

# EKS 110

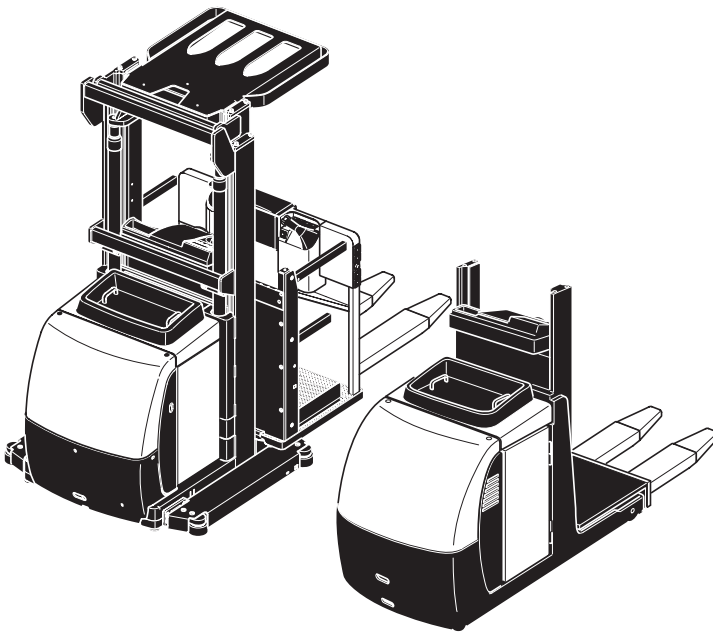
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Betriebsanleitung



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# Declaration of Conformity



Jungheinrich AG, Am Stadtrand 35, D-22047 Hamburg  
Manufacturer or his authorized representative in the Community

Type	Option	Serial No.	Year of construction
EKS 110			

**Additional information**

**Authorised signatory**

**Date**

## **GB** EU Declaration of Conformity

The signatories hereby certify that the specified powered industrial truck conforms to the EU Directive 2006/42/EC (Machine Directive) and 2004/108/EEC (Electro-Magnetic Compatibility, EMC) including their amendments as translated into national legislation of the member countries. The signatories are individually empowered in each case to compile the technical documentation.



# 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. Jungheinrich reserves 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.

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### **WARNING!**

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

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### **CAUTION!**

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

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### **NOTE**

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

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 Used before notices and explanations.

- Indicates standard equipment
- Indicates optional equipment

## Copyright

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# Table of Contents

<b>A</b>	<b>Correct Use and Application .....</b>	<b>9</b>
1	General.....	9
2	Correct application.....	9
3	Approved application conditions.....	9
4	Proprietor responsibilities .....	10
5	Adding attachments and/or accessories.....	10
<b>B</b>	<b>Transport and Commissioning .....</b>	<b>11</b>
1	Lifting by crane .....	11
2	Securing the truck during transport .....	13
3	Using the Truck for the First Time .....	14
4	Operating the truck without its own drive system .....	15
<b>C</b>	<b>Truck Description .....</b>	<b>17</b>
1	Application.....	17
2	Travel direction definition.....	18
3	Assemblies and Functional Description.....	19
3.1	Assembly Overview .....	19
3.2	Functional Description .....	21
4	Technical Specifications .....	22
4.1	Performance data .....	22
4.2	Weights.....	23
4.3	Tyre type.....	23
4.4	Dimensions.....	24
4.5	EN norms.....	26
4.6	Conditions of use.....	26
5	Identification points and data plates .....	27
5.1	Data plate .....	28
5.2	Truck capacity plate.....	29
<b>D</b>	<b>Battery - Servicing, Recharging, Replacement .....</b>	<b>31</b>
1	Safety Regulations Governing the Handling of Lead-Acid Batteries .....	31
1.1	General notes on handling batteries.....	32
2	Battery types.....	32
3	Exposing the battery.....	34
4	Battery removal and installation .....	35
5	Charging the battery .....	37

<b>E</b>	<b>Operation .....</b>	<b>39</b>
1	Safety Regulations for the Operation of the Forklift Truck.....	39
2	Displays and Controls.....	41
2.1	Operator platform position in drive direction.....	41
2.2	Second control station (o) in load direction .....	43
2.3	Auxiliary lift controls.....	45
2.4	Pedestrian EKS 110 with gates.....	46
2.5	Deadman button and gate.....	47
2.6	Displays.....	48
3	Starting up the truck .....	50
3.1	Checks and operations to be performed before starting daily operation ..	50
3.3	Setting up the operator position.....	51
4	Industrial Truck Operation .....	52
4.1	Safety regulations for truck operation.....	52
4.2	Preparing the truck for operation .....	54
4.3	Parking the truck securely .....	55
4.4	Emergency Disconnect.....	55
4.5	Deadman button.....	56
4.6	Travel.....	57
4.7	Steering .....	58
4.8	Brakes .....	58
4.9	Travelling in pedestrian touch mode (o) .....	59
4.10	Operator platform lifting and lowering.....	60
4.11	Auxiliary Lift – raising and lowering .....	62
4.12	Lifting and lowering in pedestrian touch mode .....	64
4.13	Lifting and lowering the operator platform with lift cutout (o).....	68
4.14	Lifting, transporting and depositing loads .....	69
4.15	Adjusting the forks.....	70
4.16	Walk-on load section with pallet guard ( Zusatzausstattung).....	71
4.17	Negotiating narrow aisles .....	73
4.18	Trucks with rail guidance and aisle recognition (Zusatzausstattung) .....	75
4.19	Emergency lowering .....	78
5	CANCODE keypad (o).....	80
5.1	Keypad .....	80
5.2	Parameters .....	81
5.3	Parameter Settings .....	81
6	Troubleshooting .....	85
6.1	Truck does not start.....	85
<b>F</b>	<b>Industrial Truck Maintenance .....</b>	<b>87</b>
1	Operational Safety and Environmental Protection.....	87
2	Maintenance Safety Regulations.....	87
3	Servicing and Inspection .....	91
4	Maintenance checklist .....	92
5	Lubricants and Lubrication Schedule .....	93
5.1	Handling consumables safely.....	93
5.2	Lubrication Schedule .....	95
5.3	Consumables.....	96

6	Maintenance and repairs .....	97
6.1	Preparing the truck for maintenance and repairs .....	97
6.2	Tightening the wheel nuts.....	98
6.3	Mast retainer assembly and removal.....	99
6.4	Front panel assembly and disassembly .....	102
6.5	Electrical System .....	103
6.6	Checking electrical fuses.....	104
7	Restoring the truck to service after maintenance and repairs .....	105
8	Decommissioning the industrial truck .....	106
8.1	Prior to decommissioning .....	106
8.2	During decommissioning .....	106
8.3	Restoring the truck to service after decommissioning .....	107
9	Safety tests to be performed at intervals and after unusual incidents .....	108
10	Final de-commissioning, disposal.....	108
11	Human vibration measurement .....	108



# 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 industrial truck described in the present operating instructions is designed for lifting, lowering and transporting load units.

It must be used, operated and serviced in accordance with the present instructions. Any other type of use is beyond the scope of application and can result in damage to personnel, the industrial truck or property.

## 2 Correct application

### NOTE

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 rest on the back of the fork carriage and centrally between the forks.

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- Lifting and lowering of loads.
- Transporting lowered loads.
- Do not travel with a raised load (>30 cm).
- Do not carry or lift passengers.
- Do not push or pull load units.

## 3 Approved application conditions

### 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 ramp / bridge cannot move or come loose during loading / unloading.

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- Operation in industrial and commercial environments.
- Permissible temperature range 5°C to 40°C.
- Application only on level surfaces to DIN 15185.
- Safety clearances between the truck and rack to EN 1726-2 item 7.3.2.
- Minimum 100 mm safety clearance between rail guided truck and rack.
- Minimum 125 mm safety clearance between wire guided truck and rack.

## 4 Proprietor responsibilities

For the purposes of the present operating instructions the “proprietor” 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 for which it is intended and that there is no danger to life and limb of the user and third parties. Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The proprietor must ensure that all users have read and understood these operating instructions.

### **NOTE**

Failure to comply with the operating instructions shall invalidate 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.

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## 5 Adding attachments and/or accessories

### **Adding accessories**

The mounting or installation of additional equipment which affects or enhances the performance of the forklift truck requires the written permission of the manufacturer. Local authority approval may also need to be obtained.

Local authority approval does not however constitute the manufacturer's approval.

# B 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 and mast from striking other objects when they are being raised, and avoid any uncontrolled movement. If necessary, secure the truck and mast with guide ropes.

- ▶ The truck and mast should only be laden by people who are trained in handling lifting slings and tools.
- ▶ Wear safety shoes when lifting by crane.
- ▶ Do not stand under a swaying load.
- ▶ Do not walk into or stand in a hazardous area.
- ▶ Only use lifting gear with sufficient capacity (for truck weight see truck data plate).
- ▶ Attach the crane slings only 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 truck attachments when it is being raised.

#### ***Lifting the truck by crane***

##### *Requirements*

- Load handler lowered
- Key switch set to OFF
- Key removed, for code lock the O key pressed.
- Emergency Disconnect OFF

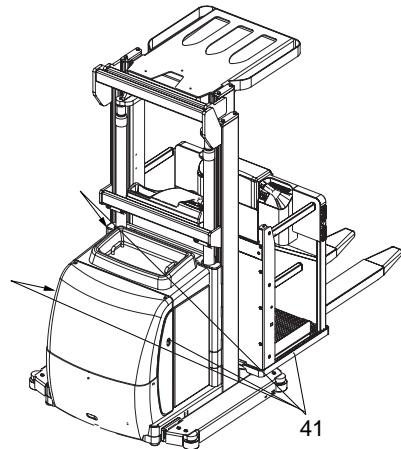
##### *Tools and Material Required*

- Lifting gear
- Crane slings

##### *Procedure*

- Secure the crane slings to the attachment points (1) and (2).

*The truck can now be lifted by crane.*





## 2 Securing the truck during transport

### **WARNING!**

#### **Accidental movement during transport**

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

- ▶ Loading must be carried out by specially trained staff in accordance with recommendations contained in Guidelines VDI 2700 and VDI 2703. In each case correct measurements must be made and appropriate safety measures adopted.
- ▶ The truck must be securely fastened when transported on a lorry or a trailer.
- ▶ The lorry / trailer must have fastening rings.
- ▶ Use wedges to prevent the truck from moving.
- ▶ Use only tension belts or tie-down straps or with sufficient strength.

#### **Securing the truck for transport**

##### *Requirements*

- Load handler lowered
- Key switch set to OFF
- Key removed, for code lock the O key pressed
- Emergency Disconnect pressed
- Battery disconnected

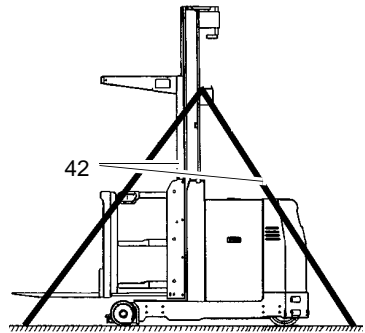
##### *Tools and Material Required*

- Tension belts/tie down straps

##### *Procedure*

- Position the truck securely on a lorry or trailer.
- Attach at least four tension belts (42) to the mast, 2 on the left and 2 on the right.

*The truck can now be transported.*



### 3 Using the Truck for the First Time

#### ***Preparing the truck for commissioning***

##### *Procedure*

- Check the equipment is complete.
- If necessary install the battery, (see "Battery removal and installation" on page 35)
- The truck should only be operated with battery current. Rectified AC current will damage the electronic components. The battery leads (tow cable) must be less than 6m long.
- Charge the battery, (see "Charging the battery" on page 37).

*The truck can now be started, (see "Starting up the truck" on page 50).*

## 4 Operating the truck without its own drive system

### Releasing the brake

**⚠ CAUTION!**

#### Uncontrolled truck movement

- ▶ Do not release the brake on slopes or inclines.
- ▶ Apply the brake again when you reach your destination.
- ▶ Do not park the truck with the brake released.

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#### Tools and Material Required

- Two M5x42 hex. socket screws
- Allen key

#### Procedure

- Turn the main switch/isolator "OFF".
- Set the key switch OFF and remove the key.
- Prevent the truck from rolling away.
- Lift up the front panel (16) and put it to one side, (see "Front panel assembly and disassembly" on page 102).
- Insert two M5x42 hex. socket screws (43) as far as the stop and lift up the anchor plate.

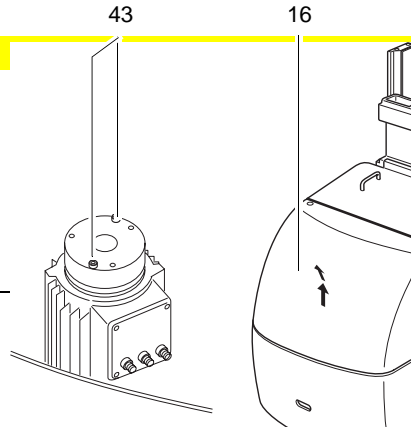
*The brake is now released and the truck can be moved.*

### Applying the brake

#### Procedure

- Unscrew the two M5x42 hex. socket screws (43) again.
- Refit and close the front panel (16).

*Braking is now restored again.*





# C Truck Description

## 1 Application

The EKS 110 is an electric powered vertical order picker. The truck is designed to transport and pick goods on level surfaces in accordance with DIN 15185.

It is designed to lift open bottom, cross-board pallets and roll cages. The truck is not suitable for stacking pallets in racking systems. The driver's cab rises with the load handler so that the shelf heights to be operated are visible and within easy reach.

The racking systems must be set up for the EKS 110. The safety clearances stipulated by the manufacturer (e.g. EN 1726-2 item 7.3.2) must be observed.

There must be a minimum safety clearance between the rack and the truck of

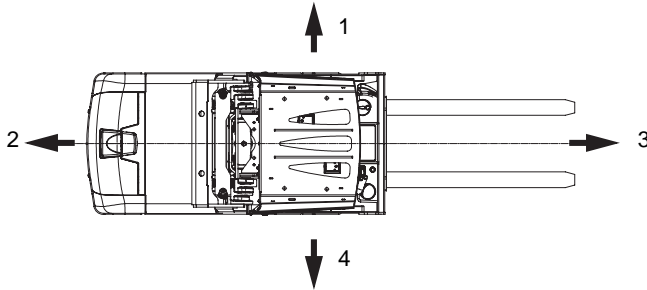
- 100 mm for rail guided trucks and
- 125 mm for wire-guided trucks.

The ground surface must comply with DIN 15185. Guide rails must be provided in the narrow aisles for the rail guidance system. Vulkollan guide wheels attached to the truck chassis guide the truck between the guide rails.

The truck is fitted as standard with a simplex mast (E mast) or a duplex mast (ZZ mast) (lift heights (see "Technical Specifications" on page 22)). Auxiliary lift is optionally available, which allows the forks to be raised a further 800 mm.

## 2 Travel direction definition

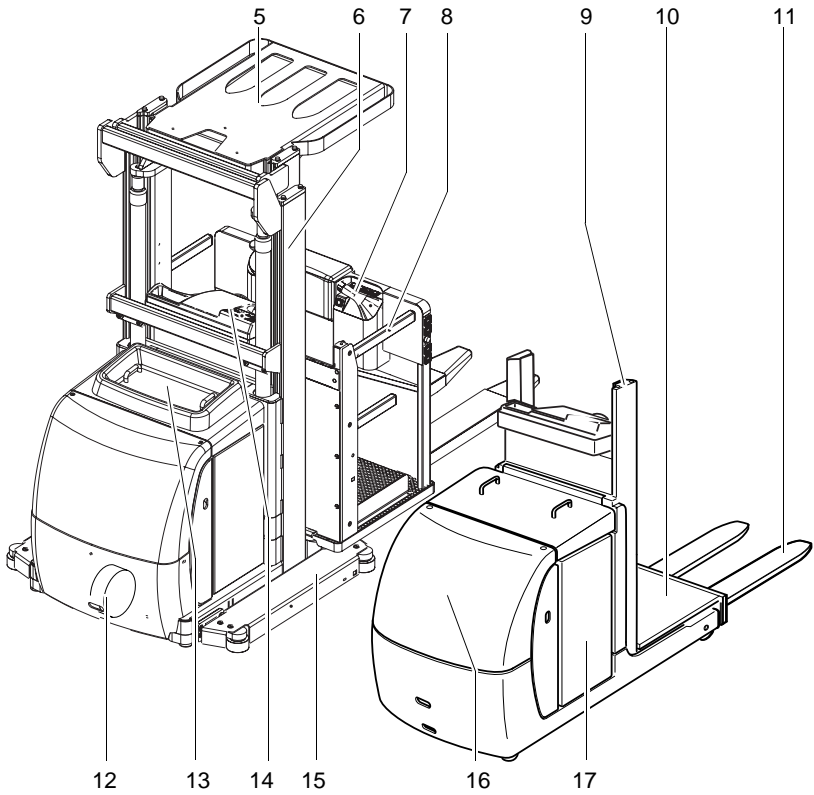
The following determinations have been made for travel direction specification:



Item	Travel direction
1	Left
3	Load direction
4	Right
2	Drive direction

### 3 Assemblies and Functional Description

#### 3.1 Assembly Overview



<b>Item</b>	<b>Description</b>
5	● Overhead guard
6	○ Duplex mast
7	● Controller
8	● Gate (from 1200 mm)
9	● Simplex mast
11	● Fork
10	● Operator platform
17	● Electrical system cover
16	● Drive panel
15	○ Guide wheels
14	● Driver's display
13	● Battery cover
12	● Drive wheel
	● Standard equipment
	○ Optional equipment

## 3.2 Functional Description

### Safety Mechanisms

The truck has an enclosed geometry. The drive wheel is surrounded by a solid skirt. The operator platform is cushioned against impacts. The overhead guard protects the driver from any falling objects. Gates on either side of the operator platform cut out all travel and lifting operations beyond a lift height of 1200 mm. In the optional "rail guidance with aisle recognition" mode (○) in narrow aisles, the two-hand operation button (○) must also be pressed to enable travel and lifting. The two-hand operation system prevents the operator from reaching into the rack while the truck is travelling or lifting.

