



SERVICE MANUAL

ELECTRICAL FORKLIFT

EFG-DF 13

EFG-DF 16/L

EFG-DF 18/L

EFG-DF 20

Edition 1998-2003 year

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Technical Description of Components

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Indicates notes regarding safety that must be observed to prevent danger to personnel.



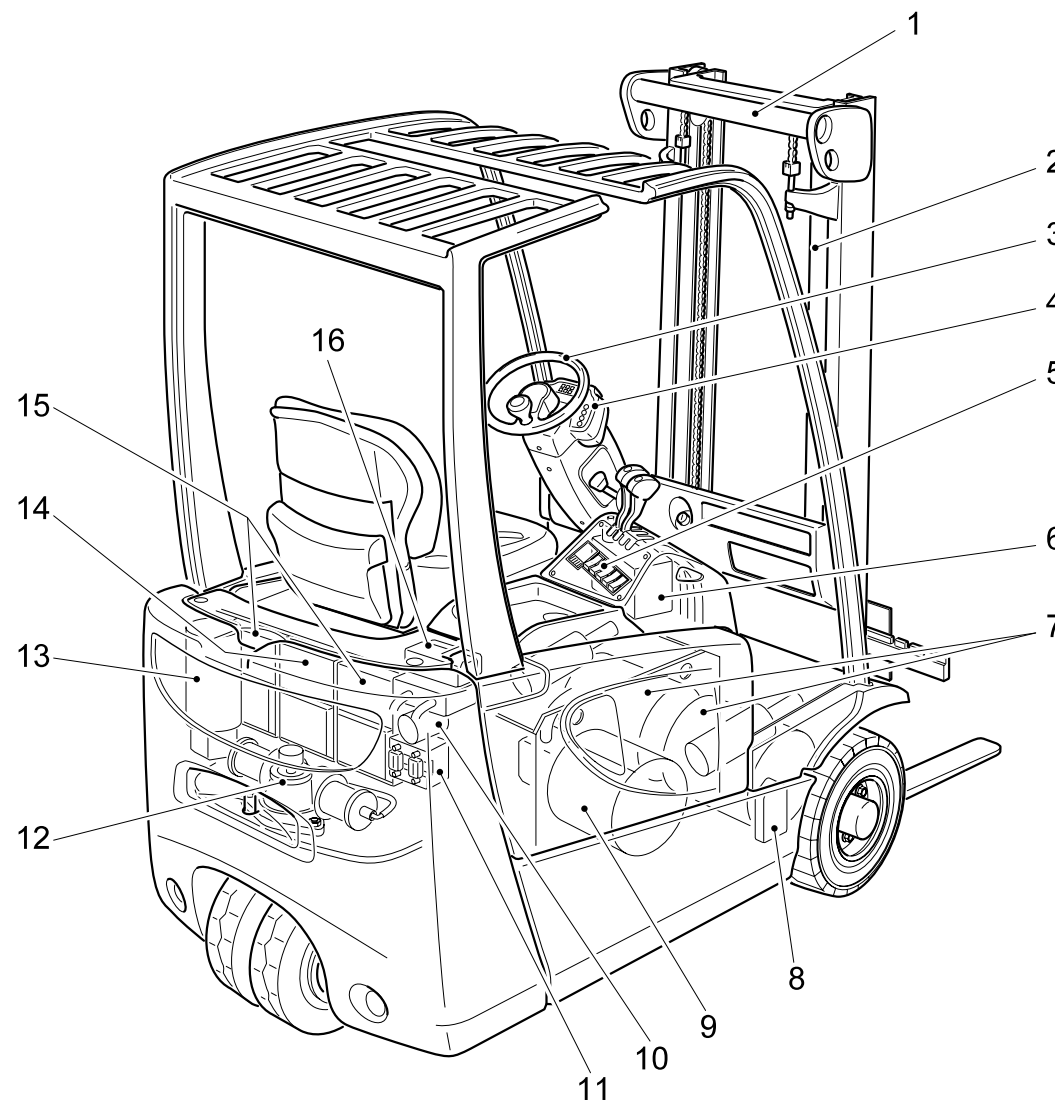
Indicates notes that must be observed to prevent damage to materials.



Indicates explanations.

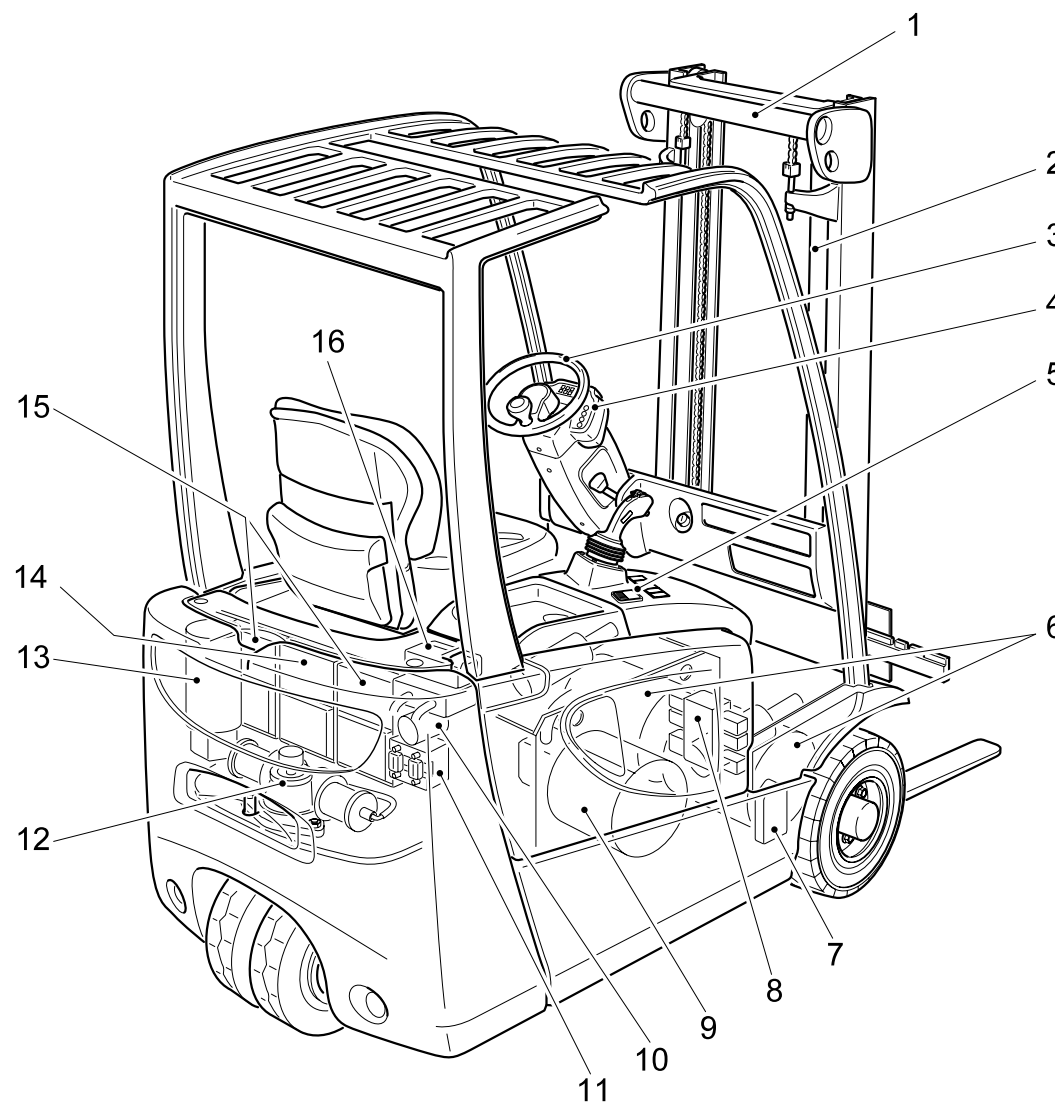
Solo Pilot (Standard) Component Layout

Item	Description
1	Hoist Frame
2	Mast lift cylinder
3	Steering
4	Information and service display
5	Main and auxiliary switch controls Aux. electrical system (optional)
6	Control valve
7	Drive motors
8	Interface 3
9	Pump motor
10	Main contactor K1
11	Main current fuses
12	Swivelling bolster steering
13	Steer motor
14	Steering control system
15	Lift and travel control system
16	Control current fuses



Multi Pilot (Option) Component Layout

Item	Description
1	Hoist frame
2	Mast lift cylinder
3	Steering
4	Information and service display
5	Main and auxiliary switch controls Aux. electrical system (optional)
6	Drive motors
7	Interface 4
8	Proportional control valve
9	Pump motor
10	Main contactor K1
11	Main current fuses
12	Swivelling bolster steering
13	Steer motor
14	Steering control system
15	Lift and travel control system
16	Control current fuses



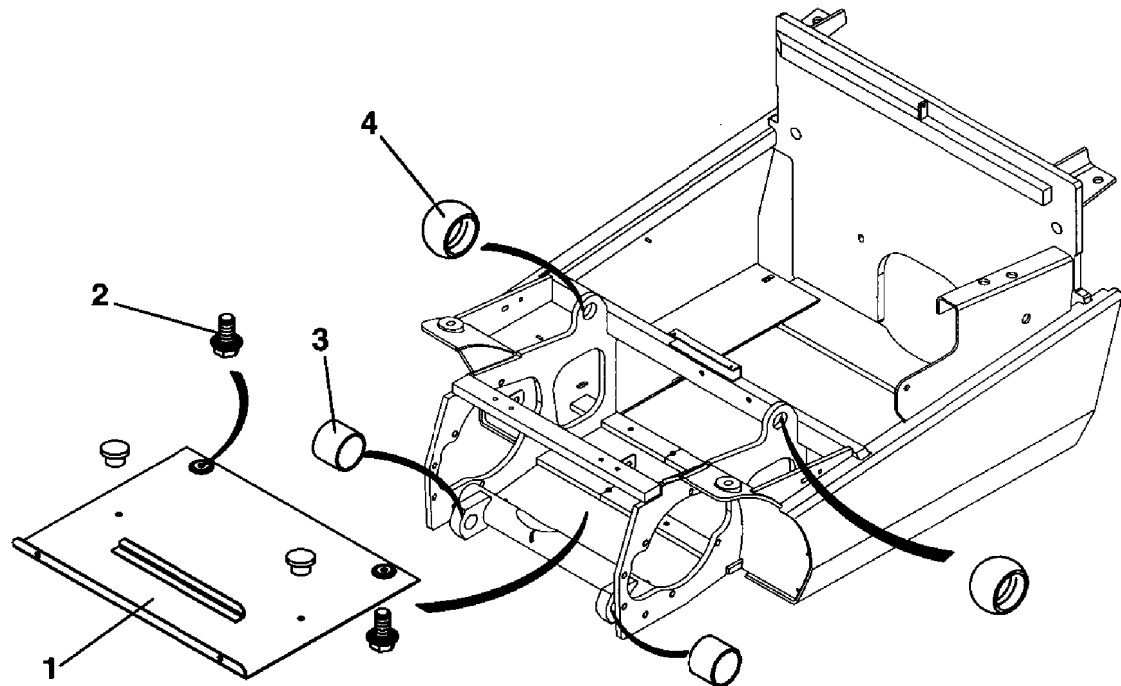
Chassis / Assembly



The lower carbon brushes of the drive motors are accessible when the base plate (1) has been disassembled.

The hydraulic unit can be disassembled via the battery compartment once the battery has been removed.

Item	Description
1	Base plate
2	Base plate attachment
3	Mast bearing
4	Tilt cylinder bearing



Drive System

Drive system assembly

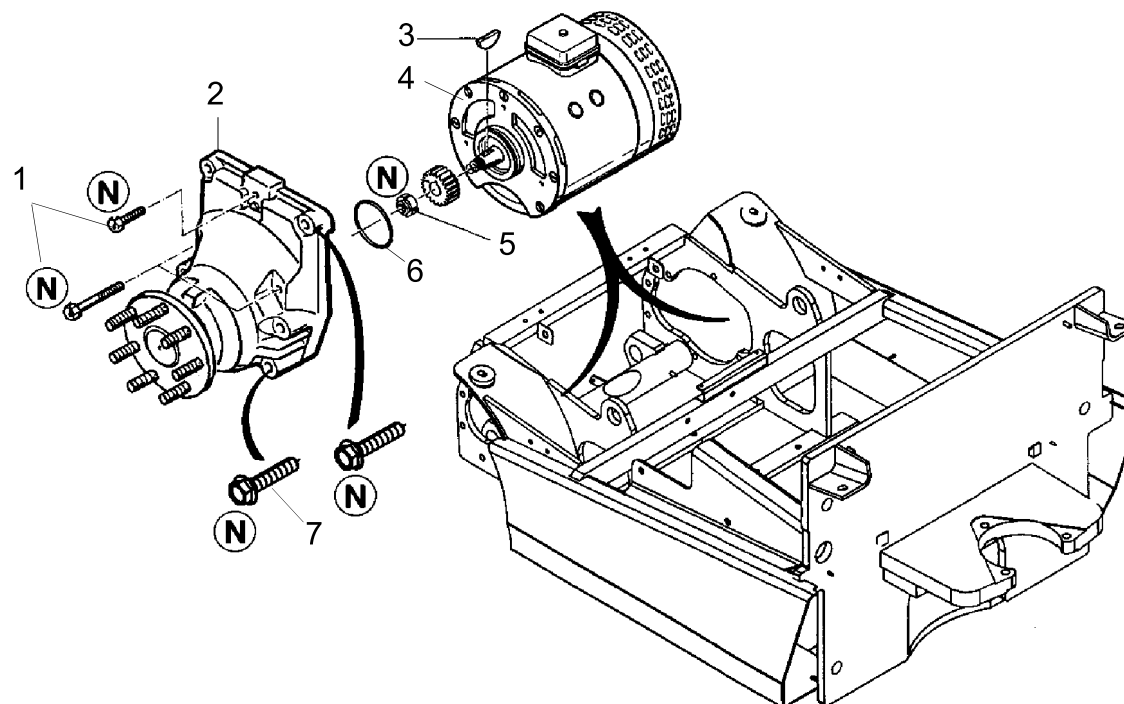
A drive unit consists of a drive motor and a two-level wheel hub gear system with an integrated multi-plate brake system.

Shunt motors (48 V / 4 kW) are used for the drive components.

The drive motor is fixed to the transmission system via an M8x50 hex. bolt and two M8x75 hex. bolts.

The complete drive unit is fixed to the chassis via 5 M16x90 ratchet bolts and two M16x60 ratchet bolts.

Item	Description
1	M8 bolt
2	Transmission
3	Key
4	Drive motor
5	Stop nut
6	O ring 76x2.5
7	M16 bolt



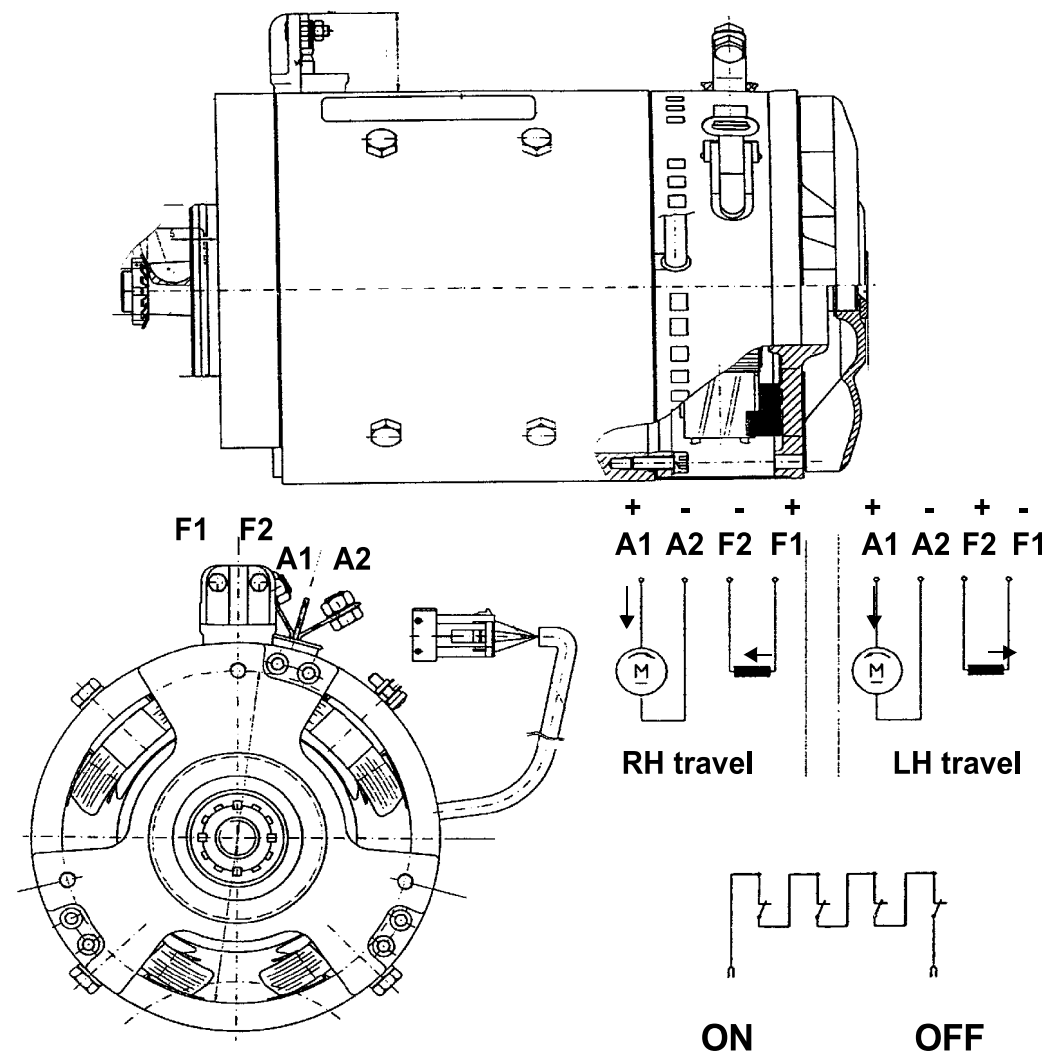
(N) For torques, see chapter 3

Assembly: Drive motor

Shunt motors (48V/4 kW) are used for the drive components. The drive motors are designed for regenerative braking.

The carbon brush wear monitoring system (4 in series “break” contacts) and the thermosensor for temperature control are contained in the brush rocker.

Carbon brush wear and motor overtemperature levels are indicated by warning lamps in the LISA multi-function display.



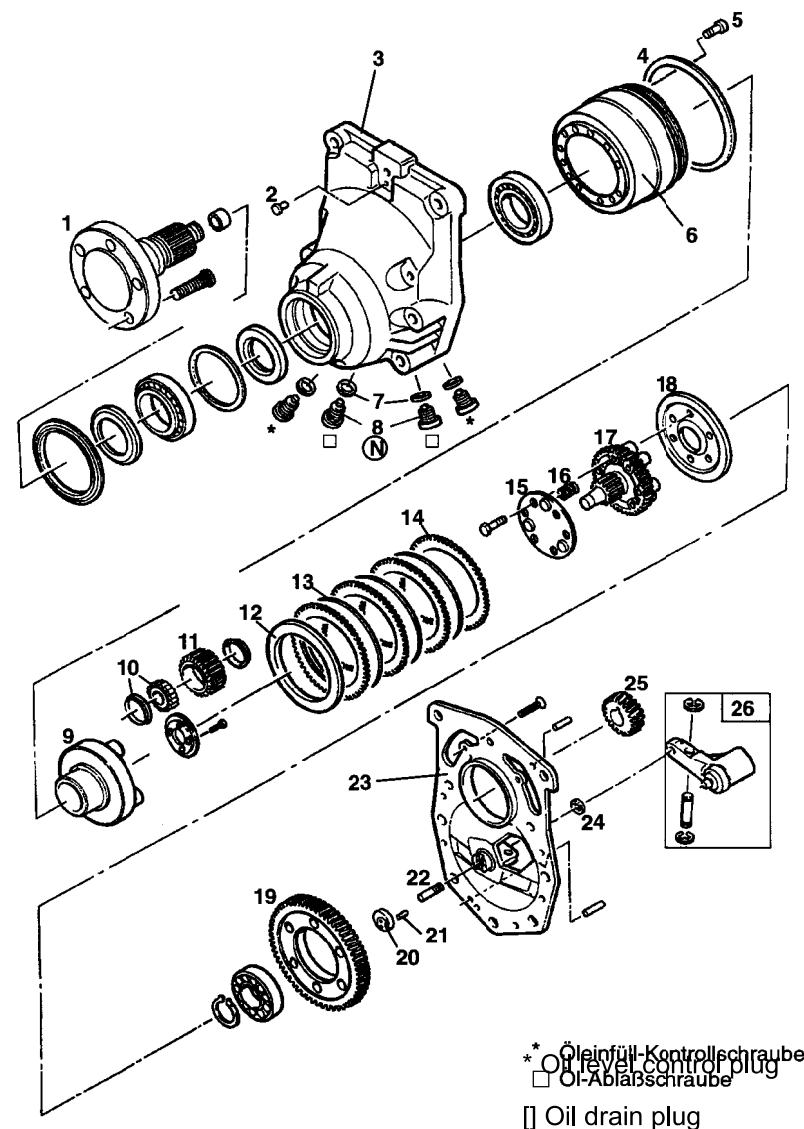
Assembly: Transmission System

Sun and planet gear system with integrated hydraulic and mechanically released multi-plate brake system, with an overall gear ratio of $i = 18,2 : 1$. The transmission system is a twin drive system and is used in front powered ground conveyor vehicles with standard tyres.

The upper filler plug is used for oil replenishment.* The exact oil capacity is defined by an oil filler opening (excess).*

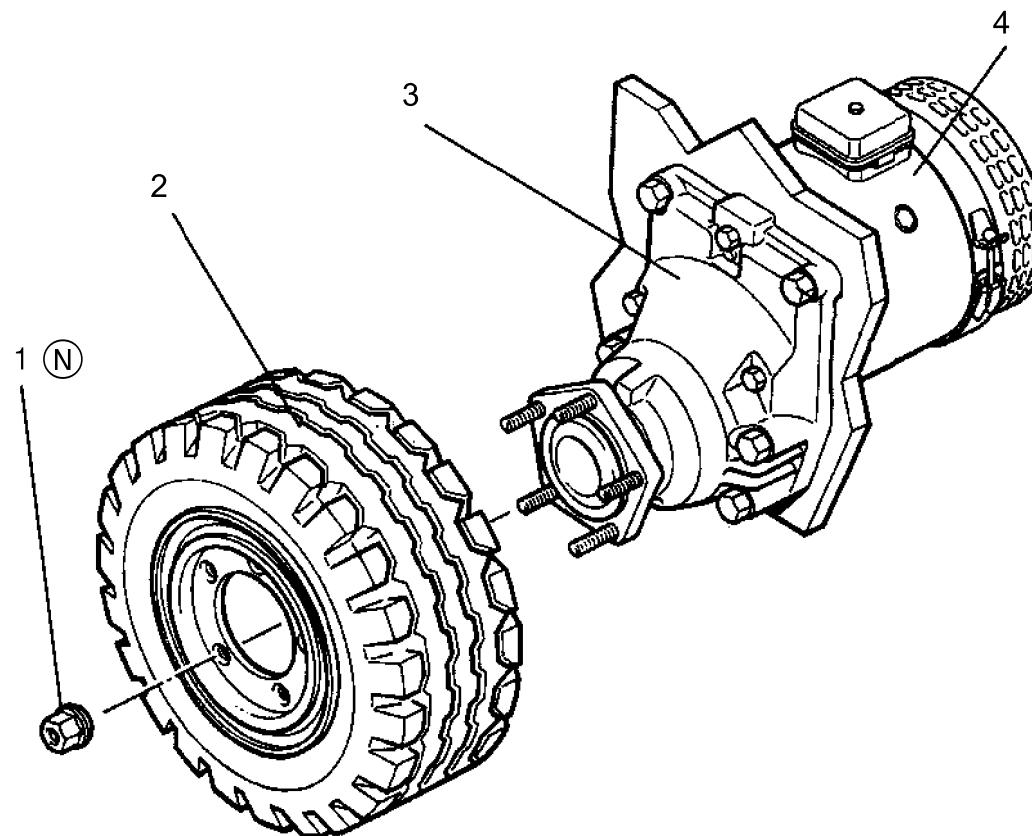
In the event of repairs do not dismantle the transmission system. Either replace or renew as a complete unit.

Item	Description	Item	Description
1	Wheel shaft	14	External multi-plate
2	Discharge filter	15	Retaining plate
3	Housing	16	Pressure spring
4	Retaining ring	17	Internal multi-plate support
5	Allen screw	18	Thrust washer
6	Ring gear, complete	19	Spur pinion
7	Seal	20	Axial slide bearing
8	Screw plug	21	Cylinder pin
9	Sun wheel	22	Pressure pin
10	Cylinder roller bearing	23	Housing cover
11	Planet wheel	24	Shaft seal
12	Thrust washer	25	Driving pinion
13	Internal multi-plate	26	Brake lever, complete



Wheels / Axles

Item	Description
1	Wheel nut
2	Running wheel
3	Transmission
4	Electrical motor



(N) For torques see chapter 3

Drive Switch / Drive Pedal

Function:

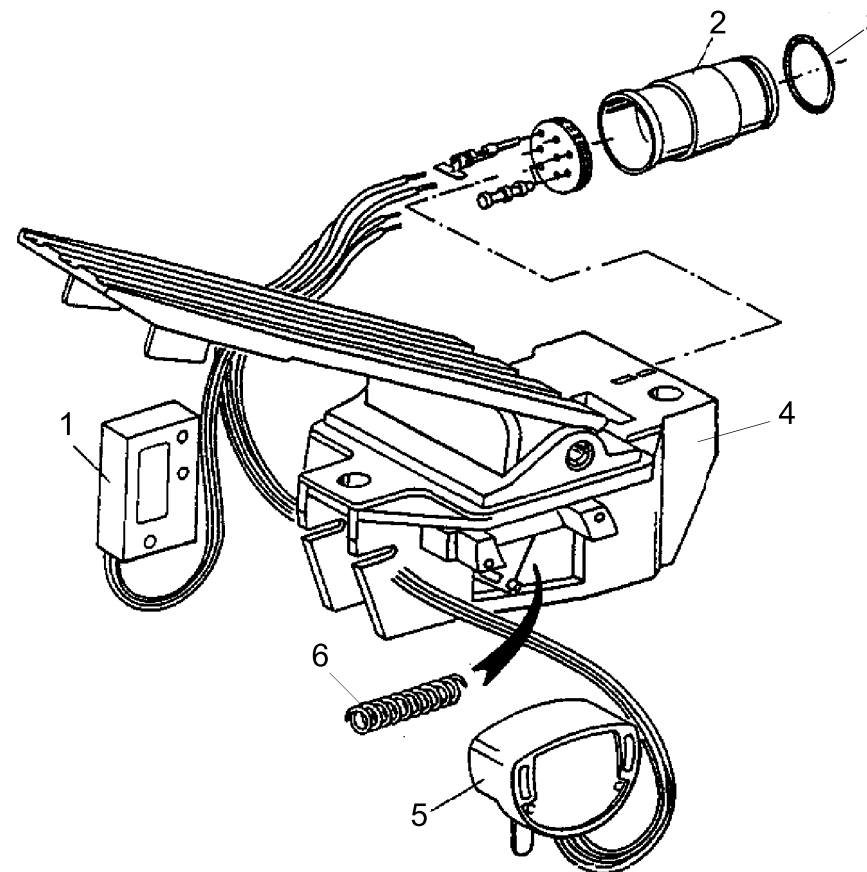
The microswitch releases the drive impulse if the seat switch is simultaneously activated.

The potentiometer controls the travel speed. Increased pressure on the pedal reduces the resistance and increases the speed.



When the standard parameters have been set or the potentiometer changed, the “MIN” and “MAX” potentiometer voltage in the “travel” parameter must be checked.
(see chapter 6 “Travel parameter setting”).

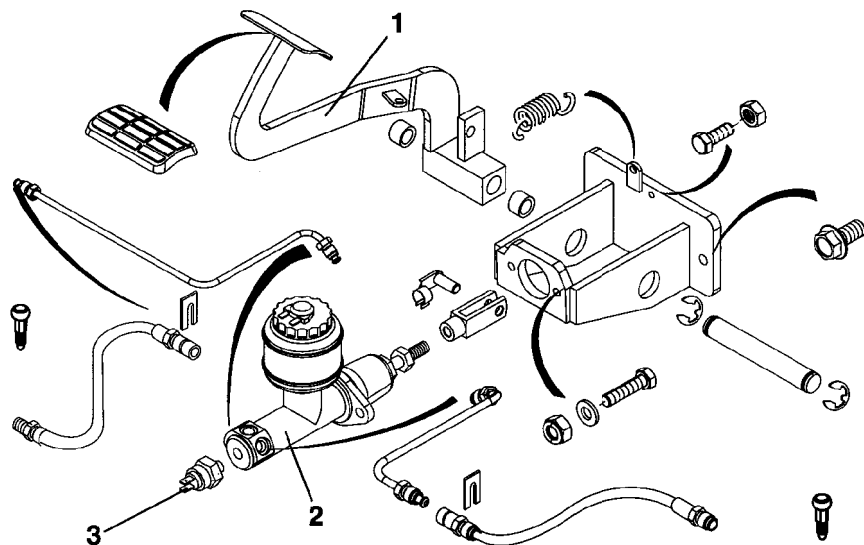
Item	Description
1	Microswitch
2	Coupler plug
3	Seal
4	Pedal/Pedal frame
5	Potentiometer
6	Spring



Brake System

Brake pedal:

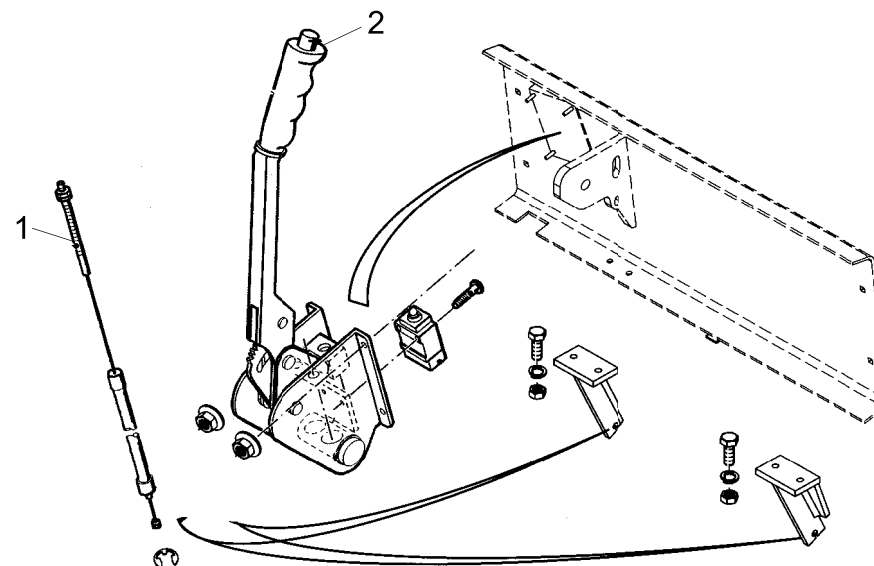
Assembly



Item	Description
1	Brake pedal
2	Main brake cylinder
3	Hydraulic pressure switch

Parking brake:

Assembly



Item	Description
1	Brake cable
2	Lever
3	Switch

Multi-plate brake:

Assembly:

Integrated hydraulic and mechanically activated multi-plate brake. Operating and parking brakes act independently of each other on the multi-plate brake.

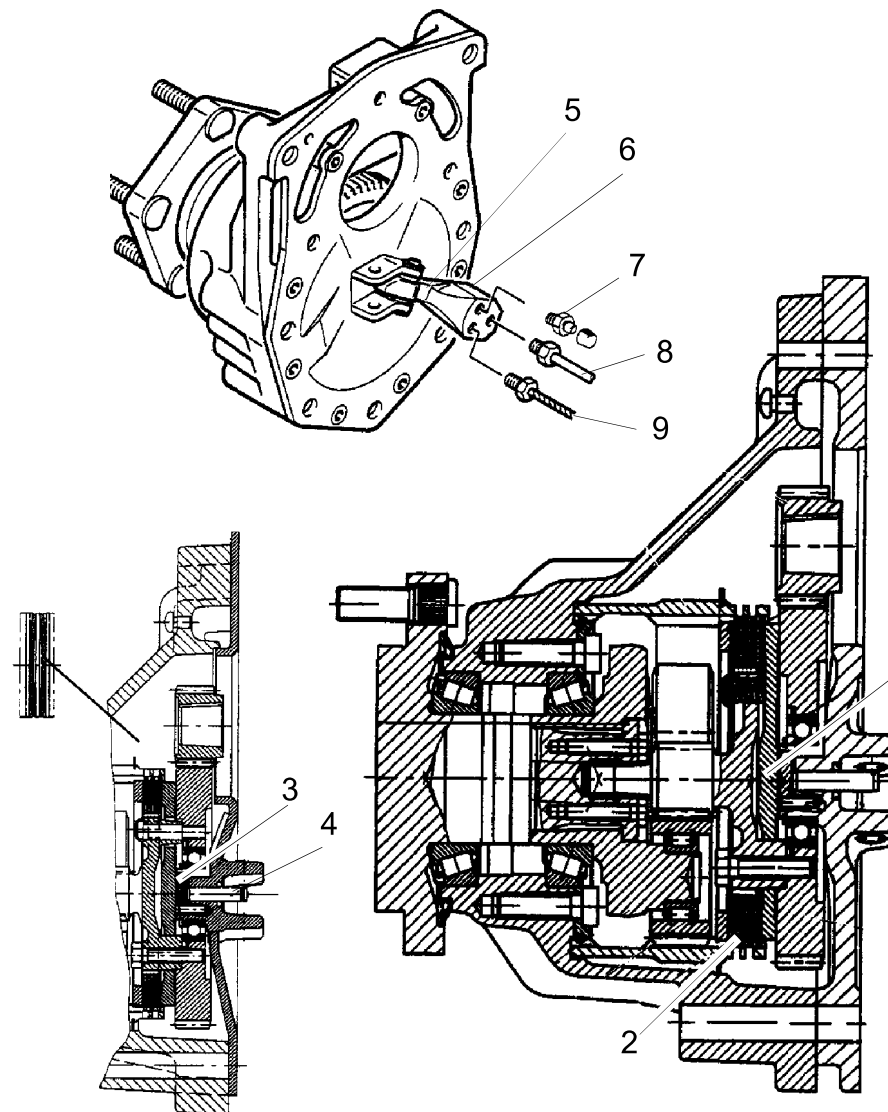
The brake pedal and the parking brake lever form the activating mechanism. The mechanical linkage, main brake cylinder, hydraulic lines, brake cylinder and the multi-plate brake system form the transmission system. The parking brake is activated by cables.

Operation:

Operating brakes: The drive wheels are hydraulically braked (via brake lever, axial slide bearing, thrust washer, internal and external multi-plates).

Parking brake: The drive wheels are mechanically braked. The cables are tightened by the handbrake lever. The "Parking brake applied" switch is simultaneously activated by the handbrake lever and shown on the multi-function display.

Item	Description	Item	Description
1	Internal multi-plates	6	Brake cylinder
2	Brake multi-plates	7	Pressure relief valve
3	Axial slide bearing	8	Brake line
4	Press pin	9	Brake cable
5	Brake lever		



Steering system

Steering column:

Assembly:

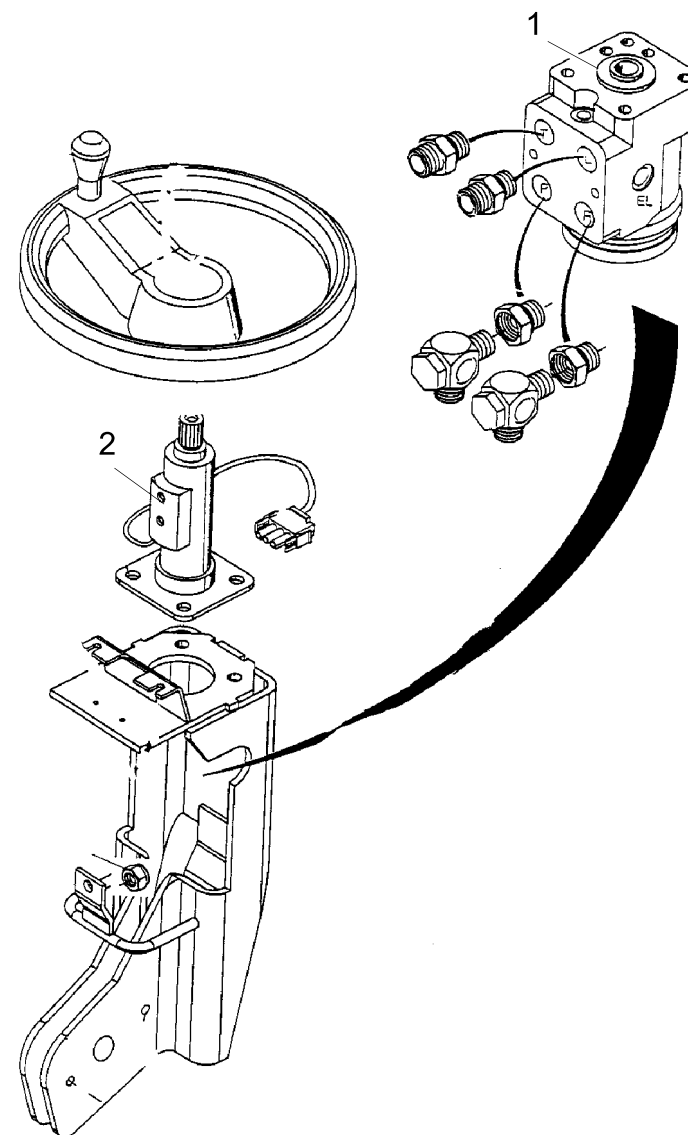
All truck versions are fitted with hydraulic steering and emergency steering as standard.

The steering motor is controlled by the field actuator of the hydraulic steering system. The hydraulic steering system is controlled by a steering sensor (Hall-Sensor).

Operation:

When the steering wheel is activated the rotary movement is transformed into an electrical signal. The servostat regulates the oil flow which is proportional to the steering wheel rotation and which is directed to the required side of the steering cylinder.

If the hydraulic pump fails, emergency steering is automatically provided by the emergency pump integrated in the servostat. The follow-up time for the pump operating at reduced speed can be programmed (see chapter 6).

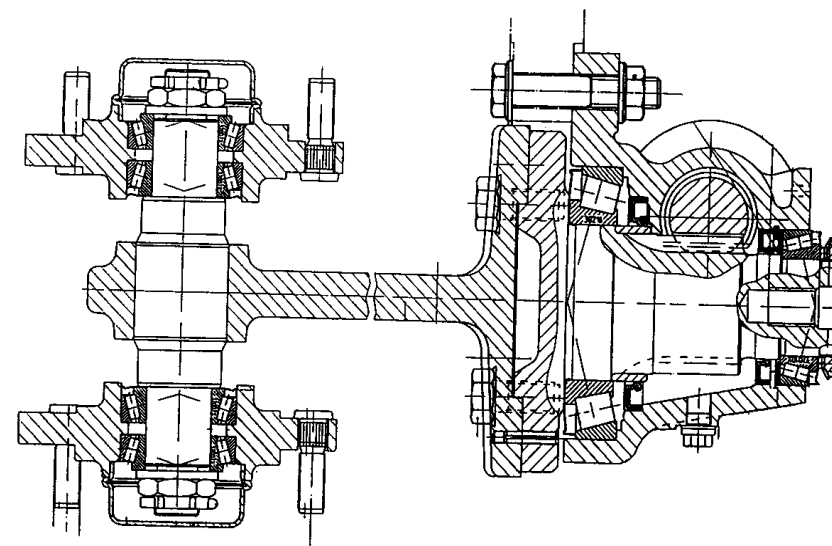
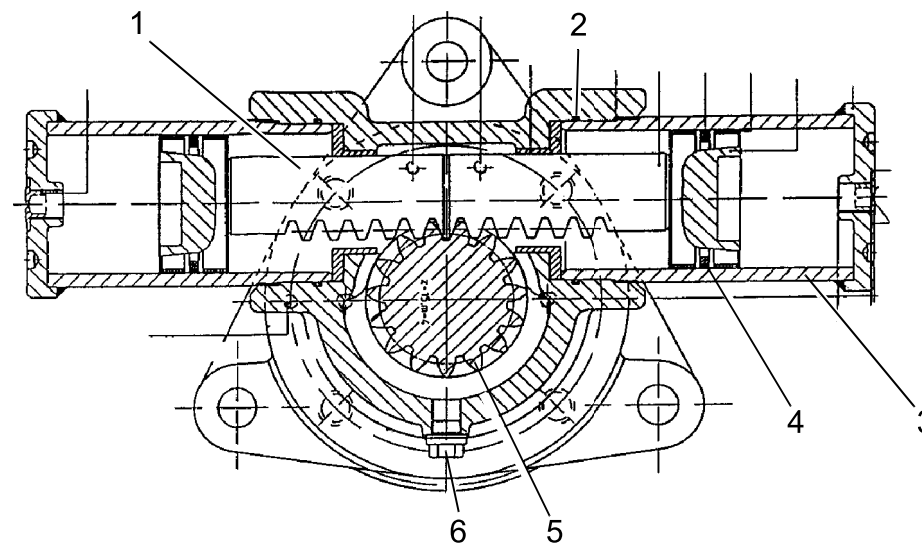


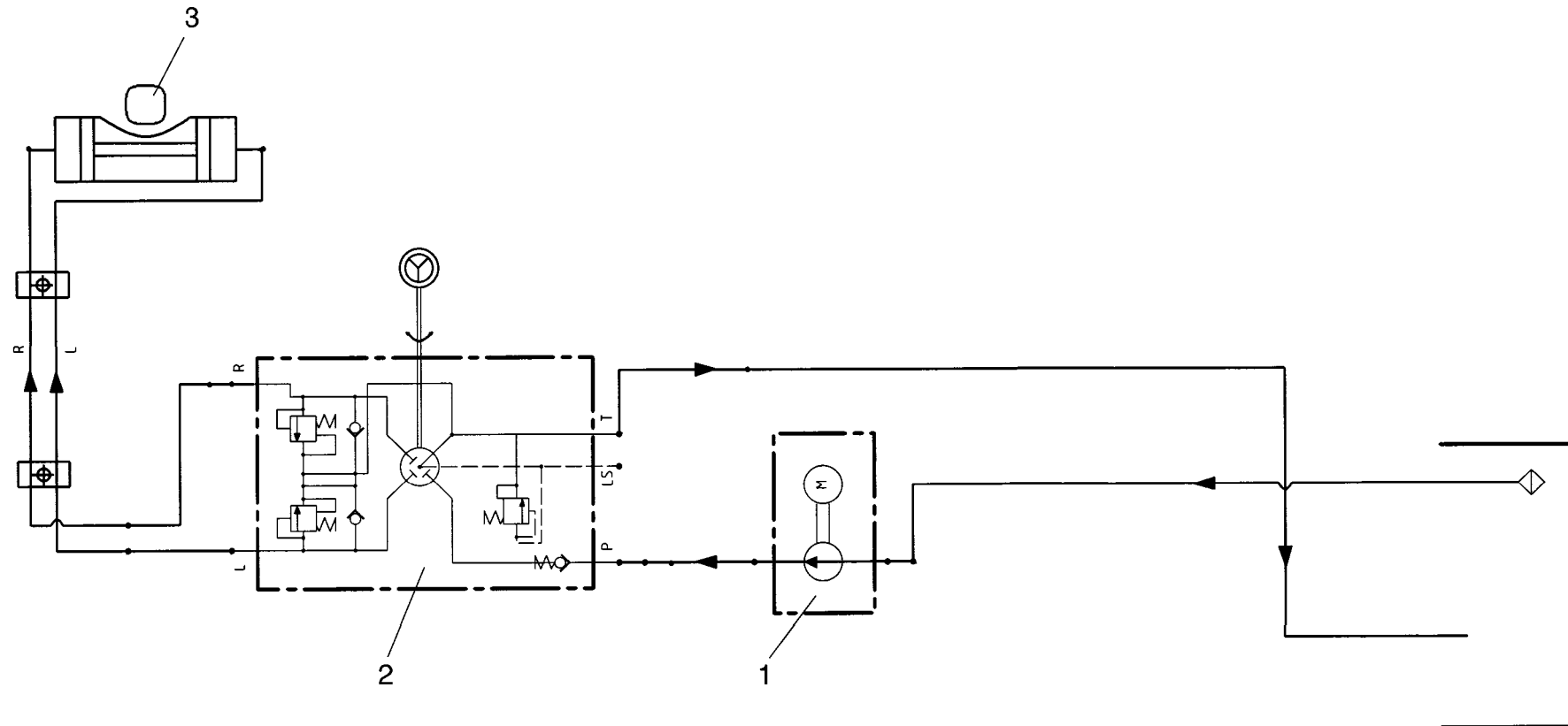
Item	Description
1	Servostat
2	Steering sensor

Swivelling bolster:
Assembly


When assembling make sure the steering toothed rack is centrally aligned with the pinion.

Item	Description
1	Toothed rack
2	Seal
3	Cylinder
4	Piston and seal
5	Pinion
6	Oil control plug



Steering System Block Diagram


Item	Description
1	Aux. steering unit
2	Steering unit
3	Swivelling bolster steering cylinder

Chassis / Load Section Connection

Tilt cylinder:

Assembly

Service notes:



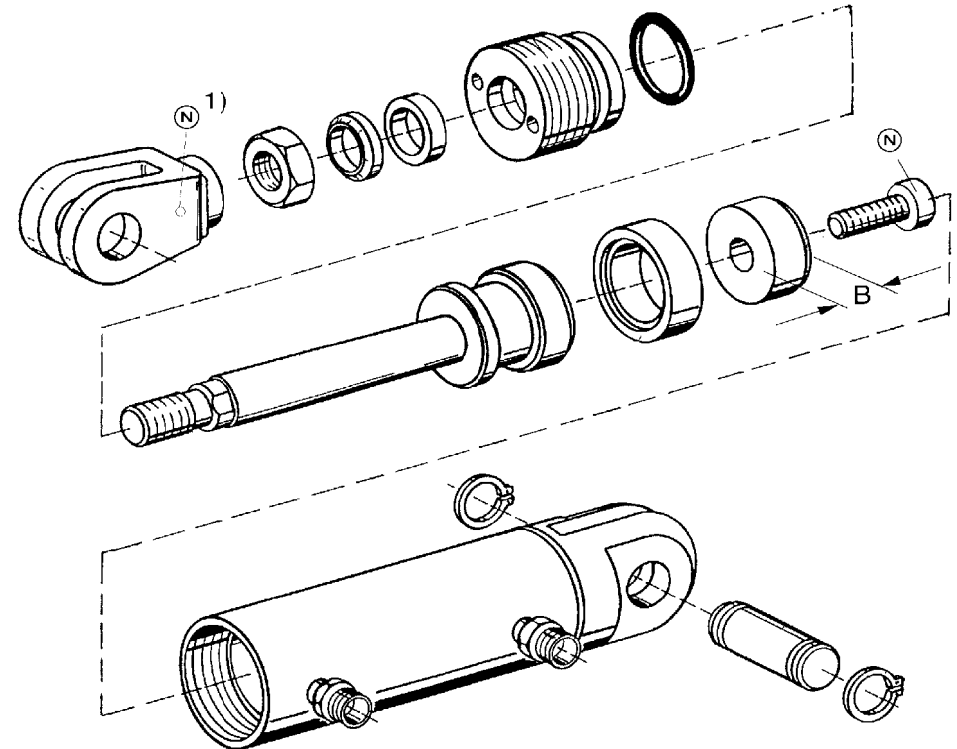
(N) Sealed with Loctite



(N)¹⁾ When setting the tilt cylinder it should be possible to feel the piston rod thread in the control bore.



Ensure synchronisation of tilt cylinders when setting.



Hydraulic System

Control Panel

Solo Pilot:

A control block with the lift/lower, tilt and aux. hydraulic (ZH1) functions is used as standard.

If additional functions are required, a control valve (ZH2) can be fitted as an option.

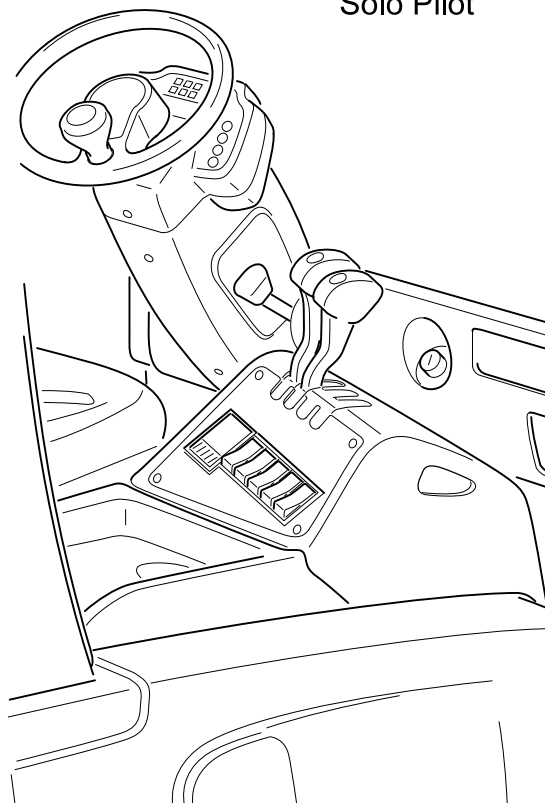
Multi Pilot:

All hydraulic functions are governed by the multi pilot.

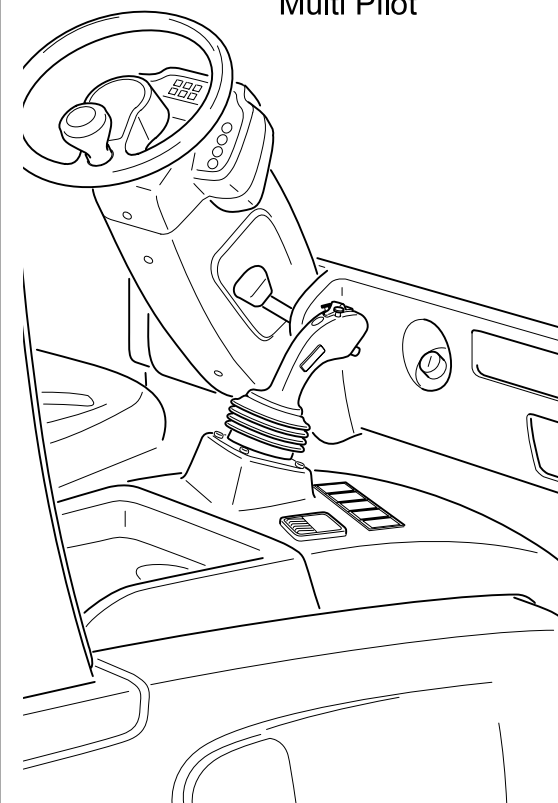
The horn switch and the travel direction switch are integrated in the multi pilot.

If the ZH2 function is incorporated, the multi pilot must be replaced in full.

Solo Pilot



Multi Pilot



Control valve:

Assembly:

The hydraulic connections for lifting, tilting, aux. hydraulics and hydraulic pumps and the tank return line are contained on the front side of the valve.

The following items are on the upper side of the valve:

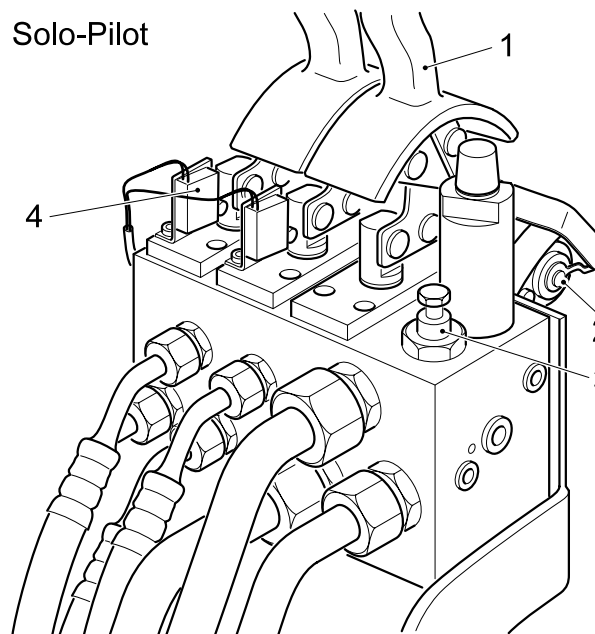
- Pressure control valve (3)
- Valve lever (1)
- Adjustable microswitch (4) for each spool.

The rear side of the valve contains the rotary potentiometer (2) for lift impulse control.

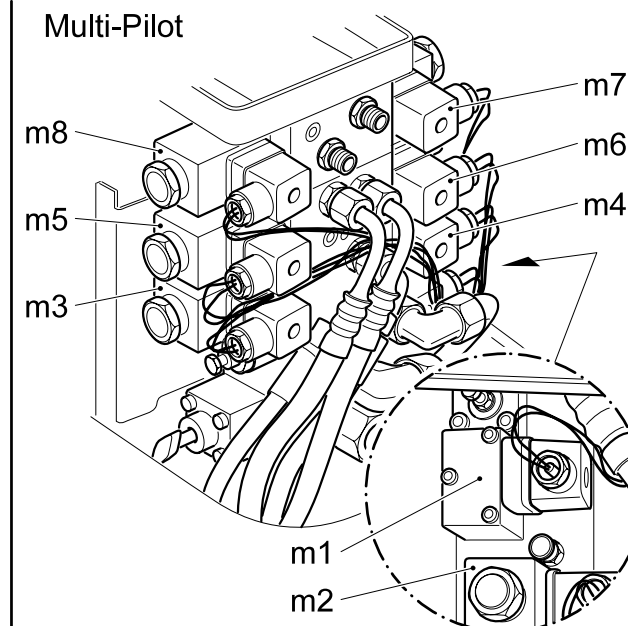
Operation:

The integrated tilt brake valve / servo control valve cannot be adjusted. This prevents the hoist frame from accidentally tilting forward when the spool is open and the electrical system is switched off.

Solo-Pilot



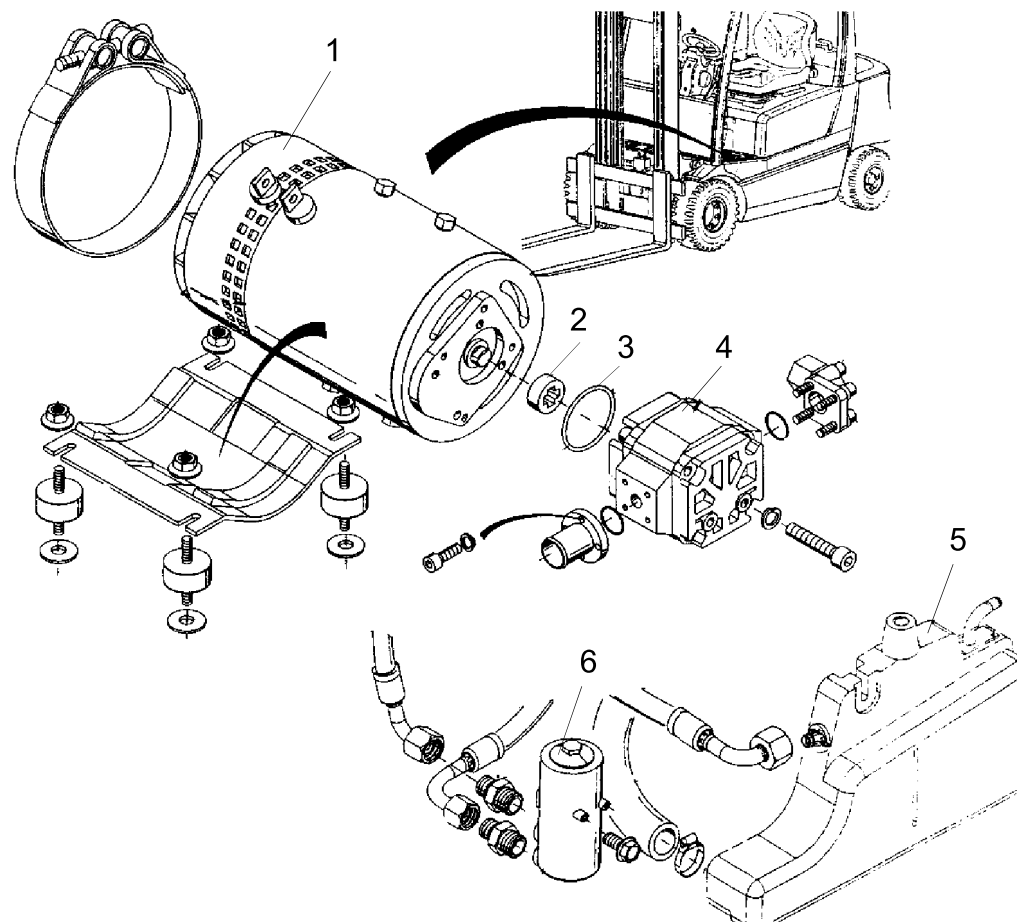
Multi-Pilot



Valve	Description/ electrical	Function	Valve	Description/ electrical	Function
m1	2Y1 / XB 29	Solenoid valve / Lift	m5	2Y46 / XB 46	Solenoid valve / Forward tilt
m2	2Y29 / XB 29	Proportional valve / Lower	m6	2Y47 / XB 47	Solenoid valve / Reverse tilt
m3	2Y49 / XB 49	Solenoid valve / ZH1 LH side shifting device	m7	2Y51 / XB 51	Solenoid valve / ZH1 (ZH2) reverse
m4	2Y48 / XB 48	Solenoid valve / ZH1 RH side shifting device	m8	2Y50 / XB 50	Solenoid valve / ZH1 (ZH2) forwards



Service note: After replacing the potentiometer check the parameter setting and adjust if necessary (see chapter 6).

Pump Motor / Pump / Pressure Filter
Assembly:


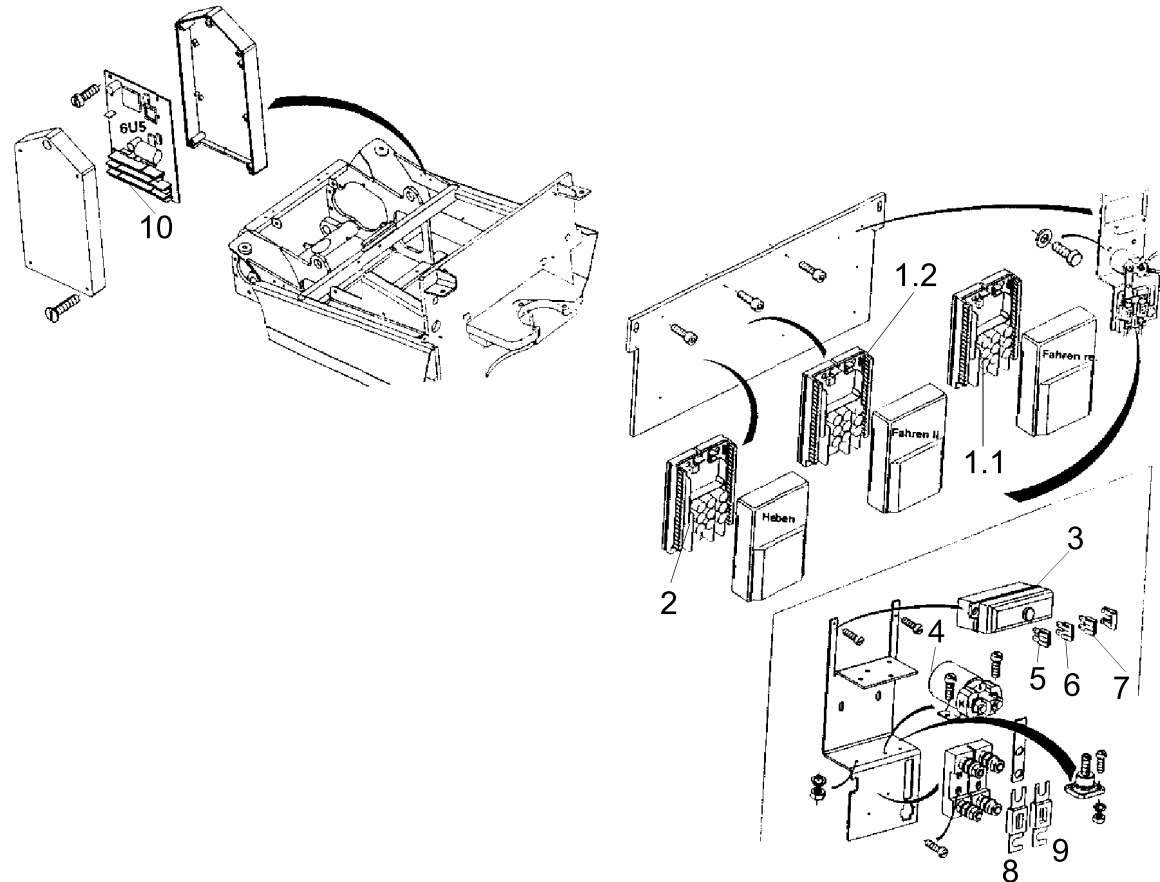
Item	Description
1	Pump motor (48V/12kW)
2	Coupling
3	O ring
4	Hydraulic pump
5	Hydraulic tank
6	Pressure filter

Electrical System

Electrical System

Assembly

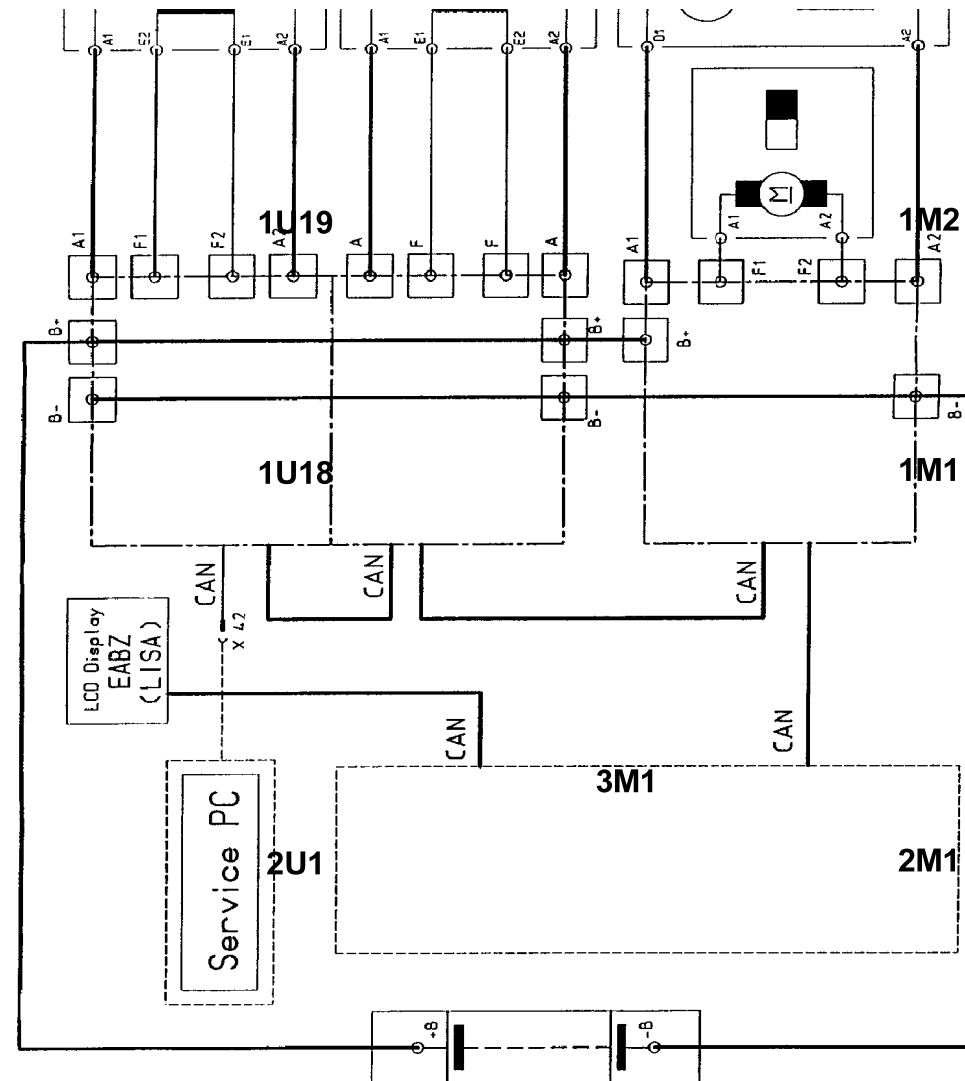
Item	Description
1.1	MP 1514 Drive control system Drive motor, RH
1.2	MP 1514 Drive control system Drive motor, LH
2	MP 1514 Lift control system
3	Fuse holder
4	Main contactor
5	Control fuse Transformer 5F2 = 10A
6	Control fuse Horn 4F1 = 10A
7	Control fuse Electronic system F/H 1F9 = 10A
8	Drive motor fuse 1F = 355A
9	Pump motor fuse 2F1 = 250A
10	Interface 3/4



Solo Pilot Block Diagram

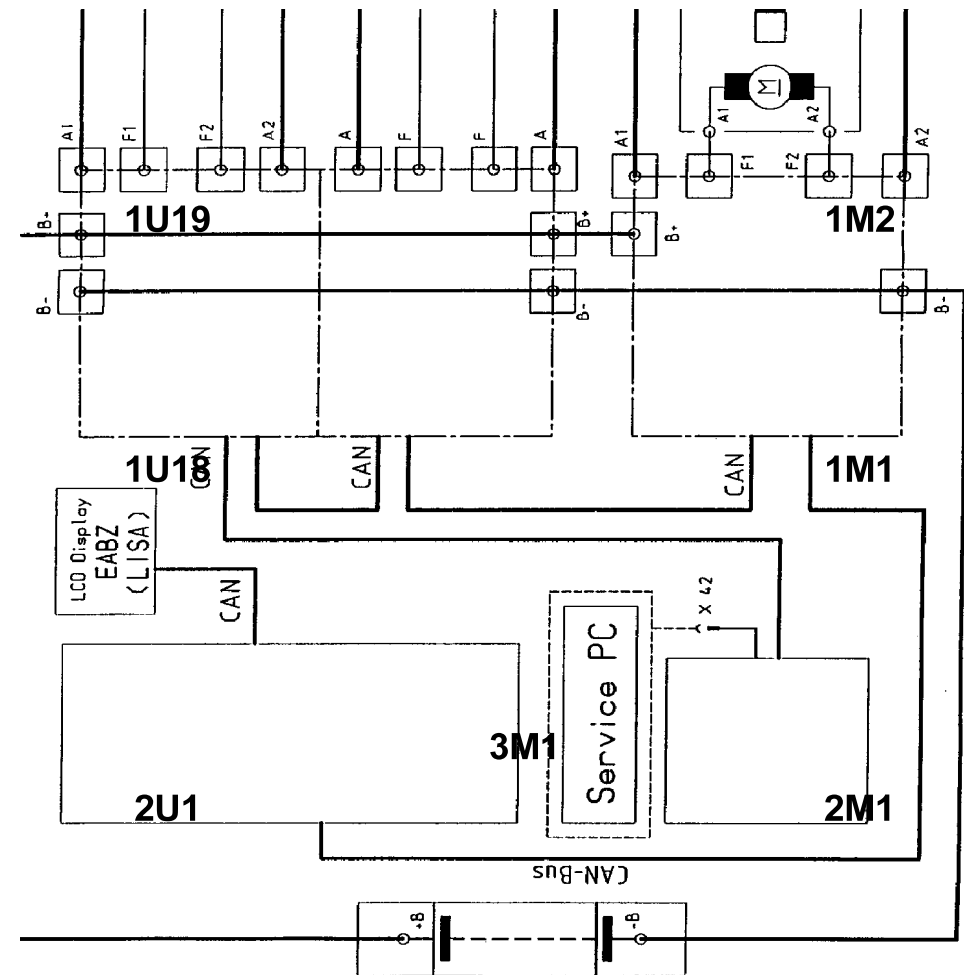
1M1	Drive motor, LH
1M2	Drive motor, RH
2M1	Pump motor
3M1	Steer motor
1U18	Drive current control system, LH
1U19	Drive current control system, RH
2U1	Hydraulic control system
6U4	Interface 3

6U4



Multi Pilot Block Diagram

7B1	Multi Pilot
1M1	Drive motor, LH
1M2	Drive motor, RH
2M1	Pump motor
3M1	Steer motor
1U18	Drive current control system, LH
1U19	Drive current control system, RH
2U1	Hydraulic control system
6U5	Interface 4

6U5
7B1


General Truck Data, Test and Setting Values

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General Truck Data

			EFG-DF 13	EFG-DF 16	EFG-DF 16L	EFG-DF 18	EFG-DF 18L	EFG-DF 20
A	Chassis / Superstructure							
	Capacity	t	1.3	1.6	1.6	1.8	1.8	2.0
	Load centre	mm	500	p	p	p	p	p
	Turning radius	mm	1439	1547	1655	p	p	p
	Net weight incl. battery	kg	2700	2900	2900	3100	3100	3250
	Axle load excl. front / rear load	kg	1280/1420	1400/1500	1400/1500	1500/1600	1500/1600	1600/1650
	Axle load incl. front / rear load	kg	3450/500	4050/450	4050/450	4380/470	4365/4485	4800/450
B	Drive							
	Nominal tractive force incl. load / excl. load S2 60 min.	N	2200/2300	2100/2300	p	2000/2200	1900/2200	p
	Max. tractive force incl. load / excl. load S2 5 min.	N	9300/9100	9200/9100	p	8800/8900	p	8700/8900
	Ramp up capacity incl. load / excl. load S2 30 min.	%	7.5/11.5	6.5/10.5	6.0/9.5	6.0/10.0	5.5/9.5	5.0/9.5
	Max. ramp up capacity incl. load / excl. load S2 5 min.	%	25.0/33.5	20.5/30.5	19.5/29.0	18.5/29.5	18.0/28.0	17.0/28.0

			EFG-DF 13	EFG-DF 16	EFG-DF 16L	EFG-DF 18	EFG-DF 18L	EFG-DF 20
	Acceleration time to 10 m incl. load / excl. load	s	4.2/3.5	4.4/3.6	p	4.4/3.7	p	4.5/3.8
	Noise level	db(A)	66	p	p	p	p	p
	Travel speed incl. load / excl. load	km/h	15/16	p	p	p	p	p
K	Battery / Charger							
	Battery	V / Ah	48/400	48/500	48/600	p	p	p
	Battery weight	kg	708	856	1013	p	p	p

Test and Setting Values

			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF20
B	Drive							
	Drive motor	Type	July / GF 116-Q7	p	p	p	p	p
	Power consumption incl. load / excl. load	A	100-145/ 80-105	p	p	p	p	p
	Drive motor output S2 6 min	kW	2 x 4	p	p	p	p	p
	New / min. carbon brush length	mm	32.8/11	p	p	p	p	p
	New / min. Ø collector.	mm	82/78	p	p	p	p	p
	Transmission	i total.	18.2	p	p	p	p	p
	Transmission oil capacity	l	approx. 0.35	p	p	p	p	p
D	Brakes							
	Piston brake pressure		1 bar^ 21 Nm wheel moment	p	p	p	p	p
	Operating brake pressure	bar	60 - 80	p	p	p	p	p
	Brake cylinder capacity - New operating condition	cm ³	approx. 1.59	p	p	p	p	p
	Brake cylinder capacity - Wear level	cm ³	approx. 3.18	p	p	p	p	p

			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF20
E	Wheels / Axles							
	Load wheel tyre size		18 x 7 - 8	p	p	200/50 - 10	p	p
	Steering wheel tyre size		15 x 4.5 - 8	p	p	p	p	p
F	Steering System							
	Steering motor	Type	L. Somer MBT 1141L	p	p	p	p	p
	Output	kW	0.85	p	p	p	p	p
	New/min. carbon brush length	mm	22/11	p	p	p	p	p
	New / min. Ø collector	mm	45.6/40	p	p	p	p	p
	Pressure relief valve (non-adjustable)	bar	70 - 75	p	p	p	p	p
	Impact valve (non-adjustable)	bar	130 - 150	p	p	p	p	p
G	Hoist Frame / Load Section							
	Lower brake Masterpilot / Manual valve (S =)	mm						
	Line brake safety device mast lift cylinder (S =)	mm	0.7	p	p	p	p	p

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			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF20
	Line brake safety device / lower brake valve Free lift cylinder (S =)	mm	1.7	p	p	p	p	p
	Load cylinder (standard)	mm	79.6	p	p	p	p	p
	Load cylinder (large)	mm	80.1	p	p	p	p	p
	Fork carriage load cylinder (standard)	mm	80.1	p	p	p	p	p
	Fork carriage load cylinder (large)	mm	80.5	p	p	p	p	p
G1	Attachment							
	Sideshifting device Operating pressure	bar	>200	p	p	p	p	p
	Overpressure valve Sideshifting device	bar	>200	p	p	p	p	p
	Attachment operating pressure	bar	>200	p	p	p	p	p
	Attachment oil capacity	l/min	25	p	p	p	p	p
H	Chassis / Load Section Connection							
	Tilt speed Forward tilt incl. load / excl. load (i.e parameter setting 5)	°/s +/- 5%	3.6/3.5	p	p	3.6/3.8	p	p

			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF20
	Tilt speed reverse tilt incl. load / excl. load (i.e parameter setting 5)	$\frac{^\circ}{s}$ +/- 5%	4.7/4.7	p	4.7/4.7	4.4/5.0	p	4.2/5.1
I	Hydraulic System							
	Lift speed: incl. load / excl. load	m/s	0.41/0.55	0.40/0.55	0.40/0.55	0.35/0.48	0.36/0.48	0.35/0.48
	Lower speed: incl. load / excl. load	m/s	0.55/0.55	p	p	p	p	p
	Oil capacity	l	approx.18	p	p	p	p	p
	Hydraulic motor	Type	July / GP 116 - F3	p	p	p	p	p
	Motor output S3 = 15%	kW	12	p	p	p	p	p
	Carbon brush length new/ min.	mm	40/15	p	p	p	p	p
	Ø Collector new	mm	82	p	p	p	p	p
	Ø Collector min.	mm	78	p	p	p	p	p
	Pump supply rate	cm ³ /U	11	p	p	p	p	p
	Protection	IP	20	p	p	p	p	p

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			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF20
J	Electrical System							
	Fuses							
	F3.1 24V DC/DC transformer	A	10/5	p	p	p	p	p
	1F Drive motors	A	355	p	p	p	p	p
	1F9 Travel / Lift Electronic system	A	10	p	p	p	p	p
	2F1 Pump motor	A	250	p	p	p	p	p
	4F1 Horn	A	10	p	p	p	p	p
	5F2 DC/DC transformer	A	10	p	p	p	p	p

Torques

			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF 20
A	Chassis / Superstructure							
	Counterweight (M 20-8.8)	Nm	400 ⁺¹⁰	p	p	p	p	p
	Overhead guard	Nm	85	p	p	p	p	p
B	Drive							
	Motor / Transmission	Nm	23	p	p	p	p	p
	Drive / chassis	Nm	135	p	p	p	p	p
	Motor pinion stop nut	Nm	55	p	p	p	p	p
	Oil filler	Nm	22	p	p	p	p	p
	Brake hydraulics - brake cable	Nm	50	p	p	p	p	p
E	Wheels / Axles							
	Drive wheel	Nm	140	p	p	p	p	p
	Steering wheel	Nm	135	p	p	p	p	p
F	Steering System							
	Motor / pump	Nm	25 ⁺⁵	p	p	p	p	p

			EFG-DF 13	EFG-DF 16	EFG-DF16L	EFG-DF18	EFG-DF18L	EFG-DF 20
G	Hoist Frame / Load Section							
	Mast holder / Chassis	Nm	85	p	p	p	p	p
H	Chassis / Load Section Connection							
	Tilt cylinder / chassis	Nm	-					
	Tilt cylinder / mast	Nm	170	p	p	p	p	p
	Tilt cylinder in cyldinder	Nm	25	p	p	p	p	p
I	Hydraulic System							
	Motor / pump	Nm	25 ⁺⁵	p	p	p	p	p
	Vent. / motor	Nm	18	p	p	p	p	p

Maintenance of Jungheinrich Products

Jungheinrich products are serviced on the basis of standard maintenance checklists. The following (enclosures) are applied:

- Maintenance checklist,
- Additional service items for system trucks,
- Additional inspection items for UVV testing where servicing and UVV test are combined.

