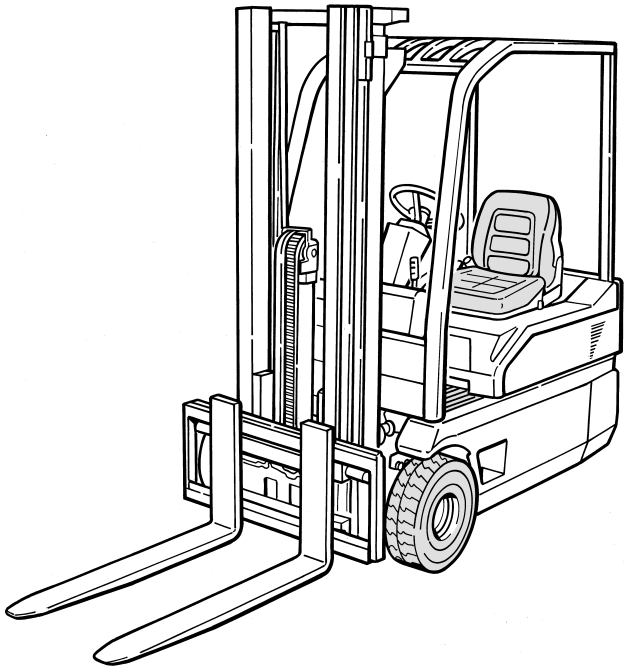
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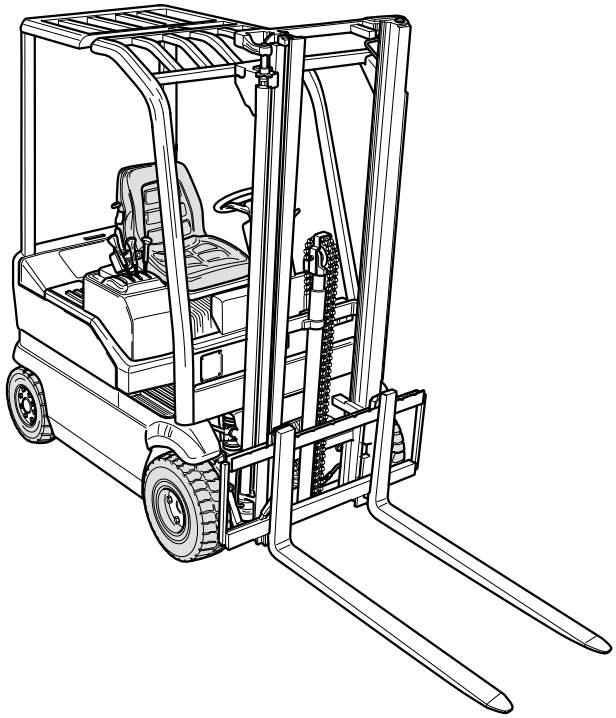
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SHOP MANUAL

Series 4016
XE 12³ • XE 15³
XE 18³



Series 4017
XE 15 • XE 18



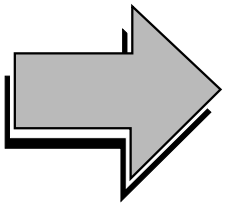
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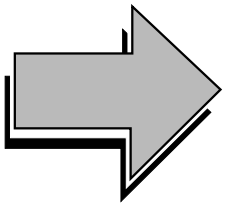
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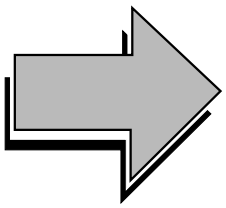
Chapter 00
Introduction



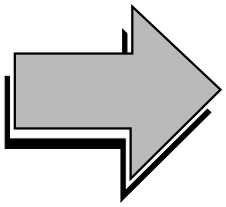
Chapter 10
Technical operating information



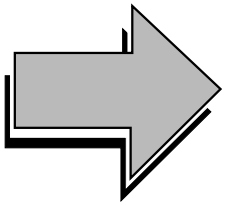
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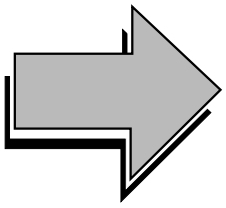
Chapter 30
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Chapter 31
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Chapter 40
Electrical section



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Chapter 00

INTRODUCTION

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00.1 - GENERAL SAFETY INSTRUCTIONS

PAY ATTENTION TO THIS SYMBOL

**This symbol indicates that the health and safety of people are at risk;
it provides warning that safety precautions must be taken to prevent accidents.
It means "ATTENTION – BE CAREFUL – YOUR SAFETY IS AT RISK"**

AVOIDING ACCIDENTS

The majority of mishaps or accidents occur in the shop as a result of someone failing to observe the basic, simple safety precautions and standards in place. Most accidents and their consequences can be avoided by exercising the necessary caution and good sense to prevent them from happening in the first place.

No matter how well a machine has been engineered or built, it is impossible to eliminate all the causes of accidents, but a careful and prudent mechanic can offer the best guarantee against mishaps.

Simply observing a single, basic safety precaution with scrupulous attention is often enough to avoid many serious accidents.

SAFETY INSTRUCTIONS

General description

Follow all maintenance and repair procedures carefully.

ATTENTION

Never clean, lubricate, or maintain a vehicle while the battery is still connected.

- Do not wear rings, wristwatches, jewelry, or loose and dangling clothing such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that could become caught in moving parts.
- Wear approved, protective clothing such as hard hats, non-slip shoes, gloves, and safety glasses.
- Do not service the machine if someone is in the operator's seat unless it is a qualified technician helping with the maintenance operations.
- Do not operate the machine or its equipment from anywhere except the operator's seat.
- Stop the engine and make sure that the pressure has been released from all hydraulic systems before removing caps or covers.
- Refer to the appropriate instructions in this manual.
- Take all the necessary precautions when performing any service operation.
- Make sure that ladders and service platforms used in the shop or at the site comply with current safety standards.

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- Label all the controls to indicate that the vehicle is being serviced. Place blocks under the machine or any part that must be lifted.
- Do not smoke while checking or topping up the fuel tank, hydraulic oil tank, or the battery due to the flammability of the fluids.
- Stabilize the machine with blocks or other similar devices because the brakes become inactive when released manually for the purposes of servicing the machine.
- Connect trailers carefully by means of the fixed hitch points only, and make sure that the pins and/or bolts are firmly in place before towing. Do not stand near tow bars, cables, or chains that are under strain.
- Use a trailer or lowered flatbed truck, if available, to transport a broken down machine.
- Load and unload the machine onto or from the transport vehicle on a flat area that firmly supports the wheels of the trailer or the truck.
- Secure the machine firmly to the flatbed of the truck or trailer and block the wheels.
- Use only ancillary sources of power that are adequately grounded to avoid electric shocks when using electric heaters, battery chargers, or other similar equipment.
- Lift or transport heavy parts by means of a crane or other similar equipment that is capable of handling the weight, and make sure that no one is in the vicinity.
- Be alert if people are in the vicinity.
- Never pour gasoline or diesel fuel into open, wide and low containers to prevent spillage or inflammable fumes from collecting.
- Never use gasoline, diesel, or other inflammable liquids as detergents. Use commercial, non-toxic, non-flammable solvents instead.
- Wear wrap-around safety glasses when using compressed air to clean parts.
- Limit pressure to a maximum of 2.1 bars, in accordance with current local or national regulations.
- Do not smoke or use an open flame or cause sparks when working near or handling inflammable materials.
- Do not use an open flame as a means of illumination when performing operations or to look for “leaks” from the machine.
- Leave all the safety devices in place when operating the machine
- Do not leave a machine with moving parts unattended.
- Always apply the parking brake and switch off the engine before leaving the operator’s seat. Remove the ignition key.
- Switch off the engine before freeing a part that has become stuck for some reason.
- Move around very carefully when performing work under, on, or near the machine.
- Wear appropriate safety clothing, such as hard hats, glasses, and safety shoes.

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- Take the machine to a flat area and place blocks under the wheels if it needs to be serviced outside the shop. If servicing the machine on a slope cannot be avoided, place blocks under the wheels then move it to a flat area as soon as it is safe to do so.
- Do not use dented or bent chains or cables to lift or pull machinery. Always wear safety gloves to handle this type of equipment.
- Attach chains securely, making sure that the attachment is capable of supporting the load and that no one is in the vicinity of the attachment, the chains, or cables.
- Keep the maintenance area clean and dry. Clean up water puddles or oil stains immediately.
- Do not pile up rags soaked in grease or oil because they pose a serious fire hazard.
- Keep them in a closed, metal container.
- Check, adjust, and lock the operator’s seat in place before starting the machine or other equipment.
- Make sure that no one is within the radius of action of the machine or equipment.
- Do not carry objects in your pockets that may fall unnoticed into the machine.
- Wear wrap-around glasses, hard hats, safety shoes and gloves if there is a danger of being struck by metal parts or similar objects.
- Wear protective clothing such as dark glasses, hard hats, overalls, gloves and shoes when operating a welder. Even individuals who are not actually welding but are in the vicinity should also wear dark glasses. **Never look at the welding arc without wearing adequate eye protection.**
- Always wear safety clothing, such as gloves, glasses, etc., to handle metal cables because they become frayed with use.
- Handle all parts carefully. Keep hands and fingers away from cracks, gears, and similar areas.
- Always wear approved safety clothing, such as safety shoes and glasses.
- Use a pit or a vehicle lift that can support the weight of the truck when working underneath it.
- Remove all tools from the machine after every maintenance operation; check that there are no loose parts or screws.
- Check that the lights are in the correct position and working properly before driving on the road at night.

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ELECTRICAL SYSTEM

Remember that when working with batteries, the ends of the cables must be connected to the terminals as follows: (+) with (+) and (-) with (-).

Do not short-circuit the terminals. The fumes emitted from the battery are highly flammable. When recharging the battery, leave the battery compartment open to ventilate the area more effectively and remove the caps. Never check the status of the battery charge by the “sparks” that occur when metal objects are placed on the terminals. Avoid creating sparks or flames near the battery.

Do not smoke near the battery to avoid the risk of explosions.
Check for electrolyte leaks and eliminate them if necessary before performing any operation.

Check for short-circuits and eliminate them if necessary before performing any operation.

Do not recharge the battery in a closed environment; make sure that there is adequate ventilation to avoid accidental explosions from fumes that have accumulated while the battery is recharging.

HYDRAULIC SYSTEM

Fluid trickling from a tiny hole may be almost invisible and have enough force to penetrate the skin, in which case, always use a piece of cardboard to check for leaks rather than your hands. If the fluid does come into contact with the skin, seek emergency medical help immediately to prevent a possible infection or skin disease that may result.

Use the appropriate instruments to check the pressure of the hydraulic system.

DETACHING AND REATTACHING PARTS

Lift and handle heavy parts with a lifting means that is capable of handling the weight. Use the appropriate hooks and slings to support the parts, and use the ringbolts provided for this purpose.
Be alert if people are in the vicinity of the load being lifted.

Handle all parts very carefully. Do not put your hands or fingers between parts. Wear approved safety clothing such as safety glasses, gloves, and shoes.

Avoid twisting the chains or metal cables.

Always wear safety gloves to handle the cables and chains.

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00.2 - SAFETY WARNINGS FOR OPERATING THE TRUCK

IMPORTANT:

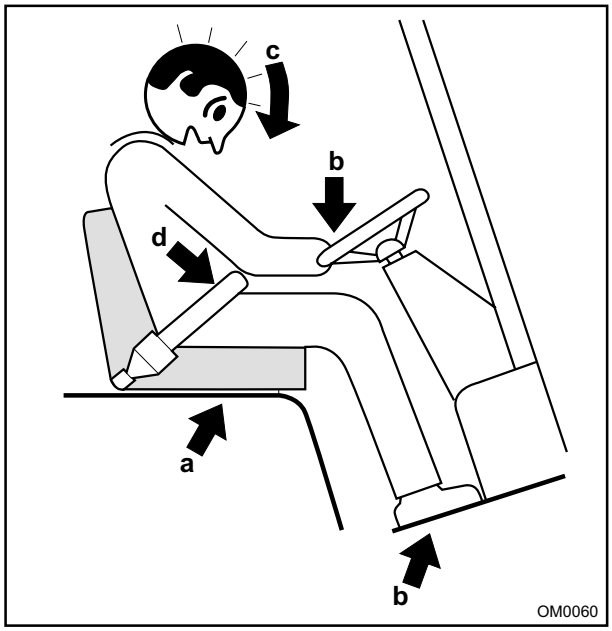
Below is a partial list of safety instructions that must be observed. These rules form part of, and do not replace, the standards described in the "Safety Instructions for Industrial Forklift Trucks" manual provided with the truck.

- Do not allow the truck to be used by unqualified, untrained, or unauthorized persons.
- Do not install attachments on the truck unless they have been supplied or approved by the manufacturer.
- Always maintain the truck in good condition, a prerequisite for minimizing risks.
- Keep the warning notices on the truck in good condition, and replace them if they are damaged.
- Carefully read and observe all the safety instructions on the truck.
- Make sure that there is enough free space above the truck.
- Do not park the truck in front of fire extinguishers, emergency exit stairs, or anywhere where it can block traffic.
- Do not use the truck if it shows signs of damage or breakage and cannot be used safely, in which case stop the vehicle, park it, and notify the maintenance supervisor.
- Pay attention to the distance that must be maintained when working near overhead high-tension wires. Observe the safe distances established by the responsible authorities.
- Never lift loads with only one fork.
- Lift loads by inserting the forks in the load center. Driving with off-center loads at the side or front may compromise the stability of the truck.
- Make sure that the surface supporting the load can carry the weight.
- Always use protective clothing in accordance with current regulations.
- Do not drive over uneven or obstructed terrain or steps.
- Do not drive with loads elevated more than 300 mm from the ground and with the mast NOT tilted backward.
- Do not turn around or stack on slopes.
- Do not exceed the carrying capacity limits indicated on the appropriate plates.
- Always use the operator safety devices (for example, safety belt, etc.).

SAFETY INSTRUCTIONS IF THE TRUCK TIPS OVER

Carefully follow the instructions below if the truck starts to tip over due to incorrect maneuvers:

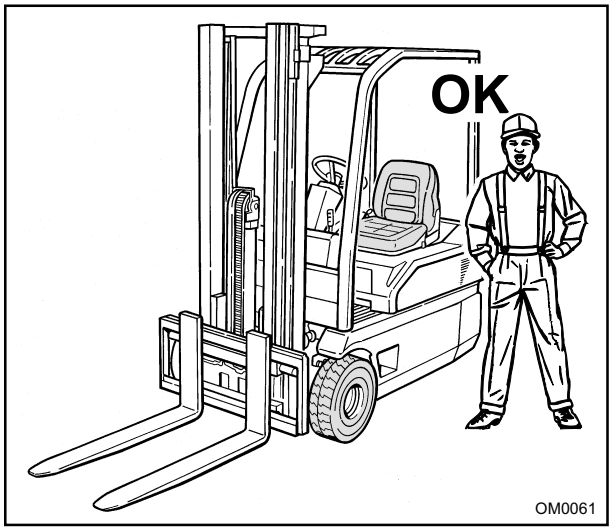
a) Do not abandon the truck
b) Remain securely in the seat, grasp the steering wheel, and keep your feet firmly on the floor.
c) Bend your head forward and move your body in the opposite direction to which the truck is tilting.
d) If the truck tips over, wait until it has reached a stable position before climbing out.



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SAFETY INSTRUCTIONS FOR OPERATING THE TRUCK

- Have confidence in the safety and reliability of the truck.
- Become familiar with the truck so that you can accurately describe malfunctions and thus be of assistance to the maintenance technicians. Trained and authorized operators must be familiar with the controls and functions of the truck.
- Report malfunctions (unusual noises, leaks, etc.) immediately because they could result in damage on a much larger scale if ignored.
- Perform the inspections described in the chapter «Daily inspections» in the Use and Maintenance manual.



IMPORTANT:

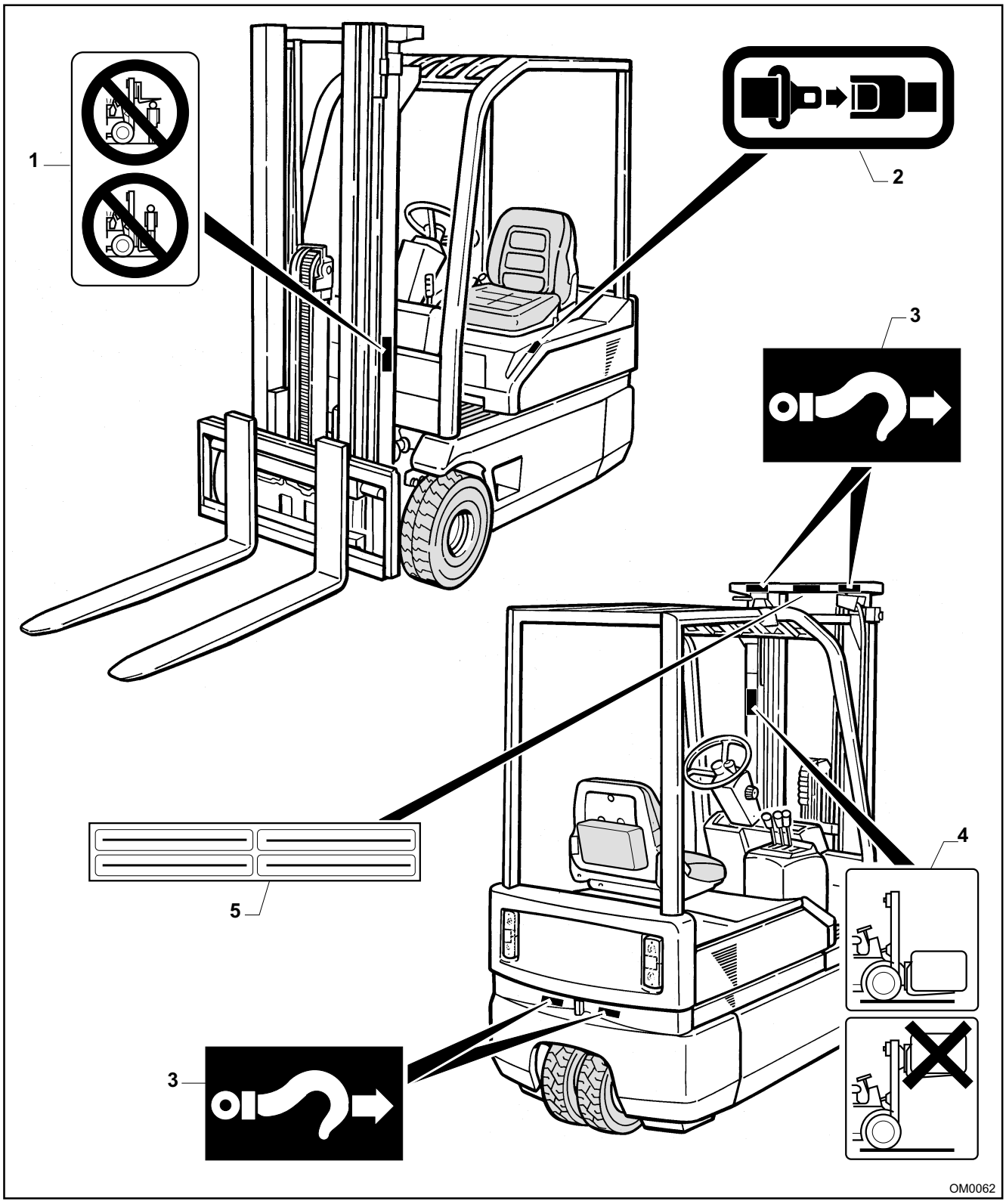
Report any oil and/or battery fluid leaks because they are dangerous and highly polluting substances.

ATTENTION:

If there is a smell of burning, stop the truck, switch off the engine, and unplug the battery.

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00.3 - LOCATION OF THE WARNING PLATES

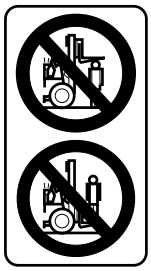


Legend

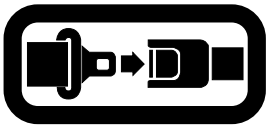
1 Fork safety
2 Fasten the seat belt
3 Lifting point of the truck
4 Driving with load
5 Attention! Do not overload

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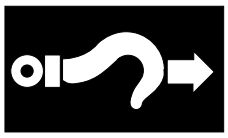
DESCRIPTION OF THE PLATES



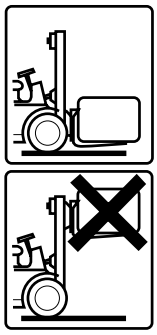
This symbol indicates that it is not permitted to remain or step under raised forks or carry passengers.
Plate with white background, red X-sign, black graphic.



This symbol indicates that the seat belt must be fastened while driving.
Plate with yellow background, black graphic.



This symbol indicates the lifting point of the truck.
Plate with yellow background, black graphic.



This symbol indicates that it is not permitted to drive with a raised load.
Plate with white background, black border and graphic, red X-sign.



This symbol indicates that the forks must not be overloaded.
Refer to the carrying capacity table.
Plate with black background, white border and wording.

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00.4 - TRUCK SAFETY

The truck has been engineered to provide maximum safety for the driver and minimum risk of damage to the truck. The truck includes the following safety devices:

OPERATOR SENSOR

- The sensor is located on the seat and is activated when the operator sits in the seat. The truck can function only when this sensor has been activated.

HAND BRAKE MICROSWITCH

- The microswitch prevents the truck from functioning by cutting off power to the motors when the hand brake is applied.

OPERATION SEQUENCE CONTROL

- The electronic system checks the sequence of operations to avoid dangerous maneuvers. It sends an alarm signal if the truck is started with the accelerator pedal depressed or the lift lever is activated.

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00.5 - HOW TO USE THE SHOP MANUAL

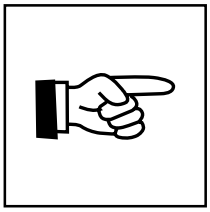
- This manual is divided into chapters covering different topics. There is a table of contents at the beginning of each chapter for ease of consultation, and the chapter, version, revision, and page numbers are repeated on each page.
- The following symbols are used to indicate the safety warnings contained in the manual:



DANGER TO PEOPLE
Failure to observe some or all of the instructions indicated by this symbol might seriously compromise the safety of the operator or maintenance personnel.



DANGER TO THE TRUCK
Failure to observe some or all of the instructions indicated by this symbol might cause serious damage to the truck and in some cases void the warranty.



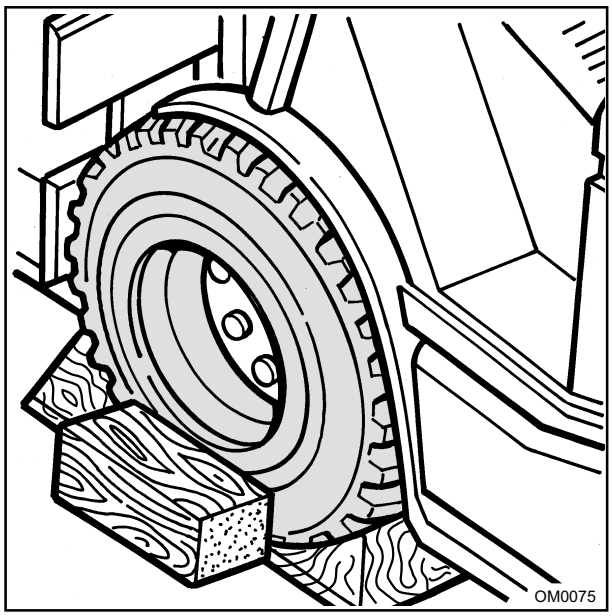
IMPORTANT INFORMATION
This symbol indicates important information for the operator.

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00.6 - TRANSPORTING AND LIFTING THE TRUCK

TRANSPORTING THE TRUCK

The truck is usually transported complete with its mast by road or rail. If the truck is bigger than the permissible limits, it will be disassembled for transport.
Make sure that the truck is adequately secured to the means of transport and that the hand brake has been applied during transport.
Place blocks under the wheels to prevent the slightest movement from occurring.



ENVIRONMENTAL CONDITIONS FOR TRANSPORTING AND STORING THE TRUCK

Protect the truck from the weather during transportation and storage, and provide adequate protection in salty environments.

LOADING AND UNLOADING THE TRUCK

Use a ramp or movable platform to load and unload the truck. Follow the instructions below to lift the truck if it is not operational or has not been equipped with a battery.

DANGER:
Lift the truck with a crane that is capable of handling its weight, as indicated on the information plate. If the battery has been installed in the truck, remember to include its weight as indicated on the identification plate when calculating the overall weight of the truck.
Make sure that the truck is lifted by qualified personnel only.
Do NOT stand within the radius of action of the crane or under the raised truck.
Use NON-METALLIC cables. Make sure that the cables can support the weight of the truck.

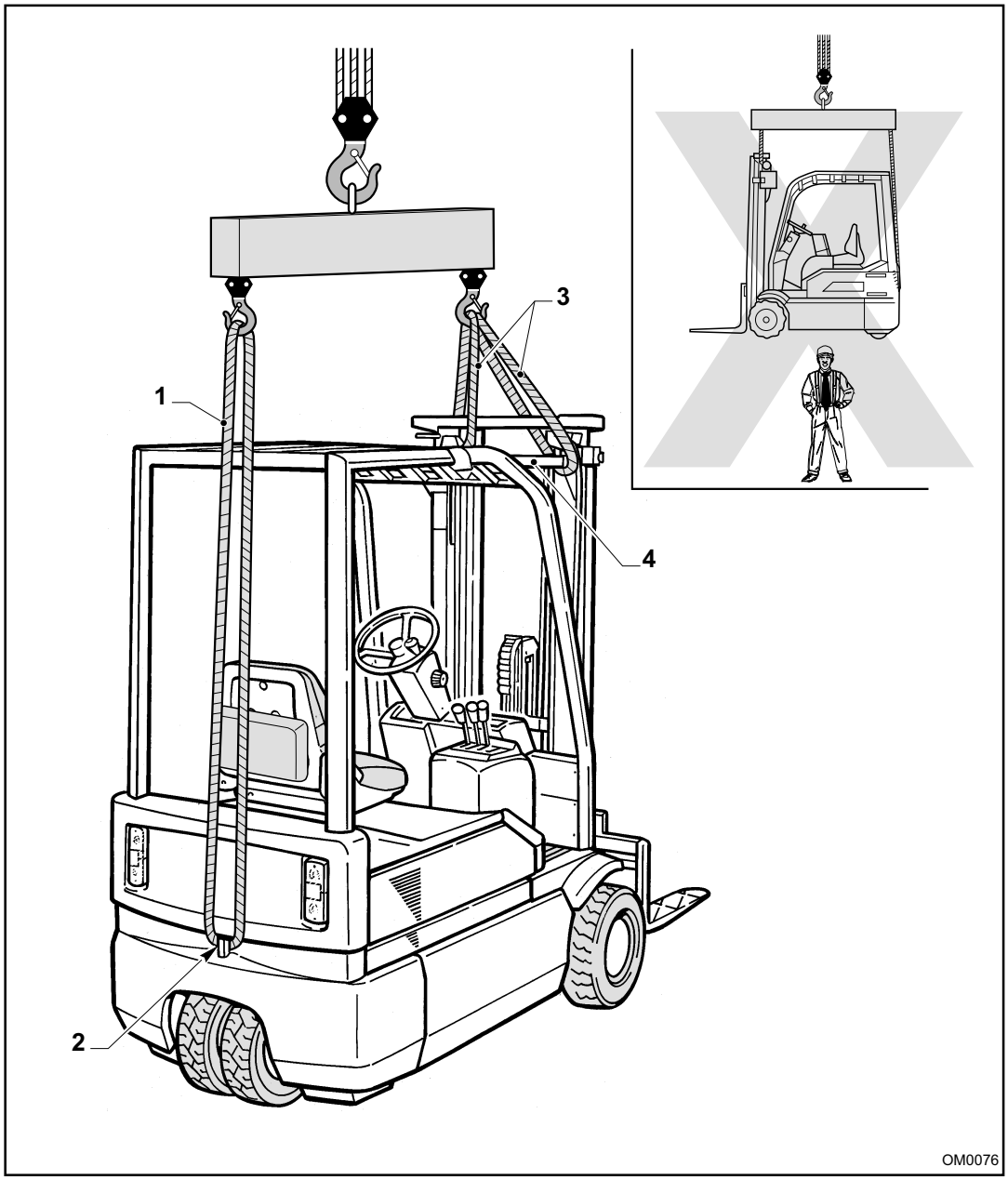
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Lift the truck as follows:

- Insert a non-metallic cable (1) through the rear tow hitch (2) of the truck. Make sure that the cable lies in the upper groove of the counterweight.
- Insert two cables (3), one for each side, through the top crossbar (4) of the fixed mast section.
- Attach the ends of the cables to the crane hook and lift the truck without jolting it.

ATTENTION:

The cables should be long enough that they do not touch the overhead guard or other equipment while the truck is being lifted. Use a swinging bar if necessary. Pull the cables vertically.



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Chapter 10

TECHNICAL OPERATING DATA

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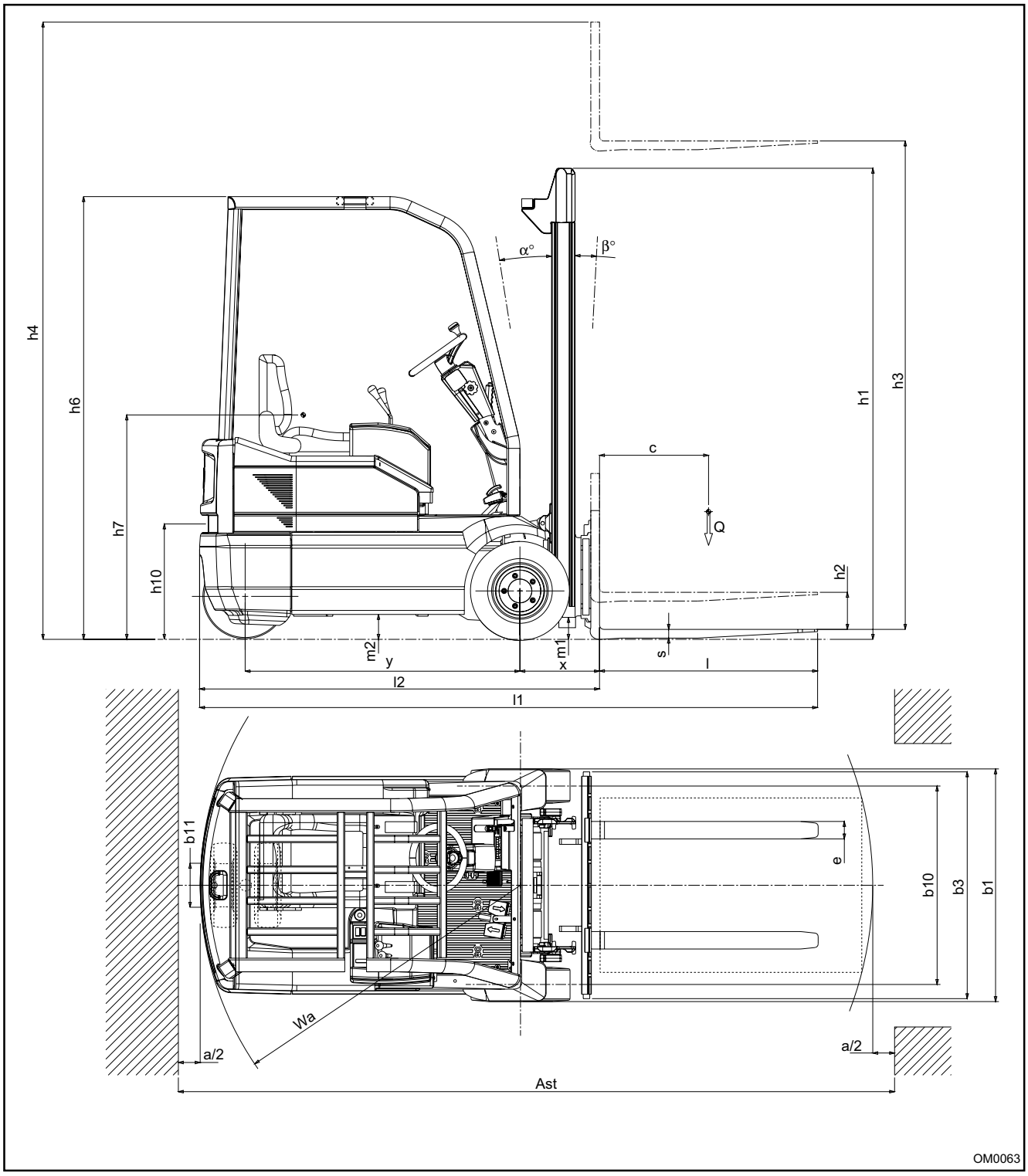
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10.1 - OVERALL DIMENSIONS OF 3-WHEEL TYPE



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10.2 - TECHNICAL DATA FOR 3-WHEEL TYPE WITH A CARRYING CAPACITY OF 1200 kg

Specification	1.3	Type of drive: Electric - Diesel - Petrol - GPL - Network Power (Electric)			Electric
	1.4	Operation Type:Tow by Hand - Walk-by - Stand-on - Ride-on			Ride-On
	1.5	Load Capacity		Q (t)	1.2
	1.6	Load Barycenter Distance		c (mm)	500
	1.8	Distance of the Fork Arms Plane from the Front Axle		x (mm)	365 [3) 4)]
	1.9	Wheel Base		y (mm)	1152
Weights	2.1	Service Weight		kg	2620
	2.2	Axle Weight with Rated Load	front / rear	kg	3323 / 497
	2.3	Axle Weight Unladen		kg	1222 / 1398
Wheels and Tyres	3.1	Tyres: SE = Superelastic PN = Pneus			SE / SE [1)]
	3.2	Front Tyres Size			18x7-8 [1)]
	3.3	Rear Tyres Size			15x4.5-8 [1)]
	3.5	Tyres: Number of Front / Rear Tyres (x = drive)			2x / 2
	3.6	Front Track Width		b_{10} (mm)	910 [8)]
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Dimensions and Overall Sizes	4.1	Lifting Assembly Tilting	forward / barckward	Grad	3° / 9° [2)]
	4.2	Mast Minimum Overall Height		h_1 (mm)	2210 [5)]
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	4.4	Lift Height		h_3 (mm)	3350
	4.5	Mast Maximum Overall Height		h_4 (mm)	3905
	4.7	Overhead Guard Height		h_6 (mm)	2024
	4.8	Seat Height		h_7 (mm)	939
	4.12	Drawbar Height		h_{10} (mm)	523
	4.19	Overall Length		l_1 (mm)	2726 [3) 4)]
	4.20	Overall Length Including Fork Arms		l_2 (mm)	1726 [3) 4)]
	4.21	Overall Width		b_1/b_2 (mm)	1067 [9)]
	4.22	Fork Arms Dimensions		s/e/l (mm)	40/80/1000
	4.23	Fork Carriage in Compliance with DIN 15173 Class / Form A, B			2A
	4.24	Fork Carriage Width		b_3 (mm)	1040 [10)]
	4.31	Mast Ground Clearance (laden)		m_1 (mm)	95 [6)]
	4.32	Chassis Ground Clearance (laden) [middle of the chassis]		m_2 (mm)	104
	4.33	Aisle Width with Pallet 1000x1200 and Fork Arms Pitch 1200		A_{st} (mm)	3052 [3) 4)]
	4.34	Aisle Width with Pallet 800x1200 and Fork Arms Pitch 800		A_{st} (mm)	3176 [3) 4)]
	4.35	Turning Radius		W_a (mm)	1361
	4.36	Turning Point Minimum Distance from the Truck Center Line		b_{13} (mm)	-
Performance	5.1	Drive Speed	laden / unladen	km/h	14 / 14
	5.2	Lifting speed	laden / unladen	m/s	0.41 / 0.58
	5.3	Lowering speed	laden / unladen	m/s	0.55 / 0.50
	5.5	Drawbar Pull Tractive Effort (S2 60 min)	laden / unladen	N	2390 / 2320
	5.6	Maximum Drawbar Pull Tractive Effort (S2 5 min)	laden / unladen	N	6060 / 5860
	5.7	Gradeability (S2 30 min)	laden / unladen	%	7.2 / 10.1
	5.8	Maximum Gradeability (S2 5 min)	laden / unladen	%	16 / 22.5
	5.9	Acceleration Time (10 m)	laden / unladen	s	4.5 / 4.2
	5.10	Service Brake			Electric/Mechanic.
Electric Motor	6.1	Drive Motor, Power S2 60 min		kW	4 x 2
	6.2	Lifting Motor, Power S3 15%		kW	9
	6.3	Battery in Compliance with DIN 43531/35/36 A,B,C, NO			43531A
	6.4	Voltage, Battery Capacity K_5		V / Ah	48 / 360 [11)]
	6.5	Battery Weight		kg	590 [11)]
	6.6	Power Consumption According to VDI - Cycle		kWh/h	-
Miscellaneous	8.1	Drive Control Type			Chopper
	8.2	Service Pressure for Attachments		bar	154 [7)]
	8.3	Oil Flow rate for Attachments (max. available)		l/min	25
	8.4	Noise at Operator's Ear		dB (A)	69
	8.5	Drawbar, Modell / Type DIN			-

1) For alternative tyres see relevant table
2) Standard-masts with $h_3 \geq 4530$ mm 3° / 5°
All Duplex and Triplex masts 3° / 5°
3) With Side Shift + 25 mm
4) With Triplex masts + 20 mm
5) With free lift 150 mm
6) For all configurations
7) 183 bar (DX) - 174 bar (TX)
8) 945 mm with tyres 200/50-10 and 875mm with 18x5x12 $^1/_8$" (vulkollan)
9) 1150.5 mm with tyres 200/50-10 and 1002mm with 18x5x12 $^1/_8$" (vulkollan)
10) with integraded side shift = 980 mm
11) optionals battery (capaciti/weight): 300Ah/549-5%Kg; 345Ah/580-5%Kg; 375Ah/590-5%Kg.
12) optionals battery (capaciti/weight): 400Ah/709-5%Kg; 406Ah/765-5%Kg; 500Ah/780-5%Kg.
13) optionals battery (capaciti/weight): 575Ah/915-5%Kg; 625Ah/930-5%Kg;

The values shown are to be considered non-binding information and are to be applied to standard versions.

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10.3 - TECHNICAL DATA FOR 3-WHEEL TYPE WITH A CARRYING CAPACITY OF 1500 kg.

Specification	1.3	Type of drive: Electric - Diesel - Petrol - GPL - Network Power (Electric)			Electric
	1.4	Operation Type:Tow by Hand - Walk-by - Stand-on - Ride-on			Ride-On
	1.5	Load Capacity		Q (t)	1.5
	1.6	Load Barycenter Distance		c (mm)	500
	1.8	Distance of the Fork Arms Plane from the Front Axle		x (mm)	365 [3) 4)]
	1.9	Wheel Base		y (mm)	1260
Weights	2.1	Service Weight		kg	2875
	2.2	Axle Weight with Rated Load	front / rear	kg	3842 / 533
	2.3	Axle Weight Unladen		kg	1313 / 1562
Wheels and Tyres	3.1	Tyres: SE = Superelastic PN = Pneus			SE / SE [1)]
	3.2	Front Tyres Size			18x7-8 [1)]
	3.3	Rear Tyres Size			15x4.5-8 [1)]
	3.5	Tyres: Number of Front / Rear Tyres (x = drive)			2x / 2
	3.6	Front Track Width		b_{10} (mm)	910 [8)]
	3.7	Rear track Width		b_{11} (mm)	202
Dimensions and Overall Sizes	4.1	Lifting Assembly Tilting	forward / barckward	Grad	3° / 9° [2)]
	4.2	Mast Minimum Overall Height		h_1 (mm)	2210 [5)]
	4.3	Free Height		h_2 (mm)	150
	4.4	Lift Height		h_3 (mm)	3350
	4.5	Mast Maximum Overall Height		h_4 (mm)	3905
	4.7	Overhead Guard Height		h_6 (mm)	2024
	4.8	Seat Height		h_7 (mm)	939
	4.12	Drawbar Height		h_{10} (mm)	523
	4.19	Overall Length		l_1 (mm)	2834 [3) 4)]
	4.20	Overall Length Including Fork Arms		l_2 (mm)	1834 [3) 4)]
	4.21	Overall Width		b_1/b_2 (mm)	1067 [9)]
	4.22	Fork Arms Dimensions		s/e/l (mm)	40/80/1000
	4.23	Fork Carriage in Compliance with DIN 15173 Class / Form A, B			2A
	4.24	Fork Carriage Width		b_3 (mm)	1040 [10)]
	4.31	Mast Ground Clearance (laden)		m_1 (mm)	95 [6)]
	4.32	Chassis Ground Clearance (laden) [middle of the chassis]		m_2 (mm)	104
	4.33	Aisle Width with Pallet 1000x1200 and Fork Arms Pitch 1200		A_{st} (mm)	3160 [3) 4)]
	4.34	Aisle Width with Pallet 800x1200 and Fork Arms Pitch 800		A_{st} (mm)	3284 [3) 4)]
	4.35	Turning Radius		W_a (mm)	1469
	4.36	Turning Point Minimum Distance from the Truck Center Line		b_{13} (mm)	-
Performance	5.1	Drive Speed	laden / unladen	km/h	14 / 14
	5.2	Lifting speed	laden / unladen	m/s	0.38 / 0.58
	5.3	Lowering speed	laden / unladen	m/s	0.55 / 0.50
	5.5	Drawbar Pull Tractive Effort (S2 60 min)	laden / unladen	N	2320 / 2270
	5.6	Maximum Drawbar Pull Tractive Effort (S2 5 min)	laden / unladen	N	6020 / 5810
	5.7	Gradeability (S2 30 min)	laden / unladen	%	6.1 / 9.0
	5.8	Maximum Gradeability (S2 5 min)	laden / unladen	%	13.8 / 20.3
	5.9	Acceleration Time (10 m)	laden / unladen	s	4.6 / 4.2
	5.10	Service Brake			Electric/Mechanic.
Electric Motor	6.1	Drive Motor, Power S2 60 min		kW	4 x 2
	6.2	Lifting Motor, Power S3 15%		kW	9
	6.3	Battery in Compliance with DIN 43531/35/36 A,B,C, NO			43531A
	6.4	Voltage, Battery Capacity K_5		V / Ah	48 / 480 [12)]
	6.5	Battery Weight		kg	780 [12)]
	6.6	Power Consumption According to VDI - Cycle		kWh/h	-
Miscellaneous	8.1	Drive Control Type			Chopper
	8.2	Service Pressure for Attachments		bar	180 [7)]
	8.3	Oil Flow rate for Attachments (max. available)		l/min	25
	8.4	Noise at Operator's Ear		dB (A)	69
	8.5	Drawbar, Modell / Type DIN			-

1) For alternative tyres see relevant table
2) Standard-masts with $h_3 \geq 4530$ mm 3° / 5°
All Duplex and Triplex masts 3° / 5°
3) With Side Shift + 25 mm
4) With Triplex masts + 20 mm
5) With free lift 150 mm
6) For all configurations
7) 210 bar (DX) - 200 bar (TX)
8) 945 mm with tyres 200/50-10 and 875mm with 18x5x12 $^1/_8$" (vulkollan)
9) 1150.5 mm with tyres 200/50-10 and 1002mm with 18x5x12 $^1/_8$" (vulkollan)
10) with integraded side shift = 980 mm
11) optionals battery (capaciti/weight): 300Ah/549-5%Kg; 345Ah/580-5%Kg; 375Ah/590-5%Kg.
12) optionals battery (capaciti/weight): 400Ah/709-5%Kg; 406Ah/765-5%Kg; 500Ah/780-5%Kg.
13) optionals battery (capaciti/weight): 575Ah/915-5%Kg; 625Ah/930-5%Kg;

The values shown are to be considered non-binding information and are to be applied to standard versions.

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10.4 - TECHNICAL DATA FOR 3-WHEEL TYPE WITH A CARRYING CAPACITY OF 1800 kg.

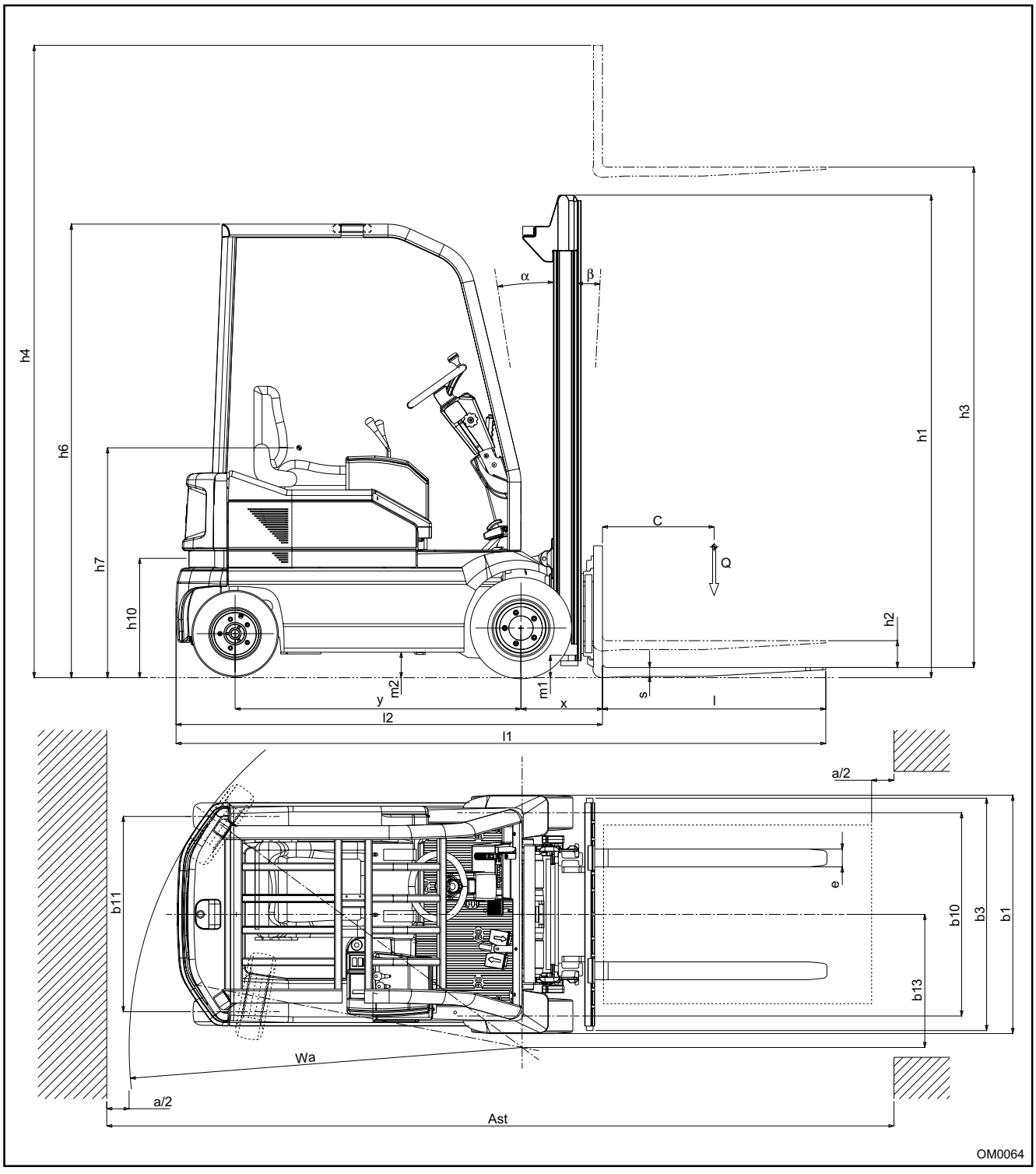
Specification	1.3	Type of drive: Electric - Diesel - Petrol - GPL - Network Power (Electric)			Electric
	1.4	Operation Type:Tow by Hand - Walk-by - Stand-on - Ride-on			Ride-On
	1.5	Load Capacity		Q (t)	1.8
	1.6	Load Barycenter Distance		c (mm)	500
	1.8	Distance of the Fork Arms Plane from the Front Axle		x (mm)	365 [3) 4)]
	1.9	Wheel Base		y (mm)	1368
Weights	2.1	Service Weight		kg	3067
	2.2	Axle Weight with Rated Load	front / rear	kg	4369 / 498
	2.3	Axle Weight Unladen	front / rear	kg	1431 / 1636
Wheels and Tyres	3.1	Tyres: SE = Superelastic PN = Pneus			SE / SE [1)]
	3.2	Front Tyres Size			18x7-8 [1)]
	3.3	Rear Tyres Size			15x4.5-8 [1)]
	3.5	Tyres: Number of Front / Rear Tyres (x = drive)			2x / 2
	3.6	Front Track Width		b_{10} (mm)	910 [8)]
	3.7	Rear track Width		b_{11} (mm)	202
Dimensions and Overall Sizes	4.1	Lifting Assembly Tilting	forward / barckward	Grad	3° / 9° [2)]
	4.2	Mast Minimum Overall Height		h_1 (mm)	2210 [5)]
	4.3	Free Height		h_2 (mm)	150
	4.4	Lift Height		h_3 (mm)	3350
	4.5	Mast Maximum Overall Height		h_4 (mm)	3973
	4.7	Overhead Guard Height		h_6 (mm)	2024
	4.8	Seat Height		h_7 (mm)	939
	4.12	Drawbar Height		h_{10} (mm)	523
	4.19	Overall Length		l_1 (mm)	2942 [3) 4)]
	4.20	Overall Length Including Fork Arms		l_2 (mm)	1942 [3) 4)]
	4.21	Overall Width		b_1/b_2 (mm)	1067 [9)]
	4.22	Fork Arms Dimensions		s/e/l (mm)	45/100/1000
	4.23	Fork Carriage in Compliance with DIN 15173 Class / Form A, B			2A
	4.24	Fork Carriage Width		b_3 (mm)	1040 [10)]
	4.31	Mast Ground Clearance (laden)		m_1 (mm)	95 [6)]
	4.32	Chassis Ground Clearance (laden) [middle of the chassis]		m_2 (mm)	104
	4.33	Aisle Width with Pallet 1000x1200 and Fork Arms Pitch 1200		A_{st} (mm)	3268 [3) 4)]
	4.34	Aisle Width with Pallet 800x1200 and Fork Arms Pitch 800		A_{st} (mm)	3392 [3) 4)]
	4.35	Turning Radius		W_a (mm)	1577
	4.36	Turning Point Minimum Distance from the Truck Center Line		b_{13} (mm)	-
Performance	5.1	Drive Speed	laden / unladen	km/h	14 / 14
	5.2	Lifting speed	laden / unladen	m/s	0.35 / 0.58
	5.3	Lowering speed	laden / unladen	m/s	0.55 / 0.50
	5.5	Drawbar Pull Tractive Effort (S2 60 min)	laden / unladen	N	2280 / 2240
	5.6	Maximum Drawbar Pull Tractive Effort (S2 5 min)	laden / unladen	N	6020 / 5780
	5.7	Gradeability (S2 30 min)	laden / unladen	%	5.4 / 8.3
	5.8	Maximum Gradeability (S2 5 min)	laden / unladen	%	12.4 / 18.9
	5.9	Acceleration Time (10 m)	laden / unladen	s	4.6 / 4.2
	5.10	Service Brake			Electric/Mechanic.
Electric Motor	6.1	Drive Motor, Power S2 60 min		kW	4 x 2
	6.2	Lifting Motor, Power S3 15%		kW	9
	6.3	Battery in Compliance with DIN 43531/35/36 A,B,C, NO			43531A
	6.4	Voltage, Battery Capacity K_5		V / Ah	48 / 600 [13)]
	6.5	Battery Weight		kg	930 [13)]
	6.6	Power Consumption According to VDI - Cycle		kWh/h	-
Miscellaneous	8.1	Drive Control Type			Chopper
	8.2	Service Pressure for Attachments		bar	213 [7)]
	8.3	Oil Flow rate for Attachments (max. available)		l/min	25
	8.4	Noise at Operator's Ear		dB (A)	69
	8.5	Drawbar, Modell / Type DIN			-

1) For alternative tyres see relevant table
2) Standard-masts with $h_3 \geq 4530$ mm 3° / 5°
All Duplex and Triplex masts 3° / 5°
3) With Side Shift + 25 mm
4) With Triplex masts + 20 mm
5) With free lift 150 mm
6) For all configurations
7) 235 bar (DX) -230 bar (TX)
8) 945 mm with tyres 200/50-10 and 875mm with 18x5x12 $^1/_8$" (vulkollan)
9) 1150.5 mm with tyres 200/50-10 and 1002mm with 18x5x12 $^1/_8$" (vulkollan)
10) with integraded side shift = 980 mm
11) optionals battery (capaciti/weight): 300Ah/549-5%Kg; 345Ah/580-5%Kg; 375Ah/590-5%Kg.
12) optionals battery (capaciti/weight): 400Ah/709-5%Kg; 406Ah/765-5%Kg; 500Ah/780-5%Kg.
13) optionals battery (capaciti/weight): 575Ah/915-5%Kg; 625Ah/930-5%Kg;

The values shown are to be considered non-binding information and are to be applied to standard versions.

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10.5 - OVERALL DIMENSIONS OF 4-WHEEL TYPE



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10.6 - TECHNICAL DATA FOR 4-WHEEL TYPE WITH A CARRYING CAPACITY OF 1500 kg.

Specification	1.3	Type of drive: Electric - Diesel - Petrol - GPL - Network Power (Electric)		Electric
	1.4	Operation Type:Tow by Hand - Walk-by - Stand-on - Ride-on		Ride-On
	1.5	Load Capacity	Q (t)	1.5
	1.6	Load Barycenter Distance	c (mm)	500
	1.8	Distance of the Fork Arms Plane from the Front Axle	x (mm)	365 [3) 4)]
	1.9	Wheel Base	y (mm)	1280
Weights	2.1	Service Weight	kg	2852
	2.2	Axle Weight with Rated Load front / rear	kg	3809 / 543
	2.3	Axle Weight Unladen front / rear	kg	1295 / 1557
Wheels and Tyres	3.1	Tyres: SE = Superelastic PN = Pneus		SE / SE [1)]
	3.2	Front Tyres Size		18x7-8 [1)]
	3.3	Rear Tyres Size		15x4.5-8 [1)]
	3.5	Tyres: Number of Front / Rear Tyres (x = drive)		2x / 2
	3.6	Front Track Width	b_{10} (mm)	910 [8)]
	3.7	Rear track Width	b_{11} (mm)	874
Dimensions and Overall Sizes	4.1	Lifting Assembly Tilting forward / barckward	Grad	3° / 9° [2)]
	4.2	Mast Minimum Overall Height	h_1 (mm)	2210 [5)]
	4.3	Free Height	h_2 (mm)	150
	4.4	Lift Height	h_3 (mm)	3350
	4.5	Mast Maximum Overall Height	h_4 (mm)	3905
	4.7	Overhead Guard Height	h_6 (mm)	2024
	4.8	Seat Height	h_7 (mm)	939
	4.12	Drawbar Height	h_{10} (mm)	523
	4.19	Overall Length	l_1 (mm)	2910 [3) 4)]
	4.20	Overall Length Including Fork Arms	l_2 (mm)	1910 [3) 4)]
	4.21	Overall Width	b_1/b_2 (mm)	1067 [9)]
	4.22	Fork Arms Dimensions	s/e/l (mm)	40/80/1000
	4.23	Fork Carriage in Compliance with DIN 15173 Class / Form A, B		2A
	4.24	Fork Carriage Width	b_3 (mm)	1040 [10)]
	4.31	Mast Ground Clearance (laden)	m_1 (mm)	95 [6)]
	4.32	Chassis Ground Clearance (laden) [middle of the chassis]	m_2 (mm)	104
	4.33	Aisle Width with Pallet 1000x1200 and Fork Arms Pitch 1200	A_{st} (mm)	3325 [3) 4)]
	4.34	Aisle Width with Pallet 800x1200 and Fork Arms Pitch 800	A_{st} (mm)	3525 [3) 4)]
	4.35	Turning Radius	W_a (mm)	1760
	4.36	Turning Point Minimum Distance from the Truck Center Line	b_{13} (mm)	596
Performance	5.1	Drive Speed laden / unladen	km/h	14 / 14
	5.2	Lifting speed laden / unladen	m/s	0.38 / 0.58
	5.3	Lowering speed laden / unladen	m/s	0.55 / 0.50
	5.5	Drawbar Pull Tractive Effort (S2 60 min) laden / unladen	N	2330 / 2280
	5.6	Maximum Drawbar Pull Tractive Effort (S2 5 min) laden / unladen	N	6030 / 5810
	5.7	Gradeability (S2 30 min) laden / unladen	%	6.2 / 9.1
	5.8	Maximum Gradeability (S2 5 min) laden / unladen	%	13.9 / 20.5
	5.9	Acceleration Time (10 m) laden / unladen	s	4.6 / 4.2
	5.10	Service Brake		Electric/Mechanic.
Electric Motor	6.1	Drive Motor, Power S2 60 min	kW	4 x 2
	6.2	Lifting Motor, Power S3 15%	kW	9
	6.3	Battery in Compliance with DIN 43531/35/36 A,B,C, NO		43531A
	6.4	Voltage, Battery Capacity K_5	V / Ah	48 / 480 [11)]
	6.5	Battery Weight	kg	780 [11)]
	6.6	Power Consumption According to VDI - Cycle	kWh/h	-
Miscellaneous	8.1	Drive Control Type		Chopper
	8.2	Service Pressure for Attachments	bar	180 [7)]
	8.3	Oil Flow rate for Attachments (max. available)	l/min	25
	8.4	Noise at Operator's Ear	dB (A)	69
	8.5	Drawbar, Modell / Type DIN		-

1) For alternative tyres see relevant table
2) Standard-masts with $h_3 \geq 4530$ mm 3° / 5°
All Duplex and Triplex masts 3° / 5°
3) With Side Shift + 25 mm
4) With Triplex masts + 20 mm
5) With free lift 150 mm
6) For all configurations
7) 210 bar (DX) -200 bar (TX)
8) 945 mm with tyres 200/50-10 and 875mm with 18x5x12 $^1/_8$" (vulkollan)
9) 1150.5 mm with tyres 200/50-10 and 1002mm with 18x5x12 $^1/_8$" (vulkollan)
10) with integraded side shift = 980 mm
11) optionals battery (capaciti/weight): 400Ah/709-5%Kg; 406Ah/765-5%Kg; 500Ah/780-5%Kg.
12) optionals battery (capaciti/weight): 575Ah/915-5%Kg; 625Ah/930-5%Kg;

The values shown are to be considered non-binding information and are to be applied to standard versions.

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10.7 - TECHNICAL DATA FOR 4-WHEEL TYPE WITH A CARRYING CAPACITY OF 1800 kg.

Specification	1.3	Type of drive: Electric - Diesel - Petrol - GPL - Network Power (Electric)			Electric
	1.4	Operation Type:Tow by Hand - Walk-by - Stand-on - Ride-on			Ride-On
	1.5	Load Capacity		Q (t)	1.8
	1.6	Load Barycenter Distance		c (mm)	500
	1.8	Distance of the Fork Arms Plane from the Front Axle		x (mm)	365 [3) 4)]
	1.9	Wheel Base		y (mm)	1388
Weights	2.1	Service Weight		kg	3045
	2.2	Axle Weight with Rated Load	front / rear	kg	4337 / 508
	2.3	Axle Weight Unladen	front / rear	kg	1416 / 1629
Wheels and Tyres	3.1	Tyres: SE = Superelastic PN = Pneus			SE / SE [1)]
	3.2	Front Tyres Size			18x7-8 [1)]
	3.3	Rear Tyres Size			15x4.5-8 [1)]
	3.5	Tyres: Number of Front / Rear Tyres (x = drive)			2x / 2
	3.6	Front Track Width		b_{10} (mm)	910 [8)]
	3.7	Rear track Width		b_{11} (mm)	874
Dimensions and Overall Sizes	4.1	Lifting Assembly Tilting	forward / barckward	Grad	3° / 9° [2)]
	4.2	Mast Minimum Overall Height		h_1 (mm)	2210 [5)]
	4.3	Free Height		h_2 (mm)	150
	4.4	Lift Height		h_3 (mm)	3350
	4.5	Mast Maximum Overall Height		h_4 (mm)	3973
	4.7	Overhead Guard Height		h_6 (mm)	2024
	4.8	Seat Height		h_7 (mm)	939
	4.12	Drawbar Height		h_{10} (mm)	523
	4.19	Overall Length		l_1 (mm)	3018 [3) 4)]
	4.20	Overall Length Including Fork Arms		l_2 (mm)	2018 [3) 4)]
	4.21	Overall Width		b_1/b_2 (mm)	1067 [9)]
	4.22	Fork Arms Dimensions		s/e/l (mm)	45/100/1000
	4.23	Fork Carriage in Compliance with DIN 15173 Class / Form A, B			2A
	4.24	Fork Carriage Width		b_3 (mm)	1040 [10)]
	4.31	Mast Ground Clearance (laden)		m_1 (mm)	95 [6)]
	4.32	Chassis Ground Clearance (laden) [middle of the chassis]		m_2 (mm)	104
	4.33	Aisle Width with Pallet 1000x1200 and Fork Arms Pitch 1200		A_{st} (mm)	3443 [3) 4)]
	4.34	Aisle Width with Pallet 800x1200 and Fork Arms Pitch 800		A_{st} (mm)	3643 [3) 4)]
	4.35	Turning Radius		W_a (mm)	1878
	4.36	Turning Point Minimum Distance from the Truck Center Line		b_{13} (mm)	646
Performance	5.1	Drive Speed	laden / unladen	km/h	14 / 14
	5.2	Lifting speed	laden / unladen	m/s	0.35 / 0.58
	5.3	Lowering speed	laden / unladen	m/s	0.55 / 0.50
	5.5	Drawbar Pull Tractive Effort (S2 60 min)	laden / unladen	N	2290 / 2240
	5.6	Maximum Drawbar Pull Tractive Effort (S2 5 min)	laden / unladen	N	6020 / 5790
	5.7	Gradeability (S2 30 min)	laden / unladen	%	5.5 / 8.4
	5.8	Maximum Gradeability (S2 5 min)	laden / unladen	%	12.5 / 19.0
	5.9	Acceleration Time (10 m)	laden / unladen	s	4.6 / 4.2
	5.10	Service Brake			Electric/Mechanic.
Electric Motor	6.1	Drive Motor, Power S2 60 min		kW	4 x 2
	6.2	Lifting Motor, Power S3 15%		kW	9
	6.3	Battery in Compliance with DIN 43531/35/36 A,B,C, NO			43531A
	6.4	Voltage, Battery Capacity K_5		V / Ah	48 / 600 [12)]
	6.5	Battery Weight		kg	930 [12)]
	6.6	Power Consumption According to VDI - Cycle		kWh/h	-
Miscellaneous	8.1	Drive Control Type			Chopper
	8.2	Service Pressure for Attachments		bar	213 [7)]
	8.3	Oil Flow rate for Attachments (max. available)		l/min	25
	8.4	Noise at Operator's Ear		dB (A)	69
	8.5	Drawbar, Modell / Type DIN			-

1) For alternative tyres see relevant table
2) Standard-masts with $h_3 \geq 4530$ mm 3° / 5°
All Duplex and Triplex masts 3° / 5°
3) With Side Shift + 25 mm
4) With Triplex masts + 20 mm
5) With free lift 150 mm
6) For all configurations
7) 235 bar (DX) -230 bar (TX)
8) 945 mm with tyres 200/50-10 and 875mm with 18x5x12 $^1/_8$" (vulkollan)
9) 1150.5 mm with tyres 200/50-10 and 1002mm with 18x5x12 $^1/_8$" (vulkollan)
10) with integraded side shift = 980 mm
11) optionals battery (capaciti/weight): 400Ah/709-5%Kg; 406Ah/765-5%Kg; 500Ah/780-5%Kg.
12) optionals battery (capaciti/weight): 575Ah/915-5%Kg; 625Ah/930-5%Kg;

The values shown are to be considered non-binding information and are to be applied to standard versions.

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10.8 - TIRE SPECIFICATIONS FOR 3-WHEEL TYPE

WHEELS						
Type	Superelastic		Pneumatic		Vulkolan/Superelastic	
	Front	Rear	Front	Rear	Front (Vulkolan)	Rear (SE)
3/12 3/15	18x7-8 (SX-DX-TX)	15x4.5-8	18x7-8/16 p.r. (SX-DX)	15x4.5-8/12 p.r.	18x5x12 1/8"(SX-DX-TX)	15x4.5-8
						(S.E white)
3/18	18x7-8 (SX-DX)	15x4.5-8	18x7-8/16 p.r. (SX-DX)	15x4.5-8/12 p.r.	18x5x12 1/8"	15x4.5-8
	200/50-10 (TX)	15x4.5-8				(S.E white)

10.9 - TIRE SPECIFICATIONS FOR 4-WHEEL TYPE

WHEELS						
Type	Superelastic		Pneumatic		Vulkolan/Superelastic	
	Front	Rear	Front	Rear	Front (Vulkolan)	Rear (SE)
4/15	18x7-8 (SX-DX-TX)	15x4.5-8	18x7-8/16 p.r.(SX-DX)	15x4.5-8/12 p.r.	18x5x12 1/8"(SX-DX-TX)	15x4.5-8
						(S.E white)
4/18	18x7-8 (SX-DX)	15x4.5-8	18x7-8/16 p.r.(SX-DX)	15x4.5-8/12 p.r.	18x5x12 1/8"(SX-DX-TX)	15x4.5-8
	200/50-10 (TX)	15x4.5-8				(S.E white)

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10.10 - CARRYING CAPACITIES FOR VERTICAL MASTS – FORKS UP TO 1400 mm.

TRUCK TYPE 3 / 12										
			S.E.S. (18x7-8) VULKOLLAN (18x5x12 1/8")				PN.S (18x7-8/16)			
			with SS		without SS		with SS		without SS	
MAST		LOAD	LIFT		LIFT		LIFT		LIFT	
TYPE	LIFT	BARYC.	MAX	3300	MAX	3300	MAX	3300	MAX	3300
SX	3330	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	3630	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	4030	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	4530	500	1200	1200	1200	1200	1100	1200	1150	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	5030	500	1150	1200	1200	1200	1050	1200	1100	1200
		600	1050	1050	1050	1050	950	1050	1000	1050
		1000	750	750	750	750	650	750	700	750
DX	2975	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	3275	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	3575	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
	3975	500	1200	1200	1200	1200	1200	1200	1200	1200
		600	1050	1050	1050	1050	1050	1050	1050	1050
		1000	750	750	750	750	750	750	750	750
TX	4470	500	1150	1200	1200	1200				
		600	1050	1050	1050	1050				
		1000	750	750	750	750				
	4770	500	1100	1200	1150	1200				
		600	1000	1050	1050	1050				
		1000	700	750	750	750				
	5220	500	1050	1200	1100	1200				
		600	950	1050	1000	1050				
		1000	650	750	700	750				
	5770	500	900	1200	950	1200				
		600	800	1050	850	1050				
		1000	550	750	600	750				
	6370	500	700	1100	750	1150				
		600	600	1000	650	1050				
		1000	450	700	450	750				
	6970	500	600	1000	650	1050				
		600	550	900	550	950				
		1000	350	600	400	650				

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TRUCK TYPES 3 / 15 - 4 / 15

			S.E.S. (18x7-8) VULKOLLAN (18x5x12 1/8")				PN.S (18x7-8/16)			
			with SS		without SS		with SS		without SS	
MAST		LOAD	LIFT		LIFT		LIFT		LIFT	
TYPE	LIFT	BARYC.	MAX	3300	MAX	3300	MAX	3300	MAX	3300
SX	3330	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
	3630	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
	4030	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
	4530	500	1500	1500	1500	1500	1400	1500	1450	1500
		600	1350	1350	1350	1350	1250	1350	1300	1350
		1000	950	950	950	950	900	950	900	950
	5030	500	1400	1500	1450	1500	1300	1500	1350	1500
		600	1250	1350	1300	1350	1150	1350	1200	1350
		1000	900	950	900	950	850	950	850	950
DX	2975	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
	3275	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
	3575	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
	3975	500	1500	1500	1500	1500	1500	1500	1500	1500
		600	1350	1350	1350	1350	1350	1350	1350	1350
		1000	950	950	950	950	950	950	950	950
TX	4470	500	1450	1450	1500	1500				
		600	1300	1300	1350	1350				
		1000	900	900	950	950				
	4770	500	1350	1450	1400	1500				
		600	1200	1300	1250	1350				
		1000	850	900	900	950				
	5220	500	1250	1450	1300	1500				
		600	1100	1300	1150	1350				
		1000	800	900	850	950				
	5770	500	1100	1450	1150	1500				
		600	1000	1300	1050	1350				
		1000	700	900	750	950				
	6370	500	850	1400	900	1450				
		600	750	1250	800	1300				
		1000	550	900	550	900				
	6970	500	650	1350	700	1400				
		600	550	1200	600	1250				
		1000	400	850	450	900				

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TRUCK TYPES 3 / 18 - 4 / 18

			S.E.S. (SX-DX 18x7-8 / TX 200/50-10) VULKOLLAN (18x5x12 1/8")				PN.S (18x7-8/16)			
			with SS		without SS		with SS		without SS	
MAST		LOAD	LIFT		LIFT		LIFT		LIFT	
TYPE	LIFT	BARYC.	MAX	3300	MAX	3300	MAX	3300	MAX	3300
SX	3330	500	1800	1800	1800	1800	1800	1800	1800	1800
		600	1600	1600	1600	1600	1600	1600	1600	1600
		1000	1150	1150	1150	1150	1150	1150	1150	1150
	3630	500	1800	1800	1800	1800	1750	1800	1800	1800
		600	1600	1600	1600	1600	1550	1600	1600	1600
		1000	1150	1150	1150	1150	1100	1150	1150	1150
	4030	500	1750	1800	1800	1800	1750	1800	1750	1800
		600	1550	1600	1600	1600	1550	1600	1600	1600
		1000	1100	1150	1150	1150	1100	1150	1150	1150
	4530	500	1750	1800	1800	1800	1600	1800	1650	1800
		600	1550	1600	1600	1600	1450	1600	1500	1600
		1000	1100	1150	1150	1150	1000	1150	1050	1150
	5030	500	1650	1800	1700	1800	1400	1800	1450	1800
		600	1450	1600	1500	1600	1250	1600	1350	1600
		1000	1050	1150	1050	1150	900	1150	950	1150
DX	2975	500	1800	1800	1800	1800	1800	1800	1800	1800
		600	1600	1600	1600	1600	1600	1600	1600	1600
		1000	1150	1150	1150	1150	1150	1150	1150	1150
	3275	500	1800	1800	1800	1800	1800	1800	1800	1800
		600	1600	1600	1600	1600	1600	1600	1600	1600
		1000	1150	1150	1150	1150	1150	1150	1150	1150
	3575	500	1800	1800	1800	1800	1750	1800	1750	1800
		600	1600	1600	1600	1600	1550	1600	1600	1600
		1000	1150	1150	1150	1150	1100	1150	1150	1150
	3975	500	1750	1800	1800	1800	1750	1800	1750	1800
		600	1550	1600	1600	1600	1550	1600	1600	1600
		1000	1100	1150	1150	1150	1100	1150	1150	1150
TX	4470	500	1650	1700	1750	1800				
		600	1500	1500	1550	1600				
		1000	1050	1050	1100	1150				
	4770	500	1600	1700	1650	1750				
		600	1450	1500	1450	1550				
		1000	1000	1050	1050	1100				
	5220	500	1450	1650	1500	1750				
		600	1300	1450	1350	1550				
		1000	950	1050	950	1100				
	5770	500	1200	1650	1250	1750				
		600	1050	1450	1100	1550				
		1000	750	1050	800	1100				
	6370	500	950	1600	1000	1700				
		600	850	1450	900	1500				
		1000	600	1000	650	1100				
	6970	500	750	1550	800	1650				
		600	650	1400	700	1450				
		1000	450	1000	500	1050				

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10.11 - MAST SPECIFICATIONS

				Standard (Simplex)				
3/12 - 3/15 - 4/15 fork carriage 4 ROLLERS (*)	Lift Height	h3	mm	3330	3630	4030	4530	5030
	Minimum Overall Height	h1	mm	2210	2360	2560	2810	3060
	Maximum Overall Height	h4	mm	3905	4205	4605	5105	5605
	Free Lift	h2	mm	150	150	150	150	150
3/18 - 4/18 fork carriage 6 ROLLERS (*)	Lift Height	h3	mm	3350	3650	4050	4550	5050
	Minimum Overall Height	h1	mm	2210	2360	2560	2810	3060
	Maximum Overall Height	h4	mm	3973	4273	4673	5173	5673
	Free Lift	h2	mm	150	150	150	150	150

				Duplex			
3/12 - 3/15 - 4/15 fork carriage 4 ROLLERS (*)	Lift Height	h3	mm	2975	3275	3575	3975
	Minimum Overall Height	h1	mm	1960	2110	2260	2460
	Maximum Overall Height	h4	mm	3550	3850	4150	4550
	Free Lift	h2	mm	1362	1512	1662	1862
3/18 - 4/18 fork carriage 6 ROLLERS (*)	Lift Height	h3	mm	2995	3295	3595	3995
	Minimum Overall Height	h1	mm	2010	2160	2310	2510
	Maximum Overall Height	h4	mm	3643	3943	4243	4643
	Free Lift	h2	mm	1362	1512	1662	1862

				Triplex					
3/12 - 3/15 - 4/15 fork carriage 4 ROLLERS (*)	Lift Height	h3	mm	4470	4770	5220	5770	6370	6970
	Minimum Overall Height	h1	mm	2010	2110	2260	2510	2710	2910
	Maximum Overall Height	h4	mm	5045	5345	5795	6345	6945	7545
	Free Lift	h2	mm	1412	1512	1662	1912	2112	2312
3/18 - 4/18 fork carriage 6 ROLLERS (*)	Lift Height	h3	mm	4490	4790	5240	5770	6390	6990
	Minimum Overall Height	h1	mm	2060	2160	2310	2560	2760	2960
	Maximum Overall Height	h4	mm	5138	5438	5888	6438	7038	7638
	Free Lift	h2	mm	1412	1512	1662	1912	2112	2312

(*) with optional fork carriage (6 rollers) h4 = h4 + 68 mm (SX) h4 = h4 + 43 mm (DX-TX)
h2 = h2 - 43 mm (DX-TX)

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10.12 - GRADIENTS

CLIMBABLE SLOPE

		Climbable slope (1 volta / 20')		
	Wheels	Length of ramp (m)	Forward drive loaded (%)	Reverse drive unloaded (%)
3/12	S.E.S. / PNS	135	16.0	22.5
		360	10.0	14.0
3/15 - 4/15	S.E.S. / PNS	135	14.0	20.5
		360	8.5	13.0
3/18 - 4/18	S.E.S. / PNS	135	12.5	19.0
		360	7.5	12

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10.13 - TIRE INFLATION PRESSURE

AXLE	MEASUREMENT	PRESSURE
Front	18x7 - 8/16 p.r.	10 bar
Rear	15x4 ½ - 8/12 p.r.	10 bar

10.14 - LIGHTS

Parking and stop lights	24V - 5W / 21W bifilament bulb
Reversing light	24V - 21W bulb

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10.15 - LAYOUT OF HYDRAULIC PARTS

LEGEND:

1= Lift distributor
2= Steering cylinder
3= Tilt cylinder
4= Oil reservoir
5= Pump with priority valve
6= Pump motor
7= Hydraulic steering - Steering control distributor
8= Oil filter
9= Tilt stop valve
10= Lift cylinders
11= Lowering speed control valve
12= Safety valve (located as described in the relative chapter)

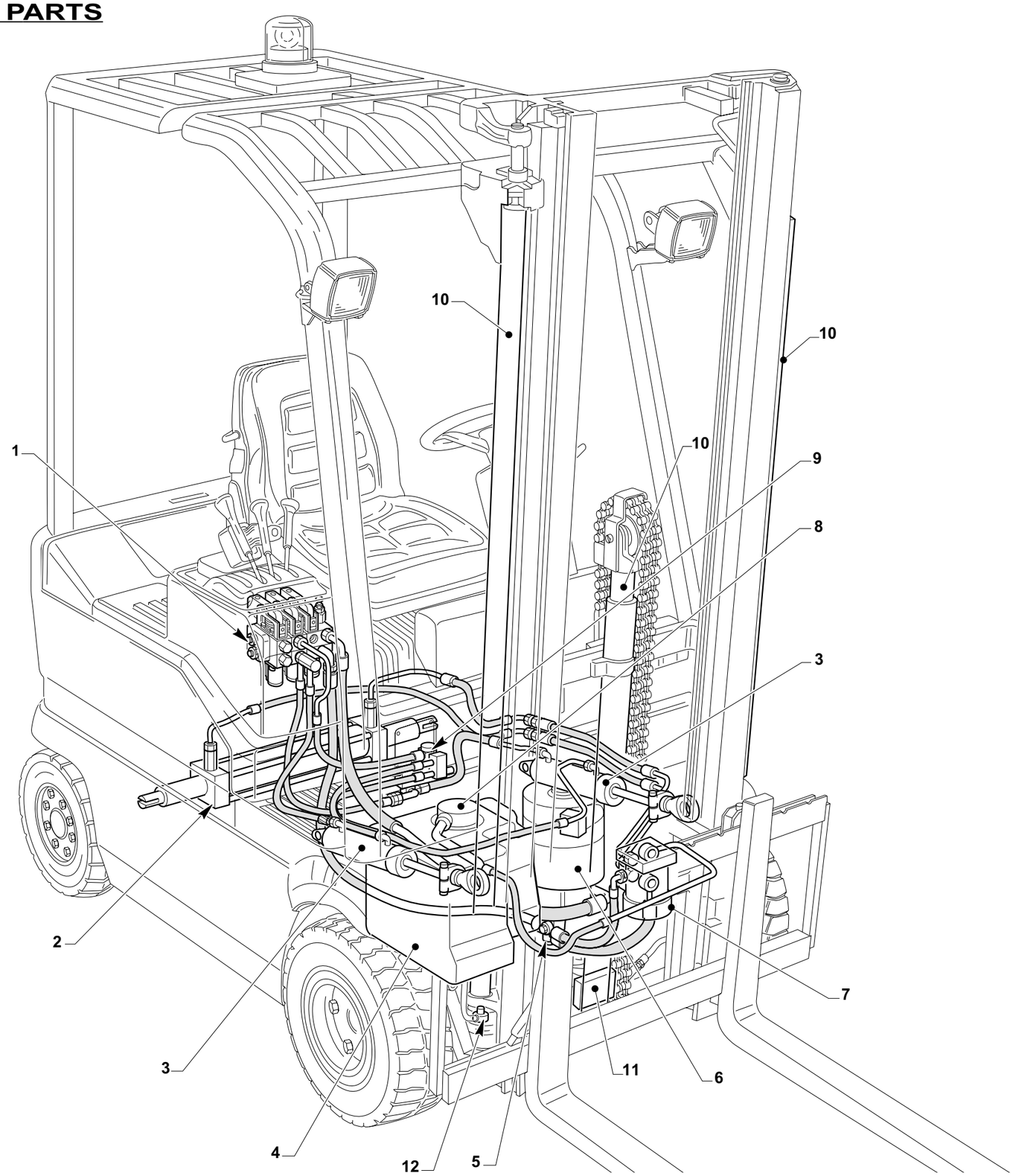
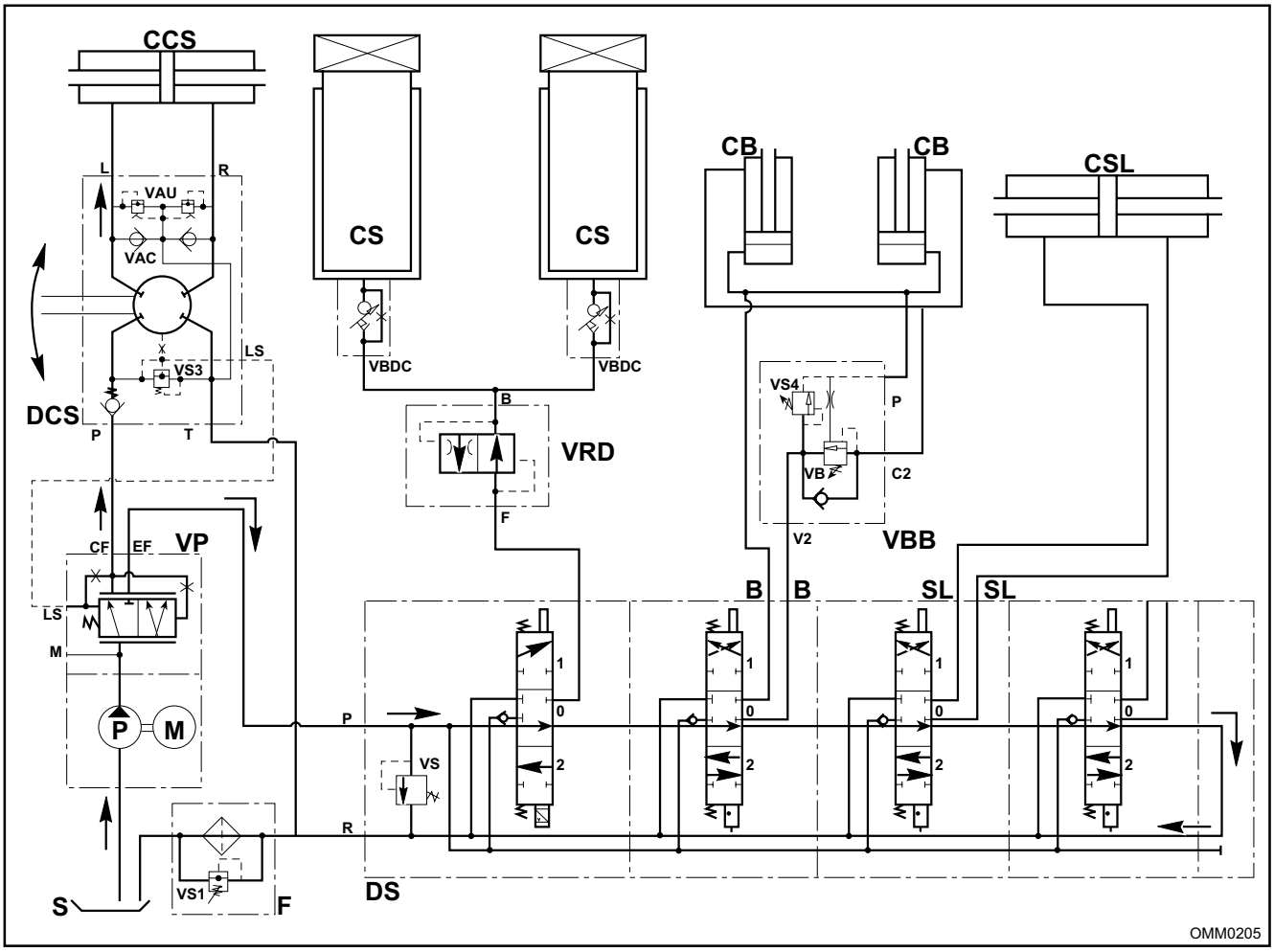


DIAGRAM 1

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10.16 - DIAGRAM OF HYDRAULIC SYSTEM



DS = Lift distributor
VS = Pressure relief valve

DCS = Steering control distributor
VAC = Anti-cavitation valve
VAU = Anti-shock valve
VS3 = Steering distributor safety valve

VP = Priority valve

P = Hydraulic system delivery pump

M = Pump motor

S = Oil tank
F = Oil filter
VS1 = Clogged filter safety valve

CS = Lift cylinder
VBDC = Lowering stop valve

VRD = Lowering speed control valve

CB = Tilt cylinder

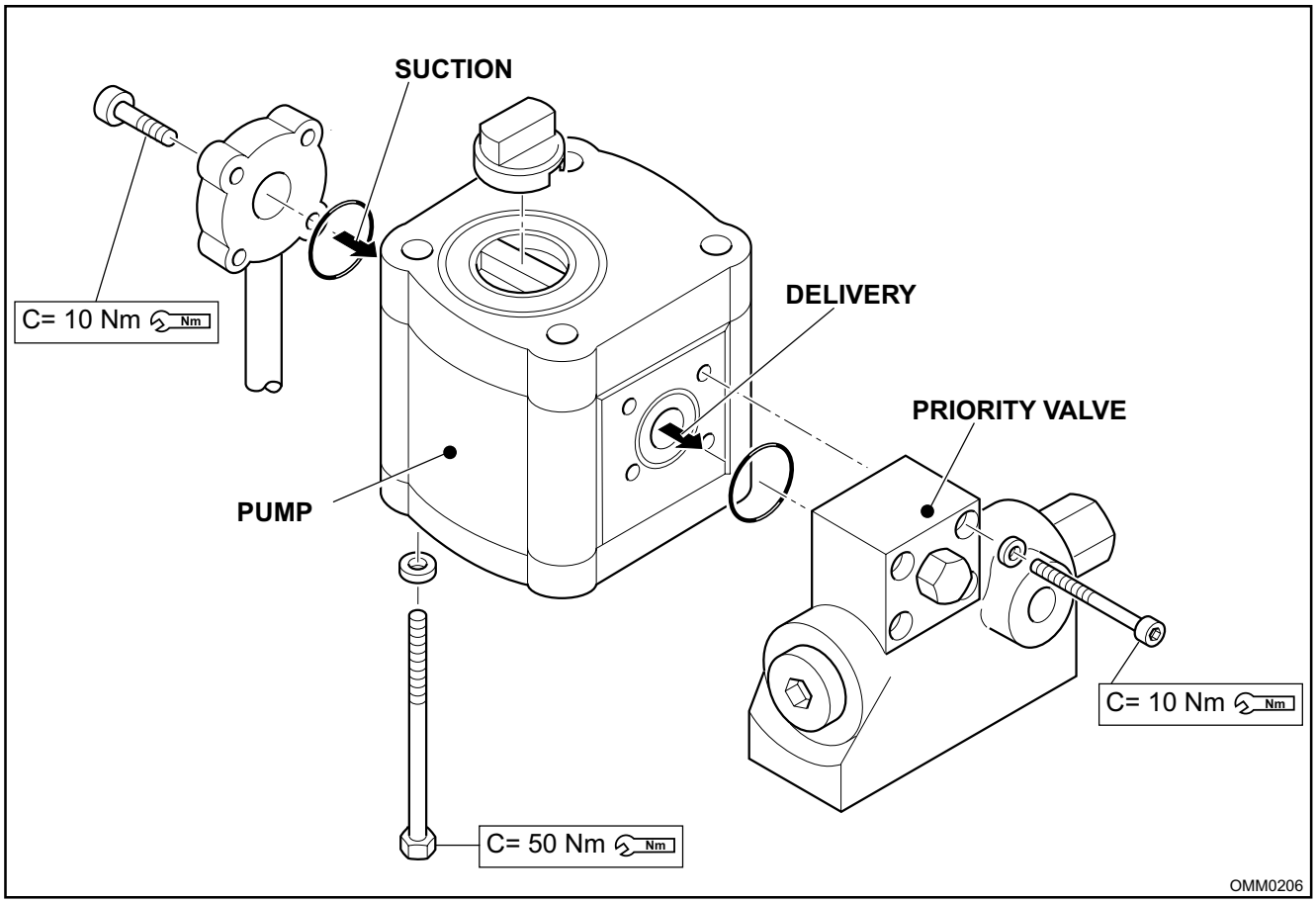
VBB = Tilt stop valve
VB = Stop valve
VS4 = Pressure relief valve

CSL = Side shift cylinder

CCS = Steering control cylinder

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HYDRAULIC PUMP AND PRIORITY VALVE



FEATURES OF THE HYDRAULIC PUMP

Direction of rotation. ..... Left
Capacity. ..... 11,26 cm^3/revolution
Maximum operating speed ..... 2900 revolutions/min
Maximum permissible speed ..... 3500 revolutions/min
Maximum permissible pressure ..... 280 bar

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FUNCTION OF THE PRIORITY VALVE

The priority valve is a load-sensing flow regulator valve whose function is to divide the flow delivered by the pump – which enters directly into the valve – into two separate streams, Q_{CF} and Q_{EF}.

The Q_{CF} flow is variable depending upon operator demand, while the Q_{EF} flow varies accordingly so that the sum of both flows is always equal to the inlet flow.

This valve is most commonly used in steering systems; the CF connector is connected to the inlet orifice of the hydraulic steering, the EF connector is connected to the hydraulic system of the mast, and the LS connector is connected to the corresponding LS connector of the hydraulic steering system.

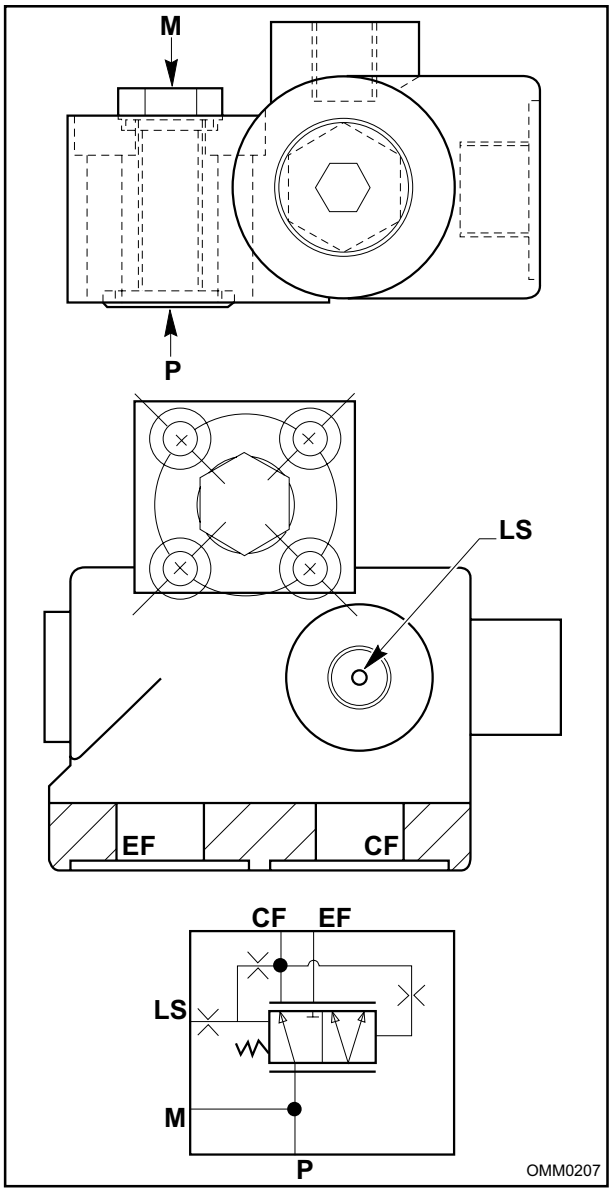
The flow in CF, which is directed to the hydraulic steering, is regulated by the operator in accordance with the steering speed, while the flow in EF (which is the flow available for other operational uses) is strictly the excess ($Q_{EF} = Q_{IN} – Q_{CF}$).

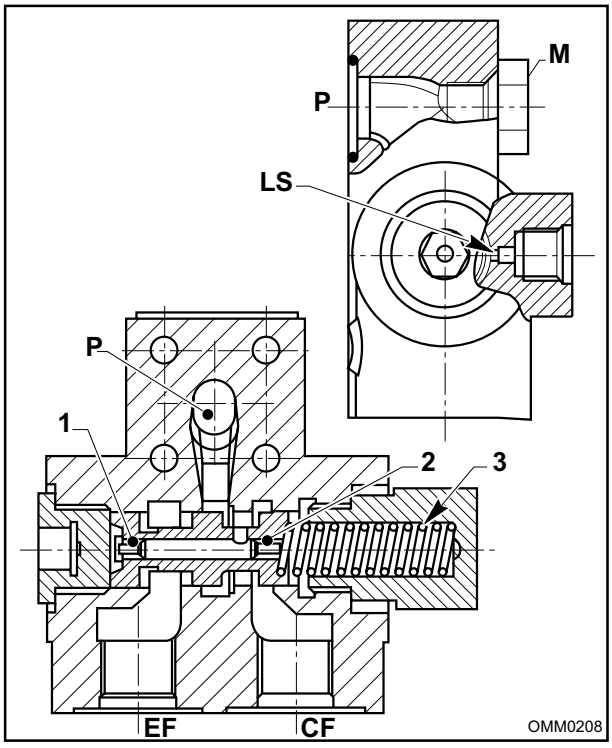
When the hydraulic steering is at rest, the LS connector is connected to the outlet (through the hydraulic steering) and the hydraulic steering inlet connector (CF) is closed; if the pump is started while in this state, the pressure on CF increases (stand-by pressure) until it has built up sufficiently to move the valve slide to the left so as to divert the QIN flow toward EF.

The steering maneuver causes the following two actions to occur: the fluid passes into the hydraulic steering system from the inlet (CF) to one of the uses (R or L), and the hydraulic steering LS connector is connected to the same use (L or R).

In this state, the priority valve ensures that the hydraulic steering system is supplied with as much oil as it requires. This occurs independently of the other uses, which will be supplied with the remaining flow.

The valve delivers to the hydraulic steering system a QCF flow, which is determined by the operator by the degree of opening of the hydraulic steering, leaving the remaining QEF available for other uses.





1 = PP-Throttle ø 1.0 mm
2 = Dynamic throttle ø 0.8 mm
3 = 7 bar spring for dynamic flow 0.85/0.92 l/min
LS = Damping port ø 1.5 mm (hole in the body)
M = Pressure gauge socket
P = Q_{IN} (inlet flow from the pump)
CF = Hydraulic steering outlet
EF = Distributor outlet

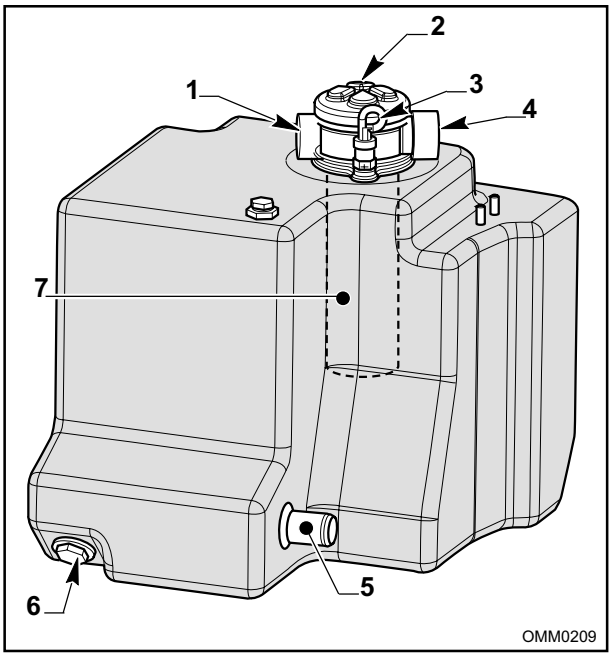
Maximum flow..... 40 l/min
Maximum pressure. ..... 250 bars
Spring calibration..... 7 bars

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HYDRAULIC OIL TANK

The tank, complete with filter, has a capacity of 23 liters. See the appropriate chapter for instructions to disassemble the tank.

1= Oil inlet
2= Oil filter
3= Dipstick
4= Breather vent
5= Sleeve for attaching the suction pump
6= Discharge cap
7= Filter cartridge



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LIFT DISTRIBUTOR

Three part distributor

SL = Side shift

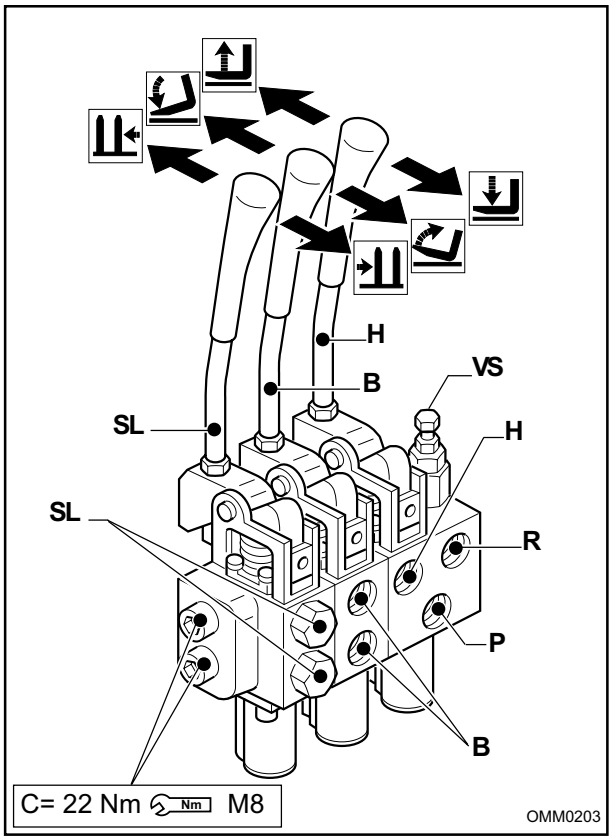
B = Tilt

H = Lift

VS = By-pass valve

R = Discharge

P = Power



Four part distributor

SL = Side shift

B = Tilt

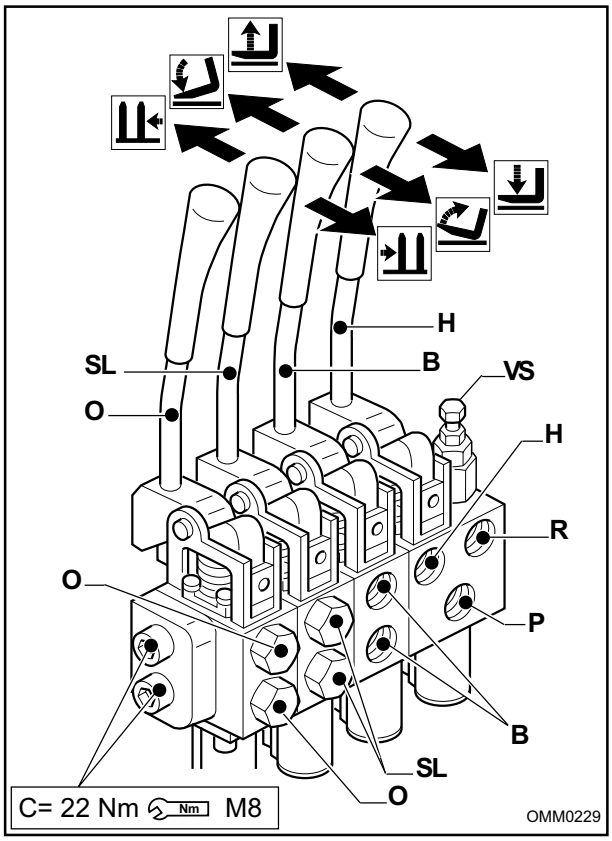
H = Lift

VS = By-pass valve

R = Discharge

P = Power

O = Optional

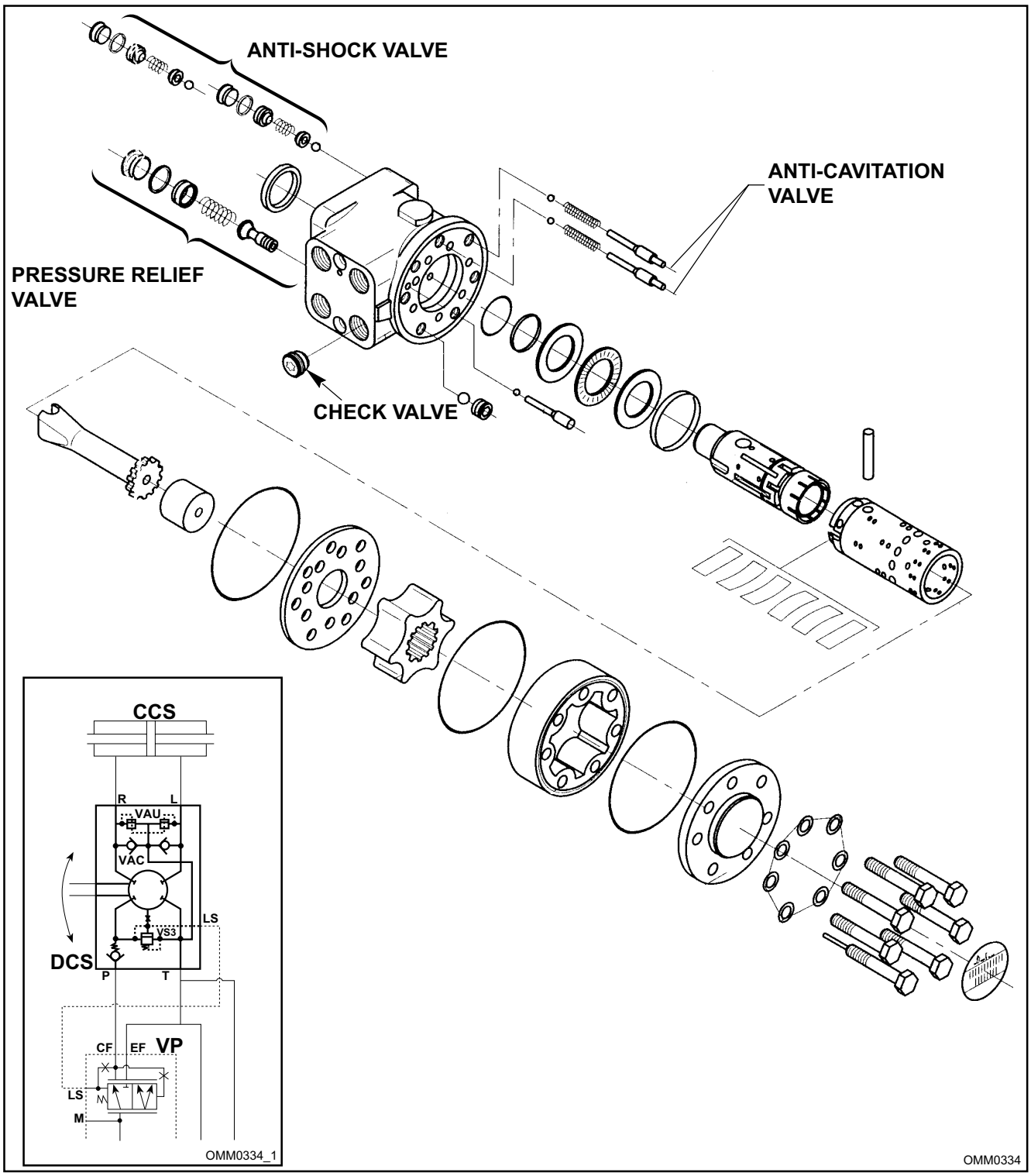


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STEERING DISTRIBUTOR

OSPF 50 type: for 3-wheel type
OSPF 80 type: for 4-wheel type

- Pressure relief valve: VS3
- Anti-shock valve: VAU
- Anti-cavitation valve: VAC
- Check valve on line P



The steering unit consists of a rotary valve and flow regulator.
When the steering column is operated, the hydraulic steering connects to the steer wheels of the vehicle. When the operator turns the steering wheel, the oil coming from the pump is directed by means of the rotary valve and flow regulator to the connection orifices of the cylinder, L or R, depending upon which way the wheel is turned.
The flow regulator meters the quantity of oil directed to the steering cylinder in proportion to the angle of rotation of the steering wheel.

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MANUAL STEERING PRESSURE

Under normal operating conditions, if the pump delivers a sufficient flow at the required pressure to the steering unit, the torque applied to the steering wheel should not exceed 0.5 daNm.
If there is insufficient or no flow, the steering unit will automatically function like a manual pump, thus allowing the vehicle to operate in emergency steering mode. The table below indicates the pressure values for manual steering (P_m) for a torque of 12 daNm applied to the steering wheel, which is considered the maximum value that can be applied by an average operator.

OSP	50	80
P_m (bar)	90	80

PRESSURE RELIEF VALVE

The pressure relief valve limits the maximum pressure of the steering unit to the calibrated value, thus protecting the unit. It also has a by-pass feature when the cylinder is at the stroke limit stop.
P= 90^{+5} bar.

ANTI-CAVITATION VALVE

The anti-cavitation valves allow the cylinders to suck in oil if a vacuum is created inside (cavitation), which may occur in some circumstances.

CHECK VALVE

The check valve protects the operator from rebounds that could be transmitted to the steering wheel. It prevents the oil from flowing back to the pump when the steering resists the pressure in the cylinder. The check valve is located in orifice P inside the hydraulic steering.

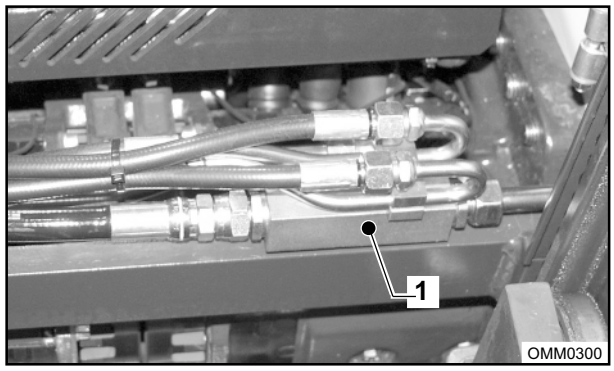
DOUBLE ANTI-SHOCK VALVE

The double anti-shock valve in the OSPF steering unit is a direct action type, thus reacting very quickly. It protects the hydraulic steering system by limiting pressure surges coming from the cylinders due to external factors. Thus, it also limits pressure drops between L and T and between R and T. The valves are calibrated to 1 l/min and the calibration value is 150^{+15} bar.

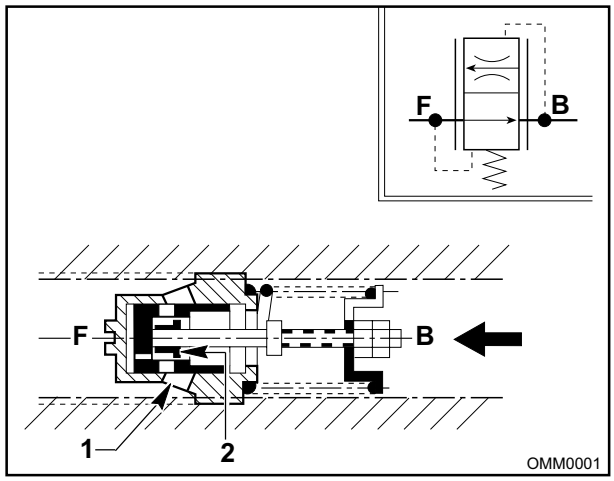
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LOWERING SPEED CONTROL VALVE (VRD)

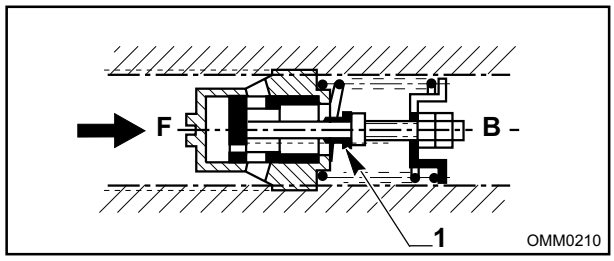
The flow speed control valve (1) is used as a braking valve, which allows the load to be lowered at a constant speed, almost independently of the weight of the load.
The unit consists of the slider and spring and the diaphragm bushing.
The diaphragm bushing is moved into operating position by the fluid passing through the valve, thus forming a ring diaphragm inside the slider whose resistance to the flow, in conjunction with the preloaded spring, determines the value of the flow.
If the flow is in the opposite direction, the slider diaphragm completely abandons the control position by eliminating the ring diaphragm formed with the control slider and thus reducing resistance to the flow to a minimum, independently of the range of control.
A valve with a movable diaphragm is thus clearly more advantageous than a valve with a fixed diaphragm, since resistance to the flow would inevitably result in the need for increased power for the lift maneuver, and thus cause unnecessary extra strain on the battery.



Method of operation
Flow in operating direction F ⟵ B
The flow is practically constant due to the self-established balance between the decrease in internal pressure and the preloading of the control slider spring.
1= Control edge
2= Diaphragm in control position

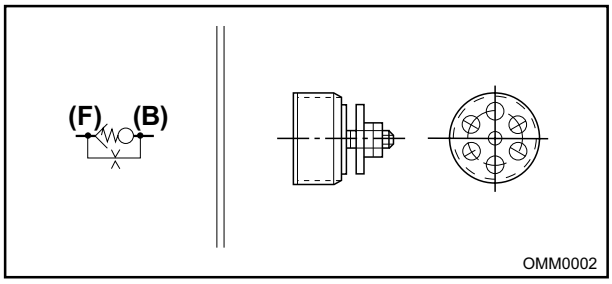


Flow in opposite direction **F ⟶ B**
Unobstructed free flow with low resistance because the slider diaphragm abandons its control position (eliminating the diaphragm effect).
1= Position of the plug diaphragm in the free flow direction.



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SAFETY VALVE (or load lowering stop valve) (VBDC)



This safety device offers protection against the breakage of the hydraulic pipes, and prevents a hydraulic operation from occurring in an uncontrolled and accelerated manner when it is subjected to a load but there is no hydraulic counterpressure because the delivery pipe has broken.
The device is screwed directly into the oil inlet of the unit to be protected. It consists of a disc which, when in the rest position, is lifted from its seat by a spring to allow oil to pass through a predetermined section.
If there is an increase in the flow, the hydraulic forces exceed the force exerted by the spring and the valve immediately closes.
The valve disc contains a hole, which independently of the force exerted by the weight of the load, allows a constant outflow of oil such that the load is slowly lowered to the ground.

