EKS 110

01.17

Operating instructions

GB

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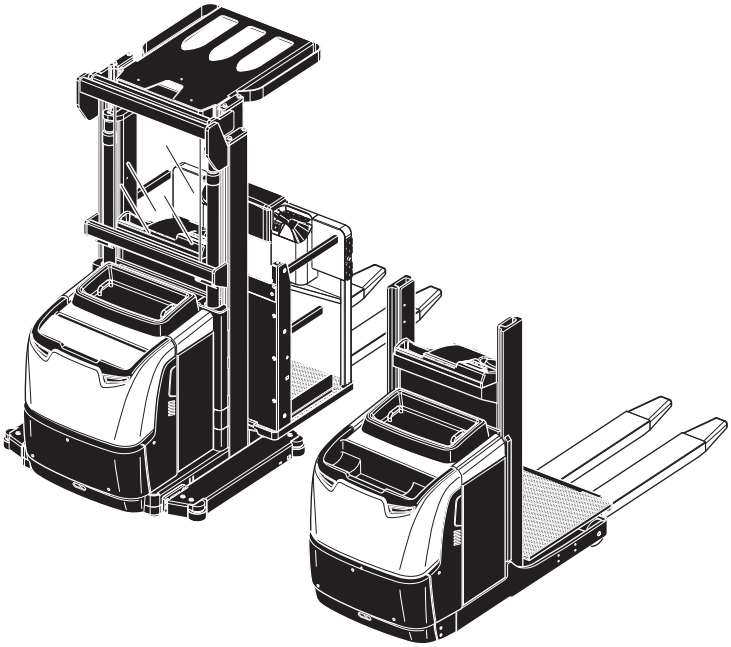
EKS 110



JUNGHEINRICH

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Declaration of Conformity

CE

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

Model	Option	Serial no.	Year of manufacture
EKS 110			

Additional information

On behalf of

Date

(GB) EC Declaration of Conformity

The undersigned hereby declare that the powered industrial truck described below in detail complies with the European Directives 2006/42/EG (Machinery Directive) and 2014/30/EU (Electromagnetic Compatibility - EMC) including amendments as well as the legislative decree to incorporate the directives in national law. The signatories are in each case individually authorised to compile the technical documents.

Foreword

Notes on the operating instructions

The present ORIGINAL OPERATING INSTRUCTIONS are designed to provide sufficient instruction for the safe operation of the industrial truck. The information is provided clearly and concisely. The chapters are arranged by letter and the pages are numbered continuously.

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

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

Safety notices and text mark-ups

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

⚠ DANGER!

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

⚠ WARNING!

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

⚠ CAUTION!

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

NOTE

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

➔ Used before notices and explanations.

- ● Indicates standard equipment
- ○ Indicates optional equipment

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Contents

A Correct Use and Application

1 General

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

2 Correct application

NOTE

The maximum load and load distance are indicated on the capacity plate and must not be exceeded.
The load must rest on the load handler or be lifted by an attachment approved by the manufacturer.
The load must be fully raised, see page 121.

The following operations are in accordance with regulations and are permitted:

– Lifting, lowering, transporting and picking of loads.
– Only walk on load aids with suitable safety mechanisms such as pallet guards or pallet tipover safety devices.
– Negotiating narrow aisles.
  • The racking systems and the truck must be equipped to allow operation in narrow aisles.
  • The safety clearances required by the manufacturer (design safety clearances) must be observed, see page 12.
– When transporting a load outside the narrow aisle, always keep it as low as possible allowing for ground clearance.

The following operations are prohibited:

– Carrying and lifting passengers.
– Do not stack pallets in racking systems.
– Pushing or pulling loads.
– Negotiating ramps and docks.
– Transverse lifting of long loads.
– Towing trailers.
– Transporting hanging loads.
– Transporting swaying loads.

3 Approved application conditions

⚠ WARNING!

Operation under extreme conditions

Operating the industrial truck under extreme conditions can lead to malfunctions and accidents.

- ▶ Special equipment and authorisation are required if the truck is to be constantly used in extreme conditions, especially in dusty or corrosive atmospheres.
- ▶ It is forbidden to operate the truck in areas where there is a risk of explosion.
- ▶ It is forbidden to operate the truck near the unprotected active components of electrical equipment.

- – Operation in industrial and commercial environments.
- – Operation in enclosed indoor areas with a maximum air humidity of 95%, non-condensing.
- – Negotiating slopes up to a maximum of 5% with rated load.
- – Negotiating inclines up to a maximum of 10 % without load.
- – Do not travel across or at an angle on slopes and inclines.
- – Operation only on level surfaces in accordance with VDMA guideline.
- – Do not exceed the permissible surface and point load limits on the travel paths.
- – Operation only on secure, level surfaces with sufficient capacity in accordance with DIN 15185.

Safety distances (interpreted safety distance)

The racking systems must be set up for the EKS. The safety distances stipulated by Jungheinrich (interpreted safety distance) must always be observed.

– For rail-guided trucks there must be a minimum safety distance on both sides of 100 mm between:
  – the operator's position and the rack, as well as the stored goods.
  – the raised load and the rack, as well as the stored goods.

The safety distance may, however, increase if special attachments are fitted.

⚠ WARNING!

An insufficient safety distance between the guided truck and the rack can result in accidents

Failure to maintain the required and prescribed safety distance can result in collisions between the guided truck and the rack.

▶ You must observe the minimum safety distance in accordance with EN 1726-2 item 7.3.2 90 mm. Do not operate the truck in these narrow aisles.

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

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

– Permissible temperature range -10°C to +40°C.
– Secure parking is only permissible at +5°C to +40°C.
– Maximum air humidity 95% non-condensing.
– The application areas can be changed, but in general this should be minimised due to thawing and possible corrosion.
– Thawing is permissible only if the truck can be subsequently dried thoroughly.
– Do not charge the battery below +5°C.

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

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

– Permissible temperature range -28°C to +25°C.
– Maximum air humidity 95% non-condensing.
– Thawing is permissible only if the truck can be subsequently dried thoroughly.
– In cold store areas below -10°C the truck must be operated permanently and should not be parked securely for more than 15 minutes.
– Do not charge the battery below +5°C.

NOTE

Battery damage

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

▶ If the battery charge is low do not use the truck in areas of -28°C to -5°C.

▶ If the battery charge is low it is preferable not to use the truck in areas of -5°C to +5°C.

▶ Charge the battery, see page 59.

4 Proprietor responsibilities

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

NOTE

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

5 Adding attachments and/or optional equipment

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

B Truck Description

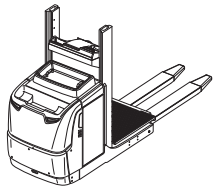
1 Application

The 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.

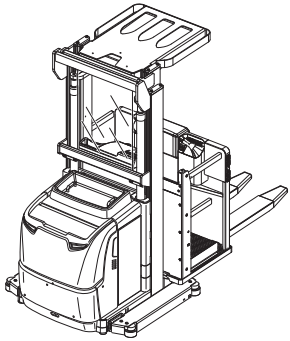
– The EKS 110 L model includes main lift.
– The EKS 110 Z model includes main lift and auxiliary lift.

The truck is fitted as standard with a simplex mast (E mast) or a duplex mast (ZZ mast) (lift heights see page 27).

EKS 110 L model with simplex mast:



EKS 110 Z model with duplex mast:



The EKS is designed to transport and pick loads on level surfaces in accordance with the VDMA guideline.

It is designed to lift open bottom, cross-board pallets and roll cages. The truck is not suitable for stacking pallets in racking systems.

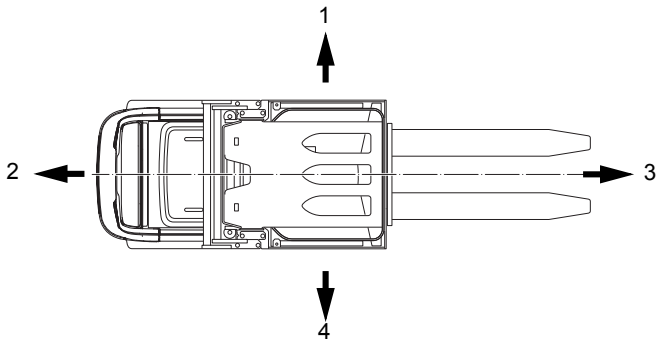
The operator's position rises together with the load handler to provide excellent visibility and easy access to the various rack heights.

➔ The ground surface must comply with the VDMA guideline.

Guide rails must be provided in the narrow aisles for the rail guidance system. Guide rollers attached to the truck chassis guide the truck between the guide rails.

2 Travel direction definition

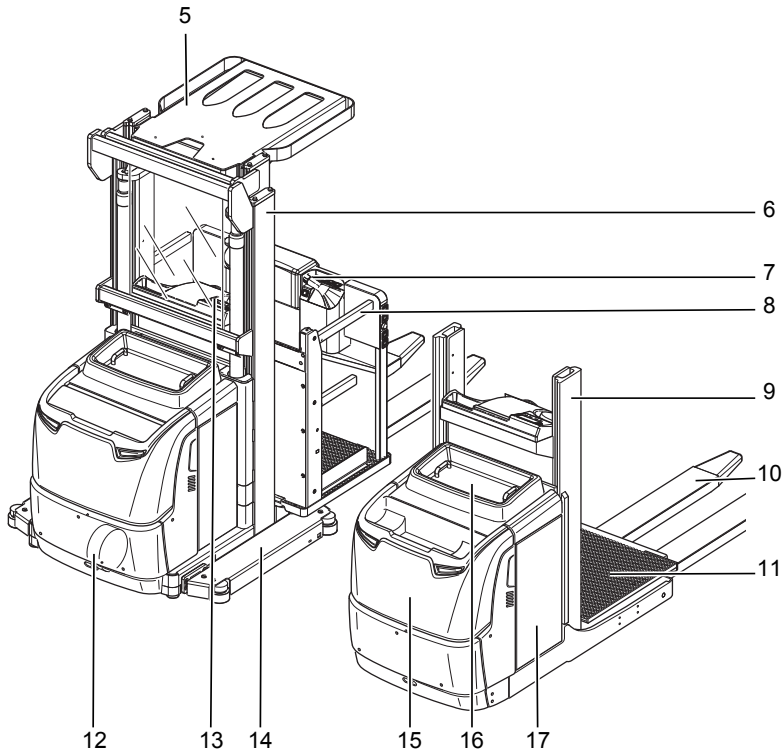
The following determinations have been made for travel direction specification:



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

3 Assemblies and Functional Description

3.1 Assembly Overview



Item		Description
5	●	Overhead guard
6	●	Duplex mast (ZZ)
7	●	Travel controller
8	●	Gate (100E, 160E, 190E, 280ZZ)
	○	Gate (100E)
9	●	Simplex mast (E)
10	●	Load handler
11	●	Operator position
12	●	Drive wheel
13	●	Driver's display
14	○	Guide rollers
15	●	Drive panel
16	●	Electrical system cover
17	●	Battery panel
	●	Standard equipment
	○	Optional equipment

3.2 Functional Description

Safety mechanisms

An enclosed truck geometry with rounded edges ensures safe truck handling. The overhead guard protects the operator from falling objects.

The drive wheel and the load wheels are protected by a solid skirt.

The emergency disconnect switch immediately disables all truck functions in hazardous situations.

Gates on either side of the operator's position platform cut out all travel and lifting operations beyond a lift height of 1200 mm when opened.

When the gates in the load direction (○) are opened they cut out all travel and lifting operations beyond a lift height of 1200 mm.

In "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.

Line-brake safety valves in the lift cylinders prevent the load from lowering in the event of a hydraulic system failure. Retaining bolts prevent the raised operator's position from lowering accidentally during maintenance and repair work (see page 202).

The mast protection pane (on the EKS 110 160E, 190E and 280ZZ) prevents people from reaching through the mast during lifting and lowering operations.

Deadman switch

The deadman switch ensures that the driver's feet do not extend outside the truck during travel. The deadman switch in the foot compartment must be depressed to enable the driver to operate the truck. Lifting and travel are inhibited if the operator takes his foot off the deadman switch. Steering and braking remain enabled.

Emergency Stop safety feature

If a serious error is detected by the controller, the truck automatically brakes to a halt. Control indicators on the driver's display indicate the emergency stop. Each time the truck is switched on, the system performs a self test which only releases the parking brake (emergency stop) if the functional test is positive.

⚠ CAUTION!

The truck brakes automatically

If the truck detects that signals which are required have not been received, or if it detects an error, the system reacts by triggering an emergency stop, either by braking the truck to a halt or until a valid signal status has been reached.

▶ Rider mode: Take up a stable standing position and hold on with both hands.

▶ In pedestrian mode: Remain at a suitable distance from the truck during operation.

Truck design

The truck is a threewheel 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.

Braking

Braking is performed by releasing the deadman button (service brake) or by releasing the travel controller (coasting brake). When the electrical system is disconnected the spring-loaded brake acts as a parking brake.

Steering

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.

When travelling in pedestrian touch mode (○) the steering is automatically set to the straight-ahead position before the truck starts up. During travel the steering is automatically kept in the straight-ahead position.

The Curve Control option helps the driver to operate the truck safely taking into consideration safety regulations. When cornering, the maximum travel speed is adapted to the steer angle.

Controls and displays

Ergonomic controls ensure fatigue-free operation for sensitive application of the travel and hydraulic operations. 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, the travel program and the event messages. A wheelbase display indicates the current steer angle of the drive wheel.

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's position and load handler 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 load handler is raised by a centre-mounted lift cylinder via a pulley chain. The truck can be fitted with a duplex mast.

Drive system

A fixed AC three-phase motor actuates the drive wheel via a bevel spur gearbox. The electronic traction controller ensures smooth speed control of the drive motor and hence smooth starting, powerful acceleration and electrically controlled braking with energy recovery. As an option, you can choose between several travel programs with set acceleration and speed levels.

The "Drive Plus" option offers load-dependent travel speed adaptation.

Electrical system

- Electronic system with wear-free sensors.
- Service laptop connection interface:
  For quick and easy configuration of all key truck data.
  To read the error log in order to establish the causes of malfunctions.

Optional equipment

- Mechanical rail guidance
- Walk-on load handler with pallet guard
- Work lights and beacons
- Travelling in pedestrian touch mode
- Lifting and lowering in pedestrian touch mode
- Lift cut-off with defined cut-off height and lift override
- Floor spot
- JetPilot
- USB charger
- Crawl speed with lowered load handler
- Pre-set fork lowering settings for stock picking for L model
- Warehouse Management System (WMS): Connection of the truck to a warehouse management system via truck terminal
  - High level of flexibility in warehouse through adaptation to existing warehouse management systems and warehouse extension

3.2.1 Hourmeter

Prepare the truck for operation, see page 94 or see page 143.

Service hours are counted while the truck is operational and the deadman button is pressed.

3.2.2 Hourmeter in Pedestrian Mode

Prepare the truck for operation, see page 94 or see page 143.

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

– "Pedestrian - drive direction" button, see page 160.
– "Pedestrian - load direction" button, see page 160.
– "Pedestrian - lift" button, see page 163.
– "Pedestrian - lower" button, see page 163.

4 Technical Specifications

The technical specification is given according to the German guideline "Type sheets for industrial trucks". 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				kg
	Travel speed with/without rated load	9.8/10.1	9.0/9.0			km/h
	Lift speed with/without rated load	0.19/0.26	0.15/0.20		0.23/0.31	m/s
	Lowering speed with/without rated load	0.24/0.24	0.23/0.22		0.28/0.26	m/s
	Gradeability with/without rated load	5/10				%
	Drive motor, output S2 60 min	2.8				kW
	Lift motor, output S3 15%	3			6[1)]	kW
	Lift motor, output S3 5%	2.2[1)]				kW
	Z auxiliary lift motor, output S3 5%, option	2.2				kW

1 For EKS 110 (280 ZZ): Lift motor, output S3 20%

4.2 Weights

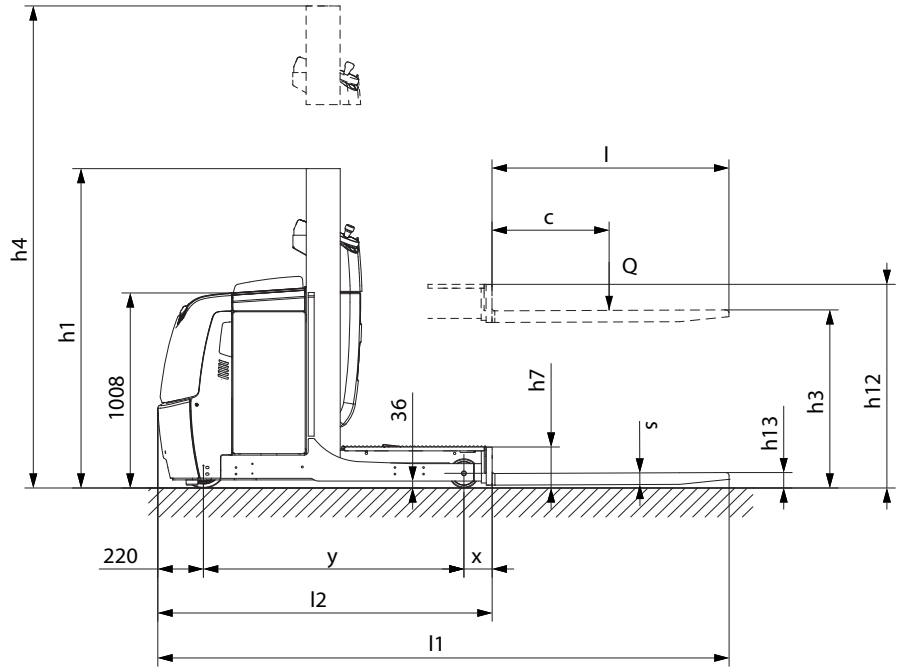
Description	EKS 110 (100 E)	EKS 110 (160 E)	EKS 110 (190 E)	EKS 110 (280 ZZ)	
Net weight incl. battery, variant L/ Z	1661/ 1763 [1]	1785/ 1907 [1]	1813/ 1953 [1]	2268/ 2390 [1]	kg
Axle load with load at front/rear (with battery) L model	491/ 2170 [2]	516/ 2269 [2]	506/ 2307 [2]	762/ 2506 [2]	kg
Axle load with load at front/rear (with battery) Z model	489/ 2274 [2]	508/ 2399 [2]	504/ 2449 [2]	754/ 2636 [2]	kg
Axle load without load at front/rear (with battery) L model	1053/ 608 [2]	1093/ 692 [2]	1084/ 729 [2]	1336/ 932 [2]	kg
Axle load without load at front/rear (with battery) Z model	1062/ 701 [2]	1083/ 824 [2]	1079/ 874 [2]	1328/ 1062 [2]	kg

– 1: With Z auxiliary lift +120 kg
– 2: With Z auxiliary lift approx. + 20 kg / +100 kg

4.3 Tyre type

Description	Value	
Wheel	Vulkollan	
Wheel size, drive direction	230x80	mm
Wheel size, load direction	150x130	mm
Number of wheels, drive direction (driven)	1	
Number of wheels, load direction	2	

4.4 Dimensions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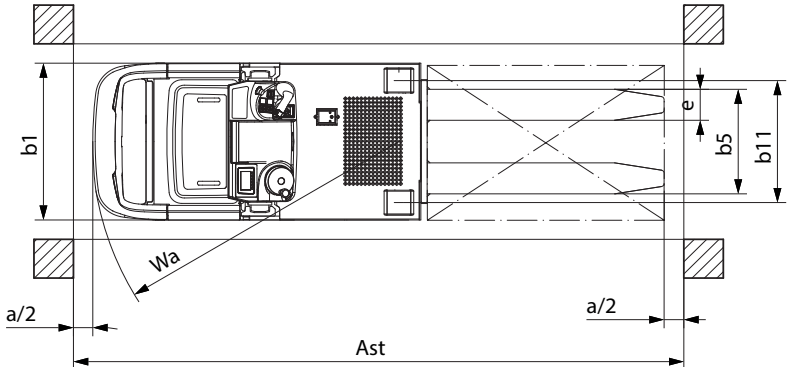
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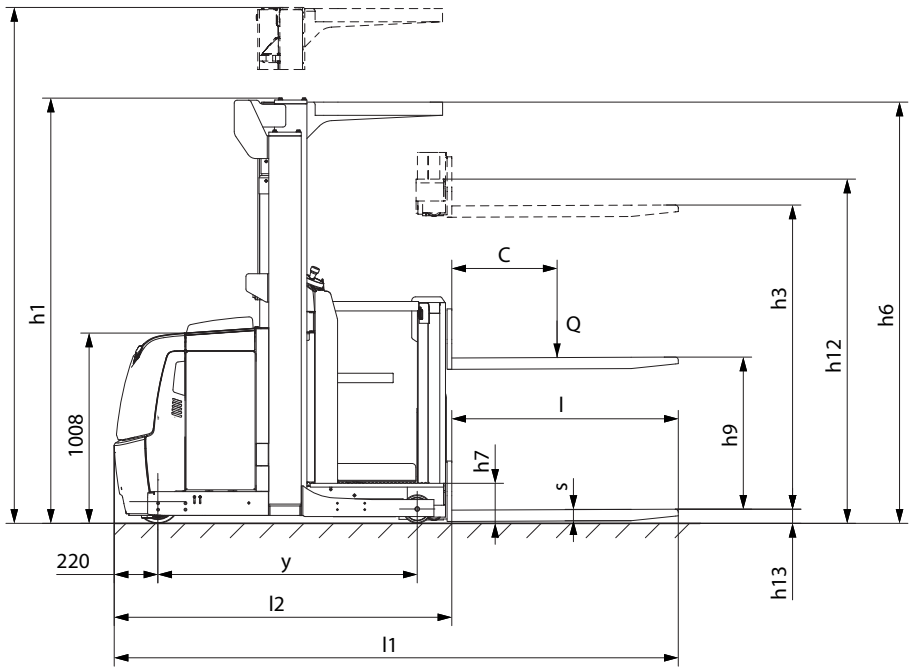
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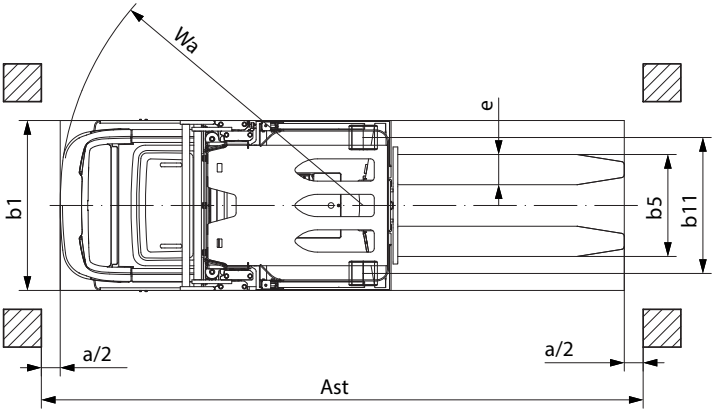
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Ast

	Description	EKS 110 (100 E)	EKS 110 (160 E)	EKS 110 (190 E)	EKS 110 (280 ZZ)	
c	Load centre distance	1000				mm
x	Load distance	240			205	mm
y	Wheelbase	1730			1785	mm
h_1	Collapsed mast height	1800[2]	2260	2560	2251	mm
h_3	Lift	1000	1600	1900	2800	mm
h_4	Mast height when extended	2650[3]	3830	4130	5034	mm
h6	Height of overhead guard	2230[4]	2230			mm
h_7	Platform height	200				mm
h_9	Z auxiliary lift	550				mm
h_{12}	Platform height raised	1200	1800	2100	3000	mm
h_{13}	Lowered height	80				mm
b_1/ b_2	Overall width	1200				mm
b_4	Width between support arms/ loading platforms	840				mm
b_5	Width across forks	Variably adjustable				mm
b_{11}	Rear track	1020				mm
l_1	Overall length	3690			3780	mm
l_2	Length including fork shank	1690[1]			1780[1]	mm
l_3	Platform length	775				mm
s/e/l	Fork dimensions	40/100/2000				mm
m_1	Ground clearance, laden, below mast	35				mm
Ast	Aisle width for 2x pallets 1000 x 1200 crossways	3908			3998	mm
Ast	Aisle width for 2x pallets 800 x 1200 lengthways	4308			4398	mm
Wa	Turning radius	1948			2003	mm
a	Safety clearance	200				mm

1 With equipment with overhead guard: + 570 mm

2 With overhead guard: 3230 mm

3 Overhead guard optional

4.5 Mast versions

Mast	Picking height h12+1600 mm	Mast height when retracted h1 with overhead guard	Mast height when extended h4 with overhead guard	
EKS 110 (100 E)	2800	2230 [1) 3)]	3230 [1) 3)]	mm
EKS 110 (160 E)	3400	2260 [2)]	3830 [3)]	mm
EKS 110 (190 E)	3700	2560 [2)]	4130 [3)]	mm
EKS 110 (280 ZZ)	4600	2250 [3)]	5030 [3)]	mm

1 Without overhead guard: Height reduces by 570 mm. Highest point is the mast.

2 Highest point is the mast.

3 Highest point is the overhead guard.

4.6 EN norms

Continuous sound pressure level

– EKS 110: 61 dB(A)

in accordance with EN 12053 as harmonised with ISO 4871.

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

Vibration

– EKS 110: 0,96 m/s²

in accordance with EN 13059.

→ The vibration acceleration acting on the body in its operating position is the linearly integrated, weighted acceleration in the vertical axis according to the standard. It is calculated when travelling over thresholds at constant speed (standard truck version). These recordings were taken on a single occasion for the truck and must not be confused with the human vibrations of the operator directive. The manufacturer offers a special service to measure these human vibrations, see page 215.

Electromagnetic compatibility (EMC)

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

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

⚠ **WARNING!**

Medical equipment can be damaged by non-ionised radiation

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

4.7 Conditions of use

Ambient temperature

– without cold store equipment: operating at -10°C to +40°C, see page 14
– with cold store equipment: operating at -28°C to +25°C, see page 14

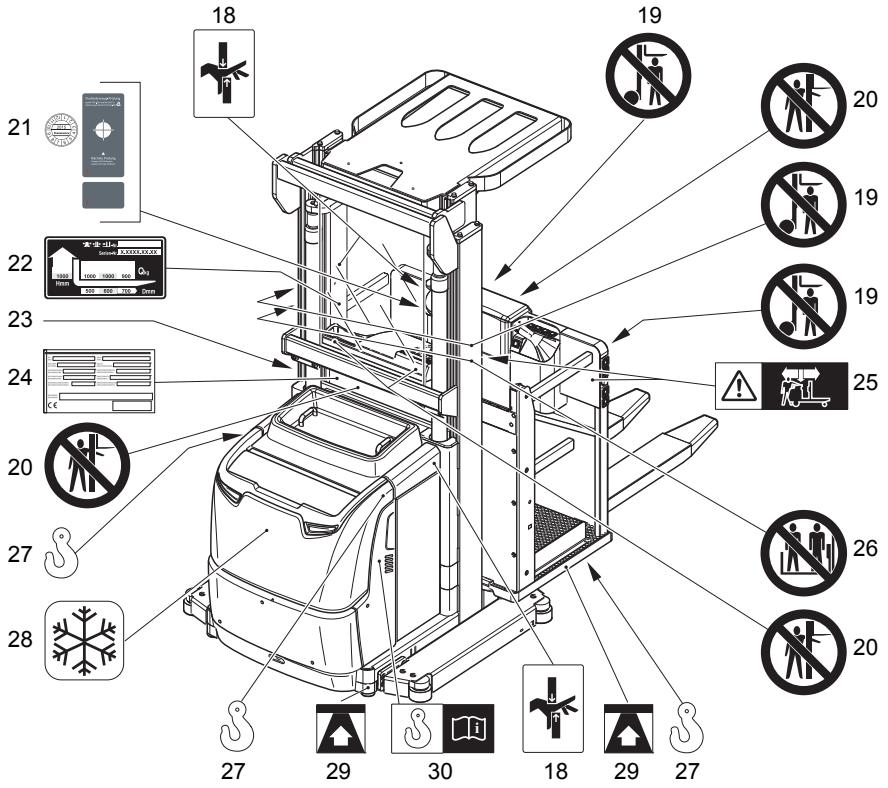
➔ Special equipment and authorisation are required if the truck is to be used continually in conditions of extreme temperature or condensing air humidity fluctuations.

4.8 Electrical Requirements

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

5 Identification Points and Data Plates

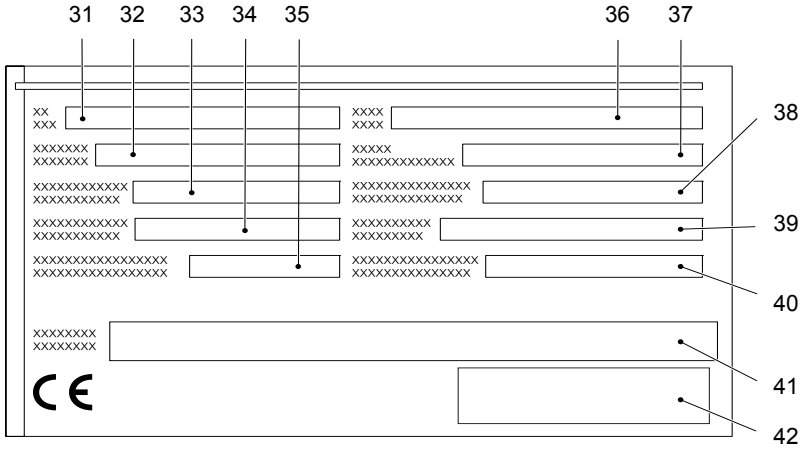
Warnings and notices such as load charts, strap points and data plates must be legible at all times. Replace if necessary.