→ see also UVV test instructions.

The enclosed lists are for sample purposes.

The maintenance checklists are issued by the persons in charge. Maintenance intervals and instructions are issued by the VZ / AF customer service managers.

1 Terminology Definition

1.1 Maintenance Definition

Maintenance:	Maintaining the rated condition.
Inspection:	Determining and assessing the actual condition.
Repair:	Restoring the rated condition (error diagnostics / error rectification, parts replacement etc.).

1.2 Maintenance Interval Definition

Preparation time:	Time required to expose the components, e.g. disassembly and assembly of brush covers.
Net servicing time:	Time spent on servicing the components, e.g. visual inspection of carbon brushes and determining the wear level.
Total servicing time:	Sum of preparation and net servicing time.
Total time:	Overall time between arrival at and departure from customer.

The maintenance checklist is a working guideline for customer service technicians to help them perform maintenance work. Any other type of work not mentioned here is repair or other test work, e.g. UVV test.

In the framework of maintenance, an operational test is performed and where possible the brake lining wear level assessed via a peep hole. A thorough inspection of the brakes is carried out at least 1 x year or every 1000 service hours. To do this, the brakes, e.g. load wheel brakes, must be opened.

The time required for this is stipulated in the UVV test overtime specifications.

2 Points covered under maintenance

3 Summary

2.1 Test items

- Operation
- Correct levels (e.g. oil level)
- Secure attachments
- Damage / wear
- Settings (e.g. play / parallelity)
- Sealing / leakages

2.2 Maintenance items

- Cleaning (removal of contamination caused through normal use, e.g. brake lining dust)
- Grease, oil, lubricants
- Bleeding
- Adjusting
- Tightening

- Maintenance is a planned preventative strategy designed to maintain the truck's rated condition.
- It is condition and time-oriented.
- It extends the working life of the product and increases its uptime.
- It provides security to the user of the product.

Maintenance and repair work is extended after 1000 service hours or at least 1 x annually.

The VK-E repair charge out rates should be applied.

Maintenance checklist

Customer:	Place:
	Type:
	Serial no.:
	Year of manufacture: Service hours:

		Complaints				Complaints	
		Yes	No			Yes	No
001	Brakes			003	Energy supply		
	Brake force of operating and parking brakes	☐	☐		Battery	☐	☐
	Brake lining wear	☐	☐		Battery plug	☐	☐
	Brake fluid level (oil level)	☐	☐		Gas system	☐	☐
	Lines and connections	☐	☐				
002	Electrics			004	Travel		
	Instruments and operating switches	☐	☐		Valve setting	☐	☐
	Testing the signal system	☐	☐		Ignition and spark plugs	☐	☐
	Fuses and wiring	☐	☐		Distributors	☐	☐
	Lighting	☐	☐		Replace air, oil and fuel filters	☐	☐
	Travel direction switches	☐	☐		Check engine oil	☐	☐
	Microswitch settings	☐	☐		V-belt	☐	☐
	Contactors and relays	☐	☐		Exhaust system	☐	☐
	Safety switches	☐	☐		Coolant level	☐	☐
	Electrical steering	☐	☐		Anti-freeze inspection	☐	☐
	Carbon brush wear	☐	☐		Engine suspension	☐	☐
	Cable and motor attachments	☐	☐		Test transmission for noises	☐	☐
	Electronics check				Hydrostat	☐	☐
	Check / delete error log book	☐	☐		Check oil or grease filling	☐	☐
	Check parameters, adjust if necessary	☐	☐		Wheel bearings and wheel attachments	☐	☐
					Tyre wear	☐	☐
					Tyre aire pressure	☐	☐

JUNGHEINRICH	Maintenance of Jungheinrich Products	12.05	4	GB
Customer:		Place:		
		Type:		
		Serial no.:		
		Year of manufacture:		Service hours:

		Complaints				Complaints	
		Yes	No			Yes	No
005	Structure of truck				Operator platform	☐	☐
	Battery trolley	☐	☐				
	Mast attachment	☐	☐	007	Agreed work		
	Doors and covers	☐	☐		Fully lubricate the truck in accordance with lubrication schedule	☐	☐
	Counterweight bolts	☐	☐		When maintenance is completed, present the truck to the responsible person.	☐	☐
	Overhead guard	☐	☐				
	Slide rails	☐	☐				
	Driver's seat	☐	☐	008	Steering		
	Support systems	☐	☐		Steering play and steering chain	☐	☐
	Labels	☐	☐		Hydraulic steering	☐	☐
					Steering axle	☐	☐
006	Hydraulic movement				Steering housing oil level	☐	☐
	Roller bearings and stops	☐	☐		Emergency recovery test	☐	☐
	Mast section play and parallelity	☐	☐				
	Lift chains	☐	☐	009	System components		
	Pull rod	☐	☐		Mast		
	Forks	☐	☐		Bracing	☐	☐
	Tilt angle	☐	☐		Lift cutouts	☐	☐
	Connections and lines	☐	☐		Diagonal travel switch	☐	☐
	Cylinders and piston rods	☐	☐		Slack chain switch	☐	☐
	Cylinders and piston rod attachments	☐	☐		Chain settings	☐	☐
	Check oil level, replenish if necessary	☐	☐		Potentiometers, index switches, sensor bearings	☐	☐
	Replace hydraulic oil filter	☐	☐		Slide pieces	☐	☐
	Hydraulic system operation	☐	☐				
	Attachments and auxiliary equipment	☐	☐				

	Maintenance of Jungheinrich Products	12.05	5	
Customer:		Place:		
		Type:		
		Serial no.:		
		Year of manufacture: Service hours:		

	Complaints			Complaints	
	Yes	No		Yes	No
Aux. lift and attachment			Wire guidance system		
Gear wheels and toothed racks	☐	☐	Hydraulic cylinder brake	☐	☐
Creep distances and limit positions	☐	☐	Stopping distances and end of aisle safety device	☐	☐
Chain settings	☐	☐	Sensors	☐	☐
Bearings and stops	☐	☐	Electrics		
Traverse and lift speeds	☐	☐	Personal safety system	☐	☐
Swivel	☐	☐	Operational test	☐	☐
Telescopic forks					
Synchronised	☐	☐			
Transmission switches	☐	☐			
Overpressure	☐	☐			
Cabin					
Cabinets	☐	☐			
Safety switches and panels	☐	☐			
Abseil device	☐	☐			
Hydraulics					
Pump speed	☐	☐			
Wheels					
Drive wheel position and forward travel	☐	☐			
Catches	☐	☐			
Starting rollers	☐	☐			
Hicont					
Sensor system	☐	☐			

Battery service maintenance checklist – to be carried out only for separately agreed battery maintenance contracts

Customer:	Place:
	Type:
	Serial no.:
	Year of manufacture: Service hours:

	Faults			Faults	
	Yes	No		Yes	No
Basic battery service			Battery service electrolyte circulation		
• Measure overall battery voltage	☐	☐	• Visually inspect hoses and coupling system	☐	☐
• Measure cell voltage	☐	☐	• Operational test	☐	☐
• Measure electrolyte density	☐	☐	• Check and replace air filter	☐	☐
• Check electrolyte level, replenish if necessary	☐	☐		☐	☐
• Visually inspect:			Aquamatik service (additional service for Aquamatik refill system)		
- Container	☐	☐	• Check stops and hoses for leaks (connect water supply)	☐	☐
- Battery surface	☐	☐	• Check water lines and container systems (no metal)	☐	☐
- Connectors	☐	☐			
- Connector cable	☐	☐			
- Plug	☐	☐			
• Assess overall condition	☐	☐			
• If applicable check Aquamatik system on battery side	☐	☐			
• Leakage?	☐	☐			
• Water flow	☐	☐			
• Floating stop operation	☐	☐			
• Draw up an inspection report	☐	☐			
	☐	☐			
Battery service basic cleaning					
• Cleaning as per ZVEI code of practice	☐	☐			
• Suction off acidic fluid	☐	☐			
• Measure battery temperature	☐	☐			

Addition Test Items for UVV Inspection

Where maintenance and UVV inspection are combined, the following tasks must be performed in addition to the maintenance.

1. Chassis

- Check for cracks on load-bearing components and weld seams.
- Check decals are complete and legible (reverse steering, hooks, capacity chart, etc.).

2. Mast

- Check load forks for cracks and deformation, (and welded seams if required).
- Measure lift chain elongation under maximum load using chain wear gauge no. 3 ($1\frac{1}{2}$ " - $1\frac{1}{4}$ ").

4. Brakes

- Record brake retardation.
- Visually inspect all brake components.
- Measure brake lining and air gap.

11. Hydraulic system

- Test pressure relief valves.
- Determine the leak oil rate for lowering and tilt.

14. Special accessories

- Ensure platform is operating safely.
-

 JUNGHEINRICH	EFG-DF	11.04	5.1	
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Service manual items

Title	SHB No.
Replacement/adjustment steering angle potentiometer	B 6002
Speed reduction setting instructions	B 6006
Replacing the Brake Multi-Plates	D 6001
Stopping distances, minimum braking	D 6360.03
Main brake cylinder (single stage)	D 6360.14
Instructions for the installation of brake tubes	D 6360.16
Tightening torques for screwed connections on brake systems	D 6360.18
Changing of the brake fluid	D 6360.19
Parking brakes	D 6360.21
Steering auxiliary motor connection layout	F 4001
Test dimensions and adjustments for hoist frames incorporating oblique support rollers	G 6233.01
Length check of load chains	G 6355.01
Fork tines	G1 6401.01
Pilot Valve Basic Setting	I 5001
Pilot Valve Basic Setting	I 5007
Mounting instructions for cutting ring joints	I 6600.06

Title	SHB No.
Lowering brakes and line break safety devices	I 6632.01
ELSE-CHECK	J 5002
Instructions for the prevention of accidents and damage to equipment when performing servicing, checking and repair operations on fork-lift trucks equipped with electronic components	J 6900.09
Notes on how to avoid accidents and material damage when carrying out maintenance, test and repair work on ground conveyor vehicles with electronic components.	Z 0000.15
Code list - cable colours	3 6900.08

Replacement/adjustment steering angle potentiometer

Preparatory actions

- Park the truck safely.
- Completely lower the load lifting device.
- Set main switch and key switch to "OFF".

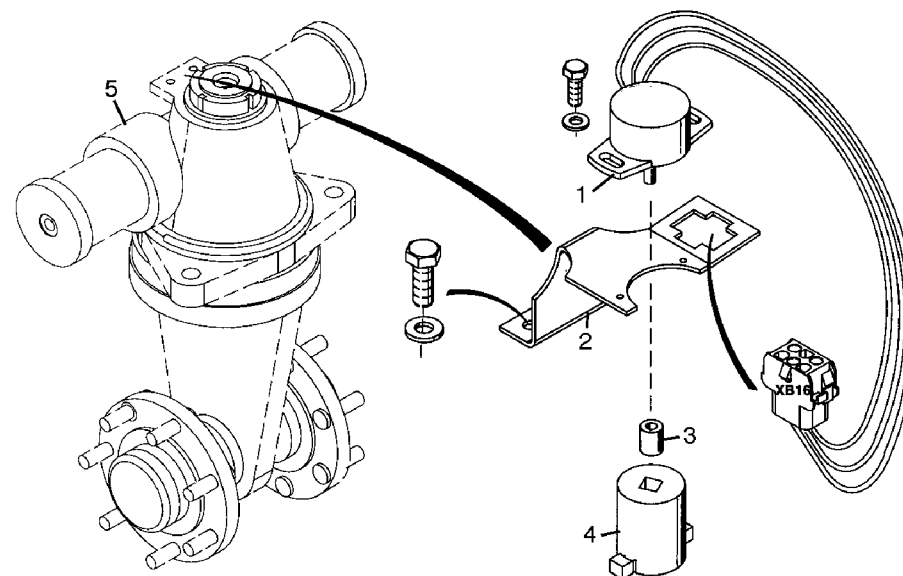
Dismounting

- Disconnect the potentiometer connection, detach plug from its clip-holder.
- Loosen the fastening screws and pull potentiometer out from the adapter.

Mounting

- Set the swivelling bolster to driving straight on. Insert adapter with the dowel pin into the swivelling bolster.
- Turn the potentiometer shaft with the shouldered side towards the red connecting cable; this sets the electrical centre of the potentiometer.
- Slip the rubber bushing onto the shaft of the steering angle potentiometer.
- Mount the steering angle potentiometer onto the adapter and screw it to the holder.
- Attach plug to the clip-holder and reconnect the potentiometer connections.
- Perform "teach-in" in parameter "Steering parameter adjustment".

☞ see section 6 "Setting the steering parameters".



Pos.	Designation
1	Steering angle potentiometer
2	Holder
3	Rubber bushing
4	Adapter with dowel pin
5	Swivelling bolster

Speed reduction setting instructions



Unlike the serial setting, the truck must be set to a general speed reduction level.

- from a lift height above 6.5 m
- or if required by the customer.

The max. adjustable speed reduction, depending on the truck type, is 12 or 14 km/h (see table).

Setting

- Park the truck securely



Jack up the truck to prevent accidents! Setting the travel parameters

- Disassemble the base plate, if necessary remove the side panel to expose Interface 3/4.
 - Prepare the truck for operation
1. Select **Service mode** on the LISA display and change the **Travel** parameters.
 2. Change and save the parameters according to the truck type / table.

Parameter	Operating program	1	2	3	4	5
P5	Reversing speed	7	8	9		
P7	Forward speed					

EFG-DF / EFG-V

Setting	9	8	7	6	5	4	3	2	1	0
km/h	12	11	10	9	8	7	6	5	4	3
V max. ¹⁾	16	15,2	14	13	12	11,3	10,6	10	9,5	9

EFG-DFac / EFG-Vac

Setting	4	3	2	1	0
km/h	6,5	5	4	3	2,5
V max. ¹⁾	13,9	13,2	12,5	11,8	11,1
Setting	9	8	7	6	5
km/h	14	12,5	11	9,5	8
V max. ¹⁾	17,2	16,5	15,8	15,2	14,5

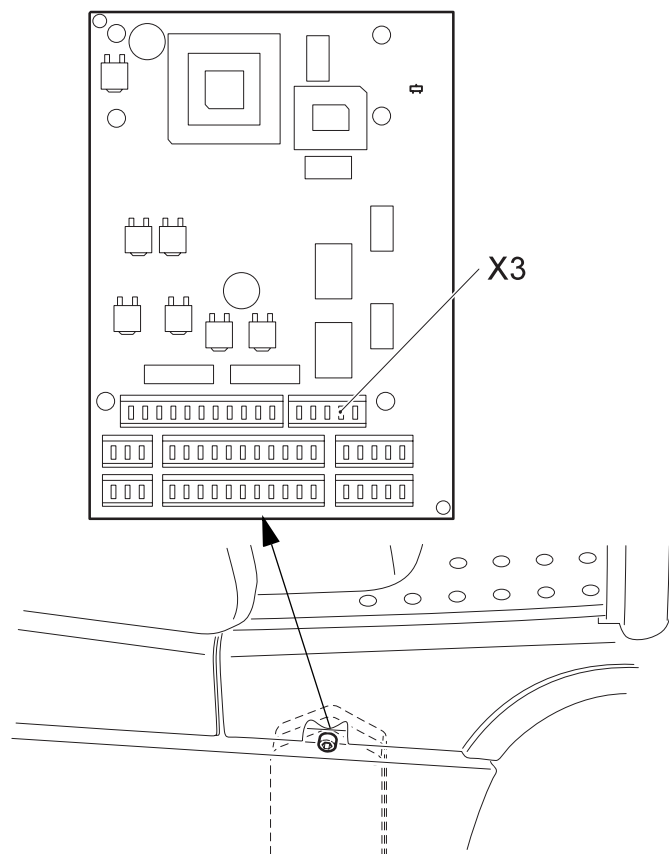
¹⁾ Jumper closed

Interface3/4

- From connector X3, remove jumper from Pin1 to Pin2



The travel parameters can now no longer be changed.



Connector layout

Connector X3

Pin	Meaning	Type
1	GND for pin 2	GND
2	Travel current reduction release	Digital input
3	Not connected	
4	Not connected	
5	Not connected	
6	GND for X2 pin 6	GND



When the jumper is open, the settings for “Forward travel” and “Reversing travel” are **not** displayed on the LISA.

Identification



After setting ,**decals** must be attached to the controllers, Interface3/4 and the driver's display to indicate that the max. travel speed has been restricted, in the event of controller components being replaced in the future

Example:

V max. = 8 km/h

52012398

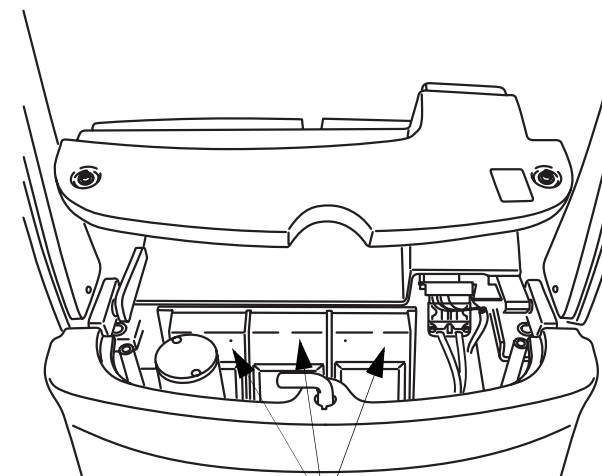
Decals	Order no.
Vmax = 6.5 km/h	52012397
Vmax = 8 km/h	52012398
Vmax = 9.5 km/h	52012399
Vmax = 11 km/h	52012400
Vmax = 12.5 km/h	52012411
Vmax = 14 km/h	52012412



After replacing controller components, the **speed reduction** parameters must be reset.

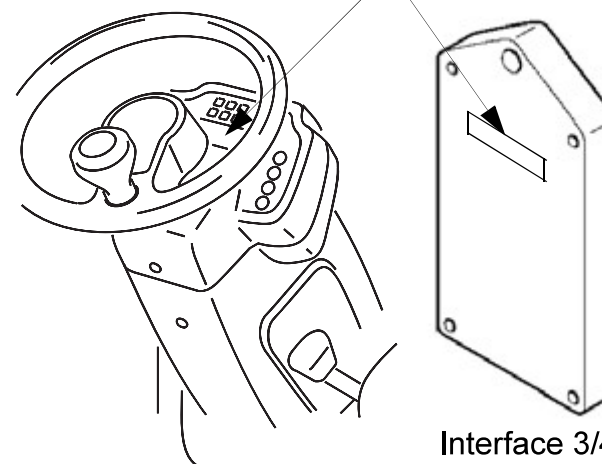


If this setting is not made, the truck will travel too fast, endangering safety.



V max. = 8 km/h

52012398



Interface 3/4

Replacing the Brake Multi-Plates

Preparation	5.1
Tools	5.1
Drive Unit Disassembly	5.2
Gear Unit Disassembly	5.3
Brake Multi-Plate Assembly	5.3
Gear Unit Assembly	5.4
Measuring the Thrust Washer Thickness	5.5
Drive Unit Assembly	5.6

Preparation

- Park the truck securely
- Raise the load pick-up



Tie the mast to the cross member with a chain.

- Turn the main switch and key lock OFF.
- Remove the floorboard.
- Jack up the truck
- Release the handbrake

Tools

- Tie chain
- Clevis
- Chain hoist
- Nylon sling 1.0t
- 2 guide bolts
- M10 screw ring



Indicates a safety note which must be observed to avoid danger to personnel.



Indicates a note which must be observed to avoid material damage.



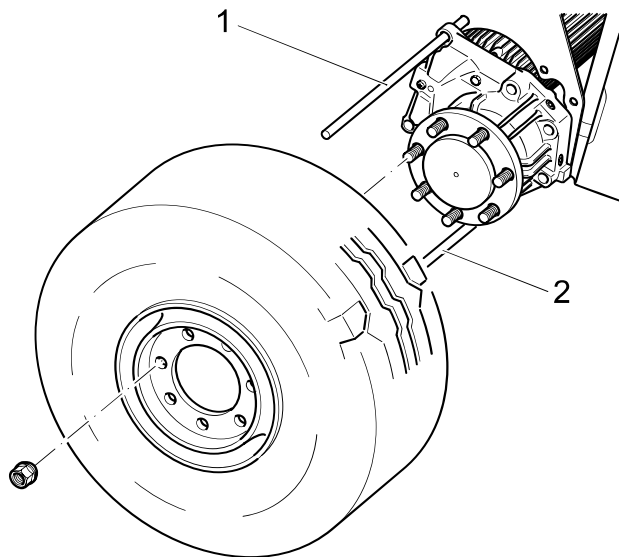
Explanation.



To ensure even braking, the brake multi-plates on both drives must always be replaced together.

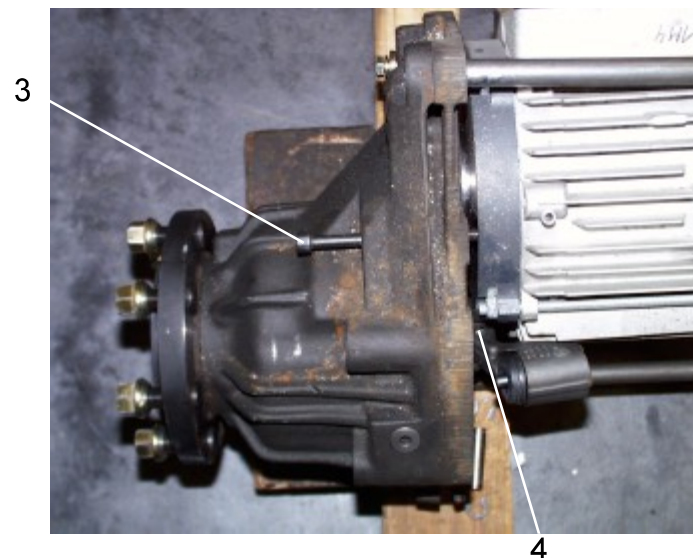
Drive Unit Disassembly

1. Remove the wheel nuts and disassemble the load wheel.
2. Disconnect the motor and sensor cables.
3. Unscrew the brake cable, taking care **not** to open the brake line.
4. Drain the gear oil.
5. Unscrew first the fastening screws in the 5 and 10 o'clock positions, insert and tighten guide bolts (1 + 2). Now remove the other fastening screws.
6. Carefully remove the drive unit by approx. 10 cm.



Block the brake pedal to prevent accidental activation. After disassembling the brake cylinder do not apply the brake pedal. The brake cylinder piston does not have an internal stop.

7. Press the upper retaining ring out of the groove and push the brake cylinder bolt (4) down. Provisionally attach the brake cylinder to the chassis.



In order to handle the drive unit (weight approx. 43 kg) more easily, insert the clevis in the eye on the top hoist frame cross member and attach the chain hoist.

8. Insert the M10 screw ring in the motor shaft and attach the chain hoist. Position the drive unit vertically and support it securely.
9. Remove the motor screws (3) and remove the motor from the gear unit.

Gear Unit Disassembly

1. Remove the eight M6x16 gear lid screws, retract the dowel pin and carefully lever the gear lid out from the housing (this is made complicated by the sealant).
2. Raise the gear lid and multi-plate carrier from the housing and remove the multi-plates and thrust washer from the gear unit. Do **not** dismantle the gear lid and internal multi-plate carrier.
3. Remove the sealant and clean the surfaces.



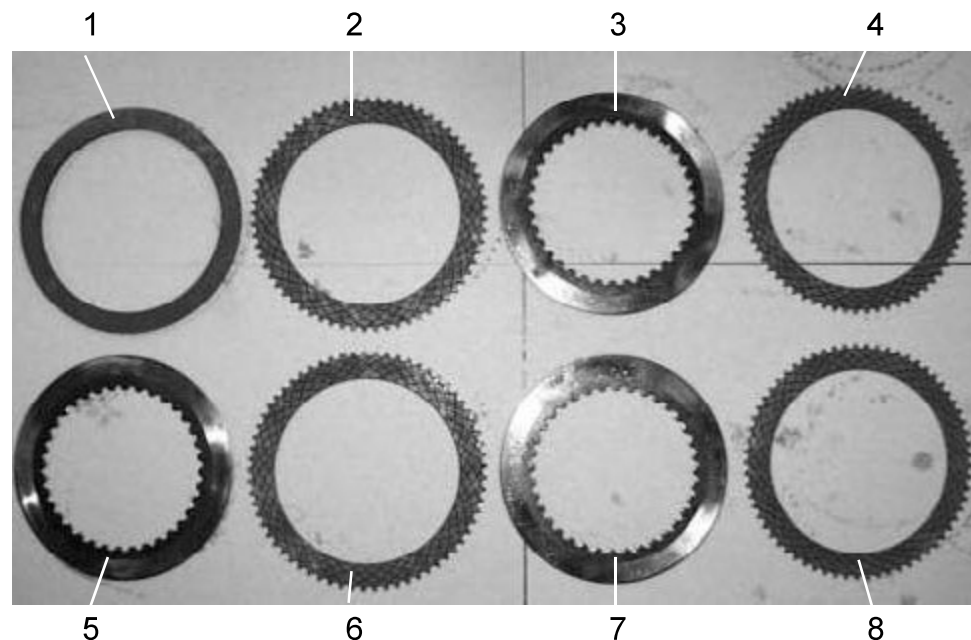
If the thrust washer (1) must be replaced due to wear, the washer thickness must be re-measured (see Measuring the Thrust Washer Thickness).

Brake Multi-Plate Assembly



If only the multi-brake group (2-8) is to be replaced, the existing thrust washer (1) can be re-used.

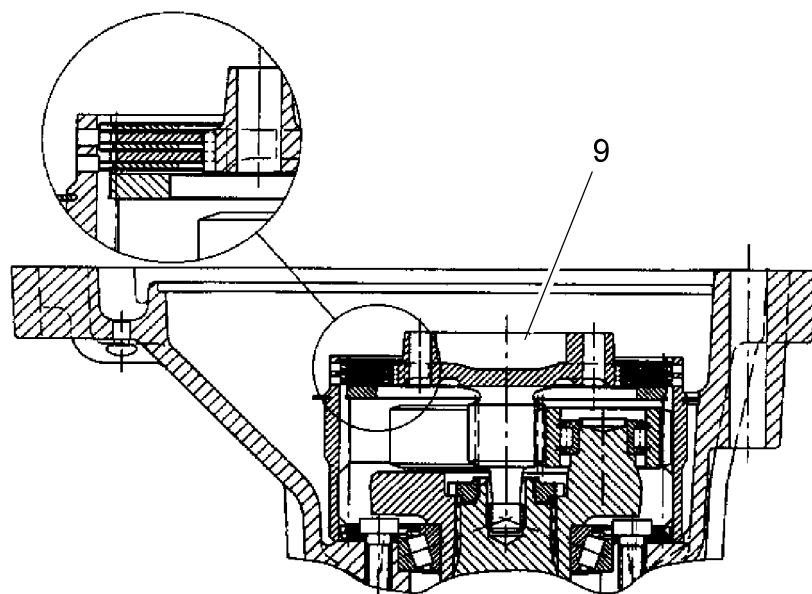
Place the multi-plates in the ring gear in the following order:



1. Thrust washer (1)
2. Outer multi-plate (2) / Inner multi-plate (3) / Outer multi-plate (4) / Inner multi-plate (5) / Outer multi-plate (6) / Inner multi-plate (7) / Outer multi-plate (8).
3. Align the Sinus inner multi-plates (3; 5; 7) evenly according to the contour. When placing the multi-plates in the ring gear note the punch direction.



A quick and precise method is centering with an inner multi-plate carrier (9) which has **not** been used for the gear unit assembly.



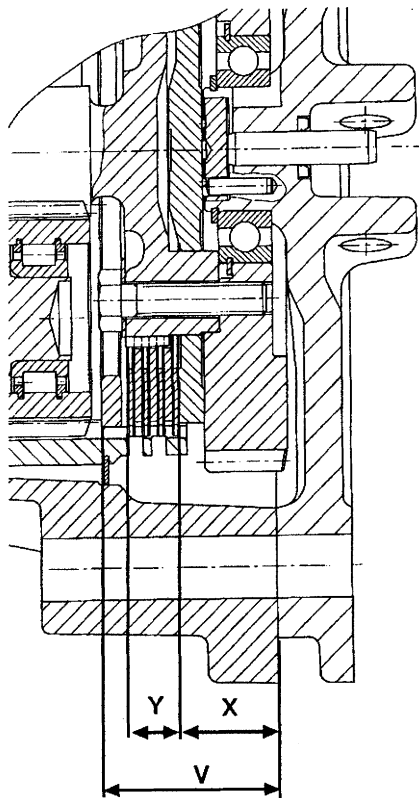
The multi-plate position is fixed by turning or moving the inner multi-plate carrier.

Gear Unit Assembly

1. Replace the sealant (Loctite 574) on the gear lid surface.
2. Carefully insert the gear lid and internal multi-plate carrier in the gear unit while taking care not to displace the centred multi-plates.
3. Drive in the dowel pins, insert the gear lid screws with Loctite 234 and torque to $M_A = 9.6 \text{ Nm}$.

Measuring the Thrust Washer Thickness

- “X” = Measure the distance between the end faces of the gear lid and the thrust washer.
- “Y” = Measure the thickness of the multi-plate group.
- “W” = Calculate X+Y
- “V” = Measure the distance between the end faces of the gear housing and the thrust washer.
- “Z” = Calculate V- W.


Example:

X = 23.23 mm (measured)

Y = 12.60 mm (measured)

W = 23.23+12.60 = **35.83 mm**

V = 41.93 mm (measured)

Z= 41.93-35.83 = **6.10 mm**

“Z”	Thrust Washer Measurement ¹⁾
5.58 to 6.10	4.8 mm
6.10 to 6.70	5.3 mm
6.70 to 7.22	5.8 mm

The required **thrust washer thickness** is **4.8 mm**.

¹⁾ See Spare Parts Catalog for order no.

Drive Unit Assembly

1. If necessary, replace the O ring on the motor bearer plate.
Place the motor back in the gear unit, insert the motor flange screws (1x M8x50 and 2x M8x75) and torque to $M_A = 23 \text{ Nm}$.
2. Place the drive unit back in its original position.
Assemble the brake cylinder. Insert the brake cylinder bolts and press the retaining ring into the groove.



Make sure the retaining ring is correctly positioned in the bolt groove.

3. Insert the fastening screws of the drive unit and torque them to $M_A = 135 \text{ Nm}$.
4. Connect the brake cable and torque to $M_A = 50 \text{ Nm}$.
5. Connect the motor and sensor cables.
6. Fill with approx. 0.35 litres of gear oil. Insert the screw plug (1) with a new seal (2) and torque to $M_A = 22 \text{ Nm}$.

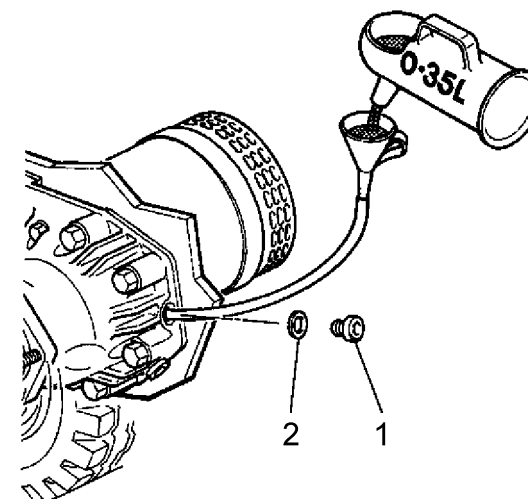


For the gear oil specification and order no. see the operators manual. The exact amount of oil is defined by the oil filler opening (overflow). Only fill when the unit is installed.



If the brake system has been opened, the whole brake assembly must be bled.

7. Fit the load wheel and torque the wheel nuts to $M_A = 140 \text{ Nm}$.



Measuring the minimum braking requirement and braking distance

According to ISO 6292 and FEM the brake test must include the minimum braking distance measured with a decelerometer (motometer, dynamometer etc.).

This document contains the max. permissible braking distance as guidelines.

Test conditions

The braking must be carried out on a level, dry, horizontal track made of concrete or similar.

If the truck has a driver's cab, the driver must be in it when recording the braking.

All industrial trucks are recorded with maximum load.



The load must be secured to prevent it from slipping.

Tow trucks are recorded without trailer and load.

The load handler must be in the transport position, i.e. freely lifted as low as possible in the home position. The mast must be tilted back and pulled back.

Braking is recorded for both forward and reverse travel in the straight-ahead direction. Tow trucks are recorded only in the tow direction.

Braking is applied suddenly. The wheels must not skid or block during braking and the truck should handle well.

Before testing the brakes:



On trucks with traction current control the regenerative braking must be deactivated.

- Deactivate pedal brake
EFG Series 1, 2 and 3: Pull off brake switch cable.
EFG Series 4 and 5: Bypass brake pedal switch contact (7S11).
- Set parameters in accordance with the table

Parameters	Parameter value
Reduction / Reducing Brake	0 (Min)
V _{max} forward + reverse	9 (Max)
Coasting brake	0 (Min)
Brake ramp	0 (Min)
Option 4	0 (Min)



After completing the brake test restore the pedal brake to the operational status and the parameters to their original range.

Braking Distance Recording

- Check the travel speed (with load) from the truck's data sheet or travel a 5m distance at maximum speed and record the time taken to cover this distance. Conversion formula:
Time recorded in seconds (t) to km/h (v): $v = 18 / t$ [km/h]
- Travel at maximum speed and then brake to a halt at a given marking.
- Record the braking distance and compare this with the maximum braking distance permissible for the type of truck.

Minimum Braking Distance Recording

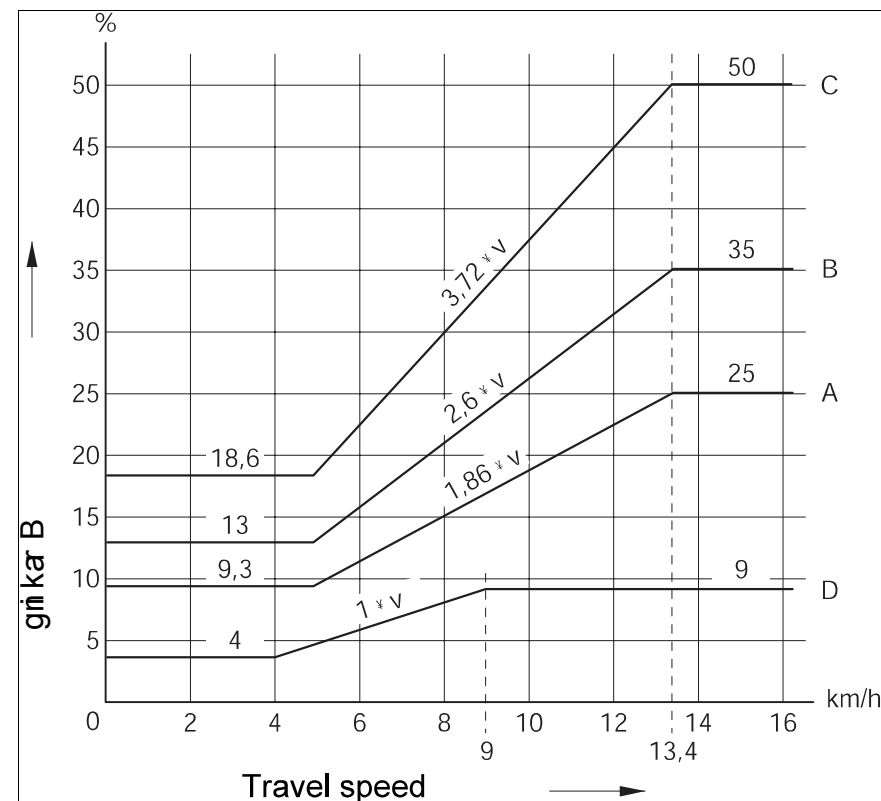
- Check the travel speed (with load) from the truck data sheet or record the maximum travel speed as described in paragraph 1 of Braking Distance Recording.
- Attach a decelerometer (motormeter, dynamometer etc.) to the truck and prepare it for operation. Note the manufacturer's instructions.
- Bring the truck to a halt from the maximum speed.



Where possible, brake a truck without an automatic brake (e.g. magnetic brake) so that the wheels are just before the point of skidding.

For pedestrian trucks move the tiller suddenly to the full braking zone.

- Compare the braking value shown in % with the minimum braking value for the truck as indicated in the diagram.



A	(See table Group A)
B	(Tow truck with 1 or 2 braked wheels)
C	(All-wheel braked tow truck)
D	(See table Group)

**Junior series, ED series, ER series, ET series, EK series,
EFG series, EJE-KmS, EJP etc.**

Group A / Minimum braking:

Travel speed (km/h)	4	5	6	7	8	9	10
Braking distance (m)	0.85	1.05	1.27	1.50	1.70	1.90	2.10

Travel speed (km/h)	11	12	13	14	15	16
Braking distance (m)	2.33	2.54	2.75	3.08	3.54	4.00

Travel speed (km/h)	17	18	19	20
Braking distance (m)	4.55	5.10	5.70	6.30

**ETX (except ETX-IF. ETX automatic),
ESP, ESP-IF, KmS 1, etc**

Group D / Minimum braking:

Travel speed (km/h)	3.5	4	5	6	7	8	9
Braking distance (m)	1.38	1.57	1.97	2.36	2.75	3.15	3.54

ETX-IF, ETX automatic, etc.

- Minimum braking:
14% (max. permissible travel speed = 9 km/h)

→ The load wheel brake must only apply max 6% (+1%/-2%).

- Max. permissible braking distances:
The min./max. permissible stopping distance (braking distance and response time) is indicated on a notice.

Teletrak etc.

- Minimum braking distance:
see diagram, **Group B** or **C**
 - Max. permissible braking distances:
For driverless vehicles with an anti-collision safety device,
the braking must be performed so that the vehicle comes to
rest within the sphere of influence or deflection path of the
anti-collision safety device.
 - For brake system setting and maintenance
see service manual 6360.xx, ETX, ESP and AS.
 - Parking brake test:
see service manual D 6360.21
-

Main Brake Cylinder (Single-Stage)

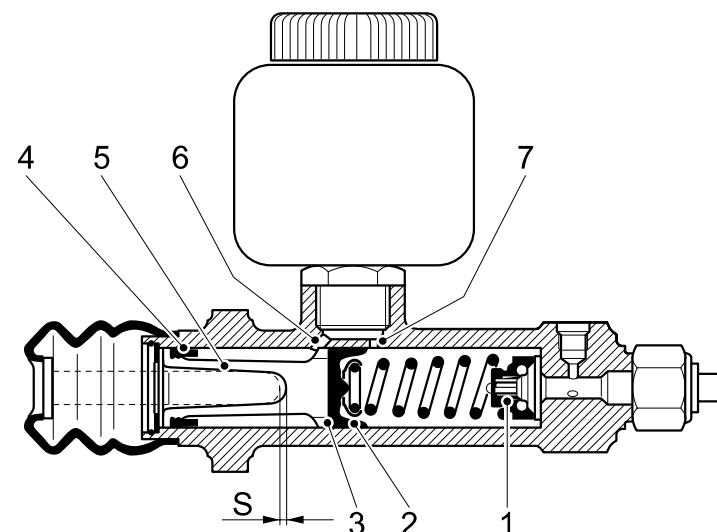
1. Design Features (general)

The main brake cylinder is used to initiate and control the braking action.

1. Main brake cylinders for brake systems incorporating drum brakes are fitted with a bottom valve to ensure a rapid brake response at short pedal travel. The bottom valve (1) ensures that the brake fluid contained in the brake system is constantly kept under a slight overpressure (pilot pressure 0.4 - 1.7 bar pressure gauge reading) when the brake pedal is not operated so that the braking action will commence immediately when the brake pedal is depressed.
2. Main brake cylinders for brake systems incorporating disc brakes are fitted with special bottom valves (bottom valve provided with throttle bore), as contrary to drum brake systems, no pilot pressure must exist in the brake system (pressure gauge reading 0 bar when the brake pedal is not operated).



To avoid any confusion between the two different brake cylinders, the main brake cylinders destined for disc brake systems are fitted with a metal or adhesive tape bearing the inscription "Cylinder is fitted with special bottom valve".



Item	Designation
1	Bottom valve
2	Disc
3	Primary sleeve
4	Vent hole
5	Admission bore
6	Secondary sleeve
7	Piston
S	Piston spindle clearance 1,0mm

2. Servicing and Repair

Servicing Intervall

Every 500 operating hours / 3 months:

Visual inspection of the line connections for security and tightness (screwed connection must be dry).

Check the dust protection cap for security, cleanliness and damage.

Adjustments

Following the removal or replacement of the main brake cylinder, the clearance "S" between the piston and the spindle must be checked and readjusted, if necessary, to ensure that the vent hole (4) is not covered by the primary sleeve (3).

Prior to performing the adjustment, remove the bolt (8), unscrew the check nut (9) and turn the fork head (10) until the prescribed clearance of

$$S = 1.0 \text{ mm}$$

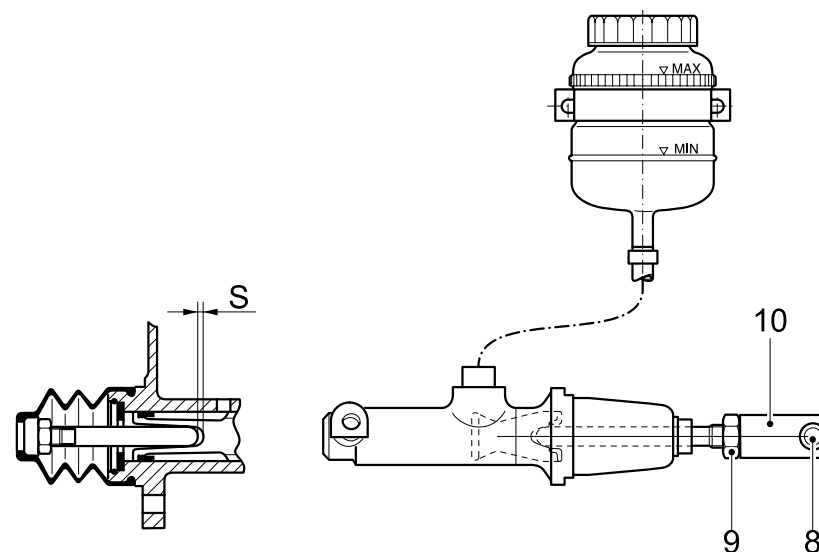
has been obtained. Refit the fork head and tighten the check nut.

Repair

Remove the cylinder. Temporarily blank off the tube coming from the compensating vessel to prevent any brake fluid from escaping. Remove the connection pipe, the attachment bolts and the pedal linkage. Dismantle the cylinder and clean all parts thoroughly using white spirit or brake fluid.

Check the cylinder bore for scoring and pitting. If any existing scoring or pitting cannot be removed by gentle polishing, discard and replace the cylinder.

When performing repairs, all parts of the repair kit must be used. Always adhere strictly to the mounting instructions supplied with the parts.



Guidelines for Installing Brake Lines

The brake lines used are manufactured in accordance with DIN 74234 and are only used with 4.75 mm outer diameter and 0.7 mm thickness.

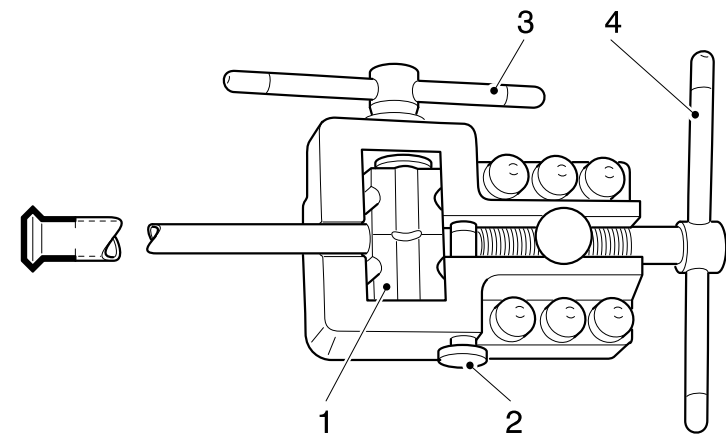
Guidelines for Laying Brake Lines

1. Brake lines must be protected against external damage.
2. Line bends of $r \leq 25$ mm must not be used. To eliminate the danger of cross-sectional restrictions, line bends must be manufactured in a cold forming process with line bending pliers.
3. Line end pieces must not be used. These could create air pockets.
4. To avoid chafing caused by line clamps, all clamps must be coated with shrink-resistant material (rubber, plastic, leather etc.)

Preparation of Brake Line Connections

1. The line connections must form a conical connection ("F" flange) with spigot FS M 10 x 1 to DIN 74 234. A flanging device is required to make a compliant flange.
2. Cut the brake line with a saw at right angles, remove any splints and chippings from the inside and outside. Apply water-free pressurised air to the line.

3. Insert blocks (1) for line $\varnothing$ 4.75 mm in the flanging device, 45° side to the flange spindle (4). Insert the brake line in the block as far as the spacer pin (2). Fit the flange insert for line $\varnothing$ 4.75 mm in the flange spindle (4) and create the flange.
4. Before tightening the spigot (line nut) coat the outer flange surface with brake fluid.



Tightening Torque for Screwed Connections on Brake Systems

To fulfill their sealing function, the sealing surfaces and threads are designed to meet the relevant requirements.



The application of forces exceeding the maximum values indicated in the tables will damage and destroy the screwed connection, seals or housing.

Table 1 - Tightening torque for screwed connections

Examples:

1. With copper sealing ring: admission pressure values, screwed sockets, banjo-bolts with ring sockets, etc.
2. Without copper sealing ring: screw plugs, union nuts, brake hose fittings, venting valves M 10 and larger.

Thread designation/pitch in mm				Tightening torque * <u>with</u> copper sealing ring	in Nm <u>without</u> copper sealing ring
1	1.25	1.5	2		
M 6				10 ^{+1.5}	2.5 ^{+1.5}
M 7				12 ⁺²	3 ⁺²
	M 8			16 ⁺³	4 ⁺⁶
M 10				15 ⁺³	12 ⁺⁴
	M 10			19 ⁺⁴	12 ⁺⁴
M 12				19 ⁺³	15 ⁺⁴
		M 12		25 ⁺⁷	15 ⁺⁵
M 14				20 ⁺⁶	20 ⁺⁵
		M 14		30 ⁺⁶	17.5 ^{+5.5}
		M 16		35 ⁺⁷	17.5 ^{+5.5}
		M 18		43 ⁺⁷	
		M 20		53 ⁺⁷	
		M 22		60 ⁺⁷	
		M 24		80 ⁺¹⁵	
		M 26		82 ⁺¹⁸	
			M 27	95 ⁺¹⁵	

* In the case of cadmium-plated threads 0.7 of the above values must be applied.



This symbol is used before safety instructions that have to be observed in order to prevent any danger to personnel.



This symbol is used before instructions that have to be observed in order to prevent any damage to assemblies.



Used before general notes and explanations.

	SHB	D 6360.18 GB
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Table 2 - Tightening torque for brake components

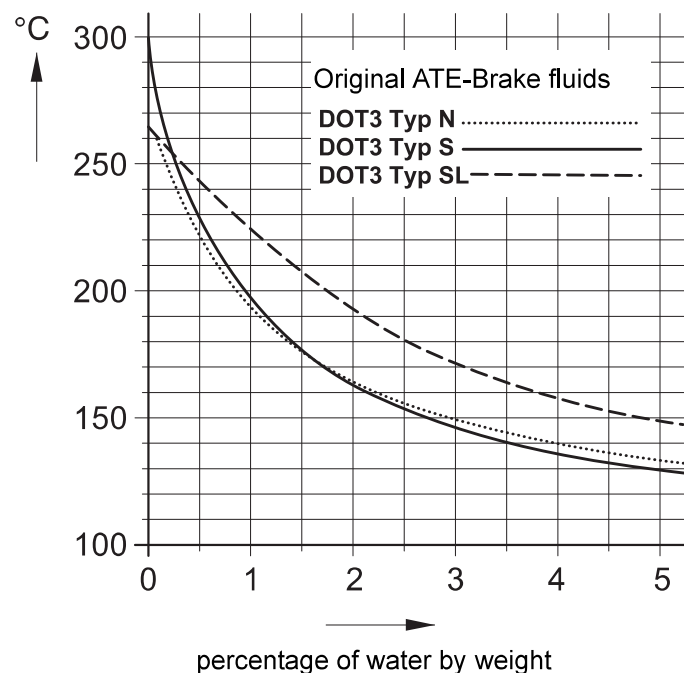
Designation	Thread	Surface protection	Screwed into	M _A in Nm
Brake light switch * without copper sealing ring	M 10 x 1 taper thread	zinc-plated	grey cast iron, brass	20 ⁺¹⁰ 13 ⁺⁴
Brake light switch with copper sealing ring	M10 x 1	zinc-plated	grey cast iron, brass	20 ⁺¹⁰ 13 ⁺⁴
Ventilation valves	M6 M7 M8	zinc-plated or phosphated	grey cast iron	2.5 ^{+1.5} 3 ⁺² 4 ⁺²
Screwed plug without copper sealing ring	M 10 x 1 taper thread	phosphated	grey cast iron	25 ⁺⁵
Connecting hose of pressure testing de- vices at test connec- tion or coupling head	M 18 x 1.5			25 ⁺⁷

* Prior to installation, apply brake cylinder compound or brake mounting spray to the threads.

Changing the Brake Fluid

Brake Fluid

Brake fluid to DOT 3 and DOT 4 is hygroscopic, i.e., it possesses the peculiarity of constantly absorbing water from the atmospheric humidity. The boiling point of fresh brake fluid is between 260°C and 290°C. This value decreases considerably with increasing water absorption, as is shown by the diagram below



The heat generated by frequent use of the brakes is considerable and, if the brake fluid contains a relatively large amount of water, might cause steam bubbles, which can lead to the failure of the brake system.

To prevent this happening, it is essential to change the brake fluid at the intervals indicated in the operating instructions:

vehicles in normal use

= every 2000 hours or at yearly intervals

vehicles used in cold storage

= every 1000 hours or half-yearly facilities intervals

Instructions for handling brake fluid

Brake fluid must always be stored in the original container.



The container must be immediately and carefully closed after brake fluid has been taken from it.

According to the SAE-Specification, the maximum storage period of brake fluid, when kept in the unopened original container (sealed), is five years.

Do not use brake fluid that has exceeded its useful life!

According to the applicable environment laws, brake fluid does not come under the provisions covering used oil. For this reason, brake fluid must always be collected and disposed of separately from used oil.



Drained brake fluid must never be used again.

Changing the brake fluid

Changing of the brake fluid must always be performed via the compensating vessel. In order to check the brake fluid for freedom of bubbles, pass a transparent hose over the connection of the vent valve. Put the free end of the hose into a suitable container filled 1/3 with brake fluid.

Unscrew and remove the screwed plug from the compensating vessel. Open the vent valve and empty the compensating vessel down to the "MIN" mark by pumping the brake pedal. Top up the compensating vessel to the "MAX" mark using fresh brake fluid. This procedure must be repeated for all vent valves of the brake system and must be kept up until clear and bubble free brake fluid is discharged from the transparent hose. Upon completion of the brake fluid change, close the vent valve and replace the protective cap.

Changing of the brake fluid also ensures proper bleeding of the brake system, as the fresh brake fluid entering the system pushes the old fluid contained in the system out through the vent valves.

Top up the compensating vessel to the "MAX" mark and replace the screwed plug.

Bleeding the brake system

The brake system must be bled whenever the system has been opened (e.g. after repair operations or replacement of components), or when the brake fluid has been changed.



The bleeding procedure must be performed on all vent valves of the brake system. In the case of disc brake callipers (e.g. A 300), both valves must be bled (two valves per calliper).



Upon completion of the bleeding operations, dust caps must be replaced on the vent valves!

Bleeding is through the main brake cylinder and by pumping operation of the brake pedal (manual bleeding). When bleeding the brake system, it must be ensured that the brake fluid level in the compensating vessel does not fall below the "MIN" mark. Upon completion of the bleeding operation, top up the compensating vessel with brake fluid to the "MAX" mark.

Check that the vent hole in the vessel's cap is not blocked and clean if required.



If, following the bleeding operation, the travel of the brake pedal is excessive, or if the pressure resistance is too soft, depress the brake pedal firmly several times and repeat the bleeding operation.

Cleaning the brake system

The brake system must be cleaned when internal contamination becomes excessive (formation of sludge in the compensating vessel). This is done by flushing the system with fresh brake fluid until clear fluid emerges from all vent valves.



Pressure gauges and measuring connections, as used for pressure testing on hydraulic systems, must never be used for tests and measurements on the brake system.

If hydraulic oil or mineral oil is inadvertently permitted to enter the brake system, this will cause the entire brake system to be inoperative within a very short time. In this case, all rubber parts, including the brake hoses and brake light switches, must be replaced.

The brake tubes (pipes) must be cleaned with Tri, rinsed with white spirit and finally blown through using dry compressed air.

Parking Brakes

(Extract from DIN 0015161 and FEM)

Requirements

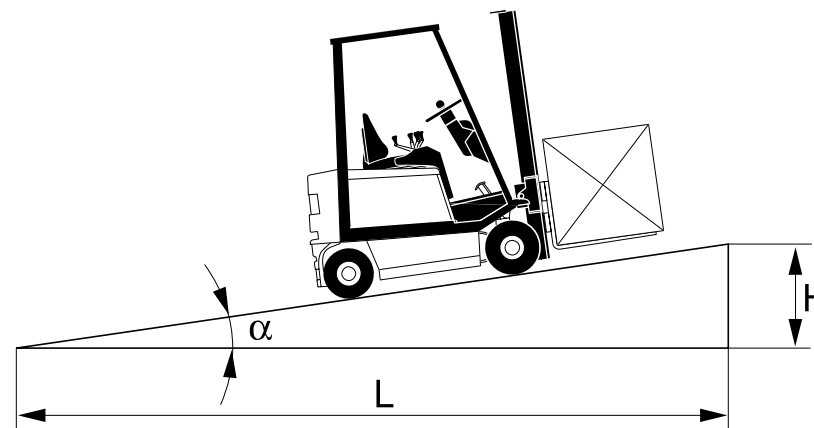
The parking brake must be able to stop an industrial vehicle with max. permissible load or an unladen tow truck without attachment and without assistance from the driver on the maximum incline permitted by the manufacturer for ascent, or on the incline described hereafter, whereby the higher value applies.

A	Operator seated and standing industrial vehicles - excluding B and D constructions -	15%
B	Stackers with extending driver's position, dual-sided trucks, triple-sided trucks	5%
C	Pedestrian and driverless industrial vehicles	10%
D	Narrow aisle industrial trucks (reach trucks, straddle trucks, high level trucks, low level trucks)	10%



5% incline means:

Gain in height H of 5 cm for 1 m horizontal length L.



Incline	Angle α
5 %	2° 50' ~ 3°
10 %	5° 50' ~ 6°
12.5 %	7° 10' ~ 7°
15 %	8° 30' ~ 9°

Tests

Testing can follow either process A or B.



For industrial trucks with automatic braking (e.g. magnetic brake or spring-loaded accumulator), the automatic brake is also the parking brake.

For pedestrian trucks the tiller acting in the braking zone is also the parking brake.

Process A

- Drive the industrial truck onto an incline in accordance with the “Requirements” section and bring to a standstill with the operating brake.
- Activate the parking brake and then release the operating brake.
- The parking brake is functional if the truck stops in accordance with the “Requirements” section.

Process B

- Halt travel (release accelerator / travel switch) and bring the truck to a standstill with the handbrake.
- The parking brake is functional if the truck achieves the respective percentage value for braking (recorded with a delay recording device), in accordance with the “Requirements” section.

Trucks with Spring-Loaded Accumulator



When the handbrake is applied the full force of the spring-loaded brake acts.

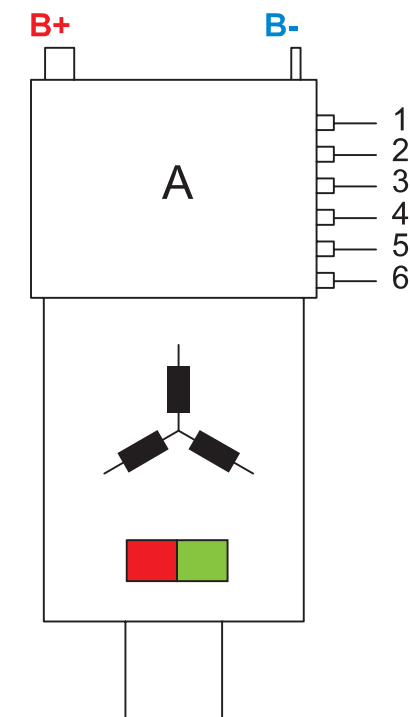
The truck brakes suddenly.

Steering auxiliary motor connection layout

Connector layout

Connector XB17										
Pin	Wire colour	Description/ Function	Note							
1	BL	Analog input	From steering sensor							
2	RED	+12 volt supply								
3	YL	Seat switch	Standby speed at 0 volts							
4		Inhibit	Prevents the motor from starting during the self-test phase							
5	GN	Thermal protection	Overtemperature message, no cutout							
6	BL	Switch on pump	To release the spring-loaded accumulator brake							
	A	Electronic control								
	X	Pin layout								

Graphical illustration



Brushless DC motor:

Threephase synchronous motor with permanent-magnetic rotor and integrated electronic system.

Fork Tines



Faulty forks (fork tines) are hazardous. Faulty fork tines must not be repaired by warm treatment or welding. Specialist personnel must carry out repairs.

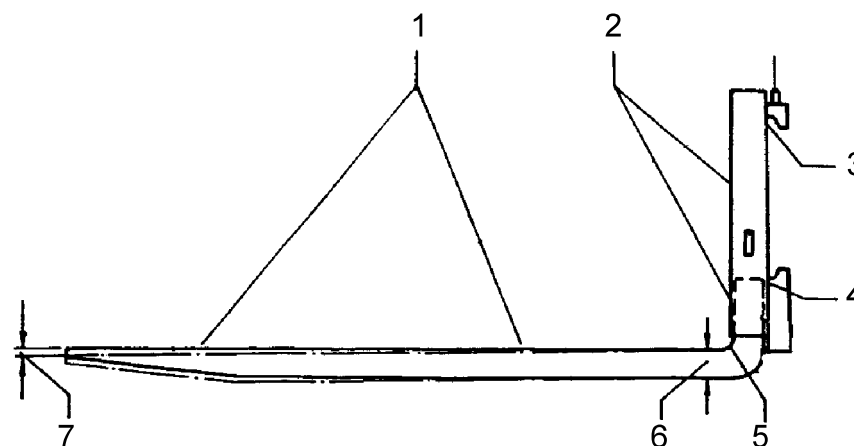
The technical specifications to be observed during testing are contained on the forks themselves.

Replacing fork tines

- When the minimum width has been reached (ISO 5057).
- If cracks appear in the welds or if the arms are damaged.
- Faulty locks on the fork tine attachments must be replaced.

Zero Load Test

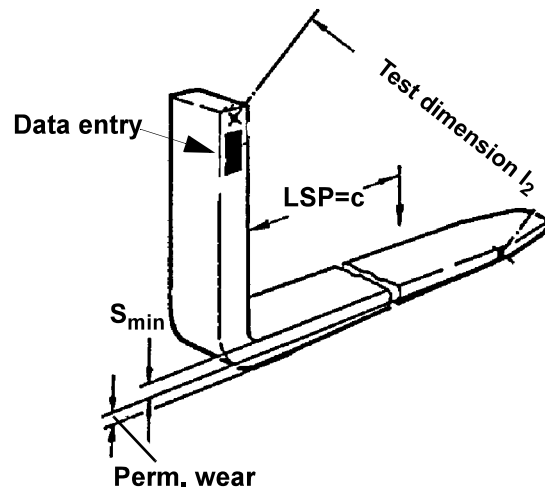
- Check fork blade (1) for deflection, max. permissible deviation from dimension l_2 is 3 mm
- Check the backrest (2) for sagging, max. deviation 3 mm
- Inspect the welds on the fork hanger (3) for surface cracks, bending and wear.
- Check the extent of wear (6), minimum thickness 90% of original (4) (backrest).
- Check the height difference of the fork tips (7), permissible deviation is 3% of fork tine length.



Load Test



Fork tines must be individually tested.
The test load of **one** fork tine corresponds to the rated capacity of the truck.



- Center the fork tines at the side, measure test dimension " l_2 ".
- Lift the test load with **one** fork tine at the load centre of gravity.
- Check the top fork hanger (3) and the fork bend (5) for cracks under load. If a diffusion spray is used in the test, clean the test areas beforehand.
- Measure test dimension " l_2 " again after removing the weight from the fork tines. There should be no distortion (sagging) once the load has been removed.

The capacity etched onto the fork tine is the capacity of the fork tine, not the test load.

Text (example)

625 x 500

= Load centre of gravity (mm)

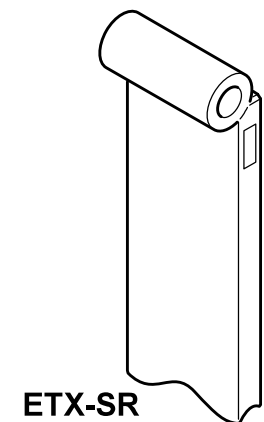
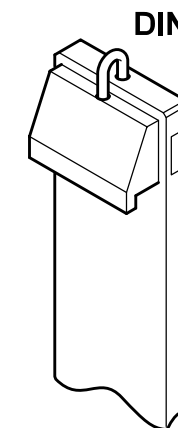
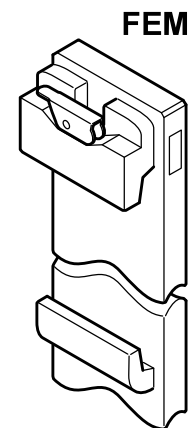
= Fork tine capacity (kg)

800 = Test measurement " l_2 " (mm)

S_{min} = 32 = Minimum fork tine thickness (mm)

64.XXXXX = Fork tine order number

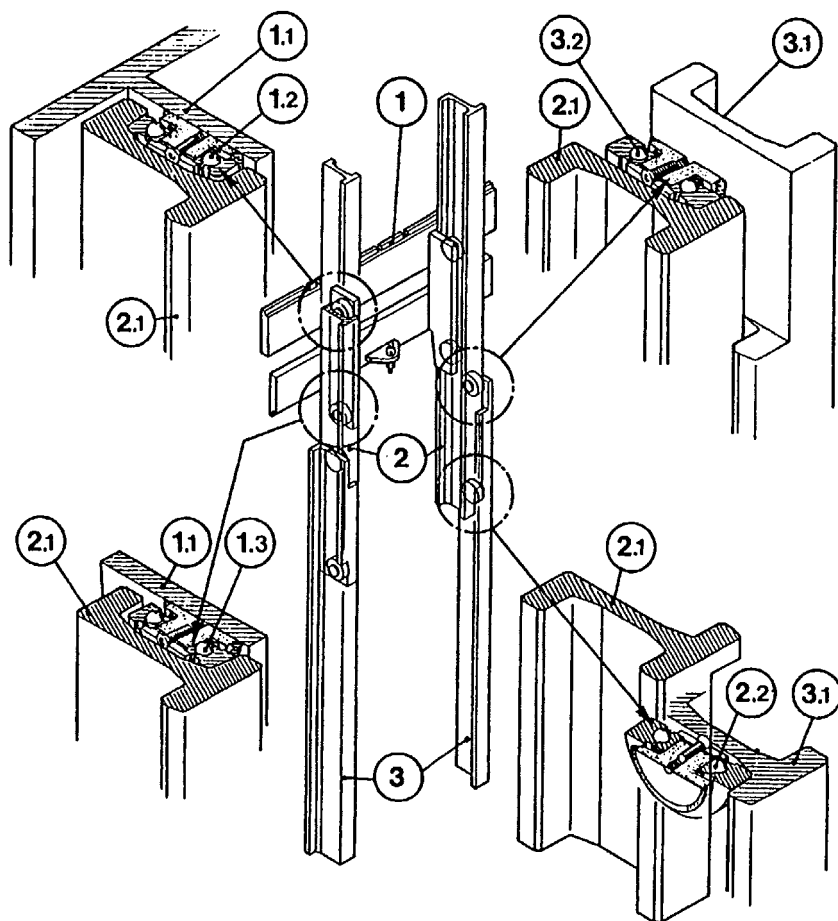
Fork Tine Shapes



Hoist Frames with Angled Rollers

Condition Assessment

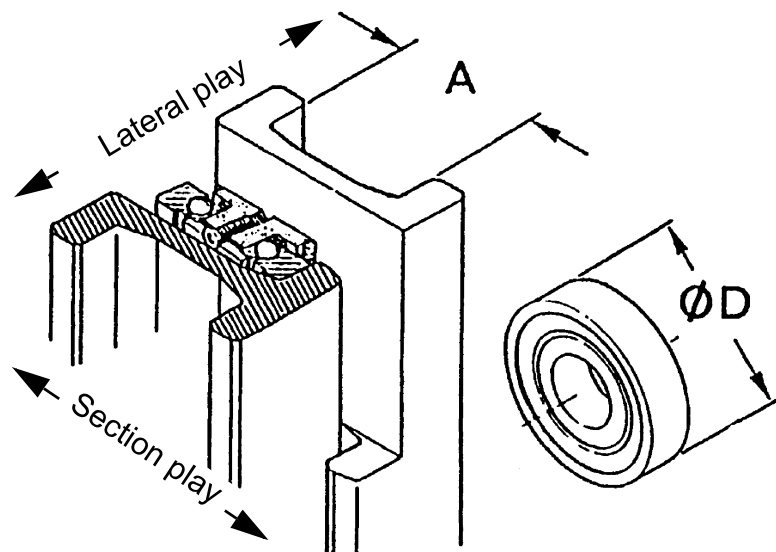
Figure / Key: Hoist Frame Angled Roller Guide



Item	Description	No.
1	Load carriage	1
1.1	Load carriage stud	2
1.2	Top roller	2
1.3	Bottom roller	2
2	Inner mast	1
2.1	Inner mast section	2
2.2	Inner mast roller	2
3	Outer mast	1
3.1	Outer mast section	2
3.2	Outer mast roller	2

Test Measurements

 If the permissible section / lateral play measurement is exceeded, the mast components must be adjusted.



Rated section dimension A (mm)	Roller Ø D -0.2 (mm)	Max. section play ¹⁾ +0.5 (mm)
62.3 +0.3	61.8	1.0
76.2 -0.8	75.9	0.9
80.2 ±0.5	79.9	
98 ±0.5	97.4	0.8
		¹⁾ Recorded with mast components installed

Rated section dimension A (mm)	Max. lateral play ²⁾ (mm)	Max. lateral play ³⁾ (mm)
62.3 +0.3	0.2	1.2
76.2 -0.8		
80.2 ±0.5		
98 ± 0.5		
	²⁾ Play in top operating position	³⁾ Play in bottom operating position

Parallelity Deviation

In upper third	» max. 1 mm
In middle third	» max. 1.25 mm
In lower third	» max. 1.5 mm

Section Wear

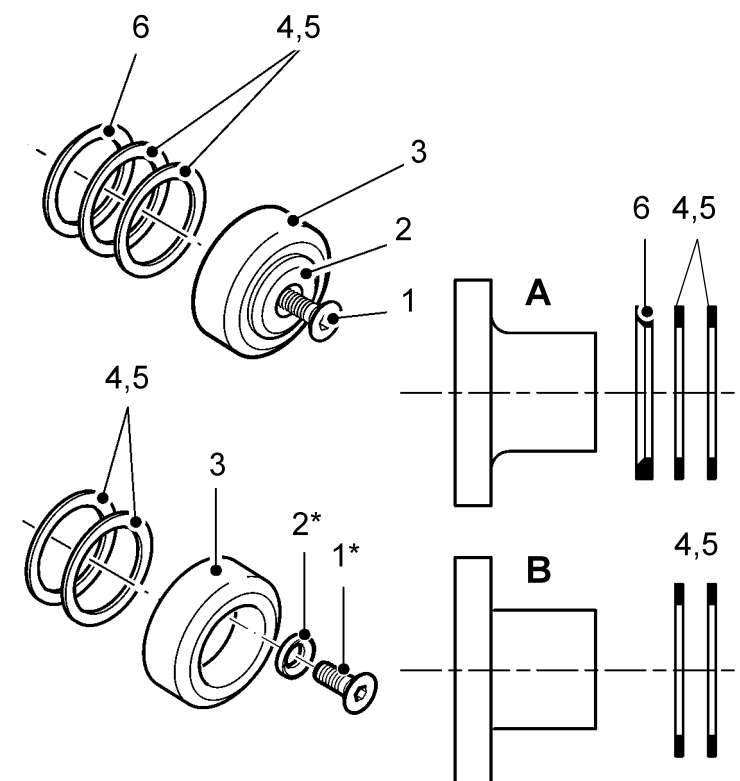
Indents, grooves, roller running marks	» Max. 0.5 mm
--	---------------

Roller Components

Item	Description	Rated section dimension A (mm)				
		62.3	76.2	80.2	80.2 ⁴⁾	98
1	Screw ¹⁾	M10x25 ²⁾	-	M10x25 ³⁾	M6x12	M6 x 12
2	bearing cap piece ⁵⁾	√	-	√	-	-
2*	Disk	-	-	-	6)	6)
3	Roller Ø (mm) (standard)	61,8	75,9	79,9	79,6	97,9
3.1	Roller Ø mm (large)	62.3	76.4	80.4	80.1	98.3
3.2	Roller Ø mm (max.)	62.8	-	-	80.5	98.8
4	Spacer; as required	31x25x0.2	40x28x0.3	36.3x28.2x0.2	40x28x0.3	50x40x0.3
5	Spacer; as required	31x25x0.5	40x28x1.0	36.3x28.2x0.5	40x28x1.0	50x40x0.5
6	Taper-faced piston ring	31x25x2.0	-	36.3x28.2x3.5	-	-

¹⁾ Replace each time after disassembly ²⁾ M_A=45 Nm; ³⁾ M_A=80 Nm; ⁴⁾ Post-1998; ⁵⁾ Pre-8.94

⁶⁾ Items 1* and 2* load carriage version with 6 rollers, upper roller pair.



A = Welded stud **with** taper-faced piston ring

B = Welded stud **without** taper-faced piston ring

Adjustment

Setting the lateral play

The spacer set for adjusting the lateral play does not have to be replaced or re-assessed for every repair.