**Emergency Disconnect:** The Emergency Disconnects switches off all electrical functions when applied.

### Truck design

The truck is a three-wheel design with a steered drive wheel within the enclosed truck geometry. An easily accessible front panel, a detachable battery cover and a detachable electrical system cover provide easy access to all the components.

### Brakes

Braking is performed by changing travel direction with the controller (inversion braking), or by releasing the controller (coasting brake). When the electrical system is disconnected the spring-loaded brake acts as a parking brake.

### Steering system

The steer range is 90° in either direction. The steering wheel acts electrically on the steering transmission motor. The spur gear transfers the steering movement to the drive wheel. In "rail guidance with aisle recognition" mode (○) the steering is automatically kept in the straight-ahead position.

### Hydraulic system

When lifting is activated, the pump unit starts to operate, supplying hydraulic oil from the oil reservoir to the lift cylinder. A hydraulic accumulator and a flow control valve ensure cushioned lifting and lowering.

### Lift mechanism

The truck has a welded simplex mast. The load carriage with the operator platform and forks runs on flanged rollers to limit frictional loss and ensure low energy consumption. Lifting is performed through the hydraulic cylinder extension. In auxiliary lift mode (○) the forks are raised by a centre-mounted lift cylinder via a pulley chain. The truck can be fitted with a duplex mast.

### Controls and displays

Controls and displays are clearly arranged in the driver's cab. A controller governs the travel speed. Lifting, lowering and the horn function are operated by buttons within easy reach. If the truck is fitted with auxiliary lift (○) "Z" the controls for lifting/lowering the auxiliary lift are also arranged in the same way on the load side (on the auxiliary lift). The driver's display shows the battery charge, the service hours plus service and diagnostic data. A wheelbase display indicates the current steer angle of the drive wheel.

## 4 Technical Specifications

- Technical data specified in accordance with VDI 2198.  
Technical modifications and additions reserved.
- All data applies to the L and Z versions unless otherwise indicated.

### 4.1 Performance data

	Description	EKS 110 (100 E)	EKS 110 (160 E)	EKS 110 (190 E)	EKS 110 (280 ZZ)	
Q	Rated capacity	1000			1000	kg
	Travel speed w / w.o. rated load	9,8/10,1	9,0/9,0		9,0/9,0	km/h
	Lift speed with / without rated load, Z	0,16/0,20	0,13/0,17		0,21/0,30	m/s
	Lift speed with / without rated load, L	0,16/0,20	0,13/0,17		0,21/0,30	m/s
	Lower speed with / without rated load, Z	0,21/0,19			0,30/0,28	m/s
	Lower speed with / without rated load, L	0,21/0,19			0,30/0,28	m/s
	Gradeability with / without rated load	5/10				%
	Traction motor, output (S2 = 60 min)	2,8				kW
	Lift motor, output at S3 15%	3				kW
	Lift motor, output at S3 5 %	2,2				kW
	Lift motor, output at S3 20 %	6				kW

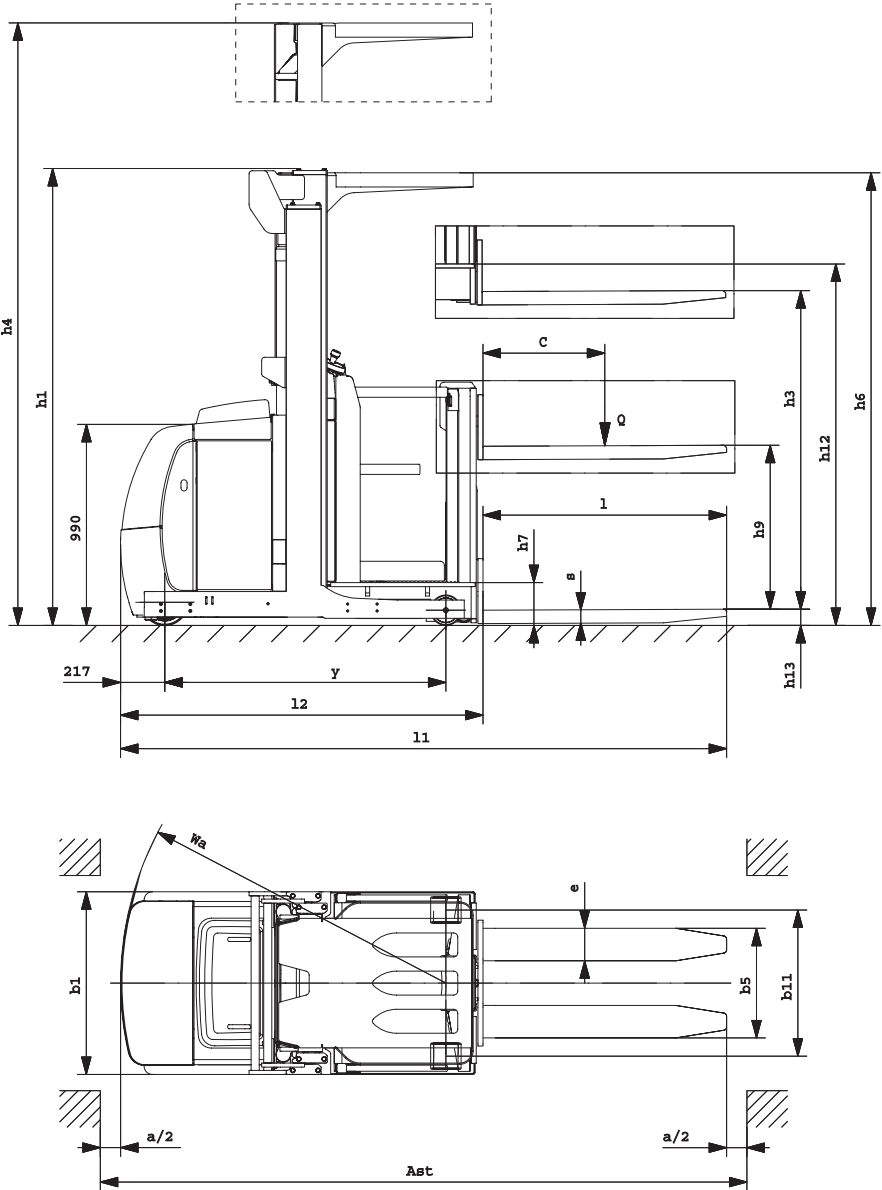
## 4.2 Weights

	Description	EKS 110 (100 E)	EKS 110 (160 E)	EKS 110 (190 E)	EKS 110 (280 ZZ)	
	Truck weight including battery L/Z	1756/ 1859	1934/ 2036	1970/ 2072	2270/ 2390	kg
	Axle load with load front/rear (with battery) Z	481/ 2377	461/ 2575	461/ 2611	755/ 2635	kg
	Axle load without load front/rear (with battery) Z	1083/ 775	1105/ 931	1113/ 959	1330/ 1060	kg
	Axle load with load front/rear (with battery) L	476/ 2280	456/ 2478	456/ 2514	765/ 2505	kg
	Axle load without load front/rear (with battery) L	1078/ 678	1100/ 834	1108/ 862	1305/ 965	kg

## 4.3 Tyre type

	Description	Rating	
	Tyre type	Vulkollan	
d1	Tyre size, front	230x80	mm
d2	Tyre size, rear	150x30	mm

## 4.4 Dimensions



	Description	EKS 110 (100 E)	EKS 110 (160 E)	EKS 110 (190 E)	EKS 110 (280 ZZ)	
c	Load centre		600	600	600	mm

	Description	EKS 110 (100 E)	EKS 110 (160 E)	EKS 110 (190 E)	EKS 110 (280 ZZ)	
x	Load distance	178			185	mm
y	Wheelbase	1300			1385	mm
h <sub>1</sub>	Mast height retracted	1660 <sup>1</sup>	2260	2560	2251	mm
h <sub>3</sub>	Lift	1000	1600	1900	2800	mm
h <sub>4</sub>	Mast height (extended) (h <sub>1</sub> + h <sub>3</sub> )	2660 <sup>1</sup>	3830	4130	5034	mm
h <sub>6</sub>	Overhead guard height	2230			2230	mm
h <sub>7</sub>	Seat height / standing height	200			200	mm
h <sub>9</sub>	Aux. lift Z	800			800	mm
h <sub>12</sub>	Truck height raised (h <sub>3</sub> + h <sub>7</sub> )	1200	1800	2100	3000	mm
h <sub>13</sub>	Lowered height	80			80	mm
Ast	Aisle width for pallets <sup>2</sup> 800 x 1200 longit.	3153			3245	mm
Ast	Aisle width for pallets <sup>2</sup> 1000 x 1200 transverse	3040			3131	mm
b <sub>1</sub> / b <sub>2</sub>	Overall width	810			900	mm
b <sub>4</sub>	Inside straddle	430			520	mm
b <sub>5</sub>	Outside straddle	540			540	mm
b <sub>11</sub>	Track width, rear	630			720	mm
l <sub>1</sub>	Overall length L/Z	2895			2985	mm
l <sub>2</sub>	Headlength L/Z	1695			1785	mm
l <sub>3</sub>	Platform length L/Z	775/710			775/710	mm
l	Fork length	800				mm
Wa	Turning radius	1518			1603	mm
s/e/ l	Fork dimensions L	60 / 160 / 1200			60 / 160 / 1200	mm
s/e/ l	Fork dimensions Z	65 / 160 / 1200			65 / 160 / 1200	mm
m <sub>1</sub>	Ground clearance with load below mast	35			35	mm
a	Safety clearance	200			200	mm
	Fork carriage ISO 2328, class/type A,B	FEM 2A (optional)				

1 equipped with overhead guard (○) +570 mm

2 For rotating in front of the occupied pallet space in accordance with VDI 2198 (diagonal method)

## 4.5 EN norms

### Noise emission level

– EKS 110: 68 dB(A)

in accordance with EN 12053 as harmonised with ISO 4871.

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

### Vibration

– EKS 110: 0,96 m/s<sup>2</sup>

in accordance with EN 13059

- The vibration acceleration acting on the body in the operating position is, in accordance with standard procedures, the linearly integrated, weighted acceleration in the vertical direction. It is calculated when travelling over bumps at constant speed. These recordings were taken on a single occasion and must not be confused with the human vibrations of the "2002/44/EC/Vibrations" operator directive. The manufacturer offers a special service to measure these human vibrations, (see "Human vibration measurement" on page 108).

### 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 with a doctor or the medical equipment manufacturer to clarify whether it can be used near the industrial truck.

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## 4.6 Conditions of use

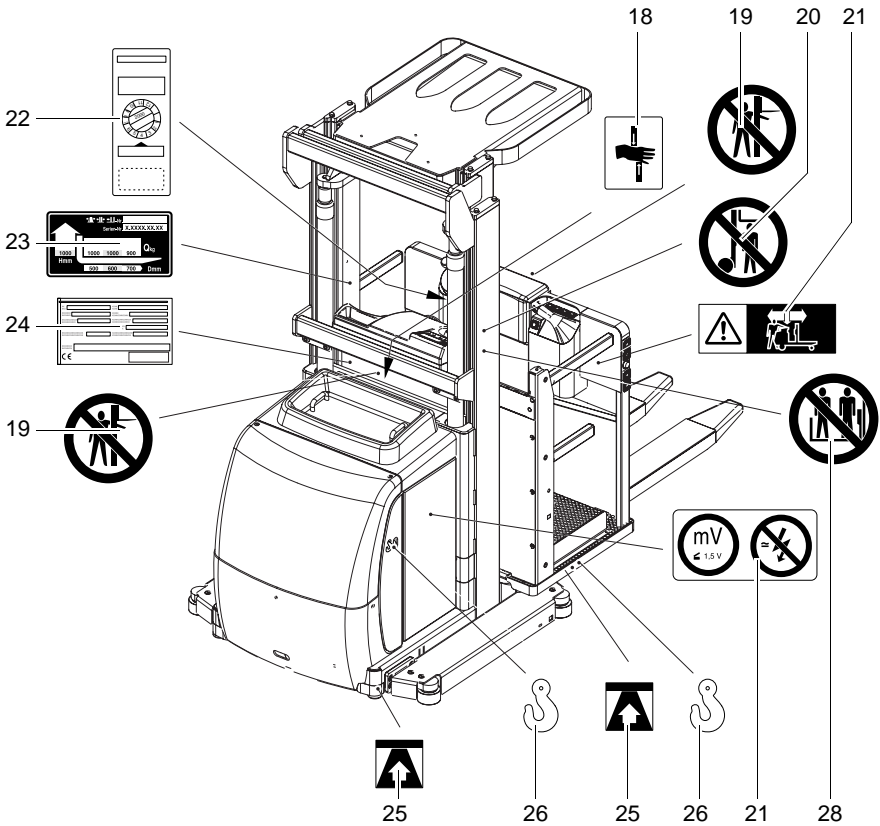
### Ambient temperature

– operating at 5°C to 40°C

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

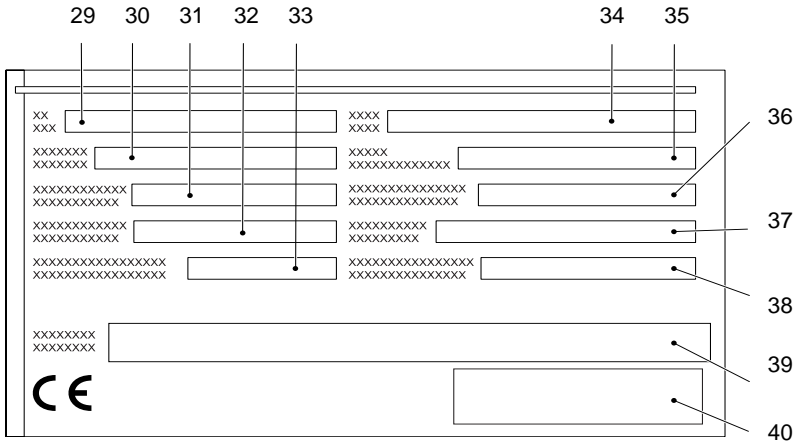
## 5 Identification points and data plates

Warnings and notices such as load charts, strap points and data plates must be legible at all times. Replace if necessary.



Item	Description
18	"Danger of trapping" warning
19	"Do not reach through the mast" warning
20	"Do not step under the load handler" warning
21	"Caution, pushbutton operation" warning
22	Test plaque (○)
23	Capacity Plate, Capacity / Load Centre of Gravity / Lift Height
24	Truck data plate
25	Jack contact point
26	Strap point for crane lifting
27	"Caution: Low voltage electronics" warning
28	"Do not carry passengers" warning

## 5.1 Data plate

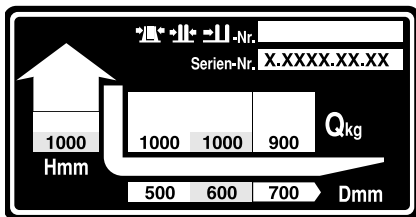


Item	Description	Item	Description
29	Type	35	Year of manufacture
30	Serial number	36	Load centre (mm)
31	Rated capacity (kg)	37	Output
32	Battery voltage (V)	38	Min./max. battery weight (kg)
33	Net weight w.o. battery (kg)	39	Manufacturer
34	Option	40	Manufacturer's logo



For queries regarding the truck or ordering spare parts always quote the truck serial number (30).

## 5.2 Truck capacity plate



The capacity plate (23) gives the capacity (Q) of the truck in kg for a vertical mast. The maximum capacity is shown as a table with a given load centre of gravity D (in mm) and the required lift height H (in mm).

### Example of how to calculate the maximum capacity

For a load centre of gravity D of 600 mm and a max. lift height H of 1000 mm the maximum capacity Q is 1000 kg.



# 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. This operator manual 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 a truck is parked for charging there must be no flammable material or consumables capable of creating sparks within a 2 metre radius of the truck. The room must be ventilated. Fire protection equipment must be on hand.

### Battery maintenance

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

### CAUTION!

Before closing the battery panel make sure that the battery cable cannot be damaged. There is a risk of short circuits with damaged cables.

---

### 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 followed.

## 1.1 General notes on handling batteries

### **WARNING!**

#### **Batteries can be hazardous**

Batteries contain an acid solution which is poisonous and corrosive. Above all avoid any contact with battery acid.

