

EFG BA113-BC330

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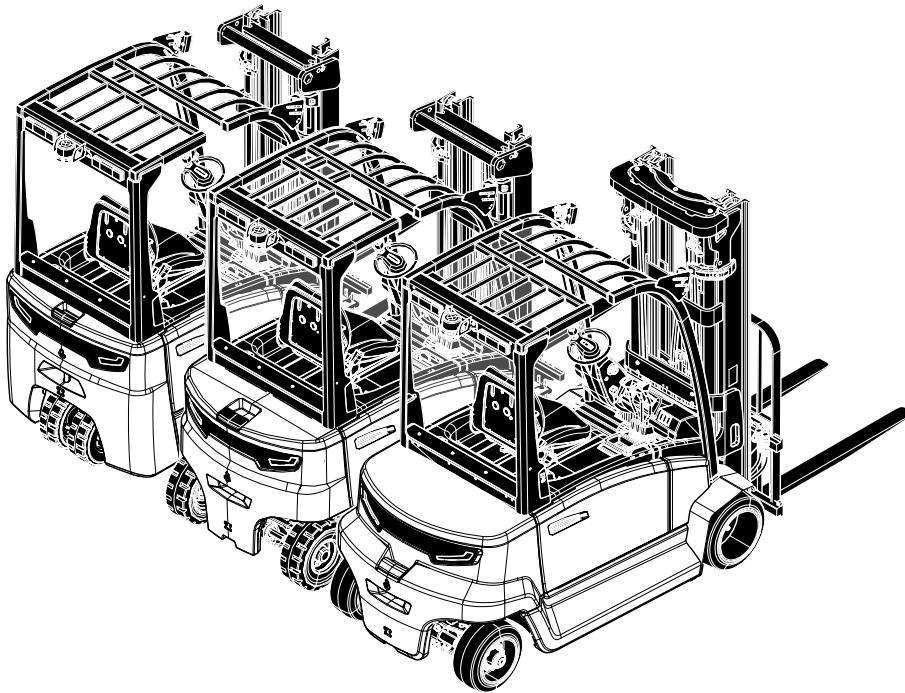
Operating instructions

en-GB

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EFG BA113
EFG BA115
EFG BB216k
EFG BC316
EFG BC320
EFG BC325k
EFG BC325
EFG BC330



Declaration of Conformity



Manufacturer

Jungheinrich AG, 22039 Hamburg, Germany

Description
Industrial truck

Type	Option	Serial no.	Year of manufacture
EFG BA113 EFG BA115 EFG BB216k EFG BC316 EFG BC320 EFG BC325k EFG BC325 EFG BC330			

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.

Declaration of Conformity (○)

Product: EFG BA113-BC330
Serial number/type number

Manufacturer: Jungheinrich Aktiengesellschaft
22039 Hamburg, Germany

UK representative: Jungheinrich UK Ltd
Sherbourne House
Sherbourne Drive
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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

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 137.

⚠ WARNING!

Loss of operational stability can cause accidents

Extended mast sections when the truck is travelling with or without load will reduce the truck's operational stability.

- ▶ Always travel with the mast tilted back, with the horizontal load centre of gravity approximately on the longitudinal centre plane of the truck and the load handler lowered.
-

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

- Lifting and lowering loads.
- Stacking and retrieving loads.
- Transporting lowered loads over short distances.
 - The mast must be tilted back when transporting lowered loads that are not secured against slipping and falling.
- Travelling with a load when the mast is tilted back.
 - The mast must be tilted back when transporting loads that are not secured against slipping and falling.
- Travel at an adapted travel speed.
 - The operator must adjust the travel speed so that the load does not slip off the load handler during acceleration and braking, changes in direction and when driving on ramps.
- Picking up and using attachments and optional equipment approved by the manufacturer; this may require additional approval from local authorities or an expert opinion.
- Occasional towing of trailer loads with the trailer coupling.

- When towing trailers, the load must be secured on the trailer. The permissible trailer load must not be exceeded.