Pos.	Bezeichnung
18	Warnschild „Scher- / Quetschgefahr“
19	Verbotsschild „Nicht unter die Lastaufnahme treten“
20	Verbotsschild „Nicht durch das Hubgerüst greifen“
21	Prüfplakette (○)
22	Tragfähigkeitsschild
23	Seriennummer
24	Typenschild Flurförderzeug
25	Warnschild „Achtung Tastbetrieb“
26	Verbotsschild „Das Mitfahren einer zweiten Person ist verboten“
27	Anschlagpunkt für Kranverladung
28	Kühlhaussymbol (○)
29	Anschlagpunkt für Wagenheber
30	Anschlagpunkt für Kranverladung und Betriebsanleitung beachten

5.1 Data plate

The illustration shows the standard version for EU member states. The data plate may differ in other countries.



Item	Description	Item	Description
31	Type	37	Year of manufacture
32	Serial number	38	Load centre distance (mm)
33	Rated capacity (kg)	39	Nominal power
34	Battery voltage (V)	40	Min./max. battery weight (kg)
35	Net weight without battery (kg)	41	Manufacturer
36	Option	42	Manufacturer's logo

For queries regarding the truck or ordering spare parts, always quote the serial number (32).

5.2 Truck capacity plate

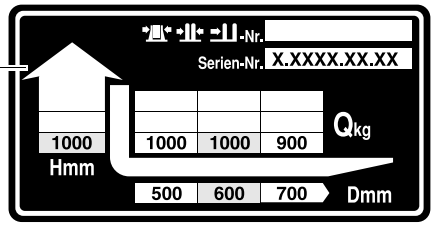
⚠ WARNING!

Replacing the forks can cause accidents

If you replace the forks with ones that differ from the originals, the capacity will change.

- ▶ When adding forks that differ from the ones originally supplied, an additional capacity plate must be attached to the truck. Example: Fitting longer forks to the truck
- ▶ Adding forks that differ from the ones originally supplied requires the manufacturer s approval.

43



The capacity plate (43) gives the capacity Q (kg) of the truck for an upright mast. The maximum capacity is shown as a table with a given load centre of gravity D (mm) and the required lift height H (mm).

The capacity plate (43) of the truck indicates the truck's capacity with the forks as originally supplied.

Example of how to calculate the maximum capacity

With a load centre distance (D) of 600 mm and a maximum lift height of (H) 1000 mm the max. capacity (Q) is 1000 kg.

6 Stability

⚠ WARNING!

Loss of stability can cause accidents

The stability as indicated in the capacity plate can only be guaranteed with the components (battery, mast) as shown on the data plate.

▶Always use batteries approved by the manufacturer, see page 55.

The truck's stability has been tested according to latest technological standards. These take into account the dynamic and static tipover forces that can occur if used correctly.

Stability can also be affected by the following components:

– Battery size and weight
– Wheels
– Mast
– Attachment
– Transported load (size, weight and centre of gravity)
– Ground clearance, e.g. modification of the tilt safety devices.
– Additional weights (e.g. in battery compartment, on the load axle)

⚠ WARNING!

Loss of stability can cause accidents

Changing the components can alter the stability.

C Transport and Commissioning

1 Lifting by crane

⚠ WARNING!

All persons involved in loading by crane must be trained

Incorrect crane loading procedures due to untrained personnel can cause the truck to fall. There is a risk of injury to personnel and a risk of material damage to the truck.

▶ Loading must only be performed by specialist personnel trained for this purpose. The specialist personnel must be instructed in securing loads on road vehicles and handling load securing devices. In each case correct measurements must be taken and appropriate safety measures applied.

⚠ WARNING!

Improper lifting by crane can result in accidents

The use of unsuitable lifting gear and the improper use of correct lifting gear can cause the truck to fall 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 loaded by people who are trained in handling lifting slings and lifting gear.

▶ Wear personal protective equipment (e.g. safety boots, helmet, hi-vis jacket, protective gloves etc.) when loading by crane.

▶ Do not stand under swaying loads.

▶ Do not walk into or stand in a hazardous area.

▶ Always use lifting gear with sufficient capacity (for truck weight see truck data plate).

▶ Always attach the crane lifting gear to the prescribed strap points and prevent them from slipping.

▶ Use the lifting slings only in the prescribed load direction.

▶ Crane slings should be fastened in such a way that they do not come into contact with any attachments when lifting.

⚠ WARNING!

Crane slings can tear, resulting in accidents

Crane slings can tear when routed over sharp edges, causing the load to fall.

▶ Do not route the crane lifting gear over sharp edges. If this is not possible, protect the crane lifting gear with a suitable underlay such as foam.

▶ Lifting slings should be attached in such a way that they do not come into contact with any parts of the truck when it is being raised.

Lifting the truck by crane

Requirements

– The truck is now parked securely, see page 97.

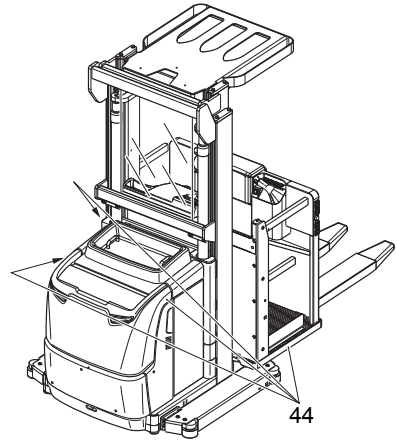
Tools and Material Required

– Lifting gear
– Crane lifting gear

Procedure

• Secure the crane lifting gear to the strap points (44).

The truck can now be lifted by crane.



1.1 Lifting the battery by crane

⚠ WARNING!

Improper lifting of the battery by crane can cause accidents

The use of unsuitable lifting gear and the improper use of correct lifting gear can cause the battery to fall when being lifted by crane.

Prevent the battery from striking other objects when they are being raised, and avoid any uncontrolled movement. If necessary secure the battery with guide ropes.

▶ The battery should only be laden by people who are trained in handling lifting slings and lifting equipment.

▶ Wear personal protective equipment (e.g. safety boots, helmet, hi-vis jacket, protective gloves etc.) when loading by crane.

▶ Do not stand under swaying loads.

▶ Do not walk into or stand in a hazardous area.

▶ Always use lifting gear with sufficient capacity (for battery weight see battery data plate).

▶ Always attach the crane lifting gear to the prescribed strap points and prevent them from slipping.

▶ Use the lifting slings only in the prescribed load direction.

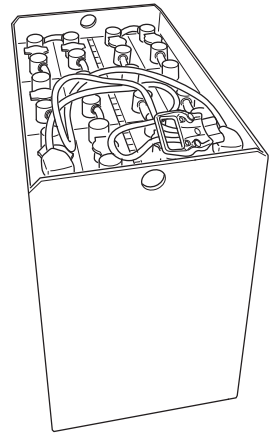
⚠ WARNING!

Batteries can be hazardous

Batteries contain an acid solution which is poisonous and corrosive. Avoid contact with battery acid at all times.

- ▶ 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.
- ▶ In the event of physical damage (e.g. skin or eye contact with battery acid) call for a doctor immediately.
- ▶ Spilled battery acid should be neutralised immediately with plenty of water.
- ▶ Only batteries with a sealed battery container may be used.
- ▶ Follow national guidelines and legislation.

Safe lifting of the battery by crane



Requirements

– Remove the battery from the truck's battery compartment, see page 61.

Tools and Material Required

– Crane lifting gear, for capacity details refer to the battery data plate.
– Pallet
– Lashing strap

Procedure

The weight of the battery to be taken into account when loading by crane can be taken from the battery data plate.

- Lifting the battery with crane lifting gear:
  - Attach the lifting gear to both eyes of the battery tray (for weight refer to the battery data plate).

  The battery can now be raised and loaded with a crane.

- Loading the battery onto a pallet:
  - Place the battery on a pallet.
  - Secure the battery to the pallet with two lashing straps.

  The battery can now be raised and loaded with an industrial truck.

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.

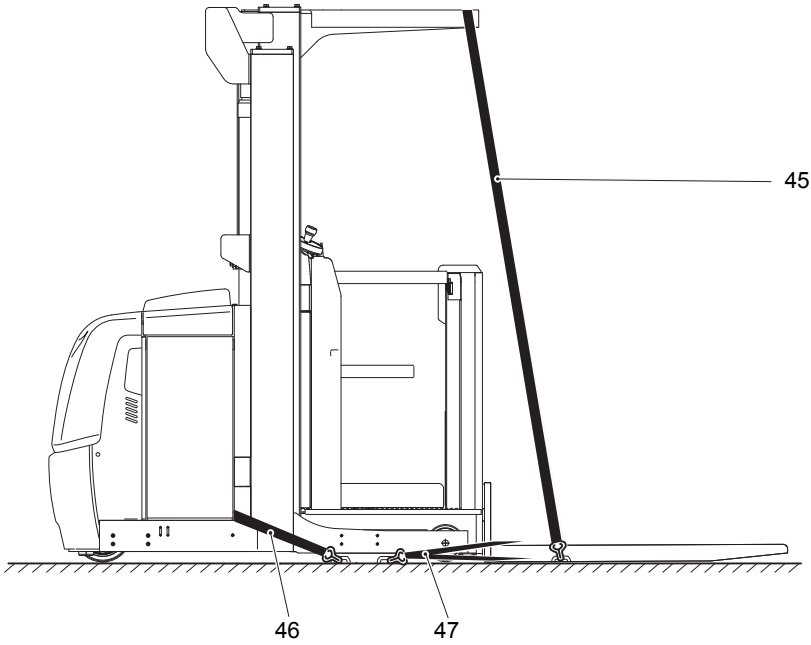
- ▶ Loading must only be performed by specialist personnel trained for this purpose. The specialist personnel must be instructed in securing loads on road vehicles and handling load securing devices. In each case correct measurements must be taken and appropriate safety measures applied.
- ▶ The truck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

⚠ WARNING!

Improper securing during transport can result in accidents

Improper securing of the truck during transport can result in serious accidents.

- ▶ To attach the truck to the lorry or trailer secure fastening belts on either side to at least two different fastening rings.



Securing the industrial truck for transport

Tools and Material Required

– 3 tensioning belts on truck without overhead guard
– 5 tensioning belts on truck with overhead guard

Procedure

- Drive the truck onto a lorry or trailer.
- Park the truck securely, see page 97.
- Disconnect the battery.
- Guide the tensioning belt (46) in front of the mast through the battery compartment and tie it down in the load direction.
- Guide one tensioning belt (47) respectively around the right and left forks and tie it down in the drive direction.
- Guide one tensioning belt (45) respectively on the right and left sides of the overhead guard and tie them down.

The truck can now be transported.

3 Using the Truck for the First Time

⚠ WARNING!

The use of unsuitable energy sources can be hazardous

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

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

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

Wheel flattening

If the truck has been parked for a long period, the wheel surfaces may tend to flatten. This flattening has a negative effect on the safety and stability of the truck. Once the truck has covered a certain distance, the flattening will disappear.

Preparing the Truck for Operation after Delivery or Transport

Requirements

– Unload the truck from the transport vehicle, lorry or trailer.

Procedure

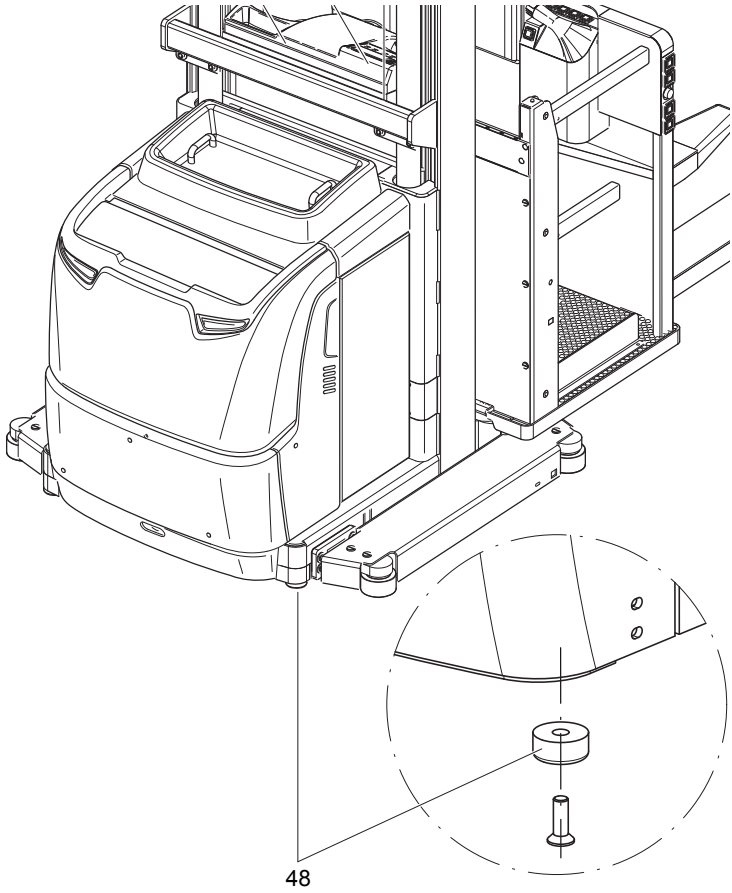
- Check the equipment is complete.
- Fit the battery if necessary (see page 61).

→ The truck should only be operated with battery current. Rectified AC current will damage the electronic components. The battery leads (tow cables) must be less than 6 m long.

- Charge the battery (see page 59).
- Check the hydraulic oil level and refill if necessary (see page 209).
- Close the operator's position emergency lowering valve, see page 127.
- Check all safety mechanisms are present and operational.
- Start up the industrial truck as indicated (see page 82 and see page 143).

The truck is ready for operation after commissioning.

3.1 Tilt safety device



→ The EKS is supplied with tilt safety devices (48). The tilt safety devices are fitted on the left and right of the truck chassis in the drive direction.

→ Do not operate the truck without the tilt safety devices fitted.

⚠ WARNING!

Missing tilt safety devices can result in loss of stability

The truck can tip over if operated with the tilt safety devices missing or if their distance from the ground has been incorrectly set.

▶Before starting, check the truck to ensure the tilt safety devices are present.

▶Before starting, check the truck to ensure the correct distance from the ground.

The distance of the tilt safety devices from the ground with a new drive wheel varies depending on the truck version. The readings from the following table must be maintained.

Truck version	Distance from tilt safety device to the gap
EKS 110 L 100E	32 ± 1 mm
EKS 110 Z 100E	25 ± 1 mm
EKS 110 L/Z 160E/190E	14 ± 1 mm
EKS 110 L/Z 280ZZ	25 ± 1 mm

3.2 Mast Protection Pane

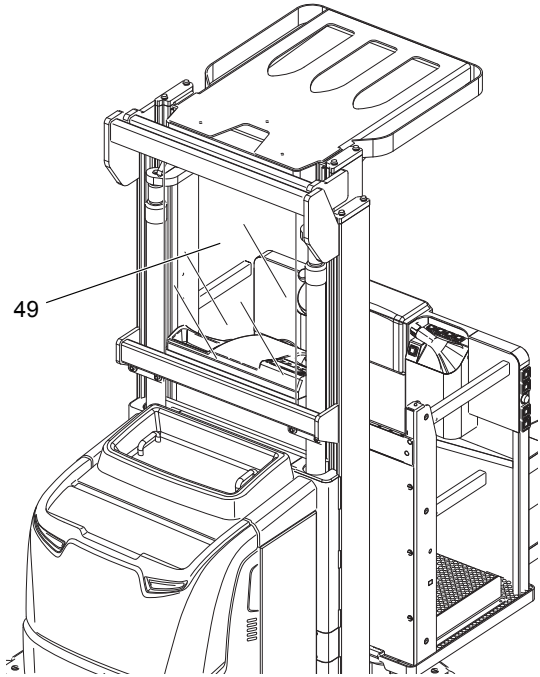
⚠ CAUTION!

Missing mast protection pane

Operating the truck with a damaged mast protection pane or none at all can result in injuries and is prohibited.

▶Check the truck's mast protection pane is present and damage-free.

The mast protection pane (49) on the EKS 110 160E, 190E and 280ZZ prevents people from reaching through the mast during lifting and lowering operations.



4 Moving the industrial truck without a battery

This operation must only be performed by suitably trained maintenance personnel.

⚠ WARNING!

It must not be performed on slopes or inclines (no brakes).

Moving the industrial truck without a battery see page 131.

D Battery - Servicing, Recharging, Replacement

1 Safety Regulations Governing the Handling of Lead-Acid Batteries

For use of lithium-ion batteries (○), see the manufacturer's operating instructions.

Maintenance personnel

Batteries may only be charged, serviced or replaced by trained personnel. These operating instructions and the manufacturer's instructions concerning batteries and charging stations must be observed when carrying out the work.

Fire Protection

Do not smoke and avoid naked flames when handling batteries. Wherever an industrial truck is parked for charging there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2000 mm from the truck. The room must be ventilated. Fire protection equipment must be available.

⚠ CAUTION!

The use of unsuitable fire protection equipment can result in scalding

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

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

Battery maintenance

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

⚠ WARNING!

Short circuits can result in fire

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

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

Battery disposal

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

1.1 General notes on handling batteries

⚠ WARNING!

Batteries can be hazardous

Batteries contain an acid solution which is poisonous and corrosive. Avoid contact with battery acid at all times.

- ▶ 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.
- ▶ In the event of physical damage (e.g. skin or eye contact with battery acid) call for a doctor immediately.
- ▶ Spilled battery acid should be neutralised immediately with plenty of water.
- ▶ Only batteries with a sealed battery container may be used.
- ▶ Follow national guidelines and legislation.

⚠ WARNING!

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

The design, weight and dimensions of the battery have a considerable effect on the operational safety of the truck, in particular its stability and capacity. The use of unsuitable batteries that have not been approved for the truck by Jungheinrich, can lead to a deterioration of the braking characteristics of the truck during energy recovery, causing considerable damage to the electric controller and resulting in serious danger to the health and safety of individuals.

- ▶ Only Jungheinrich-approved batteries may be used on the truck.
- ▶ Battery equipment may only be replaced with the agreement of Jungheinrich.
- ▶ When replacing/installing the battery make sure the battery is securely located in the battery compartment of the truck.
- ▶ Do not use batteries that have not been approved by the manufacturer.

Park the truck securely before carrying out any work on the batteries (see page 97).

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 (L tray)	Voltage	Capacity	Weight
3 PzV 300 (maintenance-free) 621x281x627 mm	24 V	300 Ah	288 kg
3 PzS 375 624x284x627 mm	24 V	375 Ah	288 kg
3 PzS 375 624x284x627 mm	24 V	375 Ah	288 kg
3 PzS 375 (dry precharged) 624x284x627 mm	24 V	375 Ah	288 kg
3 PzV 330 (maintenance-free) 624x284x627 mm	24 V	330 Ah	274 kg

Battery type (L tray, high)	Voltage	Capacity	Weight
3 PzS 465 626x289x782 mm	24 V	465 Ah	368 kg
3 PzV 360 (maintenance-free) 626x289x782 mm	24 V	360 Ah	368 kg
3 PzS 465 626x289x782 mm	24 V	465 Ah	No data
3 PzV 420 (maintenance-free) 626x289x782 mm	24 V	420 Ah	420 kg

Battery type (XL tray)	Voltage	Capacity	Weight
4 PzS 620 624x356x784 mm	24 V	620 Ah	500 kg
4 PzV 480 (maintenance-free) 624x356x784 mm	24 V	480 Ah	500 kg
4 PzS 620 624x356x784 mm	24 V	620 Ah	500 kg
4 PzS 620 (dry precharged) 624x356x784 mm	24 V	620 Ah	525 kg
4 PzV 560 (maintenance-free) 624x356x784 mm	24 V	560 Ah	475 kg

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

⚠ WARNING!

An unsecured truck can cause accidents

It is hazardous and prohibited to park the truck on inclines, with a raised operator's position or load handler.

▶ Park the truck on a level surface. In special cases the truck may need to be secured with wedges.

▶ Fully lower the operator's position and load handler.

▶ Select a place to park where no other people are at risk of injury from the lowered load handler.

▶ If the brakes are not working, place wedges underneath the wheels of the truck to prevent it from moving.

NOTE

The truck must not be parked on transport or escape routes, in front of safety installations, or in front of factory equipment that must be accessible at all times.

Requirements

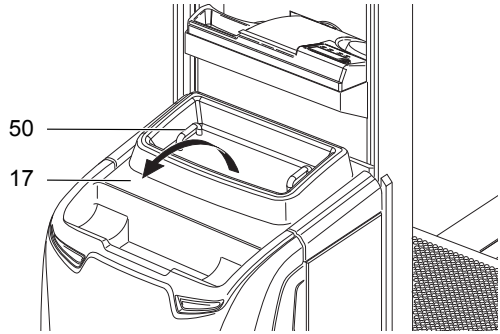
– Park the truck securely, see page 97.

Procedure

- Grab the battery cover (17) by both handles (50) and lift it up as far as the stop.

  The battery cover is held up by its own weight.

The battery is now exposed.



Closing the Battery Panel

Procedure

- Restore all covers and connections to their operating position before starting up the truck.
- Always use the handles (50) to close the battery panel.

⚠ WARNING!

Collision hazard when operating the truck

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

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

⚠ CAUTION!

Short circuits can result in fire

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

- ▶ Before closing the battery cover make sure that the battery cables are not damaged.
- ▶ Report any defects immediately to your supervisor.
- ▶ Mark defective truck and take out of service.
- ▶ Do not return the industrial truck to service until you have identified and rectified the fault

---

⚠ CAUTION!

Trapping hazard

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

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

---

4 Charging the battery

⚠ WARNING!

The gases produced during charging can cause explosions

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

- ▶ Switch the charging station and truck off first before connecting/disconnecting the charging cable of the battery charging station to/from the battery connector.
- ▶ The charger must be adapted to the battery in terms of voltage and charge capacity.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶ The battery cover must be open and the battery cell surfaces must be exposed during charging to ensure adequate ventilation.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there shall be no inflammable material or lubricants capable of creating sparks within 2000 mm around the truck.
- ▶ Fire protection equipment must be on hand.
- ▶ Do not lay any metallic objects on battery.
- ▶ It is essential to follow the safety regulations of the battery and charger station manufacturers.

NOTE

Risk of fire and risk of material damage

The battery charger must be calibrated for the battery in terms of voltage and charge capacity. Always follow the safety regulations of the battery manufacturer and the charging station manufacturer.

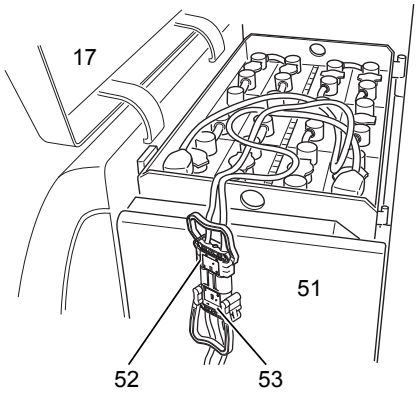
Charging the battery

Requirements

– Park the truck securely, see page 97.
– Expose the battery, see page 57.
– Switch off the battery charger.
– Set the correct charging program on the battery charger.

Procedure

- Remove the battery connector (52).
- If necessary, remove the insulating mat from the battery.
- Connect the charger cable (53) of the battery charging station to the battery connector (52).



- Switch on the battery charger. Charge the battery in accordance with the battery and battery charger manufacturers' instructions.

The battery is charging.

NOTE

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

Preparing the battery for operation after charging

Requirements

– The battery (51) is fully charged.

Procedure

- Switch off the charger.
- Disconnect the charging cable from the battery connector (52).
- Check all cables and connectors for visible signs of damage.
- Connect the battery connector (52) to the truck.
- Close the battery cover (17), see page 57.

After the battery charge the truck is ready for operation.

5 Battery removal and installation

⚠ WARNING!

Accident risk during battery removal and installation

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

- ▶ Note the "Safety regulations for handling acid batteries" section in this chapter.
- ▶ Wear safety shoes when removing and installing the battery.
- ▶ Use only batteries with insulated cells and terminal connectors.
- ▶ 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.

⚠ CAUTION!

Battery installation and removal can cause short circuits

The battery cable or connector can get trapped between the truck chassis and battery when the battery is installed and removed.
Damaged cables can cause short circuits, setting the truck and battery on fire.

- ▶ Place the battery cable and connector on the battery.
- ▶ Do not pinch or trap the battery cable and connector.

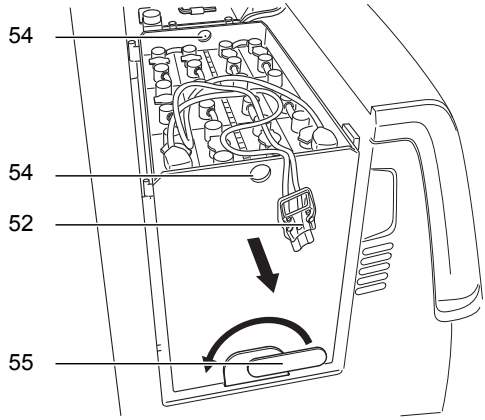
⚠ CAUTION!

Risk of accidents and injury from electrical voltage

When installing and removing the lithium-ion battery, there is a risk of accidents and injury from electrical voltages.

- ▶ The lithium-ion battery may only be installed and removed by trained experts.

Removing the battery



Requirements

– Truck parked securely, see page 97.
– Expose the battery, see page 57.
– Battery disconnected.

Tools and Material Required

– Crane or forklift truck
– Crane lifting gear
– Battery replacement trolley (○)

Procedure

- Pull the clamping lever (55) 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.
    Observe the battery replacement trolley operating instructions.
- Removing the battery with a crane or forklift truck
  - Attach the hooks of the crane slings to the strap eyes (54) 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 (54) 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 (55) of the battery lock 180° clockwise.
- Attach the battery connector (52) 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.

E Operation

1 Safety Regulations for the Operation of Forklift Trucks

Driver authorisation

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

Operator's rights, responsibilities and rules of conduct

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

Unauthorised use of truck

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

Damage and faults

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

Repairs

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

Hazardous area

⚠ WARNING!

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

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

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

Safety devices, warning signs and warning instructions

Safety devices, warning signs (see page 36) and warning instructions in the present operating instructions must be strictly observed.

⚠ WARNING!

Accident risk due to removing or disabling of safety devices

Removal or disabling of safety devices such as the Emergency Disconnect switch, deadman switch, horn, warning lights, gates, protective window, covers, etc. may result in accidents and injuries.

- ▶ 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.