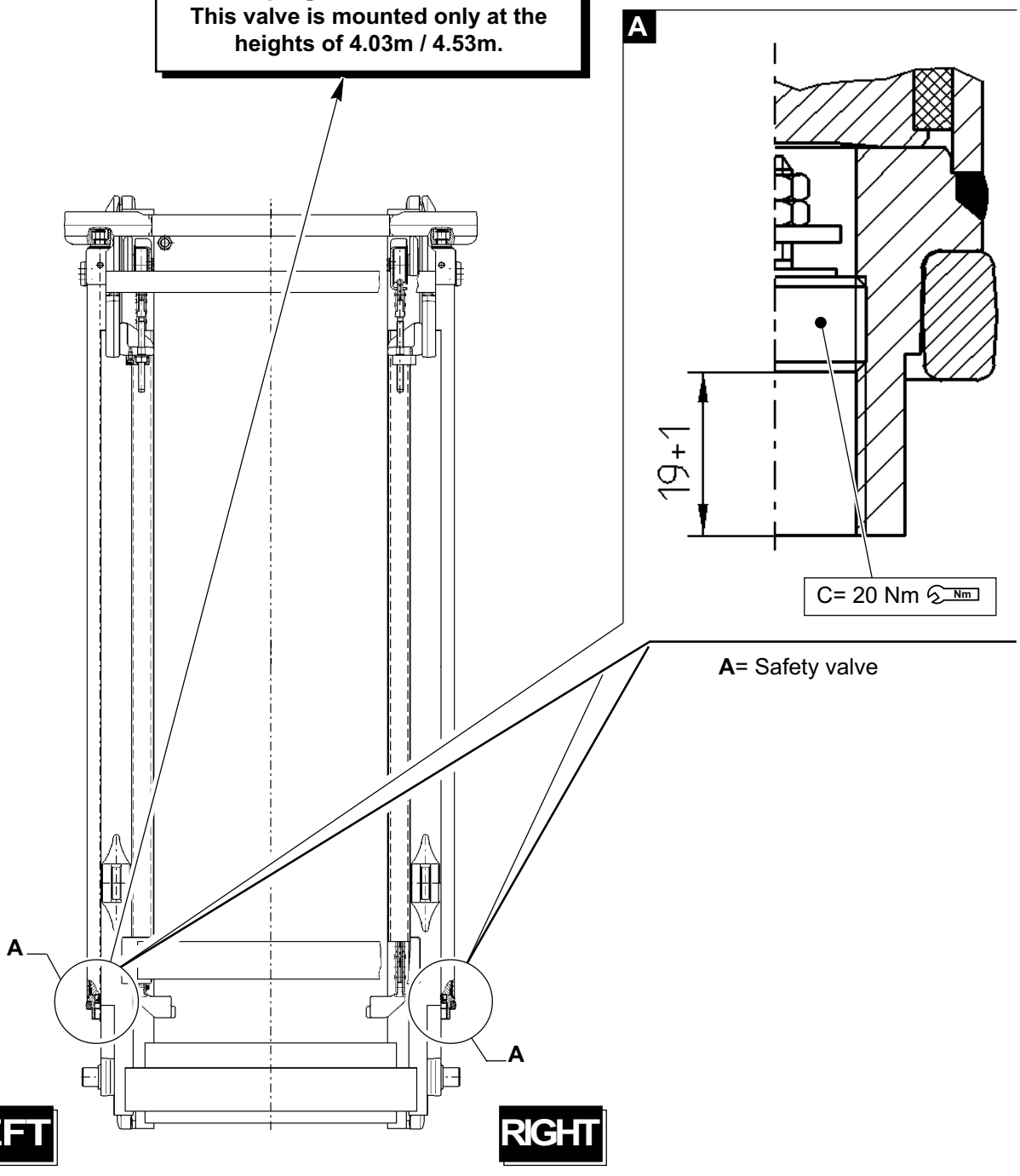
IMPORTANT:
See the diagrams on the following pages for the location of the valves on the different types of masts.

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LOCATION OF THE SAFETY VALVES ON THE SIMPLEX MAST

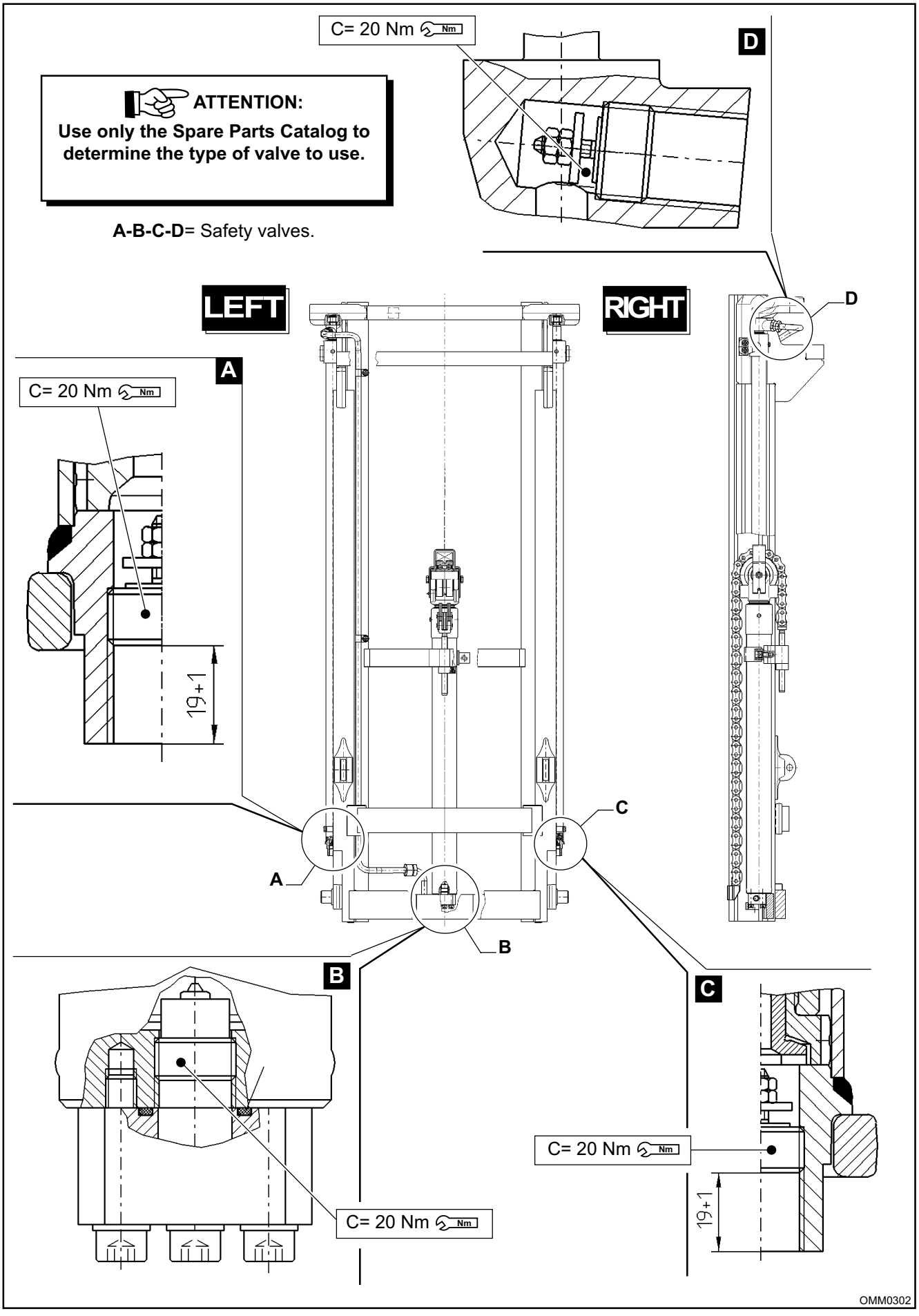
ATTENTION:
Use only the Spare Parts Catalog to determine the type of valve to use.

ATTENTION:
This valve is mounted only at the heights of 4.03m / 4.53m.



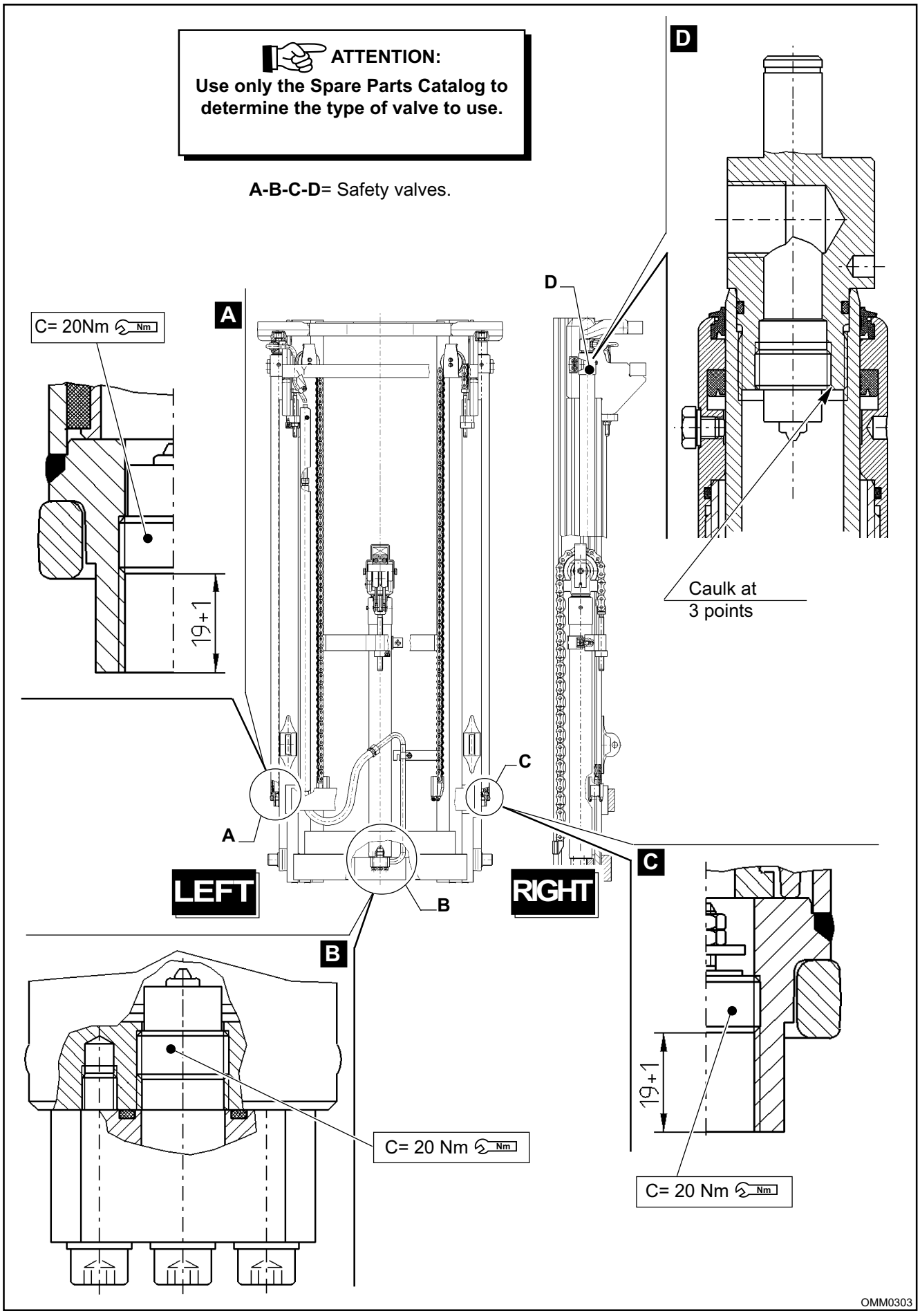
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LOCATION OF THE SAFETY VALVES ON THE DUPLEX MAST



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LOCATION OF THE SAFETY VALVES ON THE TRIPLEX MAST



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TILT STOP VALVE (VBB)

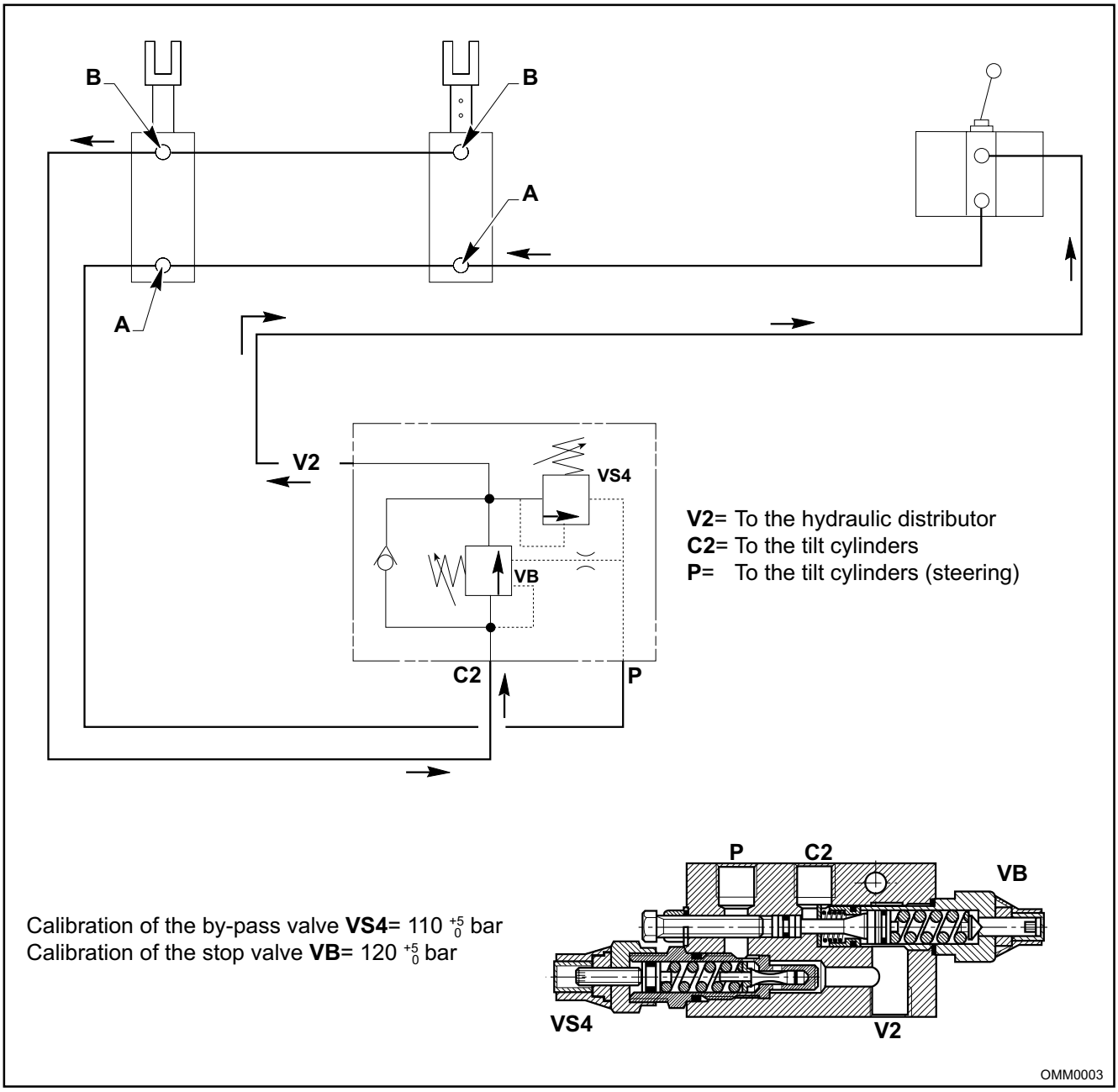
The tilt stop valve consists of two valves: an anti-cavitation valve and a pressure relief valve.

Stop or anti-cavitation valve

When the distributor for tilting the lift group forward is operated, the valve prevents the load on the forks from causing oil to be discharged from the front chambers before oil has entered the rear chambers and thus creating a vacuum (cavitation) in the rear chambers.

Forward tilt

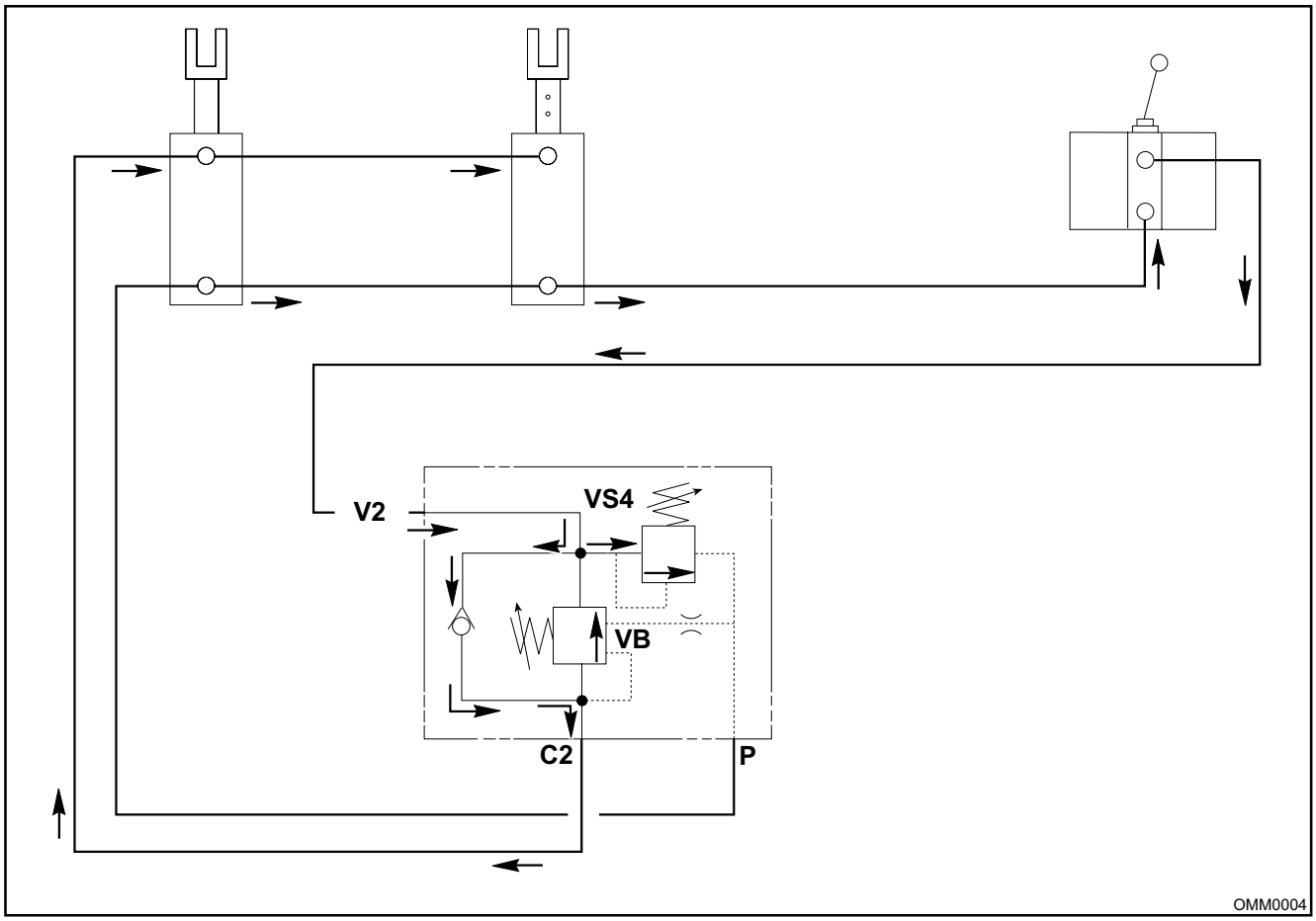
When the distributor for forward tilting is operated, it causes chambers A to be supplied with oil at the same time as chambers B open to discharge it.
The oil discharging from chambers B, however, is intercepted by the VB valve, which allows the oil to discharge only if a certain pressure is reached, thus ensuring that the chambers are always full.



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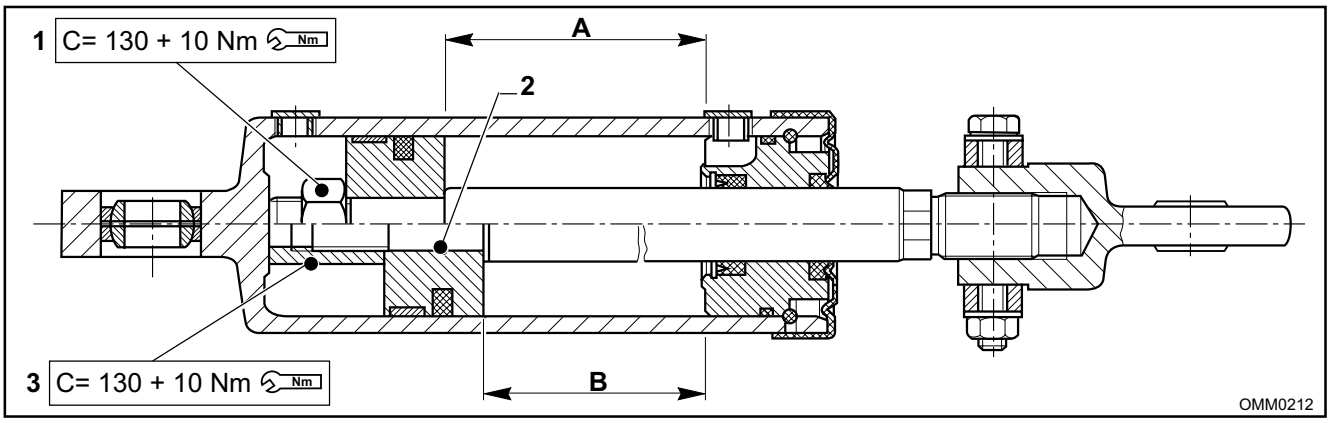
Backward tilt

When the cylinder reaches the VS4 calibration value at the stroke limit stop, the outlet opens and maintains the established pressure in the cylinder, which is less than the value of the main pressure relief valve VS. This results in lower energy consumption and less strain on the battery



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TILT CYLINDERS

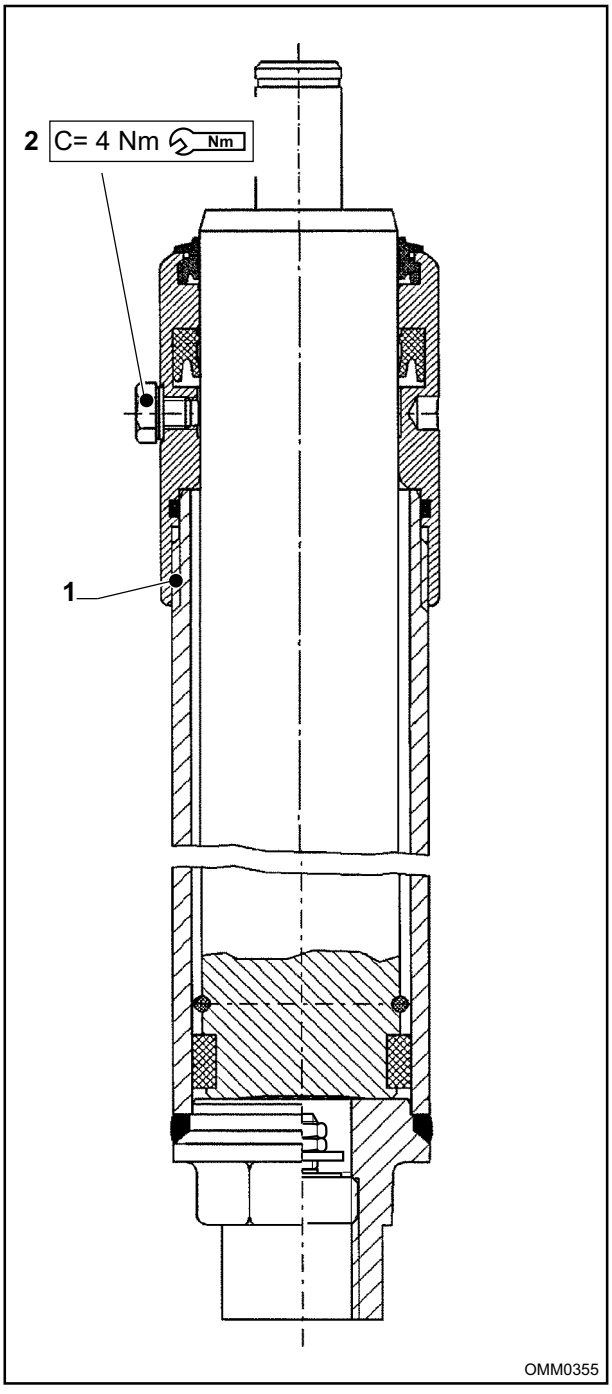


1= Apply Loctite 270.
2= Sealed with Loctite 270.
3= Apply Loctite 270.
A= Stroke 78 - For height 2975 ÷ 4030 mm
B= Stroke 52 - For height 4450 ÷ 6970 mm

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SIMPLEX LIFT CYLINDERS

• RIGHT/LEFT
1= Apply Loctite 243
2= Air bleed screw

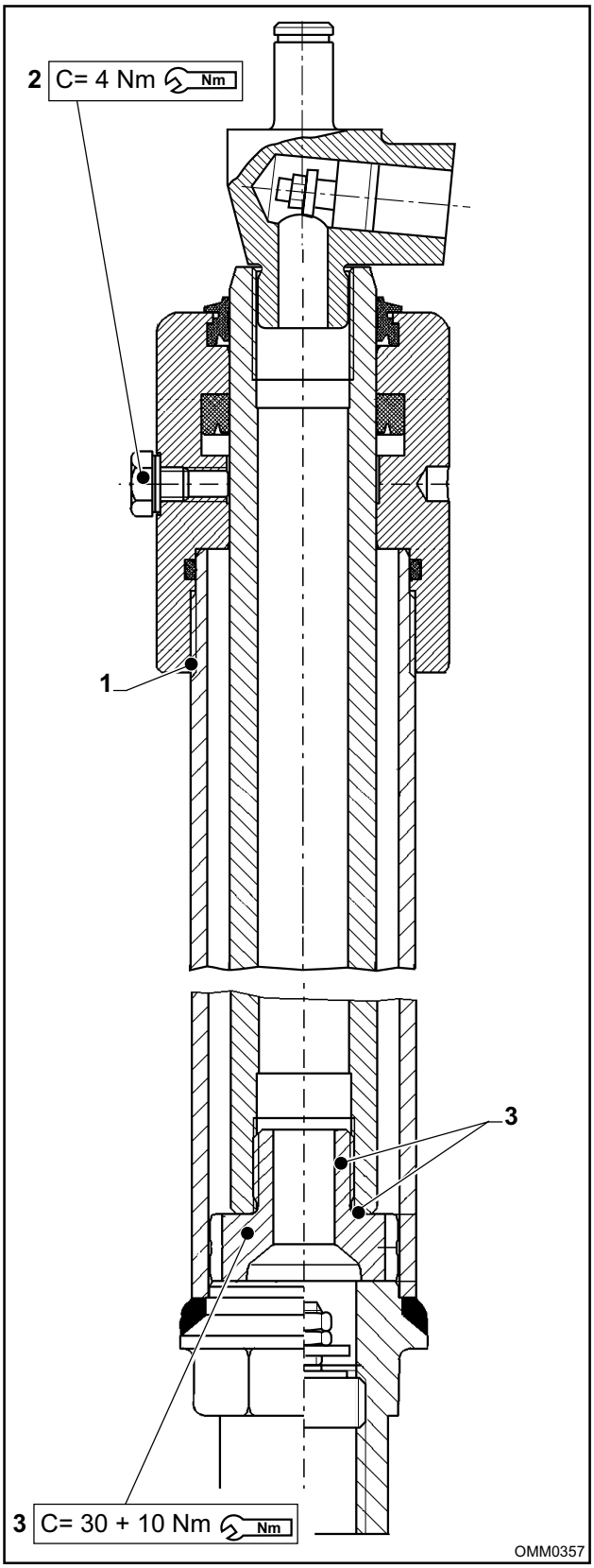


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DUPLEX LIFT CYLINDERS

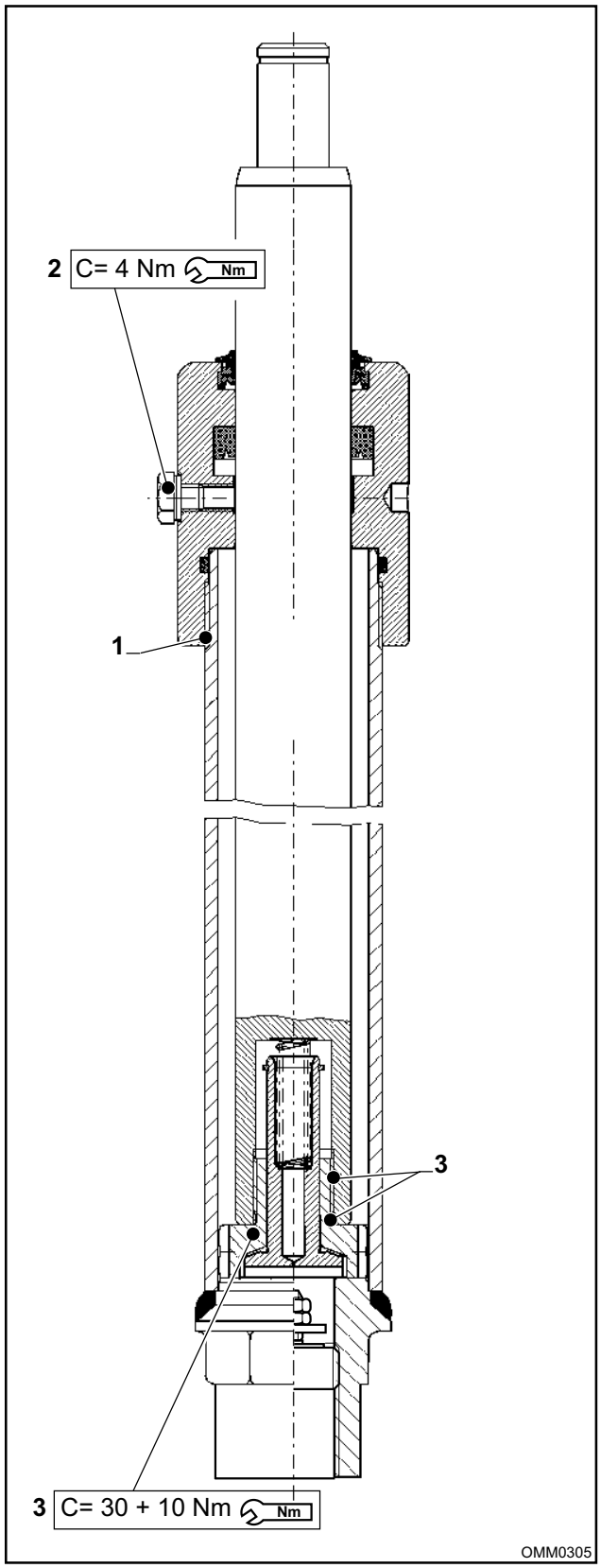
• LEFT CYLINDER

1= Apply Loctite 243
2= Air bleed screw
3= Apply Loctite 275



• RIGHT CYLINDER

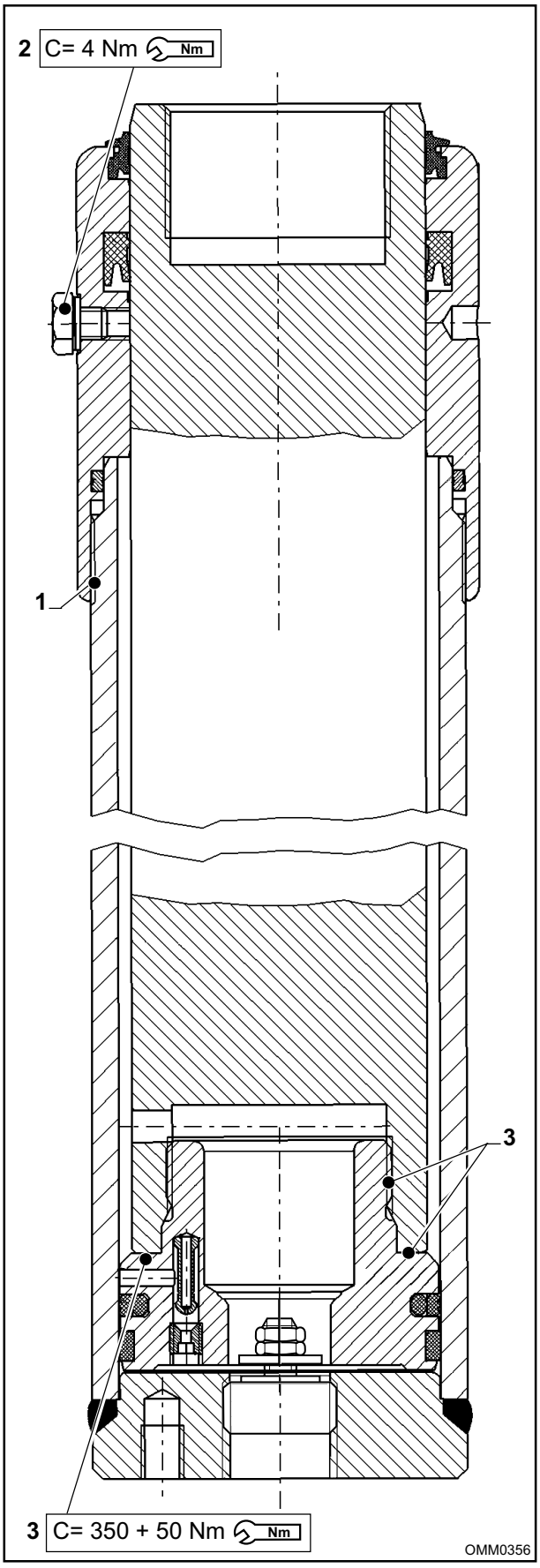
1= Apply Loctite 243
2= Air bleed screw
3= Apply Loctite 275



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• MIDDLE CYLINDER

1= Apply Loctite 243
2= Air bleed screw
3= Apply Loctite 275

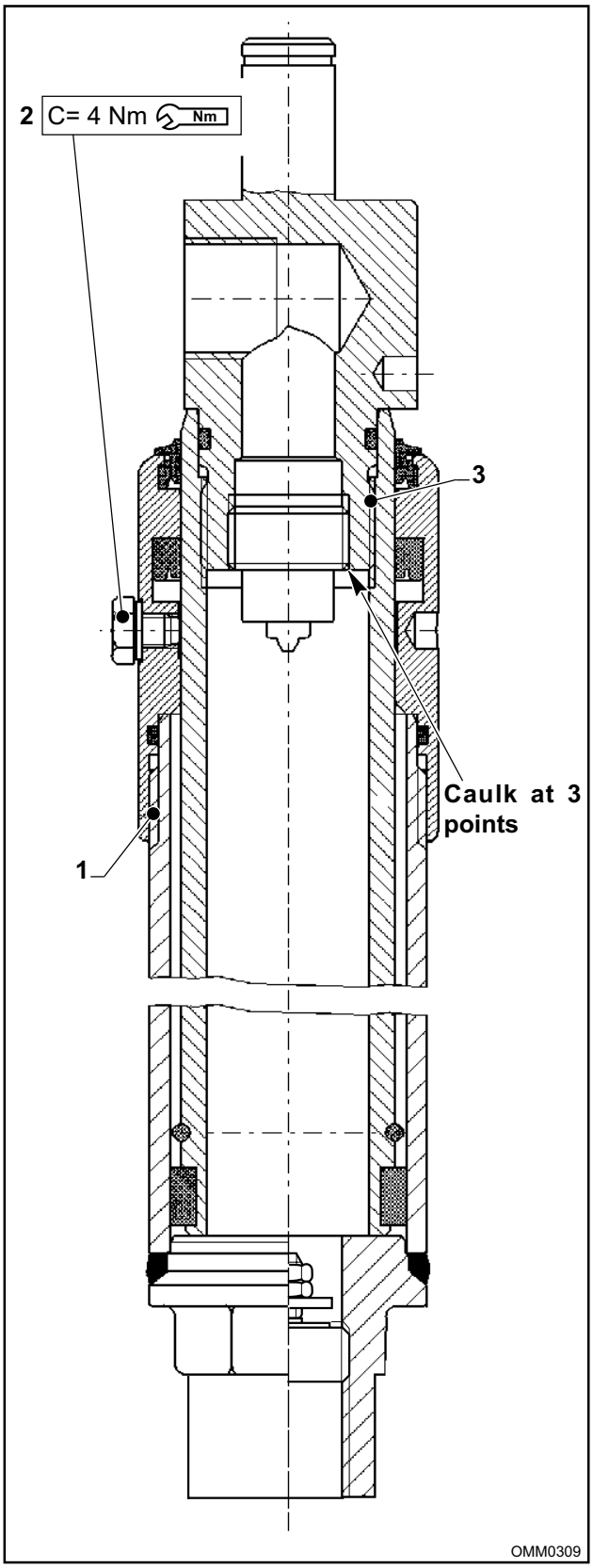


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TRIPLEX LIFT CYLINDERS

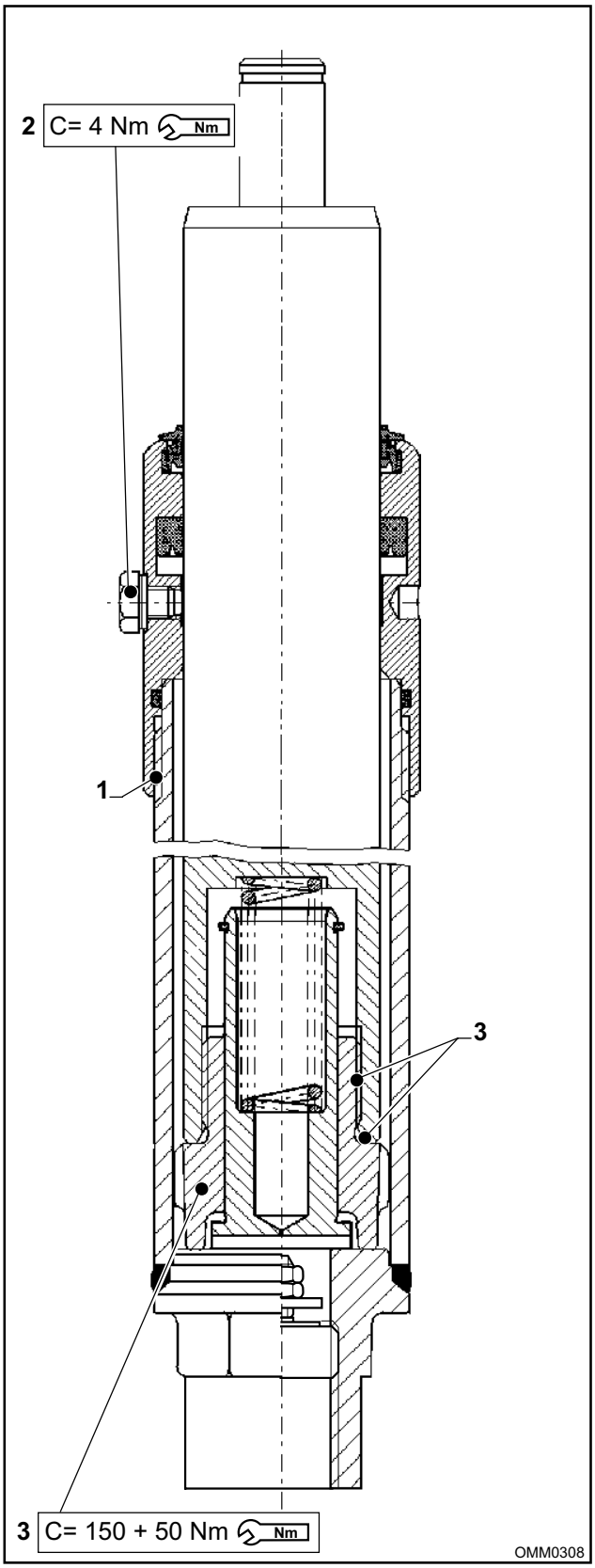
• LEFT CYLINDER

1= Apply Loctite 243
2= Air bleed screw
3= Apply Loctite 275



• RIGHT CYLINDER

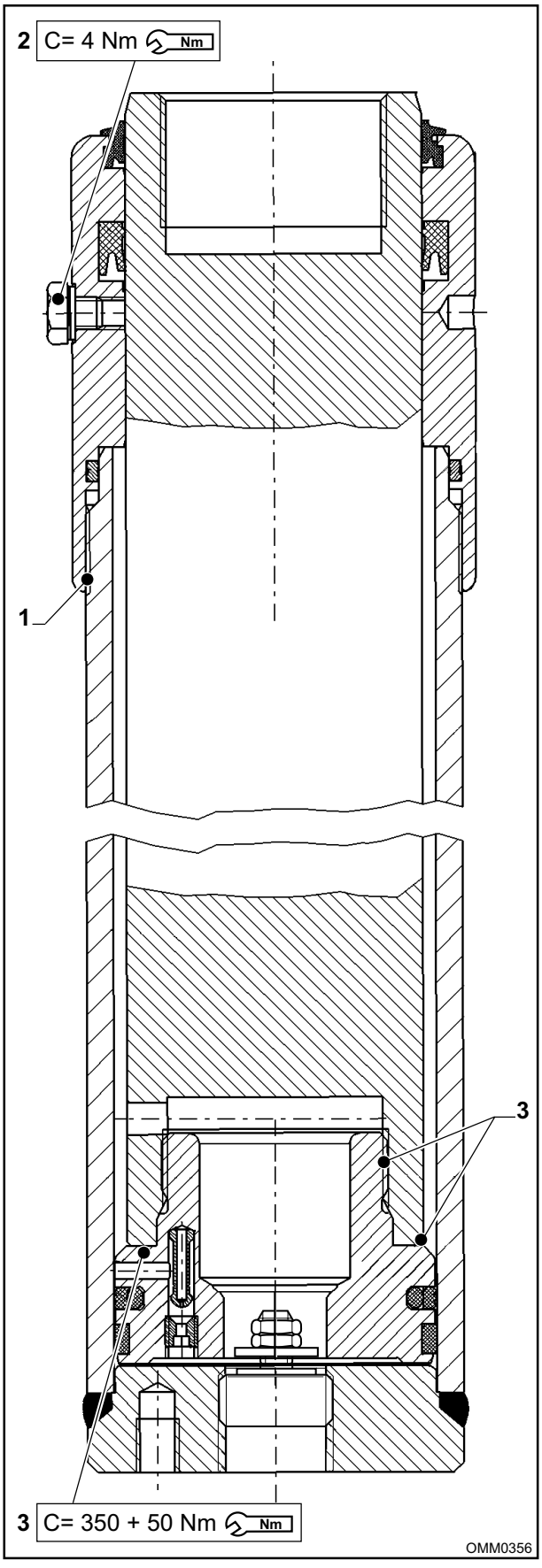
1= Apply Loctite 243
2= Air bleed screw
3= Apply Loctite 275



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• MIDDLE CYLINDER

1= Apply Loctite 243
2= Air bleed screw
3= Apply Loctite 275



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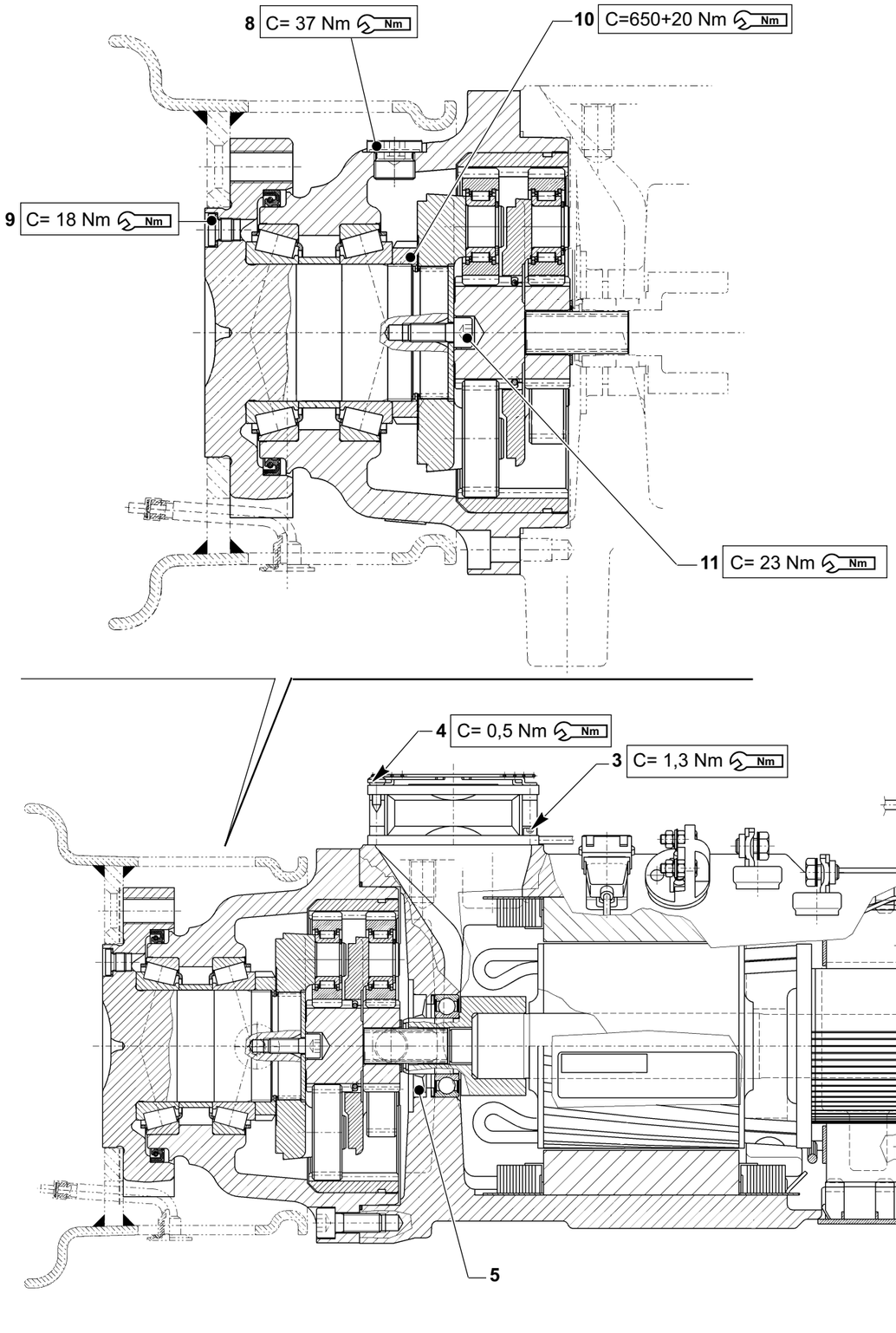
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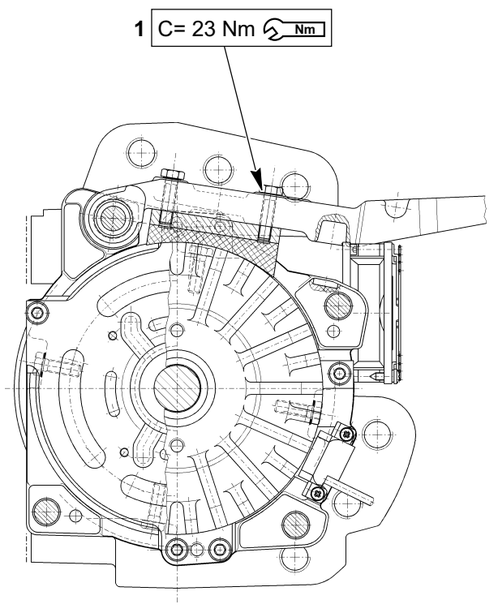
10.17 - FRONT AXLE

The front axle assembly consists of two gear motors that are connected to each other by a rigid shaft with the brake pulleys located in the middle of the assembly.
The motors are powered independently, creating the electric differential.

See attached diagram 2.
1= Brake shoe fastening screw
2= Reducer gear oil discharge cap
3= Electric fan fastening screw
4= Electric fan grill fastening screw
5= Sealing ring filled with a maximum of 50% FIAT TUTELA MR2 grease
6= Gear motor assembly screw
7= Screw to fasten the reducer gear to the motor
8= Cap
9= Topping up caps and level of reducer gear oil
10= Hub bearing lock nut.
Apply Loctite 270; threads clean, degreased, dry.
11= Planetary gear holder fastening screw
A= FORWARD drive.

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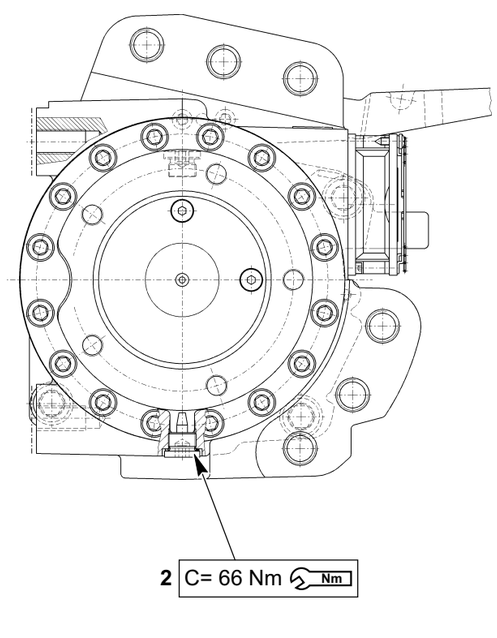


DIAGRAM 2

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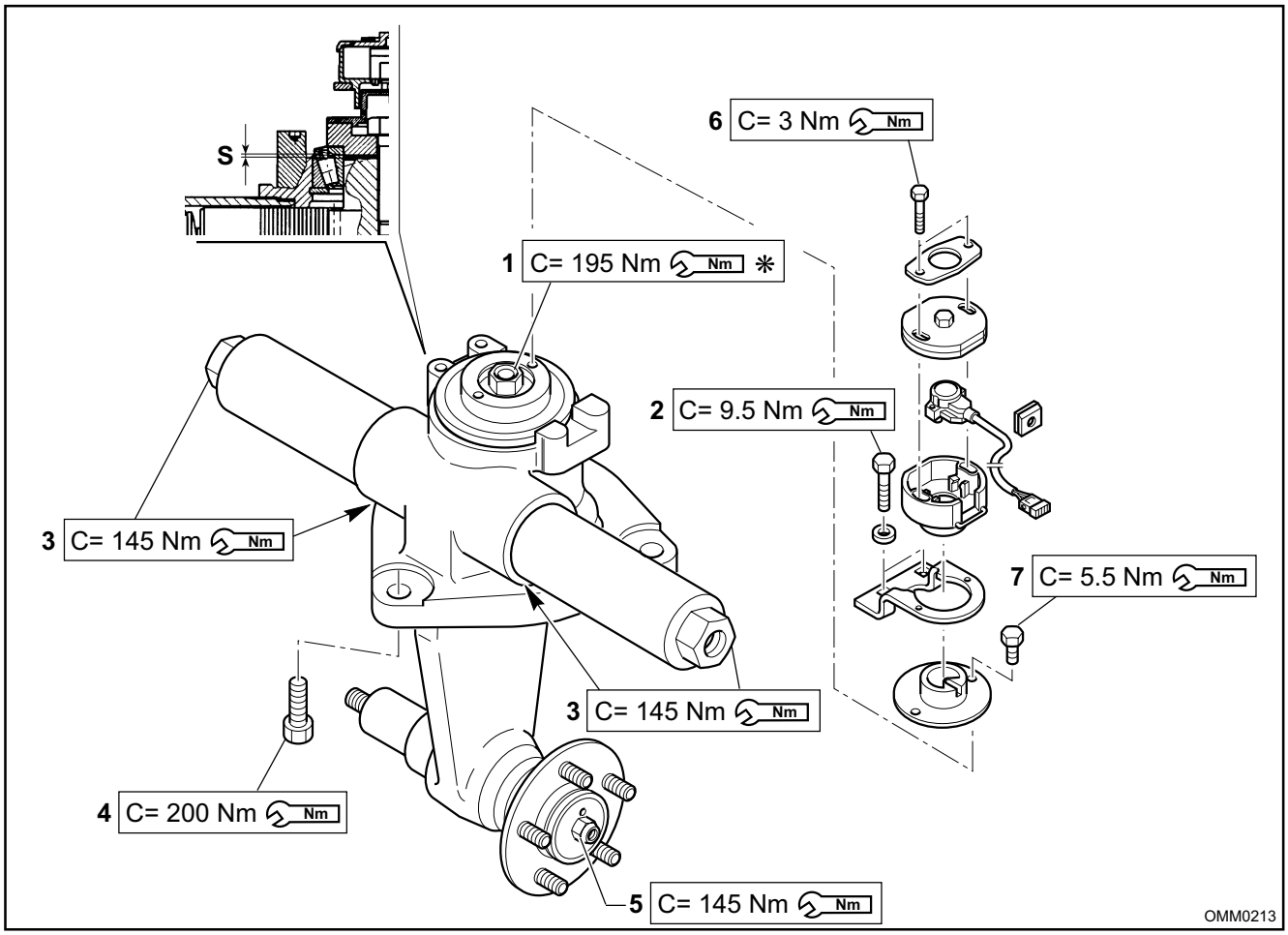
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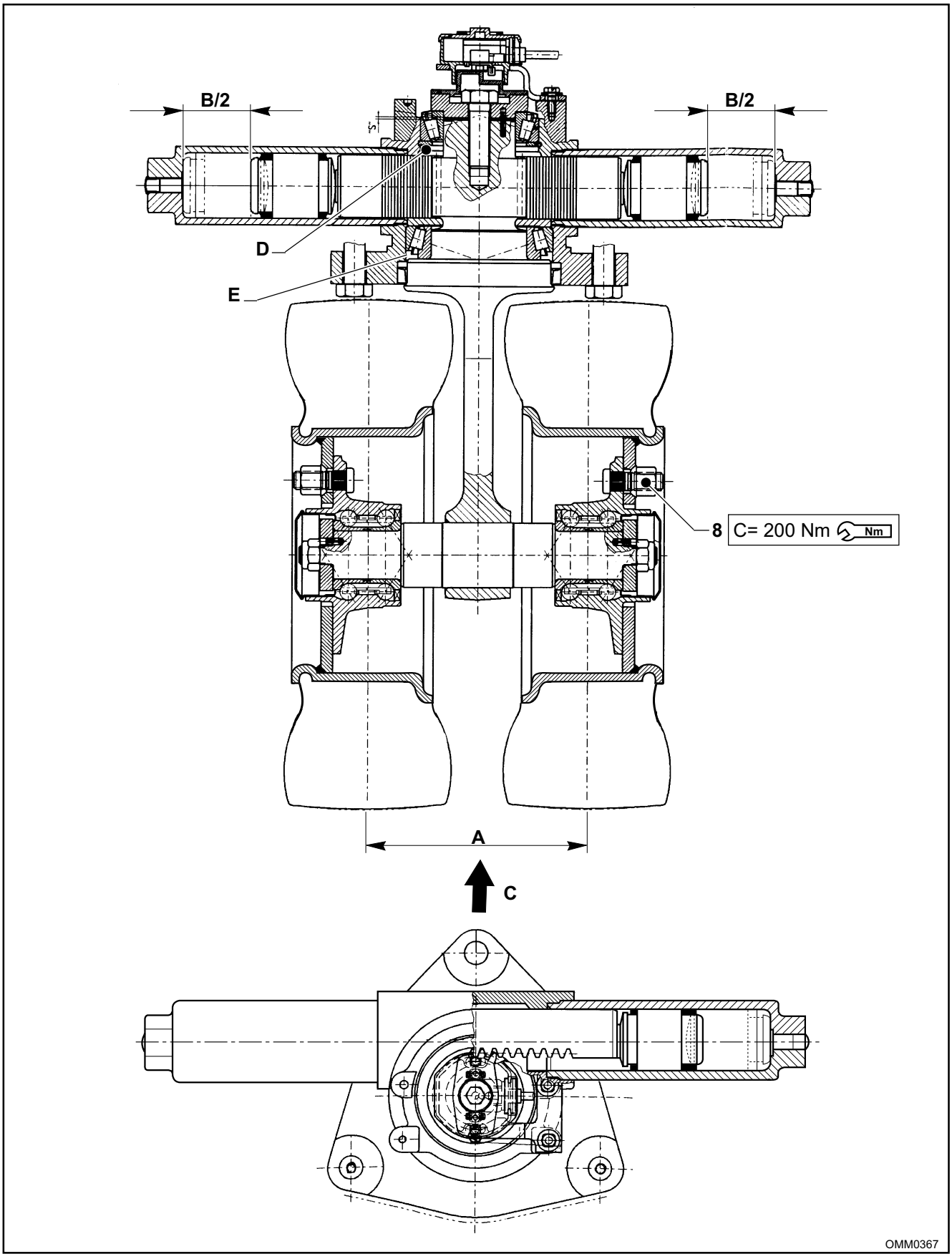
10.18 - 3-WHEEL REAR AXLE

This is a pivoting axle attached to the frame.
It consists of the steering cylinder, which is supplied by the steering distributor and rotates the axle body by means of a toothed shaft. A potentiometer connected to the axle creates the electric differential.



1= Axle body fastening screw
⁕ Tighten the screw to 15 Nm of torque. Measure the dimension "**S**", round it to the nearest decimal, then tighten the screw to 195 Nm of torque (see chapter 30).
Apply Loctite 270; threads clean, degreased, dry.
2= Potentiometer support fastening screw.
3= Cylinder barrel lock nut
Apply Loctite 243; threads clean, degreased, dry.
4= Screw fastening the axle to the frame.
5= Wheel hub lock nut.
6= Potentiometer fastening screw.
7= Potentiometer drag disc fastening screw.
8= Wheel lock nut.
A= Track = 168 mm.
B= Travel = 103.7 mm.
C= Forward drive.
D= Steering box support filled with lithium grease (TUTELA MR2) during mounting.
Quantity of grease: 250g.
If mounting for cold store operations, fill with low temperature grease.
E= Fill with lithium grease (TUTELA MR2) during mounting.
If mounting for cold store operations, fill with low temperature grease.

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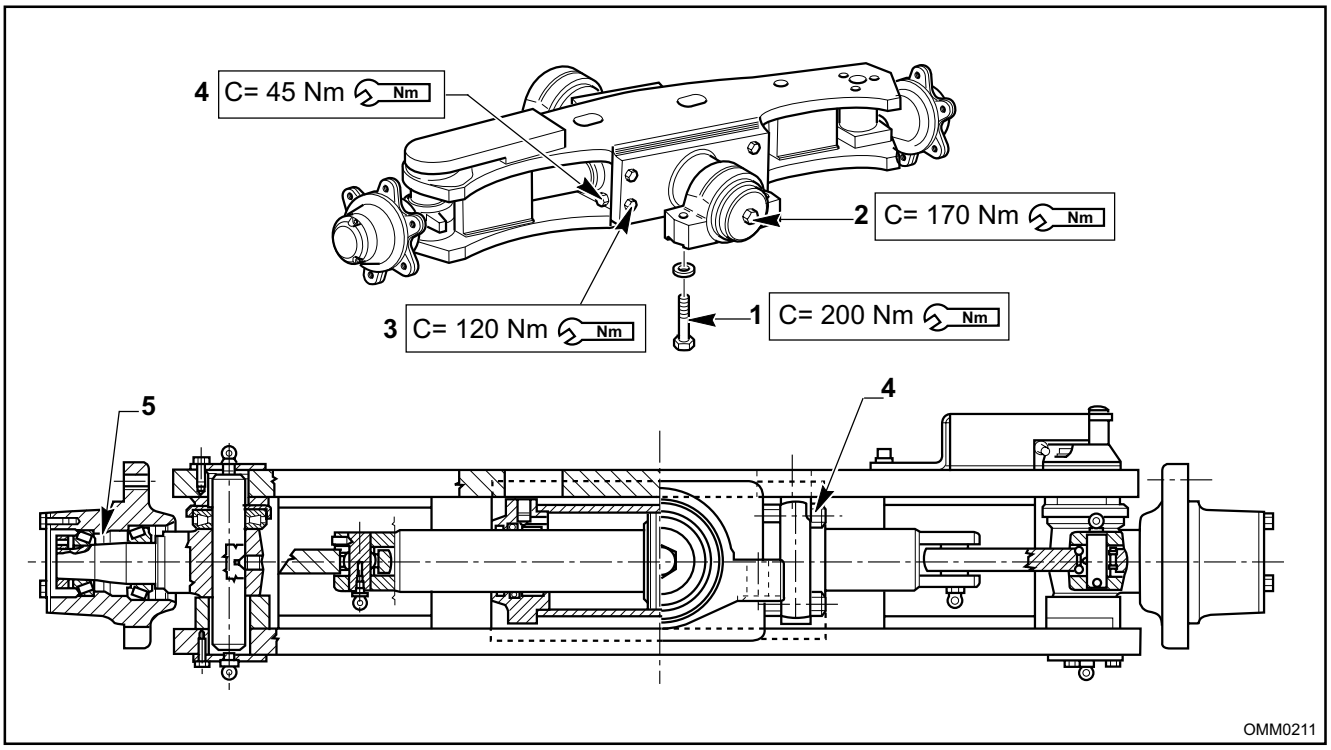
TECHNICAL DATA

Steer axle	pivoting
Wheel excursion angle	90°
Toe-in	/
Wheel angle	/
Incidence angle	/
Torque specifications	
Wheel hub	145 Nm
Wheel nuts	200 Nm
Axle body fastening screw	195 Nm
Steering cylinder stroke	103,7 Nm
Hexagonal nut on stub axle bolt	
Lubrication	
Wheel hub support	Tutela MR2 Lithium grease Consistency N.L.G.I.2
Stub axle support	Tutela MR2 Lithium grease Consistency N.L.G.I.2

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10.19 - 4-WHEEL REAR AXLE

Made of welded steel, the rear axle consists of the body, stub axles, the hubs, and the double-acting cylinder connected to the stub axles by the coupling rods. The joint pins are mounted onto roller bearings, which are lubricated by means of grease nipples. The wheel hubs are mounted onto taper roller bearings. The oscillating rear axle moves on two rubber supports located in the middle of the frame.



Specifications and data:
Clearance of rear wheel bearings ..... 0,06÷0,1 mm

Torque specifications[a]
Part:

	Torque[b] Nm
1= Screw fastening the axle support to the frame TE M16x1,5x60	≃ 200
2= Screw fastening the supports to the axle body TE M16x1,5x40	≃ 170
3= Screw fastening the steering cylinder to the axle body M12x1,25x63	≃ 120
4= Screw fastening the steering cylinder heads	≃ 45*

[a] The torque specifications do not account for the addition of lubricants.
[b] Values with tolerances of +5%, -15°%.
* Tighten in small increments in a crisscross sequence.

Maximum steering angle left ..... 54,5° ± 1° 30'
Maximum steering angle right ..... 78° ± 1° 30'

Adjusting the rear wheel bearings (5):
Adjust the bearing as described in the relative paragraph.

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Chapter 20

CHECKS AND ADJUSTMENTS

CONTENTS

20.1 - BLEEDING AIR. **2**
Bleeding the SIMPLEX masts **2**
Bleeding the lift cylinders **2**
Bleeding the tilt cylinders **2**
Bleeding the DUPLEX and TRIPLEX masts **3**
Bleeding the lift cylinders **3**
Bleeding the tilt cylinders **3**

20.2 - CHECKING AND CALIBRATING HYDRAULIC PRESSURE. **4**
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Checking the calibration of the by-pass valve **4**
Checking the calibration and pressure of the lift distributor **5**
Checking the calibration and pressure of the power steering **6**

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20.1 - BLEEDING AIR

The air must be bled every time the mast is disconnected or after any operation on the hydraulic system that involves disassembling the pipes.

BLEEDING THE SIMPLEX MASTS

Bleeding the lift cylinders

1 - Place a load on the forks (between 200-300 kg).
2 - Loosen the air bleed screw **A** located at the top of the lift cylinders (1/2 turn ÷ 1 turn is sufficient; do not loosen too much).
3 - Carefully move the fork lift lever into the lift forks position.
4 - Tighten the screw **A** when the air or air-oil mixture stops escaping.



Bleeding the tilt cylinders

5 - Tilt the mast forward and backward several times until the cylinders reach the limit stop.
The air will escape automatically.
6 - Check the level of oil when finished.

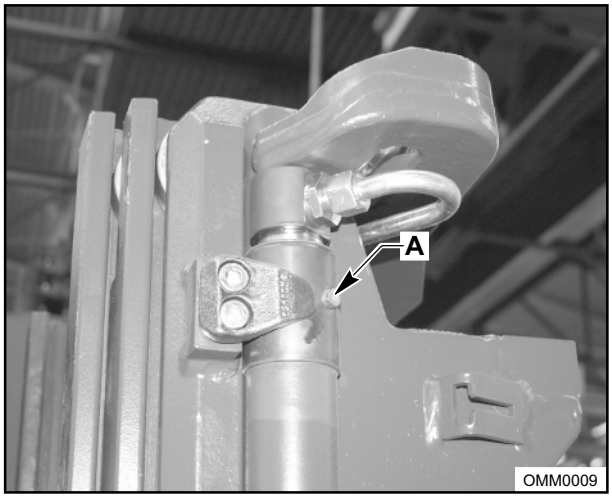
IMPORTANT:
Dispose of used oil in accordance with the regulations in force.

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BLEEDING THE DUPLEX AND TRIPLEX MASTS

Bleeding the lift cylinders

1 - Place a load on the forks (between 200-300 kg).
2 - Loosen the air bleed screw **A** located on top of the side lift cylinders and the middle cylinder (1/2 turn ÷ 1 turn is sufficient; do not loosen the screw too much).
3 - Carefully move the fork lift lever into the lift forks position.
4 - Tighten the screw **A** when the air or air-oil mixture stops escaping.

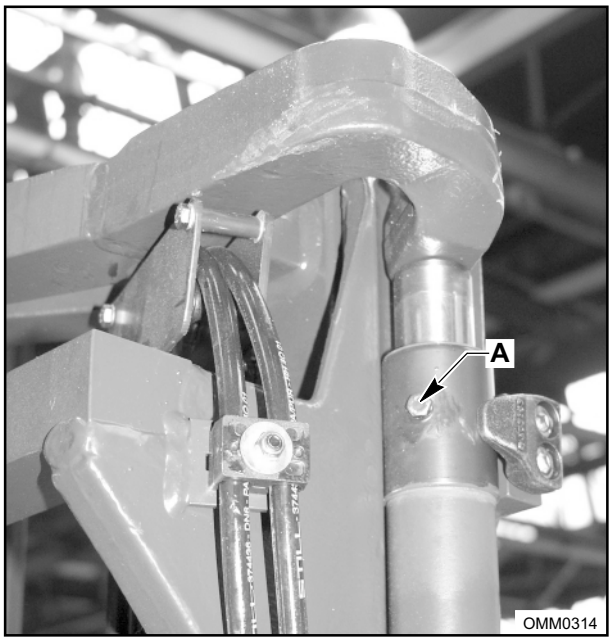


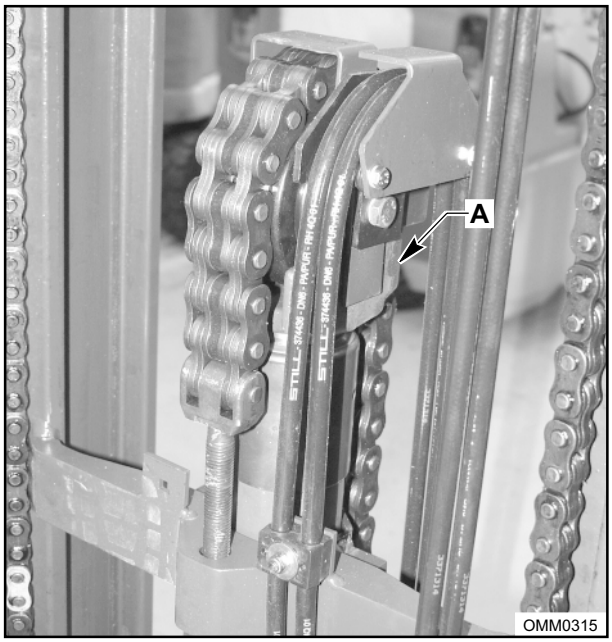
Bleeding the tilt cylinders

5 - Tilt the mast completely forward and backward several times until the cylinders reach the stroke limit stop.
The air will escape automatically.
6 - Check the level of oil when finished.

IMPORTANT:

Dispose of used oil in accordance with the regulations in force.



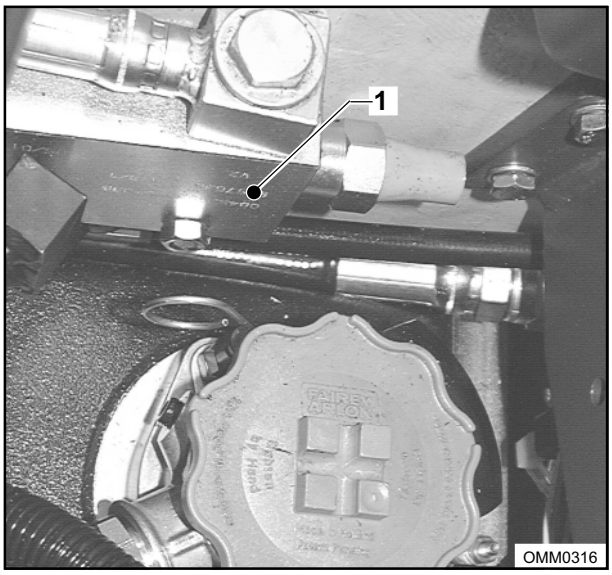


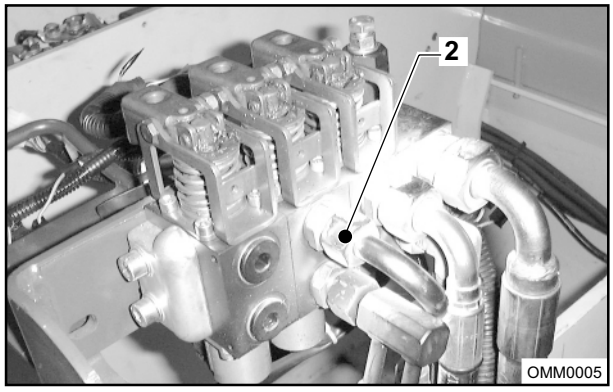
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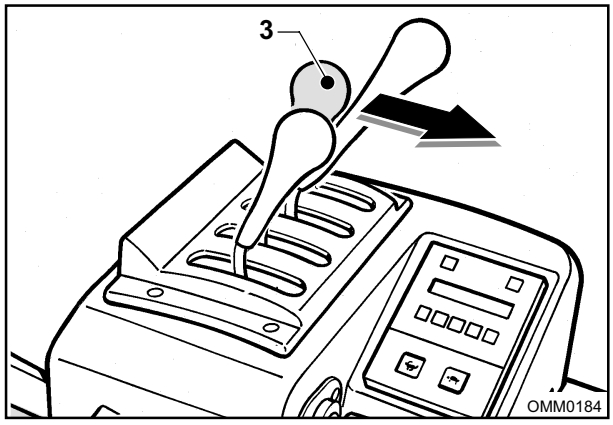
20.2 - CHECKING AND CALIBRATING HYDRAULIC PRESSURE

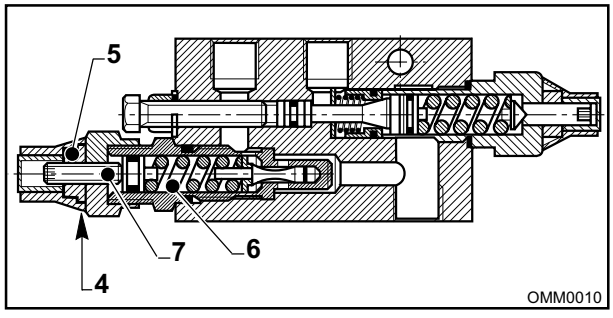
STOP VALVE
CHECKING THE CALIBRATION OF THE BY-PASS VALVE

1 - If there is a breakdown or malfunction during the backward tilt maneuver, check that the by-pass valve located in the stop valve (1) is calibrated correctly.
Proceed as follows:
2 - Remove the dashboard as described in the relative paragraph.
3 - Remove the mat, loosen the screws to remove the platform, and disconnect the accelerator pedal.
4 - With the engine switched off, move the distributor lever in both directions to release the pressure from the system.
5 - Unscrew the pipe (2), connect a pressure gauge with a range 0-200 bars and reconnect the pipe.
6 - Switch on the machine and operate either the hydraulic steering or the hydraulic lift system until the oil reaches a temperature of 45÷50°C.
7 - Move the tilt lever (3) backward until the cylinders are at the stroke limit stop and take the max pressure reading.
8 - If the value is not the same as the value indicated in the “TECHNICAL DATA” chapter, adjust the by-pass valve as described below.
9 - Upon authorization from the Customer Service Department, remove the seal on the cap (4).
10 - Remove the cap (4), loosen the lock nut (5), and adjust the tension of the spring (6) by means of the grub screw (7): tightening the screw will increase the pressure and loosening it will decrease it.
11 - Check and adjust the pressure again until it is calibrated correctly.
12 - Tighten the lock nut to lock the screw and replace the seal on the cap.







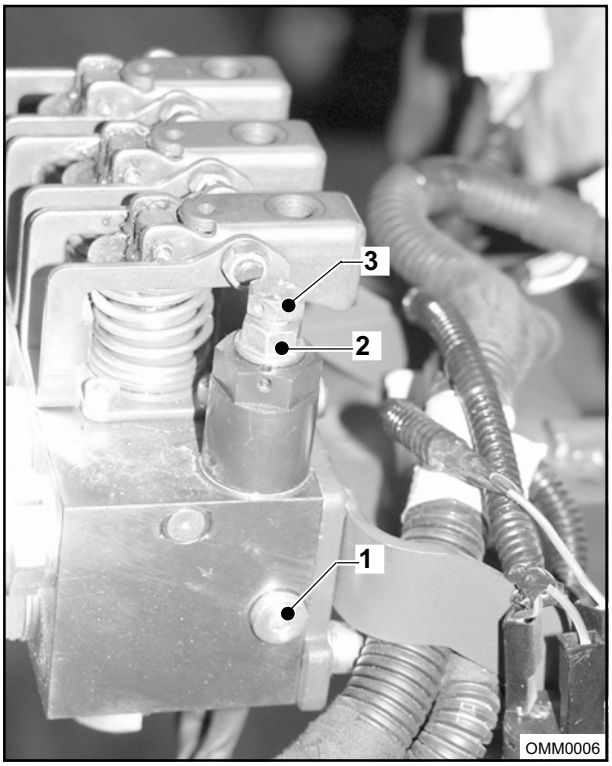


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CHECKING THE PRESSURE AND CALIBRATION OF THE LIFT DISTRIBUTOR

Remove the dashboard as described in the relative paragraph.

- Bring the oil in the lift system to a temperature of ~ 45÷50°C.
- With the engine switched off, move the distributor levers in both directions to release the pressure from the system.
- Connect a pressure gauge with a range 0-250/300 bars to the lift distributor at point (1).
- Extend the mast to its maximum height and check that the pressure is the same as specified in the appropriate table.
- If it is not, remove the seal on the by-pass valve, loosen the lock nut (2) and tighten or loosen the screw (3) to increase or decrease the pressure of the by-pass valve.
- After adjusting the pressure, tighten the lock nut (2) to lock the screw (3).
- Seal the valve with lead.



1= Cap 1/8” G

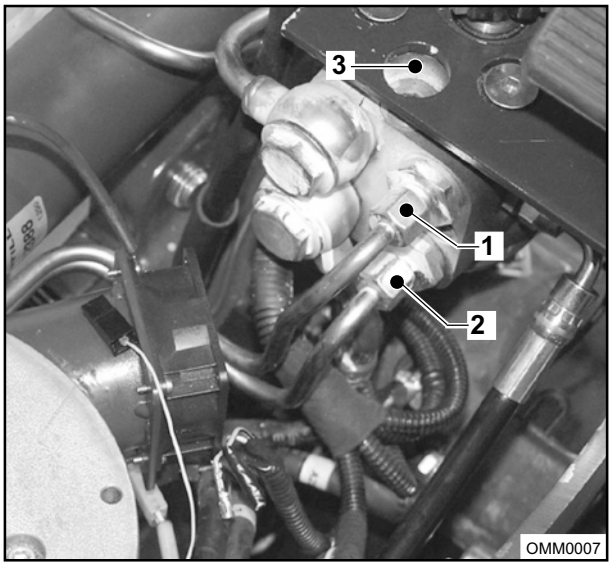
Calibrating the pressure relief valve (Bar)			
Mast	Standard capacity truck		
	1200 kg	1500 kg	1800 kg
SX	154^{+5}_{0}	180^{+5}_{0}	213^{+5}_{0}
DX	183^{+5}_{0}	210^{+5}_{0}	235^{+5}_{0}
TX	174^{+5}_{0}	200^{+5}_{0}	230^{+5}_{0}

SX= Simplex
DX= Duplex
TX= Triplex

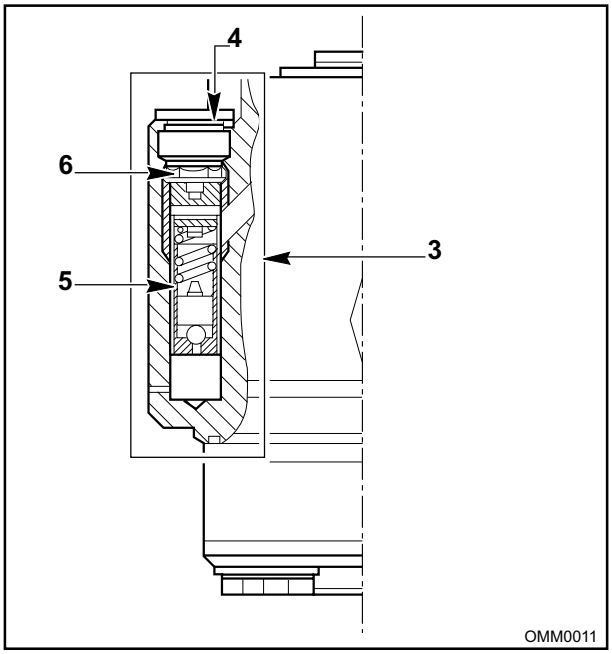
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CHECKING THE PRESSURE AND CALIBRATION OF THE POWER STEERING

- Remove the rubber mat.
- Remove the platform by loosening the screws and disconnecting the accelerator pedal.
- Unscrew one of the two pipes (1) and (2), connect a pressure gauge with a range 0-150 bars and reconnect the pipe.
- Bring the oil to a temperature of 45÷50°C.
- Turn the steering wheel completely to the left or right until the steering cylinder reaches the stroke limit stop and take the max pressure reading, which should equal 90+5 bar.
- If the pressure does not equal the above value, adjust the by-pass valve (3) on the steering distributor.
- Remove the cap (4).
- Adjust the tension of the spring (5) by means of the Allen screw (6), tightening the screw to increase the pressure and loosening it to decrease it.
- Check and adjust the pressure again until it is correctly calibrated.
- Reassemble by following the above instructions in reverse.



1-**2**= Steering cylinder pipe



Steering control distributor by-pass valve

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Chapter 30

REMOVING AND REINSTALLING PARTS

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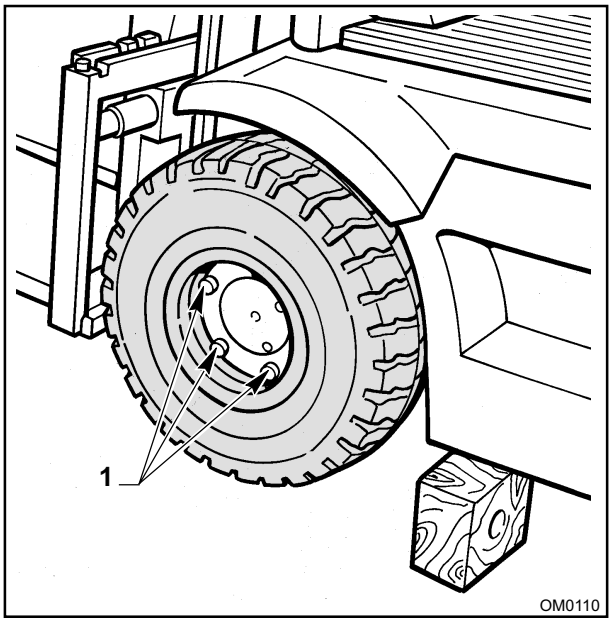
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30.1 - MAST

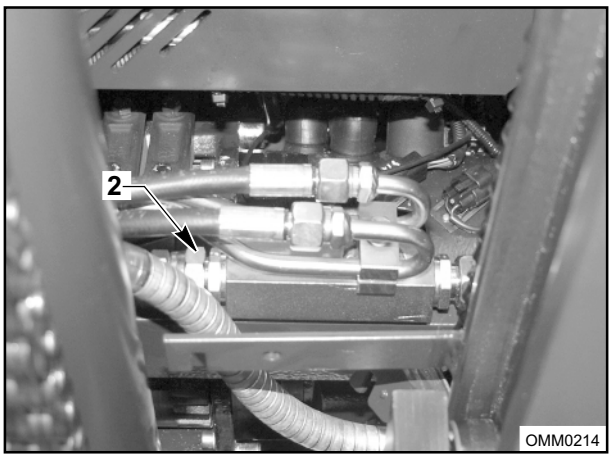
REMOVING THE MAST

Bring the mast into the vertical position.
Completely lower the fork carriage.
Remove the forks from the movable carriage assembly.
Unplug the battery or operate the emergency button.
Release the pressure from the cylinders (lift, tilt, attachments, or SLI) by moving the hydraulic system distributor levers in both directions several times.

Loosen the wheel nuts (1).
Lift the truck and place it on solid, stable supports.
Completely unscrew the wheel nuts and remove the wheels.



Disconnect the delivery pipes for the lift cylinder (2), the sideshifter, or attachments if any.



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Hook straps or cables capable of supporting the weight of the mast (check the weight) to the lifting points and lift it with a crane.
Pull the cable taut.


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MAST WEIGHTS

		Height (m)	**Withou SLI** Weight (kg)	**Witht SLI** Weight (kg)
3/12	Sx	3,33	360	393
		3,63	377	410
		4,03	400	433
		4,53	438	461
		5,03	467	490
3/15	Dx	2,975	349	382
		3,275	366	399
		3,575	383	416
		3,975	406	439
4/15	Tx	4,47	471	504
		4,77	487	520
		5,22	512	545
		5,77	553	586
		6,37	586	619
		6,97	619	652
3/18	Sx	3,33	376	409
		3,63	393	426
		4,03	416	449
		4,53	444	477
		5,03	473	506
4/18	Dx	2,975	365	398
		3,275	382	415
		3,575	399	432
		3,975	422	455
	Tx	4,47	487	520
		4,77	503	536
		5,22	528	561
		5,77	569	602
		6,37	602	635
		6,97	635	688

Remove the rubber stop rings from the hook pins on the mast tilt cylinders.


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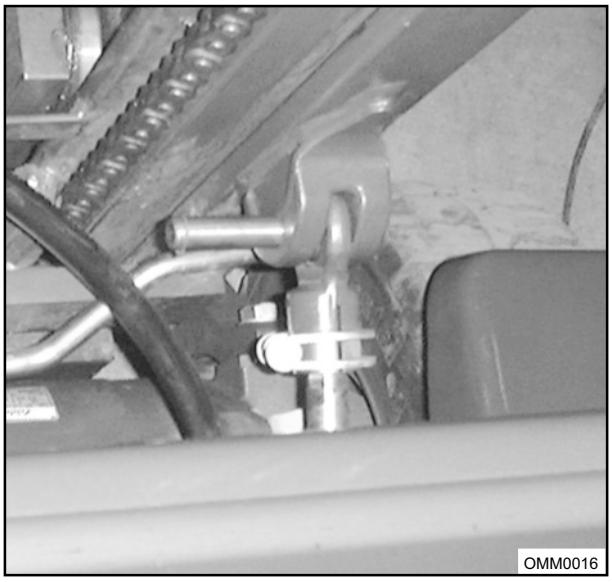
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DANGER

Use the appropriate equipment.
Do not place your hands or fingers between parts.

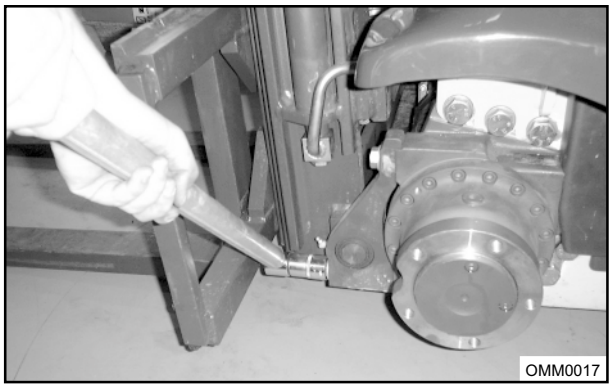
Push the pin out with a rod that is long enough to remove it.





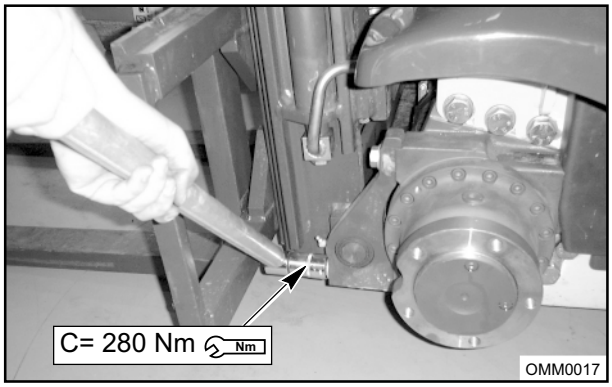
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Loosen the mast support fastening screws.
Lift and remove the entire mast assembly from the truck.



REINSTALLING THE MAST

Reinstall the mast by following the operations described above in reverse, making sure that the mast supports are tightened to the specified torque.
Once the mast has been reinstalled, bleed the air from the hydraulic system as described in chapter 20, paragraph 20.15
If the mast is replaced with another type of mast, change the carrying capacity plate.



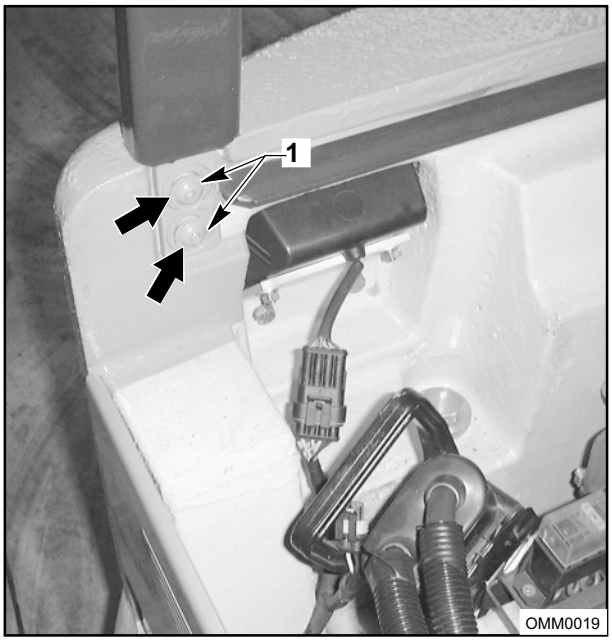
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30.2 - OVERHEAD GUARD

REMOVING THE OVERHEAD GUARD

Apply the hand brake to block the truck.
Unplug the battery or operate the emergency button.
Bring the hydraulic distributor to the front.
Lift the battery compartment cover.
Loosen and remove the screws (1) that fasten the overhead guard to the counterweight in the rear.



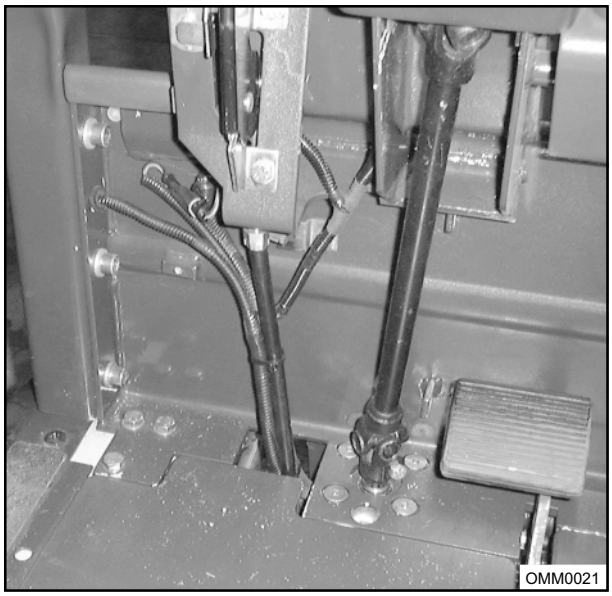


Remove the plastic guard from the front chassis.



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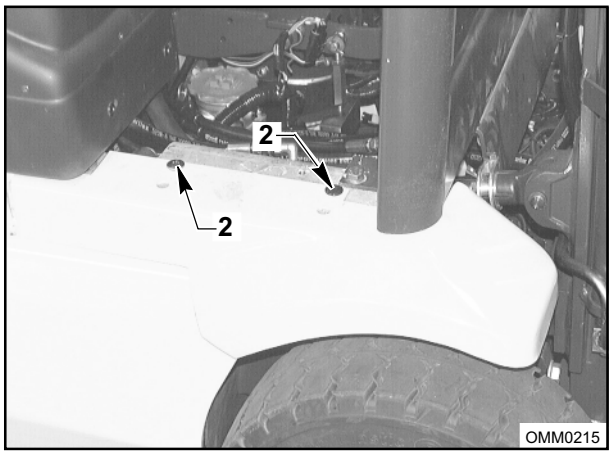
Disconnect the wiring from the revolving beacon or other electrical devices located on the overhead guard.



Remove the screws from the platform, lift it and disconnect the wiring from the pedal assembly.

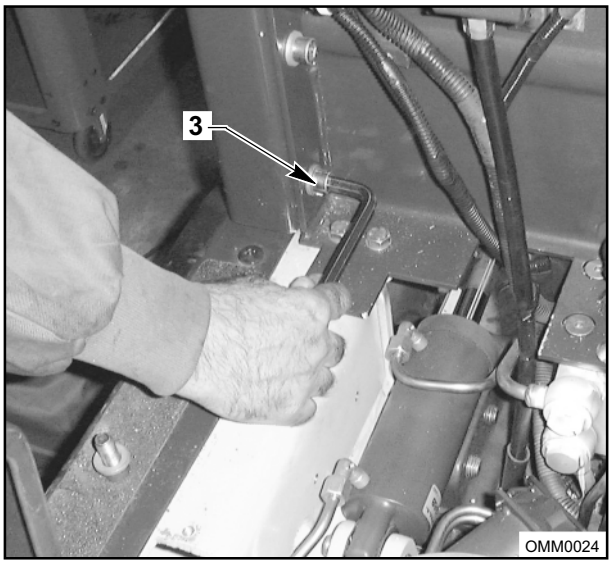


Remove the platform and loosen the screws (2) to remove the two front fenders.



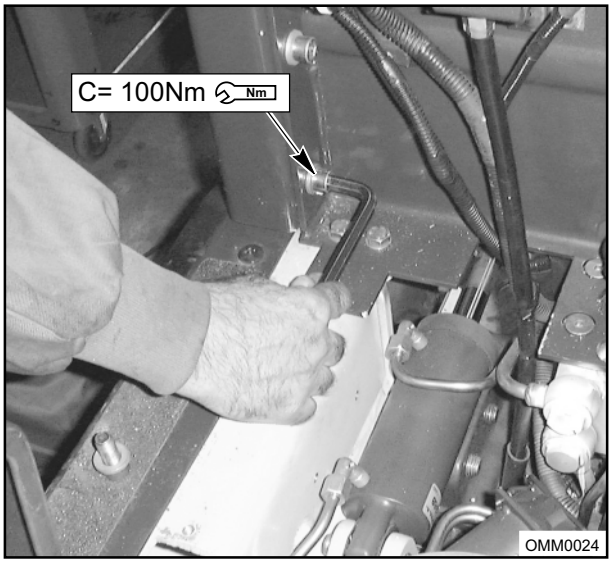
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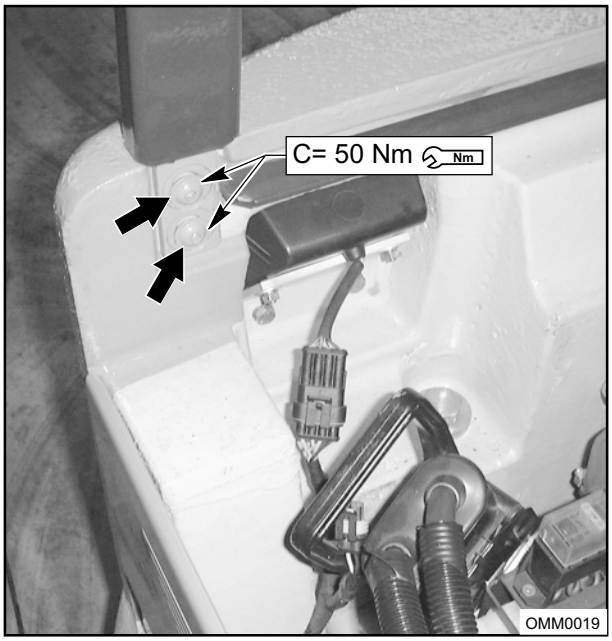
Loosen the screws (3) that fasten the overhead guard to the chassis (three per side).
Lift the overhead guard with cables or straps and remove it.



REINSTALLING THE OVERHEAD GUARD

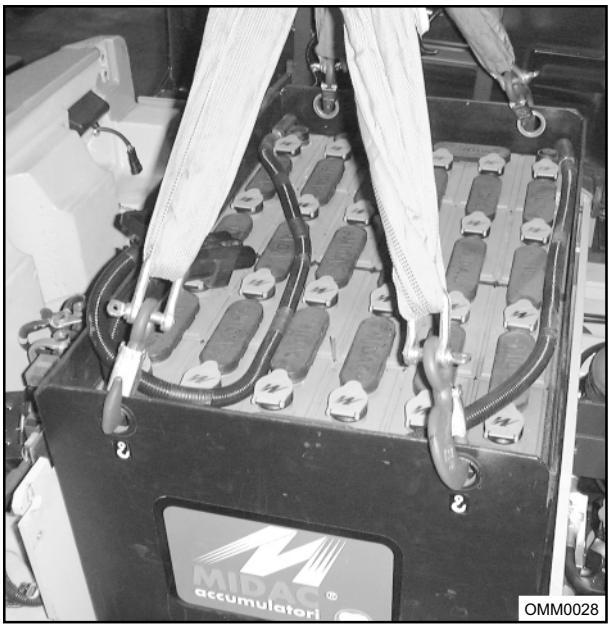
Reinstall the overhead guard by following the operations described above in reverse, making sure that the screws are tightened to the specified torque.





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30.3 - BATTERY



REMOVING THE BATTERY

Apply the hand brake to block the truck.
Unplug the battery or operate the emergency button.
Bring the hydraulic distributor to the front.
Lift the battery compartment cover.
Unplug the battery.
Remove the right side panel.
Hook the battery at the four lifting points to a crane with a swinging bar or cables capable of supporting the weight of the battery (check the weight of the battery).
Lift the battery and remove it from its compartment.

Truck type	Weight kg ± 5%
3/12	**549** (Ah 300 / 315) **580** (Ah 345) **590** (Ah 360) **590** (Ah 375)
3/15 - 4/15	**709** (Ah 400 / 420) **765** (Ah 460) **780** (Ah 480) **780** (Ah 500)
3/18 - 4/18	**915** (Ah 575) **930** (Ah 600) **930** (Ah 625)

REINSTALLING THE BATTERY

Reinstall the battery by following the operations described above in reverse.

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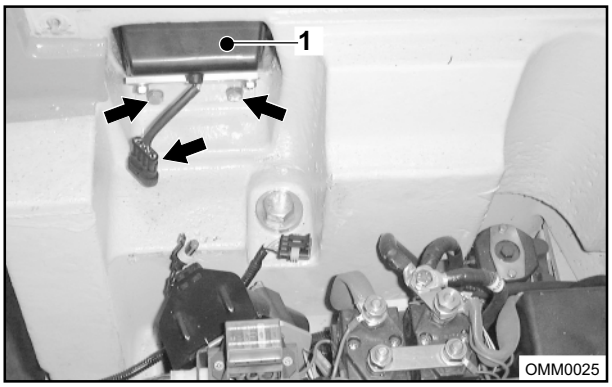
30.4 - COUNTERWEIGHT

DANGER

Before performing the operations below, it is absolutely ESSENTIAL that the mast be completely lowered and tilted backward.
Bring the forks or attachments if any to the ground and place solid, stable supports under the fixed masts or mast supports.
FAILURE TO OBSERVE THESE INSTRUCTIONS MAY CAUSE THE TRUCK TO TIP OVER!

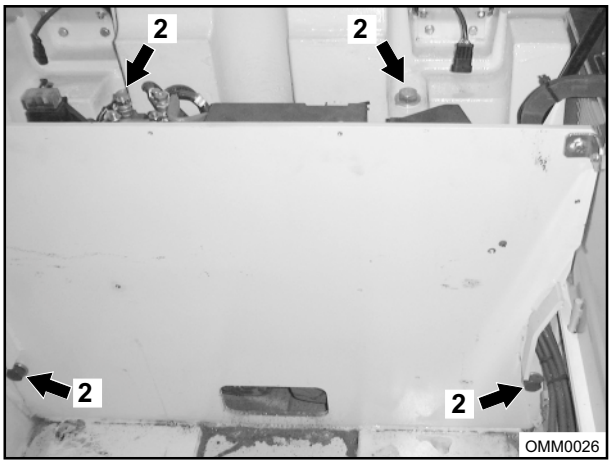
REMOVING THE 3-WHEEL COUNTERWEIGHT

Remove the battery as described in the relative paragraph.
Loosen and remove the screws that fasten the overhead guard to the counterweight.
Remove the rear lights (1) from their housing.
Insert straps or cables capable of supporting the weight of the counterweight in the counterweight openings.

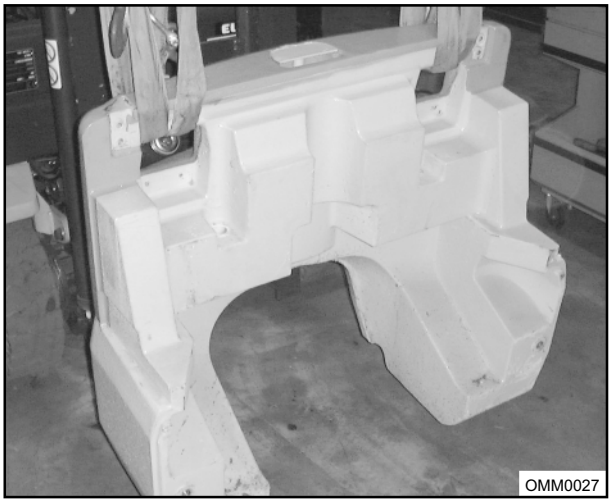


Counterweight for the 3/12 truck: 785 kg.
Counterweight for the 3/15 truck: 835 kg.
Counterweight for the 3/18 truck: 835 kg.
Attach the cables to a crane and pull them taut.

Loosen and remove the four counterweight fastening screws (2).



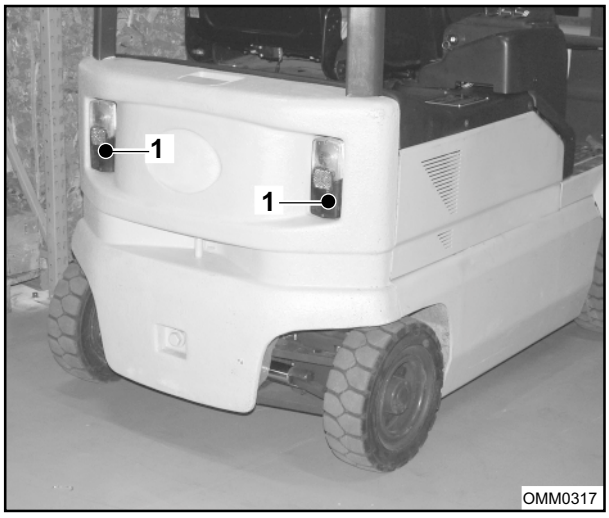
Lift the counterweight and withdraw with the crane, removing the counterweight from the frame.



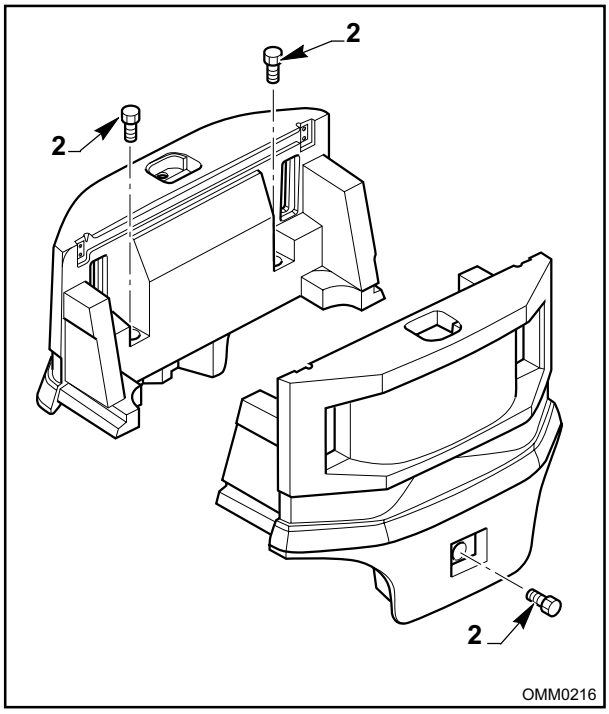
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REMOVING THE 4-WHEEL COUNTERWEIGHT

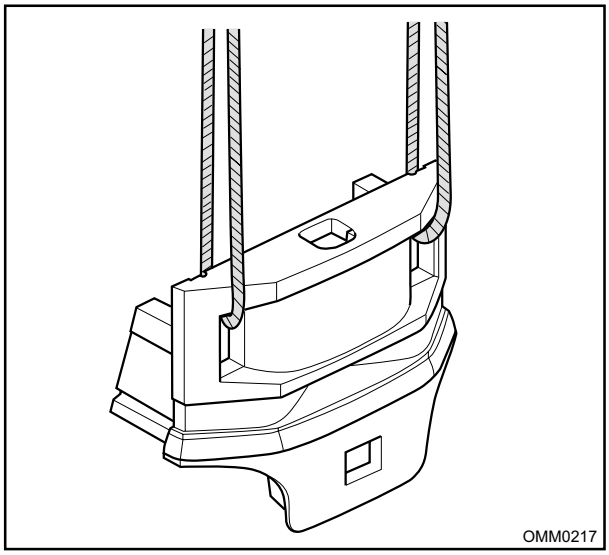
Remove the battery as described in the relative paragraph.
Loosen and remove the screws that fasten the overhead guard to the counterweight.
Remove the rear lights (1) from their housing.
Insert straps or cables capable of supporting the weight of counterweight in the counterweight openings (the counterweight weighs 715 kg).
Attach the cables to a crane and pull them taut.



Loosen and remove the three counterweight fastening screws (2).



Lift the counterweight and withdraw with the crane, removing the counterweight from the frame.



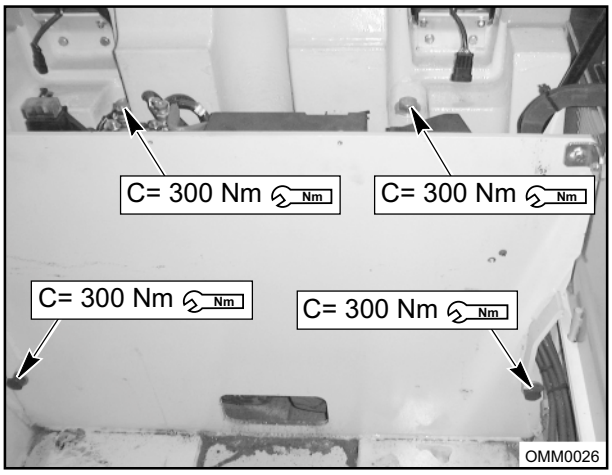
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REINSTALLING THE COUNTERWEIGHT

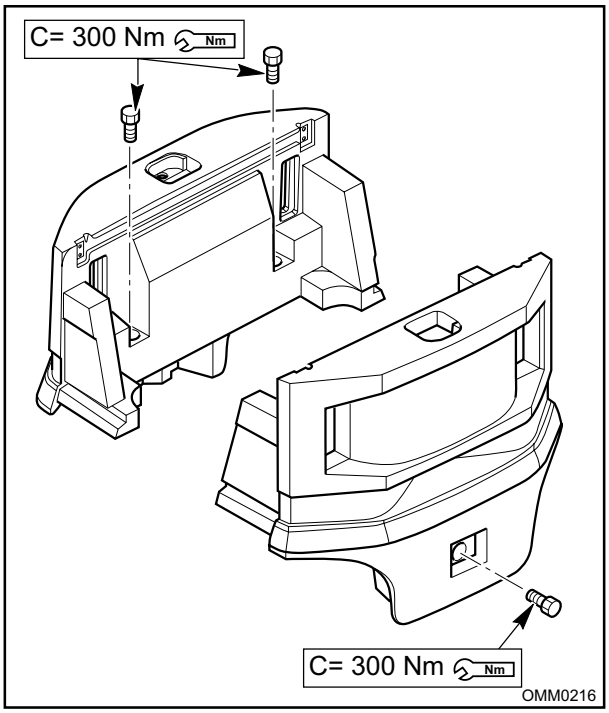
Reinstall the counterweight by following the operations described above in reverse, making sure that the counterweight and overhead guard screws are tightened to the specified torque.

Tightening torque for the overhead guard to counterweight screws:

3-wheel counterweight



4-wheel counterweight

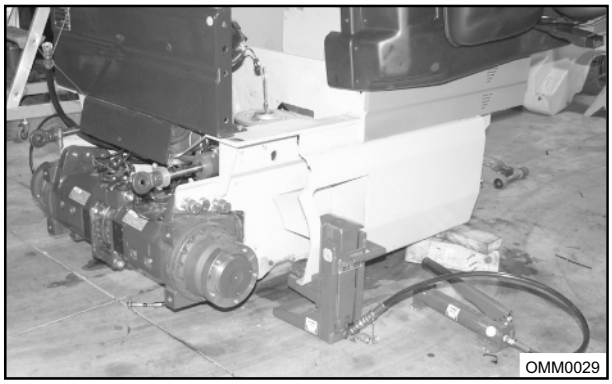


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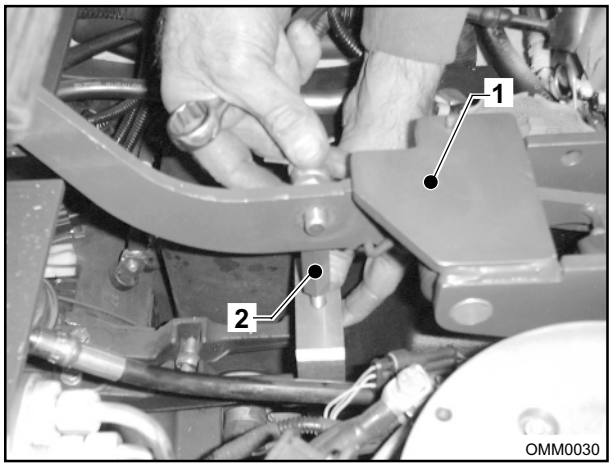
30.5 - FRONT AXLE

REMOVING THE FRONT AXLE

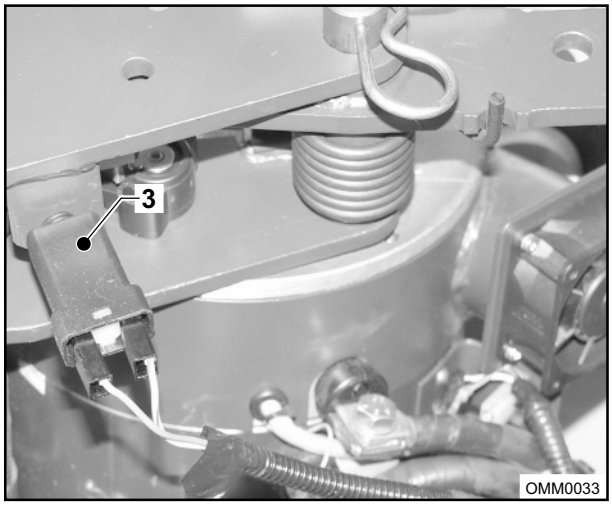
Apply the hand brake to block the truck.
Unplug the battery or operate the emergency button.
Lift the truck and place it on four solid, stable supports (wooden blocks or hydraulic jackstands).
Remove the front wheels.
Remove the mast as described in the relative paragraph.
Remove the two plastic side housings and the acoustic warning signal.



Disassemble the brake pedal support (1) complete with pedal and push rod (2) or simply disconnect the latter.

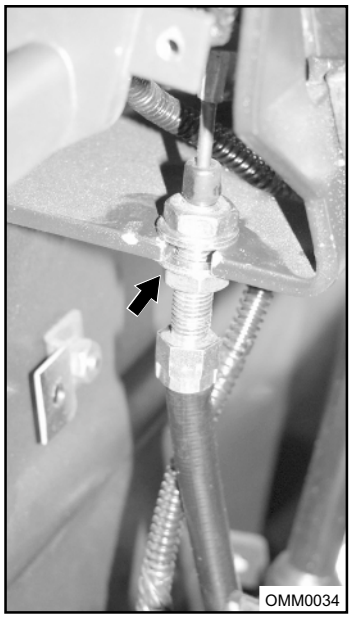


Disconnect the connectors from the microswitch (3).

