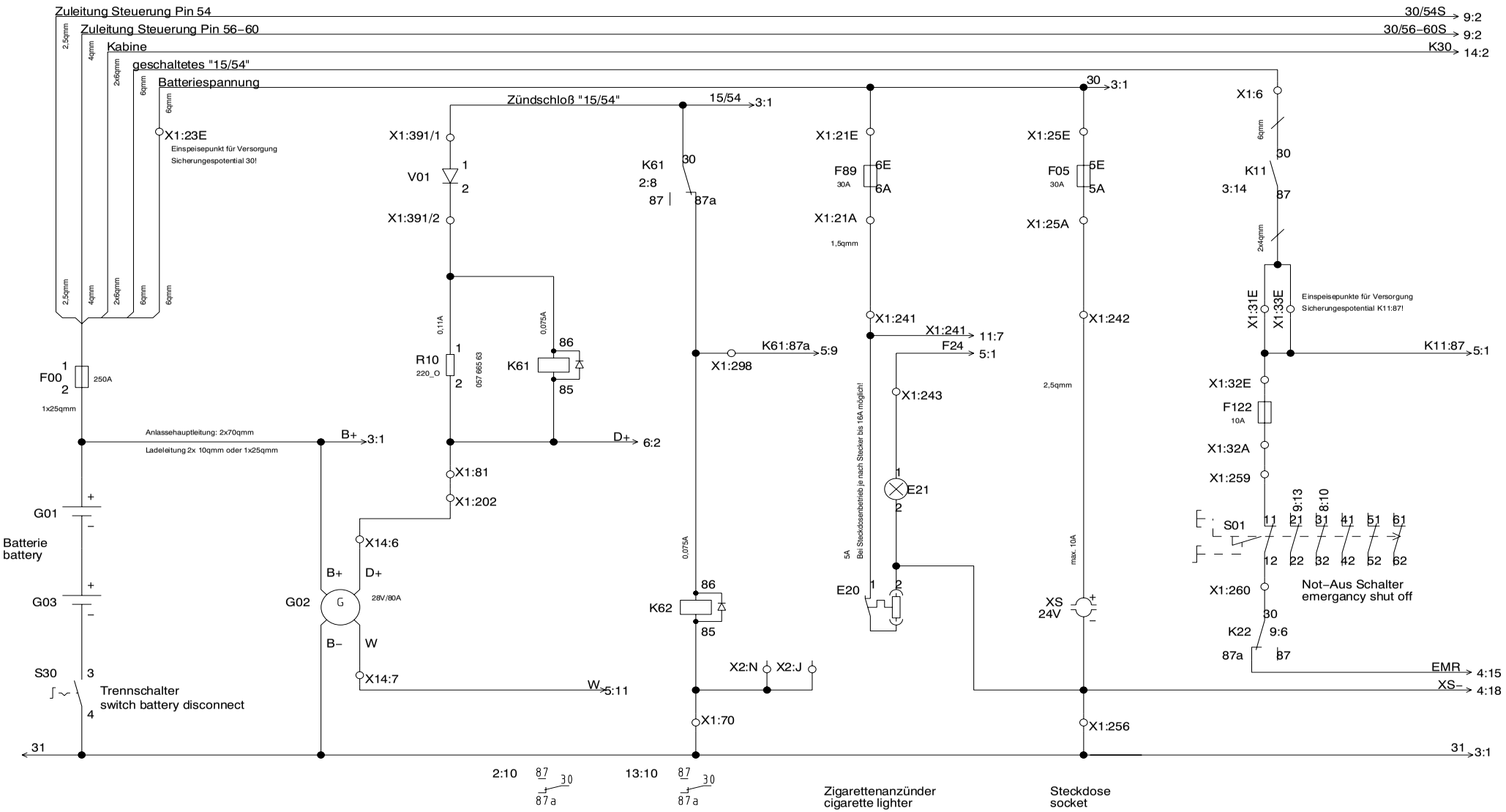
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Blatt Nr.: sheet no.:	Zeichnungsnummer drawing – no.	Funktionsgruppe	function unit
001	vorläufig	Stromlaufplan	Circuit Diagram
002	vorläufig	Versorgung, Zigarettenanzünder	supply, cigarette lighter
003	vorläufig	Zündschloß, Starter	ignition switch, starter
004	vorläufig	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot.	DEUTZ controller EDC 7 for 6– and 8–zylinder engine
005	vorläufig	Instrumente	indicators
006	vorläufig	Anzeigen, Störmeldungen	monitoring, failure indication
007	vorläufig	Fahrpumpen, Radmotoren, Startfreigabe	driving pumps, weehl motors, starting release
008	vorläufig	Fahrstufen, Bremse, Verzögerungspedal	speed ranges, brakes, decelerator device
009	vorläufig	Versorgung Steuerung, Warnsummer, Override	supply controllers, warning buzzers, override
010	vorläufig	Lenkung und Arbeitshydraulik	steering and working hydraulic system
011	vorläufig	Hupe, Schmieranlage, Tachograph, Sitzfunktionen	horn, lubrication systhem, tachograph, seat funktions
012	vorläufig	Heizung und Belüftung	heating and ventilation
013	vorläufig	Schutzbelüftung, Zyklon Abscheider, Klimatronik	protected vent. system, cyclone separator, air cond.
014	vorläufig	Kabine und Anbauteile	cabin and attachment–parts
101	vorläufig	Bauteilliste	component listing
201	vorläufig	Schaltkasten	e–box
301	vorläufig	Lokalisierungsgrafik Steckverbinder Draufsicht	localization graphic connectors top view

1	2	3	4	5	6	7	8	9	10

	Gez.: 17.01.2007 Name: Werner Gepr.: 17.01.2007 Name: Seis	Stromlaufplan circuit diagram	Seite: 001 von: 001 page: 001 from: 001 Ers.f.: Replaces:	570 700 39 Blatt Nr.: 001 sheet no.: 001

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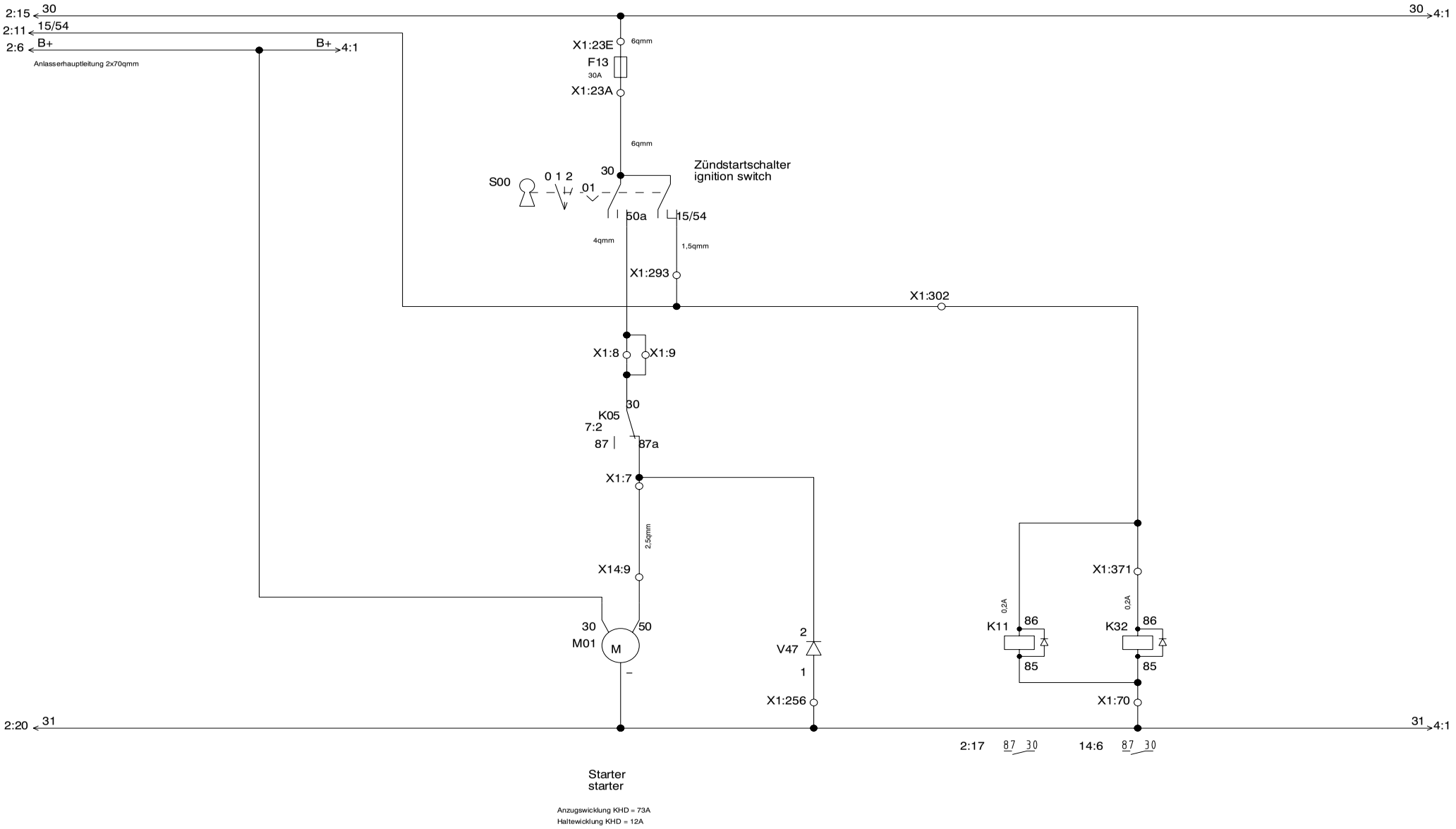
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	Gez.: 17.01.2007 Name: Werner	Versorgung, Zigarettenanzünder supply, cigarette lighter	Seite: 1 von: 1 page: 1 from: 1
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:

570 700 39

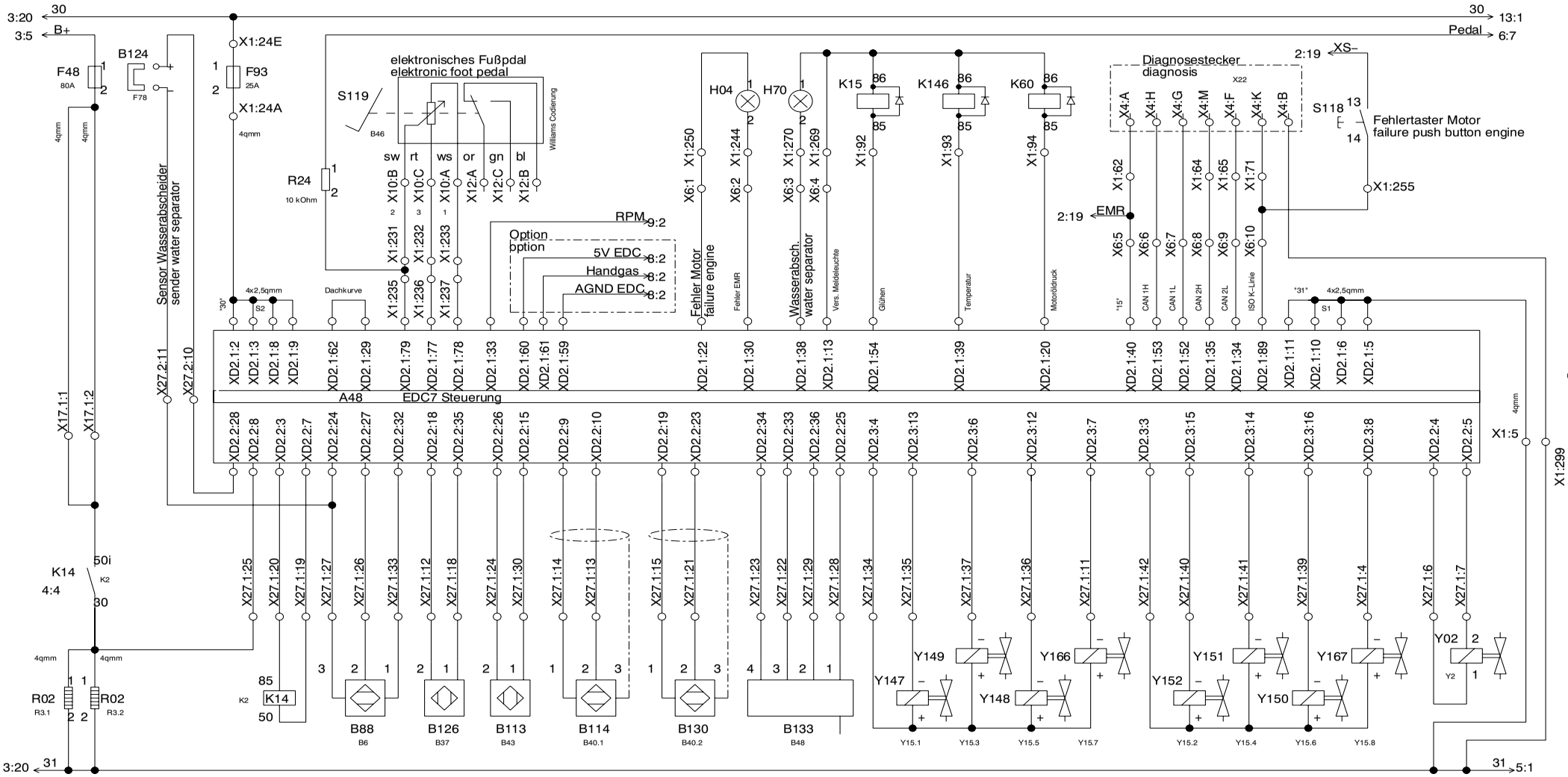
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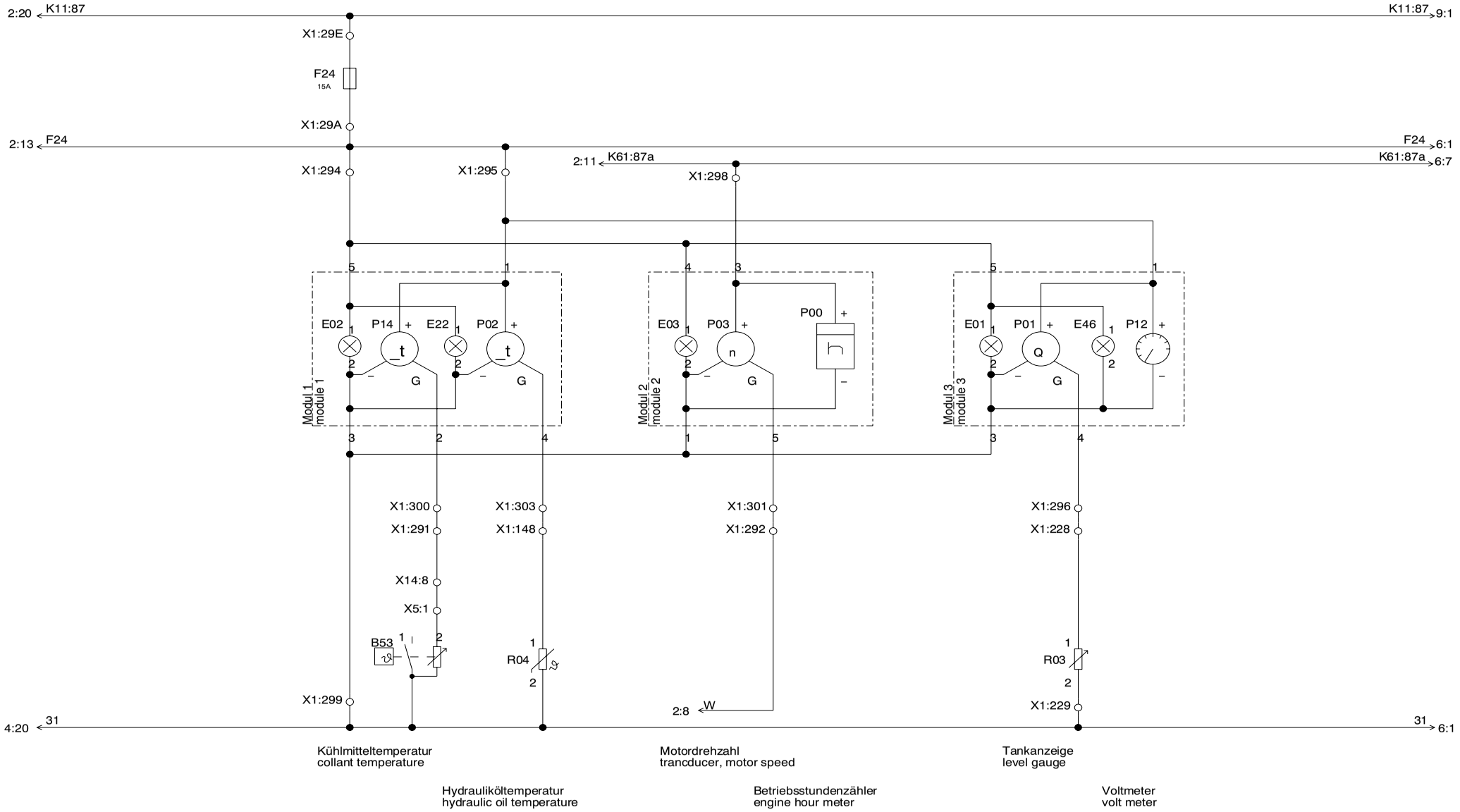
	Gez.: 17.01.2007 Name: Werner	Zündschloß, Starter ignition switch, starter	Seite: 1 von: 1 page: 1 from: 1	570 700 39	
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 003	

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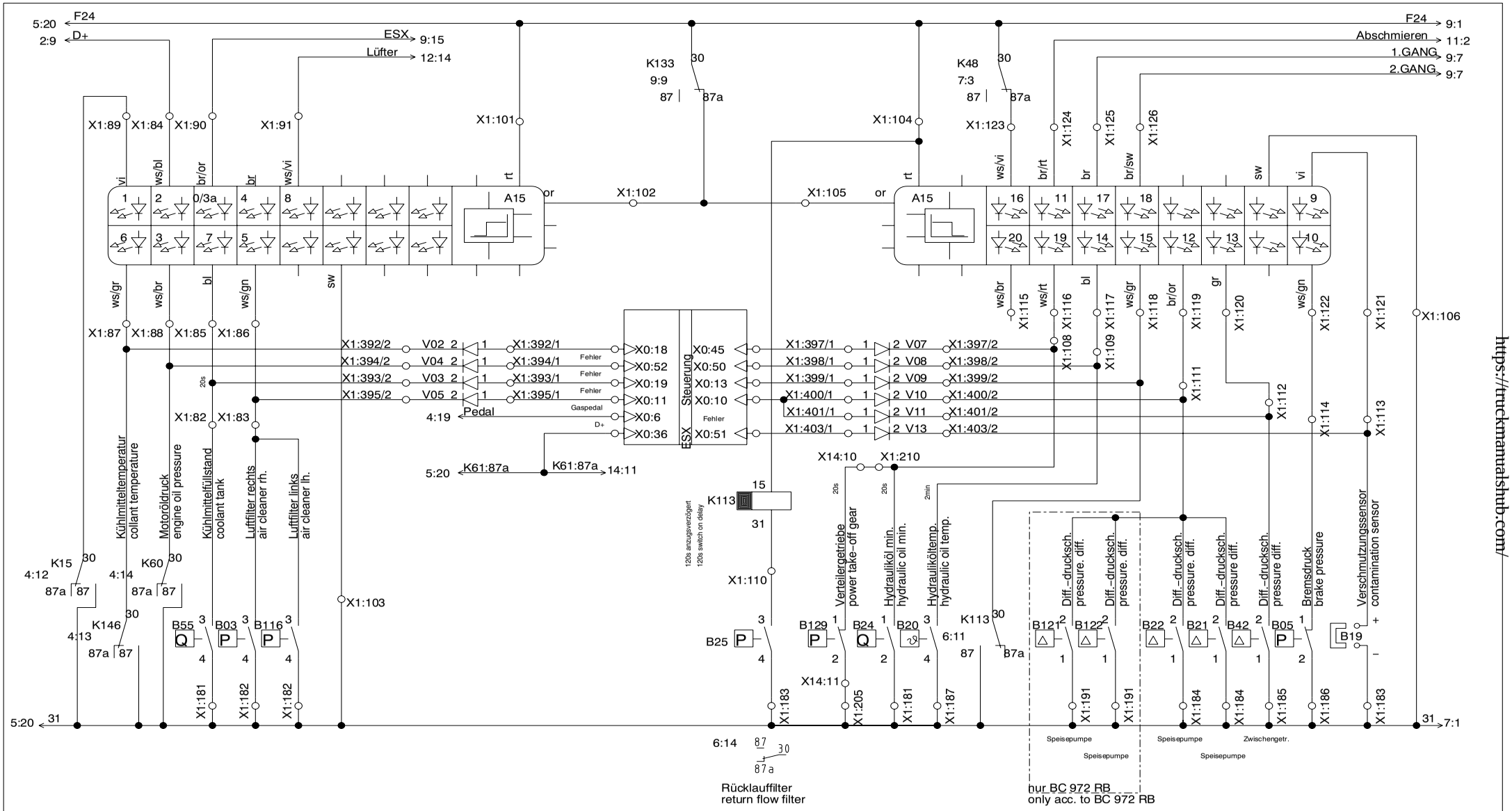
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	Gez.: 17.01.2007 Name: Werner	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot. DEUTZ controller EDC 7 for 6– and 8–zylinder engine	Seite: 1 von: 1 page:	570 700 39
	Gepr.: 17.01.2007 Name: Seis	066_8	Ers.f.: Replaces:	Blatt Nr.: 004 sheet no.:



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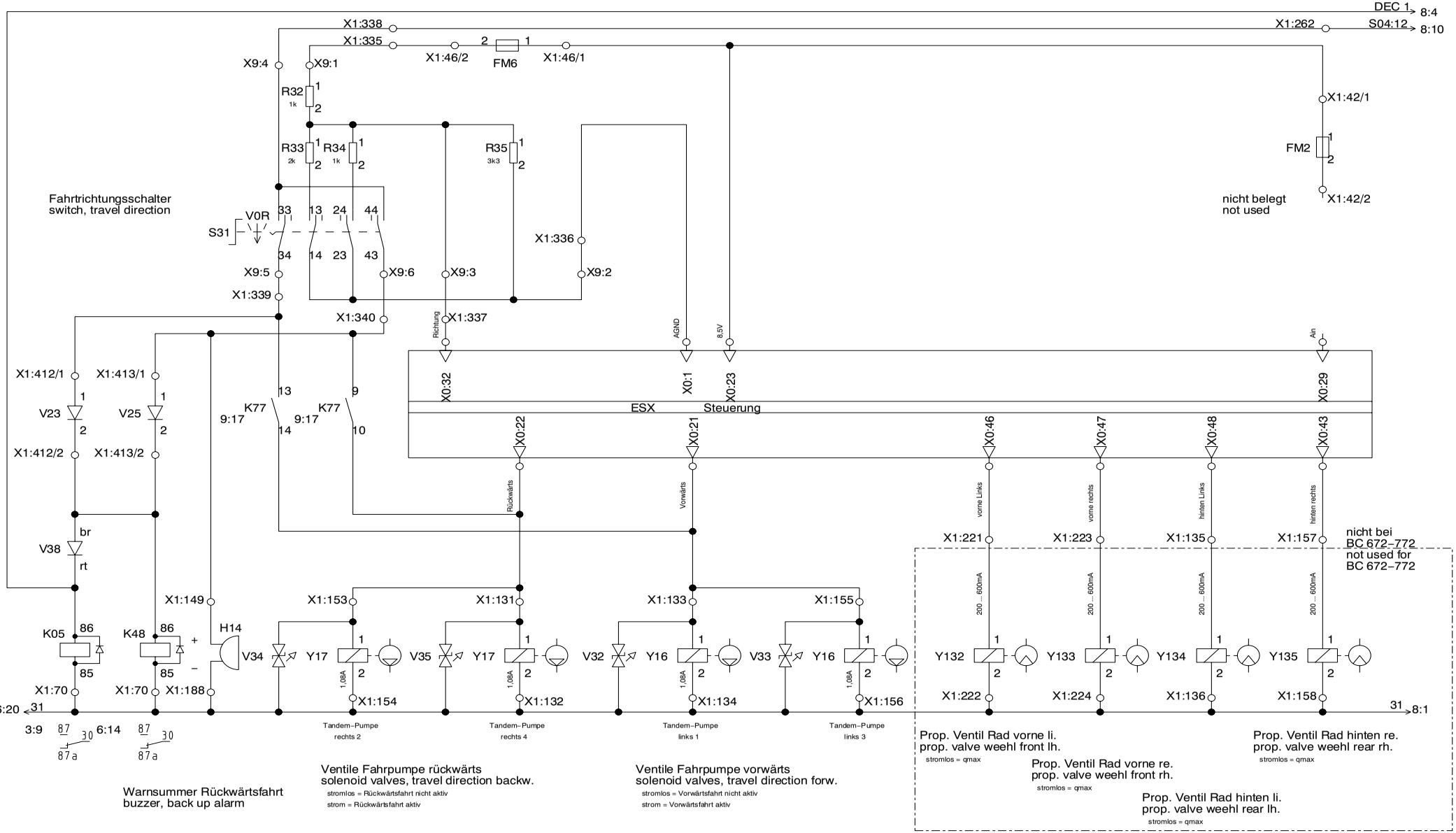
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		Gez.: 17.01.2007 Name: Werner		Instrumente indicators												Seite: 1 von: 1 page: 1 from: 1		570 700 39	
		Gepr.: 17.01.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 005	



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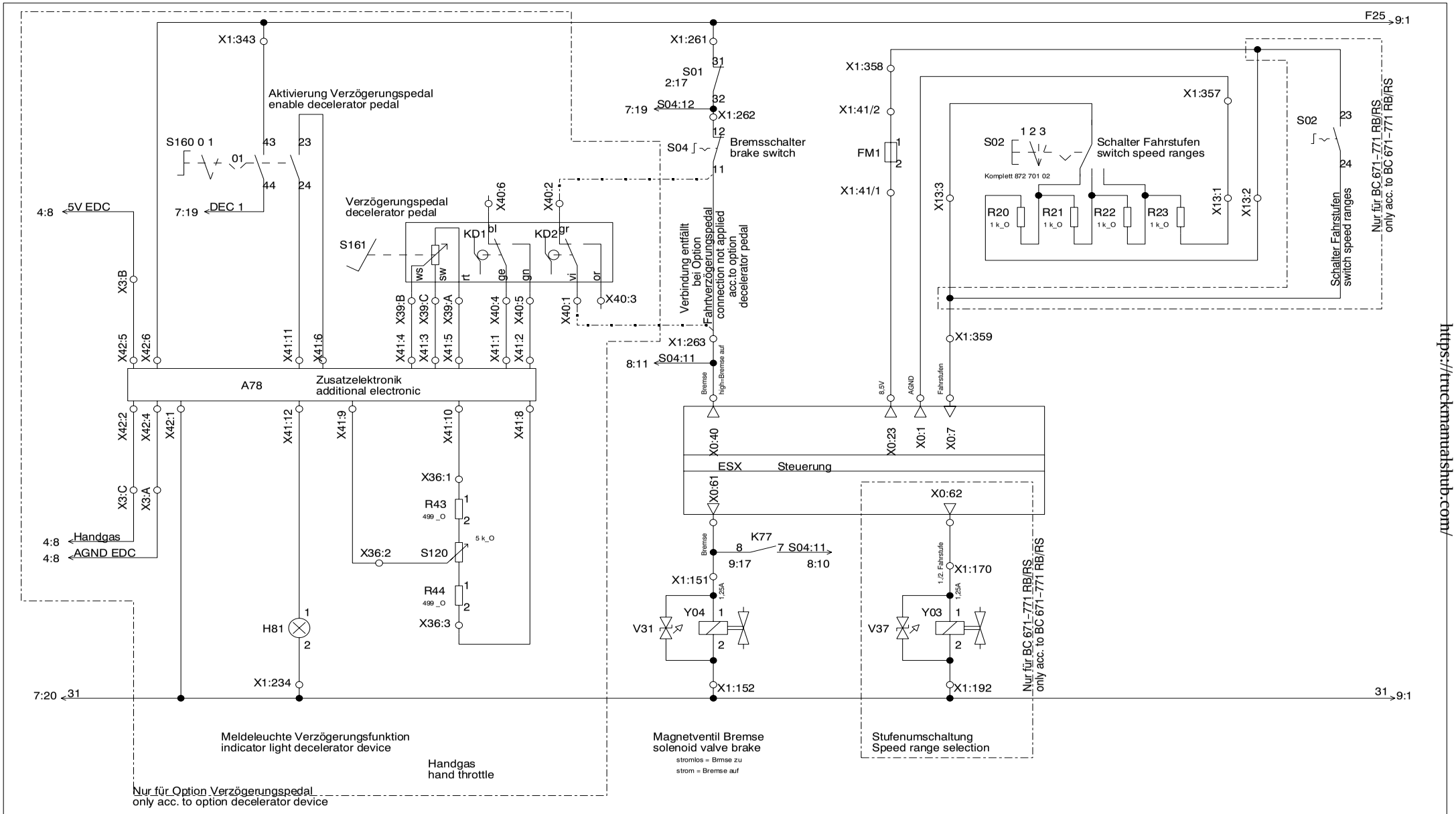
	Gez.: 17.01.2007 Name: Werner	Anzeigen, Störmeldungen monitoring, failure indication	Seite: 1 von: 1 page:	570 700 39	
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	006

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 17.01.2007 Name: Werner		Fahrpumpen, Radmotoren, Startfreigabe driving pumps, weehl motors, starting release												Seite: page: 1	von: from: 1	570 700 39	
		Gepr.: 17.01.2007 Name: Seis														Ers.f.: Replaces: 1		Blatt Nr.: sheet no.: 007	

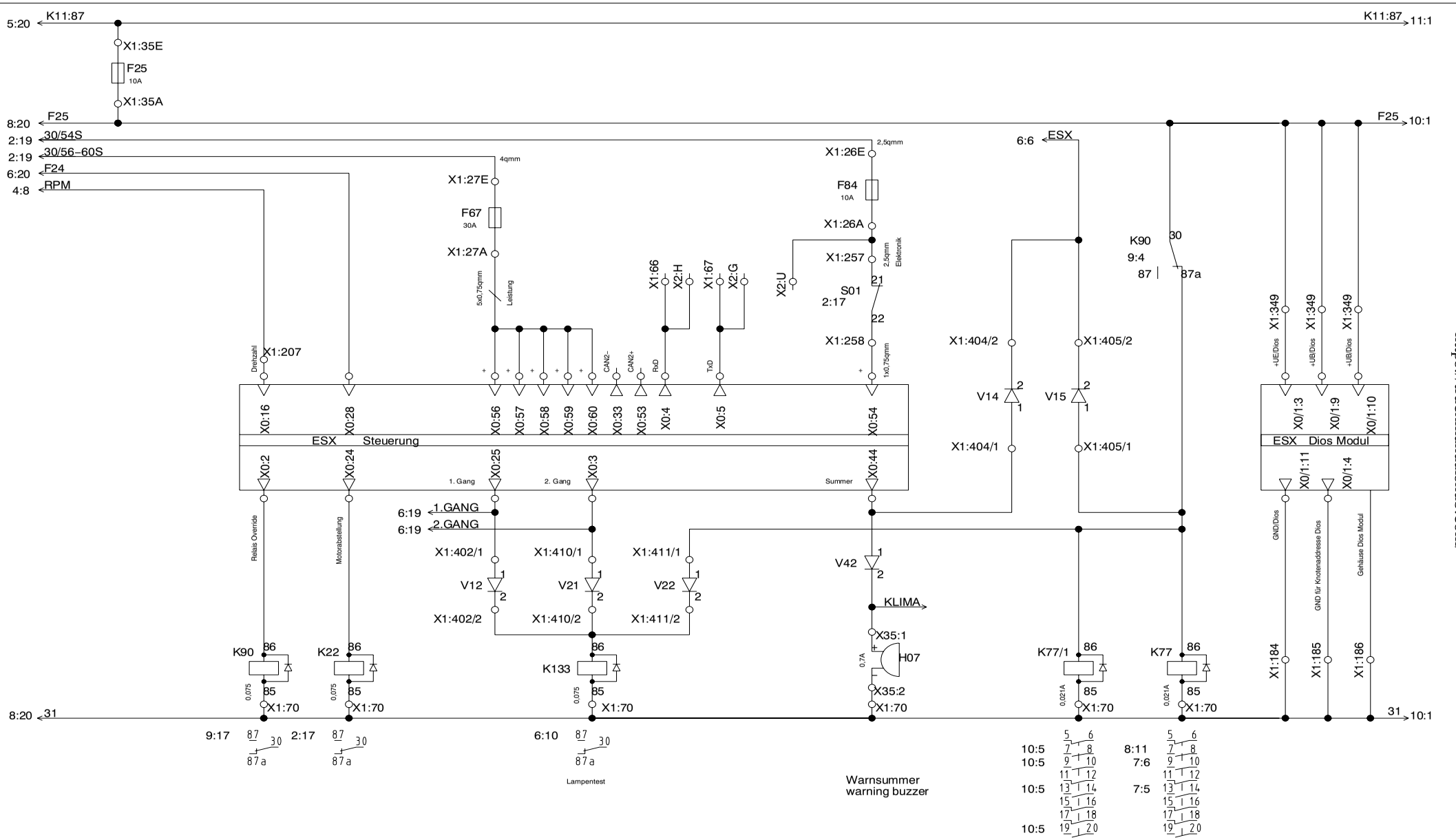
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	Gez.: 17.01.2007 Name: Werner	Fahrstufen, Bremse, Verzögerungspedal speed ranges, brakes, decelerator device	Seite: 1 page: von: 1 from:	570 700 39	
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: 1 Replaces:	Blatt Nr.: 008 sheet no.:	

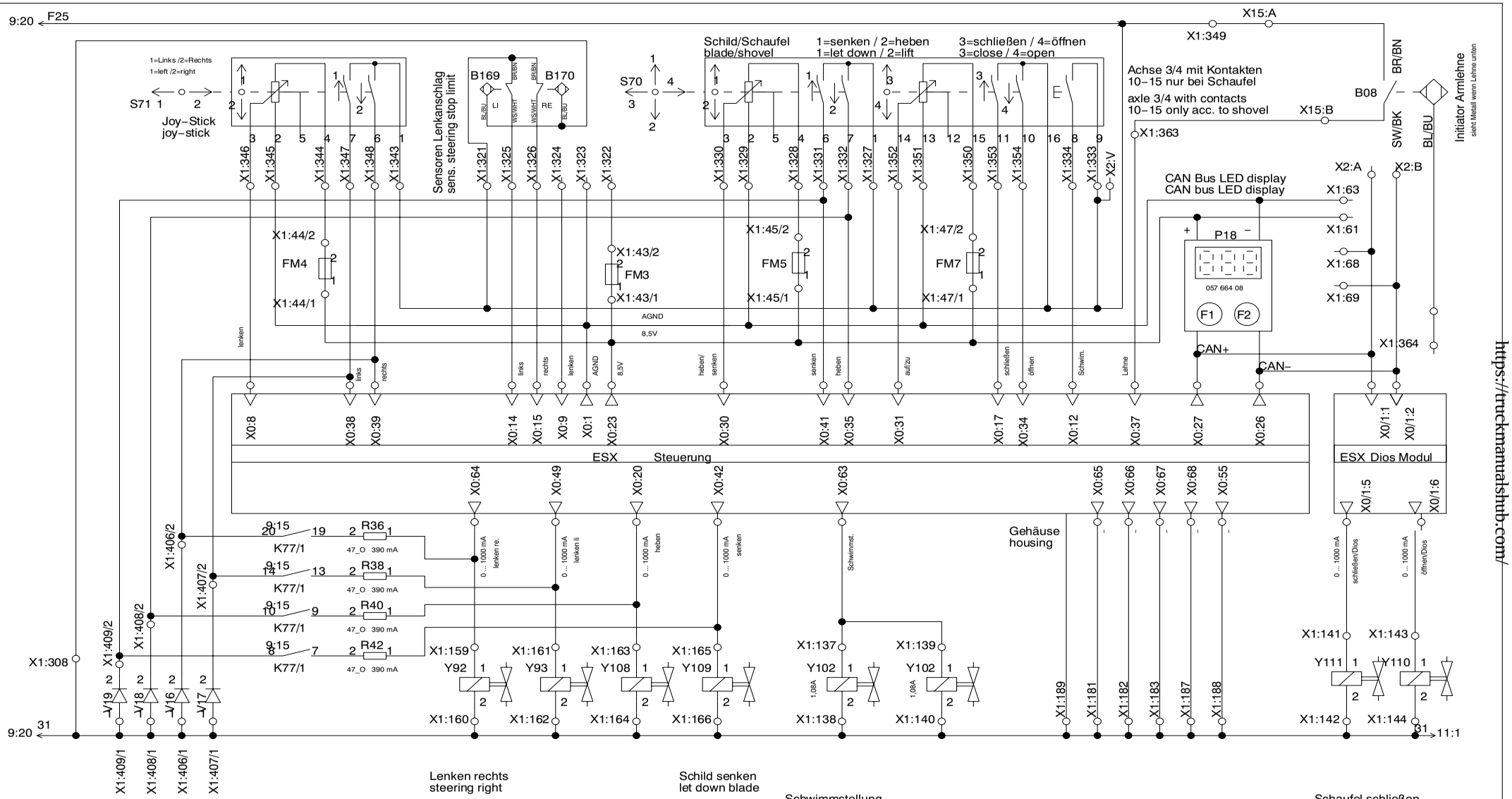
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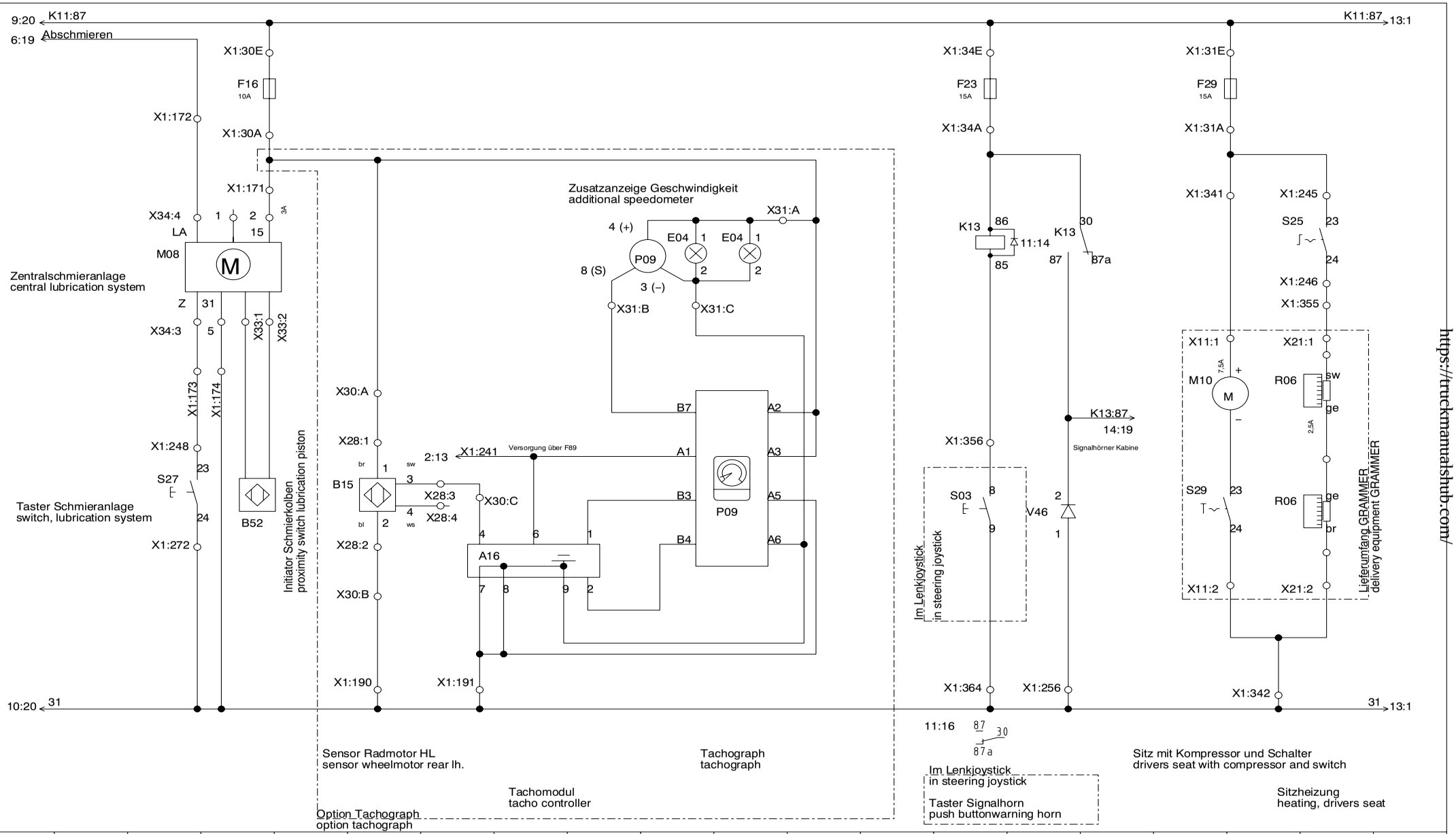
	Gez.: 17.01.2007 Name: Werner	Versorgung Steuerung, Warnsummer, Override supply controllers, warning buzzers, override	Seite: 1 page: von: 1 from:	570 700 39	
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: 1 Replaces:	Blatt Nr.: 009 sheet no.:	



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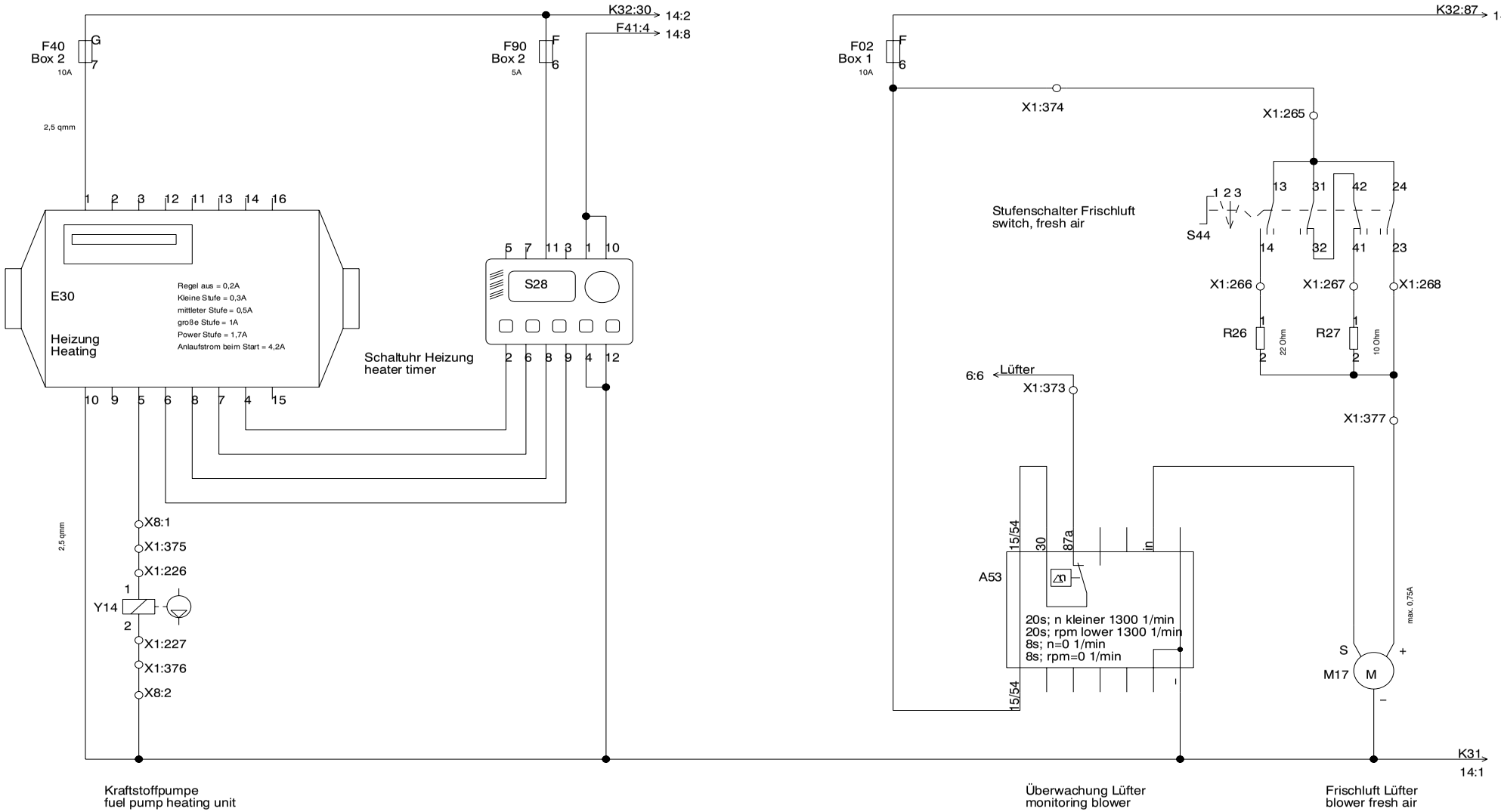
	Gez.: 17.01.2007 Name: Werner	Lenkung und Arbeitshydraulik steering and working hydraulic system	Seite: 1 von: 1 page: from:	570 700 39	
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 010 sheet no.:	



