

Operating instructions

T 16 - T 18 - T 20

360 804 25 11

03/97 →

Linde - Your Partner



Linde AG Linde Material Handling Division

Linde, an enterprise operating worldwide in the investment and service sector, is one of the large industrial enterprises in the EC with its three business segments and six divisions.

The Linde Material Handling division is a leading manufacturer of industrial trucks and hydraulics. It includes eight manufacturing plants in the Federal Republic of Germany, France and Great Britain, as well as subsidiaries and branches in all economically important countries.

Linde industrial trucks enjoy a worldwide reputation - thanks to their high quality in engineering, performance and service.



Werk II, Aschaffenburg-Nilkheim



Fenwick-Linde, Châtelleraut



Lansing Linde Ltd., Basingstoke



Werk I, Aschaffenburg



Werk III, Kahl am Main



Linde Heavy Truck Division Ltd., Merthyr Tydfil

Your

LINDE truck offers you the best in performance, safety and driving comfort. It is up to you to ensure a long life for these qualities, and to learn how to make the most of their benefits.

Accessories must be used in conformity with the directions for use supplied with the equipment. Follow the instructions applicable to the truck delivered to you, and carry out regular inspections and services in accordance with the maintenance schedule, using the specified materials.

This manual contains everything you need to know about running in, driving, servicing and maintaining your truck.

Where they appear in the text, the terms 'front', 'rear', 'right' and 'left' refer to the fitted position of components in relation to the forward motion of the truck.

Special uses

The LINDE lift-truck is designed for stacking and transporting the loads indicated in the "load capacity" table. Please pay attention to the VDMA booklet "Safety rules governing the use of handling trucks".

The safety rules governing the use of handling trucks must be observed by service personnel and by the user.

The user must take responsibility for any failure to observe these rules; in this event, the manufacturer disclaims all responsibility.

Should you wish to use the truck for operations other than those indicated in the directions for use, please contact your local representative.

No modification may be made on your truck, in particular the fitting of accessories, or any structural changes, without the manufacturer's approval.

Servicing operations must be carried out by qualified personnel authorised by LINDE. These operations must be recorded in a service booklet, as both the validity of the guarantee and the perfect operation of the equipment depend on their being properly carried out.

Technical notes

It is expressly prohibited to photocopy, translate or convey this manual or any part thereof to a third party without written permission from LINDE.

LINDE is constantly striving to improve its products. For this reason, we reserve the right to modify designs, equipment and technical specifications without notice.

Consequently, no claims can be entertained in relation to the specifications, illustrations or descriptions appearing in this manual.

If you have any queries about your truck, or any orders for spare parts, please submit these to your local representative along with your address.

For repairs, be sure to use only original LINDE parts. Only by doing so will you be able to maintain your truck to its technical standard when first delivered.

When ordering spare parts, give the following information in addition to the part numbers:

- Truck type;
- Manufacturer's number / year of manufacture;
- Mast serial number (for fork-lift trucks).

Upon delivery of your truck, we suggest that you make a note of its numbers on this page.

Acceptance of the lift-truck

Before leaving our factory, the truck is subjected to detailed checks in order to ensure that the equipment reaches you in perfect operational condition and fully equipped as ordered. Your local representative will then conduct a final inspection and, on delivery of the equipment, will provide you with all necessary information for its operation and servicing.

In order to avoid any subsequent claims, please make a careful and personal inspection in order to ensure that the truck is in perfect order, complete with all fittings, at the time of delivery.

The truck is supplied with the following documents:

- 1 - Operating manual.
- 1 - Spare parts catalogue.
- 1 - Battery servicing manual (electric trucks delivered with battery).
- 1 - Charger instruction manual (for trucks delivered with separate chargers).
- 1 - Certificate of conformity (manufacturer's certification that the machine complies with European standards).
- 1 - VDMA booklet regarding directives on the use of Handling Trucks in accordance with specified applications and regulations.

We wish you good use and complete satisfaction.

Plates and labels

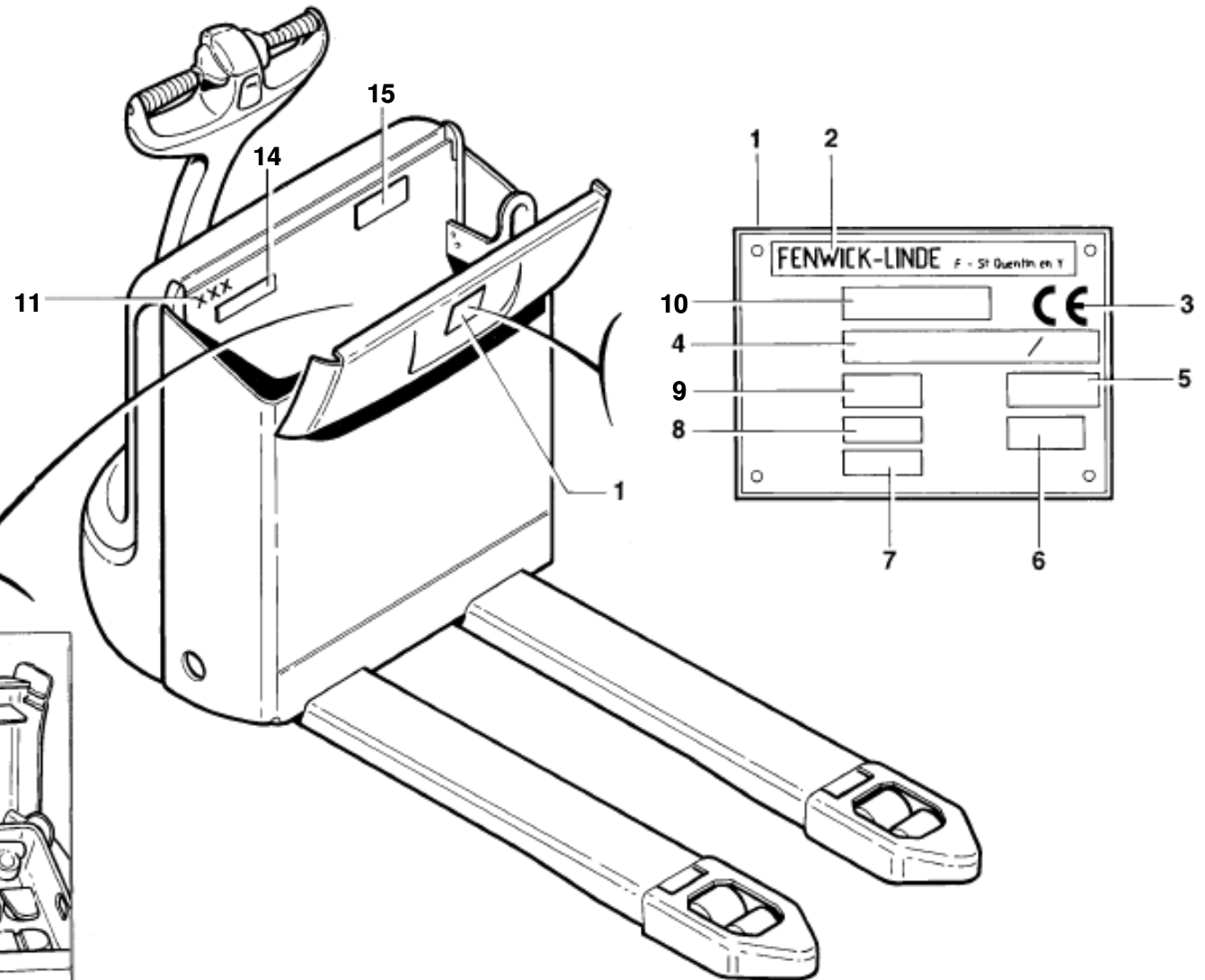
Identification plates

1. Identification plate
2. Manufacturer
3. EC mark
(this plate certifies that the machine conforms to European regulations applicable to handling trucks)
4. Serial number / year
5. Unladen weight
6. Battery voltage
7. Minimum battery weight
8. Maximum battery weight
9. Nominal load capacity of truck
10. Model
11. Manufacturer's number (stamped)

Labels

12. Slings label
13. Battery safety label (inside cover)
14. Charger label
15. Battery label

Note: regularly check that the equipment in service is fitted with these various plates and labels



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Maintenance every 500 hours

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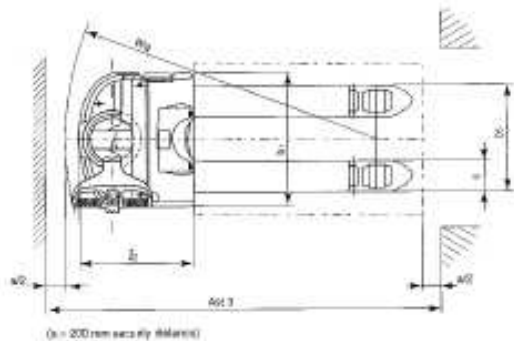
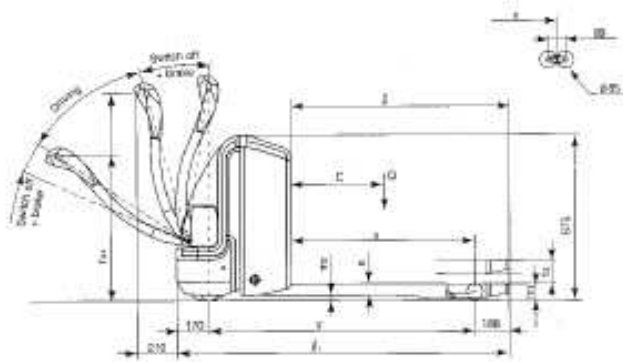
Maintenance every 1000 hours

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Maintenance every 2000 hours

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(x = 200 mm accuracy tolerance)

Battery type	Battery capacity	Length to fork base / 2 (mm)	Overall length / 1 (mm)	Fork length / 2 (mm)	Turning radius (mm)	Axle width	
						Pallet 800 x 1150 lengthwise	Pallet 1000 x 1200 crosswise
BB	up to 120 Ah	540	1.085	560 1150	1438 1573	2918	1878
2.PB8	180 Ah / 240 Ah	660	1.320	680 1150	1542 1652	3088	1988
3.PB8 *	270 Ah to 380 Ah	670	1.342	690 1150	1611 1701	3128	1989

* axle width in T16 model

LINDE		Data sheet for Pedestrian Electric Pallet Truck				
FEBRUARY 2007		T16	T18	T20B	T20	
Classification	1.1 Manufacturer	LINDE	LINDE	LINDE	LINDE	
	1.2 Model designation	T16	T18	T20B	T20	
	1.3 Power and battery: make, period, LFP, main power	Battery	Battery	Battery	Battery	
	1.4 Operation manual, pedestrian, standard, safety, order price	pedestrian	pedestrian	pedestrian	pedestrian	
Weight	1.5 Load capacity	Q (t)	1.6	1.8	2.0	
	1.6 Load centre	cm (mm)	600	600	600	
	1.8 Axle centre to fork face	x (mm)	660 / 962 *	660 / 962 *	660 / 962 *	660 / 962 *
	1.9 Wheelbase	y (mm)	1290 *	1390 *	1390 *	1390 *
Width	2.1 Service width	kg	480 *	480 *	480 *	
	2.2 Axle load with load, front/rear (or drive/steering) side	kg	770 / 730 *	734 / 691 *	694 / 651 *	650 / 607 *
	2.3 Axle load without load, front/rear (or drive/steering) side	kg	378 / 117 *	378 / 120 *	378 / 120 *	378 / 120 *
	3.1 Fork set width (B), front/rear (or drive/steering) side	R / P	R / P	R / P	R / P	
	2.2 Type size, load for drive axle		ø 250 x 30	ø 250 x 30	ø 270 x 30	ø 270 x 30
	3.2 Type size, load for load axle		85 x 105 (2" x 4.15" x 3.93")	85 x 105 (2" x 4.15" x 3.93")	85 x 105 (2" x 4.15" x 3.93")	85 x 105 (2" x 4.15" x 3.93")
	3.4 Auxiliary wheels (dimension)		ø 80 x 100 x 40	ø 80 x 100 x 40	ø 80 x 100 x 40	ø 80 x 100 x 40
	3.5 Wheel, number, front/rear (or drive/steering) side (dimension)		1x ø 202 (7 7/8" x 7.91") *	1x ø 202 (7 7/8" x 7.91") *	1x ø 202 (7 7/8" x 7.91") *	1x ø 202 (7 7/8" x 7.91") *
	3.0 Track width, front (or drive) side	fu (mm)	440	440	440	
	3.1 Track width, rear (or load) side	fr (mm)	380	380	380	
Dimension	4.4 LR	fu (mm)	120	120	120	
	4.6 Weight at drive axle in operating position, max./min	fu (mm)	775 / 1100	775 / 1100	775 / 1100	775 / 1100
	4.10 Fork height, lowered	fu (mm)	85	85	85	
	4.10 Overall length	L (mm)	1750 *	1750 *	1750 *	
	4.20 Length to fork base	L (mm)	690 *	690 *	690 *	
	4.21 Overall width	fu (mm)	780	780	780	
	4.20 Fork clearance	mm (mm)	55 x 168 x 1180	55 x 168 x 1180	55 x 168 x 1180	55 x 168 x 1180
	4.20 Fork spread at wheel/steering	fu (mm)	340 *	340 *	340 *	
	4.32 Ground clearance, centre of wheelbase	fu (mm)	30	30	30	
	4.33 Axle width with wheel 1000 x 1000 crosswise	fu (mm)	1080 **	1080 **	1080 **	
4.34 Axle width with wheel 900 x 1000 lengthwise	fu (mm)	1008 **	1008 **	1008 **		
4.20 Turning radius	R (mm)	1418 / 1650 *	1418 / 1650 *	1390 / 1620 *	1390 / 1620 *	
Performance	5.1 Travel speed, with/without load	min	6.1 / 6.0	6.6 / 6.0	6.6 / 6.0	
	5.2 Lifting speed, with/without load	m/s	0.037 / 0.048	0.034 / 0.048	0.033 / 0.040	
	5.4 Lifting capacity, with/without load	m/s	0.089 / 0.035	0.091 / 0.038	0.090 / 0.038	
	5.7 Climbing ability, with/without load, 10-minute rating	%	-	-	-	
	5.9 Maximum ramping ability, with/without load, 3-minute rating	%	9.5 / 24	9 / 24	8 / 24	
Drive	6.10 Service brake	Mechanical	Mechanical	Mechanical	Mechanical	
	6.1 Drive motor, kW (hp) (speed)	min	0.7	0.9	0.9	
	6.2 LR motor, kW (hp)	min	0.8	0.8	0.8	
	6.3 Battery connection to DIN standard (A, B, C, or)	min	DN 4321 A	DN 4321 A	DN 4321 A	
Misc.	6.4 Battery voltage / rated capacity (V)	min	24 / 240	24 / 240	24 / 240	
	6.5 Battery weight (x 3%)	kg	231	234	234	
	6.6 Power consumption according to IEC cycle	min	-	-	-	
6.7 Type of drive control		L1M drive control	L1M drive control	L1M drive control		
6.8 Noise level at operator's ear	dB(A)	below 80	below 80	below 80		

T 16, T 18 and T 20 pallet trucks are high-performance machines, designed for intensive use.

Their small size, ease of handling and responsiveness make them particularly suitable for loading and unloading operations.

The range of these machines covers the capacities of 1600, 1800 and 2000 kg.

Drive

Power is supplied by a 24 V high-capacity drive battery.

An automatically ventilated electric motor, equipped with sensors on the most powerful models to regulate the speed, drives the drive wheel through a 2-stage gearbox:

- 1st stage by belt and pulley
- 2nd stage by gears greased for life contained in a housing.

The traction motor is controlled by a speed controller with MOSFET transistors, specifically developed by LINDE for this product range.

This controller offers excellent efficiency and allows optimum control of the speed, acceleration and reverse braking.

On the most recent models equipped with the LDC (Linde Digital Control) controller, this is controlled by a microprocessor which offers numerous adjustment possibilities and is equipped with a failure auto-diagnosis system.

NB:

As an alternative, there is a more traditional starting system with resistors and contactors. On this latter model, the speed changes are, however, controlled by an electronic circuit.

Hydraulic system

A compact motor pump unit, consisting of a motor, pump, tank, filter and descent valve, supplies the two lifting jacks of the fork arms.

Lifting system

- This is activated by 2 jacks, and is equipped with 2 torque arms, activating the bogies.
- All the hinge pins are treated to be abrasion-proof and corrosion-resistant, and the pivot rings are self-lubricating.

Handling

A long, sturdy and ergonomic drawbar allows the truck driver to steer the drive and guide wheel effortlessly.

The various controls - forward, reverse, raising and lowering of the fork and horn - are grouped together at the end of the drawbar.

For safety reasons, the drawbar, under the action of a gas jack, automatically rises to an upright position when released.

Braking

A shoe brake situated on the countershaft of the gearbox is controlled by the position of the drawbar.

The parking brake is applied automatically when the drawbar is released.

Gradual and controlled reverse braking is obtained by the inversion of the direction of movement.

On some models, this braking is automatically controlled on the release of the accelerator; this is the LBC (Linde Brake Control) automatic braking system.

Built-in charger*

This totally automatic charger, of the high-frequency switching power supply type, provides full and satisfactory recharging of the 24 V batteries from 160 to 240 Ah.

The charging is controlled by a microprocessor and indicator lights situated on the control panel of the pallet truck.

