

Инструкция по эксплуатации **JUNGHEINRICH HC 110**

JUNGHEINRICH · редакция 12.14; stated period 01.09 onward

Язык: EN

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Продавец и подбор техники

kupit-shtabeler.ru

zakaz@kupit-shtabeler.ru

+7 495 159-44-32

HC 110

01.09 -

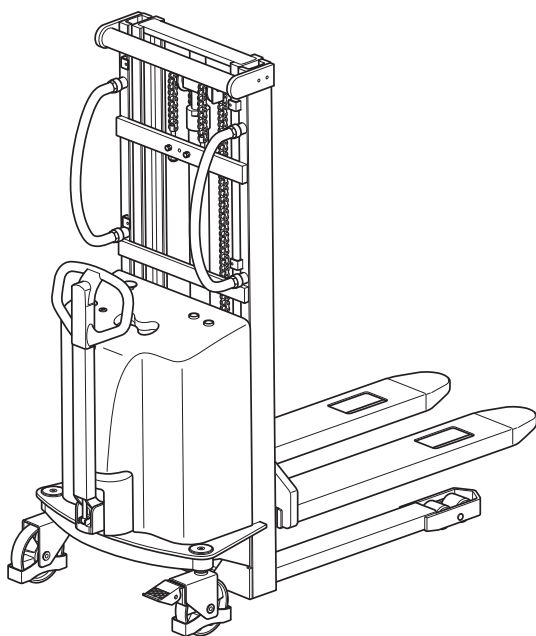
Operating instructions



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12.14

HC 110



Declaration of Conformity



Jungheinrich AG, Am Stadtrand 35, D-22047 Hamburg
Manufacturer or agent acting in the European Union

Type	Option	Serial no.	Year of manufacture
HC 110			

Additional information

On behalf of

Date

EU Conformity Declaration

The undersigned hereby declare that the powered industrial truck described below in detail complies with the European Directives 2006/42/EC (Machinery Directive) and 2004/108/EEC (Electromagnetic Compatibility - EMC) including amendments as well as the legislative decree to incorporate the directives in national law. The signatories are in each case individually authorized to compile the technical documents.

Foreword

Notes on the operating instructions

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 and the pages are numbered continuously.

The operator manual details different industrial truck models. When operating and servicing the industrial truck, make sure that the particular section applies to your truck model.

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

Safety notices and text mark-ups

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

DANGER!

Indicates an extremely hazardous situation. Failure to comply with this instruction will result in severe irreparable injury and even death.

WARNING!

Indicates an extremely hazardous situation. Failure to comply with this instruction may result in severe irreparable injury and even death.

CAUTION!

Indicates a hazardous situation. Failure to comply with this instruction may result in slight to medium injury.

NOTE

Indicates a material hazard. Failure to comply with this instruction may result in material damage.



Used before notices and explanations.

- Indicates standard equipment
- Indicates optional equipment

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Jungheinrich Aktiengesellschaft

Am Stadtrand 35
22047 Hamburg - Germany

Tel: +49 (0) 40/6948-0

www.jungheinrich.com

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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

1 General

The truck must be used, operated and serviced in accordance with the present instructions. All other types of use are beyond its scope of application and may result in damage to personnel, the industrial truck or property.

2 Correct application

NOTE

The maximum load and load distance are indicated on the capacity plate and must not be exceeded.

The load must rest on the load handler or be lifted by an attachment approved by the manufacturer.

The load must be fully raised, see "Lifting, transporting and depositing loads" on page 44.

-
- Lifting and lowering of loads.
 - Transporting lowered loads.
 - Do not travel with a raised load (>500 mm).
 - Do not carry or lift passengers.
 - Do push or pull load units.

3 Approved application conditions

DANGER!

Do not exceed the permissible surface and point loading on the travel lanes.

At blind spots get a second person to assist.

The driver must ensure that the loading dock /dock leveller cannot be removed or come loose during loading/unloading.

-
- Operation in industrial and commercial environments.
 - Permissible temperature range 5°C to 40°C.
 - Operation only on secure, level surfaces with sufficient capacity.
 - Operation only on routes that are visible and approved by the operating company.
 - Do not negotiate inclines.
 - Operation in partially public traffic.
 - Operation in workplaces with sufficient lighting (observe national regulations).



Special equipment and authorisation are required if the truck is to be constantly used in extreme conditions.

The truck is not authorised for use in areas at risk of explosion.

4 Proprietor responsibilities

For the purposes of the present operating instructions the “operating company” is defined as any natural or legal person who either uses the industrial truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting) the proprietor is considered the person who, in accordance with existing contractual agreements between the owner and user of the industrial truck, is charged with operational duties. The proprietor must ensure that the industrial truck is used only for the purpose it is intended for and that danger to life and limb of the user and third parties are excluded. Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The operating company must ensure that all users have read and understood these operating instructions.

NOTE

Failure to comply with the operating instructions invalidates the warranty. The same applies if improper work is carried out on the truck by the customer or third parties without the permission of the manufacturer.

5 Adding attachments and/or optional equipment

The mounting or installation of additional equipment which affects or enhances the performance of the industrial truck requires the written permission of the manufacturer. Local authority approval may also need to be obtained. Local authority approval however does not constitute the manufacturer's approval.

B Truck Description

1 Application

The industrial truck is a four-wheel electric walkie stacker. It is designed for transporting goods on level surfaces. Open-bottom pallets or roll cages can be lifted. The rated capacity is indicated on the data plate or the capacity plate Qmax.

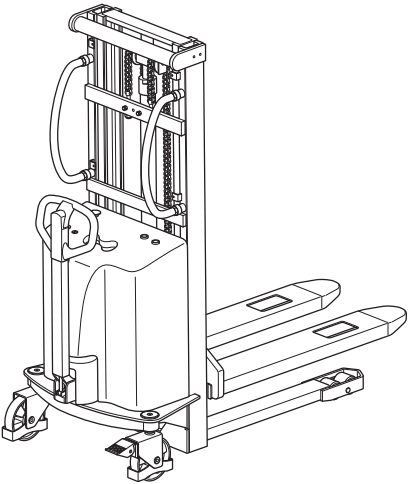
1.1 Truck models and rated capacity

The rated capacity depends on the model. The rated capacity can be derived from the model name.

HC110

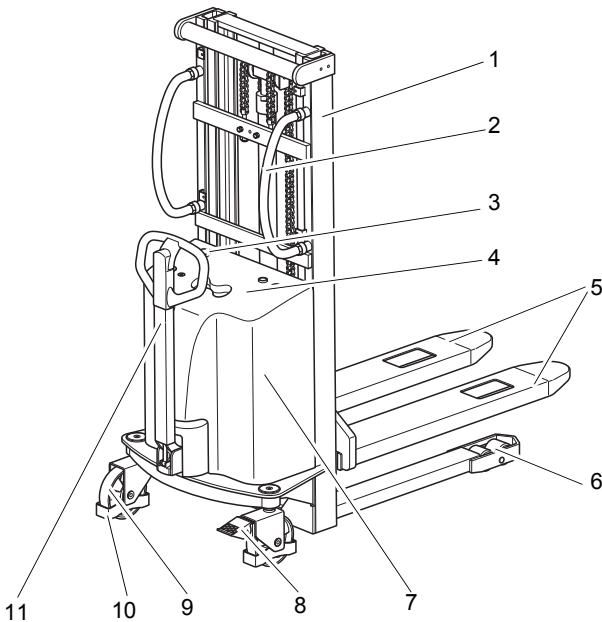
HC	Model name
1	Series
10	Rated capacity x 100 kg

The rated capacity is not generally the same as the permissible capacity. The capacity can be found on the capacity plate attached to the truck.



2 Assemblies and Functional Description

2.1 Assembly Overview



Item		Component	Item		Component
1	●	Mast	7	●	Front panel
2	●	Push handles	8	●	Brake pedal (parking brake)
3	●	Emergency Disconnect switch	9	●	Steer wheels
4	●	Control panel	10	●	Castor wheel assembly support
5	●	Forks	11	●	Tiller
6	●	Load wheels			
	●	Standard equipment		○	Optional equipment

2.2 Functional Description

Safety mechanisms

- The wheels are surrounded by a solid castor wheel assembly support.

- Activating the Emergency Disconnect switch rapidly cuts out all electrical functions in hazardous situations.

Design

The HC 110 is a four-wheel truck with two steered wheels (9) and two load wheels (6). The electrical components and the hydraulic unit are located under the front cover (7).

Controls and displays

The lift and lower controls are arranged on the front panel.
The truck is equipped with a battery discharge indicator.

Steering

The tiller (11) is used to steer within a range of approx. 90° on either side.

Brake system

The parking brake is actuated via the brake pedal (8).

Hydraulic system

Lifting and lowering are applied via the lift and lower buttons. The pump unit starts with lifting is activated. The hydraulic oil is pumped from the oil reservoir into the cylinder. The forks (5) are raised.

Electrical system

12 volt system.

3 Technical Specifications

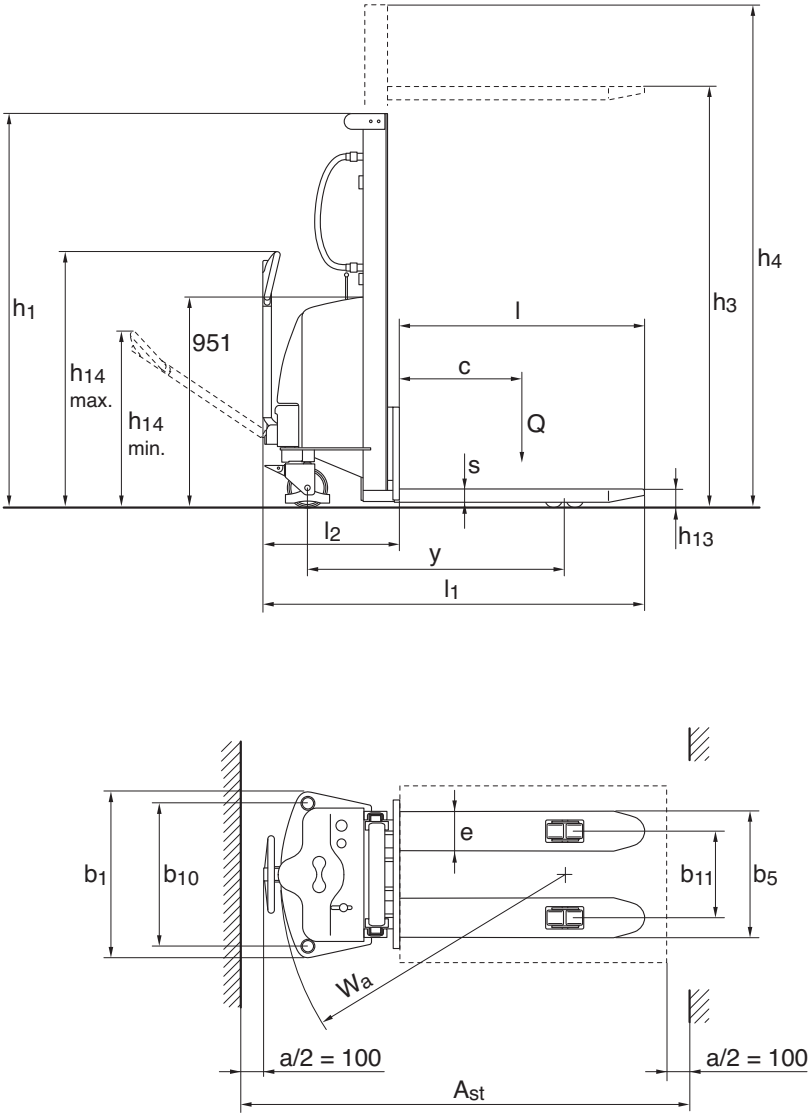


The technical specification is given according to the German guideline "Type sheets for industrial trucks". Technical modifications and additions reserved.

