EKS 514 - 516 / EKX 410 - 516

10.23

Operating instructions

en-GB

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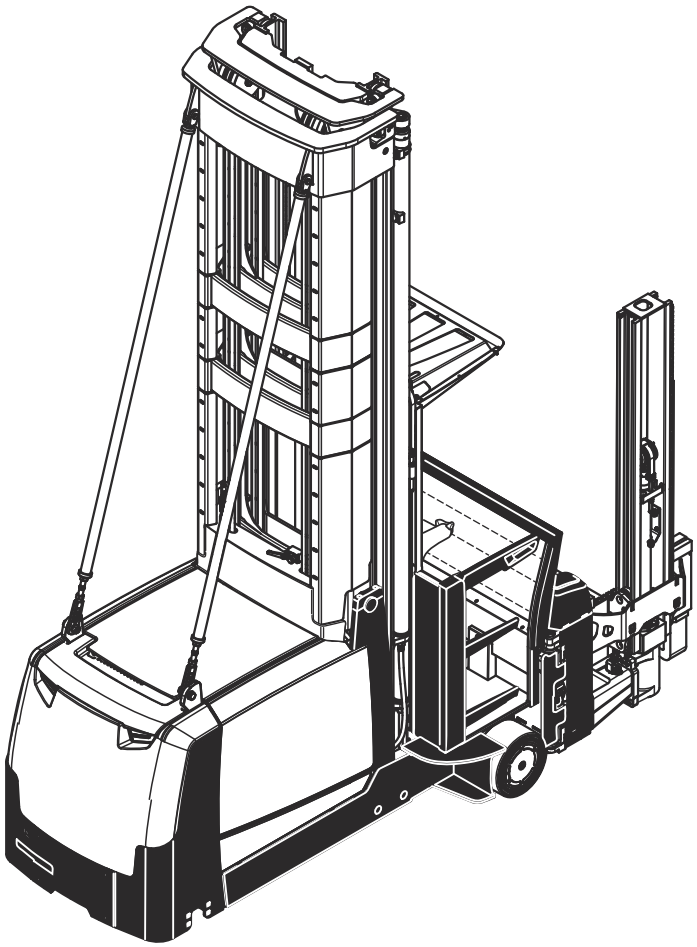
EKS 514
EKS 516k
EKS 516
EKX 410
EKX 412
EKX 514
EKX 516k
EKX 516



JUNGHEINRICH

Declaration of Conformity

CE

Manufacturer

Jungheinrich AG, 22039 Hamburg, Germany

Description
Industrial truck

Type	Option	Serial no.	Year of manufacture
EKS 514 EKS 516k EKS 516 EKX 410 EKX 412 EKX 514 EKX 516k EKX 516			

On behalf of

Date

EU DECLARATION OF CONFORMITY

The undersigned hereby declare that the powered truck described in detail complies with the current versions of European Directives 2006/42/EG (Machinery Directive) and 2014/30/EU (Electromagnetic Compatibility - EMC). The manufacturer is authorised to compile the technical file.

UK CA

JUNGHEINRICH

Declaration of Conformity (○)

Product:	EKX 410-412 / EKX 514-516 / EKS 514-516 Serial number/type number
Manufacturer:	Jungheinrich Aktiengesellschaft 22039 Hamburg, Germany
UK representative:	Jungheinrich UK Ltd Sherbourne House Sherbourne Drive Tilbrook Milton Keynes MK7 8HX

Authorised to compile documentation:

The manufacturer is authorised to compile the technical documentation and its representative is authorised to make documentation available upon reasoned request for a period of at least 10 years from the date of first placement of the product on the UK market.

The manufacturer bears sole responsibility for issuance of this Declaration of Conformity.

The subject of the Declaration as outlined above satisfies the applicable UK legislation:

Supply of Machinery (Safety) Regulations 2008 No. 1597

and

Electromagnetic Compatibility Regulations 2016 No. 1091

Signed for and on behalf of:

Jungheinrich Aktiengesellschaft

10.23 en-GB

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.

NOTICE

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

Copyright

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A Correct Use and Application

1 General

The truck must be used, operated and serviced in accordance with these operating instructions. All other types of use are beyond its scope of application and may result in damage to persons, material assets and/or the truck.

2 Correct application

NOTICE

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 326.

NOTICE

Use of working platforms

The use of working platforms is governed by national law. In individual states, the use of working platforms may be prohibited on industrial trucks.

- ▶ The operating company must check and observe the country-specific requirements before the working platform is used. Consult the relevant national supervising body if necessary.
- ▶ Only when the law in the country of use and the manufacturer of the truck permit the use of the working platform may a person be raised and transported using the working platform.

Description of the working platform: see page 582.

2.1 EKS

Permissible activities:

– Lifting, lowering, transporting and picking of loads.
– 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 18.
– When transporting a load outside the narrow aisle, always keep it as low as possible while ensuring sufficient ground clearance.
– Walking on suitable load aids is permitted only with the corresponding safety devices (e.g. safety harness, guard, tilt safety device, clamp).

Prohibited activities:

– Carrying and lifting passengers
– Storing loads in racking systems is prohibited.
– Retrieving loads from racking systems is prohibited.
– Pushing or pulling loads
– Driving on slopes and inclines
– Negotiating loading ramps and docks
– Towing trailers
– Transporting suspended loads
– Transporting swaying loads

2.2 EKX

Permissible activities:

– Lifting, lowering, transporting and picking of loads.
– 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 18.
– When transporting a load outside the narrow aisle, always keep it as low as possible while ensuring sufficient ground clearance.

Prohibited activities:

– Carrying and lifting passengers
– Pushing or pulling loads
– Driving on slopes and inclines
– Negotiating loading ramps and docks
– Towing trailers
– Transporting suspended 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 interiors.
- – Operation only on level surfaces in accordance with VDMA guideline.
- – Do not exceed the permissible surface and spot load limits on the travel routes.

Changing the application areas and thawing

– 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.

Special equipment and authorisation are required if the truck is to be used continually under 5 °C or in conditions of extreme temperature fluctuations or condensing air humidity.

3.1 Indoor Application outside the Cold Store (●)

In accordance with the approved application conditions, the truck remains in enclosed interiors outside the cold store.

Usage and ambient conditions	
Permissible temperature range	5 °C to 40 °C
Temperature range for secure parking	5 °C to 40 °C
Minimum temperature for charging the battery	5 °C
Maximum relative air humidity (enclosed interiors)	95 %, non-condensing

4 Safety Clearances (Design Safety Clearances)

⚠ WARNING!

An insufficient safety distance between the guided truck and the rack can produce a risk of collision

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

- ▶ If the safety distances required and prescribed by the manufacturer are not met, the maximum travel speeds must be reduced.
- ▶ You must observe the minimum safety distance of 90 mm in accordance with EN ISO 3691-3 Section 6.4.2. Do not operate the truck in these narrow aisles.

Safety clearances (design safety clearance) for the EKS

➔ The racking systems must be set up for the EKS. The safety clearances (design safety clearance) required by the manufacturer between the following truck components and the racking system must be observed.

- The safety clearance on both sides between the operator position and the rack as well as the stored goods.
- The safety clearance on both sides between the correctly raised load and the rack as well as the stored goods.

➔ Refer to the following table for the safety clearances (design safety clearance) required depending on the type of guidance system of the truck in the narrow aisle.

Truck guidance in the narrow aisle	Safety clearance
Wire-guided truck	125 mm
Rail-guided truck	100 mm

➔ The safety clearance may be increased if special attachments or special travel speeds are applied.

Safety clearances (design safety clearance) for the EKX

➔ The racking systems must be set up for the EKX. The safety clearances (design safety clearance) required by the manufacturer between the following truck components and the racking system must be observed.

– The safety clearance on both sides between the operator position and the rack as well as the stored goods.
– The safety clearance on both sides between the swivel traverse frame and the rack as well as the stored goods.
– The safety clearance on both sides between the attachment (turret head) and the rack as well as the stored goods.
– The safety clearance on both sides between the correctly raised load and the rack as well as the stored goods.

➔ Refer to the following table for the safety clearances (design safety clearance) required depending on the type of guidance system of the truck in the narrow aisle.

Truck guidance in the narrow aisle	**Safety clearance**
Wire-guided truck	125 mm
Rail-guided truck	100 mm

➔ The safety clearance may be increased if special attachments or special travel speeds are applied.

5 Residual risk

⚠ WARNING!

Risk of accident and injury due to incorrect behaviour in the case of unavoidable residual risks

Incorrect behaviour or failure to observe the operating instructions can lead to accidents and injuries.

- ▶ The operator must be instructed in the operation of the truck, optional equipment and attachments, specifically with regard to appropriate behaviour in hazardous areas as well as in situations where unavoidable residual risks exist or implemented safety measures cannot be fully effective.
- ▶ The operator must be familiar with the contents of the operating instructions and must observe these at all times.

Residual risks are particular hazards that arise when working with the truck but cannot be eliminated despite the safety-compliant design of the system. Residual risks are not immediately apparent and are a potential cause of accidents, injuries or health problems.

The transport, setup, operation and maintenance of the truck, optional equipment and attachments – as well as any other reasonably foreseeable use of thereof– can take place under the designated conditions without exposing persons to specific hazards.

Risks are eliminated or minimised to as great an extent as possible. Improper use is prevented if it entails specific risks. Appropriate safety measures are implemented to counter unavoidable risks.

Residual risks that cannot be eliminated by means of risk mitigation are highlighted explicitly in the operating instructions.

Residual risks can be further reduced by trained and technically qualified personnel as well as responsible, safety-conscious conduct during operation and maintenance.

6 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.

NOTICE

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.

7 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.

8 Removal of components

It is forbidden to modify or remove truck components, particularly protective and safety equipment.

➔ If in doubt, contact the manufacturer's customer service department.

B Truck Description

1 Application

The EKS is an electric powered order picker.

The EKX with a standard attachment is an electric three-way order picker.
The EKX with a telescopic table is an electric two-way order picker.

The EKS / EKX is designed to transport and pick loads on level surfaces.

➔ The ground surface must comply with the VDMA guideline.

It can lift open-bottom or diagonal board pallets beyond the area above the load wheels, as well as roll cages. Loads can be stacked, retrieved and transported over long distances.

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

If the EKS / EKX is used for assembly work with an corresponding working platform, the working platform must be supplied or approved in writing by the manufacturer.

➔ Description of the working platform: see page 582.

⚠ WARNING!

An insufficient safety distance between the guided truck and the rack can produce a risk of collision

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

- ▶ If the safety distances required and prescribed by the manufacturer are not met, the maximum travel speeds must be reduced.
- ▶ You must observe the minimum safety distance of 90 mm in accordance with EN ISO 3691-3 Section 6.4.2. Do not operate the truck in these narrow aisles.

➔ Observe the safety clearances (design safety clearances) in the narrow aisle – see page 18.

Rail guidance (RG) requires guide rails in the narrow aisles. Rail guidance rollers attached to the truck chassis guide the truck between the guide rails.

A guide wire must be routed in the ground for the wire guidance system. The signals from the wire are received by sensors on the chassis and processed by the on-board computer.

➔ The capacity is shown on the data plate.

2 Truck models and rated capacity

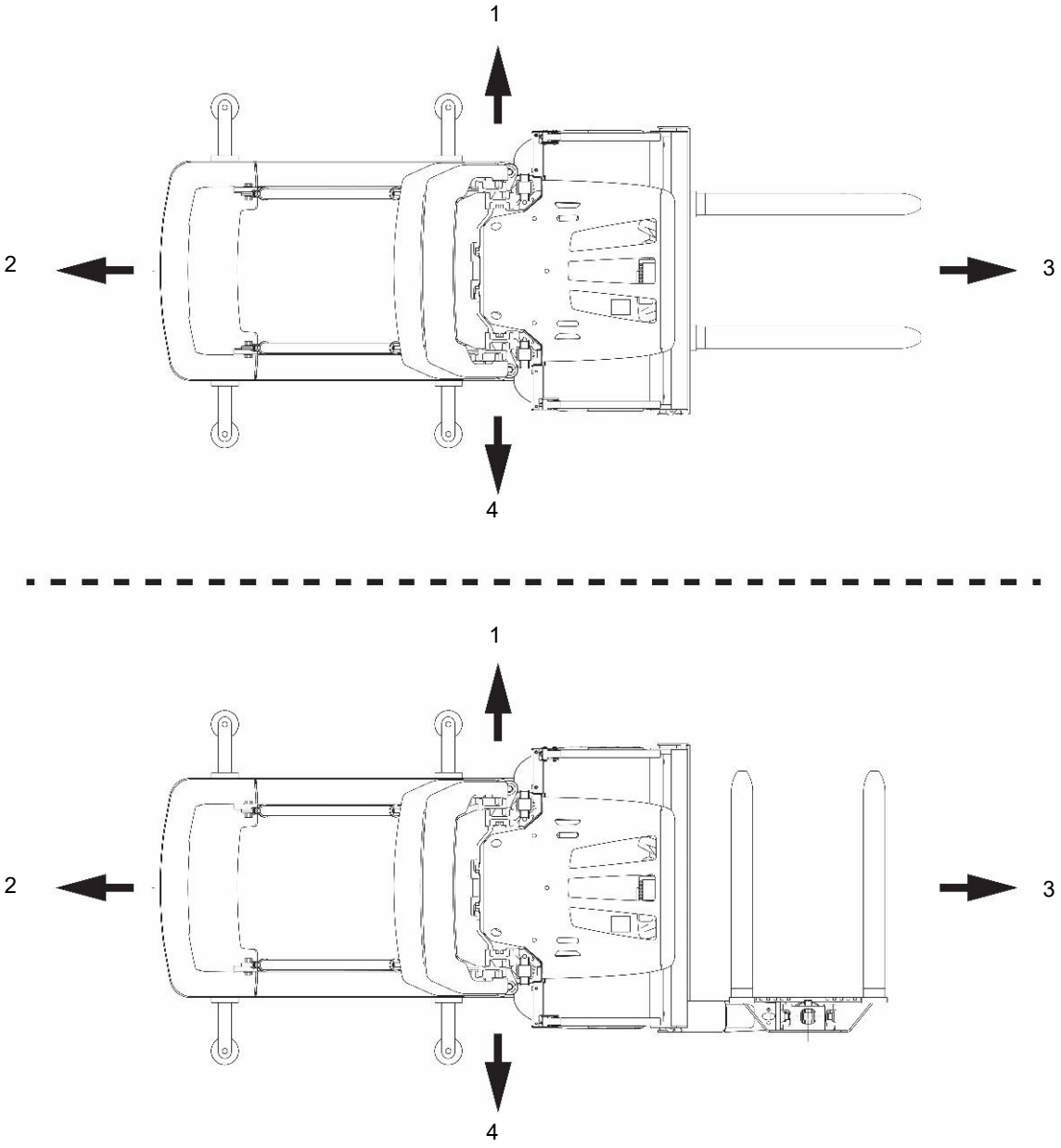
The rated capacity depends on the model and can be derived from the type designation.

➔ The following uses the EKX **5**14 as an example to indicate the information that can be derived from the type designation.

EKX 514	
EKX	Type designation
5	Series
14	Rated capacity x 100 kg ➔ The rated capacity is not generally the same as the permissible capacity. The capacity can be found on the capacity plate attached to the truck.

3 Travel direction definition

The following determinations have been made for travel direction specification:



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

4 Assemblies and Functional Description

4.1 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. A slight danger nevertheless remains for third parties.
- The emergency disconnect switch immediately disables all truck functions in hazardous situations.
- Gates on either side of the operator position interrupt all truck operations as soon as they are opened.
- Gates in the load direction disconnect all truck operations as soon as they are opened (EKS with load backrest only).
- Safety valves in the lift cylinders prevent the load handler from lowering in the event of a hydraulic system failure.
- Slack chain safety devices monitor the lift chains and report any non-tensioned "slack" chains. For example, a chain can become slack when the load handler or the operator position are attached, when the chain is loosened and/or breaks. When a slack chain safety device reports a "slack" lift chain the operator position stops lowering (see page 354).
- Mast bracing to avoid and quickly reduce mast sway (optional equipment for trucks with high masts).
- Retaining bolts to secure the raised operator position from lowering accidentally during maintenance and repair work, see page 714.

Deadman switch

When the truck is ready for operation and the gates are closed, the following truck functions will be enabled or locked when the deadman switch in the footwell of the operator position is applied.

➔ Prepare the truck for operation, see page 265.

● = "Press deadman switch at least once" version
With this version the deadman switch must be pressed at least once when the truck is made ready for operation and the gates have been closed in order to operate the truck.

- Deadman switch not pressed:
  - Steering functions are enabled.
  - The parking brake is activated (prevents the truck from accidentally rolling away).
  - Travel functions are disabled.
  - Hydraulic functions are inhibited.
- Deadman switch pressed briefly at least once:
  - Drive functions are enabled.
  - Steering functions are enabled.
  - Brake functions are enabled.
  - Hydraulic functions are enabled.

➔ When a gate has been opened and closed the deadman switch must be applied at least once to operate the industrial truck.

○ = "Press deadman switch permanently" version

With this version the deadman switch must be pressed permanently once when the truck is made ready for operation and the gates have been closed in order to operate the truck.

- Deadman switch not pressed:
  - Steering functions are enabled.
  - The parking brake is activated (prevents the truck from accidentally rolling away).
  - Travel functions are disabled.
  - Hydraulic functions are inhibited.
- Press and hold down the deadman's switch:
  - Drive functions are enabled.
  - Steering functions are enabled.
  - Brake functions are enabled.
  - Hydraulic functions are enabled.

Emergency Stop safety feature

– If an 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.

Drive system

– Upright, highly durable, maintenance-free three-phase motor without wear parts. The motor is directly connected to the single-wheel driving gear for problem-free and rapid maintenance.
– As options, there are multiple travel programs to choose from with preset accelerations and travel speeds.

Steering

– Extremely smooth steering with threephase drive system (sturdy and maintenance-free threephase motor with no wear parts).
– The steering wheel is integrated in the control panel. The position of the steered drive wheel is shown in the driver's display. The maximum steer angle is ± 90°.
– In rail guidance mode the drive wheel is set to the straight-ahead position by pressing a button. Manual steering is deactivated in this mode (○).
– When wire guidance mode is activated, the steering is assumed by the truck controller when the guide wire is detected. Manual steering is deactivated in this mode (○).

Braking system

– The operator can brake gently and wear-free by pulling back the travel control knob.
– This feeds energy into the battery (service brake).

Electronically controlled drive brake:
– The electromagnetic spring pressure brake acting on the drive motor serves as a parking brake.
– The parking brake is electrically released and actuated through spring pressure.

Electronically controlled load wheel brake (only on EKS 514-516 / EKX 514-516):
– The load wheel brake (electromagnetic spring-loaded multi-plate brake) is electrically released and actuated through spring pressure.
– Depending on the lift height, the load wheel brake acting on the front axle is only activated when the emergency disconnect switch is pressed or if the truck is set to emergency stop.

➔ Description of braking methods, see page 277.

Hydraulic system

– All hydraulic operations are controlled by a sturdy, maintenance-free AC motor with no wear parts and with a flanged low emission gear pump.
– Oil is distributed via magnetic switch valves. The varying oil requirements are controlled by the speed of the motor.
– During a lowering operation the hydraulic pump drives the motor which then acts as a generator. The energy recovered in this way is fed into the battery (regenerative lowering).
– Extremely torsion-resistant mast for high residual capacities and minimal mast sway.

Controls and displays

– Ergonomic controls ensure fatigue-free operation for sensitive application of the travel and hydraulic operations.
– Soft keys to control functions (attachment traverse, fork carriage rotate ...) and menus.
– Coloured driver's display unit displays all information of importance for the operator such as steering wheel position, overall lift, truck status reports (e.g. faults), service hours, battery capacity, time and wire-guidance status etc.
– Adjustable control panel (height and tilt).
– Non-switch two-handed operating principle for maximum safety and operating comfort. Sensors record any contact made by the operator and feed this information to the on-board computer.
– For EKS only:
  Different control panel arrangements available (○).

Electrical System

– Electronic system with wear-free sensors.
– Service laptop connection interface:
  To configure all the key truck data (limit position damping, lift cut-out, retardation and acceleration patterns, cut-outs etc.) rapidly and reliably.
  To read off the error log to analyse fault causes.
  To simulate and analyse program operations.
  Simple function extension by releasing code numbers.
– The controller is fitted with a CAN Bus and a constantly recording sensor system. All operations can be set using parameters. The controller provide smooth start-up and braking of the load in all limit positions through end position and intermediate dampers. The MOSFET three phase controller provides smooth start-up of all movements.
– Highly efficient three phase technology with energy recovery for the traction and lift motors provides high travel and lift speeds and better use of energy.
– Simultaneous main lift and auxiliary lift raise / lower (EKS 514-516 / EKX 514-516 only).
– Simultaneous main lift and auxiliary lift lower.
– Speed recording on the wheels with traction control and drive wheel wear recognition (○).

→ For traction battery options, see page 151.

Ergonomics and Comfort

– Generous entry room
– Large leg area, adjustable knee pads
– Excellent view of the load and travel lane with extremely low swivel/traverse guides and clear view masts.
– Cushioned, adjustable and folding comfort seat.
– Individual truck programs.
– Limit position / transition damping for all hydraulic functions.

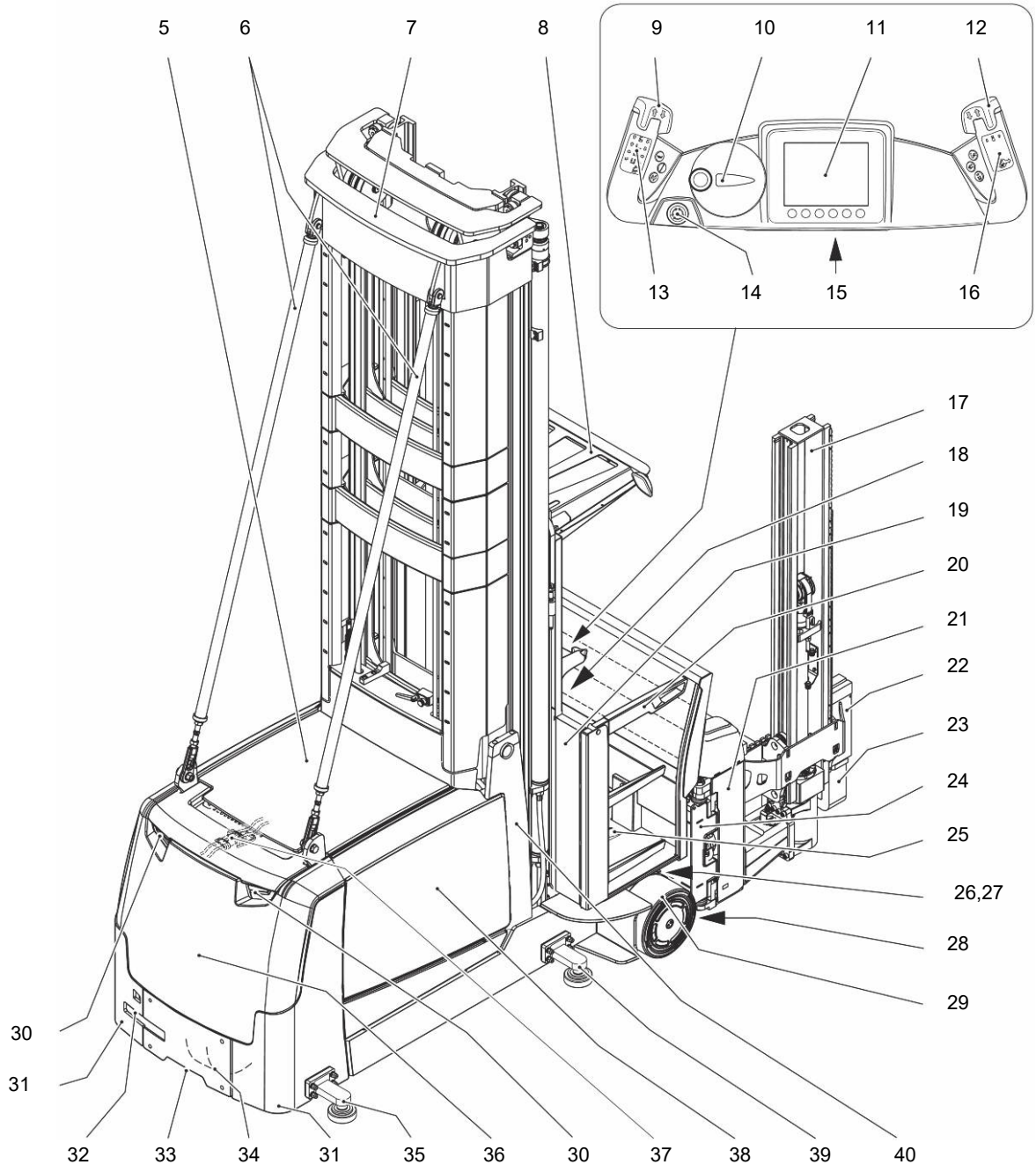
Optional Equipment

- Mechanical rail guidance.
- Wire guidance for precise aisle guidance with no physical load on components.
- Performance package (Drive Plus) for greater travel speeds.
- Performance package (Lift Plus) for greater lift speeds.
- Performance package (Speed Profil Plus) for greater attachment or telescopic fork reach speeds.
- Performance package (Capacity Plus) to increase the residual capacity.
- Faster cycles through synchronised swivel within or outside the narrow aisle.
- A range of modular telescopic forks.
- Symmetrical and asymmetrical fork positioner.
- Truck prepared to receive work platforms.
- “Workstation” comfort package with rear view mirror, panoramic mirror, workstation lighting or fan.
- Radio with CD player and MP3 interface.
- Mechanical and electrical interfaces for material flow management systems.
- Jungheinrich ISM: Information system for truck management.
- Keyless access systems via soft key, PIN code or transponder (EasyAccess).
- Cut-outs on the overhead guard (e.g. protective device, etc.).
- Modular system of lift, lower and travel cut-outs plus speed reductions.
- Modular system of attachment reach and rotary cut-outs.
- Jungheinrich Warehouse Navigation:
  - Connection of the truck to a warehouse management system via a truck terminal or scanner.
  - Direct receipt of target position in narrow aisle by the truck computer.
  - Automatic vertical positioning.
  - Automatic horizontal positioning.
  - Automatic stacking.
  - Effective twin cycles.
  - Avoidance of wrong journeys through area detection.
  - Maximum flexibility in warehouse through adaptation to existing warehouse management systems and warehouse extension.
- Transponder-based truck controller system:
  - Permanent route measurement for precise identification of all warehouse zones.
  - High degree of flexibility for various functions (end of aisle safety device, lift, lower and travel cut-outs, speed reduction)
  - Travel speed setting optimisation through floor topology.
- Integrated Personal Protection System (PPS).
- Collision protection with integrated personal protection system and collision protection system for use of several trucks in the narrow aisle.
- On-board charger.
- Weigher feature to display the load weight in the driver's display.
- Camera system.
- Rack Height Select, see description below.
- Closed driver's cab.
- Floor spot as optical warning signal.
- Emergency console.
- Fire extinguisher.

Rack Height Select (○)

– Rack Height Select can be used both to lift and lower the load as well as for stacking and retrieving.
– With Rack Height Select, the operator can select the required lift height via a keypad.
– Lifting ends automatically when the required lift height has been reached.
– Rack Height Select is designed for a range of warehouse areas with different rack heights.

4.2 Assembly Overview



Item		Description
5	●	Battery panel
6	○	Mast bracing (depending on mast height)
7	●	Mast
8	●	Overhead guard
9	●	"Hydraulic functions" control lever
10	●	Steering wheel
11	●	Control panel and driver's display
12	●	Travel control knob
13	●	Left handle for two-hand operation

Item		Description
14	●	Emergency disconnect switch
15	●	Key switch with key (under the control panel)
	○	ISM access module (under the control panel)
	○	Keypad (under the control panel)
	○	Transponder reader (under the control panel)
16	●	Right handle for two-hand operation
17	●	Auxiliary mast (EKX only)
18	●	Driver's seat
19	●	Height-adjustable operator position
20	●	Gates
21	●	Attachment/turret head (EKX only)
22	●	Fork carriage
23	●	Fork arms
24	●	Traverse pivot frame (EKX only)
	○	Telescopic table (EKX only)
25	●	Deadman button
26	○	Front sensor for wire-guidance system (not shown)
27	○	Front scanner for personal protection system (not shown)
28	○	Rail guidance wheel attachment in front of the load wheel (on either side)
29	●	Load wheel
30	●	Strobe light
31	●	Tilt safety device
32	○	Rear personal-protection-system scanner
33	○	Rear sensor for wire guidance system
34	●	Drive wheel
35	○	Drive wheel rail guidance wheel attachment (on either side)
36	●	Drive compartment cover
37	●	Battery connector
38	●	Side panel
39	○	Rail guidance wheel attachment behind the load wheel (on either side)
40	●	Truck chassis

5 Technical Specifications

The technical specification is given according to the German guideline "Type sheets for industrial trucks". Technical modifications and additions reserved.
Values indicated with *) may vary depending on the configuration of the truck (e.g. mast, etc.).

5.1 Performance data

5.1.1 Performance data of the EKX 410

	Description	EKX 410	
Q	Capacity (where D = 600 mm):		
	• Truck with standard attachment	1000	kg
	• Truck with telescopic table	1000	kg
D	Load centre distance	600	mm
	Operating mode	Lateral and front stacking truck	
	Travel speed without load (unguided)	9.0	km/h
	Travel speed with load (unguided)	9.0	km/h
	Travel speed without load (RG)	10.5	km/h
	Travel speed with load (RG)	10.5	km/h
	Travel speed without load (WG)	9.0	km/h
	Travel speed without load (WG)	9.0	km/h
	Lift speed without load	0.40*)	m/s
	Lift speed with load	0.40*)	m/s
	Lowering speed without load	0.40*)	m/s
	Lowering speed with load	0.40*)	m/s
	Aux. lift speed without load	0.30	m/s
	Aux. lift speed with load	0.30	m/s
	Aux. lift lowering speed without load	0.30	m/s
	Aux. lift lowering speed with load	0.30	m/s
	Service brake	Inversion/regenerative	
	Parking brake	Electric spring-loaded brake/ magnetic brake	
	Type of power control	Synchronous reluctance	
	Battery voltage	48 V	
	steering	Electric	

	Description	EKX 410	
	Standard attachment		
	Traverse speed without load	0.40[5)]	m/s
	Traverse speed with load	0.40[5)]	m/s
	Rotating without load	12	s/180°
	Rotating with load	12	s/180°
	Telescopic forks		
	Traverse speed without load	0.40[6)]	m/s
	Traverse speed with load	0.40[6)]	m/s

FF: Free ranging
RG: Rail Guidance
WG: Wire guidance

* Depending on mast version

5) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

6) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

5.1.2 Performance data of the EKX 412

	Description	EKX 412	
	Capacity (where D = 600 mm)		
Q	• Truck with standard attachment	1200	kg
	• Truck with telescopic table	1200	kg
D	Load centre distance	600	mm
	Operating mode	Lateral and front stacking truck	
	Travel speed without load (unguided)	9.0	km/h
	Travel speed with load (unguided)	9.0	km/h
	Travel speed without load (RG)	10.5	km/h
	Travel speed with load (RG)	10.5	km/h
	Travel speed without load (WG)	9.0	km/h
	Travel speed without load (WG)	9.0	km/h
	Lift speed without load	0.40[*)]	m/s
	Lift speed with load	0.40[*)]	m/s
	Lowering speed without load	0.40[*)]	m/s
	Lowering speed with load	0.40[*)]	m/s
	Aux. lift speed without load	0.30	m/s
	Aux. lift speed with load	0.30	m/s
	Aux. lift lowering speed without load	0.30	m/s
	Aux. lift lowering speed with load	0.30	m/s
	Service brake	Inversion/regenerative	
	Parking brake	Electric spring-loaded brake/ magnetic brake	
	Type of power control	Synchronous reluctance	
	Battery voltage	48 V	
	steering	Electric	
	Standard attachment		
	Traverse speed without load	0.40[5)]	m/s
	Traverse speed with load	0.40[5)]	m/s
	Rotating without load	12	s/180°
	Rotating with load	12	s/180°
	Telescopic forks		
	Traverse speed without load	0.40[6)]	m/s
	Traverse speed with load	0.40[6)]	m/s

FF: Free ranging
RG: Rail Guidance
WG: Wire guidance

* Depending on mast version

5) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

6) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

5.1.3 EKS 514 and EKX 514 performance data

	Description	EKS 514	EKX 514	
Q	Capacity (where D = 600 mm)			
	• Truck with standard attachment	1400	1400	kg
	• Truck with telescopic table	--	1200	kg
D	Load centre distance	600	600	mm
	Operating mode	Order picker	Three-way truck	
	Travel speed without load (unguided)	9.0	9.0	km/h
	Travel speed with load (unguided)	9.0	9.0	km/h
	Travel speed without load (RG)	10.5	10.5	km/h
	Travel speed with load (RG)	10.5	10.5	km/h
	Travel speed without load (WG)	9.0	9.0	km/h
	Travel speed without load (WG)	9.0	9.0	km/h
	Lift speed without load	0.45[*)]	0.45[*)]	m/s
	Lift speed with load	0.45[*)]	0.45[*)]	m/s
	Lowering speed without load	0.48[*)]	0.48[*)]	m/s
	Lowering speed with load	0.48[*)]	0.48[*)]	m/s
	Aux. lift speed without load	--	0.35	m/s
	Aux. lift speed with load	--	0.35	m/s
	Aux. lift lowering speed without load	--	0.34	m/s
	Aux. lift lowering speed with load	--	0.34	m/s
	Combined raising of main and aux. lift	--	0.90[*)]	m/s
	Service brake	Inversion/regenerative		
	Parking brake	Electric spring-loaded brake/ magnetic brake		
	Traction controller type	Synchronous reluctance		
	Battery voltage	80 V		
	steering	Electric		
	Standard attachment			
	Traverse speed without load	--	0.40[5)]	m/s
	Traverse speed with load	--	0.40[5)]	m/s
	Rotating without load	--	12	s/180°
	Rotating with load	--	12	s/180°
	Telescopic forks			
	Traverse speed without load	--	0.40[6)]	m/s
	Traverse speed with load	--	0.40[6)]	m/s

FF: Free ranging
RG: Rail Guidance
WG: Wire guidance

* Depending on mast version

5) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

6) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

5.1.4 EKS 516k and EKX 516k performance data

	Description	EKS 516k	EKX 516k	
Q	Capacity (where D = 600 mm)			
	• Truck with standard attachment	1600	1600	kg
	• Truck with telescopic table	--	1200	kg
D	Load centre distance	600	600	mm
	Operating mode	Order picker	Three-way truck	
	Travel speed without load (unguided)	9.0	9.0	km/h
	Travel speed with load (unguided)	9.0	9.0	km/h
	Travel speed without load (RG)	10.5[1)]	10.5[1)]	km/h
	Travel speed with load (RG)	10.5[1)]	10.5[1)]	km/h
	Travel speed without load (WG)	9.0[2)]	9.0[2)]	km/h
	Travel speed without load (WG)	9.0[2)]	9.0[2)]	km/h
	Lift speed without load	0.50[3,*)]	0.50[3,*)]	m/s
	Lift speed with load	0.50[3,*)]	0.50[3,*)]	m/s
	Lowering speed without load	0.50[*)]	0.50[*)]	m/s
	Lowering speed with load	0.50[*)]	0.50[*)]	m/s
	Aux. lift speed without load	--	0.40[4)]	m/s
	Aux. lift speed with load	--	0.40[4)]	m/s
	Aux. lift lowering speed without load	--	0.40	m/s
	Aux. lift lowering speed with load	--	0.40	m/s
	Combined raising of main and aux. lift	--	0.90[*)]	m/s
	Service brake	Inversion/regenerative		
	Parking brake	Electric spring-loaded brake/ magnetic brake		
	Traction controller type	Synchronous reluctance		
	Battery voltage	80 V		
	steering	Electric		
	Standard attachment			
	Traverse speed without load	--	0.40[5)]	m/s
	Traverse speed with load	--	0.40[5)]	m/s
	Rotating without load	--	12	s/180°
	Rotating with load	--	12	s/180°
	Telescopic forks			
	Traverse speed without load	--	0.40[6)]	m/s
	Traverse speed with load	--	0.40[6)]	m/s

FF: Free ranging
RG: Rail Guidance
WG: Wire guidance

* Depending on mast version

1) Available with optional "Drive Plus (rail-guided truck)" up to a maximum of 12 km/h
2) Available with optional "Drive Plus (wire-guided truck)" up to a maximum of 10,5 km/h
3) Available with optional "Lift Plus (main lift)" up to a maximum of 0,60 m/s
4) Available with optional "Lift Plus (auxiliary lift)" up to a maximum of 0,50 m/s
5) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)
6) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

5.1.5 EKS 516 and EKX 516 performance data

	Description	EKS 516	EKX 516	
Q	Capacity (where D = 600 mm)			
	• Truck with standard attachment	1600	1600	kg
	• Truck with telescopic table	--	1200	kg
D	Load centre distance	600	600	mm
	Operating mode	Order picker	Three-way truck	
	Travel speed without load (unguided)	9.0	9.0	km/h
	Travel speed with load (unguided)	9.0	9.0	km/h
	Travel speed without load (RG)	10.5[1)]	10.5[1)]	km/h
	Travel speed with load (RG)	10.5[1)]	10.5[1)]	km/h
	Travel speed without load (WG)	9.0[2)]	9.0[2)]	km/h
	Travel speed without load (WG)	9.0[2)]	9.0[2)]	km/h
	Lift speed without load	0.50[3,*)]	0.50[3,*)]	m/s
	Lift speed with load	0.50[3,*)]	0.50[3,*)]	m/s
	Lowering speed without load	0.50[*)]	0.50[*)]	m/s
	Lowering speed with load	0.50[*)]	0.50[*)]	m/s
	Aux. lift speed without load	--	0.40[4)]	m/s
	Aux. lift speed with load	--	0.40[4)]	m/s
	Aux. lift lowering speed without load	--	0.40	m/s
	Aux. lift lowering speed with load	--	0.40	m/s
	Combined raising of main and aux. lift	--	0.90[*)]	m/s
	Service brake	Inversion/regenerative		
	Parking brake	Electric spring-loaded brake/ magnetic brake		
	Traction controller type	Synchronous reluctance		
	Battery voltage	80 V		
	steering	Electric		
	Standard attachment			
	Traverse speed without load	--	0.40[5)]	m/s
	Traverse speed with load	--	0.40[5)]	m/s
	Rotating without load	--	12	s/180°
	Rotating with load	--	12	s/180°
	Telescopic forks			
	Traverse speed without load	--	0.40[6)]	m/s
	Traverse speed with load	--	0.40[6)]	m/s

FF: Free ranging
RG: Rail Guidance
WG: Wire guidance

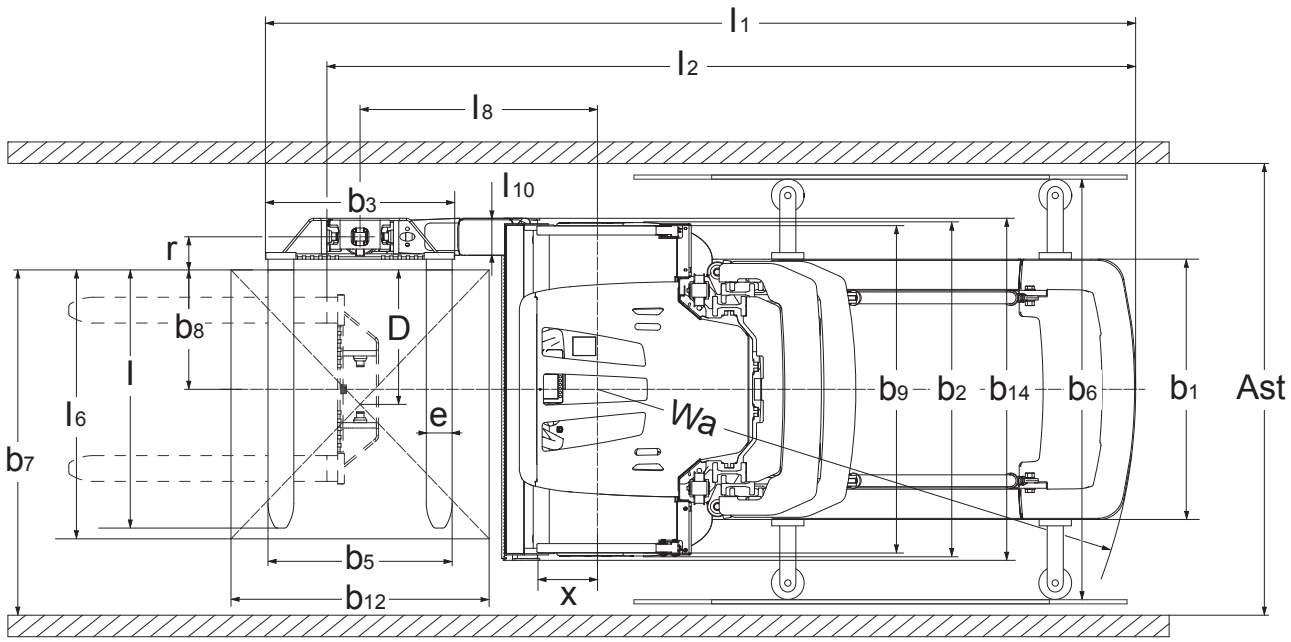
* Depending on mast version

1) Available with optional "Drive Plus (rail-guided truck)" up to a maximum of 12 km/h
2) Available with optional "Drive Plus (wire-guided truck)" up to a maximum of 10,5 km/h
3) Available with optional "Lift Plus (main lift)" up to a maximum of 0,60 m/s
4) Available with optional "Lift Plus (auxiliary lift)" up to a maximum of 0,50 m/s
5) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)
6) Available with optional "Speed Profil Plus" up to a maximum of 0,50 m/s (lift height dependent 0,40 m/s to 0,50 m/s)

5.2 Dimensions (as per data plate)

➔ The dimensions of the delivered truck can be found on the data plate and on the supplied data sheet. The mast dimensions specified below relate to a truck with the mast specified below the table.

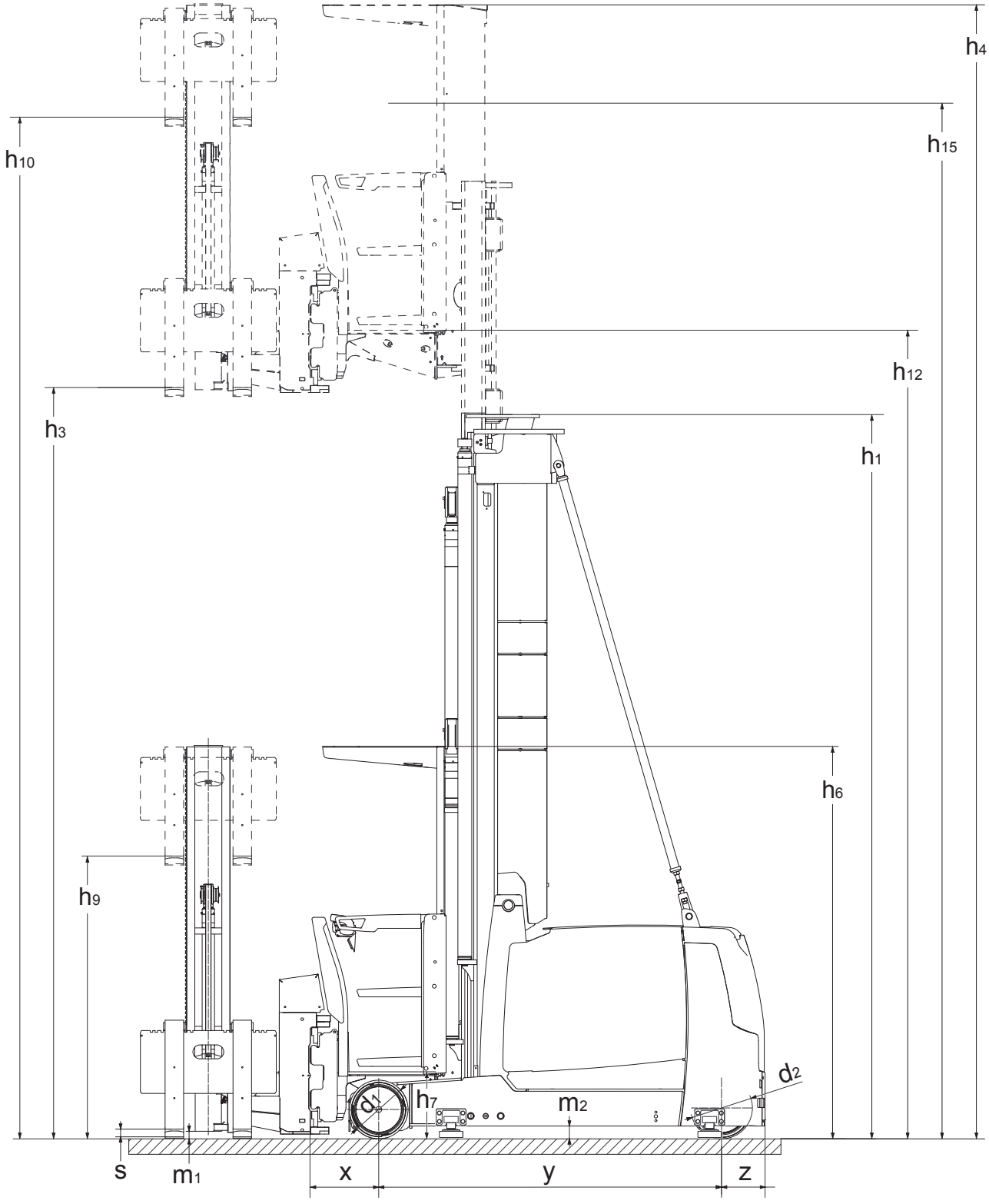
5.2.1 Dimensions of the EKX 410 with standard attachment



	Description	EKX 410	
D	Load centre distance	600	mm
b_1	Overall width	1210	mm
b_2		1450	mm
--	Fork carriage ISO 2328, Class/type A, B	2/B	--
b_3	Fork carriage width	880	mm
b_5	Width across forks	856	mm
b_6	Width across guide rollers	1600	mm
b_7	Traverse, lateral	1300	mm
b_8	Traverse, lateral from centre of truck	480	mm
b_9	Outer operator position width	1440	mm
b_{10}	Track, front (not shown)	1106	mm
b_{12}	Pallet width	1200	mm
b_{14}	Swivel-traverse frame width	1440	mm
e	Width of fork	120	mm
l	Length of fork	1200	mm
l_1	Overall length without load	3665	mm
l_2	Length, including fork shank	3369	mm

	Description	EKX 410	
l_6	Pallet length	1200	mm
l_8	Fork pivot point distance	1103	mm
l_8 - x	Fork pivot point - toothed rack distance	653	mm
l_{10}	Attachment/turret head width	172*)	mm
r	Forks swivel point - fork shank distance	144	mm
Ast	Working width for pallet 1200 mm x 1200 mm	1640	mm
Wa	Turning radius	2122	mm
x	Load distance	450	mm

* Special Build: l_{10} = 190 mm

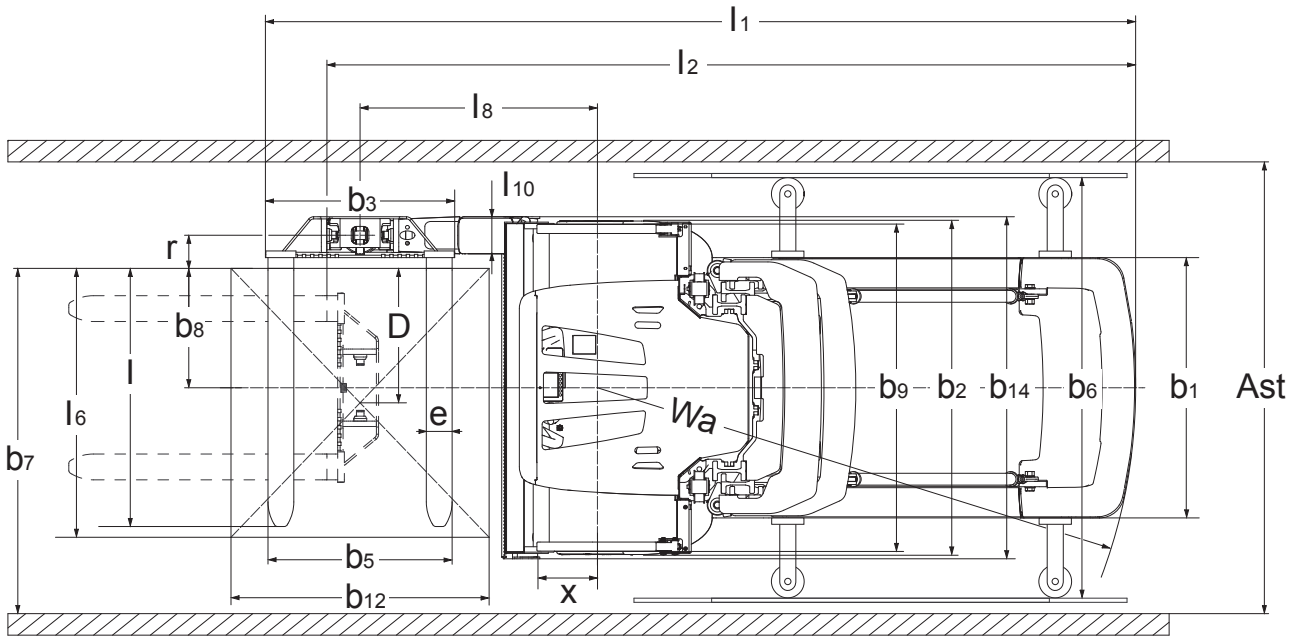


	Description	EKX 410	
x	Load distance	450	mm
y	Wheelbase	1807	mm
z	Centre of drive wheel/counterweight (Truck geometry)	320	mm
h_1	Collapsed mast height	2850	mm
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	mm

	Description	EKX 410	
h_3	Lift	3500[1)]	mm
h_4	Mast height when extended	6050	mm
h_6	Overhead guard height	2550	mm
h_7	Sit-down/standing height	430	mm
h_9	Auxiliary lift	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	5280[1)]	mm
h_{12}	Platform height, raised	3930[1)]	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	mm
m_1	Ground clearance under mast	80	mm
m_2	Ground clearance, centre wheelbase	80	mm
d_1	Load wheel diameter	see page 88	
d_2	Drive wheel diameter		
s	Fork thickness	40	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	mm
--	Clear operator position entry width	490	mm
--	Lowest position top of fork (s + 25 mm)	65	mm

1) EKX 410 with 3500 - telescopic mast (ZT mast)

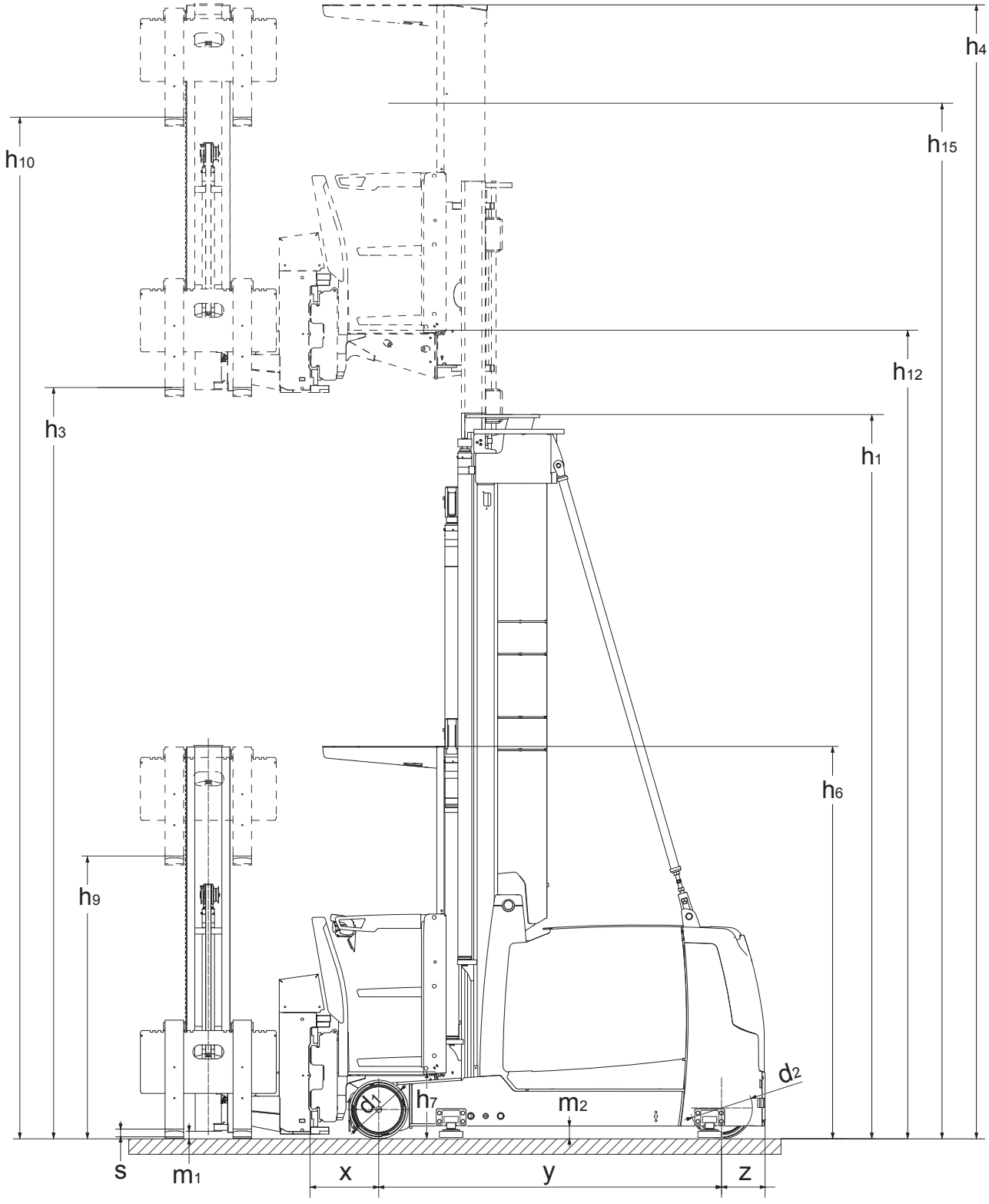
5.2.2 Dimensions of the EKX 412 with standard attachment



	Description	EKX 412	
D	Load centre distance	600	mm
b_1	Overall width	1210	mm
b_2		1450	mm
--	Fork carriage ISO 2328, Class/type A, B	2/B	--
b_3	Fork carriage width	880	mm
b_5	Width across forks	856	mm
b_6	Width across guide rollers	1600	mm
b_7	Traverse, lateral	1300	mm
b_8	Traverse, lateral from centre of truck	480	mm
b_9	Outer operator position width	1440	mm
b_{10}	Track, front (not shown)	1106	mm
b_{12}	Pallet width	1200	mm
b_{14}	Swivel-traverse frame width	1440	mm
e	Width of fork	120	mm
l	Length of fork	1200	mm
l_1	Overall length without load	3665	mm
l_2	Length, including fork shank	3369	mm
l_6	Pallet length	1200	mm
l_8	Fork pivot point distance	1103	mm
l_8 - x	Fork pivot point - toothed rack distance	653	mm
l_{10}	Attachment/turret head width	172*)	mm

	Description	EKX 412	
r	Forks swivel point - fork shank distance	144	mm
Ast	Working width for pallet 1200 mm x 1200 mm	1640	mm
Wa	Turning radius	2122	mm
x	Load distance	450	mm

* Special Build: l_{10} = 190 mm

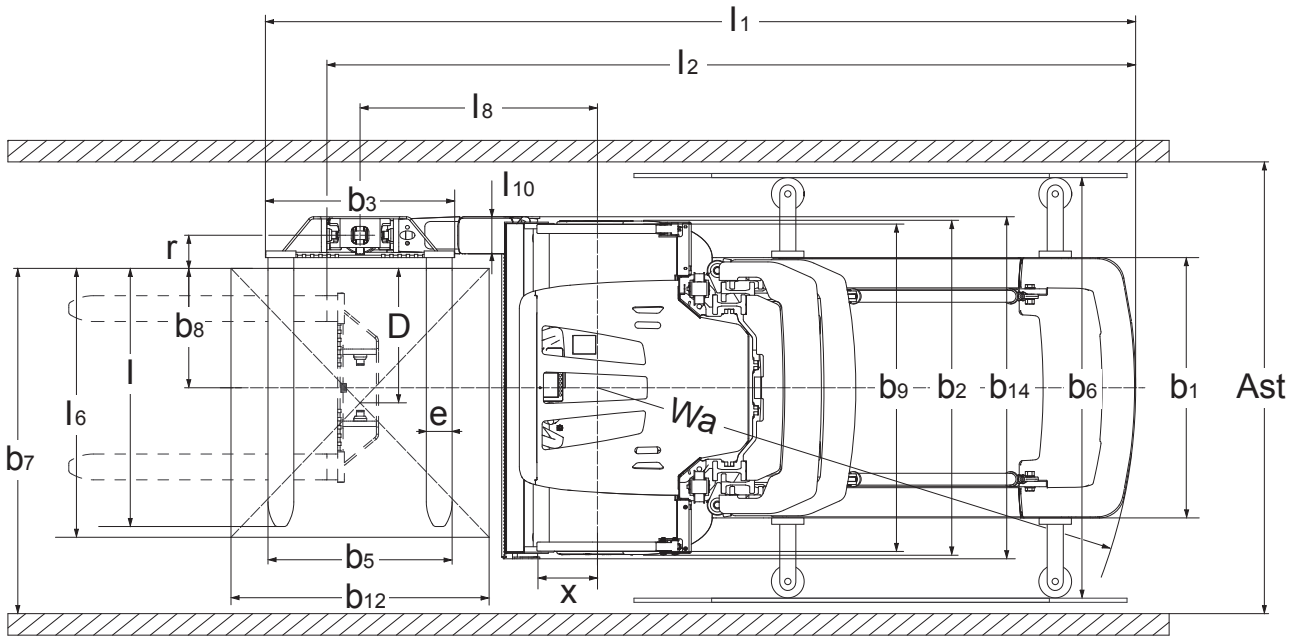


	Description	EKX 412	
x	Load distance	450	mm
y	Wheelbase	1807	mm
z	Centre of drive wheel/counterweight (Truck geometry)	320	mm
h_1	Collapsed mast height	2850	mm
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	mm

	Description	EKX 412	
h_3	Lift	3500[1)]	mm
h_4	Mast height when extended	6050	mm
h_6	Overhead guard height	2550	mm
h_7	Sit-down/standing height	430	mm
h_9	Auxiliary lift	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	5280[1)]	mm
h_{12}	Platform height, raised	3930[1)]	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	mm
m_1	Ground clearance under mast	80	mm
m_2	Ground clearance, centre wheelbase	80	mm
d_1	Load wheel diameter	see page 88	
d_2	Drive wheel diameter		
s	Fork thickness	40	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	mm
--	Clear operator position entry width	490	mm
--	Lowest position top of fork (s + 25 mm)	65	mm

1) EKX 412 with 3500 - telescopic mast (ZT mast)

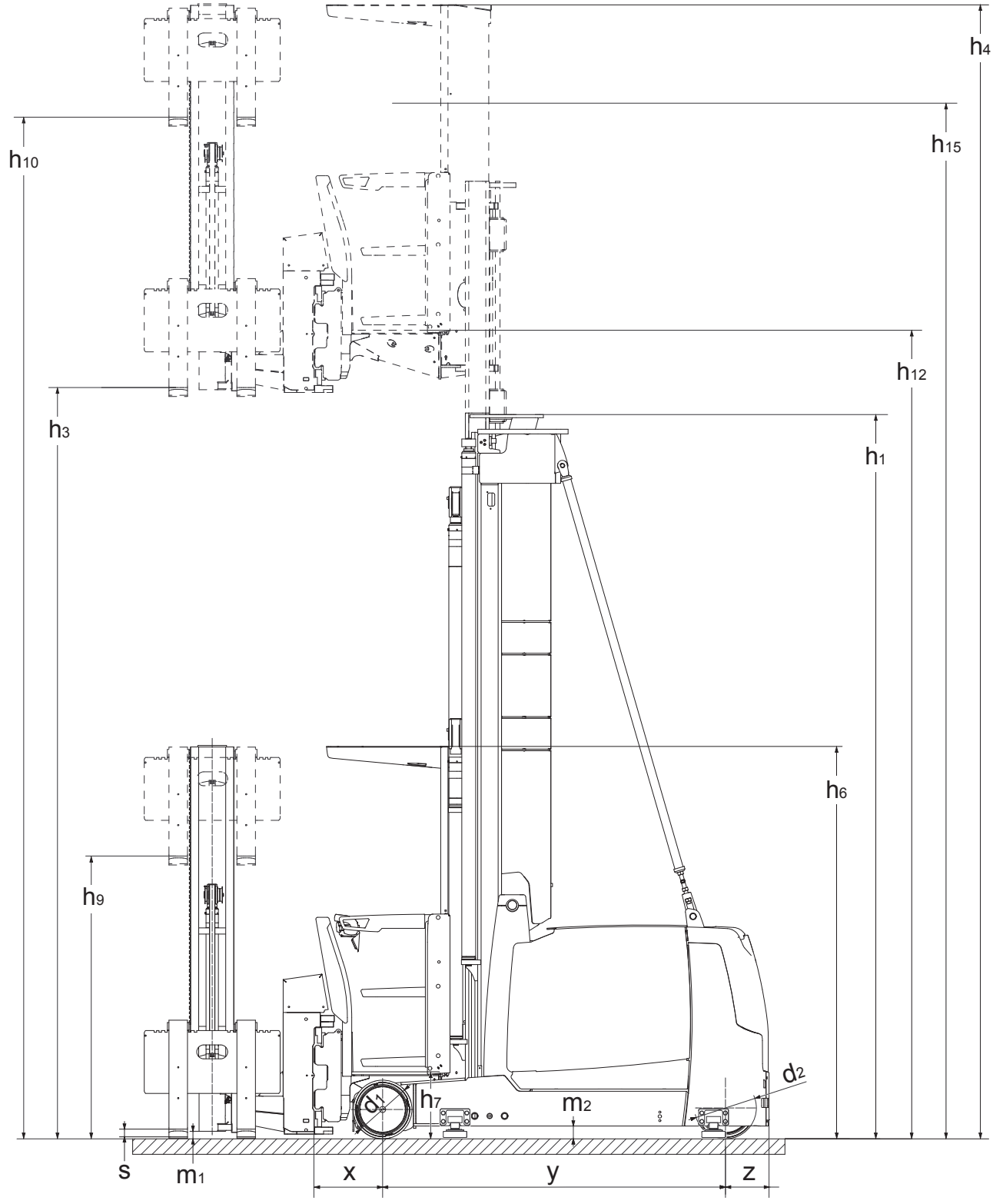
5.2.3 EKS 514 / EKX 514 dimensions with standard attachment



	Description	EKS 514	EKX 514	
D	Load centre distance	600	600	mm
b_1	Overall width	1210	1210	mm
b_2		1450	1450	mm
--	Fork carriage ISO 2328, Class/type A, B	2/B	2/B	--
b_3	Fork carriage width	880	880	mm
b_5	Width across forks	856	856	mm
b_6	Width across guide rollers	1640	1640	mm
b_7	Traverse, lateral	--	1300	mm
b_8	Traverse, lateral from centre of truck	--	480	mm
b_9	Outer operator position width	1440	1440	mm
b_{10}	Track, front (not shown)	1258	1258	mm
b_{12}	Pallet width	1200	1200	mm
b_{14}	Swivel-traverse frame width	--	1440	mm
e	Width of fork	120	120	mm
l	Length of fork	1200	1200	mm
l_1	Overall length without load	3665	3665	mm
l_2	Length, including fork shank	3380	3380	mm
l_6	Pallet length	1200	1200	mm
l_8	Fork pivot point distance	--	1103	mm
l_8 - x	Fork pivot point - toothed rack distance	--	658	mm
l_{10}	Attachment/turret head width	172*)	172*)	mm

	Description	EKS 514	EKX 514	
r	Forks swivel point - fork shank distance	--	154	mm
Ast	Working width for pallet 1200 mm x 1200 mm	1640	1640	mm
Wa	Turning radius	2122	2122	mm
x	Load distance	445	445	mm

* Special Build: l_{10} = 190 mm

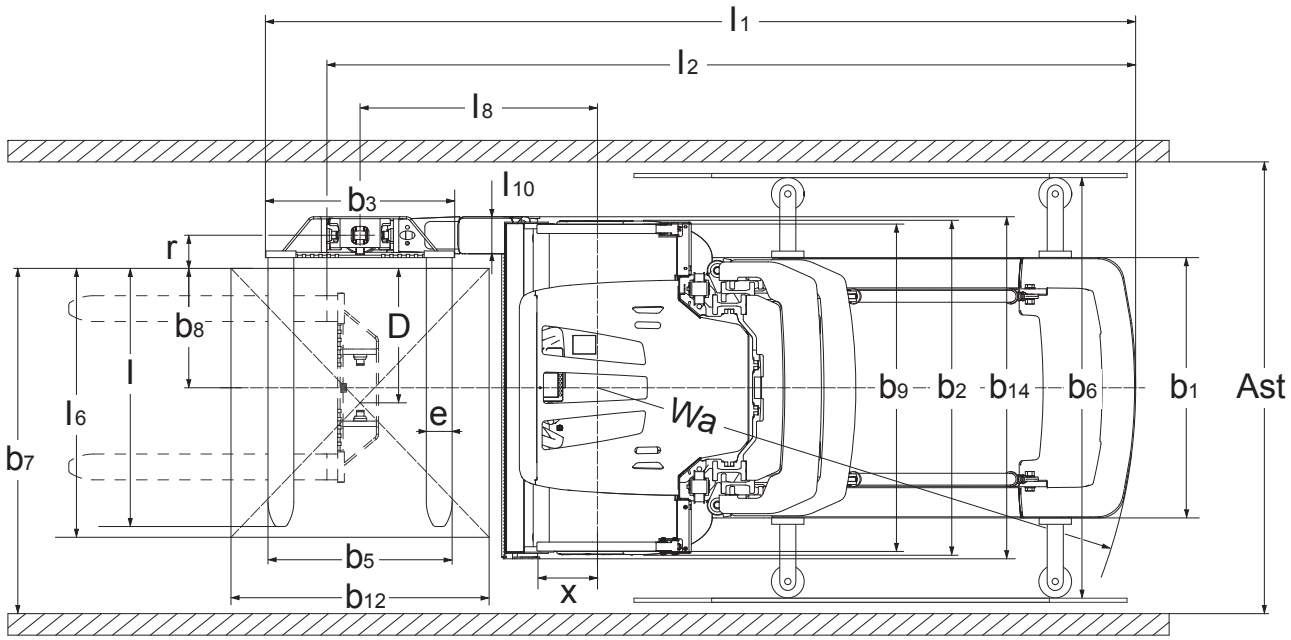


	Description	EKS 514	EKX 514	
x	Load distance	445	445	mm
y	Wheelbase	1840	1840	mm
z	Centre of drive wheel/counterweight (Truck geometry)	282	282	mm
h_1	Collapsed mast height	2955	2955	mm

	Description	EKS 514	EKX 514	
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	--	mm
h_3	Lift	3500[1)]	3500[2)]	mm
h_4	Mast height when extended	6050	6050	mm
h_6	Overhead guard height	2550	2550	mm
h_7	Sit-down/standing height	430	430	mm
h_9	Auxiliary lift	--	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	--	5280[2)]	mm
	Overall lift EKS (h_3)	3500[1)]	--	mm
h_{12}	Platform height, raised	3930[1)]	3930[2)]	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	5530[2)]	mm
m_1	Ground clearance under mast	80	80	mm
m_2	Ground clearance, centre wheelbase	80	80	mm
d_1	Load wheel diameter	see page 88		
d_2	Drive wheel diameter			
s	Fork thickness	50	50	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	2100	mm
--	Clear operator position entry width	490	490	mm
--	Lowest position top of fork (s + 25 mm)	75	75	mm

1) EKS 514 with 3500 - telescopic mast (ZT mast)
2) EKX 514 with 3500 - telescopic mast (ZT mast)

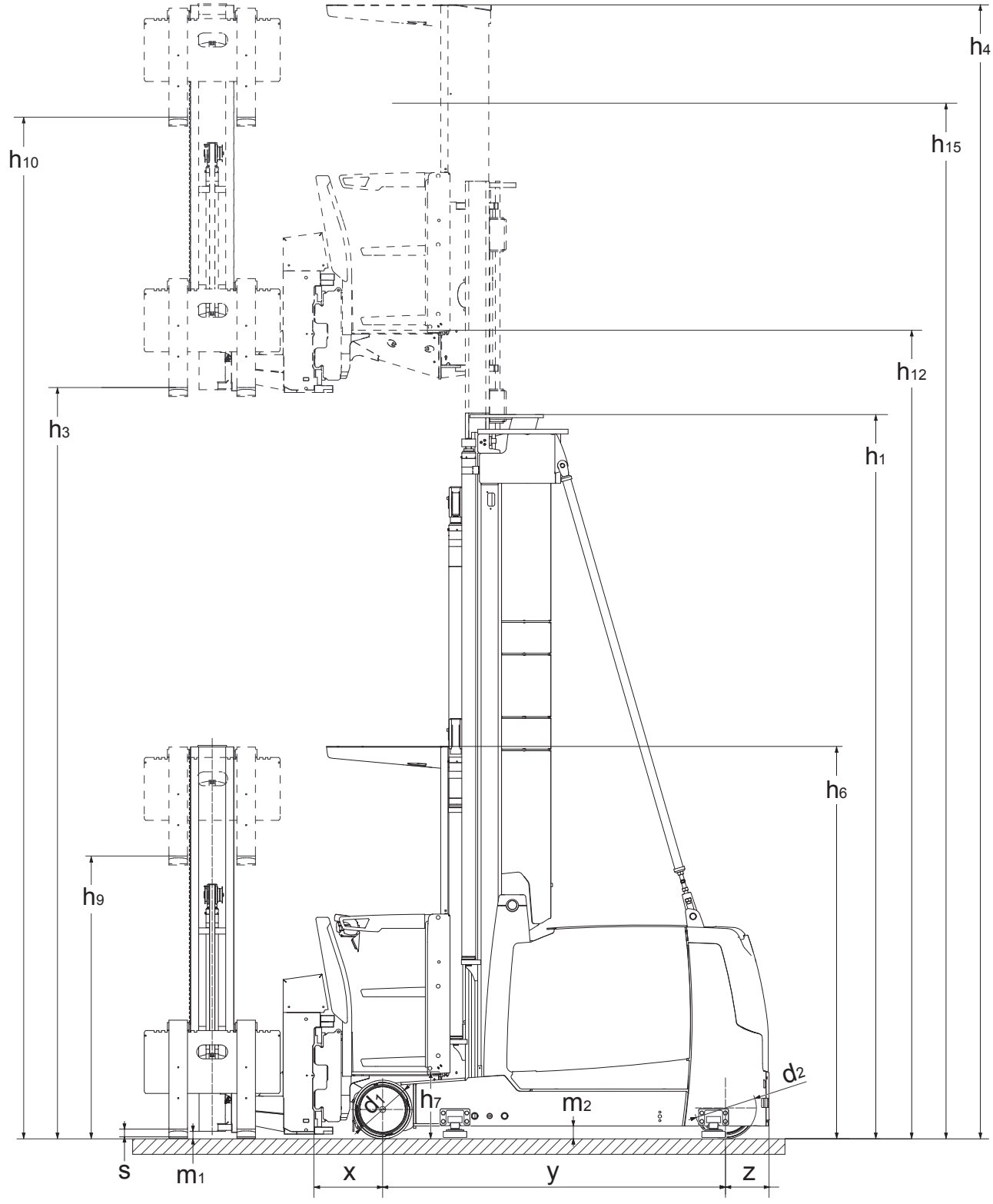
5.2.4 EKS 516k / EKX 516k dimensions with standard attachment



	Description	EKS 516k	EKX 516k	
D	Load centre distance	600	600	mm
b_1	Overall width	1210	1210	mm
b_2		1450	1450	mm
--	Fork carriage ISO 2328, Class/type A, B	2/B	2/B	--
b_3	Fork carriage width	880	880	mm
b_5	Width across forks	856	856	mm
b_6	Width across guide rollers	1640	1640	mm
b_7	Traverse, lateral	--	1300	mm
b_8	Traverse, lateral from centre of truck	--	480	mm
b_9	Outer operator position width	1440	1440	mm
b_{10}	Track, front (not shown)	1258	1258	mm
b_{12}	Pallet width	1200	1200	mm
b_{14}	Swivel-traverse frame width	--	1440	mm
e	Width of fork	120	120	mm
l	Length of fork	1200	1200	mm
l_1	Overall length without load	3775	3775	mm
l_2	Length, including fork shank	3490	3490	mm
l_6	Pallet length	1200	1200	mm
l_8	Fork pivot point distance	--	1103	mm
l_8 - x	Fork pivot point - toothed rack distance	--	658	mm
l_{10}	Attachment/turret head width	172*)	172*)	mm

	Description	EKS 516k	EKX 516k	
r	Forks swivel point - fork shank distance	--	154	mm
Ast	Working width for pallet 1200 mm x 1200 mm	1640	1640	mm
Wa	Turning radius	2232	2232	mm
x	Load distance	445	445	mm

* Special Build: l_{10} = 190 mm

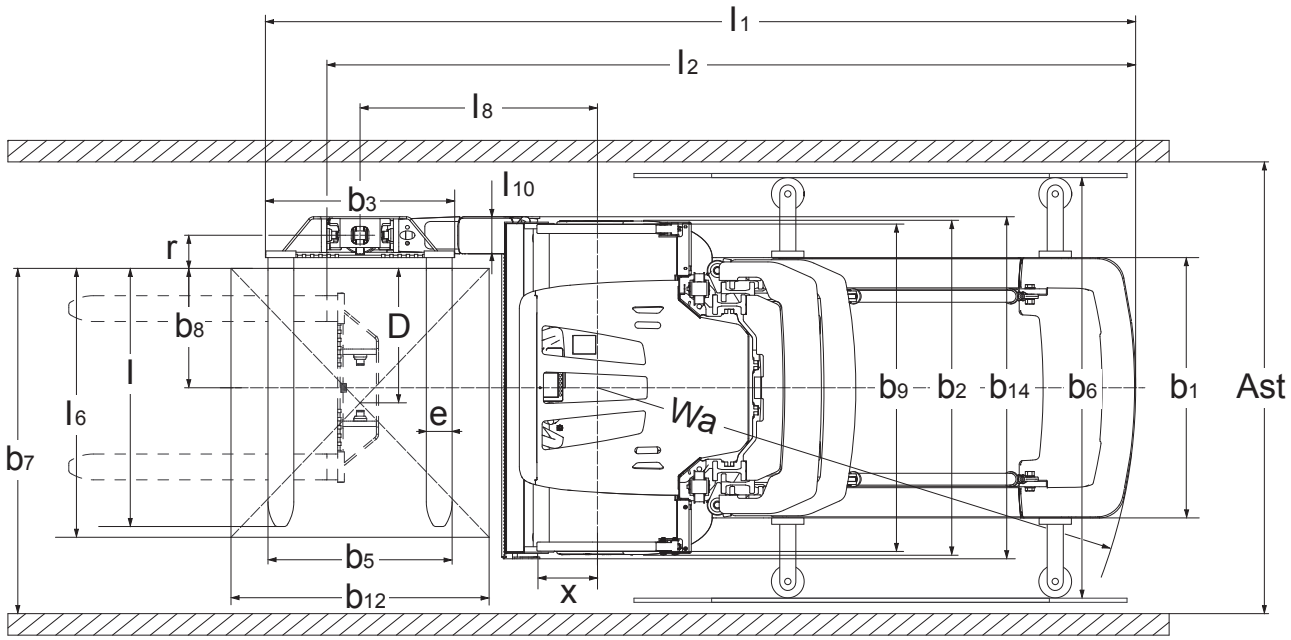


	Description	EKS 516k	EKX 516k	
x	Load distance	445	445	mm
y	Wheelbase	1950	1950	mm
z	Centre of drive wheel/counterweight (Truck geometry)	282	282	mm
h_1	Collapsed mast height	2955	2955	mm

	Description	EKS 516k	EKX 516k	
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	--	mm
h_3	Lift	3500[1)]	3500[2)]	mm
h_4	Mast height when extended	6050	6050	mm
h_6	Overhead guard height	2550	2550	mm
h_7	Sit-down/standing height	430	430	mm
h_9	Auxiliary lift	--	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	--	5280[2)]	mm
	Overall lift EKS (h_3)	3500[1)]	--	mm
h_{12}	Platform height, raised	3930[1)]	3930[2)]	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	5530[2)]	mm
m_1	Ground clearance under mast	80	80	mm
m_2	Ground clearance, centre wheelbase	80	80	mm
d_1	Load wheel diameter	see page 88		
d_2	Drive wheel diameter			
s	Fork thickness	50	50	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	2100	mm
--	Clear operator position entry width	490	490	mm
--	Lowest position top of fork (s + 25 mm)	75	75	mm

1) EKS 516k with 3500 - telescopic mast (ZT mast)
2) EKX 516k with 3500 - telescopic mast (ZT mast)

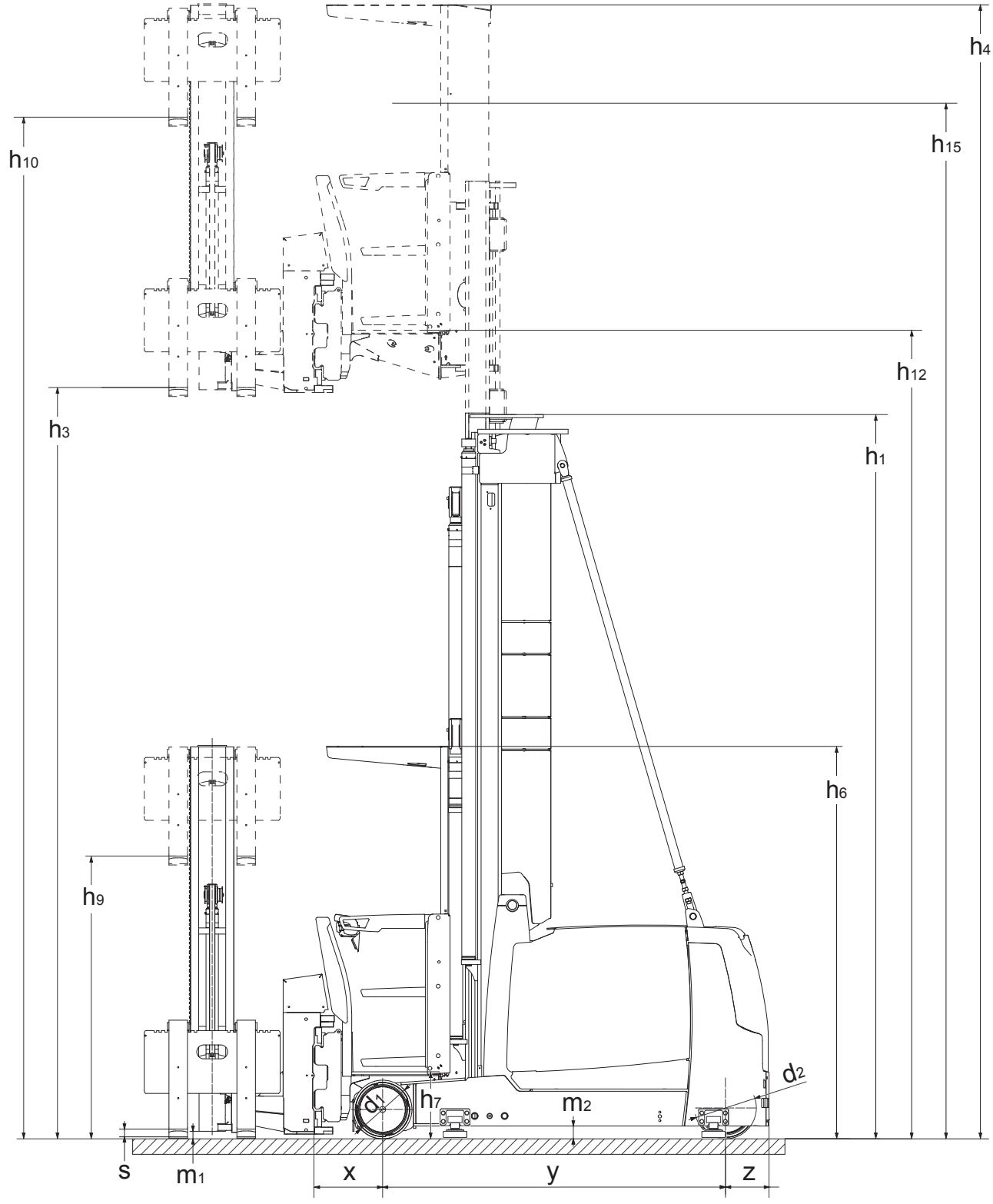
5.2.5 EKS 516 / EKX 516 dimensions with standard attachment



	Description	EKS 516	EKX 516	
D	Load centre distance	600	600	mm
b_1	Overall width	1210	1210	mm
b_2		1450	1450	mm
--	Fork carriage ISO 2328, Class/type A, B	2/B	2/B	--
b_3	Fork carriage width	880	880	mm
b_5	Width across forks	856	856	mm
b_6	Width across guide rollers	1640	1640	mm
b_7	Traverse, lateral	--	1300	mm
b_8	Traverse, lateral from centre of truck	--	480	mm
b_9	Outer operator position width	1440	1440	mm
b_{10}	Track, front (not shown)	1258	1258	mm
b_{12}	Pallet width	1200	1200	mm
b_{14}	Swivel-traverse frame width	--	1440	mm
e	Width of fork	120	120	mm
l	Length of fork	1200	1200	mm
l_1	Overall length without load	4045	4045	mm
l_2	Length, including fork shank	3760	3760	mm
l_6	Pallet length	1200	1200	mm
l_8	Fork pivot point distance	--	1103	mm
l_8 - x	Fork pivot point - toothed rack distance	--	658	mm
l_{10}	Attachment/turret head width	172*)	172*)	mm

	Description	EKS 516	EKX 516	
r	Forks swivel point - fork shank distance	--	154	mm
Ast	Working width for pallet 1200 mm x 1200 mm	1640	1640	mm
Wa	Turning radius	2502	2502	mm
x	Load distance	445	445	mm

* Special Build: l_{10} = 190 mm

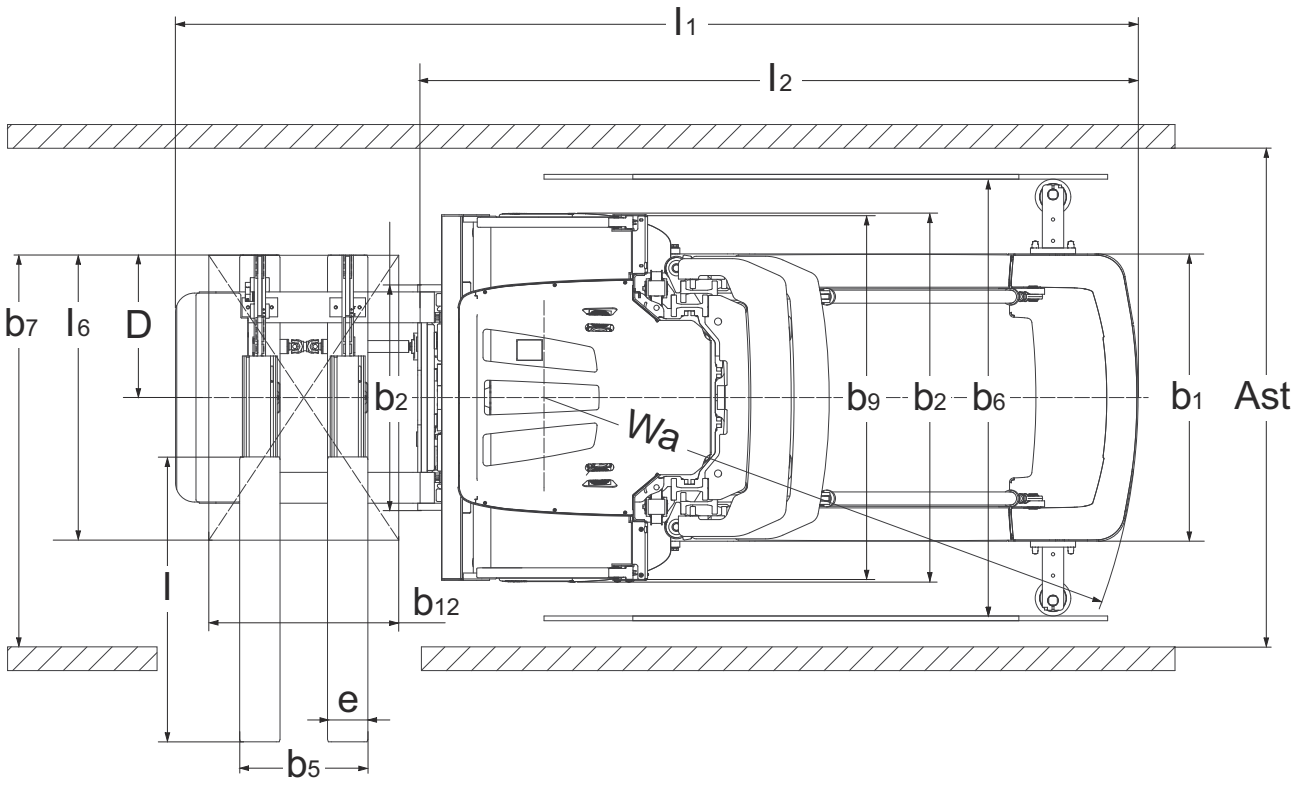


	Description	EKS 516	EKX 516	
x	Load distance	445	445	mm
y	Wheelbase	2220	2220	mm
z	Centre of drive wheel/counterweight (Truck geometry)	282	282	mm
h_1	Collapsed mast height	2955	2955	mm

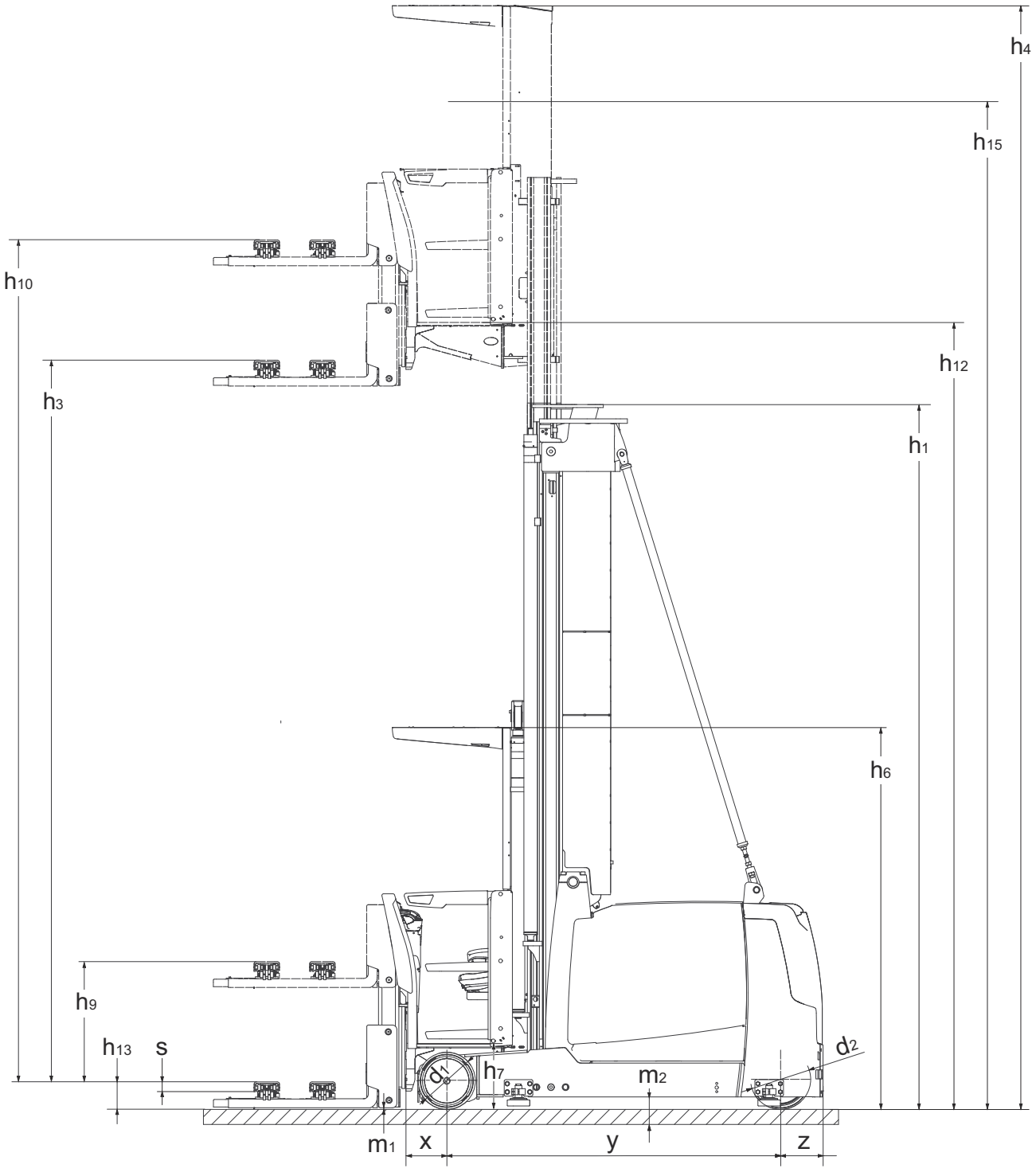
	Description	EKS 516	EKX 516	
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	--	mm
h_3	Lift	3500[1)]	3500[2)]	mm
h_4	Mast height when extended	6050	6050	mm
h_6	Overhead guard height	2550	2550	mm
h_7	Sit-down/standing height	430	430	mm
h_9	Auxiliary lift	--	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	--	5280[2)]	mm
	Overall lift EKS (h_3)	3500[1)]	--	mm
h_{12}	Platform height, raised	3930[1)]	3930[2)]	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	5530[2)]	mm
m_1	Ground clearance under mast	80	80	mm
m_2	Ground clearance, centre wheelbase	80	80	mm
d_1	Load wheel diameter	see page 88		
d_2	Drive wheel diameter			
s	Fork thickness	50	50	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	2100	mm
--	Clear operator position entry width	490	490	mm
--	Lowest position top of fork (s + 25 mm)	75	75	mm

1) EKS 516 with 3500 - telescopic mast (ZT mast)
2) EKX 516 with 3500 - telescopic mast (ZT mast)

5.2.6 Dimensions of the EKX 410 and EKX 412 with telescopic table (TG)



	Description	EKX 410	EKX 412	
D	Load centre distance	600	600	mm
b_1	Overall width	1210	1210	mm
b_2		1450	1450	mm
b_5	Width across forks	540	540	mm
b_6	Width across guide rollers	1600	1600	mm
b_7	Traverse, lateral	1650	1650	mm
b_9	Outer operator position width	1440	1440	mm
b_{10}	Track, front (not shown)	1106	1106	mm
b_{12}	Pallet width	800	800	mm
e	Width of telescopic fork	170	170	mm
l	Length of telescopic fork	1200	1200	mm
l_1	Overall length without load	3665	3665	mm
l_2	Length, including fork shank	2655	2655	mm
l_6	Pallet length	1200	1200	mm
Ast	Working width for pallet 800 mm x 1200 mm	1640	1640	mm
Wa	Turning radius	2122	2122	mm

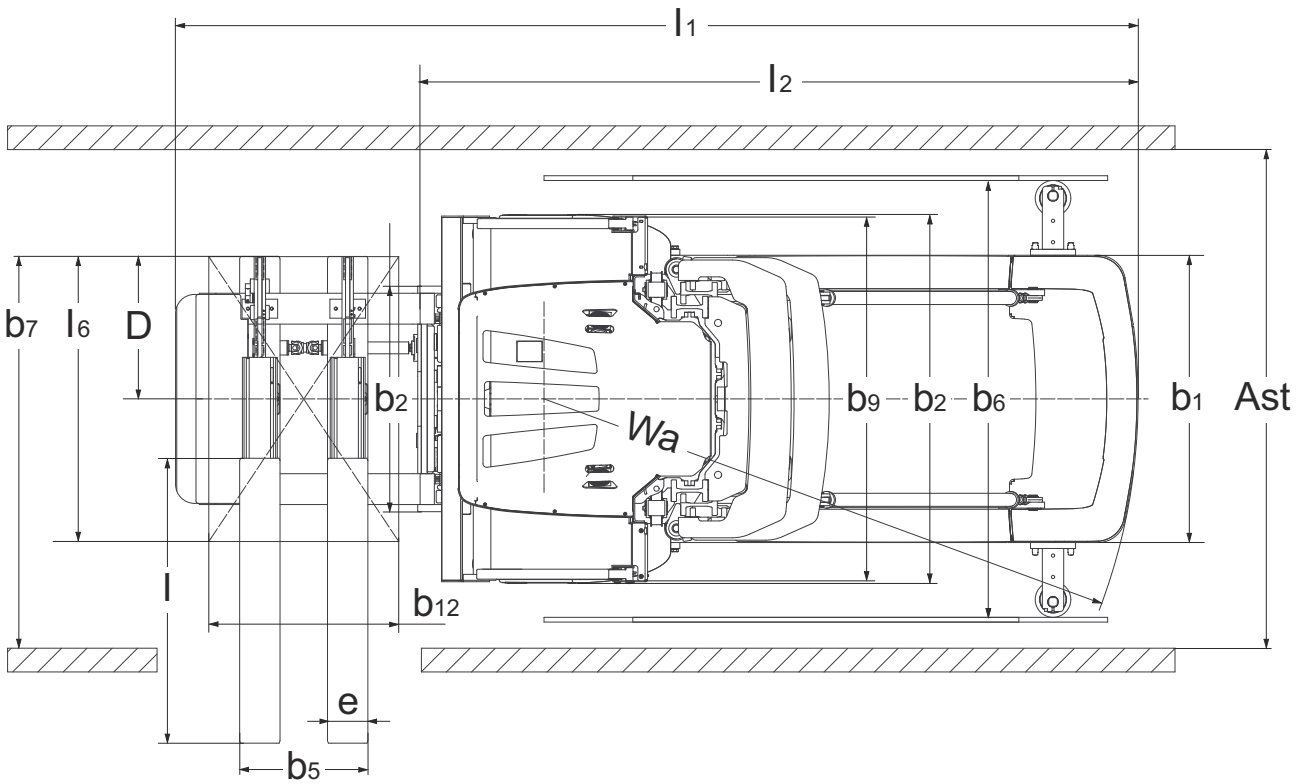


	Description	EKX 410	EKX 412	
x	Load distance	450	450	mm
y	Wheelbase	1807	1807	mm
z	Centre of drive wheel/counterweight (Truck geometry)	320	320	mm
h_1	Collapsed mast height	2850	2850	mm
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	--	mm
h_3	Lift	3500[1)]	3500[1)]	mm

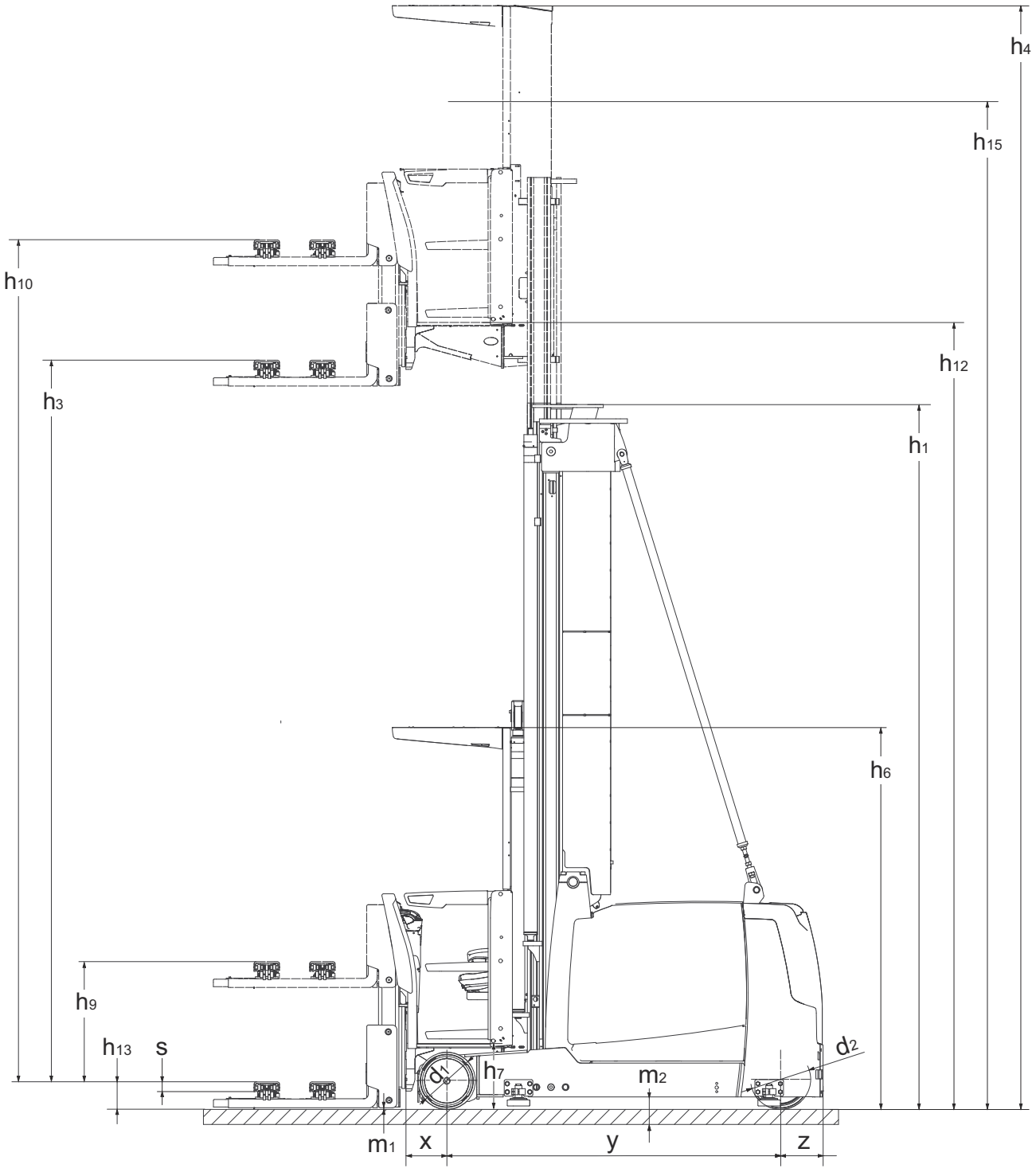
	Description	EKX 410	EKX 412	
h_4	Mast height when extended	6050	6050	mm
h_6	Overhead guard height	2550	2550	mm
h_7	Sit-down/standing height	430	430	mm
h_9	Auxiliary lift	800	800	mm
h_{10}	Overall lift (h_3+h_9)	4300[1)]	4300[1)]	mm
h_{12}	Platform height, raised	3930[1)]	3930[1)]	mm
h_{13}	Lowest position of top of telescopic forks	350	350	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	5530[1)]	mm
m_1	Ground clearance under mast	80	80	mm
m_2	Ground clearance, centre wheelbase	80	80	mm
d_1	Load wheel diameter	see page 88		
d_2	Drive wheel diameter			
s	Fork thickness	65	65	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	2100	mm
--	Clear operator position entry width	490	490	mm

1) 3500 - telescopic mast (ZT mast)

5.2.7 Dimensions of the EKX 514, EKX 516k and EKX 516 with telescopic table (TG)



	Description	EKX 514	EKX 516k	EKX 516	
D	Load centre distance	600	600	600	mm
b_1	Overall width	1210	1210	1210	mm
b_2		1450	1450	1450	mm
b_5	Width across forks	540	540	540	mm
b_6	Width across guide rollers	1640	1640	1640	mm
b_7	Traverse, lateral	1650	1650	1650	mm
b_9	Outer operator position width	1440	1440	1440	mm
b_{10}	Track, front (not shown)	1258	1258	1258	mm
b_{12}	Pallet width	800	800	800	mm
e	Width of telescopic fork	170	170	170	mm
l	Length of telescopic fork	1200	1200	1200	mm
l_1	Overall length without load	3675	3785	4055	mm
l_2	Length, including fork shank	2655	2765	3035	mm
l_6	Pallet length	1200	1200	1200	mm
Ast	Working width for pallet 800 mm x 1200 mm	1640	1640	1640	mm
Wa	Turning radius	2122	2232	2502	mm



	Description	EKX 514	EKX 516k	EKX 516	
x	Load distance	532	532	532	mm
y	Wheelbase	1840	1950	2220	mm
z	Centre of drive wheel/counterweight (Truck geometry)	282	282	282	mm
h_1	Collapsed mast height	2955	2955	2955	mm
h_2	Free lift, two-stage triplex mast (DZ mast) only	--	--	--	mm
h_3	Lift	3500[1)]	3500[1)]	3500[1)]	mm

	Description	EKX 514	EKX 516k	EKX 516	
h_4	Mast height when extended	6050	6050	6050	mm
h_6	Overhead guard height	2550	2550	2550	mm
h_7	Sit-down/standing height	430	430	430	mm
h_9	Auxiliary lift	800	800	800	mm
h_{10}	Overall lift (h_3+h_9)	4300[1)]	4300[1)]	4300[1)]	mm
h_{12}	Platform height, raised	3930[1)]	3930[1)]	3930[1)]	mm
h_{13}	Lowest position of top of telescopic forks	350	350	350	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5530[1)]	5530[1)]	5530[1)]	mm
m_1	Ground clearance under mast	80	80	80	mm
m_2	Ground clearance, centre wheelbase	80	80	80	mm
d_1	Load wheel diameter	see page 88			
d_2	Drive wheel diameter				
s	Fork thickness	65	65	65	mm
--	Clear internal operator position height (distance from operator position floor to bottom of overhead guard)	2100	2100	2100	mm
--	Clear operator position entry width	490	490	490	mm

1) 3500 - telescopic mast (ZT mast)

5.3 Mast versions

5.3.1 Standard mast version with telescopic mast (ZT)

Telescopic mast design (ZT)
The telescopic mast (ZT) consists of the following components:
– Outer mast frame.
  The outer mast frame is rigidly connected to the basic truck.
– Inner mast frame.
  The inner mast frame runs in the outer mast frame.
– Height-adjustable operator position with load handler.
  The height-adjustable operator position runs in the inner mast frame.

Telescopic mast (ZT) operating principle:
When operating the hydraulic "lift" function, the inner mast frame is lifted by two outer hydraulic cylinders. When the inner mast frame is raised the operator position is raised at the same time through chain transmission.

For a description of the hydraulic "lift" function, see page 292.

⚠ WARNING!

Mast collisions
When the operator position is raised the mast height changes. When working with the truck the operator must take the altered mast height and the height of the operator position into account (e.g. when driving through narrow thoroughfares, with low ceiling heights, etc.).
▶When operating the truck, ensure that the mast does not collide with obstacles.

	Description	EKX 410	EKX 412	
h_1	Collapsed mast height	2600 - 4925	2600 - 5475	mm
h_3	Lift	3000 - 7500	3000 - 8500	mm
h_4	Mast height when extended	5550 - 10050	5550 - 11050	mm
h_6	Height of overhead guard	2550	2550	mm
h_7	Seat height/platform height	430	430	mm
h_9	Auxiliary lift EKX	1780	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	4780 - 9280	4780 - 10280	mm
h_{12}	Platform height, raised (h_3 + h_7)	3430 - 7930	3430 - 8930	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5030 - 9530	5030 - 10530	mm

➔ The standard dimension for the clear internal operator position height is 2100 mm.

	Description	EKS 514 EKX 514	
h_1	Collapsed height	2705 – 6155	mm
h_3	Lift	3000 – 9500	mm
h_4	Mast height (extended)	5550 – 12050	mm
h_6	Height of overhead guard	2550	mm
h_7	Seat height / platform height	430	mm
h_9	Auxiliary lift EKX	1780	mm
	Auxiliary lift EKS	--	
h_{10}	Overall lift EKX (h_3+h_9)	4780 - 11280	mm
	Overall lift EKS (h_3)	3000 - 9500	
h_{12}	Raised operator position height (h_3 + h_7)	3430 - 9930	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5030 - 11530	mm

➔ The standard dimension for the clear internal operator position height is 2100 mm.

	Description	EKS 516k EKX 516k	EKS 516 EKX 516	
h_1	Collapsed height	2705 – 6655	2705 - 6655	mm
h_3	Lift	3000 – 10500	3000 - 10500	mm
h_4	Mast height (extended)	5550 – 13050	5550 - 13050	mm
h_6	Height of overhead guard	2550	2550	mm
h_7	Seat height / platform height	430	430	mm
h_9	Auxiliary lift EKX	1780	1780	mm
	Auxiliary lift EKS	--	--	
h_{10}	Overall lift EKX (h_3+h_9)	4780 - 12280	4780 - 12280	mm
	Overall lift EKS (h_3)	3000 - 10500	3000 - 10500	
h_{12}	Raised operator position height (h_3 + h_7)	3430 - 10930	3430 - 10930	mm
h_{15}	Picking height (h_{12} + 1600 mm)	5030 - 12530	5030 - 12530	mm

➔ The standard dimension for the clear internal operator position height is 2100 mm.

5.3.2 Standard mast with two stage triplex mast (DZ)

Two-stage triplex mast design (DZ)

The two-stage triplex mast (DZ) consists of the following components:

– Outer mast frame.
  The outer mast frame is rigidly connected to the basic truck.
– Centre mast frame.
  The centre mast frame runs in the outer mast frame.
– Inner mast frame.
  The inner mast frame runs in the centre mast frame.
– Height-adjustable operator position with load handler.
  The height-adjustable operator position runs in the inner mast frame.
– The two-stage triplex mast is always equipped with free lift. The free lift corresponds to the maximum lift height to which the operator position can be lifted before the height of the mast changes. The free lift allows the load to be raised from the ground without affecting the "collapsed height" dimension (h_1).

Two-stage triplex mast (DZ) operating principle:

When operating the hydraulic "lift" function, the centre-mounted free lift cylinder completely lifts the operator position by chain deflection. The centre mast frame is then raised by the two outer hydraulic cylinders. At the same time, the inner mast is raised by chains.

For a description of the hydraulic "lift" function, see page 292.

⚠ WARNING!

Collisions caused by the load or operator position when the free lift is fully extended

When the free lift (h_2) is fully raised, the height over the load or operator position can exceed the "collapsed height“ dimension (h_1). The operator must take the height of the load and the operator position into account when operating the truck (e. g. when driving through doorways, when the ceiling is low, etc.).

▶When operating the truck, ensure that the raised load or operator position does not collide with obstacles.

	Description	EKX 410	EKX 412	
h_1	Collapsed mast height	2625 - 3675	2625 - 4025	mm
h_2	Free lift height	75 - 1125	75 - 1475	mm
h_3	Lift	4500 - 7500	4500 - 8500	mm
h_4	Mast height when extended	7050 - 10050	7050 - 11050	mm
h_6	Height of overhead guard	2550	2550	mm
h_7	Seat height/platform height	430	430	mm
h_9	Auxiliary lift EKX	1780	1780	mm
h_{10}	Overall lift EKX (h_3+h_9)	6280 - 9280	6280 - 10280	mm
h_{12}	Platform height, raised (h_3 + h_7)	4930 - 7930	4930 - 8930	mm
h_{15}	Picking height (h_{12} + 1600 mm)	6530 - 9530	6530 - 10530	mm

➔ The standard dimension for the clear internal operator position height is 2100 mm.

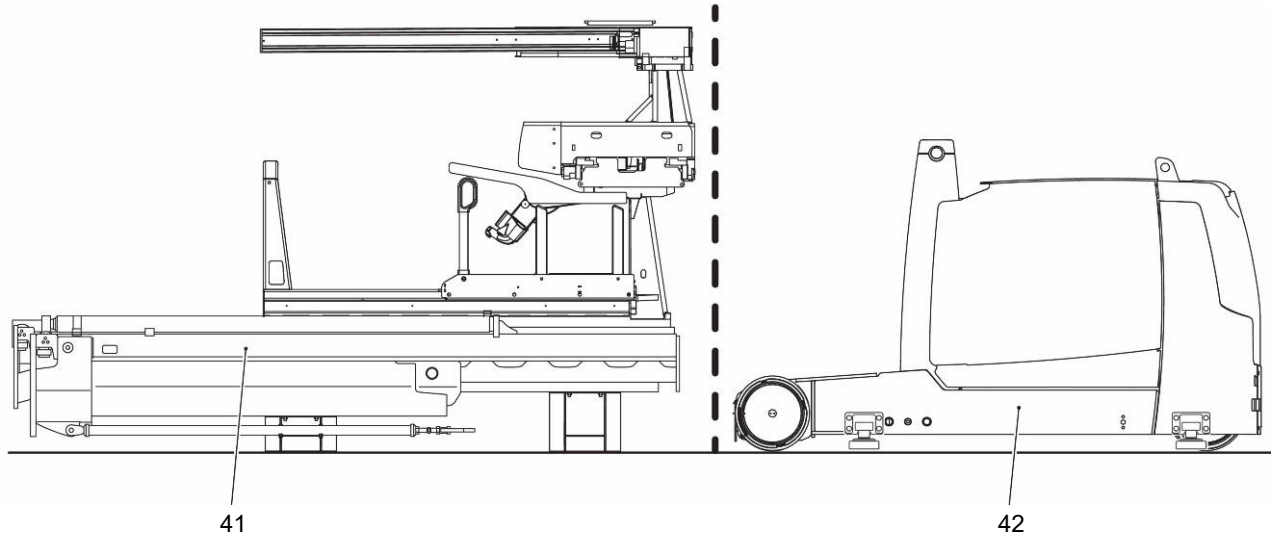
	Description	EKS 514 EKX 514	
h_1	Collapsed height	2550 – 4695	mm
h_2	Free lift height	0 - 2145	mm
h_3	Lift	4000 – 9500	mm
h_4	Mast height (extended)	6550 – 12050	mm
h_6	Height of overhead guard	2550	mm
h_7	Seat height / platform height	430	mm
h_9	Auxiliary lift EKX	1780	mm
	Auxiliary lift EKS	--	
h_{10}	Overall lift EKX (h_3+h_9)	5780 - 11280	mm
	Overall lift EKS (h_3)	4000 - 9500	
h_{12}	Raised operator position height (h_3 + h_7)	4430 - 9930	mm
h_{15}	Picking height (h_{12} + 1600 mm)	6030 - 11530	mm

➔ The standard dimension for the clear internal operator position height is 2100 mm.

	Description	EKS 516k EKX 516k	EKS 516 EKX 516	
h_1	Collapsed height	2550 – 5045	2550 - 6850	mm
h_2	Free lift height	0 - 2495	0 - 4300	mm
h_3	Lift	4000 – 10500	4000 - 14500	mm
h_4	Mast height (extended)	6550 – 13050	6550 - 17050	mm
h_6	Height of overhead guard	2550	2550	mm
h_7	Seat height / platform height	430	430	mm
h_9	Auxiliary lift EKX	1780	1780	mm
	Auxiliary lift EKS	--	--	
h_{10}	Overall lift EKX (h_3+h_9)	5780 - 12280	5780 - 16280	mm
	Overall lift EKS (h_3)	4000 - 10500	4000 - 14500	
h_{12}	Raised operator position height (h_3 + h_7)	4430 - 10930	4430 - 14930	mm
h_{15}	Picking height (h_{12} + 1600 mm)	6030 - 12530	6030 - 16530	mm

➔ The standard dimension for the clear internal operator position height is 2100 mm.

5.4 Weights



5.4.1 Weight of basic truck / mast including operator position and attachment

Basic truck weight (excl. battery)

➔ The following weights for the basic truck (42) refer to the standard chassis widths also indicated in the table (b_2). If the chassis widths differ the weights of the basic truck supplied (42) and the mast (41) can be taken from the truck file.

Truck	Standard chassis width (b_2)	Weight of basic truck
EKX 410 / EKX 412	1450 mm	2300 kg
EKS 514 / EKX 514	1450 mm	2400 kg
EKS 516k / EKX 516k	1450 mm	2600 kg
EKS 516 / EKX 516	1450 mm	2800 kg

Weight of mast including operator position and attachment

➔ The weight of the mast including operator position and attachment (41) can be calculated using the following formula. The data required, for example the net weight (overall weight) of the truck without battery, are to be found on the data plate, see page 108.

A	Net weight of the truck without battery
B	Weight of mast including operator position and attachment

Formula for EKX 410 / EKX 412:

B = A - 2300 kg

Formula for EKS 514 / EKX 514:

B = A - 2400 kg

Formula for EKS 516k / EKX 516k:

B = A - 2600 kg

Formula for EKS 516 / EKX 516:

B = A - 2800 kg

Example:

Required information:
(see truck data plate)
– Type of truck = EKX 514
– Net weight of the industrial truck without battery = 5112 kg

Formula:
B = A - 2400 kg = 5112 kg - 2400 kg = 2712 kg

➔ The weight of the mast including the operator position and attachment is 2712 kg.

5.4.2 Tare weight / axle loads

➔ The following weights refer to a truck with a standard attachment and the mast specified under the table.

Description	EKX 410
Net weight of the truck without battery	see page 108
Front axle load, with picked-up load	4895 kg[1)]
Rear axle load, with picked-up load	1630 kg[1)]
Front axle load, without picked-up load	3270 kg[1)]
Rear axle load, without picked-up load	2245 kg[1)]

Description	EKX 412
Net weight of the truck without battery	see page 108
Front axle load, with picked-up load	5400 kg[1)]
Rear axle load, with picked-up load	1705 kg[1)]
Front axle load, without picked-up load	3450 kg[1)]
Rear axle load, without picked-up load	2445 kg[1)]

1) EKX 410-412 with 3500 - telescopic mast (ZT mast)
2) EKS 514-516 / EKX 514-516 with 3500 - telescopic mast (ZT mast)

Description	EKS 514 / EKX 514
Net weight of the industrial truck without battery	see page 108
Front axle loading, laden	5720 kg[2)]
Rear axle loading, laden	1880 kg[2)]
Front axle loading, unladen	3850 kg[2)]
Rear axle loading, unladen	2500 kg[2)]

Description	EKS 516k / EKX 516k
Net weight of the industrial truck without battery	see page 108
Front axle loading, laden	6190 kg[2)]
Rear axle loading, laden	2060 kg[2)]
Front axle loading, unladen	3950 kg[2)]
Rear axle loading, unladen	2770 kg[2)]

Description	EKS 516 / EKX 516
Net weight of the industrial truck without battery	see page 108
Front axle loading, laden	6590 kg[2)]
Rear axle loading, laden	2810 kg[2)]
Front axle loading, unladen	4480 kg[2)]
Rear axle loading, unladen	3420 kg[2)]

1) EKX 410-412 with 3500 - telescopic mast (ZT mast)
2) EKS 514-516 / EKX 514-516 with 3500 - telescopic mast (ZT mast)

5.5 Wheels, chassis

⚠ WARNING!

Accident risk from incorrect wheel disassembly/assembly

The load / drive wheels can only be disassembled or assembled by the manufacturer's customer service department which has been trained to do this. Exceptionally, this task may be performed by a customer service organisation authorised by the manufacturer.

⚠ WARNING!

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

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

Uneven wear reduces truck stability and increases the stopping distance.

▶After replacing wheels, make sure the truck is not skewed.

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

When replacing wheels fitted at the factory, only use the manufacturer’s original spare parts. Otherwise the truck's rated performance cannot be ensured, see page 671.

Description	EKX 410-412
Tyres	Vulkollan / Besthane
Wheels, front (load wheel)	295 mm x 144 mm
Wheels, rear (drive wheel)	343 mm x 110 mm
Wheels, number of front (load wheel)	2
Wheels, number of rear (*= driven)	1*

Description	EKS 514-516 / EKX 514-516
Tyres	Vulkollan / Besthane
Wheels, front (load wheel)	380 mm x 192 mm
Wheels, rear (drive wheel)	400 mm x 160 mm
Wheels, number of, front (load wheel)	2
Wheels, number of rear (*= driven)	1*

5.6 Engine Data

Description	EKX 410
Drive motor, output where S_2 = 60 min	6.9 kW
Hydraulic motor, output where S_3 = 15%	9.5 kW
Steer mode, output where S_2 = 60 min	0.7 kW

Description	EKX 412
Drive motor, output where S_2 = 60 min	6.9 kW
Hydraulic motor, output where S_3 = 15%	9.5 kW
Steer mode, output where S_2 = 60 min	0.7 kW

Description	EKS 514 EKX 514
Drive motor, output at S_2 = 60 min	9.0 kW
Hydraulic motor, output where S_3 = 15 %	25.0 kW
Steer motor, output at S_2 = 60 min	1.0 kW

Description	EKS 516k EKX 516k
Drive motor, output at S_2 = 60 min	9.0 kW
Hydraulic motor, output where S_3 = 15 %	25.0 kW
Steer motor, output at S_2 = 60 min	1.0 kW

Description	EKS 516 EKX 516
Drive motor, output at S_2 = 60 min	9.0 kW
Hydraulic motor, output where S_3 = 15 %	25.0 kW
Steer motor, output at S_2 = 60 min	1.0 kW

5.7 EN norms

Noise emission level

– EKX 410-412: 60 dB(A)
– EKS 514-516 / EKX 514-516: 64 dB(A)

in accordance with EN 12053 as harmonised with ISO 4871.

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

Vibration

– EKX 410-412: 0,64 m/s²
– EKS 514-516 / EKX 514-516: 0,78 m/s²

in accordance with EN 13059.

Vibration at driver's seat

– EKX 410-412: 0,66 m/s²
– EKS 514-516 / EKX 514-516: 0,83 m/s²

in accordance with EN 13059.

➔ The internal accuracy of the measuring chain for at 21 °C at ± 0,02 m/s². Further deviations may occur in particular through the positioning of the sensor and different driver weights.

➔ 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 735.

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!

Damage to medical equipment due to non-ionising radiation

Electrical equipment on the truck emitting non-ionising 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 the medical equipment can be used near the industrial truck.

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

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

Component	Frequency range	Transmission power
WMT 110	2.4 GHz (Bluetooth)	≤10 mW
WMT 110	2.4 GHz (WLAN)	≤100 mW
WMT 110	5.0 GHz (WLAN)	≤100 mW
Access module (ISM Online)	13.56 MHz	< 100 mW
Transponder reader (EasyKey)	2.4 GHz	≤ 67,6 mW
Transponder reader (EasyKey)	5.8 GHz	≤ 66,1 mW
RFID reader	125 kHz	---
WLAN stick (WN821N)	2.4000 GHz to 2.4835 GHz	---

Component	Frequency range	Transmission power
Telematics box basic 2G EU	2.4 GHz (Bluetooth)	< 20 mW
	900 MHz (2G)	< 2 W
	1800 MHz (2G)	< 1 W
Telematics box basic 3G/2G INT	2.4 GHz (Bluetooth)	< 20 mW
	850/ 900 MHz (2G)	< 2 W
	1800/ 1900 MHz (2G)	< 1 W
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 250 mW
Telematics box basic 4G/2G EU	2.4 GHz (Bluetooth)	< 20 mW
	850/ 900 MHz (2G)	< 2 W
	1800/ 1900 MHz (2G)	< 1 W
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 200 mW
Telematics box basic 4G/3G EU	2.4 GHz (Bluetooth)	< 20 mW
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 250 mW
	700/850/1700/1900 MHz (4G)	< 200 mW
Telematics box basic 4G/3G AUS	2.4 GHz (Bluetooth)	< 20 mW
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 250 mW
	700/850/1700/1900 MHz (4G)	< 200 mW
Telematikbox Basis 4G/3G US	2.4 GHz (Bluetooth)	< 20 mW
	800/ 850/ 900/ 1900 / 2100 MHz (3G)	< 250 mW
	700/ 850/ 1700/ 1900 MHz (4G)	< 200 mW

Component	Frequency range	Transmission power
Telematics box Plus 3G/2G INT	2.4 GHz (Bluetooth)	< 10 mW
	2.4 GHz (WLAN)	< 100 mW
	5 GHz (WLAN)	< 100 mW
	850/ 900 MHz (2G)	< 2 W
	1800/ 1900 MHz (2G)	< 1 W
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 250 mW
Telematics box Plus 4G/2G EU	2.4 GHz (Bluetooth)	< 10 mW
	2.4 GHz (WLAN)	< 100 mW
	5 GHz (WLAN)	< 100 mW
	850/ 900 MHz (2G)	< 2 W
	1800/ 1900 MHz (2G)	< 1 W
	800/900/1800/2100 MHz (3G)	< 200 mW
Telematics box plus 4G/3G US	2.4 GHz (Bluetooth)	< 10 mW
	2.4 GHz (WLAN)	< 100 mW
	5 GHz (WLAN)	< 100 mW
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 250 mW
	700/ 850/ 1700/ 1900 MHz (4G)	< 200 mW
Telematics box plus 4G/3G AUS	2.4 GHz (Bluetooth)	< 10 mW
	2.4 GHz (WLAN)	< 100 mW
	5 GHz (WLAN)	< 100 mW
	800/ 850/ 900/ 1900/ 2100 MHz (3G)	< 250 mW
	700/ 850/ 900/ 1800 MHz (4G)	< 200 mW

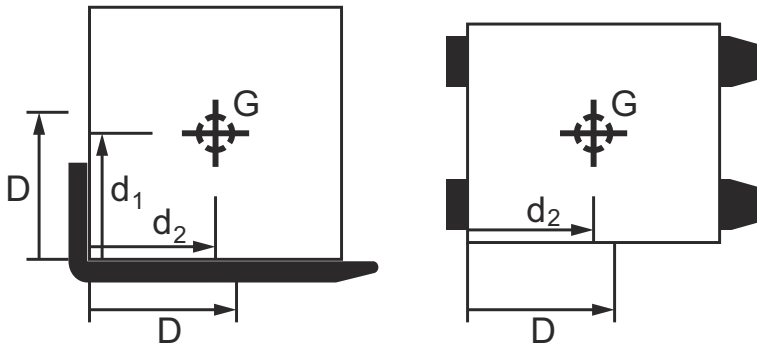
5.9 Electrical requirements

The manufacturer confirms compliance with the requirements for designing and manufacturing the electrical equipment for the intended use of the truck in accordance with UL 583 and EN 1175 "Safety of industrial trucks - Electrical requirements".

5.10 Safety of trucks

The manufacturer confirms adherence to the requirement for design and manufacture of the truck with regard to the safety requirements specific to intended use in accordance with EN ISO 3691-1.

5.11 Load centre distance

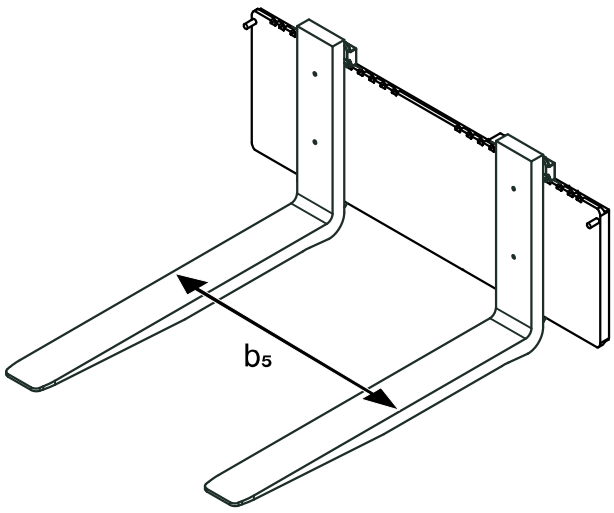


The load centre distance D of the load handler is specified horizontally from the front edge of the back and vertically from the upper edge of the load handler.

➔ The capacity plate shows the following valid load centre distances for standard load handlers:
- 500 mm
- 600 mm
- 700 mm

The distances d_1 and d_2 depicted in the illustration between the load handler and the actual centre of gravity G of the load must be smaller or equal to the load centre distance D ($d_1 \leq D$ and $d_2 \leq D$) to avoid the risk of overturning – see page 326.

5.12 Load height



The maximum permitted load height depends on the following criteria:
- Distance "b_5" between the outer edges of the fork arms (width across forks)

Distance between the outer edges of the fork arms

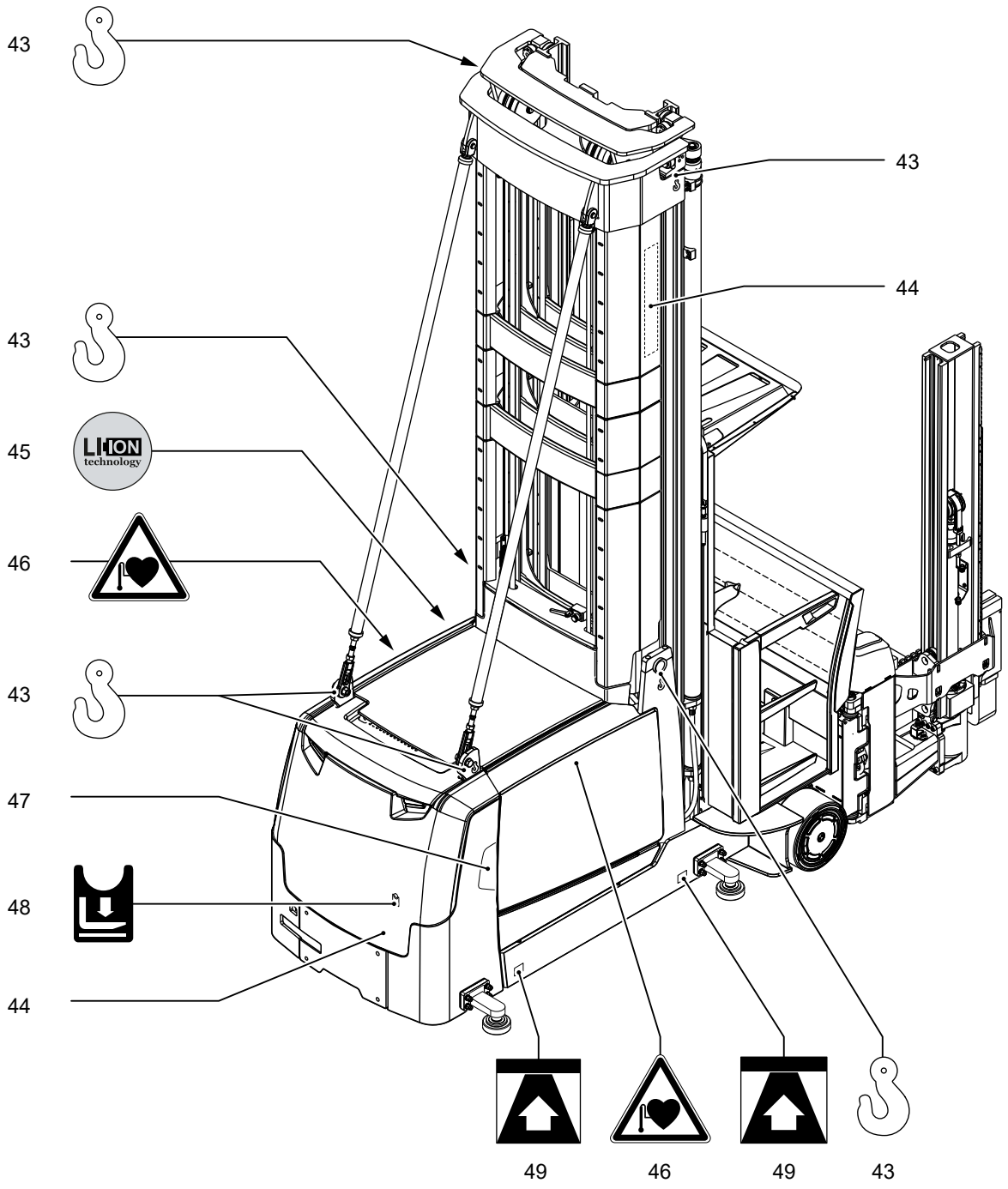
The maximum permitted load height is determined by the width across forks (b_5).

– Maximum permitted load height = width across forks (b_5) **x** 4
– *Example:*
  – *b_5= 400 mm*
  – *Maximum permitted load height = 400 mm **x** 4 = 1600 mm*

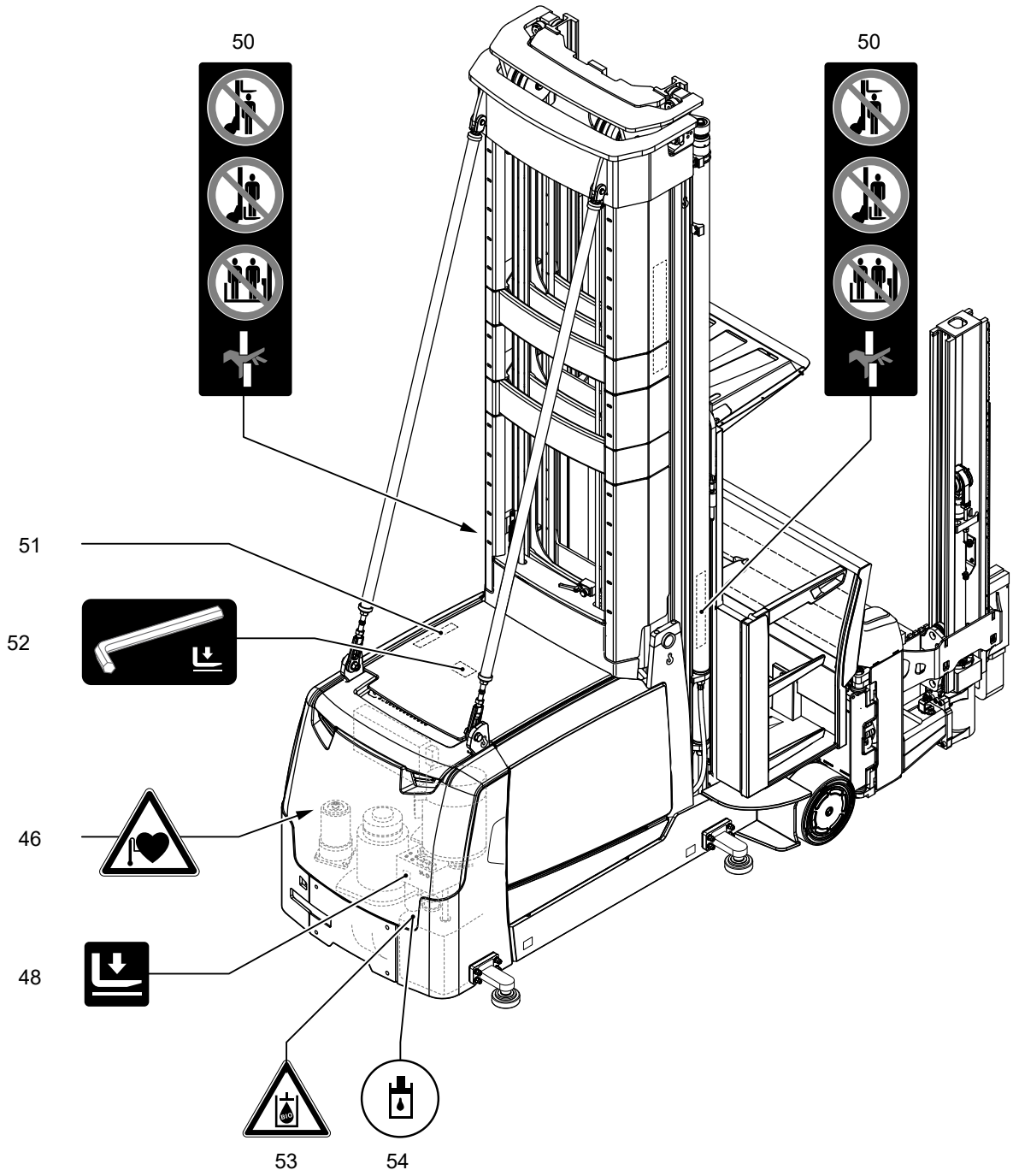
6 Identification Points and Data Plates

Warnings and notices such as capacity plates, attachment points and data plates must be legible at all times. Replace if necessary.

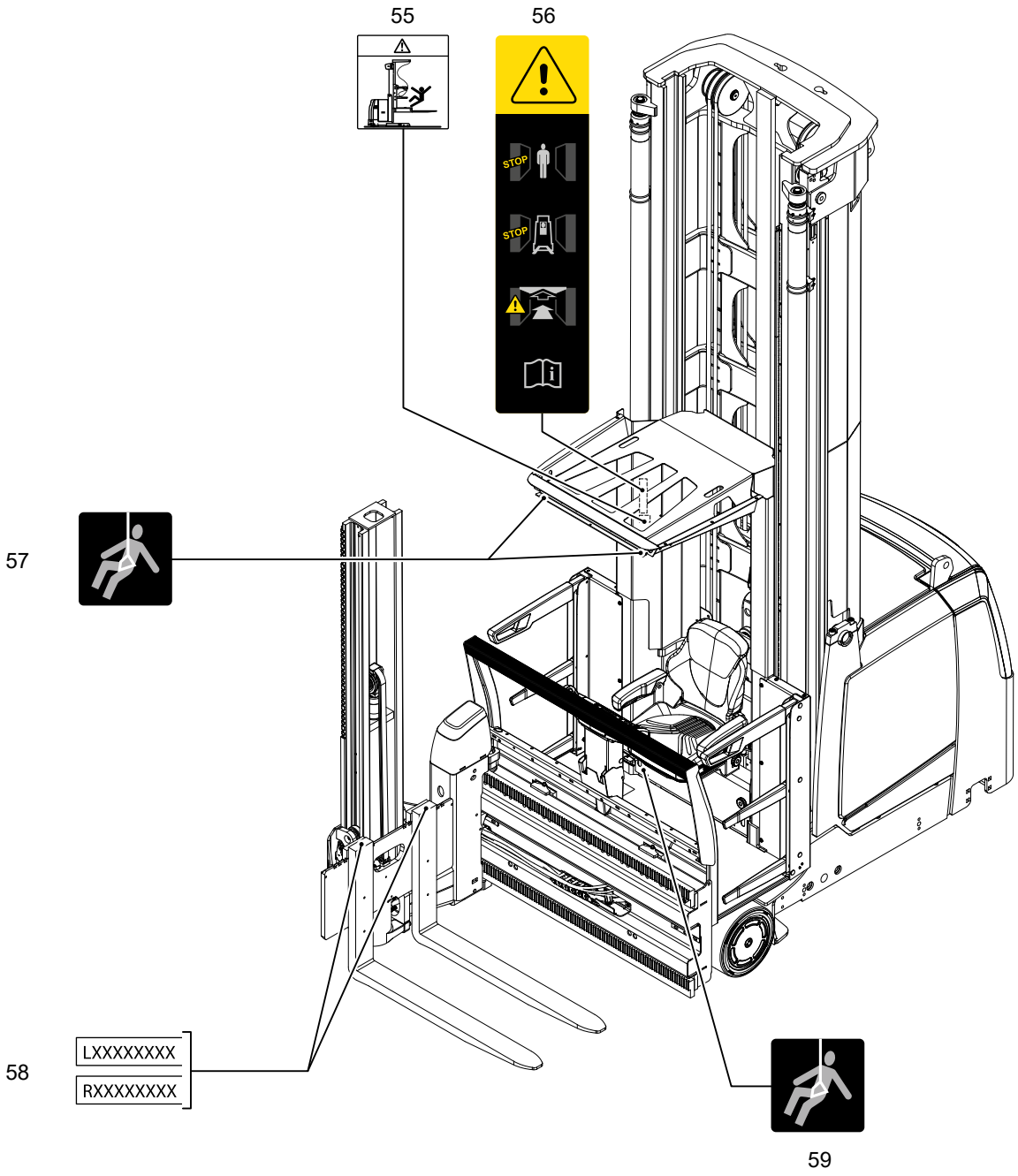
6.1 Indication Points



Item	Description	Installation location
43	Attachment points for loading by crane	– On the top of the mast on both sides – On both sides of chassis
44	Company name	– On both sides of mast – On the drive panel
45	"Lithium-ion battery technology" plate (○) – Only for industrial trucks with a lithium-ion battery	– On the left side panel
46	Warning notice: "Medical and technical device operation affected by magnets" – see page 115	– On both side panels (inside)
47	Type designation	– On both sides of chassis
48	Information label: "emergency lower" – see page 346	– On the drive panel – Behind the drive panel on the valve block
49	Jacking points – see page 115	– On both sides of chassis


50
50
51
52
46
48
53
54

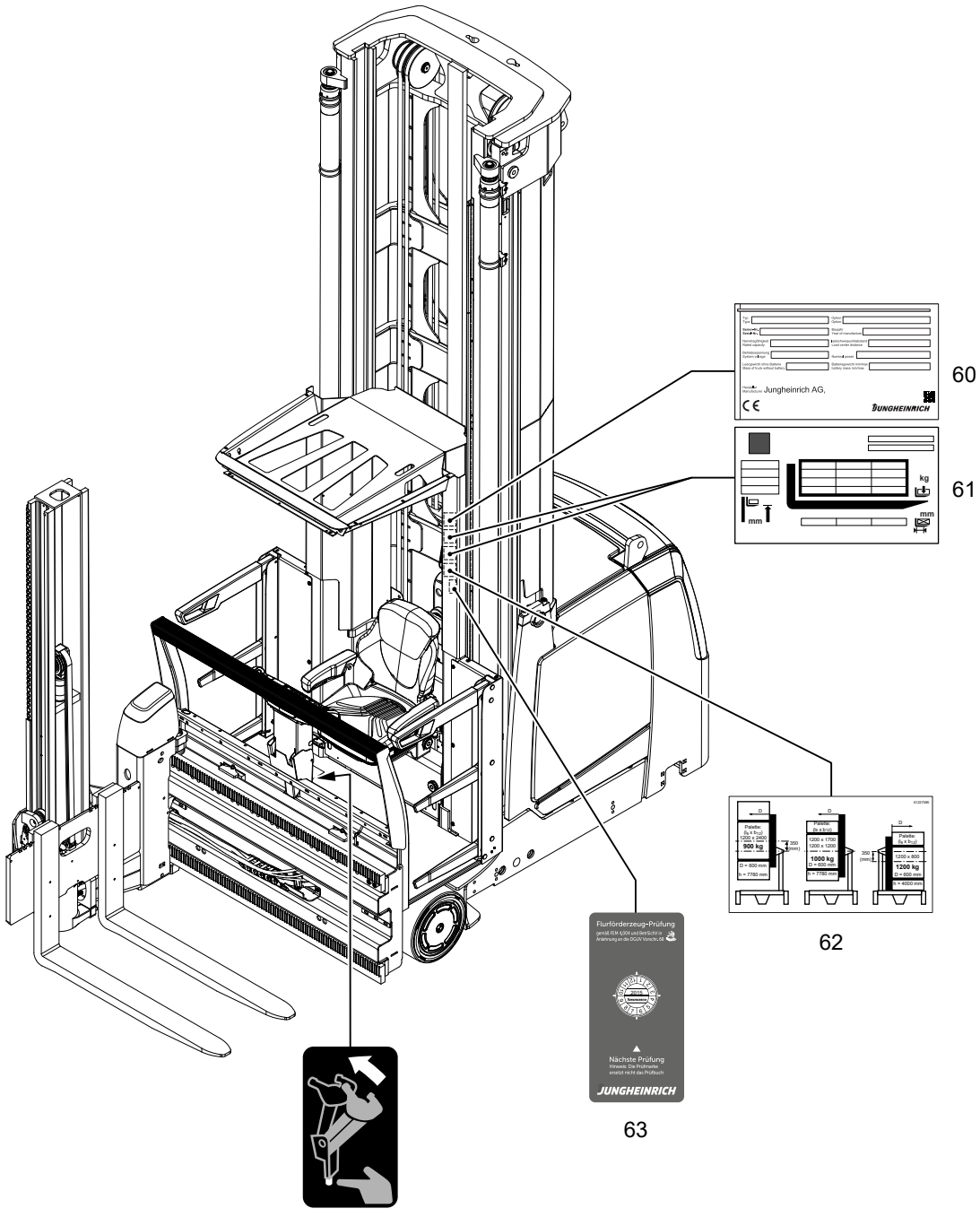
Item	Description	Installation location
46	Warning notice: "Medical and technical device operation affected by magnets" – see page 115	– Behind the drive panel near the I/O nodes
48	Information label: "emergency lower" – see page 346	– On the drive panel – Behind the drive panel on the valve block
50	Warning notice: "do not step onto or beneath the load, trap point and riding prohibited"	– On both sides of mast
51	Serial number	– Engraved in chassis underneath the battery panel
52	Information label: "Emergency lower key" – see page 346	– On the truck chassis under the battery panel
53	Information label: "Add bio-based hydraulic oil" (○) – see page 706	– Behind the drive panel on the hydraulic reservoir
54	Information label: "Add hydraulic oil" (●) – see page 706	– Behind the drive panel on the hydraulic reservoir


55
56
STOP
STOP
57
58
LXXXXXXXX
RXXXXXXXX
59

Item	Description	Installation location
55	Warning notice: "Attach the safety harness with safety rope and secure to the overhead guard" – see page 236	Depending on the attachment point for the safety rope (only on the EKS): – In the operator position on the front section of the overhead guard – In the operator position next to the mast protection pane
56	Warning notice: "hazards in narrow aisle and observe operating instructions" – see page 283	– In the operator position next to the mast protection pane
57	Information label: "Attachment point for rescue equipment" [1] – see page 394	– On the front section of the overhead guard on both sides (load side) – On the rear section of the overhead guard, on both sides of the attachment rail (○) (mast side)
58	Marking of the forks (○)	– On the respective fork
59	Information label "Storage compartment for rescue equipment" [2], see page 394	– In the operator position below the driver's seat (mast side)

[1] *The information label is not required for industrial trucks with a maximum platform height (h_{12}) below 3 m. These trucks are supplied without rescue equipment.*

[2] *The information label indicates the storage compartment for the rescue equipment in the operator position. If the truck is supplied without rescue equipment, this information label is not present.*


Junghenrich AG,
JUNGHEINRICH
kg
mm
mm
Flurförderzeug-Prüfung
Nächste Prüfung
JUNGHEINRICH

60

61

62

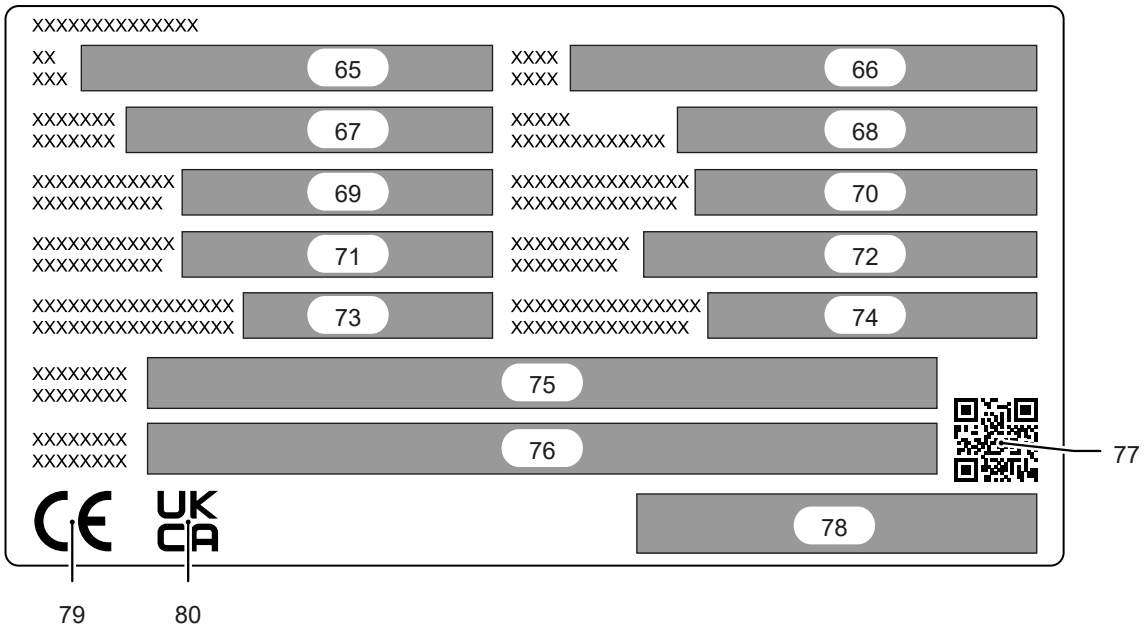
63

64

Item	Description	Installation location
60	Truck data plate – see page 108	– In the operator position next to the mast protection pane
61	Capacity plate – see page 110	– In the operator position next to the mast protection pane
62	Decal: "attachments or special attachments capacity" (○) – see page 114	– In the operator position next to the mast protection pane
63	Inspection plaque (○)	– In the operator position next to the mast protection pane
64	Information label: "Manual unlocking of control unit" – see page 234	– In operator position below the control unit

6.2 Data plate

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



Item	Description	Item	Description
65	Type	73	Net weight without battery [kg]
66	Option	74	Min./max. battery weight [kg]
67	Serial number	75	Manufacturer
68	Year of manufacture	76	Importer - imported by (○)
69	Rated capacity [kg]	77	QR code
70	Load centre distance [mm]	78	Manufacturer's logo
71	Battery voltage [V]	79	CE marking[1)]
72	Drive output [kW]	80	UKCA marking (○)[2)]

For queries regarding the truck or when ordering spare parts, always quote the truck serial number (67).

