

# EME 112

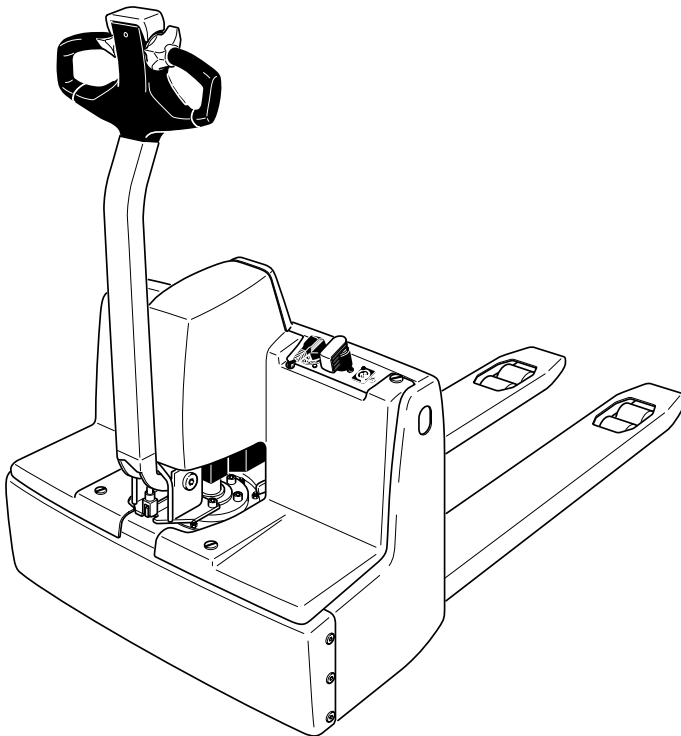
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Operating instructions



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# Foreword

The present ORIGINAL OPERATING INSTRUCTIONS are designed to provide sufficient instruction for the safe operation of the industrial truck. The information is provided clearly and concisely. The chapters are arranged by letter. Each chapter starts with page 1. The page identification consists of a chapter letter and a page number.

For example: Page B 2 is the second page in chapter B.

The operating instructions detail different truck models. When operating and servicing the truck, make sure that the instructions apply to your truck model.

Safety instructions and important explanations are indicated by the following graphics:



Used before safety instructions which must be observed to avoid danger to personnel.



Used before notices which must be observed to avoid material damage.



Used before notices and explanations.



Used to indicate standard equipment.



Used to indicate optional equipment.

Our trucks are subject to ongoing development. Jungheinrich reserves the right to alter the design, equipment and technical features of the truck. No guarantee of particular features of the truck should therefore be inferred from the present operating instructions.

## Copyright

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# Appendix

## JH Traction Battery Operating Instructions



These operating instructions apply only to Jungheinrich battery models. If using another brand, refer to the manufacturer's operating instructions.



# A Correct use and application of the truck



The “Guidelines for the Correct Use and Application of Industrial Trucks” (VDMA) are included in the scope of delivery for this truck. The guidelines are part of these operating instructions and must always be heeded. National regulations are fully applicable.

The fork-lift truck described in these operating instructions is a truck that is suitable for lifting and transporting loads.

It must be used, operated and maintained according to the information in these operating instructions. Any other uses are outside the design envelope and can lead to injury to persons or damage to equipment and property. Above all, overloading caused by excessively heavy or unbalanced loads must be avoided. The max. admissible load to be picked up is indicated on the identification plate or load diagram label shown on the truck. The fork-lift truck must not be operated in spaces subject to fire or explosion hazards, or in spaces where corrosive or very dusty atmospheres prevail.

**Duties of the user:** A “user” within the meaning of these operating instructions is defined as any natural or legal person who either uses the fork-lift truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting), the user is considered the person, who, in accordance with existing contractual agreements between the owner and the user of the fork-lift truck, is charged with the observance of the operating duties.

The user must ensure that the truck is not abused and only used within its design limits and that all danger to life and limb of the operator, or third parties, is avoided. In addition to this, it must be ensured that the relevant accident prevention regulations and other safety-related provisions, as well as the operating, servicing and maintenance guidelines, are observed. The user must also ensure that all persons operating the truck have read and understood these operating instructions.



If these operating instructions are not observed the warranty becomes void. The same applies if improper works are carried out at the device by the customer and/or third parties without permission of our Customer Service.

**Mounting of attachments:** The mounting or installation of any attachments which will interfere with, or supplement, the functions of the truck is permitted only after written approval by the manufacturer has been obtained. If necessary, the approval of local authorities has to be obtained. Any approval obtained from local authorities does not, however, make the approval by the manufacturer unnecessary.





# B Description of the truck

## 1 Application

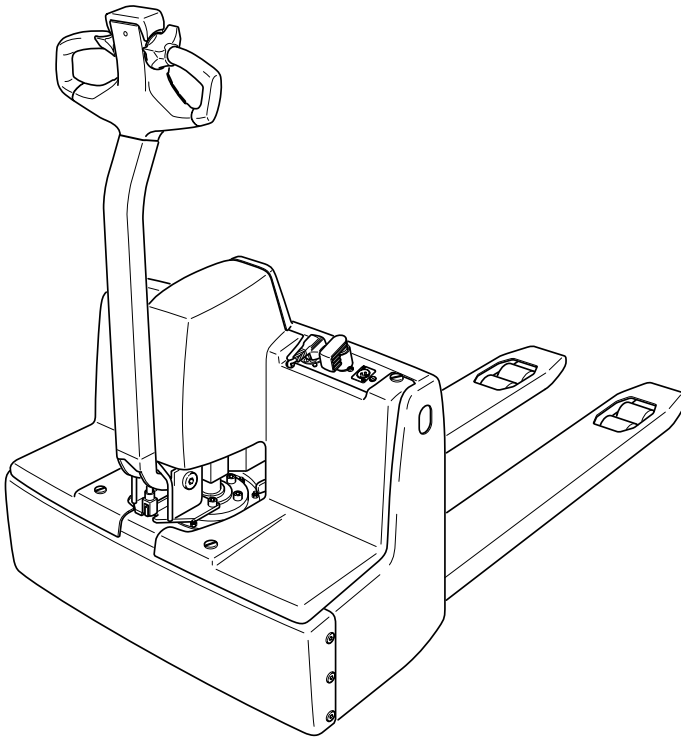
The truck is intended for transporting goods on a level floor. It can pick up pallets that are open to the ground or trolleys. The capacity of the truck can be found on the capacity label  $Q_{max}$ .



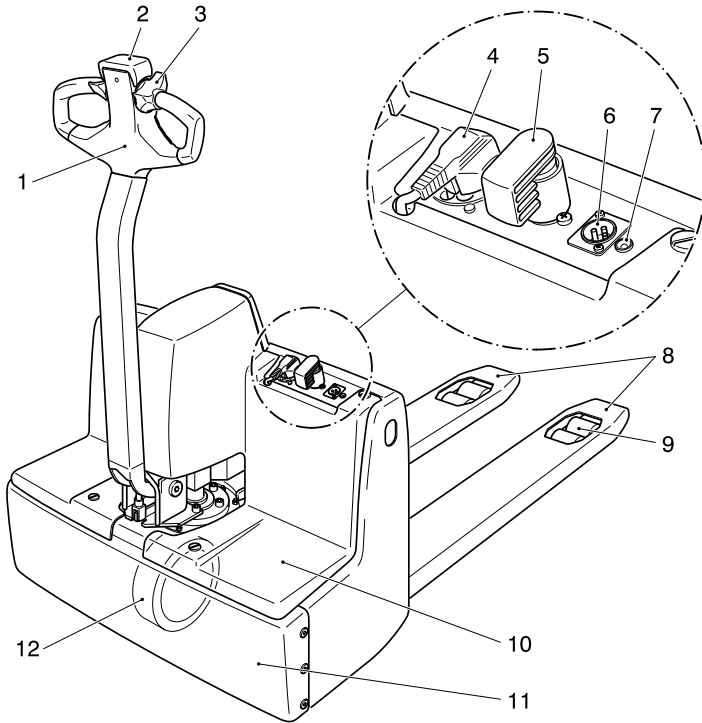
The EME truck has been designed for light duty, maximum continuous operation should not exceed 2 hours.

Truck type, load capacity and motor output:

Type	Load capacity	Motor output
EME	1200 kg	0.3 kW AC



## 2 Description of the assemblies and functions



Item		Designation
1	●	Control shaft
2	●	Collision protection button
3	●	Controller
4	●	Battery charge plug 230 VAC (integrated battery charger, 24 V / 6,5 A)
5	●	Emergency-off switch/ key switch
6	○	Battery charge connection 24 VDC (lorry charging)
7	●	Discharge control LED (discharge indicator)
8	●	Load lifting device
9	●	Load-bearing wheel
10	●	Front hood
11	●	Front wall
12	●	Drive wheel

● = Standard equipment

○ = Optional equipment

## 2.1 Truck

**Construction:** EME is a three-wheel truck with steered drive wheel (12) and two load wheels (9). The easy-to-open hood (10) provides good accessibility to all units. The control elements are located at the control shaft head.

### **Safety features:**

- The truck chassis protects the feet of the operator and, in case of collisions, the load lying on the pallet.
- The control shaft (1) ensures that the operator is at a safe distance from the truck. Due to its shape it slides upward at the operator's body in case of danger, until the truck decelerates.
- When the control shaft (1) is released, a gas pressure spring causes it to be pushed into the upper braking position.
- The collision protection button (2) in the control shaft head reacts when touched. The direction of travel is reversed and the truck moves away from the operator.
- By pressing the emergency-off switch (5) all electrical functions are disabled.

**Operating controls and indicators:** The operating controls for lifting, lowering, inching speed and the horn function are arranged on the control shaft (1). The truck is equipped with a discharge control LED (discharge indicator) (7). In order to protect the battery against deep discharging, the function Lifting is switched off at a residual capacity of 20%.

**Drive system:** The drive system is arranged symmetrically. The 0.3 kW drive motor drives the drive wheel (12) via a transmission. Reversing the direction of travel by using the controller (3) in the control shaft head allows the truck to be braked by counter-current braking.


**Steering system:** The truck is steered using the control shaft (1). The steering range is approx. 90° to either side.

**Brake system:** A spring pressure brake (service brake) acts directly upon the drive motor. Tilting the control shaft (1) into the upper or lower braking area causes the truck to be braked.

**Hydraulic system:** The lifting and lowering functions are triggered using the control buttons on the control shaft head. When the lifting function is activated, the pump unit starts up. Hydraulic oil is pumped from the oil reservoir into the cylinder. The load lifting device (8) is lifted.

**Electrical system:** 24 Volt system. As standard, the truck is equipped with electronic three-phase current control.

### 3 Technical data - standard version

 Technical data specified according to VDI 2198.  
Technical data are subject to alteration and additions.