The following cases serve as examples.

Replacing rollers without changing the lateral play

Re-use existing spacer set, use rollers of the same size. Check play after assembly.

Section wear and increased lateral play

Before disassembling the components determine the play (section and lateral play).

If the permissible tolerance is not exceeded, fit larger rollers in accordance with the **roller component** table, items 3.1/3.2.

Re-use the spacer set, check the roller freedom of movement and the roller studs for cracking or grooving.

Fit bearing cap piece¹⁾ with a new screw. Check play after assembly.



¹⁾ Not applicable for hoist frames with section of A=98 mm.

Complete Assembly Replacement

Components are replaced in full, e.g. new load carriage in existing hoist frame:

Survey spacer set in accordance with setting instructions; compensate any section play with larger rollers.

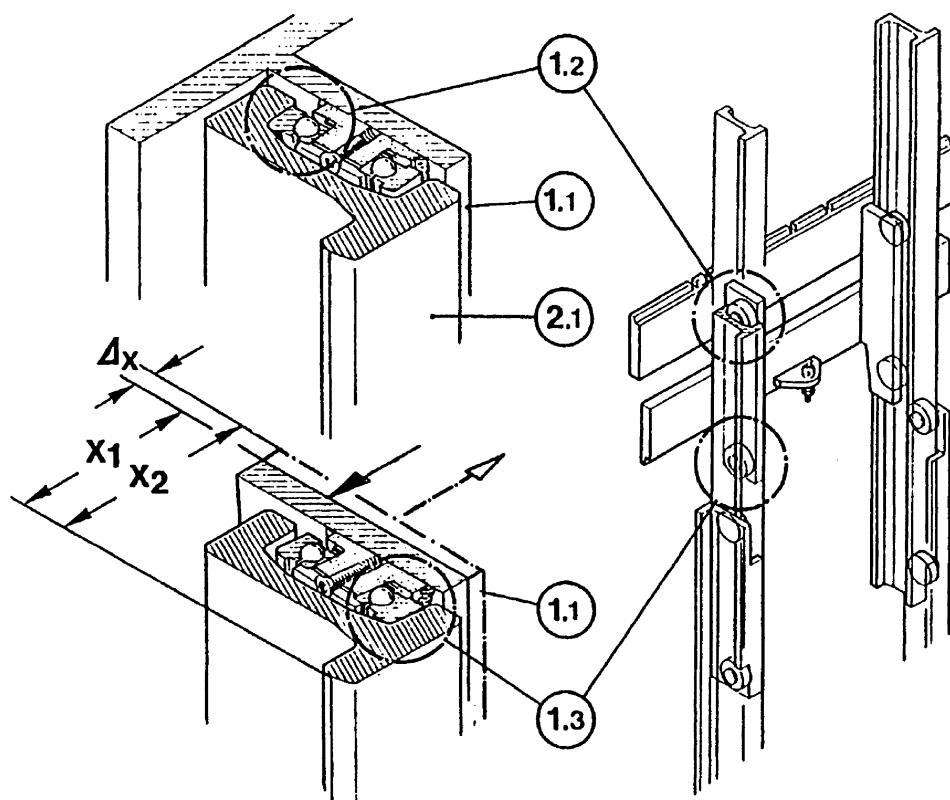


To achieve the best setting, remove the hoist frame and place it horizontally on a workbench where it is **totally secure**, load carriage facing down.

Disassemble the assembly(ies) to be assessed.

Setting Instructions

-  The following measuring procedure is with respect to the installation of the mast carriage / inner mast assembly.
 When assessing the inner mast / outer mast assembly proceed in a similar manner



- Fit the taper faced piston rings¹⁾ and roller without bearing cap piece¹⁾ onto bearing studs.
- Insert the assembly to be assessed.

- Rest the rollers on the running surfaces in accordance with the torque stresses, top roller (1.2) tensioned in the load direction, bottom roller (1.3) in the opposite direction. (Use wooden block or similar)
- Move the load carriage sideways in the lower operating position so that the rollers rest on the inner mast section (2.1).
- Calculate the distance over the carriage stud (1.1) and the inner mast section by the roller and record the measurement (X_1)
- Repeat the measurement in the middle and upper operating positions.
- Rest the load carriage on the opposite section side, apply tension and determine the measurement at the same measuring point (as 1st set) (X_2)
- Repeat the measurement in the middle and upper operating positions in the same way as for the lower operating position.
- Divide the **lowest** difference calculated in the 3 measurements by two.

 **Spacer Dimension** $\Delta x_{1/2} = X_2 - X_1 / 2$.

This corresponds to the spacer dimension required for all four roller studs.

- Remove load carriage, disassemble rollers.
- Place the spacer set to be assessed onto roller studs, assemble the rollers and fit them with new screws.

 Note the torques.

When assembling the bearing cap piece¹⁾ make sure that the cap piece can press the bearing inner ring and the spacers against the bolt.

If necessary, insert spacers between the bearing cap piece and the bearing inner ring (min. 0.5 mm).



¹⁾ Not applicable to hoist frames with section A=98 mm.

Cleaning

If the chain becomes so contaminated on the outside during operation that the lubricant cannot penetrate, clean between the link plates to remove contamination, grease or other particles.

The contamination prevents the lubricant from penetrating between the pin plate and bearing.



Only lubricate a discharged chain.

- Chains must only be cleaned with paraffin derivatives such as petroleum, turpentine or diesel.



Never clean chains with a high pressure steam jet, cold cleaning , fat dissolving or chemical agents!
This can cause immediate chain damage through gassing.

Inspection

→ Lift chains wear rapidly if not lubricated. The intervals stated in the service checklist apply to normal duty use. More demanding conditions (dust, temperature) require more regular lubrication.

STOP The chain must be replaced immediately if:

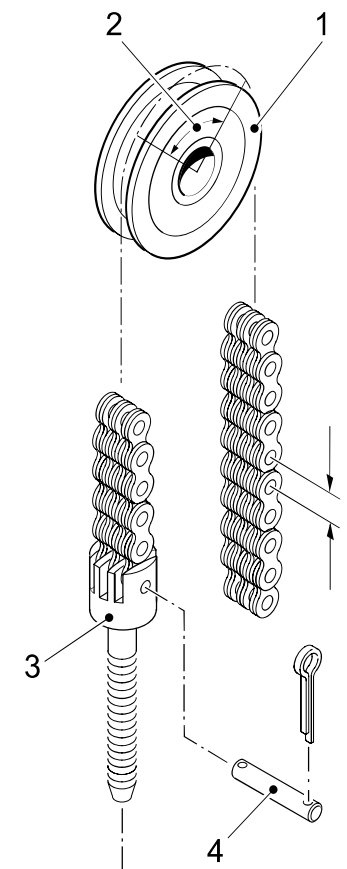
- the chain has elongated significantly within a short period of time.
- signs of external wear or heavy corrosion are visible.
- an error has occurred that could have resulted in a peak voltage in the chain.
- there is excessive contamination.

→ However, careful inspection is made more difficult if the chain is coated with a thick layer of grease. The inspection will not be reliable unless the chain has been thoroughly cleaned beforehand.

If the chain is removed for inspection, it should be re-installed in the reverse order of disassembly.

STOP If the truck is fitted with two lift chains, both chains must always be replaced. This is the only way to ensure even load distribution over the two chains. When replacing a chain, also replace the chain tensioning bolt (3) and cotter bolt (4). All used parts must be scrapped. Do not replace individual chain links.

Item	Description
1	Chain pulley
2	Maximum wear area
3	Chain tensioning bolt
4	Cotter bolt



Checking the chain wear level

Check the wear level on the edge of the chain links:

- near an anchor point
- on sections that rest on pulleys during transportation, as these are subject to greater wear levels.



Check chains for torn or missing link plates, extended holes, cracking in the outer link plates, loose, worn or damaged pins (pin heads and cotter pins).



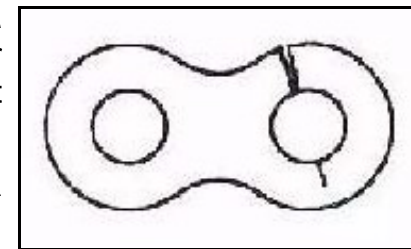
Chains should also be replaced immediately if visible damage is noted, as such damage causes permanent breakage over time.

Re-tensioning

The chain tension must be checked during an inspection and re-tensioned if necessary.

Broken link plates

Broken link plates are indicated by a rising of the respective plate near the plate head or by a missing part of the head.

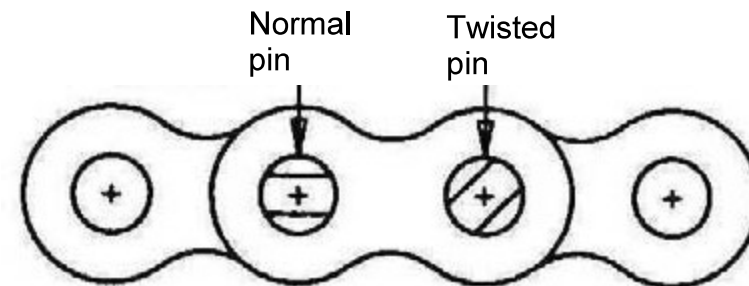


Corrosion can also be a cause of a broken link plate.



Chains with broken link plates are unsafe for operation. The chain must be replaced immediately.

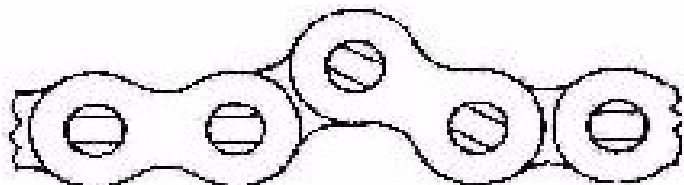
Twisted pins



If there are twisted pins, this means the blockage in the chain joint is already so severe that the press fit between the chain bolt and outer plate has been overcome.



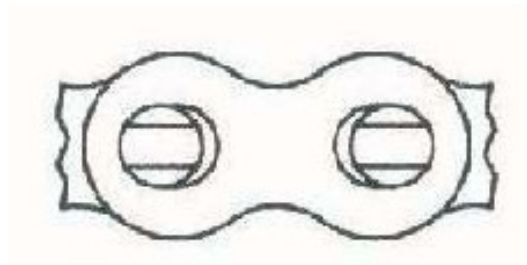
Chains with twisted pins are unsafe for operation. The chain must be replaced immediately.

Stiff joints

If the chain links cannot return to their elongated position after leaving the pulley, the chain joint is not functional. This appearance can be caused by cold welding, friction corrosion or excessive contamination.



If the stiff joints cannot be rectified by cleaning and lubricating, the chain must be replaced.

Plate hole wear

If plates have impact markings or other deformities, or if wear is detected on the plate holes, the chain must be immediately replaced.

Checking chains for corrosion

- Check chains for corrosion, in particular inside the link plates.



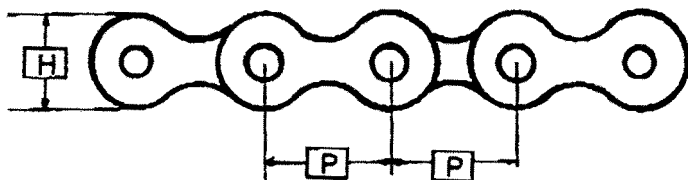
Corroded, worn or damaged chains must be replaced, as the corrosion can ultimately lead to permanent breakage.

Checking the wear limit of link plate height "H"

Check if the chain has excess wear to link plate height "H", e.g. due to constant contact with chassis / mast section



The max. permissible reduction of the link plate height is 5% of the overall height of link plate height "H", irrespective of whether the wear is showing on one or both sides.



H = Link plate height
P = Separation

Example of a chain where division P = 1" (25 mm):

Dimension of link plate height "H" = 24 mm

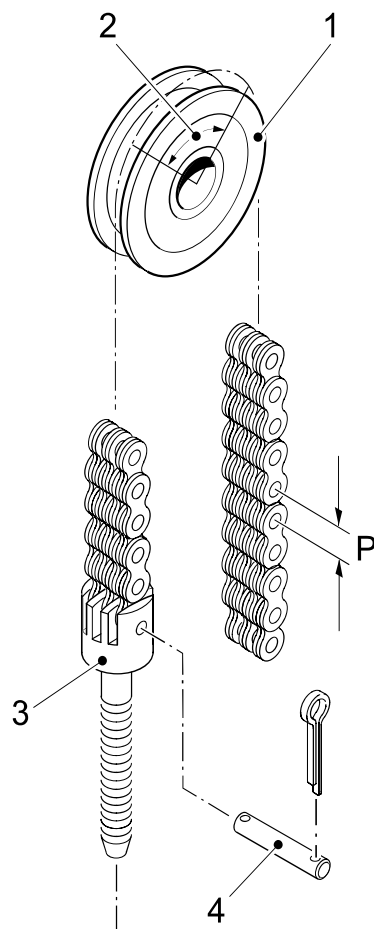
Maximum wear (5% of 24 mm) = 1.2 mm

Minimum plate height (24 mm – 1.2 mm) = 22.8 mm



If the wear exceeds this level, the chains must be replaced.

Checking chains for elongation



Item	Description	Item	Description
1	Chain pulley	3	Chain tensioning bolt
2	Maximum wear area	4	Cotter bolt

Tool: Bore hole gauge,
Wear gauge in UVV test kit

- ➔ The bore hole gauge / wear gauge can measure chain elongation of 3% with precision. This means that for a 3% chain elongation 33 links or 33 pins [1 to 34 chain pins] lie between the markings of the bore hold gauge / wear gauge.
- ⛔ Replacing the chains is recommended for a 2% elongation for safety reasons.
This means that the maximum elongation of a section or indeed the whole chain must not exceed 2% of the length of the chain.
- ⚠ The permissible elongation of chains must be tested using rated load. The length of the laden chain must be measured over 17 double links or 34 chain pins [1 to 35 chain pins].
 - Measure the chains at three different points, in particular the sections that lie over the pulleys (2) during transport as these are subject to greater wear levels.
- ⛔ If the truck is fitted with two lift chains, both chains must always be replaced. This is the only way to ensure even load distribution over the two chains.
When replacing a chain, also replace the chain tensioning bolt (3) and cotter bolt (4). All used parts must be scrapped. Do not replace individual chain links.

The following table shows the dimensions produced for a 2% elongation of a specific section of a chain (17 double links over 34 chain pins [1 to 35 chain pins]):

Chain dimension = Separation P		Dimension over 17 double links or 34 chain pins		Wear limit (dimension over 17 double links + 2%)	
mm	(inch)	mm	inch	mm	inch
12.7	1/2	431.80	17.00	440.44	17.34
15.875	5/8	539.75	21.25	550.55	21.68
19.05	3/4	647.70	25.50	660.65	26.01
25.4	1	863.60	34.00	880.87	34.68
31.75	1 1/4	1079.50	42.50	1101.09	43.35
38.1	1 1/2	1295.40	51.00	1321.31	52.02
44.45	1 3/4	1511.30	59.50	1541.53	60.69
50.8	2	1727.20	68.00	1761.74	69.36
76.2	3	2590.80	102.00	2642.62	104.04

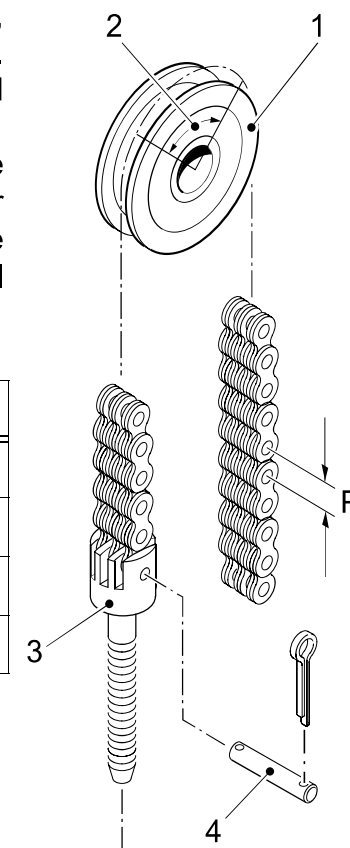


Replace the entire chain including the chain tensioning bolt (3) and cotter bolt (4) when the wear limit has been reached. Do not replace individual chain links. All used parts must be scrapped.



If the truck is fitted with two lift chains, both chains must always be replaced. This is the only way to ensure even load distribution over the two chains. When replacing a chain, also replace the chain tensioning bolt (3) and cotter bolt (4). All used parts must be scrapped. Do not replace individual chain links.

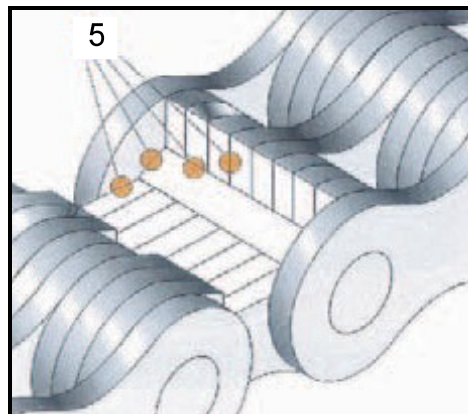
Item	Description
1	Chain pulley
2	Maximum wear area
3	Chain tensioning bolt
4	Cotter bolt



Lubrication

General Instructions

Effective chain lubrication extends a chain's service life several times over. The amount of oil used is not the only factor; how much oil actually reaches the lubrication points in the chain joint (5) is equally important. The chain must be lubricated shortly before commissioning.



The amount of lubricant used is sufficient if:

- when you run your finger along the chain it is coated with a thin, clear layer of oil.

The chain surface should be coated with a thin layer of oil to provide the necessary corrosion protection.



Never apply so much lubricant to the chain that it starts to drip off.



The chain lubricant also protects the chain from corrosion. It is essential that all link plates and pin surfaces are coated with lubricant as corrosion can cause gassing of the link plates, which in turn could result in chain breakage with unexpectedly low loads.

- The chains must be lubricated in accordance with the maintenance intervals listed in the operating instructions.
- The chain tensioning bolts must be lubricated after the chain has been assembled and all subsequent adjustments made.

- When the chains have been cleaned they should be lubricated by applying a thorough layer of grease and protected against corrosion. The lubricants to be used are listed in the operating instructions (in the “**Consumables**”) section.
It is not sufficient to lubricate only the bearing surfaces.
- The drip method should preferably be used for disassembled chains.
- Mark the assembly position of the chains and remove them from the truck. Clean the chains then soak them in lubricant for an hour.
Remove the chains from the immersion bath, allow the lubricant to drip off and install the chains back on the truck in the reverse order (note markings).
- Lubricate the chain tensioning bolts before and after chain assembly.



It is advisable to carry out a test run on the load chains to remove oil drips and to check whether unusual noise or vibrations occur.

Lubricants



The lubricants to be used are listed in the operating instructions (in the “**Consumables**” section).

The prescribed chain spray must be used in accordance with the instructions. Applying grease externally will not provide sufficient lubrication.



Poisonous and hazardous vapours can be produced when using lubricants / fluids. Therefore, apply the appropriate safety regulations when handling these materials.

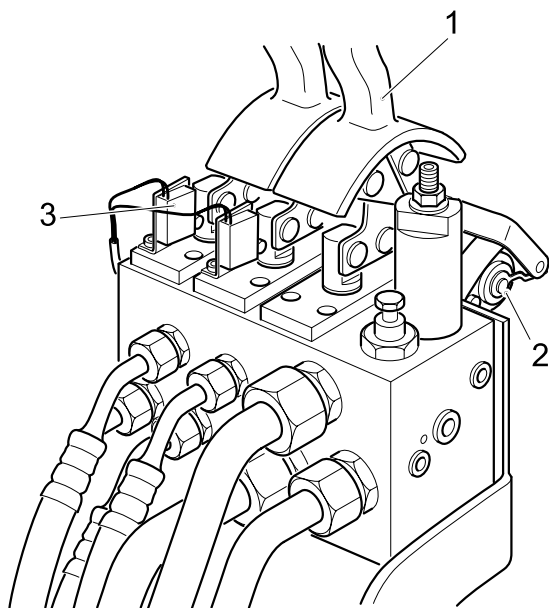
- Trucks that are being decommissioned for a longer period or chains that are being stored require a coating of *Esso BAN 396* after the chains have been treated with normal lubricant

The grease *ESSO BAN* can be removed during normal cleaning with petroleum or turpentine substitute.

Pilot Valve Basic Setting

Mechanical Basic Setting for all Functions:

- The control lever path (1) is limited via the valve.
The lever path cannot be adjusted.



Rotary Potentiometer Setting:

The rotary potentiometer (2) for “Lifting” must be fitted in such a way that it is slightly pre-tensioned when the control lever is in neutral.

Microswitch Setting:

The microswitches (3) must be adjusted in such a way that they are activated when the control plunger has travelled approx. 1 mm.

Flow Control Valve Setting:

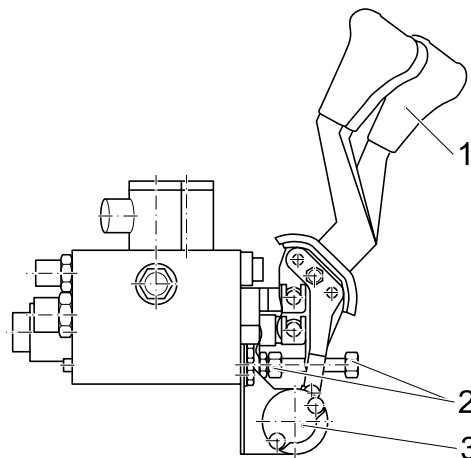
The flow control valves for “Tilt”, “Aux. Lift 1” and “Aux. Lift 2” are factory set and cannot be adjusted.

Pilot Valve Default Setting

Mechanical Default Setting for all Functions

- ☞ Use stop screws (screw nuts) to restrict the path of the control lever.

Lever path setting



1. Turn back the stop nuts (2) until the stop is located in the valve when the control lever is activated.
2. Move the control lever (1) backwards or forwards as far as the stop in the valve. Screw in the stop nuts (2) until they contact the control lever (1).
3. Set the control lever (1) to neutral and turn the stop nuts (2) a further half turn.

Throttle Valve Setting

“Tilt” Function

- Using the throttle valve set the tilt speed 0.3 s/° for the piston side.
- Now using the stop nuts determine the speed for the rod side.

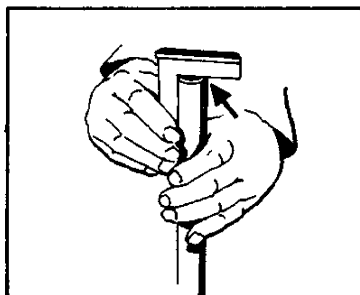
“Aux. Lift 1” and “Aux. Lift 2” Function

- If the aux. function is performed with a differential cylinder, set the required speed for the piston side via the throttle valve.
- Now determine the speed for the rod side using the stop nuts.

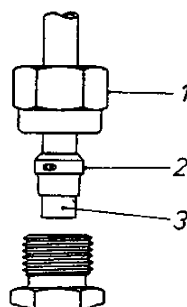
Swivel Potentiometer Setting

- ☞ The swivel potentiometer (3) for the “Lift” function must be fitted so that it is slightly pre-tensioned when the control lever is in the neutral position.

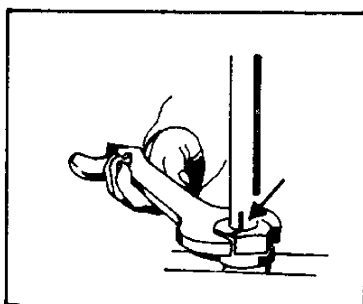
DIRECTIVES FOR EXECUTING SCREWED JOINTS



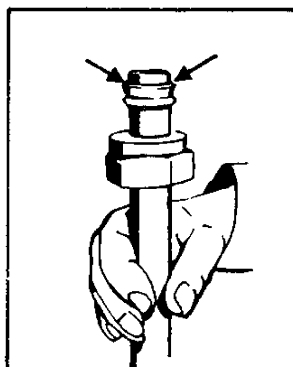
Cut pipe at right angle and deburr



All threaded parts must be oiled (do not grease)
Push nut 1 and cutting ring 2 over the end of pipe 3.



1. Screw nut by hand onto the male member.
2. Push pipe in till it comes to rest.
3. Tighten with wrench about $3/4$ turn.
4. The cutting ring will cut itself with its edge into the pipe.
5. Unscrew nut from male member.



1. Checking the cutting edge.
It is of no importance if the cutting ring can be turned on the end of the pipe.
2. The final fitting on the male member is performed with another $3/4$ turn.

Lowering brakes and pipe failure safety devices

Required test equipment

- Lowering speed timer

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1.2 Pipe failure safety device	3
2. External lowering brake	4
3. Integrated lowering brake	5 - 6
4. Settings for integrated lowering brakes and pipe failure safety devices	7 - 11
4.1 Settings, general	7 - 9
4.2 Settings for ETM/V-MSE vehicles	10 - 11

1. General

1.1 Lowering brake

Lowering brakes are provided to control the lowering speed of loads raised on forks. For safety reasons the approved lowering speed must never be exceeded.

Specification for Jungheinrich vehicles:

The lowering speed without load and under load must be within

0.36 to 0.50 m/s equivalent to 2.8 to 2.0 s/m

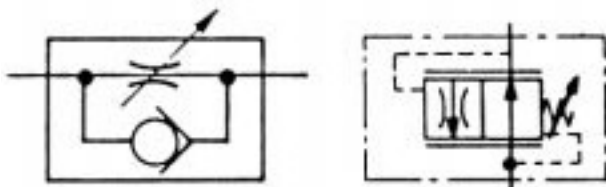
with the faster value applying to lowering under load.

Lowering brake

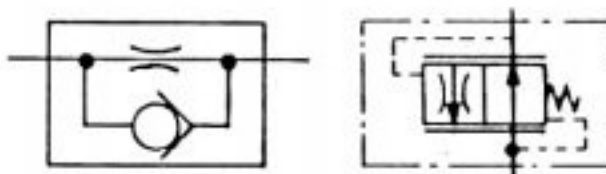
adjustable in-situ
from the outside.

not adjustable in-situ. Brake
normally adjustable only in the
removed condition.

Simplified Pictogram Detailed



Simplified Pictogram Detailed



Two different types of lowering brakes are in use:

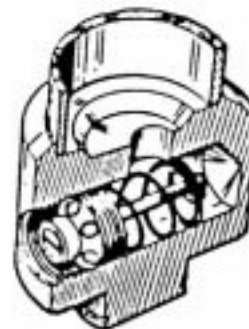
- External lowering brake -

Normally mounted on a transverse member of the hoist frame



- Integrated lowering brake -

Arranged in the hydraulic connection of the lifting cylinder



NOTE: When replacing lifting cylinders, check whether they are fitted with integrated lowering brakes.

1.2 Pipe failure safety device

Pipe failure safety devices are valves which in the event of a sudden loss of pressure - as is experienced in the case of a pipe failure - will prevent excessively rapid lowering of the load. In the event of a sudden loss of pressure, the return flow is interrupted or reduced to such an extent that a lowering speed of 30 - 40% of the max. admissible lowering speed of 0.6 m/s will result.

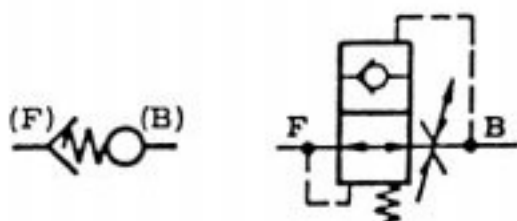
Pipe failure safety device for:

Immobilising
of the load

Pictogram

Simplified

Detailed

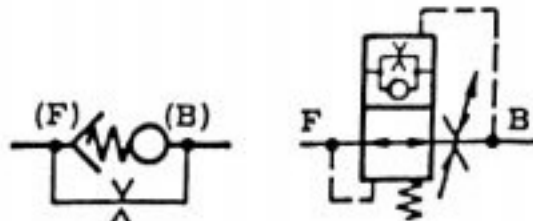


Slow lowering
of the load

Pictogram

Simplified

Detailed



NOTE: When replacing lifting cylinders, check for the presence of pipe failure safety devices.

2. External lowering brake

The lowering brakes are employed for hydraulic systems where the lifting cylinder is provided with its own integrated lowering brake or with a pipe failure safety device.

Setting operation:

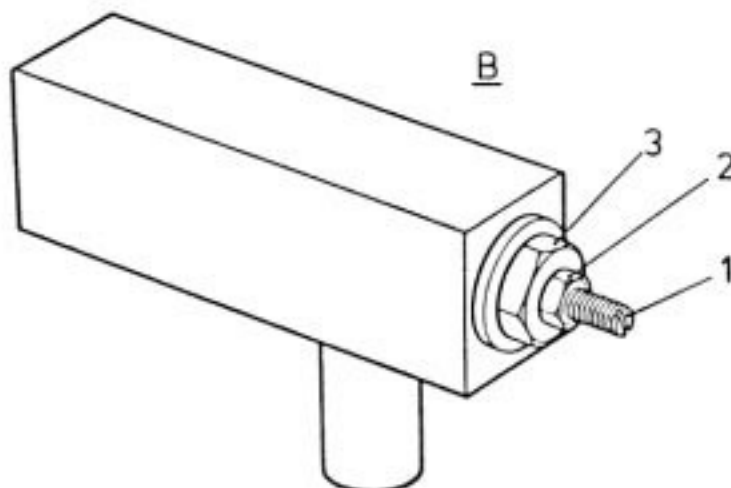
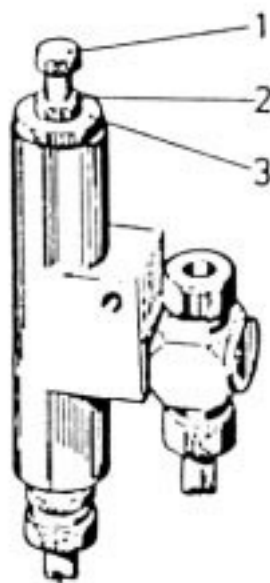
- Pick up a nominal load
- Slacken the check nut (2)

CAUTION! Do not unscrew the locking screw (3)!

- Lift against the stop
- Lower the fork by fully deflecting the control valve lever
- Set the lowering speed by means of the adjusting screw (1)
- The lowering speed is increased by screwing in the adjusting screw and is reduced by backing off the adjusting screw.

NOTE: In case of ZZ-hoist frames and DZ-hoist frames the second stage is measured.

- Upon completion of the adjustment of the lowering speed, check the adjusting screw (1) by means of the check nut (2).
- Apply locking lacquer to the adjusting screw (1) and to the nut (2).



3. Integrated lowering brake

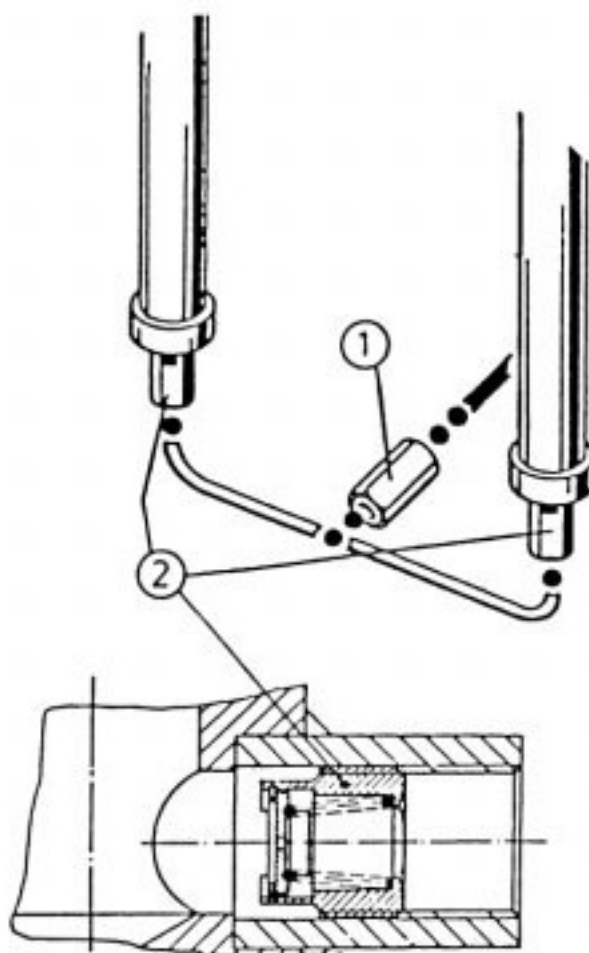
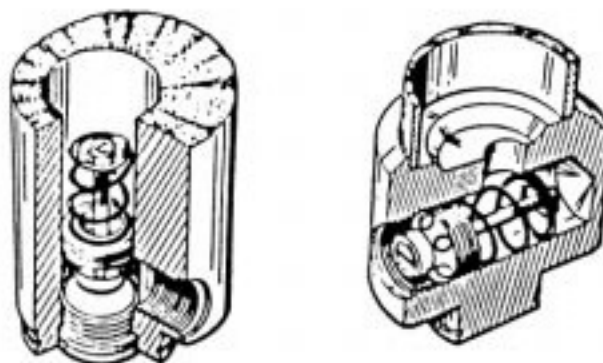
Integrated lowering brakes are located in the base of the lifting cylinder. The lowering brake also acts as pipe failure safety device.

In the event of a leakage or pipe failure, the load will not drop suddenly, but will be lowered at the rate of the admissible lowering speed.

NOTE: In case of hoist frames fitted with two lifting cylinders, the lowering brake is accommodated in a housing (1) located outside the lifting cylinders.

In this case the connections of the lifting cylinders are provided with special throttle non-return valves (2) acting as pipe failure safety devices.

In the event of leakages or pipe failure these valves will also limit the lowering speed to an admissible rate.



NOTE: When replacing lifting cylinders check for the presence of integrated lowering brakes.

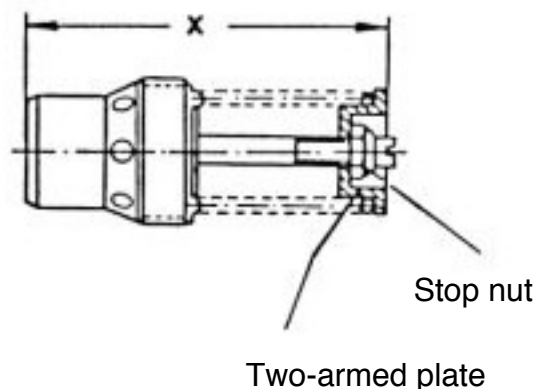
The integrated lowering brake is provided in two versions.

Version B

Order n°

073 116 904

x = Adjusting dimension



Type designation

Version H

Order n°

Type

073 153 902 SB 23 C

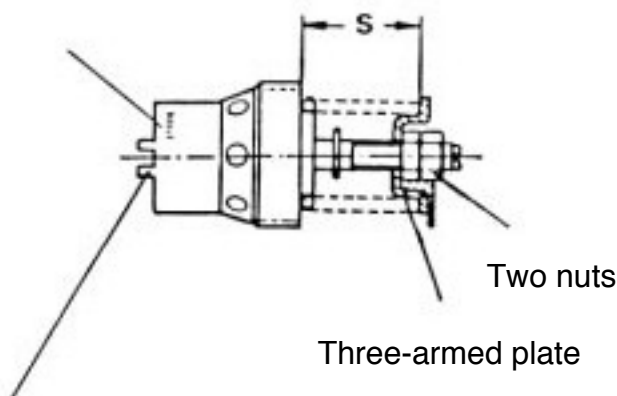
073 154 005 SB 25 C

073 093 106 SB 27 C

073 120 407 SB 29 C

073 286 502 SB 35 C

S = Adjusting dimension for spring length under tension



Grooved pin, not fitted with earlier type valves.

Adjustment

Normally no adjustments are required for these valves, as precision setting is performed when assembling the lifting cylinder.

An adjustment becomes necessary when the valve is replaced. The adjustment is carried out with the valve removed.

NOTE: Please note relation between the order number of the lifting cylinder and the order number of the lowering brake!

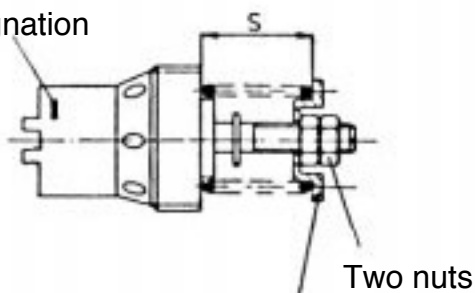
In the case of H-version valves it is absolutely necessary to check the nuts by means of the check nuts after completion of the adjusting operation!

4. Settings for integrated lowering brakes and pipe failure safety devices

Version H

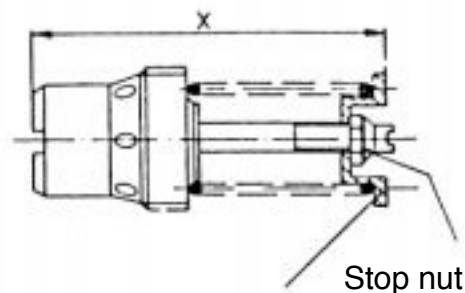
Version B

Type designation



Two nuts

Three-armed plate



Stop nut

Two-armed plate

4.1 Settings for integrated lowering brakes, general (for ETM/V-MSE vehicles refer to 4.2)

4.1.1 Settings, hoist frame ZT fitted with lifting cylinder T

Cyl. Type	Cylinder table n°	- Version H -		- Version B -		Lowering speed Load carriage		Max. load kg
		Type Material n°	Setting dimension S +0,2 mm	Type Material n°	Setting dimension X +0,2 mm	<u>cm</u> sec	<u>sec</u> m	
T	990 155 403	SB27C 073 093 106	14,4	-----	----	50	2,0	1600
T	991 593 208	SB27C 073 093 106	17,2	-----	----	50	2,0	1600
T	991 593 904	SB25C 073 154 005	15,1	S3P2 073 116 904	46,1	50	2,0	1000 1250
T	991 716 102	SB27C 073 093 106	14,4	-----	----	50	2,0	1250
T	991 716 204	SB25C 073 154 005	15,1	S3P2 073 116 904	46,1	50	2,0	1000 1250
T	991 855 408	SB29C 073 120 407	14,1	-----	----	50	2,0	2500
T	991 856 708	SB27C 073 093 106	14,4	-----	----	50	2,0	2000
T	992 228 204	SB23C 073 153 902	14,4	S3P2 073 116 904	48,7	42	2,4	1000 1250 1600
T	992 079 700	SB25C 073 154 005	16,3	S3P2 073 116 904	46,1	42	2,4	1250
T	992 079 802	SB27C 073 093 106	17,4	-----	----	42	2,4	1600
T	992 643 904	SB25C 073 154 005	15,1	S3P2 073 116 904	46,1	50	2,0	1000
T	992 645 103	SB25C 073 154 005	15,1	S3P2 073 116 904	46,1	50	2,0	1000
T	992 645 400	SB25C 073 154 005	15,1	S3P2 073 116 904	46,1	50	2,0	1250
T	992 645 901	SB27C 073 093 106	14,4	-----	----	50	2,0	1600

4.1.2 Settings, hoist frame ZZ fitted with lifting cylinders Z

Cyl. Type	Cylinder table n°	- Version H -		- Version B -		Lowering speed Load carriage ±15%		Max. load kg
		Type Material n°	Setting dimension S +0,2 mm	Type Material n°	Setting dimension X +0,2 mm	<u>cm</u>	<u>sec</u>	
						sec	m	
Z	991 594 601	SB25C 073 154 007	13,8	S3P2 073 116 904	44,7	50	2,0	1000 1250
Z	991 594 805	SB27C 073 093 106	15,3	-----	----	50	2,0	1600
Z	991 715 303	SB25C 073 154 007	13,8	S3P2 073 116 904	44,7	50	2,0	1250
Z	991 715 702	SB27C 073 093 106	15,3	-----	----	50	2,0	1600
Z	992 047 004	SB27C 073 093 106	15,3	-----	----	50	2,0	2000
Z	992 051 101	SB29C 073 120 407	16,3	-----	----	50	2,0	2500
Z	992 072 901	SB25C 073 154 007	13,8	S3P2 073 116 904	44,7	50	2,0	1250
Z	992 074 508	SB27C 073 093 106	15,3	-----	----	50	2,0	1600

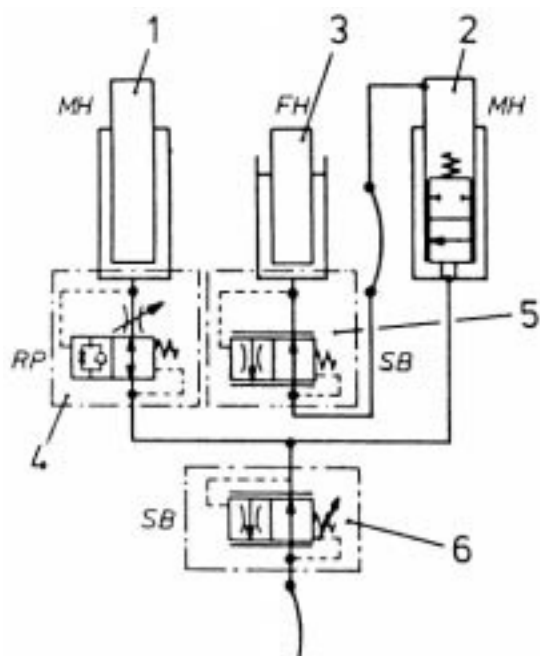
4.1.3 Settings, hoist frame ZZ fitted with two lifting cylinders T

Cyl. Type	Hoist frame cylinder table n°	- Version H -		- Version B -		Lowering speed Load carriage ±15%		Max. load kg
		Type Material n°	Setting dimension S +0,2 mm	Type Material n°	Setting dimension X +0,2 mm	<u>cm</u>	<u>sec</u>	
						sec	m	
T	991 878 602	SB23C	13,2	S3P2	48,1	42	2,4	1250
T	992 228 102	073 153 902		073 116 904				1600
T	992 228 408							

Cyl. Type	Hoist frame Cylinder table n°	- Version H -		- Version B -		Lowering speed Load carriage ±15%		max. load
		Type Material n°	Setting dimension S +0,2 mm	Type Material n°	Setting dimension X +0,2 mm	cm	sec	
						sec	m	kg
T T	992 051 908	SB25C	15,1	S3P2	46,1	42	2,4	1000
	992 228 501	073 154 005		073 116 904				1250
	992 228 306							1600

4.2 Settings for ETM/V - MSE vehicles

Hydraulic diagram



- 1 Mast lifting cylinder, solid plunger
- 2 Mast lifting cylinder, hollow plunger
- 3 Free-lift cylinder
- 4 Pipe failure safety device
- 5 Integrated lowering brake
- 6 External lowering brake

Integrated lowering brake

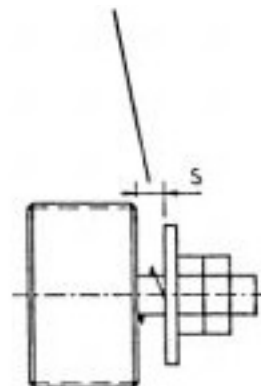
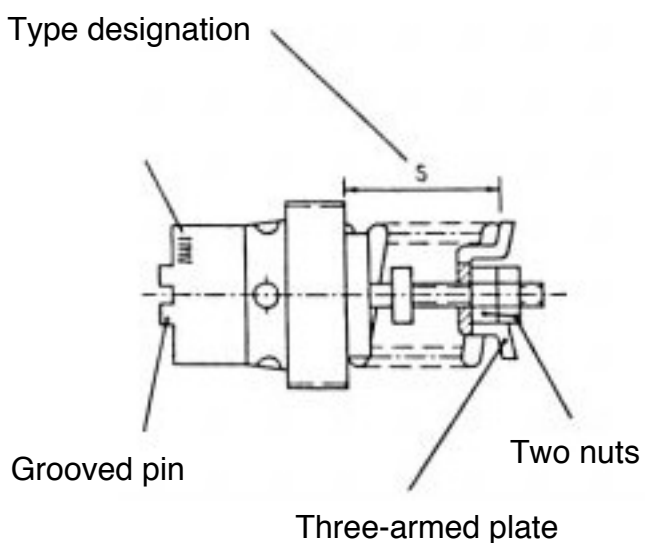
Version H

Version "S"

Pipe failure safety device

Adjustment dimension "S"

Type designation



Lowering brakes and pipe failure safety devices installed in MSE-Retrak lifting cylinders.		Mast lifting cylinder					Free-lift cylinder			
Vehicle ET -	Hoist frame	Cylinder table n°	Plunger Ø mm	Material	Pipe failure safety device Type	S mm	Cylinder table n°	Plunger Ø mm	Lower. brake Version H Type	S mm
10 - 16	ZT	992 631 903	40	solid	LB 3C 1,5	0,5	-	-	-	-
		992 584 204	40	solid	LB 3C 1,5	0,5				
		992 640 403	40	solid	LB 3C 1,5	0,5				
10 - 16	ZZ	992 588 903	28	solid	LB 3C 1,5	0,5	992 584 501	60	SB 27C	14
		992 640 208	28	solid	LB 3C 1,5	-	992 630 408	60	SB 27C	14
		992 584 306	28	hollow	-	-				
		992 640 106	28	hollow	-	-				
10 - 16	DZ	992 584 603	40	solid	LB 3C 1,5	0,5	992 584 501	60	SB 27C	14
		992 630 408	40	solid	LB 3C 1,5	0,5	992 630 608	60	SB 27C	14
		992 584 705	40	hollow	-	-				
		992 630 501	40	hollow	-	-				
20/25	ZT	992 641 202	50	solid	LB 3C 1,5	0,8	-	-	-	-
		992 641 304	50	solid	LB 3C 1,5	0,8				
20	DZ	992 642 307	45	solid	LB 3C 1,5	0,6	992 642 502	70	SB 35C	21
		992 642 205	45	hollow	-	-				
25	DZ	992 631 003	50	solid	LB 3C 1,5	0,8	992 631 105	75	SB 35C	19
		992 630 807	50	hollow	-	-				

ELSE-CHECK



A safety note which must be observed to avoid personal danger.



A note which must be observed to avoid material damage.



Explanation.

Notes on how to avoid accidents and material damage



For notes on avoiding accidents and material damage in ground conveyor vehicles with electronic components see J 6900.09.



During repair work, all thermal conduction aids (metallic surfaces) must remain intact.

Assembly/disassembly of components not contained in the spare parts catalogue is not permitted. Thermal conductivity and insulation could be affected.

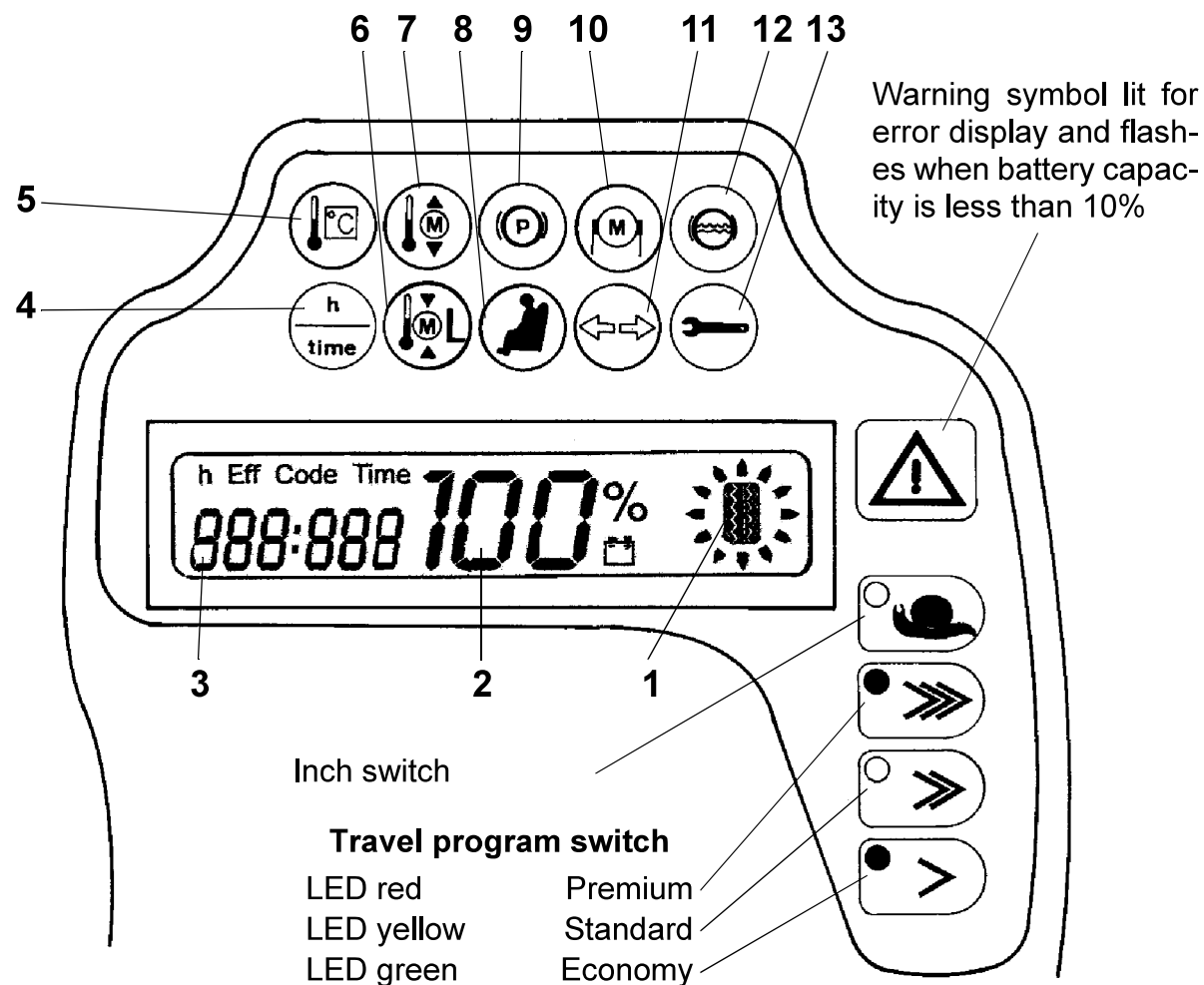
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Control Panel and LCD Display

Graphic Illustration

Item	Description
1	Wheel position and travel direction display
2	Battery capacity display
3	Time and service hour display, diagnostic and error display
4	Time/Service hour changeover key
5	Controller overtemperature display
6	Pump motor overtemperature display
7	Traction motor overtemperature display
8	Seat switch display
9	Handbrake on display
10	Carbon brush wear display
11	Indicator display
12	Insufficient brake fluid display
13	Service display



Functional Description

Wheel Position and Travel Direction Display

The display shows the preselected travel direction (forward or reverse) and the position of the steered wheels.

Battery Capacity Display

Numerical display via LCD in %

100% corresponds to a fully charged battery

000% corresponds to an 80% discharged battery

The display shows the available capacity in 10% increments. When there is only 10% available capacity the red indicator (warning symbol) flashes. When 0% is reached, lifting is inhibited after approx. 30-40 seconds. When lift inhibit is effective, the battery must be charged to at least 40% to release lifting again. It is possible to adjust to different battery types (wet - dry, change in discharge characteristic curve) via a PC or the "LISA".

Error Display

Error or warnings are displayed when they occur. The "h", "Eff", or "Time" symbols disappear. Errors are displayed as "Err:000" and warnings as "Inf:000" (from info).

If several errors occur, they are displayed alternately in 1.5 second intervals. A warning is also sounded.

Hourmeter

There are two hourmeters, one to record when the truck keyswitch is "ON" and "Eff" service hours. It is also possible to display the time.

The functions displayed can be changed using the "h/time" key.

Controller Overtemperature Display

If the controllers are too hot, this will be displayed (LED display). The performance will reduce continuously depending on the temperature.

Pump and Aux. Steering Motor Overtemperature Display

This monitors any overtemperature of the pump and aux. steering motors.

In the event of an overtemperature the temperature switch in the motor opens and the pump motor overtemperature LED display lights up (the temperature switches of both motors are in series).

Traction Motor Overtemperature Display

This monitors any overtemperature of the traction motors.

In the event of an overtemperature the temperature switch in the motor opens and the traction motor overtemperature LED display lights up (a single display for both motors).

Seat Switch Not Closed Display

If the driver's seat is not occupied while the truck is in operational mode this is indicated via an LED (seat occupied symbol).

The seat switch is a safety switch, i.e. both make and break contacts are monitored.

Handbrake On Display

If the handbrake / parking brake is applied while the truck is operational, this is displayed via LED (parking brake symbol).

If the handbrake is not applied and the driver's seat is not occupied an alarm is sounded. In addition, an alarm is sounded if the truck moves with the handbrake applied (can be activated or deactivated via PC or "LISA").

Carbon Brush Wear Display

If the carbon brushes of the traction, steering or pump motor are worn, this is indicated via LEDs (single display for all motors).

Indicator Display (Indicator Symbol Display)

Option for lighting with indicator system.

A 2-pole module connector underneath the control panel is designed for connection to the indicator system.

Brake Fluid Too Low Display

Switch closes when the brake fluid is too low (LED display).

There is a test switch on the brake fluid reservoir to test the operation.

Service Display

The **service display** lights up when the set service interval has been exceeded.

The keyswitch "**ON**" hourmeter is used for this.

Reset the service interval

First service interval after 50 hours

Thereafter every 1000 hours.

Key Functions

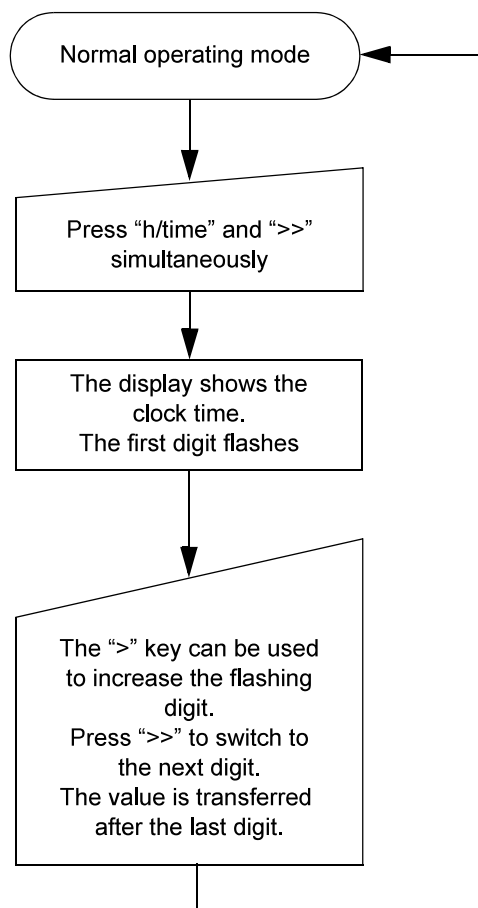
- You can press the “**h/time**” key to change the display from “**h**” **service hours** (switch on time), “**Eff**” **service hours** (operating time) and “**Time**” (clock time).
 - If an error or a warning occurs it will be displayed. The symbols “**h**”, “**Eff**”, or “**Time**” will disappear. Errors are displayed as “**Err:000**” and warnings as “**Inf:000**” (from info). If several errors occur they are displayed alternately in 1.5 second intervals. A warning will also sound.
 - 3 operating programs are installed in the series which can be selected using the following keys:
 - “>” Economy travel program,
(current saving mode)
 - “>>” Standard travel program,
 - “>>>” Premium travel program,
(high turnover)

The information is transmitted to the traction controllers via CAN Bus and repeated in cycles.

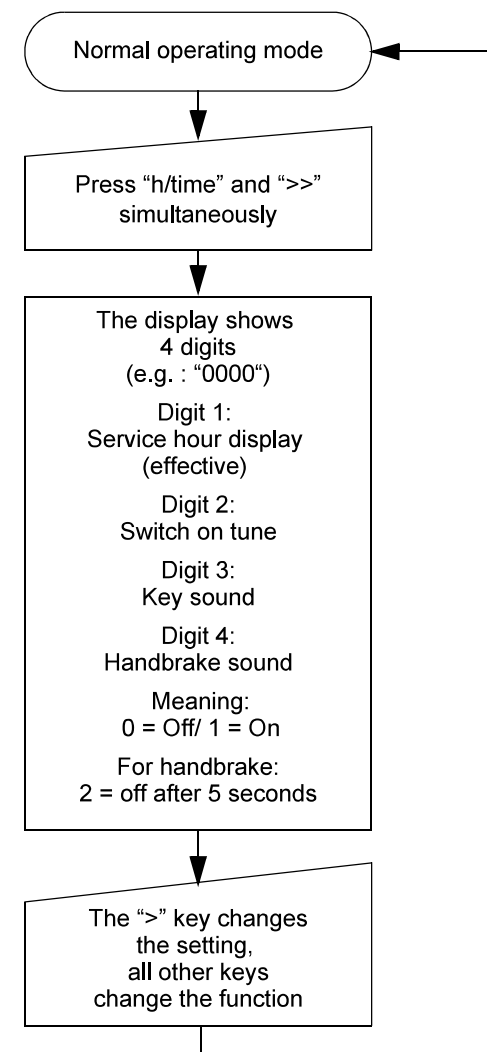
The Standard program is preset (“>>”), i.e. each time the system is switched on “>>” is set, unless it is deactivated.
- The **service display** lights up if the set service interval has passed.
The keyswitch on hourmeter is used for this.
Reset the service interval
First service interval after 50 hours
Thereafter every 1000 hours.
 - The **snail key** activates inching mode.
Max. travel speed 6 km/h.

Settings

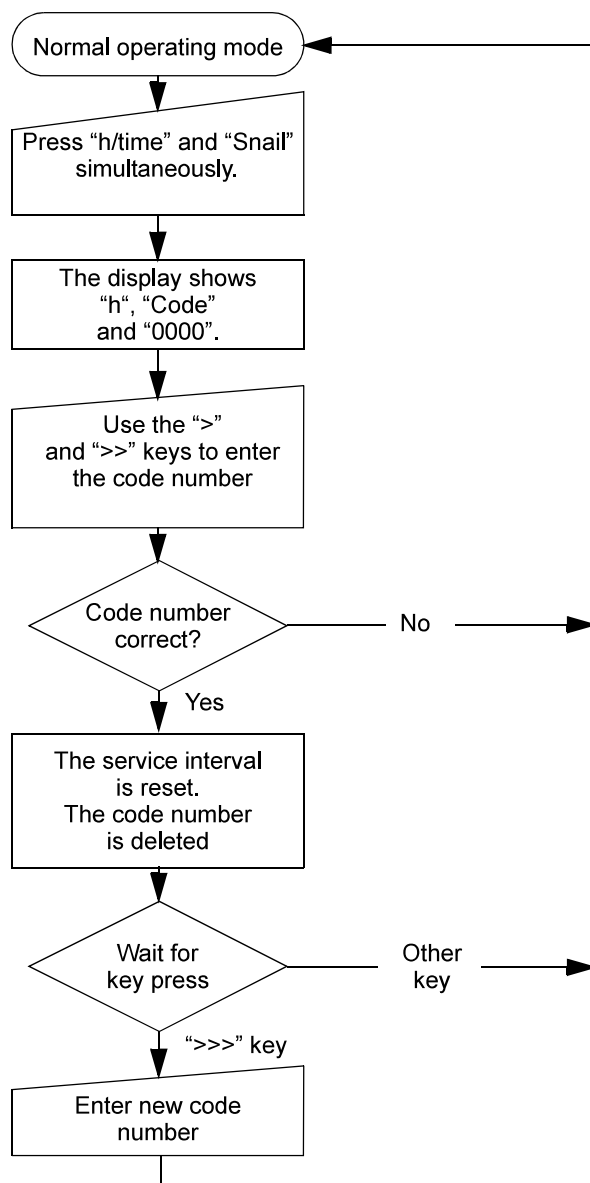
Setting the Time (V1.41 and 1.51)



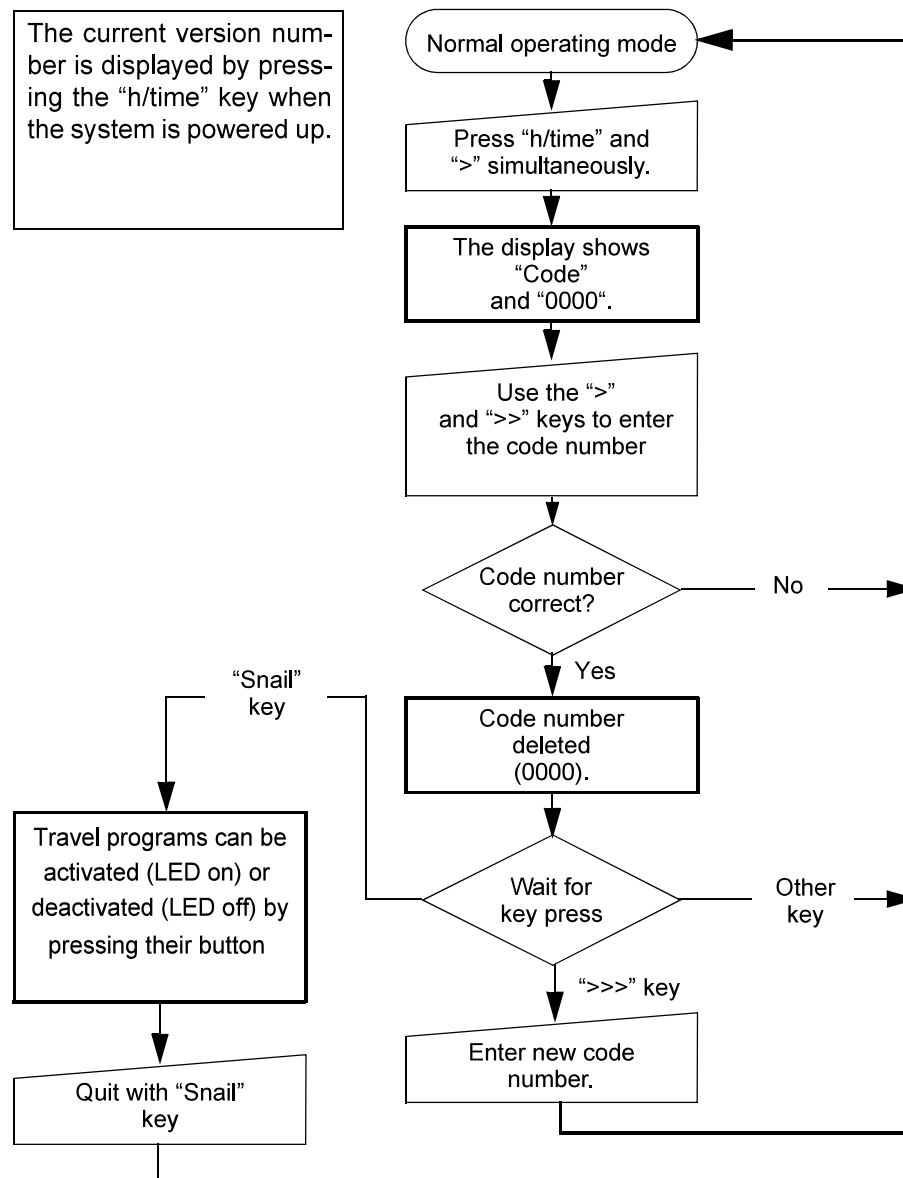
Switching Sounds on and off (from V1.51)



Resetting the Service Interval Counter (V1.41 and 1.51)

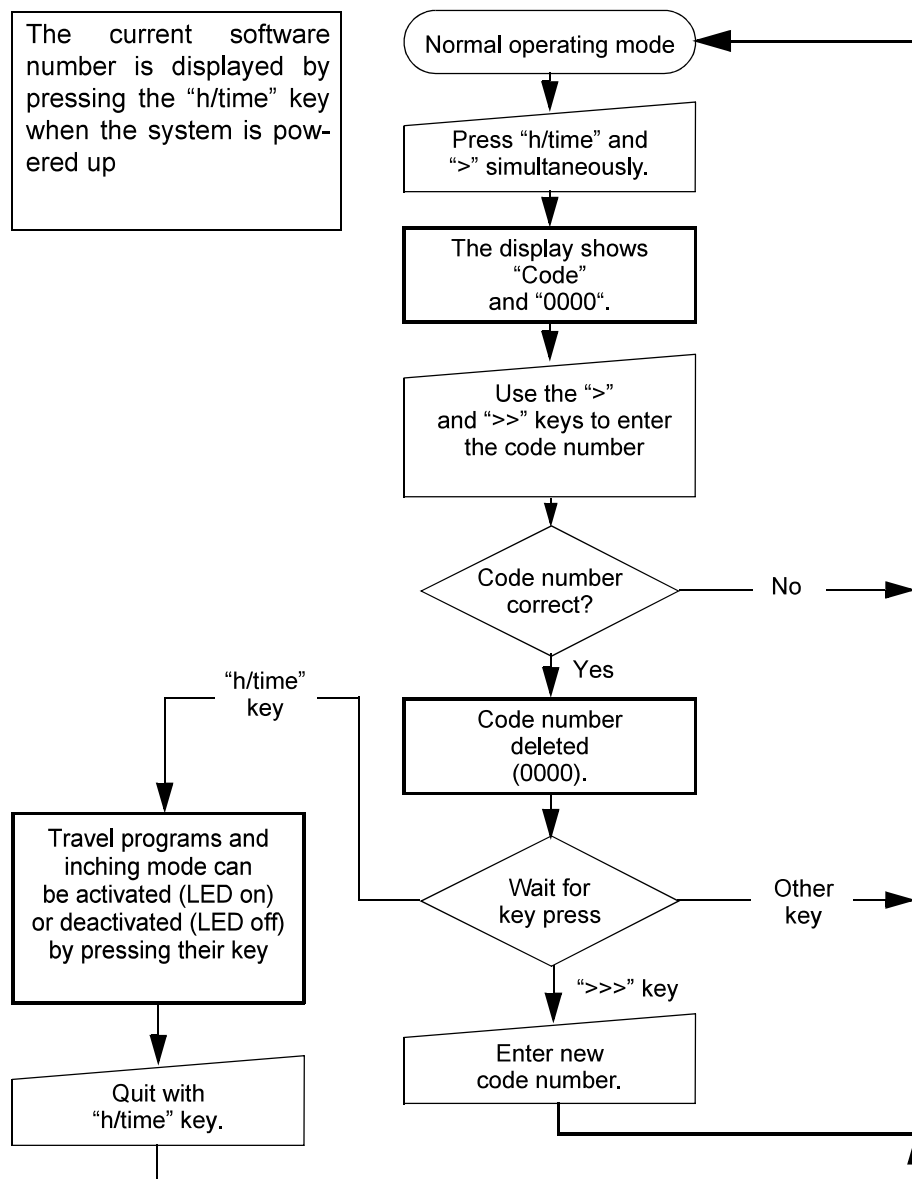


Activating / Deactivating the Travel Program (up to V1.41)



Activating / Deactivating the Travel Program (from V1.41)

The current software number is displayed by pressing the "h/time" key when the system is powered up



Instructions for the prevention of accidents and damage to equipment when performing servicing, checking and repair operations on fork lift trucks equipped with electronic assemblies

1. Safety measures

- Observe the operating instructions, section "Repair".
- Remove all rings, bracelets and similar objects before commencing any operations on fork lift trucks.
- Repairs, as well as removal and installation of electronic components and fuses must only be performed on a dead system. Unplug the battery plug or disconnect the battery.
- Connect the battery and switch on control voltages only, if required for checking operations. Exercise care during all operations (hazard of arcing).
- If not instructed otherwise, the vehicle must be jacked up for checking to allow the drive wheels to move freely. (Ensure absolutely that the vehicle cannot slip.)

2. Electric welding operations

Before commencing any electric welding operations on a fork lift truck, ensure that all control current plugs and all cable connections have been disconnected from the electronic assemblies, and that all electronic mounting boards have been removed.

During electric welding operations on the vehicle, the welding current causes in the cables an inductive voltage with high voltage peaks which is liable to destroy the semi-conductors incorporated in the electronic assemblies.

3. Correct handling of electronic printed circuit boards

When removing or installing electronic mounting boards or when fitting the test adapter ensure that

- the electric system is dead (switch off battery main switch and key switch),
- the contact pins are not deformed,
- the coding on the multipoint connector corresponds with the coding on the mounting board,
- the contacts of the mounting board and multipoint connector are facing each other correctly when there is no coding),
- the mounting board is correctly inserted into the guide rail,
- a seized mounted board is not removed or installed by force (contacts will be deformed),
- Use a tool (brass sockets) for the removal of printed circuit boards which are fitted by means of lugs.

4. Handling of electronic components (MOS-components, E-PROM and others)

These electronic components are very sensitive against static charges and might be destroyed by such static charges.

Always ensure that the electronic components, when not required, are placed with their connecting contacts on metallic, bare supports, or that they are in conductive foam rubber.

New electronic components are always supplied on a strip of conductive foam rubber and for transportation purposes the replaced electronic components must be set back into the conductive foam rubber.

5. Changing the EPROM



In case of varnished boards, do not exchange the EPROM.



Do not bend or damage the connecting contacts of the EPROM!

- Lift the EPROM equally out of the plug connector by putting the tool - order no. 081.0996 (plastic pliers) - under the narrow edges.
- When replacing the EPROM, ensure that the sides are correctly placed. EPROM and plug connector are marked by a notching.

6. Installation of heat-sensitive components

(Diodes, thyristors, transistors, cooling elements, etc.)

Heat-sensitive components must be installed using heat conducting compound, heat-conducting mats or foils.

Do only apply enough heat-conducting compound to the threads of electronic components or into tapped holes accepting such components, or onto the surfaces of cooling elements that the threads or any unevenness in the cooling element surfaces are just filled or evened out.

If excessive heat-conducting compound is applied, the compound, which softens when the components become heated, will leak out (leaving hollows) thus impairing its heat conducting properties.

7. Cleaning operations

- Cleaning operations must only be performed on dead installations. Unplug the battery plug or disconnect the battery.
- Do not use a steam jet when cleaning electronic components, but use low-pressure compressed air and a brush.
- See SHB 0000.15.

Instructions for the prevention of functional failures and damage to equipment when performing cleaning operations on fork lift truck

1. Cleaning operations, general

- Unplug the battery connector or disconnect the battery, before commencing any cleaning operations.
- Only non-inflammable liquids must be used when performing cleaning operations (for cleaning and servicing of chains refer to section 2).
- Do not use water or a steam jet when cleaning electric and electronic assemblies or components. Use vacuum intake air, weak compressed air and a non-metal brush.
- Carefully cover all delicate components, especially electric and electronic assemblies and components before applying water or a steam jet.
- After completion of steam jet cleaning, grease the vehicle in accordance with the lubrication schedule. Friction surfaces, guide rollers and chains must only be greased with the lubricant specified for the respective operating conditions (normal operating conditions/operation in cold storage facilities).
- Parts susceptible to corrosion must be subjected to the prescribed after-treatment.
- Before putting the vehicle into operation again, ensure that the electric/electronic assemblies are dry. If necessary, dry them using air. Ensure that any residual water or liquid detergent still present on the chassis or inside the vehicle cannot penetrate into electric or electronic assemblies as a result of vehicle movements.
- The entire vehicle must be perfectly dry, before operations in cold storage facilities are resumed.
- Perform several braking tests (drying out the brakes) before putting the vehicle into operation again.
- No sealing spray should be used, as sprayed surfaces tend to increase the attraction of dust and dirt.
- Limit the application of contact spray to as little an area as possible.

2. Cleaning and servicing of chains

Lifting chains fall into the category of safety elements. Their servicing and lubrication must be carried out with great care, as befits safety elements. Lack of lubrication causes rapid wear of chains. The intervals indicated in the servicing checklist apply to normal operating conditions. Under rugged working conditions (dust, high temperatures) more frequent lubrication becomes necessary. It is advisable to use the chain spray indicated in the lubrication schedule. With a clean chain (dust and grease crusts to be removed beforehand) this will ensure penetration of the lubricant. Mere external application of grease does not provide adequate lubrication.

- Chains should not be excessively dirty.
- Do not clean chains by means of steam jets, i.e. do not direct the steam jet directly on to the chain.
- Paraffin derivatives only must be used for cleaning purposes (petrol, petroleum or diesel fuel).
- Chains must be lubricated whenever they have been cleaned.
- Corrosive products and acids must not come into contact with chains, as they will lead to their destruction.
- When servicing or replacing lift chains, check for uniform tension and for aligned and smooth passage over the guide rollers.