1) *Conformité Européenne*

2) *United Kingdom Conformity Assessed*

6.2.1 Position of serial number

The serial number (67) of the truck is specified on the data plate and embossed on the truck chassis, see page 100.

6.2.2 QR code

The QR code contains the serial number and product hierarchy of the industrial truck.

6.3 Truck capacity plate

⚠ WARNING!

Replacing the forks can cause accidents

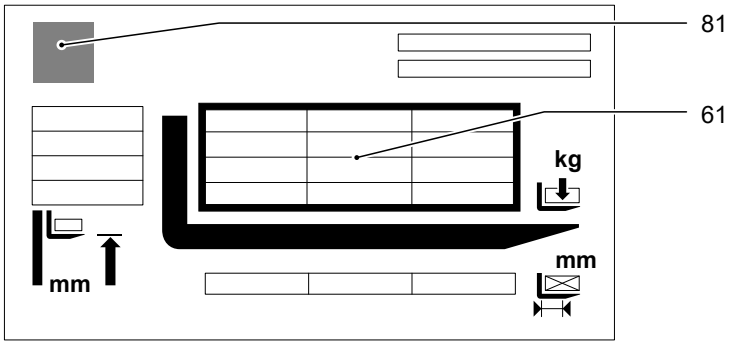
If you replace the forks with ones that differ from the originals, the capacity will change.

- ▶ 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.

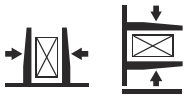
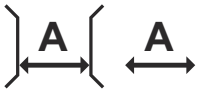
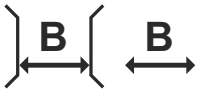
Note the capacity reduction according to weight (operator, rider or loads) in the operator position, see page 112.

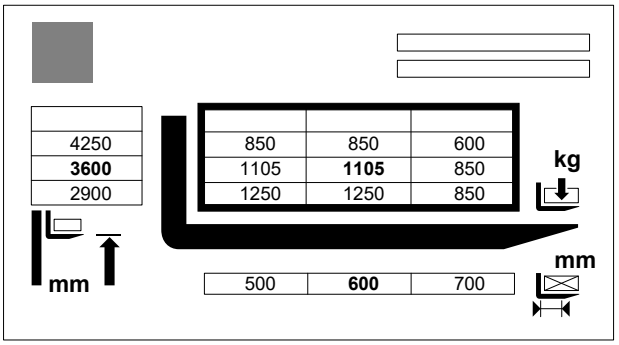
The capacity plate (61) gives the capacity Q (kg) of the truck for an upright mast. The maximum capacity is shown as a table with a given load centre of gravity D (mm) and the required lift height h_3 (mm).

The capacity plate (61) of the truck indicates the truck's capacity with the forks as originally supplied.



The symbol (81) specifies the application range (e. g. picking up front loads) or the attachment (e. g. fork extension) for which the capacity plate applies.

Symbol	Meaning
	Fork extension
	Clamp: – Clamp in "front lifting" position – Clamp in "home" position (only on trucks with swivel traverse frame)
	Standard load handler: – Load handler in “front lifting” position – Load handler in “home” position (only on trucks with swivel traverse frame)
	"sideshiftPLUS" (only for industrial trucks with swivel traverse frames): – Display A - Narrow aisle with standard aisle width (Ast)
	"sideshiftPLUS" (only for industrial trucks with swivel traverse frames): – Display B - Narrow aisle, wider than the standard aisle width (Ast)
	Carrying boom: – Carrying boom in “front lifting” position – Carrying boom in “home” position (only on trucks with swivel traverse frame)



Example of how to calculate the maximum capacity

With a load centre distance (D) of 600 mm and a maximum lift height of (h_3) 3600 mm the max. capacity (Q) is 1105 kg.

6.4 Capacity reduction according to weight (operator, rider or loads) in the operator position

⚠ WARNING!

Influence of weight in the operator position on the operational stability and capacity of the truck

The weight of the operator, rider or loads in the operator position have an influence on the operational stability and capacity of the truck. The capacities specified on the capacity plate refer to a weight (operator, rider or loads) of 98 kg in the operator position, in accordance with ISO 22915-1.

▶ In the event that the weight of the operator, rider or loads in the operator position exceeds 98 kg, the capacity of the truck must be reduced. Otherwise, this weight can have a negative influence on the operational stability of the truck.

Example A "Capacity reduction (without rider)"

Requirements

– Capacity of the truck in accordance with the capacity plate: 1000 kg
– Weight of the operator: 100 kg
– Weight of loads or objects in the operator position: 50 kg

Procedure

• Weight in the operator position: 100 kg + 50 kg = 150 kg

➔ Maximum weight in the operator position without capacity reduction: 98 kg

• Reduction in truck capacity by the weight in the operator position: 150 kg - 98 kg = 52 kg

Capacity of the truck after capacity reduction: 948 kg

Example B "Capacity reduction (with rider)"

Requirements

– Capacity of the truck in accordance with the capacity plate: 1000 kg
– Weight of the operator: 85 kg
– Weight of the rider: 90 kg
– No loads or objects in the operator position

Procedure

• Weight in the operator position: 85 kg + 90 kg = 175 kg

➔ Maximum weight in the operator position without capacity reduction: 98 kg

• Reduction in truck capacity by the weight in the operator position: 175 kg - 98 kg = 77 kg

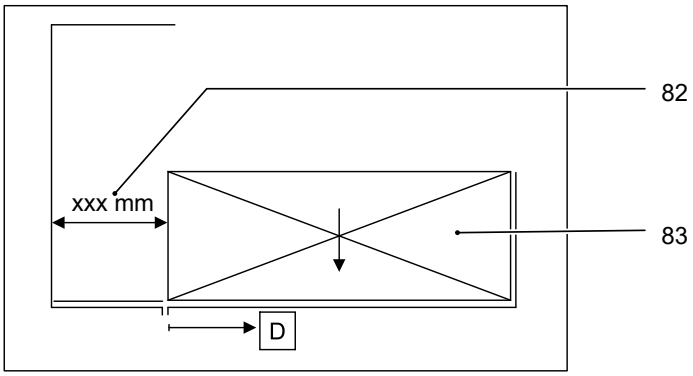
Capacity of the truck after capacity reduction: 923 kg

6.5 Attachment capacity plate

The attachment capacity plate indicates the industrial truck's capacity Q (kg) in conjunction with the attachment fitted. The serial number on the capacity plate must match the data plate of the attachment, as the specific capacity for each truck is specified by the manufacturer. The capacity is shown in the same way as the truck's capacity and is to be determined in the same manner.(see page 110).

➔ The capacity is reduced as a function of the load centre and the lift height h_3. Refer to the data on the capacity plate of the attachment.

6.6 Sign: "Load centre distance on EKS with walk-on platform"



On the EKS with walk-on platform, the sign: (83) is also fitted in the operator position under the data plate or capacity plate.
The "depth of operator position" dimension (82) is specified on this sign (83).
The load centre distance (D) required to calculate the maximum capacity starts behind the "depth of operator position" dimension.

➔ Description of the capacity plate, see page 110.

6.7 "Medical and technical device operation affected by magnets" warning notice

⚠ WARNING!

Influence of exposed magnets on medical and technical devices

Once the side panels have been removed (e.g. on battery replacement), the magnets on the truck chassis or battery retainers are exposed. Exposed magnets generate a magnetic field. This magnetic field can impact the function of medical and technical devices (e.g. pacemakers, hearing aids, credit cards, debit cards) and cause them to malfunction.

▶ Maintain a safety distance of 100 mm between medical or technical devices (e.g. pacemakers, hearing aids, credit cards, debit cards) and exposed magnets.

6.8 Jacking points for jacks

The "Jack contact point" decal (49) indicates where the truck may be lifted and jacked up (see page 712)

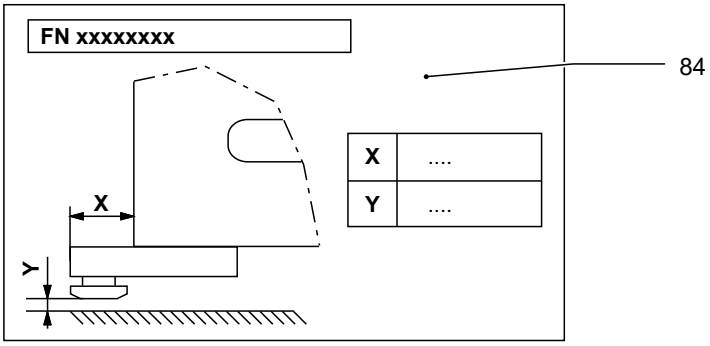
6.9 "Residual capacity" tilt safety device notice (○)

⚠ WARNING!

Exceeding the maximum capacity can cause a tipover

If you use the optional "residual capacity" tilt safety device, the maximum capacity must still not be exceeded.

▶Never exceed the maximum loads specified on the capacity plate, see page 110 and see page 114.



With industrial trucks the residual capacity can be increased by using the optional "residual capacity" tilt safety devices.

Unlike standard tilt safety devices, these devices are fitted on the side of the truck chassis.

For details of standard tilt safety devices see page 144.

If you use the optional "residual capacity" tilt safety device, the plate (84) is fitted in the operator position below the data plate or capacity plate, see page 100.

7 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 151.

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 load centre)
- Ground clearance (e.g. modification of the tilt safety devices, if present)
- Additional weights (e.g. in or under the battery compartment, on the load axle, under the drive compartment)

⚠ WARNING!

Loss of operational stability can cause accidents

Changing the components can affect operational stability.

▶Do not exceed permissible loads and load centre distances.

▶Only manufacturer-approved components may be used on the truck. Do not use components that have not been approved by the manufacturer.

▶The components listed must be replaced only with the agreement of the manufacturer. If necessary, sufficient operational stability under the local operating conditions must be proven by an expert opinion.

C Transport and Commissioning

1 Transport

The truck can be transported in two different ways, depending on the height of the mast and the local conditions.

– Vertically with the mast and load handler assembled (for low heights).
– Vertically with the mast and load handler assembled (for large heights).
  – All hydraulic lines between the basic truck and mast are disconnected for transport.

Safety Instructions for Assembly and Commissioning

⚠ WARNING!

Incorrect assembly can result in accidents

The assembly of the truck at the application site, commissioning and operator training must only be performed by the manufacturer's customer service representatives who have been specially trained for these tasks.

▶ The hydraulic and electrical lines may only be connected to the basic truck / mast interface when the mast has been properly assembled.

▶ Start the truck only after the mast has been assembled correctly.

▶ If several trucks have been delivered, make sure that the serial numbers of the load handlers, masts and basic trucks always match.

2 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 lifting gear can tear

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

- ▶ Do not route crane lifting gear over sharp edges, use suitable cut protection, if necessary.
- ▶ Lifting accessories 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.

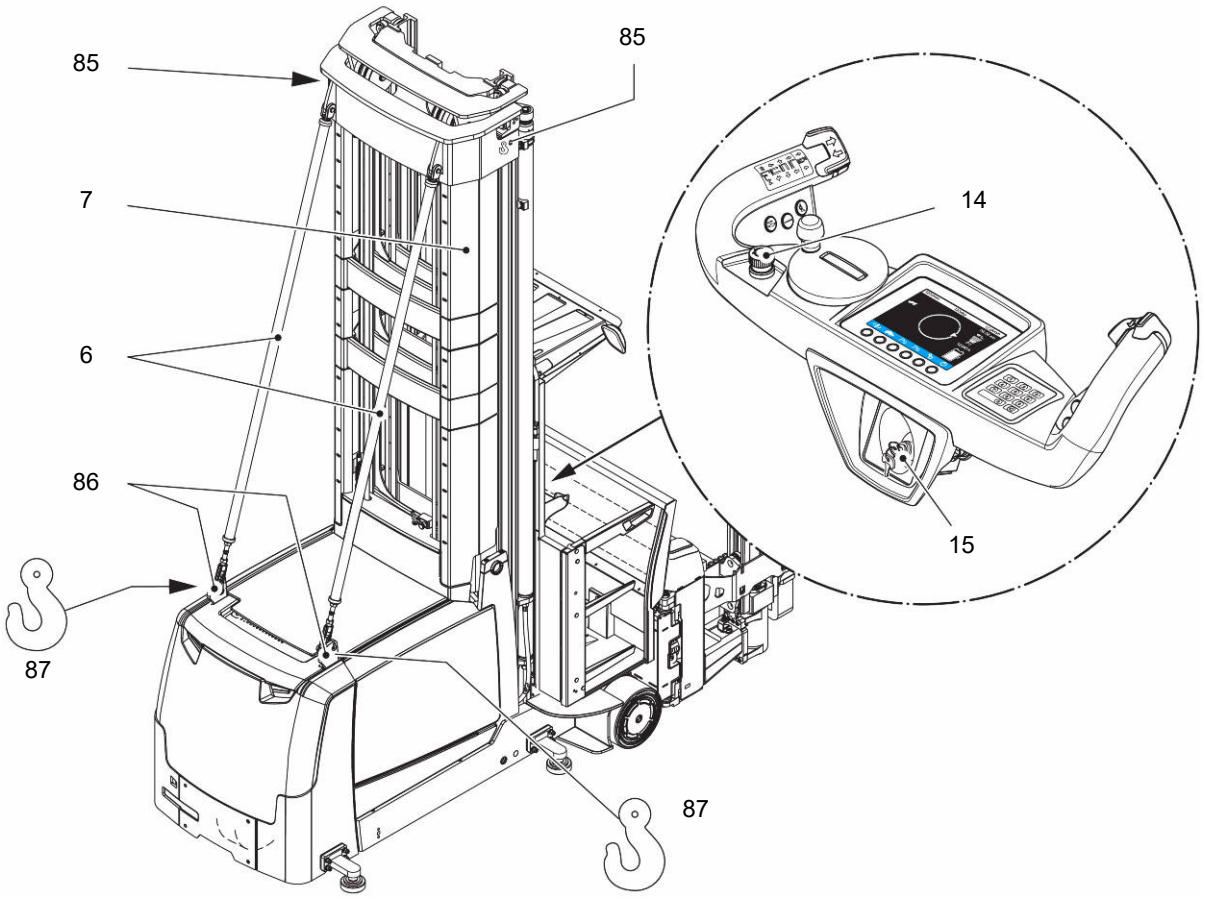
⚠ WARNING!

Torn lashing straps

Lashing straps can tear when routed over sharp edges.

- ▶ Do not route lashing straps over sharp edges, use suitable cut protection, if necessary.
- ▶ Lashing straps that are routed over lift chains must be protected with a suitable oil-resistant base.

2.1 Loading of the basic truck by crane with the mast assembled



Item	Component
86	Support to protect the crane slings from sharp edges

Safe lifting of the basic truck by crane with the mast assembled

Requirements

– Truck parked securely, see page 314.
– Battery removed, see page 166.

Tools and Material Required

– Slings for lifting gear (thread M24)
– Crane lifting gear with sufficient capacity
– A ladder if necessary

Procedure

For details of the weight of the "basic truck with mast assembled" to be taken into account when loading by crane, refer to the truck data plate, see page 108.

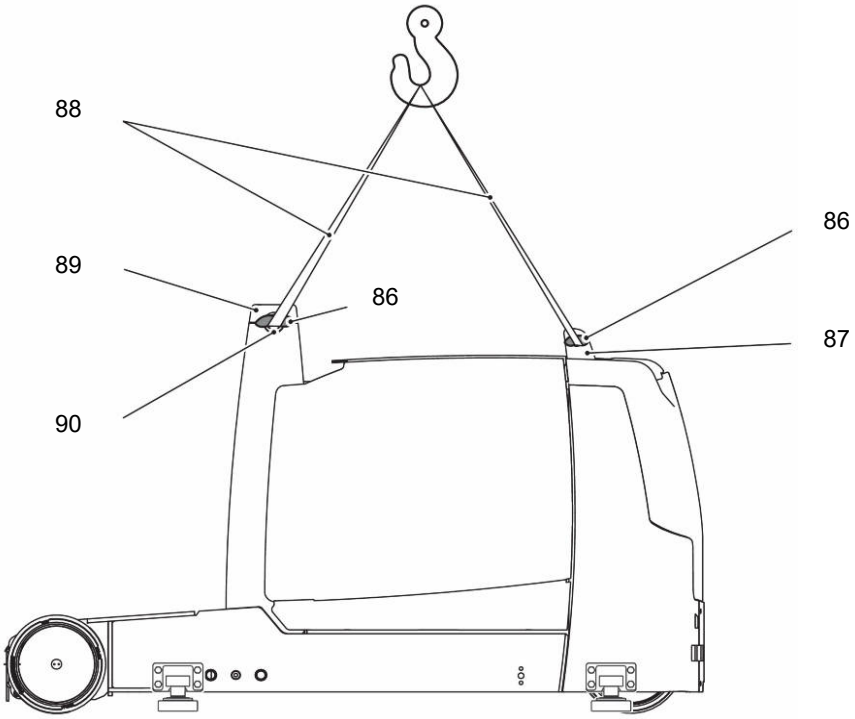
- Insert a sling (85) on either side into the threaded hole (M24) at the top of the mast (7).
- Undo any mast bracing (6) from the bottom of the basic truck.
- Carefully guide the mast bracing (6) towards the mast (7).
- Secure the mast bracing (6) to the mast (7) in such a way that it does not start to move randomly during lifting.

- Attach the crane lifting gear to the attachment points (85,87) so that the truck cannot slip:
  - Secure the crane lifting gear to each of the fitted slings (85).
  - On either side secure crane lifting gear to the "eyes of the bottom mast bracing" attachment points (87).

  The truck can now be lifted.
- Raise and load the truck.
- Lower the truck carefully onto a level surface.
- Secure the truck with wedges to prevent it from rolling away.

Loading the basic truck by crane with the mast attached is now complete.

2.2 Lifting the basic truck by crane



Item	Component
86	Support to protect the crane slings from sharp edges

Safe loading of the basic truck by crane

Requirements

– Truck parked securely – see page 314.
– Mast not attached to the basic truck. Any mast bracing disassembled. The mast and the mast bracing must only be removed by the manufacturer's specialist customer service department personnel who have been trained to do this. In exceptional cases this task may be performed by a customer service organisation authorised by the manufacturer.

Tools and Material Required

– Torque wrench with a minimum torque of 205 Nm
– Torque wrench fitting:
  Hexagon socket, size EKS 514-516 / EKX 514-516 = 17 mm
– Crane lifting gear with sufficient capacity

Procedure

➔ Weight of the basic truck to be taken into account – see page 84.
If a battery is installed in the battery compartment of the basic truck, the battery weight must be added to the weight of the basic truck – see page 151.

- Assemble the half shells (89) on both sides of the truck:
  - On both sides, position a half shell (89) above the "mast receptacle/top half shell" attachment point (90).
  - Attach the half shell (89) to the chassis with two hexagon socket screws (90).

NOTICE

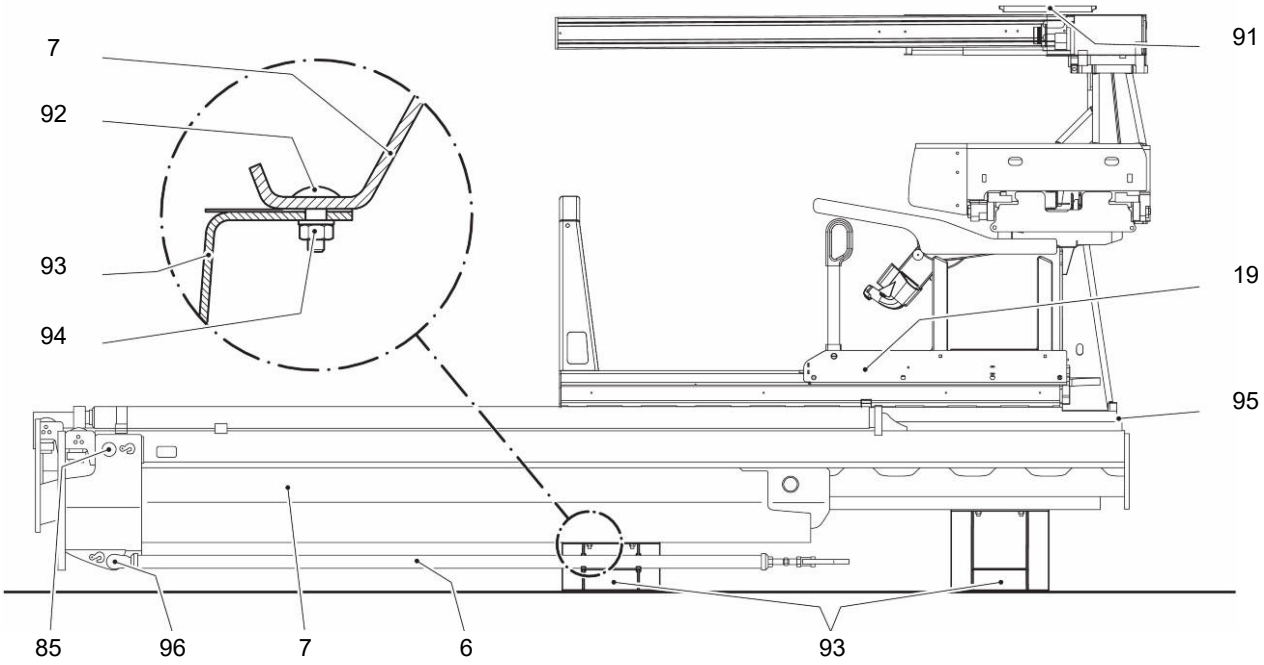
Torque the hexagon socket screws (size EKS 514-516 / EKX 514-516 = 17 mm) to 205 Nm.

- Attach the crane lifting gear (88) to the attachment points (87|90) so that it cannot slip:
  - On both sides, attach the crane lifting gear (88) to the "mast receptacle/top half shell" attachment points (90).
  - On both sides, attach the crane lifting gear (88) to the "eyelets of the bottom mast bracing" attachment points (87).

  The basic truck can now be loaded.
- Raise and load the basic truck.
- Lower the basic truck carefully onto a level surface.
- Secure the basic truck with wedges to prevent it from rolling away.

Loading the basic truck by crane is now complete.

2.3 Loading of the mast with operator position and load handler by crane



Safe loading of the mast with operator position and load handler by crane

Requirements

– Forks disassembled (if fitted), see page 321.
– Truck parked securely, see page 314.
– Fork carriage (91) prevented from slipping.
– Activities to be performed only on trucks with a swivel traverse frame:
  • Attachment moved to the centre of the swivel traverse frame.
  • Attachment prevented from slipping.
– Mast (7) not attached to the basic truck. The mast (7) can only be removed by the manufacturer's specialist customer service personnel who have been trained to do this. In exceptional cases, this task may be performed by a customer service organisation authorised by the manufacturer.

Tools and Material Required

– Slings for lifting gear (thread M24)
– Crane lifting gear with sufficient capacity
– Four legs (93)
– Cable ties

Procedure

→ Weight of the mast with operator position and load handler to be taken into account, see page 84.

• Insert a sling (85) on either side into the threaded hole (M24) at the top of the mast (7).
• Secure the crane lifting gear to each of the fitted slings (85).
• Undo any mast bracing (6) from the bottom of the basic truck.
• Carefully guide the mast bracing (6) towards the mast (7).

- Fit two legs (93) on the mast (7) and secure any mast bracing (6) to the legs (93):
  - Guide the mast bracing (6) into the recess in the corresponding leg (93).
  - Secure the leg (93) with two screws (92) and hex. nuts (94) to the mast (7).
  - Prevent the mast bracing (6) from sliding out using cable ties on the legs (93).

  Repeat this process for all legs (93). The mast (7) can now be loaded.
- Raise the mast (7) and load it.

NOTICE

Mast damage

When lifting or laying down the mast (7) make sure the bottom section of the mast (7) does not get damaged.

▶Before lifting or laying it down, protect the bottom section of the mast (7) e.g. by placing a pallet underneath.

- Set down the mast (7) safely:
  - Carefully place the mast (7) and the four legs (93) on the ground.
  - Disassemble the crane lifting gear from the straps (85).
  - On either side unscrew the straps (85) from the threaded holes at the top of the mast (7).
- Prevent the operator position (19) from slipping by using the transport retainer (Allen screw):
  - Insert the Allen screw (95) from the bottom through the mast (7) into the operator position (19) (key width 36 mm).

Loading the mast (7) by crane is now complete.

2.4 Lifting the battery by crane

⚠ WARNING!

All persons involved in loading by crane must be trained

Incorrect crane loading procedures due to untrained personnel can result in the battery falling. There is a risk of injury to personnel and a risk of material damage to the battery.

- ▶ 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 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.

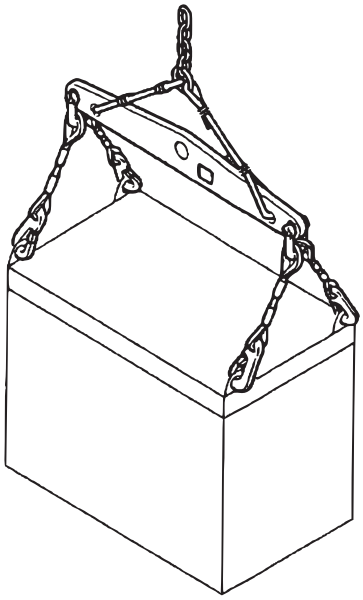
⚠ WARNING!

Risk of accidents and injuries when handling acid batteries

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

- ▶ Dispose of used battery acid in accordance with regulations.
- ▶ Wear protective clothing and eye protection when working with acid 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 injuries (e.g. skin or eye contact with battery acid), call a doctor immediately.
- ▶ Neutralise spilled battery acid immediately with plenty of water.
- ▶ Use only batteries with a closed battery tray.
- ▶ Follow national guidelines and legislation.

Safe lifting of the battery by crane



Requirements

– Battery removed, see page 166.

Tools and Material Required

– Crane lifting gear with sufficient capacity
– 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 the four eyes on the battery tray (for weight refer to the battery rating plate).

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

- Loading the battery onto a pallet:
  - Place the battery on a pallet.
  - Remove the crane lifting gear from the four eyes of the battery tray.
  - Secure the battery to the pallet with two lashing straps.

The pallet with the battery can be raised lifted and loaded.

3 Securing the truck during transport

⚠ WARNING!

Danger due to uncontrolled movement of the truck or the mast during transport

If the truck and mast are not properly secured during transport, serious accidents can occur. Slipping lashing straps can lead to uncontrolled movements of the truck or mast and even a fall during transport. Accidents caused by this can result in property damage and fatal injuries.

- ▶ 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 working with load securing equipment. Correct dimensioning and implementation of load securing measures must be ensured in each individual case.
- ▶ The truck or mast must be professionally and securely fastened when transported on a lorry or trailer.
- ▶ The lorry or trailer must be equipped with lashing rings.
- ▶ Use wedges to prevent the truck from accidentally moving.
- ▶ Use only lashing straps with sufficient tensile strength. Attach the lashing straps so that they cannot slip.
- ▶ Use non-slip materials to secure the transport aids (pallet, wedges, etc.), e.g. non-slip mats.

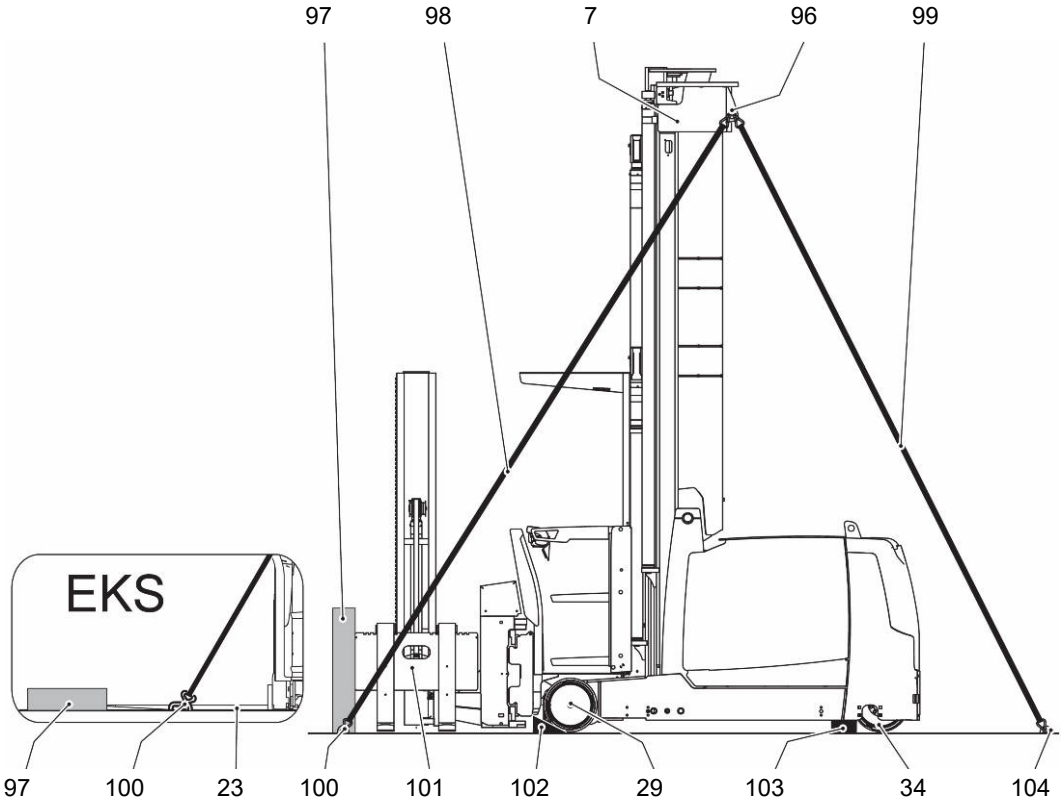
⚠ WARNING!

Torn lashing straps

Lashing straps can tear when routed over sharp edges.

- ▶ Do not route lashing straps over sharp edges, use suitable cut protection, if necessary.
- ▶ Lashing straps that are routed over lift chains must be protected with a suitable oil-resistant base.

3.1 Securing the basic truck during transport with the mast assembled



⚠ WARNING!

Improper securing during transport can result in accidents

Improper securing of the basic 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 basic truck with the mast assembled for transport

Requirements

– Truck parked securely, see page 314.
– Disconnect the battery if this is also supplied with the truck.
– Support skids disassembled.

Tools and Material Required

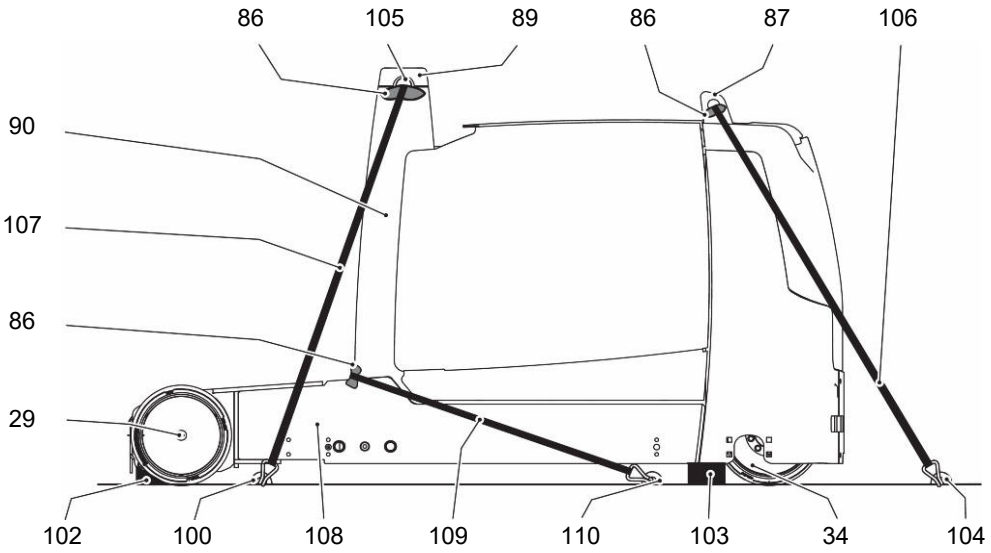
– Tie-down straps with a rated capacity of > 5 tonnes.
– Two hard wooden blocks with identical dimensions and composition.
– Two identical wedges.
– Wooden plank, pallet or rubber mat.

Procedure

- Load the truck correctly onto the lorry or trailer, see page 122.
- Ensure a positive fit between the front of the transporter and the truck:
  - On the EKS:
    Position a wooden beam, pallet or rubber mat (97) between the front of the transporter and the load handler (23).
  - On the EKX:
    Position a wooden beam, pallet or rubber mat (97) between the front of the transporter and the fork carriage (101).
- Discharge the drive wheel (34):
  - Place hard wooden blocks (103) on either side under the truck chassis at the height of the drive wheel (34).
- Place wedges (102) in front of the load wheels (29) to prevent the truck from moving accidentally.
- Secure the truck with at least four tie-down straps (98,99):
  - On either side attach two tie-down straps (98) to the "top mast crossmember" attachment points (96) on the mast and the lashing rings (100).
  - On either side attach two tie-down straps (99) to the "top mast crossmember" attachment points (96) on the mast and the lashing rings (104).
  - Tighten the lashing straps (98,99) with their tensioners.

The basic truck with the mast assembled is now secured for transport.

3.2 Securing the basic truck during transport



Item	Component
86	Support to protect the fastening belt from sharp edges

⚠ WARNING!

Improper securing during transport can result in accidents

Improper securing of the basic 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 three different lashing rings.

Securing the basic truck for transportation

Requirements

– Truck parked securely, see page 314.
– Mast not attached to the basic truck. Any mast bracing disassembled. The mast and the mast bracing must only be removed by the manufacturer's specialist customer service personnel who have been trained to do this. In exceptional cases, this task may be performed by a customer service organisation authorised by the manufacturer.
– Disconnect the battery if this is also supplied with the truck.
– Support skids disassembled.

Tools and Material Required

– Tie-down straps with a rated capacity of > 5 tonnes.
– Two hard wooden blocks with identical dimensions and composition.
– Two identical wedges.
– Torque wrench with a minimum torque of 205 Nm.
– Torque wrench fitting: Allen key with key width
  - EKS 514-516 / EKX 514-516 = 17 mm.

Procedure

• Load the basic truck correctly onto the lorry or trailer, see page 124.
• Discharge the drive wheel (34):
  • Place hard wooden blocks (103) on either side under the truck chassis at the height of the drive wheel (34).

- Place wedges (102) in front of the load wheels (29) to prevent the truck from moving accidentally.
- Remove the side panel if fitted and package it separately.

NOTICE

When assembling the fastening belts be aware of the electric and hydraulic line routing. Prevent the electric and hydraulic lines from being damaged by the fastening belts.

- Fit the tie-down strap (106):
  - Guide the tie-down strap (106) through the "eyes of the bottom mast bracing" strap points (87).
  - Secure the tie-down strap (106) to the lashing rings (104) on both sides.
  - Tighten the tie-down strap (106) with the tension device.
- Fit the tie-down strap (107):
  - On either side position a half shell (89) above the "mast receptacle / top half shell" attachment point (90).
  - Attach the half shell (89) to the chassis with two Allen screws (90).

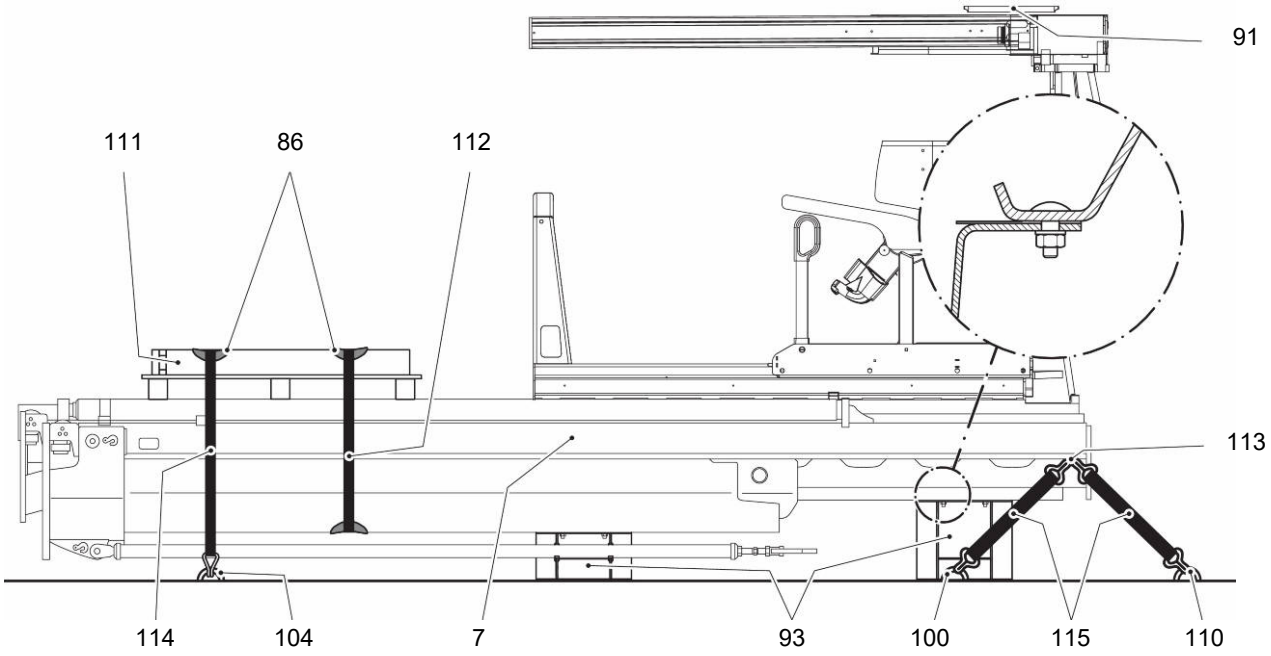
NOTICE

Torque the Allen screws (key width EKS 514-516 / EKX 514-516 = 17 mm) to 205 Nm.

  - Guide the tie-down strap (107) through the openings of the top mast attachment (105).
  - Secure the tie-down strap (107) to the lashing rings (100) on both sides.
  - Tighten the tie-down strap (107) with the tension device.
- Fit the tie-down strap (109):
  - Guide the tie-down strap (109) over both outriggers (108).
  - Secure the tie-down strap (109) to the lashing rings (110) on both sides.
  - Tighten the tie-down strap (109) with the tension device.

The basic truck without the mast is now secured for transport.

3.3 Securing the mast during transport



Item	Component
86	Support to protect the fastening belt from sharp edges

⚠ WARNING!

Improper securing during transport can result in accidents

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

▶To attach the mast to the lorry or trailer secure fastening belts on either side to at least three different lashing rings.

Securing the mast for transportation

Requirements

– Forks disassembled (if fitted), see page 321.
– Truck parked securely, see page 314.
– Fork carriage (91) prevented from slipping.
– Activities to be performed only on trucks with a swivel traverse frame:
  • Attachment moved to the centre of the swivel traverse frame.
  • Attachment prevented from slipping.
– Mast (7) not attached to the basic truck. The mast (7) can only be removed by the manufacturer's specialist customer service personnel who have been trained to do this. In exceptional cases, this task may be performed by a customer service organisation authorised by the manufacturer.

Tools and Material Required

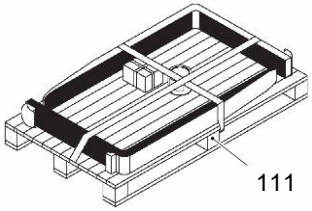
– Tie-down straps with a rated capacity of > 5 tonnes.
– Four legs (93).
– Cable ties.
– Pallet (111) to stow any supplied parts (forks, guide rollers, etc.).

Procedure

NOTICE

When assembling the fastening belts be aware of the electric and hydraulic line routing. Prevent the electric and hydraulic lines from being damaged by the fastening belts.

- Load the mast (7) correctly onto the lorry or trailer, see page 126.
- Stow any supplied parts (forks, guide rollers, etc.) on a pallet (111) so that they cannot slip.



- Place the pallet (111) on the mast and secure it (not possible with small masts):
  - Place a pallet (111) on the top section of the mast (7).
  - Route the tie-down strap (112) over the pallet (111) and around the mast (7).
  - Tighten the tie-down strap (112) with the tension device.
- Fit the tie-down strap (114):
  - Sling the tie-down strap (114) over the top section of the mast (7), if necessary over the pallet (111) and secure on both sides to the lashing rings (104).
  - Tighten the lashing straps (114) with their tensioners.
- Fit the tie-down straps (115):
  - On either side attach two tie-down straps (115) to one of the recesses (113) on the bottom section of the mast (7) and to the lashing rings (100,110).
  - Tighten the lashing straps (115) with their tensioners.

The mast (7) can now be transported.

4 Using the Truck for the First Time

Safety Instructions for Assembly and Commissioning

⚠ WARNING!

Incorrect assembly can result in accidents

The assembly of the truck at the application site, commissioning and operator training must only be performed by the manufacturer's customer service representatives who have been specially trained for these tasks.

- ▶ The hydraulic and electrical lines may only be connected to the basic truck / mast interface when the mast has been properly assembled.
- ▶ Start the truck only after the mast has been assembled correctly.
- ▶ If several trucks have been delivered, make sure that the serial numbers of the load handlers, masts and basic trucks always match.

⚠ 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.

4.1 Moving the industrial truck without a battery

This operation must only be carried out by a specialist maintenance engineer who has been instructed in operation.

⚠ WARNING!

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

→ Moving the truck without battery, see page 370.

4.2 Installing and removing the mast

⚠ WARNING!

The mast can only be disassembled / assembled by the manufacturer's specialist customer service personnel who have been trained to do this. Exceptionally, this task may be performed by a customer service organisation authorised by the manufacturer.

⚠ WARNING!

Trapping hazard in the swivel and traverse area of the attachment

There is a trapping hazard in the attachment area while the attachment is traversing and swivelling.

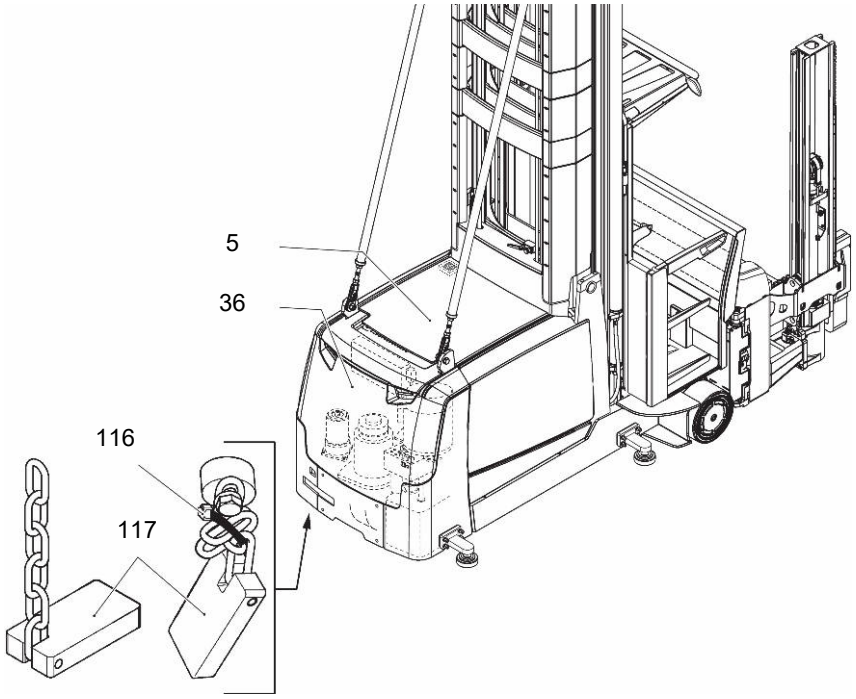
▶ Keep all personnel out of the hazardous area during hydraulic operations.

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

▶ Stop working with the truck if people do not leave the hazardous area.

4.3 Commissioning

4.3.1 Commissioning the EKX 410-412



Preparing for operation after delivery or transport

Requirements

– Truck unloaded from the transport vehicle, lorry or trailer.
– Mast secured to the basic truck. Any mast bracing assembled. The mast and the mast bracing must only be assembled by the manufacturer's customer service department which has been trained to do this. In exceptional cases this task may be performed by a customer service department authorised by the manufacturer.

Tools and Material Required

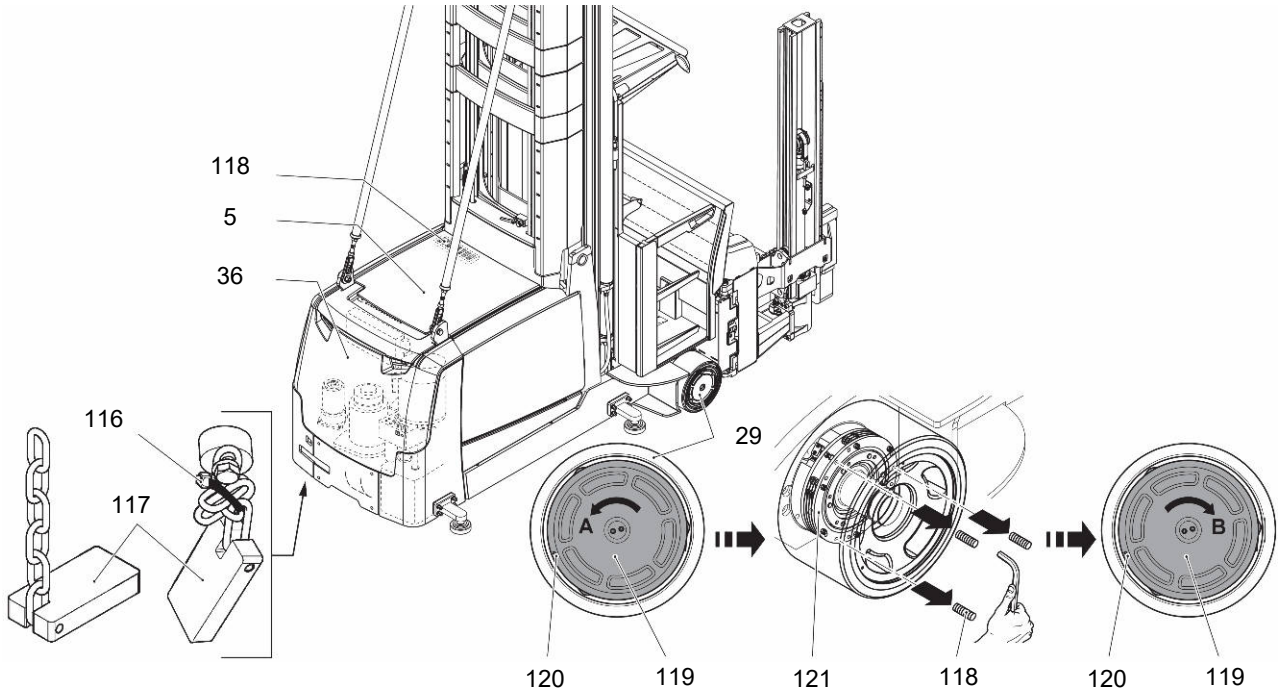
– Slotted screwdriver
– Diagonal pliers

Procedure

- Check that the equipment is complete.
- Open the battery panel (5).
- Disassemble the drive compartment cover (36), see page 686.
- For transport, remove the secured static charge eliminator (117) from the drive compartment:
  - Remove the cable ties (116).
  - Ensure that the static charge eliminator (117) contacts the ground.
- Install the battery if necessary, see page 166.
- Charge the battery, see page 160.
- Check the hydraulic oil level and top up if necessary (see page 706).
- Close the load-handler emergency lowering valve, see page 346.
- Check that all safety mechanisms are present and test them (e. g. tilt safety devices etc.).
- Fit the drive compartment cover (36), see page 686.
- Close the battery panel (5).
- Start the truck as described (see page 219 and see page 265).

The truck is ready for operation after commissioning.

4.3.2 Commissioning the EKS 514-516 / EKX 514-516



Preparing for operation after delivery or transport

Requirements

– Truck unloaded from the transport vehicle, lorry or trailer.
– Mast secured to the basic truck. Any mast bracing assembled. The mast and the mast bracing must only be assembled by the manufacturer's customer service department which has been trained to do this. In exceptional cases this task may be performed by a customer service department authorised by the manufacturer.

Tools and Material Required

– Slotted screwdriver
– Diagonal pliers
– Allen key (key width 6 mm)
– Screwdriver or punch (\< 4 mm)

Procedure

- Check that the equipment is complete.
- Open the battery panel (5).
- Disassemble the drive compartment cover (36), see page 686.
- For transport, remove the secured static charge eliminator (117) from the drive compartment:
  - Remove the cable ties (116).
  - Ensure that the static charge eliminator (117) contacts the ground.
- Install the battery if necessary, see page 166.
- Charge the battery, see page 160.
- Check the hydraulic oil level and top up if necessary (see page 706).
- Disassemble the guards (119) of the load wheels (29) on both sides:
  - Insert the dowel pin (120) with a screwdriver or punch.
  - Turn the cover (119) anti-clockwise until the covers (119) can be removed from the load wheel (29) (see arrow direction "A").
  - Remove the covers (119).

- Remove the setscrews (118) from the threaded holes (241) of the load wheel brake (121).

➔ The setscrews (118) loosen the load wheel brakes (121) when they are de-energised.

The load wheel brakes (121) are now applied without power.

- Insert the setscrews (118) in the bracket above the battery compartment.
- Fit the guards (119) of the load wheels (29) on both sides:
  - Place the cover (119) onto the load wheel (29).
  - Turn the cover (119) clockwise until the dowel pin (120) engages in one of the holes in the cover (119) (see arrow direction "B").
- Close the load-handler emergency lowering valve, see page 346.
- Check that all safety mechanisms are present and test them (e. g. tilt safety devices etc.).
- Fit the drive compartment cover (36), see page 684.
- Close the battery panel (5).
- Start the truck as described (see page 219 and see page 265).

The truck is ready for operation after commissioning.

4.4 Tilt safety device

Depending on the tilt test the EKS / EKX may be supplied with tilt safety devices (31). The tilt safety devices are fitted to the left and right of the rear truck chassis.

Trucks from year of manufacture 09.13
When a tilt safety device (31) is used, under the battery cover (5) an "X" is engraved in the chassis (40) after the serial number (see page 100).

⚠ WARNING!

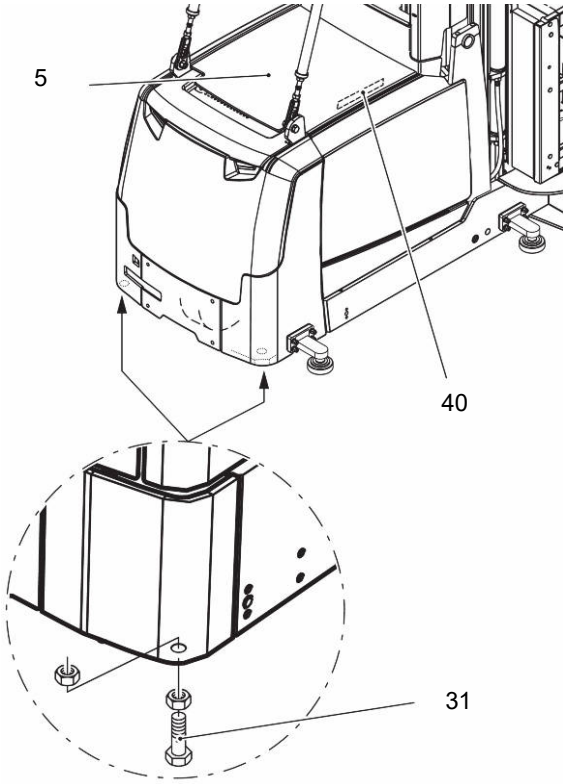
Missing tilt safety devices can result in loss of stability

The truck can tip over if it is operated either without or with incorrectly adjusted tilt safety devices.

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

NOTICE

For a new drive wheel, the distance from the tilt safety device (31) to the ground should be 10 mm to 12 mm.



D Battery - Servicing, Recharging, Replacement

1 Notes on types of battery technology

Lead-acid battery

The truck is fitted with a lead-acid battery as standard.

Replaceable lithium-ion battery (○)

The truck is optionally fitted with a lithium-ion battery.

→ Note the separate operating instructions for the lithium-ion battery.

2 General safety regulations for batteries

⚠ 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.

⚠ WARNING!

Risk of tipover when using the battery without a counterbalance weight (additional weight)

Operating the truck with a battery and no counterbalance weight (additional weight) reduces the operational stability and capacity. When loads are picked up in accordance with the capacity plate, there is a risk of tipover for the truck.

▶ When replacing a battery always install the same battery type in the battery compartment.

▶ Compensating weights must not be removed and must remain in the same position.

– Do not physically machine or modify the battery.
– Do not open, damage, penetrate or bend the battery.
– Do not throw the battery into a fire.
– Protect the battery from high temperatures and overheating.
– Protect the battery from solar irradiation.
– Keep the battery away from radiant sources and strong heat sources.
– The specified charging, operating and storage temperature ranges must be observed.

Failure to observe these safety instructions can result in fire.

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.

The truck must be parked securely before all work on the batteries, see page 314.

2.1 Safety instructions for handling lead-acid batteries

⚠ WARNING!

Risk of accidents and injuries when handling acid batteries

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

- ▶ Dispose of used battery acid in accordance with regulations.
- ▶ Wear protective clothing and eye protection when working with acid 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 injuries (e.g. skin or eye contact with battery acid), call a doctor immediately.
- ▶ Neutralise spilled battery acid immediately with plenty of water.
- ▶ Use only batteries with a closed battery tray.
- ▶ Follow national guidelines and legislation.

⚠ WARNING!

Risk of short circuits or electric shock

Batteries without an insulated cover or without insulated live components can cause short circuits or electric shocks.

- ▶ Always use batteries whose covers or live components are insulated.

Fire protection measures

⚠ WARNING!

Short circuits can result in fire

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

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

⚠ CAUTION!

The use of unsuitable fire-protection equipment can result in acid burns

In the event of fire, a reaction with the battery acid can occur if water is used to extinguish the fire. This can lead to acid burns.

- ▶ Use powder extinguishers.
- ▶ Never extinguish burning batteries with water.

Do not smoke and avoid naked flames when handling batteries. Wherever an industrial truck is parked for charging, there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2,5 m from the truck. The room must be ventilated. Fire protection equipment must be on hand.

The truck must be parked securely before all work on the batteries, see page 314.

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.

2.1.1 Instructions for disposal

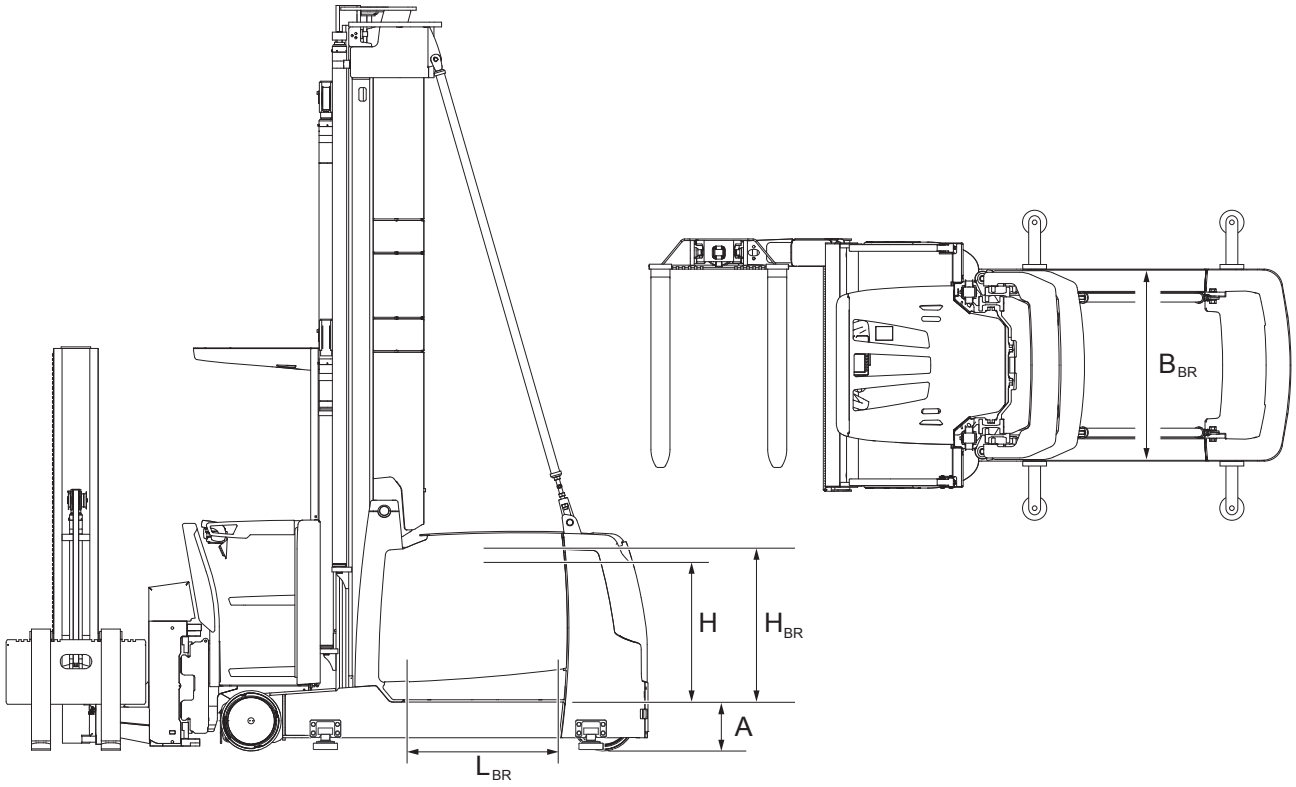
Battery disposal

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

2.2 Safety regulations for handling lithium-ion batteries

➔ Note the separate operating instructions for the lithium-ion battery.

3 Dimensions of the battery compartment



Description		EKX 410 EKX 412
A	Top of battery roller to ground	325 mm
B_{SE}	Battery compartment width	1060 mm
H	Maximum battery height	880 mm
H_{SE}	Battery compartment height	925 mm
L_{SE}	Battery compartment length	632 mm

Description		EKS 514 EKX 514	EKS 516k EKX 516k	EKS 516 EKX 516
A	Top of battery roller to ground	325 mm	325 mm	325 mm
B_{SE}	Battery compartment width	1060 mm	1060 mm	1060 mm
H	Maximum battery height	880 mm	880 mm	880 mm
H_{SE}	Battery compartment height	925 mm	925 mm	925 mm
L_{SE}	Battery compartment length	632 mm	742 mm	1012 mm

4 Battery types

⚠ WARNING!

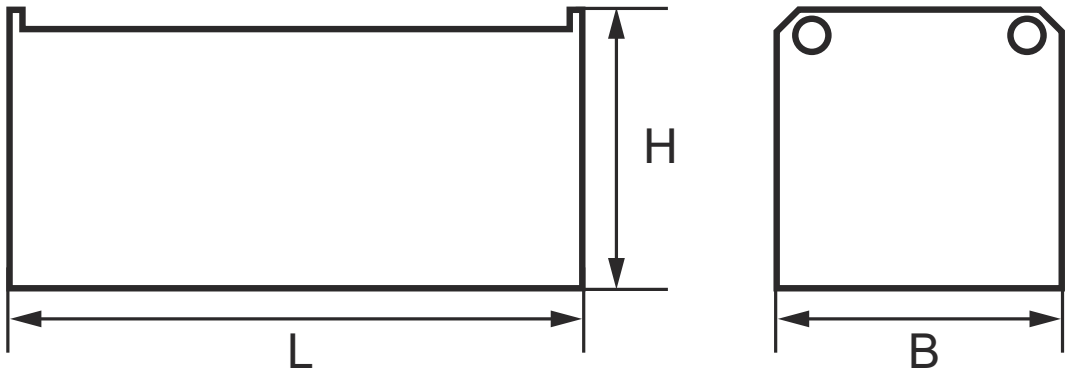
Unsuitable batteries that have not been approved by Jungheinrich for the truck can be hazardous

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.

The EKS / EKX can be fitted with a variety of battery types. The following table shows which combinations are included as standard:

The battery weights can be taken from the battery data plate.



EKX 410

Battery type	Voltage (V)	Capacity (Ah)	Dimensions LxWxH (mm)	Weight*) (kg)
4 PzS 460[1)]	48	460	1030x439x627	709
5 PzS 575[1)]	48	575	1030x529x627	856
6 PzS 690[1)]	48	690	1030x619x627	1011
6 PzS 720[1)]	48	720	1032x620x854	1011
6 PzS 930[1)]	48	930	1035x623x784	1415
GNB 595[1)]	48	595	1016x610x610	998

*) Tolerance range: ± 5 %

1 Single-part battery version
2 Two part battery version
3 Battery tray with fork shoes

EKX 412

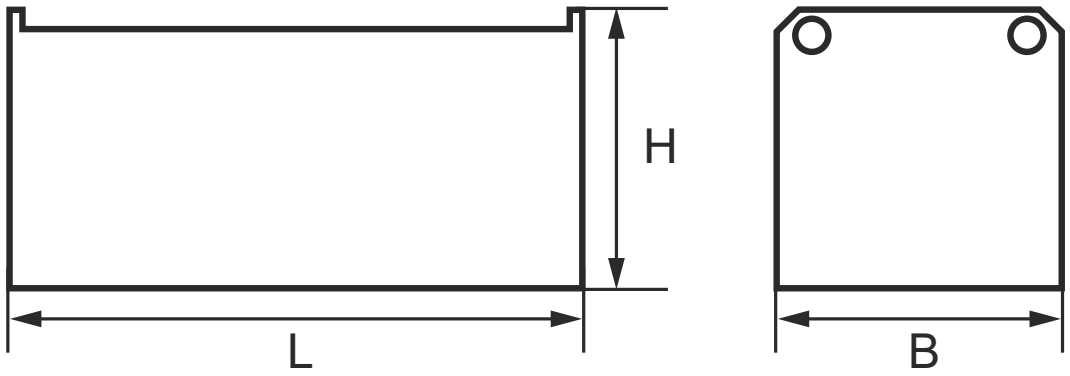
Battery type	Voltage (V)	Capacity (Ah)	Dimensions LxWxH (mm)	Weight*) (kg)
4 PzS 460[1)]	48	460	1030x439x627	709
5 PzS 575[1)]	48	575	1030x529x627	856
6 PzS 690[1)]	48	690	1030x619x627	1011
6 PzS 720[1)]	48	720	1032x620x854	1011
6 PzS 930[1)]	48	930	1035x623x784	1415
GNB 595[1)]	48	595	1016x610x610	998

EKS 514 / EKX 514

Battery type	Voltage (V)	Capacity (Ah)	Dimensions LxWxH (mm)	Weight (kg)
3 PzS 420[1)]	80	420	1028x567x784	1176 to 1300
3 PzS 420[2)]	2 x 40	420	526x612x862	2 x 625
3 PzS 465[1)]	80	465	1028x567x784	1176 to 1300
3 PzS 465[1.3)]	80	465	1025x564x864	1232 to 1362
3 PzS 465[2)]	2 x 40	465	526x612x862	2 x 625
4 PzS 620[1)]	80	620	1180x612x862	1520 to 1680
GNB[1)]	80	500	1042x610x775	1175 to 1494

*) Tolerance range: ± 5 %

1 Single-part battery version
2 Two part battery version
3 Battery tray with fork shoes



EKS 516k / EKX 516k

Battery type	Voltage (V)	Capacity (Ah)	Dimensions LxWxH (mm)	Weight (kg)
3 PzS 420[1)]	80	420	1028x567x784	1176...1300
3 PzS 420[2)]	2 x 40	420	526x612x862	2 x (594...657)
3 PzS 465[1)]	80	465	1028x567x784	1176...1300
3 PzS 465[1.3)]	80	465	1025x564x864	1232...1362
3 PzS 465[2)]	2 x 40	465	526x612x862	2 x (594...657)
4 PzS 560[1)]	80	560	1028x711x784	1480...1636
4 PzS 560[2)]	2 x 40	560	526x703x862	2 x (760...840)
4 PzS 600[2)]	2 x 40	600	526x703x862	2 x (760...840)
4 PzS 620[1)]	80	620	1028x711x784	1480...1636
4 PzS 620[1.3)]	80	620	1025x708x864	1536...1698
4 PzV 560[1)]	80	560	1028x711x784	1592...1760
GNB[1)]	80	500	1042x610x775	1352...1494
GNB[1)]	80	500	1054x620x775	1336...1476
GNB[1)]	80	620	1048x693x775	1594...1762
GNB[1)]	80	625	1048x705x775	1594...1762

1 Single-part battery version
2 Two part battery version
3 Battery tray with fork shoes

EKS 516 / EKX 516

Battery type	Voltage (V)	Capacity (Ah)	Dimensions LxWxH (mm)	Weight (kg)
4 PzS 560[1)]	80	560	1028x711x784	1480 - 1636
4 PzS 620[1)]	80	620	1028x711x784	1480 - 1636
4 PzS 620[1.3)]	80	620	1028x711x784	1536 - 1698
5 PzS 700[1)]	80	700	1028x855x784	1769 - 1957
5 PzS 700[2)]	2 x 40	700	526x832x862	2 x (903...998)
5 PzS 775[1)]	80	775	1028x855x784	1769 - 1957
5 PzS 775[2)]	2 x 40	775	526x832x862	2 x (903...998)
6 PzS 690[1)]	80	690	1026x996x627	1634 - 1808
6 PzS 750[1)]	80	750	1026x996x627	1634 - 1808
6 PzS 840[1)]	80	840	1028x999x784	2069 - 2287
6 PzS 840[2)]	2 x 40	840	508x900x784	2 x (1045...1155)
6 PzS 840[2)]	2 x 40	840	538x980x862	2 x (1021...1129)
6 PzS 900[2)]	2 x 40	900	538x980x862	2 x (1021...1129)
6 PzS 930[1)]	80	930	1028x999x784	2069 - 2287
6 PzS 930[1.3)]	80	930	1025x996x864	2125 - 2349
4 PzV 560[1)]	80	560	1028x711x784	1592 - 1760
6 PzV 720[1)]	80	720	1028x999x784	2069 - 2287
6 PzV 840[1)]	80	840	1028x999x784	2070
6 PzW 840[1)]	80	840	1028x999x784	2069 - 2287
GNB[1)]	80	500	1042x610x775	1352 - 1494
GNB[1)]	80	500	1054x620x775	1336 - 1476
GNB[1)]	80	620	1048x693x775	1594 - 1762
GNB[1)]	80	625	1048x705x775	1594 - 1762
GNB[1)]	80	875	1053x1005x775	2172 - 2401

1 Single-part battery version
2 Two part battery version
3 Battery tray with fork shoes

5 Opening or Closing the Battery Panel

⚠ WARNING!

An unsecured truck can cause accidents

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

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

⚠ 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

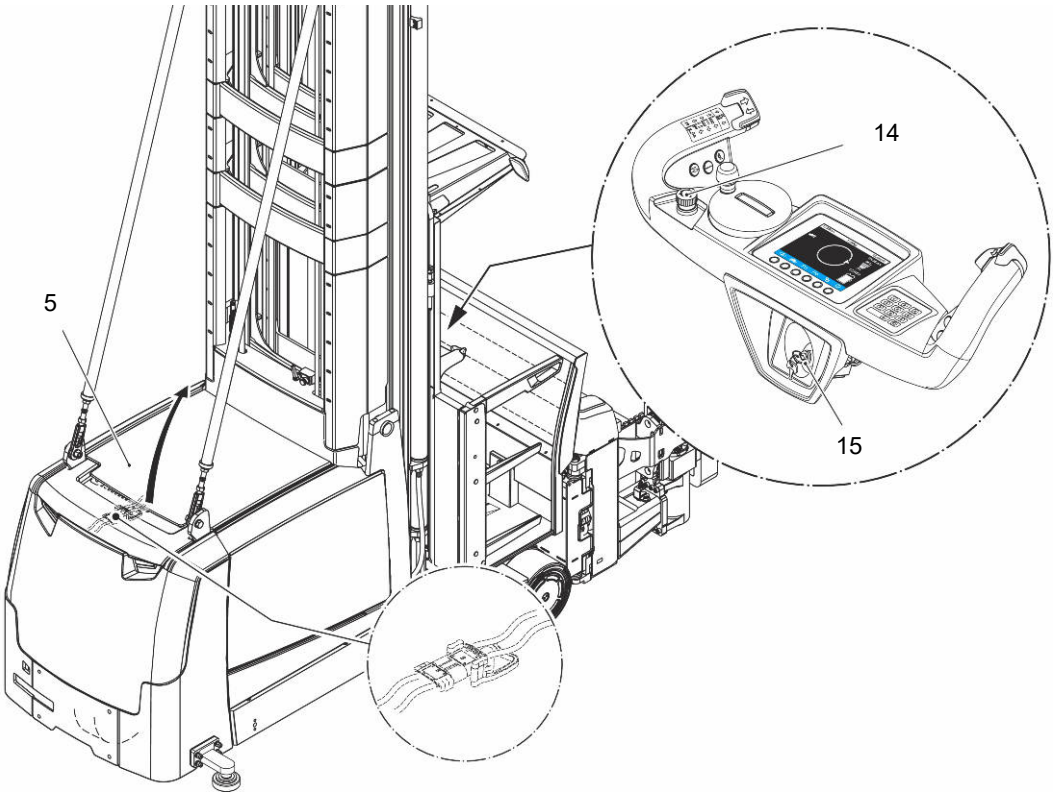
Damaged cables can cause short circuits, setting the truck and battery on fire.

- ▶ 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

NOTICE

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.

5.1 Opening the battery panel



Opening the Battery Cover

Requirements

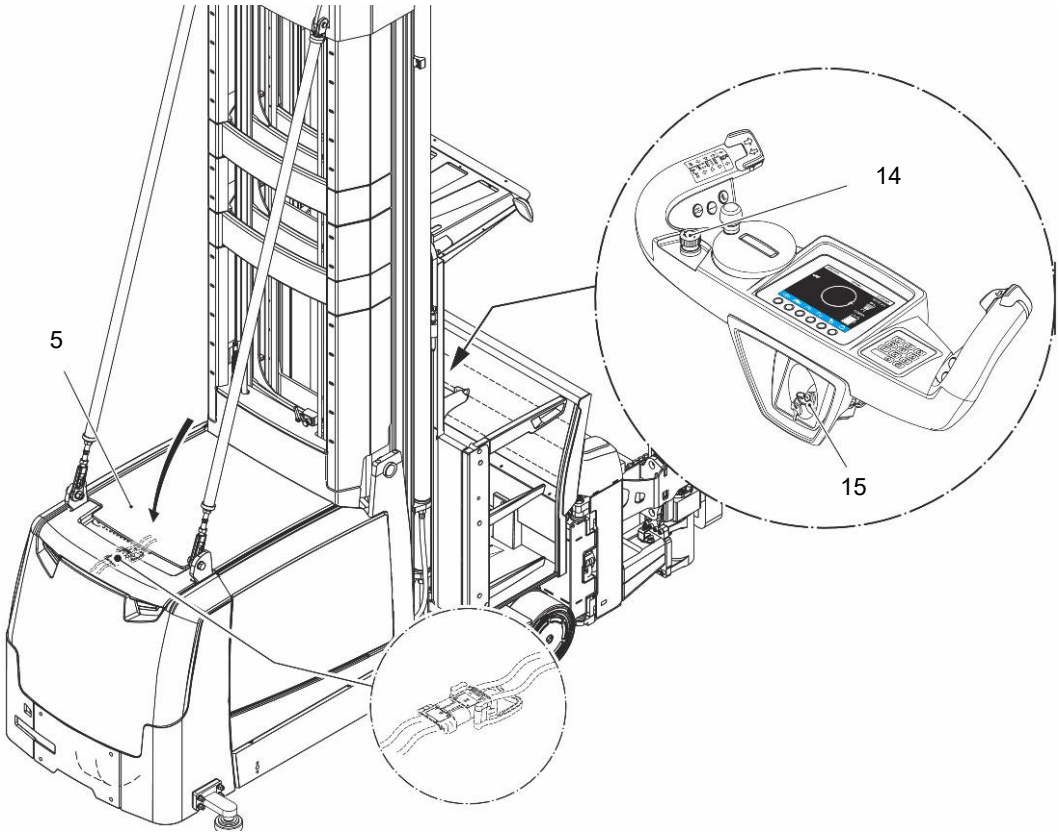
– Park the truck securely, see page 314.

Procedure

- Fully lower the load handler, see page 292.
- Switch off the truck, see page 266.
- Press the emergency disconnect switch (14) down.
- Lift up the battery cover (5) (see arrow direction).

The battery cover (5) is now open.

5.2 Closing the battery cover



⚠ 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.

Closing the battery cover

Requirements

– Park the truck securely, see page 314.
– Battery cover (5) open.

Procedure

• Close the battery panel (5) carefully.

The battery cover (5) is closed and prevented from opening automatically.

6 Charging the battery

6.1 Charging the lithium-ion battery

Note the separate operating instructions for the lithium-ion battery.

6.2 Charging the Lead-Acid Battery

6.2.1 Safety information

⚠ WARNING!

The gases produced during charging can cause explosions

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

- ▶ Switch the charging station and truck off first before connecting/disconnecting the charging cable of the battery charging station to/from the battery connector.
- ▶ The charger must be adapted to the battery in terms of voltage and charge capacity.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶ The battery cover must be open and the battery cell surfaces must be exposed during charging to ensure adequate ventilation.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there shall be no inflammable material or lubricants capable of creating sparks within 2,5 m around the truck.
- ▶ Fire protection equipment must be on hand.
- ▶ Do not lay any metallic objects on battery.
- ▶ It is essential to follow the safety regulations of the battery and charger station manufacturers.

⚠ WARNING!

Risk of electric shock and fire due to insufficient or inappropriate residual current devices

A lack of residual current devices or the use of inappropriate residual current devices can result in fatal injury due to electric shocks or electrical fires in the event of a fault.

- ▶ The owner must conduct an operational risk assessment of the usage location.
- ▶ An RCD switch (residual current device, circuit breaker) of type B or B+ must be used where necessary.

⚠ WARNING!

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

If any safety-related modifications, damage or other defects are discovered on the charger or during operation, the charger must be taken out of service until it has been repaired.

▶Report any defects immediately to your supervisor.

▶Tag out and decommission a faulty charger.

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

⚠ WARNING!

Warning: hazardous electrical voltage!

The charger is an electric component conducting voltages and currents that are hazardous to people.

- ▶ The charger must only be operated by trained technicians.
- ▶ Disconnect the mains supply and the battery connector before carrying out any work on the charger.
- ▶ The charger should only be opened and serviced by trained electricians.

⚠ WARNING!

Risk of electric shock and burning

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

- ▶ Always use mains cables with a maximum length of 30 m.
  Local regulations must be observed.
- ▶ Unwind the cable reel fully when using it.
- ▶ Always use original manufacturer’s mains cables.
- ▶ Insulation safety, acid and caustic ratings must comply with the manufacturer's mains lead.
- ▶ The charging connector must be dry and clean when used.

⚠ WARNING!

There is a danger of sparks if charging is improperly interrupted

Owing to the high charge currents, there is a risk of spark discharge if the charge connector is removed while charging is active. There is a risk of injury and of damage to the electrical contacts.

▶ Stop charging on the battery charger before removing the charge connector.

▶ Do not disconnect the mains cable or charge connector of the battery charger while charging (under load).

NOTICE

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

NOTICE

The use of unevenly charged batteries can result in material damage

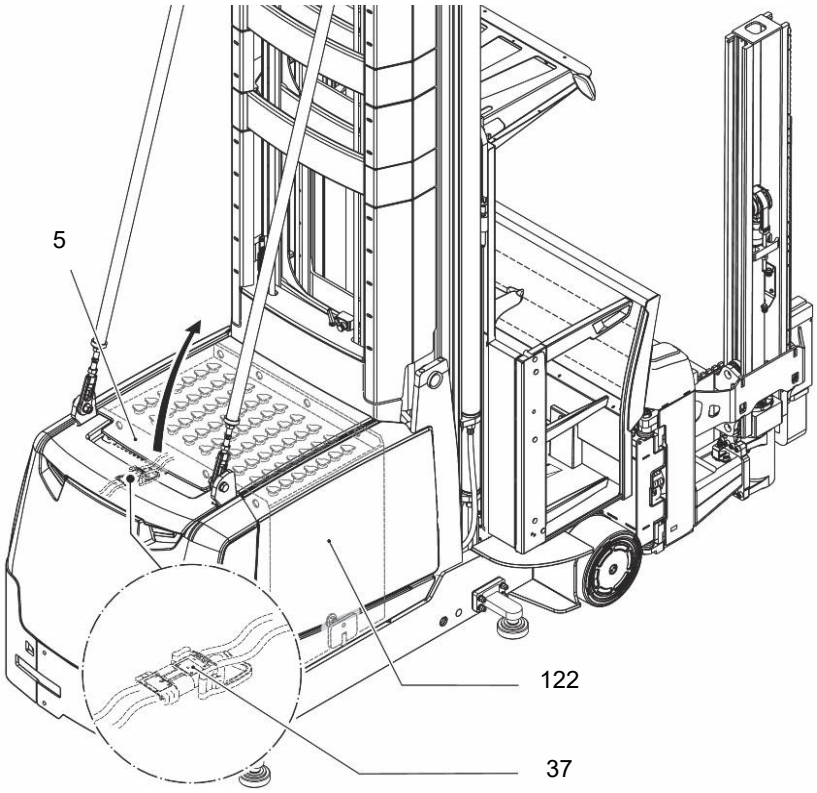
If using the two battery version, the following safety regulations must be observed to prevent material damage to the batteries.

Operating with unevenly charged batteries will result in material damage to the batteries, so that both batteries will have to be replaced.

▶ Always remove and install batteries in pairs.

▶ Always charge batteries in pairs.

6.2.2 Charging the battery with the battery connector



Safety procedure for charging batteries

Requirements

– Truck parked securely, see page 314.
– Battery panel open, see page 156.
– Battery charger switched off.
– Correct charging program set on battery charger.

Procedure

- Disconnect the battery connector (37).
- Connect the battery connector (37) to the charger cable of the battery charger.

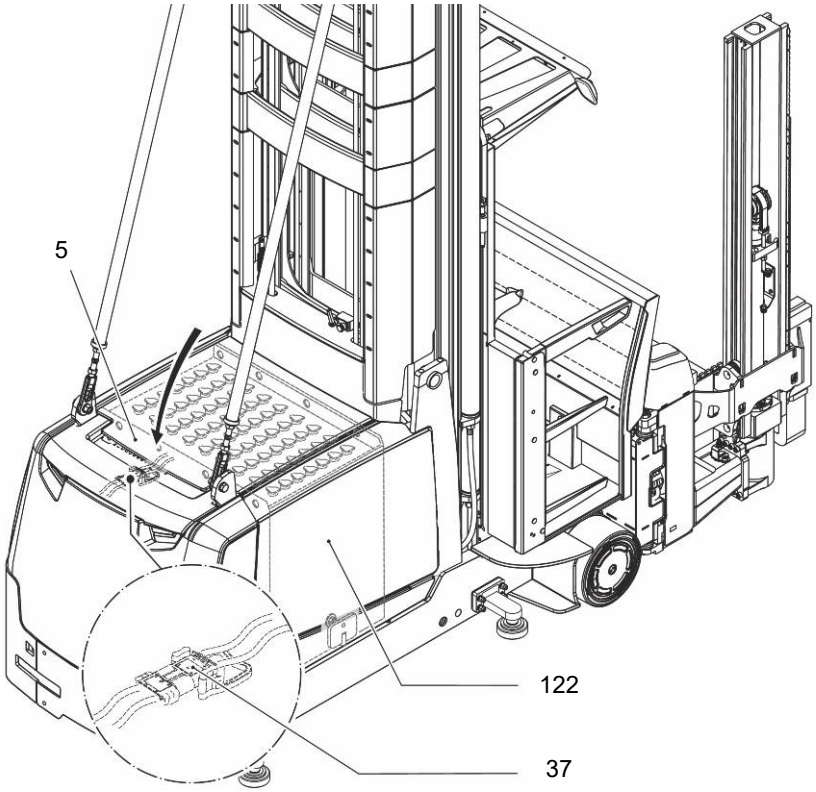
NOTICE

Risk of fire and risk of material damage

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

- Switch on the battery charger.
- Charge the battery (122) in accordance with the battery and battery charger manufacturer’s instructions.

The battery (122) is being charged.



Preparing the battery for operation after charging

Requirements

– The battery (122) is fully charged.

Procedure

- Switch off the charger.
- Disconnect the charging cable from the battery connector (37).
- Check all cables and connectors for visible signs of damage.
- Connect the battery connector (37) to the truck.
- Close the battery cover (5), see page 156.

After the battery charge the truck is ready for operation.

After a fully discharged battery has been completely re-charged and the truck switched on, it may take a few seconds before the truck is operational. During this time the battery symbol in the driver's display flashes.

7 Removing or installing the battery

7.1 Removing and installing the lithium-ion battery

The lithium-ion battery remains permanently in the battery compartment of the forklift truck. The lithium-ion battery may only be installed or removed by the manufacturer's customer service department. The manufacturer has a customer service department specially trained for these tasks.

7.2 Removing and Installing the Lead-Acid Battery

⚠ 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.

⚠ WARNING!

Risk of crushing when removing or installing the battery

When removing or installing the battery, there is a risk of crushing due to the weight of the battery. Personnel may become trapped between the battery and the truck, the ground or other components and suffer serious injuries to the arm, leg or chest area. There is also a risk of acid burns from contact with battery acid.

- ▶ Note the "Safety regulations for handling lead-acid batteries" section in this chapter.
- ▶ Use only batteries with insulated cells and terminal connectors.
- ▶ Park the truck on a level surface to prevent the battery from sliding out.
- ▶ Wear personal protective equipment (e.g. safety footwear, safety gloves, goggles) when removing and installing the battery.
- ▶ Use only approved equipment to change the battery, e.g. battery roller stand, battery replacement station, stacking high-lift truck.
- ▶ When replacing a battery always install the same battery type in the battery compartment. Additional weights must not be removed or have their position changed.
- ▶ Check that the battery is firmly seated in the battery compartment after installation. The battery retainers must be engaged in the truck chassis on both sides and secured against unintentional loosening.

⚠ CAUTION!

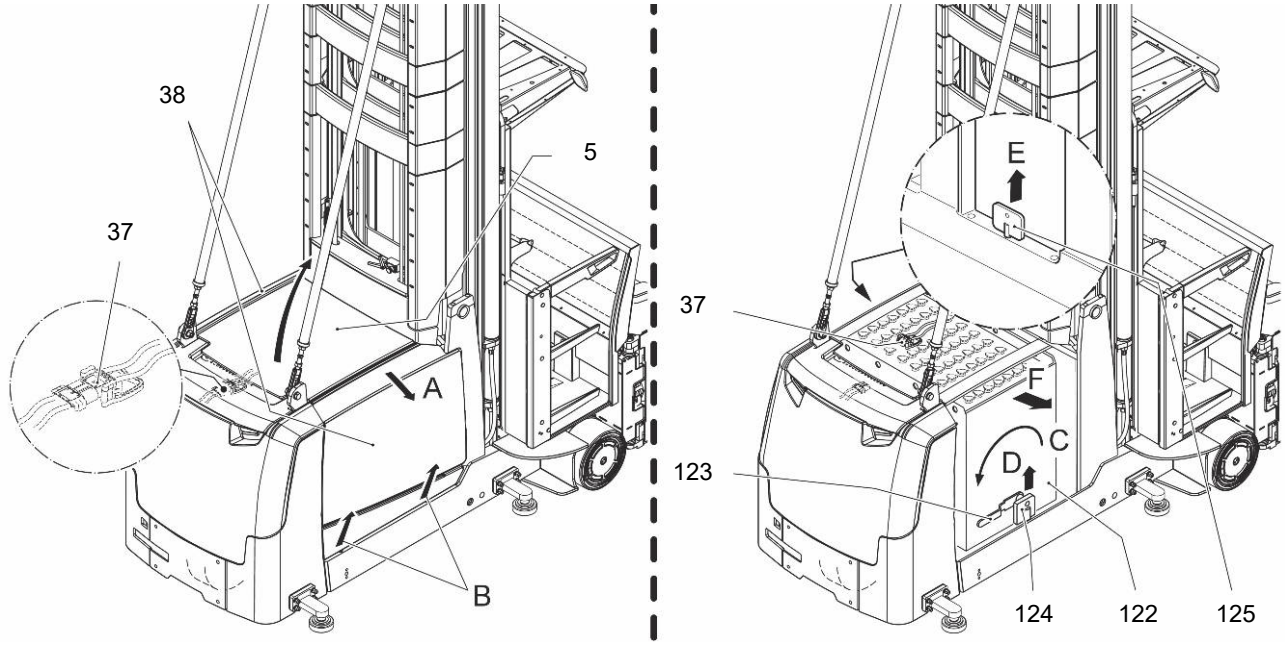
Battery installation and removal can cause short circuits

The battery cable or connector can get trapped between the truck chassis and battery when the battery is installed and removed.

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

Medical and technical device operation affected by magnets, see page 115.

7.2.1 Removing and installing the battery with a battery roller stand (single part batteries)



Removing the battery

Requirements

– Park the truck securely, see page 314.
– Expose the battery, see page 156.

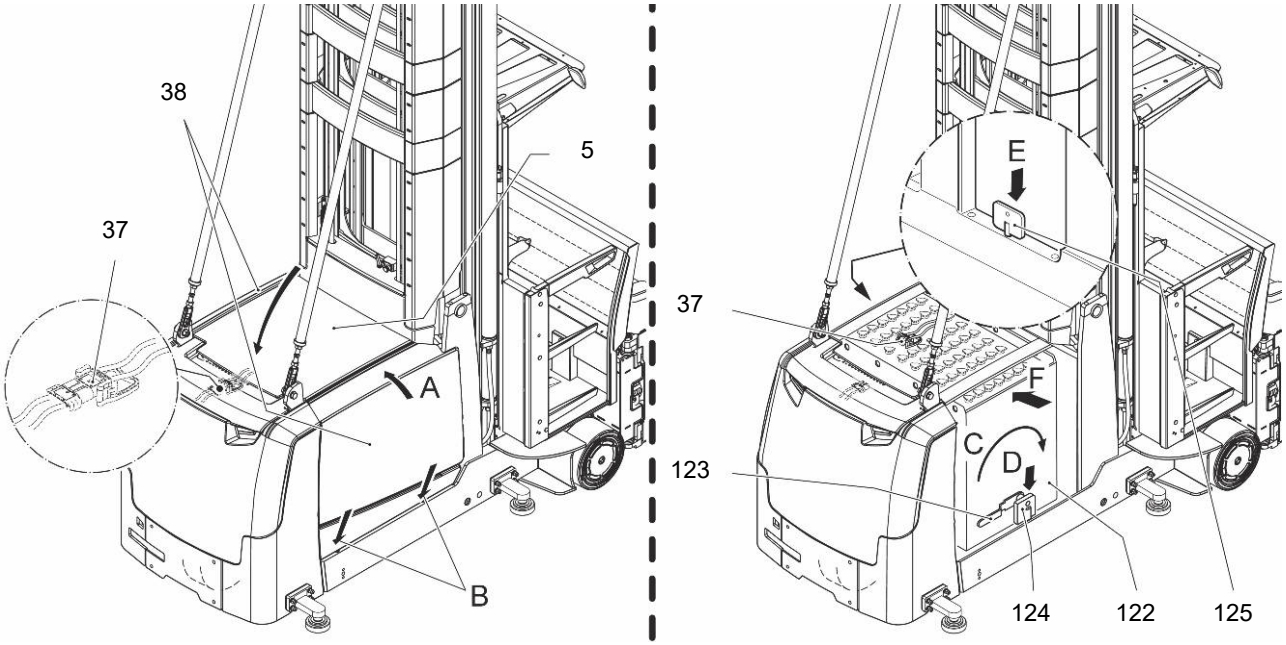
Tools and Material Required

– Battery roller stand

Procedure

- Disconnect the battery (37).
- Place the battery connector (37) and the battery cable on the battery (122) so that these are not damaged when removing the battery (122).
- Remove the side panels (38):
  - Remove the top section of the side panels (38) from the battery compartment (see arrow direction "A").
  - Lift up the side panels (38) (see arrow direction "B").
- Unlatch and remove the battery retainer (124):
  - Turn the handle (123) approx. 180° anticlockwise (see arrow direction "C").
  - Lift out the battery retainer (124) (see arrow direction "D").
- Lift out the battery retainer (125) (see arrow direction "E").
- Position the battery roller stand in front of the battery compartment in such a way that the battery (122) can be safely pushed onto the roller stand.
- Push the battery (122) sideways onto the prepared battery roller stand (see arrow direction "F").
- Secure the battery (122) on the roller stand against accidental movement.

The battery has now been removed.



⚠ CAUTION!

Hand / arm trapping hazard

There is a risk of trapping when you close the battery cover and fit the side panels, battery retainers, battery locks and battery.

▶ Make sure there is nothing between the parts mentioned above and the truck when you fit the battery, retainers and side panels.

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

Battery Installation

Requirements

– Park the truck securely, see page 314.
– Expose the battery, see page 156.

Tools and Material Required

– Battery roller stand

Procedure

- Place the battery connector (37) and the battery cable on the battery (122) so that these are not damaged when installing the battery (122).
- Position the battery roller stand with the battery (122) in front of the battery compartment in such a way that the battery (122) can be safely pushed into the truck's battery compartment.

➔ The battery retainers (124,125) can swap positions. The battery retainers (124,125) can be inserted in either the left- or right-hand side of the truck's chassis.

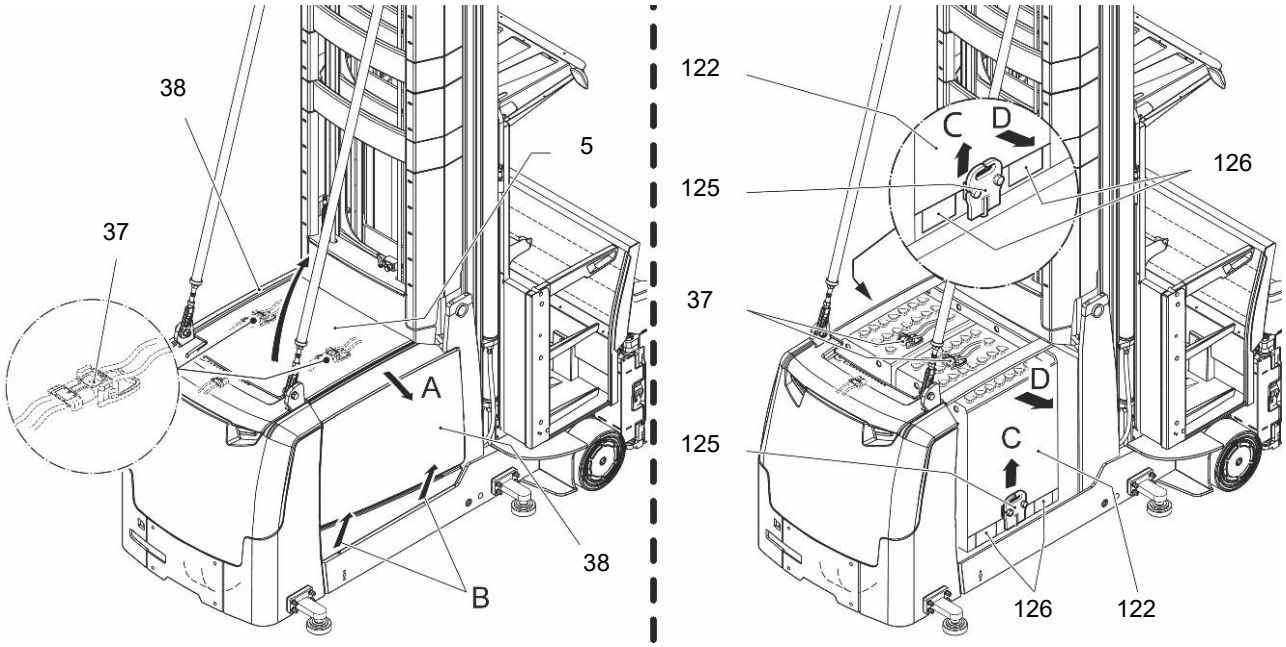
Insert the battery retainer (125) opposite the entry side into the chassis (see arrow direction "E").

- Undo the battery latch on the battery roller stand.
- Push the battery (122) off the roller stand as far as the stop in the truck's battery compartment (see arrow direction "F").

- Insert and lock the battery retainer (124):
  - Insert the battery retainer (124) in the chassis (see arrow direction "D").
  - Turn the handle (123) approx. 180° clockwise (see arrow direction "C").
- Fit the side panels (38):
  - Insert the bottom section of the side panels (38) at an angle into the chassis (see arrow direction "B").
  - Pull up the side panels (38) and engage them with the chassis (see arrow direction "A").
- Check all cables and connectors for visible signs of damage.
- Connect the battery connector (37) to the truck.
- Close the battery cover (5), see page 156.

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

7.2.2 Battery assembly / removal using a fork lift truck (two part batteries)



Removing the battery

Requirements

– Park the truck securely, see page 314.
– Expose the battery, see page 156.

Tools and Material Required

– Fork lift truck with a minimum fork length of 1200 mm and a capacity in excess of 2 tonnes.
  Attention:
  Note the maximum capacity with respect to the load centre distance.

Procedure

- Disconnect the battery (37).
- Place the battery connector (37) and the battery cable on the battery (122) so that these are not damaged when removing the battery (122).
- Remove the side panels (38):
  - Remove the top section of the side panels (38) from the battery compartment (see arrow direction "A").
  - Lift up the side panels (38) (see arrow direction "B").
- Lift up the battery retainers (125) on both sides (see arrow direction "C").

Carefully pull out the battery (122) on the left or right-hand side using a forklift truck:

NOTICE

Risk of material damage

When replacing and installing the batteries avoid damaging the truck chassis, batteries and battery compartment.

▶ Use a jack with sufficient capacity and the correct fork length.

▶ Insert the forks of the truck used for removal or assembly carefully into the fork shoe of the battery roller stand.

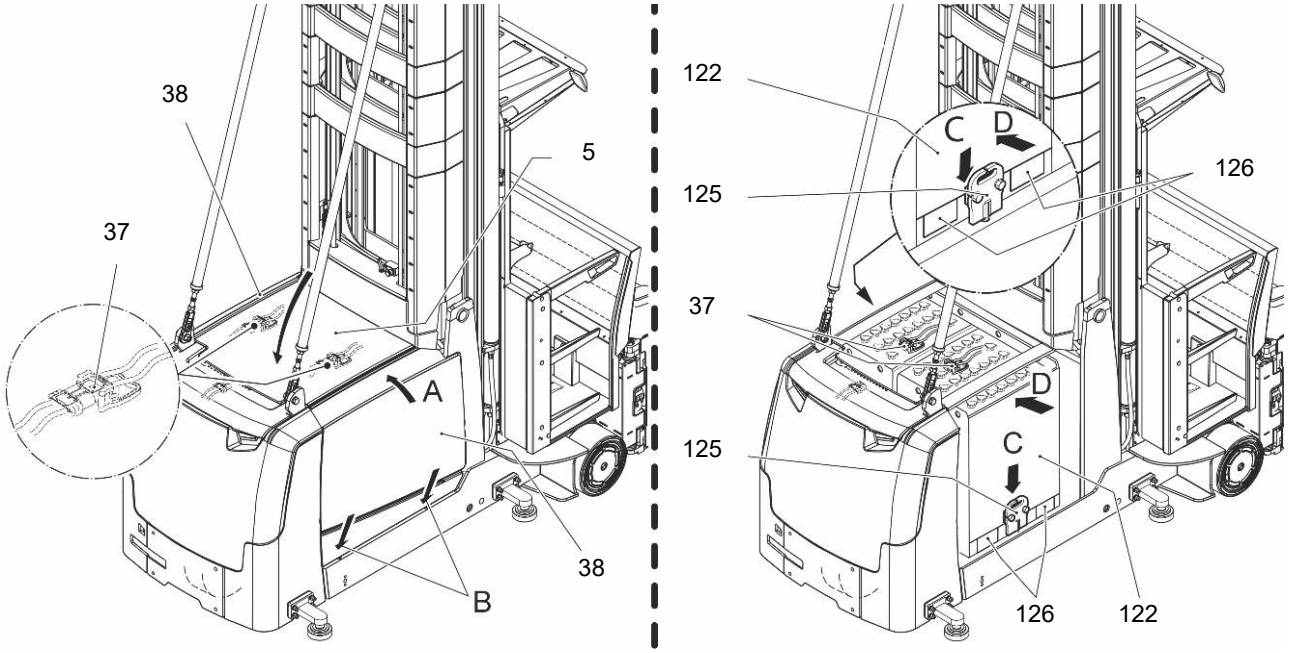
▶ Raise the batteries just high enough so that they can be moved into the battery compartment without striking it.

▶ Avoid tilting the batteries during removal or assembly.

- Place the truck's mast upright, thereby bringing the load handler into a horizontal position.
- Insert the forks of the truck into the fork shoes (126) of the battery roller stand.
- Drive the forklift truck slowly forward until the forks are touching the stop in the battery compartment.
- Raise the battery (122) carefully until it is clear of the ground.
- Reverse the truck carefully and pull the battery (122) out of the battery compartment (see arrow direction "D").

- Lower the battery (122) outside of the battery compartment.
- Slowly push the forks into the fork shoe (126) of the battery roller stand until the fork shank is resting against the battery (122).

The first battery is removed and can be transported. Repeat the procedure for the second battery.



⚠ CAUTION!

Hand / arm trapping hazard

There is a risk of trapping when you close the battery cover and fit the side panels, battery retainers, battery locks and battery.

▶Make sure there is nothing between the parts mentioned above and the truck when you fit the battery, retainers and side panels.

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

Battery installation

Requirements

– Park the truck securely, see page 314.
– Expose the battery, see page 156.

Tools and Material Required

– Fork lift truck with a minimum fork length of 1200 mm and a capacity in excess of 2 tonnes.
Attention:
Note the maximum capacity with respect to the load centre distance.

Procedure

- Place the battery connector (37) and the battery cable on the battery (122) so that these are not damaged when installing the battery (122).
- Bring the battery (122) in front of the battery compartment.
- Lower the battery (122).
- Reverse the forklift truck so that the forks are flush with the battery roller stand and are not sticking out of the fork shoes (126).

Insert the battery (122) into the battery compartment on the left or right side:

NOTICE

Risk of material damage

When replacing and installing the batteries avoid damaging the truck chassis, batteries and battery compartment.

▶ Use a jack with sufficient capacity and the correct fork length.

▶ Insert the forks of the truck used for removal or assembly carefully into the fork shoe of the battery roller stand.

▶ Raise the batteries just high enough so that they can be moved into the battery compartment without striking it.

▶ Avoid tilting the batteries during removal or assembly.

- Raise the battery (122) so that it can be moved into the battery compartment without striking it.
- Slowly insert the battery (122) into the battery compartment as far as the stop (see arrow direction "D").
- Lower the battery (122).
- Slowly reverse the truck and pull the forks carefully out of the fork shoes (126) of the battery roller stand.

The first battery is now inserted in the battery compartment. Repeat the procedure for the second battery.

- Insert the battery retainers (125) on both sides into the truck chassis (see arrow direction "C").

The battery retainers (125) can swap positions. This means that they can both be fitted in either the left or right side of the truck's chassis.

- Fit the side panels (38):
  - Insert the bottom section of the side panels (38) at an angle into the chassis (see arrow direction "B").
  - Pull up the side panels (38) and engage them with the chassis (see arrow direction "A").
- Check all cables and plug connections for visible signs of damage.
- Attach the battery connector (37) to the industrial truck.
- Close the battery cover (5).

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, obligations and responsibilities

The operator 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.

➔ Note the capacity reduction according to weight (operator, rider or loads) in the operator position, see page 112.

Do not allow unauthorised persons to use the 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.

When leaving the industrial truck, the operator must ensure that the industrial truck is secured against unauthorised use, e.g. remove the key or keep the access code secret.

Damage and defects

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.

Safety devices, warning signs and warning instructions

Safety devices, warning signs (see page 100) and warning instructions in the present operating instructions must be strictly observed.

Warnings and notices such as capacity plates, attachment points and data plates must be legible at all times. Replace if necessary.

⚠ 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.

Hazardous area

The "hazardous area" is the area in which people can be endangered by the movements (travel or hydraulic) of the truck, its load handler or attachments. This also includes the area within reach of falling loads or lowering, falling operating equipment.

⚠ WARNING!

Risk of injury in the hazardous area of the truck

People may collide with the truck in the truck hazardous area. This can result in serious injuries. The same applies for falling loads or operating equipment.

- ▶ Apart from the operator (in the normal operating position), there must be no one else in the hazardous area of the truck.
- ▶ Give a warning signal with plenty of time for people to leave.
- ▶ Instruct unauthorised people to move out of the hazardous area of the truck.
- ▶ If unauthorised people do not leave the hazardous area despite being asked to do so, cease working with the truck immediately and bring the truck to a halt without delay. Also prevent the truck from being used by unauthorised personnel.

⚠ WARNING!

Falling objects can cause accidents

Falling objects can injure the operator while the truck is being operated.

- ▶ The operator must remain within the protected area of the overhead guard while the truck is being operated.

⚠ WARNING!

Loads or objects in the operator position leg compartment

Loads or objects in the operator position leg compartment can impede the operation of controls in this area. For example, objects can accidentally activate or jam the controls.

Loads or objects protruding out of the perimeter of the operator position can collide with other components (e.g. racking systems) during operation. In the event of a collision, the operator in the operator position may be injured or the truck may be damaged.

Loads or objects also pose a trip hazard.

▶ Position loads or objects in the operator position such that there is no trip hazard and that the operation of controls in the leg compartment is not impeded.

▶ Ensure that loads or objects cannot protrude out of the operator position during operation.

▶ Secure loads or objects against slipping and falling.

NOTICE

Damage to the operator position due to heavy loads or objects leaning.

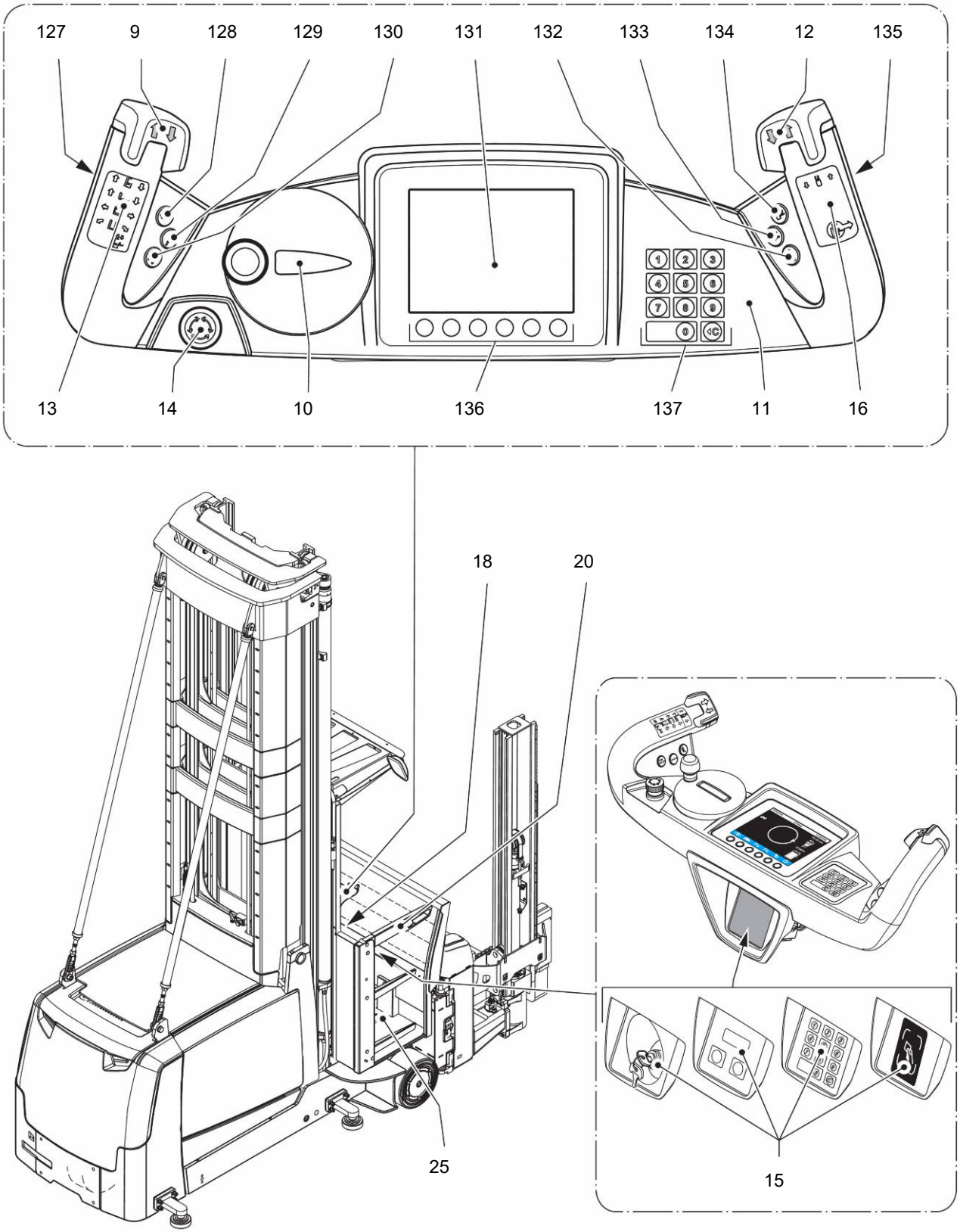
Heavy loads or objects can damage the following moving components in the operator positions:

- Control panel
- Gate
- Mechanical or hydraulic ramp

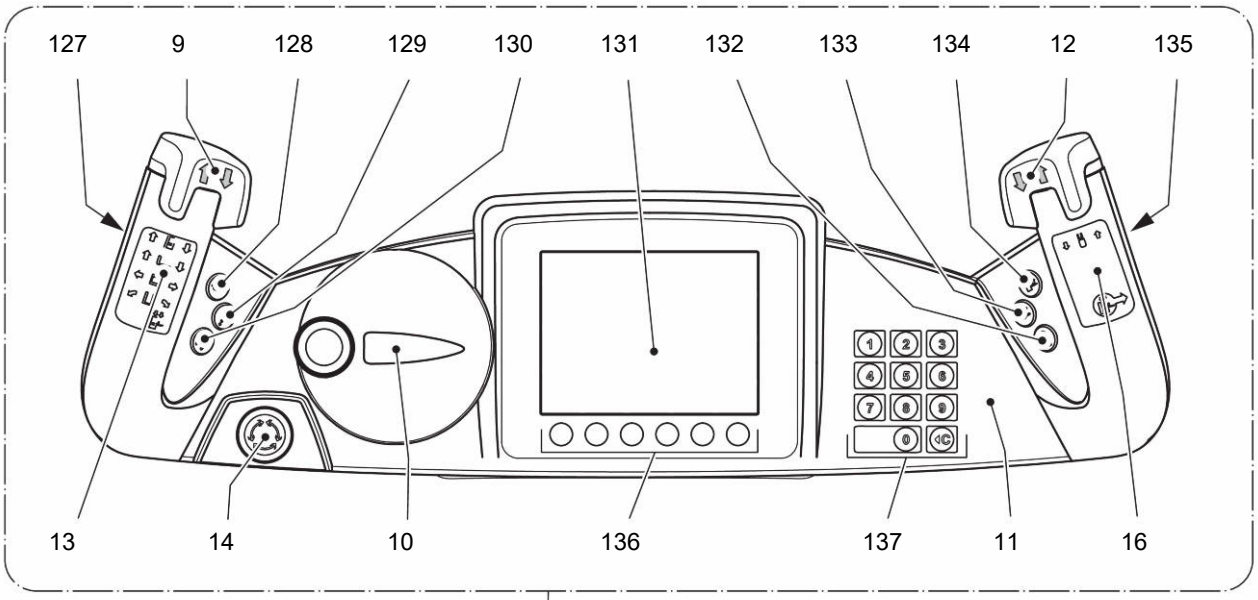
▶ Never lean loads or objects against the aforementioned components.

2 Displays and Controls

2.1 Controls and displays on the control panel



Item	Control/display		Function
9	"Hydraulic functions" control lever	●	Controls the hydraulic functions, e.g. Main Lift raise and lower, fork carriage rotate in conjunction with the "Fork carriage rotate" button (132), attachment traverse in conjunction with the "Attachment traverse" key (133).
10	Steering wheel	●	Steers the truck in the required direction.
11	Control panel	●	Truck functions can be controlled with the control panel.
12	Travel control knob	●	Controls the travel direction and speed of the truck.
13	Handle with contact point	●	Two-hand operation in narrow aisle (via contacts in the handle). Enables lifting and travel in the narrow aisle.
14	Emergency disconnect switch	●	Disconnects the main power supply; all truck movements are disabled.
15	Key switch and key	●	Switches the truck on and off. Removing the key prevents the truck from being switched on by unauthorised personnel.
	ISM online access module	○	Switches the truck on with a card or transponder. Switches the truck off with the control button on the ISM online access module. – Timeout monitoring – Records the truck's operators (shifts) – Operational data logging
	Keypad	○	Switches the truck on with an access code or transponder. Switches the truck off with one of the "Function" buttons (136) under the control panel with the driver's display (131).
	Transponder reader	○	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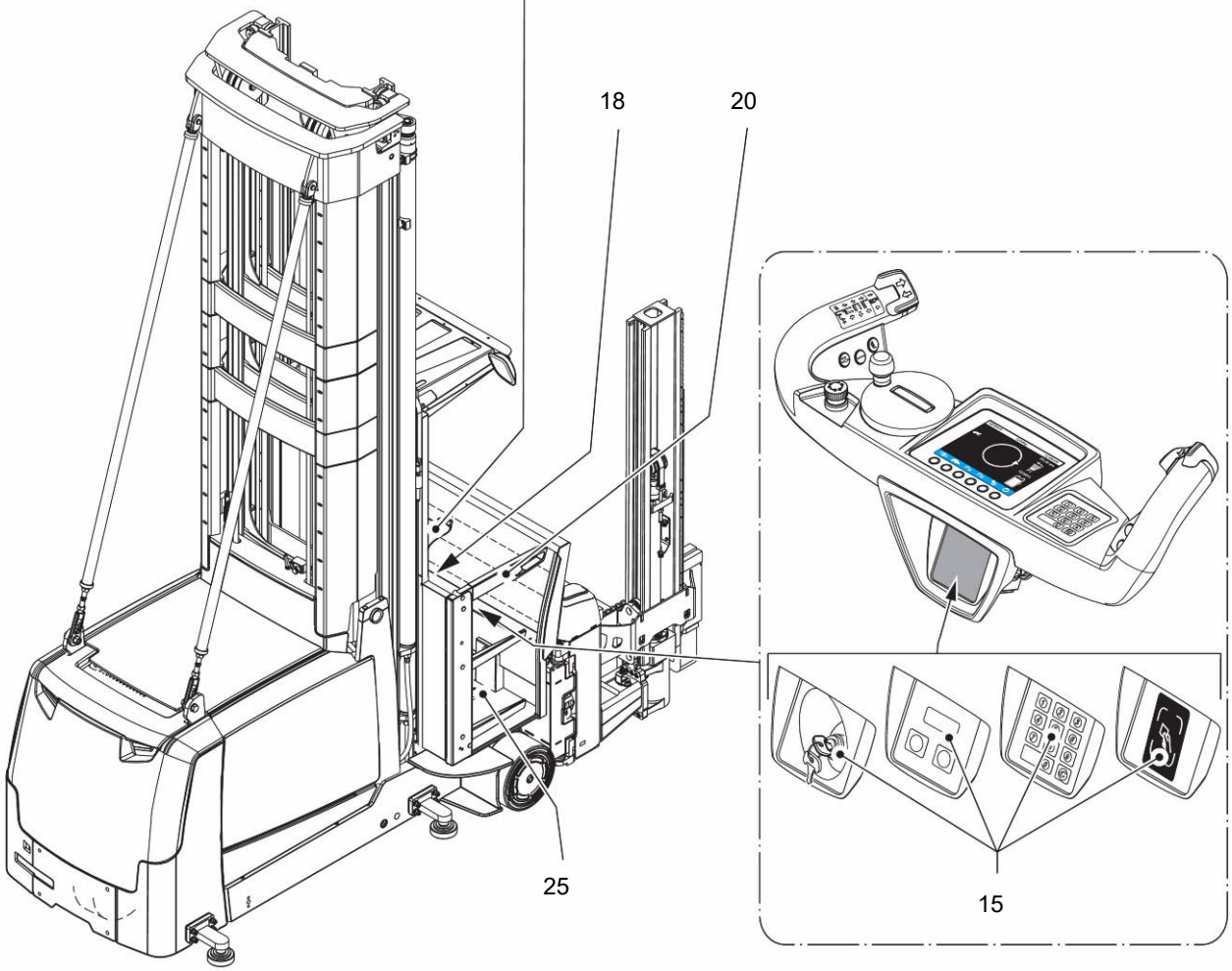
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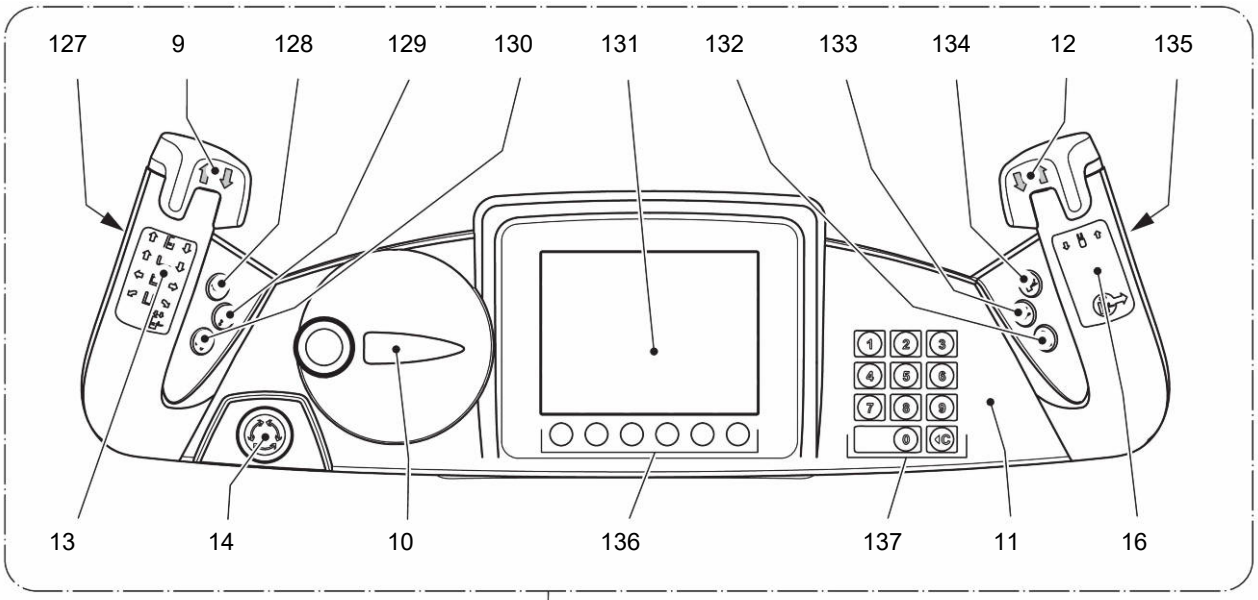
Item	Control/display		Function
16	Handle with contact point	●	Two-hand operation in narrow aisle (via contacts in the handle). Enables lifting and travel in the narrow aisle.
18	Driver's seat	●	Adjusts the driver's seat, see page 228.
20	Gates	●	Prevent the operator from falling out. The EKS 514, EKS 516k and EKS 516 with load guard also have gates in the load direction. These also act as a block to prevent the driver from falling out.
25	Deadman button (foot switch)	●	The deadman button ensures that the operator remains in the operator position as travel and lift operations are being performed. **"Press deadman button at least once" version** With this version the deadman button must be pressed at least once when the truck is made ready for operation and the gates have been closed in order to operate the truck. – Not pressed (the "deadman button not pressed" symbol lights up on the driver's display, see page 190): • Steering, driver's display and horn are released. • Travel functions are blocked. • Hydraulic functions are blocked. – Pressed at least once briefly (the "deadman button not pressed" symbol goes out, see page 190): • Travel functions are released. When the travel control button has been released the truck brakes regeneratively to a halt (parking brake applied). The truck coasts to a stop according to the set "coasting brake" parameter. • Hydraulic functions are released.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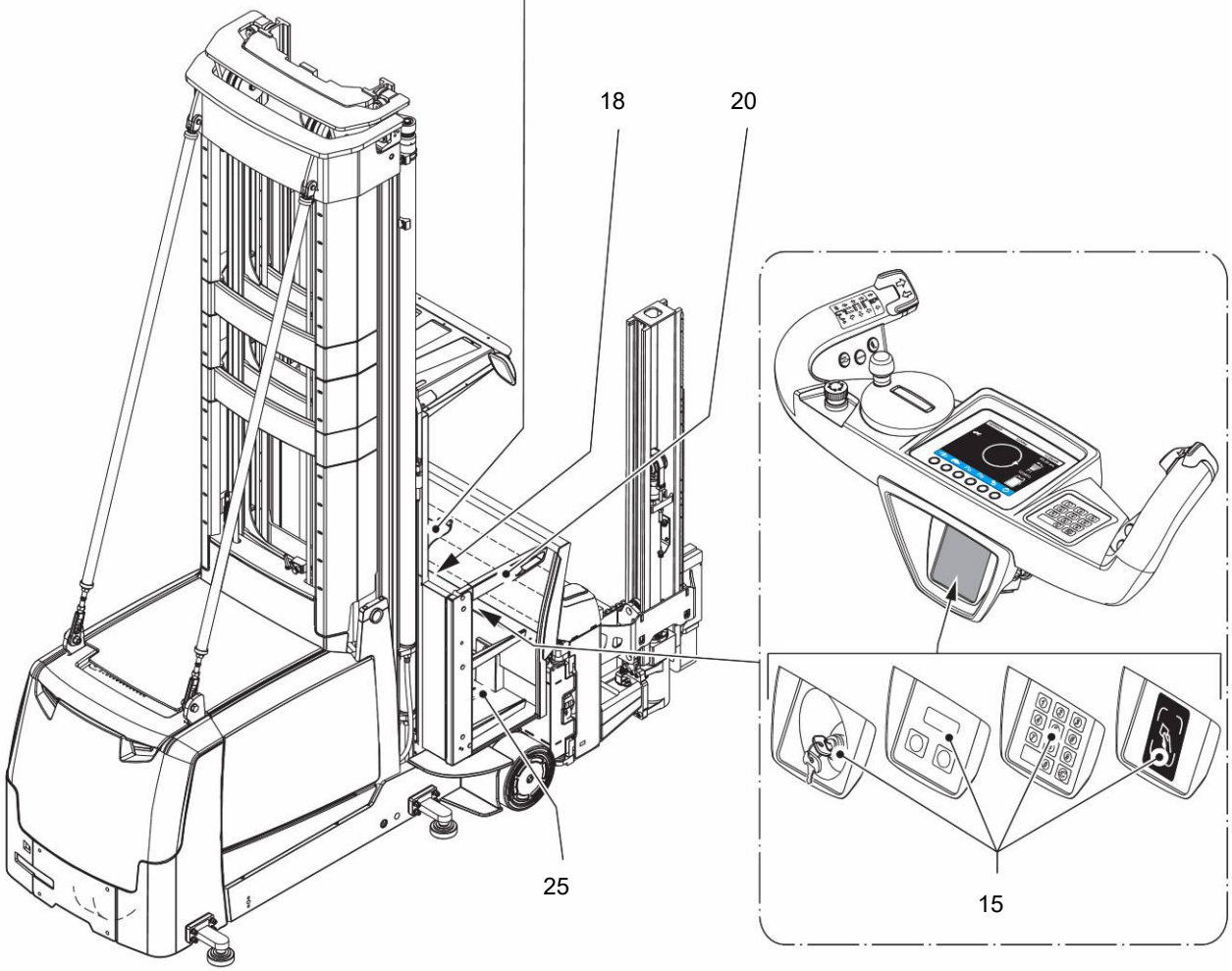
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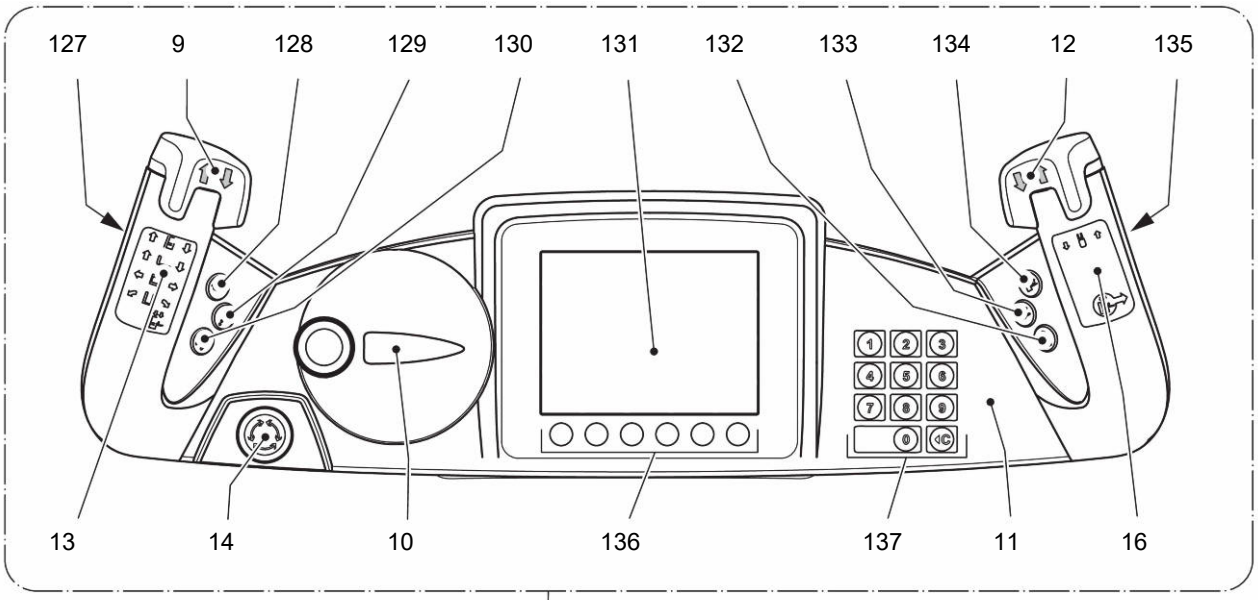
Item	Control/display		Function
25	Deadman button (foot switch)	○	The deadman button ensures that the operator remains in the operator position as travel and lift operations are being performed. **"Press deadman button permanently" version** With this version, the deadman button must be pressed permanently once when the truck is made ready for operation and the gates have been closed in order to operate the truck. – Press and hold the deadman button (the "deadman button not pressed" symbol goes out, see page 190): • Travel functions are released. • Hydraulic functions are released. – Response of the truck after releasing the deadman button (the "deadman button not pressed" symbol lights up on the driver's display, see page 190): • The truck brakes regeneratively to a half (parking brake applied). The truck coasts to a stop according to the set "coasting brake" parameter. • Travel functions are blocked. • Hydraulic functions are blocked. • Steering, driver's display and horn are released.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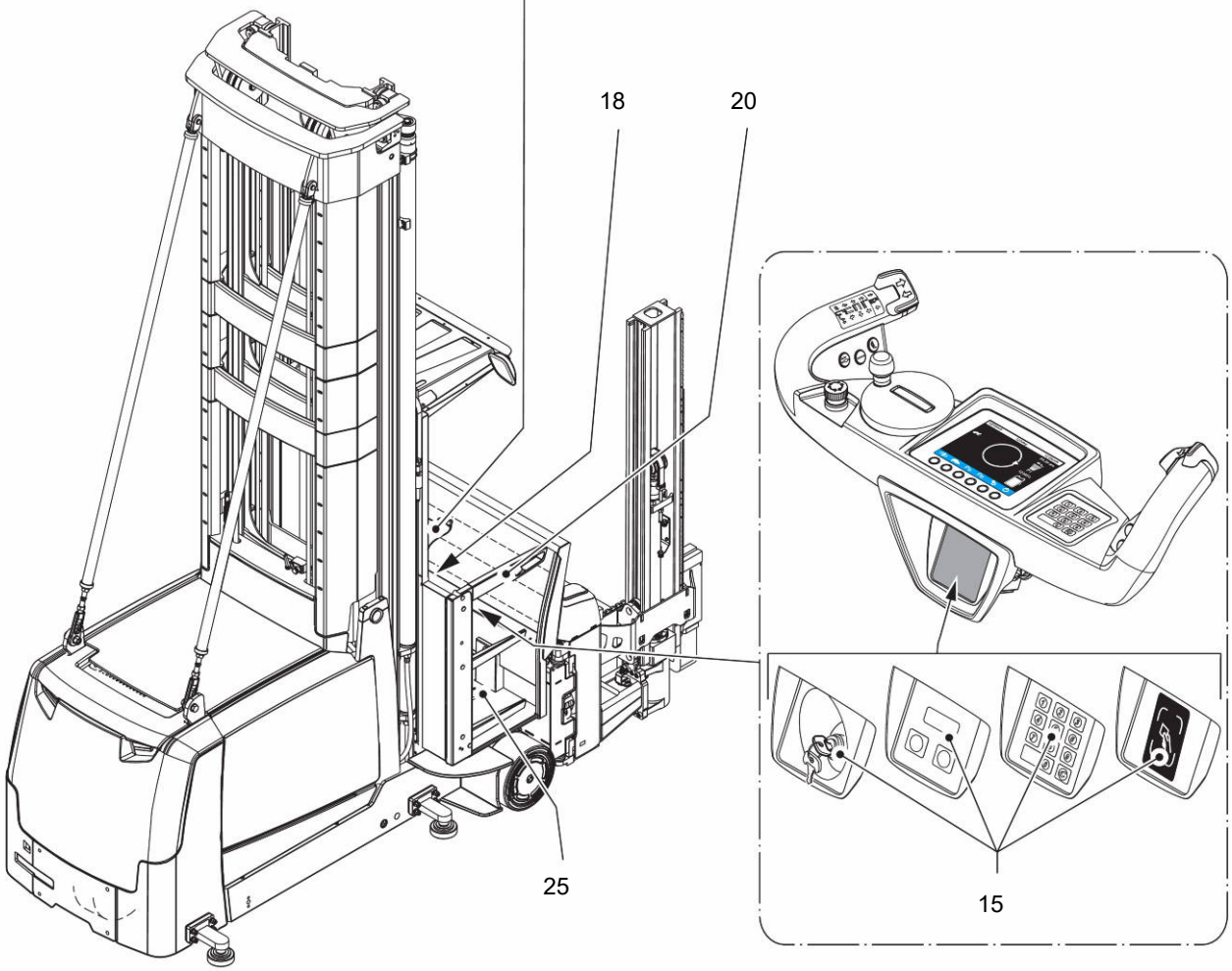
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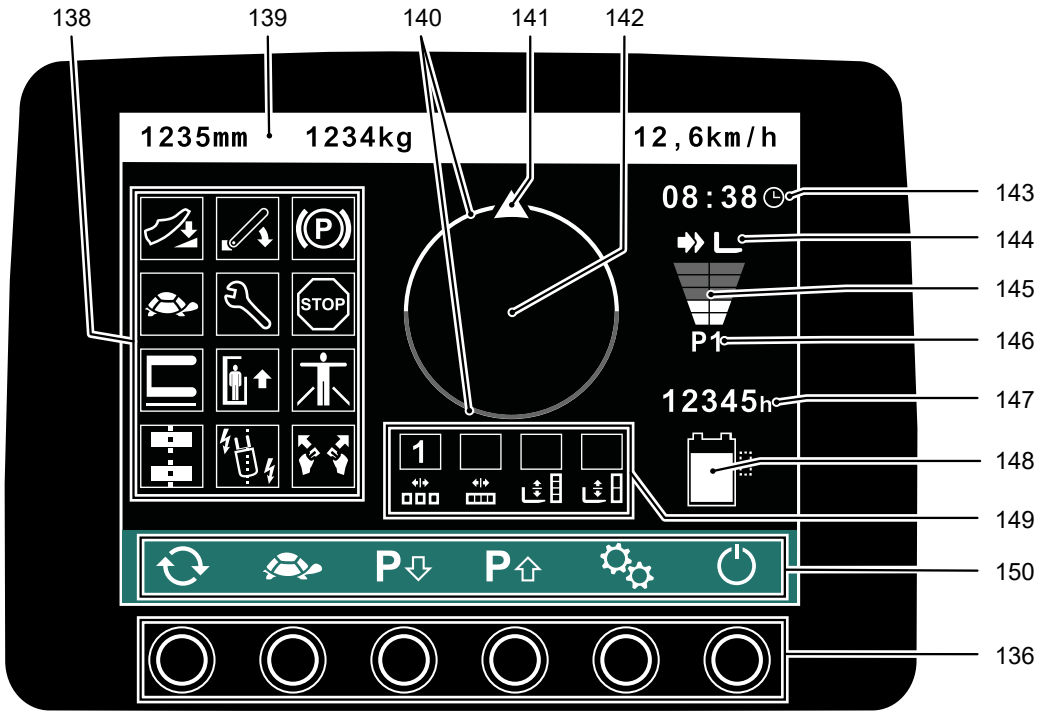
Item	Control/display		Function
136	"Functions" button	●	The functions displayed on the driver's display (shown as symbols) are activated or confirmed with the button below the symbol. The symbol appears bright or inverse when the corresponding button is pressed.
127	"Acknowledge" button	●	Optional functions button.
128	"Horn" button	●	Activates the horn, activates an audible signal.
129	"Switch automatic rail guidance on/off" button	●	Activates rail guidance in the narrow aisle. Rail guidance: – Turns the drive wheel to the straight-ahead position. Wire guidance: – Activates wire acquisition (and frequency selection for multi-frequencies).
130	"Control panel adjustment" button	●	Option for adjusting the control panel: – Electrical tilt adjustment of -5° to 50°, see page 234. – To year of manufacture 11.16: Electrical height adjustment of 100 mm, see page 232.
131	Control panel and driver’s display	●	Function, operating information and warning message display.
132	"Fork carriage rotate" button	●	Changes the "hydraulic functions" control lever to rotating the fork carriage.
133	"Attachment traverse" button	●	Changes the "hydraulic functions" control lever to traversing the attachment.
134	"Auxiliary lift" button	●	Changes the hydraulic control lever to lifting or lowering the fork carriage without the operator position.
135	"Main and auxiliary lift lower" button	●	On the EKX 410-412: Changes the hydraulic control lever to simultaneous lowering of the main and auxiliary lift.
	"Main and auxiliary lift raise/lower" button	●	On the EKS 514-516 / EKX 514-516: Changes the hydraulic control lever to simultaneous lifting or lowering of the main and auxiliary lift.
137	Numerical keypad	○	Controls and settings for optional functions (e.g. rack height select, manual warehouse navigation data entry).

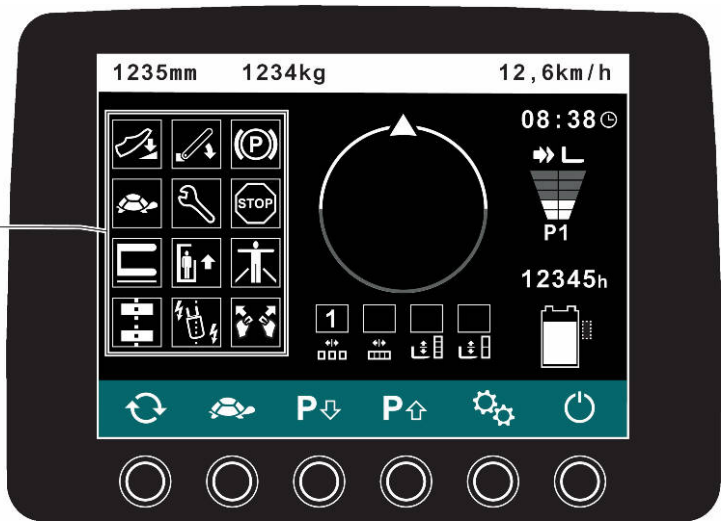
2.2 Driver's display



Item	Control and display element	Function
150	Function symbols	Description of function symbols, see page 208.
136	"Functions" button	The functions displayed on the driver's display are activated or confirmed with the button below the symbol, see page 208. The symbol appears bright or inverse when the corresponding button is pressed or function applied.
138	Symbol field	Displays the current truck statuses or entry prompts as symbols, see page 192.
139	Information line	Displays information and truck properties such as: – Event messages see page 338 – Current lift height of load handler – Displays the capacity and load centre see page 206 – Current speed (○) – Current weight of raised load (○) – ...
140	Direction preset	Shows the current travel direction of the truck (white semi-circle).
141	Arrow to display the travel and steering directions	Shows the current travel direction of the truck and the current wheel position.
142	Guidance in narrow aisle	Displays the information on truck guidance in the narrow aisle, see page 202.
143	Time	Displays the current time.

Item	Control and display element	Function
144	Attachment position	Displays the position of the attachment (●).
	Telescopic fork position	Displays the position of the telescopic forks (○).
	Stacking operation symbols	Displays the stacking operation of the "Horizontal positioning" function (○), see page 538.
145	Power display	Shows the travel and hydraulic performance of the operating program selected.
146	Operating program	Shows the operating program selected.
147	Service hours	Displays the number of service hours since the truck was started for the first time, see page 201.
148	Battery discharge indicator	Shows the battery charge status: – Bar display (●) – Residual capacity as a percentage (○)
149	Rack height select or horizontal positioning symbols	– Displays the rack height select symbols (○), see page 528. – Displays the horizontal positioning symbols (○), see page 538.

2.3 Symbols in driver's display (truck statuses and input requests)



Any number of symbols can be displayed in the symbol field (138). Which symbols are shown in the symbol field (138) depends on the operating and truck status.

2.3.1 Symbols - input requests

Symbol	Meaning	Colour	Function
	Press deadman button	Yellow	Controls pressed without the deadman button being activated.
	Release deadman button	Yellow	Controls pressed without the deadman button being released.
	Close the gate	Yellow	Operator position raised and the gates are not closed. In this case load handler lifting is inhibited.
	"Main-lift raising" referencing	Yellow	Main lift must be raised, see page 295.
	"Main lift lowering" referencing	Yellow	Main lift must be lowered, see page 295.
	"Aux. lift raise" referencing	Yellow	Auxiliary lift must be raised, see page 296.
	"Aux. lift lower" referencing	Yellow	Auxiliary lift must be lowered, see page 296.

2.3.2 Symbols - Safety and Warnings

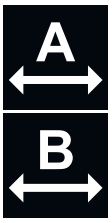
Symbol	Meaning	Colour	Function
	Stop notice	Flashing red	Functions deactivated due to truck malfunctions: – Event messages are displayed on the driver's display. – The truck brakes to a halt.
	Emergency disconnect switch pressed	Red	Emergency disconnect switch pressed.
	Truck malfunction or operating error	Flashing red	Truck malfunction, see page 338: – Event messages are displayed on the driver's display. – The truck brakes. The travel speed is restricted to slow travel (2,5 km/h).
			Operating error, see page 338: – Information messages are displayed on the driver's display.
	Overtemperature	Red	Overtemperature detected. Travel and hydraulic functions are inhibited.
		Yellow	Overtemperature detected. The performance of the travel and hydraulic functions is reduced.

Symbol	Meaning	Colour	Function
	Possible travel speed	Green	Hare: – Maximum travel speed enabled.
		Green	Tortoise: – Travel speed is restricted to slow travel due to a truck malfunction (2,5 km/h). – Travel speed is restricted to slow travel due to the position of the truck in the warehouse (2,5 km/h).
	Battery indicator	Red	Charge the battery immediately to avoid damaging the battery. The "lift" function of the load handler is inhibited. The battery capacity is below the following levels: – Wet cell batteries: Battery capacity: ≤ 20 % – Gel batteries: Battery capacity: ≤ 30 % If the battery capacity exceeds the following values, the "lift" function of the load handler is released again: – Wet cell batteries: Battery capacity: ≥ 40 % – Gel batteries: Battery capacity: ≥ 50 %
		Yellow	Battery charging is recommended. The battery capacity is below the following levels: – Wet cell batteries: Battery capacity: ≤ 30 % – Gel batteries: Battery capacity: ≤ 40 %

2.3.3 Symbols - Braking

Symbol	Meaning	Colour	Function
	Parking brake engaged	Red	Indicates the truck is stationary. Parking brake (drive wheel brake) is applied.
	Adjustable drive wheel brake referencing	Red	Indicates the truck is stationary. The adjustable drive wheel brake is referenced.

2.3.4 Symbols - capacity

Symbol	Meaning	Colour	Function
	Automatically detected aisle width (Ast) of the narrow aisle	Yellow	Display A: – Narrow aisle with standard aisle width (Ast) – "sideshiftPLUS" optional equipment is not used
			Display B: – Narrow aisle, wider than the standard aisle width (Ast) – "sideshiftPLUS" optional equipment is used (see page 666)

2.3.5 Symbols - Attachment

Symbol	Meaning	Colour	Function
	Attachment in home position	Yellow	Displays the attachment's home position, see page 317.
	"Traverse" referencing	Yellow	The position (traverse, rotate) of the attachment must be referenced, see page 273.
	"Rotate" reference run	Yellow	
	Side shift beyond centre position	Yellow	Indicates that the side shift is not in the centre position
	Side shift centre position	Green	Displays the side shift centre position
	Telescopic table telescopic forks in centre position (home position)	Yellow	Displays the centre position (home position) of the telescopic forks, see page 317.
Displays the stacking operation of the "rack height select" (○) optional equipment, see page 528.			
Displays the stacking operation of the "horizontal positioning" (○) optional equipment, see page 538.			

2.3.6 Symbols - Narrow aisle

Symbol	Meaning	Colour	Function
	Guide wire detection	Yellow	Wire guidance sensors that have detected the guide wire light up.
	Release two-hand operation	Yellow	Travel and hydraulic functions are inhibited. Travel and hydraulic functions are enabled again: – Do not touch the handles (13,16). – Do not press the deadman button. – "Remove two-hand operation" symbol goes out. – Press the deadman button. – Touch the handles (13,16) again.
Other truck guidance symbols in narrow aisle, see page 202.			

2.3.7 Symbols - Personal Protection System

Symbol	Meaning	Colour	Function
	Carry out cycle test	Red	The personal protection system cycle test must be carried out (every 24 hours), see page 422. The truck brakes. The travel speed is restricted to slow travel (2,5 km/h).
	Protection field violation	Red	The following is detected during narrow aisle journeys: – Persons or obstacles are in the protection field of the personal protection system, see page 424. – No release frequency for the stationary personal protection component. The truck brakes to a halt.
	Warning field violation	Yellow	Persons or obstacles are in the warning field of the personal protection system, see"Obstacles or Persons in the Warning Field" on page 423. The truck brakes. The travel speed is restricted to slow travel (2,5 km/h).

2.3.8 Symbols - Optional equipment

Symbol	Meaning	Colour	Function
	ISM impact display (truck impact)	Red	Severe impact due to incorrect operation: – Travel and hydraulic functions are inhibited.
		Yellow	Medium impact due to incorrect operation: – The truck brakes. The travel speed is restricted to slow travel (2,5 km/h).
	FloorPro	Green	The "FloorPro" optional equipment is released in the narrow aisle, see page 670.
	sideshiftPLUS	Green	The "sideshiftPLUS" optional equipment is released in the narrow aisle, see page 666.
	Overload display	Yellow	The picked-up load exceeds the maximum weight indicated in the load chart. The "lift" function of the load handler is inhibited.
	Replace hydraulic oil	Yellow	The permissible water level in the hydraulic oil has been exceeded. The hydraulic oil must be replaced. Notify the manufacturer's customer service department.
	Working platform raised but not secured	Yellow	The working platform has been raised but is not secured against falling.
	Working platform raised securely	Green	The working platform has been raised correctly and is secured against falling. The raised and locked working platform is monitored by non-contact sensors.