#### 3.1 Performance data for standard trucks

	Designation	EME	
Q	Rated load capacity	1200	kg
C	Load centre	600	mm
	Travelling speed with / without load	4.2 / 5	km/h
	Lifting speed with / without load	20 / 30	cm/s
	Lowering speed with / without load	30 / 20	cm/s

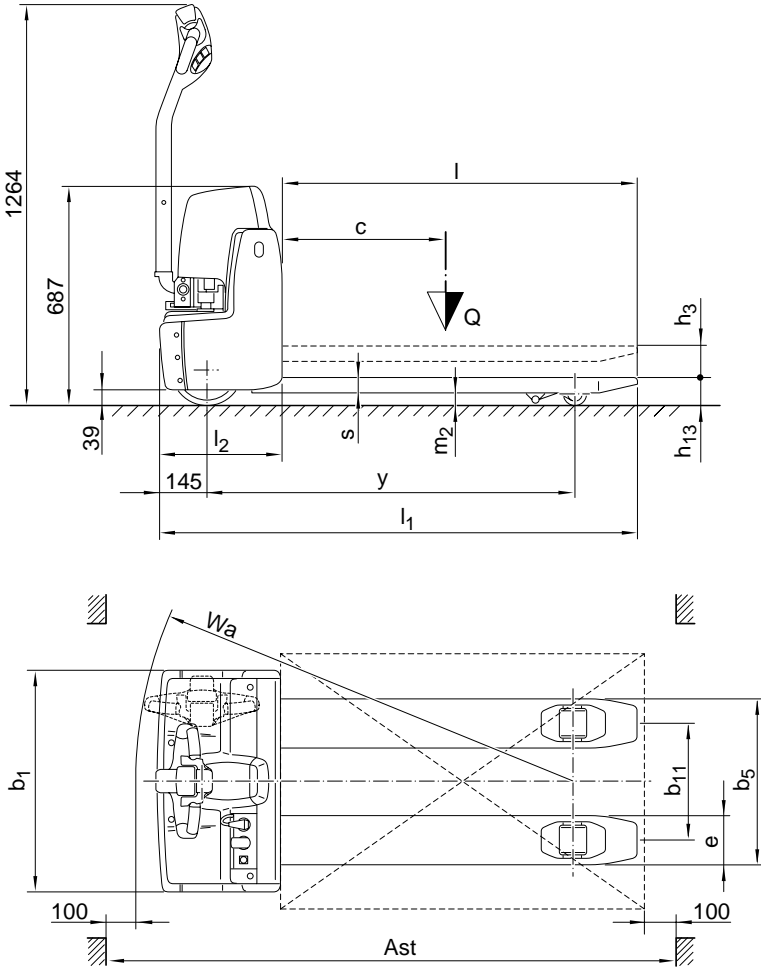
#### 3.2 Dimensions

	Designation	Standard EME	Broad version EME	
$h_3$	Lifting height	95 ±5	95 ±5	mm
$h_{13}$	Lowered height	82	82	mm
s	Thickness of fork	50	50	mm
y	Wheel base, load part lowered	1218	1218	mm
l	Fork length	1177	1177	mm
$l_1$	Truck length	1555	1555	mm
$l_2$	Front section length	378	378	mm
e	Fork width	150	150	mm
$b_1$	Truck width	700	700	mm
$b_5$	Distance between the forks, outside	520	650	mm
$b_{11}$	Track width of load section	370	500	mm
$m_2$	Ground clearance	32	32	mm
Wa	Turning radius	1425	1425	mm
Ast*	Aisle width 1000x1200 in transversal dir.	1640	1640	mm
Ast*	Aisle width 800x1200 in longitudinal dir.	1840	1840	mm

\* Ast includes a safety distance of 200 mm

#### 3.3 Batteries and motor output

	EME
Battery	2 x 12 V / 42 Ah in series
Motor output	0.3 kW



### 3.4 EN standards

Continuous sound level: 66 dB(A)

according to prEN 12053 as stipulated in ISO 4871



The continuous sound level is a value averaged according to standard regulations, taking the sound pressure level into account when driving, lifting and idling. The sound pressure level is measured at the ear.

Vibration: 0.30 m/s<sup>2</sup>

according to prEN 13059



The swinging acceleration acting on the body in its operating position is, according to standard regulations, the linear integrated, weighted acceleration in the vertical plane. It is determined by driving over bumps with a constant speed.

Electromagnetic compatibility (EMC)

The manufacturer confirms compliance with the limit values for electromagnetic emission and interference immunity as well as testing of static electricity discharge according to prEN 12895 and the references to other standards contained therein.



Electrical or electronic components and their arrangement may only be modified after written approval by the manufacturer has been obtained.

### 3.5 Conditions for application

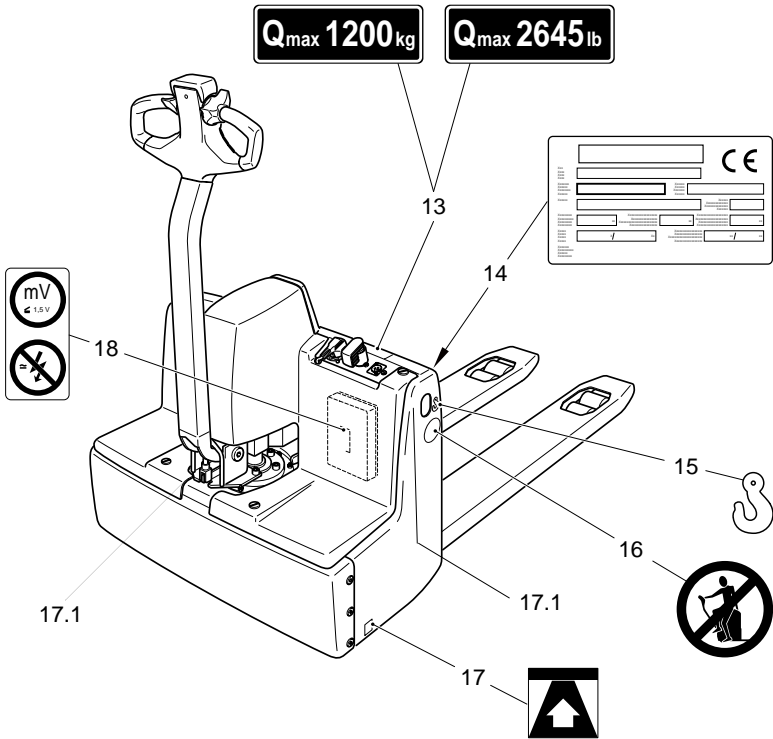
Ambient temperature

- during operation: 0 °C to 40 °C



Industrial trucks must be specially equipped and approved for continuous use in environments with temperatures below 5°C or in cold stores respectively with extreme temperatures or humidity changes.

4 Labels



Item	Designation
13	Load capacity $Q_{max}$
14	Truck identification plate
15	Eye for crane loading
16	Prohibitive sign "Do not ride on the truck"
17	Label "Application points for lifting jack"
17.1	Truck number (embossed)
18	Warning sign "Caution: electronics and low voltage"





# C Transportation and commissioning

## 1 Transportation by crane



Only use lifting gear of adequate capacity (loading weight = dead weight + battery weight; see truck identification plate).



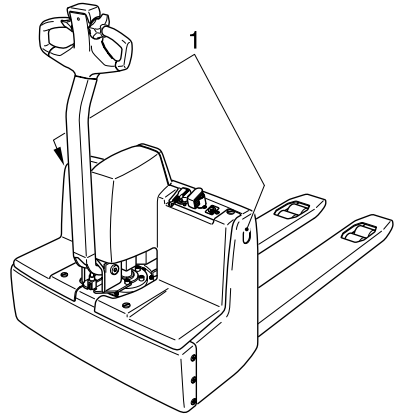
Lifting points (1) are provided for loading the truck by means of crane gear. The lifting points are covered by plastic covers that must be re-inserted after transport.

- Park the truck and render it safe (see chapter E).
- Attach the crane gear to the lifting eye (1).



The crane gear must be attached to the lifting eye in such a manner that it cannot slip!

The crane gear must be attached in such a manner that it does not touch any attachments during lifting.



## 2 Commissioning



The truck must only be operated on battery current! Cables connected to the battery (trailing cables) must be less than 6 m in length.

To prepare the truck for operation after delivery or transportation, the following operations must be performed:

- Check the equipment for completeness.
- If necessary, install the battery. Make sure that the battery cable is not damaged.
- Charge the battery (see chapter D).
- Put the truck into operation in the stipulated manner (see chapter E).



When the truck is parked, the surface of the tyres may flatten. The flattening will disappear after the truck has been operated for a short time.

### 3 Moving an incapacitated truck (emergency operation)

To move the truck by emergency operation, the electromagnetically applied brake must be released.

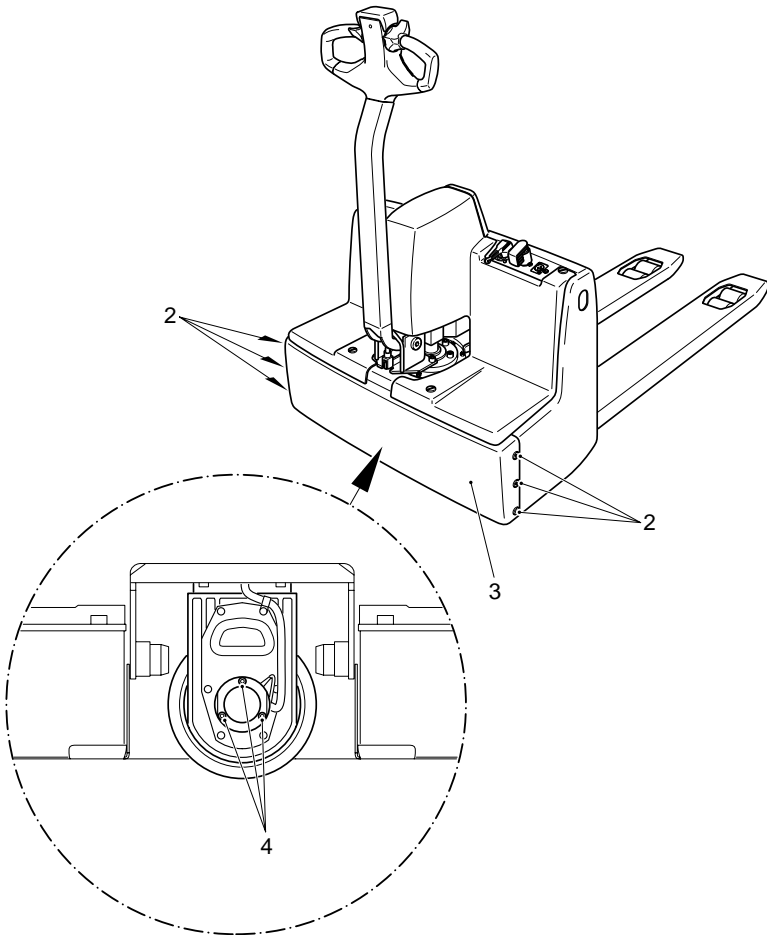
- Losen screws (2).
- Remove front wall (3).
- Losen fastening screws (4) until the truck can be moved (no braking action).

The truck can now be moved.



After setting down the truck at the destination, the fastening screws (4) must be re-tightened.

Braking action is restored!



# D Battery-Servicing, recharging, replacement

## 1 Safety regulations governing the handling of lead-acid batteries

The truck must be parked and rendered safe before any operations on batteries are undertaken (refer to chapter E).

**Servicing staff:** Recharging, servicing and replacing of batteries must only be performed by qualified personnel. The instructions contained in this operating manual, and the instructions of the manufacturer of the battery and of the battery recharging station, must be observed when performing the above operations.

**Fire protection measures:** Smoking and naked flames are not permitted when handling batteries. No inflammable substances or spark-generating materials must be present or stored within a distance of 2 meters of the truck parked for battery recharging. The location must be well ventilated and fire fighting equipment must be kept ready.

**Servicing of batteries:** The battery cell screw caps must be kept dry and clean. Terminals and cable shoes must be clean, lightly greased with pole grease and must be securely tightened. Batteries with bare terminal posts must be covered using a non-skid insulating mat.

**Disposal of the battery:** Batteries must only be disposed of as stipulated in the national environmental protection regulations or waste disposal provisions. The manufacturer's specifications for the disposal must be heeded.



Before closing the battery hood, make sure that the battery cable cannot be damaged.



Batteries contain dissolved acid which is toxic and caustic. For this reason, protective clothing and goggles must be worn whenever work is undertaken on batteries. Avoid physical contact with battery acid.

If clothing, skin or eyes accidentally come into contact with battery acid, liberally flush the affected parts with clean water. Consult a doctor when skin or eyes come into contact with battery acid. Spilled battery acid must be immediately neutralized.



Only batteries with closed tray may be used.