- Single-phase supply 220 V 50 Hz **
- Effective current input 8 A
- Charging current 30 A at start of charging

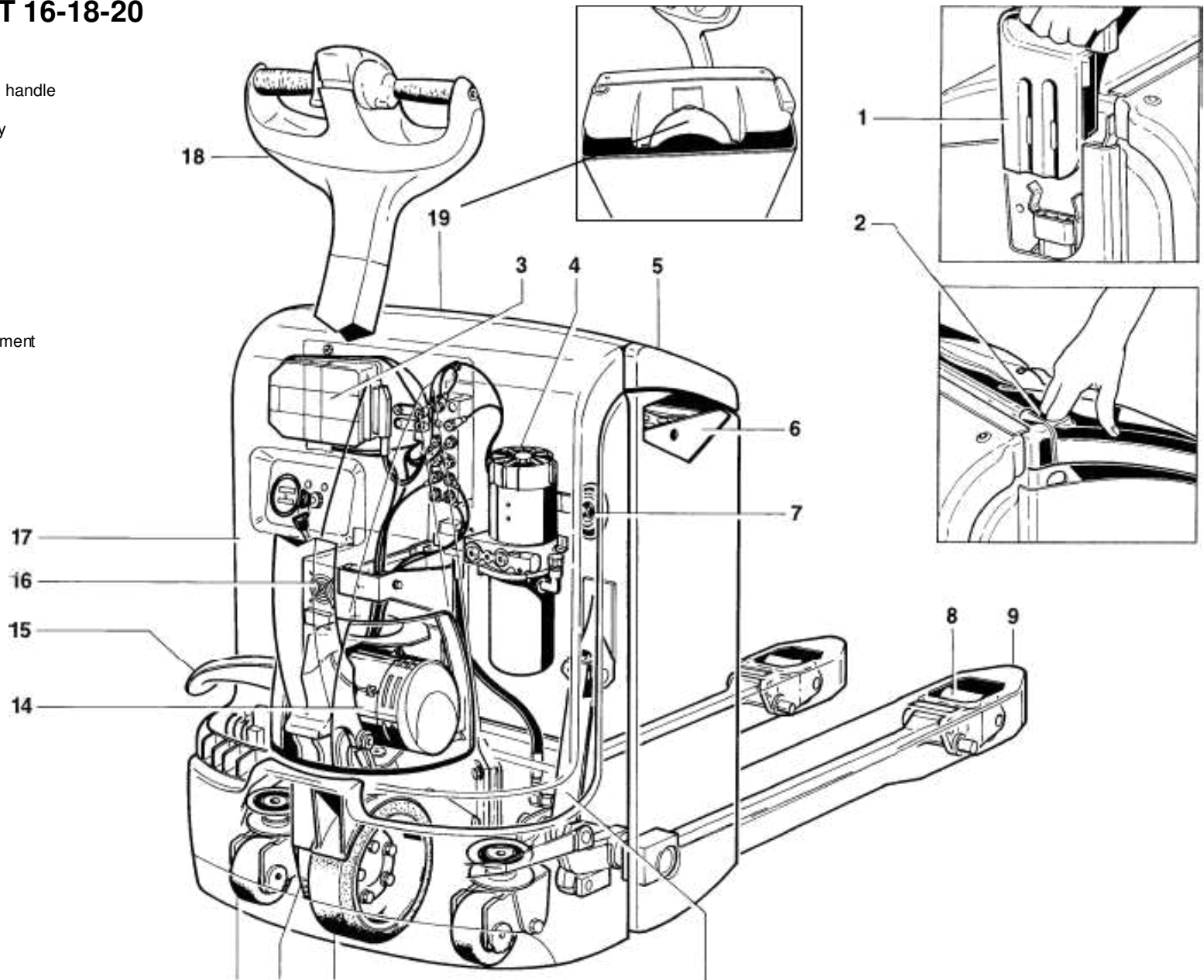
**Other voltages and frequencies available as an option.

*OPTIONALEXTRA

General view T 16-18-20

1. Battery plug handle
2. Battery cover opening handle
3. Electric control unit
4. Motor-pump assembly
5. Battery cover
6. Battery
7. Horn
8. Load wheels
9. Forks
10. Lift cylinders
11. Traction wheel
12. Reduction gearbox
13. Stabilizer wheels
14. Traction motor
15. Power cable compartment
16. In built charger*
17. Frontcover
18. Tiller
19. Document holder

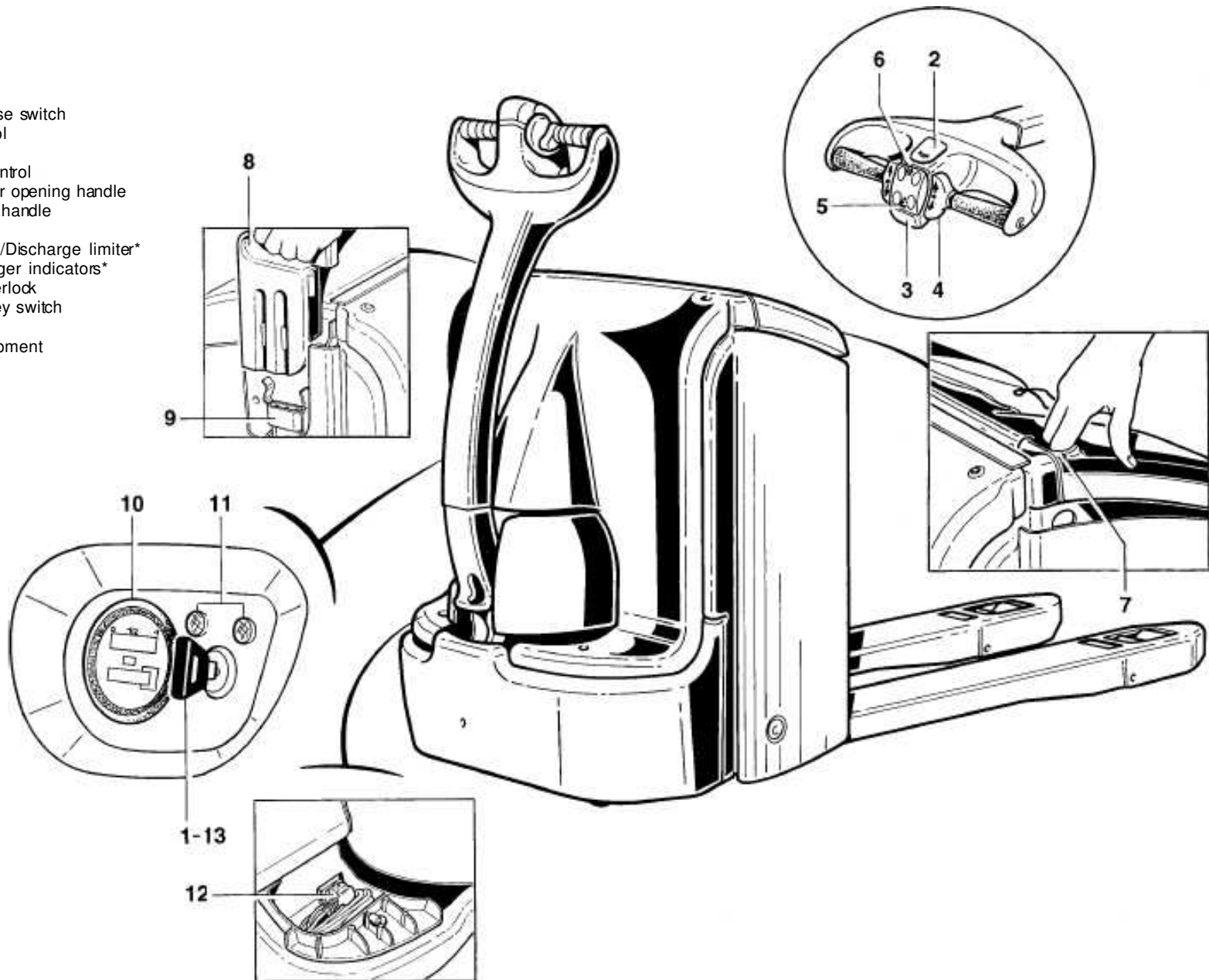
* Optional equipment



Controls

- 1. Key switch
- 2. Horn button
- 3. Safety reverse switch
- 4. Travel control
- 5. Lift control
- 6. Lowering control
- 7. Battery cover opening handle
- 8. Battery plug handle
- 9. Battery plug
- 10. Hour meter*/Discharge limiter*
- 11. Built-in charger indicators*
- 12. Charger interlock
- 13. Additional key switch

* Optional equipment



Combination hour meter /

Discharge limiter/indicator

The battery discharge limiter/indicator (9) and the hour meter (5) are combined in a single housing. The face of the dial is made from extremely durable makrolon.

Hour meter operation

- The hour meter indicates the truck's hours of operation.
- The counter starts when the truck is switched on and the safety pedal is depressed.
- During metering, the "egg-timer" icon (8) flashes slowly.
- The LCD indicator (5) displays the hours (6) and 1/10ths of an hour (7). While the truck battery is connected, it displays the hours stored in memory.

NOTE

When the battery connector is disconnected, the hours are retained in memory.

If the hour meter has to be replaced, make a note of the service hours recorded by the defective meter, in the place provided for this purpose adjacent to the hour meter, and in the service booklet.

Operation of the discharge limiter/indicator

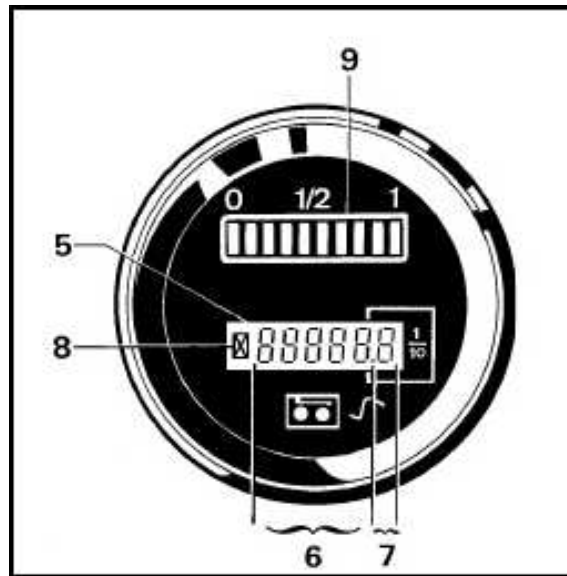
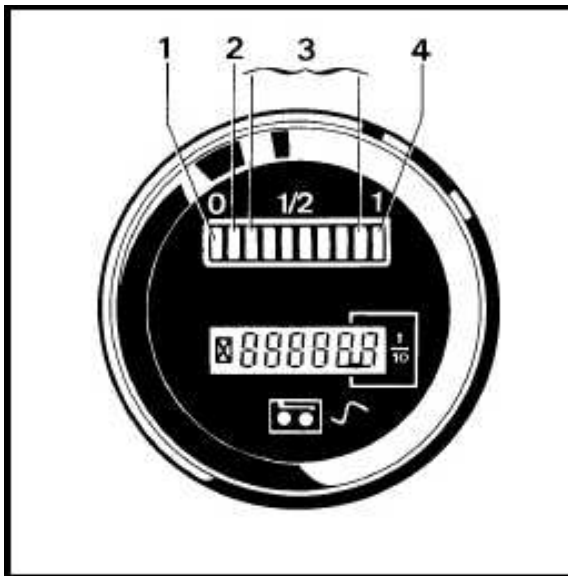
- The LED indicator (9) lights when the battery is connected and the truck is switched on, and shows the charge state of the battery.
- When the battery is fully charged, the green diode (4) lights.
- During discharge, the green and orange diodes (3) light successively (from right to left, one diode at a time).
- When the red diode (2) lights and flashes, the battery is approximately 70% discharged.
- When the red diodes (1) and (2) flash alternately, the battery is 80% discharged; when this threshold is reached, the limiter prevents operation of the lift motor.
- In this event, it will be necessary to recharge the battery in order to be able to continue using the truck.

NOTE:

A potentiometer at the rear of the housing allows the cut-off threshold to be adjusted for any special operating conditions. The normal position is with the arrow pointing towards the letter N. If any special setting is needed for a particular use, please ask your local representative for advice.

N.B.

Batteries with gel electrolyte require a special setting.



This instruction manual, and the VDMA booklet "Directive s governing the use of handling trucks in conformity with specifications and regulations" supplied with the truck, must be given to the relevant persons, and in particular to personnel responsible for driving and servicing the truck. The employer must ensure that the truck operator has properly understood this information, particularly in relation to safety.

Please comply with the enclosed directives and safety rules, with particular regard to the following:

- Information regarding the use of handling trucks.
- Regulations regarding traffic lanes and working area.
- Driving conduct, and the driver's rights and obligations.
- Use in special environments.
- Information regarding starting, driving and braking.
- Information regarding maintenance and repair.
- Regular checks and technical inspections.
- Recycling of greases, oils and batteries.
- Residual hazards.

It is recommended that both the user and the person in charge (employer) take care to comply with all safety rules regarding the use of handling trucks.

During the instruction of truck operators, particular emphasis should be placed on the following points:

- special characteristics of the truck,
- special accessories,
- special features of the workplace.

The user should be trained in driving and mast manoeuvres until the truck is fully under control. Then, and only then, should pallets be moved or stacked.

The stability of the lift-truck is guaranteed when used correctly. If, in the event of improper use or driver error, the truck shows any tendency to overbalance, it is essential that the instructions below are followed.

Definition of terms relating to safety

The terms DANGER, CAUTION, ATTENTION and NOTE are used in this manual to indicate a particular risk or to give any special information which requires attention:



DANGER

Meaning: Non-observance entails the risk of death, or of serious material damage.



CAUTION

Meaning: Non-observance entails the risk of serious injury, and/or serious material damage.



ATTENTION

Meaning: Non-observance entails the risk of deterioration or destruction of the equipment.

NOTE

Meaning: Special attention must be paid to a particular technical point which may not be immediately obvious, even to an expert.

Use of materials

Materials must always be used in conformity with the instructions supplied by the manufacturer.

Materials must be stored only in regulation containers, and only in the locations designated for this purpose. Ingredients may be flammable, and must therefore not be placed in contact with any flame or hot object.

Use only the proper receptacles for draining liquids.

Observe any safety and recycling recommendations provided by the manufacturer of the material or cleaning product concerned.

Avoid any spillage of materials. Use absorbent materials to clean any floor spillage, and recycle such materials correctly.

Old or exhausted materials must be recycled in conformity with regulations.

Comply with legal regulations.

Clean the parts concerned before carrying out lubrication, changing filters, or working on the hydraulic system.

Any worn-out parts removed must be recycled in conformity with regulations for protection of the environment.



CAUTION

Accidental penetration of pressurised hydraulic fluid under the skin is dangerous. In the event of injury, consult a doctor immediately.



CAUTION

Incorrect handling of cooling products or additives is hazardous to health and to the environment.

Before operation

Periodic inspection of trucks

The head of the establishment concerned must conduct periodic general inspections of the truck, or arrange for these to be conducted, in order to ensure early detection of any potentially dangerous deterioration. (Article R. 233-11 of the working code introduced by Decree No. 93-41.)

The Order of 9 June 1993 gives the list of apparatus affected, as well as the content and intervals of the inspections.

Stacker trucks and trucks with an on-board driver must be inspected every six months by an authorised person. The results of these inspections must be recorded in a written report.

NOTE :

The small walking pallet trucks are exempt from these inspections

Operating recommendations

Your new truck is ready for immediate use. However, we recommend that you avoid subjecting it to excessively intensive use during the first 50 hours of service.

During the initial period of service, and after every wheel change, wheel nuts should be checked for perfect tightness several days in succession.

NOTE :

The torque setting for crosswise tightening of the wheel nuts is given in the maintenance section.

Checks prior to initial operation

- Check forward and reverse controls
- Check lift and lower controls
- Check operation of indicators
- Check braking
- Check horn operation
- Check battery electrolyte level and specific gravity
- Check battery cable connections
- Check hydraulic fluid level
- Check for oil leaks
- Check tightness of wheels

NOTE:

The last 3 operations above are detailed in the maintenance section.

Daily checks prior to operation *

IMPORTANT

Before each shift, it is essential for the following operational checks to be conducted on the equipment, with particular reference to safety fittings.

- Check forward/reverse and raise/lower controls
- Check braking
- Check horn operation
- Check battery charge state.

*** NOTE**

These checks are detailed in the following pages.



CAUTION

In the event of any anomaly, notify the person in charge immediately. Do not use the equipment.

Daily checks and tasks prior to operation

Checking forward/reverse and raise/lower controls

- For checking the correct operation of these controls, see the "driving" chapter.

Checking braking system

Drive the pallet truck and check the braking action by tilting the tiller to the upper area (1) and the lower area (2).

In both these areas, the truck is braked mechanically.

NOTE

A gas cylinder automatically returns the tiller to position (1).



ATTENTION

Please contact your local representative if you detect any anomaly in the steering mechanism.

Checking the safety reverse button

- Put the tiller to the drive position and move the truck forwards.
- When pressed, the safety reverse button (3) will reverse the truck for several meters.