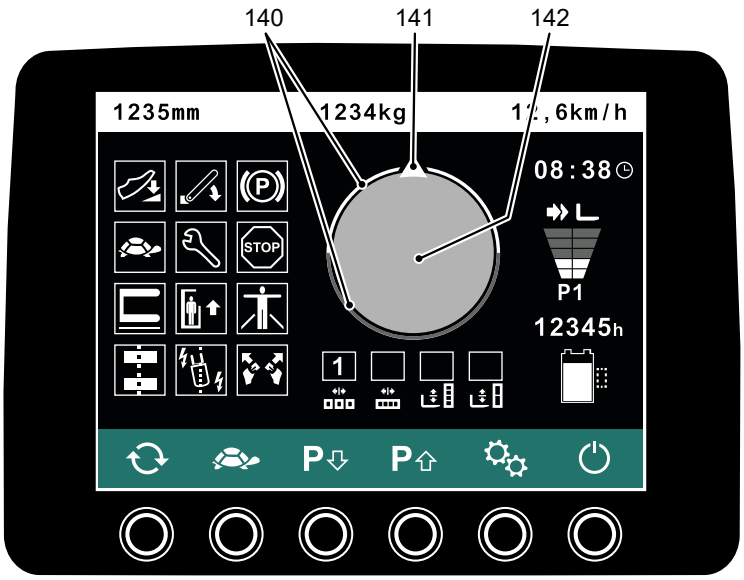
Symbol	Meaning	Colour	Function
	Connection to truck terminal	Yellow	Connection to truck terminal interrupted.
	Risk of colliding with the bus bar	Red	– The truck is ready for operation. – Truck is in narrow aisle. – Load handler at bus bar height. – Load handler traversing is inhibited to prevent it from being pushed into the bus bar.
	On-board charger malfunction	Flashing red	On-board charger malfunction. Battery charging interrupted. Notify the manufacturer's customer service department. – Truck is in narrow aisle. – Battery not charging. Example: - Faulty collector; - Faulty on-board charger; - Faulty bus bar; - No power supply;
	On-board charger switched on	Yellow	Battery charging active: – Truck is in narrow aisle. – The battery is charged.

2.4 Hourmeter

→ Prepare the truck for operation, see page 219.

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

2.5 Truck guidance symbols in narrow aisle



2.5.1 Guided truck symbols

Within the narrow aisle the "Travel direction presetting" (140) displays and the (141) arrow to display the travel direction and steering direction go out. The following "Guidance in narrow aisle" symbols (142) show the information for truck guidance within the narrow aisle.

Symbol	Meaning	Function
	Truck guided (with aisle recognition)	Truck is automatically guided and has received an aisle signal.
	Truck guided (without aisle recognition)	Truck is automatically guided and has not received an aisle signal. – Continue driving industrial truck along the narrow aisle. – When the industrial truck receives an aisle signal, the "Truck guided (without aisle detection)" symbol is replaced by the "Truck guided (with aisle recognition)" symbol.

2.5.2 Wire-guided truck symbols

Within the narrow aisle the "Travel direction presetting" (140) displays and the (141) arrow to display the travel direction and steering direction go out. The following "Guidance in narrow aisle" symbols (142) show the information for truck guidance within the narrow aisle.

Symbol	Meaning	Function
	Truck guided (with aisle recognition)	Truck is automatically guided onto the guide wire and has received an aisle signal.
	Truck guided (without aisle recognition)	Truck is automatically guided onto the guide wire and has not received an aisle signal. – Continue driving industrial truck along the narrow aisle. – When the industrial truck receives an aisle signal, the "Truck guided (without aisle detection)" symbol is replaced by the "Truck guided (with aisle recognition)" symbol.
	Guide wire acquisition in progress Truck not guided	Truck is guided onto the guide wire / truck has been turned off and on again with the key switch while on the guide wire. – Continue driving industrial truck along the narrow aisle. – When the industrial truck has acquired the guide wire and received a valid aisle signal, the "Truck guided (with aisle recognition)" symbol lights up.
	Deviation from guide wire	Within the narrow aisle a wire guidance sensor on the guided truck has abandoned the specified range of the guide wire. The industrial truck immediately performs an Emergency Stop (see page 368).

2.6 "Bar display" battery discharge indicator

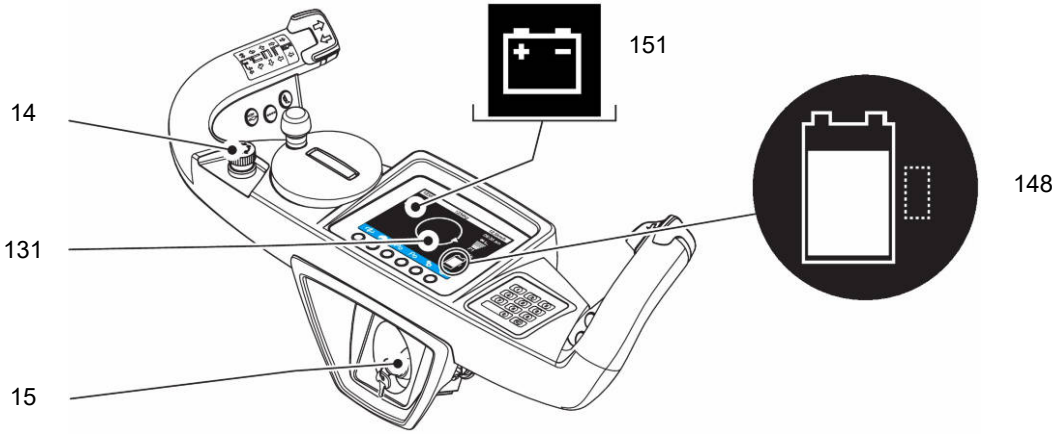
The standard setting for the battery discharge indicator / discharge monitor is based on standard batteries. When using maintenance-free batteries or special batteries, the display and cut-off points of the battery discharge monitor must be set by the manufacturer's customer service department. If this setting is not configured, the battery may be damaged due to deep discharge.

NOTICE

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.



Requirements

– Connect the battery to the truck.
– Close the battery cover, see page 156.
– Enter the operator position, see page 224.

Procedure

- Turn the Emergency Disconnect switch (14) to unlock it.
- Switch the truck on, see page 265.

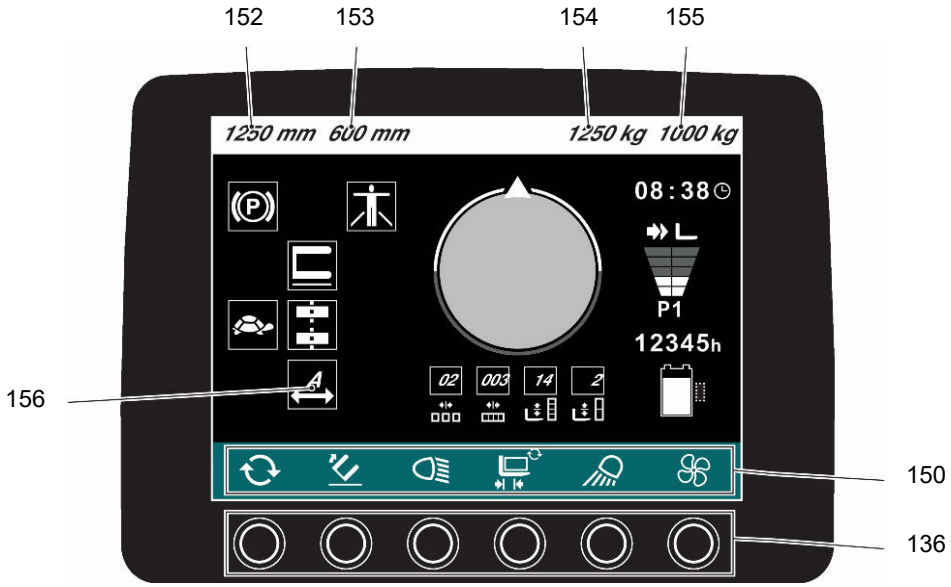
The battery discharge indicator in the driver's display (131) shows the available battery capacity.

2.6.1 Battery discharge monitor ("Battery indicator" symbol and battery discharge indicator)

"Battery indicator" symbol (151)	Meaning
Not lit	Battery is charged. – The more bars the battery discharge indicator (148) shows, the greater the battery's residual capacity.
Steady yellow light	Battery charging is recommended. The battery capacity is below the following levels: – Wet cell batteries: Battery capacity: ≤30 % – Gel batteries: Battery capacity: ≤40 %
Steady red light	Charge the battery immediately to avoid damaging the battery. The "lift" function of the load handler is inhibited. The battery capacity is below the following levels: – Wet cell batteries: Battery capacity: ≤20 % – Gel batteries: Battery capacity: ≤30 % The "lift" function of the load handler is only enabled when the battery capacity is above the following levels: – Wet cell batteries: Battery capacity: ≥40 % – Gel batteries: Battery capacity: ≥50 %

Lifting is only enabled again when the connected battery has the following charge levels:
– For wet-cell batteries: The battery must be at least 40% charged.
– For gel batteries: The battery must be at least 50% charged.

2.7 Capacity indicator on the driver's display



Item	Description
152	Displays the height of the load handler.
153	Displays the set load centre distance.
154	Displays the maximum permissible capacity of the truck. This capacity is dependent on the set load centre distance (153).
155	Displays the weight of the picked-up load. If the weight of the picked-up load is greater than the maximum permissible capacity of the truck, the display (155) flashes. If the following conditions are satisfied, the weight of the picked-up load is displayed on the driver's display: – Load handler with the main lift raised by a minimum of 10 cm. – Load handler with the auxiliary lift raised by a minimum of 10 cm. ➔ The display (155) is not a substitute for calibrated scales.
156	Displays the automatically detected working width (Ast) of the narrow aisle to be travelled through, see page 196.
150	Function symbols, see page 215.
136	"Functions" button.

The maximum capacity Q (kg) of the truck with a certain load centre distance D (mm) and current lift height h_3 (mm) are displayed on the driver's display.

The capacities shown for the load centre distances correspond to the data on the capacity plate of the truck, see page 110.

Note the capacity reduction according to weight (operator, rider or loads) in the operator position, see page 112.

Setting the load centre distance (D)

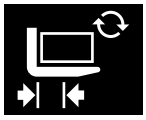
Requirements

– Prepare the truck for operation, see page 265.

Procedure

• Press the button (136) under the symbol (157) until the desired load centre distance (D) is displayed on the driver's display.

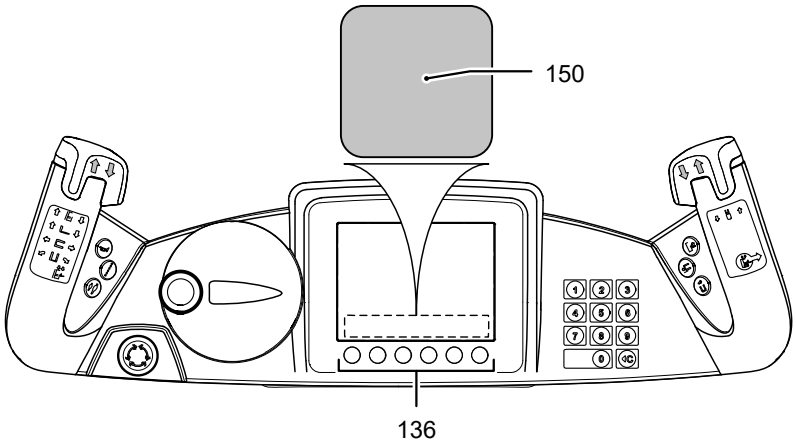
157



The set load centre distance (153) is displayed on the driver's display according to the specifications on the capacity plate, see page 110*. In addition, the maximum capacity (154) of the truck is displayed according to the current height (152) of the load handler.*

2.8 Driver's display function symbols

Functions and operator menus that can be operated via the icons and keys of the driver's display depend on the operating situation, the scope and the settings of the truck.

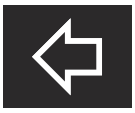
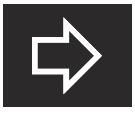


Procedure

- The "Functions" key (136) underneath the symbol (150) activates or confirms the corresponding function.
  The symbol (150) has a light or inverse background.

→ The following is a description of the symbols and their functions.

2.8.1 "Default settings / sub menu operation" key layout

Symbol	Meaning
	Menu change: – Changing from the submenu to the next operator menu
	Operating program up: – Changing the operating program.
	Operating program down: – Changing the operating program.
	Entry or selection field back: – Activate previous entry or selection field.
	Entry or selection field forward: – Activate next entry or selection field.

Symbol	Meaning
	Back: – Cancels the current operation and returns to the previous menu.
	Confirm: – Confirms an entry or a transponder code.
	Settings - Change to setting mode (○): – Setting the time. – Setting access authorisations (codes or transponders).
	Shutdown (○): – Allows the truck to be switched off.

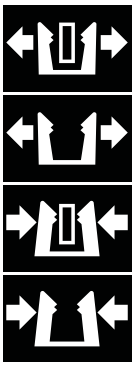
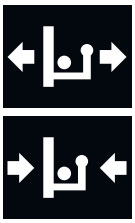
2.8.2 "Standard attachment / fork operation" key layout

Symbol	Meaning
	"Traverse/rotate operation without contour limit" menu change: – Switch from the main menu to the "traverse/rotate operation without contour limit" submenu.
	"Traverse/rotate operation with contour limit" menu change: – Switch from the main menu to the "traverse/rotate operation with contour limit" submenu.
	Manual traverse/rotate operation – see page 304: – Activates automatic rotation of the load handler (fork carriage) to the left and manual traverse of the attachment to the right. – The attachment traverse movement is controlled with the "hydraulic functions" control lever. – The rotary movement of the load handler (fork carriage) follows automatically. The rotary movement is controlled by the truck controller.
	Automatic traverse/rotate operation without contour limit – see page 308: – Activates automatic rotation of the load handler (fork carriage) to the left and automatic traverse of the attachment to the right. – The rotation and traverse movements are controlled by the truck controller.
	Automatic traverse/rotate operation with contour limit[1)] – see page 308: – Activates automatic rotation of the load handler (fork carriage) to the left and automatic traverse of the attachment to the right. – The rotation and traverse movements are controlled by the truck controller.
	Manual traverse/rotate operation – see page 304: – Activates automatic rotation of the load handler (fork carriage) to the right and manual traverse of the attachment to the left. – The attachment traverse movement is controlled with the "hydraulic functions" control lever. – The rotary movement of the load handler (fork carriage) follows automatically. The rotary movement is controlled by the truck controller.
	Automatic traverse/rotate operation without contour limit – see page 308: – Activates automatic synchronous rotation of the load handler (fork carriage) to the right and automatic traverse of the attachment to the left. – The rotation and traverse movements are controlled by the truck controller.
[1)] *Functional description of "contour limit"* – see page 312.	

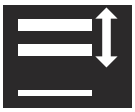
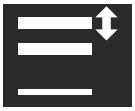
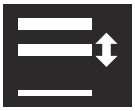
Symbol	Meaning
	Automatic traverse/rotate operation with contour limit[1] – see page 308: – Activates automatic synchronous rotation of the load handler (fork carriage) to the right and automatic traverse of the attachment to the left. – The rotation and traverse movements are controlled by the truck controller.
	Manual traverse/rotate operation with stop in centre position – see page 306: – Activates automatic rotation of the load handler (fork carriage) 90° to the left or right and manual traverse of the attachment to the centre position (front lifting). – The attachment traverse movement is controlled with the "hydraulic functions" control lever. – The rotary movement of the load handler (fork carriage) follows automatically. The rotary movement is controlled by the truck controller.
	Automatic traverse/rotate operation with stop in centre position without contour limit – see page 310: – Activates automatic rotation of the load handler (fork carriage) 90° to the left or right and automatic traverse of the attachment to the centre position (front lifting). – The rotation and traverse movements are controlled by the truck controller.
	Automatic traverse/rotate operation with stop in centre position with contour limit[1] – see page 310: – Activates automatic rotation of the load handler (fork carriage) 90° to the left or right and automatic traverse of the attachment to the centre position (front lifting). – The rotation and traverse movements are controlled by the truck controller.
[1] *Functional description of "contour limit"* – see page 312.	

2.8.3 "Attachment/optional equipment" key layout

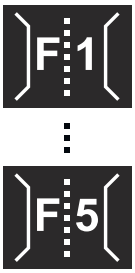
Symbol	Meaning
	Switching between warehouse or order-picking mode:: – Activates warehouse or order-picking mode. – For details of warehouse or order-picking mode, see page 540.
	"Fork positioning/side shift" menu change: – Switch from the main menu to the "fork positioning/side shift" submenu.
	Fork arm side shift: – Activates sideshift of both fork arms. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 514.
	Single telescopic fork: – Activates the extension and retraction of the single telescopic forks. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 522.
	2nd stacking depth of the attachment – see page 514: – Activates the attachment right or left extension into the 2nd stacking depth. – Activates the attachment right or left retraction from the 2nd stacking depth. – This hydraulic function is controlled with the "hydraulic functions" control lever.
	"Asymmetrical fork positioning" menu change: – Switch from the main menu to the "asymmetrical fork positioning" submenu.

Symbol	Meaning
	Left fork-arm positioning: – Activates the individual movement of the left fork. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 520.
	Right fork-arm positioning: – Activates the individual movement of the right fork. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 520.
	Load lock (e.g. hydraulic clamp): – Controls the opening or closing of the load lock – see page 462. – Load sensing display – see page 454.
	Load lock (e.g. claw): – Controls the opening or closing of the load lock – see page 466. – Load sensing display – see page 454.

2.8.4 "Telescopic table / telescopic forks operation" key layout

Symbol	Meaning
	"Moving the telescopic forks" menu change: – Switch from the main menu to the "moving the telescopic forks" submenu.
	Manual extension or retraction of both telescopic forks: – Activates extension or retraction of both telescopic forks in the load direction or drive direction. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 504.
	Manual extension or retraction of front telescopic fork: – Activates extension or retraction of front telescopic fork in the load direction or drive direction. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 504.
	Manual extension or retraction of rear telescopic fork: – Activates extension or retraction of rear telescopic fork in the load direction or drive direction. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 504.
	Manual movement of both telescopic forks: – Activates simultaneous (symmetrical) movement of both telescopic forks in the load direction or drive direction. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 502.
	Manual movement of front telescopic fork: – Activates movement of the front telescopic fork in the load direction or drive direction. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 502.
	Manual movement of rear telescopic fork: – Activates movement of the rear telescopic fork in the load direction or drive direction. – This hydraulic function is controlled with the "hydraulic functions" control lever – see page 502.
	2nd stacking depth of the telescopic forks – see page 524: – Activates extension of both telescopic forks to the right or left into the 2nd stacking depth. – Activates retraction of both telescopic forks to the right or left from the 2nd stacking depth. – This hydraulic function is controlled with the "hydraulic functions" control lever.

2.8.5 "Guidance systems" key layout

Symbol	Meaning
	Multi-frequency operation for truck wire guidance: – Select the frequency for truck wire guidance. – Up to 5 frequencies can be selected. – Setting the frequency – see page 291.

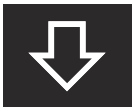
2.8.6 "Personal Protection System (PPS) key layout".

Symbol	Meaning
	Acknowledgement of the cycle test: – The personal protection system cycle test must be performed (every 24 hours) – see page 422. – Starts the automatic cycle test.
	Truck travel despite "protection field infringement": – Overrides the protection function and enables slow travel (2,5 km/h) if there is sufficient distance from the obstacle. – Travel is controlled with the accelerator pedal/travel direction switch – see page 424.

2.8.7 "Capacity - load centre distance" button allocation

Symbol	Meaning
	Setting of the specified load centre distance (D) – see page 206.

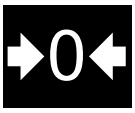
2.8.8 "Menu for administration of codes or transponders" key layout

Symbol	Meaning
	Chronological log-in process: – In the log-in process, the last differing access codes or transponders with which the truck was switched on are displayed. – The last successful log-in is displayed first.
	Change set-up code: – To change the set-up code and to activate the keypad or the transponder reader.
	Edit access code or transponder: – To add or delete access codes and transponders.
	Selection up: – To select access codes or transponders. – To scroll back during the log-in process.
	Selection down: – To select access codes or transponders. – To scroll forward during the log-in process.
	Delete: – To delete selected access codes.
	Add: – To add new access codes.
	Back: – Cancels the current operation and returns to the previous menu.
	Confirm: – Confirms an entry or a transponder code.

2.8.9 "Cutouts / warnings" key layout

Symbol	Meaning
	"Cut-offs/warnings" menu change: – Switch from the main menu to the "cut-offs/warnings" submenu.
	Storage area-dependent or height-dependent travel cut-off: – Indicates that the travel cut-off is activated. – Overrides the travel cut-off for adjustment runs (○) – see page 360. The truck can be driven at slow travel speed (0,8 km/h or 2,5 km/h).
	Slack chain safety device: – Indicates that at least one lift chain of the main lift is "slack" and not tensioned. – Bypasses the slack chain safety device to lift the operator position or load handler – see page 354.
	Storage area-dependent or height-dependent lift cut-off: – Indicates that the lift cut-off is activated. – Bypasses the lift cut-off to raise the load handler (○), see page 356.
	Storage area-dependent or height-dependent lower cut-off: – Indicates that the lower cut-off is activated. – Bypasses the lower cut-off to lower the load handler (○), see page 358.
	Storage area-dependent or height-dependent traverse cut-out: – Indicates that the traverse cutout is activated. – Bypasses the traverse cut-out to extend or retract the attachment (○) – see page 362.
	Storage area or height-dependent rotary cut-out: – Indicates that the rotary cutout is activated. – Bypasses the rotary cut-out to rotate the fork carriage (○) – see page 364.

2.8.10 "Optional equipment" button allocation

Symbol	Meaning
	"Lights/fan" menu change: – Switch from the main menu to the "lights/fan" submenu.
	Front work lights: – Switches the front work lights on or off.
	Operator position lighting: – Switches the operator position lighting on or off.
	Work lights in load direction: – Switches the work lights on or off.
	Drive direction work lights: – Switches the work lights on or off.
	Overhead guard strobe light: – Switches the strobe light on or off.
	"Positioning" spotlight: – Switches the spotlight on or off.
	Fan in operator position: – Switches the fan on or off.
	Battery latch not engaged in truck chassis – see page 664: – Indicates that the travel cut-off is activated. – Bypasses the travel cut-off for adjustment runs. The truck can be driven at slow travel speed (0,8 km/h).
	Weigher display zero setting: – Sets the weight measurement to ZERO (tare) – see page 526.

3 Preparing the Truck for Operation

⚠ WARNING!

Risk of accidents in the hazardous area of the truck

Before the truck can be started, operated or a load lifted, transported or lowered, the operator must ensure that there is nobody within 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.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.

3.1 Checks and operations to be performed before starting daily operation

⚠ WARNING!

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

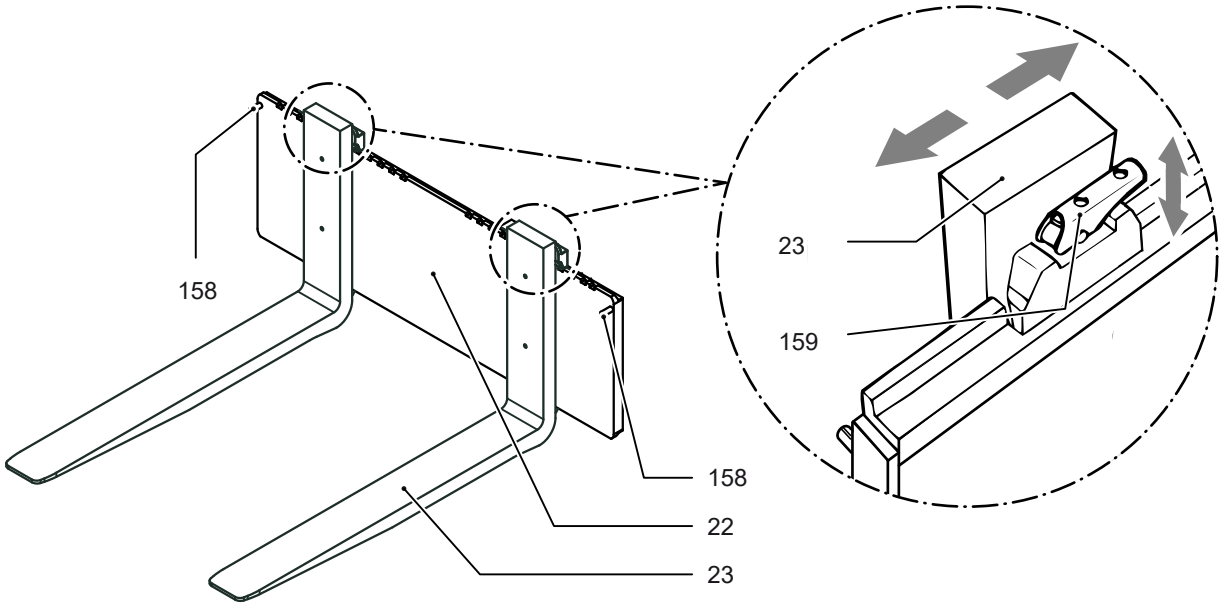
If damage or other truck or attachment (optional equipment) defects are discovered during the following checks, the truck must be taken out of service until it has been repaired.

▶ 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.

3.1.1 Visually inspecting the truck for external damage



Procedure

- Check truck for damage.
- Check the overhead guard for damage.
- Check operator position for damage.
- Check the mast guard in the operator position for damage.
- Check the operator mat and steps are non-slip and not damaged.
- Check side/safety gates for damage.
- Check the load handler (forks (23), fork carriage (22), etc.) for visible signs of damage such as cracks, bent or severely worn forks. Check the extension safety mechanisms (158) on the forks (23) are present. Test the operation of the stop (159) on the forks (23).
- Check static charge eliminator is present.
- Make sure panels are secure and check for damage.
- Check labels are legible and complete, see page 100.
- Check travel control labels are legible and complete.
- Check hydraulic control labels are legible and complete.
- Check control panel for damage.

- Check control panel setting and adjust if necessary see page 232 and see page 234.
- Test the gas struts on the battery cover and check for damage.
- Check driver's seat, backrest and padding for damage.
- Check driver's seat setting and adjust if necessary see page 228.
- Check mast bracing for damage (○).
- Make sure support skids are present and check their adjustment(○), see page 144.
- If using an attachment: Check bearing, guides and stops for wear and damage.
- Check that optional equipment such as mirrors, storage compartments, grips, etc. function correctly and check for damage (○).
- Check overhead guard cover for damage and make sure it is secure (○).

3.1.2 Visually inspecting the hydraulic system

Procedure

- Check the whole of the outside of the truck for leaks in the hydraulic system:
  - On the hydraulic cylinders
  - On the hydraulic connections
  - On the hydraulic lines
  - On the hydraulic hoses

⚠ WARNING!

Damaged / leaky hydraulic cylinders, ports, lines and hoses must be replaced before the truck is started.

▶ Report any defects immediately to your supervisor.

▶ Tag out and decommission a faulty lift truck.

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

▶ Spilled fluids must be removed immediately with an appropriate bonding agent. The bonding agent / consumable mixture must be disposed of in accordance with regulations.

- Check that the lift chains are evenly tensioned and damage-free.

3.1.3 Visually inspecting the wheels

Procedure

- Check drive wheel and load wheels for wear and damage, see page 691.
- For rail guidance systems, check rail guidance wheels run smoothly and check for wear and damage (○).

3.1.4 Visually inspecting the battery

Procedure

- Check the battery and battery container for damage.
- Check the battery connector cable connections for damage.
- Check battery cables and cell connectors for damage.
- Check battery connectors for damage.
- Check the battery connectors are secure.
- Check battery lock / battery attachment is present and working.
- Make sure battery is securely fixed in the battery compartment.
- Check battery cover and side panels are secure and look for damage.

3.1.5 Rescue equipment / safety harness

Procedure

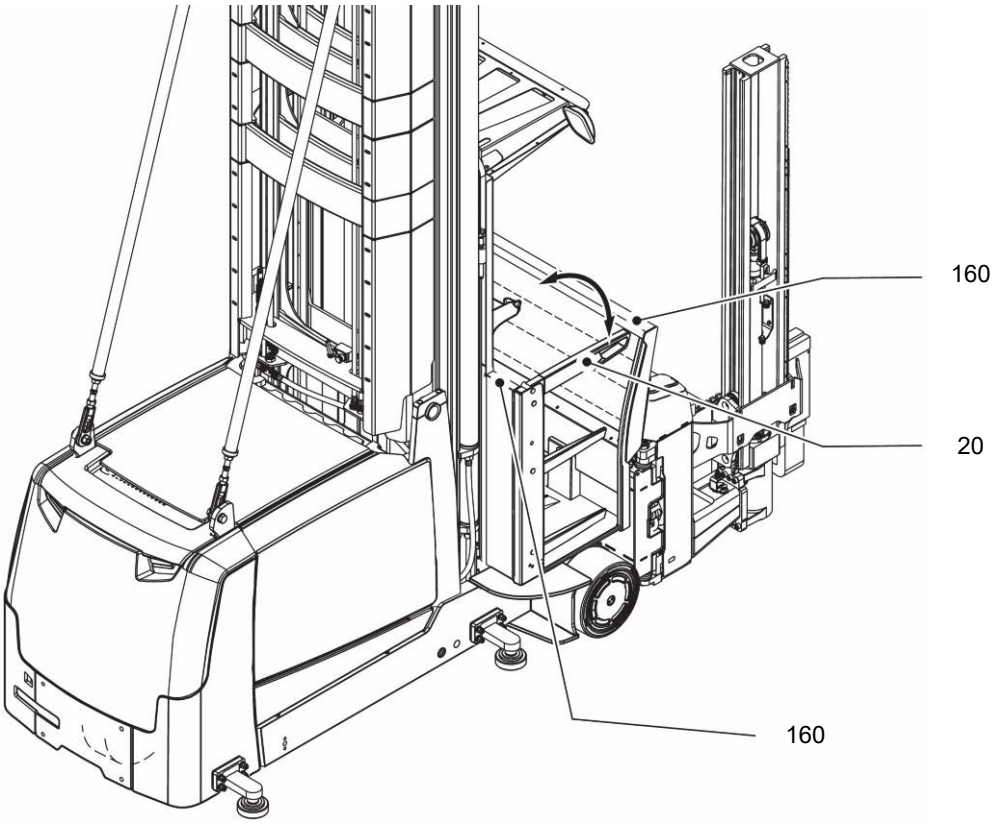
- Rescue equipment:
  - Check that the rescue equipment is present, see page 395.
- Safety harness with safety rope:

➔ Observe the national regulations for wearing a safety harness with safety rope.

- Check the safety harness and safety rope for damage and ensure that both are present, see page 246.
- Check the attachment rail for the safety harness on the overhead guard for attachment and damage.

➔ Industrial trucks are factory equipped with theRKA 18 safety harness and theRFD 12 safety rope, see page 236.

3.2 Entering or exiting



⚠ WARNING!

Loads or objects in the operator position leg compartment

Loads or objects in the operator position leg compartment can impede the operation of controls in this area. For example, objects can accidentally activate or jam the controls.

Loads or objects protruding out of the perimeter of the operator position can collide with other components (e.g. racking systems) during operation. In the event of a collision, the operator in the operator position may be injured or the truck may be damaged.

Loads or objects also pose a trip hazard.

- ▶ Position loads or objects in the operator position such that there is no trip hazard and that the operation of controls in the leg compartment is not impeded.
- ▶ Ensure that loads or objects cannot protrude out of the operator position during operation.
- ▶ Secure loads or objects against slipping and falling.

⚠ WARNING!

Falls due to open gates

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.
- ▶ Safety harness checked and worn.
  Observe the national regulations for wearing a safety harness with safety rope.

⚠ 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 position when opening the gates.

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

▶ Always open or close the gate with the handle provided.

⚠ CAUTION!

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

Requirements

– Truck braked to a halt.
– Load handler fully lowered, see page 292.

Procedure

• Lift up the gates (20).

➔ Always enter and exit the truck facing the load direction.

• Hold on to the frame (160) when entering and exiting.
• Close the gates (20).

3.3 Driver's seat removal and assembly

⚠ CAUTION!

An unsecured driver's seat can result in accidents and injury

An unsecured driver's seat can slide during operation and result in accidents.

▶The twist grip screws must be tightened before operating the truck.

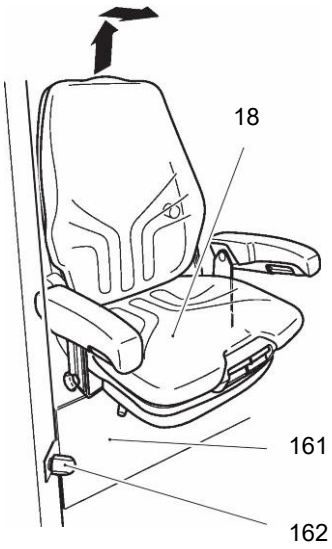
▶The driver's seat must be lock in place before operating the truck.

▶Do not adjust the driver's seat during operation.

Disassembling the driver's seat

Requirements

– Park the truck securely, see page 314.



Procedure

- Remove the twist grip screws (162) from the left and right sides behind the driver's seat (18).
- Carefully tilt the driver's seat (18) slightly in the load direction.
- If the driver's seat (18) has seat heating, the seat heating plug connection must be removed.

➔ The driver's seat (18) with the panel (161) has a net weight of 65 kg.

- Lift out the driver's seat (18) with the panel (161).
- Obtaining help from a second person, lift the driver's seat (18) out of the operator position.

Driver's seat (18) removed.

Install the driver's seat

Requirements

– Park the truck securely, see page 314.

Procedure

The driver's seat (18) with the panel (161) has a net weight of 65 kg.

- Obtaining help from a second person, lift the driver's seat (18) and panel (161) into the operator position.
- Insert the driver's seat (18) and panel (161) into the guide slots.
- If the driver's seat (18) has seat heating, the seat heating plug must be connected.
  Carefully tilt the driver's seat (18) back.

⚠ CAUTION!

Hand trapping hazard

Trapping hazard for hands when tilting back the driver's seat.

▶Make sure there is nothing between the driver's seat and the operator position when you tilt the driver's seat back.

- Attach the driver's seat (18) to the operator position using the two twist grip screws (162).

Driver's seat (18) installed.

3.4 Setting up the operator position

⚠ CAUTION!

An unsecured driver's seat and control panel can result in falls and injury

An unsecured driver's seat or control panel can slide during operation and result in accidents.

▶ The driver's seat and control panel must be locked in place when the truck is in operation.

▶ Do not adjust the driver's seat and control panel during operation.

Procedure

- Before operating, adjust the driver's seat and control panel so that all the controls are within reach and can be applied without having to strain.
- Adjust the visibility aid equipment (mirrors, camera systems etc.) so that the working environment can be clearly seen.

3.4.1 Adjusting the driver's seat

The procedure for adjusting the driver's seat applies to standard models. For other models, follow the manufacturer's setting instructions. When adjusting, ensure that all controls are within easy reach.

⚠ WARNING!

Risk of accidents and damage to health

An incorrectly adjusted driver's seat can result in accidents and damage to health.

▶ Do not adjust the driver's seat while travelling.

▶ The driver's seat should lock in position after adjustment.

The driver's seat (18) has a high backrest (163) and a sculpted seating area (165) providing fatigue-free operation when seated. The padded underside of the seat is used to lean against when the operator is standing.

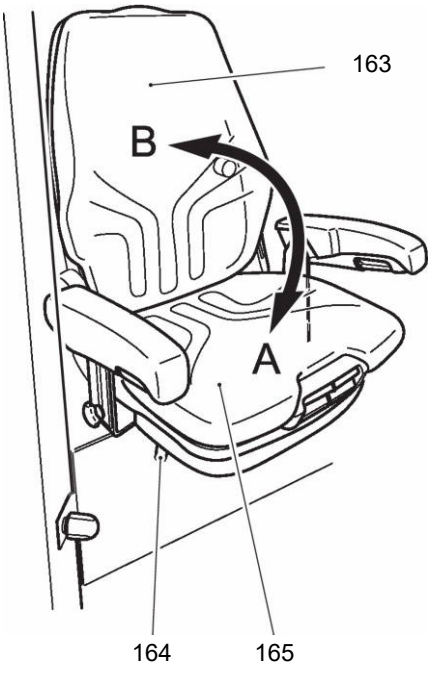
Using the driver's seat as a backrest or seat

Procedure

- Using the driver's seat as a backrest:
  - Fold the seat (165) up (see arrow direction "B").

  The driver's seat can now be used as a backrest.
- Using the driver's seat as a seat:
  - Fold the seat (165) down (see arrow direction "A").

  The driver's seat can now be used as a seat.



Adjusting the seated position

Procedure

- Pull the lever (164) up.
- Sit down or stand up from the seat (165) to seat the desired seat height.
  The height of the seated position can be adjusted by 120 mm.
- Release the lever (164) again.

The seat position is now correctly set.

Adjusting the seat (○)

Procedure

- To adjust the angle of the seat (165):
  - Push the lever (170) down.
    The angle of the seat (165) is adjusted up or down.
  - Release the lever (170) again.

➔ The seat (165) can be tilted by 40 mm.

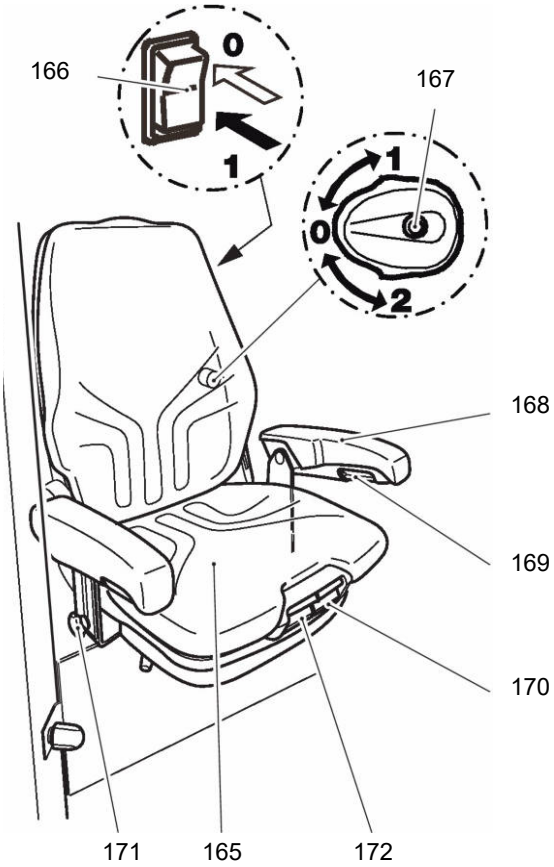
- To adjust the seat (165) horizontally:
  - Push the lever (172) down.
  - Move the seat (165) in the drive or load directions.
  - Release the lever (172) again.

  The seat (165) is now adjusted horizontally.

➔ The seat (165) can be moved by 50 mm.

- The seat (165) can now be folded up or down.

➔ When the driver's seat has been folded up, it can be used as a backrest for standing operation.



The seat (165) is now adjusted.

Adjusting the armrest (○)

Procedure

- To adjust the height of the armrest (168):
  - Loosen the screw (171).
  - Move the armrest (168) up or down to the desired position.
  - Tighten the screw (171).
- Adjust the tilt of the armrests (168) by turning the adjusting wheel (169).

The armrest (168) is adjusted.

Adjusting the lumbar support (○)

Procedure

- Turn the hand wheel (167) to the required position.
  Position 0 = no warping in lumbar vertebrae area.
  Position 1 = increasing warping in upper lumbar vertebrae area.
  Position 2 = increasing warping in lower lumbar vertebrae area.

The lumbar support is now set.

Switching the seat heating on or off (○)

Requirements

– Prepare the truck for operation, see page 265.

Procedure

- To switch the seat heating on or off with the "seat heating" switch (166):
  - Seat the "seat heating" switch (166) to position '1'.
    The seat heating is switched on.
  - Seat the "seat heating" switch (166) to position '0'.
    The seat heating is switched off.

NOTICE

The seat heating must not be switched on when the seat (165) is folded up.

▶Before folding up the seat (165) set the "seat heating" switch (166) to position '0'.

3.4.2 Control panel height adjustment

⚠ CAUTION!

An unsecured control panel can cause accidents and injury

An unsecured control panel can slide during operation and result in accidents.

▶ The control panel must be locked in place when the truck is in operation.

▶ Do not adjust the control panel during operation.

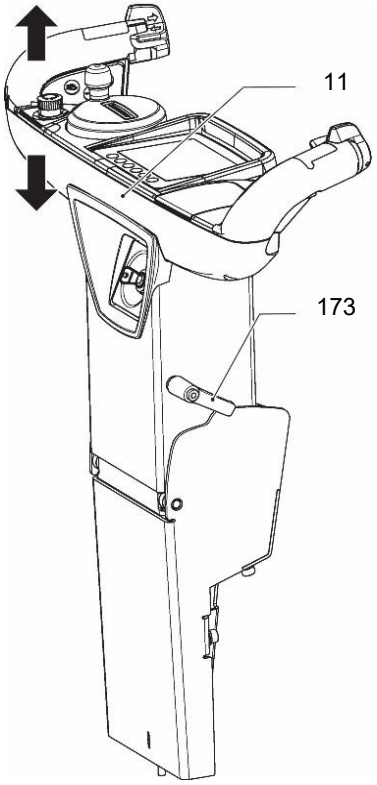
The height of the control panel (11) can be vertically adjusted by 100 mm.

Manual height adjustment of the control panel (●)

Procedure

- Hold onto the control panel (11) with one hand.
- Turn the twist-grip screw (173) anti-clockwise.
- Set the height of the control panel (11) to the desired position (see arrow direction).
- Turn the twist grip screw (173) clockwise and secure the control panel (11) in this position.

The height of the control panel (11) is now adjusted.

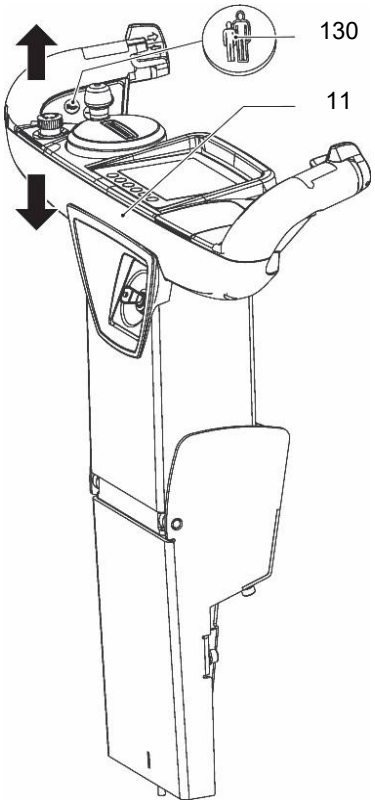


Electrical height adjustment of the control panel (○) - to year of manufacture 11.16

Procedure

- Grab the control panel (11) with both hands.
- Apply and hold down on the "control panel adjustment" button (130).
- Set the height of the control panel (11) to the desired position (see arrow direction).
- Release the "control panel adjustment" button (130).
- Make sure the control panel (11) is locked in position:
  - Pull the control panel slightly up or push it slightly down without applying the "control panel adjustment" button (130).

The height of the control panel (11) is now adjusted.



3.4.3 Adjusting the control panel angle

⚠ CAUTION!

An unsecured control panel can cause accidents and injury

An unsecured control panel can slide during operation and result in accidents.

▶ The control panel must be locked in place when the truck is in operation.

▶ Do not adjust the control panel during operation.

NOTICE

If the truck's electronic system is faulty or if there is no power supply, the control panel (11) can be manually adjusted:

▶ Press and hold down on the unlocking pin (174).

▶ Tilt the control panel (11) manually in the load direction.

▶ Release the unlocking pin (174) again.

➔ The angle of the control panel (11) can be infinitely adjusted by 55°. (Control panel angle range: -5° to 50°).

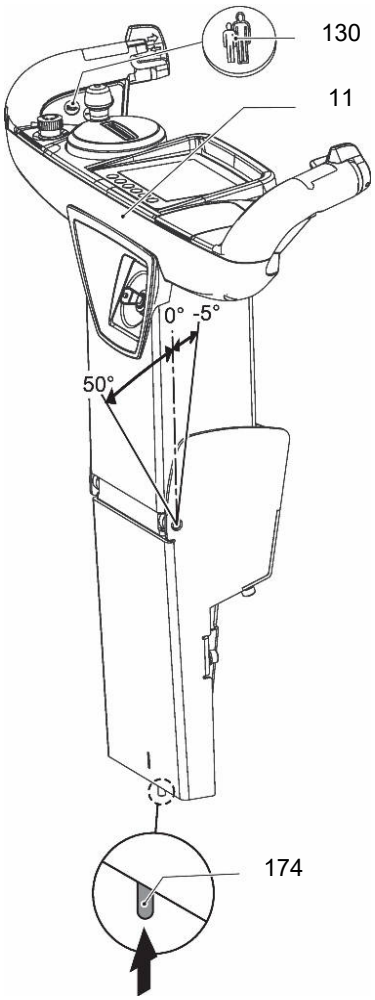
Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Apply and hold down on the "control panel adjustment" key (130).
- Set the angle of the control panel (11) to the desired position (see arrow direction).
- Release the "control panel adjustment" button (130).
- Make sure the control panel (11) is locked in position:
  - Tilt the control panel slightly in the load or drive direction without applying the "control panel adjustment" button (130).

The angle of the control panel (11) is now set.



3.5 Safety harness with safety rope (○)

⚠ WARNING!

Falling from operator position during operation

Unsecured operators are at risk of falling from a raised operator position during truck operation. If the operator operates the truck without wearing a safety harness and safety rope that are attached to the overhead guard, the operator is considered to be unsecured.

- ▶ The safety harness and safety rope must comply with national regulations.
- ▶ Truck without front guard or front gate:
  While operating the truck, the operator must wear the safety harness and secure himself to the overhead guard with the safety rope. You must not operate the truck without wearing a safety harness.
- ▶ Truck with front guard or front gate:
  Observe the national regulations for wearing the safety harness with safety rope when operating the truck with front guard or gate.
- ▶ The operator must undergo annual training in the use of the safety harness. Observe national regulations.

NOTICE

The safety harness and the safety rope are not included with the truck as standard. Optionally, the trucks can be supplied with the safety harness and the safety rope.

- ▶ The following sections describe and provide instructions for using the safety harness and the safety rope.

The safety harness with safety rope must not be used for abseiling rescue operations.

There is a danger of falling for operators operating trucks with an elevating operator position without a front guard or gate. For this reason, the truck operator must wear the safety harness and secure himself to the overhead guard with the safety harness to prevent falls.
When operating the truck with an elevating operator position and front guard or gate, the operator must observe the national regulations on wearing the safety harness with safety rope.

⚠ WARNING!

Danger due to modifications to the safety harness with safety rope

If the safety harness with safety rope is modified (repairs or additions), the strength and thus the safe use of the safety harness or the safety rope cannot be guaranteed.

- ▶ The safety harness with safety rope must not be modified in any way.

⚠ WARNING!

Untrained operators and a non-serviced safety harness with safety rope can result in accidents and injury

The safety harness with safety rope should only be used by people who are physically capable, trained to use the equipment safely and who have the required expertise.

A rescue plan for the operator must be available listing all necessary actions to be taken in emergencies.

▶ The operator must undergo annual training in the use of the safety harness. Observe national regulations.

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

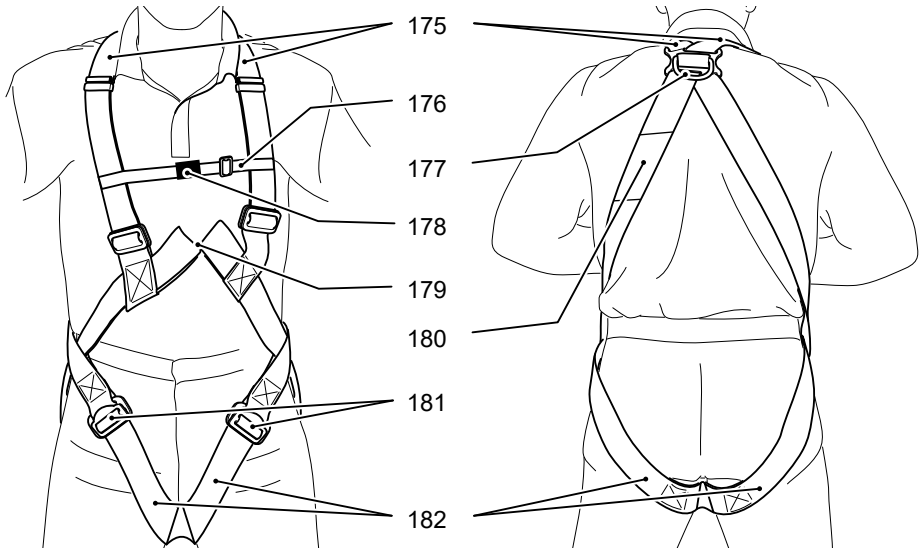
3.5.1 Description of the safety harness with safety rope

Description of the safety harness

The safety harness consists of two adjustable leg and shoulder straps, a chest strap, two catch loops in the chest area and a back strap with D-ring.

Adjust the chest and leg straps to achieve optimum adjustment of the safety harness. The length of the chest strap and leg straps can be adjusted using buckles.

➔ The temperature-independent application range of the safety harness is between ambient temperatures of -25 °C and 80 °C.



Item	Description
175	Adjustable shoulder straps
176	Adjustable chest strap
177	D ring on back strap
178	Plastic lock on the chest strap
179	D ring on chest strap
180	Data plate, see page 241
181	Clip-on buckles
182	Adjustable leg straps

Description of the safety rope

The safety rope is equipped with an integrated friction shock absorbing lanyard. The safety rope in conjunction with the safety harness is designed to secure one person.

The friction shock absorbing lanyard consists of an aluminium body through which the safety rope is guided in accordance with EN 354 or EN 353-2. The karabiner hook on the friction shock absorbing lanyard is attached to the D-ring of the safety harness.

At one end of the safety rope is a rope end connection (secured knot) that prevents the safety rope from slipping through the friction shock absorbing lanyard in the event of a fall. At the other end of the rope is a karabiner hook which is attached to the overhead guard (attachment rail or eye) of the truck.

The friction shock absorbing lanyard reduces the impact force that occurs in the event of a fall to max. 6 kN by reducing impact force through the friction of the core cladded rope as it is guided through the aluminium body.

Only one safety rope can be fitted between the safety harness and overhead guard.

⚠ WARNING!

Insufficient shock absorption can result in injury if the operator falls out of the operator position

If the operator falls out of the operator position a damaged friction shock absorbing lanyard, or one that has been used previously, will not arrest the fall sufficiently. The lack of shock absorption can cause injury to the operator.

▶ A damaged friction shock absorbing lanyard or one that has already been used, must not be used again. In this case the safety rope must be replaced.

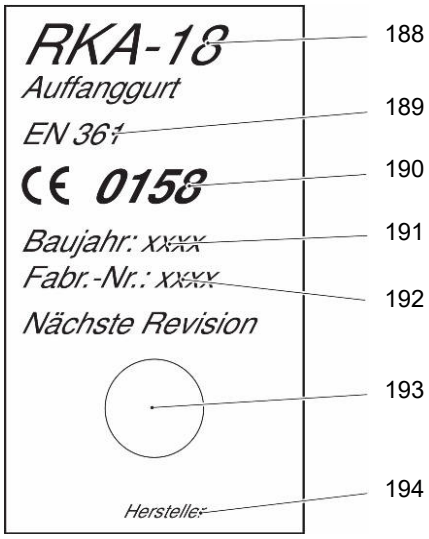
The temperature-independent application range of the safety rope is between ambient temperatures of -30 °C and 80 °C.

Item	Description
183	Karabiner hook "Fastening on the safety belt"
184	Friction shock absorbing lanyard
185	Safety rope
186	End knot
187	Karabiner hook "Fastening on the overhead guard“

3.5.2 Technical specifications for the safety harness

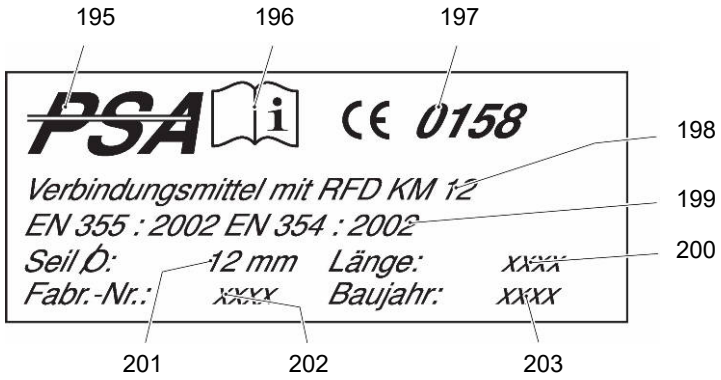
Net weight:	1 kg
Load capacity:	One person
Size:	UNISIZE
Standard:	EN 365

3.5.3 Safety harness data plate



Item	Description
188	Model description
189	Prototype tested to EN
190	CE mark
191	Year of manufacture
192	Serial number
193	Next inspection
194	Manufacturer

3.5.4 Safety rope data plate



Item	Model
195	Manufacturer
196	Note: Read operating instructions
197	CE mark
198	“Fastener” type designation
199	Type approved to EN
200	Length
201	Diameter of the safety rope
202	Serial number
203	Year of manufacture

3.5.5 Checking and servicing the safety harness with safety rope

⚠ WARNING!

A safety harness with safety rope that has not been inspected can cause accidents

When using a safety harness with safety rope that has not been inspected, the strength and thus the safe use of the safety harness or the safety rope cannot be guaranteed.

- ▶ The safety harness must be checked by the manufacturer or a specialist approved by the manufacturer after any incident involving catching a person (not including practice).
- ▶ The safety rope must be replaced after every incident involving catching a person.

The safety harness with safety rope must be checked at least annually by the manufacturer or a specialist approved by the manufacturer. Observe national regulations.

More regular inspections are necessary if the safety harness with safety rope is used frequently or is subject to heavy-duty usage (e. g. environmental or industrial factors affecting the material).

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

3.5.6 Service life of the safety harness and safety rope

Service life of the safety belt

Safety belts have a service life of 8 years under normal operating conditions or if the they are not used.

Service life of the safety rope

Safety ropes have a service life of 6 years under normal operating conditions or if they are not used.

The exact service life of the karabiner hook and aluminium body of the friction shock absorbing lanyard depend on the application and ambient conditions.

3.5.7 Storing and transporting the safety harness with safety rope

⚠ WARNING!

Accident risk if safety belt with safety rope are improperly stored

The storage of the safety belt with safety rope has a significant influence on service life.

- ▶ Protect the safety belt with safety rope from moisture, heat and UV radiation during storage.
- ▶ Avoid contact with acid, corrosive fluids and oils.
- ▶ Protect the safety belt with safety rope from contact with sharp objects.

To transport the safety belt with safety rope always use a secure equipment bag or case to prevent damage caused by external influences.

3.5.8 Cleaning the safety harness or the safety rope

⚠ WARNING!

Risk of material damage during drying

Incorrect drying damages the safety harness and the safety rope material. Due to this damage, the strength and thus the safe use of the safety harness or the safety rope is no longer guaranteed.

- ▶ Always allow the safety harness or the safety rope to dry naturally, e. g. in a well-ventilated and shady location.
- ▶ Do not dry the safety harness or the safety rope in a tumble dryer, in direct sunlight or close to a fire or other sources of heat.

The safety belt and safety rope must only be cleaned with a fine washing detergent at max. 40 °C.

NOTICE

To protect the washing drum, stow the safety rope in a water-permeable bag before starting the washing process. During the washing process, spin function must be deactivated.

3.5.9 Visually inspecting the safety harness and safety rope

⚠ WARNING!

Risk of falling due to damaged parts of the safety harness or safety rope

Damaged parts impair the function of the safety harness or safety rope (with karabiner hook). If the safety harness and the safety rope are used during a fall, the damaged safety harness or the damaged safety rope can tear. If the operator falls, there is a risk of serious or fatal injury.

- ▶ Always perform a visual inspection for damage before using the safety harness and the safety rope.
- ▶ It is forbidden to use a damaged safety harness or safety rope.
- ▶ If you discover any damage or have any doubts regarding the functional capability of the safety harness, the safety harness must be withdrawn from service.
- ▶ If you discover any damage or have any doubts regarding the functional capability of the safety rope, the safety rope must be withdrawn from service.
- ▶ Report any defects immediately to your supervisor.
- ▶ Do not re-use the safety harness or the safety rope until the fault has been identified and repaired.

The user must carry out a visual inspection of the safety harness and safety rope (with karabiner hook) before each use. This will ensure that the safety harness and the safety rope (with karabiner hook) are operational and fit for purpose.

3.5.9.1 Visual Inspection of the Safety Harness

Pay attention to the following points during the visual inspection of the safety harness:

– Check the harness material for damage such as by cuts, tears, wear, abrasion, rotting, chemical damage or burns.
– Check the seams of the harness for loose, damaged or worn fibres as well as faulty seams.
– Check the buckles.
– Check the buckles for damage caused by corrosion, deformation or cracking.
– Check the attachment eyelet on the back strap for damage caused by corrosion, deformation or cracking.
– Check the data plate is present and legible.

3.5.9.2 Visually inspecting the safety rope with karabiner hook

Visual inspection of aluminium body

When carrying out the visual inspection make sure the aluminium body is not corroded, physically damaged, deformed and/or cracked.

Visual inspection of the karabiner hook

When carrying out the visual inspection, make sure the karabiner hook is not corroded, physically damaged, deformed or cracked.

In addition, check that the karabiner hook latch works correctly:

– The latch should open and close easily.
– The karabiner hook latch must be return to its original position automatically after manual opening.

Visual inspection of the safety rope

The red markings on the safety rope must be at the same height, just beneath the rope outlet and rope inlet. If the markings are one over the other on the rope outlet side, the friction shock-absorbing lanyard has already been used during a fall. Withdraw the safety rope plus friction shock-absorbing lanyard from service and hand over to the manufacturer or an expert authorised by the manufacturer for inspection.

The stitching of the rope ends with karabiner hook must be in faultless condition.

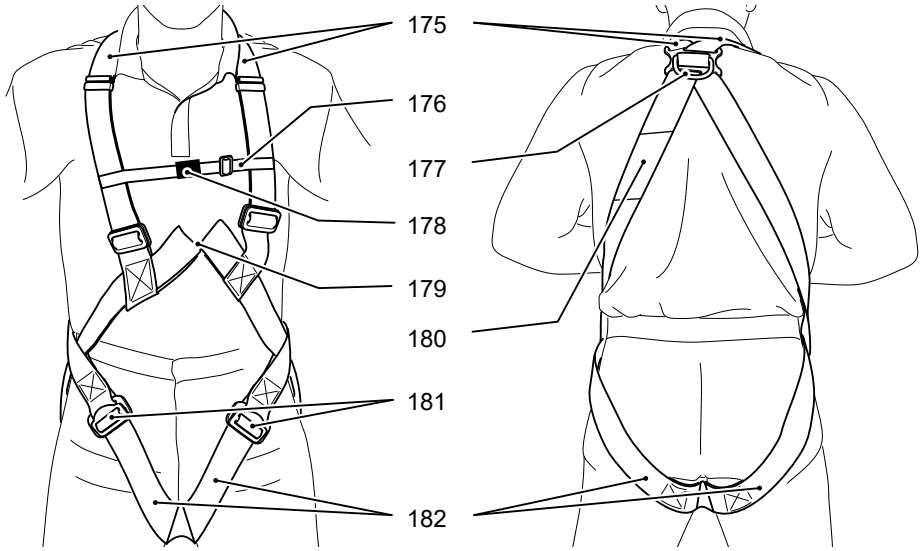
Check that there is an end knot at the end of the rope. There must be an end knot at the end of the rope so that the safety rope does not run out of the aluminium body during a fall.

During the visual inspection, make sure that the safety rope does not exhibit any of the following signs of mechanical damage, defects or damage due to the effects of heat, chemicals etc.:

– Cut parts
– Fibre damage
– Swelling
– Twisting
– Significant wear or excessive signs of deterioration such as fluff
– Sheath displacement
– Open or loose end connections
– Loops
– Node
– Burnt parts
– Decayed parts

➔ Check the safety rope for the above features before use. Do this by letting the safety rope slide through your hands.

3.5.10 Applying the safety harness



Preparation

Procedure

- Remove all objects from your trouser pockets.
- Remove the safety rope from the equipment bag or case.
- Open the buckles (181) on the leg straps (182) (two off).
- Open the plastic lock (178) on the breast belt (176).
- Perform a visual inspection of the safety harness with safety rope, see page 247.
- Hold the safety harness in front of your body with one hand on the D ring (177).

Put on the safety harness:

Procedure

- Pull the safety harness apart at the shoulder straps (175).
- Put on the safety harness like a jacket.

➔ Avoid twisting the shoulder straps (175). The D ring (177) on the back strap must also be facing away from the body.

Adjust the safety harness to match the size of the operator's body:

Procedure

- Close the plastic lock (178) on the breast belt (176).

➔ Avoid twisting the breast belt (176).

- Pull the leg straps (182) forward between your legs and then up.

➔ Avoid twisting the leg straps (182).

- Close the clip-on buckles (181) on the leg straps (182) (2 buckles).

➔ Do not cross the left and right leg straps (182) over.

- Adjust the leg straps (182) to fit your individual size and tighten the straps (182).
  - Adjust the leg straps (182) so that you can move your flat hand between the leg strap (182) and thigh.

- Adjust the breast belt (176) to fit your individual size and tighten the breast belt (176).
  - Adjust the breast belt (176) so that you can move your flat hand between the breast belt (176) and chest.
- Adjust the shoulder straps (175) to fit your individual size and tighten the straps (175).
  - Adjust the shoulder straps (175) so that the two adjusting clamps are at the same height.
- Secure loose straps with suitable plastic clamps to prevent them from hanging down.

Final tasks

Procedure

- When the operator is standing upright the safety harness must be put on after adjusting the leg straps (182), breast belt (176) and the shoulder straps (175), as outlined below:
  - The safety harness must lie comfortably.
  - The straps must be taut but should not affect the freedom of movement of the operator.
  - The safety harness must not cut into any part of the body.
  - The shoulder straps (175) must not slide down during movement.
  - The leg straps (182) must be below the rear of the operator.
  - The D ring (177) on the rear belt must be exactly between the shoulder blades.
  - The two catch loops (179) in the chest area must be resting centred against the ribcage.

3.5.11 Fastening the safety harness with safety rope on the overhead guard

⚠ WARNING!

Risk of falling due to damaged attachment point for the safety rope on the overhead guard

The industrial truck must not be operated with a damaged attachment point (attachment rail or eyelet) for the safety harness on the overhead guard. A damaged attachment point can result in the operator falling off the truck.

- ▶ 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.

⚠ WARNING!

Danger of falling due to faulty or incorrectly worn safety harness

The truck must not be operated unless the driver has put on the safety harness and the safety rope is attached to the truck. In addition, a faulty safety harness or safety rope must not be used. These causes can result in the operator falling.

- ▶ Truck without front guard or gate:
  While operating the truck, the operator must wear the safety harness and secure himself to the overhead guard with the safety rope.
- ▶ Truck with front guard or front gate:
  Observe the national regulations for wearing and securing the operator to the overhead guard with the safety harness and safety rope.
- ▶ The driver must put on the safety harness with safety rope before operating the industrial truck.
- ▶ If a safety harness or safety rope is faulty, identify it and withdraw it from use.
- ▶ Report any defects immediately to your supervisor.

⚠ WARNING!

A safety harness with safety rope that has not been inspected can cause accidents

When using a safety harness with safety rope that has not been inspected, the strength and thus the safe use of the safety harness or the safety rope cannot be guaranteed.

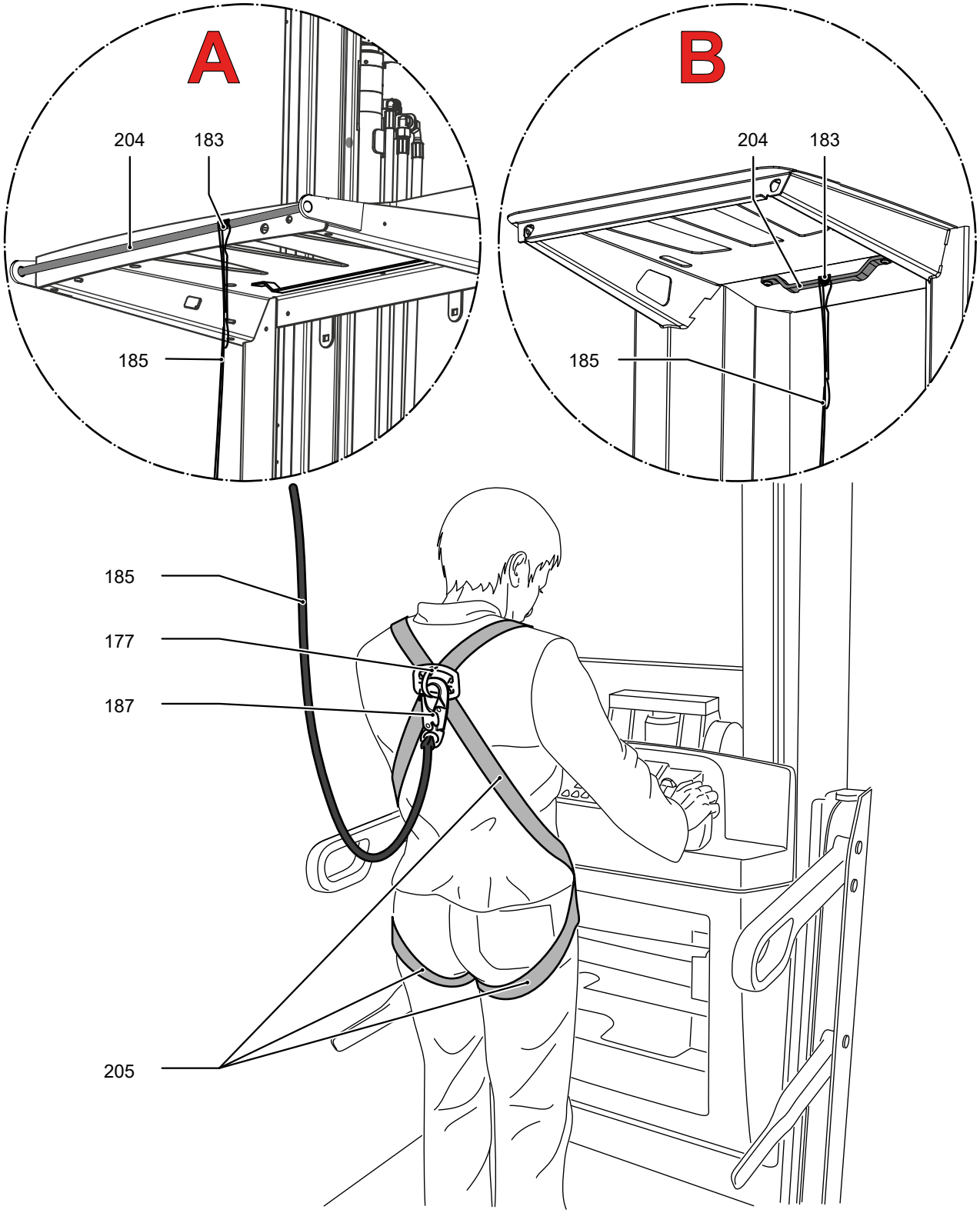
- ▶ The safety harness must be checked by the manufacturer or a specialist approved by the manufacturer after any incident involving catching a person (not including practice).
- ▶ The safety rope must be replaced after every incident involving catching a person.

⚠ WARNING!

Risk of falling due to torn safety harness or safety rope

If the straps of the safety harness or the safety rope are run over sharp metal edges, the straps or the safety rope will be damaged. The straps or the safety rope will also be damaged if they come into contact with acids, caustic liquids and oils. For these reasons, the strength and hence the safe operation of the safety harness or the safety rope can no longer be guaranteed.

- ▶ Protect the straps of the safety harness or the safety rope against contact with sharp objects.
- ▶ Protect the straps of the safety harness or the safety rope from coming into contact with acids, corrosive fluids and oils.


A
204
183
185
B
204
183
185
185
177
187
205

Procedure

- Carry out a visual inspection of the safety harness with safety rope – see page 246.
- Check the attachment point (204) for the safety rope on the overhead guard for attachment and damage.
  Possible attachment point (204) variants for the safety rope:
  - For the attachment rail or eyelet on the front section of the overhead guard, see version "**A**" (●).
  - For the attachment rail on the rear section of the overhead guard, see version "**B**" (○).

  Attach the karabiner hook (183) on the friction shock-absorbing lanyard to the eyelet (177) on the safety harness (205).

⚠ WARNING!

Do not attach the safety rope including the friction shock absorbing lanyard onto the retaining hooks or D hooks of a safety harness.

- If present, secure the karabiner hook (183) on the friction shock-absorbing lanyard with the screw lock to prevent it from opening accidentally.
- Put on the safety harness (205) – see page 250.
- Attach the karabiner hook (187) on the safety rope (185) to the attachment point (204) on the overhead guard – see version "**A**" or "**B**" shown.
- Check that both karabiner hooks (183|187) are closed.

The operator is protected by the safety harness (205) with safety rope (185) and can operate the truck.

4 Working with the truck

4.1 Safety regulations for travel mode

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.

NOTICE

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 condition of the ground on which the truck is used must satisfy the following requirements:

– The ground surface must comply with the VDMA guideline.
– The ground must be level and smooth. There must not be any gaps, drainage systems etc. in this area.
– The floor must be resistant to oil and grease.
– The ground must be well maintained to keep it free of contamination, obstacles and liquids that could affect the safe operation of the truck.
– The bleeder resistance of the ground (ground insulation resistance) must not exceed 10^6 Ω (in accordance with EN 1081).

NOTICE

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.

Negotiating slopes and inclines

⚠ WARNING!

Do not negotiate slopes or inclines.

Travelling on docks, dock plates and loading platforms

⚠ WARNING!

Do not travel on docks, dock plates or loading platforms.

Faults due to strong magnets

⚠ 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.

Travel conduct

The operator must adapt the travel speed to local conditions. The operator must travel slowly for example when negotiating bends or narrow passageways, when passing through swing doors, at blind spots and when entering and leaving the narrow aisle. 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.

Entry and exit

⚠ WARNING!

Risk of injury when entering or exiting during travel

Entering or exiting during travel can result in serious injury, e.g. colliding with the truck or stationary objects or getting caught on the truck.

▶ Only enter or exit a truck when it is stationary.

▶ Jumping from a moving truck is permitted only in an emergency.

⚠ 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.

Truck contour

⚠ WARNING!

Risk of trapping during travel

Serious injury to body parts caught between the moving truck and fixed objects in the travel area.

▶ Always remain within the truck contour during travel. Do not lean out or reach out.

▶ Do not carry objects that protrude beyond the truck contour.

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 279). 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.

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 position railing, driver's seat etc. can cause the driver to fall out of the operator position.

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

⚠ WARNING!

Falls due to open gates

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.
- ▶ Safety harness checked and worn.
  Observe the national regulations for wearing a safety harness with safety rope.

When a gate has been opened, an optional warning may sound when the operator position is raised. The lift height at which the warning sounds can be set by the manufacturer's customer service department.

Types of load to be carried

The operator must make sure that the loads are in a satisfactory condition. Loads must always be positioned safely and carefully. Take appropriate countermeasures if there is a risk of the load or parts of the load tipping or falling down.

Prevent liquid loads from sloshing out. Drive slowly and take special care when transporting liquid loads. Avoid abrupt braking or acceleration.

⚠ 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 332.

⚠ 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.

Towing trailers and other vehicles

⚠ CAUTION!

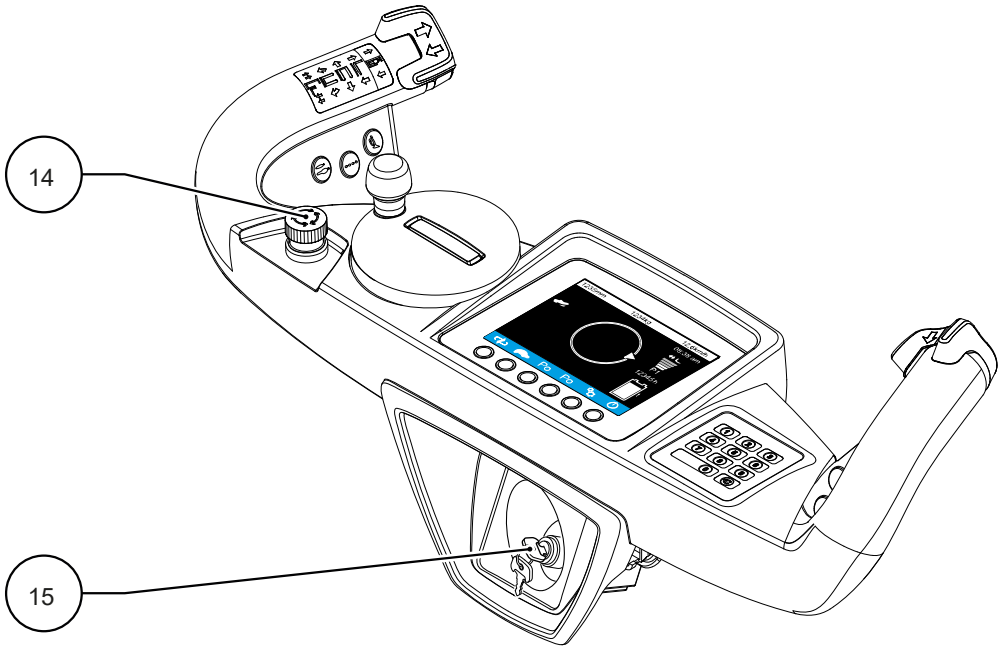
The truck must not be used to tow a trailer or other vehicles.

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.

4.2 Preparing the truck for operation



This section describes how to make the truck ready for operation with the key switch (●). Other keyless access systems are outlined in the "Optional equipment" section – see page 478.

Switching on the truck

Requirements

– Visual inspections and operations performed before starting daily work, see page 220.
– Battery connector connected to the truck.
– Battery latch properly inserted and locked.
– Side panels properly inserted and locked.
– Battery panel closed, see page 156.
– Operator position entered, see page 224.
– Safety harness checked and worn.
  Observe the national regulations for wearing a safety harness with safety rope.
  Visual inspection of the safety harness and safety rope performed, see page 246.
  Safety harness worn, see page 250.
  Safety harness with safety rope attached to the overhead guard, see page 252.

Procedure

- Close the gates – see page 224.
- Turn the emergency disconnect switch (14) to unlock it – see page 275.
- Insert the key into the key switch (15).
- Turn the key in the key switch (15) as far to the right as it will go.

Press the emergency disconnect switch (14) immediately if the truck performs unwanted travel or lifting movements during the switch-on process. Brief steering movements during steering referencing are permissible.

The truck is ready for operation. The steering is in the straight-ahead position.

4.3 Switching off the truck

This section describes how to switch off the truck with the key switch (●). Other keyless access systems are outlined in the "Optional equipment" section – see page 478.

NOTICE

Special feature when switching off the truck with the "keyless access systems" optional equipment

After activating the automatic emergency stop device, the truck cannot be switched off by pressing the button under the "switch off" symbol (⏻) twice. The truck control prevents the truck from being switched off, .

▶Switching off the truck after activating the automatic emergency stop device – see page 352.

Switch off the truck

Procedure

- Turn the key in the key switch (15) as far to the left as it will go.
  The truck is switched off.
- Remove the key from the key switch (15).
- Press the emergency disconnect switch (14) – see page 275.

4.4 Visual inspections and activities to be performed after establishing operational readiness

⚠ DANGER!

Truck defects can result in accidents

Do not use the truck if the brake system, steering and/or hydraulic system is defective or faulty.

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

▶Report any defects immediately to your supervisor.

▶Tag out and decommission a faulty lift truck.

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

Requirements

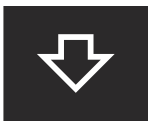
– Truck operational, see page 265.

Procedure

- Test warning indicators and safety equipment:
  - Test the emergency disconnect switch, see page 275.
  - Test the horn.
  - Test the reversing buzzer (○).
  - Test the deadman button.
  - Test the side/safety gates.
  - Test the service and parking brake, see page 277.
  - Test the steering, see page 299. The maximum steer angle of ± 90 ° must be reached and displayed on the driver's display.
  - Do a function test of the hydraulic system, see page 292 and see page 300.
  - Test the lift cut-offs (○), see page 356.
  - Test the travel functions, see page 279 and see page 283.
  - Test the end of aisle safety device and aisle recognition functions (○), see page 366.
  - Test the travel cut-offs (○), see page 360.
  - Test the lighting (work lights, etc.) (○).
  - Test the personal protection system (○), see page 416.
  - Check the front screens of the personal protection system (○) laser scanner for dirt and clean as required, (see page 419).
  - Check optical sensors (○) for dirt and clean if necessary (see page 726).
- Test the controls and displays and check for damage, see page 182.
- Check that the controls are automatically restored to their neutral position after being actuated (e.g. the "hydraulic functions" control lever, deadman button).
- Carry out a reference run to adjust the height indicator, see page 271.
- Test two-hand operation in narrow aisles, see page 283.
- Carry out the personal protection system (○) cycle test, see page 422.

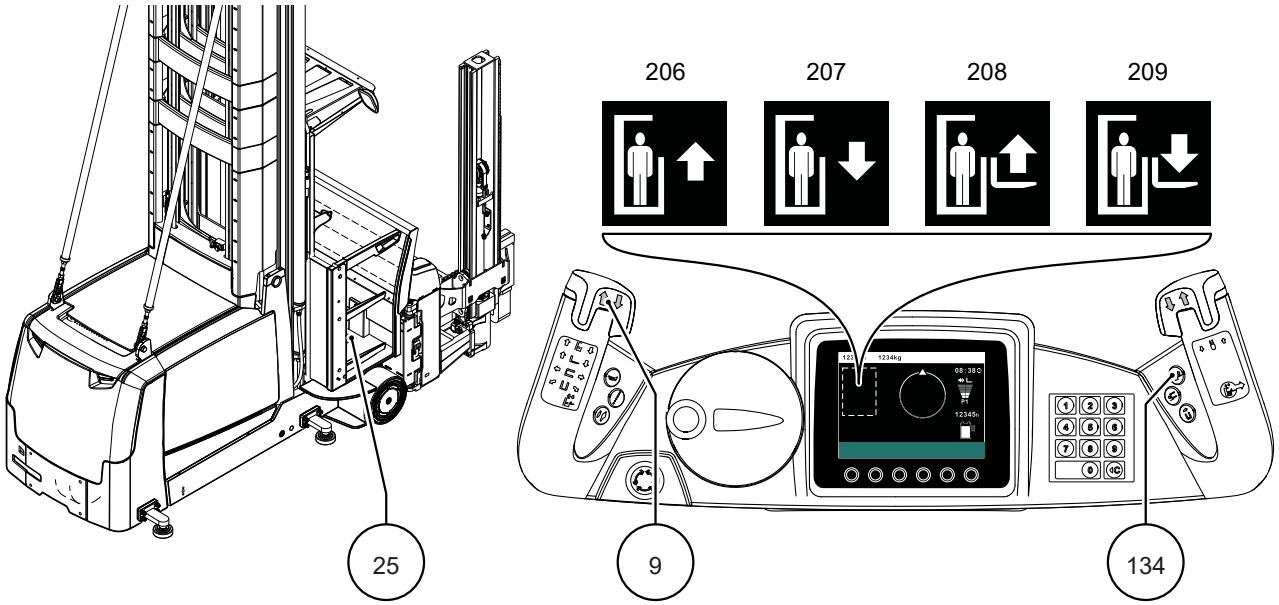
4.5 Setting the time

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.

4.6 Referencing the main and auxiliary lift



The symbols (206|209) indicate that a reference run is required according to the driver's display. After the reference run, the control unit issues a release to execute all movements of the industrial truck at maximum speed. The reference run is also used to adjust the height indicator.

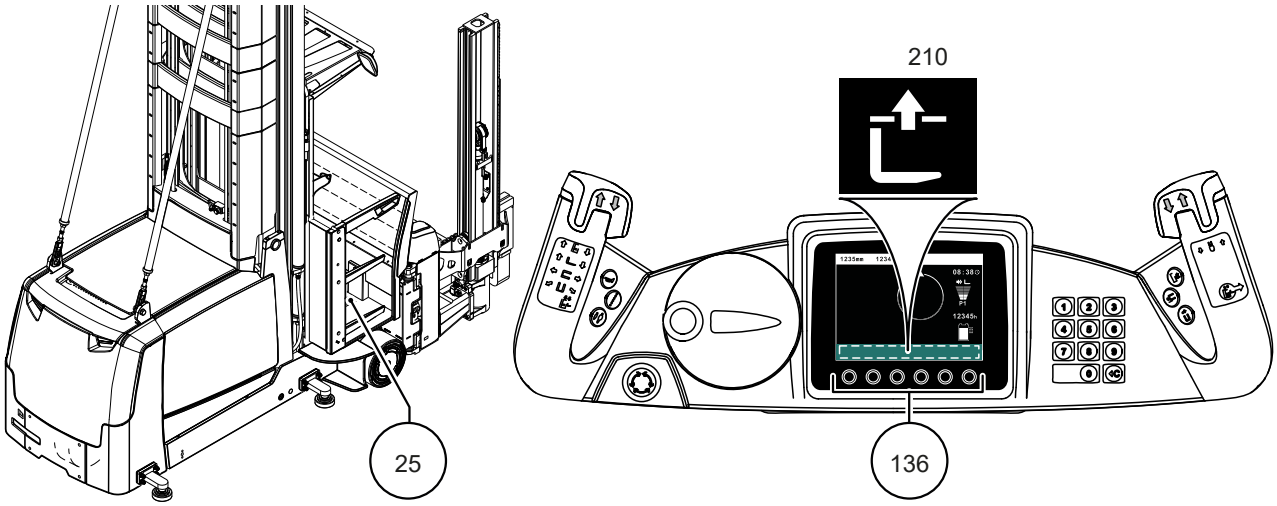
Requirements

– Truck has been prepared for operation, see page 265.

Procedure

- Press the deadman switch (25).
- Perform the "raise main lift" reference run when the symbol (206) is displayed:
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.
  - Raise the main lift until the symbol (206) is no longer displayed.
- Perform the "lower main lift" reference run when the symbol (207) is displayed:
  - Turn the "hydraulic functions" control lever (9) clockwise.
  - Lower the main lift completely until the symbol (207) is no longer displayed.
- Perform the "auxiliary lift raise" reference run when the symbol (208) is displayed:
  - Press and hold the "auxiliary lift" button (134).
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.
  - Raise the auxiliary lift until the symbol (208) is no longer displayed.
- Perform the "auxiliary lift lower" reference run when the symbol (209) is displayed:
  - Press and hold the "auxiliary lift" button (134).
  - Turn the "hydraulic functions" control lever (9) clockwise.
  - Lower the auxiliary lift completely until the symbol (209) is no longer displayed.

After referencing, the current lift height is shown on the driver’s display.



Lift cutout during referencing

⚠ WARNING!

An extended mast can cause accidents

The lift cutout is an auxiliary function designed to support the operator which however does not release him from his responsibility to stop hydraulic operations e.g. when confronted with an obstacle.

▶When the lift cutout has been de-activated the truck must be operated with extra care in order to detect obstacles when the mast is extended.

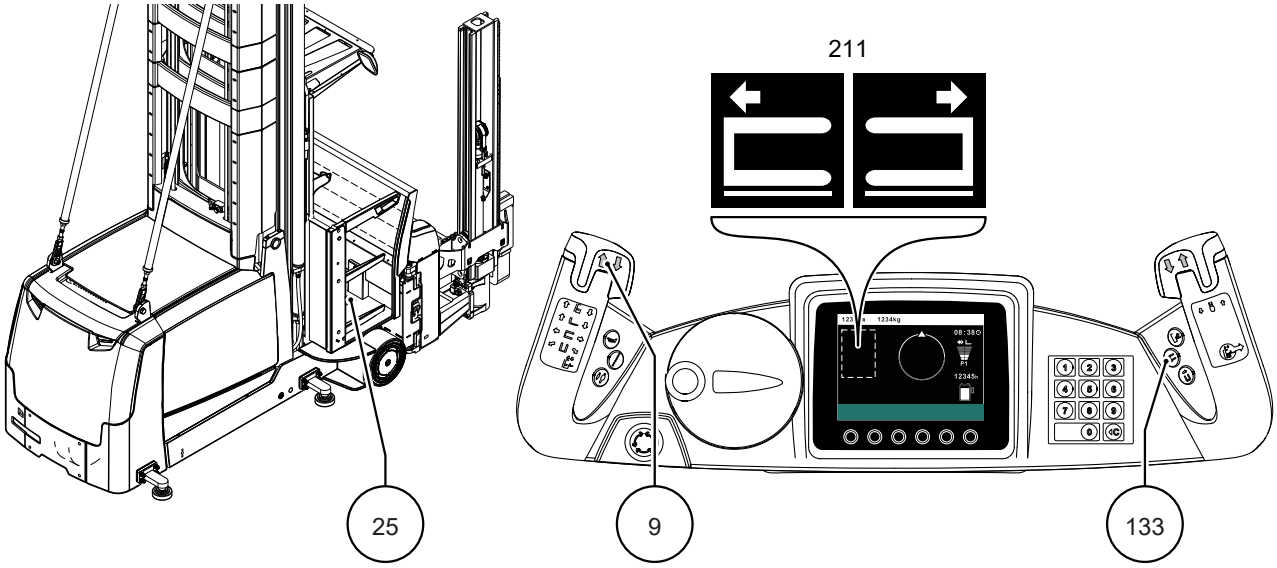
▶Stop lifting before you reach the obstacle.

Procedure

- Press the deadman switch (25).
- Pressing the “lift cut-out override” button (136) below the "lift cut-out" symbol (210) disables the lift cut-out.
- The hydraulic functions are controlled with the "hydraulic functions" control lever, see page 295.

4.7 Re-referencing the load handler (traverse/rotate)

If the position of the load handler (attachment position, rotation of the load handler (fork carriage)) has changed while the truck was switched off, the load handler needs to be re-referenced.
After the industrial truck has been switched on again, the symbols for "traverse reference run" (211) or "rotate" reference run (212) are shown on the driver's display. The attachment traverse or load handler rotate must be referenced.

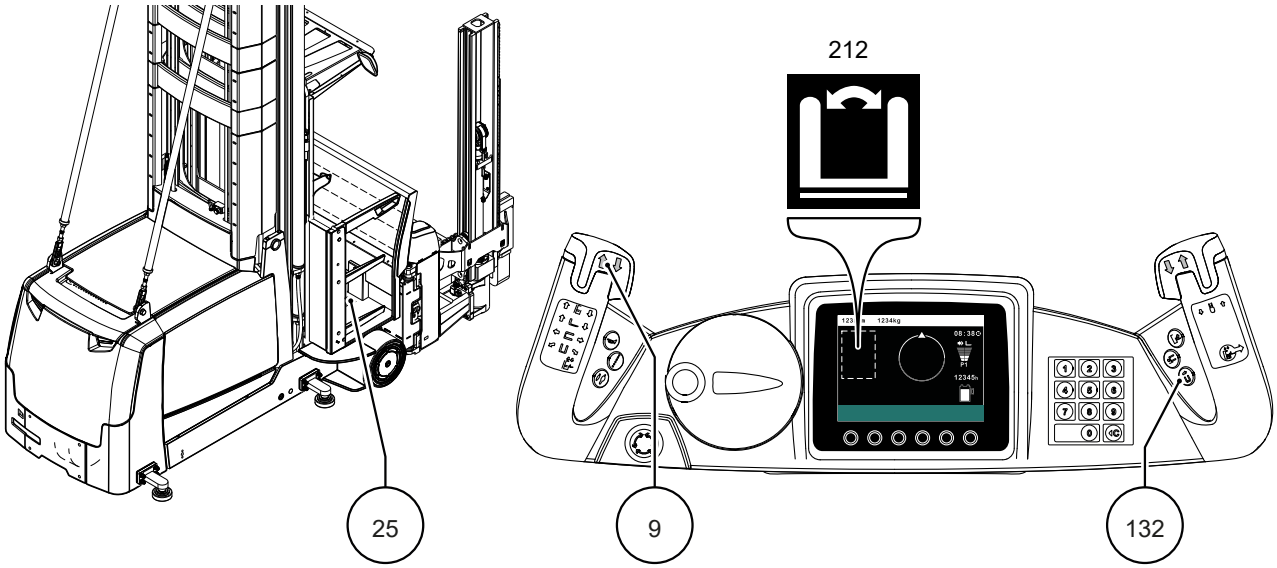


"Traverse" referencing

Procedure

- Press the deadman switch (25).
- Press and hold down on the "Attachment traverse" key (133).
- Traverse the attachment through the centre of the swivel traverse frame:
  - Turn the hydraulic control lever (9) clockwise = Attachment right traverse.
  - Turn the hydraulic control lever (9) anti-clockwise = Attachment left traverse.
- Traverse attachment back to home position, see page 317.

"Traverse" referencing is successful if the "Traverse reference run" symbol (211) goes out after referencing.
If the "Traverse reference run" symbol (211) does not go out after referencing, contact the manufacturer's service department and take the truck out of service.



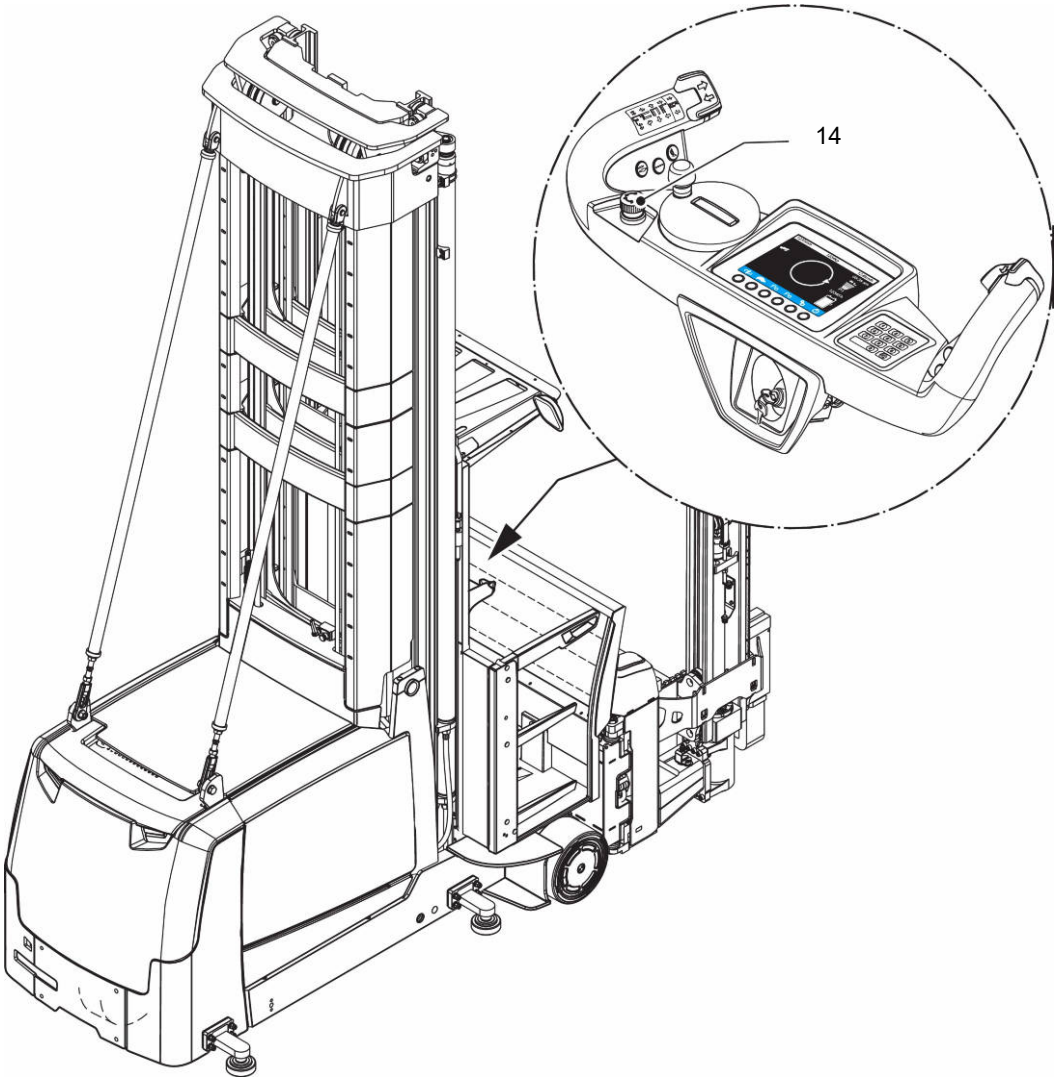
"Rotate" referencing

Procedure

- Press the deadman switch (25).
- Press and hold down on the "Fork carriage rotate" key (132).
- Carry out a fork carriage 180° rotation:
  - Turn the hydraulic control lever (9) clockwise = Fork carriage right rotation.
  - Turn the hydraulic control lever (9) anti-clockwise = Fork carriage left rotation.
- Rotate fork carriage back to home position, see page 317.

"Rotate" referencing is successful if the "Rotate reference run" symbol (212) goes out after referencing.
If the "Rotate reference run" symbol (212) does not go out after referencing, contact the manufacturer's service department and take the truck out of service.

4.8 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.

Pressing the Emergency Disconnect switch

Procedure

- Press the Emergency Disconnect (14).

All electrical functions are deactivated. The truck brakes to a halt at maximum brake force.

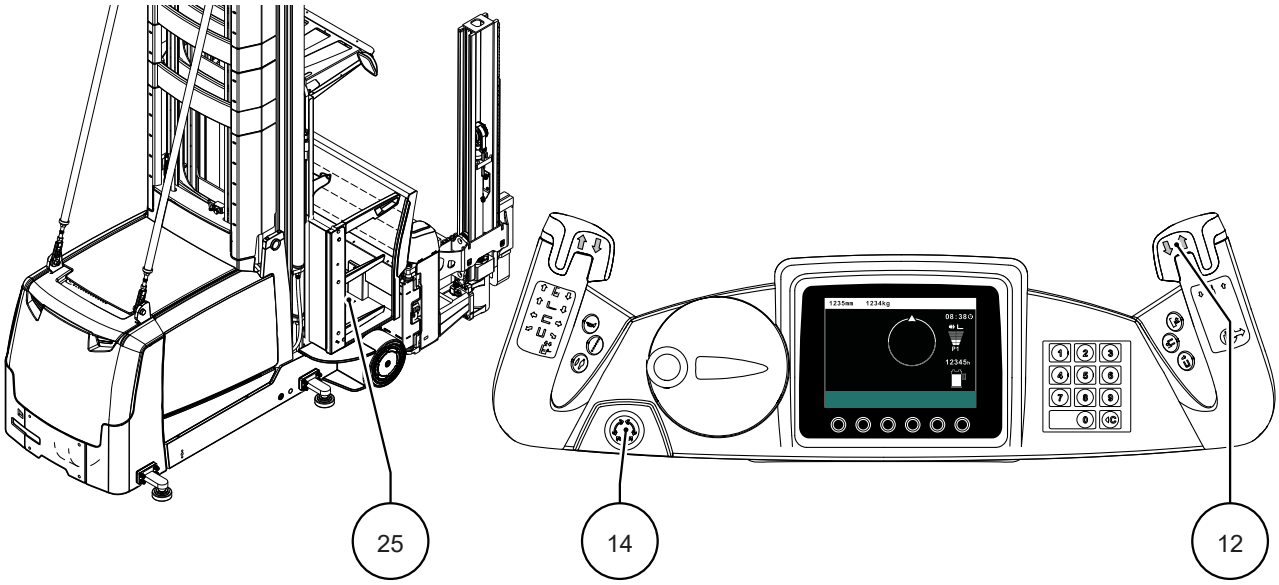
Releasing the emergency disconnect switch

Procedure

- Turn the emergency disconnect switch (14) to unlock it.

All electrical functions are enabled and the truck is operational again (assuming the truck was operational before the emergency disconnect switch was pressed).

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 can brake in two ways:

– Braking with the coasting brake (●).
– Braking with the deadman switch (○).

➔ Braking with the coasting brake is referred to as the service brake.

Braking with the coasting brake (●)

Procedure

- During travel, release the travel control knob (12).
  The travel control knob (12) reverts to the neutral position.

The truck brakes via the traction controller. This method reduces energy consumption. Energy is recovered, which is controlled by the traction controller.

Braking with the deadman button (○)

Procedure

- During travel, take your foot off the deadman button (25).

➔ This method of braking only acts as a parking brake and not as a service brake.

The truck brakes to a halt.

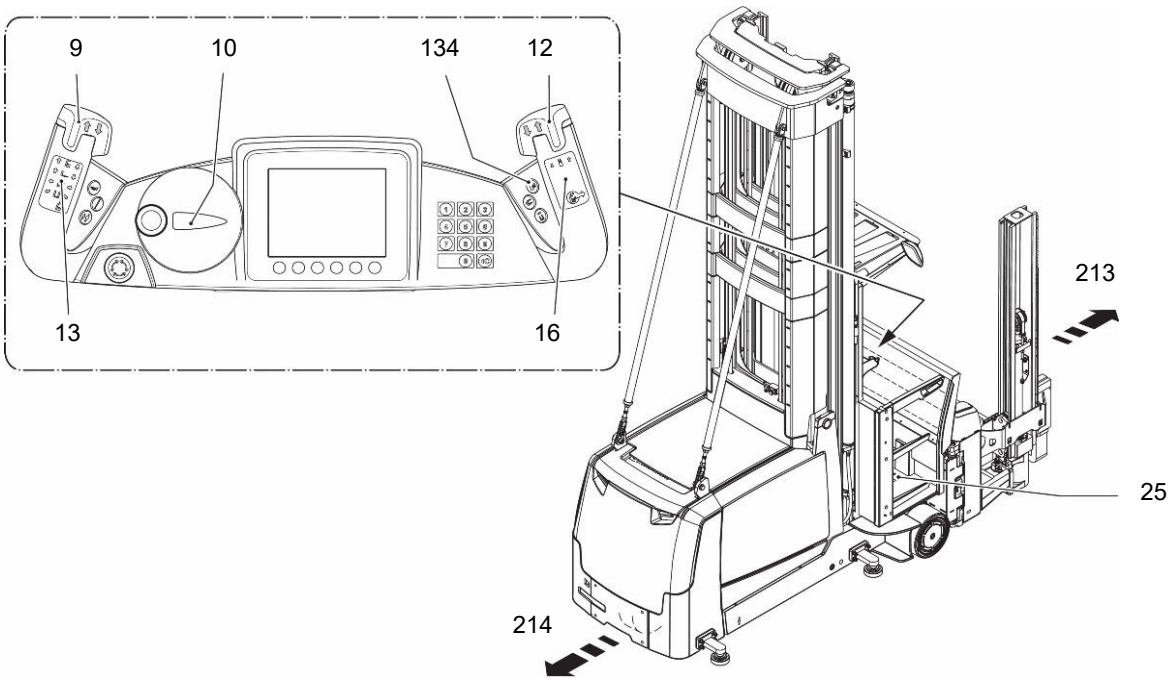
Parking Brake

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.

Changing direction during travel

➔ The truck brakes regeneratively via the traction controller until it starts to move in the opposite direction. Description of the functionalities, see page 281

4.10 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.

⚠ 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.

The truck can be operated in 3 modes:

- Free ranging in the apron field (FR)
- Rail guided (RG), see page 284.
- Wire guided (WG), see page 287.

The operating mode used depends on the guide system of the racking systems in question.

Industrial Truck Operation

Requirements

– Prepare the truck for operation, see page 265.
– Carry out a reference run to adjust the height display, see page 271.

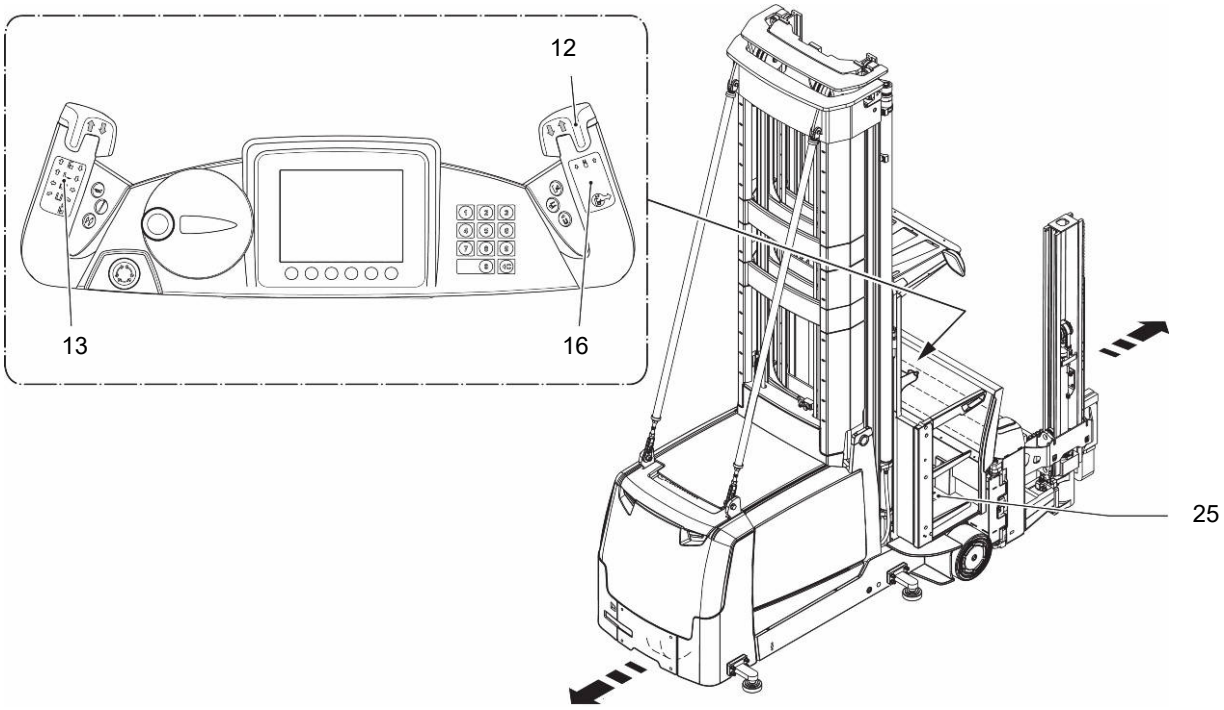
Procedure

- Grab hold of the grip (13) with your left hand and the grip (16) with your right hand (only within the narrow aisle [two-hand operation]).
- Press the deadman switch (25).
- Fully lower the Main Lift:
  - Turn the "hydraulic functions" control lever (9) clockwise.
- Fully lower the Aux. Lift:
  - Apply the "Auxiliary lift" button (134) and hold it down.
  - Turn the "hydraulic functions" control lever (9) clockwise.
- Raise the load handler so that it is free of the ground:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.
- Set the travel direction and speed with the travel control knob (12):
  - Turn the travel control knob (12) slowly clockwise:
    Travel in load direction (213).
  - Turn the travel control knob (12) slowly anti-clockwise:
    Travel in drive direction (214).
- You can control the travel speed by turning the travel control knob (12) further forward or back.
- Use the steering wheel (10) to steer the truck in the required direction.

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

For details of the brake functions, see page 277.

4.10.1 Changing the direction of 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

Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Grab hold of the grip (13) with your left hand and the grip (16) with your right hand (only within the narrow aisle [two-hand operation]).
- Press the deadman switch (25).
- Drive the truck in the load or drive direction:
  - Apply the travel control knob (12).
- While travelling in the opposite direction turn the travel control knob (12).

  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.
- After setting off in the opposite direction, apply the travel control knob (12) gently or not at all.

4.11 Negotiating 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!

Risk of collision between the attachment and the racking system

If the attachment is not in the home position while the truck is attaining the guide wire, the attachment can collide with the racking system.

- ▶ Before entering the narrow aisle ensure that the attachment is in the home position.

⚠ 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.

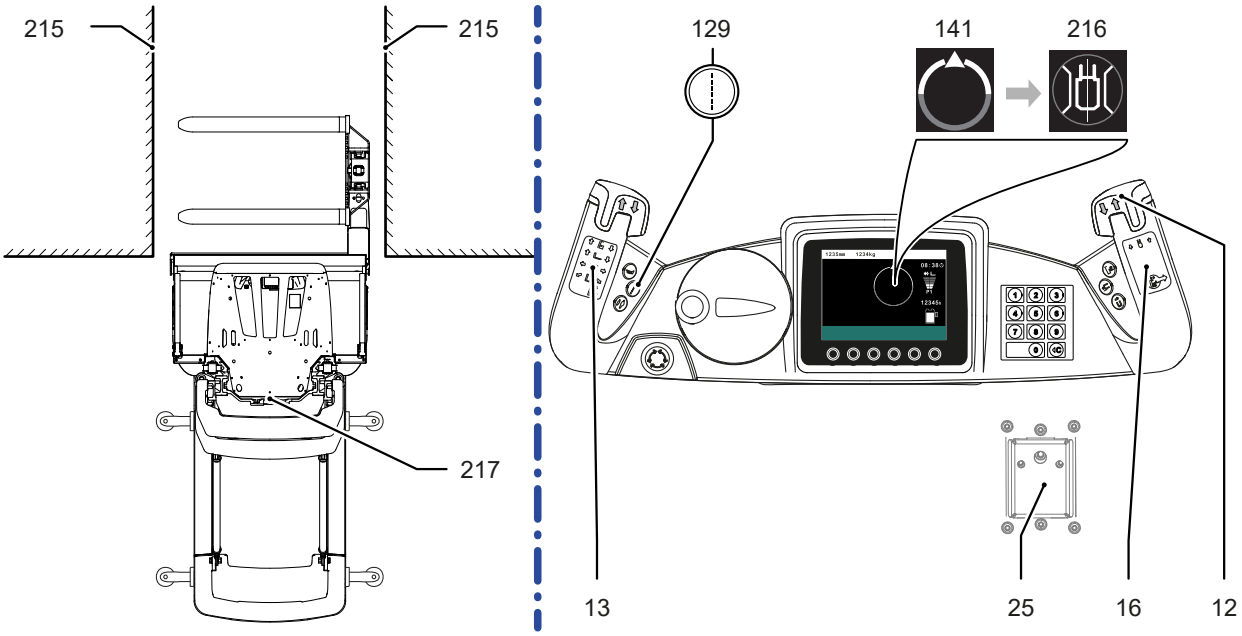
- ▶ Do not lean out of the truck while travelling.
- ▶ Do not lean out of the truck while carrying out hydraulic operations (lifting or lowering).
- ▶ Check the length and height of the narrow aisle for protruding objects before entering it.
- ▶ Once in the narrow aisle, enter the rack compartments carefully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

NOTICE

Note the safety clearances between the truck and rack

Description of the safety clearances (design safety clearance) between rail-guided or wire-guided truck and rack, see page 18.

4.11.1 Negotiating narrow aisle with rail-guided trucks (○)



Travelling in narrow aisles with rail-guided trucks

Requirements

– Narrow aisles must be equipped with guide rails (215).
– Truck has been prepared for operation – see page 265.

Procedure

➔ Rail-guided trucks are fitted with sensors or RFID readers. These sensors activate aisle recognition when the truck enters a narrow aisle.

⚠ WARNING!

Danger due to faulty or loose guide rails

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.

- Press the deadman button.
- Approach the narrow aisle at reduced speed so the truck (217) is aligned with the narrow aisle and is within the demarcations.
- Observe the markings on the travel path (e.g. aisle centre line).
- Drive the truck slowly into the narrow aisle (217). Ensure that the rail guidance rollers of the truck (217) enter the narrow aisle guide rails (215).
- Press the “switch rail guidance on/off” button (129).

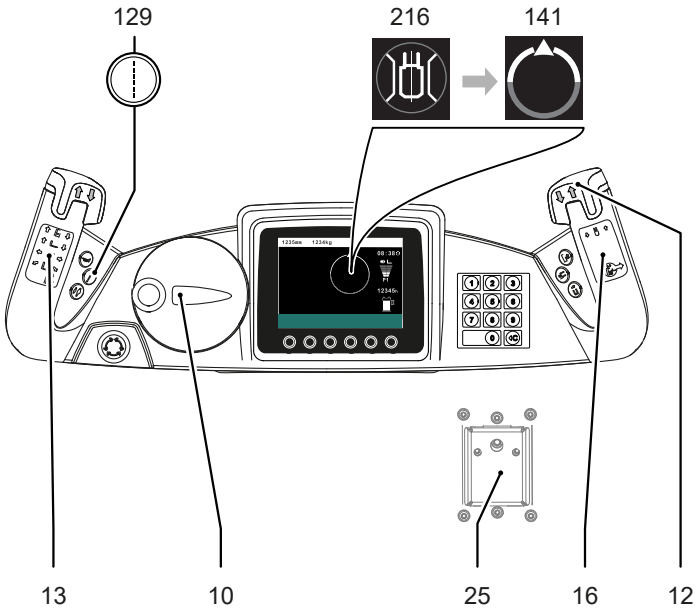
➔ The drive wheel is set automatically to the straight-ahead position. The steer angle display (141) changes to “truck guided” (216). Manual steering of the truck is deactivated.

- Grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation).

➔ Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

- Set the travel direction and speed with the travel control knob (12):
  - Turn the travel control knob (12) slowly clockwise:
    Travel in load direction.
  - Turn the travel control knob (12) slowly anti-clockwise:
    Travel in drive direction:
- You can control the travel speed by turning the travel control knob (12) further forward or back.
- For details of the brake functions, see page 277.
- For details of hydraulic operation, see page 292 and see page 300.

The truck has now entered the narrow aisle and is automatically guided.



Leaving the narrow aisle

Procedure

- Drive the truck completely out of the narrow aisle.
- Bring the truck to rest.

⚠ CAUTION!

You can only change from automatic to manual steering once the truck has fully exited the narrow aisle.

- Press the “Switch automatic guidance on/off” button (129).

➔ The "Truck guided” display (216) changes to the steer angle indicator (141). The truck is now free to move again. The steer angle indicator (141) shows the current position of the drive wheel.

➔ Always travel outside of narrow aisles with the load lowered.

The truck has left the narrow aisle. Use the steering wheel (10) to adjust the angle of the drive wheel again.

4.11.2 Negotiating narrow aisles with wire-guided trucks (○)

⚠ WARNING!

A non-guided truck can cause collisions

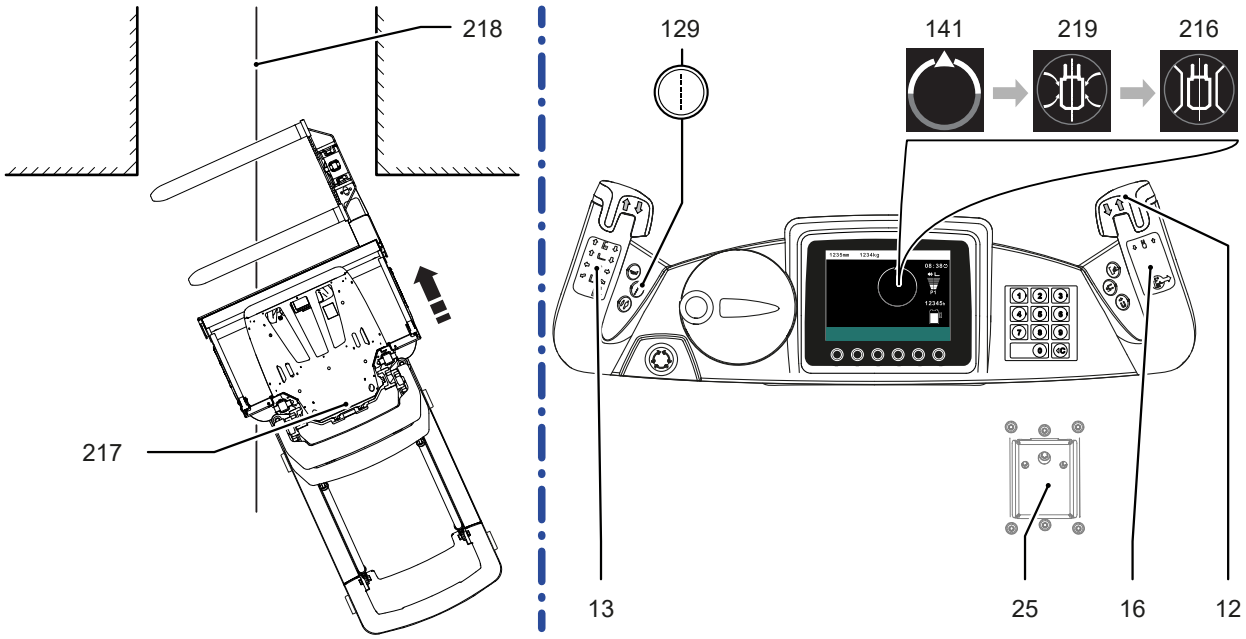
If the truck's wire guidance is switched off or is lost, the truck could collide with the racking system. If the truck continues to travel a warning is sounded and the speed is reduced or the truck brakes to a halt.

▶ The truck's wire guidance can be lost for the following reasons:
- Truck switched off and on again.
- Faulty guidance system or system switched off and on again (e.g. sensors for wire guidance on the truck, line driver, etc.).

▶ Switch the wire guidance off only briefly before leaving the aisle. The operator must check the position of the drive wheel as manual steering is now activated again. Avoid collisions between the truck and the racking system.

▶ If the wire guidance in the narrow aisle is lost, the truck must acquire the guide wire again. During alignment, the rear section of the truck may veer out when it reaches the guide wire.

▶ If the wire guidance system is faulty or switched off, drive the truck manually out of the narrow aisle at slow travel speed and with particular care. The operator must check the position of the drive wheel as manual steering is now activated again. Avoid collisions between the truck and the racking system.



Travelling in narrow aisles with wire-guided trucks

Requirements

– Narrow aisles must be equipped with a guide wire (218).
– Truck has been prepared for operation – see page 265.

Procedure

➔ Always attain the guide wire in the load direction if this is possible. This has the advantage that the time needed and the distance involved are less then when attaining the guide wire in the drive direction.

- Press the dead man's switch.
- Approach the guide wire (218) with the industrial truck (217) at an angle and at reduced speed.
- Before guide-wire acquisition, position the truck (217) at an angle between 10° and 50° to the guide wire (218). During guide-wire acquisition, the truck (217) should not be parallel to the guide wire (218).
- Description of the guide-wire acquisition process:
  - When you are close to the guide wire (218), switch wire guidance on with the "switch automatic guidance on/off" key (129).
  - The acquisition signal sounds.
  - Move the truck (217) slowly in the direction of the guide wire (218).

➔ On reaching the guide wire (218), the truck is guided automatically. Guide-wire acquisition ensues automatically at reduced speed. Manual steering is deactivated.

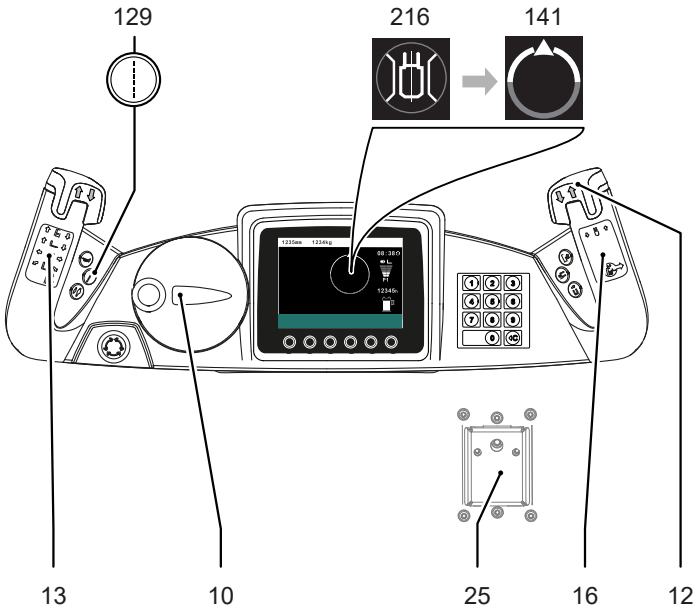
- The steering angle indicator (141) changes to “acquisition in progress” (219).
- The truck is now automatically steered by wire guidance and is pivoted onto the guide wire. (218).
- Acquisition is complete once the truck has been aligned precisely with the guide wire.
- The “acquisition in progress” display (219) changes to “truck guided” (216).
- The acquisition signal no longer sounds.

- Grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation).

➔ Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

- Set the travel direction and speed with the travel control knob (12):
  - Turn the travel control knob (12) slowly clockwise:
    Travel in load direction.
  - Turn the travel control knob (12) slowly anti-clockwise:
    Travel in drive direction:
- You can control the travel speed by turning the travel control knob (12) further forward or back.
- For details of the brake functions, see page 277.
- For details of hydraulic operation, see page 292 and see page 300.

The truck has now entered the narrow aisle and is automatically guided.



Leaving the narrow aisle

Procedure

- Drive the truck completely out of the narrow aisle.
- Bring the truck to rest.

⚠ CAUTION!

You can only change from automatic to manual steering once the truck has fully exited the narrow aisle.

- Press the “Switch automatic guidance on/off” button (129).

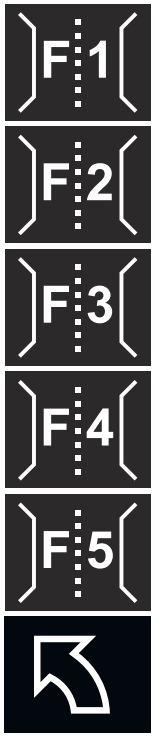
➔ The "Truck guided” display (216) changes to the steer angle indicator (141). The truck is now free to move again. The steer angle indicator (141) shows the current position of the drive wheel.

➔ Always travel outside of narrow aisles with the load lowered.

The truck has left the narrow aisle. Use the steering wheel (10) to adjust the angle of the drive wheel again.

4.11.2.1 Multi-Frequency Operation – Setting the Frequency

Symbol	Meaning

	Frequency for truck wire guidance:
	– Selects the frequency for the truck wire guidance.
	– A maximum of 5 different frequencies can be selected.
	Set the frequency:
	• Press the "switch rail guidance on/off" button for min. 2 sec.
	• The sub-menu "Select the frequency for truck wire guidance" is displayed on the driver's display.
	• Activate the frequency for truck wire guidance:
	  • Press the "functions" button under the "F1-F5" symbol.
	  • The sub-menu "Select the frequency for truck wire guidance" returns to the previous menu.
	• Cancel the frequency for truck wire guidance:
	  • Press the "functions" button under the "Return to previous menu" symbol.
	  • The "Select the frequency for truck wire guidance" sub-menu returns to the previous menu.

4.12 Lifting or 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 movements made by the truck, including the load handler, attachments, etc. This also includes areas which can be reached by falling loads, operating equipment etc.
Apart from the operator (in the normal operating position), there must be no one else in the hazardous area of the truck.

- ▶ Instruct other people to move out of the hazardous area of the truck. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ Only carry loads that have been secured and positioned in accordance with regulations. Use suitable precautions to prevent the load or 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 in the operator position must not leave the operator position in the raised position. Do not climb onto parts of the building or other trucks.

⚠ WARNING!

Unauthorised lowering speeds can cause accidents

The line break safety valve in the Main Lift hydraulic cylinders stops the load handler 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 bonding agent / consumable mixture must be disposed of in accordance with regulations.

⚠ WARNING!

Falls due to open gates

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.
- ▶ Safety harness checked and worn.
  Observe the national regulations for wearing a safety harness with safety rope.

⚠ CAUTION!

Positioning or blocking the load handler or operator position

The lift chains may sag when positioning or blocking the load handler or operator position There is a risk of the load handler or operator position dropping suddenly once no longer supported or when the block is released. If the load handler or operator position drops suddenly, the lift chains or hydraulic hoses may become damaged.

- ▶ When lowering the load handler or operator position, ensure that the lift chains are not are slack.
- ▶ Retension the lift chains:
  Raise the load handler or operator position carefully until the lift chains are retensioned.
- ▶ When raising the load handler or the operator position, ensure that the hydraulic hoses are located in their guides.
- ▶ Check the cause of the block and rectify, if necessary.

⚠ CAUTION!

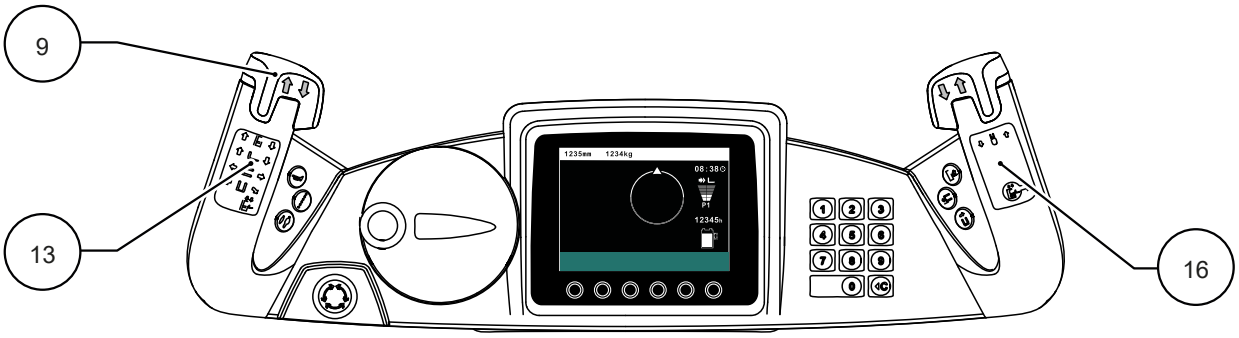
Risk of accident when the raised load handler slowly lowers of its own accord

The raised load handler can lower independently due to internal leakage. According to EN ISO 3691-1 the load handler may lower by up to 100 mm during the first 10 minutes at the rated capacity with the hydraulic oil at normal operating temperature.

- ▶ Never stand underneath a raised load handler.

4.12.1 Lifting or Lowering the Main Lift

➔ 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.



Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation). Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

Procedure

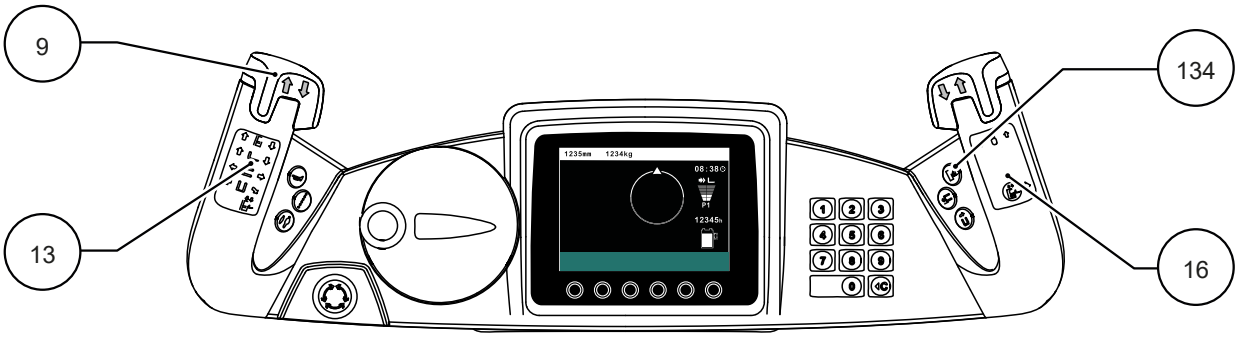
- Press the deadman switch.
- To raise the main lift:
  Turn the "hydraulic functions" control lever (9) anticlockwise.
- To lower the main lift:
  Turn the "hydraulic functions" control lever (9) clockwise.

➔ The lift and lowering speeds are proportional to how far the "hydraulic functions" control lever (9) is moved. The maximum lift speed is achieved when the attachment is in the home position or the telescopic table is in the centre position (see page 317 or see page 317).

The Main Lift is raised or lowered.

4.12.2 Auxiliary lift raise/lower

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 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation). Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

Procedure

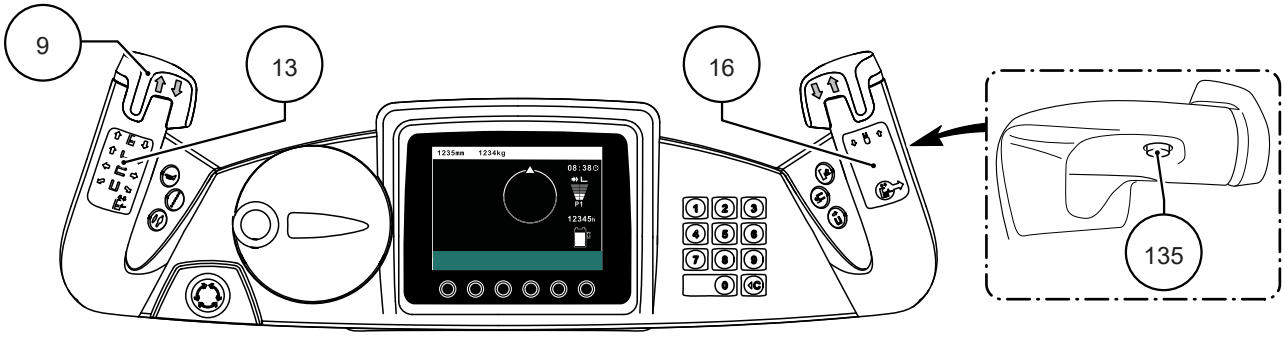
- Press the deadman switch.
- To raise the auxiliary lift:
  - Press the "Auxiliary lift" key (134) and hold it down.
  - Turn the "hydraulic functions" control lever (9) anticlockwise.
- To lower the auxiliary lift:
  - Press the "Auxiliary lift" key (134) and hold it down.
  - Turn the "hydraulic functions" control lever (9) clockwise.

The lift and lowering speeds are proportional to how far the "hydraulic functions" control lever (9) is moved. The maximum lift speed is achieved when the attachment is in the home position or the telescopic table is in the centre position (see page 317 or see page 317).

The Auxiliary Lift is raised or lowered.

4.12.3 Simultaneous lifting / lowering of Main and Auxiliary Lift (○)

➔ Simultaneous Main / Auxiliary Lift raising and lowering is not available on the EKS.



Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation). Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

Procedure

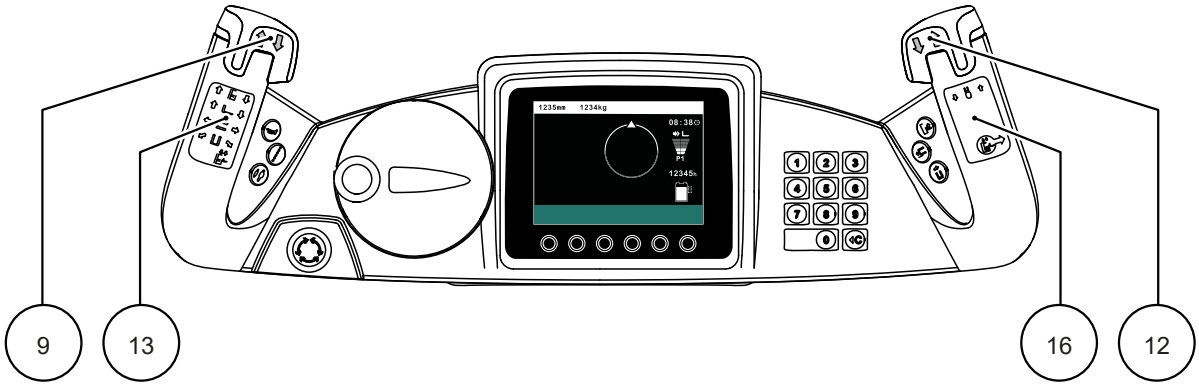
- Press the deadman switch.
- Simultaneous raising of the Main and Auxiliary Lift:
  - Press and hold down on the “Main and Aux. Lift lower / raise” button (135).
  - Turn the "hydraulic functions" control lever (9) anticlockwise.
- Simultaneous lowering of the Main and Auxiliary Lift:
  - Press and hold down on the “Main and Auxiliary Lift lower / raise” button (135).
  - Turn the "hydraulic functions" control lever (9) clockwise.

➔ You can stop the raising or lowering of the Auxiliary Lift by releasing the "Main and Auxiliary Lift raise / lower" button (135).

➔ The lift and lowering speeds are proportional to how far the "hydraulic functions" control lever (9) is moved. The maximum lift speed is achieved when the attachment is in the home position or the telescopic table is in the centre position (see page 317 or see page 317).

The Main and Auxiliary Lift are raised / lowered simultaneously.

4.13 Diagonal travel



Requirements

– Get the truck ready for operation, see page 265.

Procedure

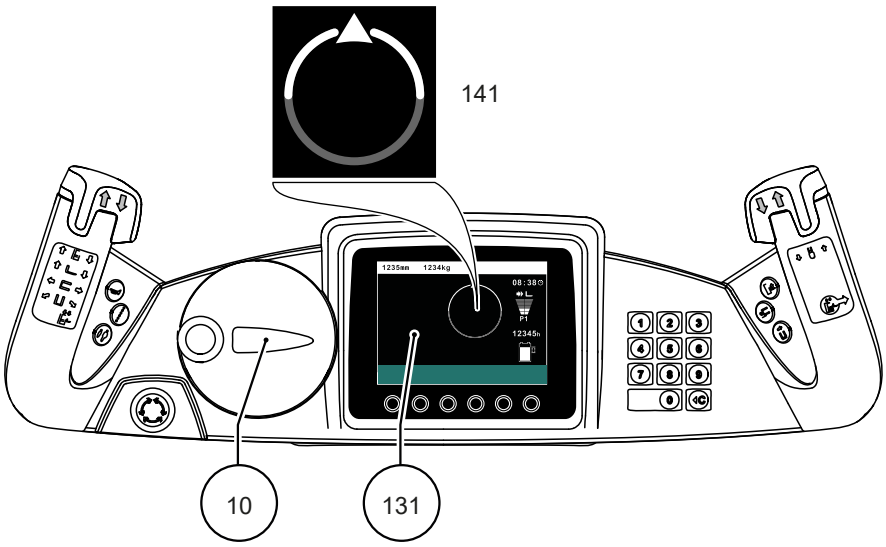
- Press the deadman switch.

➔ Inside the narrow aisle, travel and hydraulic operations can only be activated with two-hand operation.

  - Grab hold of the handle (13) with your left hand and handle (16) with your right hand (two-hand operation).

- Diagonal travel (simultaneous travel and lifting/lowering) can be achieved by pressing the "hydraulic functions" control lever (9) and the travel control knob (12) simultaneously.
  - Drive the truck in the load or drive direction, see page 279.
  - Raise or lower the main lift, see page 292.

4.14 Steering



Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Steering outside narrow aisles:
  - Turn the steering wheel (10) to the left or right, depending on the travel direction.

➔ The drive wheel position (141) is indicated on the driver's display (131).

- Steering inside narrow aisles:
  - The truck is automatically guided and steering wheel (10) operation is deactivated.

4.15 Traversing / rotating outside and inside narrow aisles

⚠ WARNING!

Risk of trapping when swivelling or traversing the load handler

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 movement of the load handler, attachments, etc. This also includes areas which can be reached by falling loads, operating equipment etc.
Apart from the operator (in the normal operating position), there must be no one else in the hazardous area of the truck.

- ▶ Instruct other people to move out of the hazardous area of the truck. Ensure there is no one in the hazardous area when carrying out swivel, traverse, synchronised rotate or lifting or lowering movements with the load handler. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ Only transport loads that have been correctly secured and positioned. Take appropriate countermeasures if there is a risk of the load or parts of the load 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.
- ▶ Do not stand on the load handler.
- ▶ Do not reach or climb into moving truck parts.
- ▶ The operator must not leave the operator position when the load handler is raised.

⚠ WARNING!

A faulty attachment can be hazardous

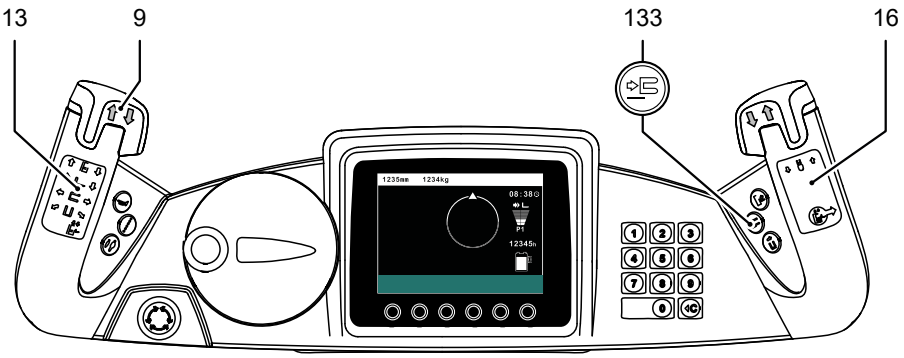
Check the attachment daily for external signs of damage or defects. Faulty attachments can cause the load to fall.

▶ 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.

4.15.1 Attachment traverse



Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation). Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

Procedure

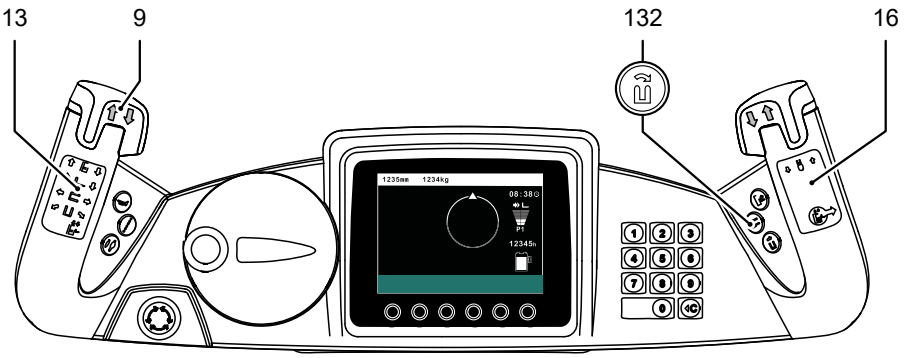
- Press the deadman switch.
- Press and hold down the "Attachment traverse" key (133).
- Traverse attachment to the right:
  - Turn the "hydraulic functions" control lever (9) clockwise.
- To traverse the attachment to the left:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The traverse speed is proportional to how far the "hydraulics function" control lever (9) is moved.

The attachment moves to the right or left.

➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

4.15.2 Rotating the load handler (fork carriage)



Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) with your right hand (two-hand operation). Travel and hydraulic operations can only be activated in the narrow aisle with two-handed operation.

Procedure

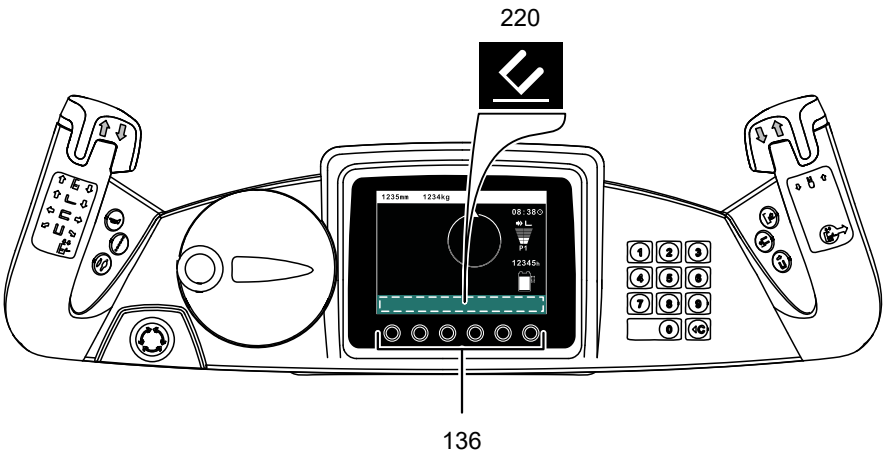
- Press the deadman switch.
- Press and hold down the "Fork carriage rotate" key (132).
- Rotate fork carriage right:
  - Turn the "hydraulic functions" control lever (9) clockwise.
- Rotate fork carriage left:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.

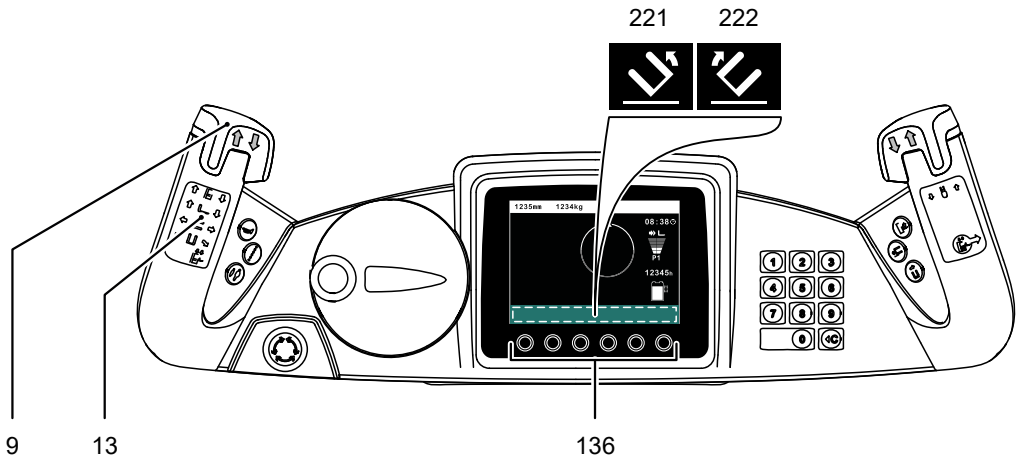
➔ The rotating speed is proportional to the displacement of the hydraulic control lever (9).

The fork carriage is rotated to the right or left.

➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

4.15.3 Manual traverse/rotate operation (●)





Functional description of "manual traverse/rotate operation"

During the manual traverse/rotate operation, the load handler automatically rotates as the attachment is traversed manually. The traverse speed of the attachment is proportional to the movement of the "hydraulic functions" control lever (9). The rotation speed of the load handler is preset.

Requirements

– Truck has been prepared for operation – see page 265.
– The attachment and the load handler are in the left or right home position.

Procedure

- Press the button (136) under the symbol (220).
  The driver's display changes from the "menu change" menu item (220) to the "manual traverse/rotate operation" functions (221|222).
- In narrow aisles grab hold of the handle (13) with your left hand (two-hand operation).
- Press the deadman button.

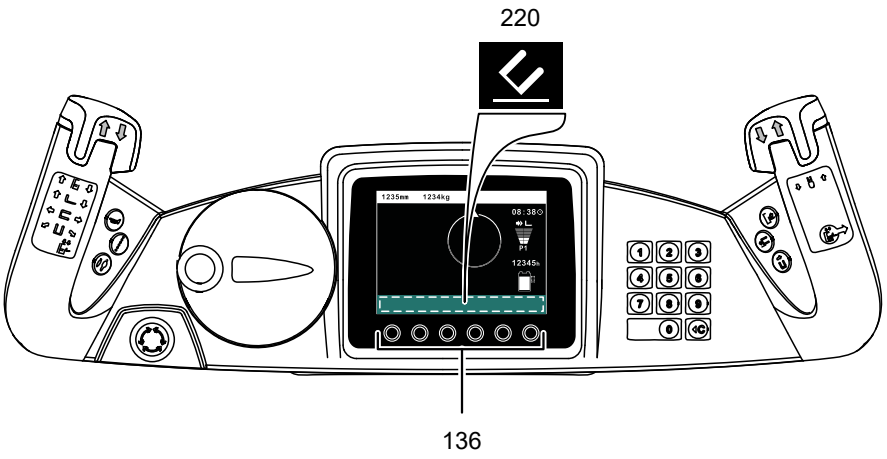
- Manually traverse the attachment to the right and automatically rotate the load handler to the left:
  - Press and hold the button (136) under the symbol (221).
  - Turn the "hydraulic functions" control lever (9) clockwise until the home position is reached.
- Manually traverse the attachment to the left and automatically rotate the load handler to the right:
  - Press and hold the button (136) under the symbol (222).
  - Turn the "hydraulic functions" control lever (9) anti-clockwise until the home position is reached.

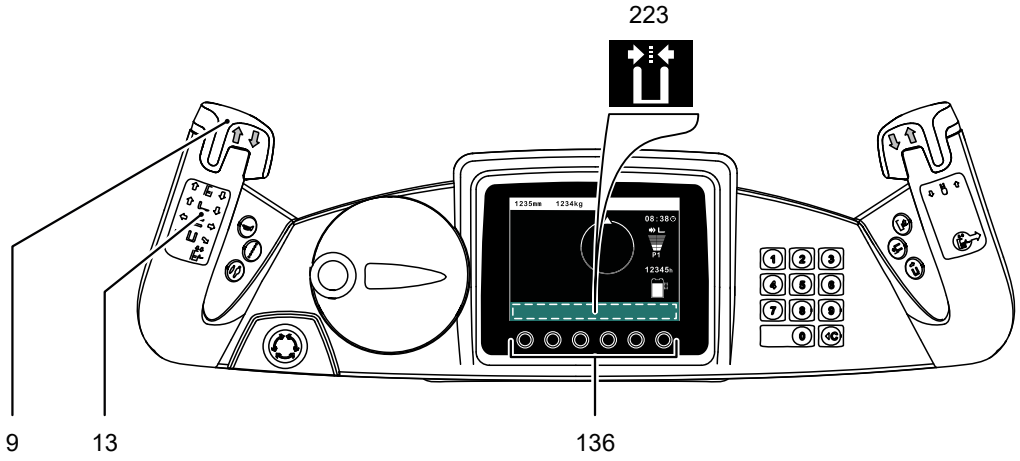
➔ The traverse/rotate operation can be interrupted e.g. by releasing the button (136), the "hydraulic functions" control lever (9) or the handle (13). The attachment and the load handler must then be manually traversed and rotated into the home position (see page 302 and see page 303).

The attachment is located at the right or left mechanical end stop of the swivel traverse frame and the load handler has been rotated through 180°.

➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

4.15.4 Manual Traverse/Rotate Operation with Stop in Centre Position (○)





Functional description of "manual traverse/rotate operation with stop in centre position"

The "manual traverse/rotate operation with stop in centre position" function rotates the load handler 90° from the home position and positions the attachment in the centre of the swivel traverse frame. The traverse speed of the attachment is proportional to the movement of the "hydraulic functions" control lever (9). The rotation speed of the load handler is preset.

Requirements

– Truck has been prepared for operation – see page 265.
– The attachment and the load handler are in the left or right home position.

Procedure

- Press the button (136) under the symbol (220).
  The driver's display changes from the "menu change" menu item (220) to the "manual traverse/rotate operation with stop in centre position" function (223).
- In narrow aisles grab hold of the handle (13) with your left hand (two-hand operation).
- Press the deadman button.

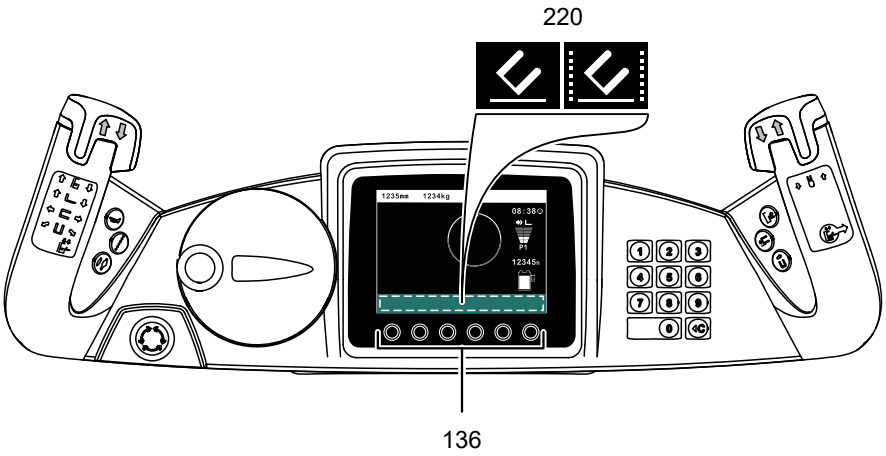
- Manually traverse the attachment to the right to the centre position and automatically rotate the load handler 90° to the left:
  - Hold down the button (136) under the symbol (223) until the rotary movement of the load handler is complete.
  - Turn the "hydraulic functions" control lever (9) clockwise until the attachment comes to a stop in the centre of the swivel traverse frame.
- Manually traverse the attachment to the left to the centre position and automatically rotate the load handler 90° to the right:
  - Hold down the button (136) under the symbol (223) until the rotary movement of the load handler is complete.
  - Turn the "hydraulic functions" control lever (9) anti-clockwise until the attachment comes to a stop in the centre of the swivel traverse frame.