Battery weight and dimensions have considerable influence on operational safety of the truck. Changing the battery equipment is not permitted without prior approval by the manufacturer.

## 2 Battery types



The truck is equipped with maintenance-free battery types (refer to chapter B). These batteries must NOT be refilled with distilled water. The covers of the cells are tightly closed. Opening the covers will destroy the battery!

The battery weight is given on the battery identification plate.

### 3 Charging the battery using the integrated charger

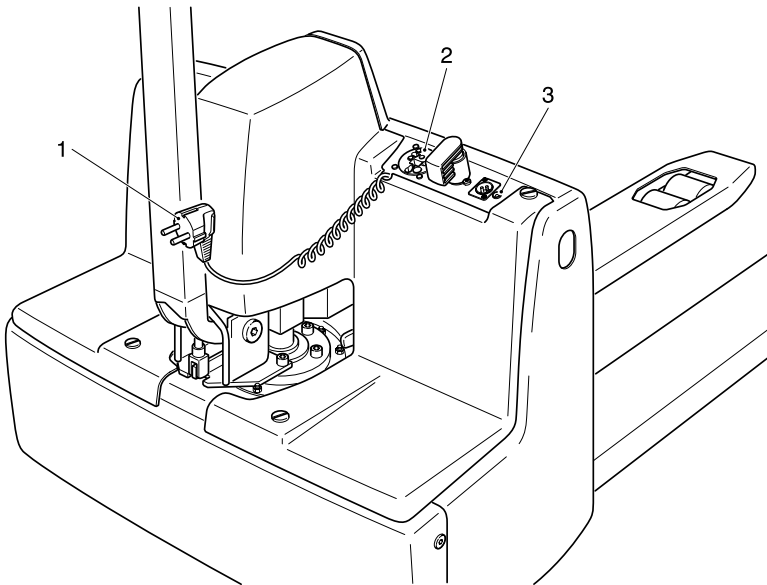
#### 3.1 Charging the battery with 230 VAC

The mains cable of the charger is accessible from outside.

- Pull the mains plug (1) out of the receptacle (2) on the charger and plug it into a suitable electric outlet (230 V  $\pm$ 10%). A green flash-light of the LED (3) indicates that the battery charger is connected to the mains and the battery is being charged.
- Charge the battery until LED (3) is steady on (green).
- Pull the plug (1) out of the electric outlet and insert it into the receptacle on the truck (2).



During charging, all electrical functions are disconnected (electronic drive inhibit). In this state, the truck cannot be operated.



#### Trickle charging

If LED (3) is steadily green, the battery has been completely charged. The charger switches to trickle charging. Trickle charging continues until the mains plug is pulled out of the electric outlet.



In order to enable a long battery life it is recommended to perform equalising charging regularly every one to two weeks. The charger must be connected to mains for at least 41 hours.

#### Mains supply

Mains voltage: 230 V  $\pm$ 10%

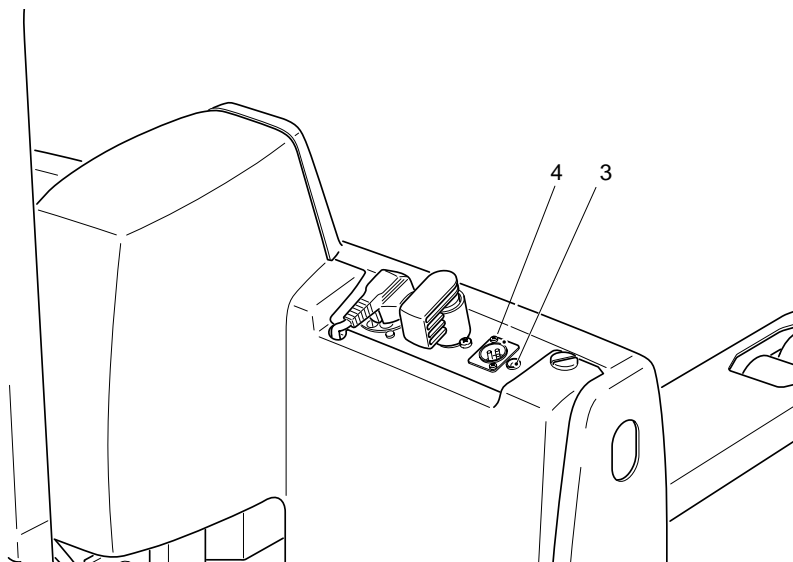
Mains frequency: 50 Hz  $\pm$ 4%

### 3.2 Charging battery with 24 VDC (lorry)

- Connect the charger cable (○) with the 24 VDC connection (4). A green flash-light of the LED (3) indicates that the battery charger is connected to the mains and the battery is being charged.
- Charge the battery until LED (3) is steady on (green).
- Disconnect the 24 VDC connection.



During charging, all electrical functions are disconnected (electronic drive inhibit). In this state, the truck cannot be operated.



#### Charging times

Depending on the state of discharge, charging the battery can take up to 6 h.

#### Partial charging

The charger is designed in such a manner that it automatically adapts itself when charging partially charged batteries. This keeps battery wearing down.



Red flashing of LED (3) means that the battery is defective or the charging circuit has been interrupted. When operating the charger via the truck supply system the battery cannot always be fully charged. Recharge (from mains) at least once per week.



If the equalising charge on the truck is performed via mains connection (115 V / 230 V) the mains connection must be equipped with an FI safety switch!

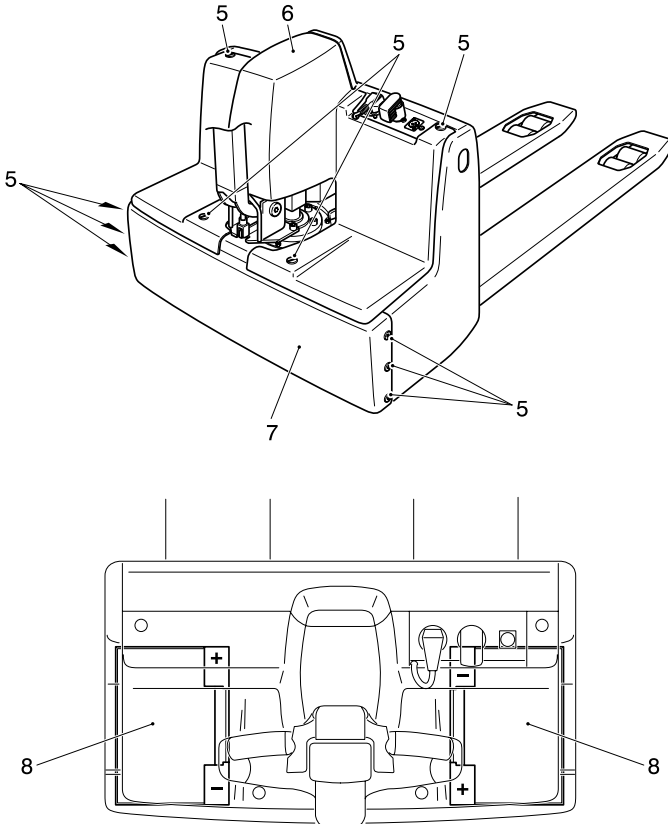
#### 4 Replacing the batteries

- Loosen screws (5), remove front hood (6) and front wall (7).
- Loosen the terminal screws and remove the battery cables from the terminals.



Place the battery cables in such a manner that they do not get caught on the truck when the battery is pulled out.

- Lift out battery at the handles (8).



Installation is in the reverse order. When installing the battery, make sure that it is in the correct position and that the batteries are correctly connected:

- red cable: + terminal of the 1st battery
- blue cable: - terminal of the 2nd cable
- After the battery has been reinstalled, check all cable connections and plugged connections for visible damage.

## 5 Discharge LED (discharge indicator)

The LED shows the charging condition of the battery.

State	Colour	Indication
on	green	Battery charge > 30%
flashing	green	Battery charge 30 - 20%
flashing	red	Battery charge < 20%



In case of light applications (load < 300 kg), the battery must already be charged if the green LED flashes.

When the LED is flashing red, the battery must be charged.

Further operation will damage the battery.

The battery will be drained, so that the voltage will fall below the minimum permissible value.



When reaching the residual capacity of 20% (red LED flashes), lifting is interrupted.





# E Operation

## 1 Safety regulations governing the operation of the fork lift truck

**Driving permission:** The fork lift truck must only be operated by persons who have been trained in the operation of trucks, who have demonstrated to the user or his representative their capability of moving and handling loads, and who have expressly been charged by the user or his representative with the operation of the truck.

**Rights, duties and conduct of the driver:** The driver must be: informed of his rights and duties; trained in the operation of the fork lift truck; and familiar with the contents of these operating instructions. All necessary rights must be granted to him. If the fork lift truck can be used in the pedestrian-controlled mode, the driver must wear safety boots when operating the truck.

**Prohibition of unauthorised use:** The driver is responsible for the fork lift truck during working time. He must forbid unauthorised persons to drive or operate the fork lift truck. The transport or lifting of persons is forbidden.

**Damage and defects:** Damage or defects noted on the fork lift truck or on the attachments must immediately be brought to the notice of the person in charge. Fork lift trucks that cannot be safely operated (e.g. due to worn tyres or defective brakes) must not be used until they have been properly repaired.

**Repairs:** Without specific training and express authorisation, the driver is not allowed to perform any repairs or modifications on the fork lift truck. Under no circumstances must the driver change the setting of switches or safety installations or render them ineffective.

**Danger area:** A "danger area" is considered to be the area within which persons are endangered by the travelling or lifting movements of the fork lift truck or its load lifting devices (e.g. fork or attachments), or by the loads being transported. This also includes the area within reach of falling loads or falling / lowering truck attachments.



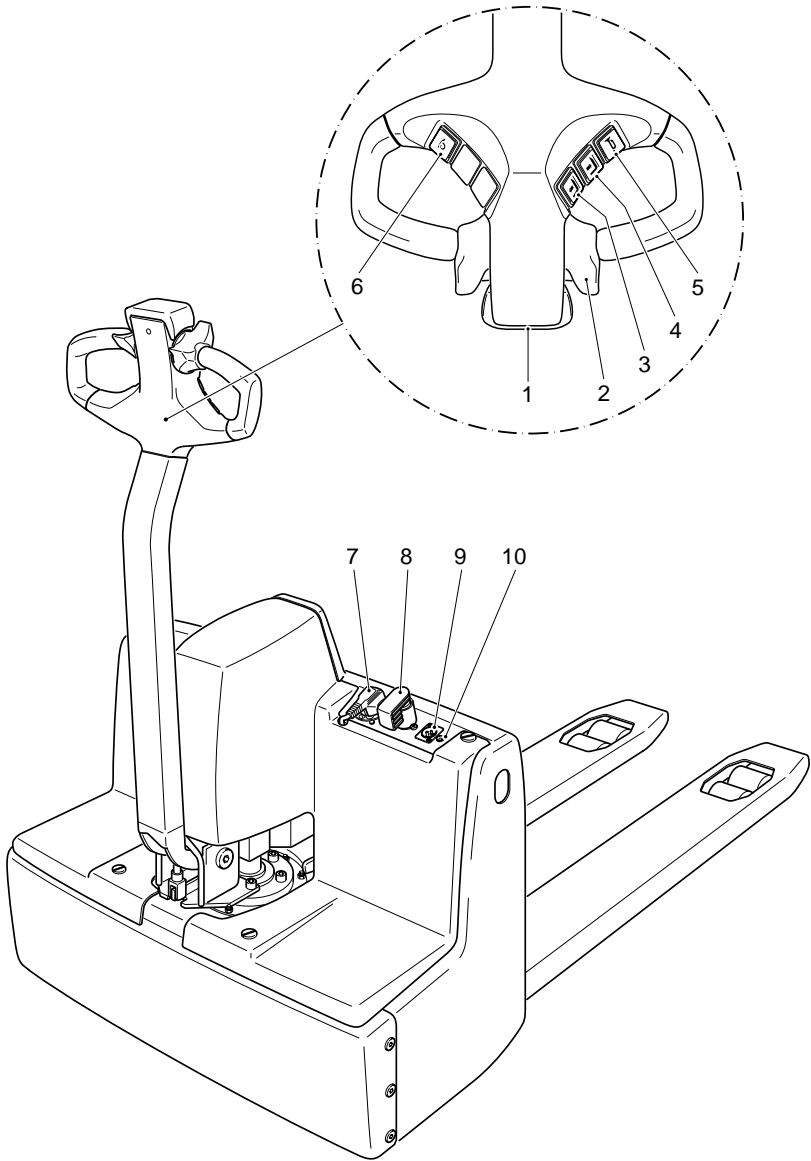
Unauthorised persons must be asked to leave the danger area. The driver must give a warning signal whenever a situation presenting danger to persons might develop. The fork lift truck must immediately be brought to a standstill if persons, although asked, do not leave the danger area.