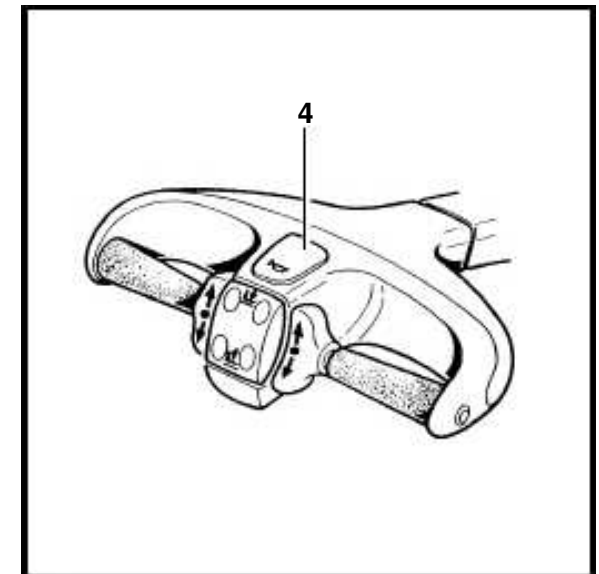
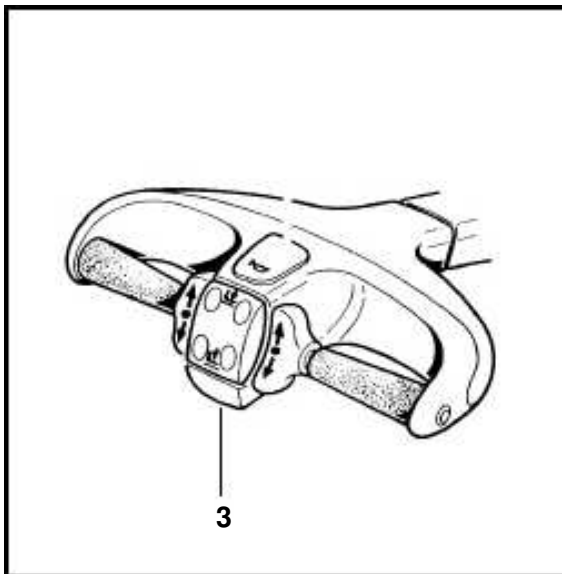
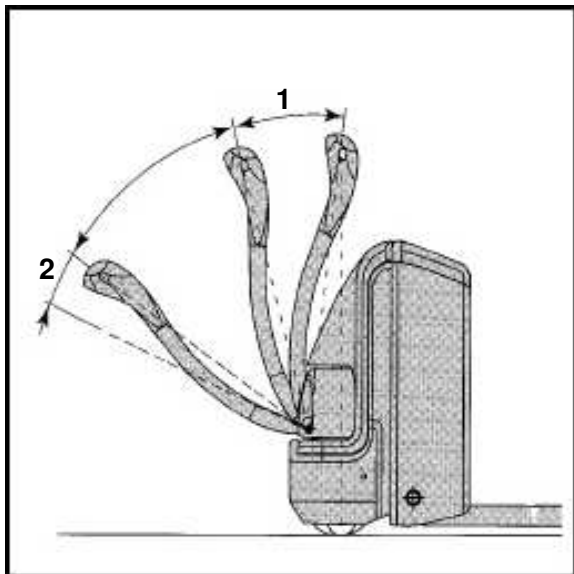
NOTE

Contact your authorized distributor for any adjustments.

Checking horn operation

- Press the horn button (4) on the control module.
- The horn sounds.

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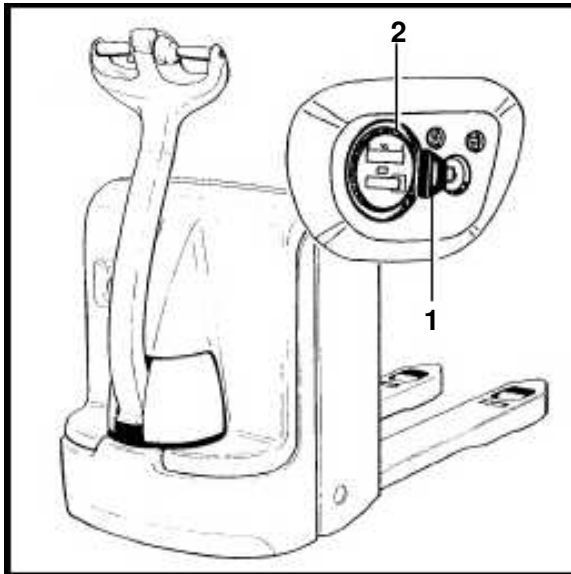


Before operation

Daily checks and tasks prior to operation

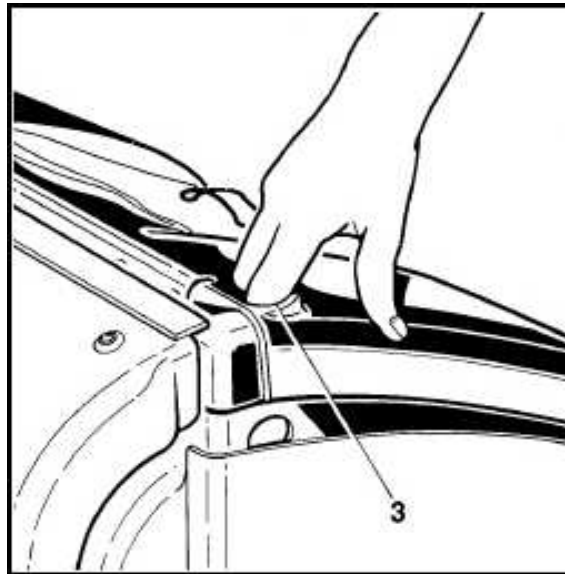
Checking the battery charge state

- Before the start of the shift, check that the battery is correctly charged.
- Plug in the battery connector.
- Activate the key switch (1).
- Check the battery charge state on the indicator (2). (See chapter on discharge limiter/indicator.)



Opening the battery cover

- Stop the machine, lower the forks.
- Switch off and remove the key.
- Release the battery cover by pressing lightly on it and pulling the flexible tab (3) towards you; then lift the cover.
- To close, replace the cover.



Daily checks and tasks prior to operation



DANGER

Charging and servicing of the battery must be carried out in conformity with the instructions supplied with the battery and the charger (if using an external charger).

The electrolyte contains sulphuric acid, which is a dangerous substance. During any work on the battery, wear gloves and goggles. In the event of any splashes on the skin or into the eyes, rinse immediately in pure water and consult a doctor if necessary. During charging, batteries emit hydrogen gas, which can create an explosive mixture. Do not create sparks, smoke, or place any flame near a battery on charge or one which has been recently charged. To avoid any accumulation of hydrogen, leave the battery cover open during charging, which should be carried out in a well-ventilated area. Do not place any metallic object on the battery, as this may create a short-circuit.

Connect / disconnect the battery plug

To disconnect

- Stop the machine, switch off and remove the key.
- The battery plug is situated on the right-hand side of the machine (1).
- Pull on the handle (2) to disconnect.

To reconnect

- Position the guides of the plug (3) opposite their housing.
- Push the plug into the socket (4) on the truck.



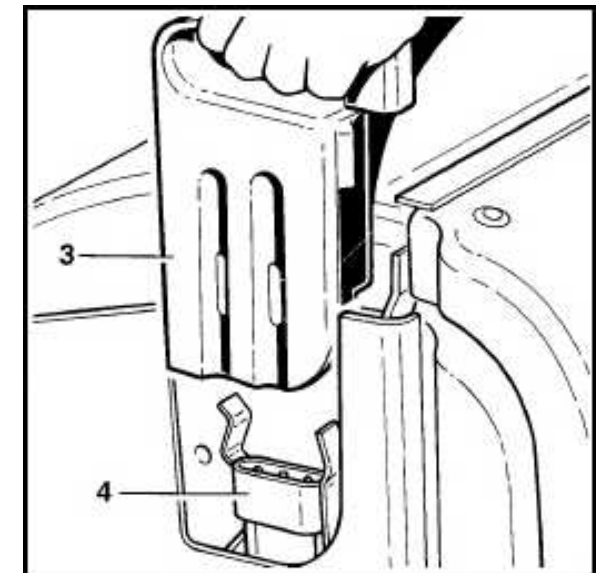
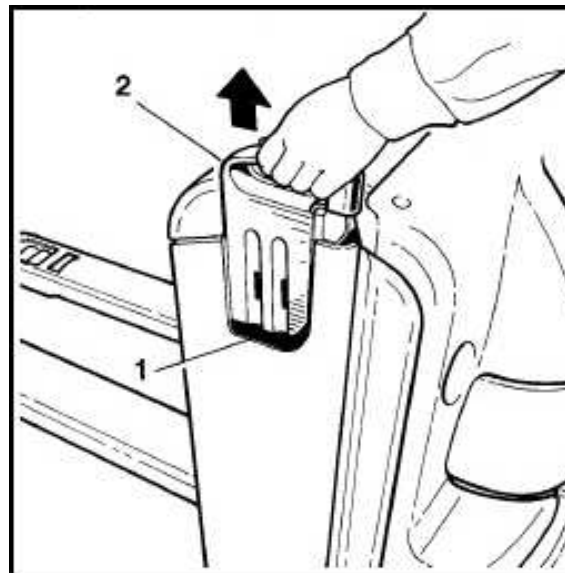
CAUTION

Never connect or disconnect the connector while current is flowing through the circuit - this may cause violent sparking and damage the contacts.

Regularly check the condition of the connector contacts, and replace them if they show any traces of arcing or of carbon deposits.

Take care to observe the + and - polarities. Always connect + to + and - to -. Do not reverse the connections.

Each half of the connector is fitted with a locating pin to avoid any risk of connection reversal. Make sure these are present and in good condition.



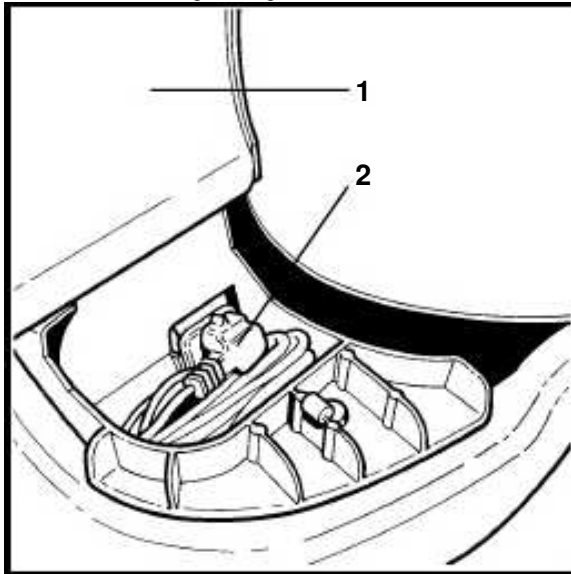
Commissioning

Daily checks and commissioning checks

Charging the battery with the built-in charger (from 07/2000)

Every day the truck is used normally, or every two days in case of non-intensive use, charge the battery at the end of the shift.

- Park the truck near a socket outlet (220 V – 10/16 A).
- Lower the forks, turn off the key switch, remove the key.
- Open the battery compartment cover (1) for good ventilation.
- Remove the plug (2) from its port, pay out the wire and connect the plug to the mains.
- The charger starts automatically, the green light (3) flashes, the red light (4) comes on and then goes off and the charger fan is switched on.
- At the end of the normal charge, the green light remains continuously on, and the fan stops.
- An equalization charge starts automatically 15 minutes later; the green light remains on and the fan is switched on.
- If the charger remains connected to the mains power supply, it will restart a charge holding cycle every 48 hours, and the green light flashes.



WARNING:

Do not disconnect the battery connector while charging (green light flashing).

Problems while charging

If a fault occurs while charging, the red light (4) comes on and the charger stops.

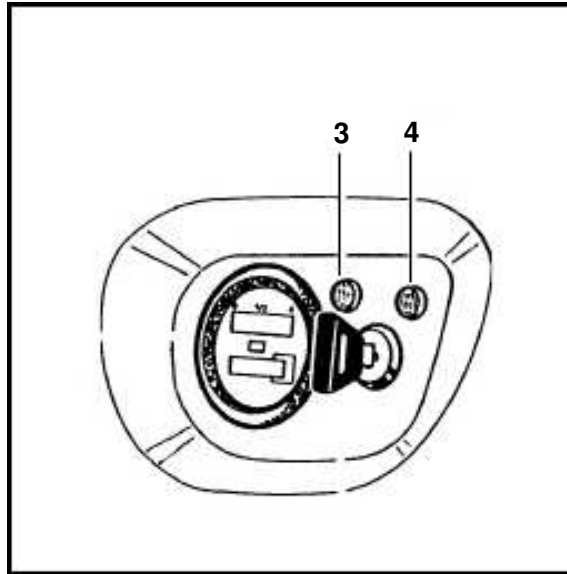
Proceed as follows to resume a charge cycle after detection of an anomaly:

- Disconnect the mains power supply
- Unplug the battery connector for at least 1 minute
- Reconnect the battery connector, and then plug the mains power supply in.

Please call one of our dealers if the problem persists.

Putting the mains power supply cable away

- Stow the cable in the compartment between the battery box and the chassis.
- Push the mains plug (2) on the cable into the red safety support in the battery compartment.
- Close the cover.



IMPORTANT

The truck will operate only if the plug is replaced correctly.

Charger electrical specifications

Mains power supply 220 V 50 Hz*Nominal battery voltage 24 V

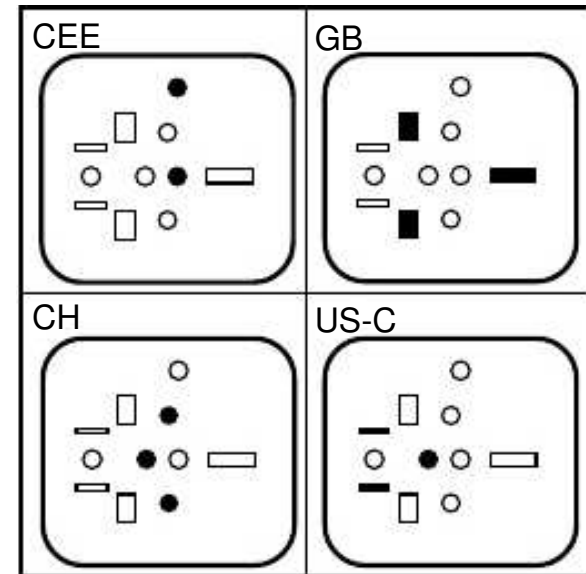
Maximum output power 720 W Maximum current 30 A

Charging time 12 h (240 Ah)

*Other voltages/frequencies available to suit electrical mains power supply in different countries

Special case of Gel batteries

Batteries with a gel electrolyte must always be charged using a special charger.



Daily checks and tasks prior to operation

Recharging the battery with an external charger

- On completion of the shift, take the truck to the charger.
- Stop the truck, lower the forks, switch off the power, remove the key (1).
- Disconnect the battery connector (2). (See chapter on connecting/disconnecting the connector.)
- Open the cover (3) of the battery compartment.
- Plug the connector attached to the battery into the charger output connector.
- Activate the charger in conformity with the specific instructions for that charger.
- When charging is complete and the charger has been switched off, disconnect the charger connector and reconnect the battery connector to the truck.
- Re-close the cover. Check the battery charge state on the truck's indicator (4) after pulling out the emergency stop button and turning on the key switch. The truck is now ready for use.



CAUTION

In order to avoid any sparks, always connect the battery connector before switching on the charger, and disconnect it after switching off the charger.

- Ensure that the charger is compatible with the truck battery in terms of voltage and charging current. (See charger instructions.)
- When connecting the battery to the charger, take care to comply with the + and - polarities (do not reverse the connections).
- The connectors are fitted with locating pins to prevent any reversal. Check regularly that these are present and in good condition.

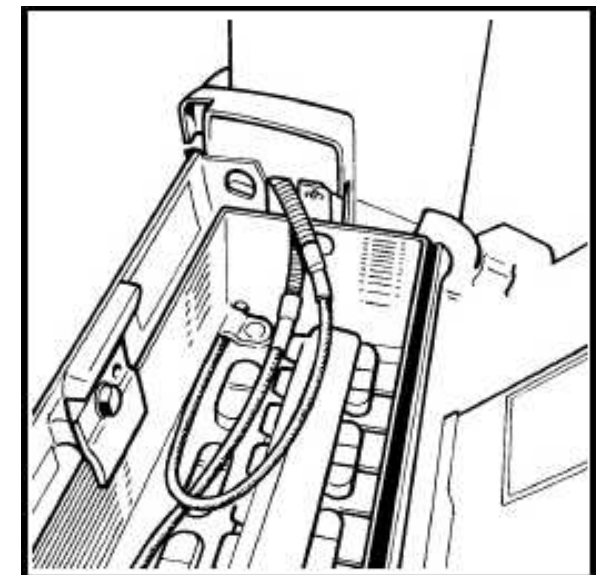
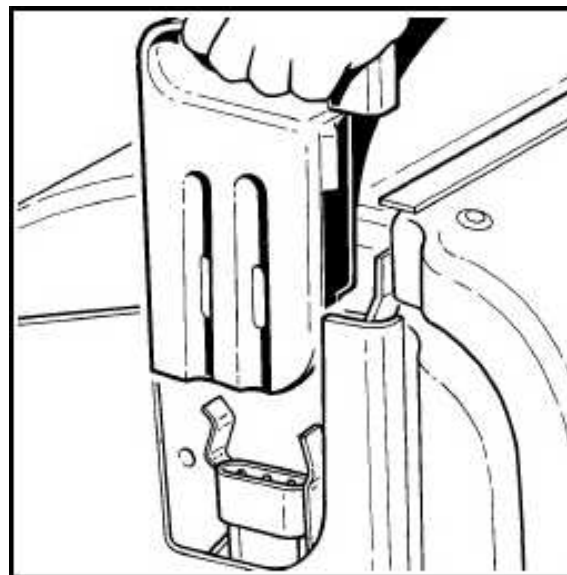
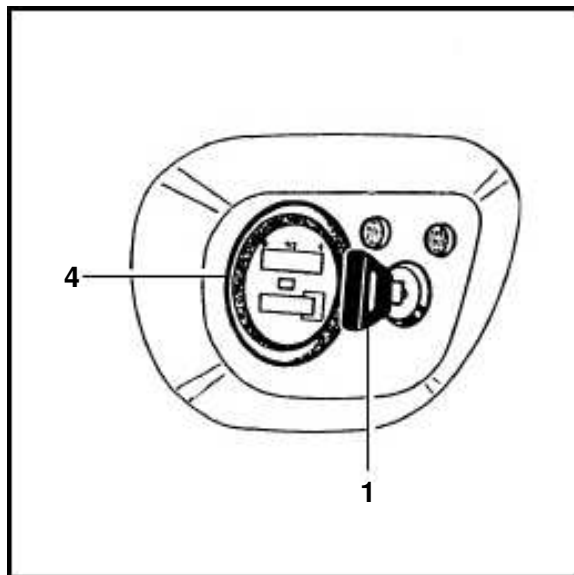
Checking the condition of battery cables, terminals and connector.

- Check that cable insulation is undamaged, and that the connections show no sign of overheating.
- Check that the + and - battery terminal pillars are not sulphated (indicated by the presence of a white salt-like deposit).
- Check the condition of the connector contacts, and the presence of the locating pin.



