# EJE 114 / 116 / 118 / 120

04.17

# Operating instructions

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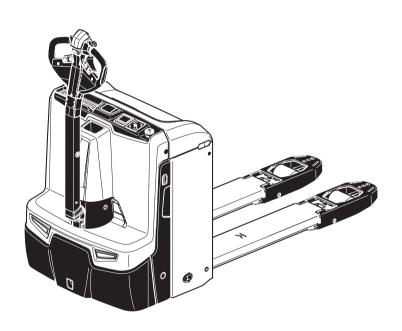


EJE 114

**EJE 116** 

**EJE 118** 

EJE 120





# **Declaration of Conformity**



Jungheinrich AG, Friedrich-Ebert-Damm 129, 22047 Hamburg, Germany Manufacturer or agent acting in the European Union

Model	Option	Serial no.	Year of manufacture
EJE 114			
EJE 116			
EJE 118			
EJE 120			

#### Additional information

On behalf of

Date

## (GB) EC Declaration of Conformity

The undersigned hereby declare that the powered industrial truck described below in detail complies with the European Directives 2006/42/EG (Machinery Directive) and 2014/30/EU (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 authorised 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
  - O Indicates optional equipment

# Copyright

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# Jungheinrich Aktiengesellschaft

Friedrich-Ebert-Damm 129 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

### **↑** CAUTION!

The maximum load and load distance are indicated on the load chart 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 raised fully at the back of the fork carriage, centrally between the load fork

- Lifting and lowering loads.
- Stacking and retrieving loads.
- Transporting raised loads.
- Do not carry or lift passengers.
- Do push or pull load units.

# 3 Approved application conditions

- Operation in industrial and commercial environments.
- Permissible temperature range 5°C to 40°C.
- Operation only on secure, level surfaces with sufficient capacity.
- Do not exceed the permissible surface and point loading on the travel paths.
- Operation only on travel paths that are clearly visible and approved by the operating company.
- Negotiating slopes up to a maximum of 20 % (without load).
- Do not travel across or at an angle on slopes. Transporting with the load facing uphill.
- Operation in partially public traffic.

#### **↑** WARNING!

#### Use under extreme conditions

Using the truck under extreme conditions can result in malfunctions and accidents.

- ► Special equipment and authorisation are required if the truck is to be constantly used in extreme conditions, especially in dusty or corrosive atmospheres.
- ▶ The truck cannot be used in areas at risk of explosion.
- ► In adverse weather conditions (thunder, lightning) the industrial truck must not be operated outside or in endangered areas.
- **→** T

The permissible operating conditions change if the truck is equipped with a lithium ion battery  $(\bigcirc)$ , see "Li-lon Battery 24V - 240Ah / 360Ah" operating instructions.

# 3.1 Internal Operation Combined with Brief External or Cold Store Operation (●)

In addition to the permissible application conditions in industrial and commercial environments, the truck may also be used in outdoor environments, cold stores and fresh food areas. Secure parking is only permissible indoors or in a cold store environment

- Permissible temperature range 5°C to 40°C.
- Secure parking is only permissible at +5°C to 40°C.
- Maximum air humidity 95% non-condensing.
- The application areas can be changed, but in general this should be minimised due to thawing and possible corrosion.
- Thawing is permissible only if the truck can be subsequently dried thoroughly.
- Do not charge the battery below +5°C.
- Optional, specially adapted equipment variants for outdoor use are available.

## 3.2 Internal Operation in Cold Stores with Cold Store Equipment (○)

In addition to the permissible operating conditions in industrial and commercial environments, the truck remains primarily in cold stores. The truck should only leave the cold store briefly to hand over a load.

- Permissible temperature range -28°C to +25°C.
- Maximum air humidity 95% non-condensing.
- Thawing is permissible only if the truck can be subsequently dried thoroughly.
- In cold store areas below 5°C the truck must be operated permanently and should not be parked securely for more than 15 minutes.
- Do not charge the battery below +5°C.

#### NOTE

#### **Battery damage**

As the temperature becomes increasingly cold, the battery can be damaged if the battery charge is low.

- ▶ If the battery charge is low do not use the truck in areas of -28°C to -5°C.
- ► If the battery charge is low it is preferable not to use the truck in areas of -5°C to +5°C.
- ► Charge the battery, see page 34.

# 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.

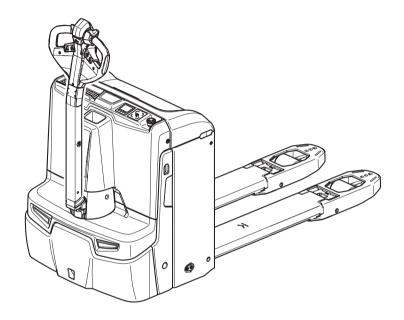
# 5 Adding attachments and/or accessories

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

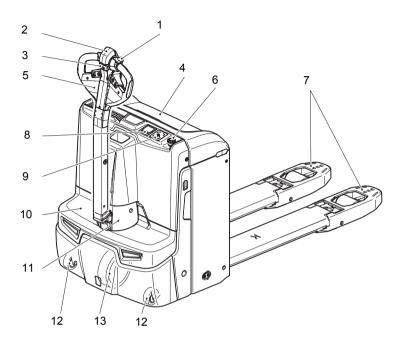
# 1 Application

The EJE 114 / 116 / 118 / 120 is designed to transport goods on level surfaces. It can lift open-bottom pallets or pallets with transverse boards outside area the load-wheel area, as well as roll cages. The capacity is shown on the capacity plate, Qmax.



# 2 Assemblies and Functional Description

# 2.1 Assembly Overview



Ite m		Model	Ite m		Model
2	•	Collision safety switch	8	•	Discharge indicator
1	•	Travel switch		0	Display unit (2-inch display)
			9	•	Key switch
3	•	Slow travel button		0	Keypad
				0	Transponder reader
5	•	Tiller		0	ISM Online
4	•	Battery panel	10	•	Front panel
6	•	Emergency disconnect switch	11	•	Tiller hood
7	•	Fork arms	12	•	Support wheels
			13	•	Drive wheel
	•	= Standard equipment		(	○ = Optional equipment

### 2.2 Functional Description

#### Safety mechanisms

- An enclosed, smooth truck geometry with rounded edges ensures safe handling of the truck.
- The wheels are surrounded by a solid skirt offering collision protection.
- Activating the emergency disconnect switch cuts out all electrical functions and lift operations in hazardous situations.

#### Collision safety switch

When travelling in the drive direction, the collision safety switch changes the travel direction if the truck comes into contact with a person.

The truck brakes, travels away from the operator for 3 s and stops. This prevents the truck driving into the operator.

#### **Emergency Stop safety feature**

- The emergency stop is activated by the traction controller.
- Each time the truck is switched on the system performed an automatic diagnosis.

#### Operator position

All travel and lift operations can be performed without having to reach.

#### Hydraulic system

Pressing the lifting button starts the pump unit, supplying hydraulic oil from the oil reservoir to the lift cylinder. Pressing the lifting button raises the load handler at a constant speed; pressing the lowering button lowers the load handler.

### Drive system

- An AC three-phase motor actuates the drive wheel via a gearbox.
- The electronic traction controller ensures smooth speed control of the drive motor and hence smooth starting, powerful acceleration and electrically controlled braking with energy recovery.
- The driver can choose from 3 travel programs depending on the load and the environment: from high-performance to energy-saving (mini display option).

#### Steering

- The driver steers with an ergonomic control handle.
- The drive system can be pivoted +/- 90°.

#### **Electrical system**

- 24 volt system.
- Electronic traction control is standard.

#### Controls and displays

The battery discharge indicator shows the available battery capacity. The optional display shows the operator key information such as the travel program, service hours, battery capacity and event messages.

#### 2.2.1 Hourmeter

Prepare the truck for operation, see page 53 or see page 78.

Service hours are counted while the truck is operational and one of the following controls is applied:

- Tiller in travel zone "F", see page 59.
- "Slow travel button", see page 60.
- "Lift" button, see page 63.
- "Lower" button, see page 63.

### 2.2.2 Explanation of travel programs

All trucks in the ERE series are supplied with a pre-set travel program ex works. The information on the data sheet relates to travel program 2.

Travel program 1: reduced top speed, reduced acceleration.

Travel program 2: standard travel program.

Travel program 3: increased acceleration, maximum braking.

# 3 Technical Specifications

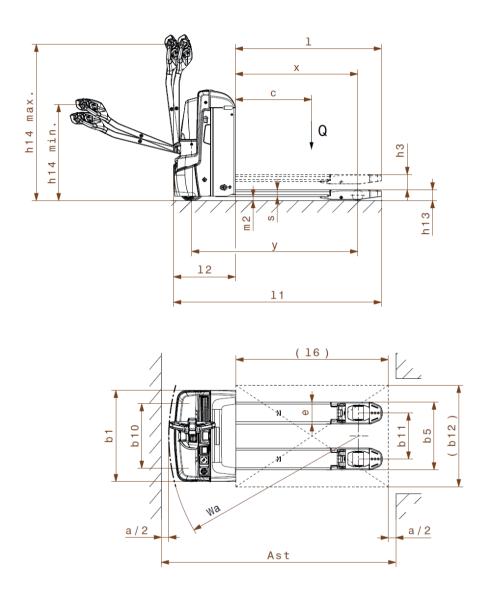
Technical data specified in accordance with VDI 2198. Technical modifications and additions reserved.

# 3.1 Performance data

	Model	EJE 114	EJE 116	EJE 118	EJE 120	
Q	Rated capacity	1400	1600	1800	2000	kg
С	Load centre distance for standard fork length *)	600	600	600	600	mm
	Travel speed with/without rated load	5.0/5.0	6.0/6.0	6.0/6.0	6.0/6.0	km/h
	Lift speed with/without rated load	0.04/0.04	0.04/0.04	0.04/0.04	0.04/0.04	m/s
	Lowering speed with/without rated load	0.05/0.04	0.05/0.04	0.05/0.04	0.05/0.04	m/s
	Max. gradeability (5 min) with/without rated load	8/20	10/20	9/20	8/20	%

<sup>\*)</sup> For longer fork lengths the load centre of gravity is in the centre of the forks

# 3.2 Dimensions



	Model	EJE 114/116/118/120	
h3	Lift	122	mm
h13	Load handler lowered	85	mm
h14	Tiller height in the travel position min./max.	750/1237	mm
Υ	Wheelbase (S/M/L)	1252/1321/1393 <sup>1.2</sup>	mm
11	Overall length (S/M/L)	1636/1705/1777 <sup>2</sup>	mm
12	Length including fork shank (S/M/L)	486/555/627	mm
I	Standard fork length	1150	mm
b1	Fork width	720	mm
b5	Width across forks	513 (EJE 114)/535	mm
b10	Front track	500 (EJE 114)/510	mm
b11	Track width, rear	363	mm
е	Fork width	150 (EJE 114)/172	mm
s	Fork thickness	55	mm
m2	Ground clearance, centre wheelbase	35	mm
Х	Load distance	908 <sup>1</sup>	mm
Wa*	Turning radius	1441/1511/1582 <sup>1.2</sup>	mm
Ast*	Working aisle width, pallets 800x1200 lengthways (S/M/L)	2251/2320/2392 <sup>2.4</sup>	mm
Ast*	Working aisle width, pallet 1000x1200 crossways (S/M/L)	2248/2317/2389 <sup>2.3</sup>	mm

<sup>&</sup>lt;sup>1</sup> Load section raised/lowered +56 mm

<sup>&</sup>lt;sup>2</sup> Side battery removal (SBE) S SBE = M; M SBE = L; L SBE = L +53 mm

<sup>&</sup>lt;sup>3</sup> Load section lowered +50 mm

<sup>4</sup>Load section lowered +68 mm

# 3.3 Weights

Model	EJE 114	EJE 116	EJE 118	EJE 120	
Truck weight S/M/L	405	420/498/ 576	420/498/ 576	420/498/ 576	kg
Axle load with load front/rear (S)	655/1150	695/1325	760/1460	785/1635	kg
Axle load without load front/rear (S)	322/83	331/89	331/89	331/89	kg

# 3.4 Tyre type

Model	EJE 114	EJE 116	EJE 118	EJE 120	
Tyre size, front		ø230 x 70			mm
Tyre size, rear; single/tandem/triple	ø80x90/ ø80x70/ ø80x35	ø85x110/ ø85x85/ ø85x44	ø85x110/ ø85x85/ ø85x44	ø85x110/ ø85x85/ ø85x44	mm
Additional wheels (dimensions)	ø100x40	ø100x40	ø100x40	ø100x40	mm
Wheels, number front / rear (x = driven)	1x +2 / 2				

# 3.5 Engine Data

Model	EJE 114	EJE 116/118/120
Drive motor	0.9 kW	1.1 kW
Lift motor -	1.2 kW	1.2 kW

#### 3.6 EN norms

#### Continuous sound pressure level

- EJE 114 / 116 / 118 / 120: 61 dB(A)

in accordance with EN 12053 as harmonised with ISO 4871.