- ▶ Dispose of used battery acid in accordance with regulations.
- ▶ Always wear protective clothing and goggles when working with batteries.
- ▶ Do not let battery acid come into contact with skin, clothing or eyes. If necessary, rinse with plenty of clean water.
- ▶ Call for a doctor immediately in the event of physical damage (e.g. skin or eye contact with battery acid).
- ▶ Neutralise any spilled battery acid immediately with plenty of water.
- ▶ Only batteries with a sealed battery container may be used.
- ▶ Follow national guidelines and legislation.

### **WARNING!**

#### **Using unsuitable batteries can cause accidents**

The weight and dimensions of the battery have a considerable effect on the operational safety and capacity of the industrial truck. Changing the battery features requires the manufacturer's approval, as compensating weights are required if smaller batteries are fitted. When replacing/installing the battery make sure the battery is securely located in the battery compartment of the truck.

Park the truck securely before carrying out any work on the batteries ((see "Parking the truck securely" in chapter 4.3)).

## 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:

Battery type	Capacity	Weight
24 volt battery (maintenance-free)	4 EPzV 480 Ah	480 kg
24 volt battery	4 EPzS 560 Ah	
24 volt battery	4 EPzS 620 Ah	
24 volt battery (maintenance-reduced)	4 EPzW 560 Ah	

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.

### **NOTE**

**Only use a battery whose weight is within the minimum and maximum range stated on the truck's data plate.**

**Failure to comply with the prescribed battery weight range can render the truck unstable.**

---

### 3 Exposing the battery

#### *Requirements*

- Load handler lowered
- Key switch set to OFF
- Key removed, for code lock the O key pressed
- Emergency Disconnect OFF

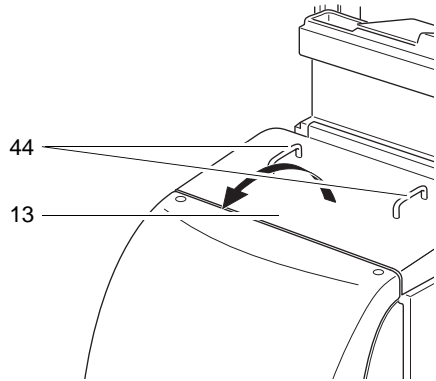
#### *Procedure*

- Grab the battery cover (13) by both handles (44) and lift it up as far as the stop.



The battery cover is held up by its own weight.

- Restore all covers and connections to their operating position before starting up the truck.
- Close the battery panel using the handles (44) only.



## 4 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.
- ▶ Park the truck on a level surface to prevent the battery from sliding out.
- ▶ Make sure the crane slings have 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.

#### **Removing the battery**

##### *Requirements*

- Park the truck securely, (see "Battery removal and installation" on page 35).
- Battery disconnected.

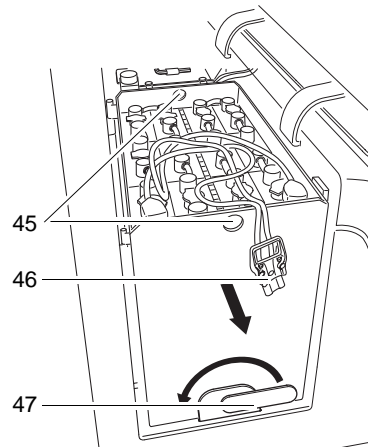
##### *Tools and Material Required*

- Crane or forklift truck
- Crane slings
- Battery replacement trolley (○)

##### *Procedure*

- Pull the clamping lever (6) of the battery lock 180° anti-clockwise.
- Pull the battery lock up.
- Removing the battery with a replacement trolley (○)
  - Pull the battery sideways off the truck.  
Follow the operating instructions of the battery replacement trolley manufacturer!
- Removing the battery with a crane or forklift truck
  - Attach the hooks of the crane slings to the strap eyes (5) on the battery.  
The discharged crane slings must not fall onto the battery cells.
  - Slowly and carefully lift the battery out of the truck.

*The battery is now removed.*



## ***Battery installation***

### *Requirements*

- Truck parked.
- Battery lock removed.

### *Tools and Material Required*

- Crane or forklift truck
- Crane slings
- Battery replacement trolley (○)

### *Procedure*

- Installing the battery with a crane or forklift truck
  - Attach the hooks of the crane slings to the strap eyes (45) on the battery. The discharged crane slings must not fall onto the battery cells.
  - Slowly and carefully lower the battery into the truck.
- Installation with a battery replacement trolley
  - Position the battery replacement trolley and battery in front of the battery compartment.
  - Push the battery as far as the stop in the battery compartment.
- Insert the battery lock.
- Pull the clamping lever (47) of the battery lock 180° clockwise.
- Attach the battery connector (46) to the truck.
- Check all cables and plug connections for visible signs of damage.
- Close the battery cover.

*When the battery has been installed the truck is ready for operation.*

## 5 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 a truck is parked for charging there must be no flammable material or consumables capable of creating sparks within a 2 metre radius of the truck.
- ▶ Fire protection equipment must be provided.
- ▶ Do not lay any metallic objects on battery.
- ▶ It is essential to follow the safety regulations of the battery and charger station manufacturers.

#### **Charging the battery**

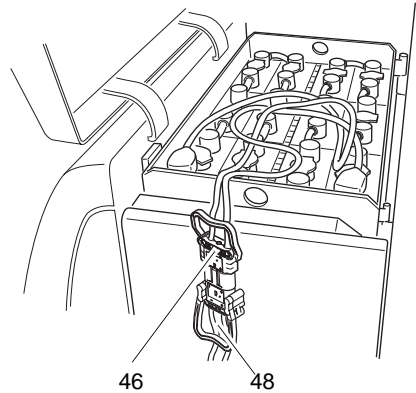
##### *Requirements*

- Battery exposed.
- Charger switched off.

##### *Procedure*

- Remove the battery connector (3).
- Remove any insulating mats from the battery.
- Connect the charging cable (4) of the battery charger station with the battery connector (3).
- Switch on the charger. Charge the battery in accordance with the battery and battery charger manufacturers' instructions.

*The battery is now charged.*





# E Operation

## 1 Safety Regulations for the Operation of the Forklift Truck

### **Driver authorisation**

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

### **Driver's rights, obligations and responsibilities**

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. The driver shall be afforded all due rights. Safety shoes must be worn for pedestrian operated trucks.

### **Unauthorised use of truck**

The driver is responsible for the truck during the time it is in use. The driver 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 immediately informed 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 driver must not carry out any repairs or alterations to the truck without the necessary training and authorisation to do so. The driver must never disable or adjust safety mechanisms or switches.

## Hazardous area



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

The hazardous area is defined as the area in which a person is at risk due to truck movement, lifting operations, the load handler (e.g. forks or attachments) or the load itself. This also includes areas which can be reached by falling loads or lowering operating equipment.

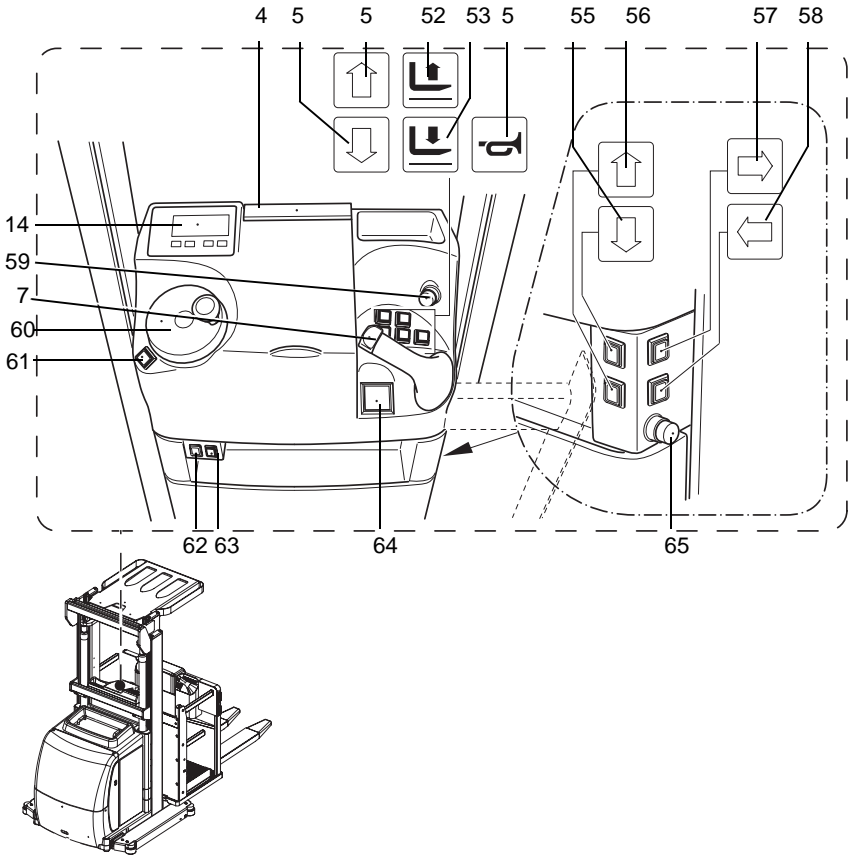
- ▶ Instruct unauthorised people to leave the hazardous area.
  - ▶ Give a warning signal with plenty of time for people to leave.
  - ▶ If unauthorised personnel are still within the hazardous area stop the truck immediately.
- 

### **Safety devices and warning labels**

It is essential to observe the safety devices, warning decals ((see "Identification points and data plates" on page 27)) and warning notices in this manual.

## 2 Displays and Controls

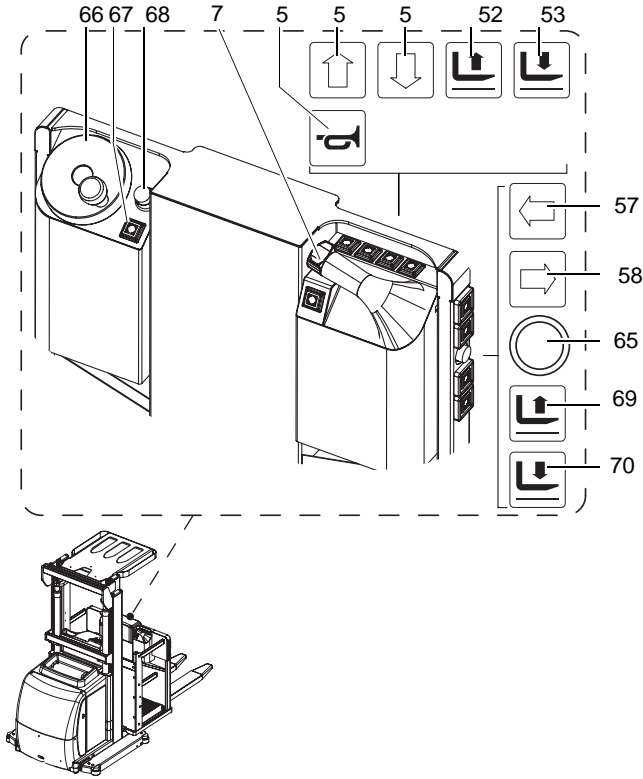
### 2.1 Operator platform position in drive direction



Item	Control / Display	Function
49	Clip board	● For holding A4 paper
50	Lower button	● Lowers the operator platform and forks.
51	Lift button	● Lifts the operator platform and forks.
52	Aux. lift "raise" button	○ Raises the forks
		○ 2nd control station
53	Aux. lift "lower" button	○ Lowers the forks
		○ 2nd control station
54	Warning button	● Activates a warning signal.
		○ 2nd control station
55	Pedestrian mode lower button	○ Pedestrian mode optional feature: Lowers the operator platform and forks.

Item	Control / Display	Function
56	Pedestrian mode lift button	○ Pedestrian mode optional feature: Lifts the operator platform and forks.
57	Drive direction pedestrian touch mode	○ Pedestrian mode optional feature, travel is continued as operator walks beside in drive direction (slow travel).
58	Fork direction pedestrian touch mode	○ Pedestrian mode optional feature, travel is continued as operator walks beside in forks direction (slow travel).
14	Driver's display	● Displays important travel and lift parameters; selection and display of steering modes, warnings, incorrect operation notes and service displays.
59	Emergency Disconnect	● The circuit is interrupted, all electrical functions are cut out and the truck automatically brakes.
7	Controller	● Controls the travel direction and speed.
		○ 2nd control station
60	Steering wheel	● Steers the truck.
61	Button Two-hand operation	○ Releases lifting and travel when pressed (in rail guidance mode with aisle recognition).
62	Indicator	○ End of aisle safety device optional feature: Indicates reduced travel speed
63	Reset button	○ End of aisle safety device optional feature: Releases normal travel speed.
64	Key switch and key	● Switches control voltage on and off. Removing the key prevents the truck from being switched on by unauthorised personnel.
	CANCODE keypad	○ Code lock, replaces the key switch. Switches control current on and off. Enables truck functions. Change access codes.
	ISM access module	○ Replaces the key switch. Checks the card (or the transponder). Enables truck functions. Timeout monitoring. Lists the truck users (shifts) and saves them onto the card. Operational data acquisition.
65	Emergency Disconnect	○ Pedestrian mode optional feature: Disconnects the supply current and deactivates all electrical functions, causing the truck to brake automatically.
●	Standard equipment	
○	Optional equipment	

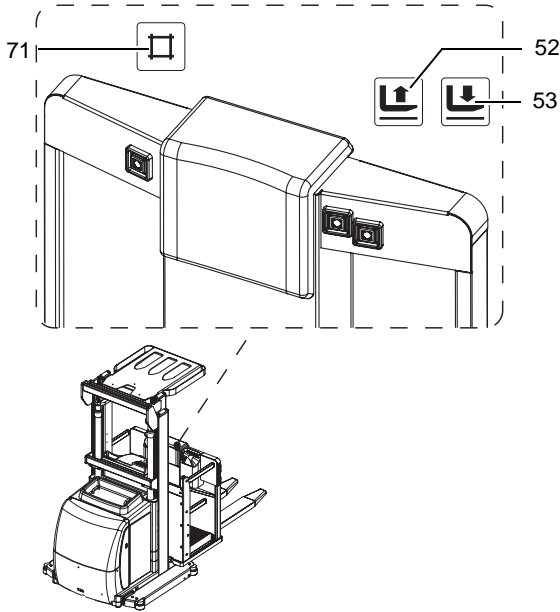
## 2.2 Second control station (○) in load direction



Item	Control / Display	Function
50	Lower button	● Lowers the operator platform and forks.
51	Lift button	● Lifts the operator platform and forks.
52	Aux. lift "raise" button	○ Raises the forks.
53	Aux. lift "lower" button	○ Lowers the forks.
54	Warning button	● Activates a warning signal.
57	Drive direction pedestrian touch mode	○ Pedestrian mode optional feature, travel is continued as operator walks beside in drive direction (slow travel).
58	Fork direction pedestrian touch mode	○ Pedestrian mode optional feature, travel is continued as operator walks beside in forks direction (slow travel).
7	Controller	● Controls the travel direction and speed.
60	Steering wheel	● Steers the truck.