The following operations are prohibited:

- Travelling with a raised load (>30 cm).
- Transporting (neither on the load handler nor in the operator area) and lifting persons without attachments or optional equipment approved for this purpose. ^{a)}
- Pushing or pulling loads, with the exception of occasional towing of trailers with the trailer coupling.
- Transporting suspended loads without expert certification and without authorised optional equipment.
- Use on public roads (exception: operation may only take place with existing statutory approval and the necessary optional equipment).

- If the truck is to be operated with suspended loads, proof of sufficient operational stability under local operating conditions must be obtained from a specialist assessor.

- a) Lifting passengers with a working platform or a work basket may be permitted in some countries. This must be verified by the owner.

- Germany: DGUV information 208-031 (BGI/GUV-5183) Use of Working Platforms on Industrial Trucks with Masts

- Australia: AS 2359.1 Powered Industrial Trucks, General Requirements; AS 2359.2 Powered Industrial Trucks, Operations

3 Approved application conditions

- Operation in industrial and commercial environments.
- Permissible temperature range -20°C to 40°C.
- Operation only on secure, level surfaces with sufficient capacity.
- Maximum relative air humidity 95% non-condensing.
- Do not exceed the permissible surface and point load limits on the travel routes.
- Operation only on travel paths that are visible and approved by the operating company.
- Read the instructions in these operating instructions before travelling on slopes and inclines:
 - Truck gradeability – see page 22.
 - Notes on travelling on slopes and inclines – see page 116.
- Do not travel across or at an angle on inclines. Travel with the load facing uphill.

WARNING!

Use under extreme conditions

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

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

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

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

- Permissible temperature range -20°C to -28°C.
- Maximum relative air humidity 95% non-condensing.
- Optional use at -10°C to +40°C at 95% air humidity (condensing).
- Thawing is permissible only if the truck can be subsequently dried thoroughly.
- Short-term use in a deep-freeze store is possible. The truck is cooled to -20°C, works for max. 5 min. at max. -28°C and then goes back into the cold store with max. -20°C and stays there for at least 10 minutes. Another period of use at max. -28°C is then possible in accordance with the described procedure.
- Within the deep-freeze area below -20°C, the truck must be operated permanently and must not be parked.
- Secure parking at -10°C to +40°C.
- Do not charge the battery below 5°C.

4 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.

5 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.

6 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.

7 Instructions for Removing and Reattaching Guarding

Disassembly and assembly of truck components is only permitted if it is carried out in accordance with the "Maintenance and Repairs" section of these operating instructions.

The truck may only be put back into operation once all the disassembled components have been properly reassembled.

Modifying or disassembling other truck components, especially protective and safety equipment, is prohibited.



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

B Truck Description

1 Application

The EFG BA113-BC330 is a three- or four-wheel electric sit-down counterbalanced truck. It is a cantilever counterbalanced truck which can lift, transport and deposit loads using the load handler attached in front.

Closed bottom pallets can also be lifted.