The continuous sound pressure level is calculated according to standard procedures and takes into account the sound pressure level when travelling, lifting and idling. The sound pressure level is measured at the operator'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.

#### 3.7 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.

## 3.8 Electrical Requirements

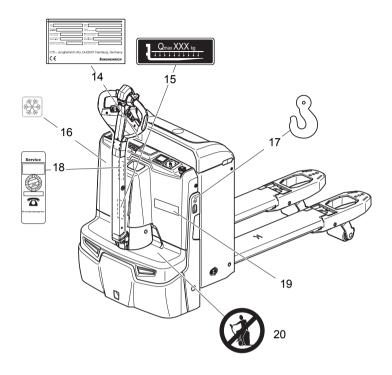
The manufacturer certifies compliance with the requirements for the design and manufacture of electrical equipment, according to EN 1175 "Industrial Truck Safety - Electrical Requirements", provided the truck is used according to its purpose.

# 3.9 Specifications according to RED guideline (Radio Equipment Directive) for radio units

The table contains any components installed according to the European Directive 2014/53/EU. The table shows the affected frequency range and the emitted transmission power for each component.

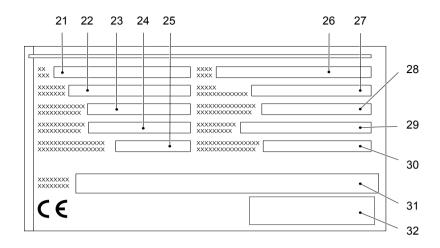
Component	Frequency range	Transmission power
WMT 110	13,56 MHz	< 100 mW
WMT 110	2,4 GHz	10 mW
Radio module (ISM Online)	433 MHz	< 10 mW
Access module (ISM Online)	13,56 MHz	< 100 mW

# 4 Identification points and data plates



Item	Model
14	Truck data plate
15	Rated capacity Qmax
16	Cold store
17	Attachment point for loading by crane
18	Inspection plaque (○)
19	Model description
20	Prohibition plate: "No passengers"

# 4.1 Data plate



Item	Description	Item	Description
21	Туре	27	Year of manufacture
22	Serial number	28	Load centre distance (mm)
23	Rated capacity (kg)	29	Nominal power
24	Battery voltage (V)	30	Min./max. battery weight (kg)
25	Net weight without battery (kg)	31	Manufacturer
26	Option	32	Manufacturer's logo

For queries regarding the truck or when ordering spare parts, always quote the truck serial number (22).

# C Transport and Commissioning

# 1 Lifting by crane

#### **↑** WARNING!

#### Improper lifting by crane can result in accidents

The use of unsuitable lifting gear can cause the truck to crash when being lifted by crane.

Prevent the truck from striking other objects when it is being raised, and avoid any involuntary movements. If necessary secure the truck with guide ropes.

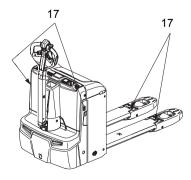
- ► The truck should only be handled by people who are trained in using lifting slings and tools.
- ▶ Wear safety shoes when lifting the truck by crane.
- ▶ Do not stand under a swaying load.
- ▶ Do not walk into or stand in a hazardous area.
- ► Always use lifting gear with sufficient capacity (for truck weight see truck data plate).
- Always attach the crane slings to the prescribed strap points and prevent them from slipping.
- ▶ Use the lifting gear only in the prescribed load direction.
- ► Crane slings should be fastened in such a way that they do not come into contact with any attachments when lifting.

## **⚠** CAUTION!

## Danger of injury from swinging truck

Different battery versions and battery weights can lead to the truck oscillating in a suspended position after being raised.

- ▶ Raise the truck carefully and allow to swing.
- ► Keep the hazardous area around the truck clear.
- Strap points (17) on the chassis are provided for transporting the truck with crane lifting gear.



## Lifting the truck by crane

## Requirements

- Park the truck securely, see page 54.

# Tools and Material Required

- Lifting gear
- Crane lifting gear

#### Procedure

- · Open the battery cover and remove the battery if necessary.
- Secure the lifting slings to the strap points (17).

The truck can now be lifted by crane.

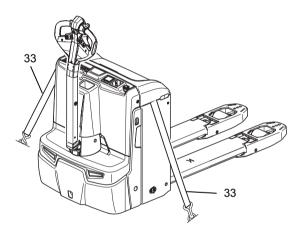
## 2 Transport

### 

#### Uncontrolled movement during transport

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

- ▶ Loading is only to be carried out by specially trained staff. The specialist personnel must be instructed in the securing of loads on road vehicles and in the use of load-securing equipment. When securing the truck, the appropriate measures must be determined and applied for each individual case.
- ▶ The truck must be securely fastened when transported on a lorry or a trailer.
- ▶ The lorry or trailer must have lashing rings.
- ▶ Use wedges to prevent the truck from moving.
- ► Use only lashing straps with sufficient load rating.
- ► Use anti-slip material to secure loading aids (pallets, wedges,...), e. g. anti-slip mats



## Securing the industrial truck for transport

#### Requirements

- Load the truck.
- Park the truck securely, see page 54.

#### Tools and Material Required

- Lashing straps

#### Procedure

 Attach the lashing straps (33) 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

# MARNING!

### The use of unsuitable energy sources can be hazardous

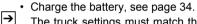
Rectified AC current will damage the assemblies (controllers, sensors, motors etc.) of the electronic system.

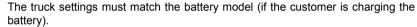
Unsuitable cable connections (too long, insufficient wire cross-section) to the battery (tow cables) can overheat, setting the truck and battery on fire.

- ▶ The truck must only be operated with battery current.
- ► Cable connections to the battery (tow leads) must be less than 6 m long and have a minimum cross-section of 50 mm².

#### Procedure

- · Check the equipment is complete.
- If necessary, install the battery, see page 43. Do not damage the battery cable.





- Check the hydraulic oil level and top up if necessary (see page 52).
- · Start up the truck (see page 53).

Truck is operational.

# 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 manufacturer's instructions concerning batteries and charging stations must be observed when carrying out the work.

#### 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-cell covers must be kept dry and clean. The terminals and cable lugs must be clean, secure and have a light coating of terminal grease.

# **↑** WARNING!

#### 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.

## MARNING!

# 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. The use of unsuitable batteries that have not been approved by Jungheinrich for the truck can lead to a deterioration of the braking system during energy recovery operations and also cause considerable damage to the electrical control system. The use of batteries that have not been approved by Jungheinrich can therefore affect the health and safety of personnel.

- ▶ 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.
- ▶ Do not use batteries that have not been approved by the manufacturer.

Park the truck securely before carrying out any work on the batteries (see page 54).

# 2 Battery types

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

The battery weights can be taken from the battery data plate. Batteries with non insulated terminals must be covered with a non slip insulating mat.

EJE 114-120 battery tray S (top battery removal)

Capacity			
	Battery type	Weight (kg)	Battery dimensions (mm)
24 V	24V2PzB130	133	650 x 145 x 560
	24V2PzVB134	144	662 x 148 x 592
	24V2PzB150	144	662 x 148 x 592
	Li-ion 25.6 V 0110	139	660 x 145 x 590

EJE 114-120 battery tray M (top battery removal)

Capacity			
	Battery type	Weight (kg)	Battery dimensions (mm)
24 V	24V2PzS180	171	624X212X537
	24V2PzS180	171	624X212X537
	24V2PzV160	171	624X212X537
	24V2PzS250	204	624X212X628
	24V2PzV200	204	624X212X628
	24V2PzS250	204	624X212X628
	24V2PzS250	204	624X212X628
	24V2PZV174	171	624X212X537
	24V2PZV220	204	624X212X628
	24V2PzM180	171	624X212X537
	24V2PzM250	204	624X212X628
	24VXFC158	204	624X212X628
	Li-ion 25.6 V 0110	210	624X207X627

EJE 114-120 battery tray M (side battery removal)

Capacity			
	Battery type	Weight (kg)	Battery dimensions (mm)
24 V	24V2PzS180	171	624X212X537
	24V2PzS180	171	624X212X537
	24V2PzV160	171	624X212X537
	24V2PzS250	204	624X212X628
	24V2PzV200	204	624X212X628
	24V2PzS250	204	624X212X628
	24V2PzS250	204	624X212X628
	24V2PZV174	171	624X212X537
	24V2PZV220	204	624X212X628
	24V2PzM180	171	624X212X537
	24V2PzM250	204	624X212X628
	24VXFC158	204	624X212X628

EJE 114-120 battery tray L (top/side battery removal)

Capacity			
	Battery type	Weight (kg)	Battery dimensions (mm)
24 V	24V3PzV300	273	624X284X628
	24V3PzS375	273	624X284X628
	24V3PzS375	273	624X284X628
	24V3PzS375	273	624X284X628
	24V3PZV330	273	624X284X628
	24V3PzM375	273	624X284X628
	24V3PzS375	273	624X284X628
	24VXFC316	273	624X284X628
	Li-ion 25.6 V 0240 Ah	273	624X284X628
	Li-ion 25.6 V 0360 Ah	273	624X284X628

Optionally, the truck can be fitted with a lithium-ion battery, see "Li-lon battery 24V - 110Ah/240 Ah/360 Ah" operating instructions.

## 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.

- ► Always park the truck on a level surface. In special cases the truck may need to be secured with wedges.
- ► Always lower the forks fully.
- ► Choose a place to park where no other people are at risk of injury from lowering fork arms.
- ▶ If the brake is not working, place wedges underneath the wheels of the truck to prevent it from moving.

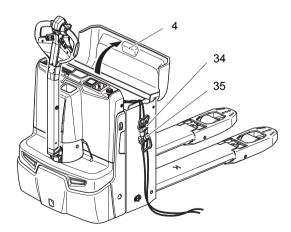
#### Requirements

- Park the truck on a horizontal surface.
- Park the truck securely, see page 54.

#### Procedure

· Open the battery panel (4).

The battery is now exposed.



## 4 Charging the battery

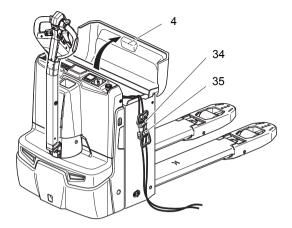
## **↑** WARNING!