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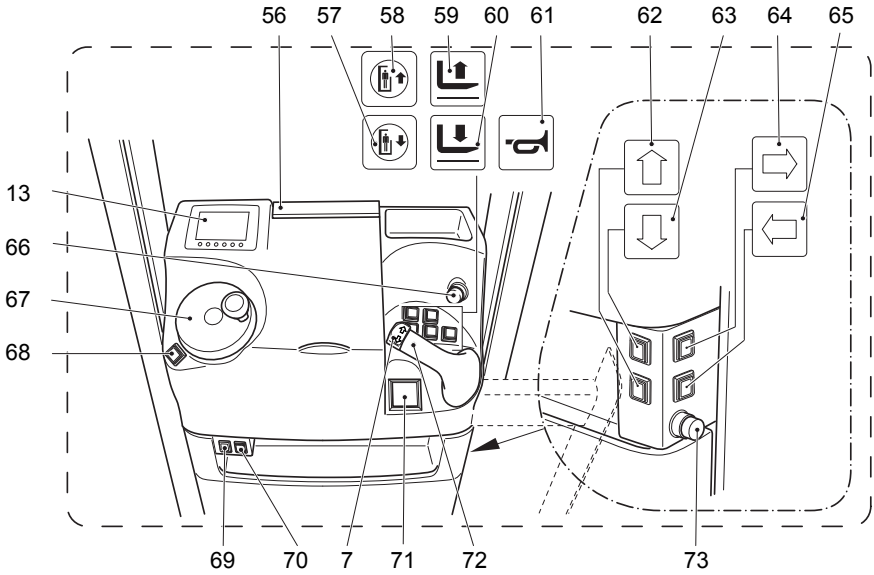
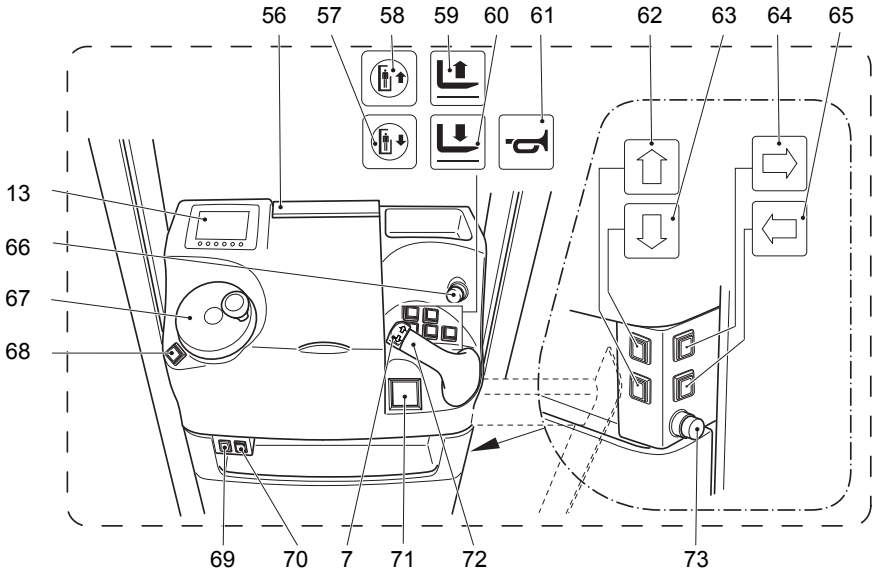
2 Displays and Controls

2.1 Control Station in Drive Direction



Item	Control/display		Function
7	Travel controller	●	Controls the travel direction and the speed.
		○	2nd control station
13	Control and display unit	●	Display for: – Battery charge status – Service hours – Event messages – Warning indicators – Operating program
	Soft keys under the display unit	●	Selection of: – Operating program – Options
		○	Entry of access codes to switch on the truck
56	Clip pad	●	For holding A4 paper
57	Lower button	●	Lowers the operator position and load handler.
58	Lift button	●	Raises the operator position and load handler.
59	Auxiliary lift raise button	○	Raises the load handler
		○	2nd control station
60	Auxiliary lift lower button	○	Lowers the load handler
		○	2nd control station

Item	Control/display		Function
61	Warning button	●	Issues a warning signal.
		○	2nd control station
62	Pedestrian mode lift button	○	Pedestrian mode optional feature: Raises the operator position and load handler.
63	Pedestrian mode lower button	○	Pedestrian mode optional feature: Lowers the operator position and load handler.
64	Drive direction pedestrian touch mode	○	Pedestrian mode optional feature, travel continues as operator walks beside in drive direction (slow travel).
65	Load direction pedestrian touch mode	○	Pedestrian mode optional feature, travel continues as operator walks beside in load direction (slow travel).
66	Emergency disconnect	●	Disconnects the power supply, deactivates all electrical functions, causing the truck to brake automatically.
67	Steering wheel	●	Steers the truck.
68	Button for two-hand operation	○	Releases lifting and travel when pressed (in rail guidance mode with aisle recognition).
69	Indicator lamp	○	End of aisle safety device optional feature: Indicates reduced travel speed
70	Reset button	○	End of aisle safety device optional feature: Releases normal travel speed
71	Key switch and key	●	Switches control voltage on and off. Removing the key prevents the truck from being switched on by unauthorised personnel.
	Keypad	○	Replaces the key switch. Switches the truck on and off. Enables truck functions.
	Transponder reader	○	Replaces the key switch. Switches the truck on and off via transponders. Enables truck functions.
	ISM access module	○	Replaces the key switch. Checks the card (or the transponder). Enables truck functions. Time-out monitoring. Lists the truck users (shifts) and saves them onto the card. Operational data acquisition.
72	Travel direction arrows	●	The travel direction arrows indicate the travel direction.
73	Emergency disconnect	○	Pedestrian mode optional feature: Disconnects the power supply, deactivates all electrical functions, causing the truck to brake automatically.
●	Standard equipment		
○	Optional equipment		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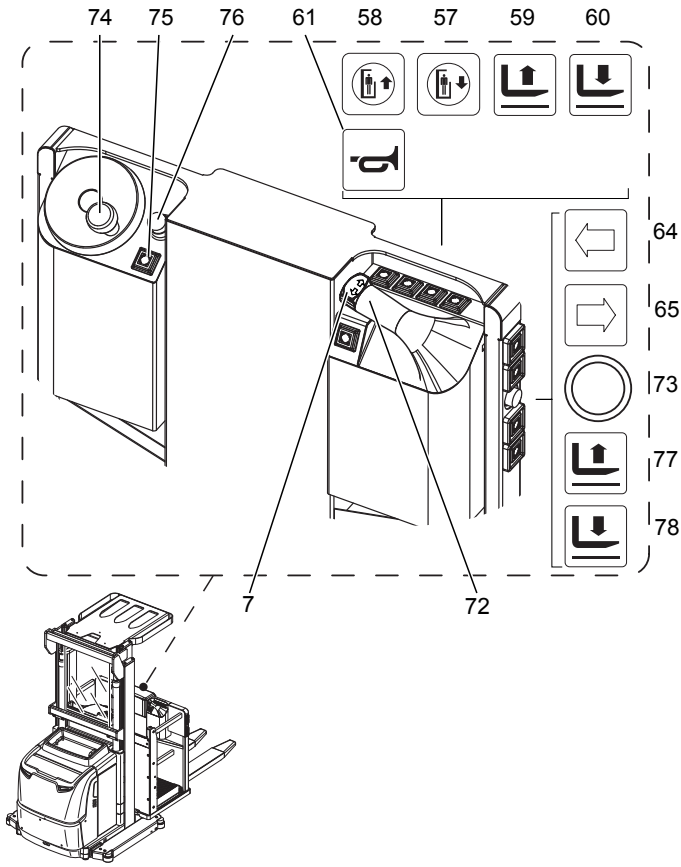
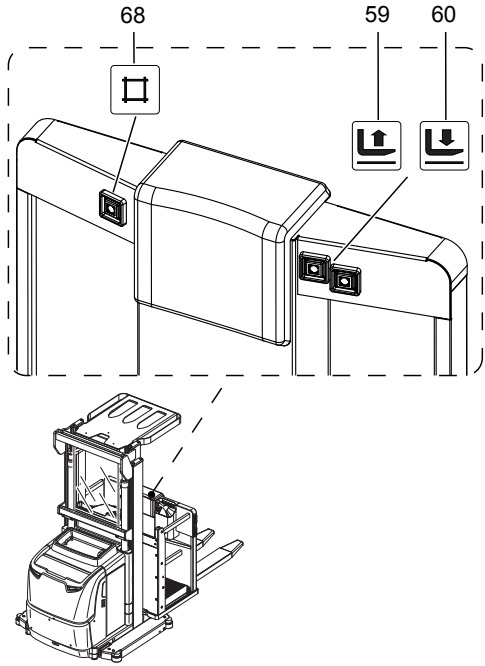
2.2 Second control station (○) in load direction



Item	Control/display	Function
7	Travel controller	Controls the travel direction and the speed.
57	Lower button	Lowers the operator position and load handler.
58	Lift button	Raises the operator position and load handler.
59	Auxiliary lift raise button	Raises the load handler.
60	Auxiliary lift lower button	Lowers the load handler.
61	Warning button	Issues a warning signal.
64	Drive direction pedestrian touch mode	Pedestrian mode optional feature, travel continues as operator walks beside in drive direction (slow travel).

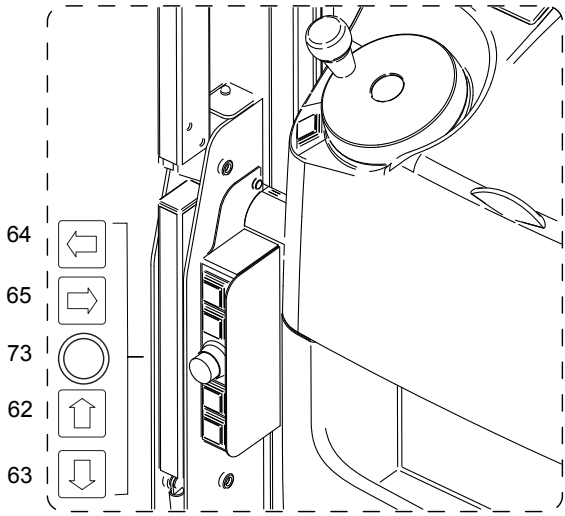
Item	Control/display	Function
65	Load direction pedestrian touch mode	Pedestrian mode optional feature, travel continues as operator walks beside in load direction (slow travel).
67	Steering wheel	Steers the truck.
72	Travel direction arrows	The travel direction arrows indicate the travel direction.
73	Emergency disconnect	Pedestrian mode optional feature: Disconnects the power supply, deactivates all electrical functions, causing the truck to brake automatically.
74	Steering wheel (2nd control station)	Steers the truck.
75	Two-hand operation button (2nd control station)	Releases lifting and travel when pressed (in rail guidance mode with aisle recognition).
76	2nd emergency disconnect (2nd control station)	Disconnects the power supply, deactivates all electrical functions, causing the truck to brake automatically.
77	Auxiliary lift raise button	Pedestrian mode optional feature: Raises the load handler.
78	Auxiliary lift lower button	Pedestrian mode optional feature: Lowers the load handler.

2.3 Auxiliary lift controls



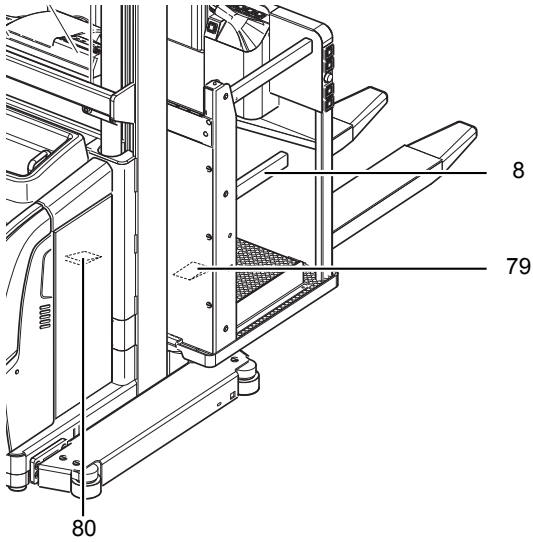
Item	Control / Display		Function
59	Aux. lift “raise” button	○	Raises the load handler
		○	2nd control station
60	Aux. lift “lower” button	○	Lowers the load handler
		○	2nd control station
68	“Two hand operation” button	○	Releases lifting and travel when pressed (in rail guidance mode with aisle recognition).
●	Standard Equipment		
○	Optional Equipment		

2.4 Pedestrian EKS 110 with gates



Item	Control/display		Function
63	Pedestrian mode lower button	○	Pedestrian mode optional feature: Lowers the operator position and load handler.
62	Pedestrian mode lift button	○	Pedestrian mode optional feature: Raises the operator position and load handler.
64	Drive direction pedestrian touch mode	○	Pedestrian mode optional feature, travel continues as operator walks beside in drive direction (slow travel).
65	Load direction pedestrian touch mode	○	Pedestrian mode optional feature, travel continues as operator walks beside in load direction (slow travel).
73	Emergency disconnect	○	Pedestrian mode optional feature: Disconnects the power supply, deactivates all electrical functions, causing the truck to brake automatically.
○	Optional equipment		

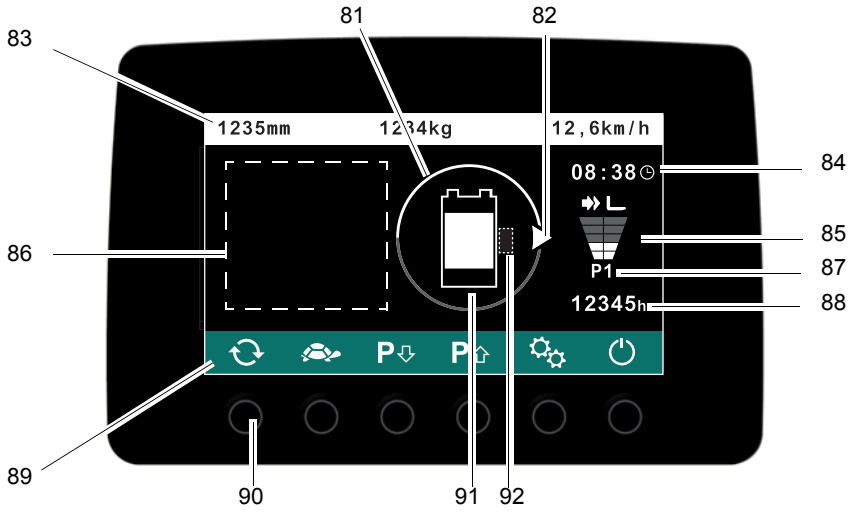
2.5 Deadman button and gate



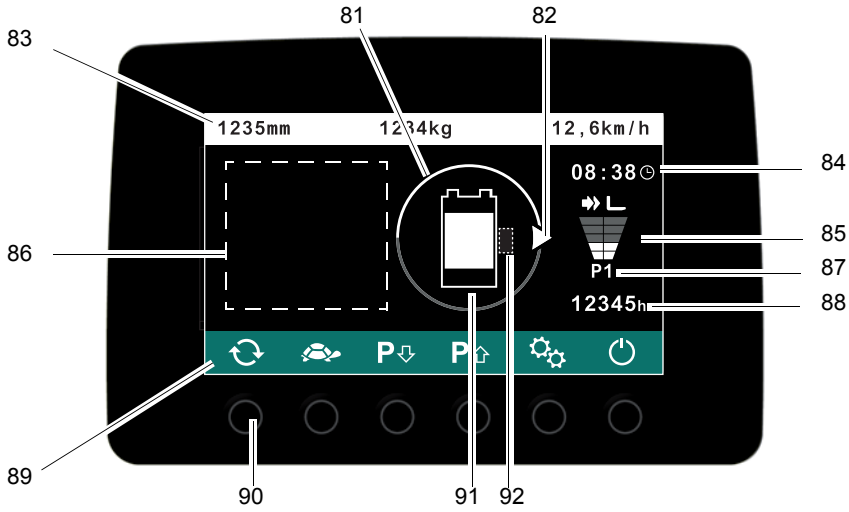
Item	Control/display		Function
8	Gate	○	Open: Lifting and travel inhibited from a lift height of 1200 mm. Closed: Lifting and travel enabled.
80	Deadman switch	●	Not applied: Travel inhibited, or truck brakes. Applied: Travel enabled.
79	Deadman switch 2nd control station	○	Not applied: Travel inhibited, or truck brakes. Applied: Travel released, operation changed to 2nd control station.
●	Standard equipment		
○	Optional equipment		

2.6 Display unit

2.6.1 Display (4 Inch)



Item	Control and Display	Function
81	Direction presetting	Shows the direction selected.
82	Arrow to display the travel and steering directions	Shows the current travel direction of the truck and the current wheel position in 15° segments.
83	Information field	Displays event messages and optional information such as speed.
84	Time	Shows the time.
85	Power display	Shows the available power in the travel program selected.
86	Icon field	Displays the icons see page 79.
87	Operating program	Shows the operating program selected.
88	Service hours	Shows the truck's service hours, see page 26.
89	Button allocation	see page 77.
90	Buttons	Selection buttons for the corresponding functions.
91	Battery capacity display	Battery discharge status
92	Battery type	Empty = Standard battery 1 = Dry battery 2 = XFC battery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2.6.2 Button allocation of the display

Main menu symbols

Symbol	Meaning
	Information field toggle: Allows the information displayed in the information field to be changed.
	Slow travel: Switches slow travel on and off.
	Travel program down: To switch the travel program down
	Travel program up: To switch the travel program up
	Settings: Change to setting mode. Set time and access authorisations (optional). To change to the menu to administer the codes or transponders
	Switching off additional equipment (○): Switching off (○) is only available in the display if the truck is switched on with an access code. Switches off truck

Additional symbols

Symbol	Meaning
	Light (○): Switches the lighting on/off.
	Work lights (○): Switches the work lights on/off.
	Setting: To change to the menu to administer the codes or transponders
	Change set-up code: To change the set-up code and to activate the keypad or the transponder reader.
	Edit access code / transponder: To add or delete access codes and transponders.
	Up selection: To select access codes or transponders.
	Down selection: To select access codes or transponders.
	Delete: To delete selected access codes.
	Add: To add new access codes.
	Back: Cancels the current procedure and returns to the previous menu.
	Confirm: To confirm an entry or a transponder code.

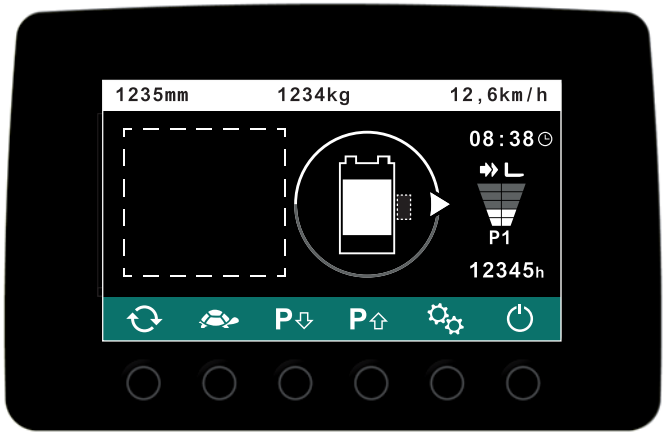
2.6.3 Symbols in the display

Any number of pictograms can be displayed in the pictogram field (86). Which pictograms are shown in the pictogram field depends on the operating and truck status.

Symbol	Meaning	Colour	Function
	Stop notice	Red	Functions deactivated due to truck malfunctions
	Warning	Yellow	Operating error
		Red	Truck malfunction
	Deadman switch	Yellow	The yellow icon illuminates when controls are applied but the deadman switch is not.
	Service note	Yellow	Maintenance due, see page 217
		Red	Safety inspection due, see page 214
	Battery indicator	Yellow	Battery capacity ≤ 30%
		Red	Battery capacity ≤ 20%
	Overtemperature	Yellow	Lifting, lowering and travel functions reduced due to overtemperature.
		Red	Lifting, lowering and travel functions disabled due to overtemperature.
	Tracking on and off activated	Yellow	Icon illuminates when the truck acquires the wire in an aisle.
	Truck guided (with aisle recognition)	Green	Icon illuminates when the truck is in the aisle.
	Aisle end recognition	Green	Icon illuminates when the truck detects the aisle end.
	Two-hand operation	Yellow	Icon illuminates when the "two-hand operation" key needs to be applied.
	Close the side gates	Yellow	Icon illuminates from a lift height of 1200 mm if the side gates are not closed.

Symbol	Meaning	Colour	Function
	Lift deactivated	Yellow	Icon illuminates when lifting functions are cut out due to insufficient battery capacity.
	Beacon / strobe light	Green	Beacon / strobe light is switched on.
	Work lights right	Green	Right work lights are switched on.
	Work lights left	Green	Left work lights are switched on.
	Interior lighting	Green	Interior lighting is switched on.
	Shock display (ISM)	Yellow	Medium impact due to incorrect operation
		Red	Severe impact due to incorrect operation
	Slow travel	Green	Travel speed reduction when the "slow travel" key is pressed on the display.
	Slow travel at safety height	Yellow	Icon illuminates when a lift height of 1200 mm is reached.
	Crawl speed	Yellow	Travel speed reduction when ISM prescribes a reduction

2.6.4 Setting the time



Setting the Time

Symbol	Procedure
	Press the button under the settings symbol.
	Press the button under the clock symbol.
	Use the arrow up key to change the time digit selected.
	Use the arrow down key to change the time digit selected.
	Press the confirm key to move to the next digit or to confirm the time.

The time is now set.

3 Preparing the Truck for Operation

3.1 Checks and Operations to Be Performed Before Starting Daily Work

⚠ WARNING!

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

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

▶ Report any defects immediately to your supervisor.

▶ Mark defective truck and take out of service.

▶ Do not return the industrial truck to service until you have identified and rectified the fault.

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 connectors are secure.
- Check the battery retainers are present and test them.
- Make sure the battery cover and side panel (if applicable) are secure.
- Check side/safety gates for damage.
- Check the overhead guard for damage.
- Check mast protection pane is secure and damage-free.
- Check tilt safety devices are present and check distance from the ground, see page 48.
- 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 rollers 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.
- Check labels are legible and complete, see page 36.

3.2 Setting up the operator position

3.2.1 Individual assembly of the second control station control panels

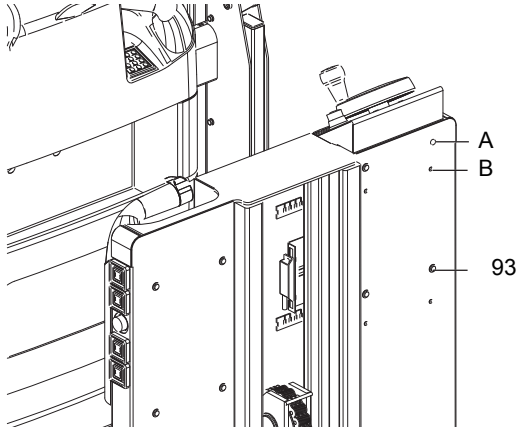
NOTE

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.

3.3 Entry and exit

⚠ WARNING!

Objects in operator's position leg compartment

Objects in the operator's position leg compartment can impede the operation of controls in this area. For example the objects can accidentally start or jam the controls. They also pose a trip hazard.

▶Keep the operator's position leg compartment clear of objects.

⚠ WARNING!

Risk of falling from a raised operator position

The operator could fall out if the gate is open and the operator position is raised.

▶Do not open the gate(s) when the operator position is raised.

⚠ CAUTION!

Gate trapping hazards

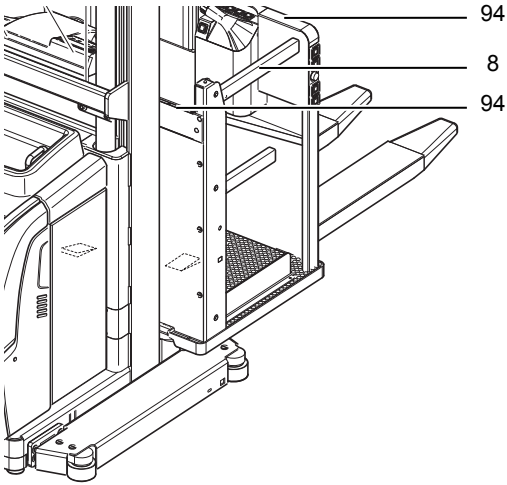
You can trap hands or feet when the gates are opened and closed.

▶Do not place any part of your body between the gate and the frame of the operator's position when opening the gates.

▶Do not place any part of your body between the gates and the leg compartment of the operator's position when closing the gates.

⚠ CAUTION!

No more than one person may operate the truck at a time.



Requirements

– Operator's position fully lowered, see page 111.

Procedure

- If present, lift up the gates (8).
- Hold on to the cabin frame (94) when entering and exiting.
- If present, close the gates (8).

⚠ CAUTION!

Injuries when leaving the operator's position

The operator can be injured when leaving the operator's position raised up to 20 cm.

▶ Always enter the truck facing towards it.

▶ The operator must hold onto the frame of the cab when entering and exiting.

▶ The operator must not leave the operator's position when raised above 20 cm. Do not climb onto parts of the building or onto other trucks and do not climb over safety equipment (such as the guard, railings or gates).

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.

⚠ DANGER!

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

NOTE

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

Travel surface

The travel surface on which the truck is to be used on must be suitably maintained in order to provide the required traction for travel, steering and braking under the prevailing ambient conditions.

The details on the truck data plate assume a level and dry travel surface. Other ground surfaces may have a negative affect on the stability of the truck. They will result in a modification of the rated performance (e.g. speed reduction etc.) of the truck.

Ground and ground conditions

The ground on which the trucks are used must be level and smooth. There must not be any gaps, drainage systems etc. in this area.

The ground must be well maintained to keep it free of contamination, obstacles and liquids that could affect the safe operation of the truck.

NOTE

Static charge can cause material damage to truck components

When the truck is operated on a surface with a shunt resistance in excess of $10^6\Omega$, static charge can result in damage to electric components (controller, control panel, ...).

▶ Operate the truck only on surfaces with a shunt resistance of less than $10^6\Omega$.

▶ The anti-static conductor must be in contact with the ground during operation.

Travel conduct

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

Do not use a mobile phone or walkie-talkie without a handsfree device while operating the truck.

⚠ WARNING!

What to do if the industrial truck tips over

If the truck is in danger of tipping over, the operator should not jump out of the truck. He must keep his whole body inside the operator position.
The operator must:

- ▶ Crouch down,
- ▶ Hold onto the operator position with both hands,
- ▶ Lean against the direction of fall.

⚠ WARNING!

Electromagnetic influence can result in accidents

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

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

Visibility when travelling outside the narrow aisle

The operator must look in the direction of travel and must always have a clear view of the route ahead.

Loads which affect visibility must be positioned at the rear of the truck (travel in the drive direction, see page 102). If this is not possible, a second person must walk alongside the truck as a lookout to observe the travel route while maintaining eye contact with the operator. In this case proceed only at walking pace and pay particular attention. Stop the truck immediately if visual contact is lost between the lookout and the operator.

Use the mirror only to observe the traffic behind you. Should you need visibility aids (mirrors, monitors etc.) to ensure adequate visibility, practice working with them beforehand.

Procedure and visibility when operating with a raised operator position or load handler

⚠ WARNING!

Operating the truck with driver's cab and load handler raised can result in accidents

Working with a raised operator position or load handler can affect the operator's visibility. Other people can be injured in the truck's hazardous area. The hazardous area is defined as the area in which people are at risk from the truck movement, the load handler, attachments etc. This also includes areas which can be reached by falling loads, operating equipment etc. Apart from the driver (in the normal operating position) there should be no other people in the truck's hazardous area.

- ▶ When carrying out hydraulic or travel operations, make sure that nobody is present in the hazardous area.
- ▶ Instruct other people to move out of the hazardous area of the truck.
- ▶ Stop working with the truck if people do not leave the hazardous area.

Negotiating lifts

Lifts may only be negotiated if they have sufficient capacity, are suitable for driving on and authorised for truck traffic by the owner. The operator must satisfy himself of the above before entering lifts. The truck must enter lifts with the load in front and must take up a position which does not allow it to come into contact with the walls of the lift shaft.

Persons riding in the lift with the forklift truck must only enter the lift after the truck has come to rest and must leave the lift before the truck.

Work platforms

⚠ WARNING!

The use of working platforms is governed by national law. In some states the use of working platforms is prohibited on industrial trucks. Observe the applicable law. Working platforms can only be used in the country of application if the law permits it.

▶ Contact the national authorities before using a working platform.

Negotiating slopes and inclines

Negotiating slopes and inclines up to 10 % is only permitted when they are recognised lanes. The slopes and inclines must be clean, have a non-slip surface, and negotiating them safely must be within the technical specifications of the truck. The truck must always be driven with the load facing uphill. The industrial truck must not be turned, operated at an angle or parked on inclines or slopes. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment.

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.

⚠ WARNING!

Suspended and swaying loads can cause accidents and tipovers during transport

Transporting suspended and swaying loads can reduce the stability of the truck. In addition, swaying loads can injury or damage people or components in the vicinity of the truck.

▶Do not transport suspended loads.

▶Do not transport swaying loads.

⚠ WARNING!

Accident risk when transporting liquid loads

The following risks may be present when transporting liquid loads:

Liquids sloshing out.

A change in the load centre due to sudden lifting and drive movements the load falling down as a result.

Adverse effect on the stability of the industrial truck due to slipping or unstable loads.

▶Follow the instructions in the section "Transporting a load", see page 123.

Fall protection

The operator must not leave the operator's position when it is raised. Do not leave the driver's seat to climb onto parts of the building or onto other trucks. Also, do not climb over or onto safety equipment within the operator's position such as railings and gates.

If Euro pallets are stored lengthways it may not be possible to reach items from the operator's position 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 safety belts, guard and / or pallet tipover safety mechanisms are in place.

⚠ WARNING!

Falls from climbing over and onto controls and components

Climbing over and onto the gates, control panel, operator's position railing etc. can result in the driver falling out of the operator's position.

▶ The operator must not climb on the gates, control panel the operator's position railing etc.

⚠ WARNING!

Falls due to open gates

The operator could fall out if the gate is open and the operator's position is raised.

▶ Do not open the gate(s) when the operator's position is raised.

▶ Seat belt checked and put on (EKS without front railing or guard only).

Towing trailers and other vehicles

⚠ CAUTION!

The truck must not be used to tow a trailer or other vehicles.