ATTENTION

Failure to observe the above procedures may result in serious damage. Please contact your local representative as quickly as possible to remedy any such damage.



Before operation

Daily checks and tasks prior to operation

The operations described below apply to lead-acid batteries with liquid electrolyte.

For "maintenance-free" batteries with gel electrolyte, refer to the manufacturer's instructions.

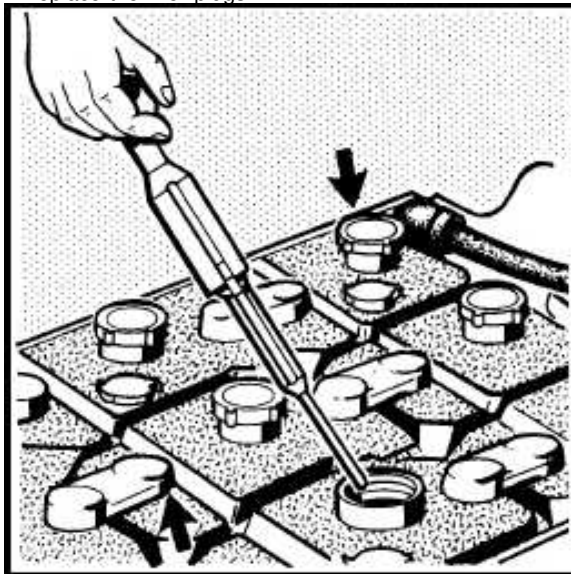


CAUTION

Avoid any contact with the acid. Do not create any short-circuit. See the recommendations in the "daily checks" section.

Checking electrolyte level and topping up with water.

- This check, and any necessary topping-up, is to be carried out once a week, after recharging the battery.
- Turn off the key-switch, open the cover, and disconnect the battery connector.
- Check the level. It should be up to the base of the filler plug, just above the top of the separator.
- Use demineralised water to top up any cells with a low water level.
- Replace the filler plugs.



ATTENTION

Use only demineralised water for topping up. Never add water before charging (risk of overspill). Do not overfill the cells.

For more information, refer to the instructions supplied with the battery.

Checking the specific gravity of the electrolyte

- Measuring the specific gravity gives an accurate indication of the state of charge of each cell in the battery. This measurement may be carried out before or after charging.
- Minimum specific gravity, battery 80% discharged: 1.14
- High specific gravity, battery 100% charged: 1.29 to 1.32 (according to make).

- We recommend measurement every week or two. Keep a record of the values measured in the service booklet for your battery.
- Remove the filler plug for each cell as described above.
- Using an acid hydrometer, carefully measure the specific gravity in each cell.
- Replace the filler plugs when finished.

NOTE:

If there are voltage discrepancies between the various cells, or if any cells show a particularly low voltage, contact your local representative. Any discharge below the threshold of 1.14 will be extremely detrimental to the lifespan of the battery.

For more information, refer to the instructions supplied with the battery.

Daily checks and tasks prior to operation

Removing/replacing the battery



ATTENTION

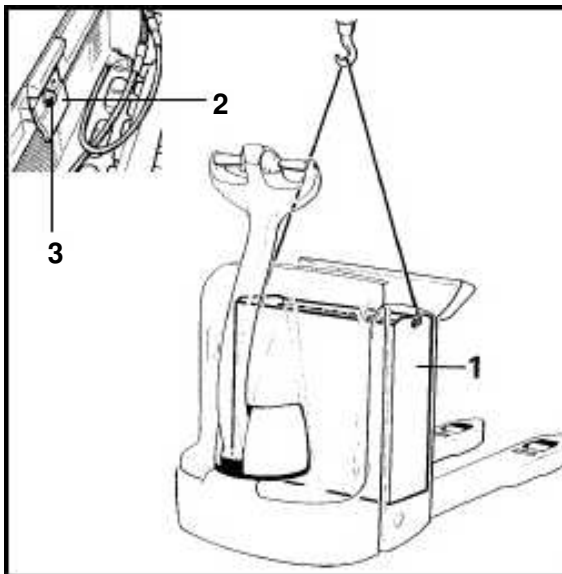
The battery is a heavy and fragile component which must be handled with care.

Use lifting gear - a hoist and a sling - of suitable capacity for the load to be lifted. Check the weight indicated on the battery plate.

When fitting a replacement battery, this must have specifications identical to the original in the following respects: weight, compartment dimensions, voltage, capacity, and connectors. Refer to the plate on the truck for the acceptable minimum and maximum weights.

Changing the battery using a hoist

- Fully lower the fork.
- Remove the battery plug.
- Remove the locking tab from the battery (2) by removing the screw (3).
- Fix the tackle hooks to the battery box (1).
- Remove the battery.
- Replace the battery by carrying out the above operations in reverse.



Changing the battery using a gantry (front exit model)

- Remove the battery cover.
- Lift the fork arms to the maximum height.
- Position the gantry over the battery.
- Fix the two hooks in the holes (1) in the battery box.
- Lower the fork arms.
- Remove the battery plug.
- Incline the drawbar to the operating position and pull the pallet truck away, or move backwards the gantry holding the battery.
- To replace the battery, carry out the above operations in reverse. Position the locking pins of the box above the holes in the frame.

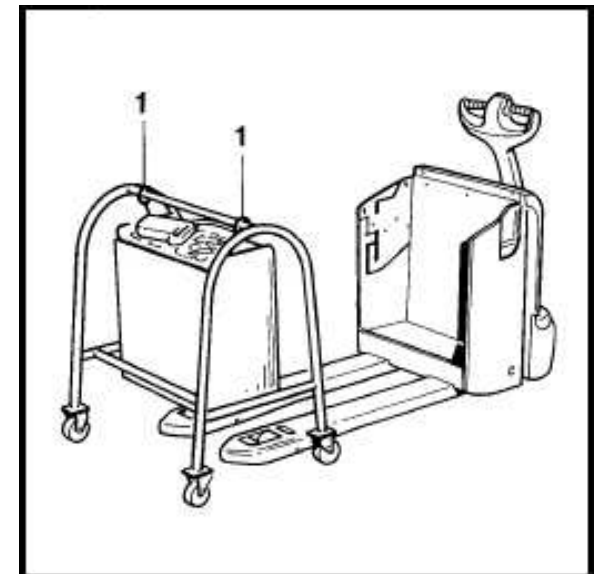
NOTE

The gantry is available from your dealer.



ATTENTION

When lowering the forks, do not place feet beneath the lifting platform.



Instructions for use

The T 16, T 18 and T 20 pallet trucks are designed to be used inside non-dangerous atmospheres; the ambient temperature must be between -10°C and +40°C and the relative humidity of the air must be less than 95%.

NOTE: For lower temperatures, there is a cold-room variant.

The ground must be level. Ground clearance at the lowest point is approx. 9 mm, but the T 16-T18-T20 can cope with clearance angles of up to 27° with the lifter in the upper position.

The resistance of the ground to indentation must be approx. 37daN/cm² (bogie), 54daN/cm² (load wheel)

The maximum negotiable gradient recommended for short distances is 10%, for reasons of braking and stability.

The machine may only be used with pallets weighing a maximum of 1.6 t, 1.8 t or 2 t according to the model, distributed evenly over the whole length of the fork arms. Loads must be uniform, with a maximum recommended height of 2 m.

For applications other than the above, please consult your local representative.



CAUTION

Always adapt your driving to the conditions of the surface concerned (irregularities, etc.), as well as to any particularly dangerous working areas and the nature of the load being carried.



ATTENTION

In order to avoid any scraping of the lifting system against the ground, always raise the forks to mid-height before setting off.



ATTENTION

Always turn off the power and remove the key before leaving the truck.



WARNING

The bumper of this machine is designed to protect the driver's feet. This protection is completely effective if the driver is wearing safety shoes.



TAKE CARE

Always keep your hands on the controls and never place them near moving parts without disconnecting the battery.

Starting

- Connect the battery plug.
- The discharge indicator (2) lights up.
- Turn the key switch (1) fully to the right.

NOTE

Always adapt your driving style to the roadway used (rough surfaces, etc.), to particularly hazardous working areas and to the load.

Operate the truck only on ground and floors with a sufficient load capacity.

Contact your distributor before driving on long slopes. The climbing ability values given in the data sheet are derived from the tractive force and apply only for crossing obstacles and for short differences in height.



Indication of direction of travel

- Tilt the tiller into area (1)

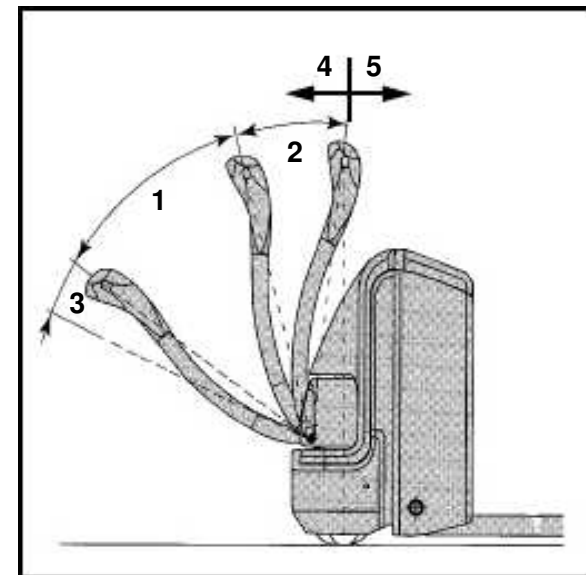
The directional markings conventionally used on pallet trucks are as follows:

- Forward travel < (4)
- Reverse travel > (5)



CAUTION

Before negotiating any tight bend, the truck must be slowed down. Taking a tight bend too fast may cause the truck to topple over.



Forward travel

- Gradually press the lower part of the accelerator control (1) with the thumb (rotation of accelerator control in direction 2).
- The speed of the truck is proportional to the pressure exerted.

NB

When starting on a slope, press the accelerator control in the required direction with the tiller in position 2 (truck braked). Power is then applied to the motor at low voltage and current.

Tilt the tiller into the driving position, in order to remove the brake and start off.

Reverse travel

- Gently press the upper part of the accelerator control with the thumb (rotation of accelerator control in direction 3).
- The pallet truck accelerates in reverse, in proportion to the pressure exerted.

Reversing the direction of travel

- Release the accelerator control and operate it in the opposite direction.

Reversal of the direction of travel can be initiated while the truck is moving.

In this case the appliance will first be braked electrically to a standstill and will then restart in the opposite direction.

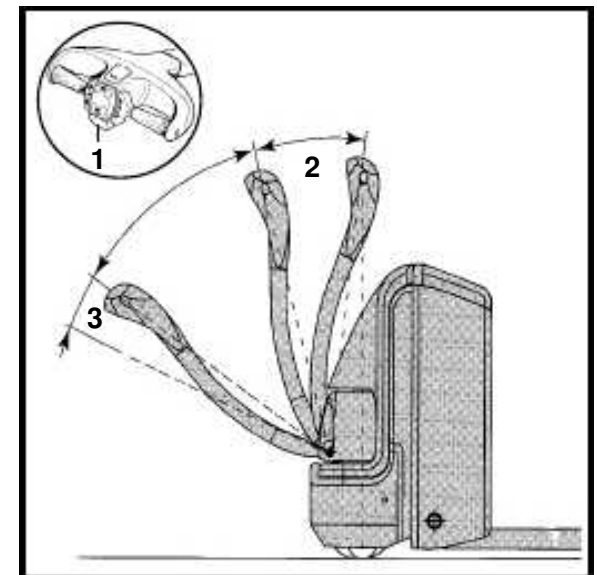
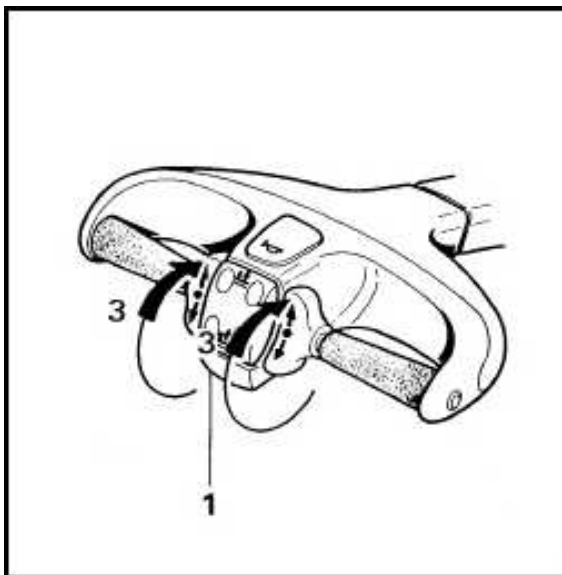
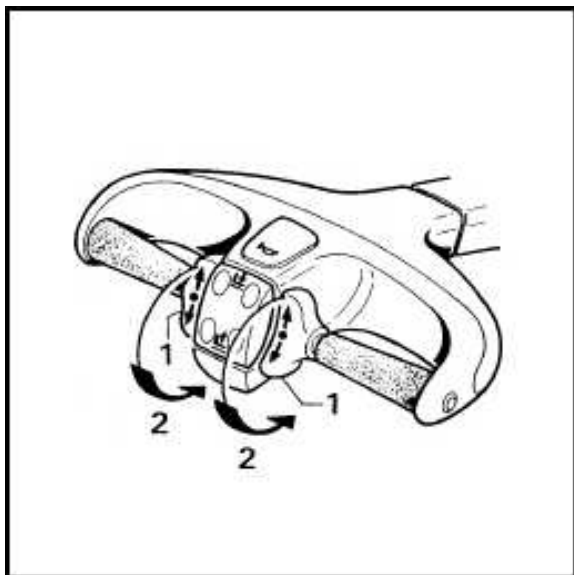
Safety reverse button

In order to protect the driver from being trapped between an obstacle and the appliance, the end of the tiller is fitted with a safety reverse button (1).

As soon as the flap is pushed in, the machine immediately stops by automatic inversion of the direction of movement.

To rearm the safety system, place the tiller in position 2 or 3 again, before reactivating the accelerator control.

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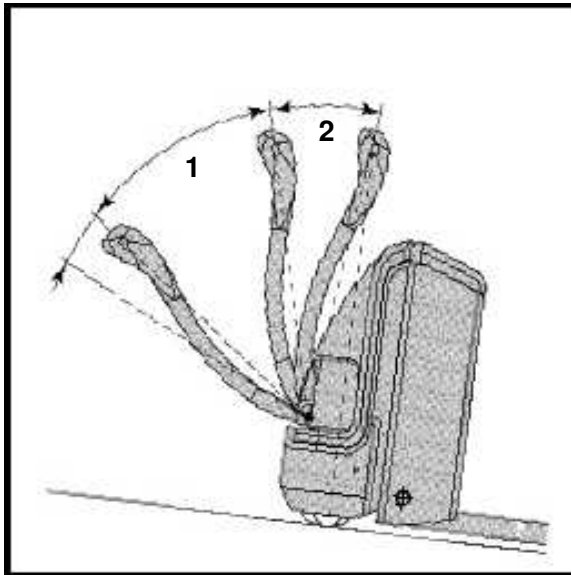
Starting on a slope

When it is necessary to stop and then restart on an incline, proceed as follows:

When starting on a slope, press the butterfly valve in the required direction with the tiller in position 2 (handbrake on).

Power is then applied to the motor at low voltage and current.

Tilt the tiller into the driving position.



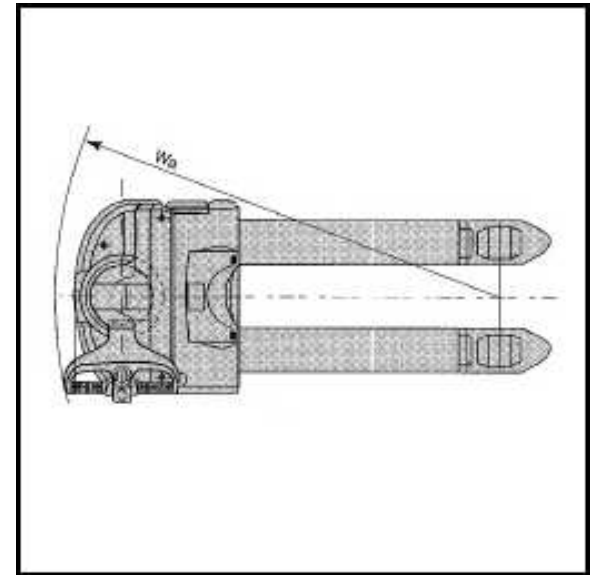
Steering

A robust and ergonomic tiller equipped with two grips directly steers the traction wheel

Turning angle

Turning angle180°

The turning radius (Wa) depends on the fork length. (See technical specifications.)



Mechanical brakes

Releasing the tiller applies the brake.

The braking is progressive, depending on the position of the tiller in tilt areas (1) and (2).

Reverse current brake

Electrical braking can be obtained by reversing the direction of travel.

- Press the travel control switch (3) to the opposite direction of travel until the truck stops, then release the switch.

NOTE

- On resistance models, perform this manoeuvre slowly and at low speed.
- On trucks equipped with pulse control, braking is controlled by the pulse control and is very gradual.

LBC * automatic braking (Linde Brake Control)

- Release the accelerator butterfly valve
- The pallet truck is braked automatically by reverse current until it stops .

* Option

Lifting device



ATTENTION

The lifting device should be used only for authorized applications. The operator must be instructed in the use of the lifting device.

- Turn the key switch clockwise.