Abkürzung Abbreviation Abréviation Abbreviazione Abreviaciòn	Schlüsselliste- Kabelfarben	Code List - Cable colours	Liste de Co- de-couleurs de cables	Lista codici co- lori del cavi	Lista de clave Colores de ca- bles
	D Einfabig	GB Single-colour	F Uni-colore	I Monocolore	E Unicolor
bl	blau	blue	bleu	blu (o azzur)	azul
br	braun	brown	marron	marrone	pardo
ge	gelb	yellow	jaune	giallo	amarillo
gn	grün	green	vert	verde	verde
gr	grau	gray	gris	grigio	gris
or	orange	orange	orange	arancione	anaranjado
rs	rosa	pink	rose	rosa	rosado
rt	rot	red	rouge	rosso	rojo
sw	schwarz	black	noir	nero	negro
vi	violett	violet	violet	viola	violado
ws	weiß	white	blanc	bianco	blanco
	zweifabig	bicoloured	bicolore	bicolore	bicolor
bl or	blau-orange	blue-orange	bleu-orange	blu-arancione	azul-anaranjado
bl rs	blau-rosa	blue-pink	bleu-rose	blu-rosa	azul-rosado
bl ws	blau-weiß	blue-white	bleu-blanc	blu-bianco	azul-blanco
ge rt	gelb-rot	yellow-red	jaune-rouge	giallo-rosso	amarillo-rojo
ge vio	gelb-violett	yellow-violet	jaune-violet	giallo-viola	amarillo-violado
ge ws	gelb-weiß	yellow-white	jaune-blanc	giallo-bianco	amarillo-blanco
gn ge	grün-gelb	green-yellow	vert-jaune	verde-giallo	verde-amarillo
gn ws	grün-weiß	green-white	vert-blanc	verde-bianco	verde-blanco
or rt	orange-rot	orange-red	orange-rouge	orancione-rosso	anaranjado-rojo
rs ws	rosa-weiß	pink-white	rose-blanc	rosa-bianco	rosado-blanco
rt bl	rot-blau	red-blue	rouge-bleu	rosso-blu	rojo-azul
rt gn	rot-grün	red-green	rouge-vert	rosso-verde	rojo-verde
rt gr	rot-grau	red-gray	rouge-gris	rosso-grigio	rojo-gris
rt rs	rot-rosa	red-pink	rouge-rose	rosso-rosa	rojo-rosado
rt sw	rot-schwarz	red-black	rouge-noir	rosso-nero	rojo-negro
rt ws	rot-weiß	red-white	rouge-blanc	rosso-bianco	rojo-blanco
sw br	schwarz-braun	black-brown	noir-marron	nero-marrone	negro-pardo
sw ge	schwarz-gelb	black-yellow	noir-jaune	nero-giallo	negro-amarillo
sw gn	schwarz-grün	black-green	noir-vert	nero-verde	negro-verde
sw or	schwarz-orange	black-orange	noir-orange	nero-arancione	negro-anaranjado
sw rs	schwarz-rosa	black-pink	noir-rose	nero-rose	negro-rosado
sw ws	schwarz-weiß	black-white	noir-blanc	nero-bianco	negro-blanco
vi or	violett-orange	violet-orange	violet-orange	viola-arancione	violado-anaranjado
ws sw	weiß-schwarz	white-black	blanc-noir	bianco-nero	blanco-negro

MP1514F/H CAN Bus Control System (2 motor drive)



For notes on avoiding accidents and material damage in ground conveyor vehicles with electronic components see J 6900.09.

During repair work, all thermal conduction measures taken (metallic surfaces) must remain intact.
 Assembly/disassembly of components not contained in the spare parts catalogue is not permitted. Thermal conductivity and insulation could be affected.

Test and Measurement Equipment

- Multimeter and Ohmmeter (digital)
- Stop watch (slow travel)



Indicates notes regarding safety that must be observed to prevent danger to personnel.



Indicates notes that must be observed to prevent damage to materials.



Indicates explanations.

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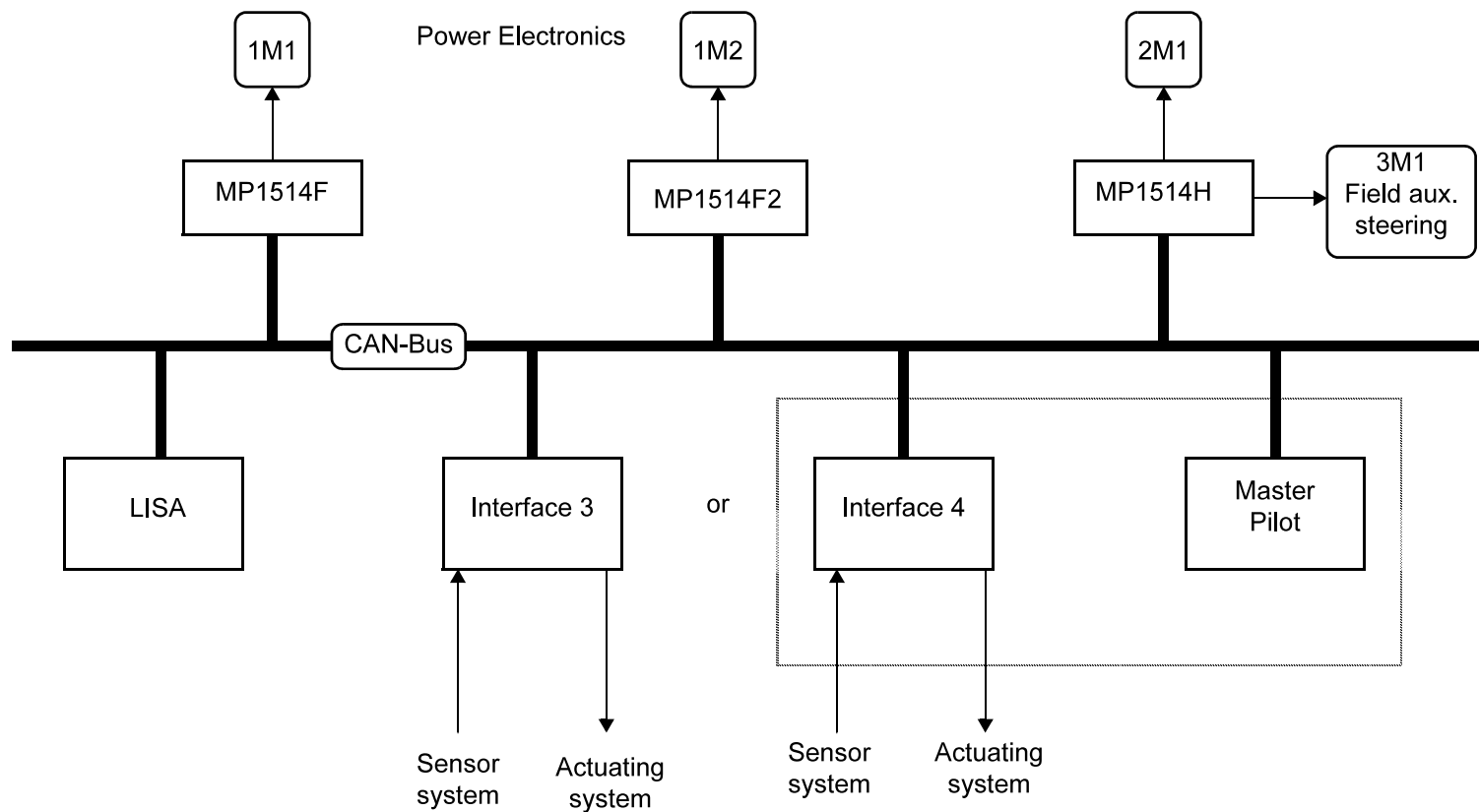
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Control System - Operational Description

The “Truck change” function on the LISA provides the components with the truck specification details.

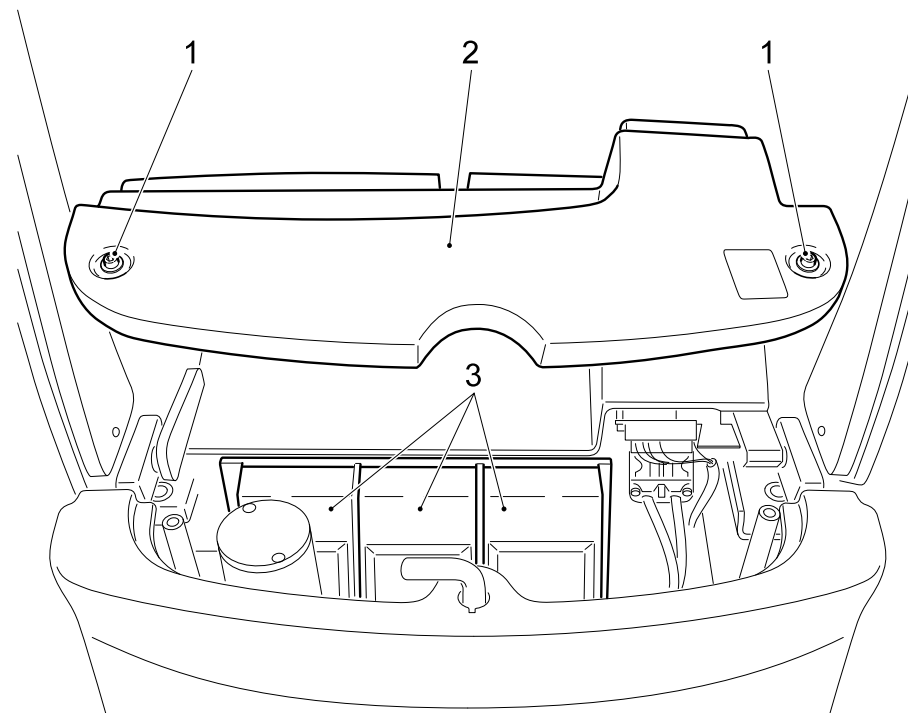
The control system used in the EFG-DF is fitted with the MP1514F and MP1514H components, the Interface 3, the Multipilot and the LISA. All the above components communicate with each other via the CAN-Bus.



Removing the contactor rack

The contactor rack has a cover on the counter weight.

- Remove the 2 screws (1).
- Remove the cover (2).
- Remove the control system (3) covers.



MP1514F Drive Current Control Systems - Operational

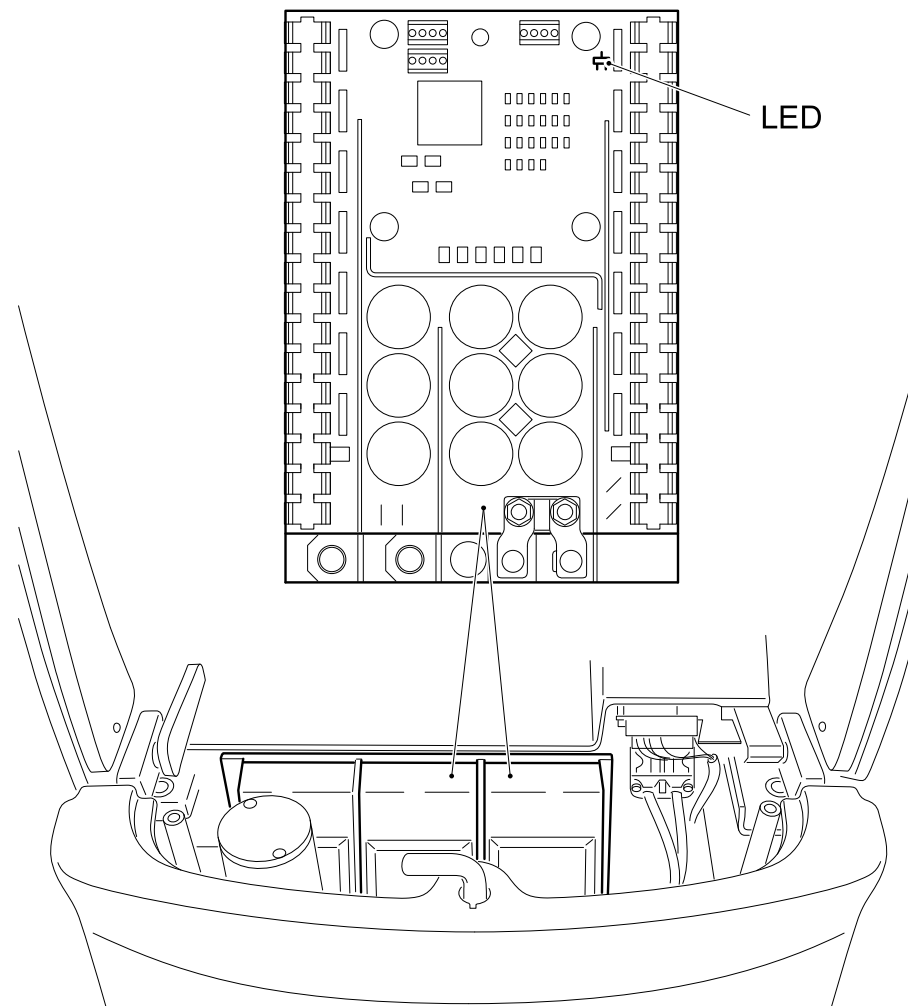
Description

The MP1514F and MP1514F2 drive current control systems govern the drive motors in a shunt system. Information is exchanged via the CAN-Bus. Internally, a microprocessor system processes all the important program parts for the components. Communication with the other truck components is solely via the CAN-Bus.

LED on the MP1514F

The MP1514F is fitted with a double green/red LED for status display and error messages. Error messages (red LED flashing code) are displayed as system messages via the LISA.

Red LED	Green LED	Description
On	On	MP 1514 F has not received a nominal value
Off	On	Power supplied to MP 1514F
Flashing	-	Flashing code matches error number
-	Flashing	Ready -> Watchdog on



MP1514F / MP1514F2 Electrical Plug Layout

Plug X3

Pin	Description	Range
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

Plug X7

Pin	Description	Range
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

Plug X8

Pin	Description	Range
1	Key switch input  On the drive current control system this is the battery measurement input.	48V
2	48V / 1A output polarity inhibit (not connected)	
3	Postive K1 (only connected for "Left travel" drive current control system)	48V
4	Negative switch K1 (only connected for "Left travel" drive current control system)	Connected: < 1V Open: 48V
5	Input Code 1 (only connected for "Right travel" drive current control system)	Low active
6	Input Code 2 Travel / Lift Travel = open / Lift = GND	Open

 As per plug layout: see circuit diagram.

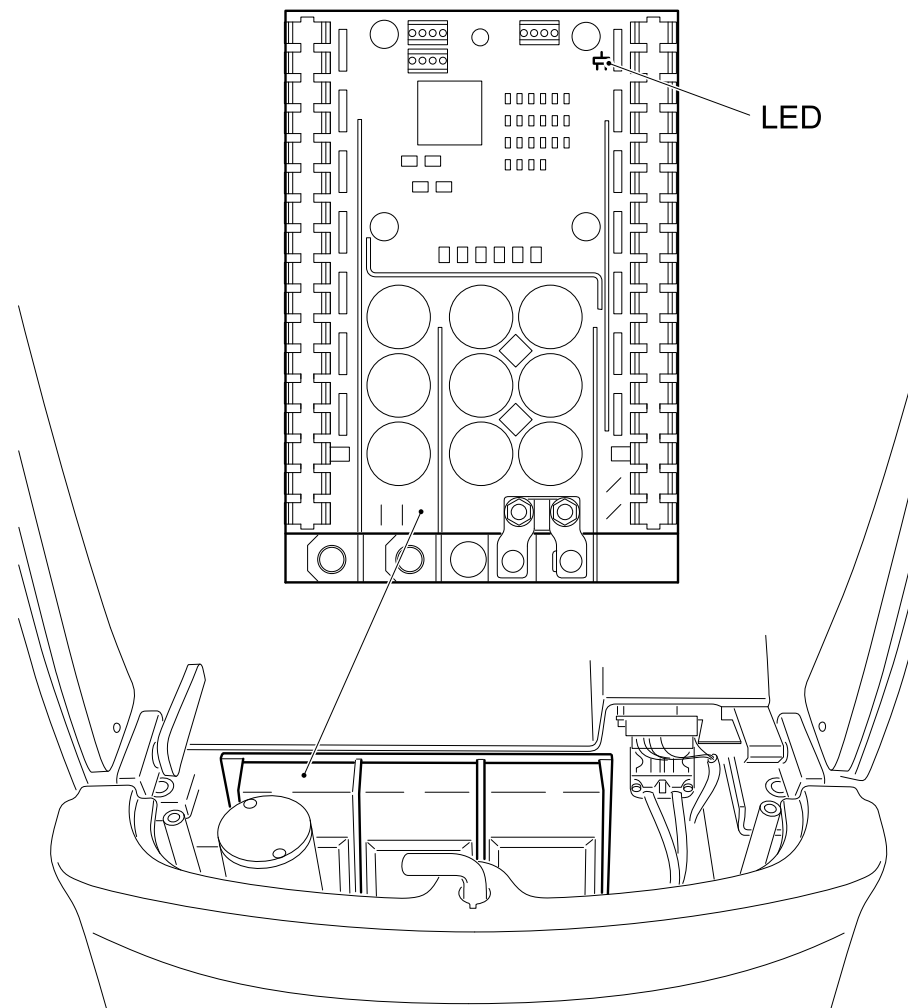
MP1514H Lifting Control System Operational Description

The MP1514H lifting control system governs the lift motor in an inverse speed system and a steer motor as a permanently energised DC motor. Information is exchanged via the CAN-Bus. Internally, a microprocessor system processes all the important program parts for the components. Communication with the other truck components is solely via the CAN-Bus.

LED on the MP1514H

The MP1514H is fitted with a double green/red LED for status display and error messages. Error messages (red LED flashing code) are displayed as system messages via the LISA.

Red LED	Green LED	Description
On	On	MP 1514 H has not received a nominal value
Off	On	Power supplied to MP 1514H
Flashing	-	Flashing code matches error number
-	Flashing	Ready -> Watchdog on



MP1514H Electrical Plug Layout

Plug X3		
Pin	Description	Range
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

Plug X7		
Pin	Description	Range
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

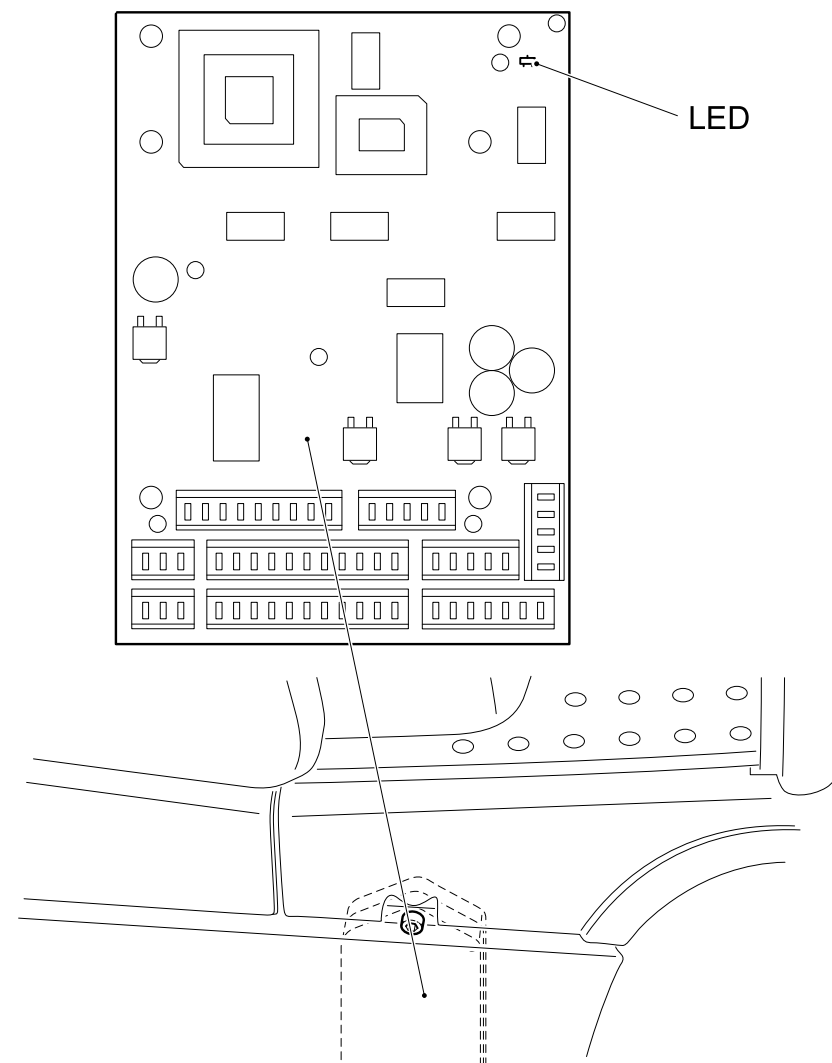
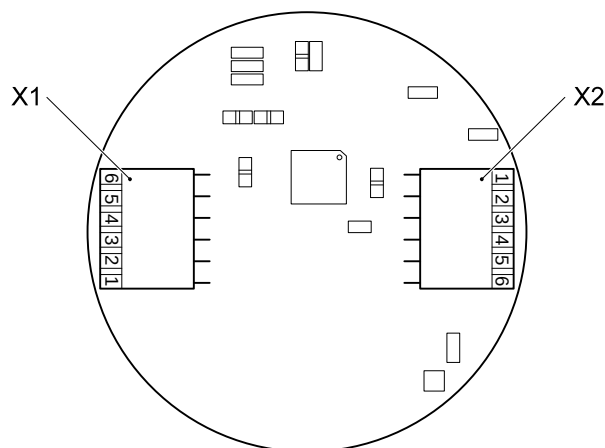
Plug X8		
Pin	Description	Range
1	Key switch input	48V
2	Void	
3	Void	
4	Void	
5	Void	
6	Input Code 2 Travel / Lift Travel = open / Lift = GND	GND

Removing the Interface Card

- Unscrew 2 X M8 screws (4) on the foot plate.
- Remove foot plate (5).
- Unscrew interface support with M10 screw (6) and carefully lift out the box (7) and the interface card.
- Unscrew the 4 cross screws (2 each side of the box), open the box and lift out the interface card.

Removing the Masterpilot

- To remove the Masterpilot remove the four screws next to the rubber joint
- Carefully lift out the Masterpilot.
- Remove plugs X1 and X2.



Interface 3 Operational Description

The Interface 3 is designed to be used in the EFG-DF. It contains all the interfaces to the electrical system of the truck (digital and analog inputs/ outputs).

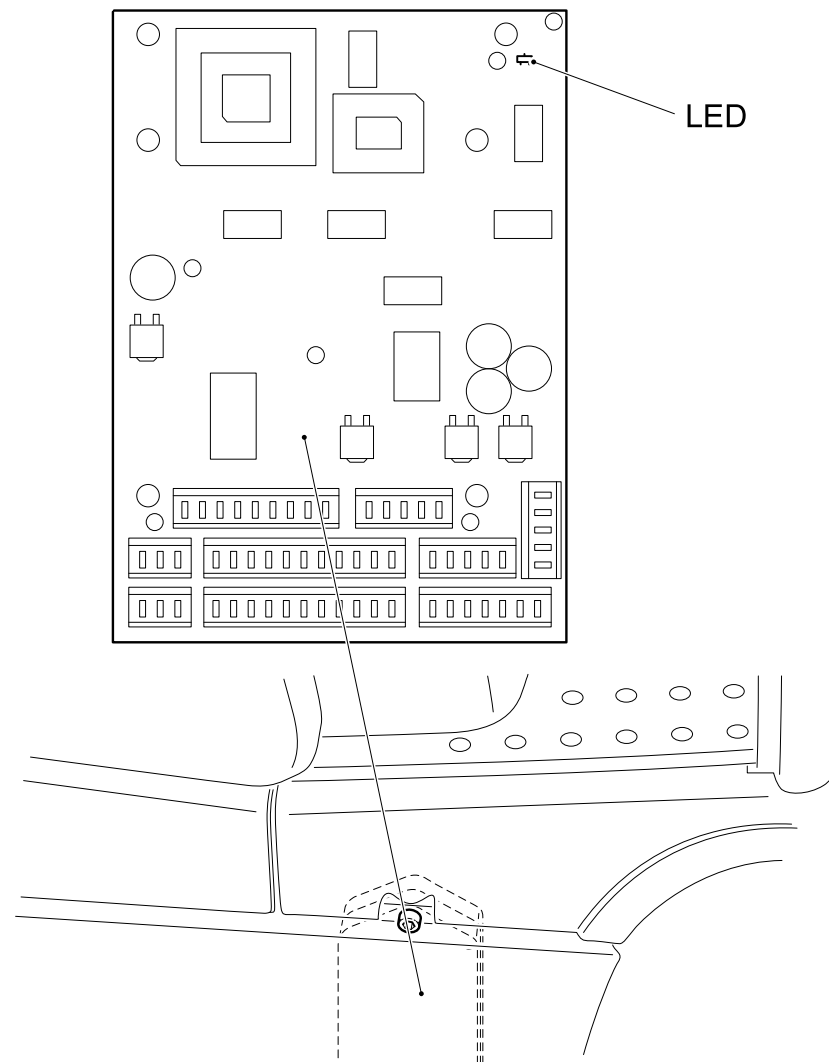
Internally, a microprocessor system processes all the important program parts for the components. Communication with the other truck components is solely via the CAN-Bus. The Interface 3 contains an LED for error messages which can also be displayed on the LISA.

LED on Interface 3

Interface 3 contains a double green/red LED for status display and error messages.

Error messages are displayed as system messages via the LISA

Red LED	Green LED	Description
-	On	Power supplied to Interface 3
On	On	Initialisation incomplete or Watchdog run out



Interface 3 Electrical Plug LayoutPart 1

Plug X1		
Pin	Description	Type
1	Travel release	Digital input
2	GND for pin 1	GND
3	Positive travel nom. value	
4	Neutral travel nom. value	Analog input
5	Negative travel nom. value	GND
6	GND for pin 7	GND
7	Seat switch	Digital input
8	12V (not connected)	
9	Void (not connected)	Digital input
10	Void (not connected)	Digital input
11	Seat switch monitor	Digital input
12	Not connected	

Plug X2		
Pin	Description	Type
1	Lift motor overtemperature	Digital input
2	GND for pin 3	GND
3	Carbon brush wear lift motor	Digital input
4	Drive motor overtemperature	Digital input
5	GND for pins 4 and 6	GND
6	Carbon brush wear drive motor	Digital input

Interface 3 Electrical Plug LayoutPart 2
Plug X3

Pin	Description	Type
1	GND for drive current inhibit	GND
2	Drive current inhibit	Digital input
3	Lift limit inhibit (not connected)	Digital input
4	Lift limit switch bypass (not connected)	Digital input
5	Drive current inhibit (release)	Digital input
6	Control 2 nominal value (-)	GND
7	Not used	
8	Not used	
9	+ 48V for outputs (not connected)	+48V
10	GND (not connected)	GND

Plug X4

Pin	Description	Type
1	Aux. lift 2 fwd. / rev.	Digital input
2	Tilt fwd. / rev.	Digital input
3	Not used	GND
4	Lift limit display (not connected)	Digital output 1A
5	Reversing lights	Digital output 1A
6	GND	GND

Interface 3 Electrical Plug Layout
Part 3
Plug X5

Pin	Description	Type
1	Steering nominal value (+)	12V
2	Steering nominal value (neutral)	Analog / digital input
3	Steering nominal value (-) (not connected)	GND
4	Steer angle actual value (+)	
5	Steer angle actual value (neutral)	Analog / digital input
6	Steer angle actual value (-)	GND

 When using a switch instead of an analog transmitter plugs X5.1 and X5.2 are bypassed. The switch is positioned between X5.2 and X5.3.

Plug X6

Pin	Description	Type
1	Forward travel	Digital input
2	Reverse travel	Digital input
3	horn	Digital input
4	GND for horn switch, pins 1 and 2	GND
5	Lift nominal value (+)	
6	Lift nominal value (neutral)	Analog input
7	Lift nominal value (-)	GND
8	Positive 48V at K1	From main contactor

 When using a switch instead of an analog transmitter plugs X6.5 and X6.6 are bypassed. The switch is positioned between X6.6 and X6.7.

Interface 3 Electrical Plug LayoutPart 4
Plug X7

Pin	Description	Type
1	horn	Digital output
2	horn (-)	horn input
3	Parking brake applied	Digital input
4	GND for pin 3	GND
5	Not used	
6	Not used	
7	Pedal brake switch	Digital input
8	GND for pin 7	GND
9	Brake fluid	Digital input
10	GND for pin 9	GND
11	Fast / slow travel	Digital input
12	GND for pin 11	GND

Plug X8

Pin	Description	Type
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

Plug X9

Pin	Description	Type
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

Interface 4 Operational Description

The Interface 4 with master pilot option is designed to be used in the EFG-DF. It contains all the interfaces to the electrical system of the truck (digital and analog inputs/outputs).

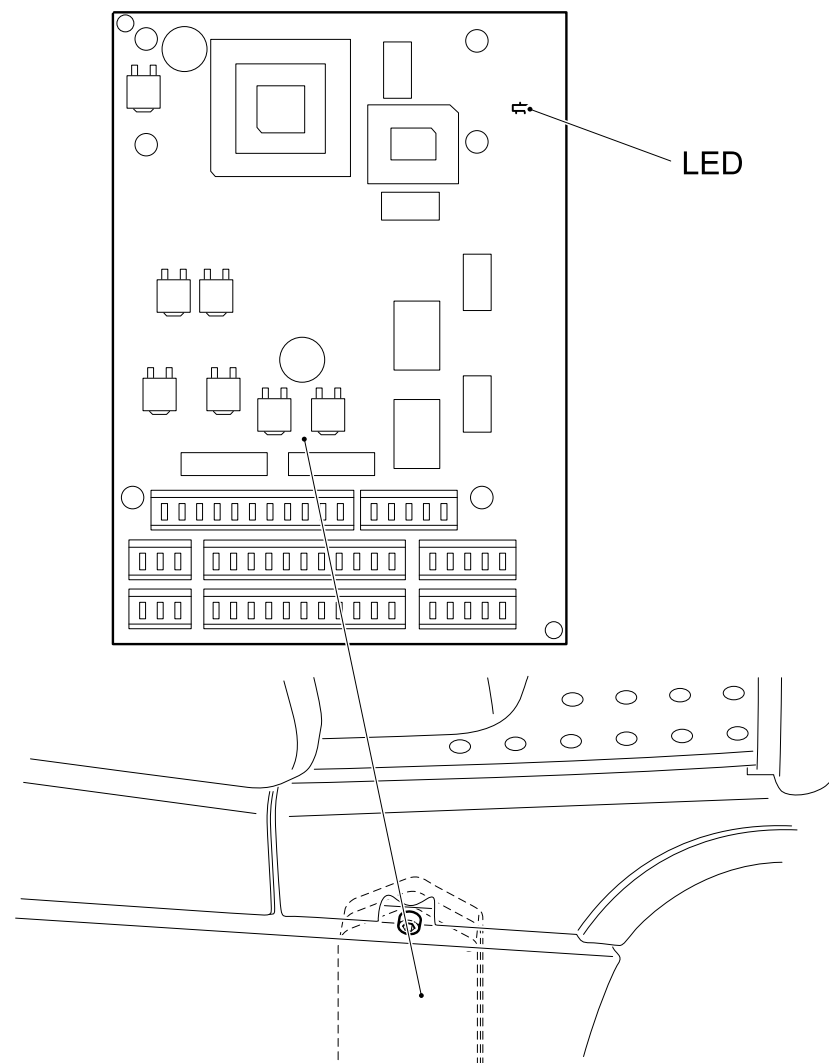
Internally, a microprocessor system processes all the important program parts for the components. Communication with the other truck components is solely via the CAN-Bus. The Interface 4 contains an LED for error messages which can also be displayed on the LISA.

LED on Interface 4

Interface 4 contains a double green/red LED for status display and error messages.

Error messages are displayed as system messages via the LISA

Red LED	Green LED	Description
-	On	Power supplied to Interface
On	On	Initialisation incomplete or Watchdog run out



Interface 4 Electrical Plug Layout
Part 1
Plug X1

Pin	Description	Type
1	Travel release	Digital input
2	GND for pin 1	GND
3	Travel nominal value (+)	
4	Travel nominal value (neutral)	Analog input
5	Travel nominal value (-)	GND
6	GND for pin 7	GND
7	Seat switch	Digital input
8	12V (not used)	
9	Not connected	Digital input
10	Not connected	Digital input
11	Seat switch monitor	Digital input
12	GND (not used)	GND

Plug X2

Pin	Description	Type
1	Lift motor overtemperature	Digital input
2	GND for pins 2 and 3	GND
3	Lift motor carbon brush wear	Digital input
4	Drive motor overtemperature	Digital input
5	GND for pins 4 and 6	GND
6	Drive motor carbon brush wear	Digital input

Interface 4 Electrical Plug Layout

Part 2

Plug X3		
Pin	Description	Type
1	GND for pins 2 and 3	GND
2	Drive current inhibit	Digital input
3	Lift limit inhibit (not connected)	Digital input
4	Lift limit switch bypass (not connected)	Digital input
5	Not used	
6	GND (not connected)	GND

Plug X4		
Pin	Description	Type
1	Steering nominal value (+)	12V
2	Steering nominal value (neutral)	Analog input
3	Steering nominal value (-) (not connected)	GND
4	Steer angle actual value (+)	Postive
5	Steer angle actual value (neutral)	Analog input
6	Steer angle actual value (-)	GND

When using a switch instead of an analog transmitter plugs X4.1 and X4.2 are bypassed. The switch is positioned between X4.2 and X4.3.

Interface 4 Electrical Plug Layout
Part 3
Plug X5

Pin	Description	Type
1	Prop. valve lower drive	Output 1A
2	+ 48V	Output 1A
3	+ 48V	Output 6A
4	Lift solenoid  Blocked during lift inhibit.	Output 1A
5	Sideshift LH solenoid	Output 1A
6	Sideshift RH solenoid	Output 1A
7	Fwd. tilt solenoid	Output 1A
8	Rev. tilt solenoid	Output 1A
9	ZH 1 LH solenoid	Output 1A
10	ZH 1 RH solenoid	Output 1A
11	Reverser valve for ZH 3	Output 1A
12	Reversing lights (not connected)	Output 1A

Plug X7

Pin	Description	Type
1	Horn	Output 2A
2	Horn (-)	horn input
3	Parking brake applied	Digital input
4	GND for pin 3	GND
5	Not used	
6	Postive 48V	
7	Pedal brake switch	Digital input
8	GND for pin 7	GND
9	Brake fluid	Digital input
10	GND for pin 9	GND
11	Slow / fast travel	Digital input
12	GND for pin 11	GND

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Interface 4 Electrical Plug LayoutPart 4

Plug X8		
Pin	Description	Type
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

Plug X9		
Pin	Description	Type
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V

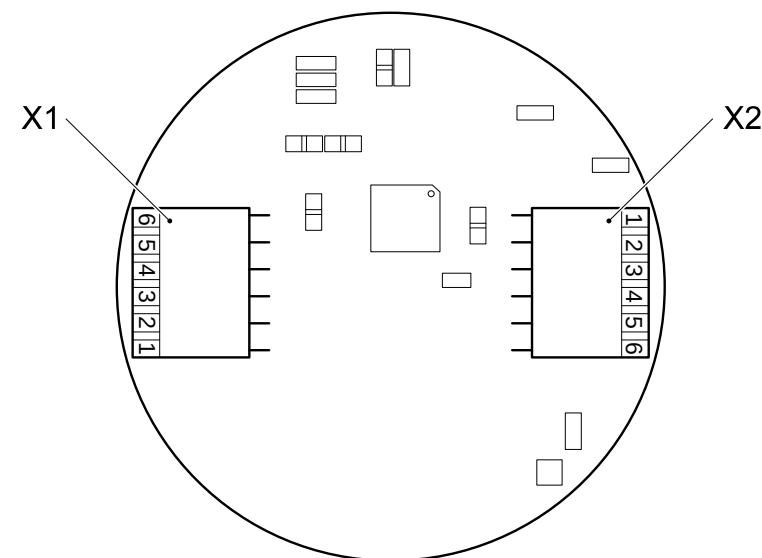
Masterpilot (optional) - Operational Description

The following functions are contained within the Masterpilot (only in conjunction with Interface4):

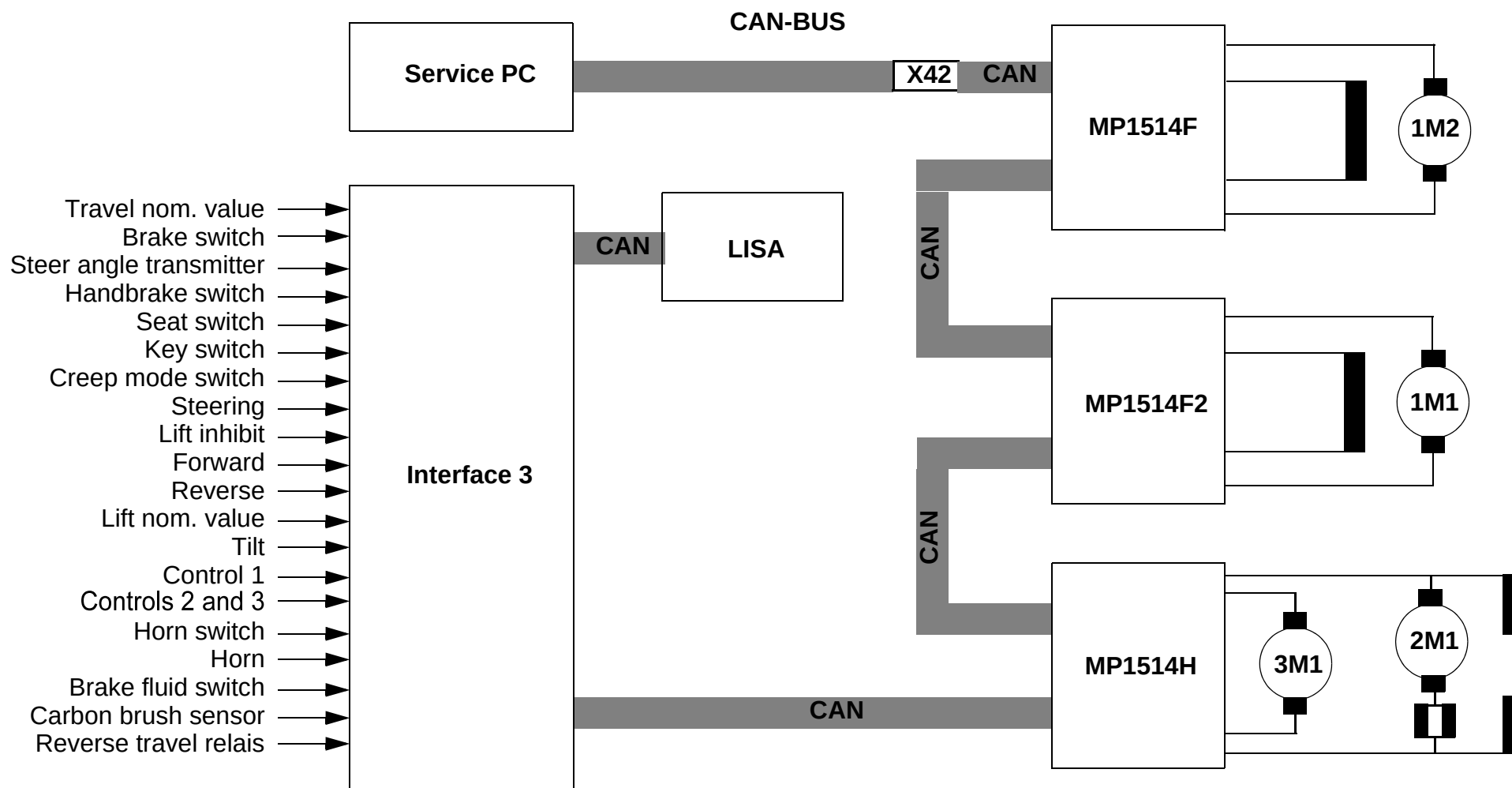
- All hydraulic functions are proportionally controlled via the CAN-BUS
- Travel direction change
- Horn

Masterpilot Electrical Plug Layout

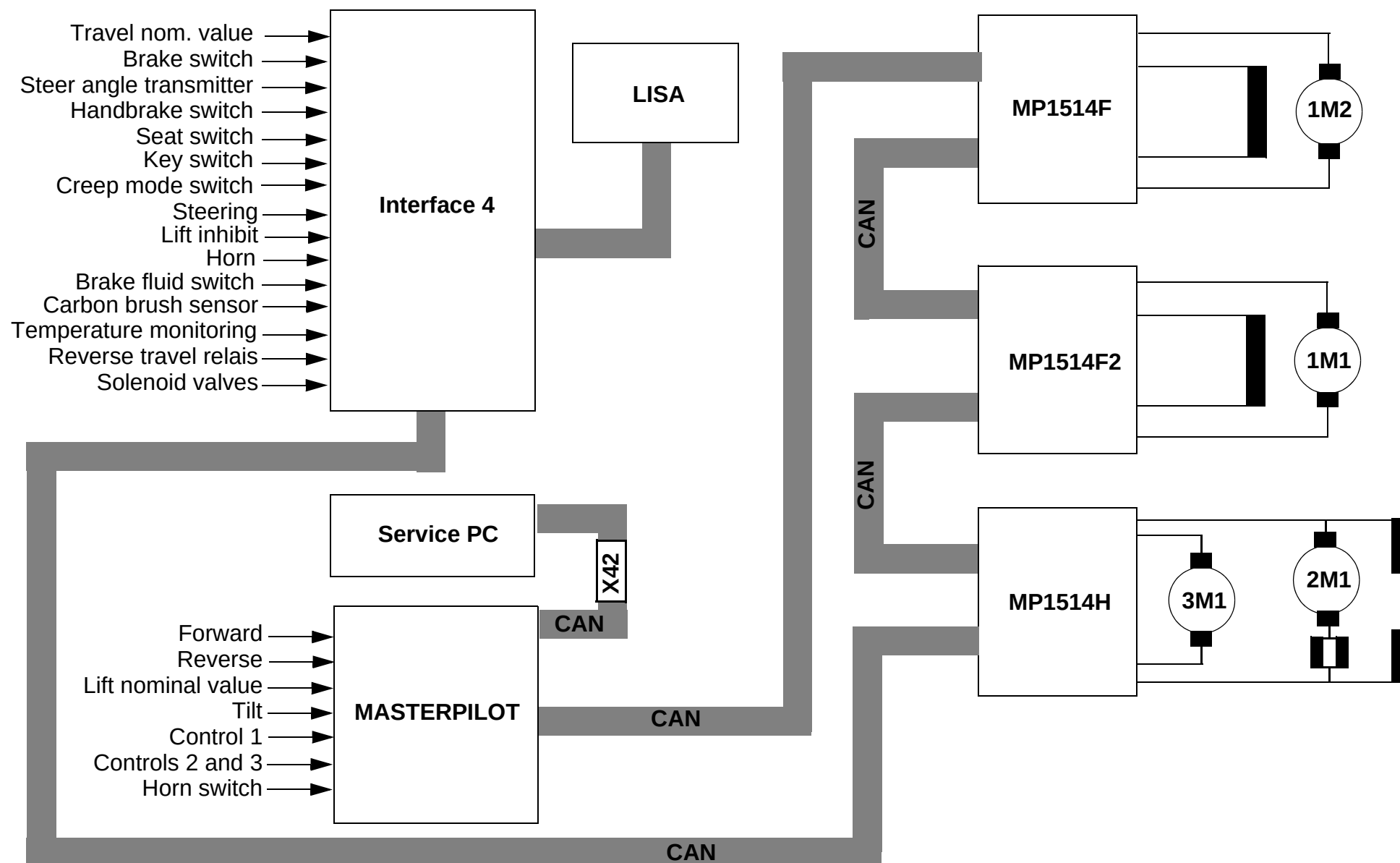
Plug X1 / Plug X2		
Pin	Description	Type
1	Postive	12V / 1A
2	GND	0V
3	CAN High	1...4V
4	CAN Low	1...4V
5	Void	
6	Void	



Block Diagram for EFG-DF with Manual Valve Lever

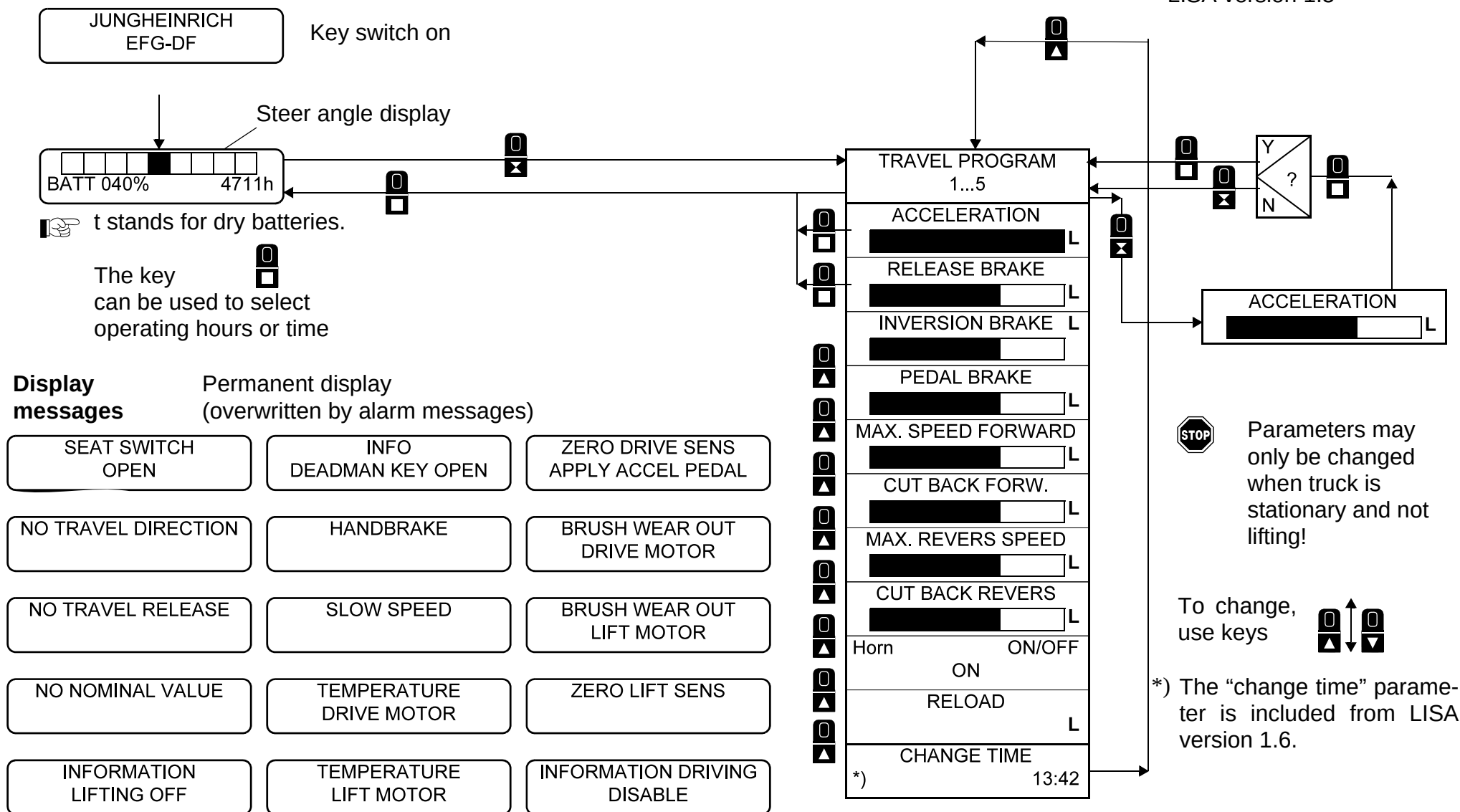


Block Diagram for EFG-DF with Masterpilot



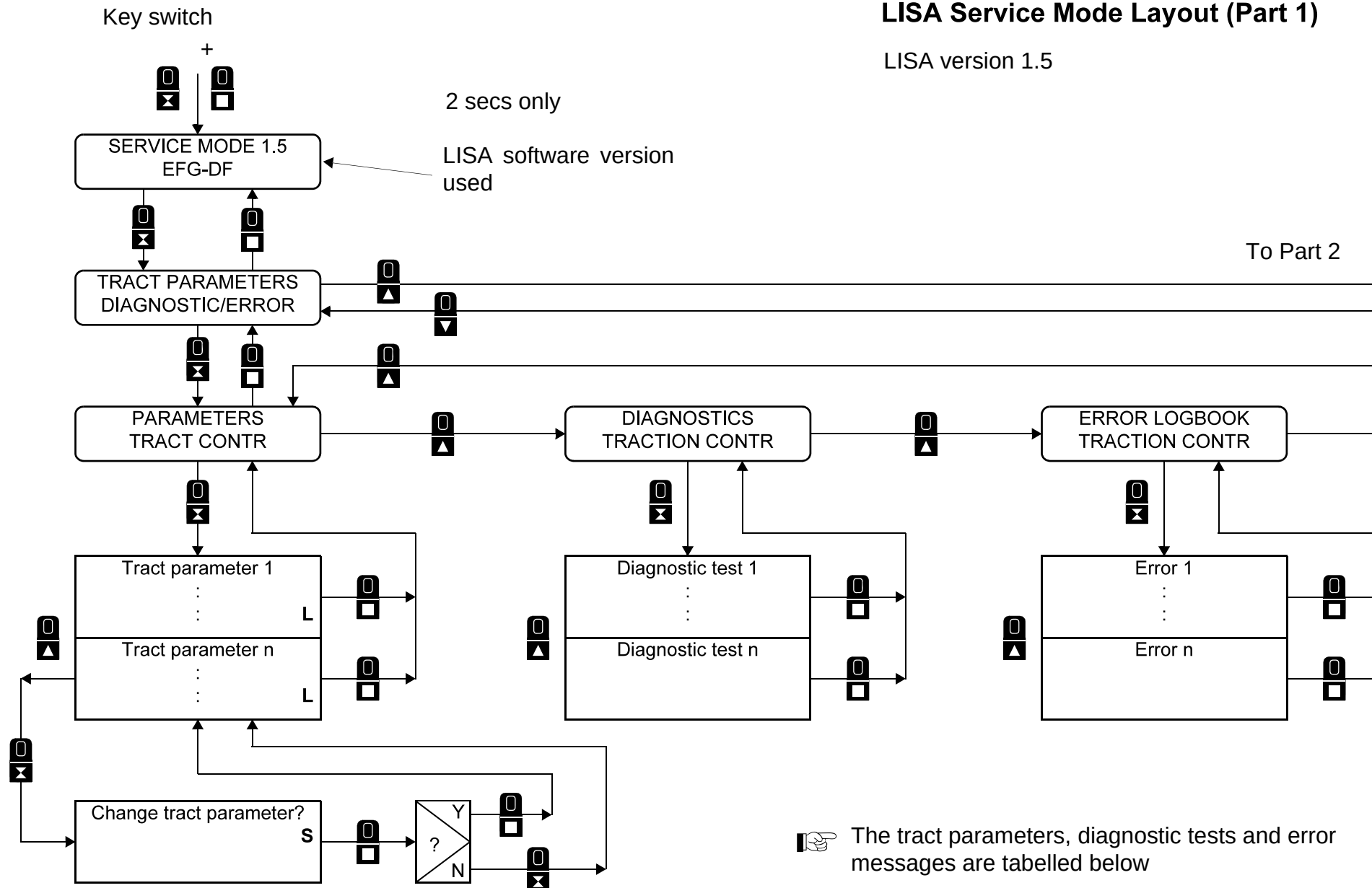
LISA User Mode Layout

LISA version 1.5



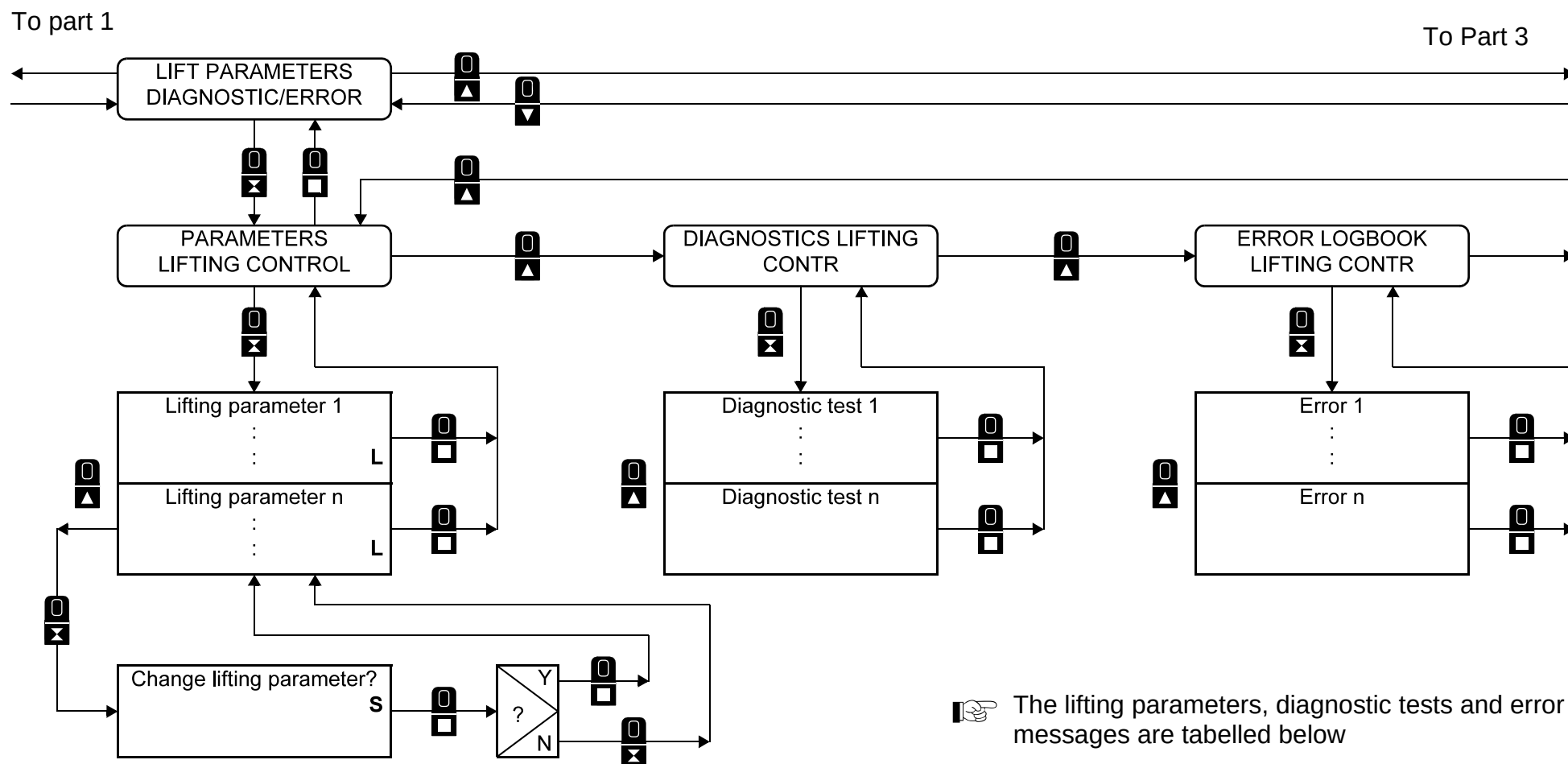
LISA Service Mode Layout (Part 1)

LISA version 1.5



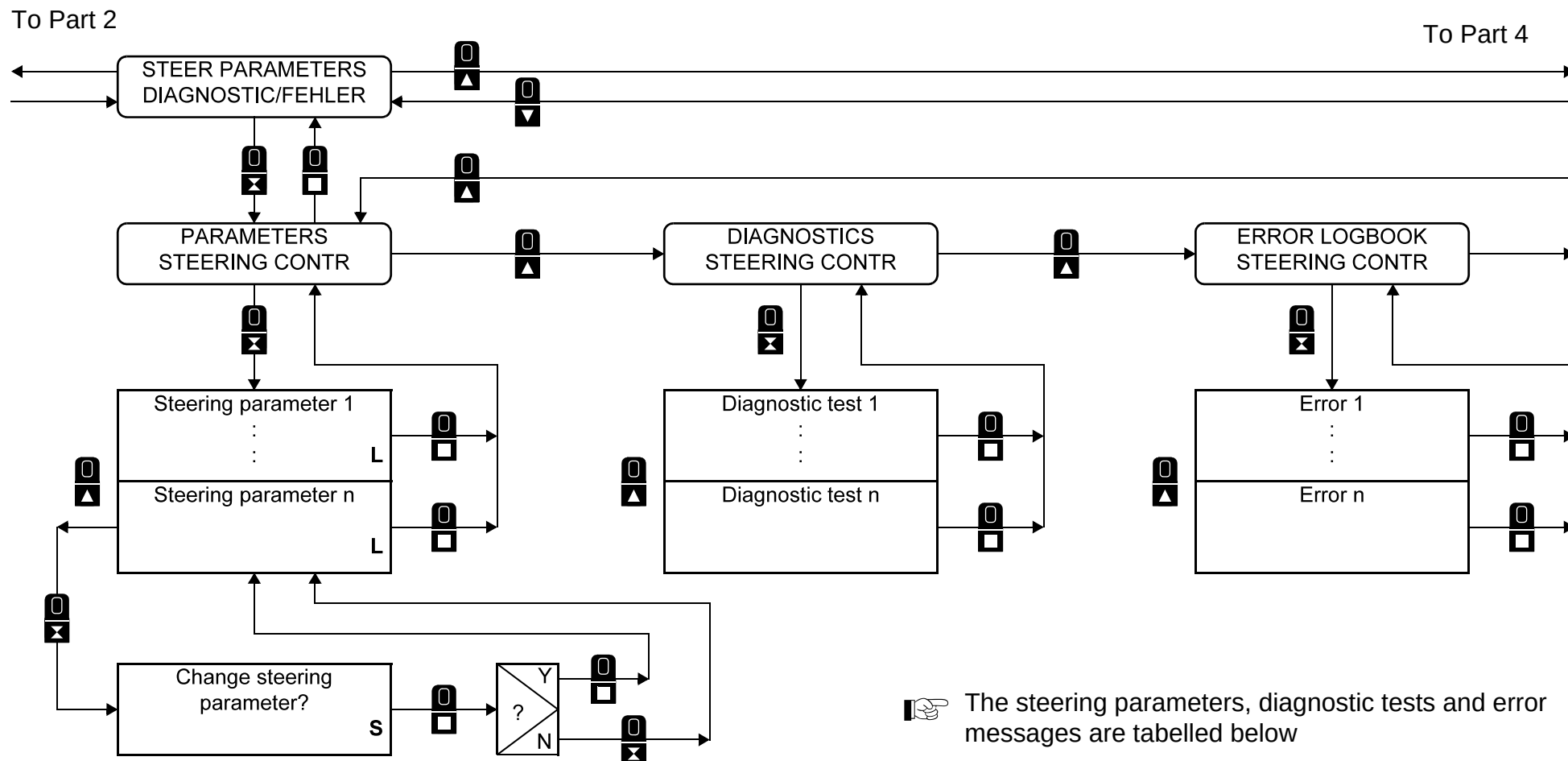
LISA Service Mode Layout (Part 2)

LISA version 1.5



LISA Service Mode Layout (Part 3)

LISA version 1.5

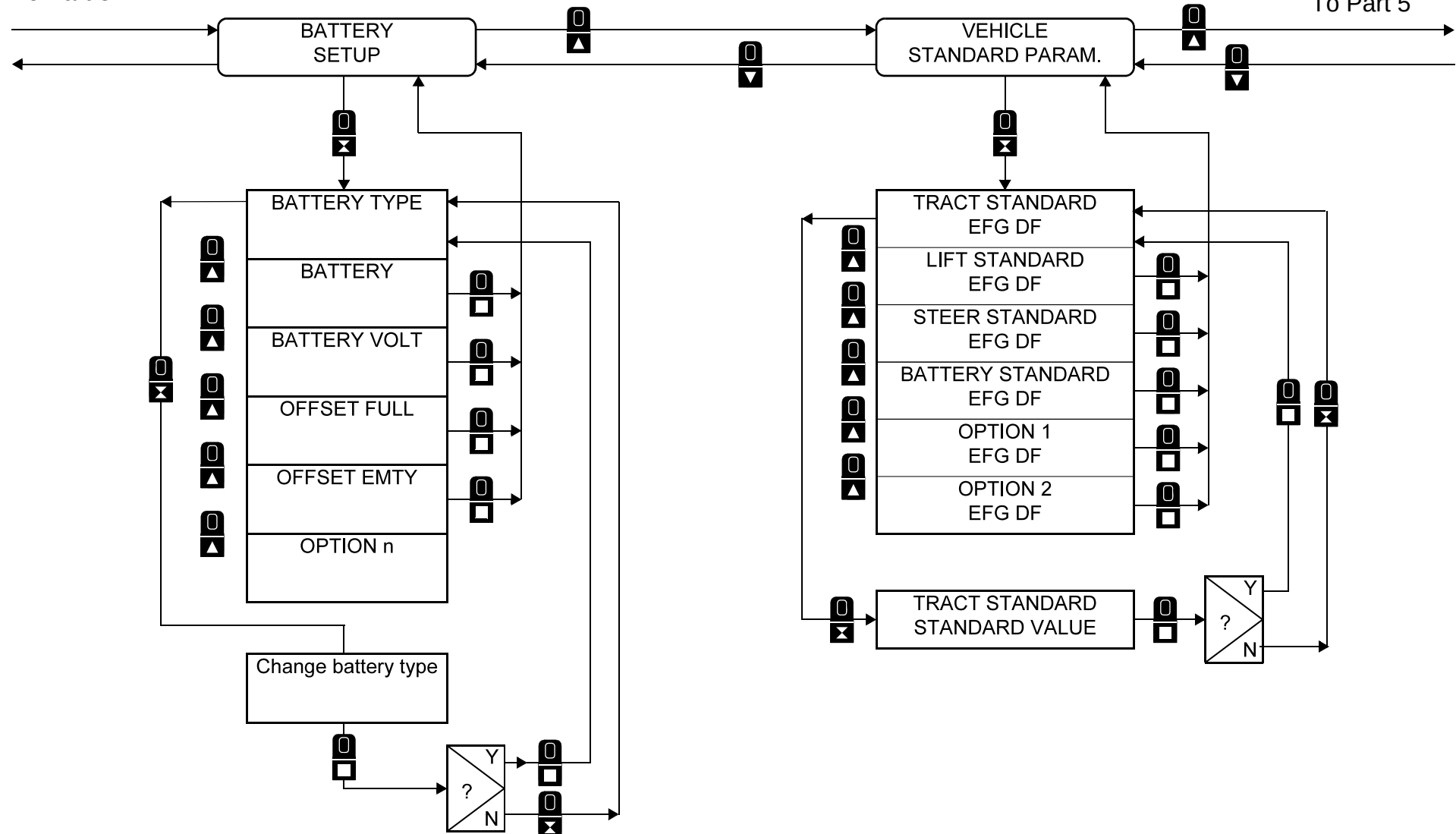


LISA Service Mode Layout (Part 4)

LISA version 1.5

To Part 3

To Part 5



LISA Service Mode Layout (Part 5)

To Part 4

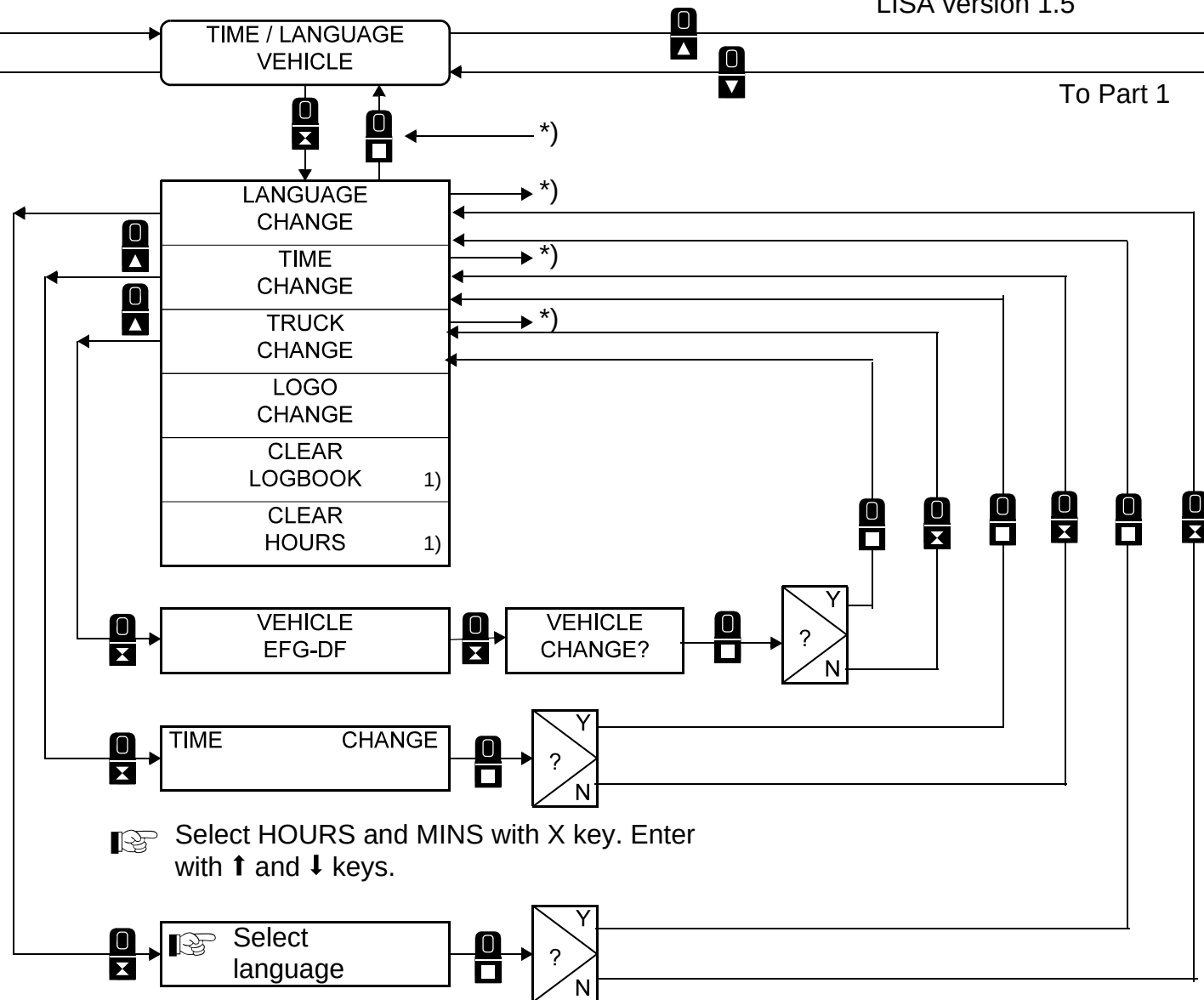
LISA version 1.5

To Part 1



After replacing components, first set the truck to EFG-DF, and then under the "Truck Standard Parameters" menu item set the travel, lift, steer and battery parameters to the respective standard values.
To apply the parameters to all components, switch the truck off and on again.

1) Menu items can be performed under the JH Logo, but have no function in the truck.



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Tract Parameter Setting

Parameter	Display Message	Setting Limits	Mode	Description
				 Optional parameters must not be changed.
	TRAVEL PROGRAM	1...5	User	One of five different travel programs can be set.
P1	ACCELERATION	0...9 9 = fast	User	 When the accelerator is released the drive current control system causes braking, which can be set to between 45A (release) and 90A. The set value is also the minimum value for inverse braking.
P2	RELEASE BRAKE	0...9 9 = sudden 0 = 8.0 secs 9 = 0.5 secs	User	 The inversion brake setting affects the maximum braking value when changing direction with the accelerator pedal fully modulated.
P3	INVERSION BRAKE	0...9 9 = sudden 0 = 3.0 secs 9 = 2.0 secs	User	Increased braking when brake pedal applied.
P4	PEDAL BRAKE	0...9 9 = sudden 0 = 3.0 secs 9 = 2.0 secs	User	Max. speed setting in reverse travel direction.
P5	MAX SPEED FORWARD	0...9 9 = high	User	Max. speed setting in drive wheel direction when the slow travel switch is applied (50% of max. travel speed).
...	 P.T.O.			

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Para-meter	Display Message	Setting Limits	Mode	Description		
P6	CUT BACK FWD.	0...9 9 = high	User	Max. speed setting in reverse travel direction when the slow travel switch is applied, (50% of max. travel speed).		
P7	MAX REVERS. SPEED	0...9 9 = high	User	Max. speed setting in load section direction.		
P8	CUT BACK REVERS.	0...9 9 = high	User	Max. speed setting in load section direction when the slow travel switch is applied, (50% of max. travel speed).		
P9	ACCEL PEDAL ZERO TEACH IN xx	teach in x x	Service	The left-hand value gives the travel switch value at the time of call-up; the right-hand value gives the travel switch value contained in the travel current control EEPROM with which the control system modulation begins.		
P10	ACCEL PEDAL MAX TEACH IN xx	teach in x x	Service	The left-hand value gives the travel switch value at the time of call-up; the right-hand value gives the travel switch value contained in the travel current control EEPROM with which the control system is modulated to 100%.		
P11	STAND STILL DET	0 or 1	Service	No function		
P12	HORN FUNCTION	0...9	Service	See horn function table after tract parameter description		
P13	PARK BRAKE FKT.	0...2	Service	See parking brake function table after tract parameter description		
P14	OPTION 1	0...9	Service	See option 1 table after tract parameter description		
P15	OPTION 2	0...9	Service	 Do not change! See option 2 table after tract parameter description		

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Horn Function Table

Parameter	Safety Switch Status	Handbrake Status	Response
0	Any	Any	No warning signal
1	Any	Any	No warning signal
2	Not connected	Not connected	Warning signal
3	Not connected	Not connected	Warning signal
4 - 9			Non defined

Parking Brake Function Table

Parameter	Parking brake Status	Response
0	Any	No warning signal
1	Connected	No travel release, warning signal on LISA
2	Connected	No travel release, Warning signal on LISA, Audible warning signal
3 - 9		Non defined

Option 1 Table

Parameter	Angle	Reaction
0	5 degrees	Speed reduction as a function of the steer angle
1	10 degrees	Speed reduction as a function of the steer angle
2	15 degrees	Speed reduction as a function of the steer angle
3	20 degrees	Speed reduction as a function of the steer angle
4	25 degrees	Speed reduction as a function of the steer angle
5	30 degrees	Speed reduction as a function of the steer angle
6	35 degrees	Speed reduction as a function of the steer angle
7	40 degrees	Speed reduction as a function of the steer angle
8	45 degrees	Speed reduction as a function of the steer angle
9	50 degrees	Speed reduction as a function of the steer angle

Tabelle Option 2

Parameter	Field Current	Reaction
0	4.0 A	Minimum field current at 100% armature current
1	4.5 A	Minimum field current at 100% armature current
2	4.8 A	Minimum field current at 100% armature current
3	5.0 A	Minimum field current at 100% armature current
4	5.2 A	Minimum field current at 100% armature current
5	5.5 A	Minimum field current at 100% armature current
6	5.8 A	Minimum field current at 100% armature current
7	6.0 A	Minimum field current at 100% armature current
8	6.5 A	Minimum field current at 100% armature current
9	7.0 A	Minimum field current at 100% armature current

Lifting Parameter Setting

Para-meter	Display Message	Setting Limits	Mode	Description
P1	TILT SPEED	0...9 0 = 15% 9 = 39%	Service	Adjustable pulse width modulation limit for the pump motor, to keep the max. pump motor speed to a minimum (reduce noise).
P3	SHIFT SPEED	0...9 1 = 7% 9 = 15%	Service	 Side shift option (0 = zero pulse width modulation) Adjustable pump motor speed, to keep the max. pump motor speed to a minimum (reduce noise).
P5	ZH 1 SPEED	0...9 0 = 10% 9 = 75%	Service	Adjustable pulse width modulation limit for the pump motor, to keep the max. pump motor speed to a minimum (reduce noise).
P9	ACCELERATION	0...9	Service	This sets the time between maximum application of the lift potentiometer and 100% modulation of electronic system.
P10	DECELERATION	0...9	Service	This sets the time between 100% modulation and inhibit (0%) when the lift potentiometer is released.
P11	LIFTING SPEED	0...9 9 = high	Service	Lift speed setting (60% to 100% of max. speed).
P12	AUX. FKT CUTOUT	0...3	Service	See Side shift function table after lift parameter description
...	 P.T.O.			

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Parameter	Display Message	Setting Limits	Mode	Description
P13	LIFT POT. ZERO TEACH IN xx	teach in x x	Service	 For Masterpilot trucks this parameter has no function. The Masterpilot is directly connected to the CAN-BUS. The left hand voltage reading gives the lift potentiometer voltage at the time of request; the right-hand value the EPROM voltage to the lifting control system at which the control system is stabilised at 100%.
P14	LIFT POT MAX TEACH IN xx	teach in x x	Service	 For Masterpilot trucks this parameter has no function. The Masterpilot is directly connected to the CAN-BUS. The left hand voltage reading gives the lift potentiometer voltage at the time of request; the right-hand value the EPROM voltage to the lifting control system at which the control system is stabilised at 100%.
P15	PROP. VENTIL MIN	10...39	Service	 Masterpilot trucks only. Setting of Masterpilot to proportional valve. Proportional lowering valve initial current in 10 mA (20 = 200 mA).
P16	PROP. VENTIL MAX	40...120	Service	 Masterpilot trucks only. Setting of Masterpilot to proportional valve. Proportional lowering valve initial current in 10 mA (50 = 500 mA).
P17	PROP. CURREND MID	0...9	Service	  Do not change! Masterpilot trucks only.
P18	PROP. VALUE MID	0...9	Service	  Do not change! Masterpilot trucks only.
P21	ZH 3 SPEED	0...9	Service	Adjustable pulse width modulation limit for the pump motor, to keep the max. pump motor speed to a minimum (reduce noise).

Side Shift Function Table

Parameter	Reaction
0	Side shift only possible as sole function
1	Side shift permitted in conjunction with tilt function (see hydraulic function locking **)
2	As for parameter 0, except all hydraulic functions are only active with the release switch in the Masterpilot is pressed.
2	As for parameter 1, except all hydraulic functions are only active with the release switch in the Masterpilot is pressed.

 Parameter changes only come into effect when the truck has been switched off and on again.