3.1 Performance data

		HC 110	
Q	Rated capacity	1000	kg
c	Load centre distance for standard fork length *)	600	mm
	Lift speed with / without load	90 / 140	mm/s
	Lower speed with / without load	120 / 100	mm/s
*) For trucks with longer forks the load centre is in the centre of the fork.			

3.2 Dimensions



	Model Lift height	HC 110 1600	HC 110 2500	HC 110 3000	
h_1	Mast height retracted	1980	1830	2080	mm
h_3	Lift	1600	2500	3000	mm
h_4	Mast height extended	1980	3070	3570	mm
h_{13}	Ground clearance below mast	85	85	85	mm
y	Wheel distance	1160	1160	1160	mm
s/e/l	Fork dimensions	60/180/1100	60/180/1100	60/180/1100	mm
l_1	Overall length	1720	1720	1720	mm
l_2	Headlength	620	620	620	mm
b_1	Truck width	762	762	762	mm
b_5	Outer fork distance	570	570	570	mm
b_{11}	Track width, rear	390	390	390	mm
Ast	Aisle width 800x1200 length	2175	2175	2175	mm
Ast	Aisle width 1000x1200 transv.	2145	2145	2145	mm
	Lift motor, output where s_3 15%	1,5	1,5	1,5	kW

3.3 Weights

Model Lift height	HC 110 1600	HC 110 2500	HC 110 3000	
Net weight incl. battery	350	435	450	kg
Axle load, w.o. load front/rear + battery	250 / 100	310 / 125	325 / 125	kg
Axle load, w. load front/rear + battery	420 / 930	460 / 975	475 / 975	kg
Battery weight	45	45	45	kg



The battery size must be adhered to for duplex masts, as the battery weight must be present in the truck to act as a counterweight.

3.4 Tyre type

	HC 110
Tyre size, rear	180 x 50 mm
size, load section	Ø74 x 93

3.5 EN norms

Noise emission level

– HC 110: 69 dB(A)

*+/- 3 dB(A) depending on the truck's equipment

in accordance with EN 12053 as harmonised with ISO 4871.



The noise emission level is calculated in accordance with standard procedures and takes into account the noise level when travelling, lifting and when idle. The noise level is measured at the level of the driver's ear.

Electromagnetic compatibility (EMC)

The manufacturer confirms that the truck adheres to the limits for electromagnetic emissions and resistance as well as the static electricity discharge test in accordance with EN 12895 as well as the standardised instructions contained therein.



No changes to electric or electronic components or their arrangement may be made without the written agreement of the manufacturer.



WARNING!

Medical equipment can be damaged by non-ionised radiation

Electrical equipment on the truck emitting non-ionised radiation (e.g. wireless data transmission) can affect operators' medical equipment (pacemakers, hearing aids etc.) and result in malfunctions. Consult a doctor or the manufacturer of the medical equipment to clarify whether it can be used near the industrial truck.

3.6 Conditions of use

Ambient temperature

– operating at 5°C to 40°C

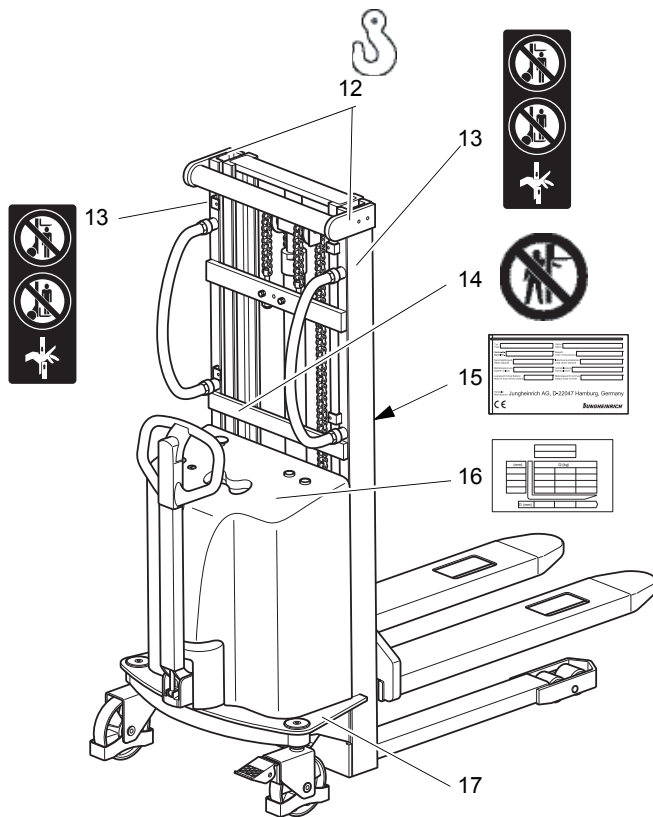


Special equipment and authorisation are required if the truck is to be used continually in conditions of extreme temperature or condensing air humidity fluctuations.

3.7 Electrical Requirements

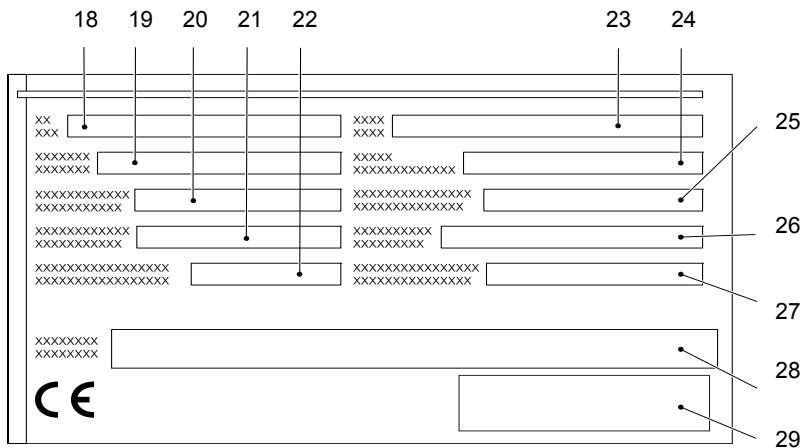
The manufacturer certifies compliance with the requirements for the design and manufacture of electrical equipment, according to EN 1175 "Industrial Truck Safety - Electrical Requirements", provided the truck is used according to its purpose.

3.8 Identification Points and Data Plates



Item	Component
12	Strap points for crane lifting
13	Do not step onto or beneath the load, risk of trapping with moving mast
14	Never reach through the mast
15	Data plate
16	Capacity Qmax
17	Serial number

3.8.1 Data plate



Item	Description	Item	Description
18	Type	24	Year of manufacture
19	Serial number	25	Load centre (mm)
20	Rated capacity (kg)	26	Output
21	Battery voltage (V)	27	Min./max. battery weight (kg)
22	Net weight w.o. battery (kg)	28	Manufacturer
23	Option	29	Manufacturer's logo



For queries regarding the truck or ordering spare parts always quote the truck serial number (19).

3.8.2 Truck capacity plate

The capacity plate (16) gives the capacity (Q in kg) of the truck for a vertical mast. The maximum capacity is shown as a table with a given load centre of gravity D (in mm) and the required lift height H (in mm).

Example of how to calculate the maximum capacity:

The diagram shows a truck capacity plate (16) with a table of capacity Q (kg) versus lift height h_3 (mm) and load centre D (mm). The table is as follows:

h_3 (mm)	Q (kg)		
4250	850	850	600
3600	1105	1105	850
2900	1250	1250	850

Below the table, the load centre D (mm) is specified as 500, 600, and 700. The maximum capacity is highlighted in bold for $h_3 = 3600$ mm and $D = 600$ mm, which is 1105 kg.

For a load centre of gravity D of 600 mm and a max. lift height h_3 of 3600 mm the maximum capacity Q is 1105 kg.

C Transport and Commissioning

1 Lifting by crane

WARNING!

Incorrect lifting by crane can result in accidents

Improper use or use of unsuitable lifting gear and can cause the truck to fall when being lifted by crane.

Prevent the truck from hitting other objects during lifting, and avoid uncontrolled movements. If necessary, secure the truck with guide ropes.

- ▶ The truck should only be loaded by personnel trained in the use of lifting slings and tools.
- ▶ Wear personal protective equipment (e. g. safety shoes, safety helmet, hi-vis jacket, protective gloves, etc.) when loading by crane.
- ▶ Do not stand under suspended loads.
- ▶ Do not enter or stand in a hazardous area.
- ▶ Always use lifting gear with sufficient capacity (for truck weight see truck rating plate).
- ▶ Always attach the crane lifting gear to the prescribed strap points and prevent them from slipping.
- ▶ Use the lifting slings only in the prescribed loading direction.
- ▶ Crane slings should be fastened in such a way that they do not come into contact with any attachments when lifting.

Lifting the truck by crane

Requirements

- Park the truck securely, see "Parking the truck securely" on page 41.
- Remove any mast guards.

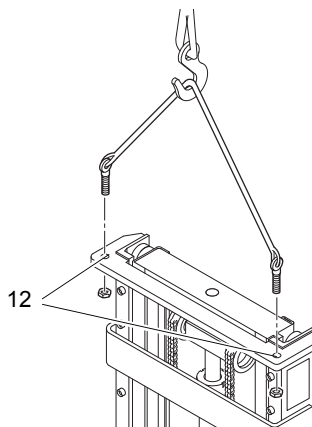
Tools and Material Required

- Lifting gear
- Crane lifting gear

Procedure

- Secure the lifting slings to the strap points (12).

The truck can now be lifted by crane.



2 Transport

WARNING!

Accidental movement during transport

Improper fastening of the truck and mast during transport can result in serious accidents.

- ▶ Loading must only be performed by specialist personnel trained for this purpose. The specialist personnel must be instructed in securing loads on road vehicles and handling load securing devices. In each case correct measurements must be taken and appropriate safety measures applied.
- ▶ The truck must be securely fastened when transported on a lorry or a trailer.
- ▶ The lorry or trailer must have fastening rings.
- ▶ Use wedges to prevent the truck from moving.
- ▶ Use only fastening belts with sufficient strength.
- ▶ Use non-slip materials to securing the load aids (pallet, wedges, ...) e. g. non-slip mats.

Securing the industrial truck for transport

Requirements

- Load the truck.
- Park the truck securely, see "Parking the truck securely" on page 41.

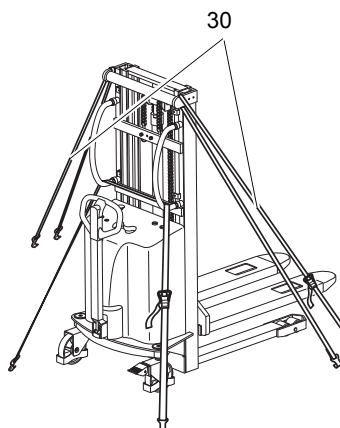
Tools and Material Required

- Lashing straps

Procedure

- Attach the lashing straps (30) to the industrial truck and the transport vehicle and tension sufficiently.

The truck can now be transported.



3 Using the Truck for the First Time

Procedure

- Check the equipment is complete.
- Install the battery (where required), see "Battery removal and installation" on page 31, do not damage the battery cable.
- Charge the battery, see "Charging the battery" on page 29.

The truck can now be started, see "Starting up the truck" on page 37.



When the truck is parked the surface of the tyres will flatten. The flattening will disappear after a short period of operation.