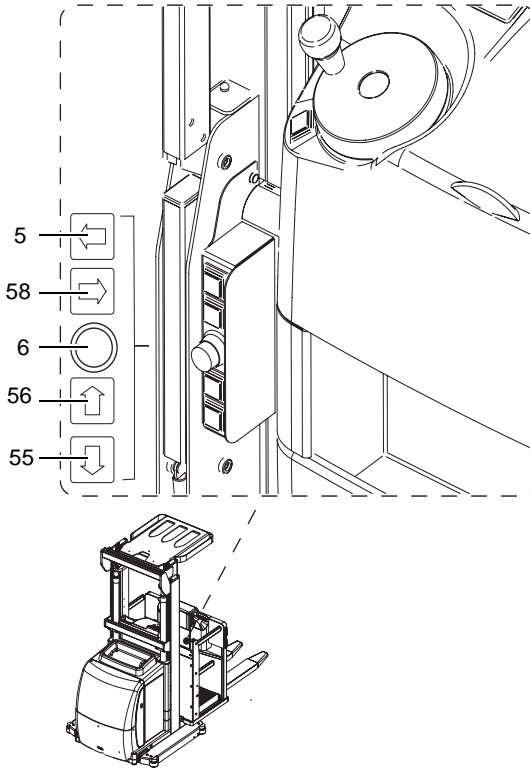
<b>Item</b>	<b>Control / Display</b>	<b>Function</b>
65	Emergency Disconnect	<input type="radio"/> Pedestrian mode optional feature: Disconnects the supply current and deactivates all electrical functions, causing the truck to brake automatically.
66	Steering wheel (2nd control station)	<input type="radio"/> Steers the truck.
67	Two-hand operation button (2nd control station)	<input type="radio"/> Releases lifting and travel when pressed (in rail guidance mode with aisle recognition).
68	2. Emergency Disconnect 2nd control station	<input type="radio"/> Disconnects the supply current and deactivates all electrical functions, causing the truck to brake automatically.
69	Aux. lift "raise" button	<input type="radio"/> Pedestrian mode optional feature: Raises the forks.
70	Aux. lift "lower" button	<input type="radio"/> Pedestrian mode optional feature: Lowers the forks.
●	Standard equipment	
○	Optional equipment	

## 2.3 Auxiliary lift controls



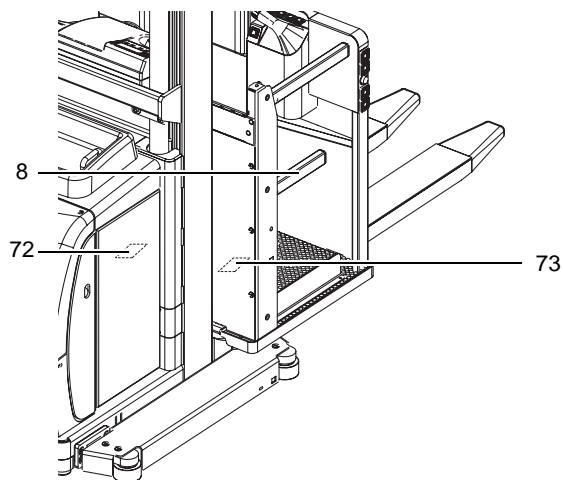
Item	Control / Display	Function	
52	Aux. lift "raise" button	<input type="radio"/>	Raises the forks
		<input type="radio"/>	2nd control station
53	Aux. lift "lower" button	<input type="radio"/>	Lowers the forks
		<input type="radio"/>	2nd control position
71	Two-hand operation, FEM fork raise/lower button	<input type="radio"/>	Raises/lowers the forks (aux. lift) Use in conjunction with buttons 4 and 5.
●	Standard equipment		
○	Optional equipment		

## 2.4 Pedestrian EKS 110 with gates



Item	Control / Display	Function
55	Pedestrian mode lower button	○ Pedestrian mode optional feature: Lowers the operator platform and forks.
56	Pedestrian mode lift button	○ Pedestrian mode optional feature: Lifts the operator platform and forks.
57	Drive direction pedestrian touch mode	○ Pedestrian mode optional feature, travel is continued as operator walks beside in drive direction (slow travel).
58	Fork direction pedestrian touch mode	○ Pedestrian mode optional feature, travel is continued as operator walks beside in forks direction (slow travel).
65	Emergency Disconnect	○ Pedestrian mode optional feature: Disconnects the supply current and deactivates all electrical functions, causing the truck to brake automatically.
●	Standard equipment	
○	Optional equipment	

## 2.5 Deadman button and gate



Item	Control / Display	Function
8	Gate	<input type="radio"/> Open: Lifting and travel inhibited from a lift height of 1200 mm. Closed: Lifting and travel released.
72	Deadman button	<input checked="" type="radio"/> Released: Travel inhibited, or truck decelerates. Applied: Travel released.
73	2nd control station deadman button	<input type="radio"/> Released: Travel inhibited, or truck decelerates. Applied: Travel released, operation changed to 2nd control station.
<input checked="" type="radio"/>	Standard equipment	
<input type="radio"/>	Optional equipment	

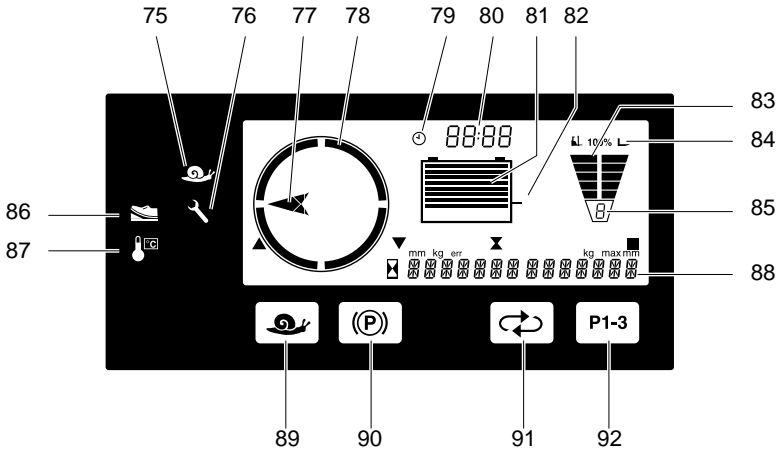
## 2.6 Displays

### Description

The driver's display unit represents the operator-truck interface. It is both a display and control unit for the operator and the service engineer.

Adjustments to the truck can be made by pressing the four short stroke keys (89, 90, 91, 92). The LEDs of the 4 luminous buttons (75, 76, 86, 87) can show 3 conditions: on, flashing or off.

The display unit gives information on the travel direction, steering angle, battery charge condition and other selected truck parameters.



Item	Description
75	Slow travel (green icon)
76	Service mode is active (yellow spanner icon), Service interval expired (icon flashing)
77	Steering angle display in 30° increments in arrow form
78	Travel direction display
79	No function
80	Time display (hours: minutes)
81	Battery discharge status
82	Discharge indicator
83	Set speed (drive direction) for current profile (in bars from 1 to 5)
84	No function
85	Profile number (travel profile 1, 2 or 3)
86	Deadman switch not pressed (yellow icon)

<b>Item</b>	<b>Description</b>
87	Overtemperature (red icon)
88	Warning and fault indication as text (14 segment display) and data registration
89	Slow travel
90	No function
91	Shift key (for changing display and accessing service mode)
92	Profile key to select travel mode

<b>Display</b>	<b>Operation</b>	<b>Description</b>
	LED 81 flashes	Battery empty, main lift cutout
	LED 86 on	Deadman button not pressed
INFO 09	LED 75	Slow travel applied or forced by battery latching
INFO 10	LED 87 on	Drive motor overtemperature

## 3 Starting up the truck

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

 **WARNING!**

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

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

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

#### ***Visual inspection before starting daily operation***

##### *Procedure*

- Check the whole of the outside of the truck for signs of damage and leaks. Damaged hoses must be replaced immediately.
- Check the battery attachment and wire connections for damage and make sure they are secure.
- Check the battery connector is secure.
- Check the battery retainers are present and test them.
- Make sure the battery cover and side panel (if applicable) are secure.
- Check the overhead guard for damage.
- Check the load handler for visible signs of damage such as cracks, bent or severely worn forks.
- Check the drive wheel and load wheels for damage.
- For rail guidance systems check the guide wheels run smoothly and check for damage (○).
- Check that the lift chains are evenly tensioned and damage-free.
- Check static charge eliminator is present.
- Check mast bracing for damage.

### 3.2 Entry and exit

### 3.3 Setting up the operator position

#### 3.3.1 Individual assembly of the second control station control panels

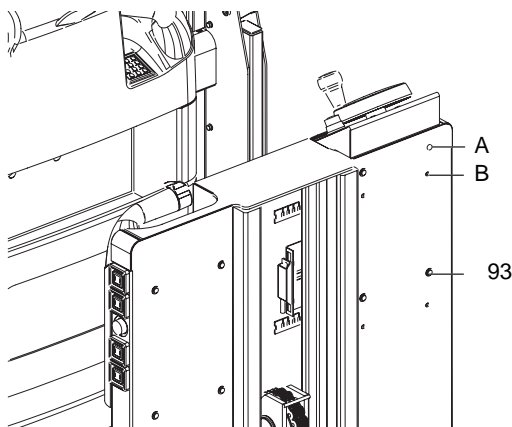
##### **NOTE**

**Improper assembly of the control panel can cause material damage.**

- ▶ When removing the control panel make sure no wires or plug connectors are trapped or disconnected.
- ▶ Prevent the control panel from falling down.
- ▶ When installing the control panel make sure no wires or plug connectors are trapped or disconnected.

The left and right-hand control panels of the second control station (O) can be set to two different heights "A" or "B".

##### ***Assembling the control panel for the second control station***



##### ***Procedure***

- Undo the four mounting screws (93) on each control panel, while preventing the control panel from falling down.
- Pull out the control panel approx. 60 mm in the drive direction.
- Install the control panel again with the required height "A" or "B".
- Fix the control panel again with the four mounting screws (93).
- Ensure the mounting screws (93) are tight.
- Test the controls on the control panel are working correctly.

*The control panel is now assembled.*

## **4 Industrial Truck Operation**

### **4.1 Safety regulations for truck operation**

#### **Travel routes and work areas**

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

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

#### **Travel conduct**

The driver 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 driver must always observe an adequate braking distance between the forklift truck and the vehicle in front and must be in control of the truck at all times. Abrupt stopping (except in emergencies), rapid U turns and overtaking at dangerous or blind spots are not permitted. Do not lean out or reach beyond the working and operating area.

#### **Travel visibility**

The driver must look in the direction of travel and must always have a clear view of the route ahead. Loads that affect visibility must be positioned at the rear of the truck. If this is not possible, a second person must walk in front of the truck as a lookout.

#### **Negotiating slopes and inclines**

Negotiating slopes or inclines is only permitted if they are specifically designed as travel routes, are clean and have a non-slip surface and providing they can be safely travelled along in accordance with the truck's technical specifications. The truck must always be driven with the load unit 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 and docks**

Lifts may only be entered 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.

People travelling in the lift with the forklift truck must only enter the lift after the truck has come to a halt and must exit the lift before the truck.

#### **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.

#### **Crash protection**

The driver must not leave the operator position in a raised position. Do not climb onto parts of the building or other trucks and do not climb over safety devices such as rail-

ings or gates. If Euro pallets are stored lengthways it may not be possible to reach items from the operator platform without the use of aids. The proprietor must provide the operators with suitable tools to pick the items without putting them at risk.

Load aids may only be walked on if suitable safety devices such as pallet guard and pallet tipover safety mechanisms are in place.

## 4.2 Preparing the truck for operation

### **Switching on the truck**

#### *Procedure*

- Step onto the operator platform.
- When entering the truck, take care not to apply the controller or the pedestrian buttons.
- Turn the Emergency Disconnect (59, 65, 68) to unlock it.
- Switch on the truck, to do this
  - Insert the key in the key switch (64) and switch on the truck.
  - Enter the code in the code lock (○).
  - 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 (54).
- Test the deadman button (72, 73) and controller (7).

*The truck is now operational. The steering is set straight-ahead.*

### **Setting the time (80)**

#### *Procedure*

- Press the Shift key (91) for 8 secs. until the "Set Clock Time" menu is displayed.
- Set the time with the Up (89) and Down (75) keys.
- Confirm with the Shift key (91).
- Set the minutes with the Up (89) and Down (75) keys.
- Confirm with the Shift (91) or profile (92) keys to return to normal operating mode.

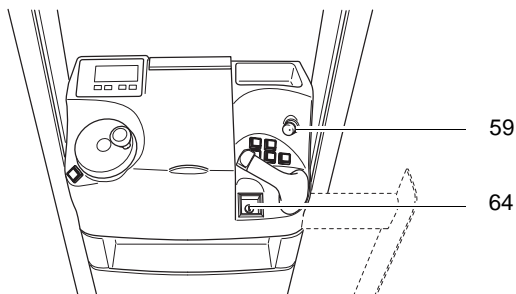
*The time is now set.*

## 4.3 Parking the truck securely

### CAUTION!


#### **An unsecured truck can cause accidents**

- ▶ Always park the truck on a level surface.
- ▶ Always lower the forks fully.
- ▶ Select a place to park where no other people are at risk of injury from lowering forks.



#### ***Parking the truck securely***


##### *Procedure*

- Lower the load handler.
- Switch off the truck (64) and remove the key.
- For code lock press the  key.
- Press the Emergency Disconnect (59).

## 4.4 Emergency Disconnect

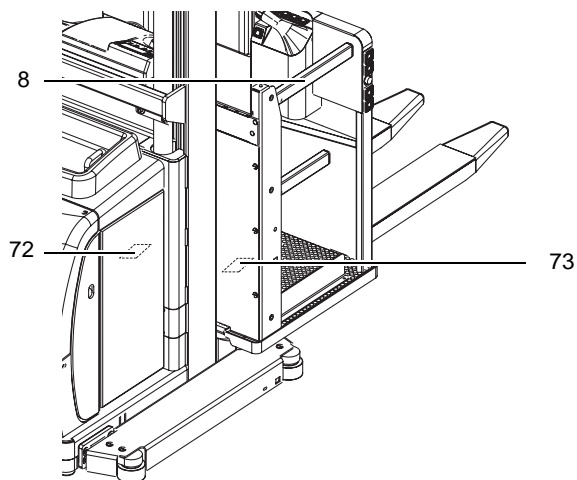
### ***Applying the Emergency Disconnect***

##### *Procedure*

- Press the Emergency Disconnect (65, 59, 68).
-  Do not use the Emergency Disconnect (65, 59, 68) as a service brake. The operation of the Emergency Disconnect (65, 59, 68) must not be affected by any objects placed in its way.

*All electrical functions are deactivated. The truck brakes until it comes to a halt.*

## 4.5 Deadman button

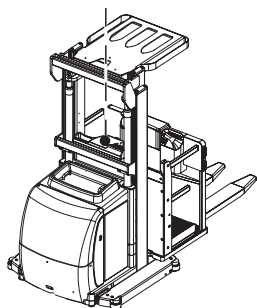
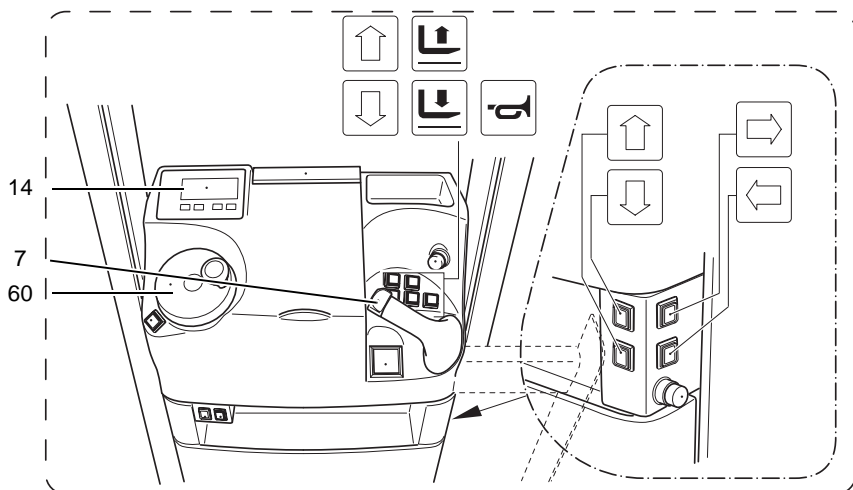


Lifting (main lift) and auxiliary lift (○) can be applied without having to press the deadman button (72, 73).

If the deadman button (72, 73) is released during travel, the truck decelerates at the maximum rate until it stops.

On trucks with a second control station (○) the deadman button (72, 73) acts as an interlock. Only the controls on the side of the deadman button (72, 73) that was pressed first will work.

## 4.6 Travel



### **Travel**

#### *Requirements*

- Truck started up.
- Beyond a lift height of 1200 mm the gates (8) must be closed to enable travel and lifting (main lift).
- Panels closed and locked correctly.

#### *Procedure*

- Press the deadman button (72, 73).
- Set the controller (7) to the required direction. Note the travel direction of the drive wheel on the driver's display (14).



Always travel outside of aisles with the load lowered.

The maximum travel speed will depend on the platform and the auxiliary lift heights (○)

*The truck travels in the required direction.*

### **Trucks with forks (version L)**

- Maximum speed up to platform height of 1200 mm
- From platform height of 1200 mm
  - at steering angle  $< \pm 10$  degrees: Travel speed 4 km/h (slow travel)
  - at steering angle  $> \pm 10$  degrees: Travel speed 2.5 km/h (slow travel)

### **Trucks with auxiliary lift (version Z)**

With auxiliary lift  $< 100$  mm

- Maximum speed up to platform height of 1200 mm
  - From platform height of 1,200 mm and steering angle  $< +/- 10$  degrees: Travel speed 4 km/h (slow travel)
  - From platform height of 1,200 mm and steering angle  $> +/- 10$  degrees: Travel speed 2.5 km/h (slow travel)

With auxiliary lift  $> 100$  mm

- Maximum speed up to platform height of 520 mm
  - From platform height of 520 mm and steering angle  $< +/- 10$  degrees: Travel speed 4 km/h (slow travel)
  - From platform height of 520 mm and steering angle  $> +/- 10$  degrees: Travel speed 2.5 km/h (slow travel)
  - From platform height of 2000 mm: Travel speed 2.5 km/h (slow travel)


## **4.7 Steering**

Turn the steering wheel (60, 66) to the left or right and travel in the required direction.