#### The gases produced during charging can cause explosions

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

- ▶ Switch the charging station and truck off first before connecting/disconnecting the charging cable of the battery charging station to/from the battery connector.
- ►The charger must be adapted to the battery in terms of voltage and charge capacity.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶The battery cover must be open and the battery cell surfaces must be exposed during charging to ensure adequate ventilation.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there shall be no inflammable material or lubricants capable of creating sparks within 2 m around the truck.
- ► Fire protection equipment must be on hand.
- ▶ Do not lay any metallic objects on battery.
- ▶It is essential to follow the safety regulations of the battery and charger station manufacturers.

# 4.1 Charging the battery with a stationary charger



## Charging the battery

## Requirements

- Expose the battery, see page 33.

### Procedure

- Disconnect the battery connector (34) from the truck connector.
- Connect the battery connector (34) to the charging cable (35) of the stationary charger.
- Start charging in accordance with the charger operating instructions.

The battery is charging.

## 4.2 Charging the battery with an on-board charger (○)

## **↑** DANGER!

#### Risk of electric shock and fire

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 safety, acid and caustic ratings must comply with the manufacturer's mains lead.
- ▶ The charging connector must be dry and clean when used.

### NOTE

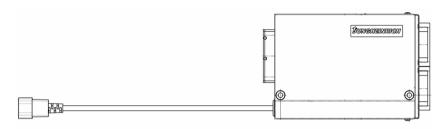
## Improper use of the on-board charger can cause material damage

If faulty, contact the manufacturer's customer service department.

▶The battery 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.

## 4.2.1 Setting the charging characteristics (ELH 2415 / 2425 / 2435)

The charging characteristic (ELH 2415 / 2425 / 2435) is set via parameter 1388 from the truck software. This can only be done by the manufacturer's customer service department.



Charging curve parameter assignment (ELH 2415)<sup>1</sup>/2425<sup>2</sup>/2435)

Flashing sequence	Selected charging curves (characteristics)
0	Truck without battery (delivery condition)
1	Wet-cell battery: PzS with 100 - 300 Ah Wet-cell battery: PzM with 100 - 179 Ah
2	Wet cell battery: PzS with pulse characteristic 200 - 400 Ah Wet-cell battery: PzM with pulse characteristic 180 - 400 Ah Wet-cell battery: PzS with pulse characteristic 200 - 414 Ah
3	Maintenance-free: PzV with 100 - 150 Ah
4	Maintenance-free: PzV with 151 - 200 Ah
5	Maintenance-free: PzV with 201 - 300 Ah
6	Maintenance-free: PzV 301 - 330 Ah
7	Cold store
8	XFC temperature ranges 5C - 15C
9	XFC temperature ranges 16C - 29C
10	XFC temperature ranges 30C - 45C
11	Li-ion

- 1. Charge curves 3-6 are not supported by the ELH 2415.
- 2. Charge curves 5 and 6 are not supported by the ELH 2425.

# NOTE

- ▶ If parameter 1388 is incorrectly set, the charger will be inhibited and the battery will not charge.
- ► With PzS 200-300 Ah wet-cell batteries, both characteristic curve 1 and characteristic curve 2 can be used.
- ► If a characteristic curve is set on the ELH 2415 / 2425 that is not supported by the charger, the charge display is lit a steady red.
- ►All other characteristic curves (≥ 8) block the charger, and the battery is not charged.

## 4.2.2 Charging the battery

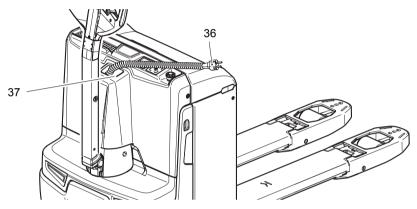
#### Starting charging with the on-board battery charger

#### - ELH mains connection

Mains supply: 230 V mains frequency: 50 Hz

The mains cable and mains connector (36) of the charger are integrated into the front panel.

### Charging the battery



### Requirements

- Park the truck securely, see page 54.
- Expose the battery, see page 33.

#### Procedure

- · The battery connector must remain plugged in.
- · Attach the mains connector (36) to a mains socket.

## The battery is charged.

When the mains connector (36) is attached to the mains, all the truck's electrical functions are disconnected (electric immobilizer). The truck cannot be operated.

## Completing battery charging, restoring the truck to operation

## NOTE

If charging is interrupted, the full battery capacity will not be available.

#### Requirements

- The lead acid battery is fully charged.

#### Procedure

- Remove the mains connector (36) from the mains socket and store it along with the cable in the storage compartment.
- · Close the battery panel (4).

The truck is now ready for operation.

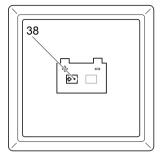
## **Charging times**

The duration of charge depends on the battery capacity.

Charging continues automatically after a mains failure. Charging can be interrupted by removing the mains connector and continued as partial charging.

## LED display (38)

Green LED (charge status)		
Lit	Charging complete, battery full.	
	(Charge interval, float or	
	compensation charge).	
Flashes slowly	Charging.	
Rapid flash	Display at beginning of charge or after setting a new characteristic curve. Number of flash pulses corresponds to the characteristic curve set.	



Red LED (fault)	
Lit	Overtemperature. Charging is interrupted.
Flashes slowly	Safety charging time exceeded. Charging is cancelled. Mains must be disconnected for charging to restart.
Rapid flash	Invalid characteristic curve setting.

## Compensation charge

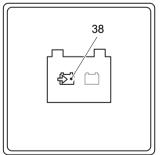
The compensation charge starts automatically when charging is complete.

## Partial charging

The charger is designed to automatically adapt to partially charged batteries. This keeps battery wear to a minimum.

## LED display (38)

Green LED (charge status)		
Lit	Charging complete, battery full.	
	(Charge interval, float or	
	compensation charge).	
Slow flash	Charging.	
Rapid flash	Display at beginning of charge or after setting a new characteristic curve. Number of flash pulses corresponds to the characteristic	
	curve set.	



Red LED (fault)	
Lit	Charging characteristics or battery parameters invalid

Red LED (fault)			
Slow flash	1xflash with noticeable interval: Overvoltage detected before charging starts		
	2xflash with noticeable interval: Max. charge time exceeded		
	3xflash with noticeable interval: Max. charge capacity exceeded		
	4xflash with noticeable interval: Control deviation Imax		
	5xflash with noticeable interval: Overvoltage cutout		
	6xflash with noticeable interval: Low voltage cutout		
	7xflash with noticeable interval: Battery is faulty, battery error		
	8xflash with noticeable interval: Fan error		
	9xflash with noticeable interval: Battery disconnected		
	from charger during charging.		
	10xflash with noticeable interval: Equipment overtemperature		

## Trickle charge

The compensation charge starts automatically when charging is complete.

# Partial charging

The charger is designed to automatically adapt to partially charged batteries. This keeps battery wear to a minimum.

# 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 scalding 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. If necessary cover them with a rubber mat.
- ▶ Park the truck on a level surface.
- Make sure the crane lifting gear has sufficient capacity to replace the battery.
- ► Use only approved battery replacement devices (battery roller stand, replacement trolley etc.).
- ▶ Make sure the battery is securely located in the truck's battery compartment.

# **↑** CAUTION!

## Trapping hazard

There is a risk of trapping when you close the battery cover.

► Make sure there is nothing between the battery cover and the truck when you close the battery cover.

## 5.1 Changing the battery from the top

## Removing the battery

#### Requirements

- Park the truck securely, see page 54.
- Expose the battery, see page 33.

#### Tools and Material Required

Crane lifting gear

#### Procedure

• Disconnect the battery connector from the truck connector.



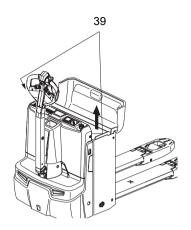
Place the battery cable on the tray so that it cannot be severed when the battery is pulled out.



Attach the crane lifting gear to the eyes (39).
 The hooks must be fitted in such a way that when the crane lifting gear is slackened, they do not fall onto the battery cells. The lifting gear must exert a vertical pull so that the battery container is not compressed.

• Lift the battery slowly out of the battery compartment using crane lifting gear.

The battery has now been removed.



## 5.2 Lateral battery removal

## Removing the battery

## Requirements

- Park the truck securely, see page 54
- Battery exposed, see page 33.

#### Procedure

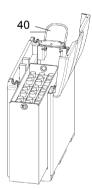
- Disconnect the battery connector from the truck connector.
- Turn the battery lock (40) as far as the stop.
- · Pull the battery out from the side.

The battery is now removed.



Installation is the reverse order. When reinstalling the battery, note the proper installation position and make sure the battery is connected correctly. Place the battery cable on the tray so that it cannot be severed when the battery is inserted.

 After installing the battery, check all cables and plug connections for visible signs of damage.



# **E** Operation

# 1 Safety Regulations for the Operation of Forklift Trucks

#### **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

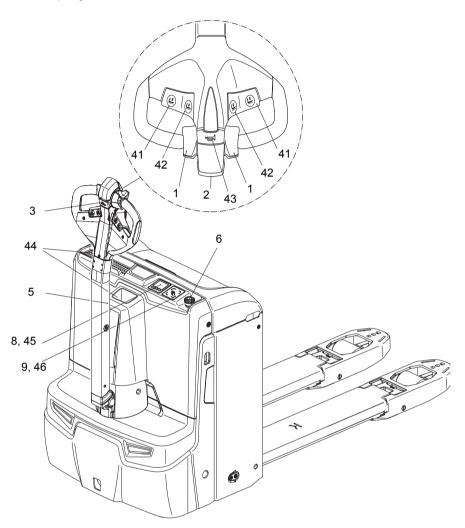
A hazardous area is defined as the area in which people are at risk due to travel or lifting operations of the truck, its load handler or the load. This also includes the area within reach of falling loads or lowering/falling operating equipment.

- ▶ 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 page 23) and warning instructions in the present operating instructions must be strictly observed.

# 2 Displays and Controls

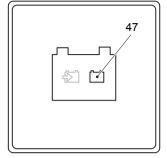


lte m	Control /display		Function
1	Travel switch	•	Controls travel direction and speed.
2	Collision safety switch	•	Safety feature When the collision safety switch is applied, the truck travels for approx. 3 seconds in the fork direction. The parking brake is then applied. The truck remains switched off until the travel switch is set to neutral.
3	Slow travel button	•	If the tiller is in the brake zone, pressing this button overrides the brake function and the truck can be operated at slow travel speed.
5	Tiller	•	Used for steering and braking
6	Emergency disconnect switch	•	All hazardous electrical functions are cut out and the truck is braked.
8	Charge/discharge indicator	•	Shows the charge/discharge status of the battery.
	Display unit	0	Display for:
	(2-inch display)		<ul> <li>Battery charge status</li> </ul>
			<ul> <li>Battery capacity</li> </ul>
			<ul> <li>Service hours</li> </ul>
			<ul> <li>Remaining run time</li> </ul>
			<ul> <li>Travel program</li> </ul>
			<ul> <li>Warning indicators</li> </ul>
			<ul> <li>Event messages</li> </ul>
	Soft keys under the display		Selection of
	unit		<ul> <li>Travel program</li> </ul>
			- Options
			Replaces the key switch
			<ul> <li>Truck release by entering master and access codes</li> </ul>
9	Key switch	•	Activates the truck by applying the control voltage
			Removing the key prevents the truck from being switched on by unauthorised personnel
41	Load handler lower button	•	Lowers the load handler.
42	Load handler raise button	•	Raises the load handler.
43	Warning button	•	Activates an audible signal.
44	On-board battery charger (with safety circuit)	0	Charges the battery by inserting the mains connector into a mains socket.

lte m	Control /display		Function
46	ISM Online	0	Replaces the key switch  - Activates the truck via a card / transponder  - Displays readiness for operation  - Operational-data logging  - Data exchange with card / transponder
	Transponder reader	0	Replaces the key switch     Provided only as a supplement to the display unit     Activates the truck via a card / transponder.
	Keypad	0	Replaces the key switch     Provided only as a supplement to the display unit     Truck release by entering master and access codes

After the truck has been started, the charge status of the battery is shown. The LED (47) colours represent the following conditions:

LED colour	Charge status
Green	40 - 100%
Orange	30 - 40 %
Green/orange flashes 1 Hz	20 - 30 %
Red	0 - 20 %



**→** 

If the LED is lit red, load can no longer be lifted. Lifting is only enabled when the battery connected is at least 70% charged.