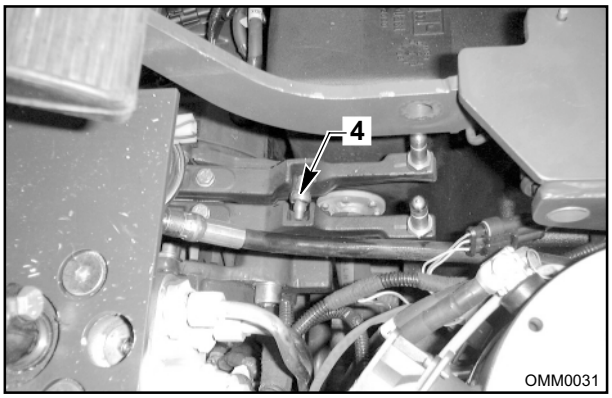


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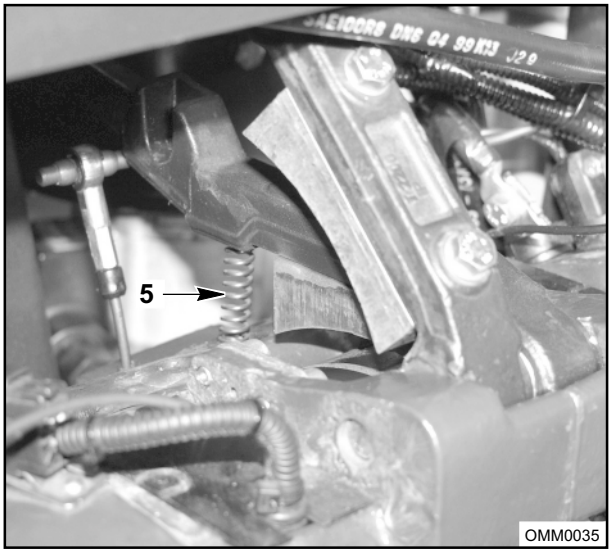
Disconnect the sheath from the hand brake support and raise it to free the terminal on the levers.



Disconnect the hand brake cable terminal (4) from the brake levers.

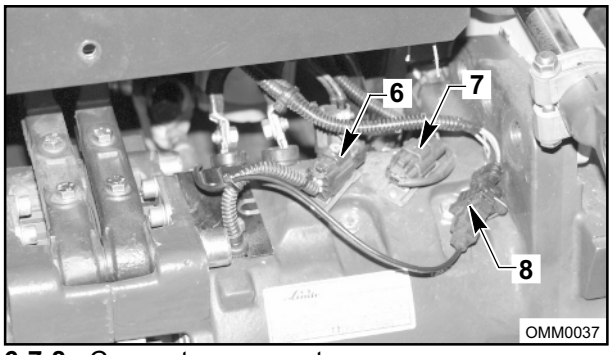


Remove the return springs (5) from the hand brake levers.

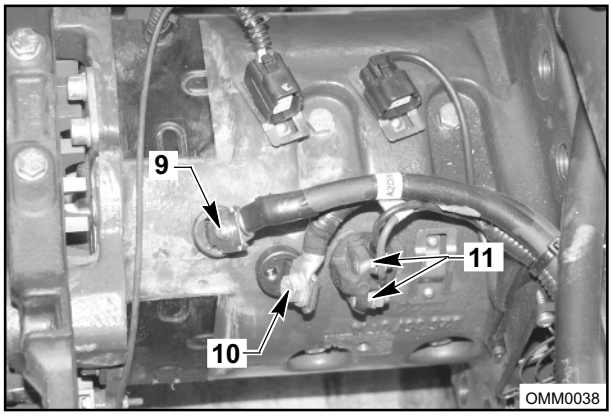


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Disconnect the wiring from the traction motors:
Three connectors per motor, plus three wire terminals per motor.

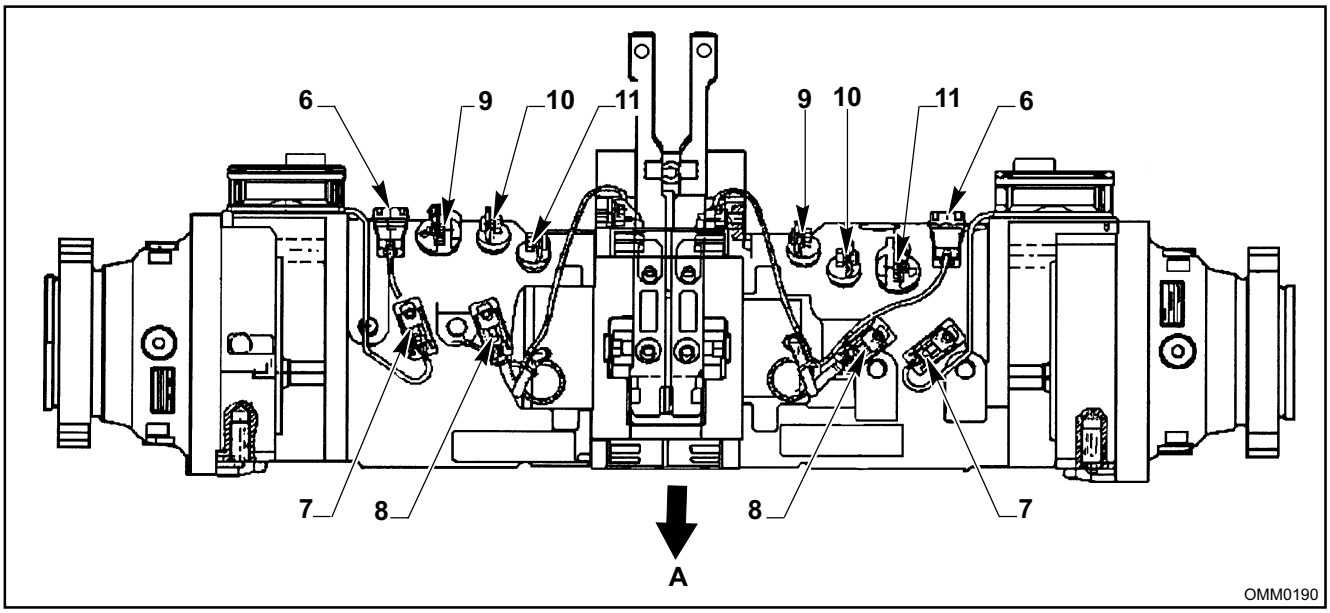


6-7-8= Connectors per motor



9-10-11= Motor wires

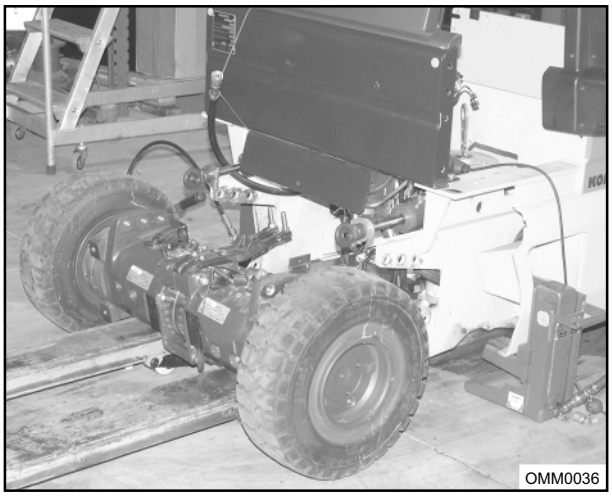
Wiring diagram



A= Front

https://truckmanualshub.com/

Place a jackstand or hand pallet truck under the axle and raise it until it is in contact with the axle.
Loosen the axle screws alternately leaving in one screw per side.
Remount the two wheels, fastening them temporarily with two screws per side.
Lower the frame until the front wheels touch the ground if the truck is standing on hydraulic jackstands.
Remove the two remaining fastening screws from the axle and remove the axle from the front, sliding it over the wheels and keeping it in position.

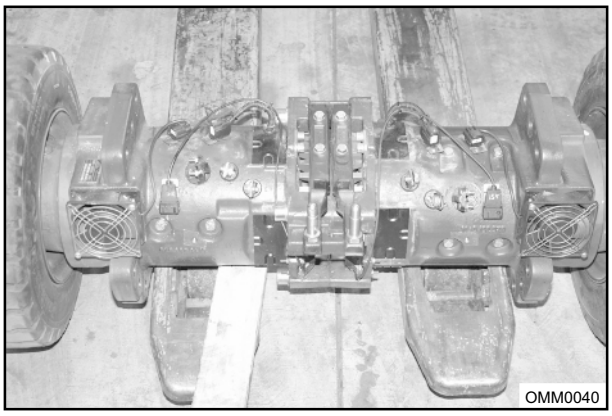

OMM0036

ATTENTION

Be careful not to bump the motor fans while removing the axle.

If a jackstand or hand pallet truck has been placed under the axle, remove the two remaining fastening screws, withdraw with the jackstand and remove the axle from the frame.

Lower the jackstand or the hand pallet truck until the wheels touch the ground.

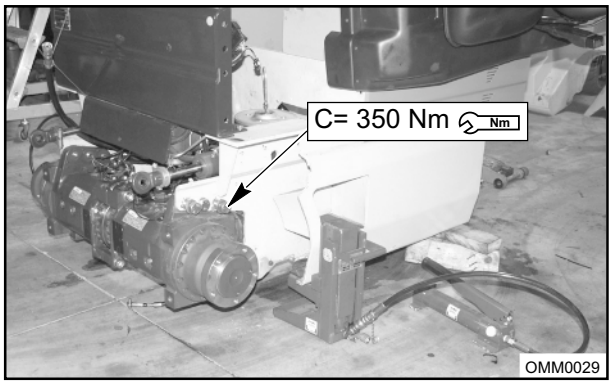

OMM0040

https://truckmanualshub.com/

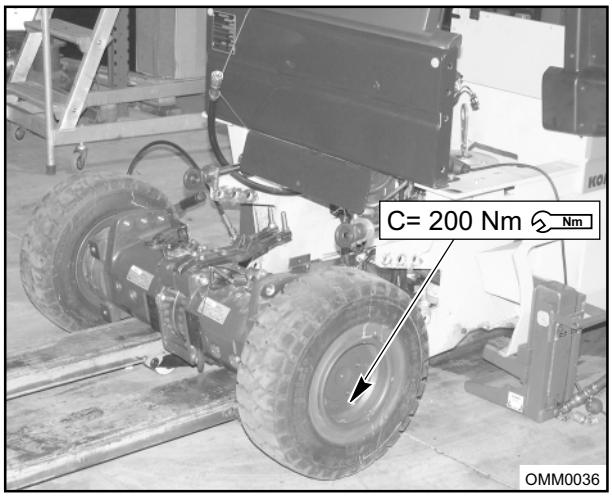
REINSTALLING THE FRONT AXLE

Reinstall the front axle by following the operations described above in reverse, making sure that the screws fastening the axle to the frame and the front wheel nuts are tightened to the specified torque. Reconnect the traction motor wiring making sure that it is connected properly.

- Tightening torque for the axle to frame screw: 350 Nm.



- Tightening torque for the front wheel nuts: 200 Nm.

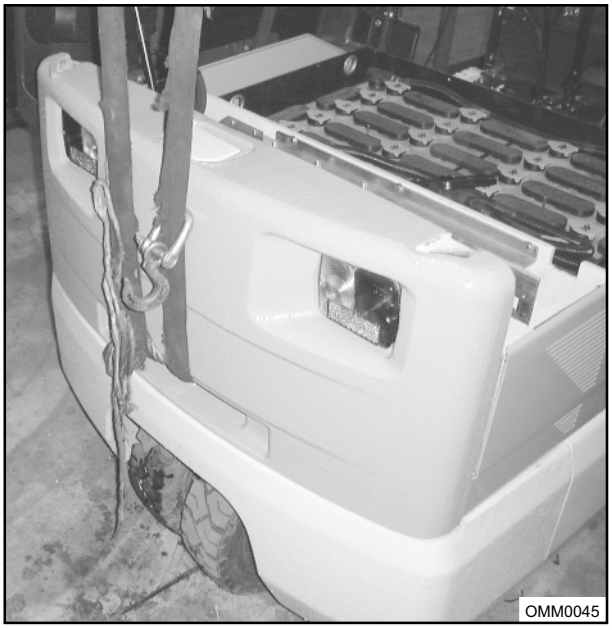


https://truckmanualshub.com/

30.6 - WHEEL REAR AXLE

REMOVING THE 3-WHEEL REAR AXLE

Apply the hand brake to block the truck.
Unplug the battery or operate the emergency button.
Lift the rear of the truck, place it on solid, stable supports and block the front wheels (hand brake and wooden blocks) to prevent the truck from moving.


OMM0045

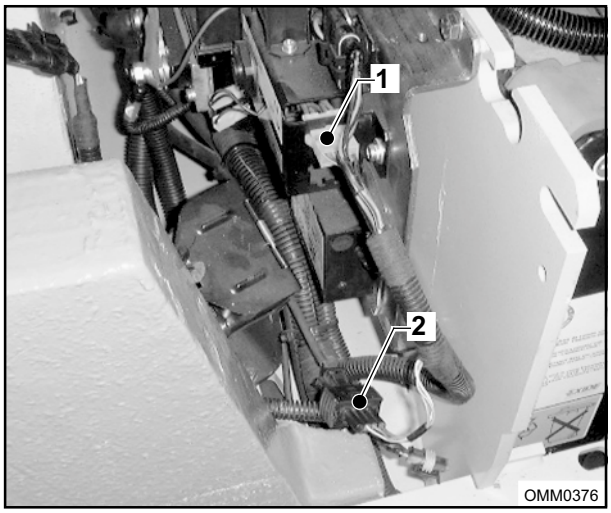
DANGER

THE TRUCK MAY TIP OVER WITHOUT THE BATTERY AND THE COUNTERWEIGHT!

IMPORTANT:

The following description and photographs show the truck without the counterweight for better clarity.
If the battery and counterweight need to be removed, lift the truck and place it on four solid, stable supports, tilt the fully lowered mast completely backward, and place solid, stable supports under the fixed masts or the mast supports.

Disconnect the two connectors (1) and (2) as shown in the photo (right side of the panel).



2= Steering potentiometer wire connector.

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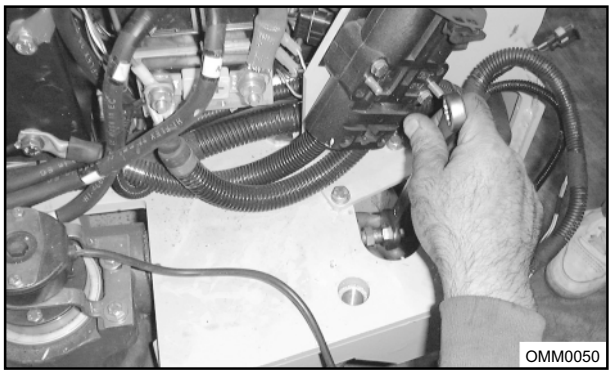
Remove the wheels from the rear axle.

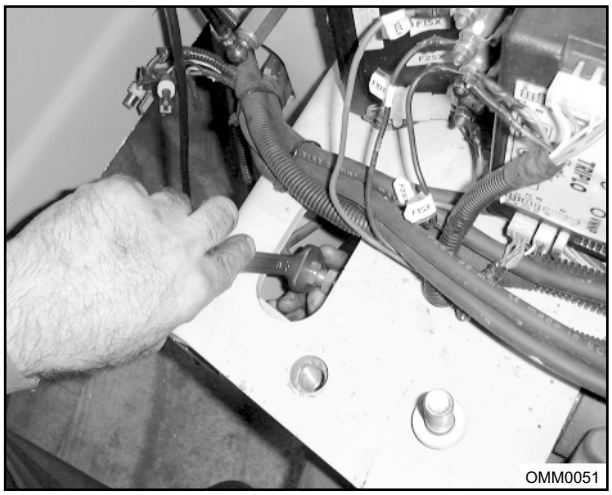


Disconnect the steering delivery cylinder pipes from their seats in the frame.

IMPORTANT:

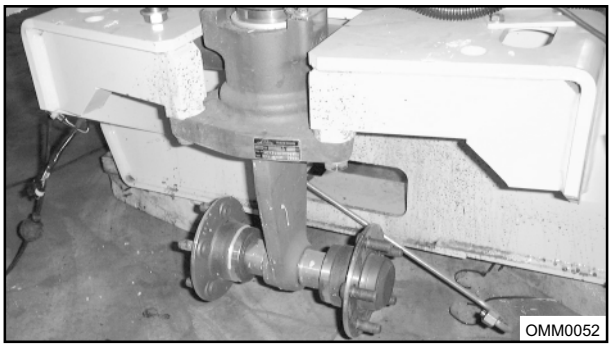
If the counterweight is mounted there will be very little space for maneuvering the wrenches, so either remove the battery plug support from the right side or disconnect the pipes from the bottom.

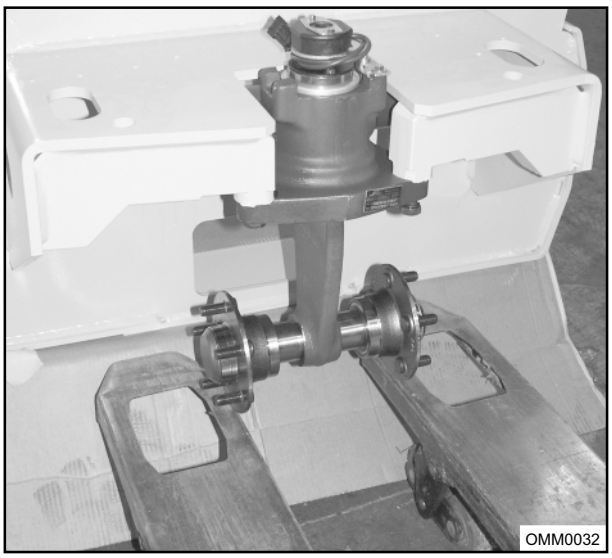




https://truckmanualshub.com/

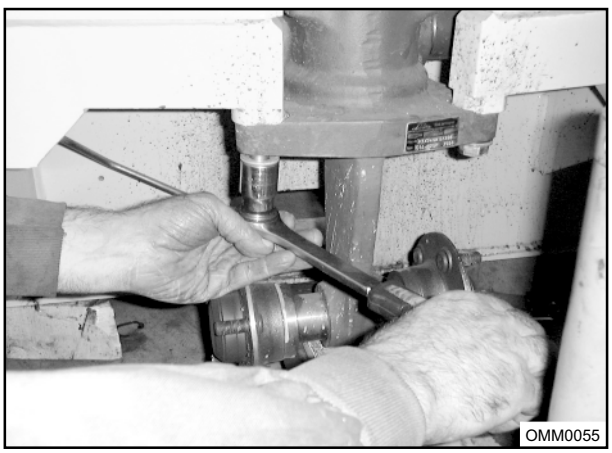
Place a jackstand or hand pallet truck under the axle and raise it until it is in contact with the axle.


OMM0052


OMM0032

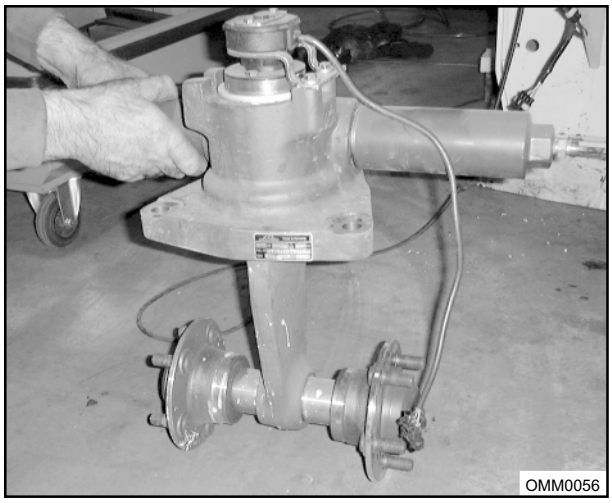
Loosen and remove the three axle fastening screws.


OMM0054

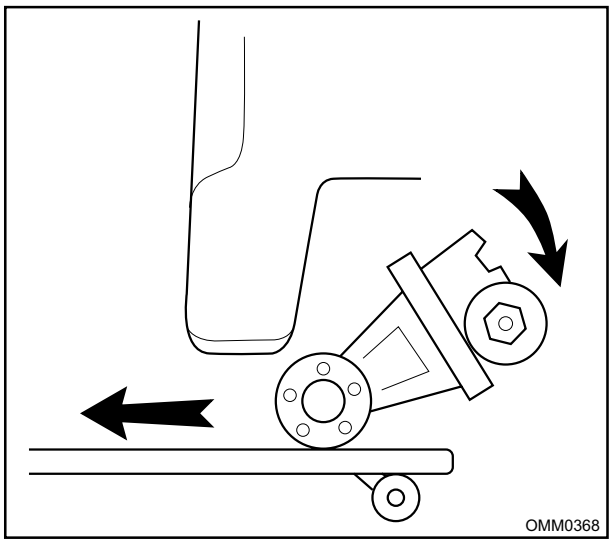

OMM0055

https://truckmanualshub.com/

Hold the axle in a vertical position and lower the jackstand to free the cylinder from the rear reinforcements of the frame to remove it.
Withdraw with the jackstand to remove the axle from frame.



If the counterweight is mounted, turn the axle while removing it to allow the cylinder to pass by.

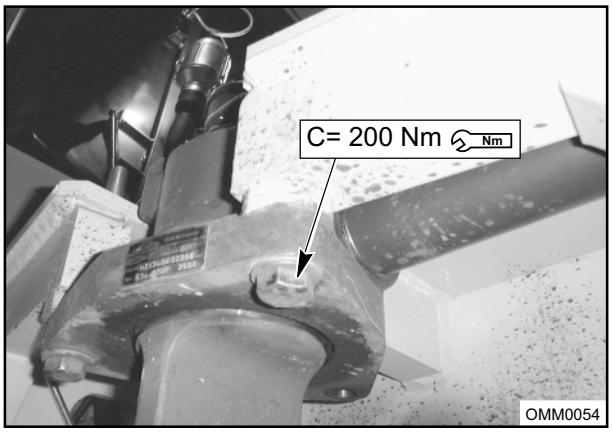


https://truckmanualshub.com/

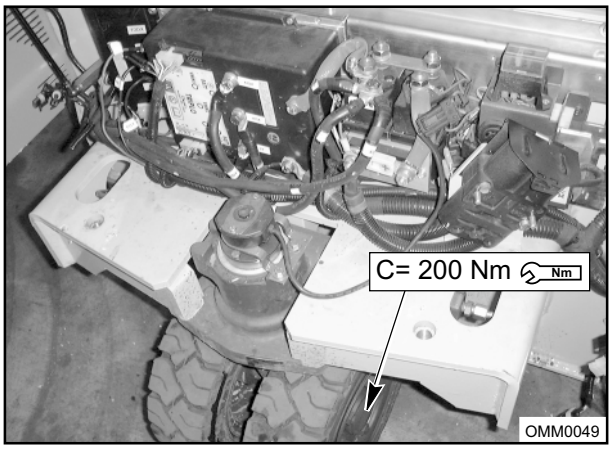
REINSTALLING THE 3-WHEEL AXLE

Reinstall the axle by following the operations described above in reverse, making sure that the screws fastening the axle to the frame and the wheel nuts are tightened to the specified torque.

- Tightening torque for the axle to frame screw: 200 Nm.



- Tightening torque for the wheel nuts: 200 Nm.



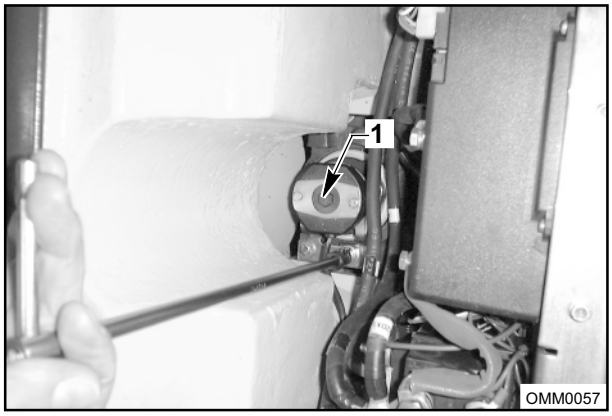
https://truckmanualshub.com/

30.7 - 3-WHEEL REAR AXLE POTENTIOMETER

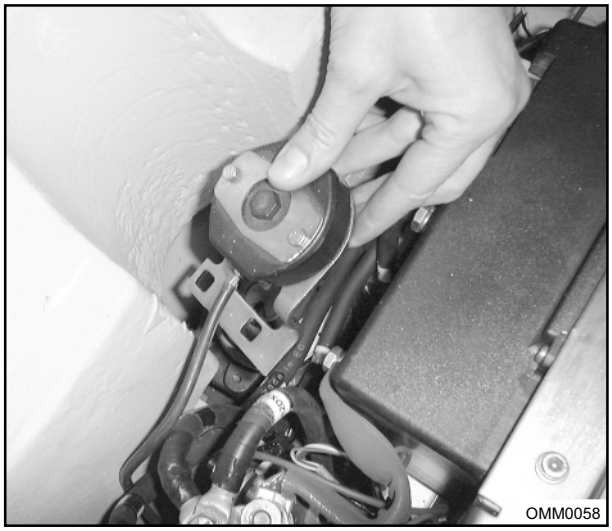
REPLACING THE 3-WHEEL REAR AXLE POTENTIOMETER

Turn the steering wheel completely to the right until it reaches the limit stop (in a clockwise direction).
Apply the hand brake.
Open the battery compartment cover.
Unplug the battery.

Loosen and remove the potentiometer support clamp screws (1).



Disconnect the potentiometer wiring from the panel (see paragraph 30.6), slide it into the potentiometer compartment and remove the potentiometer from the counterweight compartment.

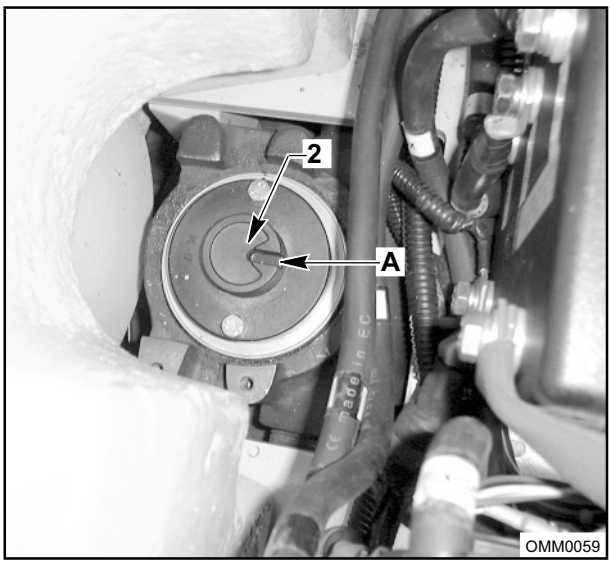


https://truckmanualshub.com/

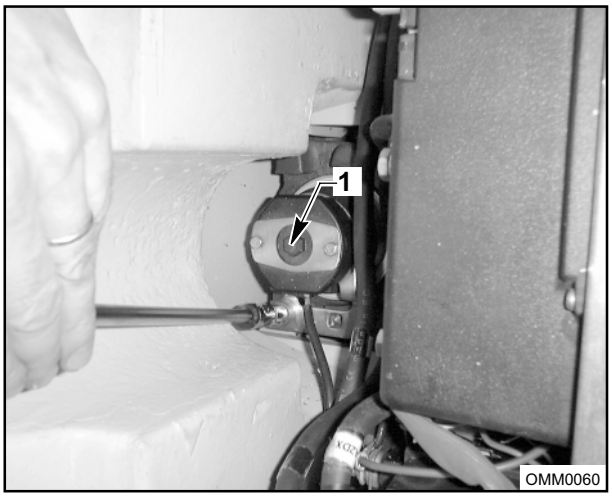
REASSEMBLY

Reinsert the wiring of the new potentiometer so that it can be connected to the panel.

Reposition the potentiometer (1) on the drag disc (2), making sure that the potentiometer control pin is inserted correctly in notch **"A**" of the drag disc.
Turn the clamp to line up its holes with the threaded axle support holes.



Tighten the two fastening screws.
Reconnect the connector.



IMPORTANT:

If alarm 60 or 58 is displayed when the truck is switched on, calibrate the potentiometer as described in "Chapter 40, paragraph 40.4 (Calibrating the steering axle potentiometer)".

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30.8 - 4-WHEEL REAR AXLE

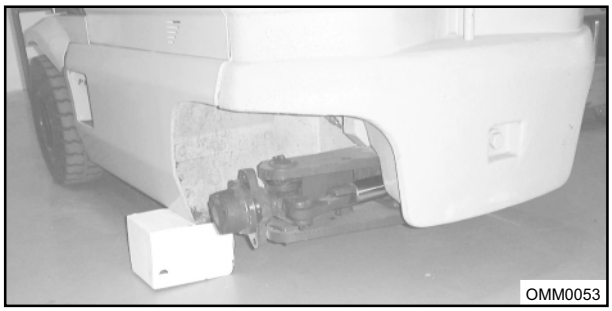
REMOVING THE 4-WHEEL REAR AXLE

Unplug the battery.
Apply the hand brake.
Loosen the rear wheel bolts.

Lift the rear part of the truck and place it on solid, stable supports.

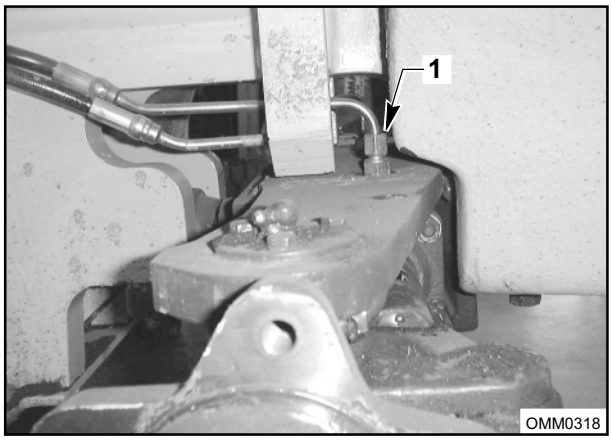


Remove the rear wheels.



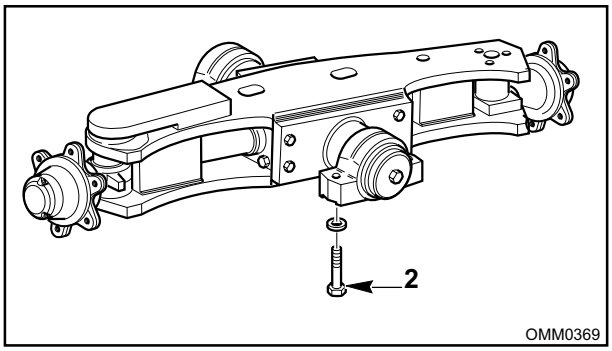
Disconnect the potentiometer wiring from the panel side as described in paragraph 30.6.

Disconnect the steering delivery cylinder connectors (1).



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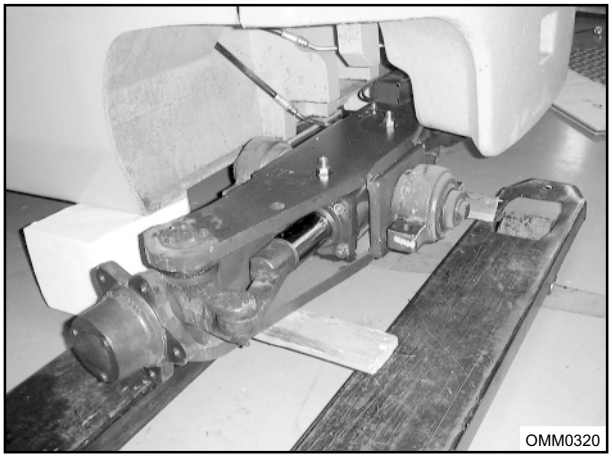
Loosen the bolts (2) fastening the front and rear axle supports to the frame.



Place a hand pallet truck under the axle and raise it until it comes into contact with the axle.

Remove the bolts (2) from the supports.

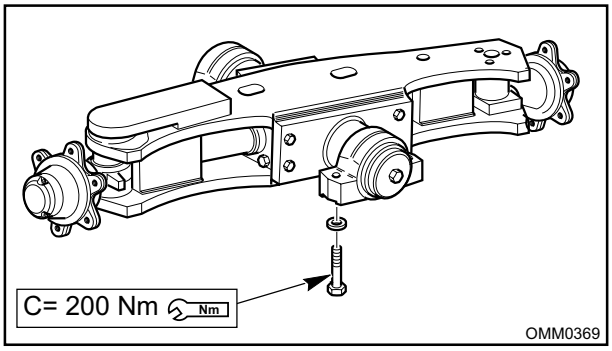
Lower the hand pallet truck and withdraw it, being careful not to bump the axle against the frame or the counterweight.



REINSTALLING THE 4-WHEEL AXLE

Reinstall the axle following the operations described above in reverse, making sure that the axle to frame bolts and the wheels nuts are tightened to the specified torque.

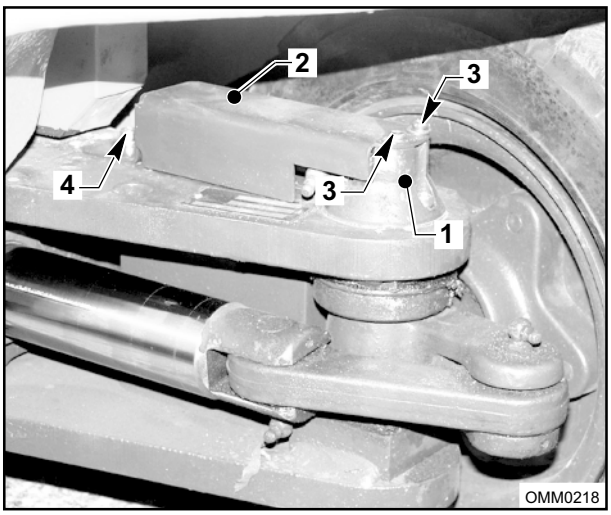
- Tightening torque for the axle to frame bolts: 200 Nm.



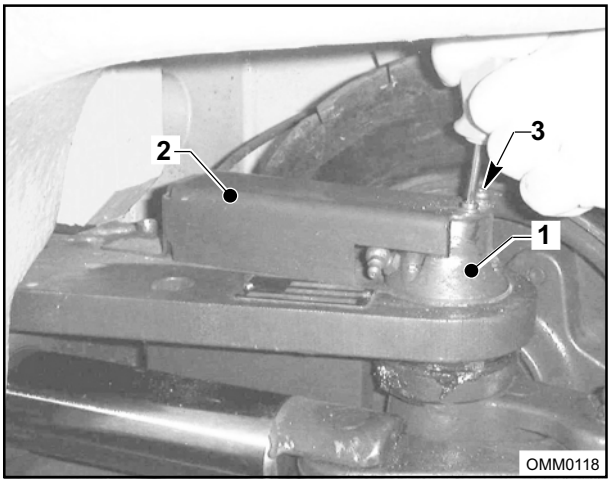
https://truckmanualshub.com/

30.9 - REPLACING THE 4-WHEEL AXLE STEERING POTENTIOMETER

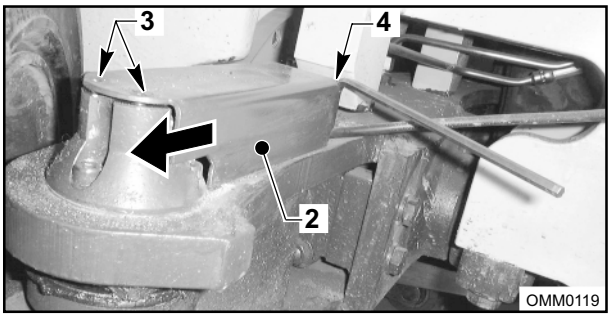
Apply the hand brake, lift the rear of the truck, and place it on solid, stable supports.
Turn the steering wheel completely to the right until it reaches the limit stop by means of the hydraulic steering, and unplug the battery.
The potentiometer (1) is located as shown in the picture. It is protected by a cover (2) and fastened to the axle by two cross-head screws (3) and an Allen screw (4). It is operated by the rotation of the stub axle pin.



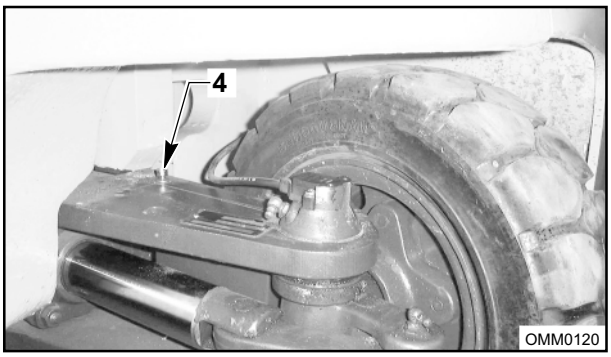
With a cross-tip screwdriver, loosen and remove the two screws (3) fastening the potentiometer cover on the wheel side as shown in the picture.



Reconnect the battery and turn the wheels completely to the left; pivot the axle by lifting the left wheel.



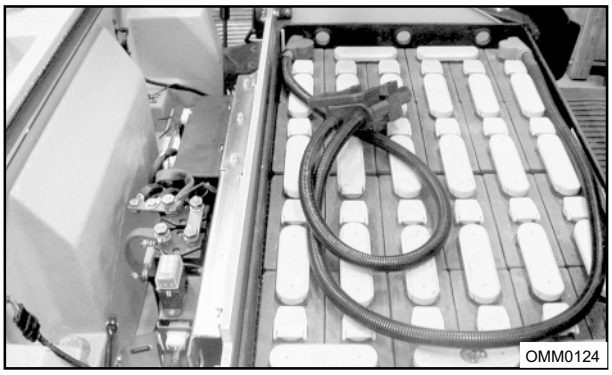
With an Allen wrench, loosen the screw (4) fastening the cover (2) on the inner side. Slide the cover (2) toward the outside to remove it.



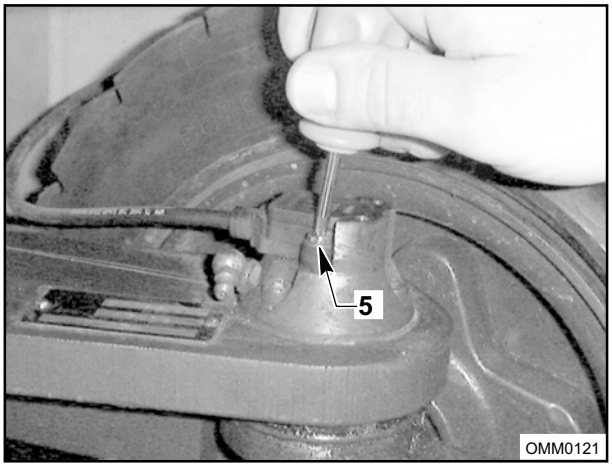
https://truckmanualshub.com/

Turn the wheels completely to the right by means of the hydraulic steering.

Lift the compartment cover and remove the battery plug, placing it on top of the battery.



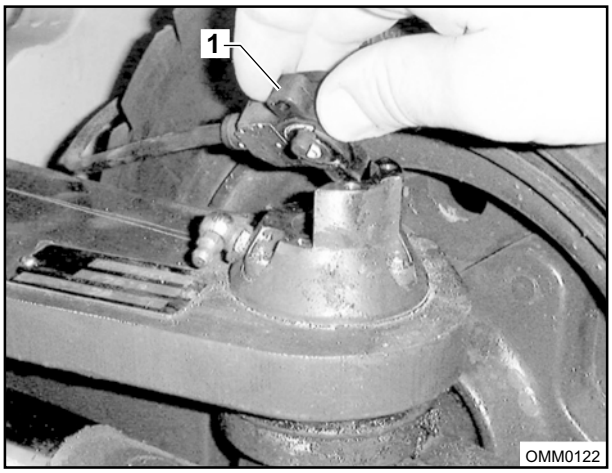
With a cross-tip screwdriver, loosen and remove the two screws (5) fastening the potentiometer to its seat.

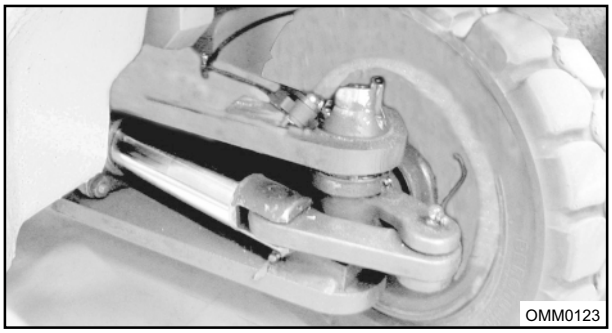


Lift out the potentiometer (1), being careful with the potentiometer control pin and place it on the axle.

IMPORTANT:

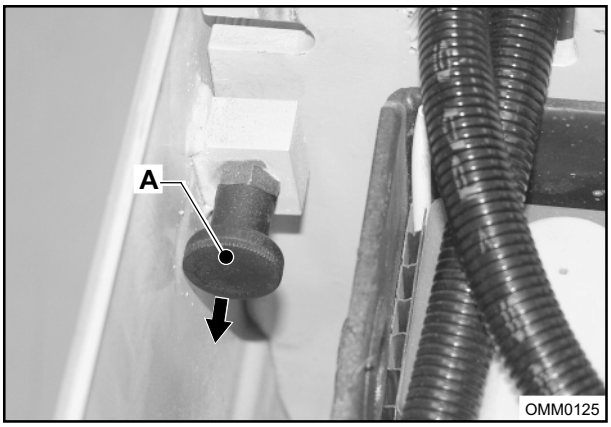
DO NOT FORCE THIS OPERATION TO AVOID DAMAGING THE POTENTIOMETER!!!



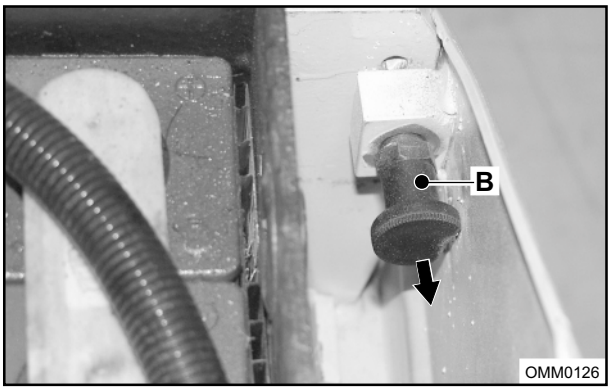


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Release the latches (A-B) to remove the right side.

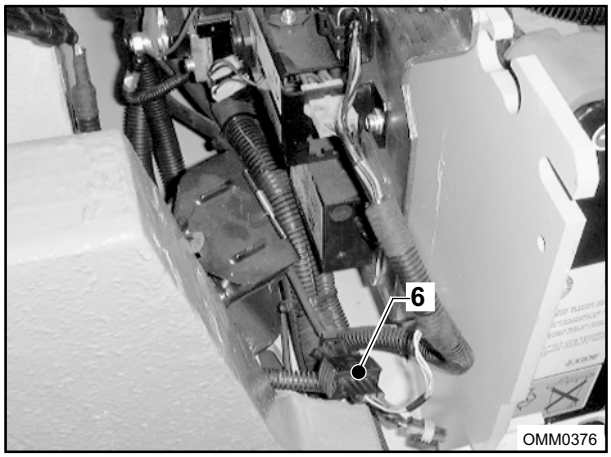


A= Front latch

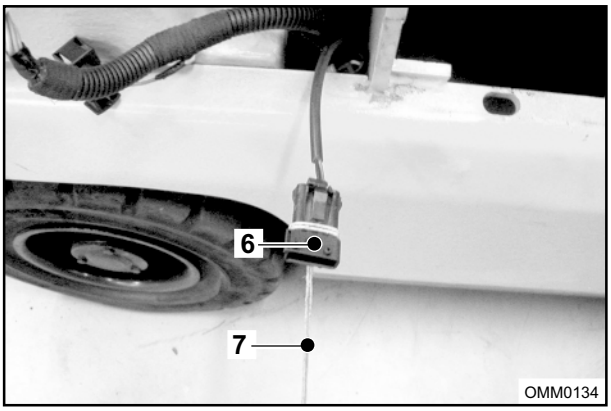


B= Rear latch

Disconnect the connector (6) in the panel compartment.



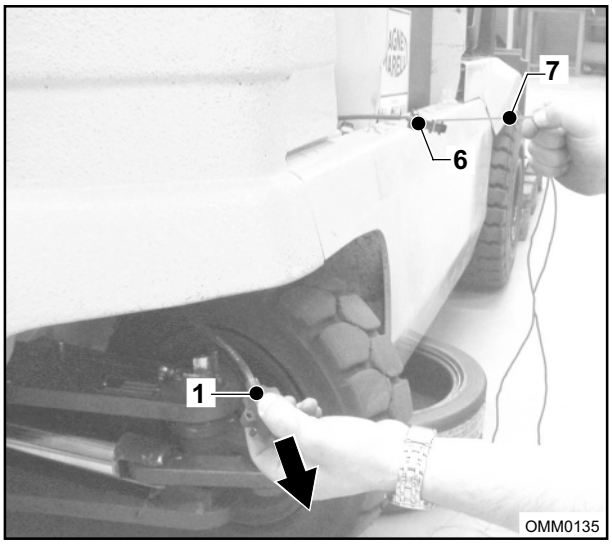
Attach a cord (7) at least 1.5 meters long to the connector (6) that was just disconnected.



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With the cord (7) attached to the connector (6), pull the other end of the wire while grasping the potentiometer (1) and slide it out it without removing the cord.

IMPORTANT:
DO NOT FORCE THIS OPERATION!!!

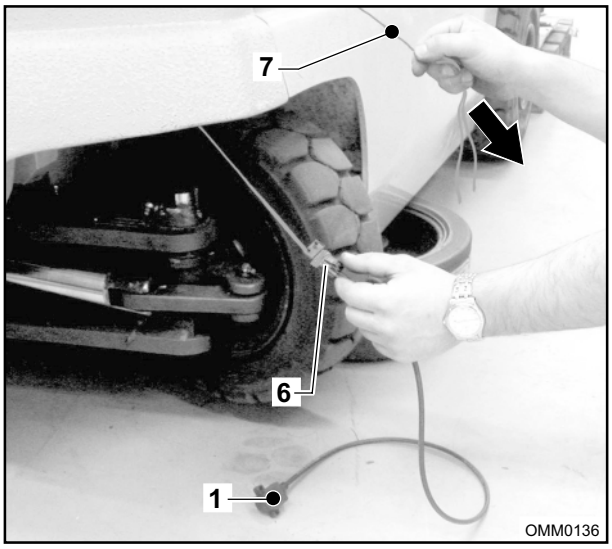


REASSEMBLY

Replace the potentiometer (1) by fastening the same cord (7) used to remove the previous potentiometer to the connector (6) of the new potentiometer, and repeat the operations described above in reverse.

IMPORTANT:
DO NOT FORCE THIS OPERATION!!!

IMPORTANT:
If alarm 60 or 58 is displayed when the truck is switched on, calibrate the potentiometer as described in «Chapter 40, paragraph 40.4 (Calibrating the steering axle potentiometer)».



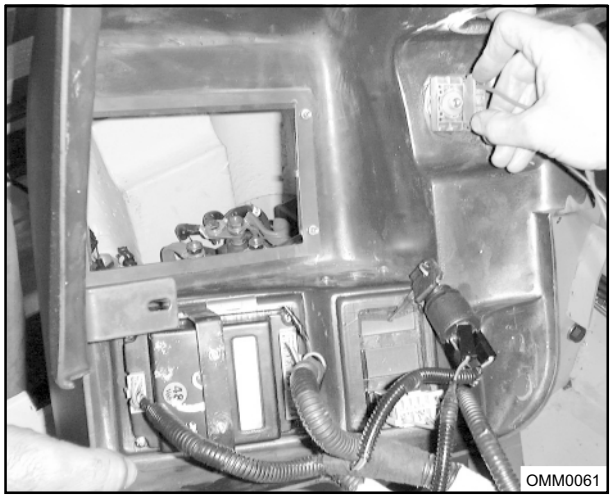
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30.10 - DISTRIBUTOR

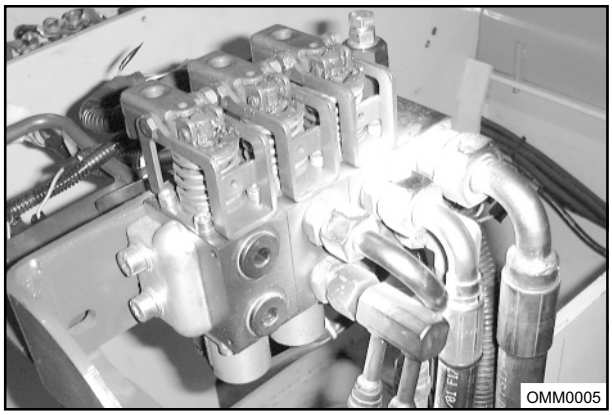
REMOVING THE DISTRIBUTOR

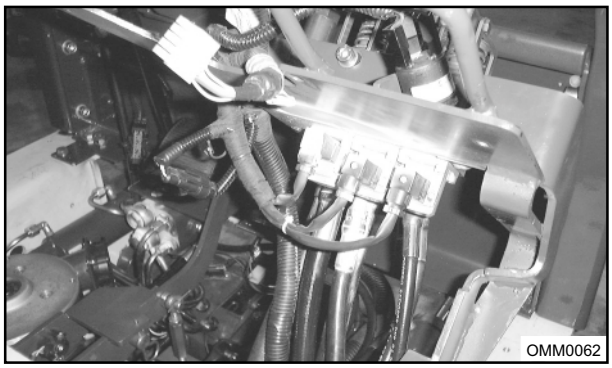
With the mast completely lowered, unplug the battery and move the distributor levers in both directions to release the pressure from the system.
Loosen and remove the lever plate fastening screws.
Remove the distributor levers.
Remove the plate.
Loosen and remove the plastic distributor guard screws.

Lift the guard and disconnect the wiring for the display, ignition key switch, emergency button, and other switches.
Remove the plastic guard.


OMM0061

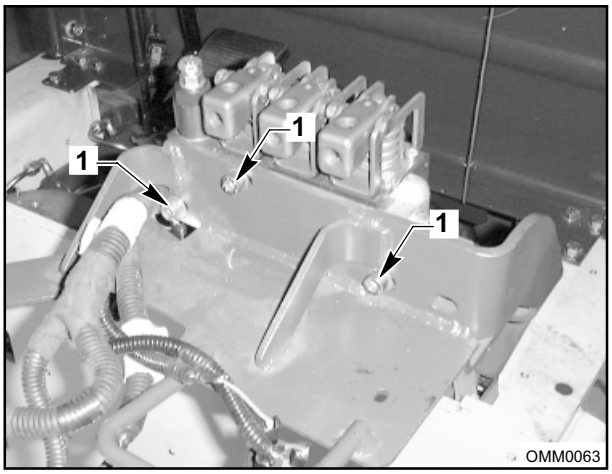
Disconnect all the pipes on the hydraulic distributor (mark them if necessary), the wiring for the Hall probe for the lift element and the wiring for the magnetic sensors of the remaining elements (on the rear side).


OMM0005

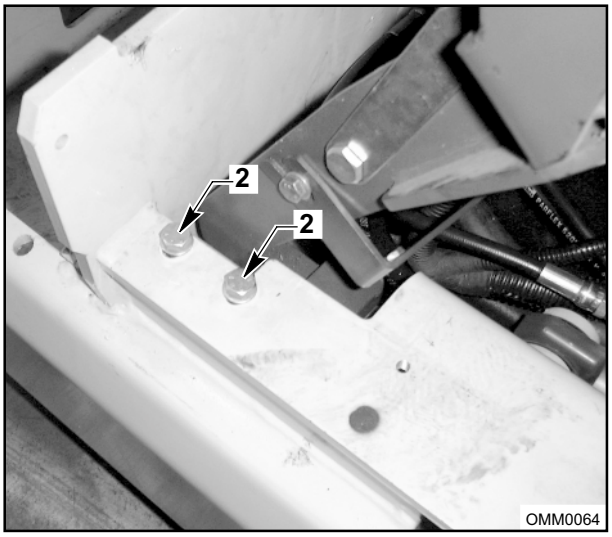

OMM0062

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Loosen and remove the three hydraulic distributor fastening screws (1).
Remove the distributor.



To remove the hydraulic distributor support, loosen and remove the two screws (2) fastening the support.



REINSTALLING THE DISTRIBUTOR

Reinstall the distributor by following the operations described above in reverse.

IMPORTANT:

After replacing the distributor, the Hall probe for the lift element will probably have to be recalibrated, in which case see Chapter 40, paragraph 40.6.

Once the distributor has been replaced, bleed the air from the hydraulic system as described in the relative chapter.

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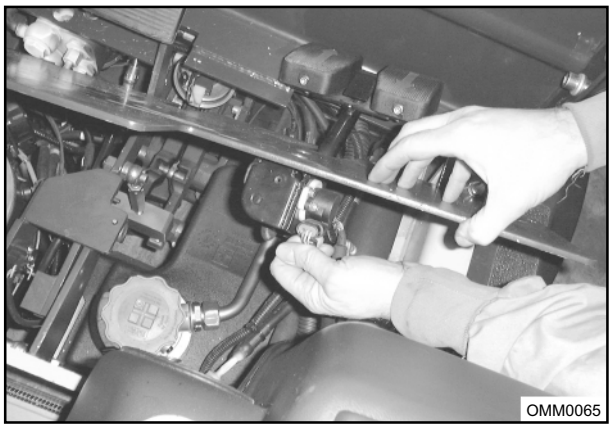
30.11 - OIL TANK

REMOVING THE OIL TANK FROM ABOVE

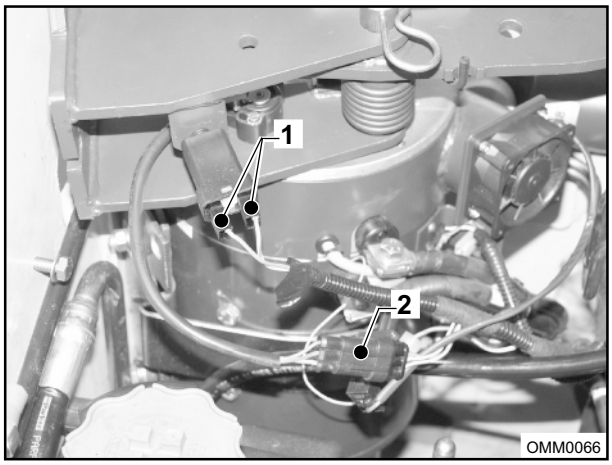
The instructions below describe how to remove the oil tank from above the truck if there is no pit or vehicle lift available.

Lift the truck and place it on four solid, stable supports.
Unplug the battery or operate the emergency button.
Remove the rubber mat.
Loosen and remove the platform fastening screws and lift it.

Disconnect the connectors from the pedal assembly and remove the platform.



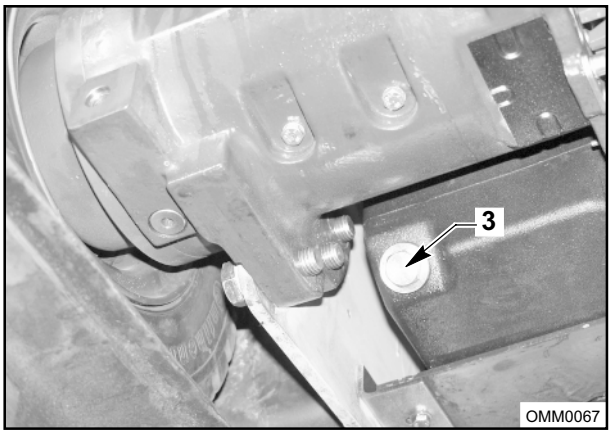
Loosen and remove the brake pedal support fastening screws, disconnect the connectors from the wiring on the brake pedal support, and remove the brake pedal support.



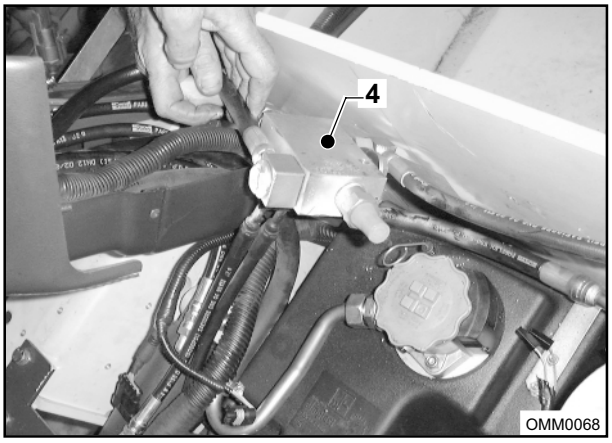
1= Fast-on stop light microswitch.
2= Brake potentiometer connector.

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Remove the cap (3) and completely drain the oil from the hydraulic oil tank.



Remove the stop/anti cavitation valve (4) from the central bulkhead of the frame without disconnecting the pipes.



Remove the distributor levers and the plate.

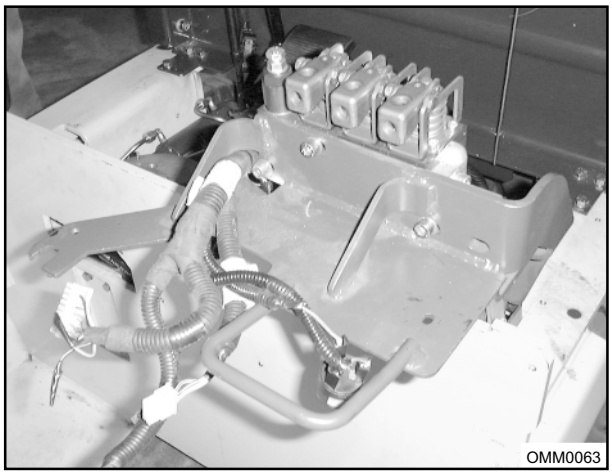


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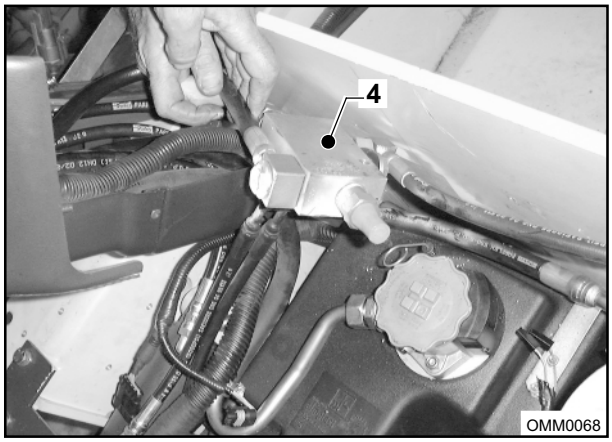
Lift the hydraulic distributor.
Loosen and remove the distributor guard fastening screws.
Disconnect the wiring from the guard and remove the display, ignition key switch, emergency button, and other switches.



Remove the plastic distributor guard.

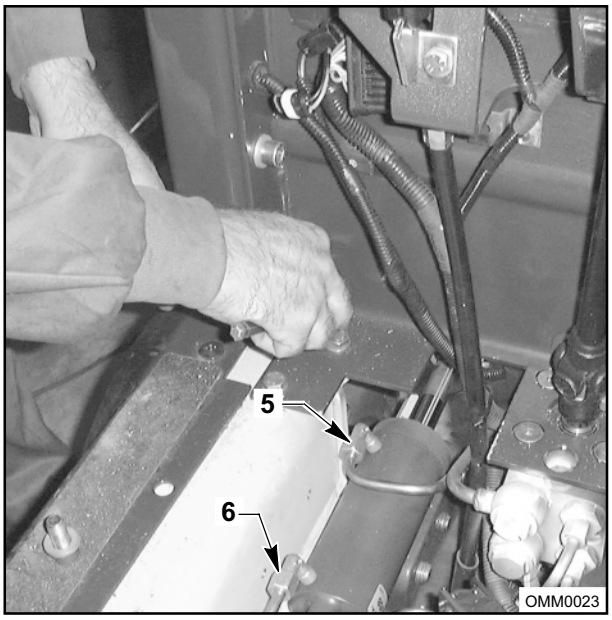


In order to position the stop valve (4) more easily and create more room in the area where you are working, it may be necessary to:



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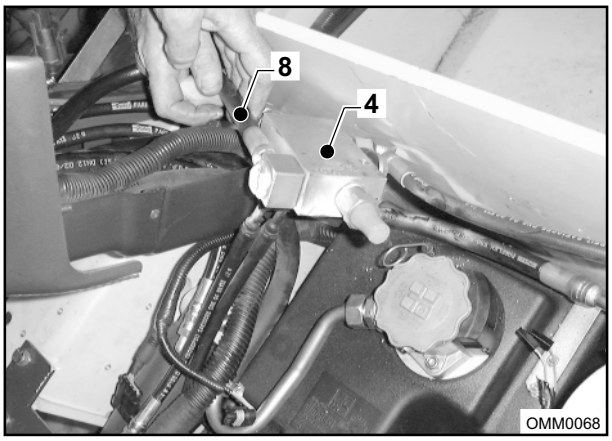
Disconnect the pipes from the rear connectors (5) and front connectors (6) of the left tilt cylinder.



Disconnect the pipes from the front connector (7) of the right tilt cylinder.

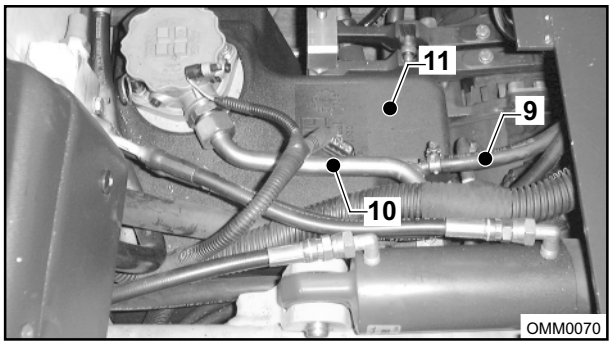


Disconnect the pipes (8) from the stop/anti cavitation valve (4) on the hydraulic distributor.

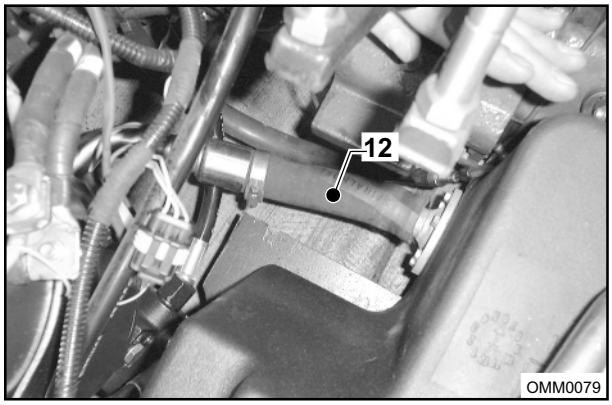


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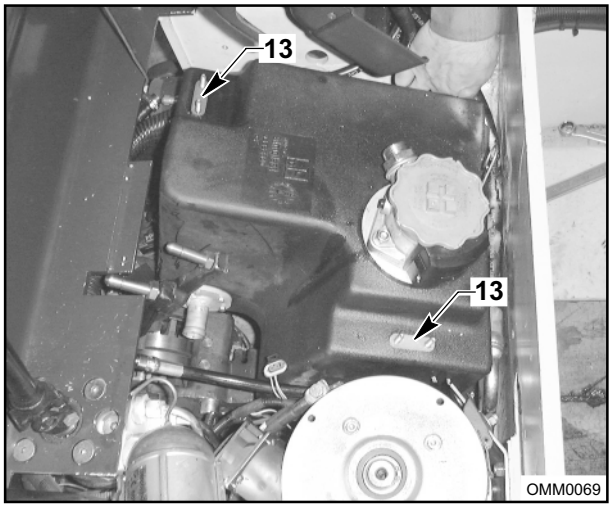
Disconnect the return pipes (9) from the hydraulic steering to the main return pipe (10), if necessary. Disconnect the oil return pipes (10) to the oil tank/filter (11).



Disconnect the suction pipes (12) from the tank to the pump by loosening the pipe clamp on the tank side.



Disconnect and remove the two tank brackets (13) (rear and side).



Lift the tank, sliding the pipe (12) from the tank flange at the same time.

REINSTALLING THE TANK

Reinstall the tank by following the operations described above in reverse.

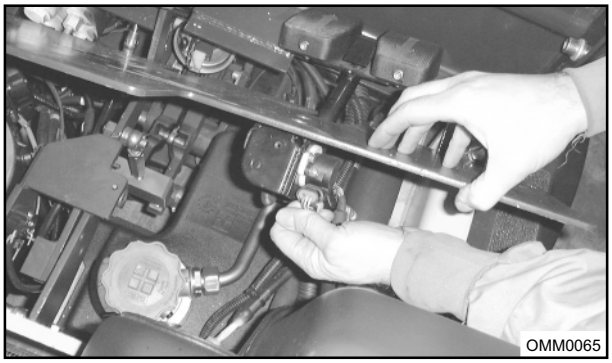
https://truckmanualshub.com/

REMOVING THE OIL TANK FROM BELOW

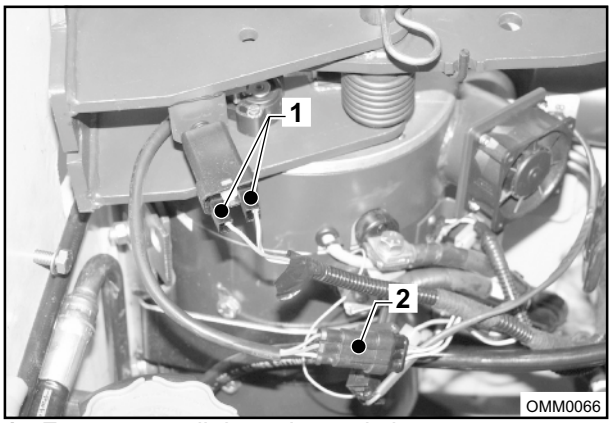
The instructions below describe how to remove the oil tank from below the truck.

Place the truck over a pit or on a vehicle lift.
Apply the hand brake and place blocks under the wheels.
Operate the emergency button or unplug the battery.
Remove the rubber mat.
Loosen and remove the platform fastening screws and lift it.

Disconnect the connectors from the pedal assembly and remove the platform.

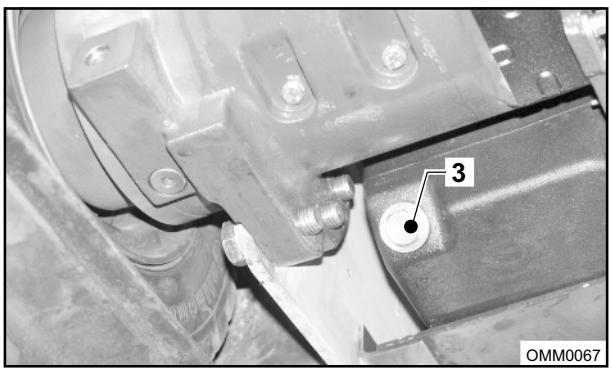


Disconnect the connectors from the wiring on the brake pedal support.
Loosen and remove the brake pedal support fastening screws and remove it.



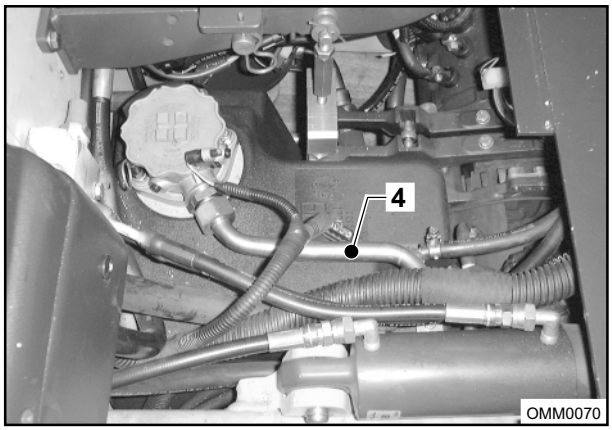
1= Fast-on stop lights microswitch.
2= Brake potentiometer connector.

Remove the cap (3) and completely drain the oil from the hydraulic oil tank from below.



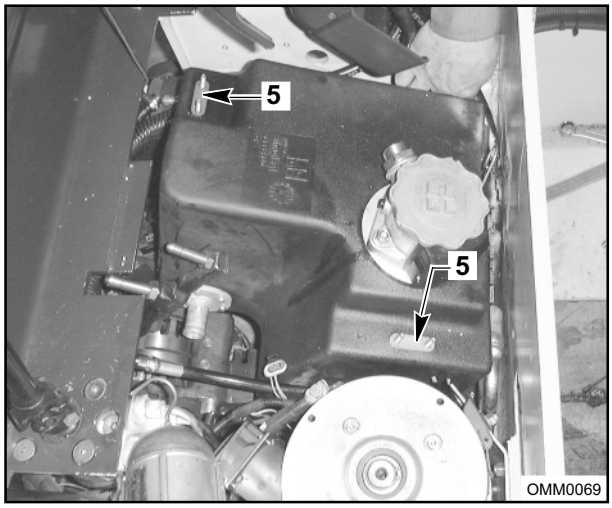
https://truckmanualshub.com/

Disconnect the oil return pipes (4) to the tank (on the filter).

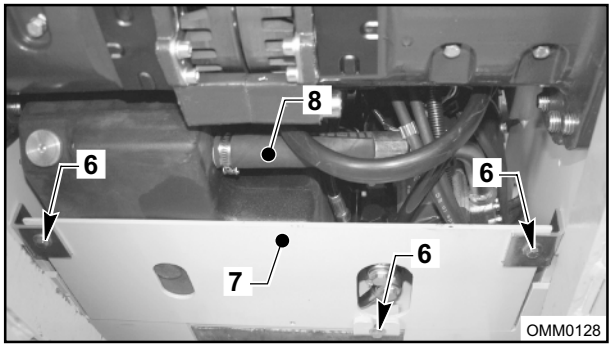


Disconnect the tank from the clamps (5) (rear and side) at the top of the tank.

Lift the tank a little and keep it in this position.



From below loosen and remove the screws (6) fastening the tank support plate (7) to the clamps.
Remove the plate (7).
Remove the right, plate-supporting clamp, disconnect the suction pipes (8), loosen the pipe clamp (tank side), and disconnect the suction flange on the pump.
Remove the pipe.
Lower the tank toward the bottom.



REINSTALLING THE TANK

Reinstall the tank by following the operations described above in reverse, together with the help of a colleague to hold the tank from the top when remounting the plate.

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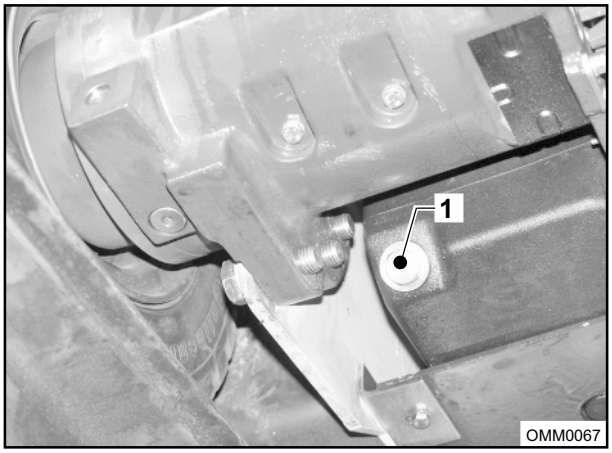
30.12 - PUMP MOTOR

REMOVING THE PUMP MOTOR

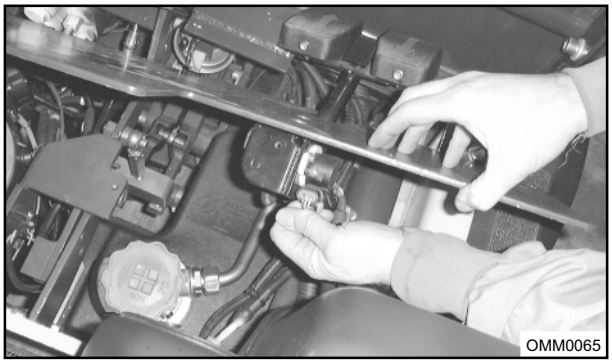
Unplug the battery.
Lift the truck and place it on four solid, stable supports. If the truck is not placed over a pit or on a vehicle lift, remove the left front wheel.

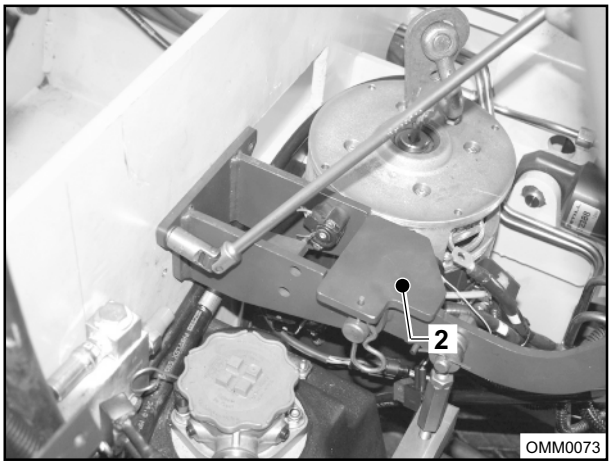
If the battery has been removed from the truck, the brush cover strip can be unhooked and removed from the motor in order to loosen and remove the motor support strip more easily.

Remove the cap (1) and completely drain the oil from the hydraulic system oil tank or suction it out.



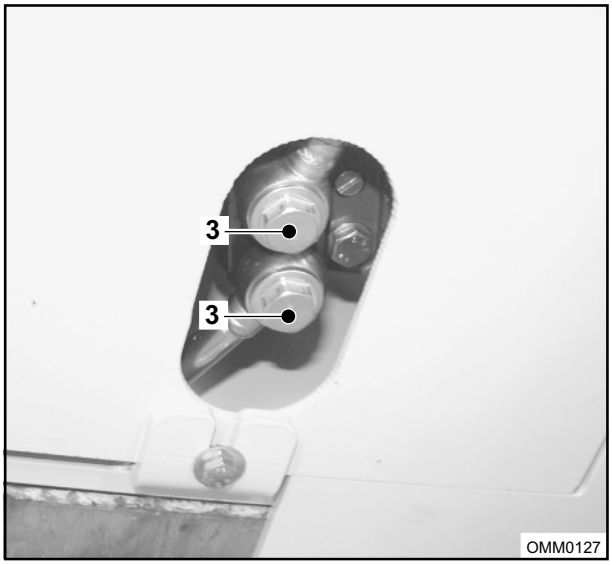
Remove the rubber mat, remove the platform fastening screws, lift the platform, disconnect the wiring on the pedal assembly and remove the platform.
Loosen and remove the brake pedal support fastening screws (2).
Disconnect the wiring and remove the brake pedal support (2).



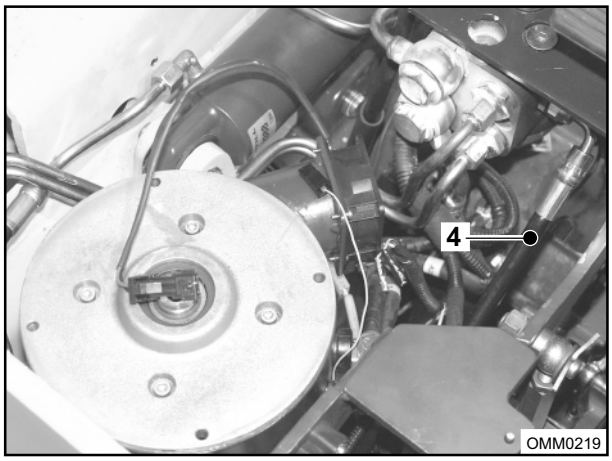


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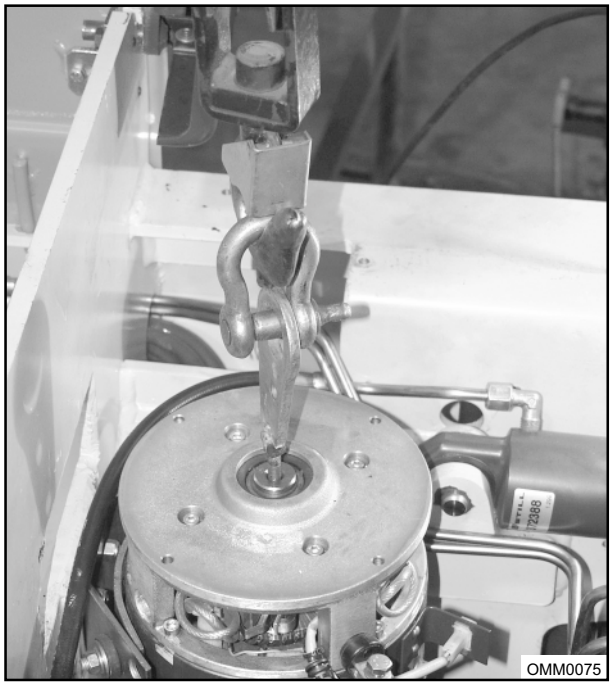
Disconnect the hydraulic steering connector (3) and the lift distributor connector (3) from the priority valve (from below).



Disconnect the load sensing pipe (4) from the hydraulic steering connection.

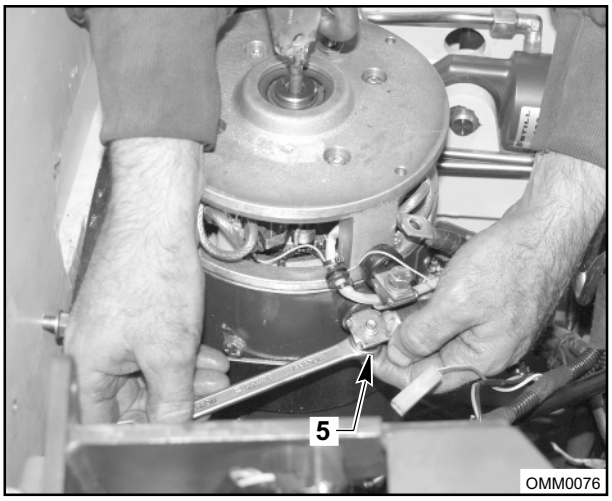


Attach a lifting hook onto the pump motor shaft.
Hook it with a crane or mobile hoist and pull it taut.

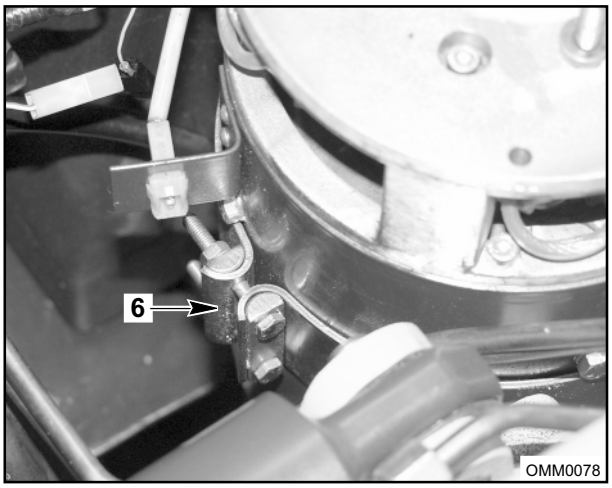


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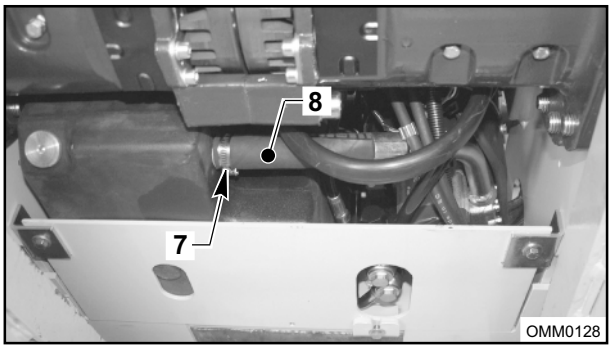
Disconnect the pump motor fan wiring (5) and the motor wiring (motor power, wear of the brushes, and thermal probe).



Loosen the closure terminal (6) on the motor support strip.
Remove the two half strips unhooking them from the rear of the support.



Loosen the clamp (7) on the suction pipes (8) of the tank.



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Lift the motor together with the load sensing pipe, sliding the suction pipe out of the tank sleeve at the same time.

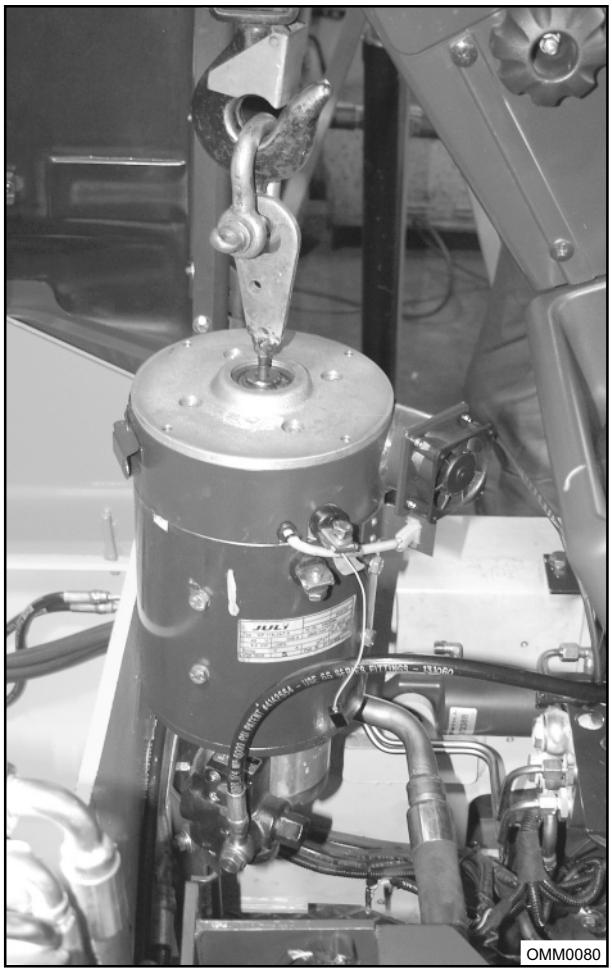
ATTENTION

Be careful not to bump the steering wheel during this operation!

Disconnect the pipes that are still connected to the priority valve and the pump.
See paragraph 30.14 for instructions to disassemble the pump.

IMPORTANT:

The pump motor has been shown without the brush cover strip in some illustrations, but this has no effect on the disassembly procedures described above.



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REINSTALLING THE PUMP MOTOR

Reinstall the pipes previously disconnected onto the pump and when repositioning the motor while lowering it, insert the flexible part of the suction pipe into the tank sleeve.

Continue lowering the motor, holding the pipe until it is completely lowered into the sleeve

Continue reinstalling the pump motor by following the operations described above in reverse.



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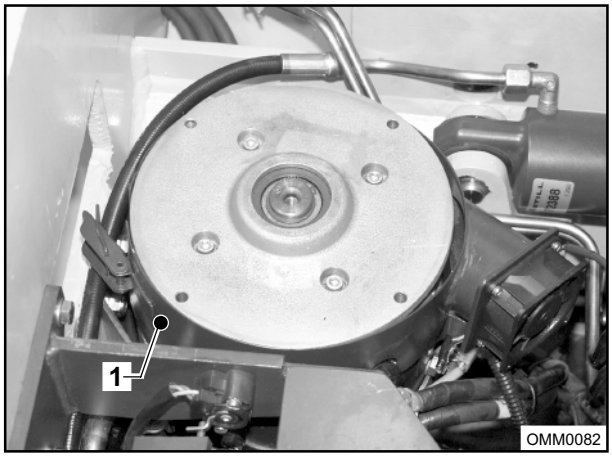
30.13 - PUMP MOTOR BRUSHES

Wear of the pump motor brushes is indicated by alarm n° 92 as soon as the condition has been detected.

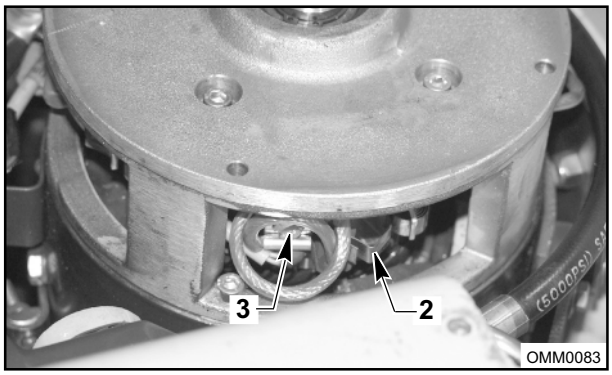
INSPECTING/CHECKING/REPLACING THE PUMP MOTOR BRUSHES

- Lift the distributor cover and the battery compartment cover
- Unplug the battery.
- Apply the hand brake to block the truck.
- Hook the battery at the four lifting points with a swinging bar or cables capable of handling the weight (see the table for the battery weights).
- Remove it from the frame.
- Remove the brake pedal support as described above.

Unhook the brush cover strip (1) from the pump motor and remove it.



Lift the brushcoil spring (2) on each of the four brushes, remove the brushes and check them for wear **(minimum length 11-13mm).**



Remove the holder screws (3) and replace the brush if necessary.

REINSTALLING THE PUMP MOTOR BRUSHES

Reinstall the pump motor brushes by following the operations described above in reverse.

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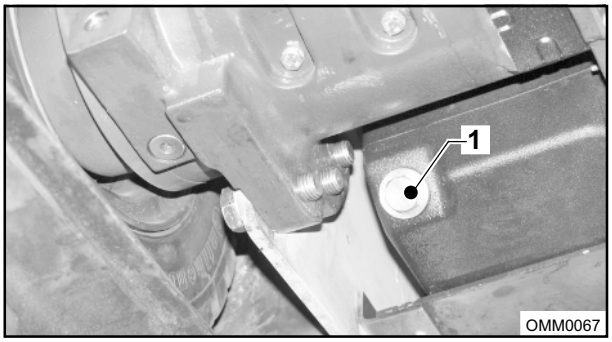
30.14 - HYDRAULIC PUMP

REMOVING THE HYDRAULIC PUMP

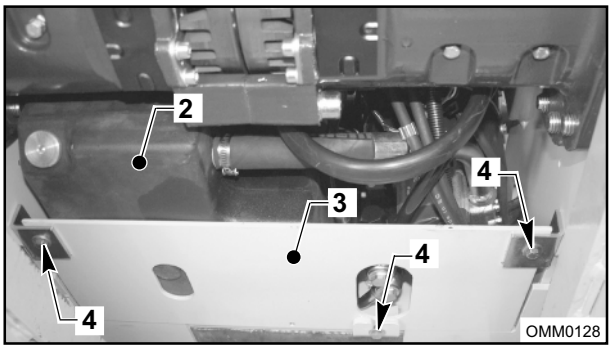
The hydraulic pump can only be replaced from below the truck.

Place the truck over a pit or on a vehicle lift, apply the hand brake, place wooden blocks under the wheels, and operate the emergency button.

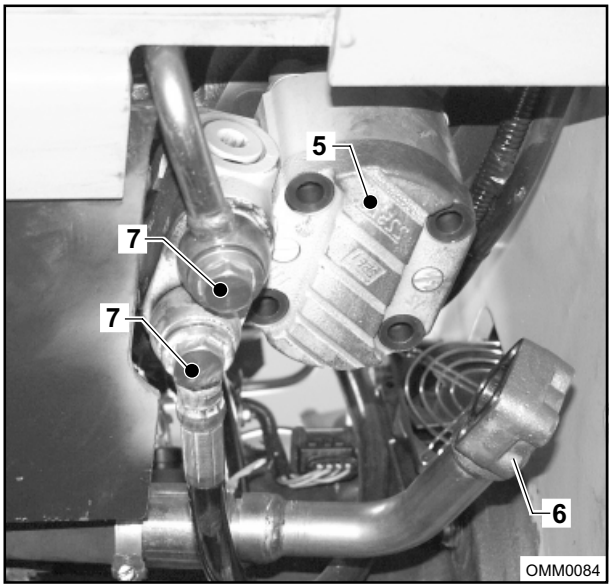
Remove the cap (1) and completely drain the oil from the hydraulic system tank, or suction it out.



Slightly lift the tank (2) and remove the plate (3) after loosening the screws (4).

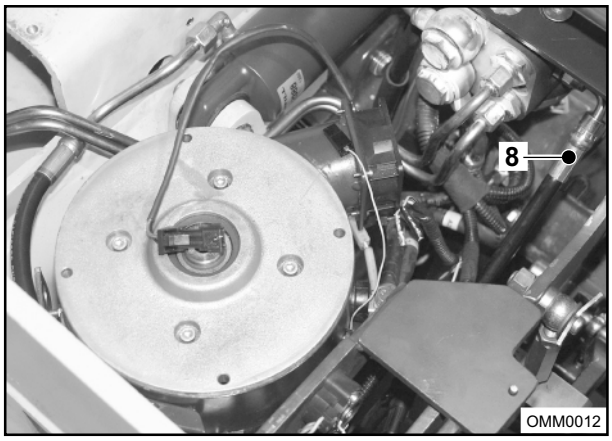


Disconnect from the pump (5) the suction pipe flange (6), the two delivery pipes (7) to the hydraulic steering and to the lift distributor (lower side).

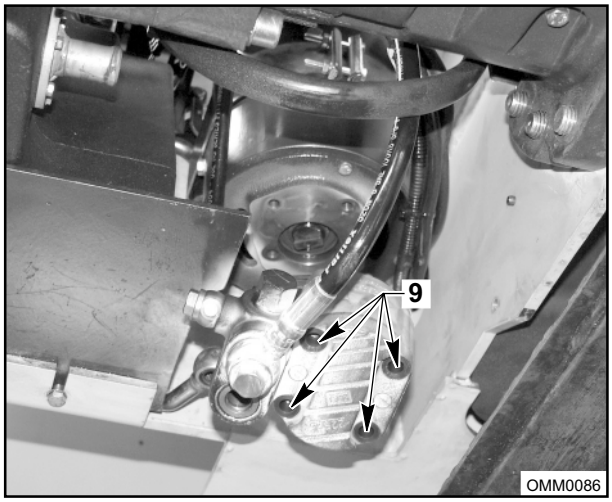


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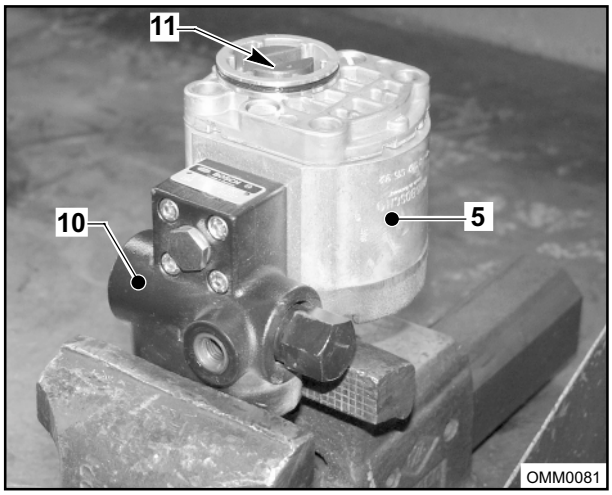
Disconnect the load sensing pipe (8) on the hydraulic steering working from above the truck.



Remove the four screws (9) fastening the pump to the motor.
Remove the pump complete with the priority valve and load sensing pipe.



At the work bench, disconnect the pipe described above and separate the priority valve (10) from the pump (5).

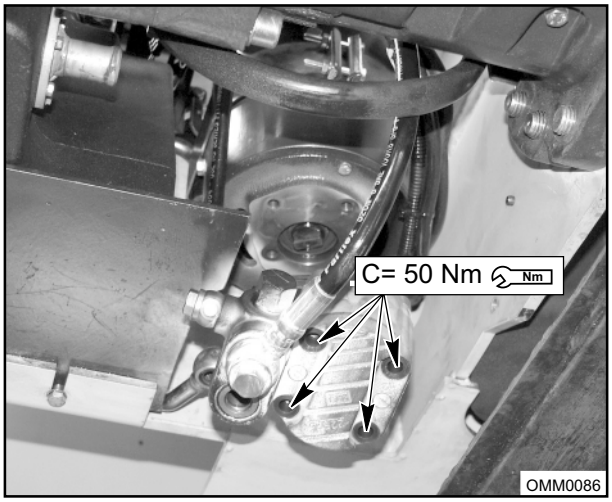


5 = Pump
10= Priority valve
11= Drag joint

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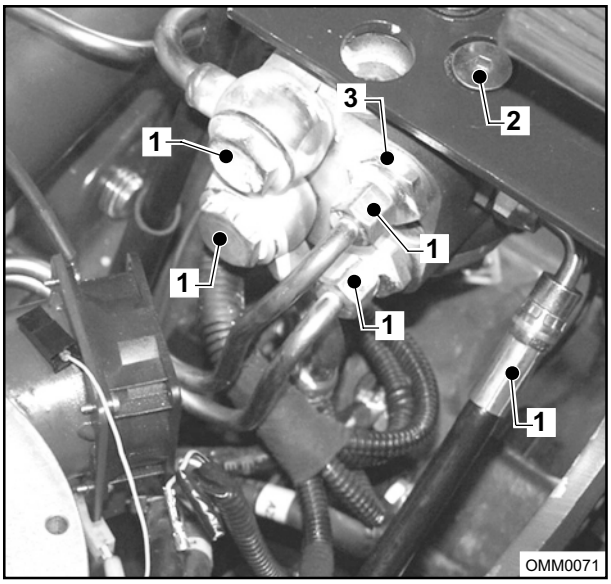
REINSTALLING THE PUMP

Reinstall the priority valve and the load sensing pipe. Properly position the drag joint on the pump (check the direction of the joint with the pump motor shaft) and reinstall the pump by following the operations described above in reverse, making sure that the pump screws are tightened to the specified torque: C= 50 Nm.



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30.15 - HYDRAULIC STEERING



REMOVING THE HYDRAULIC STEERING

- Apply the hand brake to block the truck.
- Unplug the battery or operate the emergency button.
- Remove the rubber mat.
- Remove the platform (as described above).
- Disconnect the pipes (1).
- Loosen the screws (2) and remove the hydraulic steering (3).

REINSTALLING THE HYDRAULIC STEERING

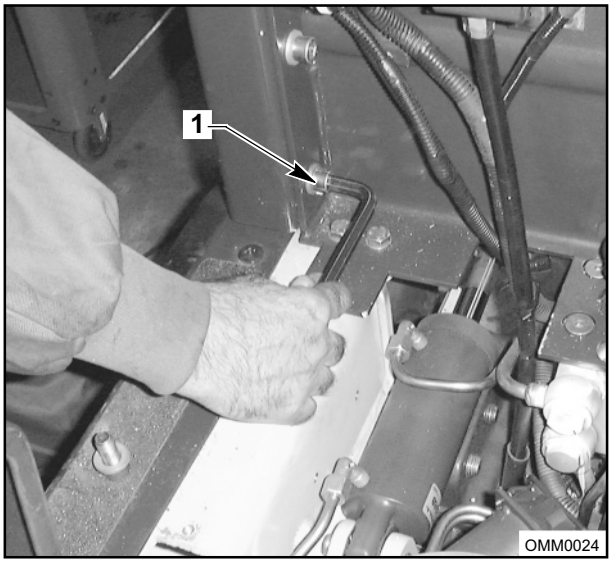
- Reinstall the hydraulic steering by following the operations described above in reverse.

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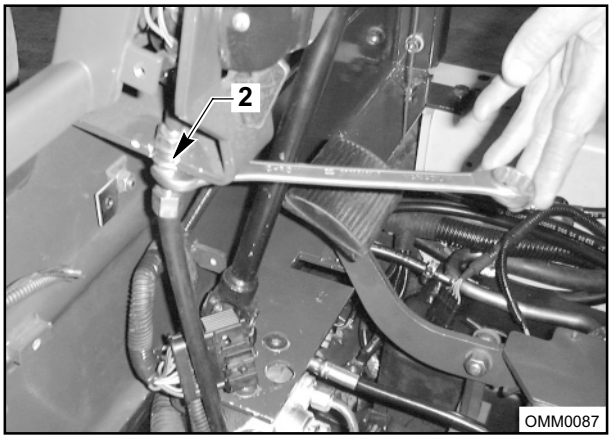
30.16 - CHASSIS

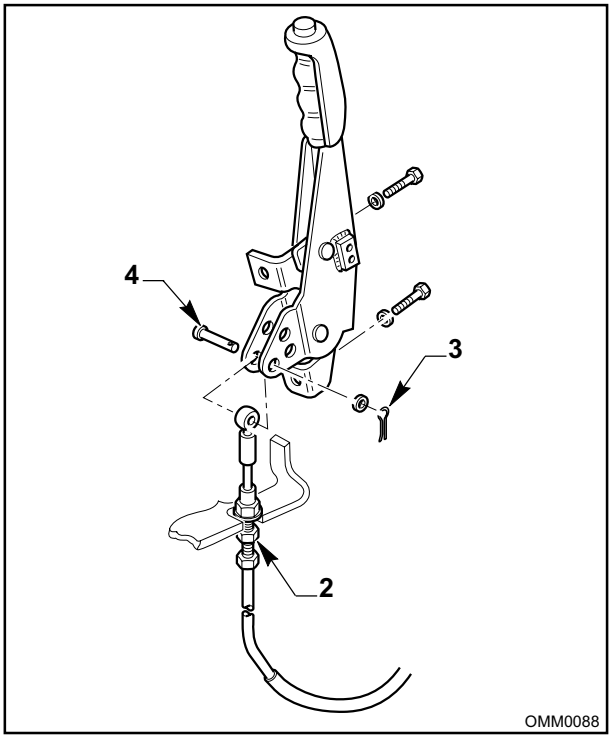
REMOVING THE CHASSIS

- Unplug the battery or operate the emergency button.
- Remove the rubber mat.
- Loosen and remove the platform fastening screws.
- Lift the platform, disconnect the wiring, and remove the platform.
- Remove the plastic guards from the chassis.
- Loosen and remove the screws (1) fastening the chassis to the overhead guard.



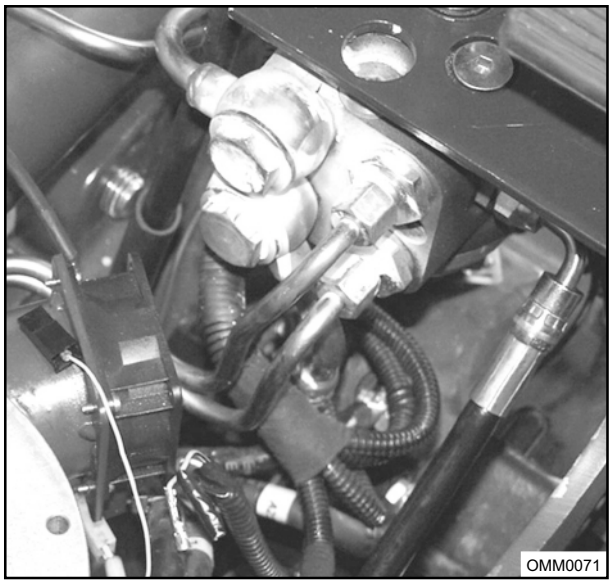
Disconnect the hand brake cable (2), loosen the sheath from the support, remove the split pin (3) and remove the pin (4). It might be easier to remove the plastic guard from the steering column first, or perform this operation after removing the hand brake lever from the support.



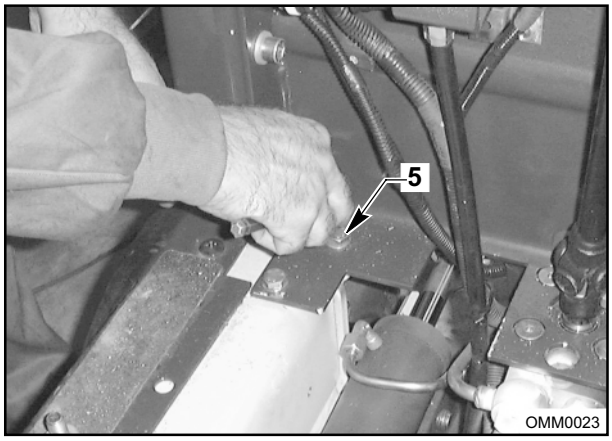


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- Disconnect the pipes on the hydraulic steering distributor, which will remain mounted on the chassis, or alternatively remove the four hydraulic steering fastening screws without disconnecting the pipes.
- Disconnect all the wiring located on the chassis (horn, hand brake, etc.).



- Loosen and remove the chassis to frame fastening screws (5).



Remove the chassis together with the steering column and, if the case, the hydraulic steering from the frame.

REINSTALLING THE CHASSIS

Reinstall the chassis by following the operations described above in reverse.

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30.17 - TRACTION MOTOR BRUSHES

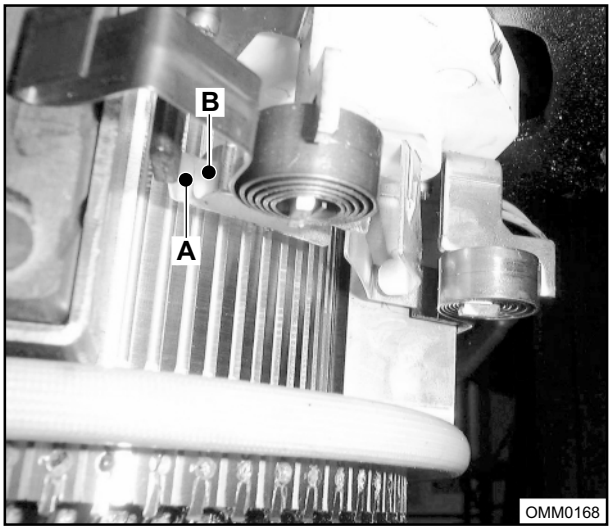
CHECKING THE TRACTION MOTOR BRUSHES

IMPORTANT:

Excessive wear of the traction motor brushes is signaled by alarm n° 90-91 (right motor, left motor) as soon as the condition is detected on any of the motor brushes.

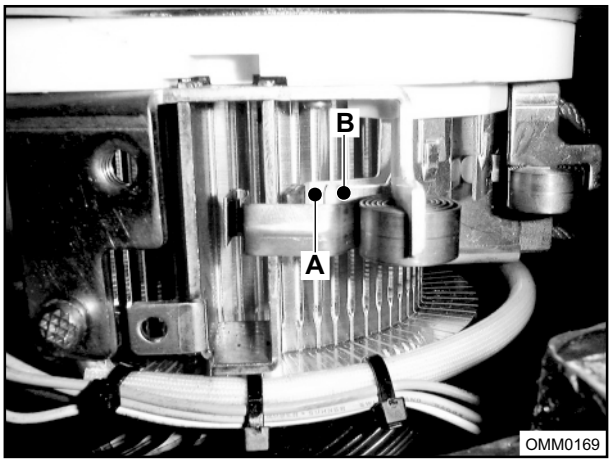
CHECKING THE WEAR OF THE TRACTION MOTOR BRUSHES

When the brushes are not worn the two metal plates **A** and **B** are in contact with each other, thus creating a closed contact.



A/B= contact closed

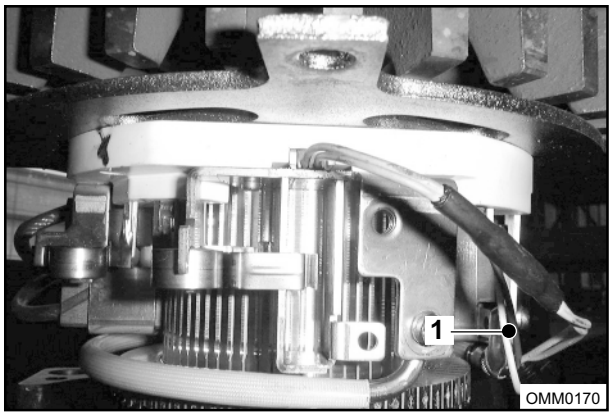
If one or more of the brushes is worn, the plates will be separated by the brush coil spring which interferes with plate **A** and thus opens the contact between **A** and **B**. All the brushes are equipped with this device and the **A** and **B** contacts for each brush are connected in line. Consequently, if any of the brushes becomes excessively worn, the contact between **A** and **B** will open and the condition will be signaled.

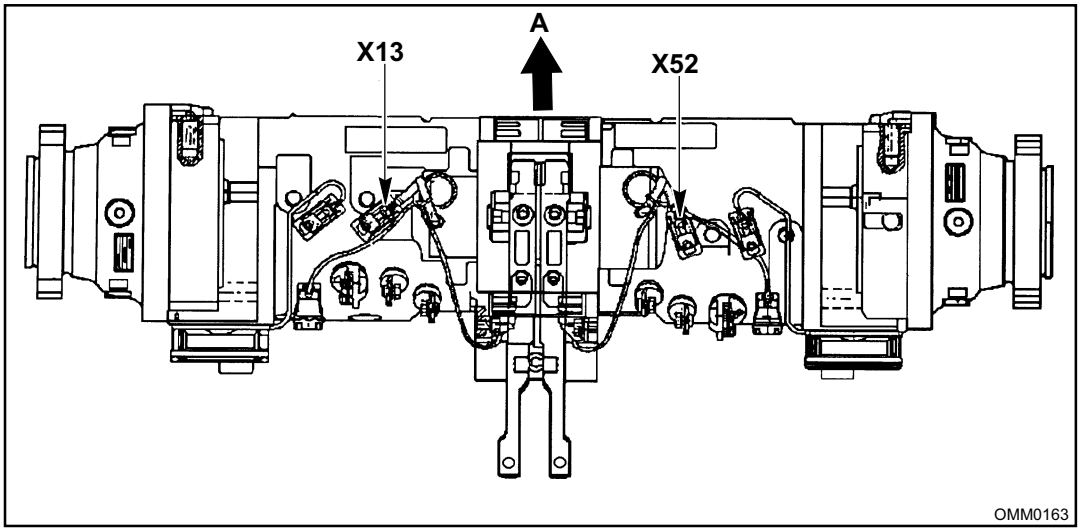


A/B= contact open

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This information is transmitted by an electric cable (1) using the X13 and X52 couplers to the electronic system, which will inform the operator by displaying the alarm signal on the DISPLAY Module.





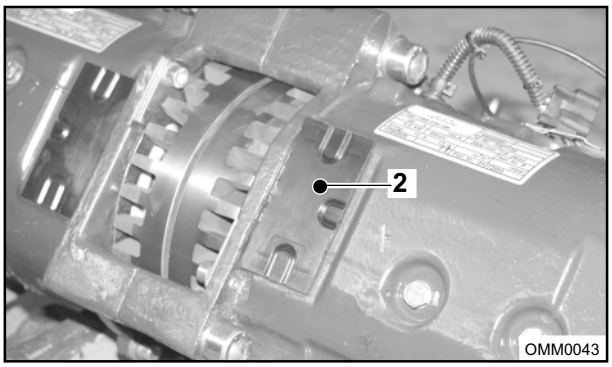
A= FORWARD drive

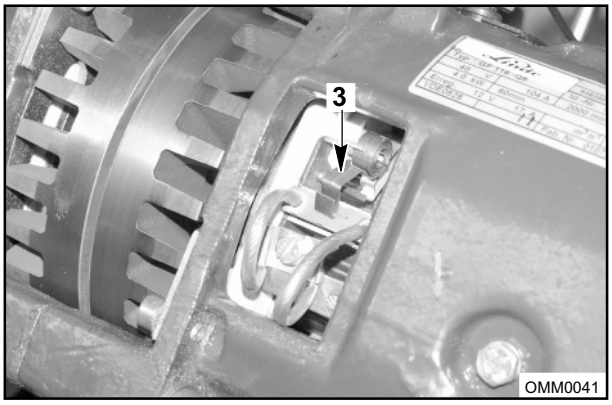
https://truckmanualshub.com/

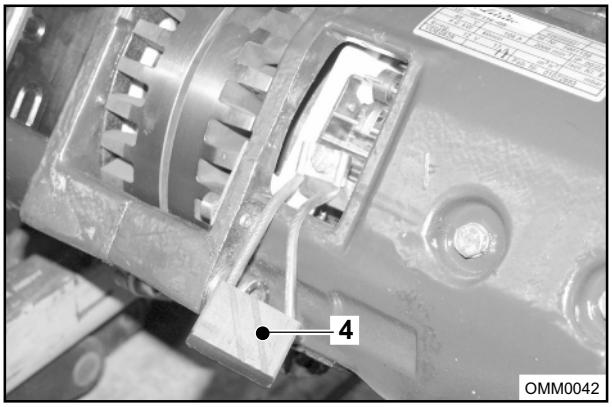
When it is time to check the brushes for wear in accordance with the schedule specified in the Use and Maintenance manual, we suggest that you check only the brushes that can be easily inspected, which are the brushes located at the top and in front of the motors (to avoid having to remove the mast and the axle).

We consider this inspection sufficiently reliable in view of the fact that unless there is a serious malfunction, all the brushes usually wear at the same rate.
Proceed as follows to perform the inspection:

- Lift the plastic brush cover (2) with a screwdriver.
- Lift the brush coil spring (3).
- Remove the brush (4) and check the amount of wear: **(minimum length 11-13 mm**).
- If it is excessively worn or has become misshapen, check all the other brushes and replace them if necessary.