## **4.8 Brakes**


### ***Braking with the service brake***

*Procedure*

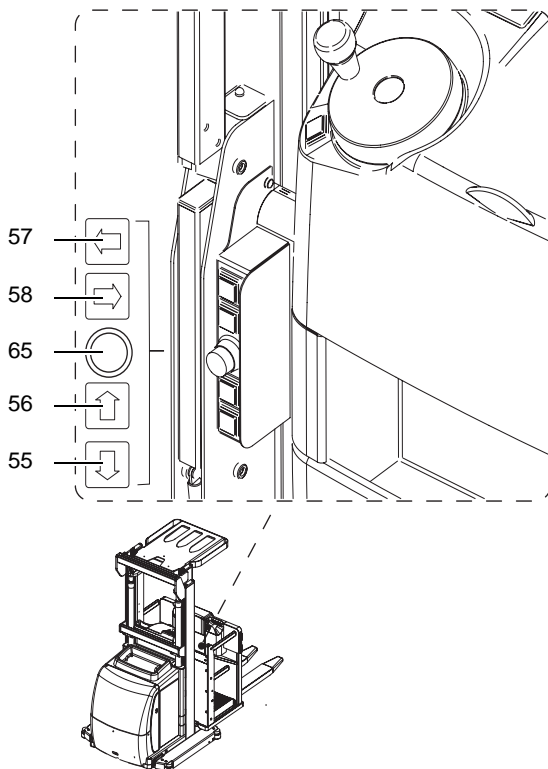
- When travelling, set the controller (7) to the opposite direction.  
 The brake force depends on the position of the controller.  
*The truck brakes regeneratively until it starts to move in the opposite direction.*

### ***Regenerative braking***

*Procedure*

- While travelling, release the controller (7). The controller reverts to neutral.  
*The truck brakes via the coasting brake.*  
 *The braking intensity can be adjusted by the manufacturer's service department.*

## 4.9 Travelling in pedestrian touch mode (○)




### CAUTION!

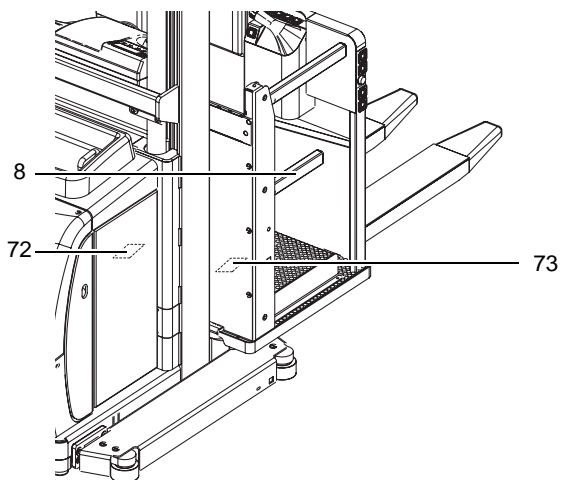
#### Risk of trapping

- ▶ Steering set straight-ahead.
- ▶ The operator must always stand beside the truck during pedestrian operation.
- ▶ Lower the load to free lift height of 200 mm.
- ▶ There must be no persons standing between the truck and any obstacles.
- ▶ There must be nobody on the operator platform.

#### Procedure

- Press the “Pedestrian drive direction” button (57). The truck travels in the drive direction at a fixed speed of approximately 2.5 km/h (slow travel).
  - Press the “Pedestrian fork direction” button (58). The truck travels in the load direction at a fixed speed of approximately 2.5 km/h (slow travel).
-  If the operator leaves the truck during pedestrian mode, the truck must be secured to prevent it from accidental operation.
- Press the Emergency Disconnect (65).

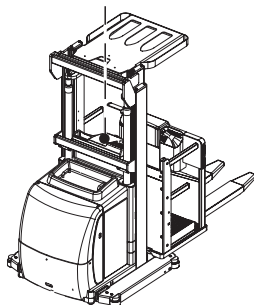
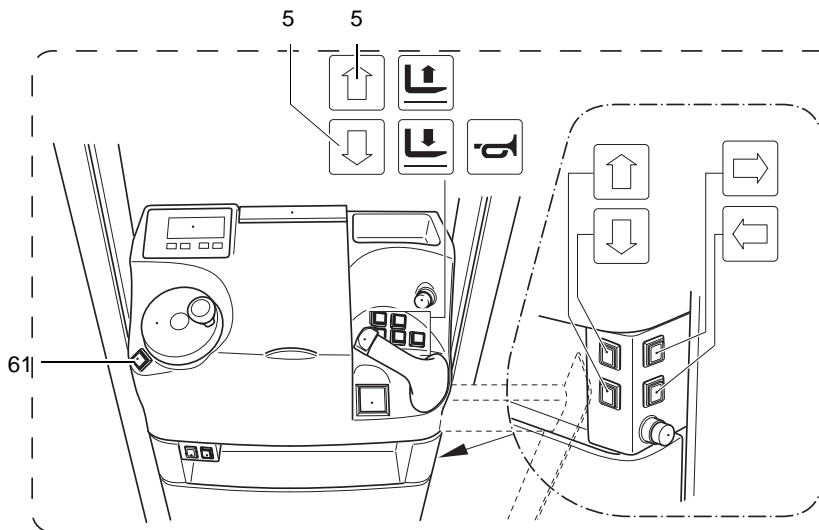
## 4.10 Operator platform lifting and lowering



### **Operator platform lifting**

#### *Procedure*

- Press the lift button (51) until you reach the desired lift height.
- ➔ On trucks with the pedestrian touch mode option (○), version L, the deadman button (72, 73) must be applied in addition to the lift button (51) in order to lift to the maximum height.



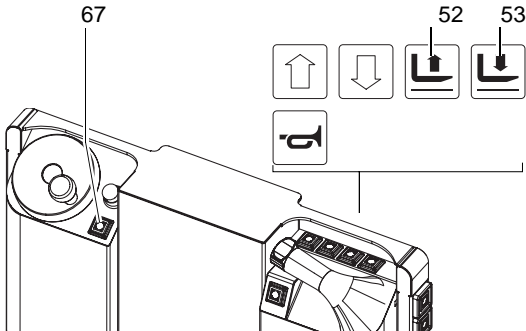
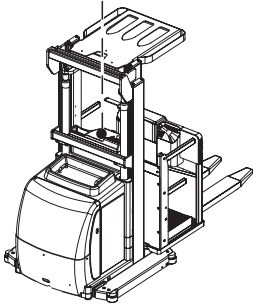
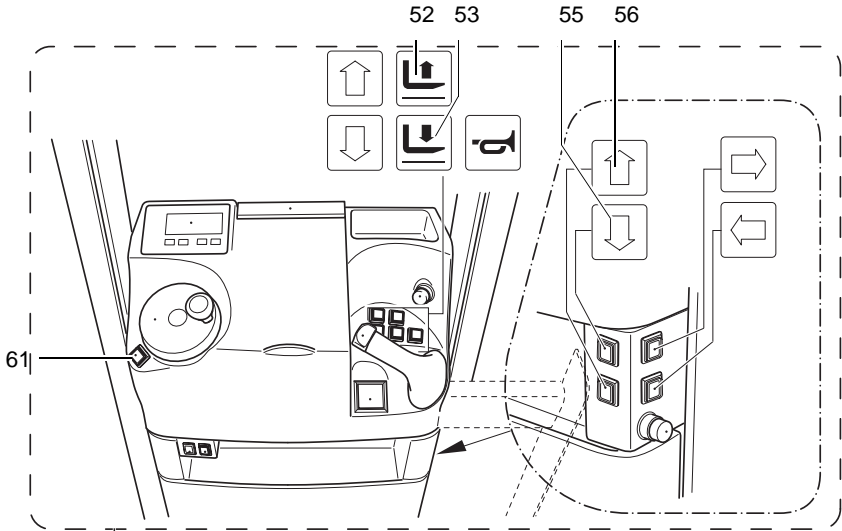
### **Operator platform lowering**

#### *Procedure*

- Press the lower button (50) until you reach the desired lift height.
- On trucks with an auxiliary mast and FEM 2A forged forks, the operator platform can only be lowered if the lower button (50) and the two-hand operation button (61) are pressed simultaneously.
- Note the order of operation: First press and hold down on the lower button (50), then press the two-hand operation button (61). Every time the lower button (50) is released the two-hand operation button (61) must also be released.

## 4.11 Auxiliary Lift – raising and lowering

The auxiliary lift enables the forks to be raised without having to raise the operator platform.



### **Auxiliary lift - raise**

#### *Procedure*

- Press the auxiliary lift raise button (52) until you reach the desired lift height.

### **Auxiliary lift - lower**

#### *Procedure*

- Press the auxiliary lift lower button (53) until you reach the desired lift height.



On trucks with an auxiliary mast and FEM 2A forged forks, the operator platform can only be raised or lowered if the auxiliary lift raise (52) or auxiliary lift lower (53) and the two-hand operation (61, 67) buttons are pressed simultaneously.

Note the order of operation: First press and hold down on the auxiliary lift raise (52) or auxiliary lift lower (53) button, then press the two-hand operation button (61, 67). Every time the auxiliary lift raise (52) or auxiliary lift lower (53) buttons are released the two-hand operation button (61, 67) must also be released.

## 4.12 Lifting and lowering in pedestrian touch mode

In pedestrian touch mode lifting and lowering can be operated from either side of the truck as an optional feature.

On trucks with forks (version L) the entire operator platform rises or lowers with the forks in pedestrian touch mode lifting/lowering.

On trucks with an auxiliary mast (version Z) the auxiliary mast forks rise or lower in pedestrian touch mode lifting/lowering.

### 4.12.1 Lifting the operator platform (version L)


#### CAUTION!

##### **Risk of trapping**

- ▶ Steering set straight-ahead.
  - ▶ The operator must always stand beside the truck during pedestrian operation.
  - ▶ There must be no persons standing between the truck and any obstacles.
  - ▶ There must be no persons on the operator platform.
- 

##### ***Lifting***

###### *Procedure*

- Press the lift button (56) until you reach the desired lift height.
-  For safety reasons the height of the forks is restricted to 625 mm.

#### 4.12.2 Lowering the operator platform (version L)

##### **WARNING!**

**Ensure there are no other people standing underneath the raised load and driver's cab.**

- ▶ Do not stand on the load handler.
  - ▶ Do not lift other people on the load handler.
  - ▶ Instruct other people to move out of the hazardous area of the truck.
  - ▶ The operator must stand outside the geometry of the truck and the load.
- 

##### ***Lowering***

###### *Procedure*

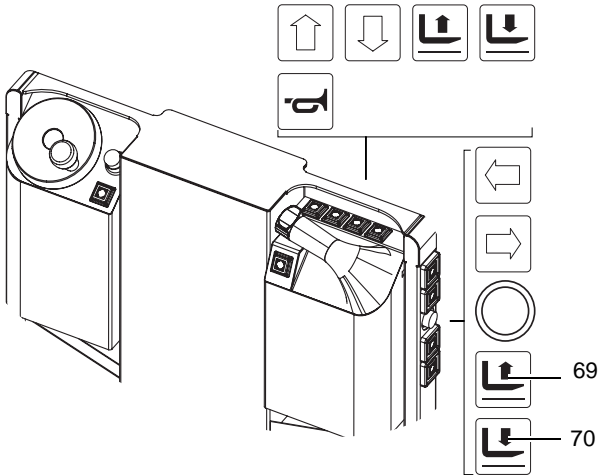
- Press the lower button (55). The operator platform and forks lower.

### 4.12.3 Lifting the forks (version Z)

#### CAUTION!

##### **Risk of trapping**

- ▶ Steering set straight-ahead.
- ▶ The operator must always stand beside the truck during pedestrian operation.
- ▶ There must be no persons standing between the truck and any obstacles.
- ▶ There must be no persons on the operator platform.



##### **Lifting**

###### *Procedure*

- Press the lift button (69) until you reach the desired lift height.

#### 4.12.4 Lowering the forks (version Z)

 **WARNING!**

**Ensure there are no other people standing underneath the raised load and driver's cab.**

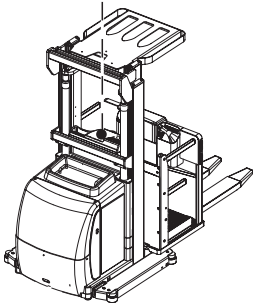
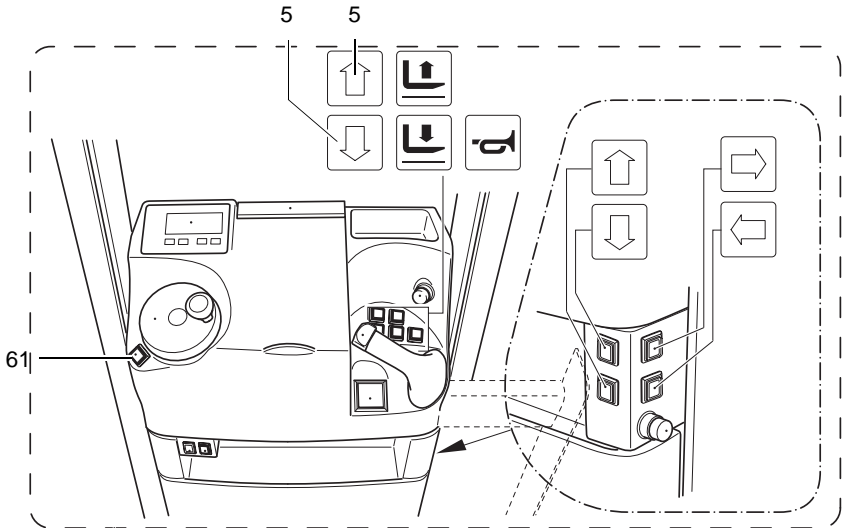
- ▶ Do not stand on the load handler.
  - ▶ Do not lift other people on the load handler.
  - ▶ Instruct other people to move out of the hazardous area of the truck.
  - ▶ The operator must stand outside the geometry of the truck and the load.
- 

#### ***Lowering***

##### *Procedure*

- Press the lower button (70). The forks lower.

## 4.13 Lifting and lowering the operator platform with lift cutout (○)



On trucks with the lift cutout option (○) the operator platform rises to a fixed cutout height which is less than the maximum lift height.

### **Lifting**

#### *Procedure*

- Press the lift button (51) until you reach the fixed cutout height.
- To lift beyond the fixed cutout height, proceed as follows:
  - Press and hold down on the lift button (51).
  - Now press the two-hand operation button (61) as well.

### **Lowering**

#### *Procedure*



- Press the lower button (50). The operator platform lowers.
- The operator platform does not stop at the fixed cutout height on lowering.

## 4.14 Lifting, transporting and depositing loads

- Do not lift long loads at an angle.
- Do not walk on the load section (except for trucks with the pallet guard option (○))

### ***Lifting load units***

#### *Requirements*

- Load unit correctly palletised.
- Fork spread for the pallet checked and adjusted if necessary.
- Load unit weight matches the truck's capacity.
- Forks evenly loaded for heavy loads.

#### *Procedure*

- Drive the truck carefully up to the pallet.
  - Slowly insert the forks into the pallet until the fork shank touches the pallet.
- The load unit must not extend by more than 50 mm beyond the fork tips.

### ***Transporting load units***

#### *Requirements*

- Good ground conditions.

#### *Procedure*

- Accelerate gradually.
- Travel at a constant speed.
- Transport the load unit as low as possible above the ground outside the rack aisle.  
Check the ground clearance.

### ***Depositing load units***

#### *Requirements*

- Warehouse location suitable for storing the load.

#### *Procedure*

- Drive carefully up to the storage location.
  - Carefully lower the load handler so that the forks are clear of the load.
- Avoid depositing the load suddenly to avoid damaging the load and the load aid.
- Carefully remove the forks from the pallet.

## 4.15 Adjusting the forks

On trucks equipped with the fork carriage with adjustable and detachable forks option, the fork spread must be checked and adjusted if necessary before lifting loads.

### **Adjusting the forks**

#### *Requirements*

- Park the truck securely, (see "Parking the truck securely" on page 55).

#### *Procedure*

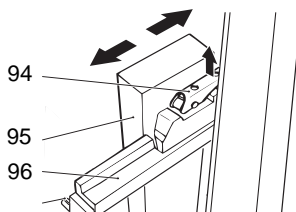
- Lift up the locking lever (94).
- Push the forks (95) into the correct position on the fork carriage (96).



To lift the load securely, the forks (95) must be spread as far apart as possible and positioned centrally with respect to the fork carriage. The load centre of gravity must be centrally aligned between the forks (95).

- Lift the locking lever (94) and move the forks until the locking pin engages in a slot.

*The forks are now adjusted.*

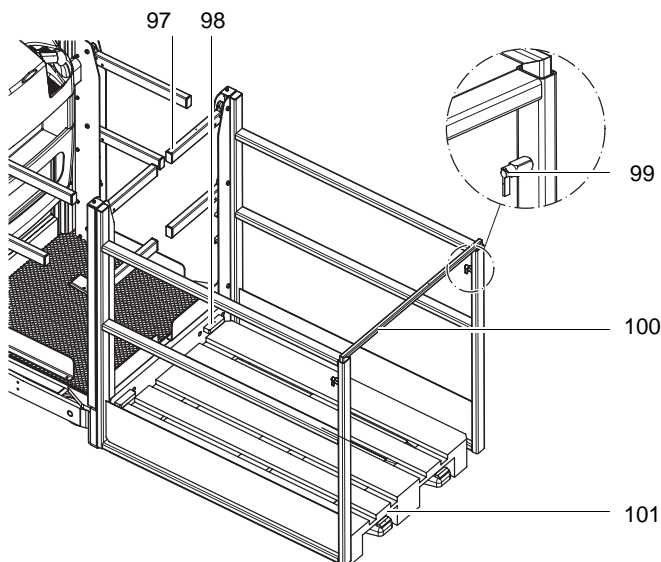


## 4.16 Walk-on load section with pallet guard (Zusatzausstattung)

### CAUTION!

#### Risk of crashing with walk-on pallets

- ▶ Only walk on a pallet if it has a pallet guard (○).
- ▶ Beyond lift heights > 1200 mm the gates must be closed to enable travel, lifting and lowering (Main Lift).
- ▶ One-way pallets cannot be used as a surface to walk on.
- ▶ Good ground conditions.
- ▶ Only use pallets of a suitable size to fit a pallet guard.