If the LED flashes red and the truck is not ready for operation, inform the manufacturer's customer service department. Red flashing is a truck controller code. The flashing sequence indicates the type of fault.

# 3 Starting up the truck

# 3.1 Checks and operations to be performed before starting daily operation

## **↑** WARNING!

### Any damage and other defects to the truck can result in accidents.

If damage or other truck 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.
- ▶ Tag out the defective truck and take it 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 industrial truck externally for signs of damage and leakage.
   Damaged hoses must be replaced immediately.
- Check that the battery is securely mounted and that the cable connections are free of damage and firmly secured.
- · Check the battery connectors are secure.
- Check the load handler for visible signs of damage such as cracks, bent or severe wear.
- Check the drive wheel and load wheels for damage.
- · Check the markings and labels for completeness and legibility, see page 23.
- Make sure the drive panels and covers are secure and check for damage.
- Make sure the load restrainer or options bar is secure and check for damage.
- · Check tiller return.

## 3.2 Preparing the truck for operation

## Switching on the truck

#### Requirements

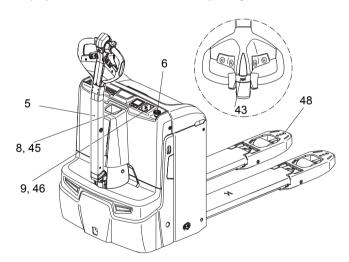
- Checks and operations to be performed before starting daily work, see page 52.

#### Procedure

- Pull the emergency disconnect switch (6) to switch it on.
- · Switch on the truck, to do this
  - Insert the key in the key switch (9) and turn it as far right as it will go.
  - Enter the code in the code lock (O).
  - Hold the card or transponder in front of the ISM access module and, depending on the setting, press the green button on the ISM access module (○).
- Test the warning signal button (43).
- · Test lifting operations.
- · Test the steering.
- Test the brake function of the tiller (5).

#### Truck is operational.

- The charge status indicator (8) shows the current battery charge status.
- The display unit indicates the current battery charge status and the service hours.



## 3.3 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 / load handler is dangerous and is strictly prohibited.

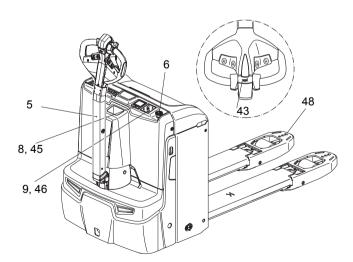
- ► Always park the truck on a level surface. In special cases the truck may need to be secured with wedges.
- ► Always fully lower the mast and forks.
- ► Select a place to park where no other people are at risk of injury from lowering forks.

## Parking the truck securely

#### Procedure

- · Park the truck on a level surface.
- Fully lower the load handler (48):
  - · Press the lower button (49).
- Using the tiller (5), turn the drive wheel to the straight-ahead position.
- · Switch off the truck: to do this:
  - Turn the key in the key switch (9) anti-clockwise as far as it will go. Remove the key from the key switch (9).
  - Press the red key on the ISM access module (○).
- · Press the emergency disconnect switch (6).

The truck is parked.



# 3.4 Battery discharge monitor

The standard setting for the battery discharge indicator / discharge monitor is based on standard batteries. When using maintenance-free or special batteries,

the display and cut-out points of the battery discharge monitor must be set by manufacturer's service department. If this adjustment is not made, the battery may become damaged due to deep discharge.

If the residual capacity falls below the required level, lifting is inhibited. An alternating display (47) appears. Lifting is only released when the battery connected is at least 70% charged.

## 4 Industrial Truck Operation

## 4.1 Safety regulations for truck operation

#### Travel routes and work areas

Only use lanes and routes specifically designated for traffic. Unauthorised third parties must stay away from work areas. The load may only be stored in the designated locations.

The truck must only be operated in work areas with sufficient lighting to avoid danger to personnel and materials.

# **↑** DANGER!

Do not exceed the permissible surface and spot load limits on the travel routes. At blind spots get a second person to assist.

The driver must ensure that the loading dock / ramp cannot move or come loose during loading / unloading.

#### Conduct while travelling

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.

## 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

Negotiating slopes and inclines up to 20 % is only permitted when they are recognised lanes. The slopes and inclines must be clean, have a non-slip surface, and negotiating them safely must be within the technical specifications of the truck. The truck must always be driven with the load facing uphill. The industrial truck must not be turned, operated at an angle or parked on inclines or slopes. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment.

#### 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.

## Type of loads to be carried

The operator must make sure that the load is in a satisfactory condition. Loads must always be positioned safely and carefully. Use suitable precautions to prevent parts of the load from tipping or falling down. Prevent liquid loads from sloshing out.

## **↑** WARNING!

### Electromagnetic influence can result in accidents

Strong magnets can cause electronic components such as Hall sensors to become damaged, resulting in accidents.

▶ Do not use magnets in the operating area of the truck. Exceptions to this rule are commercial, weak clamping magnets for attaching notices.

## 4.2 Emergency Disconnect, Travel, Steering, Braking

## 4.2.1 Emergency Disconnect

### Press the Emergency Disconnect switch

Procedure

· Press the Emergency Disconnect (6).

All electrical functions are deactivated. The truck brakes to a halt.

## 4.2.2 Automatic braking

When the tiller is released, it returns automatically to the upper brake zone (B) and the brakes are applied automatically.

## **↑** WARNING!

#### Risk of collision due to a defective tiller

Operating the truck with a defective tiller can lead to collisions with persons or objects.

- ▶ If the tiller returns to the brake position slowly or not at all, the truck must be taken out of service until the cause of this fault is be rectified.
- ▶ Contact the manufacturer's customer service department.

#### 4.2.3 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
- ► When travelling through swing doors etc. make sure that the doors do not activate the collision safety button.

#### Requirements

- Start up the truck, see page 52

#### Procedure

- Set the tiller (5) to the travel range (F) and press the travel switch (1) in the desired direction (fwd. or rev.).
- Control the travel speed with the travel switch (1).

  When the travel switch is release it automatically returns to its original position.

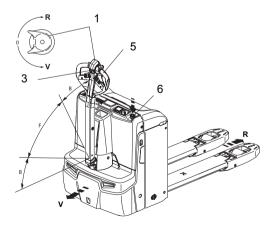
The brakes are released and the truck moves in the selected direction.

Preventing the truck from "rolling downhill":

If the truck rolls backwards on an incline the controller detects the situation and the brake applies automatically after a short jerk.

#### OReduced speed when the load handler is fully lowered

When the load handler is fully lowered the truck can only travel at reduced speed. The load handler must be raised in order to use the maximum available speed.



#### 4.2.4 Slow travel

## **↑** CAUTION!

Particular attention is required from the operator when using the "Slow travel" button (3).

The brake is only activated after releasing the "Slow travel" button.

► In hazardous situations brake by immediately releasing the slow travel button (3) and the travel switch (1).

The truck can be operated with an upright tiller (5) (e.g. in congested areas / elevator).

#### Switch on the slow travel function

#### Procedure

- · Press the slow travel switch (3).
- Set the travel switch (1) to the required travel direction (fwd. or rev.).

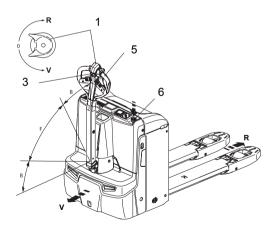
The brake is released. The truck travels at slow speed.

### Switching off slow travel

#### Procedure

- Release the slow travel button (3).
   In zone "B" the brake applies and the truck stops.
   In zone "F" the truck continues at slow travel.
- · Release the travel switch (1).

Slow travel ends and the truck can now travel again at normal speed.



## 4.2.5 Steering

#### Procedure

· Move the tiller (5) to the left or right.

The truck is steered in the required direction.

#### 4.2.6 Brakes

The brake pattern of the truck depends largely on the travel-lane conditions. The driver must take this into account when driving the truck.

The truck can brake in the following ways:

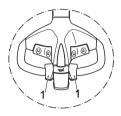
- By inversion braking (travel switch)
- By regenerative braking (coasting brake)
- Emergency disconnect switch
- Set the tiller to the "B" zone.

#### **Brakes**

#### Procedure

 Move the tiller (5) up or down to one of the brake zones (B).

The truck decelerates at the maximum rate, and the brake is applied.



## Inversion braking

#### Procedure

• The travel switch (1) can be used to switch directions while travelling.

The truck brakes until it starts to move in the opposite direction.

## Regenerative braking

#### Procedure

• If the travel switch is set to 0, the truck automatically brakes regeneratively.

The truck brakes to a halt via the coasting brake. The brake is then applied.

When braking regeneratively, energy is returned to the battery, ensuring a longer service time.

## 4.3 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 or falling down.
- ▶ Damaged loads must not be transported.
- ▶ Never exceed the maximum loads specified on the load chart.
- ▶ 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.

# **↑** CAUTION!

▶ Do not lift longitudinal goods (e.g. pipes) from the side.

## Picking up the load units

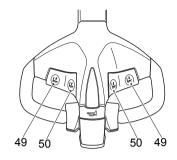
#### Requirements

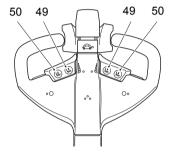
- Load unit correctly palletised.
- Load weight matches the truck's capacity.
- Fork arms evenly loaded for heavy loads.

#### Procedure

- Drive the truck carefully up to the pallet.
- · Carefully insert the fork arms into the pallet.
- Press the "Raise load handler" button (50) until you reach the maximum lift height.

The load unit is raised.





## Requirements

- Load raised correctly.
- 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.
- · Be prepared to brake at all times.
  - · Brake gently in normal circumstances.
  - · Only stop abruptly in hazardous situations.
- Watch out for other traffic at crossings and passageways.
- Always travel with a lookout at blind spots.
- Do not travel across or at an angle on inclines. Do not turn on slopes and inclines, and always drive with the load facing uphill.

### Depositing load units

#### NOTE

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

## Requirements

- Warehouse location suitable for storing the load.

### Procedure

- Drive carefully up to the storage location.
- Press the "Lower load handler" button (49).
- Carefully lower the load handler so that the forks are clear of the load.
- Carefully remove the forks from the pallet.

The load unit is lowered.

# 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 Truck does not start

Possible Cause	Action
Battery connector not plugged in	Check the battery connector and plug it in if necessary.
Emergency Disconnect pressed.	Unlock the Emergency Disconnect
Key switch set to O.	Set the key switch to "I"
Battery charge too low	Check the battery charge and charge battery if necessary.
Faulty fuse	Check fuses

### 5.2 Load cannot be lifted

Possible cause	Action
Truck not operational	Carry out all actions listed under "Truck does not start"
Hydraulic oil level too low	Check the hydraulic oil level
Battery discharge monitor has switched off	Charge battery
Excessive load	Note maximum capacity, see data plate.

# 6 Operating the truck without its own drive system

# ↑ WARNING!

#### Accidental truck movement

When the brakes are deactivated, the truck must be parked on a level surface, as the brakes are no longer effective.