Raising the forks

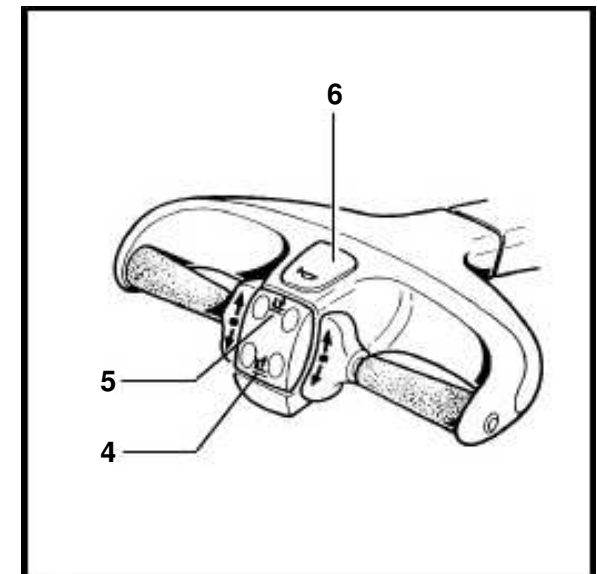
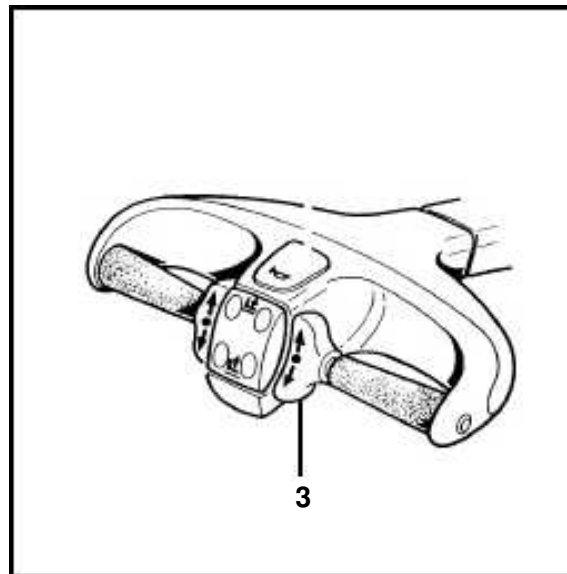
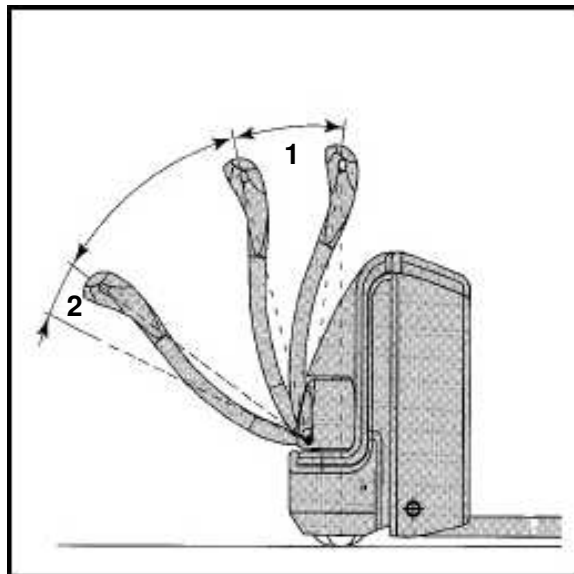
- Press the control switch (4) on the tiller.

Lowering the forks

- Press the control switch (5) on the tiller.

Operating of the horn

- Press the button (6) on the tiller.





ATTENTION

Before lifting a load, ensure that its weight does not exceed the truck's capacity.

- Refer to the nominal capacity marked on the truck's plate.
- Ensure that the load is stable and uniform in order to prevent any partial spillage.
- Check that the width of the load is compatible with the width of the forks.



ATTENTION

Take care not to disturb any adjacent loads, or those which may be to the side or in front of the load being handled.

Loads should be laid out as follows:

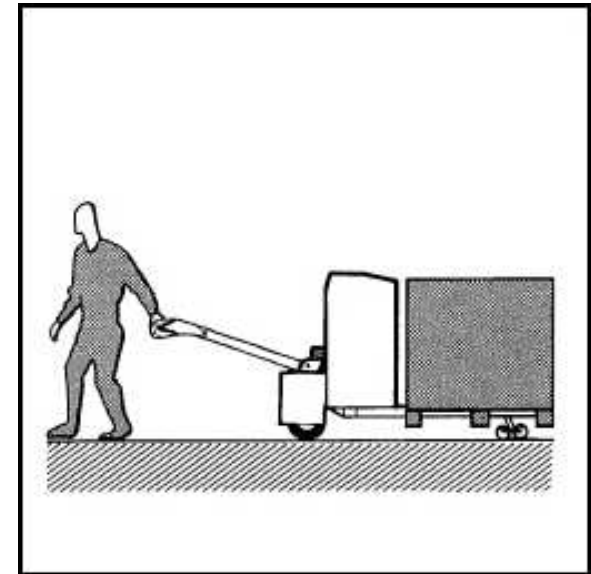
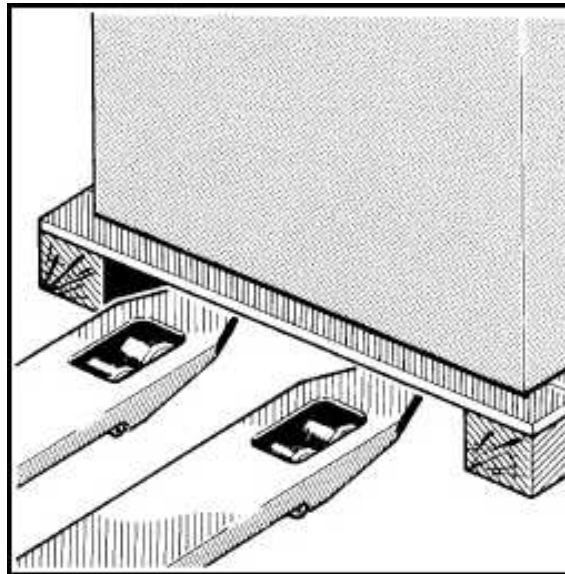
- Line up loads with a small space between each one and its neighbour in order to avoid any fouling.

Loading

- Carefully approach the load
- Adjust the height of the fork arms until they can be easily inserted into the pallet
- Insert the forks beneath the load
- If the load is shorter than the forks, position the forks so that the front of the load overhangs them by several centimetres, in order to avoid any interference with the load immediately ahead
- Lift the load a few centimetres from its support
- Back the truck away from the pallet holder or any neighbouring loads, gently and in a straight line.
- Lower the forks until the load is a few centimetres from the ground.

Transporting the load

- Always carry loads in the forward direction of travel in order to have the best visibility.
- When carrying a load on a slope, always ascend or descend with the load up-slope. Never drive laterally across a slope or perform a U-turn.
- Reverse travel is to be used solely for unloading. Since visibility is reduced when travelling in this direction, drive only at very slow speed.



Unloading

- Carefully drive the truck to the desired location
- Raise the fork platform to the appropriate height
- Carefully advance the load into the unloading area
- Lower the load until the fork arms are free
- Back the truck away in a straight line
- Return the forks to mid-height



ATTENTION

Take care not to disturb any loads which may be adjacent to or behind the truck.

Before leaving the truck

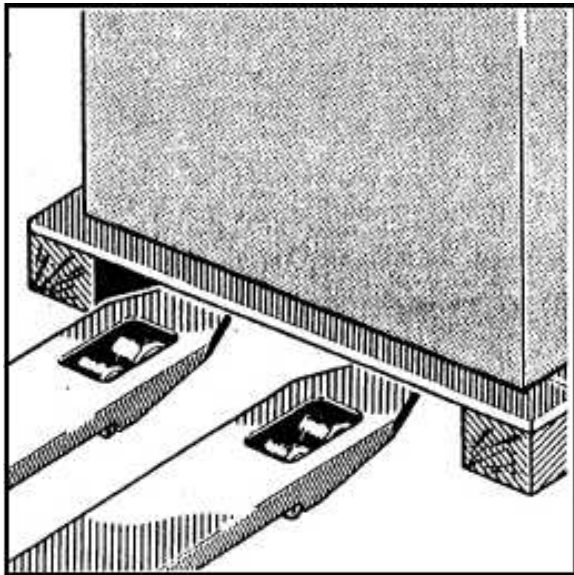


ATTENTION

Always stop the truck on level ground and away from traffic lanes.

- Lower the fork arms to their full extent
- Turn off the power and remove the key
- When stopping for prolonged periods, depress the emergency stop button and disconnect the battery.

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Slinging the truck



CAUTION

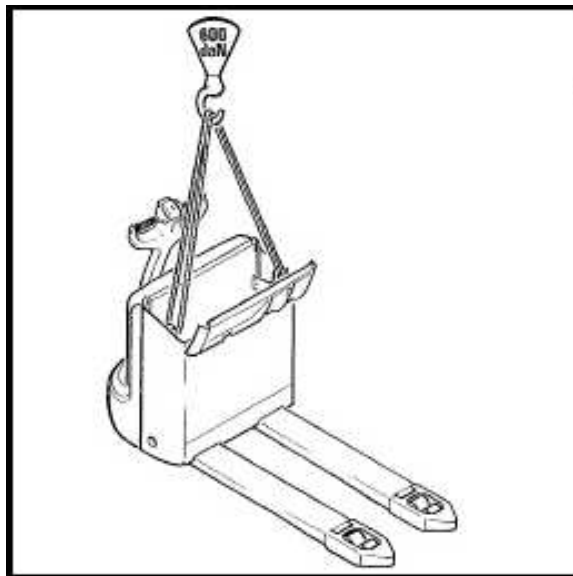
Use only slings or hoists of adequate capacity, and protect all parts coming into contact with the lifting equipment. Attach the lifting equipment as illustrated below.

Truck weight (with battery): see technical specifications.



DANGER

During any lifting of the truck, there must be no person beneath or close to the truck.



Jacking the truck

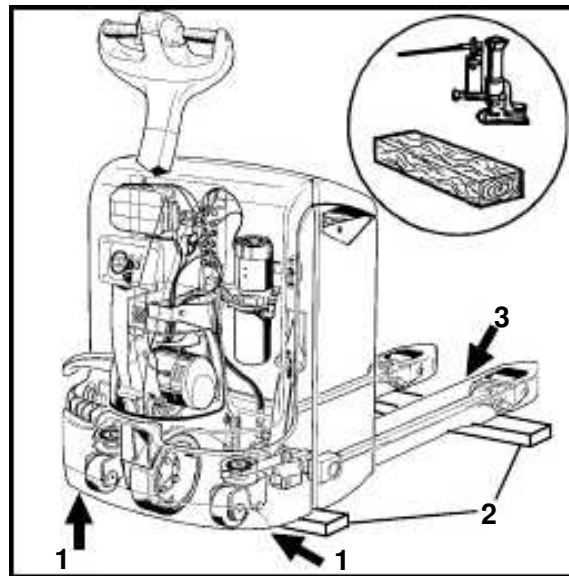
For certain servicing tasks, it is necessary to raise the truck

- Use a jack of adequate capacity
- To raise the front section of the truck, place the jack beneath the chassis at the corners (1). Chock with wooden blocks (2) for safety.
- For servicing of the load wheels, the jack must be placed beneath the fork arms at the points shown (3).



CAUTION

Always thoroughly secure and chock the truck once it is raised.



Transporting the truck

When transporting the truck, ensure that it is properly chocked and protected against bad weather.

Storage

If the truck is not to be used for a long period, it will be necessary to:

- remove the battery and recharge it at least once per month
- lower the forks to their full extent
- mount the truck on chocks in order to avoid any deformation to the tyres.

Maintenance

General information

In order to keep your handling truck in good condition and working order, it must be regularly checked and serviced in accordance with this manual.

Servicing must be carried out only by qualified and authorised personnel.

This work can be carried out by your local LINDE representative under a service contract. If you prefer to carry out this work yourself, we recommend that the first three services should be conducted by the local representative in the presence of your maintenance personnel, so that your staff can be given appropriate training.



CAUTION

During all servicing work, park the truck on level ground in an area set aside for this purpose. Chock the wheels, remove the key and disconnect the battery.

On completion of any servicing work, always carry out tests on the truck to ensure correct operation.

You must not make any alteration to your truck, fit any accessory or make any structural modification without the manufacturer's prior approval.

NOTE

If the truck is used in difficult conditions (extremes of hot or cold, dusty environments, etc.), the service intervals must be reduced.

Before carrying out any lubrication, changing filters or working on the hydraulic system, carefully clean the exterior of the parts concerned.

Use clean receptacles for lubrication operations.



ATTENTION

Comply with regulations for the use of the ingredients concerned.



ATTENTION

Use only lubricants which meet the relevant specifications.

See the table of recommended lubricants.

Inspection and maintenance after first 50 hours of service *

- Check braking system
- Check tightness of wheels
- Check condition of wheels
- Check hydraulic fluid level
- Check for leaks in hydraulic system
- Clean hydraulic filter
- Check level and specific gravity of battery electrolyte
- Check condition and fastening of electrical cables and connections
- Check mechanical fixings of chassis and lifting system
- Carry out general lubrication
- Check the transmission belt tension
- Check the battery charger

* NOTE

Descriptions of these tasks are given in the following pages

Inspection and maintenance schedule

Maintenance

Operation / Interval	Prior to initial use	Daily checks	After first 50 hours	As required
Checks prior to initial operation (see page 12)	●			
Daily checks before use (see page 12)		●		
Check braking system			●	
Check tightness of wheels			●	
Check condition of wheels			●	
Check hydraulic fluid level			●	
Check for leaks in hydraulic system			●	
Clean hydraulic filter			●	
Check level and specific gravity of battery electrolyte			●	
Check condition and fastening of electrical cables and connections			●	
Check mechanical fixings of chassis and lifting system			●	
Carry out general lubrication			●	
Check the transmission belt tension			●	
Check the battery charger			●	
Test operation of truck			●	
Clean truck				●
Check tightness of wheels				●
Check condition of wheels				●
Adjust height of stabiliser wheel				●
Check electrolyte level and top up with water				●
Check electrolyte specific gravity				●
Check condition of cables, terminals and battery connector				●
Clean battery and battery compartment				●
Check fuses				●
Test operation of truck				●

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Inspection and maintenance schedule

Maintenance

Operation / Interval	Every 500 hours or every 6 months	Every 1000 hours or every year	Every 2000 hours or every 2 years	
Check the braking system	●			
Check the reduction gear belt	●			
Check hydraulic fluid level	●			
Check hydraulic system for leaks	●			
Check condition and fastening of electrical cables and connections	●			
Clean pulse control plate	●			
Check contacts for wear	●			
Check / replace drive motor brushes	●			
Check miscellaneous joints	●			
Test operation of truck	●			
Check / replace pump motor brushes		●		
Clean and replace hydraulic filter		●		
Check mechanical components		●		
Test operation of truck		●		
Change hydraulic fluid			●	
Test operation of truck			●	

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Cleaning the truck

Disconnect the battery before commencing cleaning. Steam jets or highly detergent products must be used only with great care, as they dilute the grease in lifetime-lubricated bearings. Since re-greasing is not possible, these cleaning methods can result in wear of the bearings.

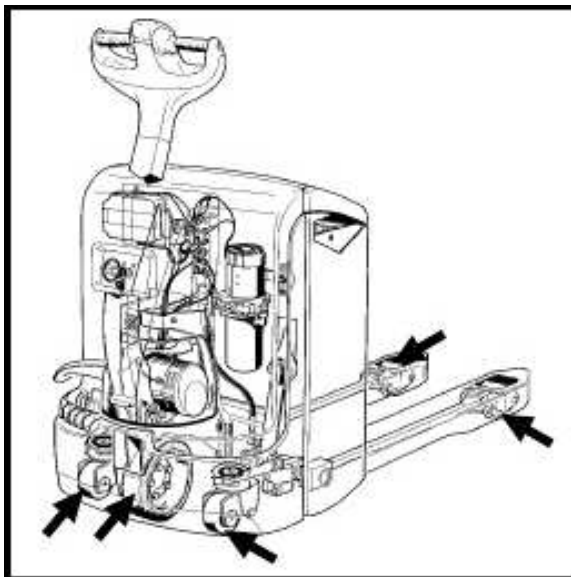


ATTENTION

When using cleaning equipment, do not expose electrical circuits, motors or switch panels to direct jets. Protect these components before cleaning.

When using compressed air, first remove any stubborn dirt using a cold detergent.

Before commencing lubrication tasks, clean oil filling holes and surrounding areas in particular, as well as grease nipples. Dry the truck after cleaning.



If, in spite of all precautions, water finds its way into the motors, the truck must be run to prevent the formation of rust, so that it dries under its own heat. Motors may also be dried using compressed air.

NOTE

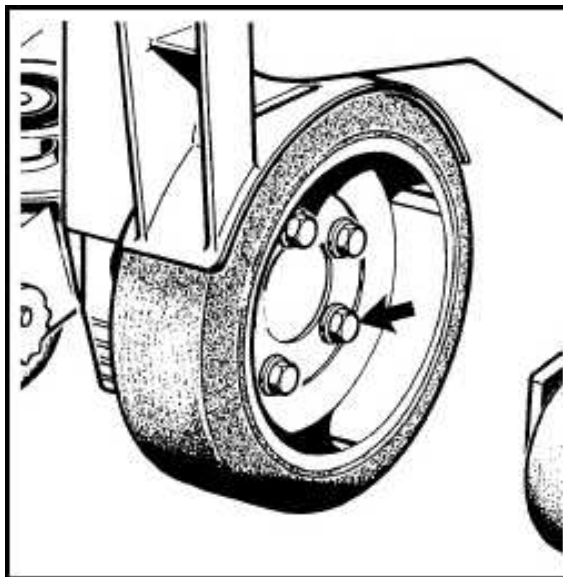
If the truck is cleaned frequently, it will also need frequent lubrication.