#### **Lifting pallets**

##### *Procedure*

- Fully lower the operator platform (Main Lift):
- Drive the truck carefully up to the pallet.
- Align the sides of the pallet guard centrally with the pallet.
- Slowly insert the forks into the pallet until the fork shank touches the pallet.



The pallet must fully rest on the forks behind the anti-slip device (101) and the pallet must be below the anti-tipover mechanism (98) on the fork shank.

- To lift pallets with a higher load,
  - Turn the lever for the stop bolts (99) up half a turn until they engage.
  - Pull the railing strap (100) up.
  - Turn the lever for the stop bolts (99) down again.
  - Move the railing strap (100) until the locking pins of the stop bolts engage.

- After lifting the pallet set the railing strap back to its lowest position. To do this,
  - Turn the lever for the stop bolts (99) up half a turn until they engage.
  - Press the railing strap (100) down.
  - Turn the lever for the stop bolts (99) down again.
  - Move the railing strap (100) until the locking pins of the stop bolts engage.

*The pallet is now raised.*

## 4.17 Negotiating narrow aisles

### 4.17.1 Safety notices for travelling in narrow aisles



#### **Unauthorised entry of narrow aisles by other trucks or people can cause accidents**

Unauthorised personnel must not enter narrow aisles (truck lanes in racking systems with safety distances < 500 mm), nor must any personnel cross through them.

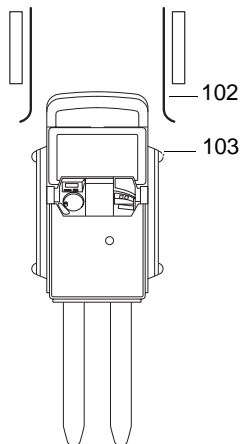
- ▶ Carry out a daily inspection of the safety mechanisms on the truck or the racking system to avoid hazards and to protect personnel.
  - ▶ These must not be rendered ineffective, misused, adjusted or removed.
  - ▶ Report any defects to your supervisor immediately.
  - ▶ Tag out and decommission a faulty lift truck.
  - ▶ Only return the truck to service when you have identified and rectified the fault.
  - ▶ Tag out faulty racking systems and block them for entry.
  - ▶ Only return the truck to service when you have identified and rectified the fault.
  - ▶ Note DIN 15185 Part 2.
  - ▶ Narrow aisles must only be entered by trucks which are designated for this purpose.
  - ▶ Before entering a narrow aisle, the driver must look for people or other trucks in the aisle. Never enter an aisle where there are people or other trucks. If there are people in the aisle, stop the truck immediately.
-

#### 4.17.2 Rail guided trucks (Zusatzausstattung)

##### ***Operating a rail-guided truck in a narrow aisle***

###### *Procedure*

- Drive slowly up to the rack aisle until the truck is aligned with the aisle.
- Note the markings attached along the route (e.g. aisle centre line).
- Slowly travel forward while ensuring that the guide wheels (103) of the truck align with the side rails (102) of the rack aisle.



## 4.18 Trucks with rail guidance and aisle recognition (Zusatzausstattung)

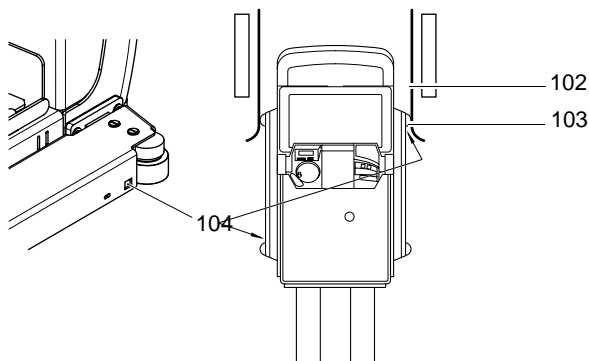
### Notes on rail-guided operation

Trucks with the light button aisle recognition option can travel at maximum speed even beyond the 1200 mm operator platform height (or 520 mm for trucks with auxiliary lift).

In rail-guided mode with aisle recognition, the two-hand operation button (61) must also be pressed in order to travel and lift.

In rail-guided mode with aisle recognition steering is overridden as the drive wheel is automatically set to the straight-ahead position.

### Entering narrow aisles

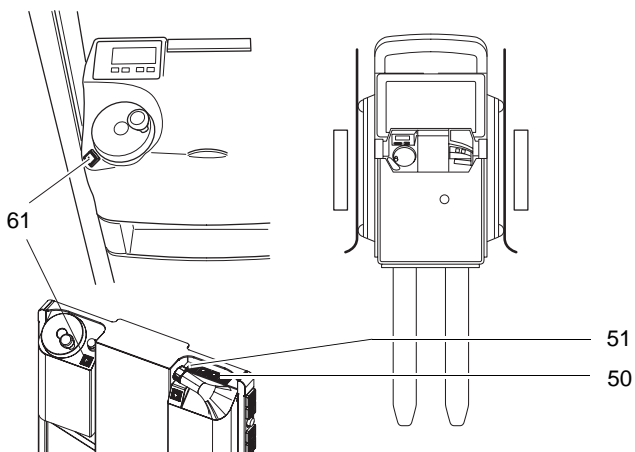


### Procedure

- Drive slowly up to the rack aisle until the truck is aligned with the aisle.
- Slowly travel forward while ensuring that the guide wheels (103) of the truck align with the side rails (102) of the rack aisle.

As soon as the first light button (104) in the travel direction is activated by the side rails (102) (truck with the first pair of guide rollers between the side rails), the travel speed is automatically reduced to 2.5 km/h (slow travel). Steering is still enabled at this point.

When the second light button (104) is activated by the side rails (102), the truck initially brakes to a halt and the steering automatically reverts to the straight ahead position.



- When the truck has come to rest, the two-hand operation button (61) must be pressed in order for travel and lifting/lowering to continue. From this point on, the steering is overridden and the drive wheel is automatically held in the straight-ahead position.



Note the operation order for lifting and steering: First press and hold down on the raise (51) or lower (50) button, then press the two-hand operation button (61). Every time the lift (51) or lower (50) button is released the two-hand operation button (61) must also be released.

### Exiting narrow aisles

As soon as the first light button in the travel direction is released by the side rails (truck with the first guide roller pair outside the side rails), the travel speed is automatically reduced to 2.5 km/h (slow travel) and travel, lifting and lowering can resume again without having to press the two-hand operation button (61).

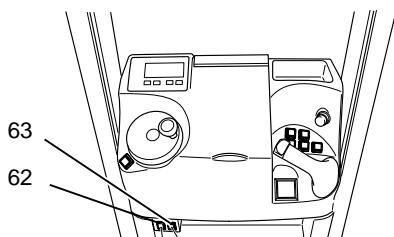


When the first light button in the travel direction is released by the side rails again, the automatic setting of the drive wheel to the straight-ahead position is lifted. The driver must now continue to steer with the steering wheel.

When the second light button is released by the side rails, the travel speed restriction is lifted.

Always travel outside of narrow aisles with the load lowered.

#### 4.18.1 Trucks with end of aisle safety device (Zusatzausstattung)



On truck fitted with the end of aisle safety device option travel is automatically reduced to 2.5 km/h (slow travel) when the truck travels over the permanent magnets in the ground (normally at the end of a narrow aisle or in the transfer aisle.) The end of aisle safety device indicator (62) lights up.

- The travel speed reduction is activated whenever the truck travels over ground magnets, irrespective of the travel direction and the order in which the magnets are passed over.

Press the Reset button (63) to resume with normal travel speed. The indicator (62) goes out again.

- On trucks with the end of aisle safety device option, the latter is automatically activated when the truck is switched on (indicator (62) lit). In order to travel at normal speed after the truck has been switched on, the Reset button (63) must therefore be pressed (indicator (62) goes out).
- The end of aisle safety device is an additional function designed to support the operator, but which does not release him from his responsibilities such as to monitor braking at the aisle end and if necessary to apply the brakes. Alternatively, the end of aisle safety device can cause the truck to brake to a halt instead of reducing travel speed to 2.5 km/h. Contact the manufacturer's service department if you wish this alteration to be performed.

## 4.19 Emergency lowering

### CAUTION!

#### **Risk of injury from the mast**

- ▶ Instruct other people to vacate the hazardous area during emergency lowering.
- ▶ Only start the truck when the error has been rectified.

---

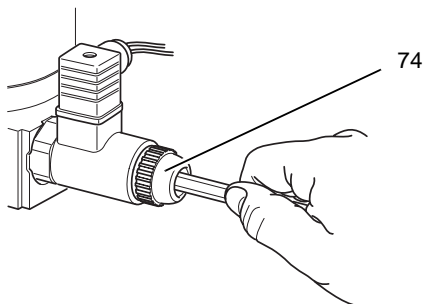
#### ***E mast emergency lowering valve***

##### *Requirements*

- 3 mm diameter pin, tool etc.

##### *Procedure*

- Remove the front panel.
- Using a suitable object (pen, tool or similar), push in and hold down on the emergency lowering valve (74) .

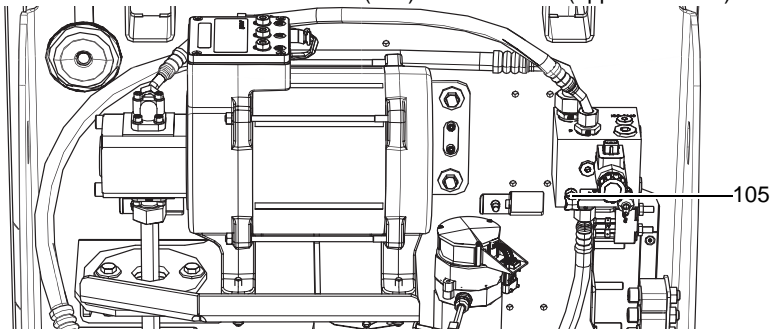


*The mast is now lowered.*

## ***ZZ mast emergency lowering valve***

### *Procedure*

- Remove the front panel.
- Turn the screw with the star handle (105) anti-clockwise (approx. 2 turns).



*The mast is now lowered.*

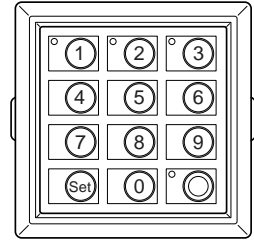
## 5 CANCODE keypad (○)

### CANCODE keypad

The keypad consists of 10 digit keys, a Set key and a ○ key.

The ○ key indicates the follow operating statuses via a red / green LED:

- Code lock function (starting up the truck)
- Setting and changing parameters.



### 5.1 Keypad

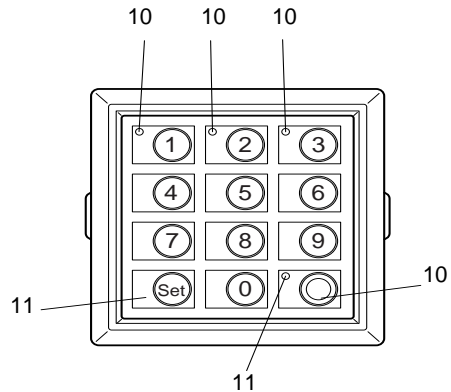
When the correct code is entered, the truck is ready for use. You can allocate an individual code to each truck, driver or group of drivers. When the truck is supplied from the factory, the CANCODE operator code (○) (factory setting 2-5-8-0) is indicated on a removable sticker. Change the master and user codes the first time you use the truck!

#### Commissioning

When the isolator is switched on the LED (111) turns red. When you enter the correct operator code the LED (111) turns green. If the wrong code is entered LED (111) flashes red for two seconds. You can then enter the code again. The Set key (110) has no function in operating mode.

#### Switching the truck off

Press the ○ key (109) to switch off the truck. This can be set to a fixed interval. To do this the relevant code lock parameters must be entered, (see "Parameter Settings" on page 81).



## 5.2 Parameters

The keypad enables parameters to be adjusted in programming mode.

### Parameter Groups

The parameter number is composed of three digits. The first digit refers to the parameter group as shown in Table 1. The second and third digits are numbered in sequence from 00 to 99.

No.	Parameter Groups
0XX	Code lock settings (codes, travel program release, automatic cutout, etc.)

## 5.3 Parameter Settings

To change the truck settings you must enter the master code.

- The master code factory setting is 7-2-9-5. Change the master code the first time you use the truck.

### ***Changing the truck settings***

#### *Procedure*

- Press the O key (109).
  - Enter the master code.
  - Enter the three-digit parameter number.
  - Confirm with the SET key (110).
  - Enter the setting as per parameter list.
- If the entry is incorrect, the LED (111) of the O key (109) turns red.
- Enter the parameter number again.
  - Enter the setting again or change it.
  - Confirm with the SET key (110).
  - Repeat the procedure for other parameters.
  - Then press the O key (109).

*The settings are now saved.*

## Parameter list

No.	Function	Setting range	Standard setting	Procedure
000	Change master code. The length (4-6 digits) of the master code also pre-determines the length of the operator code (4-6 digits). Provided the operator codes are programmed, only new codes of the same length can be entered. If the code length is to be changed, all operator codes must first be deleted.	0000 - 9999 or 00000 - 99999 or 000000 - 999999	7295	<ul style="list-style-type: none"> <li>– (LED 106 flashes) Enter current code</li> <li>– Confirm (Set 110)</li> <li>– (LED 107 flashes) Enter a new code</li> <li>– Confirm (Set 110)</li> <li>– (LED 108 flashes) repeat new code</li> <li>Confirm (Set)</li> </ul>
001	Add operator code (max. 600)	0000 - 9999 or 00000 - 99999 or 000000 - 999999	2580	<ul style="list-style-type: none"> <li>– (LED 107 flashes) Enter a code</li> <li>– Confirm (Set 110)</li> <li>– (LED 108 flashes) repeat code entry</li> <li>– Confirm (Set 110)</li> </ul>

LEDs 106-108 are located in keypads 1-3.

No.	Function	Setting range	Standard setting	Procedure
002		0000 - 9999 or 00000 - 99999 or 000000 - 999999		<ul style="list-style-type: none"> <li>– (LED 106 flashes) Enter the current code</li> <li>– Confirm (Set 110)</li> <li>– (LED 107 flashes) Enter a new code</li> <li>– Confirm (Set 110)</li> <li>– (LED 108 flashes) Re-enter the code</li> <li>– Confirm (Set 110)</li> </ul>
003		0000 - 9999 or 00000 - 99999 or 000000 - 999999		<ul style="list-style-type: none"> <li>– (LED 107 flashes) Enter a new code</li> <li>– Confirm (Set 110)</li> <li>– (LED 108 flashes) repeat code entry</li> <li>– Confirm (Set 110)</li> </ul>
004	Delete code log (deletes all user codes)	3265		<ul style="list-style-type: none"> <li>– 3265 = delete</li> <li>– other inputs = do not delete</li> </ul>
010	Automatic timeout	00-31	00	<ul style="list-style-type: none"> <li>– 00 = No timeout</li> <li>– 01 - 30 = Timeout in minutes</li> <li>– 31 = Timeout after 10 seconds</li> </ul>

LEDs 106-108 are located in keypads 1-3.

### Keypad error messages

The LED (111) flashes red to indicate the following errors:

- New master code is the same as the operator code.
- New operator code is the same as the master code.

- Operator code to be changed does not exist.
- Operator code should be changed to another operating code which already exists.
- Tried to delete an operator code that does not exist.
- Code memory full.

## 6 Troubleshooting

This chapter allows the user to identify and rectify basic faults or the effects of incorrect operation. When trying to locate a fault, proceed in the order shown in the table.



If the fault cannot be rectified after carrying out the above procedures, notify the manufacturer's service department, as further troubleshooting can only be performed by specially trained and qualified service personnel.

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

- Truck serial number
- Error number on the display unit (if applicable)
- Error description
- Current location of truck

### 6.1 Truck does not start

Fault	Possible Cause	Action
Truck does not start	<ul style="list-style-type: none"> <li>- Battery connector not connected.</li> <li>- Emergency Disconnect switch pressed.</li> <li>- Key switch set to O.</li> <li>- Battery charge too low.</li> <li>- Gate not closed.</li>   <li>- Two-hand operation not pressed (○).</li> <li>- Deadman switch not pressed.</li> <li>- Faulty fuse.</li> </ul>	<ul style="list-style-type: none"> <li>- Check battery connector and plug in if necessary.</li> <li>- Unlock the Emergency Disconnect button.</li> <li>- Set the key switch to "1".</li> <li>- Check battery charge, charge battery if necessary.</li> <li>- Close gates on either side of the operator platform.</li> <li>- Press two-hand operation button (○).</li> <li>- Press the deadman button.</li> <li>- Check fuses 1F and F1.</li> </ul>

Fault	Possible Cause	Action
Load cannot be lifted	<ul style="list-style-type: none"> <li data-bbox="448 113 725 215">– Truck not operational.</li> <li data-bbox="448 215 725 279">– Hydraulic oil level too low.</li> <li data-bbox="448 279 725 343">– Gate not closed.</li> <li data-bbox="448 343 725 406">– Two-hand operation not pressed (○).</li> <li data-bbox="448 406 725 470">– Battery discharge monitor has switched off.</li> <li data-bbox="448 470 725 518">– Faulty fuse.</li> <li data-bbox="448 518 725 563">– Load is too heavy.</li> </ul>	<ul style="list-style-type: none"> <li data-bbox="725 113 1002 199">– Carry out all measures listed under “Truck does not start”.</li> <li data-bbox="725 199 1002 247">– Check hydraulic oil level.</li> <li data-bbox="725 247 1002 343">– Close gates on either side of the operator platform.</li> <li data-bbox="725 343 1002 391">– Press two-hand operation button (○).</li> <li data-bbox="725 391 1002 438">– Charge the battery.</li> <li data-bbox="725 438 1002 486">– Check the fuses.</li> <li data-bbox="725 486 1002 563">– Note maximum capacity (see data plate).</li> </ul>

# F Industrial Truck Maintenance

## 1 Operational Safety and Environmental Protection

### **WARNING!**

#### **Risk of accidents and damage to components**

All modifications to the forklift truck assemblies, in particular the safety mechanisms, are prohibited. The operating speeds of the truck must not be increased under any circumstances.