D Battery - Servicing, Recharging, Replacement

1 Safety Regulations Governing the Handling of Lead-Acid Batteries

Maintenance personnel

Batteries may only be charged, serviced or replaced by trained personnel. These operating instructions and the battery manufacturer's instructions must be observed when performing these operations.

Fire Protection

Do not smoke and avoid naked flames when handling batteries. Wherever an industrial truck is parked for charging there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2 m from the truck. The room must be ventilated. Fire protection equipment must be available.

CAUTION!

The use of unsuitable fire protection equipment can result in scalding

Extinguishing fires with water can cause a reaction with the battery acid. This can result in scalding from the acid.

- ▶ Use powder extinguishers.
 - ▶ Never extinguish a burning battery with water.
-

Battery maintenance

The battery must be kept dry and clean. The terminals and cable shoes must be clean, secure and have a light coating of dielectric grease.

CAUTION!

Short circuits can result in fire

Damaged cables can cause short circuits, setting the truck and battery on fire.

- ▶ Before closing the battery cover, make sure that the battery cables are not damaged.
-

Battery disposal

Batteries may only be disposed of in accordance with national environmental protection regulations or disposal laws. The manufacturer's disposal instructions must be observed.

 WARNING!

Batteries can be hazardous

Batteries contain dissolved acid which is toxic and caustic. Above all, avoid any contact with battery acid.

- ▶ Always wear protective clothing and goggles when working with batteries.
 - ▶ Do not let battery acid come into contact with skin, clothing or eyes. If necessary, rinse with plenty of clean water.
 - ▶ In the event of physical damage (e.g. skin or eye contact with battery acid) consult a doctor immediately.
 - ▶ Leaked battery acid should be neutralised immediately with plenty of water.
 - ▶ Only batteries with a sealed battery container may be used.
 - ▶ Follow national guidelines and legislation.
-

 WARNING!

Unsuitable batteries that have not been approved by Jungheinrich for the truck can be hazardous

The design, weight and dimensions of the battery have a considerable effect on the operational safety of the truck, in particular its stability and capacity.

- ▶ Only Jungheinrich-approved batteries may be used on the truck.
 - ▶ Battery equipment may only be replaced with the agreement of Jungheinrich.
 - ▶ When replacing/installing the battery, make sure the battery is securely located in the battery compartment of the truck.
-

Park the truck securely before carrying out any work on the batteries (see "Parking the truck securely" on page 41).

2 Battery types

- Use non-gassing batteries only. Optimum battery useful life is achieved at battery temperatures of 15 °C to 35 °C. Low temperatures reduce the available battery capacity, high temperatures reduce the battery useful life.

NOTE

45 °C is the maximum temperature for batteries, at which point the truck cannot be operated. Special equipment and authorisation are required if the truck is to be used continually in conditions of extreme temperature or condensing air humidity fluctuations.

- The truck (securely parked) should not be stored without a battery compensation charge for more than 3 months at 20°C or 2 months at 30°C.

Depending on the model, the truck will be supplied with different battery types. The following table shows which combinations are included as standard:

Battery type	Capacity
Banner 12 V - battery 410 x 177 x 225 mm (LXWXH)	124.0 Ah /10 HR
	134.8 Ah /20 HR
Cebalog 12 V - battery 410 x 176 x 227 mm (LXWXH)	120.0 Ah /10 HR
	124.0 Ah /20 HR
Tianneng Group 12 V - battery 407 x 171 x 240 mm (LXWXH)	136.0 Ah /10 HR
	150.0 Ah /20 HR

The battery weights can be taken from the battery data plate. The battery terminals must be covered with terminal protectors.

3 Exposing the battery

CAUTION!

Trapping hazard

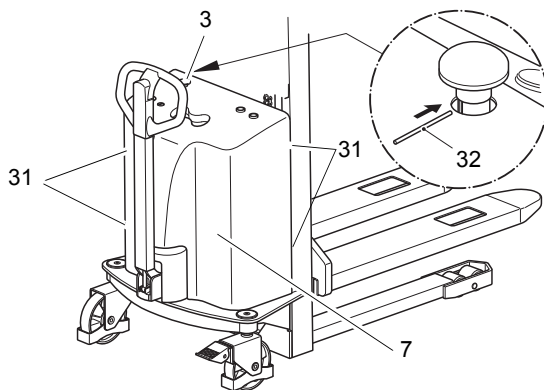
- Make sure there is nothing between the battery cover and the truck when you fit the battery cover.

WARNING!

An unsecured truck can cause accidents

Parking the truck on an incline or with a raised load handler is dangerous and is strictly prohibited.

- Park the truck on a level surface. In special cases the truck may need to be secured with wedges.
- Fully lower the load handler.
- Select a place to park where no other people are at risk of injury from the lowered load handler.
- If the brakes are not working, place wedges underneath the wheels of the truck to prevent it from moving.



Requirements

- Park the truck on a horizontal surface.
- Park the truck securely, see "Parking the truck securely" on page 41.

Procedure

- Removing the knob (3) from the emergency disconnect switch:
 - Prevent the switch shaft from rotating using the pin (32) and screw off the knob (3) anticlockwise.
- Loosen the screws (31).
- Remove the front cover (7).

The battery can now be accessed.

4 Charging the battery

DANGER!

Risk of electric shock and burning

Damaged and unsuitable cables can cause electric shocks and can overheat, resulting in fires.

- ▶ Always use mains cables with a maximum length of 30 m.
Local regulations must be observed.
 - ▶ Unwind the cable reel fully when using it.
 - ▶ Always use original manufacturer's mains cables.
 - ▶ Insulation classes and resistance to acids and alkalis must correspond to those of the manufacturer's mains lead.
 - ▶ The charger connector must be dry and clean when used.
 - ▶ The battery may only be charged using the on-board charger.
-

NOTE

Improper use of the on-board charger can cause material damage

The on-board charger consisting of a battery charger and battery controller must not be opened. If faulty, contact the manufacturer's customer service department.

- ▶ The charger must only be used for batteries supplied by Jungheinrich or other approved batteries provided it has been adapted by the manufacturer's customer service department.
 - ▶ Batteries must never be swapped from truck to truck.
 - ▶ Do not connect the battery to two chargers simultaneously.
-

Starting to charge with the on-board charger

Mains connection

Mains supply: 230 V (+/-10%)

Mains frequency: 50 Hz (+/-10%)

The mains cable (34) of the charger is contained in the front panel.

Charging the battery

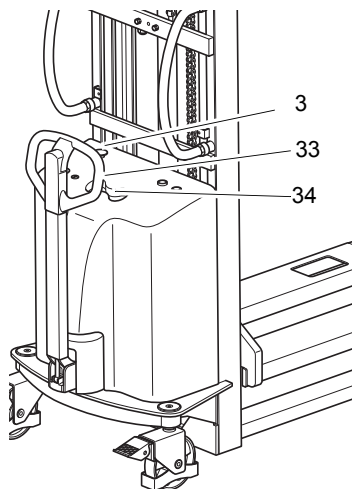
Requirements

- Park the truck securely, see "Parking the truck securely" on page 41.

Procedure

- Attach the mains connector (34) to a mains socket.
- Pull the Emergency Disconnect switch (3) up.
The flashing LED indicates the charge status (33) or a fault (for flashing codes see "LED Display" table).

The battery is now charged.



LED displays (33) battery charger

LED

Red

Yellow

Green

Meaning

Battery is almost empty and must be charged.

Battery is almost charged, 80% charge capacity reached.

Battery is fully charged.

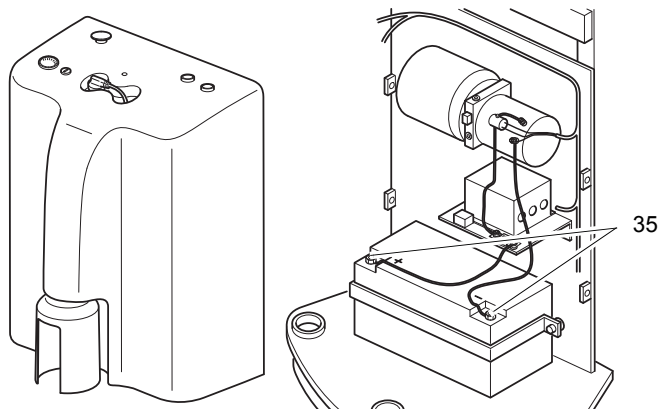
5 Battery removal and installation

WARNING!

Accident risk during battery removal and installation

Due to the battery weight and acid there is a risk of trapping or burning when the battery is removed and installed.

- ▶ Note the "Safety regulations for handling acid batteries" section in this chapter.
- ▶ Wear safety shoes when removing and installing the battery.
- ▶ Use only batteries with insulated cells and terminal connectors.
- ▶ Park the truck on a level surface to prevent the battery from sliding out.
- ▶ Make sure the battery is located securely in the truck's battery compartment.



Requirements

- Park the truck on a level surface.
- Park the truck securely, see "Parking the truck securely" on page 41.
- Expose the battery, see "Exposing the battery" on page 28.

Procedure

- Undo the terminal screws (35) and pull the battery cable off the terminals.
- Lift out the battery.

The battery is now removed.



Installation is in the reverse order. When reinstalling the battery, note the proper installation position and make sure the battery is connected correctly.

E Operation

1 Safety Regulations for the Operation of the Forklift Truck

Driver authorisation

The truck may only be used by suitably trained personnel, who have demonstrated to the proprietor or his representative that they can drive and handle loads and have been authorised to operate the truck by the proprietor or his representative.

Operator's rights, responsibilities and rules of conduct

The driver must be informed of his duties and responsibilities and be instructed in the operation of the truck and shall be familiar with the operating instructions. Safety shoes must be worn on pedestrian-operated trucks.

Unauthorised use of truck

The operator is responsible for the truck during the time it is in use. The operator must prevent unauthorised persons from driving or operating the truck. Do not carry passengers or lift other people.

Damage and faults

The supervisor must be informed immediately of any damage or faults to the truck or attachment. Trucks which are unsafe for operation (e.g. wheel or brake problems) must not be used until they have been rectified.

Repairs

The operator must not carry out any repairs or alterations to the truck without authorisation and the necessary training to do so. The operator must never disable or adjust safety mechanisms or switches.

Hazardous area

WARNING!

Risk of accidents/injury in the hazardous area of the truck

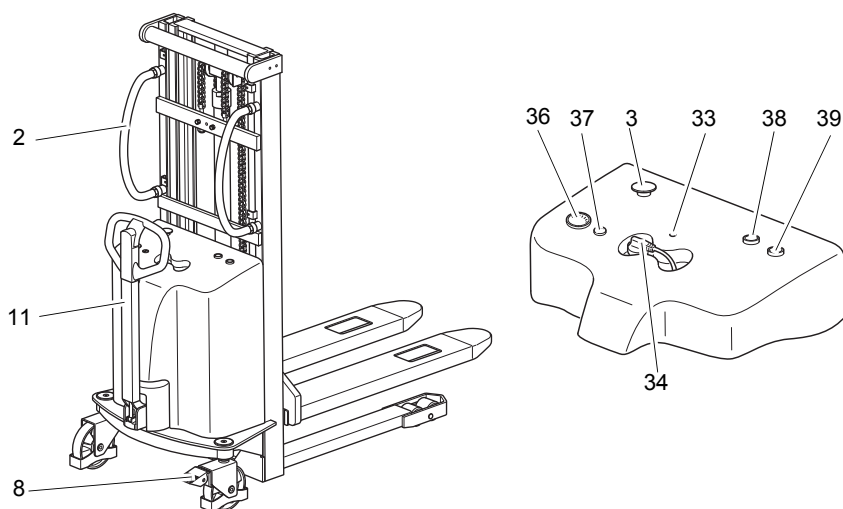
A hazardous area is defined as the area in which people are at risk due to travel or lifting operations of the truck, its load handler or the load. This also includes the area within reach of falling loads or lowering/falling operating equipment.