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

	Gez.: 17.01.2007 Name: Werner	Hupe, Schmieranlage, Tachograph, Sitzfunktionen horn, lubrication systhem, tachograph, seat funktions	Seite: 1 von: 1 page: 1 from: 1	570 700 39
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 011 sheet no.:

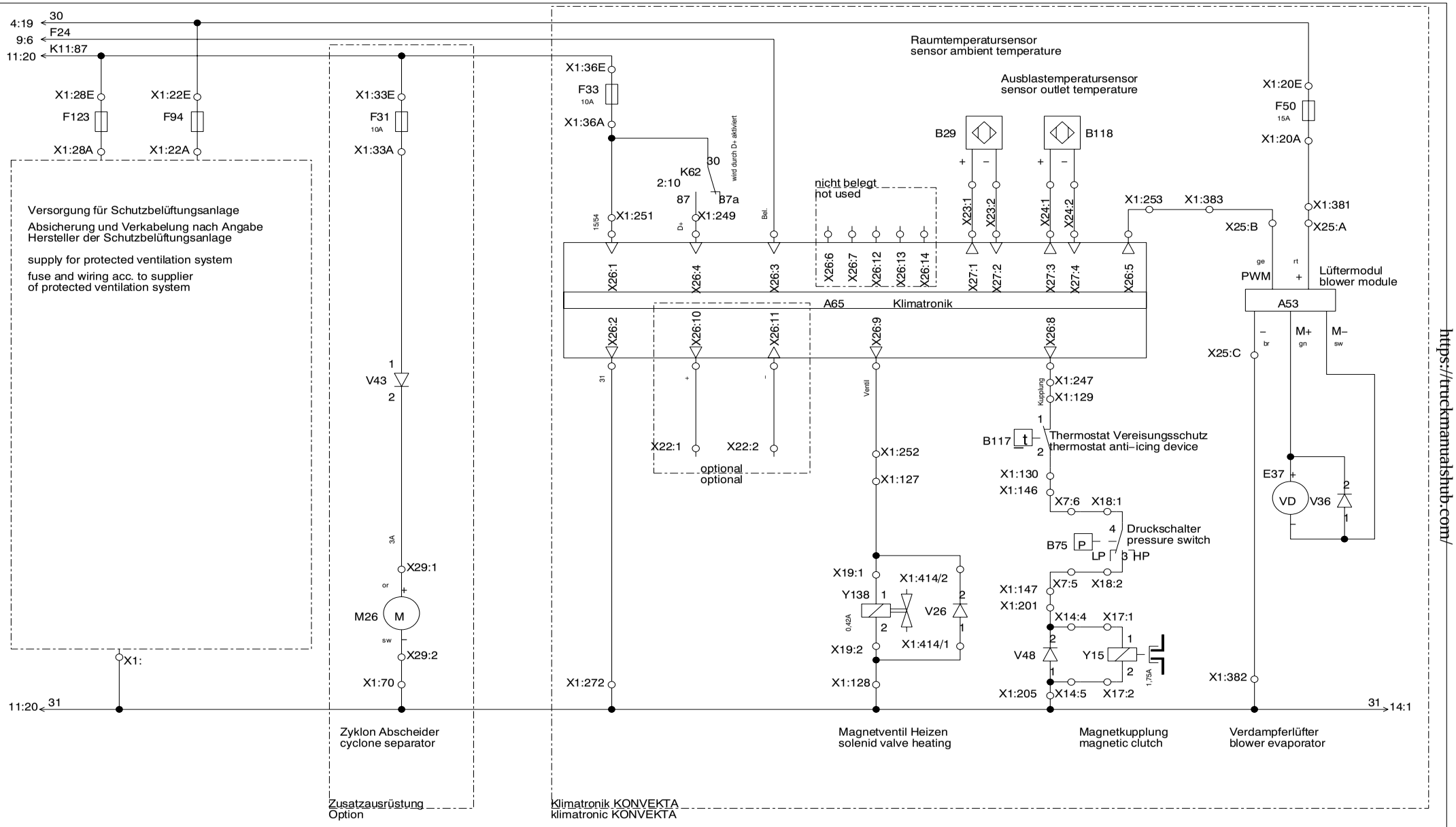
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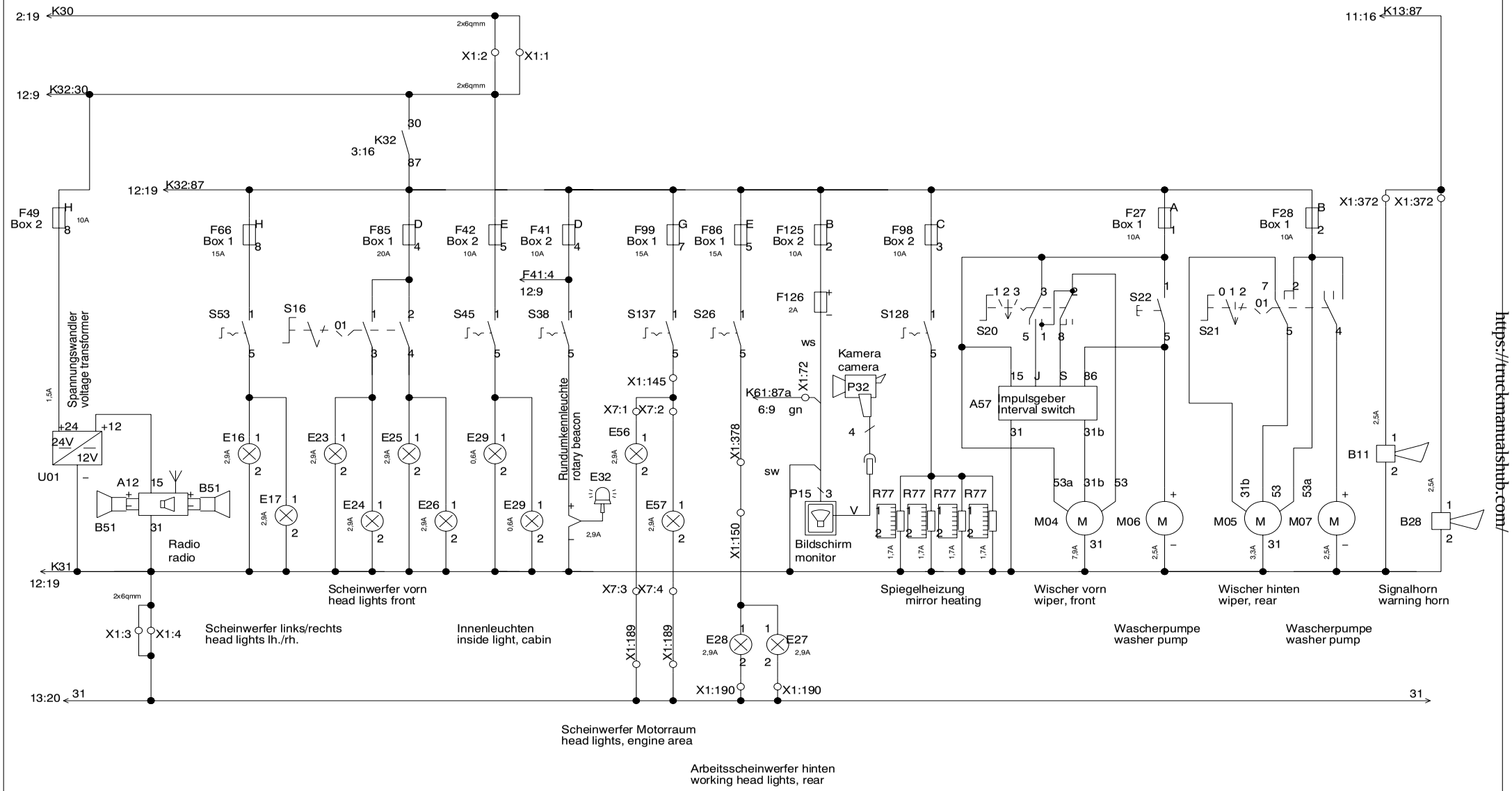
	Gez.: 17.01.2007 Name: Werner	Heizung und Belüftung heating and ventilation	Seite: 1 von: 1 page: from:	570 700 39
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 012 sheet no.:



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

		Gez.: 17.01.2007 Name: Werner		Schutzbelüftung, Zyklon Abscheider, Klimatronik protected vent. system, cyclone separator, air cond.												Seite: 1 von: 1 page: 1 from: 1		570 700 39	
		Gepr.: 17.01.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.:	013



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 17.01.2007 Name: Werner		Kabine und Anbauteile cabin and attachment–parts												Seite: 1 von: 1 page: 1 from: 1		570 700 39	
		Gepr.: 17.01.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 014	

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Name	Bl.	Pf.	Benennung		TYP
A12	014	2	Radio	Radio	
A15	006	7	Ueberwachungsmodul	monitoring module	
A15	006	13	Ueberwachungsmodul	monitoring module	
A16	011	9	Elektronik Tachograph	Electronic system, tachograph	
A48	004	9	Elektronische Motorsteuerung	Electronic engine management	
A53	012	14	Modul Luefterueberwachung	Modul blower monitoring	
A53	013	18	Modul Luefterueberwachung	Modul blower monitoring	
A57	014	14	Intervallschalter Scheibenwischer	Interval switch, wiper	
A65	013	14	Steuerung Klimatronik	Controller klimatronic	
A78	008	3	Zusatzelektronik	Additional control unit	
B03	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B05	006	18	Druckschalter Bremse	Pressure switch, brake	
B08	010	19	Naeherungsinitiator Fahrhebel '0'-Stell.	Proximity switch, travel lever '0' pos.	max. 1,08A
B11	014	19	Signalhorn	Warning horn	2,5A
B15	011	6	Aufnehmer Geschwindigkeit	Transducer, speed	
B19	006	19	Magnetsensor Verschmutzung	Magnetic sensor, contamination	
B20	006	13	Temperaturschalter Hydraulikoel	Temperature switch, hydraulic oil	
B21	006	17	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B22	006	16	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B24	006	12	Schwimmerschalter Hydraulikoel	Float switch, hydraulic oil	
B25	006	11	Druckschalter Ruecklauffilter	Pressure switch, return flow filter	
B28	014	20	Signalhorn	Warning horn	2,5A
B29	013	14	Raumthermostat	Room thermostat	
B42	006	17	Differenzdruckschalter Hydraulikoel	Hydraulic oil pressure differential switch	
B51	014	2	Lautsprecher Radio	Speaker radio	
B51	014	3	Lautsprecher Radio	Speaker radio	
B52	011	4	Naeherungsinitiator Schmierkolben	Proximity switch, lubrication piston	
B53	005	6	Temperaturgeber Kuehlmittel	Temperature switch, collant	
B55	006	3	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B75	013	16	Kuehlmitteldruck	coolant pressure	
B88	004	5	Druckgeber Motoroel	Sender, engine oil pressure	
B113	004	7	EMR Temperaturgeber Kuehlmittel	EMR Temperature switch, collant	
B114	004	8	EMR Aufnehmer, Motordrehzahl 1	EMR Trancducer, engine speed 1	
B116	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B117	013	15	Thermostat Klimaanlage	Thermostar, air conditioning	
B118	013	15	Temperaturfühler Auslaß	Temperature sender outlet	
B121	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B122	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B124	004	3	Geber Wasserstandsabscheider Diesel	Sender, water separator fuel	
B126	004	6	EMR Temperaturgeber Kraftstoff	EMR fuel temperature sender	
B129	006	12	Druckschalter Verteilergetriebe	pressure switch power take-off gear	
B130	004	9	EMR Aufnehmer, Motordrehzahl 2	EMR Trancducer, engine speed 2	
B133	004	11	Sensor Ladeluftdruck / -temperatur	sesnor charging air prssure / temperature	
B169	010	7	Näherungsinitiator Lenkanschlag links	proximity switch steering stop limit left	
B170	010	8	Näherungsinitiator Lenkanschlag rechts	proximity switch steering stop limit right	
E01	005	14	Beleuchtung Tankanzeige	Illumination, level gauge	
E02	005	5	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	
E03	005	10	Beleuchtung Drehzahlmesser	Illumination, rpm meter	
E04	011	10	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E04	011	11	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E16	014	4	Scheinwerfer links	Head light, lh.	55W
E17	014	4	Scheinwerfer rechts	Head light, rh.	55W
E20	002	12	Zigarettenanzuender	Cigarette lighter	
E21	002	12	Beleuchtung Zigarettenanzuender	Illumination, cigarette lighter	
E22	005	7	Beleuchtung Temperaturanzeige Hydr.-oel	Illumination, temp. gauge, hydraulic oil	
E23	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E24	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E25	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E26	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E27	014	11	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	55W
E28	014	10	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	55W
E29	014	7	Innenleuchte Kabine	Inside light, cabin	15W
E29	014	8	Innenleuchte Kabine	Inside light, cabin	15W
E30	012	3	Heizgeraet	Heating unit	
E32	014	8	Kennleuchte	Warning light	70W
E37	013	18	Klimaverdampfer	Air conditioning, evaporator	
E46	005	15	Beleuchtung Voltmeter	Illumination volt meter	
E56	014	9	Scheinwerfer Motorraum rechts	Head light, engine area rh.	55W
E57	014	9	Scheinwerfer Motorraum links	Head light, engine area lh.	55W
ESX	006	9	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	007	12	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	008	10	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	5	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	18	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	010	9	Elektronisches Steuergeraet	Electronic system, control unit	max. 1,08A
ESX	010	19	Elektronisches Steuergeraet	Electronic system, control unit	0,2A
F00	002	2	Hauptsicherung Batterie	Fuse, main, battery	250A
F02	012	12	Ersatzsicherung	Fuse, spare	10A
F05	002	15	Sicherung Steckdose	Fuse, socket	30A
F13	003	9	Sicherung Startschalter	Fuse, starter switch	30A
F16	011	4	Sicherung Zentralschmieranlage	Fuse, central lubrication system	10A
F23	011	14	Sicherung Signalhorn	Fuse, warning horn	15A
F24	005	5	Sicherung Ueberwachungsmodul	Fuse, monitoring module	15A
F25	009	2	Sicherung Magnetv. Fahren u. Bremse	Fuse, sol. valve, travel and brake	10A
F27	014	16	Sicherung Wischer u. Wascher vorne	Fuse, windscr. wiper and washer, fr.	10A
F28	014	18	Sicherung Wischer u. Wascher hinten	Fuse, windscr. wiper and washer, re.	10A
F29	011	18	Sicherung Kompressor Sitzverstell.	Fuse, compr., seat height adjustm.	15A
F31	013	6	Sicherung Kabinenluefter	Fuse, cabin ventilator	10A
F33	013	9	Sicherung Klimageraet	Fuse, air conditioning	10A
F40	012	3	Sicherung Kabinenheizung	Fuse, heating unit cab	10A
F41	014	8	Sicherung Rundumkennleuchte	Fuse, rotary beacon	10A
F42	014	7	Sicherung Kabineninnenleuchte	Fuse, inside light cab	10A
F48	004	2	Sicherung Gluehanlage	Fuse, glow plug system	80A
F49	014	1	Sicherung Spannungswandler	Fuse, voltage transformer	10A
F50	013	19	Sicherung Klimageraet	Fuse, air conditioning	15A
F66	014	4	Sicherung Scheinwerfer vorne	Fuse, head light front	15A

Gez.: 17.01.2007
Name: Werner
Gepr.: 17.01.2007
Name: Seis

Bauteilliste
component listing

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Blatt Nr.: sheet no.: 101

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Name	Bl.	Pf.	Benennung	Benennung	TYP
F67	009	7	Sicherung Steuerung (Potential 30)	Fuse, controller (pot.30)	30A
F84	009	13	Sicherung Steuerung (Klemme 54)	Fuse, controller (Pin 54)	10A
F85	014	6	Sicherung, Scheinwerfer vorne	Fuse, head light front	20A
F86	014	10	Sicherung, Scheinwerfer hinten	Fuse, head lights rear	15A
F89	002	12	Sicherung, Zigarettenanzuender	Fuse, cigarette lighter	30A
F90	012	8	Sicherung, Ansteuerung	Fuse, actuation	5A
F93	004	4	Sicherung Steuerung (Potential 30)	Fuse, controller (pot. 30)	25A
F94	013	3	Sicherung Schutzbelueftung	Fuse, protected ventilation syst.	
F98	014	13	Sicherung Spiegelheizung	fuse,mirror heating	10A
F99	014	9	Sicherung Motorraumbeleuchtung	fuse, illumination engine area	15A
FM1	008	13	Platinensicherung	Multifuse	0,2A
FM2	007	19	Platinensicherung	Multifuse	0,2A
FM3	010	9	Platinensicherung	Multifuse	0,2A
FM4	010	5	Platinensicherung	Multifuse	0,2A
FM5	010	11	Platinensicherung	Multifuse	0,2A
FM6	007	7	Platinensicherung	Multifuse	0,2A
FM7	010	14	Platinensicherung	Multifuse	0,2A
F122	002	17	Sicherung EMR	Fuse, EMR	10A
F123	013	2	Sicherung Schutzbelüftungsanlage	Fuse, protected ventilation system	
F125	014	11	Vorsicherung	pre-fusing	10A
F126	014	11	Sicherung Rückfahrkamera	Fuse, back up camera system	2A
G01	002	2	Batterie	Battery	
G02	002	5	Generator	Generator	28V/80A
G03	002	2	Batterie	Battery	
H04	004	10	Meldeleuchte Betriebsstoerung	Indicator light, breakdown	
H07	009	13	Warnsummer Betriebsstoerung	Warning buzzer, breakdown	0,2A
H14	007	4	Warnsummer Rueckwaertsfahrt	Back-up alarm buzzer	max. 2,5A
H70	004	11	Anzeige Wasser im Diesel	Indicator water in fuel	
H81	008	5	Meldeleuchte Verzögerungsfunktion	Indicator light, decelerator device	
K05	007	2	Relais Startstrom	Relay, starting current	BOSCHW
K11	003	14	Relais Klemme 30 auf 15	Relay, terminal 30 to 15	BOSCHL
K13	011	14	Relais Signalhorn	Relay, warning horn	BOSCHW
K14	004	4	Relais Vorgluehen	Relay, glow plug system	K2DEUTZ
K15	004	12	Relais Gluehen beim Start	Relay, glowing during starting	BOSCHW
K22	009	6	Relais Hubmagnet Motor	Relay, shut off solenoid, engine	BOSCHW
K32	003	16	Relais Kabine	Relay, cabin	BOSCHL
K48	007	3	Relais Fahrhebel 0-Stellung	Relay, travel lever 0-position	BOSCHW
K60	004	14	Relais Motoroeldruck	Relay, engine oil pressure	BOSCHW
K61	002	8	Relais Ladekontrolle	Relay, charge control	BOSCHW
K62	002	10	Relais D+	Relay, D+	BOSCHW
K77	009	17	Relais Override	Relay, override	SDS/SF4
K90	009	4	Relais, Meldeleuchte Stoerung SPS	Relay, indicat.light brake down SPS	BOSCHW
K113	006	11	Zeitrelais	Timing relay	BOSCHW
K133	009	9	Relais Test	Relay, test	BOSCHW
K146	004	13	Relais Kühlmitteltemperatur	relay, coolant temperature	BOSCHW
K77/1	009	15	Relais Override	Relay, override	SDS/SF4
M01	003	9	Starter	Starter	
M04	014	15	Scheibenwischermotor vorne	Windscreen wiper motor, front	190W
M05	014	17	Scheibenwischermotor hinten	Windscreen wiper motor, rear	max 3,3A
M06	014	16	Scheibenwaschermotor vorne	Windscreen washer motor, front	60W
M07	014	18	Scheibenwaschermotor hinten	Windscreen washer motor, rear	60W
M08	011	3	Zentralschmieranlage	Central lubrication system	max. 3A
M10	011	18	Kompressor Fahrersitzhoehenverstellung	Compr., operator's seat height adjustm.	7,5A
M17	012	18	Zusatzluefter	Additional blower	max. 0,75A
M24	013	10	Stellmotor Luftklappe	adjusting motor air inlet flap	
M26	013	6	Zyklon Abscheider	cyclone separator	3A
P00	005	12	Betriebsstundenzaehler	Operating hour meter	
P01	005	15	Tankanzeige	Level gauge	
P02	005	7	Temperaturanzeige Hydraulikoel	Temperature gauge, hydraulic oil	
P03	005	11	Drehzahlmesser	Rpm meter	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P12	005	16	Voltmeter	Volt meter	
P14	005	6	Anzeige Kuehlmitteltemperatur	Temperature gauge, coolant	
P15	014	11	BCM 03 Bildschirm	BCM 03 terminal	
P18	010	16	Diagnose	Diagnostics	max. 1,08A
P32	014	12	Kamera Rückraumüberwachung	Camera, back up monitoring	
R02	004	2	Gluehkerze	Glow plug	
R02	004	2	Gluehkerze	Glow plug	
R03	005	15	Geber Tankanzeige	Sender, level gauge	
R04	005	8	Geber Hydraulikoeltemperatur	Sender, hydraulic oil temp.	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R10	002	7	Parallelwiderstand	Parallel resistor	220 OHM
R20	008	15	Widerstand	Resistor	1 KOHM
R21	008	15	Widerstand	Resistor	1 KOHM
R22	008	16	Widerstand	Resistor	1 KOHM
R23	008	17	Widerstand	Resistor	1 KOHM
R24	004	5	Widerstand	Resistor	10 kOHM
R26	012	17	Widerstand	Resistor	22 OHM
R27	012	18	Widerstand	Resistor	10 OHM
R32	007	5	Widerstand	Resistor	1 kOhm
R33	007	5	Widerstand	Resistor	2 kOhm
R34	007	6	Widerstand	Resistor	1 kOhm
R35	007	8	Widerstand	Resistor	3,3 kOhm
R36	010	6	Widerstand	Resistor	47 OHM
R38	010	6	Widerstand	Resistor	47 OHM
R40	010	6	Widerstand	Resistor	47 OHM
R42	010	6	Widerstand	Resistor	47 OHM
R43	008	7	Widerstand	Resistor	499Ohm
R44	008	7	Widerstand	Resistor	499Ohm
R77	014	12	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W

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Name	Bl.	Pf.	Benennung	Designation	TYP
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	14	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
S00	003	9	Startschalter	Starter switch	MERIT
S01	002	17	Schalter NOT AUS	Switch, emergency off	NOTAUSH
S01	002	17	Schalter NOT AUS	Switch, emergency off	
S02	008	16	Fahrstufenschalter	Switch, speed range selector	
S02	008	19	Fahrstufenschalter	Switch, speed range selector	
S03	011	14	Taster Signalhorn	Push button, warning horn	
S04	008	10	Bremsschalter	Switch, brake	
S16	014	5	Schalter Arbeitsbeleuchtung vorne	Switch, working head lights, front	
S20	014	14	Schalter Scheibenwischer vorne	Switch, windscreen wiper, front	
S21	014	18	Schalter Scheibenwischer hinten	Switch, windscreen wiper, rear	
S22	014	16	Schalter Scheibenwascher vorne	Switch, windscreen washer, front	
S25	011	19	Schalter Fahrersitzheizung	Switch, heating, operator's seat	
S26	014	10	Schalter Arbeitsbeleuchtung hinten	Switch, working head lights, rear	
S27	011	3	Taster Zentralschmieranlage	Push botton, central lubrication system	
S28	012	8	Schalter Kabinenheizung	Switch, cabin heating	
S29	011	18	Schalter Fahrersitz Hoehenverstellung	Switch, operator's seat height adjustm.	
S30	002	2	Batterietrennschalter	Switch, battery disconnect	
S31	007	5	Schalter Fahrtrichtung	Switch, travel direction	
S38	014	8	Schalter Kennleuchte	Switch, warning light	
S44	012	17	Schalter Kabinenluefter	Switch, cabin ventilator	
S45	014	7	Schalter Kabineninnenleuchte	Switch, cabin inside light	
S53	014	4	Schalter Arbeitsbeleuchtung	Switch, working lights	
S70	010	10	Schalter Schubsschild	Switch, dozer blade	WAGO
S71	010	4	Schalter Lenkung	Switch, steering	max. 1,08A
S118	004	18	Schalter Fehlerdiagnose	Switch, fault diagnosis	
S119	004	6	Elektronisches Fusspedal	Electronic foot pedal	
S120	008	7	Schalter Motordrehzahl	Switch, engine speed	5 kOhm
S128	014	13	Schalter Spiegelheizung	Switch, mirror heating	
S137	014	9	Schalter Motorraumbeleuchtung	Switch, illumination engine area	
S160	008	4	Schalter Aktivierung Verzögerungspedal	Switch, enable decelerator pedal	
S161	008	6	Verzögerungspedal	decelerator pedal	
U01	014	1	Spannungswandler	Voltage transformer	
V01	002	7	Diode	Diode	WAGO
V02	006	7	Diode	Diode	WAGO
V03	006	7	Diode	Diode	WAGO
V04	006	7	Diode	Diode	WAGO
V05	006	7	Diode	Diode	WAGO
V07	006	12	Diode	Diode	WAGO
V08	006	12	Diode	Diode	WAGO
V09	006	12	Diode	Diode	WAGO
V10	006	12	Diode	Diode	WAGO
V11	006	12	Diode	Diode	WAGO
V12	009	7	Diode	Diode	WAGO
V13	006	12	Diode	Diode	WAGO
V14	009	14	Diode	Diode	Wago
V15	009	15	Diode	Diode	Wago
V16	010	3	Diode	Diode	WAGO
V17	010	4	Diode	Diode	WAGO
V18	010	3	Diode	Diode	WAGO
V19	010	2	Diode	Diode	WAGO
V21	009	9	Diode	Diode	WAGO
V22	009	10	Diode	Diode	WAGO
V23	007	2	Diode	Diode	WAGO
V25	007	3	Diode	Diode	WAGO
V26	013	14	Diode	Diode	WAGO
V31	008	10	Diode	Diode	Lütze
V32	007	9	Diode	Diode	Lütze
V33	007	11	Diode	Diode	Lütze
V34	007	5	Diode	Diode	Lütze
V35	007	7	Diode	Diode	Lütze
V36	013	19	Diode	Diode	FE5B
V37	008	13	Diode	Diode	Lütze
V38	007	2	Diode	Diode	FE5B KabeldiodeDiode
V42	009	13	Diode (A2)	Diode (A2)	Diodenmodul
V43	013	6	Diode (A3)	Diode (A3)	Diodenmodul
V46	011	15	Diode (A6)	Diode (A6)	Diodenmodul
V47	003	12	Diode (A7)	Diode (A7)	Diodenmodul
V48	013	15	Diode (A8)	Diode (A8)	Diodenmodul
X0/1:1	010	19	DIOS STECKER	Dios connector	
X0/1:2	010	19	DIOS STECKER	Dios connector	
X0/1:3	009	18	DIOS STECKER	Dios connector	
X0/1:4	009	19	DIOS STECKER	Dios connector	
X0/1:5	010	18	DIOS STECKER	Dios connector	
X0/1:6	010	19	DIOS STECKER	Dios connector	
X0/1:9	009	19	DIOS STECKER	Dios connector	
X0/1:10	009	19	DIOS STECKER	Dios connector	
X0/1:11	009	18	DIOS STECKER	Dios connector	
X0:1	007	10	ESX STECKER	esx connector	
X0:1	008	13	ESX STECKER	esx connector	
X0:1	010	8	ESX STECKER	esx connector	
X0:2	009	4	ESX STECKER	esx connector	
X0:3	009	9	ESX STECKER	esx connector	
X0:4	009	10	ESX STECKER	esx connector	
X0:5	009	11	ESX STECKER	esx connector	
X0:6	006	9	ESX STECKER	esx connector	
X0:7	008	14	ESX STECKER	esx connector	
X0:8	010	4	ESX STECKER	esx connector	
X0:9	010	8	ESX STECKER	esx connector	
X0:10	006	10	ESX STECKER	esx connector	
X0:11	006	9	ESX STECKER	esx connector	
X0:12	010	15	ESX STECKER	esx connector	
X0:13	006	10	ESX STECKER	esx connector	
X0:14	010	7	ESX STECKER	esx connector	

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X0:15	010	8	ESX STECKER	esx connector	
X0:16	009	4	ESX STECKER	esx connector	
X0:17	010	14	ESX STECKER	esx connector	
X0:18	006	9	ESX STECKER	esx connector	
X0:19	006	9	ESX STECKER	esx connector	
X0:20	010	9	ESX STECKER	esx connector	
X0:21	007	10	ESX STECKER	esx connector	
X0:22	007	8	ESX STECKER	esx connector	
X0:23	007	11	ESX STECKER	esx connector	
X0:23	008	13	ESX STECKER	esx connector	
X0:23	010	9	ESX STECKER	esx connector	
X0:24	009	6	ESX STECKER	esx connector	
X0:25	009	7	ESX STECKER	esx connector	
X0:26	010	17	ESX STECKER	esx connector	
X0:27	010	16	ESX STECKER	esx connector	
X0:28	009	6	ESX STECKER	esx connector	
X0:29	007	19	ESX STECKER	esx connector	
X0:30	010	10	ESX STECKER	esx connector	
X0:31	010	13	ESX STECKER	esx connector	
X0:32	007	7	ESX STECKER	esx connector	
X0:33	009	9	ESX STECKER	esx connector	
X0:34	010	14	ESX STECKER	esx connector	
X0:35	010	12	ESX STECKER	esx connector	
X0:36	006	9	ESX STECKER	esx connector	
X0:37	010	16	ESX STECKER	esx connector	
X0:38	010	5	ESX STECKER	esx connector	
X0:39	010	6	ESX STECKER	esx connector	
X0:40	008	10	ESX STECKER	esx connector	
X0:41	010	12	ESX STECKER	esx connector	
X0:42	010	10	ESX STECKER	esx connector	
X0:43	007	19	ESX STECKER	esx connector	
X0:44	009	13	ESX STECKER	esx connector	
X0:45	006	10	ESX STECKER	esx connector	
X0:46	007	14	ESX STECKER	esx connector	
X0:47	007	16	ESX STECKER	esx connector	
X0:48	007	17	ESX STECKER	esx connector	
X0:49	010	8	ESX STECKER	esx connector	
X0:50	006	10	ESX STECKER	esx connector	
X0:51	006	10	ESX STECKER	esx connector	
X0:52	006	9	ESX STECKER	esx connector	
X0:53	009	9	ESX STECKER	esx connector	
X0:54	009	13	ESX STECKER	esx connector	
X0:55	010	17	ESX STECKER	esx connector	
X0:56	009	7	ESX STECKER	esx connector	
X0:57	009	8	ESX STECKER	esx connector	
X0:58	009	8	ESX STECKER	esx connector	
X0:59	009	8	ESX STECKER	esx connector	
X0:60	009	9	ESX STECKER	esx connector	
X0:61	008	10	ESX STECKER	esx connector	
X0:62	008	14	ESX STECKER	esx connector	
X0:63	010	12	ESX STECKER	esx connector	
X0:64	010	7	ESX STECKER	esx connector	
X0:65	010	15	ESX STECKER	esx connector	
X0:66	010	16	ESX STECKER	esx connector	
X0:67	010	16	ESX STECKER	esx connector	
X0:68	010	16	ESX STECKER	esx connector	
X1:	013	2	Wago Zentralelektrik	Wago e-box	
X1:1	014	7	Wago Zentralelektrik	Wago e-box	
X1:2	014	7	Wago Zentralelektrik	Wago e-box	
X1:3	014	2	Wago Zentralelektrik	Wago e-box	
X1:4	014	2	Wago Zentralelektrik	Wago e-box	
X1:5	004	20	Wago Zentralelektrik	Wago e-box	
X1:6	002	17	Wago Zentralelektrik	Wago e-box	
X1:7	003	9	Wago Zentralelektrik	Wago e-box	
X1:8	003	9	Wago Zentralelektrik	Wago e-box	
X1:9	003	9	Wago Zentralelektrik	Wago e-box	
X1:61	010	19	Wago Zentralelektrik	Wago e-box	
X1:62	004	15	Wago Zentralelektrik	Wago e-box	
X1:63	010	19	Wago Zentralelektrik	Wago e-box	
X1:64	004	16	Wago Zentralelektrik	Wago e-box	
X1:65	004	16	Wago Zentralelektrik	Wago e-box	
X1:66	009	10	Wago Zentralelektrik	Wago e-box	
X1:67	009	11	Wago Zentralelektrik	Wago e-box	
X1:68	010	19	Wago Zentralelektrik	Wago e-box	
X1:69	010	19	Wago Zentralelektrik	Wago e-box	
X1:70	002	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	003	16	Wago Zentralelektrik	Wago e-box	
X1:70	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	009	4	Wago Zentralelektrik	Wago e-box	
X1:70	009	6	Wago Zentralelektrik	Wago e-box	
X1:70	009	9	Wago Zentralelektrik	Wago e-box	
X1:70	009	13	Wago Zentralelektrik	Wago e-box	
X1:70	009	15	Wago Zentralelektrik	Wago e-box	
X1:70	009	17	Wago Zentralelektrik	Wago e-box	
X1:70	013	6	Wago Zentralelektrik	Wago e-box	
X1:71	004	17	Wago Zentralelektrik	Wago e-box	
X1:72	014	11	Wago Zentralelektrik	Wago e-box	
X1:81	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:82	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:83	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:84	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:85	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:86	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:87	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:88	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:89	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:90	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:91	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	

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X1:92	004	12	Wago Zentralelektrik	Wago e-box	
X1:93	004	13	Wago Zentralelektrik	Wago e-box	
X1:94	004	14	Wago Zentralelektrik	Wago e-box	
X1:101	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:102	006	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:103	006	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:104	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:105	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:106	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:108	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:109	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:110	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:111	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:112	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:113	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:114	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:115	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:116	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:117	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:118	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:119	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:120	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:121	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:122	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:123	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:124	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:125	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:126	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:127	013	13	Wago Zentralelektrik	Wago e-box	
X1:128	013	13	Wago Zentralelektrik	Wago e-box	
X1:129	013	15	Wago Zentralelektrik	Wago e-box	
X1:130	013	15	Wago Zentralelektrik	Wago e-box	
X1:131	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:132	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:133	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:134	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:135	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:136	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:137	010	12	Wago Zentralelektrik	Wago e-box	
X1:138	010	12	Wago Zentralelektrik	Wago e-box	
X1:139	010	13	Wago Zentralelektrik	Wago e-box	
X1:140	010	13	Wago Zentralelektrik	Wago e-box	
X1:141	010	18	Wago Zentralelektrik	Wago e-box	
X1:142	010	18	Wago Zentralelektrik	Wago e-box	
X1:143	010	19	Wago Zentralelektrik	Wago e-box	
X1:144	010	19	Wago Zentralelektrik	Wago e-box	
X1:145	014	9	Wago Zentralelektrik	Wago e-box	
X1:146	013	15	Wago Zentralelektrik	Wago e-box	
X1:147	013	15	Wago Zentralelektrik	Wago e-box	
X1:148	005	8	Wago Zentralelektrik	Wago e-box	
X1:149	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:150	014	10	Wago Zentralelektrik	Wago e-box	
X1:151	008	10	Wago Zentralelektrik	Wago e-box	
X1:152	008	10	Wago Zentralelektrik	Wago e-box	
X1:153	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:154	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:155	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:156	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:157	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:158	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:159	010	7	Wago Zentralelektrik	Wago e-box	
X1:160	010	7	Wago Zentralelektrik	Wago e-box	
X1:161	010	8	Wago Zentralelektrik	Wago e-box	
X1:162	010	8	Wago Zentralelektrik	Wago e-box	
X1:163	010	9	Wago Zentralelektrik	Wago e-box	
X1:164	010	9	Wago Zentralelektrik	Wago e-box	
X1:165	010	10	Wago Zentralelektrik	Wago e-box	
X1:166	010	10	Wago Zentralelektrik	Wago e-box	
X1:170	008	14	Wago Zentralelektrik	Wago e-box	
X1:171	011	4	Wago Zentralelektrik	Wago e-box	
X1:172	011	3	Wago Zentralelektrik	Wago e-box	
X1:173	011	3	Wago Zentralelektrik	Wago e-box	
X1:174	011	4	Wago Zentralelektrik	Wago e-box	
X1:181	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:181	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:181	010	15	Wago Zentralelektrik	Wago e-box	
X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:182	010	16	Wago Zentralelektrik	Wago e-box	
X1:183	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:183	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:183	010	16	Wago Zentralelektrik	Wago e-box	
X1:184	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:184	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:184	009	18	Wago Zentralelektrik	Wago e-box	
X1:185	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:185	009	19	Wago Zentralelektrik	Wago e-box	
X1:186	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:186	009	19	Wago Zentralelektrik	Wago e-box	
X1:187	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:187	010	16	Wago Zentralelektrik	Wago e-box	
X1:188	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:188	010	17	Wago Zentralelektrik	Wago e-box	
X1:189	010	15	Wago Zentralelektrik	Wago e-box	
X1:189	014	9	Wago Zentralelektrik	Wago e-box	
X1:189	014	9	Wago Zentralelektrik	Wago e-box	
X1:190	011	6	Wago Zentralelektrik	Wago e-box	
X1:190	014	10	Wago Zentralelektrik	Wago e-box	
X1:190	014	11	Wago Zentralelektrik	Wago e-box	

Gez.: 17.01.2007
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	Name	Bl.	Pf.	Benennung	Info	TYP
1	X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:191	011	7	Wago Zentralelektrik	Wago e-box	
2	X1:192	008	14	Wago Zentralelektrik	Wago e-box	
	X1:201	013	15	Wago Zentralelektrik	Wago e-box	
	X1:202	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:205	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:205	013	15	Wago Zentralelektrik	Wago e-box	
3	X1:207	009	4	Wago Zentralelektrik	Wago e-box	
	X1:20A	013	19	Sika – Klemme	fuse terminal	
	X1:20E	013	19	Sika – Klemme	fuse terminal	
	X1:210	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:21A	002	12	Sika – Klemme	fuse terminal	
4	X1:21E	002	12	Sika – Klemme	fuse terminal	
	X1:221	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:222	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:223	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:224	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
5	X1:226	012	3	Wago Zentralelektrik	Wago e-box	
	X1:227	012	3	Wago Zentralelektrik	Wago e-box	
	X1:228	005	15	Wago Zentralelektrik	Wago e-box	
	X1:229	005	15	Wago Zentralelektrik	Wago e-box	
	X1:22A	013	3	Sika – Klemme	fuse terminal	
6	X1:22E	013	3	Sika – Klemme	fuse terminal	
	X1:231	004	6	Wago Zentralelektrik	Wago e-box	
	X1:232	004	6	Wago Zentralelektrik	Wago e-box	
	X1:233	004	7	Wago Zentralelektrik	Wago e-box	
	X1:234	008	5	Wago Zentralelektrik	Wago e-box	
7	X1:235	004	6	Wago Zentralelektrik	Wago e-box	
	X1:236	004	6	Wago Zentralelektrik	Wago e-box	
	X1:237	004	7	Wago Zentralelektrik	Wago e-box	
	X1:23A	003	9	Sika – Klemme	fuse terminal	
	X1:23E	002	3	Sika – Klemme	fuse terminal	
8	X1:23E	003	9	Sika – Klemme	fuse terminal	
	X1:241	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:242	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:243	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:244	004	10	Wago Zentralelektrik	Wago e-box	
9	X1:245	011	19	Wago Zentralelektrik	Wago e-box	
	X1:246	011	19	Wago Zentralelektrik	Wago e-box	
	X1:247	013	15	Wago Zentralelektrik	Wago e-box	
	X1:248	011	3	Wago Zentralelektrik	Wago e-box	
	X1:249	013	10	Wago Zentralelektrik	Wago e-box	
10	X1:24A	004	4	Sika – Klemme	fuse terminal	
	X1:24E	004	4	Sika – Klemme	fuse terminal	
	X1:250	004	10	Wago Zentralelektrik	Wago e-box	
	X1:251	013	9	Wago Zentralelektrik	Wago e-box	
	X1:252	013	13	Wago Zentralelektrik	Wago e-box	
11	X1:253	013	17	Wago Zentralelektrik	Wago e-box	
	X1:255	004	18	Wago Zentralelektrik	Wago e-box	
	X1:256	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:256	003	12	Wago Zentralelektrik	Wago e-box	
	X1:256	011	15	Wago Zentralelektrik	Wago e-box	
12	X1:257	009	13	Wago Zentralelektrik	Wago e-box	
	X1:258	009	13	Wago Zentralelektrik	Wago e-box	
	X1:259	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:25A	002	15	Sika – Klemme	fuse terminal	
	X1:25E	002	15	Sika – Klemme	fuse terminal	
13	X1:260	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:261	008	10	Wago Zentralelektrik	Wago e-box	
	X1:262	007	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:262	008	10	Wago Zentralelektrik	Wago e-box	
	X1:263	008	10	Wago Zentralelektrik	Wago e-box	
14	X1:265	012	18	Wago Zentralelektrik	Wago e-box	
	X1:266	012	17	Wago Zentralelektrik	Wago e-box	
	X1:267	012	18	Wago Zentralelektrik	Wago e-box	
	X1:268	012	19	Wago Zentralelektrik	Wago e-box	
	X1:269	004	11	Wago Zentralelektrik	Wago e-box	
15	X1:26A	009	13	Sika – Klemme	fuse terminal	
	X1:26E	009	13	Sika – Klemme	fuse terminal	
	X1:270	004	11	Wago Zentralelektrik	Wago e-box	
	X1:272	011	3	Wago Zentralelektrik	Wago e-box	
	X1:272	013	9	Wago Zentralelektrik	Wago e-box	
16	X1:27A	009	7	Sika – Klemme	fuse terminal	
	X1:27E	009	7	Sika – Klemme	fuse terminal	
	X1:28A	013	2	Sika – Klemme	fuse terminal	
	X1:28E	013	2	Sika – Klemme	fuse terminal	
	X1:291	005	7	Wago Zentralelektrik	Wago e-box	
17	X1:292	005	11	Wago Zentralelektrik	Wago e-box	
	X1:293	003	10	Wago Zentralelektrik	Wago e-box	
	X1:294	005	5	Wago Zentralelektrik	Wago e-box	
	X1:295	005	7	Wago Zentralelektrik	Wago e-box	
18	X1:296	005	15	Wago Zentralelektrik	Wago e-box	
	X1:298	002	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:298	005	11	Wago Zentralelektrik	Wago e-box	
	X1:299	004	20	Wago Zentralelektrik	Wago e-box	
	X1:299	005	5	Wago Zentralelektrik	Wago e-box	
19	X1:29A	005	5	Sika – Klemme	fuse terminal	
	X1:29E	005	5	Sika – Klemme	fuse terminal	
	X1:300	005	7	Wago Zentralelektrik	Wago e-box	
	X1:301	005	11	Wago Zentralelektrik	Wago e-box	
	X1:302	003	13	Wago Zentralelektrik	Wago e-box	
20	X1:303	005	8	Wago Zentralelektrik	Wago e-box	
	X1:308	010	2	Wago Zentralelektrik	Wago e-box	
	X1:30A	011	4	Sika – Klemme	fuse terminal	
	X1:30E	011	4	Sika – Klemme	fuse terminal	
	X1:31A	011	18	Sika – Klemme	fuse terminal	
	X1:31E	002	17	SIKA KLEMME	fuse terminal	
	X1:31E	011	18	Sika – Klemme	fuse terminal	