Checking the wheel nuts

- Raise the truck until the wheels are no longer touching the ground, and chock it up
- Check the tightness of the nuts on the driven wheel. Recommended torque setting: 80 Nm
- Check the tightness of the mounting bolts on the load wheels. Recommended torque setting: 50 Nm

Checking the condition of the wheels

- Raise the truck until the wheels are no longer touching the ground, and chock it up



- Check the free rotation of the wheels, and remove any object which might interfere with them.
- Replace any worn or damaged wheels
- Check first in front and after backwards

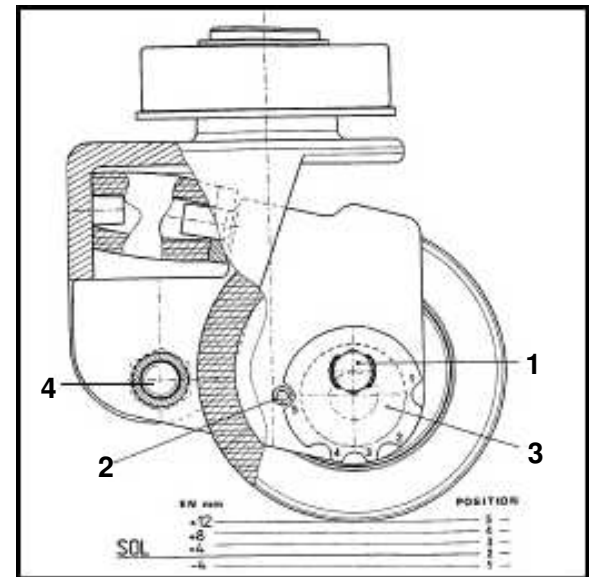


ATTENTION

If any wire becomes wrapped around the wheel hubs or bearings, this must be removed. Failure to do so may result in rapid wear to the wheels.

Fitting and adjustment of the stabiliser wheel

- Check the tightness of the cap nuts (4), recommended torque setting :15 Nm
- Loosen the bolt (1) on the side of pin (2)
- Pull the eccentric bearing (3) clear of the pin (2) in order to be able to turn the eccentric assembly and the wheel spindle using the other bolt.
- Position the corresponding notch (5 possible choices) adjacent to the locking pin (2)
- Tighten bolt (1) to torque $C_n = 32 \text{ Nm}$



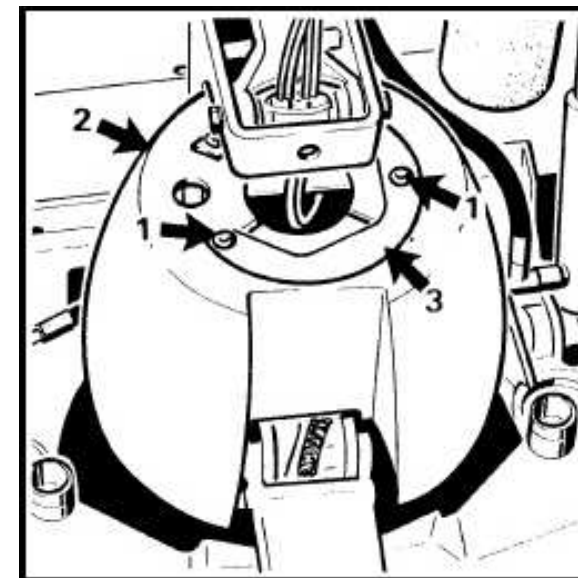
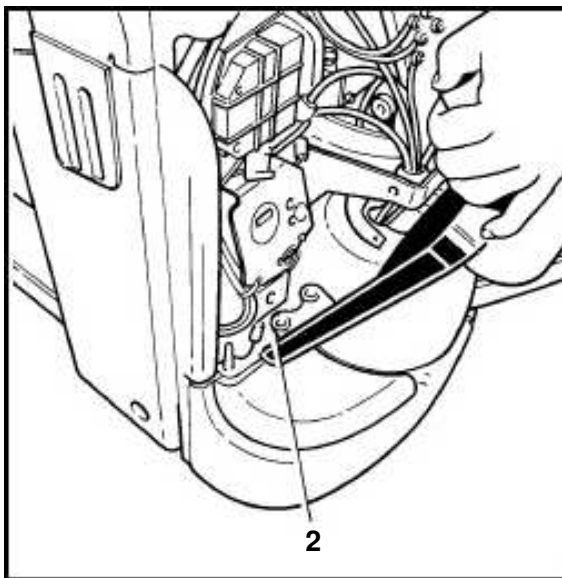
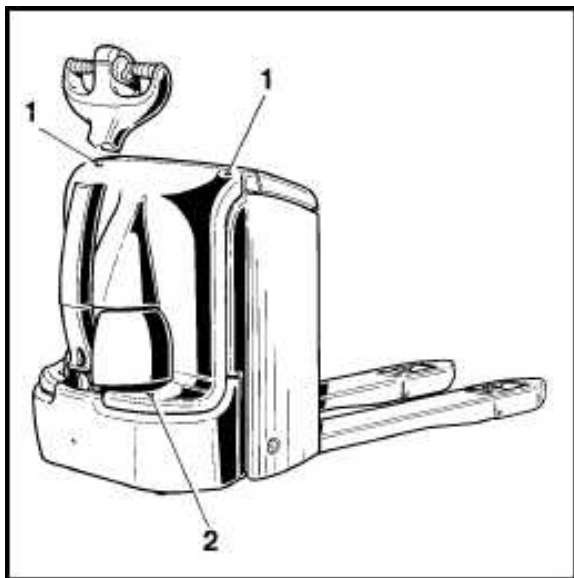
Opening the front cover

- Unscrew the 2 screws (1) holding the cover.
- Pull the cover towards the back.
- Lift the cover and place it on the ground.
- To close, position the lower locking pins (2) in the holes in the frame or in the power cable compartment.
- Replace the 2 screws (1) in the cover.

Pull the flexible cover clear to access the reduction gearbox and the motor

- Remove the front cover
- Remove the three flexible cover (2) support screws (1)
- Remove the bearing plate (3)
- Move the tiller to the right (for the reduction gearbox) or to the left for the motor.
- Lift the cover by 2 to 3 cm and then pass it over the bracket making use of the cutouts.
- Fold the lower part back on the inside support.

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Maintenance as required

The operations described below apply to lead-acid batteries with liquid electrolyte.

For "maintenance-free" batteries with gel electrolyte, refer to the manufacturer's instructions.

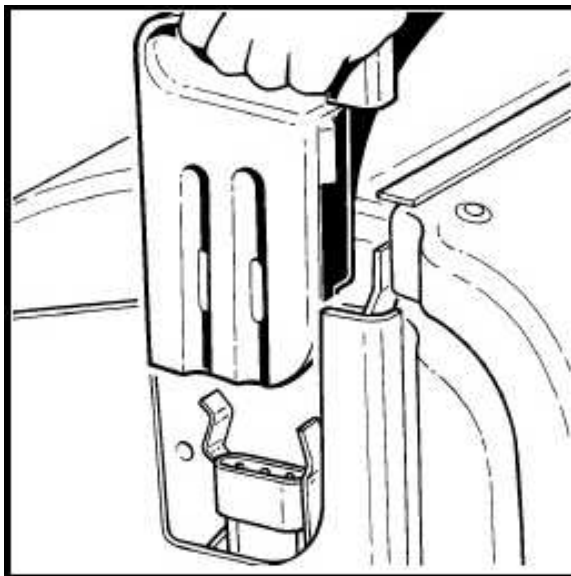


CAUTION

Avoid any contact with the acid. Do not create any short-circuit. See the recommendations in the "daily checks" section.

Checking electrolyte level and topping up with water.

- This check, and any necessary topping-up, is to be carried out once a week, after recharging the battery.
- Turn off the key-switch, open the cover and disconnect the battery connector.
- Check the level. It should be up to the base of the filler plug, just above the top of the separator.
- Use demineralised water to top up any cells with a low water level.
- Replace the filler plugs.



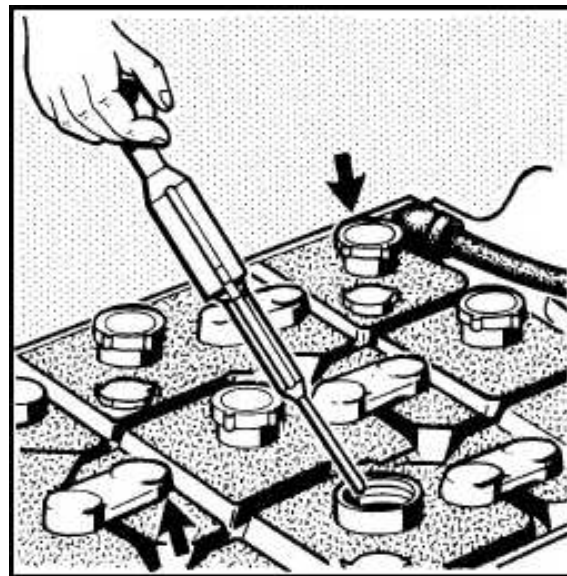
ATTENTION

Use only demineralised water for topping up. Never add water before charging (risk of overflow). Do not overfill the cells.

For more information, refer to the instructions supplied with the battery.

Checking the electrolyte specific gravity

- Measuring the specific gravity gives an accurate indication of the state of charge of each cell in the battery. This measurement may be carried out before or after charging.
- Minimum specific gravity, battery 80% discharged: 1.14
- High specific gravity, battery 100% charged: 1.29 to 1.32 (according to make).
- We recommend measurement every week or two. Keep a record of the values measured in the service booklet for your battery.



Maintenance

- Remove the filler plug for each cell as described above.
- Using an add hydrometer, carefully measure the specific gravity in each cell.
- Replace the filler plugs when finished.

NOTE:

If there are voltage discrepancies between the various cells, or if any cells show a particularly low voltage, contact your local representative. Any discharge below the threshold of 1.14 will be extremely detrimental to the lifespan of the battery.

For more information, refer to the instructions supplied with the battery.

Fuses

- Remove the front cover for access to the fuses.
- The 7.5 A fuse protects the control circuits.
- The 160 A fuse protects the power circuit of the traction motor.
- The 100 A fuse protects the power circuit of the pump motor.

Charger fuses *

Two 25 A fuses protect the in-built charger secondary circuit.

Fuse changing is only permitted once the charger has been disconnected from the mains voltage and the battery voltage.

The output fuses are changed by opening the charger (and dismantling the base plate). Press the fuses home in their holder.



DANGER

For dismantling the base plate, wait at least 10 minutes after the mains connector has been disconnected so as to eliminate any risk of electric shock.

* Option

Maintenance as required

Maintenance

Checking the condition of battery cables, terminals and connector

- Check that cable insulation is undamaged, and that the connections show no sign of overheating.
- Check that the + and - battery terminal pillars are not sulphated (indicated by the presence of a white salt-like deposit).
- Check the condition of the connector contacts, and the presence of the locating pin.



ATTENTION

Failure to observe the above procedures may result in serious damage. Please contact your local representative as quickly as possible to remedy any such damage.

Cleaning the battery and battery compartment



CAUTION

This is a delicate operation, and requires the wearing of gloves, goggles and acid-resistant clothing.

Observe the precautions stipulated in the preceding chapters. Do not dispose of acid-polluted washing water in drains.

For further information, refer to the instructions supplied with the battery.

Battery in unsealed box

- Check for traces of sulphation in the box and on the chassis.
- If sulphation is mild, it is sufficient to clean the upper surface of the cells with a damp cloth.
- In the case of heavier sulphation, it is necessary to remove the battery, pressure-wash it and clean the chassis.

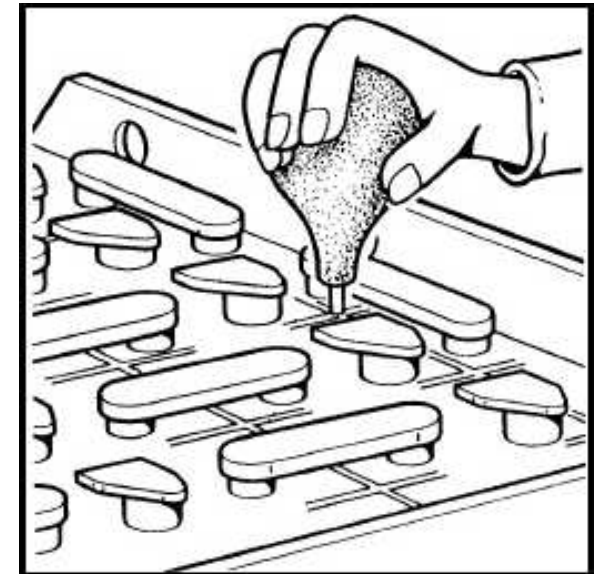
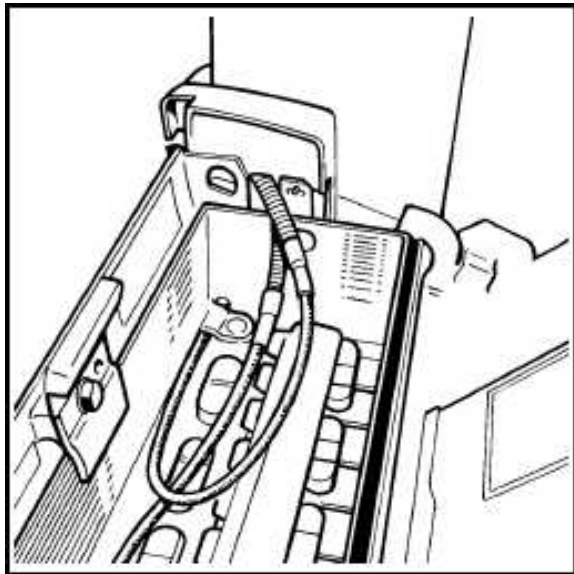
Battery in sealed box

- Check that there is no electrolyte in the bottom of the box by connecting the suction bulb supplied with the battery to the plastic plunge tube.
- Pump out any electrolyte which may have overflowed between the cells.
- Clean the upper surface of the cells with a damp cloth.



ATTENTION

In the event of heavy sulphation or substantial electrolyte overflow, please contact your local representative.

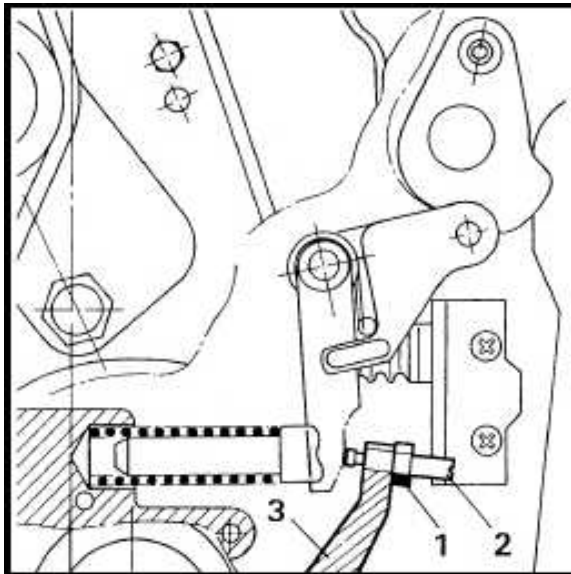


Checking and adjusting the brake control

- Check the truck braking. If it proves to be unsatisfactory, adjust as follows:
- Remove the front cover, remove the flexible cover, and remove the reduction gear cover.
- Loosen the lock nut (1).
- With the tiller in the working position, tighten the screw (2) until the lever (3) grips the jaws of the brake drum.
- Back off the screw (2) by two or three turns until the brake pulley rotates freely.
- Tighten the lock nut (1).
- Release the tiller and check that the truck is correctly braked in this position.

NOTE

We recommend that this operation be carried out by our network.



Checking and adjusting the belt tension

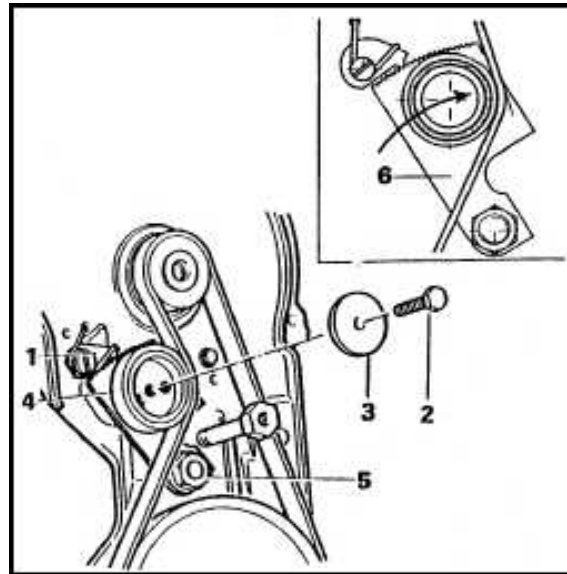
With the truck lifted about 20 cm off the ground and then put on blocks:

- Remove the casing cover from underneath.
- Remove the bolt (2) and the washer (3).
- Count the number of notches on the tensioner rack (6).
- Refer this number to the «notch» curve and read the re-tensioning torque.
- Tighten the tensioner nut (5) by turning it clockwise with a torque wrench to the torque determined, whilst turning the motor at low speed to accurately position the belt.

NB

Make sure that the roller (4) is not touching the bolt (2). If it is, remove the bolt (2) and the washer (3) and move them one hole towards the right. There are three possible bolt positions.

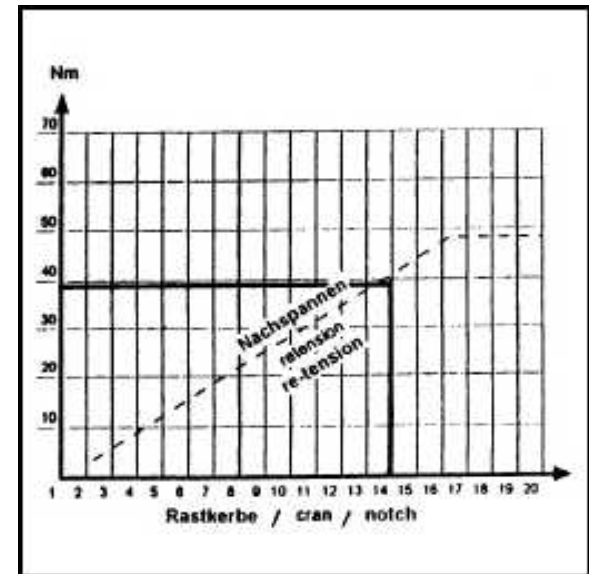
The ratchet (1) must lock correctly.