4.2 Preparing the truck for operation

Switching on the truck

Requirements

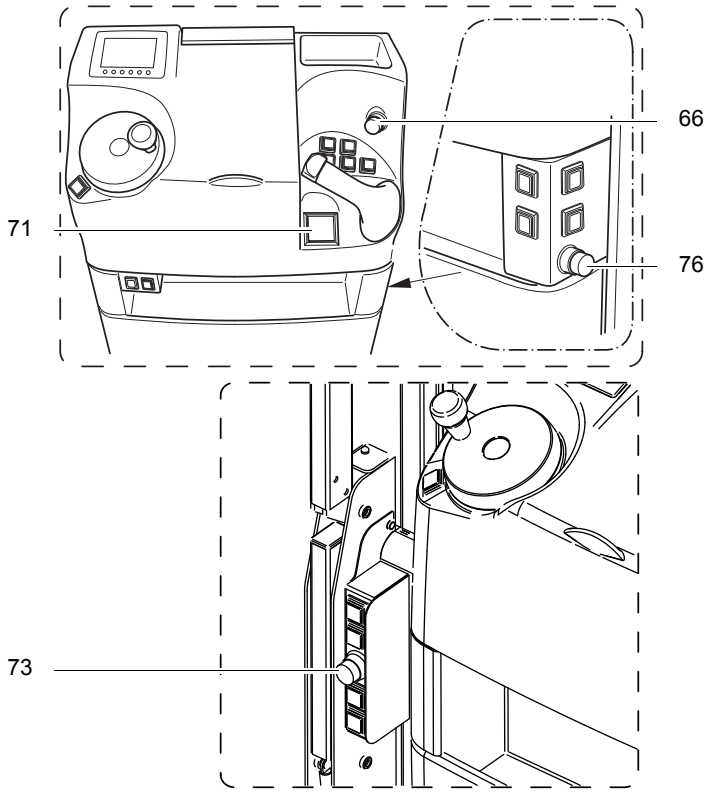
– Perform visual inspections and operations before starting daily work, see page 82.

Procedure

- Step onto the operator platform.

  Take care not to actuate the travel controller or the pedestrian buttons when entering the truck.
- Close the gates.
- Turn the emergency disconnect switch (66, 73, 76) to unlock it.
- To switch on the truck:
  - Insert the key in the key switch (71) and switch on the truck.
  - Keyless access systems (○), see page 143.

The truck is now operational. The steering is set straight-ahead.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4.3 Checks and operations to be carried out when the truck is operational

⚠ WARNING!

Risk of accident due to damage to or other defects in the truck and optional features

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

▶ Report any defects immediately to your supervisor.

▶ Mark defective truck and take out of service.

▶ Do not return the industrial truck to service until you have identified and rectified the fault.

Requirements

– Prepare the truck for operation, see page 94 or see page 143.

Procedure

- Test warning indicators and safety devices:
  - Test the Emergency Disconnect switch, see page 99.
  - Test the horn.
  - Test the deadman switch.
  - Test the side/safety gates.
  - Test the service and parking brakes, see page 109.
  - Test the steering, see page 108. The maximum steering angle of ± 90 ° must be reached and shown in the driver's display.
  - Test the hydraulic system, see page 111.
  - Test the travel functions, see page 102 and see page 175.
  - Test the end of aisle safety device and aisle detection functions (○), see page 173.
  - Test the lighting (work lights, etc.) (○).
- Test the controls and displays and check for damage (see page 67).
- Check the controls are automatically restored to their neutral position after being applied (e.g. the hydraulic control lever, deadman switch, etc.).
- Test two-hand operation in narrow aisles, see page 175.

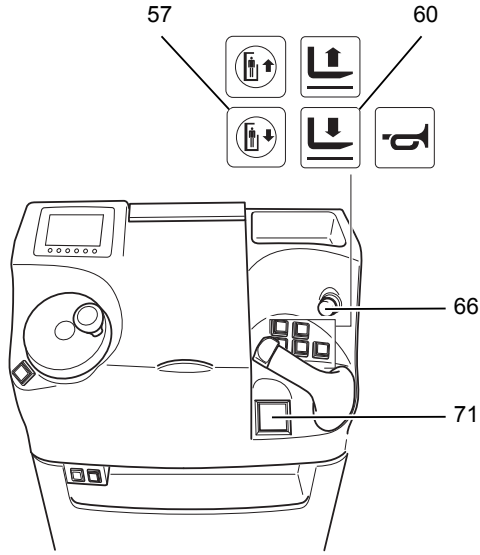
4.4 Parking the truck securely

⚠ WARNING!

An unsecured truck can cause accidents

Do not park the truck on an incline. Do not park the truck without the brakes engaged. Do not park or leave the truck with a raised operator's position or load handler.

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



Parking the truck securely

Procedure

- Park the truck on a level surface.
- Fully lower the operator's position and load handler:
  - Press the "lower" button (57).
  - Apply the auxiliary lift "lower" button (60) if necessary.
- Set the drive wheel to the forward position.
- Switch off the truck, to do this:
  - Turn the key in the key switch (71) anti-clockwise as far as it will go. Remove the key from the key switch (71).
  - Keyless access systems (○), see page 143.
- Press the Emergency Disconnect switch (66).

The truck is parked.

4.5 Emergency Disconnect

⚠ CAUTION!

Applying maximum braking can result in accidents

Applying the Emergency Disconnect switch during travel will cause the truck to decelerate to a halt at maximum force. This may cause the load to slide off the load handler. There is a higher risk of accidents and injury.

- ▶ Do not use the Emergency Disconnect switch as a service brake.
- ▶ Use the Emergency Disconnect switch during travel only in emergencies.

⚠ CAUTION!

Faulty or non-accessible Emergency Disconnect switches can cause accidents

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

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

Applying the Emergency Disconnect

Procedure

- Press the Emergency Disconnect (73, 66, 76).

Do not use the Emergency Disconnect (73, 66, 76) as a service brake. The operation of the Emergency Disconnect (73, 66, 76) 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.

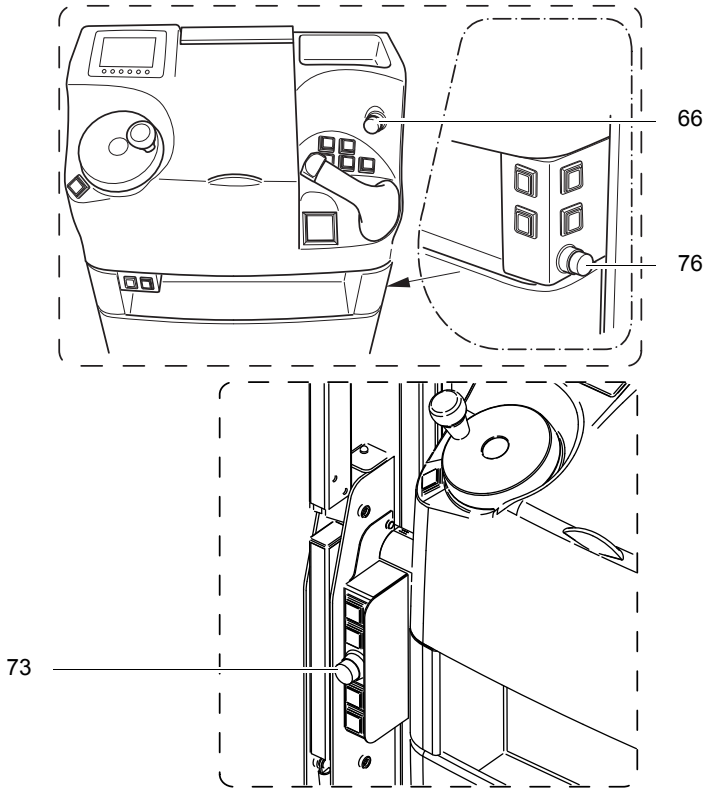
Release the Emergency Disconnect switch

Procedure

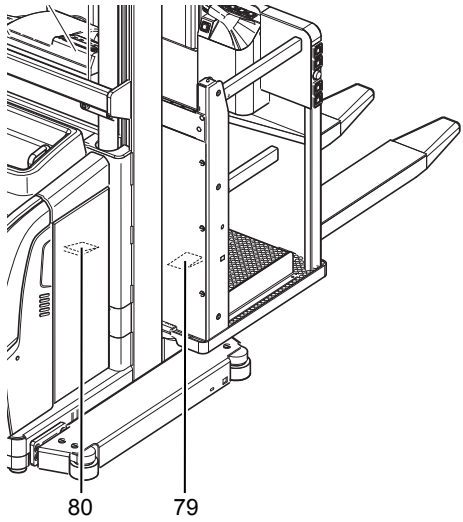
- Turn the Emergency Disconnect switch (73, 66, 76) to unlock it.

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

If the truck is not equipped with a key switch, the truck is not operational after the emergency disconnect switch has been released. Prepare the truck for operation, see page 143.



4.6 Deadman button



Lifting (main lift) and auxiliary lift (○) cannot be applied without pressing the deadman switch (80, 79).

If the deadman switch (80, 79) is released during travel, the truck decelerates at the maximum rate until it stops.

On trucks with a second control station (○) the deadman switch (80, 79) acts as an interlock. Only the controls on the side of the deadman switch (80, 79) that was pressed first will work.

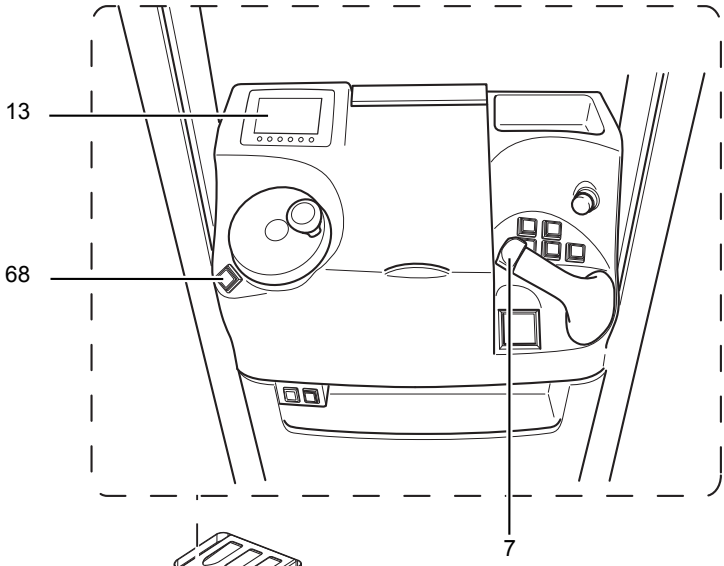
4.7 Travel

⚠ WARNING!

Incorrect travel can cause accidents and injury

Incorrect travel can cause accidents and therefore injury to the operator and / or third parties.

- ▶ Always transport a load outside the narrow aisle as low as possible, allowing for ground clearance.
- ▶ Do not lean out of the truck while travelling.
- ▶ Make sure the travel routes are clear.
- ▶ Adapt your travel speed to the route conditions, the work area and the load.
- ▶ Make sure you have sufficient visibility when reversing.
- ▶ Ensure that there is nobody in the hazardous area when carrying out travel and hydraulic operations.
- ▶ Instruct other people to move out of the hazardous area of the truck.
- ▶ Stop working with the truck if people do not leave the hazardous area.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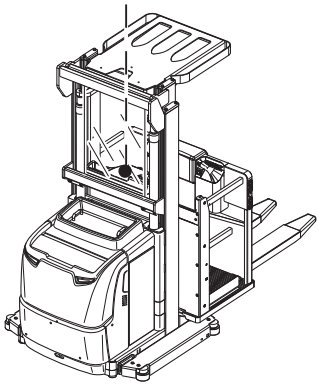

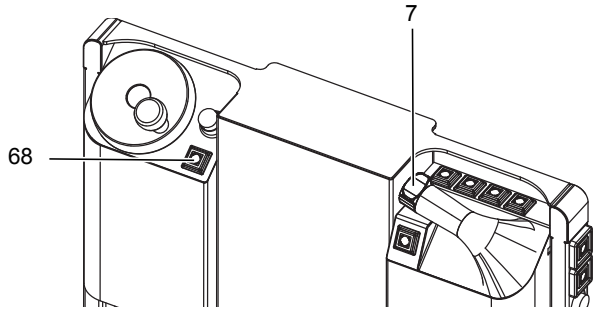
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68

Travel

Requirements

– Truck started up, see page 94 or the see page 143.
– 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.

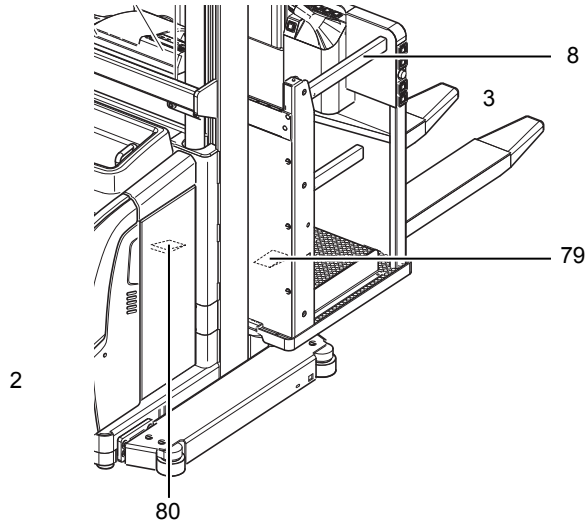
Procedure

- Wait until the truck has started up and all icons appear in the display unit.

  If the deadman switch is pressed too soon, an error message will appear in the display unit.
- Press the deadman switch (80, 79).
- Control panel in load direction:
  - Turn the travel controller (7) forward slowly:
    Travel in load direction (3).
  - Turn the travel controller (7) back slowly:
    Travel in drive direction (2).
- Control panel in drive direction:
  - Turn the travel controller (7) forward slowly:
    Travel in drive direction (2).
  - Turn the travel controller (7) back slowly:
    Travel in load direction (3).
- Control the travel speed by rotating the travel controller (7) further or less.

  The maximum travel speed will depend on the operator's position and the auxiliary lift heights (○).

The truck travels in the required direction.



Travelling into the narrow aisle

Requirements

– Prepare the truck for operation, see page 94 or see page 143.
– 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.

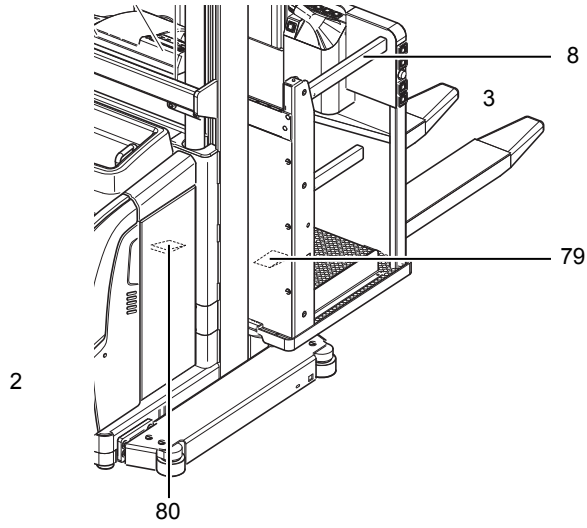
Procedure

- Press the deadman switch (80, 79).

In the narrow aisle the two-hand operation key (68) must be applied with the left hand simultaneously for all functions.

- Control panel in load direction:
  - Turn the travel controller (7) forward slowly:
    Travel in load direction (3).
  - Turn the travel controller (7) back slowly:
    Travel in drive direction (2).
- Control panel in drive direction:
  - Turn the travel controller (7) forward slowly:
    Travel in drive direction (2).
  - Turn the travel controller (7) back slowly:
    Travel in load direction (3).
- Control the travel speed by rotating the travel controller (7) further or less.

The truck travels in the required direction at the requested speed.



Trucks with main lift (version L)

– Maximum speed up to platform height of 1200 mm
– From platform height of 1200 mm
  for steering angle < ± 10 degrees: Travel speed 4 km/h (slow travel)
  for steering angle > ± 10 degrees: Travel speed 2.5 km/h (slow travel)

Trucks with main and auxiliary lift (version Z)

for auxiliary lift < 100 mm

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

for auxiliary lift > 100 mm

– Maximum speed up to platform height of 520 mm
  From a platform height 520 mm at steering angle < +/- 10 degrees: Travel speed 4 km/h (slow travel)
  From a platform height 520 mm at 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)

4.7.1 Changing direction during travel

⚠ CAUTION!

Danger when changing travel direction during travel

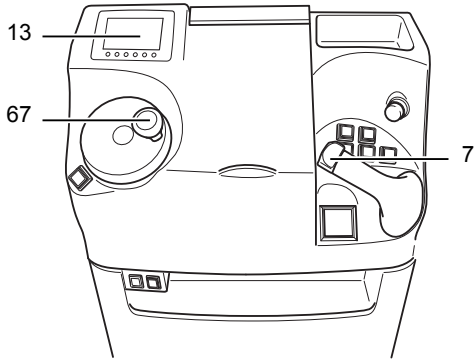
When the travel direction is changed, the truck can start travelling at high speed in the opposite travel direction unless the travel control knob is released in time. Changing the travel direction causes the truck to decelerate sharply.

- ▶ After setting off in the opposite travel direction, apply the travel control knob gently or not at all.
- ▶ Do not perform any sudden steering operations.
- ▶ Face the direction of travel.
- ▶ Have an adequate overview of the route to be travelled.

Changing direction during travel

Procedure

- While travelling in the opposite direction turn the travel controller (7).
  The truck brakes regeneratively via the traction controller until it starts to move in the opposite direction. The travel direction change reduces the truck's energy consumption. Energy is recovered, which is controlled by the traction controller.



4.8 Steering

Requirements

– Prepare the truck for operation, see page 94 or see page 143.

Procedure

- Steering outside narrow aisles:
  - Turn the steering wheel (67) to the left or right, depending on the travel direction. The drive wheel position is indicated on the driver's display (13).
- Steering inside narrow aisles:
  - The truck is automatically guided and steering wheel (67) operation is deactivated.

4.9 Brakes

⚠ WARNING!

Accident risk while braking

The truck's braking response depends largely on the floor condition and the type of surface. The truck's braking distance increases when the ground is wet or dirty.

▶ The operator must be aware of floor conditions and take them into account when braking.

▶ Brake with care to prevent the load from slipping.

The truck's brake pattern depends largely on the ground conditions. The operator must take this into consideration when driving the truck.

The truck can brake in two ways:

– With the service brake (deadman switch).

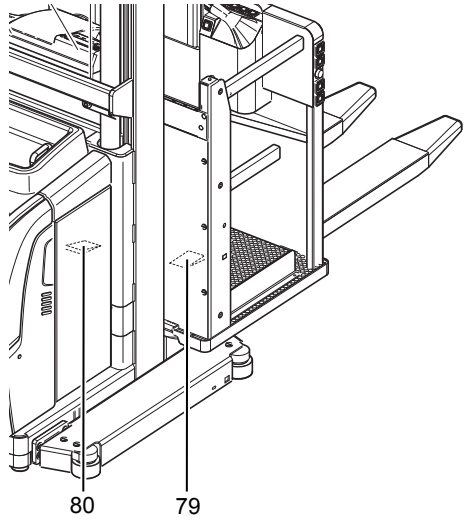
– With the coasting brake

Braking with the service brake

Procedure

- While travelling, release the deadman switch for the respective travel direction (80, 79).

  The truck decelerates regeneratively at the maximum rate until it comes to a halt.



Braking with the coasting brake

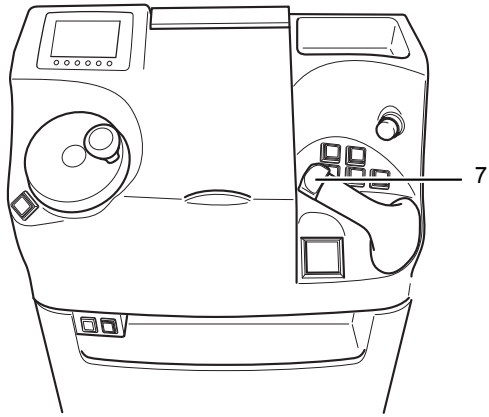
Procedure

- While travelling, release the controller (7). The controller reverts to neutral.
  The truck brakes via the coasting brake.

→ *The braking intensity can be set by the manufacturer's service department.*

Parking Brake

When the truck has come to a halt the parking brake applies automatically. The parking brake is electrically released and actuated through spring pressure. The parking brake prevents the truck from accidentally rolling away.



4.10 Lifting / lowering – outside and inside narrow aisles

⚠ WARNING!

Risk of accidents during lifting and lowering

People can be injured in the hazardous area of the truck.

The hazardous area is defined as the area in which people are at risk from the truck movement, the load handler, attachments, etc. This also includes areas that can be reached by falling loads, operating equipment, etc.

Apart from the operator (in the normal operating position), no other people are permitted in the hazardous area of the truck.

- ▶ Instruct people to move out of the hazardous area of the truck. Stop using the truck immediately if people do not vacate the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ Transport only loads that have been secured and positioned in accordance with regulations. Use suitable precautions to prevent parts of the load from tipping or falling down.
- ▶ Damaged loads must not be transported.
- ▶ Do not exceed the maximum loads specified on the capacity plate.
- ▶ Do not stand underneath a raised load handler or raised operator position.
- ▶ Do not stand on the load handler.
- ▶ Do not lift other people on the load handler.
- ▶ Do not reach or climb into moving truck parts.
- ▶ The operator must not leave the operator position when it is raised. Do not climb onto parts of the building or other trucks.

⚠ WARNING!

Falls due to open gates

The operator could fall out if the gate is open and the operator's position is raised.

- ▶ Do not open the gate(s) when the operator's position is raised.
- ▶ Seat belt checked and put on (EKS without front railing or guard only).

⚠ CAUTION!

Placing the load handler or operator's position on the rack support bar

The load handler and operator's position can rest on the rack support bar during lowering. This makes the lift chains slack. There is a risk that the load handler and operator's position will drop suddenly when they are clear of the rack support bar. Furthermore, the rack support bar can de damaged by the load handler or operator's position.

▶ Do not allow the load handler to rest on the support bar.

▶ Do not allow the operator's position to rest on the rack support bar.

4.10.1 Lifting and Lowering the Operator's Position

When the main lift is raised or lowered the operator's position rises or lowers together with the load handler. The auxiliary lift does not change while the main lift rises or lowers.

⚠ WARNING!

Unauthorised lowering speeds can cause accidents

The line break safety valve in the Main Lift hydraulic cylinders stops the operator's position from lowering if the lowering speed is out of range (> 0,6 m/s). If the safety valve applies for an unauthorised lowering speed, determine the cause.

▶ If there no leakage in the hydraulic system, raise the Main Lift slightly and then lower it again slowly.

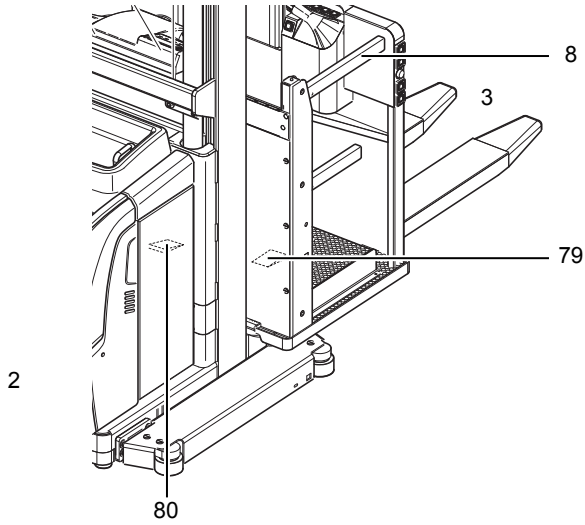
▶ Report any defects immediately to your supervisor.

▶ Mark defective truck and take out of service.

▶ Do not return the industrial truck to service until you have identified and rectified the fault.

▶ Spilled, leaking hydraulic oil must be removed immediately with an appropriate bonding agent.

▶ The mixture of bonding agents and consumables must be disposed of in accordance with relevant regulations.



Requirements

– Prepare the truck for operation, see page 94.
– In narrow aisles apply the two-hand operation key (68) with your left hand while simultaneously pressing the (57 or 58) keys with your right hand (two-hand operation). Hydraulic operations can only be activated in the narrow aisle with two-hand operation.
– On trucks with the lift cutout option (○) the operator's position (main lift) rises to a fixed cutout height which is less than the maximum lift height.

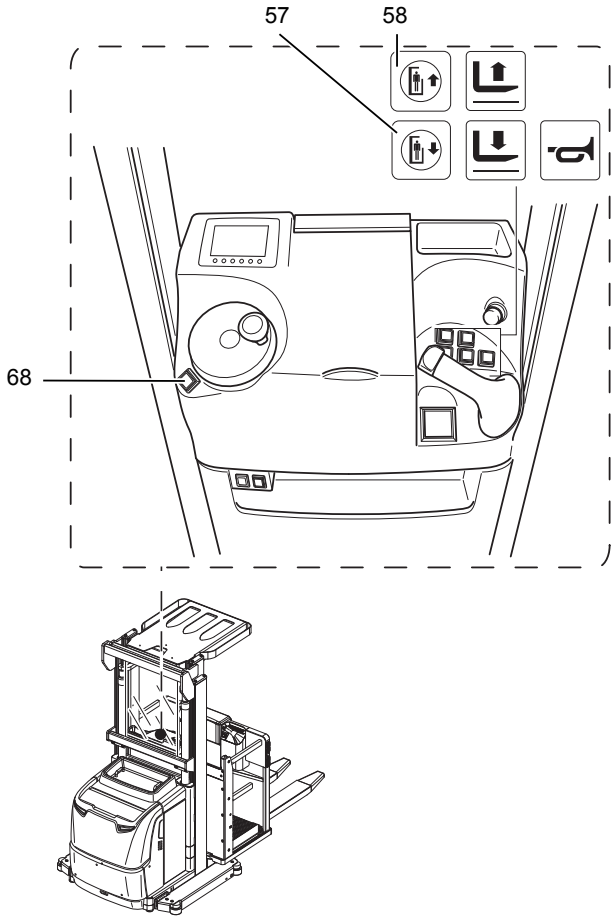
Procedure

• Press the deadman switch (80, 79).
• Press the lift button (58) until you reach the desired lift height.

→ Beyond an operator's position lift height of 1200 mm the gates (8) must be closed in order to travel, lift and lower.

• Press the lowering button (57) until you reach the desired height.

The operator's position is raised or lowered.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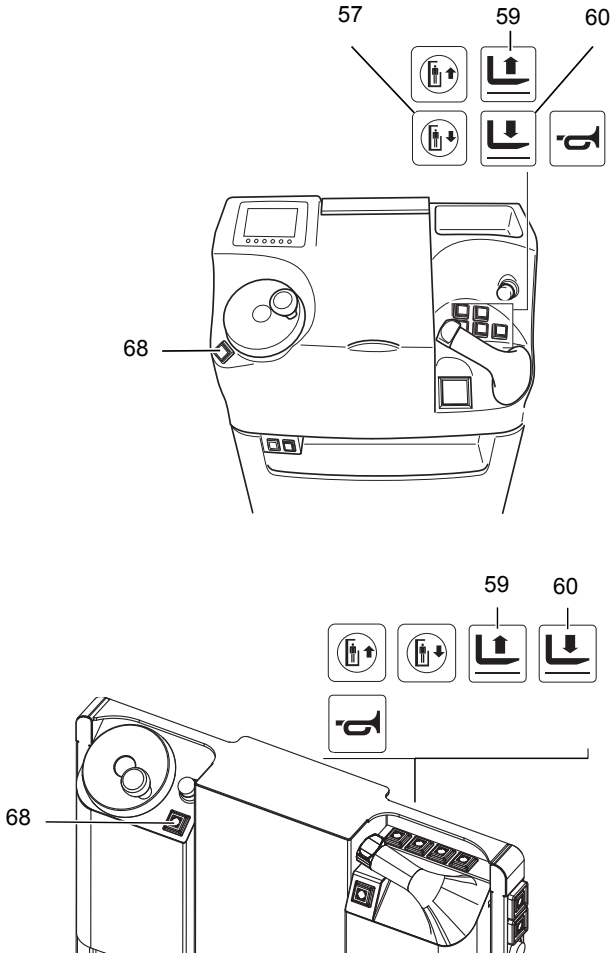
68

4.10.2 Auxiliary Lift – raising and lowering

When the auxiliary lift is raised or lowered the load handler rises or lowers without the operator's position. The main lift does not change while the auxiliary lift rises or lowers.



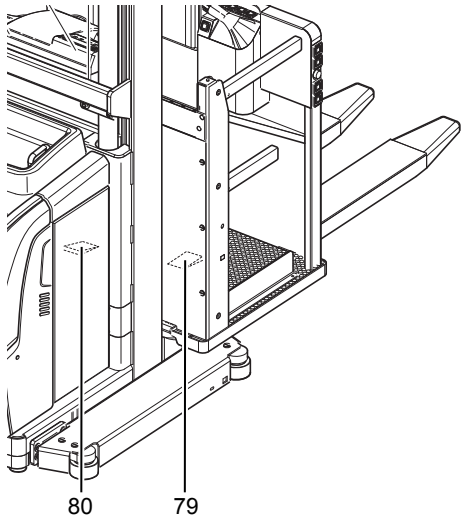
Requirements

– Prepare the truck for operation, see page 94.
– In narrow aisles apply the two-hand operation button (68) with your left hand while simultaneously pressing the (59 or 60) keys with your right hand (two-hand operation). Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

Procedure

- Press the deadman switch (80, 79).
- Press the auxiliary lift raise button (59) until you reach the desired lift height.
- Press the auxiliary lift lowering button (60) until you reach the desired lift height.

The auxiliary lift (load handler) rises or lowers.



5 Order picking and stacking

5.1 Adjusting the forks (○)

⚠ WARNING!

Incorrect fork adjustments can cause accidents

To lift the load securely, the fork tines should be as far apart as possible and centrally positioned with respect to the fork carriage. The load centre of gravity must be centrally aligned between 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.

⚠ WARNING!