Hydraulic function locking - Masterpilot Trucks

Function	Lift	Lower	Tilt	Side shift	ZH2	ZH3	
Lift			Yes *)	No	No	No	
Lower			Yes	Yes	No	No	
Tilt	Yes *)	Yes		No **)	No	No	
Side shift	No	Yes	No **)		No	No	
ZH2	No	No	No	No		No	
ZH3	No	No	No	No	No		
Steer	Yes	Yes	Yes	Yes	Yes	Yes	Own hydraulic pump

*) Simultaneous lifting and tilting is mechanically inhibited. **) Set to requirements (see Side Shift Function Table)

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Steering Parameter Setting

Parameter	Display Message	Setting Limits	Mode	Description
P1	STEER. POT. ZERO TEACH IN : xx	teach in x x	Service	Potentiometer steering angle straight ahead.  After replacing the steering potentiometer: determine the zero position (0Ω) before teach-in.
P2	STEER. POT. RIGHT TEACH IN : xx	teach in x x	Service	Turn steering wheel to the right until the stop.
P3	STEER. POT. LEFT TEACH IN : xx	teach in x x	Service	Turn steering wheel to the left until the stop.
P4	STEER RPM MIN	0...9	Service	No function
P5	STEER RPM MAX	0...9	Service	No function
P6	STEER PUMP LAG	0...9	Service	Adjustable steering run-in time - reduced speed.
P7	VEHICLE LENGTH	0...4	Service	See truck length table
P8	STEER POTI MIN TEACH IN : xx	teach in x x	Service	No function
P9	STEER POTI MAX TEACH IN : xx	teach in x x	Service	No function

 It takes approx. 2 seconds to change to the next menu item.

Truck Length Table

Parameter	Steer Geometry
0	1249 mm axle base -> 3 wheel
1	1357 mm axle base -> 3 wheel
2	1465 mm axle base -> 3 wheel
3	1380 mm axle base -> 4 wheel  Do not use with EFG-DF!
4	1488 mm axle base -> 4 wheel  Do not use with EFG-DF!
5 - 9	Non-defined

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Battery Parameter Setting

Parameter	Display Message	Setting Limits	Mode	Meaning
P1	BATTERY TYPE	0...2	Service	0 = Normal 1 = Increased output 2 = Dry
P2	BATTERY	0...9	Service	Free for other applications
P3	BATTERY VOLT	0...9	Service	Free for other applications
P4	OFFSET FULL	0...9	Service	See battery setting table
P5	OFFSET EMPTY	0...9	Service	See battery setting table
P6	OPTION 1	0...9	Service	 See battery setting table Do not change
P7	OPTION 2	0...9	Service	 See battery setting table Do not change
P8 - P11	OPTION 3 to OPTION 6	0...9	Service	Parameter void

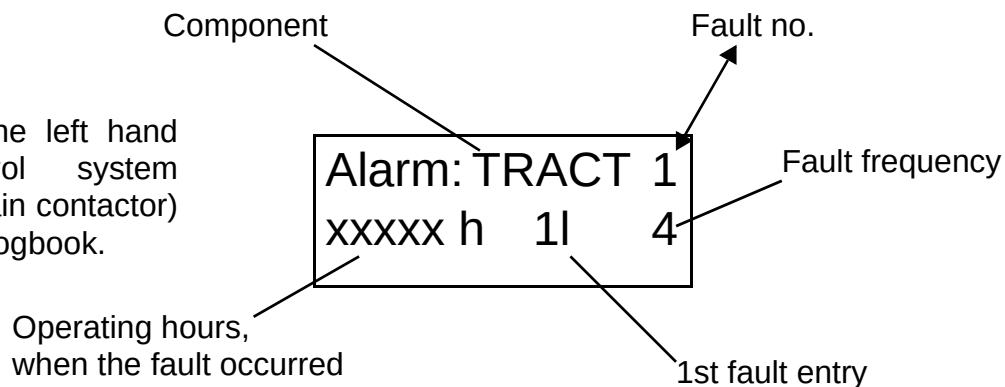
Battery Setting Table

Parameter	OFFSET FULL  Battery recovery 100% 10 Δ 100 mV general	OFFSET EMPTY  Battery recovery 0% 10 Δ 100 mV general	OPTION1  Trim value for wet batteries type 0 or 1 10 Δ 100 mV	OPTION2  Trim value for dry batteries
0	Offset +50	Offset +50	Offset +50	Offset 0
1	Offset +40	Offset +40	Offset +40	Offset 15
2	Offset +30	Offset +30	Offset +30	Offset 30
3	Offset +20	Offset +20	Offset +20	Offset 45
4	Offset +10	Offset +10	Offset +10	Offset 60
5	Offset 0 standard setting	Offset 0 standard setting	Offset 0 standard setting	Offset 75
6	Offset -10	Offset -10	Offset -10	Offset 90
7	Offset -20	Offset -20	Offset -20	Offset 105
8	Offset -30	Offset -30	Offset -30	Offset 120
9	Offset -40	Offset -40	Offset -40	Offset 125

Error Logbook Schematic

 Error messages see system messages

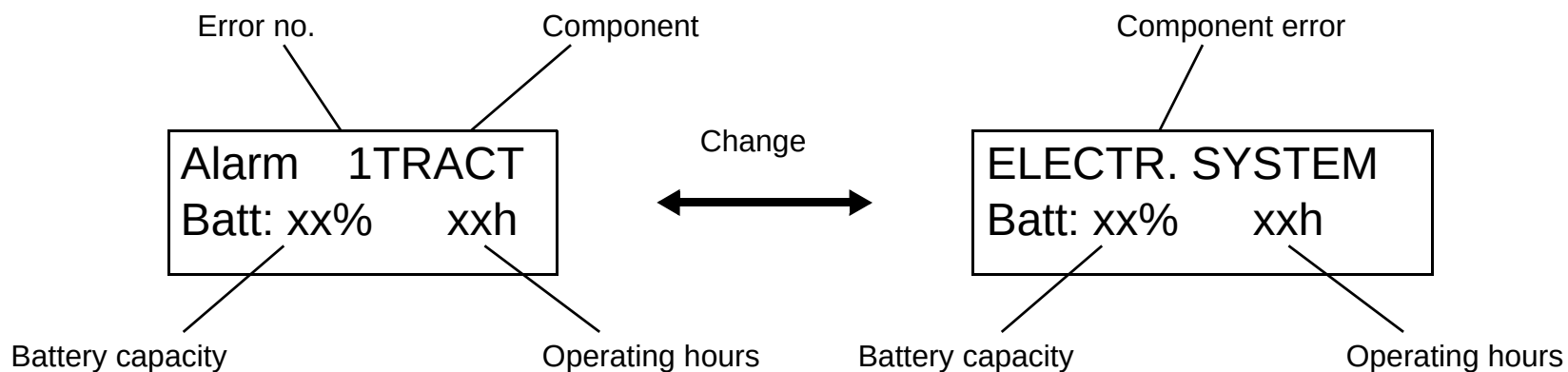
 Only the errors from the left hand travel current control system (connected to the K1 main contactor) are entered in the error logbook.



 64 faults can be displayed.

Error Display

 An alternating display appears



Diagnostics - Travel

 The diagnostic display messages appear in English only.

LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
MOTOR CURRENT	NOT IMPLEMENTED		Test cannot be performed
MOTOR VOLTAGE	NOT IMPLEMENTED		Test cannot be performed
MODULATION	NOT IMPLEMENTED		Test cannot be performed
FIELD CURRENT	NOT IMPLEMENTED		Test cannot be performed
DRIVING CONTROL	XX	Analog input	Travel controller test
KEY - VORWARD	NOT IMPLEMENTED		Test cannot be performed
KEY - REVERSE	NOT IMPLEMENTED		Test cannot be performed
RELEASE SWITCH	0 or 1	Digital input	Travel release microswitch test
DIRECTION VORW.	0 or 255	Digital input	For Masterpilot trucks: 0 => No travel direction 255 => Forward travel
	0 or 1	Digital input	For manual valve block trucks: 0 => Forward travel 1 => Reverse travel
...	 P.T.O.		

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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
DIRECTION REW.	0 or 255	Digital input	For Masterpilot trucks: 0 => No travel direction 255 => Forward travel
	0 or 1	Digital input	For manual valve block trucks: 0 => Forward travel 1 => Reverse travel
FULL SPEED	0 or 1	Digital input	“Slow travel” switch test
SECURITY SWITCH	0 or 1	Digital input	Seat switch test
PARKING BREAK SW	0 or 1	Digital input	Parking brake switch test
EL. BREAK SWITCH	0 or 1	Digital input	Electrical pedal brake support test -> Brake pressure switch
HORN	0 or 255 (Masterpilot) 0 or 1 (manual valve block)	Digital input	Horn test
DRIVE PROG.1	NOT IMPLEMENTED		Test cannot be performed
DRIVE PROG.2	NOT IMPLEMENTED		Test cannot be performed
DRIVE PROG.3	NOT IMPLEMENTED		Test cannot be performed
SECOND RELEASE S			Currently not used
...	 P.T.O.		

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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning			
ARRANGE MODE	NOT IMPLEMENTED		Test cannot be performed			
COLLISION GUARD	NOT IMPLEMENTED		Test cannot be performed			
COLLISION GUARD 1	NOT IMPLEMENTED		Test cannot be performed			
BREAK FLUID	0 or 1	Digital input	Brake fluid check			
MAX TEMP MOTOR	0 or 1	Digital input	1 = max. engine temperature on drive motor			
BRUSH WEAR OUT	0 or 1	Digital input	Carbon brush wear display - drive motor			
SECURITY SWITCH 2	0 or 1	Digital input	Deadman key test (option)			
CONTROL SHAFT	NOT IMPLEMENTED		Test cannot be performed			
BATTERY LOCK	NOT IMPLEMENTED		Test cannot be performed			
BREAK POTI	NOT IMPLEMENTED		Test cannot be performed			
AISLE SIGNAL 1	NOT IMPLEMENTED		Test cannot be performed			
AISLE SIGNAL 2	NOT IMPLEMENTED		Test cannot be performed			
AISLE END 1	NOT IMPLEMENTED		Test cannot be performed			
AISLE END 2	NOT IMPLEMENTED		Test cannot be performed			
DOOR SWITCH	NOT IMPLEMENTED		Test cannot be performed			
...	 P.T.O.					

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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
2 HAND OPERATION	NOT IMPLEMENTED		Test cannot be performed
TRUCK CODE 0	NOT IMPLEMENTED		Test cannot be performed
TRUCK CODE 1	NOT IMPLEMENTED		Test cannot be performed
TRUCK CODE 2	NOT IMPLEMENTED		Test cannot be performed
TRUCK CODE 3	NOT IMPLEMENTED		Test cannot be performed
BREAK OUTPUT	NOT IMPLEMENTED		Test cannot be performed
HORN OUTPUT	0 or 1	Digital output	Horn function
CONTROL LIFTCUT.	NOT IMPLEMENTED		Test cannot be performed
CONT. LAMP BACK	0 or 1	Digital output	 Masterpilot trucks only. Reversing light test via the travel switch
HOLD BREAK MAG.	NOT IMPLEMENTED		Test cannot be performed
PULL BREAK MAG.	NOT IMPLEMENTED		Test cannot be performed

Diagnostics - Lifting

 The diagnostic display messages appear in English only.

LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
MOTOR CURRENT	NOT IMPLEMENTED		Test cannot be performed
MOTOR VOLTAGE	NOT IMPLEMENTED		Test cannot be performed
MODULATION	NOT IMPLEMENTED		Test cannot be performed
FIELD CURRENT	NOT IMPLEMENTED		Test cannot be performed
LIFTING CONTROL	0...255	Analog input	“Lift” controller test
LOWERING CONTR.	NOT IMPLEMENTED		Test cannot be performed
SHIFT VORWARD	0...255	Analog input	“Forward traverse” - Masterpilot trucks
	0 or 1	Digital input	“Forward traverse” - Manual valve block trucks
SHIFT BACK	0...255	Analog input	“Reverse traverse” - Masterpilot trucks
	0 or 1	Digital input	“Reverse traverse” - Manual valve block trucks
...	 P.T.O.		

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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
TILT VORWARD	0...255	Analog input	“Forward tilt” - Masterpilot trucks
	0 or 1	Digital input	“Forward tilt” - Manual valve block trucks
TILT BACK	0...255	Analog input	“Reverse tilt” - Masterpilot trucks
	0 or 1	Digital input	“Reverse tilt” - Manual valve block trucks
ZH1 VORWARD	0...255	Analog input	“Forward aux. lift” - Masterpilot trucks
	0 or 1	Digital input	“Forward aux. lift” - Manual valve block trucks
ZH1 BACK	0...255	Analog input	“Reverse aux. lift” - Masterpilot trucks
	0 or 1	Digital input	“Reverse aux. lift” - Manual valve block trucks
ZH2 VORWARD	NOT IMPLEMENTED		Test cannot be performed
ZH2 BACK	NOT IMPLEMENTED		Test cannot be performed
ZH3 VORWARD	0...255	Analog input	“Forward aux. lift” - Masterpilot trucks
	NOT IMPLEMENTED	Digital input	Manual valve block trucks - no function
...	 P.T.O.		

	EFG-DF		12.07	6.48	
LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning		
ZH 3 BACK	0...255	Analog input	“Forward aux. lift” - Masterpilot trucks		
	NOT IMPLEMENTED	Digital input	Manual valve block trucks - no function		
EXTRA LIFT	NOT IMPLEMENTED		Test cannot be performed		
OVERRIDE ESA	NOT IMPLEMENTED	Digital input	For Masterpilot trucks - no function		
	0 or 1		Side shift locking - see side shift / lifting parameters function table P12)		
MAX TEMP MOTOR	0 or 1	Digital input	1 = max. motor temperature for lift motor		
BRUSH WEAR OUT	0 or 1	Digital input	Carbon brush wear display - lift motor		
SHIFT OFF VORW.	NOT IMPLEMENTED		Test cannot be performed		
SHIFT OFF BACK	NOT IMPLEMENTED		Test cannot be performed		
LIFT OFF	0		No function		
SECURITY HIGHT	NOT IMPLEMENTED		Test cannot be performed		
SHIFT MIDLE POS	NOT IMPLEMENTED		Test cannot be performed		
FREIGABE LIFT	0...255	Analog input	“Lift” Masterpilot test		
	NOT IMPLEMENTED	Digital input	Manual valve block trucks - no function		
...	 P.T.O.				

	EFG-DF	12.07	6.49	
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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
FREIGABE LOWER	0...255	Analog input	“Lower” Masterpilot test
	NOT IMPLEMENTED	Digital input	Manual valve block trucks - no function
RELEASE LIFT	NOT IMPLEMENTED		Test cannot be performed
RELEASE LOWER	NOT IMPLEMENTED		Test cannot be performed
CYL. LIFT RAMP	NOT IMPLEMENTED		Test cannot be performed
LIFT FOR RAMP	NOT IMPLEMENTED		Test cannot be performed
INIT. REL. LIFT	NOT IMPLEMENTED		Test cannot be performed
INIT. REL. LOW.	NOT IMPLEMENTED		Test cannot be performed
DIGITAL 1	NOT IMPLEMENTED		Test cannot be performed
LOAD SWITCH	NOT IMPLEMENTED		Test cannot be performed
VENTIL LIFT	NOT IMPLEMENTED		Test cannot be performed
VENTIL LOWER	NOT IMPLEMENTED		Test cannot be performed
VENTIL SHIFT VW	0 or 1	Digital input	ZH3 “right traverse“ valve test
	NOT IMPLEMENTED		Manual valve block trucks - no function
...	 P.T.O.		

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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning		
VENTIL SHIFT B	0 or 1 NOT IMPLEMENTED	Digital input	ZH3 “left traverse“ valve test Manual valve block trucks - no function		
VENTIL TILT VW	0 or 1 NOT IMPLEMENTED	Digital input	“Forward tilt” valve test Manual valve block trucks - no function		
VENTIL TILT B	0 or 1 NOT IMPLEMENTED	Digital input	“Reverse tilt” valve test Manual valve block trucks - no function		
VENTIL ZH1 VW	0 NOT IMPLEMENTED	Digital input	Masterpilot trucks - no function Manual valve block trucks - no function		
VENTIL ZH1 BACK	0 NOT IMPLEMENTED	Digital input	Masterpilot trucks - no function Manual valve block trucks - no function		
VENTIL ZH2 VW	NOT IMPLEMENTED		Test cannot be performed		
VENTIL ZH2 BACK	NOT IMPLEMENTED		Test cannot be performed		
PUMP CONTACTOR	NOT IMPLEMENTED 0 or 1	Digital input	Masterpilot trucks - no function Manual valve block trucks - no function		
...	 P.T.O.				

 UNGHEINRICH	EFG-DF	12.07	6.51	
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LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
VENTIL ZH VW-	NOT IMPLEMENTED		Test cannot be performed
VENTIL ZH BACK-	NOT IMPLEMENTED		Test cannot be performed
VENTIL ZH1 ONLY	NOT IMPLEMENTED		Test cannot be performed
VENTIL ZH2 ONLY	NOT IMPLEMENTED		Test cannot be performed
INIT. LIFT	NOT IMPLEMENTED		Test cannot be performed
INIT. LOWER	NOT IMPLEMENTED		Test cannot be performed
RAMP LIFT	NOT IMPLEMENTED		Test cannot be performed
MAIN CONTACTOR	NOT IMPLEMENTED		Test cannot be performed
LAMP LIFT END	NOT IMPLEMENTED		Test cannot be performed
VENTIL ZH3	0	Digital input	Masterpilot trucks - no function
	NOT IMPLEMENTED		Manual valve block trucks - no function
OUTPUT BSZ	NOT IMPLEMENTED		Test cannot be performed

Diagnostics - Steering

 The diagnostic display messages appear in English only.

LISA Display Test point 1st Column	LISA Display Test point 2nd Column	Digital/Analog	Meaning
MOTOR CURRENT	NOT IMPLEMENTED		Test cannot be performed
MOTOR VOLTAGE	NOT IMPLEMENTED		Test cannot be performed
MODULATION	NOT IMPLEMENTED		Test cannot be performed
FIELD CURRENT	0		No function
STEERING ANGLE	0...255	Analog input	Steer angle
STEERING PRESS.	NOT IMPLEMENTED		Test cannot be performed
STEERING CHECK	NOT IMPLEMENTED		Test cannot be performed
STEER. WHEEL 1A	NOT IMPLEMENTED		Test cannot be performed
STEER. WHEEL 1B	NOT IMPLEMENTED		Test cannot be performed
STEER. WHEEL 2A	NOT IMPLEMENTED		Test cannot be performed
STEER. WHEEL 2B	NOT IMPLEMENTED		Test cannot be performed
BREAK POTI	NOT IMPLEMENTED		Test cannot be performed
STEERING RPM	16...244	Analog input	Steering pressure requirement
DRIVER1	NOT IMPLEMENTED		Test cannot be performed

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Commissioning a Truck with the CAN-LISA System

Truck Setting

 None of the components know the truck in which they are located. As the same components may be found in different trucks and the functions and standard parameters may be different, the truck type must always be entered first.

- TIME / LANGUAGE menu and VEHICLE
- TRUCK CHANGE sub-menu
- Select truck EFG-DF

Setting Standard Parameters

- All the components now know which truck they are located in. In order to set the parameters to the standard values agreed for this truck, the standard values are entered for all components.
- TRUCK STANDARD PARAM. menu
- TRACT STANDARD sub-menu
- LIFT STANDARD sub-menu
- STEER STANDARD sub-menu
- BATTERY STANDARD sub-menu

Setting Key Parameters

 The two powered wheels on the truck cover different routes depending on the steering angle and the truck length (geometry). To prevent the motors from acting against each other, it is necessary to input the truck geometry in the form of the truck length.

- STEER PARAMETERS / DIAGNOSTIC/ERROR menu
- PARAMETERS STEERING CONTR sub-menu
- Set VEHICLE LENGTH 1...4

Adjusting Potentiometer Values

-  The interface has 3 analog inputs. Steer angle potentiometer, nominal value potentiometer and lift value potentiometer (manual valve lever version only).

Adjusting the steering angle potentiometer

- STEER PARAMETERS / DIAGNOSTIC/ERROR menu
- PARAMETERS STEERING CONTR sub-menu
- STEER. POT. ZERO “TEACH IN” sub-menu- set steered wheel to straight ahead and confirm.
- STEER. POT. RIGHT “TEACH IN” sub-menu - turn steered wheel to right stop and confirm.
- STEER. POT. LEFT “TEACH IN” sub-menu - turn steered wheel to left stop and confirm.
- Adjust drive pedal potentiometer
- TRACT PARAMETERS / DIAGNOSTIC/ERROR menu
- TRACT PARAMETERS sub-menu
- ACCEL. PEDAL ZERO “TEACH IN” sub-menu - press on accelerator until the microswitch is activated and confirm.
- ACCEL. PEDAL MAX “TEACH IN” sub-menu - press on accelerator until you reach the stop and confirm.

Adjusting the lift potentiometer

- LIFT PARAMETERS / DIAGNOSTIC/ERROR menu
- LIFT PARAMETERS sub-menu
- LIFT POTI ZERO “TEACH IN” sub-menu - confirm lever in rest position
- LIFT POTI MAX “TEACH IN” sub-menu - pull lever until you reach the stop and confirm.

Electrical Diagrams

Terminology Listing	D->GB
MF Circuit Diagram (Multi-Pilot)	05 049 417
HS Circuit Diagram (Solo-Pilot)	05 049 420
Circuit Diagram EFG 213-220 dc SP	99 501 669
MF (Multi-Pilot) Wiring Diagram.....	05 058 671
HS (Solo-Pilot) Wiring Diagram	05 058 673
Wiring diagram (Solo-Pilot).....	05 109 982
Wiring diagram (Multi-Pilot)	05 109 983
Wiring diagram EFG 213-220 dc SP	99 501 667
EFG 213-220 dc MP wiring diagram.....	99 501 668
EFG 213-220 dc MP wiring diagram.....	99 501 670

Optional:

Road traffic regulations lighting diagram	05 055 972
Back-up light/ Buzzer Reversing dir.....	05 056 006
MSG 75 driver's seat	99 501 632
MSG 65 driver's seat with heating	99 501 671
MSG 20 driver's seat	99 501 672
MSG 20 driver's seat with heating	99 501 673
Savas driver's seat.....	99 501 674

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Hydraulic Wiring Diagrams

Manual Control Hydraulic Diagram (Solo-Pilot)	05 046 236	1/1	08.98
Proportional Valve Hydraulic Diagraml (Multi-Pilot)	05 063 065	1/1	09.98

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Instructions for the prevention of accidents and damage to equipment when performing servicing, checking and repair operations on fork lift trucks equipped with electronic assemblies

1. Safety measures

- Observe the operating instructions, section "Repair".
- Remove all rings, bracelets and similar objects before commencing any operations on fork lift trucks.
- Repairs, as well as removal and installation of electronic components and fuses must only be performed on a dead system. Unplug the battery plug or disconnect the battery.
- Connect the battery and switch on control voltages only, if required for checking operations. Exercise care during all operations (hazard of arcing).
- If not instructed otherwise, the vehicle must be jacked up for checking to allow the drive wheels to move freely. (Ensure absolutely that the vehicle cannot slip.)

2. Electric welding operations

Before commencing any electric welding operations on a fork lift truck, ensure that all control current plugs and all cable connections have been disconnected from the electronic assemblies, and that all electronic mounting boards have been removed.

During electric welding operations on the vehicle, the welding current causes in the cables an inductive voltage with high voltage peaks which is liable to destroy the semi-conductors incorporated in the electronic assemblies.

3. Correct handling of electronic printed circuit boards

When removing or installing electronic mounting boards or when fitting the test adapter ensure that

- the electric system is dead (switch off battery main switch and key switch),
- the contact pins are not deformed,
- the cooling on the multipoint connector corresponds with the coding on the mounting board,
- the contacts of the mounting board and multipoint connector are facing each other correctly when there is no coding),
- the mounting board is correctly inserted into the guide rail,
- a seized mounted board is not removed or installed by force (contacts will be deformed),
- Use a tool (brass sockets) for the removal of printed circuit boards which are fitted by means of lugs.

 UNGHEINRICH	SHB J 6900.09	09.90	2	G
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4. Handling of electronic components (MOS-components, E-PROM and others)

These electronic components are very sensitive against static charges and might be destroyed by such static charges.

Always ensure that the electronic components, when not required, are placed with their connecting contacts on metallic, bare supports, or that they are in conductive foam rubber.

New electronic components are always supplied on a strip of conductive foam rubber and for transportation purposes the replaced electronic components must be set back into the conductive foam rubber.

5. Changing the EPROM



In case of varnished boards, do not exchange the EPROM.



Do not bend or damage the connecting contacts of the EPROM!

- Lift the EPROM equally out of the plug connector by putting the tool - order no. 081.0996 (plastic pliers) - under the narrow edges.
- When replacing the EPROM, ensure that the sides are correctly placed. EPROM and plug connector are marked by a notching.

6. Installation of heat-sensitive components

(Diodes, thyristors, transistors, cooling elements, etc.)

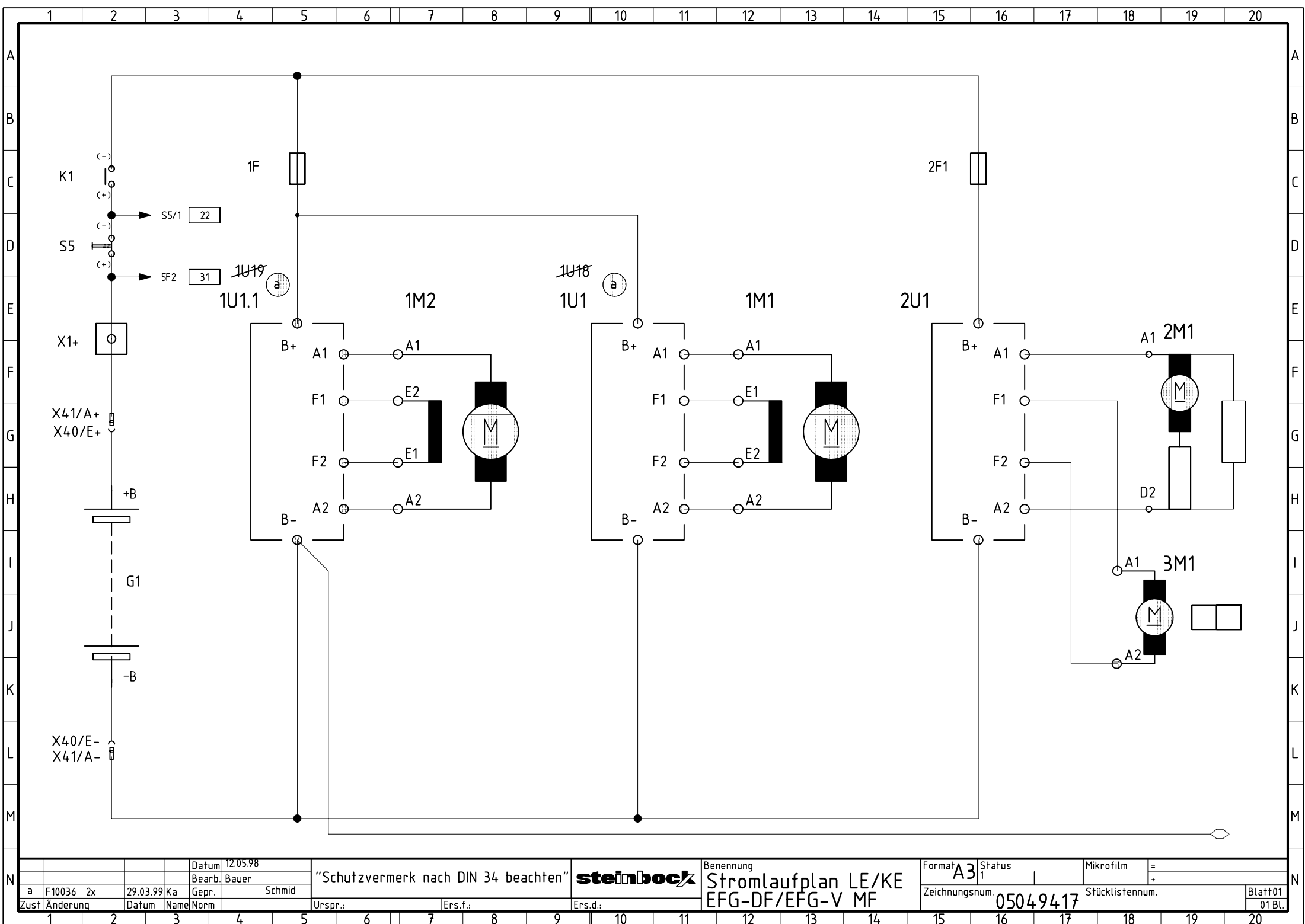
Heat-sensitive components must be installed using heat conducting compound, heat-conducting mats or foils.

Do only apply enough heat-conducting compound to the threads of electronic components or into tapped holes accepting such components, or onto the surfaces of cooling elements that the threads or any unevenness in the cooling element surfaces are just filled or evened out.

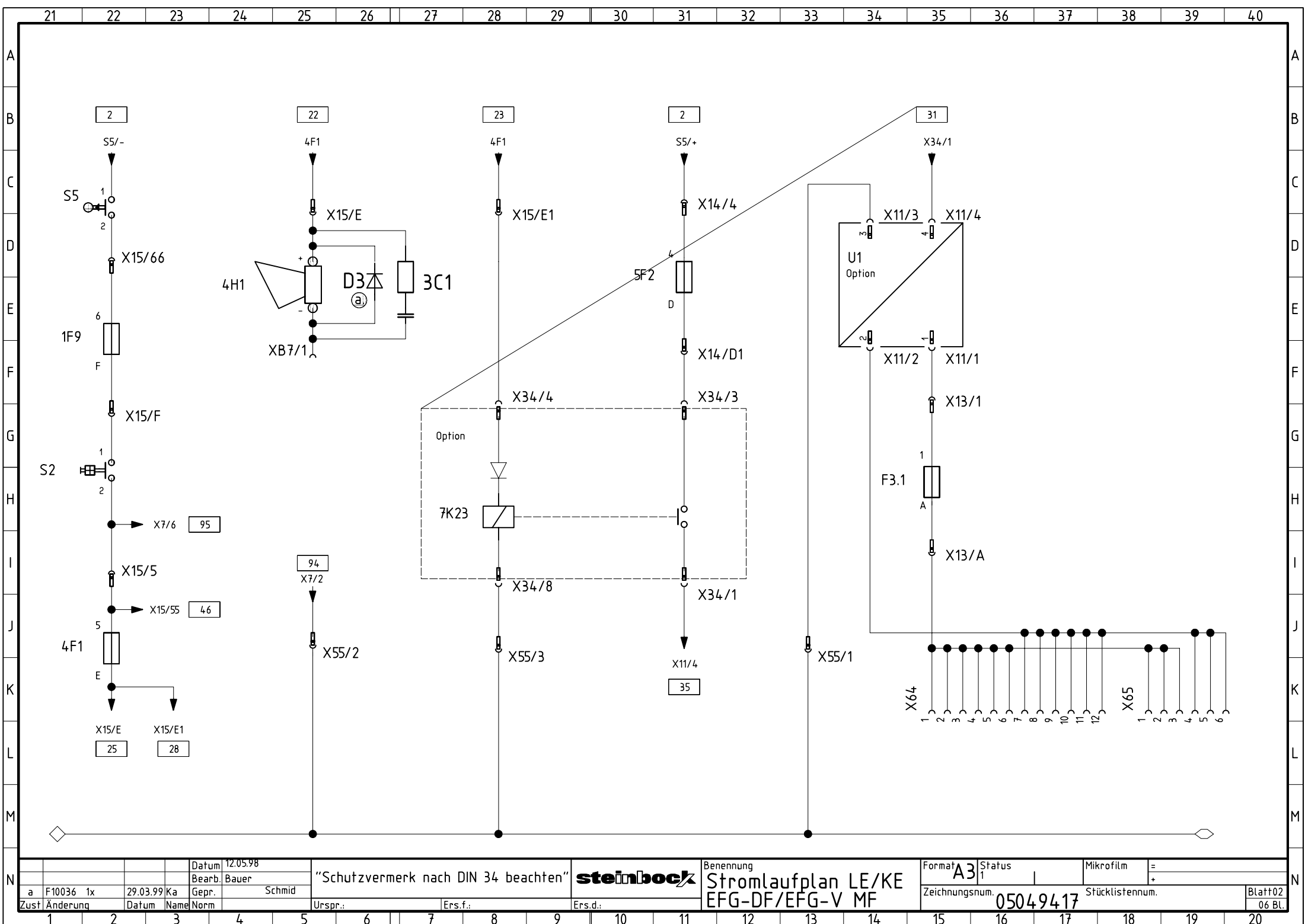
If excessive heat-conducting compound is applied, the compound, which softens when the components become heated, will leak out (leaving hollows) thus impairing its heat conducting properties.

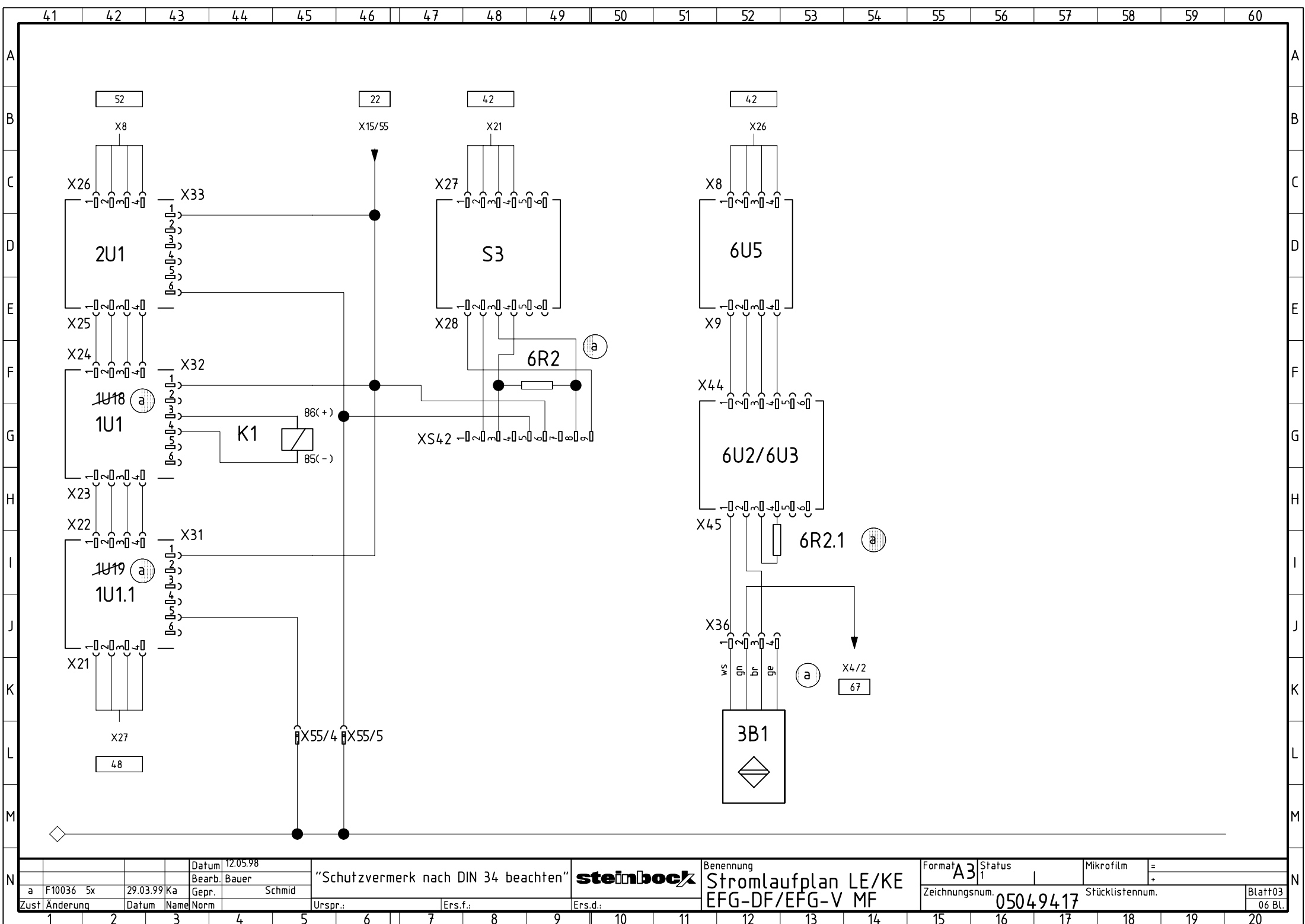
7. Cleaning operations

- Cleaning operations must only be performed on dead installations. Unplug the battery plug or disconnect the battery.
- Do not use a steam jet when cleaning electronic components, but use low-pressure compressed air and a brush.
- See SHB 0000.15.

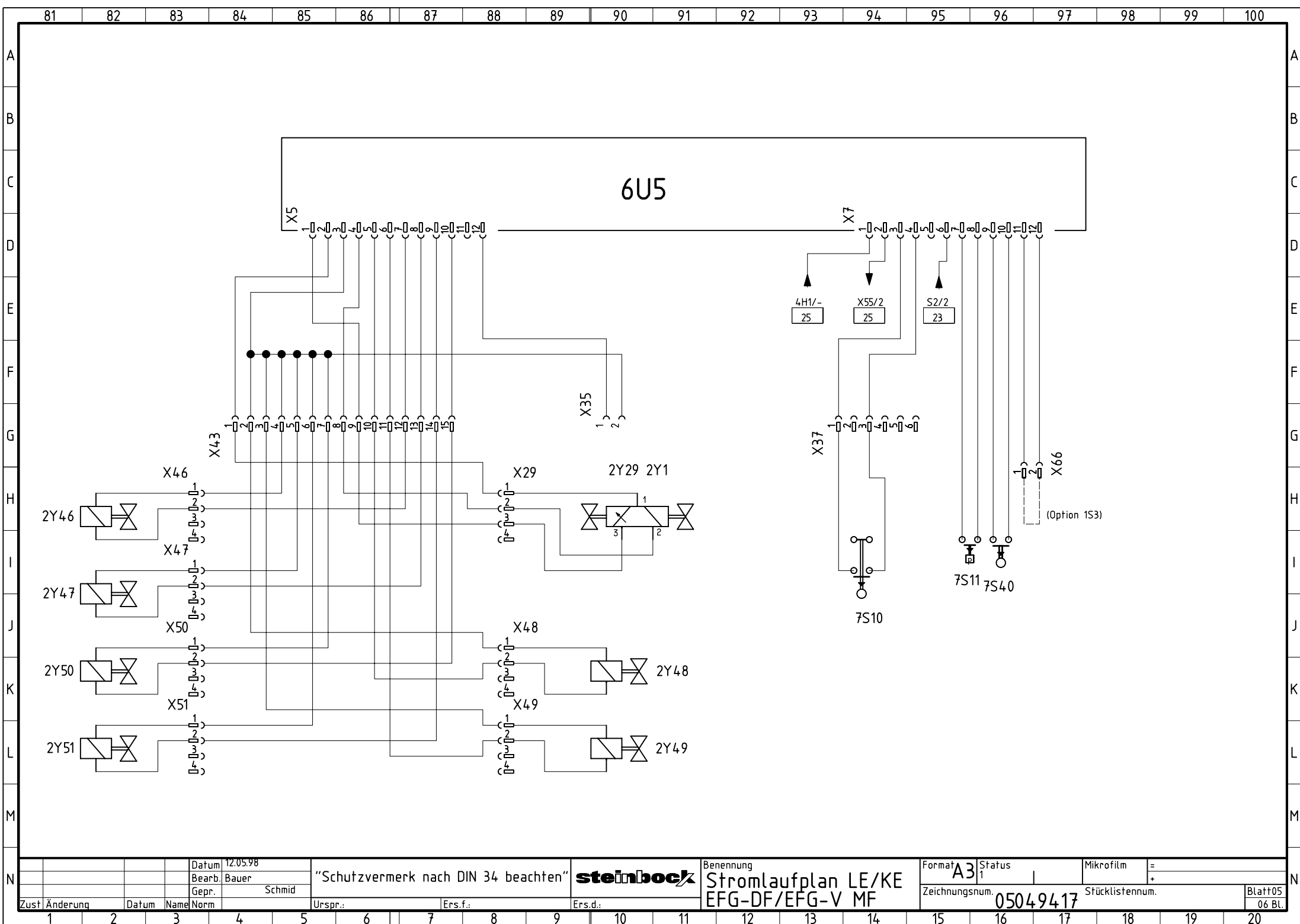


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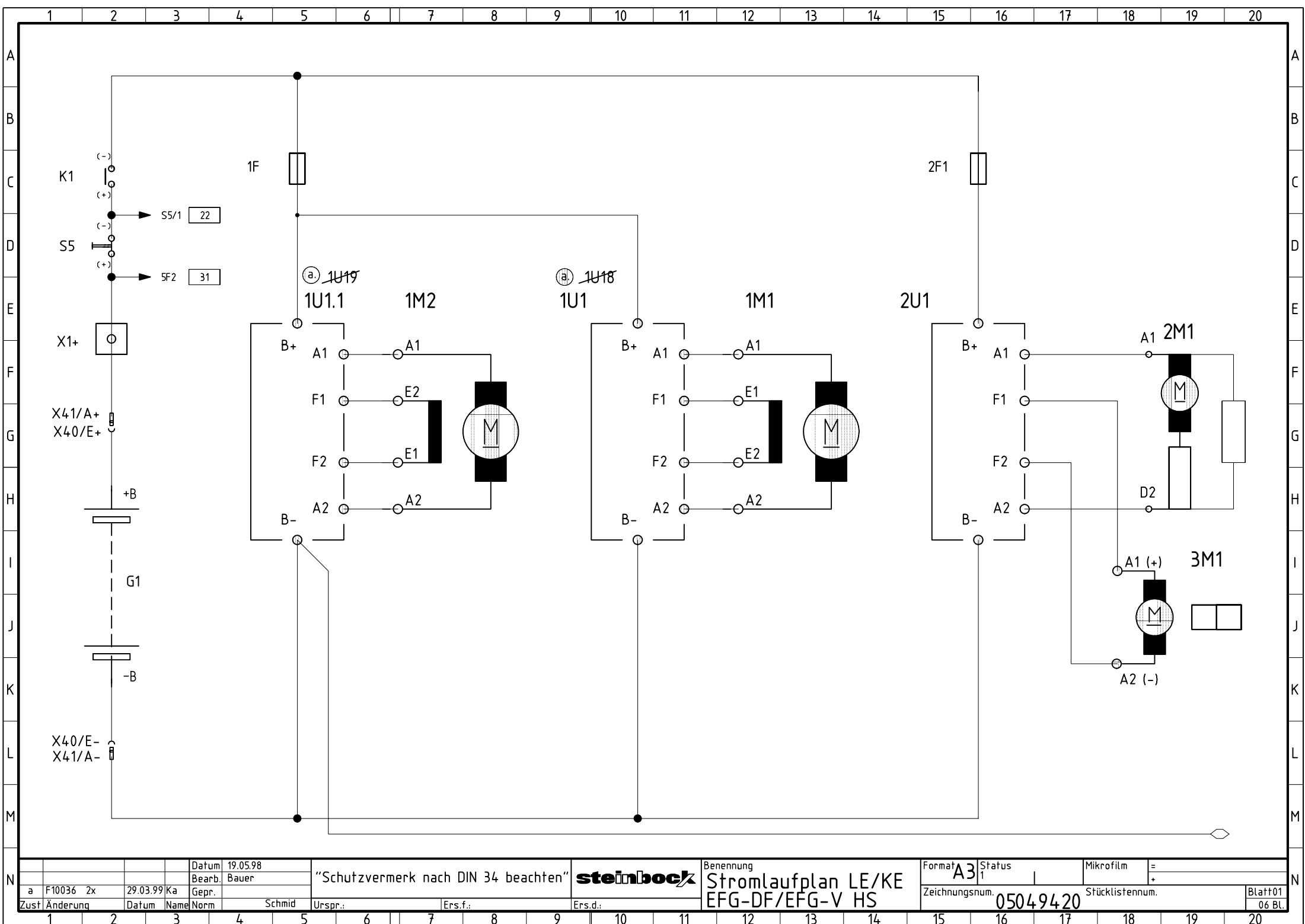




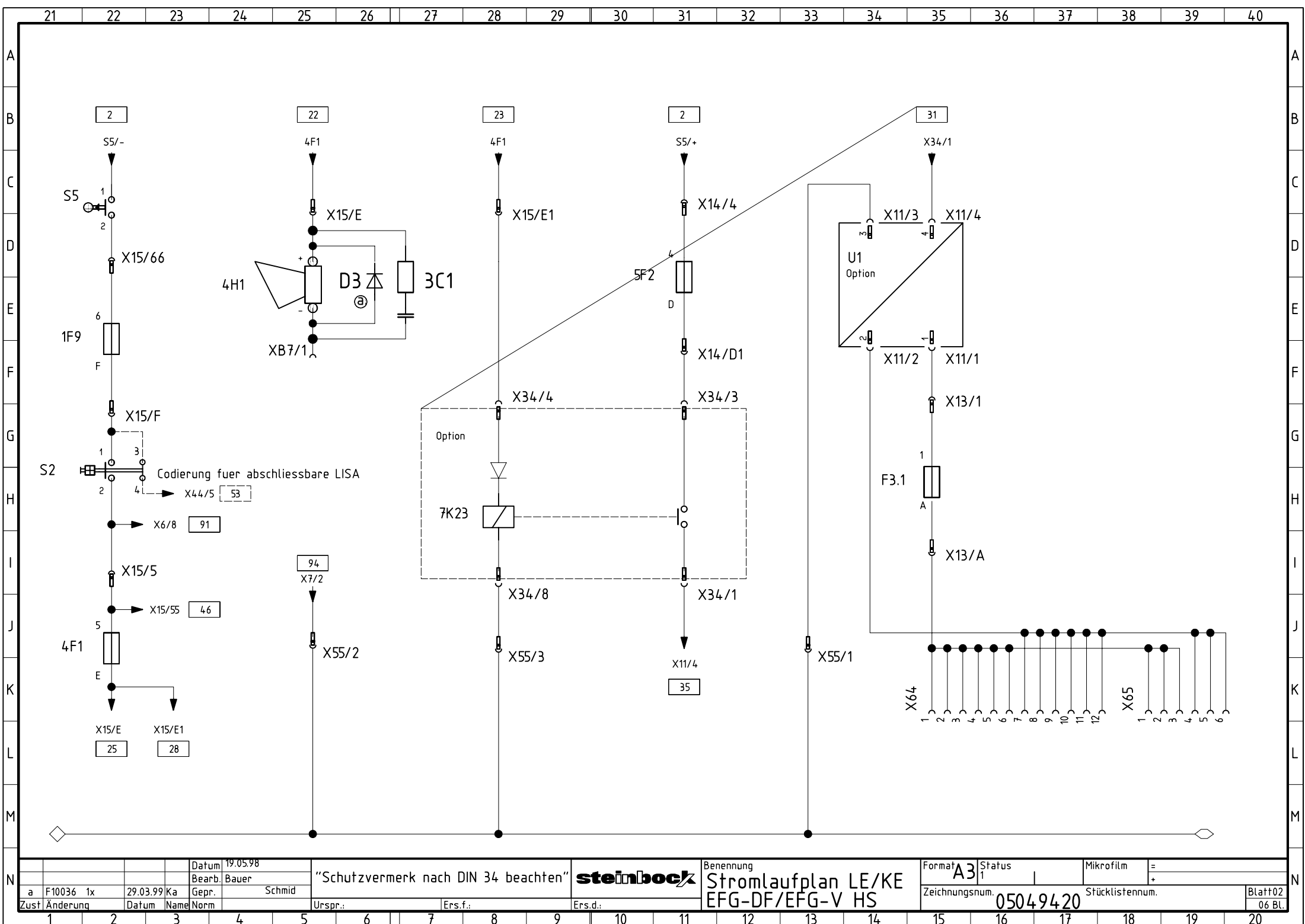
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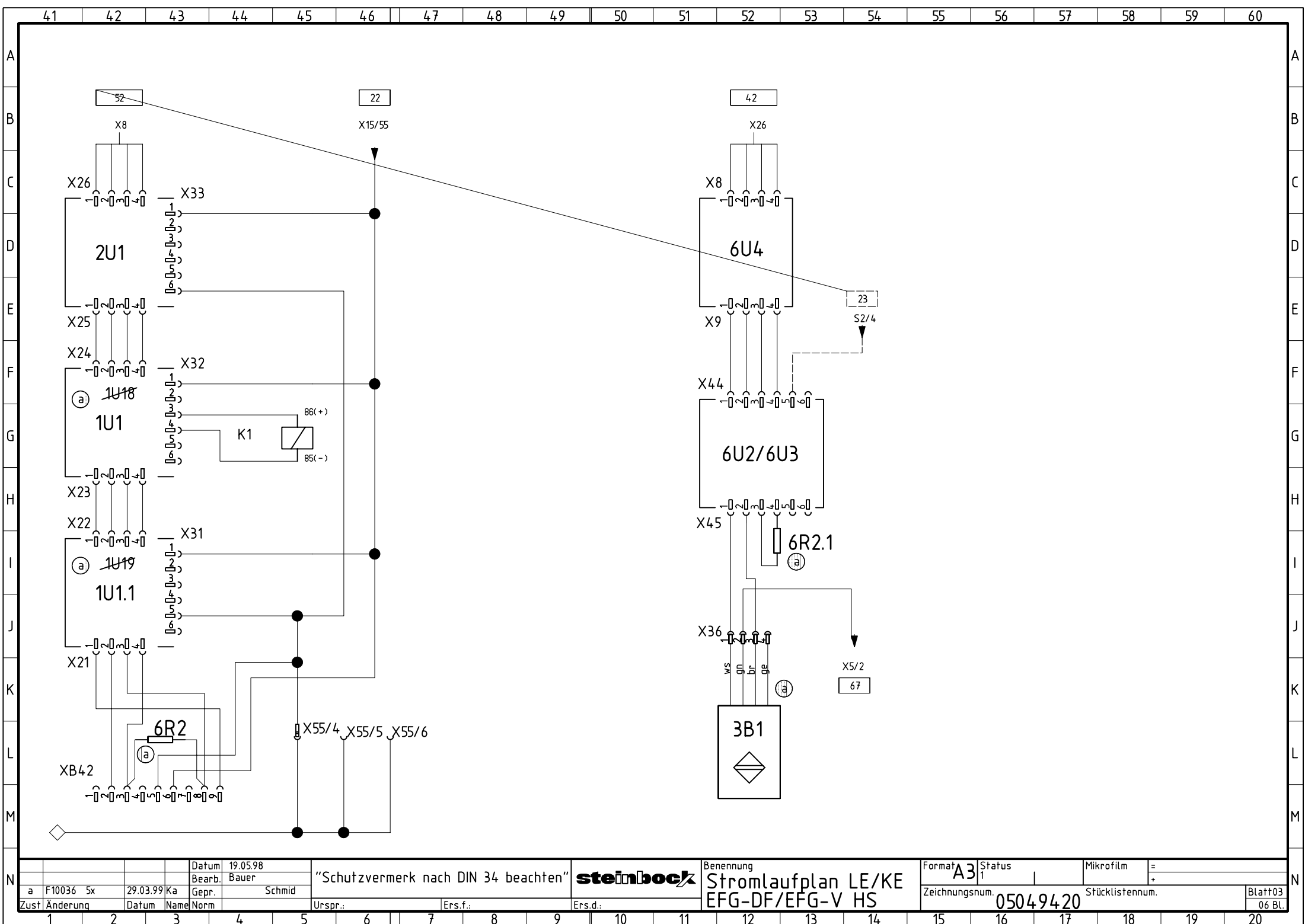
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A	3B1	Lenkhilfe-Sensor					S2	Schaltschloss					U1	DC/DC-Wandler								
B	3B7	Lenkradsensorik					S3	Multifunktionshebel					a 1U18 1U1	Steuerung-Fahren-Links								
	3B15	Sensor-Rad-rechts-eingeschlagen					S5	"NOT-AUS"					1U19 1U1.1	Steuerung-Fahren-Rechts								
C	3B16	Sensor-Rad-links-eingeschlagen					1S2	Fahrschalter					2U1	Steuerung-Heben								
	3C1	Entstoerkondensator					6S7	Kohlebuerstensor-Fahrmotor-1					6U2	LCD-Information-und-Serviceanzeige (LISA) / JH								
D	a D3	Freilaufdiode					6S8	Kohlebuerstensor-Fahrmotor-2					6U3	Informationsanzeige-CAN / STB								
	F3.1	Sicherung-24V					6S9	Kohlebuerstensor-Pumpenmotor					6U5	CAN-Interface-4								
E	1F	Sicherung-Fahrmotore					6S10	Kohlebuerstensor-Lenkhilfe-Motor					X1+	Klemmsocket-plus								
	1F9	Steuersich.-Elektronik-F/H					7S9	Sitzschalter					2Y1	Magnetventil-Heben								
F	2F1	Sicherung-Pumpenmotor					7S10	Handbremsschalter					2Y29	Proportionalventil-Senken								
	4F1	Steuersicherung-Hupe					7S11	Fussbremsschalter					2Y46	Magnetventil-Neigen-vor								
	5F2	Steuersich.DC/DC-Wandler					7S40	Bremsfluessigkeitsstand-Schalter					2Y47	Magnetventil-Neigen-zurueck								
G	G1	Batterie					9S5	Temperaturschalter-Fahrmotor-1					2Y48	Magnetventil-ZH1-vor								
	4H1	Hupe					9S6	Temperaturschalter-Fahrmotor-2					2Y49	Magnetventil-ZH1-zurueck								
H	K1	Hauptschuetz-1					9S7	Temperaturschalter-Pumpenmotor					2Y50	Magnetventil-ZH2-vor								
	7K23	Versorgungsrelais-f.-StVZO					9S8	Temperaturschalter-Lenkhilfe-Motor					2Y51	Magnetventil-ZH2-zurueck								
I	1M1	Fahrmotor-1-																				
	1M2	Fahrmotor-2-																				
J	2M1	Pumpenmotor-1																				
	3M1	Lenkhilfemotor																				
K	a 6R2	Abschlusswiderstand-CANBus Servicestecker																				
	a 6R2.1	Abschlusswiderstand-CANBus Anzeige																				
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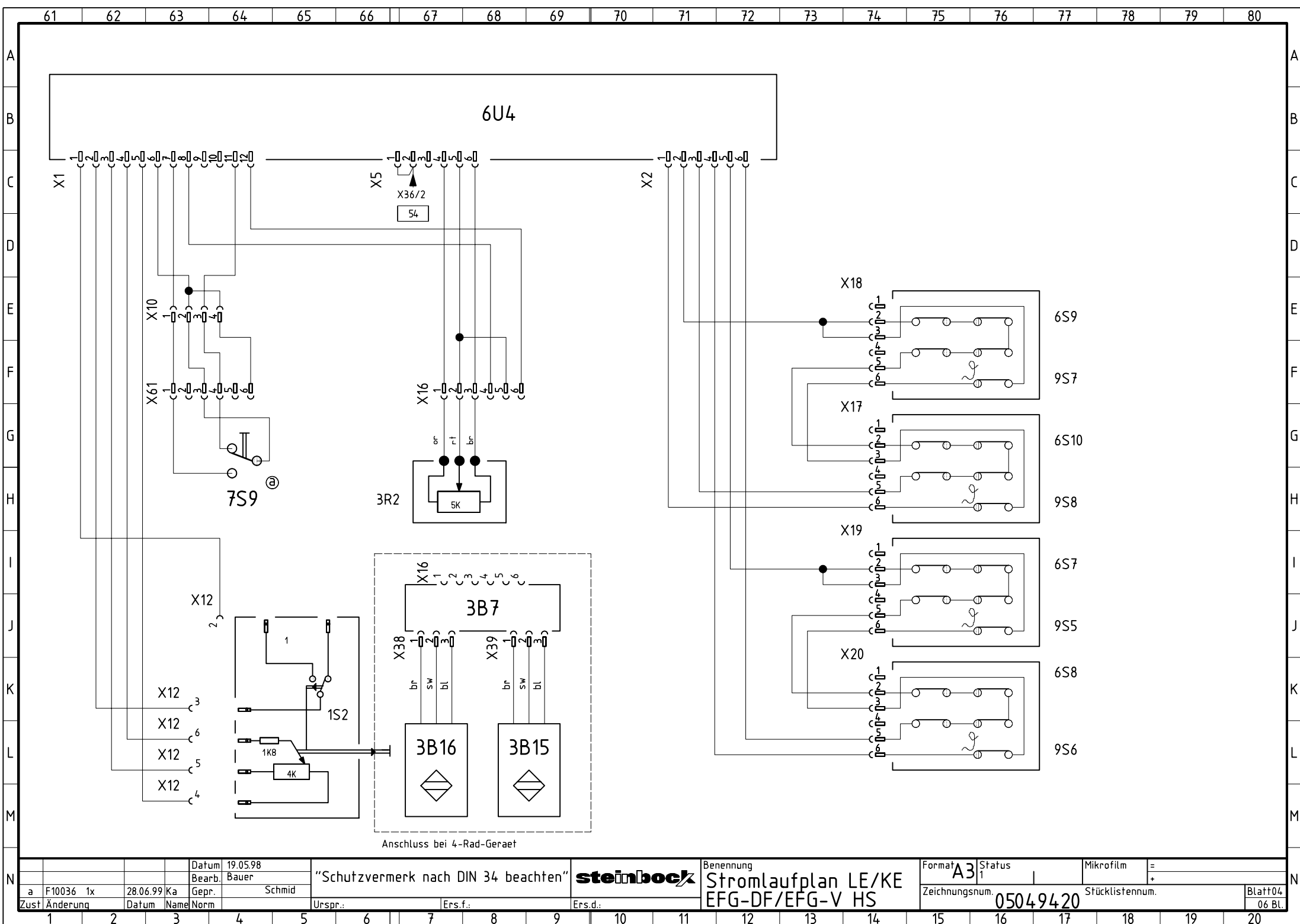


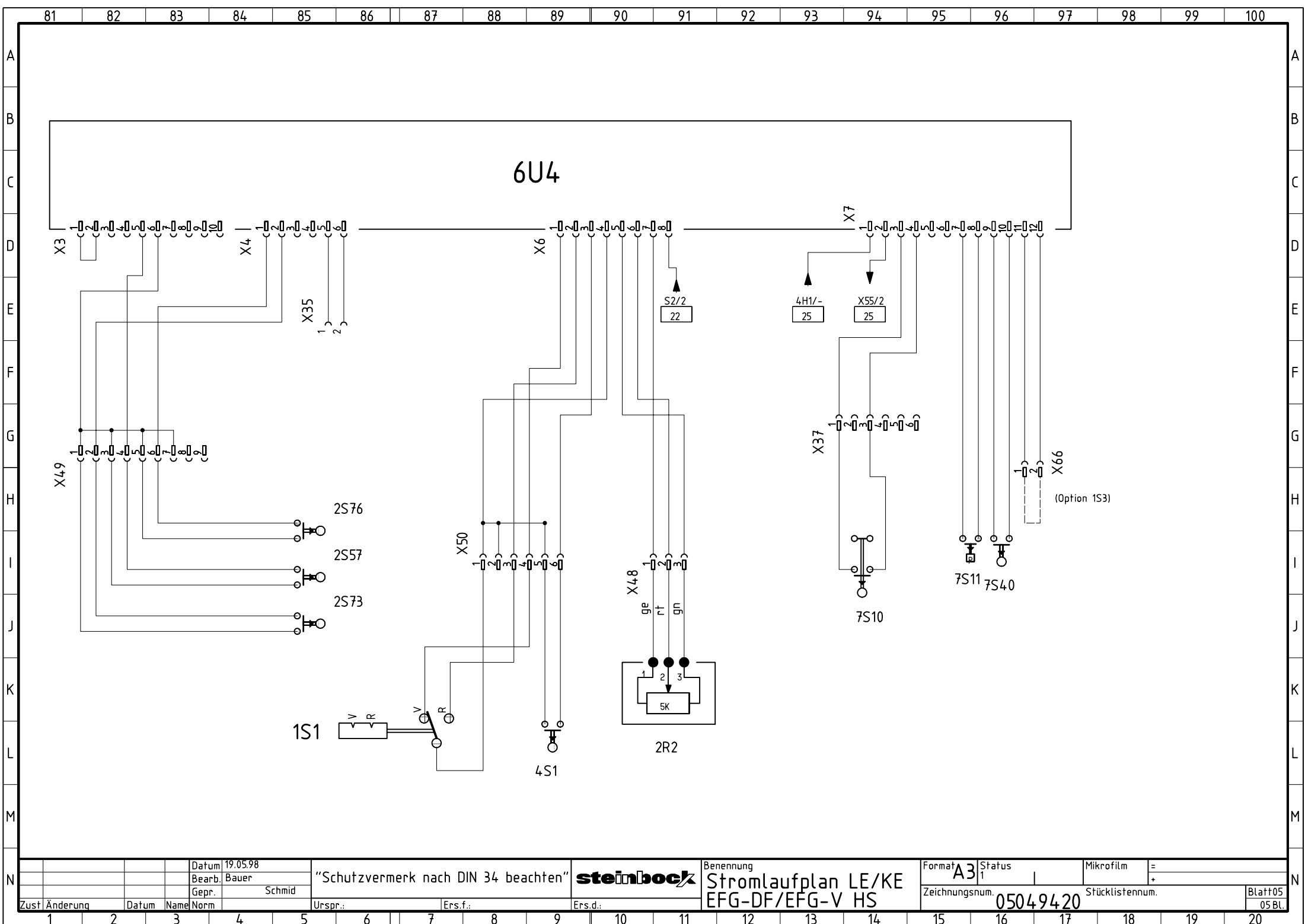
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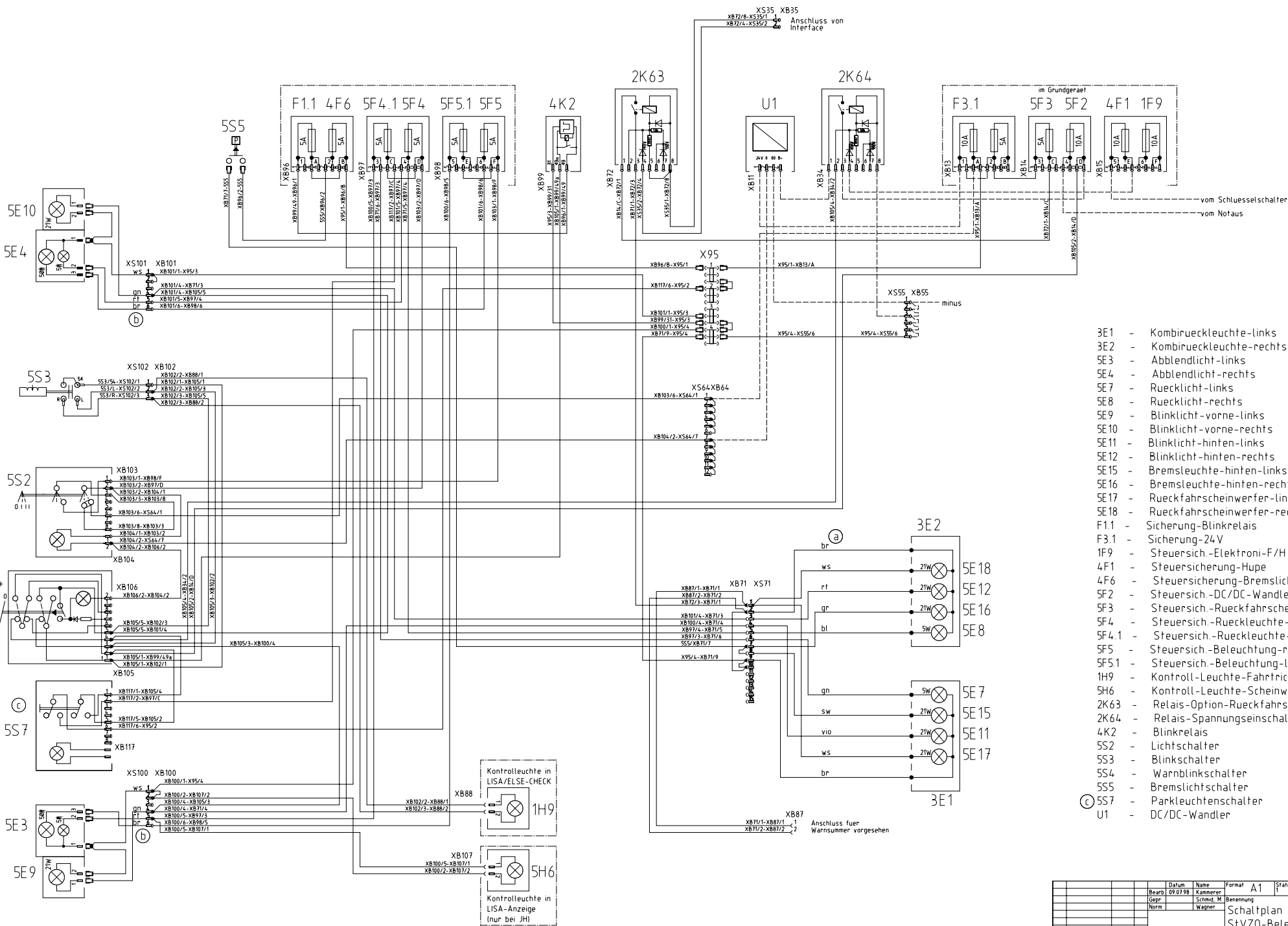






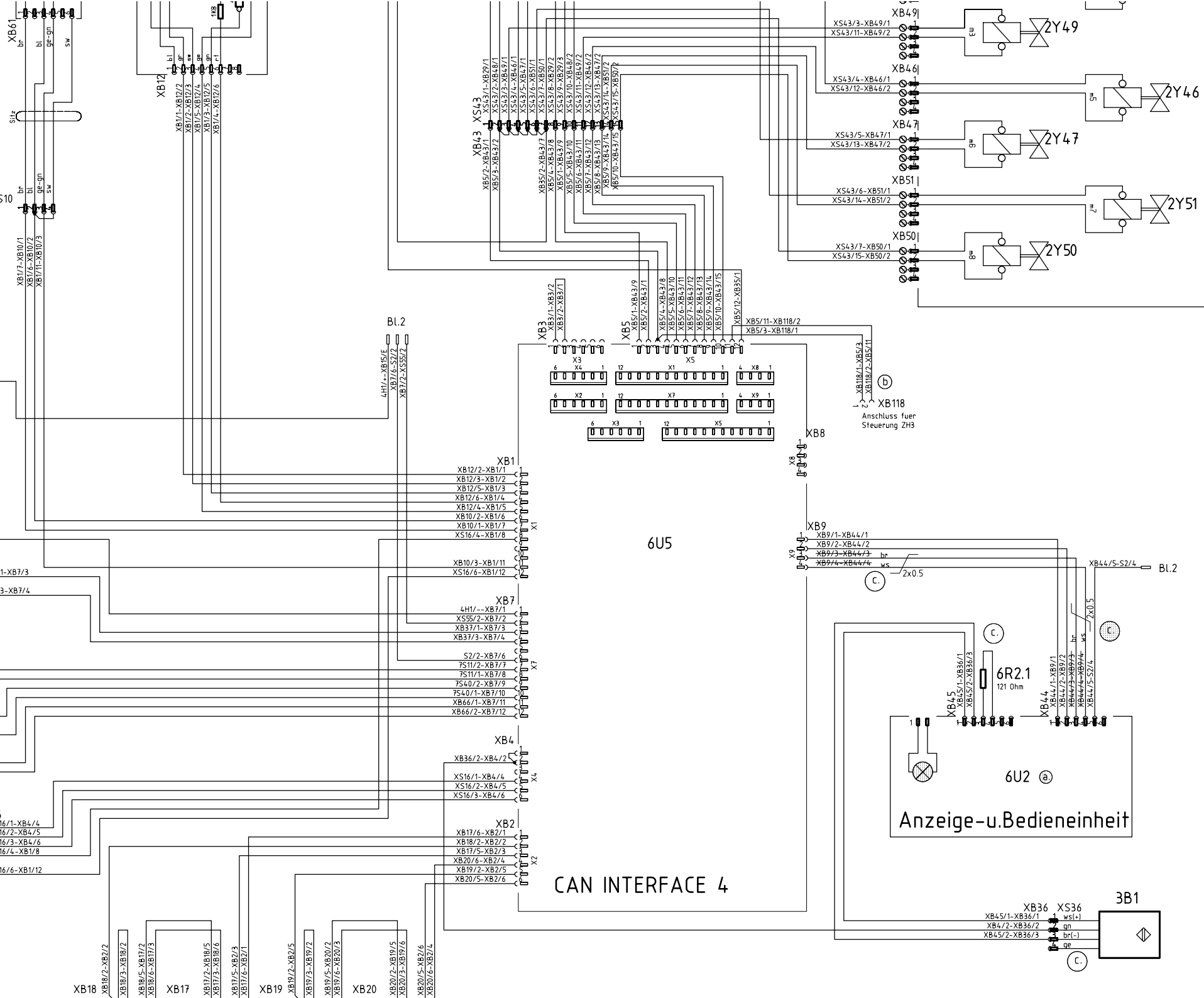
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	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
A	3B1	Lenkhilfe-Sensor				2R2	Linearpoti-Heben				U1	DC/DC-Wandler									
B	3B7	Lenkradsensorik				6R2	Abschlusswiderstand-Canbus-Servicest.				1U18	1U1	Steuerung-Fahren-links								
	3B15	Sensor-Rad-rechts-eingeschlagen				a 6R2.1	Abschlusswiderstand-Canbus-Anzeige				1U19	a 1U1.1	Steuerung-Fahren-rechts								
C	3B16	Sensor-Rad-links-eingeschlagen				S2	Schaltschloss				2U1	Steuerung-Heben									
	3C1	Entstoerkondensator				S5	"NOT-AUS"				6U2	LCD-Information-und-Serviceanzeige (LISA) / JH									
D	a D3	Freilaufdiode				1S1	Fahrtrichtungsschalter				6U3	Informationsanzeige-CAN / STB									
	F3.1	Sicherung-24V				1S2	Fahrschalter				6U4	CAN-Interface-3									
E	1F	Sicherung-Fahrmotore				2S57	ZH1-Ventilschalter				X1+	Klemmsockel-plus									
	1F9	Steuersich.-Elektronik-F/H				2S73	Taster-Neigen-vor/zurueck														
	2F1	Sicherung-Pumpenmotor				2S76	ZH2-Ventilschalter														
F	4F1	Steuersicherung-Hupe				4S1	Taster-Hupe														
	5F2	Steuersich.DC/DC-Wandler				6S7	Kohlebuerstensor-Fahrmotor-1														
G	G1	Batterie				6S8	Kohlebuerstensor-Fahrmotor-2														
	4H1	Hupe				6S9	Kohlebuerstensor-Pumpenmotor														
H	K1	Hauptschuetz-1				6S10	Kohlebuerstensor-Lenkhilfe-Motor														
	7K23	Versorgungsrelais-f.-StVZO				7S9	Sitzschalter														
I	1M1	Fahrmotor-1-				7S10	Handbremsschalter														
	1M2	Fahrmotor-2-				7S11	Fussbremsschalter														
J	2M1	Pumpenmotor-1				7S40	Bremsfluessigkeitsstand-Schalter														
	3M1	Lenkhilfemotor				9S5	Temperaturschalter-Fahrmotor-1														
K						9S6	Temperaturschalter-Fahrmotor-2														
						9S7	Temperaturschalter-Pumpenmotor														
L						9S8	Temperaturschalter-Lenkhilfe-Motor														
M																					
N					Datum	19.05.98	"Schutzvermerk nach DIN 34 beachten"						Benennung Stromlaufplan LE/KE EFG-DF/EFG-V HS		Format	A3	Status	1	Mikrofilm	=	
					Bearb.	Bauer															
	a	F10036	3x	29.03.99	Ka	Gepr.	Schmid							Zeichnungsnum.		05049420	Stücklistennum.		Blatt06		
	Zust	Änderung		Datum	Name	Norm	Urspr.:		Ers.f.:		Ers.d.:										
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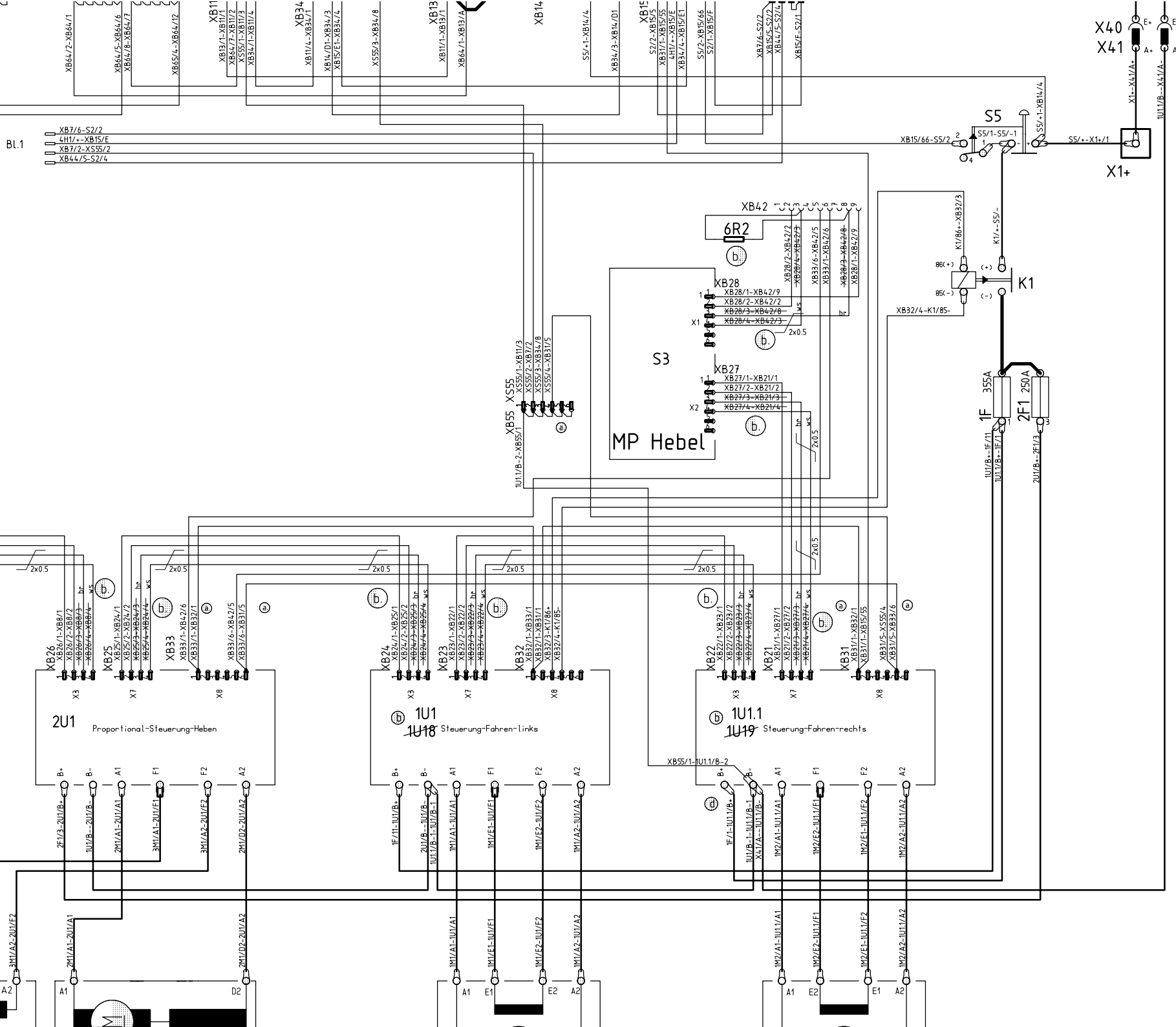


- 3E1 - Kombirueckleuchte-links
- 3E2 - Kombirueckleuchte-rechts
- 5E3 - Abblendlicht-links
- 5E4 - Abblendlicht-rechts
- 5E7 - Ruecklicht-links
- 5E8 - Ruecklicht-rechts
- 5E9 - Blinklicht-vorne-links
- 5E10 - Blinklicht-vorne-rechts
- 5E11 - Blinklicht-hinten-links
- 5E12 - Blinklicht-hinten-rechts
- 5E15 - Bremsleuchte-hinten-links
- 5E16 - Bremsleuchte-hinten-rechts
- 5E17 - Rueckfahrcheinwerfer-links
- 5E18 - Rueckfahrcheinwerfer-rechts
- F1.1 - Sicherung-Blinkrelais
- F3.1 - Sicherung-24V
- 1F9 - Steuersich.-Elektroni-F/H
- 4F1 - Steuersicherung-Hupe
- 4F6 - Steuersicherung-Bremslicht
- 5F2 - Steuersich.-DC/DC-Wandler
- 5F3 - Steuersich.-Rueckfahrcheinwerfer
- 5F4 - Steuersich.-Rueckleuchte-rechts
- 5F4.1 - Steuersich.-Rueckleuchte-links
- 5F5 - Steuersich.-Beleuchtung-rechts
- 5F5.1 - Steuersich.-Beleuchtung-links
- 1H9 - Kontroll-Leuchte-Fahrtricht-Anzeige
- 5H6 - Kontroll-Leuchte-Scheinwerfer-Ein
- 2K63 - Relais-Option-Rueckfahrcheinw.
- 2K64 - Relais-Spannungseinschalt.-b.-Optionen
- 4K2 - Blinkrelais
- SS2 - Lichtschalter
- SS3 - Lichtschalter
- SS4 - Warnblinkschalter
- SS5 - Bremslichtschalter
- SS7 - Parkleuchtschalter
- U1 - DC/DC-Wandler

Datum	Name	Format	A1	Status	Microfilm
Bearb.	09.07.98	Kammerer			
Gepr.		Schmid, M.			
Norm		Wagner			
Schaltplan					
StVZO-Beleuchtung					
Zeichnungsnummer					
05055972					
Stücklistennummer					
01					
Blatt					
01					
Bl.					