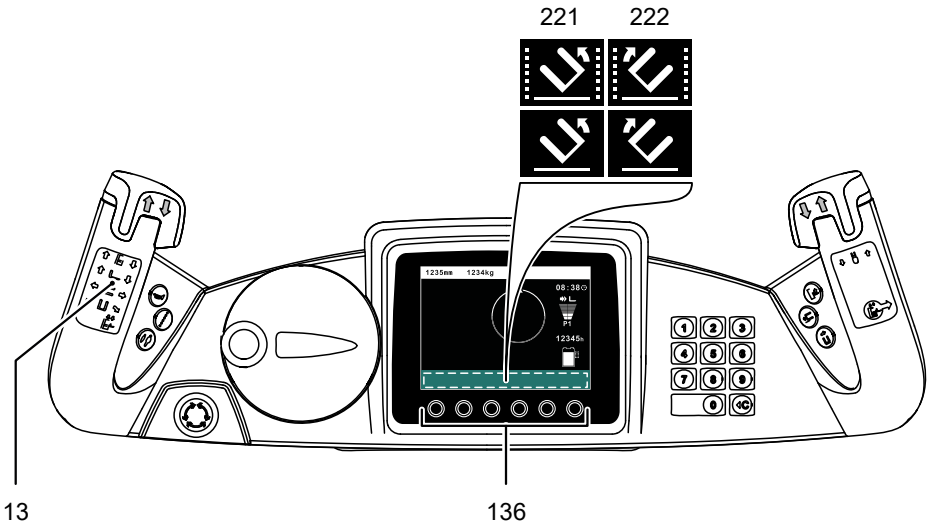
➔ This function can be interrupted e.g. by releasing the button (136), the "hydraulic functions" control lever (9) or the handle (13). The attachment and the load handler must then be manually traversed and rotated into the home position (see page 302 and see page 303).

The attachment is in the centre of the swivel traverse frame and the load handler is at a right angle (90°) to the swivel traverse frame. Loads can now be lifted from the front.

➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

4.15.5 Automatic traverse/rotate operation (○)





Functional description of "automatic traverse/rotate operation"

During the automatic traverse/rotate operation, the attachment and the load handler are traversed and rotated automatically. The traverse speed of the attachment and the rotation speed of the load handler are preset.

▶ Optionally, the automatic traverse/rotate operation can be monitored with the "contour limit" function.
▶ Functional description of "contour limit" – see page 312.

Requirements

– Truck has been prepared for operation – see page 265.
– The attachment and the load handler are in the left or right home position.

Procedure

- Press the button (136) under the symbol (220).
  The driver's display changes from the "menu change" menu item (220) to the "automatic traverse/rotate operation" functions (221|222).
- In narrow aisles grab hold of the handle (13) with your left hand (two-hand operation).
- Press the deadman button.

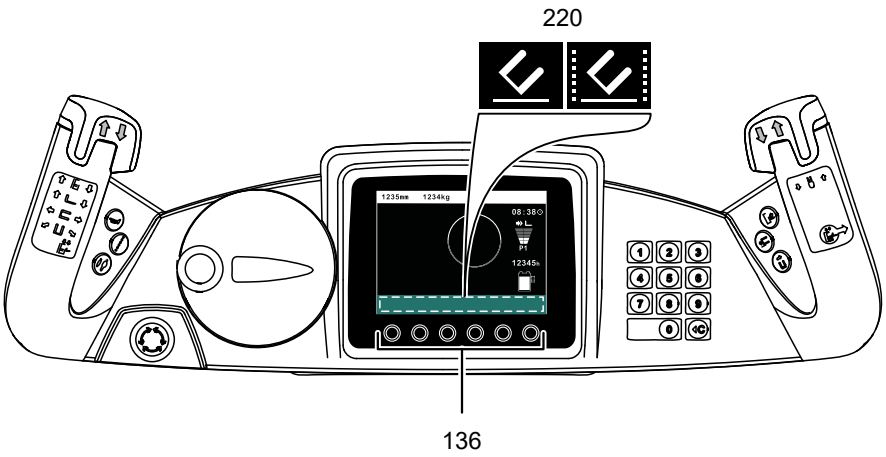
- Automatically traverse the attachment to the right and automatically rotate the load handler to the left:
  - Press and hold the button (136) under the symbol (221) until the home position is reached.
- Automatically traverse the attachment to the left and automatically rotate the load handler to the right:
  - Press and hold the button (136) under the symbol (222) until the home position is reached.

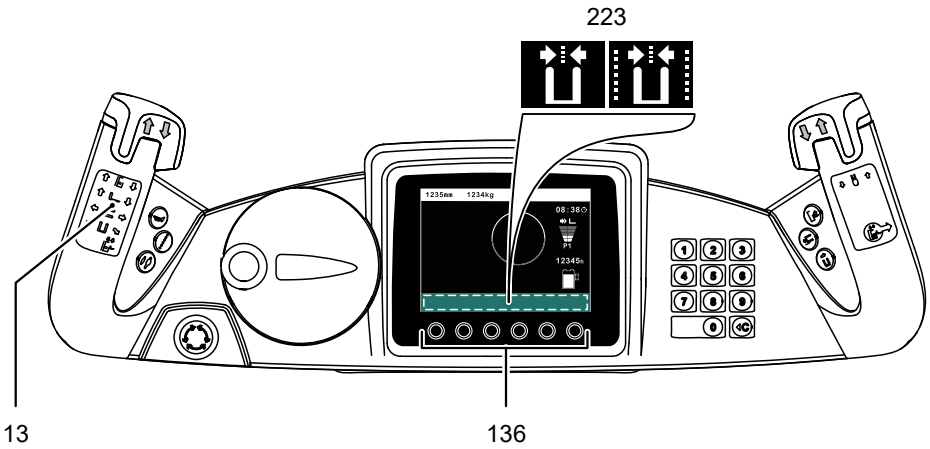
➔ The traverse/rotate operation can be interrupted e.g. by releasing the button (136) or the handle (13). The attachment and the load handler must then be manually traversed and rotated into the home position (see page 302 and see page 303).

The attachment is located at the right or left mechanical end stop of the swivel traverse frame and the load handler has been rotated through 180°.

➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

4.15.6 Automatic Traverse/Rotate Operation with Stop in Centre Position (○)





Functional description of "automatic traverse/rotate operation with stop in centre position"

The "automatic traverse/rotate operation with stop in centre position" function rotates the load handler 90° from the home position and positions the attachment in the centre of the swivel traverse frame. The traverse speed of the attachment and the rotation speed of the load handler are preset.

▶ Optionally, the automatic traverse/rotate operation with stop in centre position can be monitored with the "contour limit" function.
▶ Description of the "contour limit" function – see page 312.

Requirements

– Truck has been prepared for operation – see page 265.
– The attachment and the load handler are in the left or right home position.

Procedure

- Press the button (136) under the symbol (220).
  The driver's display changes from the "menu change" menu item (220) to the "automatic traverse/rotate operation with stop in centre position" function (223).
- In narrow aisles grab hold of the handle (13) with your left hand (two-hand operation).

- Press the deadman button.
- Synchronised load handler rotation through 90° and attachment traverse to the centre position:
  - Press and hold the button (136) under the symbol (223) until the attachment stops in the centre of the swivel traverse frame and the rotation of the load handler is completed.

➔ This function can be interrupted e.g. by releasing the button (136) or the handle (13). The attachment and the load handler must then be manually traversed and rotated into the home position (see page 302 and see page 303).

The attachment is in the centre of the swivel traverse frame and the load handler is at a right angle (90°) to the swivel traverse frame. Loads can now be lifted from the front.

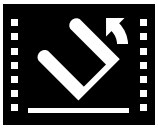
➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

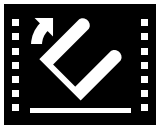
4.15.7 Contour Limit (○)

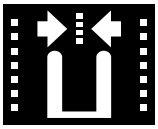
Functional description of "contour limit" during automatic traverse/rotate operation

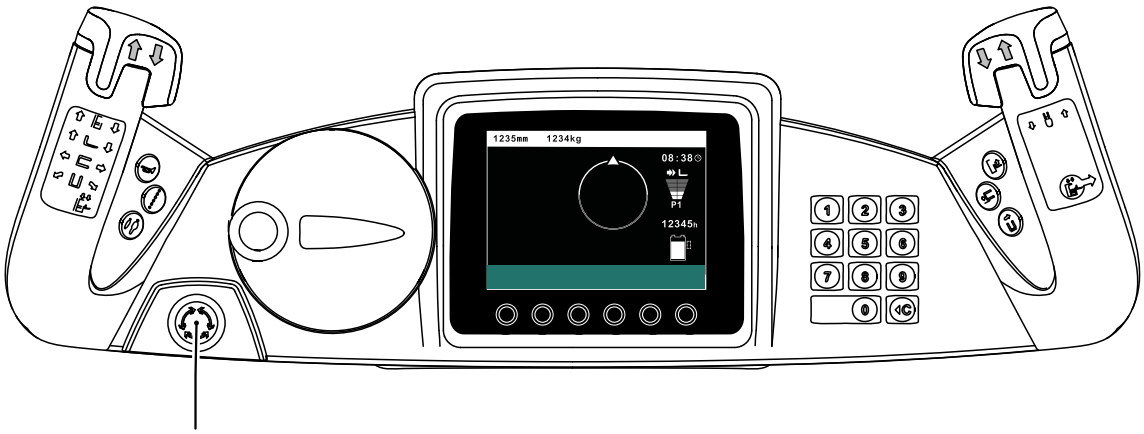
The contour limit is effective only with the "automatic traverse/rotate operation" and "automatic traverse/rotate operation with stop in centre position" functions. Within the narrow aisle, the contour of the fork carriage and the load is monitored during the automatic traverse/rotate operation with and without stop in centre position. The activated contour limit is indicated by the dashed line to the right and left of the symbols (221|222|223). If there is a risk of collision of parts of the load or the attachment (load handler) with the rack, the rotary movement of the load handler and the traverse movement of the attachment are stopped. The event message "**E**2662.01" appears on the driver's display.

- ▶ The contour limit is a Jungheinrich assistance system and supports the operator.
- ▶ When using the assistance system, responsibility for the safe operation of the truck lies with the operator.
- ▶ The contour limit does not release the operator from the responsibility to stop the "automatic traverse/rotate operation with and without stop in centre position" functions in time before a collision with racking components. The operator must also be familiar with the system amenities, as well as potential hazards in the event of a failure.
- ▶ The operator remains obligated to monitor the environment and control the truck at all times.

221 

222 

223 



Acknowledging the contour limit (contour violation)

Requirements

– The rotary movement of the load handler and the traverse movement of the attachment were stopped due to a contour limit.
– Event message "**E**2662.01" is shown on the driver's display.

Procedure

- Press the emergency disconnect switch (14).
- Unlock the emergency disconnect switch (14).
  The contour limit has been acknowledged.
- Carefully traverse and rotate the attachment and load handler and manually into the home position:
  - Traversing the attachment – see page 302.
  - Rotating the load handler – see page 303.

4.16 Parking the truck securely

⚠ WARNING!

An unsecured truck can cause accidents

Do not leave an unsecured truck.

- ▶ Park the truck securely when leaving it.
- ▶ Exception: If the operator intends to remain in the immediate vicinity and is leaving the truck for only a short while, the applied parking brake is sufficient to hold the truck, see page 277. Immediate vicinity is when the operator is able respond to malfunctions or attempts to use the truck by unauthorised persons immediately.

⚠ WARNING!

An unsecured truck can cause accidents

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

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

⚠ WARNING!

Risk of tripping or accidents due to the load handler

A stationary truck is potentially hazardous in work areas. People can collide with the load handler or the load. These collisions can lead to impact injuries or crushing. People can also trip over the lowered or raised load handler.

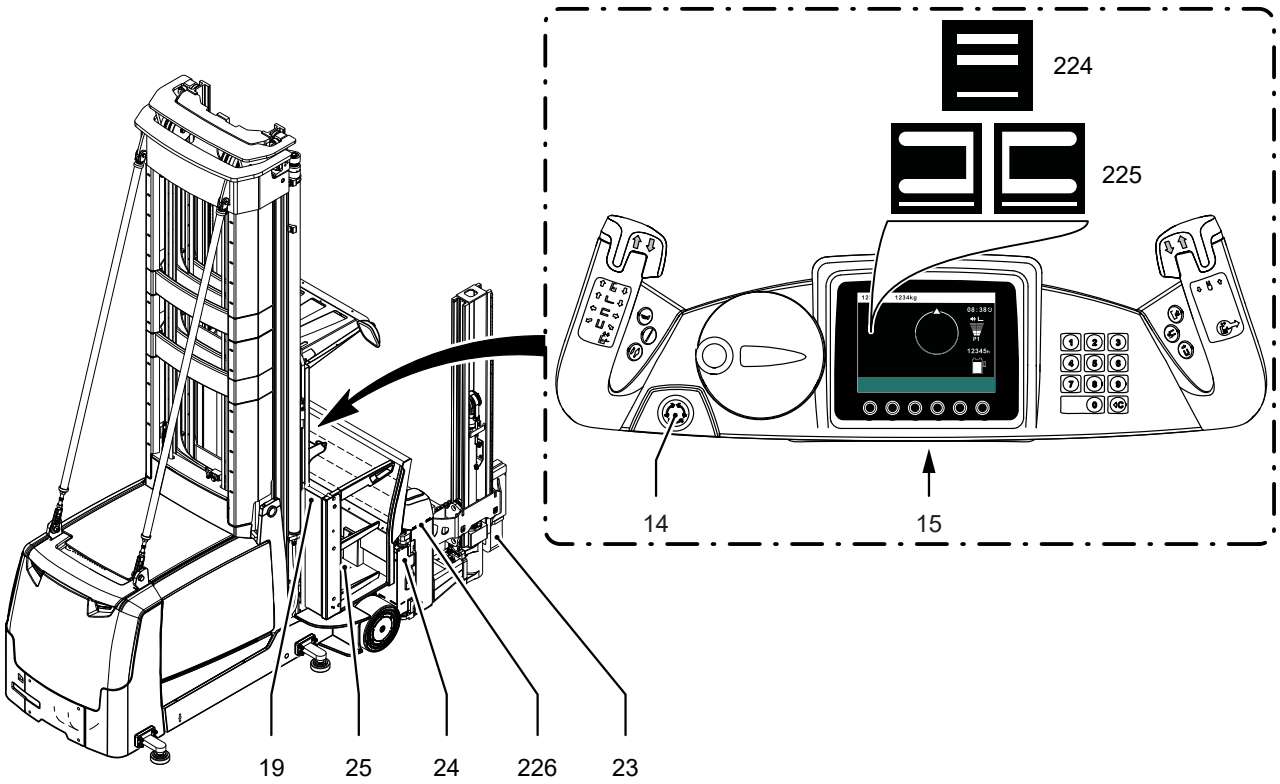
- ▶ Park the truck securely when leaving it.
- ▶ Fully lower the load handler.
- ▶ Select a place to park where no other people are at risk of injury from the lowered load handler.

NOTICE

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.

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.



Parking the truck securely

Requirements

– Truck has been prepared for operation – see page 265.

Procedure

- Press the deadman button (25).
- Move the truck to the park position and park on a level surface – see page 279.
- Fully lower the operator position (19) with the main lift – see page 295
- Fully lower the load handler (23) with the auxiliary lift – see page 296.
- Traverse and rotate the attachment (226) to the home position – see page 317.
- Traverse the telescopic forks to the centre position (○) – see page 317.
- Switch off the truck – see page 266.
- Press the emergency disconnect switch (14).

The truck is securely parked.

4.16.1 Traverse the attachment and load handler (fork carriage) into the home position and rotate (●)

Requirements

– Truck has been prepared for operation – see page 265.

Procedure

- Traverse the attachment to the right-hand or left-hand end stop of the swivel traverse frame (24) – see page 302.
- Rotate the load handler (fork arms) (23) parallel to the swivel traverse frame (24) – see page 303.

The driver's display shows the symbol (225) for "attachment and load handler in left home position" or "attachment and load handler in right home position".

4.16.2 Traverse the telescopic forks to the centre position (○)

Requirements

– Truck has been prepared for operation – see page 265.

Procedure

- Traverse the telescopic forks to the centre position – see page 500.

The driver's display shows the "telescopic forks in centre position" symbol (224).

5 Order picking and stacking

5.1 Adjusting the forks

⚠ 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. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ Only transport loads that have been correctly secured and positioned. Take appropriate countermeasures if there is a risk of the load or parts of the load 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!

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.

5.1.1 Adjusting the Forks (●)

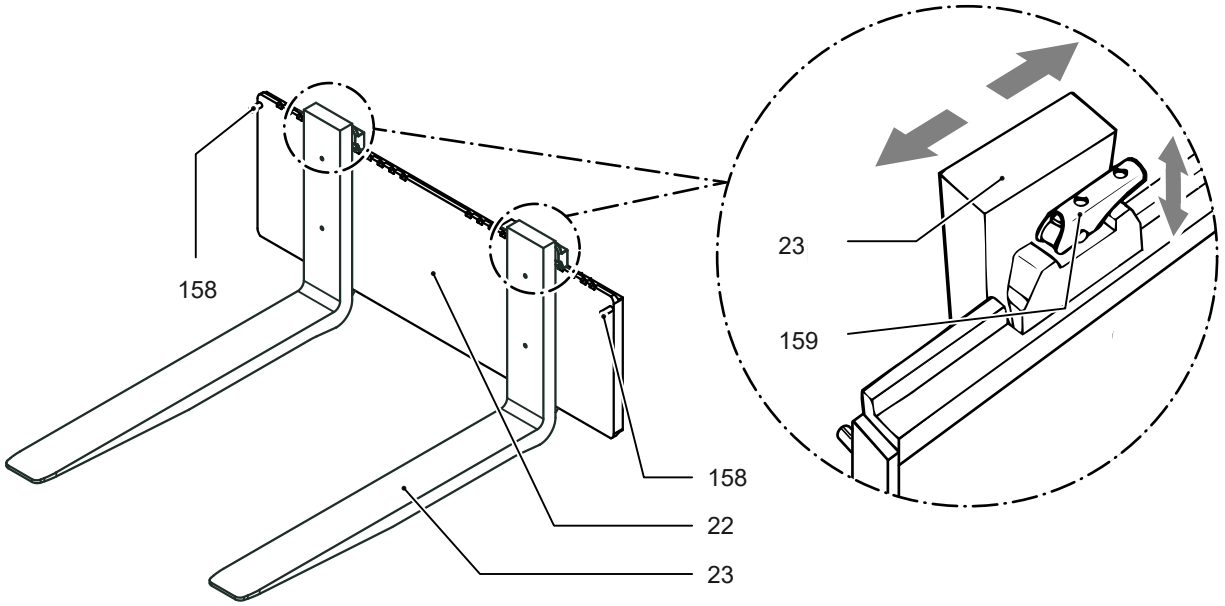
⚠ WARNING!

Unsecured forks can cause accidents

The forks must be prevented from falling with the extension safety mechanisms (158). The truck must not be operated without an extension safety mechanism (158).

▶Check the extension safety mechanisms (158) are present.

▶Ensure the extension safety mechanisms (158) are secure.



Adjusting the forks

Requirements

– Park the truck securely, see page 314.

Procedure

- Lift up the locking lever (159).
- Push the forks (23) into the correct position on the fork carriage (22).
- Swing the locking lever (159) down and move the fork tines until the locking pin (23) engages in a slot.

The forks are now adjusted.

5.1.2 Adjusting the forks (○)

⚠ WARNING!

Unsecured forks can cause accidents

The forks must be prevented from falling with the lock screws (227). The truck must not be operated without retraining screws (227).

▶Check the lock screws (227) are present.

▶Ensure the lock screws (227) are secure. Lock screw torque: 80 Nm.

Adjusting the forks

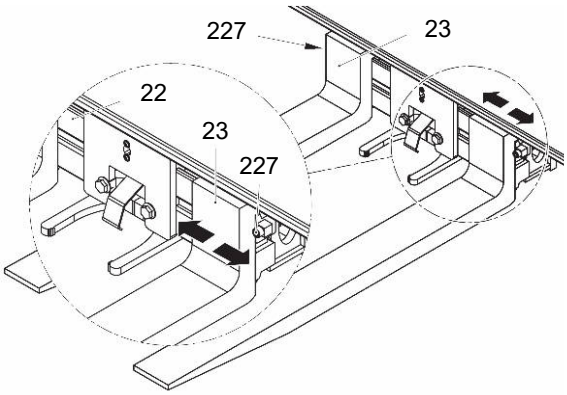
Requirements

– Truck parked securely, see page 314.

Procedure

- Push the forks (23) into the correct position on the fork carriage (22).

The forks are now adjusted.



5.2 Replacing the forks

⚠ 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.

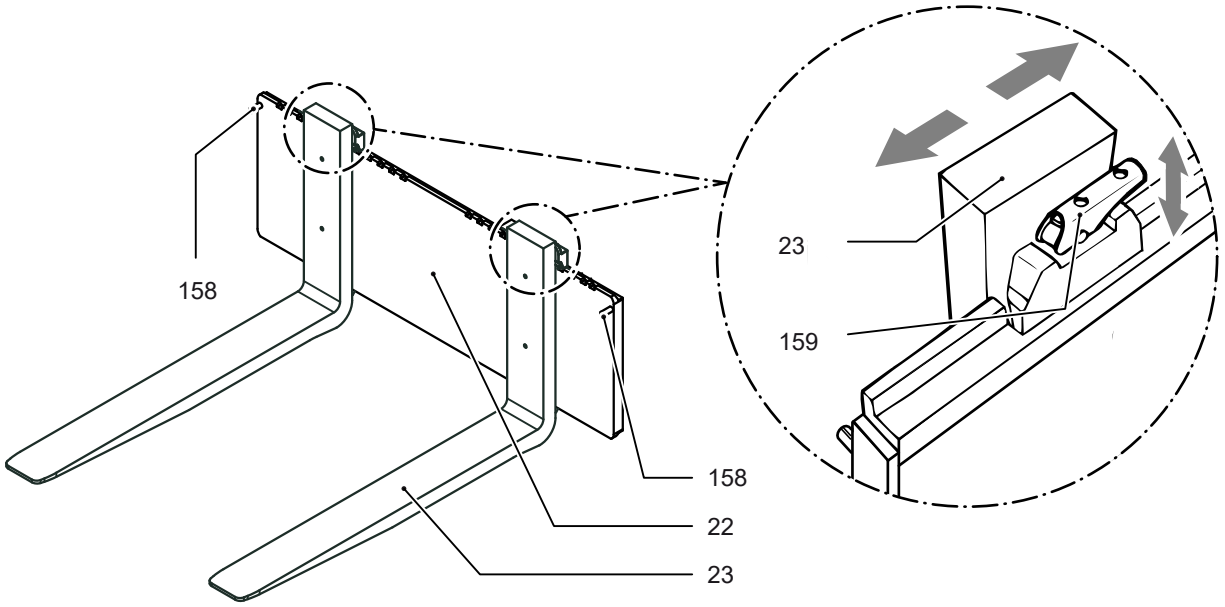
5.2.1 Replacing the fork tines (●)

⚠ 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 314.
– Raise the load handler until the forks are no longer touching the ground.

Procedure

- Disassemble the extension safety mechanism (158).
- Lift up the locking lever (159).
- Carefully push the fork tines (23) off the fork carriage (22).

The fork tines (23) are now dismantled from the fork carriage (22) and can be replaced.

Assembling the Forks

Requirements

– Park the truck securely, see page 314.
– Raise the fork carriage so that the forks can be pushed onto the fork carriage.
– Disassemble the extension safety mechanism (158).

Procedure

- Carefully push the fork tines (23) onto the fork carriage (22).
- Adjust the forks (23), see page 318.
- Set the locking lever (159) down and move the fork tines (23) 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 (158). The truck must not be operated without an extension safety mechanism (158).

▶Check the extension safety mechanisms (158) are present.

▶Ensure the extension safety mechanisms (158) are secure.

Fit the extension safety mechanism (158) and make sure it is secure.

The fork tines (23) are mounted on the fork carriage (22).

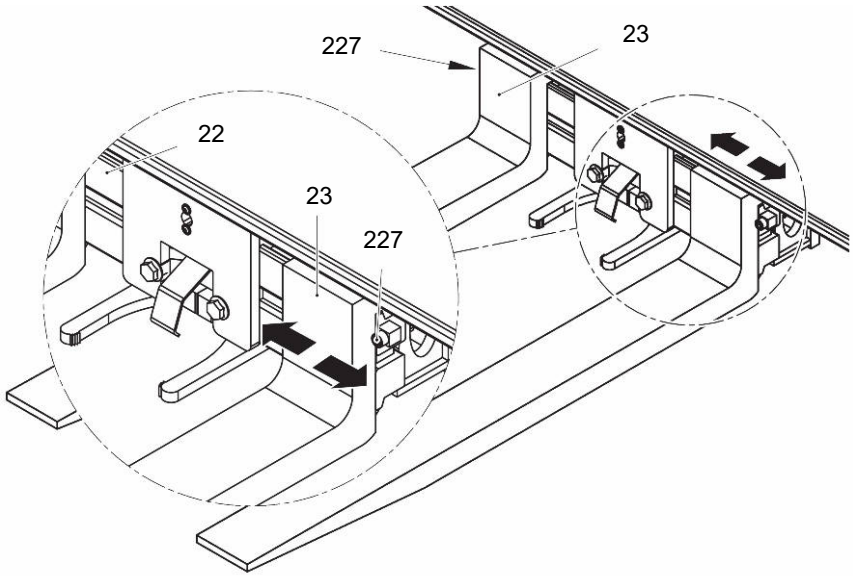
5.2.2 Replacing the fork tines (○)

⚠ 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.
- ▶ Assemble the lock screws (227) in the fork carriage after replacing the forks. Ensure the lock screws are seated correctly. Lock screw torque: 80 Nm.



Disassembling the fork arms

Requirements

– Park the truck securely, see page 314.
– Raise the operator position until the fork arms are no longer touching the ground.

Tools and Material Required

– Torque wrench
– M12-Allen key to release or tighten the lock screws (227)

Procedure

- Disassemble the lock screws (227).
- Carefully push the fork arms (23) off the fork carriage (22).

The fork arms (23) are now dismantled from the fork carriage (22) and can be replaced.

Assembling the fork arms

Requirements

– Park the truck securely, see page 314.
– Raise the operator position so that the fork arms can be pushed onto the fork carriage.
– Disassemble the lock screws (227).

Tools and Material Required

– Torque wrench
– M12-Allen key to release or tighten the lock screws (227)

Procedure

• Carefully push the fork arms (23) onto the fork carriage (22).
• Adjust the fork arms (23), see page 318.

⚠ WARNING!

Unsecured forks can cause accidents

The forks must be prevented from falling with the lock screws (227). The truck must not be operated without retraining screws (227).

▶ Check the lock screws (227) are present.
▶ Ensure the lock screws (227) are secure. Lock screw torque: 80 Nm.

Insert the lock screws (227) into the fork carriage (22). Torque the lock screws (227) to 80 Nm.

The fork arms (23) are mounted on the fork carriage (22).

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. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ Only transport loads that have been correctly secured and positioned. Take appropriate countermeasures if there is a risk of the load or parts of the load 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.

➔ Picking up or setting down the load according to the retaining clamp (e.g. bale clamp, claw, mechanical lock on fork carriage or on the fork arms) on trucks with load backrest and walk-on pallet, see page 456.

Maximum load length

The load to be picked up must not extend more than 50 mm beyond the load handler tips.

5.3.1 Raising a load

Requirements

– Truck has been prepared for operation – see page 265.
– Load correctly palletised.
– Fork spread for the pallet checked and adjusted if necessary – see page 318.
– Load weight does not exceed the truck capacity.
– Forks evenly loaded for heavy loads.
– Perfect ground conditions.

5.3.1.1 EKS - Picking up a Load from the Front

⚠ WARNING!

Risk of crushing when storing loads in or retrieving loads from racking systems

When storing loads in the racking system, the rack support bar may enter the contours of the operator position. If the operator does not brake the truck in a timely manner, there is a risk of the operator being crushed between the rack support bar and the operator position. This can result in fatal injuries. The same also applies when retrieving loads from the racking system.

▶ Do not store loads in racking systems with this truck.

▶ Do not retrieve loads from racking systems with this truck.

Procedure

- Press the deadman button.
- Drive slowly up to the storage location (see page 279).

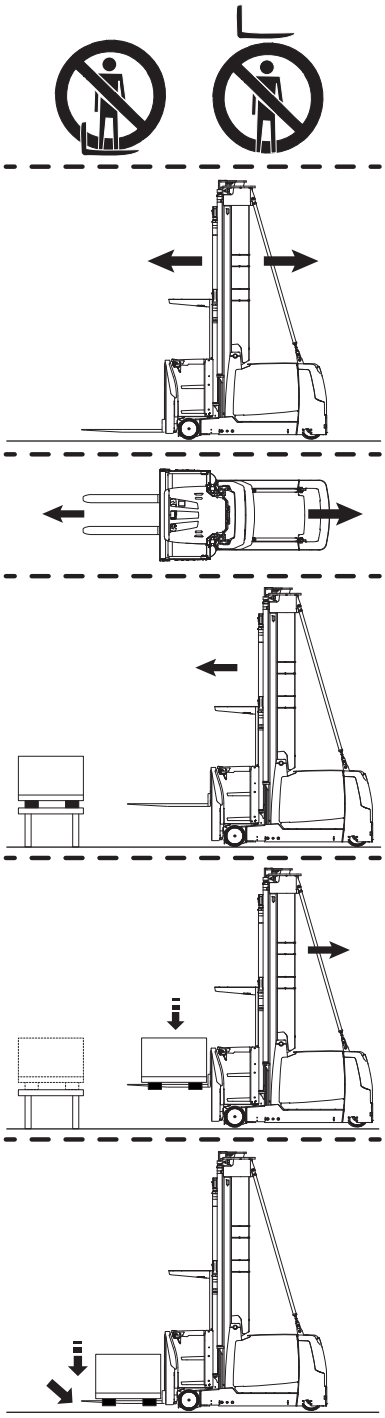
➔ The retrieval of loads from racking systems is prohibited.

- Raise or lower the load handler so that the load can be picked up (see page 292).
- Slowly insert the fork arms into the pallet until the fork shank touches the load or the pallet.

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

- Raise the load handler until the load rests freely on the fork arms.
- Ensure that you can see behind you and that you have sufficient travel path in which to move. Now reverse the truck slowly until the load is clear (e.g. out of the rack).
- Make sure you have a clear view and sufficient travel path in which to move.
- The load can now be transported with the truck (see page 332).

The load has been lifted correctly.



5.3.1.2 EKX - Picking up a Load from the Side

Procedure

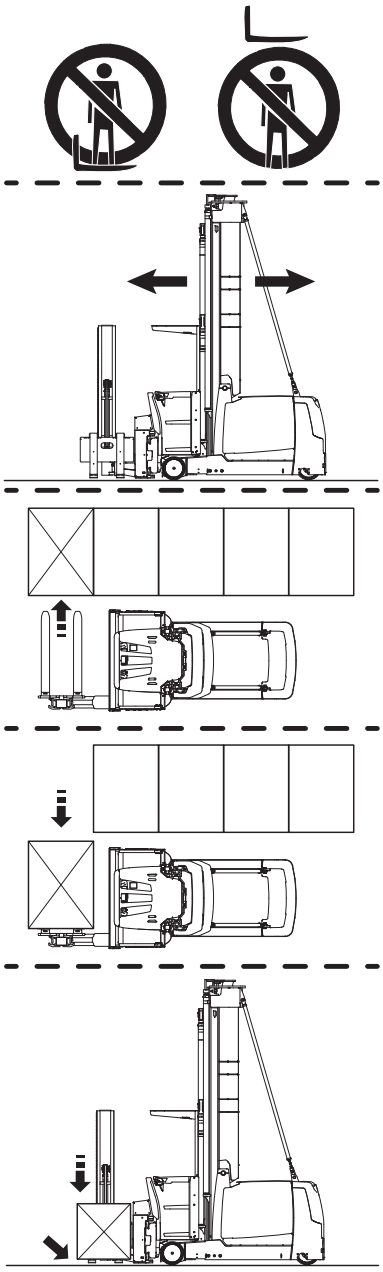
- Press the deadman switch.
- Drive slowly up to the storage location (see page 279).
- Raise or lower the load handler so that the load can be lifted (see page 292).
- Slowly insert the load handler into the pallet until the fork face touches the load or the pallet.

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

  - Attachment traverse (●), see page 302.
  - Telescopic fork traverse (○), see page 500.

- Raise the load handler until the load rests freely on the forks.
- Slowly retract the load handler to the home position.
  - Traverse the attachment to the home position (●), see page 317.
  - Traverse the telescopic forks to the centre position (○), see page 317.
- Make sure you have a clear view and sufficient area to move in.
- The load can now be transported with the truck, (see page 332).

The load has been lifted correctly.



5.3.1.3 EKX - Picking up a Load from the Front (with the Standard Attachment)

Procedure

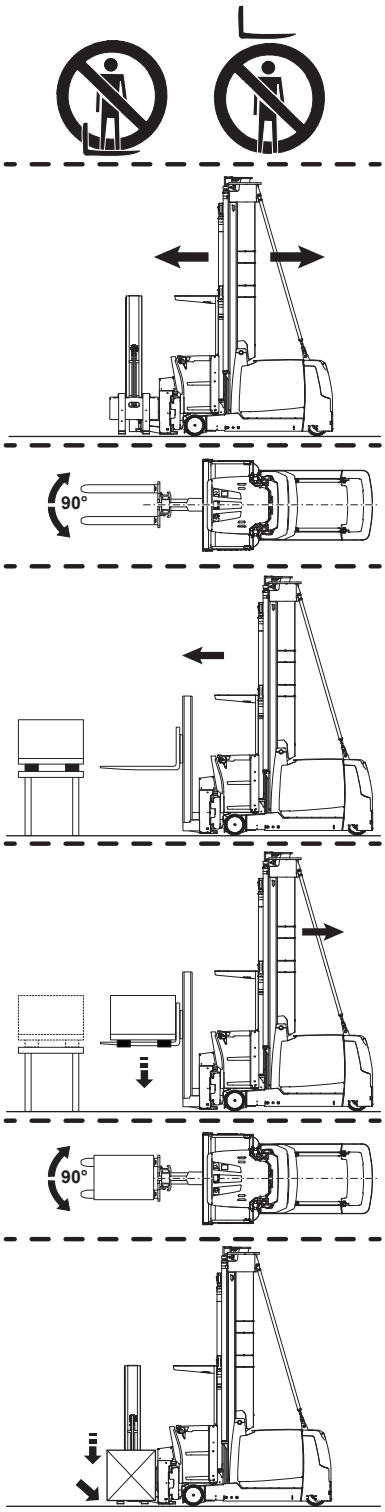
- Press the deadman switch.
- Drive slowly up to the storage location (see page 279).
- Rotate and traverse the attachment to the "front lifting" position.
  - Traverse the attachment to the centre of the swivel traverse frame (see page 302).
  - Rotate the forks so that they are at right angles (90°) to the swivel traverse frame (see page 303).

  The attachment is middle of the swivel traverse frame and the forks are at a right angle (90°) to the swivel traverse frame. Loads can now be lifted from the front.
- Raise or lower the load handler so that the load can be lifted (see page 292).
- Slowly insert the forks into the pallet until the fork shank touches the load or the pallet.

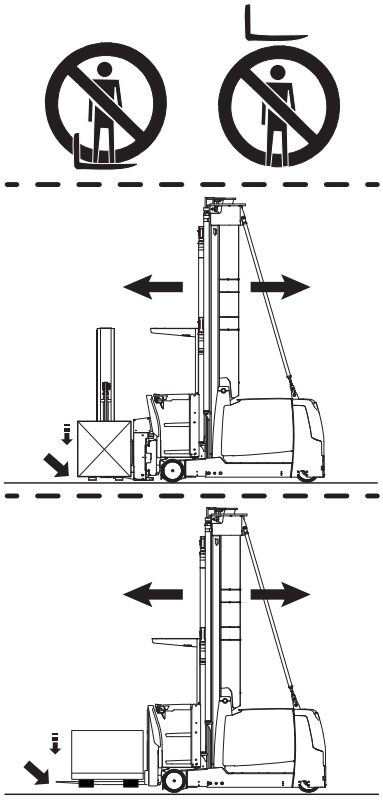
➔ The load must not extend by more than 50 mm over the fork tips.

- Raise the load handler until the load rests freely on the forks.
- Make sure you can see behind you and that you have sufficient space to move. Now reverse the truck slowly until the load is clear (e.g. out of the rack).
- Rotate and traverse the load handler to one of the home positions (see page 317).
- Make sure you have a clear view and sufficient area to move in.
- The load can now be transported with the truck, (see page 332).

The load has been lifted correctly.



5.3.2 Transporting a load



Requirements

– Truck has been prepared for operation – see page 265.
– Load picked up correctly – see page 328.
– Perfect ground conditions.

Procedure

➔ Always transport loads with both fork arms. When transporting heavy loads, always ensure that both fork arms are evenly laden.

- Press the deadman button.
- Raise the load handler until the load rests freely on the fork arms (see page 292).

➔ When transporting a load outside the narrow aisle, always keep it as low as possible while ensuring sufficient ground clearance.

- Accelerate gradually (see page 279).
- Travel at a constant speed.
  - Adapt your travel speed to the conditions of the route and the load you are transporting.
- Always be ready to brake:
  - Brake gently in normal circumstances.
  - Only stop abruptly in hazardous situations.
- Reduce speed accordingly on narrow bends.
- Watch out for other traffic at crossings and passageways.
- You must use 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).

⚠ CAUTION!

Positioning or blocking the load handler or operator position

The lift chains may sag when positioning or blocking the load handler or operator position There is a risk of the load handler or operator position dropping suddenly once no longer supported or when the block is released. If the load handler or operator position drops suddenly, the lift chains or hydraulic hoses may become damaged.

▶ When lowering the load handler or operator position, ensure that the lift chains are not are slack.

▶ Retension the lift chains:
Raise the load handler or operator position carefully until the lift chains are retensioned.

▶ When raising the load handler or the operator position, ensure that the hydraulic hoses are located in their guides.

▶ Check the cause of the block and rectify, if necessary.

NOTICE

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

– Truck has been prepared for operation – see page 265.
– Load picked up correctly – see page 328.
– Storage location suitable for storing the load (dimensions and capacity).
– Perfect ground conditions.

5.3.3.1 EKS - Depositing a Load from the Front

⚠ WARNING!

Risk of crushing when storing loads in or retrieving loads from racking systems

When storing loads in the racking system, the rack support bar may enter the contours of the operator position. If the operator does not brake the truck in a timely manner, there is a risk of the operator being crushed between the rack support bar and the operator position. This can result in fatal injuries. The same also applies when retrieving loads from the racking system.

▶ Do not store loads in racking systems with this truck.

▶ Do not retrieve loads from racking systems with this truck.

Procedure

- Press the dead man's switch.
- Drive slowly up to the storage location (see page 279).

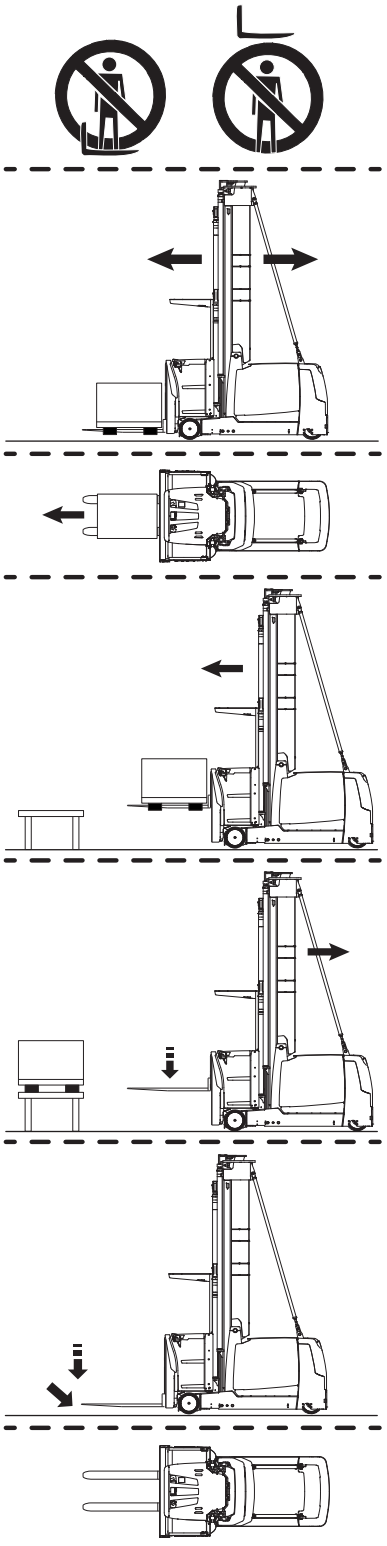
➔ Do not stack loads in racking systems.

- Raise or lower the load handler so that the load can enter the storage location without colliding (see page 292).
- Carefully move the load into its storage location.
- Carefully lower the load handler so that the fork arms are clear of the load.

➔ Avoid depositing the load suddenly to avoid damaging the load, load handler or the rack support bar.

- Ensure that you can see behind you and that you have sufficient travel path in which to move.
- Carefully remove the load handler from the load.
- Fully lower the load handler.

The load has been deposited correctly.



5.3.3.2 EKX - Depositing a Load from the Side

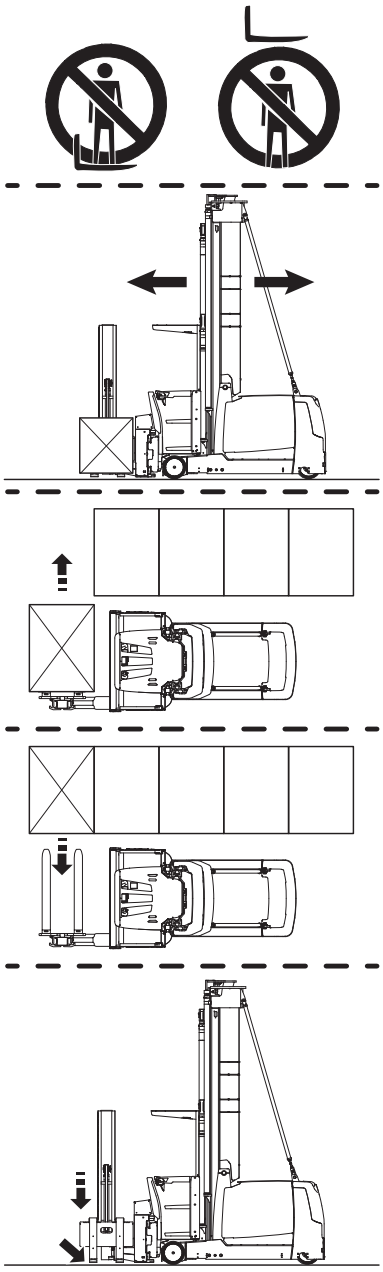
Procedure

- Press the deadman switch.
- Drive carefully up to the storage location (see page 279).
- Raise or lower the load handler so that the load can enter the storage location without colliding (see page 292).
- Carefully move the load into its storage location.
  - Attachment traverse (●), see page 302.
  - Telescopic fork traverse (○), see page 500.
- Carefully lower the load handler so that the forks are clear of the load.

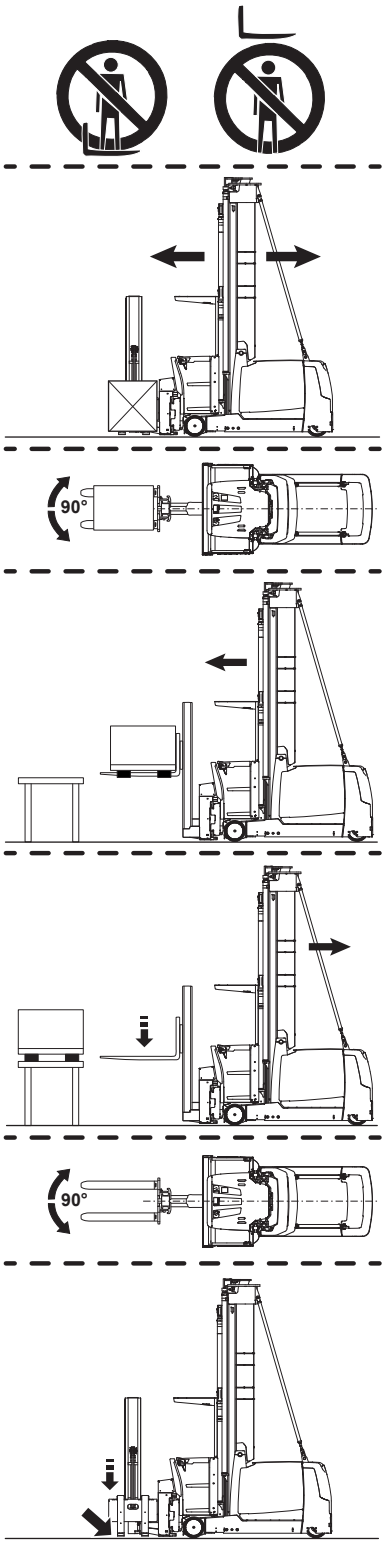
➔ Avoid depositing the load suddenly to avoid damaging the load, load handler or the rack.

- Slowly retract the load handler to its home position.
  - Traverse the attachment to the home position (●), see page 317.
  - Traverse the telescopic forks to the centre position (○), see page 317.
- Fully lower the load handler.

The load has been deposited correctly.



5.3.3.3 EKX - Depositing a Load from the Front (with the Standard Attachment)



Procedure

- Press the deadman switch.
- Drive slowly up to the storage location (see page 279).
- Rotate and traverse the attachment to the "front lifting" position.
  - Traverse the attachment to the centre of the swivel traverse frame (see page 302).
  - Rotate the forks so that they are at right angles (90°) to the swivel traverse frame (see page 303).

  The attachment is middle of the swivel traverse frame and the forks are at a right angle (90°) to the swivel traverse frame. Loads can now be deposited from the front.
- Raise or lower the load handler so that the load can enter the storage location without colliding (see page 292).
- Carefully move the load into its storage location.
- Carefully lower the load handler so that the forks are clear of the load.

➔ Avoid depositing the load suddenly to avoid damaging the load, load handler or the rack.

- Make sure you can see behind you and that you have sufficient space to move.
- Carefully remove the load handler from the load.
- Rotate and traverse the load handler to one of the home positions (see page 317).
- Fully lower the load handler.

The load has been deposited correctly.

6 Troubleshooting

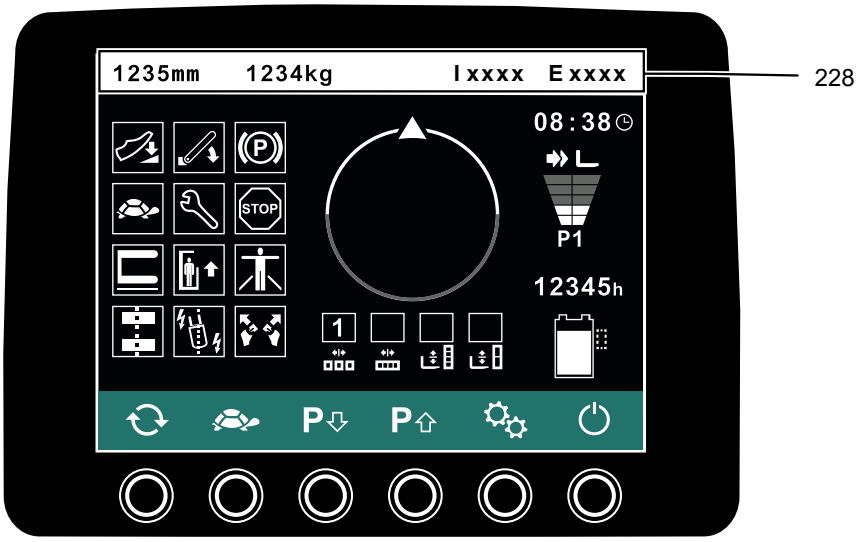
6.1 Troubleshooting

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

If, after carrying out the following remedial action, the truck cannot be restored to operation or if a fault in the electronics system is displayed with a corresponding error code, contact the manufacturer's service department.
Troubleshooting must only be performed by the manufacturer's customer service department. The manufacturer has a service department specially trained for these tasks.
In order for customer services to react quickly and specifically to the fault, the following information is essential:
- Truck serial number
- Event message from the display unit (if applicable)
- Error description
- Current location of truck.

Event messages (E) and information messages (I)

Event messages and information messages are shown in the driver's display in the area (228).



6.1.1 The truck is not ready for operation

Possible cause	Actions
– Battery connector not inserted	– Connect the battery to the truck.
– Gate open	– Close the gates.
– Emergency disconnect switch pressed	– Release the emergency disconnect switch – see page 275.
– Key switch turned off	– Switch on the truck with the key switch – see page 265.
– Keyless access system switched off	– Switch on the truck with the keyless access system (○) – see page 478.
– Battery charge too low (travel and/or lift cut-off)	– Check battery charge. – Charge the battery – see page 160.
– Faulty fuse	– Check fuse – see page 698. – Replace fuse – see page 692.

6.1.2 Truck does not start

Possible cause	Actions
– Truck not operational	– Carry out remedial actions for "truck not operational" fault – see page 339.
– Deadman switch not applied	– Press the deadman switch.
– No two-hand operation in narrow aisle	– Grab hold of the left grip on the control unit with your left hand. – Grab hold of the right grip on the control unit with your right hand.
– Travel cut-off activated	– Description of the travel cut-off – see page 360. – Travel with particular care and attention in the load or drive direction.
– Travel cut-off activated via end of aisle safety device	– Set the travel control knob to neutral and press it again – see page 366.
– Lift chains slack	– Override slack chain protection – see page 354. – Raise the operator position with particular care and attention and re-tension the lift chains.

6.1.3 Load handler cannot be lifted

Possible cause	Actions
– Truck not operational	– Carry out remedial actions for "truck not operational" fault – see page 339.
– Deadman switch not applied	– Press the deadman switch.
– No two-hand operation in narrow aisle	– Grab hold of the left grip on the control unit with your left hand. – Grab hold of the right grip on the control unit with your right hand.
– Lift chains slack	– Override slack chain protection – see page 354. – Raise the operator position with particular care and attention and re-tension the lift chains.
– Lift cut-off activated	– Description of the lift cut-off – see page 356. – Raise the load handler with particular care and attention.
– Rotary cut-out activated	– Description of the rotary cut-out – see page 364. – Raise the load handler with particular care and attention.
– Insufficient hydraulic oil	– Check the hydraulic oil level – see page 706. – Add hydraulic oil – see page 706.

6.1.4 Load handler cannot be lowered

Possible cause	Actions
– Truck not operational	– Carry out remedial actions for "truck not operational" fault – see page 339.
– Deadman switch not applied	– Press the deadman switch.
– No two-hand operation in narrow aisle	– Grab hold of the left grip on the control unit with your left hand. – Grab hold of the right grip on the control unit with your right hand.
– Lower cut-off activated	– Description of the lower cut-off – see page 358. – Lower the load handler with particular care and attention.

6.1.5 Truck cannot be steered

Possible cause	Actions
– Truck not operational	– Carry out remedial actions for "truck not operational" fault – see page 339.
– Rail guidance switched on	– Press the "rail guidance on/off" button to switch off the "travelling in narrow aisle" function – see page 283.

6.1.6 Rapid travel disabled

Possible cause	Actions
– Attachment or load handler (fork carriage) not in home position	– Traverse and rotate the attachment and load handler (fork carriage) into the home position – see page 317.
– Telescopic forks are not in the centre position (home position)	– Traverse the telescopic forks to the centre position (home position) – see page 317.
– Load handler raised above 0,5 m	– Lower the load handler below 0,5 m – see page 292.
– WG search mode activated	– Align the truck with the guide wire or switch off the "travelling in narrow aisle" function – see page 287.
– No reference run performed	– Carry out a reference run to adjust the height indicator – see page 271.
– Load in scanning range of laser scanner (personal protection system)	– Raise the main lift – see page 292. – Raise the main lift until the "protection field infringement" symbol is no longer displayed.

6.1.7 Information Messages

Fault	Possible cause	Actions
I1901	– Travel control knob actuated during power-up test	– Do not actuate the travel control knob. – Switch the truck off and on again.
I2902	– "Hydraulic functions" control lever actuated during power-up test	– Do not actuate the "hydraulic functions" control lever. – Switch the truck off and on again.
I4916	– A "functions" button was actuated during power-up test	– Do not actuate "functions" buttons under the driver's display. – Switch the truck off and on again.
I4916	– Button on the numerical keypad actuated during power-up test	– Do not actuate buttons on the numerical keypad (○). – Switch the truck off and on again.
I4917	– A function preselection key was actuated during power-up test	– Do not actuate function preselection keys (rail guidance on/off etc.). – Switch the truck off and on again.
I4918	– Deadman switch pressed during power-up test	– Do not press the deadman switch. – Switch the truck off and on again.

6.1.8 Event messages

Fault	Possible cause	Actions
E3670	– Truck has left the guide wire	– Restore wire guidance – see page 368.
E3752	– Truck has left the guide wire (emergency operation)	– Restore wire guidance – see page 368.
E9901	– The personal protection system cycle test must be performed	– Perform the personal protection system cycle test – see page 422.
E9963	– Laser scanner front screen is dirty	– Clean the front screen of the laser scanner on the personal protection system – see page 419.
E2662.01	– Contour violation stopped during traverse/ rotate operation.	– Rotary movement of the load handler and the traverse movement of the attachment were stopped due to a contour violation. – There is a risk of collision between parts of the load or the attachment (load handler) and the rack. – Acknowledge the contour violation – see page 312. – Traverse and rotate the attachment and load handler (fork carriage) into the home position – see page 317.

6.2 Load handler emergency lowering

⚠ WARNING!

Lowering the load handler and operator position can result in injuries

When lowering the operator position with load handler via the emergency lowering system, there is a risk of serious injury from crushing under the operator position or the load handler. It is possible for people to get trapped between the operator position or load handler and the ground.

- ▶ Instruct other people to move out of the hazardous area of the truck during emergency lowering. The hazardous area is defined as the area in which a person is at risk due to the mast, the operator position, the load handler (e.g. forks or attachments) or the load. This also includes the area within range of falling loads or lowering or falling operating equipment.
- ▶ Do not walk or stand underneath a raised load handler or raised operator position.
- ▶ If a second person is used to lower the load handler and operator position via the emergency lowering system, this person must consult with the operator. Both people must be in a safe area to avoid danger.
- ▶ If the load handler is in the rack, emergency lowering of the load handler and operator position via the emergency lowering system is prohibited.
- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out the defective truck and take it out of service.
- ▶ Do not return the truck to service until the fault has been identified and rectified.

NOTICE

Risk of material damage through automatic lowering of the 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.

▶Secure the load handler against further lowering. For example, secure the mast against lowering with a sufficient strong retaining chain.

▶Report any defects immediately to your supervisor.

▶Arrange for trained personnel to recover the truck as soon as possible.

▶Tag out the defective truck and take it out of service.

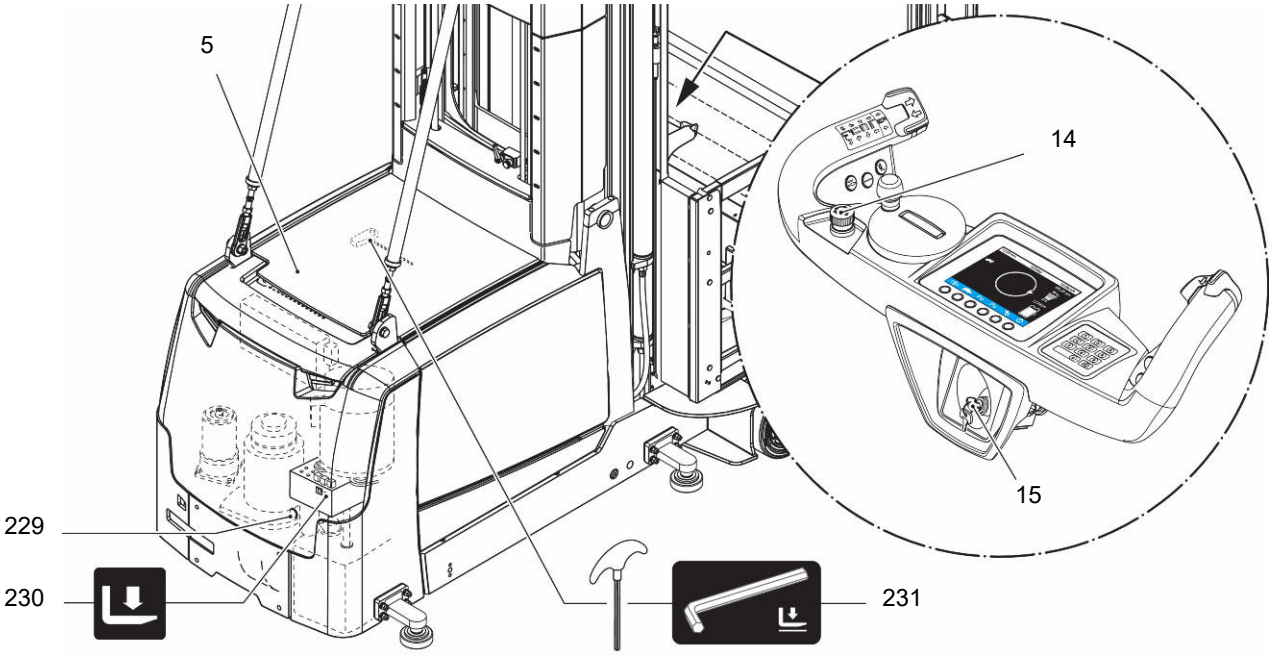
▶Do not return the truck to service until the fault has been identified and rectified.

NOTICE

Material damage to the clamp or claw

When performing an emergency lowering of the operator position with the load lifted and clamped, the clamp (○) or claw (○) can be damaged when it reaches the floor (EKS only).

▶Stop lowering approx. 10 cm before the floor.



⚠ WARNING!

Trapping hazard during emergency lowering

There is a risk of trapping between the operator position and rack for the operator in the operator position.

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

Emergency lowering of operator position with load handler

Requirements

– Load handler is not in the rack.

Tools and Material Required

– Allen key (supplied with the truck).

Procedure

If necessary, a second person can be deployed from the ground to lower the operator position.

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Allen key (231) storage location on the EKS 514-516 / EKX 514-516:
  - Remove the Allen key (231) from the bracket in the battery compartment.
- Insert the Allen key (231) through the opening (229) into the lowering valve (230).
- Open the lowering valve (230), to do this turn the Allen key (231) a maximum of two turns anti-clockwise.

The lowering speed increases the further the lowering valve (230) is opened.

The operator position and load handler are fully lowered.

NOTICE

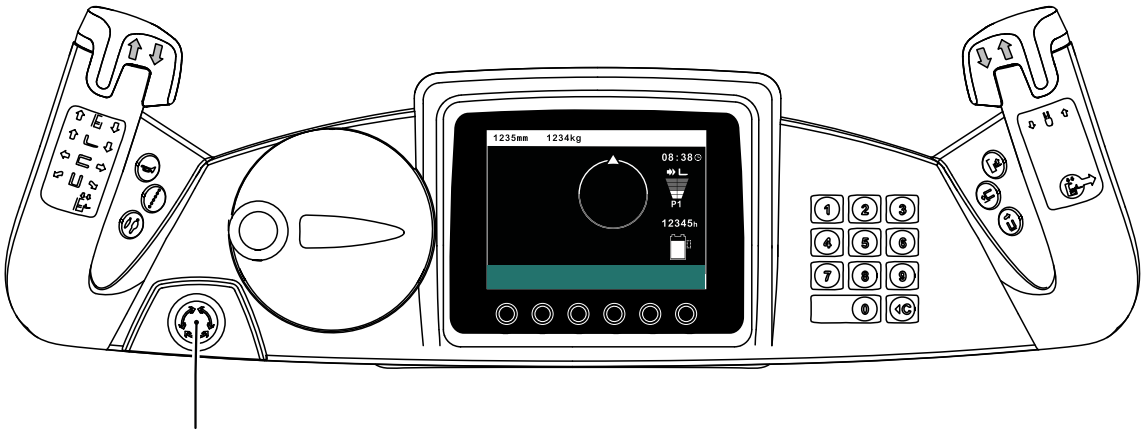
Lowering must be interrupted immediately if the moving mast parts such as the operator position, load handler etc. will not lower. The same applies if the lift chains become slack during lowering.

- Close the lowering valve (230), to do this turn the Allen key (231) clockwise as far as the stop.
  Lowering of the operator position with the load handler stops.
- Storing the Allen key (231) on the EKS 514-516 / EKX 514-516:
  - Place the Allen key (231) in the bracket in the battery compartment.
- Close the battery cover (5).

⚠ WARNING!

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

6.3 Emergency stop



Emergency stop safety concept

If a fault is identified, the emergency stop automatically brakes the truck until it comes to a halt. Faults can be identified as part of the self-diagnostic after switch-on and also during truck operation.

An emergency stop is indicated by a symbol on the display unit.

Display symbols

Symbol	Meaning	Colour	Function
	Emergency stop	Red	Lights up in the case of automatic function deactivation due to truck malfunctions.

Resetting the emergency stop

Procedure

- Press the emergency disconnect switch (14).
- Turn the emergency disconnect switch (14) to unlock it.

Emergency stop has been reset.

If the emergency stop continues to appear on the control and display unit following repeated reset attempts, contact the manufacturer's customer service department or a customer service organisation authorised by the manufacturer.

6.4 Emergency stop device

When the automatic emergency stop device applies (e.g. if the wire is abandoned, electrical steering fails) the truck brakes to a halt. Determine the cause of the fault and eradicate it before starting up the truck again. When starting the truck again, follow the manufacturer's instructions as indicated in the present operating instructions (see page 256).

Switching off the truck with the "keyless access systems" optional equipment after the automatic emergency stop device has been triggered (○)

Requirements

– The truck has been braked to a halt by the automatic emergency stop device.
– Event messages are shown in the driver's display.

Procedure

- Press the button under the “Switch off” symbol shown on the driver’s display (⏻) again.
  The truck is disabled. The login screen appears on the driver’s display. The truck can be started again using a valid transponder.
- Press the button below the "Switch off" symbol (⏻) again and hold down for at least 2 seconds.
  The truck is switched off.

6.5 Cut-offs

A Jungheinrich assistance system supports the operator, but does not release them from their responsibilities: When using the assistance system, responsibility for the safe operation of the truck lies with the operator. The operator must also be familiar with the system amenities, as well as potential hazards in the event of a failure.

The operator remains obligated to monitor the environment and control the truck at all times.

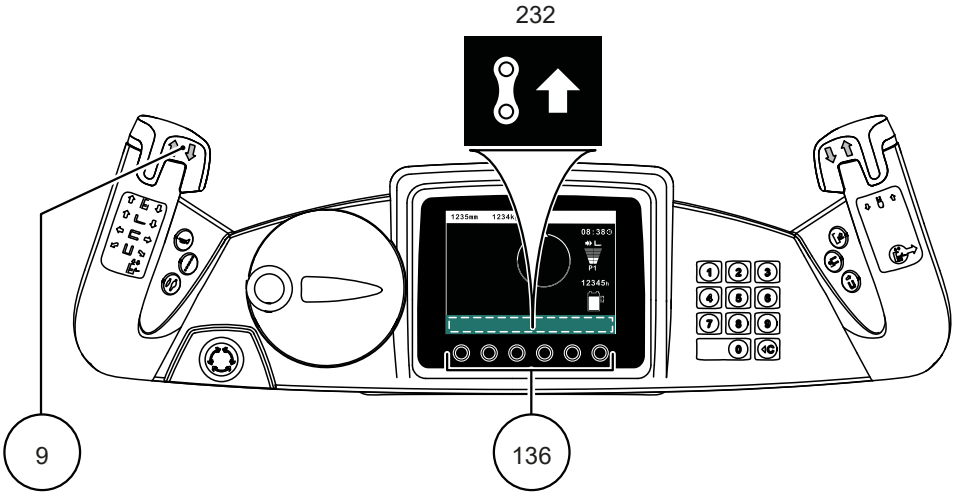
The cut-offs outlined below are auxiliary functions for supporting the operator with safe operation of the truck. The cut-offs do not release the operator from his responsibility for safe operation of the truck.

In the event of simultaneous personal protection system protection field infringement and other cut-offs (lift cut-off, etc.), the cause of the cut-off must be rectified first. The personal protection system protection field infringement can then be overridden.

For a description of the personal protection system protection field infringement, see page 424.

6.5.1 Bypassing the slack chain safety device

➔ The slack chain safety device reports a non-tensioned, "slack" lift chain. A chain can become slack for example when the load handler or the operator position are attached, when the chain is loosened or breaks.



Lifting the main lift with slack chain protection activated

Procedure

➔ The "lower main lift" function is not available with slack chain protection activated.

- Press the deadman button.
- Press and hold the button (136) under the "slack chain protection override" symbol (232).
- Turn the “hydraulic functions” control lever (9) anti-clockwise.
- Raise the main lift slightly (approx. 0,25 m) until the "slack chain protection override" symbol (232) is no longer displayed.
- If necessary, push the fork arms into home position and turn, see page 317 or see page 317.

The lift chains are re-tensioned and the truck is ready for use.

⚠ WARNING!

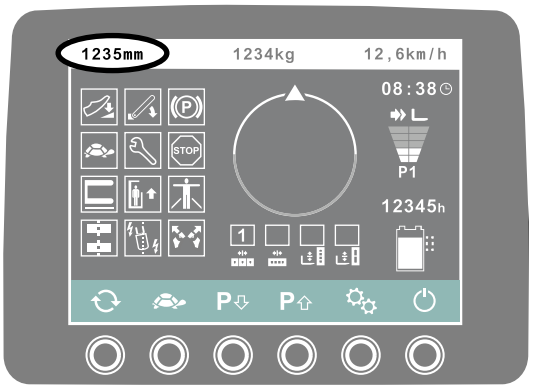
If the "slack chain safety device override" symbol does not disappear after the Main Lift has been raised approx. 0,25 m, the truck can only be started again when the fault has been identified and rectified.

▶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.

6.5.2 Lift cut-off



If local conditions require, an automatic lift cutout can be installed. The lift cutout becomes effective from a certain lift height or within a defined storage area. The lift cutout prevents the Main and Auxiliary lifts from lifting. The driver's display shows the "Lift cutout override" symbol (210).

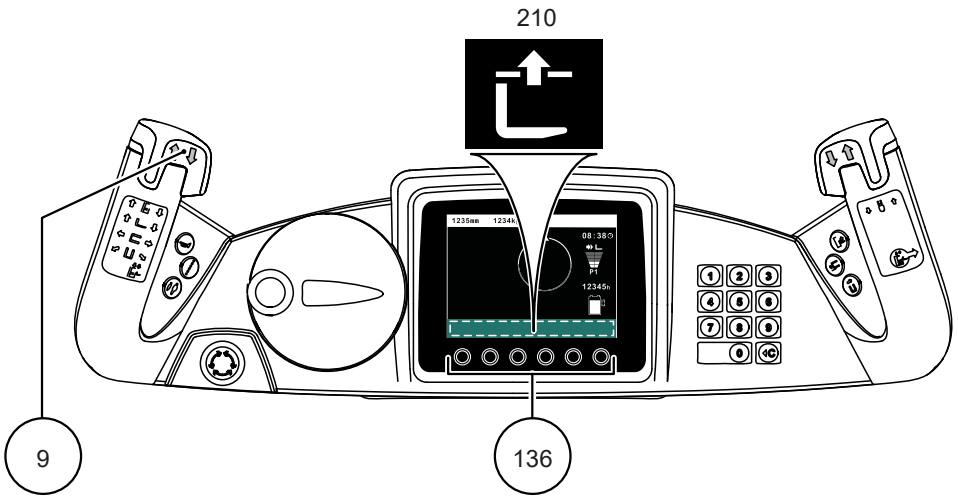
⚠ WARNING!

An extended mast can cause accidents

The lift cutout is an auxiliary function designed to support the operator which however does not release him from his responsibility to stop hydraulic operations e.g. when confronted with an obstacle.

- ▶When the lift cutout has been de-activated the truck must be operated with extra care in order to detect obstacles when the mast is extended.
- ▶Stop lifting before you reach the obstacle.

Lift cutout only becomes effective after referencing has been carried out (see page 271). When referencing has been completed, the height actual value is shown in the driver's display.



Overriding the lift cut-off

Procedure

- Press the deadman button.
- Raising the load handler despite a lift cut-off:
  - Press and hold the button (136) under the “override lift cut-off” symbol (210).
  - Turn the “hydraulic functions” control lever (9) anti-clockwise.

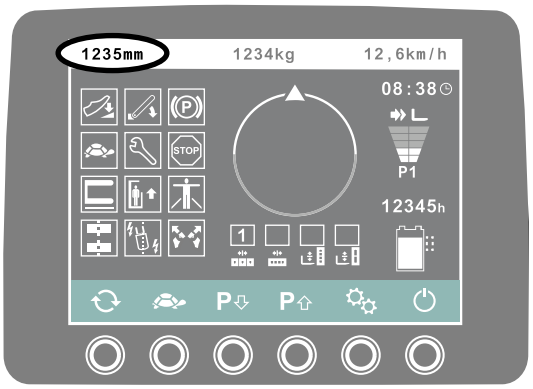
    Depending on the setting, the load handler raises with the main or auxiliary lift. Lift cut-off is deactivated.

➔ Lift cut-off is re-activated each time the mast falls below the lift cut-off height.

NOTICE

Pressing the (136) button under the corresponding override symbol releases different travel and hydraulic speeds as well as travel and hydraulic directions. The override functions can be adjusted by the manufacturer's customer service department.

6.5.3 Lowering cut-off



If local conditions require, an automatic lower cutout can be installed. The lower cutout becomes effective from a certain lift height or within a defined storage area. The lower cutout prevents the Main and Auxiliary lifts from lowering. The driver's display shows the "Lower cutout override" symbol (233).

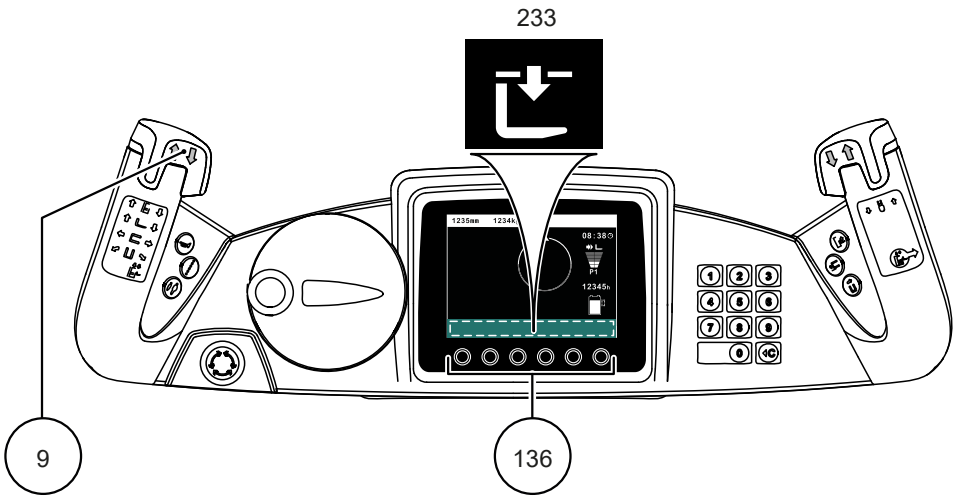
⚠ WARNING!

Risk of accident when setting down the operator position or the load handler

The lowering cut-out is an auxiliary function designed to support the operator which, however, does not release him from his responsibility to stop hydraulic operations, e. g. when confronted with an obstacle.

- ▶When the lowering cut-out has been de-activated the truck must be operated with extra care in order to detect obstacles when lowering the operator position or the load handler.
- ▶Stop lowering the operator position or load handler before you reach the obstacle.

Lower cutout only becomes effective after referencing has been carried out (see page 271). When referencing has been completed, the height actual value is shown in the driver's display.



Overriding the lowering cut-off

Procedure

- Press the deadman button.
- Lowering the load handler despite a lowering cut-off:
  - Press and hold the button (136) under the “override lowering cut-off” symbol (233).
  - Turn the “hydraulic functions” control lever (9) clockwise.
    Depending on the setting, the load handler lowers with the main or auxiliary lift. The lowering cut-off is overridden.

➔ The lowering cut-off is re-activated each time the mast is raised above the lowering cut-off height.

NOTICE

Pressing the (136) button under the corresponding override symbol releases different travel and hydraulic speeds as well as travel and hydraulic directions. The override functions can be adjusted by the manufacturer's customer service department.

6.5.4 Travel Cut-off

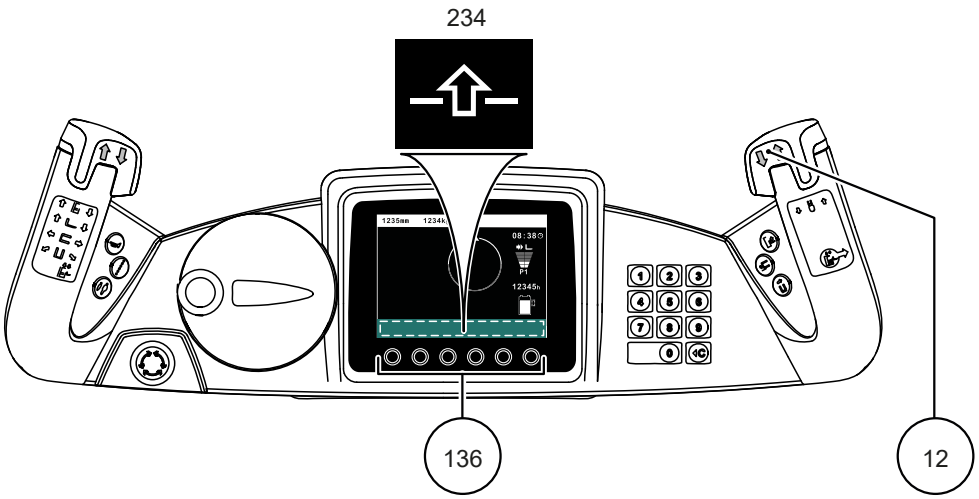
⚠ WARNING!

The truck can cause accidents

The travel cut out is an auxiliary function to assist the operator. However, it does not release him from his responsibility to monitor the braking functions – for example braking at the aisle end or in front of an obstacle and the initiation of braking, etc. – and to initiate braking if necessary.

- ▶When the travel cutout has been de-activated the truck must be operated with extra care in order to avoid colliding with obstacles.
- ▶Stop travelling before you reach the obstacle.

If local conditions require, an automatic travel cut-off can be installed in the truck. The travel cut-off becomes effective from a certain lift height within a defined warehouse area. The travel cut-off prevents the truck from travelling. The driver's display shows the "travel cut-off" symbol (234).



Driving the truck despite travel cut-off

Procedure

- Press the deadman button.
- Press and hold the button (136) under the "override travel cut-off" symbol (234).
- Set the travel direction and speed with the travel control knob (12):
  - Turn the travel control knob (12) slowly clockwise:
    travel in load direction.
  - Turn the travel control knob (12) slowly anti-clockwise:
    travel in drive direction.

The truck can be driven at slow travel speed (2,5 km/h).

NOTICE

Pressing the (136) button under the corresponding override symbol releases different travel and hydraulic speeds as well as travel and hydraulic directions. The override functions can be adjusted by the manufacturer's customer service department.

6.5.5 Traverse Cut-out

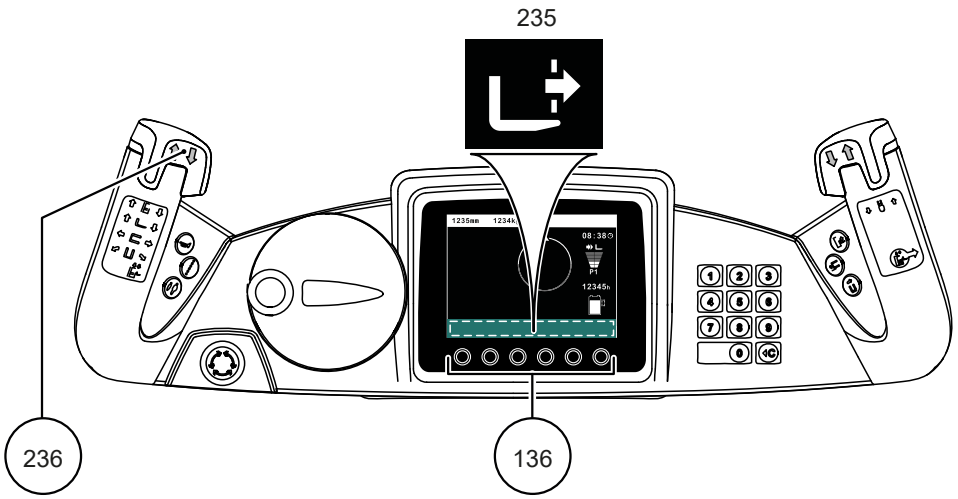
⚠ WARNING!

Accident risk when traversing the attachment

The traverse cut-out is an auxiliary function designed to support the operator which, however, does not release him from his responsibility to stop the traverse movement of the attachment, e.g. when confronted with an obstacle.

- ▶ When the traverse cutout has been de-activated the truck must be operated with extra care in order to detect obstacles when traversing the attachment.
- ▶ Stop traversing the attachment before you reach the obstacle.

If local conditions require, an automatic traverse cut-out can be installed in the truck. The traverse cut-out becomes effective from a certain lift height or within a defined warehouse area. The traverse cutout prevents the attachment from extending. As soon as the traverse cut-out is activated, the "traverse cut-out" symbol (235) lights up on the driver's display.



Overriding the traverse cut-off

Procedure

- Press the deadman button.
- Traversing the attachment to the right despite traverse cut-off:
  - Press and hold the button (136) under the “override traverse cut-off” symbol (235).
  - Turn the “hydraulic functions” control lever (9) clockwise.
- Traversing the attachment to the left despite traverse cut-off:
  - Press and hold the button (136) under the “override traverse cut-off” symbol (235).
  - Turn the “hydraulic functions” control lever (9) anti-clockwise.

The attachment is traversed to the right or left. Traverse cut-off is deactivated.

NOTICE

Pressing the (136) button under the corresponding override symbol releases different travel and hydraulic speeds as well as travel and hydraulic directions. The override functions can be adjusted by the manufacturer's customer service department.

6.5.6 Rotation cut-out

⚠ WARNING!

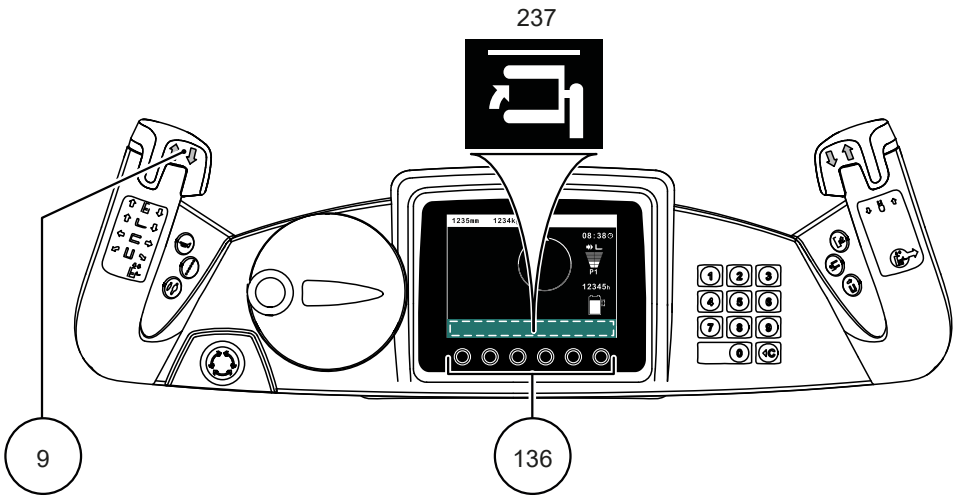
Accident risk when rotating the fork carriage

The rotary cut-out is an auxiliary function designed to support the operator which, however, does not release him from his responsibility to stop the rotary movement of the fork carriage, e.g. when confronted with an obstacle.

▶When the rotary cutout has been de-activated the truck must be operated with extra care in order to detect obstacles when rotating the fork carriage.

▶Stop rotating the fork carriage before you reach the obstacle.

If local conditions require, an automatic rotary cutout can be installed. The rotary cutout becomes effective from a certain lift height or within a defined storage area. The rotary cutout prevents the fork carriage from rotating. As soon as the rotary cutout is activated, the "Rotary cutout override" symbol (237) lights up in the driver's display.



Rotary cut-off override

Procedure

- Press the deadman button.
- Turning the fork carriage to the right despite the rotary cut-off:
  - Press and hold the button (136) under the “override lowering rotary cut-off” symbol (237).
  - Turn the “hydraulic functions” control lever (9) clockwise.
- Turning the fork carriage to the left despite rotary cut-off:
  - Press and hold the button (136) under the “override lowering rotary cut-off” symbol (237).
  - Turn the “hydraulic functions” control lever (9) anti-clockwise.

The fork carriage is rotated to the right or left. The rotary cut-off is deactivated

NOTICE

Pressing the (136) button under the corresponding override symbol releases different travel and hydraulic speeds as well as travel and hydraulic directions. The override functions can be adjusted by the manufacturer's customer service department.

6.6 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

Other variants (affecting the subsequent travel speed, lift height etc.) are available.

1. Braking to a halt

When the truck passes over the end of aisle safety device (route measurement, magnets, etc.) when driving towards the aisle end, the truck decelerates to a halt.

➔ The stopping distance depends on the travel speed.

To continue travelling:

- Briefly release the travel control button and press it again.

The truck can be driven out of the narrow aisle at a maximum of ≤ 2,5 km/h.

⚠ WARNING!

A unbraked truck can cause accidents

The end of aisle safety device braking is an assistance system to support the operator. However, the end of aisle safety device braking does not release the operator from the responsibility to monitor the braking at the aisle end and to trigger it personally if necessary.

▶ Ensure that the speed of the industrial truck has been reduced to a maximum of ≤ 2,5 km/h before leaving the narrow aisle.

2. Braking to ≤ 2,5 km/h

When the truck passes over the end of aisle safety device (route measurement, magnets, etc.) when driving towards the aisle end, the truck decelerates to ≤ 2,5 km/h and can be driven out of the narrow aisle at this speed.

The stopping distance depends on the travel speed.

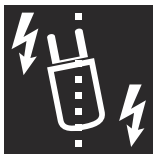
⚠ WARNING!

A unbraked truck can cause accidents

The end of aisle safety device braking is an assistance system to support the operator. However, the end of aisle safety device braking does not release the operator from the responsibility to monitor the braking at the aisle end and to trigger it personally if necessary.

▶ Ensure that the speed of the industrial truck has been reduced to a maximum of ≤ 2,5 km/h before leaving the narrow aisle.

6.7 WG emergency operation (event messages E3670 / E3752)



If the wire-guided truck's antenna leaves the pre-determined range of the guide wire, an emergency stop is immediately triggered. The driver's display flashes the "wire guidance fault" symbol and displays the event messages "**E**3670" and "**E**3752".

If the "spanner" symbol lights up next to the "wire guidance fault" symbol, other faults have occurred in addition to the wire guidance fault. The resulting event messages or info messages are shown on the driver's display.

If the truck is travelling parallel to the guide wire, travel is not disabled. In this case the operator is warned by the "alignment on" display which lights up in the driver's display and the audible alignment signal sounding.

Automatic Emergency Stop

If during operation one of the monitors for steering control, steering system, wire guidance, the safety cutout for the traction electronic system or the power electronic system applies, the truck safety devices will cause the truck to stop.

To enable the truck to travel again after an Emergency Stop, carry out the following:

Procedure

The driver's display flashes the "Wire guidance fault" symbol and displays the event messages "**E**3670" and "**E**3752".

- Determine the possible cause of the Emergency Stop and rectify it.
- Turn the Emergency Disconnect to unlock it.
  - The "Wire guidance fault" symbol and the event messages "**E**3670" and "**E**3752" go out in the driver's display.
- Switch on automatic wire guidance again, see page 287.
  - Press the “Automatic guidance on/off” button.
  - Apply the travel control knob and carefully align the truck with the guide wire.

The truck is now operational and aligned with the guide wire.

Note on the automatic emergency stop

If, after an automatic emergency stop and rectification of the cause, it is no longer possible to set off, the following steps must be carried out:

▶ Switch the truck off and on again with the key switch.
▶ Then carry out a reference run (see page 271) and the points mentioned above.
▶ The truck is now operational again.
▶ Once the industrial truck is ready for operation again, check the proper functioning of the industrial truck with manual steering (outside the narrow aisle) and automated wire guidance.

Manual Emergency Stop

A manual Emergency Stop is induced when the Emergency Stop button is pressed. The truck is operational again when the Emergency Stop has been released.

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

⚠ WARNING!

Danger when recovering the truck

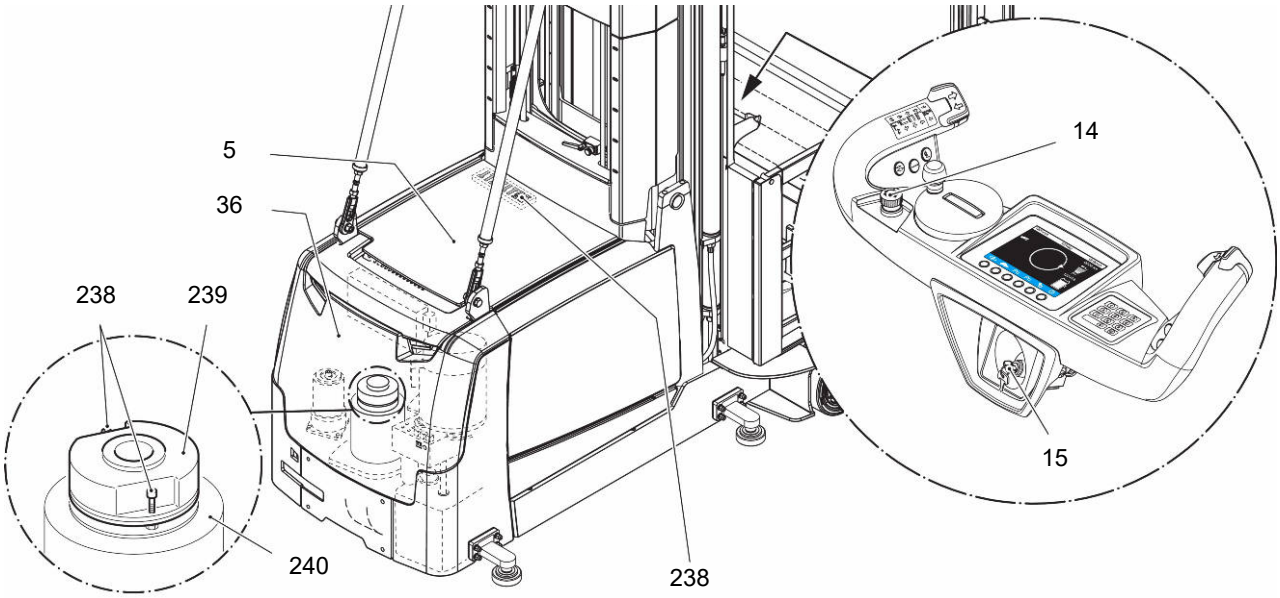
If the truck is towed away incorrectly, it can collide with persons, warehouse equipment and other trucks. This may result in people being injured, and warehouse equipment and other trucks being damaged.

- ▶ The truck may be recovered only by specialist maintenance personnel.
- ▶ The specialist maintenance personnel 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. In addition, on the EKS 514-516 / EKX 514-516 the load wheel brakes must be released.

6.8.1 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 brakes on slopes or inclines.

▶Do not park the truck with the brakes released.

▶Apply the brakes again when you reach your destination.

Releasing the drive wheel brake

Requirements

– Load handler fully lowered, see page 292 or see page 346.
– For EKX only:
  Attachment in home position (●), see page 317.
  Telescopic table is centred (○), see page 317.

Tools and Material Required

– Two set screws (hex socket) with hex. nuts (supplied with the truck).
– Allen key (supplied with the truck).
– Combination wrench (key width 8 mm).

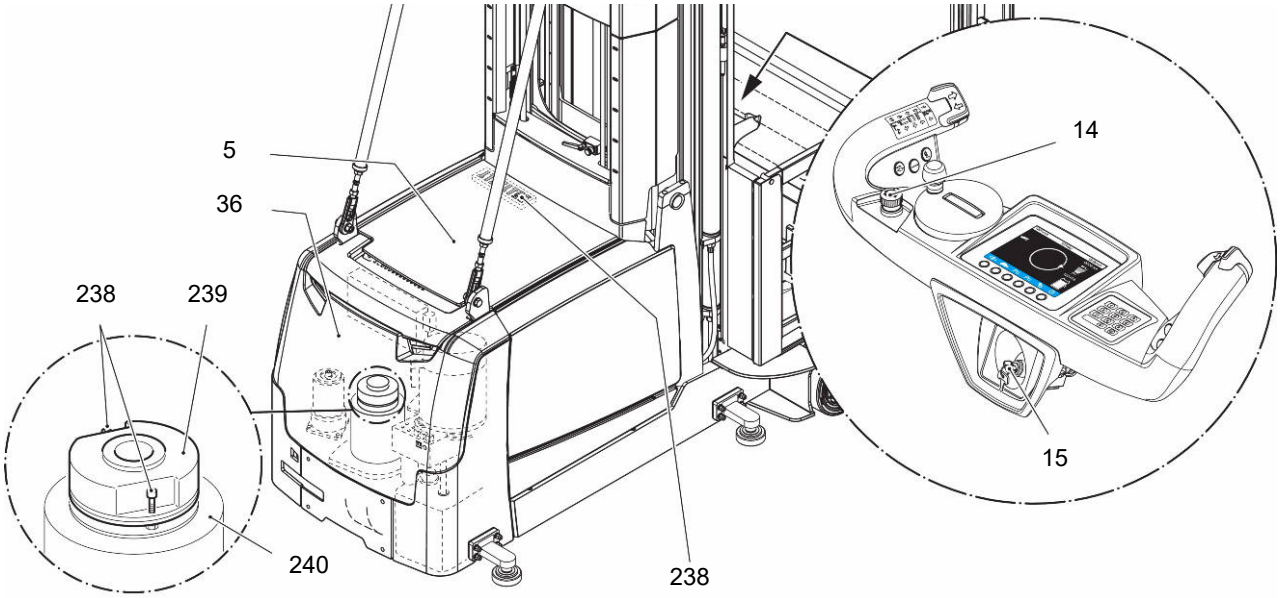
Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Open the battery cover (5).
- Disconnect the battery.
- Prevent the truck from moving accidentally, e.g. by placing wedges underneath the wheels.
- Disassemble the drive compartment cover (36), see page 686.
- Remove the setscrews (238) and two hex. nuts from the bracket above the battery compartment.
- Undo both hex. nuts from the setscrews (238).
- Insert the set screws (238) into the drive wheel brake (239) above the drive motor (240) and tighten them with the two hex. nuts.

➔ The two set screws (238) are used to tension (unlock) the compression springs which activate the parking brake, so that the truck does not brake when de-energised.

- Fit the drive compartment cover (36), see page 686.
- Release the load wheel brake (if applicable), see page 376.
- Remove the wedges.

The drive wheel brake is now released and the truck can be recovered and moved.



⚠ WARNING!

An unsecured truck can cause accidents

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

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

▶ Fully lower the load handler.

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

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

NOTICE

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 drive wheel brake

Requirements

– Drive wheel brake wheel.
– Truck switched off securely.

Tools and Material Required

– Allen key (supplied with the truck).
– Combination wrench (key width 8 mm).

Procedure

- Prevent the truck from moving accidentally, e.g. by placing wedges underneath the wheels.
- Disassemble the drive compartment cover (36), see page 686.
- Remove the set screws (238) from the drive wheel brake (239).
- Turn both hex nuts slightly onto the setscrews (238).
- Insert the setscrews (238) and two hex. nuts into the bracket above the battery compartment.
- Fit the drive compartment cover (36), see page 686.

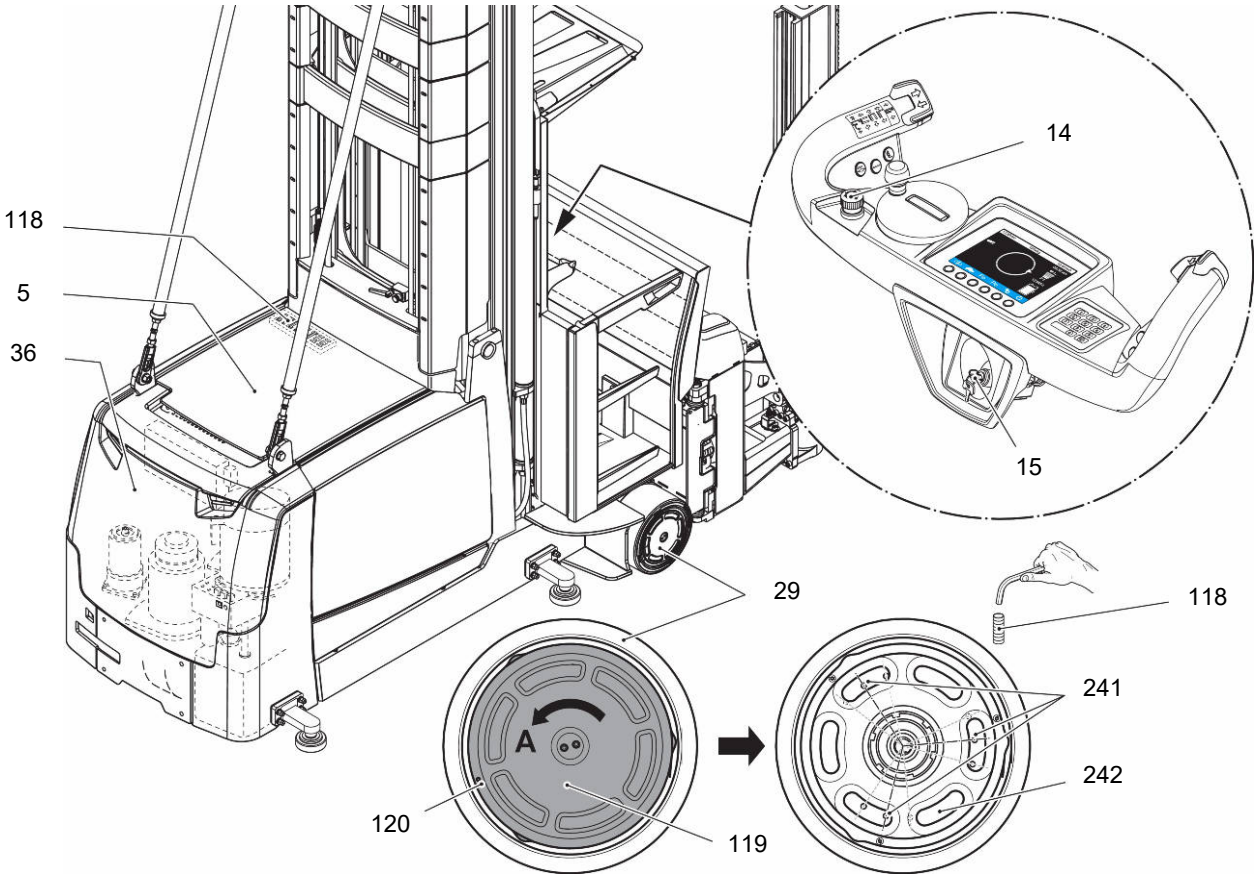
- Apply the load wheel brake (if applicable), see page 376.
- Remove the wedges.
- Test the drive wheel brake when using the truck again.

The drive wheel brake can now be applied without current. The industrial truck can no longer be pushed.

⚠ WARNING!

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

6.8.2 Releasing and applying the load wheel brake



➔ The load wheel brakes are fitted only on the EKS 514-516 / EKX 514-516.

⚠ 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 brakes on slopes or inclines.

▶Do not park the truck with the brakes released.

▶Apply the brakes again when you reach your destination.

Releasing the load wheel brake

Requirements

– Load handler fully lowered, see page 292 or see page 346.
– For EKX only:
  Attachment in home position (●), see page 317.
  Telescopic table is centred (○), see page 317.

Tools and Material Required

– Six setscrews (118). The setscrews (118) are supplied with the truck.
– Allen key (key width 6 mm)
– Screwdriver or punch (\< 4 mm)

Procedure

• Switch off the truck, see page 266.
• Press the Emergency Disconnect switch (14).
• Open the battery cover (5).

- Disconnect the battery.
- Prevent the truck from moving accidentally, e.g. by placing wedges underneath the wheels.
- Disassemble the drive compartment cover (36), see page 686.
- Disassemble the guards (119) of the load wheels (29) on both sides:
  - Insert the dowel pin (120) with a screwdriver or punch.
  - Turn the guard (119) anti-clockwise until the guards (119) can be removed from the load wheel (29) (see arrow direction "A").
  - Remove the guards (119).

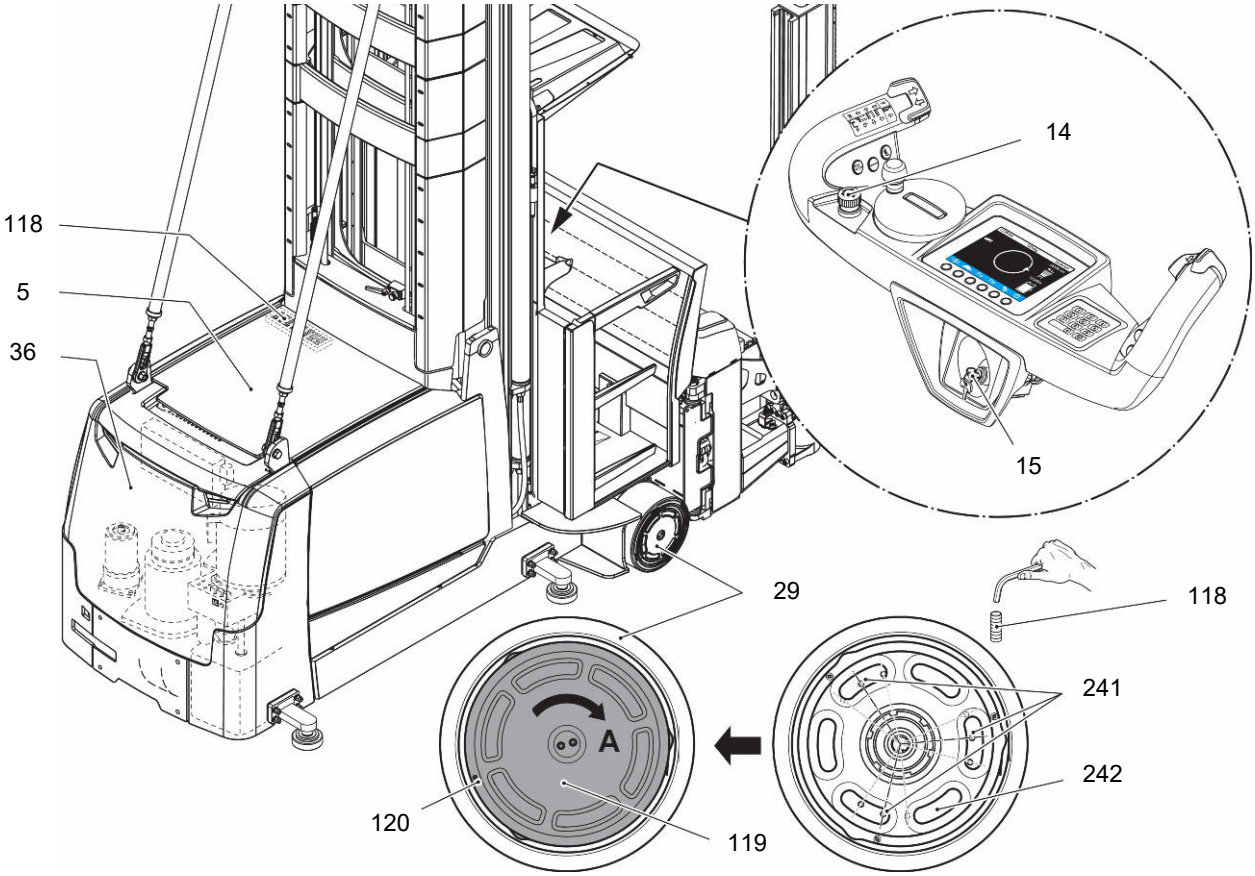
➔ The load wheel (29) has six notches (242) which are arranged so that for each position of the load wheel (29) at least three out of nine possible thread holes (241) can be accessed by the load wheel brake.

- Remove the setscrews (118) from the bracket above the battery compartment.

➔ The setscrews (118) are used to tension (unlock) the compression springs which activate the load wheel brakes, so that the truck does not brake when de-energised.

- Undo the load wheel brakes on both sides:
  - For each load wheel brake (118), insert three setscrews with an angle offset of 120° loosely into the thread holes (241) of the load wheel brake.
  - Tighten the setscrews (118) by no more than half a turn.
- Release the drive wheel brake, see page 372.
- Fit the drive compartment cover (36), see page 686.
- Remove the wedges.

The load wheel brakes are now released and the truck can be recovered and moved.



⚠ WARNING!

An unsecured truck can cause accidents

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

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

NOTICE

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.

Applying the load wheel brake

Requirements

– Load wheel brakes released.
– Truck switched off securely.

Tools and Material Required

– Six setscrews (118). The setscrews (118) are supplied with the truck.
– Allen key (key width 6 mm)
– Screwdriver or punch (\< 4 mm)

Procedure

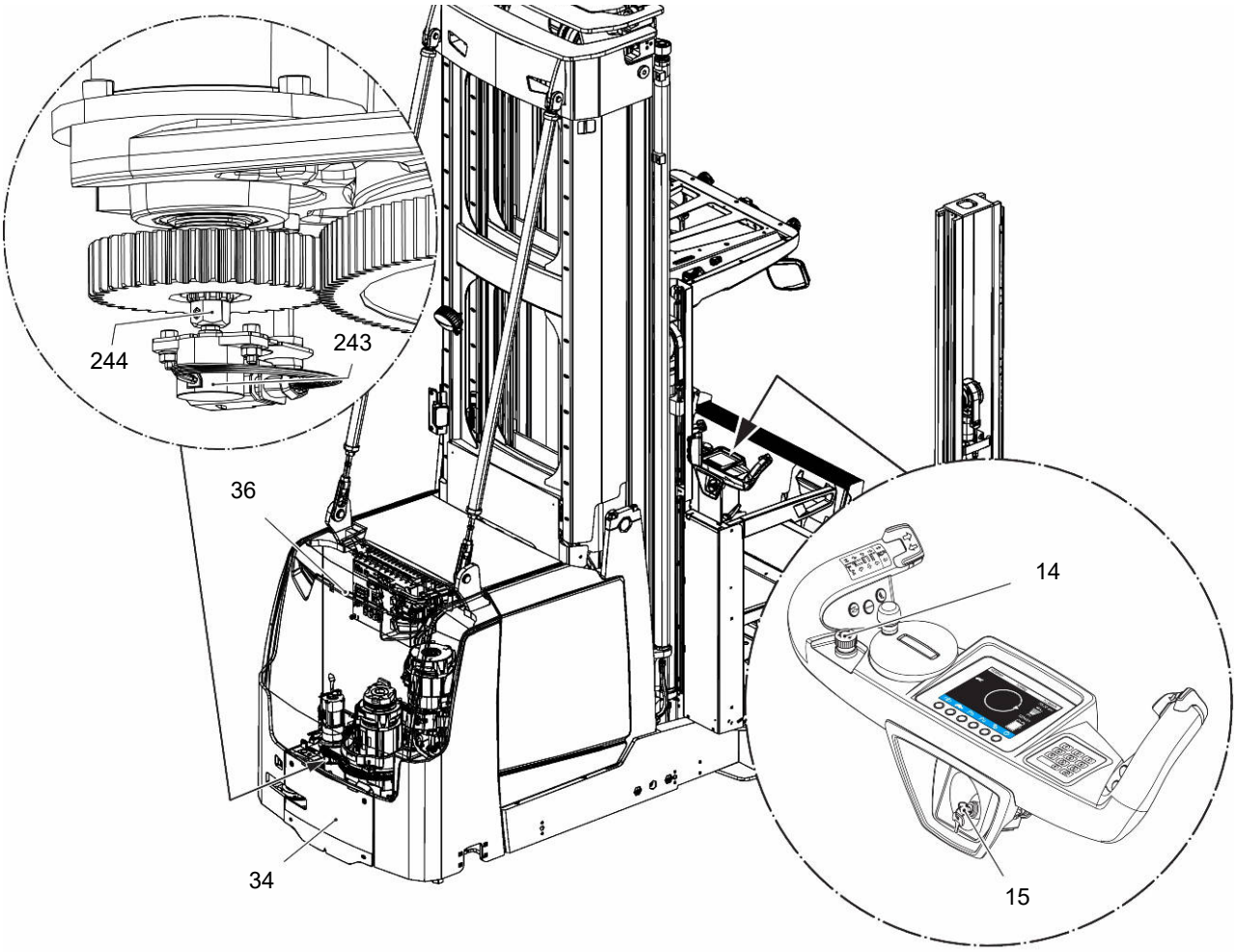
- Prevent the truck from moving accidentally, e.g. by placing wedges underneath the wheels.
- Disassemble the drive compartment cover (36), see page 686.
- Remove the setscrews (118) from the threaded holes (241) of the load wheel brake.
- Insert the setscrews (118) in the bracket above the battery compartment.
- Fit the guards (119) of the load wheels (29) on both sides:
  - Place the guard (119) onto the load wheel (29).
  - Turn the guard (119) clockwise until the dowel pin (120) engages in one of the holes in the guard (119) (see arrow direction "A").
- Apply the drive wheel brake, see page 372.
- Fit the drive compartment cover (36), see page 686.
- Remove the wedges.
- Test the load wheel brakes when using the truck again.

The load wheel brakes can now be applied without current. The industrial truck can no longer be pushed.

⚠ WARNING!

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

6.8.3 Steering a truck without its own drive system



Steering the truck without its own drive system on the EKX 410-412

⚠ 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.
- ▶ When setting an angle of more than 4 degrees it is advisable to relieve the wheel by raising/jacking up the truck.

Adjusting the steer angle

Requirements

– Load handler fully lowered – see page 292 or see page 346.

Tools and Material Required

– Open-end spanner (size: 14 mm)

Procedure

- Switch off the truck – see page 266.
- Press the emergency disconnect switch (14).
- Open the battery panel.
- Disconnect the battery connector.
- Remove the drive compartment cover (36) – see page 686.
- Close the battery panel.
- Using the open-ended spanner, set the drive wheel (34) in the required direction by turning the hexagon screw (244) on the steering potentiometer (243).

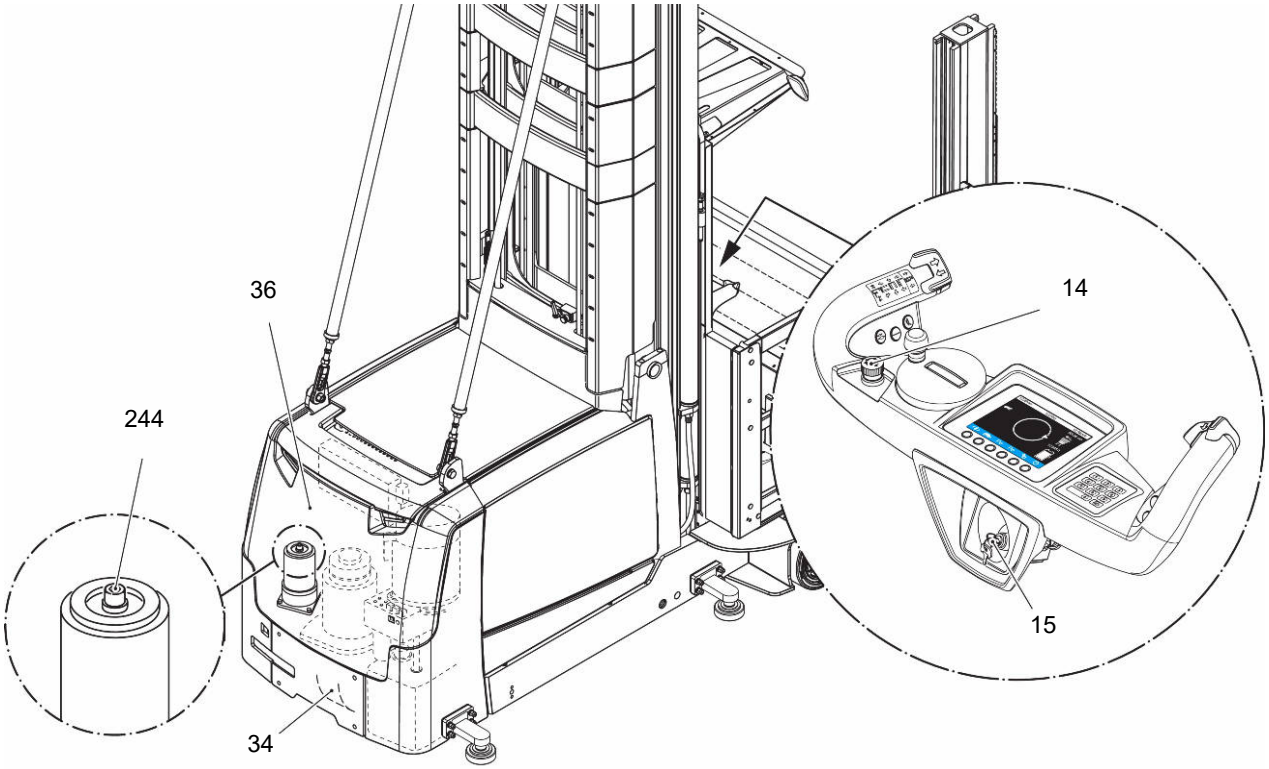
➔ When setting a steer angle of more than 4 degrees, the drive wheel (34) must be relieved by securely raising or jacking up the truck. Lifting and jacking up the truck securely – see page 712.

The steer angle has now been set.

- Fit the cover (36) on the drive compartment – see page 686.

⚠ WARNING!

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



Steering the truck without its own drive system on the EKS 514-516 / EKX 514-516

⚠ 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.
- ▶ When setting an angle of more than 4 degrees it is advisable to relieve the wheel by raising/jacking up the truck.

Adjusting the steer angle

Requirements

– Load handler fully lowered, see page 292 or see page 346.

Tools and Material Required

– Allen key (key width 8 mm).

Procedure

- Switch off the truck, see page 266.
- Press the emergency disconnect switch (14).
- Open the battery panel.
- Disconnect the battery.
- Disassemble the drive compartment cover (36), see page 686.
- Set the drive wheel (34) to the required direction using the Allen key via the screw (244) at the top of the steer motor.

➔ When setting a steer angle of more than 4 degrees, the drive wheel (34) must be relieved by raising and jacking up the truck securely, see page 712.

The steer angle has now been set.

⚠ WARNING!

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

6.8.4 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 380).
- ▶ Only return the truck to service when you have identified and rectified the fault.

⚠ WARNING!

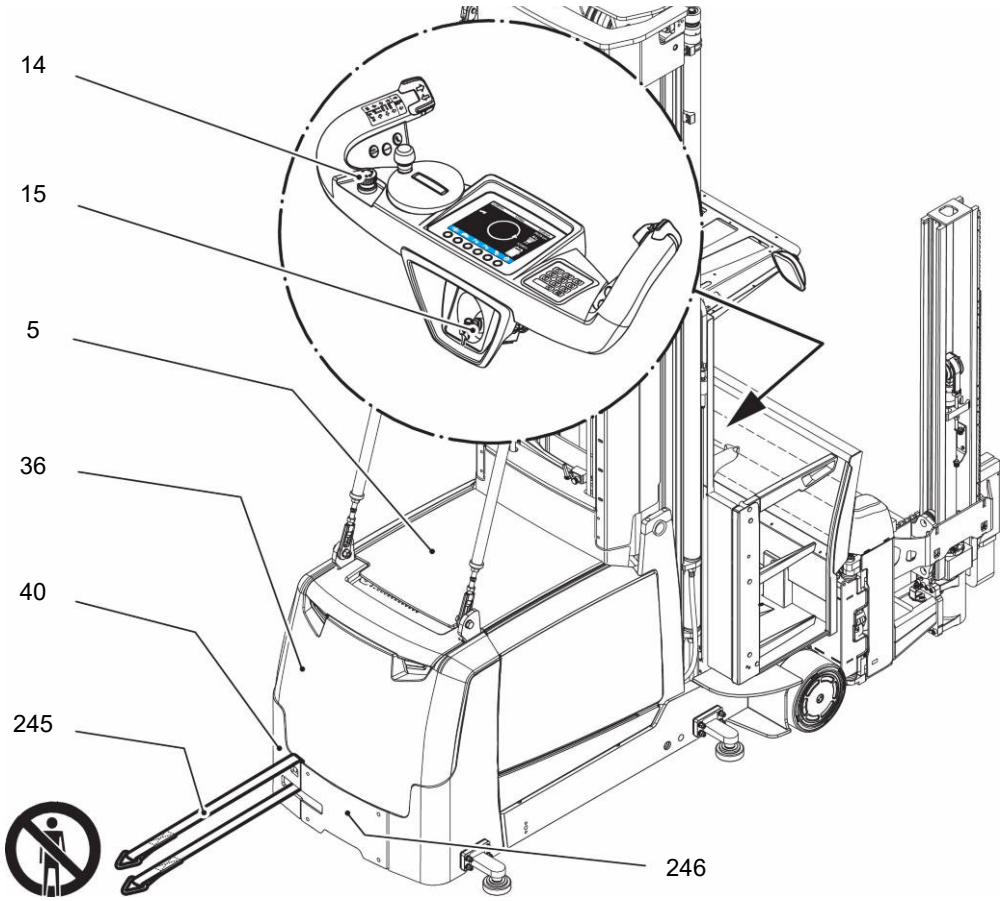
An unsecured truck can cause accidents

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

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

NOTICE

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.



Recovering the truck in the drive direction with and without load

Requirements

– Load handler fully lowered, see page 292 or see page 346.
– For EKX only:
  Attachment in home position (●), see page 317.
  Telescopic table is centred (○), see page 317.
– Drive wheel brake released, see page 372.
– For EKS 514-516 / EKX 514-516 only:
  Load wheel brake released, see page 376.

Tools and Material Required

– Tow rope, tow force > 5 tonnes

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Open the battery cover (5).
- Disconnect the battery.
- Disassemble the drive compartment cover (36), see page 686.

NOTICE

Risk of damage from the tow rope

Do not route the tow rope (245) over the tailgate (246) as the tailgate (246) is not designed for recovery operations and will get damaged.

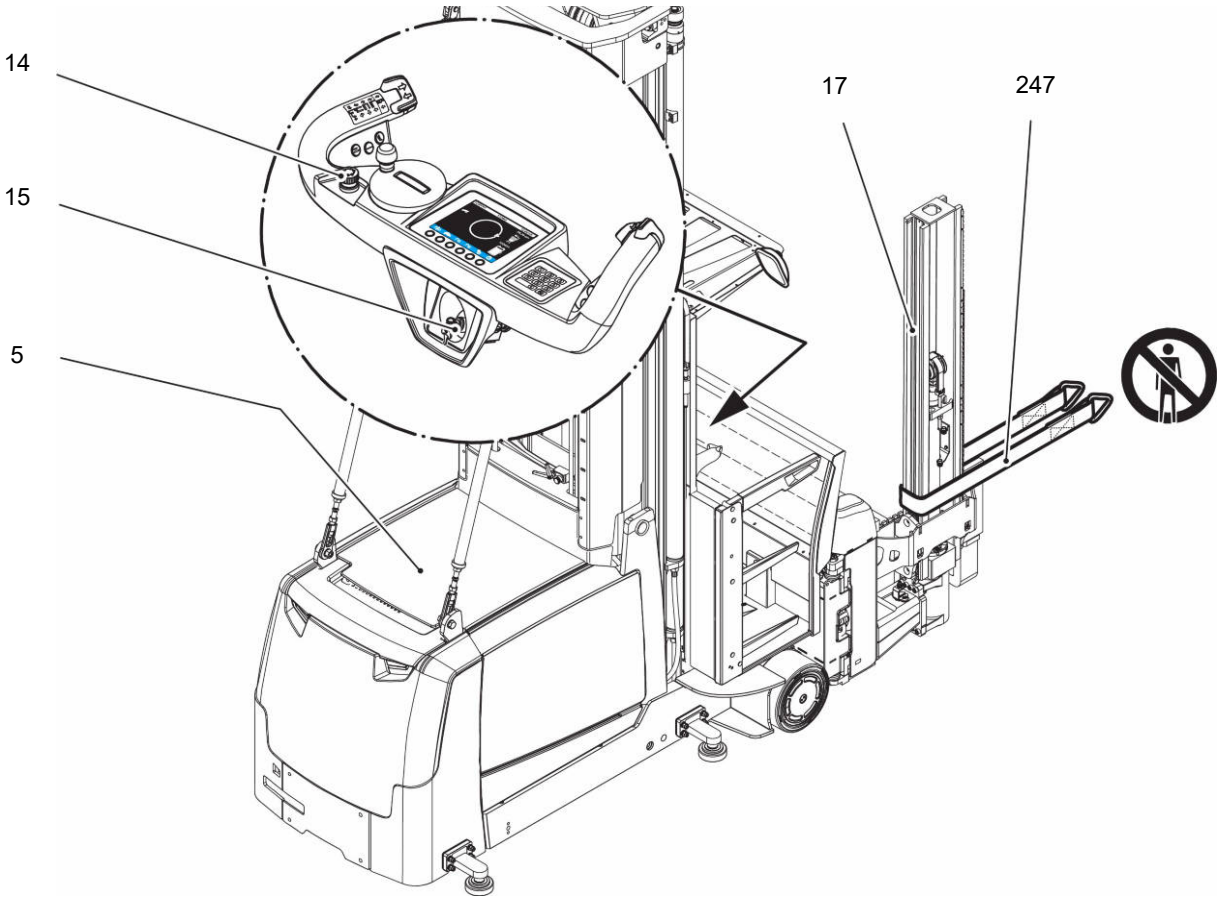
Do not guide the tow rope (245) over or around hydraulic lines or electric cables.

- Route the tow rope (245) through the recess around the truck chassis (40) (see illustration).

- Recover the truck carefully and slowly in the drive direction.
- If the steering angle has to be changed during a recovery operation, brake until the truck comes to a halt:
  - Adjust the steer angle, see page 380.
- After recovery, secure the truck to prevent it from moving accidentally:
  - Apply the drive wheel brake, see page 372.
  - Apply the load wheel brake (if applicable), see page 376.

⚠ WARNING!

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



EKX with standard attachment - recovery in load direction with and without load

Requirements

– Load handler fully lowered, see page 292 or see page 346.
– Attachment in home position (●), see page 317.
– Drive wheel brake released, see page 372.
– For EKS 514-516 / EKX 514-516 only:
  Load wheel brake released, see page 376.

Tools and Material Required

– Tow rope, tow force > 5 tonnes

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Open the battery cover (5).
- Disconnect the battery.

NOTICE

Risk of damage from the tow rope

During recovery route the tow rope to the front in such a way as to avoid damaging the following components:

▶Hydraulic hoses

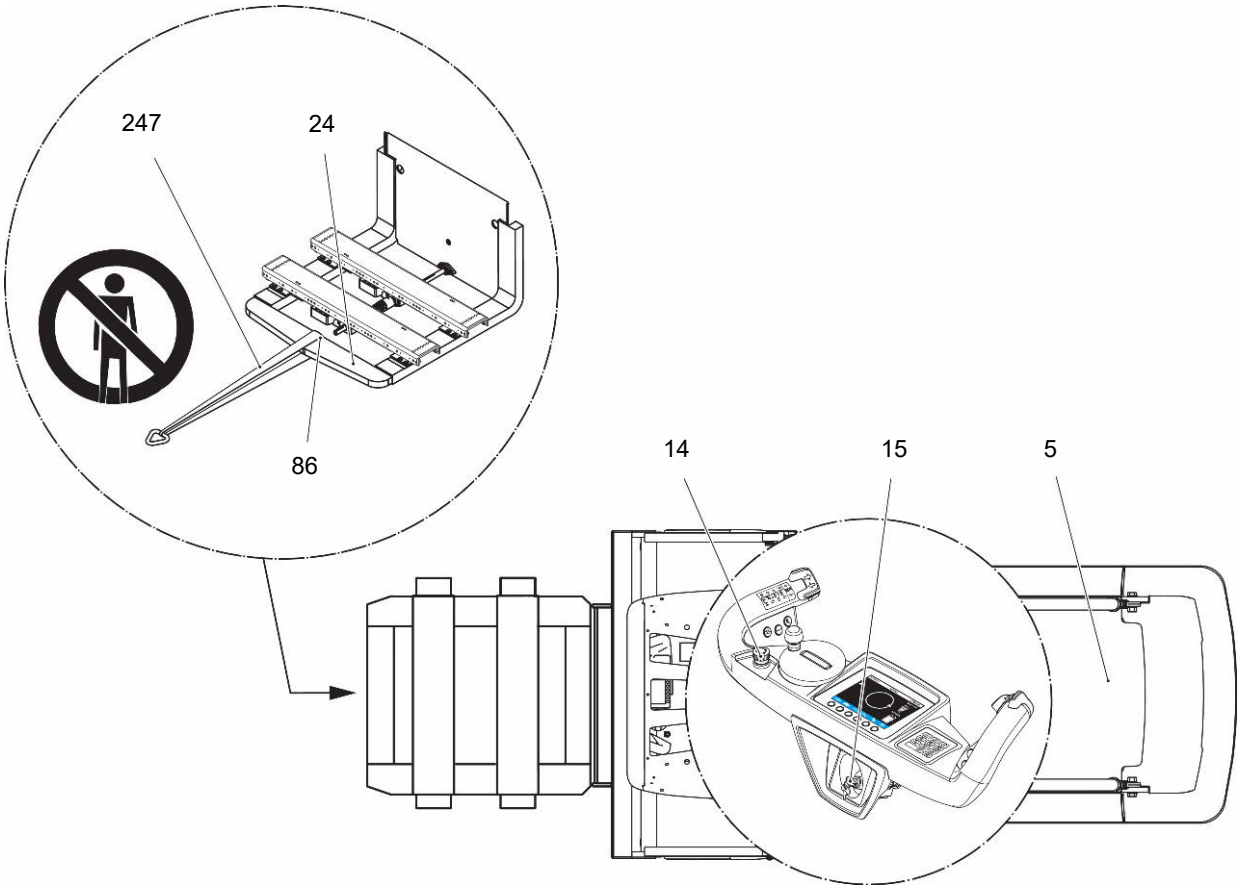
▶Electric cables

- Route the tow rope (247) around the bottom of the auxiliary mast (17) (see illustration).
- Recover the truck carefully and slowly in the load direction.

- If the steering angle has to be changed during a recovery operation, brake until the truck comes to a halt:
  - Adjust the steer angle, see page 380.
- After recovery, secure the truck to prevent it from moving accidentally:
  - Apply the drive wheel brake, see page 372.
  - Apply the load wheel brake (if applicable), see page 376.

⚠ WARNING!

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



EKX with telescopic table - recovery in load direction with and without load

Requirements

– Load handler fully lowered, see page 292 or see page 346.
– Telescopic table is centred (○), see page 317.
– Drive wheel brake released, see page 372.
– For EKS 514-516 / EKX 514-516 only:
  Load wheel brake released, see page 376.

Tools and Material Required

– Tow rope, tow force > 5 tonnes

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Open the battery cover (5).
- Disconnect the battery.

NOTICE

Risk of damage from the tow rope

During recovery route the tow rope to the front in such a way as to avoid damaging the following components:

▶Hydraulic hoses

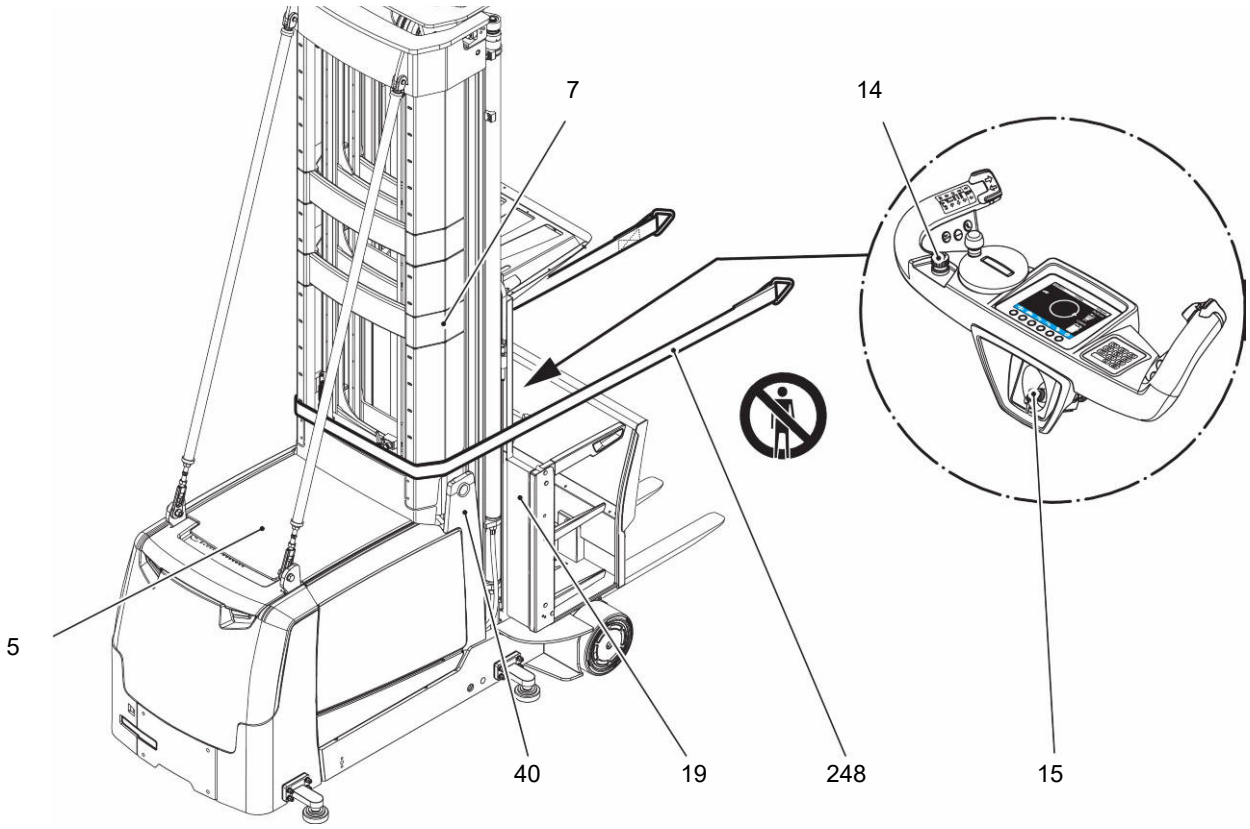
▶Electric cables

- Route the tow rope (247) around the telescopic table (24) (see illustration).
- Recover the truck carefully and slowly in the load direction.

- If the steering angle has to be changed during a recovery operation, brake until the truck comes to a halt:
  - Adjust the steer angle, see page 380.
- After recovery, secure the truck to prevent it from moving accidentally:
  - Apply the drive wheel brake, see page 372.
  - Apply the load wheel brake (if applicable), see page 376.

⚠ WARNING!

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



EKS - Recovery in load direction with and without load

Requirements

– Load handler fully lowered, see page 292 or see page 346.
– Drive wheel brake released, see page 372.
– For EKS 514-516 / EKX 514-516 only:
  Load wheel brake released, see page 376.

Tools and Material Required

– Tow rope, tow force > 5 tonnes

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Open the battery cover (5).
- Disconnect the battery.

NOTICE

Risk of damage from the tow rope

During recovery route the tow rope to the front in such a way as to avoid damaging the following components:

▶Hydraulic hoses
▶Electric cables
▶Operator position

- Route the tow rope (248) around the mast (7) (see illustration).
- Recover the truck carefully and slowly in the load direction.

- If the steering angle has to be changed during a recovery operation, brake until the truck comes to a halt:
  - Adjust the steer angle, see page 380.
- After recovery, secure the truck to prevent it from moving accidentally:
  - Apply the drive wheel brake, see page 372.
  - Apply the load wheel brake (if applicable), see page 376.

⚠ WARNING!

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

7 Rescue Equipment

Industrial trucks with an elevating operator position capable of reaching a platform height (h_{12}) in excess of 3 m are equipped with an emergency lowering system and rescue equipment (rescue harness/abseil device with rescue rope) for the operator.

If the raised operator position cannot be lowered due to a fault, not even with emergency lowering (see page 346), the operator must exit the operator position using the rescue equipment.

⚠ WARNING!

Danger due to uninstructed or untrained operators as well as rescue equipment that has not been maintained.

The rescue equipment may only be used by persons in good health who have been trained in its operation and who possess the requisite knowledge.
A rescue plan must be available for the operator, containing all relevant measures to be taken in the event of an emergency.

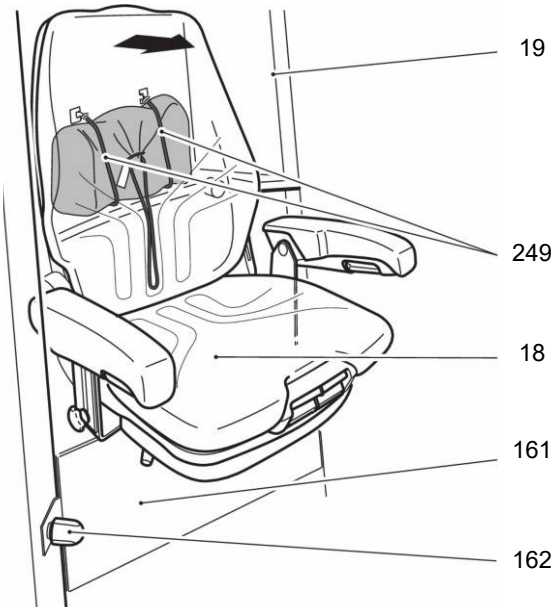
▶ The operator must undergo annual training in the use of the rescue equipment. Observe national regulations.

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

7.1 Rescue equipment storage compartment in the operator position

The rescue equipment can be fitted or stored in the following places in the operator position:

– The rescue equipment is located in the storage compartment (161) below the driver's seat (18).
– The rescue equipment is attached behind the driver's seat (18) on the back wall of the driver's cab (19).



Procedure

- Remove the twist grip screws (162) from the left and right sides behind the driver's seat (18).
- Tilt the operator seat (18) carefully in the load direction (see arrow direction).
- "Rescue equipment in storage compartment below the driver's seat" version:
  - Take the rescue equipment out of the storage compartment (161) below the driver's seat (18).
- "Rescue equipment on back wall of operator position" version:
  - Remove the tensioning rubber (249).
  - Remove the rescue equipment from the back wall of the operator position (19).

  Carefully tilt the driver's seat (18) back.

⚠ CAUTION!

Hand trapping hazard

Trapping hazard for hands when tilting back the driver's seat.

►Make sure there is nothing between the driver's seat and the operator position when you tilt the driver's seat back.

- Attach the driver's seat (18) to the operator position using the two twist grip screws (162).

7.2 Checking and servicing the rescue equipment

⚠ WARNING!

Risk of accidents due to untested rescue equipment

Using rescue equipment that has not been inspected can result in the operator falling.

- ▶ The rescue equipment must be checked at least annually by the manufacturer or an expert approved by the manufacturer when not in use.
- ▶ The rescue equipment must undergo more regular inspection if subjected to heavy-duty use (e. g. environmental or industrial factors which affect the material).
- ▶ Do not reuse rescue equipment after use and dispose of it in accordance with the applicable regulations. Replace used rescue equipment with new rescue equipment.

⚠ WARNING!

Danger due to modifications to the rescue equipment

In the event of modifications (e. g. additions, repairs) to the rescue equipment (rescue harness, abseil device with rescue rope and fastener), the stability and therefore safe use of the rescue equipment cannot be guaranteed.

- ▶ Do not modify the rescue equipment in any way.

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

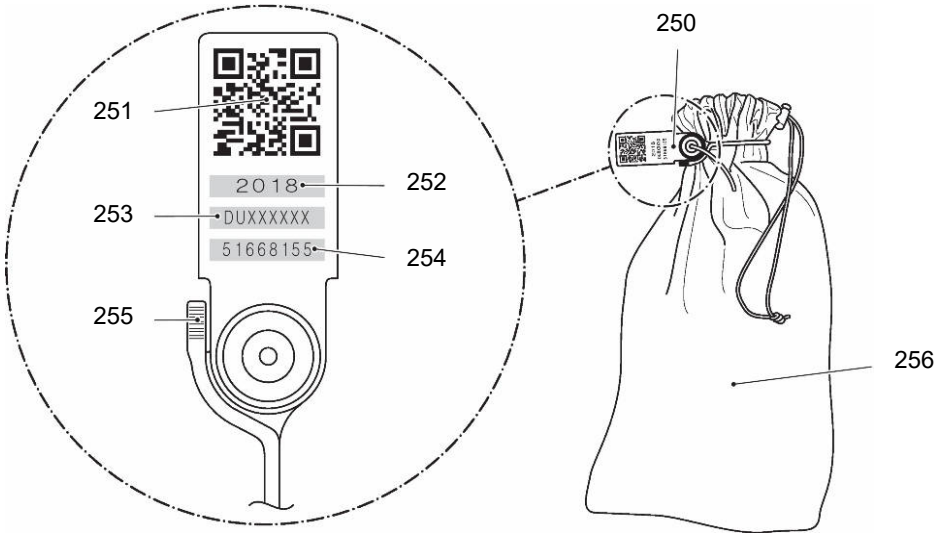
7.3 Seals and rescue equipment bags

⚠ WARNING!

Damaged seals or damaged rescue equipment bags

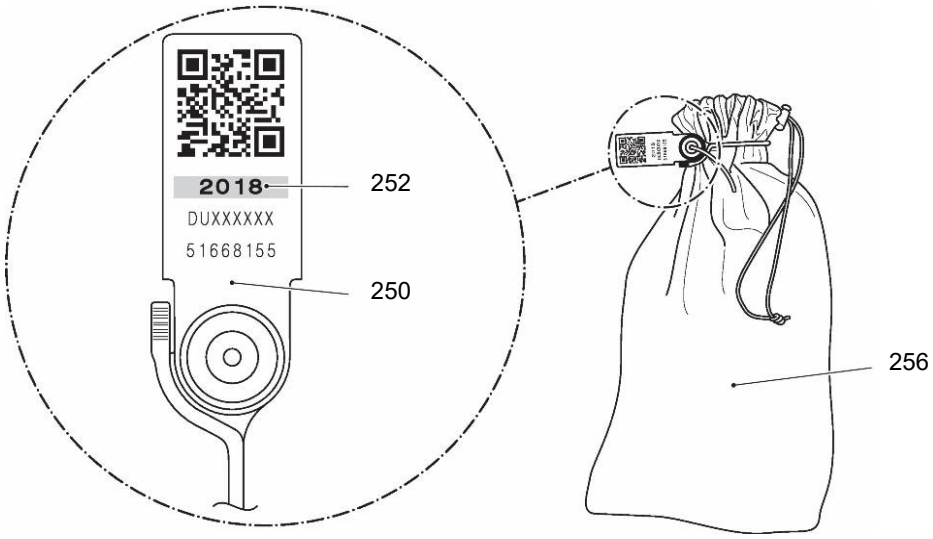
If damage is observed on seals or rescue equipment bags, the rescue equipment must not be used. The usability of the rescue equipment cannot be guaranteed.

▶Return the rescue equipment to the manufacturer or an expert authorised by the manufacturer for inspection.



Item	Model
250	Seal for sealing the rescue equipment bag
251	QR code for identifying the rescue equipment (order number, etc.)
252	Year of manufacture
253	Internal number
254	Rescue equipment order number
255	Lock for opening the seal
256	Rescue equipment bag with rescue equipment

7.4 Rescue equipment service life



➔ The year of manufacture (252) of the rescue equipment is specified on the seal (250) used to seal the rescue equipment bag (256).

7.4.1 Duration of use of the rescue harness

Under normal usage conditions or if not used, the maximum usage duration of the rescue harness is 10 years.

7.4.2 Duration of Use of the Abseil Device

Under normal usage conditions or if not used, the maximum usage duration of the textile rescue rope is 10 years.

➔ The precise usage duration of the abseil device, karabiner hook and screw lock karabiner is dependent on the usage conditions and ambient conditions.

7.5 Storing or transporting the rescue equipment

⚠ WARNING!

Incorrectly stored rescue equipment

The storage of the rescue equipment has a significant influence on its stability functionality.

- ▶ Store the rescue equipment inside the rescue equipment bag in the truck's storage compartment. This ensures that the rescue equipment is protected from wet, cold, heat and UV radiation and can be accessed in the event of a fault.
- ▶ Contact between the rescue equipment and acids, corrosive liquids, oils, fuels and other chemicals or vapours must be avoided.
- ▶ Protect the rescue equipment from contact with sharp objects.

To transport the rescue equipment always use a secure equipment bag or case to prevent damage caused by external influences.

7.6 Usage and ambient conditions

→ The usage and ambient conditions of the rescue equipment correspond with those of the truck, see page 16.

7.7 Description and use of the rescue equipment

The rescue equipment consists of the following components:

- Rescue harness
- Abseil device
- Fastener (screw lock karabiner or screw karabiner) between the abseil device and rescue harness
- Preassembled rescue rope with karabiner hook and secured end knots

The rescue equipment is approved for a maximum capacity of 160 kg (≥ 30 kg ... ≤ 160 kg).

⚠ WARNING!

Improper use of the rescue equipment

If the elevated operator position can no longer be lowered due to a fault, the rescue equipment is used for evacuation of the operator from the elevated operator position.

▶The rescue equipment must not be used to catch falling persons.

▶Leave the raised operator position with the rescue equipment, see page 410.

⚠ WARNING!

Danger due to modifications to the rescue equipment

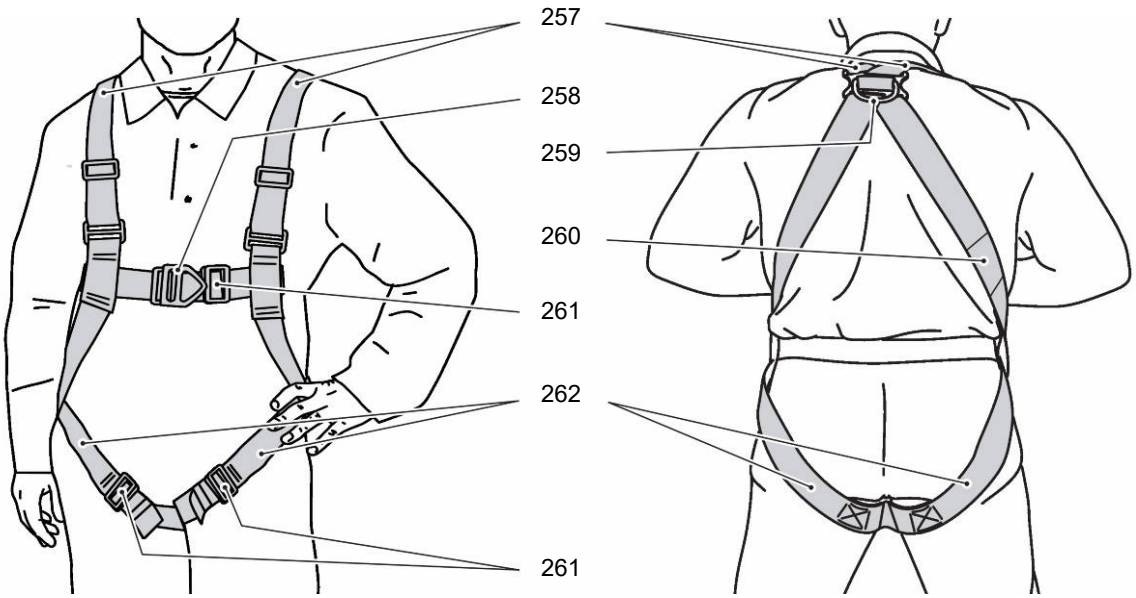
In the event of modifications (e. g. additions, repairs) to the rescue equipment (rescue harness, abseil device with rescue rope and fastener), the stability and therefore safe use of the rescue equipment cannot be guaranteed.

▶Do not modify the rescue equipment in any way.

7.7.1 Description of the rescue harness

The rescue harness consists of two adjustable leg and shoulder straps, a chest strap with D-ring and a back strap with suspension eyelet. The supporting belt straps comprise 45 mm wide belt material.

Adjust the chest and leg straps to achieve optimum adjustment of the rescue harness to the user. The length of the chest strap and leg straps can be adjusted using buckles.



Item	Model
257	Adjustable shoulder straps
258	D-ring on chest strap for attaching the abseil device to the rescue harness
259	D-ring on back strap
260	Data plate
261	Clip-on buckles
262	Adjustable leg straps

7.7.2 Technical specifications for the rescue harness

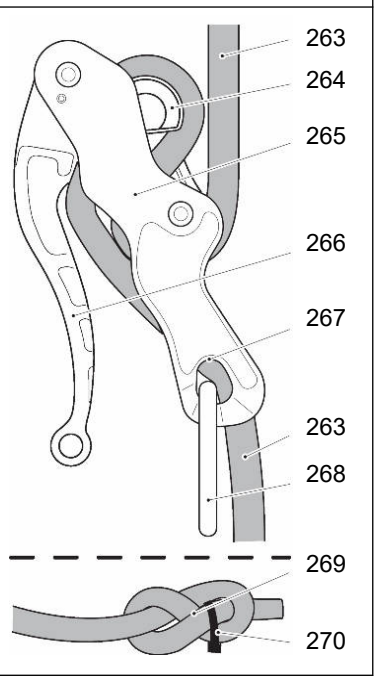
Net weight:	1,2 kg
Load capacity:	One person
Size:	UNISIZE
Standard:	EN 361

7.7.3 Description of the abseil device with rescue rope and fastener

The abseil device consists of a main body to which the operating lever and brake cam are attached. The bottom section of the body contains a D-ring to which a fastener (screw lock karabiner or screw lock) in accordance with EN 362 can be attached.