Unsecured forks can cause accidents

The forks must be prevented from falling with the extension safety mechanisms (98). The truck must not be operated without an extension safety mechanism (98).

▶ Check the extension safety mechanisms (98) are present.

▶ Ensure the extension safety mechanisms (98) are secure.

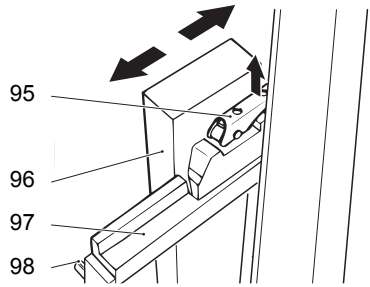
Adjusting the forks

Requirements

– Park the truck securely, see page 97.

Procedure

- Lift up the locking lever (95).
- Push the forks (96) into the correct position on the fork carriage (97).
- Swing the locking lever (95) down and move the fork tines until the locking pin (96) engages in a slot.



The forks are now adjusted.

5.2 Replacing the fork tines (○)

⚠ WARNING!

Faulty fork tines can cause accidents

Faulty fork tines can cause the load to fall.

- ▶ Do not operate the truck with faulty forks.
- ▶ If one fork tine is damaged, both fork tines must be replaced.
- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out faulty forks and withdraw them from use.

⚠ WARNING!

Using two different forks can cause accidents

Installing fork tines that are not identical in design will affect the stability of the industrial truck.

- ▶ Use only the same type of fork that has been approved by the manufacturer.
- ▶ Always replace forks in pairs.
- ▶ The fork tine dimensions must match.

⚠ CAUTION!

Trapping risk when moving the forks

You can trap your arms and legs when moving the forks on the fork carriage.

- ▶ Wear personal protective equipment (e.g. safety boots etc.) when replacing the forks.
- ▶ Always push the forks away from your body, never towards it.
- ▶ Secure heavy forks with lifting slings and a crane before pushing them down from the fork carriage.
- ▶ Keep all parts of your body away from the forks and fork carriage.

⚠ CAUTION!

Injury risk when replacing forks

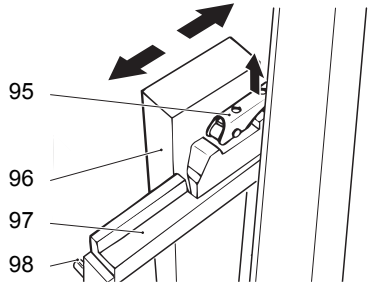
The forks can slide off the fork carriage when being replaced. As a result you could injure your legs.

- ▶ Wear personal protective equipment (e.g. safety boots etc.) when replacing the forks.
- ▶ Always push the forks away from your body, never towards it.
- ▶ Secure heavy forks with lifting slings and a crane before pushing them down from the fork carriage.
- ▶ After replacing the forks fit the extension safety mechanism and make sure it is seated correctly in the fork carriage.

Disassembling the forks

Requirements

– Park the truck securely, see page 97.
– Raise the load handler until the forks are no longer touching the ground.



Procedure

- Disassemble the extension safety mechanism (98).
- Lift up the locking lever (95).
- Carefully push the fork tines (96) off the fork carriage (97).

The fork tines (96) are now dismantled from the fork carriage (97) and can be replaced.

Assembling the Forks

Requirements

– Park the truck securely, see page 97.
– Raise the fork carriage so that the forks can be pushed onto the fork carriage.
– Disassemble the extension safety mechanism (98).

Procedure

- Carefully push the fork tines (96) onto the fork carriage (97).
- Adjust the forks (96), see page 117.
- Set the locking lever (95) down and move the fork tines (96) until the locking pin engages in a slot.

⚠ WARNING!

Unsecured forks can cause accidents

The forks must be prevented from falling with the extension safety mechanisms (98). The truck must not be operated without an extension safety mechanism (98).

▶ Check the extension safety mechanisms (98) are present.

▶ Ensure the extension safety mechanisms (98) are secure.

- Fit the extension safety mechanism (98) and make sure it is secure.

The fork tines (96) are mounted on the fork carriage (97).

5.3 Lifting, transporting and depositing loads

⚠ WARNING!

Unsecured and incorrectly positioned loads can cause accidents.

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

- ▶ Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- ▶ Only carry loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping or falling down.
- ▶ Do not transport loads other than on the authorised load handler.
- ▶ Damaged loads must not be transported.
- ▶ If the stacked load obscures forward visibility, then you must reverse the truck.
- ▶ Do not exceed the maximum loads specified on the capacity plate.
- ▶ Check the fork spread before lifting the load and adjust if necessary.
- ▶ Insert the forks as far as possible underneath the load.

⚠ WARNING!

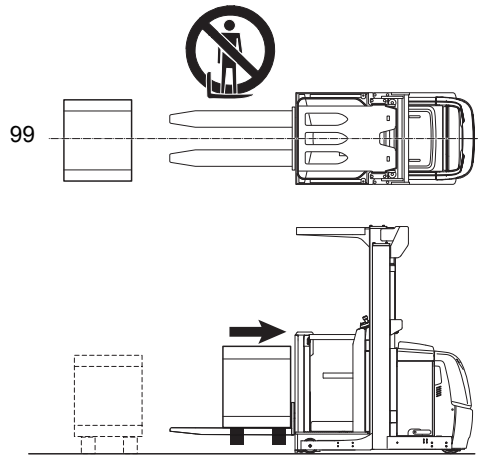
Persons standing underneath or on a raised load handler or under the raised operator position are at risk of accidents

Do not allow anyone to stand under or on a raised load. In addition, do not permit anyone to stand underneath a raised operator position.

- ▶ Do not stand on the load handler.
- ▶ Do not lift any persons on the load handler.
- ▶ Instruct other people to move out of the hazardous area of the truck.
- ▶ Do not stand underneath a raised and unsecured load handler.
- ▶ Do not stand underneath a raised and unsecured operator position.

→ Do not walk on the load handler (except for trucks with the pallet guard option (○)).

5.3.1 Raising a load



Requirements

– Prepare the truck for operation, see page 94 or see page 143.
– Load correctly palletised.
– Fork spread for the pallet checked and adjusted if necessary, see page 117.
– Load weight does not exceed the truck's capacity.
– Load handler evenly laden for heavy loads.
– Good ground conditions.

Procedure

- Press the deadman switch.
- Drive carefully up to the storage location.

➔ Do not stack pallets in or retrieve them from racking systems.

- Lower/raise the load handler so that the load can be lifted.
- Slowly insert the load handler into the pallet until the load or pallet is resting against the fork shank.

➔ The load centre of gravity must be along the longitudinal plane (99) of the truck and lie centrally between the forks.

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

- Raise the load handler slightly until the load is resting fully on the load handler.
- Make sure you have a clear view and sufficient area to move in.
- The load can now be transported with the truck, see page 123.

The load has been lifted correctly.

5.3.2 Transporting a load

⚠ WARNING!

Ensure there is nobody standing under or on a raised load.

▶ Do not stand on the load handler.

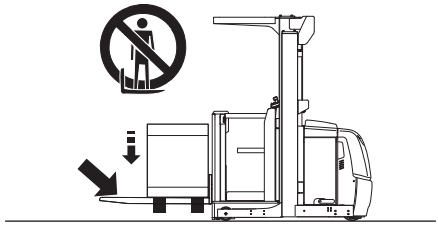
▶ Do not lift other people on the load handler.

▶ Instruct other people to move out of the hazardous area of the industrial truck.

▶ Never stand underneath a raised and unsecured load handler.

Requirements

– Prepare the truck for operation, see page 94 or see page 143.
– Load raised correctly, see page 122.
– Good ground conditions.



Procedure

When transporting heavy loads always ensure that the load handler is evenly laden.

- Press the deadman switch.

When transporting a load outside the narrow aisle, always keep it as low as possible allowing for ground clearance.

- Accelerate gradually.
- Travel at a constant speed.
  - Adapt your travel speed to the conditions of the route and the load you are transporting.
- Be prepared to brake at all times.
  - Brake gently in normal circumstances.
  - Only stop suddenly in dangerous situations.
- Reduce speed accordingly on narrow bends.
- Watch out for other traffic at crossings and passageways.
- Always travel with a lookout at blind spots.

5.3.3 Depositing a load

⚠ WARNING!

Depositing loads can be hazardous

A storage location that is unsuitable for the load can become damaged when depositing the load. Neighbouring rack components can also be damaged.

▶ Deposit the load only in locations that are suitable for storage (in terms of dimensions and capacity).

NOTE

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

Requirements

– Prepare the truck for operation, see page 94 or see page 143.
– Load raised correctly, see page 122.
– Storage location suitable for the load (size and capacity).
– Good ground conditions.

Procedure

- Press the deadman switch.
- Drive carefully up to the storage location.
- Raise/lower the load handler so that the load can be moved to the storage location without striking any objects.
- Carefully bring the load to its storage location.

  Do not stack pallets in or retrieve them from racking systems.
- Carefully lower the load handler until it is clear of the load.

  Avoid depositing the load suddenly to avoid damaging the load and the load handler.
- Make sure you can see behind you and that you have sufficient space to move.
- Carefully remove the load handler from the load.
- Fully lower the load handler.

The load has been deposited correctly.

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	Remedy
Truck does not start	– Battery connector not plugged in. – Emergency disconnect switch pressed. – Key switch set to O. – Battery charge too low. – Gate not closed. – Two-hand operation not pressed (○). – Deadman switch not pressed. – Faulty fuse.	– Check battery connector and plug in if necessary. – Unlock the Emergency Disconnect switch. – Set the key switch to "I". – Check battery charge, charge battery if necessary. – Close the gates on either side of the operator's position. – Press two-hand operation button (○). – Press the deadman switch. – Check fuses 1F and F1.

Fault	Possible cause	Remedy
Load cannot be lifted	– Truck not operational.	– Carry out all measures listed under “Truck does not start”.
	– Hydraulic oil level too low.	– Check hydraulic oil level.
	– Gate not closed.	– Close the gates on either side of the operator's position.
	– Two-hand operation not pressed (○).	– Press two-hand operation button (○).
	– Battery discharge monitor has switched itself off.	– Charge the battery.
	– Faulty fuse.	– Check the fuses.
	– Excessive load.	– Note maximum capacity (see data plate).
	– Deadman switch not pressed.	– Press the deadman switch.

6.2 Emergency lowering

The operator's position can be lowered by an assistant using the emergency drain valve. This function is important in the following situations:

– If the operator is no longer able to operate the truck, e.g. through loss of consciousness.
– If a technical fault is blocking the truck with a raised operator's position and load handler.

If the operator is working alone in the warehouse zone, communication with other persons must be provided at all times, e.g. through radio or mobile phone.

⚠ WARNING!

Lowering the load handler and operator position can result in injuries

The hazardous area is defined as the area in which a person is at risk due to the mast, operator position or load handler (e.g. forks or attachments) or the load. This also includes the area within reach of falling loads or lowering/falling operating equipment.

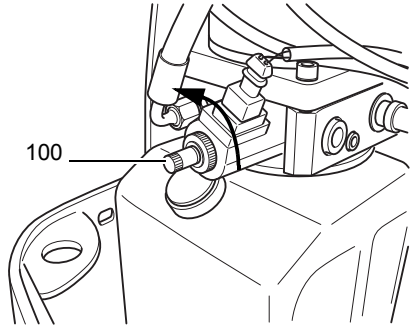
▶ Instruct other people to move out of the hazardous area of the truck during emergency lowering.
▶ Do not walk or stand underneath a raised load handler and raised operator position.
▶ The operator position, load handler and load must have sufficient clearance from the rack on all sides.
▶ When the load handler and operator position are lowered via the emergency lowering valve below, the operator and assistant must communicate with each other. Both people must be in a safe area to avoid danger.
▶ Make sure that the whole of the operator's body remains within the perimeter of the operator position during emergency lowering. If not, stop the emergency lowering process immediately.
▶ Do not activate emergency lowering of the load handler and operator position when the load handler is in the rack.
▶ When the assistant opens the lowering valve, he must check to ensure that the operator position lowers immediately. If the operator position does not lower, it may be that the operator position and load handler are physically blocked. In this case, the lowering valve must be closed again immediately.
▶ If the operator position is physically blocked, the operator can be rescued by other means, such as suitable industrial trucks, lifting work platforms or safety ladders.
▶ The operating company must instruct the operator in how to leave a raised operator position safely.
▶ Report any defects to your supervisor immediately.
▶ Mark the defective truck and take it out of service.
▶ Do not return the truck to service until you have identified and rectified the fault.

⚠ WARNING!

Risk of accidents / material damage through automatic lowering of the operator position and load handler

If the load handler is in the rack, emergency lowering must not be carried out. Due to leakage losses in the hydraulic system, there is also the risk that the rack could be damaged by the load handler lowering.

- ▶ Prevent the operator position and load handler from lowering further, e.g. with a sufficiently strong chain.
- ▶ Report any defects to your supervisor immediately.
- ▶ Arrange for trained personnel to recover the truck as soon as possible.
- ▶ Mark the defective truck and take it out of service.
- ▶ Do not return the truck to service until you have identified and rectified the fault.



Emergency lowering of operator's position (simplex mast)

Procedure

- Remove the front panel, see page 197.
- Loosen the screw (100) by turning it (approx. 3 turns) anti-clockwise.
  The lowering speed increases the further the screw is turned anti-clockwise.

The operator's position lowers.

Lowering stops when the screw is turned anti-clockwise as far as the stop.

⚠ WARNING!

Trapping hazard during emergency lowering

There is a risk of trapping between the operator's position and mast for the operator in the operator's position.

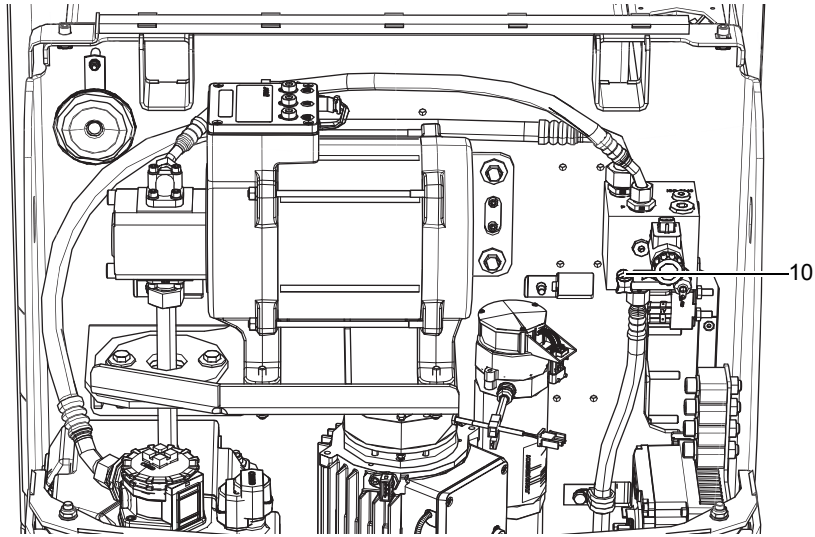
▶Keep the whole of your body inside the operator's position.

Emergency lowering of operator's position (duplex mast)

Procedure

- Remove the front panel, see page 197.
- Turn the screw with the star handle (101) anti-clockwise (approx. 2 turns).

The operator's position lowers.



6.3 Recovering the truck from a narrow aisle / Moving the truck without a battery

⚠ WARNING!

Danger when recovering the truck

If the truck is towed away incorrectly, it can collide with persons, warehouse equipment and other trucks. This may result in people being injured, and warehouse equipment and other trucks being damaged.

- ▶ The truck may only be recovered by specialist maintenance personal.
- ▶ The specialist maintenance personal must be trained in operating the truck with the brakes disabled.
- ▶ When the brakes are deactivated, the truck must be parked on a level surface, as the brakes are no longer effective.

Obtain assistance from another person. The other person must be trained and familiar with recovery operations.

→ To recover the truck from the narrow aisle, the drive wheel brake must first be released.

6.3.1 Release and activate the drive wheel brake

⚠ WARNING!

Accidental truck movement

When the brakes are de-activated the truck must be parked on a level surface, since the brakes are no longer effective.

▶ Do not release the brake on slopes or inclines.

▶ Do not park the truck with the brake released.

▶ Apply the brake again when you reach your destination.

Release the brake

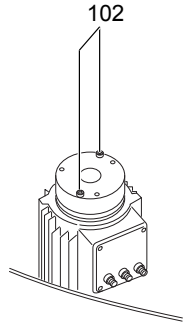
Requirements

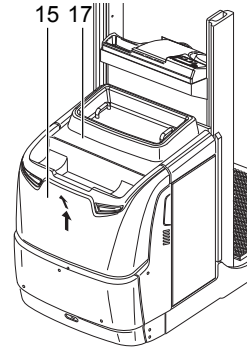
– Park the truck securely, see page 97.

Tools and Material Required

– Two M5x42 hex. socket screws

– Allen key





Procedure

- Prevent the truck from moving accidentally, e.g. by placing wedges underneath the wheels.
- Open the battery panel (17).
- Disconnect the battery.
- Close the battery cover (17).
- Remove the front panel (15), see page 197.
- Insert two M5x42 Allen screws (102) as far as the stop in the drive brake.
- Install the front panel (15), see page 197.
- Remove the wedges.

The drive wheel brake is now released. The truck can now be towed or pushed.

⚠ WARNING!

An unsecured truck can cause accidents

It is hazardous and prohibited to park the truck on inclines, with a raised operator's position or load handler.

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

NOTE

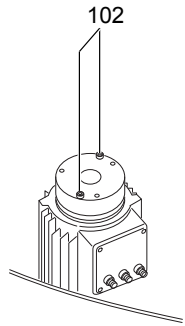
The truck must not be parked on transport or escape routes, in front of safety installations, or in front of factory equipment that must be accessible at all times.

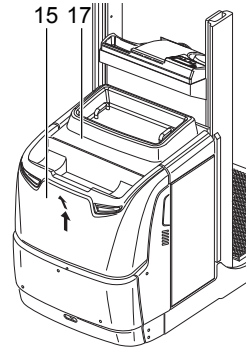
Activating the brake

Requirements

– Drive wheel brake wheel.
– Truck parked securely.

Procedure





- Prevent the truck from moving accidentally, e.g. by placing wedges underneath the wheels.
- Remove the front panel (15), see page 197.
- Remove the two M5x42 Allen screws (102) from the drive wheel brake.
- Install the front panel (15), see page 197.
- Connect the battery to the truck.

The brakes are now applied again.

⚠ WARNING!

Only return the truck to service when you have identified and rectified the fault.

⚠ CAUTION!

Open covers can cause injury and accidents

▶The covers (battery cover, side panels, drive compartment cover etc.) must be closed during operation.

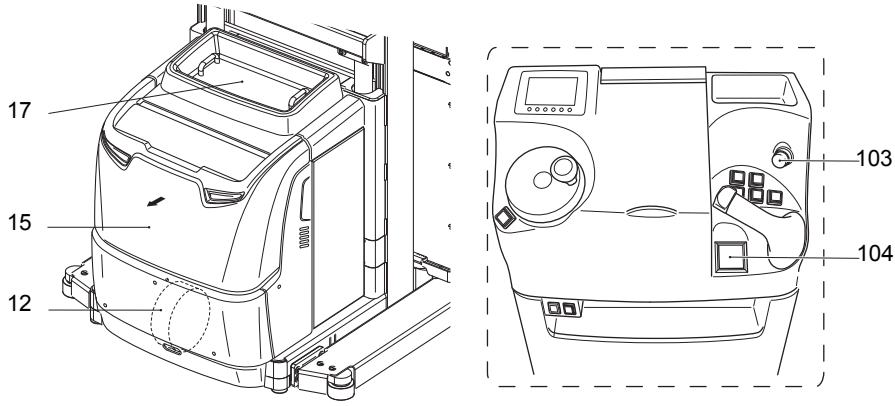
6.3.2 Steering the truck without its own drive system

⚠ CAUTION!

A non-steered truck can cause accidents

It may not be possible to steer the truck if the steering system is damaged. The truck can only be steered without its own drive system when it is stationary.

▶Do not adjust the truck's steering angle during a recovery operation.



Adjusting the steer angle

Requirements

– Operator's position and load handler fully lowered, see page 111.

Procedure

- Switch off the truck, to do this:
  - Turn the key in the key switch (104) to the left as far as the stop and remove the key.
  - Keyless access systems (○), see page 143.
- Press the Emergency Disconnect (103).
- Open the battery panel (17).
- Disconnect the battery.
- Disassemble the drive compartment cover (15), see page 197.
- Discharge the drive wheel (12) by raising or jacking up the truck safely, see page 195.
- Manually set the drive wheel (12) to the desired direction.

The steering angle has now been set.

⚠ WARNING!

Only return the truck to service when you have identified and rectified the fault.

6.3.3 Recovering the truck from a narrow aisle

⚠ WARNING!

Risk of accidents and trapping during recovery operations

Damage to other people and materials can occur if the truck is not towed correctly. There is a risk of accidents and trapping from the towed truck.

- ▶ Towing trucks must have sufficient tow and brake force for the towed truck which does not have any brakes.
- ▶ Start the towed truck gently and always allow sufficient time to brake. Do not stop abruptly (except in emergencies).
- ▶ Recover the truck carefully and slowly.
- ▶ Do not stand between the towing truck and the recovered truck during a recovery operation.
- ▶ If the steering angle has to be changed during a recovery operation, this can only be performed when the truck is stationary (see page 135).
- ▶ Only return the truck to service when you have identified and rectified the fault.

⚠ WARNING!

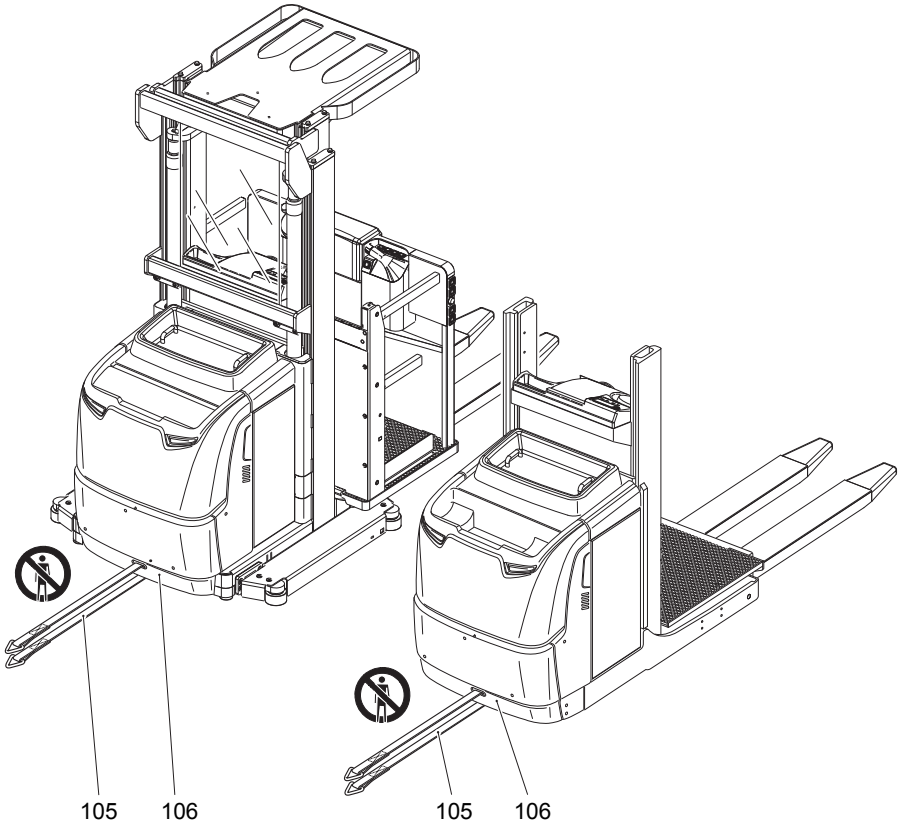
An unsecured truck can cause accidents

It is hazardous and prohibited to park the truck on inclines, with a raised operator's position or load handler.

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

NOTE

The truck must not be parked on transport or escape routes, in front of safety installations, or in front of factory equipment that must be accessible at all times.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106
105
106

Recovering the truck in the drive direction with or without a load

Requirements

– Operator position and load handler fully lowered, see page 111.
– Truck switched off, see page 97.
– Battery disconnected.
– Drive wheel brake released, see page 132.

Tools and Material Required

– Tow rope, tow force 5 tonnes.

Procedure

NOTE

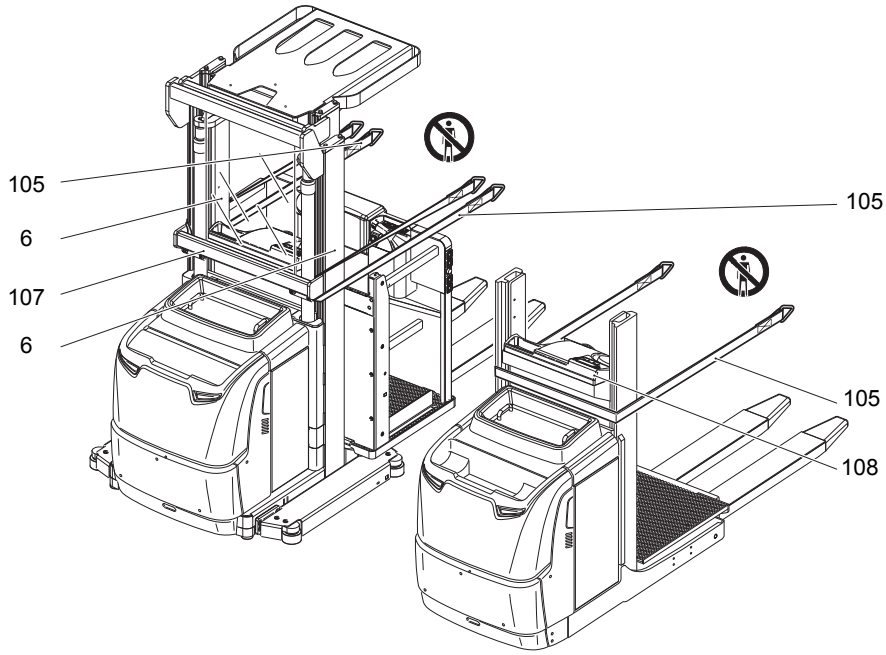
Risk of damage from the tow rope

Do not route the tow rope (105) over or around hydraulic hoses or electric cables.

- Route the tow rope (105) through the recess in the truck chassis (106) (see illustration).
- Recover the truck carefully and slowly in the drive direction.
- If the steer angle has to be changed during a recovery operation, brake until the truck comes to a halt:
  - Adjust the steer angle, see page 135.
- After recovery, secure the truck to prevent it from moving, see page 132.

⚠ WARNING!

Only return the truck to service when you have identified and rectified the fault.



Recovering the truck in the load direction with or without a load

Requirements

– Operator position and load handler fully lowered, see page 111.
– Truck switched off, see page 97.
– Battery disconnected.
– Drive wheel brake released, see page 132.

Tools and Material Required

– Tow ropes, tow force 5 tonnes.

Procedure

NOTE

Risk of damage from tow ropes

Route the tow ropes at the front so as to avoid damaging the hydraulic hoses, the electric cables, the mast and the operator position during recovery.

- EKS 110 L model with simplex mast:
  - Sling the tow rope (105) around the mast below the control panel (108) (see illustration).
- EKS 110 Z model with duplex mast:

- Route 2 tow ropes (105) past the outside of the masts (6) and around the mast cross member (107) in the load direction (see illustration).
- Recover the truck carefully and slowly in the load direction.
- If the steer angle has to be changed during a recovery operation, brake until the truck comes to a halt:
  - Adjust the steer angle, see page 135.
- After recovery, secure the truck to prevent it from moving, see page 132.

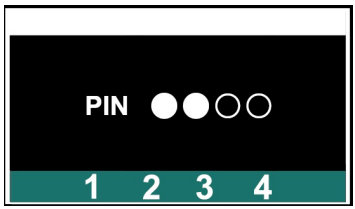
⚠ WARNING!

Only return the truck to service when you have identified and rectified the fault.

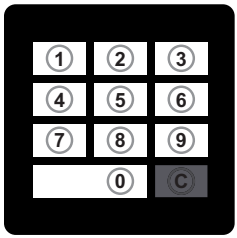
7 Optional equipment

7.1 Keyless Access System

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



109



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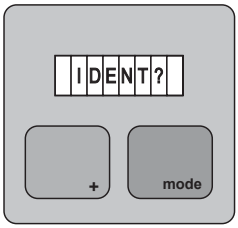
111



112

Item	Description
109	Display unit (EasyAccess Softkey): – Description, see page 75 – Entry of 4-digit set-up and access codes – Up to 10 access codes can be stored – For set-up and access codes with the numbers 1 to 4
110	Keypad (EasyAccess PINCode): – Consists of keys 0 to 9 and C (clear) – Entry of 4-digit set-up and access codes – Up to 100 access codes can be stored
111	Transponder reader (EasyAccess Transponder): – Up to 100 transponders can be stored
112	ISM Online: – If the truck is equipped with an ISM Online access module, see "ISM Online Access Module" operating instructions.