- ▶ Do not install or remove the brake on slopes or inclines.
- ▶The brake may only be installed or removed by the manufacturer's customer service department.
- ▶ Do not park the truck with the brake removed.

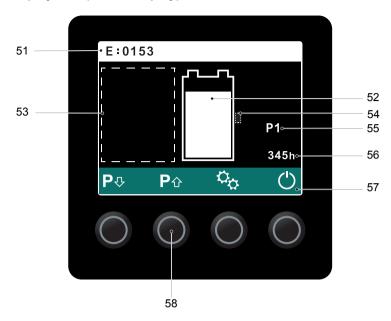
### Recovering the truck

The truck can be moved without its own drive system only when the drive wheel brake is disassembled.

The brake may be disassembled and assembled only by authorised service personnel.

# 7 Optional equipment

# 7.1 Display unit (2 inch display)



Item	Control or display	Function
51	Information line	Display of event messages, speed and remaining run time
52	Battery capacity display	Battery discharge status
53	Symbol field	Displays the symbols, see page 72.
54	Battery type (characteristics)	Displays the set battery type or set battery characteristic curve <sup>1</sup>
		1 = Maintenance-free gel/dry-cell battery
		2 = Special battery, for example XFC
55	Travel program	Shows the active travel program.
56	Service hours	see page 16
57	Button allocation	see page 70
58	Buttons	Selection buttons for the functions shown above them.

<sup>1.</sup> If the setting is for normal or high-performance wet-cell batteries or batteries for special options, no battery type is shown.

# 7.1.1 Button allocation of the display unit (o)

# Key allocation in main menu

Symbol	Meaning
P⊹	Travel program down: To switch the travel program down
Pû	Travel program up: To switch the travel program up
O <sub>O</sub>	Settings (○): To change to the menu to administer the codes or transponders
(h)	Switch off ( $\bigcirc$ ): Allows the truck to be switched off Switch off is only available in the display if the truck is switched on with an access code.

# Key allocation in menu for managing codes or transponders (○)

Symbol	Meaning				
	Change Set-Up Code: To change the set-up code and to activate the keypad or the transponder reader.				
	Edit access code / transponder: To add or delete access codes and transponders.				
⇧	Up selection: To select access codes or transponders.				
₽	Down selection: To select access codes or transponders.				
С	Clear: To delete selected access codes.				
+	Add: To add new access codes.				
乙	Back: Cancels the current procedure and returns to the previous menu.				
<b>~</b>	Confirm: To confirm an entry or a transponder code.				

## 7.1.2 Symbols in the display

Any number of pictograms can be displayed in the pictogram field (53). Which pictograms are shown in the pictogram field depends on the operating and truck status.

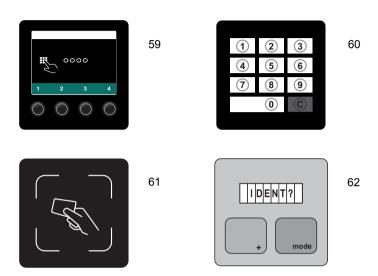
Symbol	Meaning	Colour	Function	
STOP	Stop notice	red	Functions deactivated due to truck malfunction	
$\wedge$	Warning	yellow	Operating error	
<u>⟨i⟩</u>		red	Truck malfunction detected. Travel is restricted to slow travel or lift, lower and travel functions are reduced.	
<del>-</del>	Battery indicator, low residual	Yellow	Residual capacity ≤ 30% The battery must be charged soon.	
	capacity	red	Residual capacity ≤ 20% The battery must be charged immediately.	
U ©	Overtemperature	yellow	Overtemperature detected. Lifting, lowering and travel functions reduced.	
		Red	Overtemperature detected. Lifting, lowering and travel functions deactivated.	
	Lithium-ion battery low temperature	yellow	Lithium-ion battery low temperature detected	
_***	(0)		<ul> <li>Discharge currents and energy recovery are reduced at low temperatures.</li> </ul>	
			Lithium-ion battery below permissible temperature range	
			The truck switches off via the battery contactor.	
类	Lift deactivated	Yellow	Illuminates if the lifting functions are shut off due to insufficient battery capacity.	
\sqrt{1}	Tiller position	Yellow	Lights up on power-up with tiller in travel zone.	
			Illuminates with travel switch operated and tiller in braking zone.	
1	Support arm lift lifting limit	yellow	Illuminates if the "lift support arms" button is pressed when the lifting limit of the support arm lift has been reached.	
<u></u>	Support arm lift lowering limit	yellow	Illuminates if the "lower support arms" button is pressed when the lowering limit of the support arm lift has been reached.	

Symbol	Meaning	Colour	Function
<b>₹</b>	Charging	Green	Battery charge display (on-board battery charger only):  - Flashing: Charging in progress  - Steady light: Charging complete
		Red	Charging interrupted
	Slow travel (○)	yellow	Illuminates when a reduction in travel speed is required, e.g. optional when the load handler is fully lowered.
<b>"</b> Д,	Impact display (ISM) (〇)	yellow	Medium-sized shock due to improper driver actions  - Slow travel activated
		red	Severe shock due to improper driver actions
			<ul> <li>Lifting, lowering and travel functions deactivated.</li> </ul>

# 7.2 Keyless Access System

The keyless access systems serve as a replacement for the key switch to release the truck.

The keyless access system allows an individual code to be allocated to each operator or group of operators.



Item	Description
59	Display unit (EasyAccess soft key):
	<ul> <li>Description see page 69</li> </ul>
	<ul> <li>Entry of 4-digit set-up and access codes</li> </ul>
	<ul> <li>For set-up and access codes with the numbers 1 to 4</li> </ul>
	<ul> <li>Up to 10 access codes can be stored</li> </ul>
60	Keypad (EasyAccess PINCode):
	<ul> <li>Only in conjunction with the display unit (59)</li> </ul>
	<ul> <li>Entry of 4-digit set-up and access codes and C (clear)</li> </ul>
	<ul> <li>For set-up and access codes with the numbers 0 to 9</li> </ul>
	<ul> <li>Up to 100 access codes can be stored</li> </ul>
61	Transponder reader (EasyAccess Transponder):
	<ul> <li>Only in conjunction with the display unit (59)</li> </ul>
	<ul> <li>Up to 100 transponders can be stored</li> </ul>
62	ISM:
	<ul> <li>If the truck is equipped with an ISM access module, see "ISM Online Access Module" operating instructions.</li> </ul>

## 7.3 General Information about the Use of Keyless Access Systems

The default code is to be found on a sticker. When using for the first time, change the set-up code and remove the sticker!

- Default code: 1-2-3-4
- Factory set-up code: 2-4-1-2
- When allocating the codes, ensure the rider trucks are given a different code than pedestrian trucks.
- When a valid code is entered or a valid transponder used, a green tick appears in the display unit.

  When an invalid code has been entered or a invalid transponder used, a red cross

When an invalid code has been entered or a invalid transponder used, a red cross is displayed, and the entry must be repeated.

If the truck is not used for a certain length of time, the display unit switches to standby mode. Pressing any key cancels the standby mode.

The following additional settings can be performed by the manufacturer's customer service department.

## 7.4 Commissioning the Keypad and the Transponder Reader

If the truck is equipped with a keypad or a transponder reader, it can only be operated using the keys in the display unit. The keypad and the transponder reader have to be activated by the operating company.

#### 7.4.1 Activating the keypad

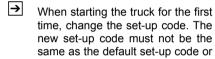
#### Procedure

- Release the emergency disconnect switch, see page 58.
- Enter the default code 1-2-3-4 using the keys below the display unit (59).

The truck is switched on.

- Press the key below the "Settings" symbol (63).
- Press the key below the "Change set-up code" symbol (64).
- Enter the set-up code 2-4-1-2 using the keypad (60).

The set-up code entered is displayed.



 Press the key below the "Delete" symbol (65).

The set-up code is deleted.

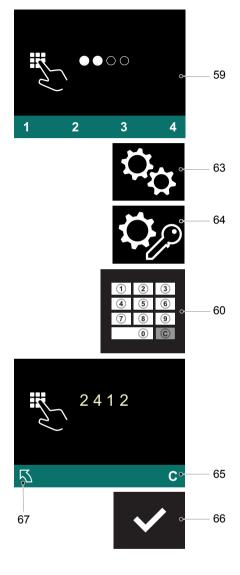
an access code.

- Enter the new set-up code using the keypad (60).
- Press the key below the "Confirm" symbol (66).

The new set-up code is displayed.

- If the new set-up code was entered incorrectly, the procedure can be repeated using the key below the "Delete" symbol (65).
  - To return to the main menu, press the key below the "Back" symbol (67).
  - Delete the default code, see page 86.
  - · Create access codes, see page 85.

The keypad is active.



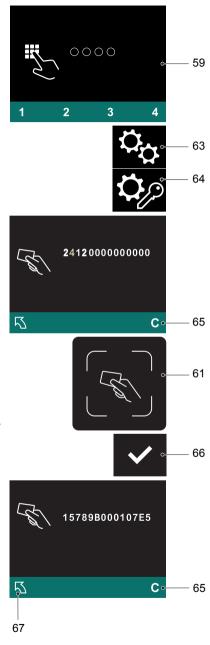
#### 7.4.2 Activating the transponder reader

#### Procedure

- Release the emergency disconnect switch, see page 58.
- Enter the default code 1-2-3-4 using the keys below the display unit (59).
   The truck is switched on.
- Press the key below the "Settings" symbol (63).
- Press the key below the "Change set-up code" symbol (64).
- Enter the set-up code 2-4-1-2 using the keys below the display unit (59).
   The set-up code entered is displayed.
- Press the key below the "Delete" symbol (65).
   The set-up code is deleted.
- Hold a transponder in front of the transponder reader (61).
   This transponder thus becomes the setup transponder.
- Press the key below the "Confirm" symbol (66).
   The code for the set-up transponder is displayed.
- If the wrong transponder has been used, the procedure can be repeated using the key below the "Delete" symbol (65).
- To return to the main menu, press the key below the "Back" symbol (67).

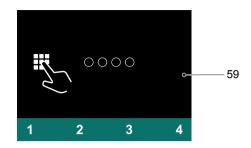
  The default code can no longer be used and must be deleted.
  - Delete the default code, see page 91.
  - Add new transponders, see page 90.

The transponder reader is now active.



#### 7.5 **Using the Display:**

#### 7.5.1 Switch on the truck with the access code.



#### Procedure

- · Release the emergency disconnect switch, see page 58.
- Enter the access code with the buttons below the display (59).

The truck is switched on.

#### 7.5.2 Switching off the truck

#### Procedure

- Press the key under the "Switch off" symbol (68) in the display unit.
- Press the Emergency Disconnect switch, see page 58.

The truck is switched off.



#### 7.5.3 Changing the Set-up Code

#### Requirements

- The truck is switched on, see page 83.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Change setup code" symbol (64).
- Enter the set-up code using the keys below the display unit (59).

The set-up code entered is shown as filled-in circles.

 Press the key below the "Delete" symbol (65).

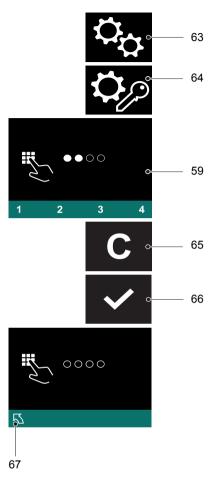
The set-up code is deleted.

- Enter the new set-up code using the keys below the display unit (59).
- The new set-up code must be different from existing access codes.
  - Press the key below the "Confirm" symbol (66).

The new set-up code is displayed.

- If the new set-up code has been entered incorrectly, delete it and add a set-up code again.
  - To return to the main menu, press the key below the "Back" symbol (67).