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Name	Bl.	Pf.	Benennung	Ident	TYP
X1:321	010	7	Wago Zentralelektrik	Wago e-box	
X1:322	010	9	Wago Zentralelektrik	Wago e-box	
X1:323	010	8	Wago Zentralelektrik	Wago e-box	
X1:324	010	8	Wago Zentralelektrik	Wago e-box	
X1:325	010	7	Wago Zentralelektrik	Wago e-box	
X1:326	010	8	Wago Zentralelektrik	Wago e-box	
X1:327	010	12	Wago Zentralelektrik	Wago e-box	
X1:328	010	11	Wago Zentralelektrik	Wago e-box	
X1:329	010	11	Wago Zentralelektrik	Wago e-box	
X1:32A	002	17	Sika – Klemme	fuse terminal	
X1:32E	002	17	Sika – Klemme	fuse terminal	
X1:330	010	10	Wago Zentralelektrik	Wago e-box	
X1:331	010	12	Wago Zentralelektrik	Wago e-box	
X1:332	010	12	Wago Zentralelektrik	Wago e-box	
X1:333	010	15	Wago Zentralelektrik	Wago e-box	
X1:334	010	15	Wago Zentralelektrik	Wago e-box	
X1:335	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:336	007	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:337	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:338	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:339	007	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:33A	013	6	Sika – Klemme	fuse terminal	
X1:33E	002	17	SIKA KLEMME	fuse terminal	
X1:33E	013	6	Sika – Klemme	fuse terminal	
X1:340	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:341	011	18	Wago Zentralelektrik	Wago e-box	
X1:342	011	18	Wago Zentralelektrik	Wago e-box	
X1:343	008	4	Wago Zentralelektrik	Wago e-box	
X1:343	010	6	Wago Zentralelektrik	Wago e-box	
X1:344	010	5	Wago Zentralelektrik	Wago e-box	
X1:345	010	4	Wago Zentralelektrik	Wago e-box	
X1:346	010	4	Wago Zentralelektrik	Wago e-box	
X1:347	010	5	Wago Zentralelektrik	Wago e-box	
X1:348	010	6	Wago Zentralelektrik	Wago e-box	
X1:349	009	18	Wago Zentralelektrik	Wago e-box	
X1:349	009	19	Wago Zentralelektrik	Wago e-box	
X1:349	009	19	Wago Zentralelektrik	Wago e-box	
X1:349	010	17	Wago Zentralelektrik	Wago e-box	
X1:34A	011	14	Sika – Klemme	fuse terminal	
X1:34E	011	14	Sika – Klemme	fuse terminal	
X1:350	010	14	Wago Zentralelektrik	Wago e-box	
X1:351	010	13	Wago Zentralelektrik	Wago e-box	
X1:352	010	13	Wago Zentralelektrik	Wago e-box	
X1:353	010	14	Wago Zentralelektrik	Wago e-box	
X1:354	010	14	Wago Zentralelektrik	Wago e-box	
X1:355	011	19	Wago Zentralelektrik	Wago e-box	
X1:356	011	14	Wago Zentralelektrik	Wago e-box	
X1:357	008	17	Wago Zentralelektrik	Wago e-box	
X1:358	008	13	Wago Zentralelektrik	Wago e-box	
X1:359	008	14	Wago Zentralelektrik	Wago e-box	
X1:35A	009	2	Sika – Klemme	fuse terminal	
X1:35E	009	2	Sika – Klemme	fuse terminal	
X1:363	010	16	Wago Zentralelektrik	Wago e-box	
X1:364	010	20	Wago Zentralelektrik	Wago e-box	
X1:364	011	14	Wago Zentralelektrik	Wago e-box	
X1:36A	013	9	Sika – Klemme	fuse terminal	
X1:36E	013	9	Sika – Klemme	fuse terminal	
X1:371	003	16	Wago Zentralelektrik	Wago e-box	
X1:372	014	19	Wago Zentralelektrik	Wago e-box	
X1:372	014	20	Wago Zentralelektrik	Wago e-box	
X1:373	012	15	Wago Zentralelektrik	Wago e-box	
X1:374	012	15	Wago Zentralelektrik	Wago e-box	
X1:375	012	3	Wago Zentralelektrik	Wago e-box	
X1:376	012	3	Wago Zentralelektrik	Wago e-box	
X1:377	012	19	Wago Zentralelektrik	Wago e-box	
X1:378	014	10	Wago Zentralelektrik	Wago e-box	
X1:381	013	19	Wago Zentralelektrik	Wago e-box	
X1:382	013	18	Wago Zentralelektrik	Wago e-box	
X1:383	013	17	Wago Zentralelektrik	Wago e-box	
X1:391/1	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:391/2	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:392/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:392/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:393/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:393/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:394/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:394/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:395/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:395/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:397/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:397/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:398/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:398/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:399/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:399/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:400/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:400/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:401/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:401/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:402/1	009	7	Wago Zentralelektrik	Wago e-box	
X1:402/2	009	7	Wago Zentralelektrik	Wago e-box	
X1:403/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:403/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:404/1	009	14	Wago Zentralelektrik	Wago e-box	
X1:404/2	009	14	Wago Zentralelektrik	Wago e-box	
X1:405/1	009	15	Wago Zentralelektrik	Wago e-box	
X1:405/2	009	15	Wago Zentralelektrik	Wago e-box	
X1:406/1	010	3	Wago Zentralelektrik	Wago e-box	
X1:406/2	010	3	Wago Zentralelektrik	Wago e-box	

Gez.: 17.01.2007
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	Name	Bl.	Pf.	Benennung		TYP
1	X1:407/1	010	4	Wago Zentralelektrik	Wago e-box	
	X1:407/2	010	4	Wago Zentralelektrik	Wago e-box	
	X1:408/1	010	3	Wago Zentralelektrik	Wago e-box	
2	X1:408/2	010	3	Wago Zentralelektrik	Wago e-box	
	X1:409/1	010	2	Wago Zentralelektrik	Wago e-box	
	X1:409/2	010	2	Wago Zentralelektrik	Wago e-box	
	X1:41/1	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:41/2	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
3	X1:410/1	009	9	Wago Zentralelektrik	Wago e-box	
	X1:410/2	009	9	Wago Zentralelektrik	Wago e-box	
	X1:411/1	009	10	Wago Zentralelektrik	Wago e-box	
	X1:411/2	009	10	Wago Zentralelektrik	Wago e-box	
	X1:412/1	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
4	X1:412/2	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:413/1	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:413/2	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:414/1	013	14	Wago Zentralelektrik	Wago e-box	
	X1:414/2	013	14	Wago Zentralelektrik	Wago e-box	
5	X1:42/1	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:42/2	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:43/1	010	9	Wago Zentralelektrik	Wago e-box	
	X1:43/2	010	9	Wago Zentralelektrik	Wago e-box	
	X1:44/1	010	5	Wago Zentralelektrik	Wago e-box	
6	X1:44/2	010	5	Wago Zentralelektrik	Wago e-box	
	X1:45/1	010	11	Wago Zentralelektrik	Wago e-box	
	X1:45/2	010	11	Wago Zentralelektrik	Wago e-box	
	X1:46/1	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:46/2	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
7	X1:47/1	010	14	Wago Zentralelektrik	Wago e-box	
	X1:47/2	010	14	Wago Zentralelektrik	Wago e-box	
	X2:A	010	19	Datenschnittstelle	data interface	
	X2:B	010	19	Datenschnittstelle	data interface	
	X2:G	009	11	Datenschnittstelle	data interface	
8	X2:H	009	10	Datenschnittstelle	data interface	
	X2:J	002	11	Datenschnittstelle	data interface	
	X2:N	002	11	Datenschnittstelle	data interface	
	X2:U	009	11	Datenschnittstelle	data interface	
	X2:V	010	15	Datenschnittstelle	data interface	
9	X3:A	008	3	Stecker Handgas	connector hand throttle	
	X3:B	008	2	Stecker Handgas	connector hand throttle	
	X3:C	008	2	Stecker Handgas	connector hand throttle	
	X4:A	004	15	EMR – Diagnose	EMR-diagnosis	
	X4:B	004	17	EMR – Diagnose	EMR-diagnosis	
10	X4:F	004	16	EMR – Diagnose	EMR-diagnosis	
	X4:G	004	16	EMR – Diagnose	EMR-diagnosis	
	X4:H	004	15	EMR – Diagnose	EMR-diagnosis	
	X4:K	004	17	EMR – Diagnose	EMR-diagnosis	
	X4:M	004	16	EMR – Diagnose	EMR-diagnosis	
11	X5:1	005	7	Deutsch Stecker Senso	Deutsch Connector sensor	
	X6:1	004	10	Wago Zentralelektrik	Wago e-box	
	X6:2	004	10	Wago Zentralelektrik	Wago e-box	
	X6:3	004	11	Wago Zentralelektrik	Wago e-box	
	X6:4	004	11	Wago Zentralelektrik	Wago e-box	
12	X6:5	004	15	Wago Zentralelektrik	Wago e-box	
	X6:6	004	15	Wago Zentralelektrik	Wago e-box	
	X6:7	004	16	Wago Zentralelektrik	Wago e-box	
	X6:8	004	16	Wago Zentralelektrik	Wago e-box	
	X6:9	004	16	Wago Zentralelektrik	Wago e-box	
13	X6:10	004	17	Wago Zentralelektrik	Wago e-box	
	X7:1	014	9	Stecker Rops	connector on rops	
	X7:2	014	9	Stecker Rops	connector on rops	
	X7:3	014	9	Stecker Rops	connector on rops	
	X7:4	014	9	Stecker Rops	connector on rops	
	X7:5	013	16	Stecker Rops	connector on rops	
14	X7:6	013	16	Stecker Rops	connector on rops	
	X8:1	012	3	Pumpenstecker Kabine	connector pump cabin;	
	X8:2	012	3	Pumpenstecker Kabine	connector pump cabin;	
	X9:1	007	5	Stecker Schalter Rich	connector direction switch	
	X9:2	007	9	Stecker Schalter Rich	connector direction switch	
15	X9:3	007	7	Stecker Schalter Rich	connector direction switch	
	X9:4	007	5	Stecker Schalter Rich	connector direction switch	
	X9:5	007	5	Stecker Schalter Rich	connector direction switch	
	X9:6	007	6	Stecker Schalter Rich	connector direction switch	
	XS	002	15	Steckdose	Socket	
16	X10:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
	X10:B	004	6	AMP Stecker Gaspedal	AMP connector throttle	
	X10:C	004	6	AMP Stecker Gaspedal	AMP connector throttle	
	X11:1	011	18	Schnittstelle Sitz	connector drivers seat	
	X11:2	011	18	Schnittstelle Sitz	connector drivers seat	
17	X12:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
	X12:B	004	8	AMP Stecker Gaspedal	AMP connector throttle	
	X12:C	004	7	AMP Stecker Gaspedal	AMP connector throttle	
	X13:1	008	17	Stecker Stufenschalte	connector speed range switch	
	X13:2	008	18	Stecker Stufenschalte	connector speed range switch	
18	X13:3	008	14	Stecker Stufenschalte	connector speed range switch	
	X14:4	013	15	Stecker Motor	connector engine	
	X14:5	013	16	Stecker Motor	connector engine	
	X14:6	002	6	Motorschnittstelle	engine interface	
	X14:7	002	6	Motorschnittstelle	engine interface	
19	X14:8	005	7	Motorschnittstelle	engine interface	
	X14:9	003	9	Motorschnittstelle	engine interface	
	X14:10	006	12	Stecker Motor	connector engine	
	X14:11	006	12	Stecker Motor	connector engine	
	X15:A	010	18	Stecker Lehne links	connector arm rest lh.	
20	X15:B	010	18	Stecker Lehne links	connector arm rest lh.	
	X15:C	010	20	Stecker Lehne links	connector arm rest lh.	
	X17:1	013	16	Stecker Klimakupplung	connector clima clutch	
	X17:2	013	16	Stecker Klimakupplung	connector clima clutch	
	X18:1	013	16	Stecker Druckschalter	connector pressure switch	

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	Name	Bl.	Pf.	Benennung		TYP
1	X18:2	013	16	Stecker Druckschalter	connector pressure switch	
	X19:1	013	13	Stecker Heizventil	connector heating valve	
	X19:2	013	13	Stecker Heizventil	connector heating valve	
2	X21:1	011	19	Schnittstelle Sitz	connector drivers seat	
	X21:2	011	19	Schnittstelle Sitz	connector drivers seat	
	X22:1	013	10	Stecker Luftklappe	connector air flap	
	X22:2	013	11	Stecker Luftklappe	connector air flap	
	X23:1	013	14	Stecker Sensor	connector sensor	
3	X23:2	013	14	Stecker Sensor	connector sensor	
	X24:1	013	15	Stecker Sensor	connector sensor	
	X24:2	013	15	Stecker Sensor	connector sensor	
	X25:A	013	19	Stecker Lüfter	connector blower	
	X25:B	013	18	Stecker Lüfter	connector blower	
4	X25:C	013	18	Stecker Lüfter	connector blower	
	X26:1	013	9	Stecker Klimasteuerun	connector climacontrol	
	X26:2	013	9	Stecker Klimasteuerun	connector climacontrol	
	X26:3	013	11	Stecker Klimasteuerun	connector climacontrol	
	X26:4	013	10	Stecker Klimasteuerun	connector climacontrol	
5	X26:5	013	16	Stecker Klimasteuerun	connector climacontrol	
	X26:6	013	12	Stecker Klimasteuerun	connector climacontrol	
	X26:7	013	12	Stecker Klimasteuerun	connector climacontrol	
	X26:8	013	15	Stecker Klimasteuerun	connector climacontrol	
	X26:9	013	13	Stecker Klimasteuerun	connector climacontrol	
6	X26:10	013	10	Stecker Klimasteuerun	connector climacontrol	
	X26:11	013	11	Stecker Klimasteuerun	connector climacontrol	
	X26:12	013	13	Stecker Klimasteuerun	connector climacontrol	
	X26:13	013	13	Stecker Klimasteuerun	connector climacontrol	
	X26:14	013	13	Stecker Klimasteuerun	connector climacontrol	
7	X27:1	013	14	Stecker Klimasteuerun	connector climacontrol	
	X27:2	013	14	Stecker Klimasteuerun	connector climacontrol	
	X27:3	013	15	Stecker Klimasteuerun	connector climacontrol	
	X27:4	013	15	Stecker Klimasteuerun	connector climacontrol	
	X28:1	011	6	Stecker Radsensor	connector wheel sensor	
8	X28:2	011	6	Stecker Radsensor	connector wheel sensor	
	X28:3	011	7	Stecker Radsensor	connector wheel sensor	
	X28:4	011	7	Stecker Radsensor	connector wheel sensor	
	X29:1	013	6	Stecker Zyklon	Connector cyclone	
	X29:2	013	6	Stecker Zyklon	Connector cyclone	
9	X30:A	011	6	Verbindungsstecker Se	connector sensor	
	X30:B	011	6	Verbindungsstecker Se	connector sensor	
	X30:C	011	7	Verbindungsstecker Se	connector sensor	
	X31:A	011	11	Verbindungsstecker An	connector gauge	
	X31:B	011	9	Verbindungsstecker An	connector gauge	
10	X31:C	011	10	Verbindungsstecker An	connector gauge	
	X33:1	011	4	Schmieranlage	lubrication system	
	X33:2	011	4	Schmieranlage	lubrication system	
	X34:1	011	4	Schmieranlage	lubrication system	
	X34:2	011	4	Schmieranlage	lubrication system	
	X34:3	011	3	Schmieranlage	lubrication system	
11	X34:4	011	3	Schmieranlage	lubrication system	
	X34:5	011	4	Schmieranlage	lubrication system	
	X35:1	009	13	Stecker Warnsummer	connector warning buzzer	
	X35:2	009	13	Stecker Warnsummer	connector warning buzzer	
	X36:1	008	7	Stecker Poti	connector potentiometer	
12	X36:2	008	6	Stecker Poti	connector potentiometer	
	X36:3	008	7	Stecker Poti	connector potentiometer	
	X39:A	008	7	Stecker Deceleratorpe	connector decelerator pedal	
	X39:B	008	6	Stecker Deceleratorpe	connector decelerator pedal	
	X39:C	008	6	Stecker Deceleratorpe	connector decelerator pedal	
13	X40:1	008	8	Stecker Deceleratorpe	connector decelerator pedal	
	X40:2	008	8	Stecker Deceleratorpe	connector decelerator pedal	
	X40:3	008	9	Stecker Deceleratorpe	connector decelerator pedal	
	X40:4	008	7	Stecker Deceleratorpe	connector decelerator pedal	
	X40:5	008	8	Stecker Decelelratorp	connector decelerator pedal	
14	X40:6	008	7	Stecker Deceleratorpe	connector decelerator pedal	
	X41:1	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:2	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:3	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:4	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
15	X41:5	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:6	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:8	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:9	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:10	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
16	X41:11	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:12	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X42:1	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:2	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:4	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
17	X42:5	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:6	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X17.1:1	004	2	2-pol SPT	2-pole SPT	
	X17.1:2	004	2	2-pol SPT	2-pole SPT	
18	X27.1:4	004	18	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:6	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:7	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:11	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:12	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
19	X27.1:13	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:14	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:15	004	9	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:18	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:19	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
20	X27.1:20	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:21	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:22	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:23	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:24	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:25	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	

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X27.1:26	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:27	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:28	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:29	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:30	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:33	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:34	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:35	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:36	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:37	004	13	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:39	004	17	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:40	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:41	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:42	004	15	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.2:10	004	3	12-pol EPC	12-pole EPC	
X27.2:11	004	3	12-pol EPC	12-pole EPC	
XD2.1:2	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:3	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:5	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:6	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:8	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:9	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:10	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:11	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:13	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:20	004	14	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:22	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:29	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:30	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:33	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:34	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:35	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:38	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:39	004	13	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:40	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:52	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:53	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:54	004	12	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:59	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:60	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:61	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:62	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:77	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:78	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:79	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:89	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.2:3	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:4	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:5	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:7	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:8	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:9	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:10	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:15	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:18	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:19	004	9	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:23	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:24	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:25	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:26	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:27	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:28	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:32	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:33	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:34	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:35	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:36	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.3:3	004	15	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:4	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:6	004	13	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:7	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:8	004	18	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:12	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:13	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:14	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:15	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:16	004	17	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
Y02	004	19	Magnetventil Flammgluehanlage	Solenoid valve, glow plug system	18W
Y03	008	14	Magnetventil Fahrstufenumschaltung	Solenoid valve, speed range selector	
Y04	008	10	Magnetventil Bremse	Solenoid valve, brake	1,25A
Y14	012	3	Kraftstoffpumpe Heizgeraet	Fuel pump, heating unit	
Y15	013	16	Magnetkupplung Klimakompressor	Magnetic clutch, air conditioning compr.	1,75A
Y16	007	10	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y16	007	12	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y17	007	6	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y17	007	8	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y92	010	7	Magnetventil Lenkung vorne rechts	Solenoid valve, steering, front rh.	max. 1,1A
Y93	010	8	Magnetventil Lenkung vorne links	Solenoid valve, steering, front lh.	max. 1,1A
Y102	010	12	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y102	010	13	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y108	010	9	Magnetventil Schaufel Heben	solenoid valve, lifting shovel	max. 1,1A
Y109	010	10	Magnetventil Schaufel Senken	solenoid valve, let down shovel	max. 1,1A
Y110	010	19	Magnetventil Schaufel oeffnen	solenoid valve, open shovel	max. 1,1A
Y111	010	18	Magnetventil Schaufel Schließen	solenoid valve, close shovel	max. 1,1A
Y132	007	14	Magnetventil Radmotor vorn links	Solenoid valve, wheel motor front lh.	max. 0,6A
Y133	007	16	Magnetventil Radmotor vorn rechts	Solenoid valve, wheel motor front rh.	max. 0,6A
Y134	007	17	Magnetventil Radmotor hinten links	Solenoid valve, wheel motor rear lh.	max. 0,6A
Y135	007	19	Magnetventil Radmotor hinten rechts	Solenoid valve, wheel motor rear rh.	max. 0,6A

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Y138	013	13	Magnetveentil Heizung	Solenoid valve, heating unit	0,42A
Y147	004	12	Injektor A1	jet pump A1	
Y148	004	14	Injektor A2	jet pump A2	
Y149	004	13	Injektor A3	jet pump A3	
Y150	004	17	Injektor B1	jet pump B1	
Y151	004	16	Injektor B2	jet pump B2	
Y152	004	16	Injektor B3	jet pump B3	
Y166	004	14	Injektor A4	jet pump A4	
Y167	004	18	Injektor B4	jet pump B4	

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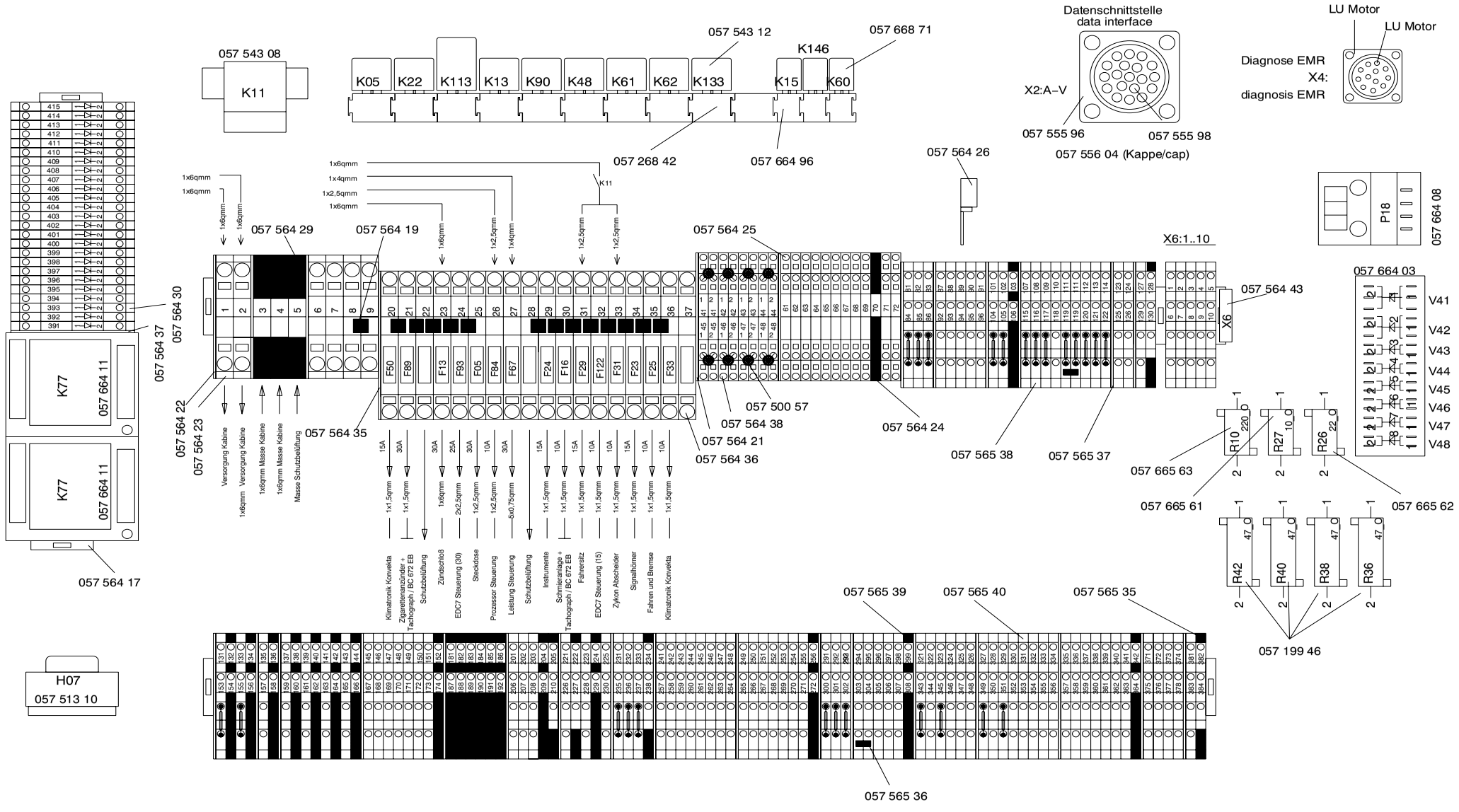
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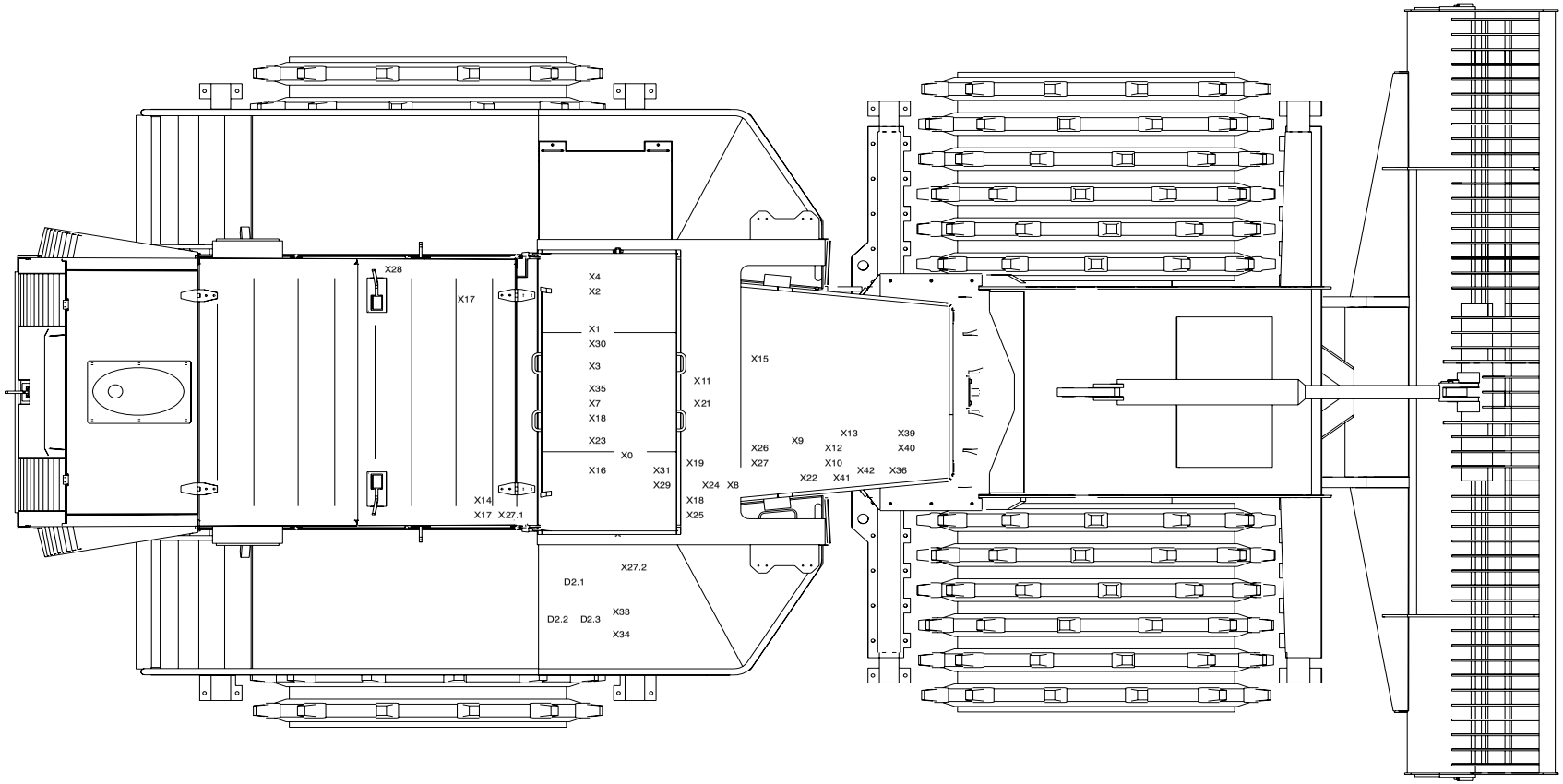
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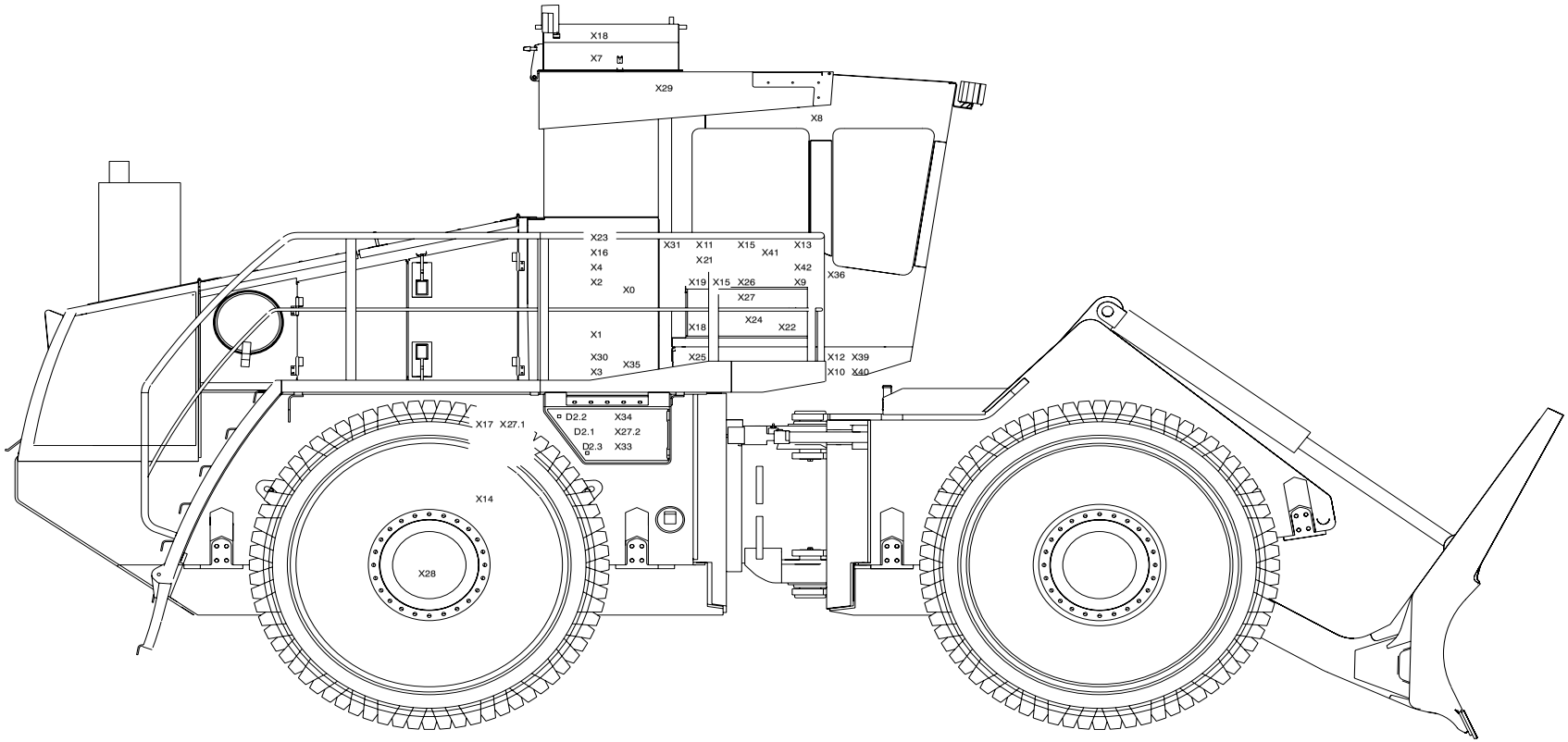
	Gez.: 17.01.2007 Name: Werner	Schaltkasten e-box	Seite: 1 von: 1 page: 1 from: 1	570 700 39
	Gepr.: 17.01.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 201

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 17.01.2007 Name: Werner					Lokalisierungsgrafik Steckverbinder Draufsicht localization graphic connectors top view									Seite: 1 von: 1 page: 1 from: 1		570 700 39	
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		Gez.: 17.01.2007 Name: Werner		Lokalisierungsgrafik Steckverbinder Seitenansicht localization graphic connectors side view												Seite: 1 von: 1 page: 1 from: 1		570 700 39	
		Gepr.: 17.01.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 302	

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19.5 Wiring diagram 570 700 42

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S/N Wiring diagram 570 700 42

S/N 101 570 571 026 ⇔ 101 570 571 028 BC772 RS-2
S/N 101 570 581 075 ⇔ 101 570 581 129 BC772 RB-2
S/N 101 570 591 019 ⇔ 101 570 591 035 BC672 RB-2
S/N 101 570 821 026 ⇔ 101 570 821 046 BC972 RB-2
S/N 101 570 831 041 ⇔ 101 570 831 059 BC1172 RB-2

Standardverkabelung: standard wireing:	dicke Linien thick lines	Platinenverdrahtung: connection on printed circuit board:	dünne Linien thin lines

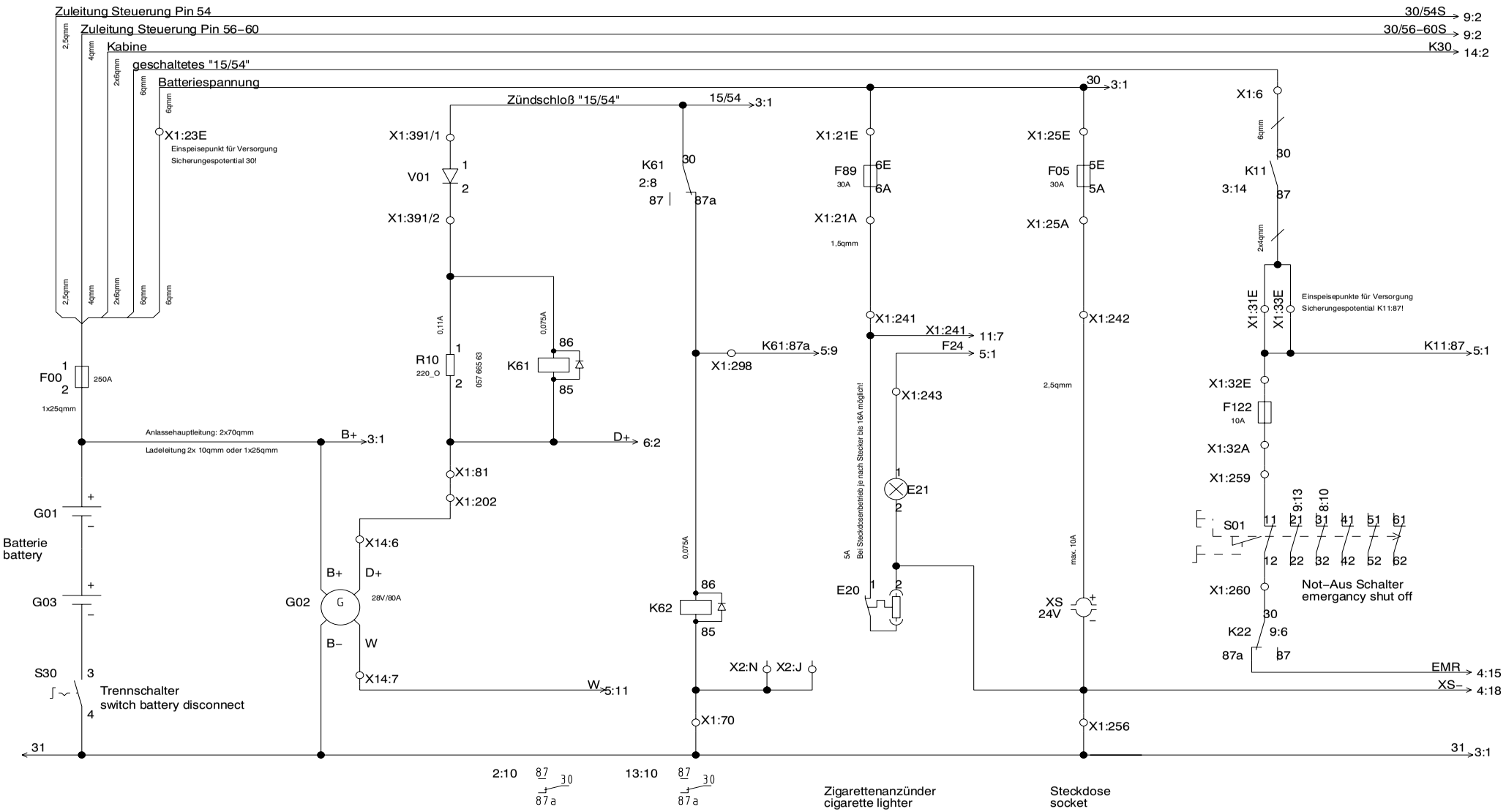
Inhaltsverzeichnis: table of contents: BC 772...1172 RB / TIER III

Blatt Nr.: sheet no.:	Zeichnungsnummer drawing – no.	Funktionsgruppe	function unit
001	570 700 42	Stromlaufplan	Circuit Diagram
002	570 700 42	Versorgung, Zigarettenanzünder	supply, cigarette lighter
003	570 700 42	Zündschloß, Starter	ignition switch, starter
004	570 700 42	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot.	DEUTZ controller EDC 7 for 6– and 8–zylinder engine
005	570 700 42	Instrumente	indicators
006	570 700 42	Anzeigen, Störmeldungen	monitoring, failure indication
007	570 700 42	Fahrpumpen, Radmotoren, Startfreigabe	driving pumps, weehl motors, starting release
008	570 700 42	Fahrstufen, Bremse, Verzögerungspedal	speed ranges, brakes, decelerator device
009	570 700 42	Versorgung Steuerung, Warnsummer, Override	supply controllers, warning buzzers, override
010	570 700 42	Lenkung und Arbeitshydraulik	steering and working hydraulic system
011	570 700 42	Hupe, Schmieranlage, Tachograph, Sitzfunktionen	horn, lubrication systhem, tachograph, seat funktions
012	570 700 42	Heizung und Belüftung	heating and ventilation
013	570 700 42	Schutzbelüftung, Zyklon Abscheider, Klimatronik	protected vent. system, cyclone separator, air cond.
014	570 700 42	Kabine und Anbauteile	cabin and attachment–parts
101	570 700 42	Bauteilliste	component listing
201	570 700 42	Schaltkasten	e–box
301	570 700 42	Lokalisierungsgrafik Steckverbinder Draufsicht	localization graphic connectors top view

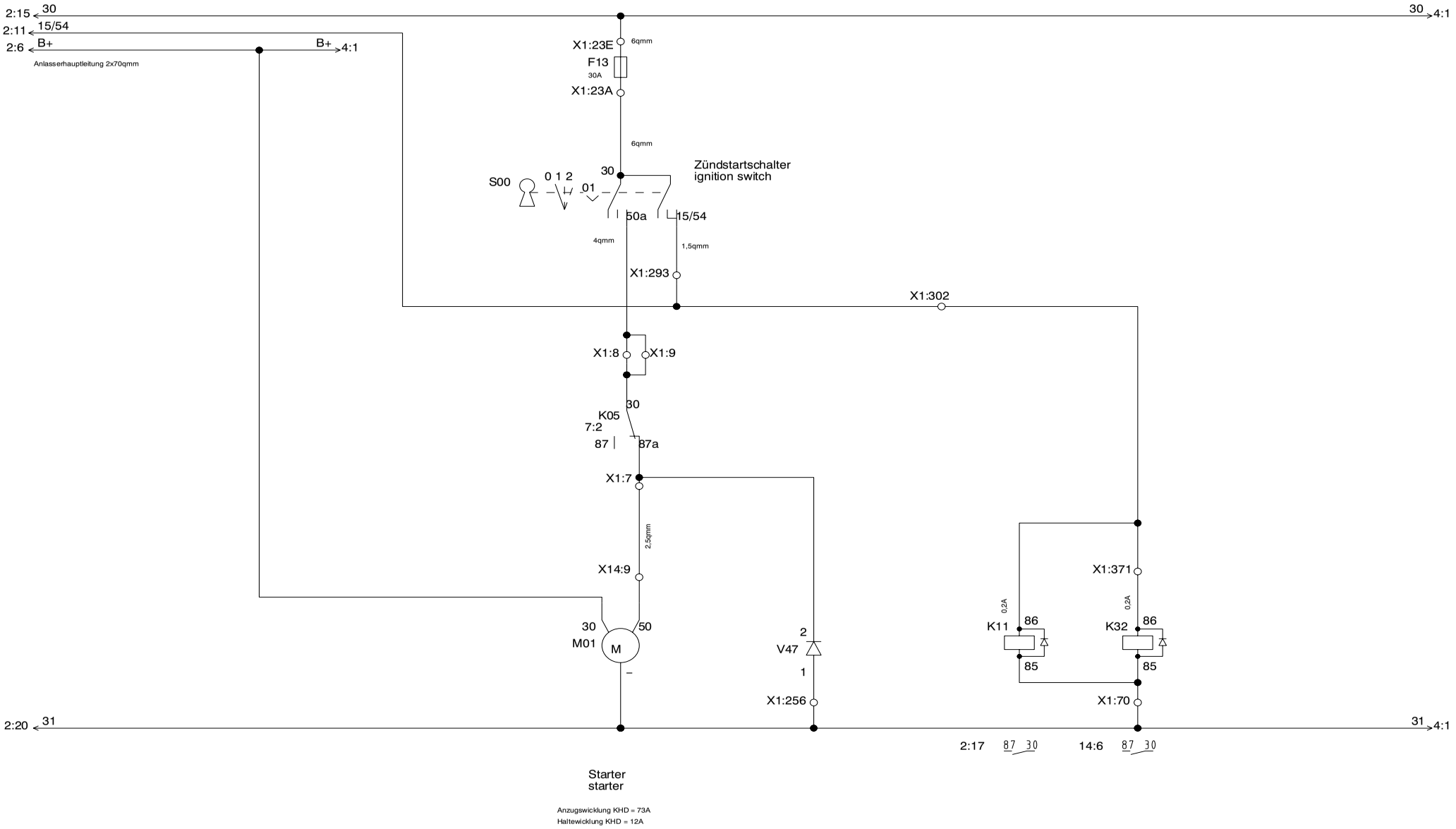
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	Gez.: 06.08.2007 Name: Werner	Stromlaufplan circuit diagram	Seite: 001 von: 001 page: from:	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 001 sheet no.:

https://truckmanualshub.com/



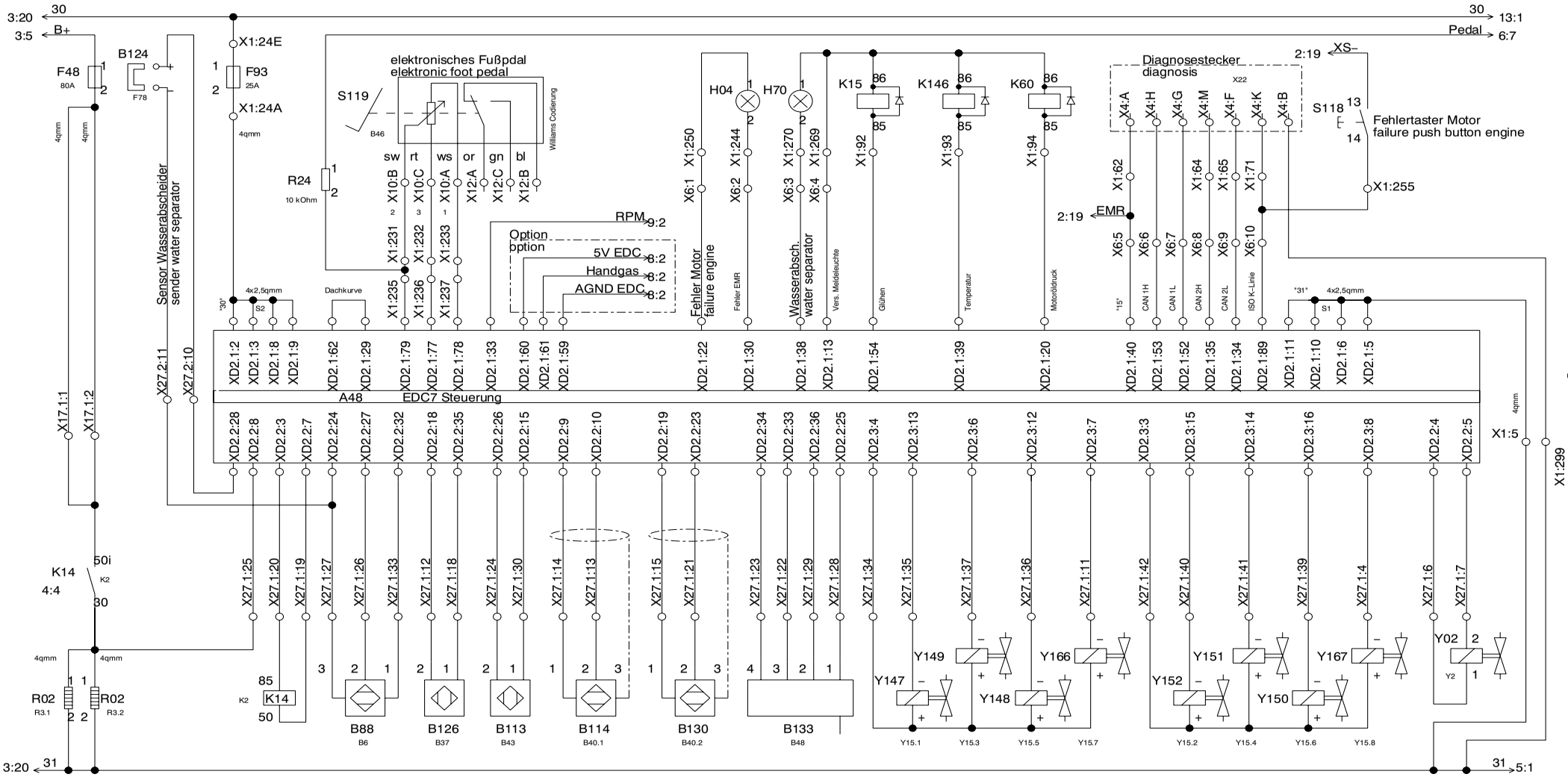
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 06.08.2007 Name: Werner		Versorgung, Zigarettenanzünder supply, cigarette lighter												Seite: 1 von: 1 page: 1 from: 1		570 700 42	
		Gepr.: 06.08.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 002	