One end of the rescue rope has a karabiner hook while the other has an end knot. The end knot is secured by a cable tie and prevents the rescue rope from running out of the abseil device. The rescue rope data plate is located below a transparent protective hose on the rope end of the karabiner hook.

The screw lock karabiner or screw karabiner (in accordance with EN 362) is used to attach the abseil device to the rescue harness. The screw lock karabiner or screw karabiner is secured with screw lock to prevent unwanted loosening of the catch during use.

Item	Model	
263	Rescue rope with karabiner hook (to attach the abseil device to the truck) and secured end knot	
264	Brake cam	
265	Abseil device	
266	Control lever	
267	Eyelet for fastener (screw lock karabiner or screw karabiner)	
268	Screw lock karabiner or screw karabiner for attaching the abseil device to the rescue harness	
269	End knot	
270	Cable ties	

7.7.4 Technical specifications for the abseil device

Net weight:	0,35 kg without rescue rope
Load capacity:	One person
Approved rope type and diameter of rescue rope to be used:	see page 403
Standard:	EN 341 Class A

7.7.5 Technical specifications for the fastener (screw lock karabiner or screw karabiner)

Net weight:	approx. 0,04 kg
Load capacity:	One person
Dimensions:	74 mm x 39 mm

7.7.6 Specifications of rescue rope and karabiner hook

Net weight:	approx. 1,5 kg
Length:	17,5 m
Load capacity:	One person
Diameter of the rope:	11 mm
Standard:	EN 1891 Type A
Karabiner hook at start of rope:	Twist lock karabiner on fastening side attached to rescue rope with PIN

7.7.7 Visually inspecting the rescue equipment

⚠ WARNING!

Risk of falling due to damaged parts of the rescue equipment

Damaged parts (rescue harness, abseil device, fastener or rescue rope) impair the functionality of the rescue equipment. Damaged parts of the rescue equipment can tear or break during abseiling and cause the operator to fall. If the operator falls, there is a risk of serious or fatal injury.

- ▶ Always perform a visual inspection for damage before using the rescue equipment.
- ▶ It is forbidden to use damaged rescue equipment.
- ▶ If you discover any damage or have any doubts regarding the functional capability of the rescue equipment, the rescue equipment must be withdrawn from service.
- ▶ Report any defects immediately to your supervisor.
- ▶ Do not return the rescue equipment to service until you have identified and rectified the fault.

The user must carry out a visual inspection of the rescue equipment (rescue harness, abseil device, fastener or rescue rope) before each use. This will ensure that the rescue equipment is operational and fit for purpose.

7.7.7.1 Visually inspecting the fastener

When carrying out the visual inspection of the fastener, note:

- The fastener (screw lock karabiner or screw karabiner) must not exhibit any corrosion damage, deformation or damage due to mechanical effects.
- The thread lock on the lock must not be broken or damaged.

7.7.7.2 Visually inspecting the rescue harness

When carrying out the visual inspection of the rescue harness, note:
– The supporting harness material must not exhibit any damage such as flaws in the seams, cracks or abrasion marks.
– The clip-on buckles must not exhibit any corrosion damage, mechanical damage, deformation or cracks.
– The D-rings on the chest strap and back strap must not exhibit any corrosion damage, damage, deformation or cracks due to mechanical effects.
– The data plate must be present and legible.

7.7.7.3 Visually inspecting the abseil device

When carrying out the visual inspection of the abseil device, note:
– The abseil device must not exhibit any corrosion damage, deformation or damage due to mechanical effects.
– The abseil device must not exhibit any increased signs of wear.
– The information on the abseil device must be legible.
– The operating lever must not exhibit any corrosion damage, deformation or damage due to mechanical effects.

In addition, a function check of the operating lever must be carried out, in which the rescue rope is pulled with the operating lever not being pressed. The rescue rope must not slip through the abseil device when this is carried out.

7.7.7.4 Visually inspecting the rescue rope with karabiner hook

Visual inspection of the karabiner hook

When carrying out the visual inspection, make sure the karabiner hook is not corroded, physically damaged, deformed or cracked.

In addition, check that the karabiner hook latch works correctly:

– The latch should open and close easily.
– The karabiner hook latch must be return to its original position automatically after manual opening.

Visual inspection of the rescue rope

Pay attention to the following points during the visual inspection of the rescue rope:
- Make sure the end knot is present at the bottom of the rope. A cable tie must be present to prevent the end knot from opening automatically. This ensures that the rescue rope does not run out of the abseil device during abseiling.
- The stitching at the top of the rope with the karabiner hook must be in good condition. It must not have any missing parts or damage.
- The plastic cover at the top of the rope with the karabiner hook must be in good condition. It must not have any missing parts or damage.
- Check the rescue rope for the following defects or damage caused by mechanical, thermal or chemical influences:
  - Interfaces
  - Cracks
  - Excessive wear such as fluff
  - Chafing
  - Fibre damage
  - Swelling
  - Twisting
  - Sheath displacement
  - Open, loose end connections
  - Loops
  - Node
  - Burnt parts
  - Decayed parts

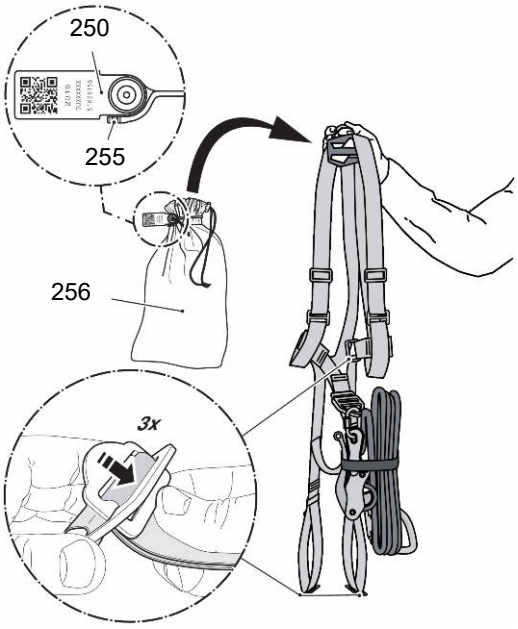
➔ Check the rescue rope for the above features before dropping it. Do this by letting the rescue rope drop through your hands.

7.7.8 Putting on the rescue harness

Preparation

Procedure

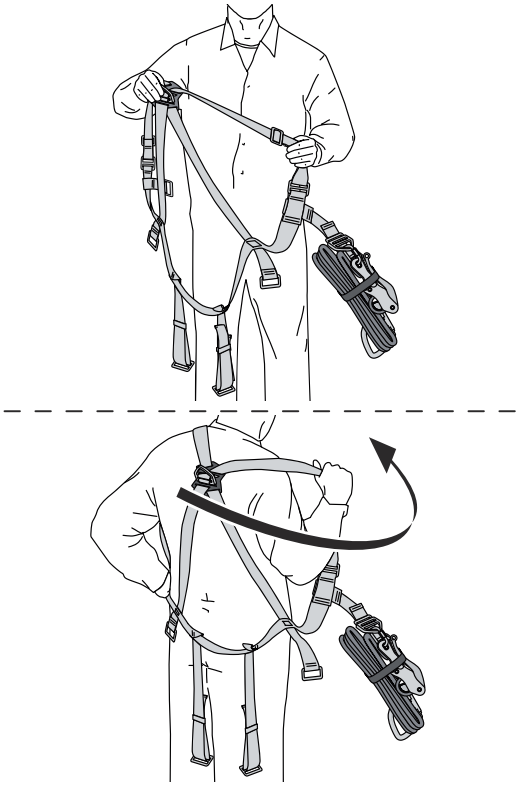
- Remove all objects from your trouser pockets.
- Remove the seal (250) by pulling on the lock (255).
- Remove the rescue equipment from the rescue equipment bag (256).
- Carry out a visual inspection of the rescue equipment, see page 404.
- Hold the rescue harness in front of your body with one hand on the D-ring.
- Open the clip-on buckles (3x).



Put on the rescue harness

Procedure

- Put on the rescue harness like a jacket
- Pull the leg straps forward between your legs and then up.



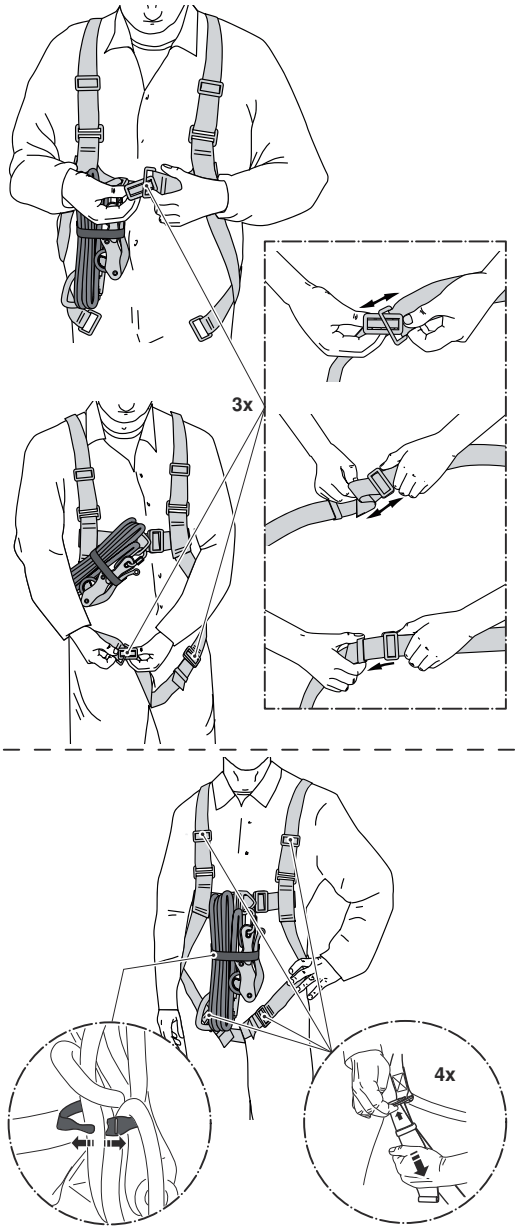
Adjust the rescue harness to match the size of the operator's body:

Procedure

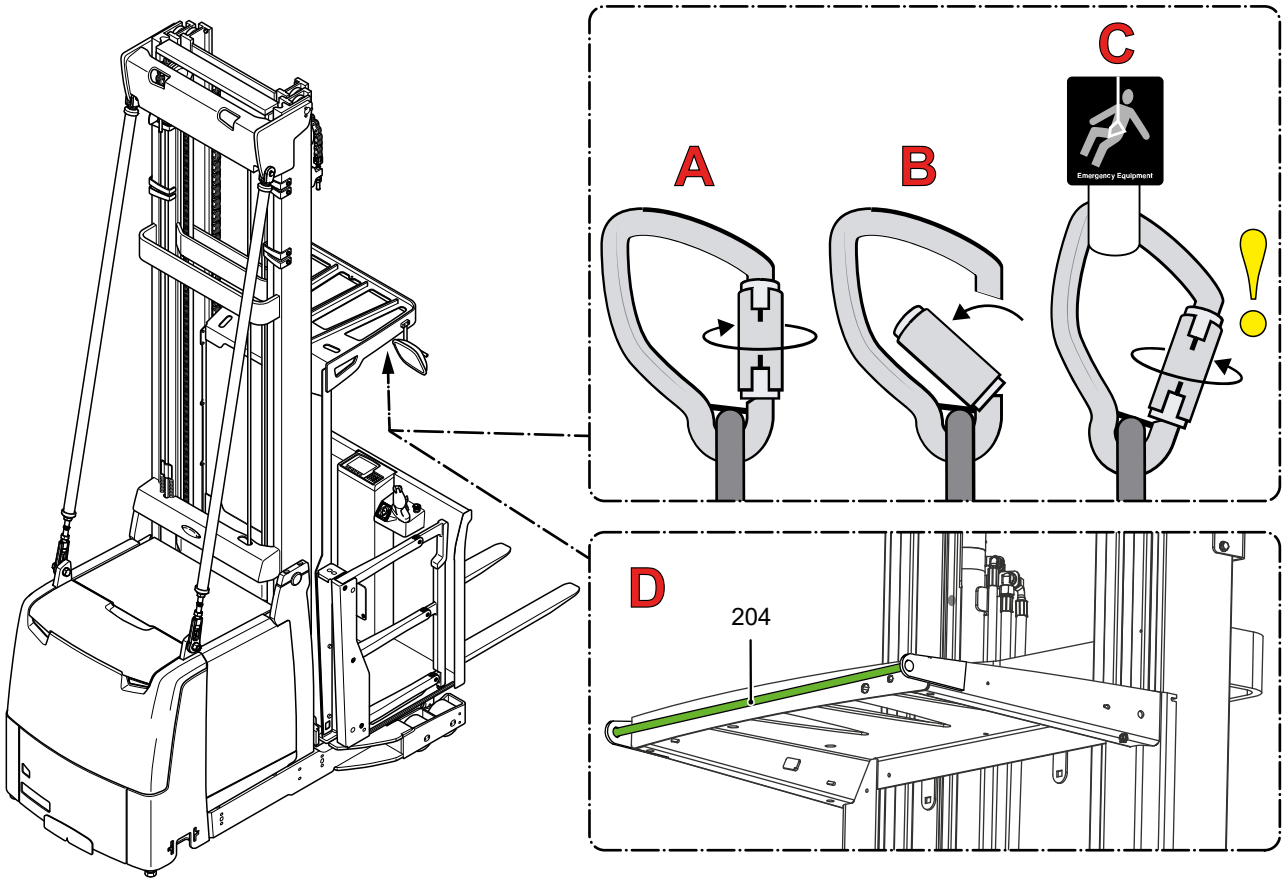
- Close the clip-on buckles (2x) on the leg straps.
- Close the clip-on buckle on the chest strap.
- Adjust the rescue harness to the individual body size and tighten the belt straps.

➔ Ensure that the leg straps are adjusted such that a flat hand can be slid between the strap and the thigh. After adjustment, the D-ring on the back strap must be centred between the shoulder blades.

- Undo the velcro so that the abseil device can be removed from the rescue harness.



7.7.9 Leaving the operator position with the rescue equipment



Procedure

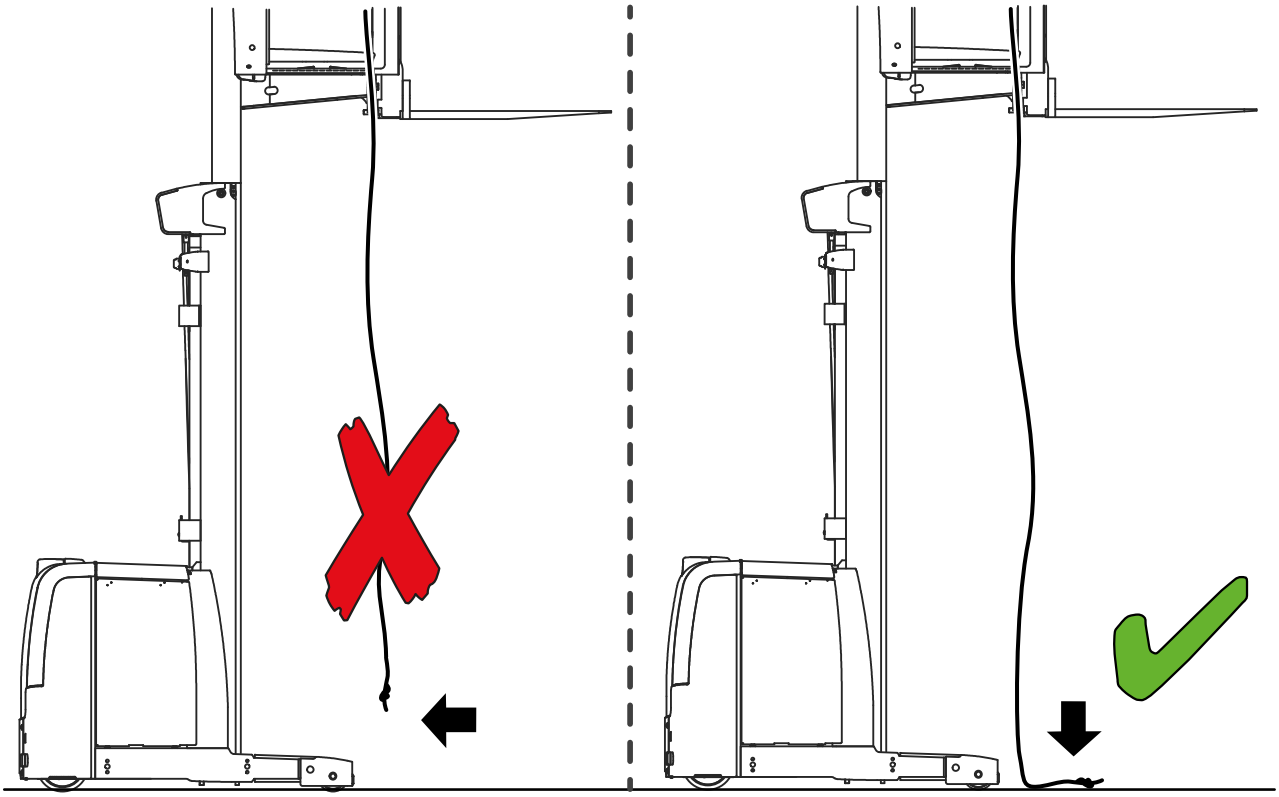
- Switch off the truck – see page 266.
- Press the emergency disconnect switch.
- Remove the bag with the rescue equipment from the storage compartment in the operator position – see page 395.
- Remove the seal from the bag – see page 408.
- Take the rescue equipment out of the bag or case.
- Visually inspect the rescue harness, abseil device, rescue rope and fastener – see page 404.
- Put on the rescue harness – see page 408.
- Attach the karabiner hook of the rescue rope to the eyelet on the overhead guard (*see Fig. "A" - "C"*):
  - Open the latch on the karabiner hook.
  - Attach the karabiner hook to the eyelet on the overhead guard.

➔ Make sure that the latch on the karabiner hook is pointing in the load direction.

  - Close the latch on the karabiner hook.
  - After attaching, check that the union nut on the karabiner hook is fully closed.

➔ Trucks with attachment rail (204) for the safety harness (*see Fig "D"*):
If the overhead guard has an attachment rail (204), the eyelet on the overhead guard can be covered and does not need to be accessible. In this case, the karabiner hook of the rescue rope must be attached as described before to the attachment rail (204).

- Throw the rescue rope down to the ground so that it is free of loops and knots (except for the end knot).
  You must not abseil down the rope unless it can reach the ground.



⚠ WARNING!

Risk of falling due to torn rescue harness or rescue rope

If the straps of the rescue harness or the rescue rope are run over sharp metal edges, the straps or the rescue rope will be damaged. The straps or the rescue rope will also be damaged if they come into contact with acids, caustic liquids and oils. For these reasons the strength and hence safe use of the rescue equipment (rescue harness and rescue rope) cannot be guaranteed and the rescue equipment may tear during abseiling.

- ▶ Run the rescue rope only over fixed truck components.
- ▶ Do not run the rope over sharp edges. If necessary use an edge trim, e.g. the rescue harness bag.
- ▶ Store the rescue equipment in the truck's storage compartment. This will ensure that the rescue rope is protected from damp, heat and UV radiation.
- ▶ Protect the rescue equipment from contact with acid, corrosive fluids and oils.
- ▶ Protect the rescue equipment from contact with sharp objects.

⚠ WARNING!

Injuries exiting the operator position

The operator must note the following points in order to avoid injury when leaving the operator position

- ▶ Always use the rescue harness to abseil.
- ▶ Avoid slack rope to keep the fall distance as short as possible.
- ▶ Do not fall into loose rescue rope or jump from the operator position into the rescue rope.
- ▶ Watch out for obstacles when exiting the operator position.

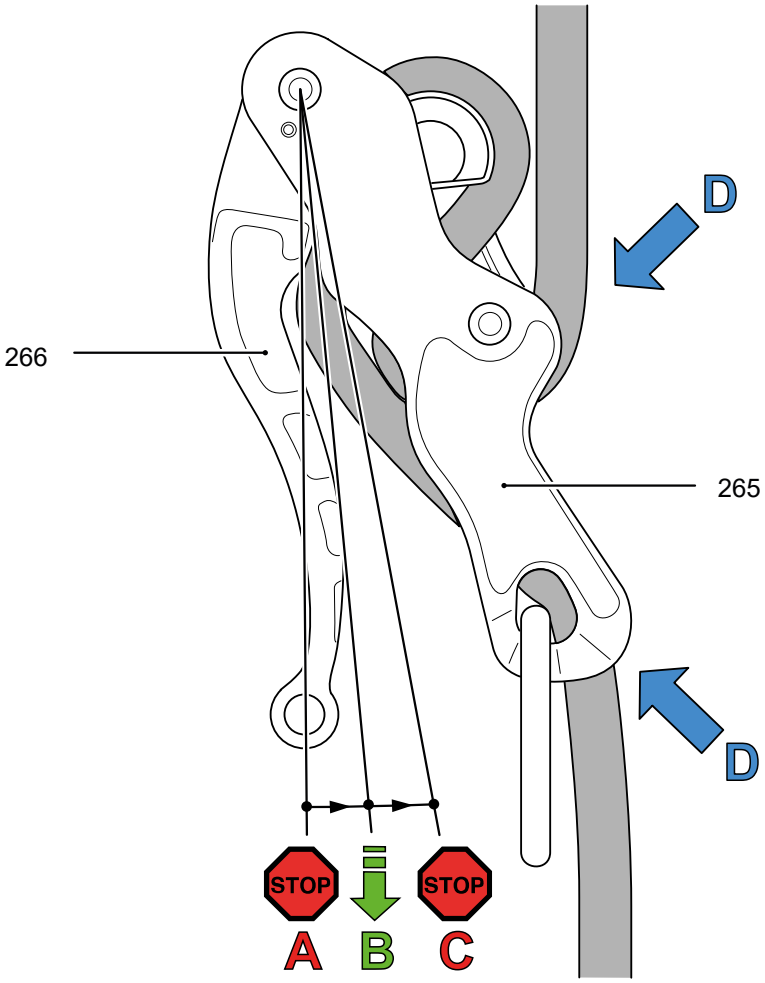
⚠ WARNING!

Injuries and falling during abseiling

The operator can collide with obstacles when abseiling. This can result in injury to the operator. The rescue equipment can also become damaged, causing the operator to fall.

▶Watch out for obstacles when abseiling.

▶Steer clear of obstacles.


D
266
265
D
STOP
STOP
A
B
C

Description of the abseil procedure

Procedure

- Pull the rescue rope taut between the overhead guard and abseil device (265). The rescue rope must be free to run in and out over the rope inlet and outlet points on the abseil device (265) (see position "**D**").

➔ The default position of the control lever (266)on the abseil device (265) is "Stop", which indicates that the abseil device (265) is not ready to descend (see position "**A**").

- Exit the truck with both feet firmly on the edge of the floor and facing towards the truck.
- Exit the truck slowly to prevent the rescue rope swinging excessively.
- Using the abseil device (265):
  - To abseil, push the control lever (266) slightly towards the abseil device (265) (see position "**B**").

    The lowering speed depends on the weight of the user and position of the control lever (266).
  - To stop abseiling, release the control lever (266) (see position "**A**") or push fully in the direction of the abseil device (265) (see position "**C**").
- Use the control lever (266) to reduce the abseil speed approx. 1,5 m - 2,0 m before reaching the ground. This ensures that the operator reaches the ground at a reduced speed.
- Remove the rescue harness after reaching the ground.
- Mark defective truck and take it out of service.
- Inform the supervisor.
- Return the rescue equipment to the manufacturer or a specialist appointed by the manufacturer for inspection.

8 Personal safety system (○)

8.1 Personal Protection System (PPS)

The truck's integrated personal protection system (PSS) is designed to protect persons. The Personal Protection System (PSS) is used with industrial trucks in warehouse systems where pedestrians are not permitted to be in narrow aisles at the same time as industrial trucks.

➔ The Personal Protection System meets the requirements of BGV D 27, §28 paragraph 2 and DIN 15185, Part 2 section 3.13. The Personal Protection System complies with ISO 13849 PXF Level D for the detection of persons and obstacles. The safety laser scanner is of laser protection class 1. No other measures for screening the laser beam are required (safe for eyes).
The laser scanner meets the requirements of standards CDRH 21,CFR 1030.10 and EN 60825:2001.

⚠ WARNING!

Exposure to hazardous radiation can result if the operating or adjusting devices used or procedures carried out differ from those stated in the above standards and directives.

National / international regulations apply to the assembly and use of the safety laser scanner both for commissioning and recurrent technical inspections, in particular:
– The Machinery Directive 2006/42/EG
– The Use of Work Equipment Directive 89/655/EWG
– Accident prevention / health and safety regulations
– Other relevant safety regulations

➔ The manufacturer and operators of the machine on which the safety laser scanner is being used are responsible for agreeing and complying with all valid safety regulations issued by the relevant authorities.

8.2 Functional description

- Mobile personal protection system with laser scanner based obstacle detection.
- Apron field protection.
- Optimum integration in the truck.
- Easy adjustment / settings to match warehouse environment.
- Automatic speed reduction / stopping in front of obstacles / personnel / other industrial trucks.

8.2.1 Standard functions

- Slow travel speed (2,5 km/h) enabled when laser scanner covered (load handler lowered).
- Slow travel speed (2,5 km/h) enabled when approaching the last pallet locations at a closed narrow aisle end.
- Automatic reduction of maximum speed to slow travel speed (2,5 km/h) before exiting the narrow aisle.
- Additional stop at aisle end; optionally temporary, confirmed or absolute.
- Lower cut-off upon protection field infringement.

⚠ WARNING!

The personal protection system does not provide collision protection in accordance with DIN 15185 Part 2.

8.2.2 Special functions depending on the ground conditions

- Identification of various aisle types within a warehouse.
- Reduction in speed for escape routes within the lane.
- Stop for escape routes within the lane.
- Zone switching within the lane with vicinity detection.
- Short-range apron field protection (directly in front of and behind the truck – depending on travel direction).
- Detection of double aisle width. Protection field change – wider monitoring field on one side.
- Option to connect additional sensors for monitoring operator position with lowering stop upon detection of a person.

8.3 Environmental awareness

The safety laser scanner is designed to keep environmental damage to a minimum. It uses minimal energy and resources. Always act with regard to the environment at your place of work. Please note the following disposal information.

Disposal:

- Always dispose of unusable or irreparable safety laser scanners in accordance with national waste disposal regulations.
- Remove the plastic components from the safety laser scanner. Now send the aluminium housing of the safety laser scanner for recycling.
- Dispose of all electronic assemblies as special waste. The electronic assemblies of the safety laser scanner are easy to disassemble.

8.4 Cleaning the laser scanner front screen

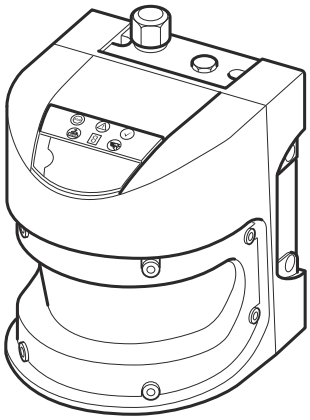
The material required to clean the front screen of the laser scanner is outlined in "Consumables", see page 683.

Requirements

– Laser scanner under the load axle:
  Prevent operator position from lowering accidentally, see page 714.
– Laser scanner in the drive compartment:
  Drive compartment cover removed, see page 686.

Procedure

• Damp clean the front screen.



Dry cleaning carries the risk of static charge. More dust will be attracted to the front screen. Moreover, there is also the risk of scratching the front screen.

• In addition, damp clean the connecting lug at the bottom of the front screen.
  Wipe the screen dry with a clean, soft woollen cloth, a microfibre cloth or a new soft paper towel.

⚠ CAUTION!

Cleaning can damage the front screen

Do not use dirty or large-fibre cleaning cloths as these can scratch the front screen. A scratched front screen will result in faults. The front screen must be replaced

• After cleaning, hold a light or torch against the front screen. Check for any contamination or scratches on the front screen and clean again if necessary.

The front screen is now clean.

8.5 Displays on the seven segment display and indicator light (LED)

The seven segment display and the indicator light (LED) on the laser scanner act as the display for the operator and the customer service engineer.

Display	LED signal	Description
	Off	– Protection field clear, no object in protection field – The truck can move at the maximum speed setting.
	Lit	– Protection field infringement, object in protection field – The truck stops.
	Off	– Warning field clear, no object in warning field – The truck can move at the maximum speed setting.
	Lit	– Warning field infringement, object in warning field – The truck decelerates to 2,5 km/h and will only travel at this speed.
	Off	– Front screen clean. – The truck can move at the maximum speed setting.
	Lit	– Front screen contaminated. – Operation inhibited. – Clean the front screen (see page 419).
	flashes at 0.5 Hz (one second off, one second on)	– Front screen contaminated. – Operation still enabled. – Clean the front screen (see page 419).

Other seven segment and indicator light (LED) error displays are relevant only to the manufacturer’s customer service department. Troubleshooting must only be performed by the manufacturer’s customer service department. The manufacturer has a customer service department specially trained for these tasks.
In order for customer services to respond quickly and specifically to the fault, the following information is essential:
- Truck serial number
- Error number from the seven segment display (if available)
- Description of the error
- Current location of truck

.

8.6 Daily checks before starting the Personal Protection System

– Check the front screens of the Personal Protection System laser scanner for contamination and clean as required (see page 419).
– Cycle test (see page 422)

8.6.1 Cycle test

NOTICE

To ensure the correct operation of the personal protection system a cycle test must be carried out after a 24 hour timer has expired or each time the truck is switched off and on again.

▶ The information message "**E**9901" or the "Acknowledge cycle test" symbol (272) prompts you to perform the cycle test. During this time the speed is restricted to slow travel (2,5 km/h).

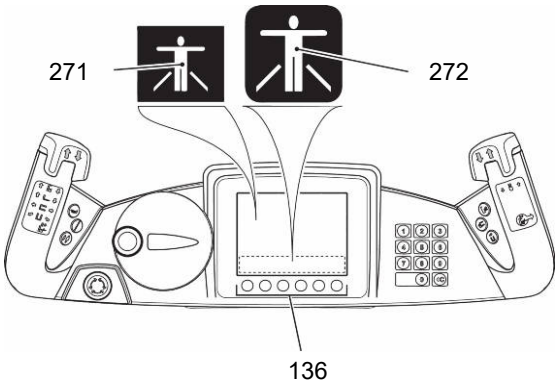
▶ The speed restriction is only removed when the cycle test has been performed.

Cycle test

Procedure

- Switch off the truck – see page 266.
- Switch on the truck – see page 265.

➔ When the truck has been switched on, the "acknowledge cycle test" symbols (271|272) are displayed.



- Press the button (136) below the "acknowledge cycle test" symbol (272).

  The truck automatically performs the cycle test.
- When the cycle test has been successfully carried out, the truck automatically undergoes the following steps:
  - The "perform cycle test" symbols (271|272) disappear.
  - The speed restriction is removed.
  - The 24-hour timer is reset and restarted.

The cycle test has been performed successfully.

8.7 Personal safety system

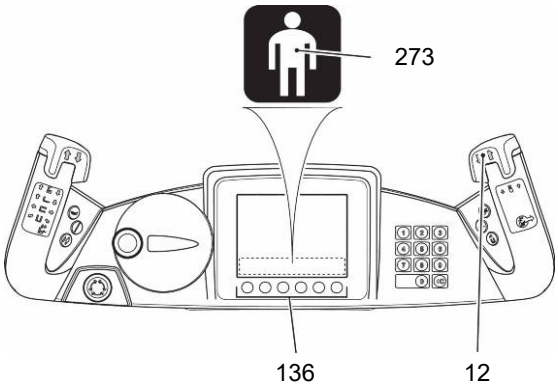
8.7.1 No Obstacles or Persons Detected

If there are no persons or obstacles in the warning field or protection field of the personal protection system, the industrial truck can be driven at the maximum enabled speed.

8.7.2 Obstacles or Persons in the Warning Field

Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

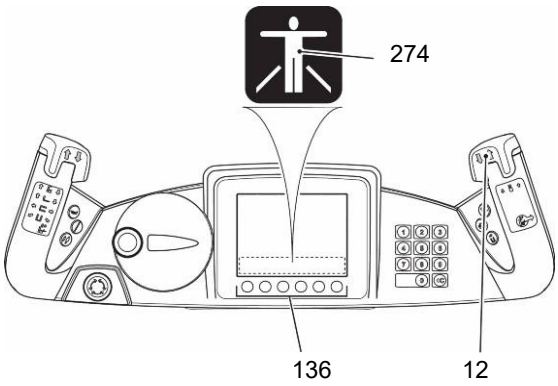


Obstacles or persons are in the warning field of the personal protection system:
– The driver's display shows the "warning field infringement" symbol (273).
– The travel speed is limited to 2,5 km/h.

There is no longer an obstacle or person in the warning field:
– The truck can travel again at the maximum speed setting.
– The "warning field infringement" symbol (273) disappears.

8.7.3 Obstacles or Persons in the Protection Field

In the event of simultaneous personal protection system protection field infringement and other cut-offs (lift cut-off, etc.), the cause of the cut-off must be rectified first. The personal protection system protection field infringement can then be overridden.



➔ For a description of the cut-offs (lift cut-off, etc.), see page 353.

➔ A personal protection system protection field infringement is indicated by the "protection field infringement" symbol (274) on the driver's display. The truck also brakes to a halt in the event of a protection field infringement.

⚠ WARNING!

Risk when driving the truck despite a protection field infringement (deactivation of the travel cut-off)

Travel cut-off deactivation is an additional function to ensure that the position of the truck can be adjusted despite a protection field infringement. However, this does not release the operator from the responsibility of bringing the truck to a halt in good time before it reaches any persons or obstacles.

▶ When the travel cut-off has been deactivated, apply greater concentration when operating the truck.

▶ Brake in good time before reaching the person or obstacle.

Travelling in the event of obstacles or persons located in the PSS protection field

Requirements

– Prepare the truck for operation, see page 265.
– Drive the truck into the narrow aisle and establish automatic rail guidance, see page 283.

Procedure

- The Personal Protection System has detected a person or an obstacle in the protection field.

➔ The truck stops. The driver's display shows the "protection field infringement" symbol (274).

- Press and hold down the key (136) under the "Protection field infringement" symbol (274).
- Press the deadman switch (25).
- Set the travel direction and speed with the travel control knob (12):
  - Turn the travel control knob (12) slowly clockwise:
    Travel in load direction.
  - Turn the travel control knob (12) slowly anti-clockwise:
    Travel in drive direction:

Depending on the truck's settings, the truck can be operated without restriction over a certain distance or for a certain time in the set direction. The setting for continued

travel is made by the manufacturer's customer service department. The maximum travel speed is restricted to 2,5 km/h.

There is no longer an obstacle or person in the protection field

Requirements

– Truck has been prepared for operation – see page 265.
– The truck is in the narrow aisle and compulsory guidance has been enabled – see page 283.

Procedure

- Press the button (136) under the "protection field infringement" symbol (274).
- The "protection field infringement" symbol (274) disappears.

The truck can once again travel at the maximum enabled speed.

9 Collision protection with the Personal Protection System (○)

⚠ WARNING!

Risk of accident due to operator not paying attention

The collision protection feature is an auxiliary function to assist the operator. However, it does not release the operator from the responsibility to monitor the brake functions, and, if necessary, initiate braking – e.g. in front of a person or an obstacle (other industrial trucks, objects).

▶ Brake in good time before reaching the person or obstacle.

⚠ WARNING!

Collisions when several trucks are operating in the narrow aisle at the same time

If several trucks are operating in the narrow aisle at the same time, there is a risk of rear-end and other collisions if the trucks are not equipped with the "collision protection " function.

▶ The combined operation of trucks with and without collision protection is forbidden in narrow aisles.

▶ The operator must ensure that combined operation is ruled out (e. g. via work instructions, signs, etc.).

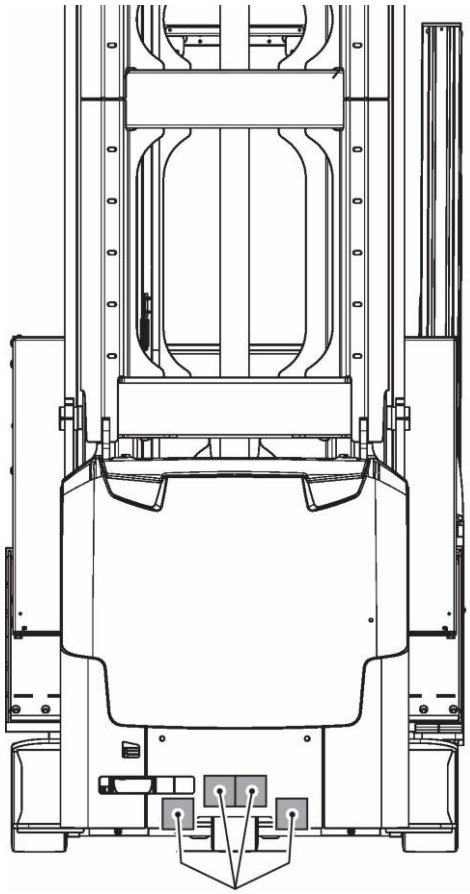
⚠ WARNING!

Unauthorised persons in narrow aisles can result in accidents

Unauthorised personnel must not enter narrow aisles (truck traffic lanes in racking systems with safety clearances < 500 mm), nor must any personnel cross through them. These work areas must be marked and identified accordingly.

- ▶ Narrow aisles must only be entered by trucks which are intended for this purpose.
- ▶ Combined operation of trucks with and without collision protection and personnel is forbidden in narrow aisles.
- ▶ The operator must ensure that personnel and trucks are not in the narrow aisle at the same time (e.g. via work instructions, labels).
- ▶ Before entering a narrow aisle, the operator must look for people in the aisle. Never enter an aisle where there are people or other trucks. If there are people in the aisle, stop the truck immediately.
- ▶ Carry out a daily inspection of the safety mechanisms on the truck or the racking system to avoid hazards and to protect personnel.
- ▶ The safety equipment must not be rendered ineffective, misused, adjusted or removed.
- ▶ Report any safety equipment defects to your supervisor immediately.
- ▶ Defective trucks or racking systems must be taken out of service and labelled accordingly.
- ▶ Do not return the truck to service until you have identified and rectified the fault.
- ▶ Do not return the racking system to service until you have identified and rectified the fault.

9.1 Positions and Number of Items of Reflectors on Truck



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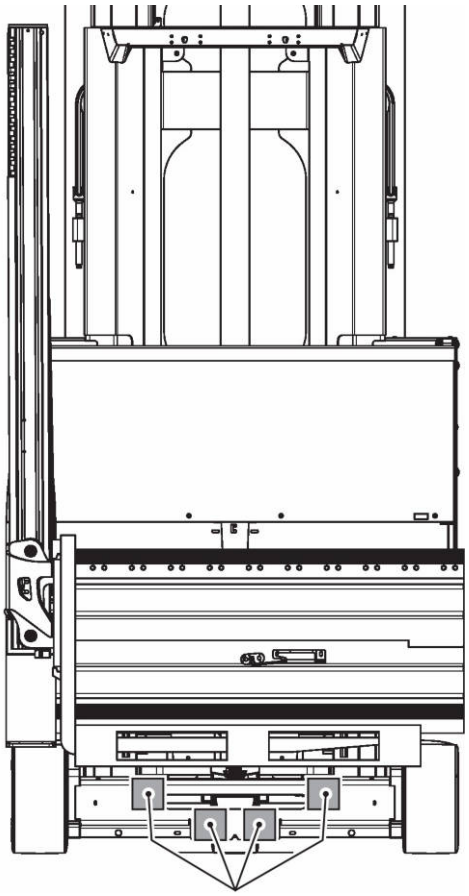


276

Pos.	Position of reflectors	Quantity
275	On the truck chassis before the drive wheel	4 off [1]
276	On the load axle	4 off [1]
[1] Dimensions of a reflector: 100 mm x 100 mm		

9.2 Description of collision protection with the Personal Protection System

The "collision protection" function with the Personal Protection System helps to prevent accidents which can occur if several authorised trucks are operating in the narrow aisle at the same time.

➔ For details of the Personal Protection System, see page 416.

According to the intended use, several trucks can be operated in a narrow aisle if the trucks fulfil the following requirements:
– Trucks must be equipped with the "collision protection" function.
– Trucks must be equipped with reflectors.

➔ For the position and number of reflectors on the truck, see page 428.

For the "collision protection" function, the protection and collision protection fields of the Personal Protection System are adjusted to allow trucks driving towards each other to detect each other at maximum speed and initiate the following countermeasures: Depending on the distance of both trucks they introduce countermeasures to avoid rear-end accidents or collisions (see page 434).

➔ Unauthorised persons in the narrow aisle are detected by the personal protection system. Depending on whether there is a protection field or collision protection field infringement, the truck brakes to a halt (emergency stop) or decelerates to slow travel (2,5 km/h).

9.3 Additional Checks and Operations to be performed before starting Daily Operation

⚠ WARNING!

Risk of collision due to damaged or missing reflectors on the truck

Oncoming trucks cannot reliably detect a truck with damaged or missing reflectors. As a result, collisions between the two trucks may occur.

- ▶ Do not drive in narrow aisles with damaged reflectors.
- ▶ Report any defects immediately to your supervisor.
- ▶ Have damaged or missing reflectors replaced by the manufacturer or a specialist approved by the manufacturer.

The following inspection points must be carried out in addition to the visual inspections and operations to be performed before starting daily operation – see page 220.

Requirements

– Park the truck securely, see page 314.

Check the reflectors in the load direction on the truck

Procedure

- Raise the operator position and secure it to prevent unintentional lowering, see page 714.
- Check the reflectors for the following:
  - Presence (position of reflectors, see page 428)
  - Contamination
  - Damage
- Clean any dirty reflectors.
- Remove the retaining bolts and fully lower the operator position, see page 714.
- Have damaged or missing reflectors replaced by the manufacturer or a specialist approved by the manufacturer.

Check the reflectors in the drive direction on the truck

Procedure

- Check the reflectors for the following:
  - Presence (position of reflectors, see page 428)
  - Contamination
  - Damage
- Clean any dirty reflectors.
- Have damaged or missing reflectors replaced by the manufacturer or a specialist approved by the manufacturer.

9.4 Description of various operational situations

⚠ WARNING!

Risk when driving the truck despite a protection field infringement (deactivation of the travel cut-off)

Travel cut-off deactivation is an additional function to ensure that the position of the truck can be adjusted despite a protection field infringement. However, this does not release the operator from the responsibility of bringing the truck to a halt in good time before it reaches any persons or obstacles.

▶ When the travel cut-off has been deactivated, apply greater concentration when operating the truck.

▶ Brake in good time before reaching the person or obstacle.

For information on operating the truck in the narrow aisle, see page 283.

9.4.1 Truck with the "collision protection" function entering the narrow aisle

– The "collision protection" function is not active.
– The operator does not yet receive assistance when operating the truck (e. g. when initiating the braking function to avoid colliding with obstacles).
– The travel speed is restricted to slow travel (2,5 km/h).

Wire-guided truck:
Once the industrial truck has acquired the guide wire and received a valid aisle signal via the transponders in the floor, the "collision protection" function is activated. The truck can now travel at the maximum enabled speed.

Rail-guided truck:
After the truck has received a valid aisle signal via the transponder in the floor, the "Collision protection" function is activated. The truck can now travel at the maximum enabled speed.

9.4.2 Truck with the "Collision Protection" Function leaving the Narrow Aisle

- The "collision protection" function is active in the entire narrow-aisle area when leaving the narrow aisle. The detection of persons or obstacles via the personal protection system results in the following truck behaviour:
  - In the event of an infringement of the collision protection field, the travel speed is reduced to slow travel (2,5 km/h).
  - In the event of an infringement of the protection field, the truck brakes to a halt (emergency stop).
- When the truck passes over the end of aisle safety device (route measurement, transponder, etc.) when driving towards the aisle end, the truck decelerates to slow travel speed (2,5 km/h). The truck can be driven out of the narrow aisle at this reduced speed.
  - In the event of an infringement of the protection field, the truck brakes to a halt (emergency stop).
- The "collision protection" function remains activated while exiting from a narrow aisle until the truck is no longer receiving a valid aisle signal or is no longer being wire-guided.
  - If the "collision protection" function is deactivated, the operator no longer receives assistance when operating the truck (e.g. when initiating the braking function to avoid colliding with obstacles).

➔ Protection field infringement: truck travel with the override button – see page 424.

9.4.3 Operation of several trucks with the "collision protection" function in narrow aisles

➔ **Wire-guided truck:**
Once the industrial truck has acquired the guide wire and received a valid aisle signal via the transponders in the floor, the "collision protection" function is activated. The truck can now travel at the maximum enabled speed.

➔ **Rail-guided truck:**
After the truck has received a valid aisle signal via the transponder in the floor, the "Collision protection" function is activated. The truck can now travel at the maximum enabled speed.

Behaviour of two oncoming trucks in the event of a collision protection field infringement (large distance between the trucks)

– The "collision protection field infringement" symbol flashes yellow on the driver's display.
– The truck is decelerated and subsequently restricted to slow travel (2,5 km/h).

➔ The truck can drive freely in the opposite direction with the maximum travel speed allowed for this narrow aisle. In this case, the "collision protection field infringement" symbol no longer appears on the driver's display.

Behaviour of two oncoming trucks in the event of a protection field infringement (short distance between the trucks)

– An audible warning is triggered.
– The "protection field infringement" symbol flashes red on the driver's display.
– The truck brakes to a halt (emergency stop).

➔ Protection field infringement: truck travel with the override button – see page 424.

➔ The truck can drive freely in the opposite direction with the maximum travel speed allowed for this narrow aisle. In this case, the "protection field infringement" symbol no longer appears on the driver's display. The audible warning also no longer sounds.

9.4.4 Travel in a Narrow Aisle open at one End only (Dead End) with the "Collision Protection" Function.

The truck with the "collision protection" function cannot differentiate between the wall or similar impediments in a dead end and persons, obstacles or other trucks.

The truck's behaviour with the "collision protection" function activated when driving towards the end of the dead end corresponds to the behaviour when two trucks are driving towards each other – see page 434.

9.4.5 Driving the truck with the "collision protection" function in narrow aisles when the laser scanner is covered up

– The load handler covers the laser scanner's scanning area in the load direction.
– The "collision protection field infringement (covered scanner)" symbol flashes yellow on the driver's display.
– The truck brakes to a halt.

➔ Protection field infringement: truck travel with the override button – see page 424.

➔ The truck can drive freely in the opposite direction with the maximum travel speed allowed for this narrow aisle. In this case, the "collision protection field infringement" symbol no longer appears on the driver's display.

9.4.6 Description of the additional symbols in the driver's display for the "collision protection" function

Symbol	Meaning	Colour	Function
	Collision protection field infringement	Flashing yellow	– Persons or obstacles are in the collision protection field of the personal protection system – see page 434. – The truck brakes. – The travel speed is restricted to slow travel (2,5 km/h).

Symbol	Meaning	Colour	Function
	Collision protection field infringement (covered scanner)	Yellow	– Persons or obstacles are in the collision protection field of the personal protection system – see page 434. – The truck brakes. – The travel speed is restricted to slow travel (2,5 km/h). Button below "collision protection field infringement (covered scanner)" symbol: – Overrides the protection function and enables slow travel (2,5 km/h) if there is sufficient distance from the obstacle. – Travel is controlled with the travel control knob – see page 424.
	Protection field infringement	Flashing red	– Persons or obstacles are in the protection field of the personal protection system – see page 434. – No release frequency for the stationary personal protection component. – The truck brakes to a halt. Press the button under the "protection field infringement" symbol: – Overrides the protection function and enables slow travel (2,5 km/h) if there is sufficient distance from the obstacle. – Travel is controlled with the travel control knob – see page 424.

10 Order picker - EKS

10.1 Truck with load guard and walk-on load (e.g. pallet, lattice box)

⚠ WARNING!

Risk of falling from the operator position during operation with walk-on pallets

Unsecured operators are at risk of falling from a raised operator position during truck operation. If the operator operates the truck without wearing a safety harness and safety rope that are attached to the overhead guard, the operator is considered to be unsecured.

- ▶ Truck without front guard or front gate:
  While operating the truck, operators must wear the safety harness and secure themselves to the overhead guard with the safety rope, see page 252. They must not operate the truck without wearing a safety harness.
- ▶ Truck with front gate:
  Observe the national regulations for wearing the safety harness with safety rope when operating a truck with front gate.
- ▶ Use only undamaged pallets of a suitable size to fit the pallet guard.
- ▶ Only walk on undamaged pallets with a pallet guard (○).
- ▶ Do not use one-way pallets as a walk-on surface.
- ▶ The ground conditions must be in good condition to ensure trouble-free operation.

⚠ WARNING!

Loads or objects in the operator position leg compartment

Loads or objects in the operator position leg compartment can impede the operation of controls in this area. For example, objects can accidentally activate or jam the controls.

Loads or objects protruding out of the perimeter of the operator position can collide with other components (e.g. racking systems) during operation. In the event of a collision, the operator in the operator position may be injured or the truck may be damaged.

Loads or objects also pose a trip hazard.

▶ Position loads or objects in the operator position such that there is no trip hazard and that the operation of controls in the leg compartment is not impeded.

▶ Ensure that loads or objects cannot protrude out of the operator position during operation.

▶ Secure loads or objects against slipping and falling.

NOTICE

Damage to the operator position due to heavy loads or objects leaning.

Heavy loads or objects can damage the following moving components in the operator positions:

- Control panel
- Gate
- Mechanical or hydraulic ramp

▶ Never lean loads or objects against the aforementioned components.

10.2 Order-picking platform without load handler option

The forklift trucks listed in this section cannot pick up the following loads as there is no fork carriage with fork arms mounted on the truck:
– Pallets
– Lattice boxes
– Order-picking boxes
– etc.

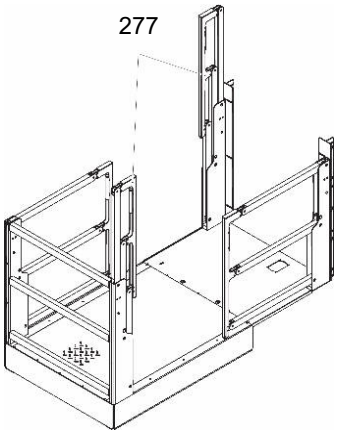
➔ The illustrations shown are examples and do not represent the equipment supplied.

Version A

– The stockpicking platform has a closed guard.
– The stockpicking platform can only be accessed from the truck.

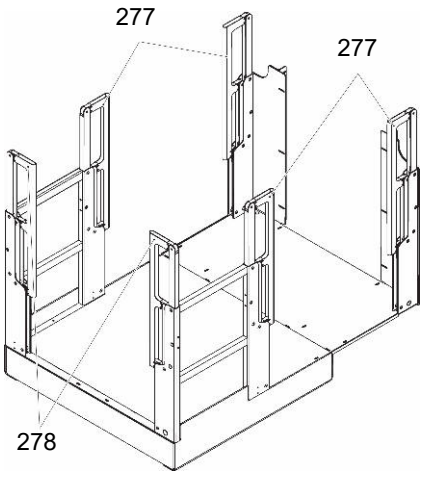
Version B

– The order-picking platform has a guard with side safety gates (277).
– The order picking platform can be walked on as follows:
  • From the truck.
  • Via the side safety gates (277) when the order-picking platform is lowered.



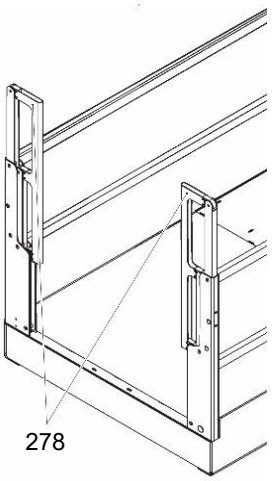
Version C

– The order-picking platform has a guard with side (277) and load side (278) safety gates.
– The order picking platform can be walked on as follows:
  • From the truck.
  • Via the side safety gates (277) when the order-picking platform is lowered.
  • Via the load-side safety gates (278) when the order-picking platform is lowered.



Version D

– The order-picking platform has a guard with load-side safety gates (278).
– The order picking platform can be walked on as follows:
  • From the truck.
  • Via the load-side safety gates (278) when the order-picking platform is lowered.

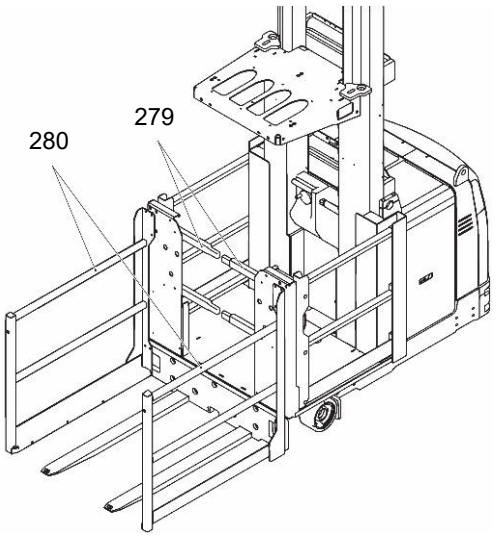


10.3 Order-picking platform with load handler option

➔ The illustrations shown are examples and do not represent the equipment supplied.

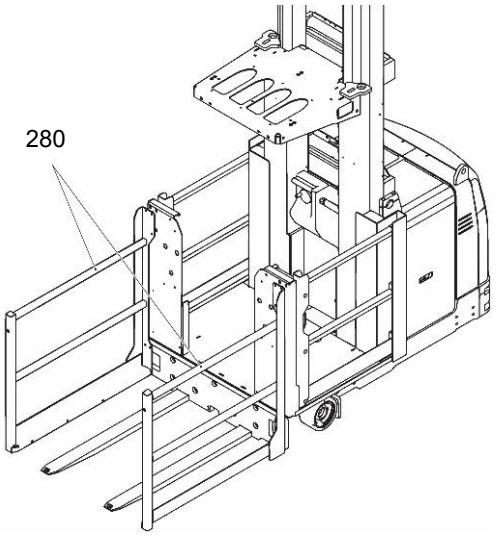
Version E

– The raised pallet can be accessed from the truck via the side gates (279) in the load direction.
– The raised pallet has a side guard (280) but is open at the front.



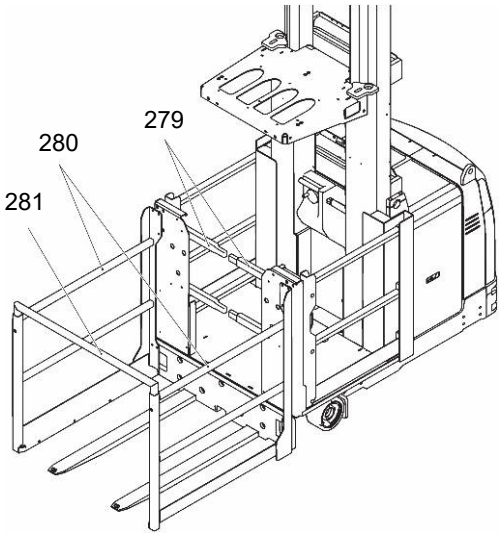
Version F

– The raised pallet can be accessed from the truck. The truck does not have any gates in the load direction.
– The raised pallet has a side guard (280) but is open at the front.



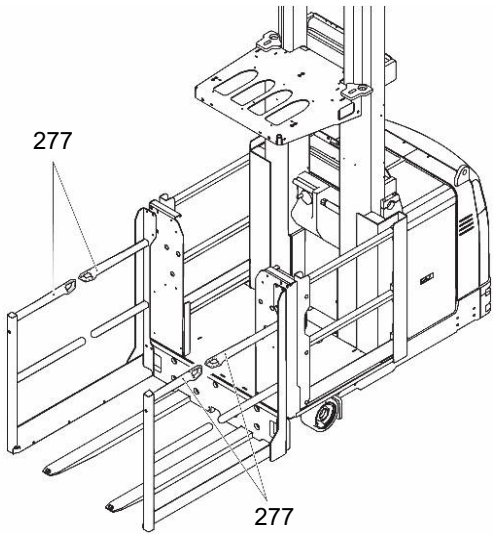
Version G

– The raised pallet can be accessed from the truck via the side gates (279) in the load direction.
– The raised pallet has a side guard (280) and a front guard (281).



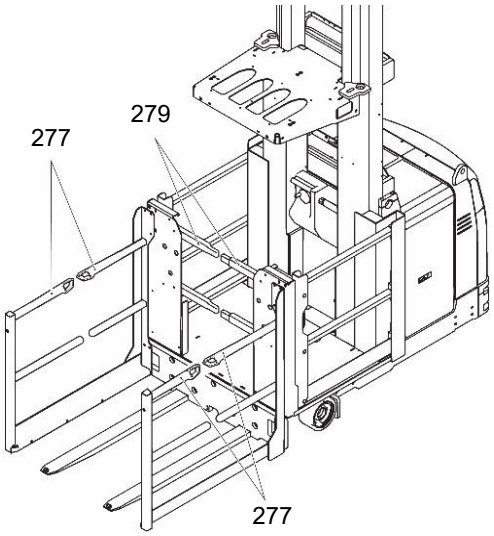
Version H

– The raised pallet can be accessed from the truck. The truck does not have any gates in the load direction.
– The pallet has side gates (277) but is open at the front.



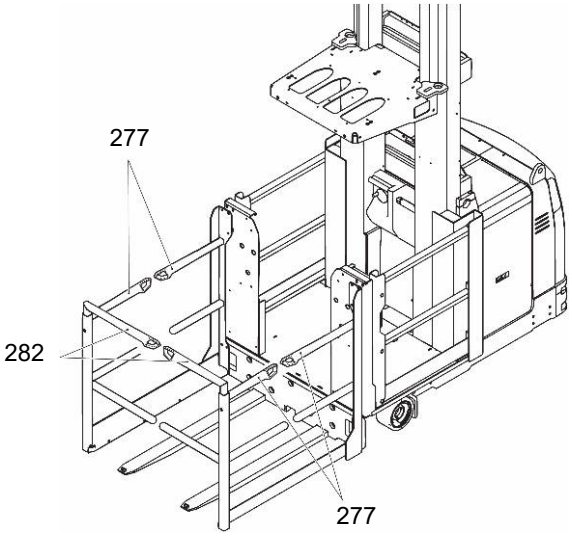
Version I

– The raised pallet can be accessed from the truck via the side gates (279) in the load direction.
– The pallet has side gates (277) but is open at the front.



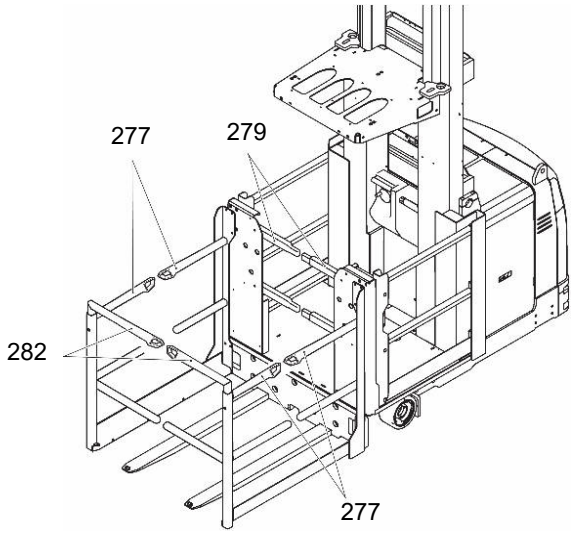
Version J

– The raised pallet can be accessed from the truck. The truck does not have any gates in the load direction.
– The pallet has side gates (277).
– There is an option for a front guard through the gates (282).



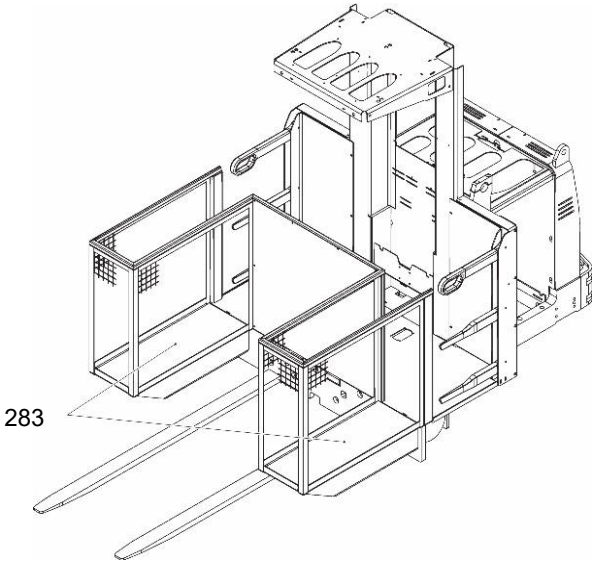
Version K

– The raised pallet can be accessed from the truck via the side gates (279) in the load direction.
– The pallet has side gates (277).
– There is an option for a front guard through the gates (282).



Version L

– The raised pallet cannot be accessed from the truck.
– The raised pallet can be reached through the operator position extension (283).



10.4 Order-picking platform with monitored and secure load handler option

⚠ WARNING!

Risk of falling when accessing an unapproved or unsecured load

If a load not approved by the operating company is picked up with the load handler, the load may not be properly secured with the corresponding load lock (e.g. clamp, claw, swing clamp). There is a risk of the load falling when the load handler is accessed and of the operator falling. This can result in fatal injuries.

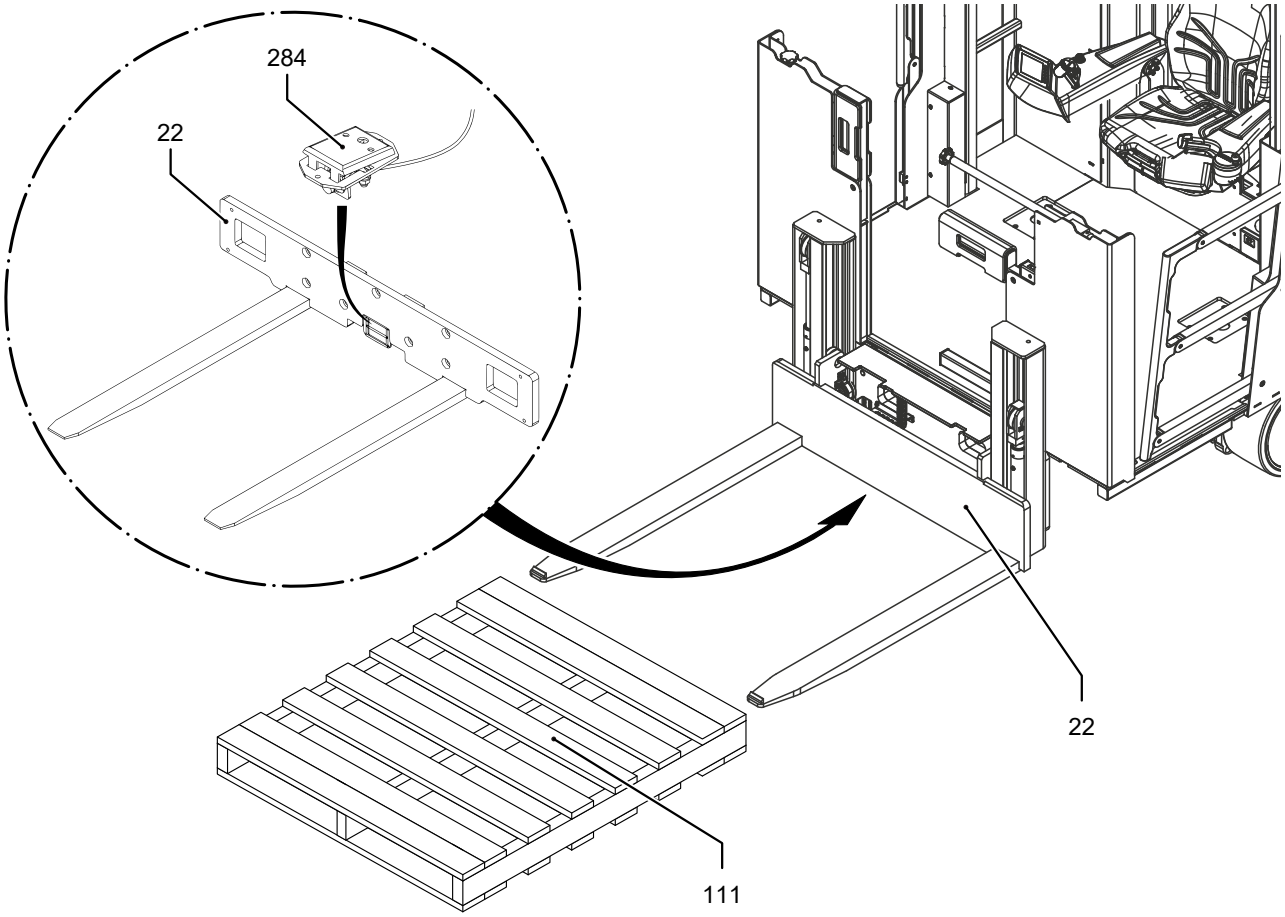
- ▶ Access only loads that have been approved by the operator for this application and have been approved for access.
- ▶ Access the load only if the load has been properly secured to the load handler with the load lock.
- ▶ Do not pick up or access damaged loads.

For example, the following loads may be approved for use by the operating company:

- Pallets
- Lattice boxes
- Order-picking boxes
- Load transport containers designed for the relevant requirement
- Etc.

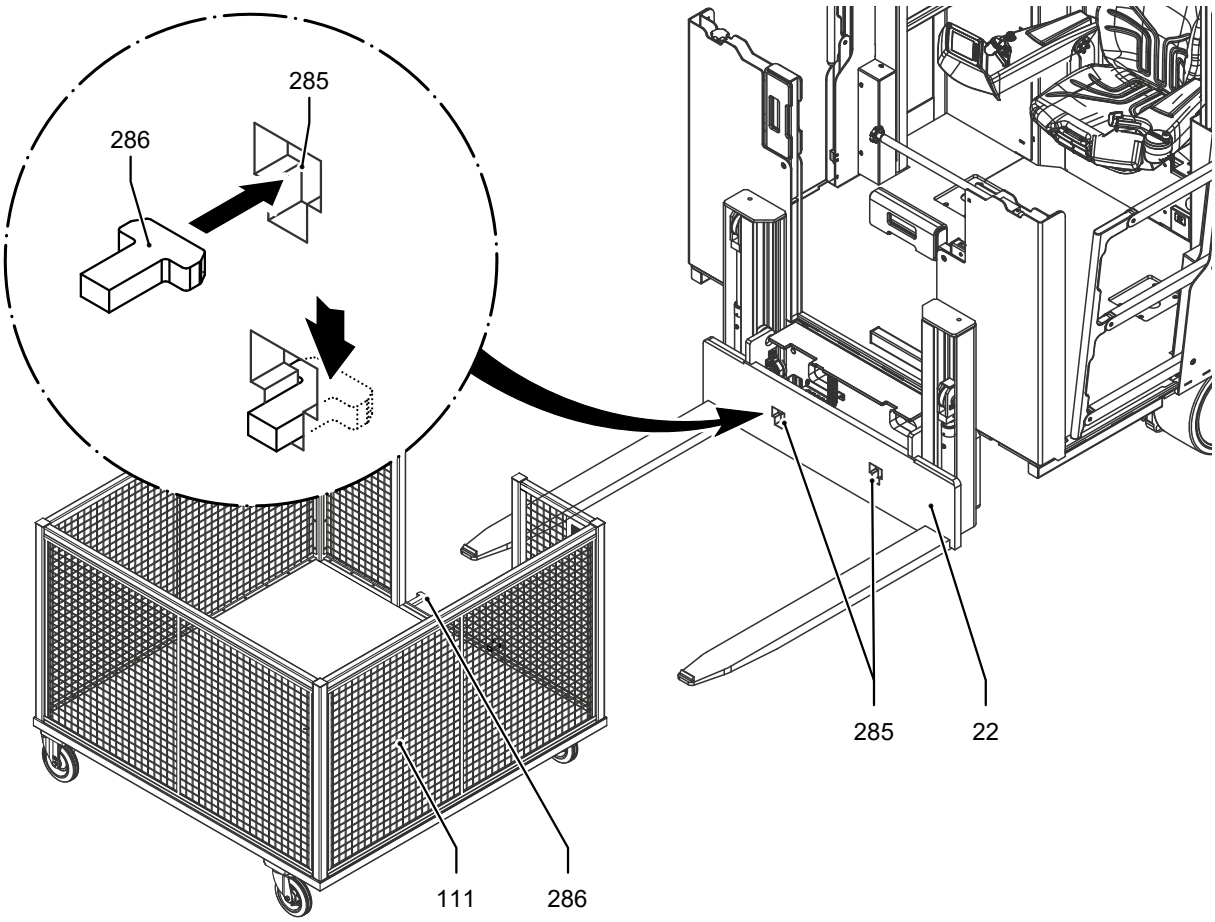
The illustrations shown are examples and do not represent the equipment supplied.

10.4.1 Load sensing of the picked-up pallet – without load lock



Description of load sensing:
- The raised load (111) is sensed by switches or non-contact sensors.
- Installation location of the "load sensing" switch or "load sensing" sensor (284):
  - The switch or sensor (284) is installed on the fork carriage (22).
- Function of the "load sensing" switch or "load sensing" sensor (284):
  - When a load (111) is present on the fork carriage (22), the switch or sensor (284) is actuated or switched.
  - For a description of the symbols shown additionally on the driver's display, see page 454.

10.4.2 Load lock – "mechanical lock (load / fork carriage) with load sensing" variant

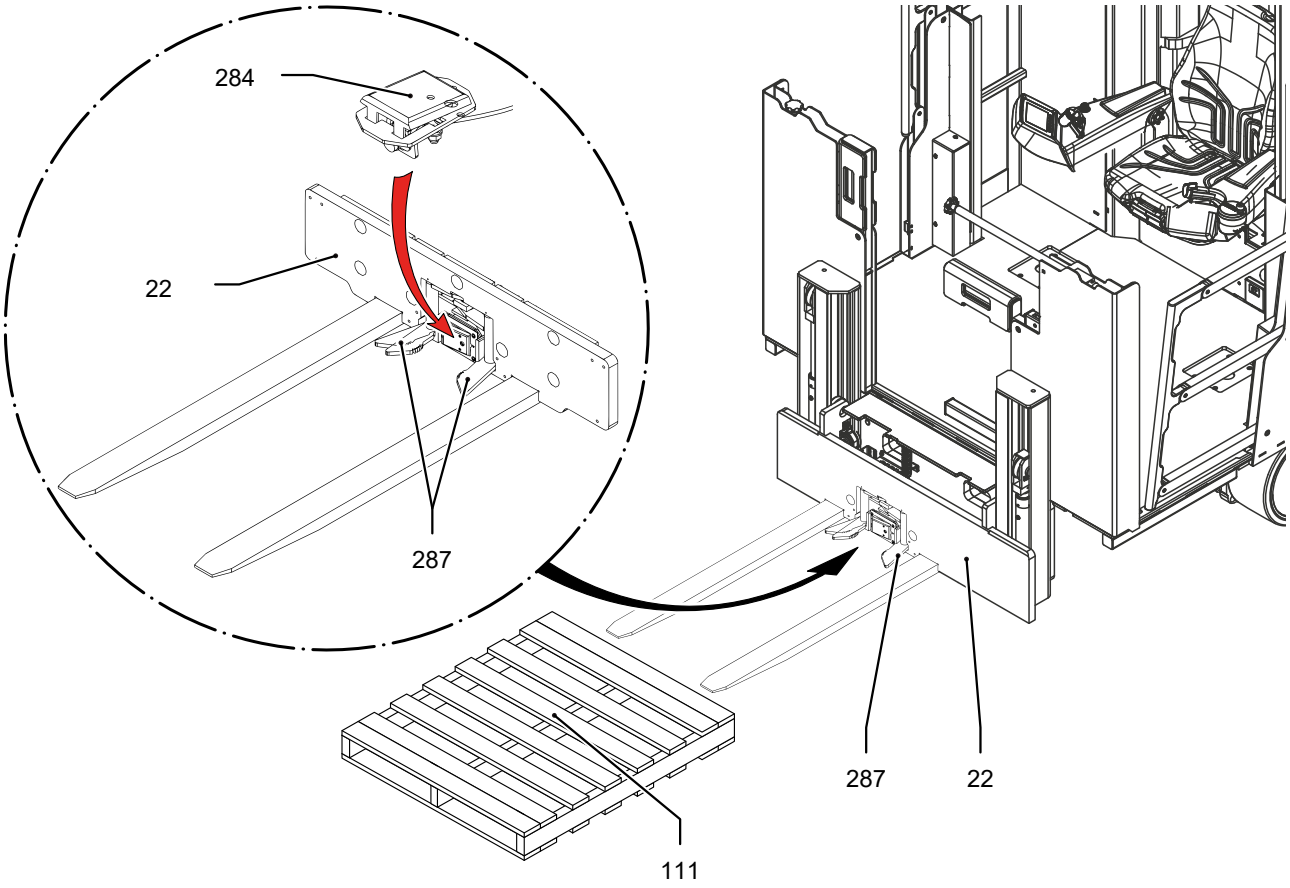


Description of the load lock:

- The load to be lifted (111) must have a stop bolt (286) for fastening (load securing) to the fork carriage (22).
- The fork carriage (22) of the industrial truck must have a recess (285 for load securing (locking) (285).
- The load to be lifted (111) is prevented from slipping in the following way:
  - The stop bolt (286) of the load (111) is positioned in the recess (285) of the fork carriage (22).
  - The fork carriage (22) has been raised slightly.

Description of load sensing:
- The lifted load (111) is sensed by switches or non-contact sensors.
- Installation location of the "load sensing" switch or "load sensing" sensor:
  - The "load sensing" switch or sensor is located on the fork carriage (22) behind the recess (285) for locking the load (111).
- Function of the "load sensing" switch or "load sensing" sensor:
  - The "load sensing" switch or sensor is actuated or switched if the following applies:
    The stop bolt (286) of the load (111) was guided through the recess (285) and the fork carriage (22) was raised slightly.
  - For a description of the symbols shown additionally on the driver's display, see page 454.

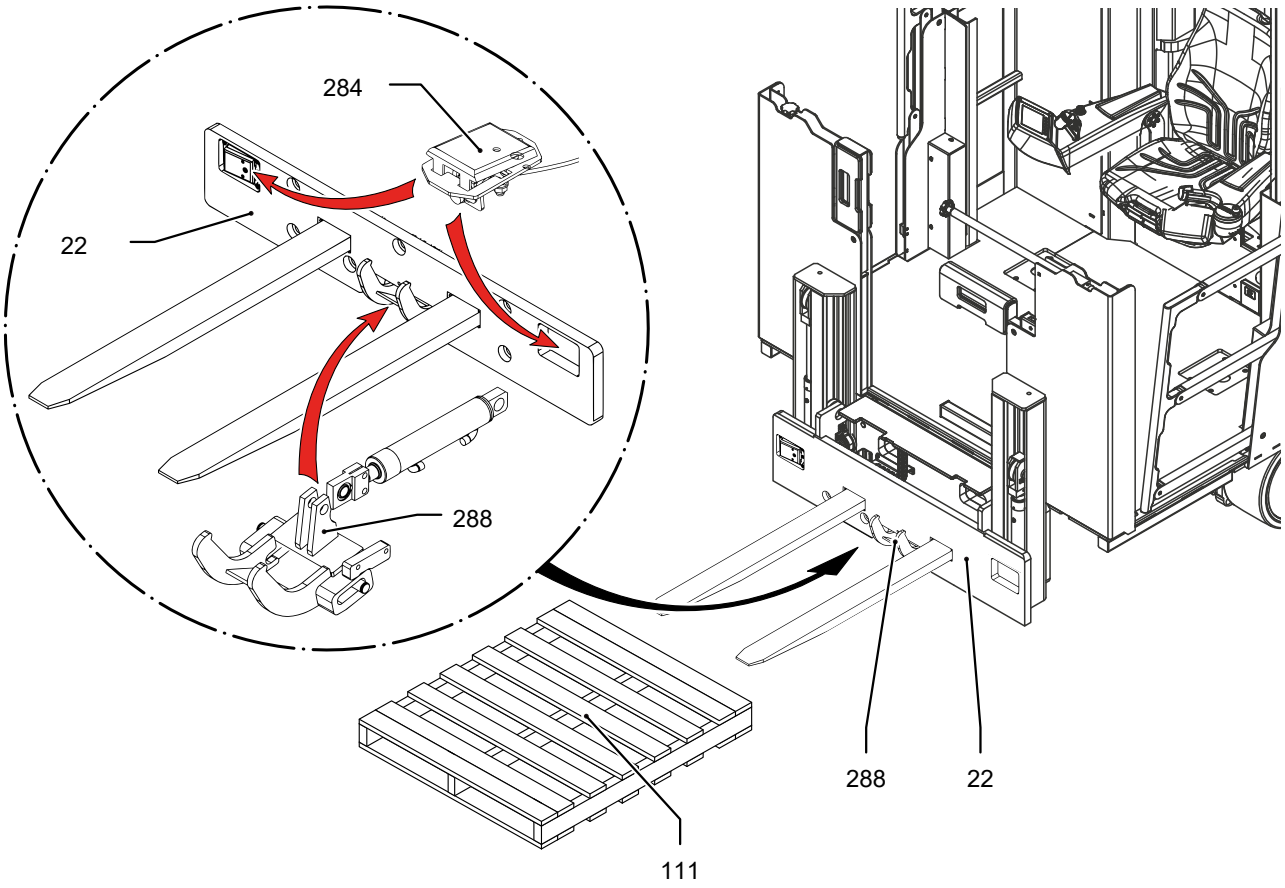
10.4.3 Load lock - "hydraulic clamp with load sensing" variant



Description of the clamp (287):
- The clamp (287) is opened and closed hydraulically. The clamp (287) is activated via the control unit.
- The clamp (287) is used to secure the raised load (111) on the load handler (22) to prevent slipping or falling.

Description of load sensing:
- The raised load (111) is sensed by switches or non-contact sensors.
- Installation location of the "load sensing" switch or "load sensing" sensor (284):
  - The switch or sensor (284) is installed on the fork carriage (22).
- Function of the "load sensing" switch or "load sensing" sensor (284):
  - When a load (111) is present on the fork carriage (22), the switch or sensor (284) is actuated or switched.
  - For a description of the symbols shown additionally on the driver's display, see page 454.

10.4.4 Load lock – "hydraulic claw with load sensing" variant



Description of the claw (288):
- The claw (288) is opened and closed hydraulically. The claw (288) is activated via the control unit.
- The claw (288) is used to secure the raised load (111) on the load handler (22) to prevent slipping or falling.

Description of load sensing:
- The raised load (111) is sensed by switches or non-contact sensors.
- Installation location of the "load sensing" switch or "load sensing" sensor (284):
  - The switch or sensor (284) is installed on the fork carriage (22).
- Function of the "load sensing" switch or "load sensing" sensor (284):
  - When a load (111) is present on the fork carriage (22), the switch or sensor (284) is actuated or switched.
  - For a description of the symbols shown additionally on the driver's display, see page 454.

10.5 Description of the function of the side and load-side safety gates

Depending on the use of the load handler, an open side or front safety gate is shown in the driver's display with the "close gate" symbol. When the symbol is displayed, the operator position can be raised up to the specified height of 1200 mm.

Order-picking platform	**Evaluation of the safety gates**
No load handler option (e.g. pallet, lattice box), see page 440	– The side safety gates are monitored. – There are no load-side safety gates installed.
Load handler option (e.g. pallet, lattice box), see page 442: – No load sensing option – No load securing option (e.g. locking clamp, claw)	– The side safety gates are monitored. – The load-side safety gates are monitored.
Monitored and secure load handler option (e.g. pallet, lattice box), see page 446: – Load sensing option – Load securing option (e.g. locking clamp, claw)	Load is **not** detected by the load sensor ("load sensor" switch is not actuated by the load): – The side safety gates are monitored. – The load-side safety gates are monitored.
	Load is detected by the load sensor ("load sensor" switch is actuated by the load): – The side safety gates are monitored. – The position of the load-side safety gates is not evaluated by the truck. – An open load-side safety gate is not shown in the driver's display.

Description of the "lift" function depending on the position of the safety gates

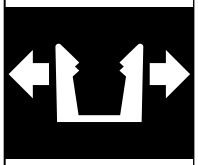
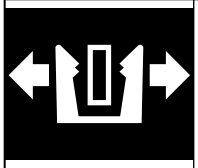
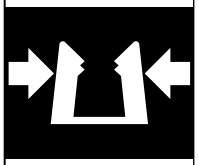
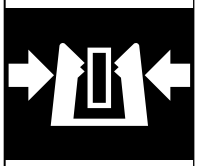
Gate	Meaning
– The side safety gates are closed. – The load-side safety gates are closed.	– The operator position can be raised up to the maximum lift height.
– At least one side gate is open. – The load-side safety gates are closed.	– The operator position can be raised up to the specified height of 1200 mm.
– The side safety gates are closed. – At least one load-side safety gate is open.	Load is **not** detected by the load sensor ("load sensor" switch is not actuated by the load): – No load was picked up with the load handler or the load was not picked up correctly with the load handler. – The operator position can be raised up to the specified height of 1200 mm.
	Load is detected by the load sensor ("load sensor" switch is actuated by the load): – The load was picked up correctly with the load handler. – The position of the load-side safety gates is not evaluated by the truck. – The operator position can be raised up to the maximum lift height.

➔ The specified operator position height can be set by the manufacturer's customer service department. However, the height must not exceed 1200 mm.

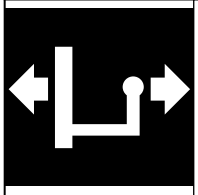
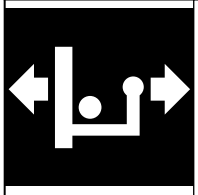
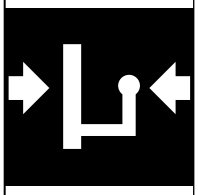
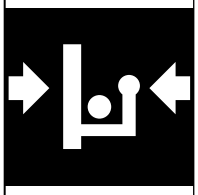
10.6 Additional symbols in driver's display

The following symbols are displayed depending on the truck's equipment:

Hydraulic clamp function symbols

Symbol	Meaning
	The clamp has been opened: – No load raised. – The load is **not** touching the fork carriage. – The clamp cannot be closed. – The button under the function symbol has no function.
	The clamp has been opened: – The load is touching the fork carriage. – The clamp can be closed by actuating the button under the function symbol.
	The clamp has been closed: – The load is **not** touching the fork carriage. – The load is not securely clamped. – The load must be properly picked up again – see page 462. – The clamp can be opened by actuating the button under the function symbol.
	The clamp has been closed: – The load is touching the fork carriage. – The closed locking clamp secures the load against slipping on the fork arms. – The load has been lifted correctly. – The clamp can be opened by actuating the button under the function symbol.

Hydraulic claw function symbols

Symbol	Meaning
	Claw is open: – No load raised. – The load is **not** touching the fork carriage. – The claw cannot be closed. – The button under the function symbol has no function.
	Claw is open: – The load is touching the fork carriage. – The claw can be closed by actuating the button under the function symbol.
	Claw is closed: – The load is **not** touching the fork carriage. – The load is not securely clamped. – The load must be correctly picked up again, see page 466. – The claw can be opened by actuating the button under the function symbol.
	Claw is closed: – The load is touching the fork carriage. – The closed claw prevents the load from slipping on the fork arms. – The load has been picked up correctly. – The claw can be opened by actuating the button under the function symbol.

10.7 Picking up or setting down the load using the load lock

⚠ WARNING!

Risk of falling from the operator position during operation with walk-on pallets

Unsecured operators are at risk of falling from a raised operator position during truck operation. If the operator operates the truck without wearing a safety harness and safety rope that are attached to the overhead guard, the operator is considered to be unsecured.

- ▶ Truck without front guard or front gate:
  While operating the truck, operators must wear the safety harness and secure themselves to the overhead guard with the safety rope, see page 252. They must not operate the truck without wearing a safety harness.
- ▶ Truck with front gate:
  Observe the national regulations for wearing the safety harness with safety rope when operating a truck with front gate.
- ▶ Use only undamaged pallets of a suitable size to fit the pallet guard.
- ▶ Only walk on undamaged pallets with a pallet guard (○).
- ▶ Do not use one-way pallets as a walk-on surface.
- ▶ The ground conditions must be in good condition to ensure trouble-free operation.

⚠ 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.

⚠ WARNING!

Risk of crushing when storing loads in or retrieving loads from racking systems

When storing loads in the racking system, the rack support bar may enter the contours of the operator position. If the operator does not brake the truck in a timely manner, there is a risk of the operator being crushed between the rack support bar and the operator position. This can result in fatal injuries. The same also applies when retrieving loads from the racking system.

- ▶ Do not store loads in racking systems with this truck.
- ▶ Do not retrieve loads from racking systems with this truck.

⚠ 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. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ Only transport loads that have been correctly secured and positioned. Take appropriate countermeasures if there is a risk of the load or parts of the load 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!

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).

⚠ WARNING!

Risk of falling when accessing an incorrectly raised load

If the load has not been correctly locked with the load lock (e.g. clamp, swing clamp) or is not resting fully on the load handler, there is a risk of the load falling when accessing the load handler and of the operator falling. This can result in fatal injuries.

▶ The load must be touching the fork carriage and be resting fully on the load handler.

▶ Access the load only if the load has been properly secured to the load handler with the load lock.

▶ Do not pick up or access damaged loads.

⚠ CAUTION!

Positioning or blocking the load handler or operator position

The lift chains may sag when positioning or blocking the load handler or operator position There is a risk of the load handler or operator position dropping suddenly once no longer supported or when the block is released. If the load handler or operator position drops suddenly, the lift chains or hydraulic hoses may become damaged.

- ▶ When lowering the load handler or operator position, ensure that the lift chains are not are slack.
- ▶ Retension the lift chains:
  Raise the load handler or operator position carefully until the lift chains are retensioned.
- ▶ When raising the load handler or the operator position, ensure that the hydraulic hoses are located in their guides.
- ▶ Check the cause of the block and rectify, if necessary.

NOTICE

Damage to the load lock and load when setting down

The load lock (e.g. clamp, claw, swing clamp) can be damaged when setting down the load. Lowering the load handler with a raised and secured load is inhibited below a lift height of 10 cm. The load handler can only be lowered further using the override button. This avoids damaging the load lock or the load.

▶Open the load lock before setting down the load.

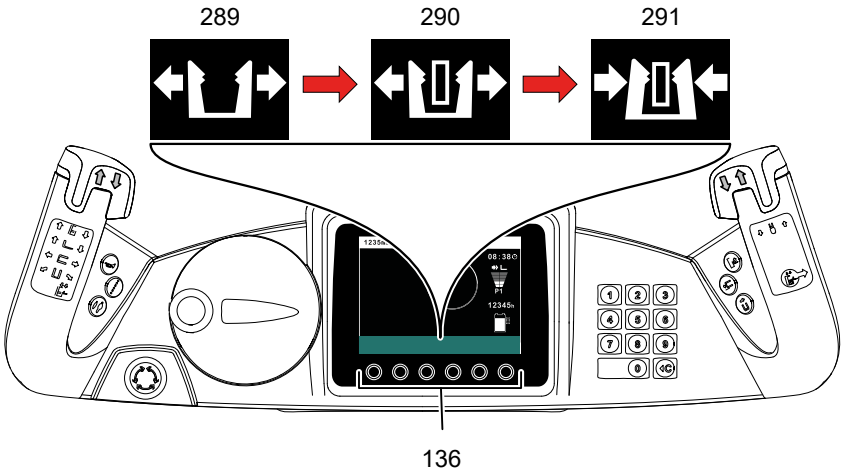
▶Override the lowering cut-off (○) if necessary – see page 358.

NOTICE

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.

10.7.1 Clamp – picking up or setting down the load

10.7.1.1 Raising a load



⚠ CAUTION!

Crushing hazard when picking up the load

When the load is picked up, there is a risk of crushing between the load and the fork carriage.

▶Do not place any part of your body between the load and fork carriage.

Requirements

– Truck operational – see page 265.
– Load to be picked up approved for this application by the operating company.
– Central web of the load to be picked up is the correct size and shape for the clamp.
– Fork spread set to the load to be picked up – see page 318.
– Load weight does not exceed the truck capacity.
– Clamp opened – see page 464.
The symbol (289) is displayed on the driver's display.

Procedure

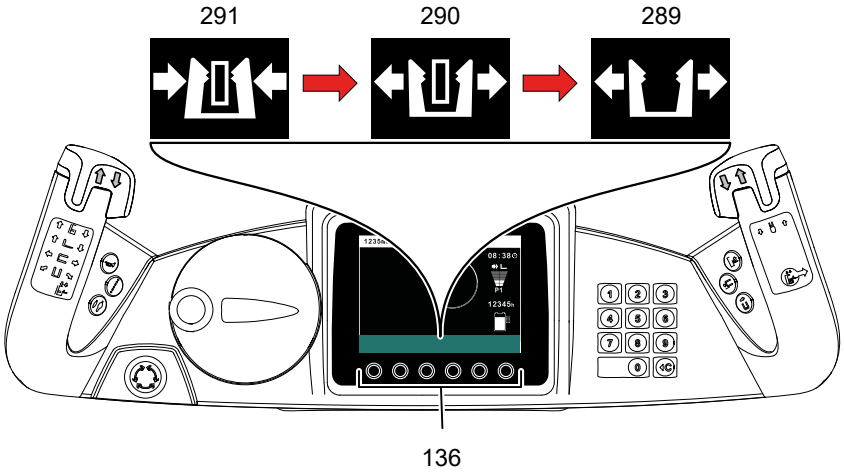
- Press the deadman button.
- Lower or raise the load handler in front of the load so that the load can be picked up.
- Drive the truck slowly up to the load.
- Insert the load handler slowly into the load until the following conditions are met:
  - The central web of the load is positioned in the clamp.
  - The load is touching the fork carriage.
  - The load activates the "load sensing" switch or sensor.

  The symbol (289) disappears and the symbol (290) appears on the driver's display.

➔ Rollable loads with a central web (e.g. lattice box, order-picking box) can also be pushed onto the load handler when the clamp is open.

- Raise the load handler until the load is resting on the load handler and is clear of the ground.
- Hold down the button (136) under the symbol (290) until the clamp is closed.
  The symbol (290) disappears and the symbol (291) appears on the driver's display. The load has been correctly lifted and is protected against slipping with the hydraulic clamp.
- Make sure you have a clear view and sufficient travel path in which to move.
- The load can now be transported with the truck.

10.7.1.2 Depositing a load



NOTICE

Damage to the load lock and load when setting down

The load lock (e.g. clamp, claw, swing clamp) can be damaged when setting down the load. Lowering the load handler with a raised and secured load is inhibited below a lift height of 10 cm. The load handler can only be lowered further using the override button. This avoids damaging the load lock or the load.

▶Open the load lock before setting down the load.

▶Override the lowering cut-off (○) if necessary – see page 358.

Requirements

– Truck operational – see page 265.
– Load (e.g. pallet, lattice box, order-picking box) has been correctly lifted – see page 462.
The symbol (291) is displayed on the driver's display.
– Storage location suitable for storing the load (dimensions and capacity).

Procedure

- Press the deadman button.
- Drive slowly up to the storage location.
- Raise or lower the load handler so that the load can enter the storage location (without colliding).
- Carefully move the load into its storage location.
- Carefully lower the load handler to a height of approx. 10 cm above the storage location.
- Hold down the button (136) under the symbol (291) until the clamp is opened.
The symbol (291) disappears and the symbol (290) appears on the driver's display.

NOTICE

Carefully lower the load handler to avoid damaging the load, the load handler and the storage location.

Avoid setting down the load suddenly.

- Carefully lower the load handler until the load handler is clear of the load.
The load is resting on the storage location.
- Ensure that you can see behind you and that you have sufficient travel path in which to move.

- Carefully remove the load handler from the load.
  The symbol (290) disappears and the symbol (289) appears on the driver's display.

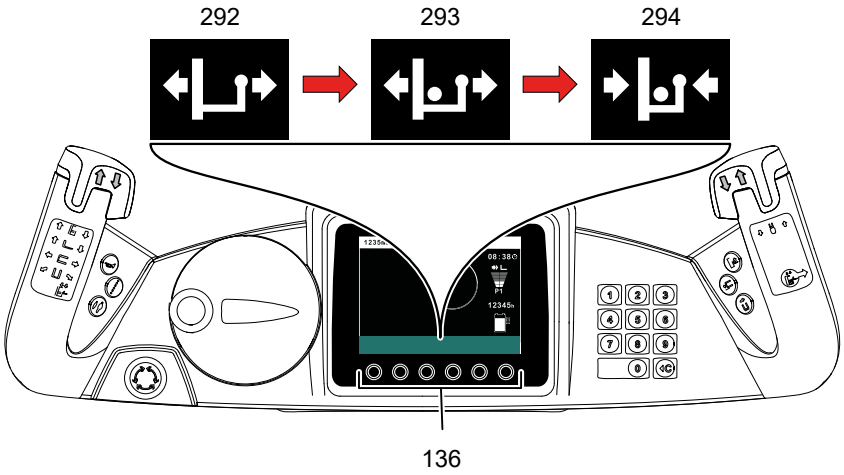
➔ Rollable loads (e.g. lattice box, order-picking box) can also be pushed by the load handler when the clamp is open.

- Fully lower the load handler.

The load has been deposited correctly.

10.7.2 Claw – picking up or setting down the load

10.7.2.1 Raising a load



⚠ CAUTION!

Crushing hazard when picking up the load

When the load is picked up, there is a risk of crushing between the load and the fork carriage.

▶Do not place any part of your body between the load and fork carriage.

Requirements

– Truck has been prepared for operation, see page 265.
– Load to be picked up approved for this application by the operating company.
– The load to be picked up is the correct size and shape for the clamp.
– Fork spread set to the load to be picked up, see page 318.
– The load weight does not exceed the truck capacity.
– Claw open, see page 468.
  The symbol (292) is displayed on the driver's display.

Procedure

- Press the deadman switch.
- Lower or raise the load handler in front of the load so that the load can be picked up.
- Drive the truck carefully up to the load.
- Insert the load handler slowly into the load until the following conditions are met:
  - The load is touching the fork carriage.
  - The load activates the "load sensing" switch or sensor.

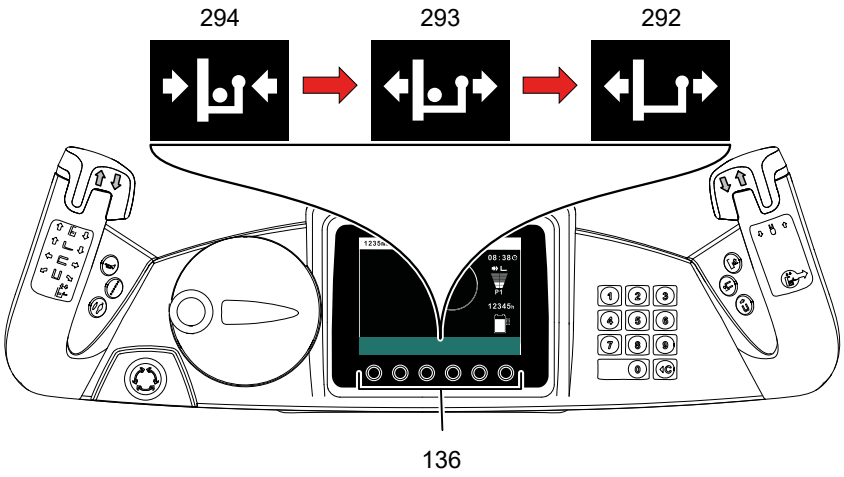
  The symbol (292) disappears and the symbol (293) appears on the driver's display.

➔ Rollable loads (e.g. lattice box, order-picking box) can also be pushed onto the load handler when the claw is open.

- Raise the load handler until the load is resting on the load handler and is clear of the ground.
- Hold down the button (136) under the symbol (293) until the claw is closed.

  The symbol (293) disappears and the symbol (294) appears on the driver's display. The load has been correctly lifted and is prevented from slipping with the hydraulic claw.
- Ensure that you have a clear view and a clear travel path.
- The load can now be transported with the truck.

10.7.2.2 Depositing a load



NOTICE

Damage to the load lock and load when setting down

The load lock (e.g. clamp, claw, swing clamp) can be damaged when setting down the load. Lowering the load handler with a raised and secured load is inhibited below a lift height of 10 cm. The load handler can only be lowered further using the override button. This avoids damaging the load lock or the load.

▶Open the load lock before setting down the load.

▶Override the lowering cut-off (○) if necessary – see page 358.

Requirements

– Truck has been prepared for operation, see page 265.
– Load (e.g. pallet, lattice box, order-picking box) has been correctly lifted, see page 466.
The symbol (294) is displayed on the driver's display.
– Storage location suitable for storing the load (dimensions and capacity).

Procedure

- Press the deadman switch.
- Drive slowly up to the storage location.
- Raise or lower the load handler so that the load can enter the storage location (without colliding).
- Carefully move the load into its storage location.
- Carefully lower the load handler to a height of approx. 10 cm above the storage location.
- Hold down the button (136) under the symbol (294) until the claw is open.
The symbol (294) disappears and the symbol (293) appears on the driver's display.

NOTICE

Carefully lower the load handler to avoid damaging the load, the load handler and the storage location.

Avoid setting down the load suddenly.

- Carefully lower the load handler until the load handler is clear of the load.
The load is resting on the storage location.
- Ensure that you have a clear view to the rear and a clear travel path.

- Carefully remove the load handler from the load.
  The symbol (293) disappears and the symbol (292) appears on the driver's display.

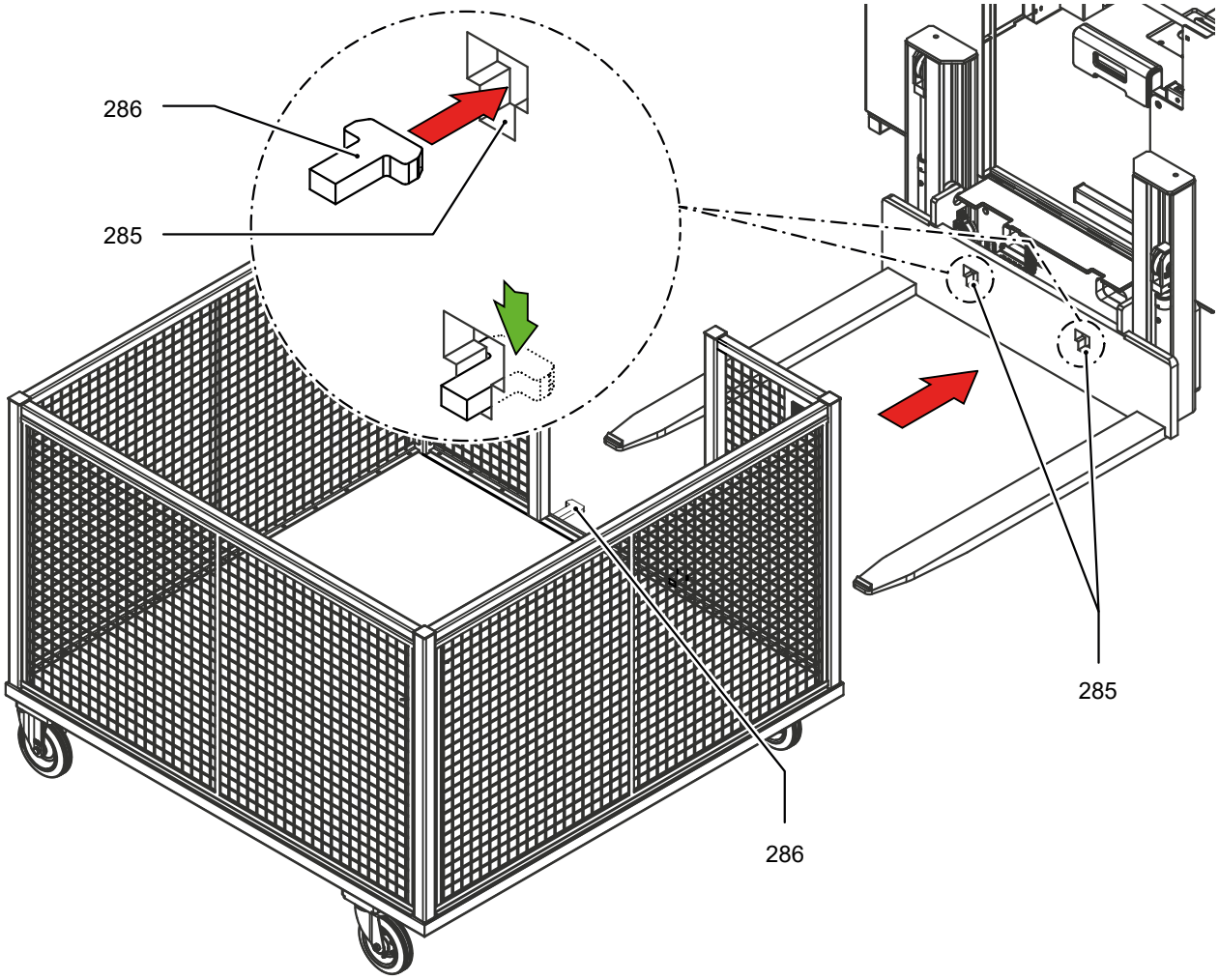
➔ Rollable loads (e.g. lattice box, order-picking box) can also be traversed by the load handler when the claw is open.

- Fully lower the load handler.

The load has been set down correctly.

10.7.3 Mechanical lock (load / fork carriage) – picking up or setting down the load

10.7.3.1 Raising a load



⚠ CAUTION!

Crushing hazard when picking up the load

When the load is picked up, there is a risk of crushing between the load and the fork carriage.

▶Do not place any part of your body between the load and fork carriage.

Requirements

– Truck has been prepared for operation, see page 265.
– Load to be picked up approved for this application by the operating company.
– The stop bolt (286) of the load to be picked up is the right size and shape for the fork carriage.
– Fork spread set to the load to be picked up, see page 318.
– The load weight does not exceed the truck capacity.

Procedure

➔ The load to be picked up must have a stop bolt (286) for locking the pallet. The recesses (285) for securing pallets (285) must be located in the load handler of the industrial truck.

- Press the deadman switch.

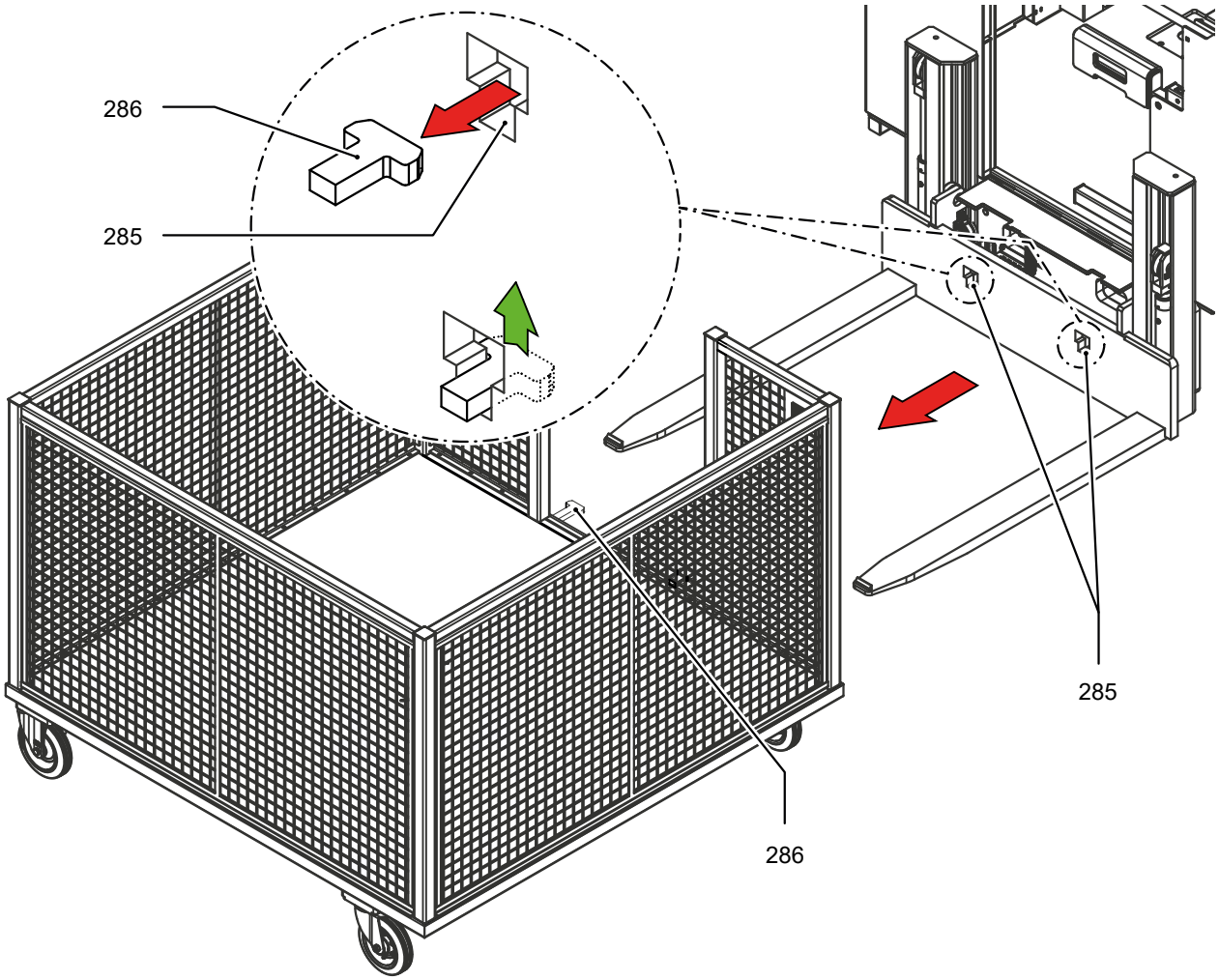
- Lower or raise the load handler in front of the load so that the load can be picked up.
- Drive the truck carefully up to the load.
- Insert the load handler slowly into the load until the following conditions are met:
  - The load is touching the fork shanks.
  - The stop bolt (286) is located in the respective recess (285) of the load handler.
  - The stop bolt (286) is resting against the "load sensing" sensor (○).

➔ Rollable loads (e.g. lattice box, order-picking box) can also be traversed onto the load handler when the load handler is lowered.

- Raise the load handler until the load is resting on the load handler and is clear of the ground.

  The load has been correctly lifted and is protected against slipping with the mechanical lock (285|286).
- Ensure that you have a clear view and a clear travel path.
- The load can now be transported with the truck.

10.7.3.2 Depositing a load



NOTICE

Damage to the load lock and load when setting down

When setting down the load, damage may occur to the load lock (e.g. stop bolts, recesses in the load handler). Lowering the load handler with a raised and secured load is inhibited below a lift height of 10 cm. The load handler can only be lowered further using the override button. This ensures that the mechanical locks (286| 285) between the industrial truck and the load are not accidentally disconnected. Furthermore, damage to the load lock or the load is avoided.

▶Lowering cut-off, see page 358.

Requirements

– Truck has been prepared for operation, see page 265.
– Load (e.g. pallet, lattice box, order-picking box) has been correctly lifted, see page 470.
– Storage location suitable for storing the load (dimensions and capacity).

Procedure

- Press the deadman switch.
- Drive slowly up to the storage location.
- Raise or lower the load handler so that the load can enter the storage location (without colliding).
- Carefully move the load into its storage location.

NOTICE

Carefully lower the load handler to avoid damaging the load, the load handler and the storage location.

Avoid setting down the load suddenly.

- Carefully lower the load handler until the following conditions are met:
  - The load no longer rests on the forks.
  - The stop bolts (286) can be pulled out of the respective recess (285) of the load handler.

  The load has been set down correctly. The mechanical lock (285|286) is released.
- Ensure that you have a clear view to the rear and a clear travel path.
- Carefully remove the load handler from the load.

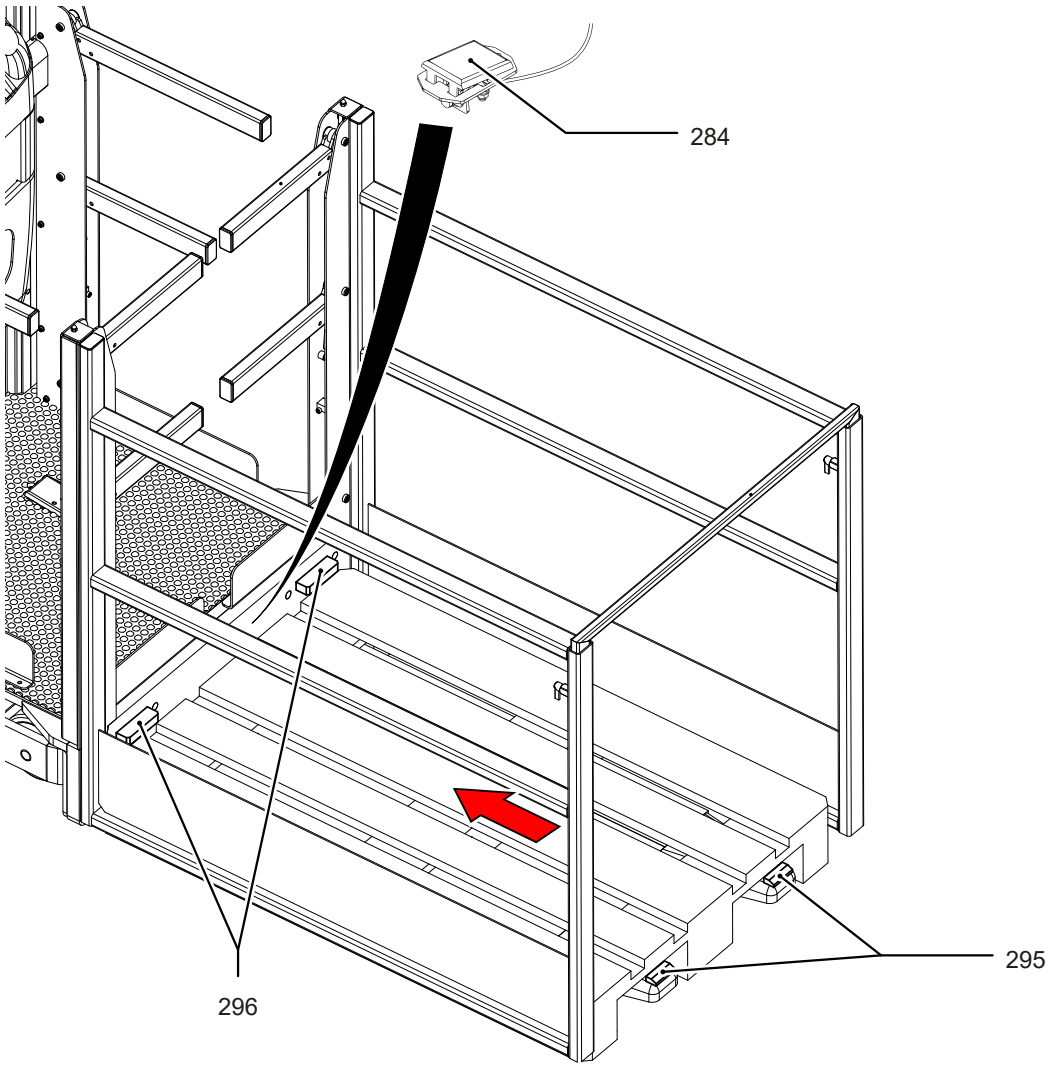
➔ Rollable loads (e.g. lattice box, order-picking box) can also be traversed by the load handler when the mechanical lock (285|286) is released.

- Fully lower the load handler.

The load has been set down correctly.

10.7.4 Mechanical lock (fork arms) – picking up or setting down the load

10.7.4.1 Raising a load



⚠ CAUTION!

Crushing hazard when picking up the load

When the load is picked up, there is a risk of crushing between the load and the fork carriage.

▶Do not place any part of your body between the load and fork carriage.

Requirements

– Truck has been prepared for operation, see page 265.
– Load to be picked up approved for this application by the operating company.
– The load to be picked up is the correct size and shape for the load handler.
– Fork spread set to the load to be picked up, see page 318.
– The load weight does not exceed the truck capacity.

Procedure

- Press the deadman switch.
- Lower or raise the load handler in front of the load so that the load can be picked up.
- Drive the truck carefully up to the load.

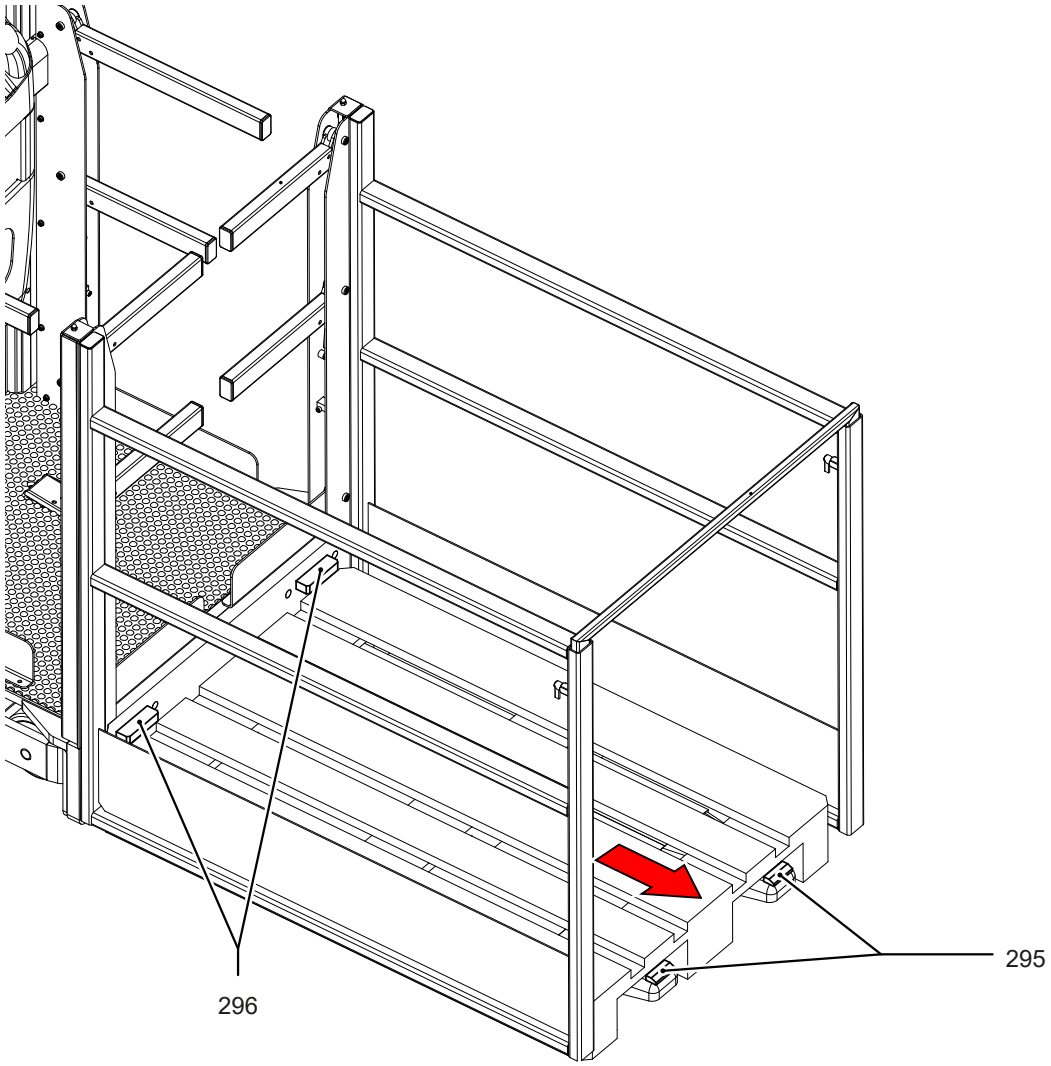
- Insert the load handler slowly into the load until the following conditions are met:
  - The load is touching the fork shanks. If present, the load is located under the optional tilt safety devices (296).
  - The load is behind the anti-slip mechanisms (295).
  - The load activates the "load sensing" switch (284) (○).

  The load has been picked up correctly.

➔ Rollable loads (e.g. lattice box, order-picking box) can also be traversed onto the load handler when the load handler is lowered.

- Raise the load handler until the load is resting on the load handler and is clear of the ground.
- Ensure that you have a clear view and a clear travel path.
- The load can now be transported with the truck.

10.7.4.2 Depositing a load



Requirements

– Truck has been prepared for operation, see page 265.
– Load (e.g. pallet, lattice box, order-picking box) has been correctly lifted, see page 474.
– Storage location suitable for storing the load (dimensions and capacity).

Procedure

- Press the deadman switch.
- Drive slowly up to the storage location.
- Raise or lower the load handler so that the load can enter the storage location (without colliding).
- Carefully move the load into its storage location.

NOTICE

Carefully lower the load handler to avoid damaging the load, the load handler and the storage location.

Avoid setting down the load suddenly.

- Carefully lower the load handler until the load handler is clear of the load.
  The load is resting on the storage location.

NOTICE

When reversing, ensure that the goods are not damaged or caused to fall down by the front guard.

- Ensure that you have a clear view to the rear and a clear travel path.
- Carefully remove the load handler from the load.

➔ Rollable loads (e.g. lattice box, order-picking box) can also be traversed by the load handler when the load handler is lowered.

- Fully lower the load handler.

The load has been set down correctly.

10.8 Lifting or Lowering the Auxiliary Lift (○)

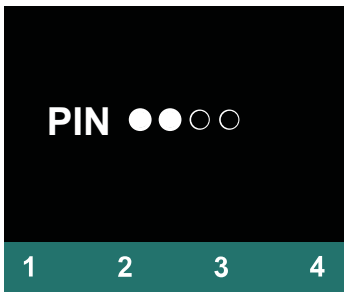
➔ For details of how to operate the Aux. Lift refer to "Auxiliary lift raise/lower", see page 296.

– Without a raised picking box the load handler can be raised approx. 450 mm with the auxiliary lift.
– With a raised and locked picking box, raising of the auxiliary lift is inhibited when it reaches the seamless transition from the operator position to the pallet / picking box.

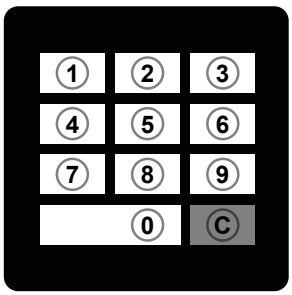
11 Optional Equipment

11.1 Keyless Access System

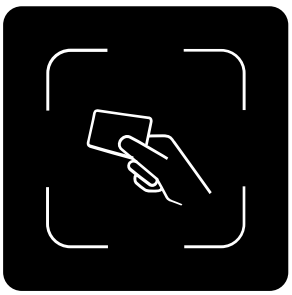
The keyless access system allows an individual code to be allocated to each operator or group of operators.



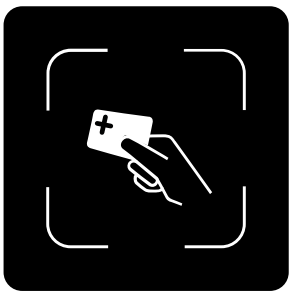
297



298



299



300

Item	Description
297	Display unit (EasyAccess Softkey): – Description – see page 482. – Entry of 4-digit set-up codes. – Entry of 4-digit access codes. – Up to 10 access codes can be stored. – For set-up and access codes comprising the numbers 1 to 4.
298	Keypad (EasyAccess PinCode): – Description – see page 487. – Comprising keys 0 to 9 and C (clear). – Entry of 4-digit set-up codes. – Entry of 4-digit access codes. – Up to 100 access codes can be stored.
299	Transponder reader (EasyAccess Transponder): – Description – see page 492. – Up to 100 transponders can be stored.
300	Transponder reader Plus: – The transponder reader Plus supports additional transponder standards.

Operation of transponder reader Plus (300) corresponds to the operation of the standard transponder reader (299).

11.2 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: 2-4-1-2

➔ 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.

11.3 Keyless access system - 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.

11.3.1 Activating the keypad

Procedure

- Release the emergency disconnect switch, see page 275.
- Enter the default code 1-2-3-4 using the keys below the display unit (297).

  The truck is switched on.
- Press the key below the "Settings" symbol (301).
- Press the key below the "Change set-up code" symbol (302).
- Enter the set-up code 2-4-1-2 using the keypad (298).

  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 (303).

The set-up code is deleted.

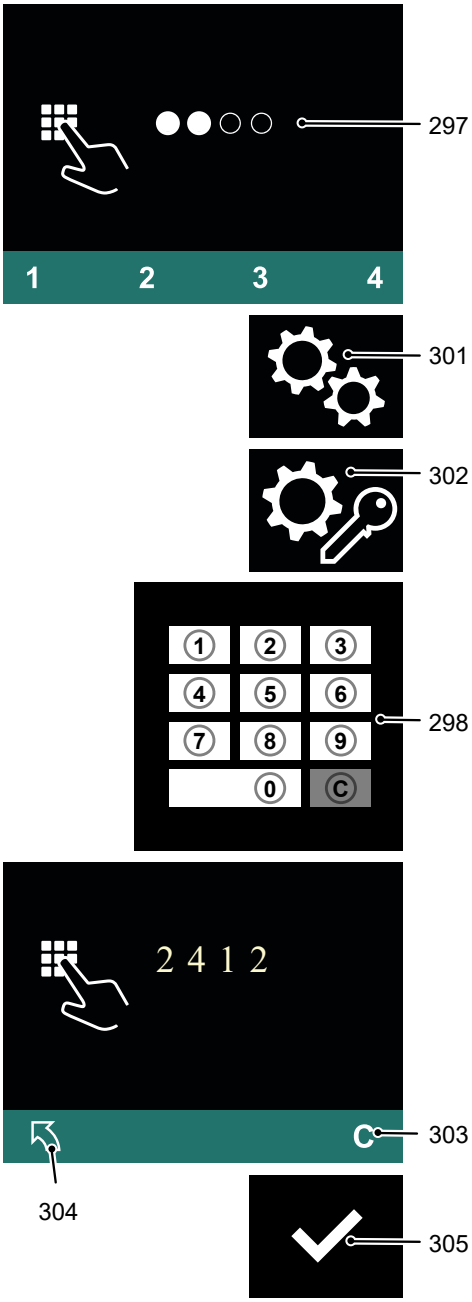
- Enter the new set-up code using the keypad (298).
- Press the key below the "Confirm" symbol (305).

  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 (303).

- To return to the main menu, press the key below the "Back" symbol (304).
- Delete the default code, see page 490.
- Create access codes, see page 489.

The keypad is active.



11.3.2 Activating the transponder reader

Procedure

- Release the emergency disconnect switch, see page 275.
- Enter the default code 1-2-3-4 using the keys below the display unit (297).

  The truck is switched on.
- Press the key below the "Settings" symbol (301).
- Press the key below the "Change set-up code" symbol (302).
- Enter the set-up code 2-4-1-2 using the keys below the display unit (297).

  The set-up code entered is displayed.
- Press the key below the "Delete" symbol (303).

  The set-up code is deleted.
- Hold a transponder in front of the transponder reader (299).

  This transponder thus becomes the set-up transponder.
- Press the key below the "Confirm" symbol (305).

  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 (303).

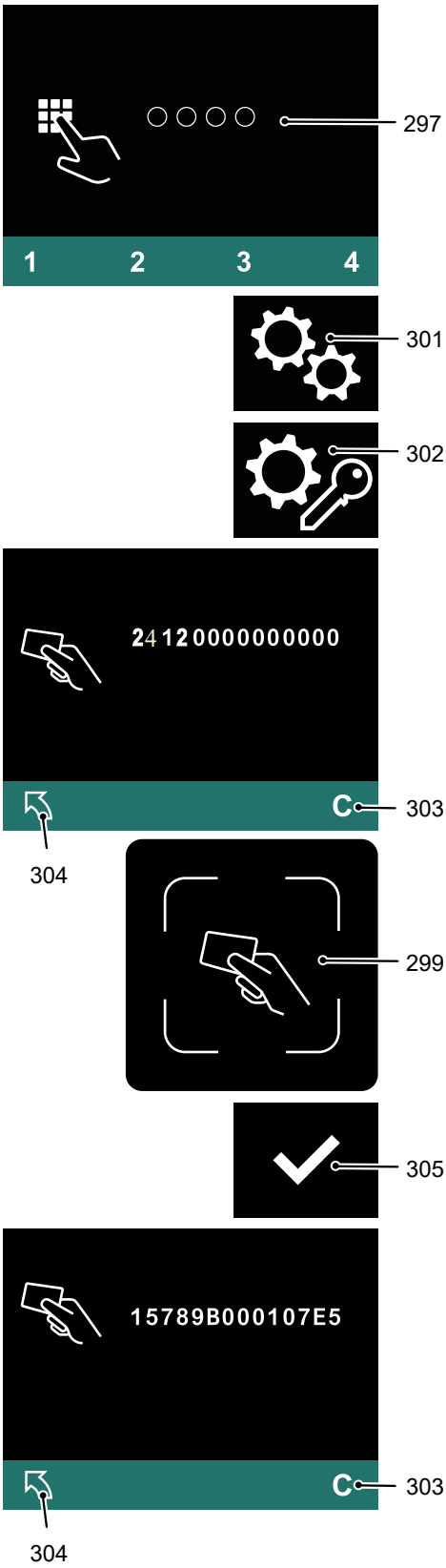
- To return to the main menu, press the key below the "Back" symbol (304).

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

Delete the default code, see page 495.

- Add new transponders, see page 494.

The transponder reader is now active.



11.4 Keyless access system - display unit

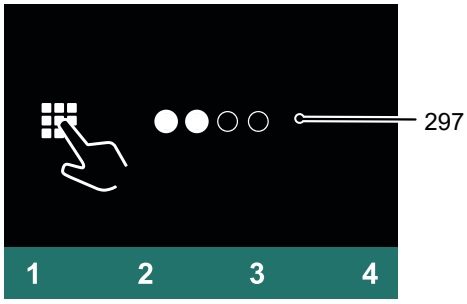
11.4.1 Switching on the truck with an access code

Requirements

– Emergency disconnect switch not pressed, see page 275.

Procedure

- Enter the access code using the button below the display (297).

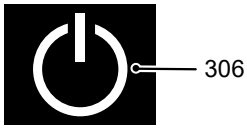


The truck is switched on.

11.4.2 Switching off the truck

Procedure

- Press the button under the "switch off" symbol (306) displayed on the driver's display on the display unit.



The login screen appears on the driver's display. The truck is in standby mode. The truck can be started again using a valid transponder.

No travel or hydraulic operations can be carried out in standby mode. No referencing of the hydraulic system and height indicator is necessary when the truck is in standby mode and switched back on.

- Press the button under the "switch off" symbol (306) again.

The travel operation is terminated. The truck is switched off.

- Press the emergency disconnect switch – see page 275.

11.4.3 Changing the set-up code

Requirements

– The truck is switched on, see page 487.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Change set-up code" symbol (302).
- Enter the set-up code using the keys below the display unit (297).

  The set-up code entered is shown as filled-in circles.
- Press the key below the "Delete" symbol (303).

  The set-up code is deleted.
- Enter the new set-up code using the keys below the display unit (297).

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

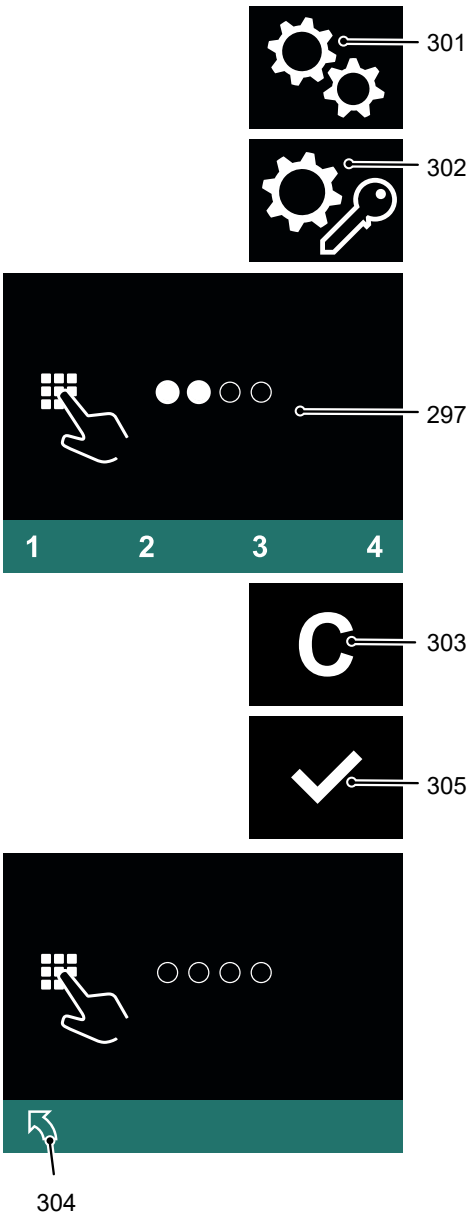
- Press the key below the "Confirm" symbol (305).

  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 (304).

The set-up code has been changed.



11.4.4 Adding a new access code

Requirements

– The truck is switched on, see page 487.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Edit access code" symbol (307).

  The set-up code is requested.
- Enter the set-up code using the keys below the display unit (297).

  All the access codes are displayed.
- Press the key below the "Add" symbol (308).
- Enter the new access code using the keys below the display unit (297).

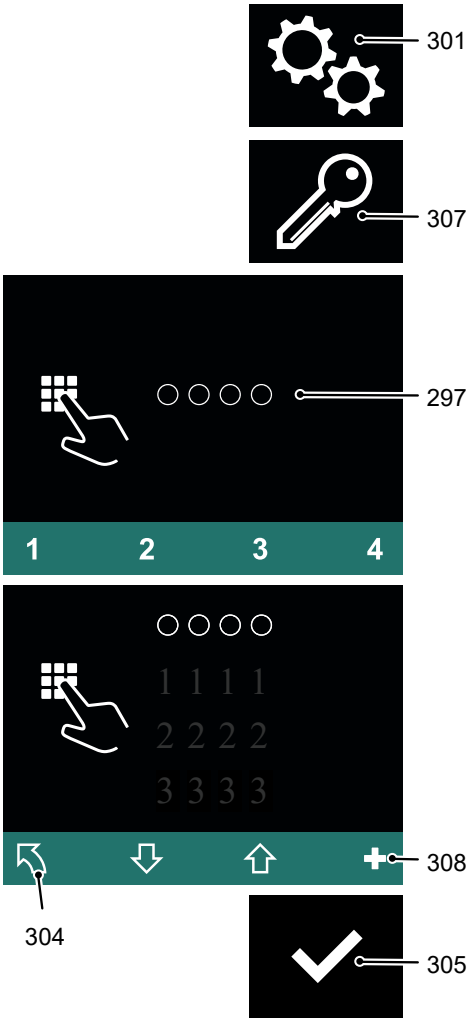
  The new access code must be different from existing access codes.
- Press the key below the "Confirm" symbol (305).

  The new access code is displayed.

  If the new access code has been entered incorrectly, delete it, see page 490, and add an access code again.

  To return to the main menu, press the key below the "Back" symbol (304).

A new access code has been added.



11.4.5 Deleting an access code

Requirements

– The truck is switched on, see page 487.

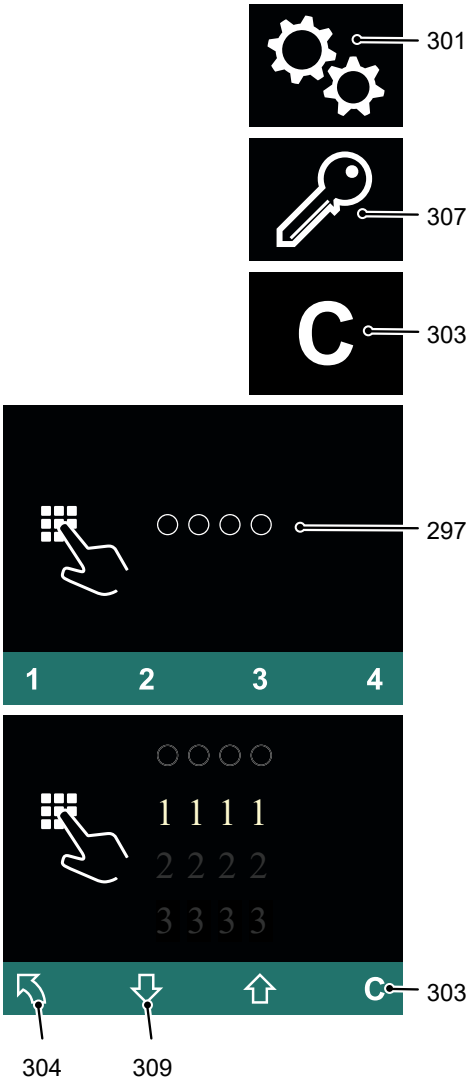
Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Edit access code" symbol (307).

  The set-up code is requested.
- Enter the set-up code using the keys below the display unit (297).

  All the access codes are displayed.
- Select the access code to be deleted using the key below the "Down selection" symbol (309).
- Press the key below the "Delete" symbol (303).

  The access code has been deleted.
- To return to the main menu, press the key below the "Back" symbol (304).



11.4.6 Displaying the log-in history

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

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

Requirements

– The truck is switched on, see page 482.

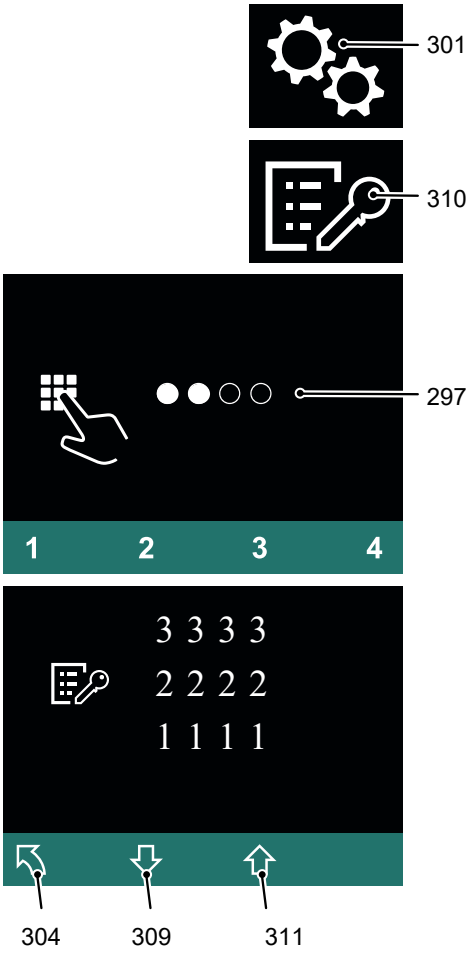
Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Log-in process" symbol (310).
- Enter the set-up code using the keys below the display unit (297).

  The set-up code entered is shown as filled-in circles.
- To scroll forward, press the button under the "Down selection" symbol (309) as many times as necessary.

  The display area moves: Additional earlier log-ins are displayed.
- To scroll back, press the button under the "Up selection" symbol (311) as many times as necessary.

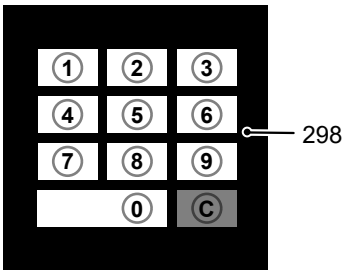
  The display area moves: More recent log-ins are displayed.
- To return to the main menu, press the key below the "Back" symbol (304).



The log-in process is displayed.

11.5 Keyless access system - keypad

11.5.1 Switching on the truck with an access code



Requirements

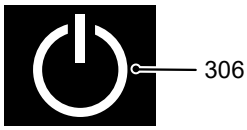
– Emergency disconnect switch not pressed, see page 275.

Procedure

- Enter the access code with the keypad (298).

The truck is switched on.

11.5.2 Switching off the truck



Procedure

- Press the button under the "switch off" symbol (306) displayed on the driver's display on the display unit.
  The login screen appears on the driver's display. The truck is in standby mode. The truck can be started again using a valid transponder.

➔ No travel or hydraulic operations can be carried out in standby mode. No referencing of the hydraulic system and height indicator is necessary when the truck is in standby mode and switched back on.

- Press the button under the "switch off" symbol (306) again.
  The travel operation is terminated. The truck is switched off.
- Press the emergency disconnect switch – see page 275.

11.5.3 Changing the set-up code

Requirements

– The truck is switched on, see page 487.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Change set-up code" symbol (302).
- Enter the set-up code using the keypad (298).

  The set-up code entered is shown in the display unit (297) as filled-in circles.
- Press the key below the "Delete" symbol (303).

  The set-up code is deleted.
- Enter the new set-up code using the keypad (298).

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

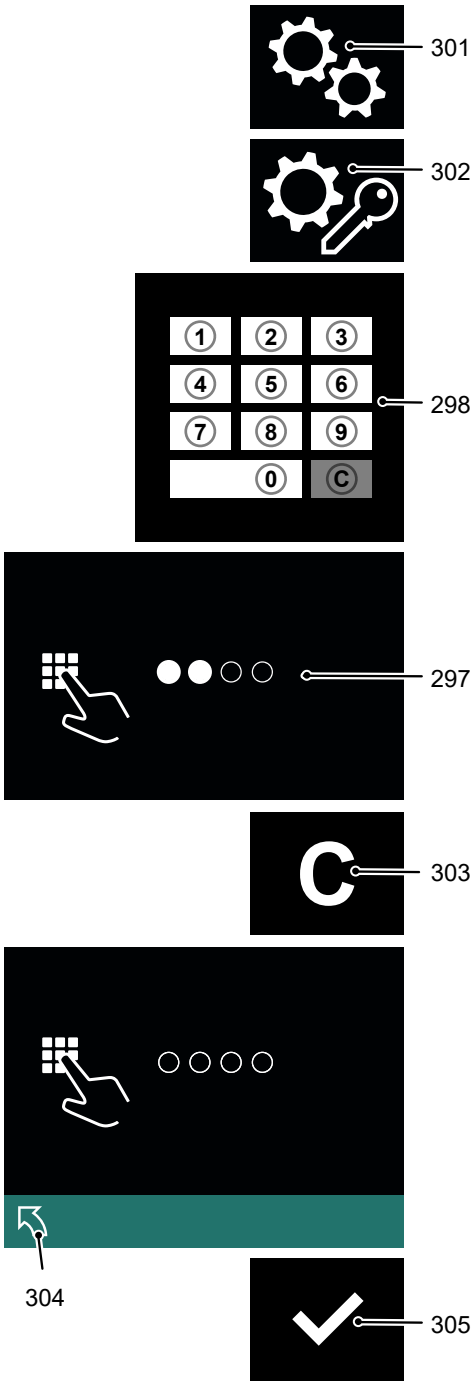
- Press the key below the "Confirm" symbol (305).

  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 (304).

The set-up code has been changed.



11.5.4 Adding a new access code

Requirements

– The truck is switched on, see page 487.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Edit access code" symbol (307).

  The set-up code is requested.
- Enter the set-up code using the keypad (298).

  All access codes are shown on the display unit (297).
- Press the key below the "Add" symbol (308).
- Enter a new access code using the keypad (298).

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

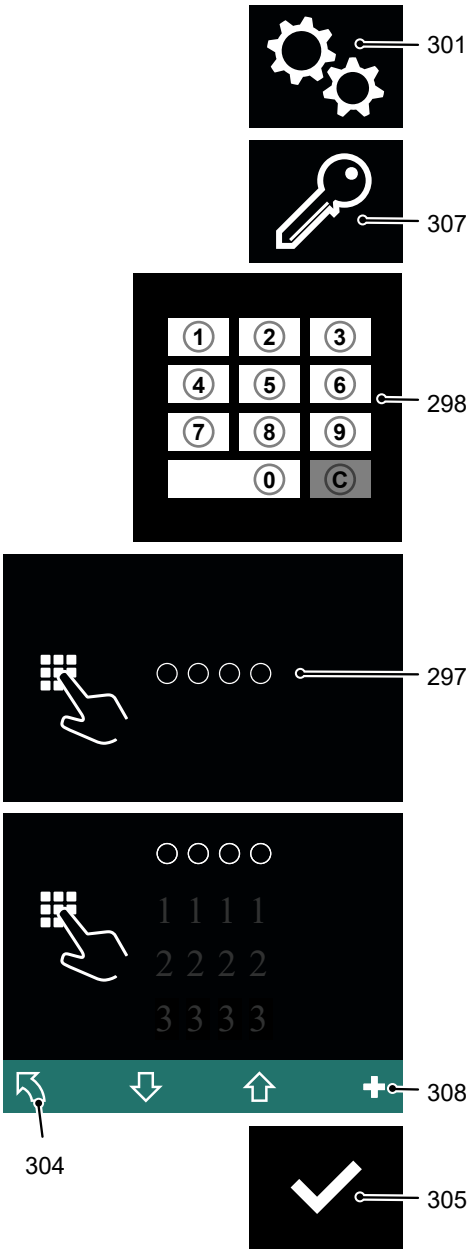
- Press the key below the "Confirm" symbol (305).

  The new access code is shown on the display unit (297).

➔ If the new access code has been entered incorrectly, delete it, see page 490, and enter the correct access code.

To return to the main menu, press the key below the "Back" symbol (304).

A new access code has been added.



11.5.5 Deleting an access code

Requirements

– The truck is switched on, see page 487.

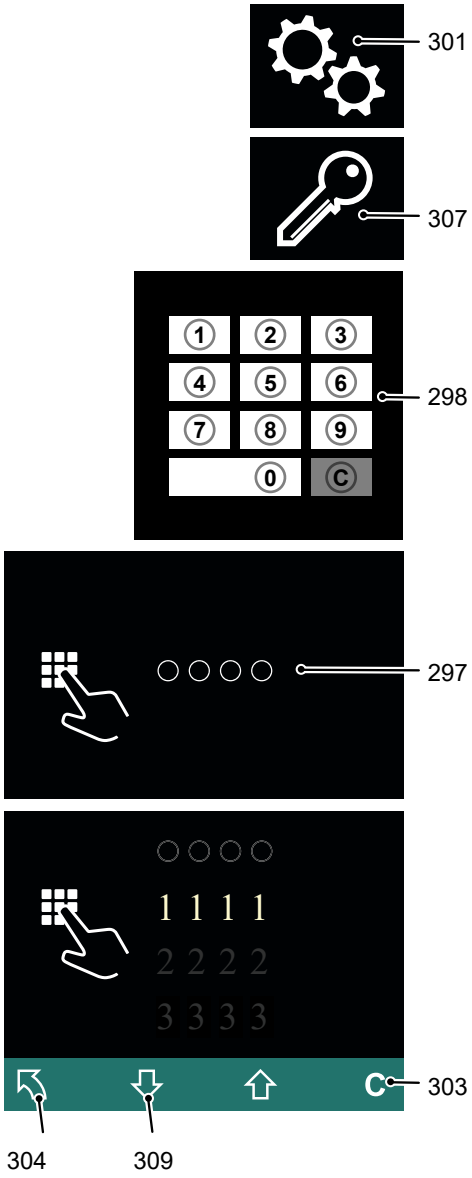
Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Edit access code" symbol (307).

  The set-up code is requested.
- Enter the set-up code using the keypad (298).