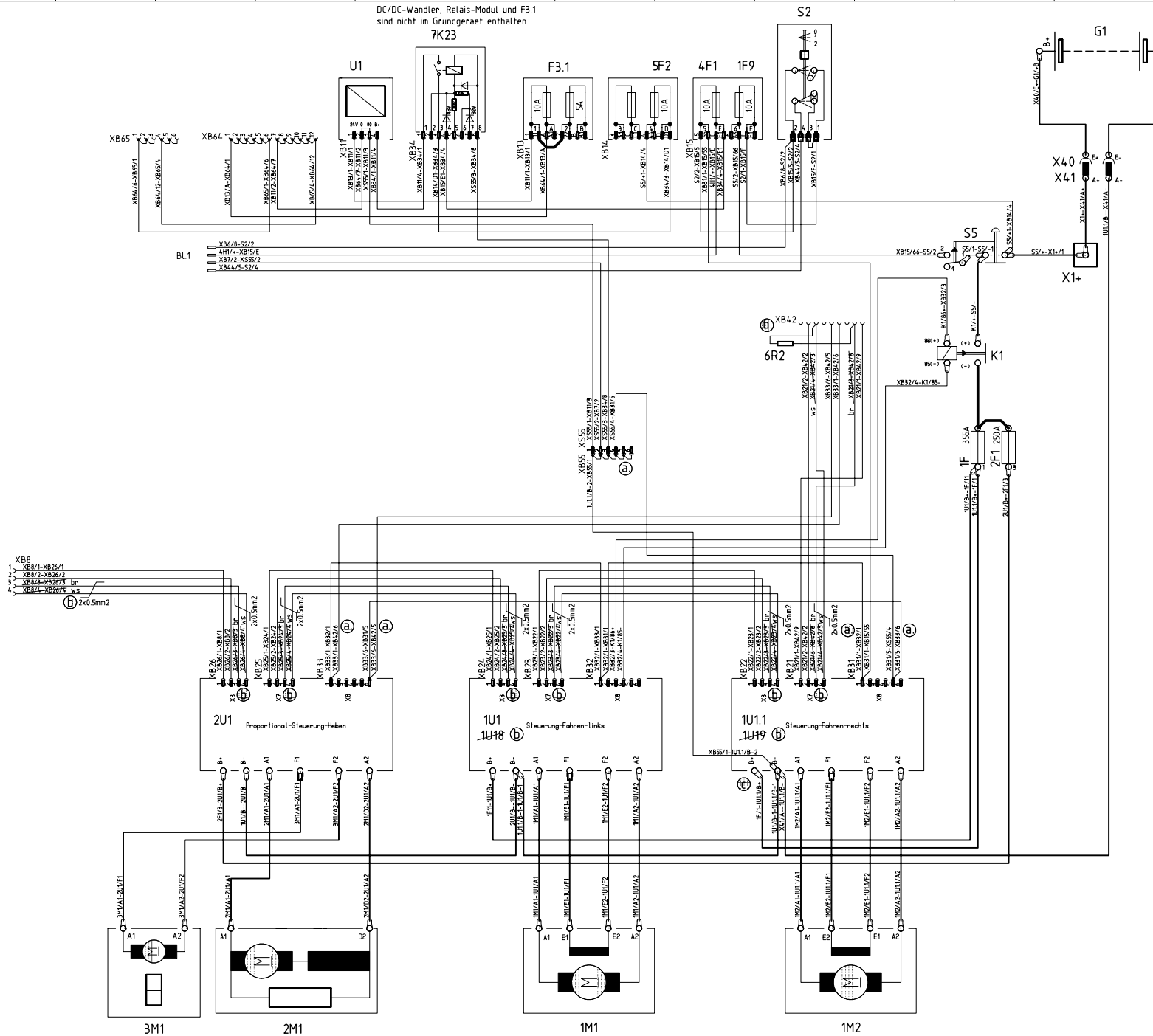
- 6R2.1 H,11 Abschlu
- 1S2 B,4 Fahrsha
- 6S7 K,5 Kohlebu
- 6S8 K,6 Kohlebu
- 6S9 K,4 Kohlebu
- 6S10 K,5 Kohlebu
- 7S9 B,3 Sitzscha
- 7S10 G,2 Handbre
- 7S11 H,2 Fussbre
- 7S40 H,2 Bremsfl
- 9S5 K,5 Tempera
- 9S6 K,6 Tempera
- 9S7 K,4 Tempera
- 9S8 K,5 Tempera
- 6U2 I,11 LCD-Info
- 6U5 H,8 CAN-Inte
- 2Y1 C,11 Magnetv
- 2Y29 C,11 Proporti
- 2Y46 C,11 Magnetv
- 2Y47 C,11 Magnetv
- 2Y48 C,11 Magnetv
- 2Y49 C,11 Magnetv
- 2Y50 C,11 Magnetv
- 2Y51 C,11 Magnetv



G1	A,12 Batterie
K1	D,11 Hauptsch
7K23	B,5 Versorgu
1M1	K,7 Fahrmo
1M2	K,9 Fahrmo
2M1	K,4 Pumpenm
3M1	K,2 Lenkhilf
6R2	D,9 Abschlus
S2	A,9 Schaltsch
S3	E,8 Multifunk
S5	C,11 NOT-AUS
U1	B,5 DC/DC-W
1U1	H,7 Steuerun
1U1.1	H,9 Steuerun
2U1	H,4 Proportio
X1+	C,12 Klemms

DC/DC-Wandler, Relais-Modul und F3.1
sind nicht im Grundgerät enthalten

7K23



- F3.1 B,7 Sicherung-24V
1F E,11 Sicherung-Fahrmotore-
1F9 B,7 Steuersich.-Elektronik-F/H
2F1 E,11 Sicherung-Pumpenmotor
4F1 B,7 Steuersicherung-Hupe
5F2 B,7 Steuersich.DC/DC-Wandler
G1 A,12 Batterie
K1 D,11 Hauptschuetz-1
7K23 B,5 Versorgungsrelais-f.-StVZO
1M1 K,7 Fahrmotor-1-
1M2 K,9 Fahrmotor-2
2M1 K,4 Pumpenmotor-1
3M1 K,2 Lenkhilfemotor-
6R2 D,9 Abschlusswiderstand-CAN-Bus-Servicest.
S2 A,9 Schaltschloss
S5 C,11 NOT-AUS
U1 B,5 DC/DC-Wandler
1U1 H,7 Steuerung-Fahren-links
1U1.1 H,9 Steuerung-Fahren-rechts
2U1 H,4 Proportional-Steuerung-Heben
X1+ C,12 Klemmsocket-plus

① 1U18
② 1U19

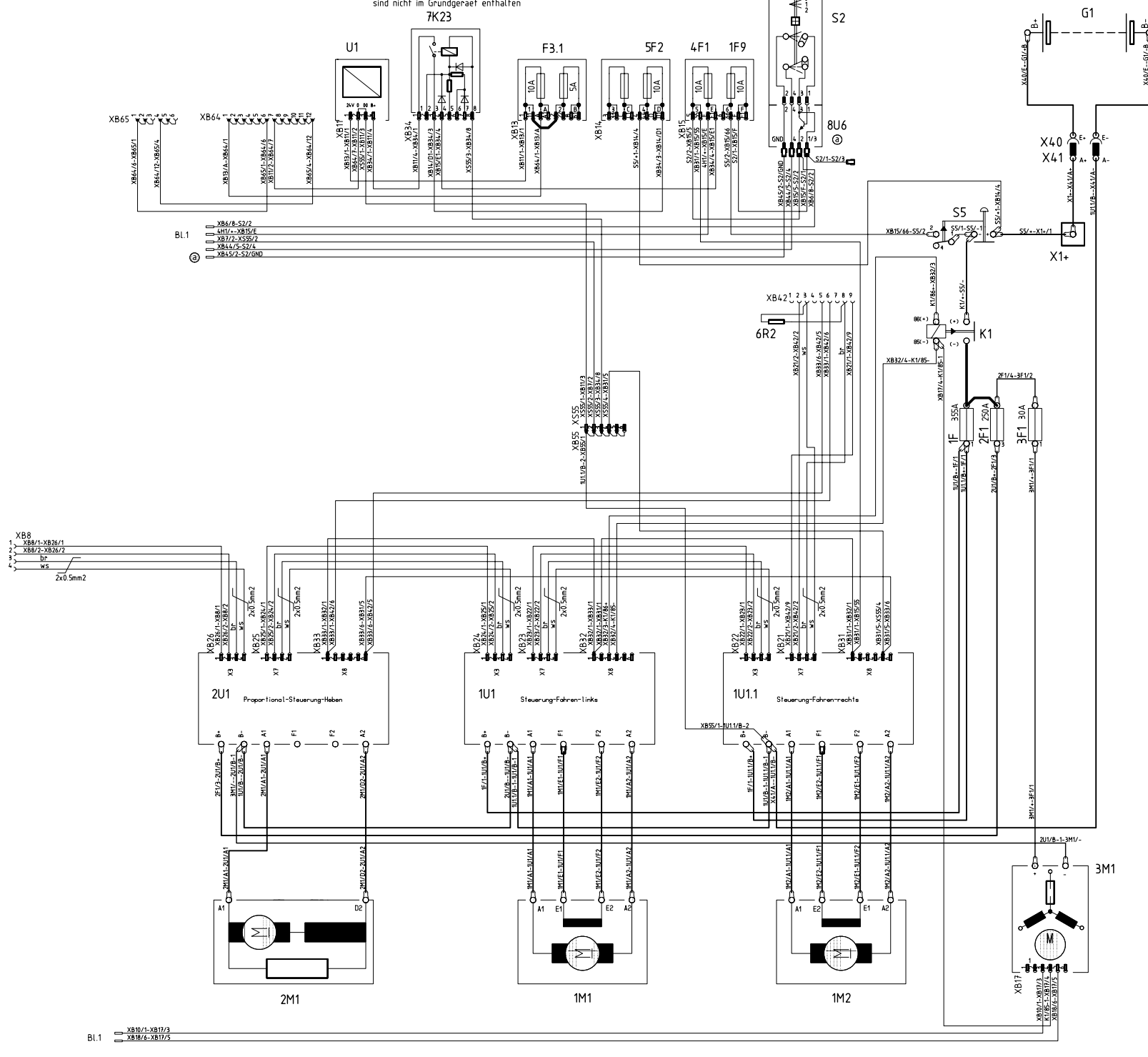
Datum	Name	Format	A1	Status	Microfilm
Bearb. 15.06.98	Anbrans				
Gepr. Norm	Schmid				
Benennung					
Schaltplan					
EFG-DF/V HS					
Zeichnungsnummer					
05058673					
Stücklistennummer					
02					
02					
1Ecsd					

1F10195	1x	27.03.00	BW
1F10036		24.06.99	Ka
1F5017K	5x	01.10.98	RA

Zust./Änderung Datum Name/Usor: 05040373

Schutzvermerk nach DIN 34 beachten

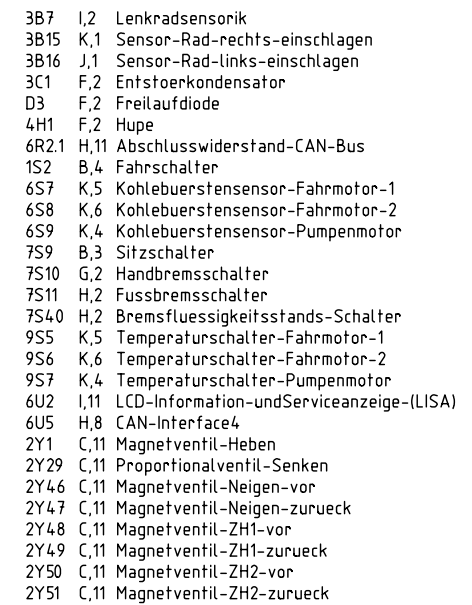
DC/DC-Wandler, Relais-Modul und F3.1
sind nicht im Grundgerät enthalten
7K23



- F3.1 B,7 Sicherung-24V
- 1F E,11 Sicherung-Fahrmotore-
- 1F9 B,7 Steuersich.-Elektronik-F/H
- 2F1 E,11 Sicherung-Pumpenmotor
- 3F1 E,11 Sicherung-Lenkhilfemotor
- 4F1 B,7 Steuersicherung-Hupe
- 5F2 B,7 Steuersich.DC/DC-Wandler
- G1 A,12 Batterie
- K1 D,11 Hauptschuetz-1
- 7K23 B,5 Versorgungsrelais-f.-StVZO
- 1M1 K,7 Fahrmotor-1
- 1M2 K,9 Fahrmotor-2
- 2M1 K,4 Pumpenmotor-1
- 3M1 K,12 Lenkhilfemotor
- 6R2 D,9 Abschlusswiderstand-CAN-Bus
- S2 A,9 Schalt Schloss
- S5 C,11 NOT-AUS
- U1 B,5 DC/DC-Wandler
- 1U1 H,7 Steuerung-Fahren-links
- 1U1.1 H,9 Steuerung-Fahren-rechts
- 2U1 H,4 Proportional-Steuerung-Heben
- 8U6 B,9 Elektronik
- X1+ C,12 Klemmsocle-plus

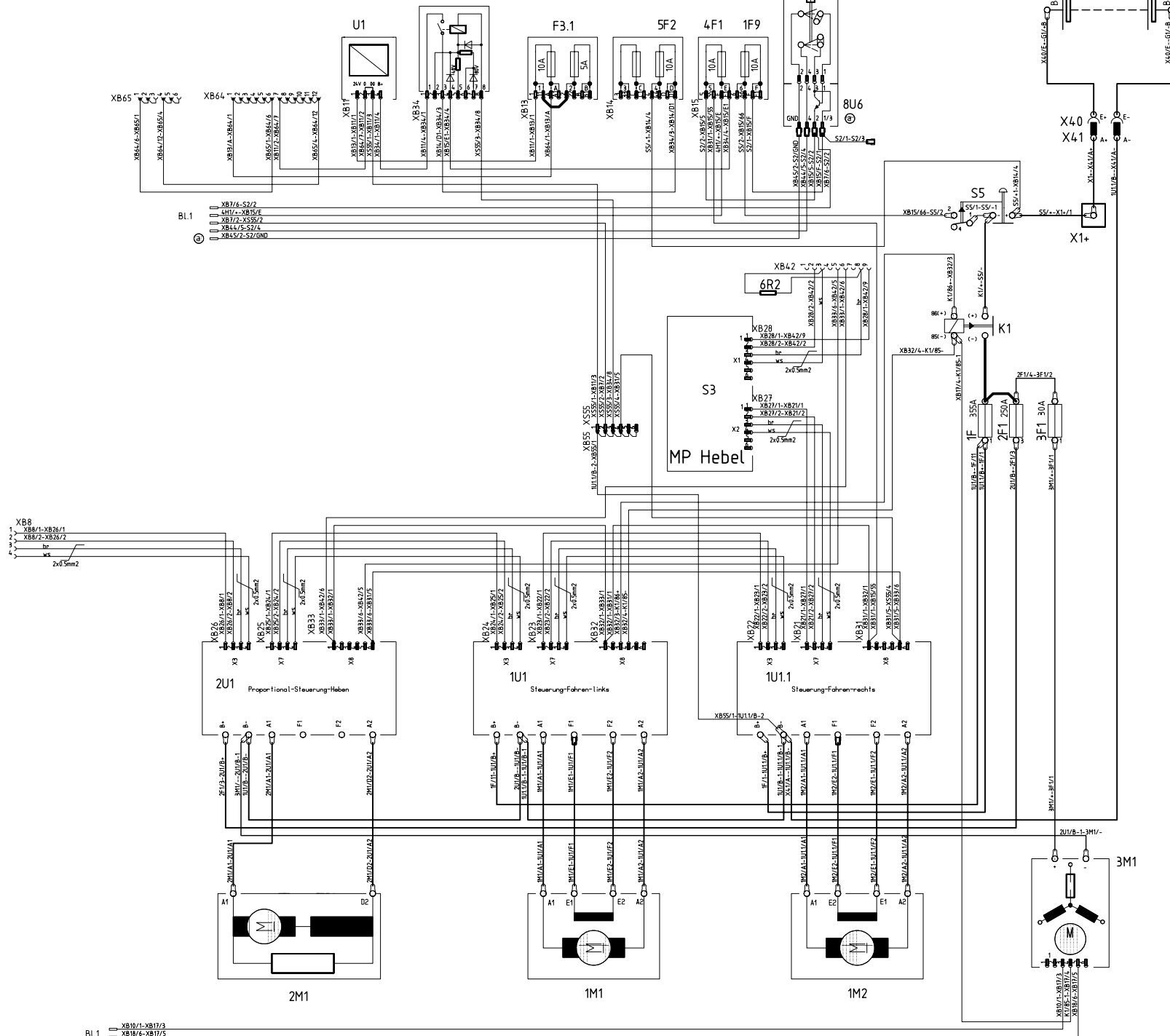
Datum	Name	Format	A1	Status	Microfilm
Bearb.	24.10.01	Kammerer			
Gepr.	20.11.01	Schmid, M.			
Norm	20.11.01	Wagner			
Benennung					
Schaltplan EFG-DF/V (DC)					
Solopilot					
Zeichnungsnummer					
05109982					
Stücklistennummer					
02					
Blatt					
92					
Bl.					

Schutzvermerk nach DIN 34 beachten

[illegible]

DC/DC-Wandler, Relais-Modul und F3.1
sind nicht im Grundgerät enthalten

7K23

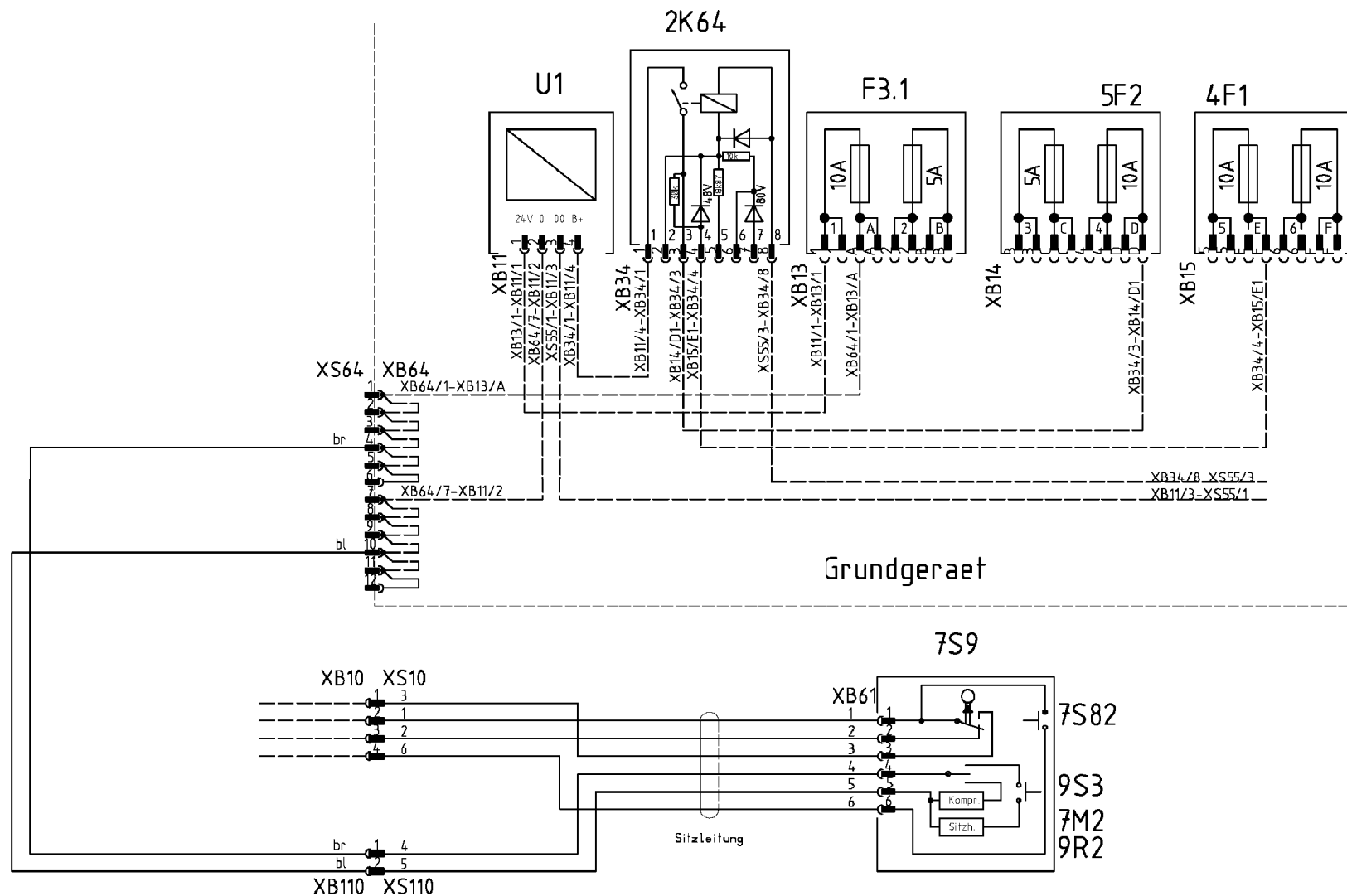


- F3.1 B,7 Sicherung-24V
- 1F E,11 Sicherung-Fahrmotore-
- 1F9 B,7 Steuersich.-Elektronik-F/H
- 2F1 E,11 Sicherung-Pumpenmotor
- 3F1 E,11 Sicherung-Lenkhilfmotor
- 4F1 B,7 Steuersicherung-Hupe
- 5F2 B,7 Steuersich.DC/DC-Wandler
- G1 A,12 Batterie
- K1 D,11 Hauptschuetz-1
- 7K23 B,5 Versorgungsrelais-f.-StVZO
- 1M1 K,7 Fahrmotor-1
- 1M2 K,9 Fahrmotor-2
- 2M1 K,4 Pumpenmotor-1
- 3M1 K,12 Lenkhilfmotor
- 6R2 D,9 Abschlusswiderstand-CAN-Bus
- S2 A,9 Schaltschloss
- S3 E,8 Multifunktions-Hebel
- S5 C,11 NOT-AUS
- U1 B,5 DC/DC-Wandler
- 1U1 H,7 Steuerung-Fahren-links
- 1U1.1 H,9 Steuerung-Fahren-rechts
- 2U1 H,4 Proportional-Steuerung-Heben
- 8U6 B,9 Elektronik
- X1+ C,12 Klemmsocket-plus

Datum	Name	Format	A1	Status	Microfilm
Bearb.	24.10.01	Kammerer			
Gepr.	20.11.01	Schmid, M.			
Norm	20.11.01	Wagner			
Benennung					
Schaltplan EFG-DF/V (DC)					
Multifunktionshebel					
Zeichnungsnummer					
05109983					
Stücklistennummer					
02					
Blatt					
92					
Bl.					
a T10456 2v					
10.09.02 KA					
Datum					
Festf.					
Festf.					
Festf.					

Schutzvermerk nach DIN 34 beachten

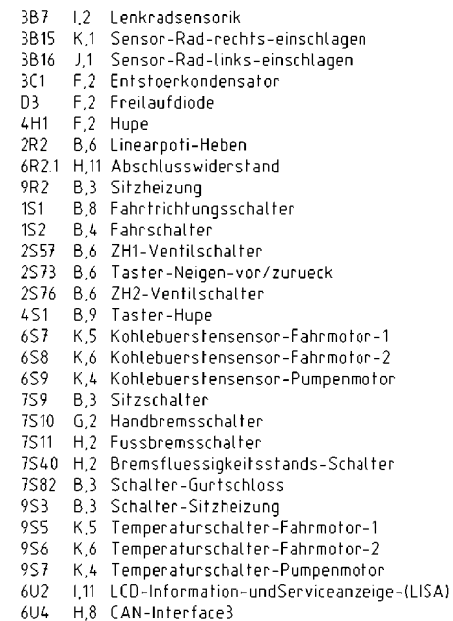
Spannung: 24V
Leistung: ca110W



- 4F1 - Steuersicherung Hupe
- 5F2 - Steuersicherung DC/DC Wandler
- F3.1 - Sicherung 24V
- 2K64 - Relais zur Spannungseinschaltung bei Optionen
- 7M2 - Motor Sitzverstellung
- 9R2 - Sitzheizung
- 7S9 - Sitzschalter
- 9S3 - Schalter-Sitzheizung
- 7S82 - Schalter Gurtschloss
- U1 - Spannungswandler

					Datum	Name	Format	A3	Status	2	Mikrofilm		
					Bearb.	17.10.05	Kuba	Benennung SPE, Schaltplan Fahrsitz MSG75					
					Gepr.	17.10.05	Schmid, M.						
					Norm	17.10.05	Wagner						
								Zeichnungsnummer				Stücklistennummer	Blatt
								99501632				01	01 Bl
Zust	Änderung	Datum	Name	Urspr.:	Ers.f.:			Ers.d.:					

"Schutzvermerk nach DIN 34 beachten"

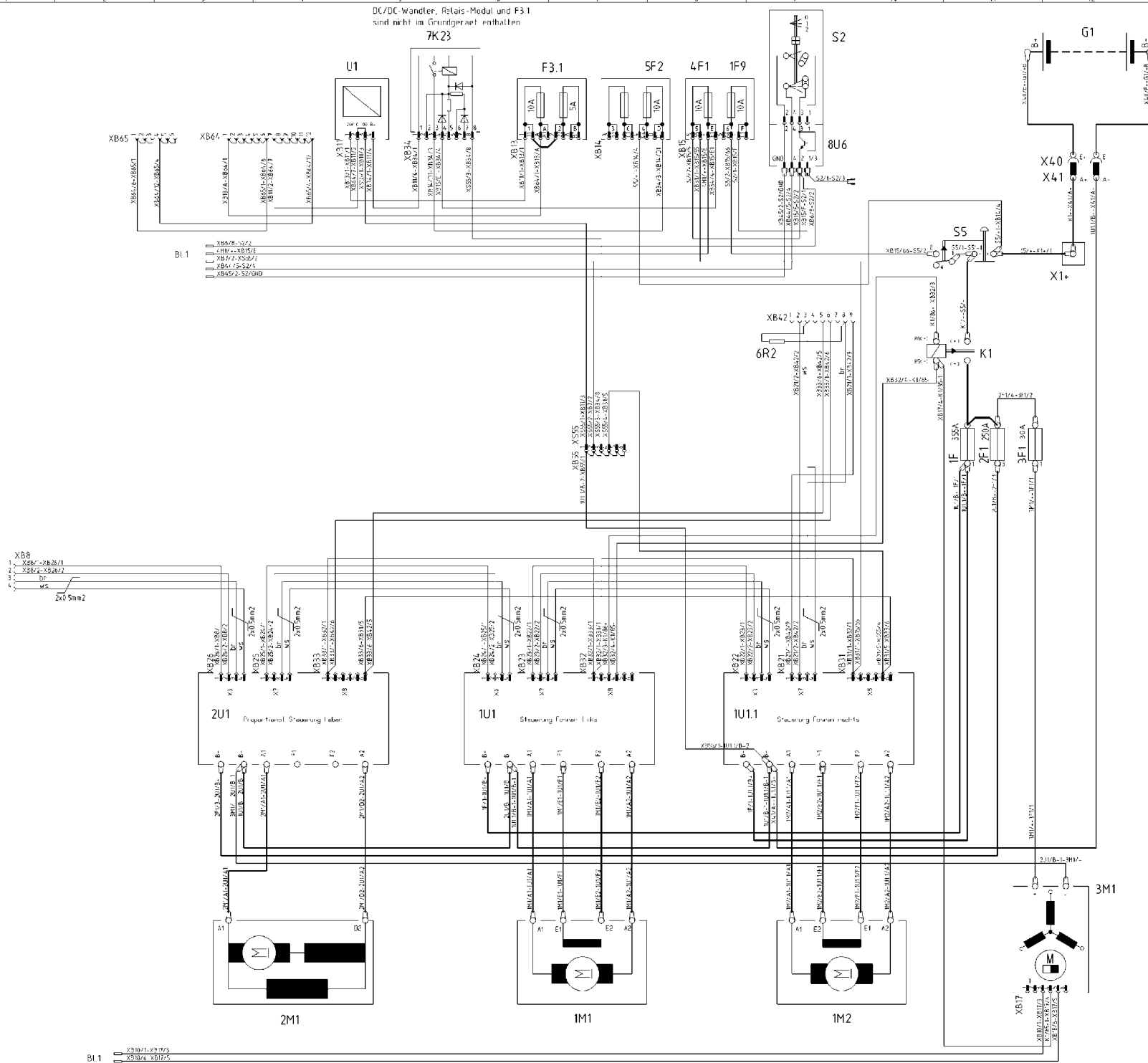


CAN INTERFACE 3

[illegible]

DC/DC-Wandler, Relais-Modul und F3.1
sind nicht im Grundgerät enthalten

7K23



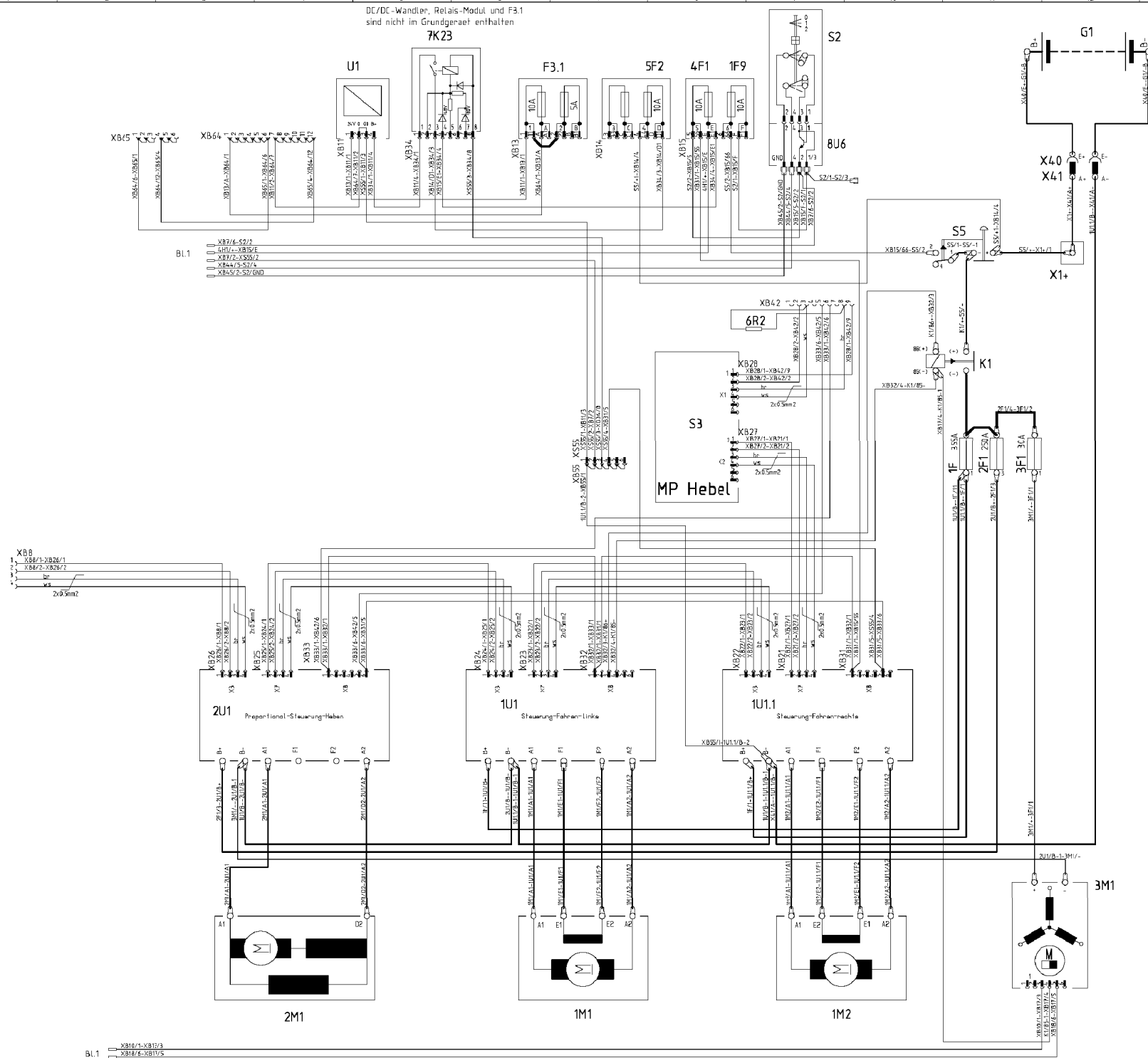
- F3.1 B.7 Sicherung-24V
1F E.11 Sicherung-Fahrmotore-
1F9 B.7 Steuersich-Elektronik-F/H
2F1 E.11 Sicherung-Pumpenmotor
3F1 E.11 Sicherung-Lenkhilfemotor
4F1 B.7 Steuersicherung-Hupe
5F2 B.7 Steuersich DC/DC-Wandler
G1 A.12 Batterie
K1 D.11 Hauptschuetz-1
7K23 B.5 Versorgungsrelais-f.-StVZO
1M1 K.7 Fahrmotor-1-
1M2 K.9 Fahrmotor-2
2M1 K.4 Pumpenmotor-1
3M1 K.12 Lenkhilfemotor
6R2 D.9 Abschlusswiderstand-CAN-Bus
S2 A.9 Schaltschloss
S5 C.11 NOT-AUS
U1 B.5 DC/DC-Wandler
U1 H.7 Steuerung-Fahren-links
U1.1 H.9 Steuerung-Fahren-rechts
2U1 H.4 Proportional-Steuerung-Heben
8U6 B.9 Elektronik
X1+ C.12 Klemmsocle-plus

Datum	Name	Format	A1	Status	Kreuz
Best: 11.05.05	Kammer				
Ent: 11.05.05	S. und M				
Norm: 11.05.05	Wagner				
SPE, Schaltplan					
EFG 213-220 dc SP					
Zeichnungsnummer					
99501667					
Erst:					
Blatt					
32					
32					

"Schutzvermerk nach DIN 34 beachten"

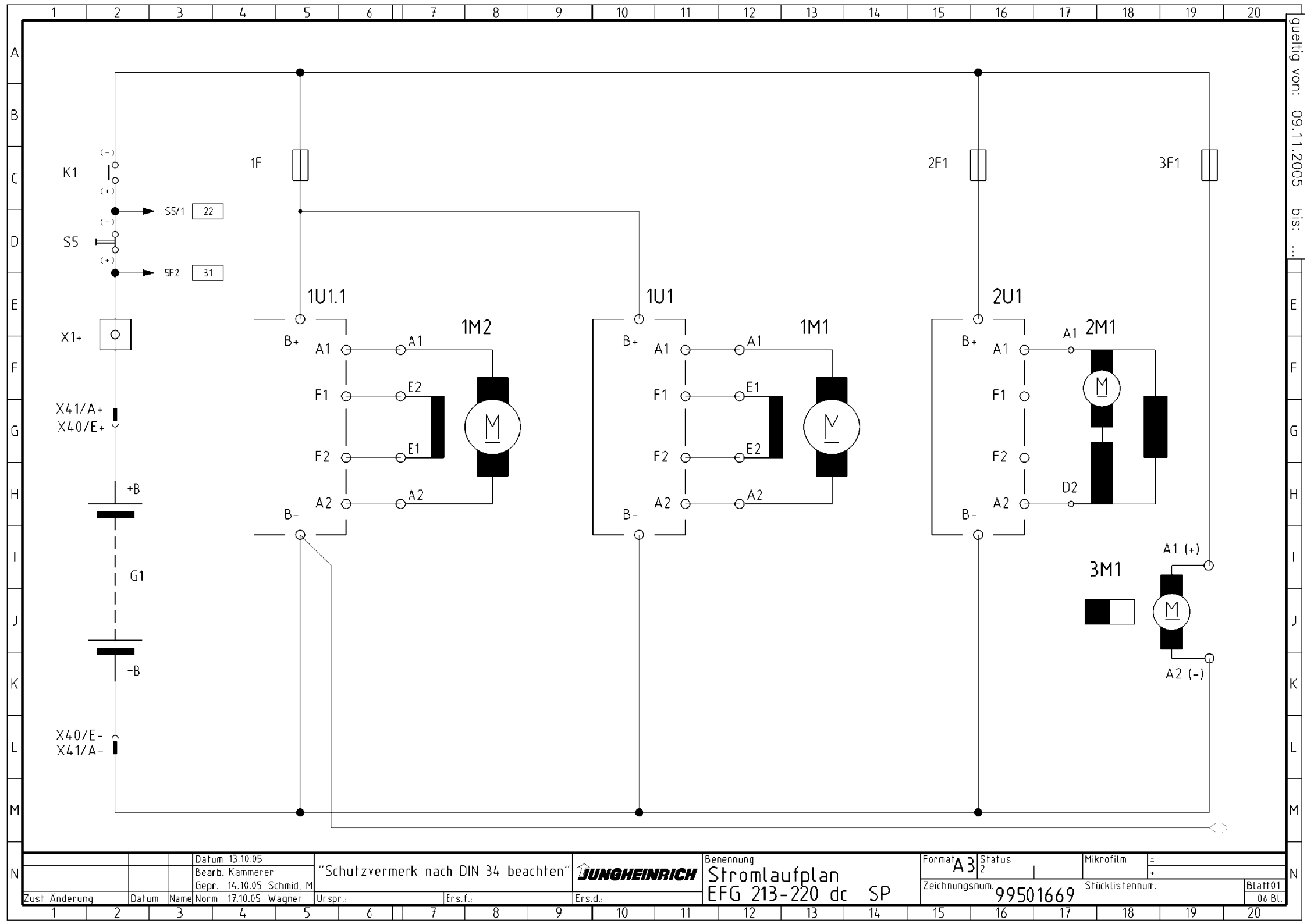


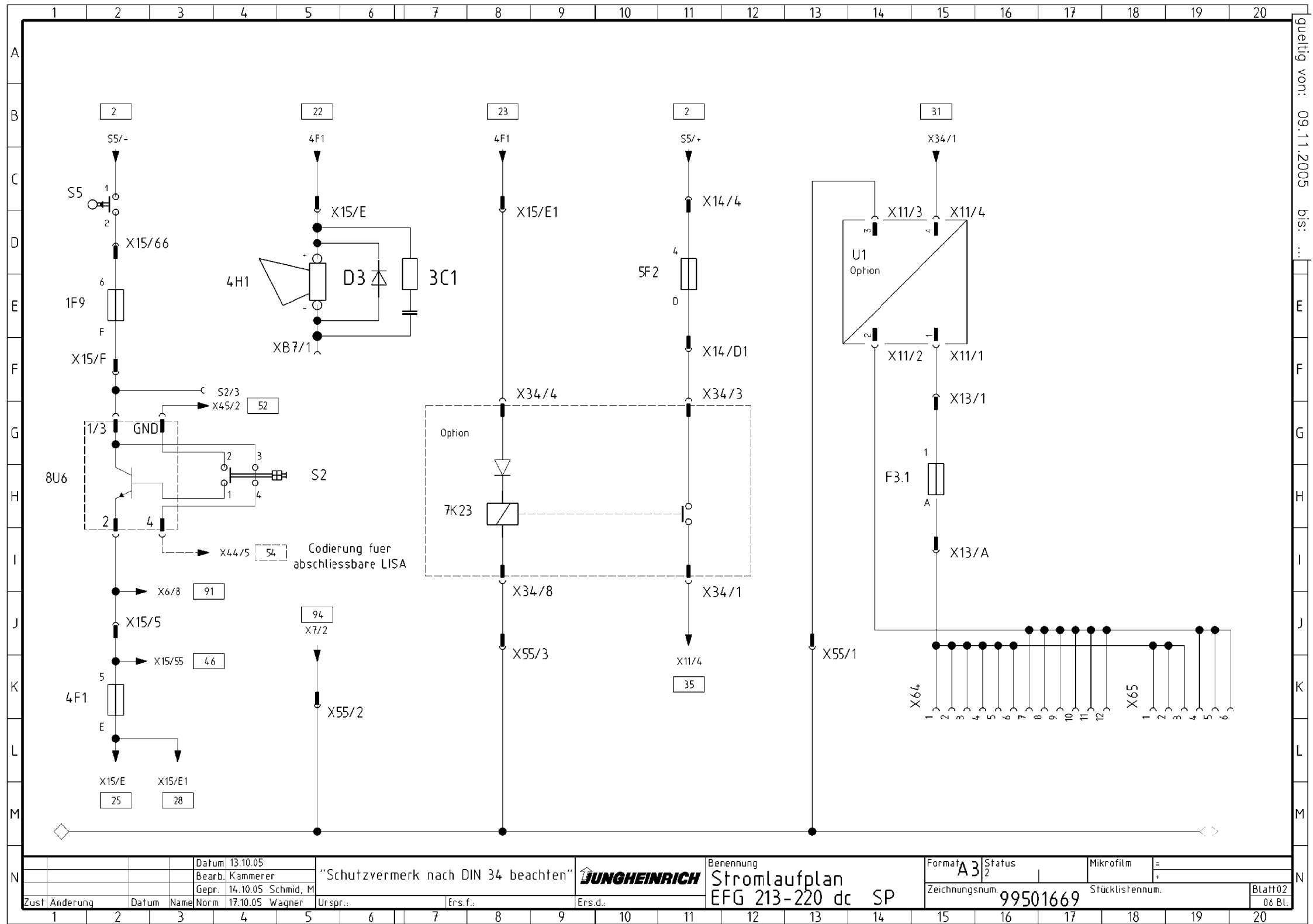
DC/DC-Wandler, Relais-Modul und F3.1
sind nicht im Grundgerät enthalten



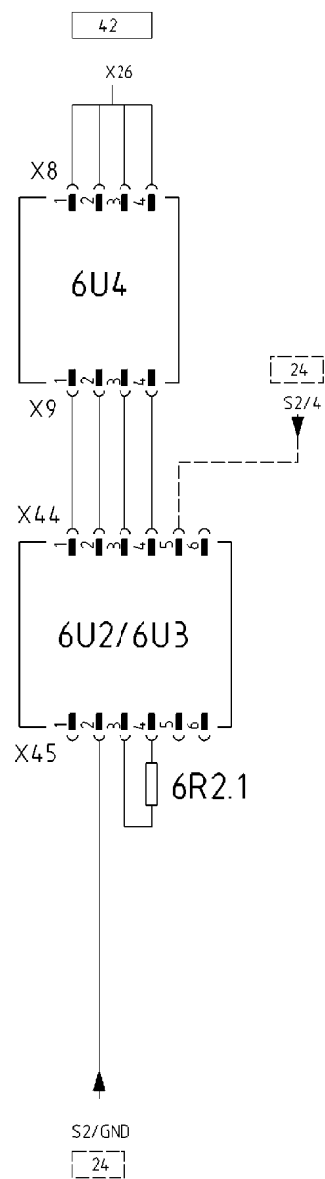
- F3.1 B,7 Sicherung-24V
- 1F E,11 Sicherung-Fahrmotore-
- 1F9 B,7 Steuersich.-Elektronik-F/H
- 2F1 E,11 Sicherung-Pumpenmotor
- 3F1 E,11 Sicherung-Lenkhilfemotor
- 4F1 B,7 Steuersicherung-Hupe
- 5F2 B,7 Steuersich.DC/DC-Wandler
- G1 A,12 Batterie
- K1 D,11 Hauptschuetz-1
- 7K23 B,5 Versorgungsrelais-f.-StVZO
- 1M1 K,7 Fahrmotor-1-
- 1M2 K,9 Fahrmotor-2
- 2M1 K,4 Pumpenmotor-1
- 3M1 K,12 Lenkhilfemotor
- 6R2 D,9 Abschlusswiderstand-CAN-Bus
- S2 A,9 Schaltschloss
- S3 E,8 Multifunktions-Hebel
- S5 C,11 NOT-AUS
- U1 B,5 DC/CC-Wandler
- 1U1 H,7 Steuerung-Fahren-links
- 1U1.1 H,9 Steuerung-Fahren-rechts
- 2U1 H,4 Proportional-Steuerung-Heben
- 8U6 B,9 Elektronik
- X1+ C,12 Klemsocket-plus

Datum	Name	Format	A1	Status	Mikrofilm
Bearb.	15.10.05	Kammerer			
Gepr.	16.10.05	Schmitt, M			
Norm	31.10.05	Wagner			
SPE, Schaltplan					
EFG 213-220 dc MP					
Zeichnungsnummer 99501668					
Stücklistennummer					
Blatt 02					
92 Bl.					

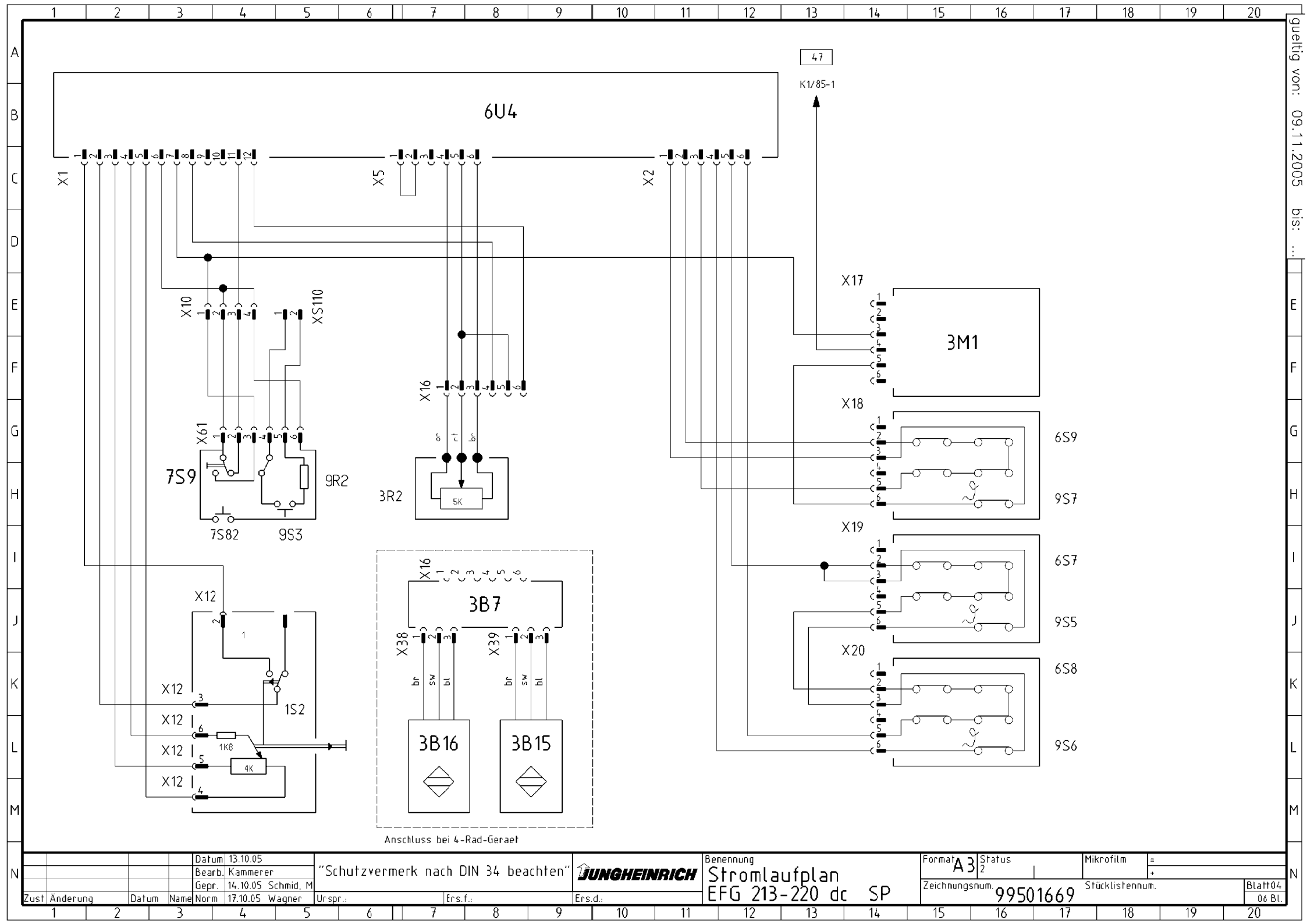


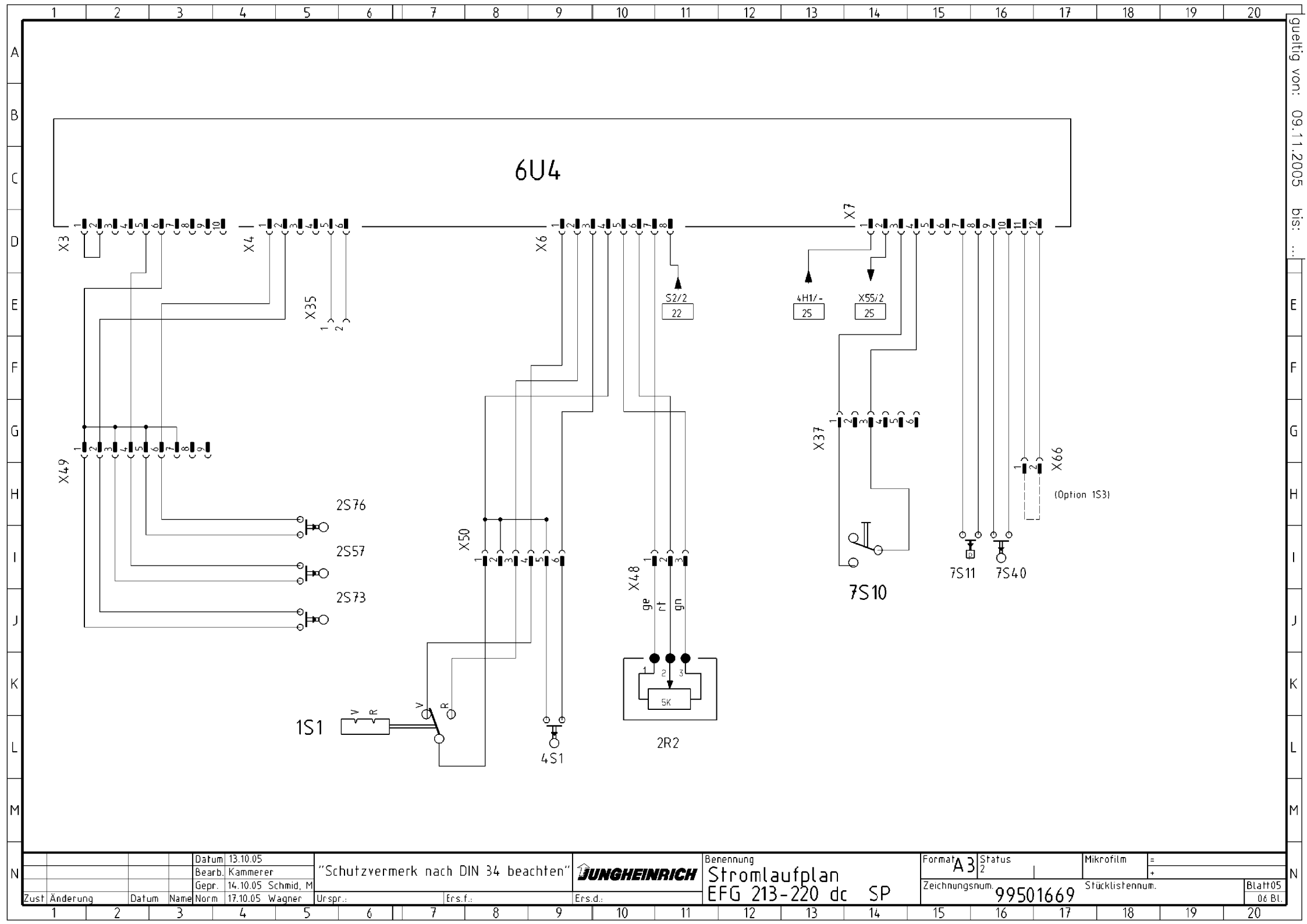


Datum 13.10.05				"Schutzvermerk nach DIN 34 beachten"				Benennung				Format A3		Status		Mikrofilm			
Bearb. Kammerer				JUNGHEINRICH				Stromlaufplan				2							
Gepr. 14.10.05 Schmid, M								EFG 213-220 dc SP				Zeichnungsnum.		99501669		Stücklistennum.		Blatt 02	
Zust Änderung				Datum Name Norm 17.10.05 Wagner				Urspr.: Ers.f.: Ers.d.:										06 Bl.	



				Datum	13.10.05	"Schutzvermerk nach DIN 34 beachten"				Benennung Stromlaufplan EFG 213-220 dc SP	Format	A3	Status	2	Mikrofilm	=					
				Bearb.	Kammerer																
				Gepr.	14.10.05 Schmid, M																
Zust	Änderung	Datum	Name	Norm	17.10.05 Wagner	Urspr.:		Ers.f.:		Ers.d.:		Zeichnungsnum.	99501669	Stücklistennum.		Blatt	03				
																	06 Bl.				



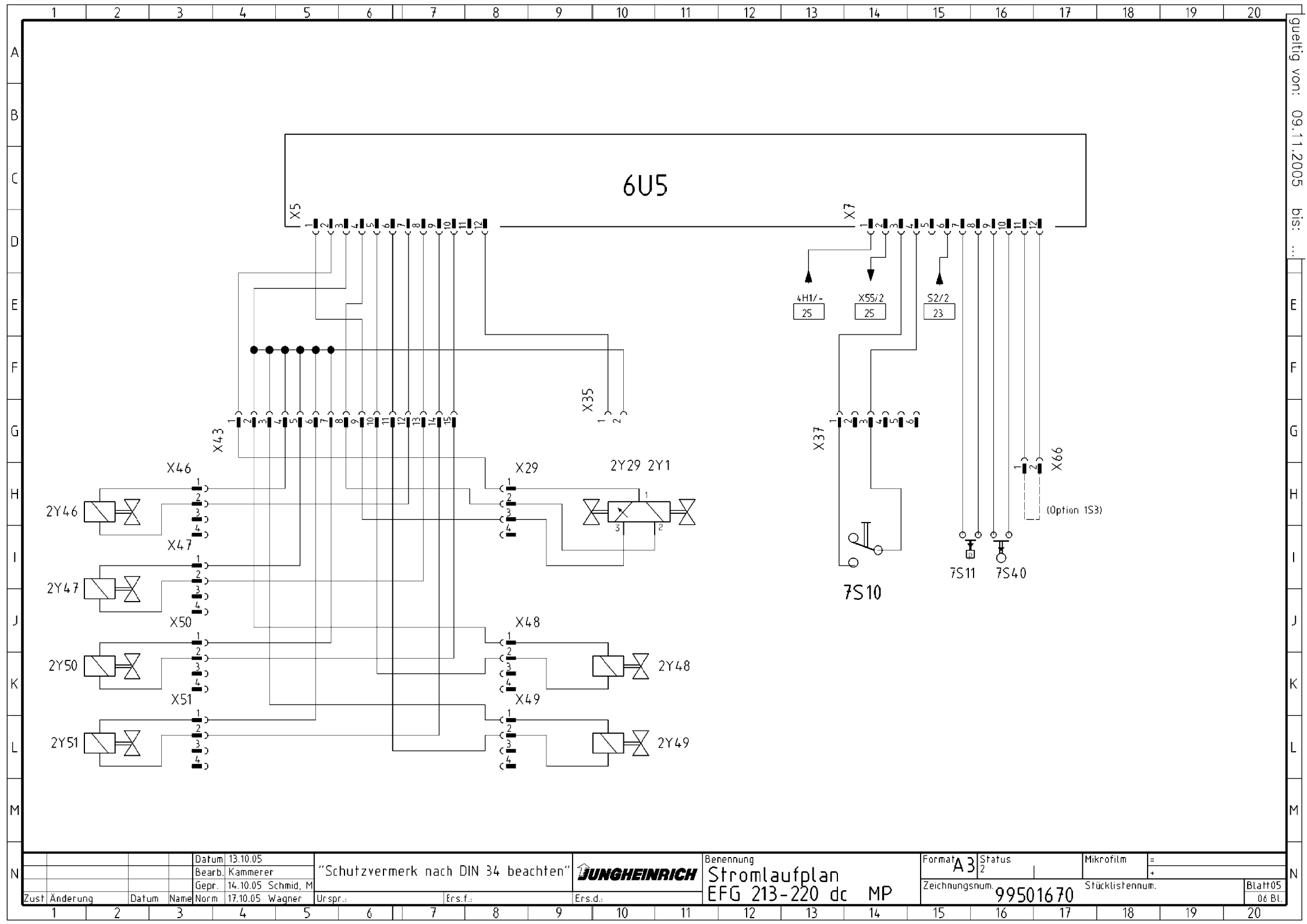


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				Bearb.	Kammerer														+	
				Gepr.	14.10.05 Schmid, M															
Zust	Änderung	Datum	Name	Norm	17.10.05 Wagner	Urspr.:		Ers.f.:		Ers.d.:		Zeichnungsnum. 99501669				Stücklistennum.				Blatt05
1												15				16				20

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	3B7	Lenkradsensorik					2R2	Linearpoti-Heben					9S3	Schalter-Sitzheizung						
B	3B15	Sensor-Rad-rechts-eingeschlagen					6R2	Abschlusswiderstand-Canbus-Servicest.					9S5	Temperaturschalter-Fahrmotor-1						
C	3B16	Sensor-Rad-links-eingeschlagen					6R2.1	Abschlusswiderstand-Canbus-Anzeige					9S6	Temperaturschalter-Fahrmotor-2						
D	3C1	Entstoerkondensator					9R2	Sitzheizung					9S7	Temperaturschalter-Pumpenmotor						
E	D3	Freilaufdiode					S2	Schaltschloss					U1	DC/DC-Wandler						
F	F3.1	Sicherung-24V					S5	"NOT-AUS"					1U1	Steuerung-Fahren-links						
G	1F	Sicherung-Fahrmotore					1S1	Fahrtrichtungsschalter					1U1.1	Steuerung-Fahren-rechts						
H	1F9	Steuersich.-Elektronik-F/H					1S2	Fahrschalter					2U1	Steuerung-Heben						
I	2F1	Sicherung-Pumpenmotor					2S57	ZH1-Ventilschalter					6U2	LCD-Information-und-Serviceanzeige (LISA) / JH						
J	3F1	Sicherung-Lenkhilfemotor					2S73	Taster-Neigen-vor/zurueck					6U3	Informationsanzeige-CAN / STB						
K	4F1	Steuersicherung-Hupe					2S76	ZH2-Ventilschalter					6U4	CAN-Interface-3						
L	5F2	Steuersich.DC/DC-Wandler					4S1	Taster-Hupe					8U6	Elektronik						
M	G1	Batterie					6S7	Kohlebuerstensen-sensor-Fahrmotor-1					X1+	Klemmsocket-plus						
N	4H1	Hupe					6S8	Kohlebuerstensen-sensor-Fahrmotor-2												
O	K1	Hauptschuetz-1					6S9	Kohlebuerstensen-sensor-Pumpenmotor												
P	7K23	Versorgungsrelais-f.-StVZO					7S9	Sitzschalter												
Q	1M1	Fahrmotor-1-					7S10	Handbrems-schalter												
R	1M2	Fahrmotor-2-					7S11	Fuß-brems-schalter												
S	2M1	Pumpenmotor-1					7S40	Bremsfluessigkeitsstand-Schalter												
T	3M1	Lenkhilfemotor					7S82	Schalter-Gurtschloss												
U																				
V																				
W																				
X																				
Y																				
Z																				
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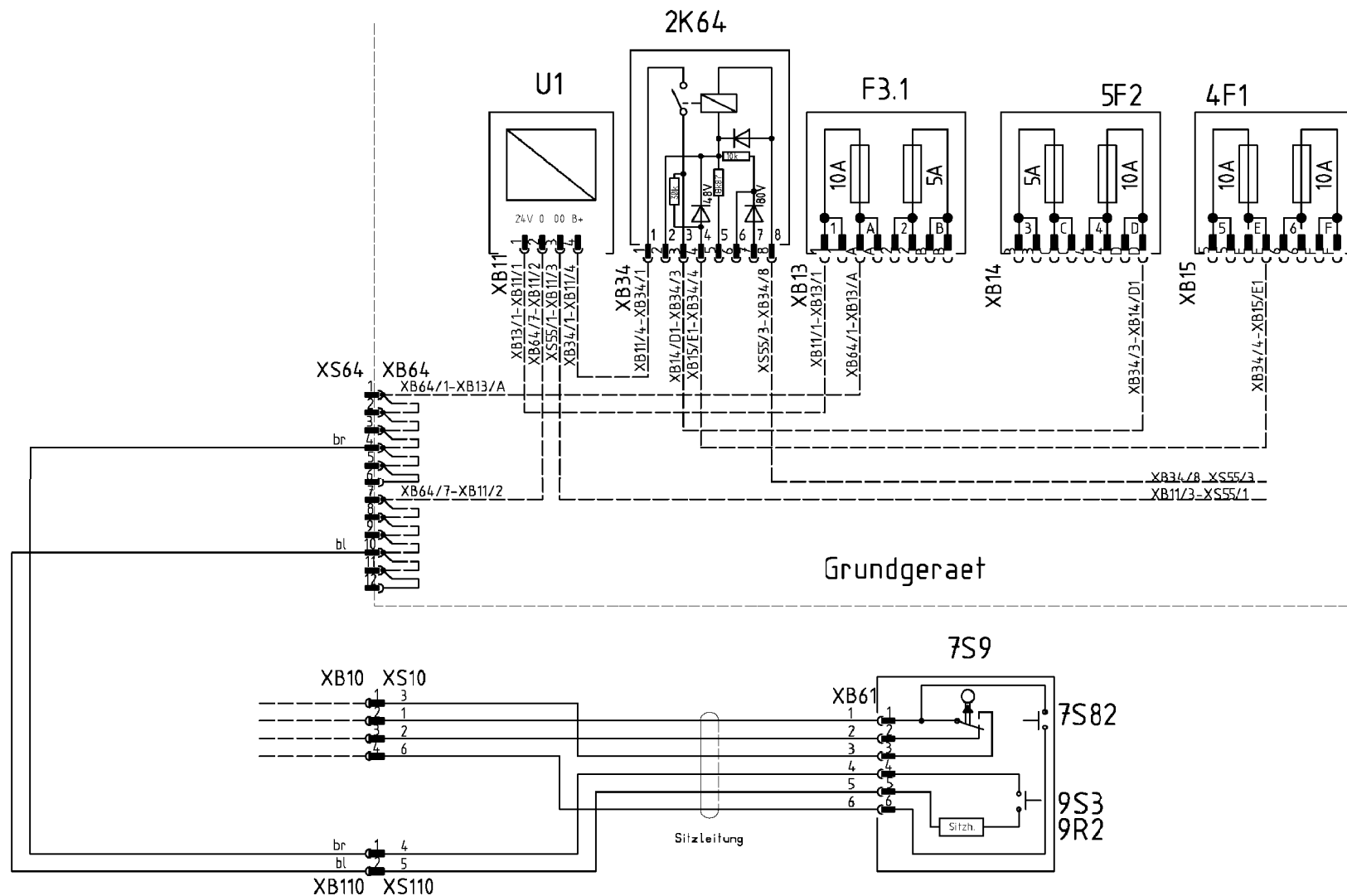
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			Datum	13.10.05	"Schutzvermerk nach DIN 34 beachten"						 Benennung				Format	A3	Status		Mikrofilm	=				
			Bearb.	Kammerer												2			+					
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			Norm	17.10.05	Wagner																			
Zust	Änderung	Datum	Name	Urspr.:		Ers.f.:		Ers.d.:																
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A	3B7	Lenkradsensorik					S2	Schaltschloss					U1	DC/DC-Wandler							
B	3B15	Sensor-Rad-rechts-eingeschlagen					S3	Multifunktionshebel					1U1	Steuerung-Fahren-Links							
	3B16	Sensor-Rad-links-eingeschlagen					S5	"NOT-AUS"					1U1.1	Steuerung-Fahren-Rechts							
C	3C1	Entstoerkondensator					1S2	Fahrschalter					2U1	Steuerung-Heben							
	D3	Freilaufdiode					6S7	Kohlebuerstensor-Fahrmotor-1					6U2	LCD-Information-und-Serviceanzeige (LISA) / JH							
	F3.1	Sicherung-24V					6S8	Kohlebuerstensor-Fahrmotor-2					6U3	Informationsanzeige-CAN / STB							
D	1F	Sicherung-Fahrmotore					6S9	Kohlebuerstensor-Pumpenmotor					6U5	CAN-Interface-4							
	1F9	Steuersich.-Elektronik-F/H					7S9	Sitzschalter					8U6	Elektronik							
E	2F1	Sicherung-Pumpenmotor					7S10	Handbremsschalter					X1+	Klemmsockel-plus							
	3F1	Sicherung-Lenkhilfemotor					7S11	Fussbremsschalter					2Y1	Magnetventil-Heben							
F	4F1	Steuersicherung-Hupe					7S40	Bremsfluessigkeitsstand-Schalter					2Y29	Proportionalventil-Senken							
	5F2	Steuersich.DC/DC-Wandler					7S82	Schalter-Gurtschloss					2Y46	Magnetventil-Neigen-vor							
G	G1	Batterie					9S3	Schalter-Sitzheizung					2Y47	Magnetventil-Neigen-zurueck							
	4H1	Hupe					9S5	Temperaturschalter-Fahrmotor-1					2Y48	Magnetventil-ZH1-vor							
H	K1	Hauptschuetz-1					9S6	Temperaturschalter-Fahrmotor-2					2Y49	Magnetventil-ZH1-zurueck							
	7K23	Versorgungsrelais-f.-StVZO					9S7	Temperaturschalter-Pumpenmotor					2Y50	Magnetventil-ZH2-vor							
I	1M1	Fahrmotor-1-											2Y51	Magnetventil-ZH2-zurueck							
	1M2	Fahrmotor-2-																			
J	2M1	Pumpenmotor-1																			
	3M1	Lenkhilfemotor																			
K	6R2	Abschlusswiderstand-CANBus Servicestecker																			
	6R2.1	Abschlusswiderstand-CANBus Anzeige																			
L	9R2	Sitzheizung																			
M																					
N					Datum	13.10.05	"Schutzvermerk nach DIN 34 beachten"					 Benennung			Format	A3	Status		Mikrofilm	=	
					Bearb.	Kammerer										2				+	
					Gepr.	14.10.05 Schmid, M	JUNGHEINRICH					Stromlaufplan EFG 213-220 dc MP			Zeichnungsnum.			Stücklistennum.			Blatt06
	Zust	Änderung		Datum	Name	Norm									17.10.05 Wagner	Urspr.:	Ers.f.:	Ers.d.:	99501670		
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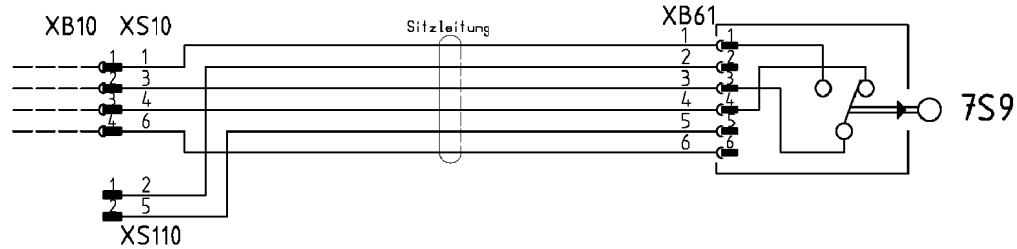
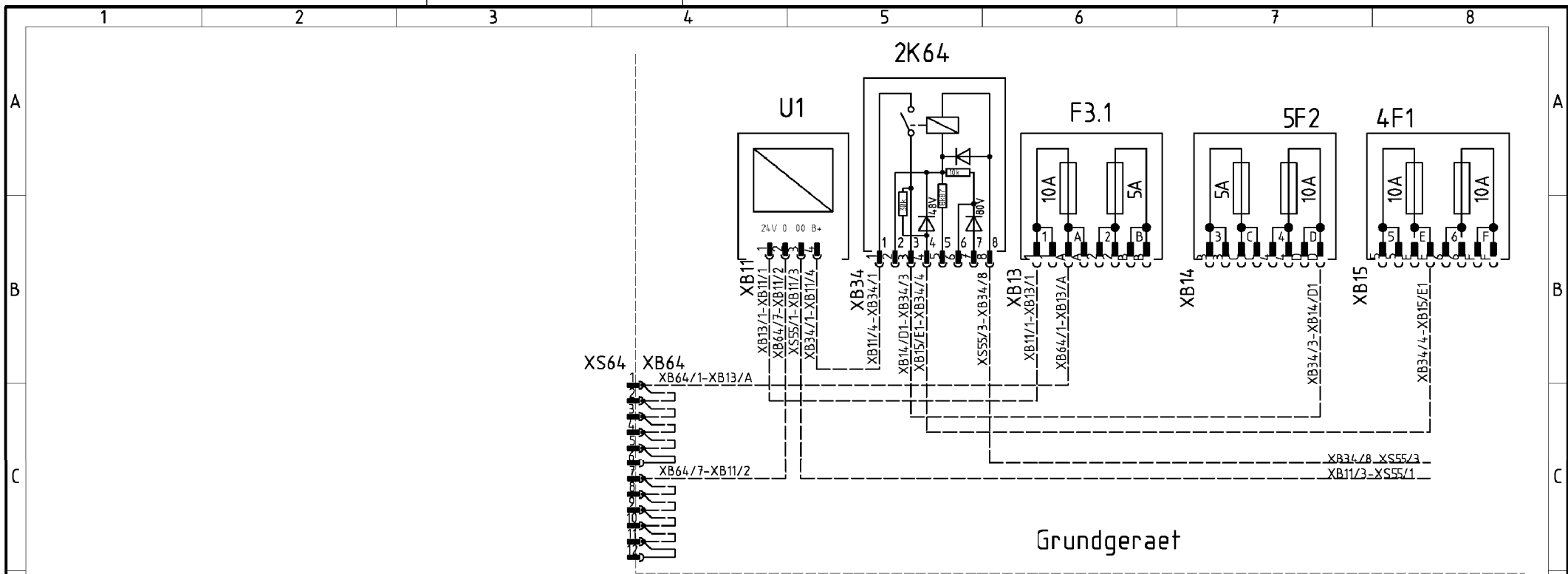
Spannung: 24V
Leistung: ca80W



- 4F1 - Steuersicherung Hupe
- 5F2 - Steuersicherung DC/DC Wandler
- F3.1 - Sicherung 24V
- 2K64 - Relais zur Spannungseinschaltung bei Optionen
- 9R2 - Sitzheizung
- 7S9 - Sitzschalter
- 9S3 - Schalter-Sitzheizung
- 7S82 - Schalter Gurtschloss
- U1 - Spannungswandler

					Datum	Name	Format	A3	Status	2	Mikrofilm			
					Bearb.	17.10.05	Kuba	Benennung SPE, Schaltplan Fahrsersitz MSG65 m.Hzg.						
					Gepr.	17.10.05	Schmid, M.							
					Norm	17.10.05	Wagner							
														
					Zeichnungsnummer							Stücklistennummer		Blatt
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														01 Bl
Zust	Änderung	Datum	Name	Urspr.:	Ers.f.:							Ers.d.:		

"Schutzvermerk nach DIN 34 beachten"



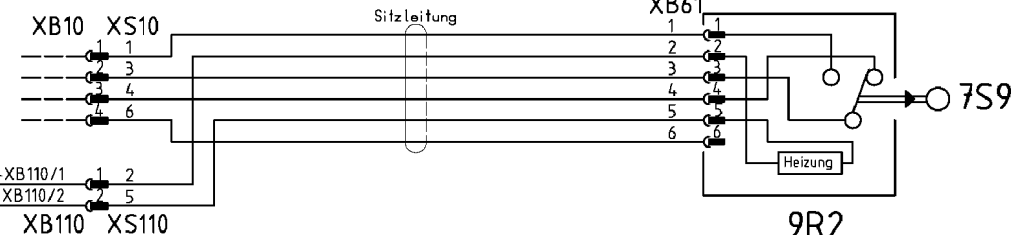
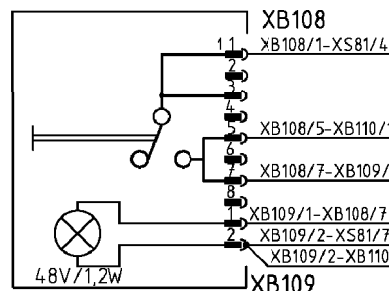
- F3.1 - Sicherung 24V
 4F1 - Steuersicherung Hupe
 5F2 - Steuersicherung DC/DC Wandler
 2K64 - Relais zur Spannungseinschaltung bei Optionen
 7S9 - Sitzschalter
 U1 - Spannungswandler

				Datum	Name	Format	A3	Status	2	Mikrofilm
				Bearb.	17.10.05	Kuba				
				Gepr.	17.10.05	Schmid, M.	Benennung			
				Norm	17.10.05	Wagner	SPE, Schaltplan Fahrsitz MSG20			
				Zeichnungsnummer		Stücklistennummer		Blatt		
				99501672				01		
				Ers.f.:		Ers.d.:		01 Bl.		
Zust.	Änderung	Datum	Name	Urspr.:						

Sitzheizung:

Spannung: 48V
Leistung: ca 70W

9S3



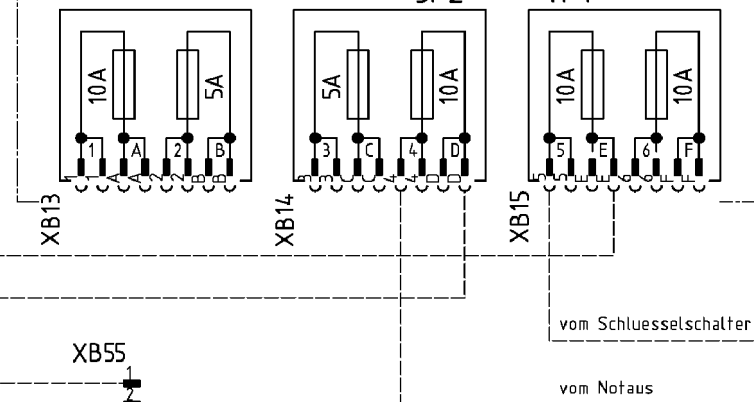
Stecker f. Spannungswandler

2K64

Sicherung im Grundgerät

5F2

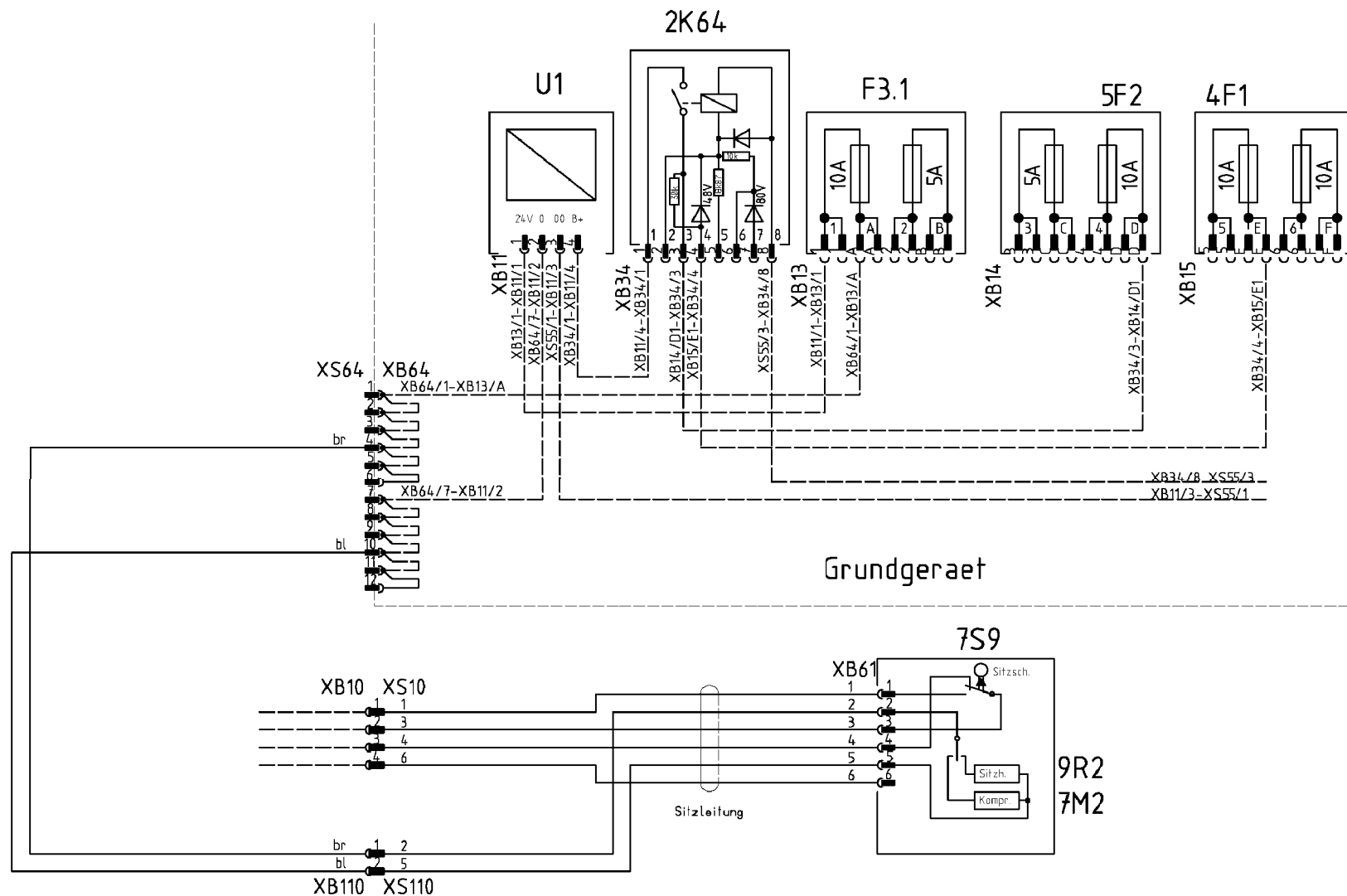
4F1



- 4F1 - Steuersicherung Hupe
- 5F2 - Steuersicherung DC/DC-Wandler
- 2K64 - Relais zur Spannungseinschaltung bei Optionen
- 9R2 - Sitzheizung
- 7S9 - Sitzschalter
- 9S3 - Schalter-Sitzheizung

	Datum	Name	Format	Status	Mikrofilm
Bearb.	17.10.05	Kuba	A3	2	
Gepr.	17.10.05	Schmid, M.	Benennung		
Norm	17.10.05	Wagner	SPE, Schaltplan		
			Fahrersitz MSG20 m.Hzg.		
			Zeichnungsnummer	Stücklistennummer	Blatt
			99501673		01
			Ers.f.:	Ers.d.:	01 Bl.