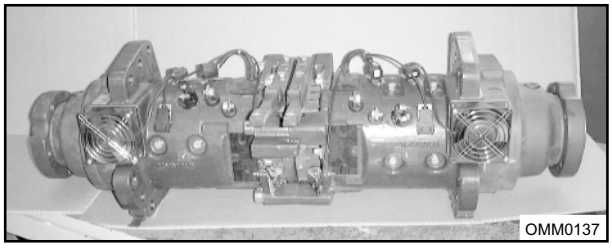
https://truckmanualshub.com/

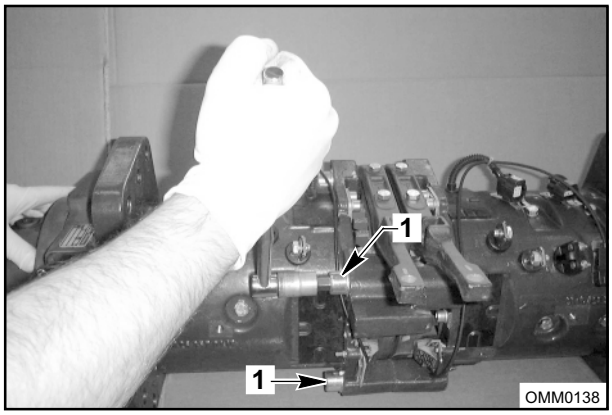
30.18 - FRONT AXLE

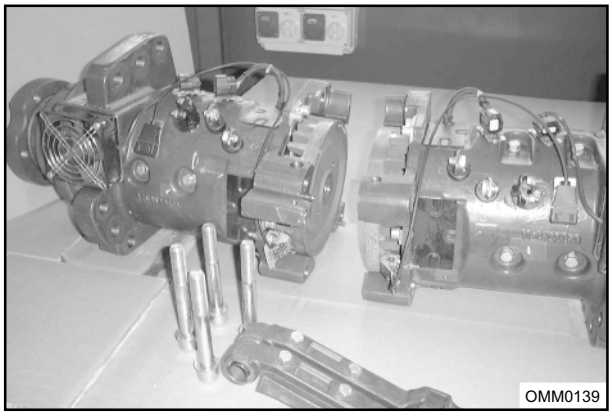
DISASSEMBLING THE AXLE

Remove the front axle from the truck (as described in the relative paragraph) after draining the oil from the reducers.

Place the axle on a workbench, remove the four fastening screws (1) and separate the two axle gear motors.

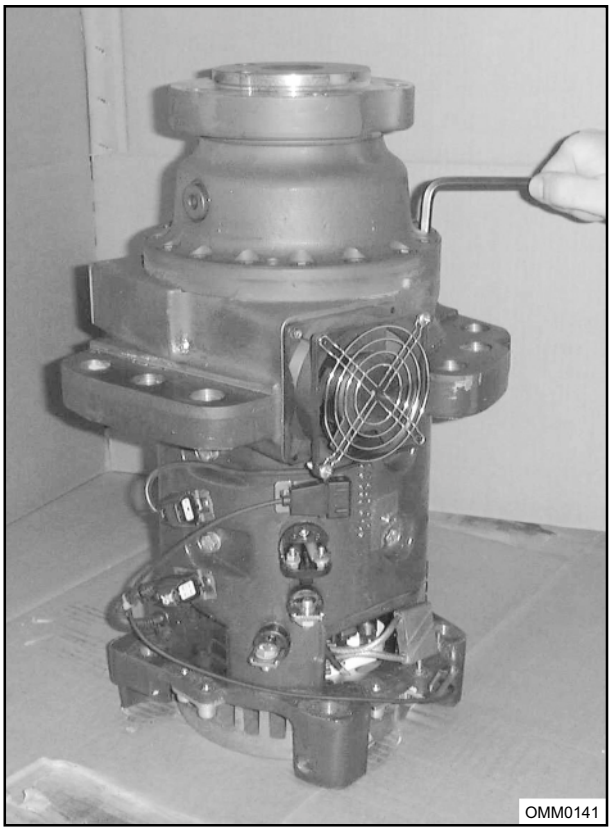


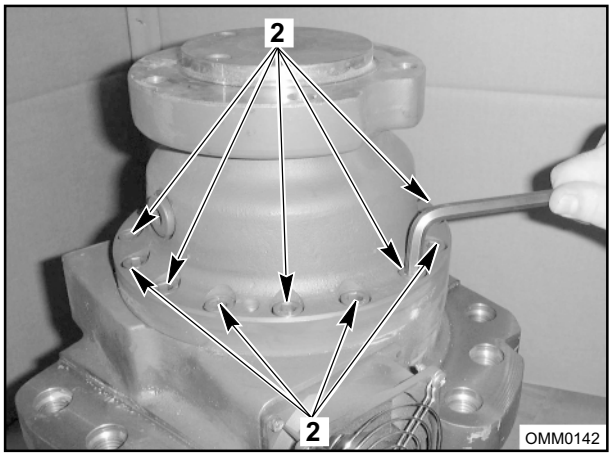




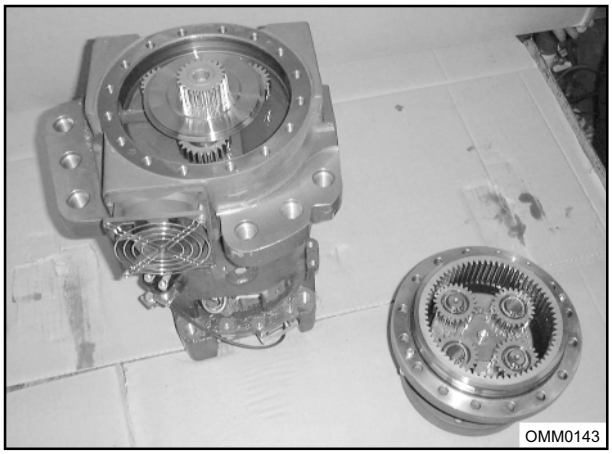
https://truckmanualshub.com/

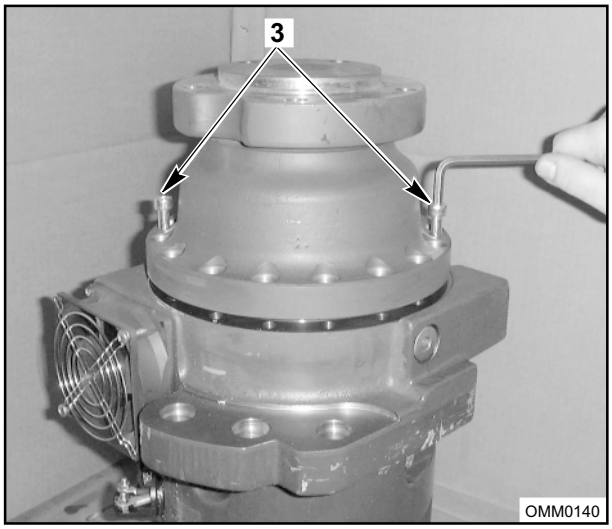
Place the gear motor in a vertical position, securing it so that it does not fall.
Loosen and remove the reducer to traction motor fastening screws (2).





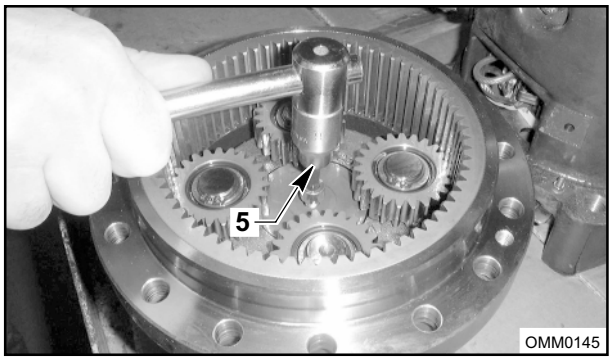
Insert two screws into the extraction holes (3) and screw them in to lift and disconnect the reducer from the motor.

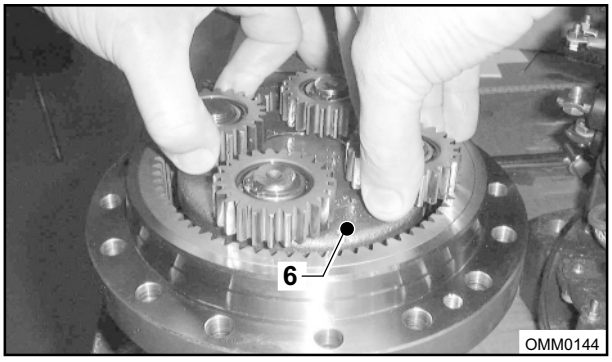


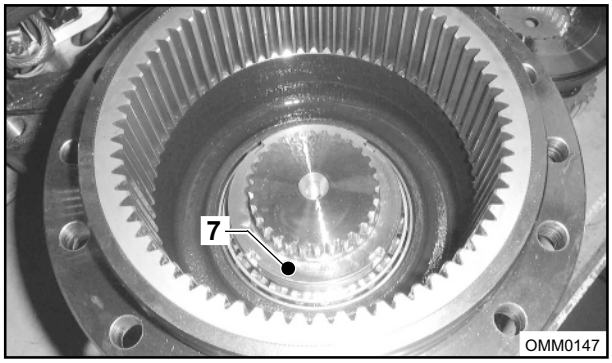


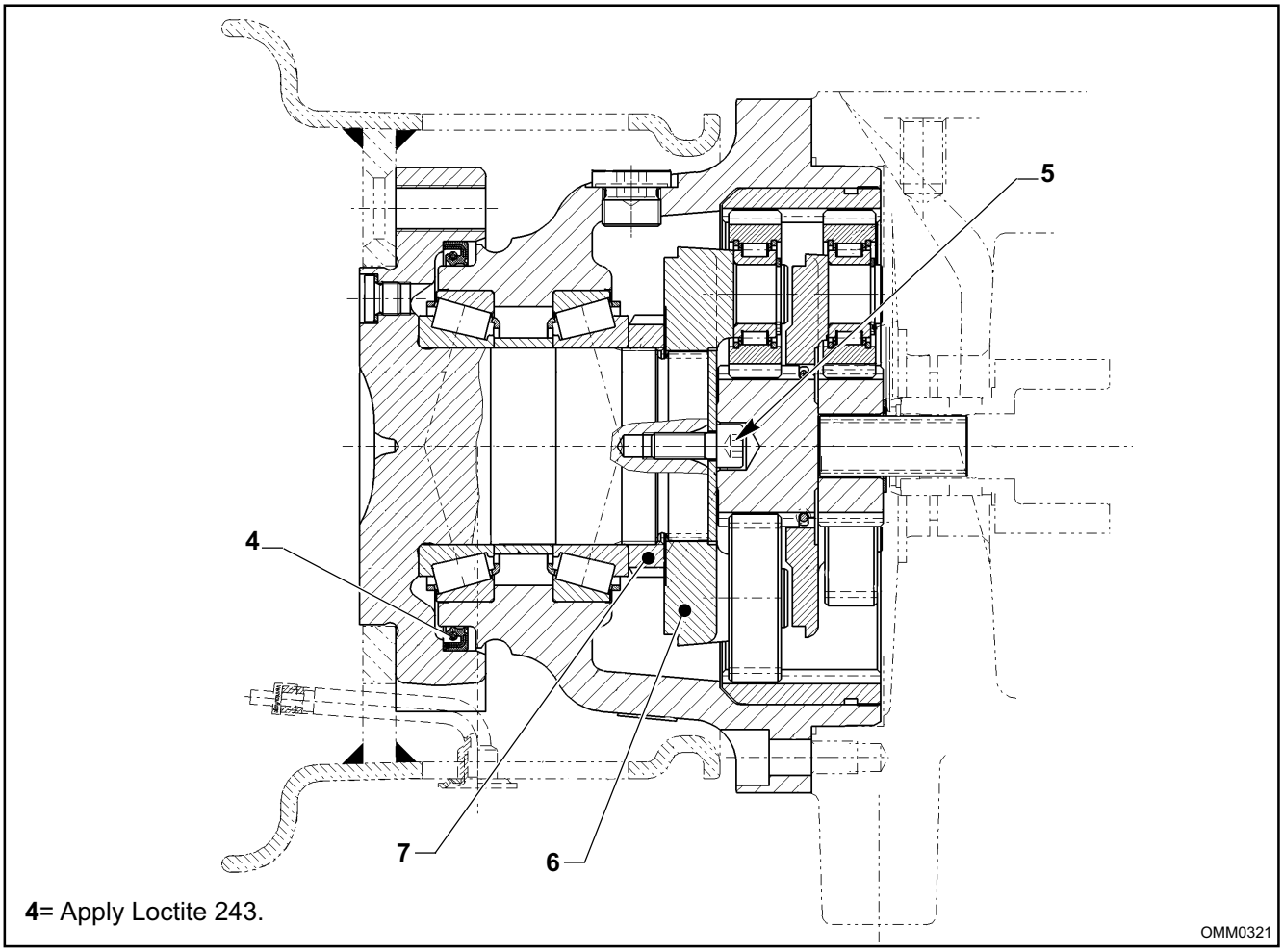
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If the oil seal (4) on the wheel hub has to be replaced, loosen and remove the Allen screw (5), and remove the planetary gear holder together with the gears (6).
Loosen and remove the slotted nut (7), remove the hub, and replace the oil seal (4).









4= Apply Loctite 243.

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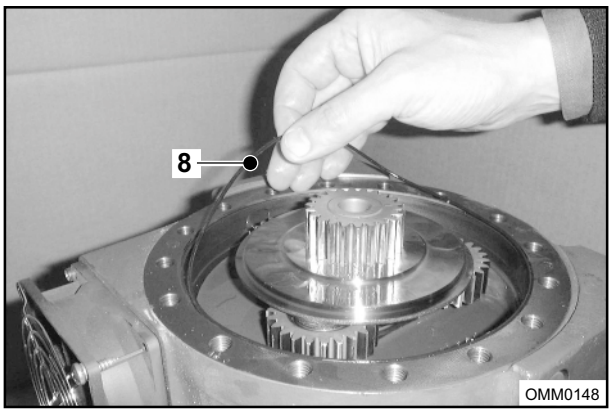
REASSEMBLING THE AXLE

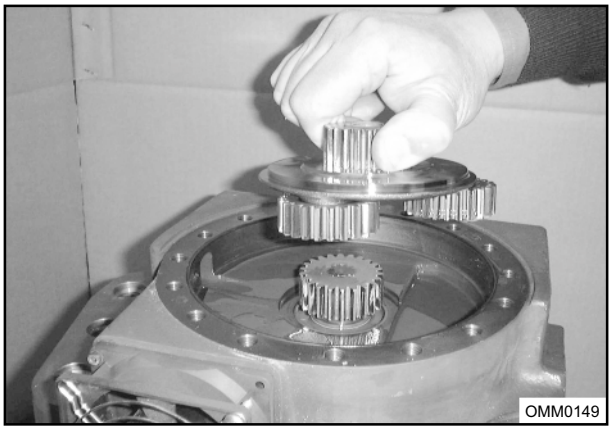
Reassemble the axle by following the operations described in the paragraph “Disassembling the axle” in reverse.

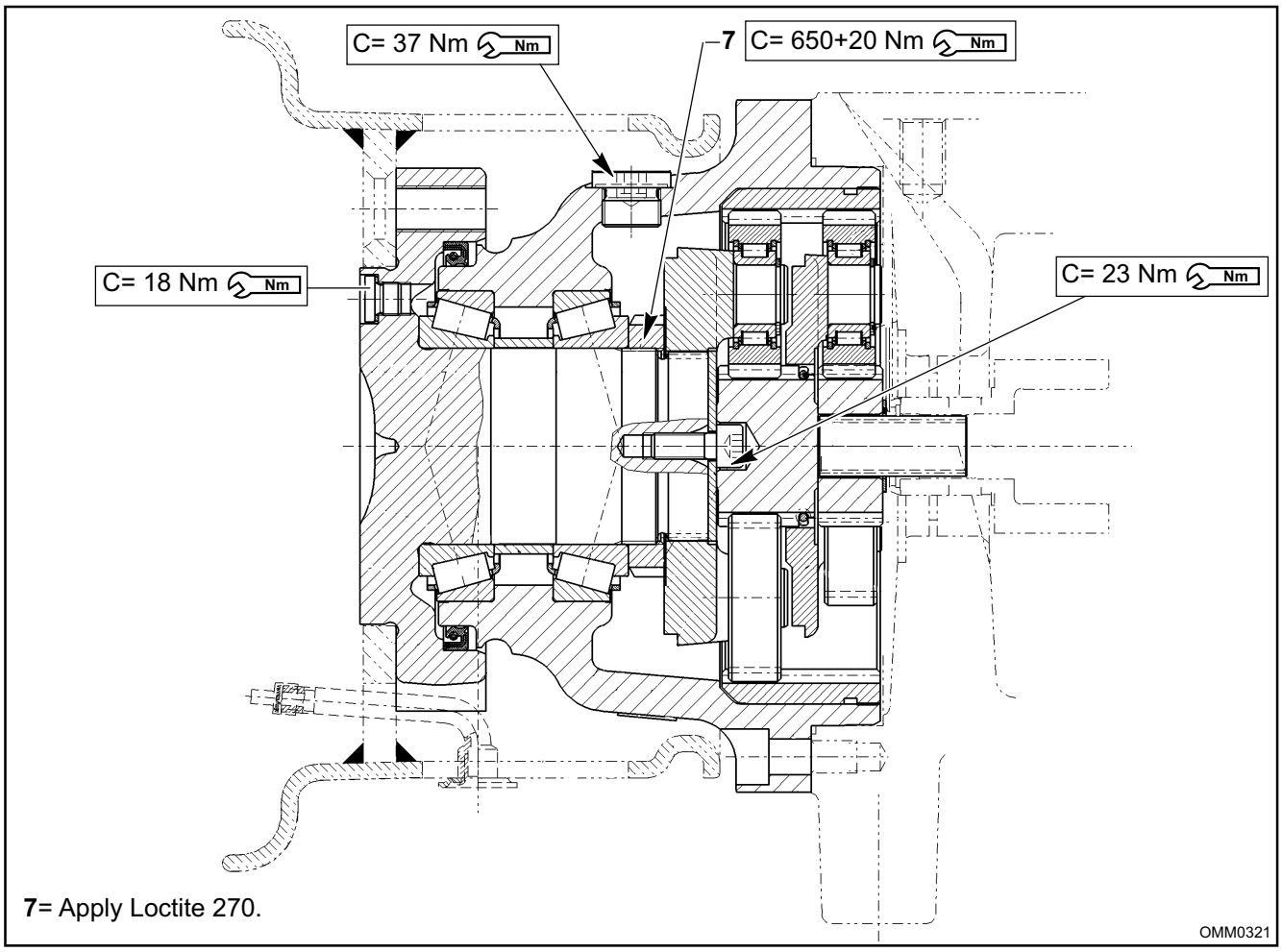
Carefully tighten the nut (7) to 650+20 Nm of torque and apply Loctite 270.

Remount the reducer on the motor, being careful with the O-ring (8) when remounting, then follow the operations described above in reverse.

Follow the instructions described in paragraph 10.5 for the torque specifications, mounting clearances, and other warning notices.





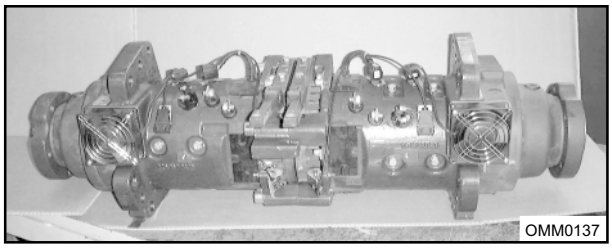


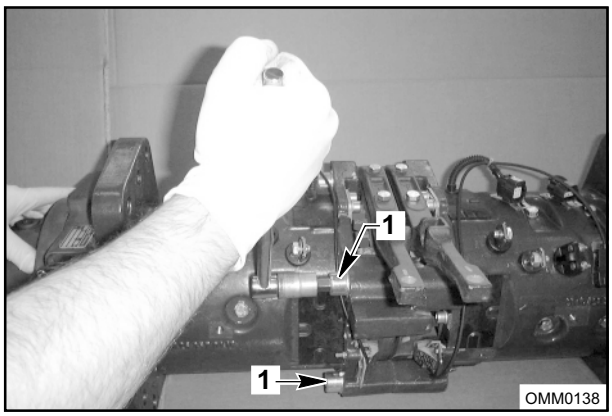
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DISASSEMBLING THE TRACTION MOTOR

Remove the front axle from the truck after draining the oil from the reducers.

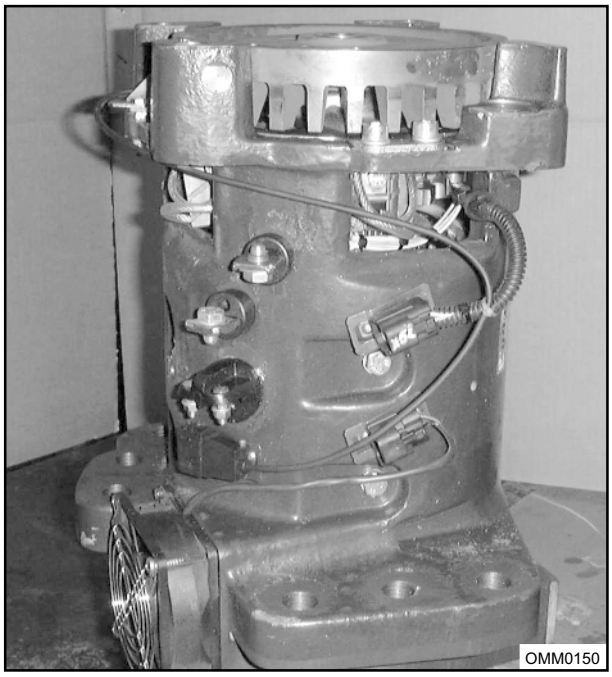
Place the axle on a workbench, remove the four fastening screws (1) and separate the two axle gear motors.

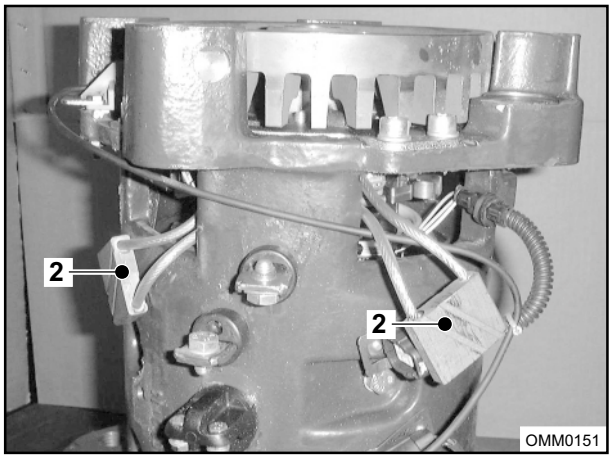




Place the gear motor in a vertical position with the brake pulley at the top, and secure it so that it does not fall.

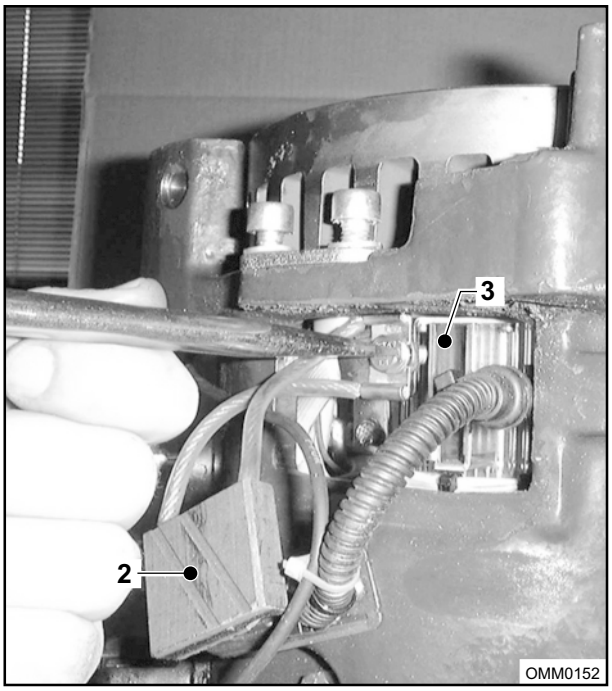
Remove the four brushes (2) from their seats.

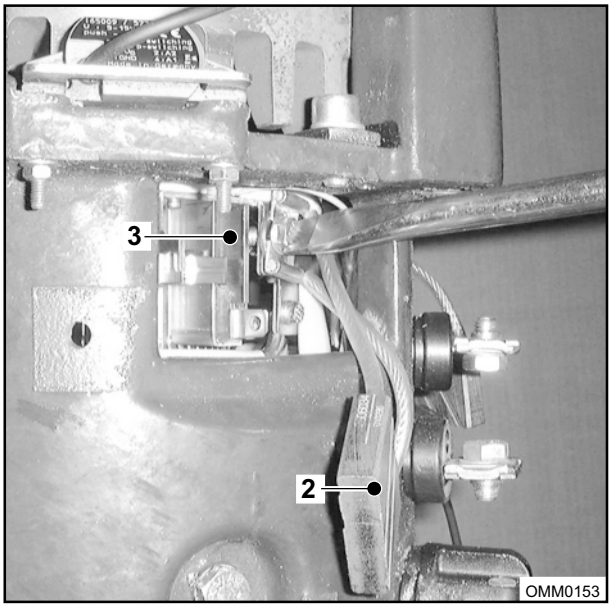




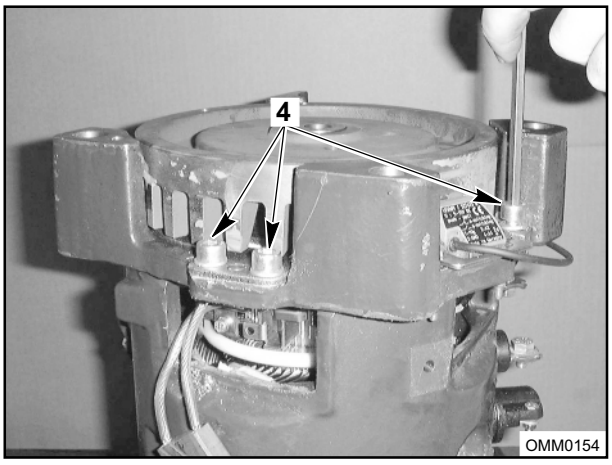
https://truckmanualshub.com/

Using a screwdriver with a wide blade, remove the two brushes (2) fastened to the two terminals (3) constituting the armature of the motor.



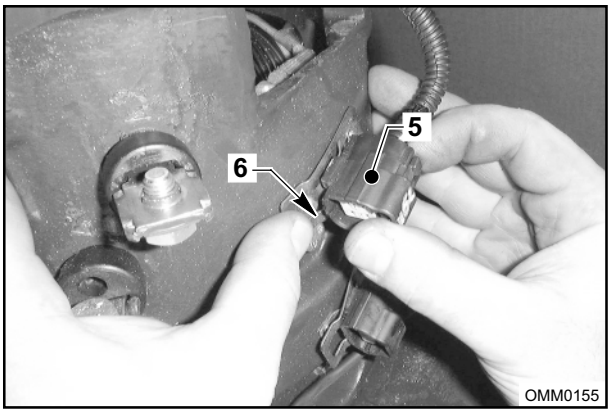


Loosen and remove the eight Allen screws (4) fastening the brush holder ring to the motor housing.

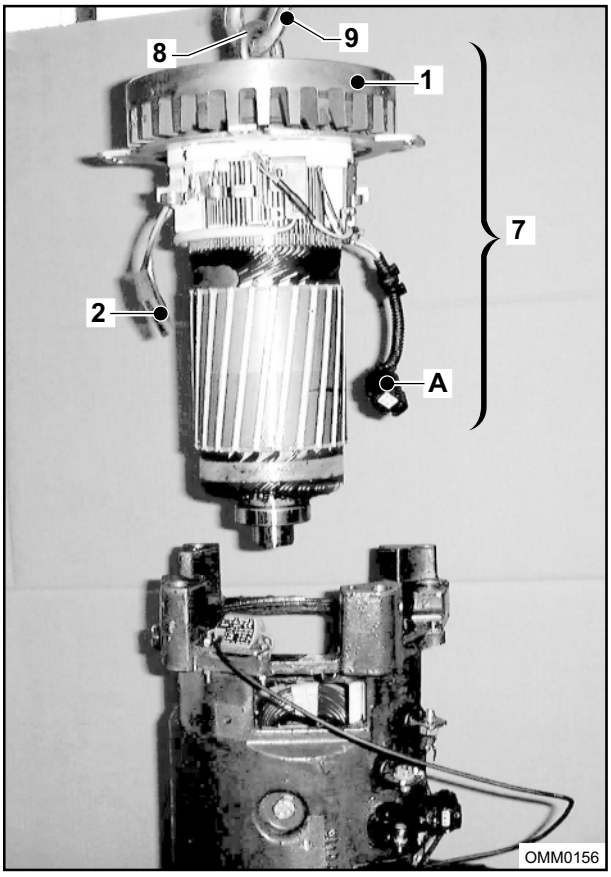


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Remove the brush wear and motor thermal probe (5) coupler from its seat by pushing on the tab (6) and pulling it toward the tab itself.



Remove the armature (7) by hooking and lifting it with a ring bolt (8), being careful during the removal process to accompany the connector "**A**" which was disconnected previously and the two brushes (2) which remain connected.
Place the armature on a workbench and remove the hook (9) used to lift it.



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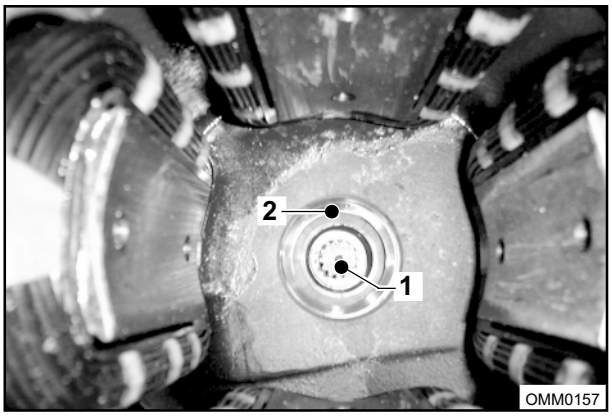
REASSEMBLING THE ARMATURE

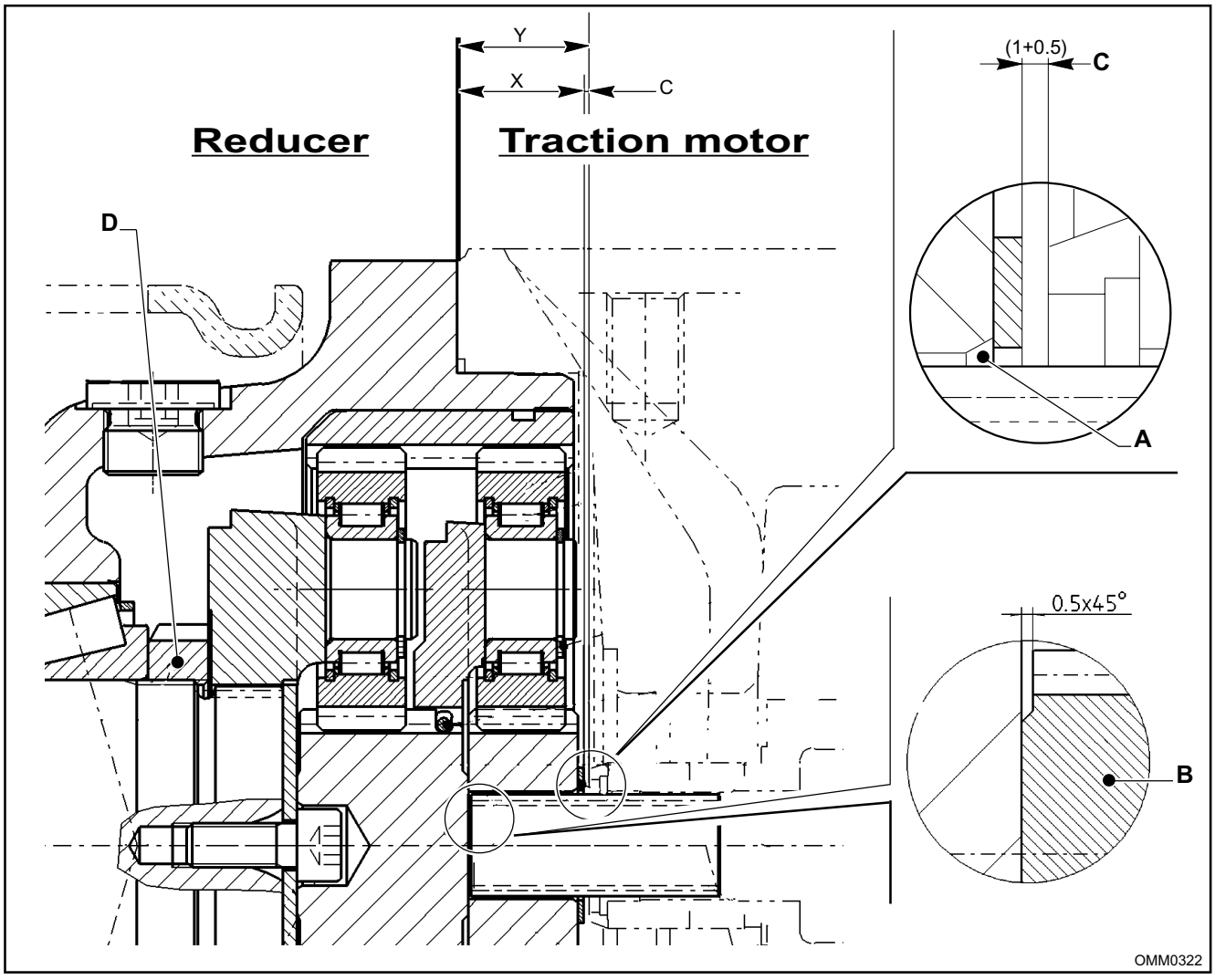
After reassembling the armature, hook it with a ring bolt and lift it.

Position it in its seat, being careful to accompany the brushes and the coupler while performing this maneuver.

Center the armature on the grooved pin (1) located inside the stator, making sure that the shims (2) are positioned correctly if they come out of their seats.

Refer to the diagram and the notes below to reinstall the armature.





A= the bevel is located on the outside.

B= insert the shaft in the planetary gears so that the groove 0.5x45°/diameter 13 is facing the planetary wheel.

C= dimension C resulting from the difference between Y and X should measure 1+0.5 mm; insert shims 20x28x….if necessary.

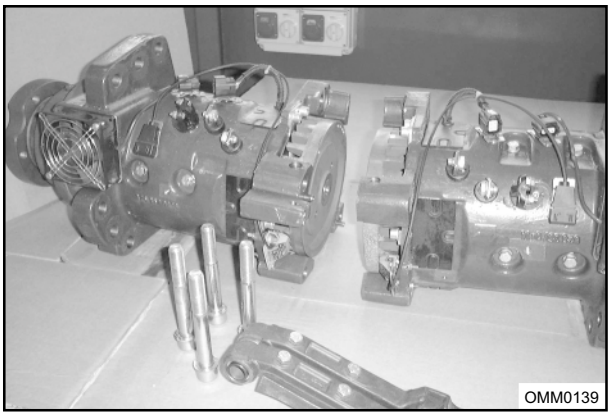
D= slotted nut; tighten to 650+20 Nm of torque. Turn the nut 10 times and tighten it to 650+10 Nm of torque.

- Check that the rolling torque of the hub is 3-6 Nm.

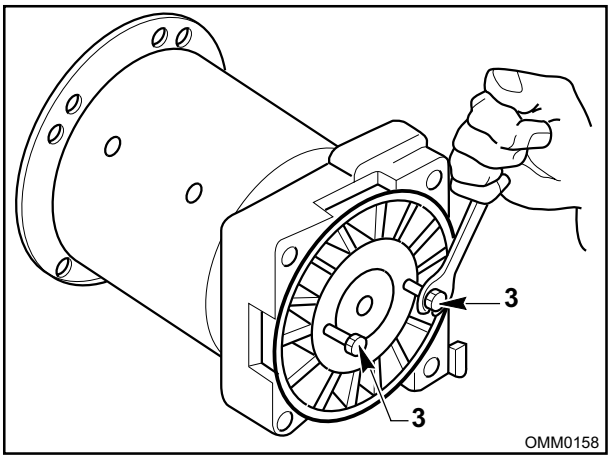
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REMOVING THE BRAKE PULLEY

After separating the two motors, place the motor being inspected on a workbench and proceed as follows:



Screw two puller bolts (3) into the two threaded holes provided specifically for this purpose. The pulley will come out of its seat.



Be careful not to damage the encoder located near the pulley during this operation.

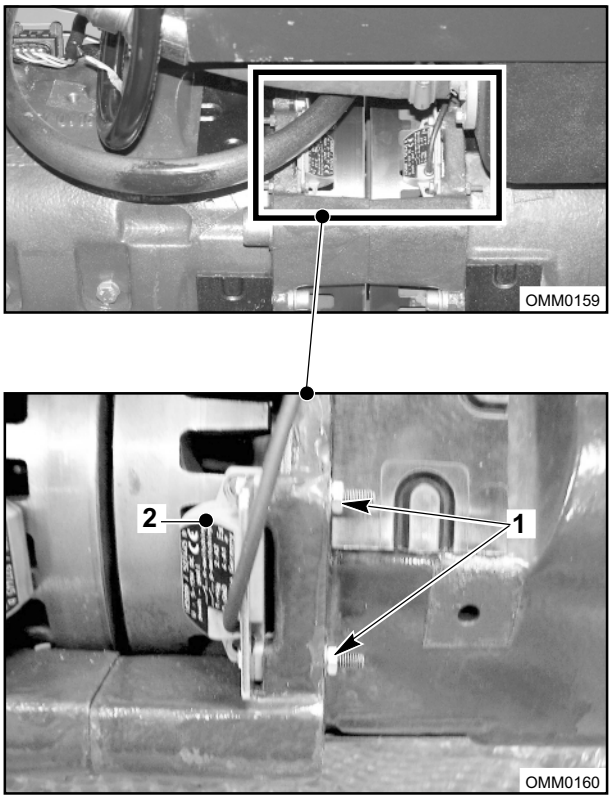
REINSTALLING THE BRAKE PULLEY

After removing the armature from the motor as described above, wipe off the grease and thoroughly clean the pulley seat.
Heat the pulley to 150°C.
Place the armature under a press.
Position the pulley correctly and press it with a load of 25KNm (2.5t).
Reassemble the motor as described above.

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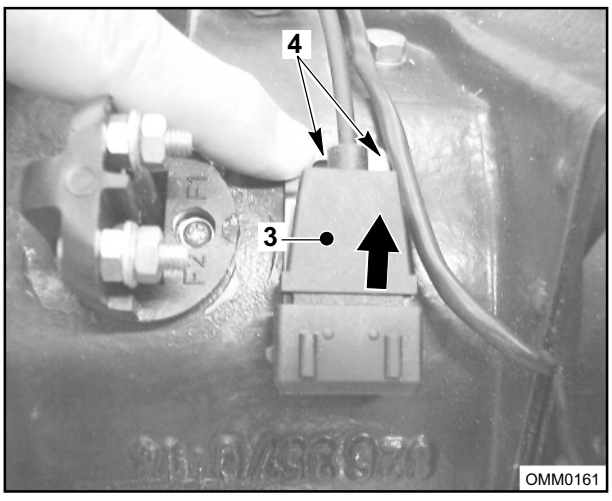
30.19 - REMOVING THE ENCODER

Place the truck over a work pit or on a vehicle lift.
Apply the hand brake and place blocks under the wheels.
Unplug the battery.
Loosen and remove the encoder (2) fastening nuts (1).

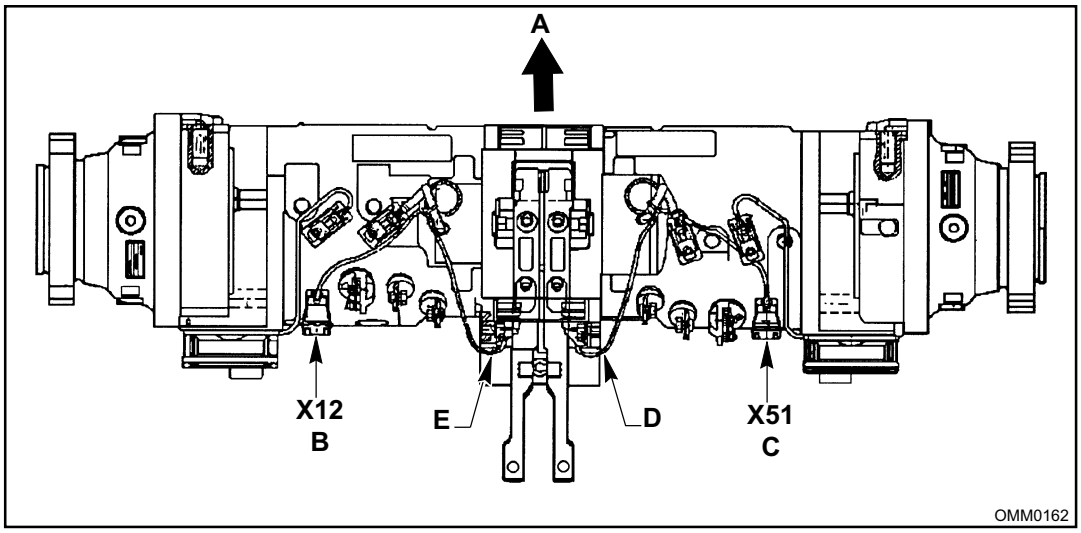


Remove the encoder.

Disconnect the encoder coupler (3) from the motor housing by pressing the tab (4) and pushing it up.



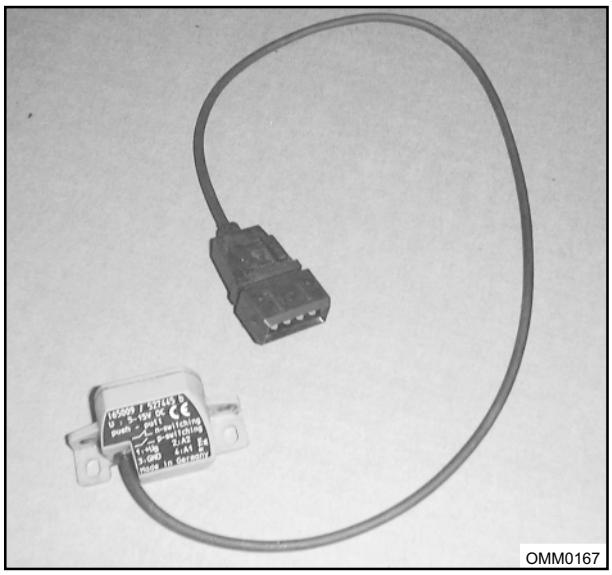
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A= FORWARD drive
B= Encoder connector
C= Encoder connector
D= Right motor Encoder
E= Left motor Encoder

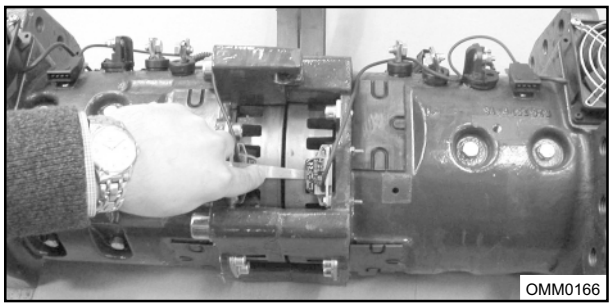
REMOVING THE ENCODER WITHOUT USING A WORK PIT

If you are not using a work pit, remove and reinstall the encoder after removing the axle from the frame, then proceed as described above.

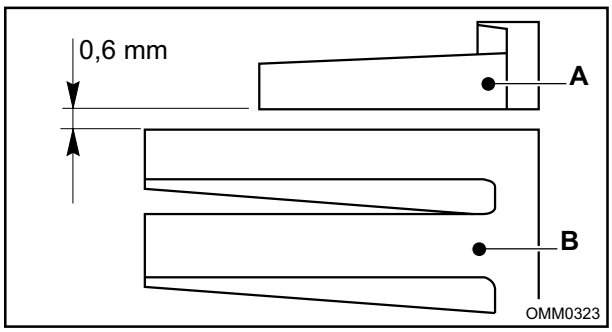


REINSTALLING THE ENCODER

Reinstall the encoder by following the above operations in reverse, using a thickness gauge positioned as shown in the figure to adjust the dimension to 0.6 mm.



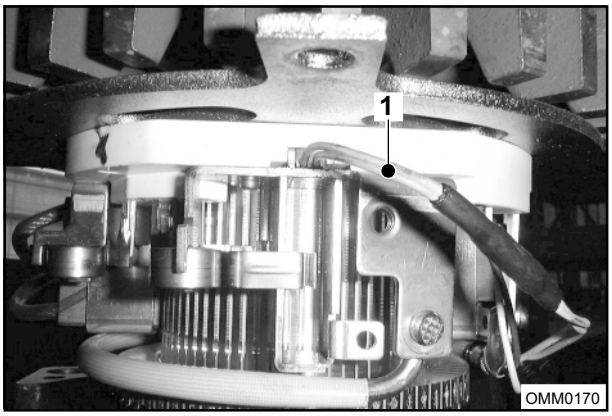
A= Encoder
B= Motor pulley



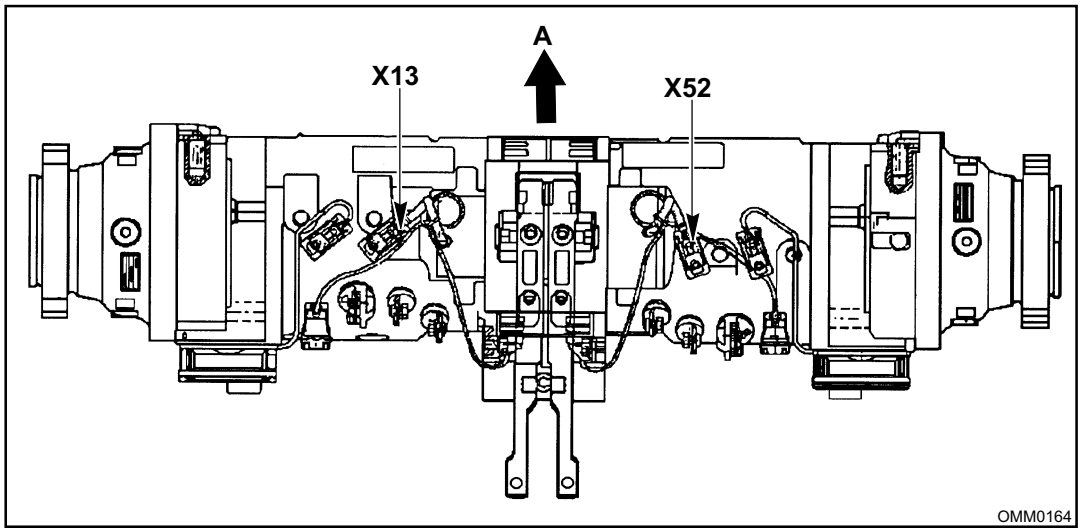
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30.20 -PTC THERMAL PROBE FOR TRACTION MOTORS

As can be seen in the figure, the traction motor thermal probe (1) is in direct contact with a brush holder.
It detects the exact temperature of the brush and sends the measurement to the electronic system, which operates the electronic control to maintain the temperature within the preset limits.
Information about this component is also transmitted by wire.



The outputs from the probes are in proportion to the temperature reached.
Roughly: at 20°C the resistance is 570 Ohm, at
100°C the resistance is 1000 Ohm
resistance measured between point 3 and point 4 of the connectors X13 and X52 respectively, or between pins 5-6 and 5-10 of the display connector C (page 27, chapter 40).

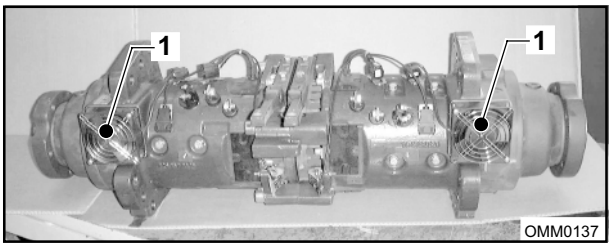


A= FORWARD drive

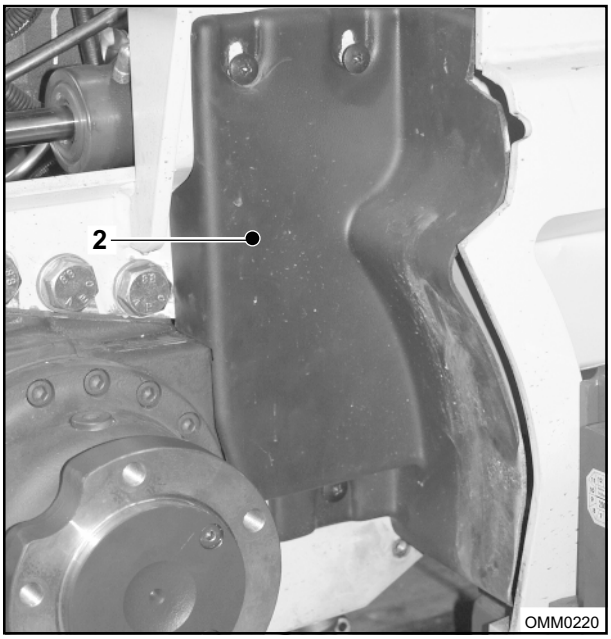
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30.21 - REMOVING/REINSTALLING THE TRACTION MOTOR COOLING FANS

The traction motors are cooled by two 25V (5.5W when idling) electric fans (1).
They are mounted directly onto the front axle.

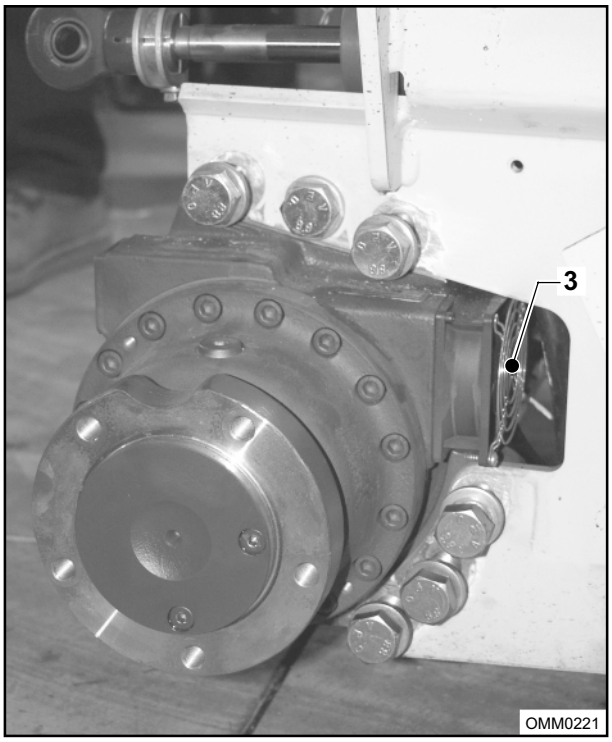


Place the truck on solid, stable supports, unplug the battery or operate the emergency button, remove the wheel, remove the fender and the plastic guard (2).

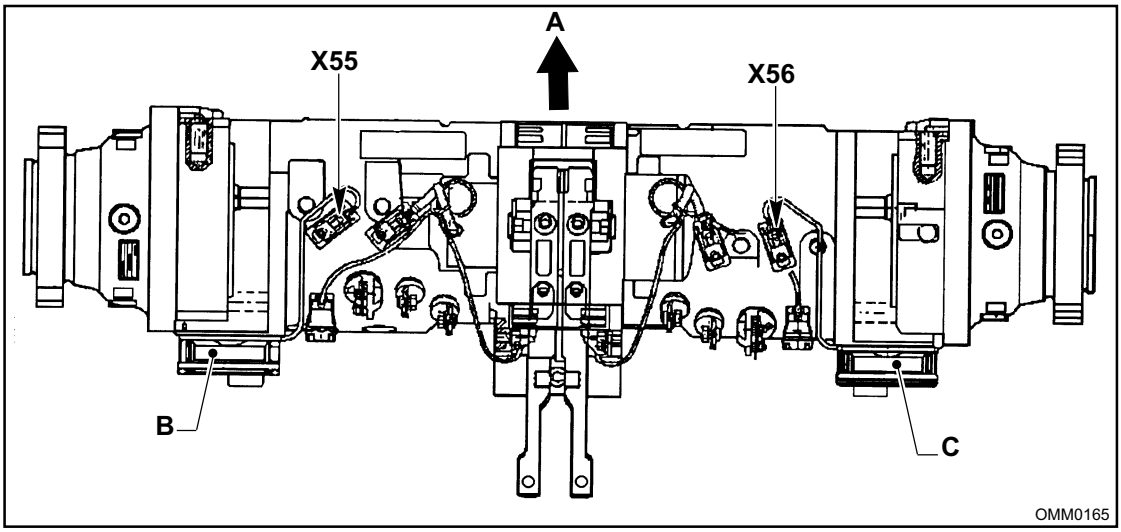


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Loosen and remove the two screws (3) fastening the safety grill and remove the two Allen screws that fasten the fan to the axle.



Remove the fan coupler and replace it by following the operations described above in reverse.
X55= Left motor fan coupler
X56= Right motor fan coupler



A= FORWARD direction
B= Left motor fan
C= Right motor fan

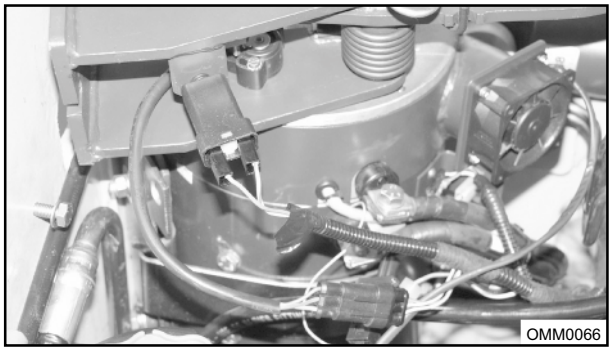
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30.22 - BRAKE SHOES

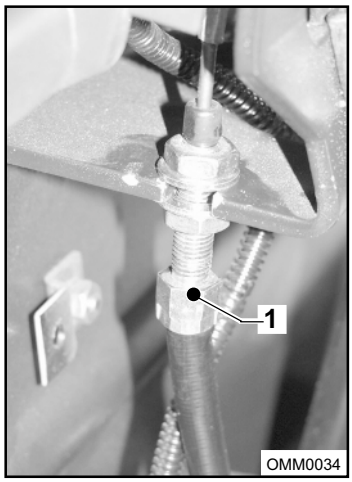
REPLACING THE BRAKE SHOES

Unplug the battery or operate the emergency button.
Remove the rubber mat.
Loosen and remove the platform fastening screws.
Lift the platform and disconnect the wires from the pedal unit.
Remove the platform.

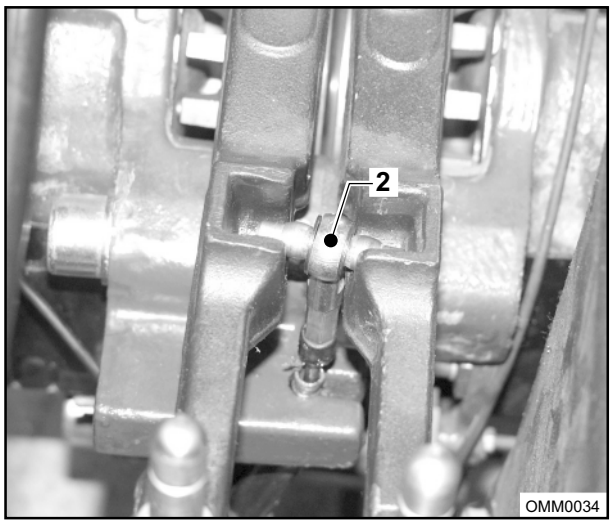
Disconnect the wires and remove the brake pedal support unit.



Disconnect the hand brake cable sheath (1) from the support on the chassis.

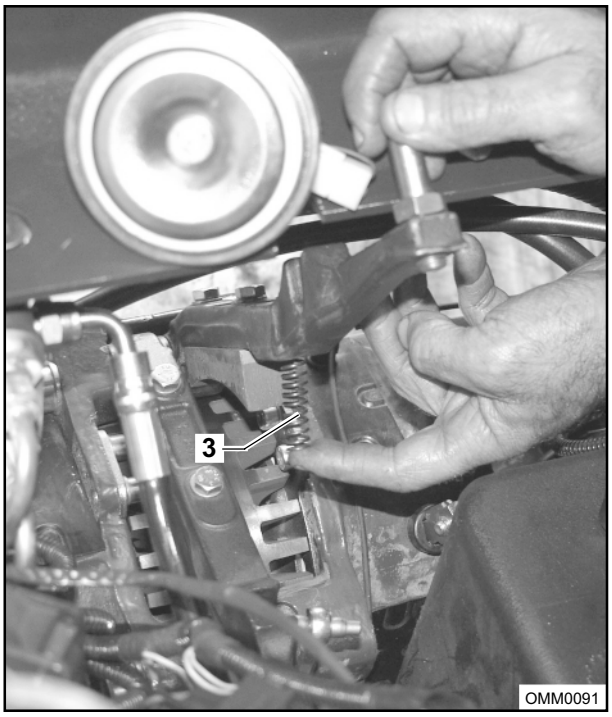


Lift the sheath and disconnect the cable terminal (2) from the two brake levers.

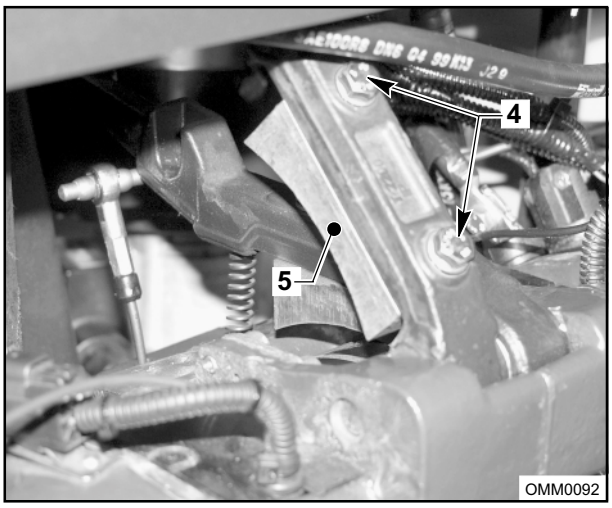


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Lift the two levers and remove the return springs (3).



Loosen and remove the brake shoes to levers fastening screws (4).
Replace the brake shoes (5).



Repeat the operations described above in reverse, adjusting the brake shoes as specified in paragraph 30.23.

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30.23 - HAND BRAKE AND PEDAL BRAKE

ADJUSTING THE BRAKES

1) Parking brake

Adjust the tension of the sheath by means of the nuts (1) until the lever in position (2) corresponds with the 3rd tooth of the ratchet (make sure that the brake discs of both motors turn freely when the lever is released).

2) Pedal brake

Adjust the position of the unit (3) by means of the push rod (4) to obtain a clearance of 3.5 ÷ 4 mm (5) on both thrust bearings: check the position of the pedal with respect to the platform.

A) Pedal in the rest position.

B) Electronic braking with initial stage mechanical braking (contact shoes).

C) End 1¡ of braking cycle (with shoes worn by 2.5 mm).

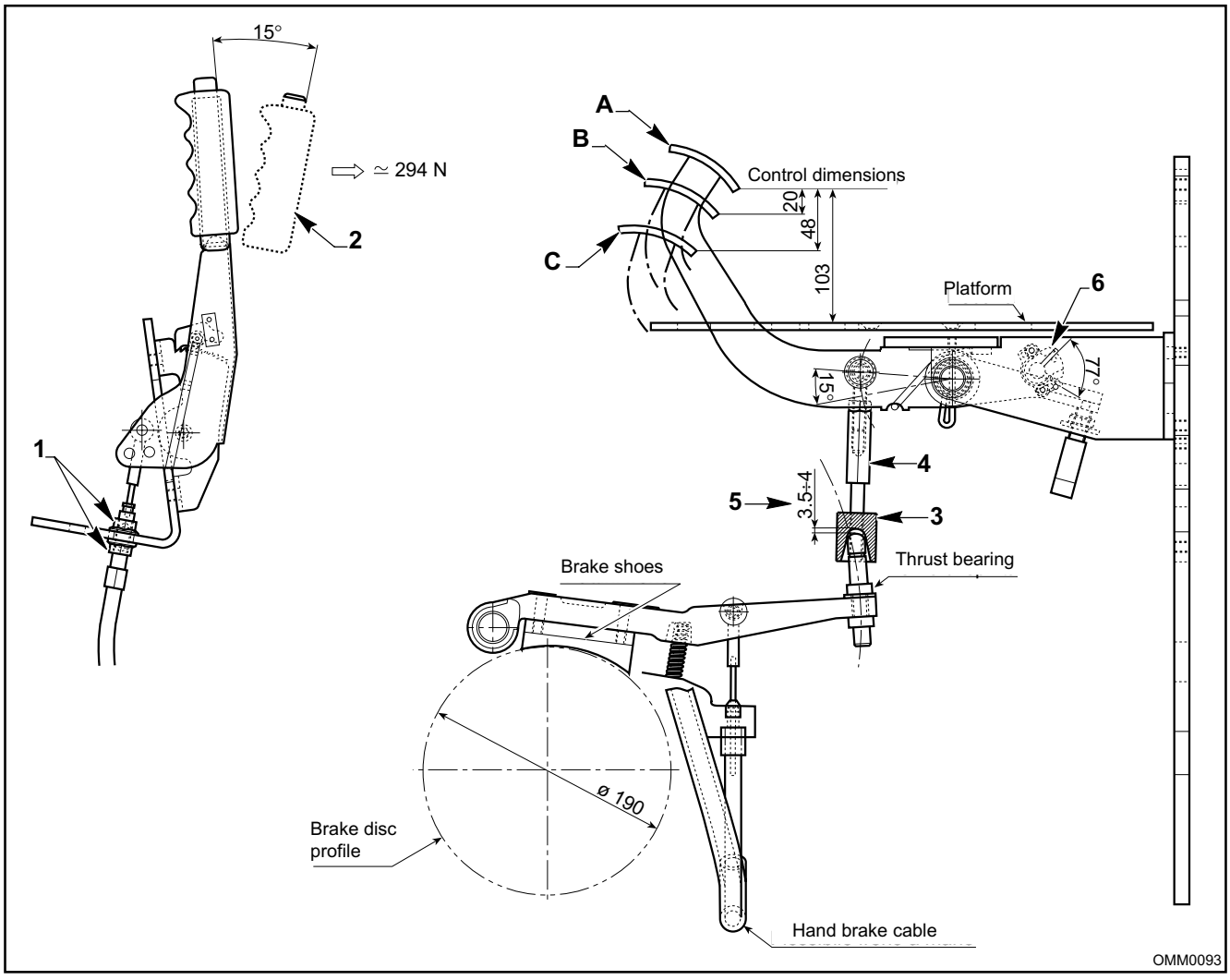
IMPORTANT:

Alarm 64 will appear on the display to provide an initial warning that the shoes have worn by 2.5 mm, in which case readjust the brake system as described in point 1.

Alarm 64 will reappear on the display to provide a second warning that the shoes have worn even further (+2.5 mm), in which case replace the brake shoes.

3) After installing the brake shoes, check that they turn freely without obstruction or scraping while the wheels are still raised.

Check that the pedal brake and the hand brake work effectively on a slope.



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ADJUSTING THE POTENTIOMETER

The potentiometer (6) must be preloaded by approximately 7° with the pedal in the rest position.
Check that the output voltage equals 0.6 ± 0.1 Volt.

20 mm ⟶ angle 31°
48 mm ⟶ angle 77°

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30.24 - STEERING AXLE

DISASSEMBLING THE STEERING AXLE

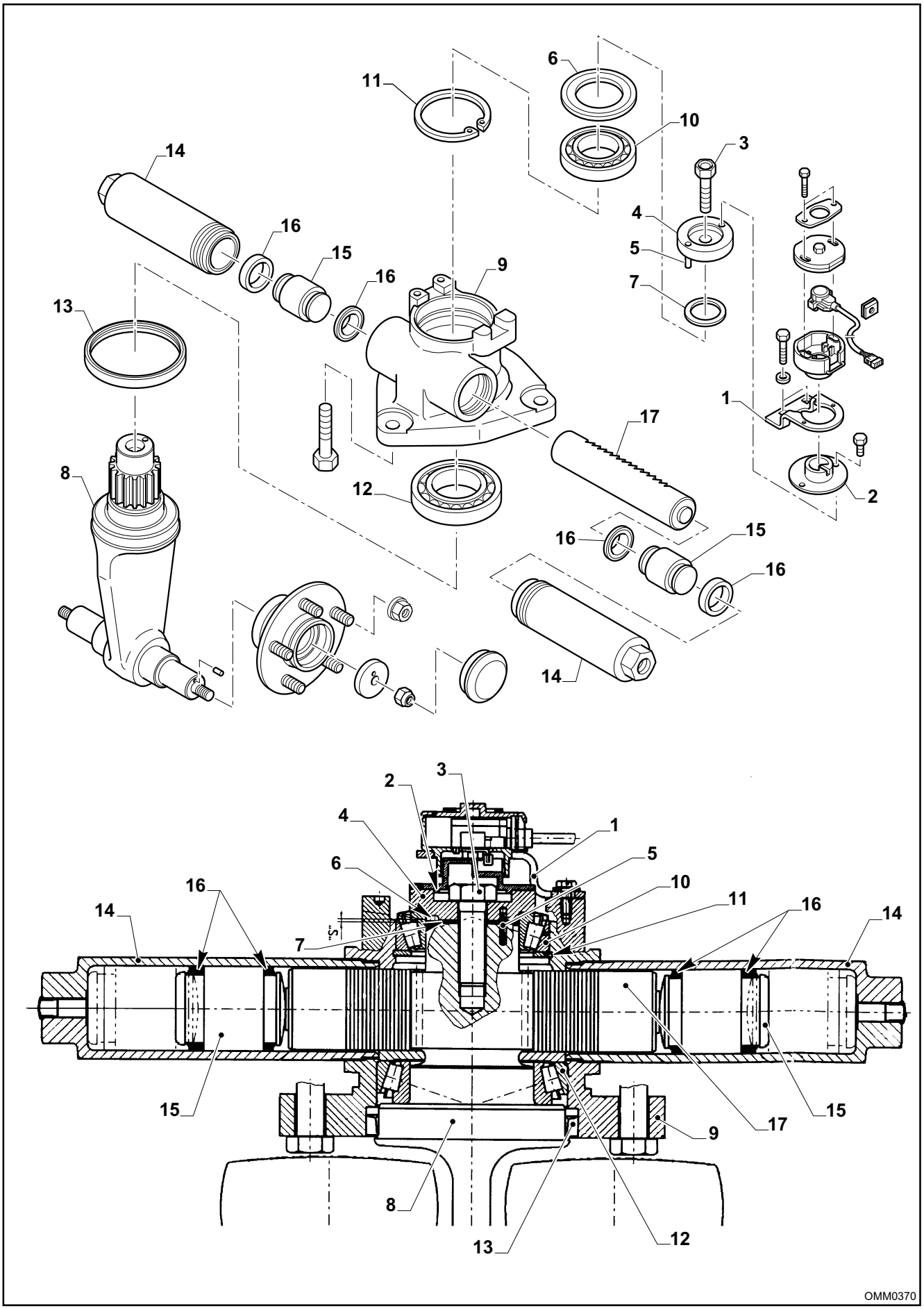
- Disassemble the potentiometer support (1) and the potentiometer drag disc (2).
- Loosen and remove the screw (3).
- Remove the disc (4) with the clamping pin (5).
- Remove the safety ring (6) and the shims (7).
- Remove the axle body (8) from the steering box (9).
- Remove the upper ball bearing inner race (10), remove the rubber ring (11) from the steering box then remove the upper ball bearing outer race.
- Remove the lower ball bearing races (12) and the oil seal (13).

DISASSEMBLING THE STEERING BOX

- Loosen and unscrew the cylinders (14).
- Remove the pistons (15) and the gaskets (16).
- Remove the toothed rod (17) from the steering box.

1= Potentiometer support
2= Drag disc
3= Screw
4= Drag disc
5= Clamping pin
6= Safety ring
7= Shims
8= Axle body
9= Steering box
10= Upper taper roller bearing
11= Rubber ring
12= Lower taper roller bearing
13= Oil seal
14= Cylinders
15= Pistons
16= Gaskets
17= Toothed rod

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REASSEMBLING THE STEERING BOX

- Reassemble the steering box by following the operations described above in reverse, applying Loctite 243 to the cylinder (1) threads (clean, degreased, and dry) which should be tightened to 145 Nm of torque.

REASSEMBLING THE AXLE SUPPORT

- Fill the cavities (2) with lithium grease (Tutela MR2).
- Place the steering box (complete with the ball races and oil seal) on the axle support together with the lower bearing, insert the upper bearing and adjust the bearings as described below.

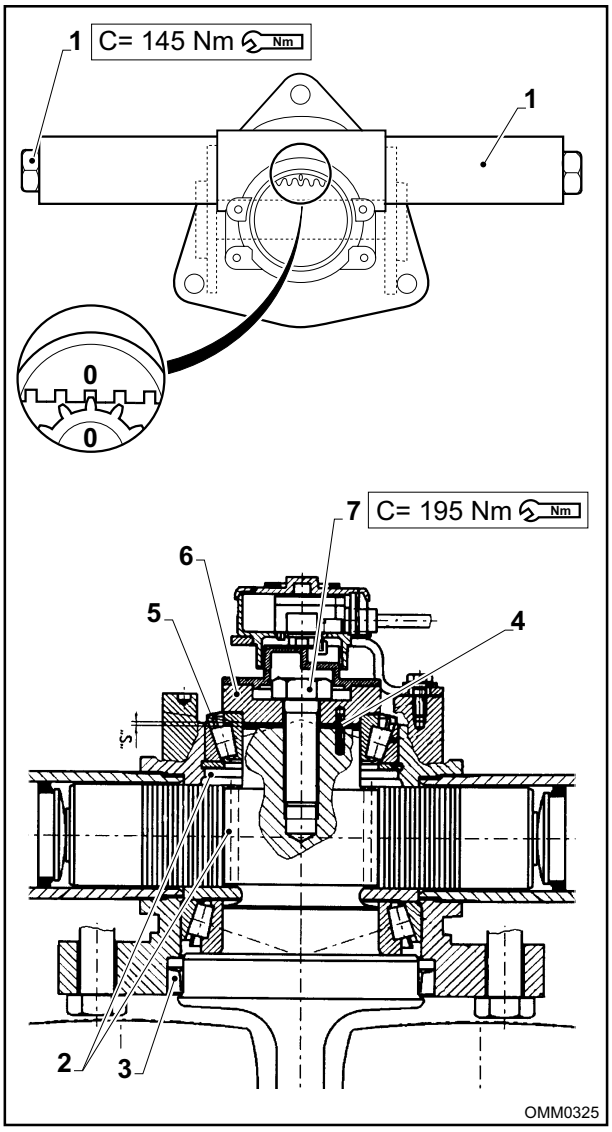
IMPORTANT:

Check that the shaft sealing ring (3) is installed in the correct mounting position. The lip must be facing the taper roller bearing.
Fill the shaft sealing ring (3) with lithium grease (Tutela MR2).

- Position the toothed rod in the middle to allow a symmetrical steering excursion: the «0»'s on the rod and the toothed wheel should be in alignment.
  The wheel pivots should thus be parallel to the steering cylinder.

ADJUSTING THE AXLE BODY BEARINGS

- Adjust the bearings using the 0.1 - 0.5 and 1 mm shims (4).
  Proceed as follows:
- After assembling the axle support and steering box as described above, insert the safety ring (5), a length of lead wire in the area (4), and the ring (6).
- Tighten the screw (7) to 15 Nm of torque.
- Remove the screw and the safety ring and measure the thickness «S» of the lead wire.
- Insert a shim (4) with the same thickness «S» as the lead wire, after rounding up to the nearest decimal.
- Tighten the screws (7) to 195 Nm of torque after applying Loctite 270.



1= Apply Loctite 243
7= Apply Loctite 270.

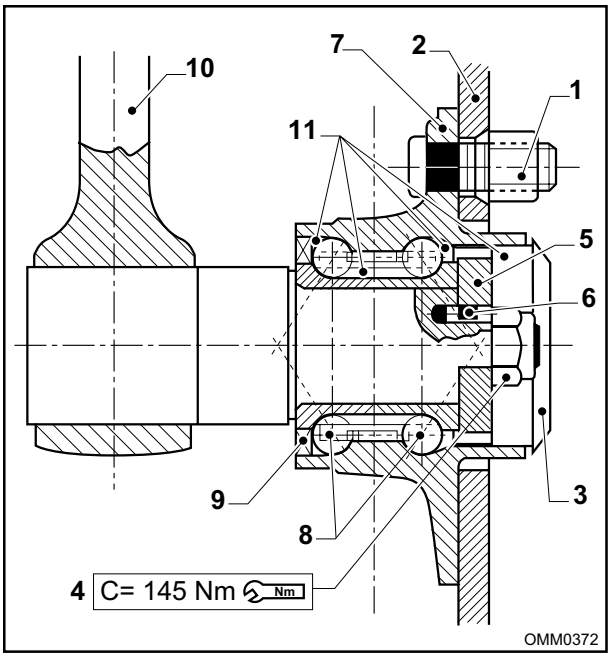
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DISASSEMBLING THE WHEEL HUB

- Unscrew the wheel nuts (1) and remove the rim (2).
- Remove the hub cap (3).
- Unscrew the safety nut (4).
- Remove the shim (5) with the clamping pin (6).
- Remove the wheel hub (7).
- Remove the double bearing (8).
- Remove the shaft sealing ring (9).

REASSEMBLING THE WHEEL HUB

- Reassemble the wheel hub by following the operations described above in reverse.
- Fill the cavity (11) with lithium grease (MR2).
- Clean the nut (4) and the threaded pin by wiping away all traces of grease and tighten to 145 Nm of torque.
- Fill the shaft sealing ring with lithium grease and mount it correctly, making sure that the lip faces the taper roller bearing.



1= Wheel nut
2= Rim
3= Hub cap
4= Nut
5= Shim
6= Clamping pin
7= Wheel hub
8= Bearing
9= Shaft sealing ring
10= Axle body
11= Greasing cavity

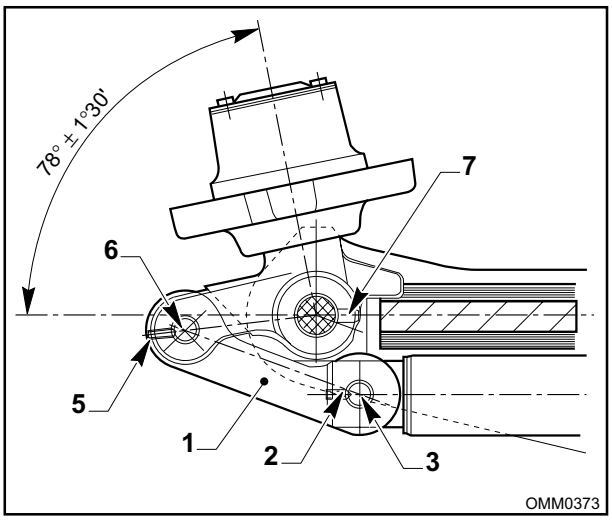
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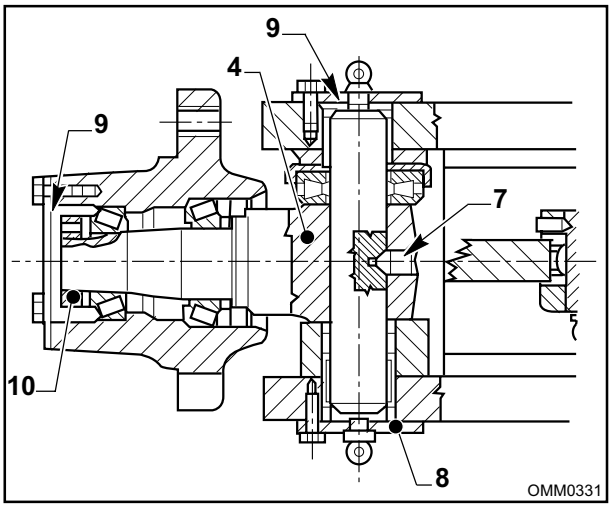
30.25 - 4-WHEEL REAR AXLE

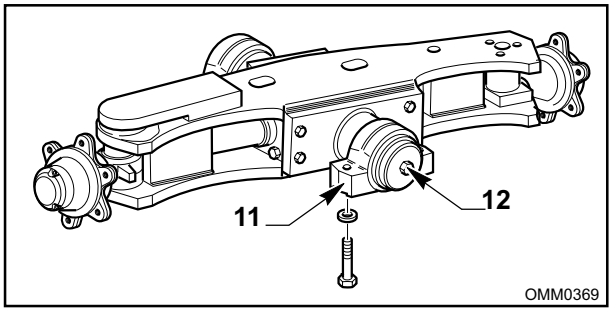
DISASSEMBLING THE 4-WHEEL REAR AXLE

- Remove the two steering cylinder delivery connectors.
- Disconnect the cylinder from the connecting rods (1), loosening the grub screws (2) and removing the pins (3).
- Loosen and remove the steering cylinder fastening screws and remove the steering cylinder from the axle.
- Disassemble the cylinder by loosening and removing the two closure head nuts and removing the closure heads.
- Remove the rod together with the piston.
- Disconnect the connecting rod from the spindle (4) by loosening the grub screw (5) and removing the pin (6).
- Disconnect the spindle from the axle by loosening the stop screw (7).
- Remove the lower cap (8) and upper cap (9) from the spindle pin and remove it.
- Disassemble the wheel hub from the stub axle by removing the cap (9), loosening the slotted nut (10) and removing the hub from the pin.
- Disassemble the two axle supports (11) by removing the fastening screws (12).

See the diagram on page 82/1.







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REASSEMBLING THE 4-WHEEL REAR AXLE

Reassemble the axle by performing the operations described above in reverse, being careful to adjust the wheel hub bearings as described in paragraph 30.26 and following the mounting instructions and torque specifications described below.

See the overall diagram on page 82/1.

1**)** Grease with MR.2 type Fiat grease.
Attention: too much grease may cause the gasket to flip over when mounting the hub.

2) The bearing MUST be assembled as shown in the diagram with the upper disc of the fifth wheel free to turn in its seat.

3) Tightening torque (Nm ~120$^{+5\%}_{-15\%}$); tighten in increments in a crisscross sequence.

4) Tightening torque: Kgm 17$^{+5\%}_{-15\%}$ (Nm 170$^{+5\%}_{-15\%}$).

5) Grease the round surfaces with Fiat MRM2 grease (Molikote).

6) Fill with MR2 type Fiat grease.

7) The specified tightening torque values apply to the screws and female threads without the addition of lubricants

8) Position the reference notch as shown so that the self-locking screw can be mounted correctly.

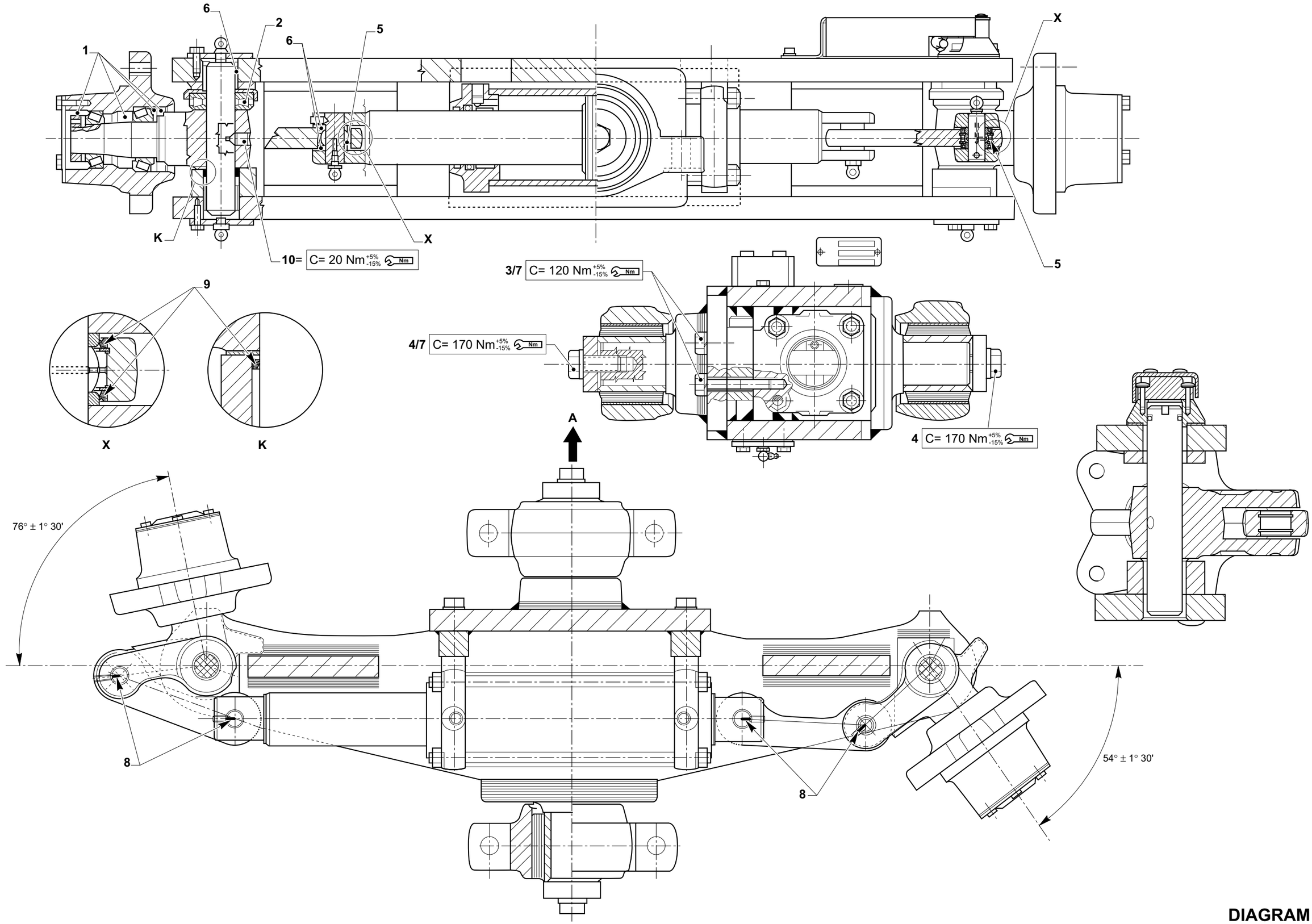
9) Mount the gaskets as shown in the diagram.

10) Tightening torque (Nm 20$^{+5\%}_{-15\%}$).

A) Forward direction.

Clearance of wheel bearings: 0.06 ÷ 0.1 mm.

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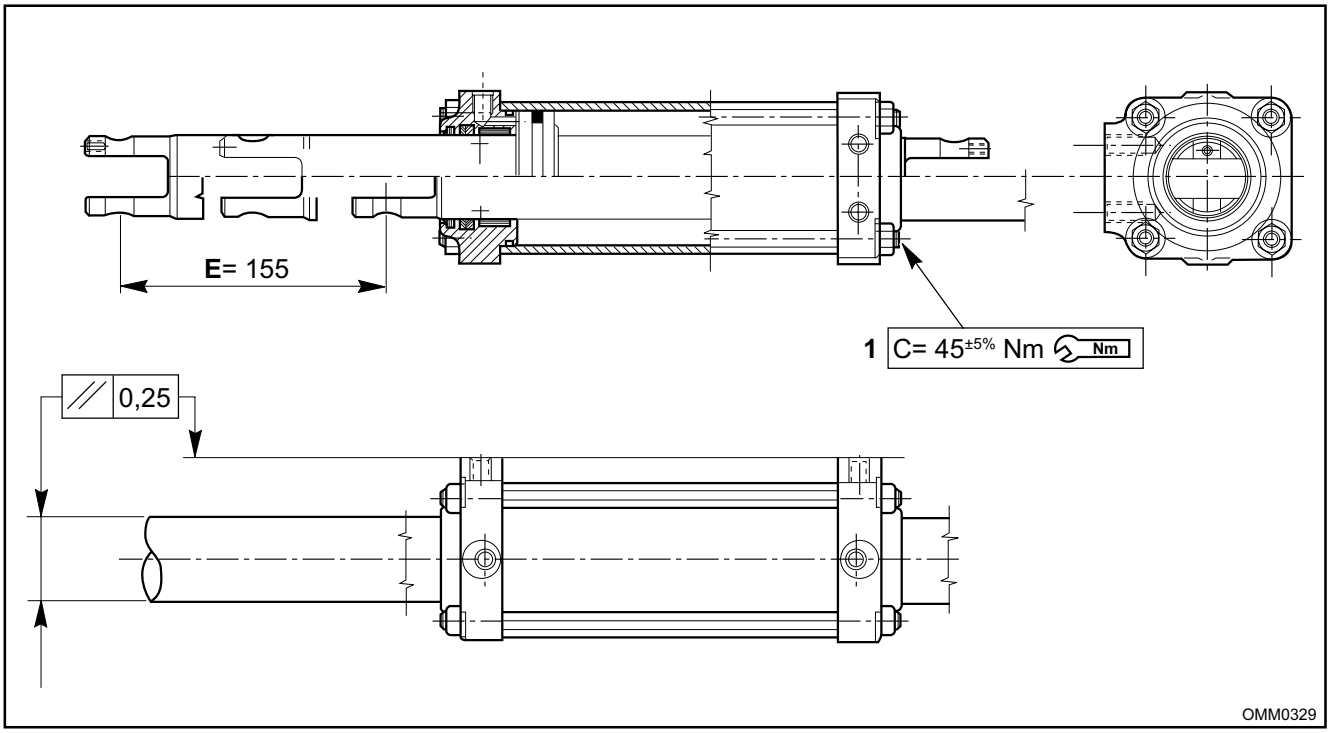
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REAR AXLE CYLINDER

Pressures:

- by-pass: 90 bars.

1) Tightening torque: Nm $45^{\pm 5\%}$. Tighten in increments in a crisscross sequence so that the two heads remain parallel. After performing this operation, make sure that the parallelism of the support surface and the piston rod is within the specified limits.

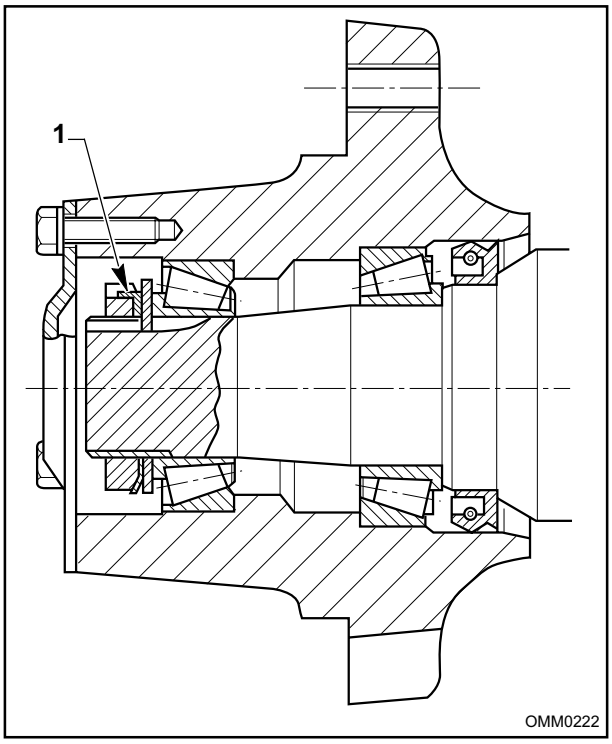


E= Stroke 155

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30.26 - REAR WHEEL BEARINGS

- Fill each bearing cavity with Fiat TUTELA MR2 grease. Place the outer bearing rings in their seats.
- Mount the bearings, hub, the tooth lock washer, and toothed washer, then tighten the slotted nut
- Rotate and tap the hub so that the taper roller bearings settle in the ball races. Tighten the slotted nut to 30 Nm of torque.
- Loosen the slotted nut and tighten it to 10 Nm of torque.
- Loosen the slotted nut to obtain an axial clearance on the bearings of 0.060.1 mm, measured with a gauge and equal to approximately 1/18 of a turn.
- After adjusting the bearings, secure the slotted nut by bending one of the lock washer lobes into one of the grooves in the slotted nut (1).
- If this is not possible, continue to screw the slotted nut until it is in the required mounting position.



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30.27 - RIMS, WHEELS, AND TIRES

- WARNING -

REPLACING THE TIRES

In order to obtain full benefit from and maintain the strength and safety features of the tires mounted on the forklift trucks, check them periodically to ensure that the operating tire inflation pressure (for pneumatic tires) is in compliance with the values specified in the User Manual, and also check the size of the tread.
Hydroplaning is not normally an issue with pneumatic and other types of tire because of their particular working conditions, in view of the loads they are subjected to and the speed at which they travel.
It is recommended, however, that the tires or full treads be replaced if they show signs of damage due to bumping or to provide greater safety if the tread has worn below the minimum thickness of 1.6 mm, which is the same legal amount required by highway regulations.
The tread of superelastic tires must NEVER be allowed to wear beyond the wear indicator marked on the side of the tread, bearing either the wording **60J** (Joule) or **SAFETY LINE** (depending upon the supplier).

RIMS AND WHEELS

SAFETY INSTRUCTIONS FOR RIMS AND WHEELS

DANGER

Wheels and rims are vital components that contribute to the overall safety of the vehicle and as such, they must be used correctly, inspected periodically, and maintained regularly. The following basic safety rules should be observed when removing or installing tires to prevent mistakes or careless accidents.

- Never use or repair damaged or buckled wheels;
- Never under any circumstances weld rims in order to repair them;
- Replace faulty components with parts of the same type, profile, and size as the previous ones;
- Clean and protect all connection surfaces from rust.

DANGER

Before removing a wheel from the vehicle, check the tire sidewalls and rims for damage, and always completely deflate the tire.

There are safety mechanisms in place on split wheel rims to prevent the accidental removal of the union nuts while the wheel is still mounted to the hub.
For dual assembly, loosen the fastening nuts for a few turns and, with the wheels off the ground, check that they are «free» from any interference that might damage the tire.
Before proceeding with any operation, remove the valve core to ensure that the tire is completely deflated (if this has not already been done).

TIRE INSTALLATION PRECAUTIONS

When installing tires, make sure that all the parts are intact and meet regulations. For rims with removable rings, **make sure that the rings are mounted onto the same rim from which they were removed,** inflate the tire slightly (approximately 0.3-0.5 bars), and with the rim lying flat, make sure that the rings are concentric and properly seated.
Use a strong safety cage or restraining device to inflate the tire to the recommended pressure - which must not be exceeded - to protect against the rare but not impossible mishaps.
It is also recommended that a cage be used when disassembling split rim wheels to provide a further measure of protection.
Wheels must be inspected systematically and thoroughly, particularly if the working conditions are demanding or abnormal, in which case it is always time well spent. The built-in reliability and safety features of the tires may be seriously jeopardized if they are corroded or worn, buckled from bumping, improperly used, or because the operator failed to observe the safety rules.

DANGER

For your safety, always use the same type of wheels or fasteners as the original parts.
Do not lubricate screws or wheel nuts to facilitate removal or installation of wheels.
After each installation, check the wheel nuts every 10 hours until the tires are broken in, then check every 100 hours.
It is recommended that the same type of wheels and rims from the same manufacturer be mounted onto the same axle.

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REMOVING THE WHEELS

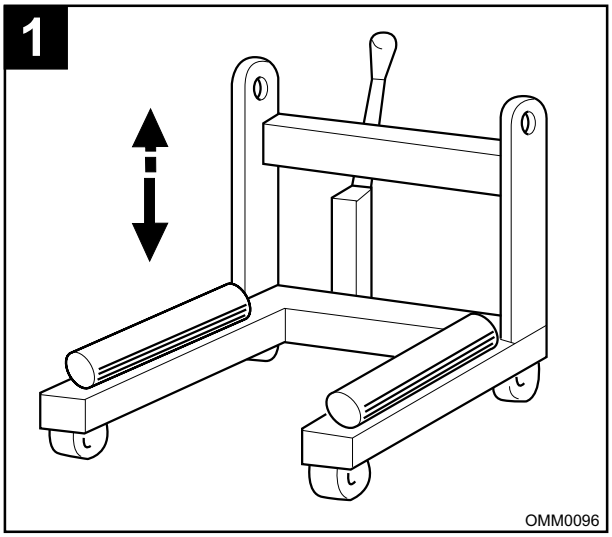
- Place the truck on a flat surface and apply the parking brake;
- Place wooden blocks under the wheels remaining on the ground;
- Keep the wheel to be replaced still on the ground and partially loosen the screws or lock nuts;
- Lift the truck until the wheel is sufficiently off the ground, and place the truck on solid, stable supports (trestles, wooden blocks, etc.).

DANGER

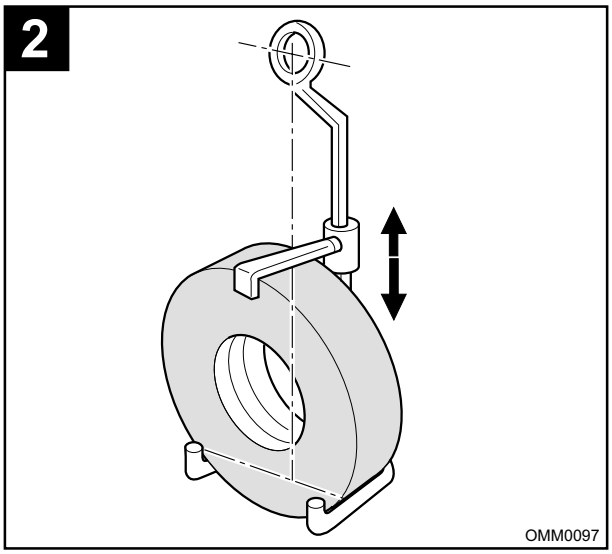
Handle all parts very carefully. Do not place your hands or fingers between parts. Wear approved, protective clothing such as safety glasses, gloves, and shoes.
Make sure that the tire is completely deflated.

- Completely loosen and remove the fastening screws or lock nuts from the wheel and remove the wheel from the hub.
- Use a wheel removal dolly for very large wheels (see figure 1) or a tool as shown in figure 2, in conjunction with a crane or hoist.

1



2



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REINSTALLING THE WHEELS

DANGER

Handle all parts very carefully. Do not place your hands or fingers between parts. Wear approved, protective clothing such as safety glasses, gloves, and shoes.

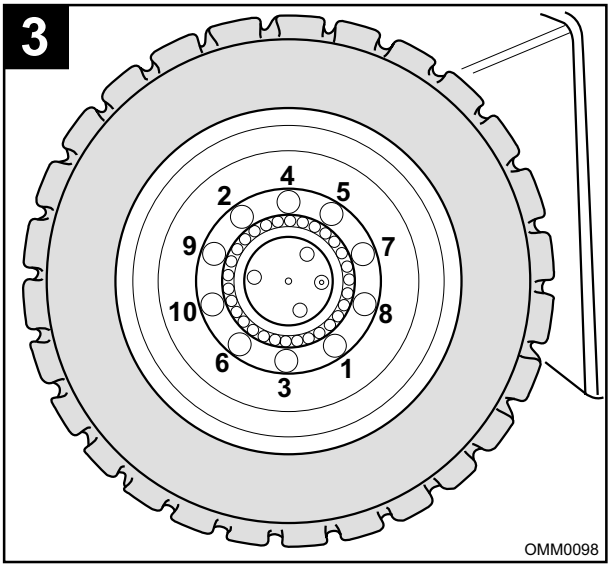
- It is recommended that the same type of wheels and rims from the same manufacturer be mounted onto the same axle;
- Use appropriate means such as a wheel removal dolly or tool to lift and move the wheel (not necessary for small wheels) and place it on the hub;
- Position the wheel so that the air valve faces outward and is turned toward the cavity on the drum, if any;
- Tighten the fastening screws or lock nuts in three incremental phases in a crisscross sequence (as shown in figures 3/4);
- Lightly tighten the fastening screws or lock nuts until the wheel is well seated on the drum;
- Tighten the screws or nuts to approximately 50% of the specified torque;
- Lower the truck and tighten the fastening screws or lock nuts to the specified torque.

DANGER

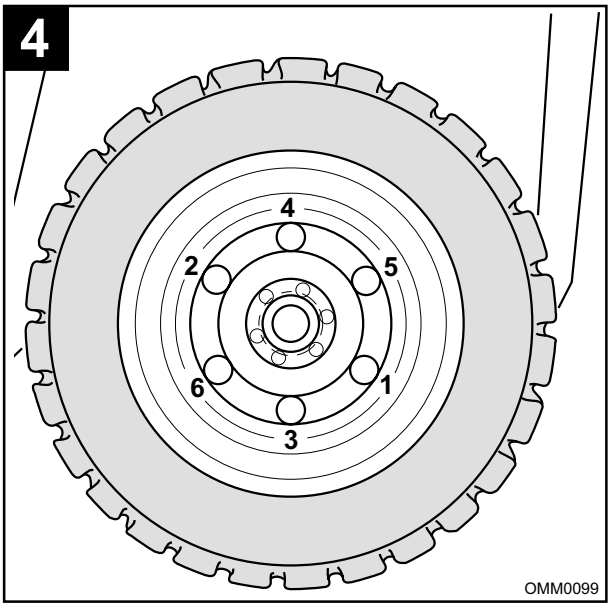
Stand to the side of the tire when adjusting the air pressure.

- Check and adjust the air pressure if necessary.

3



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REMOVING/REINSTALLING PNEUMATIC TIRES ON WHEEL RIMS WITH REMOVABLE RINGS

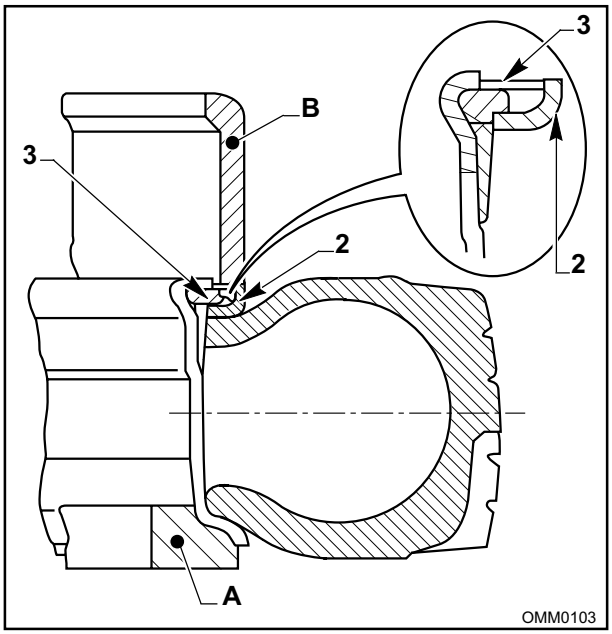
A mounting press must be used to perform this operation. Check that the components are intact and meet specifications.

REMOVING THE TIRES

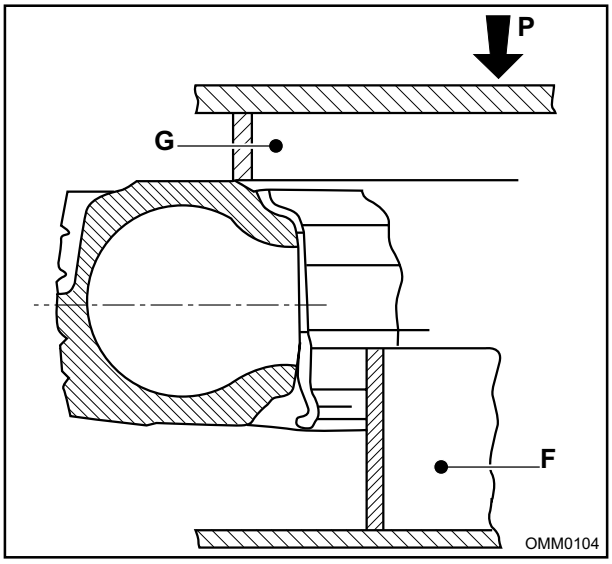
IMPORTANT:

When removing the tires, mark or identify the removable rings to ensure that they are mounted onto the same rim from which they were removed.

- Place the molded support ring (A) under the wheel and tire assembly;
- Using the mounting press and the molded ring (B), push the outer ring (2) down until it can be removed from the retaining ring (3).



- Place the rim on a support ring (F) and using a pressure ring (G) and the mounting press, remove the tire from the rim.



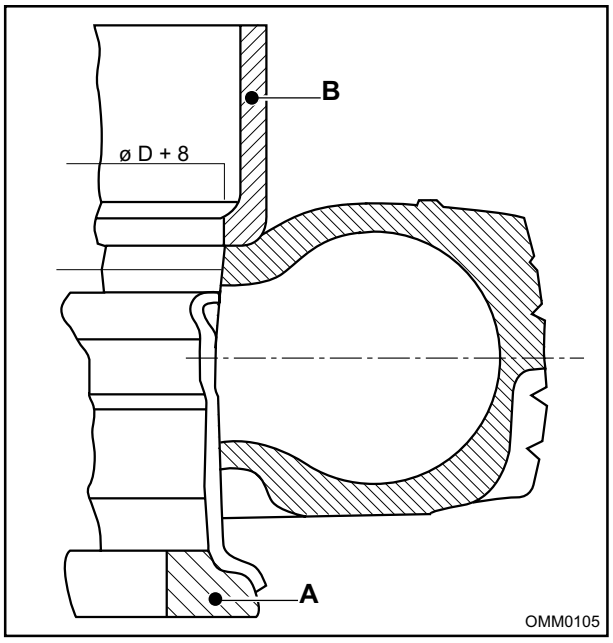
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REINSTALLING THE TIRES

IMPORTANT:

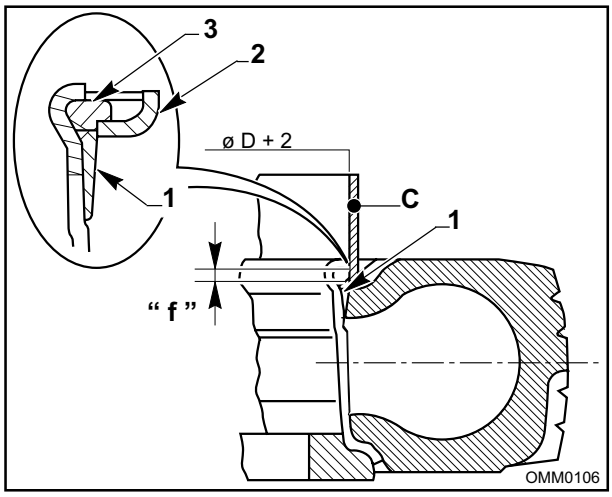
Make sure that the removable rings are mounted onto the same ring from which they were removed.
Wipe the groove of the rim and the bottom of the tire with a solution of soap and water (1:20) or special tire grease.
Never use lubricants for this operation.

- Fit the tire together with the inner tube onto the rim, positioning the air valve in the opening on the rim;
- Press the tire bead down.



Do not turn the ring (1) upside down.

- Place the shoulder ring (1) around the bead of the rim and press it with the molded ring (C) to create the space («f») that will accommodate the outer ring and the retaining ring.

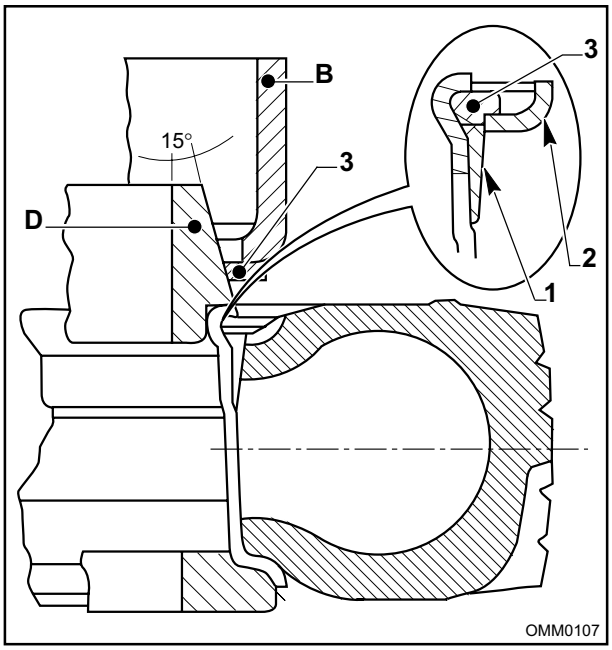


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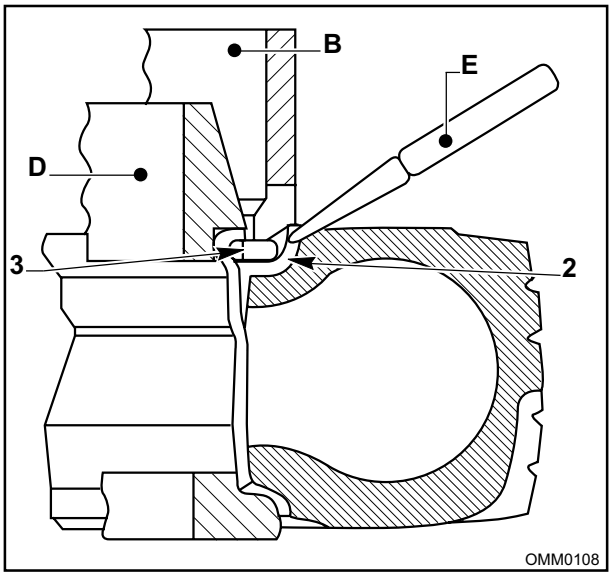
- Position the outer ring (2).
- Apply a tapered molded ring (D) and place the retaining ring (3) on it.
- Push the retaining ring (3) with the molded ring (B).

IMPORTANT:

The shoulder rings (1) and the outer ring (2) are in one piece on some types of rim.



- With a hammer and tire irons (E) insert the retaining ring (3) in the groove of the rim to secure the outer ring (2).



- Inflate the tire slightly (approximately 0.3÷0.5 bars), then with the rim lying flat check that the rings are concentric and well seated.

DANGER

Stand to the side when adjusting the pressure of the tire.

- With the wheel completely assembled, inflate the tire in a strong cage in accordance with safety standards;
- Do not exceed the maximum specified pressure.

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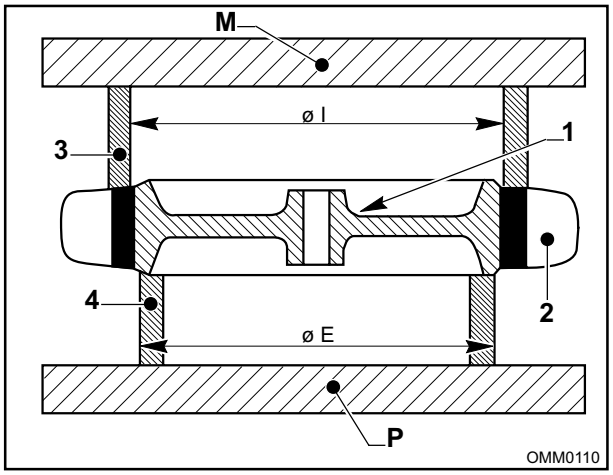
REMOVING AND REINSTALLING CUSHION TIRES ON WHEEL RIMS

A mounting press must be used for this operation.

- Check that the outside circumference of the rim and the inside circumference of the metal ring of the tire are equipped with a lead-in bevel.
- Remove any traces of rust from the connection surfaces and grease them.

REMOVING THE TIRES

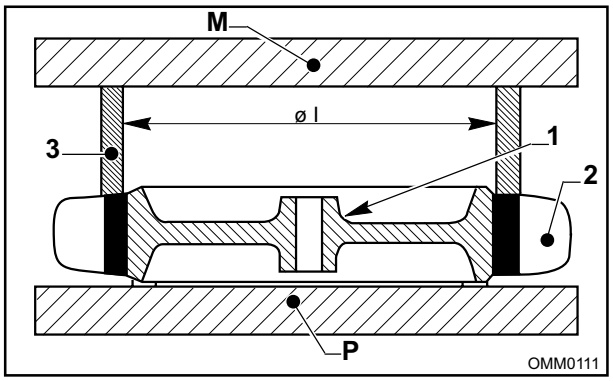
- Place the ring (4) on surface (P).
- Center the wheel (1) complete with tire (2) on the ring (4) and keeping it centered, place the ring (3) (or a new tire) on the tire (2) to be disassembled.
- Operate the movable plate (M) very carefully until the old tire comes out (or until the new tire is completely seated).



øI = outer rim ø +2 mm
øE = outer rim ø –2 mm

REINSTALLING THE TIRES

- Place the rim (1) on surface (P) and carefully center the tire (2) on the circumference.
- Very carefully position the ring (3) so that it cannot slip.
- Bring the tire to room temperature in winter or freezing weather.
- NEVER heat the metal ring.
- Operate the movable plate (M) very carefully to fit the tire onto the rim.