**Safety devices and warning labels:** The safety devices, warning labels and warning notes described in the present operating instructions must always be heeded.

## 2 Description of the operating controls and indicators

Item	Control or indicator		Function
1	Collision protection button	●	The truck moves away from the operator.
2	Controller	●	Controls the direction and speed of travel.
3	Button "Lift load lifting device"	●	For lifting the load lifting device.
4	Button "Lower load lifting device"	●	For lowering the load lifting device.
5	Button "Horn"	●	Triggers an acoustic signal.
6	Button - Manoeuvring	●	If the control shaft is in the upper braking range, the braking action can be overridden by a button and the truck can be moved with decreased speed (manoeuvring).
7	Integrated charger (incl. safety cut-out)	●	The battery is charged when the mains plug is plugged into an electric outlet.
8	Key swith with integrated emergency-off button	●	For switching the control current on and off. Removing the key prevents the truck from being switched on by unauthorised persons.
9	Charging connection for 24 V lorry charging cable (○)	○	Charging battery by plugging in the 24 V lorry charging cable.
10	Discahrge control LED (discharge indicator)	●	Shows the charging condition of the battery (refer to chapter D).

● = Standard equipment	○ = Optional equipment
------------------------	------------------------



### 3 Starting up the truck



The driver must make sure that nobody is within the danger area of the truck before the truck is switched on or operated or before a load is lifted.

#### Checks and operations to be performed before starting daily work

- Check the entire truck (especially the wheels and the load lifting device) for damage.

#### Switching on the truck

- Check whether the charging plug (7) is connected.
- Insert key element into key switch (8), press and turn clockwise to the limit and then pull it up.

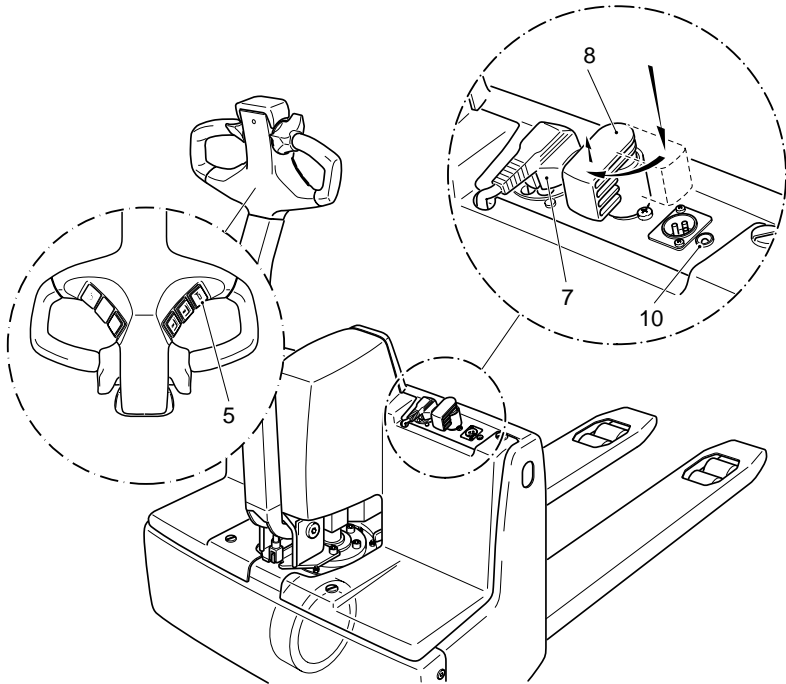


The discharge control LED (discharge indicator) (10) shows the present battery capacity.

- Check the “Horn” button (5) for proper functioning by pressing it.

The truck is now ready for operation.

- Check the braking function of the control shaft (see section 4.2).



## 4 Operation of the fork lift truck

### 4.1 Safety regulations applicable when operating the truck

**Driving lanes and work areas:** Only such lanes and routes that are specially allocated for truck traffic must be used. Unauthorized persons must stay away from work areas. Loads must only be stored at places specially provided for this purpose.

**Driving conduct:** The travelling speed must be adapted to the prevailing local conditions. The truck must be driven at slow speed when negotiating bends or narrow passages, when passing through swing doors and at blind spots. The driver must always observe an adequate braking distance between the fork lift truck and the vehicle in front and he must be in control of his truck at all times. Sudden stopping (except in emergencies), rapid U-turns and overtaking at dangerous or blind spots is not permitted. It is forbidden to lean out of or reach beyond the working and operating area.

**Visibility:** The driver must look in the direction of travel and must always have a clear view of the route ahead. When loads blocking the view are carried, the fork lift truck must be driven with the load at the rear. If this is not possible, a second person must walk in front of the fork lift truck to give suitable warnings.

**Negotiating slopes and inclines:** Negotiating of slopes and inclines is permitted only when they are recognised lanes, when they are clean and non-slipping, and when the technical specification of the truck permits safe driving on such slopes or inclines. Loads must always be carried at that end of the truck facing uphill. U-turns, cutting obliquely over slopes or inclines and parking of the fork lift truck on slopes or inclines is not permitted. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment.

**Use of lifts and driving on loading platforms:** Lifts and loading platforms must only be used if they are of adequate load bearing capacity, if suitable for driving on, and if authorised by the user of the truck for truck traffic. The fork lift truck driver has to satisfy himself accordingly before driving into lifts or on to loading platforms. The truck must enter lifts with the load in front and must take up a position which does not allow it to come into contact with the walls of the lift shaft. Persons riding in the lift together with the fork lift truck must only enter the lift after the fork lift truck has come safely to a standstill, and must leave the lift before the fork lift truck.

**Nature of the loads carried:** Only loads that have been safely and correctly secured must be carried. Never transport loads stacked higher than the top of the fork carriage, or stacked higher than the guard grille.

**Towing trailers:** The maximum trailer load given for the fork lift truck for braked and/or unbraked trailers must not be exceeded. The trailer load must be properly secured and must not exceed the dimensions permitted for the driving routes. After attaching the trailer but before starting driving, the driver must check that the trailer attachment is secured against detachment. Towing fork lift trucks must be operated in such a manner that safe driving and braking of the truck and the trailer is guaranteed for all driving movements.

## 4.2 Driving, steering, braking



It is not admissible to stay on the vehicle during driving.

### Emergency stop

- Push the emergency-off button (8).

All of the electrical functions are switched off.

### Automatic braking

Releasing the control shaft causes automatic braking - the control shaft automatically moves into the upper braking range (B).



If the control shaft moves to the braking position more slowly than normal, the cause must be determined and eliminated. If necessary, the gas pressure spring must be replaced.

### Driving

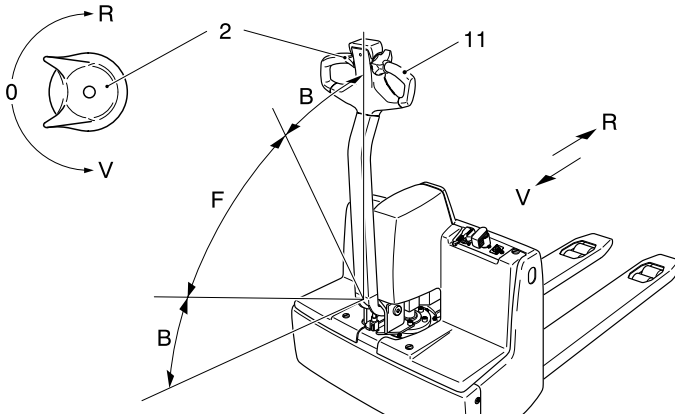


Only drive with the hoods closed and properly locked.

- Start up the truck (see section 3).

The travelling speed can be controlled using the controller (2).

- Tilt the control shaft (11) into the driving range (F) and set the controller (2) to the desired direction (V or R).



### Steering

- Swivel the control shaft (11) to the left or the right.



In narrow bends, the control shaft protrudes beyond the truck contour!

## Manoeuvring



When using button “manoeuvring” (6) the driver must be especially careful.

The truck can be driven with the control shaft in vertical position (e.g. in narrow locations / elevators):

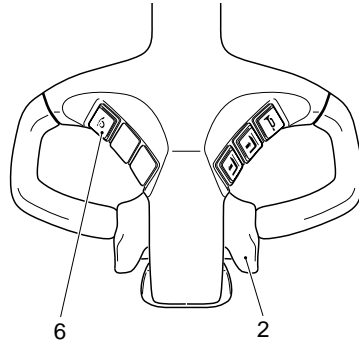
- Push the “manoeuvring” button (6).
- Move the drive control (2) into the desired driving direction (F or R).

The service brake is released. The truck drives slowly.



When releasing the controller (2) the solenoid brake engages.

In case of danger decelerate the truck by immediate release of the controller (2) or pushbutton (6) “Manoeuvring”.



## Braking



The braking behaviour of the truck strongly depends on the state of the floor. This must be taken into account by the driver for his driving behaviour.

The truck can be braked in three ways:

- by using the generator brake (controller (2))
- by counter-current braking (controller (2))
- by using the service brake (control shaft (11))

### Braking using the generator brake:

- Release the controller (2).

### Counter-current braking:

- While driving, switch the controller (2) to the opposite direction.
- The truck is decelerated by counter-current braking until it starts moving in the opposite direction.



In case of emergency, the service brake must be used to brake the truck.

### Braking using the service brake:

- Tilt the control shaft (11) upwards or downwards into one of the braking ranges (B).



## Accelerating on slopes



The load must face uphill!

The slope to be negotiated must not exceed 10 m in length:

- without load: 15%
- load of 600 kg: 6%
- load of 1200 kg: 3,5%



The truck must not be driven on slopes exceeding the specified values. Successive slopes may only be negotiated after longer breaks.

### 4.3 Picking up and setting down loads



Before picking up a load, the driver must make sure that the load rests properly on its pallet and that it does not exceed the maximum load capacity of the truck. Picking up long loads crosswise is not permitted.

- Move the truck so that the load lifting device passes completely below the load.



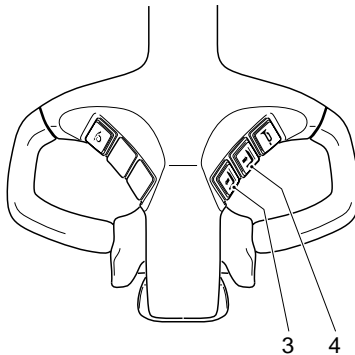
The lifting and lowering speeds are preset.

#### Lifting

- Press the “Lift load lifting device” button (3) until the required lifting height has been reached.

#### Lowering

- Press the “Lower load lifting device” button (4).