1.1 Truck models and rated capacity

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

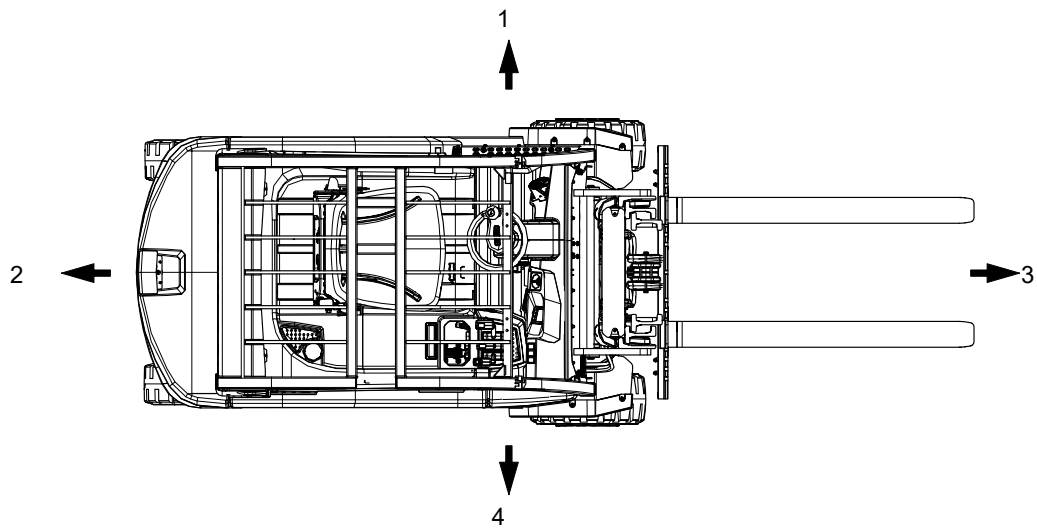
EFG BB216k

EFG	Model name
BB2	Series
16	Rated capacity x 100 kg
k	Compact version

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

2 Assemblies and Functional Description

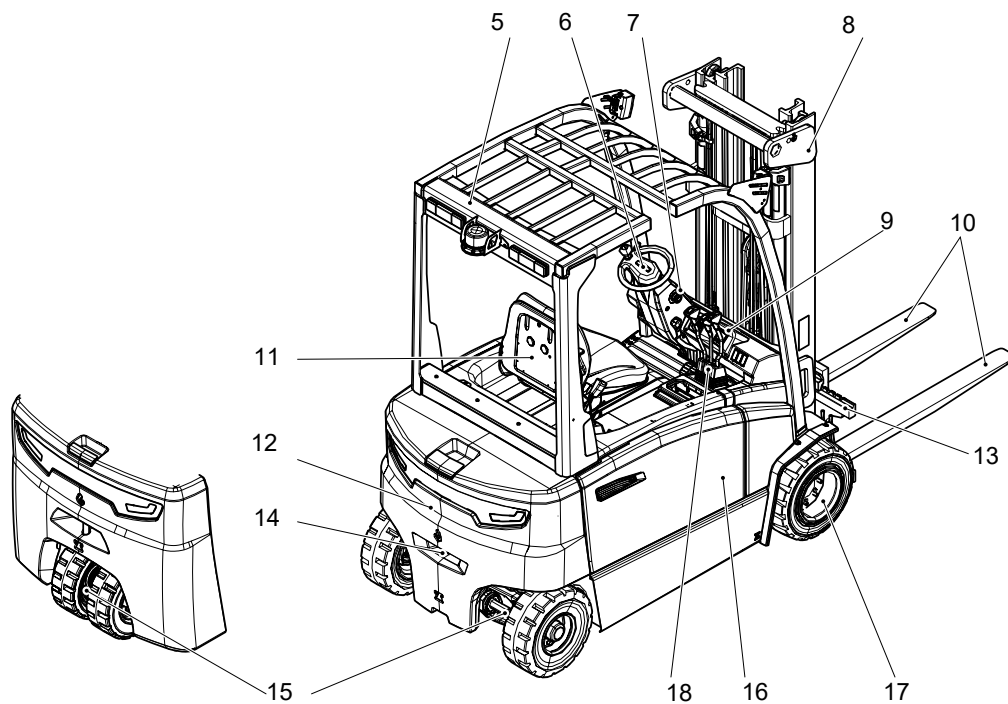
2.1 Travel direction definition



The following conventions have been agreed for travel direction specification:

Item	Travel direction
1	Left
2	Reverse
3	Forward
4	Right

2.2 Assembly Overview



Item		Description	Item		Description
5	●	Overhead guard	12	●	Counterweight
6	●	Steering wheel	13	●	Fork carriage
7	●	Emergency disconnect switch	14	●	Trailer coupling
8	●	Mast	15	●	Steer axle
9	●	Control and display unit	16	●	Battery door
10	●	Forks	17	●	Drive system
11	●	Driver's seat	18	●	Lift mechanism control
	●	Standard equipment			

2.3 Functional Description

Chassis

The chassis, in conjunction with the counterweight, forms the supporting base structure of the truck. It is used to support the main components.

Operator position and overhead guard

The overhead guard protects the operator from falling objects and other external influences. All the controls are ergonomically arranged. The steering column and driver's seat can be adjusted individually.