- ▶ Instruct unauthorised persons to leave the hazardous area.
 - ▶ In case of danger to third parties, give a warning signal in good time.
 - ▶ If unauthorised persons are still within the hazardous area, stop the truck immediately.
-

Safety devices, warning signs and warning instructions

Safety devices, warning signs (see "Identification Points and Data Plates" on page 18) and warning instructions in the present operating instructions must be strictly observed.

2 Displays and Controls



Item	Control /Display	Function
2	Push handle	● – Move the truck forward/backward.
3	Emergency Disconnect switch	● Disconnects the battery supply – All electrical functions are deactivated
8	Brake pedal (parking brake)	● – Prevent the truck from rolling away.
11	Tiller	● – Steers the truck.
33	Charge display	● – Battery charge status
34	On-board battery charger connection	● – Charges the battery by inserting the mains connector into a mains socket.
36	Battery discharge indicator	● – Battery charge status.
37	Key switch and key	● – Activates the truck by applying the control voltage – Removing the key prevents the truck from being switched on by unauthorized personnel.
38	“Lowering” button	● – Lowers the lift mechanism.
39	“Lift” button	● – Raises the lift mechanism.

2.1 Battery discharge indicator

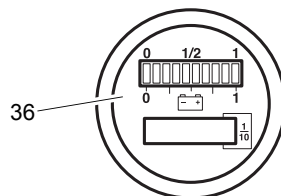
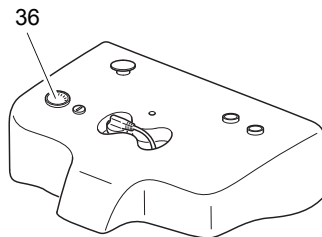
NOTE

Deep discharge can damage the battery

The standard adjustment of the battery discharge indicator is for maintenance-free batteries (gel batteries). When using other batteries, the display must be reset.

- ▶ This adjustment should only be made by the manufacturer's customer service department.
- ▶ The battery discharge indicator shows the battery's residual capacity.
- ▶ Charge the battery, see "Charging the battery" on page 29.

The battery charge status is shown via the battery discharge indicator (36) on the truck. As the battery increasingly discharges, the bars go out from right to left.



3 Starting up the truck

3.1 Checks and Operations to Be Performed Before Starting Daily Work

WARNING!

Damage and other truck or attachment (optional equipment) defects can result in accidents.

If damage or other truck or attachment (optional equipment) defects are discovered during the following checks, the truck must be taken out of service until it has been repaired.

- ▶ Report any defects immediately to your supervisor.
- ▶ Mark defective truck and take out of service.
- ▶ Do not return the industrial truck to service until you have identified and rectified the fault.

Inspection before daily operation

Procedure

- Check the whole of the outside of the truck for signs of damage and leaks. Damaged hoses must be replaced immediately.
- Check the load handler for visible signs of damage such as cracks, bent or severely worn forks.
- Check the load wheels for damage.
- Check that the markings and labels are present, clean and legible, see "Identification Points and Data Plates" on page 18.
- Test the emergency disconnect switch.
- Check the tiller (damper) is restored to its normal position.
- Check the controls are automatically restored to zero after being applied.
- Test the brakes.
- Check the protective screen is secure and undamaged.
- Make sure the front panel and covers are secure and check for damage.

4 Industrial Truck Operation

4.1 Safety regulations for truck operation

Travel routes and work areas

Only use lanes and routes specifically designated for truck traffic. Unauthorised third parties must stay away from work areas. Loads must only be stored in places specially designated for this purpose.

The truck must only be operated in work areas with sufficient lighting to avoid danger to personnel and materials. Additional equipment is necessary to operate the truck in areas of insufficient lighting.



Do not exceed the permissible surface and point loading on the travel lanes.

At blind spots get a second person to assist.

The driver must ensure that the loading dock /dock leveller cannot be removed or come loose during loading/unloading.

Travel conduct

The operator must adapt the travel speed to local conditions. The truck must be driven at slow speed when negotiating bends or narrow passageways, when passing through swing doors and at blind spots. The operator must always observe an adequate braking distance between the forklift truck and the vehicle in front and must be in control of the truck at all times. Abrupt stopping (except in emergencies), rapid U turns and overtaking at dangerous or blind spots are not permitted. Do not lean out or reach beyond the working and operating area.

Travel visibility

The operator must look in the direction of travel and must always have a clear view of the route ahead. If the truck is carrying loads that affect visibility, the truck must travel against the load direction. If this is not possible, a second person must walk alongside the truck as a lookout to observe the travel route while maintaining eye contact with the operator. Proceed only at walking pace and with particular care. Stop the truck as soon as you lose eye contact.

Negotiating slopes and inclines

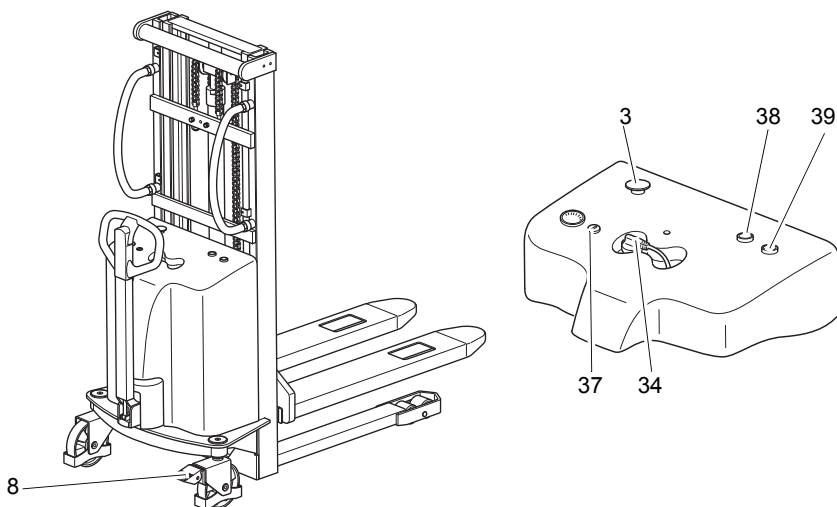
WARNING!

Do not negotiate slopes or inclines.

Negotiating lifts, loading ramps and docks

Lifts may only be negotiated if they have sufficient capacity, are suitable for driving on and authorised for truck traffic by the owner. The driver must satisfy himself of the above before entering these areas. 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 with the forklift truck must only enter the lift after the truck has come to a rest and must leave the lift before the truck. The driver must ensure that the loading ramp / dock cannot move or come loose during loading / unloading.

4.2 Preparing the truck for operation



Switching on the truck

Requirements

- For checks and operations to be performed before starting daily operation, see "Checks and Operations to Be Performed Before Starting Daily Work" on page 37.
- On-board charger mains plug (34) disconnected.

Procedure

- Pull out the Emergency Disconnect switch (3).
- Switch on the truck. To do this:
 - Insert the key in the key switch (37) and turn it to the right as far it will go.
- Test lifting (39) and lowering (38) by applying the control button.
- Test the brakes (8).

Truck is operational.

4.3 Parking the truck securely

WARNING!

An unsecured truck can cause accidents

Parking the truck on an incline, without the brakes applied or with a raised load or load handler is dangerous and is strictly prohibited.

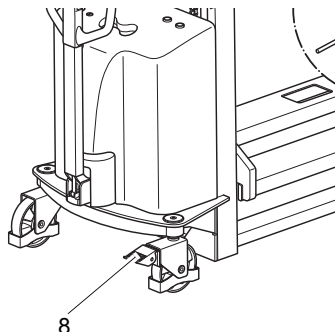
- ▶ Park the truck on a level surface. In special cases the truck may need to be secured with wedges.
- ▶ Fully lower the load handler.
- ▶ Select a place to park where no other people are at risk of injury from the lowered load handler.
- ▶ If the brakes are not working, place wedges underneath the wheels of the truck to prevent it from moving.

Parking the truck securely

Procedure

- Fully lower the load handler.
- Turn off the key switch and remove the key.
- Press the Emergency Disconnect.
- Apply the brake pedal (8).

The truck is parked.



4.4 Emergency Disconnect, Travel, Steering, Braking

4.4.1 Emergency Disconnect

CAUTION!

Faulty or non-accessible Emergency Disconnect switches can cause accidents

A faulty or non-accessible Emergency Disconnect switch can cause accidents. In dangerous situations the operator cannot bring the truck to a halt in time by applying the Emergency Disconnect switch.

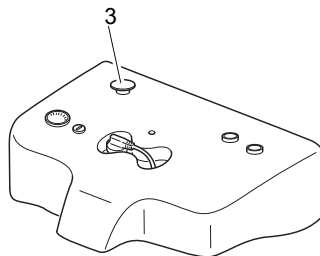
- ▶ The operation of the Emergency Disconnect switch must not be affected by any objects placed in its way.
- ▶ Report any defects on the Emergency Disconnect switch immediately to your supervisor.
- ▶ Mark defective truck and take out of service.
- ▶ Do not return the industrial truck to service until you have identified and rectified the fault.

Applying the Emergency Disconnect

Procedure

- Press the Emergency Disconnect switch (3) down.

All electrical functions are deactivated.



Releasing the Emergency Disconnect

Procedure

- Pull the Emergency Disconnect switch (3) up until you can feel the Emergency Disconnect switch (3) engaging.

All electrical functions are enabled and the truck is operational again (assuming the truck was operational before the Emergency Disconnect was pressed).

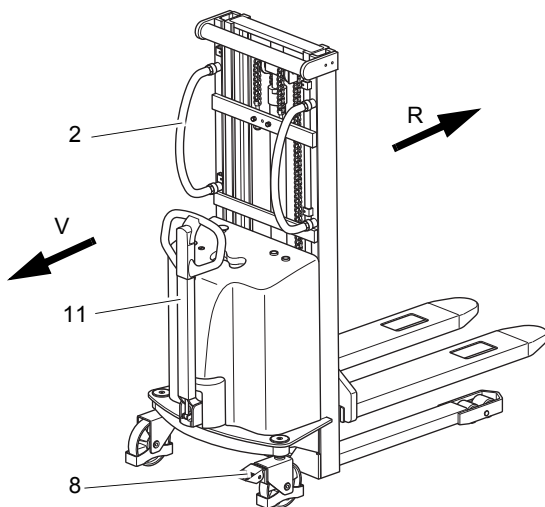
4.5 Travel

WARNING!

Collision hazard when operating the truck

Collisions with personnel and equipment can result if the truck is operated with open panels.

- Do not operate the truck unless the panels and covers are closed and properly locked.



Requirements

- Start up the truck, see "Starting up the truck" on page 37

Procedure

- Release the parking brake by applying the brake pedal (8).
- Using the push handles (2) move the truck in the reverse (R) direction.
- Push the tiller (11) down and pull the truck in the forward direction (V).

The truck can be pushed or pulled in the required direction.

4.6 Steering

Procedure

- Move the tiller (11) to the left or right.



On tight bends the tiller extends beyond the perimeter of the truck.

4.7 Brakes

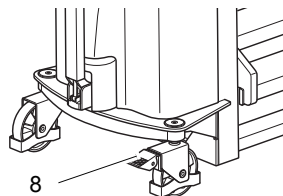
The truck's braking characteristics depend largely on the surface condition of the lanes. The operator must take this into account when travelling.