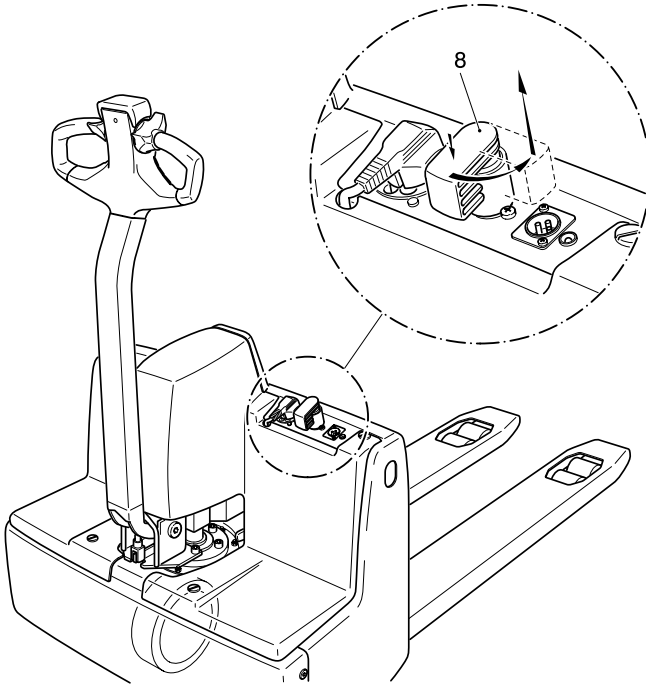


#### 4.4 Parking the truck and rendering it safe



Always render the truck safe when parking it.  
Do not park the truck on slopes.  
The load lifting device must always be completely lowered.

- Lower the load lifting device.
- Set the key element (8) to vertical position and remove the key.





# F Maintenance of the fork-lift truck

## 1 Operational safety and environmental protection

The checks and servicing operations contained in this chapter must be performed in accordance with the intervals as indicated in the servicing checklists.



Modifications of fork-lift truck assemblies, especially of the safety installations, are not permitted. On no account must the operational speeds of the truck be changed.



Only original spare parts have been certified by our quality assurance service. To ensure safe and reliable operation of the fork-lift truck, only spare parts of the manufacturer must be used. Used parts, oils and fuels must be disposed of in accordance with the applicable environmental protection regulations. For oil changes, the oil service of the manufacturer is available to you.

Upon completion of any checking and servicing activities, the operations contained in the section "Recommissioning" must be performed (see section 4.4).

## 2 Safety regulations applicable to truck maintenance

**Servicing and maintenance personnel:** The fork-lift truck must only be serviced and maintained by trained personnel of the manufacturer. The service organization of the manufacturer has external technicians trained especially for these assignments. We thus recommend signing a maintenance contract with the relevant service location of the manufacturer.

**Lifting and jacking up:** When a fork-lift truck is to be lifted, the lifting gear must only be secured to the points specially provided for this purpose. When the truck is to be jacked up, suitable measures must be taken to prevent the truck from slipping or tipping over (use of wedges, wooden blocks). Work underneath the raised load lifting device must only be carried out when the fork is immobilised and supported by a chain of adequate strength.

**Cleaning operations:** No inflammable liquids must be used when cleaning the fork-lift truck. Prior to commencing cleaning operations, all safety measures that are required to prevent sparking (e.g. by short-circuits) have to be taken. For battery-operated fork-lift trucks, the battery plug must be removed. Only weak indraft, weak compressed air and non-conducting, antistatic brushes must be used for the cleaning of electric or electronic assemblies.



If the fork-lift truck is to be cleaned using a water jet or a high-pressure cleaner, all electric and electronic components must be carefully covered beforehand because moisture can lead to incorrect functioning. Cleaning by means of a steam jet is not permitted.

Upon completion of cleaning work, the operations detailed in the section "Recommissioning" must be performed.

**Work on the electric system:** Work on the electric system of the truck must only be performed by personnel specially trained for such operations. Before commencing any work on the electric system, all measures required to prevent electric shocks have to be taken. For battery-operated fork-lift trucks, the truck must also be depowered by removing the battery plug.

**Welding operations:** To prevent any damage to electric or electronic components, these have to be removed from the fork-lift truck before any welding operations are undertaken.

**Settings:** When repairing or replacing hydraulic, electric or electronic components or assemblies, all truck-specific settings have to be retained.

**Tyres:** The quality of the tyres greatly affects the stability and the driving behaviour of the fork-lift truck. The factory-mounted tyres must only be replaced by original spare parts of the manufacturer, since otherwise the specification of the data sheet cannot be met. When replacing wheels or tyres, it must be ensured that the fork-lift truck remains level (tyres and wheels must always be replaced in pairs, i.e. left and right together).

**Hydraulic hoses:** The hoses must be renewed every six years. When replacing hydraulic components, also renew the hoses in this hydraulic system.

### 3 Maintenance checklist



To ensure safe operation and a long service life of the truck, the activities listed in the maintenance checklist must be carried out **every 6 months**.

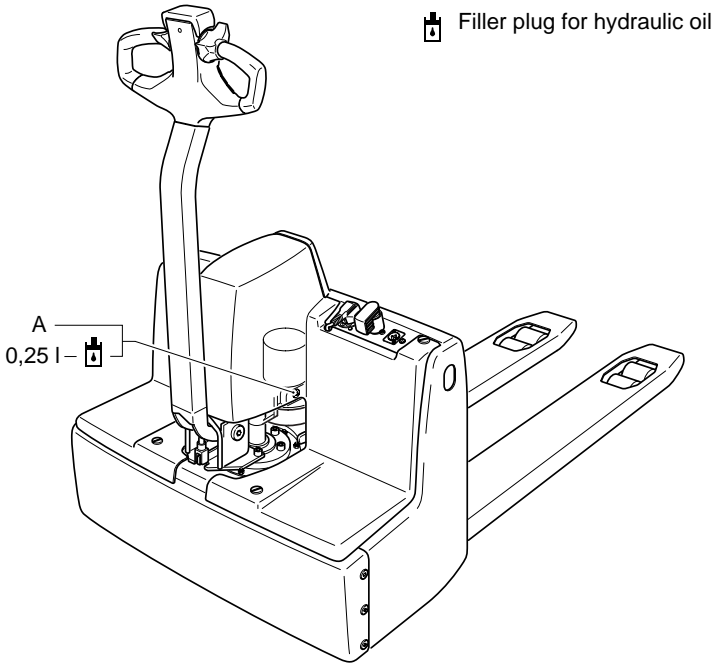
Chassis / superstructure:	Check all load bearing elements for damage
	Check all bolted connections
Drive unit:	Check the transmission for noises and leakage
Wheels:	Check for wear and damage
	Check the wheel bearings and ensure secure fastening of wheels
	Check that the wheel bolts are firmly seated; tighten if necessary
Steering / brake system:	Check the steering bearing play
	Performance and adjustment check
	Check the braking function of the gas pressure spring; check the gas pressure spring for leakage and damage
Lifting device:	Check for proper functioning and wear
	Check load section and kinematics for wear and damage
Hydraulic system:	Performance check
	Check hydraulic unit for tightness and damage
	Check the oil level
Electrical system:	Performance check
	Check cable for tight seating of connections and for damage
	Check the fuses for correct amperage
	Check the warning systems and safety circuits for correct functioning
Electric motors:	Check motor for secure attachment
Batteries:	Check the terminals for secure attachment and apply grease
	Check the battery cables for damage; renew if necessary



W1 service intervals are to be performed by the customer.

In the run-in period - after approx. 100 service hours - or after repair work, the owner must check the wheel nuts/bolts and re-tighten if necessary.

## 4 Hydraulic oil level



## 5 Fuels, coolants and lubricants

**Handling consumption-type material:** Consumption-type material must always be handled properly. Manufacturer's instructions are to be observed.



Improper handling is injurious to health, life and environment. Consumption-type materials must be stored in adequate containers. They might be inflammable and, therefore, must not come into contact with hot components or open fire.

When filling in consumption-type materials, use clean containers only. Mixing consumption-type materials of different grades or qualities is prohibited, except if mixing is expressly prescribed in these operating instructions.

Avoid spilling. Spilt liquid must be removed immediately using a suitable binding agent and the mixture of consumption-type material and binding agent is to be disposed of according to the regulations.

Code	Designation	Used for
A	H-LP 46, DIN 51524	Hydraulic system

## 6 Notes regarding maintenance

### 6.1 Preparing the truck for maintenance work

All required safety measures must be taken to prevent any accidents in the course of the servicing and maintenance operations. The following preparatory operations must be performed:

- Park the truck and render it safe (see chapter E).
- Push the emergency-off button (1).

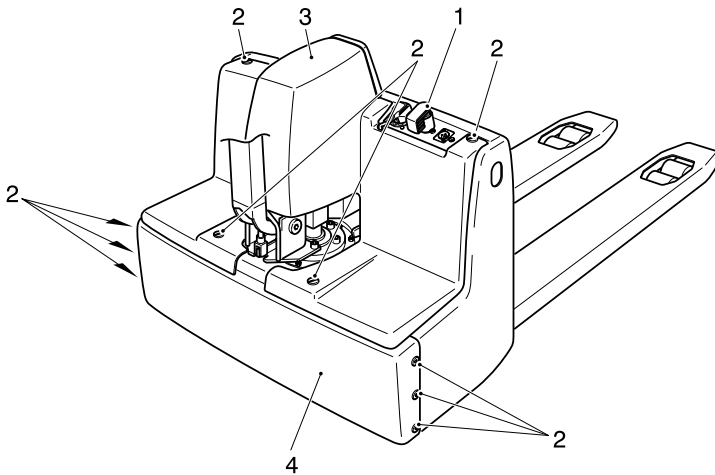


When work has to be performed under the raised fork or under the jacked up truck, suitable measures must be taken to prevent any dropping, tilting or slipping of the fork or truck. When lifting the truck, the instructions contained in chapter "Transportation and commissioning" have to be observed.

When performing work on the parking brake, the truck must be secured against moving.

### 6.2 Removing front hood and front wall

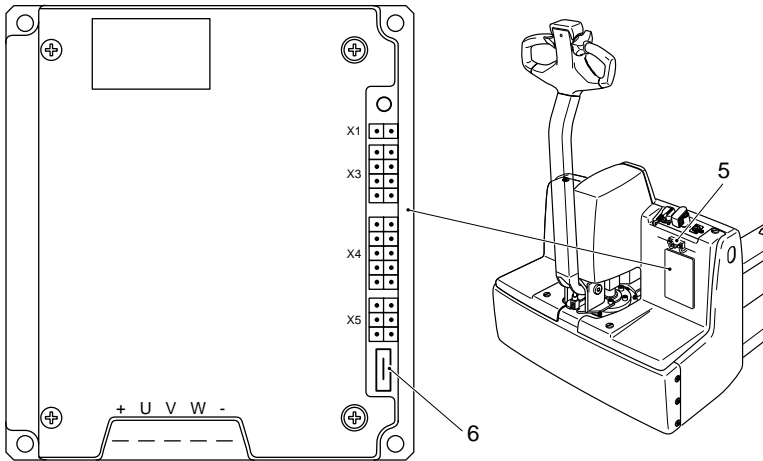
- Losen the fastening screws (2).
- Carefully remove front hood (3) and front wall (4).





### 6.3 Checking the electric fuses

- Prepare the truck for maintenance work (see section 4.1).
- Remove the front hood (see section 4.2).
- Check all fuses for the correct rating and, if necessary, replace.



Item	Designation	Type of fuse:	EME
5	F1	Power fuse	63 A
6	F2	Control fuse	5 A

### 6.4 Recommissioning the truck

Recommissioning of the truck following the performance of cleaning or maintenance work is permitted only after the following operations have been performed:

- Check the brake for correct functioning.
- Check the horn for proper functioning.

## 7 Decommissioning the fork-lift truck

If the fork-lift truck is to be decommissioned for more than 6 months, it must be parked in a frost-free and dry location and all measures to be taken before, during and following decommissioning must be performed as detailed below.