Spannung: 24V
Leistung: ca140W



- 4F1 - Steuersicherung Hupe
5F2 - Steuersicherung DC/DC Wandler
F3.1 - Sicherung 24V
2K64 - Relais zur Spannungseinschaltung bei Optionen
7M2 - Motor Sitzverstellung
9R2 - Sitzheizung
7S9 - Sitzschalter
U1 - Spannungswandler

					Datum	Name	Format	A3	Status	2		Mikrofilm			
					Bearb.	17.10.05	Kuba	Benennung SPE, Schaltplan Fahrsitz Savas							
					Gepr.	17.10.05	Schmid, M.								
					Norm	17.10.05	Wagner								
												Zeichnungsnummer		Stücklistennummer	Blatt
												99501674			01
															01 BL
Zust	Änderung	Datum	Name	Urspr.:	Ers.f.:			Ers.d.:			Blatt				
											01 BL				

"Schutzvermerk nach DIN 34 beachten"

(D)

(GB)

A	Baugruppen	Assemblies
A1	Sicherungskarte	Fuse board
A2	Rechner Antriebsraum	Computer, drive compartment
A3	Rechner Fahrzeugplatzträger	Computer, driver stand carrier
A4	Bedienpult	Control desk
A5	Bedienpult Lenkung 1	Control desk, steering 1
A6	Bedienpult Lenkung 2	Control desk, steering 2
A7	Bedienpult Fahren 1	Control desk, driving 1
A8	Bedienpult Fahren 2	Control desk, driving 2
A9	Anzeigeeinheit	Display unit
A10	Rechner Bedienpult	Computer control desk
A11	I/O Knoten	I/O node
A11.1	IO Knoten Personenschutzsystem	Personal safety system IO nodes
A11.2	IO Knoten Bodenanlage	Ground system IO nodes
A11.3	IO Knoten Ladegerät	IO Charger nodes
A11.4	IO Knoten Fahrerplatzträger	IO Operator position carriage nodes
A11.5	IO Knoten Lastaufnahmemittel	Load handler IO nodes
A12	Rechner Anbaugerät	Attachment computer
A13	Rechner JXP-Safe	Ordinateur JXP-Safe
A14	JXP Safe Dongle	JXP Safe Dongle
A15	JXP I/O Knoten PSA	JXP I/O node PSS
A16	Wegfahrsperre	Travel block
A17	Fahrzeugterminal	Truck terminal
7A1	Motortreiber Sitzverstellung	Seat adjustment motor driver
7A2	Motortreiber Bremskraftregler	Braking force regulator motor driver

(D)

(GB)

B	Umsetzer (elektr.-mech.)	Transmitter (elec.-mech.)
1B1	Initial Überw. MV red. Bremsung	Initial monitoring SV (solenoid valve): reduced braking
1B2	Initial Überw. MV red. Bremsung	Initial monitoring SV (solenoid valve): reduced braking
1B3	Gangerkennungssensor	Aisle recognition sensor
1B4	Gangerkennungssensor	Aisle recognition sensor
1B5	Inkrementalgeber Fahrmotor	Incremental transmitter, drive motor
1B6	Drehzahlsensor Fahrmotor	Speed sensor, drive motor
1B7	Temperatursensor Fahrmotor	Temperature sensor, drive motor
1B8	Sensorlager Fahrmotor	Sensor bearing, drive motor
1B9	Sensor UEW Bremsventil	Sensor, monitoring of brake valve
1B10	Sensor Drehzahl Lastrad links	Speed sensor, left load-bearing wheel
1B11	Sensor Drehzahl Lastrad rechts	Speed sensor, right load-bearing wheel
1B12	Fahrpedal	Accelerator pedal
1B13	Doppelpedal	Double pedal
1B14	Bremspedal	Brake pedal
1B15	Sensorlager-Fahrmotor-links	Drive motor LH sensor bearing
1B16	Temperatursensor-Fahrmotor-links	Drive motor LH gauge
1B17	Sensorlager-Fahrmotor- rechts	Drive motor RH sensor bearing
1B18	Temperatursensor-Fahrmotor-rechts	Drive motor RH gauge
1B19	Sensor Freigabe Bremspedal	Speed sensor-steer motor
1B20	Ansaug/Ladedruckgeber	Intake/charge pressure transmitter
1B21	Kraftstofftemperatur Sensor	Fuel temperature sensor
1B22	Regelschieberweggeber	control valve position sensor
1B23	Nadelhubgeber	Needle lift transmitter
1B24	Saugrohrtemperaturgeber	Intake pipe temperature gauge
1B25	Überwachungssensor-Batterietür	Battery door monitoring sensor
2B1	Proportional-Schalter / Drehen li/re	Proportional switch/Swivelling left/right

Ⓓ	Ⓔ	
2B2	Proportional-Schalter / Schieben li/re	Proportional switch/Traversing left/right
2B3	Drehzahlsensor Pumpenmotor	Speed sensor, pump motor
2B4	Temperatursensor Pumpenmotor	Temperature sensor, pump motor
2B5	Sensorlager Haupthub	Sensor bearing, main lift
2B6	Sensorlager Fahrerplatzträger	Sensor bearing, driver stand carrier
2B6.1	Sensorlager-Fahrerplatzträger	Operator position carriage sensor bearing
2B7	Sensorlager Zusatzhub	Sensor bearing, auxiliary lift
2B8	Referenz Haupthub	Reference, main lift
2B9	Referenz Fahrerplatzträger	Reference, driver stand carrier
2B10	Referenz Zusatzhub	Reference, auxiliary lift
2B11	Referenz Schieben	Reference, traversing
2B12	Sensorlager Pumpmotor	Sensor bearing, pump motor
2B13	Dämpfung Ende ZH	Cushioning, end, auxiliary lift
2B14	Dämpfung unten ZH	Cushioning, bottom, auxiliary lift
2B15	Endabschaltung ZH	Final cut-out, auxiliary lift
2B16	Lasterkennung links	Load detection, left
2B16.1	Init-Totmann	Init. deadman
2B17	Lasterkennung rechts	Load detection, right
2B18	Lasterkennung Gabelträger	Load detection, fork carrier
2B19	KOOI Gabel Grundstellung	KOOI fork home position
2B20	Sensorlager Heben Anbaugerät	Attachment lifting sensor bearing
2B21	Referenz Heben Anbaugerät	Attachment lifting reference
2B22	Dämpfung Drehen rechts	Damping, turning right
2B23	Dämpfung Drehen links	Damping, turning left
2B24	Dämpfung Drehen mitte rechts	Damping, turning center right
2B25	Dämpfung Drehen mitte links	Damping, turning center left
2B26	Kippgabel Grundstellung	Tilt Fork Home Position
2B27	Höhe Zusatzhub	Height Auxliary Lift

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2B28	Transportst. Schubrahmen li	Transport Position Thrust Frame Left	
2B29	Transportst. Schubrahmen re	Transport Position Thrust Frame right	
2B30	Stapel.Schubrahmen li	Stacking Position Thrust Frame Left	
2B31	Stapel.Schubrahmen re	Stacking Position Thrust Frame Right	
2B32	Sensor Freihub	Free lift sensor	
2B33	Sensor Masthub	Mast lift sensor	
2B34	Sensor Neigen	Tilt sensor	
2B35	Drucksensor	Pressure sensor	
2B36	Sensor Mastvorschub Dämpfung	Mast reach dampening sensor	
2B37	Sensor Schubende Mastseite	Mast side traversing end sensor	
2B38	Sensor Schubende Batterieseite	Battery side traversing end sensor	
2B39	Sensor Seitenschieber	Side shift sensor	
2B40	Palettenklammer zu	Pallet clamp closed	
2B41	Sensor Schubende	Reach limit sensor	
2B42	Teleskopgabel Transportstellung	Telescopic forks transport position	
2B42.1	Teleskopgabel Transportstellung	Telescopic forks transport position	
2B43	Höhensensor 1 FPT	Operator position carriage height sensor 1	
2B44	Höhensensor 2 FPT	Operator position carriage height sensor 2	
2B45	Höhensensor 3 FPT	Operator position carriage height sensor 3	
2B46	Höhensensor 1 HG	Mast height sensor 1	
2B47	Höhensensor 2 HG	Mast height sensor 2	
2B48	Höhensensor 3 HG	Mast height sensor 3	
3B1	Lenkhilfe Sensor	Steering booster sensor	
3B2	Tachogenerator für Drehrichtung-Erkennung	Tacho-generator for recognition of sense of rotation	
3B3	Stillstandskontrolle	Standstill monitor	
3B4	Sensorik Radstellung Fahrtrieb	Wheel position sensor - drive wheel	
3B5	Sensorik Radstellung Lastrad links	Wheel position sensor left load bearing wheel	
3B6	Sensorik Radstellung Lastrad rechts	Wheel position sensor right load bearing wheel	

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3B7	Lenkradsensorik	Sensors - steering wheel
3B8	Stillstandssensor linkes Lastrad	Standstill sensor - left load bearing wheel
3B9	Stillstandssensor rechtes Lastrad	Standstill sensor- right load bearing wheel
3B10	Radstellung Sensor für 2-Motor/Antrieb	Wheel position sensor for 2-motor/drive
3B11	Stillstandssensor I	Standstill sensor I
3B12	Stillstandssensor II	Standstill sensor II
3B13	Sensorlager 1	Sensor bearing 1
3B14	Sensorlager 2	Sensor bearing 2
3B15	Sensor-Rad - rechts einschlagen	Sensor, turn wheel to right
3B16	Sensor-Rad - links einschlagen	Sensor, turn wheel to left
3B17	Sensorlager Lenkmotor	Sensor bearing, steering motor
3B18	Lenkwinkelbegrenzung	Steering angle limiter
3B19	Referenz Lenken	Reference, steering
3B20	Sensorlager Lenkmotor Lastrad links	Left load wheel steering booster motor sensor bearing
3B21	Sensorlager Lenkmotor Lastrad rechts	Right load wheel steering booster motor sensor bearing
3B22	Sensor Lenkradstellung	Wheel position sensor
3B23	Drezahl Sensor Lenkmotor Antriebsrad	Speed Sensor Steering Motor Drive Wheel
3B24	Drehzahl Sensor Lenkmotor Lastrad links	Speed Sensor Steering Motor Load Wheel Left
3B25	Drehzahl Sensor Lenkmotor Lastrad rechts	Speed Sensor Steering Motor Load Wheel Right
3B26	Temperatursensor Lenkmotor	Steering motor temperature sensor
3B27	Drehzahlsnesor-Lenkmotor	Steer motor speed sensor
3B28	Temperatursensor Lenkmotor Lastrad li.	LH load wheel steer motor temperature sensor
3B29	Temperatursensor Lenkmotor Lastrad re.	RH load wheel steer motor temperature sensor
5B1	Dämmerungssensor	Daylight sensor
6B1	Wiegezelle	Weigh Bin
6B2	Wassertemperatursensor	Water temperature sensor
6B3	Temperatursensor-Kabine	Temperature gauge - cabin

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6B4	Tankfüllstandsanzeige	Tank level indicator
6B5	Gas-Sensor	Gas sensor
6B6	Gas-Elektronik	Gas electronics
6B7	Neigungswinkelsensor	Tilt angle sensor
6B8	Temperatursensor für Kaltstarteinrichtung	Cold start mechanism temperature gauge
7B1	Initiator Fallriegel rechts	Initiator, drop latch - right
7B2	Initiator Fallriegel links	Initiator, drop latch - left
7B3	Initiator Dachabschaltung	Initiator, roof cut-out
7B3.1	Initiator Dachabschaltung	Initiator, roof cut-out
7B3.2	Initiator Dachabschaltung	Initiator, roof cut-out
7B4	Initiator Gabel Frontstellung	Initiator, fork front position
7B4.1	Initiator Gabel Frontstellung	Initiator, fork front position
7B5	Initiator Ausleger mitte	Initiator, boom - center
7B5.1	Initiator Ausleger mitte	Initiator, boom - center
7B6	Ultraschallsensor	Ultrasonic sensor
7B6.1	Ultraschallsensor rechts	Ultrasonic sensor right
7B6.2	Ultraschallsensor mitte rechts	Ultrasonic sensor centre right
7B6.3	Ultraschallsensor mitte links	Ultrasonic sensor centre left
7B6.4	Ultraschallsensor links	Ultrasonic sensor left
7B7	Initiator Türe Arbeitsbühne	Initiator, working platform
7B8	Initiator Türe Arbeitsbühne aufgenommen	Initiator, door - working platform picked up
7B9	Kapazitiver Taster 1	Capacitive button 1
7B10	Kapazitiver Taster 2	Capacitive button 2
7B11	Initiator Fallriegel vorne links	Drop latch initiator, front left
7B12	Initiator Fallriegel vorne rechts	Drop latch initiator, front right
7B13	Initiator Batterieverriegelung	Battery interlock initiator
7B13.1	Initiator Batterieverriegelung	Battery interlock initiator
7B14	Endabschaltung Sitzverstellung	Seat adjustment limit switch

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7B15	Endabschaltung Sitzverstellung	Seat adjustment limit switch
7B16	Initiator Totmann	Init. Dead Man
7B17	Initiator Klammer	Init. Clamp
7B18	Sensor-UEW-Handbremse	Sensor UEW Hand Brake
7B19	Sensor Totmann	Dead man sensor
7B20	Sensor Fahrertüre rechts	RH driver's door sensor
7B21	Sensor Fahrertüre links	LH driver's door sensor
7B22	Sensor-Endstellung-Sensierung 180°	Sensor - 180° limit position sensing
7B23	Laserscanner PSA Lastachse	Laser scanner PSS load axle
7B24	Laserscanner PSA Antriebsachse	Laser scanner PSS drive axle
7B26	Gateway	Gateway
7B27	Stromabnehmer links eingefahren	LH current collector retracted
7B28	Stromabnehmer links ausgefahren	LH current collector extended
7B29	Stromabnehmer rechts eingefahren	RH current collector retracted
7B30	Stromabnehmer rechts ausgefahren	RH current collector extended
7B31	Achslastsensor	xle load sensor
7B32	Achslastsensor	xle load sensor
7B33	Schienenlochsensoren	Rail hole sensor
7B34	Kollisionssensoren	Impact sensor
7B35	Palettendetektion	Pallet detection
7B36	Körperschutzsensoren	Personal safety system sensor
7B37	Positionierungssensoren	Positioning sensor
7B38	Senkende	Lower limit
7B39	Drucksensor Not Stop	Emergency Stop pressure sensor
7B40	Drucksensor Lastradbremsen	Load wheel brake pressure sensor
7B41	Hubende, Sensor	Lift limit, sensor
7B85	Wasser in Öl Sensor	water in oil sensor

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7B34.1	Kollisionssensor	Impact sensor
7B34.2	Kollisionssensor	Impact sensor
7B34.3	Kollisionssensor	Impact sensor
7B35.1	Palettendetektion	Pallet detection
7B36.1	Körperschutzsensor	Personal safety system sensor
7B37.1	Positionierungssensor	Positioning sensor
8B1	Handbarcodeleser	Manual bar-code reader
8B2	Barcodeleser	Bar-code reader
8B3	Initiator links außen (405)	Initiator, left / outside (405)
8B4	Initiator links mitte (255)	Initiator, left / centre (255)
8B5	Initiator links innen (105)	Initiator, left / inside (105)
8B6	Initiator rechts innen (105)	Initiator, right / inside (105)
8B7	Initiator rechts mitte (255)	Initiator, right / centre (255)
8B8	Initiator rechts außen (405)	Initiator, right / outside (405)
8B9	Initiator links außen (330)	Initiator, left / outside (330)
8B10	Initiator links mitte (180)	Initiator, left / center (180)
8B11	Initiator rechts mitte (180)	Initiator, right / center (180)
8B12	Initiator rechts außen (330)	Initiator, right / outside (330)
8B13	RLS Platzzählung Einfahrt Antriebsrichtung	RLS space counting - entering in drive direction
8B14	RLS Platz erreicht Antriebsrichtung	RLS space reached - drive direction
8B15	RLS Platzzählung Einfahrt Lastrichtung	RLS space counting - entering in load direction
8B16	RLS Platz erreicht Lastrichtung	RLS space reached - load direction
8B17	RLS Reset	RLS Reset
8B18	Sensor red. Geschwindigkeit	Reduced speed sensor
9B1	Lautsprecher links	Loudspeaker, left
9B2	Lautsprecher rechts	Loudspeaker, right
9B3	Lambda Sonde	Lambda probe
9B4	Lautsprecher Innenraum	Internal loudspeaker

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9B5 Lautsprecher Aussenraum

External loudspeaker

9B6 Mikrofon

Microphone

C Kondensatoren**Capacitors**

C1 Kondensator zur Induktions-Löschung

Capacitor for induction cancelling

C2 Kondensator für Zeitverzögerung

Capacitor for time delay

C3 Kondensator für Schutzbeschaltung

Capacitor for protection circuit

C4 Puffer-Kondensator

Buffer capacitor

C5 Stützkondensator

Back-up capacitor

C5.1 Stützkondensator Antriebsrad

Back-up capacitor - drive wheel

C5.2 Stützkondensator Lastrad links

Back-up capacitor - left load bearing wheel

C5.3 Stützkondensator Lastrad rechts

Back-up capacitor - right load bearing wheel

C6 Entstörkondensator

Interference capacitor

3C1 Entstörkondensator

Interference capacitor

D

D1 Diode-Entkoppelung

Suppressor diode

D1.1 Diode-Entkoppelung

Suppressor diode

D1.2 Diode-Entkoppelung

Suppressor diode

D1.3 Diode-Entkoppelung

Suppressor diode

D3 Freilaufdiode

freewheel diode

D4 Diodenbaustein

Diode module

D4.1 Diodenbaustein

Diode module

E Verschiedenes**Miscellaneous**

3E1 Kombirückleuchte - links

Combined rear light - left

3E2 Kombirückleuchte - rechts

Combined rear light - right

3E3 Kombileuchte -links

Twin light - LH

D		GB
3E4	Kombileuchte - rechts	Twin light - RH
5E1	Arbeitsleuchte FSD links	Work lamp, left, overhead guard
5E2	Arbeitsleuchte FSD rechts	Work lamp, right, overhead guard
5E3	Abblendlicht links	Dipped beam, left
5E4	Abblendlicht rechts	Dipped beam, right
5E5	Standlicht links	Parking light, left
5E6	Standlicht rechts	Parking light, right
5E7	Rücklicht links	Tail lamp, left
5E7.1	luz trasera izquierda delantera	Front LH tail light
5E8	Rücklicht rechts	Tail lamp, right
5E8.1	Rücklicht-rechts-vorne	Front RH tail light
5E9	Blinklicht vorne links	Turn signal, front left
5E10	Blinklicht vorne rechts	Turn signal, front right
5E11	Blinklicht hinten links	Turn signal, rear left
5E12	Blinklicht hinten rechts	Turn signal, rear right
5E13	Kennzeichen-Licht	Number plate lamp
5E14	Arbeitsleuchte FSD hinten	Work lamp, rear, overhead guard
5E15	Bremsleuchte hinten links	Stoplight rear left
5E15.1	Bremsleuchte hinten mitte	Stoplight rear center
5E15.2	Bremsleuchte-vorne-links	Front LH brake light
5E16	Bremsleuchte hinten rechts	Stoplight rear right
5E16.2	Bremsleuchte-vorne-rechts	Front RH brake light
5E17	Rückfahrscheinwerfer links	Back-up light left
5E18	Rückfahrscheinwerfer rechts	Back-up light right
5E19	Arbeitsleuchte FSD links vorn	Working lamp, overhead guard - front left
5E20	Arbeitsleuchte FSD rechts vorn	Working lamp, overhead guard - front right
5E21	Arbeitsleuchte FSD links hinten	Working lamp, overhead guard - rear left
5E22	Arbeitsleuchte FSD rechts hinten	Working lamp, overhead guard - rear right

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5E23	Arbeitsleuchte-Mast-links	Working light-Mast-Left
5E23.1	Arbeitsleuchte-Mast-mitte-links	Work lights – mast centre Left
5E24	Arbeitsleuchte-Mast-rechts	Working light-Mast-Right
5E24.1	Arbeitsleuchte-Mast-mitte-rechts	Work lights – mast centre Right
5E25	Arbeitsleuchte Gabelrichtung	Work lights fork direction
5E26	Arbeitsleuchte Antriebsrichtung	Work lights drive direction
5E27	Leuchte Kommissionierrichtung li	Spotlight for order picking in leftwards direction
5E28	Leuchte Kommissionierrichtung re	Spotlight for order picking in rightwards direction
9E1	Heizfolie für Fahrschalter	Heating foil for controller
9E2	Sitzheizung	Seat heating
9E3	Heizung FPT	Heating FPT
9E4	Heizung FPT	Heating FPT
9E5	Radio	Radio
9E6	Heizung Hydrauliköl	Heating hydraulic oil
9E7	Monitor	Monitor
9E8	Kamera	Camera
9E8.1	Kamera	Camera
9E9	Kameraumschalter	Camera Toggle Switch
9E10	Zündkerze	Spark plug
9E11	Zündspule-Verteilereinheit	Ignition coil-distributor assembly
9E12	Rueckhaltesystem	Restraint system
9E13	Kamera-Anschlußbox	Camera connection box
9E14	Klimaanlage	Air conditioning system
9E15	Wechselsprechverstärker	ntercom amplifier
9E17	Dosierpumpe	Metering pump

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F	Sicherungen	Fuses
F1	Gesamtsteuersicherung	Master control fuse
F1.1	Sicherung	Fuse
F1.2	Steuersicherung 80 V	Control fuse 80 V
F2	Überstromauslöser	Over-current release
F2.1	Sicherung 80 V	Fuse 80 V
F3	Geräteschutzsicherung (FI-Schalter)	Fuse protection (FI switch)
F3.1	Sicherung 24 V	Fuse 24 V
F3.2	Sicherung-24V	24 volt fuse
F4	Steuersicherung Hauptschütz	Master contactor control fuse
F5	Steuersicherung - Minus Leitung	Control fuse - negative lead
F6	Sicherung Hydrauliköl-Heizung	Hydraulic oil heater fuse
F7	Steuersicherung - Abfrage Fahren	Control fuse - travel inquiry
F8	Hauptsicherung Plus Leitung (VDE 0666)	Main fuse, positive lead (VDE 0666)
F9	Hauptsicherung Minus Leitung (VDE 0666)	Main fuse, negative lead (VDE 0666)
F10	Sicherung Ladegerät	Battery charger fuse
F11	Sicherung Versorgung EW/BZ	Fuse supply EW/BZ
F12	Steuersicherung Schützständer	Control fuse contactor rack
F13	Steuersicherung Magnetventil / Magnetbremse	Control fuse solenoid valve / solenoid brake
F14	Sicherung Heizung	Fuse - heating
F14.1	Sicherung-Heizung-Lüfter	Heating fan fuse
F15	Sicherung Fahren/Heben	Fuse travel/lift
F16	Sicherung Notstop-Magnet	Fuse Emergency Stop-Magnet
F17	Sicherung Datenfunk-Gerät	Fuse Radio Data Transmission Device
F18	Steuersich.Schuetz-Spannungseinschaltung■	Power-on contactor control fuse■
F19	Sicherung-12V	Fuse, 12 V
F20	Sicherung - Klimaanlage	Fuse - air conditioning system

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F21	Sicherung Rel. Zündung	Ignition relay fuse
F25	Zusatzsicherung UL	UL auxiliary fuse
F25.1	Zusatzsicherung UL	UL auxiliary fuse
1F	Sicherung-Fahrmotore	Fuse - drive motors
1F1	Sicherung Fahrmotor 1	Fuse - drive motor 1
1F2	Sicherung Fahrmotor 2	Fuse - drive motor 2
1F3	Steuersicherung Impulssteuerung	Control fuse - impulse control system
1F4	Steuersicherung - Fahren	Control fuse - travel
1F5	Steuersicherung - Heizwiderstand Fahrschalter	Control fuse - controller heating resistor
1F6	Steuersicherung für Nebenschlußfeld	Control fuse for shunt field
1F7	Sicherung Druckschalter Federbein Antrieb	Fuse for spring leg switch drive
1F8	Steuersicherung Treiber Fahren	Control fuse - driver travel
1F9	Steuersicherung Elektronik Fahren / Heben	Control fuse - electronics travel / lifting
1F10	Sicherung Feld Fahren	Fuse - field travel
1F11	Sicherung Drehstromsteuerung FA	Fuse, 3-phase control system - drive system
1F12	Steuersicherung Fahrsteuerung	Drive controller control fuse
1F13	Steuersicherung MFC Fahren / Bremsen■	MFC driving/braking control fuse■
1F14	Steuersicherung MFC Fahren / Bremsen■	MFC driving/braking fuse■
2F1	Sicherung Pumpenmotor 1	Fuse - pump motor 1
2F2	Sicherung Pumpenmotor 2	Fuse - pump motor 2
2F3	Sicherung Pumpenmotor 3	Fuse - pump motor 3
2F4	Steuersicherung - P-Schütz	Control fuse - P contactor
2F5	Steuersicherung - HJC-Schwenkschub	Control fuse - HJC swivel/traverse
2F6	Steuersicherung - Anbaugerät ETX	Control fuse - ETX attachment
2F7	Sicherung Druckschalter - Überlastsicherung, dynamisch	Pressure switch fuse - dynamic overload protection
2F8	Sicherung Druckschalter - Überlastsicherung, statisch	Pressure switch fuse - static overload protection
2F9	Sicherung Abfrage 2K2	Fuse 2K2 inquiry
2F10	Steuersicherung Hubelektronik	Control fuse - lifting electronics

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2F11	Steuersicherung Proportionalsteuerung Heben	Control fuse - proportional control - lifting
2F12	Steuersicherung Treiber Heben	Control fuse - driver lifting
2F13	Sicherung Feld Heben	Fuse - field lifting
2F14	Sicherung Ventilsteuerung	Fuse - Valve controlled distribution
2F15	Sicherung Drehstromsteuerung HY	Fuse - 3-phase control system HY
2F16	Steuersicherung Hubsteuerung■	Lifting controller control fuse■
2F17	Steuersicherung MFC Hydraulik■	MFC hydraulics control fuse■
2F18	Sicherung MFC Hydraulik■	MFC hydraulics fuse■
2F19	Sicherung heben/senken	Lift/lower fuse
3F1	Sicherung Lenkhilfemotor	Fuse - steering booster motor
3F2	Steuersicherung Lenkhilfe	Control fuse - steering booster
3F3	Hauptstromsicherung Rollenbahn-Motor	Main current fuse for roller train motor
3F4	Steuersicherung Rollenbahn-Motor	Control fuse for roller train motor
3F5	Steuersicherung Notstop	Emergency stop control fuse
3F6	Sicherung Lenkmotor Antriebsrad	Fuse - drive wheel steering motor
3F7	Sicherung Lenkmotor Lastrad links	Fuse-steering motor left load bearing wheel
3F8	Sicherung Lenkmotor Lastrad rechts	Fuse-steering motor right load bearing wheel
3F9	Steuersicherung elektrische Lenkung	Control fuse electronic steering
3F10	Sicherung Drehstromsteuerung LK	Fuse - 3-phase control system LK
3F11	Steuersicherung Lenkung Antriebsrad	Drive wheel steering control fuse
3F12	Steuersicherung Lenkung Lasträder	Load wheel steering control fuse
3F13	Sicherung-Schwenkmotor	Traverse motor fuse
3F13	Lenkung linkes Lastrad	LH load wheel steering
3F14	Lenkung rechtes Lastrad	RH load wheel steering
4F1	Steuersicherung Hupe	Control fuse - hooter
4F2	Steuersicherung Summer	Control fuse - buzzer
4F3	Steuersicherung Div.	Control fuse - various
4F4	Steuersicherung Rundumkennleuchte	Control fuse - 360° warning light

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4F5	Steuersicherung Warnblinkanlage	Control fuse warning flashlight
4F5.1	Steuersicherung Blinker links	Left indicator control fuse
4F5.2	Steuersicherung Blinker rechts	Right indicator control fuse
4F6	Steuersicherung Bremslicht	Control fuse stoplight
4F7	Steuersicherung Anzeigebedieneinheit	Display operating unit control fuse
4F9	Steuersicherung-Elektronik	Control fuse - electronics
4F10	Sicherung Lüfter	Fuse Fan
4F11	Sicherung Bordcomputer	Fuse Onboard Computer
4F12	Steuersicherung MFC Zusatz■	MFC option control fuse■
4F13	Sicherung MFC Zusatz■	MFC option fuse■
4F14	Steuersich.-Blitzleuchte	Strobe control fuse
5F1	Steuersicherung Suchscheinwerfer 5A	Spot lamp control fuse 5A
5F1.1	Steuersicherung Suchscheinwerfer zus.1	Search light aux. 1 control fuse
5F1.2	Steuersicherung Suchscheinwerfer zus.2	Search light aux. 2 control fuse
5F2	Steuersicherung DC/DC-Wandler	Control fuse for DC/DC converter
5F3	Steuersicherung Rückfahrscheinwerfer	Reversing lamp control fuse
5F3.1	Sicherung-Rueckfahrscheinwerfer-lks	Left reverse light fuse
5F3.2	Sicherung-Rueckfahrscheinwerfer-rts	Reverse light fuse
5F4	Steuersicherung Rückleuchten	Control fuse, rear lights
5F4.1	Steuersicherung Rückleuchten	Control fuse, rear lights
5F4.2	Steuersicherung Rückleuchten vorne	Tail lights front control fuse
5F5	Steuersicherung Beleuchtung	Control fuse for lighting system
5F5.1	Sicherung-Beleuchtung-links	Fuse, illumination - left
5F5.2	Sicherung-Bremsrückfahrleuchte	Fuse, stop light/reversing lamp
5F5.3	Sicherung-Beleuchtung-rts	Fuse, lighting right
5F6	Sicherung Kabine	Cabin fuse
5F7	Sicherung Optionen Fahrerschutzdach■	Overhead guard options fuse■
5F8	Fahrplatzbeleuchtung	Operator position lighting

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5F9	Sicherung Abblendlicht	Dipped lights fuse
5F10	Sicherung StVZO Beleuchtung	Road traffic regulations fuse
5F11	Sicherung-ASW-vorne-lks	Work lights fuse – front left
5F11.1	Sicherung-ASW-vorne-rts	Work lights fuse – front right
5F11.2	Sicherung-ASW-hinten-lks	Work lights fuse – rear left
5F11.3	Sicherung-ASW-hinten-rts	Work lights fuse – rear right
5F12	Sicherung Ladekabel	Charger lead fuse
5F13	Sicherung-Warnleuchten-Beleuchtung	Indicator lighting fuse
6F1	Steuersicherung Entladeanzeiger	Control fuse - discharge indicator
6F2	Steuersicherung - Betriebsstundenzähler	Control fuse - operating hour counter
6F3	Steuersicherung Entladeanzeiger in der Minus-Leitung	Control fuse for discharge indicator in negative line
6F4	Steuersicherung Kohlebürsten-Verschleißanzeige	Control fuse for carbon brush wear indicator
6F5	Steuersicherung-12V	Control fuse-12V
6F6	Steuersicherung Datarecorder	Data recorder control fuse
6F9	Sicherung Kamara	Camera fuse
7F1	Sicherung Magnetbremse	Fuse Solenoid Brake
7F2	Sicherung-Spannungswandler-Ladegerät	Fuse-Voltage Transformer-Battery Charger
7F3	Steuersicherung DC/DC-Wandler	Control fuse, DC/DC converter
7F4	Steuersicherung DC/DC-Wandler	Control fuse, DC/DC converter
7F5	Sicherung-Bremsanlage	Fuse, brake system
7F6	Sicherung Zubehörträger	Accessory carriage fuse
7F7	Sicherung-Schwenkmotor	Traverse motor fuse
7F8	Sicherung-Scanne	Scanner fuse
8F1	Sicherung Höhengvorwahl	Fuse - height selection system
8F2	Sicherung Gangerkennung	Fuse - aisle recognition system
8F3	Sicherung IF-Keltronik	IF-Keltronic fuse
9F1	Steuersicherung Scheibenwischer	Windscreen wiper control fuse
9F1.1	Steuersicherung Scheibenwascher	Windscreen wiper control fuse

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9F2	Steuersicherung Sitzheizung	Control fuse for seat heating
9F3	Steuersicherung Lüfter	Control fuse fan
9F4	Heizung FPT	Heating FPT
9F5	Sicherung Scheibenheizung	Windshield heater fuse
9F6	Sicherung Hydrauliköl-Heizung	Hydraulic oil heater fuse
9F7	Sicherung-Optionen-Zündung-ein	Fuse-Options-Ignition-ON
9F8	Sicherung-Optionen-Motor-ein	Fuse-Options-Engine-ON
9F9	Sicherung-Heizung-Anzeige	Heating fuse display
9F10	Sicherung-Rueckhaltesystem	Safety restraint system
9F11	Sicherung Vorgluehen	Pre-heat fuse
9F12	Sicherung Katalysator	Catalyzer fuse
9F13	Steuersicherung Katalysator	Catalyzer control fuse
9F14	Steuersicherung Scheibenwischer hinten	Rear windscreen wiper control fuse
9F15	Steuersicherung Scheibenwischer Dach	Roof windscreen wiper control fuse
9F16	Sicherung Zuendschloss	Ignition lock fuse
9F17	Sicherung Optionen	Options fuse
9F18	Sicherung Vorsicherung Vorglühen	Pre-heat fuse
9F19	Sicherung Generator	Generator fuse
9F20	Sicherung Klimaanlage	Air conditioning system fuse
9F22	Sicherung elektromechanische Komponenten	Operating functions release solenoid
9F23	Sicherung - Umschatent.	Fuse – changeover valve
9F24	Sicherung-Radio	Radio fuse
9F25	Sicherung - Luftmassenmesser	Air mass recorder fuse
9F26	Sicherung - Steckdose 12V	12 volt socket fuse
9F27	Sicherung – Klemme 30 nach HR	Fuse – terminal 30 after HR
9F28	Sicherung – LPG-Control Valve Gluehzeit TDI	Fuse– LPG TDI glow time control valve
9F29	Sicherung – EPW TDI	Fuse – EPW TDI
9F30	Sicherung – Diagnose DFG	Fuse - DFG diagnostics

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9F31	Sicherung - Ladekontrolleuchte	Fuse – charger indicator
9F32	Sicherung Kraftstoffpumpe	Fuel pump fuse
9F33	Sicherung-Scheibenwaschpumpe	Windscreen washer pump
9F34	Sicherung Magnetkupplung	Magnetic coupling fuse

G Stromversorgung

Electr. power supply

G1	Batterie	Battery
G2	Ladegerät	Battery charger
G3	Stromversorgung Standby	Standby power supply
G4	Generator	Generator
7G1	Stromabnehmer-links	Collector -left
7G2	Stromabnehmer-rechts	Collector - right

H Meldeeinrichtung

Signalling system

H1	Betriebsbereitschaft	Ready for operation
H2	Sensorkontrolle	Sensor check
1H1	Motorschutz-Kontrolleuchte	Motor protection control lamp
1H2	Fahrbereitschaft Bremse	Brake Operational
1H3	Fahren - vorwärts	Travelling - forward
1H4	Fahren - rückwärts	Reversing
1H5	Langsamfahrt Ein	Slow travel On
1H5.1	Langsamfahrt Ein	Slow travel On
1H6	Blinkleuchte für Fahren	Flashing light for travelling
1H7	Blinkleuchte über 2,5 m Hubhöhe (KmS)	Flashing light for lifting heights above 2.5 m (KmS)
1H8	Blinkleuchte (FSD)	Flashing light (overhead guard)
1H9	Kontroll-Leuchte Fahrtrichtung Anzeige	Control lamp direction indicator
2H1	Heben	Lifting
2H2	Heben im Schnellgang	Rapid lifting

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2H3	Heben im Schleichgang	Lifting at inching speed
2H4	Senken	Lowering
2H5	Senken im Schleichgang	Lowering at inching speed
2H6	Neigen vorwärts	Tilting out
2H7	Neigen rückwärts	Tilting in
2H8	Neigen Mittelstellung	Neutral position - Tilting
2H9	Drehen links	Swivelling left
2H10	Drehen rechts	Swivelling right
2H11	Drehen Mittelstellung	Neutral position - Swivelling
2H12	Drehen Schleichgang	Swivelling at inching speed
2H13	Mittelstellung Lastaufnahme (SR oder CS)	Central position - load lifting device (SR or CS)
2H14	Schieben links	Traversing left
2H15	Schieben rechts	Traversing right
2H16	Schieben Mittelstellung	Traversing to center position
2H16.1	Schieben Mittelstellung	Traversing to center position
2H17	Schieben Schleichgang	Traversing at inching speed
2H18	Anzeigenleuchte 2. Einstapeltiefe	Control lamp - stacking in second row
2H19	Gabelverstellgerät Ein	Fork adjusting device On
2H20	Anzeigenleuchte für Gabelverstellung	Control lamp - fork adjustment
2H21	Klammer schließen	Close clamp
2H22	Klammer öffnen	Open clamp
2H23	Filterkontrolle	Filter check
2H24	Hubbegrenzung	Lifting limitation
2H25	Kontrolleuchte für 1 ZH	Control lamp for 1 ZH
2H26	Schieben vor	Traversing out
2H27	Schieben zurück	Traversing in
2H28	TG in Frontaufnahmestellung	Fork in frontal position
2H29	TG in Transportstellung	Fork in transport position

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2H30	Transportstellung links	Transport position left
2H31	Transportstellung rechts	Transport position right
2H32	Stapelstellung links	Stacking position left
2H33	Stapelstellung rechts	Stacking position right
2H34	Anzeige Last angehoben	Operating unit load lifted
4H1	Hupe	Hooter
4H2	Summer	Buzzer
4H3	Rundumkennleuchte	360° warning lamp
4H3.1	Blitzleuchte	Flash lamp
4H4	Punktleuchte	Spot lamp
4H5	Blinkleuchte vorn rechts	Turn signal, front right
4H6	Blinkleuchte hinten rechts	Turn signal, rear right
4H7	Blinkleuchte vorn links	Turn signal, front left
4H8	Blinkleuchte hinten links	Turn signal, rear left
4H9	Kontroll-Lampe für Warnleuchte	Control lamp for warning blinker
4H10	Warnleuchte Kohlebürsten	Carbon brushes warning lamp
4H11	Läutewerk	Bell
4H12	Blinkleuchte Heck	Indicating light, rear
4H13	Blinkleuchte vorn	Indicating light, front
4H14	Warnsummer Handbremse	Handbrake buzzer
4H15	Ladezustand Batterie voll	Battery full charge status
4H15.1	Ladezustand Batterie voll	Battery full charge status
5H6	Kontrolleuchte Scheinwerfer Ein	Control lamp - Headlight ON
5H8	Rückfahrscheinwerfer	Reversing lamp
5H9	Parkleuchte	Parking light
5H10	Arbeitsscheinwerfer	Spotlight
5H11	Leselampe	Reading lamp
5H12	Fahrkorbbeleuchtung	Cage lighting

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5H13	Suchscheinwerfer	Spot lamp
5H14	Kontrolleuchte Warnblinkanlage	Control lamp Warning flashlight
5H15	Lampe - Gabel - Neigen	Lamp - Fork - Tilting
5H16	Lampe - Seitenschub	Lamp - Lateral traversing
5H17	Fahrerplatzbeleuchtung	Driver stand illumination
5H17.1	Fahrerplatzbeleuchtung	Driver stand illumination
6H1	Radstand links	Wheel position, left
6H2	Radstand rechts	Wheel position, right
6H3	Radstand Mitte	Wheel position, centre
6H4	Radstellungsanzeige Lastrad links	Wheel position indicator, load bearing wheel, left
6H5	Radstellungsanzeige Lastrad rechts	Wheel position indicator, load bearing wheel, right
6H6	Radstellungsanzeige Antriebsrad	Wheel position indicator, drive wheel
6H7	Fahrtrichtungsanzeige Querfahrt rechts	Direction indicator - Transverse movement, right
6H8	Fahrtrichtungsanzeige Querfahrt links	Direction indicator - Transverse movement, left
6H9	Entlademeldung Aus	Discharge message OFF
6H10	Ladegerätstörung	Battery charger fault
6H13	Ladegerät Ladebetrieb	Charger Charging Mode
7H1	Abschaltung der Kaltleiter (VDE 0666)	Ballast tubes disconnected (VDE 0666)
7H2	Kontrolleuchte Handbremse	Control lamp - handbrake
7H3	Batteriewagen entriegelt	Battery trolley - unlocked
7H4	Störung der Notstopbremse	Emergency brake malfunction
7H5	Störung in der E-Anlage (SPS)	Electrical fault
7H6	Stromabnehmer-links-aktiv	Collector - left - active
7H7	Stromabnehmer-rechts-aktiv	Collector - right - active
7H8	Wareneinrichtung Netzausfall	Warning Device Mains Failure
8H1	Alarmgeber in IF	Alarm - inductive guidance
8H2	Lampe Draht IF	On wire lamp - inductive guidance
8H3	Kontrolleuchte Gangendsicherung	Control lamp - end-of-aisle protection system

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8H4	Höhenvorwahl Ein	Height selection system On
8H5	Stapelautomatik Ein	Automatic stacking system On
8H6	Höhenvorwahl 30 Positionen	Height selection system - 30 positions
8H7	IF-Automatik Ein	Inductive guidance automatics On
8H8	Kontrolleuchte Fahrzustand IF	Control lamp-travelling state industrial guidance
8H9	Kontrolleuchte Automatiklenkung	Control lamp - automatic steering
8H10	Notstop	Emergency stop
8H11	Suchen	Searching
8H12	Lenkung gestört	Steering fault
8H13	Lastkorrektur	Load correction
8H14	Synchronisation Ein	Synchronization On
8H15	Lenkung verriegelt	Steering interlocked
8H16	Lampe für Empf. Sicherheitsbereich	Lamp for safety area receiver
8H17	Lenken nach rechts	Steering to the right
8H18	Lenken nach links	Steering to the left
8H19	Kontroll-Leuchte red. Geschwindigkeit	Reduced speed indicator
9H1	Kontrolleuchte Sitzbeheizung	Control lamp - seat heating
9H2	Kontrolleuchte Kühlkörper Fahrsteuerung	Control lamp - Drive control cooling body
9H3	Kontrolleuchte Skanner	Control lamp - Scanner
9H4	Kontrolleuchte Display-Verriegelung	Control lamp - Display interlock
9H5	Richtleuchte	Guide light
K	Relais + Schütze	Relays + contactors
K1	Hauptschütz 1	Master contactor 1
K2	Batterie-Serien-Parallelschütz	Battery - Serial/parallel contactor
K3	Relais Ladegerät Ein	Relay for battery charger On
K4	Relais Ladegerät Verzögerte Störmeldung	Relay - battery charger delay fault
K5	Hauptschütz 2	Master contactor 2

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K6	Schütz zur Spannungseinschaltung	Contactor power on
K7	Einschalterschütz	Power-on contactor
K90	Drehstrom Ein / Aus	Three-phase current On / Off
1K1	Fahrschütz vorwärts	Drive contactor forward
1K1.1	Fahrschütz vorwärts	Drive contactor forward
1K2	Fahrschütz rückwärts	Drive contactor backward
1K2.1	Fahrschütz rückwärts	Drive contactor backward
1K3	Sicherheitsschütz für Impuls	Safety contactor for impulse
1K3.1	Sicherheitsschuetz-f.Impuls	Safety contactor for impulse
1K4	Kurzschlußschütz für Impuls	Short-circuit contactor for impulse
1K5	Hilfsrelais für Nebenschlußfeld	Auxiliary relay for shunt-wound field
1K5.1	Schütz für Nebenschlußfeld	Contactor for shunt-wound field
1K6	Fahrstufenschütz	Travel stepping contactor
1K7	Fahrstufenschütz	Travel stepping contactor
1K8	Fahrstufenschütz	Travel stepping contactor
1K9	Fahrstufenschütz	Travel stepping contactor
1K10	Hilfsrelais - Fahren	Auxiliary relay - travelling
1K11	Hilfsrelais - Fahren	Auxiliary relay - travelling
1K12	Schleichgang - Fahren	Travelling - inching speed
1K13	Fahrrelais vorwärts	Travel relay forward
1K14	Fahrrelais rückwärts	Travel relay reverse
1K15	Umschaltsperre	Change-over lock
1K16	Hilfsrelais für Verschiebe-Betrieb	Auxiliary relay - Shifting operation
1K17	Hilfsrelais für Mitgeherbetrieb	Auxiliary relay - Pedestrian guided operation
1K18	Verriegelungsrelais - Fahren	Interlocking relay - travelling
1K18.1	Verriegelungsrelais - Fahren	Interlocking relay - travelling
1K19	Hilfsrelais Mitfahrbetrieb	Auxiliary relay - rider operation
1K20	Hilfsrelais - K-Schützverzögerung	Auxiliary relay - K-contactor delay

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1K21	Hilfsrelais - Totmannschalter	Auxiliary relay - dead man switch
1K22	Halte-Relais (Fahren)	Holder relay - Travelling
1K23	Relais Freigabe Fahren bei Transportstellung	Relay releasing Travelling function at transport position
1K24	Fahrabschaltung oberhalb 600 mm bei aufgenommener Arbeitsbühne	Travelling cut-out with working platform raised above 600 mm
1K25	Abschaltung Fahren im Sicherheitsbereich	Travelling cut-out when moving in safety range
1K26	Hilfsrelais Auffahrsicherheit	Anti-collision auxiliary relay
1K27	Verriegelung Fahren rückwärts	Interlocking - Reversing
1K28	Bremsschütz	Brake contactor
1K29	Hilfsrelais Pumpenschütz	Auxiliary relay of pump contactor
1K30	Hilfsrelais Proportionalventil	Auxiliary relay of proportional valve
1K31	Schütz Magnetventil Not-Stop	Contactor, solenoid valve (emergency stop)
1K32	Fahr-Brems-Schütz	Driving/braking contactor
1K33	Relais Neutralstellung Fahren	Neutral relay
1K34	Relais-Fahrtrichtungsabschaltung	Relay-Drive direction cut-out
1K35	Fahrtfreigaberelais	Travel release relay
2K1	Pumpenschütz	Pump contactor
2K2	Pumpenschütz	Pump contactor
2K3	Relais für Heben, langsam	Relay - slow lifting
2K4	Relais für Heben, schnell	Relay - rapid lifting
2K5	Verriegelungsrelais - Heben	Interlocking relay - lifting
2K6	Relais für Hubendabschaltung	Relay for lifting limit cut-out
2K7	Relais Überlastverriegelung	Relay - overload interlocking
2K8	Verzögerungsrelais für Pumpe	Delay relay for pump
2K9	Hilfsrelais für Pumpenschütz (bei HV 09 - 24 V)	Additional relay for pump contactor (at HV 09 - 24 V)
2K10	Hilfsrelais - Heben	Auxiliary relay - lifting
2K11	Verriegelungsrelais	Interlocking relay
2K12	Relais für Senken	Relay - lowering
2K13	Relais für Senken, langsam	Relay - slow lowering

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2K14	Relais für Senken, schnell	Relay - rapid lowering
2K15	Pumpenschütz 3	Pump contactor 3
2K16	Verriegelungsrelais für Senken	Interlocking relay for lowering
2K17	Relais für Drehen links	Relay - swivelling left
2K18	Relais für Drehen rechts	Relay - swivelling right
2K19	Relais für Drehen Mittelstellung	Relay - swivelling to central position
2K20	Relais für Drehen im Schleichgang	Relay - swivelling at inching speed
2K21	Relais für Endstellung drehen links	Relay - end position swivelling left
2K22	Relais für Endstellung drehen rechts	Relay - end position swivelling right
2K23	Relais für Endstellung Mitte (Drehen)	Relay - central end position (swivelling)
2K24	Entriegelung - Drehen	Unlocking - swivelling
2K25	Verriegelung - Drehen	Interlocking - swivelling
2K26	Transportstellung Umschaltung links	Transport position change-over left
2K27	Transportstellung Umschaltung rechts	Transport position change-over right
2K28	Umschaltrelais - Drehen	Change-over relay - swivelling
2K29	Relais - Schieben, links	Relay - traverse, left
2K30	Relais - Schieben, rechts	Relay - traverse, right
2K31	Relais - Schieben, Mittelstellung	Relay - traversing central position
2K32	Relais - Schieben, Schleichgang	Relay - traversing at inching speed
2K33	Relais - Endstellung, links (Schieben)	Relay - end position, left (traversing)
2K33.1	Relais - Endstellung, links (Schieben)	Relay - end position, left (traversing)
2K33.2	Relais - Endstellung, links (Schieben)	Relay - end position, left (traversing)
2K34	Relais - Endstellung, rechts (Schieben)	Relay - end position, right (traversing)
2K34.1	Relais - Endstellung, rechts (Schieben)	Relay - end position, right (traversing)
2K34.2	Relais - Endstellung, rechts (Schieben)	Relay - end position, right (traversing)
2K35	Relais - Endstellung, Mitte (Schieben)	Relay - central end position (traversing)
2K35.1	Relais - Endstellung, Mitte (Schieben)	Relay - central end position (traversing)
2K36	Entriegelung Schieben	Unlocking - traversing

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2K37	Verriegelung Schieben	Interlocking - traversing
2K38	Transportstellung	Transport position
2K39	Relais 2. Einstapeltiefe	Relay - second stacking row
2K39.1	Schütz 2. Einstapeltiefe	Contactor - second stacking row
2K39.2	Relais 2. Einstapeltiefe (palettenabhängig)	Relay - second stacking row (depending on pallets)
2K39.3	Relais 2. Einstapeltiefe (palettenabhängig)	Relay - second stacking row (depending on pallets)
2K39.4	Relais 2. Einstapeltiefe (palettenabhängig)	Relay - second stacking row (depending on pallets)
2K40	Relais Gabelverstellung TG	Relay - fork adjustment TG
2K41	Relais für Zusatzhub - Heben	Relay - auxiliary lift
2K42	Relais Hubhöhenverriegelung 500-70 mm	Relay - 500-70mm lifting height interl.
2K43	Hubhöhenrelais 100 + 310 mm	Relay - lifting height 100 + 310 mm
2K44	Heben Freigabe - Normallast	Lifting release - normal load
2K45	Hilfsrelais Schieben	Auxiliary relay - traversing
2K46	Relais - Schleichgangabschaltung im Regal	Relay - inching speed switch-off in rack
2K47	Relais Zinkenverstellung	Relay - tine adjustment
2K48	Höhenabhängiges Schieben im Schleichgang	Height-dependent traversing at inching speed
2K49	Hilfsrelais Senken bei DZ-Mast	Auxiliary relay - lowering with DZ-mast
2K50	Verriegelung - Anbaugerät	Interlocking - attachment
2K51	Zeitrelais Verriegelung Anbaugerät	Time relay - attachment interlocking
2K52	Hilfsrelais Heben	Auxiliary relay - lifting
2K54	Abschaltung - Drehen Schleichgang (z. B. Zinkenverstellgerät)	Cut-out - swivelling at inching speed (e.g. tyne adjusting device)
2K55	Verriegelung Zusatzhub	Interlocking - auxiliary lift
2K56	Startschalter Zusatzhub	Starting switch - auxiliary lift
2K57	Verriegelung Haupthub	Interlocking - main lift
2K58	Verriegelung Haupthub	Interlocking - main lift
2K59	Relais Gabelvorschub	Relay - fork traversing
2K60	Relais Schubrichtung - Umschaltung drehbare Telegabel	Relay - change-over of traversing direction of swivel tel. fork
2K61	Relais TG in Frontstellung	Relay - fork in front position

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2K62	Relais TG Drehen	Relay - fork swivelling
2K63	Relais Option	Relay, option
2K64	Relais zur Spannungseinschaltung bei Optionen	Relay for switching on the voltage supply for options
2K65	Schütz 3. Teleskopgabel	Contacteur, 3rd telescopic fork
2K66	Schütz zur Spannungseinschaltung	Contacteur power on
3K1	Lenkhilfeschütz	Steering booster contactor
3K2	Lenkhilfe Einschaltautomatik	Automatic starter for steering booster
3K3	Schütz Rollenantrieb auflaufen	Contacteur - roller drive, run up
3K4	Schütz Rollenantrieb ablaufen	Contacteur - roller drive, run off
3K5	Halterelais Rollenbahn Mitte auflaufen	Holder relay - center roller train, run up
3K6	Halterelais Rollenbahn Mitte ablaufen	Holder relay - center roller train, run off
3K7	Stop-Relais	Stop relay
3K8	Sperr-Relais	Blocking relay
3K9	Lenkung Antriebsrad	Drive wheel steering
3K10	Relais Lenkung linkes Lastrad	Relay - left load-bearing wheel steering
3K11	Relais Lenkung rechtes Lastrad	Relay - right load-bearing wheel steering
3K12	Schuetz-Schwenkmotor	Traverse motor contactor
4K1	Relais Rundumkennleuchte	Relay - 360° warning lamp
4K2	Blinkrelais	Blinker relay
4K2.2	Warnblinkrelais-bei-Rueckwaertsfahrt	Warning Flasher For Reverse Travel
4K3	Relais für Klingel	Bell relay
4K4	Hilfsrelais für Kohlebürstenverschleißabschaltung	Aux. relay - cut-out in case of excessive carbon brush wear
4K5	Verzögerungsrelais Kohlebürstenverschleißabschaltung	Delay relay - cut-out in case of excessive carbon brush wear
4K6	Umschaltung Abstandssensoren	Change-over of distance sensors
4K7	Relais Hupe	Relay hooter
5K1	Relais Verriegelung Arbeitsscheinwerfer	Relay locking mechanism working headlight
5K2	Relais Arbeitsscheinwerfer	Head light relay
5K3	Relais Arbeitsscheinwerfer	Light on relay

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5K4	Relais-Dämmerungsschalter	Daylight sensor relay
5K5	Relais-Rueckfahrscheinwerfer	Relay-reversing lights
5K6	Relais Abblendlicht	Dipped lights relay
6K1	Relais Unterspannung - Überwachung	Relay - undervoltage monitoring
6K2	Hilfsrelais - Entladeanzeige	Auxiliary relay - discharge indicator
6K3	Hilfsrelais Kundendienstleuchte	Auxiliary relay - after sales service lamp
7K1	Relais Pendelschalter	Relay - pendulum switch
7K2	Relais für Abschaltung Kaltleiter VDE 0666	Relay - ballast tube cut-out VDE 0666
7K3	Relais Fahrzeug im Gang	Relay - vehicle in aisle
7K4	Zusatzrelais Sicherheitsschaltung	Auxiliary relay - safety circuit
7K5	Überbrückungsrelais	By-pass relay
7K6	Relais - Reflex-Taster	Relay - reflex key
7K6.1	Relais - Reflex-Taster	Relay - reflex key
7K7	Schütz für Stromabnehmersteuerung	Contactor - current collector control
7K8	Schütz für Stromabnehmersteuerung	Contactor - current collector control
7K9	Schütz für Stromabnehmersteuerung	Contactor - current collector control
7K10	Schütz für Stromabnehmersteuerung	Contactor - current collector control
7K11	Fahrstandverriegelung	Control platform interlocking
7K12	Relais für Totmannschalter	Relay - deadman switch
7K13	Relais für Druckschalter	Relay - pushbutton switch
7K14	Relais für Antriebsrad 90°/rechts	Relay - drive wheel 90° right
7K15	Relais für Antriebsrad 90°/links	Relay - drive wheel 90° left
7K16	Relais für Lastrad 0°/Geradeausfahrt	Relay - load-bearing wheel 0° / straight on
7K17	Relais Notstop der Steuerung	Relay - emergency stop of control system
7K18	Relais Einfahren - Ausfahren	Relay - entering-exit
7K19	Hilfsrelais für Totmannschalter	Auxiliary relay - deadman switch
7K20	Relais Synchr. Vorfeld	Relay - synchronization on apron
7K21	Hilfsschütz für Magnetbremse	Auxiliary contactor for magnetic brake

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7K22	Zugmagnetschütz Bremse	Pull-type electromagnet contactor brake
7K23	Versorgungsrelais für StVZO	Supply relay for StVZO
7K24	Schütz-Feldschwächung	Contactor, field weakening
7K25	Relais-Stromabnehmer	Relay, collector
7K26	Hilfschütz / Spannungswandler	Auxiliary contactor / voltage transformer
7K27	Relais Bremslicht	Brake light relay
7K28	Hilfsrelais-Handbremsueberwachung	Auxiliary Relais Hand Brake Monitor
7K28	Entlastungsrelais	Discharge relay
7K29	Energierückgewinnung aktiv	Energy Reclamation Active
7K30	Modul Gurtschlossueberwachung	Belt lock monitoring module
7K31	Zeitrelais einstellbar	Adjustable time relay
7K32	Schuetz-Schwenkmotor	Traverse motor contactor
7K33	Relais-Sitzschalter	Relay – seat switch
8K1	Relais Höhenvorwahl - Heben	Height selection relay - lifting
8K2	Relais Einstapelautomatik	Relay - automatic stacking system
8K3	Relais Umschaltung Istwertgeber Höhenvorwahl	Change-over relay-actual value transmitter for height selection system
8K4	Relais Positioniersteuerung	Relay - rack approach control
8K5	Relais IF - EIN	Relay - inductive guidance ON
8K6	Relais Umschaltgruppe 30 Pos.	Relay - change-over assy. 30 pos.
8K7	Relais Umschaltgruppe 30 Pos.	Relay - change-over assy. 30 pos.
8K8	Umschaltrelais Handautomatik	Change-over relay - manual/automatic
8K9	Heben - Senken - Stop	Lifting - lowering - stop
8K10	Relais Heben - Senken	Relay - lifting - lowering
8K11	Hilfsrelais Abfragemagnet Last	Auxiliary relay - load inquiry magnet
8K11.1	Relais Lastsensor	Relay load sensor
8K12	Umschaltrelais Halteposition Senken - Heben	Change-over relay - stop position lowering - lifting
8K13	Relais Umgehungsventil Einstapelautomatik	Relay - by-pass valve for automatic stacking system
8K14	Relais Umschaltventil Einstapelautomatik	Relay - change-over valve for automatic stacking system

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8K15	Verzögerungsrelais Lenkarretierung IF	Delay relay - inductive guidance steering lock
8K16	Hilfsrelais Lenkarretierung IF	Auxiliary relay - industrial guidance steering lock
8K17	Hilfsrelais Heben	Auxiliary relay - lifting
8K18	Hilfsrelais Senken	Auxiliary relay - lowering
8K19	Relais Gangerkennung AUS	Relay - aisle recognition OFF
8K20	Relais Gangerkennung EIN	Relay - aisle recognition ON
8K21	Relais Aufsetzdämpfung	Relay - impact damping
8K22	Relais Gangendsicherung	Relay - end of aisle protection system
8K29	Relais IF-Notbetrieb	Relay - industrial guidance emergency operation
8K30	Relais Schleichgang IF	Relay - inching speed under industrial guidance
8K31	Relais Notstop IF	Relay - emergency stop under industrial guidance
8K32	Relais Sicherheitsschaltung	Relay - safety circuit
8K33	Relais Ventil-Umschaltung	Relay - valve change-over
8K34	Hilfsschütz	Auxiliary contactor
8K35	Speicher - Relais	Relay - storage
8K36	Umschaltrelais Manuell-Automatik	Change-over relay - manual/automatic
8K37	Hilfsrelais	Auxiliary relay
8K38	Hilfsschütz für Magnetbremse	Auxiliary contactor for magnetic brake
8K39	Überbrückung für Notstop	Bridging for emergency stop
8K40	Hilfsrelais Draht	Auxiliary relay - wire
8K41	Überwachungsrelais Notstop	Monitoring relay - emergency stop
8K42	Überwachungsrelais Notstop	Monitoring relay - emergency stop
8K43	Überbrückung bei Automatik	Bridging in automatic mode
8K44	Höhenvorwahl EIN	Height preselection ON
8K45	Relais Lastsensor	Relay Load sensor
8K46	Relais Draht - IF	Relay - Wire - Inductive Guidance (IF)
8K47	Relais Fahrzustand - IF	Relay - Travelling state - IF
8K48	Überbrückung für Notstop Laststeuerung	Load control bridging for emergency stop

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8K49	Überbrückung für Notstop Hubsteuerung	Lifting control bridging for emergency stop
8K50	Überbrückung für Notstop Lenksteuerung	Steering control bridging for emergency stop
8K51	Relais Notstop Laststeuerung	Load control emergency stop relay
8K52	Relais Notstop Hubsteuerung	Lifting control emergency stop relay
8K53	Relais Notstop Lenksteuerung	Steering control emergency stop relay
8K54	Relais red. Geschwindigkeit	Reduced speed relay
9K1	Hilfsrelais Magnetbremse	Auxiliary relay - solenoid brake
9K2	Schütz Heizung Hydrauliköl	Contacteur, hydraulic oil / heating
9K3	Relais Starten	Start relay
9K4	Relais Glühkerzen	Glow plug relay
9K5	Relais Fahrersitzheizung	Relay Driver's Seat Heating
9K6	Relais Scheibenheizung	Windshield heater relay
9K7	Schütz Kabine	Cabin contactor
9K8	Relais-Optionen-Zündung-ein	Relay-Options-Ignition-ON
9K9	Relais-Optionen-Motor-ein	Relay-Options-Engine-ON
9K10	Hilfsrelais-Vorgluehen	Preheat aux. relay
9K11	Relais Katalysator	Catalyzer relay
9K12	Relais-Wischer-vorne	Front wiper relay
9K13	Relais-Wischer-oben	Top wiper relay
9K14	Relais-Wischer-hinten	Rear wiper relay
9K15	Relais Uebertemperaturabschaltung	Overtemperature cutout relay
9K17	Relais Abblendlicht	Dipped lights relay
9K18	Relais Abblendlicht links	LH dipped lights relay
9K19	Relais-Bel-StVZO-links	Road traffic regulations LH lighting relay
9K20	Relais Bel. StVZO rechts	Road traffic regulations RH lighting relay
9K21	Relais Lüfter	Fan relay
9K22	HR-Motor	HR motor

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9K23	Rel Z-Motor läuft nicht	Z motor relay not operating
9K24	Rel Z-Motor läuft	Z motor relay operating
9K25	Relais Kraftstoffpumpe	Fuel pump relay
9K26	Relais Magnetkupplung	Relay magnetic coupling
9K27	Abschaltung Klimaanlage	ir conditioner cutout

L

L1	Zündspule	Ignition coil
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M	Motore	Motors
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1M1	Fahrmotor 1	Drive motor 1
1M2	Fahrmotor 2	Drive motor 2
1M3	Fahrmotor-Drehstrom-1	Drive motor, three-phase 1
1M4	Fahrmotor-Drehstrom-2	Drive motor, three-phase 2
2M1	Pumpenmotor 1	Pump motor 1
2M2	Pumpenmotor 2	Pump motor 2
2M3	Pumpenmotor für Lastaufnahmemittel	Pump motor for load lifting device
2M4	Pumpenmotor für Drehen	Pump motor - Swivelling
2M5	Pumpenmotor für Schieben	Pump motor - Traversing
2M6	Pumpenmotor für Klammern	Pump motor - Clamps
2M7	Pumpenmotor für Speicherbremse lösen	Pump motor for energy-storage brake release
2M8	Pumpenmotor 3	Pump motor 3
2M9	Pumpenmotor-Drehstrom	Pump motor, three-phase
2M10	Motor Palettenklammer	Pallet clamp motor
3M1	Lenkhilfemotor	Steering booster motor
3M2	Rollenbahnmotor	Roller train motor
3M3	Lenkmotor Antriebsrad	Steering motor - drive wheel
3M4	Lenkmotor Lastrad links	Steering motor - left load-bearing wheel