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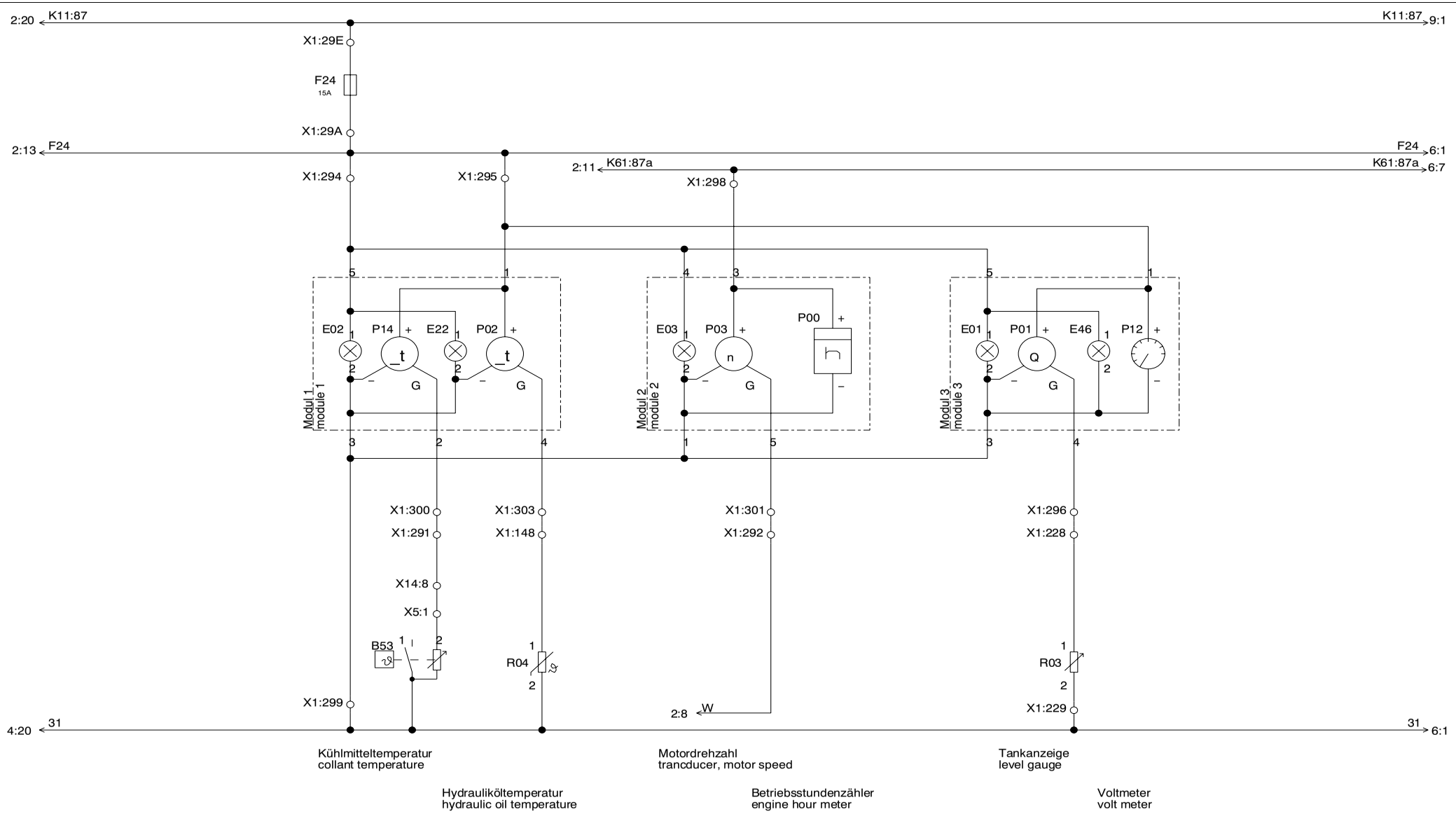
	Gez.: 06.08.2007 Name: Werner	Zündschloß, Starter ignition switch, starter	Seite: 1 von: 1 page: 1 from: 1	570 700 42	
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 003	



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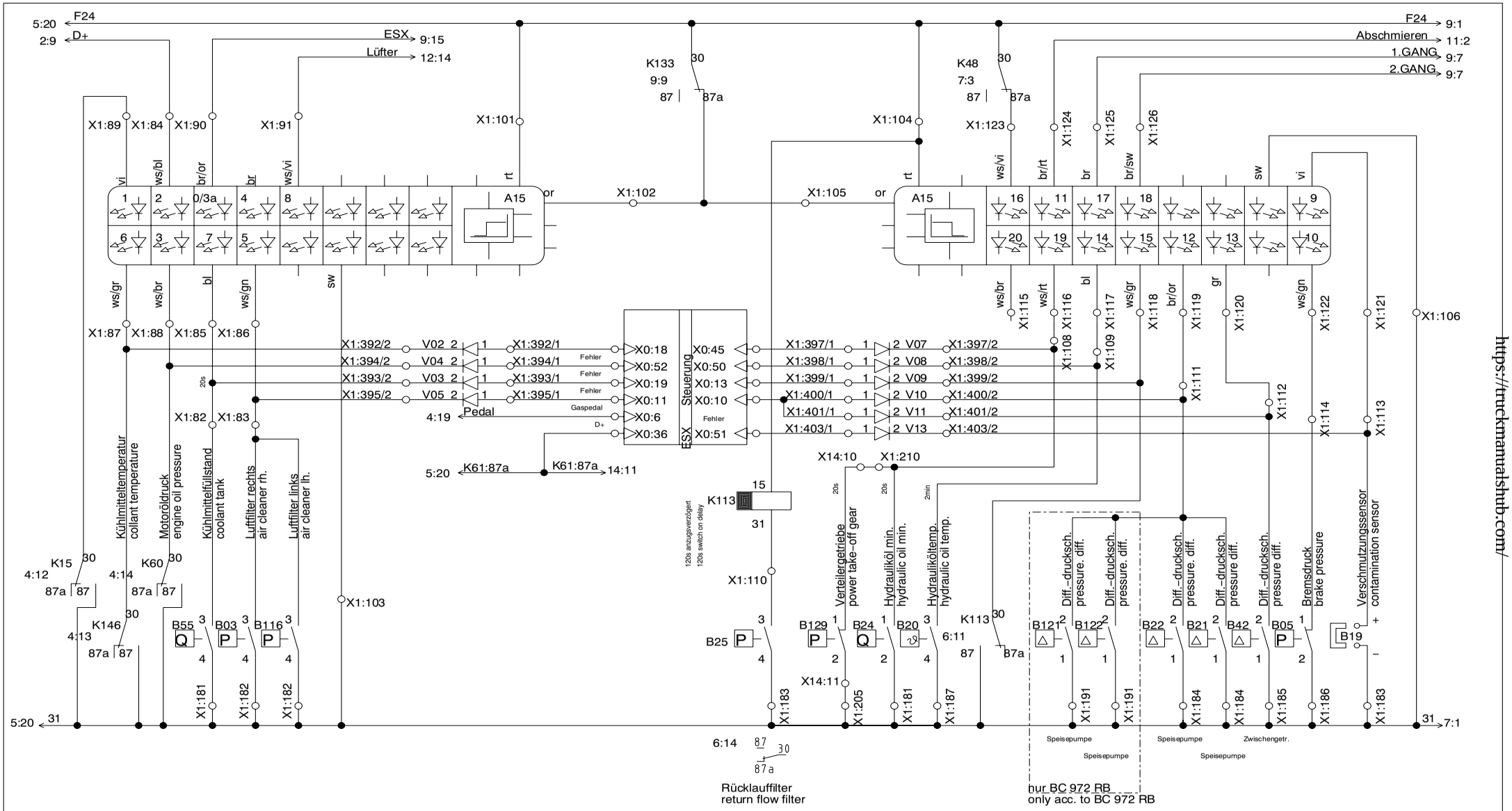
	Gez.: 06.08.2007 Name: Werner			Seite: 1 von: 1 page:	570 700 42
	Gepr.: 06.08.2007 Name: Seis	066_9	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot. DEUTZ controller EDC 7 for 6– and 8–zylinder engine	Ers.f.: Replaces:	Blatt Nr.: sheet no.: 004



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 06.08.2007 Name: Werner	Instrumente indicators	Seite: 1 von: 1 page: 1 from: 1	570 700 42	
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 005	

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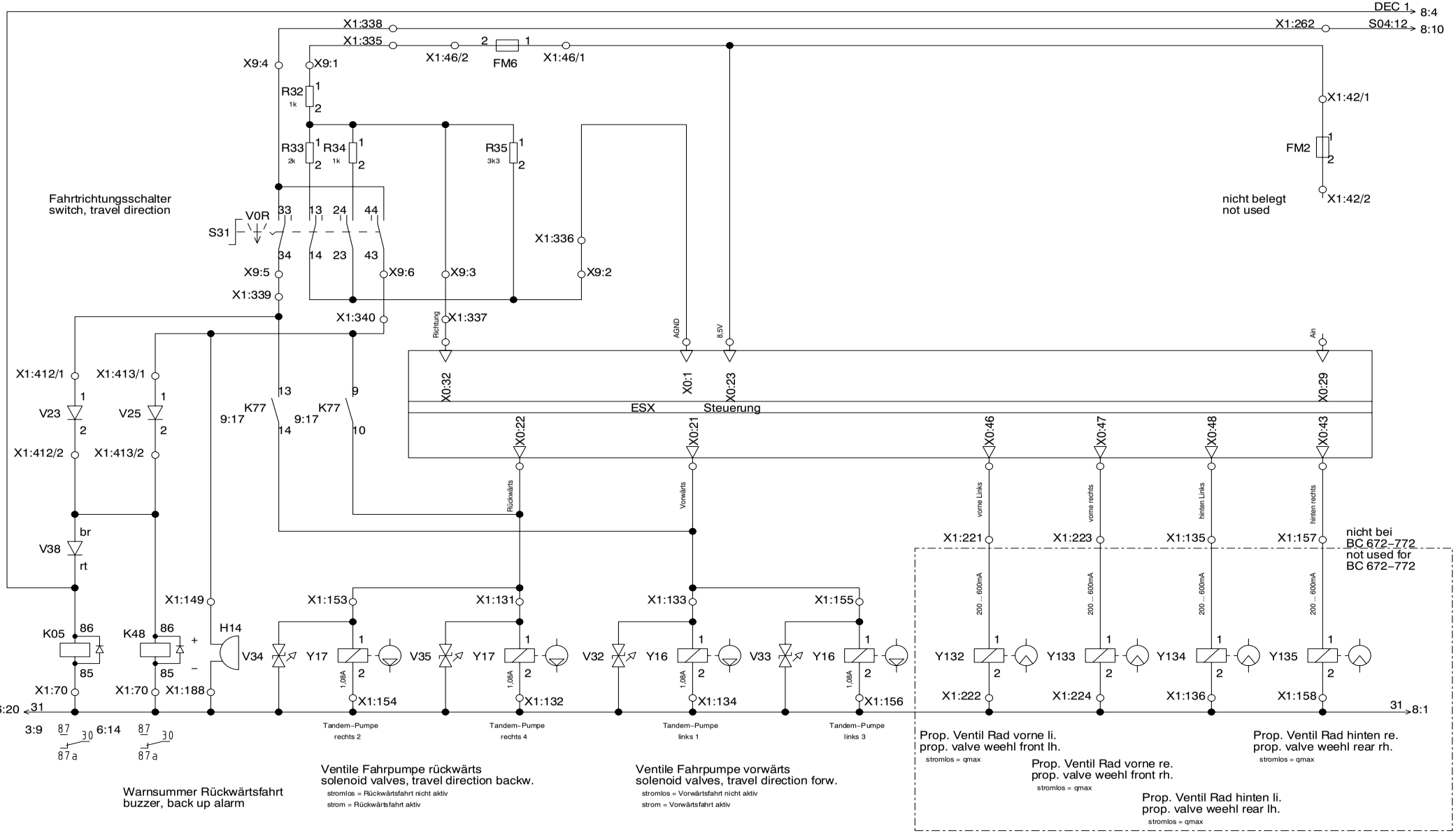
Modul 1: Motorfunktionen
module 1: engine functions

Modul 2: Maschinenfunktionen
module 2: maschine functions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

	Gez.: 06.08.2007 Name: Werner	Anzeigen, Störmeldungen monitoring, failure indication	Seite: 1 von: 1 page: 1 from: 1	570 700 42	
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.:	006

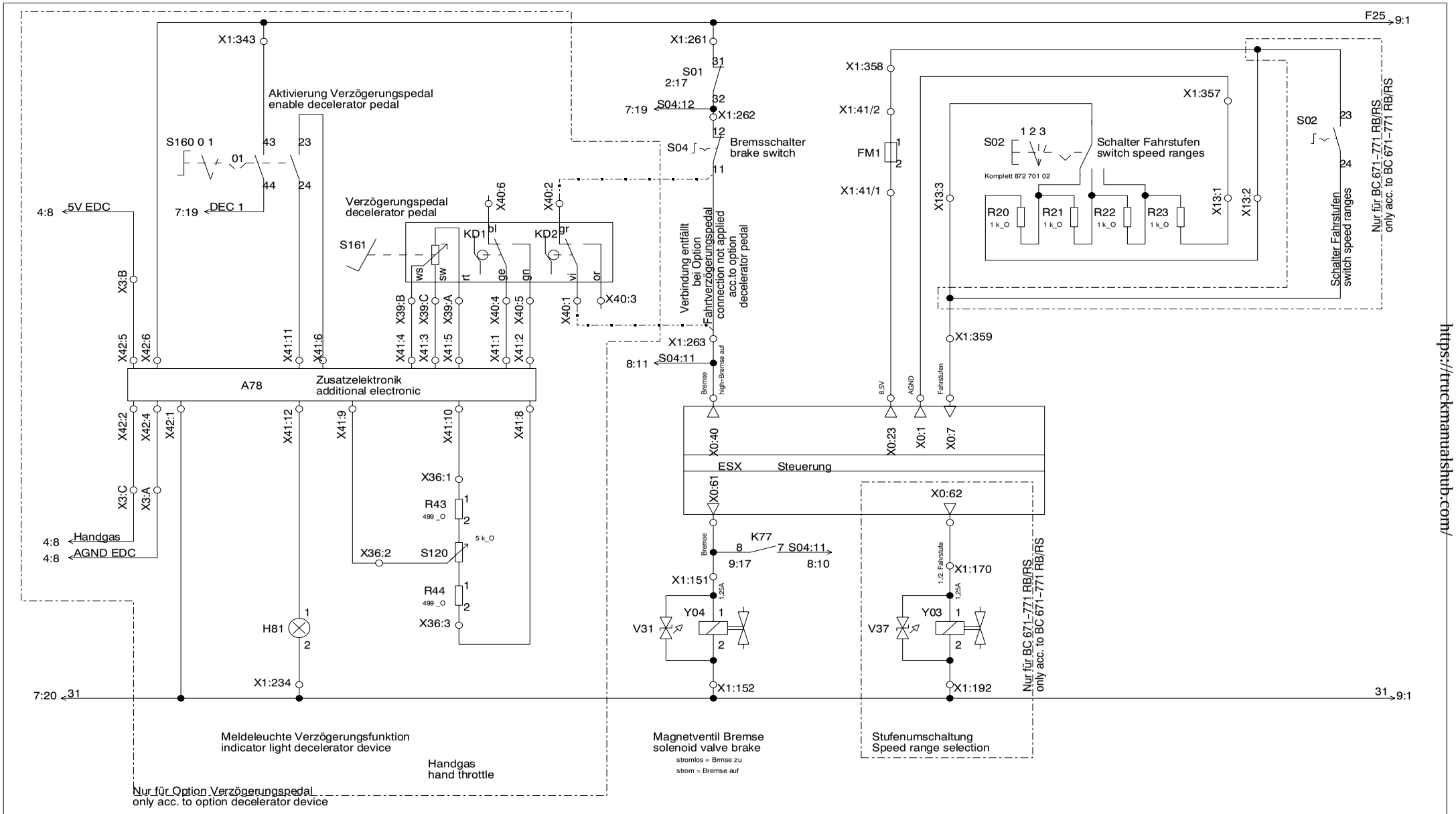
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 06.08.2007 Name: Werner	Fahrpumpen, Radmotoren, Startfreigabe driving pumps, weehl motors, starting release	Seite: 1 von: 1 page: from:	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 007

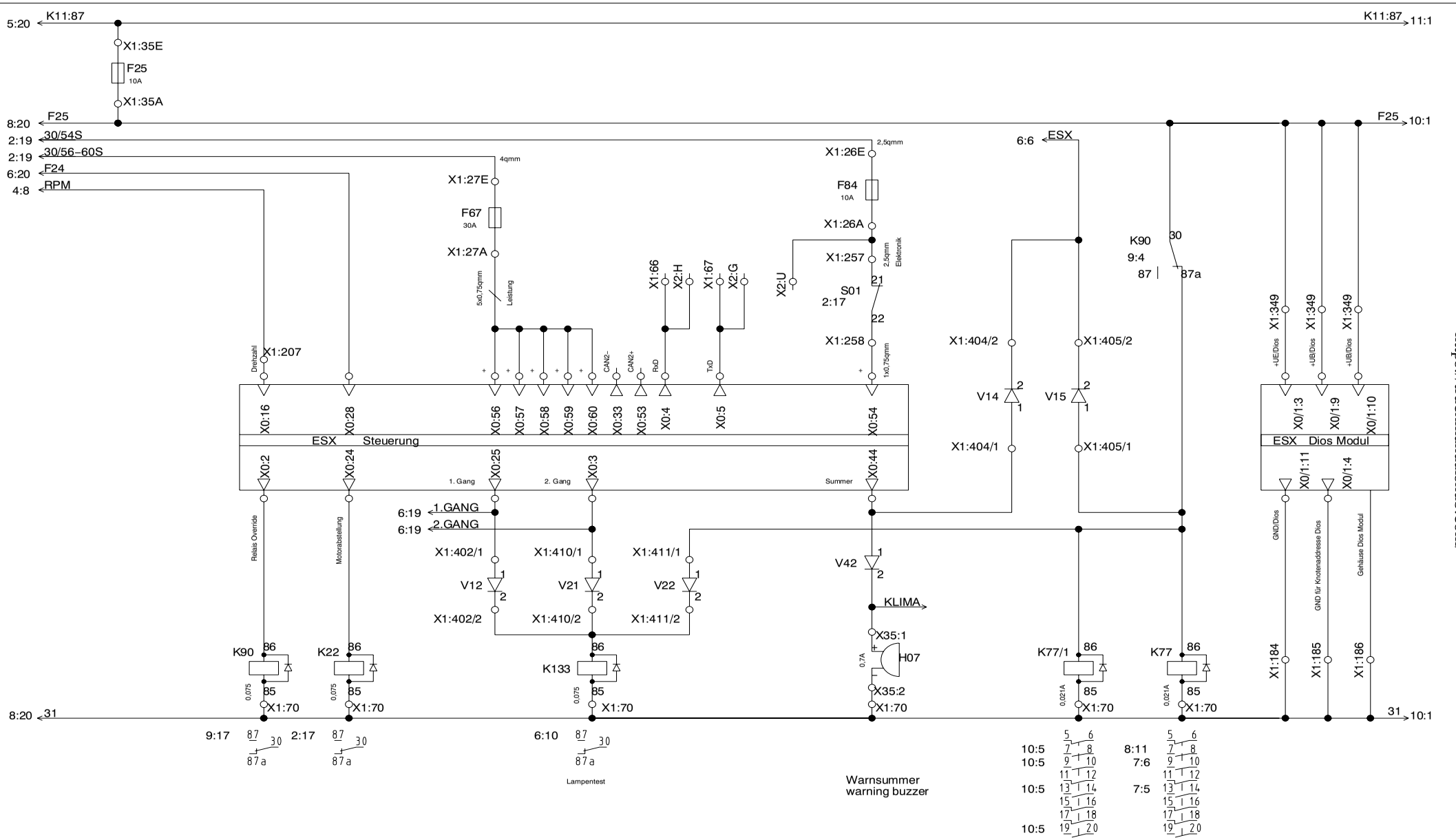
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 06.08.2007 Name: Werner	Fahrstufen, Bremse, Verzögerungspedal speed ranges, brakes, decelerator device	Seite: 1 von: 1 page: from:	570 700 42	
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 008	

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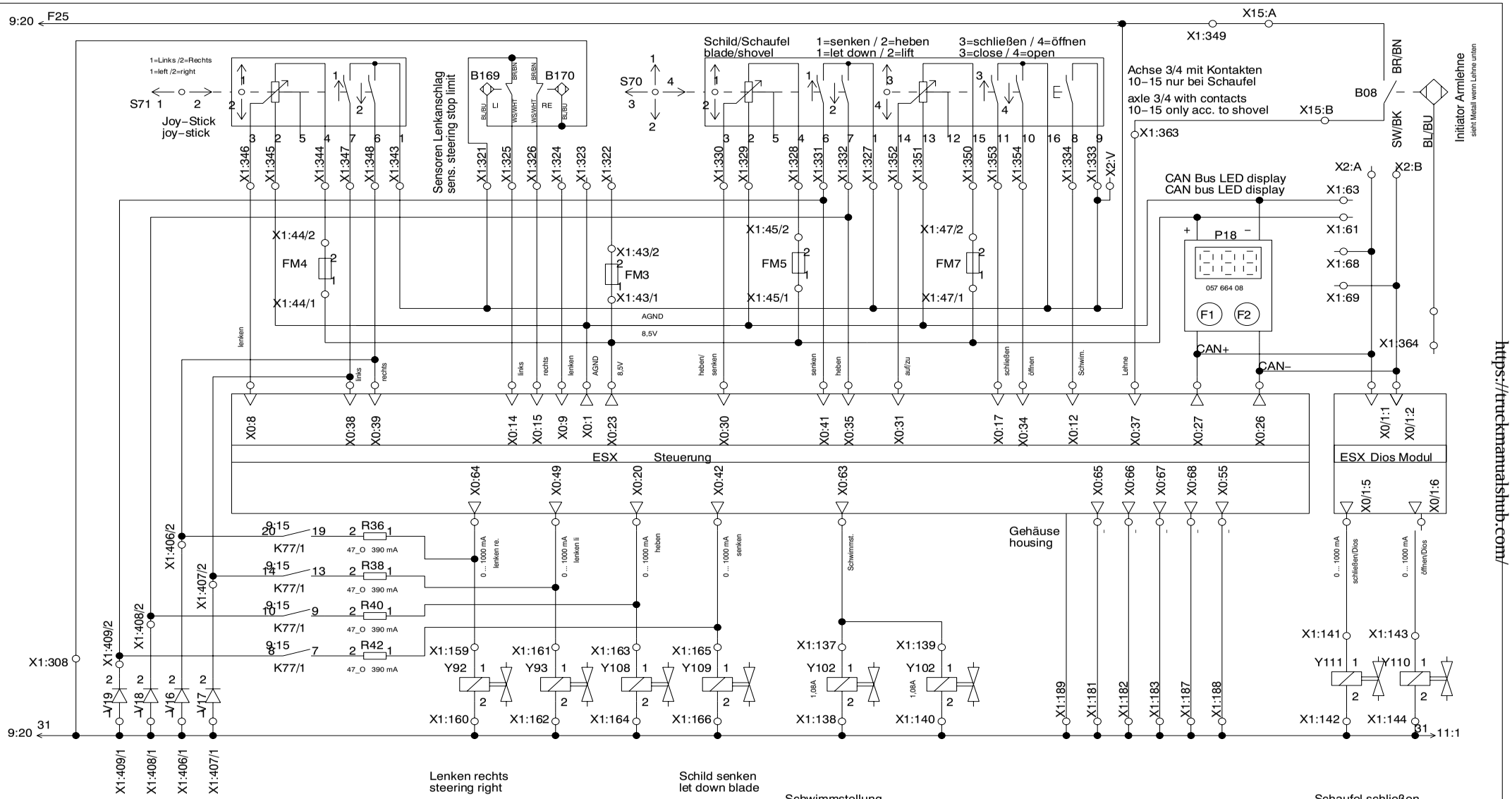
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	Gez.: 06.08.2007 Name: Werner	Versorgung Steuerung, Warnsummer, Override supply controllers, warning buzzers, override	Seite: 1 von: 1 page: 1 from: 1
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces: 1

570 700 42

Blatt Nr.: 009
sheet no.:

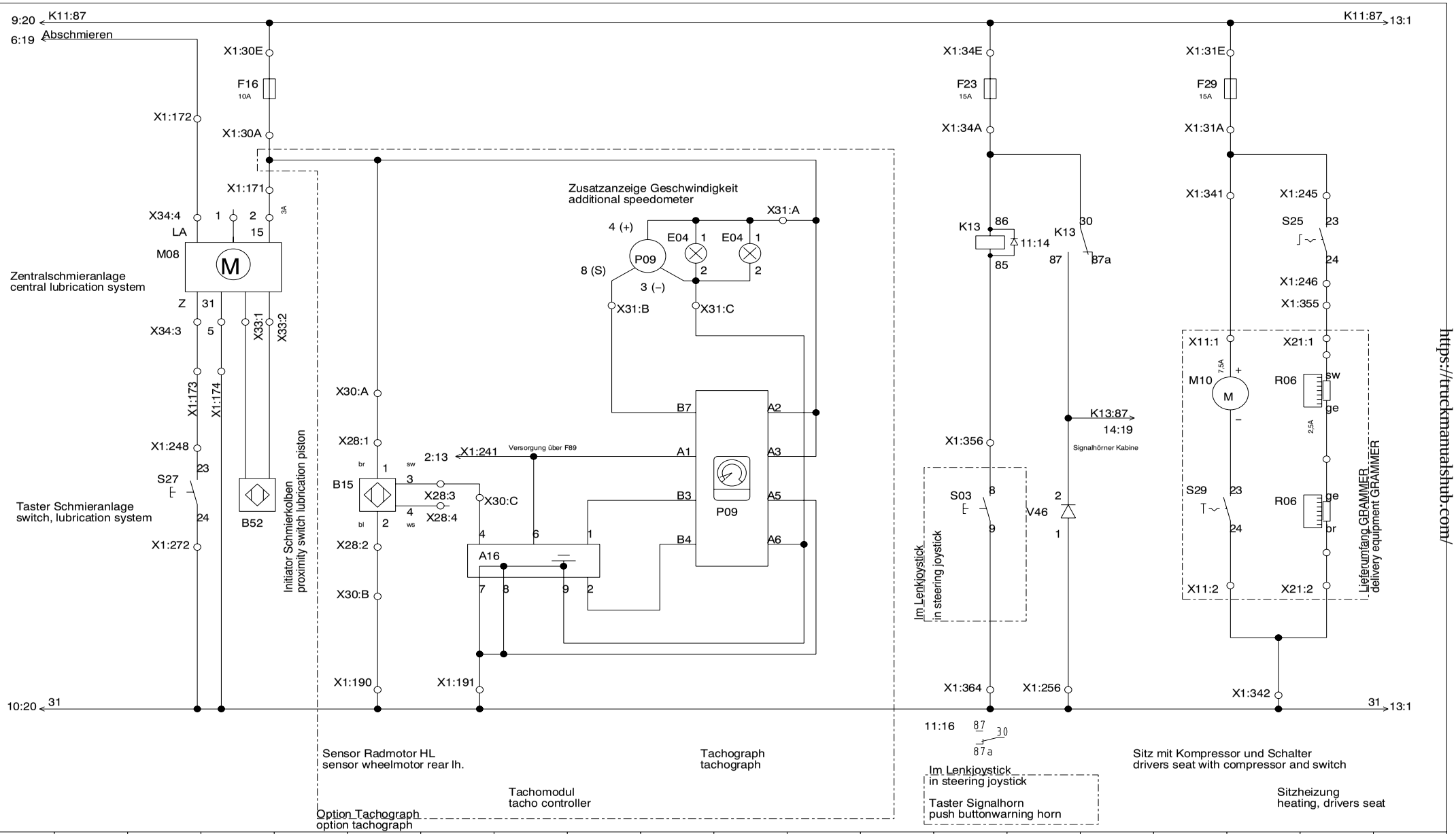
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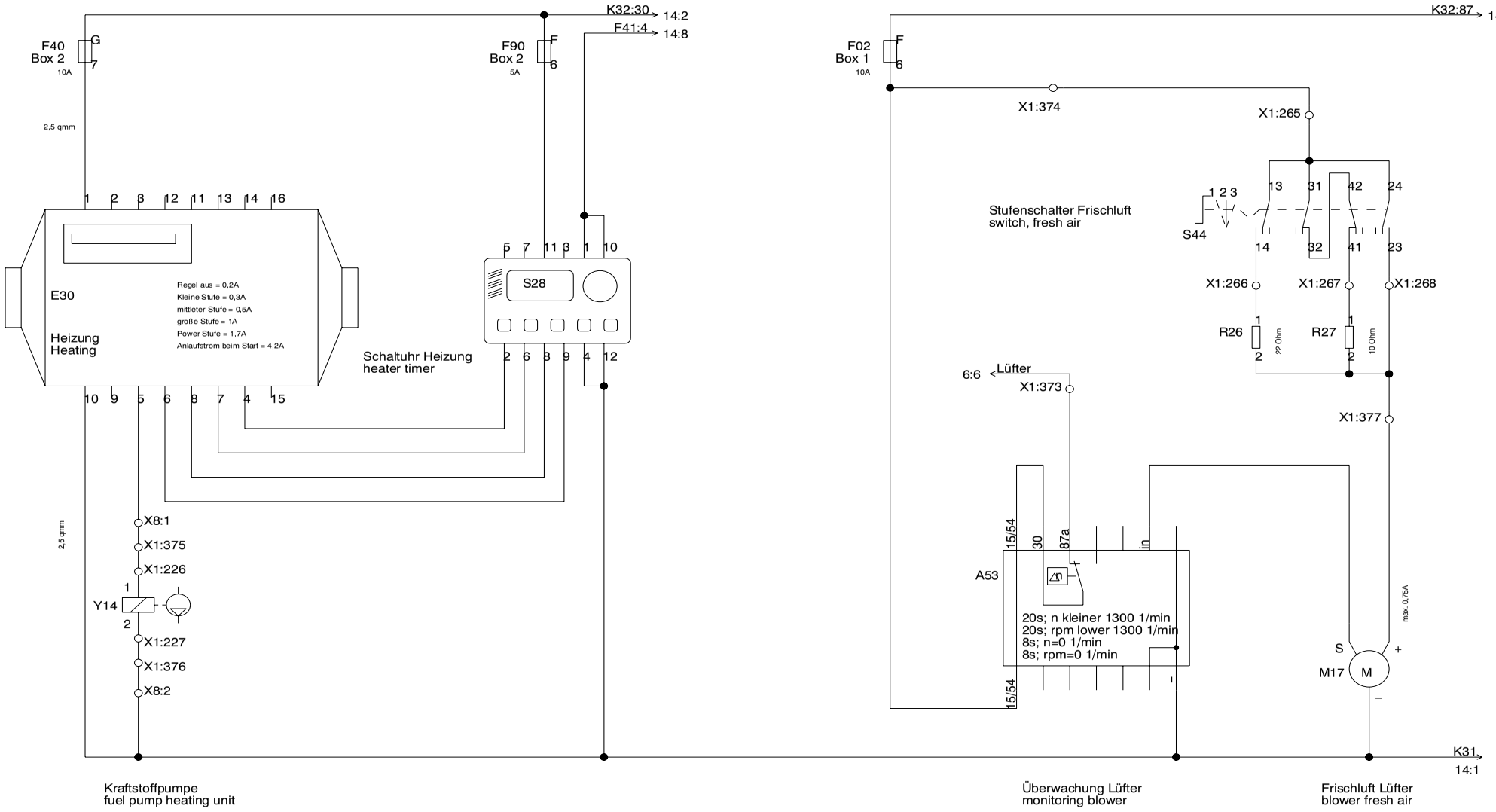
	Gez.: 06.08.2007 Name: Werner	Lenkung und Arbeitshydraulik steering and working hydraulic system	Seite: 1 von: 1 page: from:	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 010 sheet no.:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

	Gez.: 06.08.2007 Name: Werner	Hupe, Schmieranlage, Tachograph, Sitzfunktionen horn, lubrication systhem, tachograph, seat funktions	Seite: 1 von: 1 page: 1 from: 1	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 011 sheet no.:

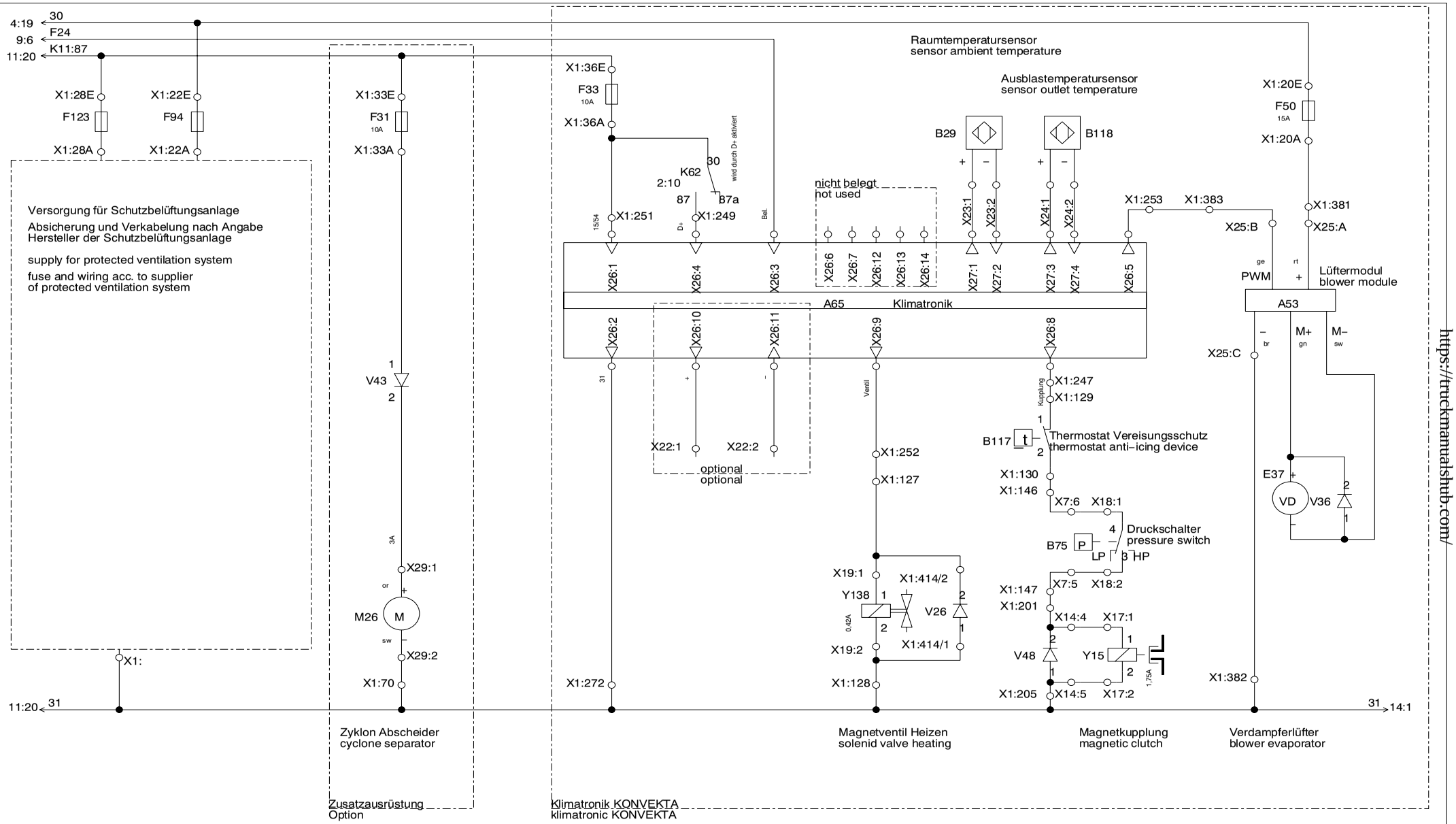
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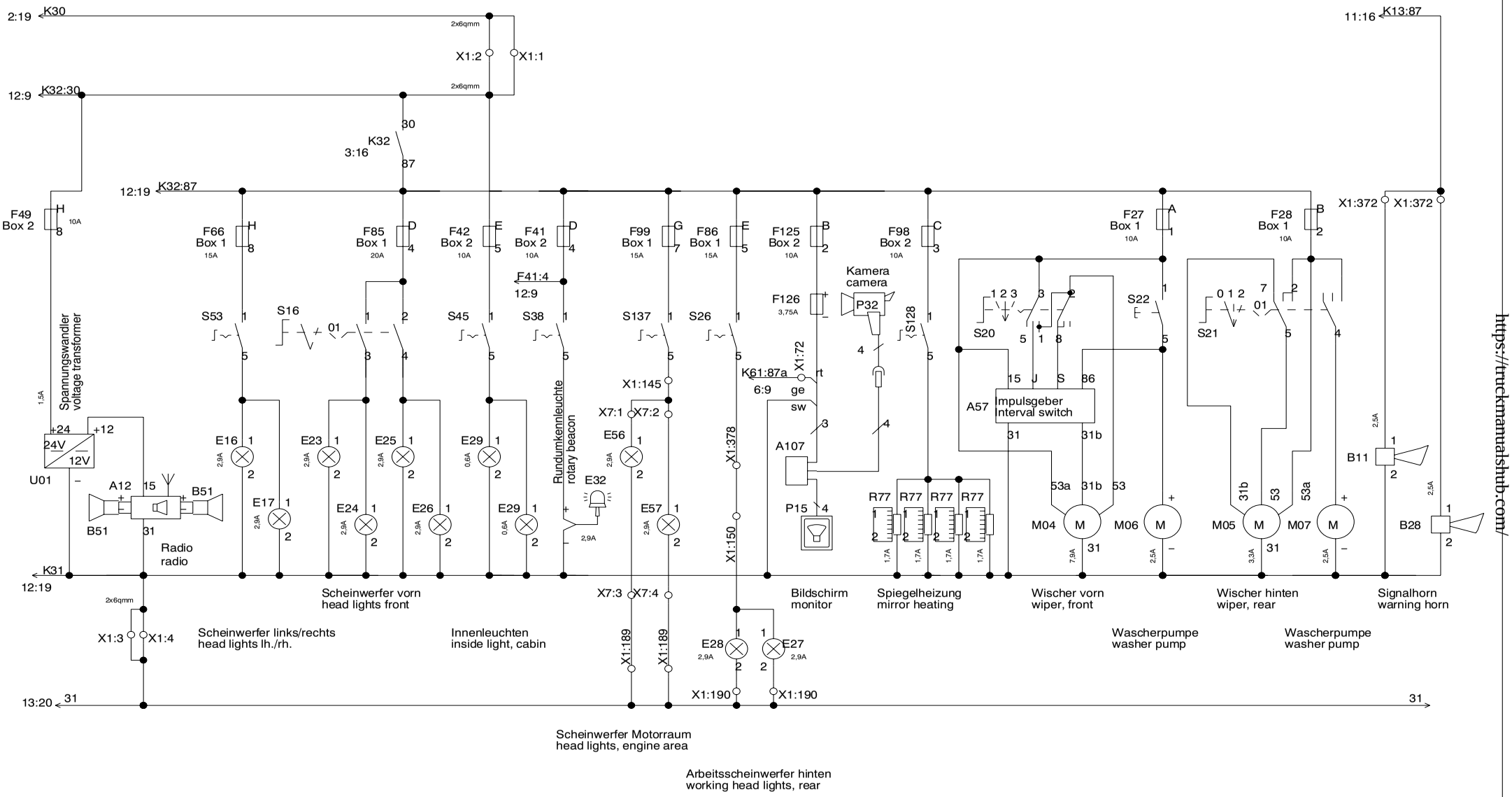
	Gez.: 06.08.2007 Name: Werner	Heizung und Belüftung heating and ventilation	Seite: 1 von: 1 page: from:	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 012



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 06.08.2007 Name: Werner	Schutzbelüftung, Zyklon Abscheider, Klimatronik protected vent. system, cyclone separator, air cond.	Seite: 1 von: 1 page:	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 013 sheet no.:



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 06.08.2007 Name: Werner														Seite: 1 von: 1 page: from:		570 700 42	
		Gepr.: 06.08.2007 Name: Seis		Kabine und Anbauteile cabin and attachment-parts												Ers.f.: Replaces:		Blatt Nr.: sheet no.:	014

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Name	Bl.	Pf.	Benennung	Title	TYP
A12	014	2	Radio	Radio	
A15	006	7	Ueberwachungsmodul	monitoring module	
A15	006	13	Ueberwachungsmodul	monitoring module	
A16	011	9	Elektronik Tachograph	Electronic system, tachograph	
A48	004	9	Elektronische Motorsteuerung	Electronic engine management	
A53	012	14	Modul Luefterueberwachung	Modul blower monitoring	
A53	013	18	Modul Luefterueberwachung	Modul blower monitoring	
A57	014	14	Intervallschalter Scheibenwischer	Interval switch, wiper	
A65	013	14	Steuerung Klimatronik	Controller klimatronic	
A78	008	3	Zusatzelektronik	Additional control unit	
A107	014	11	Umschaltbox	switch box	
B03	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B05	006	18	Druckschalter Bremse	Pressure switch, brake	
B08	010	19	Naeherungsinitiator Fahrhebel '0'-Stell.	Proximity switch, travel lever '0' pos.	max. 1,08A
B11	014	19	Signalhorn	Warning horn	2,5A
B15	011	6	Aufnehmer Geschwindigkeit	Transducer, speed	
B19	006	19	Magnetsensor Verschmutzung	Magnetic sensor, contamination	
B20	006	13	Temperaturschalter Hydraulikoel	Temperature switch, hydraulic oil	
B21	006	17	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B22	006	16	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B24	006	12	Schwimmerschalter Hydraulikoel	Float switch, hydraulic oil	
B25	006	11	Druckschalter Ruecklauffilter	Pressure switch, return flow filter	
B28	014	20	Signalhorn	Warning horn	2,5A
B29	013	14	Raumthermostat	Room thermostat	
B42	006	17	Differenzdruckschalter Hydraulikoel	Hydraulic oil pressure differential switch	
B51	014	2	Lautsprecher Radio	Speaker radio	
B51	014	3	Lautsprecher Radio	Speaker radio	
B52	011	4	Naeherungsinitiator Schmierkolben	Proximity switch, lubrication piston	
B53	005	6	Temperaturgeber Kuehlmittel	Temperature switch, collant	
B55	006	3	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B75	013	16	Kuehlmitteldruck	coolant pressure	
B88	004	5	Druckgeber Motoroel	Sender, engine oil pressure	
B113	004	7	EMR Temperaturgeber Kuehlmittel	EMR Temperature switch, collant	
B114	004	8	EMR Aufnehmer, Motordrehzahl 1	EMR Trancducer, engine speed 1	
B116	006	4	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B117	013	15	Thermostat Klimaanlage	Thermostar, air conditioning	
B118	013	15	Temperaturfühler Auslaß	Temperature sender outlet	
B121	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B122	006	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B124	004	3	Geber Wasserstandsabscheider Diesel	Sender, water separator fuel	
B126	004	6	EMR Temperaturgeber Kraftstoff	EMR fuel temperature sender	
B129	006	12	Druckschalter Verteilergetriebe	pressure switch power take-off gear	
B130	004	9	EMR Aufnehmer, Motordrehzahl 2	EMR Trancducer, engine speed 2	
B133	004	11	Sensor Ladeluftdruck / -temperatur	sesnor charging air prssure / temperature	
B169	010	7	Näherungsinitiator Lenkzylinder links	proximity switch steering cylinder left	
B170	010	8	Näherungsinitiator Lenkzylinder rechts	proximity switch steering cylinder right	
E01	005	14	Beleuchtung Tankanzeige	Illumination, level gauge	
E02	005	5	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	
E03	005	10	Beleuchtung Drehzahlmesser	Illumination, rpm meter	
E04	011	10	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E04	011	11	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E16	014	4	Scheinwerfer links	Head light, lh.	55W
E17	014	4	Scheinwerfer rechts	Head light, rh.	55W
E20	002	12	Zigarettenanzuender	Cigarette lighter	
E21	002	12	Beleuchtung Zigarettenanzuender	Illumination, cigarette lighter	
E22	005	7	Beleuchtung Temperaturanzeige Hydr.-oel	Illumination, temp. gauge, hydraulic oil	
E23	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E24	014	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E25	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E26	014	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E27	014	11	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	55W
E28	014	10	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	55W
E29	014	7	Innenleuchte Kabine	Inside light, cabin	15W
E29	014	8	Innenleuchte Kabine	Inside light, cabin	15W
E30	012	3	Heizgeraet	Heating unit	
E32	014	8	Kennleuchte	Warning light	70W
E37	013	18	Klimaverdampfer	Air conditioning, evaporator	
E46	005	15	Beleuchtung Voltmeter	Illumination volt meter	
E56	014	9	Scheinwerfer Motorraum rechts	Head light, engine area rh.	55W
E57	014	9	Scheinwerfer Motorraum links	Head light, engine area lh.	55W
ESX	006	9	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	007	12	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	008	10	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	5	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	18	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	010	9	Elektronisches Steuergeraet	Electronic system, control unit	max. 1,08A
ESX	010	19	Elektronisches Steuergeraet	Electronic system, control unit	0,2A
F00	002	2	Hauptsicherung Batterie	Fuse, main, battery	250A
F02	012	12	Ersatzsicherung	Fuse, spare	10A
F05	002	15	Sicherung Steckdose	Fuse, socket	30A
F13	003	9	Sicherung Startschalter	Fuse, starter switch	30A
F16	011	4	Sicherung Zentralschmieranlage	Fuse, central lubrication system	10A
F23	011	14	Sicherung Signalhorn	Fuse, warning horn	15A
F24	005	5	Sicherung Ueberwachungsmodul	Fuse, monitoring module	15A
F25	009	2	Sicherung Magnetv. Fahren u. Bremse	Fuse, sol. valve, travel and brake	10A
F27	014	16	Sicherung Wischer u. Wascher vorne	Fuse, windscr. wiper and washer, fr.	10A
F28	014	18	Sicherung Wischer u. Wascher hinten	Fuse, windscr. wiper and washer, re.	10A
F29	011	18	Sicherung Kompressor Sitzverstell.	Fuse, compr., seat height adjustm.	15A
F31	013	6	Sicherung Kabinenluefter	Fuse, cabin ventilator	10A
F33	013	9	Sicherung Klimageraet	Fuse, air conditioning	10A
F40	012	3	Sicherung Kabinenheizung	Fuse, heating unit cab	10A
F41	014	8	Sicherung Rundumkennleuchte	Fuse, rotary beacon	10A
F42	014	7	Sicherung Kabineninnenleuchte	Fuse, inside light cab	10A
F48	004	2	Sicherung Gluehanlage	Fuse, glow plug system	80A
F49	014	1	Sicherung Spannungswandler	Fuse, voltage transformer	10A
F50	013	19	Sicherung Klimageraet	Fuse, air conditioning	15A