Manual braking

Procedure

- Pull or push against the direction of movement.

The truck brakes.



Braking with the parking brake

Procedure

- Applying the brake pedal (8).

The truck brakes.

4.8 Lifting, transporting and depositing loads

⚠ WARNING!

Unsecured and incorrectly positioned loads can cause accidents.

Before lifting a load unit, the driver must make sure that it has been correctly palletised and does not exceed the truck's capacity.

- ▶ Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- ▶ Only carry loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping over or falling off the truck.
- ▶ Damaged loads must not be transported.
- ▶ Never exceed the maximum loads specified on the load diagram.
- ▶ Never stand underneath a raised load handler.
- ▶ Do not stand on the load handler.
- ▶ Do not lift other people on the load handler.
- ▶ Insert the load handler as far as possible underneath the load.

NOTE

Adapt a slower speed when stacking and retrieving.

4.8.1 Raising a load

Requirements

- Load correctly palletised.
- Load weight matches the truck's capacity.
- Forks evenly loaded for heavy loads.

Procedure

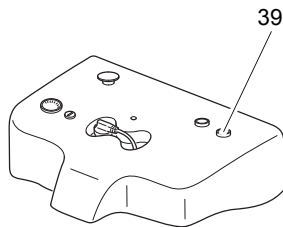
- Drive the truck carefully up to the pallet.
- Slowly insert the forks into the pallet until the fork shank touches the pallet.



The load must not extend by more than 50 mm beyond the fork tips.

- Press the "Lift" button (39) button until you reach the desired lift height.

The load is raised.



4.8.2 Transporting a load

Transporting loads

Requirements

- Load raised correctly.
- Mast lowered for transport (approx. 150 - 200 mm above the ground).
- Good ground conditions.

Procedure

- Accelerate and decelerate with care.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Travel at a constant speed.
- Watch out for other traffic at crossings and passageways.
- Always travel with a lookout at blind spots.



WARNING!

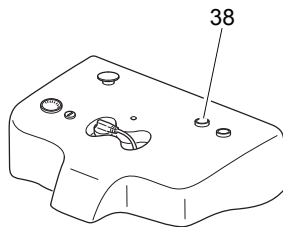
Do not negotiate slopes or inclines.

4.8.3 Depositing a load

Depositing loads

NOTE

Loads must not be deposited on travel or escape routes, in front of safety mechanisms or plant equipment that must be accessible at all times.



Requirements

- Storage location suitable for storing the load.

Procedure

- Drive the truck carefully up to the storage location.
- Apply the "lower" button (38) until the forks are clear of the load.



Do not set down the load abruptly in order to avoid damaging the load and the load handler.

- Carefully remove the forks from the pallet.

The load is deposited.

5 Troubleshooting

This chapter enables the operator to localize and rectify basic faults or the results of incorrect operation himself. When trying to locate a fault, proceed in the order shown in the remedy table.



If, after carrying out the following remedial action, the truck cannot be restored to operation or if a fault in the electronics system is displayed with a corresponding error code, contact the manufacturer's service department.

Troubleshooting must only be performed by the manufacturer's customer service department. The manufacturer has a service department specially trained for these tasks.

In order for customer services to react quickly and specifically to the fault, the following information is essential:

- Truck serial number
- Event message from the display unit (if applicable)
- Error description
- Current location of truck.

5.1 Load cannot be lifted

Possible Cause	Remedy
Emergency Disconnect pressed	Unlock the Emergency Disconnect
Key switch set to O.	Set the key switch to "I"
Hydraulic oil level too low	Checking the hydraulic oil level
Battery charge too low	Check the battery charge and charge battery if necessary.
Battery discharge monitor has switched off	Charge the battery
Faulty fuse	Check fuses
Excessive load	Note maximum capacity, see data plate.

F Industrial Truck Maintenance

1 Operational Safety and Environmental Protection

The checks and servicing operations contained in this chapter must be performed in accordance with the maintenance checklist service intervals.

WARNING!

Risk of accidents and component damage

Any modification to the truck, in particular the safety mechanisms, is prohibited.

NOTE

Only original spare parts are subject to the manufacturer's quality control. To ensure safe and reliable operation, use only the manufacturer's spare parts.

For safety reasons, only components which have been specially agreed by the manufacturer for this truck may be installed near the computer, controllers and wire guidance sensors (antennae). These components (computers, controllers, wire guidance sensors (antennae)) must therefore not be replaced by similar components from other trucks of the same series.

2 Maintenance Safety Regulations

Maintenance personnel

The truck should only be serviced and repaired by the manufacturer's specialist customer service personnel who have been trained to do this. We therefore recommend that you enter into a maintenance contract with the manufacturer's local sales office.

Lifting and jacking up

WARNING!

Lifting and jacking up the truck safely

In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose.

You may only work under a raised load handler / raised cab if they have been secured with a sufficiently strong chain or the fastening bolt.

In order to raise and jack up the truck safely, proceed as follows:

- ▶ Jack up the truck only on a level surface and prevent it from moving accidentally.
 - ▶ Always use a jack with sufficient capacity. When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
 - ▶ In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose, see "Transport and Commissioning" on page 21.
 - ▶ When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
-

CAUTION!

Fire hazard

Do not use flammable liquids to clean the industrial truck.

- ▶ Always disconnect the battery before starting cleaning work.
 - ▶ Carry out all necessary safety measures to prevent sparking before cleaning (e.g. by short-circuiting).
-

Working on the electrical system

WARNING!

Accident risk

- ▶ Only suitably trained electricians may operate on the truck's electrical system.
 - ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
 - ▶ Always disconnect the battery before starting work.
-

WARNING!

Electrical current can cause accidents

Make sure the electrical system is voltage-free before starting work on it. Before starting maintenance on the electrical system:

- ▶ Park the truck securely (see "Parking the truck securely" on page 41).
 - ▶ Press the emergency disconnect switch.
 - ▶ Disconnect the battery.
 - ▶ Remove any rings or metal bracelets, etc. before working on electrical components.
-

CAUTION!

Consumables and used parts are an environmental hazard

Used parts and consumables must be disposed of in accordance with the applicable environmental-protection regulations. Oil changes should be carried out by the manufacturer's customer service department, whose staff are specially trained for this task.

- ▶ Note the safety regulations when handling these materials.

WARNING!

The use of wheels that do not comply with the manufacturer's specifications can result in accidents

The quality of wheels affects the stability and driving characteristics of the truck.

Uneven wear affects the truck's stability and increases the stopping distance.

- ▶ After replacing wheels, make sure the truck is not skewed.
- ▶ Always replace wheels in pairs, i.e. the left- and right-hand wheels at the same time.



When replacing wheels fitted at the factory, only use the manufacturer's original spare parts. Otherwise the manufacturer's specification will not be adhered to.

NOTE

Testing and replacing hydraulic hoses

Hydraulic hoses can become brittle through age and must be checked at regular intervals. The application conditions of the industrial truck have a considerable impact on the ageing of the hydraulic hoses.

- ▶ Check the hydraulic hoses at least annually and replace if necessary.
- ▶ If the operating conditions become more arduous the inspection intervals must be reduced accordingly.
- ▶ In normal operating conditions a precautionary replacement of the hydraulic hoses is recommended after 6. The owner must carry out a risk assessment to ensure safe, prolonged use. The resulting protection measures must be observed and the inspection interval reduced accordingly.

WARNING!

Leaky hydraulic systems can result in accidents

Hydraulic oil can escape from leaky and faulty hydraulic systems.

- ▶ Report any defects immediately to your supervisor.
- ▶ Mark defective truck and take out of service.
- ▶ Do not return the industrial truck to service until you have identified and rectified the fault.
- ▶ Remove any spilled hydraulic immediately with an appropriate bonding agent.
- ▶ The bonding agent / consumable mixture must be disposed of in accordance with regulations.

 WARNING!

Faulty hydraulic hoses can result in injury and infection

Pressurised hydraulic oil can escape from fine holes or hairline cracks in the hydraulic hoses. Brittle hydraulic hoses can burst during operation. People standing near the truck can be injured by the hydraulic oil.

- ▶ Call for a doctor immediately in the event of an injury.
 - ▶ Do not touch pressurised hydraulic hoses.
 - ▶ Report any defects immediately to your supervisor.
 - ▶ Mark defective truck and take it out of service.
 - ▶ Do not return the industrial truck to service until you have identified and rectified the fault.
-

3 Lubricants and Lubrication Schedule

3.1 Handling consumables safely

Handling consumables

Consumables must always be handled correctly. Follow the manufacturer's instructions.

WARNING!

Improper handling is hazardous to health, life and the environment

Consumables can be flammable.

- ▶ Keep consumables away from hot components and naked flames.
 - ▶ Always keep consumables in prescribed containers.
 - ▶ Always fill consumables in clean containers.
 - ▶ Do not mix up different grades of consumable. The only exception to this is when mixing is expressly stipulated in the operating instructions.
-

CAUTION!

Spilled consumables can cause slipping and endanger the environment

Risk of slipping from spilled consumables. The risk is greater when combined with water.

- ▶ Do not spill consumables.
 - ▶ Spilled consumables must be removed immediately with an appropriate bonding agent.
 - ▶ The bonding agent / consumable mixture must be disposed of in accordance with regulations.
-

 WARNING!

Improper handling of oils can be hazardous

Oils (chain spray / hydraulic oil) are flammable and poisonous.

- ▶ Dispose of used oils in accordance with regulations. Store used oil safely until it can be disposed of in accordance with regulations.
 - ▶ Do not spill oil.
 - ▶ Spilled oils must be removed immediately with an appropriate bonding agent.
 - ▶ The mixture consisting of the bonding agent and oil must be disposed of in accordance with regulations.
 - ▶ Observe national regulations when handling oils.
 - ▶ Wear safety gloves when handling oils.
 - ▶ Prevent oil from coming into contact with hot motor parts.
 - ▶ Do not smoke when handling oil.
 - ▶ Avoid contact and digestion. If you swallow oil do not induce vomiting but seek medical assistance immediately.
 - ▶ Seek fresh air after breathing in oil fumes or vapours.
 - ▶ If oil has come into contact with your skin, rinse your skin with water.
 - ▶ If oil has come into contact with your eyes, rinse them with water and seek medical assistance immediately.
 - ▶ Replace oil-soaked clothing and shoes immediately.
-

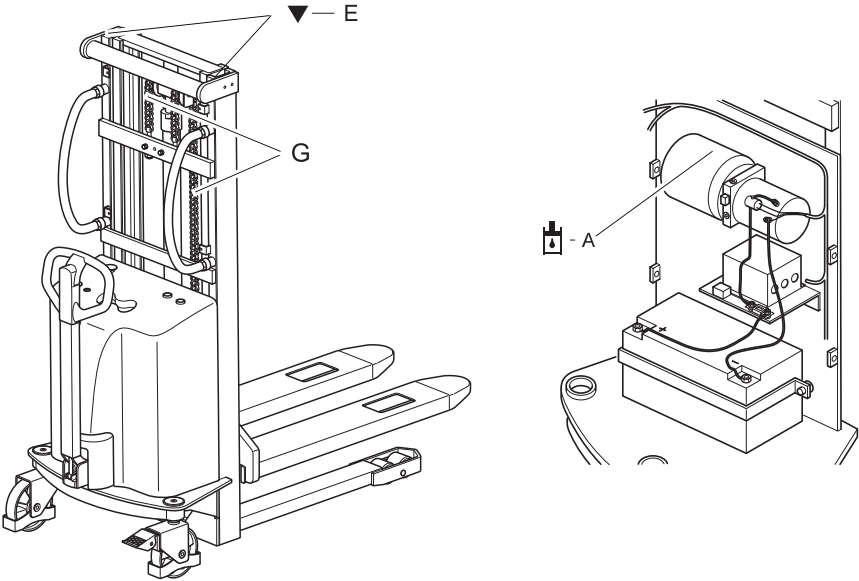
 CAUTION!