7.2 General Information about the Use of Keyless Access Systems

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

– Default code: 1-2-3-4
– Factory set-up code: #VAR:2ZOLL_MASTERCODE_VARJH#

➔ When allocating the codes, ensure the rider trucks are given a different code than pedestrian trucks.

➔ When a valid code is entered or a valid transponder used, a green tick appears in the display unit.
When an invalid code has been entered or a invalid transponder used, a red cross is displayed, and the entry must be repeated.

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

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

7.3 Commissioning the Keypad and the Transponder Reader

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

7.3.1 Activating the keypad

Procedure

- Release the emergency disconnect switch, see page 99.
- Enter the default code 1-2-3-4 using the keys below the display unit (109).
  The truck is switched on.
- Press the key below the "Settings" symbol (113).
- Press the key below the "Change set-up code" symbol (114).
- Enter the set-up code #VAR:2ZOLL_MASTERCODE_VARJH# using the keypad (110).
  The set-up code entered is displayed.

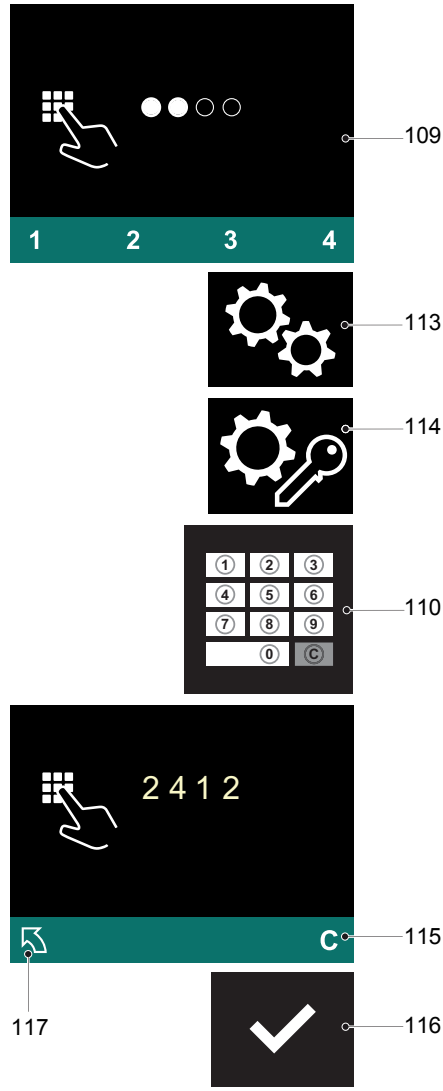
When starting the truck for the first time, change the set-up code. The new set-up code must not be the same as the default set-up code or an access code.

- Press the key below the "Delete" symbol (115).
  The set-up code is deleted.
- Enter the new set-up code using the keypad (110).
- Press the key below the "Confirm" symbol (116).
  The new set-up code is displayed.

If the new set-up code was entered incorrectly, the procedure can be repeated using the key below the "Delete" symbol (115).

- To return to the main menu, press the key below the "Back" symbol (117).
- Delete the default code, see page 154.
- Create access codes, see page 153.

The keypad is active.



7.3.2 Activating the transponder reader

Procedure

- Release the emergency disconnect switch, see page 99.
- Enter the default code 1-2-3-4 using the keys below the display unit (109).
  The truck is switched on.
- Press the key below the "Settings" symbol (113).
- Press the key below the "Change set-up code" symbol (114).
- Enter the set-up code #VAR:2ZOLL_MASTERCODE_VARJH # using the keys below the display unit (109).
  The set-up code entered is displayed.
- Press the key below the "Delete" symbol (115).
  The set-up code is deleted.
- Hold a transponder in front of the transponder reader (111).
  This transponder thus becomes the set-up transponder.
- Press the key below the "Confirm" symbol (116).
  The code for the set-up transponder is displayed.

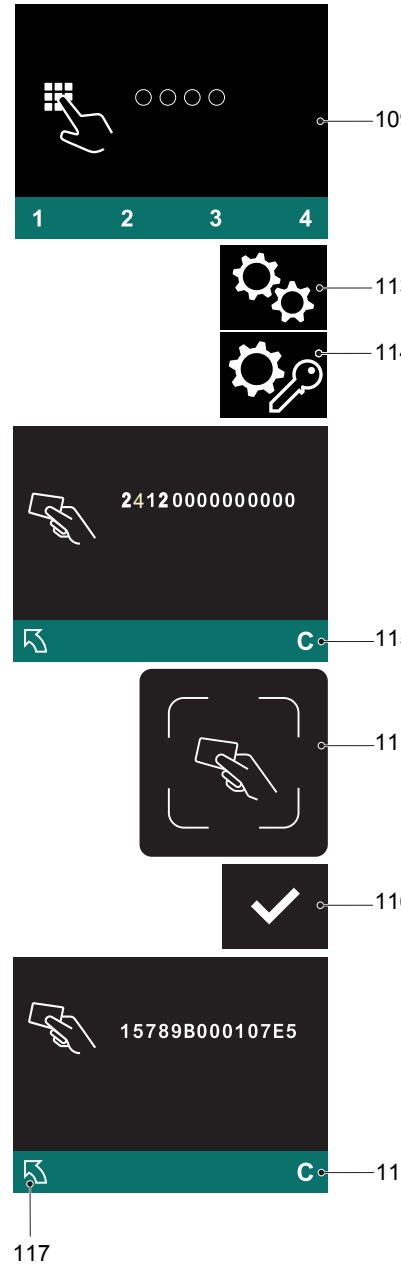
If the wrong transponder has been used, the procedure can be repeated using the key below the "Delete" symbol (115).

- To return to the main menu, press the key below the "Back" symbol (117).

The default code can no longer be used and must be deleted.

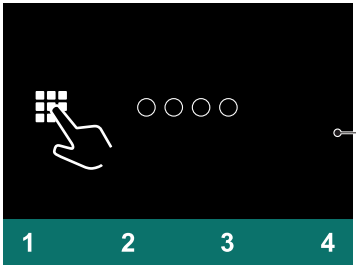
- Delete the default code, see page 158.
- Add new transponders, see page 157.

The transponder reader is now active.



7.4 Using the Display:

7.4.1 Switch on the truck with the access code.



Procedure

- Release the emergency disconnect switch, see page 99.
- Enter the access code with the buttons below the display (109).

The truck is switched on.

7.4.2 Switching off the truck

Procedure

- Press the key under the "Switch off" symbol (118) in the display unit.
- Press the Emergency Disconnect switch, see page 99.

The truck is switched off.

7.4.3 Changing the Set-up Code

Requirements

– The truck is switched on, see page 151.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Change set-up code" symbol (114).
- Enter the set-up code using the keys below the display unit (109).

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

- Press the key below the "Delete" symbol (115).

  The set-up code is deleted.

- Enter the new set-up code using the keys below the display unit (109).

The new set-up code must be different from existing access codes.

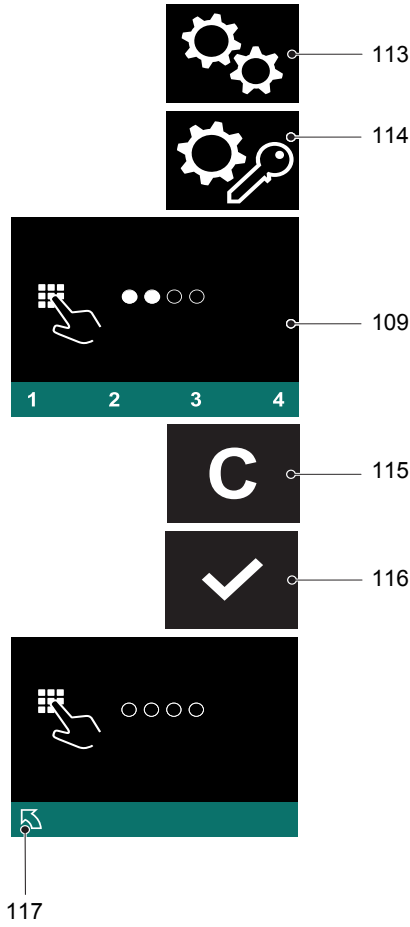
- Press the key below the "Confirm" symbol (116).

  The new set-up code is displayed.

If the new set-up code has been entered incorrectly, delete it and add a set-up code again.

- To return to the main menu, press the key below the "Back" symbol (117).

The set-up code has been changed.



7.4.4 Adding a new access code

Requirements

– The truck is switched on, see page 151.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Edit access code" symbol (119).
  The set-up code is requested.
- Enter the set-up code using the keys below the display unit (109).
  All the access codes are displayed.
- Press the key below the "Add" symbol (120).
- Enter the new access code using the keys below the display unit (109).

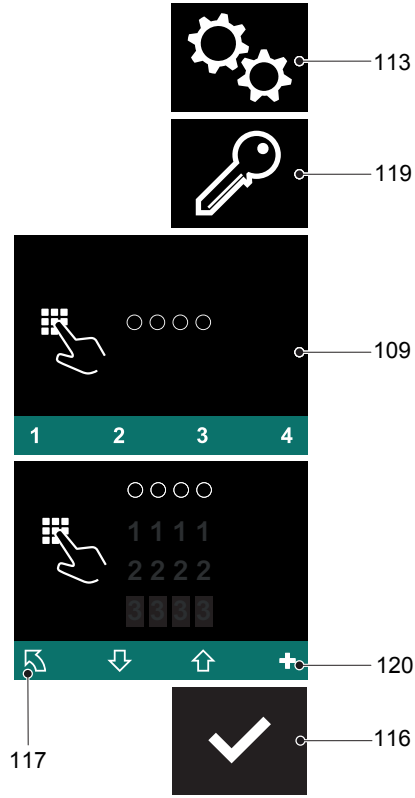
The new access code must be different from existing access codes.

- Press the key below the "Confirm" symbol (116).
  The new access code is displayed.

If the new access code has been entered incorrectly, delete it, see page 154, and add an access code again.

- To return to the main menu, press the key below the "Back" symbol (117).

A new access code has been added.



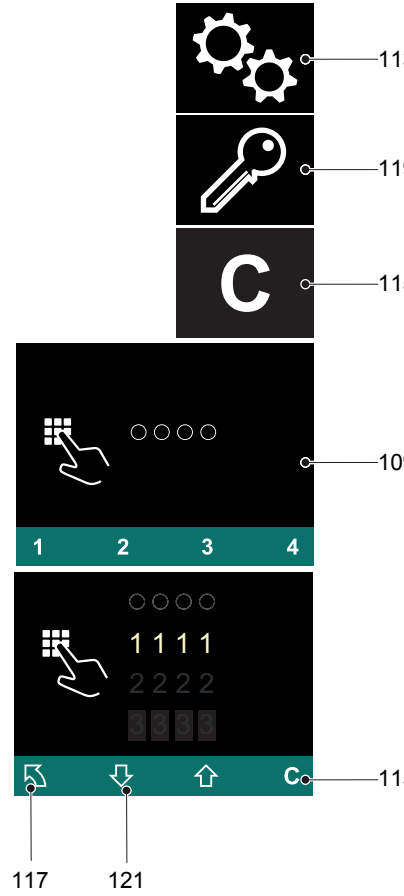
7.4.5 Deleting an access code

Requirements

– The truck is switched on, see page 151.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Edit access code" symbol (119).
  The set-up code is requested.
- Enter the set-up code using the keys below the display unit (109).
  All the access codes are displayed.
- Select the access code to be deleted using the key below the "Down selection" symbol (121).
- Press the key below the "Delete" symbol (115).
  The access code has been deleted.
- To return to the main menu, press the key below the "Back" symbol (117).



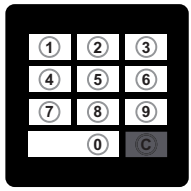
7.5 Using the Keypad

7.5.1 Switch on the truck with the access code.

Procedure

- Release the emergency disconnect switch, see page 99.
- Enter the access code with the keypad (110).

The truck is switched on.



110

7.5.2 Switching off the truck

Procedure

- Press the key under the "Switch off" symbol (118) in the display unit.
- Press the Emergency Disconnect switch, see page 99.

The truck is switched off.


118

7.5.3 Changing the Set-up Code

Requirements

– The truck is switched on, see page 151.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Change set-up code" symbol (114).
- Enter the set-up code using the keypad (110).

  The set-up code entered is shown in the display unit (109) as filled-in circles.

- Press the key below the "Delete" symbol (115).

  The set-up code is deleted.

- Enter the new set-up code using the keypad (110).

The new set-up code must be different from existing access codes.

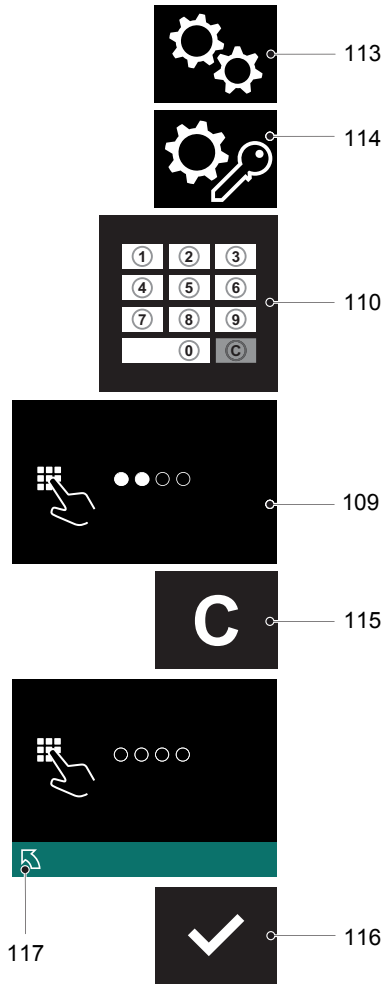
- Press the key below the "Confirm" symbol (116).

  The new set-up code is displayed.

If the new set-up code has been entered incorrectly, delete it and enter the correct set-up code.

- To return to the main menu, press the key below the "Back" symbol (117).

The set-up code has been changed.



7.5.4 Adding a new access code

Requirements

– The truck is switched on, see page 151.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Edit access code" symbol (119).
  The set-up code is requested.
- Enter the set-up code using the keypad (110).
  All access codes are shown on the display unit (109).
- Press the key below the "Add" symbol (120).
- Enter a new access code using the keypad (110).

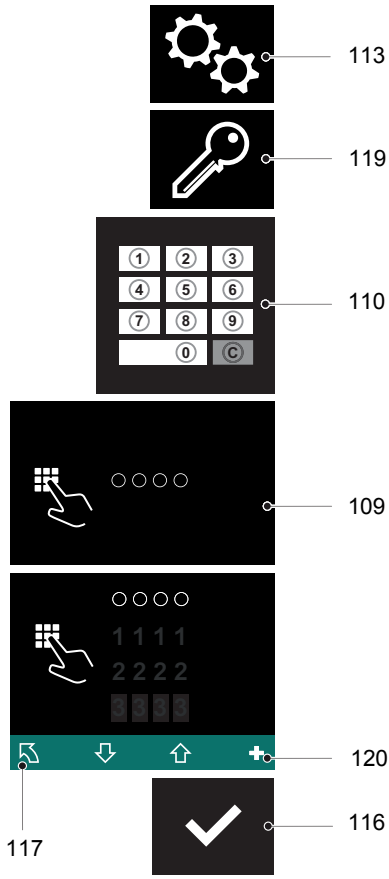
The new access code must be different from existing access codes.

- Press the key below the "Confirm" symbol (116).
  The new access code is shown on the display unit (109).

If the new access code has been entered incorrectly, delete it, see page 154, and enter the correct access code.

- To return to the main menu, press the key below the "Back" symbol (117).

A new access code has been added.



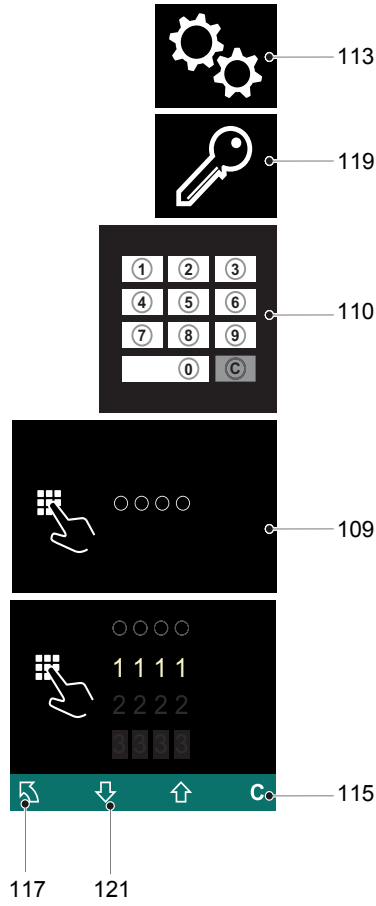
7.5.5 Deleting an access code

Requirements

– The truck is switched on, see page 151.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Edit access code" symbol (119).
  The set-up code is requested.
- Enter the set-up code using the keypad (110).
  All access codes are shown on the display unit (109).
- Select the access code to be deleted using the key below the "Down selection" symbol (121).
- Press the key below the "Delete" symbol (115).
  The access code has been deleted.
- To return to the main menu, press the key below the "Back" symbol (117).



7.6 Using the Transponder Reader

NOTE

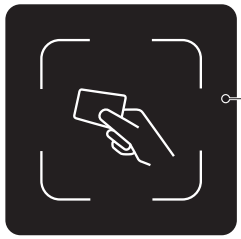
Take care not to damage the transponder. If the transponder is damaged, the truck cannot be switched on.

7.6.1 Switching on the truck with the transponder

Procedure

- Release the Emergency Disconnect switch, see page 99.
- Hold the transponder in front of the transponder reader (111).
  A green tick appears and remains until the transponder has been confirmed. If there is no confirmation within 20 seconds the access prompt appears.
- Press the button below the "Confirm" symbol (116).

The truck is switched on.



7.6.2 Switching off the truck

Procedure

- Press the key under the "Switch off" symbol (118) in the display unit.
- Press the Emergency Disconnect switch, see page 99.

The truck is switched off.

7.6.3 Changing the Set-up Transponder

Requirements

– The truck is switched on, see page 155.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Change set-up code" symbol (114).
- Place the set-up transponder on the transponder reader (111).
  The code of the set-up transponder is shown on the display unit (109).
- Press the key below the "Delete" symbol (115).
  A dashed line is shown.
- Place the new set-up transponder on the transponder reader (111).

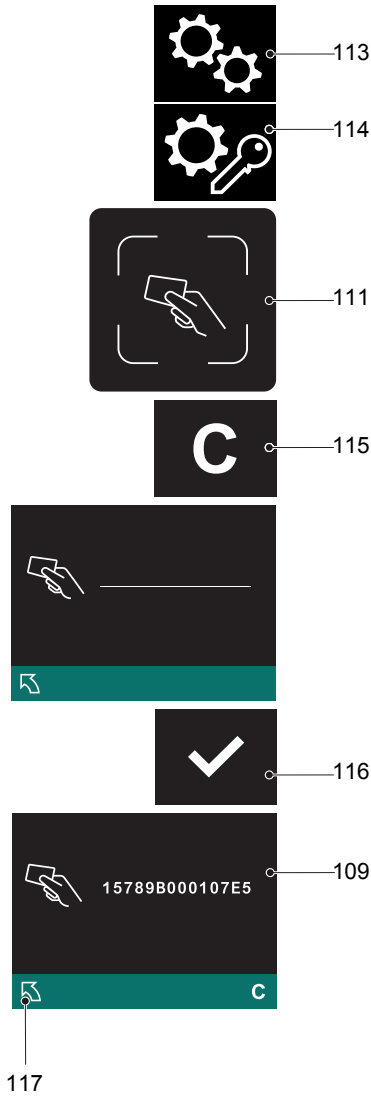
The new set-up transponder code must be different from existing transponder codes.

- Press the key below the "Confirm" symbol (116).
  The new code for the set-up transponder is displayed.

If the wrong transponder has been used, the procedure can be repeated using the key below the "Delete" symbol (115).

- To return to the main menu, press the key below the "Back" symbol (117).

The set-up transponder has been changed.



7.6.4 Adding a new transponder

Requirements

– The truck is switched on, see page 155.

Procedure

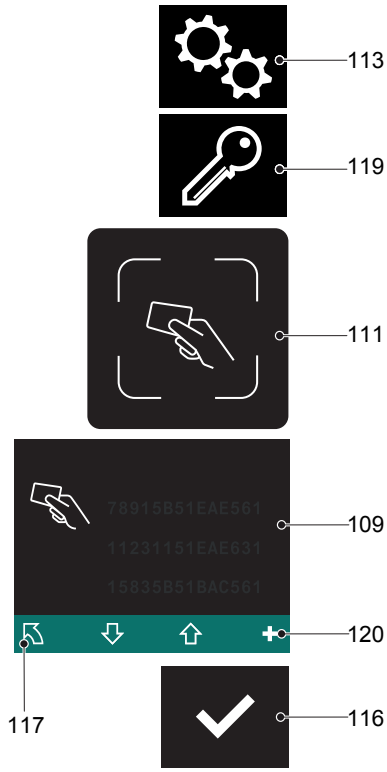
- Press the key below the "Settings" symbol (113).
- Press the key below the "Edit transponder" symbol (119).
  The set-up transponder is requested.
- Place the set-up transponder on the transponder reader (111).
  All transponder codes are shown on the display unit (109).
- Press the key below the "Add" symbol (120).
- Place the new transponder on the transponder reader (111).

The new transponder code must be different from existing transponder codes.

- Press the key below the "Confirm" symbol (116).
  The new transponder code is displayed.

If the wrong transponder has been used, delete it, see page 158, and add a correct transponder.

- To return to the main menu, press the key below the "Back" symbol (117).



A new transponder has been added.

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

7.6.5 Deleting transponders

Requirements

– The truck is switched on, see page 155.

Procedure

- Press the key below the "Settings" symbol (113).
- Press the key below the "Edit transponder" symbol (119).
  The set-up transponder is requested.
- Place the set-up transponder on the transponder reader (111).
  All transponder codes are shown on the display unit (109).
- Select the transponder code to be deleted using the key below the "Down selection" symbol (121).
- Press the key below the "Delete" symbol (115).
  The transponder has been deleted.
- To return to the main menu, press the key below the "Back" symbol (117).

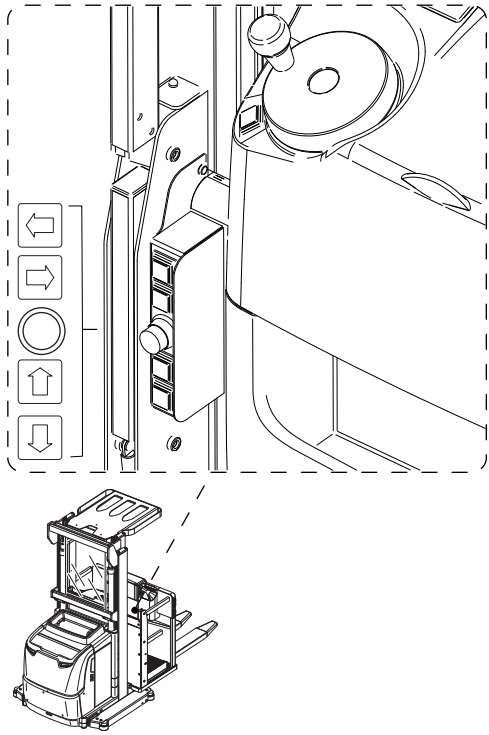
7.7 ISM access module (○)

If the truck is equipped with an ISM access module refer to the “ISM Access Module” operator manual.

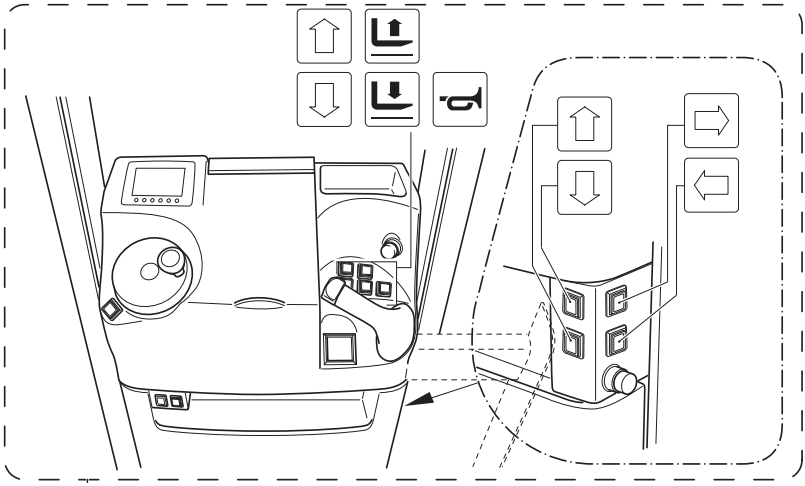
7.8 Travelling in pedestrian touch mode (○)

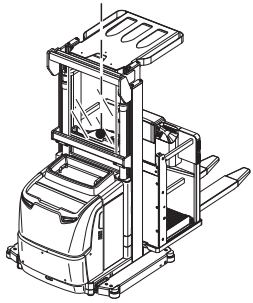
There are 2 versions for pedestrian touch mode:
– Touch mode version with gate
– Touch mode version without gate

Touch mode version with gate



Touch mode version without gate





⚠ CAUTION!

Trapping hazard from the truck during pedestrian mode

In pedestrian mode the truck can pose a trapping hazard for the operator and other people.

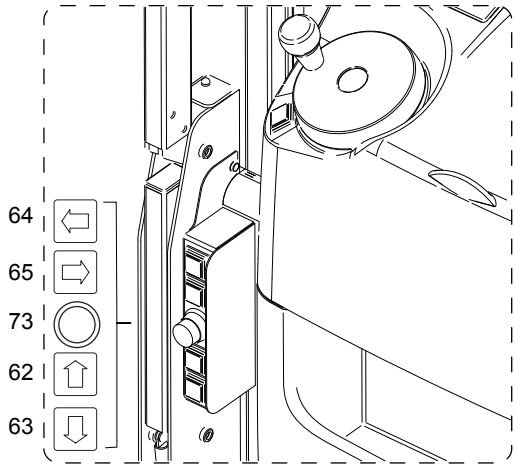
- ▶ Wear personal protective equipment (e.g. safety shoes, ...).
- ▶ The operator must always stand beside the truck during pedestrian operation.
- ▶ The truck must be operated with particular care and attention in pedestrian mode.
- ▶ Ensure there are no other people standing between the truck and obstacles when operating in pedestrian mode.
- ▶ Steering set straight-ahead.
- ▶ Ensure that nobody is riding on the operator platform when operating in pedestrian mode.

Procedure

- Press the “Pedestrian drive direction” button (64). The truck travels in the drive direction at a fixed speed of approximately 4 km/h (slow travel).
- Press the “Pedestrian load direction” button (65). The truck travels in the load direction at a fixed speed of approximately 4 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 switch (73).



7.9 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 main lift (version L) the entire operator's position and load handler rise or lower with the forks in pedestrian touch mode lifting or lowering.

On trucks with a main lift and auxiliary mast (version Z) the auxiliary mast load handler rises or lowers in pedestrian touch mode lifting or lowering.

7.9.1 Lifting the Operator's Position (Version L)

⚠ CAUTION!

Trapping hazard from the truck during pedestrian mode

In pedestrian mode the truck can pose a trapping hazard for the operator and other people.

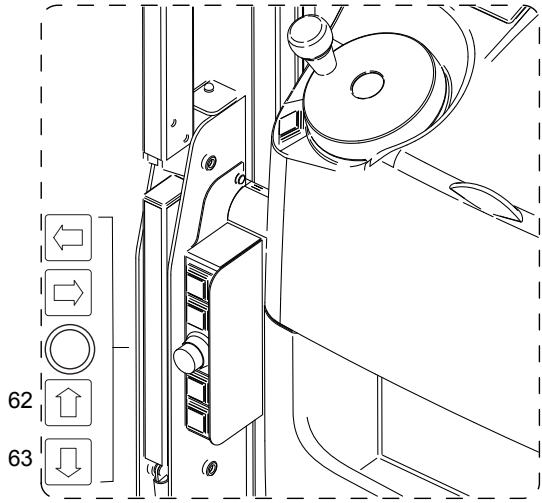
- ▶ Wear personal protective equipment (e.g. safety shoes, ...).
- ▶ The operator must always stand beside the truck during pedestrian operation.
- ▶ The truck must be operated with particular care and attention in pedestrian mode.
- ▶ Ensure there are no other people standing between the truck and obstacles when operating in pedestrian mode.
- ▶ Steering set straight-ahead.
- ▶ Ensure that nobody is riding on the operator platform when operating in pedestrian mode.

Lifting

Procedure

- Press the lift button (62) until you reach the desired lift height.

  For safety reasons the height of the operator's position and load handler is restricted to 625 mm.