The controls and warnings on the control and display unit enable the system to be monitored during operation, thereby ensuring a very high level of safety.

Steering

The steering offers a high level of efficiency and ergonomics. The tilt angle of the steering column is adjustable. The low cross-section means the operator has maximum legroom at all times.

The steering is particularly smooth, offering a high level of efficiency.

The steer angle is shown in the display.

Wheels

All models will be equipped with rubber tyres.

Drive and brake system

The 2 motor front drive provides maximum traction to the drive wheels at all times. When cornering, the exact speed required for the wheel on the inside or outside of the bend respectively is set in proportion to the steer angle.

The service brake is a maintenance-free wet disk brake. The truck also brakes regeneratively via the drive motors. The energy recovered in the process is fed back to the battery.

The parking brake operates manually.

Hydraulic system for operating functions

A multi-function control valve allows for sensitive operation of the functions via the controls. A speed-controlled hydraulic pump ensures a proportionate and efficient supply to the hydraulic functions.

Emergency Stop safety feature

If the system recognises a fault in the steering, an emergency stop is automatically introduced. The truck brakes to a halt, the travel direction does not change. An event message is shown in the control and display unit. The truck performs a self-test whenever it is switched on. Travel is only enabled again when the truck is operational and the parking brake (= emergency stop) released.

Mast

Two or three-stage masts, optionally with free lift function; narrow mast sections ensure excellent visibility of the forks and attachments. Fork carriage and mast run on permanently lubricated and hence maintenance-free support rollers.

Attachments

The trucks can be optionally fitted with mechanical and hydraulic attachments.

Storage

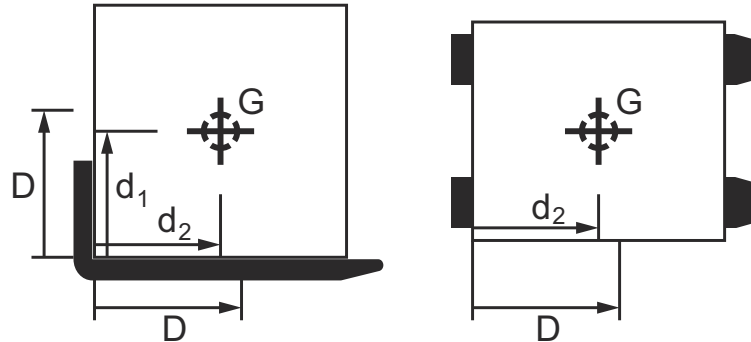
Variety of storage bins, drink holder and paper clip are available.

3 Technical Specifications

All technical details refer to standard trucks with the smallest ZT mast available.
All values marked with *) may vary depending on the type of equipment used (e.g. mast, tyres etc.).

- The technical specifications comply with the German "Industrial Truck Data Sheet" Guidelines.
Technical modifications and additions reserved.

Load centre distance



The load centre distance D of the load handler is specified as the horizontal distance from the front face and the vertical distance from the upper edge of the load handler.

- The capacity plate for standard load handlers specifies valid load centre distances of 500 mm, 600 mm and 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 137.

3.1 Performance data

Model ¹	EFG BA 113	EFG BA 115	
Battery	375	500	Ah
Rated capacity (Q)	1.3	1.5	t
Travel speed with / without load	12.50 / 12.50	12.50 / 12.50	km/h
Lift speed with / without load	0.25 / 0.53	0.25 / 0.53	m/s
Lowering speed with / without load	0.55 / 0.54	0.55 / 0.54	m/s
Drawbar pull with / without load	716 / 757	886 / 767	N
Max. drawbar pull with / without load	8752 / 8480	8675 / 9149	N
Gradeability with / without load	8 / 12	8 / 11	%
Max. gradeability with / without load	15 / 20	14 / 19	%
Acceleration time with / without load (measured with distance 15 m)	7.1/ 6.1	7.1 / 6.5	s
Drive motor rating S2 60 min.	3.7 / 3.7	3.7 / 3.7	kW
Lift motor rating at S3 15%	10	10	kW
Max. working pressure	230	230	bar
Oil flow for attachments	17	25	l/min
Battery according to DIN 43531/35/36 A,B,C, no	A 43531	A 43531	
Battery voltage / nominal capacity	48 / 375	48 / 500	V / Ah
Battery weight	560	708	kg
Battery dimensions L/W/H (max)	830 / 414 / 627	830 / 522 / 627	mm
Energy consumption according to VDI cycle	3.33	3.64	kw/h
Turnover output	86	97	
Energy consumption according to turnover output	3.38	3.92	
Sound pressure level at operator´s ear according to EN 12053	72	75	db (A)
Service brake	Mechanical / Hydraulic		
Trailer coupling	Bolt		
¹⁾ Mast: ZT300			