Consumables and used parts are an environmental hazard

Used parts and consumables must be disposed of in accordance with the applicable environmental-protection regulations. Oil changes should be carried out by the manufacturer's customer service department, whose staff are specially trained for this task.

- ▶ Note the safety regulations when handling these materials.
-

3.2 Lubrication Schedule



▼	Contact surfaces		
↓	Grease nipple		Hydraulic oil filler neck

3.3 Consumables

Code	Order no.	Package quantity	Component	Used for
A	50 449 669	8.0 l	HLP-B 46	Hydraulic system
E	29 202 050	1.0 kg	Grease, Polyube GA 352P	Lubrication
G	29 201 280	0.51 l	Chain spray	Chains

Grease guidelines

Code	Saponification	Dew point °C	Worked penetration at 25 °C	NLG1 class	Application temperature °C
E	Lithium	>220	280 - 310	2	-35/+120

4 Maintenance and repairs

4.1 Preparing the truck for maintenance and repairs

All necessary safety measures must be taken to avoid accidents when carrying out maintenance and repairs. The following preparations must be made:

Procedure

- Park the truck on a level surface.
- Fully lower the main and auxiliary lift.
- Park the truck securely, see "Parking the truck securely" on page 41.
- When working under a raised lift truck, secure it to prevent it from lowering, tipping or sliding away.



WARNING!

Risk of accidents when working under the load handler, driver's cab and lift truck

- ▶ When working under a raised load handler, driver's cab or a raised truck, secure them to prevent the truck from lowering, tipping or sliding away.
 - ▶ When raising the truck, follow the instructions, see "Transport and Commissioning" on page 21. When working on the parking brake, prevent the truck from accidentally rolling away (e.g. with wedges).
-

4.2 Lifting and jacking up the truck safely

WARNING!

A truck tipover can cause accidents

In order to raise the truck, use only suitable lifting gear at the points specially provided for this purpose.

- ▶ Note the weight of the truck on the data plate.
- ▶ Always use a jack with a minimum capacity of 5000 kg.
- ▶ Raise the unladen truck on a level surface.
- ▶ When raising the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

Raising and jacking up the truck securely

Requirements

- Prepare the truck for maintenance and repairs (see "Preparing the truck for maintenance and repairs" on page 56).

Tools and Material Required

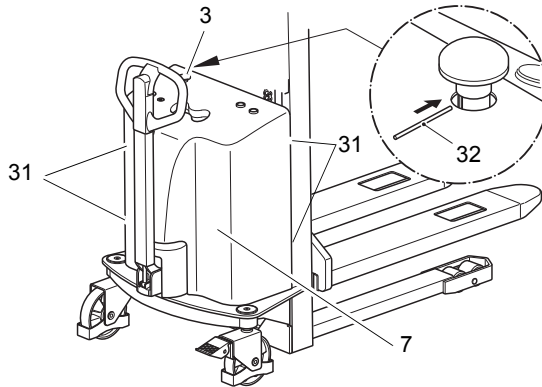
- Jack
- Hard wooden blocks

Procedure

- Place the jack against the contact point.
-  Jack contact point, see "Identification Points and Data Plates" on page 18.
- Raise the truck.
 - Support the truck with hard wooden blocks.
 - Remove the jack.

The truck is now securely raised and jacked up.

4.3 Front cover disassembly



Requirements

- Park the truck on a horizontal surface.
- Park the truck securely, see "Parking the truck securely" on page 41.

Procedure

- Removing the knob (3) from the emergency disconnect switch:
 - Prevent the switch shaft from rotating using the pin (32) and screw off the knob (3) anticlockwise.
- Loosen the screws (31).
- Remove the front cover (7).

The battery can now be accessed.

4.4 Installing the Front Panel

Procedure

- Assembly is in the reverse order to disassembly.

The front panel has been fitted.

4.5 Checking electrical fuses

Check fuses

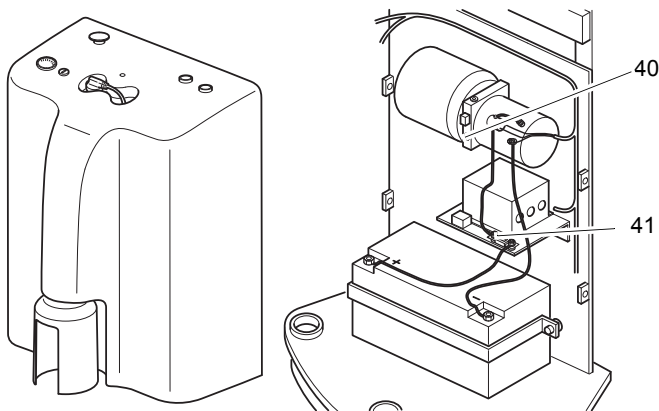
Requirements

- Truck prepared for maintenance and repairs, see "Preparing the truck for maintenance and repairs" on page 56.
- Remove the front panel, see "Front cover disassembly" on page 58.

Procedure

- Check the fuse ratings against the table and replace if necessary.

The fuses are now checked.



Item	Component	To protect	Rating (A)
40	F1	Control fuse	6
41	2F1	Power fuse	200

4.6 Restoring the truck to service after maintenance and repairs

Procedure

- Thoroughly clean the truck.
- Lubricate the truck according to the lubrication schedule, see "Lubrication Schedule" on page 55.
- Clean the battery, grease the terminals and connect the battery.
- Charge the battery, see "Charging the battery" on page 29.
- Check the transmission oil for condensation water and replace if necessary.
- Check the hydraulic oil for condensation water and replace if necessary.



The manufacturer's customer service department is specially trained to carry out these operations.



WARNING!

Faulty brakes can cause accidents

Test the brakes immediately as soon as the truck has been commissioned.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.



- Start up the truck, see "Starting up the truck" on page 37.
- If there are switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by applying them repeatedly.

5 Decommissioning the Industrial Truck

If the truck is to be out of service for more than a month, it must be stored in a frost-free and dry room. All necessary measures must be taken before, during and after decommissioning as described hereafter.

When the truck is out of service it must be jacked up so that all the wheels are clear of the ground. This is the only way of ensuring that the wheels and wheel bearings are not damaged.



Jack up the truck, see "Lifting and jacking up the truck safely" on page 57.

If the truck is to be out of service for more than 6 months, agree further measures with the manufacturer's customer service department.

5.1 Prior to decommissioning

Procedure

- Thoroughly clean the truck.

WARNING!

Faulty brakes can cause accidents

Test the brakes immediately as soon as the truck has been commissioned.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.

-
- Test the brakes.
 - Check the hydraulic oil level and replenish if necessary, see "Lubrication Schedule" on page 55.
 - Apply a thin layer of oil or grease to any non-painted mechanical components.
 - Lubricate the truck according to the lubrication schedule, see "Lubrication Schedule" on page 55.
 - Charge the battery, see "Charging the battery" on page 29.
 - Disconnect the battery, clean it and grease the terminals.



In addition, follow the battery manufacturer's instructions.

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

5.2 During decommissioning

NOTE

Full discharge can damage the battery

Self-discharge can cause the battery to fully discharge. Full discharge shortens the useful life of the battery.

- ▶ Charge the battery at least every 2 months.



Charge the battery, see "Charging the battery" on page 29.

5.3 Restoring the truck to service after decommissioning

WARNING!

Faulty brakes can cause accidents

Test the brakes immediately as soon as the truck has been commissioned.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.

Procedure

- Thoroughly clean the truck.
- Lubricate the truck according to the lubrication schedule, see "Lubrication Schedule" on page 55.
- Clean the battery, grease the terminals and connect the battery.
- Charge the battery, see "Charging the battery" on page 29.
- Check the hydraulic oil for condensation water and replace if necessary.
- The manufacturer's customer service department is specially trained to carry out these operations.
- Start up the truck, see "Starting up the truck" on page 37.
- If there are switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by applying them repeatedly.

6 Safety tests to be performed at intervals and after unusual incidents

The truck must be inspected at least annually (refer to national regulations) or after any unusual event by a qualified inspector. The manufacturer offers a safety inspection service which is performed by personnel specifically trained for this purpose.

A complete test must be carried out on the technical condition of the truck with regard to safety. The truck must also be examined thoroughly for damage.

The operating company is responsible for ensuring that faults are rectified immediately.

7 Final de-commissioning, disposal



Final de-commissioning or disposal of the truck must be performed in accordance with the regulations of the country of use. In particular, regulations governing the disposal of batteries, consumables and electronic and electrical systems must be observed.

The truck must only be disassembled by trained personnel in accordance with the procedures as specified by the manufacturer.

8 Servicing and Inspection

WARNING!

Lack of maintenance can result in accidents

Failure to perform regular servicing can lead to truck failure and poses a potential hazard to personnel and equipment.

► Thorough and expert servicing is one of the most important requirements for the safe operation of the industrial truck.

The application conditions of an industrial truck have a considerable impact on component wear. The following service intervals are based on single-shift operation under normal operating conditions. They must be reduced accordingly if the equipment is to be used in conditions of extreme dust, temperature fluctuations or multiple shifts.

NOTE

To prevent damage due to wear, the manufacturer recommends an on-site application analysis to agree on appropriate service intervals.

The following maintenance checklist lists the activities to be performed and the respective intervals to be observed. Maintenance intervals are defined as:

- W = Every 50 service hours, at least weekly
- A = Every 500 service hours
- B = Every 1000 service hours, or at least annually
- C = Every 2000 service hours, or at least annually
- = Standard maintenance interval
- * = Cold store maintenance interval (in addition to standard maintenance interval)



"W" maintenance interval operations should be performed by the operating company.

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

9 Maintenance checklist

		Maintenance intervals			
		Standard = ●	W	A	B C
Brakes					
1.1	Test brakes and adjust if necessary.			●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Electrical system					
2.1	Test warning and safety devices in accordance with operating instructions.			●	
2.2	Test cables and motor attachments.			●	
2.3	Test instruments, displays and control switches.			●	
2.4	Test Emergency Disconnect switch.			●	
2.5	Check contactors and relays.			●	
2.6	Check fuse ratings.			●	
2.7	Carry out a frame leakage test.			●	
2.8	Make sure wire connections are secure and check for damage.			●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Power Supply					
3.1	Visually inspect battery and battery components.			●	
3.2	Check battery cable connections are secure, grease terminals if necessary.			●	
3.3	Check battery voltage.			●	
3.4	Visually inspect the mains connector and mains cable			●	
3.5	Check wires and electrical connections are secure			●	
3.5	Measure potential on chassis while charging is in progress (all trucks with on-board chargers)			●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Travel					
4.1	Check wheel suspension and attachment.			●	
4.2	Check wheels for wear and damage.			●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Chassis and superstructure					
5.1	Check the doors and covers.			●	
5.2	Check labels are present and complete.			●	
5.3	Check chassis and screw connections for damage.			●	
5.4	Check mast attachment / mounting.			●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Hydraulic Operation					
6.1	Test the "hydraulic function" controls and make sure the labels are present and complete.			●	
6.2	Check cylinders and piston rods for damage and leaks, and make sure they are secure.			●	
6.3	Check settings and wear levels of slide pieces and stops, and adjust if necessary.			●	
6.4	Visually inspect the mast rollers and check contact surface wear level.			●	
6.5	Check that hose and pipe lines and their connections are secure, check for leaks and damage.			●	
6.6	Check load chain setting and tension if necessary.			●	
6.7	Check lateral clearance of mast connections and of load handler.			●	
6.8	Test the hydraulic system.			●	
6.10	Check hydraulic oil level and top up if necessary.			●	
6.11	Replace the hydraulic oil.			●	
6.12	Check tie / plunger rods.			●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Agreed performance levels					
7.1	Carry out a test run with rated load.			●	
7.2	Demonstration after servicing.		*	●	
7.3	Lubricate truck according to the lubrication schedule.		*	●	

		Maintenance intervals			
		Standard = ●	W	A	B C
Steering					
8.1	Check tiller recuperating function.			●	
8.2	Check the steering head bearings, steering play and steering tothing and/or steering chain. Lubricate the steering tothing and/or steering chain.			●	

A Traction Battery Appendix

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1 Correct Use and Application

Failure to observe the operating instructions, carrying out repairs with non-original spare parts, tampering with the battery or using electrolyte additives will invalidate the warranty.