The set-up code has been changed.



#### 7.5.4 Adding a new access code

#### Requirements

- The truck is switched on, see page 83.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Edit access code" symbol (69).

The set-up code is requested.

• Enter the set-up code using the keys below the display unit (59).

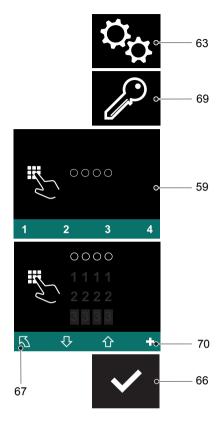
All the access codes are displayed.

- Press the key below the "Add" symbol (70).
- Enter the new access code using the keys below the display unit (59).
- The new access code must be different from existing access codes.
  - Press the key below the "Confirm" symbol (66).

The new access code is displayed.

- If the new access code has been entered incorrectly, delete it, see page 86, and add an access code again.
  - To return to the main menu, press the key below the "Back" symbol (67).

A new access code has been added.



#### 7.5.5 Deleting an access code

#### Requirements

- The truck is switched on, see page 83.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Edit access code" symbol (69).

The set-up code is requested.

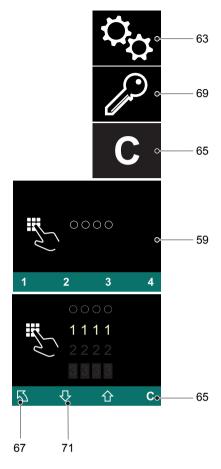
• Enter the set-up code using the keys below the display unit (59).

All the access codes are displayed.

- Select the access code to be deleted using the key below the "Down selection" symbol (71).
- Press the key below the "Delete" symbol (65).

The access code has been deleted.

 To return to the main menu, press the key below the "Back" symbol (67).



#### 7.5.6 Displaying the Log-in Process

The use of the last different access codes is displayed during the log-in process. The last log-in is displayed first.

If multiple access codes are logged as being displayable simultaneously, the display area can be moved by scrolling forward or back.

#### Requirements

- The truck is switched on, see page 78.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Log-in process" symbol (72).
- Enter the set-up code using the keys below the display unit (59).

The set-up code entered is shown as filled-in circles.

 To scroll forward, press the button under the "Down selection" symbol (71) as many times as necessary.

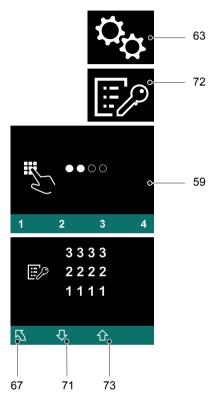
The display area moves: Additional earlier log-ins are displayed.

 To scroll back, press the button under the "Up selection" symbol (73) as many times as necessary.

The display area moves: More recent log-ins are displayed.

 To return to the main menu, press the key below the "Back" symbol (67).

The log-in process is displayed.



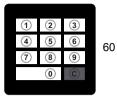
#### 7.6 Using the Keypad

#### 7.6.1 Switch on the truck with the access code.

#### Procedure

- · Release the emergency disconnect switch, see page 58.
- Enter the access code with the keypad (60).

The truck is switched on.



#### Procedure

- Press the key under the "Switch off" symbol (68) in the display unit.
- Press the Emergency Disconnect switch, see page 58.

The truck is switched off.

#### 7.6.2 Switching off the truck

#### Procedure

- · Press the key under the "Switch off" symbol (68) in the display unit.
- Press the Emergency Disconnect switch, see page 58.

The truck is switched off.



#### 7.6.3 Changing the Set-up Code

#### Requirements

The truck is switched on, see page 83.

#### Procedure

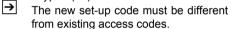
- Press the key below the "Settings" symbol (63).
- Press the key below the "Change set-up code" symbol (64).
- Enter the set-up code using the keypad (60).

The set-up code entered is shown in the display unit (59) as filled-in circles.

• Press the key below the "Delete" symbol (65).

The set-up code is deleted.

• Enter the new set-up code using the keypad (60).

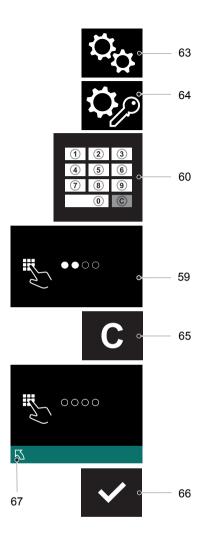


 Press the key below the "Confirm" symbol (66).

The new set-up code is displayed.

- If the new set-up code has been entered incorrectly, delete it and enter the correct set-up code.
  - To return to the main menu, press the key below the "Back" symbol (67).

The set-up code has been changed.



#### 7.6.4 Adding a new access code

#### Requirements

- The truck is switched on, see page 83.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Edit access code" symbol (69).

The set-up code is requested.

 Enter the set-up code using the keypad (60).

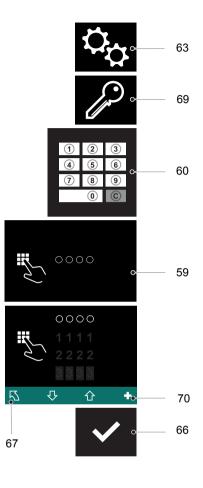
All access codes are shown on the display unit (59).

- Press the key below the "Add" symbol (70).
- Enter a new access code using the keypad (60).
- The new access code must be different from existing access codes.
  - Press the key below the "Confirm" symbol (66).

The new access code is shown on the display unit (59).

- If the new access code has been entered incorrectly, delete it, see page 86, and enter the correct access code.
  - To return to the main menu, press the key below the "Back" symbol (67).

A new access code has been added.



#### 7.6.5 Deleting an access code

#### Requirements

- The truck is switched on, see page 83.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Edit access code" symbol (69).

The set-up code is requested.

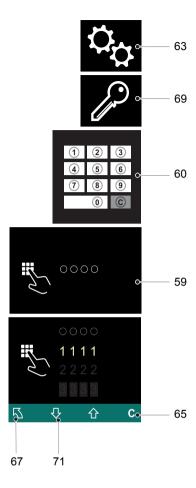
• Enter the set-up code using the keypad (60).

All access codes are shown on the display unit (59).

- Select the access code to be deleted using the key below the "Down selection" symbol (71).
- Press the key below the "Delete" symbol (65).

The access code has been deleted.

• To return to the main menu, press the key below the "Back" symbol (67).



#### 7.6.6 Displaying the Log-in Process

The use of the last different access codes is displayed during the log-in process. The last log-in is displayed first.

If multiple access codes are logged as being displayable simultaneously, the display area can be moved by scrolling forward or back.

#### Requirements

- The truck is switched on, see page 78.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Log-in process" symbol (72).
- Enter the set-up code using the keypad (60).

The set-up code entered is shown in the display unit (59) as filled-in circles.

 To scroll forward, press the button under the "Down selection" symbol (71) as many times as necessary.

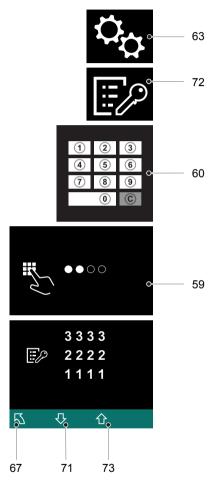
The display area moves: Additional earlier log-ins are displayed.

 To scroll back, press the button under the "Up selection" symbol (73) as many times as necessary.

The display area moves: More recent log-ins are displayed.

 To return to the main menu, press the key below the "Back" symbol (67).

The log-in process is displayed.



## 7.7 Operating the transponder reader

#### NOTE

Take care not to damage the transponder. If the transponder is damaged, the truck cannot be switched on.

#### 7.7.1 Switching on the truck with the transponder

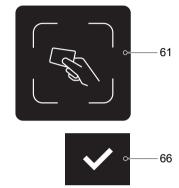
#### Procedure

- Release the Emergency Disconnect switch, see page 58.
- Hold the transponder in front of the transponder reader (61).

A green tick appears and remains until the transponder has been confirmed. If there is no confirmation within 20 seconds the access prompt appears.

 Press the button below the "Confirm" symbol (66).

The truck is switched on.



The truck can only be switched on when the display unit (59) is lit. If the display unit is in standby the code or transponder will not be recognised. Pressing any key cancels standby mode.

#### 7.7.2 Switching the truck off (transponder reader)

#### Procedure

- Press the key under the "Switch off" symbol (68) in the display unit.
- Press the Emergency Disconnect switch, see page 58.

The truck is switched off.



#### 7.7.3 Changing the Set-up Transponder

#### Requirements

- The truck is switched on, see page 88.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Change set-up code" symbol (64).
- Place the set-up transponder on the transponder reader (61).

The code of the set-up transponder is shown on the display unit (59).

 Press the key below the "Delete" symbol (65).

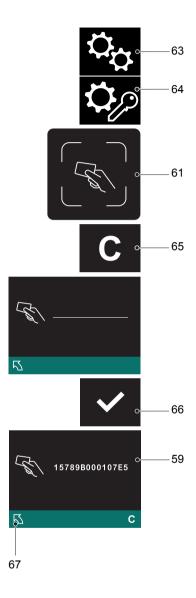
A dashed line is shown.

- Place the new set-up transponder on the transponder reader (61).
- The new set-up transponder code must be different from existing transponder codes.
  - Press the key below the "Confirm" symbol (66).

The new code for the set-up transponder is displayed.

- If the wrong transponder has been used, the procedure can be repeated using the key below the "Delete" symbol (65).
  - To return to the main menu, press the key below the "Back" symbol (67).

The set-up transponder has been changed.



#### 7.7.4 Adding a new transponder

#### Requirements

- The truck is switched on, see page 88.

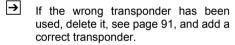
#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Edit transponder" symbol (69).

The set-up transponder is requested.

- Place the set-up transponder on the transponder reader (61).
   All transponder codes are shown on the display unit (59).
- Press the key below the "Add" symbol (70).
- Place the new transponder on the transponder reader (61).
- The new transponder code must be different from existing transponder codes.
  - Press the key below the "Confirm" symbol (66).

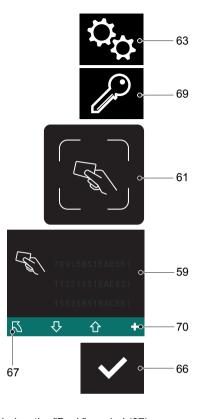
The new transponder code is displayed.



• To return to the main menu, press the key below the "Back" symbol (67).

A new transponder has been added.

The transponder codes saved are sorted first of all numerically and then alphabetically.



#### 7.7.5 Deleting transponders

#### Requirements

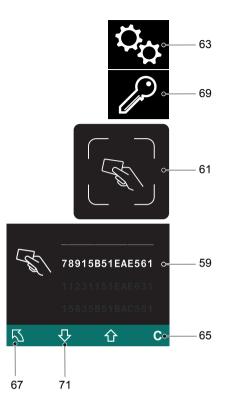
 The truck is switched on, see page 88.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Edit transponder" symbol (69).

The set-up transponder is requested.

- Place the set-up transponder on the transponder reader (61).
   All transponder codes are shown on the display unit (59).
- Select the transponder code to be deleted using the key below the "Down selection" symbol (71).
- Press the key below the "Delete" symbol (65).
   The transponder has been deleted.
- To return to the main menu, press the key below the "Back" symbol (67).



#### 7.7.6 Displaying the Log-in Process

The use of the last different transponders is displayed during the log-in process. The last log-in is displayed first.

If multiple transponders are logged as being displayable simultaneously, the display area can be moved by scrolling forward or back.