- Tighten the bolt (2) fitted with its washer (3). Tightening torque: 24 Nm.
- Fix the casing cover with the attachment screws. Tightening torque: 10 Nm.

IMPORTANT: When installing a new belt, follow the steps indicated above, having firstly carried out the following:

- apply an initial tension of 17Nm on the sprocket (4).
- count the number of notches and
- apply the final torque as per the graph.



Checking the hydraulic fluid level

- Lower the forks to their full extent
- Remove the front cover cover
- The fluid level (1) must be between the min. and max. marks on the reservoir (mid-way mark)
- Top up with fluid if necessary, after unscrewing the cap (2)
- Replace the cap to complete the operation



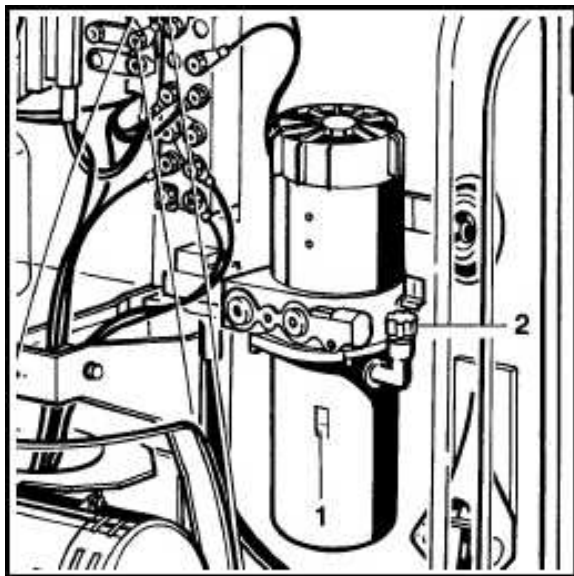
ATTENTION

- Use only hydraulic fluid which meets the relevant specifications (see table of lubricants)
- Do not refill with brake fluid

Checking for leaks in the hydraulic system

- Inspect the hydraulic system: pipes, flexible hoses and unions between the pump motor and the pressure cylinders
- Tighten unions if necessary
- Check the two lifting cylinders for leaks
- Check that the flexible hoses are correctly fitted and not chafed.

If any leaks are observed, please contact your local representative.



Maintenance every 500 hours



ATTENTION

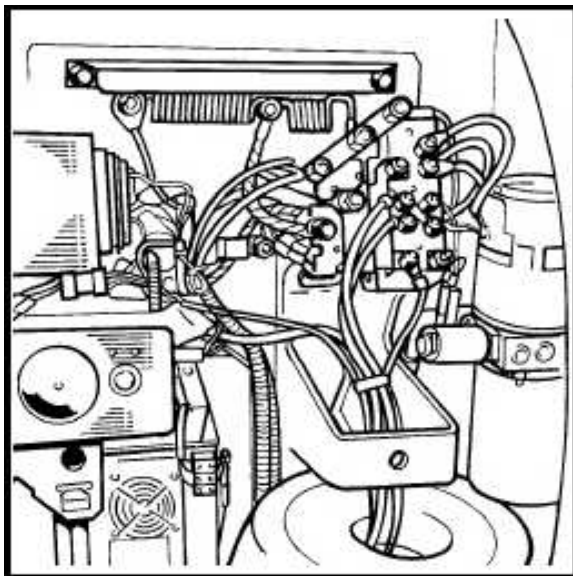
Before commencing any work on the electrical equipment, the battery connector must be disconnected.

Electrical system: checking the condition and fastening of electrical cables and connections

- Remove the front cover.
- Check the tightness of the connections, and ensure that there are no traces of corrosion.
- Check that cable fastenings are secure.
- Check the cables for any areas of chafing. Ensure that they are properly insulated and fastened.

NOTE

Corroded connections and damaged cables may cause voltage drops and overheating, which can result in malfunction.



Cleaning the electrical panel

- Disconnect the battery connector.
- Remove the front cover.
- Clean the pulse control panel using compressed air.

NOTE

Protect the electrical panel against moisture. Adjustment and repair must be carried out only by our representatives.



ATTENTION

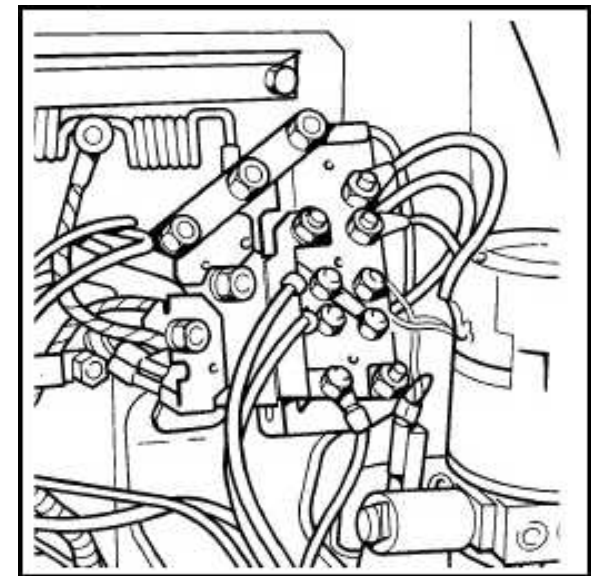
Before commencing work on any electrical component, disconnect the battery connector.

Cleaning and checking contacts for wear

- Disconnect the battery connector.
 - Clean the contacts using compressed air, and check their mechanical integrity.
 - Any contacts which show advanced wear or substantial traces of burning must be replaced.
- Always replace the contacts as a complete set.

NOTE

We recommend leaving this operation to your local representative.



Inspection / replacement of the traction motor brushes

- Disconnect the battery connector.
- Remove the front cover.
- Pull the plastic covers (1) clear.
- Remove the motor protection screen (2).
- Clean the motor using compressed air.
- Check that there are no traces of overheating on the brush connections.
- Check the tightness of the connections.
- Check that the brushes move freely in their channels by pulling gently on their shunts.
- Lift the springs, withdraw the brushes and their guides (2), and measure their length.
- Replace if necessary.
- Check that the commutator is not scored, and shows no signs of sparking.

NOTE

Always replace brushes as a complete set.
We recommend leaving this operation to your local representative.

Dimensions:

Drive motor:

0,7 kW	neuf : 25 mm mini : 15 mm
0,9 kW	neuf : 25 mm mini : 15 mm
1,2 kW	neuf : 32 mm mini : 15 mm

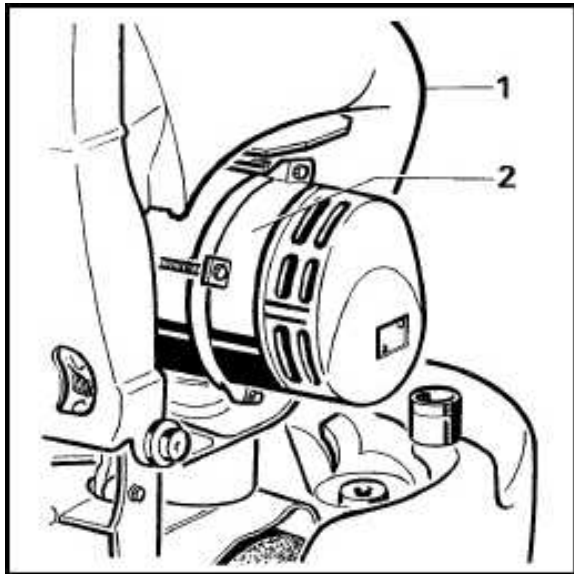


ATTENTION

In the event of any anomaly, please contact your local representative.

Checking miscellaneous joints

- Inspect and lubricate the various pivots:
- Use oil or an aerosol lubricant.



Changing the hydraulic fluid

- Remove the pump motor unit.
- Remove the two semi-circular collars (2).
- Detach the reservoir (1).
- Drain the fluid.
- Clean the two strainers (3).

Refilling

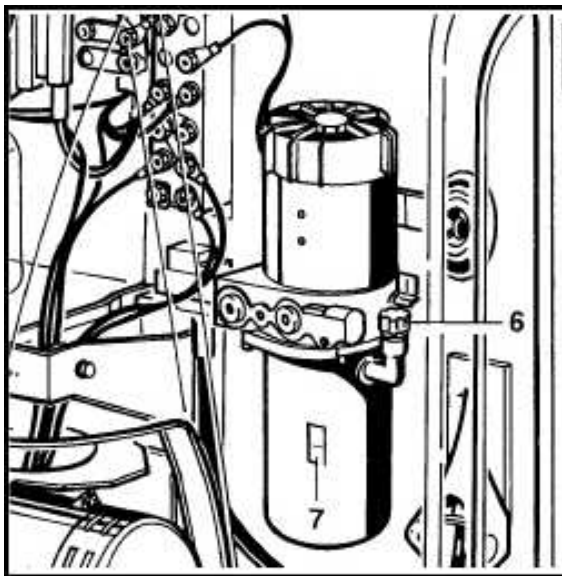
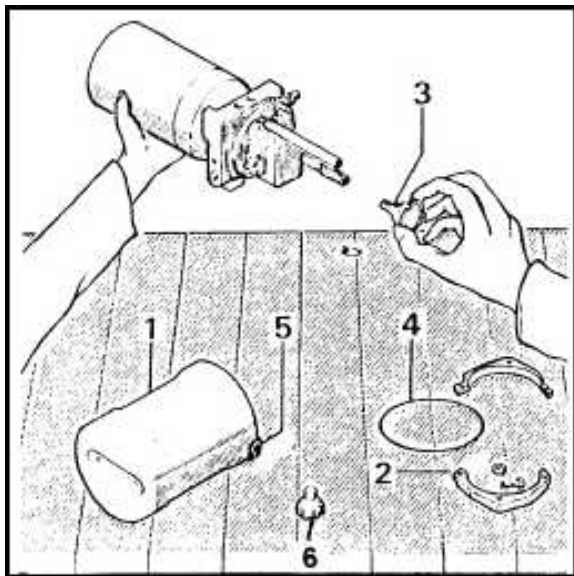
- Refit the reservoir (1) to the pump motor unit, taking care to seat the O-ring (4) properly.
- Refit the pump motor unit to the chassis.
- Reconnect the pipes.
- Unscrew the filler plug (6).
- Refill the reservoir (1) through the opening (5).
- Fill the reservoir to its maximum level.
- Replace the filler plug (6).
- Operate the lifting system several times in order to purge the system.

- Lower the fork arms to their full extent.
- To check the fluid level.
- The fluid level (7) must be between the min. and max. markings on the reservoir (mid-way mark).
- If necessary, remove the filler plug (6) and top up with fluid.
- Replace the filler plug when finished.
- Close the front cover by swivelling.



ATTENTION

Use only hydraulic fluid which meets the relevant specifications (see table of lubricants).



Unit	Part / lubricant	Capacity / adjustment value
Hydraulic system Hydraulic system Hydraulic system	Hydraulic fluid Filter element Max. pressure	1.25 l Efficiency: 150 µ 170 bar(start of opening)
Reduction gear	Grease	Life lubricated
Driven wheel Stabiliser wheel Load wheels	Wheel nuts Cap nuts Spindle nuts Mounting bolt	Torque setting : 80 Nm Torque setting : 15 Nm Torque setting: 32 Nm Torque setting : 50 Nm
Traction motor Pump motor Control harness Built-in charger	Fuses Fuses Fuses Fuses	Power 160 A Qty:1 Power 100 A Qty:1 Control 7.5 A Qty:1 Secondary 25 A Qty:2
Traction motor 1,2 KW Traction motor 0.9 KW Traction motor 0,7 KW Pump motor 0,8 KW Pump motor 1,0 KW	Brushes Brushes Brushes Brushes Brushes	New 32 mm, min. 15 mm New 25 mm, min. 15 mm New 25 mm, min. 15 mm New 18 mm, min. 8 mm New 18 mm, min. 8 mm
Battery	Distilled water	As necessary
Joints	Lithium-based grease	As necessary

Recommended lubricants

Hydraulic fluid

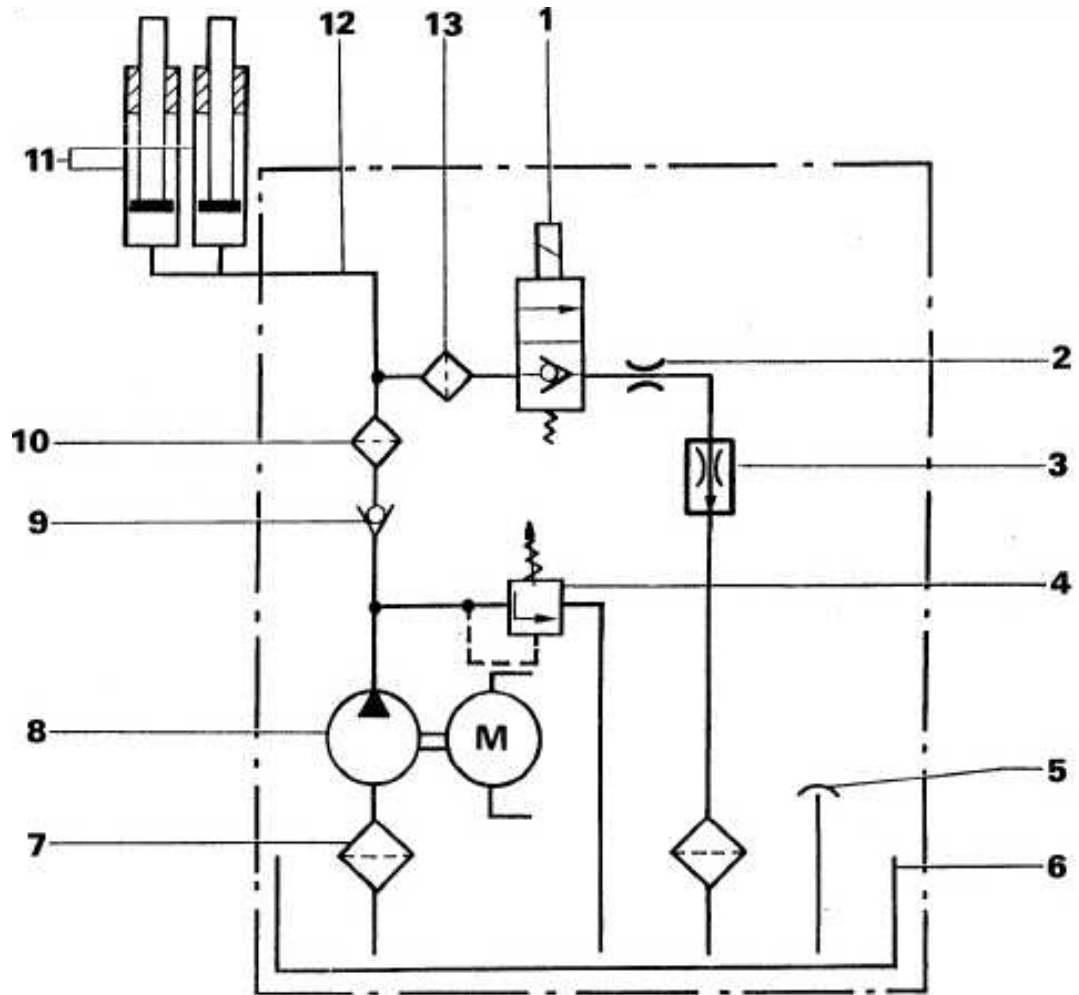
ISO VG H-L or H-LP (DIN 51524). Manufacturer's code, 5-litre cans: 8101521.
For cold-room operation: 8101489 (25-litre cans).

Multi-purpose grease

Lithium-based grease, high-pressure with anti-wear additive: Standard DIN 51825 - KPF 2K - 30, KPF 2K - 20, KPF 2N- 30.
Manufacturer's code, cartridge: 7.337.475 140.