Observe the instructions for maintaining the safety rating during operation for batteries in accordance with Ex I and Ex II (see relevant certification).

2 Data plate

1,2

Type
type

48 V 5 PzS 775

Produktionswoche/-jahr
Week/Year of Manufacture

40/2012

3

4

Serien-Nr.
Serial-No

80882194

Lieferanten Nr.
Supplier-No

17769

5

6

Nennspannung
Nominal Voltage

48 V

Kapazität C5
Capacity C5

775 Ah

7

8

Zellenanzahl
Number of Cells

24

Gewicht ± 5%
Weight ± 5%

1118 kg

9

10

Sachnummer
Part-No

50297157

Säuremenge
Acid volume

189,4 l

15

11

Hersteller
Manufacturer

Jungheinrich AG, 22039 HAMBURG, GERMANY

13

12



14



1	Battery name
2	Battery type
3	Production week/year manf.
4	Serial number
5	Supplier number
6	Rated voltage
7	Rated capacity
9	Battery weight in kg
8	Number of cells
15	Electrolyte volume in litres
10	Battery number
11	Manufacturer
13	Manufacturer's logo
12	CE mark only for batteries beyond 75 volts
14	Safety instructions and warning information

3 Safety Instructions, Warning Indications and other Notes

 	Used batteries must be treated as hazardous waste. These batteries are marked with the recycling symbol and the sign showing a crossed-out rubbish bin, and should not be disposed of with ordinary household waste. Buy-back terms and type of recycling are to be agreed with the manufacturer as described in § 8 of the battery legislation.
	Do not smoke! No naked flames, glowing embers or sparks near the battery - fire and explosion hazard!
	Avoid fire and explosion hazards and short circuits due to overheating! Keep away from naked flames and strong heat sources.
	Always wear protective clothing (e.g. safety goggles and safety gloves) when working on cells and batteries. Always wash your hands after completing the work. Use insulated tools only. Do not physically alter the battery, strike, crush, compress, notch, dent or modify it in any way.
	Hazardous electric voltage! The metal parts of the battery cells are permanently live. Therefore do not place any foreign objects or tools on the battery. Observe national health and safety regulations.
	If the materials leak, do not inhale the fumes. Wear safety gloves.
	Follow the user instructions and keep them in a visible position in the charging area. Work on the batteries should be performed only as instructed by specialist personnel.

4 Lead acid batteries with armour plated cells and liquid electrolyte

4.1 Description

Jungheinrich traction batteries are lead acid batteries with armour plated cells and liquid electrolyte. The names of the traction batteries are PzS, PzB, PzS Lib and PzM.

Electrolyte

The rated density of the electrolyte assumes a temperature of 30°C and the rated electrolyte level is fully charged. Higher temperatures will reduce, lower temperatures will increase the electrolyte density. The adjustment factor is ± 0.0007 kg/l per K, e.g. electrolyte density 1.28 kg/l at 45°C corresponds to a density of 1.29 kg/l at 30°C.

The electrolyte must conform to DIN 43530 Part 2 purity regulations.

4.1.1 Battery nominal data

1.	Product	Traction battery
2.	Nominal voltage	2.0 V x no. of cells
3.	Rated capacity C5	See data plate
4.	Discharge current	C5/5h
5.	Nominal electrolyte density ¹	1.29 kg/l
6.	Nominal temperature ²	30 °C
7.	System rated electrolyte level	up to "Max" electrolyte level marking
	Limit temperature ³	55°C

1. Reached within the first 10 cycles.

2. Higher temperatures shorten the useful life, lower temperatures reduce the available capacity.

3. Not permissible as operating temperature.

4.2 Operation

4.2.1 Commissioning unfilled batteries



The operations required must be carried out by the manufacturer's customer service department or a customer service organisation authorised by the manufacturer.

4.2.2 Commissioning filled and charged batteries

Checks and operations to be performed before starting daily work

Procedure

- Make sure the battery is in physically good condition.
- Make sure the terminals are correct (positive to positive and negative to negative) and check that contacts on the battery terminal conducting system are secure.
- Check the terminal screw torques ($M_{10} = 23 \pm 1 \text{ Nm}$) of the terminal conductors and connectors.
- Charge up the battery.
- Check the electrolyte level.



The electrolyte level must be above the cell baffle or the top of the separator.

- Add electrolyte with distilled water up to the nominal level.

Checks completed.

4.2.3 Discharging the battery



To achieve an optimum useful life avoid operational discharge of more than 80% of nominal capacity (full discharge). This corresponds to a minimum electrolyte density of 1.13 kg/l at the end of the discharge. Recharge a discharged battery immediately.

4.2.4 Charging the battery

WARNING!

The gases produced during charging can cause explosions

The battery gives off a mixture of oxygen and hydrogen (electrolytic gas) during charging. Gassing is a chemical process. This gas mixture is highly explosive and must not be ignited.

- ▶ Always disconnect the charger and truck before connecting or disconnecting the charger and battery.
- ▶ The charger must be adapted to the battery in terms of voltage, charge capacity and battery technology.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶ Battery cell surfaces must remain exposed during charging in order to ensure sufficient ventilation, see truck operating instructions, chapter D, Charging the Battery.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2 m from the truck.
- ▶ Fire protection equipment must be available.
- ▶ Do not place any metallic objects on the battery.
- ▶ Always follow the safety regulations of the battery and charger station manufacturers.

NOTE

The battery must only be charged with DC current. All charging processes in accordance with DIN 41773 and DIN 41774 are permissible.

- The electrolyte temperature rises by approx. 10 K during charging. Charging should therefore only begin when the electrolyte temperature is below 45°C. The electrolyte temperature of batteries must be at least +10°C before charging. Otherwise the battery will not charge correctly. Below 10°C the battery is insufficiently charged with standard charging systems.

Charging the battery

Requirements

- Electrolyte temperature min. 10°C to max. 45°C

Procedure

- Open or take off the tray lid or covers from the battery compartment.
- Deviations are outlined in the truck's operating instructions. The plugs remain on the cells or remain closed.
- Connect the battery to the switched off charger, ensuring the terminals are connect (positive to positive and negative to negative).
- Switch on the charger.

Battery charged

- *Charging is considered to be complete when the electrolyte density and battery voltage remain constant for more than 2 hours.*

Compensation charging

Compensation charging is used to ensure the useful life and maintain capacity after full discharge and repeated insufficient charging. The maximum compensation charge current is 5 A/100 Ah rated capacity.

- Compensation charging should be carried out weekly.

Trickle charging

Battery trickle charging is partial charging that extends the daily application time. Higher average temperatures occur during trickle charging which reduce the useful life of the batteries.

- Trickle charges should only be performed when the charge level is below 60 %. Use replacement batteries instead of regular trickle charging.

4.3 Servicing lead-acid batteries with armour plated cells

Water quality

- The quality of the water used to fill up electrolyte must correspond to purified or distilled water. Purified water can be produced through distillation or ion exchangers and is then suitable for the production of electrolyte.

4.3.1 Daily

- Charge the battery after each discharge.
- After charging, check the electrolyte level.
- If necessary, add purified water up to the rated level after charging.

- The height of the electrolyte level should not be below the cell baffle or above the top of the separator, or the "Min" and "Max" electrolyte markings respectively.

4.3.2 Weekly

- After re-charging, carry out a visual inspection for dirt and physical damage.
- If the battery is charged regularly according to the IU characteristic, carry out a compensation charge.

4.3.3 Monthly

- Towards the end of the charging process measure and record the voltages of all the cells with the charger switched on.
- After charging measure and record the electrolyte density and the electrolyte temperature in all the cells.
- Compare the results with the previous ones.

- If you find significant differences compared with the previous measurements or differences between the cells, contact the manufacturer's customer service department.

4.3.4 Annually

- Measure the truck insulation resistance in accordance with EN 1175-1.
- Measure the battery insulation resistance in accordance with EN 1987-1.

- In accordance with DIN EN 50272-3 the battery insulation resistance should not be less than 50 Ω per volt of rated voltage.

5 PzV and PzV-BS lead-acid batteries with sealed armour plated cells

5.1 Description

PzV batteries are sealed batteries with fixed electrolytes, to which no water can be added over the entire lifespan of the battery. Relief valves are used as plugs which are destroyed when opened. During operation the same safety requirements apply to the sealed batteries as for batteries with liquid electrolyte. This is to avoid electric shock, explosion of the electrolyte charging gases or hazardous electrolyte burns if the cell vessels are destroyed.



PzV batteries are low gassing, but not gassing-free.

Electrolyte

The electrolyte is sulphuric acid which is fixed in gel. The density of the electrolyte cannot be measured.

5.1.1 Battery nominal data

1.	Product	Traction battery
2.	Nominal voltage	2.0 V x no. of cells
3.	Rated capacity C5	See data plate
4.	Discharge current	C5/5h
5.	Rated temperature	30 °C
	Limit temperature ¹	45°C, not permissible as operating temperature.
6.	Rated density of the electrolyte	Cannot be measured
7.	System rated electrolyte level	Cannot be measured

1. Higher temperatures shorten the useful life, lower temperatures reduce the available capacity.

5.2 Operation

5.2.1 Commissioning

Checks and operations to be performed before starting daily work

Procedure

- Make sure the battery is in physically good condition.
- Make sure the terminals are correct (positive to positive and negative to negative) and check that contacts on the battery terminal conducting system are secure.
- Check the terminal screw torques ($M_{10} = 23 \pm 1 \text{ Nm}$) of the terminal conductors and connectors.
- Re-charge the battery.
- Charge the battery.

Check completed.

5.2.2 Discharging the battery



To achieve an optimum useful life avoid operational discharges of more than 60% of nominal capacity.



If the battery is discharged during operation by more than 80% of rated capacity the useful life of the battery will reduce significantly. Fully or partially discharged batteries must be re-charged immediately and not left unattended.

5.2.3 Charging the battery



WARNING!

The gases produced during charging can cause explosions

The battery gives off a mixture of oxygen and hydrogen (electrolytic gas) during charging. Gassing is a chemical process. This gas mixture is highly explosive and must not be ignited.

- ▶ Always disconnect the charger and truck before connecting or disconnecting the charger and battery.
- ▶ The charger must be adapted to the battery in terms of voltage, charge capacity and battery technology.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶ Battery cell surfaces must remain exposed during charging in order to ensure sufficient ventilation, see truck operating instructions, chapter D, Charging the Battery.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2 m from the truck.
- ▶ Fire protection equipment must be available.
- ▶ Do not place any metallic objects on the battery.
- ▶ Always follow the safety regulations of the battery and charger station manufacturers.