#### Requirements

- The truck is switched on, see page 78.

#### Procedure

- Press the key below the "Settings" symbol (63).
- Press the key below the "Log-in process" symbol (72).
- Place the set-up transponder on the transponder reader (61).
- To scroll forward, press the button under the "Down selection" symbol (71) as many times as necessary.

The display area moves: Additional earlier log-ins are displayed.

 To scroll back, press the button under the "Up selection" symbol (73) as many times as necessary.

The display area moves: More recent log-ins are displayed.

 To return to the main menu, press the key below the "Back" symbol (67).

The log-in process is displayed.



# 7.8 ISM access module (O)

If the truck is equipped with an ISM access module, refer to the "ISM Access Module" operating instructions.

# F Industrial Truck Maintenance

# 1 Operational Safety and Environmental Protection

The inspections and maintenance tasks listed in chapter "Maintenance and Inspection" must be performed according to the defined service intervals (see page 109).

The manufacturer recommends the replacement of the maintenance parts also listed in chapter "Maintenance and Inspection" according to the specified replacement intervals (see page 109).

## ↑ WARNING!

#### Risk of accidents and component damage

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

**Exception:** Operating companies should only make changes or have changes made to powered industrial trucks if the manufacturer is no longer operating in the field and there is no successor to the business; operating companies must however:

- Ensure that the changes to be made are planned, tested and performed by a specialist engineer in industrial trucks taking safety into account.
- Keep permanent graphic records of the plans, tests and completion of the changes
- Carry out and have authorised the respective changes to the capacity data plates, decals and stickers as well as the operator and service manuals.
- Attach permanent and clearly visible marking to the truck indicating the types of changes made, the date of the changes and the name and address of the organisation responsible for the work.

#### 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.

**→** 

On completion of inspection and service work, carry out the operations listed in the "Recommissioning the truck after cleaning or maintenance work" section (see page 107).

## 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 accessories must only be secured to the points specially provided for this purpose.

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 accessories must only be secured to the points specially provided for this purpose, see page 25.
- ► 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.

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

#### 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 cleaning operations.

## **↑** WARNING!

#### Electric currents 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 page 54).
- ▶ Press the Emergency Disconnect.
- ▶ 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!

#### Fire hazard

Welding operations on the truck can damage or ignite components.

▶ Do not performing welding operations on the truck.

#### Settings

When repairing or replacing hydraulic, electric or electronic components or assemblies, always note the truck-specific settings.

## **↑** 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.

## **↑** 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.

#### 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 years. 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.

## 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!

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 fluids must be removed immediately with an appropriate bonding agent.
- ▶The bonding agent / consumable mixture 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 call for a doctor 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 call for a doctor immediately.
- ▶ Replace oil-soaked clothing and shoes immediately.

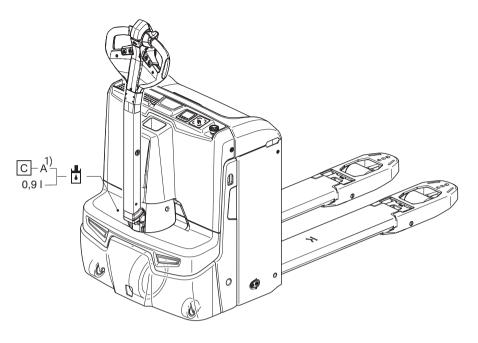
#### **↑** CAUTION!

#### 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



ı	Hydraulic oil filler plug	*	* Cold store application	
		•	Transmission oil filler neck	

1 Compound ratio for cold store application 1:1

#### 3.3 Consumables

Code	Order no.	Quantity	Description	Used for
Α	51132826		, 5	Hydraulics
	5113 2827 *	5.0 L	hydraulic oil	
С	5103 7497	5.0 L	HVLP 32, DIN 51524	
	51081875	5.0 L	Renolin MR 310 as additive	Cold store hydraulic system

#### **Grease guidelines**

Code	Saponification	°C .	Worked penetration at 25 °C	NLG1 class	Application temperature °C
Е	Lithium	185	265 - 295	2	-35/+120

<sup>\*</sup>The trucks are factory-equipped with a special hydraulic oil (the Jungheinrich hydraulic oil with a blue colouration) and the cold store hydraulic oil (red colouration). The Jungheinrich hydraulic oil is available only from the Jungheinrich service department. The Jungheinrich hydraulic oil may be mixed with one of the named alternative hydraulic oils.

## 4 Maintenance and repairs

## 4.1 Preparing the truck for maintenance and repairs

#### Procedure

- Park the truck securely, see page 54.
- · Disconnect the battery to prevent the truck from being switched on accidentally.

## 4.2 Removing the front panel

#### Removing the front and drive panel

#### Requirements

- Prepare the truck for maintenance and repair work, see page 101.

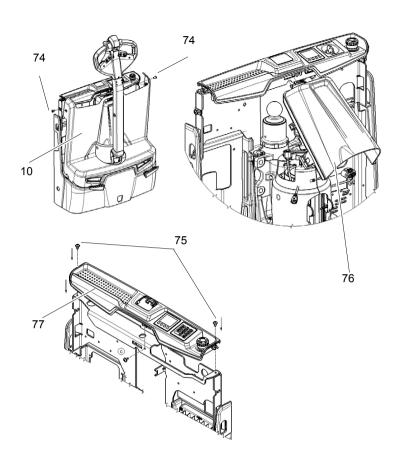
#### Tools and Material Required

- Allen key with width across flats 13 (7 Nm)

#### Procedure

- Remove the M8 hex bolt with width across flats 13 (7 Nm) (74) from the front panel (10).
- Lift and remove the front panel (10).
- · Remove the drive panel (76).
- Remove the screws (75) from the dashboard panel (77).
- Remove the dashboard panel (77).

The front and drive panel have been removed.



# 4.3 Checking electrical fuses

## Checking fuses

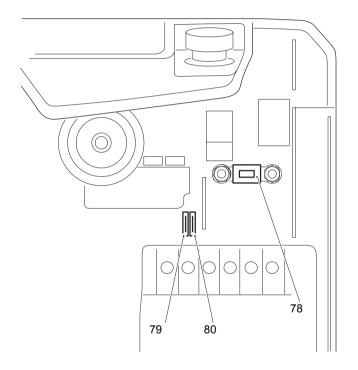
## Requirements

- Truck prepared for maintenance and repairs, see page 101.
- Front panel removed, see page 101.

## Procedure

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

The fuses have been checked.



Item	To protect	Rating		
79	Magnetic brake main contactor control fuse			
	Horn/tiller head/key/access systems (ISM Online, transponder, 2-inch display, keypad) control fuse	4 A		
78	Drive motor/pump motor	150 A		

## 4.4 Restoring the truck to service after maintenance and repairs

#### Procedure

- · Thoroughly clean the truck.
- · Lubricate the truck according to the lubrication schedule, see page 99
- Clean the battery, grease the terminals and connect the battery.
- · Charge the battery, see page 34.

## **↑** WARNING!

#### Faulty brakes can cause accidents

As soon as the truck has been started, test the brakes several times.

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

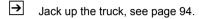


 Commission the truck, see page 52.
 In the event of switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by actuating them repeatedly.

## 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.



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, see page 100.
- · Prevent the truck from rolling away accidentally.
- Check the hydraulic oil level and replenish if necessary, see page 99.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- · Lubricate the truck according to the lubrication schedule, see page 34.
- · Charge the battery, see page 34.
- Disconnect the battery, clean it and grease the terminals.
  In addition, follow the battery manufacturer's instructions.

## 5.2 Action to be taken 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 page 34.

## 5.3 Restoring the truck to service after decommissioning

## Procedure

- Thoroughly clean the truck, see page 99.
- Lubricate the truck according to the lubrication schedule, see page 34.
- Clean the battery, grease the terminal screws and connect the battery.
- Charge the battery, see page 52.
- Start up the truck, see page 52.

# 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 in 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.

## G Maintenance and Inspection

## **↑** WARNING!

#### Lack of maintenance can result in accidents

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

▶ Thorough and expert maintenance and inspections are among the most important requirements for the safe operation of the industrial truck.

## NOTE

The application conditions of an industrial truck have a considerable impact on component wear. The following service, inspection and replacement intervals are based on single-shift operation under normal operating conditions. The intervals must be reduced accordingly if more stringent requirements are placed on the equipment, e.g., use in conditions of extreme dust, temperature fluctuations or multiple shifts.

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

The following chapter defines the tasks to be performed, the respective intervals to be observed and the maintenance parts for which replacement is recommended.

## 1 Maintenance Contents EJE 114/ 116/118/ 120/ 120US

Issued on: 25.10.2017 14:48:09

## 1.1 Owner

To be performed every 50 service hours, but at least once a week.

## 1.1.1 Maintenance contents

## 1.1.1.1 Standard equipment

Pov	ver	SII	nn	lν

Correct the battery acid level using demineralised water.

## Hydr. movements

Correct the hydraulic oil level.

## Steering

Test the tiller return function.

## 1.1.2 Inspection contents

## 1.1.2.1 Standard equipment

The following points must be checked:

#### Electrics

Warning and safety devices are in accordance with the operating instructions

Function of display and controls

The emergency disconnect for function and damage

#### Power supply

Battery and battery components for damage

Battery cable connections are secure

Battery connector is secure and functions correctly, and for damage

## Driving

The collision safety switch for function and damage

Wheels for wear and damage

## Chassis and superstructure

Doors and/or covers for damage

industrial truck for damage and leaks

Labels are legible, complete and plausible

Protective mechanism against trapping and shearing is present, secure, functions correctly and free of dirt and damage

#### Hydr. movements

The hydraulic system function

The forks or load handler for wear and damage

## 1.1.2.2 Optional equipment

The following points must be checked:

## Standard on-board charger

^	<b>L</b> .		_	_	
u	na	ar	a	е	Г

Check the mains plug and mains cable for damage

## On-board charger 35A

## Charger

Check the mains plug and mains cable for damage

#### 1.2 Customer Service

#### 1.2.1 Maintenance contents

In accordance with the EJE 114/ 116/118/ 120/ 120US service interval, to be performed every 1000 service hours, but at least once a year.

## 1.2.1.1 Standard equipment

#### Brakes

Test the brake with the tiller in the maximum vertical and horizontal positions.

Measure the air gap of the magnetic brake.

#### Electrics

Test the contactors and/or relays.

Carry out a chassis insulation-resistance test.

#### Power supply

Clean and grease the battery terminals.

Clean the battery.

Measure acid density and battery voltage.

Correct the battery acid level using demineralised water.

#### Chassis and superstructure

Check that the panels and covers as well as mounting brackets are secure. Ensure they function correctly and are safe.

#### Hydr. movements

Correct the hydraulic oil level.

Test the pressure relief valve.

#### Agreed performance

Carry out a test run with the rated load or a customer-specific load.

Demonstration after maintenance.

## Steering

Test the tiller return function.

## 1.2.1.2 Optional equipment

#### Standard on-board charger

## Charger

Test the immobiliser on trucks with on-board chargers.

Carry out a potential measurement on the chassis while charging is in progress.

#### Data radio

## System components

Clean the scanner and terminal.

#### Other inspections

## Agreed performance

Note

Tests on other options and special parts such as radio data and access modules (ISM) must be recorded in the test report.

## On-board charger 35A

## Charger

Test the immobiliser on trucks with on-board chargers.

Clean the fan.

Carry out a potential measurement on the chassis while charging is in progress.