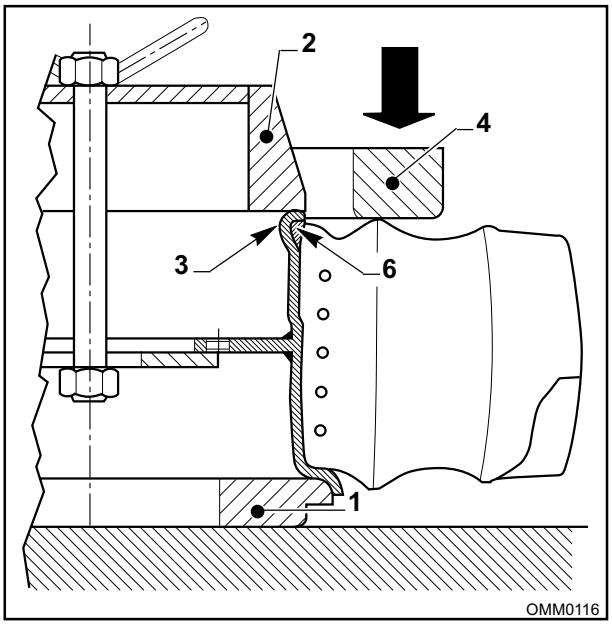
øI = outer rim ø +2 mm

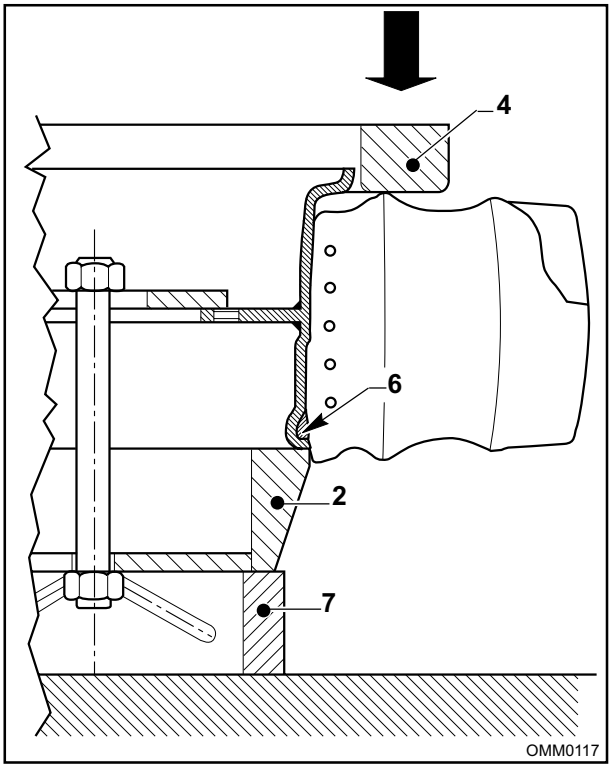
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REMOVING/REINSTALLING QUICK TIRES

REMOVING THE TIRES

- Place the base that protects the removable rim flange (1) onto the mounting press and place the tire on the base (1). Center and lock the mount cone (2) onto the rim hook (3).
- Position the thrust ring (4) and push it until the Teflon ring (6) is seated in the rim (outer hook). Once the Teflon ring is seated, grease it liberally before releasing it, then release the thrust ring (4).
- Place the shim tube (7) on the mounting press, turn the mount cone/rim/tire assembly over and place it on the shim tube, then push it with the thrust ring (4) until the tire comes away from the rim.
  Remove the Teflon ring (6) from the rim.





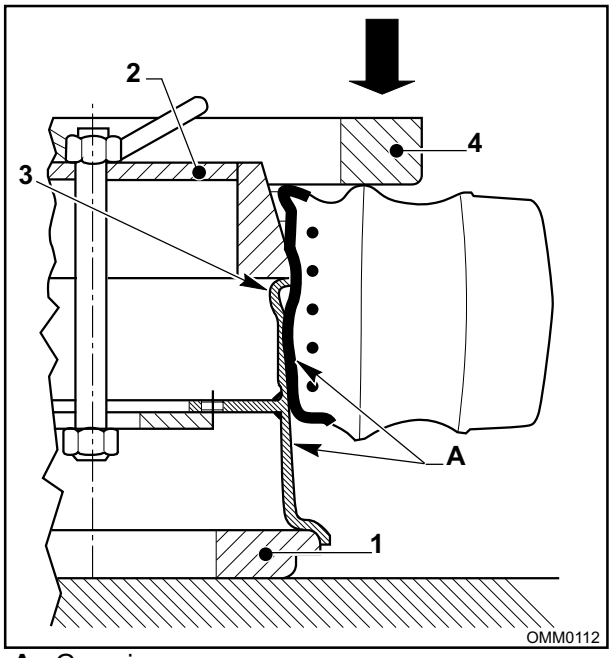
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REINSTALLING THE TIRES

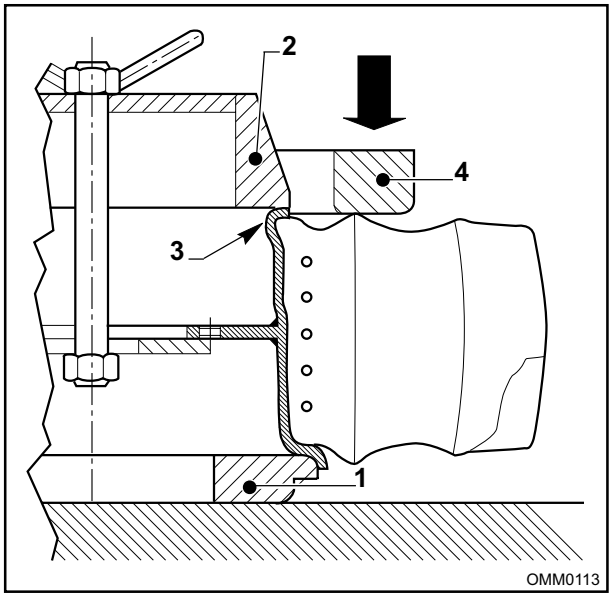
IMPORTANT:

A mounting press and rings must be used to perform this operation.
Before starting this operation, grease the entire inner surface of the tire bead and the outer Quick edge using special tire mounting grease.
Grease the entire surface of the rim that comes into contact with the tire, especially the outer hook area and the last section of the mount cone.

- Place the base that protects the removable rim flange (1) onto the mounting press and place the rim to be mounted on the base (1).
- Place the mount cone (2) on the rim hook (3) and center it if necessary.
- Place the tire to be mounted on the mount cone, position the thrust ring (4) and push it until the tire is completely seated around the circumference of the rim and then release it.

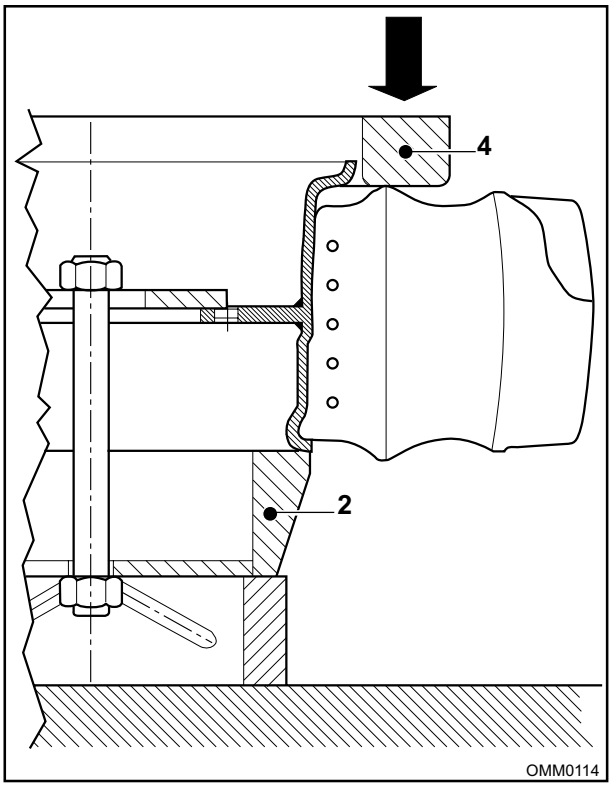


A= Greasing

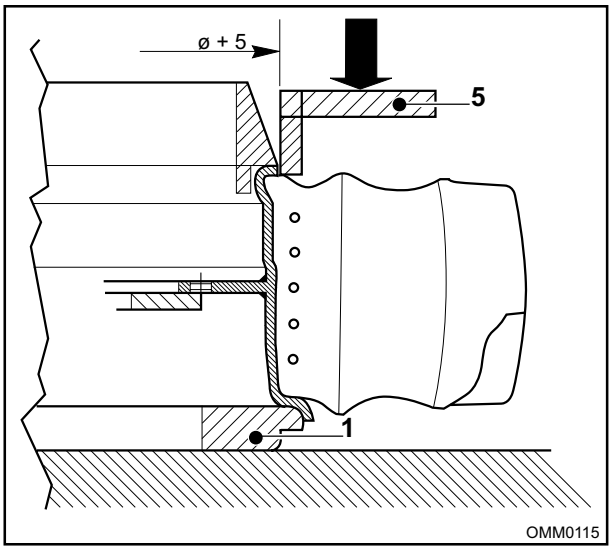


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- If the tire has been pushed too much, determine whether to push the tire/rim assembly in the opposite direction with the same equipment in order to return the Quick tire to its normal position on the rim.



- If the tire has not been properly inserted around the circumference, press it around the edge with the shim tube (5) until it is completely inserted.

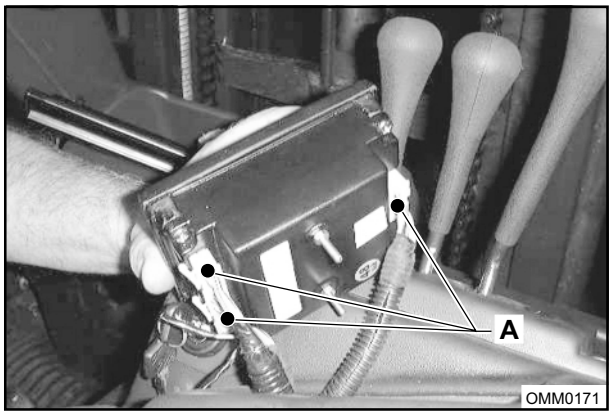


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30.28 - DISPLAY MODULE

REMOVING THE DISPLAY MODULE

Turn the ignition key OFF.
Unplug the battery.
Open the hood.
Release the fastening clamps on the DISPLAY Module.
Lift it and remove it from its housing.
Disconnect the connectors.



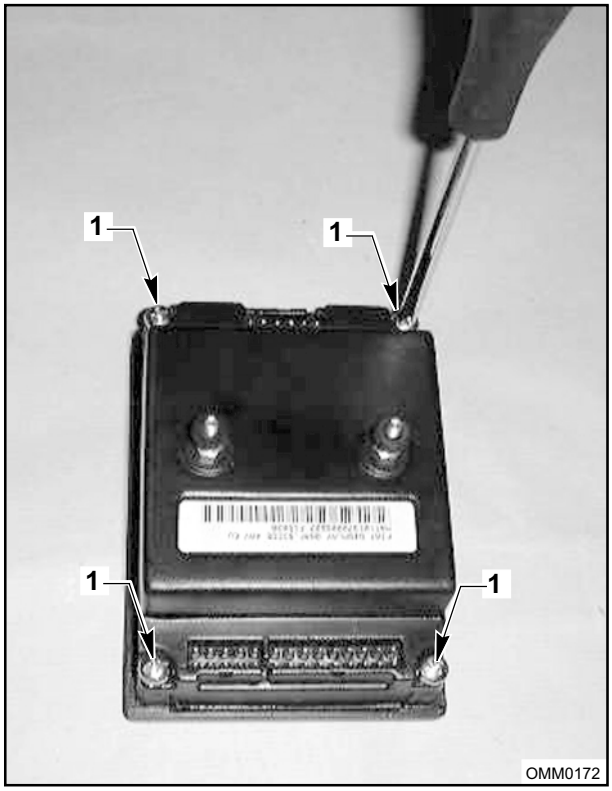
A = Connectors

REINSTALLING THE DISPLAY MODULE

Reinstall the DISPLAY Module by performing the operations described above in reverse.

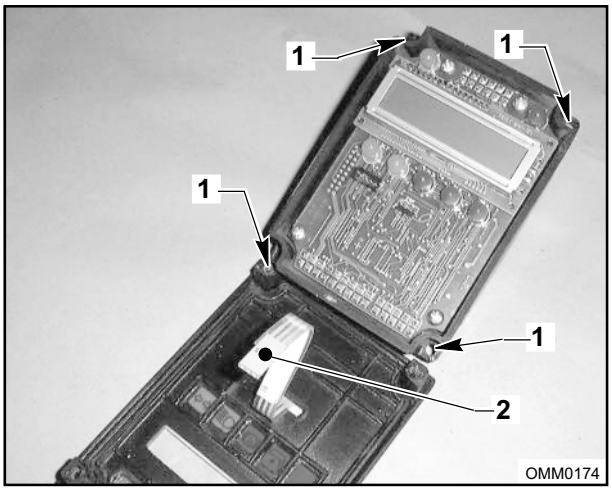
DISASSEMBLING THE DISPLAY MODULE

After removing the DISPLAY Module, place it on a workbench and turn it upside down.
Loosen and remove the four screws (1) as shown in the figure.

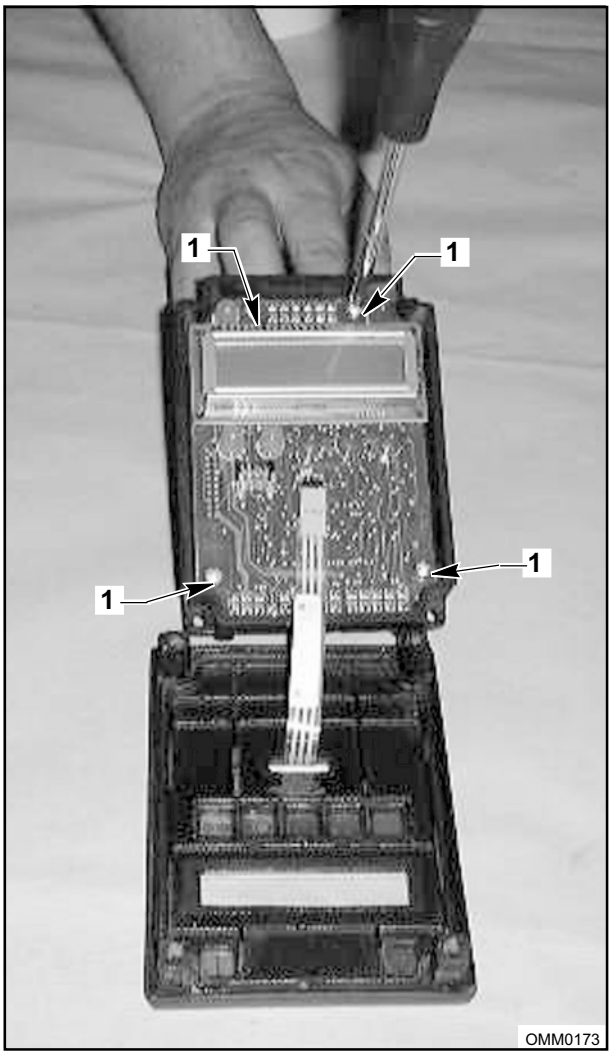


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The DISPLAY Module will open but remain connected by means of a flat wire (2) with 3 connectors. Disconnect the flat wire (2).



Loosen and remove the four screws (1) as shown in the figure.

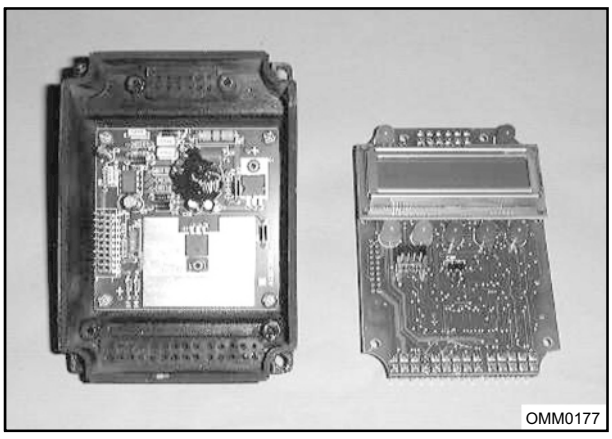


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Turn the DISPLAY Module over and carefully press each connector so as not to damage them and remove the circuit board located inside.

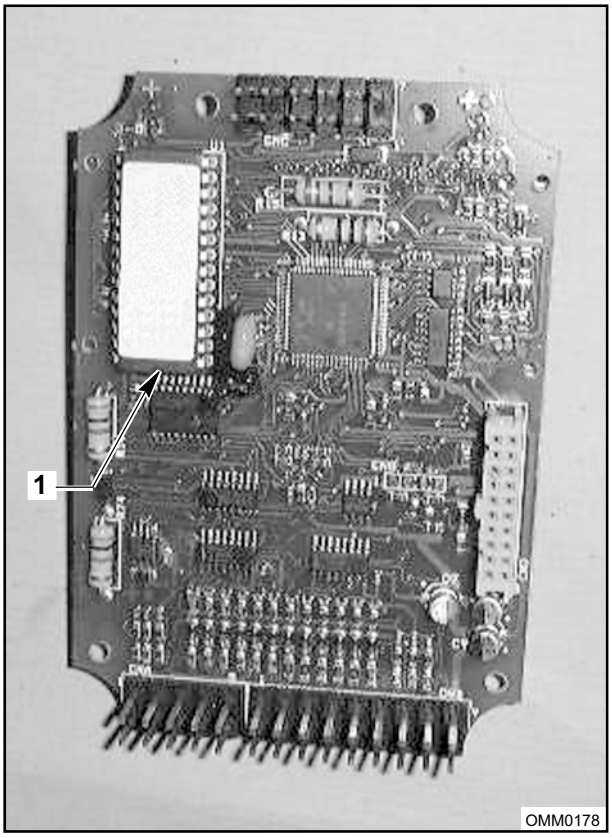

OMM0175


OMM0176


OMM0177

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The Eprom can now be accessed if it needs to be replaced
If necessary, replace the Eprom very carefully so as not to jeopardize the functioning of the Module.
Be aware of the Eprom correct position, usually indicated by a «notch» located either on the Eprom or on the base of the Eprom-holder (1).



REASSEMBLING THE DISPLAY MODULE

Reassemble the Eprom by performing the operations described above in reverse, being careful to replace the seals that were removed from the connectors when disassembling the DISPLAY Module in exactly the same position...

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Chapter 31

MASTS

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31.1 - TECHNICAL SERVICING DATA

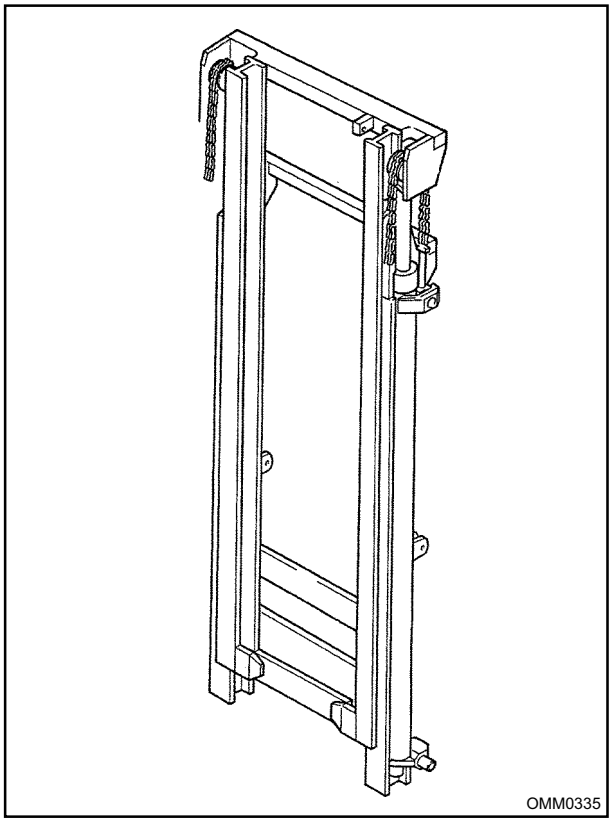
Mast support screws	tightening torque = 280 Nm
Roller screws	tightening torque = 60 Nm ± 6 Nm
Lift chains	max. lengthening 2% in accordance with safety standards
Lowering speed	max. permissible speed 0.55 / 0.50 m/sec.

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31.2 - MAST TYPES

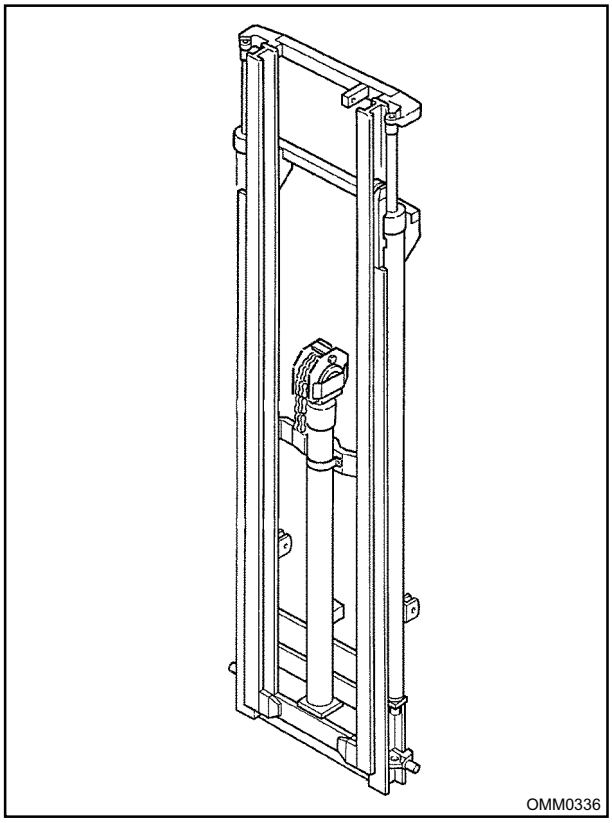
SIMPLEX MAST

When lifting, the overall mast is always higher than the raised load.
The Simplex mast consists of two lift cylinders and two mast sections (fixed and movable).



DUPLEX MAST

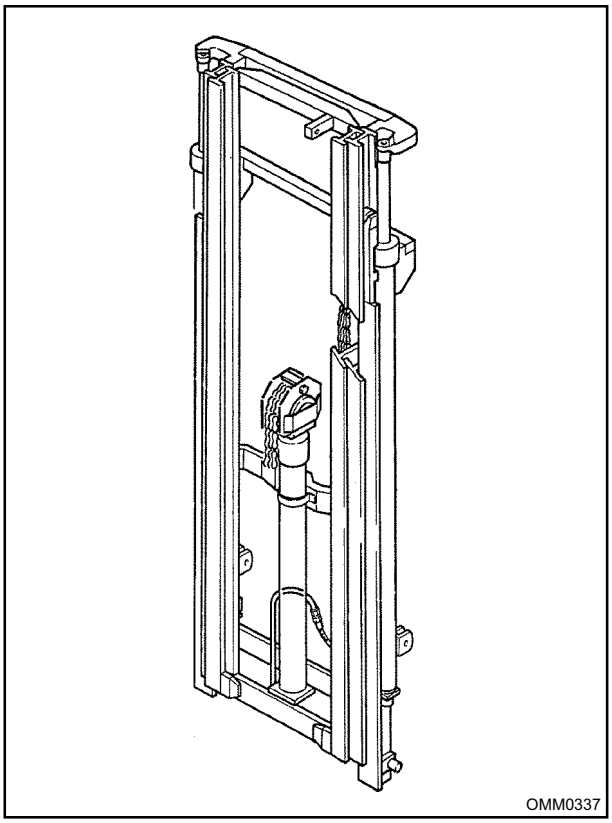
The Duplex mast consists of three lift cylinders (two side cylinders and one middle cylinder), and two mast sections (fixed and movable).
When lifting, the movable mast section is never higher than the raised load.



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TRIPLEX MAST

The Triplex mast consists of three lift cylinders (two side cylinders and one middle cylinder) and three mast sections (fixed, middle and movable).
Similar to the Duplex mast, the movable mast section is never higher than the raised load when lifting.



All the mast types provide a high degree of visibility. The mast section profile is a double «T». The fork carriage assembly and the mast profiles ride on support rollers, which also absorb transversal forces.

See chapter 30, paragraph 30.1 for instructions on how to remove and reinstall the mast.

IMPORTANT:

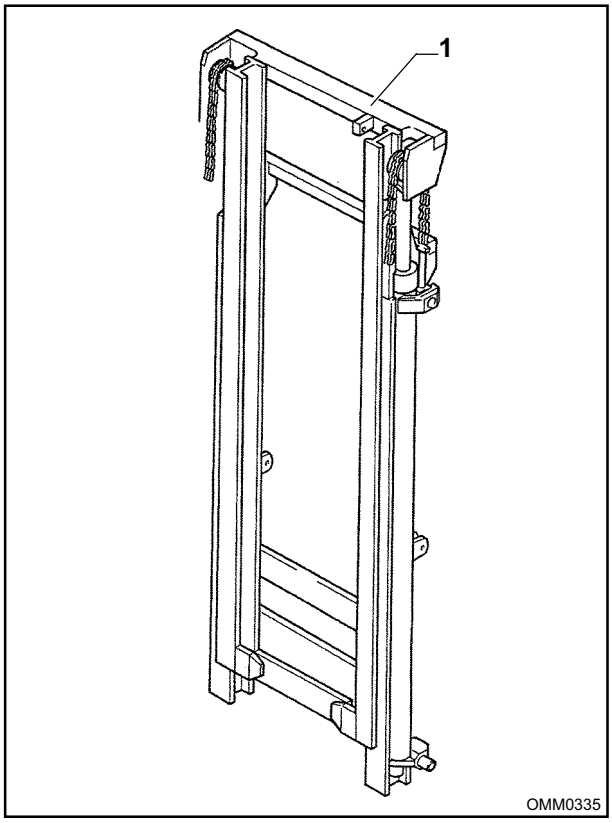
To reduce wear, grease the roller tracks as necessary with high pressure adhesive lubricants.

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31.3 - SIMPLEX MAST

FUNCTIONAL DESCRIPTION OF THE MAST

The two cylinders are located in the outer mast section profile and are supplied by a pipe branching from the lowering speed control valve.



The two pistons are connected at the top to the inner (or movable) mast section crossbar

Supplying the cylinders, the two pistons extend and lift the inner mast section.

The stroke limit stop is located inside the cylinder.

The lift chains are attached to the outer (fixed) mast section and pass around the inner mast by means of the chain rollers, while the other ends of the chains are connected to the fork carriage assembly.

The mast thus extends at a ratio of 1:2 with respect to the fork carriage assembly.

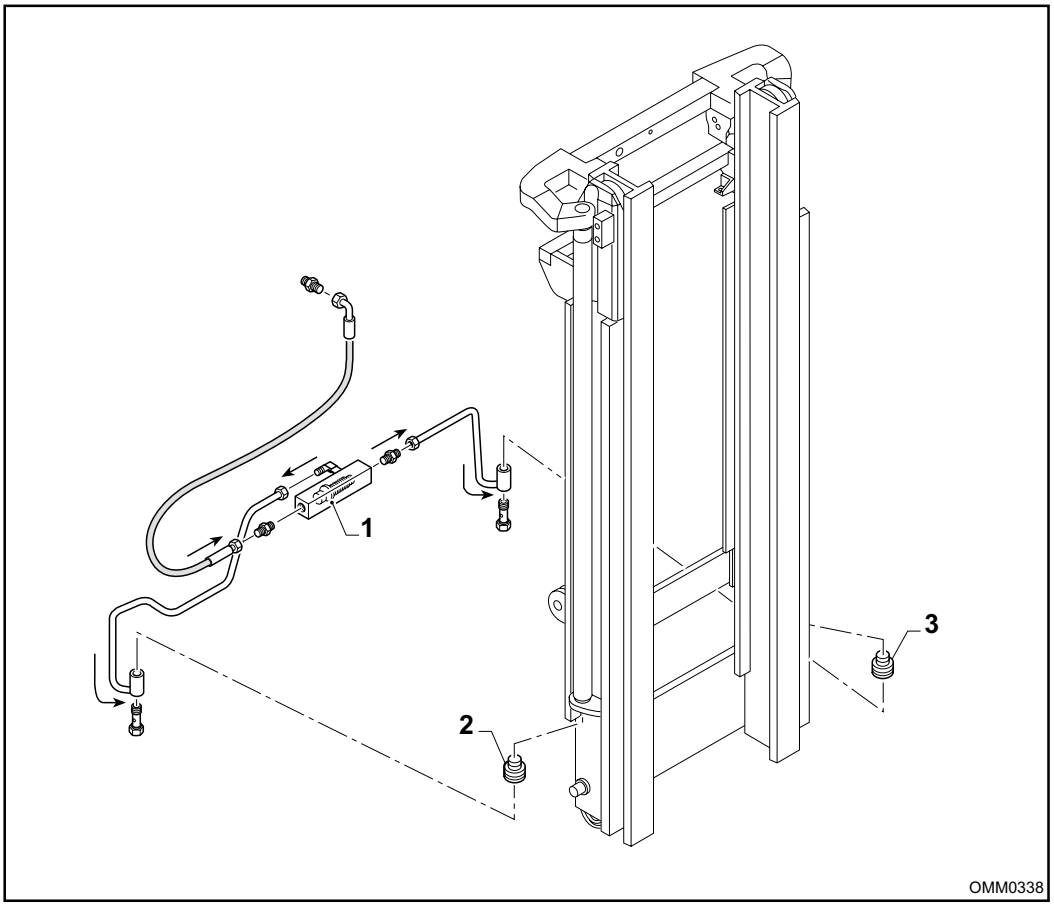
A load lowering brake (lowering speed control valve) incorporated into the rigid pipe limits the maximum lowering speed to 0.55 / 0.50 m/sec.

1= Slide lock mechanism

The slide lock mechanism prevents the fork carriage assembly from accidentally sliding out of the movable mast (see paragraph 31.7).

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HYDRAULIC SYSTEM OF THE SIMPLEX MAST CYLINDERS



1= Lowering speed control valve
2= Safety valve (located at all heights)
3= Safety valve (located only at heights 4.03 - 4.53 m).

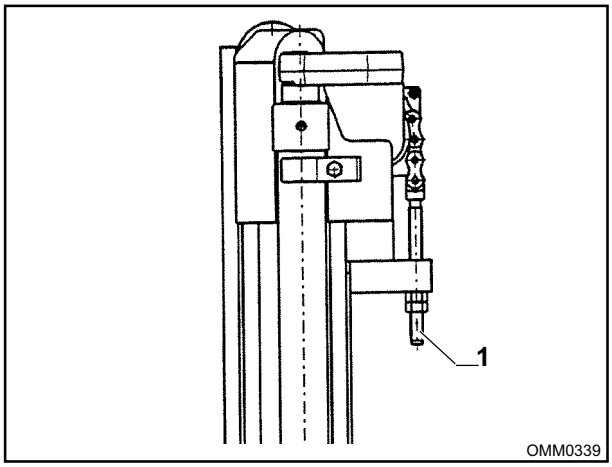
Oil entering through the lowering speed control valve (1) is delivered by the pipes to the two cylinders. If a pipe breaks, safety valves located inside the cylinders prevent the load from lowering too quickly and in an uncontrolled manner.

IMPORTANT:
It is not permitted to adjust or repair the valves. Replace any faulty or malfunctioning valves. Refer only to the Spare Parts Catalog from the supplier to determine the type of valve to use.

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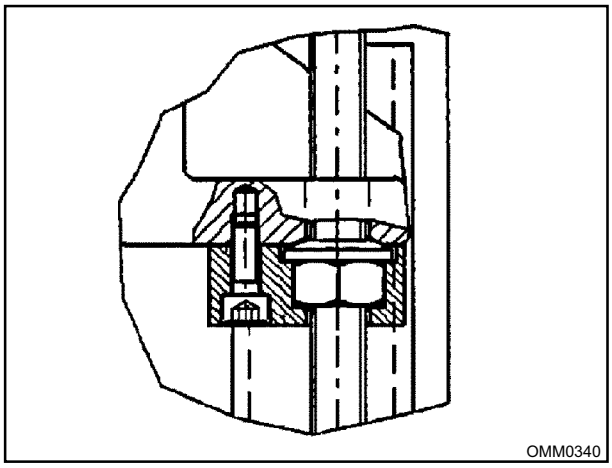
ADJUSTING THE LIFT CHAIN

The lift chains must be adjusted evenly by means of the tie rod linkages (1).



The center of the upper rollers of the fork carriage assembly (with four rollers) or, alternatively, the center of the middle rollers of the fork carriage assembly (with six rollers), must remain inside the inner mast section profile with a dimension at least greater than “X” (see diagram on page 10/1), with the lift cylinder piston rods completely extended (stroke limit stop inside the cylinder).

Never compensate for the wear of tires by adjusting the tension of the lift chains.



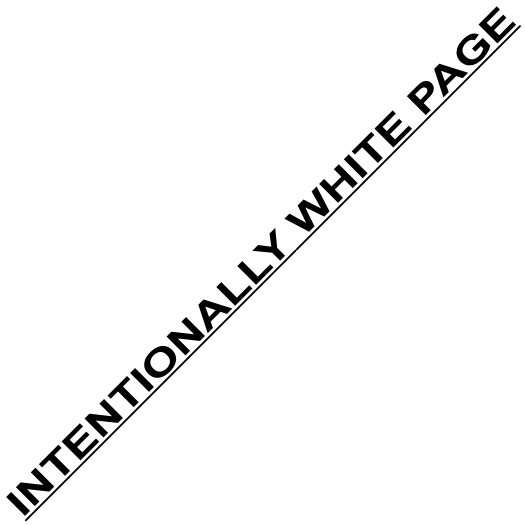
When adjusting the lift chains, they absolutely must be kept at a minimum distance of 2 mm from the fork carriage assembly slide lock mechanism (see paragraph 31.7).

See paragraph 31.6 for the lift chain stop mechanism shown in the diagram at side.

IMPORTANT:

The lift chains must be inspected for wear, damage, or lengthening in accordance with the safety instructions described in the Use and Maintenance manual.

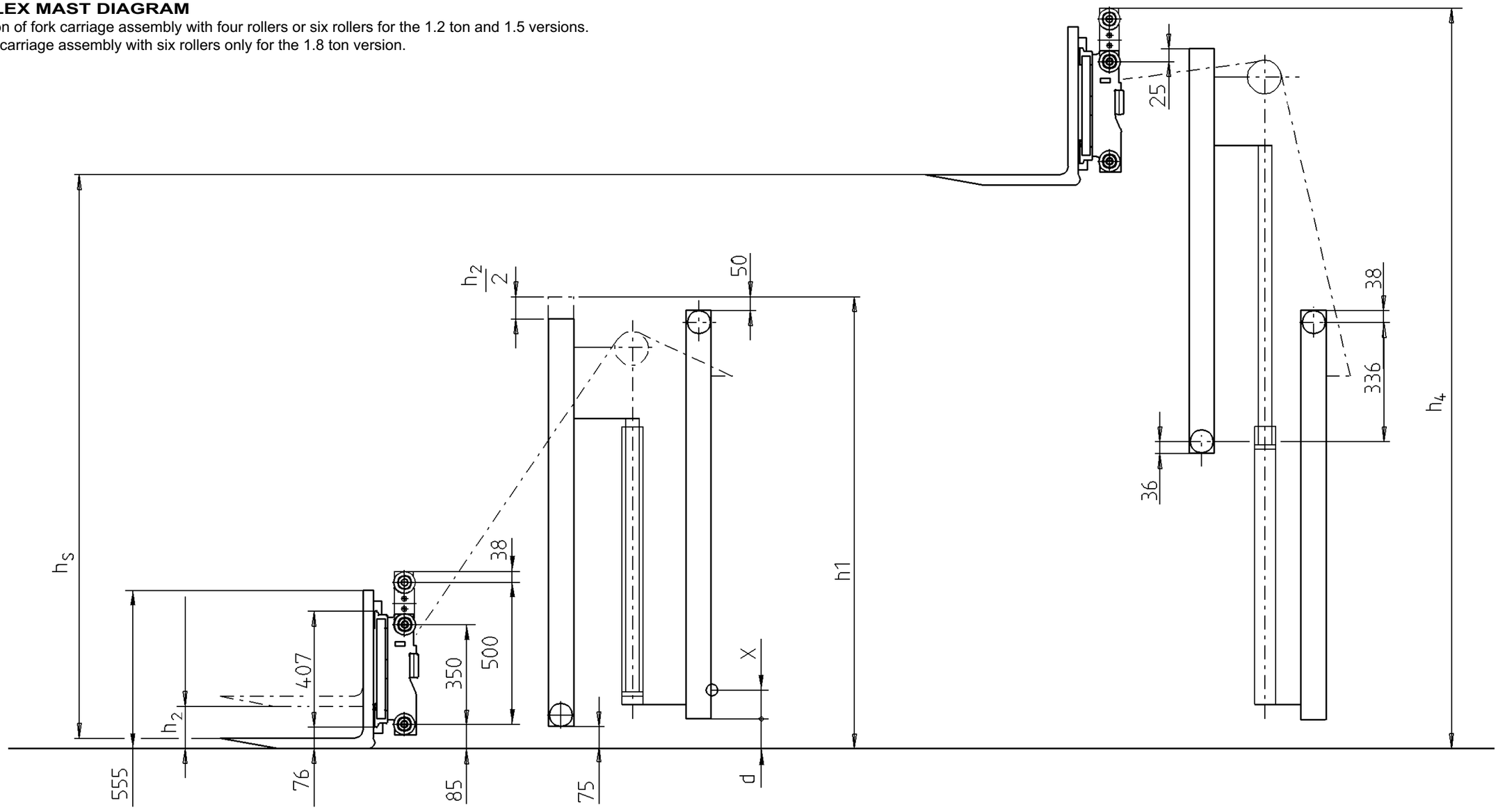
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SIMPLEX MAST DIAGRAM

- Option of fork carriage assembly with four rollers or six rollers for the 1.2 ton and 1.5 versions.
- Fork carriage assembly with six rollers only for the 1.8 ton version.



SIMPLEX 1,2t • 1,5t • 1,8t								
Nominal lift height		mm	3330	3630	4030	4530	5030
Overall external height	h1	mm	2210	2360	2560	2810	3060
Free lift	h2	mm	150	150	150	150	150
Ground clearance	d	mm	100	100	100	100	100
Mast support pin	x	mm	71	71	71	71	71
Pin diameter		mm	35	35	35	35	35

hs= fork carriage assembly travel
hs= 2 x overall external height - 1070

h4= maximum overall height (fork carriage assembly with four rollers)
h4= 2 x overall external height - 515

h4= maximum overall height (fork carriage assembly with six rollers)
h4= 2 x overall external height - 447

DIAGRAM 4

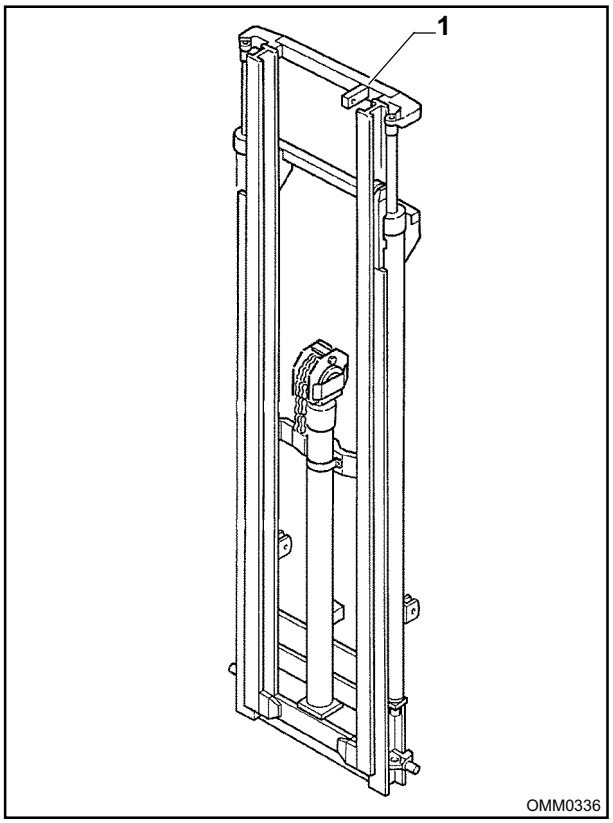
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31.4 - DUPLEX MAST

FUNCTIONAL DESCRIPTION OF THE MAST

The mast is equipped with three cylinders.



The middle cylinder provides high free lift due to the telescopic effect of the movable mast section.

The chain is attached to the movable mast section and passes around the middle cylinder by means of a chain roller, while the other end of the chain is attached to the fork carriage assembly.

The fork carriage assembly can thus be raised without extending beyond the overall height of the mast.

The two outer cylinders are located in the double “T” profile of the outer mast section (fixed).

The outer cylinder piston rods are connected to the inner mast section (movable).

When the cylinders fill with oil, the middle cylinder piston rod extends first because it has the greatest surface area.

The two outer cylinder piston rods then extend and lift the inner mast section.

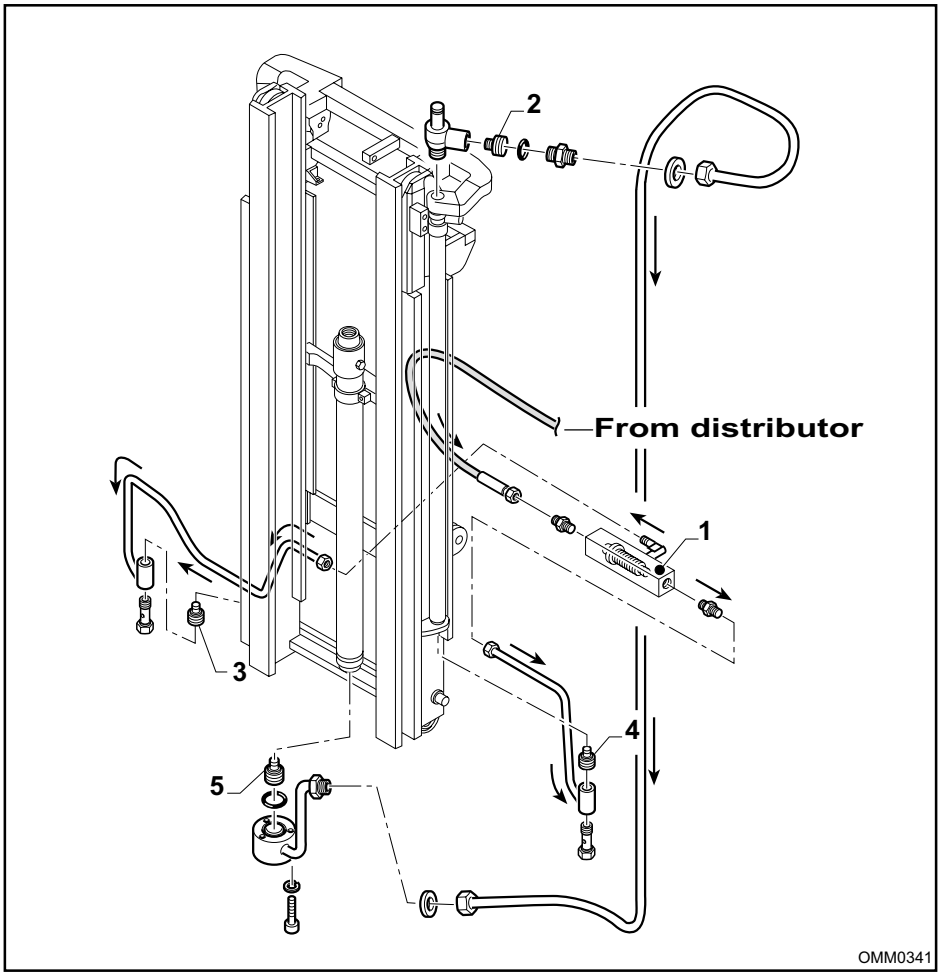
A lowering speed control valve limits the maximum lowering speed to 0.55 / 0.50 m/s.

1= Fork carriage assembly slide stop mechanism

The slide stop mechanism prevents the fork carriage assembly from accidentally sliding out of the movable mast section (see paragraph 31.7 for adjustment instructions).

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HYDRAULIC SYSTEM OF THE DUPLEX MAST CYLINDERS



The oil entering through the lowering speed control valve (1) is delivered by the side pipes to the outer cylinders. On the Duplex mast, the oil is delivered to the middle cylinder by means of the left outer cylinder and the vertical pipe.
The middle cylinder piston rod extends first due to the difference in the surface area of the piston rods.

Stroke 1= operates the fork carriage assembly only
Stroke 2= extends the inner mast section (movable).
(see diagrams 5 and 6).

The safety valves are located inside the cylinders and prevent the load from lowering too quickly or in an uncontrolled manner if the pipes break.

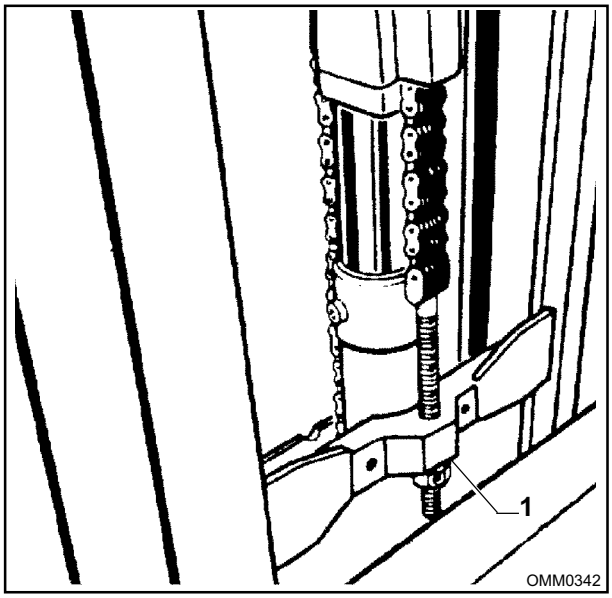
1= Lowering speed control valve
2= Safety valve
3= Safety valve
4= Safety valve
5= Safety valve

IMPORTANT:
It is not permitted to adjust or repair the valves. Replace any faulty or malfunctioning valves. Refer only to the Spare Parts Catalog from the supplier to determine the type of valve to use.

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ADJUSTING THE LIFT CHAINS

The lift chains must be adjusted evenly by means of the tie rod linkages (1).

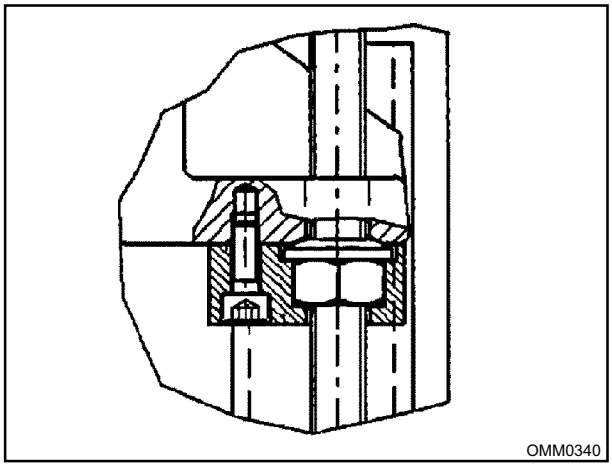


The center of the upper rollers of the fork carriage assembly (with four rollers) or, alternatively, the center of the middle rollers of the fork carriage assembly (with six rollers), must remain inside the inner mast section profile with a dimension at least greater than “X” (see diagram on page 14/1 and 14/2), with the middle lift cylinder piston rod completely extended (stroke limit stop inside the cylinder).

Never compensate for the wear of tires by adjusting the tension of the lift chains.

When adjusting the lift chains, they absolutely must be kept to a minimum distance of 2 mm from the fork carriage assembly slide lock mechanism (see paragraph 31.7).

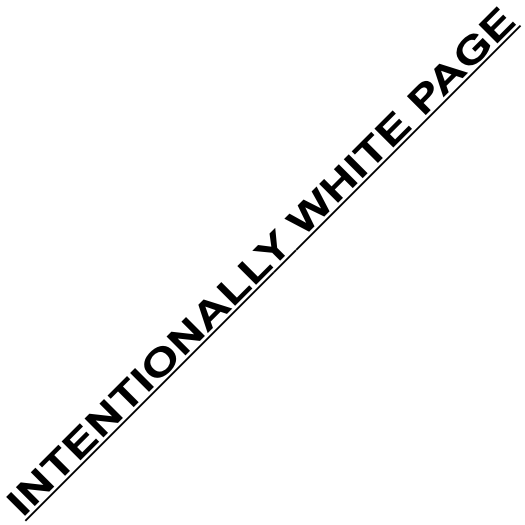
See paragraph 31.6 for the lift chain stop mechanism shown in the diagram at side.



IMPORTANT:

The lift chains must be inspected for wear, damage, or lengthening in accordance with the safety instructions described in the Use and Maintenance manual.

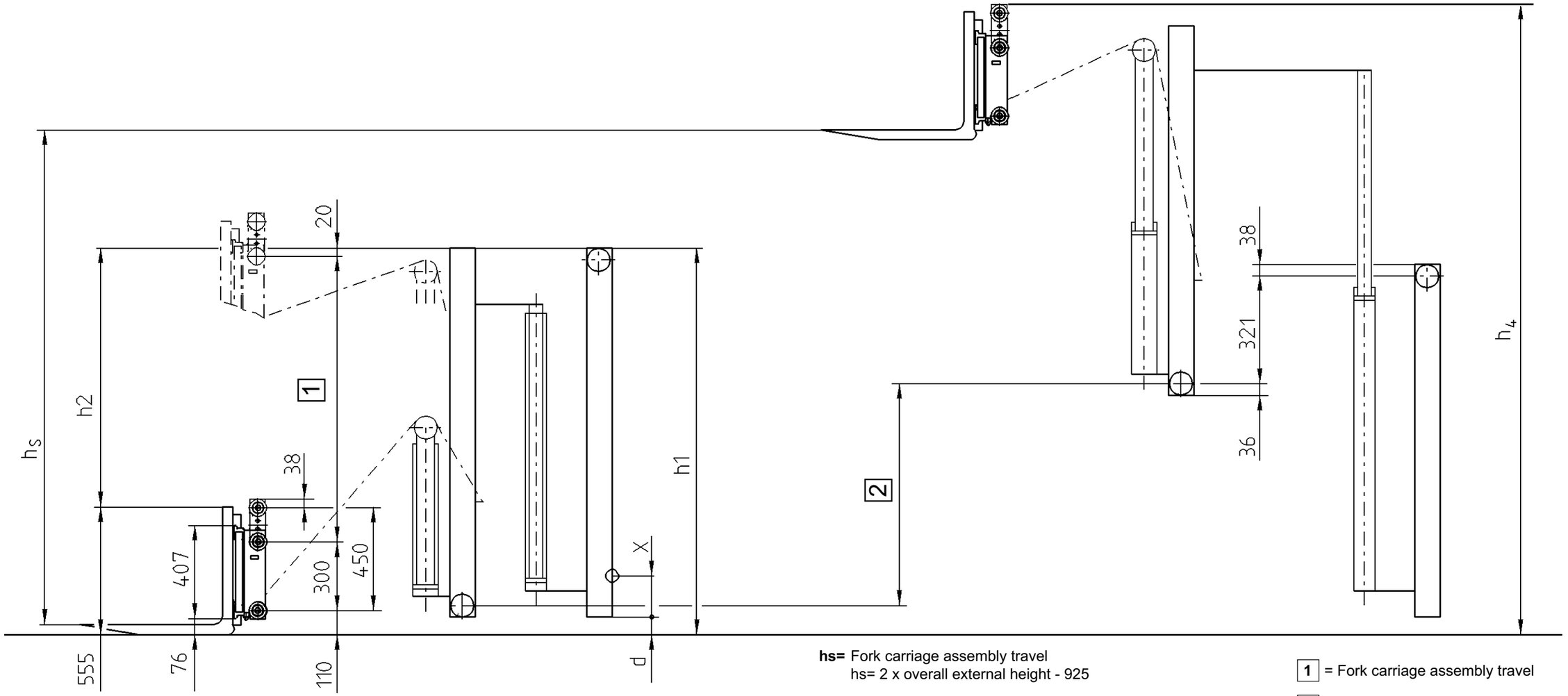
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1.2 TON AND 1.5 TON DUPLEX MAST DIAGRAM

- Option of fork carriage assembly with four rollers or six rollers for the 1.2 ton and 1.5 versions.



DUPLEX 1,2t • 1,5t							
Nominal lift height			mm	2975	3275	3575	3975
Overall external height	h1		mm	1960	2110	2260	2460
Ground clearance	d		mm	100	100	100	100
Mast support pin	x		mm	71	71	71	71
Pin diameter			mm	35	35	35	35

hs= Fork carriage assembly travel
hs= 2 x overall external height - 925

h4= Maximum overall height (fork carriage assembly with four rollers)
2 x overall external height - 370

h4= Maximum overall height (fork carriage assembly with six rollers)
2 x overall external height - 327

Travel 1
1= Overall external height - 430

Travel 2
2= Overall external height - 495

h2= Free lift (fork carriage assembly with four rollers)
h2= Overall external height - 598

h2= Free lift (fork carriage assembly with six rollers)
h2= Overall external height - 641

[1] = Fork carriage assembly travel

[2] = Mast section lift

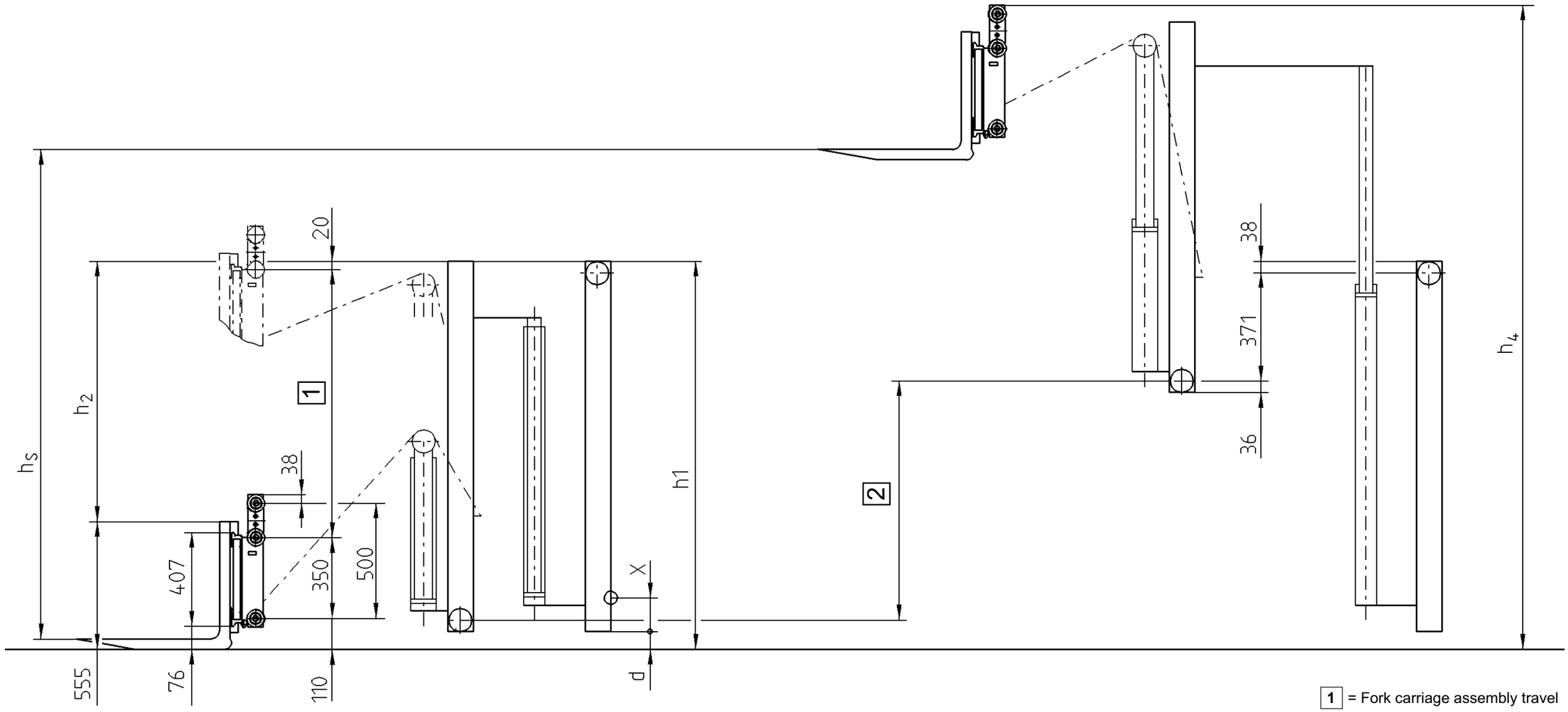
DIAGRAM 5

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1,8 TON DUPLEX MAST DIAGRAM

- Fork carriage assembly with six rollers.



DUPLEX 1,8t							
Nominal lift height			mm	2975	3275	3575	3975
Overall external height	h1		mm	2010	2160	2310	2510
Ground clearance	d		mm	100	100	100	100
Mast support pin	x		mm	71	71	71	71
Pin diameter			mm	35	35	35	35

1 = Fork carriage assembly travel

2 = Mast section lift

hs= Fork carriage assembly travel
hs= 2 x overall external height - 1025

h4= Maximum overall height
h4= 2 x overall external height - 377

Travel 1
1= Overall external height - 480

Travel 2
2= Overall external height - 545

h2= free lift
h2= Overall external height - 648

DIAGRAM 6

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31.5 - TRIPLEX MAST

FUNCTIONAL DESCRIPTION OF THE MAST

The mast is equipped with three cylinders.
The middle cylinder provides high free lift due to the telescopic effect of the inner mast section but without extending beyond the overall height of the mast.

The two outer cylinders are located in the double “T” profile of the outer mast section (fixed).

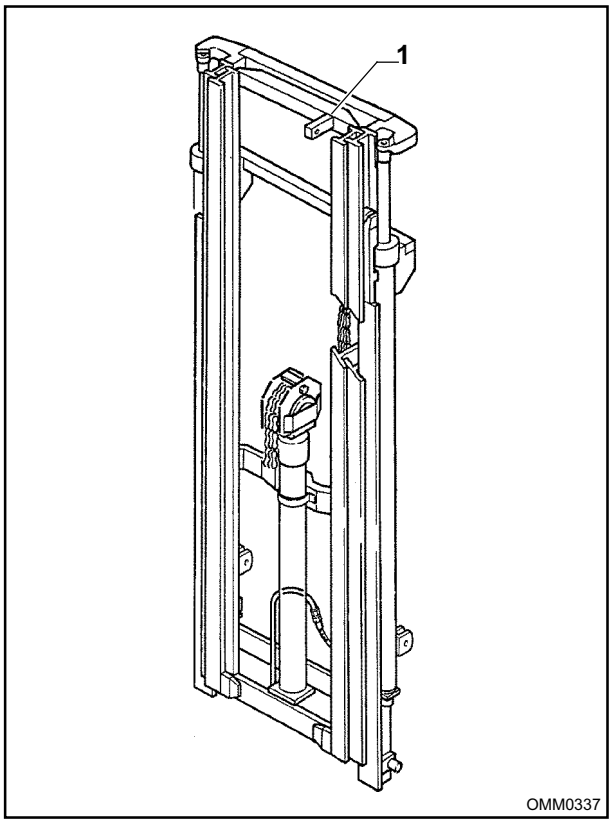
The outer cylinder piston rods are connected to the middle mast section.

The lift chains for stroke 2 (see lift diagram) are attached to the outer mast section (fixed) at the top and to the inner mast section (movable) at the bottom.

When the cylinders fill with oil, the middle cylinder piston rod extends first because it has the greatest surface area.

The two outer cylinder piston rods then extend and lift the middle mast section. The middle mast section lifts the inner mast section because the chain is connected at a ratio of 1:2.

A lowering speed control valve limits the maximum lowering speed to 0.55 / 0.50 m/s.

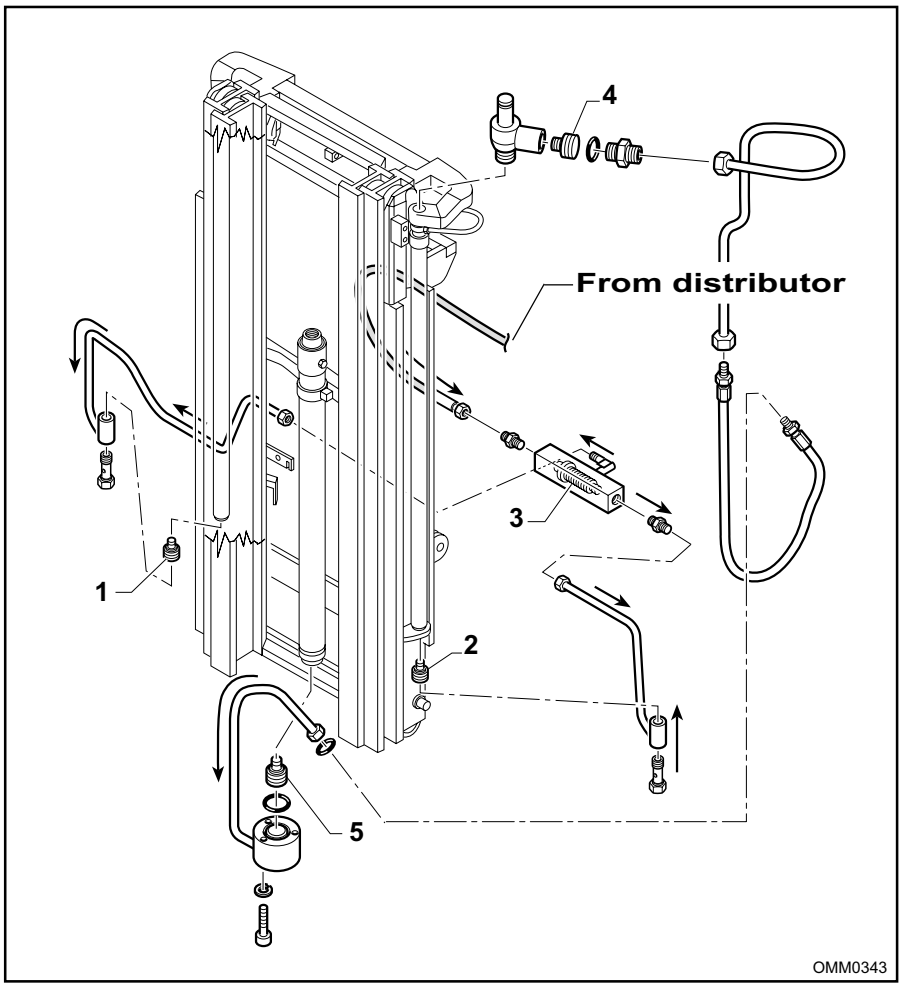


1= Fork carriage assembly slide lock mechanism

The slide lock mechanism prevents the fork carriage assembly from accidentally sliding out of the inner mast section (see paragraph 31.7 for adjustment instructions).

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HYDRAULIC SYSTEM OF THE TRIPLEX MAST CYLINDERS



The oil entering through the lowering speed control valve (3) is delivered by the side pipes to the outer cylinders. The oil is delivered to the middle cylinder by the left outer cylinder and the pipe.
The middle cylinder piston rod extends first due to the difference in the surface area of the piston rods. Once it has reached the stroke limit stop, the outer cylinder piston rods extend.

Stroke 1: operates the fork carriage assembly only
Stroke 2: extends the middle and inner mast section
(see diagrams 7 and 8).

The safety valves are located inside the cylinders and prevent the load from lowering too quickly or in an uncontrolled manner if the pipes break.

1= Safety valve
2= Safety valve
3= Lowering speed control valve
4= Safety valve
5= Safety valve

IMPORTANT:
It is not permitted to adjust or repair the valves. Replace any faulty or malfunctioning valves. Refer only to the Spare Parts Catalog from the supplier to determine the type of valve to use.

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ADJUSTING THE LIFT CHAINS

Outer chains:
The outer lift chains must be adjusted evenly by means of the tie rod linkages (1).

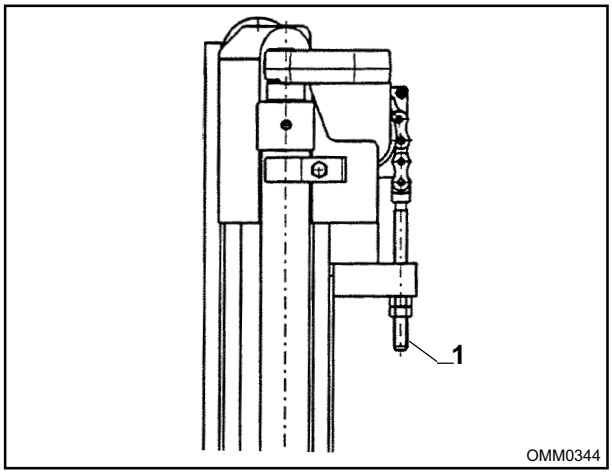
Middle chain:
The middle lift chain is adjusted by means of the tie rod linkage (2).

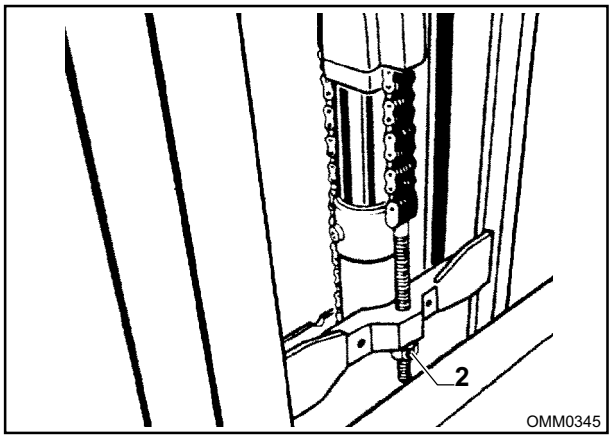
The center of the upper rollers of the fork carriage assembly (with four rollers) or, alternatively, the center of the middle rollers of the fork carriage assembly (with six rollers), must remain inside the inner mast section profile with a dimension at least greater than “X” (see diagram on page 18/1 and 18/2), with the middle lift cylinder piston completely extended (stroke limit stop inside the cylinder).

Never compensate for the wear of tires by adjusting the tension of the lift chains.

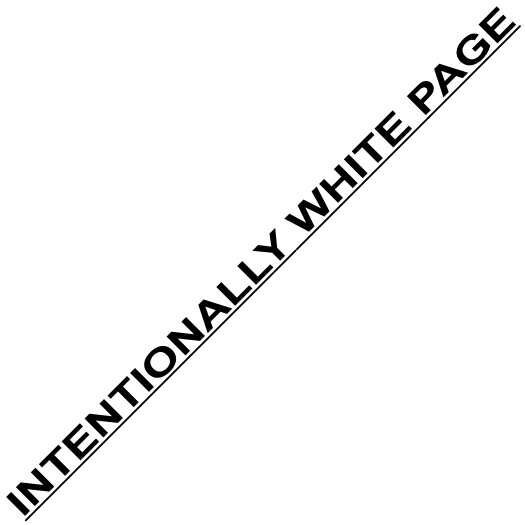
When adjusting the lift chains, they absolutely must be kept to a minimum distance of 2 mm from the fork carriage assembly slide lock mechanism (see adjustment in paragraph 31.7).

IMPORTANT:
The lift chains must be inspected for wear, damage, or lengthening in accordance with the safety instructions described in the Use and Maintenance manual.





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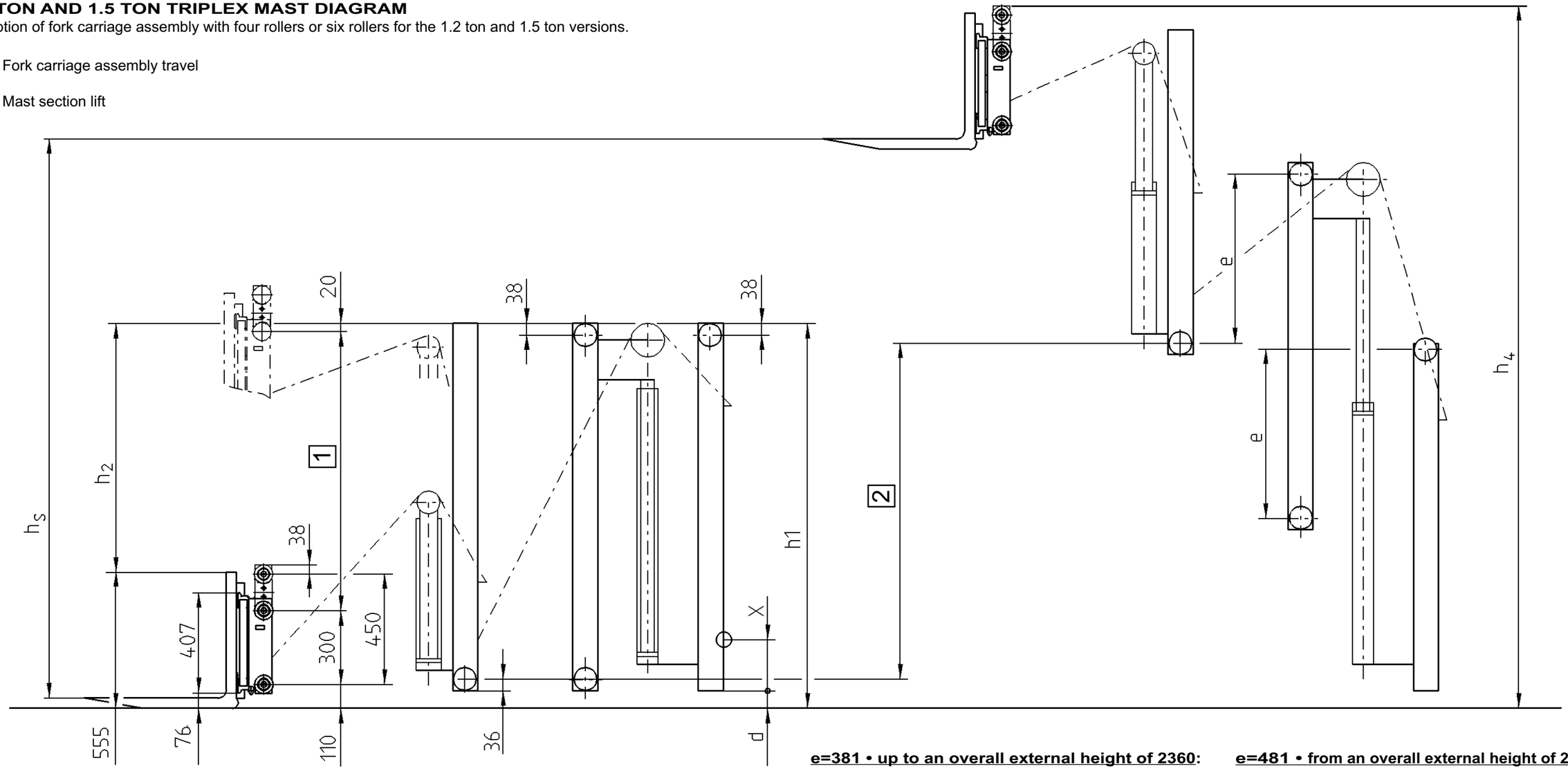
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1.2 TON AND 1.5 TON TRIPLEX MAST DIAGRAM

- Option of fork carriage assembly with four rollers or six rollers for the 1.2 ton and 1.5 ton versions.

1 = Fork carriage assembly travel

2 = Mast section lift



TRIPLEX 1,2t • 1,5t									
Nominal lift height			mm	4470	4770	5220	5770	6370	6970
Overall external height	h1		mm	2010	2110	2260	2510	2710	2910
Ground clearance	d		mm	100	100	100	100	100	100
Mast support pin	x		mm	71	71	71	71	71	71
Pin diameter			mm	35	35	35	35	35	35

e=381 • up to an overall external height of 2360:

hs= Fork carriage assembly travel

hs= 3 x overall external height - 1540

h4= Max. overall height (fork carriage assembly with four rollers)

h4= 3 x overall external height - 985

h4= Max. overall height (fork carriage assembly with six rollers)

h4= 3 x overall external height - 942

Travel 1

1= overall external height - 430

Travel 2

2= 2 x overall external height - 1110

h2= Free lift

h2= overall external height - 598

e=481 • from an overall external height of 2460:

hs= Fork carriage assembly travel

hs= 3 x overall external height - 1740

h4= Max. overall height (fork carriage assembly with four rollers)

h4= 3 x overall external height - 1185

h4= Max. overall height (fork carriage assembly with six rollers)

h4= 3 x overall external height - 1142

Travel 1

1= overall external height - 430

Travel 2

2= 2 x overall external height - 1310

h2= Free lift

h2= overall external height - 598

DIAGRAM 7

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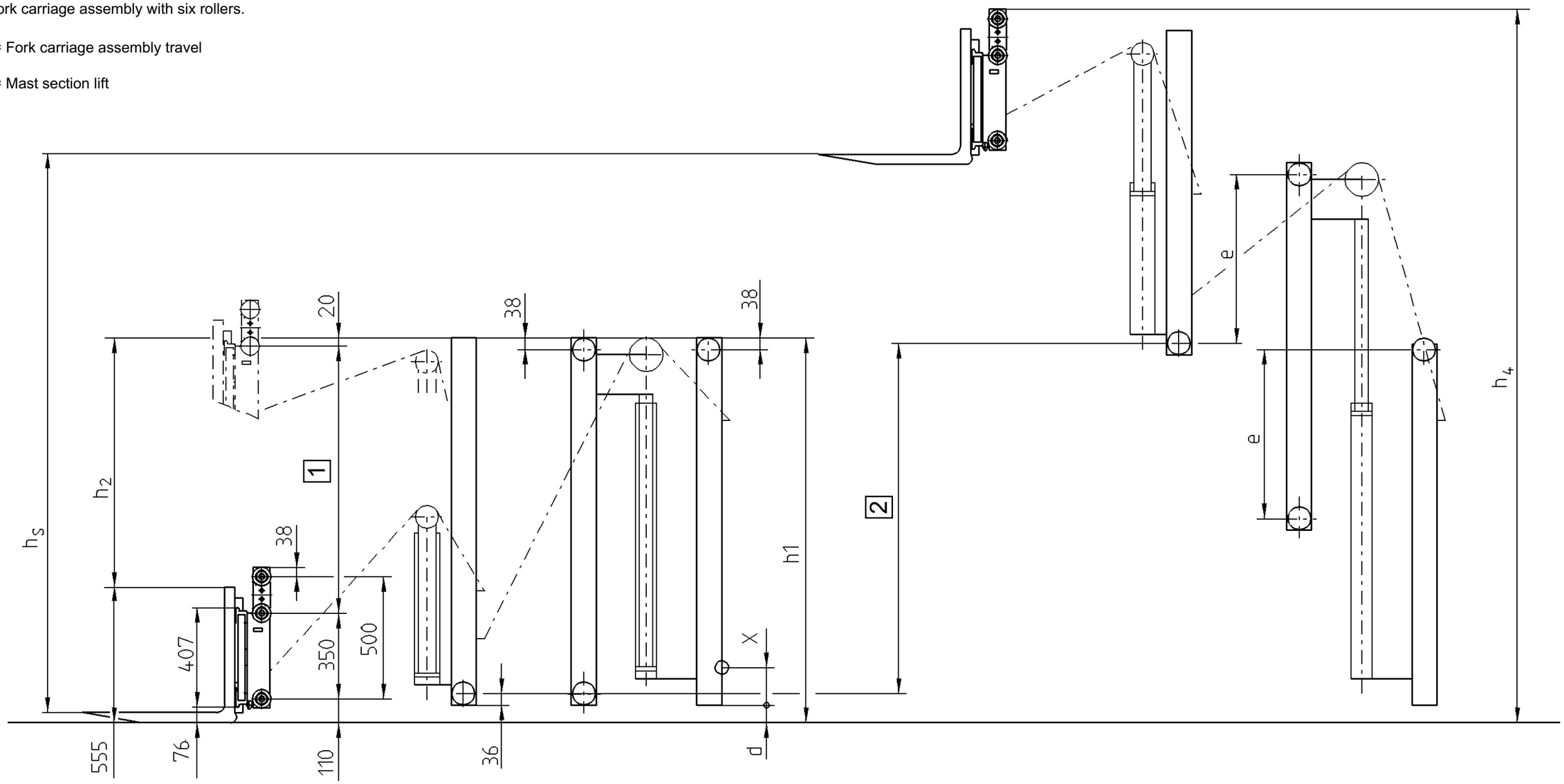
https://truckmanualshub.com/

1,8 TON TRIPLEX MAST DIAGRAM

- Fork carriage assembly with six rollers.

1 = Fork carriage assembly travel

2 = Mast section lift



TRIPLEX 1,8t									
Nominal lift height			mm	4470	4770	5220	5770	6370	6970
Overall external height	h1		mm	2060	2160	2310	2560	2760	2960
Ground clearance	d		mm	100	100	100	100	100	100
Mast support pin	x		mm	71	71	71	71	71	71
Pin diameter			mm	35	35	35	35	35	35

e=431 • up to an overall external height of 2360:

hs= Fork carriage assembly travel

hs= 3 x overall external height - 1960

h4= Maximum overall height

h4= 3 x overall external height - 1042

Travel 1

1= overall external height - 480

Travel 2

2= 2 x overall external height - 1210

h2= Free lift

h2= overall external height - 648

e=531 • from an overall external height of 2460:

hs= Fork carriage assembly travel

hs= 3 x overall external height - 1890

h4= Maximum overall height

h4= 3 x overall external height - 1242

Travel 1

1= overall external height - 480

Travel 2

2= 2 x overall external height - 1410

h2= Free lift

h2= overall external height - 648

DIAGRAM 8

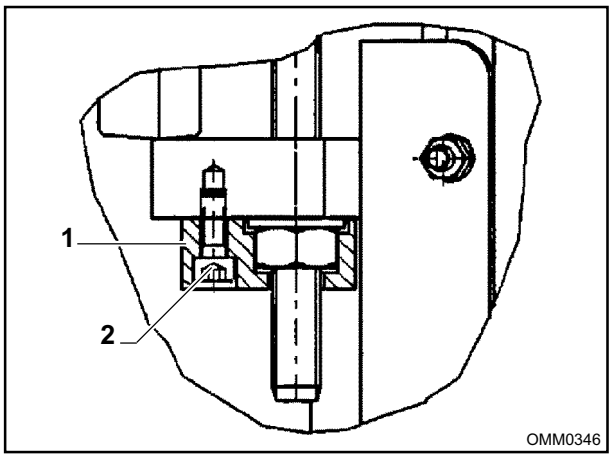
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31.6 - LIFT CHAIN STOP

The middle chain of the Duplex and Triplex masts and the outer chains of the Simplex and Triplex masts are locked into place as shown in the diagram.

1= Hood
2= M6 cylindrical head screws coated with Tuflok.

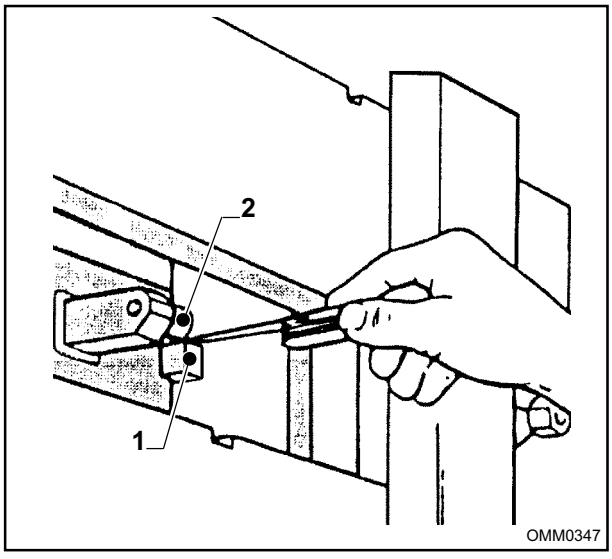


31.7 - FORK CARRIAGE ASSEMBLY SLIDE LOCK MECHANISM

When adjusting the lift chains, check that when the lift cylinder is completely extended, the stroke limit stop does not extend beyond the lift cylinder stroke; in other words, make sure that the stop (1) and the slide lock mechanism (2) do not touch.

The stop (1) and the slide lock mechanism (2) MUST be at least 2 mm apart.

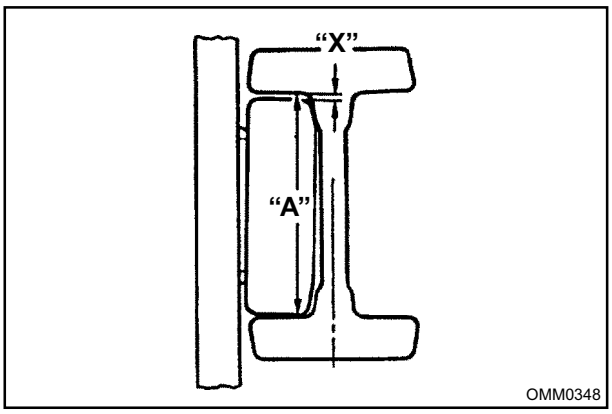
IMPORTANT:
The clearance on masts with a high lift height can be easily determined by placing a piece of plasticine on the stroke limit stop (1), raising the fork carriage assembly to the stroke limit stop then measuring the thickness of the plasticine with a gauge.



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31.8 - INSTALLING THE MAST SECTION/FORK CARRIAGE ASSEMBLY SUPPORT ROLLERS

Roller ø	Dimension "A" above	Dimension "A" up to	Dimension "X"
75,3	--	75,9	0,6
75,6	--	76,2	0,6
75,9	--	76,5	0,6
76,2	76,5	--	

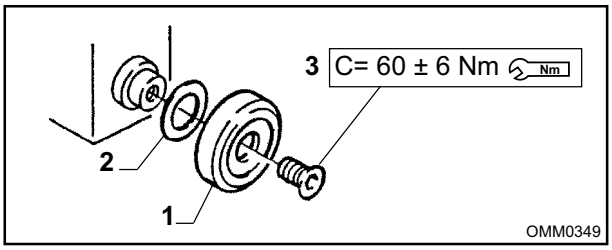


Permissible radial clearance (dimension X):
min. 0.05 / max 0.4 at the narrowest point, otherwise max 0.6.

IMPORTANT:
Dimension "A" must be measured on the inner border of the support roller track where the radius starts.

Dimension "A" with a new mast:
75,4 + 0,8.

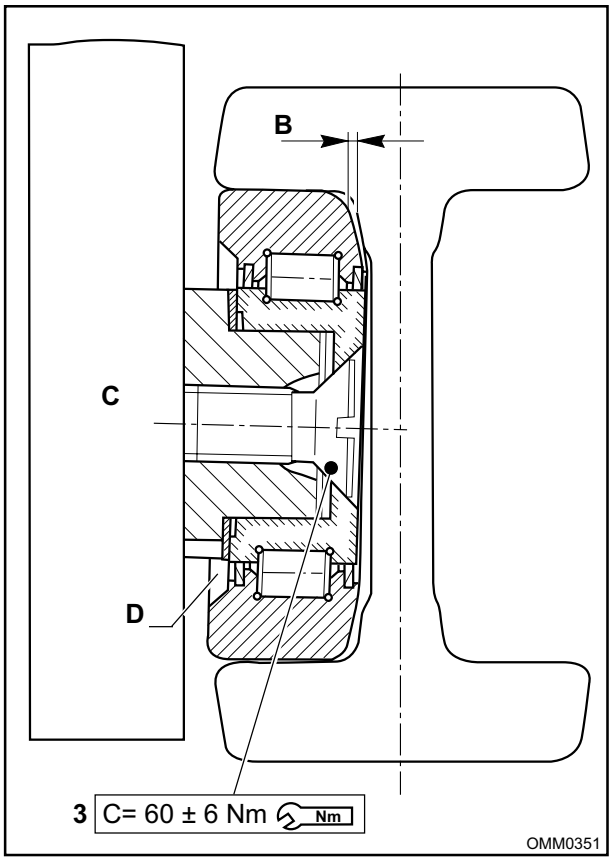
1= Support roller
2= Adjustment shims
3= Tightening torque = 60Nm ± 6Nm
Countersunk head screw



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Total permissible lateral clearance (B):
min. 0.1 / max 0.3 at the narrowest point, otherwise max 1.1.

For fork carriage assemblies with six rollers: clearance of middle rollers 0.2 greater than the clearance of the upper rollers.



C= Fork carriage assembly or mast section
D= Shims

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31.9 - INSPECTION

DETERMINING THE LATERAL CLEARANCE AND DIMENSION “X” WITH A THICKNESS GAUGE

The dimension “X” = 0.6 mm serves as a guideline for inserting the next size (bigger) support roller during the running-in phase; in other words, at the beginning the material of the new profile (dimension “A” = 75.4 + 0.8) will compress at the slide points of the support rollers.

After the running-in period, which varies depending upon the application, dimension “X” will no longer vary and will become steady.

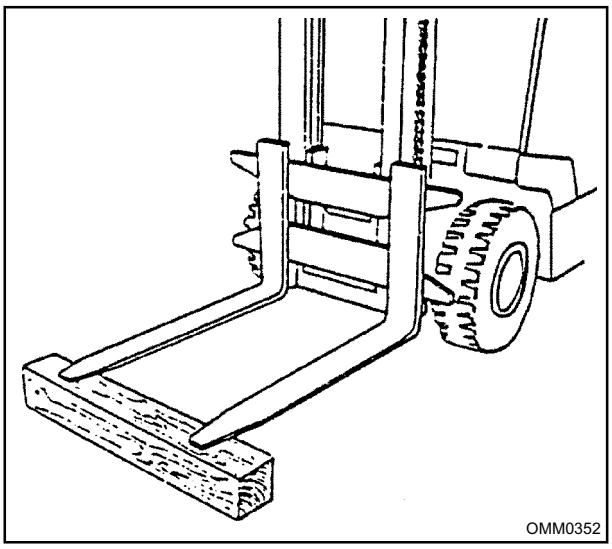
To keep wear to a minimum, it is important to lubricate the roller tracks with an adhesive lubricant after cleaning the dirt off the tracks.

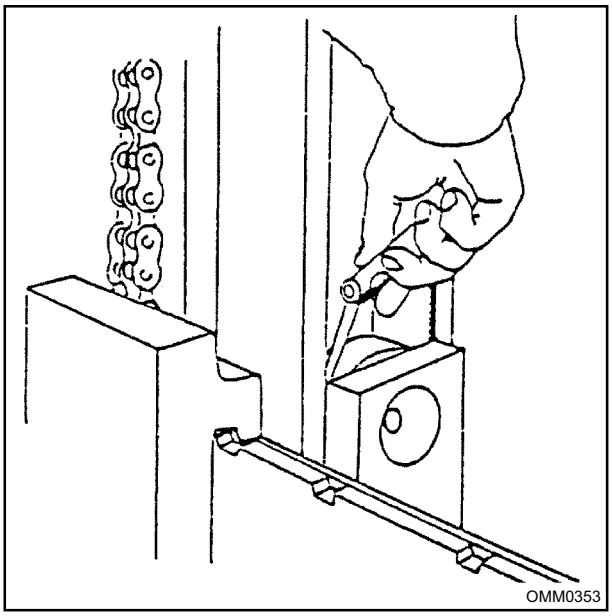
The figures on the right show how to determine dimension “X” of the fork carriage assembly support rollers.

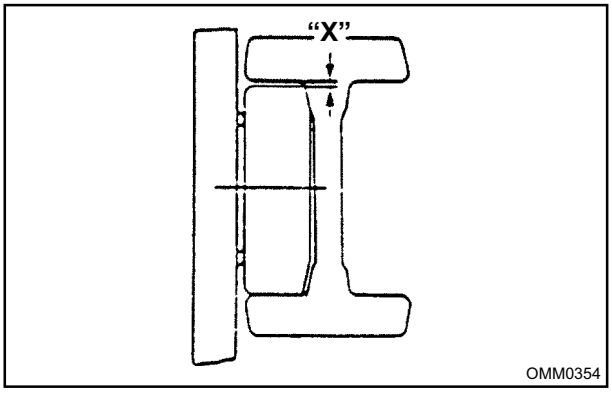
- Lift the fork carriage assembly
- Place wooden blocks under the forks.
- Lower the fork carriage assembly.

The support rollers will stop on the side opposite the track.

- At this point, you can determine dimension “X”.


OMM0352


OMM0353



OMM0354

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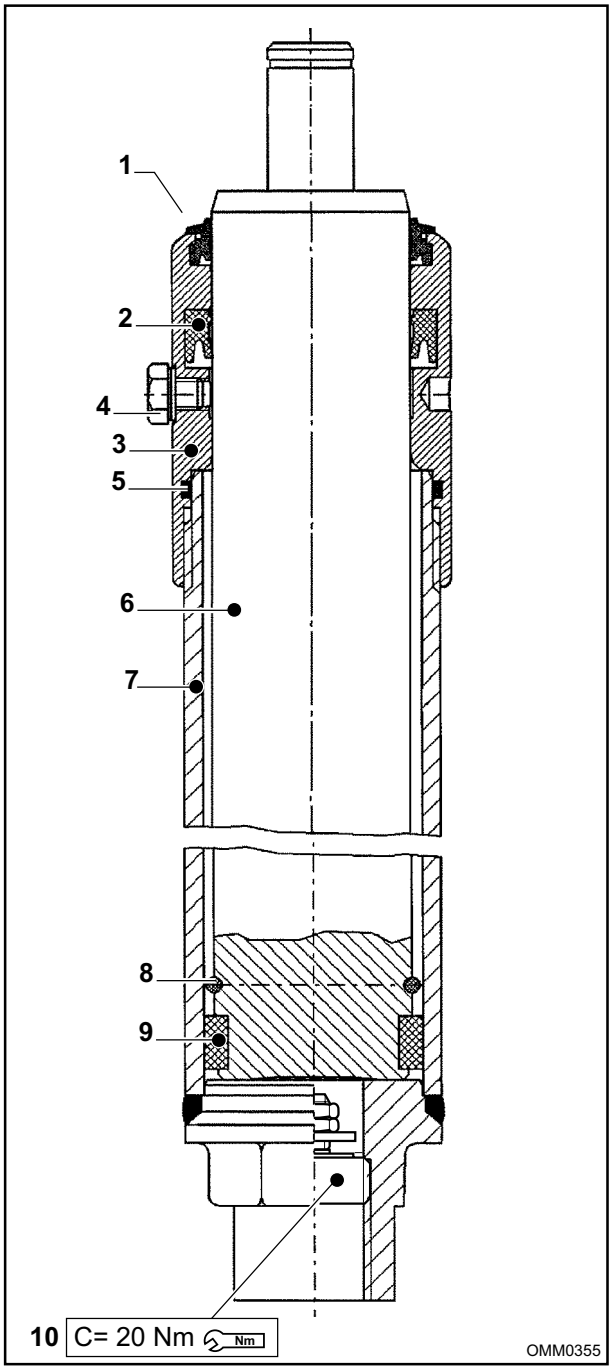
31.10 - REMOVING THE SIMPLEX MAST CYLINDER

- Bring the mast into a vertical position.
- Extend the lift piston rod (approximately 20 cm) until the upper fastening can be easily accessed so that the safety ring can be removed.
- Remove the safety ring from the upper piston rod fastening.
- Hook the upper crossbar of the inner mast section to a crane by means of a cable or strap and keep the mast section in this position.
- Completely lower the mast (the piston rods will retract from the crossbar).
  Operate the emergency button and then move the distributor in both directions to completely release the pressure from the hydraulic system.
- Loosen the lower delivery connector.
- Loosen the fastening clamp and remove the cylinder from the mast.

Replacing the gasket set:
- Lock the cylinder in a vise.
- Unscrew the cylinder head with a toothed wrench used for unscrewing the slotted nuts.
  If you cannot unscrew the cylinder head, heat it with a torch.

The cylinder head is fastened by Loctite 243 applied to three spots on the perimeter.

1= Gasket
2= Seal
3= Cylinder head
4= Bleed screw
5= O-ring
6= Piston rod
7= Cylinder
8= Rubber ring
9= Guide bushing
10= Safety valve



REINSTALLING THE SIMPLEX CYLINDER

Reinstall the cylinder by following the operations described above in reverse.

IMPORTANT:

When reinstalling the cylinder (3), apply Loctite 243 to three spots on the perimeter of the cylinder head thread and tighten it completely.
Once the cylinder has been reinstalled, bleed the hydraulic system as described in paragraph 20.1.

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31.11 - REMOVING THE DUPLEX MAST SIDE CYLINDERS

- Bring the mast into a vertical position.
- Apply the hand brake.
- Operate the emergency button.
- Hook the upper crossbar of the movable mast section to a crane by means of a cable or strap.
- Move the distributor lever in both directions to completely release the pressure from the hydraulic system.
- Disconnect the delivery pipe of the middle cylinder and the lower connectors of the side cylinders.
- Remove the rubber rings that fasten the piston rods to the crossbar.
- Lift the movable mast section with the crane to release the piston rods from the crossbar (use a screwdriver if necessary).
- Loosen and remove the cylinder fastening clamps.
- Remove the cylinders.

1= Adapter
2= O-ring (grease it before inserting upon reinstallation)
3= Cylinder head
4= Piston
5= Safety valve
6= Bleed screw

REINSTALLING THE CYLINDERS

Reinstall the cylinders by following the operations described above in reverse.

IMPORTANT:

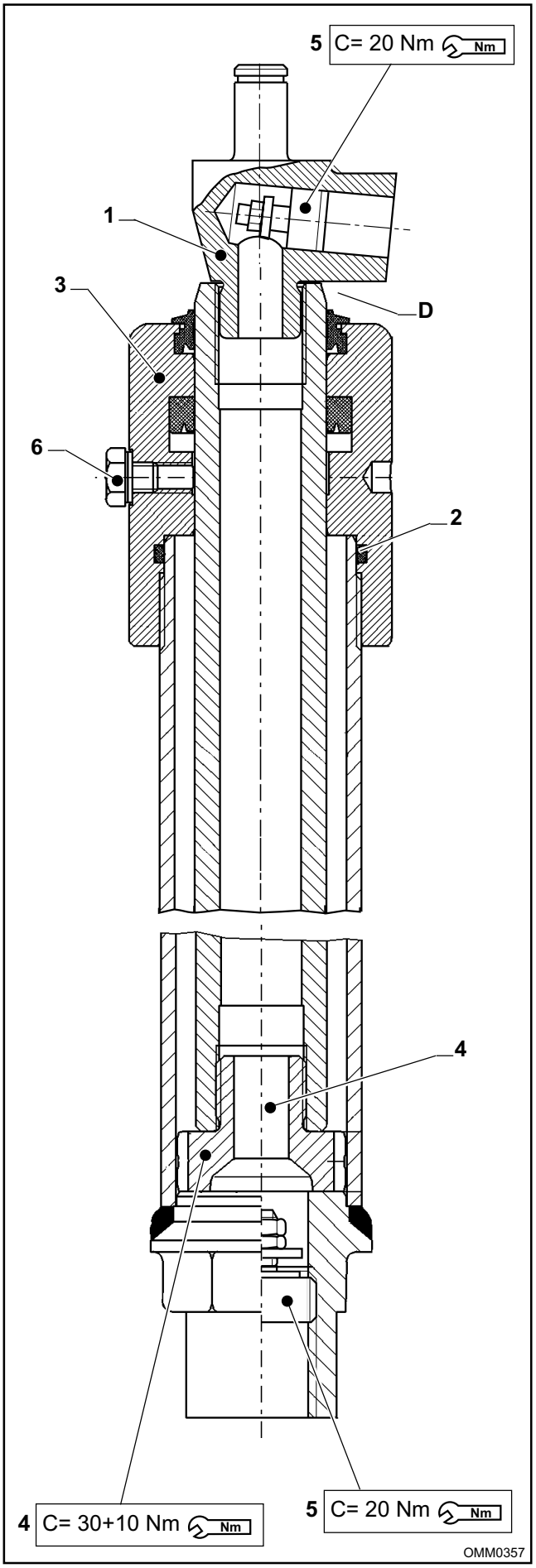
Proceed as follows to reassemble the adapter (1), the cylinder head (3) and the piston (4):

- **Adapter (1):**
  Completely tighten it after applying Loctite 275 to the threads and Loctite 243 to the support surface «D».
- **Cylinder head (3):**
  Completely tighten it after applying Loctite 243 to three spots on the perimeter of the threads.
- **Piston (4):**
  Tighten to 30 + 10 Nm of torque after applying Loctite 275 to the threads.

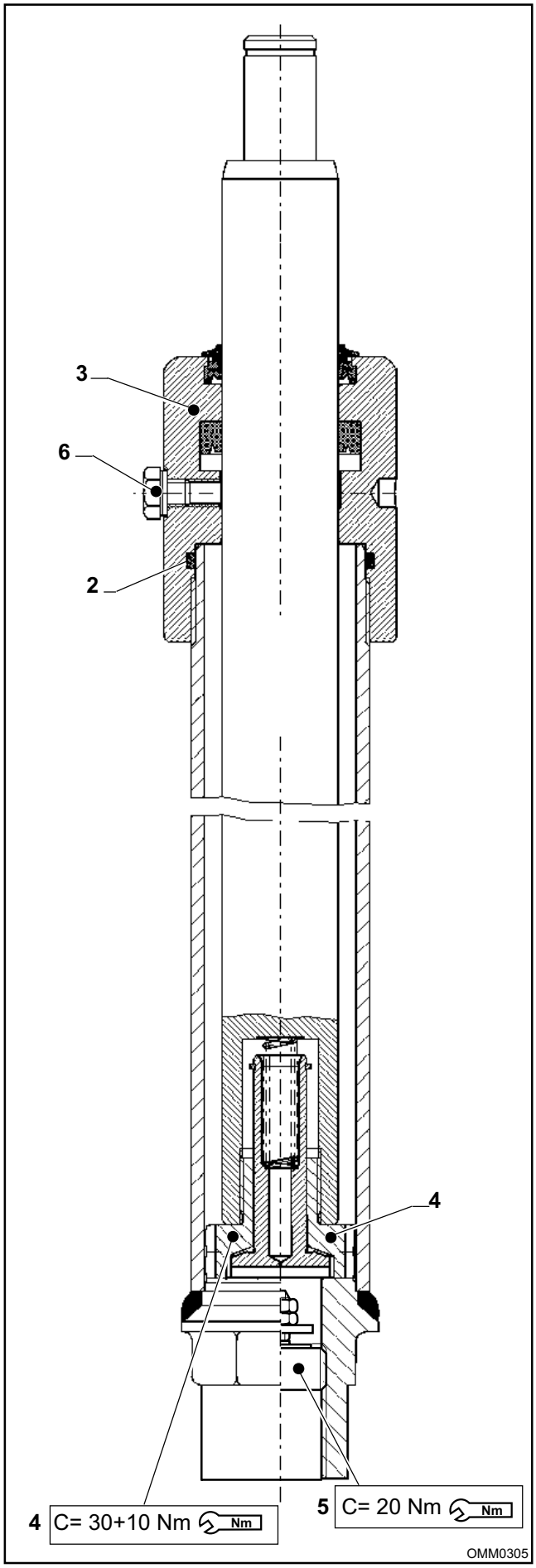
Once the cylinder has been reinstalled, bleed the hydraulic system as described in paragraph 20.1.

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• LEFT



• RIGHT



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31.12 - REMOVING THE TRIPLEX MAST SIDE CYLINDERS

- Bring the mast into a vertical position.
- Apply the hand brake and operate the emergency button.
- Hook the upper crossbar of the middle mast section to a crane by means of a cable or strap.
- Move the distributor lever in both directions to completely release the pressure from the hydraulic system.
- Disconnect the delivery pipe of the middle cylinder (upper part of the side cylinder)
- Disconnect the lower connectors of the side cylinders.
- Remove the rubber rings that fasten the side cylinder piston rods to the crossbar.
- Lift the middle mast section with the crane to release the piston rods from the crossbar (use a screwdriver if necessary).

IMPORTANT:

During this operation, the inner mast section is pulled by the chains and will be lifted together with the middle cylinder and the fork carriage assembly: CHECK THAT THERE IS NO INTERFERENCE, OBSTACLE, OR RISK OF BREAKAGE!

- Loosen and remove the side cylinder fastening clamps.
- Remove the cylinders.

1= Adapter
2= O-ring (grease it before inserting upon reinstallation)
3= Cylinder head
4= Safety valve
5= Rubber ring
6= Guide ring
7= Piston

REINSTALLING THE CYLINDERS

Reinstall the cylinders by following the operations described above in reverse.

IMPORTANT:

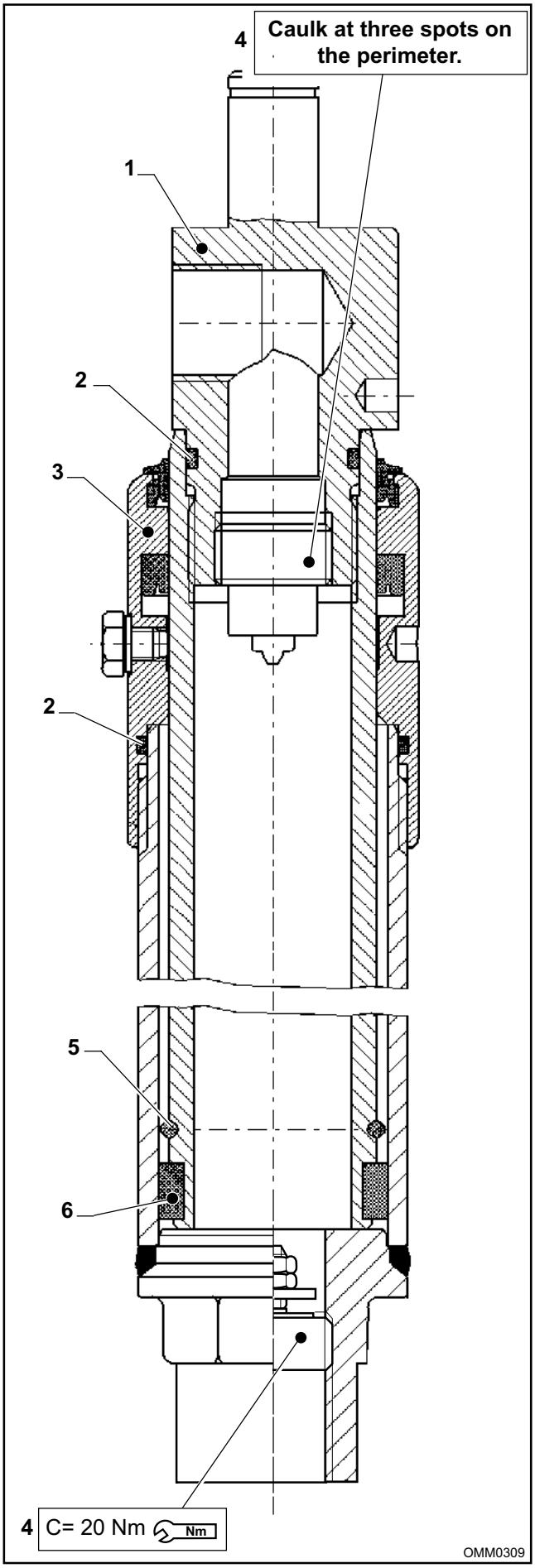
Proceed as follows to reassemble the adapter (1), the cylinder head (3) and the piston (4):

- **Adapter (1):**
  Completely tighten it after applying Loctite 275 on the threads.
- **Cylinder head (3):**
  Completely tighten it after applying Loctite 243 to three spots around the perimeter of the threads.
- **Piston (7):**
  Tighten to 150 + 50 Nm of torque after applying Loctite 275 to the threads and the contact surface of the piston rod.

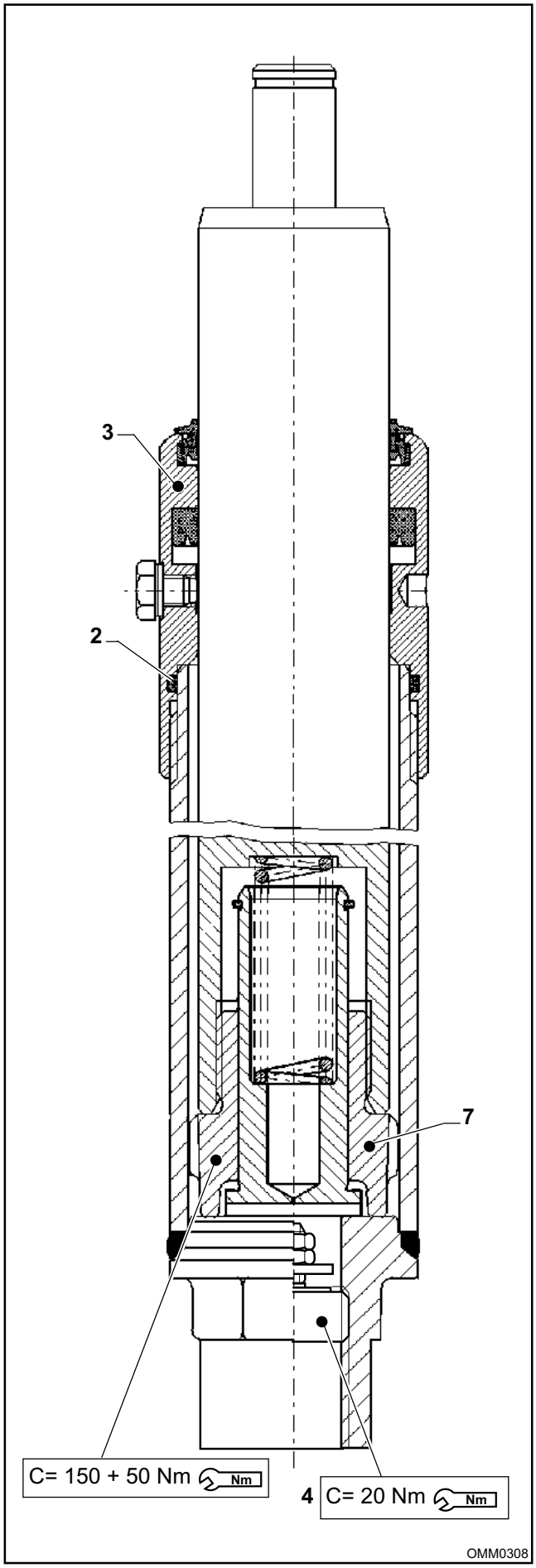
Once the cylinder has been reinstalled, bleed the hydraulic system as described in paragraph 20.1.

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• LEFT



• RIGHT



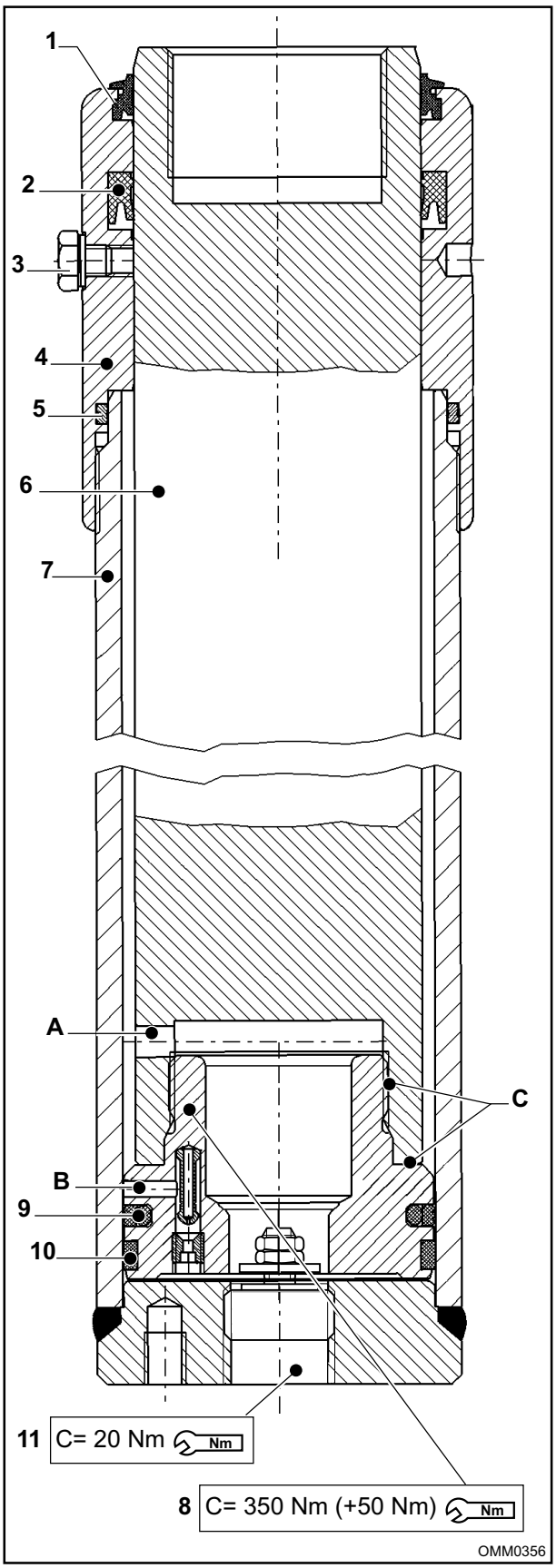
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31.13 - DUPLEX/TRIPLEX MAST MIDDLE CYLINDER

This is a single-acting cylinder (plunger cylinder).
The cylinder barrel and bottom plate are welded together.
The cylinder head is screwed onto the cylinder barrel and tightened with Loctite 243.
The cylinder barrel and cylinder head are sealed with an O-ring.
The cylinder head and the piston rod are sealed with a gasket (2).
The stroke limit stop is operated by the piston screwed onto the piston rod and is fastened with Loctite 275.
A safety valve is screwed onto the cylinder bottom plate to prevent the load from lowering too quickly or in an uncontrolled manner if the pipe breaks.

The middle cylinder is equipped with a stroke end damper (holes A and B).

Remove the middle cylinder as follows:
- Raise the fork carriage assembly. Hook it to a crane or hoist with cables. Place a solid, stable support under the fork carriage assembly and lower it onto the support. Unhook the chain.
- Operate the emergency button, move the distributor levers in both directions to release the pressure from the hydraulic system.
- Disconnect the hydraulic connector from the cylinder bottom plate.
- Disconnect the fastening clamp from the cylinder.
- Remove the lift cylinder.
- Lock the cylinder pipe in a vise near the bottom plate of the cylinder (so that the cylinder pipe does not become misshapen).
- Unscrew the cylinder head with a toothed wrench. If you cannot unscrew the cylinder head, heat it with a torch.
- Remove the piston rod from the cylinder pipe.
- Clamp the piston rod in a vise using the protective jaws and unscrew the pulley support bracket.
  The support bracket is fastened with Loctite 243.
- Remove the cylinder head from the piston rod.



1= Double gasket
2= Sealing ring
3= Bleed screw
4= Cylinder head
5= O-ring.
6= Piston rod
7= Cylinder
8= Piston rod head
9= Gasket
10= Guide ring
11= Safety valve

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REINSTALLING THE CYLINDERS

Reinstall the cylinders by following the operations described above in reverse.

IMPORTANT:

Proceed as follows to reassemble the cylinder head (4) and the piston (8):

- **Cylinder head (4):**
  Completely tighten it after applying Loctite 243 to three spots around the perimeter of the threads.
- **Piston (8):**
  Tighten to 350 + 50 Nm of torque after applying Loctite 275 to the entire surface of the threads.