---

### **NOTE**

Only original spare parts have been certified by our quality assurance department. To ensure safe and reliable operation of the truck, 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 either by similar components from other trucks of the same series.

---

## 2 Maintenance Safety Regulations

### **Maintenance personnel**

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

### **Lifting and jacking up**

### **WARNING!**

#### **Lifting and jacking up the truck safely**

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

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

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

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

## Cleaning

### CAUTION!

#### Fire hazard

Do not use flammable liquids to clean the industrial truck.

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

### CAUTION!

#### Risk of electrical system damage

The electrical system can be damaged if it is cleaned with water. It is prohibited to clean the electrical system with water.

- ▶ Do not clean the electrical system with water.
  - ▶ Clean the electrical system with weak suction or compressed air (use a compressor with a water trap) and not a conductive, anti-static brush.
- 

### CAUTION!

#### Risk of component damage when cleaning the truck

If the truck is to be cleaned with a water jet or a high-pressure cleaner, all electrical and electronic components must be carefully covered beforehand as moisture can cause malfunctions. Do not clean with pressurised water.

---



After cleaning, carry out the operations detailed in "Recommissioning the truck after cleaning or maintenance work" ((see "Restoring the truck to service after maintenance and repairs" on page 105)).

---

## 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 "Parking the truck securely" on page 55)).
  - ▶ Press the Emergency Disconnect.
  - ▶ Disconnect the battery.
  - ▶ Remove any rings or metal bracelets etc. before working on electrical components.
-

## Consumables and used parts

### CAUTION!

#### **Consumables and used parts are an environmental hazard**

Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. To change the oil contact the manufacturer's customer service department, who have been specially trained for this task.

▶ Note the safety regulations when handling these materials.

---

#### **Welding**

Remove electrical and electronic components from the truck before performing welding operations, to avoid damage.

#### **Settings**

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

#### **Wheels**

### WARNING!

#### **The use of wheels that do not match the manufacturer's specifications can result in accidents.**

The quality of wheels affects the stability and performance of the truck.

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

▶ When replacing wheels make sure the truck is not skewed.

▶ Always replace wheels in pairs, i.e. left and right at the same time.

---



When replacing wheels fitted at the factory, only use the manufacturer's original spare parts. Otherwise the truck's rated performance cannot be ensured.

#### **Hydraulic hoses**

### WARNING!

#### **Brittle hydraulic hose lines can cause accidents**

The hoses must be replaced every six years. The manufacturer's customer service department is specially trained to carry out these operations.

▶ Comply with the safety regulations for hydraulic hose lines in accordance with BGR 237.

---

 **WARNING!**

**Hydraulic line leaks can cause accidents**

Hydraulic oil can escape from leaky and faulty hydraulic lines.

- ▶ Report any defects immediately to your supervisor.
  - ▶ Tag out and decommission a faulty lift truck.
  - ▶ Only return the truck to service when you have identified and rectified the fault.
  - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent. The bonding agent / consumable mixture must be disposed of in accordance with regulations.
- 

 **WARNING!**

**Hairline cracks in the hydraulic lines can cause injury and infection**

Pressurised hydraulic oil can penetrate the skin through fine holes or hairline cracks in the hydraulic lines, causing severe injury.

- ▶ Call for a doctor immediately if you are injured.
  - ▶ Do not touch pressurised hydraulic lines.
  - ▶ Report any defects immediately to your supervisor.
  - ▶ Tag out and decommission a faulty lift truck.
  - ▶ Only return the truck to service when you have identified and rectified the fault.
  - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent. The bonding agent / consumable mixture must be disposed of in accordance with regulations.
- 

**Lift chains**

 **WARNING!**

**Non-lubricated and incorrectly cleaned lift chains can cause accidents**

Lift chains are safety-critical parts. They must not contain any serious contamination. Lift chains and pivot pins must always be clean and well lubricated.

- ▶ Lift chains should only be cleaned with paraffin derivatives e.g. petroleum or diesel fuels.
  - ▶ Never clean chains with steam jet high pressure cleaners, cold or chemical cleaning agents.
  - ▶ Immediately after cleaning, dry the lift chain with compressed air and apply a chain spray.
  - ▶ Always lubricate a chain when it is discharged.
  - ▶ Lubricate a lift chain with particular care around the pulleys.
-

### 3 Servicing and Inspection

Thorough and expert servicing is one of the most important requirements for the safe operation of the industrial truck. Failure to perform regular servicing can lead to truck failure and poses a potential hazard to personnel and equipment.

#### **WARNING!**

The application conditions of an industrial truck have a considerable impact on the wear of the service components.

We recommend that a Jungheinrich customer service adviser carries out an application analysis on site to work out specific service intervals to prevent damage due to wear.

The service intervals stated are based on single shift operation under normal operating conditions. They must be reduced accordingly if the truck is to be used in conditions of extreme dust, temperature fluctuations or multiple shifts.

---

The following servicing checklist indicates the operations to be performed and the respective intervals to be observed. Maintenance intervals are defined as:

- W = Every 50 service hours, at least weekly
- A = Every 500 service hours
- B = Every 1000 service hours, or at least annually
- C = Every 2000 service hours, or at least annually

 W maintenance interval operations are performed by the proprietor.

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

## 4 Maintenance checklist

		Maintenance Intervals					
		Standard = ●		W	A	B	C
		Cold store = *					
<b>Brakes</b>							
1.1	Check magnetic brake air gap					●	
<b>Electrical System</b>							
2.1	Test instruments, displays and control switches.					●	
2.2	Test warning and safety devices	*				●	
2.3	Check fuse ratings.						●
2.4	Make sure wire connections are secure and check for damage.					●	
2.5	Test micro switch settings					●	
2.6	Check contactors and relays					●	
2.7	Safety switch					●	
2.8	Test cable and motor attachments					●	
2.9	Check carbon brush wear, replace if necessary	*				●	
<b>Power supply</b>							
3.1	Visually inspect battery	*				●	
3.2	Check battery cable connections are secure, grease terminals if necessary	*				●	
3.3	Check acid density, acid level and battery voltage	*				●	
<b>Travel</b>							
4.1	Check the transmission for noise and leakage					●	
4.2	Replace gear oil if service life exceeded (10000 hours)						
4.3	Check rail guide roller bedding and attachment					●	
4.4	Check wheels (load wheels / drive wheel) for wear and damage	*				●	
4.5	Check wheel suspension and attachment					●	
<b>Chassis and superstructure</b>							
5.1	Test the operator platform and check for damage					●	
5.2	Check chassis and screw connections for damage					●	
5.3	Check labels					●	
<b>Hydraulic operation</b>							
6.1	Visually inspect rollers, slide pieces and stops.					●	
6.2	Check operation, wear and setting.					●	
6.3	Test hydraulic system.	*				●	
6.4	Check the hydraulic auxiliary unit (not on EKS 110 LG).					●	
6.5	Check that hose and pipe lines and their connections are secure, check for leaks and damage.	*				●	
6.6	Check cylinders and piston rods for damage and leaks, and make sure they are secure.	*					●
6.7	Check hydraulic oil level.	*				●	
6.8	Replace hydraulic oil. (This may have to be performed via a specialist environmental service truck)				*		●

Maintenance Intervals				
Standard = ●	W	A	B	C
Cold store = *				

Brakes				
6.9	Replace hydraulic oil filter.			* ●
Agreed performance levels				
7.1	Lubricate the truck according to the lubrication schedule.	*		●
7.2	Carry out a test run with rated load.			●
7.3	Demonstration after servicing.			●
Steering system				
8.1	Test the electric steering and its components			●
8.2	Check the steering head bearings, steering play and steering toothing and/or steering chain. Lubricate the steering toothing and/or steering chain.			●

## 5 Lubricants and Lubrication Schedule

### 5.1 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 liquids can cause slipping and endanger the environment**

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

- ▶ Do not spill fluids.
- ▶ Spilled fluids 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.
- 

**Consumables and used parts**

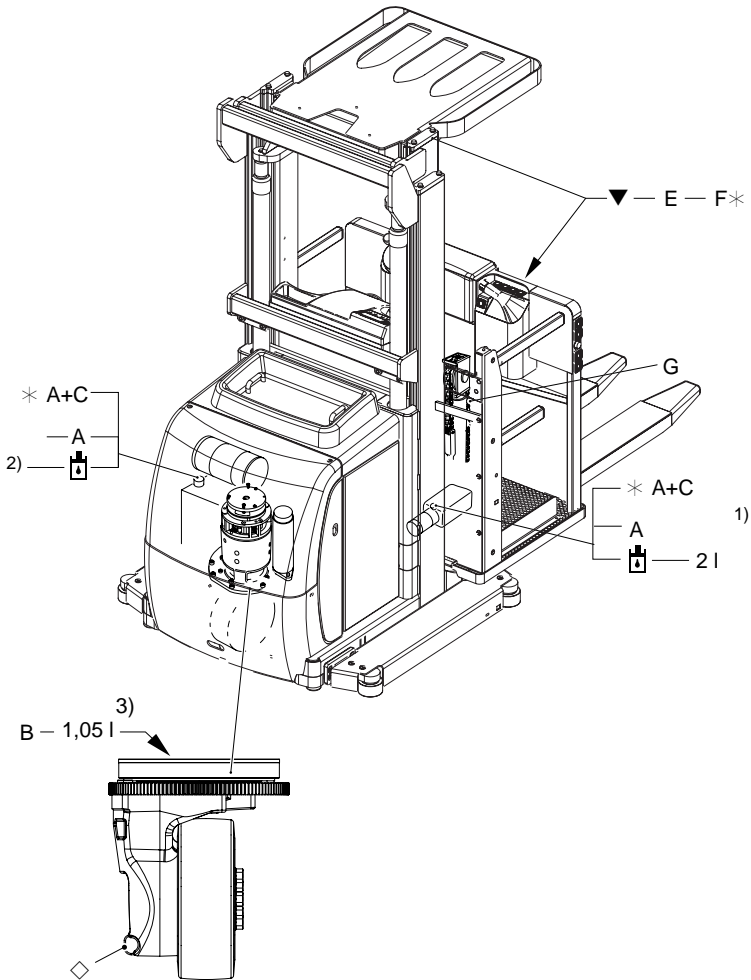
 **CAUTION!**

**Consumables and used parts are an environmental hazard**

Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. To change the oil contact the manufacturer's customer service department, who have been specially trained for this task.

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

## 5.2 Lubrication Schedule



▼	Contact surfaces	*	Cold Store Application
↓	Grease nipple	◆	Transmission oil filler neck
⬇️	Hydraulic oil filler neck	◇	Transmission oil drain plug

1 Compound ratio for cold store usage 1:1

2 Capacity (see "Consumables" on page 96).

3 Gear oil values are guidelines only. The spur wheel should be dipped approx. 2mm in the oil.

### 5.3 Consumables

Code	Purchase Order No:	Package quantity	Description	Application
A	29 200 670	5.0 l	H-LP 46, DIN 51524	Hydraulic system
B	50 380 904	5.0 l	Fuchs Titan Gear HSY 75W-90	Gear unit
C	29 200 810	5.0 l	H-LP 10, DIN 51524	Hydraulic system, gear unit
E	29 201 430	1.0 kg	Grease, DIN 51825	Lubrication
F	29 200 100	1.0 kg	Grease, TTF52	Lubrication
G	29 201 280	0.4 l	Chain spray	Chains

#### Grease guidelines

Code	Saponification	Dew point °C	Worked penetration at 25 °C	NLG1 class	Application temperature °C
E	Lithium	185	265 - 295	2	-35/+120
F	--	--	310 - 340	1	-52/+100

#### Hydraulic oil capacities

Lift height [mm]	Capacity in litres
1000	3,0
1600	5,0
1900	5,0
2800	12,0

## 6 Maintenance and repairs

### 6.1 Preparing the truck for maintenance and repairs

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

#### *Procedure*

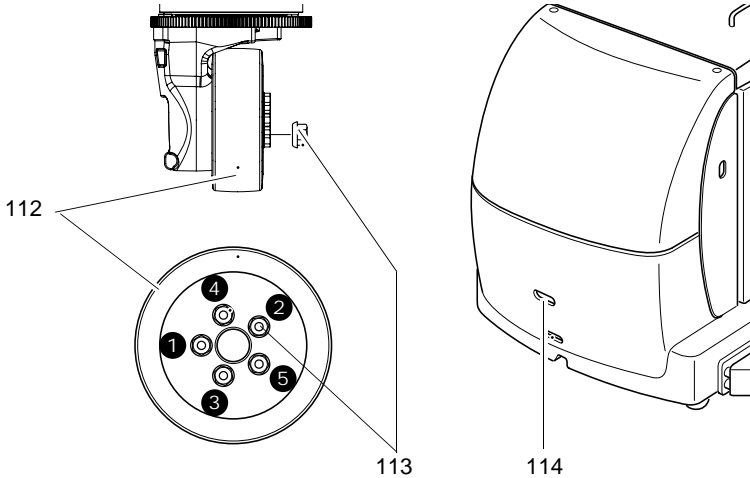
- Park the truck on a level surface.
- Fully lower the main and auxiliary lift.
- Park the truck securely, (see "Parking the truck securely" on page 55).
- Switch off the truck, to do this:
  - Turn the key in the key switch left as far as the stop and remove the key.
  - Press the red button on the ISM access module (○).
- Press the Emergency Disconnect.
- Disconnect the battery to prevent the truck from being switched on accidentally.
- When working under a raised lift truck, secure it to prevent it from lowering, tipping or sliding away.

#### **WARNING!**

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

- ▶ When working under a raised load handler, driver's cab or a raised truck, secure them to prevent the truck from lowering, tipping or sliding away.
  - ▶ When raising the truck, follow the instructions in chapter C ((see "Transport and Commissioning" on page 11)). When working on the parking brake, prevent the truck from accidentally rolling away (e.g. with wedges).
-

## 6.2 Tightening the wheel nuts



The wheel nuts on the drive wheel must be retightened in accordance with the maintenance intervals indicated in the maintenance checklist, (see "Maintenance checklist" on page 92)

### ***Tightening the wheel nuts***

#### *Requirements*

- To prepare the truck for maintenance and repairs, (see "Preparing the truck for maintenance and repairs" on page 97)

#### *Tools and Material Required*

- Torque wrench

#### *Procedure*

- Position the drive wheel (113) at right angles to the longitudinal axis of the truck.
- Tighten all the wheel nuts (112) in the chassis with the torque wrench through the hole (114).

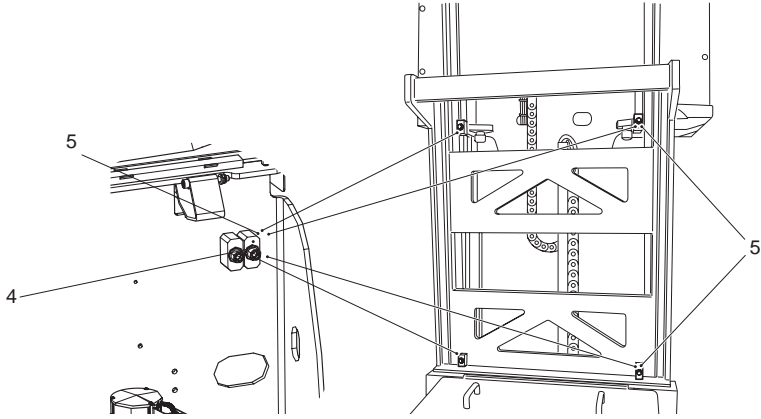
To do this, torque the wheel nuts in the prescribed order

- initially to 10 Nm
- then to 150 Nm.