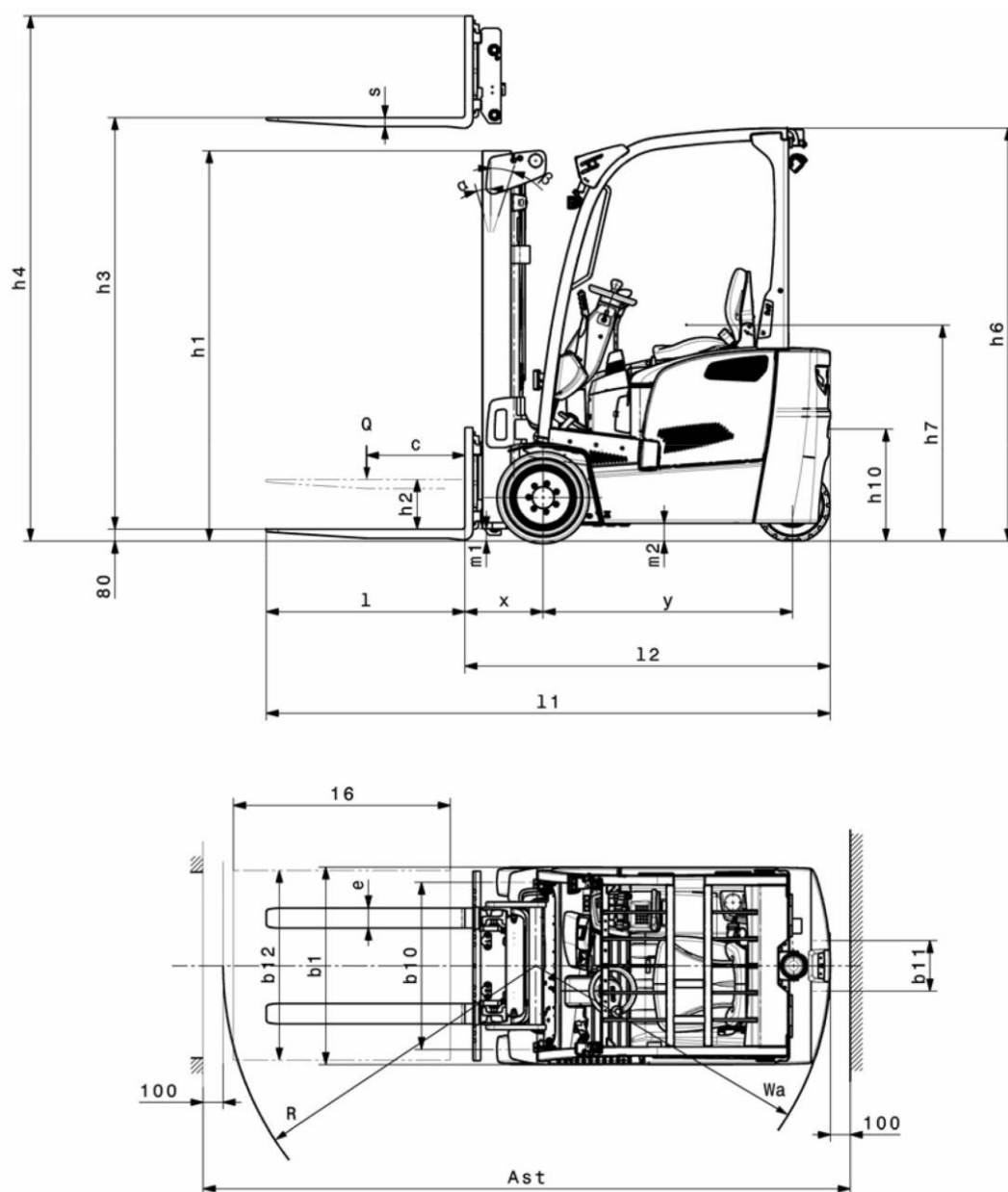
Model	EFG BB 216k	EFG BC 316	EFG BC 320	
Battery	500	625	625	Ah
Rated capacity (Q)	1.6	1.6	2.0	t
Travel speed with / without load	15 / 15	15 / 15	15 / 15	km/h
Lift speed with / without load	0.43 / 0.53	0.43 / 0.53	0.34 / 0.44	m/s
Lowering speed with / without load	0.51 / 0.55	0.51 / 0.55	0.51 / 0.55	m/s
Drawbar pull with / without load	1300 / 1500	1300 / 1500	1600 / 1900	N
Max. drawbar pull with / without load	9000 / 9400	9000 / 9400	9200 / 10500	N
Gradeability with / without load	6.5 / 14	6.5 / 14	5 / 11	%
Max. gradeability with / without load	13.5 / 16	13.5 / 16	11 / 15	%
Acceleration time with / without load (efficiency)	5.5 / 5.0	5.5 / 5.0	6.0 / 5.2	s
Drive motor rating S2 60 min.	3.7 / 3.7	3.7 / 3.7	3.7 / 3.7	kW
Lift motor rating at S3 15%	10	10	10	kW
Max. working pressure	230	230	230	bar
Oil flow for attachments	25	25	25	l/min
Battery according to DIN 43531/35/36 A,B,C, no	A 43531	A 43531	A 43531	
Battery voltage / nominal capacity	48 / 500	48 / 625	48 / 625	V / Ah
Battery weight	708	856	856	kg
Battery dimensions L/W/H (max)	830 / 522 / 627	830 / 630 / 627	830 / 630 / 627	mm
Energy consumption according to VDI cycle	4.25	4.25	4.80	kw/h
Turnover output	113	113	136	