Once the cylinder has been reinstalled, bleed the hydraulic system as described in paragraph 20.1.

IMPORTANT:

Do not remove the piston rod head when replacing the gasket set.

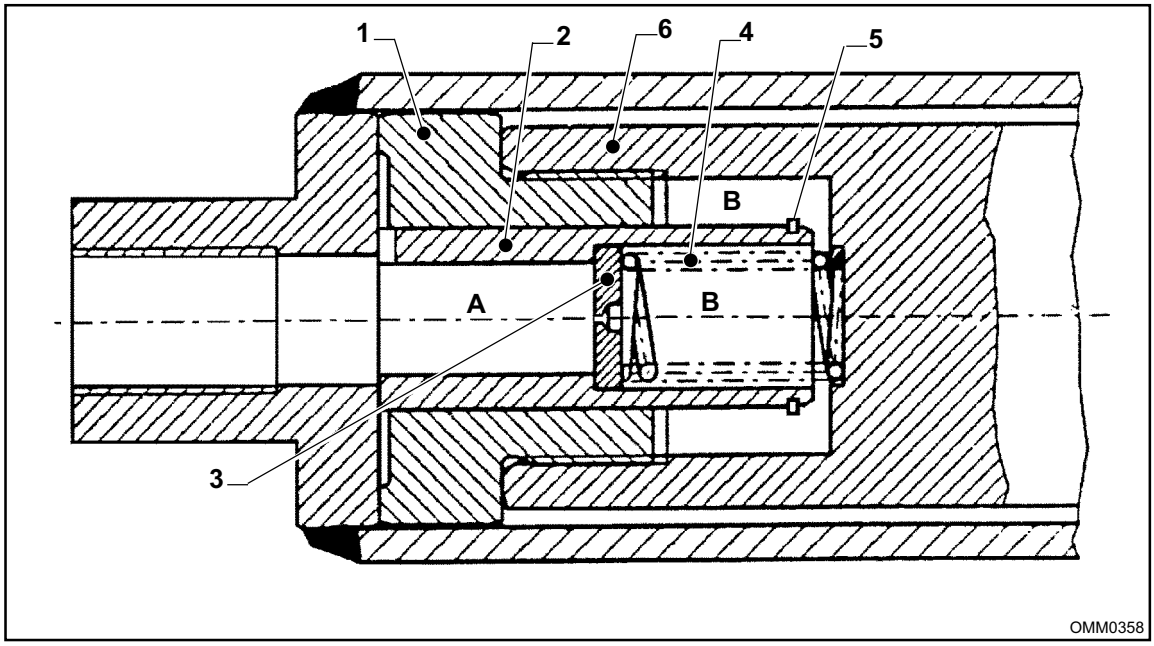
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31.14 - STROKE END DAMPERS

The purpose of the stroke end dampers on the Duplex and Triplex masts is to hydraulically brake the outer cylinder piston rod just before it reaches its final position when the mast is lowered and at the precise moment when stroke two transitions to stroke one.
This prevents metal from bumping against metal.

FUNCTIONAL DESCRIPTION OF THE STROKE END DAMPERS

When oil under pressure enters the cylinder during the lifting process, the bushing (2) is pushed by the elastic force of the compression spring (4) in the direction of the bottom plate of the cylinder, until the rubber ring (5) comes to a stop. The oil under pressure flows through the diaphragm hole (3) from chamber A to chamber B, until the pressure is equalized.
Before the piston rod reaches its final position during the lowering process, the bushing (2) meets the bottom plate of the cylinder. The bushing (2) is pushed in the direction of the piston rod, while the oil under pressure flows from chamber B to chamber A through the diaphragm hole (3). This pressure equalization thus brakes the mast hydraulically.

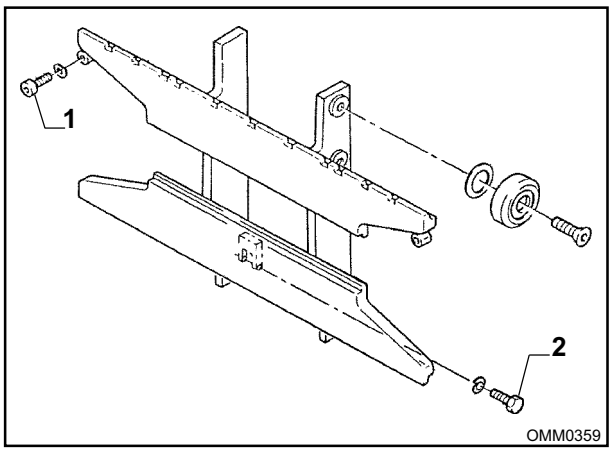


1= Piston rod head
2= Bushing
3= Diaphragm
4= Compression spring
5= Rubber ring
6= Piston rod

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31.15 - REMOVING THE FORK CARRIAGE ASSEMBLY

- Bring the mast into a vertical position.
- Remove the forks or attachments if any.
- Slightly raise the fork carriage assembly. Place it on a solid, stable support.
- Completely lower the inner mast using the hydraulic system.
- Unhook the lift chains from the fork carriage assembly.
- Remove the fork carriage assembly slide lock mechanism screw from the inner mast section.
- Remove the fork carriage assembly from the top of the inner mast section.



Adjust the support rollers:
- See the instructions in paragraph 31.8 / 31.9.

Adjust the slide lock mechanism:
- See the instructions in paragraph 31.7.

1= Safety screw to prevent the forks from sliding outward.
2= Safety screw to prevent the last link of the lift chain from becoming unhooked.

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31.16 - TILT CYLINDER

REMOVING THE TILT CYLINDER

Lock the cylinder in a vise in the area near the bottom plate.
Unscrew the threaded connector on the cylinder head side (the threaded connector protrudes into the cylinder chamber).
Remove the safety cover (15).
Lightly push the cylinder head (9) back.
Squeeze the rubber ring (11) through the hole on the cylinder barrel using a pair of pliers and remove the rubber ring with a screwdriver (see figure A).
Pull sharply on the piston rod and remove the cylinder head from the cylinder.

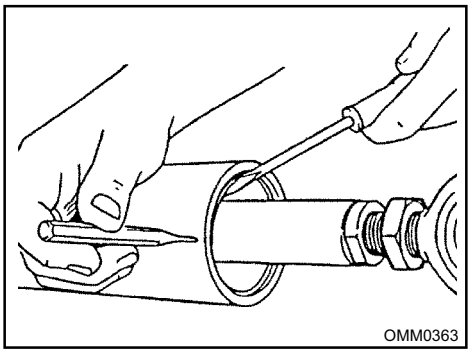
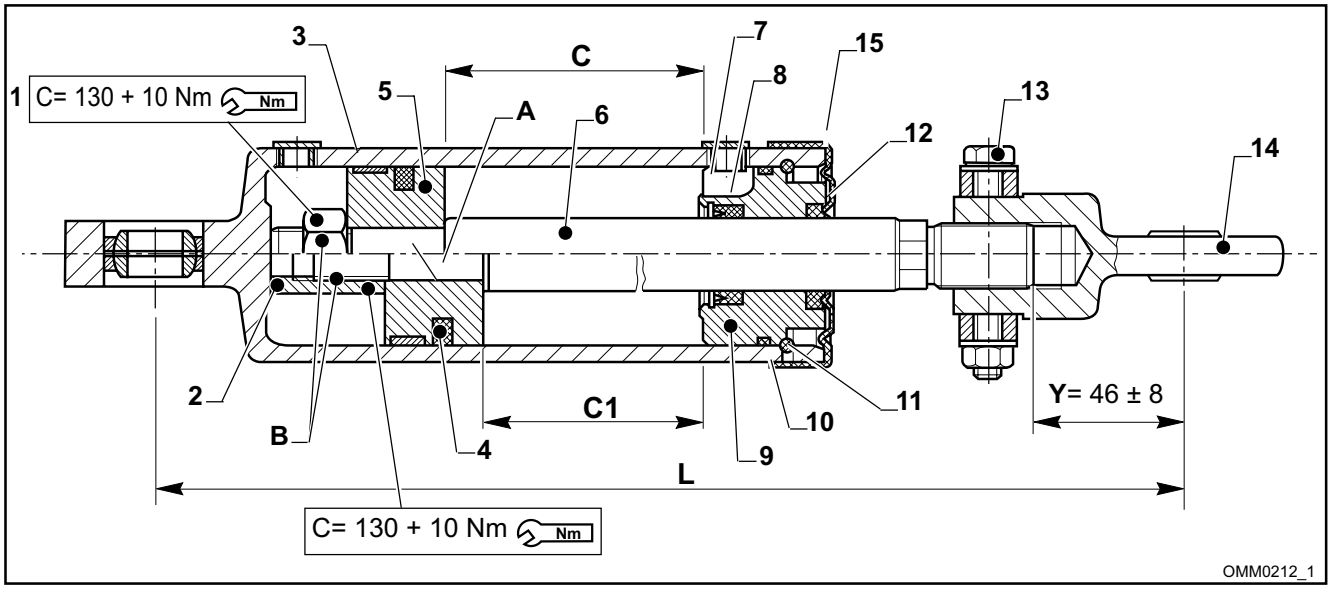


Fig. A

IMPORTANT:
Use protective jaws to lock the piston rod in the vise!

1= Piston lock nut
2= Piston lock bushing
3= Piston guide ring
4= Piston seal
5= Piston
6= Piston rod
7= Seeger ring
8= Sealing ring
9= Cylinder head
10= O-ring
11= Rubber ring
12= Oil seal
13= Hexagon head cap screw to lock the eye terminal
14= Eye terminal
15= Safety cover
C= Stroke 78 - For height 2975 ÷ 4030 mm.
C1= Stroke 52 - For height 4450 ÷ 6970 mm.
L= Length between the two pins



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REINSTALLING THE TILT CYLINDER

Check the parts for wear.
The piston (5) is sealed onto the piston rod (6) after applying Loctite 270 to surface A.
The hexagonal head cap nut (1) or alternatively, the spacer bushing (2), are sealed with Loctite 270 applied to threads B.

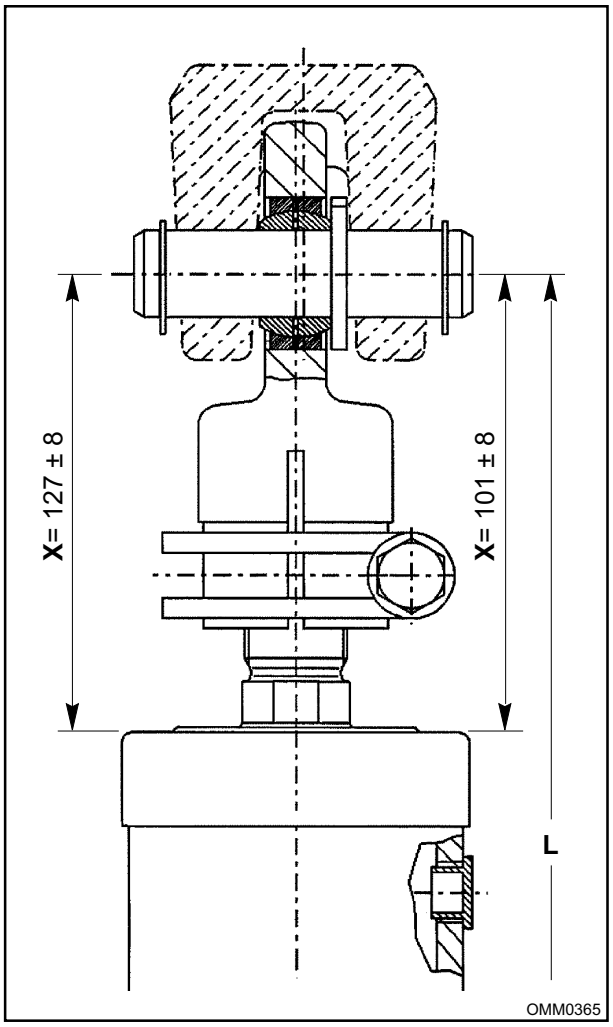
When assembling the piston guide ring, the seal, and the gasket set for the cylinder head, insert the cylinder head into the cylinder with the cavity on the cylinder head facing the threaded connection hole.

Check dimension **X** with the cylinder closed during assembly!

Grease the insertion holes before assembling the tilt cylinder bolts!

The ball joints are protected from sliding sideways because they are embedded on both sides, at the points marked with an arrow (figure B).

IMPORTANT:
When assembling the cylinders on the truck, check that the stroke limit stop and the tilt angle comply with the specifications contained in the Technical Data and Specifications table (see chapter 10), and that dimension Y equals 46 ± 8 mm.



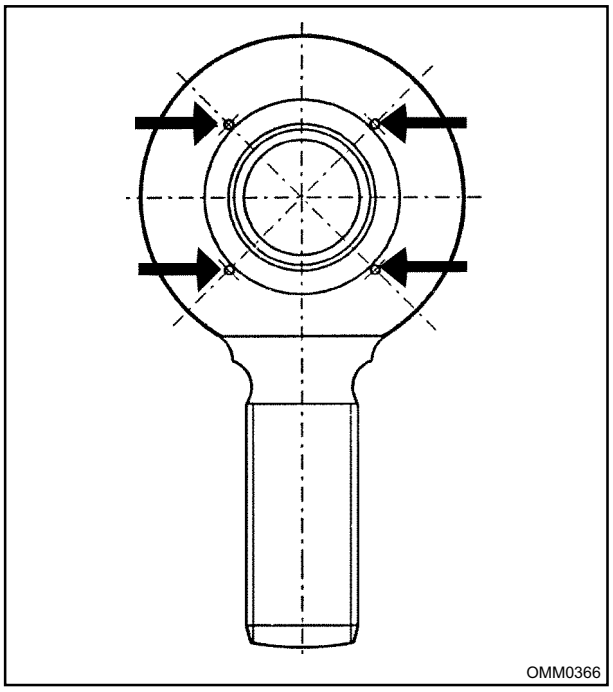


Fig. B

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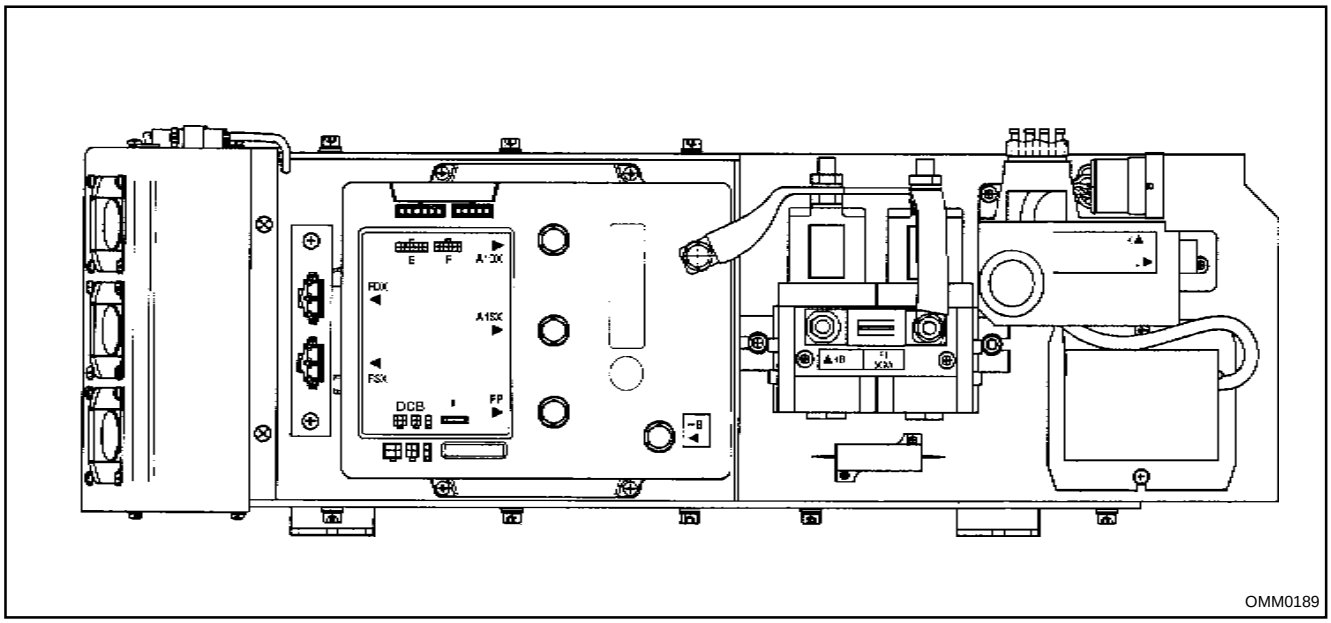
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40.1 - INTRODUCTION

MOSFET ELECTRONIC SWITCHBOARD

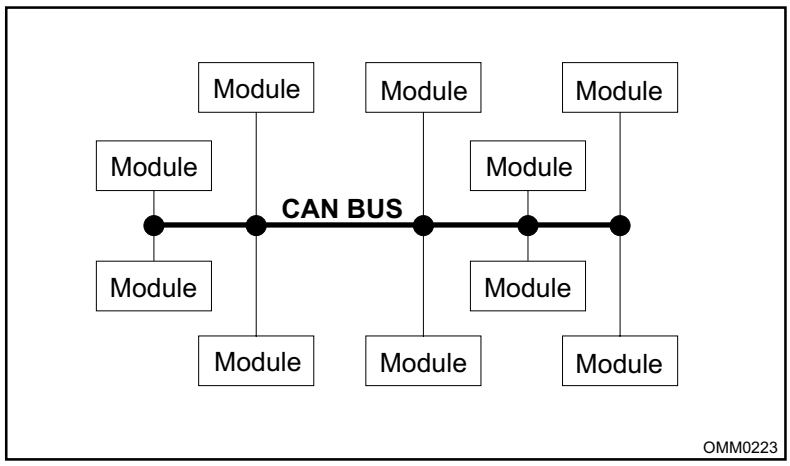


The solution installed allows separate controlling of the traction motors, the traction field, and the pump motor by means of a single microprocessor. This completely static device is composed of Mosfet modules and operates both the pump motor and the traction motors with separate excitation. This has proven to be a valid solution because it ensures that the electronic system will function properly under any operating conditions and still meet current noise standards. Also, its simple construction/application and the reliability of its components mean that the system rarely malfunctions.
Besides powering the traction motors and the pump motor, it also exchanges information with a new alphanumeric display, which is an essential component for the electronic system to work. The system includes two controls of the field current for both traction motors, two further controls of the armature current, plus one control more for the pump motor current.
Each control works separately.
The operating frequency of 16kHz renders the operation completely silent.
The currents are adjusted separately for each motor. The speed of both motors is adjusted separately based on the steering angle of the wheels, which allows a perfect electronic differential to be obtained.
The electronic braking system enables energy recovery and is activated by releasing the drive pedal, reversing direction, or by depressing the brake pedal; the force of the braking action is proportional to the brake pedal stroke.
The electronic power components are mounted onto an aluminum plate and are cooled by three electric fans, specifically designed to perform this task.
A thermal probe will also work in conjunction with the electronic system in real time whenever necessary to prevent the system from overheating.
The software-controlled electronic protection devices and the hardware-controlled, quickly reactive, protection devices are processed by the microprocessor and stored even after the ignition switch has been turned off. Malfunctions can thus be identified and an analysis performed of their frequency.
Lastly, the use of an RS 232 serial port and a CAN BUS data communications system ensure that all the electronic parameters have been optimized and can be accurately identified in real time on a PC or a console.

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CAN (Controller Area Network) SYSTEM
An advanced communication system

The growth of electronics applications geared toward industry is partly due to the need of customers for a greater level of safety and comfort, and partly due to legal requirements that demand greater control over the release of harmful emissions into the environment and a reduction in fuel consumption.
Conventional systems exchange data by means of dedicated signal lines, but this method is becoming more difficult and cumbersome to manage because the functions are becoming more complex. The only way to handle this is to create a network between the system components using a serial data bus system. Bosch has developed the “Controller Area Network” (CAN) specifically for this purpose.
Several basic modules are connected by a serial “bus” with the CAN System. The “bus” itself is a circuit with two wires that may be screened or not.



The purpose of the CAN is to allow any module to communicate with another module without overloading the control.
The advantages of this type of network connection are the ease with which the entire system can be configured and the ability to perform centralized diagnostics. It is also inexpensive, it functions efficiently even under difficult electrical conditions, and last but not least, transmission errors caused by magnetic interference can be identified and corrected.

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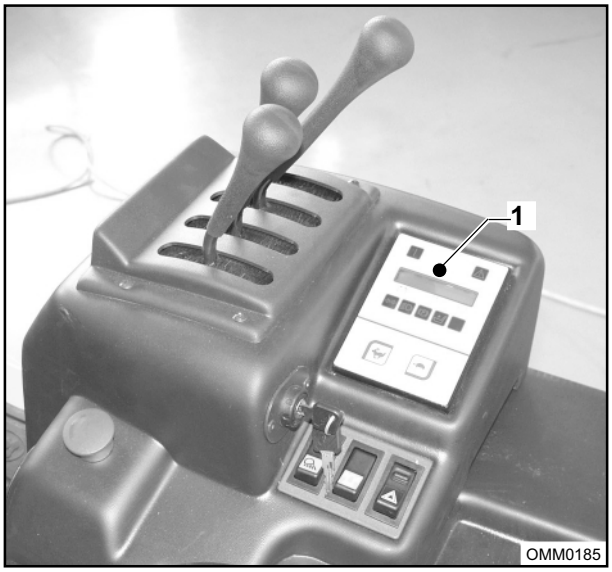
40.2 - ELECTRONIC CONTROL COMPONENTS

The electronic system consists of two Modules: DISPLAY (1) and POWER (2).

DISPLAY Module (1)

Entirely new, dust and waterproof with protection class IP 54, it includes the following pilot lights:

- Seat micro switch (red).
- Safety belts contact, optional device without symbol (red).
- Handbrake contact (red).
- Turn indicator lights (green).
- Low beam lights (green).
- Ignition switch (green).
- Alarm on (flashing red).



Moreover 2 keys,  (hare) and  (tortoise) are provided, which enable maximum speed variations in 1 km/h increments.

IMPORTANT: In this case the DISPLAY Module is not a mere indicator of electrical functions or parameters, but is an integral part of the electronic control. In fact the truck cannot be operated al all without the DISPLAY Module.

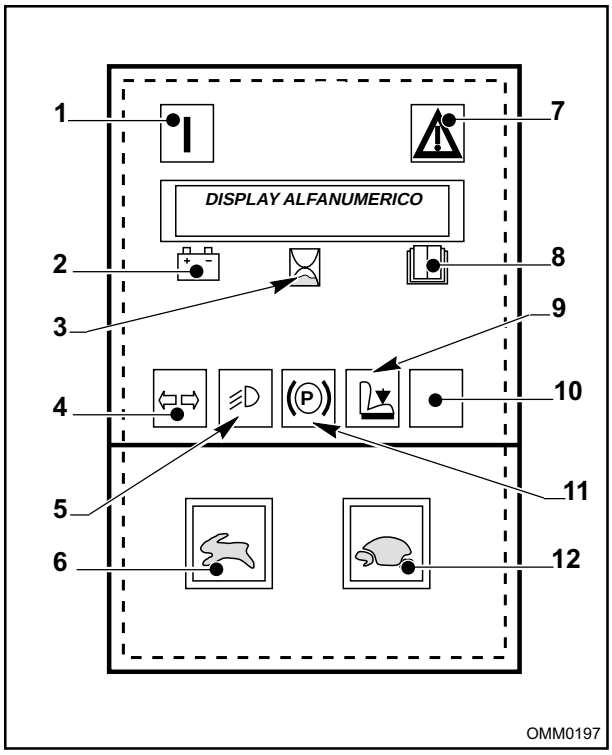
This Module:

- Controls an alphanumeric display.
- Controls two inputs for the keys “  (HARE)” and “  (TORTOISE)”.
- Receives analog and digital signals.
- Exchanges signals with the POWER Module via the CAN BUS line.
- Communicates with the console via the POWER Module.
- Allows the lift, brake pedal, and accelerator potentiometers to be calibrated.
- Allows the hydraulic functions to be modified.
- It is an integral part of the electronic system. **“The truck cannot function without the DISPLAY Module”.**

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The following information and keys are provided on the Display Module:

1= Ignition switch
2= Battery charge percentage
3= Hour meter
4= Turn indicator lights
5= Low beam lights
6= Hare key
7= Alarm on
8= Alarm list
9= Seat micro switch
10= Not used
11= Handbrake contact
12= Tortoise key



IMPORTANT:
The maximum speed reached during the last drive operation can be visualized by depressing the  **and**  **keys together with the truck at a standstill.**

If replaced, the following procedure must be performed:

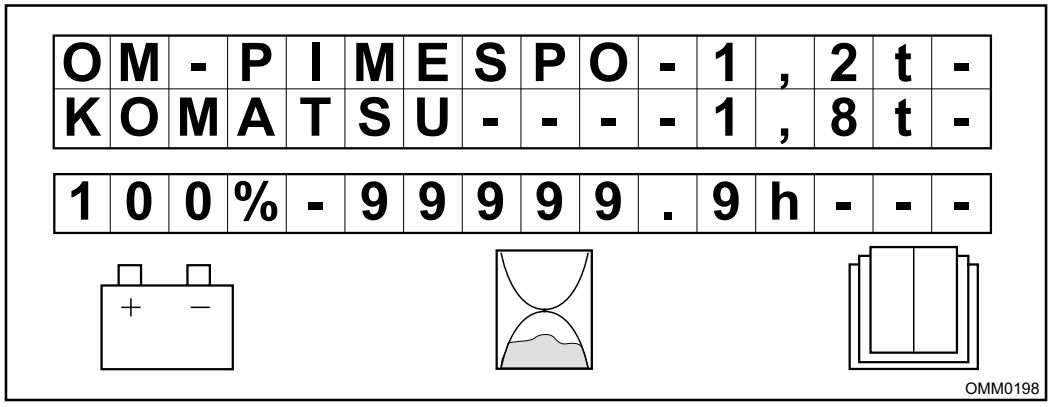
1. **Calibrate the accelerator potentiometer (see paragraph 40.5 page 19).**
2. **Calibrate the brake potentiometer (see paragraph 40.7 page 22).**
3. **Calibrate the lift potentiometer (see paragraph 40.6 page 20).**
4. **Turn the "AUX CURRENT #1" ON (see paragraph 40.13 page 46).**
5. **Customize the truck parameters (see paragraph 40.13 page 46).**
6. **Select the capacity of the truck (see paragraph 40.13 page 46).**
7. **Reset the type of scheduled maintenance (see paragraph 40.13 page 46).**
8. **Customize the buzzer actuation (see paragraph 40.13 page 46).**

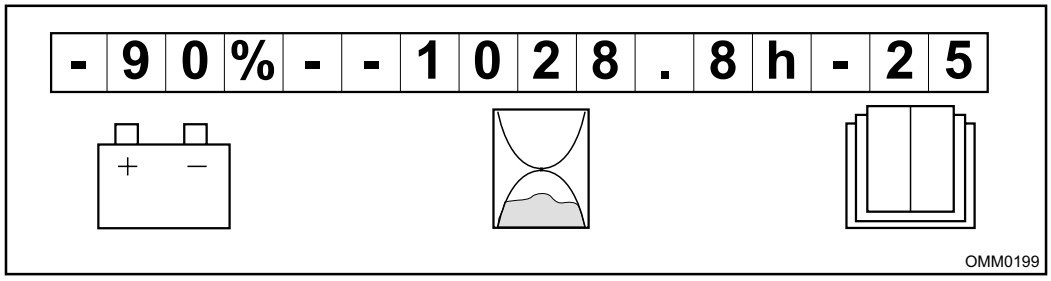
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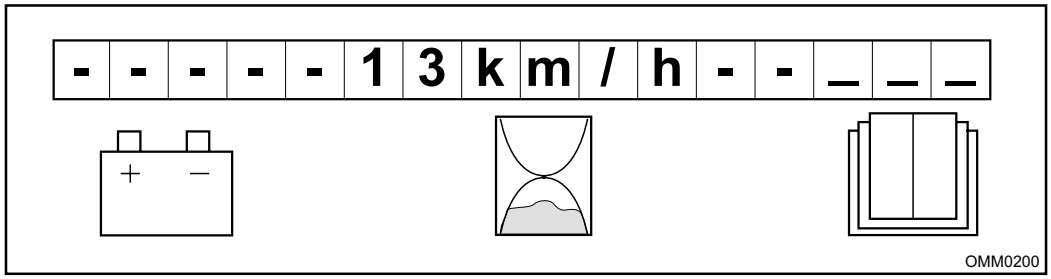
The driver can adjust the truck speed freely in 1km/h increments within a range from a maximum value of approximately 14 km/h up to a minimum value of approximately 5 km/h. The maximum and minimum values are preset by the factory and can be changed by the After Sales Department via an external console or a PC.
The maximum and minimum speed values can be identical.
Acceleration, electrical and hydraulic braking parameters can be adjusted via console/PC.
During the normal truck operation the following information are visualized (an example is pictured in Fig. OMM0198):

- Truck version: **OM PIMESPO** or **KOMATSU**, respectively.
- Battery charge percentage: in the example pictured. **100%**.
- Truck operation hours (traction motor pump motor without hydraulic steering); in the example pictured: **99999.9h.**
- Any alarm; in the example pictured (see Fig. OMM0199): **Alarm No. 25.**

The maximum speed reached during the last drive operation can be visualized by depressing the Hare and Tortoise keys together (see Fig. OMM0200): **13 km/h**.







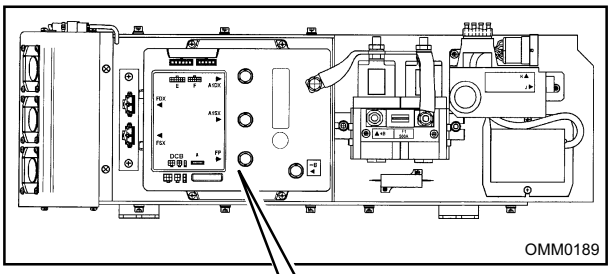
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POWER Module (2)

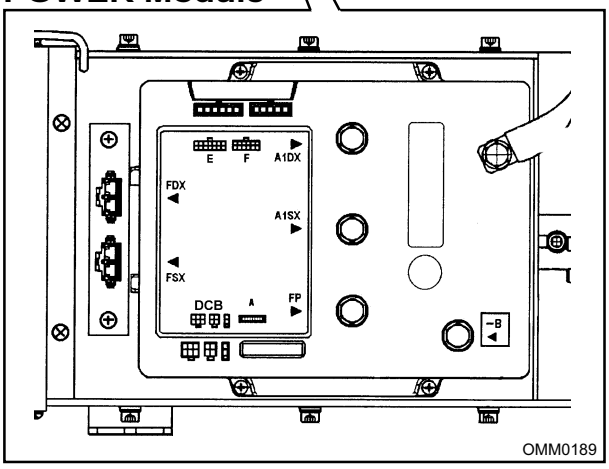
Located in the rear part of the truck, between battery and counterweight, this Module is the most important component of the electronic switchboard.
It includes the (Mosfet) power electronic components needed for the traction and pump motors to operate.
An electronic card controls the Mosfets and activates the safety circuits whenever electronic failure occur.
This Module:

- Receives signals from the DISPLAY Module via the CAN BUS connection.
- Controls all the functions of both traction motors.
- Controls the pump motor.
- Communicates with the console/PC via the serial line.
- Allows the steering potentiometer to be calibrated.
- Allows the traction/braking parameters, battery, hour counter etc., to be modified plus many other features that will be described later.

Electronic Switchboard



POWER Module



<u>If replaced, the following procedure must be performed:</u>

- **Calibrate the steering potentiometer (see paragraph 40.4 page 13).**
- **Turn the "AUX CURRENT #1" ON (see paragraph 40.13 page 46).**
- **Select the 3- or 4-wheeled type (see paragraph 40.13 page 38).**
- **Calibrate the battery-state-of-charge indicator correctly (see paragraph 40.8, pages 24-25).**
- **Select the correct capacity of the truck (see the Display module SET OPTION menu, pages 46-47).**

IMPORTANT:
The console can be connected to the POWER Module and communicate with the DISPLAY Module.

ATTENTION
THE CONSOLE MUST BE CONNECTED AND DISCONNECTED WITH THE IGNITION SWITCH TURNED OFF.

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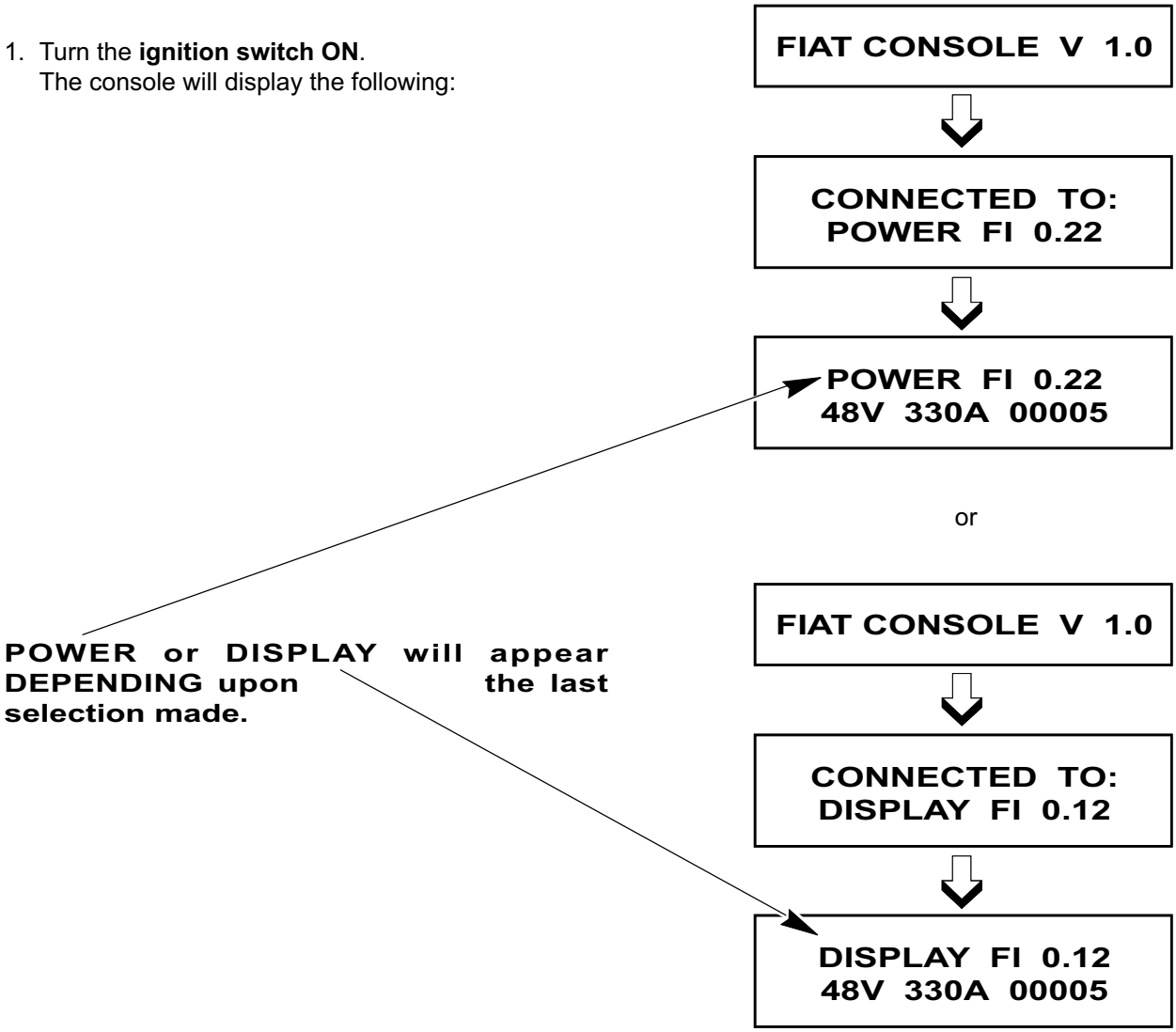
SELECTING THE MODULE (DISPLAY / POWER)

Perform the following:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console as shown (figure OMM0224).



1. Turn the **ignition switch ON**.
   The console will display the following:



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2. Depress the **PARAM** and **ROLL** ↑ keys together; the console will display:

```
CONFIG. MENU
SET MODEL
```

3. Depress the **ENTER** key.
   The console will display:

```
CONNECTED TO:
1
```

   Indicating that connection has been made to the DISPLAY Module (1).

4. Depress **PARAM** or **SET** to switch from **1** (DISPLAY Module) to **2** (POWER Module).
   The console will display:

```
CONNECTED TO:
2
```

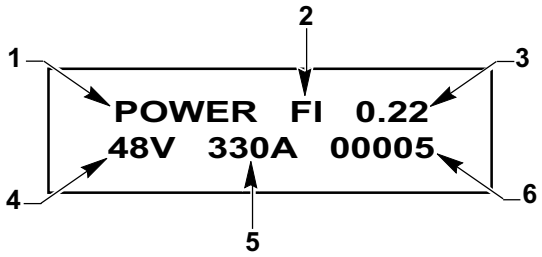
5. Depress first the **ENTER** key to confirm and then the **OUT** key to abort. The console will display:

```
ARE YOU SURE?
Yes=ENTER  No=OUT
```

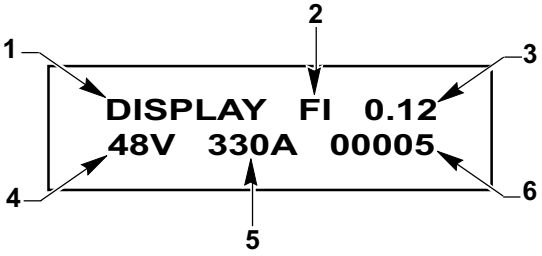
6. Depress the **ENTER** key to confirm or the **OUT** key to abort without confirming. The console will display:

```
CONFIG. MENU
SET MODEL
```

7. Turn the ignition switch **OFF** and then **ON** to display the new selection.
   The console will display:



or



1= Connection Module
2= Model
3= Software Release
4= Power
5= Maximum current for each traction motor
6= Hours of operation

IMPORTANT:

If you abort the "SET MODEL" menu without turning the ignition switch, the parameters and the associated values displayed will refer to the Module selected. The hours of operation refer to the Module selected.

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40.3 - ELECTRONIC CONTROL CONFIGURATION

SELECTING THE TYPE (3 or 4-wheeled)

If the truck has not been configured, the DISPLAY Module will display alarm **"60"**, in which case the truck can only move at a very slow rate of speed.

Proceed as follows to solve the problem:
- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select the **POWER Module (2)** (see paragraph 40.2 page 10).
  The console will display:

POWER FI 0.22 48V 330A 00005

- Depress **ROLL** ↑ + **PARAM**. The console will display:

CONFIG MENU SET MODEL

- Depress **ENTER**. The console will display:

CONNECTED TO 2

IMPORTANT:
If the console displays Connected to 1, see paragraph 40.2.

- Depress **ROLL** ↑. The console will display:

STEER TABLE 1

- Depress the **PARAM** or **SET** key to select the model type: 0 = 4-wheelde; 1 0 3-wheeled.
- Depress **ENTER**.
- Depress **OUT**. The console will display:

ARE YOU SURE? Yes=ENTER No=OUT

- Depress **ENTER** to confirm.
- After performing the above, **alarm 60** will disappear from the DISPLAY Module.

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40.4 - CALIBRATING THE STEERING AXLE POTENTIOMETER

3-WHEELED TYPE

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON.**
- Select the **POWER Module (2)** (see paragraph 40.2 page 10). The console will display:

POWER FI 0.22 **48V 330A 00005**

- Depress **ROLL↑ + PARAM**.
  The console will display:

CONFIG MENU **SET MODEL**

- Depress **ROLL↓**. The console will display:

CONFIG MENU **ADJUSTMENTS**

- Depress **ENTER**. The console will display:

SET STEER RIGHT **0,6V**

- Depress **ENTER**. The console will display:

SET STEER RIGHT **2,3V**

IMPORTANT:
The voltage depends upon the position of the wheels.

- **Turn off the seat switch and depress the brake pedal to activate the hydraulic steering function.**

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- **Turn the steering wheel completely to the right.**
  The console will display:



- Release the brake pedal.

- Depress **ENTER**, depress **OUT**.
  The console will display:



- Depress **ENTER**. The console will display:



- Depress **ENTER**. The console will display:



- Depress **ROLL↑**. The console will display:



- Depress **ENTER**. The console will display:



- **Turn off the seat switch and depress the brake pedal to activate the hydraulic steering function.**

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- **Turn the steering wheel completely to the left.**
  The console will display:

SET STEER LEFT 4,6V

- Release the brake pedal.

- Depress **ENTER** (the display will not change).

- Depress **OUT**. The console will display:

ARE YOU SURE? Yes=ENTER No=OUT

- Depress **ENTER** to confirm.
  The console will display:

CONFIG MENU ADJUSTMENTS

NB: If the procedure has been performed incorrectly, All 58 will appear on the DISPLAY Module and the console will display:

ALARM STEER SENSOR KO

Repeat the procedure described above.

Values detected by the tester /see paragraph 40.10 page 29)

3-Wheeled Type Steering Potentiometer Power 16A	**Right Limit Position** Yellow (pin E2 – POWER Module)			**Left Limit Position** Yellow (pin E2 – POWER Module)		
Orange + 16V (pin E1 – POWER Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
White – B (pin E3 – POWER Module) min.	1,5	**2**	2,5	13,5	**14**	14,5

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4-WHEELED TYPE

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select the **POWER Module (2)** (see paragraph 40.2. page 10). The console will display:

POWER FI 0.22 **48V 330A 00005**

- Depress **ROLL↑ + PARAM.**
  The console will display:

CONFIG MENU **SET MODEL**

- Depress **ROLL↓**.The console will display:

CONFIG MENU **ADJUSTMENTS**

- Depress **ENTER**. The console will display:

SET STEER RIGHT **1,0V**

- Depress **ENTER**. The console will display:

SET STEER RIGHT **2,3V**

IMPORTANT:
The voltage value depends on the position of the wheels.

- **Turn off the seat switch and depress the brake pedal to activate the hydraulic steering function.**

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- **Turn the steering wheel completely to the right.**
  The console will display:

```
SET STEER RIGHT
1,0V
```

- Release the brake pedal.

- Depress **ENTER**, depress **OUT**.
  The console will display:

```
ARE YOU SURE?
Yes=ENTER  No=OUT
```

- Depress **ENTER**. The console will display:

```
CONFIG MENU
ADJUSTMENTS
```

- Depress **ENTER**. The console will display:

```
SET STEER RIGHT
1,0V
```

- Depress **ROLL ↑**. The console will display:

```
SET STEER LEFT
3,6V
```

- Depress **ENTER**. The console will display:

```
SET STEER LEFT
1,0V
```

- **Turn off the seat switch and depress the brake pedal to activate the hydraulic steering function.**

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- **Turn the steering wheel completely to the left.**
  The console will display:

SET STEER LEFT 3,6V

- Release the brake pedal.

- Depress **ENTER** (the display will not change).

- Depress **OUT**. The console will display:

ARE YOU SURE? Yes=ENTER No=OUT

- Depress **ENTER** to confirm.
  The console will display:

CONFIG MENU ADJUSTMENTS

NB: If the procedure has been performed incorrectly, All 58 will appear on the DISPLAY Module and the console will display:

ALARM STEER SENSOR KO

Repeat the procedure described above.

Values detected by the tester (see paragraph 40.10 page 29)

4-Wheeled Type Steering Potentiometer Power 16A	**Right Limit Position** Yellow (pin E2 – POWER Module)			**Left Limit Position** Yellow (pin E2 – POWER Module)		
Orange + 16V (pin E1 – POWER Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
White – B (pin E3 – POWER Module)	2,9	**3,2**	3,5	11,4	**11,7**	12

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40.5 - CALIBRATING THE ACCELERATOR PEDAL POTENTIOMETER

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select the **DISPLAY Module (1)** (see paragraph 40.2 page 10). The console will display:

DISPLAY FI 0.12 **48V 330A 00005**

- Depress **ENTER**. The console will display:

MAIN MENU **PARAMETER CHANGE**

- Depress one of the two **ROLL** keys and select the **PROGRAM VACC** menu.

MAIN MENU **PROGRAM VACC**

- Depress **ENTER**. The console will display the minimum and maximum values entered for the accelerator pedal potentiometer.

VACC	**SETTING**
0.5V	**5.0V**

- Depress **ENTER**. The console will display:

MIN	**VACC**	**MAX**
0.0V		**0.0V**

- Slowly depress one of the drive pedals throughout to the end of stroke. The console will display:

MIN	**VACC**	**MAX**
0.5V		**4,8V**

- Release the pedal.
- Depress **ENTER**.
- Depress **OUT**. The console will display:

ARE YOU SURE? **Yes=ENTER No=OUT**

- Depress **ENTER** to confirm or **OUT** to abort without confirming.

Values detected by the tester (see paragraph 40.9 page 27)

Accelerator potentiometer Power 10V	**Neutral** Red (pin B 16 – DISPLAY Module)			**Limit Position** Red (pin B 16 – DISPLAY Module)		
Pink +10V (pin A6 – DISPLAY Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
Gray - B (pin A8 – DISPLAY Module)	0,6	**0,9**	1,1	5	**5,4**	6

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40.6 - CALIBRATING THE LIFT HALL SENSOR

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select the **DISPLAY Module (1)** (see paragraph 40.2. page 10). The console will display:

DISPLAY FI 0.12 **48V 330A 00005**

- Depress the **PARAM** and **ROLL ↑** keys together. The console will display:

CONFIG MENU **SET MODEL**

- Depress **ROLL ↓**. The console will display:

CONFIG MENU **ADJUSTMENTS**

- Depress **ENTER**. The console will display:

MIN	**POT** **2.9V**	**LIFT**

- **Do not move the lift lever.**

- Depress **ENTER**, depress **OUT**. The console will display:

ARE YOU SURE? **Yes=ENTER No=OUT**

- Depress **ENTER**. (The stand-by value will be saved). The console will display:

CONFIG MENU **ADJUSTMENTS**

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- Depress **ENTER**. The console will display:

MIN	POT 2.9V	LIFT

- Depress **ROLL** ↑. The console will display:

MAX	POT 2.9V	LIFT

- Pull the lift lever all the way up the voltage value will increase progressively as the lever is being pulled until it reaches the maximum value (approximately 4.3V).

- Keep the lever up and depress **ENTER**, then depress **OUT**. The console will display:

MAX	POT 4.3V	LIFT

- Depress **ENTER** to confirm the value obtained (maximum value) or depress **OUT** to abort without confirming.

ARE YOU SURE?
Yes=ENTER No=OUT

- Release the lift lever.

Values detected by the tester (see paragraph 40.9 page 27)

Lift Hall Sensor Power 10V	**Neutral** Blue (pin A7 DISPLAY Module)			**Backward Limit Position** Blue (pin A7 DISPLAY Module)		
Pink +10V (pinA6 – DISPLAY Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
Gray - B (pinA8 – DISPLAY Module)	4,6	**4,9**	5,2	7,3	**7,6**	7,9

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40.7 - CALIBRATING THE BRAKE PEDAL POTENTIOMETER

- Turn the **ignition switch OFF**.
- Connect the console.
- Turn the **ignition switch ON**.
- Select the **DISPLAY Module (1)** (see paragraph 40.2 page 10). The console will display:

DISPLAY FI 0.12 **48V 330A 00005**

- Depress the **PARAM** and **ROLL ↑** keys together. The console will display:

CONFIG MENU **SET MODEL**

- Depress **ROLL ↓**. The console will display:

CONFIG MENU **ADJUSTMENTS**

- Depress **ENTER**. The console will display:

MIN POT LIFT **3,1V**

- Depress **ROLL ↑**. The console will display:

MAX POT LIFT **4,3V**

- Depress **ROLL ↑**. The console will display:

MIN POT BRAKE **0,2V**

- **Do not depress the brake pedal.**
- Depress **ENTER**, depress **OUT**.
  The console will display:

ARE YOU SURE? **Yes=ENTER No=OUT**

- Depress **ENTER**. The console will display:

CONFIG MENU **ADJUSTMENTS**

- Depress **ENTER**. The console will display:

MIN POT LIFT **2,8V**

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- Depress **ROLL** ↑. The console will display:

MAX	POT	LIFT
	4,3V	

- Depress **ROLL** ↑. The console will display:

MIN	POT	BRAKE
	0,2V	

- Depress **ROLL** ↑. The console will display:

MAX	POT	BRAKE
	1,9V	

- Depress **ENTER**. The console will display:

MAX	POT	BRAKE
	0,2V	

- Depress the brake pedal throughout up to the end of stroke and keep it depressed. The console will display:

MAX	POT	BRAKE
	1,7V	

IMPORTANT:
This value depends upon the wear and tear of the brake shoes.

- Depress **ENTER**, depress **OUT**.
  The console will display:

ARE YOU SURE?
Yes=ENTER No=OUT

- Depress **ENTER** to save the value displayed.
- Release the brake pedal. The console will desplay:

CONFIG MENU
ADJUSTMENTS

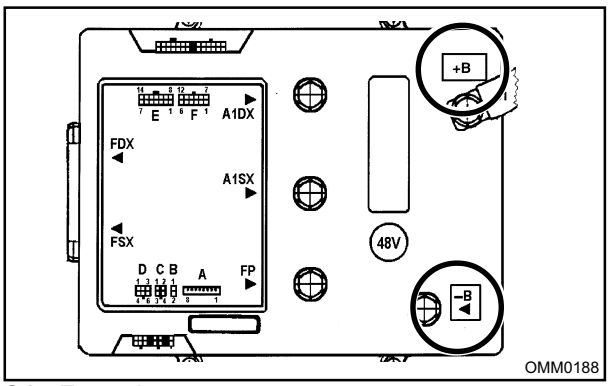
Values detected by the tester (see paragraph 40.9 page 27)

Brake potentiometer Power 10V	**Neutral** Green pin B 15 (DISPLAY Module)			**End of stroke (New shoes)** Green pin B 15 (DISPLAY Module)			**End of stroke (Worn shoes)** Green pin B 15 (DISPLAY Module)		
Pink +10V(pin A6- DISPLAY Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
Gray - B (pin A8- DISPLAY Module)	0,4	**0,6**	0,8	3,6	**3,9**	4,2	7,6	**7,9**	8,2

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40.8 - CALIBRATING THE BATTERY CHARGE INDICATOR

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the tester between **+B and -B on the POWER Module**.
- Turn the **ignition switch ON**. Read the value. Example: **volt 49.4.**
- Turn the **ignition switch OFF**.
- Connect the console.
- Turn the **ignition switch ON**.



S1= From the contactor

- Select the **POWER Module (2)** (see paragraph 40.2 page 10). The console will display:

POWER FI 0.22 48V 330A 00006

- Depress **ROLL↑ + PARAM**. The console will display:

CONFIG MENU SET MODEL

- Depress **ROLL↓**. The console will display:

CONFIG MENU ADJUSTMENTS

- Depress **ENTER**. The console will display:

SET STEER RIGHT 0,6V

- Depress **ROLL↓**. The console will display:

ADJUST BATTERY 48,1V

IMPORTANT:
Value detected by the POWER Module.

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- Depress **ENTER** to access the battery volt memory. The value will not change.
- Set the value detected by the tester using the **PARAM**↑ or **SET**↓ keys.

- Depress first **ENTER** and the **OUT**. The console will display:

```
ARE YOU SURE?
Yes=ENTER  No=OUT
```

- Depress **ENTER** to confirm the new value. The console will display:

```
CONFIG MENU
ADJUSTMENTS
```

- Depress **OUT**. The console will display:

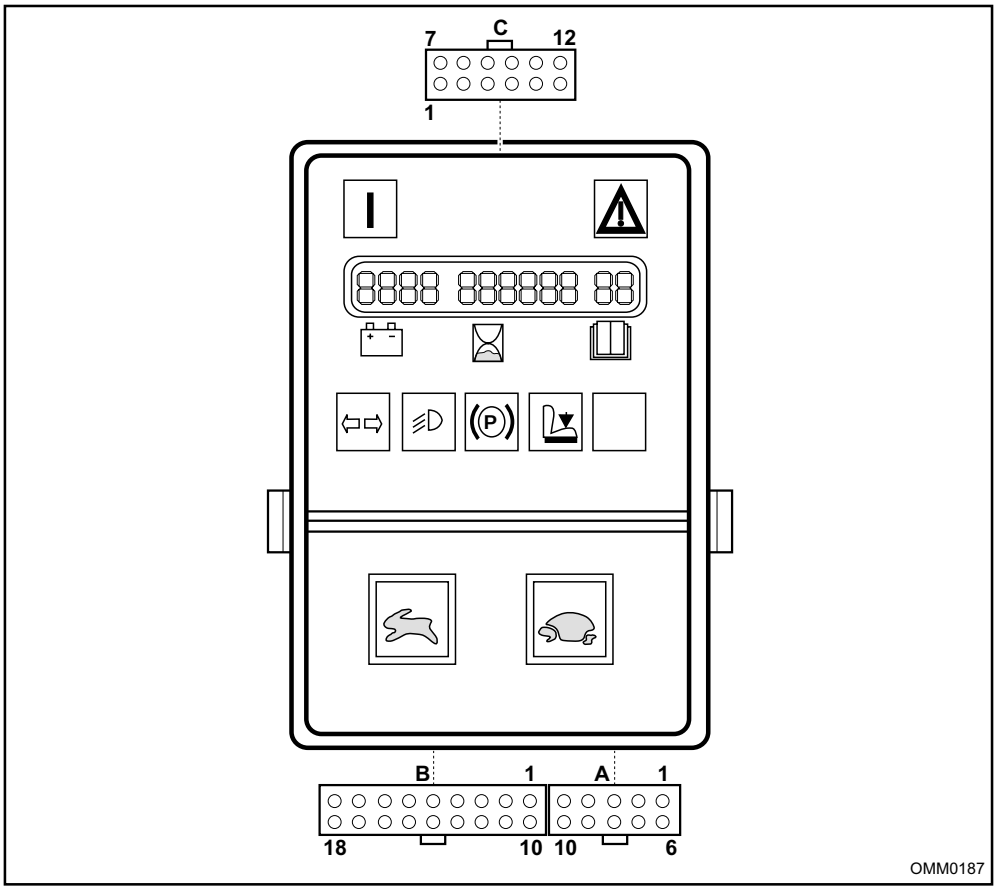
```
POWER FI 0.22
48V 330A 00006
```

The setting has been performed correctly.
The battery charge percentage will be visualized correctly on the DISPLAY Module after a short truck's operation time is elapsed.

IMPORTANT:
Hydraulic functions will properly work only if the above mentioned adjustment procedure had been correctly performed.

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40.9 - DISPLAY MODULE



Connector A

Pin No.	Description	
1	Ignition switch input (Battery+)	Red/yellow
2	Common, distributor micro switch (Battery+)	White/black
3	Not used	
4	Buzzer (Battery- max 100mA)	Violet
5	Option, distributor micro switch	Blue/red
6	+10V Power (buzzer, distributor, accelerator potentiometer and brake pedal)	Pink
7	Lift Hall sensor output	Blue
8	Potentiometer Battery-; distributor, accelerator and brake pedal	Gray
9	Tilt micro switch (normally Battery-; if operated Battery+)	White/red
10	Shift micro witch (normally Battery-; if operated Battery+)	Blue/black

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Connector B

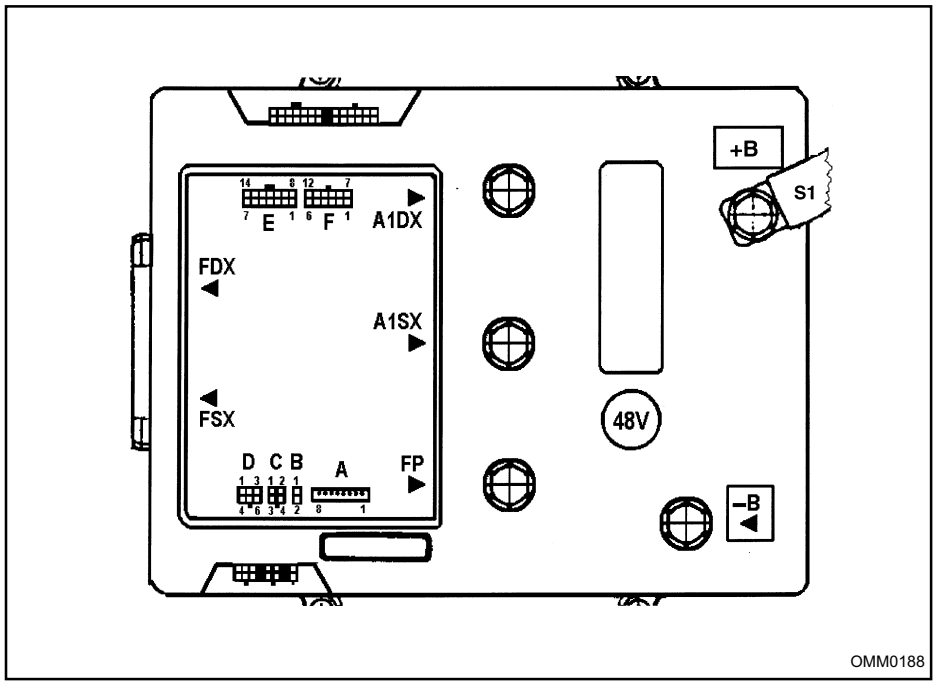
Pin No.	Description	
1	Right traction motor brushes sensor (operated with open circuit)	Black/violet
2	CAN-BUS (H) line High signal “1”	Yellow/blue
3	Forward drive micro switch, MA, (normally Battery-, if operated Battery+)	Brown/green
4	Not used	
5	Handbrake micro switch, FM, (normally Battery-, if operated Battery+)	Green
6	Common, drive micro switches (Battery+)	Light blue/black
7	Minus (insulated) CAN-BUS Supply	Green/black
8	Battery-	Black
9	Plus (+12V insulated) CA-BUS Supply	Gray
10	Left traction motor brushes sensor (operated with open circuit)	Brown
11	CAN-BUS (L) Line, Low signal “0”	Pink/black
12	Pump motor thermal switch input (TMP) (operated with closed circuit)	Brown/white
13	Backward drive micro switch, MI, (normally Battery-, if operated Battery+)	Gray/brown
14	Not used	
15	Brake potentiometer output (POT2)	Green
16	Accelerator potentiometer output (POT1)	Red
17	Not used	
18	Pump motor brush input C.U.SP. (Operated with Battery+ or Battery-)	Violet/white

Connector C

Pin No.	Description	
1	Left traction motor encoder signal A	Pink
2	Right traction motor encoder signal A	Gray/black
3	+10V Power to encoder E1 (MTD) and E2 (MTS)	Light blue/white
4	Turn indicator light signal input (+24V from DC/DC)	Yellow/black
5	Traction encoder Battery- and common PTC1 and PTC2	Orange/black
6	PTC1 Input (thermal control) right traction motor 20°C ◄► 570 Ω	Orange/green
7	Right traction motor encoder signal B	Gray/green
8	Tail lights / low beam lights signal input (+24V from DC/DC)	Yellow
9	Not used	
10	Input PTC2 (thermal control) left traction motor 20°C ◄► 570 Ω	Blue
11	Battery- of DC/DC converter (turn indicators, low beam lights, etc.)	Black
12	Left traction motor encoder signal B	Pink/yellow

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40.10 - POWER MODULE



S1= From the contactor

SPECIFICATIONS

	XE12[3]-XE15[3]-XE18[3] XE15-XE18
Rated voltage	48V
Minimum operation voltage	30V
Maximum operation voltage	60V
Maximum field current	76A (1')
Maximum pump current	350A (1')
Traction armature rated current	480A (1')
Traction armature impulse current	640A (5")
Hz Maximum field frequency	1K
Hz Switching frequency / armature control	16K
Pedal supply voltage	10V
Pedal output voltage	from 0,9 V to 5,5 V
Outer temperature limits	-25°C +40°C
Maximum radiator temperature	75°C
Efficiency	90%
Protection class	IP 42

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Connector A (console/PC)
2 Pin Connector B (not used)

Connector C

Pin No.	Description	
1	Battery- S2 contactor coil	Blue/black
2	Battery- S1 contactor coil	Yellow/black
3	Battery+ common to contactores (S1 and S2)	White/red
4	Intermediate connection for both contactor contacts	Red/green

Connector D

Pin No.	Description	
1	Ignition switch input Battery+	Red/yellow
2	Forward drive micro switch (Battery+ if operated)	Brown/green
3	CAN BUS (H) Line, High signal “1”	Yellow/blue
4	Emergency switch Battery+	Red/green
5	Backward drive micro switch (battery+ if operated)	Gray/brown
6	CAN BUS (L) Line, Low signal “0”	Pink/black

Connector E

Pin No.	Description	
1	+16V Steering potentiometer power supply POT 3	Orange
2	Steering potentiometer output POT3 (OUT)	Yellow
3	Battery- steering potentiometer POT3	White
4	Not used	
5	Not used	
6	Seat micro switch (Battery- if operated)	Violet
7	Safety belts micro switch (Battery- if operated)	White
8	Battery- common to safety belts micro switches and seat contact	Orange/blue
9	Not used	
10	Not used	
11	Not used	
12	Battery- CAN BS line power supply	Green/black
13	Not used	
14	Plus +12V (insulated) CAN BUS line power supply	Gray

Connector F (Not used)

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TABLES OVERVIEW

ANALOG MAGNITUDE DEFAULT VALUES TABLE FOR: steering potentiometer, accelerator pedal potentiometer, brake pedal potentiometer, lift Hall sensor.

Data detected by the tester.

3-Wheeled Type Steering Potentiometer Power 16A	**Right Limit Position** Yellow (pin E2 – POWER Module)			**Left Limit Position** Yellow (pin E2 – POWER Module)		
Orange + 16V (pin E1 – POWER Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
White – B (pin E3 – POWER Module)	1,5	**2**	2,5	13,5	**14**	14,5

4-Wheeled Type Steering Potentiometer Power 16A	**Right Limit Position** Yellow (pin E2 – POWER Module)			**Left Limit Position** Yellow (pin E2 – POWER Module)		
Orange + 16V (pin E1 – POWER Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
White – B (pin E3 – POWER Module)	2,9	**3,2**	3,5	11,4	**11,7**	12

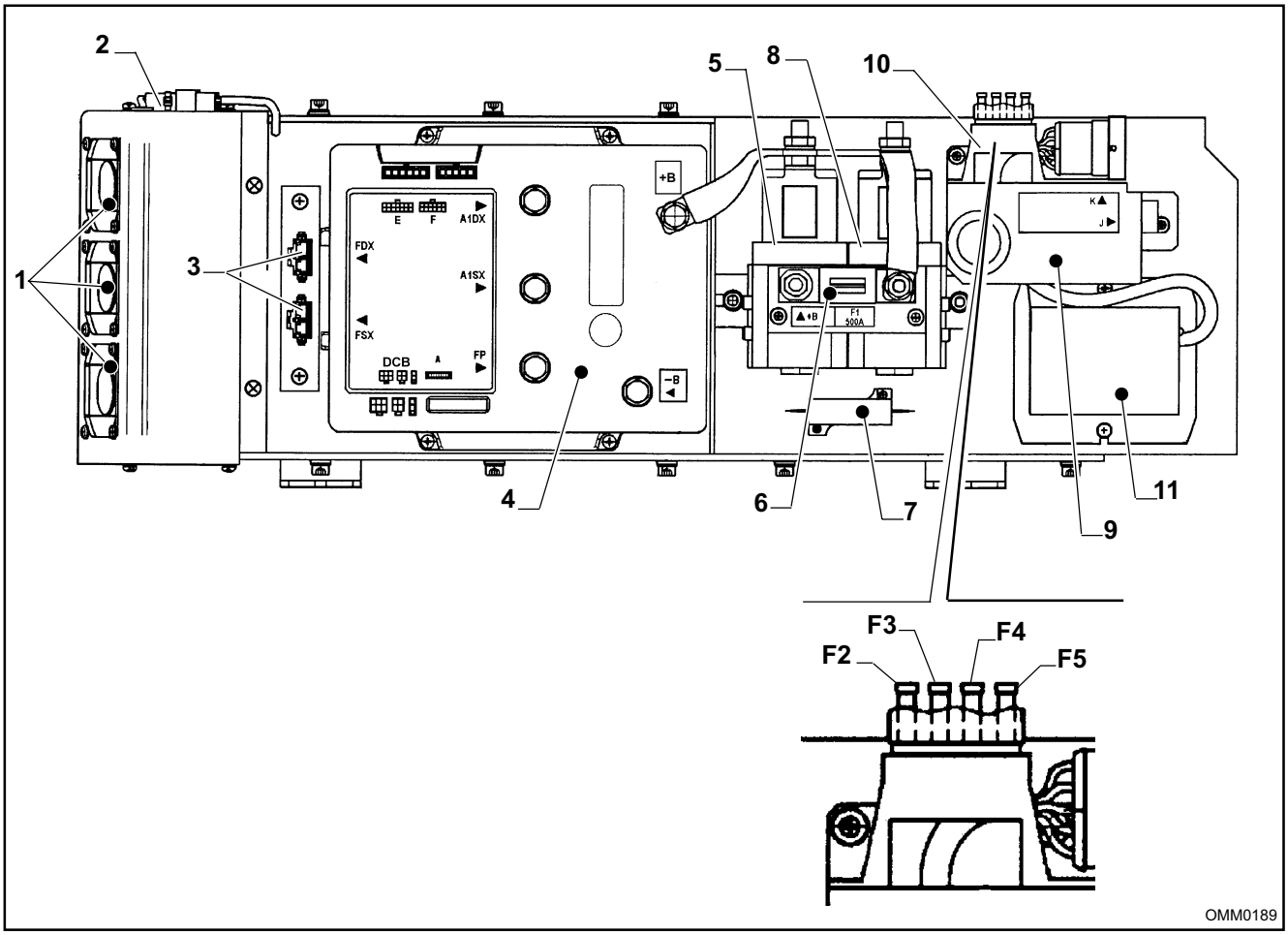
Accelerator potentiometer Power 10V	**Neutral** Red (pin B 16 – DISPLAY Module)			**Limit Position** Red (pin B 16 – DISPLAY Module)		
Pink +10V (pin A6 – DISPLAY Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
Gray - B (pin A8 – DISPLAY Module)	0,6	**0,9**	1,1	5	**5,4**	6

Brake potentiometer Power 10V	**Neutral** Green pin B 15 (DISPLAY Module)			**End of stroke (New shoes)** Green pin B 15 (DISPLAY Module)			**End of stroke (Worn shoes)** Green pin B 15 (DISPLAY Module)		
Pink +10V(pin A6- DISPLAY Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
Gray - B (pin A8- DISPLAY Module)	0,4	**0,6**	0,8	3,6	**3,9**	4,2	7,6	**7,9**	8,2

Lift Hall Sensor Power 10V	**Neutral** Blue (pin A7 DISPLAY Module)			**Backward Limit Position** Blue (pin A7 DISPLAY Module)		
Pink +10V (pinA6 – DISPLAY Module)	min. (V)	rated (V)	max. (V)	min. (V)	rated (V)	max. (V)
Gray - B (pinA8 – DISPLAY Module)	4,6	**4,9**	5,2	7,3	**7,6**	7,9

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40.11 - LOCATION OF THE ELECTRONIC COMPONENTS



CAPTION:

1. Cooling fans (3 X 3,6W-24V)
2. Fan connector
3. Traction motor field connectors
4. POWER Module
5. S1 Contactor S1
6. Power fuse F1 = 250V/500A
7. Load resistance capacitors 100 Ohm 50W
8. S2 Contactor S2
9. Buzzer
10. Control fuse holders:
F2 = 80V/5A (ignition switch fuse)
F3 = 80V/5A (horn fuse)
F4 = 80V/20A (optional lights fuse)
F5 = 80V/10A (available, but not enabled)
11. DC/DC Converter In 48V Out 24V 4,2A

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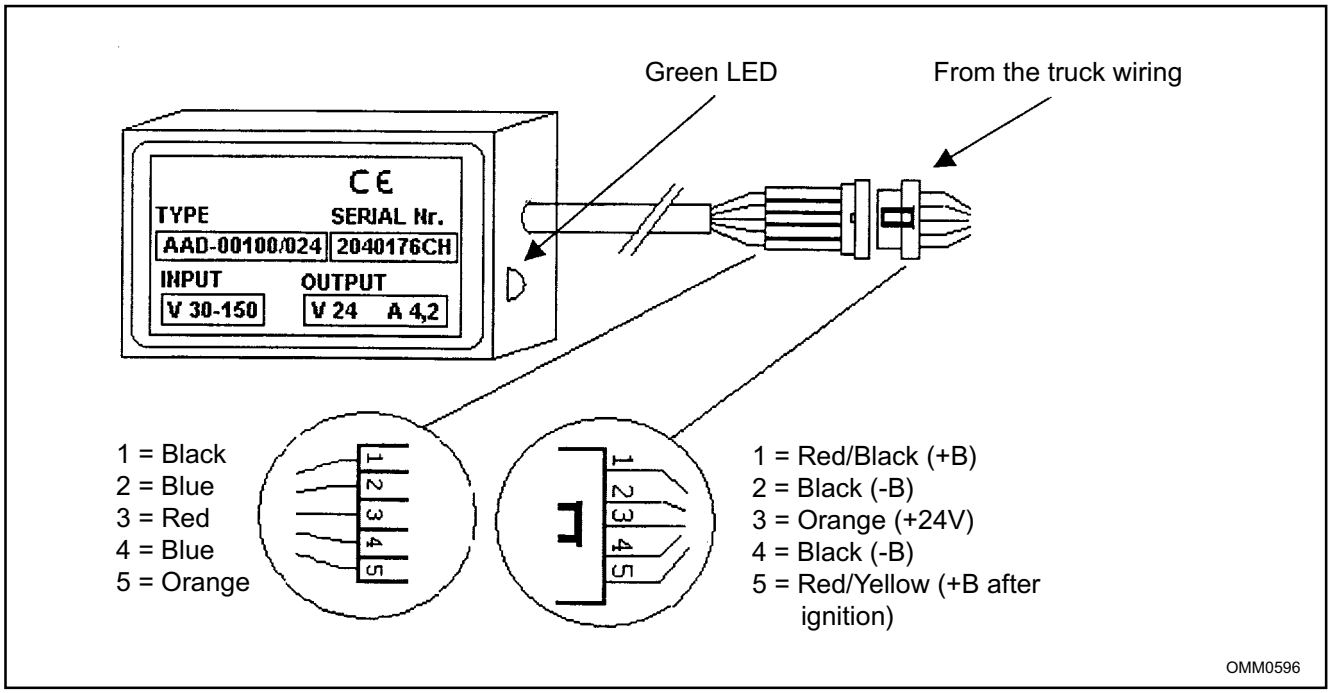
VOLTAGE REDUCER INPUT 48V OUTPUT 24V - 4.2A

Located as shown in the figure, this component reads the battery voltage (48V) and reduces it to 24V, providing a power of 100W.
It provides power to the following:

- Stop and reverse lights
- The two traction motor cooling fans
- The pump motor cooling fan
- The three electronic panel cooling fans
- The flashing light, if any (Ver. 717)

This component allows all the battery elements to discharge evenly, thus improving the life and performance of the battery itself.

Wiring diagram:



This component is powered by means of pins 1 (+Battery) and 4 (-Battery), and is activated by bringing the positive battery onto pin 5 after ignition.
When the component is activated, the green LED lights up as shown in the figure.

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40.12 - PARAMETERS

A menus set is available for both the POWER and DISPLAY Modules enabling different customizations and diagnostics.
In the following pages each parameter function and content details are explained.

POWER Module

PARAMETER CHANGE MENU (See paragraph 40.13 page 34)	**This menu enables modifying:** • Acceleration delay: "**Acceler.Delay**" • Braking when releasing the drive pedal: "**Release Braking**" • Braking when reversing: "**Invers.Braking**" • Braking by brake pedal: "**Pedal Braking**"

ADJUSTMENTS MENU (See paragraph 40.13 page 36)	**This menu enables:** • Calibrating the steering potentiometer: "**Set Steer RGT/LFT**" • Setting the battery type: "**Set Battery Type**" • Adjusting the battery value**:** "**Adjust Battery**"

SET MODEL MENU (See paragraph 40.13 page 38)	**This menu enables:** • Selecting the Communication Module: "**Connected to**" • Selecting the 3- or 4-wheeled type: "**Steer Table**"

SET OPTION MENU (See paragraph 40.13 page 39)	**This menu enables selecting:** • Hour meter operation mode: "**Hour Counter**" • Operation with empty battery: "**Battery Check**"

TESTER MENU (See paragraph 40.13 page 40)	**This menu enables displaying:** • Currents, voltages, temperatures, micro switches status, pedal output, etc....

ALARMS MENU (See paragraph 40.13 page 41)	**This menu enables displaying:** • The 5 alarms saved at last in sequence

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DISPLAY Module

PARAMETER CHANGE MENU (See paragraph 40.13 page 42)	**This menu enables modifying:** • Max. Speed reduction: "**Cutback speed**" • Max. Speed: "**Cutback Speed2**" • Lift speed: "**1ST Speed Coarse**" • Tilt speed: "**2ND Speed Fine**" • Side shift speed: "**3RD Speed Fine**" • Optional devices speed: "**4TH Speed Fine**" • Hydraulic steering delay: "**Hydro Time**"
ADJUSTMENTS MENU (See paragraph 40.13 page 44)	**This menu enables self teaching-in:** • By the lift potentiometer: "**Min/Max Pot Lift**" • By the brake potentiometer: "**Min/Max Pot Brake**"
SPECIAL ADJUST MENU (See paragraph 40.13 page 48)	**This menu enables modifying:** • DISPLAY Module contrast: "**Adjustment #3**"
SET MODEL MENU (See paragraph 40.13 page 45)	**This menu enables selecting:** • The Communication Module: "**Connected to**" • 3- or 4-Wheeled type: "**STEER TABLE**"
SET OPTION MENU (See paragraph 40.13 page 46)	**This menu enables:** • Selecting the scheduled maintenance: "**Check Up Type**" • Resetting the scheduled maintenance: "**Check Up Done**" • Selecting the hour meter operation mode: "**Hour Counter**" • Taking over the max current of the POWER Module: "**Aux Current # 1**" • Selecting the truck load capacity: "**Maximum Load**" • Customizing the truck: "**Display Name**" • Customizing the buzzer use: "**Reverse Buzzer**"
TESTER MENU (See paragraph 40.13 page 49)	**This menu enables displaying:** • Voltages, temperatures, micro switches status, brushes, motors, traction motor speed
PROGRAM VACC MENU (See paragraph 40.5 page 19)	**This menu enables:** • Calibrating the accelerator pedal potentiometer
ALARMS MENU (See paragraph 40.13 page 50)	**This menu enables displaying:** • The 5 alarms saved at last in sequence

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40.13 - MENUS and SUBMENUS

In the following all MENUS, detailed SUBMENUS (including the maximum and minimum ranges as well as the default values) and alarms which are matched to a number displayed on the DISPLAY Module, besides to a description on the console, are described. This information is useful for the customer to detect the alarm peculiarity by reading the Use and Maintenance Manual.

POWER Module

PARAMETER CHANGE MENU (POWER Module 2)

To enter the **PARAMETER CHANGE** menu, proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select the **POWER Module (2)** (see paragraph 40.2 page 10). The console will display:

```
POWER FI 0.22
48V 330A 00007
```

- Depress **ENTER.**
  The console will display:

```
MAIN MENU
PARAMETER CHANGE
```

- Depress first **ENTER** to access to the menu and then select the function needed by the **ROLL** keys.
- Depress the **PARAM** or **SET** keys to modify the value.
- Depress first **ENTER** and then **OUT**. The console will display:

```
ARE YOU SURE?
Yes=ENTER  No=OUT
```

- Depress **ENTER** to confirm or **OUT** to abort.

IMPORTANT:

Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

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PARAMETER CHANGE MENU

Submenu Parameter Description	Application range (The default settings are marked with a boldfaced frame)									
ACCELER.DELAY Modifies the acceleration delay	**Measurement unit: sec**									
	0	1	2	**3**	4	5	6	7	8	9
	2	2,3	2,7	**3**	3,3	3,7	4	4,3	4,7	5
RELEASE BRAKING Modifies the electronic braking efficiency when releasing the drive pedal.	**Measurement unit: sec**									
	0	1	2	3	4	5	6	7	8	**9**
INVERS. BRAKING Modifies the electronic braking efficiency when reversing.	**0 = weak 9 = strong**									
	0	1	2	3	4	5	6	7	8	**9**
BRAKING PEDAL Modifies the electronic braking efficiency when braking by the brake pedal.	**0 = weak 9 = strong**									
	0	1	2	3	**4**					

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ADJUSTMENT MENU (POWER Module)

To enter the **ADJUSTMENT** menu, proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- **Turn the ignition switch ON**.
- Select the **POWER Module (2)** (see paragraph 40.2 page 10). The console will display:

POWER FI 0.22 **48V 330A 00007**

- Depress **ROLL** ↑ + **PARAM**. The console will display:

CONFIG MENU **SET MODEL**

- Depress **ROLL** ↓. The console will display:

CONFIG MENU **ADJUSTMENTS**

- Depress **ENTER**. The console will display:

  For the 3-wheeled type

SET STEER RIGHT **0,6V**

  Or,

  for the 4-wheeled type.

SET STEER RIGHT **1,0V**

- Depress any of both **ROLL** keys to display the submenus

IMPORTANT:

Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

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ADJUSTMENT MENU

Submenu Parameter Description	Application range		
SET STEER RIGHT Takes over the steering potentiometer value at the right limit stop.	**Measurement unit: V**		
	Minimum acceptable		Maximum acceptable
	0,89 (4-wheeled type)		1,09 (4-wheeled type)
	0,46 (3-wheeled type)		0,77 (3-wheeled type)
SET STEER LEFT Takes over the steering potentiometer value at the left limit stop.	**Measurement unit: V**		
	Minimum acceptable		Maximum acceptable
	3,49 (4-wheeled type)		3,68 (4-wheeled type)
	4,43 (3-wheeled type)		4,76 (3-wheeled type)
SET BATTERY TYPE Sets the battery type.	Option 1		Option 2
	Lead based		CHAMPION
ADJUST BATTERY Adjusts the battery value read in the TESTER MENU to the actually measured battery value. (See paragraph 40.8)	**Measurement unit: V**		
	47,5V (Value detected by the POWER Module)		

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SET MODEL MENU (POWER Module)

Proceed as follows to access the **SET MODEL** menu:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **POWER Module (2)** (see paragraph 40.2. page 10). The console will display:

POWER FI 0.22 **48V 330A 00007**

- Depress **ROLL** ↑ + **PARAM**. The console will display:

CONFIG MENU **SET MODEL**

- Depress **ENTER**. The console will display:

CONNECTED TO **2**

IMPORTANT:
Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

SET MODEL MENU

Submenu Parameter Description	Possible options		
STEER TABLE Selects the type.	**Option 0** 4-wheeled type	**Option 1** 3-wheeled type	**Option 2** Type not configured
CONNECTED TO Selects the Module which you intend to communicate.	**Option 1** Display	**Option 2** Power	

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SET OPTION MENU (POWER Module)

Proceed as follows to access the **SET OPTION** menu:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **POWER Module (2)** (see paragraph 40.2 page 10). The console will display:

POWER FI 0.22 48V 330A 00007

- Depress **ROLL ↑** + **PARAM**. The console will display:

CONFIG MENU SET MODEL

- Depress **ROLL ↑**. The console will display:

CONFIG MENU SET OPTION

- Depress **ENTER**. The console will display:

HOUR COUNTER RUNNING

IMPORTANT:
Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

SET OPTIONS MENU

Submenu Parameter Description	Possible options (The default settings are marked with a boldfaced frame)	
HOUR COUNTER Selects the hour meter operation mode.	**KEYON**	**RUNNING**
	Active whenever the ignition switch is on	Active with traction and/or pump motor
BATTERY CHECK Operation mode whenever the battery is empty.	**Option 1**	**Option 2**
	Lock up of all hydraulic functions except for the hydraulic steering	Drive speed reduction to approx. 5 km/h

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TESTER MENU (POWER Module)

Proceed as follows to access the **TESTER** menu:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **POWER Module (2)** (see paragraph 40.2. page 10). The console will display:

POWER FI 0.22 48V 330A 00007

- Depress **ENTER**. The console will display:

MAIN MENU PARAMETER CHANGE

- Depress **ROLL ↑**. The console will display:

MAIN MENU TESTER

IMPORTANT:
Use the ROLL keys to scroll through the submenus.

TESTER MENU

L VMN R	L I MOTOR R	L FIELD CURR R
VMN (R) right motor armature voltage. VMN (L) left motor armature voltage.	Right motor armature voltage (R) and left motor armature voltage (L).	Right motor field current (R). Left motor field current (L).
Measurement unit: V	Measurement unit: A	Measurement unit: A
PUMP VMN	**PUMP CURRENT**	**BATTERY VOLTAGE**
Voltage at the pump motor terminal ends.	Pump motor current.	Battery voltage.
Measurement unit: V	Measurement unit: A	Measurement unit: V
STEER ANGLE	**TR. ACCELERATOR**	**LIFT ACCELERATOR**
Displays the steering angle.	Accelerator pedal output received from the CAN BUS line.	Hall sensor output received from the CAN BUS line.
Measurement unit: degree	Measurement unit: V	Measurement unit: V
TEMPERATURE	**SEAT SWITCH**	**FORWARD SWITCH**
POWER Module temperature.	Seat micro switch status (ON/OFF-GND).	Forward drive micro switch status (ON/OFF-GND).
Measurement unit: °c		
BACKWARD SWITCH	**SEATBELT SWITCH**	**BATTERY CHARGE**
Backward drive micro switch status (ON/OFF-GND).	NOT ENABLED	Battery charge percentage.
		Measurement unit: %
DIGITAL INPUT # 1	**DIGITAL INPUT # 2**	**DIGITAL INPUT # 3**
NOT ENABLED	NOT ENABLED	NOT ENABLED

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ALARMS MENU (POWER Module)

To enter the **ALARMS** menu proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **POWER Module (2)** (see paragraph 40.2. page 10). The console will display:

```
POWER FI 0.22
48V 330A 00007
```

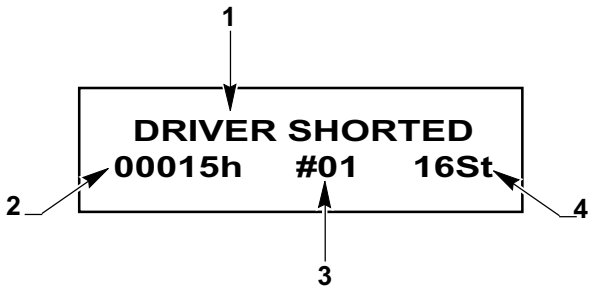
- Depress **ENTER**. The console will display:

```
MAIN MENU
PARAMETER CHANGE
```

- Depress **ROLL ↑** and keep it depressed as long as the console displays:

```
MAIN MENU
ALARMS
```

- Depress **ENTER**. The console will display the last alarm saved, if there is any:
  Example:



  1= Alarm identification
  2= Operation hours before the failure occurred
  3= Failure repetition
  4= Software information

- The other alarms can be visualized by depressing the **ROLL** keys.
- To delete the alarm memory depress **OUT**. The console will display:

```
CLEAR LOGBOOK?
Yes=ENTER No=OUT
```

- Depress **ENTER**. The console will display:

```
ARE YOU SURE?
Yes=ENTER No=OUT
```

- Depress **ENTER**. The console will display:

```
LOGBOOK CLEARED!
(PRESS OUT)
```

- If no **ALARMS** are available the console will display:

```
NONE
00000h #00 0St
```

- Depress **OUT** to return to the starting MENU.

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DISPLAY Module
PARAMETER CHANGE MENU (DISPLAY Module)

To enter the **PARAMETER CHANGE** menu proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2. page 10). The console will display:

DISPLAY FI 0.12 48V 330A 00007

- Depress **ENTER**. The console will display:

MAIN MENU PARAMETER CHANGE

- Depress **ENTER** and select the function required by the **ROLL** keys.

IMPORTANT:
Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

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PARAMETER CHANGE MENU

Submenu Parameter Description	Application range (The default settings are marked with a boldfaced frame)									
1ST SPEED COARSE Lift speed adjustment unladen.	**Measurement unit: %Vbatt**									
	0	1	2	3	**4**					
	40	50	68	72	**76**					
2ND SPEED FINE Tilt speed adjustment unladen.	**Measurement unit: %Vbatt**									
	0	1	2	3	4	**5**				
	0	5	14	19	20	**22**				
3RD SPEED FINE Side shift speed adjustment unladen.	**Measurement unit: %Vbatt**									
	0	1	2	3	4	5	**6**			
	0	5	14	19	20	22	**25**			
4TH SPEED FINE Optional devices speed adjustment unladen.	**Measurement unit: %Vbatt**									
	0	1	2	3	4	**5**	6	7	8	9
	0	5	14	19	20	**22**	25	30	35	40
HYDRO TIME Delay time elapsing from the hydraulic steering requirement (released handbrake, traction in stand-by) until the pump motor comes to a stop.	**Measurement unit: s**									
	0	1	2	3	4	**5**	6	7	8	9
	0	1	1.5	2	2.5	**3**	3.5	4	4.5	5
CUTBACK SPEED Maximum speed setting. This speed can be adjusted with the Hare/Tortoise keys.	**Measurement unit: km/h**									
	0	1	2	3	4	5	6	7	8	**9**
	5	6	7	8	9	10	11	12	13	**14**
CUTBACK SPEED 2 Maximum speed setting. This speed cannot be adjusted with the Hare/Tortoise keys.	**Measurement unit: km/h**									
	0	1	2	3	4	5	6	7	8	**9**
	5	6	7	8	9	10	11	12	13	**14**

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ADJUSTMENT MENU (DISPLAY Module)

This menu is enabled only provided that the traction / pump motors are to a standstill.
To enter the **ADJUSTMENTS** menu proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2. page 10). The console will display:

DISPLAY FI 0.12 48V 330A 00007

- Depress **ROLL↑ + PARAM.** The console will display:

CONFIG MENU SET MODEL

- Depress **ROLL↓**. The console will display:

CONFIG MENU ADJUSTMENTS

- Depress **ENTER**. The console will display:

MIN POT LIFT 3,11V

IMPORTANT:
Use the ROLL keys to scroll through the submenus.

ADJUSTMENT MENU

Submenu Parameter Description	Application range		
MIN POT LIFT Adjustment of the minimum output value of the lift Hall sensor.	**Measurement unit: V**		
	Minimum acceptable		Maximum acceptable
	2,9		3,3
MAX POT LIFT Adjustment of the maximum output value of the lift Hall sensor.	**Measurement unit: V**		
	Minimum acceptable		Maximum acceptable
	4,1		4,5
MIN POT BRAKE Adjustment of the minimum output value of the brake potentiometer.	**Measurement unit: V**		
	Minimum acceptable		Maximum acceptable
	0,5		1
MAX POT BRAKE Adjustment of the maximum output value of the brake potentiometer. **(With new brake shoes).**	**Measurement unit: V**		
	Minimum acceptable		Maximum acceptable
	2		2,2

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SET MODEL MENU (DISPLAY Module)

To enter the **SET MODEL** menu proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2. page 10). The console will display:

DISPLAY FI 0.12 48V 330A 00007

- Depress **ROLL** ↑ + **PARAM**. The console will display:

CONFIG MENU SET MODEL

- Depress **ENTER**. The console will display:

CONNECTED TO 1

IMPORTANT:
Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

SET MODEL MENU

Parameter Description	Application range		
CONNECTED TO Selects the Module you intend to communicate to.	Option 1		Option 2
	DISPLAY		POWER

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SET OPTION MENU (DISPLAY Module)

To enter the **SET OPTION** menu proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2. page 10). The console will display:

```
DISPLAY FI 0.12
48V 330A 00007
```

- Depress **ROLL** ↑ + **PARAM**. The console will display:

```
CONFIG MENU
SET MODEL
```

- Depress **ROLL** ↑. The console will display:

```
CONFIG MENU
SET OPTION
```

- Depress **ENTER**. The console will display:

```
CHECK UP TYPE
LEVEL = 5
```

IMPORTANT:

Use the ROLL keys to scroll through the submenus, and the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

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SET OPTION MENU

Submenu Parameter Description	Application range (The default settings are marked with a boldfaced frame)					
CHECK UP TYPE Selects the scheduled maintenance interval. The indicated operation hours are referred to the DISPLAY Module.	Option 0	No CHECK UP NEEDED message.				
	Option 1	CHECK UP NEEDED alarm after 300 hours.				
	Option 2	CHECK UP NEEDED alarm after 300 hours and speed reduction after 340 hours.				
	Option 3	CHECK UP NEEDED alarm after 450 hours.				
	Option 4	CHECK UP NEEDED alarm after 450 hours and speed reduction after 500 hours.				
	Option 5	**CHECK UP NEEDED alarm after 600 hours.**				
	Option 6	CHECK UP NEEDED alarm after 600 hours and speed reduction after 650 hours.				
CHECK UP DONE	ON	Resets to zero: the hour meter of the last maintenance operation performed; the CHECK UP NEEDED alarm and any lock / reduction.				
	OFF	Remains automatically in this mode (OFF) whenever the check-up conditions have been restored.				
HOUR COUNTER Select the hour meter operation mode.	KEYON	**RUNNING**				
	Enabled whenever the ignition switch is on.	**Enables only with traction and/or pump motor running.**				
AUX CURRENT # 1 Takes over the current saved in the POWER Module.	OFF	**ON**				
	No takeover.	**Takes over current from the controller. Switch the truck off and on.**				
MAXIMUM LOAD Selects the truck's load capacity.	0	**1**	2	3	4	
	1,2t	**1,5t**	1,8t	NOT ENABLED	NOT ENABLED	
DISPLAY NAME Customizes the truck	Option #1	Option #2				
	OM	KOMATSU				
REVERSE BUZZER Customizes the buzzer operation mode.	**ON**	OFF				
	It buzzers when driving backward.	It does not buzzer.				

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SPECIAL ADJUST MENU (DISPLAY Module)

Proceed as follows to access the **SPECIAL ADJUST** menu:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2 page 10). The console will display:

DISPLAY FI 0.12 **48V 330A 00007**

- Depress **ENTER**. The console will display:

MAIN MENU **PARAMETER CHANGE**

- Depress **ROLL** ↑ until **ALARMS** appears.

MAIN MENU **ALARMS**

- Depress **ENTER** and then the **PARAM** + **SET** keys together. The console will display:

FIAT MENU **SPECIAL ADJUST.**

- Depress **ENTER**. The console will display:

ADJUSTMENT #3 **LEVEL = 5**

IMPORTANT:

Use the PARAM and SET keys to change the values. After the last operation, press ENTER then OUT. The console will ask for confirmation (ARE YOU SURE?). At this point, press ENTER to confirm or OUT to abort without confirming.

Submenu Parameter Description	Measurement unit: 0=weak; 9=strong (The default settings are marked with a boldfaced frame)									
ADJUSTMENT # 3 Changes the DISPLAY Module brightness.	0	1	2	3	4	**5**	6	7	8	9

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TESTER MENU (DISPLAY Module)

Proceed as follows to access the **TESTER** menu:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2 page 10). The console will display:

DISPLAY FI 0.12 **48V 330A 00007**

- Depress **ENTER**. The console will display:

MAIN MENU **PARAMETER CHANGE**

- Depress **ROLL ↑**. The console will display:

MAIN MENU **TESTER**

IMPORTANT:
Use the ROLL keys to scroll through the submenus.

TESTER MENU

ACCELERATOR Accelerator pedal potentiometer output. Measurement unit: V	**LIFTING CONTROL** Lift lever Hall sensor output. Measurement unit: V	**BRAKEPEDAL POT.** Brake pedal potentiometer output. Measurement unit: V
FORWARD SWITCH Forward drive micro switch input. (ON/OFF-GND).	**BACKWARD SWITCH** Backward drive micro switch input. (ON/OFF-GND).	**LIFTING SWITCH** If ON, the lift sensor output signal exceeds the set limit value.
TILT SWITCH Tilt micro switch input. (ON/OFF-GND).	**SHIFT SWITCH** Shift micro switch input. (ON/OFF-GND).	**DIGITAL INPUT # 1** NOT ENABLED.
BRAKE SWITCH If ON, the brake sensor output signal exceeds the set limit value.	**HANDBRAKE** Handbrake micro switch input. (ON/OFF-GND).	**TEMPERATURE # 1** Right traction motor temperature. Measurement unit: °C
TEMPERATURE # 2 Left traction motor temperature. Measurement unit: °C	**PUMP MOTOR TEMP** Pump motor temperature. (ON/OFF-GND).	**RGT TRAC BRUSHES** Right traction motor brushes sensor. (ON/OFF-GND).
LFT TRAC BRUSHES Left traction motor brushes sensor. (ON/OFF-GND).	**PUMP BRUSHES** Pump motor brushes sensor. (ON/OFF-GND).	**ENCODER # 1** Right traction motor speed. Measurement unit: rpm
ENCODER # 2 Left traction motor speed Measurement unit: rpm	**HYDRO SPEED REQ** NOT ENABLED	**SEAT SWITCH** NOT ENABLED.

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ALARMS MENU (DISPLAY Module)

To enter the **ALARMS** menu proceed as follows:

- Turn the **ignition switch OFF**.
- Apply the hand brake.
- Connect the console.
- Turn the **ignition switch ON**.
- Select **DISPLAY Module (1)** (see paragraph 40.2. page 10). The console will display:

```
DISPLAY FI 0.12
48V 330A 00007
```

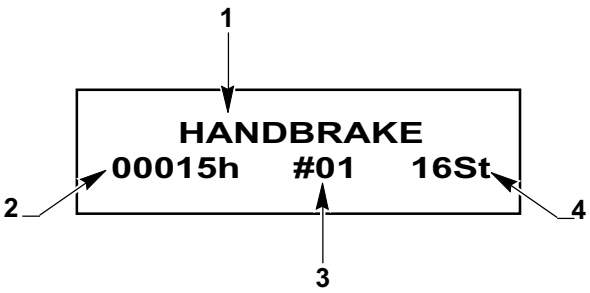
- Depress **ENTER**. The console will display:

```
MAIN MENU
PARAMETER CHANGE
```

- Depress **ROLL ↑** and keep it depressed as long as the console displays:

```
MAIN MENU
ALARMS
```

- Depress **ENTER**. The console will display the last alarm saved, if there is any:
  Example:



  1= Alarm identification
  2= Operation hours before the failure occurred
  3= Failure repetition
  4= Software information

- The other alarms can be visualized by depressing the **ROLL** keys.
- To delete the alarm memory depress **OUT**. The console will display:

```
CLEAR LOGBOOK?
Yes=ENTER No=OUT
```

- Depress **ENTER**. The console will display:

```
ARE YOU SURE?
Yes=ENTER No=OUT
```

- Depress **ENTER**. The console will display:

```
LOGBOOK CLEARED!
(PRESS OUT)
```

- If no **ALARMS** are available the console will display:

```
NONE
00000h #00 0St
```

- Depress **OUT** to return to the starting MENU.

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40.14 - ALARMS LIST

The list of alarms below shows the following information:
- The alarm number that appears on the DISPLAY Module.
- The alarm message that appears on the console.
- A short description of the meaning of the alarm.
- The function that is disabled.

N.B.: If a serious alarm appears on the DISPLAY Module, the **alarm number will light up** together with the **part light**.
If the **alarm is not serious, only the alarm number** will light up.

ALARMS TABLE

Alarm Number	Message displayed by the console	Description of the alarm	Disabled function
1	**CAPACITOR CHARGE** **Only if properly discharged V<3v**	Input capacitors were not charged during ignition. **Probable causes**: R (cut off) F1 (cut off) Or connector C pin4 POWER Module and S1/S2 cut off.	**All**
2	**R VMN NOT OK**	Voltage on the «minus» of right traction motor is lower than the battery value on standby (+B), or does not follow the set-point applied when driving.	**All**
3	**L VMN NOT OK**	Voltage on the «minus» of left traction motor is lower than the battery value on standby (+B), or does not follow the set-point applied when driving.	**All**
4	**R VFIELD NOT OK**	Voltage on the right motor field on stand-by null or different from VB/2.	**All**
5	**L VFIELD NOT OK**	Voltage on the left motor field on stand-by null or different from VB/2.	**All**
6	**PUMP VMN NOT OK**	Voltage on the «minus» of the pump motor is lower than the “plus” battery value on standby.	**All**
10	**RGT STBY I HIGHT**	Right motor armature current is high on standby. **Probable causes:** current sensor (out of calibration), Mosfet (MTD2 shorted).	**All**
11	**LEFT STBY I HIGHT**	Left motor armature current is high on standby. **Probable causes**: current sensor (out of calibration), Mosfet (MTS2 shorted).	**All**
12	**RIGHT I = 0 EVER**	Right motor current always null. **Probable causes**: current sensor (out of calibration), right motor (open), Mosfet MTD2 (open).	**All**
13	**LEFT I = 0 EVER**	Left motor current always null. **Probable causes:** current sensor (out of calibration), left motor (open), Mosfet MTS2 (open).	**All**
14	**R FIELD I LOW**	Right motor field current is low with respect to the field set point applied when driving.	**All**
15	**L FIELD I LOW**	Left motor field current is low with respect to the field set point applied when driving.	**All**

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Alarm Number	Message displayed by the console	Description of the alarm	Disabled function
16	R FIELD I HIGH	Right motor field current is high on standby.	All
17	L FIELD I HIGH	Left motor field current is high on standby.	All
18	HIGH PUMP CURR.	Pump motor current is high on standby	All
19	PUMP I=0 EVER	The current always null on pump motor when hydraulic function activated.	All
20	BATTERY LOW	Battery discharged: ≤20%. Reduced traction or lift current.	See text
21	WRONG BATTERY	Battery voltage too low contained between 18 and 3 W. Alarm when ignition switch is turned on.	All
30	CAN BUS KO CHOP	The CAN BUS line is not receiving messages from thePOWER Module.	All
31	CAN BUS KO DISP	The CAN BUS line is not receiving messages from the DISPLAY Module.	All
40	DRIVER 1 KO	The S1 contactor coil driver did not close. **Probable causes:** Coil shorted or driver's failure. White/ yellow wire on contacts S1/S2 disconnected.	All
41	DRIVER 2 KO	The S2 contactor driver did not close. **Probable causes:** Coil shorted or driver's failure.	All
42	COIL SHORTED	One of the two contactors coils shorted.	All
43	DRIVER SHORTED	One of the two contactors coil drivers is shorted. **Probable causes:** Coil S2 open - short circuit on contacts S2/S1.	All
44	CONTACTOR CLOSED	Both contactors are closed during ignition.	All
45	EMERGENCY	Emergency switch open, or power disconnected from S1-S2 coil(s).	All
50	HANDBRAKE	Truck is started with handbrake on. Traction is delayed (approx. 2s) to allow the truck to start on a slope.	Traction
51	FORW + BACK	Two drive commands entered at the same time.	Traction
52	INCORRECT START	Drive command entered upon ignition or start-up sequence is incorrect.	All
53	PUMP INC START	Hydraulic function command entered before ignition. (Except for hydraulic steering).	All
54	VACC NOT OK **(See paragraph 40.5 page 19)**	The output of traction potentiometer is high on standby when there is no drive command. A calibration might be necessary.	All
55	LIFT POT NOT OK **(See paragraph 40.6 page 20)**	The output of the lift Hall sensor is incorrect upon ignition. It may need to be calibrated. The "zero is out of calibration" and is too low.	All

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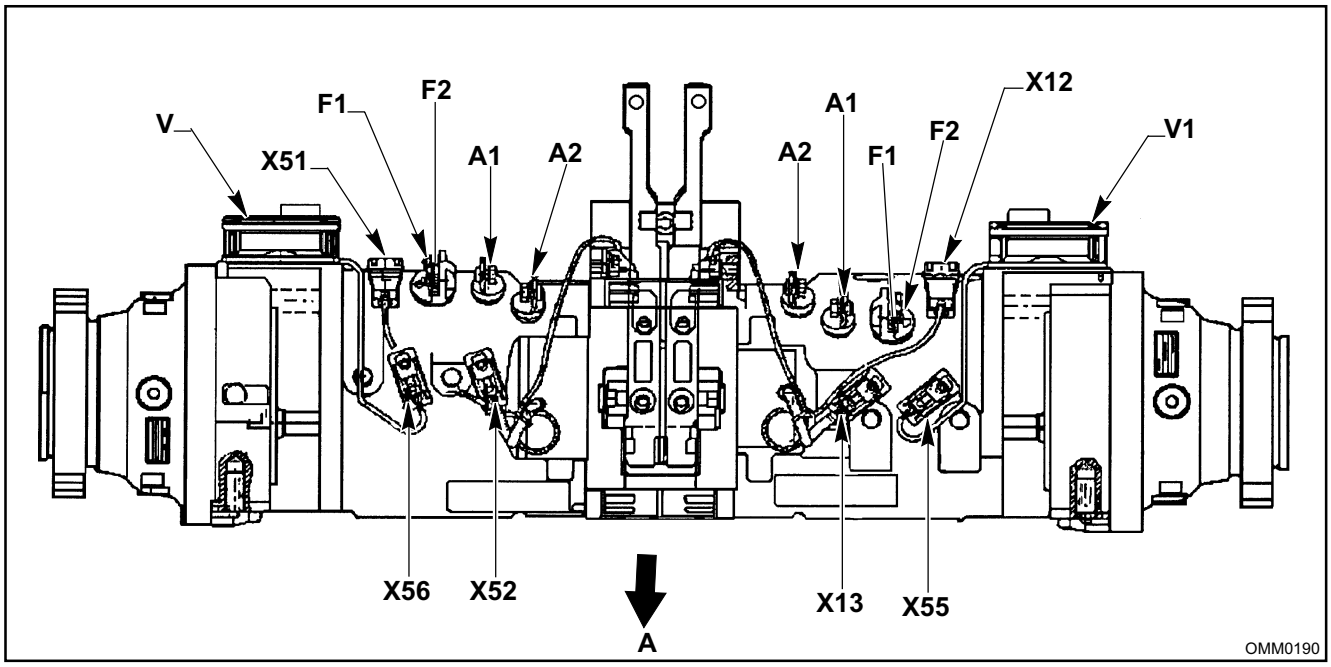
Alarm Number	Message displayed by the console	Description of the alarm	Disabled function
56	**ACC OUT OF RANGE** (See paragraph 40.5 page 19)	The output of the accelerator potentiometer is out of range. Traction is disabled; only braking is enabled.	See text
57	**LFT OUT OF RANGE** (See paragraph 40.6 page 20)	The output of the lift potentiometer is out of range. Hydraulic system is disabled, but not the hydraulic steering. A calibration might be necessary.	See text
58	**STEER SENSOR KO** (See paragraph 40.4 page 13)	Steering potentiometer malfunction signal: the steering potentiometer is broken or incorrectly programmed. A calibration might be necessary. Reduced speed.	See text
59	**STEER HAZARD** (See paragraph 40.4 page 13)	The maximum right and left steering angles programmed are not compatible with the truck type selected (3/4-wheels).	Traction
60	**CHOPPER NOT CONF** (See paragraph 40.3 page 12)	The truck type has not been selected. Output of the accelerator pedal potentiometer is forced almost to zero. Drive mode at reduced speed.	See text
61	**ENCODER ERROR**	One of the 2 encoders (or both) does not detect the voltages/currents applied. If speed control is enabled, the speed is reduced when moving.	See text
62	**CURRENT SENS. KO** (See paragraph 40.13 page 46)	The currents stored in the POWER Module are not the same as those stored in the DISPLAY Module. Traction is disabled, but braking remains enabled. Reset the alarm by activating the AUX CURRENT #1 option on the DISPLAY Module.	See text
63	**HIGH CURRENT**	The POWER Module protection software for excessive spiking of current has been activated: the current has spiked too too quickly.	None
64	**BRAKE RUN OUT**	The brake shoes need to be changed or adjusted. They can be adjusted only once, after which they must be replaced.	None
70	**WATCHDOG**	The circuit is disabled or has performed unexpected operations.	All
71	**LOGIC FAILURE # 1**	Drive inputs on the POWER Module and drive inputs on the DISPLAY Module not the same.	All
72	**LOGIC FAILURE # 2**	Diagnostics of S1 and S2 coils indicates a wrong value during ignition: logics problem.	All
73	**EEPROM KO**	Error in writing / reading of EEPROM. (Reduced speed).	See text
80	**HIGH TEMPERATURE**	The temperature of the POWER Module too high (>75°C). Current of both traction motors restricted up to 85°C, after which the traction current is reduced to zero.	See text

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Alarm Number	Message displayed by the console	Description of the alarm	Disabled function
81	**RGT TR.MOT.TEMP** **(See paragraph 30.20 page 68)**	Temperature of right traction motor too high: >160°C. Low speed.	**See text**
82	**LFT TR.MOT.TEMP** **(See paragraph 30.20 page 68)**	Temperature of left traction motor too high: >160°C. Low speed.	**See text**
83	**PUMP MOT TEMP**	Temperature of pump motor too high: >160°C. Hydraulic functions disabled, except hydraulic steering.	**See text**
90	**RGT TRAC BRUSHES**	Right traction motor brushes are worn.	**None**
91	**LFT TRAC BRUSHES**	Left traction motor brushes are worn.	**None**
92	**PUMP BRUSHES**	Pump motor brushes are worn.	**None**
99	**CHECK UP NEEDED** **(See paragraph 40.13 page 46)**	The scheduled maintenance interval has expired. Activate the CHECK UP DONE option to reset the alarm.	**As entered**

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40.15 - TRACTION MOTOR CONNECTION DIAGRAM



X51 = Right Motor Encoder Connection
F2 = Motor Field Connections
F1 = Motor Field Connections
A1 = Motor Armature Connections
A2 = Motor Armature Connections
X12 = Left Motor Encoder Connection
X56 = Right Motor Fan Connection
X52 = PTC1 Right Motor Brush Control and Thermal Probe Connection
X13 = PTC2 Left Motor Brush Control and Thermal Probe Connection
X55 = Left Motor Fan Connection
A = Forward Drive
V/V1 = Motors Cooling Fans

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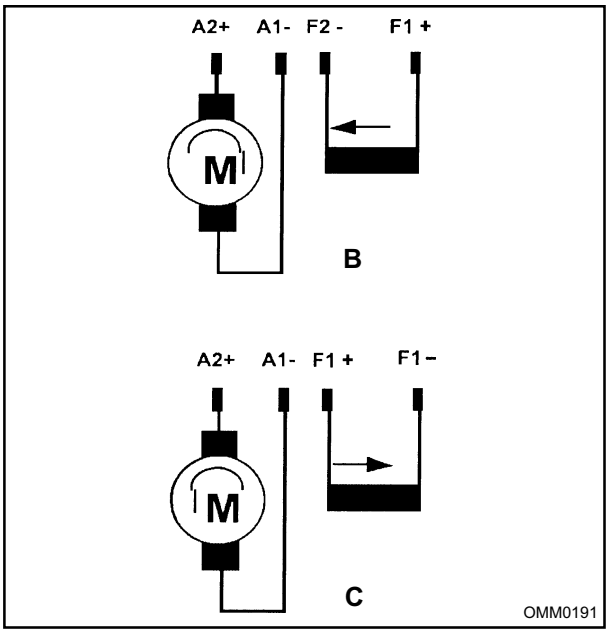
DIAGRAM

A1/A2 = Armature connection
F1/F2 = Field connection
B = Clockwise direction
C = Anti-clockwise direction

Reverse the drive direction by changing the direction of the field current.

Neutral area for the brushes
This area cannot be changed because the brush holder is in a fixed position, specifically designed by the motor manufacturer to ensure that the motor functions correctly.

The position of ARMATURE and FIELD connections are shown in figure OMM0190.



TECHNICAL DATA

Power (kW)	=	4
I minimum excitation (A)	=	5,5
I excitation (A)	=	17
I maximum excitation (A)	=	38
Rated revolutions 1/min	=	2000
Maximum revolutions 1/min	=	4000
Voltage (V)	=	48
I armature (A)	=	104
Excitation	=	12 V / 17A
Operation	=	S2 60
Protection class	=	IP 22
Insulation class	=	F
Maximum torque (N m)	=	38
Brushes	=	H100
Wear and tear limits	=	11/13 mm
Quantity	=	4
Worn brushes sensor	=	Contact on brush holder
Dimensions	=	10x40x32
Ventilation	=	Electric fans
Stator resistance (field) (Ω)	=	1,2 at 20°C
PTC on brush holder.	=	20°C ◄► 570Ω 100°C ◄►1KΩ

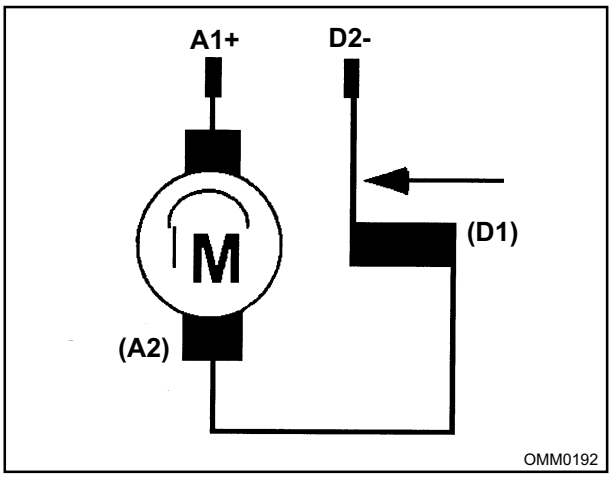
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40.16 - PUMP MOTOR CONNECTION DIAGRAM

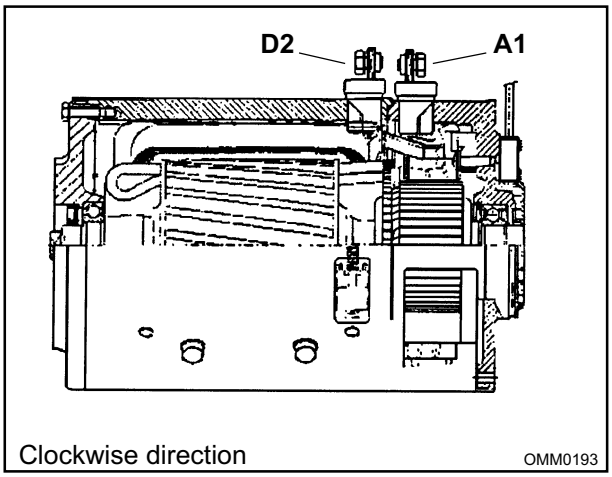
DIAGRAM

A1/(A2) = Rotor
D2/(D1) = Stator

(A2 and D1 are connections inside the motor and therefore not accessible).