During decommissioning, the fork-lift truck must be jacked up, ensuring that the wheels are clear of the ground. Only this measure will ensure that wheels and wheel bearings do not suffer damage.

- Recharge the battery (refer to chapter D).
- Disconnect and clean the battery. Apply pole grease to the battery poles.



In addition to this, all instructions given by the battery supplier must be observed.

- Spray all exposed electrical contacts with a suitable contact spray.

### 7.1 Measures to be taken during decommissioning

#### Every 6 months:

- Recharge the battery (refer to chapter D).



Battery-operated fork lift trucks:

Regular recharging of the battery is very important; otherwise, exhaustive depletion of the battery caused by self-discharging would occur. Owing to sulfatisation, this will result in the destruction of the battery.



When continuously trickle-charging, it is not necessary to charge the battery every 6 months as a protection against draining.

## 7.2 Recommissioning the truck

- Thoroughly clean the fork-lift truck.
- Clean the battery. Grease the pole screws using pole grease and reconnect the battery.
- Recharge the battery (refer to chapter D).
- Check if the hydraulic oil contains condensed water and change if required.
- Start up the fork-lift truck (refer to chapter E).



Perform several brake tests immediately after recommissioning the truck.

## 8 Safety checks to be performed at regular intervals and following any unusual incidents



Carry out a safety check in accordance with national regulations. Jungheinrich recommends checks in accordance with FEM Guideline 4.004. Jungheinrich has a special safety department with trained personnel to carry out such checks.

The truck must be inspected at least annually (refer to national regulations) or after any unusual event by a qualified inspector. The inspector shall assess the condition of the truck from purely a safety viewpoint, without regard to operational or economic circumstances. The inspector shall be sufficiently instructed and experienced to be able to assess the condition of the truck and the effectiveness of the safety mechanisms based on the technical regulations and principles governing the inspection of forklift trucks.

A thorough test of the truck must be undertaken with regard to its technical condition from a safety aspect. The truck must also be examined for damage caused by possible improper use. A test report shall be provided. The test results must be kept for at least the next 2 inspections.

The owner is responsible for ensuring that faults are immediately rectified.



A test plate is attached to the truck as proof that it has passed the safety inspection. This plate indicates the due date for the next inspection.

## 9 Final de-commissioning, disposal



Final, proper decommissioning or disposal of the truck must be performed in accordance with the regulations of the country of application. In particular, regulations governing the disposal of batteries, fuels and electronic and electrical systems must be observed.

## 10 Fault localisation and identification

### 10.1 Fault localisation

Fault	Possible cause	Remedial action
Truck does not move	<ul style="list-style-type: none"><li>– Battery is still being charged</li><li>– Key switch in vertical position</li><li>– Battery charge to low</li><li>– Fuses defective</li></ul>	<ul style="list-style-type: none"><li>– Disconnect 230 V or 24 V connection</li><li>– Push key and turn clockwise to the limit and then pull out</li><li>– Check battery charge and charge battery, if necessary</li><li>– Check fuses F1 and F2</li></ul>
Load cannot be lifted	<ul style="list-style-type: none"><li>– Truck is not operational</li><li>– Fuse defective</li><li>– Button “Lift load lifting device” defective</li></ul>	<ul style="list-style-type: none"><li>– Perform all remedial actions listed under “Truck does not move”</li><li>– Check fuse F1</li><li>– Check the button for correct functioning according to the operating diagram</li></ul>
Load cannot be lowered	<ul style="list-style-type: none"><li>– Button “Lower load lifting device” defective</li><li>– Solenoid valve defective</li><li>– Fuse defective</li></ul>	<ul style="list-style-type: none"><li>– Check the button for correct functioning according to the operating diagram</li><li>– Check the solenoid valve for correct functioning according to the operating diagram</li><li>– Check fuse F1</li></ul>



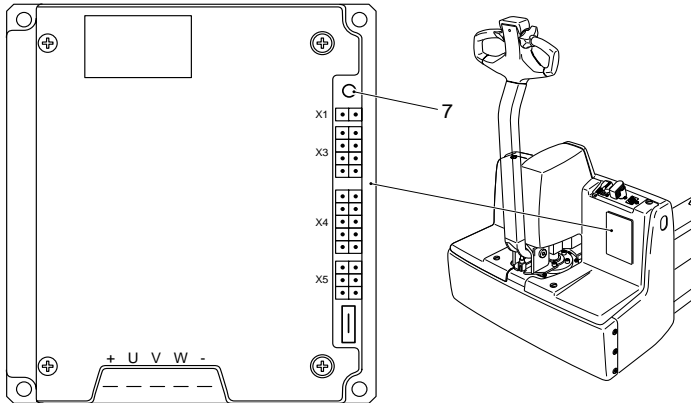
If the fault cannot be eliminated, decommission the truck and inform the service department.

## 10.2 Fault identification (flash codes emitted by the LED on the control board)

The control board is fitted with an LED (7) for fault identification purposes. The type of fault can be identified by the flash signal.



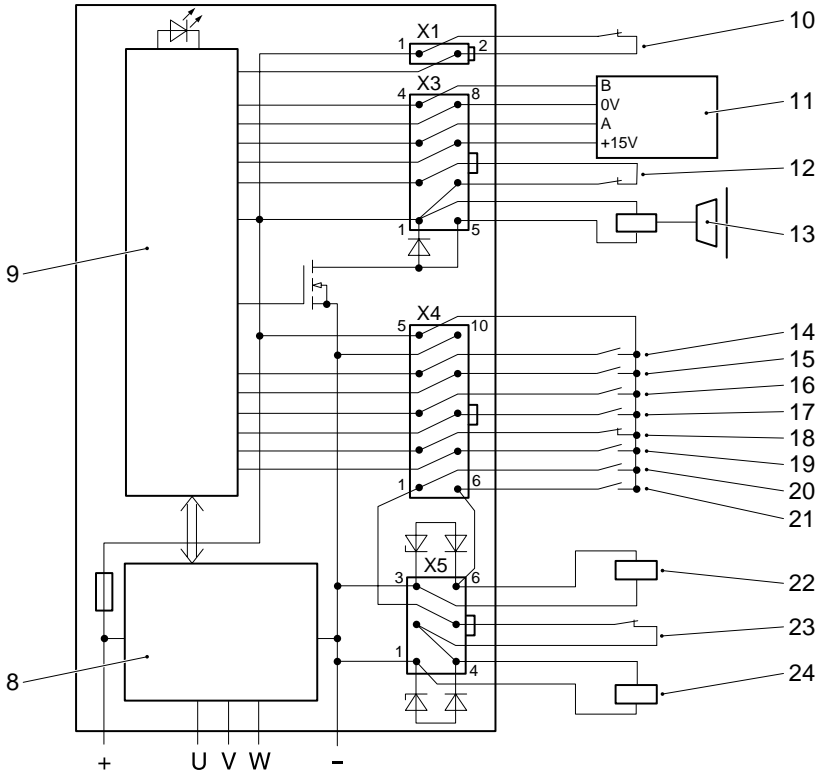
The faults described below must only be eliminated by trained personnel or after-sales service technicians.



The flash or light codes have the following meaning:

Flash code	Possible cause	Fault elimination
1x	– Control fault – RAM fault	– Replace control
2x	– Drive overloaded – Power section defective	– Remove overload condition – Replace control
3x	– Overtemperature in power section	– Switch off truck and let cool down
4x	– Battery voltage low	– Charge battery
5x	Overvoltage – Control error  – Battery defective – Faulty connection – Power section defective	– Switch off truck and switch on again after approx. 5 seconds. – Check connections and replace, if necessary – Replace control
6x	– Control signals for rotational direction or speed are issued in wrong sequence / combination	– Check drive switch and associated connecting cable and replace, if necessary
7x	– Motor connection faulty	– Check motor connections and replace, if necessary
8x	– Brake defective	– Repair brake, replace, if necessary
12x	– Monitoring of the collision protection switch (ground identification switch actuated upon start or defective)	– Let go collision protection switch – Replace collision protection switch

### 10.3 Circuit diagram



#### Legend for the circuit diagram

8	Power stage	17	Backward
9	Control	18	Belly switch
10	Move protection	19	Manoeuvring
11	Sensor bearing	20	Lifting
12	Control shaft switch	21	Lowering
13	Retaining brake	22	Lowering valve
14	Setpoint 1	23	Lift limit switch
15	Setpoint 2	24	Hydraulic motor contactor
16	Forward		



# Instructions for use

## Jungheinrich traction battery

### Table of contents

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# 1 Jungheinrich traction battery

with positive tubular plates type EPzS and EPzB

## Rating Data

1. Nominal capacity C5:	See type plate
2. Nominal voltage:	2,0 V x No of cells
3. Discharge current::	C5/5h
4. Nominal S.G. of electrolyte*	
Type EPzS:	1,29 kg/l
Type EPzB:	1,29 kg/l
5. Rated temperature:	30° C
6. Nominal electrolyte level:	up to electrolyte level mark „max.“

\* Will be reached within the first 10 cycles.



- Pay attention to the operation instruction and fix them close to the battery!
- Work on batteries to be carried out by skilled personnel only!



- Use protective glasses and clothes when working on batteries!
- Pay attention to the accident prevention rules as well as DIN EN 50272-3, DIN 50110-1!



- No smoking!
- Do not expose batteries to naked flames, glowing embers or sparks, as it may cause the battery to explode!



- Acid splashes in the eyes or on the skin must be washed with water. In case of accident consult a doctor immediately!
- Clothing contaminated by acid should be washed in water.



- Risk of explosion and fire, avoid short circuits!



- Electrolyte is highly corrosive!



- Batteries and cells are heavy!
- Ensure secure installation! Use only suitable handling equipment e.g. lifting gear in accordance with VDI 3616.



- Dangerous electrical voltage!
- Caution! Metal parts of the battery are always live. Do not place tools or other metal objects on the battery!

Ignoring the operation instructions, repair with non-original parts or using additives for the electrolyte will render the warranty void.

For batteries in classes Ⓔ I and Ⓔ II the instructions for maintaining the appropriate protection class during operation must be complied with (see relevant certificate).

**1. Commissioning filled and charged batteries. For commissioning of unfilled batteries see separate instructions!**

The battery should be inspected to ensure it is in perfect physical condition.

The charger cables must be connected to ensure a good contact, taking care that the polarity is correct. Otherwise battery, vehicle or charger could be damaged.

The specified torque loading for the polscrews of the charger cables and connectors are:

	steel
M 10	23 ± 1 Nm

The level of the electrolyte must be checked. If it is below the antisurge baffle or the top of the separator it must first be topped up to this height with purified water.

The battery is then charged as in item 2.2.

The electrolyte should be topped up to the specified level with purified water.

**2. Operation**

DIN EN 50272-3 «Traction batteries for industrial trucks» is the standard which applies to the operation traction batteries in industrial trucks.

**2.1 Discharging**

Be sure that all breather holes are not sealed or covered.

Electrical connections (e.g. plugs) must only be made or broken in the open circuit condition.

To achieve the optimum life for the battery, operating discharges of more than 80% of the rated capacity should be avoided (deep discharge).

This corresponds to an electrolyte specific gravity of 1.13 kg/l at the end of the discharge. Discharged batteries must be recharged immediately and must not be left discharged. This also applies to partially discharged batteries.

**2.2 Charging**

Only direct current must be used for charging. All charging procedures in accordance with DIN 41773 and DIN 41774 are permitted. Only connect the battery assigned to a charger, suitable for the size of battery, in order to avoid overloading of the electric cables and contacts, unacceptable gassing and the escape of electrolyte from the cells.

In the gassing stage the current limits given in DIN EN 50272-3 must not be exceeded. If the charger was not purchased together with the battery it is best to have its suitability checked by the manufacturers service department. When charging, proper provision must be made for venting of the charging gases.

Battery container lids and the covers of battery compartments must be opened or removed. The vent plugs should stay on the cells and remain closed.