62
63

7.9.2 Lowering the Operator's Position (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.

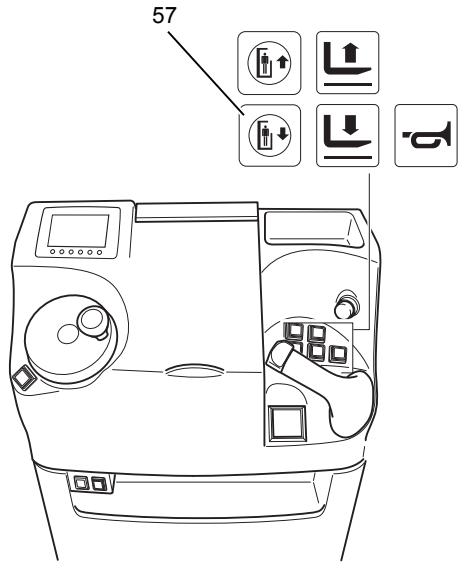
Lowering

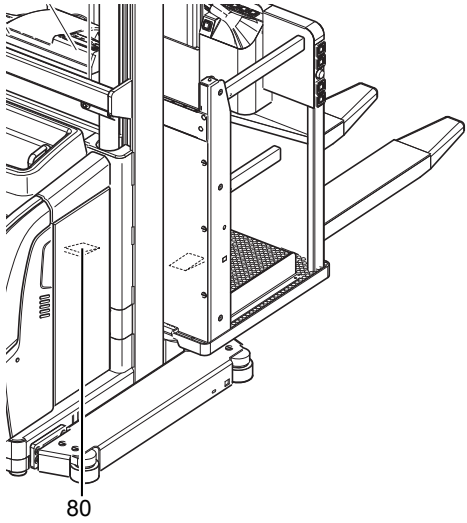
Procedure

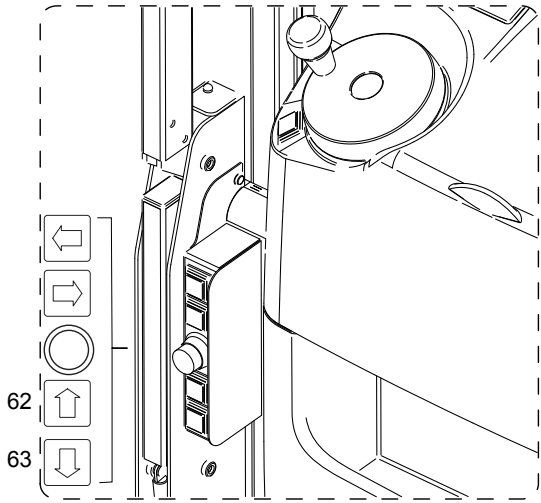
- Press the lowering button (63).
  The operator's position and load handler are lowered until the "lowering brake" sensor applies.

- Enter the operator's position.
- Press the deadman switch (80).
- Press the lowering button (57).

The operator's position and load handler are fully lowered.




80


62
63

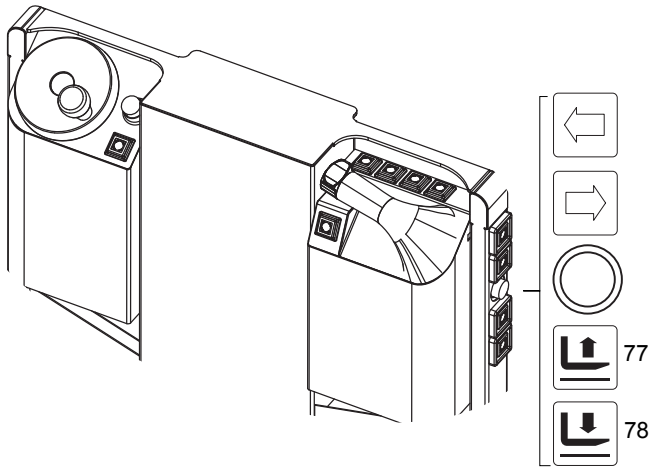
7.9.3 Raising the Auxiliary Lift (Version Z)

⚠ CAUTION!

Trapping hazard from the truck during pedestrian mode

In pedestrian mode the truck can pose a trapping hazard for the operator and other people.

- ▶ Wear personal protective equipment (e.g. safety shoes, ...).
- ▶ The operator must always stand beside the truck during pedestrian operation.
- ▶ The truck must be operated with particular care and attention in pedestrian mode.
- ▶ Ensure there are no other people standing between the truck and obstacles when operating in pedestrian mode.
- ▶ Steering set straight-ahead.
- ▶ Ensure that nobody is riding on the operator platform when operating in pedestrian mode.



Lifting

Procedure

- Press the lift button (77) until you reach the desired lift height.

The auxiliary lift (load handler) is raised.

7.9.4 Lowering the Auxiliary Lift (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.

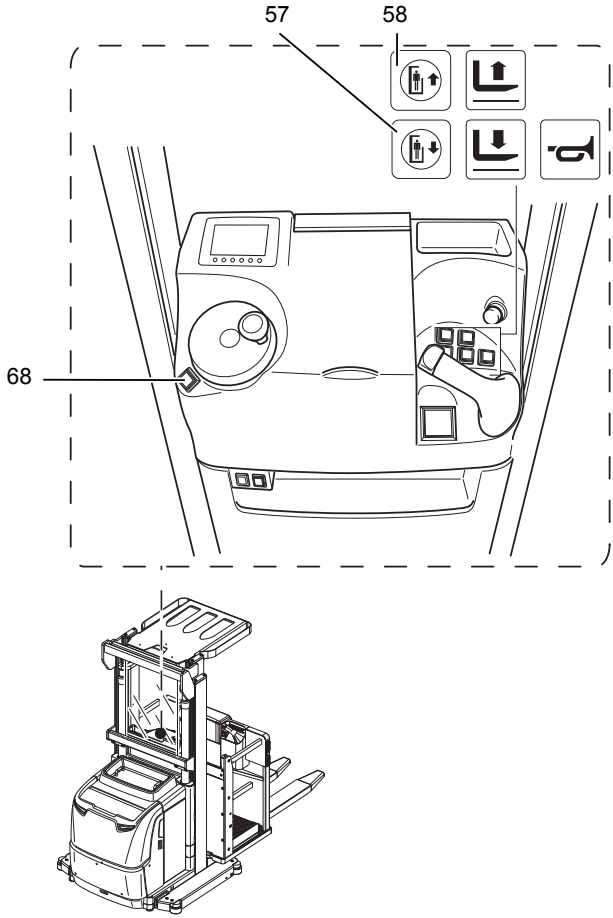
Lowering

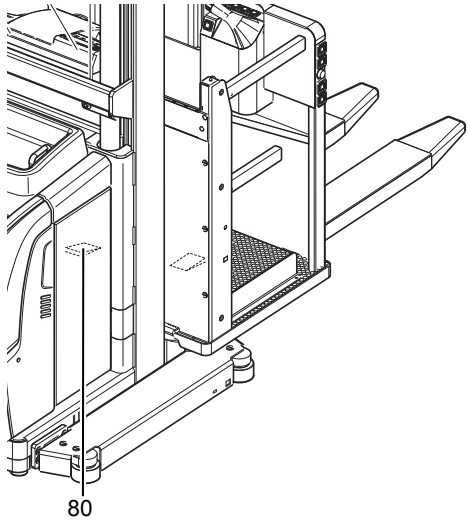
Procedure

- Press the lowering button (78).

The auxiliary lift (load handler) is lowered.

7.10 Lifting and Lowering the Operator's Position with Lift Cutout (○)





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

Lifting

Procedure

- Press the deadman switch (80).
- Press the lift button (58) 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 (58) and two-hand operation button (68) simultaneously.

The operator's position rises.

Lowering

Procedure

- Press the deadman switch (80).
- Press the lowering button (57).

The operator's position lowers.

→ *The operator's position does not stop at the fixed cutout height on lowering.*

7.11 Trucks with Rail Guidance and Aisle Recognition (○)

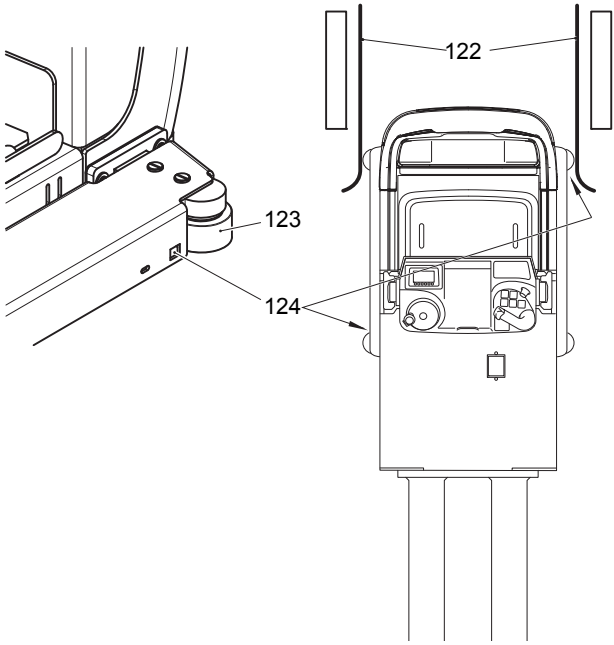
Notes on rail-guided operation

The "aisle recognition via light button" option enables the truck to travel at maximum speed in the aisle.

In rail-guided mode with aisle recognition, the two-hand operation button (68) must also be pressed in order to travel, lift and lower.

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



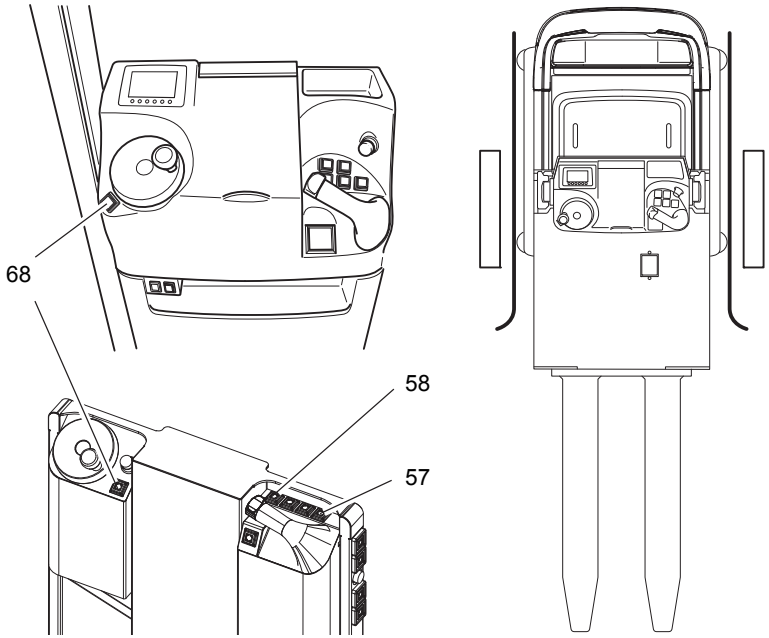
Procedure

- Drive slowly up to the rack aisle until the truck is aligned with the aisle.
- Slowly travel forward while ensuring that the guide rollers (123) of the truck align with the side rails (122) of the rack aisle.

  As soon as the first light button (124) in the travel direction is activated by the side rails (122) (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.

  If the second light button (124) is activated by the side rails (122), the steering is automatically set to the straight-ahead position.
- To continue operating the truck, the two-hand operation button (68) must also be pressed for travel, lifting and lowering. From this point on, the steering is overridden and the drive wheel is automatically held in the straight-ahead position.

➔ The lift (58) or lower (57) buttons and the two-hand operation button (68) must be pressed and held down switch for lifting and lowering operations.



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 (68).

➔ 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 removed. The operator 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.

7.11.1 End of aisle safety device (○)

Trucks with the end of aisle safety device brake before the aisle exit or in the transfer aisle. There are two basic versions for this:

1) Braking to a halt
2) Braking to 2,5 km/h can be adjusted by the manufacturer's customer service department. The factory setting is "braking to a halt".

On trucks with the end of aisle safety device option, this function is automatically activated when the truck is switched on (indicator lamp (69) lit). In order to travel at normal speed after the truck has been switched on, the Reset button (70) must therefore be pressed (indicator (69) goes out).

1. Braking to a halt

When crossing over the end of aisle safety device (magnets in the ground) travelling towards the aisle end, the truck brakes until it comes to rest and the end of aisle safety device indicator lamp (69) lights up.

⚠ WARNING!

The stopping distance depends on the travel speed.

To continue travelling:

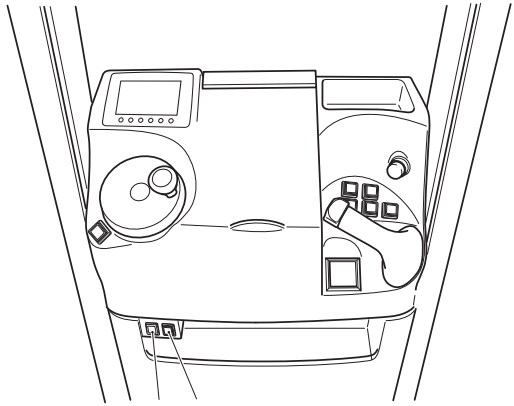
- Press the Reset button (70).

The indicator lamp (69) goes out again.

⚠ WARNING!

Accident risk due to truck without braking system

End of aisle safety braking 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.



2. Braking up to 2,5 km/h

When crossing over the end of aisle safety device (magnets in the ground) travelling towards the aisle end, the truck brakes to 2,5 km/h and the end of aisle safety device indicator lamp (69) lights up. The truck can be driven out of the narrow aisle at this speed.

⚠ WARNING!

The stopping distance depends on the travel speed.

To continue travelling at normal speed:

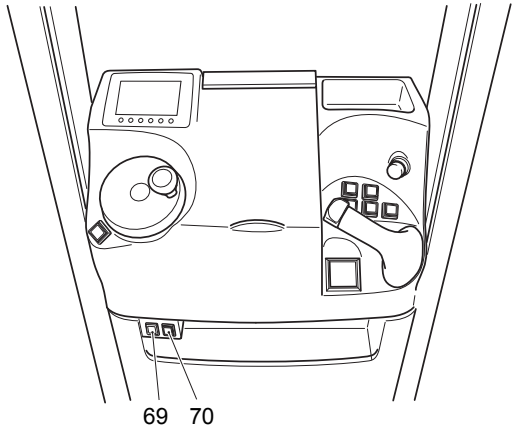
- Press the Reset button (70).

The indicator lamp (69) goes out again.

⚠ WARNING!

Accident risk due to truck without braking system

End of aisle safety braking 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.



7.12 Negotiating narrow aisles

7.12.1 Safety notices for travelling in narrow aisles

⚠ WARNING!

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. These work areas must be marked and identified accordingly.

- ▶ 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.
- ▶ Mark defective truck and take out of service.
- ▶ Do not return the industrial truck to service until you have identified and rectified the fault.
- ▶ Tag out faulty racking systems and block them for entry.
- ▶ Return the truck to service only 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 operator 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 or trucks in the aisle, stop the truck immediately.

⚠ WARNING!

Objects protruding out of the racks can be hazardous

The operator of the truck in a narrow aisle can be injured by objects protruding from the racks (e. g. pallets, loads etc.). A collision between the truck and the protruding objects could also cause material damage to the truck and the rack construction.

- ▶ Do not lean out of the truck while travelling.
- ▶ Do not lean out of the truck while carrying out hydraulic operations (lifting or lowering).
- ▶ Check the length and height of the narrow aisle for protruding objects before entering it.
- ▶ Once in the narrow aisle, enter the rack compartments carefully with the truck. Raise and remove loads securely or stack them correctly.

NOTE

Note the safety clearances between the truck and rack

- ▶ Maintain a minimum 100 mm safety distance between a rail guided truck and the rack.

7.12.2 Rail Guided Trucks (○)

⚠ WARNING!

Faulty or loose guide rails can be dangerous

Do not operate the truck in narrow aisles with faulty or loose guide rails. The lack of guidance could cause a collision between the truck and the racks.

- ▶ Check the guide rails in the narrow aisle for damage before travelling along the full length.
- ▶ Travel only in narrow aisles with undamaged, secure guide rails.

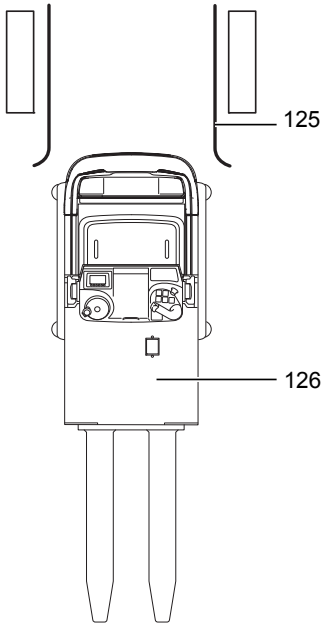
Travelling in narrow aisles with rail-guided trucks

Requirements

– Narrow aisles must be equipped with guide rails (125).
– Prepare the truck for operation, see page 94 or see page 143.

Procedure

- Press the deadman switch.
- Approach the aisle at reduced speed so that the truck (126) is aligned with the narrow aisle and is within the demarcations.
- Observe the markers attached to the travel path (e.g. aisle centre line).
- Drive the truck slowly into the narrow aisle (126). Ensure that the guide rollers of the truck (126) enter the narrow aisle guide rails (125).



→ Rail-guided trucks are fitted with sensors. These sensors activate aisle detection when the truck enters an aisle.

→ The drive wheel is automatically set forward. The driver's display shows the "guided truck" icon. Steering is disabled.

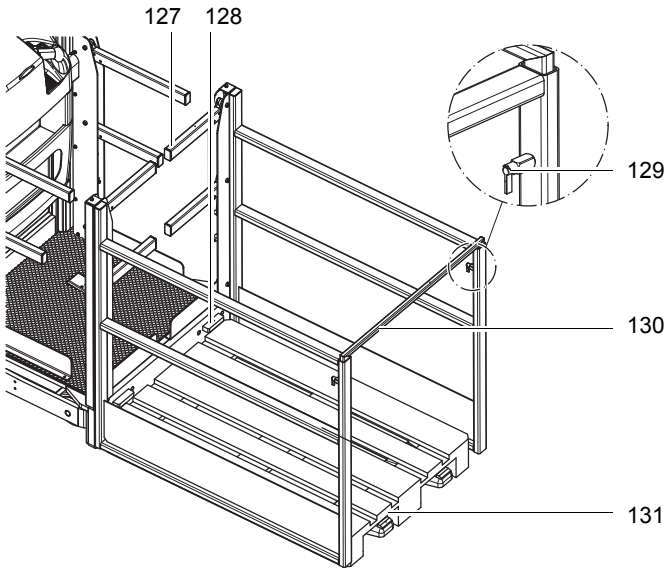
The truck has now entered the narrow aisle and is automatically guided. Travel and hydraulic operations can now only be activated in the narrow aisle with two-hand operation.

7.13 Walk-On Load Handler with Pallet Guard (○)

⚠ 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

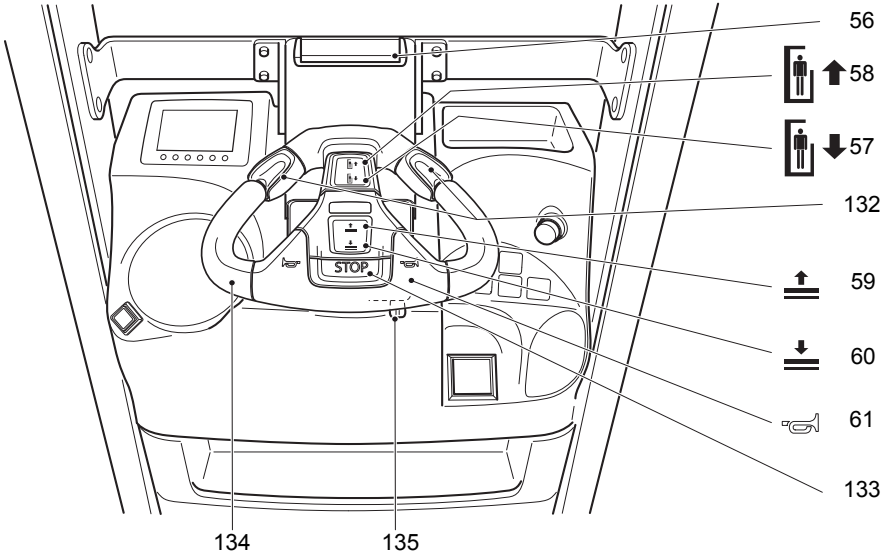
- Fully lower the operator's position (main lift).
- Drive the truck carefully up to the pallet.
- Align the sides of the pallet guard centrally with the pallet.
- Slowly insert the load handler into the pallet until the fork face touches the pallet.

→ The pallet must fully rest on the load handler behind the anti-slip device (131) and the pallet must be below the tilt safety device (128) on the fork shank.

- To lift pallets with a higher load,
  - Turn the lever for the stop bolts (129) up half a turn until they engage.
  - Pull the railing strap (130) up.
  - Turn the lever for the stop bolts (129) down again.
  - Move the railing strap (130) 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 (129) up half a turn until they engage.
  - Press the railing strap (130) down.
  - Turn the lever for the stop bolts (129) down again.
  - Move the railing strap (130) until the locking pins of the stop bolts engage.

The pallet is now raised.

7.14 JetPilot



Item	Control/display	Function
57	Lower button	Lowers the operator position and load handler.

Item	Control/display	Function
58	Lift button	Raises the operator position and load handler.
59	Auxiliary lift raise button	Raises the load handler.
60	Auxiliary lift lower button	Lowers the load handler.
61	Warning button	Issues a warning signal.
56	Clip pad	For holding A4 paper
132	JetPilot travel switch	Controls the travel direction and the speed.
133	Stop button	The truck brakes to a halt via the service brake.
		The truck decelerates via the service brake for as long as the button is pressed.
134	JetPilot	Steers the truck.

7.15 Pre-set Fork Lowering Settings for Stock Picking for L Model

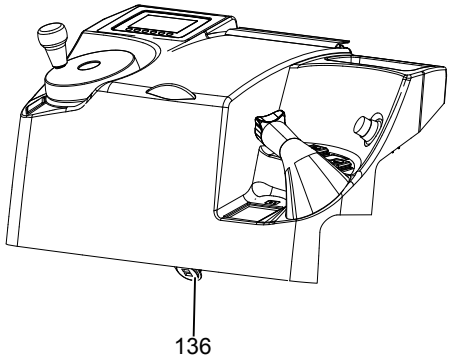
On trucks equipped with the pre-set fork lowering settings for stock picking option (○), the operator position lowers when the lower button is pressed down to a defined cut-off height such that the load handler is lowered to just above the ground. If the pallet is to be set down, the lower button must be pressed again.

➔ The cut-off height can be set by the customer service department.

7.16 USB Charger

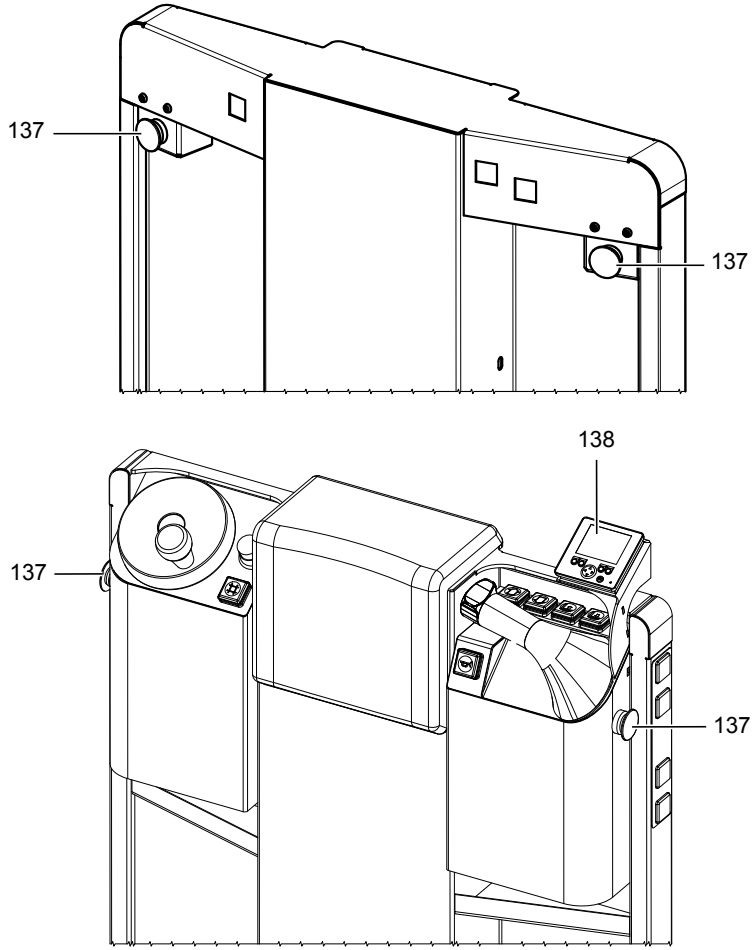
The USB charger (136) is suitable for charging up to 2 electrical devices such as smartphones, tablets and other mobile end devices.

The USB charger (136) supplies 5 V and max. 1 A per connection.



7.17 Warehouse Management System (WMS)

Control station without and with controls in the load direction



Item	Control/display	Function
138	WMS additional display	Truck terminal for working at the control station in the load direction.
137	Push button	Push button for acknowledging the raised load.

7.18 Crawl Speed with Lowered Load Handler

The crawl speed function (○) reduces the truck speed when the operator position and load handler have been lowered to below 15 cm.

F Industrial Truck Maintenance

1 Operational Safety and Environmental Protection

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

⚠ WARNING!

Risk of accidents and component damage

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

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

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

NOTE

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

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

On completion of inspection and service work, carry out the operations listed in the “Recommissioning the truck after cleaning or maintenance work” section (see page 211).

2 Maintenance Safety Regulations

Maintenance and repair personnel

The manufacturer has a service department specially trained for these tasks. A maintenance contract with the manufacturer will ensure trouble-free operation.

Truck maintenance and repair work must only be carried out by specially trained personnel. The following operations are assigned to the following target groups.

Operating company

The maintenance personal of the operating company has the technical expertise and experience to perform the activities in the maintenance check list for the operating company. The maintenance and repair work to be performed by the operating company are also written down, see page 211.

Customer Services

Customer Services are specially trained in the use of the truck and are able to carry out maintenance and repairs independently. Customer Services are aware of the relevant standards, guidelines and safety regulations as well as potential risks.

2.1 Working on the electrical system

⚠ WARNING!

Electrical current can cause accidents

Ensure the electrical system is de-energised before starting work. The capacitors in the control must be completely discharged. The capacitors are fully discharged approx. 10 minutes after disconnecting the electrical system from the battery.

Before starting maintenance on the electrical system:

- ▶ Only suitably trained electricians may work on the truck's electrical system.
- ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
- ▶ Park the truck securely (see page 97).
- ▶ Disconnect the battery.
- ▶ Remove any rings, metal wristbands etc.

2.2 Consumables and used parts

⚠ CAUTION!

Consumables and used parts are an environmental hazard

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

- ▶ Note the safety regulations when handling these materials.

2.3 Wheels

⚠ WARNING!

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

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

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

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

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

Wheel flattening

If the truck has been parked for a long period, the wheel surfaces may tend to flatten. This flattening has a negative effect on the safety and stability of the truck. Once the truck has covered a certain distance, the flattening will disappear.

2.4 Attachment Repairs and Inspection

⚠ WARNING!

A faulty attachment can be hazardous

Check the attachment daily for external signs of damage or defects. Faulty attachments can cause the load to fall.

- ▶ 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.

2.5 Lift chain inspection

Unauthorised wear and external damage:

NOTE

In accordance with official regulations, a lift chain is considered to be worn if its length has increased by 2,9 % in the section which runs over the pulley.

⚠ WARNING!

Accident risk from damaged lift chains

Replace a chain immediately if it shows external signs of damage. Damage will result in permanent breakage and hence tearing of the lift chain.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Lift chains must only be replaced by the manufacturer's customer service department which has been specially trained.
- ▶ Only return the truck to service when you have identified and rectified the fault.

⚠ WARNING!

If the truck is fitted with two lift chains, both chains must always be replaced. This is the only way to ensure even load distribution over the two chains.

- ▶ When replacing chains the connecting bolts between the chain anchor and the chain must be replaced.
- ▶ Always use new original parts.
- ▶ Lift chains must only be replaced by the manufacturer's customer service department which has been specially trained.

→ The manufacturer has a service department specially trained for these tasks.

2.6 Hydraulic system

NOTE

Testing and replacing hydraulic hoses

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

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

⚠ **WARNING!**

Leaky hydraulic systems can result in accidents

Hydraulic oil can escape from leaky and faulty hydraulic systems.

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

⚠ **WARNING!**

Faulty hydraulic hoses can result in injury and infection

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

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

The manufacturer has a service department specially trained for these tasks.

3 Lubricants and Lubrication Schedule

3.1 Handling consumables safely

Handling consumables

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

⚠ WARNING!

Improper handling is hazardous to health, life and the environment

Consumables can be flammable.

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

⚠ CAUTION!

Spilled consumables can cause slipping and endanger the environment

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

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

⚠ WARNING!