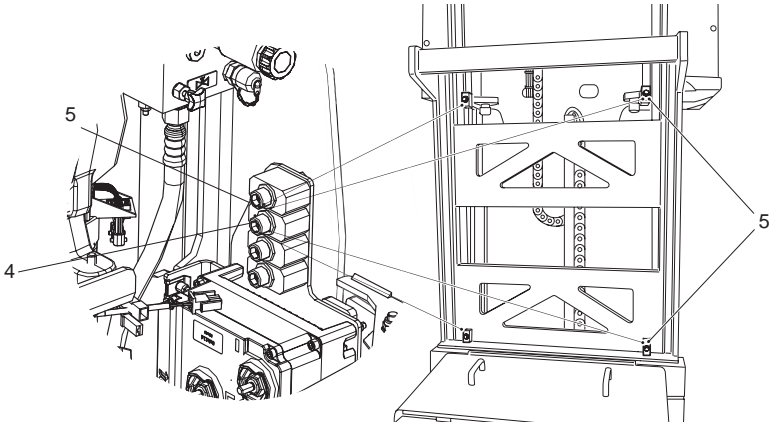
*The wheel nuts are now tightened.*

### 6.3 Mast retainer assembly and removal

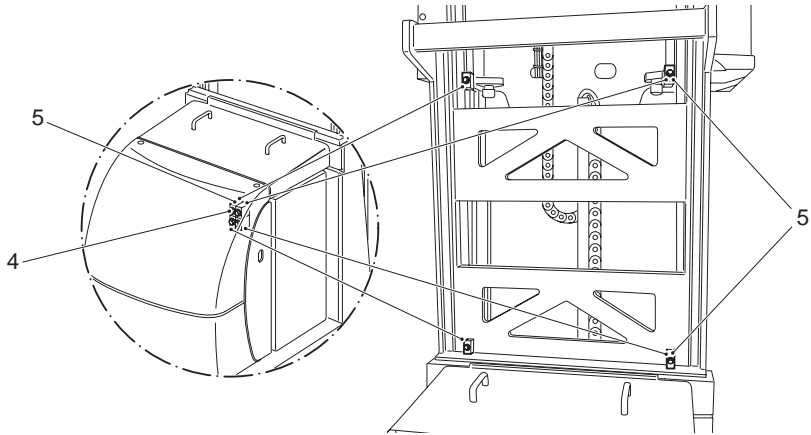
#### ESK 110 -Z- 100E mast retainers



#### ESK 110 -Z- 280ZZ mast retainers



The truck has four (for simplex mast 2) retaining blocks to secure the mast.



### ***Mast retainer assembly***

#### *Requirements*

– Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 97)).

#### *Tools and Material Required*

– Allen key, size 10

#### *Procedure*

- Open the front panel.
- Remove the screws (4) from the retaining blocks (5).
- Raise the mast until the threads for the retaining bolts are free.
- Screw the retaining blocks (5) onto the mast.
- Lower the mast until the retaining blocks are resting on the mast cross-members.

*The mast retainer is now assembled.*

### ***Mast retainer removal***

#### *Requirements*

– Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 97)).

#### *Tools and Material Required*

– Allen key, size 10

#### *Procedure*

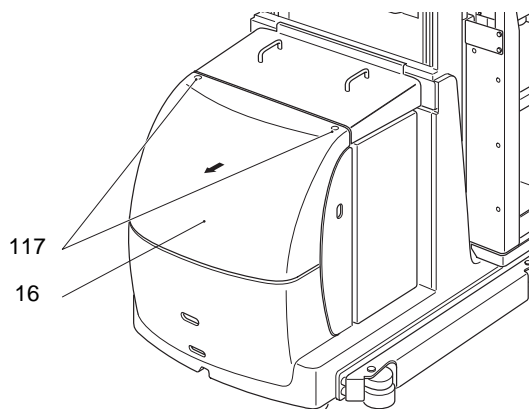
- Raise the mast until the retaining blocks are free.
- Unscrew the retaining blocks (6) from the mast.
- Fully lower the mast.
- Screw the retaining blocks into their allocated position in the motor compartment.



Tighten the screws manually so that they cannot be undone by normal impacts caused during operation.

*The mast retainer is now removed.*

## 6.4 Front panel assembly and disassembly



### **Front panel disassembly**

#### *Tools and Material Required*

- Allen key, size 6

#### *Procedure*

- Remove the screws (7).
- Lift and remove the front panel (8).
- Place the front panel (8) safely to one side.

*The front panel is now disassembled.*

### **Front panel assembly**

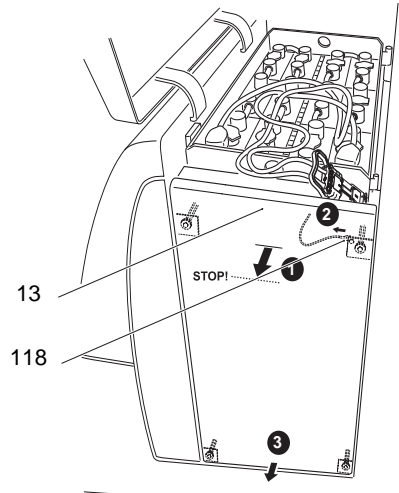
#### *Procedure*

- Insert the front panel (8).
- Tighten the screws (7).

*The front panel is now disassembled.*

## 6.5 Electrical System

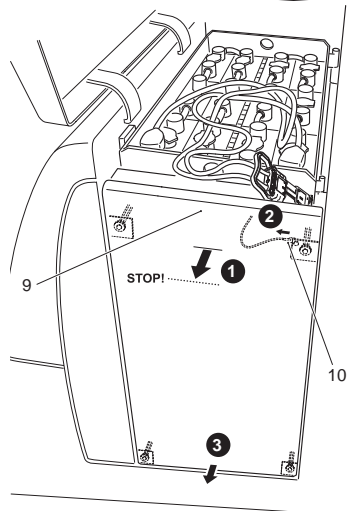
### Exposing the electrical system



#### Procedure

- Open the battery panel, (see "Exposing the battery" on page 34).
- Hold the top of the electrical system cover (9) and pull it away from the truck until the top two snap lock connections are disengaged.
- Remove the plug connector of the earth lead (10) from the cover.
- Pull the cover (9) down off the truck until the bottom snap lock connections are disengaged.
- Store the cover in a safe place.

*The electrical system is now exposed and the traction controller and truck fuses are accessible for maintenance.*



### Closing the electrical system

#### Procedure

- Push the cover into the bottom snap connection until it engages.
- Connect the plug connector of the earth lead (10) to the cover.
- Push the cover (9) into the top snap connection until it engages.
- Close the battery cover.

*The electrical system is now closed again.*

## 6.6 Checking electrical fuses

### Checking fuses

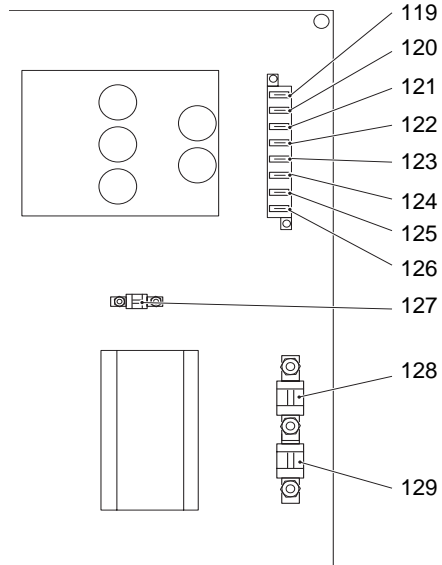
#### Requirements

- Truck prepared for maintenance and repairs.
- Electrical system exposed.

#### Procedure

- Check fuse ratings and check for damage.
- Replace any damaged fuses in accordance with the table.
- Close the electrical system.

*The fuses are now checked.*



Item	Description	To protect	Rating
11	3F6	Steer motor	30
12	F4	Main contactor control fuse	10
13	3F9	Steering controller control fuse	2
14	F1	Overall control fuse	10
15	5F2	DC/DC converter (○)	10
16	5F5	Lighting / spare	10
17	6F1	Discharge indicator control fuse	10
18	4F1	Horn control fuse	3
19	F1.1	Travel control fuse	300
20	2F2	Aux. lift pump motor (○)	150
21	2F1	Pump motor	150

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

### *Procedure*

- Thoroughly clean the truck.
  - Lubricate the truck according to the lubrication schedule, (see "Lubricants and Lubrication Schedule" on page 93).
  - Clean the battery, grease the terminals and connect the battery.
  - Charge the battery, .
  - Check the transmission oil for condensation water and replace if necessary.
  - Check the hydraulic oil for condensation water and replace if necessary.
- The manufacturer's customer service department is specially trained to carry out these operations.

### **WARNING!**

#### **Faulty brakes can cause accidents**

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

- ▶ Report any defects immediately to your supervisor.
  - ▶ Tag out and decommission a faulty lift truck.
  - ▶ Only return the truck to service when you have identified and rectified the fault.
- 
- Start up the truck, (see "Starting up the truck" on page 50).
- If there are switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by applying them repeatedly.

## 8 Decommissioning the industrial truck



If the truck is to be out of service for more than a month, e.g. for commercial reasons, 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.



### **WARNING!**

#### **Lifting and jacking up the truck safely**

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

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

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

- ▶ Jack up the truck only on a level surface and prevent it from moving accidentally.
- ▶ Only use a jack with sufficient capacity. When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
- ▶ In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose. (see "Identification points and data plates" on page 27).
- ▶ When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

---

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.

### 8.1 Prior to decommissioning

#### *Procedure*

- Clean the truck thoroughly.
- Test the brakes.
- Check the hydraulic oil level and replenish if necessary, .
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck according to the lubrication schedule, .
- Charge the battery, (see "Charging the battery" on page 37).
- Disconnect the battery, clean it and grease the terminals.



In addition, follow the battery manufacturer's instructions.

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

### 8.2 During decommissioning

#### **Every 2 months:**

#### *Procedure*

- Charge the battery, (see "Charging the battery" on page 37).

 **CAUTION!**

**Risk of battery damage**

It is important to charge the battery regularly as otherwise automatic discharge will result in battery depletion. The ensuing sulphating will damage the battery.

---

### 8.3 Restoring the truck to service after decommissioning

*Procedure*

- Thoroughly clean the truck.
- Lubricate the truck according to the lubrication schedule, (see "Lubricants and Lubrication Schedule" on page 93).
- Clean the battery, grease the terminals and connect the battery.
- Charge the battery, .
- Check the transmission oil for condensation water and replace if necessary.
- Check the hydraulic oil for condensation water and replace if necessary.



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

 **WARNING!**

**Faulty brakes can cause accidents**

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

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



- Start up the truck, (see "Starting up the truck" on page 50).
- If there are switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by applying them repeatedly.

## 9 Safety tests to be performed at intervals and after unusual incidents

- Perform a safety check in accordance with national regulations. Jungheinrich recommends the truck be checked to FEM guideline 4.004. The Jungheinrich safety department has trained personnel who are able to carry out inspections.

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

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

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

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

## 10 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, fuels and electronic and electrical systems must be observed.

## 11 Human vibration measurement

- Vibrations that affect the driver during operation over the course of the day are known as human vibrations. Excessive human vibrations will cause the driver long term health problems. The European "2002/44/EC/Vibration" operator directive has therefore been established to protect drivers.  
To help operators to assess the application situation, the manufacturer offers a service of measuring these human vibrations.

# Instructions for use

## Jungheinrich traction battery

### Table of contents

<b>1</b>	<b>Jungheinrich traction battery</b>	
	with positive tubular plates type EPzS and EPzB .....	2-6
	<b>Type plate Jungheinrich traction battery</b> .....	7
	<b>Instruction for use</b>	
	Aquamatic/BFS III water refilling system .....	8-12
<b>2</b>	<b>Jungheinrich traction battery</b>	
	Maintenance free traction batteries with positive tubular plates type EPzV and EPzV-BS .....	13-17
	<b>Type plate Jungheinrich traction battery</b> .....	17

# 1 Jungheinrich traction battery

with positive tubular plates type EPzS and EPzB

## Rating Data

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

\* Will be reached within the first 10 cycles.



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



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



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



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



- Risk of explosion and fire, avoid short circuits!



- Electrolyte is highly corrosive!



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



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

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

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

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

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

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

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

	steel
M 10	23 ± 1 Nm

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

The battery is then charged as in item 2.2.

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

**2. Operation**

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

**2.1 Discharging**

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

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

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

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

**2.2 Charging**

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

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

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

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

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

### **2.3 Equalising charge**

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

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

### **2.4 Temperature**

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

### **2.5 Electrolyte**

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

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

### **3. Maintenance**

#### **3.1 Daily**

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

#### **3.2 Weekly**

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

#### **3.3 Monthly**

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

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

#### **3.4 Annually**

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

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

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

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

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

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

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

## 5. Storage

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

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

## 6. Malfunctions

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

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



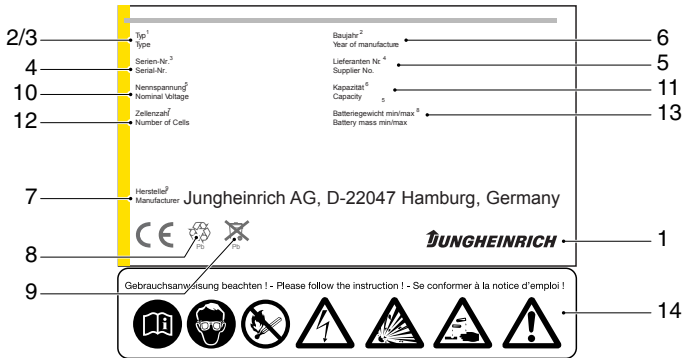
Back to the manufacturer!

Batteries with this sign must be recycled.

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

We reserve the right make technical modification.

## 7. Type plate, Jungheinrich traction battery



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

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

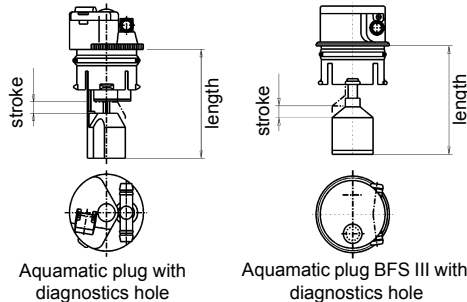
**Aquamatic/BFS III water refilling system for Jungheinrich traction battery with EPzS and EPzB cells with tubular positive plates**

**Aquamatic plug arrangement for the Operating Instructions**

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

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

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



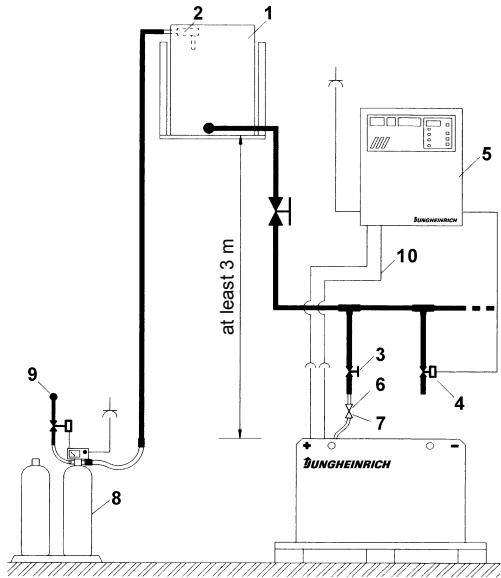
Non-adherence to the operating instructions, repairs carried out with non-original spare parts, unauthorised interference, and the use of additives for the electrolytes (alleged improvement agents) will invalidate any claim for warranty.

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

## Diagrammatic view

### Equipment for the water refilling system

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



## 1. Design

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

## 2. Application

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

## 3. Function

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## **8. Battery hose connections**

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

## **9. Operating temperature**

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

### **CAUTION:**

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

### **9.1 Diagnostics hole**

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

### **9.2 Float**

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

### **9.3 Cleaning**

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

## **10. Accessories**

### **10.1 Flow indicator**

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

### **10.2 Plug lifter**

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

### 10.2.1 Clamping ring tool

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

### 10.3 Filter element

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

### 10.4 Sealing coupler

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

## 11. Functional data

PS - self-sealing pressure: Aquomatic > 1.2 bars

BFS system none

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

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

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

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

## 2 Jungheinrich traction batterie

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

#### Rating Data

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

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

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



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



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



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



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



- Risk of explosion and fire, avoid short circuits!



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



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



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

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

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

## 1. Commissioning

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

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

Otherwise battery, vehicle or charger could be destroyed.

The battery has to be charged according to item 2.2

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

	steel
M 10	23 ± 1 Nm

## 2. Operation

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

### 2.1 Discharging

Ventilation openings must not be sealed or covered.

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

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

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

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

This also applies to partially discharged batteries.

### 2.2 Charging

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

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

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

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

Special instructions for the operation of batteries in hazardous areas.

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

### **2.3 Equalising charge**

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

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

### **Watch the temperature!**

#### **2.4 Temperature**

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

#### **2.5 Electrolyte**

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

### **3. Maintenance**

Don't refill water!

#### **3.1 Daily**

Charge the battery immediately after every discharge.

### **3.2 Weekly**

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

### **3.3 Quarterly**

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

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

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

### **3.4 Annually**

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

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

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

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

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

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

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

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

## **5. Storage**

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

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

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

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

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

## 6. Malfunctions

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

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



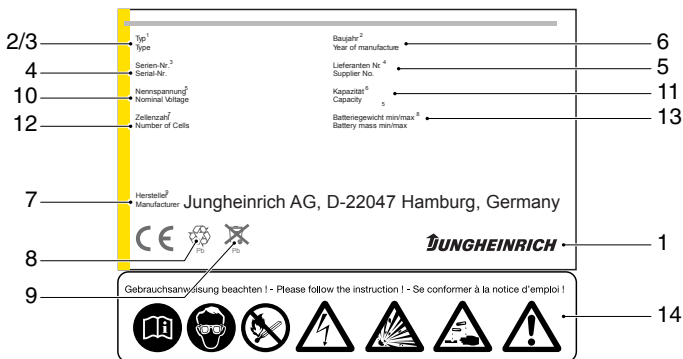
Back to the manufacturer!

Batteries with this sign must be recycled.

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

We reserve the right make technical modification.

## 7. Type plate, Jungheinrich traction battery



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

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