With the charger switched off connect up the battery, ensuring that the polarity is correct. (positive to positive, negative to negative). Now switch on the charger. When charging the temperature of the electrolyte rises by about 10°C, so charging should only begin if the electrolyte temperature is below 45°C. The electrolyte temperature of batteries should be at least +10°C before charging otherwise a full charge will not be achieved.

A charge is finished when the specific gravity of the electrolyte and the battery voltage have remained constant for two hours. Special instructions for the operation of batteries in hazardous areas. This concerns batteries which are used in accordance with EN 50014, DIN VDE 0170/0171 Ex (in areas with a firedamp hazard) or Ex II (in potentially explosive areas). During charging and subsequent gassing the container lids must be removed or opened so that the explosive mixture of gases loses its flammability due to adequate ventilation. The containers for batteries with plate protection packs must not be closed until at least half an hour after charging has past.

### **2.3 Equalising charge**

Equalising charges are used to safeguard the life of the battery and to maintain its capacity. They are necessary after deep discharges, repeated incomplete recharges and charges to an IU characteristic curve. Equalising charges are carried out following normal charging. The charging current must not exceed 5 A/100 Ah of rated capacity (end of charge - see point 2.2).

#### **Watch the temperature!**

### **2.4 Temperature**

An electrolyte temperature of 30°C is specified as the rated temperature. Higher temperatures shorten the life of the battery, lower temperatures reduce the capacity available. 55°C is the upper temperature limit and is not acceptable as an operating temperature.

### **2.5 Electrolyte**

The rated specific gravity (S. G.) of the electrolyte is related to a temperature of 30°C and the nominal electrolyte level in the cell in fully charged condition. Higher temperatures reduce the specified gravity of the electrolyte, lower temperatures increase it. The temperature correction factor is -0.0007 kg/l per °C, e.g. an electrolyte specific gravity of 1.28 kg/l at 45°C corresponds to an S.G. of 1.29 kg/l at 30°C.

The electrolyte must conform to the purity regulations in DIN 43530 part 2.

### **3. Maintenance**

#### **3.1 Daily**

Charge the battery after every discharge. Towards the end of charge the electrolyte level should be checked and if necessary topped up to the specified level with purified water. The electrolyte level must not fall below the anti-surge baffle or the top of the separator or the electrolyte „min“ level mark.

#### **3.2 Weekly**

Visual inspection after recharging for signs of dirt and mechanical damage. If the battery is charged regularly with a IU characteristic curve an equalising charge must be carried out (see point 2.3).

#### **3.3 Monthly**

At the end of the charge the voltages of all cells or bloc batteries should be measured with the charger switched on, and recorded. After charging has ended the specific gravity and the temperature of the electrolyte in all cells should be measured and recorded.

If significant changes from earlier measurements or differences between the cells or bloc batteries are found further testing and maintenance by the service department should be requested.

#### **3.4 Annually**

In accordance with DIN VDE 0117 at least once per year, the insulation resistance of the truck and the battery must be checked by an electrical specialist.

The tests on the insulation resistance of the battery must be conducted in accordance with DIN EN 60254-1.

The insulation resistance of the battery thus determined must not be below a value of 50  $\Omega$  per Volt of nominal voltage, in compliance with DIN EN 50272-3.

For batteries up to 20 V nominal voltage the minimum value is 1000  $\Omega$ .

### **4. Care of the battery**

The battery should always be kept clean and dry to prevent tracking currents. Cleaning must be done in accordance with the ZVEI code of practice «The Cleaning of Vehicle Traction batteries».

Any liquid in the battery tray must be extracted and disposed of in the prescribed manner. Damage to the insulation of the tray should be repaired after cleaning, to ensure that the insulation value complies DIN EN 50272-3 and to prevent tray corrosion. If it is necessary to remove cells it is best to call in our service department for this.

## 5. Storage

If batteries are taken out of service for a lengthy period they should be stored in the fully charged condition in a dry, frost-free room. To ensure the battery is always ready for use a choice of charging methods can be made:

1. a monthly equalising charge as in point 2.3
2. float charging at a charging voltage of  $2.23 \text{ V} \times \text{the number of cells}$ . The storage time should be taken into account when considering the life of the battery.

## 6. Malfunctions

If malfunctions are found on the battery or the charger our service department should be called in without delay. The measurements taken in point 3.3 will facilitate fault finding and their elimination.

A service contract with us will make it easier to detect and correct faults in good time.



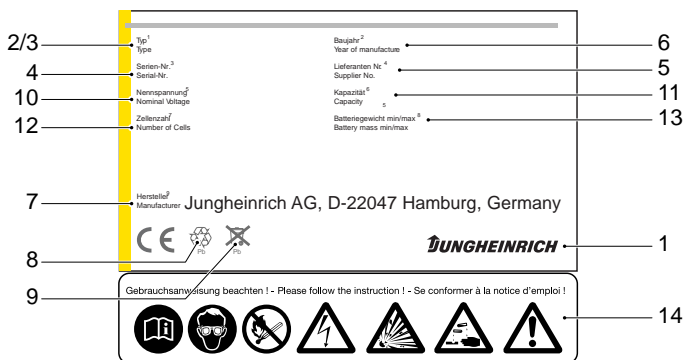
Back to the manufacturer!

Batteries with this sign must be recycled.

Batteries which are not returned for the recycling process must be disposed of as hazardous waste!

We reserve the right make technical modification.

## 7. Type plate, Jungheinrich traction battery



Item	Designation	Item	Designation
1	Logo	8	Recycling symbol
2	Battery designation	9	Dustbin/material
3	Battery type	10	Nominal battery voltage
4	Battery number	11	Nominal battery capacity
5	Battery tray number	12	Number of battery cells
6	Delivery date	13	Battery weight
7	Battery manufacturer's logo	14	Safety instructions and warnings

\* CE mark is only for batteries with a nominal voltage greater than 75 volt.

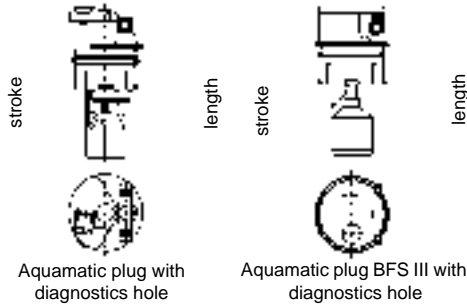
**Aquamatic/BFS III water refilling system for Jungheinrich traction battery with EPzS and EPzB cells with tubular positive plates**

**Aquamatic plug arrangement for the Operating Instructions**

Cell series*		Aquamatic plug type (length)	
EPzS	EPzB	Frötek (yellow)	BFS (black)
2/120 – 10/ 600	2/ 42 – 12/ 252	50,5 mm	51,0 mm
2/160 – 10/ 800	2/ 64 – 12/ 384	50,5 mm	51,0 mm
–	2/ 84 – 12/ 504	50,5 mm	51,0 mm
–	2/110 – 12/ 660	50,5 mm	51,0 mm
–	2/130 – 12/ 780	50,5 mm	51,0 mm
–	2/150 – 12/ 900	50,5 mm	51,0 mm
–	2/172 – 12/1032	50,5 mm	51,0 mm
–	2/200 – 12/1200	56,0 mm	56,0 mm
–	2/216 – 12/1296	56,0 mm	56,0 mm
2/180 – 10/900	–	61,0 mm	61,0 mm
2/210 – 10/1050	–	61,0 mm	61,0 mm
2/230 – 10/1150	–	61,0 mm	61,0 mm
2/250 – 10/1250	–	61,0 mm	61,0 mm
2/280 – 10/1400	–	72,0 mm	66,0 mm
2/310 – 10/1550	–	72,0 mm	66,0 mm

\* The cell series comprise cells with two to ten (twelve) positive plates, e.g. column EPzS. 2/120 - 10/600.

These are cells with the positive plate 60Ah. The type designation of a cell is e.g. 2 EPzS 120.



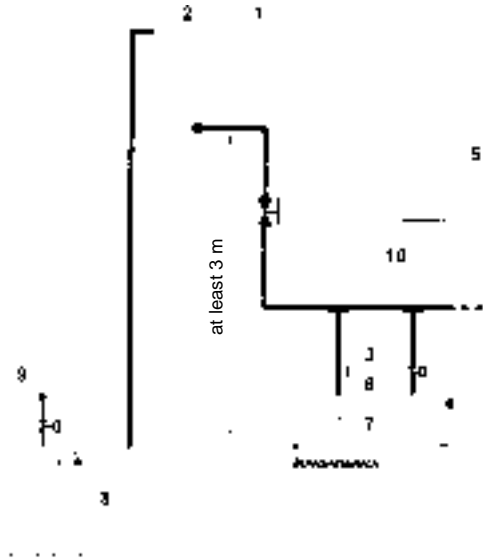
Non-adherence to the operating instructions, repairs carried out with non-original spare parts, unauthorised interference, and the use of additives for the electrolytes (alleged improvement agents) will invalidate any claim for warranty.

When using batteries which comply with I and II, it is important to follow the instructions on maintaining the respective protection class during operation (see associated certification).

## Diagrammatic view

### Equipment for the water refilling system

1. Water tank
2. Level switch
3. Discharge point with ball valve
4. Discharge point with solenoid valve
5. Charger
6. Sealing coupler
7. Closing nipple
8. Ion exchange cartridge with conductance meter and solenoid valve
9. Connection for untreated water
10. Charging lead



## 1. Design

The Aquamatic/BFS battery water refilling systems are used for automatically adjusting the nominal electrolyte level. Venting holes are provided for letting off the gases which arise during charging. In addition to the optical level indicator, the plug systems also have a diagnostics hole for measuring the temperature and the electrolyte density. All battery cells of the design series EPzS; EPzB can be equipped with the Aquamatic/BFS filling systems. The water can be refilled by means of a central sealing coupler through the hose connections in the individual Aquamatic/BFS plugs.

## 2. Application

The Aquamatic/BFS battery water refilling system is used in traction batteries for forklift trucks. The water refilling system is provided with a central water connection for the water supply. Soft PVC hose is used for this connection and for the hose connections for the individual plugs. The hose ends are put onto the hose connection sleeves located on the T or < pieces.

## 3. Function

The quantity of water required in the refilling process is controlled by the valve located in the plug in combination with the float and the float rods. In the Aquamatic System the existing water pressure at the valve turns off the water supply and ensures that the valve closes securely. When the maximum filling level is reached in the BFS system, the float and the float rods through a lever system close the valve with five times the buoyant force and consequently interrupt the water supply reliably.



#### **4. Filling (manual/automatic)**

The batteries should be filled with battery water as soon as possible before the battery charging comes to an end; this ensures that the refilled water quantity is mixed with the electrolyte. In normal operation it is usually sufficient to fill once a week.

#### **5. Connection pressure**

The water refilling unit is to be operated in such a way that the water pressure in the water pipe is between 0.3 bars and 1.8 bars. The Aquamatic System has an operating pressure range of between 0.2 bars and 0.6 bars. The BFS system has an operating pressure range of 0.3 bars to 1.8 bars. Deviations from the pressure ranges impair the system's functional reliability. This wide pressure range permits three types of filling.

##### **5.1 Falling water**

The height of the tank is chosen to suit whichever water refilling system is used. For the Aquamatic System the installation height is 2 m to 6 m and for the BFS system the installation height is 3 m to 18 m over the battery surface.

##### **5.2 Pressurised water**

The pressure-reducing valve in the Aquamatic System is set from 0.2 bars to 0.6 bars and from 0.3 bars to 1.8 bars in the BFS system.

##### **5.3 Water Refill Trolley (serviceMobil)**

The submersible pump located in the ServiceMobil's tank generates the necessary filling pressure. No difference in height is permitted between the standing level of the ServiceMobil and the standing level of the battery.