Hydraulic system diagram

1. Lowering solenoid valve
2. Restrictor (T 18)
3. Flow regulator (T 20)
4. Adjustable pressure reducing valve
5. Breather (built into the filling cap)
6. Reservoir
7. Suction strainer
8. Pump
9. Non-return valve
10. Pressure filter
11. Lift cylinders
12. Hydraulic line
13. Filter



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Circuit diagram

RESISTANCE CONTROL

Mark	Item	Position
1A1	Control logic	10-22
1B1	Potentiometer	20-22
1B2	Motor speed sensor	5
4B1	Horn	25
1F1	Traction motor fuse	5
1F3	Control fuse	12
2F1	Pump motor fuse	8
G1	Battery	2
1K11	Forward travel contactor	4,6,12-13
1K12	Reverse travel contactor	4,6,13-14
1K13	Second speed contactor	3,4,15
1K14	Third speed contactor	6,7,16
2K1	Pump motor contactor	8,31
1M1	Traction motor	5
2M1	Pump motor	8
6P2	Hour meter, battery discharge limiter *	30-35
S1	Key switch	12
1S2	Microswitch, start	12-13
1S3	Microswitch, safety reverse button on tiller	18
1S4	Microswitch, tiller safety	33
4S5	Microswitch, horn button	25
2S6	Microswitch, lower fork control	28
2S7	Microswitch, lift fork control	31
S9	Microswitch, in-built charger safety device	12
X1	Battery plug	2
1X1	Control logic connector	
1X2	Control panel-speed sensor circuit connector	
1X3	Control panel-tiller circuit connector	
1X5	Tiller-tiller head circuit connector	
6X1	Hour meter-battery discharge limiter connector	

Mark	Item	Position
2Y30	Lowering solenoid valve	28
1Z1	Suppression diode	12,14-17, 24,27,30
3Z1	Suppression circuit	14,23-24 26-27, 29-30

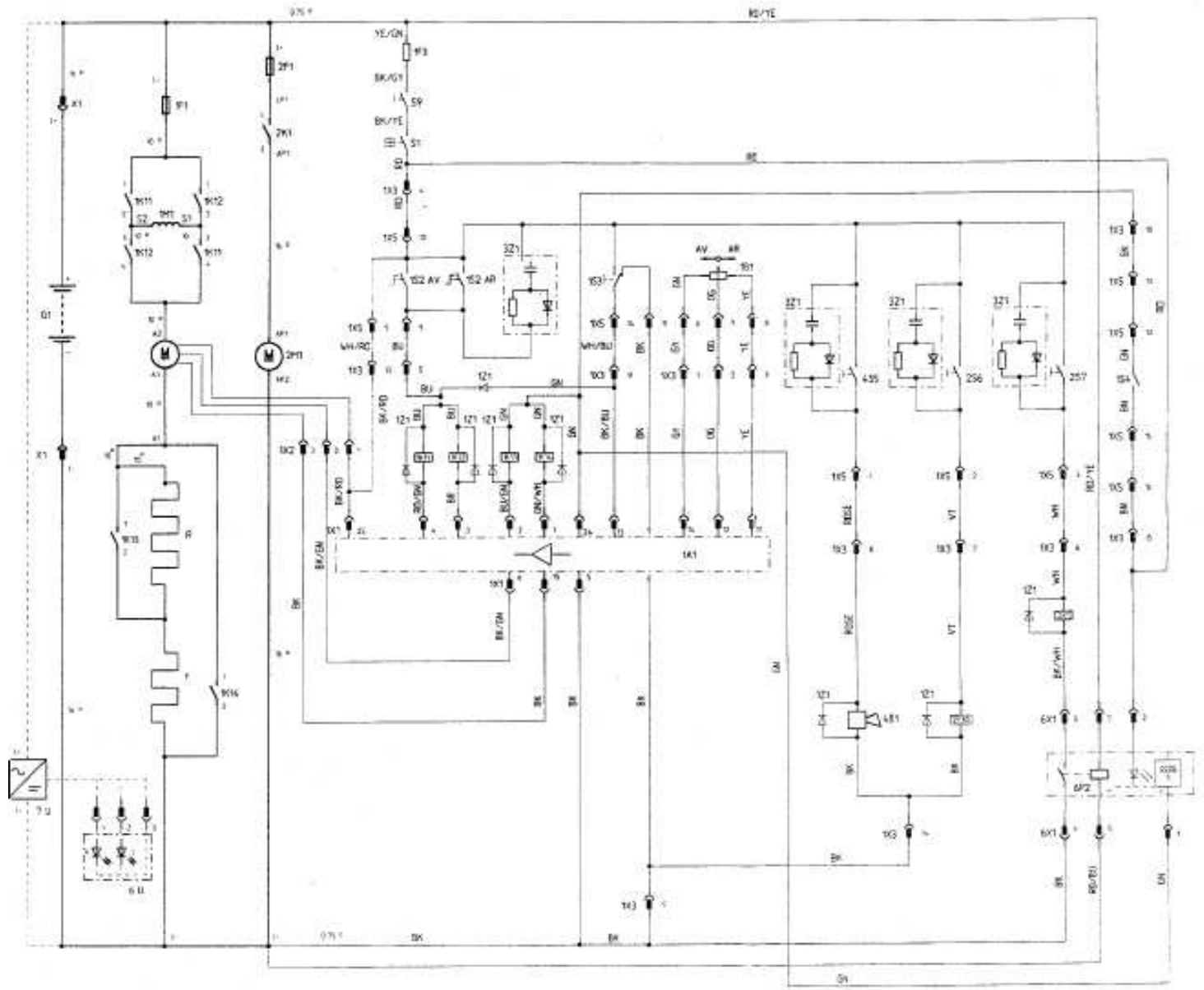
OPTION.INBUILTCHARGER

7U	Inbuilt charger	1
6U	Signal lamp	3-4
	J (Yellow) Mains set	
	V (Green) Battery charged 90%	

Code	Colour	Code	Colour
BK	Black	GN	Green
WH	White	VT	Violet
BU	Blue	RD	Red
OG	Orange	YE	Yellow
BN	Brown	GY	Grey

Resistance

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Circuit diagram

PULSE CONTROL LTM

Mark	Item	Position
1A1	Traction pulse control	3-9,13-26
1B1	Travel control potentiometer	23-25
1B2	Motor speed sensor	6
1B3	Current meter shunt	6
4B1	Horn	33
1C1	Suppression capacitor	34-35,36-37
1F1	Fuse, traction motor	6
1F3	Control current fuse	14
2F1	Pump motor fuse	10
G1	Battery	3
1K11	Forward travel contactor	5,7,16
1K12	Reverse travel contactor	5,7,18
2K1	Pump motor contactor	8,30
1M1	Traction motor	6
2M1	Pump motor	10
6P2	Hour meter, battery discharge limiter	36-40
R0	Resistance 560 ohms	9-10
S1	Key switch	14
S2	Microswitch, start of travel control	14
S3	Microswitch, safety reverse button on tiller	21
S4	Microswitch, tiller safety	17
S5	Microswitch, horn button	33
S6	Microswitch, lower fork control	35
S7	Microswitch, lift fork control	37
S9	Microswitch, in-built charger safety device	14
X1	Battery plug	3
1X1	Pulse control circuit connector	
1X2	Pulse control-speed sensor circuit connector	
1X3	Pulse control-tiller circuit connector	
1X4	Resistance connector	
1X5	Tiller-tiller head circuit connector	
1X6	Power transistor control connector	
1X10	Coldstore connector	
6X1	Hour meter-battery discharge limiter connector	

Mark	Item	Position
Y30	Lowering solenoid valve	35
1Z1	Suppression diode	15,17,31,34,36
3Z1	Suppression circuit	31-32
OPTION COLD STORE		
R1	Resistor	27
R2	Resistor	28
OPTION. INBUILT CHARGER		
7U	Inbuilt charger	1
6U	Signal lamp	4-6
	J (Yellow): Mains set	
	V (Green): Battery charged 90%	

Code	Colour	Code	Colour
BK	Black	GN	Green
WH	White	VT	Violet
BU	Blue	RD	Red
OG	Orange	YE	Yellow
BN	Brown	GY	Grey

Circuit diagram

PULSE CONTROL LTM WITH LBC BRAKING

Mark	Item	Position
1A1	Traction pulse control	3-7, 9-21
1A7	Circuit L.B.C.	22-34
1B1	Travel control potentiometer	17-19
1B3	Current meter shunt	5
1B4	Tachometer	35
1B5	Tachometer	32
4B1	Horn	35
1F1	Fuse, traction motor	5
1F3	Control current fuse	11
2F1	Pump motor fuse	8
G1	Battery	2
1K11	Forward travel contactor	4, 6, 12
1K12	Reverse travel contactor	4, 6, 14
2K1	Pump motor contactor	8, 41
1M1	Traction motor	5
2M1	Pump motor	8
6P2	Hour meter, battery discharge limiter	41-44
R0	Resistance 560 ohms	8-9
R1	Resistor (6 Km/h)	23, 24
R2	Adaptation resistor	30-31
S1	Key switch	11
S2	Microswitch, start of travel control	28
S3	Microswitch, safety reverse button on tiller	16
S4	Microswitch, tiller safety	13
S5	Microswitch, horn button	35
S6	Microswitch, lower fork control	38
S7	Microswitch, lift fork control	41
S9	Microswitch, built-in charger safety device	11
X1	Battery plug	2
1X1	Pulse control circuit connector	
1X2	Pulse control-speed sensor circuit connector	
1X3	Pulse control-tiller circuit connector	
1X5	Tiller-tiller head circuit connector	
1X6	Power transistor control connector	
1X7	Pulse control/Circuit LBC connector	
1X8	Pulse control/speed sensor circuit connector	
1X9	Speed sensor circuit connector with LBC	

Mark	Item	Position
6X1	Hour meter-battery discharge limiter connector	
Y30	Lowering solenoid valve	38
1Z1	Suppression diode	11, 13, 34-37 40
3Z1	Suppression circuit	34,37,40

OPTION COLDSTORE

R1-CF	Resistor (truck)	21
R2-CF	Resistor (truck)	22

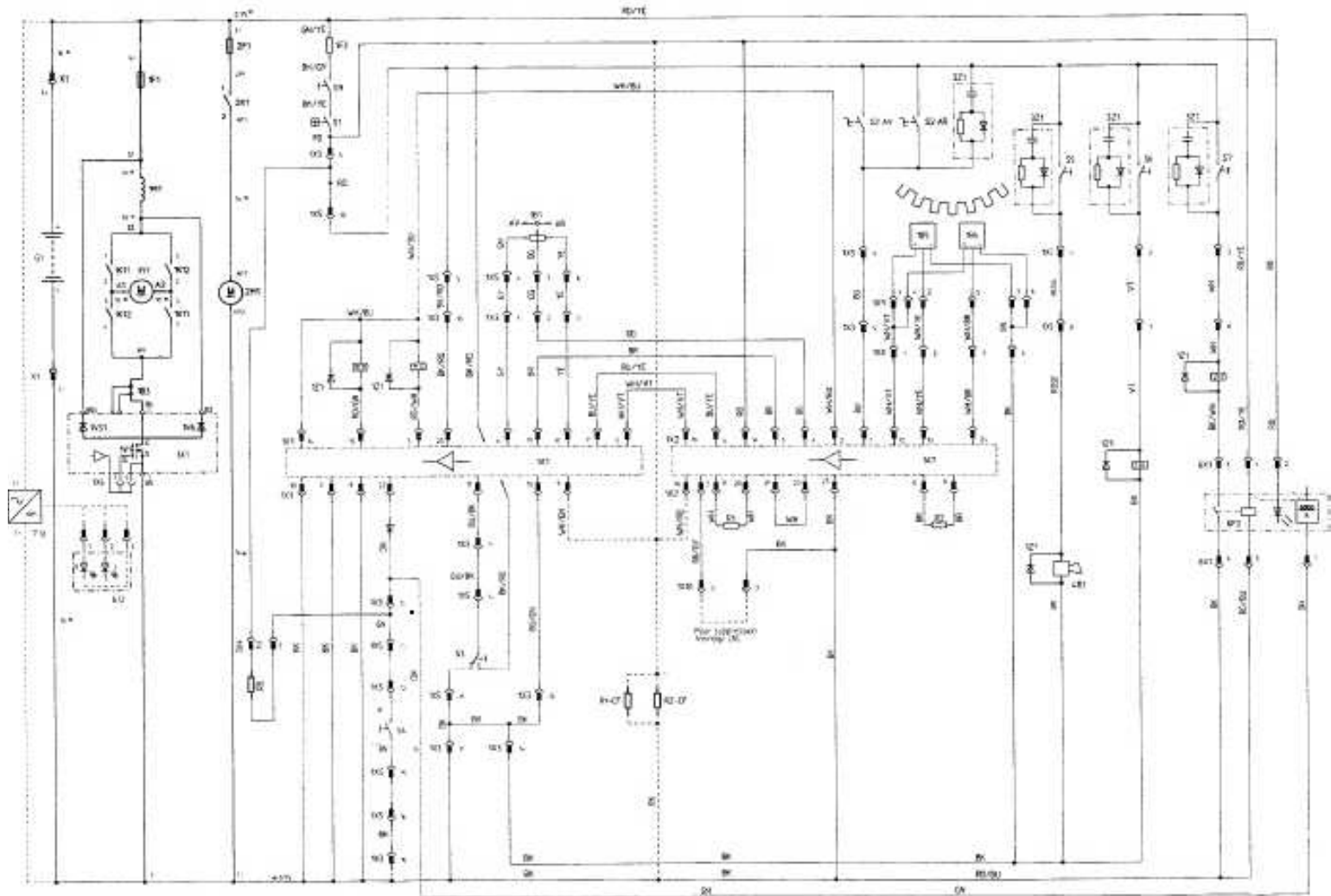
OPTION. INBUILT CHARGER

7U	Inbuilt charger	1
6U	Signal lamp	3-5
	J (Yellow): Mains set	
	V (Green): Battery charged 90%	

Code	Colour	Code	Colour
BK	Black	GN	Green
WH	White	VT	Violet
BU	Blue	RD	Red
OG	Orange	YE	Yellow
BN	Brown	GY	Grey

Pulse control with LBC braking

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Circuit diagram

PULSE CONTROL LDC

Mark	Item	Position
1A1	Traction pulse control	4-9,12-26
1B1	Travel control potentiometer	24-26
1B2	Motor speed sensor	6-7
1B3	Current meter shunt	6
4B1	Horn	30
1F1	Fuse, traction motor	6
1F3	Control current fuse	14
2F1	Pump motor fuse	10
G1	Battery	1
1K11	Forward travel contactor	5,8,17
1K12	Reverse travel contactor	5,8,17
2K1	Pump motor contactor	10,37
1M1	Traction motor	6
2M1	Pump motor	10
6P2	Hour meter, battery discharge limiter	36-40
1S1	Key switch	14
1S2	Microswitch, start of travel control	14-15
1S3	Microswitch, safety reverse button on tiller	21
1S4	Microswitch, tiller safety	17
4S5	Microswitch, horn button	30
2S6	Microswitch, lower fork control	33
2S7	Microswitch, lift fork control	37
1S8	Microswitch, in-built charger safety device	14
X1	Battery plug	3
1X1	Pulse control circuit connector	
1X2	Pulse control-speed sensor circuit connector	
1X3	Pulse control-tiller circuit connector	
1X4	Resistance connector	
1X5	Tiller-tiller head circuit connector	
1X6	Power transistor control connector	
1X10	Coldstore connector	
6X1	Hour meter-battery discharge limiter connector	
2Y30	Lowering solenoid valve	33
1Z1	Suppression diode	31,32,36
3Z1	Suppression circuit	28,32,35

Mark	Item	Position
------	------	----------

OPTION COLDSTORE

R1	Resistor	40
R2	Resistor	42

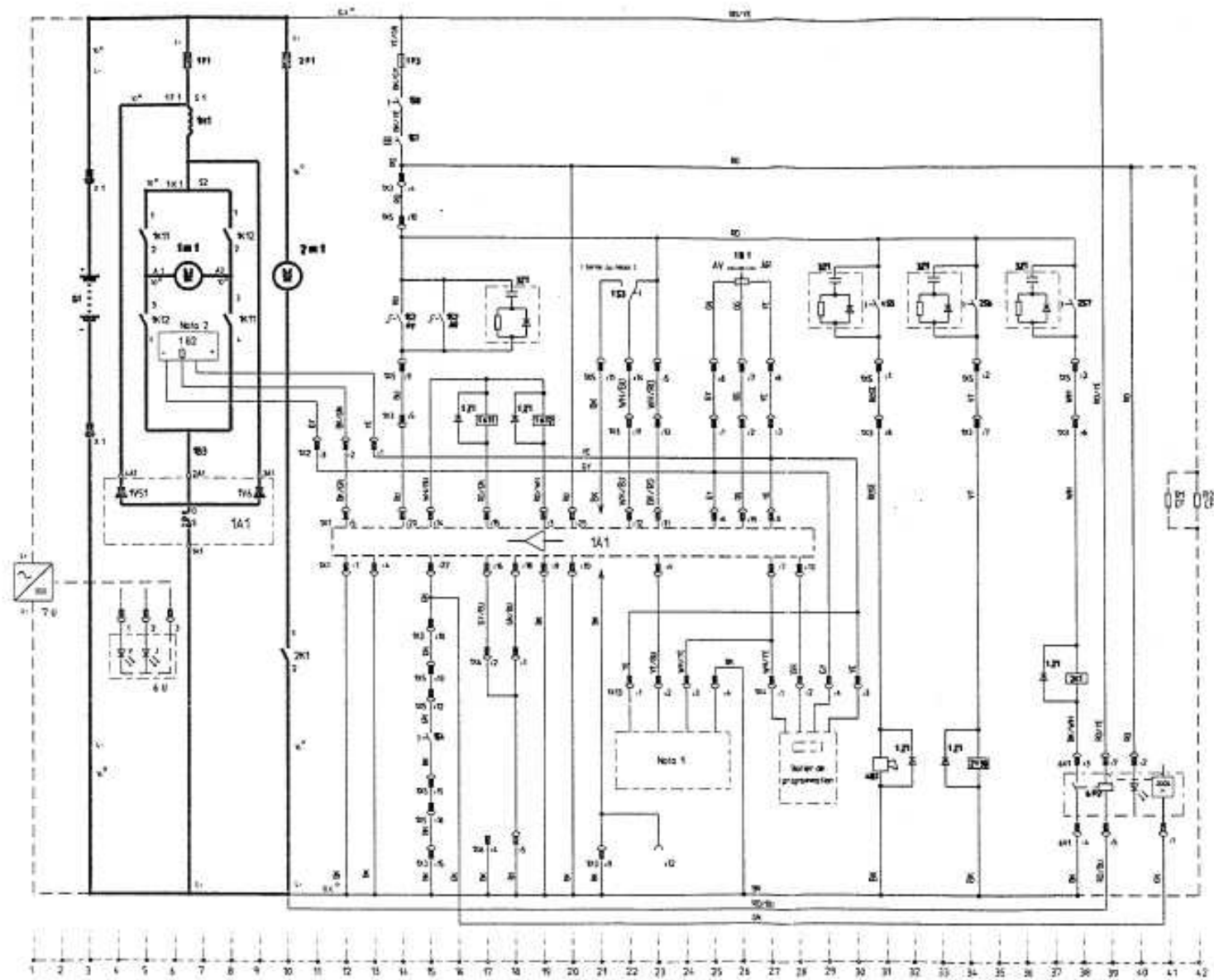
OPTION. INBUILT CHARGER

6U	Signal lamp	
	J (Yellow): Mains set	5
	V (Green): Battery charged 90%	4
7U	Inbuilt charger	1

Code	Colour	Code	Colour
BK	Black	GN	Green
WH	White	VT	Violet
BU	Blue	RD	Red
OG	Orange	YE	Yellow
BN	Brown	GY	Grey

Pulse control LDC

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