Gez.: 06.08.2007
Name: Werner
Gepr.: 06.08.2007
Name: Seis

Bauteilliste
component listing

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Ers.f.:
Replaces:

Blatt Nr.: 101
sheet no.:

570 700 42

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Name	Bl.	Pf.	Benennung	Designation	TYP
F66	014	4	Sicherung Scheinwerfer vorne	Fuse, head light front	15A
F67	009	7	Sicherung Steuerung (Potential 30)	Fuse, controller (pot.30)	30A
F84	009	13	Sicherung Steuerung (Klemme 54)	Fuse, controller (Pin 54)	10A
F85	014	6	Sicherung, Scheinwerfer vorne	Fuse, head light front	20A
F86	014	10	Sicherung, Scheinwerfer hinten	Fuse, head lights rear	15A
F89	002	12	Sicherung, Zigarettenanzuender	Fuse, cigarette lighter	30A
F90	012	8	Sicherung, Ansteuerung	Fuse, actuation	5A
F93	004	4	Sicherung Steuerung (Potential 30)	Fuse, controller (pot. 30)	25A
F94	013	3	Sicherung Schutzbelueftung	Fuse, protected ventilation syst.	
F98	014	13	Sicherung Spiegelheizung	fuse,mirror heating	10A
F99	014	9	Sicherung Motorraumbeleuchtung	fuse, illumination engine area	15A
FM1	008	13	Platinensicherung	Multifuse	0,2A
FM2	007	19	Platinensicherung	Multifuse	0,2A
FM3	010	9	Platinensicherung	Multifuse	0,2A
FM4	010	5	Platinensicherung	Multifuse	0,2A
FM5	010	11	Platinensicherung	Multifuse	0,2A
FM6	007	7	Platinensicherung	Multifuse	0,2A
FM7	010	14	Platinensicherung	Multifuse	0,2A
F122	002	17	Sicherung EMR	Fuse, EMR	10A
F123	013	2	Sicherung Schutzbelüftungsanlage	Fuse, protected ventilation system	
F125	014	11	Vorsicherung	pre-fusing	10A
F126	014	11	Sicherung Rückfahrkamera	Fuse, back up camera system	2A
G01	002	2	Batterie	Battery	
G02	002	5	Generator	Generator	28V/80A
G03	002	2	Batterie	Battery	
H04	004	10	Meldeleuchte Betriebsstoerung	Indicator light, breakdown	
H07	009	13	Warnsummer Betriebsstoerung	Warning buzzer, breakdown	0,2A
H14	007	4	Warnsummer Rueckwaertsfahrt	Back-up alarm buzzer	max. 2,5A
H70	004	11	Anzeige Wasser im Diesel	Indicator water in fuel	
H81	008	5	Meldeleuchte Verzögerungsfunktion	Indicator light, decelerator device	
K05	007	2	Relais Startstrom	Relay, starting current	BOSCHW
K11	003	14	Relais Klemme 30 auf 15	Relay, terminal 30 to 15	BOSCHL
K13	011	14	Relais Signalhorn	Relay, warning horn	BOSCHW
K14	004	4	Relais Vorgluehen	Relay, glow plug system	K2DEUTZ
K15	004	12	Relais Gluehen beim Start	Relay, glowing during starting	BOSCHW
K22	009	6	Relais Hubmagnet Motor	Relay, shut off solenoid, engine	BOSCHW
K32	003	16	Relais Kabine	Relay, cabin	BOSCHL
K48	007	3	Relais Fahrhebel 0-Stellung	Relay, travel lever 0-position	BOSCHW
K60	004	14	Relais Motoroeldruck	Relay, engine oil pressure	BOSCHW
K61	002	8	Relais Ladekontrolle	Relay, charge control	BOSCHW
K62	002	10	Relais D+	Relay, D+	BOSCHW
K77	009	17	Relais Override	Relay, override	SDS/SF4
K90	009	4	Relais, Meldeleuchte Stoerung SPS	Relay, indicat.light brake down SPS	BOSCHW
K113	006	11	Zeitrelais	Timing relay	BOSCHW
K133	009	9	Relais Test	Relay, test	BOSCHW
K146	004	13	Relais Kühlmitteltemperatur	relay, coolant temperature	BOSCHW
K77/1	009	15	Relais Override	Relay, override	SDS/SF4
M01	003	9	Starter	Starter	
M04	014	15	Scheibenwischermotor vorne	Windscreen wiper motor, front	190W
M05	014	17	Scheibenwischermotor hinten	Windscreen wiper motor, rear	max 3,3A
M06	014	16	Scheibenwaschermotor vorne	Windscreen washer motor, front	60W
M07	014	18	Scheibenwaschermotor hinten	Windscreen washer motor, rear	60W
M08	011	3	Zentralschmieranlage	Central lubrication system	max. 3A
M10	011	18	Kompressor Fahrersitzhoehenverstellung	Compr., operator's seat height adjustm.	7,5A
M17	012	18	Zusatzluefter	Additional blower	max. 0,75A
M24	013	10	Stellmotor Luftklappe	adjusting motor air inlet flap	
M26	013	6	Zyklon Abscheider	cyclone separator	3A
P00	005	12	Betriebsstundenzaehler	Operating hour meter	
P01	005	15	Tankanzeige	Level gauge	
P02	005	7	Temperaturanzeige Hydraulikoel	Temperature gauge, hydraulic oil	
P03	005	11	Drehzahlmesser	Rpm meter	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P09	011	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P12	005	16	Voltmeter	Volt meter	
P14	005	6	Anzeige Kuehlmitteltemperatur	Temperature gauge, coolant	
P15	014	11	BCM 03 Bildschirm	BCM 03 terminal	
P18	010	16	Diagnose	Diagnostics	max. 1,08A
P32	014	12	Kamera Rückraumüberwachung	Camera, back up monitoring	
R02	004	2	Gluehkerze	Glow plug	
R02	004	2	Gluehkerze	Glow plug	
R03	005	15	Geber Tankanzeige	Sender, level gauge	
R04	005	8	Geber Hydraulikoeltemperatur	Sender, hydraulic oil temp.	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R06	011	19	Heizung Fahrersitz	Heating, operator's seat	
R10	002	7	Parallelwiderstand	Parallel resistor	220 OHM
R20	008	15	Widerstand	Resistor	1 KOHM
R21	008	15	Widerstand	Resistor	1 KOHM
R22	008	16	Widerstand	Resistor	1 KOHM
R23	008	17	Widerstand	Resistor	1 KOHM
R24	004	5	Widerstand	Resistor	10 kOHM
R26	012	17	Widerstand	Resistor	22 OHM
R27	012	18	Widerstand	Resistor	10 OHM
R32	007	5	Widerstand	Resistor	1 kOhm
R33	007	5	Widerstand	Resistor	2 kOhm
R34	007	6	Widerstand	Resistor	1 kOhm
R35	007	8	Widerstand	Resistor	3,3 kOhm
R36	010	6	Widerstand	Resistor	47 OHM
R38	010	6	Widerstand	Resistor	47 OHM
R40	010	6	Widerstand	Resistor	47 OHM
R42	010	6	Widerstand	Resistor	47 OHM
R43	008	7	Widerstand	Resistor	499Ohm
R44	008	7	Widerstand	Resistor	499Ohm
R77	014	12	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W

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R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	014	14	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
S00	003	9	Startschalter	Starter switch	MERIT
S01	002	17	Schalter NOT AUS	Switch, emergency off	NOTAUSH
S01	002	17	Schalter NOT AUS	Switch, emergency off	
S02	008	16	Fahrstufenschalter	Switch, speed range selector	
S02	008	19	Fahrstufenschalter	Switch, speed range selector	
S03	011	14	Taster Signalhorn	Push button, warning horn	
S04	008	10	Bremsschalter	Switch, brake	
S16	014	5	Schalter Arbeitsbeleuchtung vorne	Switch, working head lights, front	
S20	014	14	Schalter Scheibenwischer vorne	Switch, windscreen wiper, front	
S21	014	18	Schalter Scheibenwischer hinten	Switch, windscreen wiper, rear	
S22	014	16	Schalter Scheibenwascher vorne	Switch, windscreen washer, front	
S25	011	19	Schalter Fahrersitzheizung	Switch, heating, operator's seat	
S26	014	10	Schalter Arbeitsbeleuchtung hinten	Switch, working head lights, rear	
S27	011	3	Taster Zentralschmieranlage	Push botton, central lubrication system	
S28	012	8	Schalter Kabinenheizung	Switch, cabin heating	
S29	011	18	Schalter Fahrersitz Hoehenverstellung	Switch, operator's seat height adjustm.	
S30	002	2	Batterietrennschalter	Switch, battery disconnect	
S31	007	5	Schalter Fahrtrichtung	Switch, travel direction	
S38	014	8	Schalter Kennleuchte	Switch, warning light	
S44	012	17	Schalter Kabinenluefter	Switch, cabin ventilator	
S45	014	7	Schalter Kabineninnenleuchte	Switch, cabin inside light	
S53	014	4	Schalter Arbeitsbeleuchtung	Switch, working lights	
S70	010	10	Schalter Schubsschild	Switch, dozer blade	WAGO
S71	010	4	Schalter Lenkung	Switch, steering	max. 1,08A
S118	004	18	Schalter Fehlerdiagnose	Switch, fault diagnosis	
S119	004	6	Elektronisches Fusspedal	Electronic foot pedal	
S120	008	7	Schalter Motordrehzahl	Switch, engine speed	5 kOhm
S128	014	13	Schalter Spiegelheizung	Switch, mirror heating	
S137	014	9	Schalter Motorraumbeleuchtung	Switch, illumination engine area	
S160	008	4	Schalter Aktivierung Verzögerungspedal	Switch, enable decelerator pedal	
S161	008	6	Verzögerungspedal	decelerator pedal	
U01	014	1	Spannungswandler	Voltage transformer	
V01	002	7	Diode	Diode	WAGO
V02	006	7	Diode	Diode	WAGO
V03	006	7	Diode	Diode	WAGO
V04	006	7	Diode	Diode	WAGO
V05	006	7	Diode	Diode	WAGO
V07	006	12	Diode	Diode	WAGO
V08	006	12	Diode	Diode	WAGO
V09	006	12	Diode	Diode	WAGO
V10	006	12	Diode	Diode	WAGO
V11	006	12	Diode	Diode	WAGO
V12	009	7	Diode	Diode	WAGO
V13	006	12	Diode	Diode	WAGO
V14	009	14	Diode	Diode	Wago
V15	009	15	Diode	Diode	Wago
V16	010	3	Diode	Diode	WAGO
V17	010	4	Diode	Diode	WAGO
V18	010	3	Diode	Diode	WAGO
V19	010	2	Diode	Diode	WAGO
V21	009	9	Diode	Diode	WAGO
V22	009	10	Diode	Diode	WAGO
V23	007	2	Diode	Diode	WAGO
V25	007	3	Diode	Diode	WAGO
V26	013	14	Diode	Diode	WAGO
V31	008	10	Diode	Diode	Lütze
V32	007	9	Diode	Diode	Lütze
V33	007	11	Diode	Diode	Lütze
V34	007	5	Diode	Diode	Lütze
V35	007	7	Diode	Diode	Lütze
V36	013	19	Diode	Diode	FE5B
V37	008	13	Diode	Diode	Lütze
V38	007	2	Diode	Diode	FE5B KabeldiodeDiode
V42	009	13	Diode (A2)	Diode (A2)	Diodenmodul
V43	013	6	Diode (A3)	Diode (A3)	Diodenmodul
V46	011	15	Diode (A6)	Diode (A6)	Diodenmodul
V47	003	12	Diode (A7)	Diode (A7)	Diodenmodul
V48	013	15	Diode (A8)	Diode (A8)	Diodenmodul
X0/1:1	010	19	DIOS STECKER	Dios connector	
X0/1:2	010	19	DIOS STECKER	Dios connector	
X0/1:3	009	18	DIOS STECKER	Dios connector	
X0/1:4	009	19	DIOS STECKER	Dios connector	
X0/1:5	010	18	DIOS STECKER	Dios connector	
X0/1:6	010	19	DIOS STECKER	Dios connector	
X0/1:9	009	19	DIOS STECKER	Dios connector	
X0/1:10	009	19	DIOS STECKER	Dios connector	
X0/1:11	009	18	DIOS STECKER	Dios connector	
X0:1	007	10	ESX STECKER	esx connector	
X0:1	008	13	ESX STECKER	esx connector	
X0:1	010	8	ESX STECKER	esx connector	
X0:2	009	4	ESX STECKER	esx connector	
X0:3	009	9	ESX STECKER	esx connector	
X0:4	009	10	ESX STECKER	esx connector	
X0:5	009	11	ESX STECKER	esx connector	
X0:6	006	9	ESX STECKER	esx connector	
X0:7	008	14	ESX STECKER	esx connector	
X0:8	010	4	ESX STECKER	esx connector	
X0:9	010	8	ESX STECKER	esx connector	
X0:10	006	10	ESX STECKER	esx connector	
X0:11	006	9	ESX STECKER	esx connector	
X0:12	010	15	ESX STECKER	esx connector	
X0:13	006	10	ESX STECKER	esx connector	

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Name	Bl.	Pf.	Benennung		TYP
X0:14	010	7	ESX STECKER	esx connector	
X0:15	010	8	ESX STECKER	esx connector	
X0:16	009	4	ESX STECKER	esx connector	
X0:17	010	14	ESX STECKER	esx connector	
X0:18	006	9	ESX STECKER	esx connector	
X0:19	006	9	ESX STECKER	esx connector	
X0:20	010	9	ESX STECKER	esx connector	
X0:21	007	10	ESX STECKER	esx connector	
X0:22	007	8	ESX STECKER	esx connector	
X0:23	007	11	ESX STECKER	esx connector	
X0:23	008	13	ESX STECKER	esx connector	
X0:23	010	9	ESX STECKER	esx connector	
X0:24	009	6	ESX STECKER	esx connector	
X0:25	009	7	ESX STECKER	esx connector	
X0:26	010	17	ESX STECKER	esx connector	
X0:27	010	16	ESX STECKER	esx connector	
X0:28	009	6	ESX STECKER	esx connector	
X0:29	007	19	ESX STECKER	esx connector	
X0:30	010	10	ESX STECKER	esx connector	
X0:31	010	13	ESX STECKER	esx connector	
X0:32	007	7	ESX STECKER	esx connector	
X0:33	009	9	ESX STECKER	esx connector	
X0:34	010	14	ESX STECKER	esx connector	
X0:35	010	12	ESX STECKER	esx connector	
X0:36	006	9	ESX STECKER	esx connector	
X0:37	010	16	ESX STECKER	esx connector	
X0:38	010	5	ESX STECKER	esx connector	
X0:39	010	6	ESX STECKER	esx connector	
X0:40	008	10	ESX STECKER	esx connector	
X0:41	010	12	ESX STECKER	esx connector	
X0:42	010	10	ESX STECKER	esx connector	
X0:43	007	19	ESX STECKER	esx connector	
X0:44	009	13	ESX STECKER	esx connector	
X0:45	006	10	ESX STECKER	esx connector	
X0:46	007	14	ESX STECKER	esx connector	
X0:47	007	16	ESX STECKER	esx connector	
X0:48	007	17	ESX STECKER	esx connector	
X0:49	010	8	ESX STECKER	esx connector	
X0:50	006	10	ESX STECKER	esx connector	
X0:51	006	10	ESX STECKER	esx connector	
X0:52	006	9	ESX STECKER	esx connector	
X0:53	009	9	ESX STECKER	esx connector	
X0:54	009	13	ESX STECKER	esx connector	
X0:55	010	17	ESX STECKER	esx connector	
X0:56	009	7	ESX STECKER	esx connector	
X0:57	009	8	ESX STECKER	esx connector	
X0:58	009	8	ESX STECKER	esx connector	
X0:59	009	8	ESX STECKER	esx connector	
X0:60	009	9	ESX STECKER	esx connector	
X0:61	008	10	ESX STECKER	esx connector	
X0:62	008	14	ESX STECKER	esx connector	
X0:63	010	12	ESX STECKER	esx connector	
X0:64	010	7	ESX STECKER	esx connector	
X0:65	010	15	ESX STECKER	esx connector	
X0:66	010	16	ESX STECKER	esx connector	
X0:67	010	16	ESX STECKER	esx connector	
X0:68	010	16	ESX STECKER	esx connector	
X1:	013	2	Wago Zentralelektrik	Wago e-box	
X1:1	014	7	Wago Zentralelektrik	Wago e-box	
X1:2	014	7	Wago Zentralelektrik	Wago e-box	
X1:3	014	2	Wago Zentralelektrik	Wago e-box	
X1:4	014	2	Wago Zentralelektrik	Wago e-box	
X1:5	004	20	Wago Zentralelektrik	Wago e-box	
X1:6	002	17	Wago Zentralelektrik	Wago e-box	
X1:7	003	9	Wago Zentralelektrik	Wago e-box	
X1:8	003	9	Wago Zentralelektrik	Wago e-box	
X1:9	003	9	Wago Zentralelektrik	Wago e-box	
X1:61	010	19	Wago Zentralelektrik	Wago e-box	
X1:62	004	15	Wago Zentralelektrik	Wago e-box	
X1:63	010	19	Wago Zentralelektrik	Wago e-box	
X1:64	004	16	Wago Zentralelektrik	Wago e-box	
X1:65	004	16	Wago Zentralelektrik	Wago e-box	
X1:66	009	10	Wago Zentralelektrik	Wago e-box	
X1:67	009	11	Wago Zentralelektrik	Wago e-box	
X1:68	010	19	Wago Zentralelektrik	Wago e-box	
X1:69	010	19	Wago Zentralelektrik	Wago e-box	
X1:70	002	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	003	16	Wago Zentralelektrik	Wago e-box	
X1:70	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	009	4	Wago Zentralelektrik	Wago e-box	
X1:70	009	6	Wago Zentralelektrik	Wago e-box	
X1:70	009	9	Wago Zentralelektrik	Wago e-box	
X1:70	009	13	Wago Zentralelektrik	Wago e-box	
X1:70	009	15	Wago Zentralelektrik	Wago e-box	
X1:70	009	17	Wago Zentralelektrik	Wago e-box	
X1:70	013	6	Wago Zentralelektrik	Wago e-box	
X1:71	004	17	Wago Zentralelektrik	Wago e-box	
X1:72	014	11	Wago Zentralelektrik	Wago e-box	
X1:81	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:82	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:83	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:84	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:85	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:86	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:87	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:88	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:89	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:90	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	

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1	X1:91	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:92	004	12	Wago Zentralelektrik	Wago e-box	
	X1:93	004	13	Wago Zentralelektrik	Wago e-box	
2	X1:94	004	14	Wago Zentralelektrik	Wago e-box	
	X1:101	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:102	006	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:103	006	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:104	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
3	X1:105	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:106	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:108	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:109	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:110	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
4	X1:111	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:112	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:113	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:114	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:115	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
5	X1:116	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:117	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:118	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:119	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:120	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
6	X1:121	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:122	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:123	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:124	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:125	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:126	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
7	X1:127	013	13	Wago Zentralelektrik	Wago e-box	
	X1:128	013	13	Wago Zentralelektrik	Wago e-box	
	X1:129	013	15	Wago Zentralelektrik	Wago e-box	
	X1:130	013	15	Wago Zentralelektrik	Wago e-box	
8	X1:131	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:132	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:133	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:134	007	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:135	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:136	007	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
9	X1:137	010	12	Wago Zentralelektrik	Wago e-box	
	X1:138	010	12	Wago Zentralelektrik	Wago e-box	
	X1:139	010	13	Wago Zentralelektrik	Wago e-box	
	X1:140	010	13	Wago Zentralelektrik	Wago e-box	
	X1:141	010	18	Wago Zentralelektrik	Wago e-box	
10	X1:142	010	18	Wago Zentralelektrik	Wago e-box	
	X1:143	010	19	Wago Zentralelektrik	Wago e-box	
	X1:144	010	19	Wago Zentralelektrik	Wago e-box	
	X1:145	014	9	Wago Zentralelektrik	Wago e-box	
	X1:146	013	15	Wago Zentralelektrik	Wago e-box	
11	X1:147	013	15	Wago Zentralelektrik	Wago e-box	
	X1:148	005	8	Wago Zentralelektrik	Wago e-box	
	X1:149	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:150	014	10	Wago Zentralelektrik	Wago e-box	
	X1:151	008	10	Wago Zentralelektrik	Wago e-box	
12	X1:152	008	10	Wago Zentralelektrik	Wago e-box	
	X1:153	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:154	007	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:155	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:156	007	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
13	X1:157	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:158	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:159	010	7	Wago Zentralelektrik	Wago e-box	
	X1:160	010	7	Wago Zentralelektrik	Wago e-box	
	X1:161	010	8	Wago Zentralelektrik	Wago e-box	
14	X1:162	010	8	Wago Zentralelektrik	Wago e-box	
	X1:163	010	9	Wago Zentralelektrik	Wago e-box	
	X1:164	010	9	Wago Zentralelektrik	Wago e-box	
	X1:165	010	10	Wago Zentralelektrik	Wago e-box	
	X1:166	010	10	Wago Zentralelektrik	Wago e-box	
15	X1:170	008	14	Wago Zentralelektrik	Wago e-box	
	X1:171	011	4	Wago Zentralelektrik	Wago e-box	
	X1:172	011	3	Wago Zentralelektrik	Wago e-box	
	X1:173	011	3	Wago Zentralelektrik	Wago e-box	
	X1:174	011	4	Wago Zentralelektrik	Wago e-box	
16	X1:181	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:181	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:181	010	15	Wago Zentralelektrik	Wago e-box	
16	X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:182	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:182	010	16	Wago Zentralelektrik	Wago e-box	
17	X1:183	006	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:183	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:183	010	16	Wago Zentralelektrik	Wago e-box	
	X1:184	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
18	X1:184	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:184	009	18	Wago Zentralelektrik	Wago e-box	
	X1:185	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:185	009	19	Wago Zentralelektrik	Wago e-box	
	X1:186	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
19	X1:186	009	19	Wago Zentralelektrik	Wago e-box	
	X1:187	006	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:187	010	16	Wago Zentralelektrik	Wago e-box	
	X1:188	007	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:188	010	17	Wago Zentralelektrik	Wago e-box	
20	X1:189	010	15	Wago Zentralelektrik	Wago e-box	
	X1:189	014	9	Wago Zentralelektrik	Wago e-box	
	X1:189	014	9	Wago Zentralelektrik	Wago e-box	
	X1:190	011	6	Wago Zentralelektrik	Wago e-box	
	X1:190	014	10	Wago Zentralelektrik	Wago e-box	

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	Name	Bl.	Pf.	Benennung	Benennung	TYP
1	X1:190	014	11	Wago Zentralelektrik	Wago e-box	
	X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:191	006	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
2	X1:191	011	7	Wago Zentralelektrik	Wago e-box	
	X1:192	008	14	Wago Zentralelektrik	Wago e-box	
	X1:201	013	15	Wago Zentralelektrik	Wago e-box	
	X1:202	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:205	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
3	X1:205	013	15	Wago Zentralelektrik	Wago e-box	
	X1:207	009	4	Wago Zentralelektrik	Wago e-box	
	X1:20A	013	19	Sika – Klemme	fuse terminal	
	X1:20E	013	19	Sika – Klemme	fuse terminal	
	X1:210	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
4	X1:21A	002	12	Sika – Klemme	fuse terminal	
	X1:21E	002	12	Sika – Klemme	fuse terminal	
	X1:221	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:222	007	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:223	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:224	007	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
5	X1:226	012	3	Wago Zentralelektrik	Wago e-box	
	X1:227	012	3	Wago Zentralelektrik	Wago e-box	
	X1:228	005	15	Wago Zentralelektrik	Wago e-box	
	X1:229	005	15	Wago Zentralelektrik	Wago e-box	
6	X1:22A	013	3	Sika – Klemme	fuse terminal	
	X1:22E	013	3	Sika – Klemme	fuse terminal	
	X1:231	004	6	Wago Zentralelektrik	Wago e-box	
	X1:232	004	6	Wago Zentralelektrik	Wago e-box	
	X1:233	004	7	Wago Zentralelektrik	Wago e-box	
7	X1:234	008	5	Wago Zentralelektrik	Wago e-box	
	X1:235	004	6	Wago Zentralelektrik	Wago e-box	
	X1:236	004	6	Wago Zentralelektrik	Wago e-box	
	X1:237	004	7	Wago Zentralelektrik	Wago e-box	
	X1:23A	003	9	Sika – Klemme	fuse terminal	
8	X1:23E	002	3	Sika – Klemme	fuse terminal	
	X1:23E	003	9	Sika – Klemme	fuse terminal	
	X1:241	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:242	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:243	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
9	X1:244	004	10	Wago Zentralelektrik	Wago e-box	
	X1:245	011	19	Wago Zentralelektrik	Wago e-box	
	X1:246	011	19	Wago Zentralelektrik	Wago e-box	
	X1:247	013	15	Wago Zentralelektrik	Wago e-box	
	X1:248	011	3	Wago Zentralelektrik	Wago e-box	
	X1:249	013	10	Wago Zentralelektrik	Wago e-box	
10	X1:24A	004	4	Sika – Klemme	fuse terminal	
	X1:24E	004	4	Sika – Klemme	fuse terminal	
	X1:250	004	10	Wago Zentralelektrik	Wago e-box	
	X1:251	013	9	Wago Zentralelektrik	Wago e-box	
	X1:252	013	13	Wago Zentralelektrik	Wago e-box	
11	X1:253	013	17	Wago Zentralelektrik	Wago e-box	
	X1:255	004	18	Wago Zentralelektrik	Wago e-box	
	X1:256	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:256	003	12	Wago Zentralelektrik	Wago e-box	
	X1:256	011	15	Wago Zentralelektrik	Wago e-box	
12	X1:257	009	13	Wago Zentralelektrik	Wago e-box	
	X1:258	009	13	Wago Zentralelektrik	Wago e-box	
	X1:259	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:25A	002	15	Sika – Klemme	fuse terminal	
	X1:25E	002	15	Sika – Klemme	fuse terminal	
13	X1:260	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:261	008	10	Wago Zentralelektrik	Wago e-box	
	X1:262	007	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:262	008	10	Wago Zentralelektrik	Wago e-box	
	X1:263	008	10	Wago Zentralelektrik	Wago e-box	
14	X1:265	012	18	Wago Zentralelektrik	Wago e-box	
	X1:266	012	17	Wago Zentralelektrik	Wago e-box	
	X1:267	012	18	Wago Zentralelektrik	Wago e-box	
	X1:268	012	19	Wago Zentralelektrik	Wago e-box	
	X1:269	004	11	Wago Zentralelektrik	Wago e-box	
15	X1:26A	009	13	Sika – Klemme	fuse terminal	
	X1:26E	009	13	Sika – Klemme	fuse terminal	
	X1:270	004	11	Wago Zentralelektrik	Wago e-box	
	X1:272	011	3	Wago Zentralelektrik	Wago e-box	
	X1:272	013	9	Wago Zentralelektrik	Wago e-box	
16	X1:27A	009	7	Sika – Klemme	fuse terminal	
	X1:27E	009	7	Sika – Klemme	fuse terminal	
	X1:28A	013	2	Sika – Klemme	fuse terminal	
	X1:28E	013	2	Sika – Klemme	fuse terminal	
	X1:291	005	7	Wago Zentralelektrik	Wago e-box	
17	X1:292	005	11	Wago Zentralelektrik	Wago e-box	
	X1:293	003	10	Wago Zentralelektrik	Wago e-box	
	X1:294	005	5	Wago Zentralelektrik	Wago e-box	
	X1:295	005	7	Wago Zentralelektrik	Wago e-box	
	X1:296	005	15	Wago Zentralelektrik	Wago e-box	
18	X1:298	002	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:298	005	11	Wago Zentralelektrik	Wago e-box	
	X1:299	004	20	Wago Zentralelektrik	Wago e-box	
	X1:299	005	5	Wago Zentralelektrik	Wago e-box	
	X1:29A	005	5	Sika – Klemme	fuse terminal	
19	X1:29E	005	5	Sika – Klemme	fuse terminal	
	X1:300	005	7	Wago Zentralelektrik	Wago e-box	
	X1:301	005	11	Wago Zentralelektrik	Wago e-box	
	X1:302	003	13	Wago Zentralelektrik	Wago e-box	
	X1:303	005	8	Wago Zentralelektrik	Wago e-box	
20	X1:308	010	2	Wago Zentralelektrik	Wago e-box	
	X1:30A	011	4	Sika – Klemme	fuse terminal	
	X1:30E	011	4	Sika – Klemme	fuse terminal	
	X1:31A	011	18	Sika – Klemme	fuse terminal	
	X1:31E	002	17	SIKA KLEMME	fuse terminal	

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Name	Bl.	Pf.	Benennung	Ablage	TYP
X1:31E	011	18	Sika – Klemme	fuse terminal	
X1:321	010	7	Wago Zentralelektrik	Wago e–box	
X1:322	010	9	Wago Zentralelektrik	Wago e–box	
X1:323	010	8	Wago Zentralelektrik	Wago e–box	
X1:324	010	8	Wago Zentralelektrik	Wago e–box	
X1:325	010	7	Wago Zentralelektrik	Wago e–box	
X1:326	010	8	Wago Zentralelektrik	Wago e–box	
X1:327	010	12	Wago Zentralelektrik	Wago e–box	
X1:328	010	11	Wago Zentralelektrik	Wago e–box	
X1:329	010	11	Wago Zentralelektrik	Wago e–box	
X1:32A	002	17	Sika – Klemme	fuse terminal	
X1:32E	002	17	Sika – Klemme	fuse terminal	
X1:330	010	10	Wago Zentralelektrik	Wago e–box	
X1:331	010	12	Wago Zentralelektrik	Wago e–box	
X1:332	010	12	Wago Zentralelektrik	Wago e–box	
X1:333	010	15	Wago Zentralelektrik	Wago e–box	
X1:334	010	15	Wago Zentralelektrik	Wago e–box	
X1:335	007	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:336	007	9	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:337	007	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:338	007	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:339	007	5	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:33A	013	6	Sika – Klemme	fuse terminal	
X1:33E	002	17	SIKA KLEMME	fuse terminal	
X1:33E	013	6	Sika – Klemme	fuse terminal	
X1:340	007	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:341	011	18	Wago Zentralelektrik	Wago e–box	
X1:342	011	18	Wago Zentralelektrik	Wago e–box	
X1:343	008	4	Wago Zentralelektrik	Wago e–box	
X1:343	010	6	Wago Zentralelektrik	Wago e–box	
X1:344	010	5	Wago Zentralelektrik	Wago e–box	
X1:345	010	4	Wago Zentralelektrik	Wago e–box	
X1:346	010	4	Wago Zentralelektrik	Wago e–box	
X1:347	010	5	Wago Zentralelektrik	Wago e–box	
X1:348	010	6	Wago Zentralelektrik	Wago e–box	
X1:349	009	18	Wago Zentralelektrik	Wago e–box	
X1:349	009	19	Wago Zentralelektrik	Wago e–box	
X1:349	009	19	Wago Zentralelektrik	Wago e–box	
X1:349	010	17	Wago Zentralelektrik	Wago e–box	
X1:34A	011	14	Sika – Klemme	fuse terminal	
X1:34E	011	14	Sika – Klemme	fuse terminal	
X1:350	010	14	Wago Zentralelektrik	Wago e–box	
X1:351	010	13	Wago Zentralelektrik	Wago e–box	
X1:352	010	13	Wago Zentralelektrik	Wago e–box	
X1:353	010	14	Wago Zentralelektrik	Wago e–box	
X1:354	010	14	Wago Zentralelektrik	Wago e–box	
X1:355	011	19	Wago Zentralelektrik	Wago e–box	
X1:356	011	14	Wago Zentralelektrik	Wago e–box	
X1:357	008	17	Wago Zentralelektrik	Wago e–box	
X1:358	008	13	Wago Zentralelektrik	Wago e–box	
X1:359	008	14	Wago Zentralelektrik	Wago e–box	
X1:35A	009	2	Sika – Klemme	fuse terminal	
X1:35E	009	2	Sika – Klemme	fuse terminal	
X1:363	010	16	Wago Zentralelektrik	Wago e–box	
X1:364	010	20	Wago Zentralelektrik	Wago e–box	
X1:364	011	14	Wago Zentralelektrik	Wago e–box	
X1:36A	013	9	Sika – Klemme	fuse terminal	
X1:36E	013	9	Sika – Klemme	fuse terminal	
X1:371	003	16	Wago Zentralelektrik	Wago e–box	
X1:372	014	19	Wago Zentralelektrik	Wago e–box	
X1:372	014	20	Wago Zentralelektrik	Wago e–box	
X1:373	012	15	Wago Zentralelektrik	Wago e–box	
X1:374	012	15	Wago Zentralelektrik	Wago e–box	
X1:375	012	3	Wago Zentralelektrik	Wago e–box	
X1:376	012	3	Wago Zentralelektrik	Wago e–box	
X1:377	012	19	Wago Zentralelektrik	Wago e–box	
X1:378	014	10	Wago Zentralelektrik	Wago e–box	
X1:381	013	19	Wago Zentralelektrik	Wago e–box	
X1:382	013	18	Wago Zentralelektrik	Wago e–box	
X1:383	013	17	Wago Zentralelektrik	Wago e–box	
X1:391/1	002	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:391/2	002	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:392/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:392/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:393/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:393/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:394/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:394/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:395/1	006	7	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:395/2	006	6	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:397/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:397/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:398/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:398/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:399/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:399/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:400/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:400/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:401/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:401/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:402/1	009	7	Wago Zentralelektrik	Wago e–box	
X1:402/2	009	7	Wago Zentralelektrik	Wago e–box	
X1:403/1	006	12	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:403/2	006	13	WAGO ZENTRALELEKTRIK	WAGO E–BOX	
X1:404/1	009	14	Wago Zentralelektrik	Wago e–box	
X1:404/2	009	14	Wago Zentralelektrik	Wago e–box	
X1:405/1	009	15	Wago Zentralelektrik	Wago e–box	
X1:405/2	009	15	Wago Zentralelektrik	Wago e–box	
X1:406/1	010	3	Wago Zentralelektrik	Wago e–box	

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X1:406/2	010	3	Wago Zentralelektrik	Wago e-box	
X1:407/1	010	4	Wago Zentralelektrik	Wago e-box	
X1:407/2	010	4	Wago Zentralelektrik	Wago e-box	
X1:408/1	010	3	Wago Zentralelektrik	Wago e-box	
X1:408/2	010	3	Wago Zentralelektrik	Wago e-box	
X1:409/1	010	2	Wago Zentralelektrik	Wago e-box	
X1:409/2	010	2	Wago Zentralelektrik	Wago e-box	
X1:41/1	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:41/2	008	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:410/1	009	9	Wago Zentralelektrik	Wago e-box	
X1:410/2	009	9	Wago Zentralelektrik	Wago e-box	
X1:411/1	009	10	Wago Zentralelektrik	Wago e-box	
X1:411/2	009	10	Wago Zentralelektrik	Wago e-box	
X1:412/1	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:412/2	007	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:413/1	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:413/2	007	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:414/1	013	14	Wago Zentralelektrik	Wago e-box	
X1:414/2	013	14	Wago Zentralelektrik	Wago e-box	
X1:42/1	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:42/2	007	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:43/1	010	9	Wago Zentralelektrik	Wago e-box	
X1:43/2	010	9	Wago Zentralelektrik	Wago e-box	
X1:44/1	010	5	Wago Zentralelektrik	Wago e-box	
X1:44/2	010	5	Wago Zentralelektrik	Wago e-box	
X1:45/1	010	11	Wago Zentralelektrik	Wago e-box	
X1:45/2	010	11	Wago Zentralelektrik	Wago e-box	
X1:46/1	007	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:46/2	007	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:47/1	010	14	Wago Zentralelektrik	Wago e-box	
X1:47/2	010	14	Wago Zentralelektrik	Wago e-box	
X2:A	010	19	Datenschnittstelle	data interface	
X2:B	010	19	Datenschnittstelle	data interface	
X2:G	009	11	Datenschnittstelle	data interface	
X2:H	009	10	Datenschnittstelle	data interface	
X2:J	002	11	Datenschnittstelle	data interface	
X2:N	002	11	Datenschnittstelle	data interface	
X2:U	009	11	Datenschnittstelle	data interface	
X2:V	010	15	Datenschnittstelle	data interface	
X3:A	008	3	Stecker Handgas	connector hand throttle	
X3:B	008	2	Stecker Handgas	connector hand throttle	
X3:C	008	2	Stecker Handgas	connector hand throttle	
X4:A	004	15	EMR – Diagnose	EMR-diagnosis	
X4:B	004	17	EMR – Diagnose	EMR-diagnosis	
X4:F	004	16	EMR – Diagnose	EMR-diagnosis	
X4:G	004	16	EMR – Diagnose	EMR-diagnosis	
X4:H	004	15	EMR – Diagnose	EMR-diagnosis	
X4:K	004	17	EMR – Diagnose	EMR-diagnosis	
X4:M	004	16	EMR – Diagnose	EMR-diagnosis	
X5:1	005	7	Deutsch Stecker Senso	Deutsch Connector sensor	
X6:1	004	10	Wago Zentralelektrik	Wago e-box	
X6:2	004	10	Wago Zentralelektrik	Wago e-box	
X6:3	004	11	Wago Zentralelektrik	Wago e-box	
X6:4	004	11	Wago Zentralelektrik	Wago e-box	
X6:5	004	15	Wago Zentralelektrik	Wago e-box	
X6:6	004	15	Wago Zentralelektrik	Wago e-box	
X6:7	004	16	Wago Zentralelektrik	Wago e-box	
X6:8	004	16	Wago Zentralelektrik	Wago e-box	
X6:9	004	16	Wago Zentralelektrik	Wago e-box	
X6:10	004	17	Wago Zentralelektrik	Wago e-box	
X7:1	014	9	Stecker Rops	connector on rops	
X7:2	014	9	Stecker Rops	connector on rops	
X7:3	014	9	Stecker Rops	connector on rops	
X7:4	014	9	Stecker Rops	connector on rops	
X7:5	013	16	Stecker Rops	connector on rops	
X7:6	013	16	Stecker Rops	connector on rops	
X8:1	012	3	Pumpenstecker Kabine	connector pump cabin;	
X8:2	012	3	Pumpenstecker Kabine	connector pump cabin;	
X9:1	007	5	Stecker Schalter Rich	connector direction switch	
X9:2	007	9	Stecker Schalter Rich	connector direction switch	
X9:3	007	7	Stecker Schalter Rich	connector direction switch	
X9:4	007	5	Stecker Schalter Rich	connector direction switch	
X9:5	007	5	Stecker Schalter Rich	connector direction switch	
X9:6	007	6	Stecker Schalter Rich	connector direction switch	
XS	002	15	Steckdose	Socket	
X10:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X10:B	004	6	AMP Stecker Gaspedal	AMP connector throttle	
X10:C	004	6	AMP Stecker Gaspedal	AMP connector throttle	
X11:1	011	18	Schnittstelle Sitz	connector drivers seat	
X11:2	011	18	Schnittstelle Sitz	connector drivers seat	
X12:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X12:B	004	8	AMP Stecker Gaspedal	AMP connector throttle	
X12:C	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X13:1	008	17	Stecker Stufenschalte	connector speed range switch	
X13:2	008	18	Stecker Stufenschalte	connector speed range switch	
X13:3	008	14	Stecker Stufenschalte	connector speed range switch	
X14:4	013	15	Stecker Motor	connector engine	
X14:5	013	16	Stecker Motor	connector engine	
X14:6	002	6	Motorschnittstelle	engine interface	
X14:7	002	6	Motorschnittstelle	engine interface	
X14:8	005	7	Motorschnittstelle	engine interface	
X14:9	003	9	Motorschnittstelle	engine interface	
X14:10	006	12	Stecker Motor	connector engine	
X14:11	006	12	Stecker Motor	connector engine	
X15:A	010	18	Stecker Lehne links	connector arm rest lh.	
X15:B	010	18	Stecker Lehne links	connector arm rest lh.	
X15:C	010	20	Stecker Lehne links	connector arm rest lh.	
X17:1	013	16	Stecker Klimakupplung	connector clima clutch	
X17:2	013	16	Stecker Klimakupplung	connector clima clutch	

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X18:1	013	16	Stecker Druckschalter	connector pressure switch	
X18:2	013	16	Stecker Druckschalter	connector pressure switch	
X19:1	013	13	Stecker Heizventil	connector heating valve	
X19:2	013	13	Stecker Heizventil	connector heating valve	
X21:1	011	19	Schnittstelle Sitz	connector drivers seat	
X21:2	011	19	Schnittstelle Sitz	connector drivers seat	
X22:1	013	10	Stecker Luftklappe	connector air flap	
X22:2	013	11	Stecker Luftklappe	connector air flap	
X23:1	013	14	Stecker Sensor	connector sensor	
X23:2	013	14	Stecker Sensor	connector sensor	
X24:1	013	15	Stecker Sensor	connector sensor	
X24:2	013	15	Stecker Sensor	connector sensor	
X25:A	013	19	Stecker Lüfter	connector blower	
X25:B	013	18	Stecker Lüfter	connector blower	
X25:C	013	18	Stecker Lüfter	connector blower	
X26:1	013	9	Stecker Klimasteuerun	connector climacontrol	
X26:2	013	9	Stecker Klimasteuerun	connector climacontrol	
X26:3	013	11	Stecker Klimasteuerun	connector climacontrol	
X26:4	013	10	Stecker Klimasteuerun	connector climacontrol	
X26:5	013	16	Stecker Klimasteuerun	connector climacontrol	
X26:6	013	12	Stecker Klimasteuerun	connector climacontrol	
X26:7	013	12	Stecker Klimasteuerun	connector climacontrol	
X26:8	013	15	Stecker Klimasteuerun	connector climacontrol	
X26:9	013	13	Stecker Klimasteuerun	connector climacontrol	
X26:10	013	10	Stecker Klimasteuerun	connector climacontrol	
X26:11	013	11	Stecker Klimasteuerun	connector climacontrol	
X26:12	013	13	Stecker Klimasteuerun	connector climacontrol	
X26:13	013	13	Stecker Klimasteuerun	connector climacontrol	
X26:14	013	13	Stecker Klimasteuerun	connector climacontrol	
X27:1	013	14	Stecker Klimasteuerun	connector climacontrol	
X27:2	013	14	Stecker Klimasteuerun	connector climacontrol	
X27:3	013	15	Stecker Klimasteuerun	connector climacontrol	
X27:4	013	15	Stecker Klimasteuerun	connector climacontrol	
X28:1	011	6	Stecker Radsensor	connector wheel sensor	
X28:2	011	6	Stecker Radsensor	connector wheel sensor	
X28:3	011	7	Stecker Radsensor	connector wheel sensor	
X28:4	011	7	Stecker Radsensor	connector wheel sensor	
X29:1	013	6	Stecker Zyklon	Connector cyclone	
X29:2	013	6	Stecker Zyklon	Connector cyclone	
X30:A	011	6	Verbindungsstecker Se	connector sensor	
X30:B	011	6	Verbindungsstecker Se	connector sensor	
X30:C	011	7	Verbindungsstecker Se	connector sensor	
X31:A	011	11	Verbindungsstecker An	connector gauge	
X31:B	011	9	Verbindungsstecker An	connector gauge	
X31:C	011	10	Verbindungsstecker An	connector gauge	
X33:1	011	4	Schmieranlage	lubrication system	
X33:2	011	4	Schmieranlage	lubrication system	
X34:1	011	4	Schmieranlage	lubrication system	
X34:2	011	4	Schmieranlage	lubrication system	
X34:3	011	3	Schmieranlage	lubrication system	
X34:4	011	3	Schmieranlage	lubrication system	
X34:5	011	4	Schmieranlage	lubrication system	
X35:1	009	13	Stecker Warnsummer	connector warning buzzer	
X35:2	009	13	Stecker Warnsummer	connector warning buzzer	
X36:1	008	7	Stecker Poti	connector potentiometer	
X36:2	008	6	Stecker Poti	connector potentiometer	
X36:3	008	7	Stecker Poti	connector potentiometer	
X39:A	008	7	Stecker Deceleratorpe	connector decelerator pedal	
X39:B	008	6	Stecker Deceleratorpe	connector decelerator pedal	
X39:C	008	6	Stecker Deceleratorpe	connector decelerator pedal	
X40:1	008	8	Stecker Deceleratorpe	connector decelerator pedal	
X40:2	008	8	Stecker Deceleratorpe	connector decelerator pedal	
X40:3	008	9	Stecker Deceleratorpe	connector decelerator pedal	
X40:4	008	7	Stecker Deceleratorpe	connector decelerator pedal	
X40:5	008	8	Stecker Decelelratorp	connector decelerator pedal	
X40:6	008	7	Stecker Deceleratorpe	connector decelerator pedal	
X41:1	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:2	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:3	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:4	008	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:5	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:6	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:8	008	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:9	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:10	008	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:11	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X41:12	008	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
X42:1	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:2	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:4	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:5	008	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X42:6	008	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
X17.1:1	004	2	2-pol SPT	2-pole SPT	
X17.1:2	004	2	2-pol SPT	2-pole SPT	
X27.1:4	004	18	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:6	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:7	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:11	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:12	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:13	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:14	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:15	004	9	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:18	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:19	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:20	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:21	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:22	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:23	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:24	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	