  All access codes are shown on the display unit (297).
- Select the access code to be deleted using the key below the "Down selection" symbol (309).
- Press the key below the "Delete" symbol (303).

  The access code has been deleted.
- To return to the main menu, press the key below the "Back" symbol (304).



11.5.6 Displaying the log-in history

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

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

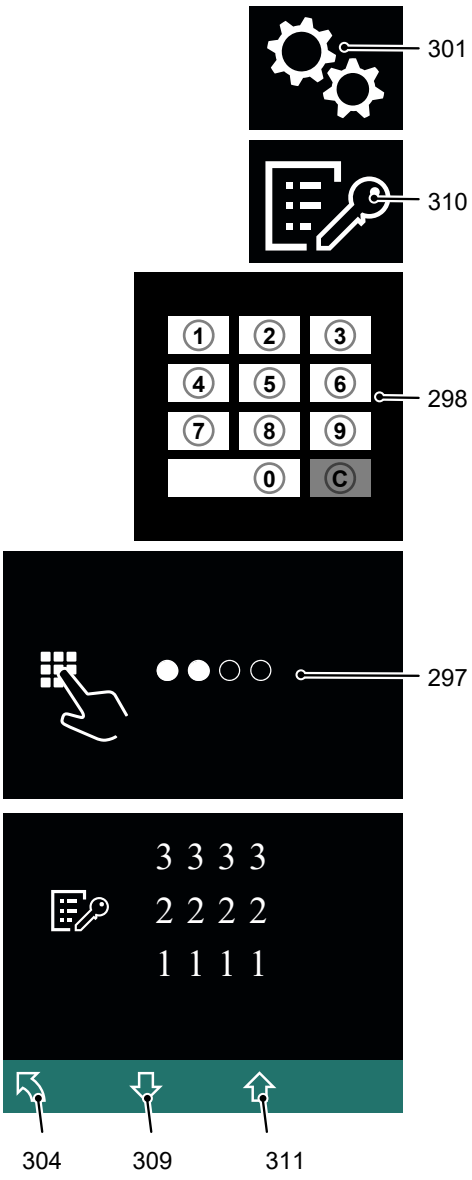
Requirements

– The truck is switched on, see page 487.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Log-in process" symbol (310).
- Enter the set-up code using the keypad (298).
  The set-up code entered is shown in the display unit (297) as filled-in circles.
- To scroll forward, press the button under the "Down selection" symbol (309) as many times as necessary.
  The display area moves: Additional earlier log-ins are displayed.
- To scroll back, press the button under the "Up selection" symbol (311) as many times as necessary.
  The display area moves: More recent log-ins are displayed.
- To return to the main menu, press the key below the "Back" symbol (304).

The log-in process is displayed.

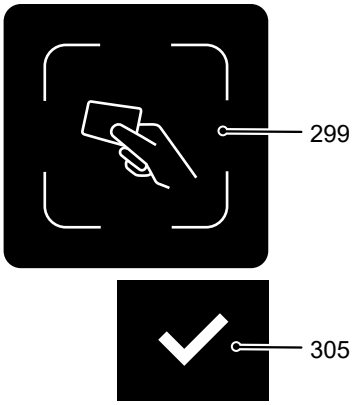


11.6 Keyless access system - transponder reader

NOTICE

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

11.6.1 Switching on the truck with a transponder



Requirements

– Emergency disconnect switch not pressed, see page 275.

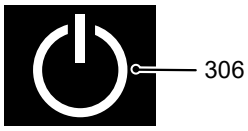
Procedure

- Hold the transponder in front of the transponder reader (299).

  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 (305).

The truck is switched on.

11.6.2 Switching off the truck



Procedure

- Press the button under the "switch off" symbol (306) displayed on the driver's display on the display unit.

  The login screen appears on the driver's display. The truck is in standby mode. The truck can be started again using a valid transponder.

No travel or hydraulic operations can be carried out in standby mode. No referencing of the hydraulic system and height indicator is necessary when the truck is in standby mode and switched back on.

- Press the button under the "switch off" symbol (306) again.

  The travel operation is terminated. The truck is switched off.
- Press the emergency disconnect switch – see page 275.

11.6.3 Changing the set-up transponder

Requirements

– The truck is switched on, see page 492.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Change set-up code" symbol (302).
- Place the set-up transponder on the transponder reader (299).

  The code of the set-up transponder is shown on the display unit (297).
- Press the key below the "Delete" symbol (303).

  A dashed line is shown.
- Place the new set-up transponder on the transponder reader (299).

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

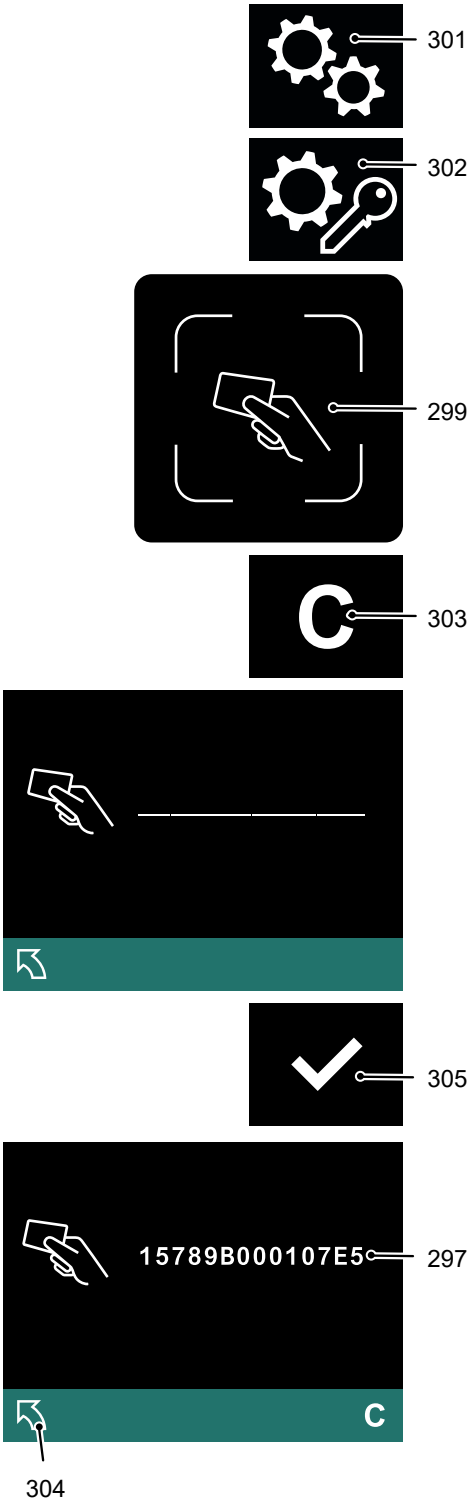
- Press the key below the "Confirm" symbol (305).

  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 (303).

To return to the main menu, press the key below the "Back" symbol (304).

The set-up transponder has been changed.



11.6.4 Adding a new transponder

Requirements

– The truck is switched on, see page 492.

Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Edit transponder" symbol (307).

  The set-up transponder is requested.
- Place the set-up transponder on the transponder reader (299).

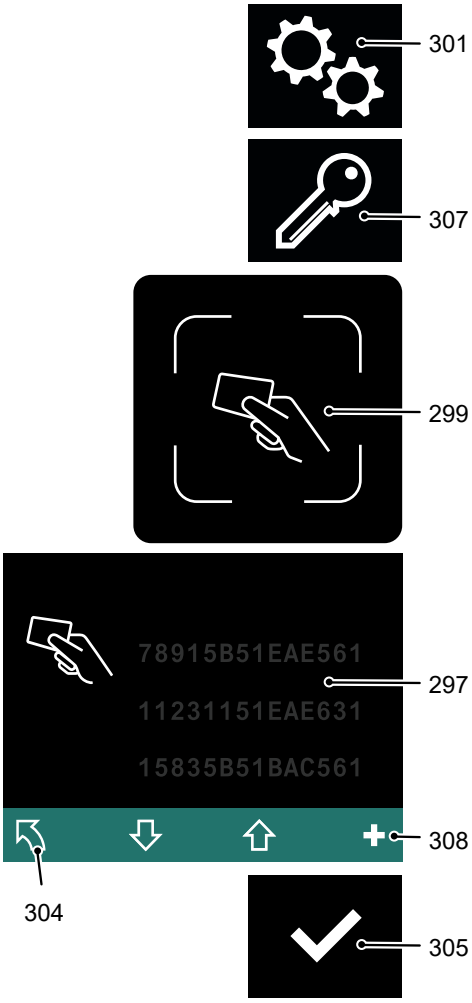
  All transponder codes are shown on the display unit (297).
- Press the key below the "Add" symbol (308).
- Place the new transponder on the transponder reader (299).

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

- Press the key below the "Confirm" symbol (305).

  The new transponder code is displayed.

➔ If the wrong transponder has been used, delete it, see page 495, and add a correct transponder.



To return to the main menu, press the key below the "Back" symbol (304).

A new transponder has been added.

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

11.6.5 Deleting a transponder

Requirements

– The truck is switched on, see page 492.

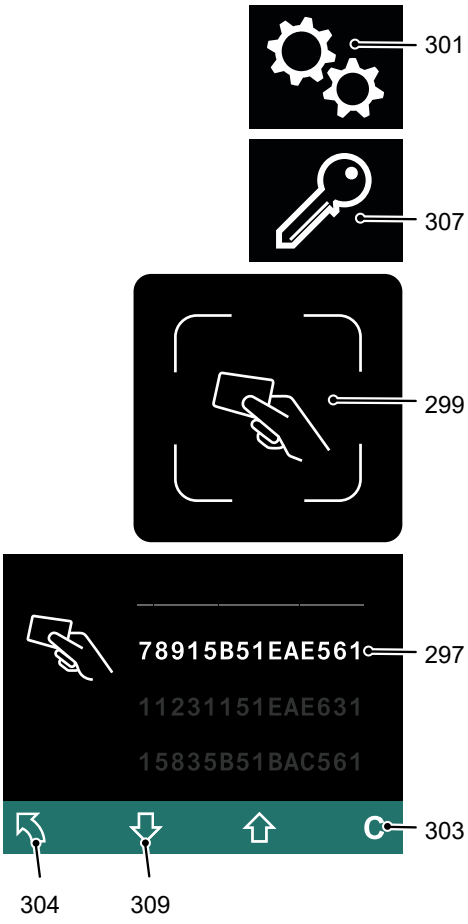
Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Edit transponder" symbol (307).

  The set-up transponder is requested.
- Place the set-up transponder on the transponder reader (299).

  All transponder codes are shown on the display unit (297).
- Select the transponder code to be deleted using the key below the "Down selection" symbol (309).
- Press the key below the "Delete" symbol (303).

  The transponder has been deleted.
- To return to the main menu, press the key below the "Back" symbol (304).



11.6.6 Displaying the log-in history

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

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

Requirements

– The truck is switched on, see page 492.

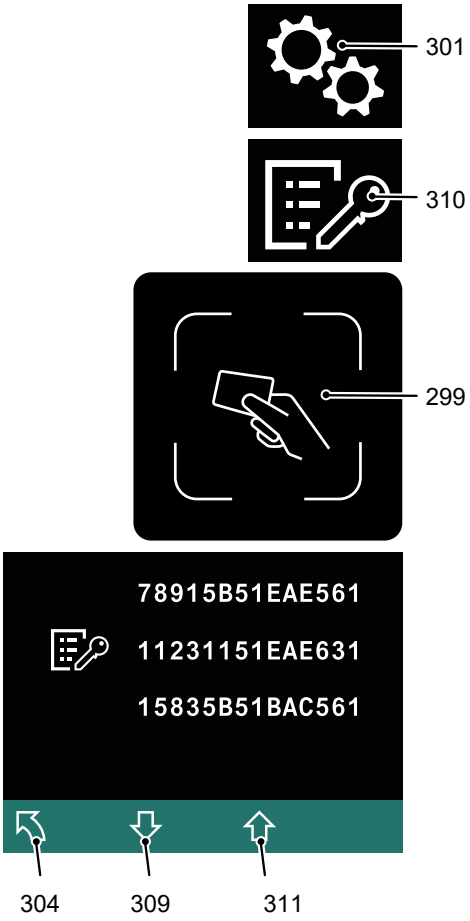
Procedure

- Press the key below the "Settings" symbol (301).
- Press the key below the "Log-in process" symbol (310).
- Place the set-up transponder on the transponder reader (299).
- To scroll forward, press the button under the "Down selection" symbol (309) as many times as necessary.

  The display area moves: Additional earlier log-ins are displayed.
- To scroll back, press the button under the "Up selection" symbol (311) as many times as necessary.

  The display area moves: More recent log-ins are displayed.
- To return to the main menu, press the key below the "Back" symbol (304).

The log-in process is displayed.



11.7 Jungheinrich Fleet Management System (○)

➔ Description of the Jungheinrich Fleet Management System optional equipment – see the "Jungheinrich Fleet Management System" operating instructions.

11.8 ISM access module (○)

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

11.9 Telescopic table (○)

⚠ 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 movements made by the truck, including the load handler, attachments, etc. This also includes areas which can be reached by falling loads, operating equipment etc.
Apart from the operator (in the normal operating position), there must be no one else in the hazardous area of the truck.

- ▶ Instruct other people to move out of the hazardous area of the truck. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ Only transport loads that have been correctly secured and positioned. Take appropriate countermeasures if there is a risk of the load or parts of the load 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.
- ▶ 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 the load handler is raised.
- ▶ Do not climb onto parts of the building or other trucks.

⚠ WARNING!

Trapping hazard when moving the telescopic forks of the telescopic table

If the telescopic forks are extended or retracted, there is a risk of crushing in the hazardous area. People can become trapped between the telescopic forks and the truck or rack components and be seriously injured. The hazardous area is the area in which people can be endangered by movement of the telescopic forks. The hazardous area also includes the area that can be reached by falling loads.

- ▶ Instruct other people to move out of the hazardous area of the truck. Ensure there is no one present in the hazardous area when the telescopic forks are moving. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ Only carry loads that have been secured and positioned in accordance with regulations. Use suitable precautions to prevent the load or 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.
- ▶ Do not reach or climb into moving truck parts.

⚠ 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.

➔ Maintenance intervals are specified in the section Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement, see page 737.

⚠ WARNING!

An incorrectly raised load can be hazardous

Loads can fall off the telescopic table if they are incorrectly raised with the telescopic forks.

▶ Raise and transport loads which are evenly distributed with both telescopic forks.

⚠ WARNING!

Accident risk from increased tipover hazard and reduced residual capacity

There is a greater risk of tipover with extended telescopic attachments.

▶ Do not exceed the maximum loads specified on the capacity plate.

▶ Only use the telescopic function for stacking and retrieving.

▶ Retract the telescopic attachment fully during transport.

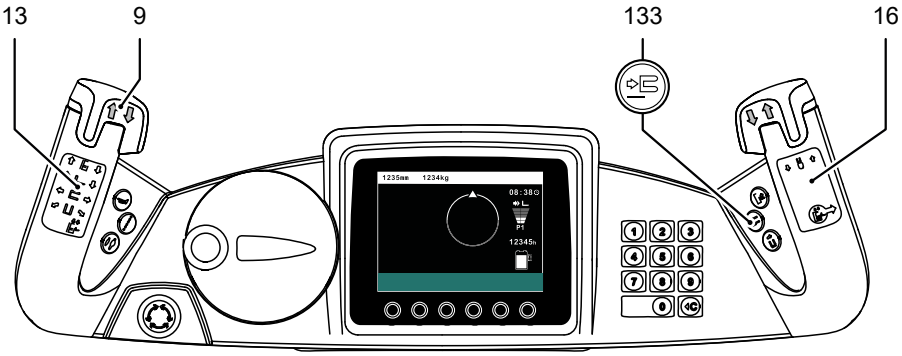
▶ Adapt the travel speed to changed load centre of gravity.

11.9.1 Traversing the telescopic forks of the telescopic table (○)

NOTICE

Risk of material damage to the telescopic forks

The telescopic forks must not be used to push or press loads.



Requirements

– Prepare the truck for operation, see page 265.

– In narrow aisles grab hold of grip (13) with your left hand and grip (16) 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.
- Press and hold down the "Attachment traverse" key (133).
- To traverse the telescopic forks of the telescopic table to the right:
  - Turn the "hydraulic functions" control lever (9) clockwise.
- To traverse the telescopic forks of the telescopic table to the left:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The traverse speed is proportional to how far the "hydraulics function" control lever (9) is moved. The extended end position of the telescopic forks is limited both electrically and mechanically.

The telescopic forks move to the right or left.

➔ The telescopic forks automatically stop in the centre position. If you release the "Hydraulic functions" control lever (9) and press it again, the telescopic forks can be moved further to the left or right.

➔ If the telescopic forks are not in the centre position, you can only travel, lift or lower at reduced speedsee page 317.

11.9.2 Telescopic forks adjustment (○)

⚠ WARNING!

Trapping hazard and risk of material damage when adjusting the telescopic forks

Other people can be damaged when the telescopic forks are adjusted.
Apart from the operator (in the normal operating position) there should be no other people in the truck's hazardous area.

▶ Instruct other people to move out of the hazardous area of the truck. Stop using the truck immediately if people do not vacate the hazardous area.

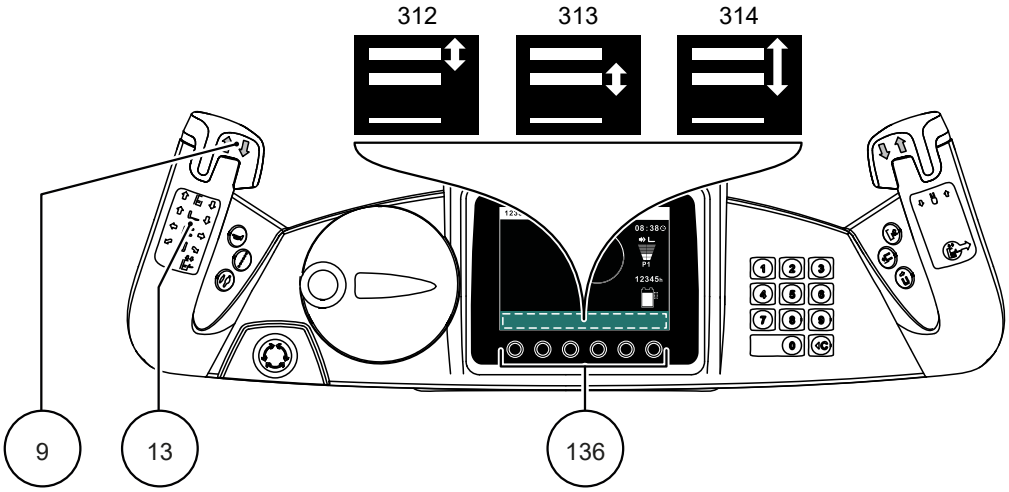
▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.

▶ The fork spread must only be adjusted without load.

NOTICE

Risk of material damage to the telescopic forks

The telescopic forks must not be used to push or press loads.



Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Press the deadman button.
- Grasp the handle (13) with the left hand (two-hand operation).
- To select the telescopic forks to be moved in the load or drive direction:
  - Move the top telescopic fork:
    Press (136) under the "Top telescopic fork selection" symbol (312).
  - Move the bottom telescopic fork:
    Press (136) under the "Bottom telescopic fork selection" symbol (313).
  - Move both telescopic forks:
    Press the (136) button under the "Both telescopic forks selection" symbol (314).
- To traverse the telescopic forks in the load direction:
  - Turn the "hydraulic functions" control lever (9) clockwise.

- To traverse the telescopic forks in the drive direction:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The traverse speed of the telescopic forks is in proportion to the movement of the hydraulic control lever (9).

The telescopic fork(s) traverse in the load or drive direction.

➔ If the telescopic forks are not in the centre position, you can only travel, lift or lower at reduced speedsee page 317.

11.9.3 Individual movement of the telescopic table fork tines (○)

⚠ WARNING!

The load can fall down if the telescopic forks do not traverse correctly

If a single telescopic fork is moved when the load is supported by both telescopic forks, this can cause the load to fall, e.g. when supporting a wire cage pallet.

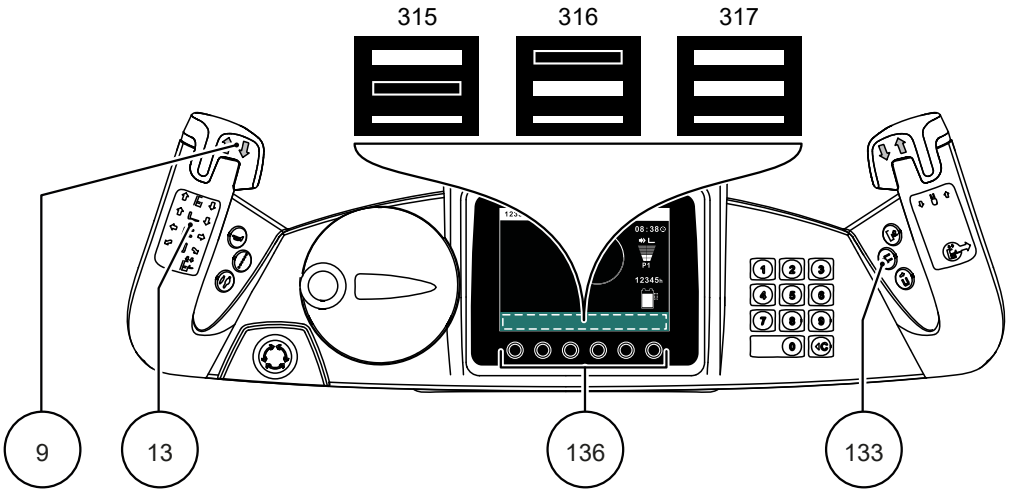
▶ Always take into account the loading of the telescopic table when choosing the telescopic forks.

▶ Do not move a single telescopic fork when the load is supported by both telescopic forks.

NOTICE

Risk of material damage to the telescopic forks

The telescopic forks must not be used to push or press loads.



Requirements

– Prepare the truck for operation, see page 265.

Procedure

The selection of the telescopic fork to be moved can be set when the telescopic forks are in the centre position.

- Press the deadman button.
- Grasp the handle (13) with the left hand (two-hand operation).
- To select the telescopic fork to be moved:
  - Move the bottom telescopic fork:
    Press (136) under the "Bottom telescopic fork selection" symbol (316).
  - Move the top telescopic fork:
    Press (136) under the "Top telescopic fork selection" symbol (315).
  - Move both telescopic forks:
    Press the (136) button under the "Both telescopic forks selection" symbol (317).
- Press and hold down the "Attachment traverse" button (133).
- To traverse the selected telescopic fork of the telescopic table to the right:
  - Turn the "hydraulic functions" control lever (9) clockwise.

- To traverse the selected telescopic fork of the telescopic table to the left:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The traverse speed is proportional to how far the "hydraulics function" control lever (9) is moved. The extended end position of the telescopic forks is limited both electrically and mechanically.

The selected telescopic fork traverses to the right or left.

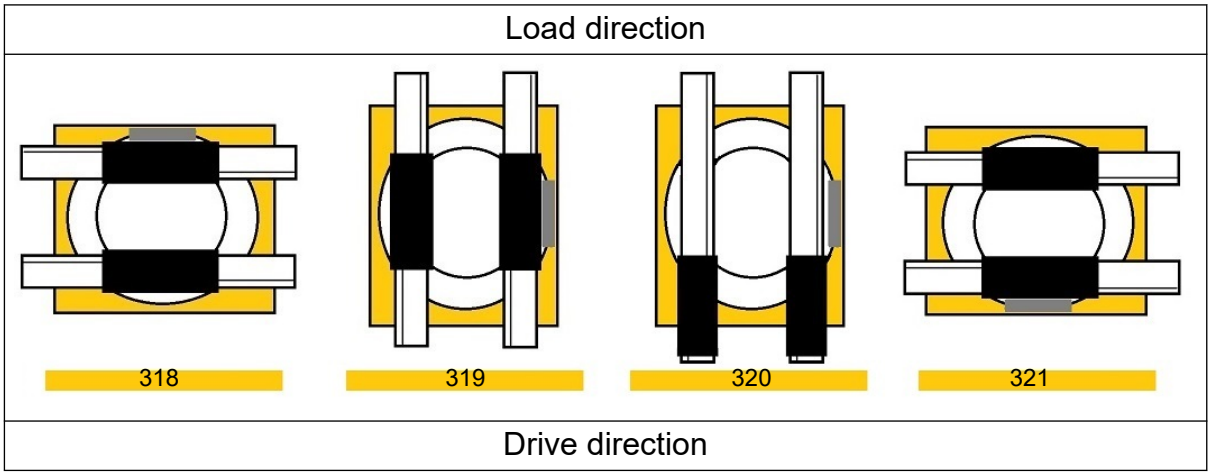
➔ The telescopic forks automatically stop in the centre position. If you release the "Hydraulic functions" control lever (9) and press it again, the telescopic forks can be moved further to the left or right.

➔ If the telescopic forks are not in the centre position, you can only travel, lift or lower at reduced speedsee page 317.

11.9.4 Rotary telescopic table (○)

11.9.4.1 Rotary telescopic shuttle table

The truck is fitted with a telescopic shuttle table that can be rotated 180°. The telescopic shuttle table can be rotated one of three fixed positions: 0°, 90° or 180°.



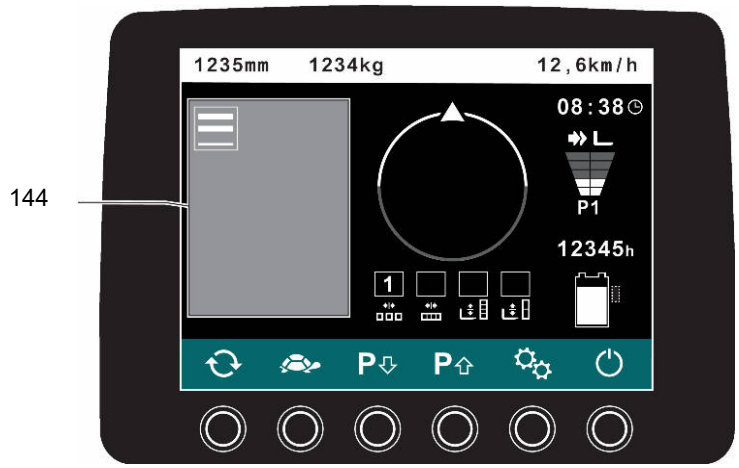
Position of telescopic shuttle table and telescopic forks	
318	– Telescopic shuttle table is in the 0° position – Telescopic forks are in the centre position
319	– Telescopic shuttle table is in the 90° position – Telescopic forks are in the centre position
320	– Telescopic shuttle table is in the 90° position – Telescopic forks are extended in the drive direction towards the operator position (picking position)
321	– Telescopic shuttle table is in the 180° position – Telescopic forks are in the centre position

The telescopic shuttle table can be rotated when the forks are in the centre position. The "Telescopic forks in centre position" symbol lights up in the driver's display.

Traversing of the telescopic forks is enabled when the telescopic shuttle table is in one of the three fixed positions: 0°, 90° or 180°.

If the telescopic shuttle table is in the 90° position the telescopic forks can only be traversed in the direction of the operator position. Transfer of goods from or to the transport pallet is easier in the picking position (see illustration 320).

11.9.4.2 Additional symbols in driver's display

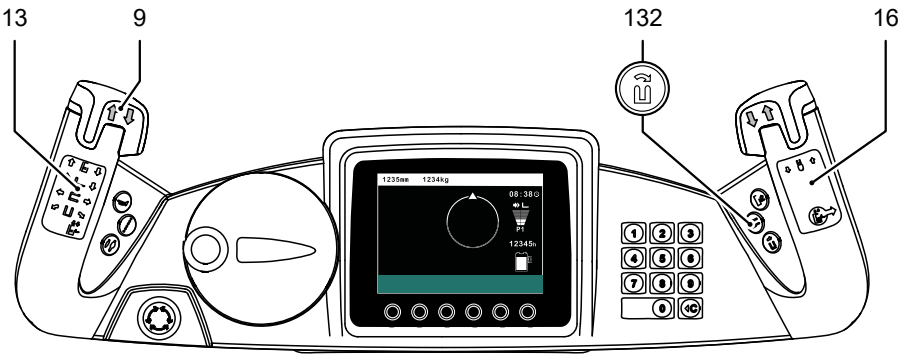


The driver's display shows the additional symbols of the rotary telescopic shuttle table with telescopic forks in the (144) field. The table also shows the effect on the travel, lift and lowering speeds.

Symbol	Meaning of symbols (144)
	– Telescopic shuttle table is in the 0° or 180° position – Telescopic forks are in the centre position – The truck can move at the maximum enabled speed – The load handler can be raised or lowered at the maximum enabled speed
	– Telescopic shuttle table is in the 0° or 180° position – Telescopic forks are traversed to the right out of the centre position – The truck can travel only at reduced speed – The load handler can only be raised or lowered at reduced speed
	– Telescopic shuttle table is in the 0° or 180° position – Telescopic forks are traversed fully into the right-hand end position – The truck can travel only at reduced speed – The load handler can only be raised or lowered at reduced speed
	– Telescopic shuttle table is in the 0° or 180° position – Telescopic forks are traversed to the left out of the centre position – The truck can travel only at reduced speed – The load handler can only be raised or lowered at reduced speed
	– Telescopic shuttle table is in the 0° or 180° position – Telescopic forks are traversed fully into the left-hand end position – The truck can travel only at reduced speed – The load handler can only be raised or lowered at reduced speed

Symbol	Meaning of symbols (144)
	– Telescopic shuttle table is in the 90° position – Telescopic forks are in the centre position – The truck can move at the maximum enabled speed – The load handler can be raised or lowered at the maximum enabled speed
	– Telescopic shuttle table is in the 90° position – Telescopic forks are traversed to the operator position out of the centre position – The truck can move at the maximum enabled speed – The load handler can be raised or lowered at the maximum enabled speed
	– Telescopic shuttle table is in the 90° position – Telescopic forks are fully traversed towards the operator position in the end position – The truck can move at the maximum enabled speed – The load handler can be raised or lowered at the maximum enabled speed
	– Telescopic shuttle table is beyond the fixed positions: 0°, 90° or 180° – The truck can travel only at reduced speed – The load handler can only be raised or lowered at reduced speed

11.9.4.3 Turning the rotary telescopic table (○)



Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) 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.
- Press and hold down the "Fork carriage rotate" key (132).

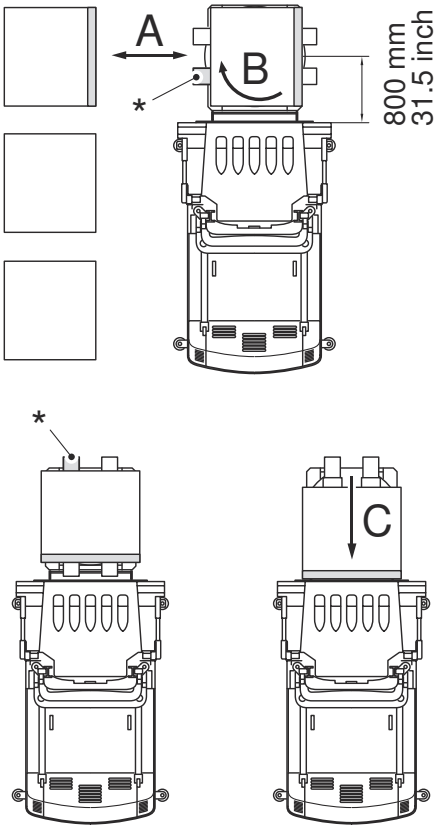
➔ The telescopic table can only be rotated if both telescopic forks are in the centre position.

- To rotate the telescopic table to the right:
  - Turn the "hydraulic functions" control lever (9) clockwise.
- To rotate the telescopic table to the left:
  - Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The rotating speed is proportional to the displacement of the hydraulic control lever (9). The rotation of the telescopic table is limited both electrically and mechanically.

The telescopic table is rotated to the right or left.

Lifting pallets from the left – rotating and traversing the pallet in the order-picking position



Procedure

- Press the deadman switch.
- Lower or raise the telescopic table so that the pallet can be lifted.
- To lift the pallet from the left with the rotary telescopic table:
  - Extend the telescopic forks to the left until the pallet is centred above the telescopic forks, see page 500.
  - Raise the telescopic table slightly until the pallet rests only on the telescopic forks.
  - Slowly retract the telescopic forks to the home position, see page 500.

  The pallet has been raised correctly and is in the home position.
- To rotate the pallet 90° clockwise, see page 510.
- Push the pallet carefully towards the operator position, see page 500.

  The pallet is in the order-picking position.

* Note the fork marking. The telescopic forks must be rotated in the corresponding direction before lifting a pallet, see page 510.

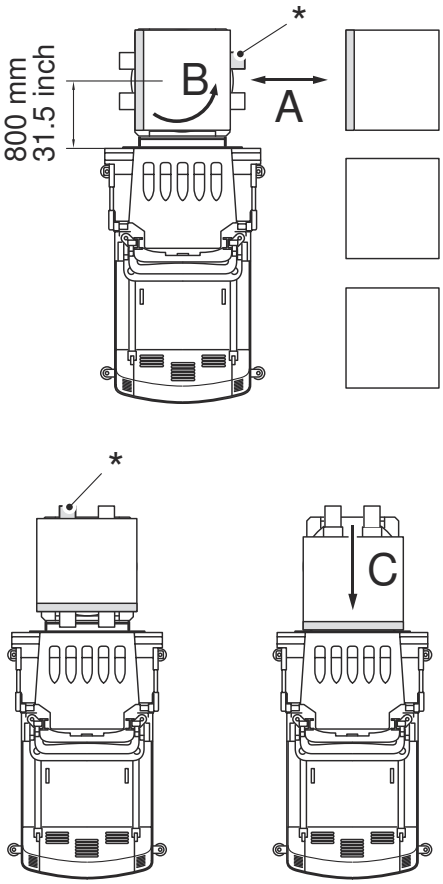
Lifting pallets from the right – rotating and traversing the pallet in the order-picking position

Procedure

- Press the deadman switch.
- Lower or raise the telescopic table so that the pallet can be lifted.
- To lift the pallet from the right with the rotary telescopic table:
  - Extend the telescopic forks to the right until the pallet is centred above the telescopic forks, see page 500.
  - Raise the telescopic table slightly until the pallet rests only on the telescopic forks.
  - Slowly retract the telescopic forks to the home position, see page 500.

  The pallet has been raised correctly and is in the home position.
- To rotate the pallet 90° anticlockwise, see page 510.
- To push the pallet carefully towards the operator position, see page 500.

  The pallet is in the order-picking position.



* Note the fork marking. The telescopic forks must be rotated in the corresponding direction before lifting a pallet, see page 510.

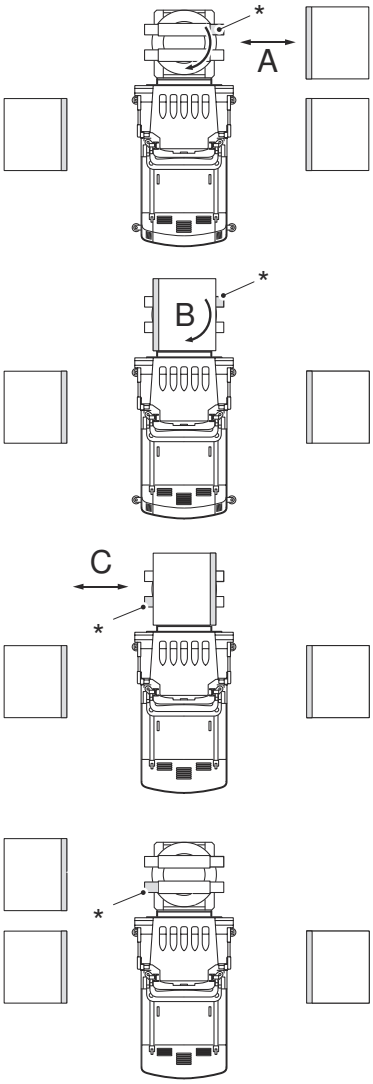
Relocating pallets – rotating the pallet 180°

Procedure

- Press the deadman switch.
- Lower or raise the telescopic table so that the pallet can be lifted.
- To lift the pallet from the right with the rotary telescopic table:
  - Extend the telescopic forks to the right until the pallet is centred above the telescopic forks, see page 500.
  - Raise the telescopic table slightly until the pallet rests only on the telescopic forks.
  - Slowly retract the telescopic forks to the home position, see page 500.

  The pallet has been raised correctly and is in the home position.
- Rotate the pallet 180° clockwise, see page 510.
- To deposit the pallet on the left with the rotary telescopic table:
  - Extend the telescopic forks to the left, see page 500.
  - Carefully lower the telescopic table until the telescopic forks are no longer in contact with the pallet.
  - Slowly retract the telescopic forks to the home position, see page 500.

  The pallet has been deposited correctly and the telescopic forks are in the home position.



* Note the fork marking. The telescopic forks must be rotated in the corresponding direction before lifting a pallet, see page 510.

11.10 Sideshifter / Fork positioner (○)

⚠ 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.

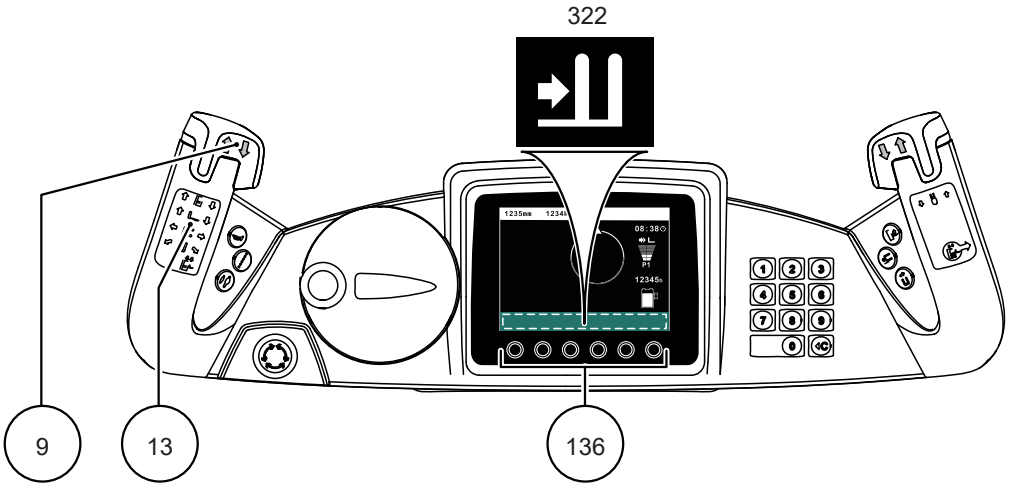
▶ Report any defects immediately to your supervisor.

▶ Tag out and decommission a faulty lift truck.

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

Maintenance intervals are specified in the section Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement, see page 737.

11.10.1 Fork sideshift (○)



Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Press the deadman button.
- Grasp the handle (13) with the left hand (two-hand operation).
- Press and hold down the button (136) under the "fork arm side shift" symbol (322).
- Attachment is in the "front lift" position, the fork arms are at right angles to the swivel traverse frame:
  - To shift the fork arms to the right:
    Turn the "hydraulic functions" control lever (9) clockwise.
  - To shift the fork arms to the left:
    Turn the "hydraulic functions" control lever (9) anticlockwise.
- Attachment is in the right home position, the fork carriage is at the right end of the swivel traverse frame and the fork arms are facing left:
  - To shift the fork arms in the load direction:
    Turn the "hydraulic functions" control lever (9) clockwise.
  - To shift the fork arms in the drive direction:
    Turn the "hydraulic functions" control lever (9) anticlockwise.

- Attachment is in the left home position, the fork carriage is at the left end of the swivel traverse frame and the fork arms are facing right:
  - To shift the fork arms in the drive direction:
    Turn the "hydraulic functions" control lever (9) clockwise.
  - To shift the fork arms in the load direction:
    Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The traverse speed of the fork arms is proportional to the movement of the "hydraulic functions" control lever (9).

Both fork arms move evenly in the prescribed direction.

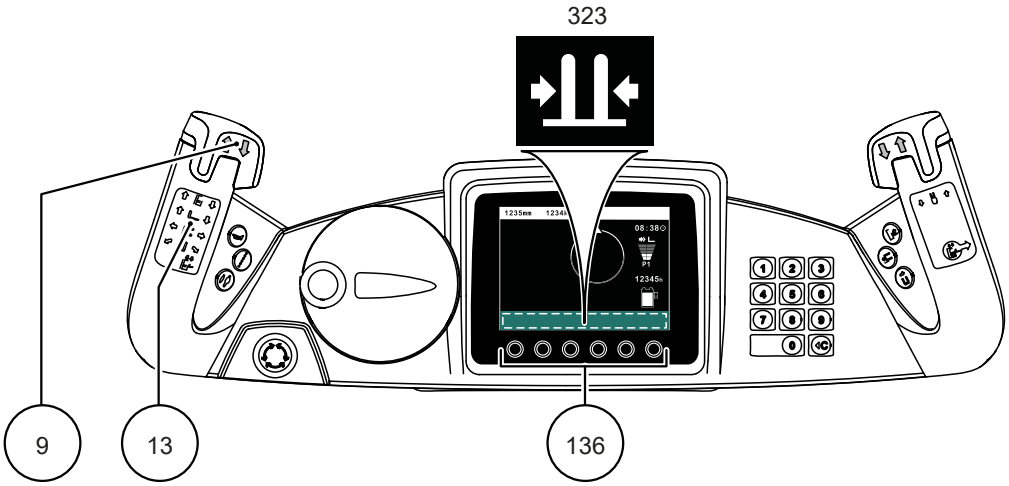
11.10.2 Fork positioner (○)

⚠ WARNING!

Trapping hazard and risk of material damage when adjusting the forks

Other people can be damaged when the forks are adjusted.
Apart from the operator (in the normal operating position) there should be no other people in the truck's hazardous area.

- ▶ Instruct other 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.
- ▶ The fork spread must only be adjusted without load.



Requirements

– Truck has been prepared for operation, see page 265.

Procedure

- Press the deadman button.
- Grip the handle (13) with the left hand.

➔ The fork spread is changed when the two fork arms traverse simultaneously. The fork arms cannot be adjusted individually.

- Press and hold the button (136) under the “fork adjustment” symbol (323).
- Reduce the fork spread:
  - Turn the “hydraulic functions” control lever (9) clockwise.
- Increase the fork spread:
  - Turn the “hydraulic functions” control lever (9) anti-clockwise.

➔ The speed of the fork arm spread is proportional to the movement of the “hydraulics” control lever (9).

The fork spread is reduced or increased.

11.10.3 Symmetric sideshift with integrated fork positioner (○)

⚠ WARNING!

Trapping hazard and risk of material damage when adjusting the forks

Other people can be damaged when the forks are adjusted.
Apart from the operator (in the normal operating position) there should be no other people in the truck's hazardous area.

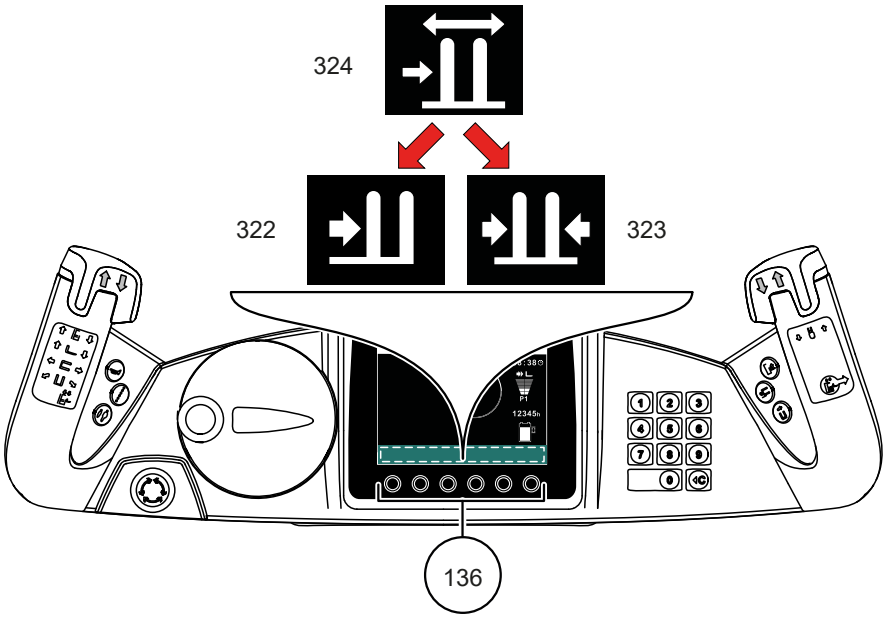
- ▶ Instruct other people to move out of the hazardous area of the truck. Stop using the truck immediately if people do not vacate the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ The fork spread must only be adjusted without load.

⚠ WARNING!

Risk of injury and material damage when operating the sideshifter with integrated fork positioner

Due to the special design of the sideshift with integrated fork positioner, the operator must ensure that the forks and sideshifter do not enter into the contour of the truck.
The fork positioner can move the forks beyond the swivel traverse frame and thus damage the truck.

- ▶ To avoid injury to personnel and damage to the truck and load, trained operators must handle the attachment with particular care.
- ▶ Stop hydraulic movements of the sideshifter with integrated fork positioner before the truck contour has been reached.



Requirements

– Truck has been prepared for operation – see page 265.

Procedure

- Press the button (136) under the "fork positioning/side shift menu change" symbol (324).

  The driver's display changes from the "fork positioning/side shift menu change" menu item (324) to functions "fork arms side shift" (322) and "fork positioning" (323).
- Shift the fork arms to the right or left – see page 514.
- Reduce or increase the fork spread – see page 516.

11.10.4 Asymmetric Sideshifter with Integrated Fork Positioner (○)

⚠ WARNING!

Trapping hazard and risk of material damage when adjusting the forks

Other people can be damaged when the forks are adjusted.
Apart from the operator (in the normal operating position) there should be no other people in the truck's hazardous area.

- ▶ Instruct other 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.
- ▶ The fork spread must only be adjusted without load.

⚠ WARNING!

Risk of injury and material damage when operating the sideshifter with integrated fork positioner

Due to the special design of the sideshift with integrated fork positioner, the operator must ensure that the forks and sideshifter do not enter into the contour of the truck.
The fork positioner can move the forks beyond the swivel traverse frame and thus damage the truck.

- ▶ To avoid injury to personnel and damage to the truck and load, trained operators must handle the attachment with particular care.
- ▶ Stop hydraulic movements of the sideshifter with integrated fork positioner before the truck contour has been reached.

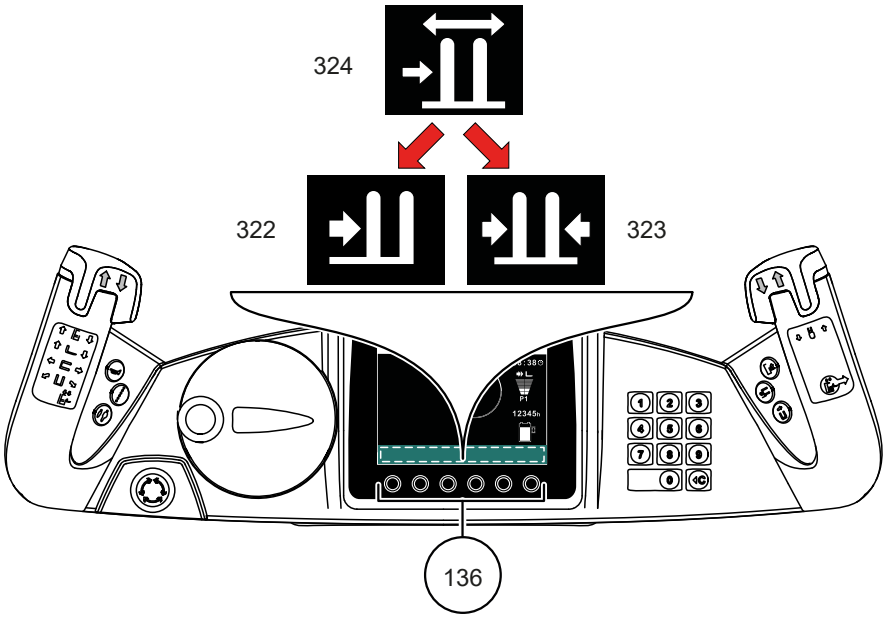
Functions of asymmetric sideshifter with integrated fork positioner

Attachment is in the right home position, i.e. the fork carriage is at the right end of the swivel traverse frame and the forks are facing left:

- In this home position the forks can be adjusted through the asymmetrical arrangement of the attachment as far as the operator position, e.g. for stockpicking.
- Be careful when adjusting the sideshifter and fork positioner! In this home position the attachment or the raised load can damage the operator position.

Attachment is in the left home position, i.e. the fork carriage is at the left end of the swivel traverse frame and the forks are facing right:

- In this home position pallets that deviate from the standard (e.g. longer pallets) can be transported.
- The sideshifter and forks cannot be adjusted as far as the operator position for stockpicking.



Requirements

– Truck has been prepared for operation – see page 265.

Procedure

- Press the button (136) under the "fork positioning/side shift menu change" symbol (324).

  The driver's display changes from the "fork positioning/side shift menu change" menu item (324) to functions "fork arms side shift" (322) and "fork positioning" (323).
- Shift the fork arms to the right or left – see page 514.
- Reduce or increase the fork spread – see page 516.

11.11 Telescopic forks (○)

⚠ WARNING!

Accident risk from increased tipover hazard and reduced residual capacity

There is a greater risk of tipover with extended telescopic attachments.

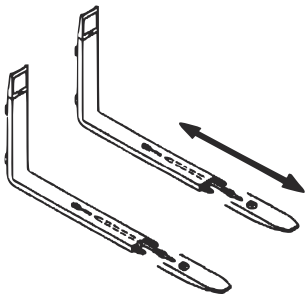
▶ Do not exceed the maximum loads specified on the capacity plate.
▶ Only use the telescopic function for stacking and retrieving.
▶ Retract the telescopic attachment fully during transport.
▶ Adapt the travel speed to changed load centre of gravity.

⚠ 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.

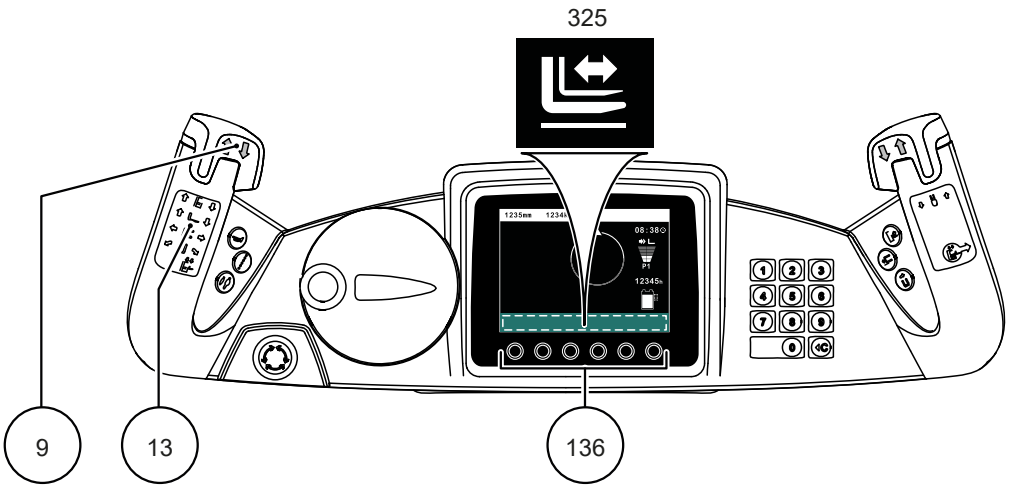


➔ Maintenance intervals are specified in the section Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement, see page 737.

Telescopic fork description

Telescopic forks are used to achieve a greater stacking depth (single telescopic forks) or double-deep storage (double telescopic forks).

11.11.1 Single telescopic forks (○)



Extending and retracting single telescopic forks

Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Press the deadman button.
- Traverse the attachment to the right or left end position of the swivel traverse frame, see page 317.
- Grasp the handle (13) with the left hand (two-hand operation).
- Press and hold down the button (136) under the "single telescopic forks" symbol (325).
- Extend the telescopic forks:
  - To extend to the left:
    Turn the "hydraulic functions" control lever (9) anticlockwise.
  - To extend to the right:
    Turn the "hydraulic functions" control lever (9) clockwise.
- To retract the telescopic forks:
  - To retract to the right:
    Turn the "hydraulic functions" control lever (9) clockwise.
  - To retract to the left:
    Turn the "hydraulic functions" control lever (9) anticlockwise.

➔ The extension or retraction speed of the telescopic forks is in proportion to the movement of the hydraulic control lever (9).

- Traverse the attachment to the right or left to the home position, see page 317.

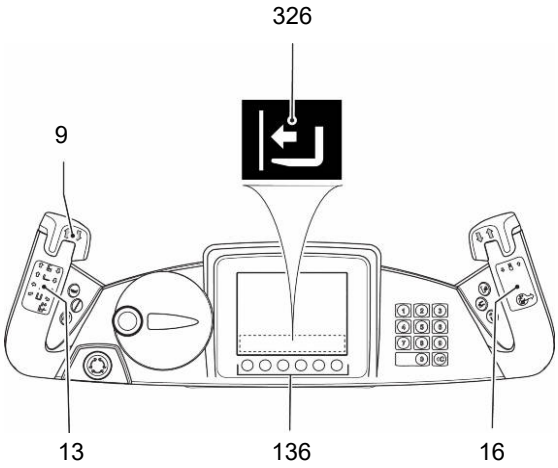
➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

11.11.2 Double telescopic forks (○)

Extending double telescopic forks

Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) 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.
- Traverse the attachment to the left or right until it stops automatically, see page 302.
  The first stacking depth has been reached.
- Press the (136) button under the "2nd stacking depth" symbol (326).
  The symbol (326) is displayed inverted. The "2nd stacking depth" hydraulic function is activated.
- Traverse the telescopic forks right or left to the next automatic stop, see page 302.
  The second stacking depth has been reached.

Version A "Retract telescopic forks, then move the attachment back to the home position"

Requirements

– Telescopic forks extended as far as the second stacking depth.

Procedure

- If necessary press the (136) button under the "2nd stacking depth" symbol (326) so that the (326) symbol can be shown inverted.
  The "2nd stacking depth" hydraulic function is activated.
- Retract the telescopic forks left or right to the automatic stop, see page 302.
  The first stacking depth has been reached.
- Press the (136) button under the "2nd stacking depth" symbol (326).
  The symbol (326) is displayed in the normal view. The "2nd stacking depth" hydraulic function is deactivated.
- Traverse attachment to the right or left to the home position, see page 302.
  Right or left home position has been reached.

➔ The extension or retraction speed of the telescopic forks is in proportion to the movement of the hydraulic control lever (9).

Version B "Move the attachment back, then retract the telescopic forks to the home position"

Requirements

– Telescopic forks extended as far as the second stacking depth.

Procedure

- If necessary press the (136) button under the "2nd stacking depth" symbol (326) so that the (326) symbol is shown in the normal view.
  The "2nd stacking depth" hydraulic function is deactivated.
- Retract the attachment to the left or right it stops automatically, see page 302.
  The first stacking depth has been reached.
- Press the (136) button under the "2nd stacking depth" symbol (326).
  The symbol (326) is displayed inverted. The "2nd stacking depth" hydraulic function is activated.
- Traverse telescopic forks right or left to the home position, see page 302.
  Right or left home position has been reached.
- Press the (136) button under the "2nd stacking depth" symbol (326).
  The symbol (326) is displayed in the normal view. The "2nd stacking depth" hydraulic function is deactivated.

➔ The extension or retraction speed of the telescopic forks is in proportion to the movement of the hydraulic control lever (9).

➔ If the attachment is not in the home position, you can only travel, lift or lower at a reduced speed, see page 317.

11.12 Weighing system (○)

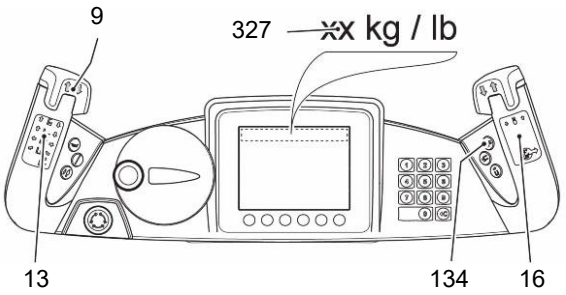
The truck can be fitted optionally with a weighing system. When the load has been raised slightly with the Main or Auxiliary lift, the weight is shown on the driver's display in kg / lb (327).

NOTICE

The weighing system is not a substitute for a calibrated weigher.

Requirements

– Prepare the truck for operation, see page 265.
– In narrow aisles grab hold of grip (13) with your left hand and grip (16) 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 button.
- Raise the load handler with the main lift a minimum of 10 cm:
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.
- Raise the load handler with the auxiliary lift a minimum of 10 cm (if applicable):
  - Press the "auxiliary lift" button (134) and hold it down.
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.

The weight (327) of the picked-up load is displayed on the driver's display.

11.12.1 Tare function (○)

The weighing system can optionally be equipped with tare function. The tare function sets the weigher display to zero.

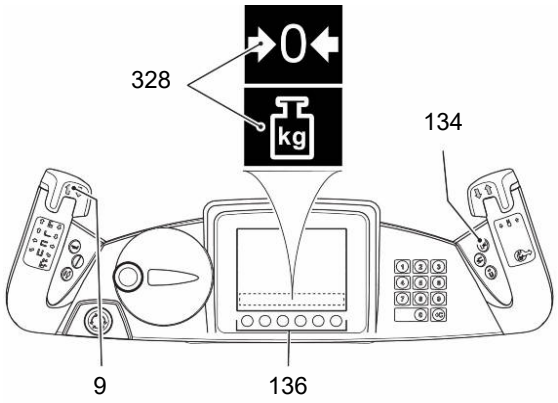
Display zero setting

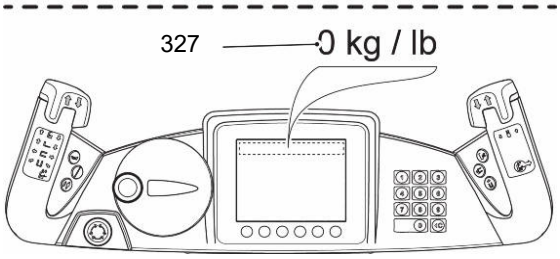
Requirements

– Prepare the truck for operation, see page 265.

Procedure

- Press the deadman switch.
- Raise the load handler with the Main Lift without load approx. 10 cm.
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.
- Raise the load handler with the Auxiliary Lift without load approx. 10 cm (if applicable):
  - Press the "Auxiliary lift" key (134) and hold it down.
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.





- Press the (136) key under the "weighing-system-display zero-setting" symbol (328).

  The weight measurement in the driver's display is zero (327).
- Fully lower the Main Lift:
  - Turn the" hydraulic functions" control lever (9) clockwise.
- Fully lower the Auxiliary lift (if applicable):
  - Press the "Auxiliary lift" key (134) and hold it down.
  - Turn the" hydraulic functions" control lever (9) clockwise.

11.13 Rack Height Select (○)

Rack Height Select helps the operator to position the load handler or telescopic shuttle table by adjusting and displaying the current lift height and the operational status. Optionally, Rack Height Select can be used to pick, store or retrieve loads in set storage locations.

Storing or retrieving loads in set storage locations is referred to in the following as a stacking operation. Description of the stacking operation – see page 562.

⚠ CAUTION!

Stacking operation with Rack Height Select

The operator of the truck is responsible during stacking operation with Rack Height Select. Rack Height Select is only an assistance system.

To use Rack Height Select, the truck must be adapted to the warehouse setup.

The necessary activities must be carried out by the manufacturer's customer service department.

Hydraulic movement and speed reduction

The hydraulic movement of the load handler or telescopic shuttle table is displayed via symbols in driver's display. When the target position is approached, the lift or lowering speed is reduced.

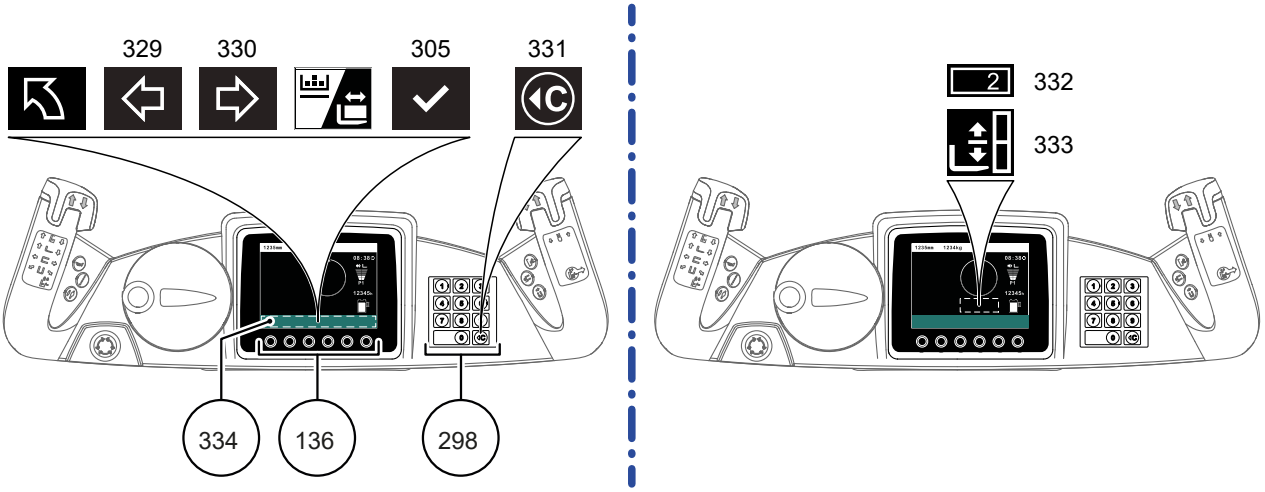
Target position

The hydraulic movement of the load handler or telescopic shuttle table stops when the target position is reached. Optionally the symbols for stacking or retrieval (stacking operation) can be shown in the driver's display. At the same time the lift or lower display goes out. The load can be deposited in or retrieved from the storage location with the "stacking operation" function, see page 562. The order is completed when the target position is reached.

11.13.1 Rack Height Select - additional symbols in the driver's display

Symbol	Function
	Compartment number entry (lift height): – A compartment number is the vertical position of the storage location (lift height) in the narrow aisle. – The compartment numbers can be entered in single, double or triple digits.
	Zone entry (warehouse area): – A zone is a warehouse area with defined lift heights. – The zones can only be entered with single digits.

11.13.2 Zone entry (warehouse area)



Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

Procedure

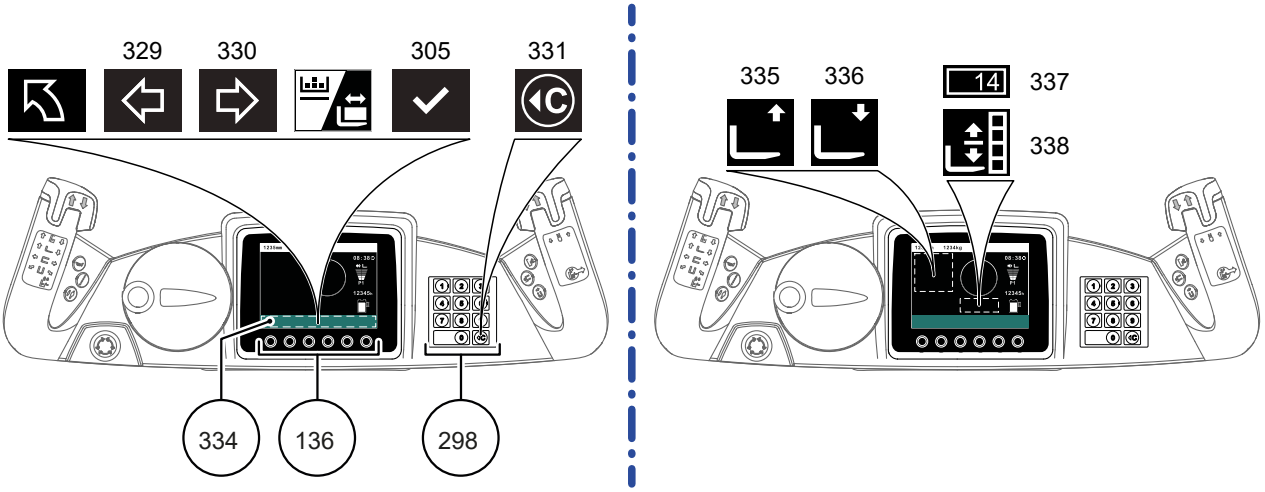
- Press one of the keys "0" to "9" on the keypad (298).
  The driver's display shows the menu level (334) via the keys (136).
- Press the key (136) under the "go back an entry field" symbol (329) or the "go forward an entry field" symbol (330) until the field (332) above the symbol (333) is displayed with a light background.
- Enter the zone with the keys "0" to "9" on the keypad (298).
  The zone can only be entered as a single digit (0 - 9).

➔ An incorrect zone entry can be deleted by pressing the "<C" key (331) on the keypad (298).

- Press the key (136) below the "confirm" symbol (305).

The zone entered (332) above the symbol (333) is displayed with a dark background.

11.13.3 Rack number entry (lift height)



Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

Procedure

- Press one of the keys "0" to "9" on the keypad (298).
  The driver's display shows the menu level (334) via the keys (136).
- Press the key (136) under the "go back an entry field" symbol (329) or the "go forward an entry field" symbol (330) until the field (337) above the symbol (338) is displayed with a light background.
- Enter the compartment number with the keys "0" to "9" on the keypad (298).
  The compartment number can be entered as a single digit (0 - 9), 2-digit (00-99) or 3-digit number (000-999).

➔ An incorrect compartment number entry can be deleted by pressing the "<C" key (331) on the keypad (298).

- Press the key (136) below the "confirm" symbol (305).

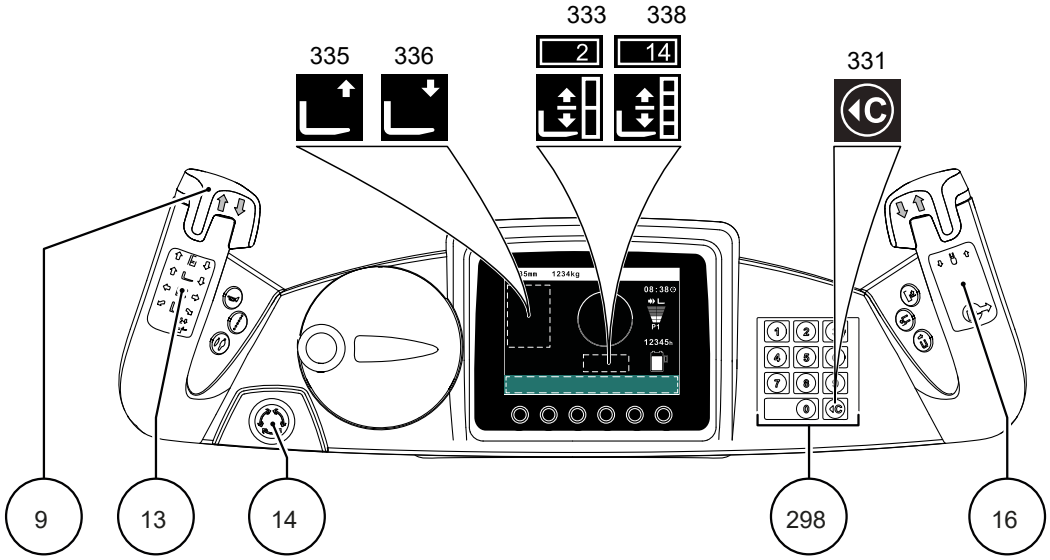
The compartment number entered (337) above the symbol (338) is displayed with a dark background. Depending on the current lift height either the "raise load handler" symbol (335) or the "lower load handler" symbol (336) is displayed. The arrow in these symbols indicates whether the main lift needs to be raised or lowered to reach the storage location.

11.13.4 Approaching the storage location with Rack Height Select

Approaching the compartment number

The entered compartment number is always approached with the main lift.

▶ Trucks with auxiliary lift only:
If the lift height (nominal height) cannot be approached with a fully extended main lift, the remaining height can be approached with the auxiliary lift, see page 296.



The approach to the storage location can be cancelled by pressing the "<C" key (331) on the keypad (298) or the emergency disconnect switch (14).

Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

Procedure

• Enter the zone (333) – see page 530.
• Enter the compartment number (338) – see page 531.

Depending on the current lift height either the "raise load handler" symbol or the "lower load handler" symbol is displayed. The arrow in these symbols indicates whether the main lift needs to be raised or lowered to reach the storage location

In order to lift or deposit loads in pre-selected storage locations, the auxiliary lift must be fully lowered (see page 296). The auxiliary lift height is irrelevant for order picking.

- Approaching the storage location with rack height select:
  - Press the deadman switch.
  - Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
  - Raise the main lift:
    Turn the "hydraulic functions" control lever (9) anti-clockwise.
  - Lower the main lift:
    Turn the "hydraulic functions" control lever (9) clockwise.

The compartment number entered has now been reached.

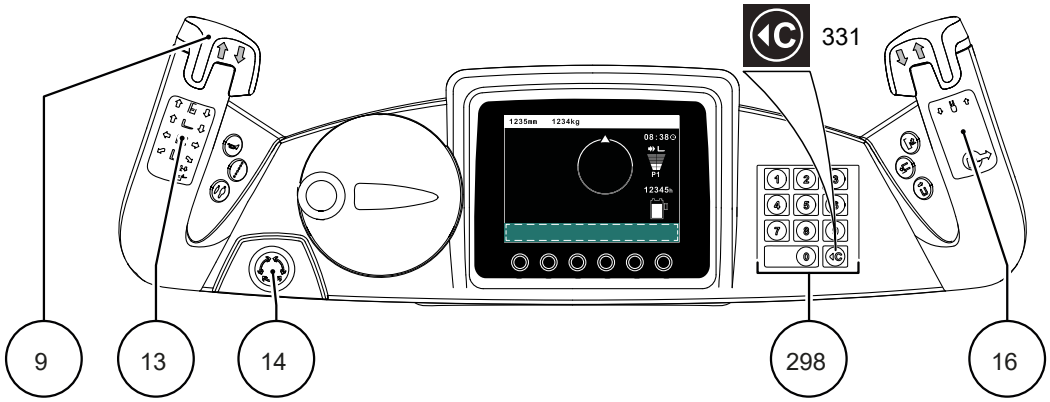
If another compartment number is entered during the positioning process, this number is displayed in the driver's display for approx. 1 second and stored in an intermediate log. On reaching the current storage location, the compartment number is automatically transferred from the intermediate log and can be approached as detailed above.

To reach the required height there are various operating modes depending on the parameter setting

Approaching the compartment number

The entered compartment number is always approached with the main lift.

▶ Trucks with auxiliary lift only:
If the lift height (nominal height) cannot be approached with a fully extended main lift, the remaining height can be approached with the auxiliary lift, see page 296.



The approach to the storage location can be cancelled by pressing the "<C" key (331) on the keypad (298) or the emergency disconnect switch (14).

Requirements

– Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).

To approach the required height manually (●):

The "Hydraulic functions" control lever (9) must be pressed and held down until the required height has been reached (automatic stop).

➔ The lift and lower speeds are in proportion to the movement of the "Hydraulic functions" control lever (9).

To approach the "Pre-limit" required height manually (○):

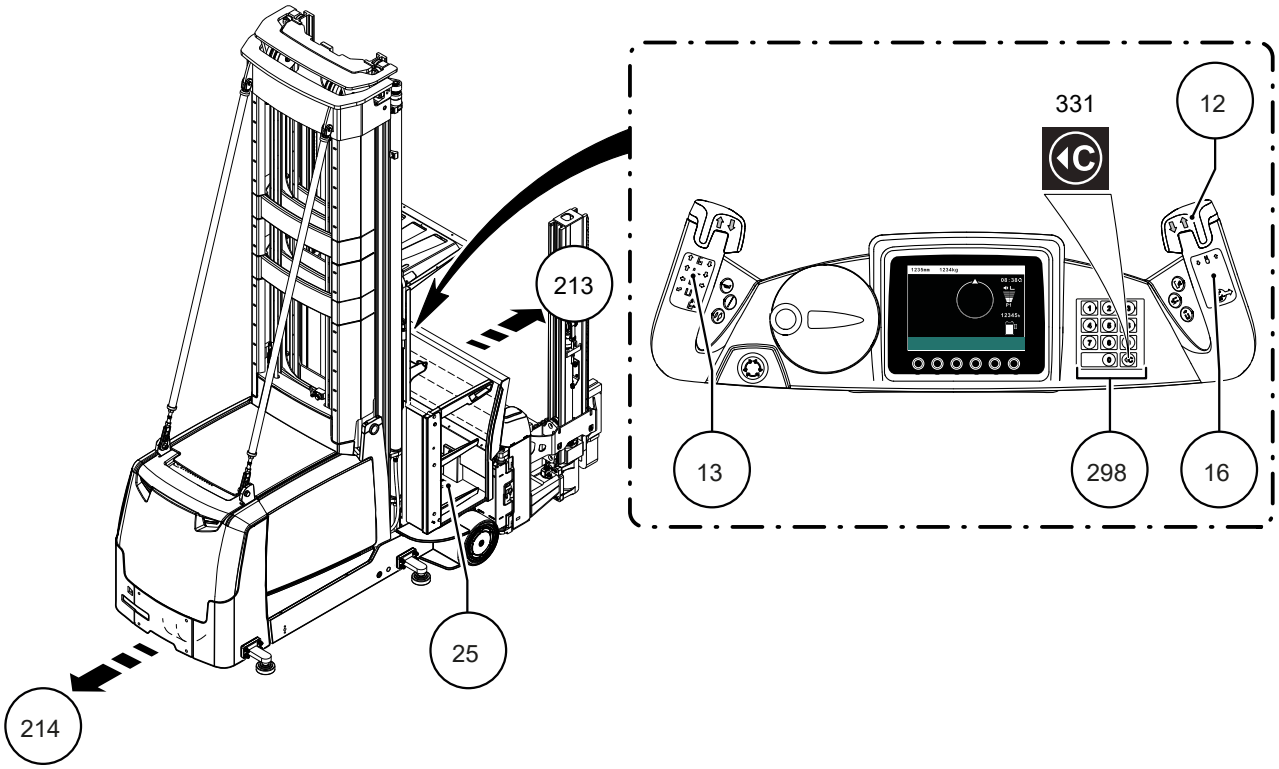
The "Hydraulic functions" control lever (9) must be pressed shortly before the required height is reached. The rest of the hydraulic operation is performed automatically.

➔ The lift and lower speeds are in proportion to the movement of the "Hydraulic functions" control lever (9).

"Jog mode" - To approach the required height automatically (○):

Turn the "Hydraulic functions" control lever (9) briefly in the desired direction. The desired height is then automatically approached.

➔ The lift and lowering speeds are fixed and cannot be influenced.



Requirements

– Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).

To approach the required height automatically (○):

– Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
– Press and hold the deadman switch (25).
– Set the travel direction and speed with the travel control knob (12):
  – Turn the travel control knob (12) slowly clockwise:
    travel in load direction (213).
  – Turn the travel control knob (12) slowly anti-clockwise:
    travel in drive direction (214).

The required height is approached automatically in the optimum manner, depending on how far away the storage location is. The lift speed and lowering speed are fixed and cannot be influenced. The travel speed can be controlled with the travel control knob.

11.13.5 Storing and retrieving loads with the optional "Stacking operation" equipment

Rack height select can be combined with the optional "Stacking operation" equipment. The operator is supported with the stacking operation when storing or retrieving loads, see page 562.

11.14 Horizontal positioning (○)

Your truck may optionally be equipped with the “Horizontal Positioning (HozPos)” function. This function supports the operator when positioning (automatic, direct targeted positioning of the pallet location) the truck in the rack and at the transfer station.

"Horizontal Positioning (HozPos)" offers programmable warehouse conditions. The setting is made by the manufacturer's customer service department.

11.14.1 Horizontal positioning on the EKS

In conjunction with the integrated rack height select, this provides for consistent stockpicking in the rack and at transfer stations with minor, monitored deviations.

Positioning accuracy:
– The positioning accuracy with warehouse navigation is ± 5 mm vertically and ± 30 mmhorizontally.

Options
– Destination entry manual via numerical keyboard of keypad
– Destination entry via barcode scanner on the control panel or load handler
– Destination entry via radio connection

11.14.2 Horizontal positioning on the EKX

In conjunction with the integrated rack height select, this provides for consistent stopping and load collecting in the rack and at transfer stations with minor, monitored deviations.

Positioning accuracy:
– The positioning accuracy with warehouse navigation is ± 5 mm vertically and ± 30 mmhorizontally.

To achieve constant stacking depths widths over the entire lift height, height-dependent traverse adjustment values can be programmed as an option. The setting is made by the manufacturer's customer service department.

As the truck enters the narrow aisle the following is checked:
– Entry into the narrow aisle required for the order
– Position of load handler (left or right home position)

Options:
– Destination entry manual via numerical keyboard of keypad
– Entry of destination via barcode scanner on the control panel or load handler
– Destination entry via radio connection
– Type of stacking operation, see page 562
– Extension locking of load handler

11.14.3 Warehouse and stockpicking mode (○)

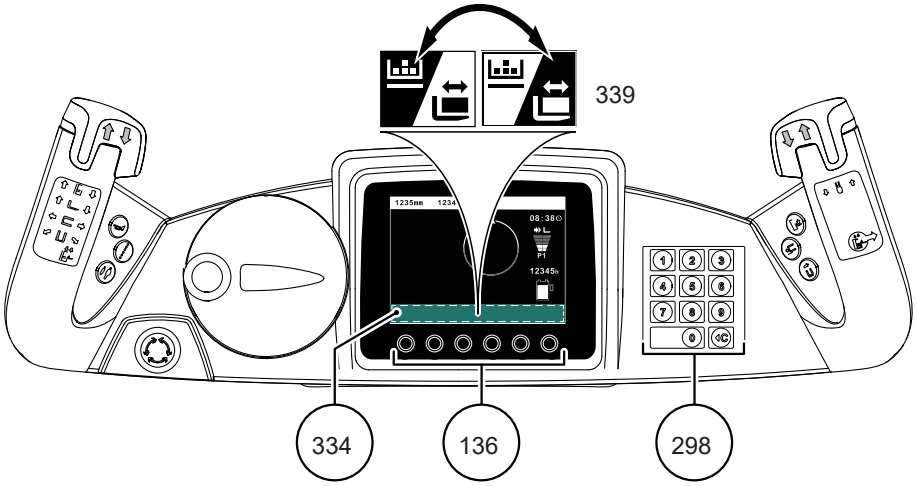
Warehouse mode:

– In storage mode pallets can be stacked and retrieved, see page 300.
– The vertical position of the storage location entered is the height of the forks.
– The horizontal position of the storage location entered is the centre of the load handler.

Stockpicking mode:

– In picking mode goods can be gathered together.
– The vertical position of the storage location entered is the picking height (raised operator position height + 1600 mm).
– The horizontal position of the storage location entered is the centre of the operator position.

11.14.4 Changing Between Warehouse and Order-Picking Mode



Requirements

– Prepare the truck for operation, see page 265.

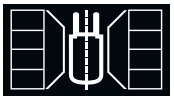
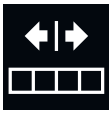
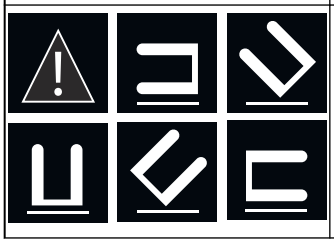
Procedure

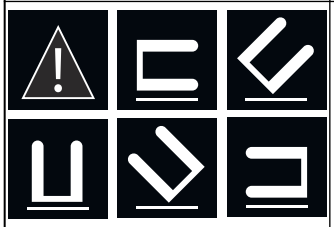
- Press one of the keys "0" to "9" in the keypad (298).
  The keys (136) in the driver's display show the menu level (334).
- Press the (136) button under the "Change between warehouse and picking mode" symbol (339) to activate storage or picking mode:

Symbol	Meaning
	– Storage mode is set. – The right-hand part of the symbol (339) is displayed with a light background.
	– Picking mode is set, – The left-hand part of the symbol (339) is displayed with a light background.

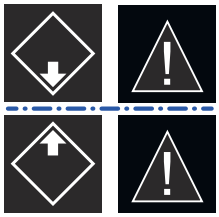
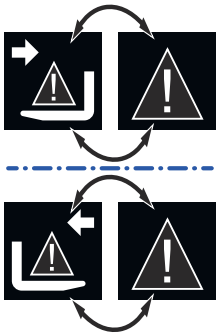
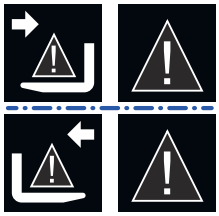
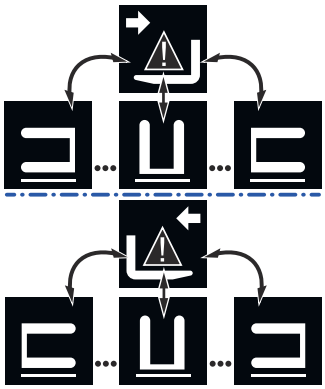
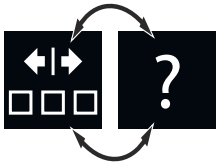
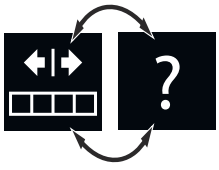
11.14.5 Driver's display

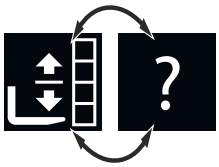
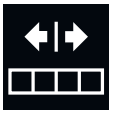
The position of the symbols can be adapted to customer requirements. The setting is made by the manufacturer's customer service department. In this case, the positions (rack row, location (marker), compartment number (lift height) and zones (storage area)) must be entered so as to match the symbol display.

Symbol	Function and description
	– Truck is in narrow aisle. – Truck has received a valid aisle signal via the transponders in the floor.
	Adjustment run in drive direction: – Within the narrow aisle, a horizontal adjustment run in the drive direction is required to reach the storage location.
	Adjustment run in load direction: – Within the narrow aisle, a horizontal adjustment run in the load direction is required to reach the storage location.
	Horizontal position reached: – Within the narrow aisle, the truck is positioned horizontally.
	Zone entry (warehouse area): – A zone is a warehouse area with defined lift heights. – The zones can only be entered as a single digit.
	Rack row entry: – A rack row is the rack to the right or left of the narrow aisle. – The rack rows can be entered in single, double or triple digits.
	Location (marker) entry: – A location is the horizontal position within the narrow aisle. – The location can be entered as single, double or triple digits.
	Compartment number entry (lift height): – A compartment number is the vertical position of the storage location (lift height) in the narrow aisle. – The compartment numbers can be entered in single, double or triple digits.
	Additional order in truck memory: – As well as the current order, there is another order in the truck memory.
	"Load handler" warning – see page 544: – Load handler not in home position. – During the stacking operation, the wrong direction was applied with the "hydraulic functions" control lever.
	Rotate the load handler to the right and traverse the attachment to the left – see page 544: – Load handler and attachment are not in the required home position for stacking operation.

Symbol	Function and description
	Rotate the load handler to the left and traverse the attachment to the right – see page 544: – Load handler and attachment are not in the required home position for stacking operation.
	"Incorrect order completion requirement" warning – see page 544: – No load picked up during retrieval. – Truck is in a narrow aisle that does not match the order. – Load handler not in home position. – Load handler is in a home position that does not match the order.
	"Incorrect order entry" warning – see page 544: – Order entered incorrectly.
	"Truck position unclear" warning – see page 544: – Position of truck in narrow aisle not detected; tolerance exceeded.

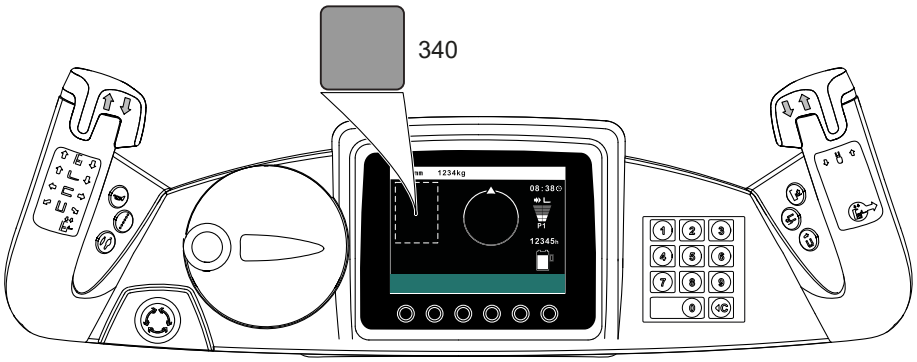
11.14.6 Horizontal positioning error description

Symbol	Description
	Industrial truck in the wrong narrow aisle: – Drive the truck in the narrow aisle given in the order. – The travel direction symbol flashes.
	Load handler and attachment are not in home position when the order is received: – Rotate and traverse the load handler and attachment to the home position displayed. – The symbols flash alternately every 5 seconds.
	No load when retrieving: – The stacking operation is performed until the attachment is in the home position. – The warning symbol lights up.
	Stacking operation – wrong direction selected with the "hydraulic functions" control lever: – Select the correct direction for the stacking operation with the "hydraulic functions" control lever. – The symbol flashes if the wrong stacking operation direction is selected.
	Stacking operation error – load handler and attachment are not in the required home position for the requested stacking operation: – Rotate and traverse the load handler and attachment to the home position displayed. – The symbols flash until the required home position is reached.
	Incorrect rack row entered with order: – Check entry. – "Question mark" and "rack row" symbols flash alternately.
	Incorrect location (marker) entered with order: – Check entry. – "Question mark" and "location (marker)" symbols flash alternately.

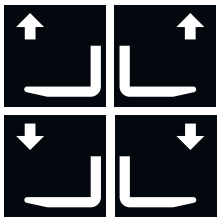
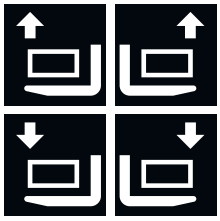
Symbol	Description
	Incorrect compartment number (lift height) entered with order: – Check entry. – "Question mark" and "compartment number (lift height)" symbols flash alternately.
	Wrong position in narrow aisle (transponder not detected): – Aisle start, aisle end or aisle centre transponder must be passed over again. – The "location (marker)" symbol and the lightning symbol flash alternately.
	Unknown position in narrow aisle (tolerance exceeded): – Aisle start, aisle end or aisle centre transponder must be passed over again. – The "location (marker)" symbol and the lightning symbol flash alternately.
	Incorrect checksum on data entry: – The order cannot be carried out. – Re-enter the data or amend the order. – The symbol flashes until the order is cleared.

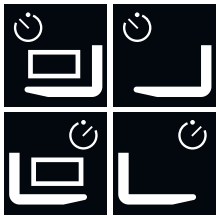
11.14.7 Storage mode symbols in the driver's display

11.14.7.1 Symbols in storage mode (standard attachment)

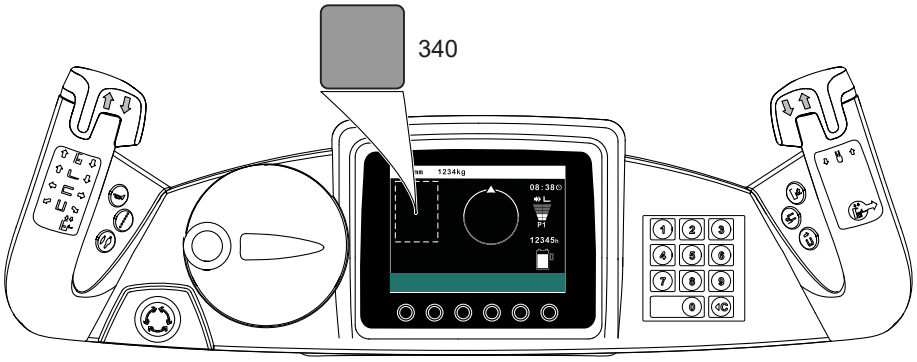


The symbols for the warehouse operation are displayed in the symbol field (340). The symbol that is displayed in the symbol field (340) is determined by the respective operating and truck status.

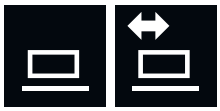
Symbol	Description and function
	– Load handler is without load in the left or right home position.
	– Load handler is with load in the left or right home position.
	– Lift or lower the load handler without load, see page 292.
	– Lift or lower the load handler with load, see page 292.
	– Traverse the load handler without load to the left or right into the storage location, see page 302.
	Optional equipment: – Keep traversing the load handler without load to the left or right into the 2nd stacking depth, see page 302.
	– Traverse the load handler with load to the left or right into the storage location, see page 302.

Symbol	Description and function
	Optional equipment: – Keep traversing the load handler with load to the left or right into the 2nd stacking depth, see page 302.
	– Traverse the load handler without load to the left or right back to the home position, see page 302.
	– Traverse the load handler with load to the left or right back to the home position, see page 302.
	Interval time active: – The interval time reduces mast vibration during retrieval or storage. – It ensures precise positioning of the load.

11.14.7.2 Symbols in storage operation (telescopic table)

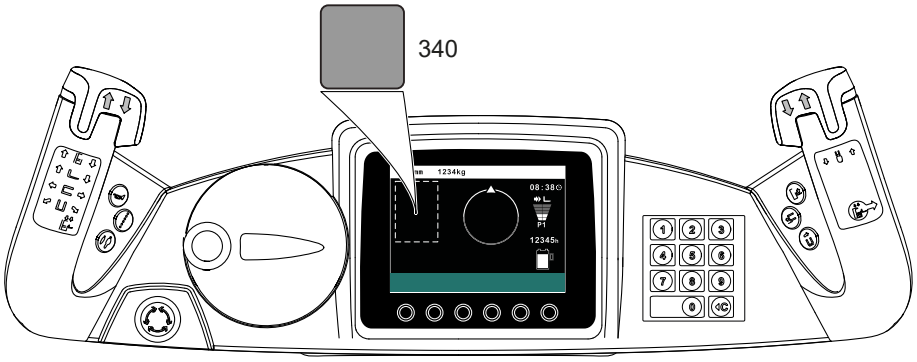


The symbols for the warehouse operation are displayed in the symbol field (340). The symbol that is displayed in the symbol field (340) is determined by the respective operating and truck status.

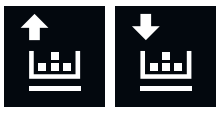
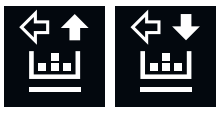
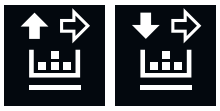
Symbol	Description and function
	– Telescopic forks are without load in the left or right home position.
	– Telescopic forks are with load in the left or right home position.
	– Lift or lower telescopic forks (telescopic table) without load, see page 292.
	– Lift or lower telescopic forks (telescopic table) with load, see page 292.
	– Traverse the telescopic forks without load to the left or right into the storage location, see page 500.
	Optional equipment: – Keep traversing the telescopic forks without load to the left or right into the 2nd stacking depth, see page 500.
	– Traverse the telescopic forks with load to the left or right into the storage location, see page 500.

Symbol	Description and function
	Optional equipment: – Keep traversing the telescopic forks with load to the left or right into the 2nd stacking depth, see page 500.
	– Traverse the telescopic forks without load to the left or right back to the home position, see page 500.
	– Traverse the telescopic forks with load to the left or right back to the home position, see page 500.
	Interval time active: – The interval time reduces mast vibration during retrieval or storage. – It ensures precise positioning of the load.

11.14.7.3 Order picking operation symbols



The symbols for the order picking operation are displayed in the symbol field (340). The symbol that is displayed in the symbol field (340) is determined by the respective operating and truck status.

Symbol	Description and function
	– Order picking operation is activated.
	– Lift or lower the load handler (operator position) to reach the storage location.
	– Remove items from the left or right storage location.
	– Display for required vertical adjustment (lift or lower) to reach the left storage location.
	– Display for required vertical adjustment (lift or lower) to reach the right storage location.

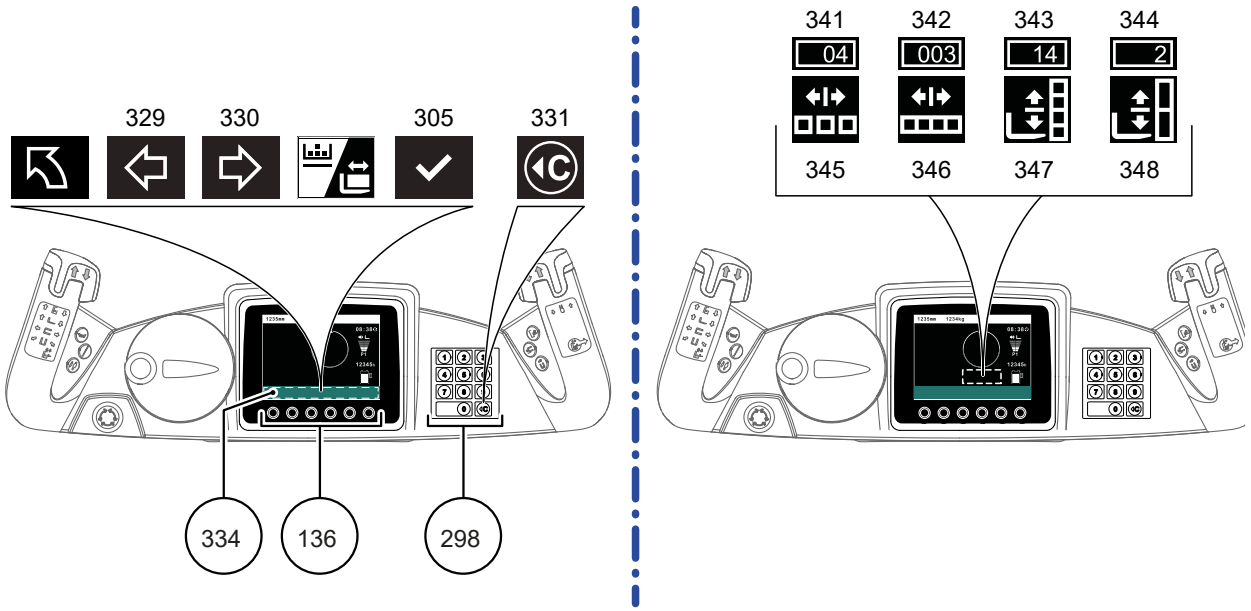
11.14.8 Destination entry for storage location

The destination for horizontal positioning can be entered in three different ways and can be adapted to customer requirements:

– Manual destination input:
  The required destination is entered and confirmed manually.
– Destination input with barcode scanner:
  The required destination is entered with a barcode scanner.
– Destination input via radio:
  The warehouse management system transmits the required destination to the truck terminal by radio .

➔ The necessary activities must be carried out by the manufacturer's customer service department.

Storage location manual entry (default setting)



The position of the symbols can be adapted to customer requirements. The setting is made by the manufacturer's customer service department. In this case, the positions (rack row, location (marker), compartment number (lift height) and zones (storage area)) must be entered so as to match the symbol display.

Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

Procedure

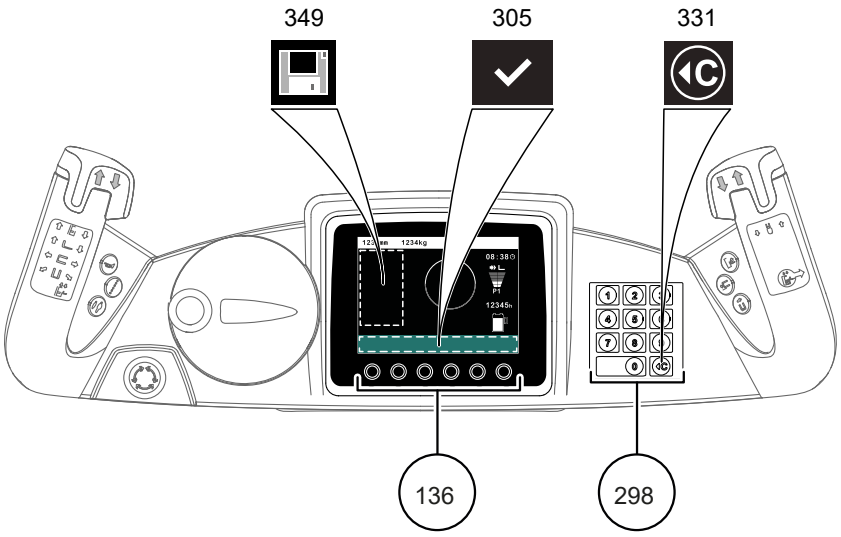
- Press one of the keys "0" to "9" on the keypad (298).
  The driver's display shows the menu level (334) via the keys (136).
- Press the key (136) under the "go back an entry field" symbol (329) or the "go forward an entry field" symbol (330) until the field (341) above the symbol (345) is displayed with a light background.
- Enter the rack row with the keys "0" to "9" in the keypad (298).
  The rack row can be entered as a single digit (0 - 9), 2-digit (00-99) or 3-digit number (000-999).
- Press the key (136) under the "go back an entry field" symbol (329) or the "go forward an entry field" symbol (330) until the field (342) above the symbol (346) is displayed with a light background.
- Enter the location (marker) with the keys "0" to "9" in the keypad (298).
  The location (marker) can be entered as a single digit (0 - 9), 2-digit (00-99) or 3-digit number (000-999).
- Press the key (136) under the "go back an entry field" symbol (329) or the "go forward an entry field" symbol (330) until the field (343) above the symbol (347) is displayed with a light background.
- Enter the compartment number with the keys "0" to "9" on the keypad (298).
  The compartment number can be entered as a single digit (0 - 9), 2-digit (00-99) or 3-digit number (000-999).

- Press the key (136) under the "go back an entry field" symbol (329) or the "go forward an entry field" symbol (330) until the field (344) above the symbol (348) is displayed with a light background.
- Enter the zone with the keys "0" to "9" on the keypad (298).
  The zone can be entered with a single digit (0 - 9).

➔ An incorrect entry can be deleted by pressing the "<C" key (331) on the keypad (298).

- Confirm the entries by pressing the key (136) under the "confirm" symbol (305).

Manual destination entry is now complete. The entered destination (341-344) is displayed above the symbols (345-348) with a dark background. The destination can now be approached.



A maximum of two orders can be stored in the truck’s memory. The destination entered first is shown on the driver's display as the current order. The second destination entered is stored in the truck’s memory. In this case the "order in memory" symbol (349) is shown in the driver's display.

- If the current destination is approached and the order is performed, the destination is cleared from the driver's display. The destination that may be stored in the truck memory is shown on the driver's display as the current order.
- Pressing the "<C" (331) key once in the keypad (298) allows the destination displayed to be cleared.
- Pressing the "<C" (331) key twice in the keypad (298) displays the previously cleared destination in the driver's display again. Pressing the (136) key under the "Confirm" symbol (305) accepts this destination again and the order can be performed again.
- Pressing one of the keys "0" to "9" in the keypad (298) displays the last destination and the most recently performed order.

Destination input with barcode scanner

Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

Procedure

- Scan in the label with the barcode scanner.
- The destination stored on the label is transmitted directly to the driver's display.

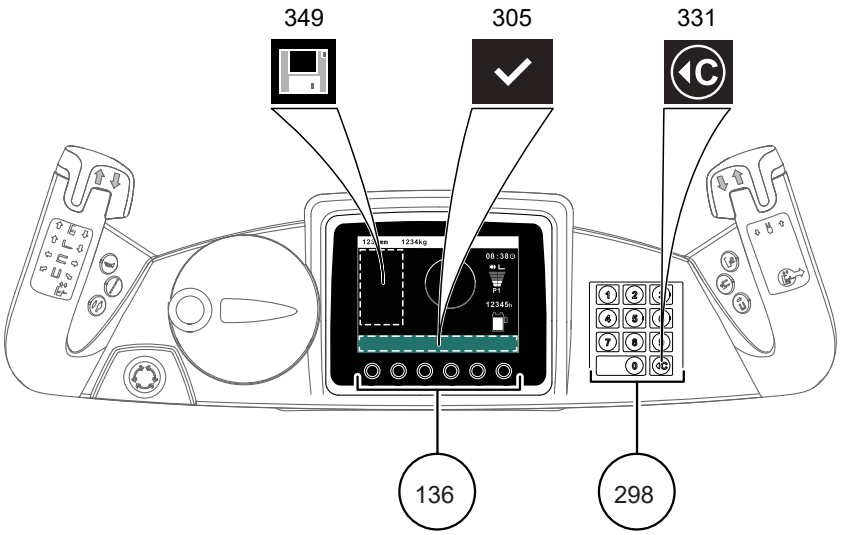
Destination entry with the barcode scanner is now complete. The destination can now be approached.

➔ A maximum of two orders can be stored in the truck’s memory. The destination scanned in first is shown on the driver's display as the current order. The second destination scanned in is stored in the truck’s memory. In this case the "order in memory" symbol (349) is shown in the driver's display.

- If the current destination is approached and the order is performed, the destination is cleared from the driver's display. The destination that may be stored in the truck memory is shown on the driver's display as the current order.
- Pressing the "<C" (331) key once in the keypad (298) allows the destination displayed to be cleared.
- Pressing the "<C" (331) key twice in the keypad (298) displays the previously cleared destination in the driver's display again. Pressing the (136) key under the "Confirm" symbol (305) accepts this destination again and the order can be performed again.
- Pressing one of the keys "0" to "9" in the keypad (298) displays the last destination and the most recently performed order.

➔ Destinations can be inputted manually if the barcode scanner fails.

Destination input via data radio transmission



Requirements

– Truck has been prepared for operation – see page 265.
– Truck driven into the narrow aisle and compulsory guidance established – see page 283.

Procedure

• The destination transmitted to the truck terminal by radio data from the warehouse management system is received by the industrial truck and appears directly on the driver's display.

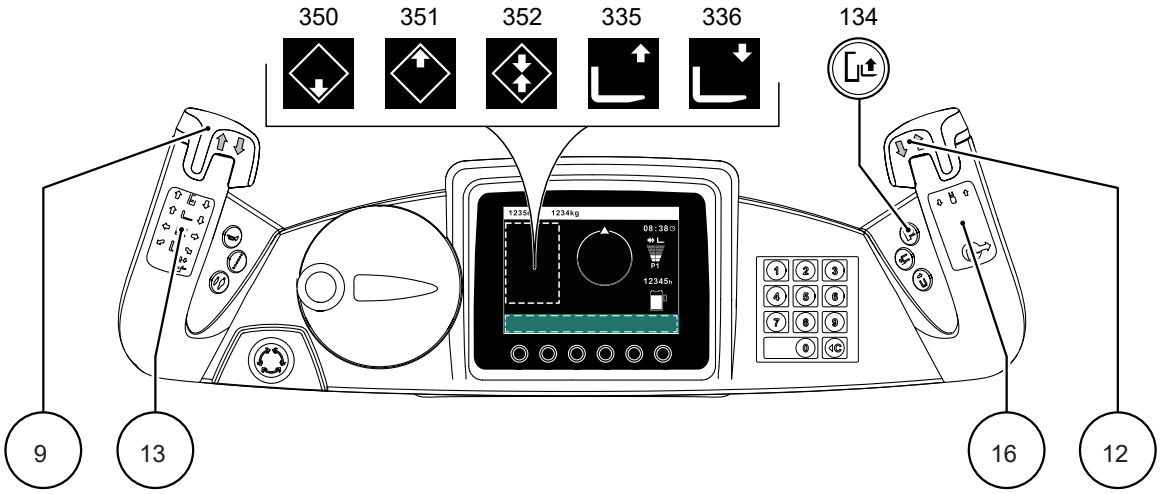
Destination entry with the truck terminal is now complete. The destination can now be approached.

- When the current order has been processed, it is deleted from the driver's display.
- Feedback is sent from the industrial truck to the truck terminal.
- Subsequently, another destination sent to the truck terminal from the warehouse management system via radio data transmission can be received and appears in the driver's display.
- Pressing the "<C" (331) key once in the keypad (298) allows the destination displayed to be cleared.

➔ Optionally, destinations can be entered manually if the truck terminal fails.

11.14.9 Approaching the storage location with horizontal positioning

11.14.9.1 Automatic horizontal and manual vertical destination approach (●)



Requirements

– Truck has been prepared for operation, see page 265.
– For EKX only:
  The attachment must be in the correct home position. Note symbols on the driver's display. If necessary, traverse and rotate the attachment to the correct home position.
– The truck is located in the set narrow aisle and is automatically guided. A narrow aisle that differs from that given in the order is indicated on the driver's display with the warning symbol ⚠.
– Enter the storage location destination, see page 551.

Procedure

- Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
- Press and hold the deadman switch.
- Set the travel direction according to the symbols (350|351) shown on the driver's display:
  - Slowly turn the travel control knob (12) anti-clockwise when the "travel in drive direction" symbol (350) is displayed.
  - Slowly turn the travel control knob (12) clockwise when the "travel in load direction" symbol (351) is displayed.
- Control the travel speed by rotating the travel control knob (12) further or less.
- When you have reached the horizontal storage location position, the "truck horizontally positioned" symbol (352) appears on the driver's display and the truck stops.

  The horizontal storage location position has now been reached.
- Use the main lift to raise the load handler if the "lift" symbol (335) is displayed:
  - Turn the "hydraulic functions" control lever (9) anti-clockwise.
- Use the main lift to lower the load handler if the "lower" symbol (336) is displayed:
  - Turn the "hydraulic functions" control lever (9) clockwise.

→ The "hydraulic functions" control lever (9) must be operated until the set height is reached.

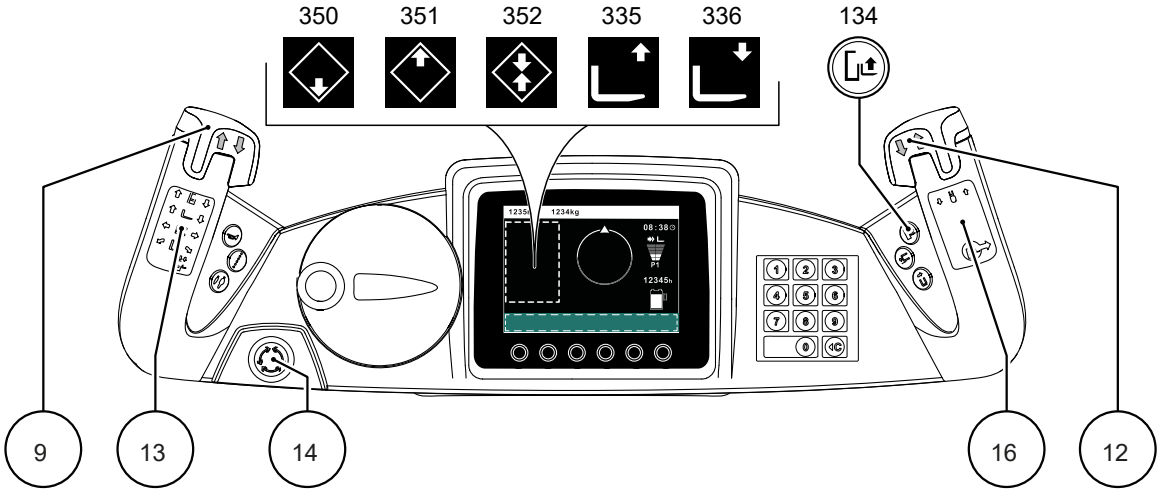
- If the vertical position of the storage location cannot be reached with the main lift fully extended or lowered, the storage location must be reached with the auxiliary lift (*only for trucks with auxiliary lift*):
  - Press and hold the "auxiliary lift" button (134).
  - Raise the load handler with the auxiliary lift, turn the "hydraulic functions" control lever (9) anti-clockwise.
  - Lower the load handler with the auxiliary lift, turn the "hydraulic functions" control lever (9) clockwise.
- After reaching the vertical storage location position, the "lift" symbol (335) or "lower" symbol (336) disappears and the movement of the load handler is stopped.

  The vertical storage location position has now been reached. The operator can start to stack or retrieve goods.
  The operator can start to pick goods (with the EKS and EKX).
  The operator can start to stack or retrieve goods (with the EKX).

➔ After reaching the storage location, the storage location can optionally be illuminated by a position light, see page 561.

➔ The entered storage location can also be approached through diagonal travel (simultaneous travel and lifting or lowering of the Main Lift). For details of diagonal travel, see page 298.

11.14.9.2 Automatic horizontal and vertical destination approach (○)



Automatic horizontal and vertical destination approach (○)

Requirements

– Truck has been prepared for operation, see page 265.
– For EKX only:
  The attachment must be in the correct home position. Note symbols on the driver's display. If necessary, traverse and rotate the attachment to the correct home position.
– The truck is located in the set narrow aisle and is automatically guided. A narrow aisle that differs from that given in the order is indicated on the driver's display with the warning symbol ⚠.
– Enter the storage location destination, see page 551.

Procedure

- Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
- Press and hold the deadman switch.
- Set the travel direction according to the symbols (350|351) shown on the driver's display:
  - Slowly turn the travel control knob (12) anti-clockwise when the "travel in drive direction" symbol (350) is displayed.
  - Slowly turn the travel control knob (12) clockwise when the "travel in load direction" symbol (351) is displayed.
- Control the travel speed by rotating the travel control knob (12) further or less.
- The truck begins automatic horizontal and vertical destination approach.

➔ Truck movements can be stopped by releasing the travel control knob (12) or handle ((13)|16) or by pressing the emergency disconnect switch (14).

- When you have reached the storage location, the truck performs the following actions:
  - The "truck horizontally positioned" symbol (352) is displayed.
  - Truck stops.
  - Lifting or lowering operations are automatically stopped.
  - "Lift" symbol (335) or "lower" symbol (335) disappears.

  The horizontal and vertical storage location position has now been reached. The operator can start to stack or retrieve goods.
  The operator can start to pick goods (with the EKS and EKX).
  The operator can start to stack or retrieve goods (with the EKX).

➔ After reaching the storage location, the storage location can optionally be illuminated by a position light, see page 561.

11.14.9.3 Storing and retrieving loads with the optional "Stacking operation" equipment

➔ Horizontal positioning can be combined with the optional "Stacking operation" equipment. The operator is supported with the stacking operation when storing or retrieving loads, see page 562.

11.14.9.4 Order picking direction position light (○)

➔ When the storage location has been reached, it is illuminated by the position lights on the operator position. The operator can start to pick in the illuminated area.

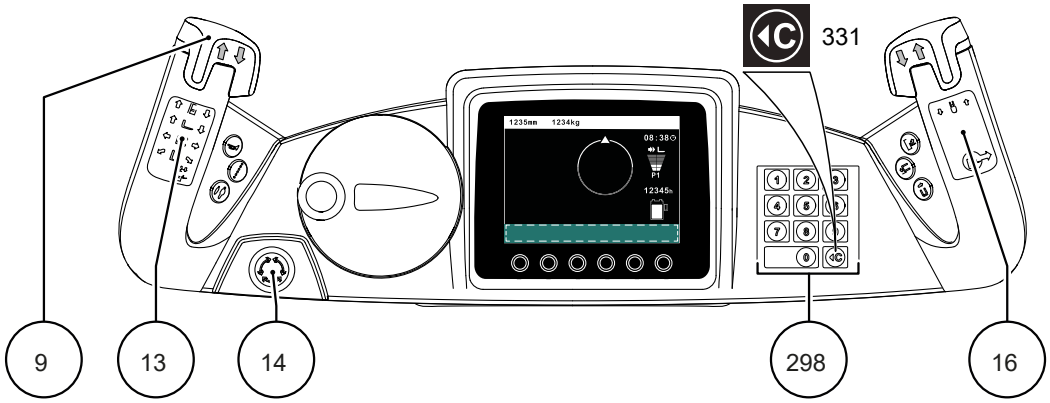
11.15 Stacking operation (○)

General procedure of the stacking operation:

– Retrieval:
  • Traverse the load handler without load to the left or right into the storage location – see page 302.
  • Raise the load handler – see page 295.
  • Traverse the load handler with load to the left or right back to the home position – see page 302
– Stacking:
  • Traverse the load handler with load to the left or right into the storage location – see page 302.
  • Wait for the interval time.
  • Lower the load handler – see page 295.
  • Traverse the load handler without load to the left or right back to the home position – see page 302

The following stacking options are available for stacking operations:

➔ The following types of stacking operation are set up by the manufacturer's specialist customer service personnel who have been trained to do this.



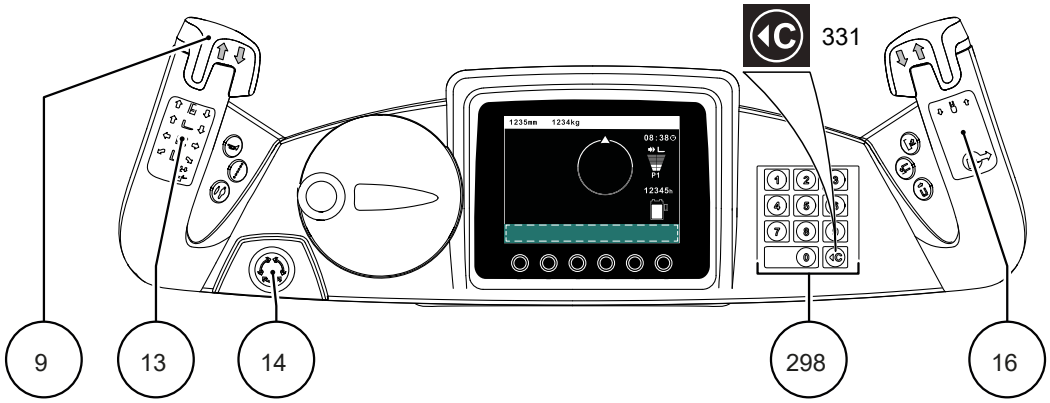
The automatic or manual stacking operation can be cancelled by pressing the "<C" key (331) on the keypad (298) or the emergency disconnect switch (14). No "order processed" message is sent to the truck terminal.

Stacking operation not active / no feedback to truck terminal

- Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
- Press and hold the deadman switch.
- Approach the storage location using rack height select (see page 532) or horizontal positioning (see page 558).

When the selected height has been reached, the rack height select order disappears from the driver's display.

- The operator can start to stack and retrieve goods manually:
  - Traversing the attachment, see page 302.
  - Raising or lowering the load handler, see page 292.



The automatic or manual stacking operation can be cancelled by pressing the "<C" key (331) on the keypad (298) or the emergency disconnect switch (14). No "order processed" message is sent to the truck terminal.

Stacking operation not active / feedback to truck terminal

Procedure

- Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
- Press and hold the deadman switch.
- Approach the storage location using rack height select (see page 532) or horizontal positioning (see page 558).

When the selected height has been reached, the rack height select order disappears from the driver's display.

- The operator can start to stack and retrieve goods manually:
  - Traversing the attachment, see page 302.
  - Raising or lowering the load handler, see page 292.
- The message "Order processed" is only issued to the truck terminal when the attachment has left and then returned to the home position.

During the positioning procedure another compartment can be entered. This entry is shown for approx. 1 sec. in the driver's display and stored in the cache. After stacking, the shelf is automatically taken from the intermediate log.

Manual stacking operation

Procedure

- Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
- Press and hold the deadman switch.
- Approach the storage location using rack height select (see page 532) or horizontal positioning (see page 558).

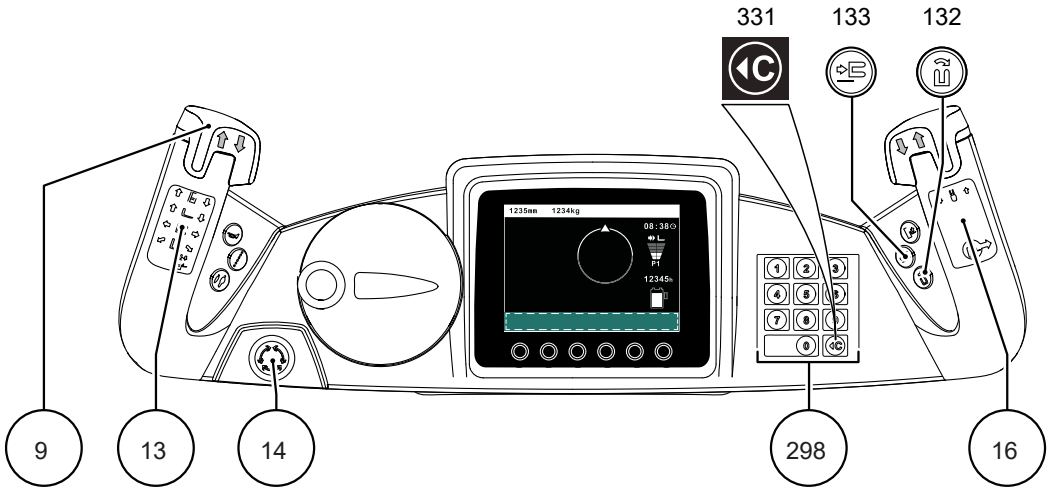
➔ Stacking / retrieval can be performed when the selected height has been reached. Stacking and retrieval are compulsorily specified to the operator by the load sensor on the driver’s display.

- The operator can start to stack and retrieve goods manually:
  - Traversing the attachment, see page 302.
  - Raising or lowering the load handler, see page 292.

➔ After reaching the respective end position (traverse or lift height reached), the next step can only be carried out when the "hydraulic functions" control lever (9) has reached the neutral position. The hydraulic speeds are proportional to the deflection of the "hydraulic functions" control lever (9).

➔ The automatic or manual stacking operation can be cancelled by pressing the "<C" key (331) on the keypad (298) or the emergency disconnect switch (14). No "order processed" message is sent to the truck terminal.

During the positioning procedure another compartment can be entered. This entry is shown for approx. 1 sec. in the driver's display and stored in the cache. After stacking, the shelf is automatically taken from the intermediate log.



➔ The automatic or manual stacking operation can be cancelled by pressing the "<C" key (331) on the keypad (298) or the emergency disconnect switch (14). No "order processed" message is sent to the truck terminal.

Automatic stacking operation with the "hydraulic functions" control lever (variant A)

Procedure

- Grasp the handle (13) with your left hand and the handle (16) with your right hand (two-hand operation).
- Press and hold the deadman switch.
- Approach the storage location using rack height select (see page 532) or horizontal positioning (see page 558).

➔ Stacking / retrieval can be performed when the selected height has been reached. Stacking and retrieval are compulsorily specified to the operator by the load sensor on the driver’s display.

- The operator can start to stack and retrieve goods. The given direction for the stacking operation must be specified and adhered to throughout the stacking operation via the "hydraulic functions" control lever (9):
  - "Left" stacking operation = turn the "hydraulic functions" control lever (9) anticlockwise and hold it down until the stacking operation is complete.
    Description of the symbols for left stacking operation, see page 568.
  - "Right" stacking operation = turn the "hydraulic functions" control lever (9) clockwise and hold it down until the stacking operation is complete.
    Description of the symbols for right stacking operation, see page 568.

➔ The hydraulic speeds are fixed and cannot be influenced.
The hydraulic functions stop when the "hydraulic functions" control lever (9) is released. The stacking operation continues when the "hydraulic functions" control lever (9) is actuated again.

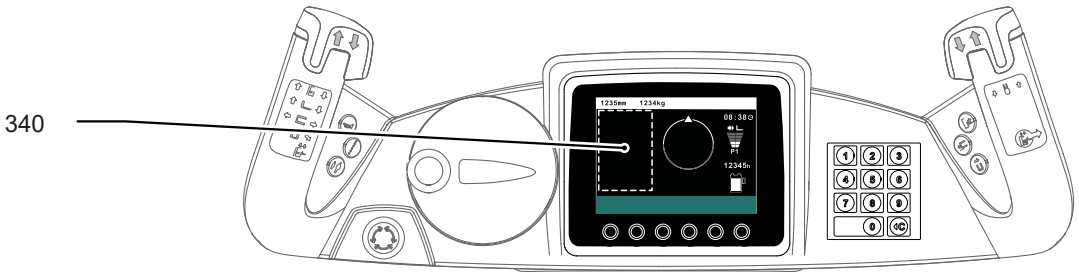
During the positioning procedure another compartment can be entered. This entry is shown for approx. 1 sec. in the driver's display and stored in the cache. After stacking, the shelf is automatically taken from the intermediate log.

Automatic stacking operation with the "Hydraulic functions" control lever (version B)

Automatic stacking operation version "B" corresponds to that of version "A" with the following deviations:

- ▶ Pressing one of the "Traverse attachment" (133) or "Rotate load handler" (132) buttons cancels the automatic stacking operation. The operator is notified of this via an audible signal.
- ▶ Once the automatic operation is cancelled, the operator must carry out the stacking operation manually, see "Manual stacking operation".

11.15.1 Description (symbols) for stacking operation



The symbols for left or right stacking operations are displayed in the symbol field (340). The symbol that is displayed in the symbol field (340) is determined by the respective operating and truck status.

11.15.1.1 Description (symbols) of the stacking operation with the standard attachment

Starting point for left stacking operation

Symbol	Meaning
	– Load handler is with or without load in the left-hand home position.

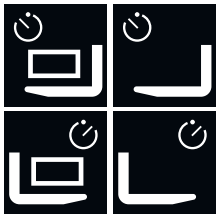
Retrieve the load from the storage location on the left side

Symbol	Meaning
	– Traverse the load handler without load to the left into the storage location, see page 302.
	Optional equipment: – Keep traversing the load handler without load to the left into the 2nd stacking depth, see page 302.
	– To raise the load handler with the main lift, see page 292. – Raise the load handler until the load is resting freely on the load handler and can be moved from the storage location without striking anything.
	– Traverse the load handler with load to the right back into the home position, see page 302.

Storing the load to the left in the storage location

Symbol	Meaning
	– Traverse the load handler with load to the left into the storage location, see page 302.
	Optional equipment: – Keep traversing the load handler with load to the left into the 2nd stacking depth, see page 302.
	– Lower the load handler with the main lift, see page 292. – Lower the load handler until the load handler is clear of the load.
	– Traverse the load handler without load to the right back into the home position, see page 302.

Interval time during storage or retrieval

Symbol	Meaning
	Interval time active: – The interval time reduces mast vibration during retrieval or storage. – It ensures precise positioning of the load.

Starting point for right stacking operation

Symbol	Meaning
	– Load handler is with or without load in the right-hand home position.

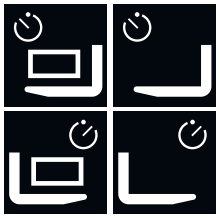
Retrieve the load from the storage location on the right side

Symbol	Meaning
	– Traverse the load handler without load to the right into the storage location, see page 302.
	Optional equipment: – Keep traversing the load handler without load to the right into the 2nd stacking depth, see page 302.
	– Raise the load handler, see page 292. – Raise the load handler until the load is resting freely on the load handler and can be moved from the storage location without striking anything.
	– Traverse the load handler with load to the left back into the home position, see page 302.

Storing the load to the right in the storage location

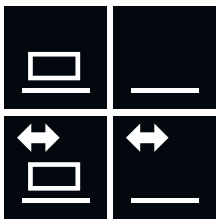
Symbol	Meaning
	– Traverse the load handler with load to the right into the storage location, see page 302.
	Optional equipment: – Keep traversing the load handler with load to the right into the 2nd. stacking depth, see page 302.
	– Lower the load handler, see page 292. – Lower the load handler until the load handler is clear of the load.
	– Traverse the load handler without load to the left back into the home position, see page 302.

Interval time during storage or retrieval

Symbol	Meaning
	Interval time active: – The interval time reduces mast vibration during retrieval or storage. – It ensures precise positioning of the load.

11.15.1.2 Description (symbols) for stacking operation with telescopic table

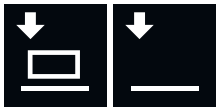
Starting point for left stacking operation

Symbol	Meaning
	– Telescopic forks are with or without load in home position.

Retrieve the load from the storage location on the left side

Symbol	Meaning
	– Traverse the telescopic forks without load to the left into the storage location, see page 500.
	Optional equipment: – Keep traversing the telescopic forks without load to the left into the 2nd stacking depth, see page 500.
	– Lift the telescopic forks (telescopic table) with the main lift, see page 292. – Lift the telescopic forks (telescopic table) until the load is resting freely on the telescopic forks and can be moved from the storage location without colliding.
	– Traverse the telescopic forks with load to the right back into the home position, see page 500.

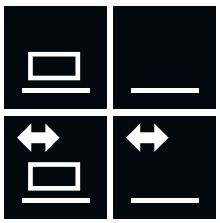
Storing the load to the left in the storage location

Symbol	Meaning
	– Traverse the telescopic forks with load to the left into the storage location, see page 500.
	Optional equipment: – Keep traversing the telescopic forks with load to the left into the 2nd stacking depth, see page 500.
	– Lower the telescopic forks (telescopic table) with the main lift, see page 292. – Lower the telescopic forks (telescopic table) until the telescopic forks are free of the load and can be pulled out of the storage location.
	– Traverse the telescopic forks without load to the right back into the home position, see page 500.

Interval time during storage or retrieval

Symbol	Meaning
	Interval time active: – The interval time reduces mast vibration during retrieval or storage. – It ensures precise positioning of the load.

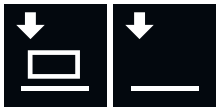
Starting point for right stacking operation

Symbol	Meaning
	– Telescopic forks are with or without load in home position.

Retrieve the load from the storage location on the right side

Symbol	Meaning
	– Traverse the telescopic forks without load to the right into the storage location, see page 500.
	Optional equipment: – Keep traversing the telescopic forks without load to the right into the 2nd stacking depth, see page 500.
	– Lift the telescopic forks (telescopic table) with the main lift, see page 292. – Lift the telescopic forks (telescopic table) until the load is resting freely on the telescopic forks and can be moved from the storage location without colliding.
	– Traverse the telescopic forks with load to the left back into the home position, see page 500.

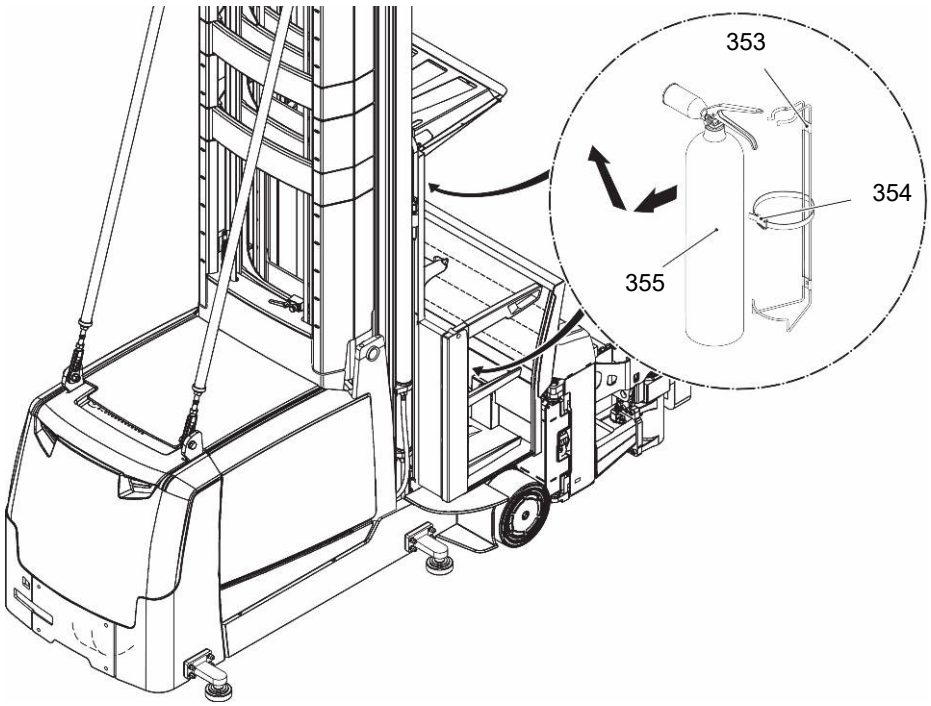
Storing the load to the right in the storage location

Symbol	Meaning
	– Traverse the telescopic forks with load to the right into the storage location, see page 500.
	Optional equipment: – Keep traversing the telescopic forks with load to the right into the 2nd. stacking depth, see page 500.
	– Lower the telescopic forks (telescopic table) with the main lift, see page 292. – Lower the telescopic forks (telescopic table) until the telescopic forks are free of the load and can be pulled out of the storage location.
	– Traverse the telescopic forks without load to the left back into the home position, see page 500.

Interval time during storage or retrieval

Symbol	Meaning
	Interval time active: – The interval time reduces mast vibration during retrieval or storage. – It ensures precise positioning of the load.

11.16 Fire extinguisher (○)



⚠ WARNING!

The use of unsuitable extinguishing agents can cause fire to spread

The extinguishing agents in a fire extinguisher are suitable only for certain types of fires, due to their extinguishing properties. The use of inappropriate extinguishing agents can cause fire to spread, and hence injure the operator.

- ▶ The proprietor is responsible for choosing suitable extinguishing agents and fire extinguishers.
- ▶ The fire extinguisher must comply with national regulations.

The fire extinguisher (355) is attached to the following positions on the operator position, depending on the width of the operator position:
– < 1300 mm: Bottom right
– ≥ 1300 mm: Top left

Procedure

- Open the latch (354).
- Pull the fire extinguisher (355) out of its bracket (353) (see arrow direction).

➔ To operate, refer to the illustrations on the fire extinguisher (355).

11.17 Rider mode in the operator position (○)

In chapter E of the truck operating instructions in the section "Safety Regulations for the Operation of Forklift Trucks" under point "Unauthorised use of truck", it is stated that it is strictly forbidden to carry one or more passengers in the operator position or on the load handler.

If the truck is equipped for ride-on mode with an additional control panel (two-hand operation), a second person may be allowed in the operator position.

⚠ WARNING!

Hazards during ride-on mode in the operator position

A second person can only be transported in the operator position if there is an additional control panel for the rider in the operator position. The control panel is electrically connected to the operator position via a connector. The control panel monitors the "two-hand operation" function of the rider. This ensures that the rider remains inside the contours of the operator position when the truck is in motion.

- ▶ Establish the electrical connection between the control panel and operator position.
- ▶ The control panel must only be fitted to the truck during rider mode. When not in use, the control panel must be stored by an authorised person.
- ▶ The operator must instruct the rider in the operator position in how to work in "rider mode" and inform him of potential hazards.
  Example: Do not lean out of the operator position while the truck is carrying out travel or hydraulic operations.

11.17.1 Operation - rider mode in operator position

⚠ WARNING!

Removing or disabling safety features of the additional control panel

If safety features of the additional control panel (e.g. "two-hand operation" buttons) are removed or disabled, this results an injury risk for the rider during travel or hydraulic movements. It cannot then be ensured that the rider remains inside the contours of the operator position or order-picking box during travel or hydraulic movements.

- ▶ Before operating the truck, test the additional control panel (e.g. function of the "two-hand operation" buttons).
- ▶ Tag out a faulty control panel and withdraw it from use.
- ▶ Report any defects immediately to your supervisor.
- ▶ Do not return the control panel to service until you have identified and rectified the fault.

⚠ WARNING!

Influence of weight in the operator position on the operational stability and capacity of the truck

The weight of the operator, rider or loads in the operator position have an influence on the operational stability and capacity of the truck. The capacities specified on the capacity plate refer to a weight (operator, rider or loads) of 98 kg in the operator position, in accordance with ISO 22915-1.

- ▶ In the event that the weight of the operator, rider or loads in the operator position exceeds 98 kg, the capacity of the truck must be reduced. Otherwise, this weight can have a negative influence on the operational stability of the truck.

➔ Note the capacity reduction according to weight (operator, rider or loads) in the operator position, see page 112.

Activating ride-on mode

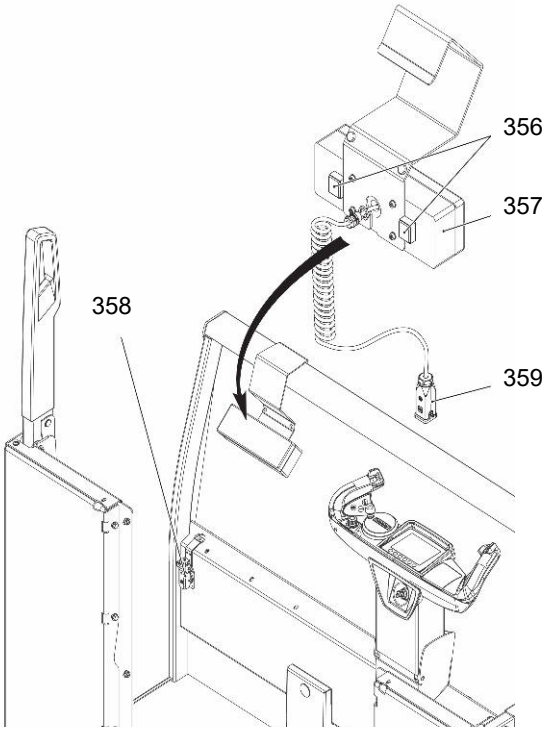
Requirements

– Connector (358) for connecting the control panel (357) to the truck is present.

Tools and Material Required

– Additional control panel (357) for activating ride-on mode

Procedure



- Switch off the truck – see page 266.
- Attach the additional control panel (357) to the guard or gate in the operator position.
- Establish the electrical connection (359| 358) between the truck and the additional control panel (357).
- Switch on the truck – see page 265.
- During the travel or hydraulic movements of the truck, the rider must press and hold the "two-hand operation" buttons (356) on the additional control panel (357) with both hands.

➔ The travel or hydraulic movements of the truck will stop or cease to function if the "two-hand operation" buttons (356) are not operated.

The additional control panel (357) for ride-on mode is installed and activated.

Deactivating ride-on mode

Requirements

– The additional control panel (357) is fitted to the truck and activated.

Procedure

- Switch off the truck – see page 266.
- Disconnect the electrical connection (359|358) between the truck and the additional control panel (357).
- Take the additional control panel (357) off the guard or gate in the operator position.
- Switch on the truck – see page 265.

The additional control panel (357) for ride-on mode has been removed from the truck.

11.18 Working platform (○)

11.18.1 Safety information

⚠ WARNING!

Risk of accident and falling when using the working platform

If the truck is equipped for use with a removable working platform, a person authorised by the operating company may be allowed within the working platform in ***exceptional circumstances***. The person working in the working platform is at risk of accident and of falling out of the working platform.

- ▶ The operating company or operator must instruct the person carried in the working platform in how to operate the working platform and point out the hazards.
  Example:
  Keep all parts of the body within the contour of the working platform during travel, lifting and lowering.
- ▶ The working platform is approved for one person only.
  If a second person is to be carried in the work platform, it must be fitted with an additional two-hand control system.

⚠ WARNING!

Unsuitable working platforms pose a risk of falling

Do not use working platforms that have not been approved for this truck. Unsuitable working platforms can slide off the load handler and fall when the truck is being operated. A fall can be fatal for the person in the working platform.

- ▶ Use only working platforms that have been approved by the manufacturer.
- ▶ The work platform must be connected both mechanically and electrically to the truck at all times during operation.

NOTICE

Use of working platforms

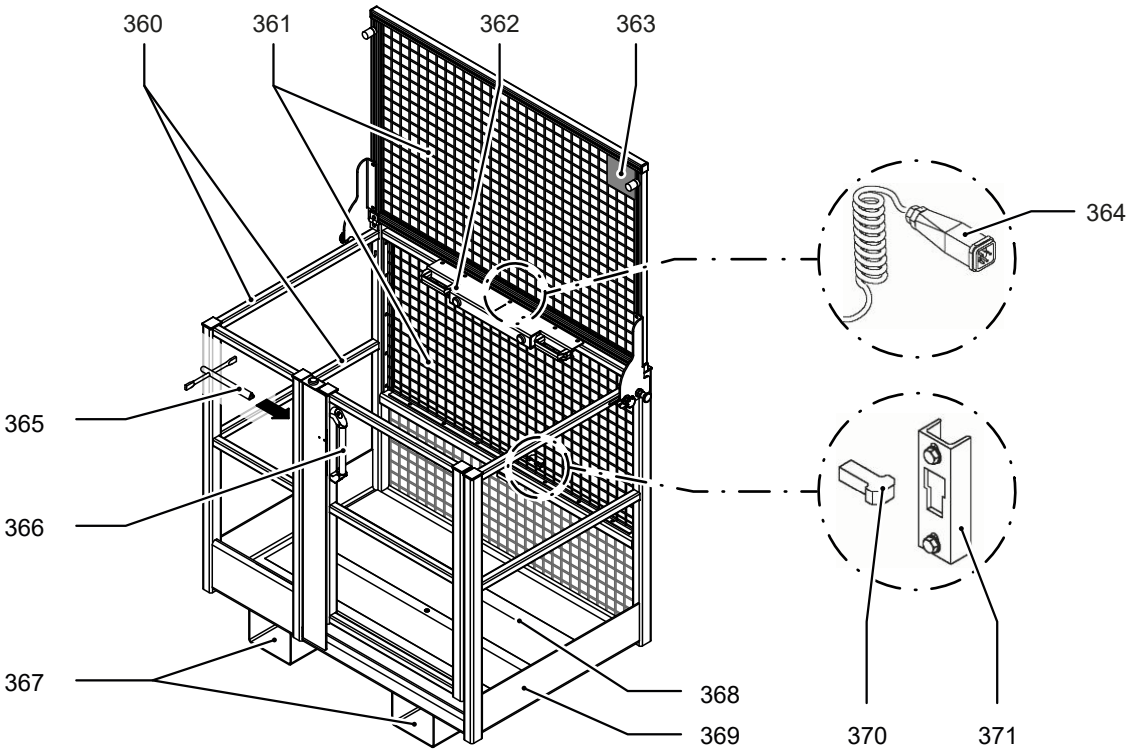
The use of working platforms is governed by national law. In individual states, the use of working platforms may be prohibited on industrial trucks.

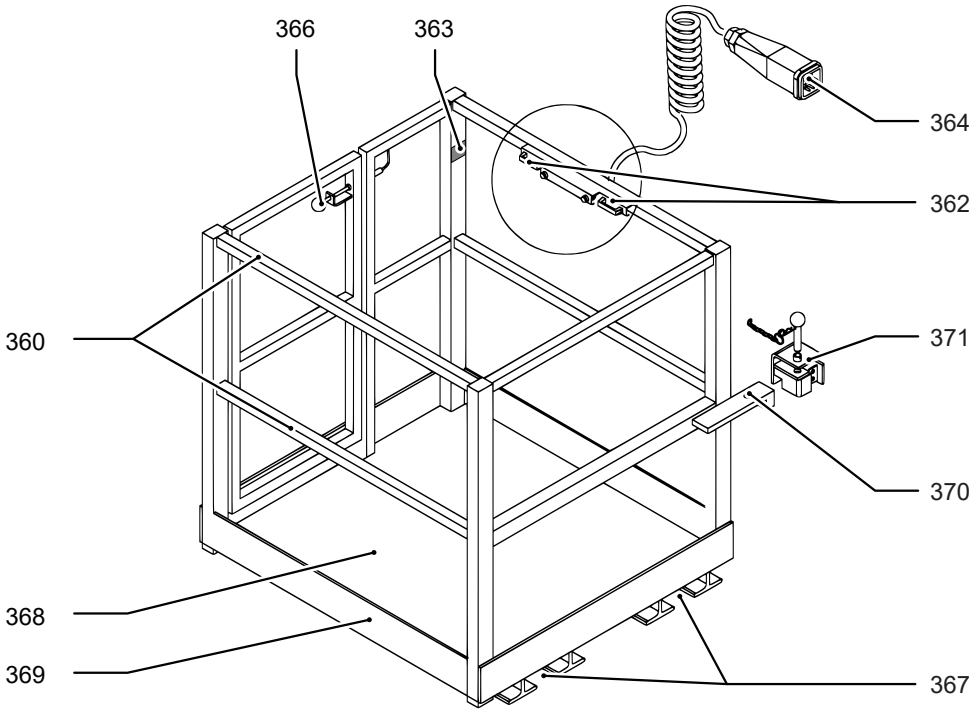
- ▶ The operating company must check and observe the country-specific requirements before the working platform is used. Consult the relevant national supervising body if necessary.
- ▶ Only when the law in the country of use and the manufacturer of the truck permit the use of the working platform may a person be raised and transported using the working platform.

Germany:
- DGUV Information 208-031 (BGI/GUV-5183)
Use of working platforms on trucks with lift mast
Australia:
- AS 2359.1 Powered Industrial Trucks "General Requirements"
- AS 2359.2 Powered Industrial Trucks "Operations"

Maintenance intervals are specified in the section Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement, see page 737.

11.18.2 Work platform components

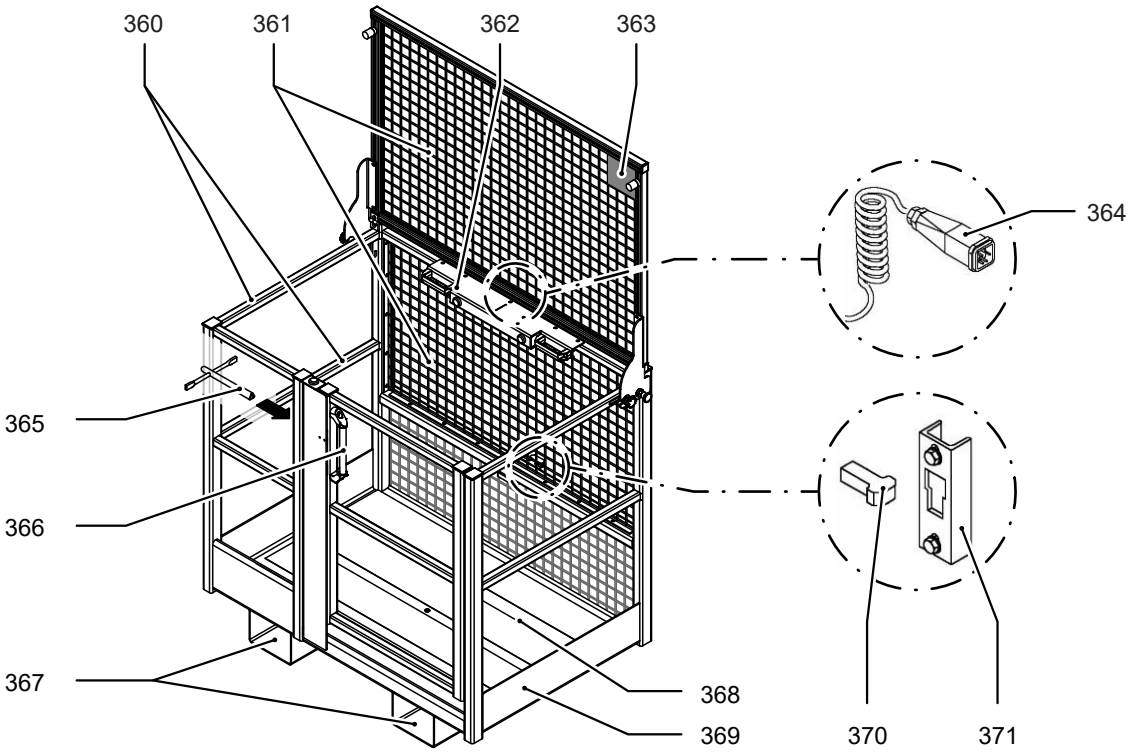




Item		Designation
360	●	Guard
361	○	Protection against reaching through (grille)
362	●	Control panel (two-hand operation): – Handle with contact point or location-fixing acknowledgement button – The truck travel or hydraulic operations are interrupted and cannot be performed if the handles are not being gripped or the acknowledgement buttons are not actuated. Prerequisite: the working platform has been electrically connected to the truck.
363	●	Data plate: – The assembly position of the data plate may vary depending on the working platform.
364	●	Connector with connecting cable between the working platform and truck: – The mating connector on the truck can be installed in the operator position or outside on the enclosed driver's cab depending on the equipment.
365	○	Key to open the door (366)
366	●	Door with electric monitoring
367	●	Fork shoes (fork pockets)
368	●	Stand-on platform (base)
369	●	Toe board
370	●	Working platform lock
371	●	Stop on the attachment of the truck

11.18.3 Picking up the Working Platform

11.18.3.1 Lifting the work platform with the standard attachment



⚠ WARNING!