Improper handling of oils can be hazardous

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

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

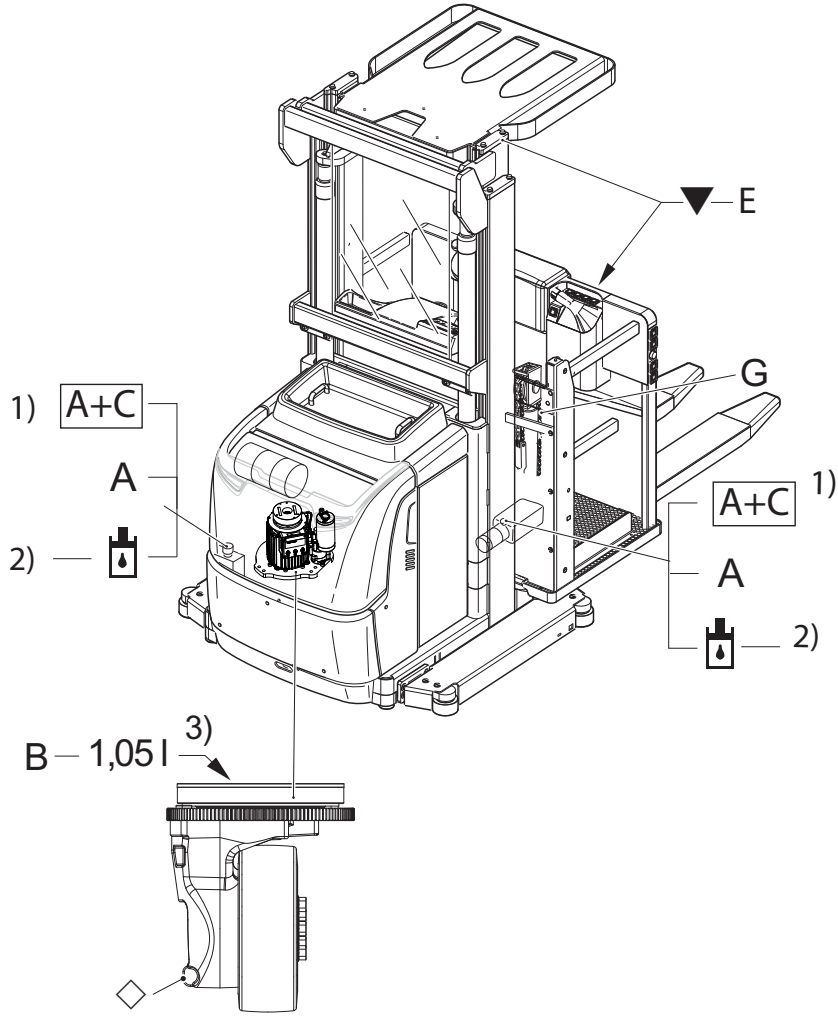
⚠ CAUTION!

Consumables and used parts are an environmental hazard

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

- ▶ Note the safety regulations when handling these materials.

3.2 Lubrication Schedule



▼	Contact surfaces	□	Cold-store application
	Hydraulic-oil filler neck	◇	Transmission oil drain plug

1 Mixture ratio for cold-store usage 1:1

2 Transmission oil is a guideline. The spur wheel should be dipped approx. 2 mm into the transmission oil.

3.3 Consumables

Code	Order no.	Package quantity	Description	Used for
A	51132827 *	5.0 L	Jungheinrich Hydraulic oil	Hydraulic System
	51132826 *	1.0 L		
			HLP 46 DIN 51524-2	
			HLPD 46 DIN 51524-2	
			HVLP 32 DIN 51524-3	
B	50380904	5.0 L	Titan Gear HSY 75W-90	Transmission
C	51081875 *	5.0 L	Renolin MR 310 Cold store hydraulic oil	Hydraulic system Additive for use in cold stores
E	29202050	1.0 kg	Polylube GA 352P	Lubrication service

Grease guidelines

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

*The trucks are factory-equipped with a special hydraulic oil (the Jungheinrich hydraulic oil with a blue colouration) and the cold store hydraulic oil (red colouration). The Jungheinrich hydraulic oil can only be obtained from the Jungheinrich service department. The use of named alternative hydraulic oils is not prohibited but may lead to a decline in functionality. The Jungheinrich hydraulic oil may be mixed with one of the named alternative hydraulic oils.

→ For cold store operations the Jungheinrich hydraulic oil and the cold store hydraulic oil must be mixed in a 1:1 ratio.

4 Maintenance and repairs

4.1 Preparing the truck for maintenance and repairs

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

Procedure

- Park the truck securely, see page 97.
- Disconnect the battery to prevent the truck from being switched on accidentally.

⚠ 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 from lowering, tipping or sliding away.

▶ When raising the truck, follow the instructions, see page 41. When working on the parking brake, prevent the truck from accidentally rolling away (e.g. with wedges).

4.2 Lifting and jacking up the truck safely

Lifting and jacking up

⚠ WARNING!

Lifting and jacking up the truck safely

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

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

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

- ▶ Jack up the truck only on a level surface and prevent it from moving accidentally.
- ▶ Always use a jack with sufficient capacity. When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
- ▶ In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose, see page 36.
- ▶ When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

Raising and jacking up the truck securely

Requirements

– Prepare the truck for maintenance and repairs (see page 194).

Tools and Material Required

– Jack
– Hard wooden blocks

Procedure

- Place the jack against the contact point.
  Jack contact point, see page 36.
- Raise the truck.
- Support the truck with hard wooden blocks.
- Remove the jack.

The truck is now securely raised and jacked up.

4.3 Front panel assembly and disassembly

Front cover disassembly

Requirements

– Prepare the truck for maintenance and repairs (see page 194).

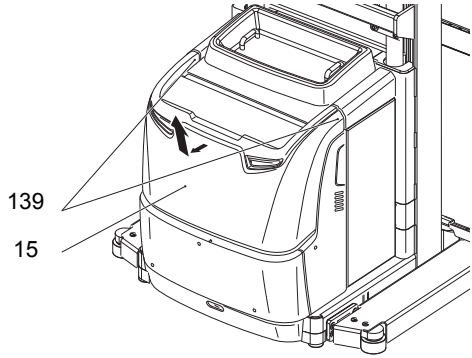
Tools and Material Required

– Allen key, size 6

Procedure

- Remove the screws (139).
- Lift and remove the front panel (15).
- Place the front panel (15) safely to one side.

The front cover has been removed.



⚠ WARNING!

Collision hazard when operating the truck

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

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

⚠ CAUTION!

Risk of crushing of arms and legs

There is a risk of crushing when you fit the drive compartment cover.

▶Make sure there is nothing between the cover and the truck when fitting the cover.

Installing the front panel

Tools and Material Required

– Allen key, size 6

Procedure

- Insert the front panel (15).
- Tighten the screws (139).

The front panel is now installed.

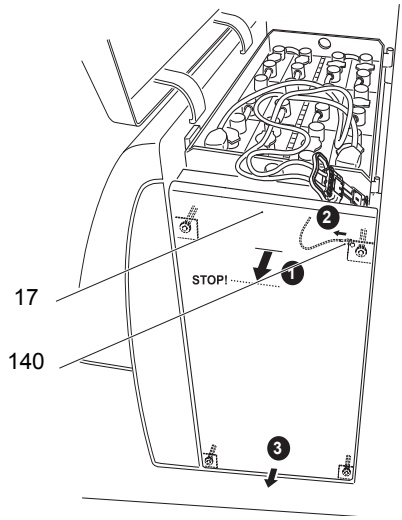
4.4 Electrical System

Exposing the electrical system

Procedure

- Open the battery panel, see page 57.
- Hold the top of the electrical system cover (17) and pull it away from the truck until the top two snap lock connections are disengaged.
- Remove the plug connector of the earth lead (140) from the cover.
- Pull the cover (17) 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 (140) to the cover.
- Push the cover (17) into the top snap connection until it engages.
- Close the battery cover.

The electrical system is now closed again.

4.5 Checking electrical fuses

Checking fuses

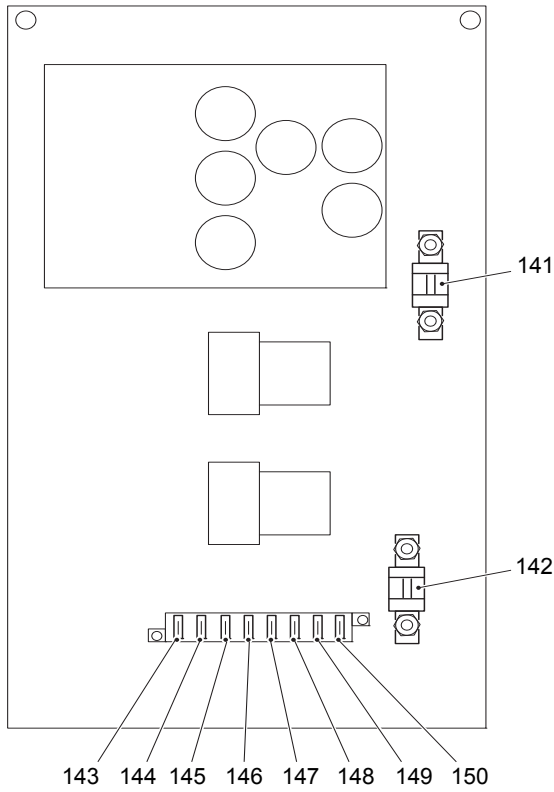
Requirements

– 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.

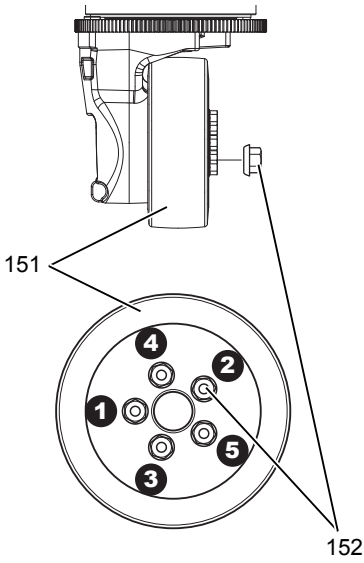


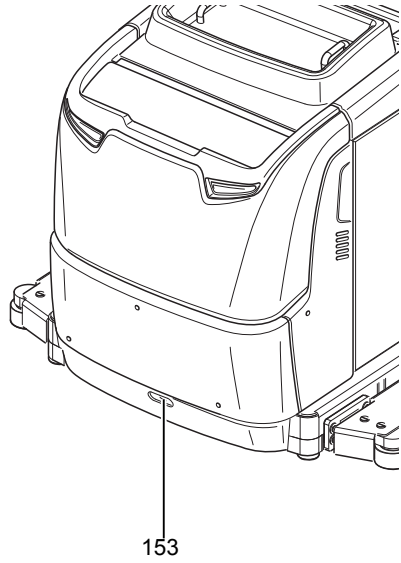
Item	Component	To protect	Value
143	F4	Main contactor	5
144	4F15	Access control	10
145	F1	Overall control circuit fuse	20
146	F3.1	Control fuse 24 V	10
147	F3.2	Control fuse 24 V	10
148	6F1	Discharge indicator control fuse	2
149	4F1	Horn control fuse	3
150	4F10	Fan control fuse	3
141	F8	Main fuse	300
142	2F1	Aux. lift pump motor (○)	150

4.6 Replace the Drive and Load Wheels

The load and drive wheels must only be replaced by the manufacturer's customer service department which has been specially trained for these tasks.

4.7 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 page 217.

Tightening the wheel nuts

Requirements

– Prepare the truck for maintenance and repairs, see page 194.

Tools and Material Required

– Torque wrench

Procedure

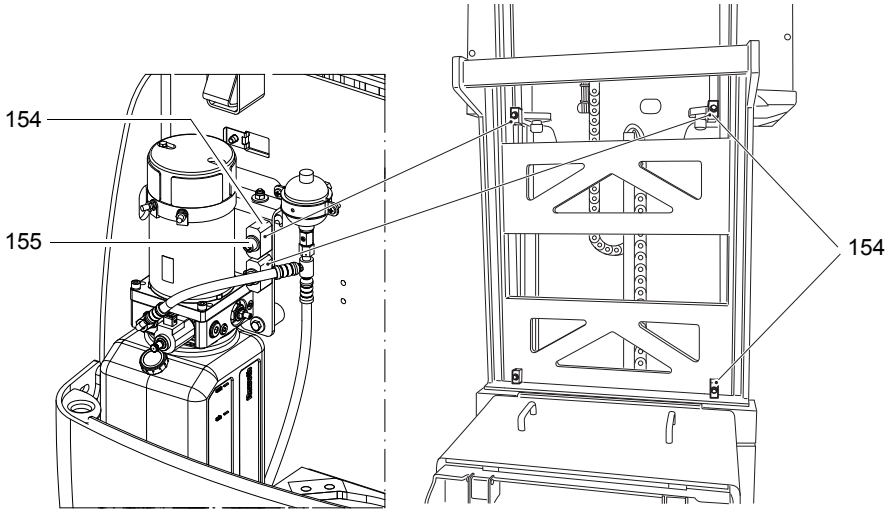
- Position the drive wheel (152) so that the wheel nuts (151) can be pulled through the hole (153).
- Tighten all the wheel nuts (151) through the hole (153) in the impact buffer with the socket wrench.

  To do this, tighten the wheel nuts in the prescribed order.
  - First of all tighten to 10 Nm.
  - and then to 150 Nm.

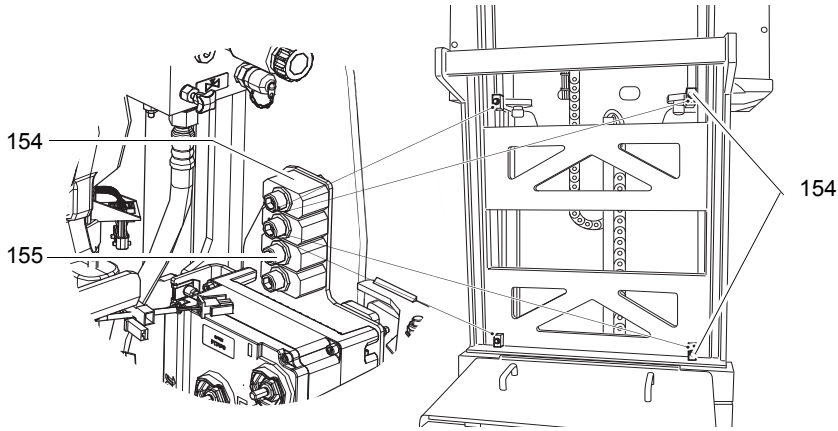
The wheel nuts have now been tightened.

4.8 Mast retainer assembly and removal

EKS 110 100E, 160 E, 190E mast retainers



EKS 110 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 page 194).

Tools and Material Required

– Allen key, size 10

Procedure

- Open the front panel.
- Remove the screws (155) from the retaining blocks (154).
- Raise the mast until the retaining block threads are exposed.
- Screw the retaining blocks (154) 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 page 194).

Tools and Material Required

– Allen key, size 10

Procedure

- Raise the mast until the retaining blocks are free.
- Unscrew the retaining blocks (154) 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.

4.9 Cleaning

4.9.1 Cleaning the truck

⚠ CAUTION!

Fire hazard

Do not use flammable liquids to clean the industrial truck.

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

⚠ CAUTION!

Risk of component damage when cleaning the truck

Cleaning with a pressure washer can result in malfunctions due to humidity.

- ▶ Cover all electronic system assemblies (controllers, sensors, motors etc.) before cleaning the truck with a pressure washer.
- ▶ Do not hold the jet of the pressure washer by the marked points to avoid damaging them (see page 36).
- ▶ Do not clean the truck with pressurised water.

Cleaning the truck

Requirements

– Prepare the truck for maintenance and repairs (see page 194).

Tools and Material Required

– Water-based solvents
– Sponge or cloth

Procedure

- Clean the surface of the truck with water-based solvents and water. Use a sponge or cloth to clean.
- In particular, clean the following areas:
  - Windows
  - All walk-on areas
  - Oil filler ports and their surroundings
  - Grease nipples (before lubrication)
- Dry the truck after cleaning, e.g. with compressed air or a dry cloth.
- Carry out all the tasks in the section "Recommissioning the truck after cleaning or maintenance work" (see page 211).

The truck is now clean.

4.9.2 Cleaning the electrical system assemblies

⚠ CAUTION!

Risk of electrical system damage

Cleaning the assemblies (controllers, sensors, motors etc.) of the electronic system with water can damage the electrical system.

▶ 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.

Cleaning the electrical system assemblies

Requirements

– Prepare the truck for maintenance and repairs (see page 194).

Tools and Material Required

– Compressor with water separator

– Non-conductive, antistatic brush

Procedure

- Expose the electrical system, see page 197.
- Clean the electrical system assemblies with weak suction or compressed air (use a compressor with a water trap) and not a conductive, anti-static brush.
- Fit the electrical system panel, see page 197.
- Carry out all the tasks in the section "Recommissioning the truck after cleaning or maintenance work" (see page 211).

The electrical system assemblies are now clean.

4.10 Lift chain servicing

⚠ 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.
- ▶ Do not clean lift chains with high pressure jets 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.

⚠ WARNING!

Solvents (e.g. paraffin derivatives) can be hazardous

- ▶ Solvents can cause irritation if they come into contact with the skin. Rinse any affected areas thoroughly.
- ▶ If they come into contact with the eyes rinse them immediately with flowing water and call for a doctor.
- ▶ Wear personal protective equipment (e.g. safety boots, hi-vis jacket, goggles, work gloves etc.) when working with solvents.

The intervals stated in the service checklist apply to normal duty use. More demanding conditions (dust, temperature) require more regular lubrication of the lift chains. The prescribed chain spray must be used in accordance with the instructions. Applying grease externally will not provide sufficient lubrication of the lift chains.

4.11 Lubricate the lift chains, clean and grease the contact surfaces in the mast sections

⚠ WARNING!

Risk of falling when carrying out maintenance work at height

There is danger of falling and trapping when performing maintenance work on elevated maintenance points (for example lubricating the mast).

- ▶ Wear personal protective equipment.
- ▶ Use a working platform, lifting stage or safety ladder.
- ▶ Do not use leaning ladders.
- ▶ Do not stand underneath the operator's position or load handler.

Requirements

– Industrial truck parked on a level surface.
– Wear personal protective equipment.

Tools and Material Required

– Work platform, lifting platform or safety ladder

Procedure

⚠ WARNING!

An extended mast can cause accidents

Be aware of the ceiling height when raising the operator's position and load handler.

- Fully raise the operator's position and load handler.
- Switch off the truck and remove the key if applicable.
- Disconnect the battery.

⚠ WARNING!

Risk of accidents when working under an unsecured operator's position and load handler

Do not place the work platform, lifting platform or safety ladder underneath an unsecured operator's position and load handler.

▶ Instruct other people to move out of the hazardous area of the truck.

▶ Never reach or climb into moving truck parts.

▶ Never stand underneath a raised operator's position or load handler.

- Position the work platform, lifting platform or safety ladder directly next to the industrial truck.
- From your position on the work platform, lifting platform or safety ladder:
  - Lubricate lift chains.
  - Clean the running faces in the mast sections and apply grease.
    Lubrication diagram see page 192.
    Lubricant see page 193.
- Remove the work platform, lifting platform or safety ladder.
- Connect the battery to the truck.
- Switch the truck on.
- Fully lower the operator's position and load handler.

Lift chains lubricated and the contact surfaces in the mast sections cleaned and greased.

4.12 Checking the hydraulic oil level

⚠ CAUTION!

The hydraulic oil is pressurised during operation and is a hazard to health and to the environment.

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

⚠ WARNING!

Leaky hydraulic systems can result in accidents

Hydraulic oil can escape from leaky and faulty hydraulic systems.

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

⚠ CAUTION!

Consumables and used parts are an environmental hazard

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

▶ Note the safety regulations when handling these materials.

The checking and adding of hydraulic oil should only be performed by the manufacturer's specialist customer service personnel who have been trained to do this.

5 Restoring the truck to service after maintenance and repairs

The truck can only be restored to service after cleaning or maintenance after the following procedures have been carried out:

Procedure

- Connect the battery connector to the truck, siehe "Battery removal and installation" in Kapitel 5.
- Prepare the truck for operation, see page 82.
- Prepare the truck for operation, see page 94.
- Test the safety equipment, see page 96.

6 Decommissioning the Industrial Truck

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

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

→ Jack up the truck, see page 195.

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

6.1 Prior to decommissioning

Procedure

- Thoroughly clean the truck, see page 204.
- Prevent the truck from rolling away accidentally.
- Check the hydraulic oil level and replenish if necessary, see page 209.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck according to the lubrication schedule, see page 192.
- Charge the battery, see page 59.
- Disconnect the battery, clean it and grease the terminals.

In addition, follow the battery manufacturer's instructions.

6.2 During decommissioning

NOTE

Full discharge can damage the battery

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

▶Charge the battery at least every 2 months.

Charge the battery see page 59.

6.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck, see page 204.
- Lubricate the truck according to the lubrication schedule, see page 192.
- Clean the battery, grease the terminal screws and connect the battery.
- Charge the battery, see page 59.
- Start up the truck, see page 82.

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

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

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

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

8 Final de-commissioning, disposal

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

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

9 Human vibration measurement

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

G Maintenance and Inspection

⚠ WARNING!

Lack of maintenance can result in accidents

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

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

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

NOTE

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

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

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

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

1 Maintenance checklist

1.1 Owner

1.1.1 Standard equipment

Brakes		W	A	B	C
1	Test the brakes.	●			

Electrics		W	A	B	C
1	Test warning and safety devices in accordance with operating instructions.	●			
2	Test the emergency disconnect switch.	●			

Power supply		W	A	B	C
1	Check battery and battery components.	●			
2	Check battery cable connections are secure, check for dirt and grease terminals if necessary.	●			
3	Check battery connector for damage, test it and make sure it is secure.	●			

Driving		W	A	B	C
1	Check wheels for wear and damage.	●			

Chassis and superstructure		W	A	B	C
1	Check doors and/or covers.	●			
2	Check labels are legible, complete and plausible.	●			
3	Check overhead guard and/or cabin are secure and check for damage.	●			
4	Check protective screen panel/protective grille for damage.	●			

Hydr. movements		W	A	B	C
1	Check the lubrication of the load chains and lubricate the load chains if necessary.	●			
2	Test hydraulic system.	●			
3	Check forks or load handler for wear and damage.	●			

Agreed performance		W	A	B	C
1	Lubricate the truck according to the lubrication schedule.	✳			

1.1.2 Optional equipment

Rail guidance

Driving		W	A	B	C
1	Check rail guide rollers for wear and damage.	●			

Work lights

Electrics		W	A	B	C
1	Test the lighting.	●			

Strobe light / beacon

Electrics		W	A	B	C
1	Test the strobe light/beacon and check for damage.	●			

Overhead guard

Chassis and superstructure		W	A	B	C
1	Check overhead guard and/or cabin are secure and check for damage.	●			

Side gates / railing

Chassis and superstructure		W	A	B	C
1	Test operation of the gates, railings and doors and check for damage.	●			

Safety belt

Chassis and superstructure		W	A	B	C
1	Check the attachment rail for the safety harness at the front of the overhead guard is secure and check for damage.	●			

Daytime travel light / lighting

Electrics		W	A	B	C
1	Test the lighting.	●			

1.2 Customer Service

1.2.1 Standard equipment

Brakes		W	A	B	C
1	Test the brakes.			●	
2	Check the magnetic brake air gap, adjust if necessary.			●	

Electrics		W	A	B	C
1	Check the cables and motor mounting are secure.			●	
2	Test warning and safety devices in accordance with operating instructions.			●	
3	Test the displays and controls.			●	
4	Test the emergency disconnect switch.			●	
5	Check fuse ratings.			●	
6	Carry out a chassis insulation-resistance test.			●	
7	Check the carbon brushes, replace if necessary. Note: When replacing the carbon brushes apply compressed air to the motor.			●	
8	Check electrical wiring for damage (insulation damage, connections). Make sure cable connections are secure.			●	

Power supply		W	A	B	C
1	Check acid density, acid level and battery voltage.			●	
2	Check battery and battery components.			●	
3	Check battery cable connections are secure, check for dirt and grease terminals if necessary.			●	
4	Check battery connector for damage, test it and make sure it is secure.			●	

Driving		W	A	B	C
1	Test the deadman switch.			●	
2	Check transmission for noise and leakage.			●	
3	Note: Replace transmission oil after 10,000 service hours.				
4	Check the wheels for wear and damage. Make sure they are secure and check the air pressure if necessary.			●	
5	Check wheel suspension and attachment.			●	

Chassis and superstructure		W	A	B	C
1	Check chassis connections and screw connections for damage.			●	
2	Check doors and/or covers.			●	
3	Check labels are legible, complete and plausible.			●	
4	Test the adjustable floor plate and make sure it is secure.			●	
5	Test the operator platform and check for damage.			●	
6	Check mast mounting/bearings.			●	
7	Check overhead guard and/or cabin are secure and check for damage.			●	
8	Check protective screen panel/protective grille for damage.			●	

Hydr. movements		W	A	B	C
1	Check cylinders and piston rods for damage and leaks, and make sure they are secure.			●	
2	Check the fastening clamps on the mast lift cylinder for wear and damage.			●	
3	Check settings and wear levels of slide pieces and stops and adjust or replace the slide pieces as required.			●	
4	Check load chain setting and tension if necessary.			●	
5	Check the lubrication of the load chains and lubricate the load chains if necessary.			●	
6	Check the load chain fasteners and check the chain bolts for wear and damage.			●	
7	Check lateral clearance of the mast connections and the fork carriage.			●	
8	Visually inspect the mast rollers and check the running surfaces for wear.			●	
9	Replace hydraulic oil filter and breather filter.			✳	●
10	Test hydraulic system.			●	
11	Check that hydraulic ports, hose and pipe lines are secure, check for leaks and damage.			●	
12	Test emergency lowering system.			●	
13	Check hydraulic oil level and top up if necessary.			●	
14	Replace the hydraulic oil.			✳	●
15	Test the pressure relief valve and adjust if necessary.			●	
16	Check forks or load handler for wear and damage.			●	

Agreed performance		W	A	B	C
1	Carry out a test run with the rated load and, if necessary, with a customer-specific load.			●	
2	Demonstration after maintenance.			●	
3	Lubricate the truck according to the lubrication schedule.			●	

Steering		W	A	B	C
1	Test the electric steering and its components.			●	
2	Check the steering bearings, steering play and steering toothing or steering chain. Lubricate the steering toothing or steering chain.			●	

1.2.2 Optional equipment

Electrolyte circulation

Power supply		W	A	B	C
1	Check hose connections and test the pump.			●	

Aquamatik

Power supply		W	A	B	C
1	Test Aquamatik plug, hose connections and float and check for leaks.			●	
2	Test flow indicator and check for leaks.			●	

Rail guidance

Electrics		W	A	B	C
1	Test two-hand operation in narrow aisles.			●	

Driving		W	A	B	C
1	Check bearings and mounting of rail guide rollers.			●	
2	Check distance between the guide rollers and the guide rails over the entire length of the rails.			●	
3	Check rail guide rollers for wear and damage.			●	

Battery refill system

Power supply		W	A	B	C
1	Test battery refill system and check for leaks.			●	

Lateral battery removal

Power supply		W	A	B	C
1	Test the battery latch/battery attachment.			●	

End of aisle safety device - magnet

System components		W	A	B	C
1	Test end of aisle safety device.			●	

Aisle recognition

System components		W	A	B	C
1	Test aisle recognition magnetic switch and/or light button, check for contamination and damage.			●	

Lift cutout

Hydr. movements		W	A	B	C
1	Test the lift-limit cut-off/lift cut-off, check for damage and make sure it is secure.			●	

Shock sensor / data recorder

Electrics		W	A	B	C
1	Check shock sensor / data recorder are secure and check for damage.			●	

Data radio

System components		W	A	B	C
1	Test scanner and terminal, check for damage and make sure they are secure and clean.			●	
2	Check fuse ratings.			●	
3	Check wiring is secure and check for damage.			●	

Work lights

Electrics		W	A	B	C
1	Test the lighting.			●	

Fire extinguisher

Agreed performance		W	A	B	C
1	Check fire extinguisher is present, secure and check test interval.				●

Access module

Electrics		W	A	B	C
1	Test the access module, check for damage and make sure it is secure.			●	

Strobe light / beacon

Electrics		W	A	B	C
1	Test the strobe light/beacon and check for damage.			●	

Audible warning devices

Electrics		W	A	B	C
1	Test the buzzer/warning alarm, check for damage and make sure it is secure.			●	

Discharge strap

Electrics		W	A	B	C
1	Check anti-static discharge strap/chain is present and not damaged.			●	

Overhead guard

Chassis and superstructure		W	A	B	C
1	Check overhead guard and/or cabin are secure and check for damage.			●	

Side gates / railing

Chassis and superstructure		W	A	B	C
1	Test operation of the gates, railings and doors and check for damage.			●	

Safety belt

Chassis and superstructure		W	A	B	C
1	Check the attachment rail for the safety harness at the front of the overhead guard is secure and check for damage.			●	

Daytime travel light / lighting

Electrics		W	A	B	C
1	Test the lighting.			●	

Cold-store application

Driving		W	A	B	C
1	Replace the transmission oil in the cold-store application.				●

Hydr. movements		W	A	B	C
1	Note: In cold-store applications, we recommend replacing the hydraulic oil every 1000 service hours or once a year.				

Pallet clamp

Hydr. movements		W	A	B	C
1	Test the pallet clamp and check for wear and damage.			●	

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