## 1.2.2 Inspection contents

The following points must be checked:

## 1.2.2.1 Standard equipment

#### Electrics

Cables and motor are secure and for damage

Warning and safety devices are in accordance with the operating instructions

Function of display and controls

The emergency disconnect for function and damage

Contactors and/or relays for wear and damage

The electric wiring for damage (insulation damage, connections) and the fuse ratings

#### Power supply

Battery, battery cables and cell connectors are secure and for damage

The battery latch and battery attachment for function and damage

Battery connector is secure and functions correctly, and for damage

#### Driving

Drivetrain bearings for wear and damage

Transmission for noise and leakage

Wheel bearings and attachment for wear and damage

Wheels for wear, damage and secure mounting

#### Chassis and superstructure

Chassis and screw connections are secure and for damage

industrial truck for damage and leaks

Labels are legible, complete and plausible

Protective mechanism against trapping and shearing is present, secure, functions correctly and free of dirt and damage

#### Hydr. movements

"Hydraulic" controls for function, legibility, completeness and plausibility

Cylinders and piston rods are secure and for leaks and damage

Lift mechanism for wear, function and damage

The hydraulic system function

The forks or load handler for wear and damage

Tie/plunger rods are uniformly adjusted and for wear and damage

Hose and pipe lines for wear, leaks, damage, blisters and kinks

## Steering

Lateral play of the tiller

The steering components for play and damage

## 1.2.2.2 Optional equipment

#### Standard on-board charger

## Charger

Check the mains plug and mains cable for damage

Cables and electrical connections are secure and for damage

#### Electrolyte circulation

## Power supply

Hose connections and pump function

#### Aquamatik

## Power supply

Aquamatik plug, hose connections and float for function and leaks

Flow indicator for function and leaks

#### Lateral battery removal

## Power supply

The battery latch and battery attachment for function and damage

#### Shock sensor / data recorder

#### Electrics

The shock sensor / data recorder is secure, and for damage

#### Data radio

## System components

Scanner and terminal are secure and function correctly; and for damage

Fuse ratings

Cables are secure and not damaged

#### Access module

#### Electrics

Access module is secure and functions correctly; and for damage

#### Entry skids/rollers

#### Hydr. movements

Entry skids or entry rollers for function, damage and wear

## On-board charger 35A

## Charger

Check the mains plug and mains cable for damage

Fan for function and damage

Cables and electrical connections are secure and for damage

## Hinged frame

## Chassis and superstructure

Test the folding frame and its stop and check for attachment and damage

## 1.2.3 Maintenance parts

The manufacturer recommends the replacement of the following maintenance parts at the specified intervals.

## 1.2.3.1 Standard equipment

maintenance part	service hours	months
Hydraulic oil	2000	12
Hydraulic system - breather filter	2000	12
Hydraulic oil filter	2000	12
Transmission oil	10000	

## 1.2.3.2 Optional equipment

## **Cold-store application**

maintenance part	service hours	months
Hydraulic oil	1000	12
Hydraulic oil additive	1000	12
the transmission oil in the cold-store application	10000	12

## **Foreword**

#### Notes to the operating instructions

The present ORIGINAL OPERATING INSTRUCTIONS are designed to provide sufficient instruction for the safe operation of the traction battery. The information is presented in a precise and clear manner. The chapters are arranged by letter and the pages are numbered continuously.

The operating instructions detail different battery variants and their optional equipment. When operating and servicing the battery, make sure that the particular section applies to your battery model.

Our traction batteries and their optional equipment are subject to ongoing development. We reserve the right to alter the design, features and technical aspects of the equipment. No guarantee of particular features of the traction battery 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

Friedrich-Ebert-Damm 129 22047 Hamburg - Germany

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

www.jungheinrich.com

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## A Traction battery

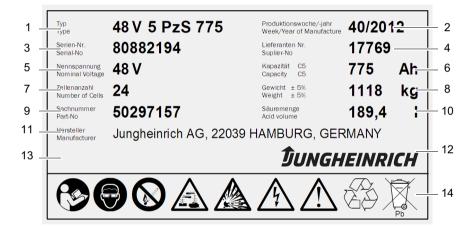
## 1 Correct Use and Application

This appendix does not apply to trucks with lithium-ion batteries. Further documentation for lithium-ion batteries can be obtained from the supplied documents

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	Model (battery name)
2	Production week / production year
3	Serial number
4	Supplier number
5	Rated voltage
6	Capacity
7	Number of cells
8	Weight
9	Part no.
10	Acid quantity
11	Manufacturer
12	Manufacturer's logo
13	CE mark (for batteries above 75 V only)

#### Safety Instructions, Warning Indications and other Notes 3



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 smokel

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 only insulated tools. Do not mechanically machine 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.

Name	Explanation
PzS	<ul> <li>Lead acid battery with "Standard" armour plated cells and liquid electrolyte</li> <li>Battery cell width: 198 mm</li> </ul>
PzB	<ul> <li>Lead acid battery with "British Standard" armour plated cells and liquid electrolyte</li> <li>Battery cell width: 158 mm</li> </ul>
PzS Lib	<ul> <li>Lead acid battery with "Standard" armour plated cells and liquid electrolyte</li> </ul>
PzM	<ul> <li>Lead acid battery with extended maintenance interval</li> <li>Battery cell width: 198 mm</li> </ul>

#### 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 corresponding adjustment factor is  $\pm$  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 comply with the purity regulations of DIN 43530 Part 2.

## 4.1.1 Battery nominal data

1.	Product	Traction battery
2.	Nominal voltage	2.0 V x number of cells
3.	Rated capacity C5	See data plate
4.	Discharge current	C5/5h
5.	Nominal electrolyte density <sup>1</sup>	1.29 kg/l
6.	Nominal temperature <sup>2</sup>	30 °C
7.	System rated electrolyte level	up to "Max" electrolyte level marking
	Limit temperature <sup>3</sup>	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.

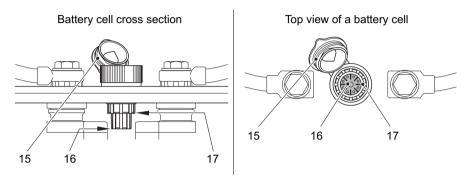
## 4.2 Operation

#### 4.2.1 Commissioning unfilled batteries

The operations required must be

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 M10 terminal screws of the conductors and connectors are secure and if necessary torque to 23 ±1 Nm.
- Charge the battery, see page 13.
- Check the electrolyte level of each battery cell after charging and top up if necessary:
- Open the plug (15).

  The electrolyte leve
  - The electrolyte level should not be less than the "Min" electrolyte marking (16) and must not exceed the "Max" (17) marking.
  - If necessary, add electrolyte with pure water up to the "Max" electrolyte level marking (17), see page 15.
  - · Close the plug (15).

The test is now complete.

## 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.

Fully or partially discharged batteries must be re-charged immediately and not left unattended.

## 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 2000 mm 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 procedures in accordance with DIN 41773 and DIN 41774 are permissible.

→

The electrolyte temperature rises by approx. 10°C 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

- Permissible electrolyte temperature 10°C to 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.

The battery is 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.

**|→**|

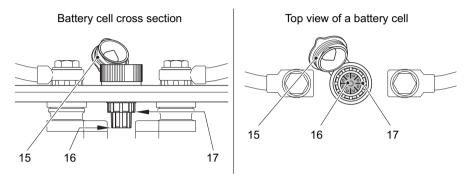
Trickle charges should only be performed when the charge level is below 60 %. Use replacement batteries instead of regular trickle charging.

## 4.3 Servicing lead-acid batteries with armour plated cells

## 4.3.1 Quality of Water for Adding Electrolyte

The quality of the water used to add 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.

#### 4.3.2 Daily



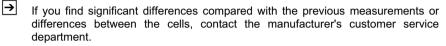
- Charge the battery after each discharge.
- After charging, check the electrolyte level of each battery cell and replenish as required:
  - Open the plug (15).
  - If necessary, add electrolyte with pure water up to the "Max" electrolyte level marking (17).
  - Close the plug (15).
- The electrolyte level should not be less than the "Min" electrolyte marking (16) and must not exceed the "Max" (17) marking.

## 4.3.3 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.

## 4.3.4 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.



## 4.3.5 Annually

- Measure the insulation resistance of the truck in accordance with EN 1175-1.
- Measure the insulation resistance of the battery in accordance with DIN EN 1987-1.
- In accordance with DIN EN 50272-3 the battery insulation resistance should not be less than 50  $\Omega$  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.

Name	Explanation
PzV	<ul> <li>Lead acid battery with "Standard" closed armour plated cells and electrolyte in gel compound</li> <li>Battery cell width: 198 mm</li> </ul>
PzV-BS	<ul> <li>Lead acid battery with "British Standard" closed armour plated cells and electrolyte in gel compound</li> <li>Battery cell width: 158 mm</li> </ul>

## 5.1.1 Battery nominal data

1.	Product	Traction battery
2.	Nominal voltage	2.0 V x number of cells
3.	Rated capacity C5	See data plate
4.	Discharge current	C5/5h
5.	Rated temperature	30°C
	Limit temperature <sup>1</sup>	45°C, not permissible as operating temperature
6.	Rated density of the electrolyte	Cannot be measured
7.	System rated electrolyte level	Cannot be measured

 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 M10 terminal screws of the conductors and connectors are secure and if necessary torque to 23 ±1 Nm.
- · Charge the battery, see page 18.

The test is now complete.

#### 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 2000 mm 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 battery cell.

- ► 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 the limit curents in accordance with DIN EN 50272-3 in the gassing area.

## 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°C 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 °C.

The battery is 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

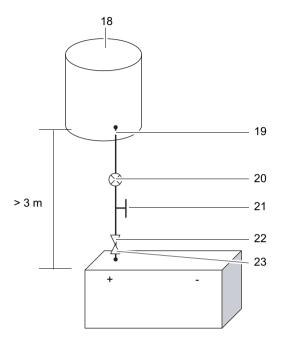
- Measure and record the overall voltage.
- Measure and record the individual voltages.
- Compare the results with the previous ones.
- Carry out the measurements after full charging and subsequent resting for at least 5 hours.
- If you find significant differences compared with the previous measurements or differences between the cells, contact the manufacturer's customer service department.

## 5.3.4 Annually

- Measure the insulation resistance of the truck in accordance with EN 1175-1.
- Measure the insulation resistance of the battery in accordance with DIN EN 1987-1.
- In accordance with DIN EN 50272-3 the battery insulation resistance should not be less than 50  $\Omega$  per volt of rated voltage.

## 6 Aquamatik water replenishment system

## 6.1 Water replenishment system design



18	Water container
19	Tap connection with ball cock
20	Flow indicator
21	Shut-off cock
22	Locking coupling
23	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°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, a visual error message appears on the battery charger. Some examples of malfunctions are listed below:

- No connection between the air coupling of the battery and the recirculation module (for separate coupling) or faulty air coupling
- Leaking or faulty hose connections on battery
- Contaminated intake filter

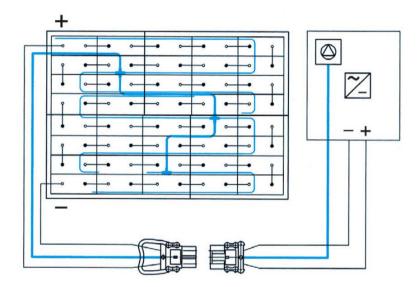
## NOTE

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 to the battery side and through-coupling to 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 tray 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.

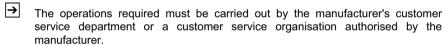
If the battery is to be taken out of service for a long period, it should be stored fully charged in a dry room protected from frost. To ensure the availability of the battery the following charges can be selected:

- Monthly compensation charge for PzS and PzB batteries or 4-monthly full charge for PzV batteries.
- Trickle charge for a charging voltage of 2.23 V x number of cells for PzS, PzM and PzB batteries or 2.25 V x number 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.



## 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.