Neutral area for the brushes
This area cannot be changed because the brush holder is in a fixed position, prescribed by the motor manufacturer to ensure that the motor functions correctly.



TECHNICAL DATA

Power (kW)	=	9
Voltage (V)	=	48
Operation	=	S3 15 %
Rated revolutions 1/min	=	2900
Maximum revolutions 1/min	=	4000
Maximum torque (Nm)	=	57
Current (A)	=	230
Protection class	=	IP 20
Insulation class	=	F
Brushes	=	EG 12
Wear and tear limits	=	11/13 mm
Quantity	=	4
Worn brushes sensor	=	Sensor on the brushes
Dimensions	=	12,5x32x32
Ventilation	=	Electric fans
Thermal sensor 160ºC	=	switch “NO”

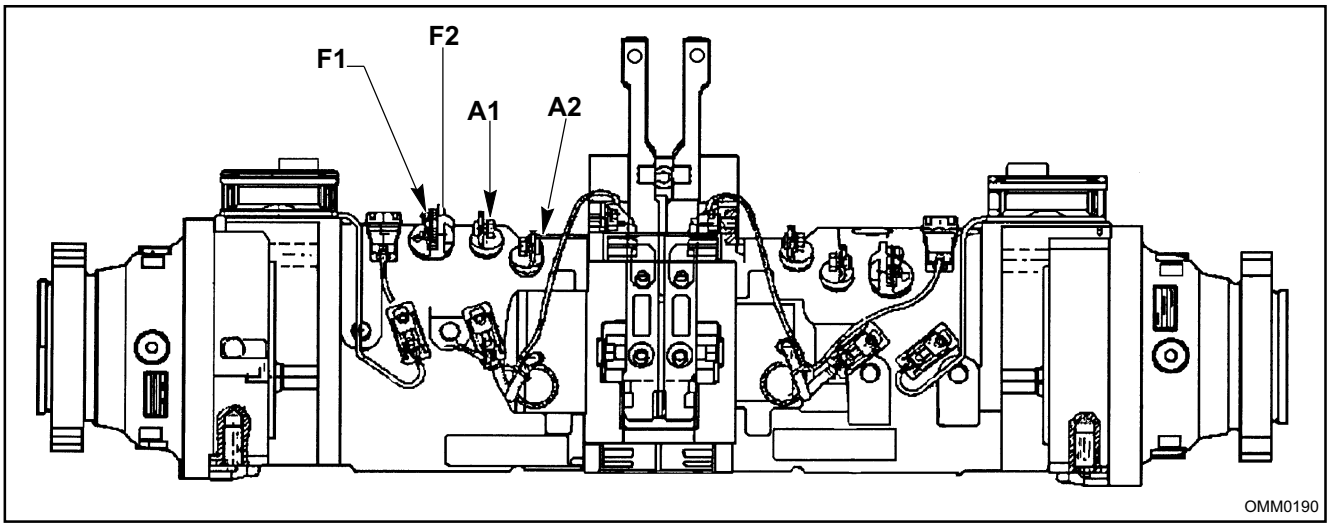
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40.17 - INSULATION RESISTANCE CONTROL

Insulation resistance for 48V trucks must be approximately 60,000 Ohm.

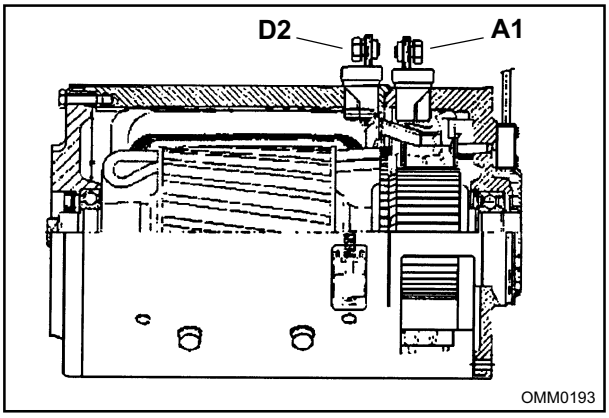
Traction Motor:
1. Between A1/A2 and axle housing.
2. Between F1/F2 and axle housing.
3. Between A1/A2 with respect to F1/F2.

Pump Motor:
1. Between D2/A1 and motor housing.



Turning the manifold:
Permissible eccentricity:
At rated revolutions (2000-2500)= 0.02mm

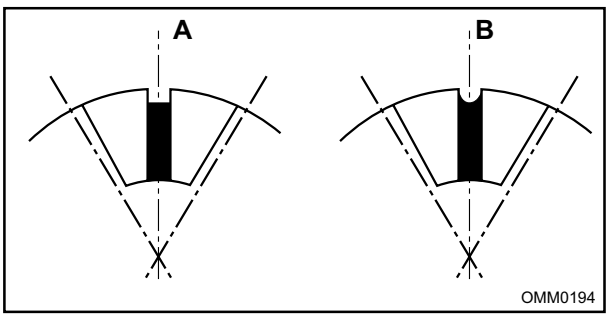
Use a lathe to turn the manifold.
The tool travel speed must be very low while the rotation speed must be very high to obtain the best results. The manifold can be turned to a diameter of 78mm for both the traction motor and the pump motor.



The manifold should be thoroughly cleaned to remove all the mica from the surface of the slot between each blade.

Depth of mica removal: approximately the width of the slot.

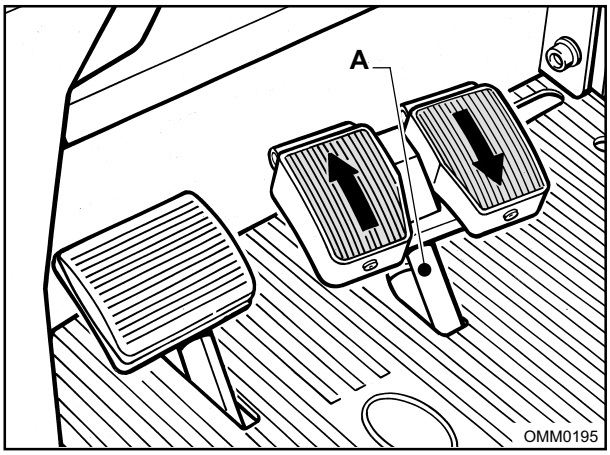
A= Correct removal of mica.
B= INCORRECT removal of mica.



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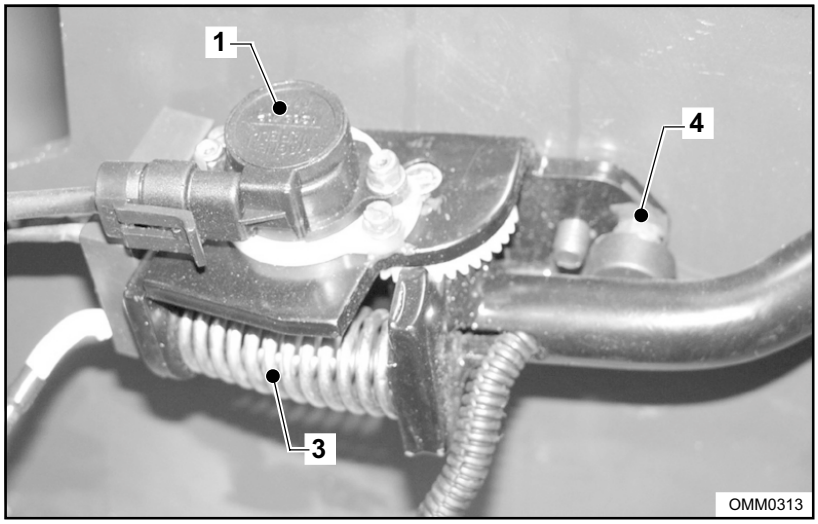
40.18 - ACCELERATOR PEDAL (A)

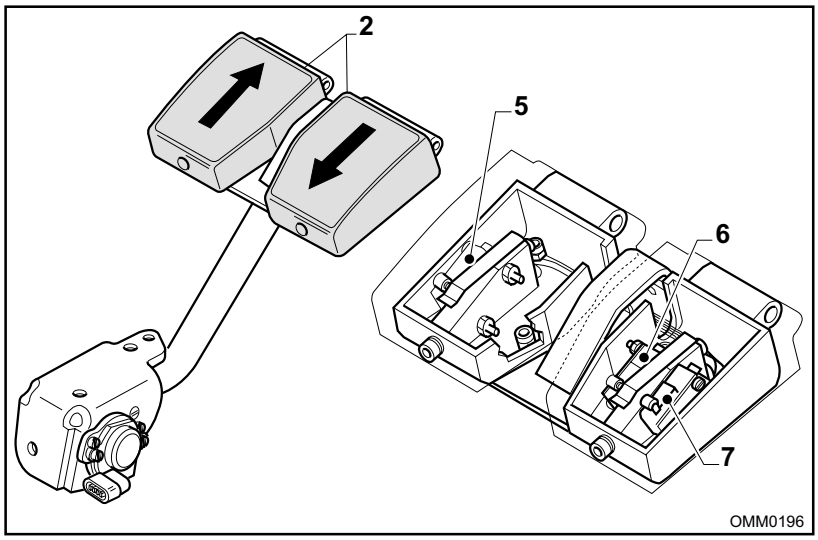
The accelerator pedal is a strong, reliable component that does not require maintenance and always functions correctly.
It sends the following information to the POWER Module: drive direction (by selecting one of the two micro switches) and the speed entered (through the variable output of the potentiometer).



COMPONENTS

The pedal is composed of the following parts:
1. Self-adjusting polymer potentiometer
2. Drive pedals marked by an arrow to indicate the drive direction
3. Return spring
4. Adjustable end of stroke and neutral pad
5. Forward micro switch
6. Backward micro switch
7. Reverse lights control micro switch





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ELECTRICAL SPECIFICATIONS:

Power voltage: ..... +10 V ..... (pink wire pin A6 DISPLAY Module)
Battery “minus”: ..... -B ..... (gray wire pin A8 DISPLAY Module)
Minimum operating voltage: ..... 0,5 V ..... (red wire pin B16 DISPLAY Module)
Maximum operating voltage: ..... 6 V ..... (red wire pin B16 DISPLAY Module)

ELECTRONIC PROTECTION DEVICES

- **Output of pedal in neutral**; if greater than 0.6V, «All 54» is displayed.
- **Output of pedal at end of stroke**, if greater than 6V, «All 54» is displayed.
- **Traction pedal**, if depressed before the ignition switch is turned on, «All 52» is displayed.
- **Direction micro switch**, if activated when the truck is at a standstill, all the traction controls are disabled and «All52» is displayed.
  If both are depressed while the truck is operating, the traction controls are disabled and the acceleration diagram will return zero.
  The controls will be enabled only when the pedal returns to the neutral position.
- **Electronic delay of approximately 500msec**, to avoid unforeseen accidents because a drive micro switch was unintentionally activated while the other was already activated. (For example if the pedal receives a hard bump or if the floor is very rough)

OVERVIEW TABLE

- Electronic adjustment range: (5.4V - 0.9V) = 4.5V.

Minimum value	Rated value	Actual mechanical range	Rated value	Maximum value
0.6V	0,9V	1,1V	5,4V	6V

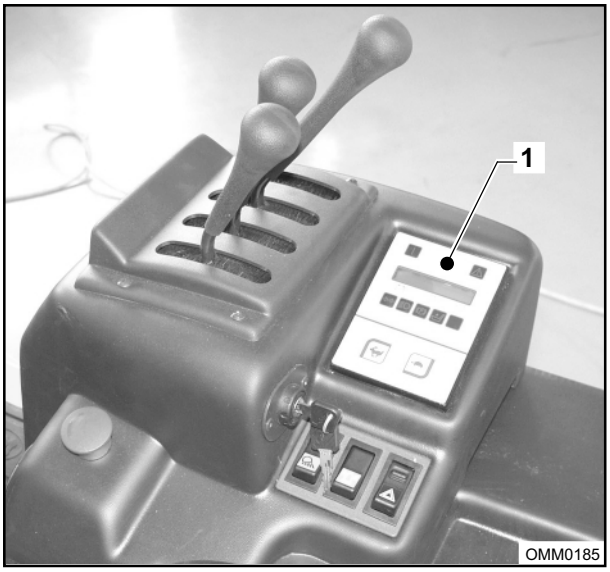
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40.19 - MAXIMUM DRIVING SPEED

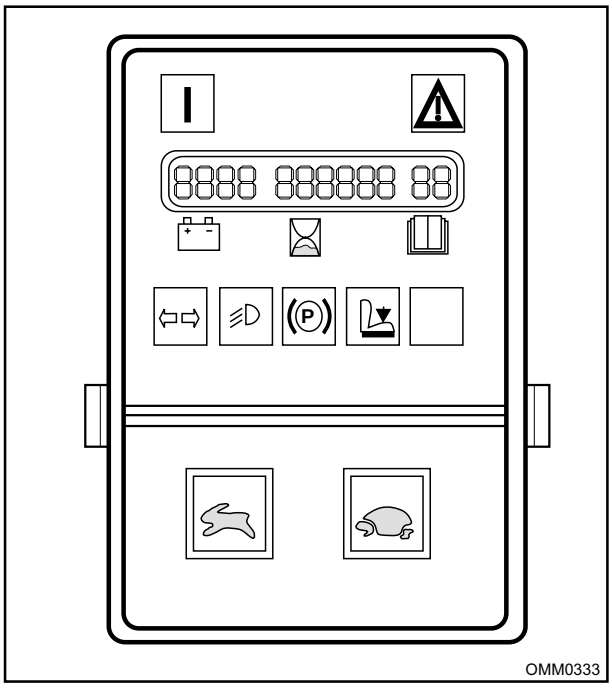
The maximum speed of the truck is defaulted to 14 km/h, which can be adjusted at any time via the DISPLAY Module (1).

Depress repeatedly the "  " key to increase the speed or the "  " key to decrease the speed.

The speed is increased or decreased in 1Km/h increments.



IMPORTANT:
The maximum speed reached during the last drive operation can be visualized bt depressing the  and  keys together with the truck at a standstill.



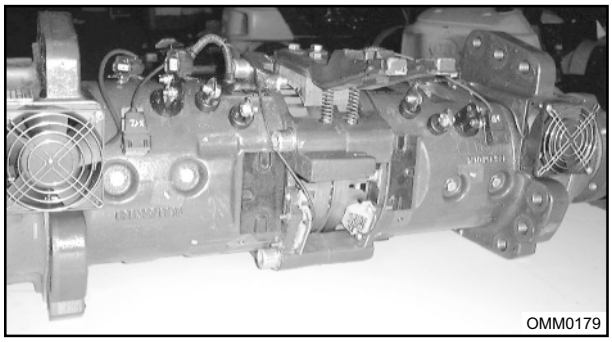
Speed

	XE 12³ - XE15³ - XE18³				XE15 - XE18			
	Speed unladen		Speed laden		Speed unladen		Speed laden	
	min	max	min	max	min	max	min	max
Forward Drive	5	14	5	14	5	14	5	14
Backward Drive	5	14	5	14	5	14	5	14

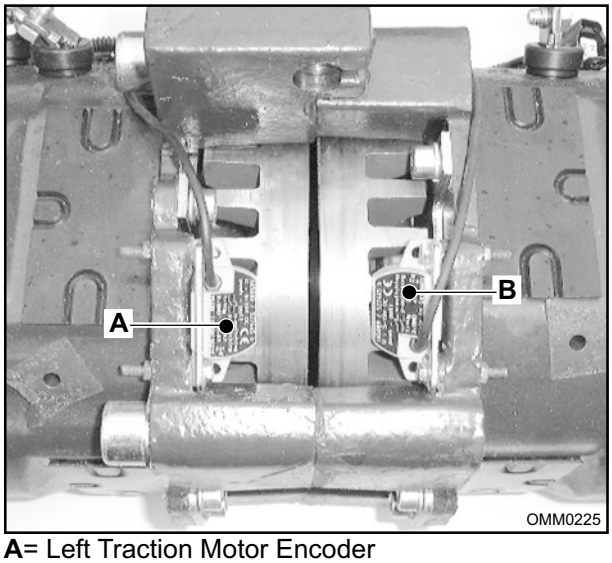
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40.20 - TRACTION ENCODER

By traction encoder, we simply mean a revolutions/ voltage transducer.
This component is mounted as shown in the picture. Its function is to convert the number of revolutions into electrical signals by using the brake pulley grooves. The signals are converted by an electronic circuit, located on the logic card of the electronic system, into useful information for both the electronic system and the driver. For example: the electronic system knows at any given time if the motors are turning, the direction they are turning, how many revolutions each motor makes, etc. The driver knows the speed at which the truck is traveling.


OMM0179

N.B.: Both Encoders are exactly the same.



OMM0225

A= Left Traction Motor Encoder
B= Right Traction Motor Encoder

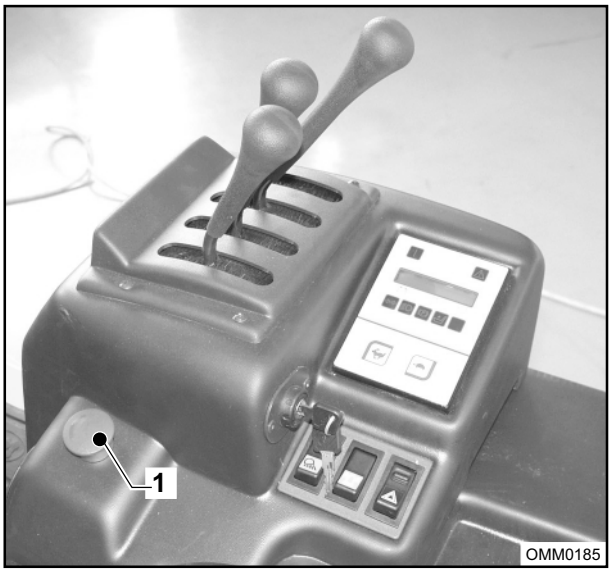
40.21 - STAND-BY

If the truck is not being used and the seat switch is open for more than 2 seconds, the electronic system will go into STAND-BY mode by cutting off the battery “plus” by opening the two line contactors (S1 and S2).
In this mode, the display is still enabled but no alarms are displayed. All the functions of the truck are disabled.

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40.22 - EMERGENCY SWITCH

A red, mushroom-head push button (1), located next to the ignition switch serves as the “emergency button”.
This push button should only be used if there is a sudden failure of electronic control.
When the push button is depressed it cuts off the power from the electronic system by opening the line contactors (S1, S2), and thus immobilizing the truck.
To restore the button standby condition, give a 1/4 turn in clockwise direction.



IMPORTANT:
If this operation is performed with a driver on board and the key in the ignition, alarm 45 will be displayed on the DISPLAY Module and all the functions of the truck will be disabled.

40.23 - AUTOMATIC SPEED ADJUSTMENT ON CURVES (Electronic differential)

New technology allows the speed of the traction motors to be managed separately while the truck is maneuvering. The electronic system uses the potentiometer located on the rear axle to adjust the speed of each motor separately without torque decrease, especially during steering operations. The perfect electronic differential obtained by this solution ensures the complete safety of the truck during steering operations, and thus avoids incorrect maneuvers and dangerous situations.
During steering operations with the three-wheeled type, the potentiometer signals to the POWER Module when to stop the curve inner wheel during steering and when to reverse the wheel rotation direction, thus obtaining a very small turning radius.
Any malfunction of the potentiometer is detected in real time by the electronic system, which will immediately activate the safety devices.

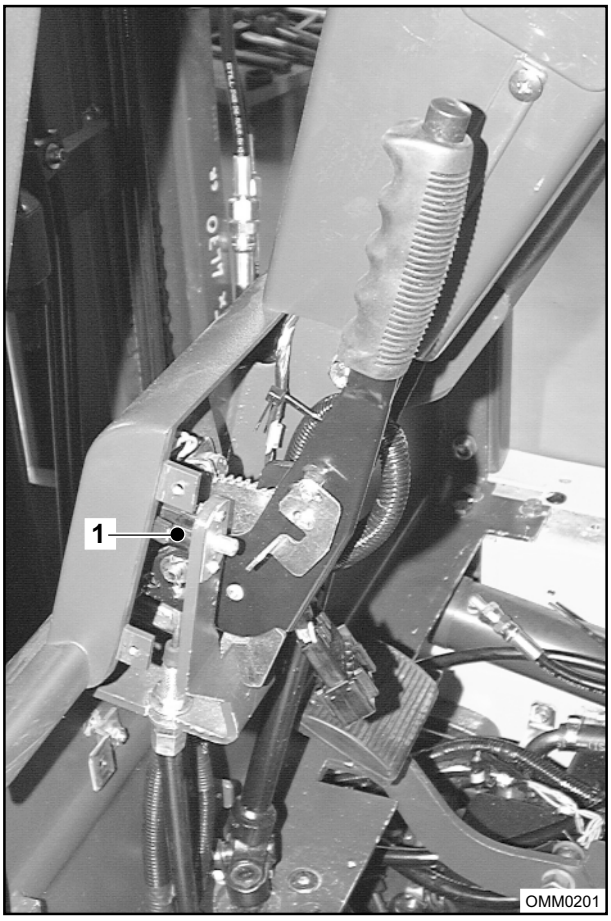
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40.24 - HAND BRAKE MICRO SWITCH

Hand brake applied (micro switch contact (1) open):

- **While the truck is at a standstill:** traction is disabled (after a set time of approximately 2 seconds) while the hydraulic system remains activated. The DISPLAY Module does not display any alarm and the hand brake warning light is lit.
- **While the truck is being operated:** the DISPLAY Module displays alarm 50, the hand brake warning light is lit, and the electronic brake is activated. Once the truck comes to a standstill, traction is disabled after approximately 2 seconds, with the exception of the hydraulic steering.

Alarm 50 is displayed because the drive pedal has been depressed.
To reset this alarm restore the pedal neutral position.

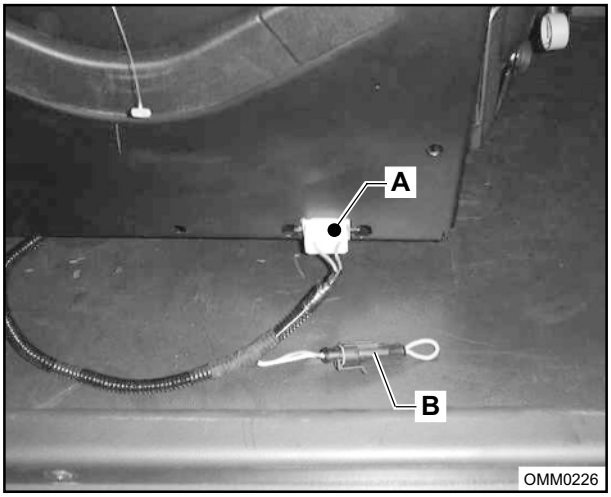


40.25 - SEAT MICRO SWITCH

Contact open:

- **Before inserting the key:** the DISPLAY Module does not display any alarm, the seat micro switch light is lit, and all the functions of the truck are disabled because the S1 and S2 contactors do not close, and an acoustic signal will continue to sound while the situation persists.
  If the drive pedal is depressed while the truck is in this condition, alarm 52 is displayed on the DISPLAY Module, which can be reset by releasing the pedal. If the reverse pedal is depressed, alarm 52 is displayed, the reverse lights will light up, and the acoustic signal continues to sound while the situation persists.

- **While the truck is being operated:** the DISPLAY Module displays alarm 52, the seat contact light is lit, the electronic brake is activated, and when the truck comes to a standstill, the functions of the truck will be disabled after approximately 2 seconds, with the exception of the hydraulic steering.

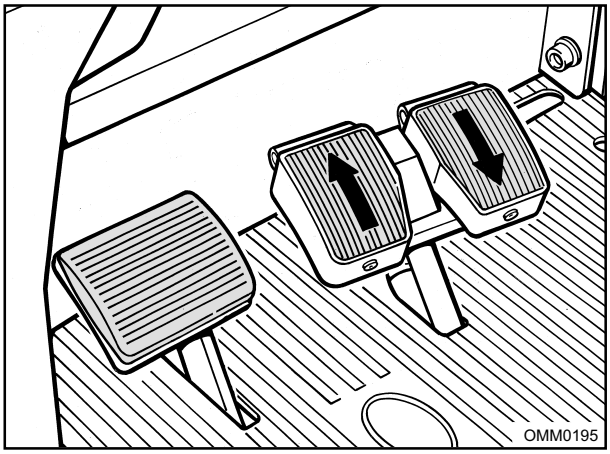


A= Seat microswitch connector
B= Safety belts micro switch preparation

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40.26 - HYDRAULIC STEERING

This function is activated whenever a pedal is depressed. The delay (pump motor revolution time elapsing after the wheels have stopped) can be adjusted by means of the console/PC.



IMPORTANT:

Particular circumstances:

a) **Truck to a standstill, driver sitting; ignition switch ON and handbrake released.**
In this situation, if the truck is moved without any driver's intervention, the hydraulic steering function is enabled automatically and remains active as long as the truck comes to a complete stop.

b) **Truck to a standstill, ignition switch ON, driver not on board and handbrake released.**
In this situation the buzzer sounds repeatedly and the hydraulic steering function is not enables, should the truck be moved.

c) **Truck moving.**
In this situation, if the driver abandons the truck, the hydraulic steering function remains enables as long as the truck comes to a stop; after this moment the buzzer sounds repeatedly.

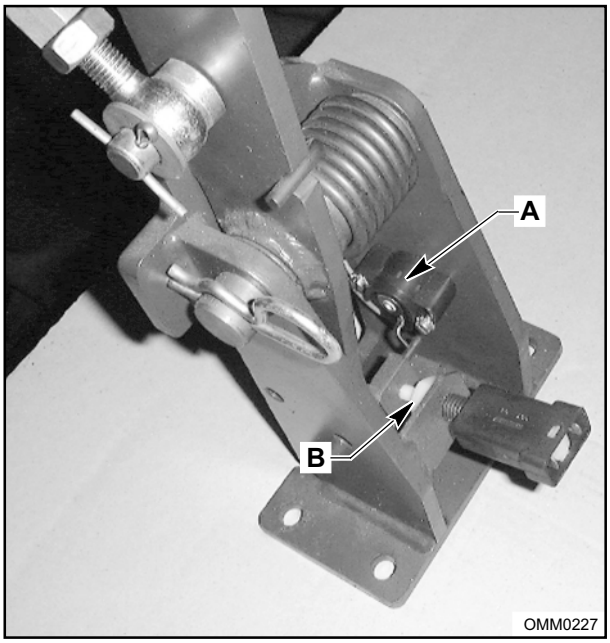
40.27 - BRAKE PEDAL WITH POTENTIOMETER AND STOP LIGHTS MICRO SWITCH

Lightly pressing the brake pedal determines an increase of the electric braking with energy recovery proportionally to the pedal lever shift.
To enable this function a potentiometer is actuated, which sends the information to the electronic system.
Depressing the pedal again applies the mechanical brake and the stop lights to light up.

Electrical specifications of the potentiometer:

- Power +10V (Pink wire pin A16 DISPLAY Module).
- Minus (Gray wire pin A8 DISPLAY Module).
- Output (Green wire pin B15 DISPLAY Module).

These values can be displayed by using the tester at the points indicated.



A= Potentiometer
B= Stop lights micro switch

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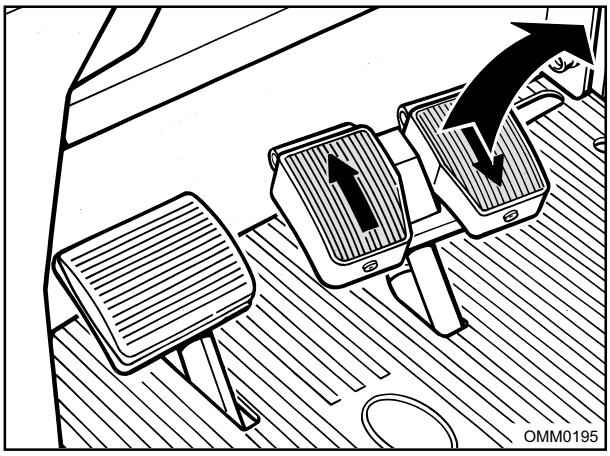
40.28 - ELECTRONIC BRAKING WITH ENERGY RECOVERY

A dedicated electronic circuit allows the battery to recharge using the power supplied by the electric traction motors when the electronic brake is applied.
In particular, during this operation both motors are used as generators which, by means of an electronic circuit, send the power generated by the motors to the battery.
This results in the following benefits:

- Increase of daily endurance.
- The battery plates are cleaned by means of a chemical reaction, which increases the life of the battery.
- Decrease in the temperature of the traction motors because they do not dissipate the energy as heat (systems without braking with energy recovery).
- Decrease in the temperature and wear and tear of the motor brushes because by preventing sparking during this operation, no deterioration occurs.
- Increase in the performance of the motors because they operate at lower temperatures.

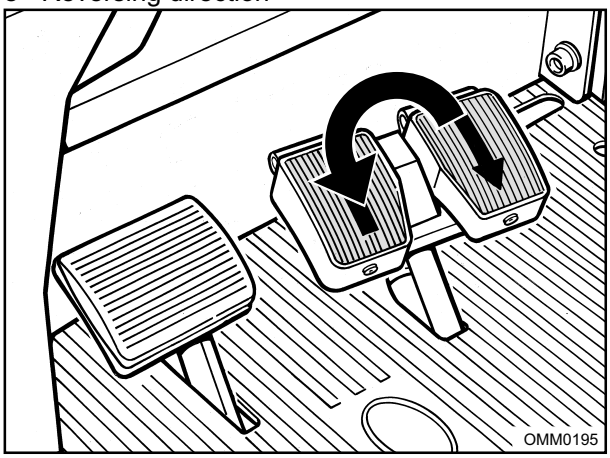
Braking with energy recovery is activated in three different conditions:
a) Releasing the accelerator pedal after driving the truck.
b) Lightly depressing the brake pedal after driving the truck.
c) Revering direction of the truck.

IMPORTANT:
The force of the braking operations described above can be adjusted separately via the console or the PC.

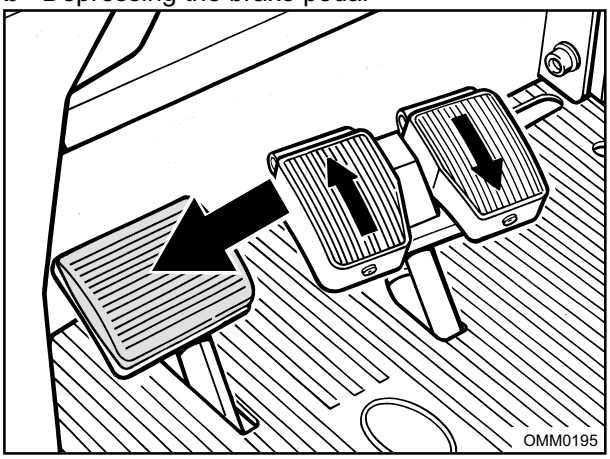


a= Accelerator pedal release

c= Reversing direction



b= Depressing the brake pedal

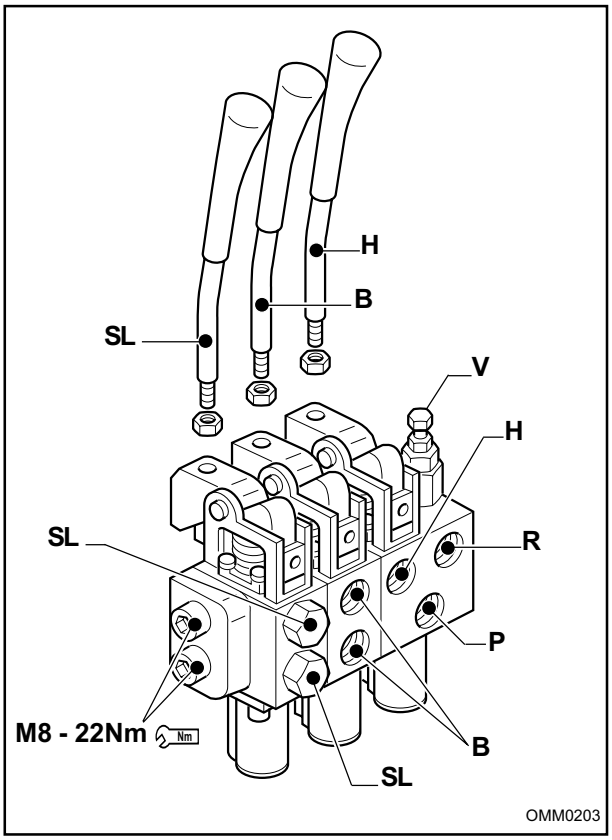


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40.29 - HYDRAULIC DISTRIBUTOR

The electric hydraulic distributor has a Hall effect magnetic sensor (1) to adjust lift speed, and magnetic micro switches (2) for the other functions.
See paragraph 40.6 for instructions on how to adjust the Hall effect magnetic sensor.

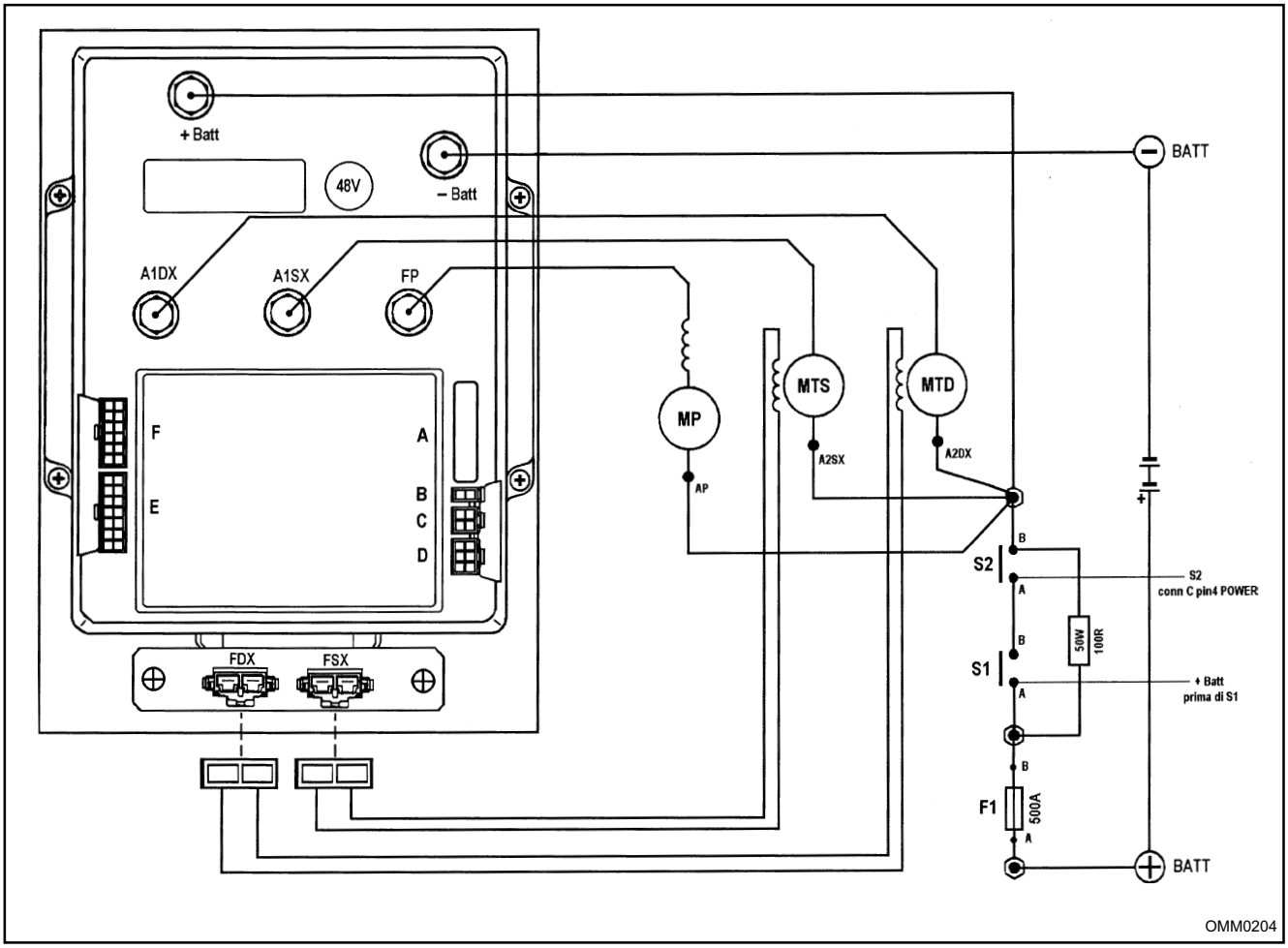
SL= Side Shift
B= Tilting
H= Mast
V= Pressure relief valve
R= Unloading
P= Power.



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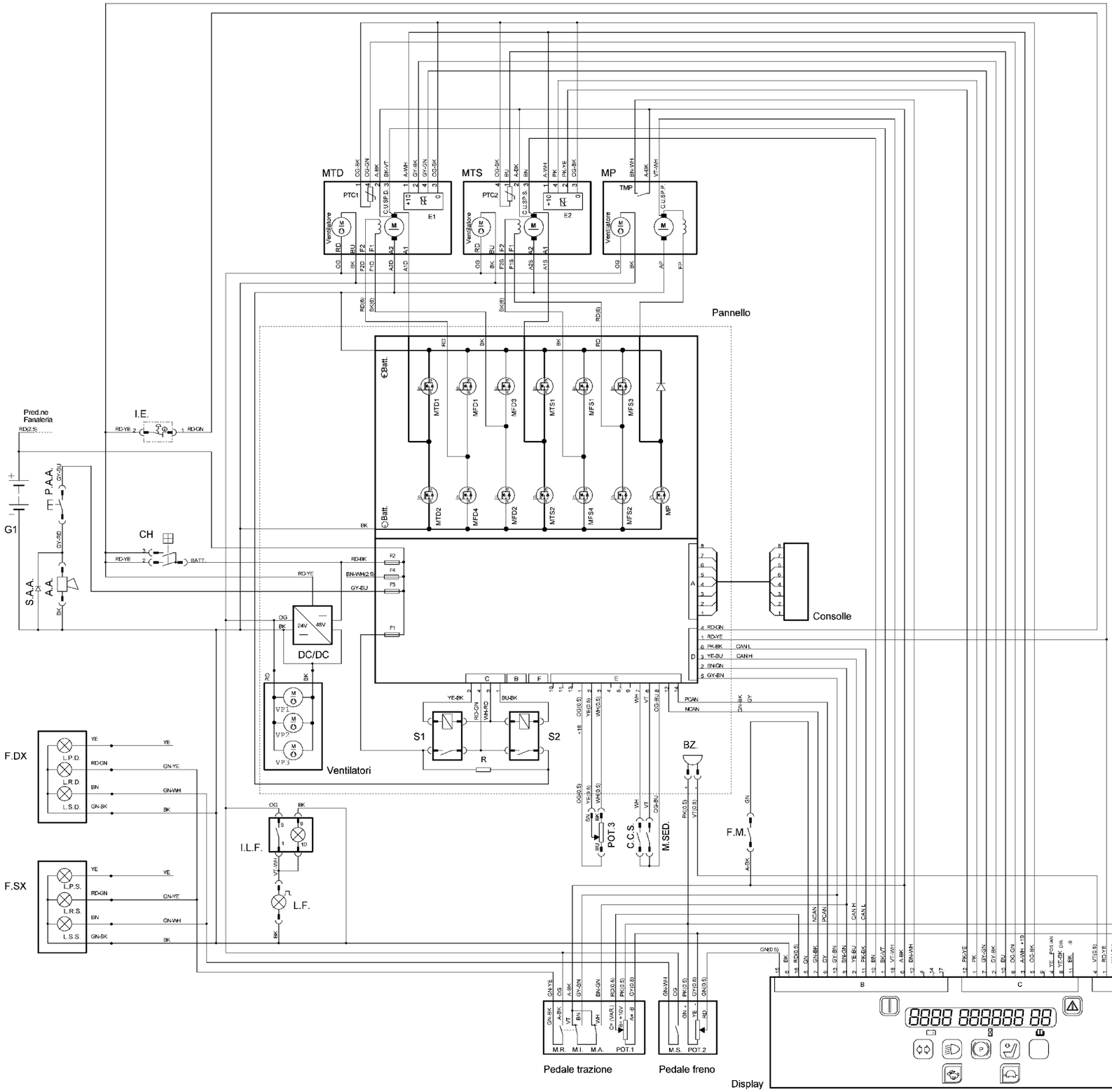
40.30 - IGNITION

When the plug is inserted, the battery “plus” is supplied the POWER Module and the armature of the three motors (points +Batt, A2DX, A2SX, AP) by means of the fuse F1 and resistance R.
When the ignition switch is turned ON, the electronic system checks that the battery positive is on + Batt of the POWER Module.
After successfully performing this check, the system checks the three VMN of the motors, which must reach t the voltage of the battery (points A1DX, A1SX, FP).
After performing these checks, the system checks the two contactors S1 and S2, the coils and all the current sensors, the various potentiometers and all the other signals used for a perfect diagnosis.



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Codice	Denominazione
G1	Batteria; 48V - 300 / 625 Ah
F1	Fusibile di potenza; 600A - 250V
F2	Fusibile per chiave; 80V - 5A
F3	Fusibile per avvisatore acustico; 80V - 5A
F4	Fusibile per fanaleria optional; 80V - 20A
P.A.A.	Pulsante avvisatore acustico
A.A.	Avvisatore acustico; 48V
S.A.A.	Soppressore per avvisatore acustico; 3A - 600V
CH	Chiave
I.E.	Interruttore di emergenza
DC/DC	Convertitore di tensione 48/24V - 100W
F.DX	Fanale posteriore destro
F.SX	Fanale posteriore sinistro
L.R.D.	Lampada retromarcia destra; 24V - 21W
L.R.S.	Lampada retromarcia sinistra; 24V - 21W
L.S.D.	Lampada stop destra; 24V - 21W
L.S.S.	Lampada stop sinistra; 24V - 21W
BZ.	Buzzer retromarcia (variante 589)
S1 - S2	Sezionatori; 48V - 250A
MTD	Motore di trazione destro; 48V - 4kW
MTS	Motore di trazione sinistro; 48V - 4kW
MP	Motore pompa: 9.0kW, 48V, 230A
PTC1-2	Controllo termico per MTD e MTS
E1 - E2	Encoder per i motori trazione
TMP	Thermoswitch pompa
VP1-3	Ventilatori pannello: 3.6W, 24V
POT.1	Potenziometro acceleratore
POT.2	Potenziometro frenatura
POT.3	Potenziometro sterzatura
C.C.S.	Contatto cinture di sicurezza
M.SED.	Micro sedile
F.M.	Freno a mano
M.R.	Micro lampade retromarcia
M.I.	Micro marcia indietro
M.A.	Micro marcia avanti
M.S.	Micro lampade di stop
C.BR.	Contatto magnetico brandeggio
C.S.L.	Contatto magnetico spostamento laterale
C.OPT.	Contatto magnetico optional
S.H.S.	Sensore Hall sollevamento
L.F.	Lampada flashante; 24V - 3W (variante 717)
I.L.F.	Interruttore lampada flashante (variante 717)
R	Resistenza di carica dei condensatori 100 Ohm - 50W
C.U.SP.D.	Controllo usura spazzole motore trazione destro
C.U.SP.S.	Controllo usura spazzole motore trazione sinistro
C.U.SP.P.	Controllo usura spazzole motore pompa

OG	ARANCIO
A	AZZURRO
WH	BIANCO
BU	BLU
YE	GIALLO
GY	GRIGIO
BN	MARRONE
BK	NERO
PK	ROSA
RD	ROSSO
GN	VERDE
VT	VIOLA

FUNCTIONAL DIAGRAM

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FUNCTIONAL DIAGRAM 95353021

N.B.: The Italian texts are ordered alphabetically

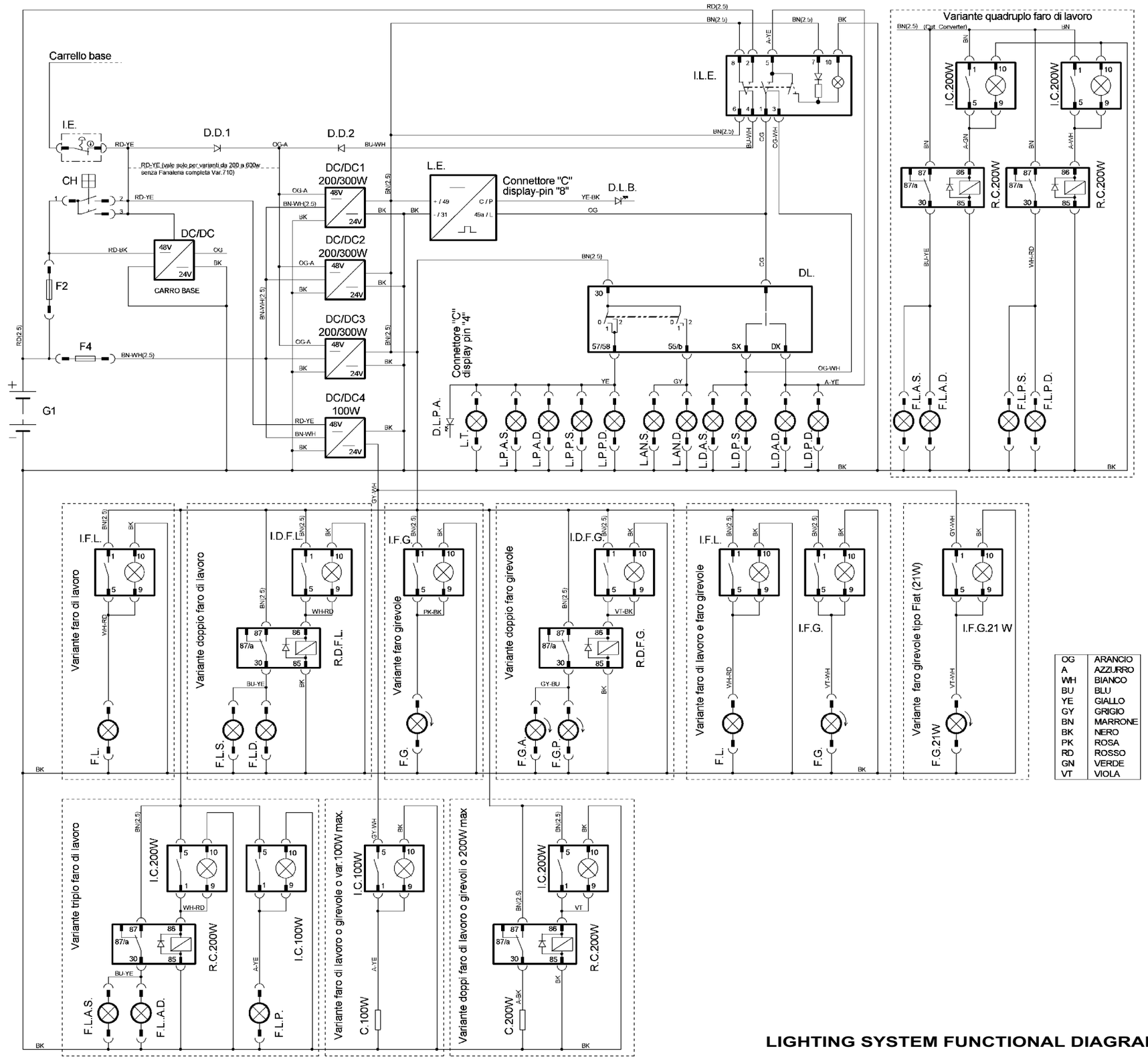
ARANCIO = Orange
Avvisatore acustico; 48V = Acoustic signal; 48 V
AZZURRO = Light Blue
Batt. = Battery
Batteria; 48V – 300 / 625 Ah = Battery; 48V – 300 / 625 Ah
BIANCO = White
BLU = Dark blue
Buzzer retromarcia (variante 589) = Reversing buzzer (version 589)
Chiave = Ignition key
Codice = Code
Consolle = Console
Contatto cintura di sicurezza = Safety belt contact
Contatto magnetico brandeggio = Tilt magnetic contact
Contatto magnetico optional = Optional magnetic contact
Contatto magnetico spostamento laterale = Side shift magnetic contact Controllo termico per MTD e MTS = Thermal controls for right and left traction motors
Controllo usura spazzole motore pompa = Pump motor brush control
Controllo usura spazzole motore trazione destro = Right traction motor brush control
Controllo usura spazzole motore trazione sinistro = Left traction motor brush control
Convertitore di tensione 48/24V – 100W =Voltage converter 48/24V – 100W
Denominazione = Designation
Distributore = Distributor
Encoder per i motori trazione = Traction motor Encoders
Fanale posteriore destro = Right rear light
Fanale posteriore sinistro = Left rear light
Freno a mano = Hand brake
Fusibile di potenza; 600A – 250V = Power fuse; 600A – 250V
Fusibile per avvisatore acustico; 80V –5A = Acoustic signal fuse; 80V – 5A
Fusibile per chiave; 80V – 5A = Ignition fuse; 80V –5A
Fusibile per fanaleria optional; 80V – 20A = Optional lights fuse; 80V – 20A
GIALLO = Yellow
GRIGIO = Gray
Interruttore di emergenza = Emergency switch
Interruttore lampada flashante (variante 717) = Flashing light switch (version 717)
Lampada flashante; 24V – 3W (variante 717) = Flashing light 24V – 3W (version 717)
Lampada retromarcia destra; 24V – 21W =Right reversing light; 24V – 21W
Lampada retromarcia sinistra; 24V – 21W =Left reversing light; 24V – 21W
Lampada stop destra; 24V – 21W = Right brake light; 24V – 21W
Lampada stop sinistra; 24V – 21W = Left brake light; 24A – 21W
MARRONE = Brown
Micro lampade di stop = Brake light micro switch
Micro lampade retromarcia = Reversing light micro switch
Micro marcia avanti = Forward micro switch
Micro marcia indietro = Backward micro switch
Micro sedile = Micro switch
Motore di trazione destro; 48V – 4kW = Right traction motor; 48V – 4kW
Motore di trazione sinistro, 48V – 4kW = Left traction motor; 48V – 4kW
Motore pompa: 9.0kW, 48V, 230A = Pump motor: 9.0kW, 48V, 230A
NERO = Black
Pannello = Switchboard
Pedale freno = Brake pedal
Pedale trazione = Traction pedal
Potenziometro acceleratore = Accelerator pedal potentiometer
Potenziometro frenatura = Brake potentiometer
Potenziometro sterzatura = Steering potentiometer
Pred.ne fanaleria = Prearrangement for lights

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Pulsante avvisatore acustico = Acoustic signal button
Resistenza di carica dei condensatori 100 Ohm – 50W = Capacitor charge resistance 100 Ohm – 50W
ROSA = Pink
ROSSO = Red
Sensore Hall sollevamento = Lift Hall sensor
Sezionatori; 48v – 4kW = Contactors, 48V – 4kW
Soppressore per avvisatore acustico; 33A – 600V = Acoustic signal suppressor; 33A – 600V
Thermoswitch pompa = Pump thermal switch
Ventilatore = Fan
Ventilatori = Fans
Ventilatori pannello: 3.6W, 24V = Switchboard fans: 3.6W, 24V
VERDE = Green
VIOLA = Violet

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Codice	Denominazione
G1	Batteria; 48V - 300 / 625 Ah (carro base)
F2	Fusibile per chiave; 80V - 5A (carro base)
F4	Fusibile; 80V - 20A
CH	Chiave (carro base)
I.E.	Interruttore di emergenza (carro base)
DC/DC	Convertitore di tensione 48/24V - 100W (carro base)
DC/DC1-2-3	Convertitori di tensione 48/24V - 200/300W
DC/DC4	Convertitore di tensione 48/24V - 100W
D.D.1-2	Diodi di disaccoppiamento 3A - 600V
L.E.	Lampeggiatore elettronico 24V 10-100W
D.L.B.	Diodo led blinker sul cruscotto
I.L.E.	Interruttore luci di emergenza
DL	Devioluci
D.L.P.A.	Diodo led posizione / anabbaglianti
L.T.	Lampada targa 24V-4W
L.P.A.S.	Lampada posizione anteriore sinistra 24V-4W
L.P.A.D.	Lampada posizione anteriore destra 24V-4W
L.P.P.S.	Lampada posizione posteriore sinistra 24V-4W
L.P.P.D.	Lampada posizione posteriore destra 24V-4W
L.AN.S.	Lampada anabbagliante sinistra 24V-70W
L.AN.D.	Lampada anabbagliante destra 24V-70W
L.D.A.S.	Lampada direzionale anteriore sinistra 24V-21W
L.D.A.D.	Lampada direzionale anteriore destra 24V-21W
L.D.P.S.	Lampada direzionale posteriore sinistra 24V-21W
L.D.P.D.	Lampada direzionale posteriore destra 24V-21W
I.F.L.	Interruttore faro di lavoro
F.L.	Faro di lavoro; 24V - 70W
I.D.F.L.	Interruttore doppio faro di lavoro
R.D.F.L.	Relè doppio faro di lavoro 24V-30A
F.L.S.	Faro di lavoro sinistro 24V-70W
F.L.D.	Faro di lavoro destro 24V-70W
I.F.G.	Interruttore faro girevole
F.G.	Faro girevole 24V-70W
I.D.F.G.	Interruttore doppio faro girevole
R.D.F.G.	Relè doppio faro girevole 24V-30A
F.G.A.	Faro girevole anteriore 24V-70W
F.G.P.	Faro girevole posteriore 24V-70W
I.C.100W	Interruttore carico da 100W
C.100W	Carico generico 100W
I.C.200W	Interruttore carico 200W
R.C.200W	Relè carico 200W
C.200W	Carico generico 200W
F.L.A.S.	Faro di lavoro anteriore sinistro
F.L.A.D.	Faro di lavoro anteriore destro
F.L.P.D.	Faro di lavoro posteriore destro
F.L.P.S.	Faro di lavoro posteriore sinistro
I.F.G.21W	Interruttore faro girevole 21W per Fiat
F.G.21W	Faro girevole 21w per Fiat
-	-
-	-
-	-



OG	ARANCIO
A	AZZURRO
WH	BIANCO
BU	BLU
YE	GIALLO
GY	GRIGIO
BN	MARRONE
BK	NERO
PK	ROSA
RD	ROSSO
GN	VERDE
VT	VIOLA

LIGHTING SYSTEM FUNCTIONAL DIAGRAM

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LIGHTING SYSTEM FUNCTIONAL DIAGRAM 95353033

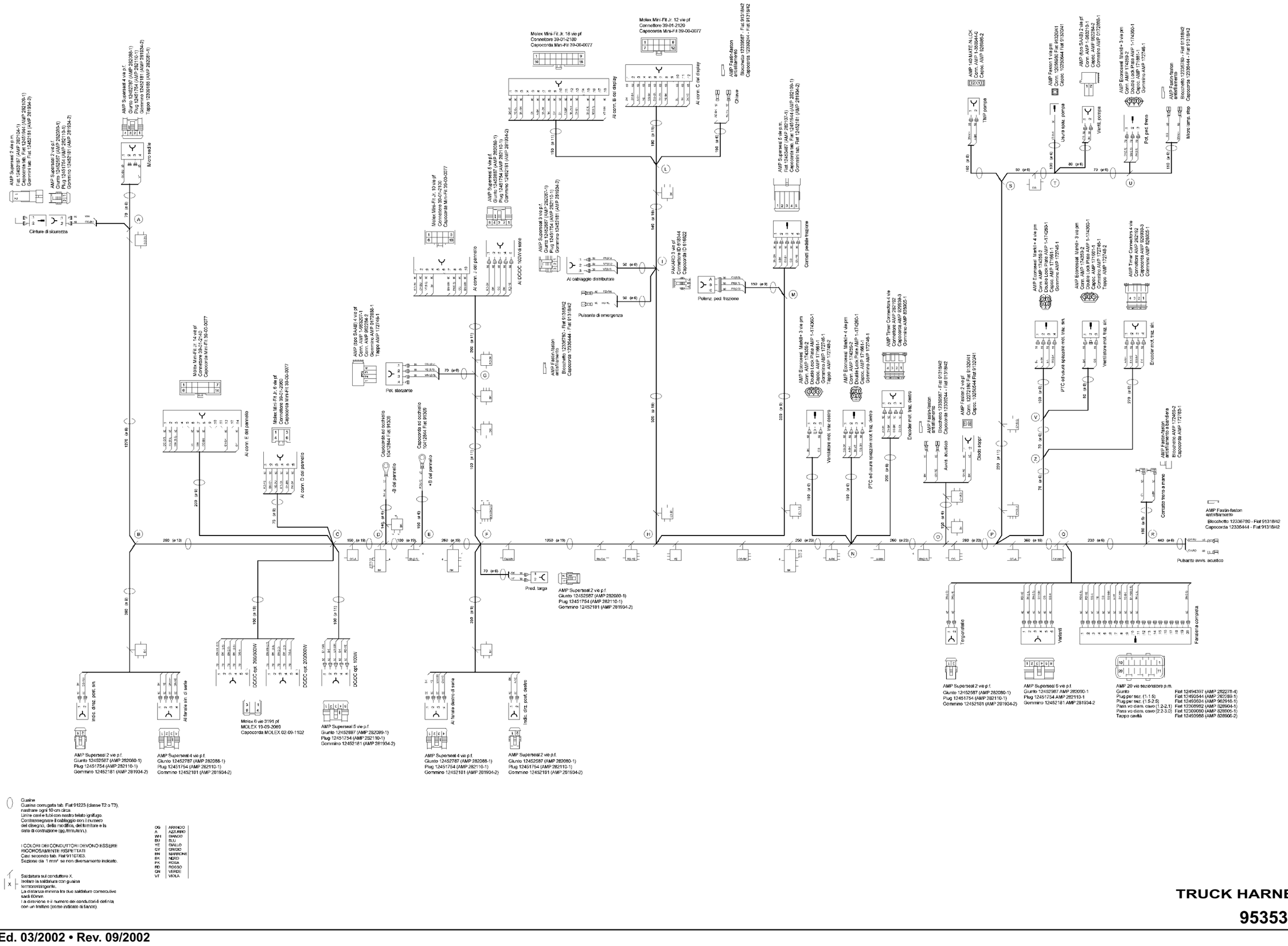
N.B.: The Italian texts are ordered alphabetically

ARANCIO = Orange
AZZURRO = Light Blue
Batteria; 48V – 300/625 Ah (carro base) = Battery; 48V – 300/625 Ah (standard chassis)
BIANCO = White
BLU = Dark blue
Carico generico 100W = 100W Basic load
Carico generico 200W =200W Basic load
Carrello base = Standard truck
Carro base = Standard chassis
Chiave (carro base) = Ignition key (standard chassis)
Codice = Code
Connettore “C” =”C” connector
Convertitore di tensione 48V/24V – 100W = Voltage converter 48V/24V – 100W
Convertitore di tensione 48V/24V – 100W (carro base) = Voltage converter 48V/24V – 100W (standard chassis)
Convertitori di tensione 48/24V – 200/300W = Voltage converters 48/24V – 200/300W
Denominazione = Designation
Devioluci = Light deflector
Diodi di disaccoppiamento 3A – 600V = Decoupling diodes 3A – 600V
Diodo led blinker sul cruscotto = Blinker LED diode on the dashboard
Diodo led posizione / anabbaglianti = Position/low beam LED diode
Faro di lavoro; 24V - 70W = Headlight 24V - 70W
Faro di lavoro anteriore destro = Right front headlight
Faro di lavoro anteriore sinistro = Left front headlight
Faro di lavoro destro 24V-70W = Right headlight 24V-70W
Faro di lavoro posteriore destro = Right rear headlight
Faro di lavoro posteriore sinistro = Left rear headlight
Faro di lavoro sinistro 24V-70W = Left headlight 24V-70W
Faro girevole 24V-70W = Beacon Beacon
Faro girevole anteriore 24V-70W = Front beacon 24V-70W
Faro girevole posteriore 24V-70W = Rear beacon 24V-70W
Fusibile; 80V – 20A = Fuse; 80A – 20A
Fusibile per chiave; 80V – 5A (carro base) = Ignition fuse; 80V – 5A (standard chassis)
GIALLO = Yellow
GRIGIO = Gray
Interruttore carico da 100W = 100W switch
Interruttore carico 200W = 200W switch
Interruttore di emergenza (carro base) = Emergency switch (standard chassis)
Interruttore doppio faro di lavoro = Double headlight switch
Interruttore doppio faro girevole = Double beacon switch
Interruttore faro di lavoro = Headlight switch
Interruttore faro girevole = Beacon switch
Interruttore faro girevole 21W per Fiat = Fiat 21W beacon switch
Interruttore luci di emergenza = Emergency lights switch
Lampada anabbagliante destra 24V-70W = Right low beam light 24V-70W
Lampada anabbagliante sinistra 24V-70W = Left low beam light 24V-70W
Lampada direzionale anteriore destra 24V-21W = Right front indicator 24V-21W
Lampada direzionale anteriore sinistra 24V-21W = Left front indicator 24V-21W
Lampada direzionale posteriore destra 24V-21W = Right rear indicator 24V-21W
Lampada direzionale posteriore sinistra 24V-21W = Left rear indicator 24V-21W
Lampada posizione anteriore destra 24V-4W = Right front light 24V-4W
Lampada posizione anteriore sinistra 24V-4W = Left front light 24V-4W
Lampada posizione posteriore destra 24V-4W = Right tail light 24V-4W
Lampada posizione posteriore sinistra 24V-4W = Left tail light 24V-4W
Lampada targa 24V –4W = License plate light 24V –4W
Lampeggiatore elettronico 24V 10-100W = Electronic blinker 24V 10-100W
MARRONE = Brown

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NERO = Black
Relè carico 200W = 200W relay
Relè doppio faro di lavoro 24V-30A = Double headlight relay 24V-30A
Relè doppio faro girevole 24V-30A = Double beacon relay
ROSA = Pink
ROSSO = Red
(vale solo per varianti da 200 a 600W senza fanaleria completa variante 710) = valid only for versions from 200 up to 600W without complete lighting system version 710)
Variante doppi faro di lavoro o girevoli o 200W max = Version with double headlight or double beacon or another user max 200W
Variante doppio faro di lavoro = Double headlight version
Variante doppio faro girevole = Double beacon version
Variante faro di lavoro = Headlight version
Variante faro di lavoro e faro girevole = Headlight and beacon version
Variante faro di lavoro o var. 100W max = Version with headlight or another user max 100W
Variante faro girevole = Beacon version
Variante faro girevole tipo Fiat (21W) = Version with Beacon type Fiat (21W)
Variante quadruplo faro di lavoro = Version with quadruple headlight
Variante triplo faro di lavoro = Triple headlight version
VERDE = Green
VIOLA = Violet

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N.B.: The Italian texts are ordered alphabetically

Al cablaggio distributore = To distributor wiring
Al conn. B del display = To B-connector on the display
Al conn. C del display = To C-connector on the display
Al conn. E del pannello = To E-connector on the switchboard
Al conn. J del pannello = To J-connector on the switchboard
Al DC/DC 100W di serie = To 100W series DC/DC
Al fanale destro di serie = To the series right light
Al fanale sin. di serie = To the series left light
AMP 20 vie sezionatore p.m. = Contactor 20-way AMP male connector
AMP Econoseal MarkII+ 3 vie pm = 3-way AMP Econoseal MarkII+ male connector
AMP Econoseal MarkII+ 4 vie pm = 4-way AMP Econoseal MarkII+ male connector
AMP Fastin–Faston antisfilamento = AMP Fastin-Faston non-slip
AMP Faston 1 via pm = 1-way AMP Faston male connector
AMP Superseal 2 vie p.f. = 2-way AMP Superseal female connector
AMP Superseal 3 vie p.f. = 3-way AMP Superseal female connector
AMP Superseal 4 vie p.f. = 4-way AMP Superseal female connector
AMP Superseal 5 vie p.f. = 5-way AMP Superseal female connector
AMP Superseal 6 vie p.f. = 6-way AMP Superseal female connector
AMP Superseal 2 vie p.m. Fiat 124553187(AMP 282104-1) = 2-way AMP Superseal male connector Pt. No. Fiat 124553187(AMP 282104-1)
AMP Superseal 5 vie p.m. Fiat 12453487 (AMP 282107-1) = 5-way AMP Superseal male connector Pt. No. Fiat 12453487 (AMP 282107-1)
AMP (tipo Saab) 2 vie pf = AMP (Saab type) 2-way female connector
AMP (tipo Saab) 4 vie pf = AMP (Saab type) 4-way female connector
AMP Timer Connectors 4 vie = 4-way AMP Timer Connectors
ARANCIO = Orange
Avvis. acustico = Acoustic signal
AZZURRO = Light Blue
+B del pannello = Switchboard battery plus
-B del pannello = Switchboard battery minus
BIANCO = White
Blocchetto 12336780 – Fiat 91318/42 = 12336780 – Fiat 91318/42 Block
Blocchetto 12339587 - Fiat 91318/42 = 12339587 - Fiat 91318/42 Block
Blocchetto AMP 172469-2 = AMP 172469-2 Block
BLU = Dark blue
Capoc. 10250544 Fiat 91320/41 = 10250544 Fiat 91320/41 Wire terminal
Capoc. AMP 171661-1 = AMP 171661-1 Wire terminal
Capocorda AMP 172763-01 = AMP 172763-01 Wire terminal
Capoc. AMP 962284-2 = AMP 962284-2 Wire terminal
Capoc. AMP 926986-2 = AMP 926986-2Wire terminal
Capocorda 12336444 – Fiat 91318/42 = 12336444 – Fiat 91318/42 Wire terminal
Capocorda 12339244 Fiat 91318/42 = 12339244 Fiat 91318/42 Wire terminal
Capocorda ad occhiello 10412844 Fiat 91309 = 10412844 Fiat 91309 Eyelet terminal
Capocorda AMP 929939-3 = AMP 929939-3 Wire terminal
Capocorda ID 616622 = ID 616622 Wire terminal
Capocorda Mini-Fit 39-00-0077 = Mini-Fit 39-00-0077 Wire terminal
Capocorda MOLEX 02-09-1102 = 02-09-1102 MOLEX Wire terminal
Capocorda tab. Fiat 12451944 (AMP 282109-1) = Wire terminal as per Fiat table 12451944 (AMP 282109-1)
Cavi secondo tab. Fiat 91107/03 = Wires as per FIAT 91107/03 table
Chiave = Ignition switch
Cinture di sicurezza = Safety belts
Conn. AMP 1-963207-1 = AMP 1-963207-1 Connector
Conn. AMP 962284-2 = AMP 962284-2 Connector
Connettore 39-01-2100 = 39-01-2100 Connector
Connettore 39-01-2120 = 39-01-2120 Connector
Connettore 39-01-2140 = 39-01-2140 Connector

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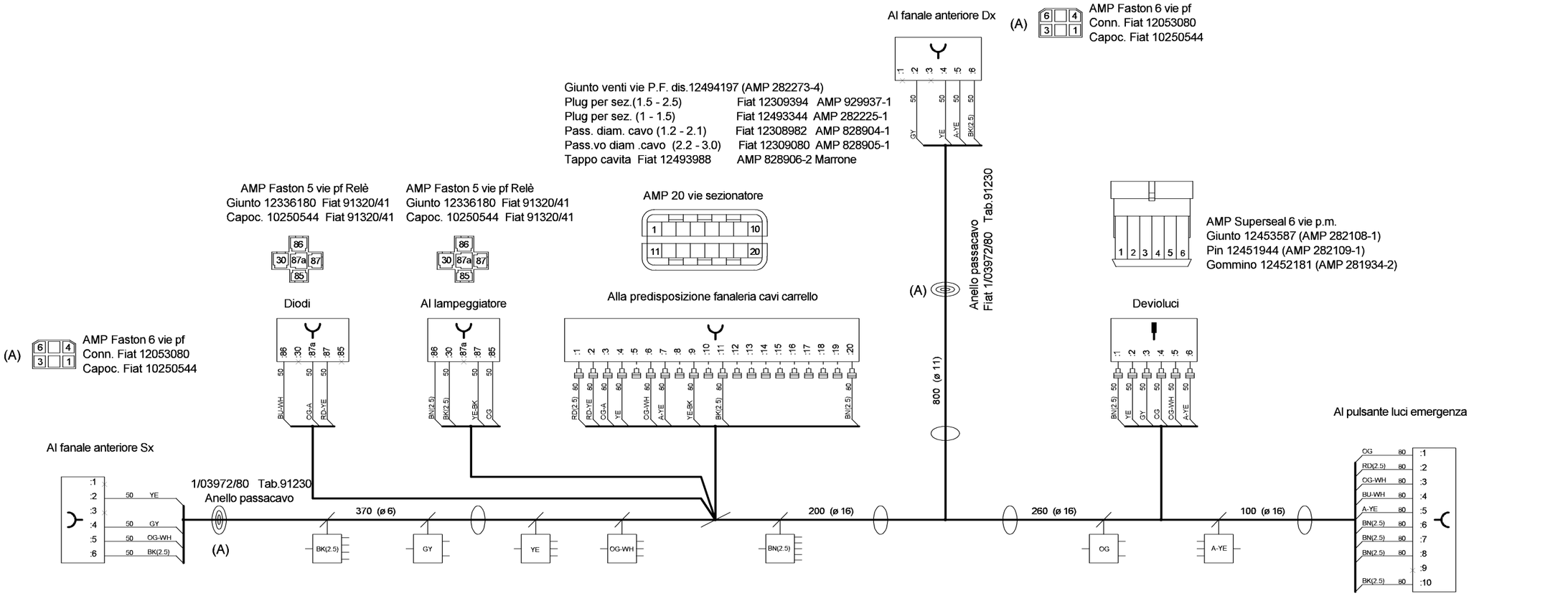
Connettore 39-01-2180 = 39-01-2180 Connector
Connettore AMP 282192 = AMP 282192 Connector
Connettore ID 618344 = ID 618344 Connector
Contatti pedale trazione = Traction pedal contacts
Contatto freno a mano = Hand brake contact
Contrassegnare il cablaggio con il numero del disegno, della modifica, del fornitore e la data di costruzione (gg./mm./ann.) = Mark the wiring with the number of the drawing, the modification, the supplier, and the year of manufacture (DD-MM-YY)
Diodo soppr. = Suppressor diode
Encoder mot. traz. destro = Right traction motor encoder
Encoder mot. traz. sin. = Left traction motor encoder
Fanaleria completa = Complete lighting system
GIALLO = Yellow
Giunto = Joint
Giunto 12452587 (AMP 282080-01) = 12452587 (AMP 282080-01) Joint
Giunto 12452687 (AMP 282087-01) = 125452687 (AMP 282087-01) Joint
Giunto 12452787 (AMP 282088-01) = 12452787 (AMP 282088-01) Joint
Giunto 12452887 (AMP 282089-1) = 12452887 (AMP 282089-1) Joint
Gommini tab. Fiat 12452181(AMP 281934-2) = Rubber pieces as per Fiat table 12452181(AMP 281934-2)
Gommino 12452181 (AMP 281934-2) = Rubber piece 12452181 (AMP 281934-2)
Gommino AMP 0172888-1 = AMP 0172888-1 Rubber piece
Gommino AMP 172746-1 = AMP 172746-1 Rubber piece
Gommino AMP 828905-1 = AMP 828905-1 Rubber piece
GRIGIO = Gray
Guaina corrugata tab. Fiat 91223 (classe T2 o T3) = Corrugated sheath as per Fiat 91223 table (class T2 or T3)
Guaine = Sheaths
I COLORI DEI CONDUTTORI DEVONO ESSERE RIGOROSAMENTE RISPETTATI = The color code of the wires must be strictly observed.
Indic.direz. post. sn. = Left rear indicator
Indic. dirz. post. destro = Right rear indicator
Isolare la saldatura con guaina termorestringente = Insulate the solder with heat-shrinking sheath
La direzione e il numero dei conduttori è definita con un trattino (come indicato di fianco) = The direction and number of the wires is indicated with a dash (as shown aside)
La distanza minima tra due saldature consecutive = The minimum distance between two consecutive solder spots is 60 mm
MARRONE = Brown
Micro lamp. stop = Stop light micro switch
Micro sedile = Seat micro switch
Molex 6 vie 3191 pf = 6-way Molex female connector 3191
Molex Mini-Fit Jr. 10 vie pf = 10-way Molex Mini-Fit Jr. female connector
Molex Mini-Fit Jr. 12 vie pf = 12-way Molex Mini-Fit Jr. female connector
Molex Mini-Fit Jr. 14 vie pf = 14-way Molex Mini-Fit Jr. female connector
Molex Mini-Fit Jr. 18 vie pf = 18-way Molex Mini-Fit Jr. female connector
nastrare ogni 10 cm circa = Tape approximately every 10 cm
NERO = Black
PAKARD 3 vie pf = 3-way PAKARD female connector
Pass.vo diametro cavo (...) = Wire clamp wire diameter (...)
Plug per sez. (...) = Plug for contactor (...)
Pred. targa = Plate prearrangement
Pot. ped. freno = Brake pedal potentiometer
Pot. sterzante = Steering potentiometer
Potenz. ped. trazione = Traction pedal potentiometer
PTC ed usure spazzole mot. traz. destro = Right traction motor PTC and brushes wear
PTC ed usure spazzole mot. traz. sin. = Left traction motor PTC and brushes wear
Pulsante avvis. acustico = Acoustic signal button
Pulsante di emergenza = Emergency button
ROSA = Pink
ROSSO = Red
Saldatura sul conduttore X = Soldering on wire X
Sezione da 1mm2 se non diversamente indicato = 1 mm2 sections unless otherwise indicated

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Tappo 12309185 (AMP 282081-1) = Plug 12309185 (AMP 282081-1)
Tappo AMP 172748-1 = AMP 172748-1 Plug
Tappo cavità = Hole plug
Tergicristallo = Windscreen wiper
TMP pompa = Pump TMP
Unire cavi e tubi con nastro telato ignifugo = Wrap wires and hoses with fire-proof fabric tape
Usura spaz. pompa = pump motor brush wear
Varianti = Special versions
Ventil. pompa = Pump fan
Ventilatore mot. traz. destro = Right traction motor fan
Ventilatore mot. traz. sin. = Left traction motor fan
VERDE = Green
VIOLA = Violet

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(A) Connettori ed anellini passacavo da nastrare nei pressi delle estremita'.

Guaine
Guaina corrugata tab. Fiat 91223 (classe T2 o T3), nastrare ogni 10 cm circa.
Unire cavi e tubi con nastro telato ignifugo.
Contrassegnare il cablaggio con il numero del disegno, della modifica, del fornitore e la data di costruzione (gg./mm./ann.).

I COLORI DEI CONDUTTORI DEVONO ESSERE RIGOROSAMENTE RISPETTATI
Cavi secondo tab. Fiat 91107/03.
Sezione da 1 mm² se non diversamente indicato.

X
Saldatura sul conduttore X.
Isolare la saldatura con guaina termorestringente.
La distanza minima tra due saldature consecutive sarà 60mm.
La direzione e il numero dei conduttori é definita con un trattino (come indicato di fianco).

OG	ARANCIO
A	AZZURRO
WH	BIANCO
BU	BLU
YE	GIALLO
GY	GRIGIO
BN	MARRONE
BK	NERO
PK	ROSA
RD	ROSSO
GN	VERDE
VT	VIOLA

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LIGHTING SYSTEM WIRING 95353143

N.B.: The Italian texts are ordered alphabetically

Al fanale anteriore Dx = To the Right front light
Al fanale anteriore Sx = To the left front light
Al lampeggiatore = To blinker
Alla predisposizione fanaleria cavi carrello = To truck wires prearranged for lighting system
Al pulsante luci di emergenza = To emergency light button
AMP 20 vie sezionatore = 20-way AMP Contactor
AMP Faston 5 vie pf Relè = 5-way AMP Faston relay female connector
AMP Faston 6 vie pf = 6-way AMP Faston female connector
AMP Superseal 6 vie p.m. = 6-way AMP Superseal male connector
Anello passacavo = Wire ring
ARANCIO = Orange
AZZURRO = Light Blue
BIANCO = White
BLU = Dark blue
Capoc. = Wire terminal
Cavi secondo tab. Fiat 91107/03 = Wires as per FIAT 91107/03 table
Conn. Fiat 12053080 = Fiat 12053080 Connector
Connettore interr. fanaleria = Light system switch connector
Connettori ed anellini passacavo da nastrare nei pressi delle estremità = Connectors and wire rings shall be wrapped at their ends
Contrassegnare il cablaggio con il numero del disegno, della modifica, del fornitore e la data di costruzione (gg./mm./ann.) = Mark the wiring with the number of the drawing, the modification, the supplier, and the year of manufacture (DD-MM-YY)
Devioluci = Light deflector
Diodi = Diodes
GIALLO = Yellow
Giunto = Joint
Giunto venti vie P.F. dis ..... = 20-way joint female connector a per drawing .....
Gommino 12452181 (AMP 281934-2) = Rubber piece 12452181 (AMP 281934-2)
GRIGIO = Gray
Guaina corrugata tab. Fiat 91223 (classe T2 o T3) = Corrugated sheath as per Fiat 91223 table (class T2 or T3)
Guaine = Sheaths
I COLORI DEI CONDUTTORI DEVONO ESSERE RIGOROSAMENTE RISPETTATI = The color code of the wires must be strictly observed.
Isolare la saldatura con guaina termorestringente = Insulate the solder with heat-shrinking sheath
La distanza minima tra due saldature consecutive = The minimum distance between two consecutive solder spots is 60 mm
MARRONE = Brown
nastrare ogni 10 cm circa = Tape approximately every 10 cm
NERO = Black
Pass. diam. cavo (...) = Wire clamp wire diameter (...)
ROSA = Pink
ROSSO = Red
Sezione da 1mm2 se non diversamente indicato = 1 mm2 sections unless otherwise indicated
Unire cavi e tubi con nastro telato ignifugo = Wrap wires and hoses with fire-proof fabric tape
VERDE = Green
VIOLA = Violet

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40.31 – INSTRUCTIONS FOR INSTALLING THE WIN-PC CONSOLE

"For XE Models"



P.C. USE

Install the program enabling the connection between the P.C. and the electronic equipment as to receive or transmit respectively data useful for programming and trouble shooting purposes.

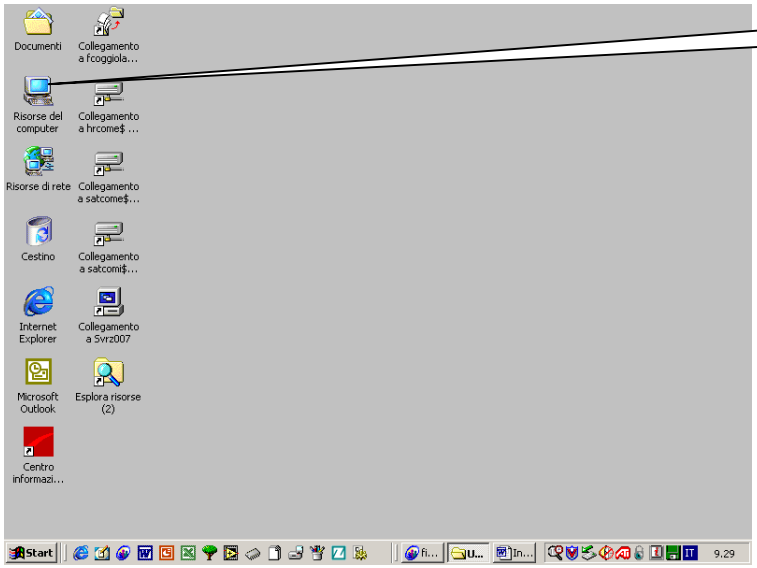
The P.C. must be equipped with a serial port or an adapter USB to RS232 per any portable computer not provided with a serial port COM1.

Together with the connection cable, a CD-ROM with the self-installing program will be provided

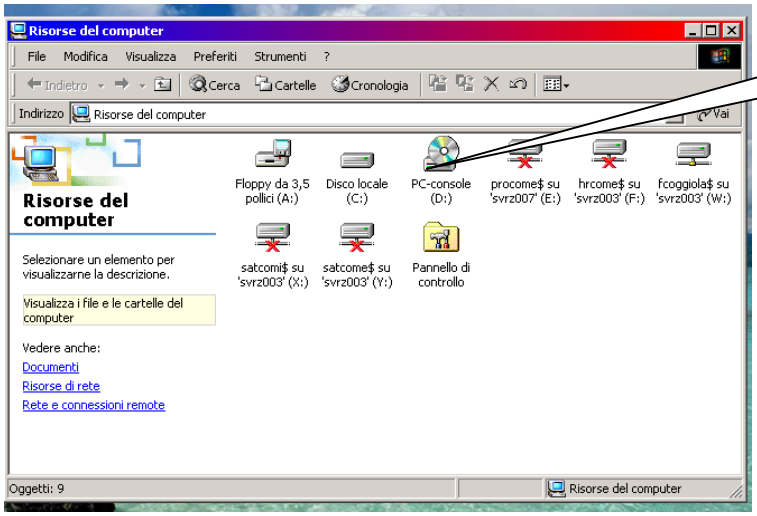
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PROGRAM INSTALLING PROCEDURE

- Switch the P.C. on and wait until the booting routines are run.
- Insert the CD-ROM in the driver provided.
- Click twice with the mouse left key on the icon "**COMPUTER RESOURCES**" provided on the DESKTOP.



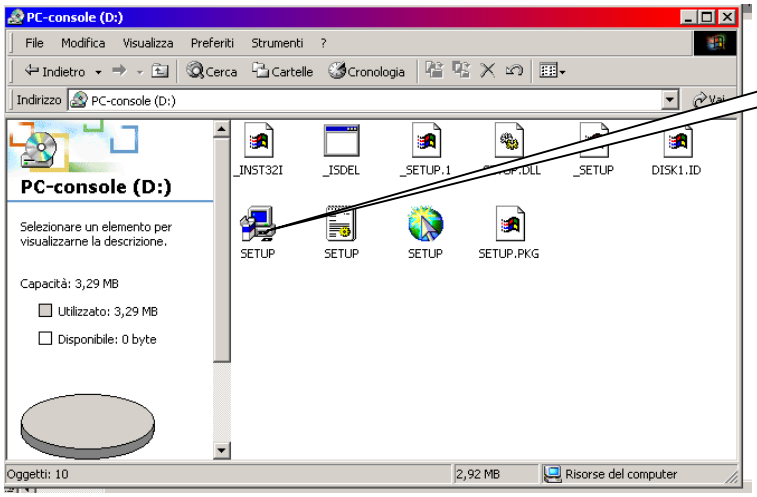
The following page will be displayed:



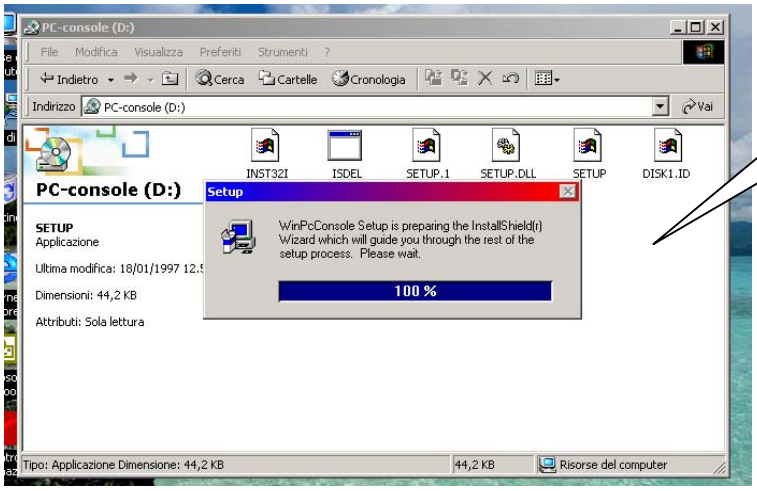
Click twice with the mouse left key on the "**PC-Console icon on the CD-ROM unit**".

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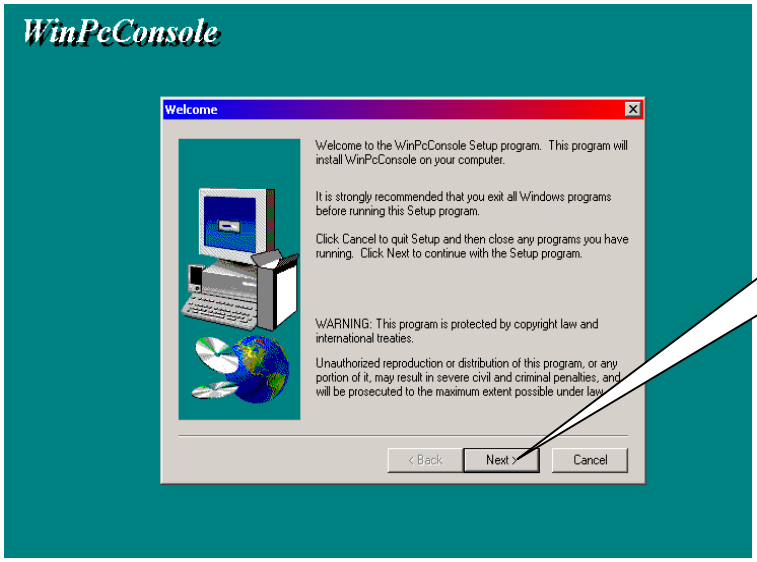
The following page will be displayed:



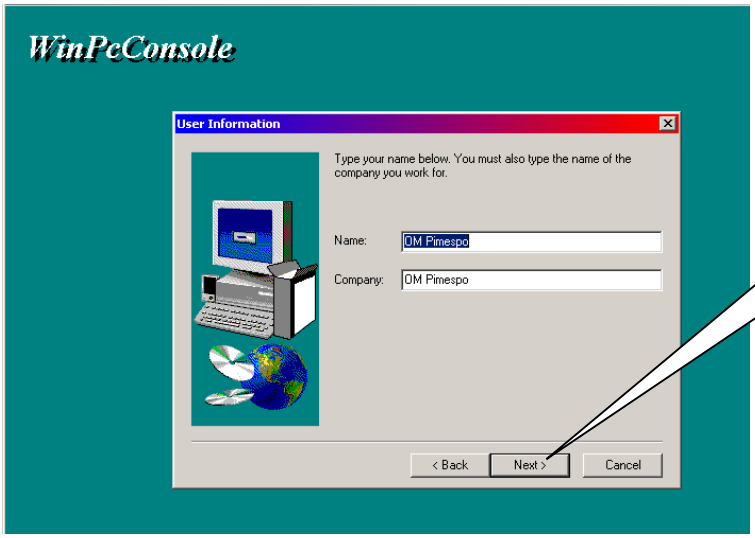
This page presents a list of the CD-ROM's contents. A directory named "**Setup**", marked through a **computer-shaped icon,** is listed as well.
This enables the program automatic installation in your P.C.
Click twice with the mouse left key on the directory mentioned and wait until the installation is performed.



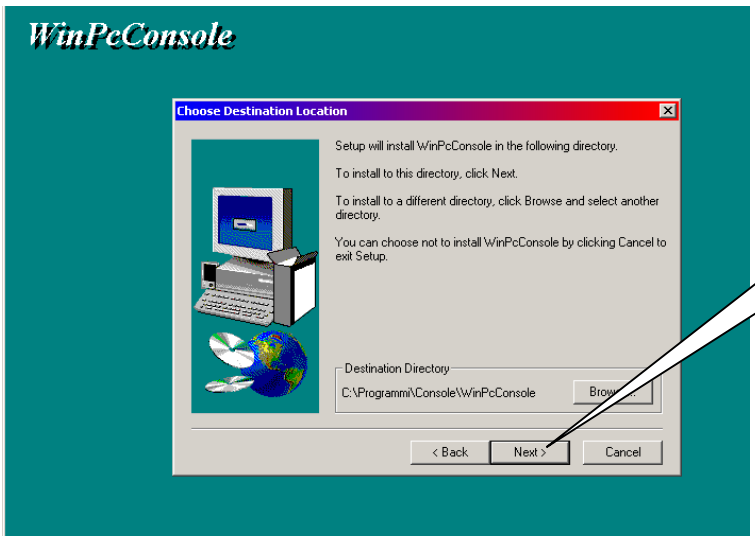
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Second page:
Click on Next.

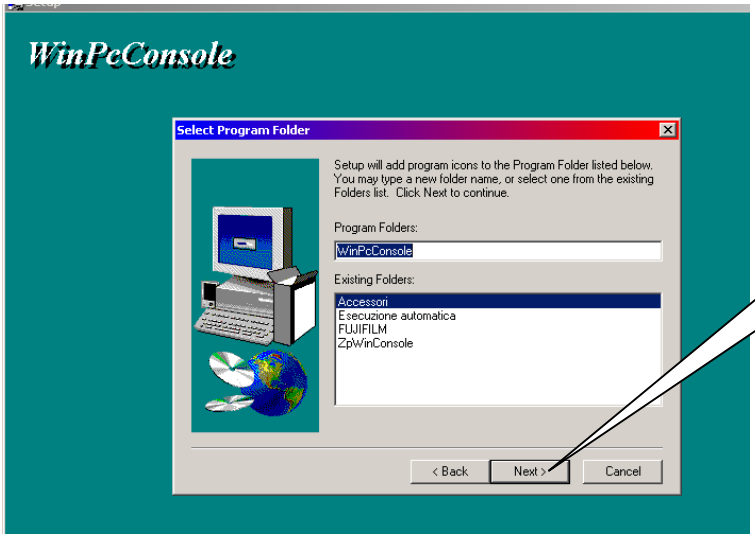


Third page:
Click on Next.

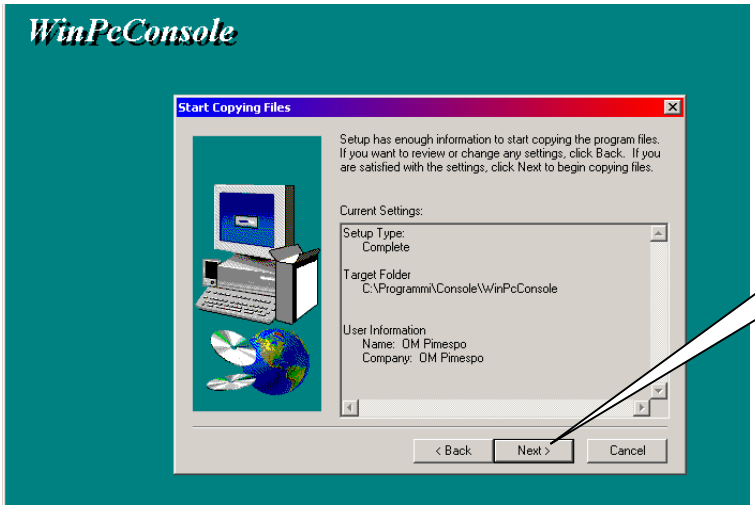


Fourth page:
Click on Next.

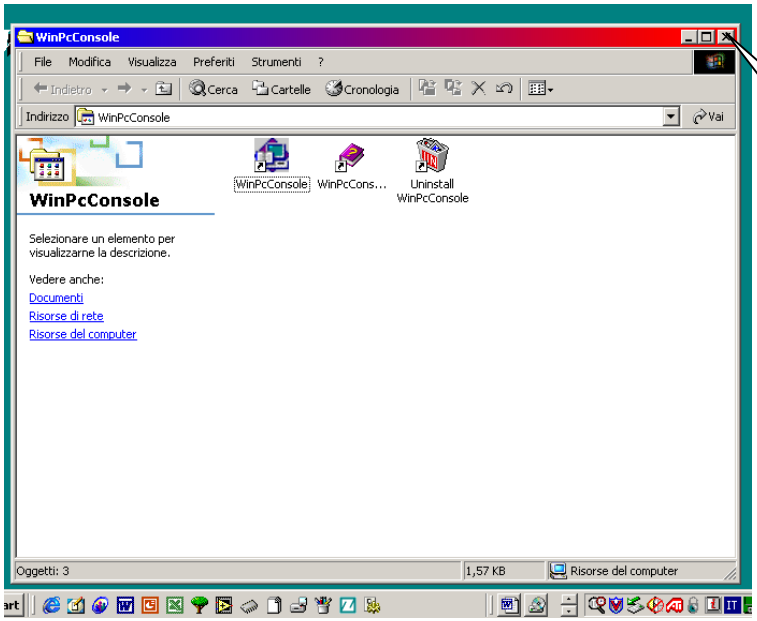
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Fifth page:
Click on Next.

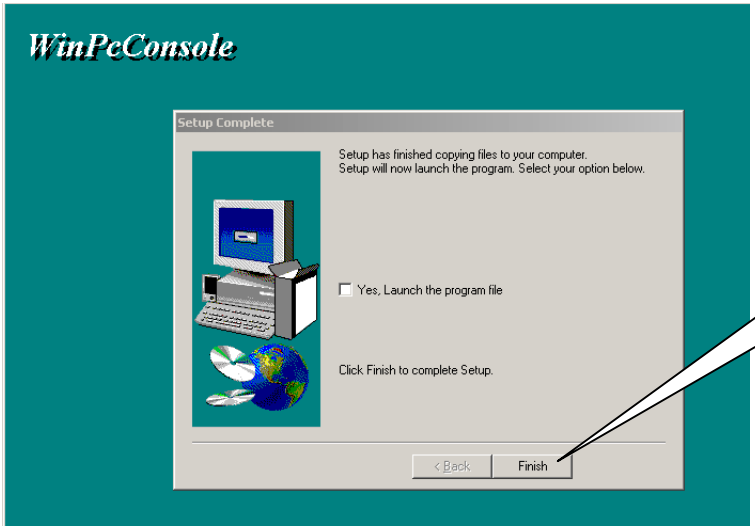


Sixth page:
Click on Next.



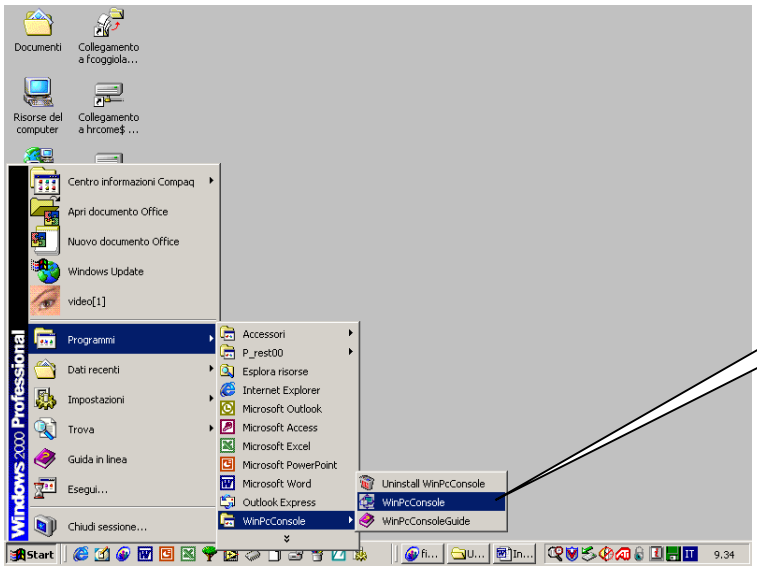
Seventh page:
The program icons have been generated.
Click on (X).

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Eighth page:
Click on Finish.

After the installation is performed, a directory named: "**WinPcConsole**" will be inserted in the directory **"PROGRAMS".**
Now click on **Start** and locate the mouse on **Programs**, as soon as the mouse is positioned on Programs the **computer-shaped icon** will be displayed on **WinPcConsole** enabling you start the program.



Program start icon

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To let the program start easier, the **WinPcConsole** icon can be copied directly onto the Desktop.

1. Select the **program start** icon (as illustrated above).
2. Depress the mouse right key.
3. Select the instruction "**send to**".
4. A pull-down menu will be displayed: "**Desktop (create link)**".

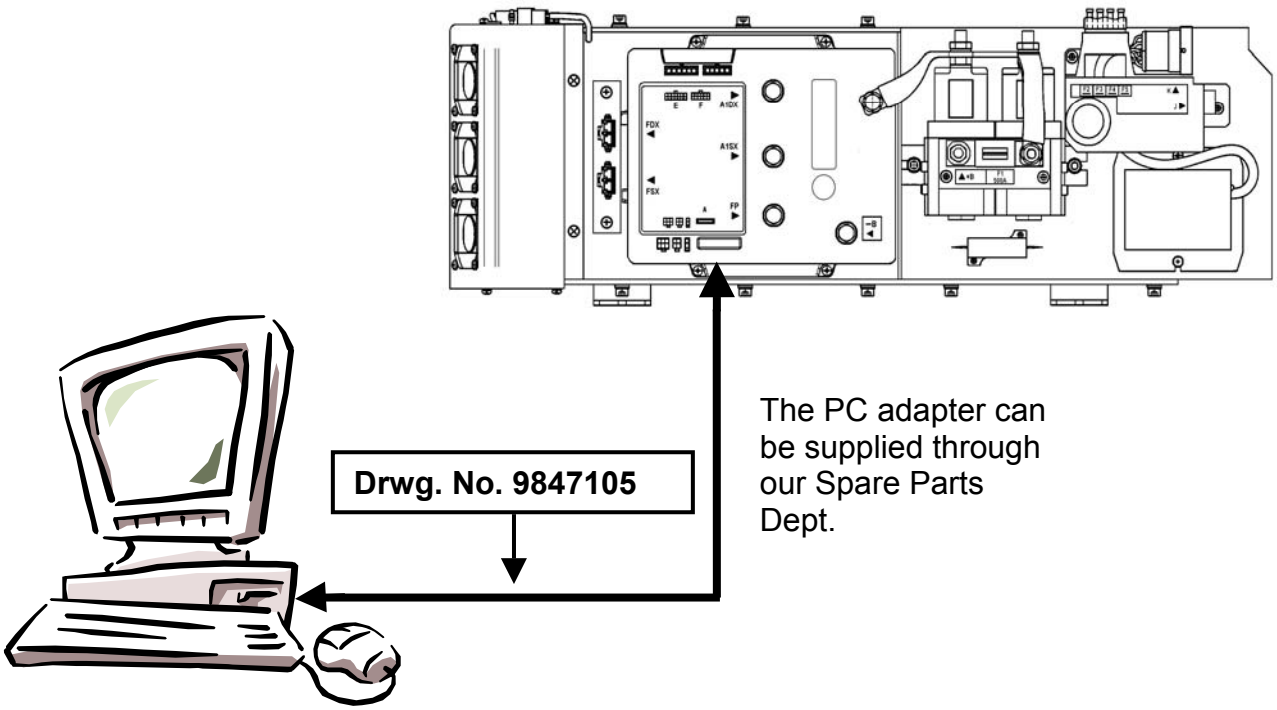
With this moment the icon will be copied on the Desktop.



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40.32 – INSTRUCTIONS FOR CONNECTING AND USING WIN-PC CONSOLE

"For XE models"

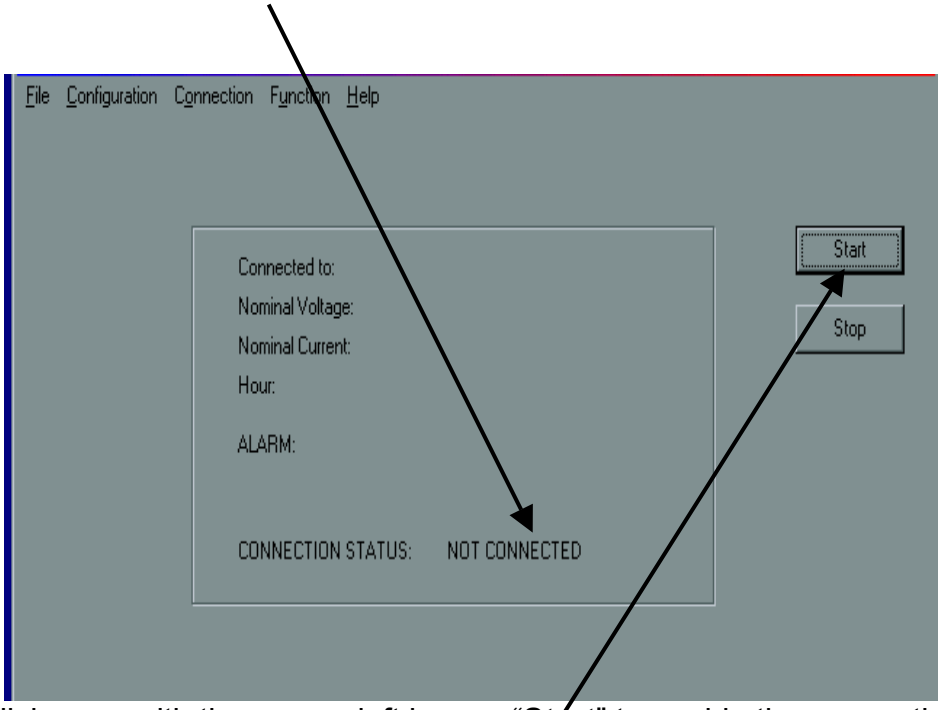


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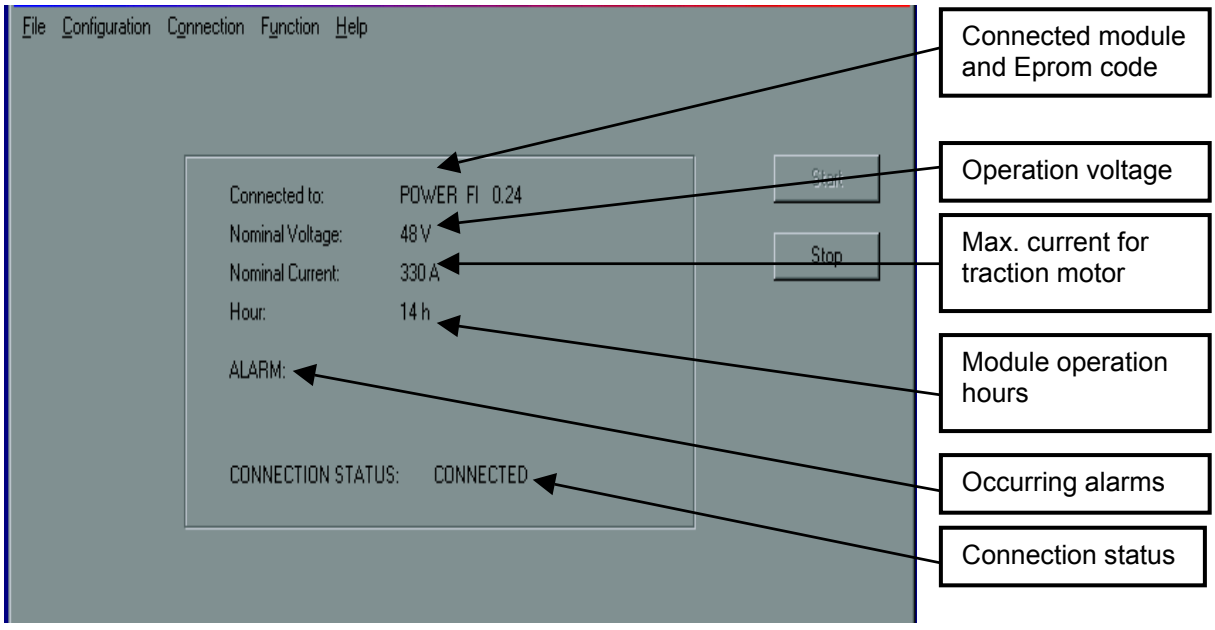
Operations to be performed:

- Engage the handbrake.
- Switch the starter key OFF.
- Raise the truck bonnet and close the seat micro-switch.
- Connect the P.C. to the electronic equipment (POWER Module) with means of the wire provided.
- Switch the starter key ON.
- Start the P.C. and wait until the booting routines are performed.
- Click once with the mouse left key on the program icon to start it.

After this operation, the following page will be displayed; it indicates that the program is activated but not yet connected to the electronic equipment, according to the message: "**NOT CONNECTED**".



Click once with the mouse left key on "**Start**" to enable the connection.
The following page will be displayed indicating the following information:



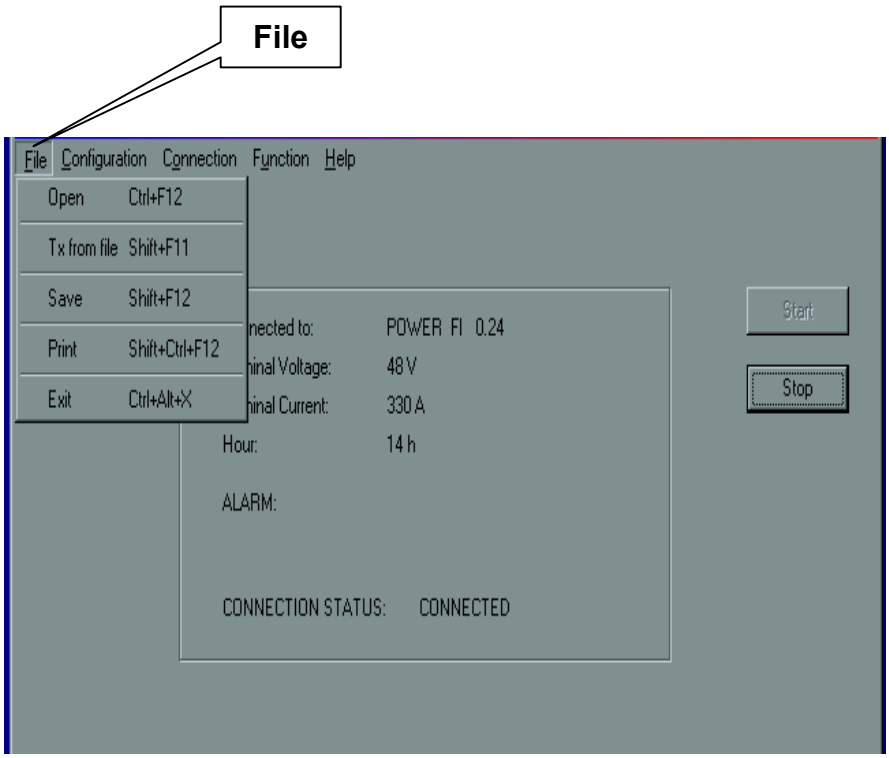
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Now the P.C. is correctly connected to the electronic equipment (POWER Module) and is able to perform any operation.
The following menus are displayed on the menu bar:

- **File**
- **Configuration**
- **Connection**
- **Function**
- **Help**

File:

The pull-down submenu will be displayed with clicking once with the mouse left key on the menu "**File**".



In the following the contents of the **File** menu are explained:

Open:
This command enables opening each file with "csv" extension previously saved and storing them in the module you are currently connected to.
These files are nothing but the saved parameters with the relevant settings.
During saving the parameters stored in the module will be displayed.

Tx from file:
This command has the same function as "Open", but the parameters are stored in the module without being displayed.

Save:
It enables storing the parameters with the relevant settings in whichever directory and with a "name" (file identification) to identify them.
Saved parameters and settings are listed in the table.

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*Table of the parameters saved with the command **"Save"***

DISPLAY Module		***POWER Module***	
1. CUTBACK SPEED	Level =6	1. ACCELER DELAY	Level =6
2. CUTBACK SPEED 2	Level =9	2. RELEASE BRAKING	Level =0
3. 1ST SPEED COARSE	Level =4	3. INVERS.BRAKING	Level =4
4. 2ND SPEED FINE	Level =5	4. PEDAL BRAKING	Level =6
5. 3RD SPEED FINE	Level =6	5. HOUR COUNTER	RUNNING
6. 4TH SPEED COARSE	Level =4	6. BATTERY CHECK	OPTION #1
7. 4TH SPEED FINE	Level =8	7. CONNECTED TO	2
8. HYDRO TIME	Level =3	8. STEER TABLE	0
9. CHECK UP TYPE	Level =3	9. SET STEER RIGHT	0V
10. HOUR COUNTER	KEYON	10. SET STEER LEFT	7V
11. CHECK UP DONE	OFF	11. SET BATTERY TYPE	OPTION#1
12. AUX CURRENT #1	OFF	12. ADJUST BATTERY	0V
13. REVERSE BUZZER	ON		
14. DISPLAY NAME	OPTION#2		
15. MAXIMUM LOAD	Level =1		
16. AUX FUNCTION 2	OFF		
17. CONNECTED TO	1		
18. MIN POT LIFT	3,0V		
19. MAX POT LIFT	6,0V		
20. MIN POT BRAKE	3V		
21. MAX POT BRAKE	3V		
22. ADJUSTMENT #3	Level =5		

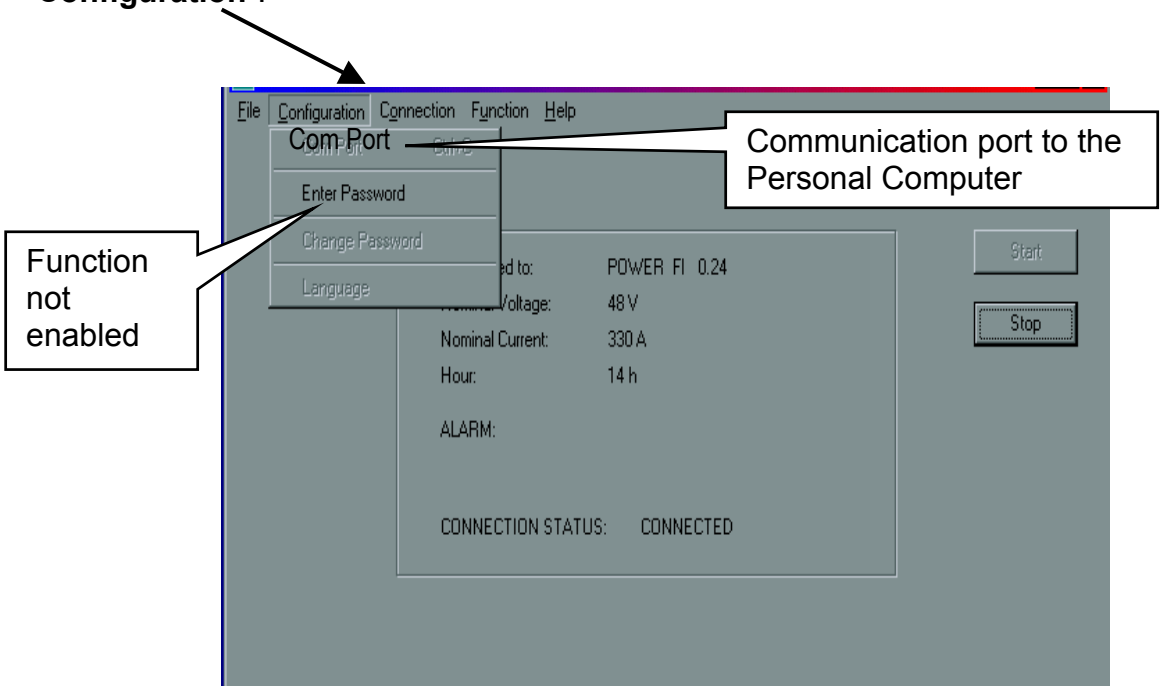
The parameters listed above, together with the relevant settings (values) will be saved in a "directory" you can choose freely in a file (named freely with you), with a "csv" extension, provided the parameters have been previously acquired through the Personal Computer.
Note: the parameters values are not real, since the table paged below represents a mere example.