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X27.1:25	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:26	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:27	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:28	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:29	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:30	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:33	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:34	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:35	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:36	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:37	004	13	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:39	004	17	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:40	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:41	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.1:42	004	15	Motor / 42-pol EPC	engine / 42-pole EPC	
X27.2:10	004	3	12-pol EPC	12-pole EPC	
X27.2:11	004	3	12-pol EPC	12-pole EPC	
XD2.1:2	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:3	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:5	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:6	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:8	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:9	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:10	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:11	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:13	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:20	004	14	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:22	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:29	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:30	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:33	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:34	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:35	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:38	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:39	004	13	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:40	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:52	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:53	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:54	004	12	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:59	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:60	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:61	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:62	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:77	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:78	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:79	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:89	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.2:3	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:4	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:5	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:7	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:8	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:9	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:10	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:15	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:18	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:19	004	9	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:23	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:24	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:25	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:26	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:27	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:28	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:32	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:33	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:34	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:35	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:36	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.3:3	004	15	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:4	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:6	004	13	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:7	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:8	004	18	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:12	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:13	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:14	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:15	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:16	004	17	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
Y02	004	19	Magnetventil Flammgluehanlage	Solenoid valve, glow plug system	18W
Y03	008	14	Magnetventil Fahrstufenumschaltung	Solenoid valve, speed range selector	
Y04	008	10	Magnetventil Bremse	Solenoid valve, brake	1,25A
Y14	012	3	Kraftstoffpumpe Heizgeraet	Fuel pump, heating unit	
Y15	013	16	Magnetkupplung Klimakompressor	Magnetic clutch, air conditioning compr.	1,75A
Y16	007	10	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y16	007	12	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y17	007	6	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y17	007	8	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y92	010	7	Magnetventil Lenkung vorne rechts	Solenoid valve, steering, front rh.	max. 1,1A
Y93	010	8	Magnetventil Lenkung vorne links	Solenoid valve, steering, front lh.	max. 1,1A
Y102	010	12	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y102	010	13	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y108	010	9	Magnetventil Schaufel Heben	solenoid valve, lifting shovel	max. 1,1A
Y109	010	10	Magnetventil Schaufel Senken	solenoid valve, let down shovel	max. 1,1A
Y110	010	19	Magnetventil Schaufel oeffnen	solenoid valve, open shovel	max. 1,1A
Y111	010	18	Magnetventil Schaufel Schließen	solenoid valve, close shovel	max. 1,1A
Y132	007	14	Magnetventil Radmotor vorn links	Solenoid valve, wheel motor front lh.	max. 0,6A
Y133	007	16	Magnetventil Radmotor vorn rechts	Solenoid valve, wheel motor front rh.	max. 0,6A
Y134	007	17	Magnetventil Radmotor hinten links	Solenoid valve, wheel motor rear lh.	max. 0,6A

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Y135	007	19	Magnetventil Radmotor hinten rechts	Solenoid valve, wheel motor rear rh.	max. 0,6A
Y138	013	13	Magnetveentil Heizung	Solenoid valve, heating unit	0,42A
Y147	004	12	Injektor A1	jet pump A1	
Y148	004	14	Injektor A2	jet pump A2	
Y149	004	13	Injektor A3	jet pump A3	
Y150	004	17	Injektor B1	jet pump B1	
Y151	004	16	Injektor B2	jet pump B2	
Y152	004	16	Injektor B3	jet pump B3	
Y166	004	14	Injektor A4	jet pump A4	
Y167	004	18	Injektor B4	jet pump B4	

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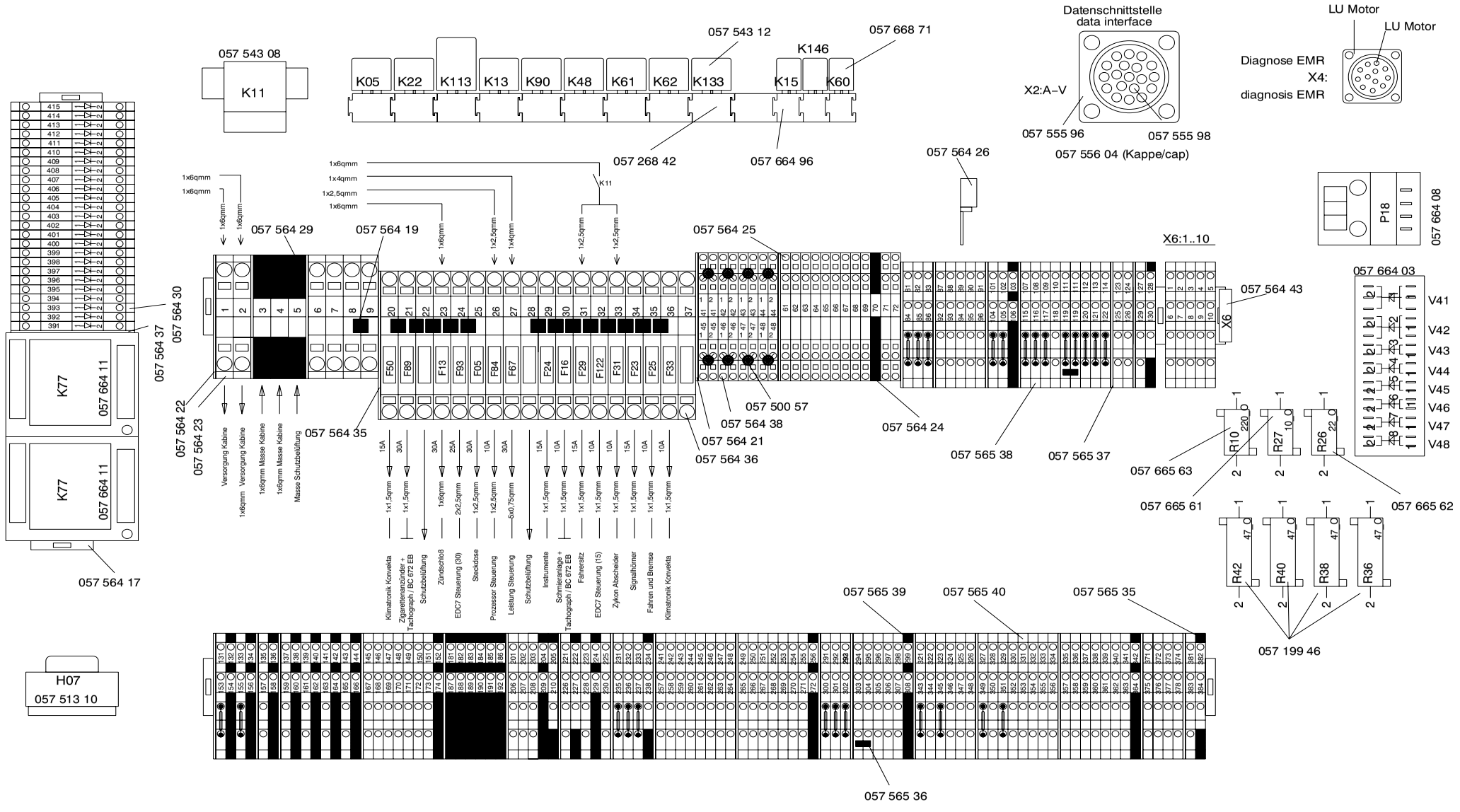
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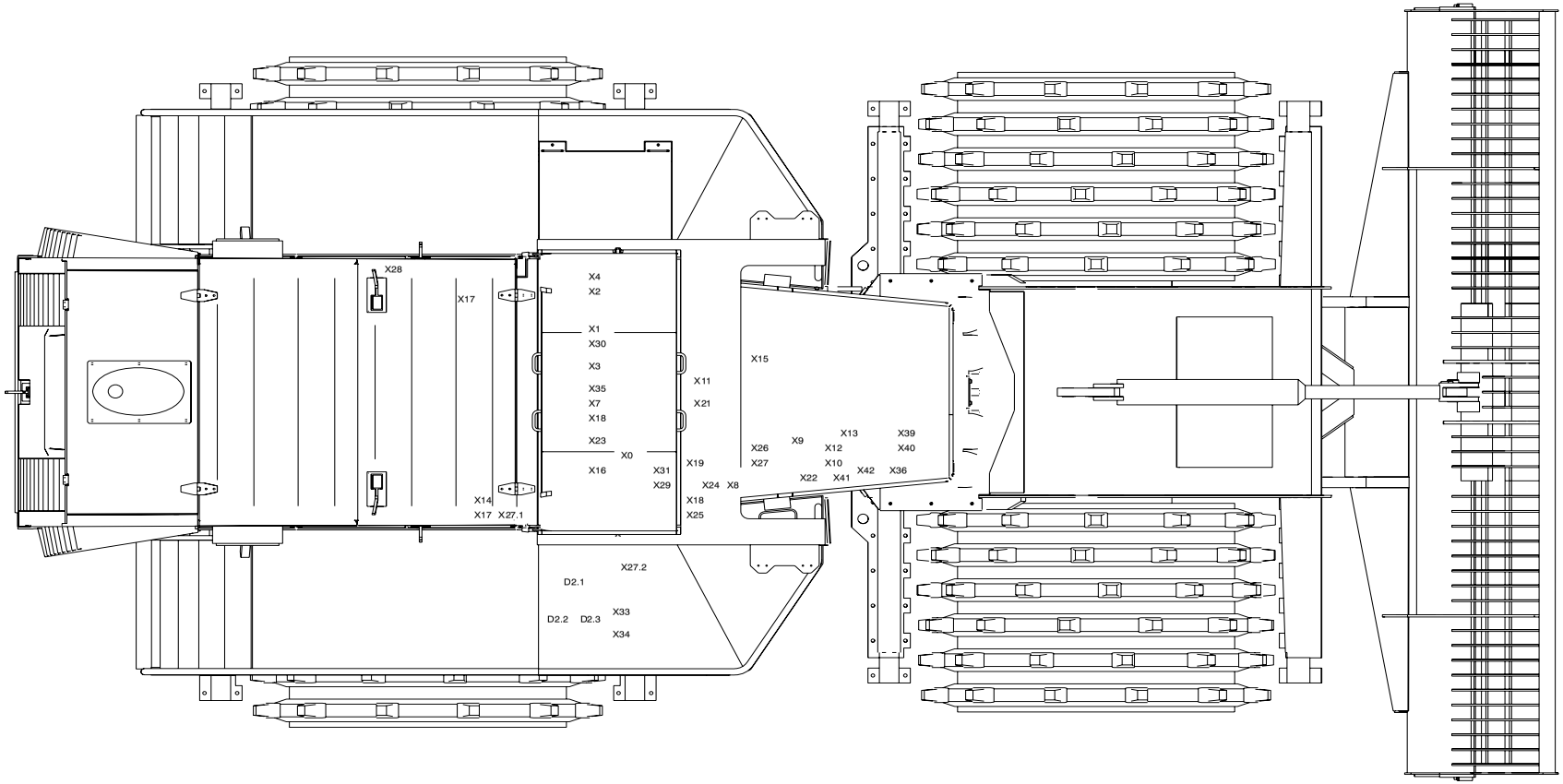
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sheet no.:



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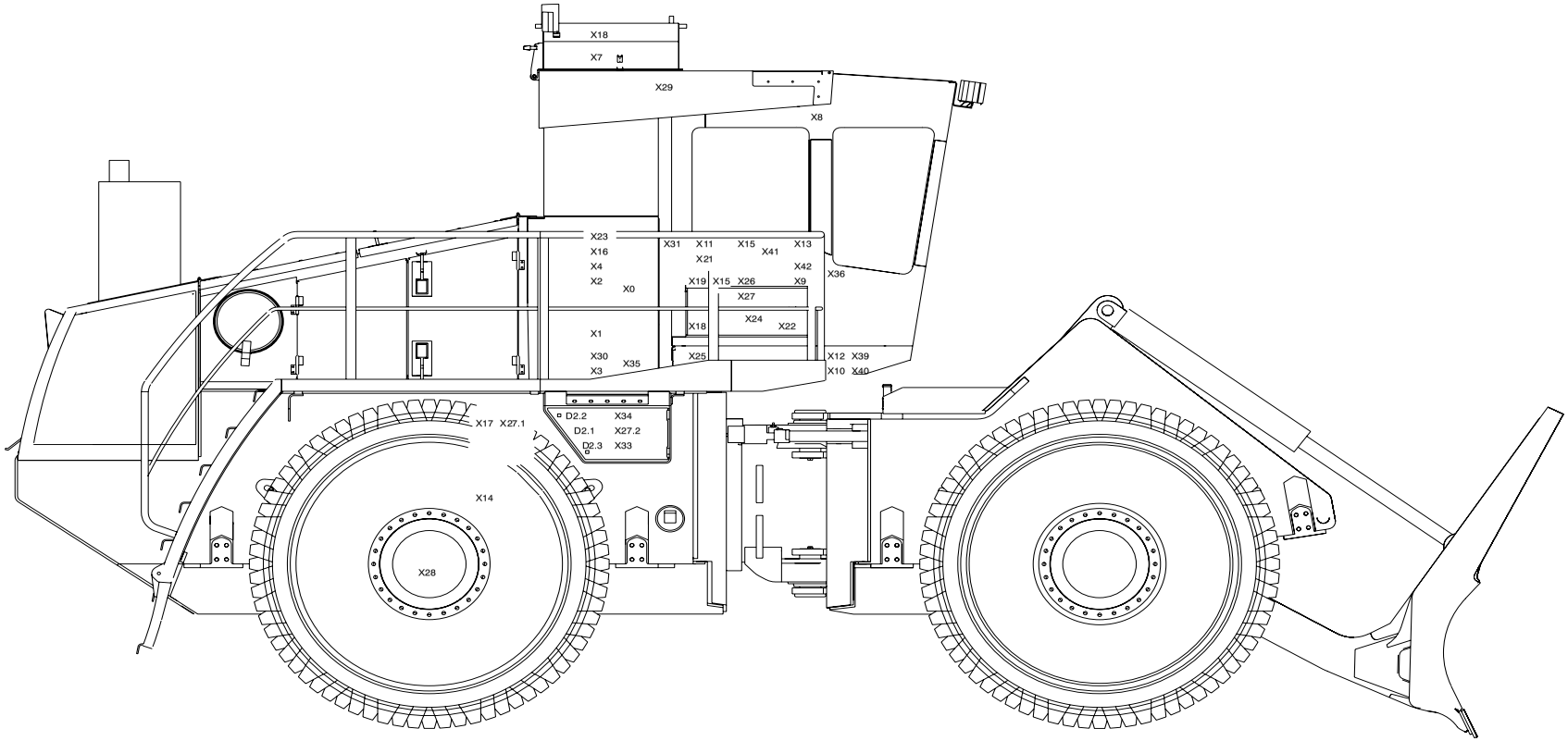
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	Gez.: 06.08.2007 Name: Werner	Schaltkasten e-box	Seite: 1 von: 1 page: from:	570 700 42
	Gepr.: 06.08.2007 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 201 sheet no.:



https://truckmanualshub.com/

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 06.08.2007 Name: Werner					Lokalisierungsgrafik Steckverbinder Draufsicht localization graphic connectors top view									Seite: 1 von: 1 page: 1 from: 1		570 700 42	
		Gepr.: 06.08.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 301	



https://truckmanualshub.com/

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		Gez.: 06.08.2007 Name: Werner		Lokalisierungsgrafik Steckverbinder Seitenansicht localization graphic connectors side view												Seite: 1 von: 1 page: 1 from: 1		570 700 42	
		Gepr.: 06.08.2007 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 302	

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19.6 Wiring diagram 570 700 44

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S/N Wiring diagram 570 700 44

S/N 101 570 571 029 ⇔ 101 570 571 ... BC772 RS-2
S/N 101 570 581 130 ⇔ 101 570 581 ... BC772 RB-2
S/N 101 570 591 036 ⇔ 101 570 591 ... BC672 RB-2
S/N 101 570 821 047 ⇔ 101 570 821 ... BC972 RB-2
S/N 101 570 831 060 ⇔ 101 570 831 ... BC1172 RB-2

Standardverkabelung: standard wireing:	dicke Linien thick lines	Platinenverdrahtung: connection on printed circuit board:	dünne Linien thin lines

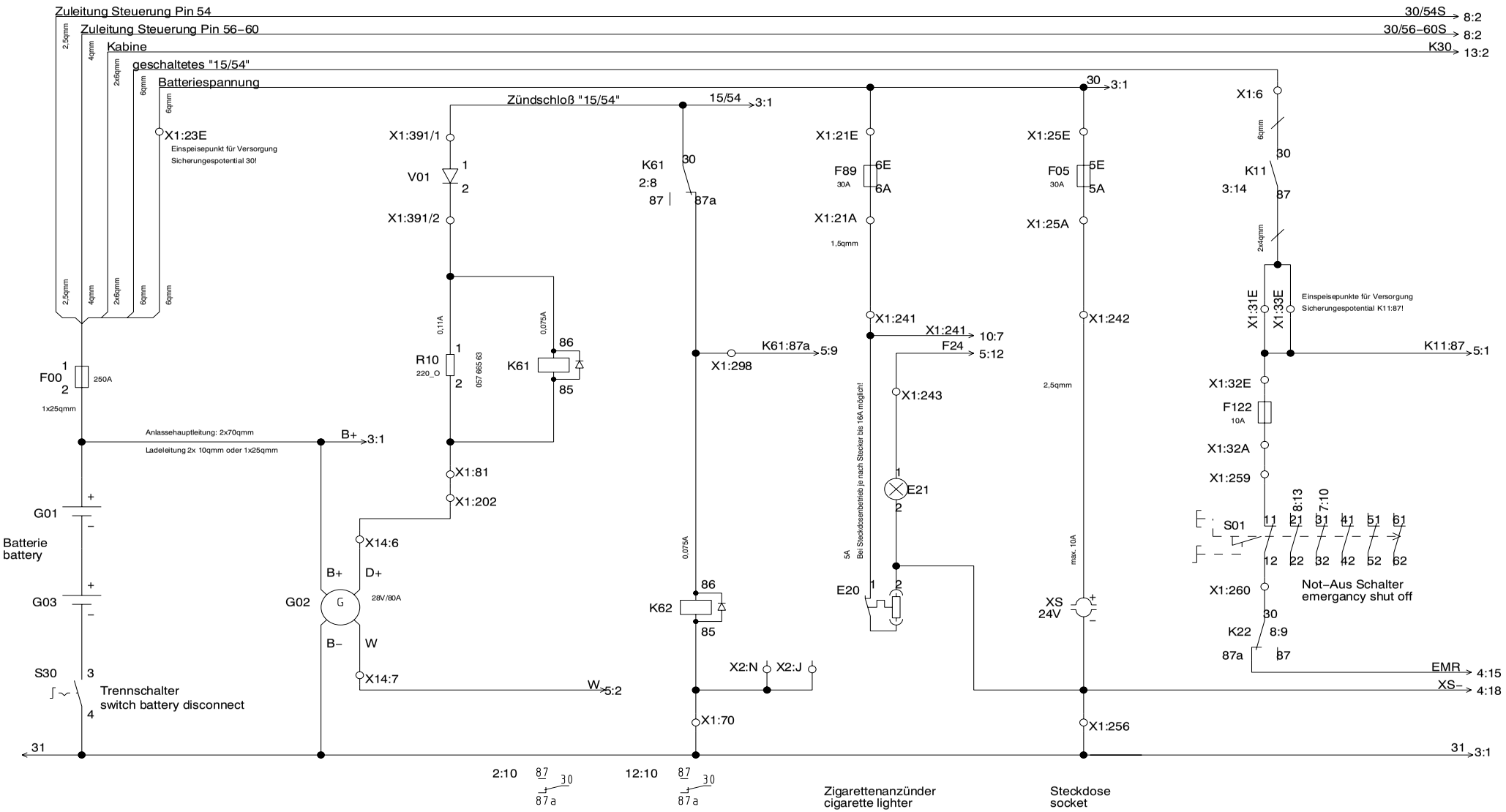
Inhaltsverzeichnis: table of contents: BC 672...1172–2 RB/EB/RS

Blatt Nr.: sheet no.:	Zeichnungsnummer drawing – no.	Funktionsgruppe	function unit
001	570 700 44	Stromlaufplan	Circuit Diagram
002	570 700 44	Versorgung, Zigarettenanzünder	supply, cigarette lighter
003	570 700 44	Zündschloß, Starter	ignition switch, starter
004	570 700 44	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot.	DEUTZ controller EDC 7 for 6– and 8–zylinder engine
005	570 700 44	Anzeigen, Störmeldungen BAUSER Geräte	monitoring, failure indication BAUSER units
006	570 700 44	Fahrpumpen, Radmotoren, Startfreigabe	driving pumps, weehl motors, starting release
007	570 700 44	Fahrstufen, Bremse, Verzögerungspedal	speed ranges, brakes, decelerator device
008	570 700 44	Versorgung Steuerung, Warnsummer, Override	supply controllers, warning buzzers, override
009	570 700 44	Lenkung und Arbeitshydraulik	steering and working hydraulic system
010	570 700 44	Hupe, Schmieranlage, Tachograph, Sitzfunktionen	horn, lubrication systhem, tachograph, seat funktions
011	570 700 44	Heizung und Belüftung	heating and ventilation
012	570 700 44	Schutzbelüftung, Zyklon Abscheider, Klimatronik	protected vent. system, cyclone separator, air cond.
013	570 700 44	Kabine und Anbauteile	cabin and attachment–parts
101	570 700 44	Bauteilliste	component listing
201	570 700 44	Schaltkasten	e–box
301	570 700 44	Lokalisierungsgrafik Steckverbinder Draufsicht	localization graphic connectors top view

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	Gez.: 04.06.2008 Name: Werner	Stromlaufplan circuit diagram	Seite: 001 von: 001 page: from: 001	570 700 44
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 001 sheet no.:

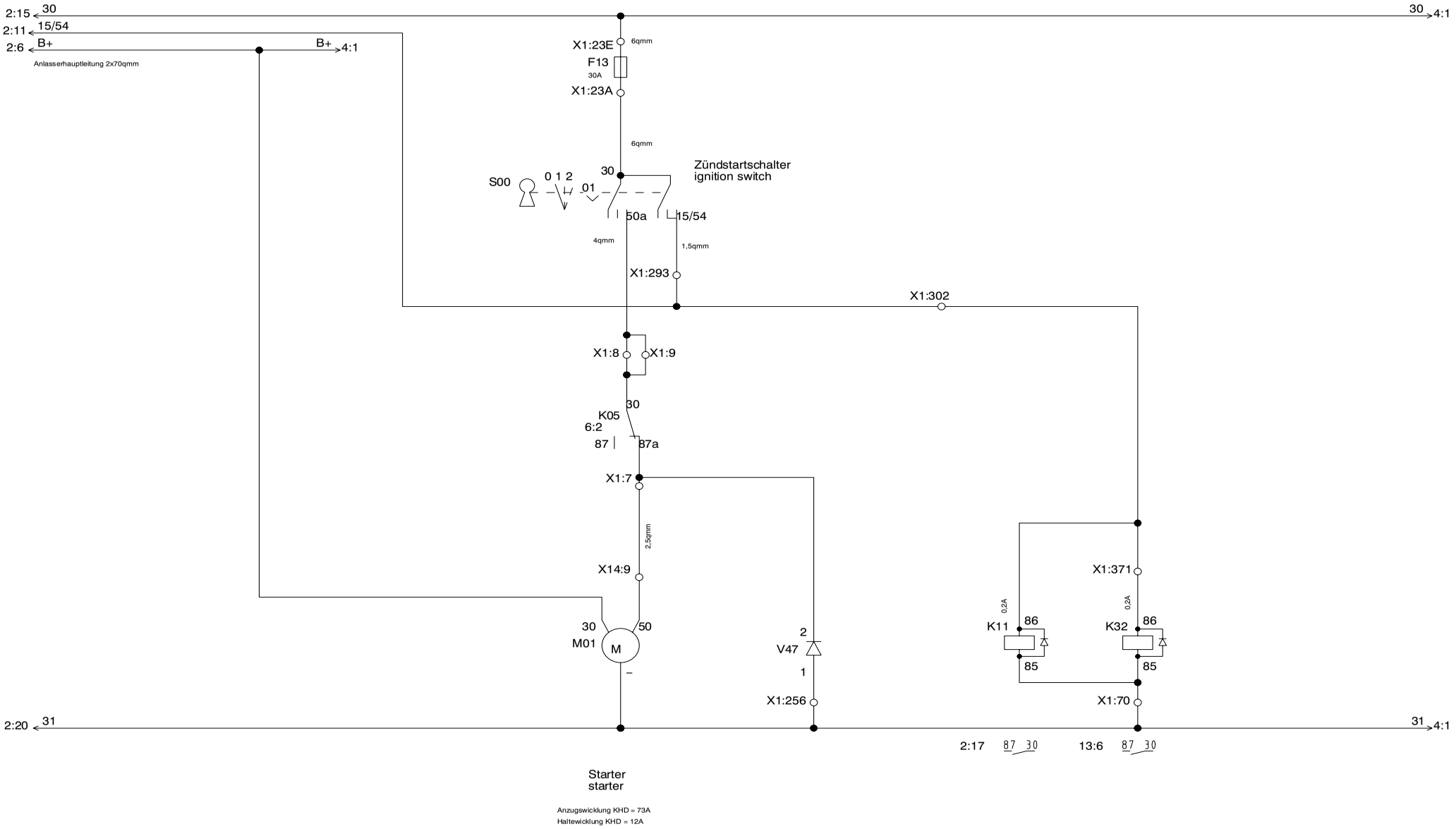
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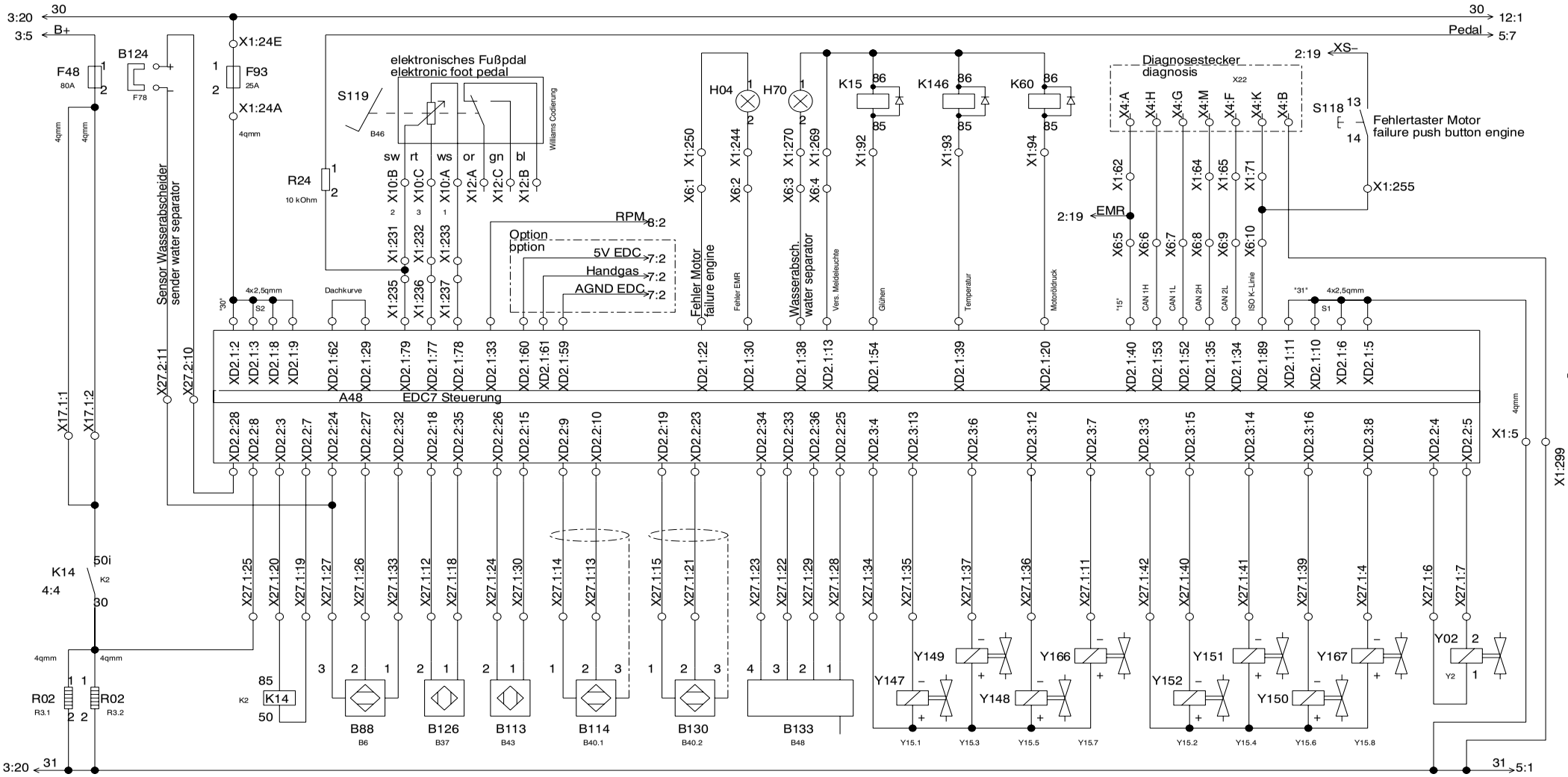
	Gez.: 04.06.2008 Name: Werner	Versorgung, Zigarettenanzünder supply, cigarette lighter	Seite: 1 von: 1 page: 1 from: 1	570 700 44	
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 002	



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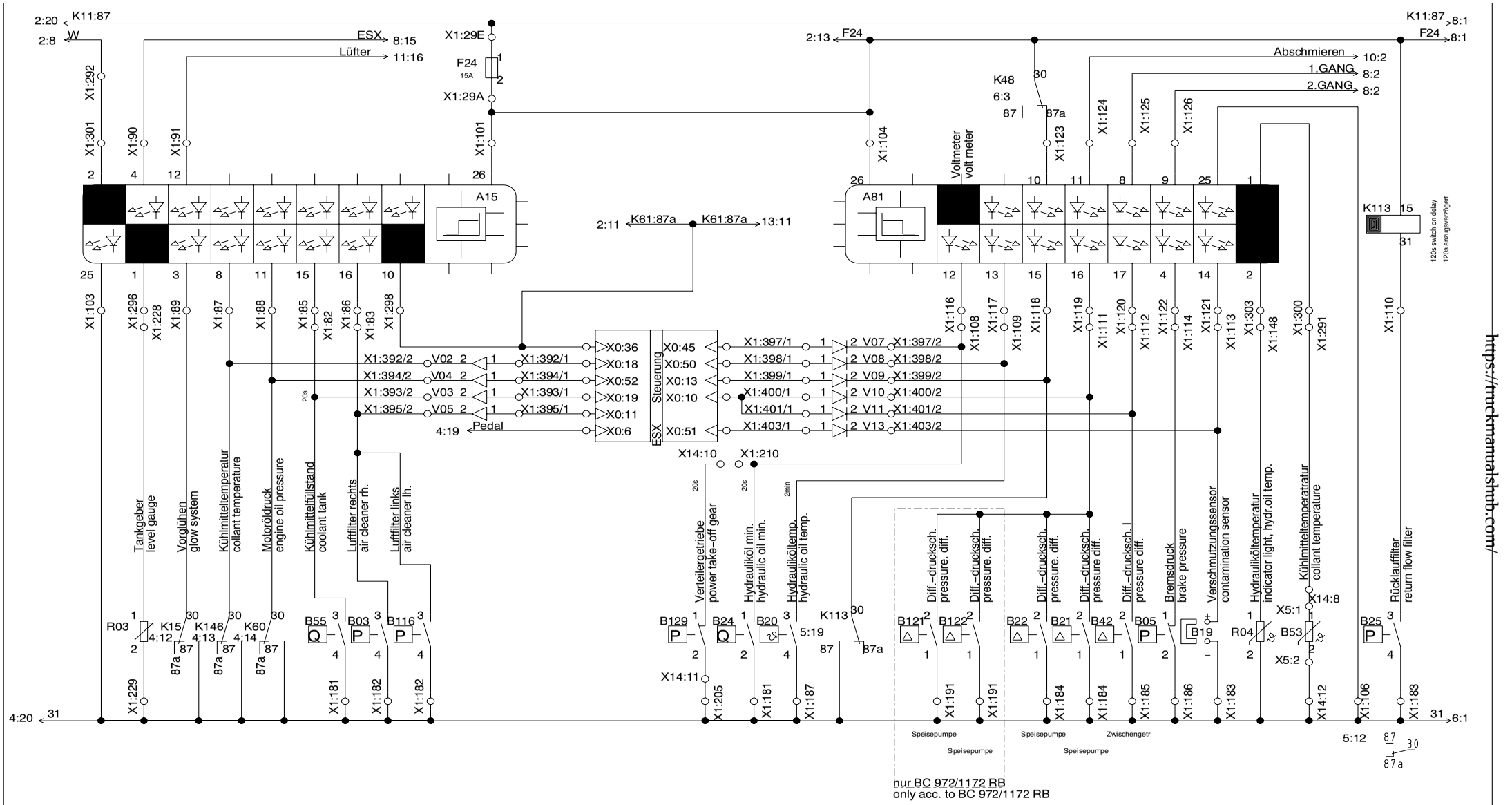
	Gez.: 04.06.2008 Name: Werner	Zündschloß, Starter ignition switch, starter	Seite: 1 von: 1 page: from:	570 700 44	
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: sheet no.: 003	

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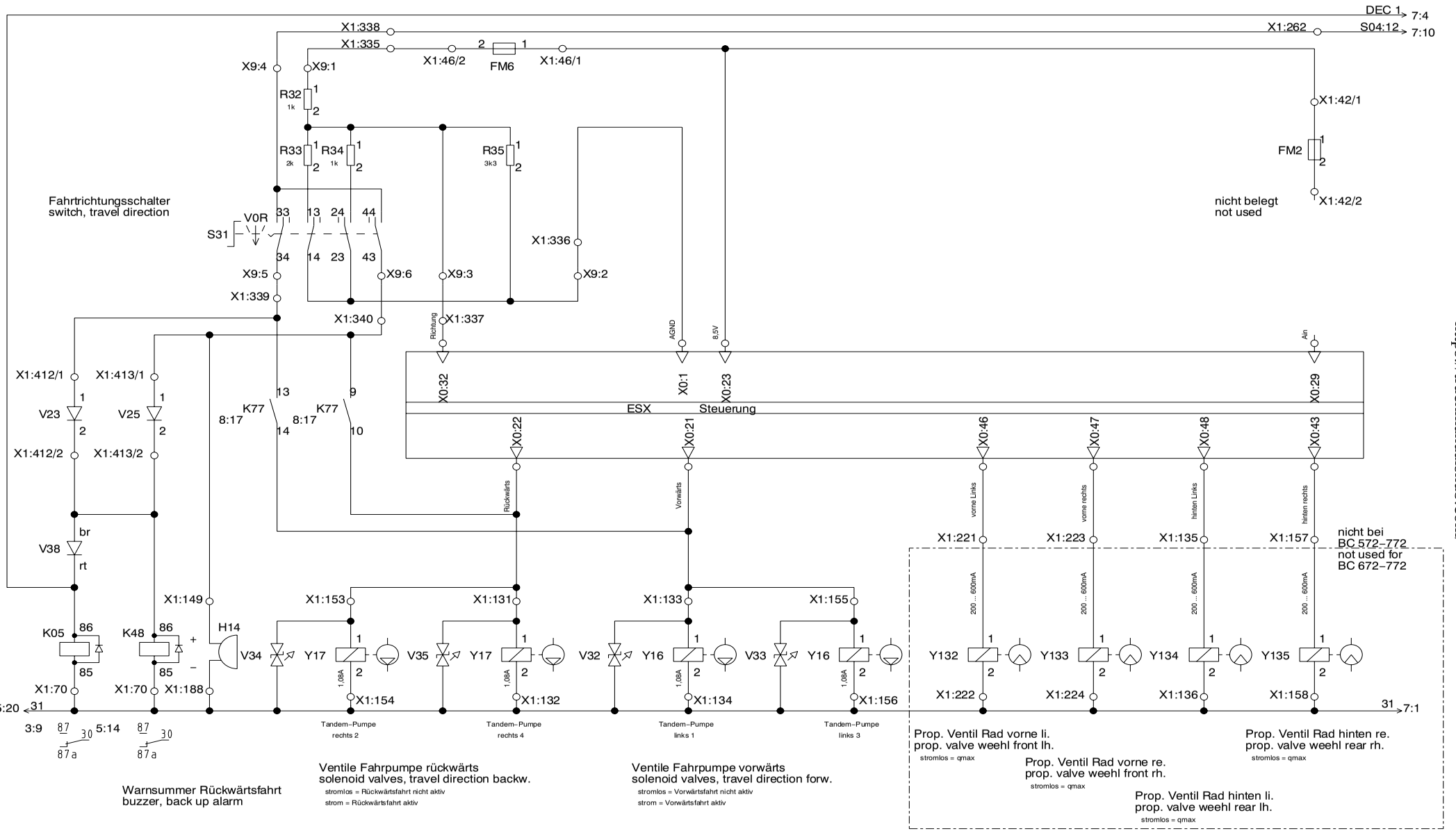
	Gez.: 04.06.2008 Name: Werner	DEUTZ Steuergerät EDC 7 f. 6– und 8–Zylindermot. DEUTZ controller EDC 7 for 6– and 8–zylinder engine	Seite: 1 von: 1 page:	570 700 44
	Gepr.: 04.06.2008 Name: Seis	070	Ers.f.: Replaces:	Blatt Nr.: 004 sheet no.:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

	Gez.: 01.07.2008 Name: Werner	Anzeigen, Störmeldungen BAUSER Geräte monitoring, failure indication BAUSER units	Seite: 1 von: 1 page: 1 from: 1	570 700 44
	Gepr.: 01.07.2008 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 005 sheet no.:

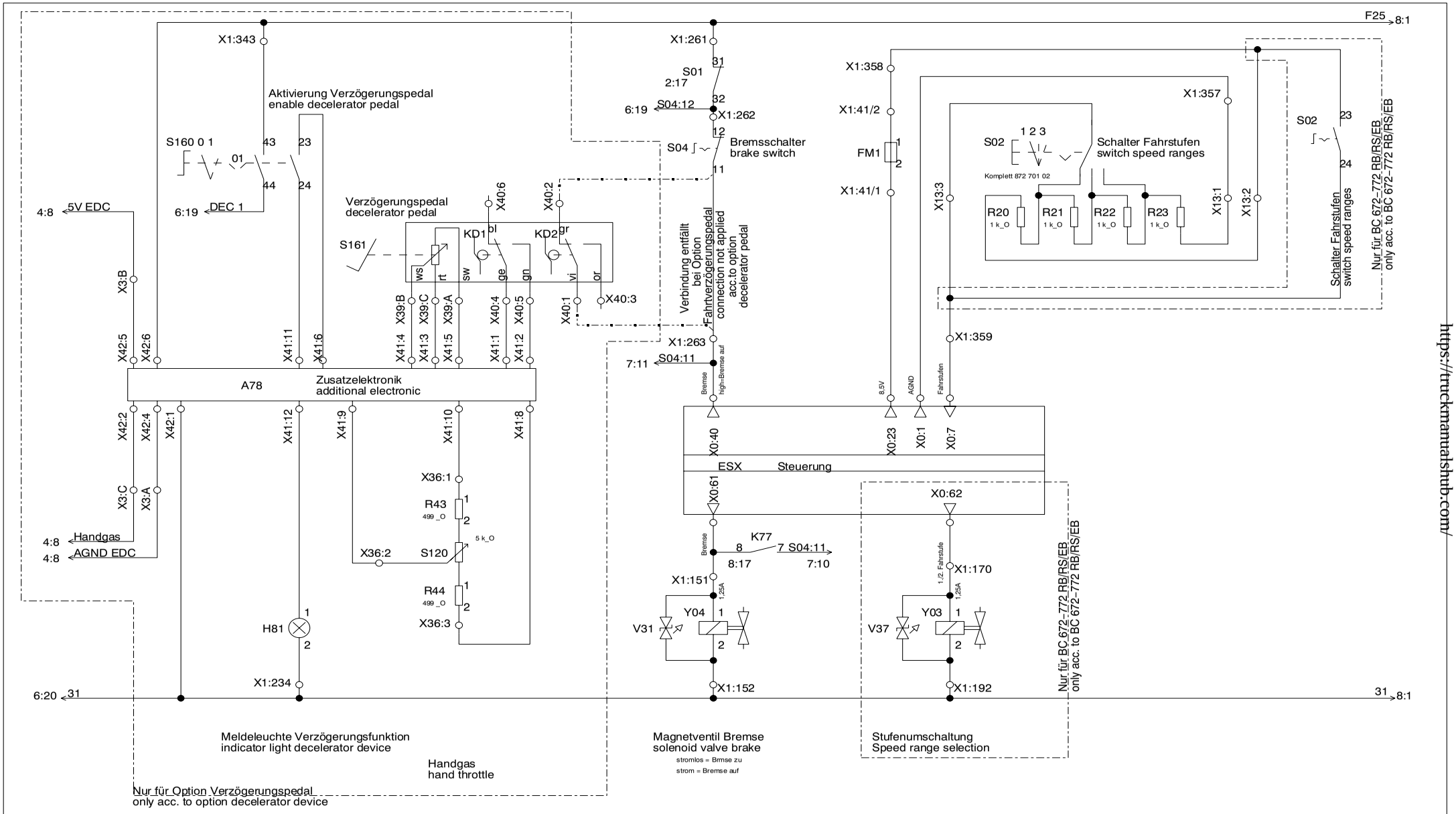
https://truckmanualshub.com/



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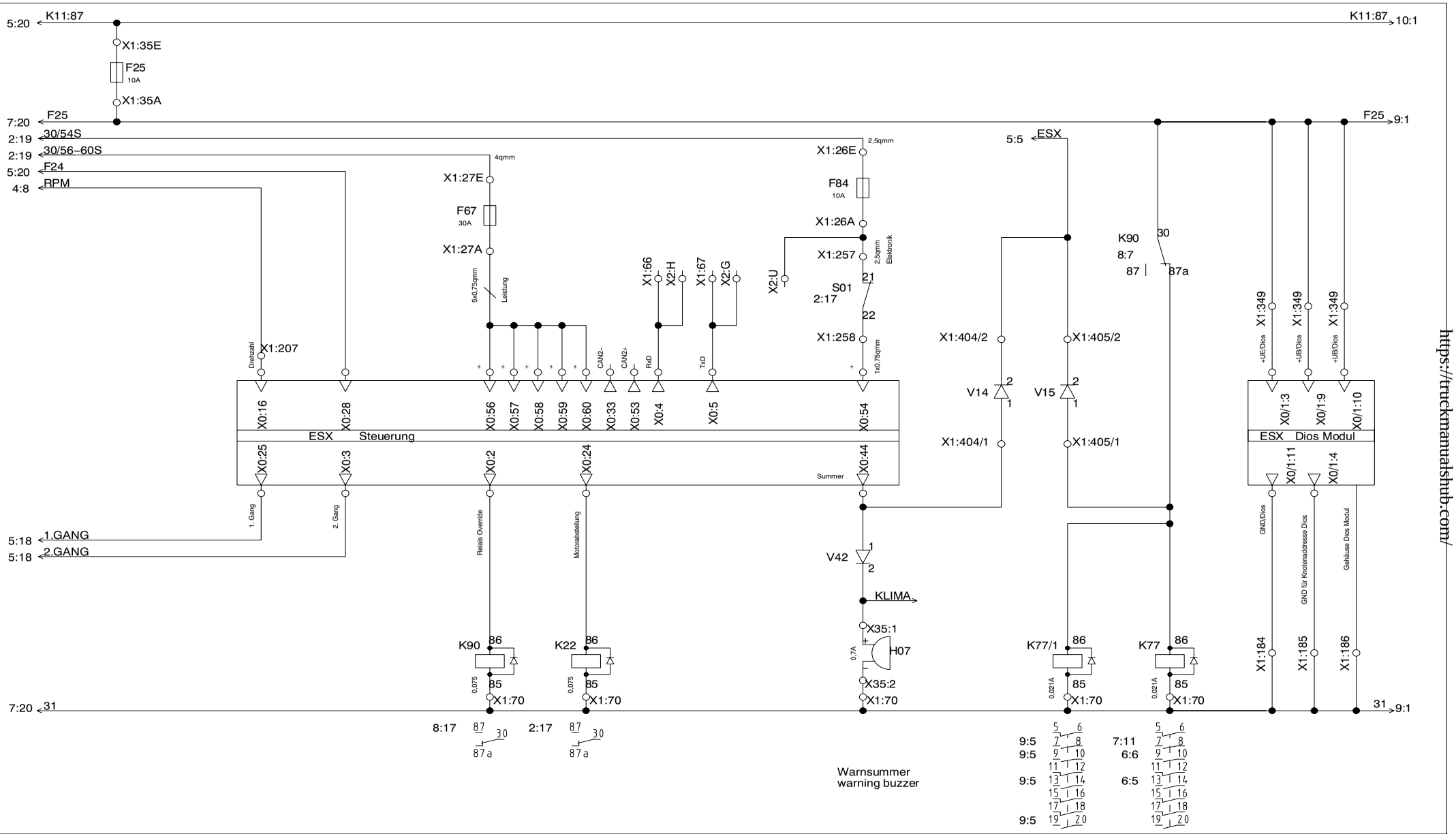
	Gez.: 04.06.2008 Name: Werner	Fahrpumpen, Radmotoren, Startfreigabe driving pumps, weehl motors, starting release	Seite: 1 von: 1 page: from:	570 700 44
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces: 1	Blatt Nr.: sheet no.: 006