Unsecured work platforms can be hazardous

The work platform must be connected both physically and electrically to the truck at all times during operation.

▶ The physical lock of the work platform must engage with the stop on the load handler.

▶ The work platform must be connected electrically to the truck at all times during operation.

Requirements

– Truck has been prepared for operation, see page 265.

Tools and Material Required

– Working platform that has been approved for this truck by the manufacturer.

Procedure

- Check the working platform for damage before use.
- Check that the lock (370) on the working platform is present and check for damage.
- Close the door (366).

➔ Pick up the working platform such that eye contact is maintained at all times between the operator and the person in the working platform during truck travel and hydraulic movements.

- Before picking up the working platform, make sure that there is no one in it.
- Position the truck in front of the working platform such that the fork arms can be inserted into the fork shoes (367).
- Carefully push the fork arms into the fork shoes (367) of the working platform.

- Raise the working platform securely:
  - Raise the working platform slightly until it is clear of the ground.

    The mechanical lock (370) of the working platform is engaged in the stop on the load handler (371). The working platform is secured against falling. The "Working platform picked up securely" symbol appears on the driver's display. The raised and locked working platform is monitored by non-contact sensors.

  - Slowly retract the forks and working platform back to the home position.
  - Connect the connector (364) of the connecting cable to the truck.

➔ The connector on the truck can be installed in the operator position or outside on the enclosed driver's cab depending on the equipment.

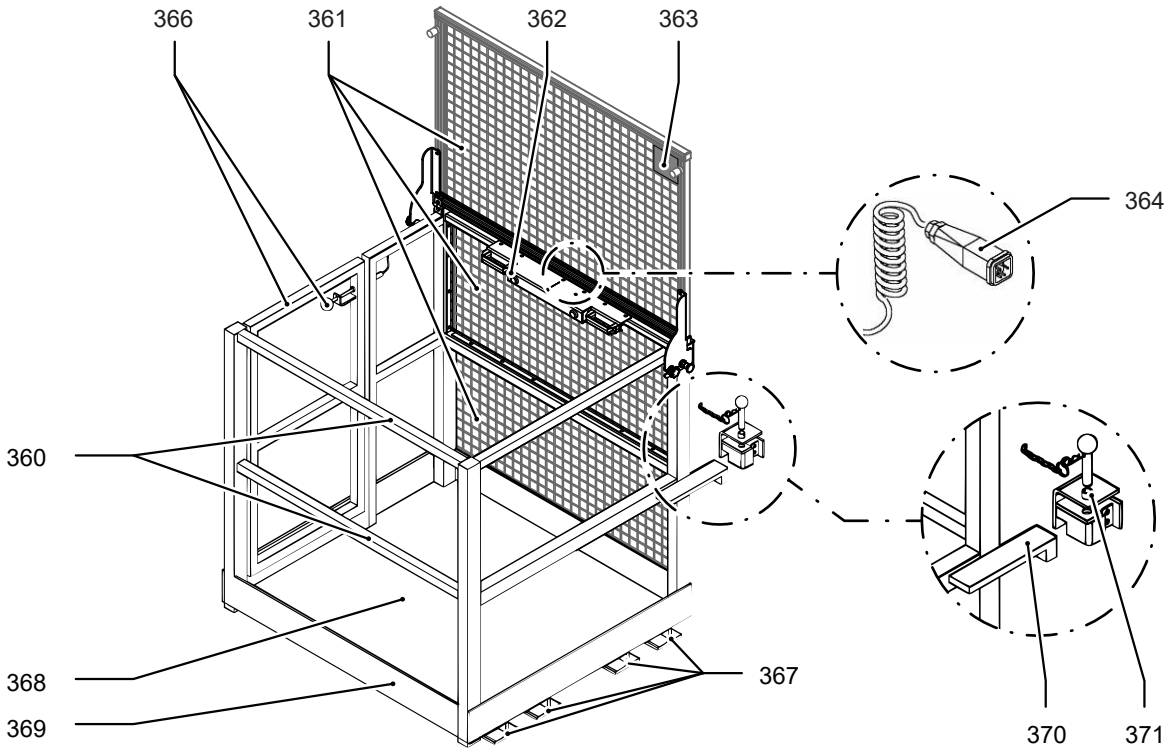
Truck travel or hydraulic movements are possible only when two-hand operation (362) is actuated (handles gripped or acknowledgement buttons actuated) and the door (366) is closed.

➔ If the truck is not connected electrically to the working platform once the working platform has been picked up, truck travel, lifting and lowering functions are disabled.

The working platform has been picked up correctly with the standard attachment. It is now possible to access the working platform, see page 590.

➔ The "attachment traverse" and "load handler (fork carriage) rotate" functions are inhibited when the working platform is picked up and electrically connected.

11.18.3.2 Lifting the work platform with the standard attachment



⚠ WARNING!

Unsecured work platforms can be hazardous

The work platform must be connected both physically and electrically to the truck at all times during operation.

▶ The physical lock of the work platform must engage with the stop on the load handler.

▶ The work platform must be connected electrically to the truck at all times during operation.

Requirements

– Truck has been prepared for operation, see page 265.

Tools and Material Required

– Working platform that has been approved for this truck by the manufacturer.

Procedure

- Check the working platform for damage before use.
- Check that the lock (370) on the working platform is present and check for damage.
- Close the door (366).

➔ Pick up the working platform such that eye contact is maintained at all times between the operator and the person in the working platform during truck travel and hydraulic movements.

- Before picking up the working platform, make sure that there is no one in it.

➔ The working platform for the telescopic table can only be lifted from the left hand side (viewed in the load direction).

- Position the truck in front of the working platform such that the telescopic forks can be inserted into the fork shoes (367).

- Carefully push the telescopic forks into the fork shoes (367) of the working platform.
- Raise the working platform securely:
  - Raise the working platform slightly until it is clear of the ground.
  - Slowly retract the telescopic forks and working platform back to the home position.

The mechanical lock (370) of the working platform is engaged in the stop on the load handler (371). The working platform is secured against falling. The "working platform picked up securely" symbol appears on the driver's display. The raised and locked working platform is monitored by non-contact sensors.

- Prevent the lock (370) on the working platform from loosening by applying the bolt on the stop of the load handler (371).
- Connect the connector (364) of the connecting cable to the truck.

➔ The connector on the truck can be installed in the operator position or outside on the enclosed driver's cab depending on the equipment.

Truck travel or hydraulic movements are possible only when two-hand operation (362) is actuated (handles gripped or acknowledgement buttons actuated) and the door (366) is closed.

➔ If the truck is not connected electrically to the working platform once the working platform has been picked up, truck travel, lifting and lowering functions are disabled.

The working platform has been raised correctly with the telescopic table. It is now possible to access the working platform, see page 590.

➔ The functions "traversing / adjusting the telescopic forks" or "rotating the telescopic table" are blocked when the working platform is picked up and electrically connected.

11.18.4 Operation in the work platform

⚠ WARNING!

Unsecured work platforms can be hazardous

The work platform must be connected both physically and electrically to the truck at all times during operation.

- ▶ The physical lock of the work platform must engage with the stop on the load handler.
- ▶ The work platform must be connected electrically to the truck at all times during operation.

⚠ WARNING!

Risk of accident due to defective safety equipment for the working platform

Defective safety equipment (lock, control panel, door, sensors) on the working platform and truck can cause the working platform to fall. If any of this safety equipment is not functional, the working platform must not be used.

- ▶ Test the safety equipment for the working platform before operation.
- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out the faulty working platform and decommission.
- ▶ Do not return the working platform to service until you have identified and rectified the fault.

⚠ WARNING!

Risk of falling from the working platform

The person in the working platform is at risk of falling when the working platform is in use. Falling from the working platform can result in fatal injuries.

- ▶ Keep the door of the working platform closed during operation.
- ▶ Use both hands to grip the handles or actuate the acknowledgement buttons of the working platform (two-hand operation) during truck travel or hydraulic movements.
- ▶ It is not permitted to use additional entry aids (e.g. ladder, stool) in the working platform.
- ▶ It is not permitted to enter or leave the working platform when in a raised position.
- ▶ Do not climb onto parts of the building or other trucks.

⚠ WARNING!

Objects protruding out of or falling from the working platform

Objects protruding out of the perimeter of the working platform can collide with other components (e.g. racking systems) during operation. In the event of a collision, the working platform may fall and injure persons in the working platform.

Objects falling out of the working platform can injure the operator of the truck or damage the truck.

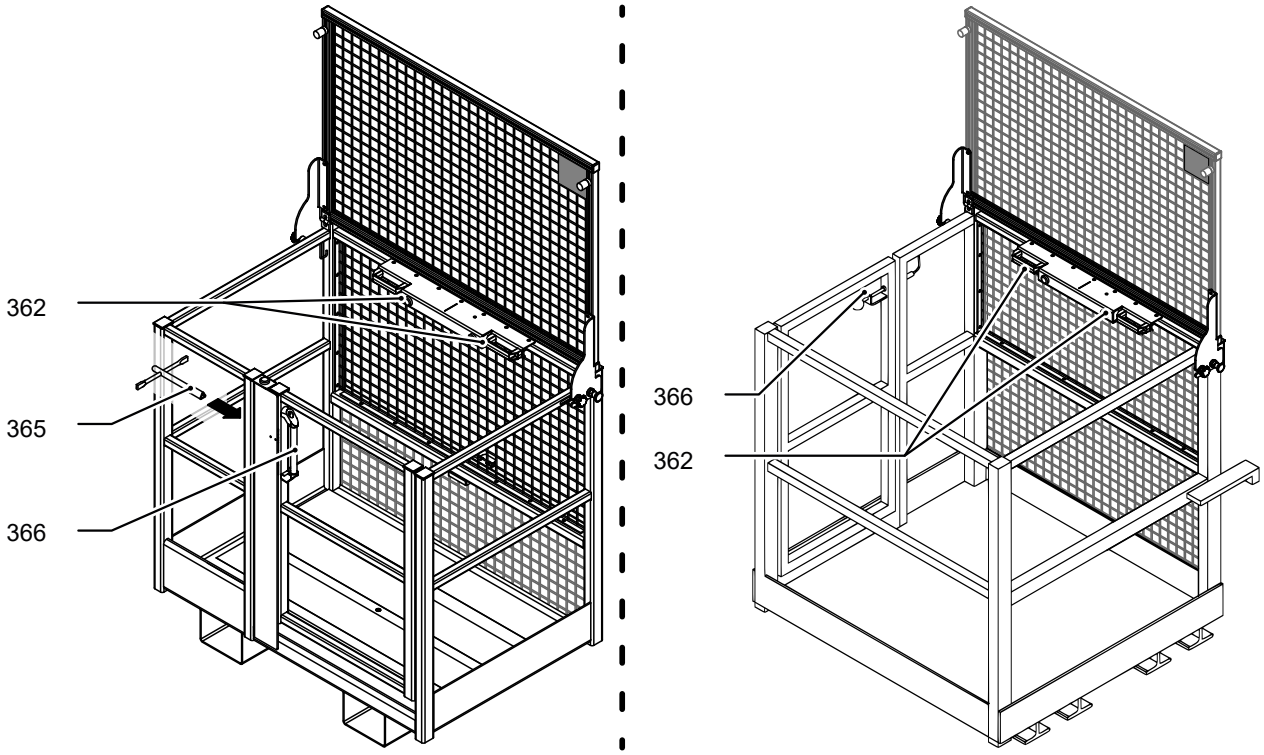
- ▶ Position objects in the working platform such that there is no trip hazard.
- ▶ Ensure that no objects can protrude out of the working platform.
- ▶ Secure objects against slipping and falling.
- ▶ Never lean objects against the door or guard of the working platform.

NOTICE

Maximum load for the work platform:

▶The maximum load can be found on the data plate.

▶Do not exceed the maximum load for the work platform.



➔ When operating the truck with the working platform, only reduced travel/hydraulic speeds are possible.

Operating the working platform

Requirements

– Truck has been prepared for operation, see page 265.
– Working platform picked up securely, see page 586.

Procedure

- Step onto the working platform:
  - Open the door (366) on the working platform.
  - Step on the working platform.
  - Close the door (366) on the working platform.

  The person has stepped onto the working platform.

➔ While the truck is in operation, the closed door (366) of the working platform is permanently monitored. Opening the door (366) will cause truck travel or hydraulic operations to stop.

- Raising, lowering or transporting a person in the working platform:
  - Use both hands to grip the handles or actuate the acknowledgement buttons (362) in the working platform (two-hand operation).

➔ If the handles are not gripped / the acknowledgement buttons (362) are not actuated, the truck travel or hydraulic movements are either interrupted or disabled.

The destination has been reached. The person in the working platform can begin to work.

⚠ WARNING!

Danger due to unsupervised person in the raised working platform

If there is a person in the raised working platform, the truck operator must constantly supervise the person in the working platform.

▶The operator must never leave the truck while the working platform is in operation.

- Leaving the working platform:
  - Use both hands to grip the handles or actuate the acknowledgement buttons (362) in the working platform (two-hand operation).
  - Lower the working platform to the ground.
  - Open the door (366) on the working platform.
  - Leave the working platform.
  - Close the door (366) on the working platform.

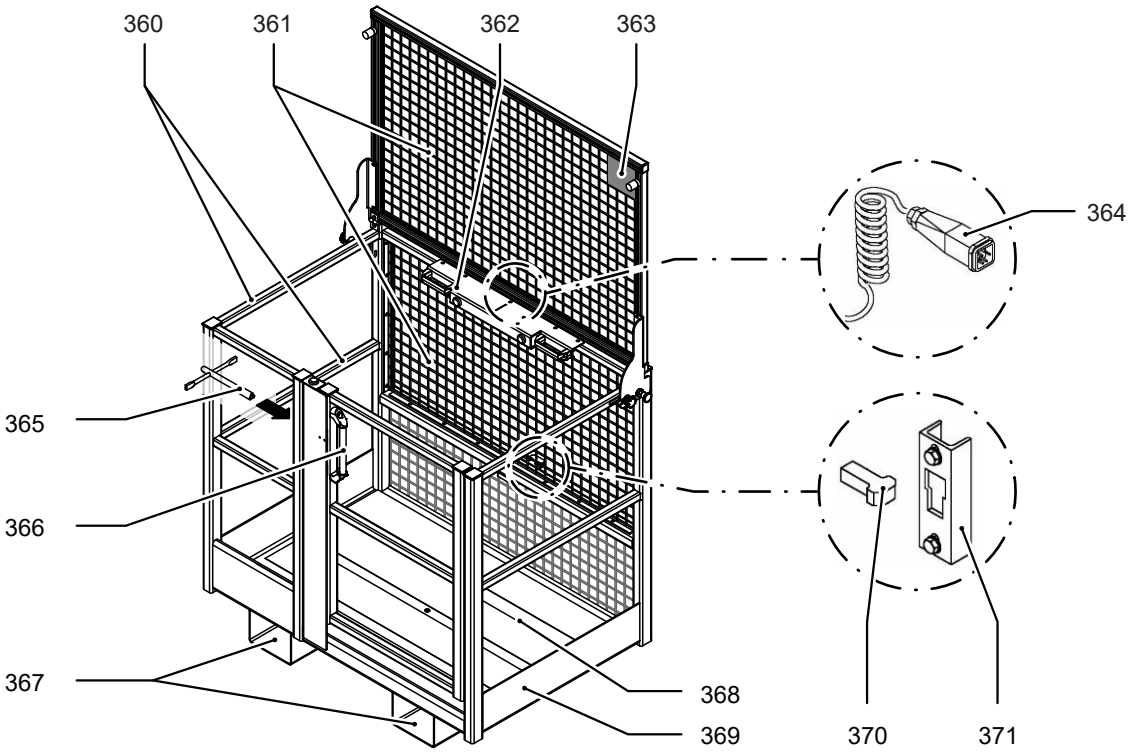
  The person has left the working platform.

NOTICE

In the event of a fault the gate (366) can be opened with the key (365) supplied.

11.18.5 Depositing the Working Platform

11.18.5.1 Lowering the work platform with the standard attachment



Requirements

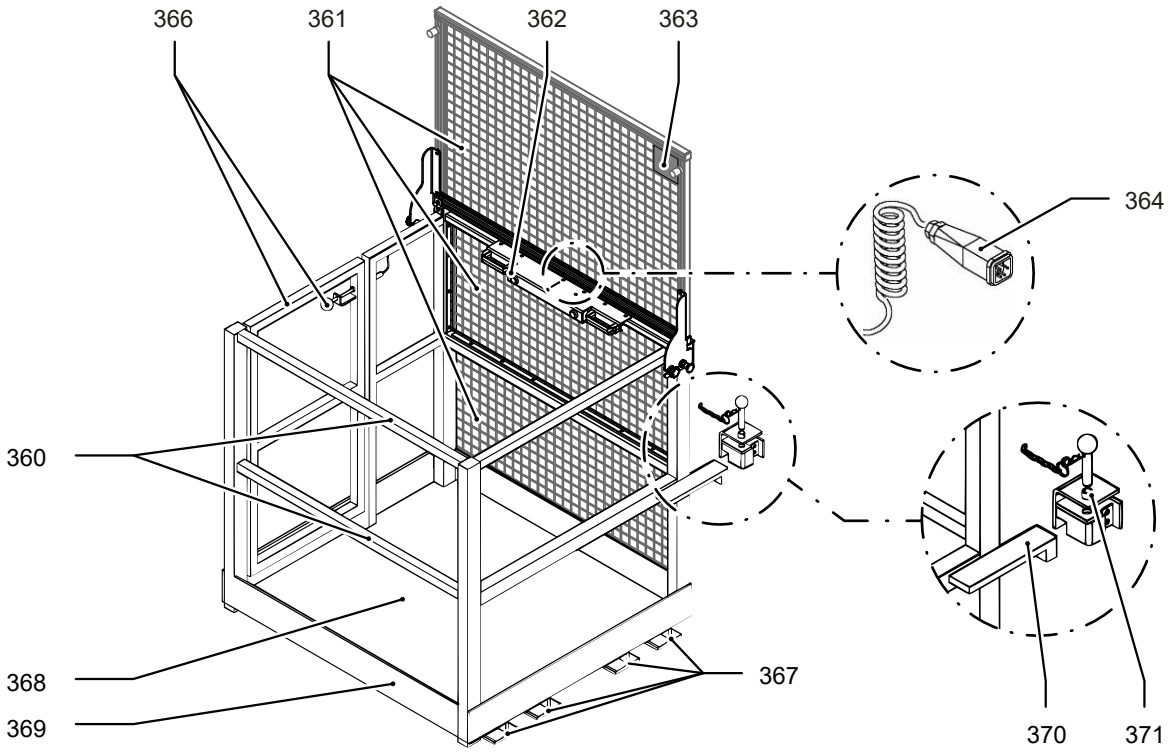
– Truck has been prepared for operation, see page 265.
– Working platform picked up securely, see page 586.
– There are no people on the working platform.

Procedure

- Raise or lower the working platform until it is clear of the ground.
- Disconnect the working platform electrically from the truck:
  - Remove the connecting cable (364) and hang it in the working platform.
- Fully extend the attachment with working platform.
- Lower the forks until they are no longer in contact with the working platform.
  The mechanical lock (370) on the working platform is disconnected from the stop on the load handler (371).
- Retract the fork arms to their home position.

The working platform has been lowered.

11.18.5.2 Lowering the work platform with the telescopic table



Requirements

– Truck has been prepared for operation, see page 265.
– Working platform picked up securely, see page 588.
– There are no people on the working platform.

Procedure

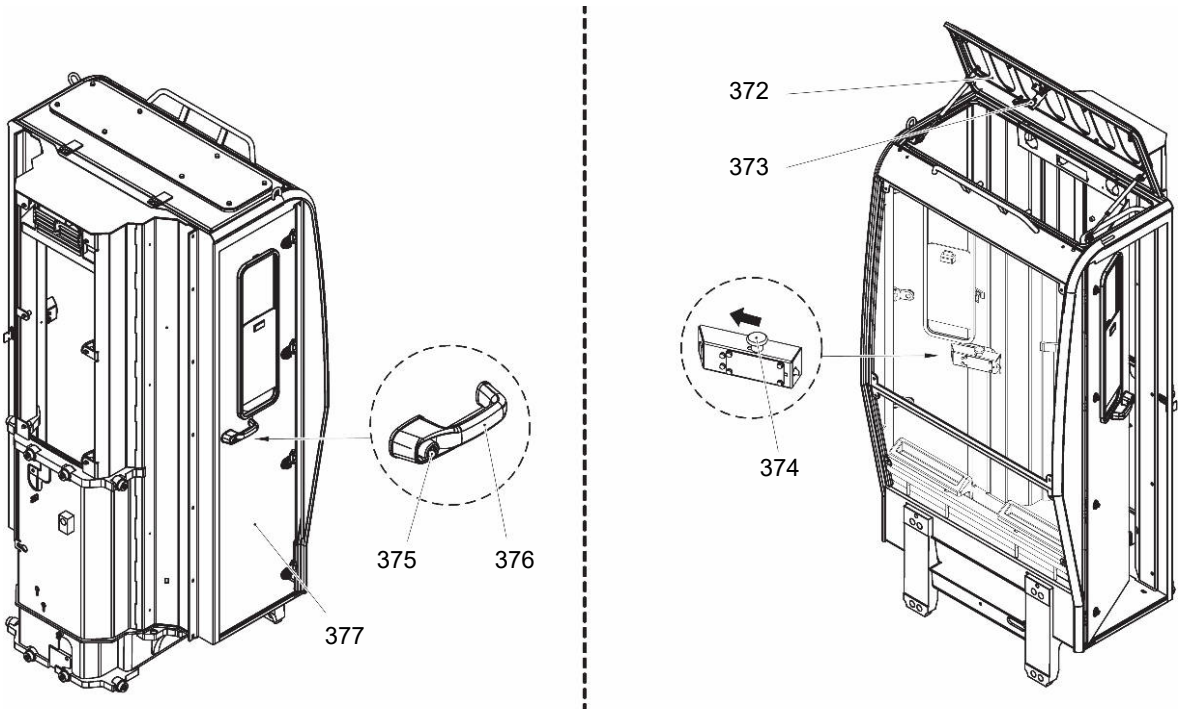
- Raise or lower the working platform until it is clear of the ground.
- Disconnect the working platform electrically from the truck:
  - Remove the connecting cable (364) and hang it in the working platform.
- Disconnect the mechanical lock (370) between the working platform and the stop on the load handler (371).
- Fully extend the telescopic forks and working platform.
- Lower the telescopic forks until they are no longer in contact with the working platform.
- Retract the telescopic forks to their home position.

The working platform has been lowered.

11.19 Enclosed driver's cab (○)

The truck can be fitted optionally with a closed driver's cab. In the event of an emergency or accident you can leave the driver's cab via the egress system.

11.19.1 Opening and locking the door of the closed driver's cab



Procedure

➔ On trucks fitted with a closed driver's cab, both doors (377) can be closed.

- To open the cab door (377);
  - Insert the key in the door lock (375).
  - Turn the key anti-clockwise as far as the stop.
- To lock the cab door (377):
  - Insert the key in the door lock (375).
  - Turn the key clockwise as far as the stop.

11.19.2 Opening and closing the door of the closed driver's cab from the outside and inside

⚠ CAUTION!

Cabin doors can pose a trapping hazard

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

▶ Make sure there is nothing between the cab chassis / leg well and the cab doors when the doors are opened and closed.

Requirements

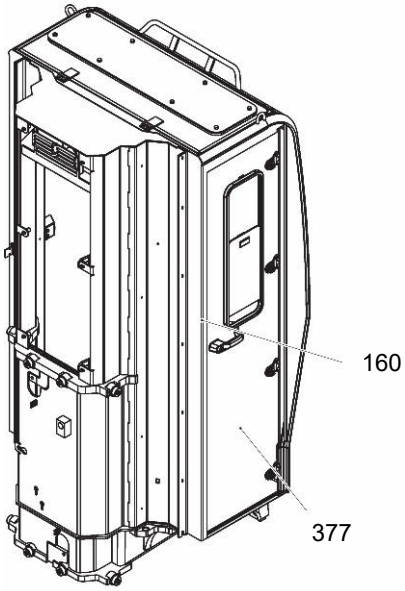
– Cabin door has been opened, see page 596.

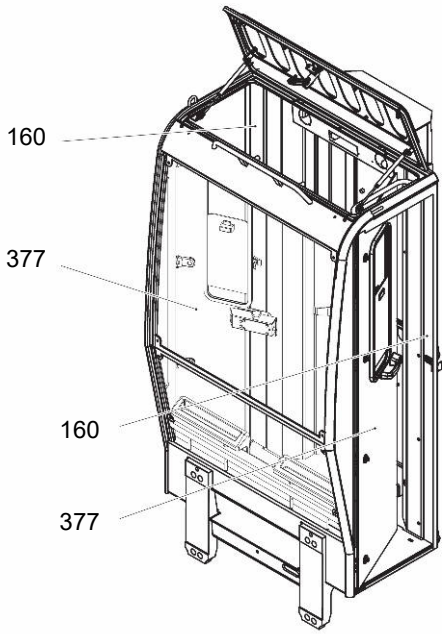
Procedure

The monitored cab doors are shown in the driver's display as a gate (see page 182).

- To open the cab door (377) from the outside:
  - Press the door lock (375).
  - Open the cab door (377) from the inside.
- To open the cab door (377) from the inside:
  - push the handle (374) as far as the stop in the arrow direction.
  - Open the cab door (377) from the inside.
- To close the cab door (377) from the outside:
  - close the cab door (377) to the outside with the door handle (376).
  - Engage the bar on the cab door (377) in the driver's cab.
- To close the cab door (377) from the inside:
  - close the cab door (377) to the outside with the handle (374).
  - Engage the bar on the cab door (377) in the driver's cab.

11.19.3 Entering / exiting the driver's cab





⚠ WARNING!

Loads or objects in the operator position leg compartment

Loads or objects in the operator position leg compartment can impede the operation of controls in this area. For example, objects can accidentally activate or jam the controls.

Loads or objects protruding out of the perimeter of the operator position can collide with other components (e.g. racking systems) during operation. In the event of a collision, the operator in the operator position may be injured or the truck may be damaged.

Loads or objects also pose a trip hazard.

- ▶ Position loads or objects in the operator position such that there is no trip hazard and that the operation of controls in the leg compartment is not impeded.
- ▶ Ensure that loads or objects cannot protrude out of the operator position during operation.
- ▶ Secure loads or objects against slipping and falling.

⚠ WARNING!

The operator could fall

When the cab door is open and the driver's cab raised, there is a risk that the operator could fall out of the cab.

▶ Do not open the cab door when the driver's cab is raised.

Requirements

– Mast / driver's cab completely lowered.

Procedure

- Open the cab door (377), see page 597.
- To enter and exit the cab, hold onto the cab chassis (160).
- Close the cab door (377), see page 597.

⚠ CAUTION!

No more than one person may operate the truck in the driver's cab at a time.

11.19.4 Opening / closing the roof hatch

⚠ WARNING!

Risk of injury when the roof hatch is full opened

When the roof hatch is fully opened the operator is not protected from falling objects.

▶ Do not open the roof hatch fully during operation.

▶ Do not perform any travel or hydraulic operations when the roof hatch is open.

Requirements

– Enter the driver's cab, see page 598.

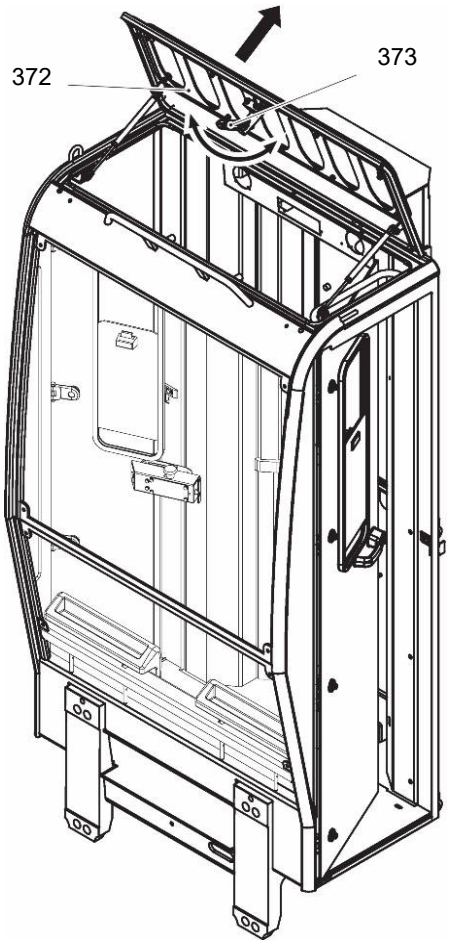
Procedure

- To close the roof hatch (372):
  - Lock the roof hatch (372) down.
  - Turn the lever (373) clockwise as far as it will go.

  The roof hatch is now closed.
- Open the roof hatch (372) at an angle of 10°:
  - Turn the lever (373) anti-clockwise.
  - Open the roof hatch (372) up.

  The roof hatch has been opened at an angle of 10°. This position allows the driver's cab to be ventilated. The operator is still protected from falling objects.
- To fully open the roof hatch (372):
  - Turn the lever (373) anti-clockwise as far as it will go.
  - Open the roof hatch (372) up.

  The roof hatch has been opened at an angle of 85°. This position allows the operator to exit the raised driver's cab in the event of a hazard or accident, see page 603.



11.19.5 Leaving a raised driver's cab - general safety notices

Industrial trucks with an elevating operator position capable of reaching a platform height (h_{12}) in excess of 3 m are equipped with an emergency lowering system and rescue equipment (rescue harness/abseil device with rescue rope) for the operator.

If the raised operator position cannot be lowered due to a fault, not even with emergency lowering (see page 346), the operator must exit the operator position using the rescue equipment.

⚠ WARNING!

Danger due to uninstructed or untrained operators as well as rescue equipment that has not been maintained.

The rescue equipment may only be used by persons in good health who have been trained in its operation and who possess the requisite knowledge.
A rescue plan must be available for the operator, containing all relevant measures to be taken in the event of an emergency.

▶ The operator must undergo annual training in the use of the rescue equipment. Observe national regulations.

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

11.19.6 Leaving a raised driver's cab through the cab doors

Requirements

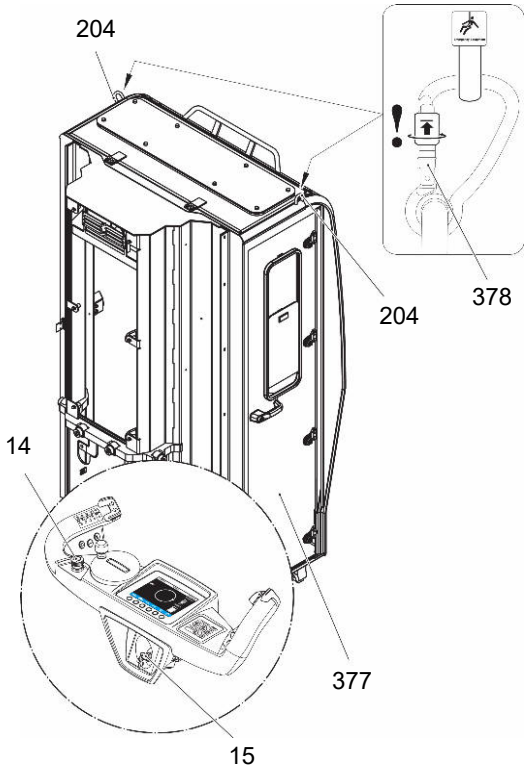
– Sufficient space between the cab and rack to leave the driver's cab through the cab door.

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Remove the abseil device and rescue harness from the storage compartment in the driver's cabsee page 395.

➔ The assembled rescue equipment is ready for use on breaking the seal, removal from the equipment bag or case and after carrying out a visual inspection.

- Visually inspect the rescue harness, abseil device, rescue rope and screw lock karabiner, see page 404.
- Put on the rescue harness, see page 408.
- Open the cab door (377), see page 597.



⚠ WARNING!

The operator could fall after opening the cab door

When the cab door is open and the driver's cab raised, there is a risk that the operator could fall out of the cab.

▶ Insert the karabiner hook of the rescue rope in the D ring of the overhead guard before leaving the driver's cab.

▶ When attaching the karabiner hook of the rescue rope make sure you are standing securely in the driver's cab.

- Insert the karabiner hook (378) of the rescue rope into the D ring (204) on the overhead guard and secure it with the union nut.
- To abseil down from the truck, see page 410.

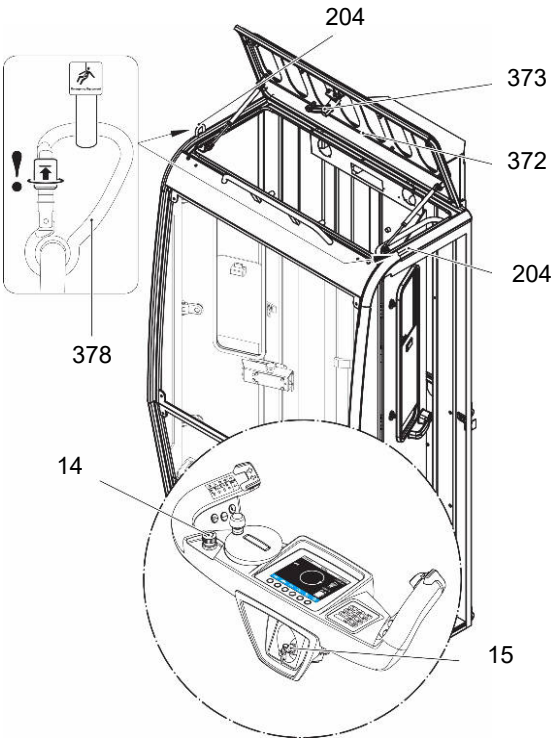
11.19.7 Leaving a raised driver's cab through the roof hatch

Requirements

– Sufficient space to open and exit the driver's cab via the roof hatch.

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Remove the abseil device and rescue harness from the storage compartment in the driver's cabsee page 395.



➔ The assembled rescue equipment is ready for use on breaking the seal, removal from the equipment bag or case and after carrying out a visual inspection.

- Visually inspect the rescue harness, abseil device, rescue rope and screw lock karabiner, see page 404.
- Put on the rescue harness, see page 408.
- Turn the lever (373) anti-clockwise as far as the stop to open the roof hatch (372).

⚠ WARNING!

The operator not secured to the overhead guard could fall

The operator may only exit via the roof hatch once he has secured himself to the driver's cab with the karabiner hook. Otherwise the non-secured operator could slide and fall after leaving the driver's cab through the roof hatch.

▶Insert the karabiner hook of the rescue rope in the D ring of the overhead guard before leaving the driver's cab.

▶When attaching the karabiner hook of the rescue rope make sure you are standing securely in the driver's cab.

- Insert the karabiner hook (378) of the rescue rope into the D ring (204) on the overhead guard and secure it with the union nut.
- Leaving the driver's cab via the roof hatch. The seat and backrest of the driver's seat can be used to help climb out of the cab.
- To abseil down from the truck, see page 410.

11.19.8 Leaving a raised driver's cab through the front window

Requirements

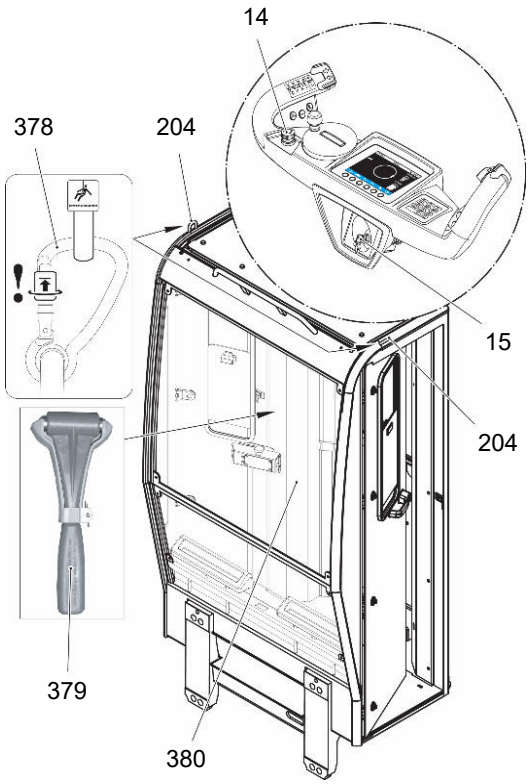
– A raised driver's cab cannot be exited through the cab door.
– A raised driver's cab cannot be exited through the roof hatch.

Procedure

- Switch off the truck, see page 266.
- Press the Emergency Disconnect switch (14).
- Remove the abseil device and rescue harness from the storage compartment in the driver's cabsee page 395.

➔ The assembled rescue equipment is ready for use on breaking the seal, removal from the equipment bag or case and after carrying out a visual inspection.

- Visually inspect the rescue harness, abseil device, rescue rope and screw lock karabiner, see page 404.
- Put on the rescue harness, see page 408.



- Remove the emergency hammer (379) from its bracket in the driver's cab.

⚠ CAUTION!

Risk of injury when striking the front window

Glass splinters can injure your face when you strike the front window.

▶Turn your face away and close your eyes before striking the front window.

- Strike the front window (380) with the emergency hammer (379).

⚠ CAUTION!

Glass splinters from the front window can cause injury

Glass splinters can cut the operator's body when exiting the driver's cab through the front window.

▶Carefully remove any glass splinters before exiting the driver's cab through the front window.

▶Use hand protection to remove the glass splinters. You can use for example the rescue harness bag as hand protection.

- Push out the glass splinters of the front window (380) in a forward direction (load direction).

⚠ WARNING!

The operator could fall out when the front window is missing

If there is no front window and the driver's cab raised, the operator risks falling out of the cab.

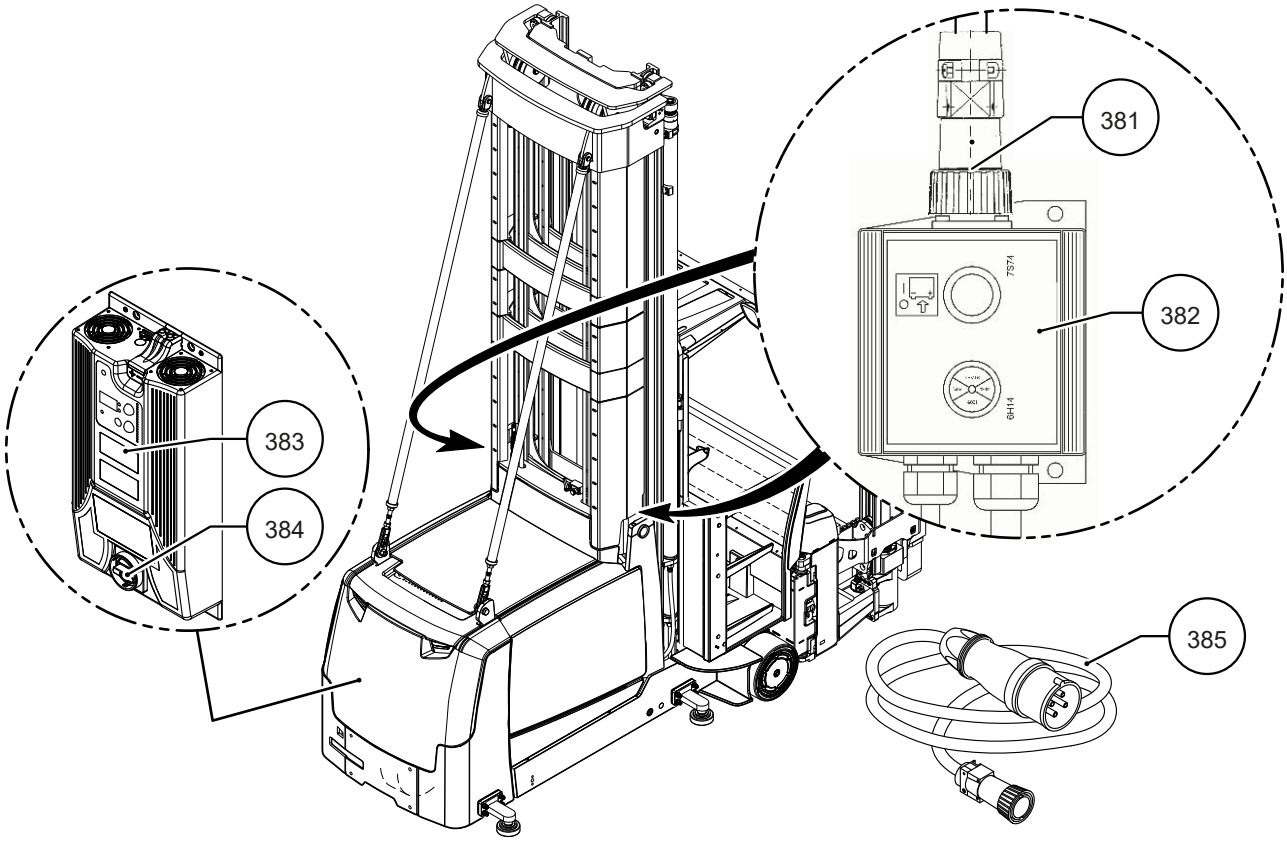
▶Insert the karabiner hook of the rescue rope in the D ring of the overhead guard before leaving the driver's cab.

▶When attaching the karabiner hook of the rescue rope make sure you are standing securely in the driver's cab.

- Insert the karabiner hook (378) of the rescue rope into the D ring (204) on the overhead guard and secure it with the union nut.
- Abseil from the truck, see page 410.

11.20 On-board charger (○)

11.20.1 Overview and description of on-board charger assemblies

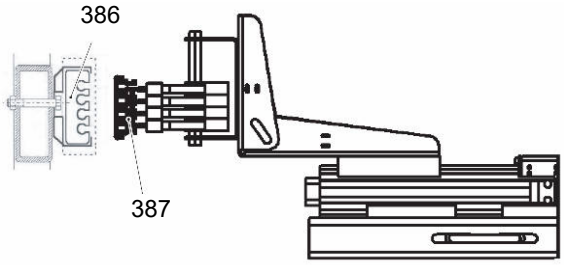
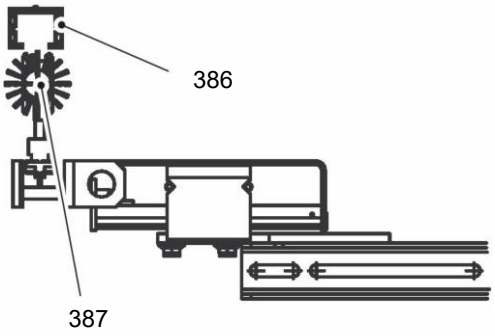


➔ The on-board charger control panel with displays and controls is mounted on the side (right or left) of the mast.

Item		Description
381	○	Connector: – Connection between on-board charger and current collector
382	○	Control panel with displays and controls, see page 609
383	○	On-board charger
384	○	Main switch
385	○	Charger cable for stationary battery charging with the on-board charger, see page 616

11.20.2 Collectors

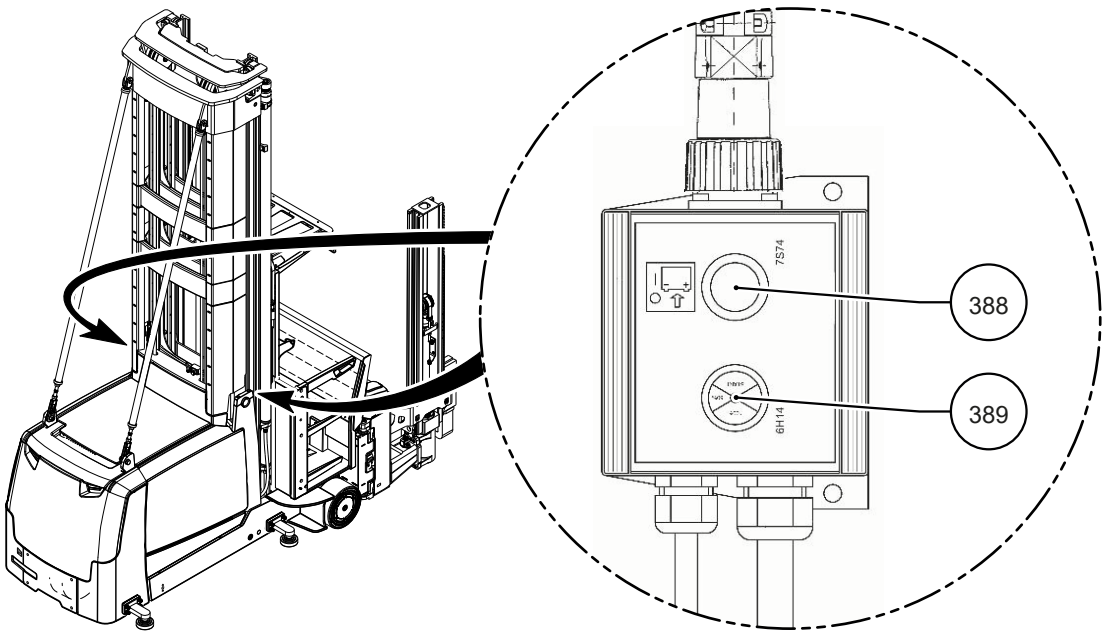
The collectors (387) can be secured on one or either side of the truck. Depending on the truck's equipment, the collectors (387) are equipped with or without an electric motor. In narrow aisles the collectors (387) engage with the bus bars (386), forming the connection with the grid of the utility company.

Collector (387) for open bus bars (386)	Collector (387) for closed bus bars (386)
	

11.20.3 On-board charger symbols in driver's display

Symbol	Meaning	Colour	Function
	"Risk of colliding with the bus bar" display	Red	– The truck is ready for operation. – Truck is in narrow aisle. – Load handler at bus bar height. – Load handler traversing is inhibited to prevent it from being pushed into the bus bar.
	On-board charger malfunction	Flashing red	On-board charger malfunction. Battery charging interrupted. Notify manufacturer's customer service. – Truck is in narrow aisle. – Battery not charging. Example: - Faulty collector; - Faulty on-board charger; - Faulty bus bar; - No power supply;
	On-board charger switched on	yellow	Battery charging active: – Truck is in narrow aisle. – The battery is being charged.

11.20.4 Display and Controls



➔ The on-board charger control panel with displays and controls is mounted on the side (right or left) of the mast.

Item		Description
388	○	"Charging ON" button
389	○	Charge status indicator, see page 609

11.20.4.1 Charge Status Indicator

The charge status indicator (389) indicates the current charge status of the battery.

Charge status indicator	Description / function
Off	– No charging. – Battery not charging.
Red	– The battery is being charged. – Battery charge status below 80 %.
Yellow	– The battery is being charged. – Battery charge status between 80 % and 99 %.
Green	– The battery is being charged. – The battery charge status is 100 %.

11.20.5 Daily checks and operations to be performed before using the on-board charger

⚠ WARNING!

Damage and other defects with the on-board charger or live attachments can result in accidents.

If damage or other defects are discovered with the on-board charger or live attachments (collectors, mains cables, connectors, ...) the truck must be taken out of service until it has been repaired.

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

⚠ WARNING!

Damage and other defects on the bus bars or the feed funnel can result in accidents

If damage or other defects are discovered on the bus bars in the narrow aisle or the feed funnel, the narrow aisle must not be operated in until it has been repaired.

- ▶ Report any defects immediately to your supervisor.
- ▶ Notify the customer service department.
- ▶ Tag out the faulty aisle and prevent it from being entered.
- ▶ De-energise the faulty narrow aisle and prevent it from being switched on again.
- ▶ Only return the aisle to service when you have identified and rectified the fault.

In addition to the inspections and operations detailed in the "Starting up the Truck" in the operating instructions, the following items must be checked each day before starting operation.

11.20.5.1 Visual inspection of on-board charger and narrow aisle

Procedure

- Check the bus bar feed funnels for damage.
- Check the bus bars for damage.
- Check the narrow aisle for overhanging components and remove them if found. Overhanging components can damage the collector or tear it out of the bus bar.
- Check the on-board charger for damage.
- Check the collector including its mechanically moving attachments for damage.
- Check the wires and connectors of the collector for damage.
- Check the wires and connectors of the on-board charger for damage.
- Check the mains plug for damage.

11.20.6 Truck operating modes with on-board charger

The on-board charger allows two different operating modes to be selected:
– Compensation charging mode, see page 612.
– Charging during travel (trickle charge), see page 612.

11.20.6.1 Compensation charging mode

➔ Compensation charging should be performed at least weekly to preserve the life of the battery. It requires the truck to be switched off.

Compensation charging can be carried out in two ways:
– Battery charge with the on-board charger without the collector, see page 616.
– Battery charge in the narrow aisle at a fixed charging position with the collector, see page 618.

11.20.6.2 Charging during travel (trickle charge)

The battery is charged within the narrow aisle to absorb peak currents that occur during stacking or order picking operations (e.g. when travelling, lifting or lowering) and to keep the battery at a constant operating voltage, see page 620. With this charge, the battery reaches a charge status of 80 %.

11.20.7 Battery charging variants

Lead-acid battery

The truck is fitted with a lead-acid battery as standard.

11.20.7.1 Safety information

⚠ WARNING!

Risk of electric shock and fire

A damaged or unsuitable cable (e.g. charger cable, current collector cable) can lead to electric shock and fire due to overheating.

- ▶ Always use charger cables with a maximum length of 30 m. Observe regional conditions.
- ▶ Unwind the cable reel fully when using it.
- ▶ Always use original manufacturer’s mains cables.
- ▶ Insulation classes and resistance to acids and alkalis must correspond to those of the manufacturer's charger cable.
- ▶ Cable connectors (e.g. charger cable, current collector cable) must be dry and clean when in use.

⚠ WARNING!

There is a danger of sparks if charging is improperly interrupted

Due to the high charging currents, a spark discharge can occur when pulling out the cable connectors (e.g. charger cable, current collector cable) or the charge connector during the active charging process. There is a risk of injury due to burning and a risk of damage to the electrical contacts.

- ▶ Stop the charging process on the battery charger before disconnecting the cable connectors (e.g. charger cable, current collector cable) or the charge connector.
- ▶ Do not pull out the cable connectors (e.g. charger cable, current collector cable) or the charge connector of the battery charger during the charging process (under load).

⚠ WARNING!

Risk of explosion due to gases produced while charging

The battery gives off a mixture of oxygen and hydrogen (oxyhydrogen 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 compatible with the battery in terms of voltage and charge capacity.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Only during stationary charging of the battery outside and inside the narrow aisle:
  - Sufficiently ventilate the room in which the truck is being charged.
  - The battery panel must be open and the battery cell surfaces must be exposed during charging to ensure adequate ventilation.
- ▶ Only while charging the battery during operation within the narrow aisle:
  - The battery panel must be closed. Sufficient ventilation of the battery is ensured by the movements of the industrial truck.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging, there must be no combustible material or consumables capable of creating sparks within a minimum distance of 2,5 m from the truck.
- ▶ Fire control equipment must be available.
- ▶ Do not place any metallic objects on the battery.
- ▶ Always follow the safety regulations of the battery manufacturer and the charging station manufacturer.

⚠ WARNING!

Collision hazard when operating the truck

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

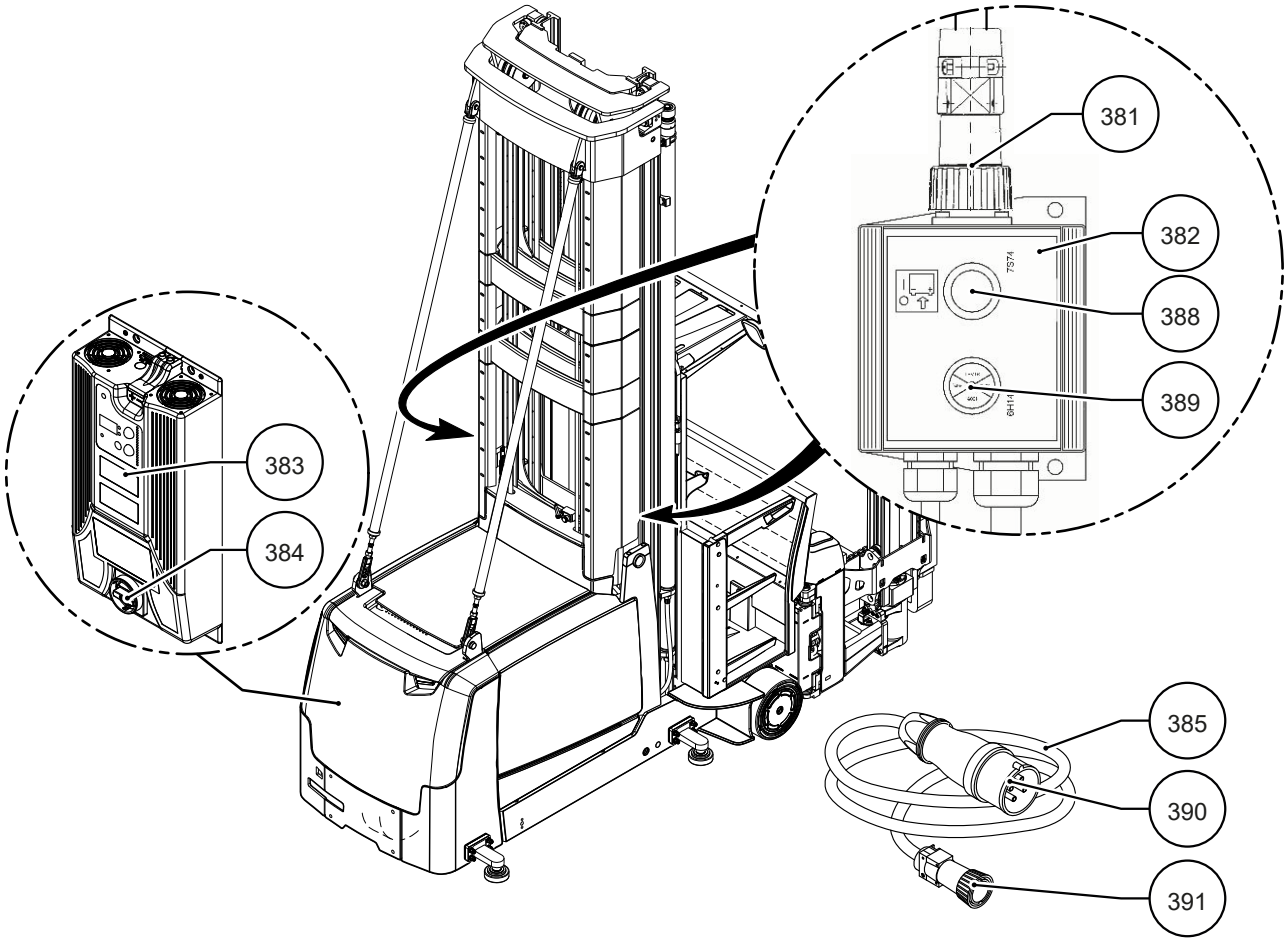
▶ Do not operate the truck unless the panels and covers are closed and properly locked.

Note the safety instructions and safety regulations!

The safety instructions and safety regulations for lead-acid batteries in the following sections must be observed and complied with:

▶ General safety regulations for batteries, see page 146.
▶ Safety regulations for handling lead-acid batteries, see page 148.
▶ Safety instructions for charging lead-acid batteries, see page 160.

11.20.7.2 Stationary battery charging outside of narrow aisles



Stationary battery charging with the on-board charger using the charger cable

Requirements

– Drive the truck out of the narrow aisle to the charging point. There must be a connection to the energy supply company's supply network at the charging point.
– Truck parked securely, see page 314.

Procedure

- Switch off the truck, see page 266.
- Press the emergency disconnect switch.
- Open the battery panel.
- Switch on the on-board charger (383) with the main switch (384).
- Disconnect the connector (381) to the current collector from the control panel (382).
- Connect the connector (391) of the charger cable (385) to the control panel (382).
- Connect the connector (390) of the charger cable (385) to the power supply connection.
- Press the (388) button.

The battery is charged. The charge status indicator (389) switches on after a few seconds. When the battery is fully charged the charger switches to trickle charging.

All truck travel operations are inhibited while the battery is being charged.

Preparing for operation after charging

Requirements

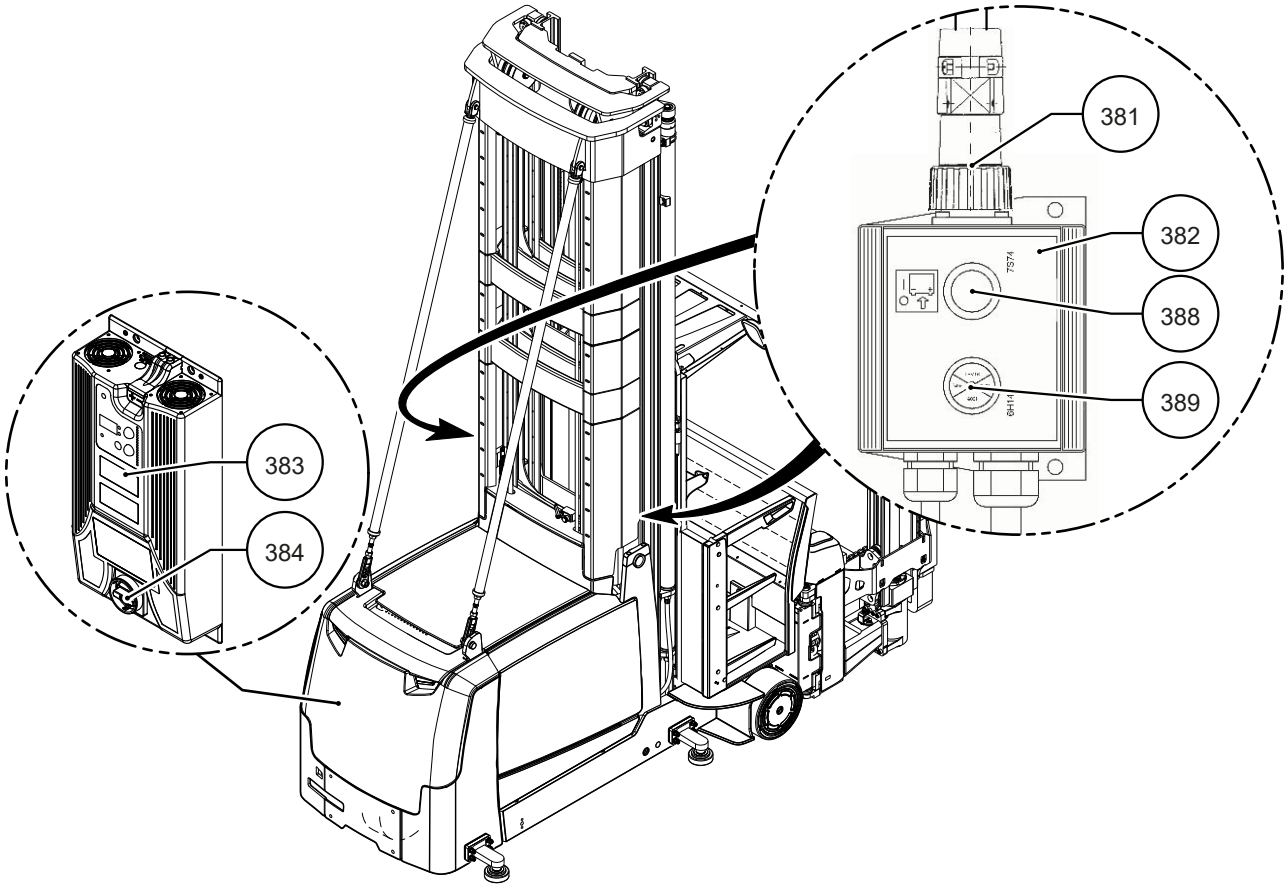
– The battery is fully charged.

Procedure

- Press the (388) button.
  The on-board charger is switched off.
- Disconnect the connector (390) of the charger cable (385) from the power supply connection.
- Disconnect the connector (391) of the charger cable (385) from the control panel (382).
- Connect the connector (381) for the current collector to the control panel (382).
- Check all cables and connectors for visible damage.
- Close the battery panel.

After the battery charge, the truck is ready for operation once more.

11.20.7.3 Stationary battery charging in narrow aisles



Stationary battery charge with the on-board charger using the current collector

Requirements

– Connector (381) is connected to the current collector on the control panel (382).
– On-board charger (383) is switched on with the main switch (384).
– Bus bar connected to the energy supply company's supply network.

Procedure

- Enter the narrow aisle slowly and carefully. Make sure the collectors are in the bus bar.
- Park the truck securely at the fixed charging position in the narrow aisle.
- Tag out the narrow aisle and prevent it from being entered.
- Park the truck securely, see page 314.
- Switch off the truck, see page 266.
- Press the emergency disconnect switch.
- Open the battery panel.
- Press the (388) button.

  The battery is charged. The charge status indicator (389) switches on after a few seconds. When the battery is fully charged the charger switches to trickle charging.

Preparing the shuttle for operation after charging

Requirements

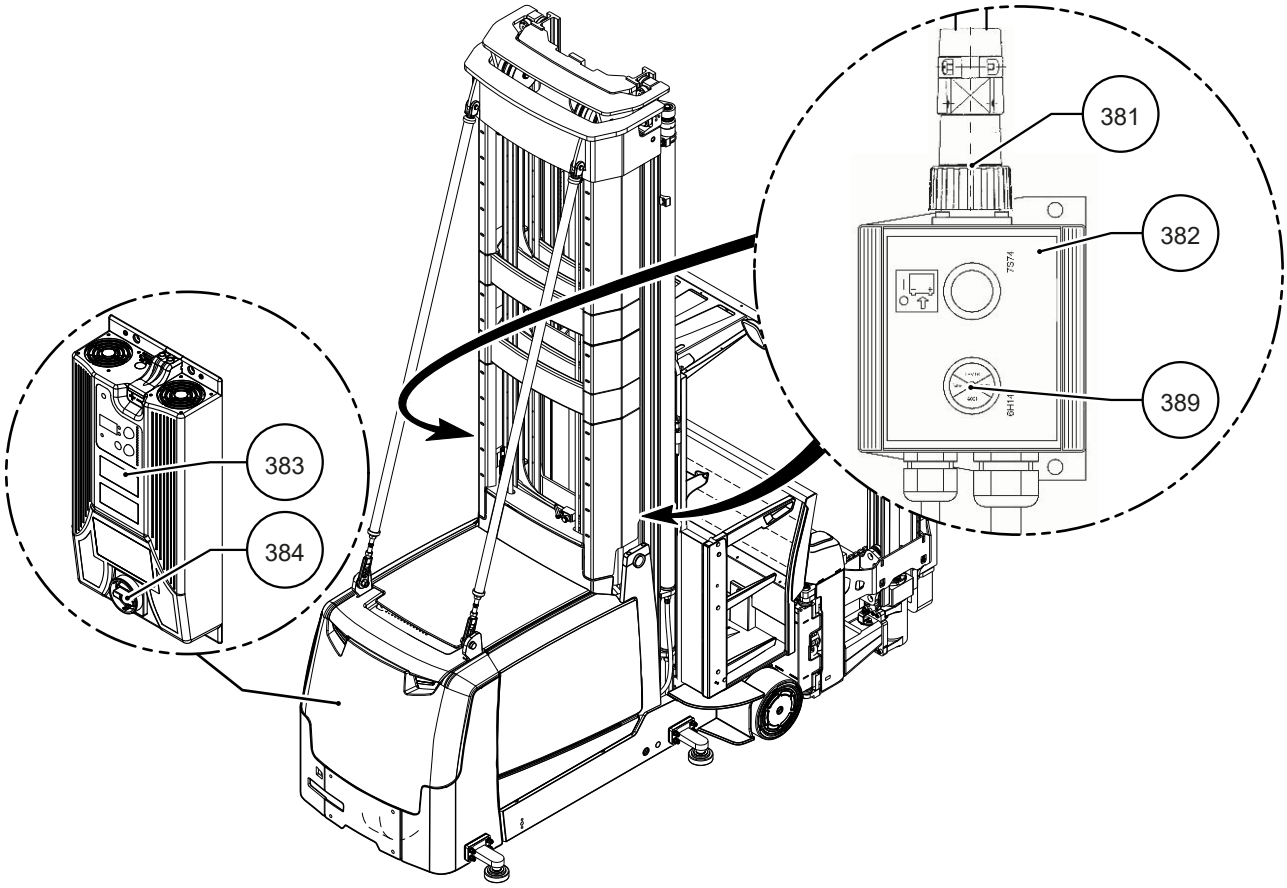
– The battery is fully charged.

Procedure

- Press (388).
  The on-board charger is switched off.
- Check all cables and plug connections for visible signs of damage.
- Close the battery cover.

After the battery charge the truck is ready for operation.

11.20.7.4 Battery charging in narrow aisles during operation



Entering the narrow aisle

Requirements

– Connector (381) is connected to the current collector on the control panel (382).
– On-board charger (383) is switched on with the main switch (384).
– Bus bar connected to the energy supply company's supply network.

Procedure

- Industrial trucks without adjustable current collectors:
  - Enter the narrow aisle slowly and carefully.
  - Make sure the current collectors are in the bus bar feed funnel.
- Industrial trucks with adjustable current collectors:
  - Enter the narrow aisle slowly and carefully.
  - The truck's electronic system checks the position of the truck in the narrow aisle.
  - After the truck has reached a defined position in the narrow aisle, the adjustable current collector is extended.
- Enter the narrow aisle slowly and carefully again.
- Make sure the collectors are fully positioned in the bus bar feed funnel.

Once the collectors are fully positioned in the bus bar and the ground sensor system has been evaluated, the maximum speed is enabled.

Charging the battery

Requirements

– Truck located inside the narrow aisle.
– Battery charge status below 80 %.
– Current collector is fully aligned in the bus bar.

Procedure

- The on-board charger is switched on by the truck controller.
  - The driver's display shows the "on-board charger switched on" symbol.
  - The charge status indicator (389) switches on after a few seconds.

The battery is charged to a charge status of 80 %.

➔ The on-board charger is switched off by the truck controller as soon as energy is recovered from regenerative lowering, braking and/or reversing.

Battery is charged with the on-board charger (382).

Exiting the narrow aisle

Requirements

– Truck located inside the narrow aisle.
– Current collector is fully aligned in the bus bar.
– Bus bar connected to the grid of the utility company.

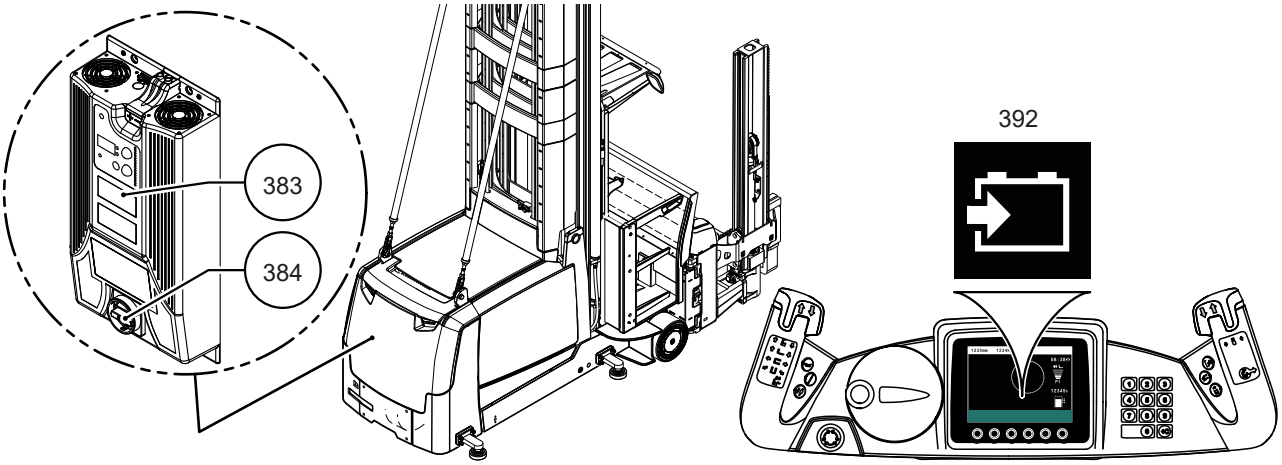
Procedure

- Before leaving the narrow aisle the on-board charger is switched off by the truck controller.
- Adjustable current collectors only:
  - The truck's electronic system checks the position of the truck in the narrow aisle.
  - When the defined position of the truck has been reached, the adjustable current collector is retracted.
- Drive out of the narrow aisle.

The truck has left the narrow aisle.

11.20.8 On-board chargers - Troubleshooting / Driver Displays

11.20.8.1 Malfunction - procedure during operation in narrow aisle



NOTICE

"On-board charger malfunction" – risk of material damage

When the "on-board charger malfunction" symbol (392) flashes red, this indicates a risk of material damage to the truck, on-board charger or the battery.

- ▶ Stop the truck immediately.
- ▶ De-energise the bus bar in this narrow aisle and prevent it from being switched on again.
- ▶ Switch off the on-board charger (383) with the main switch (384).
- ▶ Drive out of the narrow aisle.
- ▶ Park the truck securely.
- ▶ Switch off the truck.
- ▶ Report any defects immediately to your supervisor.
- ▶ Notify the customer service department.
- ▶ Tag out the defective truck and take it out of service.
- ▶ Do not return the truck to service until the fault has been identified and rectified.

Malfunction - partially or fully non-aligned current collector in narrow aisle

⚠ WARNING!

Risk of accidents from electrical voltage

During operation in the narrow aisle a partially or fully non-aligned current collector can damage the truck or bus bar. This damage can result in short circuits or hazardous electrical voltages on the truck.

▶To leave the truck without personal injury from contact with electrical voltage, the following procedure must be maintained.

Procedure

- Stop the truck immediately.
- Do not leave the truck.
- Remain completely within the perimeter of the operator position.
- Warn other personnel or your supervisor of the malfunction, e.g. by sounding the horn.
- Get the other personnel or your supervisor to de-energise the faulty narrow aisle and prevent it from being switched on again.
- Once the narrow aisle has been de-energised you may leave the truck.
- Tag out the defective narrow aisle and block against entry.
- Notify the customer service department and arrange for the following tasks to be carried out:
  - Recover the truck from the narrow aisle.
  - Check the cause of the malfunction and rectify the defect.
- The narrow aisle must not be put back into service until the defect has been traced and rectified.

11.20.8.2 On-board chargers - Troubleshooting / Driver Displays

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

➔ If, after carrying out the following remedial action, the truck cannot be restored to operation or if a fault in the electronics system is displayed with a corresponding error code, contact the manufacturer's service department.
Troubleshooting must only be performed by the manufacturer's customer service department. The manufacturer has a service department specially trained for these tasks.
In order for customer services to react quickly and specifically to the fault, the following information is essential:
- Truck serial number
- Event message from the display unit (if applicable)
- Error description
- Current location of truck.

Display	Effect/cause	Action
I0567.004	– Adjustable current collector does not extend – Extension of the current collector was blocked by the key switch on the overhead guard.	– Insert the key into the key switch on the overhead guard and turn to the "Release extension" position.
E5138	– LH adjustable collector does not extend – Collector does not reach defined end position	– Notify the customer service department.
E5138	– RH adjustable collector does not extend – Collector does not reach defined end position	– Notify the customer service department.
E5139	– Adjustable collector does not reach defined end position within a specific time	– Drive out of the narrow aisle in the opposite direction. – Enter the narrow aisle again slowly and carefully. – If the malfunction is displayed again, notify the customer service department.

Display	Effect/cause	Action
Symbol flashes red every second	– No power supply to the bus bar	– Arrange for a competent electrically trained person to check the bus bar power supply. – Arrange for a competent electrically trained person to check the mains fuse.
	– Bus bar disconnection	– De-energise the bus bar of the narrow aisle and prevent it from being switched on again. – Check the entire length of bus bar for damage and disconnection. – Notify the customer service department.
	– Collector faulty	– Notify the customer service department.
	– The on-board charger has been switched off by the truck's controller	– Notify the customer service department.

11.20.9 On-board charger maintenance notes

⚠ WARNING!

Electric currents can cause accidents

Maintenance and repair work to on board chargers and the live attachments (collectors, mains plug, connectors etc.) can only be performed by trained specialists or electrical engineers.

- ▶ Carry out work on on-board chargers only when they are de-energised.
- ▶ Carry out work on live attachments (collectors, mains plug, connectors etc.) only when they are de-energised.
- ▶ Disconnect the battery from the on-board charger.
- ▶ When carrying out repairs outside the narrow aisle, disconnect the mains plug of the charger lead from the grid.
- ▶ When carrying out repairs in the narrow aisle, disconnect the bus bar power supply.

Battery maintenance and servicing is subject to the regulations specified in Chapter D of the operating instructions.

Maintenance intervals are specified in the section Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement, see page 737.

11.21 Emergency console (○)

11.21.1 Emergency console application

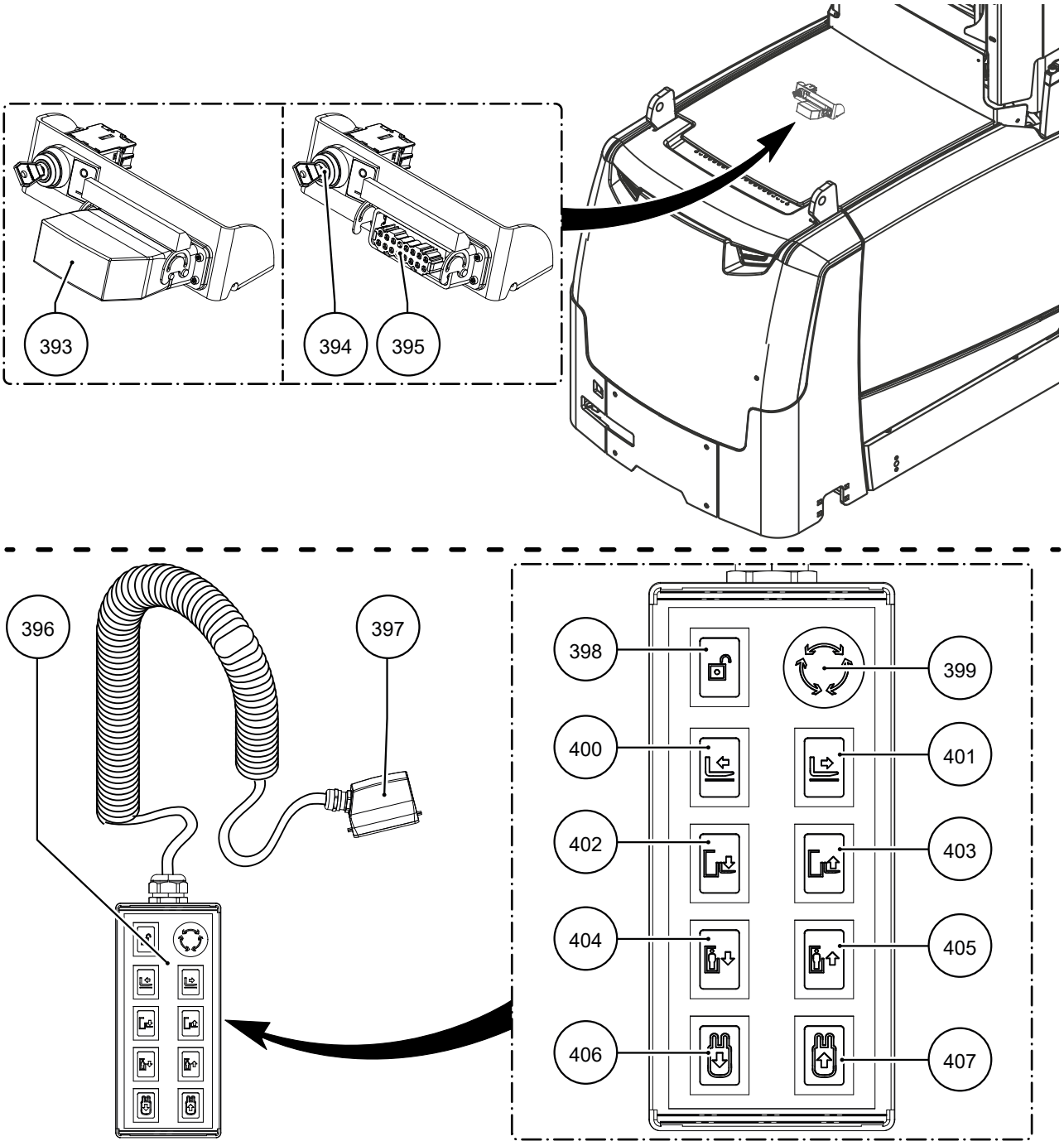
The emergency console is used to rescue the operator from the raised operator position. It must only be used if the operator cannot operate the truck when the operator position is raised.

The emergency console should only be attached to a fully functional, powered-up truck with the side gates closed. It is not operational when the truck is switched off or the side gates are open. This also applies if there is a fault with the truck.

When the emergency console is attached to the truck, the following truck functions can be performed individually and at reduced speed:
– Attachment traverse
– Auxiliary lift raise/lower
– Main lift raise/lower
– Travel in load and drive directions

The emergency console cannot be used to rotate the load handler and steer the truck.

11.21.2 Description of the Controls



Item	Description
393	Jumper connector: – In "*normal*" operation without an emergency console, the jumper connector must be mounted on the coupling (395). Otherwise the truck cannot be moved.
394	Key switch: – Switching the emergency console on or off.
395	Coupling: – Connecting the connector from the emergency console to the truck (under the battery panel).
396	Emergency console
397	Emergency console connector

Item	Description
398	Acknowledgement button
399	Emergency disconnect switch: – The main circuit is disconnected. – All truck movements are braked with maximum deceleration and switched off.
400	"Attachment traverse to the left" button *(view in load direction)*
401	"Attachment traverse to the right" button *(view in load direction)*
402	"Aux. lift lower" button: – The load handler is lowered with the auxiliary lift. – The height of the operator position remains unchanged.
403	"Aux. lift raise" button: – The load handler is raised with the auxiliary lift. – The height of the operator position remains unchanged.
404	"Main lift lower" button: – The load handler and the operator position are lowered with the main lift. – The height of the auxiliary lift remains unchanged.
405	"Main lift raise" button: – The load handler and the operator position are lifted with the main lift. – The height of the auxiliary lift remains unchanged.
406	"Travel in drive direction" button
407	"Travel in load direction" button

11.21.3 Safety information

⚠ WARNING!

Unauthorised entry of narrow aisles can result in accidents

Do not enter a narrow aisle unless you are authorised. In exceptional circumstances it may be necessary to enter a narrow aisle, e.g. to recover a truck or to rescue the operator from the raised operator position. The following requirements must be met before and while entering a narrow aisle:

- ▶ Ensure the operator can no longer operate the truck with the operator position raised.
- ▶ Block off the aisle to other industrial trucks.
- ▶ Close adjacent or adjoining narrow aisles for other industrial trucks to drive through.
- ▶ Approach the truck only from the drive compartment side and with particular caution.
- ▶ Do not stand underneath a raised load handler or raised operator position.

⚠ WARNING!

Risk of accident due to deactivation of lift, lower and travel cut-outs

When the emergency console has been connected to the truck, any lift, lower or travel cut-outs will be deactivated.

- ▶ When the travel cut-out is deactivated, the operator of the emergency console must proceed with particular caution to stop the truck in time before it strikes an obstacle.
- ▶ When the lift cut-out is deactivated, the operator of the emergency console must proceed with particular caution to prevent the mast colliding with other components during lifting.
- ▶ When the lower cut-out is deactivated, the operator of the emergency console must proceed with particular caution to prevent the operator position or load handler colliding with other components during lowering.

⚠ 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 movements made by the truck, including the load handler, attachments, etc. This also includes areas which can be reached by falling loads, operating equipment etc.
Apart from the operator (in the normal operating position), there must be no one else in the hazardous area of the truck.

- ▶ Instruct other people to move out of the hazardous area of the truck. Cease working with the truck immediately if people do not leave the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ Only carry loads that have been secured and positioned in accordance with regulations. Use suitable precautions to prevent the load or 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 in the operator position must not leave the operator position in the raised position. Do not climb onto parts of the building or other trucks.

⚠ WARNING!

Risk of accident due to deactivation of the Personal Protection System (PPS)

When the emergency console has been attached, a Personal Protection System (PPS) installed on the truck will be deactivated.

▶ When the Personal Protection System (PPS) is deactivated, the operator of the emergency console must proceed with particular caution to prevent the truck from colliding with other persons.

⚠ WARNING!

Risk of injury and crushing for the emergency console operator

When operating the industrial truck with the emergency console, there is a risk of serious irreversible or fatal injury due to crushing.

▶ Wear personal protective equipment (safety footwear, hi-vis jacket, safety goggles, safety gloves, etc.) when using the emergency console.

▶ The operator of the emergency console must be instructed and trained in the handling and operation of the emergency console. Observe the safety instructions, see page 630.

▶ The operator may only perform the truck functions with the emergency console behind the truck (drive direction). Ensure that a minimum distance of 0,5 m is maintained between the operator and the truck.

▶ Pay particular attention when travelling in the drive direction. Ensure that the operator does not become trapped between the truck and obstacles or collide with the truck. Stop travelling in good time.

▶ Do not stand underneath a raised load handler or raised operator position.

NOTICE

Risk of material damage to the racking

The attachment must be in the home position before carrying out any travel, lifting or lowering operations. When the load handler is in the rack, the following functions of the industrial truck are prohibited:

- Travel operations
- Lifting or lowering the load handler / operator position if they will come in contact with rack components

Otherwise there is a risk of collision between the load handler and the racking. A collision between the load handler and the racking can jeopardise the stability of the racking and thus cause the racking to collapse.

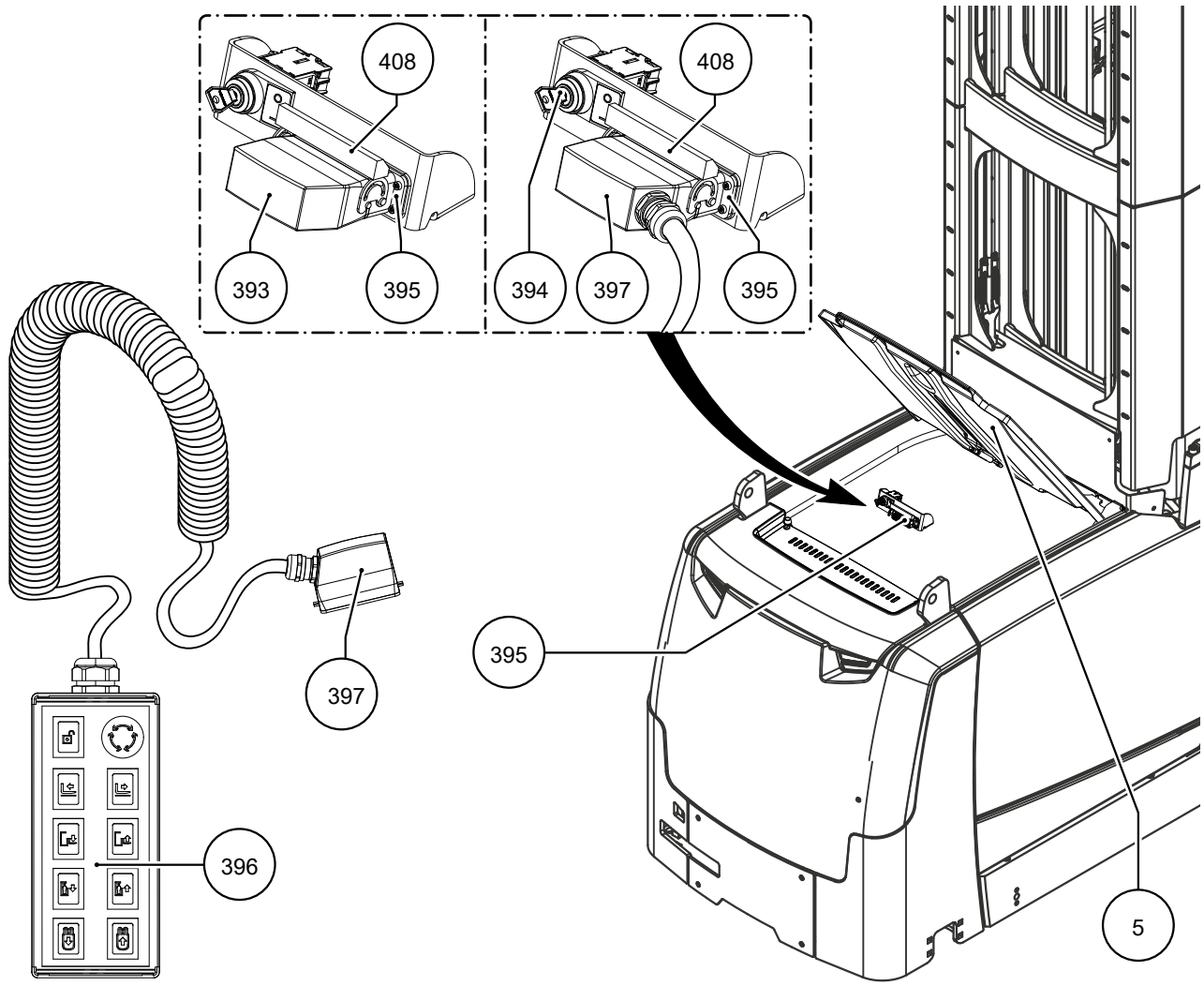
▶ Traverse the attachment into the home position using the emergency console, see page 638.

Reduced speeds

When operating the industrial truck with the emergency console, the travel and hydraulic functions can only be carried out at the following reduced speeds:

▶ Maximum travel speed of the industrial truck in load and drive direction: 0,8 km/h.
▶ Maximum lift or lowering speed of the operator position (main lift): 0,2 m/s.
▶ Maximum lift or lowering speed of the load handler using the auxiliary lift: 0,15 m/s.

11.21.4 Operating the Truck using the Emergency Console



11.21.4.1 Connecting the Emergency Console to The Truck

Tools and Material Required

– Emergency console (396)

Procedure

- Open the battery panel (5), see page 158.
- Remove the jumper connector (393) from the coupling (395):
  - Press the lock (408) as far as it will go.
  - Pull the jumper connector (393) from the coupling (395) on the industrial truck.
- Insert the connector (397) of the emergency console (396) into the coupling (395) on the industrial truck.

➔ Ensure that the connector (397) of the emergency console (396) is secured by the lock (408) to prevent accidental loosening.

- Switch on the emergency console (396):
  - Insert the key into the key switch (394).
  - Turn the key switch (394) with the key to the position "**I**".

The emergency console (396) has been connected to the truck.

11.21.4.2 Disconnecting the Emergency Console from the Truck

Requirements

– Emergency console (396) connected to the industrial truck, see page 634.

Procedure

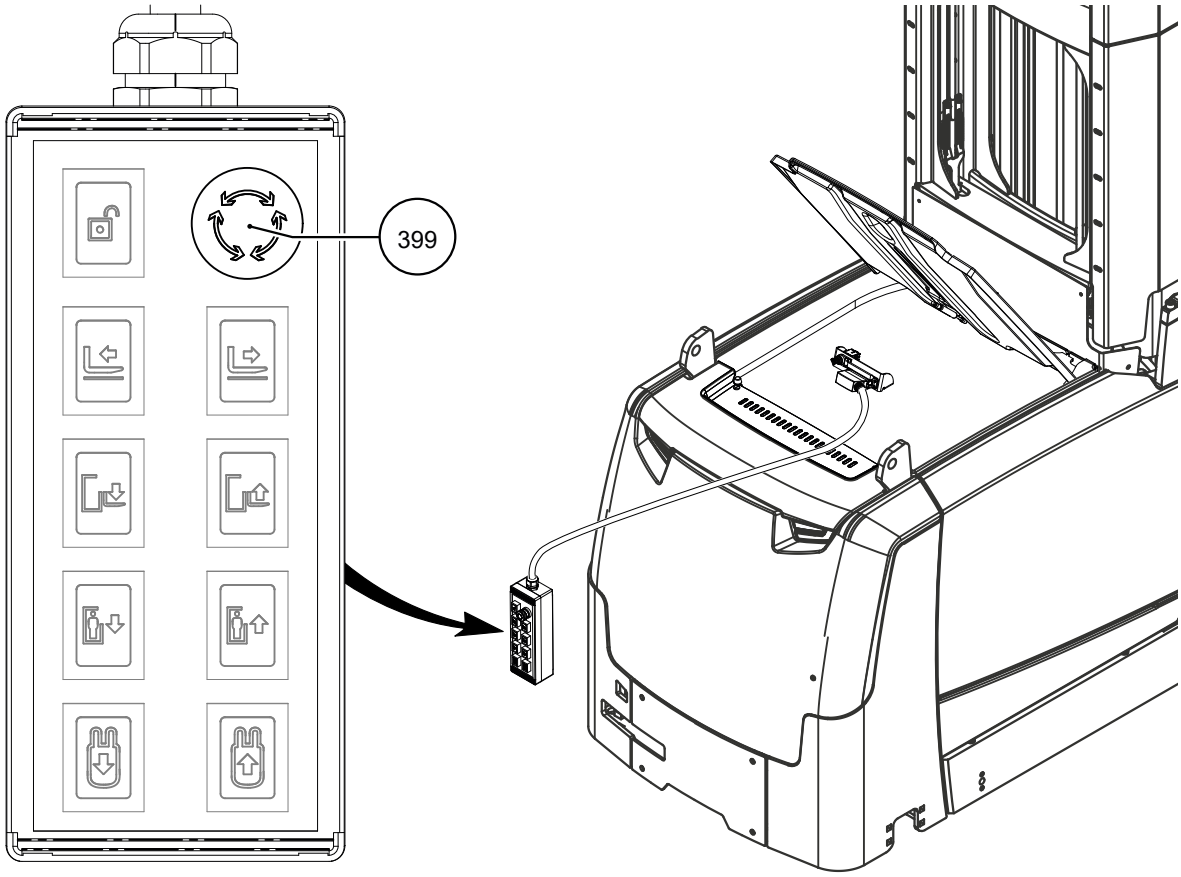
- Switch off the emergency console (396):
  - Turn the key switch (394) with the key to the position "**O**".
  - Remove the key from the key switch (394).
- Remove the connector (397) of the emergency console (396) from the coupling (395):
  - Press the lock (408) as far as it will go.
  - Pull the connector (397) of the emergency console (396) from the coupling (395).

  The emergency console (396) has been disconnected from the truck.
- Insert the jumper connector (393) into the coupling (395) on the industrial truck.

➔ Ensure that the jumper connector (393) is secured by the lock (408) to prevent accidental loosening.

- Carefully close the battery panel (5), see page 159.

11.21.4.3 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 switch

Requirements

– Emergency console connected to the truck, see page 634.

Procedure

• Press the emergency disconnect switch (399).

All electrical functions are deactivated. The truck brakes to a halt at maximum brake force.

Releasing the emergency disconnect switch

Requirements

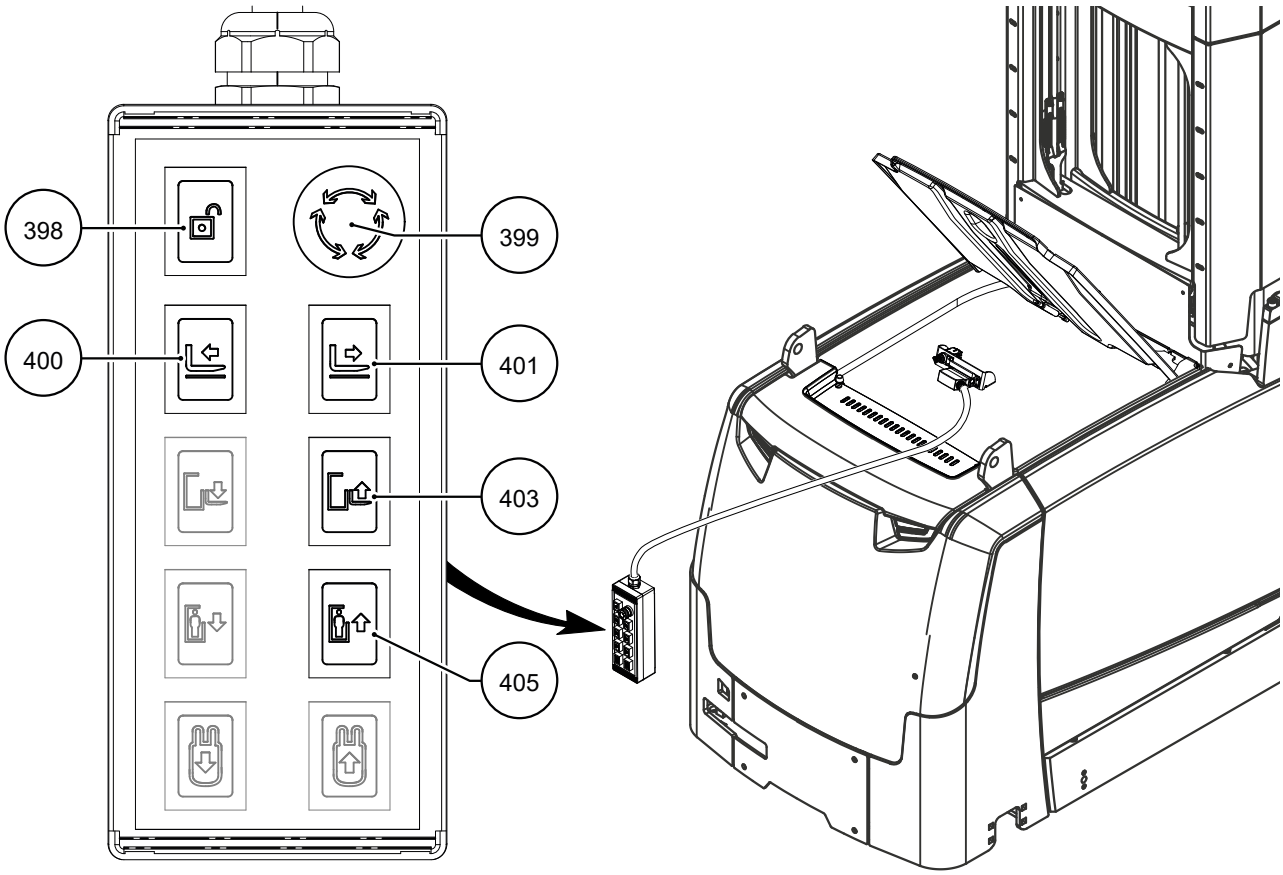
– Emergency console connected to the truck, see page 634.

Procedure

• Turn the emergency disconnect switch (399) to unlock it.

All electrical functions are enabled and the truck is operational again (assuming the truck was operational before the emergency disconnect switch was pressed).

11.21.4.4 Traversing Attachment to the Home Position using the Emergency Console



⚠ WARNING!

Risk of crushing when traversing the load handler

There must be nobody present in the hazardous area when the load handler is traversed with the emergency console.

▶ Instruct other people to move out of the hazardous area of the truck. Stop using the truck immediately if people do not vacate the hazardous area.

In the event of danger or if unwanted travel or hydraulic movements are carried out while operating the emergency console, immediately press the emergency disconnect switch (399).

Requirements

– Emergency console connected to the truck, see page 634.

Procedure

➔ When the load handler is in the rack, the attachment must be pushed back to the home position. Before moving the load handler, ensure that it is not resting on the rack support bar and can be pushed back from the rack or load without colliding. The load handler can be lifted together with the operator position (main lift) or without the operator position (auxiliary lift).

- Lift the load handler *without* the operator position using the auxiliary lift:
  - Press and hold the acknowledgement button (398).
  - Press the button (403).

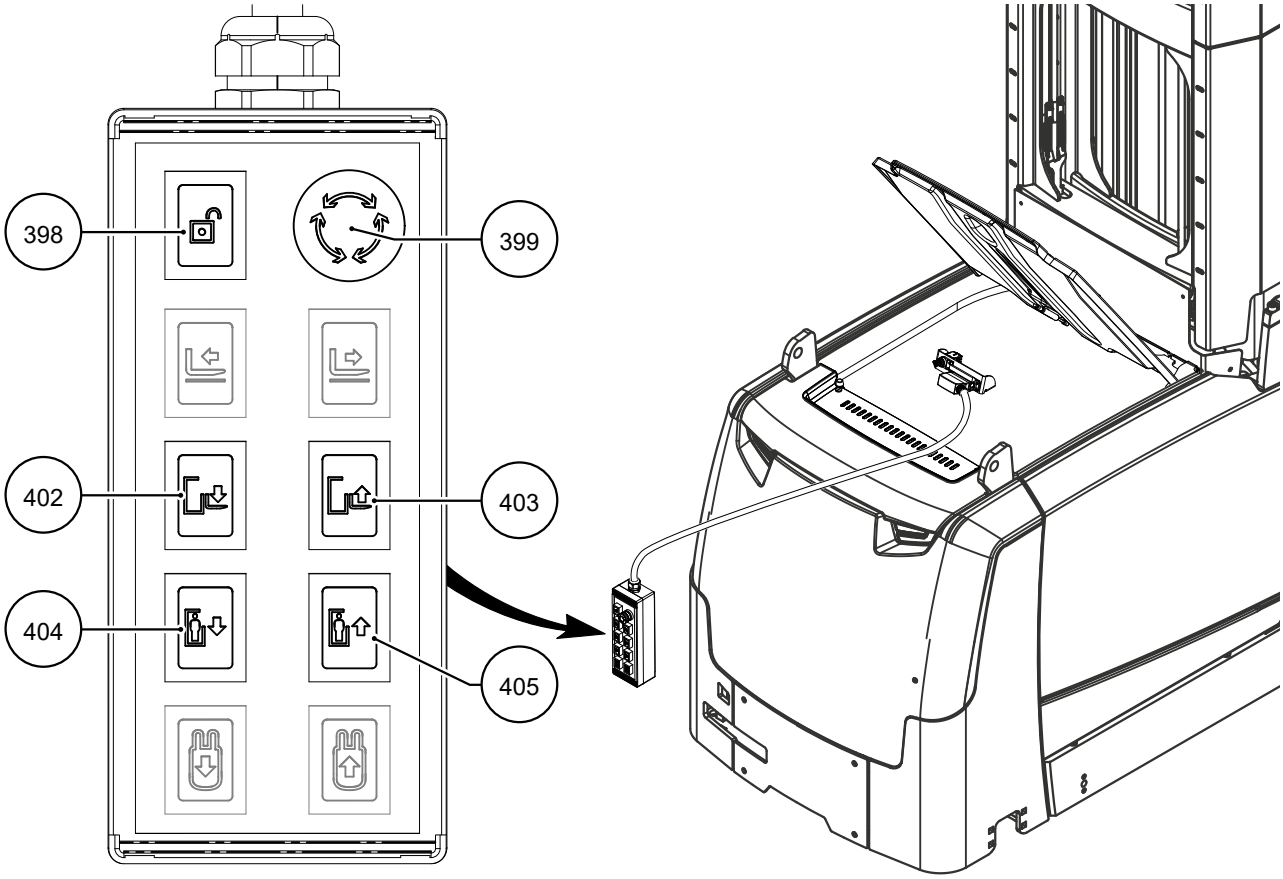
    The auxiliary lift is raised at reduced speed.
  - Lift the load handler until the load handler is not resting on the rack support bar and can be pushed back from the rack or the load without colliding.
  - Do not continue to press the button (403) and the acknowledgement button (398).
- Lift the load handler *with* the operator position using the main lift:
  - Press and hold the acknowledgement button (398).
  - Press the button (405).

    The main lift is raised at reduced speed.
  - Lift the load handler until the load handler is not resting on the rack support bar and can be pushed back from the rack or the load without colliding.
  - Do not continue to press the button (405) and the acknowledgement button (398).
- Traverse the attachment to the right-hand end stop of the swivel traverse frame:
  - Press and hold the acknowledgement button (398).
  - Press the button (401).

    The attachment is traversed at reduced speed to the right until it reaches the right-hand end stop (right home position).
  - Do not press the button (401) and the acknowledgement button (398) when the attachment is in the right-hand home position.
- Traverse the attachment into the left-hand end stop of the swivel traverse frame:
  - Press and hold the acknowledgement button (398).
  - Press the button (400).

    The attachment is traversed at reduced speed to the left until it reaches the left-hand end stop (left home position).
  - Do not press the button (400) and the acknowledgement button (398) when the attachment is in the left-hand home position.

11.21.4.5 Fully Lowering the Load Handler using the Emergency Console



➔ In the event of danger or if unwanted travel or hydraulic movements are carried out while operating the emergency console, immediately press the emergency disconnect switch (399).

Requirements

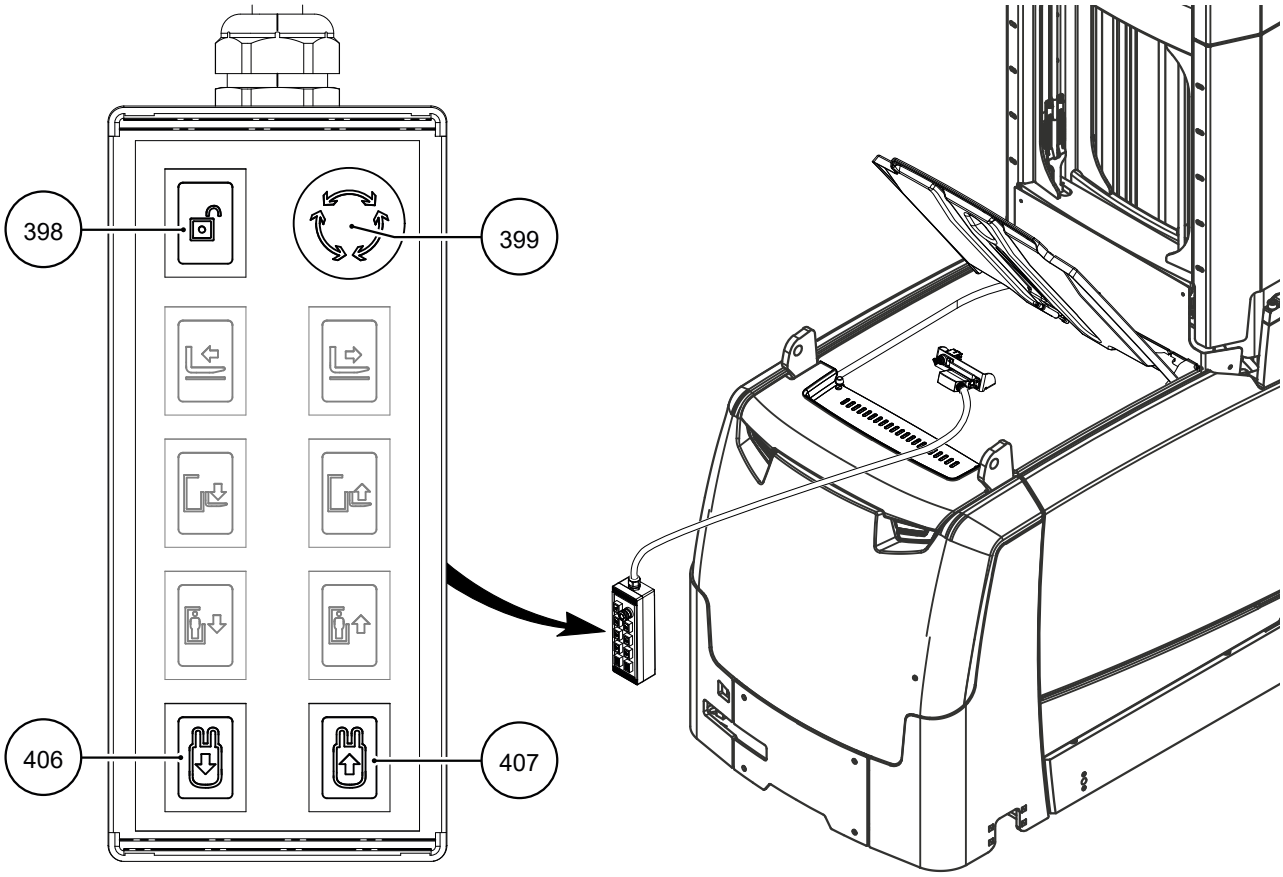
– Emergency console connected to the truck, see page 634.
– Attachment in home position, see page 638.

Procedure

- Lower the load handler with the auxiliary lift:
  - Press and hold the acknowledgement button (398).
  - Press the button (402).
    The auxiliary lift is lowered at reduced speed.
  - Lower the load handler completely until the load handler is at the lower end stop of the auxiliary mast.
  - Do not continue to press the button (402) and the acknowledgement button (398).
- Lower the operator position with the main lift:
  - Press and hold the acknowledgement button (398).
  - Press the button (404).
    The main lift is lowered at reduced speed.
  - Fully lower the operator position.
  - Do not continue to press the button (404) and the acknowledgement button (398).

The load handler and the operator position were lowered completely.

11.21.4.6 Driving the Truck using the Emergency Console



⚠ CAUTION!

Improper operation of the truck with the emergency console can result in accidents

Before carrying out a travel operation, make sure the following conditions have been met:

- ▶ Make sure there is no one in the truck's hazardous area.
- ▶ Make sure there are no obstacles in the travel route such as doorways, built-on areas, goods protruding out of the rack, trip hazards, etc.

In the event of danger or if unwanted travel or hydraulic movements are carried out while operating the emergency console, immediately press the emergency disconnect switch (399).

Requirements

- – Emergency console connected to the truck, see page 634.
- – Attachment in home position, see page 638.
- – Load handler lowered, see page 640.

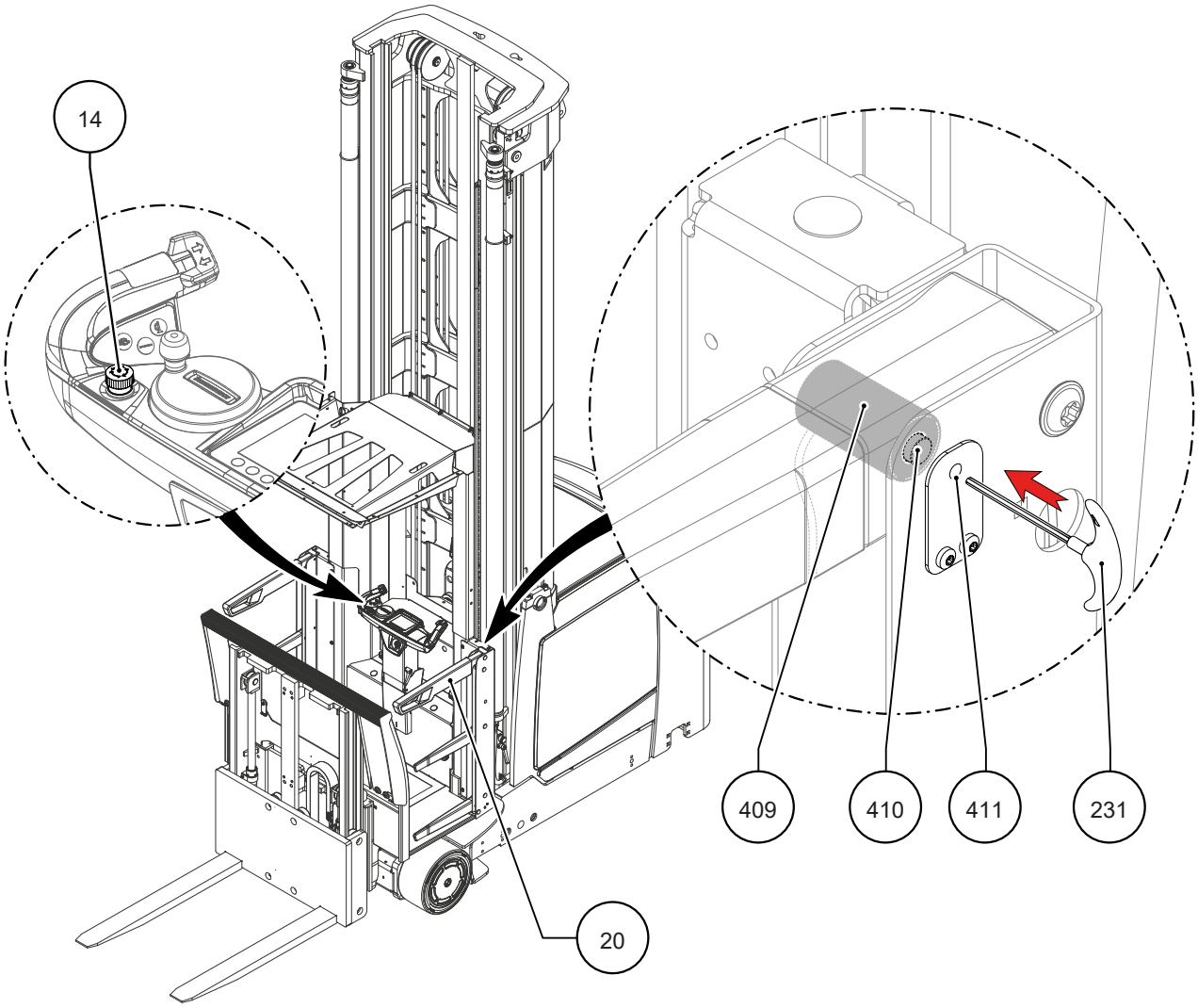
Procedure

- Drive the truck out of the narrow aisle in the load direction:
  - Press and hold the acknowledgement button (398).
  - Press the button (407).

    The truck travels at a speed of 0,8 km/h in the load direction.
  - Do not press the button (407) and the acknowledgement button (398) when the truck is outside the narrow aisle.
- Drive the industrial truck out of the narrow aisle in the drive direction:
  - Press and hold the acknowledgement button (398).
  - Press the button (406).

    The truck travels at a speed of 0,8 km/h in the drive direction.
  - Do not press the button (406) and the acknowledgement button (398) when the truck is outside the narrow aisle.
- Park the truck securely outside the narrow aisle.

11.22 Locking Gates (○)



Functional description

From a defined platform height (lift height) of the operator position, the gates (20) can no longer be opened. The opening of the gates (20) is prevented by the extended bolt (410).

Once below the defined platform height, the bolt (410) is retracted and the gates (20) can be opened again.

The specified operator position height can be set by the manufacturer's customer service department.

If the gates (20) cannot be opened due to a malfunction when the operator position is fully lowered, the gates (20) can be unlocked manually.

Manual unlocking of the locking gate

Requirements

– Operator position fully lowered, see page 292.
– Gate (20) cannot be opened when the operator position is fully lowered.

Tools and Material Required

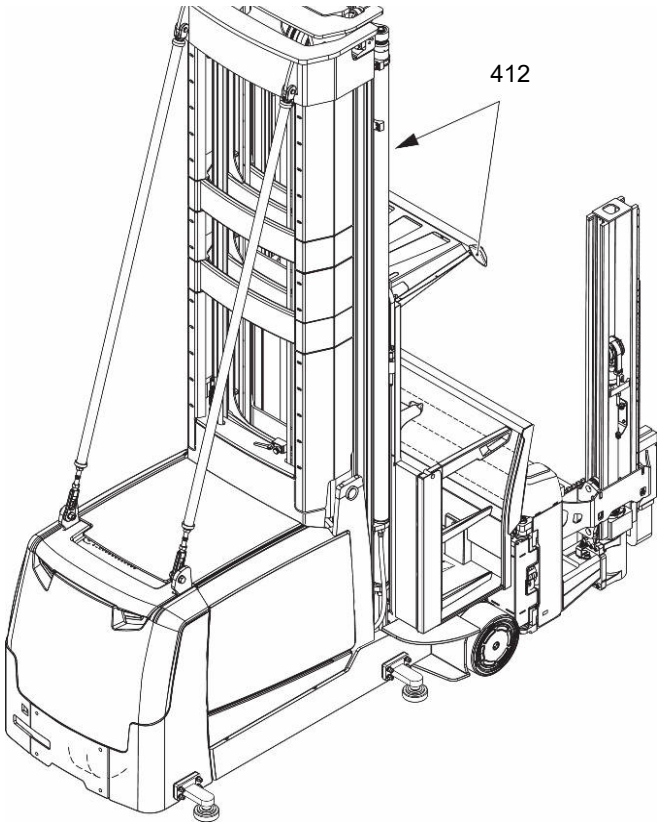
– Allen key (231) for emergency lowering of the operator position, screwdriver or similar with a maximum diameter of 6 mm

Procedure

- Switch off the truck, see page 266.
- Press the emergency disconnect switch (14).
- Unlock the bolt (410) of the magnet (409):
  - Guide the tool (231) from the outside through the opening (411).
  - Press the tool (231) against the bolt (410) until the lock on the gate (20) is released.
  - Pull the tool (231) out of the opening (411).
- Open the gate (20).

If this malfunction occurs repeatedly, contact the manufacturer's customer service department or a (specialist) customer service organisation authorised by the manufacturer.

11.23 Rear-View Mirror○)



NOTICE

Optionally the truck can be equipped with mirrors.

▶Adjust the mirror so that you can obtain a good view of the working environment.

▶Use the mirror only to observe the traffic behind you.

▶Do not use the mirror as a reversing aid.

The rear view mirror (412) is fitted with a swivel link. This allows the driver to adjust the rear view mirror (412) to his or her individual needs.

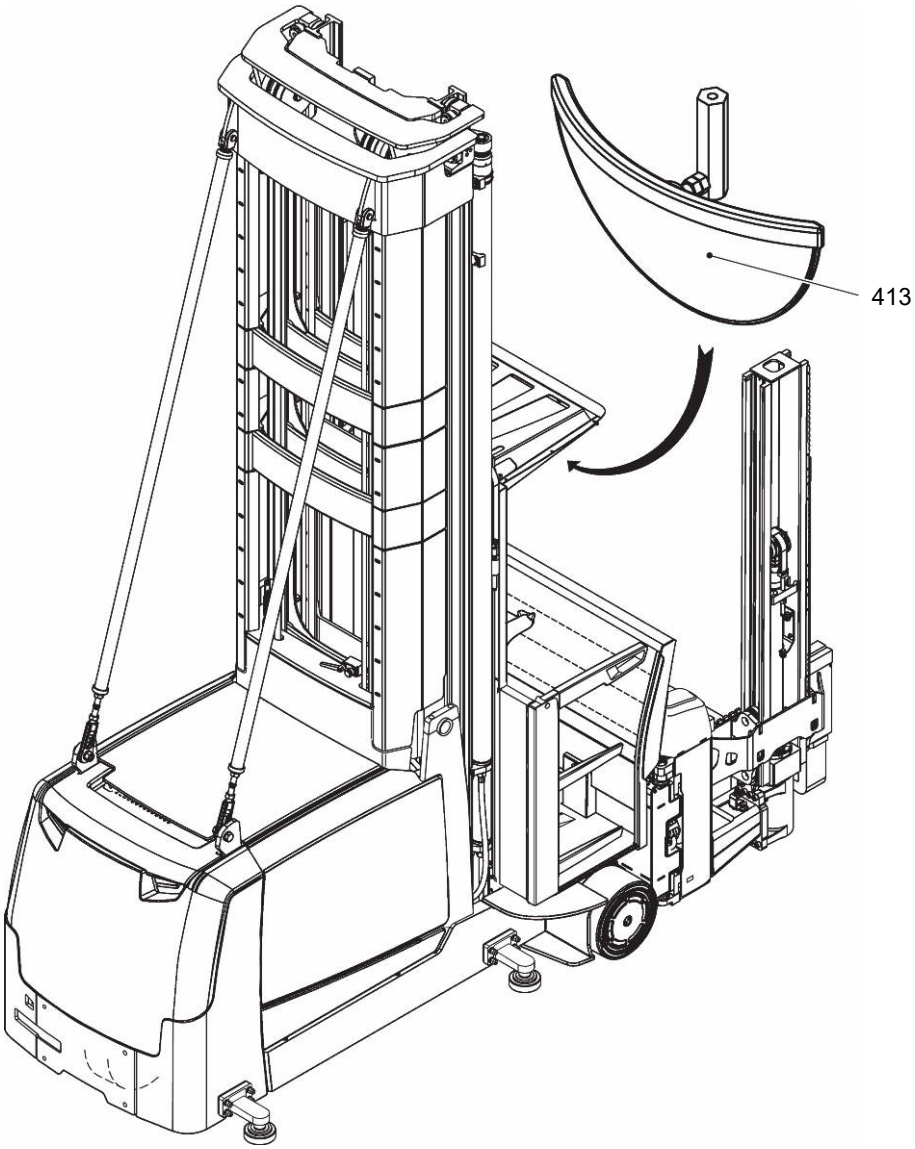
NOTICE

Incorrectly adjusted mirrors can cause collisions

Mirrors fitted on the side of the overhead guard can collide with the racking or the goods when operating in the narrow aisle.

- ▶ Adjust the mirrors so that the following safety distances between the truck and the rack are maintained.
- ▶ Maintain a minimum 100 mm safety distance between a rail guided truck and the rack.
- ▶ Maintain a minimum 125 mm safety distance between a wire guided truck and the rack.

11.24 Panoramic Mirror (○)



NOTICE

Optionally the truck can be equipped with mirrors.

▶Adjust the mirror so that you can obtain a good view of the working environment.

▶Use the mirror only to observe the traffic behind you.

▶Do not use the mirror as a reversing aid.

The panoramic mirror (413) is equipped with a pivoting joint. This allows the driver to adjust the panoramic mirror (413) to his individual needs.

11.25 Floor-Spot (○)

11.25.1 Description of the Floor-Spot

The Floor-Spot serves as a visual aid and provides greater safety in the warehouse. When the load handler is lowered, the Floor-Spot projects a red or blue spot on the ground at a distance of approx. 5 m in front of or behind the industrial truck.

The position of the projected spot is preset in the factory.

In poor visibility people are forewarned of the approaching truck. This avoids accidents when exiting the narrow aisle, at interchanges and other warehouse areas with restricted visibility.

⚠ CAUTION!

Risk of accident due to restricted view

Looking directly at the Floor-Spot (LED light) can dazzle and temporarily impair eyesight.

- ▶ Do not look directly at the Floor-Spot.
- ▶ Practise travelling and working with the Floor-Spot carefully.
- ▶ Do not change the factory setting.

⚠ CAUTION!

Reduced intensity of spot projected on the ground for trucks with raising operator position (EKS 514-516 / EKX 410-516)

When travelling with a raised operator position in the load direction, the spot of the Floor-Spot projected on the ground weakens as the lift height increases. At the same time, the distance from the spot on the ground to the truck grows as the lift height increases.

- ▶ Leave the narrow aisle with the load handler and operator position lowered.
- ▶ Travel outside the narrow aisle with the load handler and operator position lowered.

NOTICE

Obscured Floor-Spot

When the truck is travelling in the load direction with a load, the load can obscure the light beam of the Floor-Spot.

Safety information for Floor-Spot with blue light

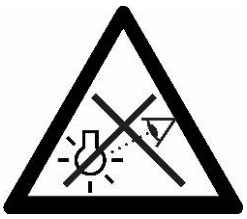
⚠ CAUTION!

Risk of retinal damage due to blue light

The Floor-Spot on the truck is classified in risk group 2 according to the standard IEC 62471: medium risk. In the range of 400 nm to 780 nm, blue light can potentially damage the retina of the human eye.

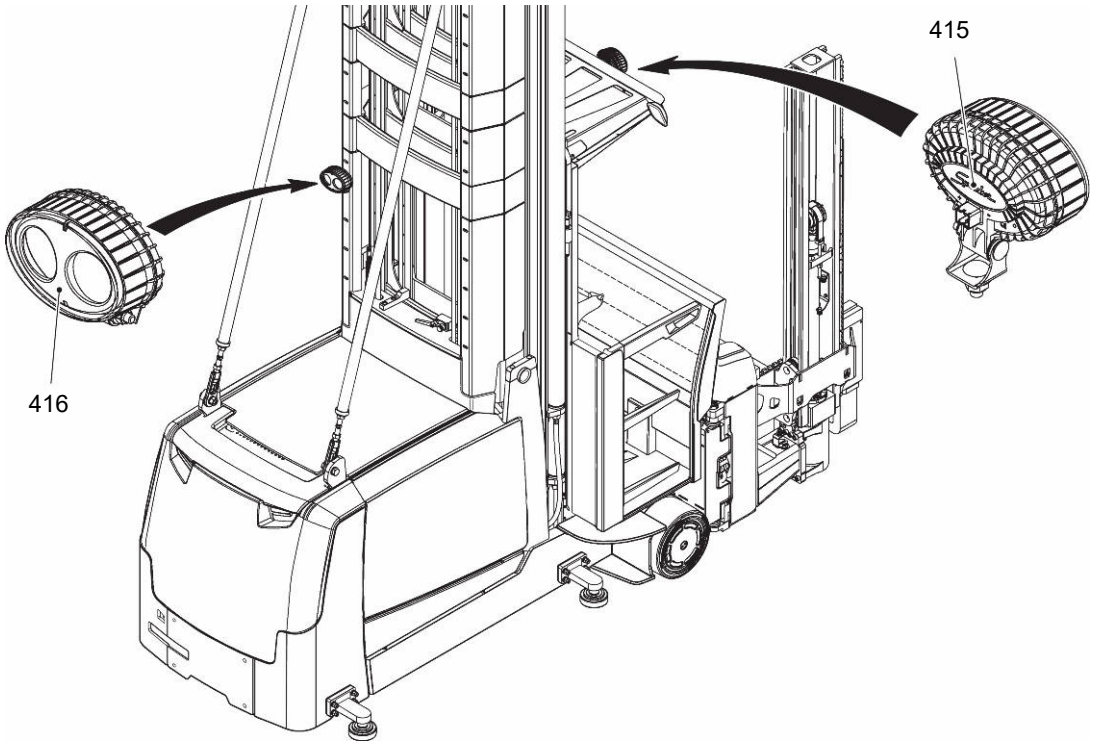
- ▶ Check that the warning notice: "Caution! Potentially dangerous optical radiation" is present and legible, and replace if necessary.
- ▶ Do not look directly into the light beam of the Floor-Spot.
- ▶ When performing maintenance and repairs, take the Floor-Spot out of service, e.g. by disconnecting the battery, and secure it against unintentional recommissioning.

The warning notice (414) is attached to the overhead guard or mast next to the Floor-Spot. An additional, smaller warning notice (414) is attached to the Floor-Spot.



414

11.25.2 List of assemblies for Floor-Spot



Item		Description
415	○	Floor-Spot in the load direction
416	○	Floor-Spot in the drive direction

11.25.3 Activating the Floor-Spot outside of narrow aisles (free ranging truck)

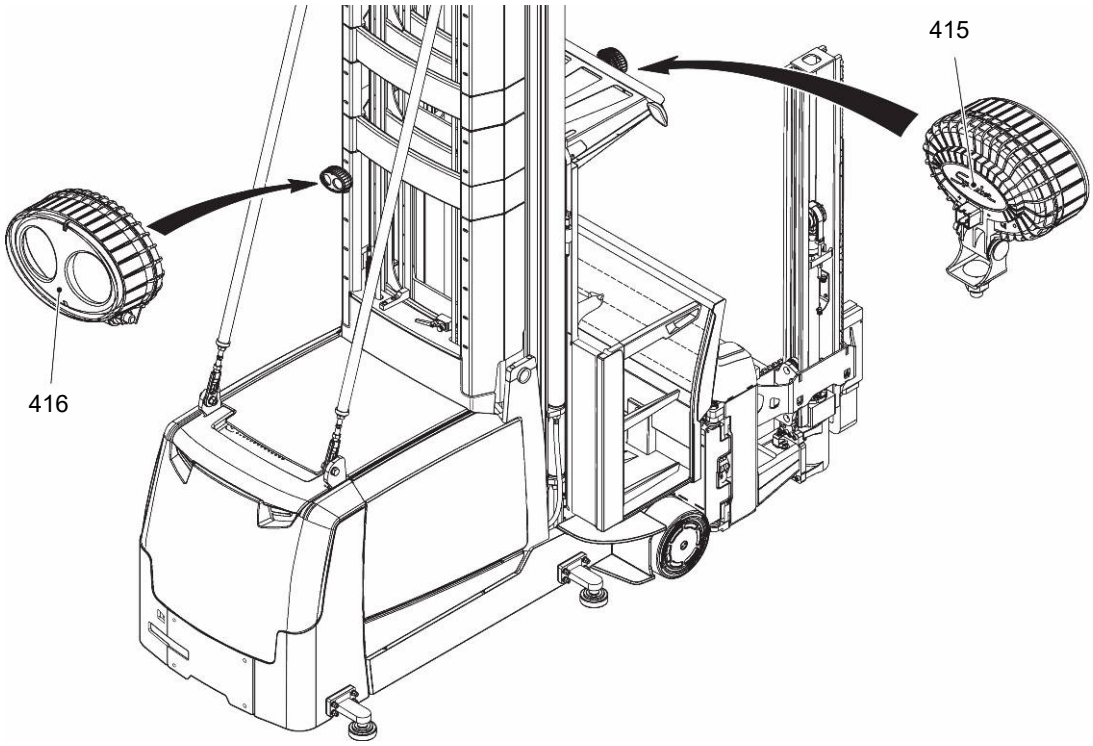
Truck stop

Truck travel function	Function of the Floor-Spot
• Truck not travelling (stationary)	• Floor-Spot (415) and Floor-Spot (416) are switched off.

Truck travels in drive or load direction

Truck travel function	Function of the Floor-Spot
• Truck travels in drive direction	• Floor-Spot (416) is switched on. • Floor-Spot (415) is switched off.
• Truck travels in load direction	• Floor-Spot (415) is switched on. • Floor-Spot (416) is switched off.

11.25.4 Activating the Floor-Spot in narrow aisles (truck with rail or wire guidance)



Truck stop

Truck travel function	Function of the Floor-Spot
• Truck not travelling (stationary)	• Floor-Spot (415) and Floor-Spot (416) are switched off.

Narrow aisle entry (alignment)

Truck travel function	Function of the Floor-Spot
• Truck travels in drive direction	• Floor-Spot (416) is switched on. • Floor-Spot (415) is switched off.
• Truck travels in load direction	• Floor-Spot (415) is switched on. • Floor-Spot (416) is switched off.

Travel within narrow aisle (narrow aisle with end of aisle safety device)

Truck travel function	Function of the Floor-Spot
• Guided truck travels between end of aisle safety device areas in drive direction	• Floor-Spot (415) and Floor-Spot (416) are switched off.
• Guided truck travels between end of aisle safety device areas in load direction	• Floor-Spot (415) and Floor-Spot (416) are switched off.

Travel within narrow aisle (narrow aisle without end of aisle safety device)

Truck travel function	Function of the Floor-Spot
• Guided truck travels in drive direction	• Floor-Spot (416) is switched on. • Floor-Spot (415) is switched off.
• Guided truck travels in load direction	• Floor-Spot (415) is switched on. • Floor-Spot (416) is switched off.

Narrow aisle exit (leaving the narrow aisle)

Truck travel function	Function of the Floor-Spot
• Guided truck passes over the end of aisle safety device in the drive direction	• Floor-Spot (416) is switched on. • Floor-Spot (415) is switched off.
• Guided truck passes over the end of aisle safety device in the load direction	• Floor-Spot (415) is switched on. • Floor-Spot (416) is switched off.

Narrow aisle exit (guided travel outside of the narrow aisle)

Truck travel function	Function of the Floor-Spot
• Guided truck exits the narrow aisle in the drive direction	• Floor-Spot (416) is switched on. • Floor-Spot (415) is switched off.
• Guided truck exits the narrow aisle in the load direction	• Floor-Spot (415) is switched on. • Floor-Spot (416) is switched off.

11.26 Camera System (○)

The camera system is a tool to assist safe use of the truck. The camera system is an auxiliary function designed to support the operator; it does not release the operator from the responsibility to stop travel and hydraulic operations when confronted with an obstacle.

⚠ WARNING!

Risk of collision when operating the monitor

Operation of the monitor during travel or hydraulic operations of the truck can lead to collisions with persons and objects.

▶ Only use the monitor when the truck is stationary.

⚠ WARNING!

Risk of collision due to restricted visibility or distraction

The monitor can restrict the operator's view depending on the mounting position. A restricted view or distraction of the operator can lead to collisions with persons and objects.

▶ Check that the monitor, support and accessories are securely fixed before daily use.

▶ Prior to operation, adjust the monitor support such that the monitor does not impair the operator's field of vision.

▶ Increased attention required during travel and hydraulic operations.

▶ Adjust your travel speed and load handling according to the visibility conditions.

⚠ WARNING!

Danger of collision due to malfunction, impaired view or overfamiliarity

Malfunctions of the camera system can cause the display on the camera system to no longer be updated. Operating the truck based solely on the camera system display and not directly looking at the operating and working area, or a lack of attention due to overfamiliarity, can result in collisions with persons and objects.

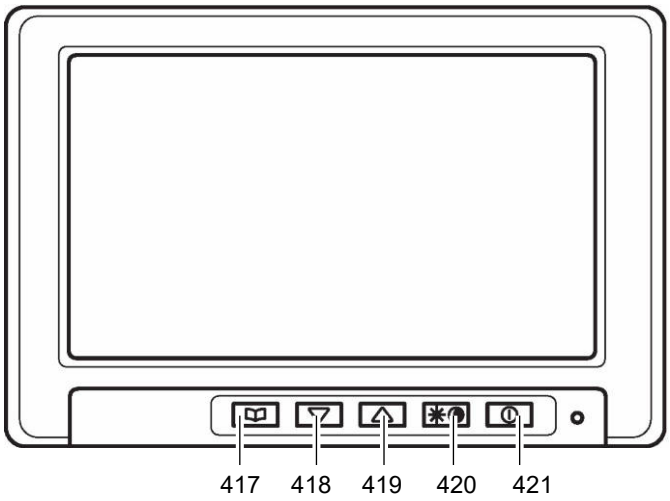
- ▶ Increased attention required during travel and hydraulic operations.
- ▶ When operating the truck, look directly at the operating and work area as well as checking the camera system display to avoid lack of attention caused by overfamiliarity.
- ▶ Align the camera such that the non-visible working area can be viewed.
- ▶ Exercise caution when travelling and working with the camera system.
- ▶ Adjust your travel speed and load handling according to the visibility conditions.

NOTICE

Risk of material damage when working with visual aids

Should you need visual aids (monitors etc.) to ensure adequate visibility, practice working with them beforehand.

➔ Clean the dirty monitor or dirty air vents with a soft cloth or brush.



When using the camera system as a reversing camera, the monitor is switched on automatically by adjusting the travel control button to travel in the drive direction.

Switching the camera system on or off

Procedure

- Press the (421) key.
  The camera system and monitor are switched on or off.

Adjusting the brightness of the monitor

Procedure

- Press the (420) key.
  The screen becomes brighter or darker (day/night toggle).

Opening the Menu

Procedure

- Press the (417) key.
  The menu opens. Pressing the (417) key several times changes between the following menu items or exits the menu.

Available menus:	
– Brightness	– Language
– Contrast	– Reflection
– Colour saturation	– Video
– Factory setting	– Indicator

Adjusting the menu items

Procedure

- Press the (419) key.
  The menu goes forward one menu item.
- Press the (418) key.
  The menu goes back one menu item.

11.27 Heater (○)

The heater is attached to the operator position under the driver's seat by means of magnets. The heater is intended exclusively for installation in the operator position footwell.

⚠ WARNING!

Improper use of the heater

In the event that the heater is not used as intended, hazards may arise which could endanger the operator (risk of injury and burns).

- ▶ Never touch the grille over the outlet and inlet openings when operating the heater (risk of burns).
- ▶ Never operate the heater with wet hands (risk of electric shock).
- ▶ Never insert fingers into the grille openings over the outlet and inlet opens (risk of injury).
- ▶ Never insert objects into the grille openings over the outlet and inlet opens (risk of injury).
- ▶ Protect the heater against moisture and contact with fluids.

⚠ WARNING!

Fire hazard

The air emitted by the heater can reach extremely high temperatures. This can pose a fire hazard for materials immediately in front of the outlet opening.

- ▶ In order to prevent the heater from heater from overheating, the heater must not be covered over.
- ▶ Never leave objects directly in front of the outlet and inlet openings.
- ▶ Never place objects on the heater.
- ▶ Ensure that air can flow in and out of the heater freely. Otherwise, there is a risk of heat building up in the heater.
- ▶ Never operate the heater unsupervised.
- ▶ Never operate the heater in the vicinity of flammable gases, fluids or other flammable materials. The same also applies in areas at risk of explosion.

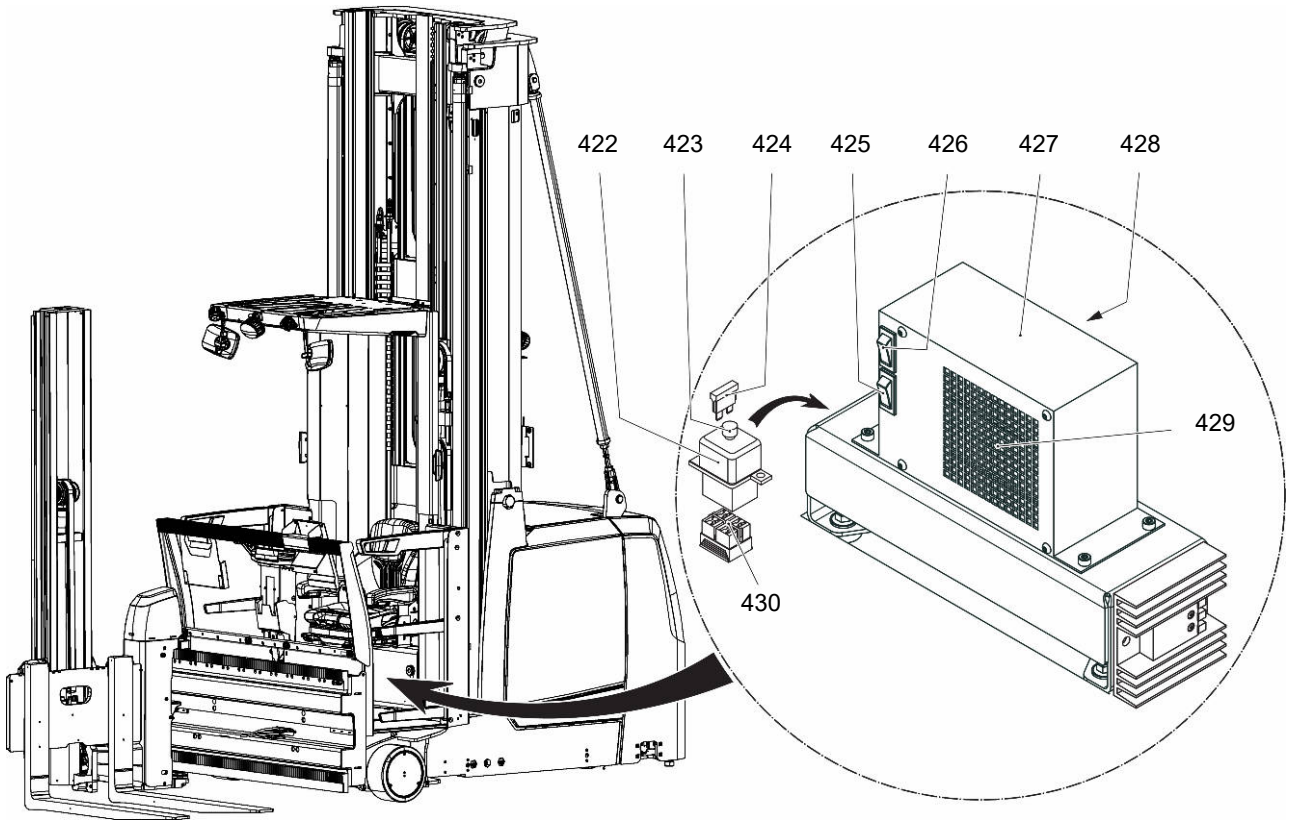
⚠ WARNING!

Danger when cleaning the heater

The heater is an electronically operated device. There is a risk of electric shock if the heater is cleaned with water or other fluids.

- ▶ Switch off the truck before performing cleaning work and disconnect the battery.
- ▶ Allow the heater to cool before performing cleaning work.
- ▶ Never clean the heater with water or other fluids.
- ▶ Clean dust and drawn-in particulate from the heater at the inlet and outlet openings with light suction or compressed air (use a compressor with water separator) and a non-conductive, anti-static brush.
- ▶ Clean the outside of the heater with a soft cloth. Never use aggressive cleaning agents, abrasive cleaners, hard sponges, steel wool, etc. to clean the device.

11.27.1 Heater components



Item	Component
422	Fuse cover (F1)
423	Knurled bolt to attach the cover (422)
424	Fuse (F1) – Rating: 15 A – Type: FK8 – Fuse replacement see page 696
425	"Heater" switch
426	"Fan" switch
427	Heater
428	Inlet opening with grille
429	Outlet opening with grille
430	Fuse holder (F1) – Use the left-hand slot

11.27.2 Operating the heater

Requirements

– Prepare the truck for operation, see page 265.

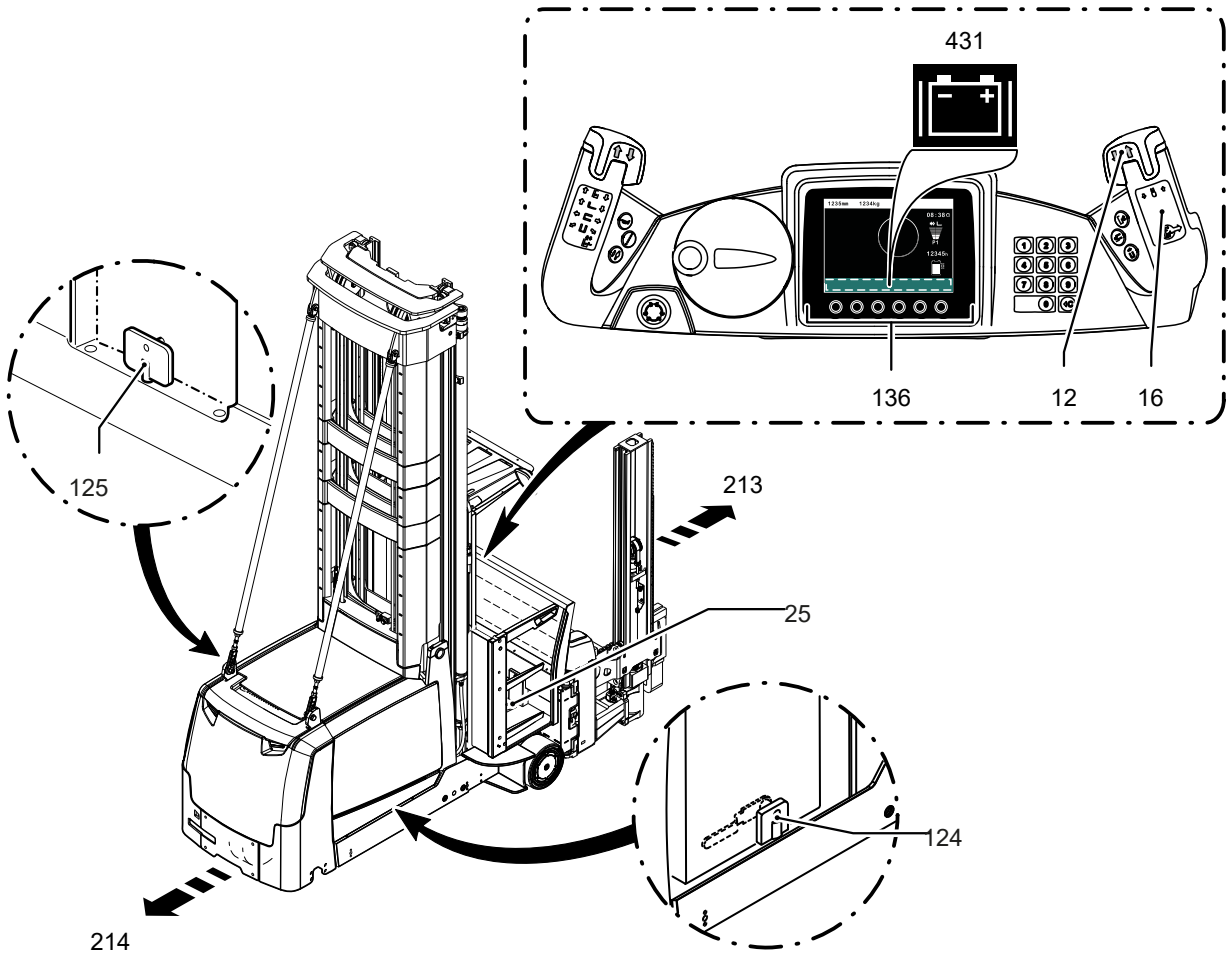
Procedure

- Switch the heater fan (427) on or off:
  - Move the "Fan" switch (426) to position "1".
    The heater fan (427) is switched on.
  - Move the "Fan" switch (426) to position "0".
    The heater fan (427) is switched off.
- Switch the heater (427) on or off:

➔ The heater (427) can only be switched on if the fan is also switched on.

  - Move the switch (425) to position "1".
    The heater (427) is switched on.
  - Move the switch (425) to position "0".
    The heater (427) is switched off.

11.28 "Battery lock" sensors (○)



⚠ CAUTION!

An unsecured battery can result in accidents

If the battery retrainers are not applied in the chassis, the battery may slide out of the battery compartment when the truck moves.

▶ Apply the battery lock in the chassis.

▶ Only short shunting operations can be performed without the battery locks. During these operations the operator must apply greater concentration.

During operation, the "battery latch" sensors monitor the battery retainers (124|125) engaged in the truck chassis.

If the battery retainers (124|125) are not properly engaged in the truck chassis, the truck is unable to travel.

The "missing battery latch" symbol (431) lights up on the driver's display.

Moving the truck without the battery latch

Requirements

– Truck has been prepared for operation – see page 265.
– At least one of the two battery retainers (124|125) is not engaged in the truck chassis.
– The “missing battery latch” symbol (431) lights up on the driver's display.