Print:
This function enables printing out the data of the table indicated above.
The printing parameters refer to the module you are currently connected to.

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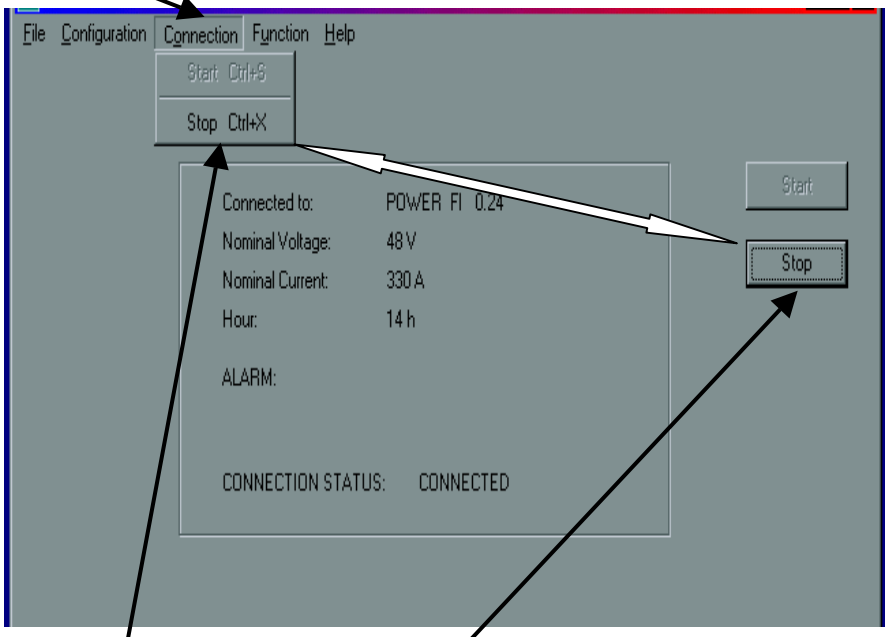
Configuration:

The following page will be displayed with clicking once with the mouse left key on "**Configuration**":



Connection:

The following page will be displayed with clicking once with the mouse left key on "**Connection**":

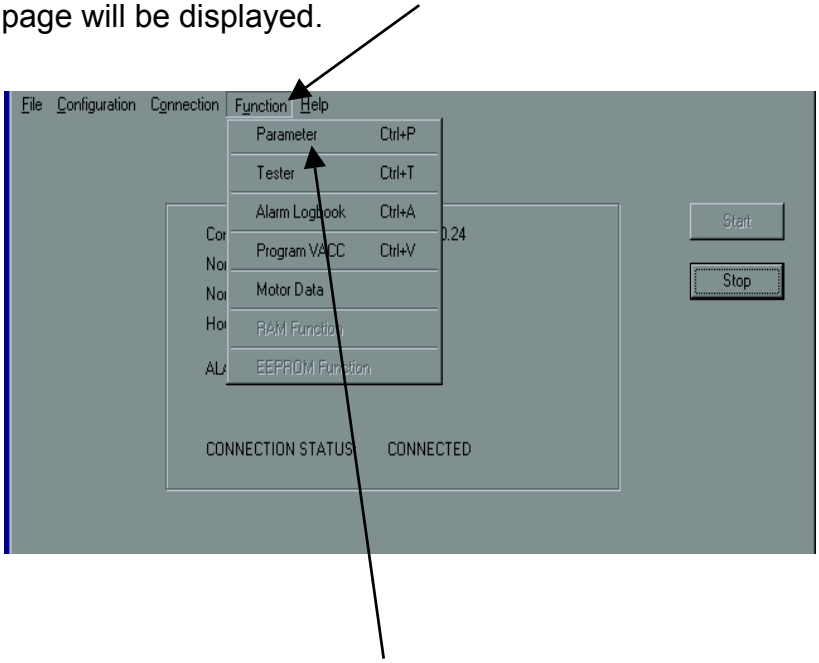


The command "**Stop Ctrl+X**" works as the **Stop** key and allows aborting the program.

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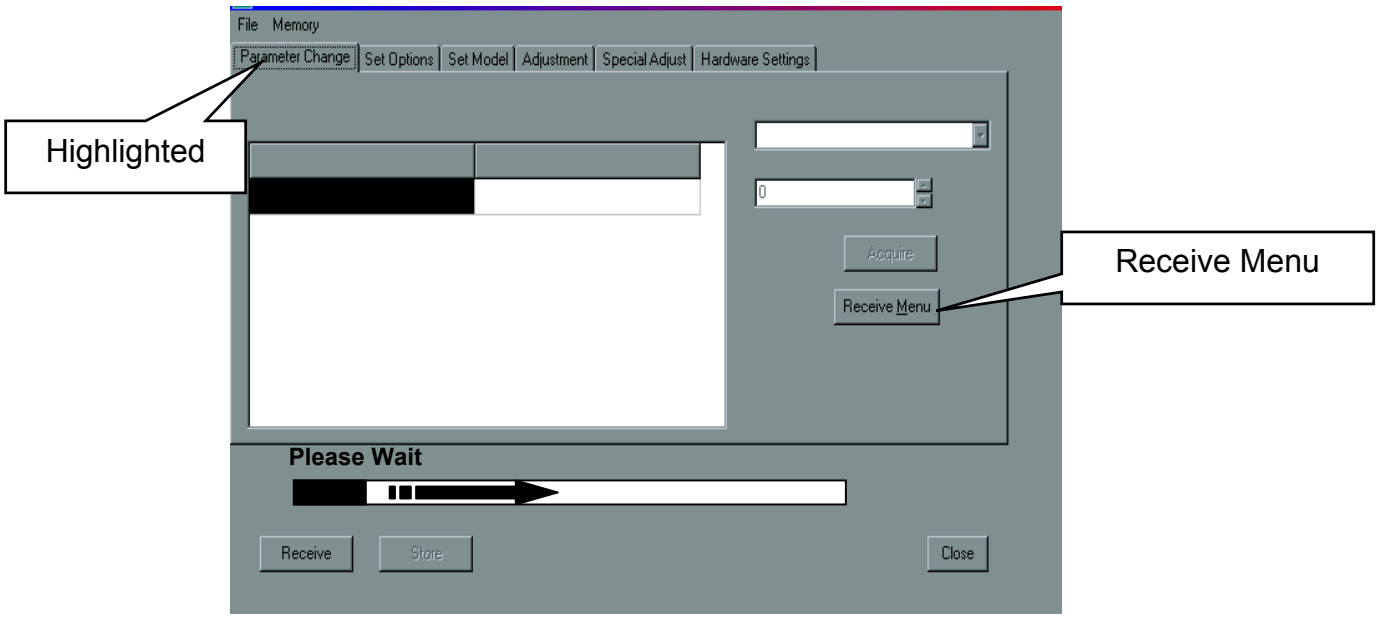
Function:

Click once with the mouse left key on "**Function**".
The following page will be displayed.



Parameter:
Click once with the mouse left key on **Parameter**".

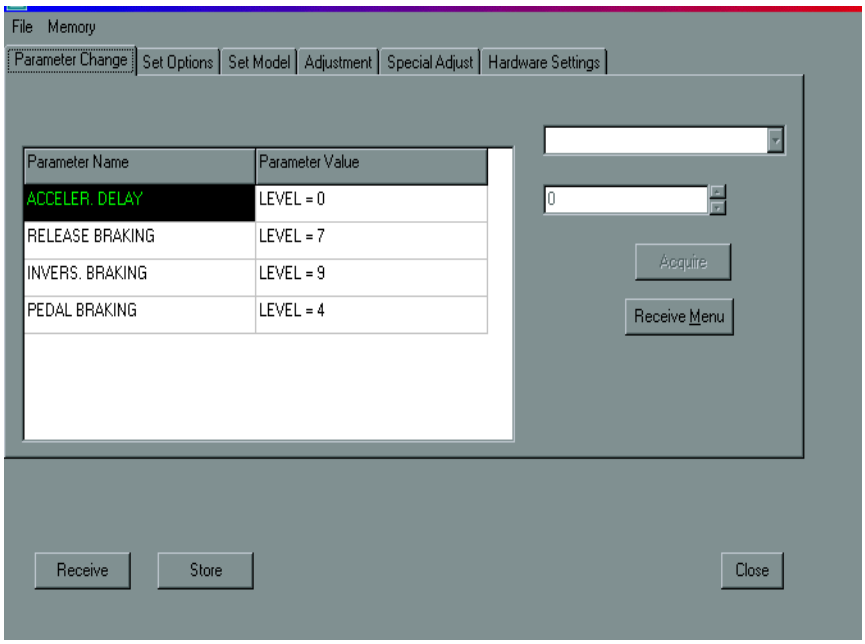
The following page will be displayed:



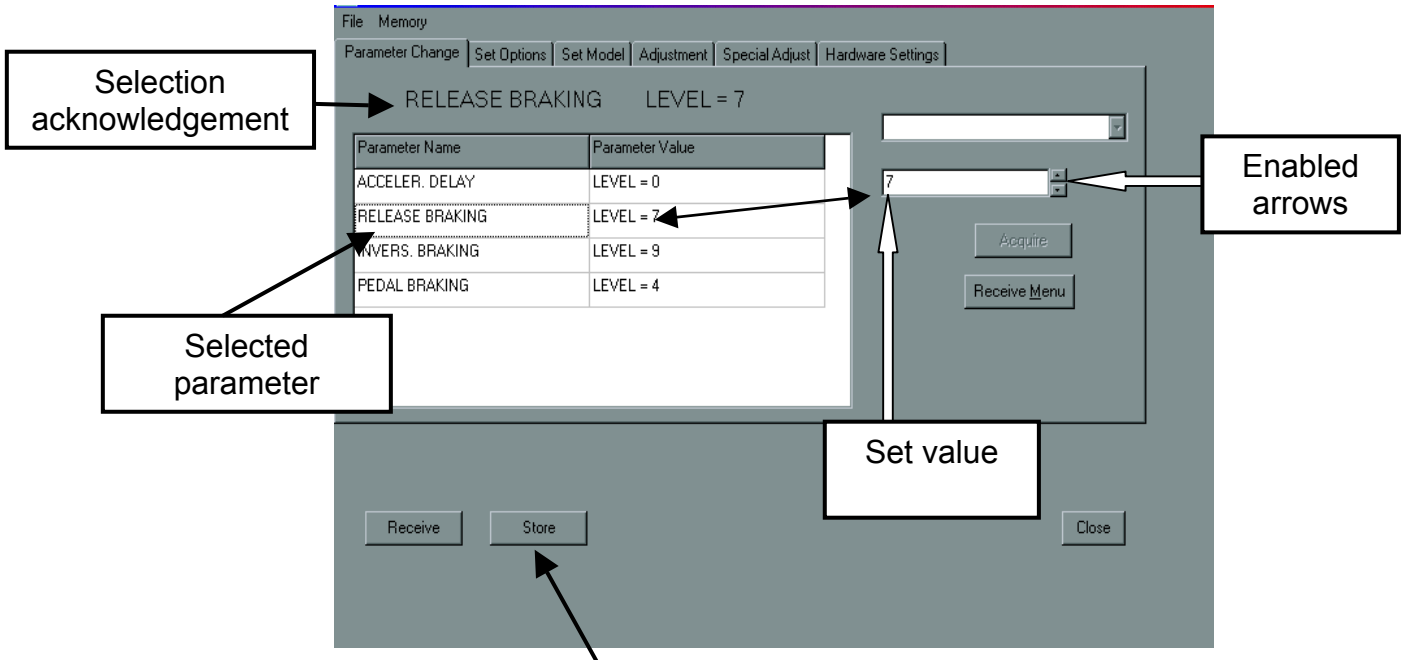
Parameter Change:
For displaying the items relevant to the choice made, the corresponding data shall be acquired. To perform data acquisition click once with the mouse left key on the command "**Receive Menu**" and wait until all data have been loaded. The data loading will be indicated through the message "**Please Wait**".

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The following page will be displayed: (**the module you are currently connected to will be displayed**).



Now you can change the set value with selecting the relevant item.
Select the item you intend to change with clicking it once with the mouse left key. The **set value** will be displayed on the right, whereas **both arrows** for increasing or reducing respectively the value **will be enabled**.



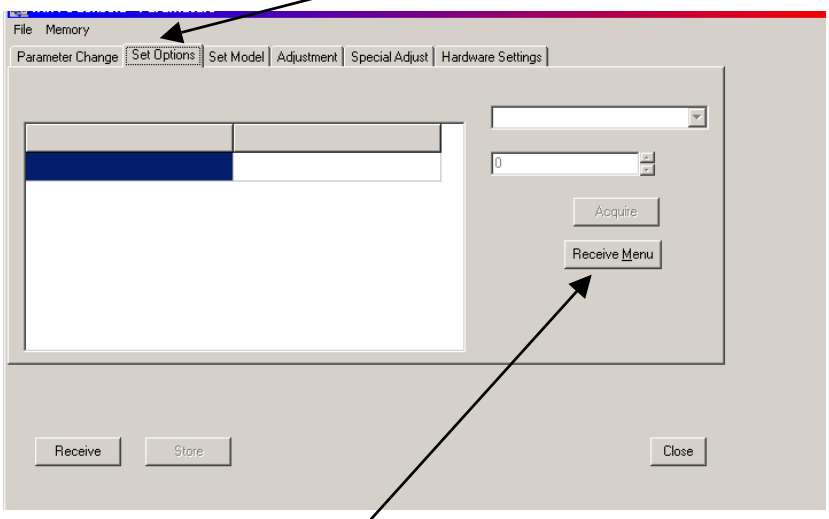
After setting each new value, to acknowledge them you just have to click one with the mouse left key on the command "**Store**". The operation enables storing the changes made.

If you miss the latter operation, the new parameters will not be saved.

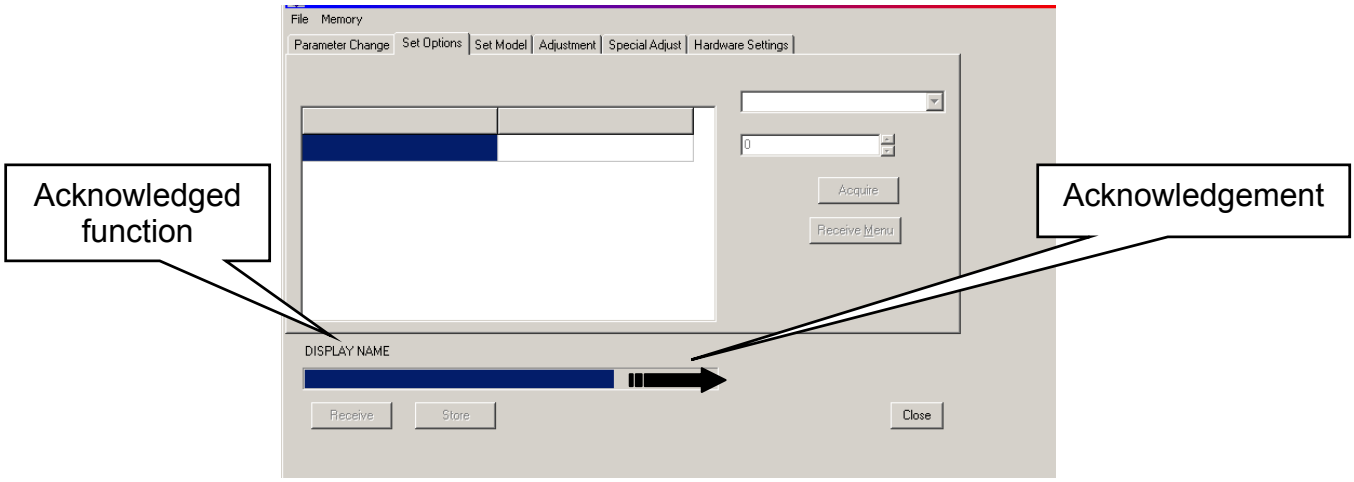
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Set Option:

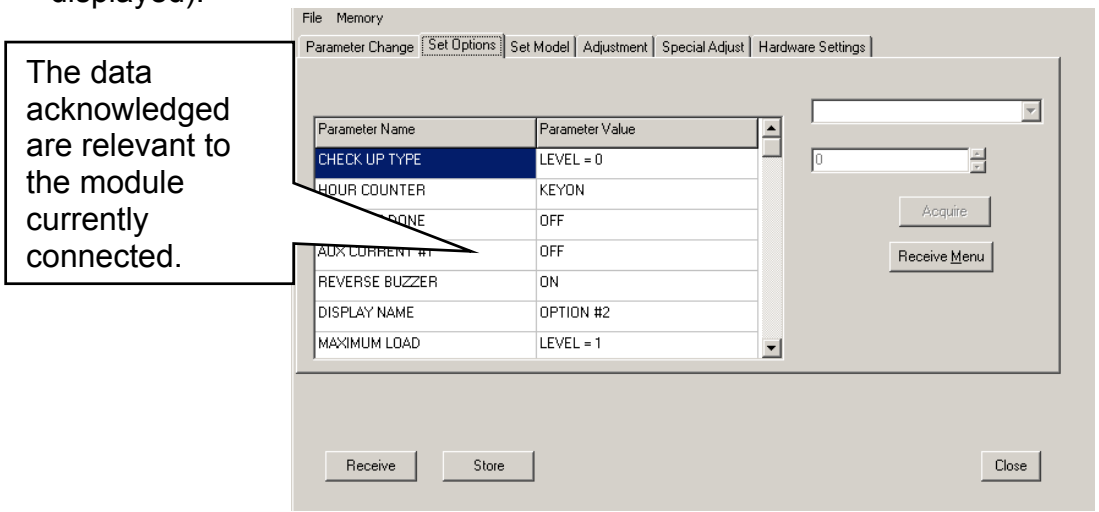
Click once with the mouse left key on "**Set Options".** The following page will be displayed:



Click once with the mouse left key on "**Receive Menu**". The following page will be displayed:



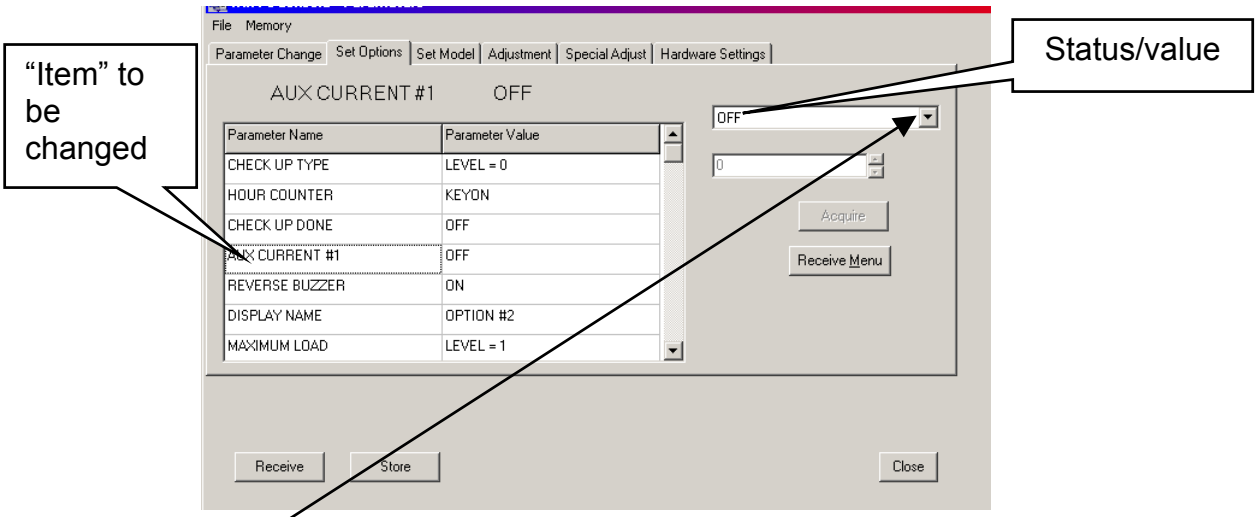
The following page will be displayed (the module you are currently connected to will be displayed):



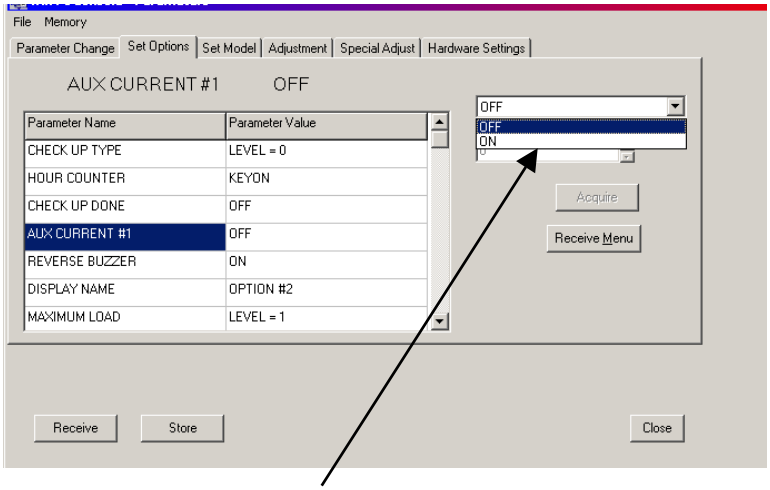
For changing the settings click once with the mouse left key on the item you intend to change.

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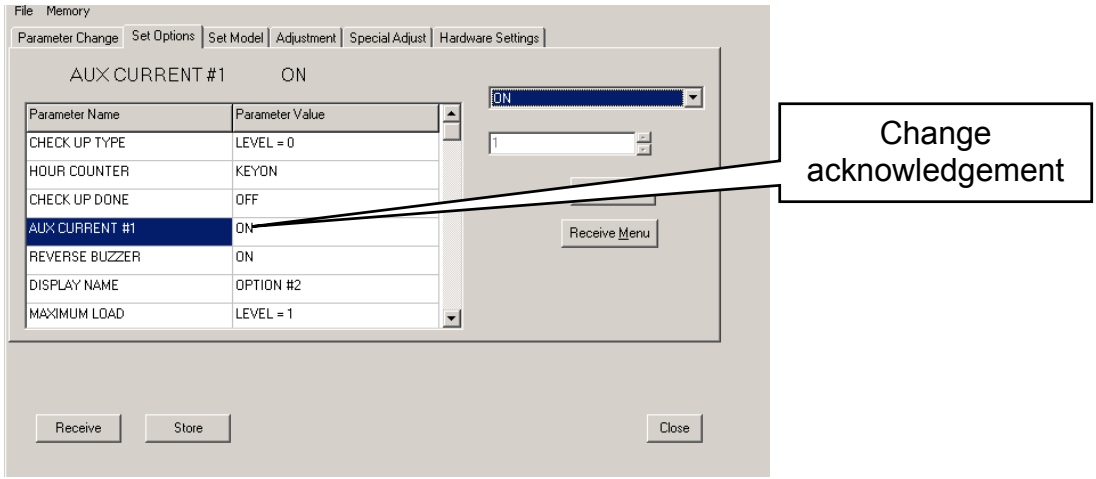
The following page will be displayed:



Click on the "**arrow**" to select a new status/value. The following page will be displayed:

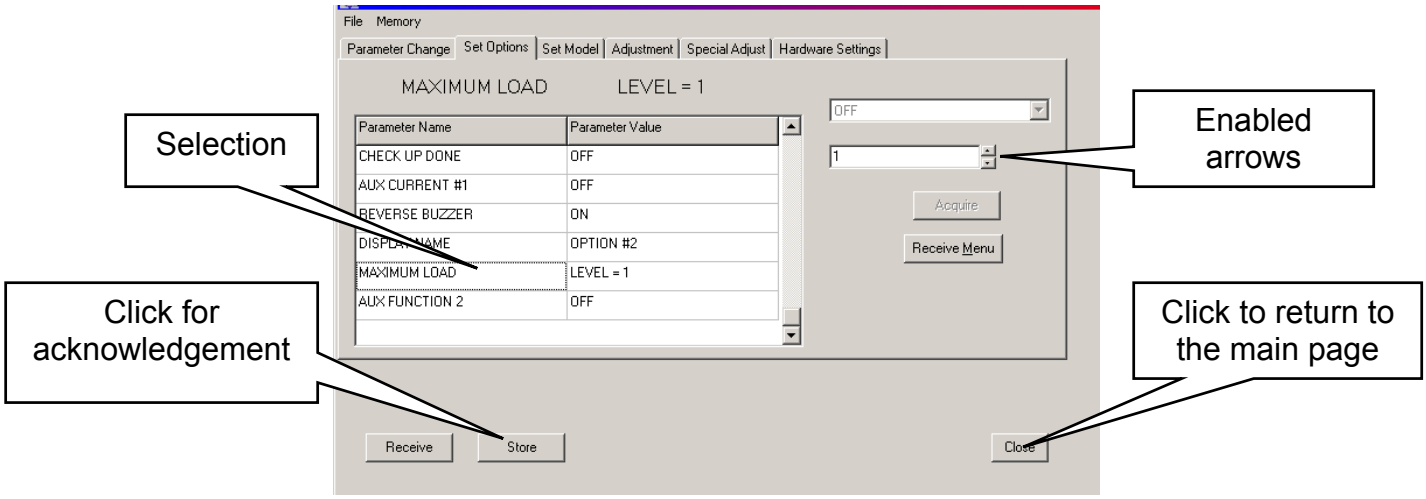


Click once with the mouse left key on "**ON**". The following page will be displayed:



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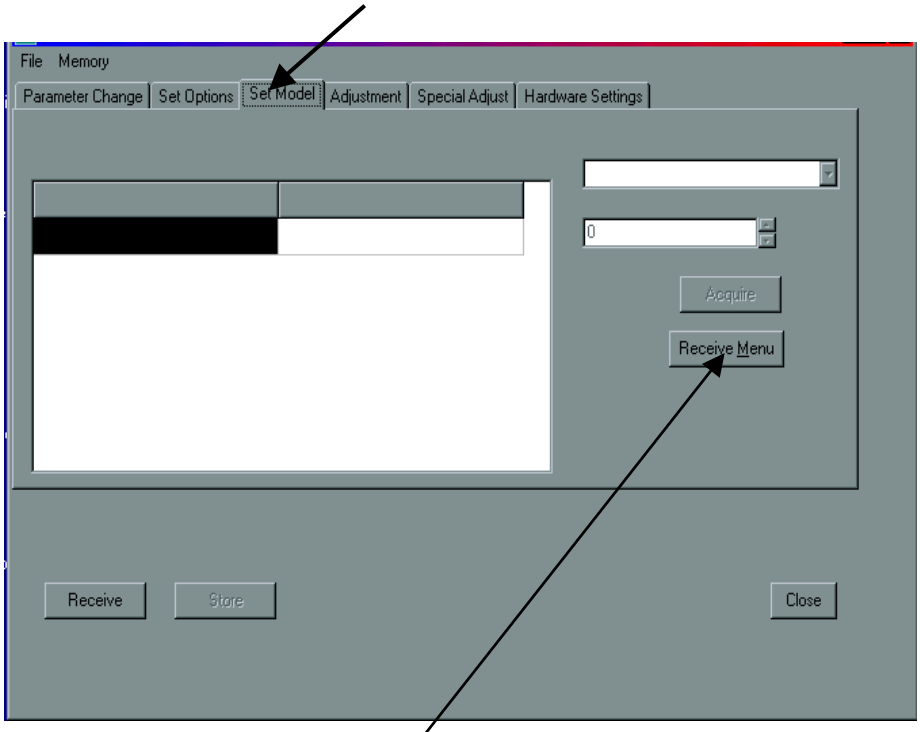
The same procedure will be run when changing e.g. a “level”; in that case the arrows marked would be activated.



When all changes are entered, click once with the mouse left key on “**Store**” to acknowledge the modifications. For returning to the main page, click once with the mouse left key on “**Close**”.

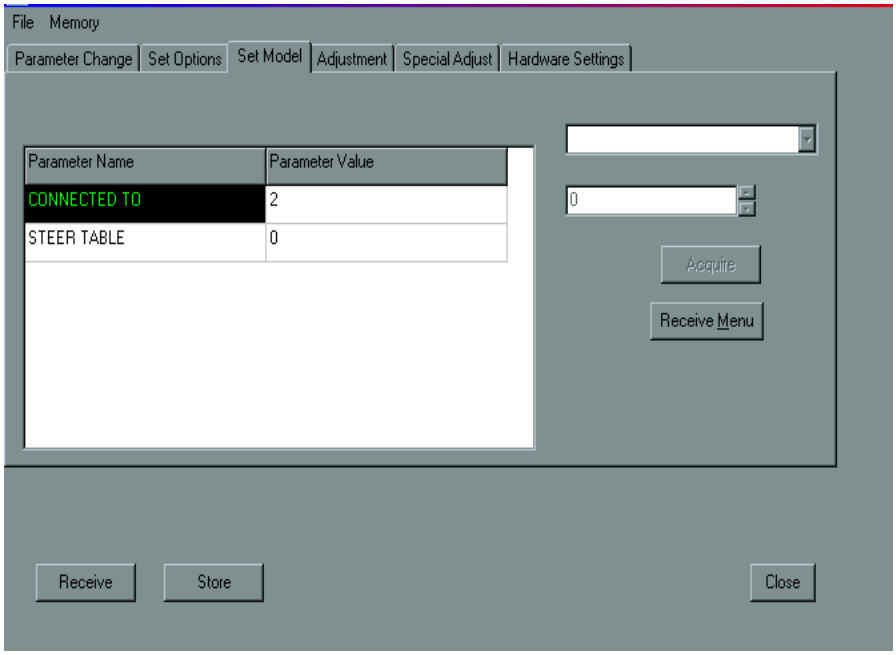
Set Model:

If you wish to display the parameters relevant to the choice you have selected, they have to be acknowledged through the Personal Computer.
Click once with the mouse left key on “**Set Model**”. The following page will be displayed:

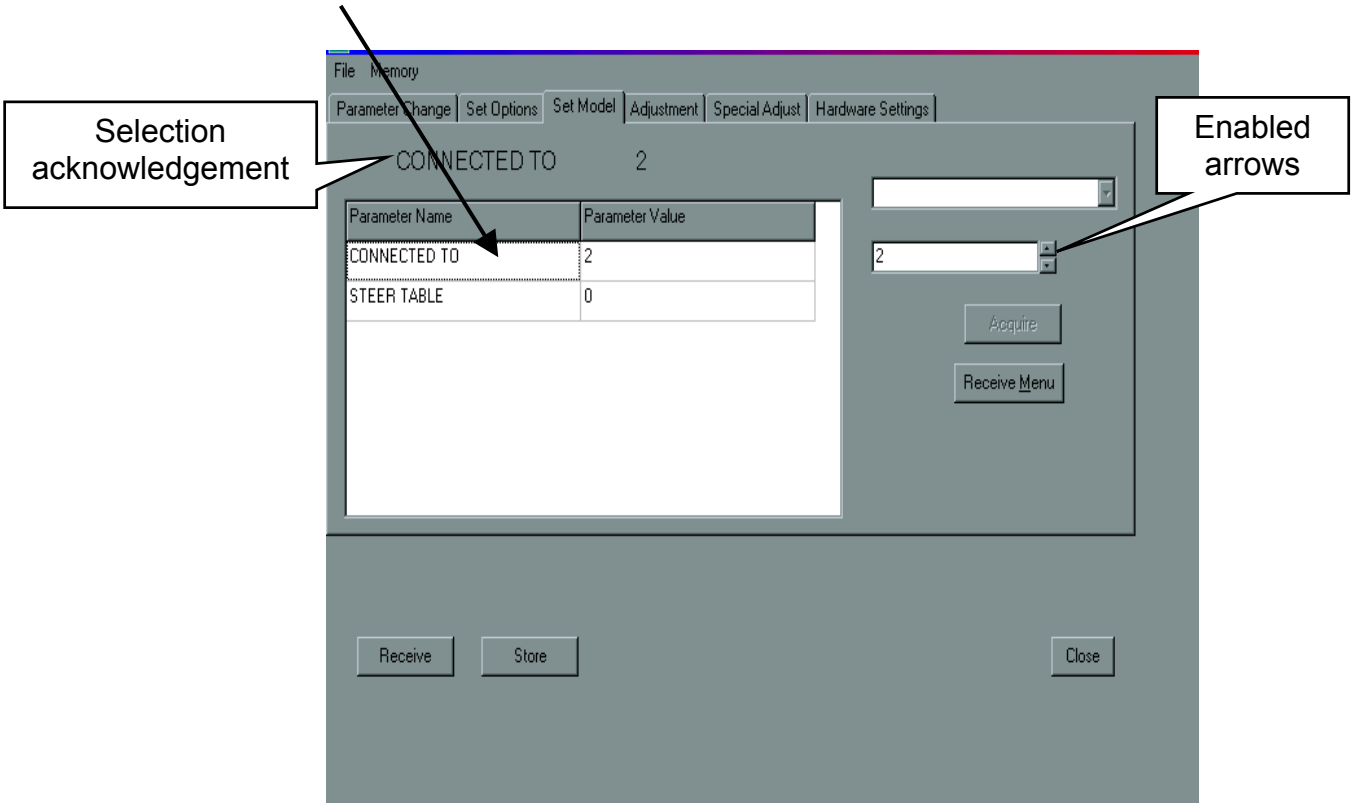


Click once with the mouse left key on “**Receive Menu**”.
After the data have been loaded, the following page will be displayed:

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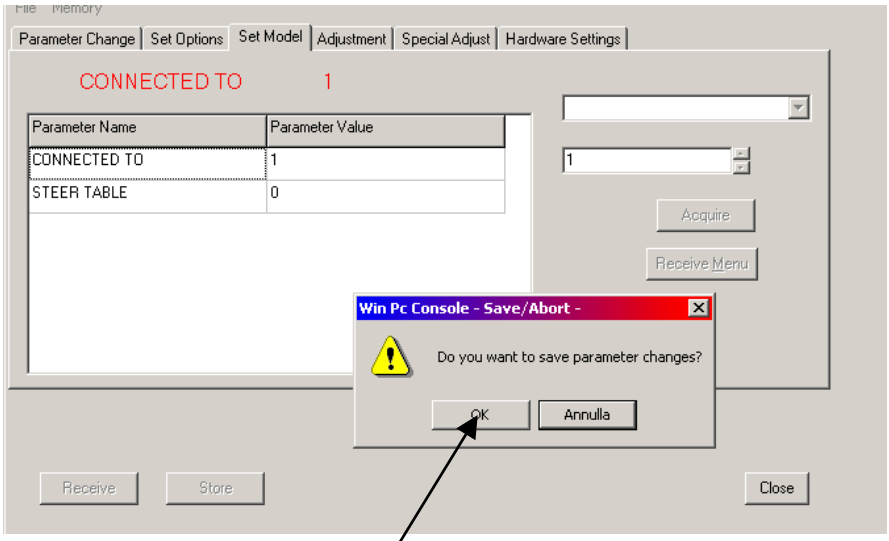


This picture indicates that we are connected to the **POWER Module (2)** and that the selected model is a **4 wheeled** "**STEER TABLE 0**".
For selecting the "**DISPLAY Module**" (1), click once with the mouse left key on the item v **"CONNECTED TO"** and look at the screen:

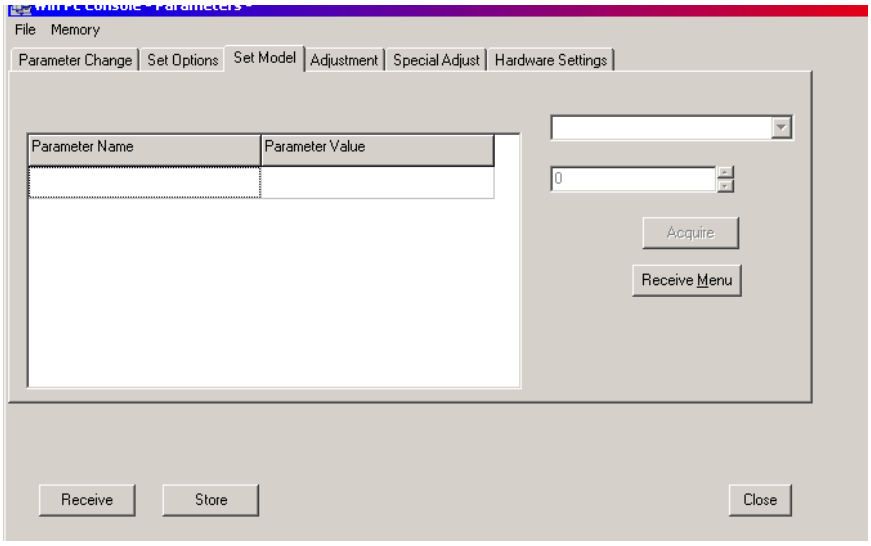


Now you can **switch the connection** to the other module, since the selection **2** is appeared in the upper part of the page and **both arrows are enabled**.
Click once with the mouse left key on the **down arrow** to switch from selection **2 (POWER Module)** to selection **1 (DISPLAY Module)**.
The following page will be displayed:

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Click once with the mouse left key on "**OK**". The following page will be displayed:



Now we have switched the Module. Of course the page is blank, since so far no data have been acknowledged.

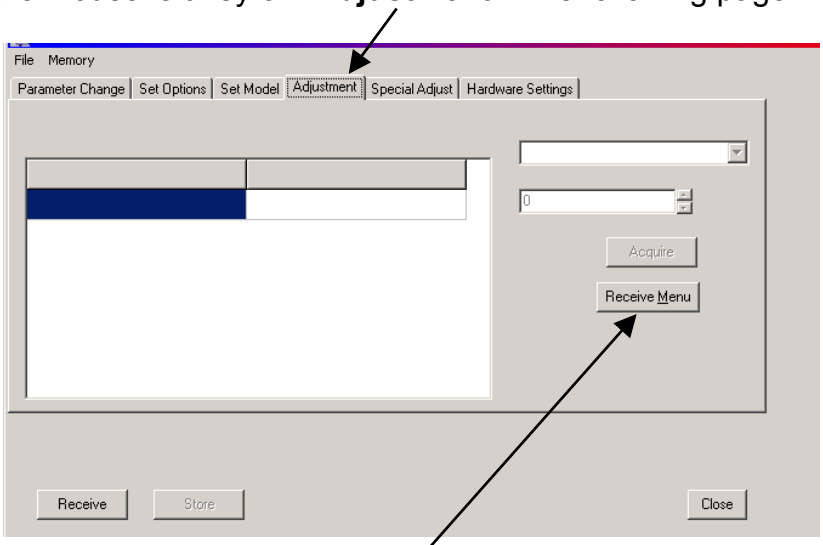
STEER TABLE (Truck model selection)
For selecting the truck type repeat the entries lustrated above. Please notice:
0 = 4-Wheeled, 1 = -Wheeled, 2 = Model not defined.

WARNING: the model switch is performed automatically and immediately. Nevertheless we recommend acknowledge the selection by clicking once with the mouse left key on the item "Store".

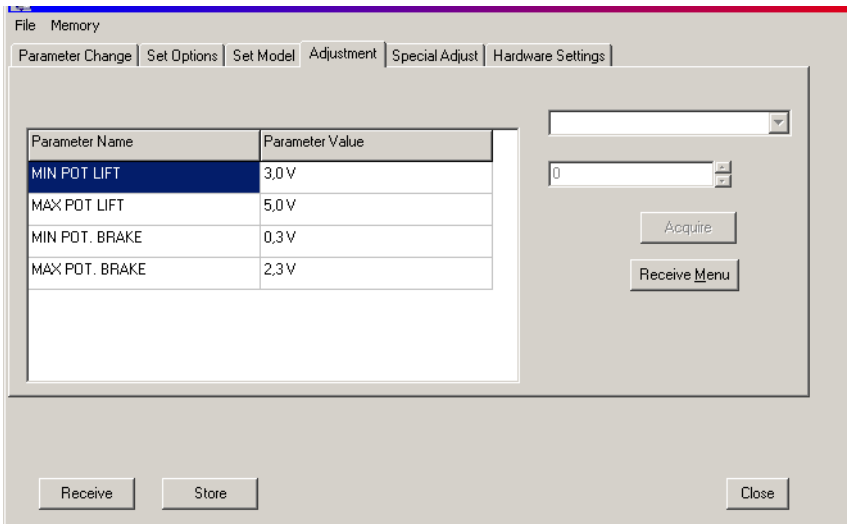
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Adjustment:

Click once with the mouse left key on "**Adjustment**". The following page will be displayed:



Click once with the mouse left key on "**Receive Menu**". The following page will be displayed:

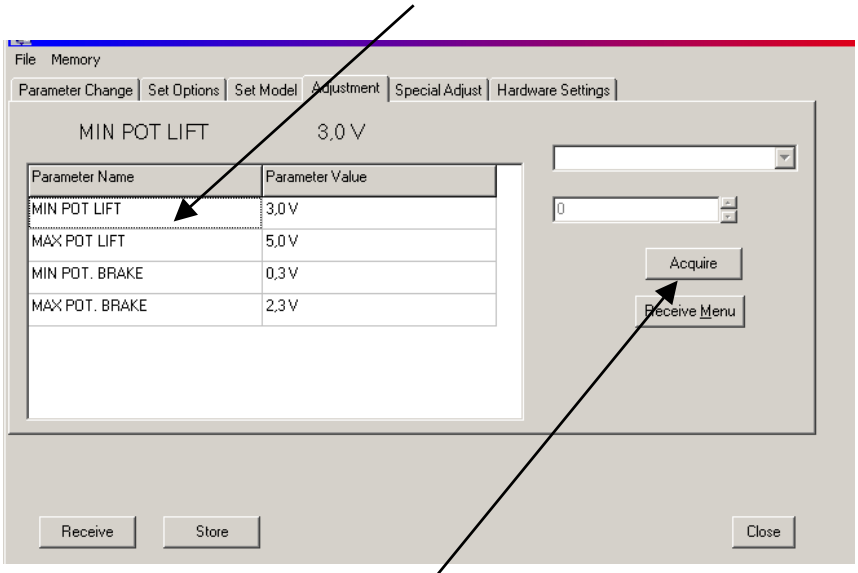


As we are connected to the Display Module, the page indicates the settings of the lifting Hall sensor as well as the brake pedal potentiometer setting.

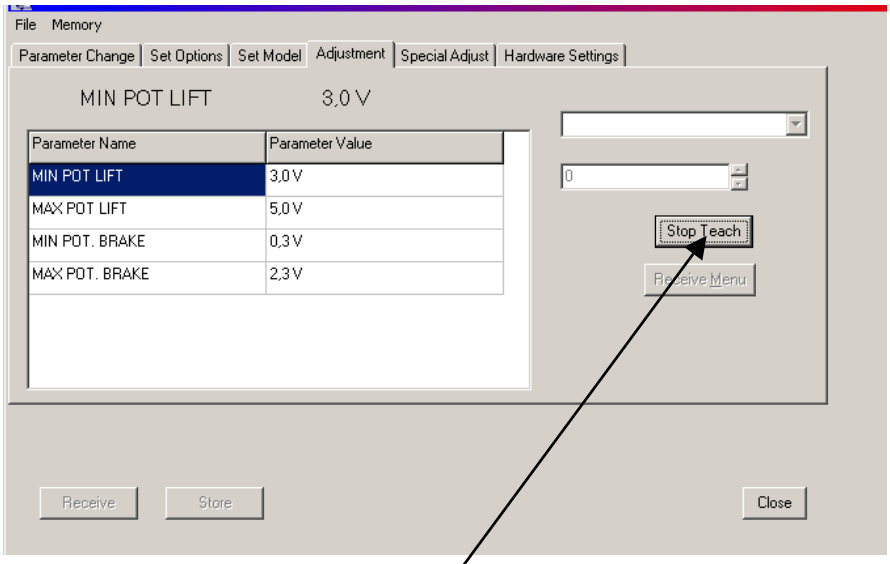
https://truckmanualshub.com/

Setting of the Lifting Hall sensor:

Click once with the mouse left key on **MIN POT LIFT**". The following page will be displayed:



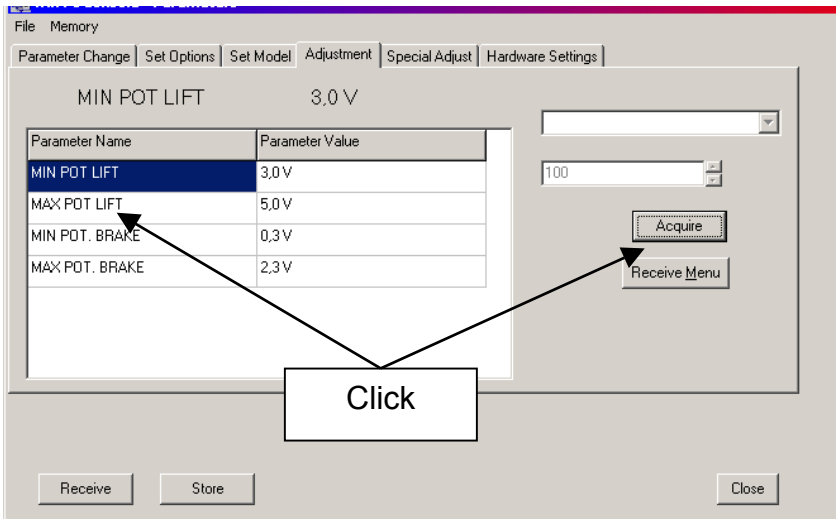
Click once with the mouse left key on "**Acquire**". The following page will be displayed:



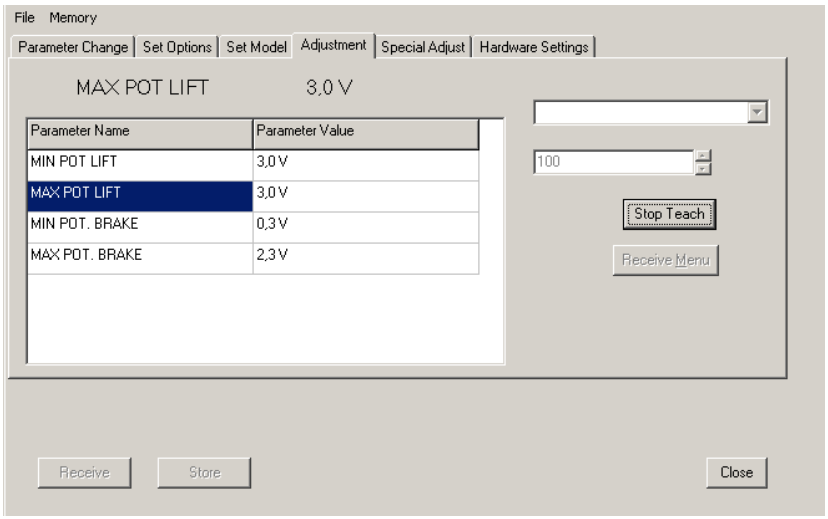
The item "**Acquire**" has changed into "**Stop Teach**".
Click once with the mouse left key on "**Stop Teach**" without moving the distributor lever of the lifting function, thus saving the minimum output value of the lifting Hall sensor.

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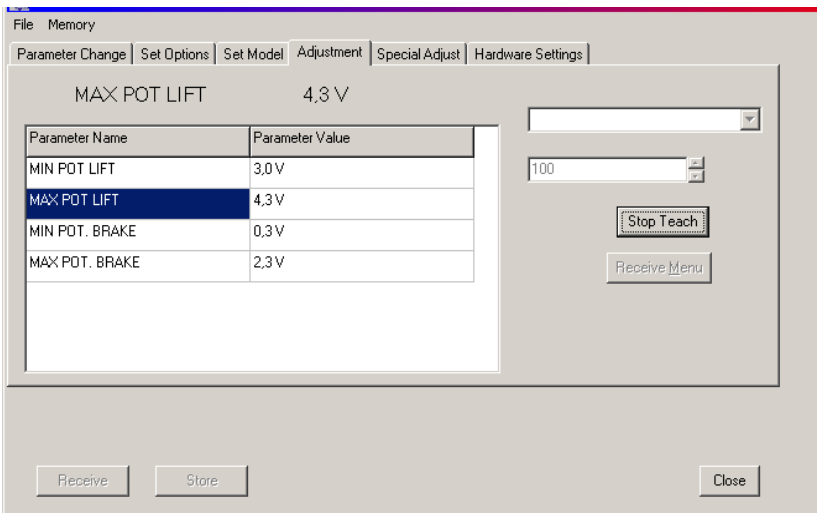
The following page will be displayed:



Click once with the mouse left key on “**MAX POT LIFT**” and on “**Acquire**”
The following page will be displayed:

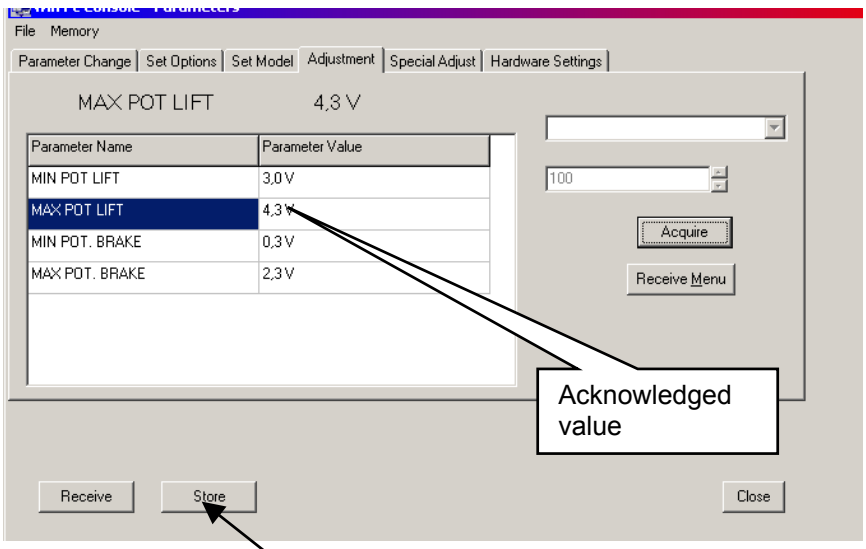


Pull the distributor lever relevant to the lifting function, until it reaches its end stroke position. The following page will be displayed:



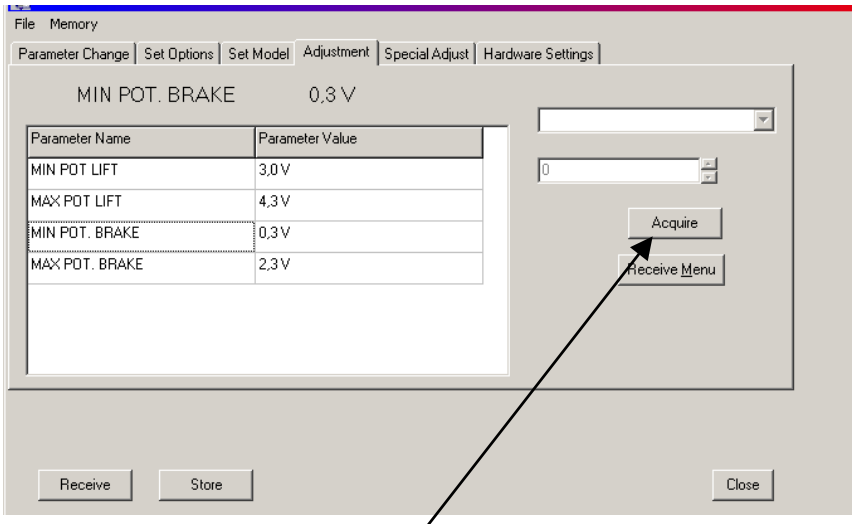
https://truckmanualshub.com/

While keep on pulling the lever, click once with the mouse left key on "**Stop Teach**".
The following page will be displayed:



Now the maximum output value of the lifting Hall sensor has been entered.
Click once with the mouse left key on "**Store**" for acknowledging both values.

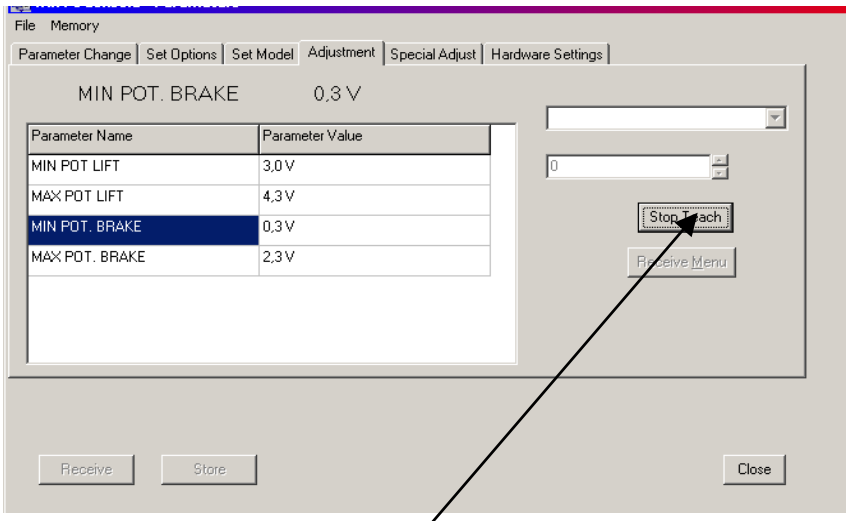
Brake pedal potentiometer setting:
Click once with the mouse left key on "**MIN POT. BRAKE**".
The following page will be displayed:



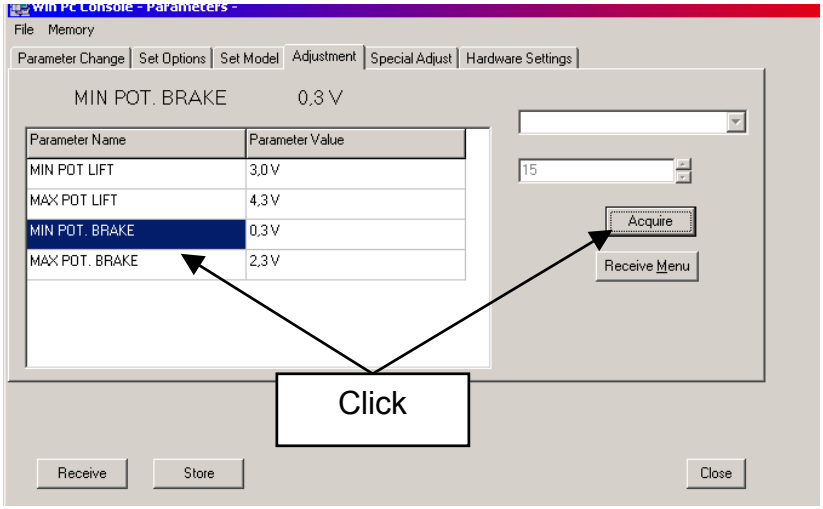
Click once with the mouse left key on "**Acquire**"

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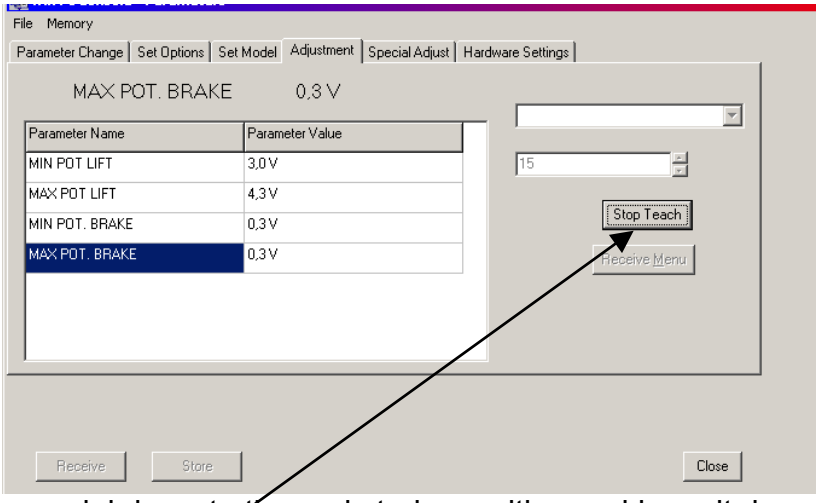
The following page will be displayed:



Click once with the mouse left key on "**Stop Teach**", without moving the pedal.
The following page will be displayed:

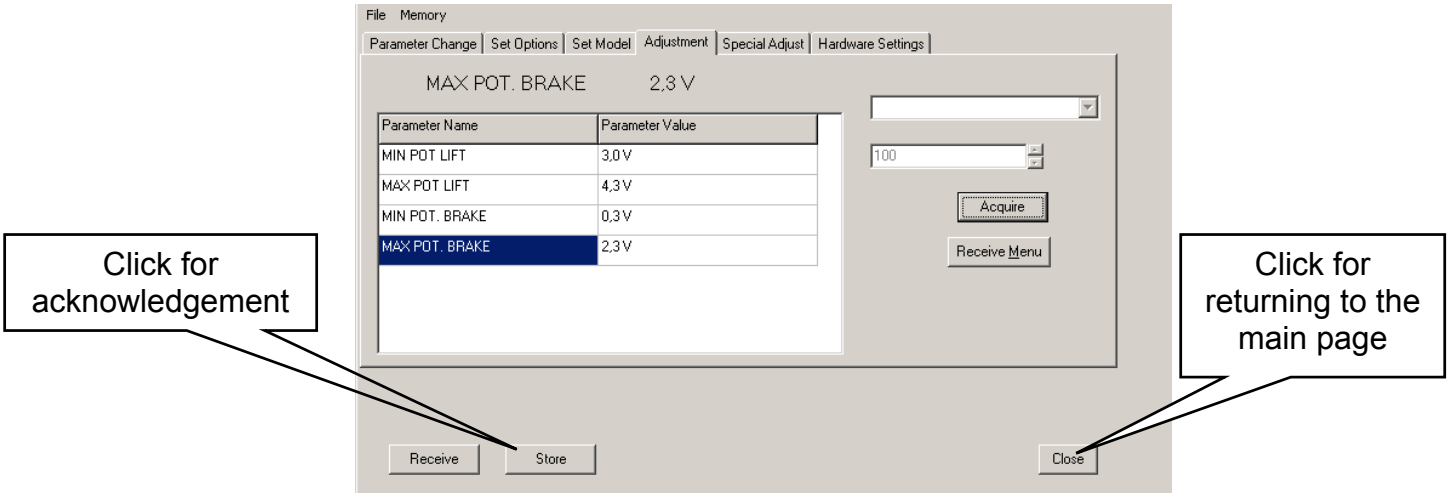


Click once with the mouse left key on "**MAX POT BRAKE**" and on "**Acquire**".
The following page will be displayed:



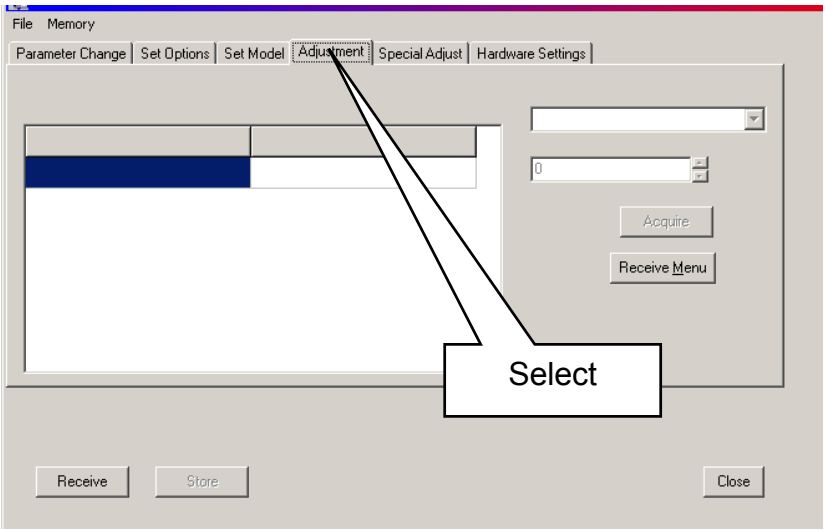
Depress the brake pedal down to the end stroke position and keep it depressed; click once with the mouse left key "**Stop Teach**" The following page will be displayed:

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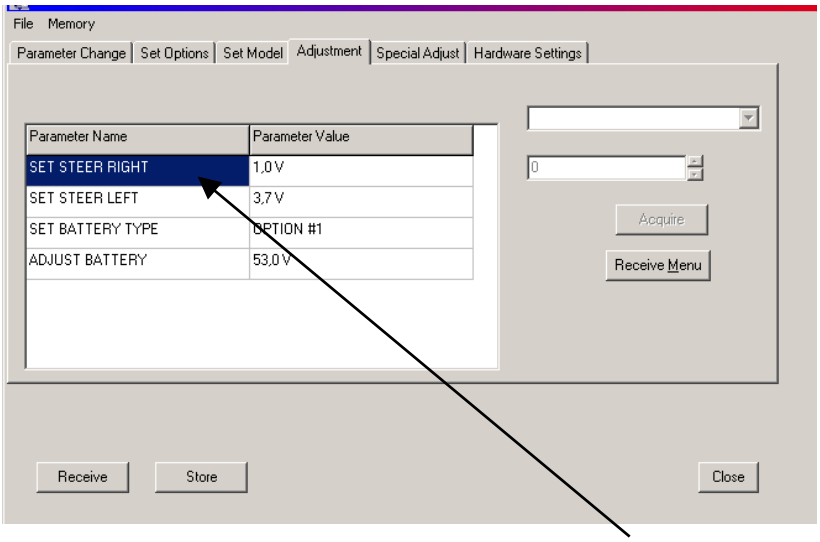
The maximum value for the brake pedal potentiometer has been acknowledged.
Click once with the mouse left key on "**Store**" for acknowledging the entrances and on "**Close**" to return to the main page.

<u>Steering Potentiometer Adjustment:</u>
Select Power Module.
Select Adjustment.
The following page will be displayed:

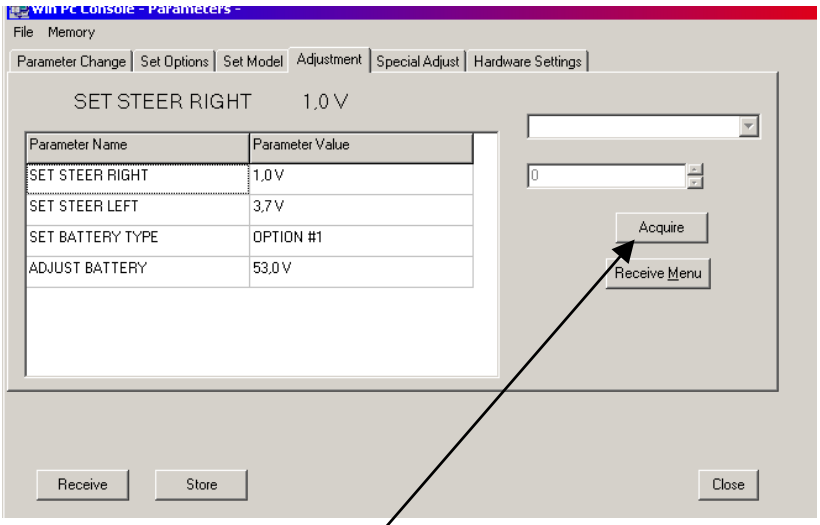


Click once with them mouse left key on "**Receive Menu**"
The following page will be displayed:

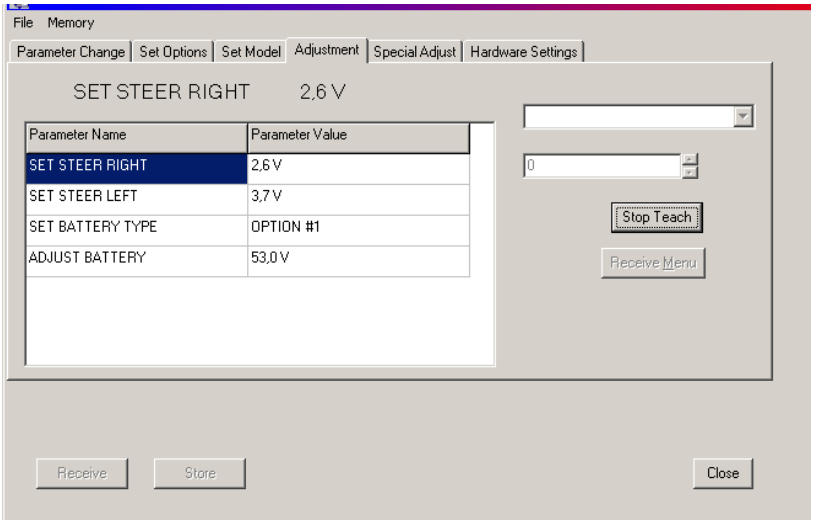
https://truckmanualshub.com/



Click once with the mouse left key on "**SET STEER RIGHT**". The following page will be displayed:



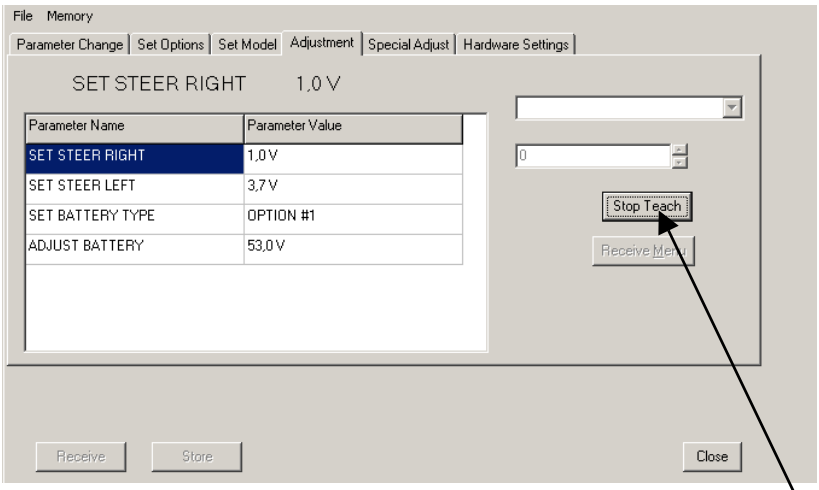
Click once with the mouse left key on "**Acquire**". The following page will be displayed:



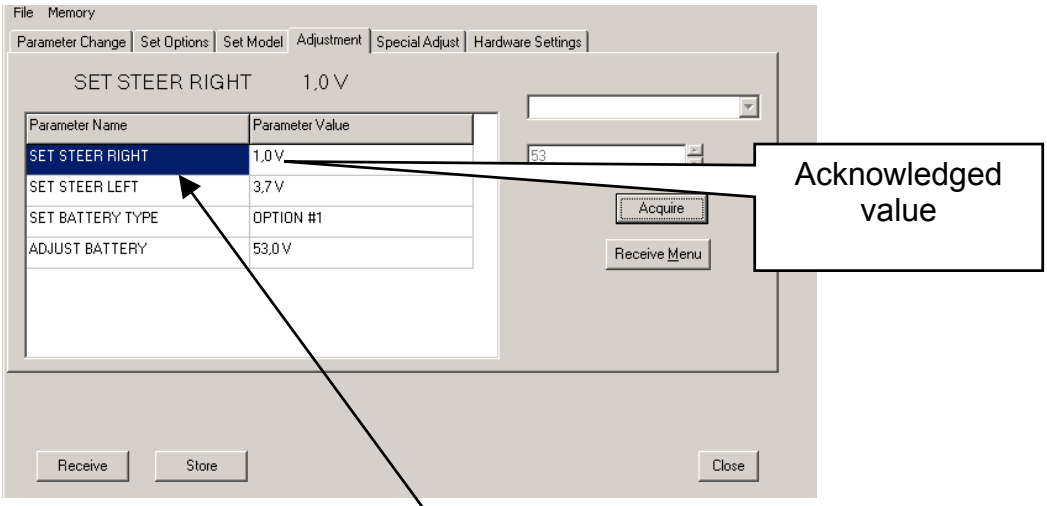
Depress the brake pedal to activate the hydraulic steering **and turn the steering wheel throughout right.**

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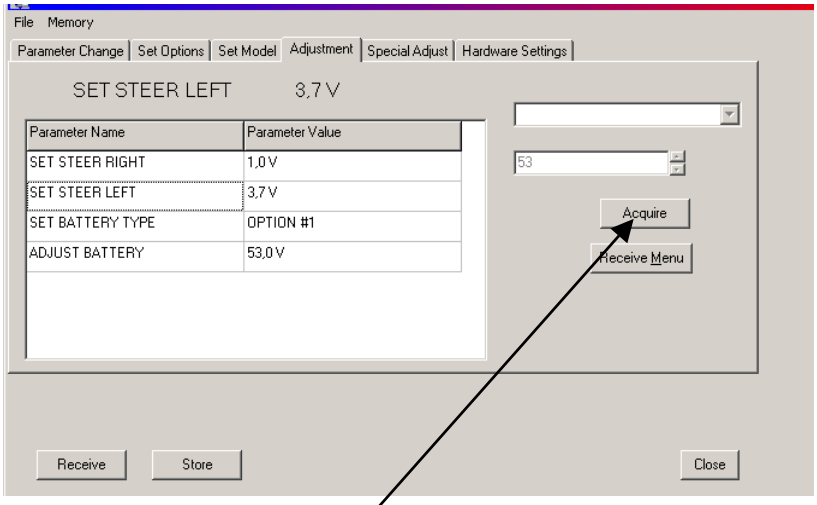
The following page will be displayed:



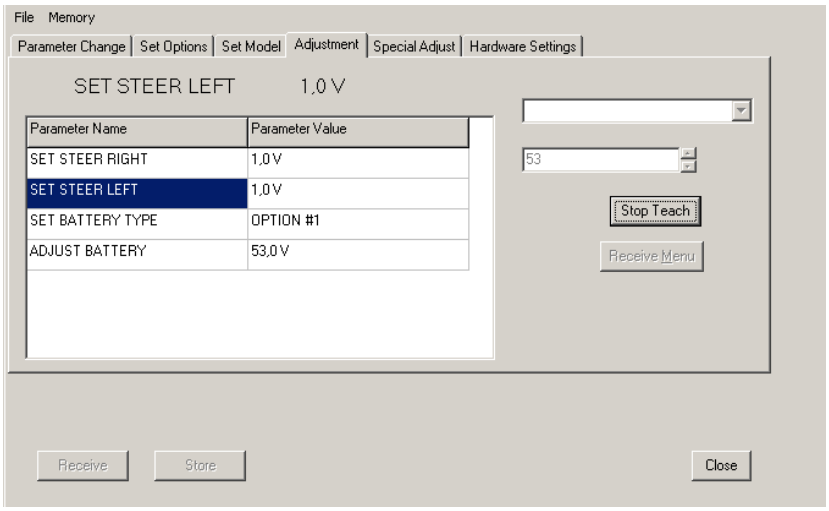
Release the brake pedal and click once with the mouse left key on "**Stop Teach**".
The following page will be displayed:



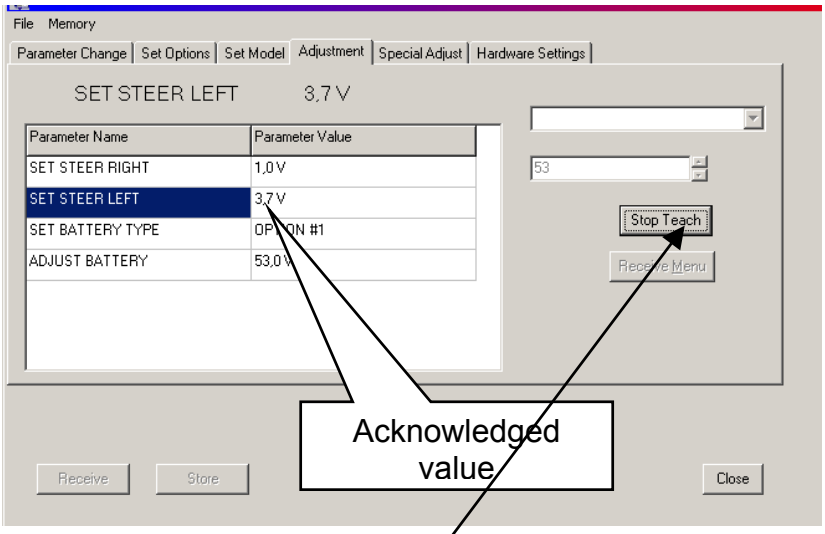
Click once with the mouse left key on "**SET STEER LEFT**".
The following page will be displayed:



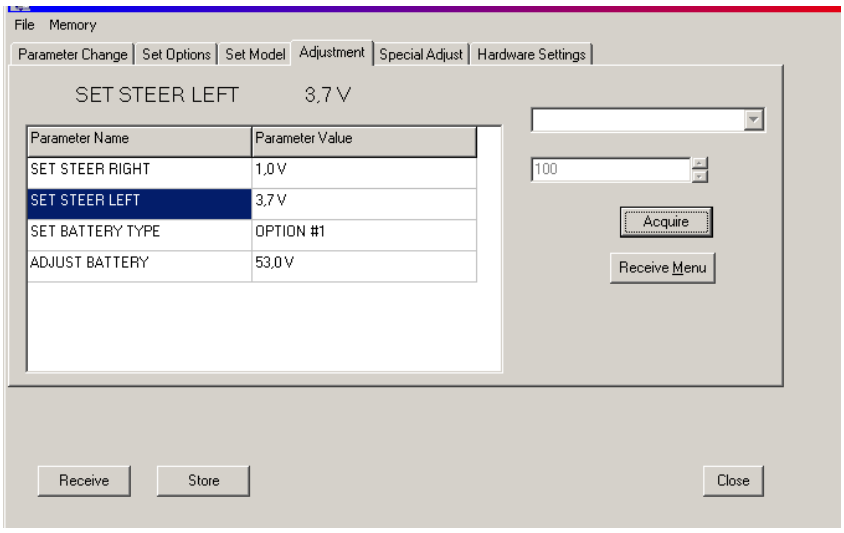
Click once with the mouse left key on "**Acquire**". The following page will be displayed:



Depress the brake pedal for actuating the hydraulic steering and **turn the steering wheel throughout left**. The following page will be displayed:

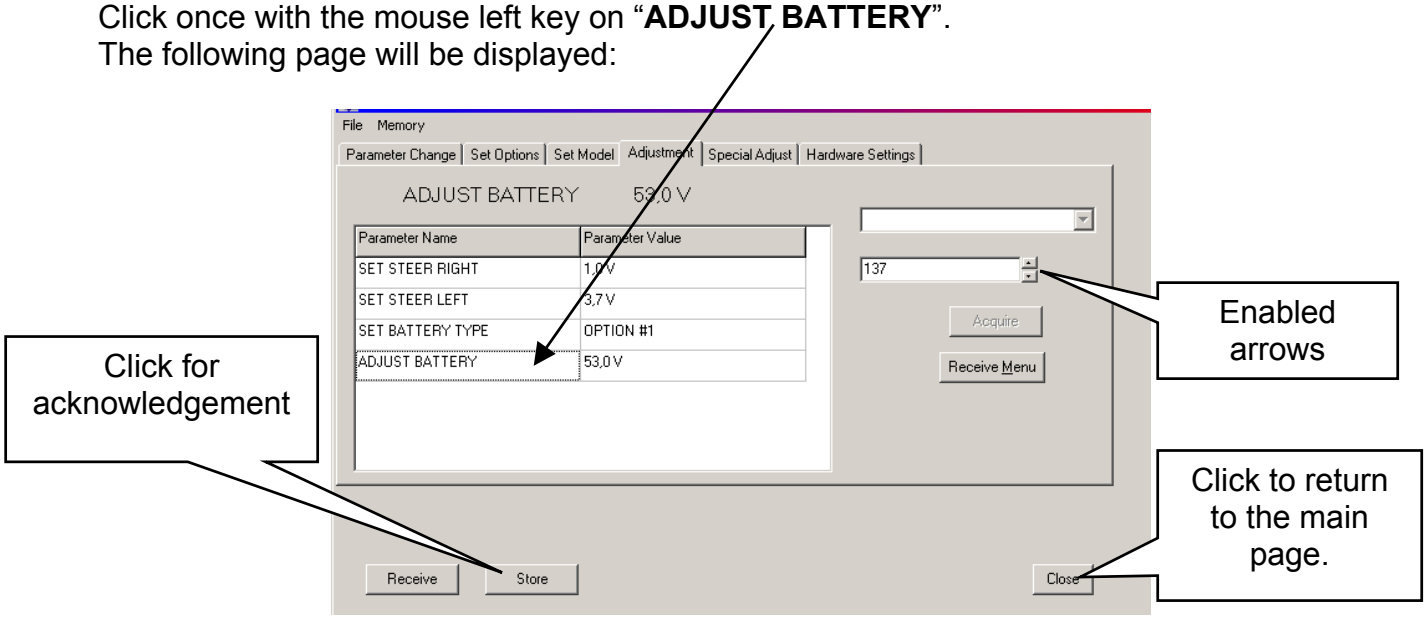


Click once with the mouse left key on "**Stop Teach**". The following page will be displayed:



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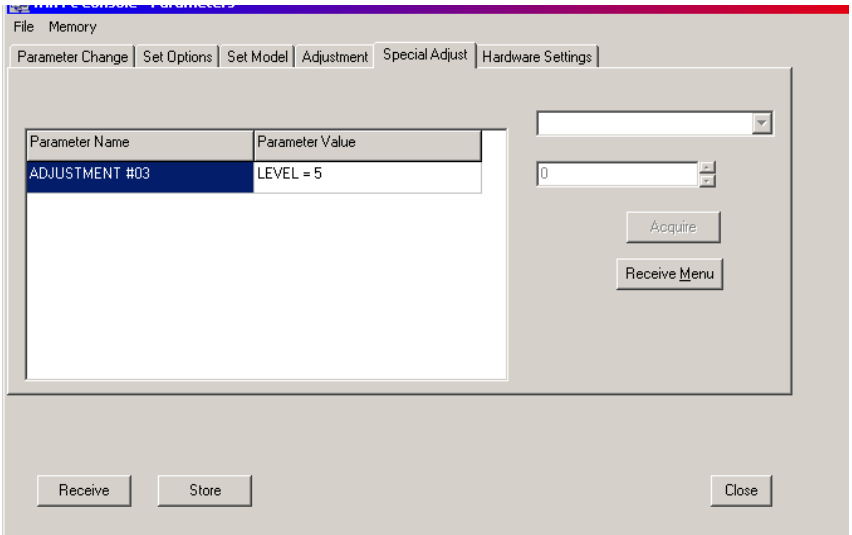
Battery Voltage Adjustment:
Click once with the mouse left key on "**ADJUST BATTERY**".
The following page will be displayed:



Use a tester for measuring the battery voltage between the **+Battery** and **–Battery-**poles on the Power Module.
Should the measurement differ from the acknowledged values, adjust it by means of the enabled arrows. **The change occurs while doing it.**
After entering the modification, click once with the mouse left key on "**Store**" for acknowledging. Click on "**Close**" for returning to the main page.

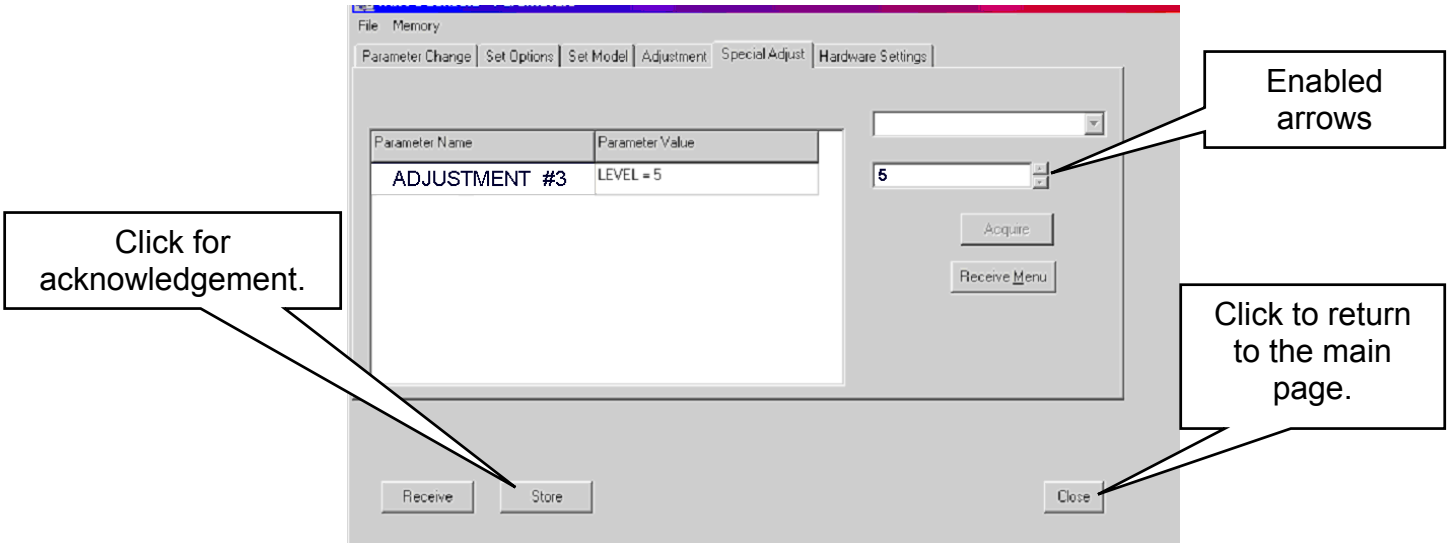
Special Adjustment (Enabled only while being connected to Display Module).

Click once with the mouse left key on "**Special Adjustment**" and then on "**Receive Menu**".
The following page will be displayed:



Click once with the mouse left key on the function for modifying it.

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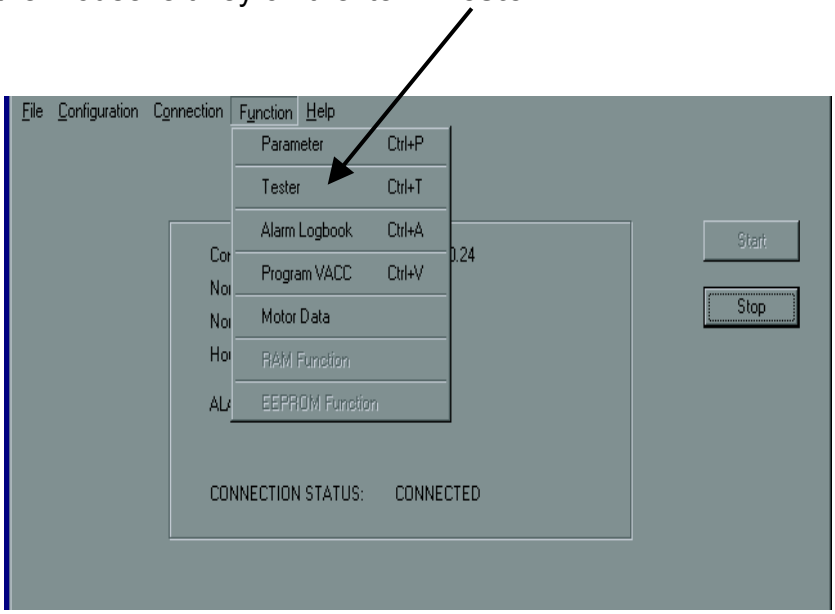


Use the enabled arrows to change for changing the value and click once with the mouse left key on “**Store**” for acknowledgement.
Click once with the mouse left key on “**Close**” for returning to the main page.

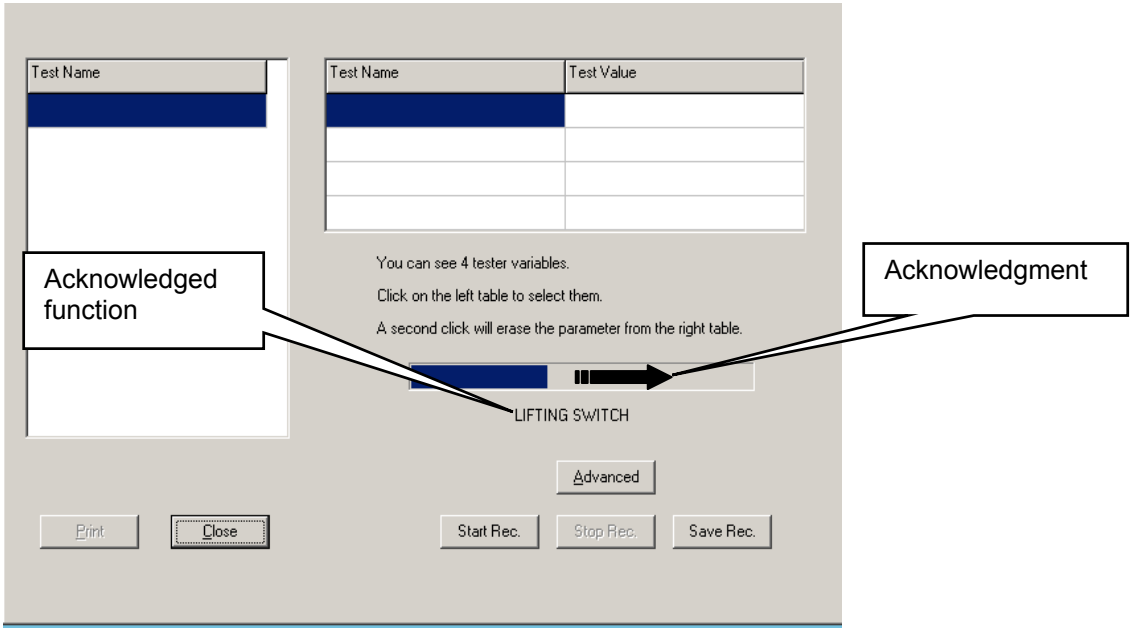
https://truckmanualshub.com/

Tester:

Click once with the mouse left key on the item "**Tester**"

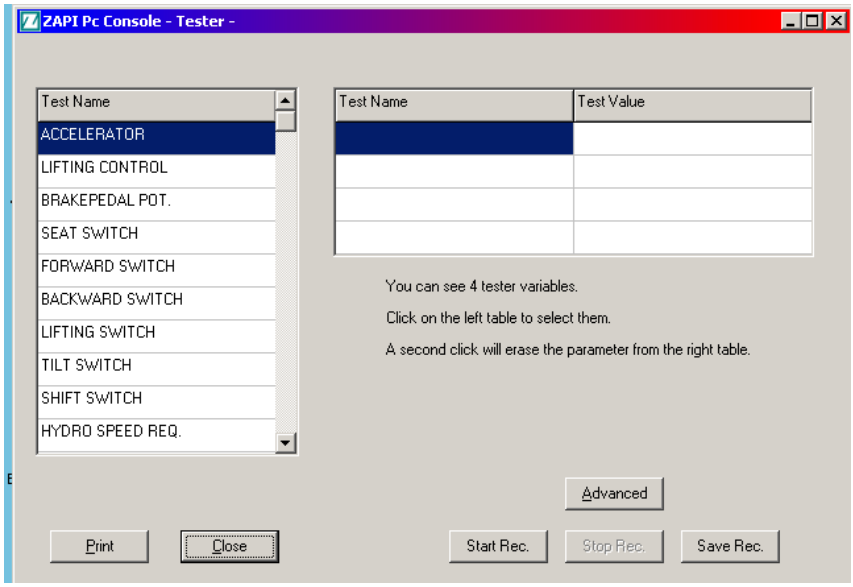


The following page will be displayed:

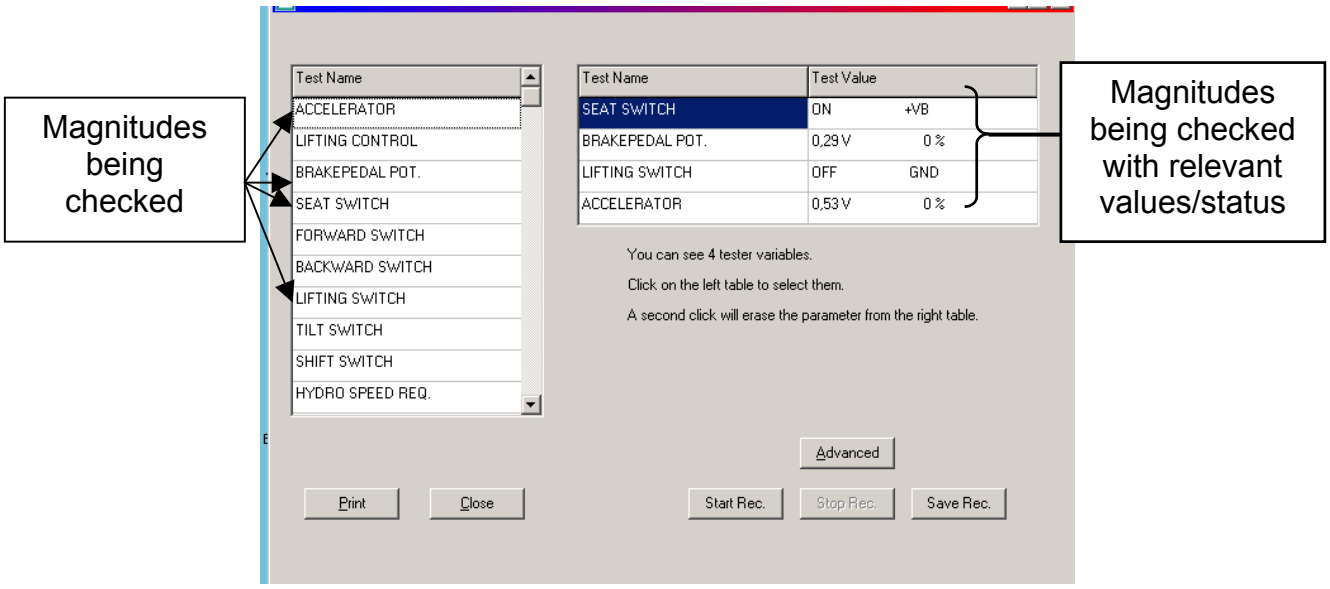


The Personal Computer is acquiring the information relevant to the magnitudes being entered from the module, which it is currently connected to.
As so as the all magnitudes have been acquired, they will be displayed.

The page will refer to the Module currently connected.



On the left side of the page the magnitudes to be checked are listed, you just have to click on the item you intend to check with the mouse left key. Click once again on the same item for disenabling its visualisation.



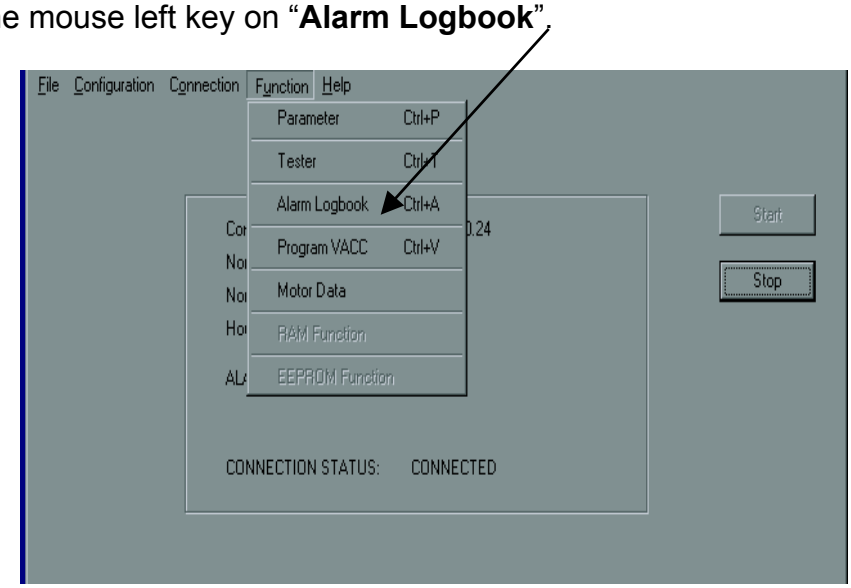
Reading occurs immediately.

Notice: the function “Seat Switch” is enabled only when connected to Power Module.

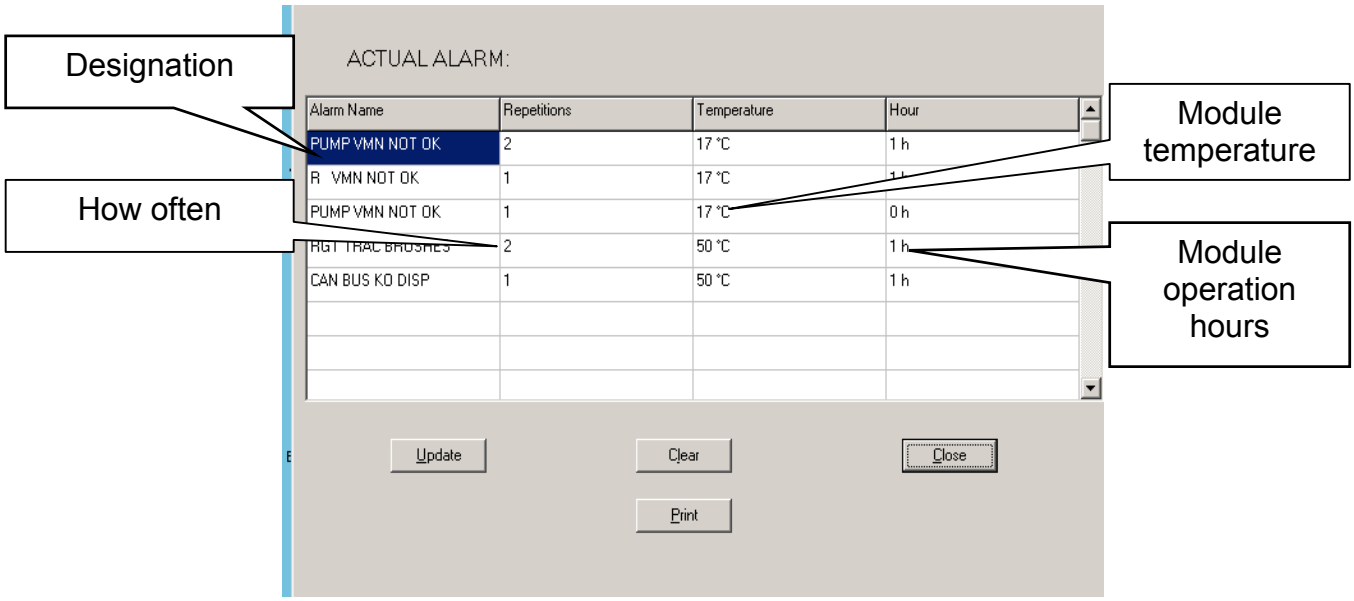
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Alarm Logbook:

Click once with the mouse left key on "**Alarm Logbook**".



The following page will be displayed (**the module you are currently connected to will be displayed**).

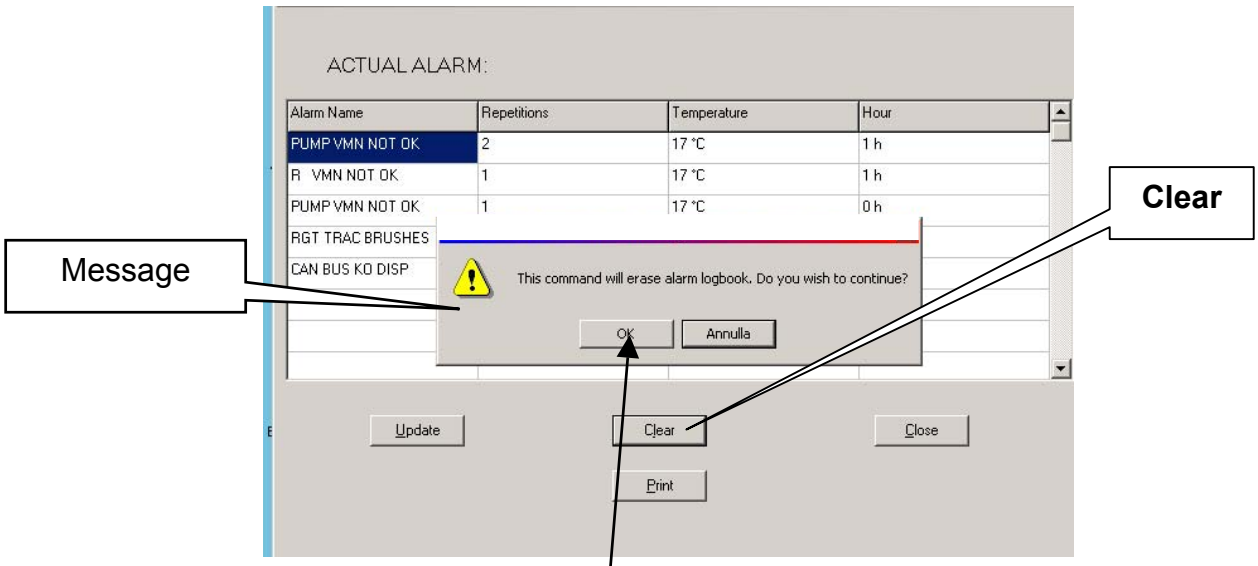


This page lists the alarms saved in the failures memory.
For each failure *designation*, *how often* the failure has occurred, *module temperature*, when the failure occurred and finally the *hours registered through the module when the failure occurred* are indicated.

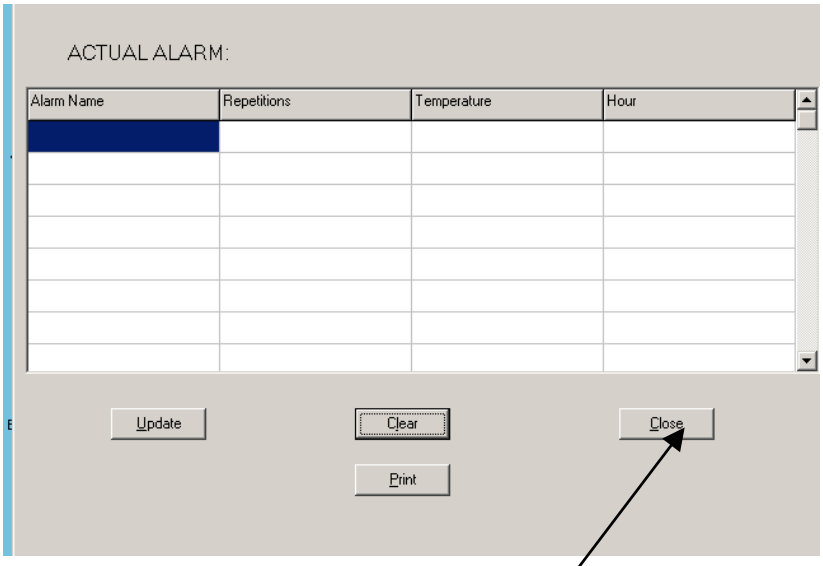
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Deleting alarms:

Click once with the mouse left key on the item "**Clear**" listed in the page displayed.
The following will be displayed:



The message makes sure that you really intend to delete the alarms from the memory.
Click once with the mouse left key on "**OK**" for deleting; the following page will be displayed.

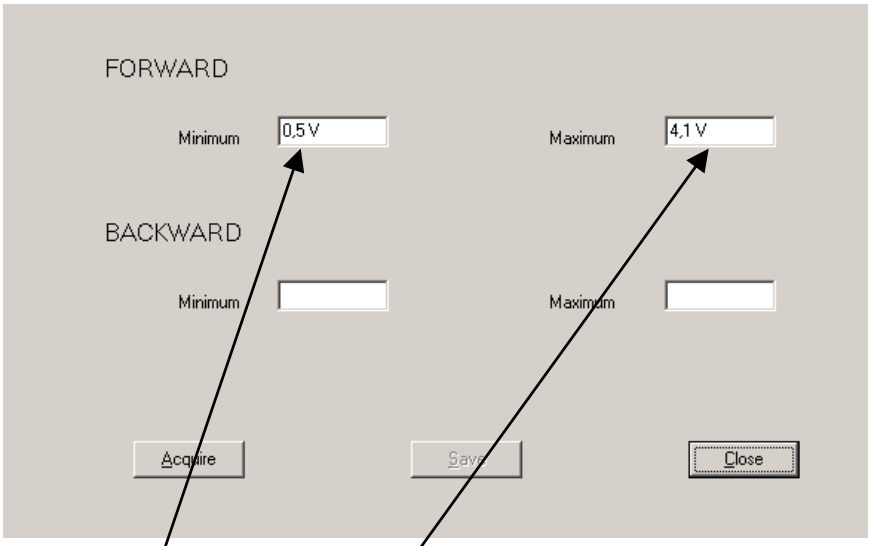


After finishing, click once with the mouse left key on "**Close**" for returning to the main page.

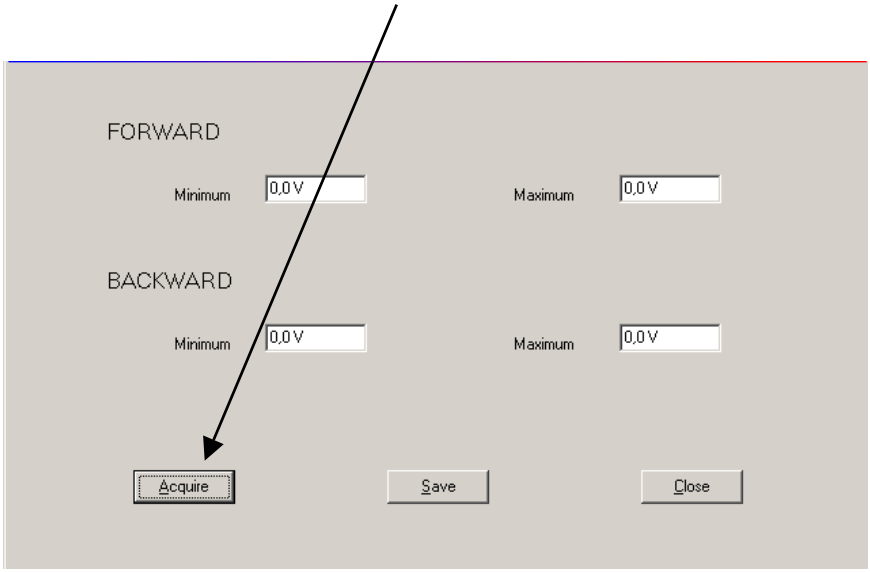
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Program VACC:

Click once with the mouse left key on "**Program VACC**".
The following page will be displayed:



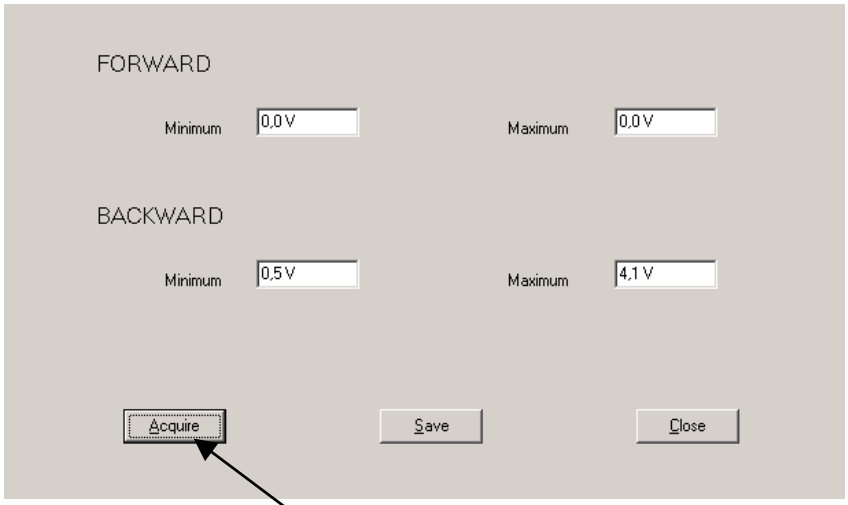
The values Minimum **0,5V** and Maximum **4,1V** are caused through the last adjustment performed.
Click once with the mouse left key on "**Acquire**". The following page will be displayed:



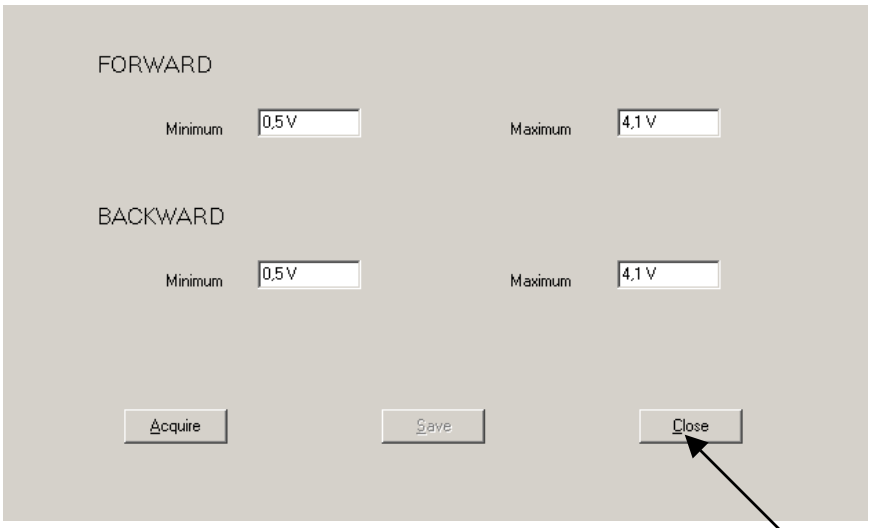
Slowly depress one of both traction pedals down to the end stroke position or depress the single pedal in case of speed selector placed on the steering wheel.
In this way the new values (Min and Max) of the pedal potentiometer will be acquired through the electronic equipment.

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The following page will be displayed:



In this case the rearward speed pedal has been depressed.
Click once with the mouse left key on "**Acquire**".
The following page will be displayed:



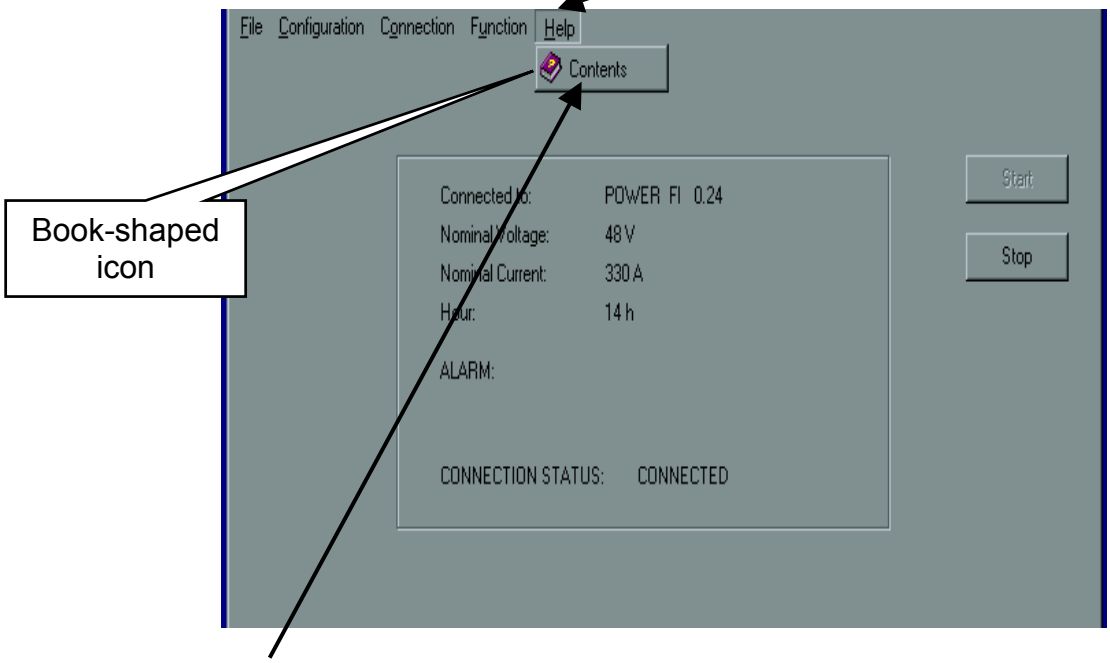
The value entered for the rearward speed will be automatically saved for the forward speed as well.
The operation ended successfully. Click once with the mouse left key on "**Close**" for returning to the main page.

Motor Data: (NOT ENABLED)

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Help:

Click once with the mouse left key on "**Help**"; the following page will be displayed:



The text "**Contents**" matched to the **book-shaped icon** means that it is a guide (**in English**) explaining the use of the different functions.