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 04.06.2008 Name: Werner														Seite: 1 page:	von: 1 from:	570 700 44	
		Gepr.: 04.06.2008 Name: Seis														Ers.f.: Replaces:	1	Blatt Nr.: sheet no.:	007

Fahrstufen, Bremse, Verzögerungspedal
speed ranges, brakes, decelerator device

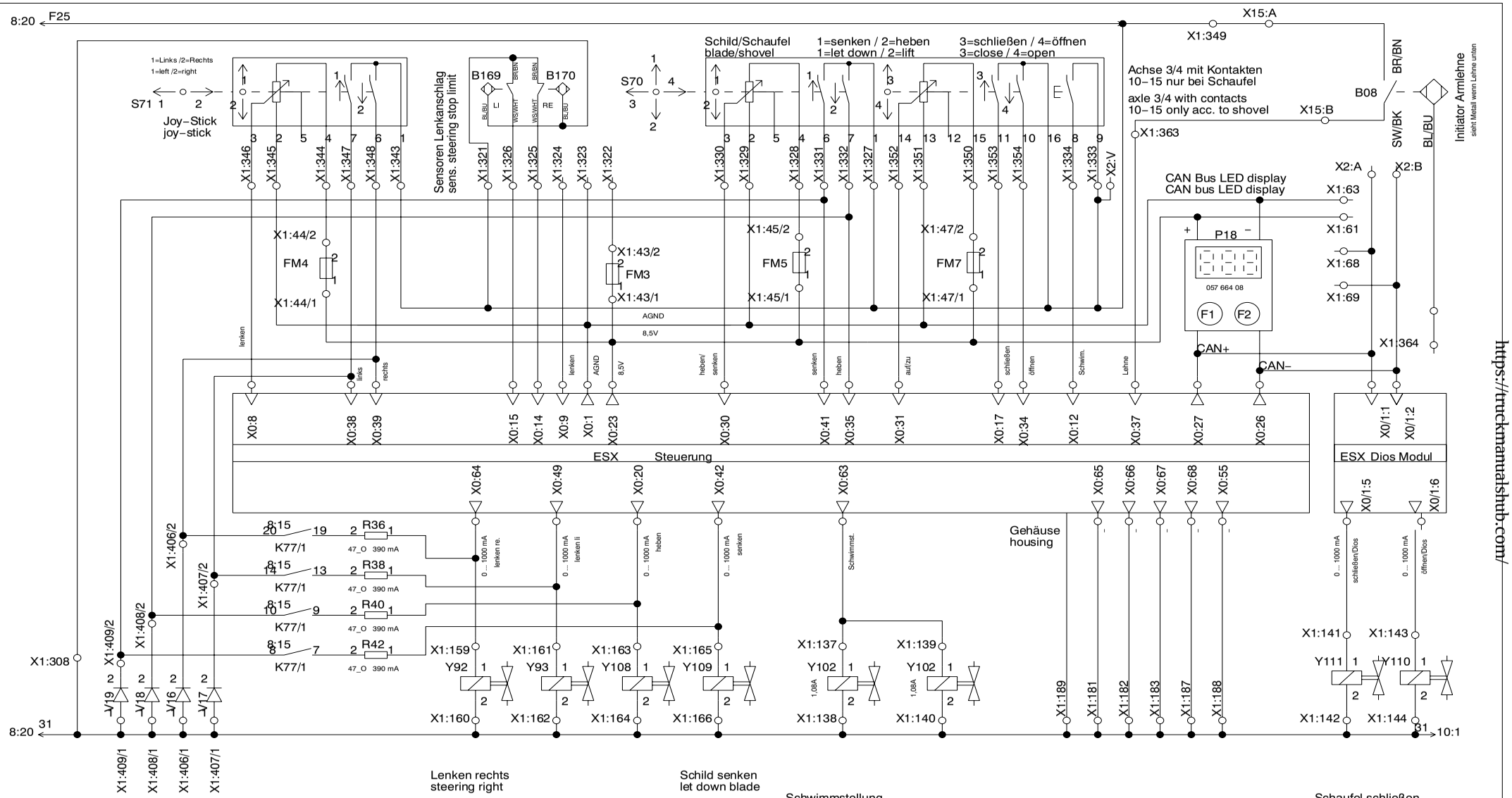
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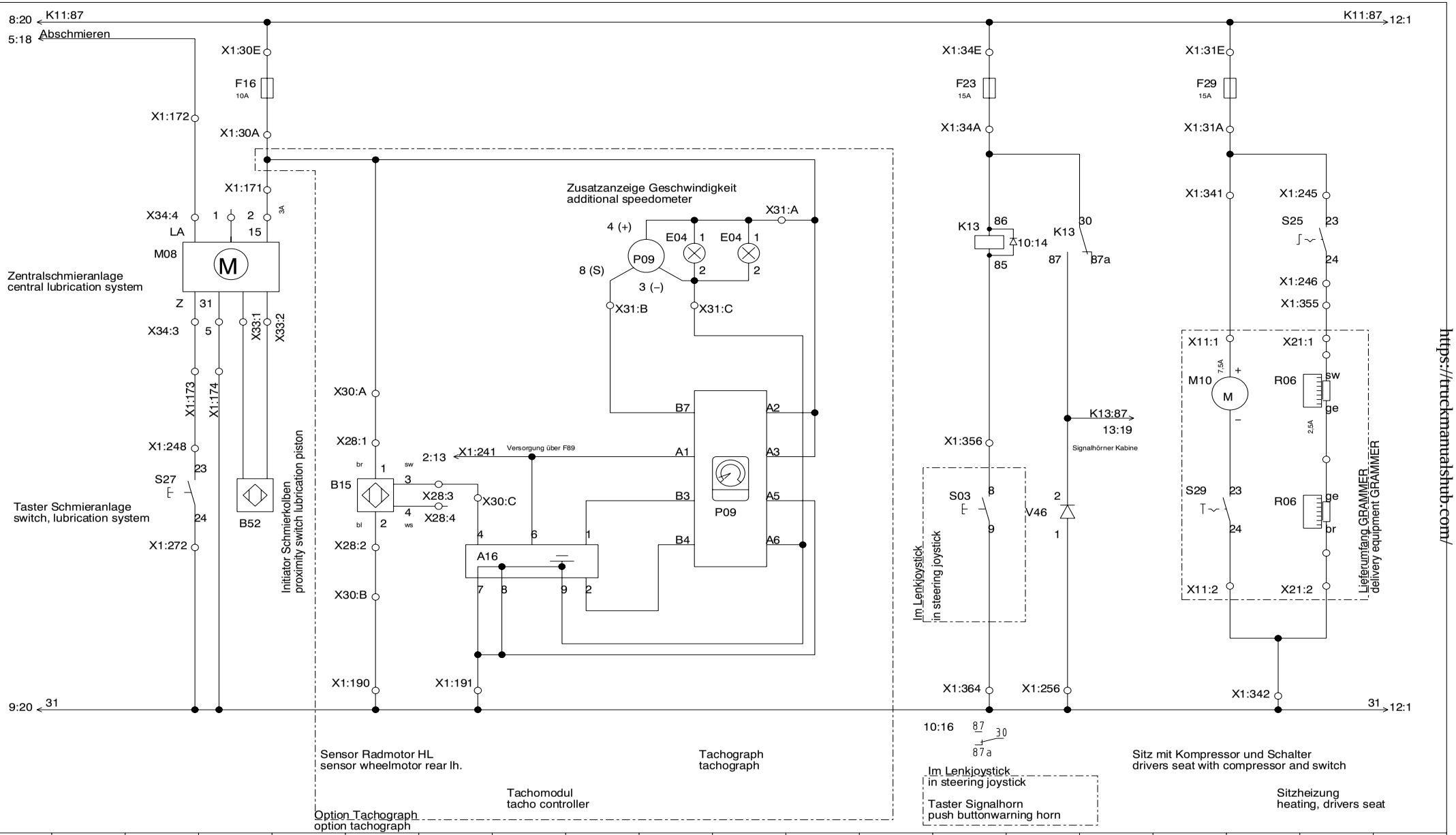
	Gez.: 04.06.2008 Name: Werner	Versorgung Steuerung, Warnsummer, Override supply controllers, warning buzzers, override	Seite: 1 page: von: 1 from: 570 700 44
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces: 1 Blatt Nr.: sheet no.: 008



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 04.06.2008 Name: Werner	Lenkung und Arbeitshydraulik steering and working hydraulic system	Seite: 1 von: 1 page: from:	570 700 44	
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 009 sheet no.:	



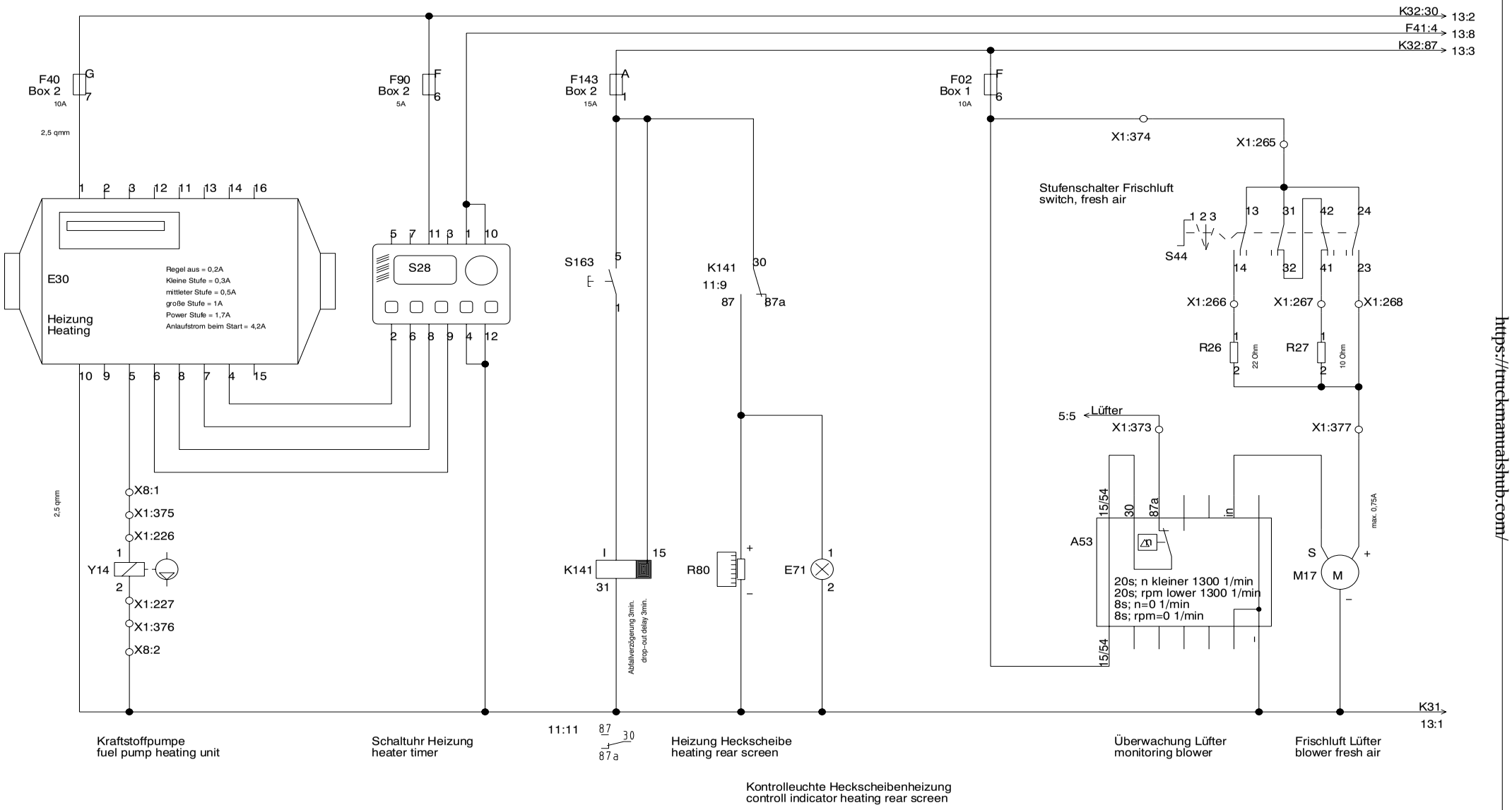
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 04.06.2008 Name: Werner	Hupe, Schmieranlage, Tachograph, Sitzfunktionen horn, lubrication systhem, tachograph, seat funktions	Seite: 1 von: 1 page: 1 from: 1
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:

570 700 44

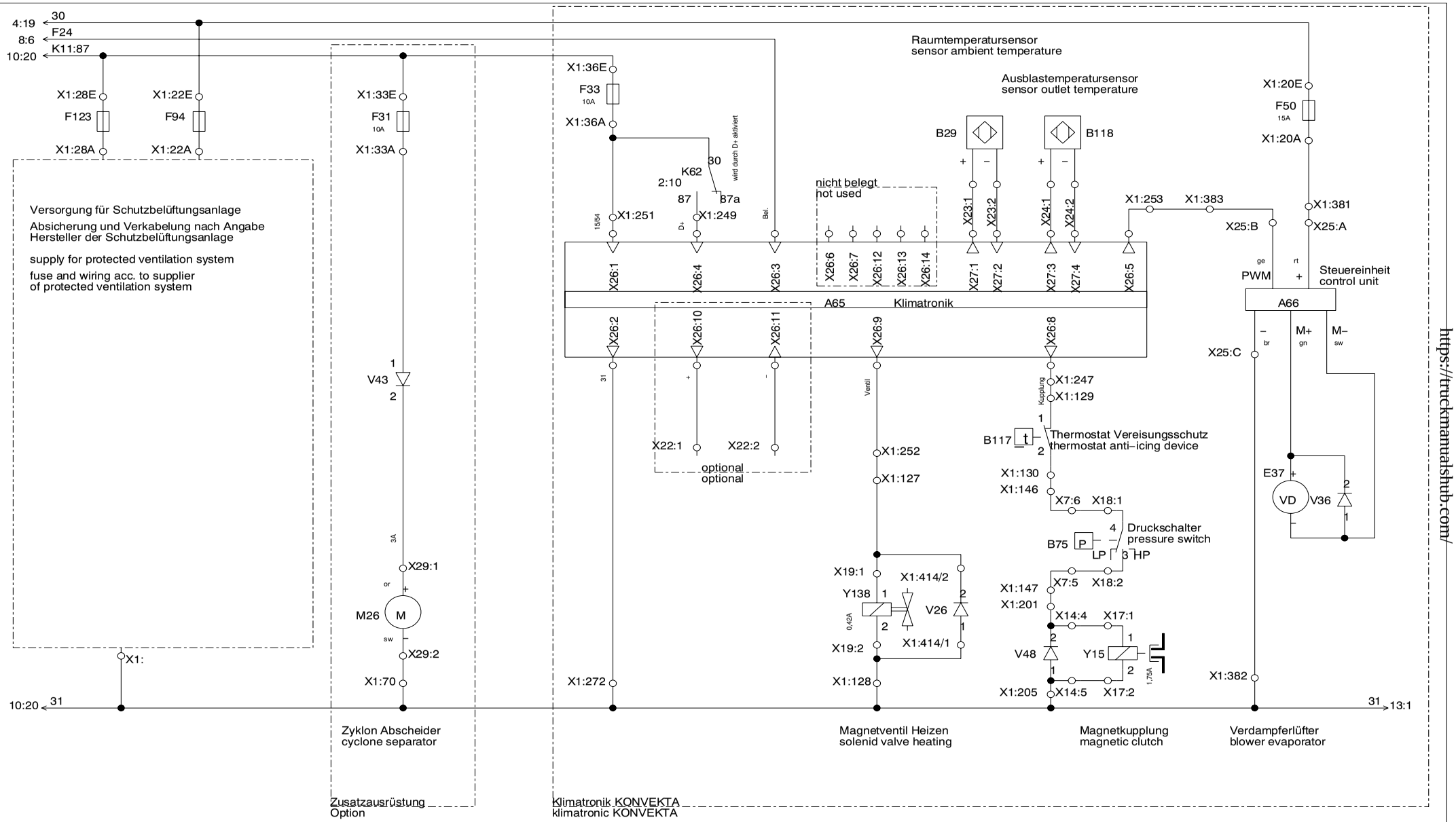
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sheet no.:



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	Gez.: 04.06.2008 Name: Werner	Heizung und Belüftung heating and ventilation	Seite: 1 von: 1 page: 1 from: 1	570 700 44
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:	Blatt Nr.: 011 sheet no.:



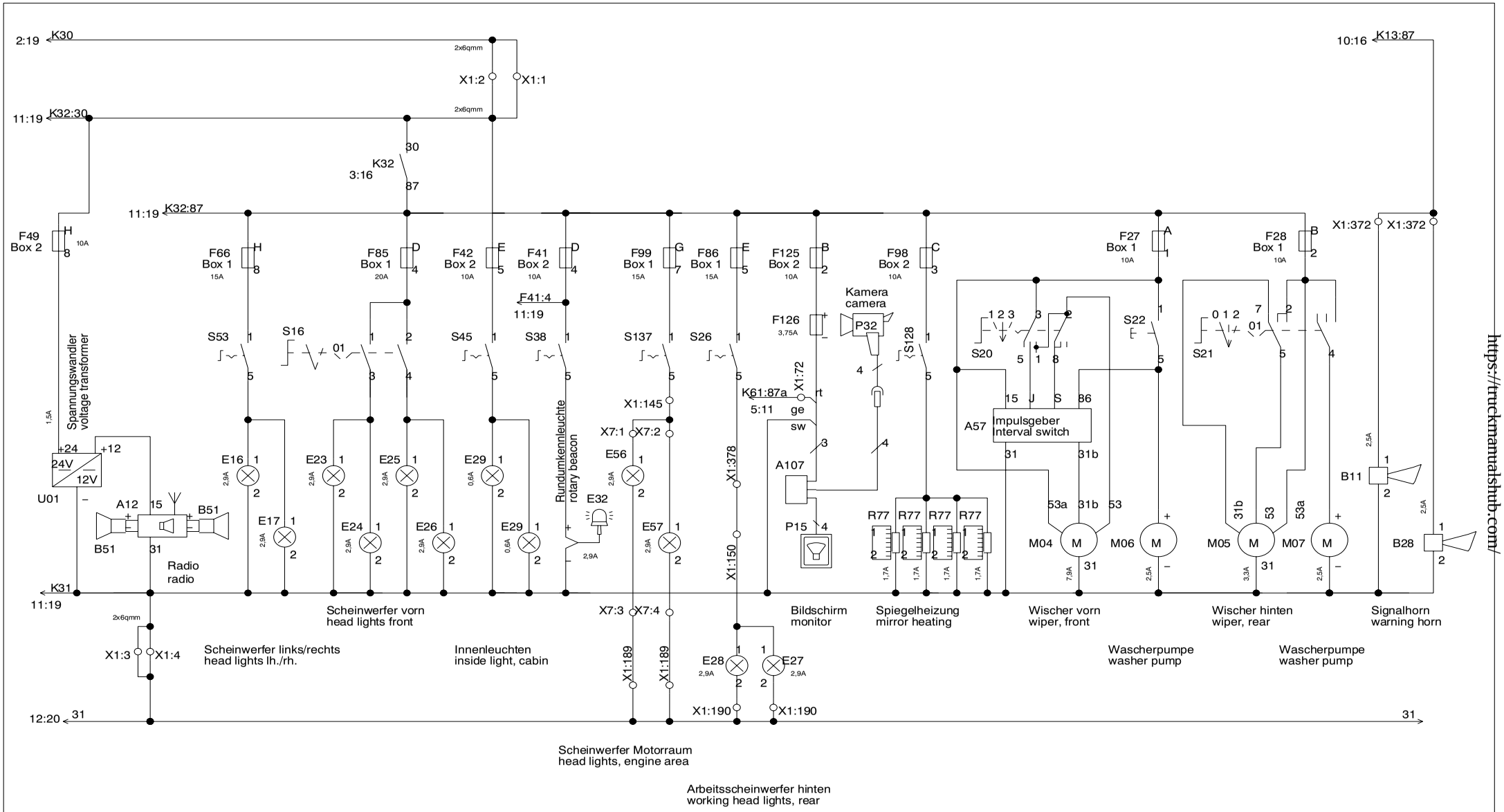
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Gez.: 04.06.2008 Name: Werner	Schutzbelüftung, Zyklon Abscheider, Klimatronik protected vent. system, cyclone separator, air cond.	Seite: 1 von: 1 page: 1 from: 1
	Gepr.: 04.06.2008 Name: Seis		Ers.f.: Replaces:

570 700 44

Blatt Nr.: 012
sheet no.: 012



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Gez.: 04.06.2008 Name: Werner		Kabine und Anbauteile cabin and attachment-parts												Seite: page: 1	von: from: 1	570 700 44	
		Gepr.: 04.06.2008 Name: Seis														Ers.f.: Replaces:		Blatt Nr.: sheet no.: 013	

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Name	Bl.	Pf.	Benennung	Title	TYP
A12	013	2	Radio	Radio	
A15	005	7	Ueberwachungsmodul	monitoring module	
A16	010	9	Elektronik Tachograph	Electronic system, tachograph	
A48	004	9	Elektronische Motorsteuerung	Electronic engine management	
A53	011	15	Modul Luefterueberwachung	Modul blower monitoring	
A57	013	14	Intervallschalter Scheibenwischer	Interval switch, wiper	
A65	012	14	Steuerung Klimatronik	Controller klimatronic	
A66	012	18	Elektronik Steuereinheit	Electronic control unit	
A78	007	3	Zusatzelektronik	Additional control unit	
A81	005	12	Anzeigeeinheit	Display-Unit	
A107	013	11	Umschaltbox	switch box	
B03	005	6	Unterdruckschalter Luftfilter neu	Vacuum switch, air cleaner new	
B05	005	16	Druckschalter Bremse	Pressure switch, brake	
B08	009	19	Naeherungsinitiator Fahrhebel '0'-Stell.	Proximity switch, travel lever '0' pos.	max. 1,08A
B11	013	19	Signalhorn	Warning horn	2,5A
B15	010	6	Aufnehmer Geschwindigkeit	Transducer, speed	
B19	005	17	Magnetsensor Verschmutzung	Magnetic sensor, contamination	
B20	005	11	Temperaturschalter Hydraulikoel	Temperature switch, hydraulic oil	
B21	005	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B22	005	15	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B24	005	11	Schwimmerschalter Hydraulikoel	Float switch, hydraulic oil	
B25	005	19	Druckschalter Ruecklauffilter	Pressure switch, return flow filter	
B28	013	20	Signalhorn	Warning horn	2,5A
B29	012	14	Raumthermostat	Room thermostat	
B42	005	16	Differenzdruckschalter Hydraulikoel	Hydraulic oil pressure differential switch	
B51	013	2	Lautsprecher Radio	Speaker radio	
B51	013	3	Lautsprecher Radio	Speaker radio	
B52	010	4	Naeherungsinitiator Schmierkolben	Proximity switch, lubrication piston	
B53	005	18	Temperaturgeber Kuehlmittel	Temperature switch, collant	
B55	005	5	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B75	012	16	Kuehlmitteldruck	coolant pressure	
B88	004	5	Druckgeber Motoroel	Sender, engine oil pressure	
B113	004	7	EMR Temperaturgeber Kuehlmittel	EMR Temperature switch, collant	
B114	004	8	EMR Aufnehmer, Motordrehzahl 1	EMR Trancducer, engine speed 1	
B116	005	6	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B117	012	15	Thermostat Klimaanlage	Thermostar, air conditioning	
B118	012	15	Temperaturfühler Auslaß	Temperature sender outlet	
B121	005	13	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B122	005	14	Differenzdruckschalter Hydr.-Oelfilter	Pressure diff. switch, hydr. oil filter	
B124	004	3	Geber Wasserstandsabscheider Diesel	Sender, water separator fuel	
B126	004	6	EMR Temperaturgeber Kraftstoff	EMR fuel temperature sender	
B129	005	10	Druckschalter Verteilergetriebe	pressure switch power take-off gear	
B130	004	9	EMR Aufnehmer, Motordrehzahl 2	EMR Trancducer, engine speed 2	
B133	004	11	Sensor Ladeluftdruck / -temperatur	sesnor charging air prssure / temperature	
B169	009	7	Näherungsinitiator Lenkzylinder links	proximity switch steering cylinder left	
B170	009	8	Näherungsinitiator Lenkzylinder rechts	proximity switch steering cylinder right	
E04	010	10	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E04	010	11	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E16	013	4	Scheinwerfer links	Head light, lh.	55W
E17	013	4	Scheinwerfer rechts	Head light, rh.	55W
E20	002	12	Zigarettenanzuender	Cigarette lighter	
E21	002	12	Beleuchtung Zigarettenanzuender	Illumination, cigarette lighter	
E23	013	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E24	013	5	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	55W
E25	013	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E26	013	6	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	55W
E27	013	11	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	55W
E28	013	10	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	55W
E29	013	7	Innenleuchte Kabine	Inside light, cabin	15W
E29	013	8	Innenleuchte Kabine	Inside light, cabin	15W
E30	011	2	Heizgeraet	Heating unit	
E32	013	8	Kennleuchte	Warning light	70W
E37	012	18	Klimaverdampfer	Air conditioning, evaporator	
E56	013	9	Scheinwerfer Motorraum rechts	Head light, engine area rh.	55W
E57	013	9	Scheinwerfer Motorraum links	Head light, engine area lh.	55W
E71	011	12	Kontrolleuchte Schalter Heckscheibenheizung	indicator light switch rear screen	
ESX	005	9	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	006	12	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	007	10	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	008	5	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	008	18	Elektronisches Steuergeraet	Electronic system, control unit	
ESX	009	9	Elektronisches Steuergeraet	Electronic system, control unit	max. 1,08A
ESX	009	19	Elektronisches Steuergeraet	Electronic system, control unit	0,2A
F00	002	2	Hauptsicherung Batterie	Fuse, main, battery	250A
F02	011	14	Ersatzsicherung	Fuse, spare	10A
F05	002	15	Sicherung Steckdose	Fuse, socket	30A
F13	003	9	Sicherung Startschalter	Fuse, starter switch	30A
F16	010	4	Sicherung Zentralschmieranlage	Fuse, central lubrication system	10A
F23	010	14	Sicherung Signalhorn	Fuse, warning horn	15A
F24	005	7	Sicherung Ueberwachungsmodul	Fuse, monitoring module	15A
F25	008	2	Sicherung Magnetv. Fahren u. Bremse	Fuse, sol. valve, travel and brake	10A
F27	013	16	Sicherung Wischer u. Wascher vorne	Fuse, windscr. wiper and washer, fr.	10A
F28	013	18	Sicherung Wischer u. Wascher hinten	Fuse, windscr. wiper and washer, re.	10A
F29	010	18	Sicherung Kompressor Sitzverstell.	Fuse, compr., seat height adjustm.	15A
F31	012	6	Sicherung Kabinenluefter	Fuse, cabin ventilator	10A
F33	012	9	Sicherung Klimageraet	Fuse, air conditioning	10A
F40	011	2	Sicherung Kabinenheizung	Fuse, heating unit cab	10A
F41	013	8	Sicherung Rundumkennleuchte	Fuse, rotary beacon	10A
F42	013	7	Sicherung Kabineninnenleuchte	Fuse, inside light cab	10A
F48	004	2	Sicherung Gluehanlage	Fuse, glow plug system	80A
F49	013	1	Sicherung Spannungswandler	Fuse, voltage transformer	10A
F50	012	19	Sicherung Klimageraet	Fuse, air conditioning	15A
F66	013	4	Sicherung Scheinwerfer vorne	Fuse, head light front	15A
F67	008	7	Sicherung Steuerung (Potential 30)	Fuse, controller (pot.30)	30A
F84	008	13	Sicherung Steuerung (Klemme 54)	Fuse, controller (Pin 54)	10A
F85	013	6	Sicherung, Scheinwerfer vorne	Fuse, head light front	20A

Gez.: 01.07.2008
Name: Werner
Gepr.: 01.07.2008
Name: Seis

Bauteilliste
component listing

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Name	Bl.	Pf.	Benennung	Benennung	TYP
F86	013	10	Sicherung, Scheinwerfer hinten	Fuse, head lights rear	15A
F89	002	12	Sicherung, Zigarettenanzuender	Fuse, cigarette lighter	30A
F90	011	6	Sicherung, Ansteuerung	Fuse, actuation	5A
F93	004	4	Sicherung Steuerung (Potential 30)	Fuse, controller (pot. 30)	25A
F94	012	3	Sicherung Schutzbelueftung	Fuse, protected ventilation syst.	
F98	013	13	Sicherung Spiegelheizung	fuse,mirror heating	10A
F99	013	9	Sicherung Motorraumbeleuchtung	fuse, illumination engine area	15A
FM1	007	13	Platinensicherung	Multifuse	0,2A
FM2	006	19	Platinensicherung	Multifuse	0,2A
FM3	009	9	Platinensicherung	Multifuse	0,2A
FM4	009	5	Platinensicherung	Multifuse	0,2A
FM5	009	11	Platinensicherung	Multifuse	0,2A
FM6	006	7	Platinensicherung	Multifuse	0,2A
FM7	009	14	Platinensicherung	Multifuse	0,2A
F122	002	17	Sicherung EMR	Fuse, EMR	10A
F123	012	2	Sicherung Schutzbelüftungsanlage	Fuse, protected ventilation system	
F125	013	11	Vorsicherung	pre-fusing	10A
F126	013	11	Sicherung Rückfahrkamera	Fuse, back up camera system	2A
F143	011	9	Sicherung Heckscheibenheizung	fuse rear screen heating unit	15A
G01	002	2	Batterie	Battery	
G02	002	5	Generator	Generator	28V/80A
G03	002	2	Batterie	Battery	
H04	004	10	Meldeleuchte Betriebsstoerung	Indicator light, breakdown	
H07	008	13	Warnsummer Betriebsstoerung	Warning buzzer, breakdown	0,2A
H14	006	4	Warnsummer Rueckwaertsfahrt	Back-up alarm buzzer	max. 2,5A
H70	004	11	Anzeige Wasser im Diesel	Indicator water in fuel	
H81	007	5	Meldeleuchte Verzögerungsfunktion	Indicator light, decelerator device	
K05	006	2	Relais Startstrom	Relay, starting current	BOSCHW
K11	003	14	Relais Klemme 30 auf 15	Relay, terminal 30 to 15	BOSCHL
K13	010	14	Relais Signalhorn	Relay, warning horn	BOSCHW
K14	004	4	Relais Vorgluehen	Relay, glow plug system	K2DEUTZ
K15	004	12	Relais Gluehen beim Start	Relay, glowing during starting	BOSCHW
K22	008	9	Relais Hubmagnet Motor	Relay, shut off solenoid, engine	BOSCHW
K32	003	16	Relais Kabine	Relay, cabin	BOSCHL
K48	006	3	Relais Fahrhebel 0-Stellung	Relay, travel lever 0-position	BOSCHW
K60	004	14	Relais Motoroeldruck	Relay, engine oil pressure	BOSCHW
K61	002	8	Relais Ladekontrolle	Relay, charge control	BOSCHW
K62	002	10	Relais D+	Relay, D+	BOSCHW
K77	008	17	Relais Override	Relay, override	SDS/SF4
K90	008	7	Relais, Meldeleuchte Stoerung SPS	Relay, indicat.light brake down SPS	BOSCHW
K113	005	19	Zeitrelais	Timing relay	BOSCHW
K141	011	9	Relais Heckscheibenheizung	relay, heating rear screen	BOSCHW
K146	004	13	Relais Kühlmitteltemperatur	relay, coolant temperature	BOSCHW
K77/1	008	15	Relais Override	Relay, override	SDS/SF4
M01	003	9	Starter	Starter	
M04	013	15	Scheibenwischermotor vorne	Windscreen wiper motor, front	190W
M05	013	17	Scheibenwischermotor hinten	Windscreen wiper motor, rear	max 3,3A
M06	013	16	Scheibenwaschermotor vorne	Windscreen washer motor, front	60W
M07	013	18	Scheibenwaschermotor hinten	Windscreen washer motor, rear	60W
M08	010	3	Zentralschmieranlage	Central lubrication system	max. 3A
M10	010	18	Kompressor Fahrersitzhoehenverstellung	Compr., operator's seat height adjustm.	7,5A
M17	011	18	Zusatzluefter	Additional blower	max. 0,75A
M24	012	10	Stellmotor Luftklappe	adjusting motor air inlet flap	
M26	012	6	Zyklon Abscheider	cyclone separator	3A
P09	010	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P09	010	10	Frequenz- und Geschwindigkeitsanzeige	Frequency- and Speedometer	
P15	013	11	BCM 03 Bildschirm	BCM 03 terminal	
P18	009	16	Diagnose	Diagnostics	max. 1,08A
P32	013	12	Kamera Rückraumüberwachung	Camera, back up monitoring	
R02	004	2	Gluehkerze	Glow plug	
R02	004	2	Gluehkerze	Glow plug	
R03	005	2	Geber Tankanzeige	Sender, level gauge	
R04	005	17	Geber Hydraulikoeltemperatur	Sender, hydraulic oil temp.	
R06	010	19	Heizung Fahrersitz	Heating, operator's seat	
R06	010	19	Heizung Fahrersitz	Heating, operator's seat	
R10	002	7	Parallelwiderstand	Parallel resistor	220 OHM
R20	007	15	Widerstand	Resistor	1 KOHM
R21	007	15	Widerstand	Resistor	1 KOHM
R22	007	16	Widerstand	Resistor	1 KOHM
R23	007	17	Widerstand	Resistor	1 KOHM
R24	004	5	Widerstand	Resistor	10 kOHM
R26	011	17	Widerstand	Resistor	22 OHM
R27	011	18	Widerstand	Resistor	10 OHM
R32	006	5	Widerstand	Resistor	1 kOhm
R33	006	5	Widerstand	Resistor	2 kOhm
R34	006	6	Widerstand	Resistor	1 kOhm
R35	006	8	Widerstand	Resistor	3,3 kOhm
R36	009	6	Widerstand	Resistor	47 OHM
R38	009	6	Widerstand	Resistor	47 OHM
R40	009	6	Widerstand	Resistor	47 OHM
R42	009	6	Widerstand	Resistor	47 OHM
R43	007	7	Widerstand	Resistor	499Ohm
R44	007	7	Widerstand	Resistor	499Ohm
R77	013	12	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	013	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	013	13	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R77	013	14	Widerstandsheizung Aussenspiegel	Resistor heating outside mirror	40W
R80	011	11	Heizung Heckscheibe	heating rear screen	87W
S00	003	9	Startschalter	Starter switch	MERIT
S01	002	17	Schalter NOT AUS	Switch, emergency off	NOTAUSH
S01	002	17	Schalter NOT AUS	Switch, emergency off	
S02	007	16	Fahrstufenschalter	Switch, speed range selector	

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Name	Bl.	Pf.	Benennung	Designation	TYP
S02	007	19	Fahrstufenschalter	Switch, speed range selector	
S03	010	14	Taster Signalhorn	Push button, warning horn	
S04	007	10	Bremsschalter	Switch, brake	
S16	013	5	Schalter Arbeitsbeleuchtung vorne	Switch, working head lights, front	
S20	013	14	Schalter Scheibenwischer vorne	Switch, windscreen wiper, front	
S21	013	18	Schalter Scheibenwischer hinten	Switch, windscreen wiper, rear	
S22	013	16	Schalter Scheibenwascher vorne	Switch, windscreen washer, front	
S25	010	19	Schalter Fahrersitzheizung	Switch, heating, operator's seat	
S26	013	10	Schalter Arbeitsbeleuchtung hinten	Switch, working head lights, rear	
S27	010	3	Taster Zentralschmieranlage	Push botton, central lubrication system	
S28	011	6	Schalter Kabinenheizung	Switch, cabin heating	
S29	010	18	Schalter Fahrersitz Hoehenverstellung	Switch, operator's seat height adjustm.	
S30	002	2	Batterietrennschalter	Switch, battery disconnect	
S31	006	5	Schalter Fahrtrichtung	Switch, travel direction	
S38	013	8	Schalter Kennleuchte	Switch, warning light	
S44	011	17	Schalter Kabinenluefter	Switch, cabin ventilator	
S45	013	7	Schalter Kabineninnenleuchte	Switch, cabin inside light	
S53	013	4	Schalter Arbeitsbeleuchtung	Switch, working lights	
S70	009	10	Schalter Schubsschild	Switch, dozer blade	WAGO
S71	009	4	Schalter Lenkung	Switch, steering	max. 1,08A
S118	004	18	Schalter Fehlerdiagnose	Switch, fault diagnosis	
S119	004	6	Elektronisches Fusspedal	Electronic foot pedal	
S120	007	7	Schalter Motordrehzahl	Switch, engine speed	5 kOhm
S128	013	13	Schalter Spiegelheizung	Switch, mirror heating	
S137	013	9	Schalter Motorraumbeleuchtung	Switch, illumination engine area	
S160	007	4	Schalter Aktivierung Verzögerungspedal	Switch, enable decelerator pedal	
S161	007	6	Verzögerungspedal	decelerator pedal	
S163	011	9	Schalter Heckscheibenheizung	switch rear screen heating unit	
U01	013	1	Spannungswandler	Voltage transformer	
V01	002	7	Diode	Diode	WAGO
V02	005	7	Diode	Diode	WAGO
V03	005	7	Diode	Diode	WAGO
V04	005	7	Diode	Diode	WAGO
V05	005	7	Diode	Diode	WAGO
V07	005	11	Diode	Diode	WAGO
V08	005	11	Diode	Diode	WAGO
V09	005	11	Diode	Diode	WAGO
V10	005	11	Diode	Diode	WAGO
V11	005	11	Diode	Diode	WAGO
V13	005	11	Diode	Diode	WAGO
V14	008	14	Diode	Diode	Wago
V15	008	15	Diode	Diode	Wago
V16	009	3	Diode	Diode	WAGO
V17	009	4	Diode	Diode	WAGO
V18	009	3	Diode	Diode	WAGO
V19	009	2	Diode	Diode	WAGO
V23	006	2	Diode	Diode	WAGO
V25	006	3	Diode	Diode	WAGO
V26	012	14	Diode	Diode	WAGO
V31	007	10	Diode	Diode	Lütze
V32	006	9	Diode	Diode	Lütze
V33	006	11	Diode	Diode	Lütze
V34	006	5	Diode	Diode	Lütze
V35	006	7	Diode	Diode	Lütze
V36	012	19	Diode	Diode	FE5B
V37	007	13	Diode	Diode	Lütze
V38	006	2	Diode	Diode	FE5B KabeldiodeDiode
V42	008	13	Diode (A2)	Diode (A2)	Diodenmodul
V43	012	6	Diode (A3)	Diode (A3)	Diodenmodul
V46	010	15	Diode (A6)	Diode (A6)	Diodenmodul
V47	003	12	Diode (A7)	Diode (A7)	Diodenmodul
V48	012	15	Diode (A8)	Diode (A8)	Diodenmodul
X0/1:1	009	19	DIOS STECKER	Dios connector	
X0/1:2	009	19	DIOS STECKER	Dios connector	
X0/1:3	008	18	DIOS STECKER	Dios connector	
X0/1:4	008	19	DIOS STECKER	Dios connector	
X0/1:5	009	18	DIOS STECKER	Dios connector	
X0/1:6	009	19	DIOS STECKER	Dios connector	
X0/1:9	008	19	DIOS STECKER	Dios connector	
X0/1:10	008	19	DIOS STECKER	Dios connector	
X0/1:11	008	18	DIOS STECKER	Dios connector	
X0:1	006	10	ESX STECKER	esx connector	
X0:1	007	13	ESX STECKER	esx connector	
X0:1	009	8	ESX STECKER	esx connector	
X0:2	008	7	ESX STECKER	esx connector	
X0:3	008	6	ESX STECKER	esx connector	
X0:4	008	10	ESX STECKER	esx connector	
X0:5	008	11	ESX STECKER	esx connector	
X0:6	005	8	ESX STECKER	esx connector	
X0:7	007	14	ESX STECKER	esx connector	
X0:8	009	4	ESX STECKER	esx connector	
X0:9	009	8	ESX STECKER	esx connector	
X0:10	005	10	ESX STECKER	esx connector	
X0:11	005	8	ESX STECKER	esx connector	
X0:12	009	15	ESX STECKER	esx connector	
X0:13	005	10	ESX STECKER	esx connector	
X0:14	009	8	ESX STECKER	esx connector	
X0:15	009	7	ESX STECKER	esx connector	
X0:16	008	4	ESX STECKER	esx connector	
X0:17	009	14	ESX STECKER	esx connector	
X0:18	005	8	ESX STECKER	esx connector	
X0:19	005	8	ESX STECKER	esx connector	
X0:20	009	9	ESX STECKER	esx connector	
X0:21	006	10	ESX STECKER	esx connector	
X0:22	006	8	ESX STECKER	esx connector	
X0:23	006	11	ESX STECKER	esx connector	