#### **6. Filling duration**

The length of time needed to fill the batteries depends on the conditions under which the battery is used, the ambient temperatures and the type of filling and/or the filling pressure. The filling time is approx. 0.5 to 4 minutes. Where filling is manual, the water feed pipe must be separated from the battery after filling.

#### **7. Water quality**

Only refilling water which conforms in quality to DIN 43530 part 4 may be used to fill the batteries. The refilling unit (tank, pipelines, valves etc.) may not contain any kind of dirt which could impair the functional reliability of the Aquamatic/BFS plug. For safety reasons it is recommendable to insert a filter element (optional) with a max. passage opening of 100 to 300 µm into the battery's main supply pipe.

## 8. Battery hose connections

Hose connections for the individual plugs are laid along the existing electric circuit. No changes may be made.

## 9. Operating temperature

The temperature limit for battery operation is set at 55° C. Exceeding this temperature damages the batteries. The battery filling systems may be operated within a temperature range of > 0° C to a maximum of 55° C.

### **CAUTION:**

**Batteries with automatic water refilling systems may only be operated in rooms with temperatures > 0° C (as there is otherwise a danger that the systems may freeze).**

### 9.1 Diagnostics hole

To be able to measure the acid density and temperature easily, the water refilling systems must have a diagnostics hole with a 6.5 mm-diameter (Aquamatic plugs) or a 7.5 mm-diameter (BFS plugs).

### 9.2 Float

Different floats are used depending on the cell design and type.

### 9.3 Cleaning

The plug systems may only be cleaned with water. No parts of the plugs may come in contact with soap or fabrics which contain solvents.

## 10. Accessories

### 10.1 Flow indicator

To monitor the filling process, a flow indicator can be inserted into the water feed pipe on the battery side. During the filling process, the paddlewheel is turned by the flowing water. When the filling process ends, the wheel stops and this indicates the end of the filling process. (ident no.: 50219542).

### 10.2 Plug lifter

Only the appertaining special-purpose tool may be used to disassemble the plug systems (plug lifter). The greatest of care must be employed when prising out the plug to prevent any damage to the plug systems.

### 10.2.1 Clamping ring tool

The clamping ring tool is used to push on a clamping ring to increase the contact pressure of the hose connection on the plugs' hose couplings and to loosen it again.

### 10.3 Filter element

For safety reasons a filter element (ident no.: 50307282) can be fitted into the battery's main supply pipe for supplying battery water. This filter element has a maximum passage cross-section of 100 to 300 µm and is designed as a bag filter.

### 10.4 Sealing coupler

The water is supplied to the water refilling systems (Aquamatic/BFS) through a central supply pipe. This is connected to the water supply system at the battery charging station by means of a sealing coupler system. On the battery side a closing nipple (ident no.: 50219538) is mounted and the customer must place a sealing coupler construction on the water supply side (obtainable under ident. no.: 50219537).

## 11. Functional data

PS - self-sealing pressure: Aquamatic > 1.2 bars

BFS system none

D - rate of flow in the opened valve when the pressure is 0.1 bars: 350 ml/min

D1 - maximum permissible leakage rate in the closed valve when the pressure is at 0.1 bars: 2 ml/min

T - permissible temperature range: 0° C to a maximum of 65° C

Pa - operating pressure range: 0.2 to 0.6 bars in the Aquamatic system and operating pressure range: 0.3 to 1.8 bars in the BFS system.

## 2 Jungheinrich traction batterie

### Maintenance free Jungheinrich traction batterie with positive tubular plates type EPzV and EPzV-BS

#### Rating Data

- |                         |                        |
|-------------------------|------------------------|
| 1. Nominal capacity C5: | See type plate         |
| 2. Nominal voltage:     | 2,0 Volt x No of cells |
| 3. Discharge current:   | C5/5h                  |
| 4. Rated temperature:   | 30° C                  |

EPzV batteries are valve-regulated batteries with an immobilised electrolyte and where a water refilling isn't permitted during the whole battery life. Instead of a vent plug there are valves used, who will be destroyed when they are opened.

When operating valve-regulated lead-acid batteries the same safety requirements as for vented cells apply to protect against hazards from electric current, from explosion of electrolytic gas and in case of the cell container is damaged, from the corrosive electrolyte.



- Pay attention to the operation instruction and fix them close to the battery!
- Work on batteries to be carried out by skilled personnel only!



- Use protective glasses and clothes when working on batteries!
- Pay attention to the accident prevention rules as well as DIN EN 50272, DIN 50110-1!



- No smoking!
- Do not expose batteries to naked flames, glowing embers or sparks, as it may cause the battery to explode!



- Acid splashes in the eyes or on the skin must be washed with water. In case of accident consult a doctor immediately!
- Clothing contaminated by acid should be washed in water.



- Risk of explosion and fire, avoid short circuits!



- Electrolyte is highly corrosive!
- In the normal operation of this batteries a contact with acid isn't possible. If the cell containers are damaged, the immobilised electrolyte (gelled sulphuric acid) is corrosive like the liquid electrolyte.



- Batteries and cells are heavy!
- Ensure secure installation! Use only suitable handling equipment e.g. lifting gear in accordance with VDI 3616.



- Dangerous electrical voltage!
- Caution! Metal parts of the battery are always live. Do not place tools or other metal objects on the battery!

Ignoring the operation instructions, repair with non-original parts and non authorised interventions will render the warranty void.

For batteries in classes ㊦I and ㊦II the instructions for maintaining the appropriate protection class during operation must be complied with (see relevant certificate).

## 1. Commissioning

The battery should be inspected to ensure it is in perfect physical condition.

The battery end cables must have a good contact to terminals, check that the polarity is correct.

Otherwise battery, vehicle or charger could be destroyed.

The battery has to be charged according to item 2.2

The specified torque loading for the pole screws of the end cables and connectors are:

	steel
M 10	23 ± 1 Nm

## 2. Operation

DIN EN 50272-3 «Traction batteries for industrial trucks» is the standard which applies to the operation traction batteries in industrial trucks.

### 2.1 Discharging

Ventilation openings must not be sealed or covered.

Electrical connections (e.g. plugs) must only be made or broken in the open circuit condition.

To achieve the optimum life for the battery, operating discharges of more than 60% of the rated capacity should be avoided (deep discharge).

They reduce the battery life considerable. To measure the state of discharge use only the battery manufacturer recommended discharge indicators.

Discharged batteries must be recharged immediately and must not be left discharged.

This also applies to partially discharged batteries.

### 2.2 Charging

Only direct current must be used for charging. Charging procedures according to DIN 41773 and DIN 41774 must only be applied in the manufacturer approved modifications. Therefore only battery manufacturer approved chargers must be used. Only connect the battery assigned to a charger, suitable for the size of battery, in order to avoid overloading of the electric cables and contacts and unacceptable gassing of the cells. EPzV batteries have a low gas emission.

When charging, proper provision must be made for venting of the charging gases. Battery container lids and the covers of battery compartments must be opened or removed.

With the charger switched off connect up the battery, ensuring that the polarity is correct (positive to positive, negative to negative). Now switch on the charger. When charging the temperature of the battery rises by about 15° C, so charging should only begin if the battery temperature is below 35° C. The battery temperature should be at least +15°C before charging otherwise a full charge will not be achieved. Are the temperatures a longer time higher than +40° C or lower than +15° C, so the chargers need a temperatures regulated voltage.

The correction factor is, in accordance with DIN EN 50272-1, -0,005 V/c and Kelvin.

Special instructions for the operation of batteries in hazardous areas.

This concerns batteries which are used in accordance with EN 50 014, DIN VDE 0170 / 0171 Ex I (in areas with a firedamp hazard) or Ex II (in potentially explosive areas). The attention pictograms has to be respected.

### **2.3 Equalising charge**

Equalising charges are used to safeguard the life of the battery and to maintain its capacity. Equalising charges are carried out following normal charging.

They are necessary after deep discharges and repeated incomplete recharges. For the equalising charges has to be used only the battery manufacturer prescribed chargers.

#### **Watch the temperature!**

### **2.4 Temperature**

A battery temperature of 30°C is specified as the rated temperature. Higher temperatures shorten the life of the battery, lower temperatures reduce the available capacity. 45° C is the upper temperature limit and is not acceptable as an operating temperature.

### **2.5 Electrolyte**

The electrolyte is immobilised in a gel. The density of the electrolyte can not be measured.

## **3. Maintenance**

Don't refill water!

### **3.1 Daily**

Charge the battery immediately after every discharge.

### **3.2 Weekly**

Visual inspection after recharging for signs of dirt and mechanical damage.

### **3.3 Quarterly**

After the end of the charge and a rest time of 5 h following should be measured and recorded:

- the voltages of the battery
- the voltages of every cells

If significant changes from earlier measurements or differences between the cells or bloc batteries are found, further testing and maintenance by the service department should be requested.

### **3.4 Annually**

In accordance with DIN VDE 0117 at least once per year, the insulation resistance of the truck and the battery must be checked by an electrical specialist.

The tests on the insulation resistance of the battery must be conducted in accordance with DIN 43539-1.

The insulation resistance of the battery thus determined must not be below a value of 50  $\Omega$  per Volt of nominal voltage, in compliance with DIN EN 50272-3.

For batteries up to 20 V nominal voltage the minimum value is 1000  $\Omega$ .

## **4. Care of the battery**

The battery should always be kept clean and dry to prevent tracking currents. Cleaning must be done in accordance with the ZVEI code of practice «The Cleaning of Vehicle Traction batteries».

Any liquid in the battery tray must be extracted and disposed of in the prescribed manner.

Damage to the insulation of the tray should be repaired after cleaning, to ensure that the insulation value complies with DIN EN 50272-3 and to prevent tray corrosion. If it is necessary to remove cells it is best to call our service department for this.

## **5. Storage**

If batteries are taken out of service for a lengthy period they should be stored in the fully charged condition in a dry, frost-free room.

To ensure the battery is always ready for use a choice of charging methods can be made:

1. a quarterly full charging like charge as in point 2.2. If any consumer is connected with, e.g. measure or controlling systems, it can be, that this charging is necessary every 14 days.

2. float charging at a charging voltage of 2.25 V x the number of cells.

The storage time should be taken into account when considering the life of the battery.

## 6. Malfunctions

If malfunctions are found on the battery or the charger our service department should be called without delay. The measurements taken in point 3.3 will facilitate fault finding and their elimination.

A service contract with us will make it easier to detect and correct faults in good time.



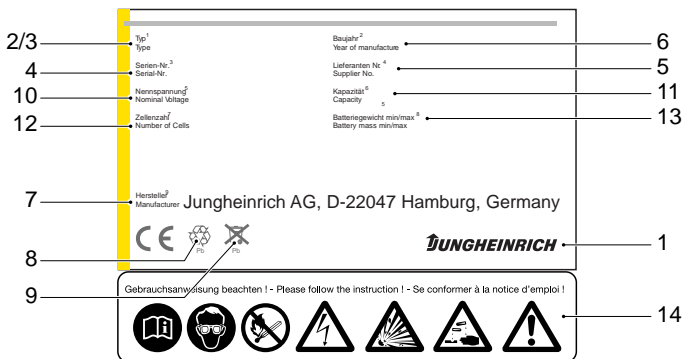
Back to the manufacturer!

Batteries with this sign must be recycled.

Batteries which are not returned for the recycling process must be disposed of as hazardous waste!

We reserve the right make technical modification.

## 7. Type plate, Jungheinrich traction battery



Item	Designation	Item	Designation
1	Logo	8	Recycling symbol
2	Battery designation	9	Dustbin/material
3	Battery type	10	Nominal battery voltage
4	Battery number	11	Nominal battery capacity
5	Battery tray number	12	Number of battery cells
6	Delivery date	13	Battery weight
7	Battery manufacturer's logo	14	Safety instructions and warnings

\* CE mark is only for batteries with a nominal voltage greater than 75 volt.