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3M5	Lenkmotor Lastrad rechts	Steering motor - right load-bearing wheel
3M6	Lenkmotor-elektrisch-kommutiert	Steering motor, commutated electrically
3M7	Schwenkmotor-Kabine	Tilt motor cabin
7M1	Motor für Stromabnehmer-Bewegung	Motor - Current collector movement
7M2	Motor Sitzverstellung	Seat adjustment motor
7M3	Motor Bremskraftregler	Braking force regulator motor
7M4	Motor Klammer	Motor Clamp
7M5	Schwenkmotor-Kabine	Tilt motor cabin
7M6	Verstellmotor Stützpilz links	Variable displacement motor LH
7M7	Verstellmotor Stützpilz rechts	Variable displacement motor RH support column
7M11	Istwertgeber rechts	Actual value transmitter RH
9M1	Lüftermotor	Fan motor
9M1.1	Lüfter-Motor-Fahren	Fan, drive motor
9M1.2	Lüfter-Motor-Hydraulik	Fan, hydraulics motor
9M1.3	Luefter-Motor-Fahren-2	Fan, drive motor-2
9M1.4	Luefter-Motor-Hydraulik-2	Fan, hydraulics motor-2
9M1.5	Lüfter-Motor 1 für Motorraum	Fan motor 1 for motor compartment
9M1.6	Lüfter-Motor 2 für Motorraum	Fan motor 2 for motor compartment
9M2	Motor-Scheibenwischer	Motor - windscreen wiper
9M2.1	Motor Scheibenwischer vorne	Windscreen wiper motor - front
9M2.2	Motor Scheibenwischer hinten	Windscreen wiper motor - rear
9M2.3	Motor Scheibenwischer Dach	Windscreen wiper motor - overhead guard
9M3	Ventilator Kabine	Cabin fan
9M3.1	Ventilator-Kabine	Cabin fan
9M4	Motor Scheibenwaschanlage	Motor windscreen wiper installation
9M5	Aktuator (Motorregelung)	Engine actuator
9M6	Starter (Anlasser)	Starter motor
9M7	Gebläse Heizung	Heater blower

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9M8	Lüfter Rechner Bedienpult	Control panel computer fan
9M10	Kraftstoffpumpe	Fuel pump
9M11	Lüftermotor Kondensator 1	Capacitor 1 fan motor
9M12	Lüftermotor Kondensator 2	Capacitor 2 fan motor

P	Meßgeräte	Measuring instruments
P6	Entladeanzeige - Ladeanzeige- Kombination	Discharge indicator / charge indicator combinatio
6P1	Betriebsstundenzähler	Operating hour counter
6P2	Entladeanzeiger	Discharge indicator
6P3	Amperemeter	Ampere meter
6P4	Betriebsstundenzähler und Entladeanzeiger	Operating hour counter and discharge indicator
6P5	Kohlebürsten-Verschleißanzeige mit Hubabschaltung	Carbon brush wear indicator with lifting cut-out
6P6	Radstellungsanzeige	Wheel position indicator
6P7	Abstandsanzeige	Distance indicator
6P8	Ladeanzeige	Charge display
6P9	Neigungsanzeige	ilt display

Q	Starkstrom-Schalter	High-voltage current switch
Q1	Hauptschalter	Master switch
Q1.1	Hauptschalter Steuerkreis	Master switch control circuit

R	Widerstände	Resistors
R1	Parallelwiderstand Hauptschütz	Parallel resistance master contactor
R2	Vorwiderstand DC/DC-Wandler	Dropping resistor, DC/DC converter
R3	Vorwiderstand Lüfter	Protective Resistor Fan
R4	Parallelwiderstand	Parallel resistor
1R1	Anfahrwiderstand	Starting resistor
1R2	Anfahrwiderstand	Starting resistor

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1R3	Anfahrwiderstand	Starting resistor
1R4	Anfahrwiderstand	Starting resistor
1R5	Ersatzwiderstand für Fahrschalter (Gangendsicherung)	Spare resistor for controller (end of aisle protection)
1R6	Schleichgang	Inching speed
1R7	Vorwiderstand für Fahrschalter	Dropping resistor - controller
1R8	Begrenzung Fahrgeschwindigkeit	Travelling speed limitation
1R9	Potentiometer für Mitgehergeschwindigkeit	Potentiometer - pedestrian-guided speed
1R10	Potentiometer Fahren	Potentiometer, driving
1R11	Potentiometer Verstellpumpe (Hydrostat)	Pump potentiometer
2R1	Vorwiderstand für Heben der Fahrerstandplattform	Dropping resistor - raising of driver standing platform
2R2	Linearpoti - Heben	Linear potentiometer - lifting
2R3	Poti Heben	Potentiometer lifting
2R4	Vorwiderstand Poti Heben	Dropping resistor potentiometer lifting
2R5	Poti Schieben	Potentiometer traversing
2R6	Vorwiderstand Poti Schieben	Dropping resistor potentiometer traversing
2R7	Poti Neigen	Potentiometer tilting
2R8	Vorwiderstand Poti Neigen	Dropping resistor potentiometer tilting
2R9	Poti - ZH2	Potentiometer - ZH2
2R10	Poti - ZH2	Potentiometer - ZH2
2R11	Poti - ZH2	Potentiometer - ZH2
2R12	Poti - ZH1	Potentiometer - ZH1
2R13	Poti - ZH1	Potentiometer - ZH1
2R14	Poti - Neigen zurück	Potentiometer - tilting backward
2R15	Poti - Neigen vor	Potentiometer - tilting forward
2R16	Poti - Schieben zurück	Potentiometer - traversing in
2R17	Poti - Schieben vor	Potentiometer - traversing out
3R1	Entstörwiderstand Lenkhilfe	Interference resistor - steering booster
3R2	Potentiometer Lenksensor	Steering sensor potentiometer

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3R2.1	Potentiometer 2 Lenksensor
3R3	Parallelwiderstand-Schwenkschuetz
3R4	Parallelwiderstand-Lenkschuetz
4R1	Vorwiderstand Rundumkennleuchte
4R2	Vorwiderstand für Blinkrelais
4R3	Vorwiderstand für Läutewerk
5R1	Vorwiderstand Pultbeleuchtung
6R1	Varistor-Hupe
6R2	Abschlußwiderstand CAN-Bus
6R2.1	Abschlußwiderstand
6R3	Temperaturregler
7R1	Vorwiderstand für Schutzbeschaltung
7R2	Vorwiderstand für Zweistufenbremse
7R3	Kaltleiter - Widerstand
7R4	Bremspoti
7R5	Vorwiderstand Spannungswandler - Ladegerät
7R6	Mess-Shunt-Ladegerät
7R7	Widerstand-Feldschwächung
7R8	Poti Überwachung Bremskraftregler
7R9	Poti Überwachung Bremskraftregler
7R10	Parallelwiderstand-Schwenkschuetz
7R11	Istwertpotentiometer-Kabine
8R1	Istwertpotentiometer
8R2	Sollwertpotentiometer
8R3	Widerstand Höhenvorwahl
9R1	Heizwiderstände
9R2	Sitzheizung
9R3	Kabinenheizung
	Steering sensor potentiometer 2
	Parallel resistance traverse contactor
	Parallel resistance steering contactor
	Dropping resistor - 360° warning light
	Dropping resistor - turn signal relay
	Dropping resistor - bell
	Dropping resistor - control panel illumination
	Varistor, horn
	Terminator CAN-Bus
	Terminator
	Temperature controller
	Dropping resistor - protective circuit
	Dropping resistor - two-stage brake
	Ballast tube resistor
	Brake poti
	Dropping resistor - voltage transformer - battery charger
	Measure - shunt - battery charger
	Resistor, field weakening
	Braking force regulator monitoring
	Braking force regulator monitoring
	Parallel resistance traverse contactor
	cabin actual value potentiometer
	Actual value potentiometer
	Nominal value potentiometer
	Resistor Lifting Height Preselection
	Heating resistors
	Seat heating
	Cabin heating system

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9R4	Heckscheibenheizung	Rear window heating
9R5	Glühkerze	Glow plug (engine)
9R6	Frontscheibenheizung■	Windshield heater■
9R7	Seitenscheibenheizung	Side window heating

S Schalter, Taster
Switches, keys

S1	Steuerschalter	Control switch
S2	SchaltSchloß	Key switch
S3	Multifunktionshebel	Multi-function lever
S4	El.Ventilhebel-ZH-II	El. Valve Lever ZH-II
S5	Not-Aus	Emergency cut-out
S6	STOP	STOP
S8	Tastenfeld	keyboard
S9	Aus	Off
S10	Ein	On
S5.1	Not - Aus	Emergency Disconnect
S9.1	Aus	Off
S10.1	Ein	On
1S1	Fahrtrichtungsschalter	Drive direction switch
1S1.1	Fahrtrichtungsschalter für StVZO	Drive direction switch for StVZO
1S2	Fahrschalter	Controller
1S2.1	Fahrschalter-2	Controller-2
1S3	Langsamfahrt Ein	Slow travel On
1S3.1	Langsamfahrt Ein	Slow travel On
1S3.2	Langsamfahrt Ein	Slow travel On
1S4	Sicherheitshöhe	Safety height
1S5	Fahrverriegelung (höhenabhängig)	Travelling interlock (height depending)
1S6	Fahrverriegelung außerhalb des Ganges 500 mm	Interlock outside of aisle 500 mm

(D)		(GB)
1S6.1	Fahrverriegelung außerhalb des Ganges 500 mm / Zusatzhub	Interlock outside of aisle 500 mm / Auxiliary hoist
1S7	Pilotschalter für CD-Feld	Pilot switch for CD field
1S8	Plattformschalter	Platform switch
1S9	Test Notstop	Test - emergency stop
1S10	Überbrückung Fahrverriegelung	By-pass travelling interlock
1S11	Schnellfahrt	Rapid travel
1S12	Fahren Start	Travelling - Start
1S13	Fahren Stop	Travelling - Stop
1S14	Tastbetrieb vorwärts	Contact operation - forward
1S14.1	Tastbetrieb vorwärts	Contact operation - forward
1S14.2	Tastbetrieb vorwärts	Contact operation - forward
1S15	Tastbetrieb rückwärts	Contact operation - reverse
1S16	Plattform Mitgebetrieb	Pedestrian guided platform
1S17	Plattform Mitfahrbetrieb	Stand-on platform
1S18	Schalter Abw. 10 Grad Geradeausfahrt	Switch, 10° variation from straight ahead
1S19	Endschalter Not-Stop-Bremse geladen	Limit switch: emergency stop brake is loaded
1S20	Verriegelung Seitenschutz	Side protection interlock
1S21	Fahren	Travelling
1S22	5 Stufen Schalter (Vario Control)	Five mode switch
2S1	Taster Heben	Key lifting
2S1.1	Heben	Key lifting
2S2	Heben - langsam	Lifting - slow
2S3	Heben - schnell	Lift - rapid
2S4	Hubbegrenzung	Lifting stop
2S4.1	Hubbegrenzung	Lifting stop
2S4.2	Hubbegrenzung	Lifting stop
2S5	Überbrückung der Hubbegrenzung	Lifting stop override
2S5.1	Überbrückung der Hubbegrenzung	Lifting stop override

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2S6	Zusatzheben	Supplementary lift
2S7	Hubendschalter	Lifting height limit switch
2S7.1	Hubbegrenzung Initialhub	Lifting stop for initial lift
2S7.2	Hubendschalter Initialhub	Lifting height limit switch - initial lift
2S8	Freihub	Free lift
2S9	Hubbegrenzung - Diagonalfahrt	Lifting stop - diagonal travel
2S10	Hubbegrenzung - Diagonalfahrt - mit Last	Lifting stop - diagonal travel - with load
2S11	Hubbegrenzung - Diagonalfahrt - ohne Last	Lifting stop - diagonal travel - without load
2S13	Heben Initialhub oder Zusatzhub	Lifting - initial lift or auxiliary lift
2S14	Hubbegrenzung Fahrstromabschaltung	Lifting stop - drive current cut-out
2S15	Taster Senken	Key lowering
2S15.1	Taster Senken	Key lowering
2S16	Senken - langsam	Lowering - slow
2S17	Senken - schnell	Lower - rapid
2S18	Schleichgang Senken/Heben (bei Z-Mast)	Lifting/lowering - inching speed (Z-mast)
2S19	Neigen vor	Tilting - In
2S20	Neigen zurück	Tilting - Out
2S21	Neigen - Mittelstellung	Tilting - neutral position
2S22	Neigen - Verriegelung	Tilting - interlock
2S23	Drehen - links	Swivelling - left
2S24	Drehen - rechts	Swivelling - right
2S25	Drehen - Mitte	Swivelling - central position
2S26	Drehen im Schleichgang	Swivelling - inching speed
2S27	Endstellung Drehen - links	End position - swivelling - left
2S28	Endstellung Drehen - rechts	End position - swivelling - right
2S29	Transportstellung links	Transport position - left
2S30	Transportstellung rechts	Transport position - right
2S31	Mittelstellung - Ein (SR+CS)	Central position - On (SR+CS)

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2S32	Schieben - links	Traversing - left
2S33	Schieben - rechts	Traversing - right
2S34	Schieben - Mitte	Traversing - central position
2S35	Schleichgang schieben links 2. Einstapeltiefe (SX)	Traversing left - inching speed, second stacking row (SX)
2S35.1	Schleichgang schieben rechts 2. Einstapeltiefe (SX)	Traversing right - inching speed, second stacking row (SX)
2S35.2	Schieben Schleichgang	Traversing - inching speed
2S35.3	Schieben Schleichgang	Traversing - inching speed
2S35.4	Schieben Schleichgang	Traversing - inching speed
2S35.5	Schleichgang schieben 2. Einstapeltiefe (TG)	Traversing - inching speed, second stacking row (TG)
2S35.6	Schleichgang schieben 2. Einstapeltiefe (TG)	Traversing - inching speed, second stacking row (TG)
2S36	Endstellung schieben links	End position - traversing left
2S36.1	Endstellung schieben links 2. Einstapeltiefe (SX)	End position - traversing left, second stacking row (SX)
2S37	Endstellung schieben rechts	End position - traversing right
2S37.1	Endstellung schieben rechts 2. Einstapeltiefe (SX)	End position - traversing right, second stacking row (SX)
2S38	Transportstellung Mitte	Transport position - central position
2S38.1	Transportstellung Mitte	Transport position - central position
2S38.2	Transportstellung Mitte	Transport position - central position
2S39	Schieben vor/zurück	Traversing in/out
2S39.1	Schieben Schleichgang 2. Einstapeltiefe palettenabhängig	Traversing - inching speed, second stacking row pallet-dependent
2S39.2	Schieben Schleichgang 2. Einstapeltiefe palettenabhängig	Traversing - inching speed, second stacking row pallet-dependent
2S39.3	Endstellung schieben links 2. Einstapeltiefe palettenabhängig	End position traversing left second stacking row pallet-dependent
2S39.4	Endstellung schieben rechts 2. Einstapeltiefe palettenabhängig	End position traversing right second stacking row pallet-dependent
2S40	Endstellung schieben zurück	End position - traversing in
2S41	Endstellung schieben vor	End position - traversing out
2S42	Schieben im Regal	Traversing in rack
2S43	Transportstellung Schubrahmen, links	Transport position - traversing frame, left
2S43.1	Transportstellung Schubrahmen links, 2. Einstapeltiefe	Transport position - traversing frame, left, second stacking row
2S44	Transportstellung Schubrahmen, rechts	Transport position - traversing frame, right

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2S44.1	Transportstellung Schubrahmen, rechts, 2. Einstapeltiefe	Transport position - traversing frame, right, second stacking row
2S45	Stapelstellung Schubrahmen links	Stacking position - traversing frame, left
2S45.1	Stapelstellung Schubrahmen links, 2. Einstapeltiefe	Stacking position - traversing frame, left, second stacking row
2S46	Stapelstellung Schubrahmen rechts	Stacking position - traversing frame, right
2S46.1	Stapelstellung Schubrahmen rechts, 2. Einstapeltiefe	Stacking position - traversing frame, right, second stacking row
2S47	Schleichgang Schieben vor/links	Traversing out/left - inching speed
2S48	Schleichgang Schieben zurück/rechts	Traversing in/right - inching speed
2S49	2. Einstapeltiefe	Second stacking row
2S49.1	2. Einstapeltiefe	Second stacking row
2S50	2. Einstapeltiefe Transportstellung Schubrahmen links (SR)	Transport pos. - second stacking row traversing frame, left (SR)
2S51	2. Einstapeltiefe Transportstellung Schubrahmen rechts (SR)	Transport pos. - second stacking row traversing frame, right (SR)
2S52	2. Einstapeltiefe Stapelstellung Schubrahmen links (SR)	Stacking pos. - second stacking row traversing frame, left (SR)
2S53	2. Einstapeltiefe Stapelstellung Schubrahmen rechts (SR)	Stacking pos. - second stacking row traversing frame, right (SR)
2S54	Schalter Zinkenverstellung / Gabelverstellung	Switch tine adjustment / fork adjustment
2S55	Seitenschieber Mittelstellung	Lateral traversing device - central position
2S56	Überbrückungstaster	Override key
2S57	ZH1-Ventilschalter	Valve switch ZH1
2S58	Abschaltung Gabelverstellung (TG)	Disconnection fork adjustment (TG)
2S59	Klammer öffnen	Clamp - Open
2S60	Klammer schließen	Clamp - Close
2S61	Verriegelung für die Klammern	Clamp interlock
2S62	Hubhöhenverriegelung Heben / Fahren	Lifting height interlock - lifting/travelling
2S63	Hubhöhe 1,5 m	Lifting height 1.5 m
2S64	Schalter für Heben / Senken	Switch - lifting / lowering
2S65	Hubhöhenverriegelung für Zusatzhub 310 mm	Lifting height interlock for auxiliary lift 310 mm
2S66	Hubendschalter für Zusatzhub	Lifting limit switch for auxiliary lift
2S66.1	Hubende Initialhub	Initial lift - lift cutout
2S66.2	Senkende Initialhub	Initial lift - lower cutout

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2S67	Hubhöhe 50 mm	Lifting height 50 mm
2S68	Druckschalter-Fahrverriegelung	Switch - travel interlock
2S69	Schlaffketten-Sicherung	Slack chain safety
2S69.1	Schlaffketten-Sicherung	Slack chain safety
2S69.2	Schlaffkettenschalter	Slack chain switch
2S69.3	Schlaffkettenschalter	Slack chain switch
2S70	Hubendschalter 2. Einstapeltiefe	Lifting limit switch - second stacking row
2S71	Unterbrechung für 2 K 2	Interruption for 2 K 2
2S72	Hubhöhenabschaltung - FSD	Lifting height cut-out - FSD
2S73	Taster Neigen vor / zurück	Key Tilting out / in
2S74	Schalter Mittelstellung - Drehen - Schleichgang	Switch in central position - swivelling at inching speed
2S75	Sicherheitshöhe f. Retrakbewegung oberhalb der Radarme	Safety height for Retrak movement above wheel arms
2S76	ZH2-Ventilschalter	Valve switch ZH2
2S76.1	ZH3-Ventilschalter	Valve switch ZH3
2S76.2	ZH4-Ventilschalter	Valve switch ZH4
2S77	Verriegelung I-Mast	Interlocking - I-mast
2S78	Senken Initialhub	Lowering - initial lift
2S79	Drehen in Frontaufnahmestellung	Swivelling to front position
2S80	Drehen in Transportstellung	Swivelling to transport position
2S81	TG in Frontaufnahmestellung	Fork in front position
2S82	TG in Transportstellung links	Fork in transport position, left
2S83	Startschalter Zusatzhub	Starting switch - auxiliary lift
2S84	Endschalter Zusatzhub	Limit switch - auxiliary lift
2S85	Schalter Mastdämpfung	Switch - mast damping
2S86	Gabelstellung 500 mm	Fork position: 500 mm
2S87	TG in Transportstellung rechts	Fork in transport position, right
2S88	Vierwegeschalter	Four-way switch
2S89	Verriegelung Hubhöhe	Interlocking - lifting height

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2S90	Überbrückungstaster - Verriegelung Heben	Override key - interlocking lifting
2S91	Überbrückungstaster Fahrverriegelung	Override key travel interlock
2S92	ZH1 zurück	ZH1 backward
2S93	ZH2 vor	ZH2 forward
2S94	ZH2 zurück	ZH2 backward
2S95	ZH1 vor	ZH1 forward
2S96	Heben Handventil	Manual lifting valve
2S97	Überlast-Schalter	Overload switch
2S98	Endschalter Schieben vor	Limit switch, shifting forward
2S99	Endschalter Schieben zurück	Limit switch, shifting backward
2S100	Seitenschieber Mittelstellung	Side shifting device, center position
2S101	Schalter Mast 1. Abschaltung	Switch, mast - 1st cutout
2S102	Schalter Mast 2. Abschaltung	Switch, mast - 2nd cutout
2S103	Schalter Mast 3. Abschaltung	Switch, mast - 3rd cutout
2S104	Schalter Mast 4. Abschaltung	Switch, mast - 4th cutout
2S105	Schalter Mast Dämpfung Heben	Switch, mast - damping of lifting
2S106	Schalter Mast Dämpfung Heben Übergang	Switch, mast - damping of lifting / crossover
2S107	Schalter Mast Dämpfung Senken	Switch, mast - damping of lowering
2S108	Schalter Mast Dämpfung Senken Übergang	Switch, mast - damping of lowering / crossover
2S109	Schleichgang Mitte von links	Inching speed, center - from left
2S110	Schleichgang Mitte von rechts	Inching speed, center - from right
2S111	Hubhözensensierung	Lifting height sensor system
2S112	Vorwahl Zusatzhub	Auxiliary lift preselection
2S113	Zusatzhub Heben	Auxiliary lift - lifting
2S114	Zusatzhub Senken	Auxiliary lift - lowering
2S115	Vorwahl Schieben	Preselection traversing
2S116	Vorwahl Drehen	Preselection rotation
2S117	Synchron Senken	Synchronous lowering

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2S118	Schalter Stützrolle ausgefahren	Switch - supporting roller extended
2S118.1	Schalter Stützrolle ausgefahren	Switch - supporting roller extended
2S119	Schalter Stützrolle eingefahren	Switch - supporting roller retracted
2S119.1	Schalter Stützrolle eingefahren	Switch - supporting roller retracted
2S120	Taster Magnetventil Notablass	Key - solenoid valve for emergency draining
2S121	Führungsrollen weit	Guide rollers, wide
2S121.1	Führungsrollen weit	Guide rollers, wide
2S121.2	Führungsrollen weit	Guide rollers, wide
2S121.3	Führungsrollen weit	Guide rollers, wide
2S122	Führungsrollen eng	Guide rollers, narrow
2S122.1	Führungsrollen eng	Guide rollers, narrow
2S122.2	Führungsrollen eng	Guide rollers, narrow
2S122.3	Führungsrollen eng	Guide rollers, narrow
2S123	Druckschalter Drehabsechtung	Pressure Switch Speed Cut-Off
2S124	Taster Gabeln waagerecht	Pushbutton "Forks horizontally"
2S125	Teleskopgabel Stellung1	Telescopic fork position 1
2S126	Teleskopgabel Stellung2	Telescopic fork position 2
2S127	Palettenklammer	Pallet clamp
2S128	Palettenklammer auf	Pallet clamp open
2S129	Palettenklammer zu	Pallet clamp closed
2S130	Senkschalter-Fahrgeschwindigkeit	Travel speed lower switch
2S132	Taster-Aufnahme-vor	Fwd. collection button
2S133	Taster-Aufnahme-zurück	Rev. collection button
2S134	Taster-Pumpe-ein	button-pump-on
2S134.1	Taster-Pumpe-ein	button-pump-on
2S134.2	Taster-Pumpe-ein	button-pump-on
2S134.3	Taster-Pumpe-ein	button-pump-on
3S1	Lenkhilfeschalter	Steering booster switch

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3S2	Verriegelung Lenkhilfe	Steering booster interlock
3S3	Lenkarretierung	Steering arrester
3S4	Endschalter - Lenkung rechts	Limit switch - steering right
3S4.1	Endschalter - Lenkung links	Limit switch - steering left
3S5	Entriegelung der Lenkarretierung	Release of steering locking mechanism
3S6	Endschalter Lenkwinkelbegrenzung	Limit switch: steering angle limiter
3S10	Überdruckschalter für Lenkhilfe	Overpressure switch - steering booster
3S11	Rollenantriebster - Auflaufen	Roller drive key - run up
3S12	Rollenantriebster - Ablaufen	Roller drive key - run off
3S13	Rollenantriebster - Mittelstellung	Roller drive key - neutral position
3S15	Lenkdruckschalter	Steering pressure switch
3S16	Schalter Notlenkung	Switch emergency steering system
3S17	Schalter Bremse	Switch brake
3S18	Taster 360 Grad Lenkung	Pushbutton “360° steering”
4S1	Hupentaster	Hooter key
4S1.1	Hupentaster	Hooter key
4S2	Taster - Handbremsstellung	Key - parking brake position
4S3	Schalter Rundumkennleuchte	Switch - 360° warning lamp
4S4	Bürstenhalter-Meldekontakt	Brushholder - message contact
4S5	Prüftaster-Meldeleuchten Bürstenverschleiß	Test key - Brush wear control lamps
4S6	Schalter DC/DC-Wandler	Switch D.C./D.C. Converter
4S7	Schalter Warnsummer abschaltbar	Warning indicator switch, adjustable
5S1	Schalter Arbeitsleuchte FSD	Switch working lamp FSD
5S2	Lichtschalter	Light switch
5S3	Blinkschalter	Turn signal switch
5S4	Warnblinkschalter	Warning lamp switch
5S5	Bremslichtschalter	Brake lamp switch
5S6	Suchscheinwerferschalter	Spot light switch

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5S7	Parkleuchtschalter	Parking light switch
5S8	Schalter Positionsleuchten	Switch: position lights
5S9	Schalter Arbeitsleuchte FSD-vorn	Switch, working lamp - overhead guard / front
5S10	Schalter Arbeitsleuchte hinten	Rear working lamp switch
5S11	Schalter-Arbeitsleuchte am Mast	Switch – Work lights on mast
6S1	Radstandsanzeige - links	Wheel position indicator - left
6S2	Radstandsanzeige - rechts	Wheel position indicator - right
6S3	Radstandsanzeige	Wheel position indicator
6S4	Entlademeldung AUS	Discharge message OFF
6S5	Resettaster - Kohlebürstenverschleißanzeige	Resetting key - Carbon brush wear indicator
6S6	Kohlebürsten-Meldekontakt	Carbon brush - message contact
6S7	Kohlebürstensor Fahrmotor 1	Carbon brush sensor - drive motor 1
6S8	Kohlebürstensor Fahrmotor 2	Carbon brush sensor - drive motor 2
6S9	Kohlebürstensor Pumpenmotor	Carbon brush sensor - pump motor
6S10	Kohlebürstensor Lenkhilfe-Motor	Carbon brush sensor - steering booster motor
6S11	Taster Wiegen	Pushbutton “Weighing”
6S78	Schalter Getriebeöltemperatur	Transmission oil temperature switch
7S1	Leitschienenschalter, links	Switch - guide rail, left
7S2	Leitschienenschalter, rechts	Switch - guide rail, right
7S3	Totmanntaster	Deadman key
7S4	Zweihandbedienung - Fahren	Driving - two-handed operation
7S4.1	Zweihandbedienung - Fahren	Driving - two-handed operation
7S5	Zweihandbedienung - Heben	Lifting - two-handed operation
7S6	Fahrstandverriegelung Tür links	Cab locking - left door
7S7	Fahrstandverriegelung Tür rechts	Cab locking - right door
7S8	Notstopschalter	Emergency stop switch
7S9	Sicherheitsschalter im Sitz	Safety switch on seat
7S10	Handbremsschalter	Hand brake switch

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7S11	Fußbremsschalter	Foot brake switch
7S12	Fahrzeug im Regalgang	Vehicle in aisle
7S13	Löschtaster	Cancelling key
7S14	Schalter Arbeitsbühne	Switch - working platform
7S15	Palettenschalter für Fahrkorbsch.	Pallet switch for cage switch
7S16	Ladetür - Palette rechts	Loading door - pallet left
7S17	Ladetür - Palette links	Loading door - pallet right
7S18	Zusatzhub - Zweihandbedienung	Auxiliary lift - two-handed operating system
7S19	Auffahrsicherheit	Collision protection device
7S20	Druckschalter für Bremsanlage	Pressure switch for brake system
7S21	Schalter Magnetbremse	Switch - magnetic brake
7S22	Bremsschalter	Brake switch
7S23	Schalter Hydro-Spanner (Lastradbremse gelöst)	Switch - hydro-tightener (load wheel brake released)
7S24	Lastschalter für Zweistufenbremse	Load switch for two-stage brake
7S24.1	Lastschalter für Zeitstufenbremse	Load switch for time ramp brake
7S25	Batteriewagen-Entriegelung	Battery trolley unlocking
7S25.1	Batteriewagen-Entriegelung für Vorschub	Battery trolley - extension release
7S26	Überwachung Lenkverriegelung	Steering interlock monitoring system
7S27	Lastradstellung EIN	Load-bearing wheel position indicator ON
7S28	Lastradkorrektur	Load wheel position correction
7S29	Lastradstellung AUS	Load-bearing wheel position indicator OFF
7S30	Filterkontrolle	Filter check
7S31	Endsch. für Stromabnehmer-Steuerung	Limit switch - current collector control
7S32	Endsch. für Stromabnehmer-Steuerung	Limit switch - current collector control
7S33	Mikroschalter für Lastradstellung (linker Selektor)	Microswitch for load-bearing wheel position (left selector)
7S34	Mikroschalter für Lastrad in Geradeausfahrt (rechter Selektor)	Microswitch - load-bearing wheel straight on (right selector)
7S35	Mikroschalter für Fahrtriebsstellung	Microswitch for drive position
7S36	Verriegelungsschalter Nachladung	Interlocking switch - battery recharging

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7S37	Batterie-Vorschub-Abschaltung	Cut-out - battery advance
7S38	Reset Lenkverriegelung	Steering interlock reset
7S39	Endschalter Notstop-Bremszylinder	End switch emergency stop brake cylinder
7S40	Bremsflüssigkeitsstands-Schalter	Brake fluid level switch
7S41	Schalter-Motor-Start	Switch-Engine-Start
7S42	Schalter-Motor-Stop	Switch-Engine-Stop
7S69	Schlaffketten-Not-Betrieb	Slack chain emergency operation
7S70	Bergeschalter Laststeuerung	Recovery switch - load control
7S71	Bergeschalter Hubsteuerung	Recovery switch - lifting control
7S72	Bergeschalter Lenksteuerung	Recovery switch - steering control
7S73	Türschalter	Door switch
7S74	Ladegerät Ein	Battery Charger - on
7S75	Schalter Spannungswandler	Switch, voltage transformer
7S76	Taster Sitzverstellung	Pushbutton Seat Adjustment
7S77	Schalter Wasserstand im Dieselfilter	Water level switch in diesel filter
7S79	Kraftstoffreserveschalter	Fuel reserve switch
7S80	Schalter f. Datenterminal	Data terminal switch
7S81	Überbr.-Stromabnehmer	Pantograph bypass
7S82	Schalter Gurtschloss	Belt lock switch
7S85	UVV Magnetbremse Fahrmotor	UVV drive motor
8S1	Schalter Höhenvorwahl Ein	Height selection system switch On
8S2	Lastschalter	Load switch
8S3	Magnetschalter Gangendsicherung	Solenoid switch - end-of-aisle protection system
8S3.1	Magnetschalter Gangendsicherung	Solenoid switch - end-of-aisle protection system
8S4	Reset Gangendsicherung	Reset - end-of-aisle protection system
8S5	Kurvenabschalter	Bend cut-out switch
8S6	Einstapelautomatik Ein	Automatic stacking system On
8S7	Umschalter Höhenvorwahl auf 30 Pos.	Height selection system - change-over switch, 30 positions

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8S8	Horizontalpositionierung Ein	Horizontal positioning system On
8S9	Magnetschalter Aus	Solenoid switch Off
8S9.1	Magnetschalter Aus	Solenoid switch Off
8S10	Magnetschalter Ein	Solenoid switch On
8S10.1	Magnetschalter Ein	Solenoid switch On
8S11	Magnetschalter für Stromabnehmer-Steuerung	Solenoid switch - current collector control
8S12	Magnetschalter Synchr. Vorfeld Aus	Solenoid switch for apron synchr. Off
8S13	Magnetschalter Synchr. Vorfeld Ein	Solenoid switch for apron synchr. On
8S14	Hubhöensch. für Kamera 1+2	Lifting height switch for Camera 1+2
8S15	Bodenidentifikation	Ground identification
8S29	Schalter IF-Notbetrieb	Switch - inductive guidance emergency operation
8S30	Schalter Manuell-Automatik IF Ein	Switch - manual / automatic IF On
8S39	Synchronisation Ein	Synchronization On
8S40	Schalter Man.-Autom. (ETX-A)	Switch Man.-Autom. (ETX-A)
8S41	Umschalter für Manuelle Datenübertragung	Change-over switch for manual data communication
8S50	Magnetschalter Gangerkennung	Solenoid switch - aisle recognition
8S51	Magnetschalter Kontrolle Gangerkennung	Solenoid switch - aisle recognition check
8S53	Magnetschalter Kontrolle Gangerkennung	Solenoid switch - aisle recognition check
8S54	Quittung Lichtschranke	Acknowledgement of light barrier
8S55	Umschalter - Gabel- Neigen/Seitenschub	Change-over switch - fork - tilting / lateral traversing
8S56	Magnettaster, links außen (405)	Magnet sensor, left / outside (405)
8S57	Magnettaster, links mitte (255)	Magnet sensor, left / centre (255)
8S58	Magnettaster, links innen (105)	Magnet sensor, left / inside (105)
8S59	Magnettaster, rechts innen (105)	Magnet sensor, right / inside (105)
8S60	Magnettaster, rechts mitte (255)	Magnet sensor, right / centre (255)
8S61	Magnettaster, rechts außen (405)	Magnet sensor, right / outside (405)
8S92	Magnetschalter, Gangerkennung	Solenoid switch - aisle recognition
9S1	Taster - Scheibenwischer	Key - windscreen wiper

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9S2	Thermoschalter	Thermo switch
9S3	Schalter - Sitzheizung	Switch - seat heating
9S4	Skannertaster	Scanner key
9S5	Temperaturschalter Fahrmotor 1	Temperature switch - drive motor 1
9S6	Temperaturschalter Fahrmotor 2	Temperature switch - drive motor 2
9S7	Temperaturschalter Pumpenmotor	Temperature switch - pump motor
9S8	Temperaturschalter Lenkhilfe-Motor	Temperature switch - steering booster motor
9S9	Sicherungstest	Fuse test
9S10	Taster Scheibenwaschanlage	Key windschield washer system
9S11	Schalter Ventilatoren Schutzdach	Switch, fans / overhead guard
9S12	Schalter Heckscheibenheizung	Heated window switch
9S13	Temperaturschalter Lenkhilfe Motor Lastrad links	Left load wheel steering booster motor temperature switch
9S14	Temperaturschalter Lenkhilfe Motor Lastrad rechts	Right load wheel steering booster motor temperature switch
9S15	Schalter Heizung	Switch - heating
9S16	Schalter-Dachscheibenwischer	Switch-roof wiper
9S17	Scheibenwischerintervallschalter	Windscreen wiper interval switch
9S18	Taster Bedienpultverstellung	Control panel adjustment switch
9S19	Schalter Klimaanlage	Air conditioning system switch
9S20	Druckschalter Kältemittel	Refrigerant pressure switch
9S21	Temperaturschalter Kältetauscher	Refrigerant replacement temperature switch
9S22	Taster Regenerationsunterdrückung	Regeneration suppression button
9S27	Druckschalter Kältemittel	Coolant pressure switch
U	Umsetzer (elektr. - elektr.)	Converter (electr. - electr.)
U1	DC-DC-Wandler	DC-DC converter
U2	Zentralverteiler	Central distributor
U3	Signalsammler-Bedienhaube	Signal collector - operating hood
U4	Signalsammler	Signal collector

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U5	DC-Wandler Fahrerschutzdach	DC-converter overhead guard
U6	DC-Wandler Punktlampe	DC-converter point lamp
U7	DC/DC-Wandler 24 / 5V	DC/DC-converter 24/5V
U8	Kombisteuerung Fahren/Heben	Combined control travelling / lifting
U9	DC/DC-Wandler 48 / 12 V	D.C./D.C. Converter 48/12 V
U10	Wandler von Wechsel auf Gleichspannung	C/DC Converter
U11	Verteiler Ausleger	Distribution board, boom
U12	Verteiler Fahrerplatzträger	Distribution board, driver stand carrier
U13	Verteiler Mast	Distribution board, mast
U14	Verteiler Fahrschalter	Distribution board, controller
U15	Verteiler Schutzdach	Distribution board, overhead guard
U16	DC/DC-Wandler	DC/DC-converter
U17	Batterie-Spannung Meßmodul	Battery voltage measuring module
U18	Pegelumsetzer	Level converter
U19	Verteiler Reedtaster	Distribution panel, reed button
U20	Verteiler Anbaugerät	Attachment distributor
U21	Verteiler Gabelträger	Fork carrier distributor
U22	DC/DC Wandler 80/24V und 12V	DC/DC-Converter 80/24V and 12V
U23	Steuerung (ECU)	Control System (ECU)
U24	Codeschloss	Code lock
U25	DC/DC-Wandler-80V/12V	DC/DC converter 80/12 V
U26	Kombisteuerung Fahren/laden	Travel/charge combination controller
U27	Kombisteuerung Fahren/Heben/Lenken	Travel/lift/steering combination controller
1U1	Fahrstromsteuerung	Drive current control system
1U1.1	Fahrelektronik rechts	Driving electronics, right
1U2	Elektr. Anfahrsteuerung (Hochlaufverzögerung)	Electric starting control (running up delay)
1U4	Schleichgang - Fahren	Travelling - inching speed
1U5	Kaltleiter (100°) Fahrmotor	Ballast tube (100°) - drive motor

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1U5.1	Kaltleiter (100°) Widerstand	Ballast tube (100°) - resistor
1U6	Verriegelung Fahren - induktiv	Travelling interlocking - inductive guidance
1U6.1	Verriegelung Fahren - induktiv	Travelling interlocking - inductive guidance
1U7	Einschaltautomatik Lenkhilfe	Steering booster - automatic starting system
1U8	Schützständerplatine	Contactork rack board
1U9	Fahrgeber	Driving sensor
1U10	Gangendsicherung	End-of-aisle protection system
1U11	Kohlebürstenverschleißplatine	Carbon brush wear board
1U12	Geschwindigkeits-Überwachung	Speed monitoring system
1U13	Diodenmodul 526 F2	Diode module 526 F2
1U14	Rückspeise-Modul	Feedback module
1U15	Leistungsteil	Power component
1U16	Interface	Interface
1U20	Modul-Doppelpedal	Double-pedal module
1U22	Sensor Getriebetemperatur	Transmission oil temperature sensor
1U23	MFC Fahren / Bremsen	MFC travel / brake
1U24	Fahr- und Lenksteuerung	Traction and steering controller
1U25	Hubimpulssteuerung	Lift pulse controller
2U1	Proportionalsteuerung - Heben	Proportional control - lifting
2U2	Antriebssteuerung Hydraulik	Drive control - hydraulics
2U3	Sollwertgeber-Antriebssteuerung Hydraulik	Nominal value transmitter -hydraulic drive control
2U4	Stromregler für Proportionalventil	Current regulator for proportional valve
2U5	Laststeuerung	Load Control
2U6	Ventilsteuerung	Valve controlled distribution
2U7	Proportional-Steuerung-Fahren-links	Proportional control, driving - left
2U8	Proportional-Steuerung-Fahren-rechts	Proportional control, driving - right
2U10	Drucksensor Haupthub	Pressure Sensor Main Lift
2U11	Drucksensor Zusatzhub	Pressure Sensor Auxiliary Lift

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2U12	MFC Hydraulik	MFC hydraulics
2U13	Multipilot	Multipilot
3U1	Lenkhilfe-Elektronik	Steering booster electronics
3U2	Sollwertgeber - Lenkkopf	Nominal value transmitter - steering head
3U3	Antriebssteuerung Lenkung Antriebsrad	Drive wheel - steering drive
3U4	Antriebssteuerung Lenkung Lastrad links	Left load-bearing wheel - steering drive
3U5	Antriebssteuerung Lenkung Lastrad rechts	Right load-bearing wheel - steering drive
3U6	Lenkkoordinator	Steering coordinator
3U7	Anzeige Bedieneinheit	Operating unit - display
3U8	Drehstromsteuerung Lenken	3-phase control, steering
3U9	Istwertgeber Lenken	Actual value transmitter, steering
3U10	Sollwertgeber Lenkung	Nominal value transmitter, steering system
3U11	Ladeschaltung-Schwenken	Load switch traverse
3U12	Ladeschaltung-Lenken	Load switch steering
5U1	Interface_Optionen_1	Interface_options_1
5U2	Interface_Optionen_2	Interface_options_2
5U3	Interface_Optionen_3	Interface_options_3
5U4	Interface_Optionen_4	Interface_options_4
6U1	Netzleitungsfilter	Power line filter
6U2	LCD-Information und Serviceanzeige (LISA)	LCD information and service display (LISA)
6U3	Informationsanzeige (ELSE-Check)	Information display (ELSE-Check)
6U4	CAN-Interface 3	CAN Interface 3
6U5	CAN-Interface 4	CAN Interface 4
6U6	Interface CANION	Interface CANION
6U7	Interface Solopilot	Interface Solopilot
6U8	Instrumententafel	Instrument panel
6U9	MFC Zusatzfunktionen	MFC auxiliary functions
6U10	Zugangsmodule	Access module

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6U11	Datarecorder	Data recorder
6U12	Funkmodul	Radio module
6U13	Interface-CANION-Kabine	Interface-CANION-cabin
7U1	Notstop-Einrichtung	Emergency stopping system
7U2	Spannungswandler-Ladegerät	Voltage transformer - battery charger
7U3	DC/DC-Wandler	DC/DC-converter
7U6	DC 7 DC Wandler Option 24V	DC/DC converter option 24V
7U6.1	DC/DC-Wandler-Option-24V	DC/DC converter option-24V
7U6.2	DC/DC-Wandler-Option-24V	DC/DC converter option-24V
7U6.3	DC/DC-Wandler-Option-24V	DC/DC converter option-24V
7U6.4	DC/DC-Wandler-Option-24V	DC/DC converter option-24V
7U6.5	DC/DC-Wandler-Option-24V	DC/DC converter option-24V
7U6.6	DC/DC-Wandler-Option-24V	DC/DC converter option-24V
7U7	Relaismodul Ladegerät	Charger relay module
7U8	Ladeschaltung-Schwenken	Load switch traverse
7U10	Istwertgeber Stützpilz links	Actual value transmitter LH
7U11	Istwertgeber rechts	Actual value transmitter RH
8U1	Höhenvorwahl	Height selection system
8U2	Einstapelautomatik	Automatic stacking system
8U3	Verriegelung Heben - induktiv	Inductive interlock - lifting
8U4	Istwertgeber (Federmotor)	Actual value transmitter (spring motor)
8U5	Tastatur (Höhenvorwahl)	Keyboard - height selection system
8U6	IF-Elektronik	Inductive guidance electronics
8U7	Sensor IF	Inductive guidance sensor
8U7.1	Sensor IF	Inductive guidance sensor
8U7.2	Sensor IF	Inductive guidance sensor
8U7.3	Sensor IF	Inductive guidance sensor
8U8	Lenkstellungsgeber IF (Pot.)	Steering positon transmitter IG (Pot.)

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8U9	Tacho-Generator IF	Inductive guidance tacho-generator
8U10	Hubsteuerung	Lifting control
8U11	Reflex-Taster Leerplatzkontrolle	Reflex key - empty position checking system
8U11.1	Reflex-Taster Leerplatzkontrolle	Reflex key - empty position checking system
8U12	Induktiver Näherungsschalter	Inductive proximity switch
8U13	Gangidentifikation	Aisle identification
8U14	Gangerkennung	Aisle recognition
8U15	Display Hoz. Pos.	Display - horizontal positioning system
8U16	Inkremental- Weggeber (Hozpos.)	Incremental path transmitter (Hozpos.)
8U17	Reflex-Lichtschanke (Hozpos.)	Reflex light barrier (Hozpos.)
8U18	Hindernissensor (Lastachse)	Obstacle sensor (load axle)
8U19	Hindernissensor (Antriebsseite)	Obstacle sensor (drive side)
8U20	Antenne (inkl. Datenübertragung)	Aerial (incl. data transmission)
8U21	Konturenkontrolle - LAM	Contour scanner - LAM
8U22	Reflex-Taster Lastsensor	Reflex key - load sensor
8U22.1	Reflex-Taster Lastsensor	Reflex key - load sensor
8U23	Reflex-Lichtschanke Sicherheitsbereich (Heben)	Reflecting light barrier safety area (lifting)
8U24	Reflex-Lichtschanke für Geschwindigkeitsüberwachung	Reflecting light barrier for speed monitor
8U25	IR-Übertragung	IR-transmitter
8U26	Synchronisation - Vorfeld	Synchronization - apron
8U27	Synchronisation (Elektronik)	Synchronization (electronics)
8U28	Istwertgeber - Drehen	Actual value transmitter - swivelling
8U29	Istwertgeber - Schieben	Actual value transmitter - traversing
8U30	Verriegelung Schieben	Interlocking - traversing
8U31	Reflex Taster bzw. Magnetschalter LG - Ein/Aus	Reflex key resp. solenoid switch LG - On/Off
8U31.1	Reflex Taster bzw. Magnetschalter LG - Ein/Aus	Reflex key resp. solenoid switch LG - On/Off
8U32	Schubbegrenzung	Traversing stop
8U33	Reflexlichttaster Schleichgang - Schieben	Reflection photosensor for traversing at inching speed

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8U34	Hoz. Pos. Steuerung	Horiz. positioning control system
8U35	Barcode-Auswerter	Bar-code evaluator
8U36	Reflex-Lichtschanke für Fahrverriegelung	Reflecting light barrier for travel interlock
8U37	Speicherprogrammierbare Steuerung	Programmable controller
8U38	Lenkendstufe	Steering terminal stage
8U39	Baugruppentraeger	Component holder
8U40	Ser./Par. Wandlung	Ser./par. transformation
8U41	Converter-RS232-20 mA	Converter - RS232 - 20mA
8U42	Lichtschanke-Sender Mast	Light berrier transmitter, mast
8U43	Lichtschanke-Sender Schutzdach	Light barrier transmitter, overhead guard
8U44	Lichtschanke-Sender Schutzdach	Light barrier transmitter, overhead guard
8U45	Sendespule	Sending coil
8U46	Frequenzgeber	Frequency transmitter
8U47	D/A Wandler	D/A converter
8U48	Relaismodul	Relay module
8U48.1	Relaismodul	Relay module
8U49	Modul Widerstände	Module Resistors
8U50	Bordcomputer	Onboard Computer
8U51	Sensor Höhenanzeige / -vorwahl	Sensor Height Display/Preselection
8U52	Sensorlager Freihub	Sensor Bearing Free Lift
8U53	Datenfunk Terminal	Radio Data Transmission Terminal
8U54	Modul-Widerstaende-2	Module resistance 2
8U55	Ladeschaltung	charging connection
9U1	Funksender Sicherheitsbereich Senken	Radio transmitter, safety area for lowering
9U1.1	Funksender Sicherheitsbereich Senken	Radio transmitter, safety area for lowering
9U2	Funkempfaenger Sicherheitsbereich Senken	Radio receiver, safety area for lowering
9U2.1	Funkempfaenger Sicherheitsbereich Senken	Radio receiver, safety area for lowering
9U3	Funksender Handsender Senken	Radio transmitter, manual transmitter for lowering

(D)

(GB)

9U4	Spannungsreduziergerät	Voltage reducer
9U5	Kraftstoffsensor	Fuel sensor
9U6	Sensor Öldruck	Engine oil pressure sensor
9U7	Steuergerät Katalysator	Catalyzer controller
9U8	Druck Fahrpumpe A	Pressure travel pump A
9U9	Druck Fahrpumpe B	Pressure travel pump B
9U13	ECU-Diesel	ECU Diesel
9U14	ECU-Gas	ECU Gas
9U15	Truck-Control-Unit	Truck Control Unit
9U16	Zentralelekt	Main electrics
9U17	Steuerung DPF	DPF controller
9U17	Handfunksender	Manual radio transmitter
9U18	Funkempfänger	Radio receiver
9U19	Motorcontroller	Motor controller

V	Dioden	Diodes
V1	Freilauf- und Sperrdioden	Free-wheeling and blocking diodes
V2	Sperrdiode	Blocking diode
V3	Sperrdiode	Blocking diode

W		
9W1	Radioantenne	Radio antenna

X	Klemmen, Stecker, Steckdosen	Terminals, connectors, sockets
X1	Klemmleisten	Terminal strips
X1.1	Klemmsockel-plus	Terminal socket, positive
X1.2	Klemmsockel-minus	Terminal socket, negative
X10	Batterie-Steckdose	Battery socket

(D)		(GB)
X11	Batterie-Stecker	Battery connector
X40	Batterie-Steckdose	Battery socket
X41	Batterie-Stecker	Battery connector
X42	Stecker Ladegerät Buchse	Plug Charger Socket
X44	Daten- und Steueranschluss Ladegerät	Charger data and control connection
X200	Service-Stecker	Service connector
X432	Ladegerät Fahrbetrieb	Charger Travel Mode
X680	Zugangsmodule-Fahrzeug E-Anlage	Access module-electric truck system
X681	Zugangsmodule-Kundenlaptop/BDE	Access module-customer laptop/OU
X682	BDE-Datarecorder	OU-data recorder
X683	Datarecorder-Funkmodul	Data recorder-radio module
X684	Datarecorder-Sensoren	Data recorder-sensors
X685	Datarecorder-Kundenlaptop	Data recorder-customer laptop
Y	Elektrisch betätigte mechanische Einrichtungen	Electrically operated mechanical systems
1Y1	Umschaltung-volle-Bremsung	Solenoid valve, change-over - full braking
1Y2	Umschaltung-reduzierte-Bremsung	Solenoid valve, change-over - reduced braking
1Y3	Magnetventil Fahren vorwärts	Foreward drive solenoid
1Y4	Magnetventil Fahren rückwärts	Reverse drive solenoid
1Y5	Sicherheitsbremse links	LH safety brake
1Y6	Sicherheitsbremse rechts	RH safety brake
1Y10	Abstellklappe	Shutoff valve
1Y11	Ventil PD Zyl1	PD
1Y12	Ventil PD Zyl 2	PD cyl 2 valve
1Y13	Ventil PD Zyl 3	PD cyl 3 valve
1Y14	Ventil PD Zyl 4	PD cyl 4
1Y15	Ladedruckbegrenzung	Charge pressure relief
1Y16	Abgasrückführungsventil	Exhaust return valve

D		GB
1Y17	Magnetventil-Lüfter	Fan solenoid
1Y18	Ventil für Einspritzbeginn	Injection start valve
1Y19	Mengensteller	Flow adjuster
2Y1	Magnetventil - Heben	Solenoid valve - lifting
2Y2	Magnetventil - Heben langsam	Solenoid valve - slow lifting
2Y3	Magnetventil - Heben schnell	Solenoid valve - rapid lifting
2Y4	Magnetventil Abschaltung - Heben (IF)	Solenoid valve disconnection - lifting (IG)
2Y5	Magnetventil - Senken	Solenoid valve - lower
2Y5.1	Heben Initialhub	Lifting - initial lift
2Y6	Magnetventil - Senken langsam	Solenoid valve - slow lowering
2Y7	Magnetventil - Senken schnell	Solenoid valve - rapid lowering
2Y8	Magnetventil - Senken Schleichgang (bei Z-Mast)	Solenoid valve - lowering at inching speed (Z-mast)
2Y9	Magnetventil - Schwenken links	Solenoid valve - swivelling left
2Y10	Magnetventil - Schwenken rechts	Solenoid valve - swivelling right
2Y11	Magnetventil - Schwenken Schleichgang	Solenoid valve - swivelling at inching speed
2Y12	Magnetventil Verriegelung - Drehen	Solenoid valve - swivelling interlocking
2Y13	Magnetventil Schieben links (Schubschlitten)	Solenoid valve - traversing left (traversing carriage)
2Y14	Magnetventil Schieben rechts (Schubschlitten)	Solenoid valve - traversing right (traversing carriage)
2Y15	Magnetventil Schieben im Schleichgang	Solenoid valve - traversing at inching speed
2Y16	Magnetventil - Schieben links (Schubrahmen)	Solenoid valve - traversing left (traversing frame)
2Y17	Magnetventil - Schieben rechts (Schubrahmen)	Solenoid valve - traversing right (traversing frame)
2Y18	Magnetventil Zinkenverstellung	Solenoid valve - tine adjustment
2Y18.1	Magnetventil Zinkenverstellung	Solenoid valve - tine adjustment
2Y18.2	Magnetventil Zinkenverstellung	Solenoid valve - tine adjustment
2Y18.3	Magnetventil Zinkenverstellung	Solenoid valve - tine adjustment
2Y19	Gabelverstellung TG	Fork adjustment TG
2Y20	Magnetventil - Heben/Senken (Zusatzhub)	Solenoid valve - lifting/lowering (aux. lift)
2Y21	Magnetventil - Heben/Senken (Zusatzhub)	Solenoid valve - lifting/lowering (aux. lift)

D		GB
2Y22	Magnetventil - Schieben/Stop	Solenoid valve - traversing/stop
2Y23	Magnetventil - Senken/Stop	Solenoid valve - lowering/stop
2Y24	Magnetventil - Antriebsdruck Federbein	Solenoid valve for drive pressure spring leg
2Y25	2. Einstapeltiefe	Second stacking row
2Y26	Magnetventil - Schieben/vor	Solenoid valve - traversing out
2Y27	Magnetventil - Schieben/zurück	Solenoid valve - traversing in
2Y28	Proportionalventil Heben-Schieben-Drehen	Proportional valve, lifting / traversing / swivelling
2Y29	Proportionalventil Senken	Proportional valve, lowering
2Y30	Umschaltung Zusatzhub	Change-over - auxiliary lift
2Y31	Magnetventil Umschaltung Anbaugerät	Solenoid valve - change-over to attachment
2Y32	Proportionalventil Heben/Senken	Proportional valve - lifting / lowering
2Y33	Mengenregler - Schieben	Volume control valve - traversing
2Y34	Mengenregler - Schwenken	Volume control valve - swivelling
2Y35	Umgehungsventil	By-pass valve
2Y36	Umgehungsventil Schieben-Schleichgang	By-pass valve traversing at inching speed
2Y37	Lasthalteventil	Load holding valve
2Y38	Sperrventil / I-Mast	Blocking valve - I-mast
2Y39	Magnetventil Gabelvorschub	Solenoid valve - fork traversing
2Y40	Magnetventil Mastdämpfung	Solenoid valve - mast damping
2Y41	Magnetventil Sperren / Drehen	Solenoid valve lock / turn
2Y42	Rücklaufsperrventil	Return-flow stop valve
2Y43	Proportionalventil Last	Proportional valve, load
2Y44	Magnetventil Schieben vor	Solenoid valve traversing forward
2Y45	Magnetventil Schieben zurück	Solenoid valve traversing backward
2Y46	Magnetventil Neigen vor	Solenoid valve tilting forward
2Y47	Magnetventil Neigen zurück	Solenoid valve tilting backward
2Y48	Magnetventil ZH1 vor	Solenoid valve ZH1 forward
2Y49	Magnetventil ZH1 zurück	Solenoid valve ZH1 backward

Ⓓ	Ⓔ	
2Y50	Magnetventil ZH2 vor	Solenoid valve ZH2 forward
2Y51	Magnetventil ZH2 zurück	Solenoid valve ZH2 backward
2Y52	Magnetventil Heben Initial	Solenoid valve - initial lifting
2Y53	Magnetventil Senken Initial	Solenoid valve - initial lowering
2Y54	Magnetventil Schieben-Drehen	Solenoid valve - traversing / swivelling
2Y57	Magnetventil Drehen links, rechts	Solenoid valve - swivelling to left / right
2Y58	Magnetventil-Rampenhub-Heben	Solenoid valve ramp lifting - lift
2Y59	Magnetventil-Heben-Haupthub	Solenoid valve - lift - main lift
2Y60	Magnetventil-Senken-Haupthub	Solenoid valve - lower - main lift
2Y61	Proportionalventil-Senken-ZH-Schwenken	Proportional valve - lower - ZH - swivel
2Y62	Magnetventil-Heben-Zusatzhub	Solenoid valve - lift - auxiliary lift
2Y63	Magnetventil-Senken-Zusatzhub	Solenoid valve - lower - auxiliary lift
2Y64	Magnetventil-Schieben-rechts	Solenoid valve - traversing - right
2Y65	Magnetventil-Schieben-links	Solenoid valve - traversing - left
2Y66	Magnetventil-Schwenken-links	Solenoid valve - swivel - left
2Y67	Magnetventil-Schwenken-rechts	Solenoid valve - swivel - right
2Y68	Magnetventil-Schieben-Schwenken-ZH-heben	Solenoid valve - traversing - swivel - ZH - lift
2Y69	Magnetventil-Schieben-Schwenken-synchron	Solenoid valve - traversing - swivel - synchronic
2Y70	Magnetkupplung 3. Teleskopgabel	Magnetic coupling, 3rd telescopic fork
2Y71	Magnetbremse 3. Teleskopgabel	Magnetic brake, 3rd telescopic fork
2Y72	Magnetventil Stützrolle ausfahren	Solenoid valve - extend supporting roller
2Y73	Magnetventil Stützrolle einfahren	Solenoid valve - retract supporting roller
2Y74	Magnetventil Notablass	Solenoid valve - emergency draining
2Y75	Magnetventil Umschaltung Führungsrollen	Solenoid valve - switching of guide rollers
2Y76	Magnetventil Führungsrollen weit	Solenoid valve - switching of guide rollers, wide
2Y77	Magnetventil Führungsrollen eng	Solenoid valve - switching of guide rollers, narrow
2Y78	Magnetventil-2-Gang	2-way solenoid valve
2Y79	Magnetventil-Neigen-Seitenschub	Solenoid valve, tilt/side shift

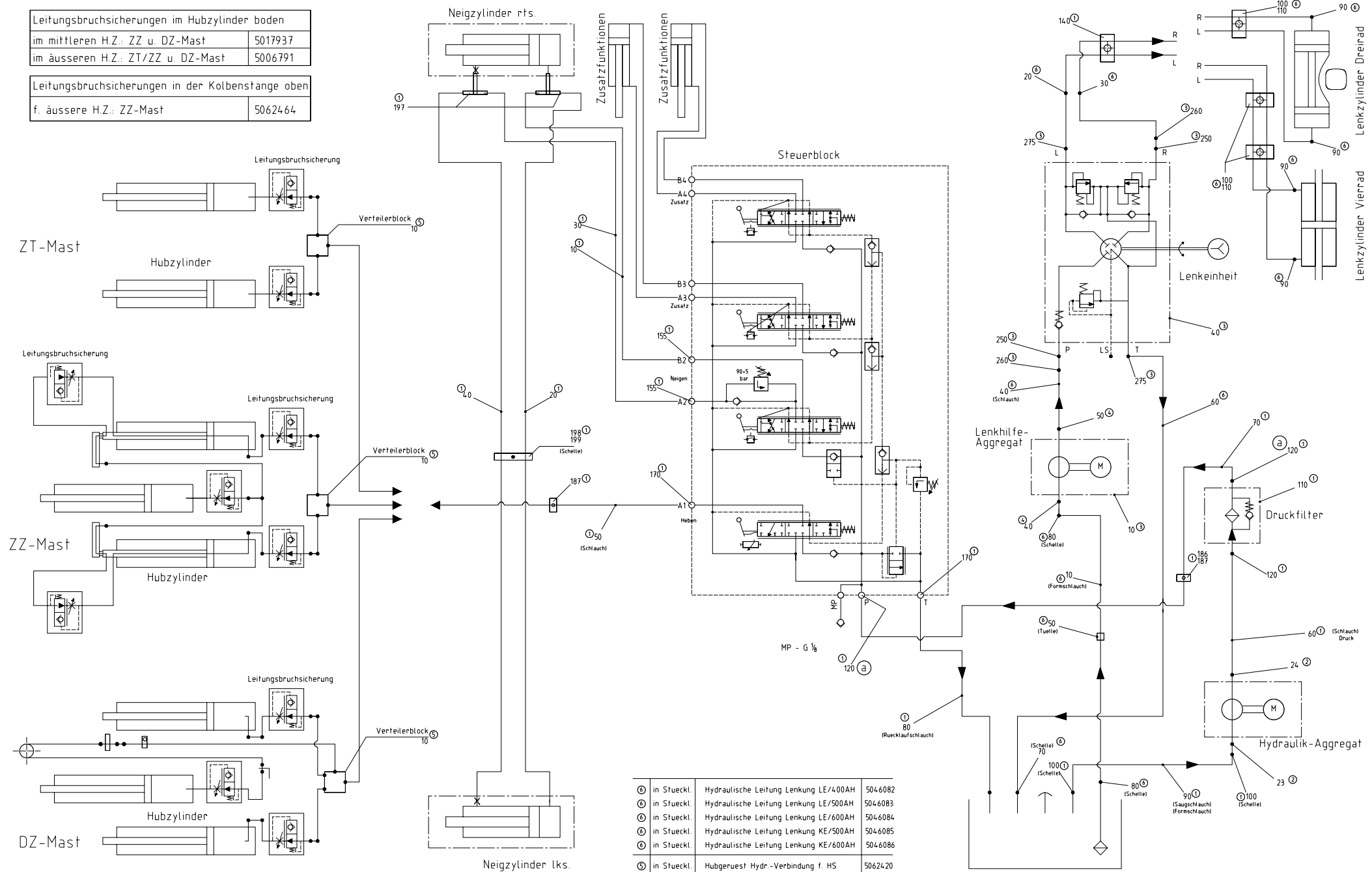
D		GB
2Y80	Magnetventil-Seitenschub	Solenoid valve, side shift
2Y81	Magnetventil-Zusatzfunktion-HF5	Solenoid valve, auxiliary function HF5
2Y82	Magnetventil-Gabel-Neigen-Zusatzfunktion-HF6	Solenoid valve, tilt fork, auxiliary function HF6
2Y83	Ventil HF 3	HF 3 valve
2Y84	Ventil HF 4-5	HF 4-5 valve
2Y87	Magnetventil Freigabe Arbeitsfunktionen	Operating functions release solenoid
2Y88	Magnetventil Retarder	Solenoid retarder
2Y89	Magnetventil Freigabe Fahren	Travel release solenoid
2Y92	Proportionalventil-ZH1-vor	ZH1 forward prop. valve
2Y93	Proportionalventil-ZH1-zurück	ZH1 rev. proportional valve
2Y94	Proportionalventil-Neigen-vor	Fwd. tilt proportional valve
2Y95	Proportionalventil-Neigen-zurück	Rev. tilt proportional valve
2Y96	Magnetventil Masthub	Mast lift solenoid
2Y97	Magnetventil Initialhub	Initial lift solenoid
2Y100	Verriegelung Heben	Lift lock
2Y101	Verriegelung Neigen	Lower lock
2Y102	Verriegelung ZH1	Lock ZH1
2Y103	Verriegelung ZH 2	Lock ZH2
2Y104	Absperrventil Klammer	Clamp shutoff valve
2Y105	Absperrventil Klammer	Clamp shutoff valve
3Y1	Magnetventil Lenkhilfe	Solenoid valve - steering booster
3Y2	Magnetventil Lenkradarretierung	Solenoid valve - steering wheel lock
3Y3	Magnetkupplung Lenkarretierung	Magnetic coupling steering arrester
3Y4	Magnet Lenkarretierung	Magnet - steering arrester
3Y5	Magnetbremse Lenkrad	Steering wheel magnetic brake
7Y1	Magnetventil Bremse/lösen	Solenoid valve - release brake
7Y2	Magnetventil für Totmannbremse	Solenoid valve - deadman brake
7Y3	Magnetbremse	Magnetic brake

D		GB
7Y4	2stufige Magnetbremse	2-stage magnetic brake
7Y4.1	2stufige Magnetbremse	2-stage magnetic brake
7Y4.2	2stufige Magnetbremse	2-stage magnetic brake
7Y5	Magnetventil Notstop-Bremsanlage	Solenoid valve - emergency stop brake system
7Y6	Magnetbremse Lastrad rechts	Solenoid brake, right load-bearing wheel
7Y7	Magnetbremse Lastrad links	Solenoid brake, left load-bearing wheel
7Y31	Zweistufenbremse - Hauptwicklung	Two-stage brake - main coil
7Y32	Zweistufenbremse - Nebenwicklung	Two-stage brake - secondary coil
7Y33	Zugmagnet Bremse	Pull-type electromagnet brake
7Y34	Haltemagnet Bremse	No-work magnet brake
7Y35	Zugmagnet Not-Stop	Emergency Stop pull-type solenoid
7Y36	Haltemagnet Not-Stop	Emergency Stop arresting solenoid
8Y1	Magnetventil Höhenvorwahl	Solenoid valve - height selection system
8Y2	Magnetventil Einstapelautomatik	Solenoid valve - automatic stacking system
8Y3	Abfragemagnet	Inquiry magnet
8Y4	Umschaltventil	Change-over valve
8Y5	Servo-Ventil IF	Servo-valve IG
8Y6	Senksperrventil (Überlastsicherung)	Blocking valve - lowering (Overload protection)
8Y30	Hydro-Spannventil	Hydraulic tension valve
8Y31	Magnetventil Not-Stop	Solenoid valve emergency stop
8Y32	Magnetventil Speicher	Solenoid valve - storage
8Y33	Umschaltventil	Change-over valve
8Y34	Automatik-Ventile IF	Automatic valves IG
8Y35	Servo-Ventil	Servo-valve
8Y36	Lenkverriegelung	Steering interlock
8Y37	Ventil - Gabel - Neigen	Valve - fork - tilting
8Y38	Ventil - Seitenschub	Valve - lateral traversing
8Y39	Ventil-Batterieentriegelung	Battery unlatch valve

JUNGHEINRICH	Schaltplanben., el. / Index of el. wiring diagrams	05.09	64	Ⓓ / Ⓔ
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Ⓓ		Ⓔ	
9Y1	Magnetventil Kraftstoffabschaltung	Fuel shut-off solenoid	
9Y2	Regelventil	Pilot valve	
9Y3	Magnet Bedienpultverstellung	Control panel adjustment magnet	
9Y5	Magnetventil für Kaltstarteinstellung	Cold start setting solenoid	
9Y6	Magnetkupplung Kompressor	Compressor magnetic coupling	
Z	Filter	Filter	
Z1	Filter	Filter	
Z1	Filter	Filter	

Leitungsbruchsicherungen im Hubzylinder boden	
im mittleren H.Z.: ZZ u. DZ-Mast	5017937
im äusseren H.Z.: ZT/ZZ u. DZ-Mast	5006791
Leitungsbruchsicherungen in der Kolbenstange oben	
f. äussere H.Z.: ZZ-Mast	5062464

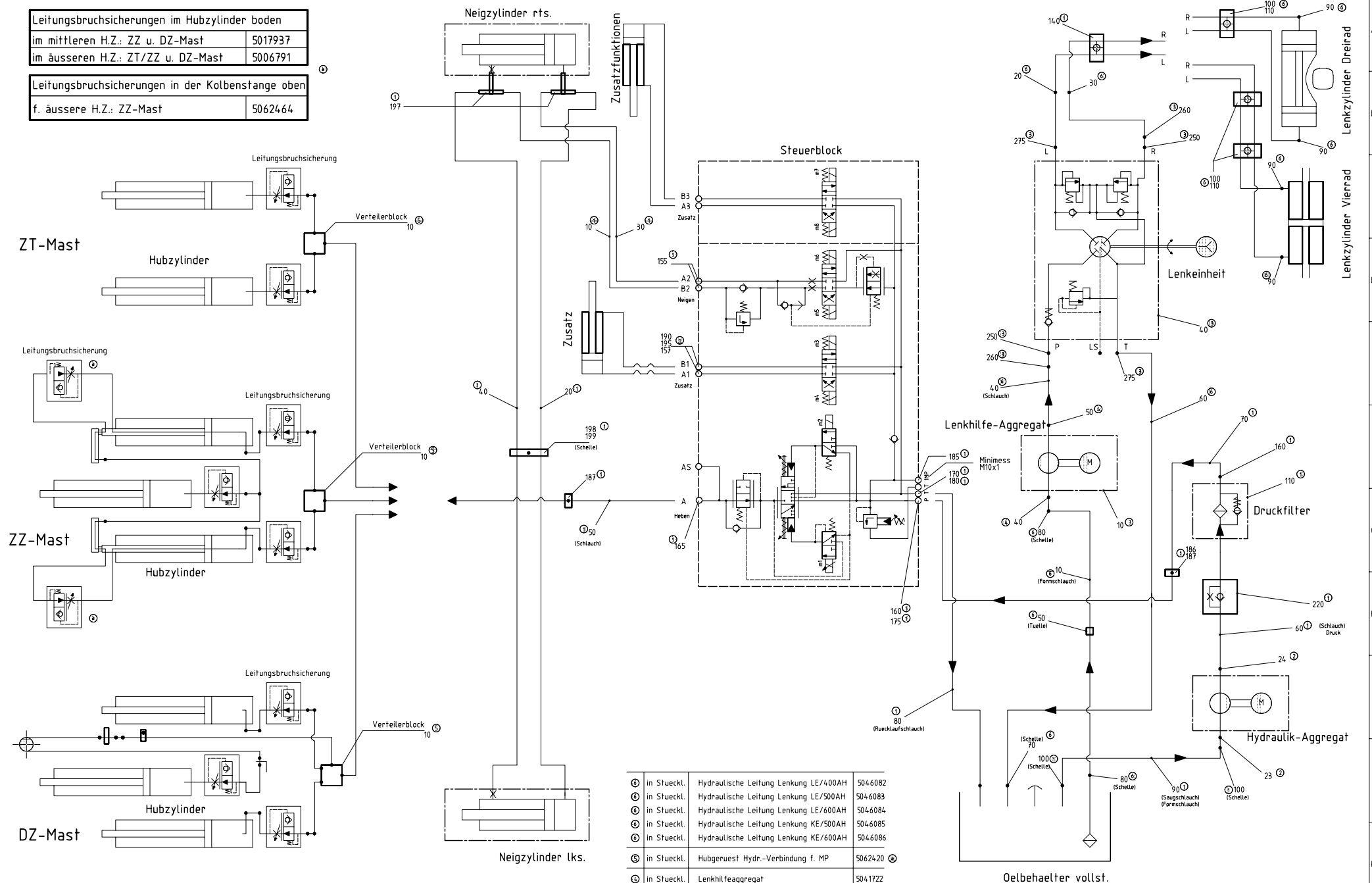


④	in Stueckl.	Hydraulische Leitung Lenkung LE/400AH	504608
④	in Stueckl.	Hydraulische Leitung Lenkung LE/500AH	504608
④	in Stueckl.	Hydraulische Leitung Lenkung LE/600AH	504608
④	in Stueckl.	Hydraulische Leitung Lenkung KE/500AH	504608
④	in Stueckl.	Hydraulische Leitung Lenkung KE/600AH	504608
⑤	in Stueckl.	Hubgeruest Hydr.-Verbindung f. HS	5062420
④	in Stueckl.	Lenkhilfegaagregat	5047222
③	in Stueckl.	Lenkung kompl. mit Lenkhilfe	504713
②	in Stueckl.	Hydraulikaggregat 48V	504551
①	in Stueckl.	Hydr. Leitung ST.-0-HS	5063123

Ölbehälter vollst

			Datum	Name	Format	A1	Status	Macrofilm
			Bearb.	15.08.98	Kammerer			
			Gepzr	Schmid	Benennung			
			Norm		HYDRAULIKPLAN 3 u 4-R			
					mit Handsteuerung			
				Stenbock Zeichnungsnummer	Stücklistennummer	Blat		
				Fördertechnik	05046236	t		
a	B0001	2x	23.02.99 KA		Ers f	Ers d		01
Eustf	Änderung	Datum	Name/Urspr					

Leitungsbruchsicherungen im Hubzylinder boden	
im mittleren H.Z.: ZZ u. DZ-Mast	5017937
im äusseren H.Z.: ZT/ZZ u. DZ-Mast	5006791
Leitungsbruchsicherungen in der Kolbenstange oben	
f. äussere H.Z.: ZZ-Mast	5062464



④	in Stueckl.	Hydraulische Leitung Lenkung LE/400AH	5046082
④	in Stueckl.	Hydraulische Leitung Lenkung LE/500AH	5046083
④	in Stueckl.	Hydraulische Leitung Lenkung LE/600AH	5046084
④	in Stueckl.	Hydraulische Leitung Lenkung KE/500AH	5046085
④	in Stueckl.	Hydraulische Leitung Lenkung KE/600AH	5046086
⑤	in Stueckl.	Hubgeruest Hydr.-Verbindung f. MP	5062420 ④
④	in Stueckl.	Lenkhilfaggregat	5041722
③	in Stueckl.	Lenkung kompl. mit Lenkhilfe	5041713
②	in Stueckl.	Hydraulikaggregat 48V	5041551
①	in Stueckl.	Hydr. Leitung ST.-0-MP	5063043

		Datum	Name	Format	A1	Status	Maschine
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				steinbock	Zeichnungsnummer	Stücklistennummer	Blatt
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a	4x B385	07.09.98Ka				lsgd.	
Real/Angebot	Idung/Rundzug		Schulzvermerk nach DIN 34 beachten				