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X0:23	007	13	ESX STECKER	esx connector	
X0:23	009	9	ESX STECKER	esx connector	
X0:24	008	9	ESX STECKER	esx connector	
X0:25	008	4	ESX STECKER	esx connector	
X0:26	009	17	ESX STECKER	esx connector	
X0:27	009	16	ESX STECKER	esx connector	
X0:28	008	6	ESX STECKER	esx connector	
X0:29	006	19	ESX STECKER	esx connector	
X0:30	009	10	ESX STECKER	esx connector	
X0:31	009	13	ESX STECKER	esx connector	
X0:32	006	7	ESX STECKER	esx connector	
X0:33	008	9	ESX STECKER	esx connector	
X0:34	009	14	ESX STECKER	esx connector	
X0:35	009	12	ESX STECKER	esx connector	
X0:36	005	8	ESX STECKER	esx connector	
X0:37	009	16	ESX STECKER	esx connector	
X0:38	009	5	ESX STECKER	esx connector	
X0:39	009	6	ESX STECKER	esx connector	
X0:40	007	10	ESX STECKER	esx connector	
X0:41	009	12	ESX STECKER	esx connector	
X0:42	009	10	ESX STECKER	esx connector	
X0:43	006	19	ESX STECKER	esx connector	
X0:44	008	13	ESX STECKER	esx connector	
X0:45	005	10	ESX STECKER	esx connector	
X0:46	006	14	ESX STECKER	esx connector	
X0:47	006	16	ESX STECKER	esx connector	
X0:48	006	17	ESX STECKER	esx connector	
X0:49	009	8	ESX STECKER	esx connector	
X0:50	005	10	ESX STECKER	esx connector	
X0:51	005	10	ESX STECKER	esx connector	
X0:52	005	8	ESX STECKER	esx connector	
X0:53	008	9	ESX STECKER	esx connector	
X0:54	008	13	ESX STECKER	esx connector	
X0:55	009	17	ESX STECKER	esx connector	
X0:56	008	7	ESX STECKER	esx connector	
X0:57	008	8	ESX STECKER	esx connector	
X0:58	008	8	ESX STECKER	esx connector	
X0:59	008	8	ESX STECKER	esx connector	
X0:60	008	9	ESX STECKER	esx connector	
X0:61	007	10	ESX STECKER	esx connector	
X0:62	007	14	ESX STECKER	esx connector	
X0:63	009	12	ESX STECKER	esx connector	
X0:64	009	7	ESX STECKER	esx connector	
X0:65	009	15	ESX STECKER	esx connector	
X0:66	009	16	ESX STECKER	esx connector	
X0:67	009	16	ESX STECKER	esx connector	
X0:68	009	16	ESX STECKER	esx connector	
X1:	012	2	Wago Zentralelektrik	Wago e-box	
X1:1	013	7	Wago Zentralelektrik	Wago e-box	
X1:2	013	7	Wago Zentralelektrik	Wago e-box	
X1:3	013	2	Wago Zentralelektrik	Wago e-box	
X1:4	013	2	Wago Zentralelektrik	Wago e-box	
X1:5	004	20	Wago Zentralelektrik	Wago e-box	
X1:6	002	17	Wago Zentralelektrik	Wago e-box	
X1:7	003	9	Wago Zentralelektrik	Wago e-box	
X1:8	003	9	Wago Zentralelektrik	Wago e-box	
X1:9	003	9	Wago Zentralelektrik	Wago e-box	
X1:61	009	19	Wago Zentralelektrik	Wago e-box	
X1:62	004	15	Wago Zentralelektrik	Wago e-box	
X1:63	009	19	Wago Zentralelektrik	Wago e-box	
X1:64	004	16	Wago Zentralelektrik	Wago e-box	
X1:65	004	16	Wago Zentralelektrik	Wago e-box	
X1:66	008	10	Wago Zentralelektrik	Wago e-box	
X1:67	008	11	Wago Zentralelektrik	Wago e-box	
X1:68	009	19	Wago Zentralelektrik	Wago e-box	
X1:69	009	19	Wago Zentralelektrik	Wago e-box	
X1:70	002	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	003	16	Wago Zentralelektrik	Wago e-box	
X1:70	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:70	008	7	Wago Zentralelektrik	Wago e-box	
X1:70	008	9	Wago Zentralelektrik	Wago e-box	
X1:70	008	13	Wago Zentralelektrik	Wago e-box	
X1:70	008	15	Wago Zentralelektrik	Wago e-box	
X1:70	008	17	Wago Zentralelektrik	Wago e-box	
X1:70	012	6	Wago Zentralelektrik	Wago e-box	
X1:71	004	17	Wago Zentralelektrik	Wago e-box	
X1:72	013	11	Wago Zentralelektrik	Wago e-box	
X1:81	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:82	005	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:83	005	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:85	005	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:86	005	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:87	005	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:88	005	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:89	005	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:90	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:91	005	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:92	004	12	Wago Zentralelektrik	Wago e-box	
X1:93	004	13	Wago Zentralelektrik	Wago e-box	
X1:94	004	14	Wago Zentralelektrik	Wago e-box	
X1:101	005	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:103	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:104	005	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:106	005	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:108	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:109	005	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:110	005	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:111	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	

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X1:112	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:113	005	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:114	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:116	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:117	005	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:118	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:119	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:120	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:121	005	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:122	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:123	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:124	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:125	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:126	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:127	012	13	Wago Zentralelektrik	Wago e-box	
X1:128	012	13	Wago Zentralelektrik	Wago e-box	
X1:129	012	15	Wago Zentralelektrik	Wago e-box	
X1:130	012	15	Wago Zentralelektrik	Wago e-box	
X1:131	006	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:132	006	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:133	006	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:134	006	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:135	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:136	006	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:137	009	12	Wago Zentralelektrik	Wago e-box	
X1:138	009	12	Wago Zentralelektrik	Wago e-box	
X1:139	009	13	Wago Zentralelektrik	Wago e-box	
X1:140	009	13	Wago Zentralelektrik	Wago e-box	
X1:141	009	18	Wago Zentralelektrik	Wago e-box	
X1:142	009	18	Wago Zentralelektrik	Wago e-box	
X1:143	009	19	Wago Zentralelektrik	Wago e-box	
X1:144	009	19	Wago Zentralelektrik	Wago e-box	
X1:145	013	9	Wago Zentralelektrik	Wago e-box	
X1:146	012	15	Wago Zentralelektrik	Wago e-box	
X1:147	012	15	Wago Zentralelektrik	Wago e-box	
X1:148	005	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:149	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:150	013	10	Wago Zentralelektrik	Wago e-box	
X1:151	007	10	Wago Zentralelektrik	Wago e-box	
X1:152	007	10	Wago Zentralelektrik	Wago e-box	
X1:153	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:154	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:155	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:156	006	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:157	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:158	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:159	009	7	Wago Zentralelektrik	Wago e-box	
X1:160	009	7	Wago Zentralelektrik	Wago e-box	
X1:161	009	8	Wago Zentralelektrik	Wago e-box	
X1:162	009	8	Wago Zentralelektrik	Wago e-box	
X1:163	009	9	Wago Zentralelektrik	Wago e-box	
X1:164	009	9	Wago Zentralelektrik	Wago e-box	
X1:165	009	10	Wago Zentralelektrik	Wago e-box	
X1:166	009	10	Wago Zentralelektrik	Wago e-box	
X1:170	007	14	Wago Zentralelektrik	Wago e-box	
X1:171	010	4	Wago Zentralelektrik	Wago e-box	
X1:172	010	3	Wago Zentralelektrik	Wago e-box	
X1:173	010	3	Wago Zentralelektrik	Wago e-box	
X1:174	010	4	Wago Zentralelektrik	Wago e-box	
X1:181	005	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:181	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:181	009	15	Wago Zentralelektrik	Wago e-box	
X1:182	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:182	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:182	009	16	Wago Zentralelektrik	Wago e-box	
X1:183	005	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:183	005	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:183	009	16	Wago Zentralelektrik	Wago e-box	
X1:184	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:184	005	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:184	008	18	Wago Zentralelektrik	Wago e-box	
X1:185	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:185	008	19	Wago Zentralelektrik	Wago e-box	
X1:186	005	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:186	008	19	Wago Zentralelektrik	Wago e-box	
X1:187	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:187	009	16	Wago Zentralelektrik	Wago e-box	
X1:188	006	4	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:188	009	17	Wago Zentralelektrik	Wago e-box	
X1:189	009	15	Wago Zentralelektrik	Wago e-box	
X1:189	013	9	Wago Zentralelektrik	Wago e-box	
X1:189	013	9	Wago Zentralelektrik	Wago e-box	
X1:190	010	6	Wago Zentralelektrik	Wago e-box	
X1:190	013	10	Wago Zentralelektrik	Wago e-box	
X1:190	013	11	Wago Zentralelektrik	Wago e-box	
X1:191	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:191	005	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:191	010	7	Wago Zentralelektrik	Wago e-box	
X1:192	007	14	Wago Zentralelektrik	Wago e-box	
X1:201	012	15	Wago Zentralelektrik	Wago e-box	
X1:202	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:205	005	10	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:205	012	15	Wago Zentralelektrik	Wago e-box	
X1:207	008	4	Wago Zentralelektrik	Wago e-box	
X1:20A	012	19	Sika – Klemme	fuse terminal	
X1:20E	012	19	Sika – Klemme	fuse terminal	
X1:210	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:21A	002	12	Sika – Klemme	fuse terminal	
X1:21E	002	12	Sika – Klemme	fuse terminal	

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Name: Werner

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	Name	Bl.	Pf.	Benennung	Ers. f.:	TYP
1	X1:221	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:222	006	14	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:223	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
2	X1:224	006	16	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:226	011	2	Wago Zentralelektrik	Wago e-box	
	X1:227	011	2	Wago Zentralelektrik	Wago e-box	
	X1:228	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:229	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
3	X1:22A	012	3	Sika – Klemme	fuse terminal	
	X1:22E	012	3	Sika – Klemme	fuse terminal	
	X1:231	004	6	Wago Zentralelektrik	Wago e-box	
	X1:232	004	6	Wago Zentralelektrik	Wago e-box	
	X1:233	004	7	Wago Zentralelektrik	Wago e-box	
4	X1:234	007	5	Wago Zentralelektrik	Wago e-box	
	X1:235	004	6	Wago Zentralelektrik	Wago e-box	
	X1:236	004	6	Wago Zentralelektrik	Wago e-box	
	X1:237	004	7	Wago Zentralelektrik	Wago e-box	
	X1:23A	003	9	Sika – Klemme	fuse terminal	
5	X1:23E	002	3	Sika – Klemme	fuse terminal	
	X1:23E	003	9	Sika – Klemme	fuse terminal	
	X1:241	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:242	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:243	002	12	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
6	X1:244	004	10	Wago Zentralelektrik	Wago e-box	
	X1:245	010	19	Wago Zentralelektrik	Wago e-box	
	X1:246	010	19	Wago Zentralelektrik	Wago e-box	
	X1:247	012	15	Wago Zentralelektrik	Wago e-box	
	X1:248	010	3	Wago Zentralelektrik	Wago e-box	
7	X1:249	012	10	Wago Zentralelektrik	Wago e-box	
	X1:24A	004	4	Sika – Klemme	fuse terminal	
	X1:24E	004	4	Sika – Klemme	fuse terminal	
	X1:250	004	10	Wago Zentralelektrik	Wago e-box	
	X1:251	012	9	Wago Zentralelektrik	Wago e-box	
8	X1:252	012	13	Wago Zentralelektrik	Wago e-box	
	X1:253	012	17	Wago Zentralelektrik	Wago e-box	
	X1:255	004	18	Wago Zentralelektrik	Wago e-box	
	X1:256	002	15	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:256	003	12	Wago Zentralelektrik	Wago e-box	
	X1:256	010	15	Wago Zentralelektrik	Wago e-box	
9	X1:257	008	13	Wago Zentralelektrik	Wago e-box	
	X1:258	008	13	Wago Zentralelektrik	Wago e-box	
	X1:259	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:25A	002	15	Sika – Klemme	fuse terminal	
	X1:25E	002	15	Sika – Klemme	fuse terminal	
10	X1:260	002	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:261	007	10	Wago Zentralelektrik	Wago e-box	
	X1:262	006	18	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:262	007	10	Wago Zentralelektrik	Wago e-box	
	X1:263	007	10	Wago Zentralelektrik	Wago e-box	
11	X1:265	011	18	Wago Zentralelektrik	Wago e-box	
	X1:266	011	17	Wago Zentralelektrik	Wago e-box	
	X1:267	011	18	Wago Zentralelektrik	Wago e-box	
	X1:268	011	19	Wago Zentralelektrik	Wago e-box	
	X1:269	004	11	Wago Zentralelektrik	Wago e-box	
12	X1:26A	008	13	Sika – Klemme	fuse terminal	
	X1:26E	008	13	Sika – Klemme	fuse terminal	
	X1:270	004	11	Wago Zentralelektrik	Wago e-box	
	X1:272	010	3	Wago Zentralelektrik	Wago e-box	
	X1:272	012	9	Wago Zentralelektrik	Wago e-box	
13	X1:27A	008	7	Sika – Klemme	fuse terminal	
	X1:27E	008	7	Sika – Klemme	fuse terminal	
	X1:28A	012	2	Sika – Klemme	fuse terminal	
	X1:28E	012	2	Sika – Klemme	fuse terminal	
	X1:291	005	18	Wago Zentralelektrik	Wago e-box	
14	X1:292	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:293	003	10	Wago Zentralelektrik	Wago e-box	
	X1:296	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:298	002	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:298	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
15	X1:299	004	20	Wago Zentralelektrik	Wago e-box	
	X1:29A	005	7	Sika – Klemme	fuse terminal	
	X1:29E	005	7	Sika – Klemme	fuse terminal	
	X1:300	005	18	Wago Zentralelektrik	Wago e-box	
	X1:301	005	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
16	X1:302	003	13	Wago Zentralelektrik	Wago e-box	
	X1:303	005	17	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:308	009	2	Wago Zentralelektrik	Wago e-box	
	X1:30A	010	4	Sika – Klemme	fuse terminal	
	X1:30E	010	4	Sika – Klemme	fuse terminal	
17	X1:31A	010	18	Sika – Klemme	fuse terminal	
	X1:31E	002	17	SIKA KLEMME	fuse terminal	
	X1:31E	010	18	Sika – Klemme	fuse terminal	
	X1:321	009	7	Wago Zentralelektrik	Wago e-box	
	X1:322	009	9	Wago Zentralelektrik	Wago e-box	
18	X1:323	009	8	Wago Zentralelektrik	Wago e-box	
	X1:324	009	8	Wago Zentralelektrik	Wago e-box	
	X1:325	009	8	Wago Zentralelektrik	Wago e-box	
	X1:326	009	7	Wago Zentralelektrik	Wago e-box	
	X1:327	009	12	Wago Zentralelektrik	Wago e-box	
19	X1:328	009	11	Wago Zentralelektrik	Wago e-box	
	X1:329	009	11	Wago Zentralelektrik	Wago e-box	
	X1:32A	002	17	Sika – Klemme	fuse terminal	
	X1:32E	002	17	Sika – Klemme	fuse terminal	
	X1:330	009	10	Wago Zentralelektrik	Wago e-box	
20	X1:331	009	12	Wago Zentralelektrik	Wago e-box	
	X1:332	009	12	Wago Zentralelektrik	Wago e-box	
	X1:333	009	15	Wago Zentralelektrik	Wago e-box	
	X1:334	009	15	Wago Zentralelektrik	Wago e-box	
	X1:335	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	

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	Name	Bl.	Pf.	Benennung	Ident	TYP
1	X1:336	006	9	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:337	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:338	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
2	X1:339	006	5	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:33A	012	6	Sika – Klemme	fuse terminal	
	X1:33E	002	17	SIKA KLEMME	fuse terminal	
	X1:33E	012	6	Sika – Klemme	fuse terminal	
	X1:340	006	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
3	X1:341	010	18	Wago Zentralelektrik	Wago e-box	
	X1:342	010	18	Wago Zentralelektrik	Wago e-box	
	X1:343	007	4	Wago Zentralelektrik	Wago e-box	
	X1:343	009	6	Wago Zentralelektrik	Wago e-box	
	X1:344	009	5	Wago Zentralelektrik	Wago e-box	
4	X1:345	009	4	Wago Zentralelektrik	Wago e-box	
	X1:346	009	4	Wago Zentralelektrik	Wago e-box	
	X1:347	009	5	Wago Zentralelektrik	Wago e-box	
	X1:348	009	6	Wago Zentralelektrik	Wago e-box	
	X1:349	008	18	Wago Zentralelektrik	Wago e-box	
5	X1:349	008	19	Wago Zentralelektrik	Wago e-box	
	X1:349	008	19	Wago Zentralelektrik	Wago e-box	
	X1:349	009	17	Wago Zentralelektrik	Wago e-box	
	X1:34A	010	14	Sika – Klemme	fuse terminal	
	X1:34E	010	14	Sika – Klemme	fuse terminal	
6	X1:350	009	14	Wago Zentralelektrik	Wago e-box	
	X1:351	009	13	Wago Zentralelektrik	Wago e-box	
	X1:352	009	13	Wago Zentralelektrik	Wago e-box	
	X1:353	009	14	Wago Zentralelektrik	Wago e-box	
	X1:354	009	14	Wago Zentralelektrik	Wago e-box	
7	X1:355	010	19	Wago Zentralelektrik	Wago e-box	
	X1:356	010	14	Wago Zentralelektrik	Wago e-box	
	X1:357	007	17	Wago Zentralelektrik	Wago e-box	
	X1:358	007	13	Wago Zentralelektrik	Wago e-box	
	X1:359	007	14	Wago Zentralelektrik	Wago e-box	
8	X1:35A	008	2	Sika – Klemme	fuse terminal	
	X1:35E	008	2	Sika – Klemme	fuse terminal	
	X1:363	009	16	Wago Zentralelektrik	Wago e-box	
	X1:364	009	20	Wago Zentralelektrik	Wago e-box	
	X1:364	010	14	Wago Zentralelektrik	Wago e-box	
9	X1:36A	012	9	Sika – Klemme	fuse terminal	
	X1:36E	012	9	Sika – Klemme	fuse terminal	
	X1:371	003	16	Wago Zentralelektrik	Wago e-box	
	X1:372	013	19	Wago Zentralelektrik	Wago e-box	
	X1:372	013	20	Wago Zentralelektrik	Wago e-box	
10	X1:373	011	16	Wago Zentralelektrik	Wago e-box	
	X1:374	011	16	Wago Zentralelektrik	Wago e-box	
	X1:375	011	2	Wago Zentralelektrik	Wago e-box	
	X1:376	011	2	Wago Zentralelektrik	Wago e-box	
	X1:377	011	19	Wago Zentralelektrik	Wago e-box	
11	X1:378	013	10	Wago Zentralelektrik	Wago e-box	
	X1:381	012	19	Wago Zentralelektrik	Wago e-box	
	X1:382	012	18	Wago Zentralelektrik	Wago e-box	
	X1:383	012	17	Wago Zentralelektrik	Wago e-box	
12	X1:391/1	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:391/2	002	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:392/1	005	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:392/2	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:393/1	005	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:393/2	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:394/1	005	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
13	X1:394/2	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:395/1	005	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:395/2	005	6	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:397/1	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:397/2	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
14	X1:398/1	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:398/2	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:399/1	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:399/2	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:400/1	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
15	X1:400/2	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:401/1	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:401/2	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:403/1	005	11	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:403/2	005	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
16	X1:404/1	008	14	Wago Zentralelektrik	Wago e-box	
	X1:404/2	008	14	Wago Zentralelektrik	Wago e-box	
	X1:405/1	008	15	Wago Zentralelektrik	Wago e-box	
	X1:405/2	008	15	Wago Zentralelektrik	Wago e-box	
	X1:406/1	009	3	Wago Zentralelektrik	Wago e-box	
17	X1:406/2	009	3	Wago Zentralelektrik	Wago e-box	
	X1:407/1	009	4	Wago Zentralelektrik	Wago e-box	
	X1:407/2	009	4	Wago Zentralelektrik	Wago e-box	
	X1:408/1	009	3	Wago Zentralelektrik	Wago e-box	
	X1:408/2	009	3	Wago Zentralelektrik	Wago e-box	
18	X1:409/1	009	2	Wago Zentralelektrik	Wago e-box	
	X1:409/2	009	2	Wago Zentralelektrik	Wago e-box	
	X1:41/1	007	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:41/2	007	13	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:412/1	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
19	X1:412/2	006	2	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:413/1	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:413/2	006	3	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:414/1	012	14	Wago Zentralelektrik	Wago e-box	
	X1:414/2	012	14	Wago Zentralelektrik	Wago e-box	
20	X1:42/1	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:42/2	006	19	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
	X1:43/1	009	9	Wago Zentralelektrik	Wago e-box	
	X1:43/2	009	9	Wago Zentralelektrik	Wago e-box	
	X1:44/1	009	5	Wago Zentralelektrik	Wago e-box	

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X1:44/2	009	5	Wago Zentralelektrik	Wago e-box	
X1:45/1	009	11	Wago Zentralelektrik	Wago e-box	
X1:45/2	009	11	Wago Zentralelektrik	Wago e-box	
X1:46/1	006	8	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:46/2	006	7	WAGO ZENTRALELEKTRIK	WAGO E-BOX	
X1:47/1	009	14	Wago Zentralelektrik	Wago e-box	
X1:47/2	009	14	Wago Zentralelektrik	Wago e-box	
X2:A	009	19	Datenschnittstelle	data interface	
X2:B	009	19	Datenschnittstelle	data interface	
X2:G	008	11	Datenschnittstelle	data interface	
X2:H	008	10	Datenschnittstelle	data interface	
X2:J	002	11	Datenschnittstelle	data interface	
X2:N	002	11	Datenschnittstelle	data interface	
X2:U	008	11	Datenschnittstelle	data interface	
X2:V	009	15	Datenschnittstelle	data interface	
X3:A	007	3	Stecker Handgas	connector hand throttle	
X3:B	007	2	Stecker Handgas	connector hand throttle	
X3:C	007	2	Stecker Handgas	connector hand throttle	
X4:A	004	15	EMR – Diagnose	EMR-diagnosis	
X4:B	004	17	EMR – Diagnose	EMR-diagnosis	
X4:F	004	16	EMR – Diagnose	EMR-diagnosis	
X4:G	004	16	EMR – Diagnose	EMR-diagnosis	
X4:H	004	15	EMR – Diagnose	EMR-diagnosis	
X4:K	004	17	EMR – Diagnose	EMR-diagnosis	
X4:M	004	16	EMR – Diagnose	EMR-diagnosis	
X5:1	005	18	Deutsch Stecker Senso	Deutsch Connector sensor	
X5:2	005	18	Deutsch Stecker Senso	Deutsch Connector sensor	
X6:1	004	10	Wago Zentralelektrik	Wago e-box	
X6:2	004	10	Wago Zentralelektrik	Wago e-box	
X6:3	004	11	Wago Zentralelektrik	Wago e-box	
X6:4	004	11	Wago Zentralelektrik	Wago e-box	
X6:5	004	15	Wago Zentralelektrik	Wago e-box	
X6:6	004	15	Wago Zentralelektrik	Wago e-box	
X6:7	004	16	Wago Zentralelektrik	Wago e-box	
X6:8	004	16	Wago Zentralelektrik	Wago e-box	
X6:9	004	16	Wago Zentralelektrik	Wago e-box	
X6:10	004	17	Wago Zentralelektrik	Wago e-box	
X7:1	013	9	Stecker Rops	connector on rops	
X7:2	013	9	Stecker Rops	connector on rops	
X7:3	013	9	Stecker Rops	connector on rops	
X7:4	013	9	Stecker Rops	connector on rops	
X7:5	012	16	Stecker Rops	connector on rops	
X7:6	012	16	Stecker Rops	connector on rops	
X8:1	011	2	Pumpenstecker Kabine	connector pump cabin;	
X8:2	011	2	Pumpenstecker Kabine	connector pump cabin;	
X9:1	006	5	Stecker Schalter Rich	connector direction switch	
X9:2	006	9	Stecker Schalter Rich	connector direction switch	
X9:3	006	7	Stecker Schalter Rich	connector direction switch	
X9:4	006	5	Stecker Schalter Rich	connector direction switch	
X9:5	006	5	Stecker Schalter Rich	connector direction switch	
X9:6	006	6	Stecker Schalter Rich	connector direction switch	
XS	002	15	Steckdose	Socket	
X10:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X10:B	004	6	AMP Stecker Gaspedal	AMP connector throttle	
X10:C	004	6	AMP Stecker Gaspedal	AMP connector throttle	
X11:1	010	18	Schnittstelle Sitz	connector drivers seat	
X11:2	010	18	Schnittstelle Sitz	connector drivers seat	
X12:A	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X12:B	004	8	AMP Stecker Gaspedal	AMP connector throttle	
X12:C	004	7	AMP Stecker Gaspedal	AMP connector throttle	
X13:1	007	17	Stecker Stufenschalte	connector speed range switch	
X13:2	007	18	Stecker Stufenschalte	connector speed range switch	
X13:3	007	14	Stecker Stufenschalte	connector speed range switch	
X14:4	012	15	Stecker Motor	connector engine	
X14:5	012	16	Stecker Motor	connector engine	
X14:6	002	6	Motorschnittstelle	engine interface	
X14:7	002	6	Motorschnittstelle	engine interface	
X14:8	005	18	Motorschnittstelle	engine interface	
X14:9	003	9	Motorschnittstelle	engine interface	
X14:10	005	10	Stecker Motor	connector engine	
X14:11	005	10	Stecker Motor	connector engine	
X14:12	005	18	Motorschnittstelle	engine interface	
X15:A	009	18	Stecker Lehne links	connector arm rest lh.	
X15:B	009	18	Stecker Lehne links	connector arm rest lh.	
X15:C	009	20	Stecker Lehne links	connector arm rest lh.	
X17:1	012	16	Stecker Klimakupplung	connector clima clutch	
X17:2	012	16	Stecker Klimakupplung	connector clima clutch	
X18:1	012	16	Stecker Druckschalter	connector pressure switch	
X18:2	012	16	Stecker Druckschalter	connector pressure switch	
X19:1	012	13	Stecker Heizventil	connector heating valve	
X19:2	012	13	Stecker Heizventil	connector heating valve	
X21:1	010	19	Schnittstelle Sitz	connector drivers seat	
X21:2	010	19	Schnittstelle Sitz	connector drivers seat	
X22:1	012	10	Stecker Luftklappe	connector air flap	
X22:2	012	11	Stecker Luftklappe	connector air flap	
X23:1	012	14	Stecker Sensor	connector sensor	
X23:2	012	14	Stecker Sensor	connector sensor	
X24:1	012	15	Stecker Sensor	connector sensor	
X24:2	012	15	Stecker Sensor	connector sensor	
X25:A	012	19	Stecker Lüfter	connector blower	
X25:B	012	18	Stecker Lüfter	connector blower	
X25:C	012	18	Stecker Lüfter	connector blower	
X26:1	012	9	Stecker Klimasteuerun	connector climacontrol	
X26:2	012	9	Stecker Klimasteuerun	connector climacontrol	
X26:3	012	11	Stecker Klimasteuerun	connector climacontrol	
X26:4	012	10	Stecker Klimasteuerun	connector climacontrol	
X26:5	012	16	Stecker Klimasteuerun	connector climacontrol	
X26:6	012	12	Stecker Klimasteuerun	connector climacontrol	
X26:7	012	12	Stecker Klimasteuerun	connector climacontrol	

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	Name	Bl.	Pf.	Benennung		TYP
1	X26:8	012	15	Stecker Klimasteuerun	connector climacontrol	
	X26:9	012	13	Stecker Klimasteuerun	connector climacontrol	
	X26:10	012	10	Stecker Klimasteuerun	connector climacontrol	
2	X26:11	012	11	Stecker Klimasteuerun	connector climacontrol	
	X26:12	012	13	Stecker Klimasteuerun	connector climacontrol	
	X26:13	012	13	Stecker Klimasteuerun	connector climacontrol	
	X26:14	012	13	Stecker Klimasteuerun	connector climacontrol	
	X27:1	012	14	Stecker Klimasteuerun	connector climacontrol	
3	X27:2	012	14	Stecker Klimasteuerun	connector climacontrol	
	X27:3	012	15	Stecker Klimasteuerun	connector climacontrol	
	X27:4	012	15	Stecker Klimasteuerun	connector climacontrol	
	X28:1	010	6	Stecker Radsensor	connector wheel sensor	
4	X28:2	010	6	Stecker Radsensor	connector wheel sensor	
	X28:3	010	7	Stecker Radsensor	connector wheel sensor	
	X28:4	010	7	Stecker Radsensor	connector wheel sensor	
	X29:1	012	6	Stecker Zyklon	Connector cyclone	
5	X29:2	012	6	Stecker Zyklon	Connector cyclone	
	X30:A	010	6	Verbindungsstecker Se	connector sensor	
	X30:B	010	6	Verbindungsstecker Se	connector sensor	
	X30:C	010	7	Verbindungsstecker Se	connector sensor	
	X31:A	010	11	Verbindungsstecker An	connector gauge	
6	X31:B	010	9	Verbindungsstecker An	connector gauge	
	X31:C	010	10	Verbindungsstecker An	connector gauge	
	X33:1	010	4	Schmieranlage	lubrication system	
	X33:2	010	4	Schmieranlage	lubrication system	
7	X34:1	010	4	Schmieranlage	lubrication system	
	X34:2	010	4	Schmieranlage	lubrication system	
	X34:3	010	3	Schmieranlage	lubrication system	
	X34:4	010	3	Schmieranlage	lubrication system	
8	X34:5	010	4	Schmieranlage	lubrication system	
	X35:1	008	13	Stecker Warnsummer	connector warning buzzer	
	X35:2	008	13	Stecker Warnsummer	connector warning buzzer	
	X36:1	007	7	Stecker Poti	connector potentiometer	
9	X36:2	007	6	Stecker Poti	connector potentiometer	
	X36:3	007	7	Stecker Poti	connector potentiometer	
	X39:A	007	7	Stecker Deceleratorpe	connector decelerator pedal	
	X39:B	007	6	Stecker Deceleratorpe	connector decelerator pedal	
10	X39:C	007	6	Stecker Deceleratorpe	connector decelerator pedal	
	X40:1	007	8	Stecker Deceleratorpe	connector decelerator pedal	
	X40:2	007	8	Stecker Deceleratorpe	connector decelerator pedal	
	X40:3	007	9	Stecker Deceleratorpe	connector decelerator pedal	
11	X40:4	007	7	Stecker Deceleratorpe	connector decelerator pedal	
	X40:5	007	8	Stecker Decelelratorp	connector decelerator pedal	
	X40:6	007	7	Stecker Deceleratorpe	connector decelerator pedal	
	X41:1	007	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
12	X41:2	007	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:3	007	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:4	007	6	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:5	007	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
13	X41:6	007	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:8	007	8	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:9	007	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:10	007	7	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
14	X41:11	007	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X41:12	007	5	Stecker 1 Anpaßplatin	connector 1 decelerator circuit board	
	X42:1	007	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:2	007	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
15	X42:4	007	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:5	007	2	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X42:6	007	3	Stecker 2 Anpaßplatin	connector 2 decelerator circuit board	
	X17.1:1	004	2	2-pol SPT	2-pole SPT	
16	X17.1:2	004	2	2-pol SPT	2-pole SPT	
	X27.1:4	004	18	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:6	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
17	X27.1:7	004	19	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:11	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:12	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:13	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
18	X27.1:14	004	8	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:15	004	9	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:18	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:19	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
19	X27.1:20	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:21	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:22	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:23	004	10	Motor / 42-pol EPC	engine / 42-pole EPC	
20	X27.1:24	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:25	004	4	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:26	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:27	004	5	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:28	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:29	004	11	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:30	004	7	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:33	004	6	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:34	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:35	004	12	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:36	004	14	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:37	004	13	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:39	004	17	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:40	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:41	004	16	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.1:42	004	15	Motor / 42-pol EPC	engine / 42-pole EPC	
	X27.2:10	004	3	12-pol EPC	12-pole EPC	
	X27.2:11	004	3	12-pol EPC	12-pole EPC	
	XD2.1:2	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
	XD2.1:3	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
	XD2.1:5	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
	XD2.1:6	004	18	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
	XD2.1:8	004	4	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	

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XD2.1:9	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:10	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:11	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:13	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:20	004	14	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:22	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:29	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:30	004	10	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:33	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:34	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:35	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:38	004	11	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:39	004	13	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:40	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:52	004	16	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:53	004	15	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:54	004	12	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:59	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:60	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:61	004	8	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:62	004	5	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:77	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:78	004	7	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:79	004	6	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.1:89	004	17	EDC7 / 89-pol BOSCH	EDC7 / 89-pol BOSCH	
XD2.2:3	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:4	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:5	004	19	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:7	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:8	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:9	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:10	004	8	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:15	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:18	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:19	004	9	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:23	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:24	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:25	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:26	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:27	004	5	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:28	004	4	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:32	004	6	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:33	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:34	004	10	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:35	004	7	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.2:36	004	11	EDC7 / 36-pol BOSCH	EDC7 / 36-pol BOSCH	
XD2.3:3	004	15	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:4	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:6	004	13	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:7	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:8	004	18	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:12	004	14	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:13	004	12	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:14	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:15	004	16	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
XD2.3:16	004	17	EDC7 / 16-pol BOSCH	EDC7 / 16-pol BOSCH	
Y02	004	19	Magnetventil Flammgluehanlage	Solenoid valve, glow plug system	18W
Y03	007	14	Magnetventil Fahrstufenumschaltung	Solenoid valve, speed range selector	
Y04	007	10	Magnetventil Bremse	Solenoid valve, brake	1,25A
Y14	011	2	Kraftstoffpumpe Heizgeraet	Fuel pump, heating unit	
Y15	012	16	Magnetkupplung Klimakompressor	Magnetic clutch, air conditioning compr.	1,75A
Y16	006	10	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y16	006	12	Magnetventil Fahrtrichtung vorwaerts	Solenoid valve, travel direction forw.	1,08A
Y17	006	6	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y17	006	8	Magnetventil Fahrtrichtung rueckwaerts	Solenoid valve, travel direction backw.	1,08A
Y92	009	7	Magnetventil Lenkung vorne rechts	Solenoid valve, steering, front rh.	max. 1,1A
Y93	009	8	Magnetventil Lenkung vorne links	Solenoid valve, steering, front lh.	max. 1,1A
Y102	009	12	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y102	009	13	Magnetventil Schwimmstellung	So.valve, floating position	max. 1,08A
Y108	009	9	Magnetventil Schaufel Heben	solenoid valve, lifting shovel	max. 1,1A
Y109	009	10	Magnetventil Schaufel Senken	solenoid valve, let down shovel	max. 1,1A
Y110	009	19	Magnetventil Schaufel oeffnen	solenoid valve, open shovel	max. 1,1A
Y111	009	18	Magnetventil Schaufel Schließen	solenoid valve, close shovel	max. 1,1A
Y132	006	14	Magnetventil Radmotor vorn links	Solenoid valve, wheel motor front lh.	max. 0,6A
Y133	006	16	Magnetventil Radmotor vorn rechts	Solenoid valve, wheel motor front rh.	max. 0,6A
Y134	006	17	Magnetventil Radmotor hinten links	Solenoid valve, wheel motor rear lh.	max. 0,6A
Y135	006	19	Magnetventil Radmotor hinten rechts	Solenoid valve, wheel motor rear rh.	max. 0,6A
Y138	012	13	Magnetveentil Heizung	Solenoid valve, heating unit	0,42A
Y147	004	12	Injektor A1	jet pump A1	
Y148	004	14	Injektor A2	jet pump A2	
Y149	004	13	Injektor A3	jet pump A3	
Y150	004	17	Injektor B1	jet pump B1	
Y151	004	16	Injektor B2	jet pump B2	
Y152	004	16	Injektor B3	jet pump B3	
Y166	004	14	Injektor A4	jet pump A4	
Y167	004	18	Injektor B4	jet pump B4	

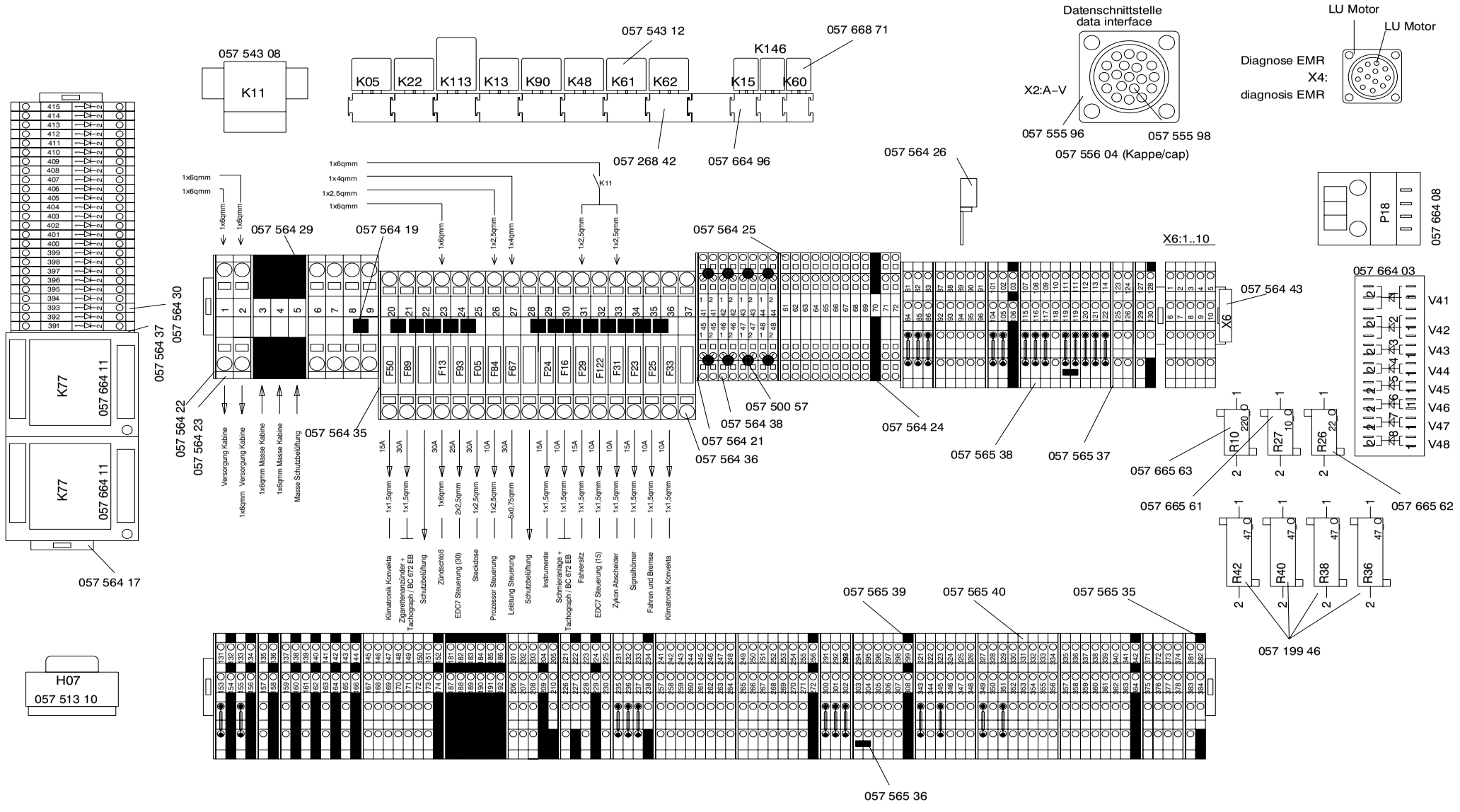
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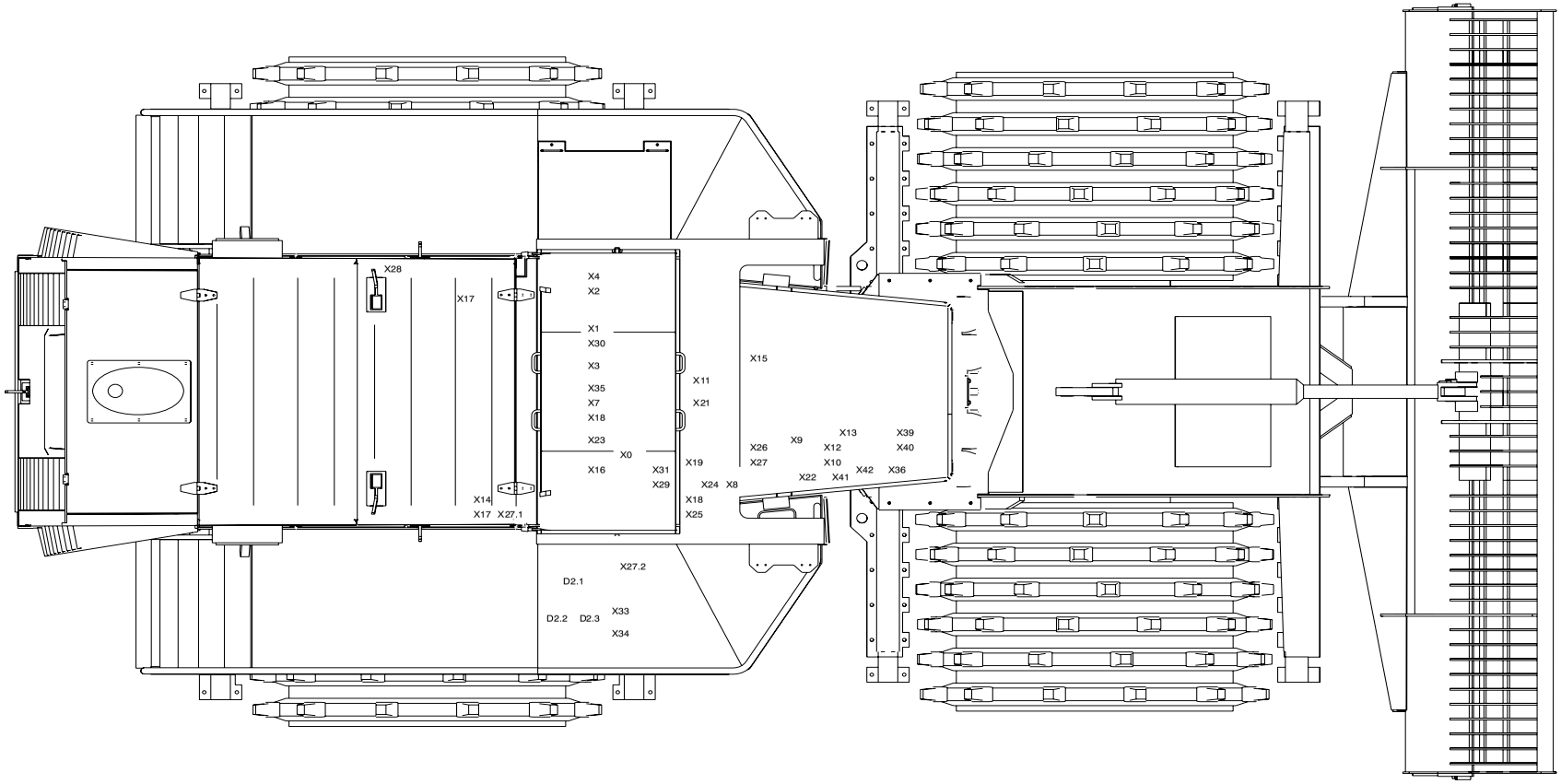


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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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Schaltkasten
e-box

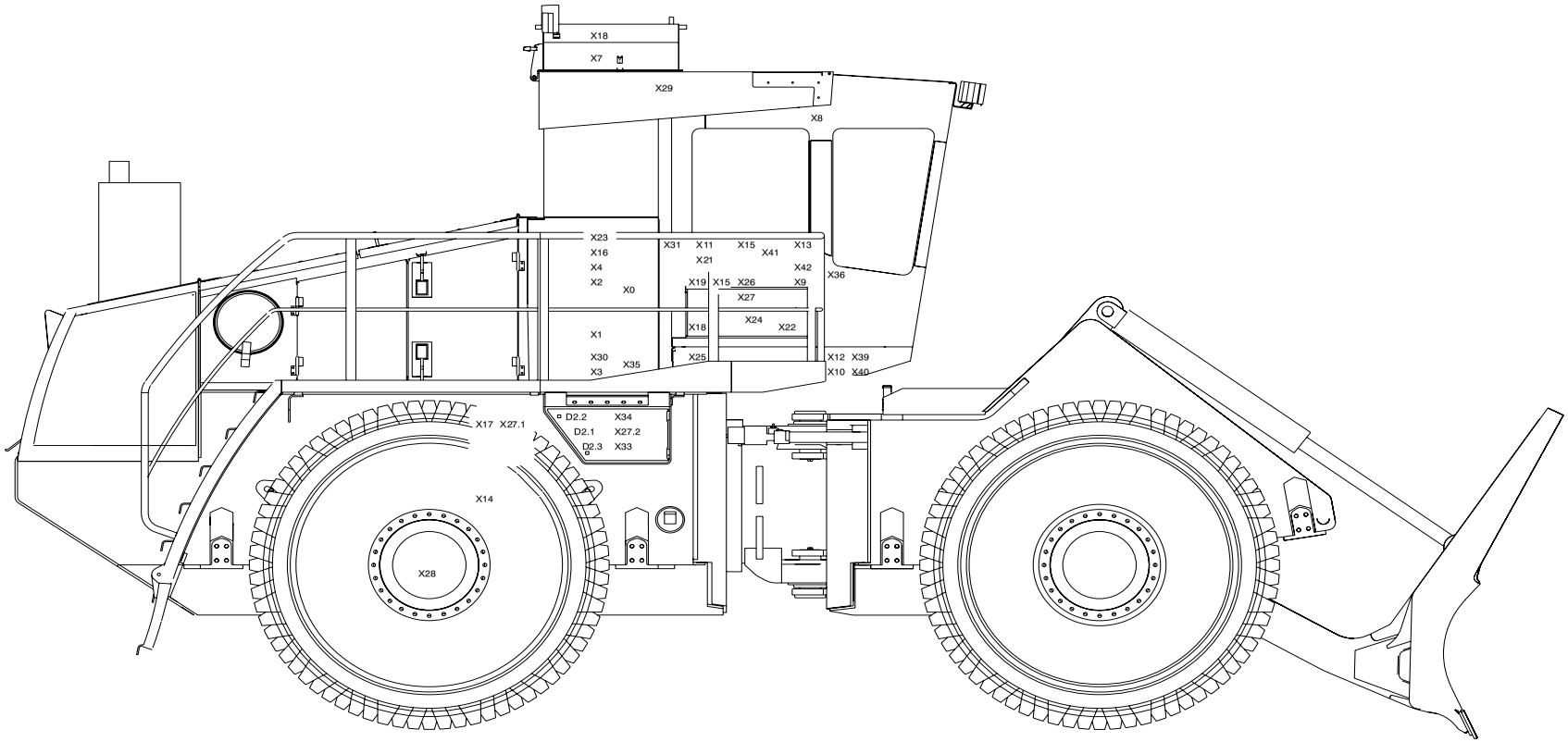
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Lokalisierungsgrafik Steckverbinder Draufsicht
localization graphic connectors top view



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