Procedure

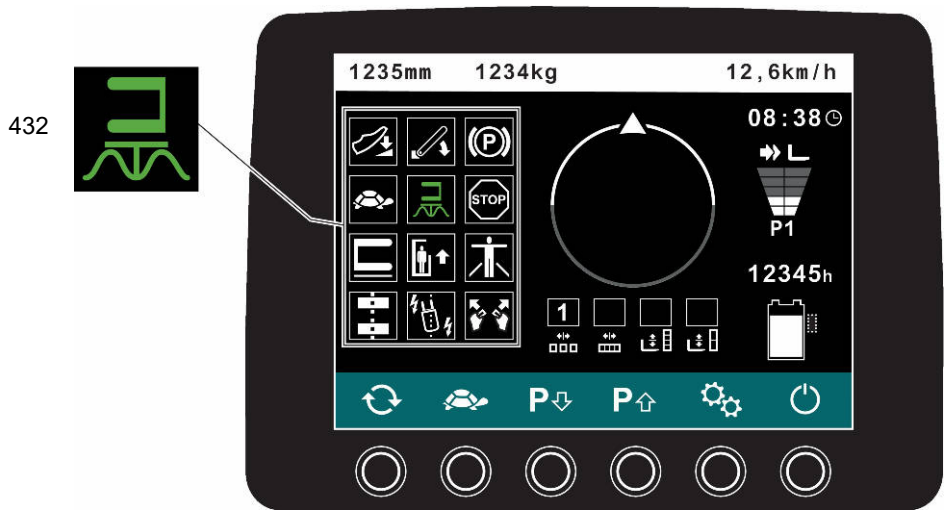
- Press the deadman switch (25).
- Grip the handle (16) with the right hand.
- Press the button (136) below the “missing battery latch” symbol (431).
  The “missing battery latch” symbol (431) appears inverse.
- Set the travel direction and speed with the travel control knob (12):
  - Turn the travel control knob (12) slowly clockwise:
    travel in load direction (213).
  - Turn the travel control knob (12) slowly anti-clockwise:
    travel in drive direction (214).

The truck travels in the required direction at max. 0,8 km/h.

➔ The speed restriction of the truck is removed once the battery retainers (124|125) are engaged in the truck chassis. The "missing battery latch" symbol (431) is hidden. The truck can now travel again at the approved speed.

➔ Hydraulic operations are not affected if the battery retainers are not in place.

11.29 sideshiftPLUS (○)



In narrow aisles in which the "sideshiftPLUS" optional equipment is released, the "second stacking depth" optional equipment cannot be used. The opposite also applies.

With the "sideshiftPLUS" optional equipment, the truck is equipped with a hydraulically extendible swivel traverse frame.

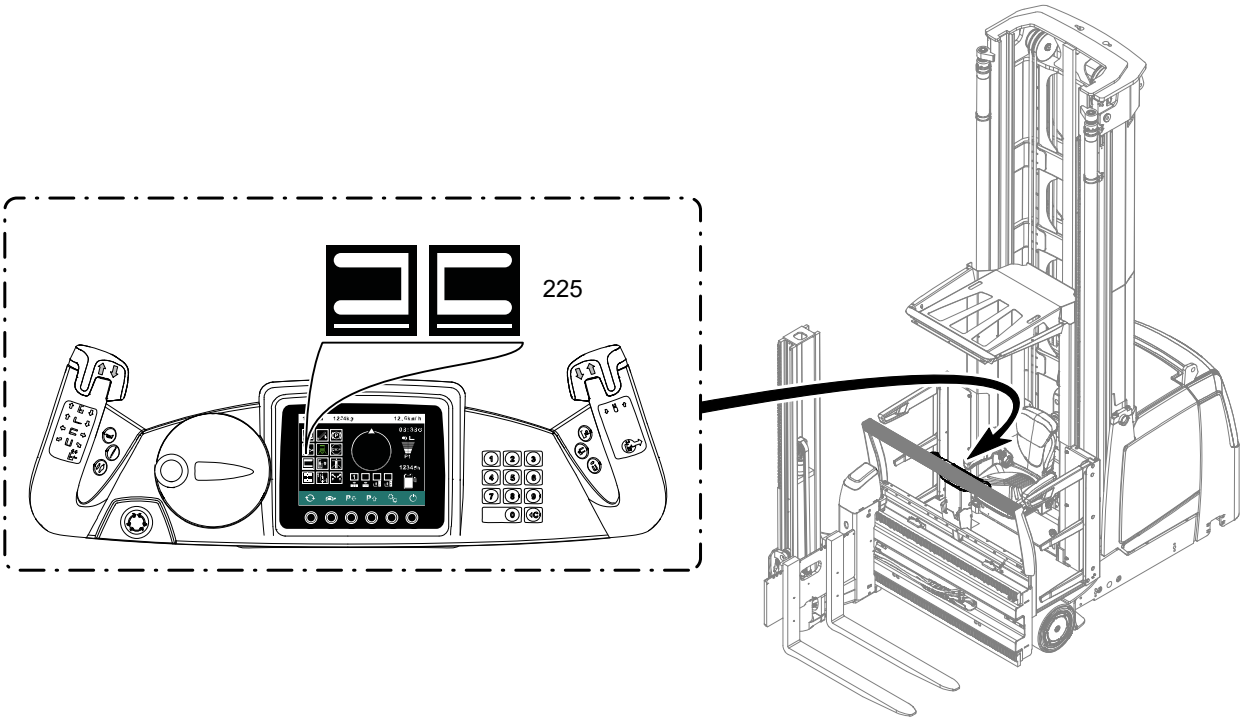
Benefits of this optional equipment:
- Additional reach path on both sides (extra traverse): 40 mm ... 100 mm
- Enables use in different aisle widths
- Simplifies handling of different load sizes
- Enables narrower narrow aisles or a greater sideways safety distance to racks

The "sideshiftPLUS" optional equipment is released or deactivated according to the aisle number of the narrow aisle.

The "sideshiftPLUS" optional equipment is always deactivated outside of the narrow aisle.

➔ The "sideshiftPLUS" optional equipment is set and released in the narrow aisle by the manufacturer's customer service department.

Activation of the "sideshiftPLUS" optional equipment in the narrow aisle is indicated to the operator by the illumination of the green symbol "swivel traverse frame centring active" (432) on the driver's display.



Optional equipment: "sideshiftPLUS" - attachment extension

Requirements

– Truck driven into the narrow aisle and compulsory guidance established – see page 283.
– In this narrow aisle, the "sideshiftPLUS" optional equipment must be activated.
– Attachment in home position – see page 317.

Procedure

• Drive the truck slowly up to the storage location – see page 279.
• Brake the truck to a complete stop in front of the storage location – see page 277.
• Raise or lower the load handler so that the load can be picked up or set down – see page 292.
• Actuate the "traverse attachment to the left or right" hydraulic function – see page 302.

The moving swivel traverse frame is moved in the actuated direction up to the set end stop (extra traverse). The attachment is then moved in the actuated direction on the swivel traverse frame up to the end position. The driver's display no longer displays the symbol (225) for "attachment and load handler in left home position" or "attachment and load handler in right home position".

Optional equipment: "sideshiftPLUS" - attachment retraction

Requirements

– The truck is in the narrow aisle and compulsory guidance has been enabled (see page 283).
– In this narrow aisle, the "sideshiftPLUS" optional equipment must be activated.
– The swivel traverse frame and attachment have been traversed fully to the left or right.

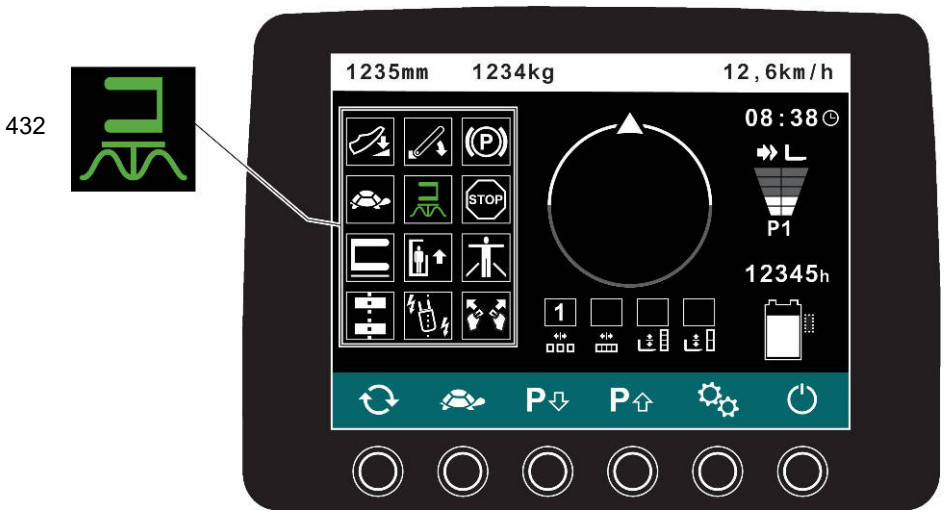
Procedure

- Actuate the "traverse attachment to the left or right" hydraulic function – see page 302.

  The attachment is retracted to the end position on the swivel traverse frame in the actuated direction. The moving swivel traverse frame is then retracted up to the centre position in the actuated direction (extra traverse). The driver's display shows the symbol (225) for "attachment and load handler in left home position" or "attachment and load handler in right home position".

- Lower the load handler – see page 292.

11.30 FloorPro (○)



Lateral mast movements may occur when travelling on uneven surfaces in the narrow aisle.
These lateral mast movements are transferred to the attachment via the operator position and the swivel traverse frame.
The higher the operator position, the more forcefully it will transfer the mast movements to the attachment.

With the "FloorPro" optional equipment, the truck is equipped with a moving swivel traverse frame.
In the narrow aisle, the operator position and the swivel traverse frame are no longer connected.
The lateral mast movements to the attachment are absorbed by the moving swivel traverse frame within a mechanical limitation.
– Mechanical limitation to the left of right: 40 mm

The "FloorPro" optional equipment is released or deactivated according to the aisle number of the narrow aisle.

The "FloorPro" optional equipment is always deactivated outside of the narrow aisle.

The "FloorPro" optional equipment is set and released in the narrow aisle by the manufacturer's customer service department.

Activation of the "FloorPro" optional equipment in the narrow aisle is indicated to the operator by the illumination of the green symbol "swivel traverse frame centring active" (432) on the driver's display.

F Truck maintenance

1 Spare Parts

To ensure safe and reliable operation, use only the manufacturer's original spare parts.

The manufacturer’s original spare parts are consistent with the manufacturer’s specifications and guarantee the highest possible quality of safety, size accuracy and material.

The installation or use of non-original spare parts can negatively affect the specified properties of the product and impair safety. The manufacturer cannot be held liable for damage caused by the use of non-original spare parts.

The product-related electronic spare parts catalogue can be found at (www.jungheinrich.de/spare-parts-search) by entering the serial number.

➔ The serial number can be found on the data plate, see page 108.

2 Operational Safety and Environmental Protection

The inspections and maintenance tasks listed in chapter "Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement" must be performed according to the defined service intervals – see page 737.

The manufacturer recommends the replacement of the maintenance parts also listed in chapter "Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement" according to the specified replacement intervals – see page 737.

⚠ 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 records of the construction, tests and completion of changes
– Carry out and have authorised the respective changes to the capacity data plates, decals and stickers as well as the operating instructions and workshop manuals
– Attach a 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.

NOTICE

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 732.

3 Maintenance Safety Regulations

Maintenance and repair personnel

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

Truck maintenance, repair work and changing of parts requiring replacement must only be carried out by specialist personnel. The activities to be carried out are divided into 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 684.

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.

3.1 Working on the electrical system

⚠ WARNING!

Electrical current can cause accidents

Make sure the electrical system is voltage-free before starting work on it. The capacitors in the controller must be completely discharged. The capacitors are completely discharged after approximately 10 minutes. Before starting maintenance on the electrical system:

- ▶ Only suitably trained electricians may operate on the truck's electrical system.
- ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
- ▶ Park the truck securely (see page 314).
- ▶ Disconnect the battery.
- ▶ Remove any rings, metal wrist bands etc.

3.2 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.

3.3 Hydraulic system

⚠ 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.

NOTICE

Checking 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 once per year and replace if necessary.
- ▶ In the case of heavy-duty operation, the inspection intervals must be reduced accordingly.
- ▶ Under normal operating conditions, preventive 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.

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

3.4 Lift chain inspection

Unauthorised wear and external damage:

NOTICE

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.

3.5 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.

---

4 Lubricants and Lubrication Schedule

4.1 Handling consumables safely

Handling consumables

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

⚠ 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.

⚠ 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 marked 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.

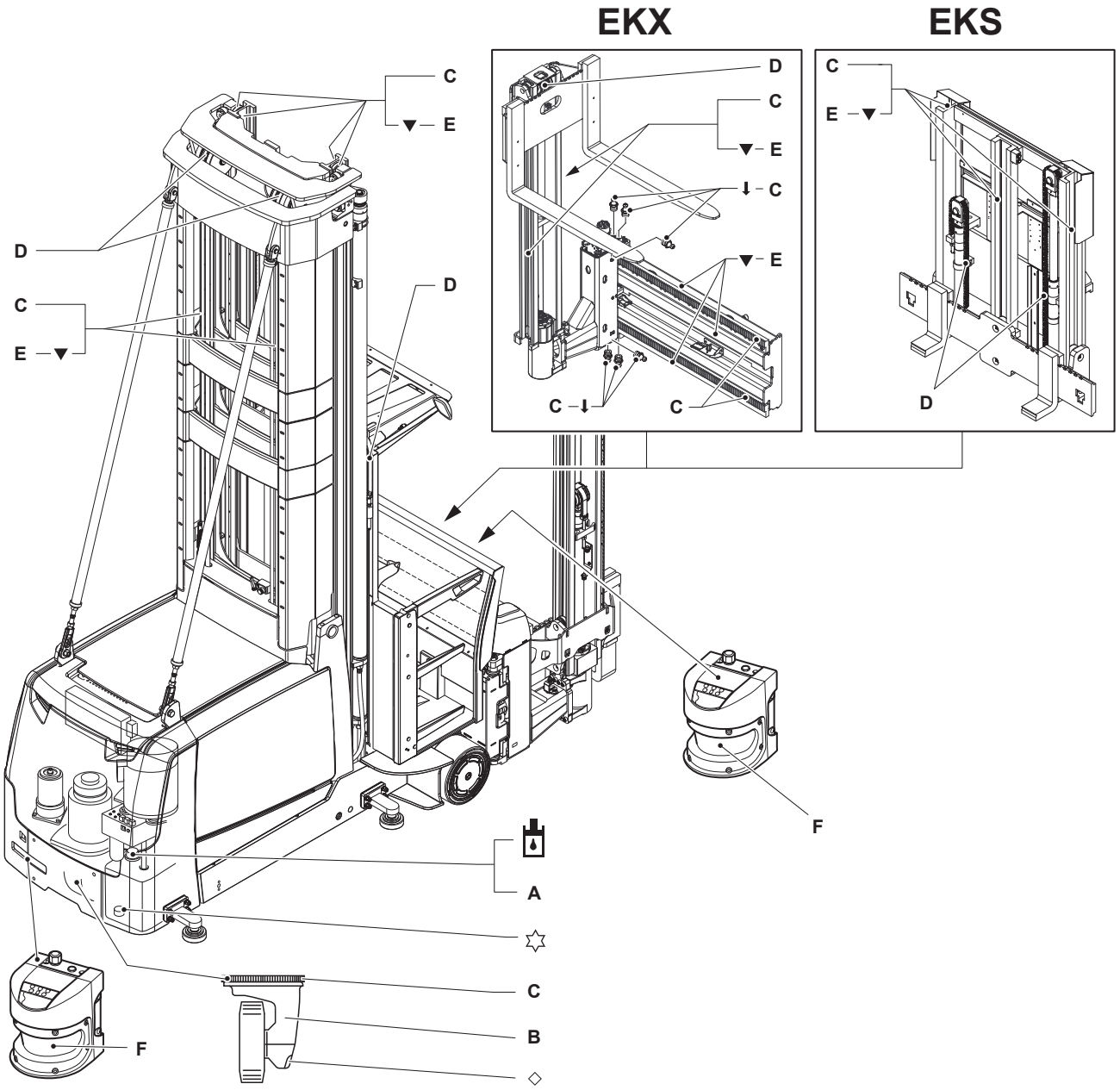
⚠ CAUTION!

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.

4.2 Lubrication Schedule



▼	Contact surfaces	☆	Hydraulic oil drain plug
⬇	Grease nipple	◆	Transmission oil filler neck
	Hydraulic oil filler neck	◇	Transmission oil drain plug

4.3 Consumables

Code	Order no.	Quantity	Description	Application
A	51 037 497	5 l	HLP D22 including 2 % additive 68 ID	Hydraulic system: – EKS 514-516 / EKX 514-516: Volume approx. 65 l – EKX 410-412: Volume approx. 33 l
	51 037 494	1 l		
	51 085 361*	5 l	Plantohyd 22 S (BIO hydraulic oil)	
B	51 179 177	1 l	British Petroleum (BP) Enersyn EP-XF150	Transmission EKS 514-516 / EKX 514-516: – Volume approx. 6,6 l
	29 200 680	5 l	Shell Omala S2 G 100	Transmission EKX 410-412: – Volume approx. 2,9 l
	50 468 756	1 l		
C	14 038 650	400 g	"Lithium " lubricating grease KP2K-30 (DIN 51825)	– General – Toothed racks – Lift mast
	29 201 430	1 kg		
D	29 201 280	400 ml	Tunfluid chain spray LT 220	– Lift chains
E	50 002 004	400 ml	Contact spray/grease	– Running surfaces
F	51 085 365	500 ml	Plastics cleaner	– Laser scanner of personal protection system (PPS)
	51 085 537	1 unit	Cleaning cloth	

* Add a 2 % content of additive 68 ID to the hydraulic oil (order number: 50 307 735)

NOTICE

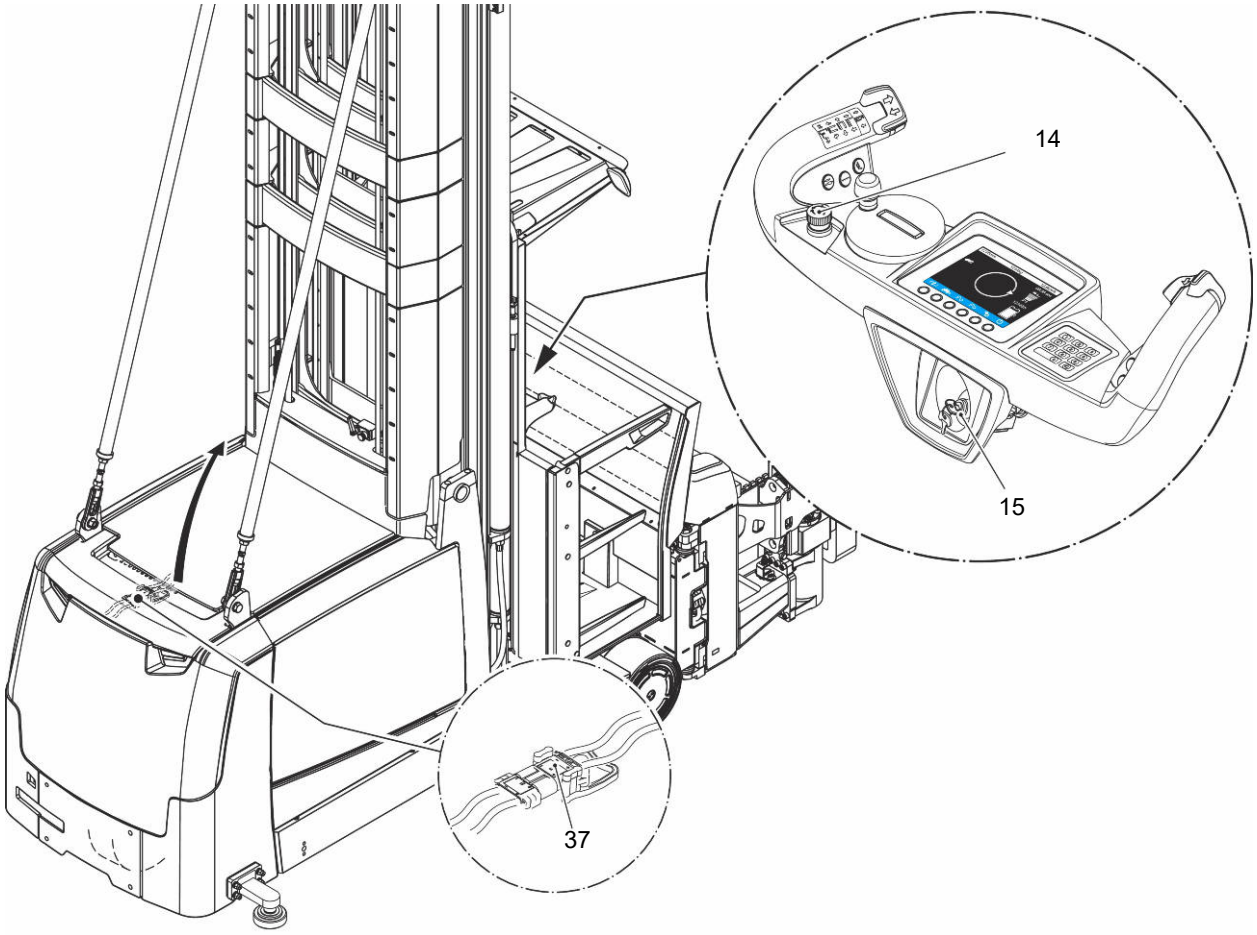
Industrial trucks are factory-equipped with "HLP D22" hydraulic oil or "Plantohyd 22 S" BIO hydraulic oil. Both hydraulic oils contain a 2 % content of additive 68 ID.

▶ You cannot change from BIO hydraulic oil "Plantohyd 22 S" to hydraulic oil "HLP D22". The same applies to changing from hydraulic oil "HLP D22" to BIO hydraulic oil"Plantohyd 22 S".

▶ Mixed operation with hydraulic oil "HLP D22" and BIO hydraulic oil "Plantohyd 22 S" is not permitted.

5 Maintenance and repairs

5.1 Preparing the truck for maintenance and repair work



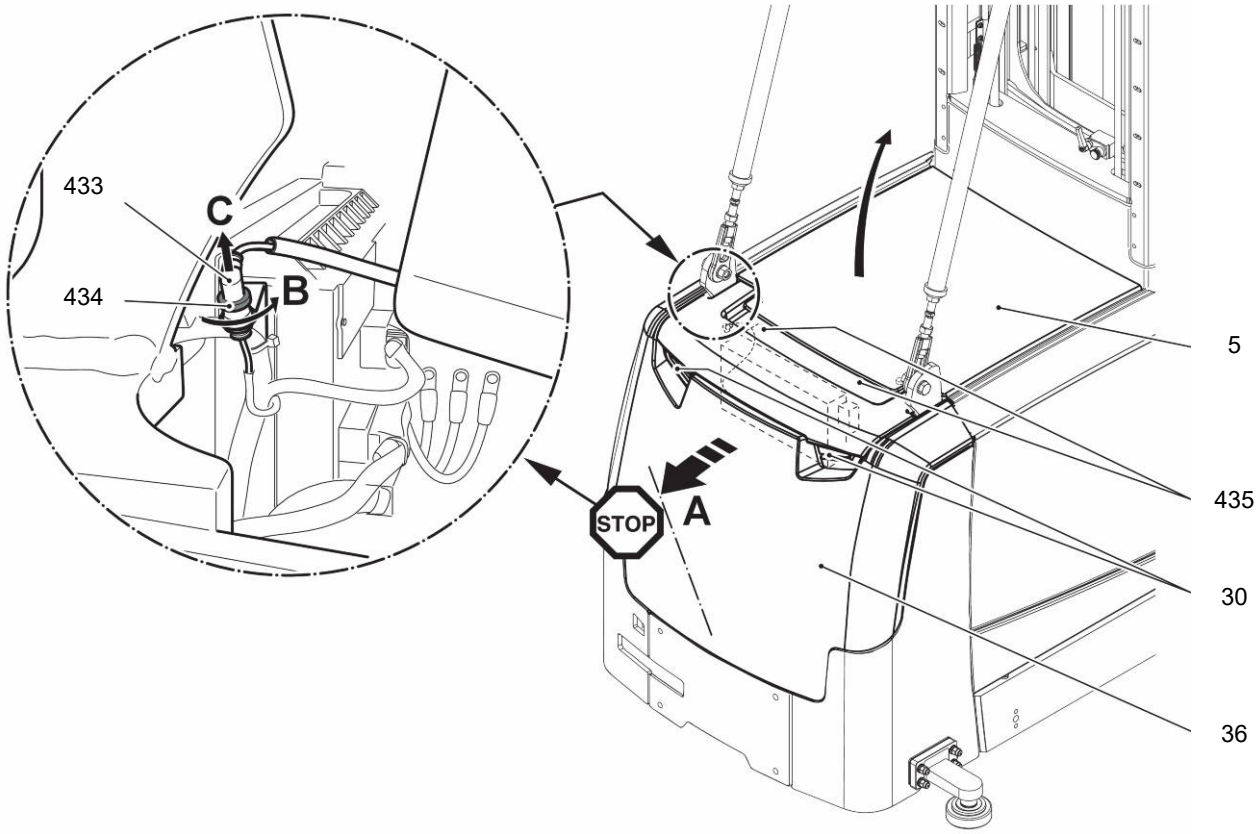
All necessary safety measures must be taken to avoid accidents when carrying out maintenance and repairs. The following preparations must be made:

Procedure

- Fully lower the load handler.
- Park the truck securely – see page 314.
- Switch off the truck – see page 266.
- Press the emergency disconnect switch (14).
- Open the battery panel (5) – see page 156.
- Disconnect the battery connector (37) to prevent the truck from being switched on accidentally.

5.2 Removing or fitting the cover of the drive compartment

5.2.1 Remove the drive compartment cover



Requirements

– Truck prepared for maintenance and repair work, see page 684.

Tools and Material Required

– Slotted screwdriver.

Procedure

- Open the battery panel (5), see page 158.
- Unscrew both slotted screws (435) using the slotted screwdriver.

NOTICE

Risk of material damage when opening the cover

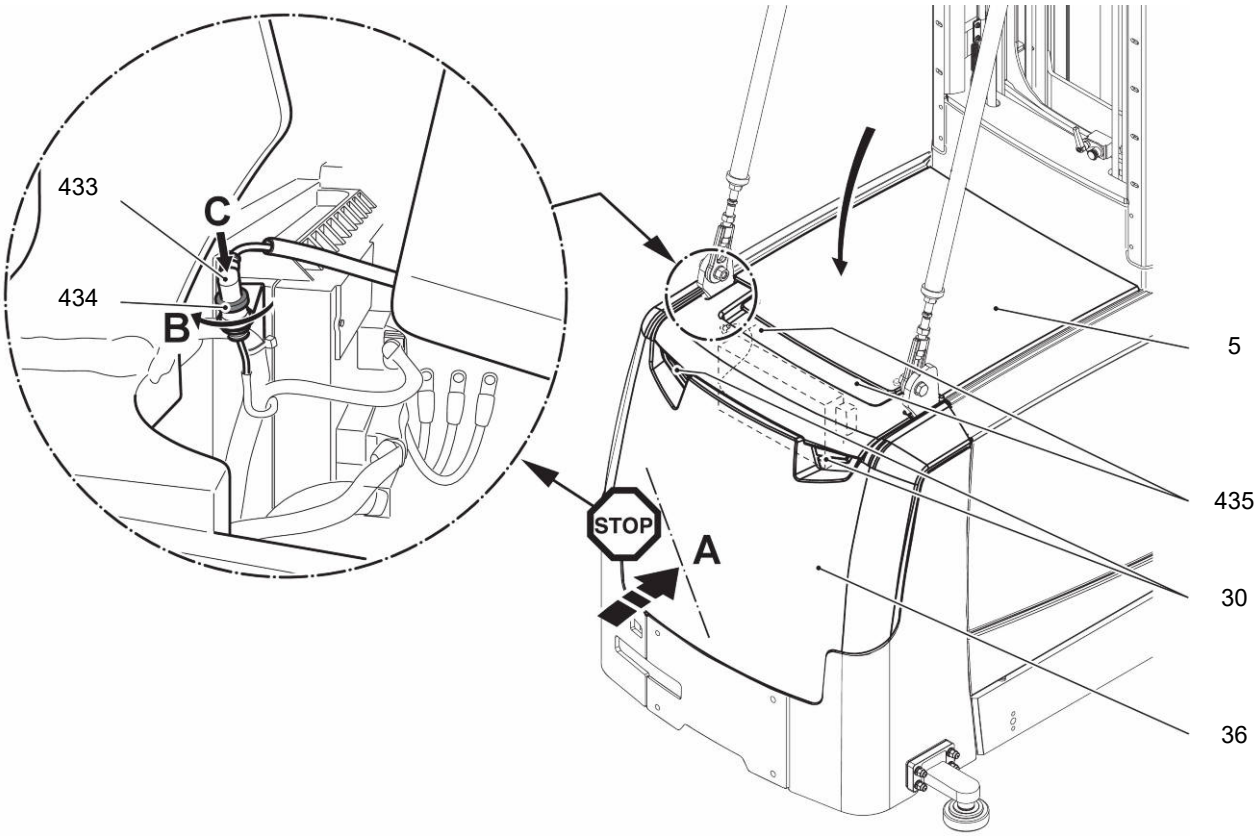
The connector can become damaged if the drive compartment cover is tilted too far in the drive direction. It is also possible that electrical connections to the connector or the rear indicators will become damaged.

- Tilt the cover (36) slightly in the drive direction until the connector (433) is visible (*see direction of arrow "A"*).
- Remove the plug connector from the rear indicators (30):
  - Turn the lock (434) on the connector (433) anti-clockwise as far as it will go (*see direction of arrow "B"*).
  - Pull the connector (433) up out of the connector coupling (*see direction of arrow "C"*).

  The plug connector to the rear indicators (30) has been disconnected.
- Lift the cover (36) up out of the truck chassis.

The cover (36) of the drive compartment has been removed.

5.2.2 Fitting the drive compartment cover



⚠ 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.

Tools and Material Required

– Slotted screwdriver

Procedure

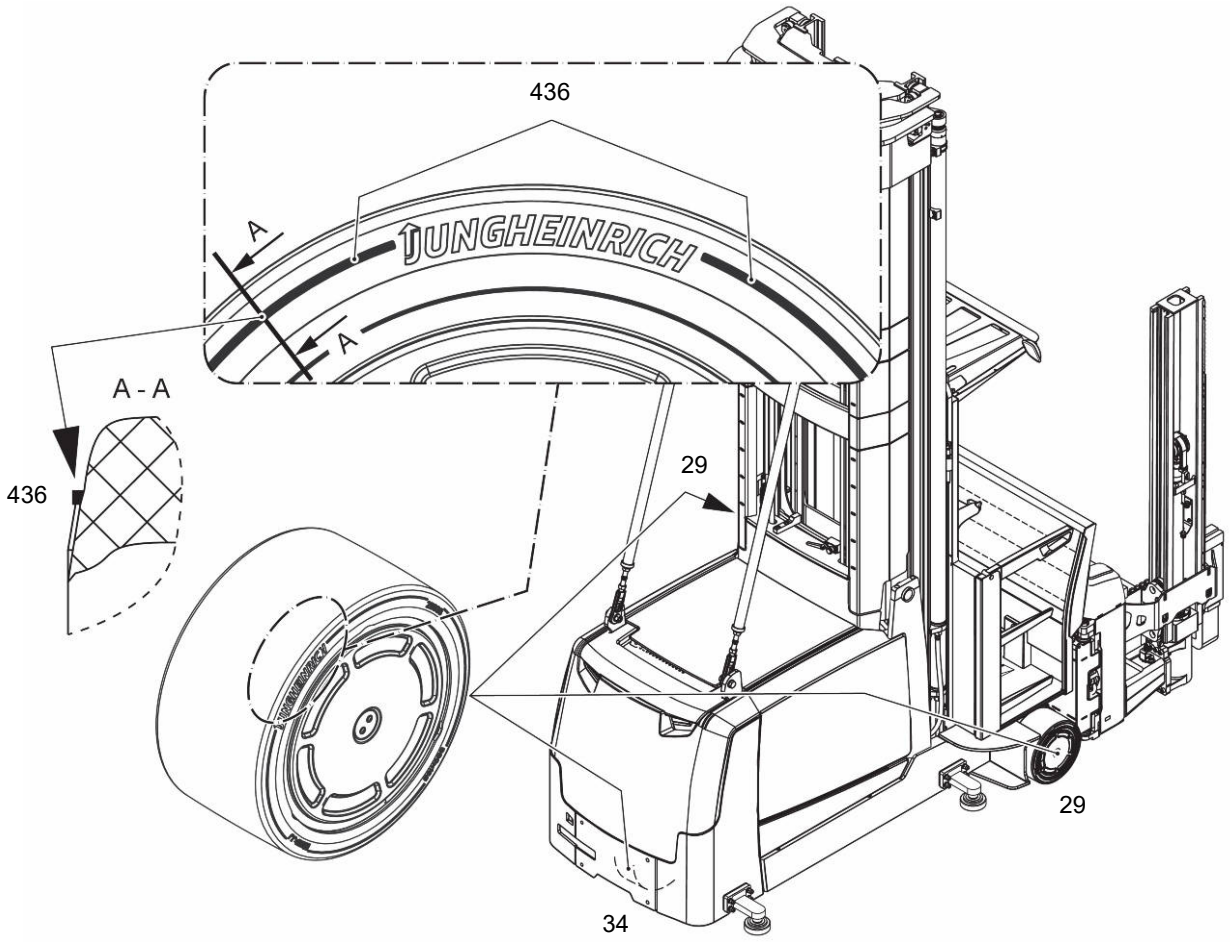
- Insert the cover (36) into the truck chassis at an angle.
- Tilt the cover (36) in the load direction until the plug connection to the rear indicators (30) can be established (*see direction of arrow "A"*).
- Establish the plug connection to the rear indicators (30) and lock it in place:
  - Insert the connector (433) onto the connector coupling (*see direction of arrow "C"*).
  - Turn the lock (434) on the connector (433) clockwise as far as it will go (*see direction of arrow "B"*).

  The plug connection to the rear indicator lights (30) has been established and locked to prevent accidental loosening.

- Tilt the cover (36) completely in the load direction.
- Attach the cover (36) to the truck with the slotted screws (435):
  - Tighten the slotted screws (435) using the slotted screwdriver.

  The cover (36) of the drive compartment has been fitted.
- Close the battery panel (5), see page 159.
- Carry out all the tasks in the section "Recommissioning the truck after cleaning or maintenance work," see page 732.

5.3 Wheels



⚠ WARNING!

Accident risk from incorrect wheel disassembly/assembly

The load / drive wheels can only be disassembled or assembled by the manufacturer's customer service department which has been trained to do this. Exceptionally, this task may be performed by a customer service organisation authorised by the manufacturer.

⚠ WARNING!

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

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

Uneven wear reduces truck stability and increases the stopping distance.

▶After replacing wheels, make sure the truck is not skewed.

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

When replacing wheels fitted at the factory, only use the manufacturer’s original spare parts. Otherwise the truck's rated performance cannot be ensured, see page 671.

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.

5.3.1 Wear limit of the drive wheel and load wheels

Check the wear on the wheels

Requirements

– Steering turned fully to the right.
– Prepare the truck for maintenance and repair work, see page 684.
– Only when checking wear on the drive wheel (34):
  Remove the drive compartment cover, see page 686.

Procedure

- Check the wear on the drive wheel (34) and load wheels (29):
  - The marking (436) on the tyre indicates the wear limit of the respective wheel.
  - If the tyre is worn to the marking (436), the wear limit has been reached and the wheel must be replaced.

⚠ WARNING!

Always replace load wheels (29) in pairs, i.e. left and right at the same time.

- Fit the drive compartment cover, see page 688.

The wear on the drive wheel (34) and load wheels (29) has been checked.

5.4 Fuses

⚠ WARNING!

Electrical current can cause accidents

Make sure the electrical system is voltage-free before starting work on it. The capacitors in the controller must be completely discharged. The capacitors are completely discharged after approximately 10 minutes. Before starting maintenance on the electrical system:

- ▶ Only suitably trained electricians may operate on the truck's electrical system.
- ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
- ▶ Park the truck securely (see page 314).
- ▶ Disconnect the battery.
- ▶ Remove any rings, metal wrist bands etc.

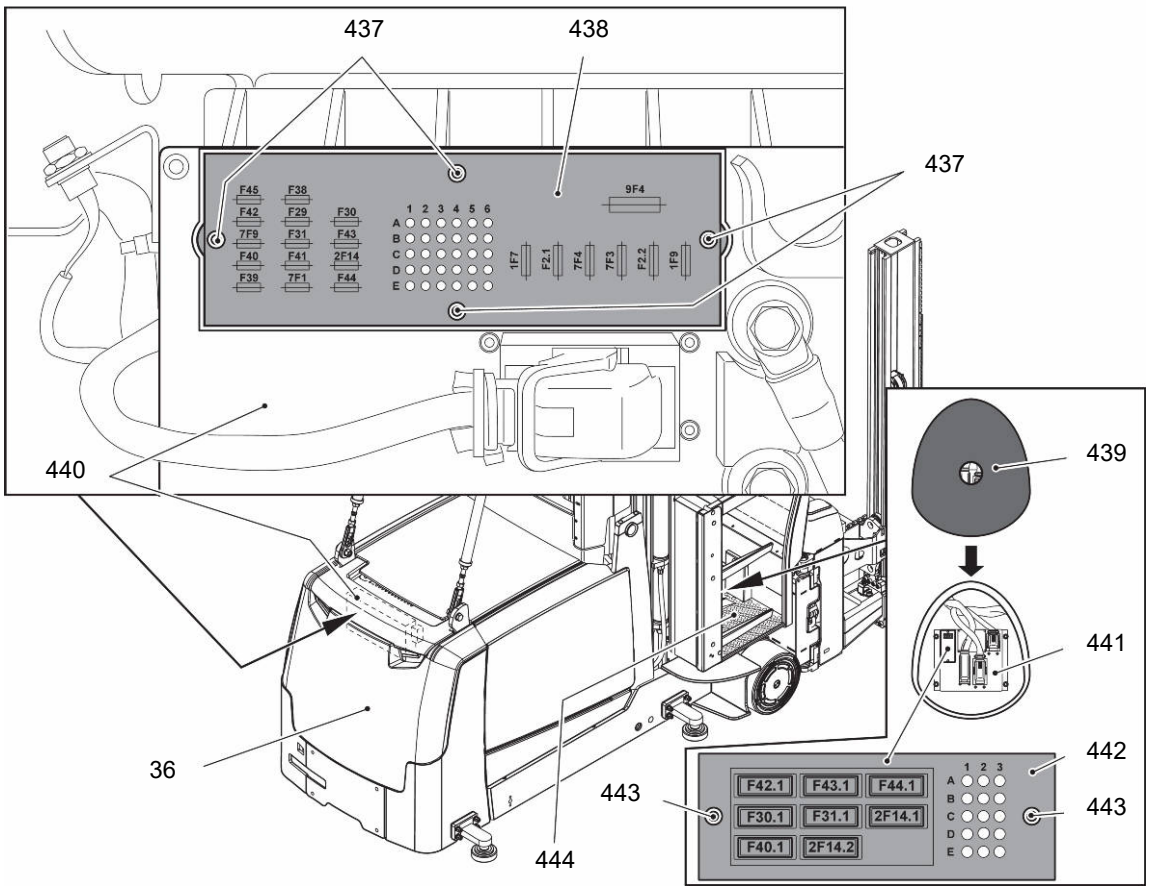
⚠ CAUTION!

The use of incorrect fuses can cause fire and damage components

The use of incorrect fuses can damage the electrical system and result in fire. The safety and functionality of the truck cannot be ensured.

▶Use only fuses with the prescribed rated current, see page 698.

5.4.1 Exposing, Replacing and Re-Covering the Fuses



Requirements

– Prepare the truck for maintenance and repairs (see page 684).

Tools and Material Required

– Screwdriver.

Procedure

- Expose the control fuses (440) in the drive compartment:
  - Remove the cover from the drive compartment (36), see page 686.
  - Remove four screws (437).
  - Remove the cover (438) from the control (440).

  The fuse box has been exposed. The fuses are accessible.
- Expose the control fuses (441) in the operator position:
  - Remove the floor mat (444) from the operator position.
  - Remove the cover plate (439) from the operator position.
  - Remove two screws (443).
  - Remove the cover (442) from the control (441).

  The fuse box has been exposed. The fuses are accessible.
- Checking fuses:
  - Pull the fuse out of its bracket.
  - Check the condition and rating of the fuse in accordance with the following "fuse rating" table (see page 698).

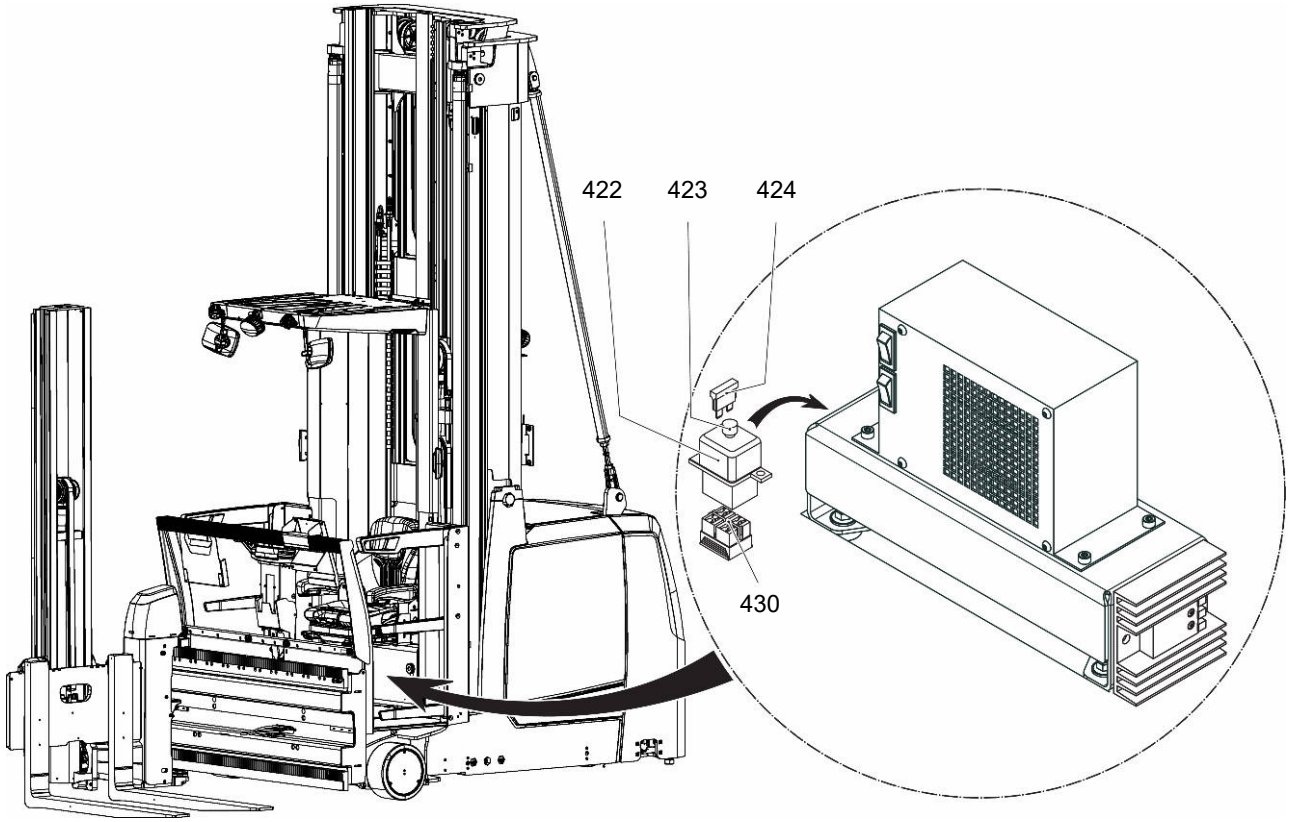
➔ Damaged fuses or fuses with the wrong rating must be replaced.

- Insert the fuse in its bracket.

- Cover the control fuses (440) in the drive compartment:
  - Check that the seal is properly seated in the fuse box.
  - Place the cover (438) on the control (440) and fasten it with the four screws (437).
  - Fit the drive compartment cover (36), see page 688.
- Cover the control fuses (441) in the operator position:
  - Check that the seal is properly seated in the fuse box.
  - Place the cover (442) on the control (441) and fasten it with the two screws442(443).
  - Insert the cover plate (439) into the operator position.
  - Place the floor mat (444) in the operator position.

The fuses have now been checked. The fuse box is protected against the penetration of dust and moisture by the corresponding seal.

5.4.2 Exposing, replacing and covering the heater fuse (○)



Checking the heater fuse (F1) and replacing if necessary (○)

Requirements

– Prepare the truck for maintenance and repair work, see page 684.

Procedure

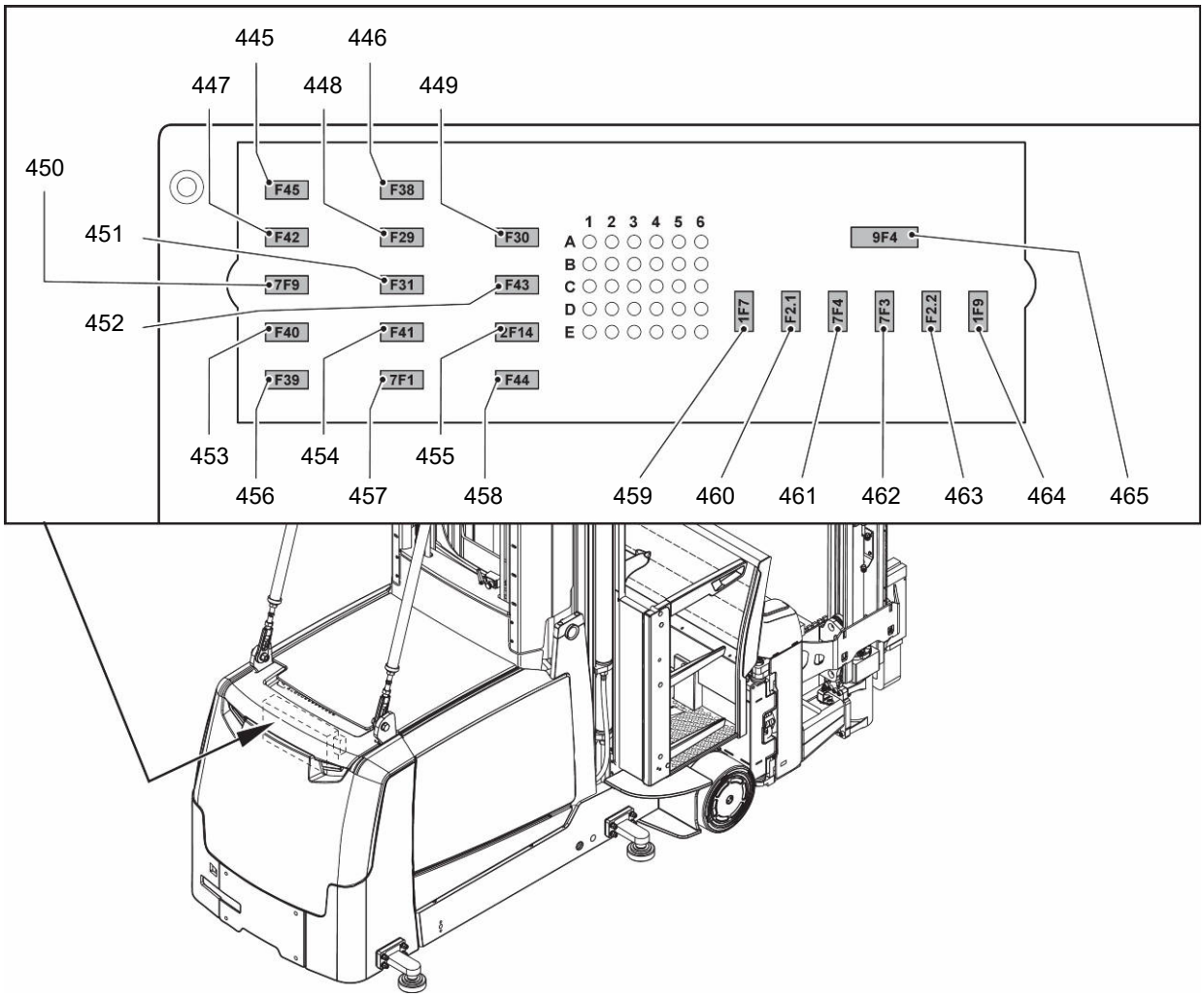
- Remove the knurled screw (423).
- Pull the cover (422) off the fuse holder (430).
- Check the fuse (F1) and replace if necessary:
  - Pull the fuse (424) from the fuse holder (430).
  - Check the fuse (424) rating and for damage (15 A / FK8)

➔ A damaged fuse or fuse with an incorrect rating must be replaced.

  - Insert the fuse (424) into the left-hand slot in the fuse holder (430).
- Place the cover (422) onto the fuse holder (430).
- Secure the cover (422) with the knurled screw (423).

The fuse (F1) has been checked and replaced if necessary.

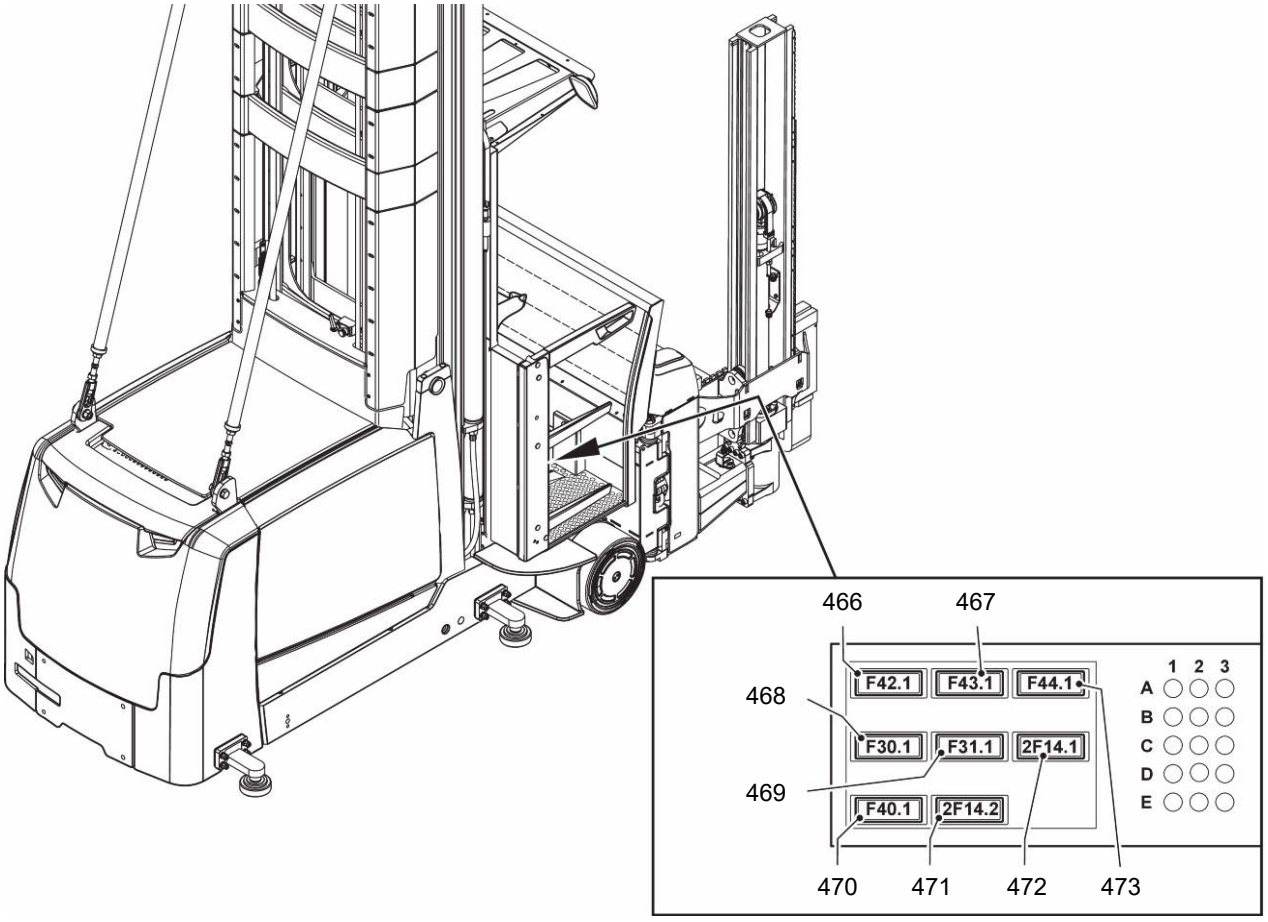
5.4.3 Fuse ratings



Fuse ratings for control in drive compartment

Item	Fuse	Electrical circuit	Value
Main circuit 24 V "Standby (V0)"			
445	F45	Protects the 24 V supply of the operator position on the control in the operator position (○)	2 A[1)]
Main circuit 24 V "Control connections (V1)"			
446	F38	Protects the 24 V supply of the operator position on the control in the operator position	4 A[1)]
447	F42	Protects the 24 V supply of the external "Ground system" I/O node (○)	4 A[1)]
448	F29	Protects the 24 V supply of the front and rear indicators (4H6, 4H8, 4H13), the horn (4H13) and the ISM data recorder	4 A[1)]
449	F30	Protects the 24 V supply of the control in the drive compartment (internal)	2 A[1)]
450	7F9	Protects the 24 V supply of the "personal protection system" optional equipment (○)	4 A[1)]
451	F31	Protects the 24 V supply of the sensor system	4 A[1)]

Item	Fuse	Electrical circuit	Value
452	F43	Protects the 24 V supply of the "wire guidance" transmitter (8H1) and the fan of the control (9M9)	4 A[1)]
Main circuit 24 V "Power connections (V2)" supply			
453	F40	Protects the 24 V supply of the external "Ground system" I/O node (○)	7.5 A[1)]
454	F41	Protects the 24 V supply of the optional equipment (○)	7.5 A[1)]
455	2F14	Protects the 24 V supply of the main contactor and the solenoids (2Y59, 2Y60 and 2Y61)	7.5 A[1)]
456	F39	Protects the 24 V supply of the operator position on the control in the operator position	7.5 A[1)]
457	7F1	Protects the 24 V supply of the drive wheel brake (7Y3), the two load wheel brakes (7Y6, 7Y7) and the solenoid (2Y68)	7.5 A[1)]
458	F44	Protects the 24 V supply of the optional equipment (○)	7.5 A[1)]
Ubatt voltage main circuit current[4)] "Power connections (V2)"			
459	1F7	Protects the internal DC/DC converter of the control	15 A[2)]
460	F2.1	Protects terminal XS4.116 for optional equipment (○)	10 A[2)]
461	7F4	Protects terminal XS4.115 for optional equipment (○)	10 A[2)]
462	7F3	Protects terminal XS4.114 for optional equipment (○)	10 A[2)]
463	F2.2	Protects terminal XS4.117 for optional equipment (○)	10 A[2)]
464	1F9	Protects the control part of the control in the drive compartment (internal)	3 A[2)]
465	9F4	Protects the power connections of the control (○)	30 A[3)]
1)	Blade-Style, Typ: FK1 Mini		
2)	Blade-Style, Typ: FKS		
3)	Blade-Style, Typ: FK3 Maxi		
4)	Ubatt on EKX 410-412: 48 V Ubatt on EKS 514-516 / EKX 514-516: 80 V		



Fuse ratings for controller in operator position

Item	Retainer	Electric circuit	Value
Main circuit 24 V "Control connections (V1)"			
466	F42.1	Protects the 24 V supply of an external I/O node (○)	4 A[4)]
467	F43.1	Protects the 24 V supply of the overhead guard for the following optional equipment (○) – Side work lights (5E1 / 5E2) – Dome lights (5H17, 5H17.1) – Fans (9M3, 9M3.1)	4 A[4)]
468	F30.1	Protects the 24 V supply of the controller in the operator position (internal)	2 A[4)]
469	F31.1	Protects the 24 V supply of the control panel and sensor system in the operator position	4 A[4)]
Main circuit 24 V "Power connections (V2)" supply			
470	F40.1	Protects the 24 V supply of an external I/O node (○)	7.5 A[4)]
471	2F14.2	Protects the 24 V supply of the solenoids (2Y64, 2Y65, 2Y66 and 2Y67)	7.5 A[4)]

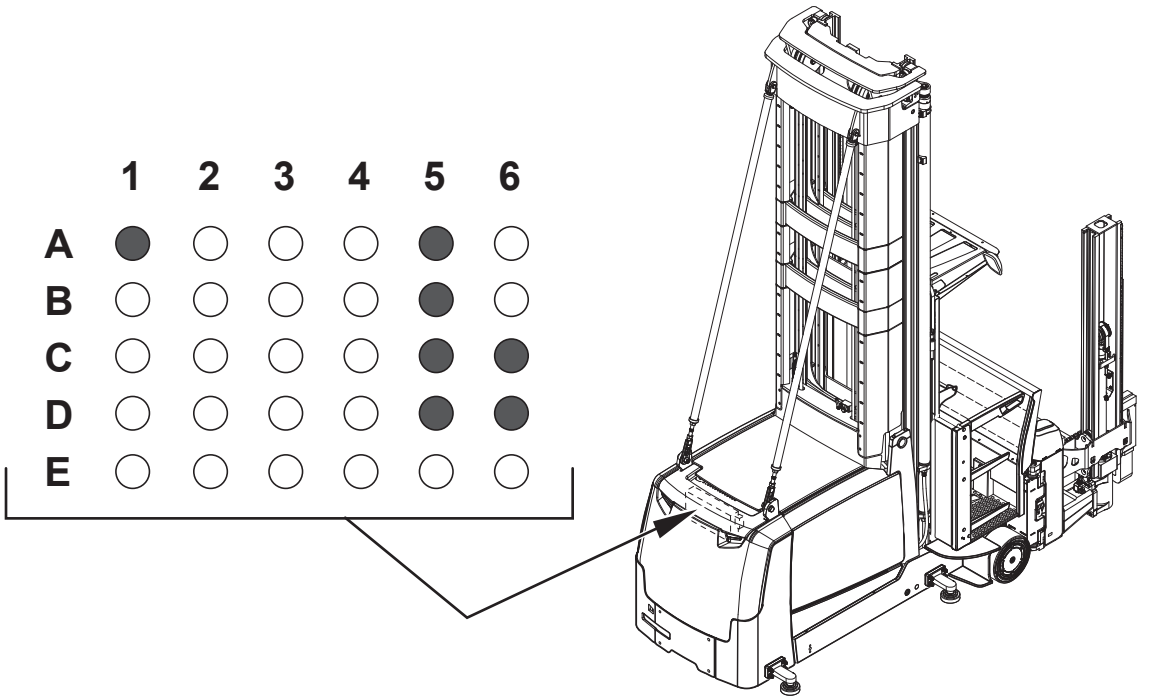
Item	Retainer	Electric circuit	Value
472	2F14.1	Protects the 24 V supply of the following components: – Solenoids (2Y54, 2Y61, 2Y62 and 2Y63) – Magnet for control panel adjustment (9Y3)	7.5 A[4)]
473	F44.1	Protects the 24 V supply of the following optional equipment (○): – "Fork positioning" solenoids (2Y18, 2Y18.1) – Work lights in load direction (5E19, 5E20) – Additional optional equipment protection available	7.5 A[4)]
4)	Blade-Style, Typ: FK1 Mini		

5.4.4 Indicator lights for controller in drive compartment

Indicator lights when truck switched off

When the truck is switched off the dark grey marked fuse indicator lights turn green.

If one of the fuse indicator lights does not light up, the fuse indicated must be replaced, see page 694.



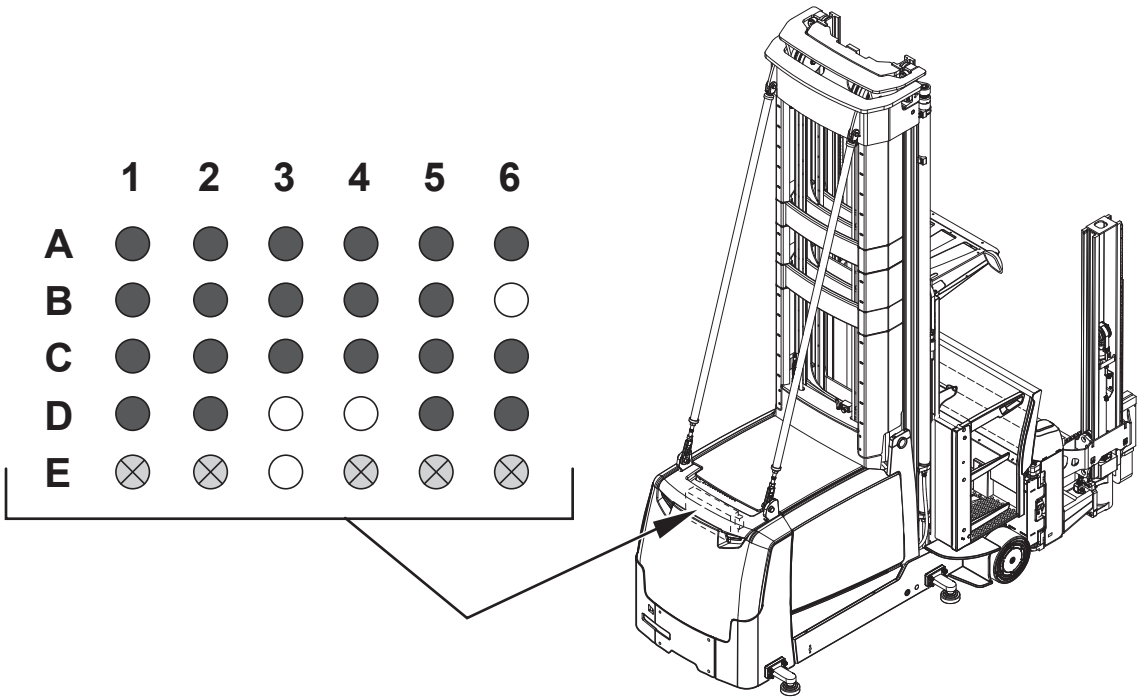
	1	2	3	4	5	6
A	F45	F30	F31	F38	1F7	1F9
B	F42	F29	7F9	F43	7F3	Option (V_{batt-})
C	F39	F40	7F1	2F14	9F4	F2.2
D	F41	F44	Not used	Not used	F2.1	7F4
E	Controller active	Controller active	Not used	"Hydraulic functions" controller active	"Traction" controller active	"Steering" controller active

Indicator lights when truck switched on

When the truck is switched on the dark grey marked fuse indicator lights turn green.

If one of the fuse indicator lights does not light up, the fuse indicated must be replaced, see page 694.

The other displays reflect truck-specific operating conditions. The control indicators (E1, E2, E4, E5 and E6) flash each second when the truck is ready for operation.



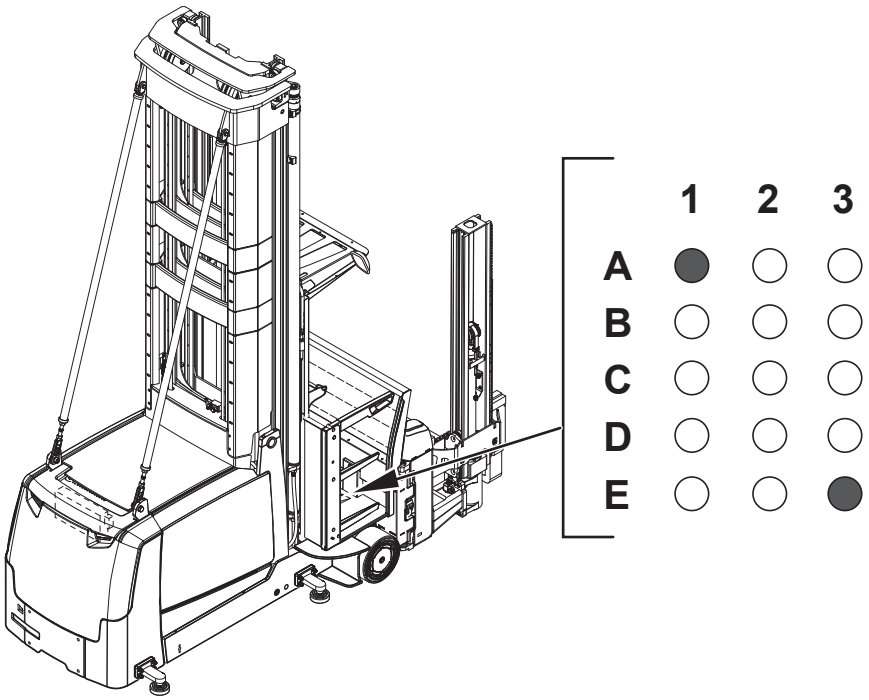
	1	2	3	4	5	6
A	F45	F30	F31	F38	1F7	1F9
B	F42	F29	7F9	F43	7F3	Option (V_{batt-})
C	F39	F40	7F1	2F14	9F4	F2.2
D	F41	F44	Not used	Not used	F2.1	7F4
E	Controller active	Controller active	Not used	"Hydraulic functions" controller active	"Traction" controller active	"Steering" controller active

5.4.5 Indicator lights for controller in operator position

Indicator lights when truck switched off

When the truck is switched off the dark grey marked fuse indicator lights turn green.

If one of the fuse indicator lights does not light up, the fuse indicated must be replaced, see page 694.



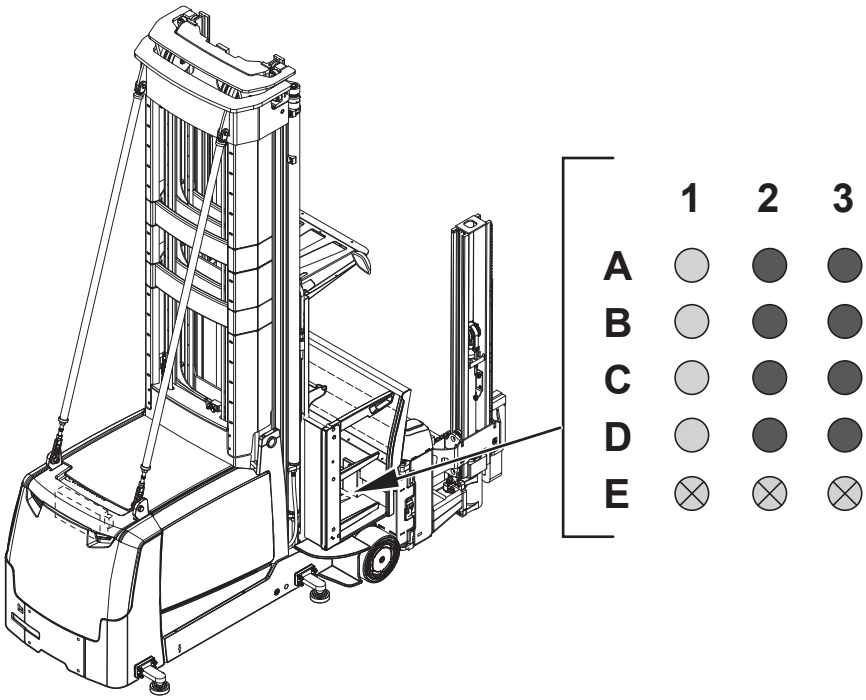
	1	2	3
A	24 V supply	F30.1	2F14.1
B	Key switch turned on	F43.1	2F14.2
C	Truck is operational	F42.1	F40.1
D	Truck is operational	F31.1	F44.1
E	Control active	Control active	Control active

Indicator lights when truck switched on

When the truck is switched on the dark grey marked fuse indicator lights turn green.

If one of the fuse indicator lights does not light up, the fuse indicated must be replaced, see page 694.

The other indicator lights (A1, B1, C1, D1 and E1-E3) reflect truck-specific operating conditions. The control indicators (E1-E3) flash each second when the truck is ready for operation.



	1	2	3
A	24 V supply	F30.1	2F14.1
B	Key switch turned on	F43.1	2F14.2
C	Truck is operational	F42.1	F40.1
D	Truck is operational	F31.1	F44.1
E	Control active	Control active	Control active

5.5 Checking the hydraulic oil level and refilling the hydraulic oil

⚠ 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.

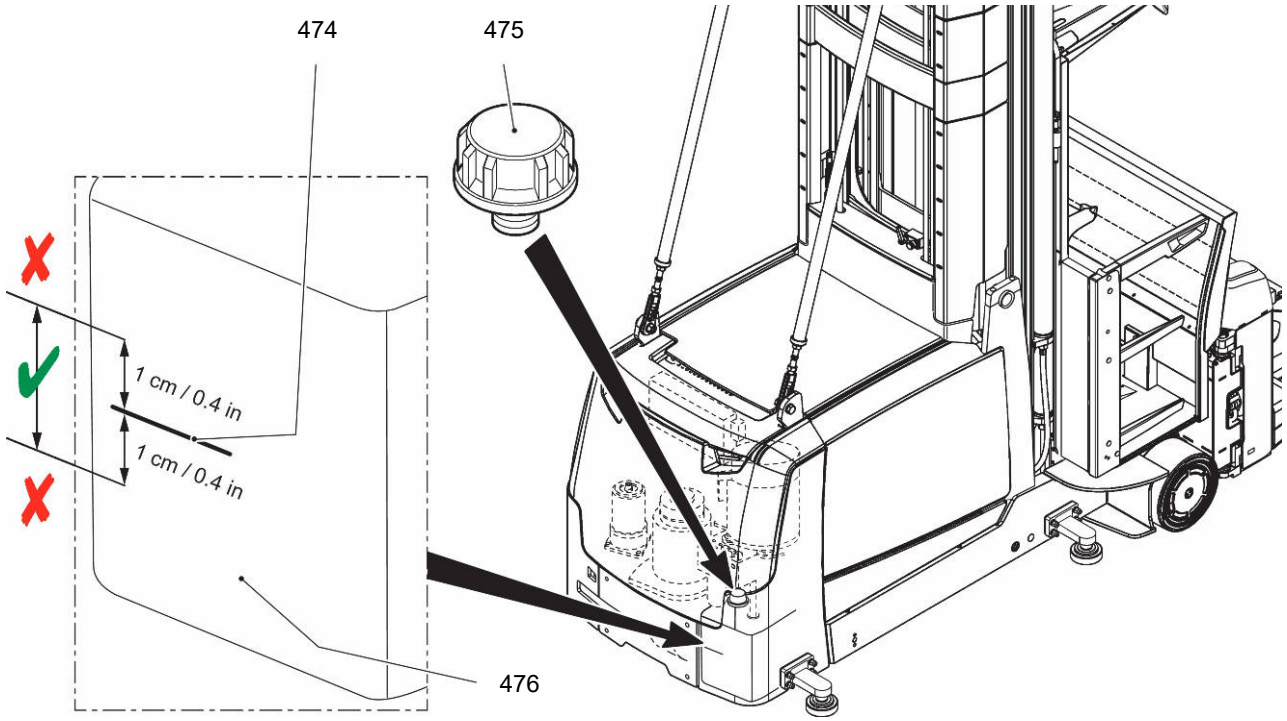
⚠ CAUTION!

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.

5.5.1 Checking the hydraulic oil and topping up on the EKX 410-412



5.5.1.1 Checking the hydraulic oil level

Requirements

– Truck prepared for maintenance and repair work, see page 684.
– Drive compartment cover removed, see page 686.

Procedure

➔ On the hydraulic tank (476) there is a marking (474) which indicates the setpoint volume.

- Read off the current hydraulic oil level.
  When the load handler is fully lowered, the hydraulic oil level must be at the level of the setpoint volume marking (474).

➔ Hydraulic oil level tolerance range: ±1 cm above / below the marking (474). To raise the hydraulic oil level in the hydraulic tank by 1 cm, the hydraulic oil must be topped up by approx. 0,6 l.

- If the hydraulic oil level is below the tolerance range, new hydraulic oil of the correct grade must be added (see page 709).
- Fit the drive compartment cover, see page 688.

5.5.1.2 Adding hydraulic oil

⚠ WARNING!

Overfilling the hydraulic reservoir can result in accidents and damage the environment

The hydraulic oil level must not exceed the tolerance range (marking (474) plus 1 cm). Hydraulic oil may escape if the tolerance range is exceeded. Spilled hydraulic oil causes environmental hazards and truck malfunctions. For example the escaping hydraulic oil could run under the drive wheel and increase the truck's stopping distance, as well as affect its handling.

▶ Top up hydraulic oil only as far as the marking (474).

▶ Remove any spilled hydraulic oil immediately with an appropriate bonding agent.

▶ The bonding agent/consumable mixture must be disposed of in accordance with regulations.

Requirements

– Truck prepared for maintenance and repair work, see page 684.
– Drive compartment cover removed, see page 686.

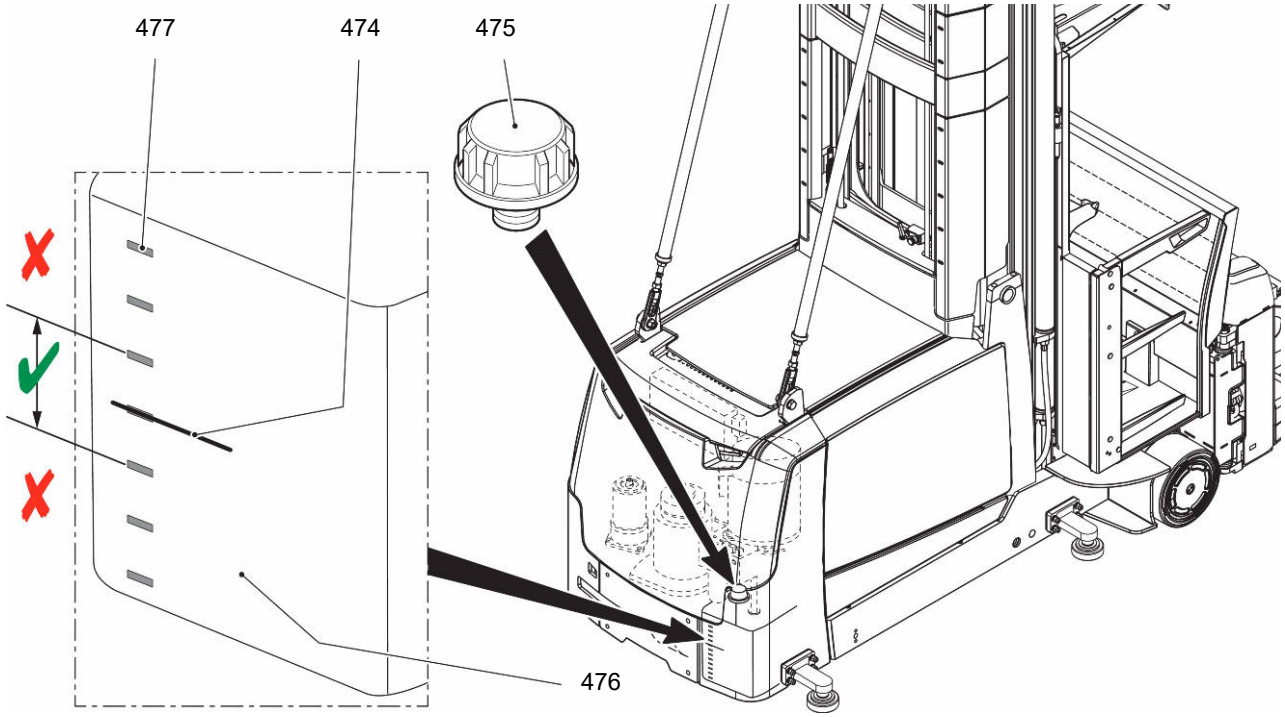
Procedure

- Turn the breather filter (475) anti-clockwise out of the hydraulic reservoir (476).
- Add hydraulic oil of the correct grade until you reach the setpoint volume marking (474) (see page 683):
  - Trucks with bio hydraulic oil have a warning notice on the hydraulic reservoir: "Add bio hydraulic oil only".
  - Trucks with normal hydraulic oil have a warning notice on the hydraulic reservoir: "Top up hydraulic oil".

  Once the setpoint volume marking (474) has been reached, the hydraulic tank (476) is completely full.

- Turn the breather filter (475) clockwise into the hydraulic reservoir (476).
- Fit the drive compartment cover, see page 688.

5.5.2 Checking the hydraulic oil and topping up on the EKS 514-516 / EKX 514-516



5.5.2.1 Checking the hydraulic oil level

Requirements

– Truck prepared for maintenance and repair work, see page 684.
– Drive compartment cover removed, see page 686.

Procedure

➔ On the hydraulic tank (476) there is an engraved scale (477) and a marking (474). The marking (474) indicates the setpoint volume.

- Read off the current hydraulic oil level.
  When the load handler is fully lowered, the hydraulic oil level must be at the level of the setpoint volume marking (474).

➔ Hydraulic oil level tolerance range: - Marking (474) ± one graduation line on the engraved scale (477). The oil quantity between two graduation lines on the scale (477) is approx. 2,5 l.

- If the hydraulic oil level is below the tolerance range, new hydraulic oil of the correct grade must be added (see page 711).
- Fit the drive compartment cover, see page 688.

5.5.2.2 Adding hydraulic oil

⚠ WARNING!

Overfilling the hydraulic reservoir can result in accidents and damage the environment

The hydraulic oil level must not exceed the tolerance range (marking (474) plus one graduation line of the engraved scale (477)). Hydraulic oil may escape if the tolerance range is exceeded. Spilled hydraulic oil causes environmental hazards and truck malfunctions. For example the escaping hydraulic oil could run under the drive wheel and increase the truck's stopping distance, as well as affect its handling.

▶ Top up hydraulic oil only as far as the marking (474).

▶ Remove any spilled hydraulic oil immediately with an appropriate bonding agent.

▶ The bonding agent/consumable mixture must be disposed of in accordance with regulations.

Requirements

– Truck prepared for maintenance and repair work, see page 684.
– Drive compartment cover removed, see page 686.

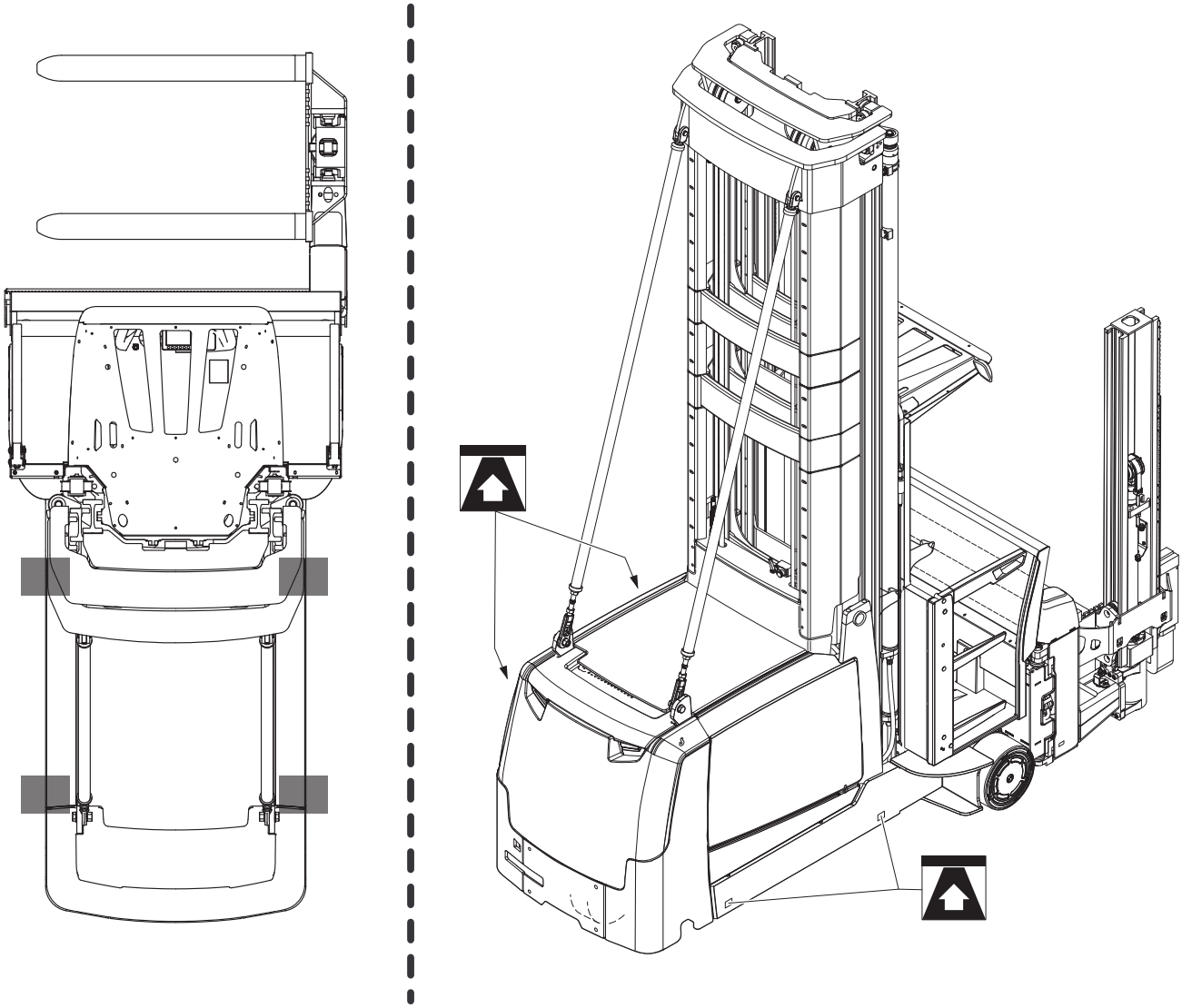
Procedure

- Turn the breather filter (475) anti-clockwise out of the hydraulic reservoir (476).
- Add hydraulic oil of the correct grade until you reach the setpoint volume marking (474) (see page 683):
  - Trucks with bio hydraulic oil have a warning notice on the hydraulic reservoir: "Add bio hydraulic oil only".
  - Trucks with normal hydraulic oil have a warning notice on the hydraulic reservoir: "Top up hydraulic oil".

  Once the setpoint volume marking (474) has been reached, the hydraulic tank (476) is completely full.

- Turn the breather filter (475) clockwise into the hydraulic reservoir (476).
- Fit the drive compartment cover, see page 688.

5.6 Safely jacking up the industrial truck



⚠ WARNING!

A truck tipover can cause accidents

Incorrect jacking up of the truck can cause it to tip over or slip. There is a risk of serious irreversible or fatal injury due to crushing as well as material damage / property damage to the truck.

- ▶ Raise the unladen truck on a level surface.
- ▶ Observe the operating instructions and safety instructions for the jack.
- ▶ Always use a jack with a minimum capacity of 5000 kg.
- ▶ Note the weight of the truck on the data plate.
- ▶ In order to jack up the truck, use only suitable lifting gear at the points specially provided for this purpose.
- ▶ When jacking up the truck, prevent it from slipping or tipping over through suitable means (wedges, wooden blocks) with a minimum capacity of 5000 kg.
- ▶ After jacking up, ensure that the industrial truck is stable.

Raising and jacking up the truck securely

Requirements

– Prepare the truck for maintenance and repairs (see page 684).

Tools and Material Required

– Jack
– Hard wooden blocks

Procedure

• Place the jack against the contact point.

➔ Jack contact point, see page 100.

• Raise the truck.
• Support the truck with hard wooden blocks.
• Remove the jack.

The truck is now securely raised and jacked up.

➔ To lower the truck, proceed in reverse order.

5.7 Preventing the operator position from accidentally lowering

⚠ WARNING!

Working under unsecured operator position can result in accidents and crushing

During maintenance and repair work beneath an unsecured operator position, there is a risk of serious to fatal injury due to inadvertent lowering of the operator position. Also, if a load is on the load handler, the load can fall down and lead to serious to fatal injuries.

- ▶ Do not perform any work beneath an unsecured operator position.
- ▶ Before carrying out maintenance and repair work beneath the operator position, secure the operator position with the retaining bolt.
- ▶ Never secure the operator position with a load on the load handler.

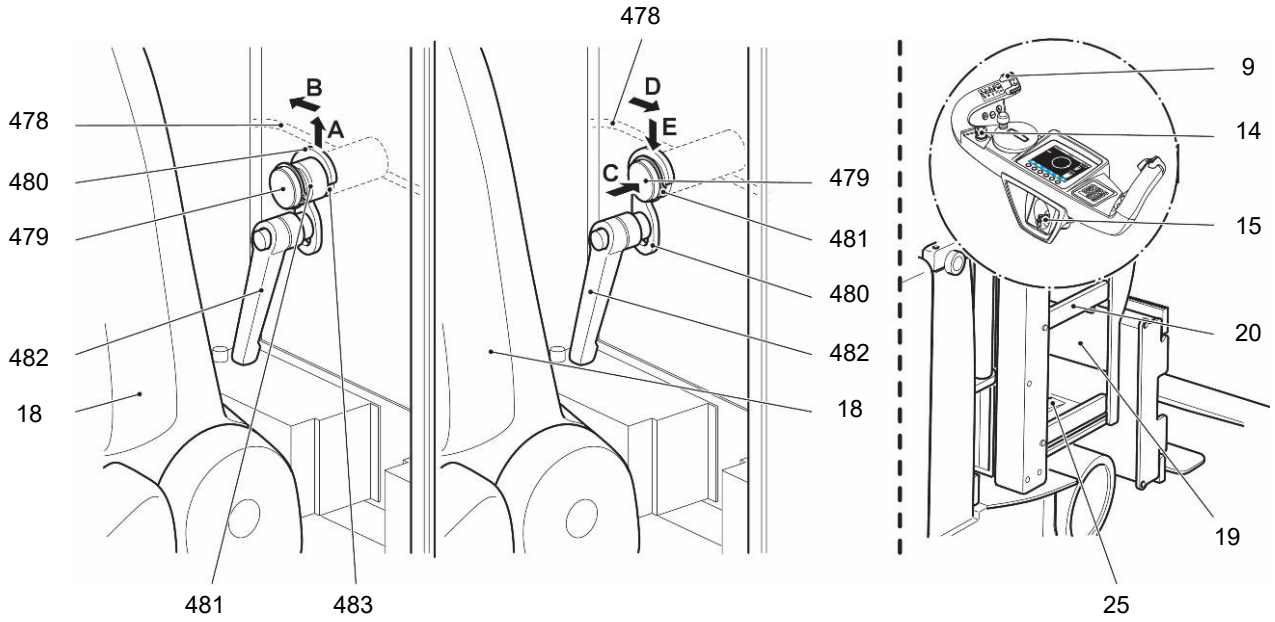
⚠ WARNING!

Risk of falling when leaving or accessing the operator position

When claiming from the raised operator position onto the entry/exit aid (e.g. work cage, safety ladder), there is a risk of serious injury from falling. This risk is also present when climbing from the entry/exit aid into the operator position.

- ▶ The operational stability of the entry/exit aid must be ensured at all times.
- ▶ When leaving or entering the raised operator position, carefully and slowly climb onto the entry/exit aid or into the operator position.
- ▶ If using a safety ladder, a safety ladder of sufficient length must be used.

5.7.1 Securing the operator position on the DZ mast



⚠ CAUTION!

Hand trapping hazard

Trapping hazard for hands when tilting back the driver's seat.

▶ Make sure there is nothing between the driver's seat and the operator position when you tilt the driver's seat back.

Requirements

– Truck parked on a level surface.
– Operator position fully lowered, see page 295.
– Auxiliary lift fully lowered, see page 296.
– The truck is ready for operation, see page 265.

Tools and Material Required

– Safety ladder (at least 3,0 m long)

Procedure

- Position the safety ladder against the truck so that the raised operator position (19) (approx. 2,0 m high) can be exited safely via the safety ladder.
- Enter the operator position (19), see page 224.
- Raise the operator position (19) above the first or second mast cross-member (478):

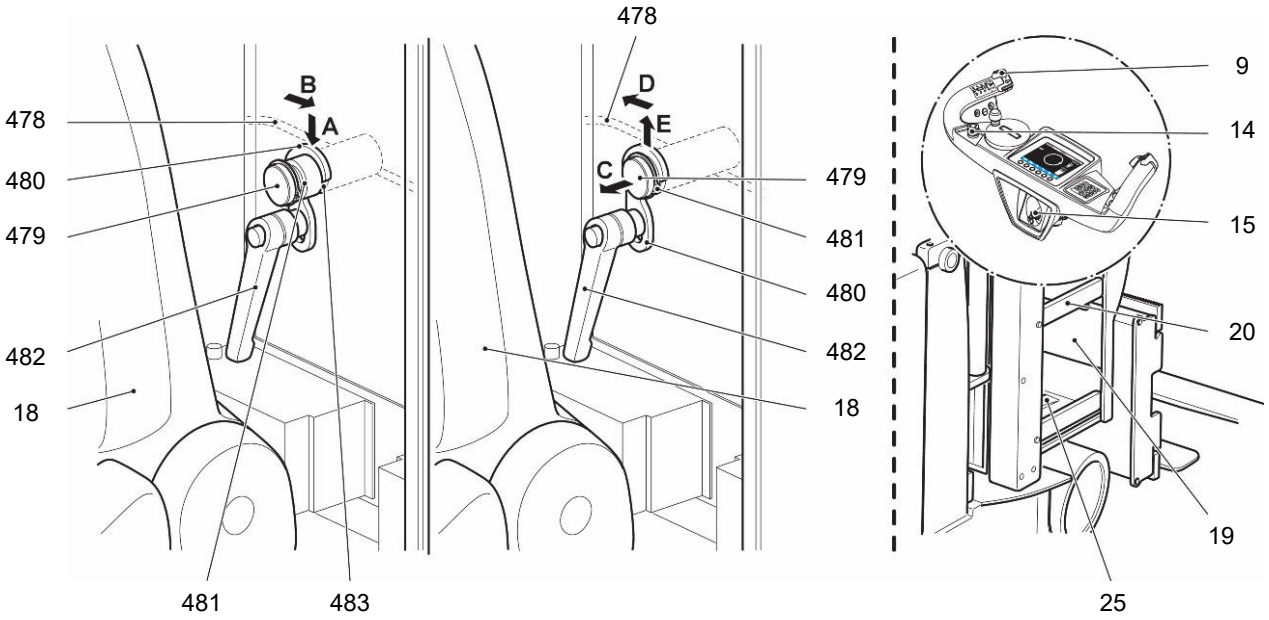
➔ The first mast cross-member (478) is located approx. 0,45 m and the second (478) approx. 1,8 m above the ground.

- Actuate the deadman button (25).
- Turn the "hydraulic functions" control lever (9) anticlockwise.

- Remove the twist grip screws (162) from the left and right sides behind the driver's seat (18).

- Tilt the operator seat (18) carefully in the load direction.
- Undo the lever (482) by turning it anti-clockwise.
- Raise the bolt retainer (480) and flip it over to the left out of the rear groove (483) (see arrow directions "A" and "B").
- Push the fastening pin (479) through as far as the front groove (481) in the drive direction (see arrow direction "C").
- Engage the bolt retainer (480) in the front groove (481) (see arrow directions "D" and "E").
- Prevent the bolt retainer (480) from moving:
  - Turn the lever (482) anti-clockwise to tighten it.
- Carefully tilt the driver's seat (18) back.
- Attach the driver's seat (18) to the operator position using the two twist grip screws (162).
- Slowly lower the operator position (19) until the fastening pin (479) is resting on the mast cross-member (478).
  - Actuate the deadman button (25).
  - Turn the hydraulic control lever (9) slowly clockwise.
- Switch off the truck, see page 266.
- Press the emergency disconnect switch (14), see page 275.
- Open the gate (20).
- Carefully leave the operator position (19) via the safety ladder.
- Open the battery panel, see page 156.
- Disconnect the battery to prevent the truck from being switched on accidentally.

The operator position (19) is now protected against accidental lowering. Maintenance and repair work beneath the operator position or the load handler can now begin.



⚠ CAUTION!

Hand trapping hazard

Trapping hazard for hands when tilting back the driver's seat.

▶Make sure there is nothing between the driver's seat and the operator position when you tilt the driver's seat back.

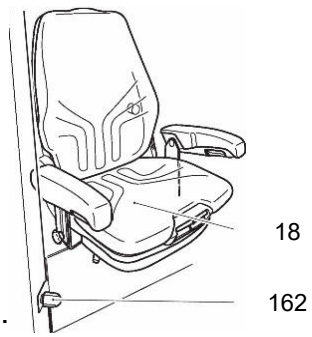
Remove the retaining bolt

Tools and Material Required

– Safety ladder (at least 3,0 m long)

Procedure

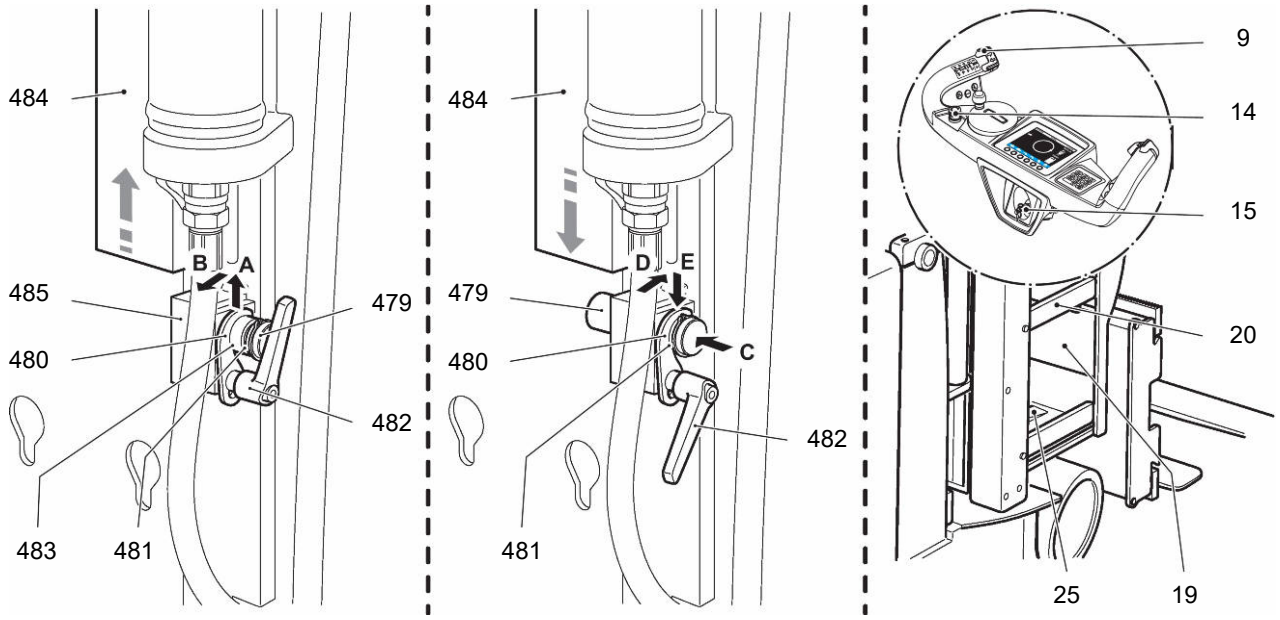
- Position the safety ladder next to the truck so that the operator position (19) can be safely reached at a height of approx. 2,0 m.
- Connect the battery connector to the truck.
- Close the battery panel, see page 156.
- Enter the operator position (19) safely via the safety ladder.
- Close the gate (20).
- Turn the emergency disconnect switch (14) to unlock it, see page 275.
- Prepare the truck for operation, see page 265.
- Raise the operator position (19) so that the fastening pin (479) is no longer resting on the mast cross member (478):
  - Actuate the deadman button (25).
  - Turn the "hydraulic functions" control lever (9) anticlockwise.
- Remove the twist grip screws (162) from the left and right sides behind the driver's seat (18).



- Tilt the operator seat (18) carefully in the load direction.
- Undo the lever (482) by turning it anti-clockwise.
- Raise the bolt retainer (480) and flip it over to the left out of the front groove (481) (see arrow directions "E" and "D").
- Pull the fastening pin (479) back to the rear groove (483) (see arrow direction "C").
- Engage the bolt retainer (480) in the rear groove (483) (see arrow directions "B" and "A").
- Prevent the bolt retainer (480) from moving:
  - Turn the lever (482) anti-clockwise to tighten it.
- Carefully tilt the driver's seat (18) back.
- Attach the driver's seat (18) to the operator position using the two twist grip screws (162).
- Fully lower the operator position (19):
  - Actuate the deadman button (25).
  - Turn the "hydraulic functions" control lever (9) clockwise.

The truck is now operational again.

5.7.2 Securing the operator position on the ZT mast



Requirements

– Truck parked on a level surface.
– Operator position fully lowered, see page 295.
– Auxiliary lift fully lowered, see page 296.
– The truck is ready for operation, see page 265.

Tools and Material Required

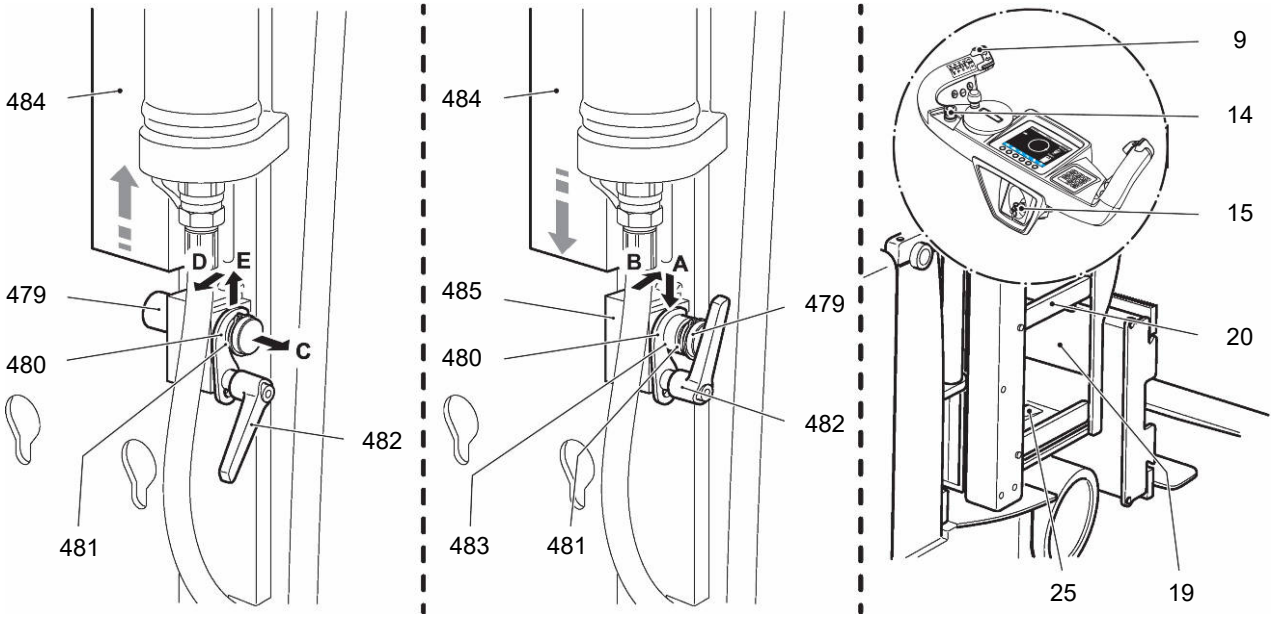
– Safety ladder (at least 3,0 m long)

Procedure

- Position the safety ladder against the truck so that the raised operator position (19) (approx. 2,0 m) can be exited safely via the safety ladder.
- Enter the operator position (19), see page 224.
- Raise the operator position (19) until the inner mast (484) is approx. 5 cm above the bracket (485) of the fastening pin (479):
  - Actuate the deadman button (25).
  - Turn the "hydraulic functions" control lever (9) anticlockwise.
- Switch off the truck, see page 266.
- Press the emergency disconnect switch (14), see page 275.
- Open the gate (20).
- Carefully leave the operator position (19) via the safety ladder.
- Open the battery panel, see page 156.
- Disconnect the battery to prevent the truck from being switched on accidentally.
- Undo the lever (482) by turning it anti-clockwise.
- Raise the bolt retainer (480) and flip it over to the left out of the rear groove (483) (see arrow directions "A" and "B").
- Push the fastening pin (479) through as far as the front groove (481) in the direction of the truck centre (see arrow direction "C").
- Engage the bolt retainer (480) in the front groove (481) (see arrow directions "D" and "E").
- Prevent the bolt retainer (480) from moving:
  - Turn the lever (482) anti-clockwise to tighten it.

- Lower the operator position (19) slowly with the aid of the lowering valve until the inner mast (479) rests on the fastening pin (479) (see page 346).
- Turn the lowering valve clockwise as far as it will go.

The operator position (19) is now protected against accidental lowering. Maintenance and repair work beneath the operator position or the load handler can now begin.



Remove the retaining bolt

Tools and Material Required

– Safety ladder (at least 3,0 m long)

Procedure

- Position the safety ladder next to the truck so that the operator position (19) can be safely reached at a height of approx. 2,0 m.
- Connect the battery connector to the truck.
- Close the battery panel, see page 156.
- Enter the operator position (19) safely via the safety ladder.
- Close the gate (20).
- Turn the emergency disconnect switch (14) to unlock it, see page 275.
- Prepare the truck for operation, see page 265.
- Raise the operator position (19) so that the inner mast (484) is no longer resting on the fastening pin (479):
  - Actuate the deadman button (25).
  - Turn the "hydraulic functions" control lever (9) anticlockwise.
- Switch off the truck, see page 266.
- Press the emergency disconnect switch (14), see page 275.
- Open the gate (20).
- Carefully leave the operator position (19) via the safety ladder.
- Undo the lever (482) by turning it anti-clockwise.
- Raise the bolt retainer (480) and flip it over to the left out of the front groove (481) (see arrow directions "E" and "D").
- Pull the fastening pin (479) back to the rear groove (483) (see arrow direction "C").
- Engage the bolt retainer (480) in the rear groove (483) (see arrow directions "B" and "A").
- Prevent the bolt retainer (480) from moving:
  - Turn the lever (482) anti-clockwise to tighten it.
- Enter the operator position (19) safely via the safety ladder.
- Close the gate (20).
- Turn the emergency disconnect switch (14) to unlock it, see page 275.

- Prepare the truck for operation, see page 265.
- Fully lower the operator position (19):
  - Actuate the deadman button (25).
  - Turn the "hydraulic functions" control lever (9) clockwise.

The truck is now operational again.

5.8 Cleaning

Cleaning tasks may only take place in the designated locations, which adhere to the stipulations of the country of use.

5.8.1 Cleaning the truck

⚠ CAUTION!

Risk of fire due to use of flammable cleaning agents

Using flammable cleaning agents increases the risk of fire.

- ▶ Do not use any flammable cleaning agents when cleaning.
- ▶ Disconnect the battery before starting cleaning work.
- ▶ Before cleaning, take necessary safety measures to prevent spark formation (e.g. due to short circuits).

NOTICE

Risk of component damage when cleaning the truck

Cleaning with a high-pressure cleaner can result in malfunctions due to humidity.

- ▶ Cover all electronic system assemblies (controls, sensors, motors etc.) before cleaning the truck with a high-pressure cleaner.
- ▶ Do not hold the jet of the high-pressure cleaner at marking points to avoid damaging them – see page 100.
- ▶ Do not clean the truck with a steam jet.

Cleaning the truck

Requirements

– Truck prepared for maintenance and repair work (see page 684).

Tools and Material Required

– Water-based cleaning agents
– Clean sponges, rags, cotton cloths or paper towels

Procedure

- Clean the surface of the truck with water-based solvents and water. Use a clean sponge, rags, cotton cloths or paper towels for cleaning purposes.
- In particular, clean the following areas:
  - Washers
  - All walk-on areas
  - Oil filler openings 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 732).

The truck has been cleaned.

5.8.2 Cleaning the electrical system assemblies

NOTICE

Risk of electrical-system damage

Cleaning the electronic system assemblies (controllers, sensors, motors etc.) 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 a non-conductive, anti-static brush.

Cleaning the electrical system assemblies

Requirements

– Truck prepared for maintenance and repair work – see page 684.

Tools and Material Required

– Compressor with water separator
– Non-conductive, antistatic brush

Procedure

- Expose the electrical system – see page 686.
- Clean the electrical system assemblies with weak suction or compressed air (use a compressor with a water separator) and a non-conductive, anti-static brush.
- Fit the electrical system cover – see page 686.
- Carry out all the tasks listed in the section "Recommissioning the truck after cleaning or maintenance work" – see page 732.

The electrical-system assemblies are now clean.

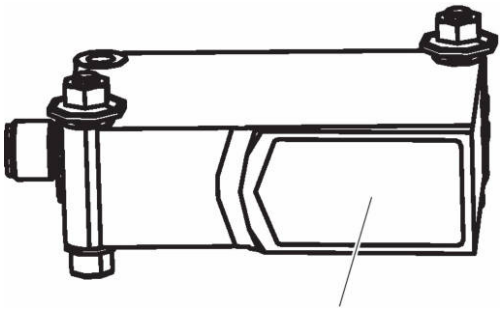
5.8.3 Cleaning the front screens of the optical sensors for optional features

Requirements

– Truck prepared for maintenance and repair work (see page 684).

Tools and Material Required

– Cotton cloth, microfibre cloth or new soft disposable paper towel
– Plastics cleaner, see page 683



486

Procedure

- Damp-clean the front screen (486).

➔ Dry cleaning carries the risk of static charge. More dust will be attracted to the front window. Moreover, there is also the risk of scratching the front window.

Wipe the screen dry with a clean, soft woollen cloth / microfibre cloth or a new soft paper towel.

NOTICE

Cleaning can damage the front screen

Do not use dirty or large-fibre cleaning cloths as these can scratch the front window. A scratched front screen will lead to faults so that the sensor will have to be replaced.

- After cleaning, hold a light or torch against the front screen. Check for any contamination or scratches on the front screen and clean again if necessary.

The front screen is now clean.

5.8.4 Cleaning the front screen of the laser scanners of the personal protection system (PPS)

➔ The material required to clean the front screen of the laser scanner is described in "Personal safety system ()" (see page 419).

5.9 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.

⚠ WARNING!

Risk of injury when working under an unsecured load handler or operator position

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

▶ Instruct other people to move out of the hazardous area of the truck.
▶ Do not reach or climb into moving truck parts.
▶ Do not stand underneath the operator position or load handler.

Requirements

– Truck parked on a level surface.
– Arrange for a second person [3)] to operate the industrial truck.
– Wear personal protective equipment.

Tools and Material Required

– Working platform, lifting platform or safety ladder

Procedure

⚠ WARNING!

Collisions with obstacles on the roof of the warehouse

Collisions with obstacles (e.g. pipes, sprinkler system) on the warehouse ceiling can occur when raising the load handler or operator position.

▶ Be aware of the ceiling height when raising the load handler or the operator position.
▶ Stop lifting before reaching the obstacle on the warehouse ceiling.

- Arrange for the second person to raise the load handler and operator position fully.
- Switch off the truck – see page 266.
- Open the battery panel.
- Disconnect the battery connector.
- Position the working platform, lifting platform or safety ladder directly next to the truck.

[3)] This person must be trained in the operation of the industrial truck. This person must have demonstrated to the operating company or its representative the ability to drive and handle loads and must have been expressly instructed by the operating company or its representative to do so; if necessary, observe national regulations.

- Carry out the following activities from the working platform, lifting platform or safety ladder:
  - Lubricate the lift chains.

➔ Lubrication diagram – see page 682.
Lubricant – see page 683.

  - Clean and grease the contact surfaces in the mast sections.
- Remove the working platform, lifting platform or safety ladder.
- Connect the battery connector to the truck.
- Prepare for operation – see page 265.
- Arrange for the second person to lower the load handler and operator position fully.

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

5.10 Maintaining the lifting chains

⚠ WARNING!

Risk of accident from non-lubricated and incorrectly cleaned lift chains

Lift chains are safety-critical parts. Lift chains must not show signs of serious contamination. Lift chains and pivot pins must always be clean and sufficiently lubricated.

- ▶ The lift chains are cleaned by wiping or brushing. Significant contamination can be softened by a paraffin derivative such as petroleum.
- ▶ Do not clean lift chains with high-pressure steam jets or chemical cleaning agents.
- ▶ Immediately after cleaning, dry the lift chain with compressed air and apply a chain spray.
- ▶ Lift chains must be unloaded when lubricated; to do this, fully lower the load handler.
- ▶ Lubricate a lift chain with particular care around the pulleys.

⚠ WARNING!

Hazard due to cleaning agents (e.g. paraffin derivatives)

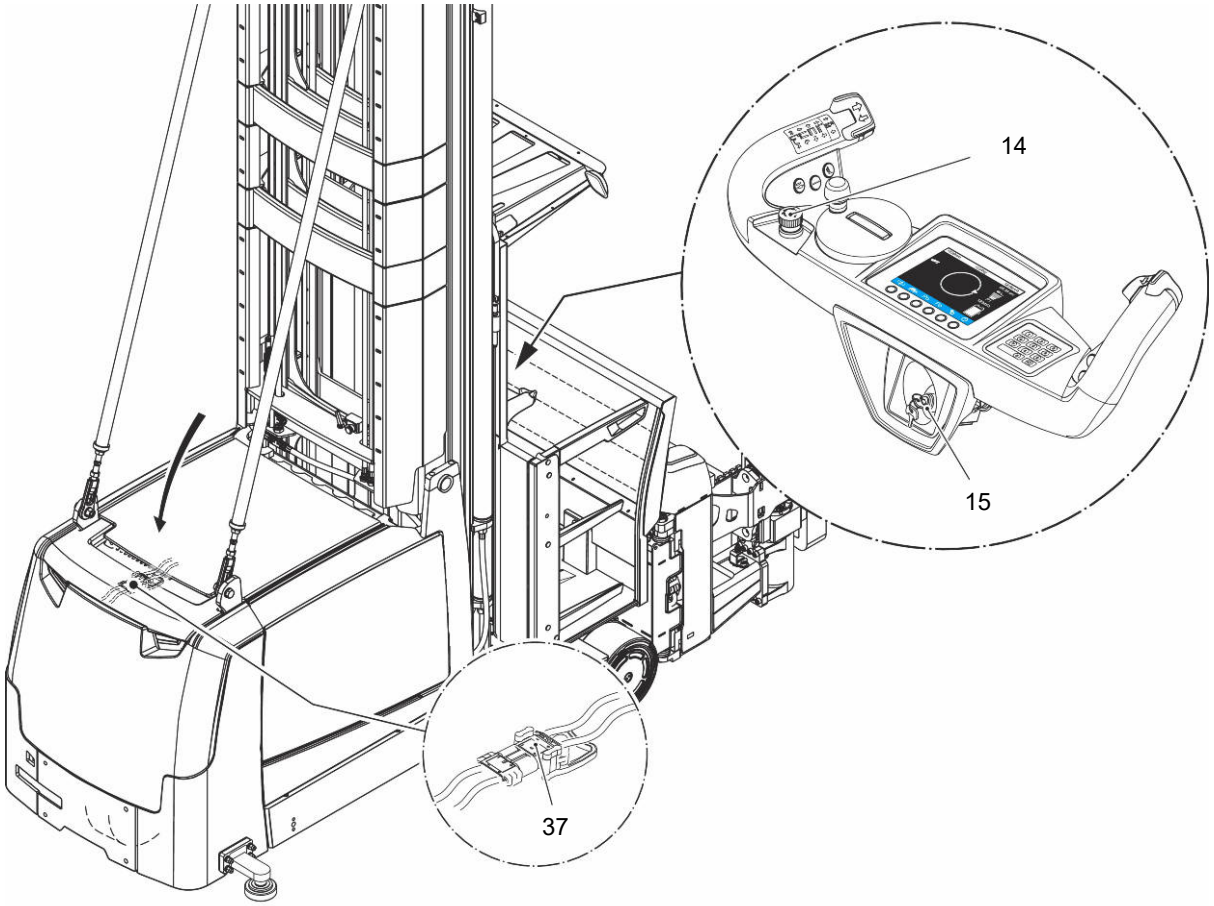
Cleaning agents may cause irritation or chemical burns if they come into contact with the skin or eyes.

- ▶ In the event of skin contact, immediately clean the affected areas thoroughly.
- ▶ In the event of contact with the eyes, rinse out immediately with plenty of clean water and consult a doctor.
- ▶ Wear personal protective equipment (e.g. safety shoes, hi-vis jacket, safety goggles, protective gloves) when working with cleaning agents.

➔ 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.

5.11 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

- Attach the battery connector (37) to the industrial truck.
- Preparing the truck for operation, see page 219.
- Prepare the truck for operation, see page 265.
- Test the safety mechanisms, see page 267.

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 712.

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 724.
- Prevent the truck from rolling away accidentally.
- Check the hydraulic oil level and replenish if necessary, see page 706.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck according to the lubrication diagram, see page 682.
- Charge the battery, see page 160.
- Disconnect and clean the battery.
- Clean the terminal screws, grease them with terminal grease and screw them into the connection thread to prevent short circuits.

➔ In addition, follow the battery manufacturer’s instructions.

6.2 During decommissioning

NOTICE

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 160.

6.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck – see page 724.
- Lubricate the forklift truck according to the lubrication schedule – see page 682.
- Equipment with lead-acid battery (●):
  Clean the battery, grease the battery terminal screws with terminal grease and connect the battery.
- Equipped with lithium-ion battery (○) without interface converter on the battery:
  Insert the truck-side control line into the connection on the battery trough.
- Equipped with lithium-ion battery (○) with interface converter on the battery:
  - Pull the battery forward.
  - Insert the control line into the battery connection at the top of the battery or the inside of the trough.
  - Slide the battery back in.
  - Connect the battery to the truck.
  - Close the battery connector lock: Tighten the bolted bar.
  - Insert the truck control line into the interface converter on the battery.
- Charge the battery – see page 160.
- Commission the forklift truck – see page 265.

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, Inspection and Changing of Maintenance Parts Requiring Replacement

⚠ WARNING!

Lack of maintenance can result in accidents

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

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

NOTICE

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

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

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

1 Maintenance Contents EKX 410-412

Issued on: 2023-10-01 12:00

1.1 Owner

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

1.1.1 Maintenance contents

1.1.1.1 Standard equipment

Brakes
Test the brake.

Hydraulic operations
Lubricate the load chains.
Clean and grease the contact surfaces in the mast sections.
Note: WARNING! RISK OF FALLING!
Correct the hydraulic-oil level.
Clean and lubricate the toothed racks.

1.1.1.2 Optional Equipment

JH personal protection system

System components
Clean protective front screens of the PPS laser scanners.

Fork positioner

Hydraulic operations
Clean and lubricate the attachment.

Telescopic forks

Hydraulic operations
Clean and lubricate the attachment.

Aisle recognition

System components
Clean magnetic switch and/or light switch for aisle recognition.

Load sensing

Hydraulic operations
Clean the sensors.

Telescopic table

Hydraulic operations
Clean and lubricate the attachment.

Swivel-traverse frame

Hydraulic operations
Clean and lubricate the attachment.

Electrical heating

Chassis/structure
Clean the heater.

Lead-acid battery, international

Power supply
Correct the battery-acid level using demineralised water.

Lead-acid battery

Power supply
Correct the battery-acid level using demineralised water.

1.1.2 Inspection contents

1.1.2.1 Standard equipment

The following points must be checked:

Electrical system
Warning and safety equipment in accordance with the operating instructions
Functionality of display and controls
Test emergency disconnect switch and check for damage
Check presence of electrostatic discharge strap or chain and check for damage

Power supply
Check battery and battery components for damage
Battery connector for secure fit, functionality and damage

Travel
Check wheels for wear and damage

Chassis/structure
Industrial truck for damage and leaks
Check labels for legibility, completeness and plausibility
Driver's seat, backrest and padding in the operator position for correct function and for damage
Gates, railings and doors for correct functioning and for damage
Battery panel gas strut for correct function and damage
Mechanism to protect against trapping and shearing is present, secure, functions correctly and is free of dirt and damage
Check the overhead guard and/or the driver's cab for secure attachment and damage

Hydraulic operations
Test hydraulic system
Check fork arms or load handler for wear and damage

1.1.2.2 Optional Equipment

The following points must be checked:

Mast anchor

Hydraulic operations
Mast anchor for secure seating and for damage

Rail guidance

Travel
Rail guidance rollers for wear and damage

Fork positioner

Hydraulic operations
Fork positioner for functionality and damage

Work lights

Electrical system
Test lighting and check for damage

Supports / tilt safety devices

Chassis/structure
Supports / tilt safety devices for presence and damage

Optional equipment

Chassis/structure
Test optional equipment such as mirrors, storage compartments, handles, windscreen wipers and windscreen washing systems, etc. and check for damage

Safety harness

Chassis/structure
Attachment rail(s) for the safety harness on the overhead guard for secure fixing and damage

W&S on-board charger

Battery charger
Current collector contacts for wear and damage
Mains plug and mains cable for damage
Bus bars and bus bar feed for damage

Lead-acid battery, international

Power supply
Check the battery cable connections for secure attachment
Check battery and battery components for damage

Lead-acid battery

Power supply
Check the battery cable connections for secure attachment

1.2 Customer Service

In accordance with the EKX 410-412 service interval, to be performed every 1000 service hours, but at least once a year.

1.2.1 Maintenance contents

1.2.1.1 Standard equipment

Brakes
Test the brake.
Test emergency recovery.
Adjust the air gap of the magnetic brake.
Measure and set the stopping distance and create a brake log.

Electrical system
Note: All safety components: encoder, laser scanner, "Flexisoft" safety PLC and relays must be replaced after 240 months.
Test the contactors and/or relays.
Perform insulation inspection.
Evaluate the logbook.

Power supply
Adjust the battery latch.

Travel
Clean vent slots of the combination controller.
Clean the sensors.
Correct the transmission oil level or grease filling of the transmission.

Chassis/structure
Clean the air vents of the drive compartment covers.

Hydraulic operations
Test safety functions (e.g. slack chain safety device) for industrial trucks with lifting operator position and adjust.
Test the sensors.
Clean the sensors.
Adjust the load chains.
Lubricate the load chains.
Clean and grease the contact surfaces in the mast sections.
Note: WARNING! RISK OF FALLING!
Test emergency lowering.

Hydraulic operations
Correct the hydraulic-oil level.
Test the pressure relief valve.
Clean and lubricate the toothed racks.
Check lifting and lowering speeds and, if applicable, traversing/rotating speeds to ensure correct values.

Agreed services
Carry out a test run with the rated capacity or a customer-specific load.
Lubricate the truck according to the lubrication schedule.
Demonstration after maintenance.
Clean motor housing of the travel and lift motor.

Steering
Lubricate steering gears or steering chain.

System components
Test lift, traction and other customer-specific cut-outs.

1.2.1.2 Optional Equipment

Wire guidance

Electrical system
Test two-hand operation in narrow aisles.

System components
Measure wire guidance current and frequency in the guide wire.
Test truck's acquisition of the guide wire when it enters the aisle.
Test handling on the guide wire and maximum deviation and adjust if necessary.
Test wire guidance system and clearance limits and adjust if necessary.
Test the wire guidance system's "EMERGENCY STOP" function.

JH personal protection system

System components
Test personal protection system.
Clean protective front screens of the PPS laser scanners.
Test warning and protection field areas of the Personal Protection System.

Rail guidance

Electrical system
Test two-hand operation in narrow aisles.

Travel
Measure distance between the rail guidance rollers and the guide rails over the entire length of the rails.

Fork positioner

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust the axial play of the front and rear rollers.
Clean and grease attachment bearings, guides and stops.

Telescopic forks

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Clean and grease attachment bearings, guides and stops.
Adjust the pistons and piston rods.

End of aisle safety device - magnet

System components
Test the function of the end of aisle safety device.

End of aisle safety device – transponder

System components
Test the function of the end of aisle safety device.

Rack height select

System components
Test rack height select.

Aisle recognition

System components
Clean magnetic switch and/or light switch for aisle recognition.

Load sensing

Hydraulic operations
Test the sensors.
Clean the sensors.

2nd stacking depth

System components
Test function and settings.

W&S lowering cut-off

Travel
Clean sensors/switches.

Rack Height Select with automatic stacking operation

System components
Test function of Rack Height Select/automatic stacking.
Test the empty space check and load detection function of the Rack Height Select/ automatic stacking.

Radio data

System components
Clean the scanner and terminal.

Video system

System components
Clean the camera.
Clean the display.

Weigher sensors/switches

Electrical system
Test the weigher.

Telescopic table

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust the axial play of the front and rear rollers.
Clean and grease attachment bearings, guides and stops.
Adjust the drive chains.

Supports / tilt safety devices

Chassis/structure
Measure the height-related and capacity-related settings.

Swivel-traverse frame

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust eccentric bolts on the swivel-traverse fork.
Clean and grease attachment bearings, guides and stops.
Adjust the pistons and piston rods.

Horizontal positioning

System components
Test HozPos functions such as emergency stop, the approach to HozPos and positioning accuracy.

Electrical heating

Chassis/structure
Clean the heater.

W&S on-board charger

Battery charger
Test the immobiliser on trucks with an on-board charger.
Carry out a potential measurement on the chassis while charging is in progress.

Personal protection system - stationary

System components
Test the functions of the external Personal Protection System, e.g. cut-outs by the release frequency.

Lead-acid battery, international

Electrical system
Perform insulation inspection.

Power supply
Clean the battery.
Clean and grease the battery terminals.
Measure acid density and battery voltage.
Correct the battery-acid level using demineralised water.

Lead-acid battery

Electrical system
Perform insulation inspection.

Power supply
Clean the battery.
Clean and grease the battery terminals.
Measure acid density and battery voltage.
Correct the battery-acid level using demineralised water.

1.2.2 Inspection contents

The following points must be checked:

1.2.2.1 Standard equipment

Brakes
Connections and cables for secure attachment and damage
Brake linings for wear and damage

Electrical system
Cables and motor for secure fit and damage
Warning and safety equipment in accordance with the operating instructions
Functionality of display and controls
Test emergency disconnect switch and check for damage
Contactors and/or relays for wear and damage
Check electrical wiring for damage (insulation damage, connections) and check whether the fuse ratings are correct
Check presence of electrostatic discharge strap or chain and check for damage

Power supply
Battery latch and battery attachment for correct function and damage
Battery connector for secure fit, functionality and damage

Travel
"Travel" controls for correct function and that the labels are legible and complete
Deadman switch for function and damage
Sensors for secure attachment, function and damage
Drive system bearings for wear and damage
Drive support plate for secure fit and damage
Transmission for noise and leaks
Check wheels for wear, damage and secure mounting
Check wheel bearings and mounting of wheels for wear and damage

Chassis/structure
Industrial truck for damage and leaks
Check chassis connections and screw connections are securely attached and check for damage
Battery rollers and mounting rubbers for presence and correct function
Check labels for legibility, completeness and plausibility
Check driver's seat is securely attached and test adjustment mechanism
Driver's seat, backrest and padding in the operator position for correct function and for damage
Gates, railings and doors for correct functioning and for damage

Chassis/structure
Battery panel gas strut for correct function and damage
Check mast is securely attached
Check mast bearings for wear
Mechanism to protect against trapping and shearing is present, secure, functions correctly and is free of dirt and damage
Check operator mat and steps are non-slip and free of damage
Check the overhead guard and/or the driver's cab for secure attachment and damage

Hydraulic operations
Test hydraulic controls and check their labels for legibility, completeness and plausibility
Sensors for secure fit and damage
Lift mechanism for wear, functionality and damage
Check cylinders and piston rods are securely attached and check for damage
Check lateral play of the mast sections and fork carriage
Check load chain mounting elements and chain pins for wear and damage
Check mast rollers and their running surfaces for wear and damage
Cab locking device for presence and correct function
Test hydraulic system
Check fork arms or load handler for wear and damage
Check the hoses, pipes and connections are securely attached and check for wear, leaks, damage, blisters and kinks
Rotate and/or traverse hydraulic motor for damage and leaks

Steering
Electric steering and its components for function, wear and damage
Wheel adjustment indicator for function and plausibility
Steering bearings, steering play and steering gear teeth or steering chain for wear and damage

1.2.2.2 Optional Equipment

JH personal protection system

System components
Laser scanner for secure seating and for damage

Electrolyte recirculation

Power supply
Hose connections and pump for correct function

Aquamatic

Power supply
Aquamatic plug, hose connections and float for functionality and sealing
Flow indicator for functionality and sealing

Mast anchor

Hydraulic operations
Mast anchor for secure seating and for damage

Rail guidance

Travel
Attachment of the rail guidance rollers
Rail guidance rollers and their bearings for wear and damage

Battery refill system

Power supply
Refill system for functionality and leaks

Fork positioner

Hydraulic operations
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check sliding blocks for completeness, wear and damage
Check attachment bearings, guides and stops for wear and damage
Check hydraulic connections are securely attached and check for leaks
Fork positioner for functionality and damage
Check cylinder seals for leaks and damage
Check cylinder rods and their bushings for wear and damage

Telescopic forks

Hydraulic operations
Test attachment and check for damage
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check attachment bearings, guides and stops for wear and damage
Check cylinder seals for leaks and damage
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Check pistons and piston rods for wear and damage

Working platform

Hydraulic operations
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage

Aisle recognition

System components
Magnetic switch and/or light switch for aisle recognition for correct function and damage

Load sensing

Hydraulic operations
Sensors for secure fit and damage

W&S lowering cut-off

Travel
Sensors/switches for secure fit, functionality and damage

Shock sensor/data recorder

Electrical system
Check shock sensor/data recorder is securely attached and check for damage

Radio data

System components
Scanner and terminal for secure fit, functionality and damage
Fuses for correct ratings
Check cables are securely attached and check for damage

Video system

System components
Check cables are securely attached and check for damage
Check camera is securely attached, test and check for damage
Check display is securely attached, test and check for damage

Work lights

Electrical system
Test lighting and check for damage

Fire extinguisher

Accessories
Check fire extinguisher is present and securely attached and check the inspection interval

Weigher sensors/switches

Electrical system
Weigher for damage

Access module

Electrical system
Check access module is securely attached, test and check for damage

Optional controls

Electrical system
Ensure optional controls are present and plausible

Telescopic table

Hydraulic operations
Test attachment and check for damage
Drive shaft and its bearings for correct function and damage
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check sliding blocks for completeness, wear and damage
Check attachment bearings, guides and stops for wear and damage
Check hydraulic connections are securely attached and check for leaks
Drive chains for wear and damage

Supports / tilt safety devices

Chassis/structure
Supports / tilt safety devices for presence and damage

Swivel-traverse frame

Hydraulic operations
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Test attachment and check for damage
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check attachment bearings, guides and stops for wear and damage
Check cylinder seals for leaks and damage
Check pistons and piston rods for wear and damage

Electrical heating

Chassis/structure
Test the heater

Optional electrical equipment

Electrical system
Test optional electrical equipment and check for damage

Optional equipment

Chassis/structure
Test optional equipment such as mirrors, storage compartments, handles, windscreen wipers and windscreen washing systems, etc. and check for damage

Discharge roller

Electrical system
Discharge roller to ensure electrostatic discharge for presence and for damage

Safety harness

Chassis/structure
Attachment rail(s) for the safety harness on the overhead guard for secure fixing and damage

W&S on-board charger

Battery charger
Current collector contacts for wear and damage
Current collector for wear, correct function and damage
Current collector mounting for secure fit and damage
Mains plug and mains cable for damage
Bus bars and bus bar feed for damage
Cables and electrical connections for secure fit and damage

Lead-acid battery, international

Power supply
Check battery, battery cables and cell connectors are securely attached and check for damage
Ensure safety labels are present and check for damage

Lead-acid battery

Power supply
Check battery, battery cables and cell connectors are securely attached and check for damage

1.2.3 Maintenance parts

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

1.2.3.1 Standard equipment

maintenance part	service hours	months
Gear oil	2000	24
Hydraulic system breather filter	2000	12
Hydraulic oil	2000	12
Hydraulic oil additive	2000	12
Hydraulic oil filter	2000	12
Hydraulic oil filter, seal kit	2000	12

2 Maintenance Contents EKX 514-516 & EKS 514-516

Issued on: 2023-10-01 12:00

2.1 Owner

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

2.1.1 Maintenance contents

2.1.1.1 Standard equipment

Brakes
Test the brake.

Hydraulic operations
Lubricate the load chains.
Clean and grease the contact surfaces in the mast sections.
Note: WARNING! RISK OF FALLING!
Correct the hydraulic-oil level.
Clean and lubricate the toothed racks.

2.1.1.2 Optional Equipment

JH personal protection system

System components
Clean protective front screens of the PPS laser scanners.

Fork positioner

Hydraulic operations
Clean and lubricate the attachment.

Telescopic forks

Hydraulic operations
Clean and lubricate the attachment.

Aisle recognition

System components
Clean magnetic switch and/or light switch for aisle recognition.

Load sensing

Hydraulic operations
Clean the sensors.

Telescopic table

Hydraulic operations
Clean and lubricate the attachment.

Swivel-traverse frame

Hydraulic operations
Clean and lubricate the attachment.

Automatic mode

Electrical system
Clean the optical sensors.

System components
Clean protective front screens of the PPS laser scanners.

Lead-acid battery, international

Power supply
Correct the battery-acid level using demineralised water.

Lead-acid battery

Power supply
Correct the battery-acid level using demineralised water.

2.1.2 Inspection contents

2.1.2.1 Standard equipment

The following points must be checked:

Electrical system
Warning and safety equipment in accordance with the operating instructions
Functionality of display and controls
Test emergency disconnect switch and check for damage
Check presence of electrostatic discharge strap or chain and check for damage

Power supply
Check battery and battery components for damage
Battery connector for secure fit, functionality and damage

Travel
Check wheels for wear and damage

Chassis/structure
Industrial truck for damage and leaks
Check labels for legibility, completeness and plausibility
Driver's seat, backrest and padding in the operator position for correct function and for damage
Gates, railings and doors for correct functioning and for damage
Battery panel gas strut for correct function and damage
Check doors or covers for damage
Mechanism to protect against trapping and shearing is present, secure, functions correctly and is free of dirt and damage
Check the overhead guard and/or the driver's cab for secure attachment and damage

Hydraulic operations
Test hydraulic system
Check fork arms or load handler for wear and damage

2.1.2.2 Optional Equipment

The following points must be checked:

Mast anchor

Hydraulic operations
Mast anchor for secure seating and for damage

Rail guidance

Travel
Rail guidance rollers for wear and damage

Work lights

Electrical system
Test lighting and check for damage

Supports / tilt safety devices

Chassis/structure
Supports / tilt safety devices for presence and damage

Electrical heating

Chassis/structure
Test the heater

Optional equipment

Chassis/structure
Test optional equipment such as mirrors, storage compartments, handles, windscreen wipers and windscreen washing systems, etc. and check for damage

Safety harness

Chassis/structure
Attachment rail(s) for the safety harness on the overhead guard for secure fixing and damage

W&S on-board charger

Battery charger
Current collector contacts for wear and damage
Mains plug and mains cable for damage
Bus bars and bus bar feed for damage

Automatic mode

Brakes
Sensors for secure attachment, function and damage

Electrical system
Warning and safety equipment in accordance with the operating instructions
Functionality of display and controls

Vibration damper / swivel-traverse attachment

Chassis/structure
Guide rails for damage

Hydraulic operations
Stops for presence and damage

Lead-acid battery, international

Power supply
Check the battery cable connections for secure attachment
Check battery and battery components for damage

Lead-acid battery

Power supply
Check the battery cable connections for secure attachment

2.2 Customer Service

In accordance with the EKX 514-516 & EKS 514-516 service interval, to be performed every 1000 service hours, but at least once a year.

2.2.1 Maintenance contents

2.2.1.1 Standard equipment

Brakes
Test the brake.
Note: Release drive wheel brake and load wheel brakes if applicable with set screws.
Test emergency recovery.
Adjust the air gap of the magnetic brake.
Measure and set the stopping distance and create a brake log.

Electrical system
Note: All safety components: encoder, laser scanner, "Flexisoft" safety PLC and relays must be replaced after 240 months.
Test the contactors and/or relays.
Perform insulation inspection.
Evaluate the logbook.

Power supply
Adjust the battery latch.

Travel
Clean vent slots of the combination controller.
Clean the sensors.
Correct the transmission oil level or grease filling of the transmission.

Chassis/structure
Clean the air vents of the drive compartment covers.

Hydraulic operations
Test safety functions (e.g. slack chain safety device) for industrial trucks with lifting operator position and adjust.
Test the sensors.
Clean the sensors.
Adjust the load chains.
Lubricate the load chains.
Clean and grease the contact surfaces in the mast sections.
Note: WARNING! RISK OF FALLING!
Test emergency lowering.

Hydraulic operations
Correct the hydraulic-oil level.
Test and adjust the pressure relief valve.
Clean and lubricate the toothed racks.
Check lifting and lowering speeds and, if applicable, traversing/rotating speeds to ensure correct values.

Agreed services
Carry out a test run with the rated capacity or a customer-specific load.
Lubricate the truck according to the lubrication schedule.
Demonstration after maintenance.
Clean motor housing of the travel and lift motor.

Steering
Lubricate steering gears or steering chain.

System components
Test lift, traction and other customer-specific cut-outs.

2.2.1.2 Optional Equipment

Wire guidance

Electrical system
Test two-hand operation in narrow aisles.

System components
Measure wire guidance current and frequency in the guide wire.
Test truck's acquisition of the guide wire when it enters the aisle.
Test handling on the guide wire and maximum deviation and adjust if necessary.
Test wire guidance system and clearance limits and adjust if necessary.
Test the wire guidance system's "EMERGENCY STOP" function.

JH personal protection system

System components
Test personal protection system.
Clean protective front screens of the PPS laser scanners.
Test warning and protection field areas of the Personal Protection System.

Rail guidance

Electrical system
Test two-hand operation in narrow aisles.

Travel
Measure distance between the rail guidance rollers and the guide rails over the entire length of the rails.

Fork positioner

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust the axial play of the front and rear rollers.
Clean and grease attachment bearings, guides and stops.

Telescopic forks

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Clean and grease attachment bearings, guides and stops.
Adjust the pistons and piston rods.

End of aisle safety device - magnet

System components
Test the function of the end of aisle safety device.

End of aisle safety device – transponder

System components
Test the function of the end of aisle safety device.

Rack height select

System components
Test rack height select.

Aisle recognition

System components
Clean magnetic switch and/or light switch for aisle recognition.

Load sensing

Hydraulic operations
Test the sensors.
Clean the sensors.

2nd stacking depth

System components
Test function and settings.

W&S lowering cut-off

Travel
Clean sensors/switches.

Rack Height Select with automatic stacking operation

System components
Test function of Rack Height Select/automatic stacking.
Test the empty space check and load detection function of the Rack Height Select/ automatic stacking.

Radio data

System components
Clean the scanner and terminal.

Video system

System components
Clean the camera.
Clean the display.

Weigher sensors/switches

Electrical system
Test the weigher.

Telescopic table

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust the axial play of the front and rear rollers.
Clean and grease attachment bearings, guides and stops.
Adjust the drive chains.

Supports / tilt safety devices

Chassis/structure
Measure the height-related and capacity-related settings.

Swivel-traverse frame

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust eccentric bolts on the swivel-traverse fork.
Clean and grease attachment bearings, guides and stops.
Adjust the pistons and piston rods.

Horizontal positioning

System components
Test HozPos functions such as emergency stop, the approach to HozPos and positioning accuracy.

Electrical heating

Chassis/structure
Clean the heater.

W&S on-board charger

Battery charger
Test the immobiliser on trucks with an on-board charger.
Carry out a potential measurement on the chassis while charging is in progress.

Personal protection system - stationary

System components
Test the functions of the external Personal Protection System, e.g. cut-outs by the release frequency.

Automatic mode

Brakes
Clean the sensors.

Electrical system
Clean the optical sensors.
Test function of programmable logic controller (PLC) inputs and outputs.

Hydraulic operations
Test the sensors.
Clean the sensors.

System components
Test function and settings.
Test HozPos functions such as emergency stop, the approach to HozPos and positioning accuracy.
Test the empty space check and load detection function of the Rack Height Select/ automatic stacking.
Test personal protection system.
Clean protective front screens of the PPS laser scanners.
Test the functions of the external Personal Protection System, e.g. cut-outs by the release frequency.
Test warning and protection field areas of the Personal Protection System.

Vibration damper / swivel-traverse attachment

Hydraulic operations
Test the sensors.
Clean the spring package.
Lubricate the guide rails.
Lubricate the spring package shaft.

Lead-acid battery, international

Electrical system
Perform insulation inspection.

Power supply
Clean the battery.
Clean and grease the battery terminals.
Measure acid density and battery voltage.
Correct the battery-acid level using demineralised water.

Lead-acid battery

Electrical system
Perform insulation inspection.

Power supply
Clean the battery.
Clean and grease the battery terminals.
Measure acid density and battery voltage.
Correct the battery-acid level using demineralised water.

Contour and clearance detection

System components
Cleaning the 3D camera.
Cleaning the 2D scanner.

2.2.2 Inspection contents

The following points must be checked:

2.2.2.1 Standard equipment

Brakes
Connections and cables for secure attachment and damage
Brake linings for wear and damage

Electrical system
Cables and motor for secure fit and damage
Warning and safety equipment in accordance with the operating instructions
Functionality of display and controls
Test emergency disconnect switch and check for damage
Contactors and/or relays for wear and damage
Check electrical wiring for damage (insulation damage, connections) and check whether the fuse ratings are correct
Check presence of electrostatic discharge strap or chain and check for damage

Power supply
Battery latch and battery attachment for correct function and damage
Battery connector for secure fit, functionality and damage

Travel
"Travel" controls for correct function and that the labels are legible and complete
Deadman switch for function and damage
Sensors for secure attachment, function and damage
Drive system bearings for wear and damage
Drive support plate for secure fit and damage
Transmission for noise and leaks
Check wheels for wear, damage and secure mounting
Check wheel bearings and mounting of wheels for wear and damage

Chassis/structure
Industrial truck for damage and leaks
Check chassis connections and screw connections are securely attached and check for damage
Battery rollers and mounting rubbers for presence and correct function
Battery retainer for presence, correct function and damage
Check labels for legibility, completeness and plausibility
Check driver's seat is securely attached and test adjustment mechanism
Driver's seat, backrest and padding in the operator position for correct function and for damage

Chassis/structure
Gates, railings and doors for correct functioning and for damage
Battery panel gas strut for correct function and damage
Check doors or covers for damage
Check mast is securely attached
Check mast bearings for wear
Mechanism to protect against trapping and shearing is present, secure, functions correctly and is free of dirt and damage
Check operator mat and steps are non-slip and free of damage
Check the overhead guard and/or the driver's cab for secure attachment and damage

Hydraulic operations
Test hydraulic controls and check their labels for legibility, completeness and plausibility
Sensors for secure fit and damage
Lift mechanism for wear, functionality and damage
Check cylinders and piston rods are securely attached and check for damage
Check lateral play of the mast sections and fork carriage
Check load chain mounting elements and chain pins for wear and damage
Check mast rollers and their running surfaces for wear and damage
Cab locking device for presence and correct function
Test hydraulic system
Check fork arms or load handler for wear and damage
Check the hoses, pipes and connections are securely attached and check for wear, leaks, damage, blisters and kinks
Rotate and/or traverse hydraulic motor for damage and leaks

Steering
Electric steering and its components for function, wear and damage
Wheel adjustment indicator for function and plausibility
Steering bearings, steering play and steering gear teeth or steering chain for wear and damage

2.2.2.2 Optional Equipment

JH personal protection system

System components
Laser scanner for secure seating and for damage

Electrolyte recirculation

Power supply
Hose connections and pump for correct function

Aquamatic

Power supply
Aquamatic plug, hose connections and float for functionality and sealing
Flow indicator for functionality and sealing

Mast anchor

Hydraulic operations
Mast anchor for secure seating and for damage

Rail guidance

Travel
Attachment of the rail guidance rollers
Rail guidance rollers and their bearings for wear and damage

Battery refill system

Power supply
Refill system for functionality and leaks

Fork positioner

Hydraulic operations
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check sliding blocks for completeness, wear and damage
Check attachment bearings, guides and stops for wear and damage
Check hydraulic connections are securely attached and check for leaks
Fork positioner for functionality and damage
Check cylinder seals for leaks and damage
Check cylinder rods and their bushings for wear and damage

Telescopic forks

Hydraulic operations
Test attachment and check for damage
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check attachment bearings, guides and stops for wear and damage
Check cylinder seals for leaks and damage
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Check pistons and piston rods for wear and damage

Working platform

Hydraulic operations
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage

Aisle recognition

System components
Magnetic switch and/or light switch for aisle recognition for correct function and damage

Load sensing

Hydraulic operations
Sensors for secure fit and damage

W&S lowering cut-off

Travel
Sensors/switches for secure fit, functionality and damage

Shock sensor/data recorder

Electrical system
Check shock sensor/data recorder is securely attached and check for damage

Radio data

System components
Scanner and terminal for secure fit, functionality and damage
Fuses for correct ratings
Check cables are securely attached and check for damage

Video system

System components
Check cables are securely attached and check for damage
Check camera is securely attached, test and check for damage
Check display is securely attached, test and check for damage

Work lights

Electrical system
Test lighting and check for damage

Fire extinguisher

Accessories
Check fire extinguisher is present and securely attached and check the inspection interval

Weigher sensors/switches

Electrical system
Weigher for damage

Access module

Electrical system
Check access module is securely attached, test and check for damage

Optional controls

Electrical system
Ensure optional controls are present and plausible

Telescopic table

Hydraulic operations
Test attachment and check for damage
Drive shaft and its bearings for correct function and damage
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check sliding blocks for completeness, wear and damage
Check attachment bearings, guides and stops for wear and damage
Check hydraulic connections are securely attached and check for leaks
Drive chains for wear and damage

Supports / tilt safety devices

Chassis/structure
Supports / tilt safety devices for presence and damage

Swivel-traverse frame

Hydraulic operations
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Test attachment and check for damage
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit and damage
Check attachment bearings, guides and stops for wear and damage
Check cylinder seals for leaks and damage
Check pistons and piston rods for wear and damage

Electrical heating

Chassis/structure
Test the heater

Optional electrical equipment

Electrical system
Test optional electrical equipment and check for damage

Optional equipment

Chassis/structure
Test optional equipment such as mirrors, storage compartments, handles, windscreen wipers and windscreen washing systems, etc. and check for damage

Discharge roller

Electrical system
Discharge roller to ensure electrostatic discharge for presence and for damage

Safety harness

Chassis/structure
Attachment rail(s) for the safety harness on the overhead guard for secure fixing and damage

W&S on-board charger

Battery charger
Current collector contacts for wear and damage
Current collector for wear, correct function and damage
Current collector mounting for secure fit and damage
Mains plug and mains cable for damage
Bus bars and bus bar feed for damage
Cables and electrical connections for secure fit and damage

Automatic mode

Brakes
Sensors for secure attachment, function and damage

Electrical system
Warning and safety equipment in accordance with the operating instructions
Functionality of display and controls

Chassis/structure
Non-slip surface for wear and damage

Hydraulic operations
Sensors for secure fit and damage

System components
Laser scanner for secure seating and for damage

Vibration damper / swivel-traverse attachment

Chassis/structure
Guide rails for damage

Hydraulic operations
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Stops for presence and damage
Spring package for damage

Lead-acid battery, international

Power supply
Check battery, battery cables and cell connectors are securely attached and check for damage
Ensure safety labels are present and check for damage

Lead-acid battery

Power supply
Check battery, battery cables and cell connectors are securely attached and check for damage

2.2.3 Maintenance parts

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

2.2.3.1 Standard equipment

maintenance part	service hours	months
Gear oil	2000	24
Hydraulic system breather filter	2000	12
Hydraulic oil	2000	12
Hydraulic oil additive	2000	12
Hydraulic oil filter	2000	12
Hydraulic oil filter, seal kit	2000	12