NOTE

Charging the battery incorrectly can result in material damage.

Incorrect battery charging can result in overloading of the electric wires and contacts, hazardous gas formation and electrolyte leakage from the cells.

- ▶ Always charge the battery with DC current.
 - ▶ All DIN 41773 charging procedures are permitted in the format approved by the manufacturer.
 - ▶ Always connect the battery to a charger that is appropriate to the size and type of the battery.
 - ▶ If necessary have the charger checked by the manufacturer's customer service department for suitability.
 - ▶ Do not exceed limit currents in the gassing area in accordance with DIN EN 50272-3.
-

Charging the battery

Requirements

- Electrolyte temperature between +15°C and 35°C

Procedure

- Open or take off the tray lid or covers from the battery compartment.
- Connect the battery to the switched off charger, ensuring the terminals are connect (positive to positive and negative to negative).
- Switch on the charger.

- The electrolyte temperature rises by approx. 10 K during charging. If the temperatures are permanently higher than 40°C or lower than 15°C, a temperature-dependent constant voltage control of the charger is required. The adjustment factor must be applied with -0.004 V/C per K.

Battery charged

- *Charging is considered to be complete when the electrolyte density and battery voltage remain constant for more than 2 hours.*

Compensation charging

Compensation charging is used to ensure the useful life and maintain capacity after full discharge and repeated insufficient charging.

- Compensation charging should be carried out weekly.

Trickle charging

Battery trickle charging is partial charging that extends the daily application time. Higher average temperatures occur during trickle charging which can reduce the useful life of the batteries.

- Trickle charges should only be performed when the charge level is below 50%. Use replacement batteries instead of regular trickle charging.
- Avoid trickle charging with PzV batteries.

5.3 Servicing PzV and PzV-BS lead-acid batteries with sealed armour plated cells



Do not add water!

5.3.1 Daily

- Charge the battery after each discharge.

5.3.2 Weekly

- Visually inspect for dirt and physical damage.

5.3.3 Every three months

- Measure and record the overall voltage.
- Measure and record the individual voltages.
- Compare the results with the previous ones.



Carry out the measurements after full charging and subsequent resting for at least 5 hours.



If you find significant differences compared with the previous measurements or differences between the cells, contact the manufacturer's customer service department.

5.3.4 Annually

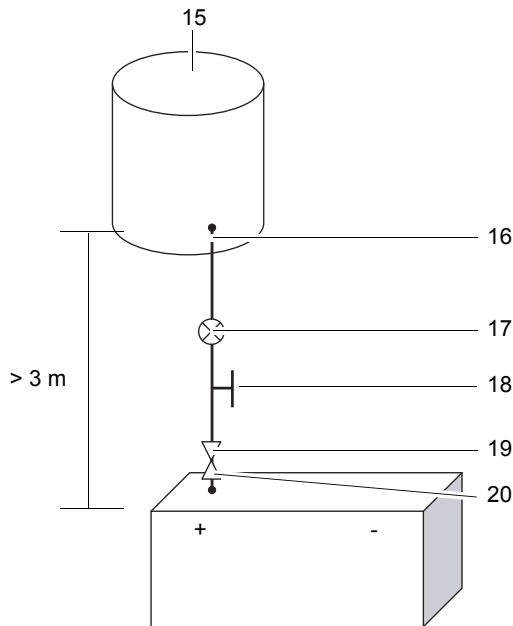
- Measure the truck insulation resistance in accordance with EN 1175-1.
- Measure the battery insulation resistance in accordance with EN 1987-1.



In accordance with DIN EN 50272-3 the battery insulation resistance should not be less than 50 Ω per volt of rated voltage.

6 Aquamatik water replenishment system

6.1 Water replenishment system design



15	Water container
16	Tap connection with ball cock
17	Flow indicator
18	Shut-off cock
19	Locking coupling
20	Battery lock connector

6.2 Functional Description

The Aquamatik water replenishment system is used to adjust the rated electrolyte level automatically on traction batteries for industrial trucks.

The battery cells are interconnected through hoses and are attached to the water supply (e.g. water container) through a plug connection. When the shut-off cock is opened all the cells are filled with water. The Aquamatik plug controls the amount of water required and, at the relevant water pressures, ensures the water supply is shut off and the valve is closed securely.

The plug systems have an optical level indicator, a diagnostic port to measure the temperature and electrolyte density and a degassing port.

6.3 Adding water

Water should be added to the batteries just before the battery is fully charged. This ensures that the amount of water added is mixed with the electrolyte.

6.4 Water pressure

The water replenishment system must be operated with a water pressure in the water line of 0.3 bar - 1.8 bar. Any deviations from the permissible pressure ranges will affect the operation of the systems.

Water drop

Assembly height above battery surface is between 3 - 18 m. 1 m corresponds to 0.1 bar

Pressure water

The pressure regulating valve is adjusted to suit the system and must lie between 0.3 - 1.8 bar.

6.5 Filling time

The filling time for a battery depends on the electrolyte level, the ambient temperature and the filling pressure. Filling ends automatically. The water supply line must be disconnected from the battery when the water has been filled.

6.6 Water quality



The quality of the water used to fill up electrolyte must correspond to purified or distilled water. Purified water can be produced through distillation or ion exchangers and is then suitable for the production of electrolyte.

6.7 Battery tubing

The tubing of the individual plugs is in accordance with the existing electric circuit. No changes should be made.

6.8 Operating temperature

Batteries with automatic water replenishment systems should only be stored in rooms with temperatures $> 0^{\circ}\text{C}$, as otherwise the systems could freeze.

6.9 Cleaning measures

The plug systems must only be cleaned with purified water in accordance with DIN 43530-4. No parts of the plugs must come into contact with solvent-based materials or soap.

6.10 Service mobile vehicle

Mobile water filling vehicle with pump and filling gun to fill individual cells. The immersion pump in the container generates the necessary filling pressure. The service mobile must be at exactly the same height as the battery base.

7 Electrolyte circulation

7.1 Functional Description

Electrolyte circulation ensures the supply of air during charging to mix the electrolyte, thereby preventing any acid layer, shortening the charge time (charge factor approx. 1.07) and reducing the formation of gas during charging. The charger must be suitable for the battery and electrolyte circulation.

A pump in the charger produces the necessary compressed air which is introduced to the battery cells via a hose system. The electrolyte is circulated via the inlet air and the electrolyte density level is constant over the entire length of the electrode.

Pump

In the event of a fault, e.g. if the pressure control system responds for an unknown reason, the filters must be checked and replaced if necessary.

Battery connection

A hose is attached to the pump module which together with the charge leads is routed from the charger to the charging connector. The air is passed on to the battery via the electrolyte circulation coupling ducts in the connector. When routing make sure the hose is not bent.

Pressure monitoring module

The electrolyte circulation pump is activated when charging begins. The pressure monitoring module monitors the build up of pressure during charging. This ensures that the required air pressure is provided for electrolyte circulation charging.

In the event of malfunctions such as:

- Battery air coupling not connected to circulation module (if coupling is separate) or faulty.
- Leaky or faulty hose connections on battery or
- Intake filter contaminated

a visual error message appears on the charger.

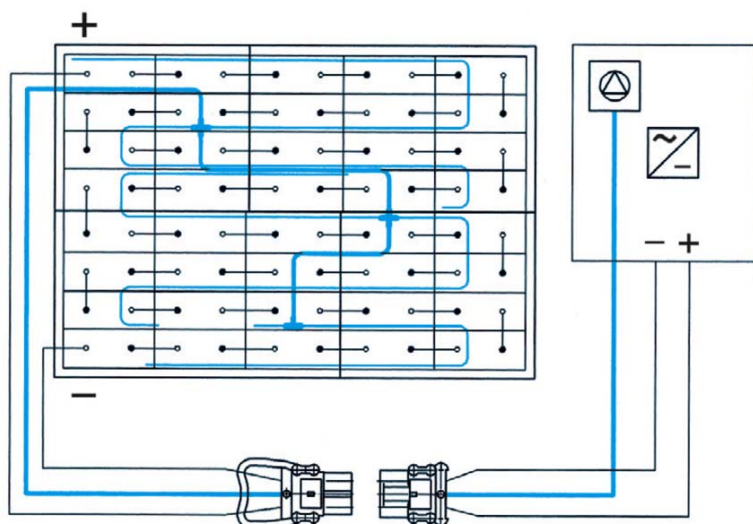
NOTE

If an installed electrolyte circulation system is seldom used or not used at all, or if the battery is subjected to severe temperature fluctuations, the electrolyte may flow back into the hose system.

► Attach a separate coupling system to the air inlet line, such as: locking coupling on the battery side and through-coupling on the air supply side.

Schematic illustration

Electrolyte circulation on the battery and air supply via the charger.



8 Cleaning batteries

Batteries and trays must be cleaned in order to

- maintain cell insulation and protect cells from ground or external conductive parts.
- Avoid damage from corrosion and stray currents.
- Avoid excessive and varying automatic discharge of the individual cells or block batteries due to stray currents.
- Avoid electric sparking due to stray currents.

When cleaning the batteries make sure that:

- The assembly site chosen for cleaning is close to a drainage system for processing the electrolytic rinsing water.
- All health and safety as well as water and waste disposal regulations are observed when disposing of used electrolyte or rinsing water.
- Protective goggles and clothing are worn.
- Cell plugs are not removed or opened.
- Clean the plastic components of the battery, in particular the cell containers, only with water or water-based cloths without any additives.
- After cleaning, the top of the battery is dried with suitable equipment, e.g. compressed air or cloths.
- Any fluid that has entered the battery box must be suctioned off and disposed of in accordance with the above-mentioned regulations.

Cleaning the battery with a high pressure cleaner

Requirements

- Cell connectors tight, plugged in securely
- Cell plugs closed

Procedure

- Follow the high pressure cleaner's user instructions.
- Do not use any cleaning additives.
- Observe the permissible cleaning device temperature setting of 140°C.
- This generally ensures that the temperature does not exceed 60°C at a distance of 30cm behind the outlet nozzle.
- Observe the maximum operating pressure of 50 bar.
- Observe a minimum distance of 30 cm from the top of the battery.
- The battery should be sprayed over its entire surface to avoid localised overheating.
- Do not clean one spot for more than 3 seconds with the jet to avoid exceeding the maximum battery surface temperature of 60°C.
- After cleaning dry the battery surface with suitable materials e.g. compressed air or cleaning cloths.

Battery cleaned.

9 Storing the battery

NOTE

The battery should not be stored for longer than 3 months without charging as otherwise it will no longer be functional.

If the battery is to be taken out of service for a long period, it should be stored fully charged in a dry room protected from frost. To ensure the availability of the battery the following charges can be selected:

- Monthly compensation charge for PzS and PzB batteries or 3-monthly full charge for PzV batteries.
- Trickle charge for a charge voltage of 2.23 volts x no. of cells for PzS, PzM and PzB batteries or 2.25 volts x no. of cells for PzV batteries.

If the battery is to be taken out of service for a long period (> 3 months), it should, as far as possible, be charged to 50% of its charge level and stored in a dry room protected from frost.

10 Troubleshooting

If any faults are found on the battery or charger, contact the manufacturer's customer service department immediately.



The operations required must be carried out by the manufacturer's customer service department or a customer service organisation authorised by the manufacturer.

11 Disposal

Batteries marked with the recycling symbol and the sign showing a crossed-out rubbish bin should not be disposed of with ordinary household waste.

Buy-back terms and type of recycling are to be agreed with the manufacturer as described in § 8 of the battery legislation.