Model	EFG BB 216k	EFG BC 316	EFG BC 320	
Battery	500	625	625	Ah
Energy consumption according to turnover output	5.13	5.13	5.88	
Sound pressure level at operator's ear according to EN 12053	75	74	74	db (A)
Service brake	Mechanical / Hydraulic			
Trailer coupling	Bolt			

Model	EFG BC 325k	EFG BC 325	EFG BC 330	
Battery	625	750	750	Ah
Rated capacity (Q)	2.5	2.5	3.0	t
Travel speed with / without load	17 / 18	17 / 18	17 / 18	km/h
Lift speed with / without load	0.4 / 0.5	0.4 / 0.5	0.3 / 0.32	m/s
Lowering speed with / without load	0.51 / 0.55	0.51 / 0.55	0.51 / 0.55	m/s
Drawbar pull with / without load	2400 / 2750	2400 / 2750	2300 / 3300	N
Max. drawbar pull with / without load	14000 / 8700	14000 / 8700	13800 / 14600	N
Gradeability with / without load	9 / 13	9 / 13	8 / 12	%
Max. gradeability with / without load	16 / 22	16 / 22	15 / 22	%
Acceleration time with / without load (performance)	5.6 / 5.0	5.6 / 5.0	5.7 / 5.2	s
Drive motor rating S2 60 min.	4.6 / 4.6	4.6 / 4.6	4.6 / 4.6	kW
Lift motor rating at S3 15%	15.5	15.5	15.5	kW
Max. working pressure	230	230	230	bar
Oil flow for attachments	25	25	25	l/min
Battery according to DIN 43531/35/36 A,B,C, no	A 43531	A 43531	A 43531	
Battery voltage / nominal capacity	48 / 625	48 / 750	48 / 750	V / Ah
Battery weight	856	1013	1013	kg

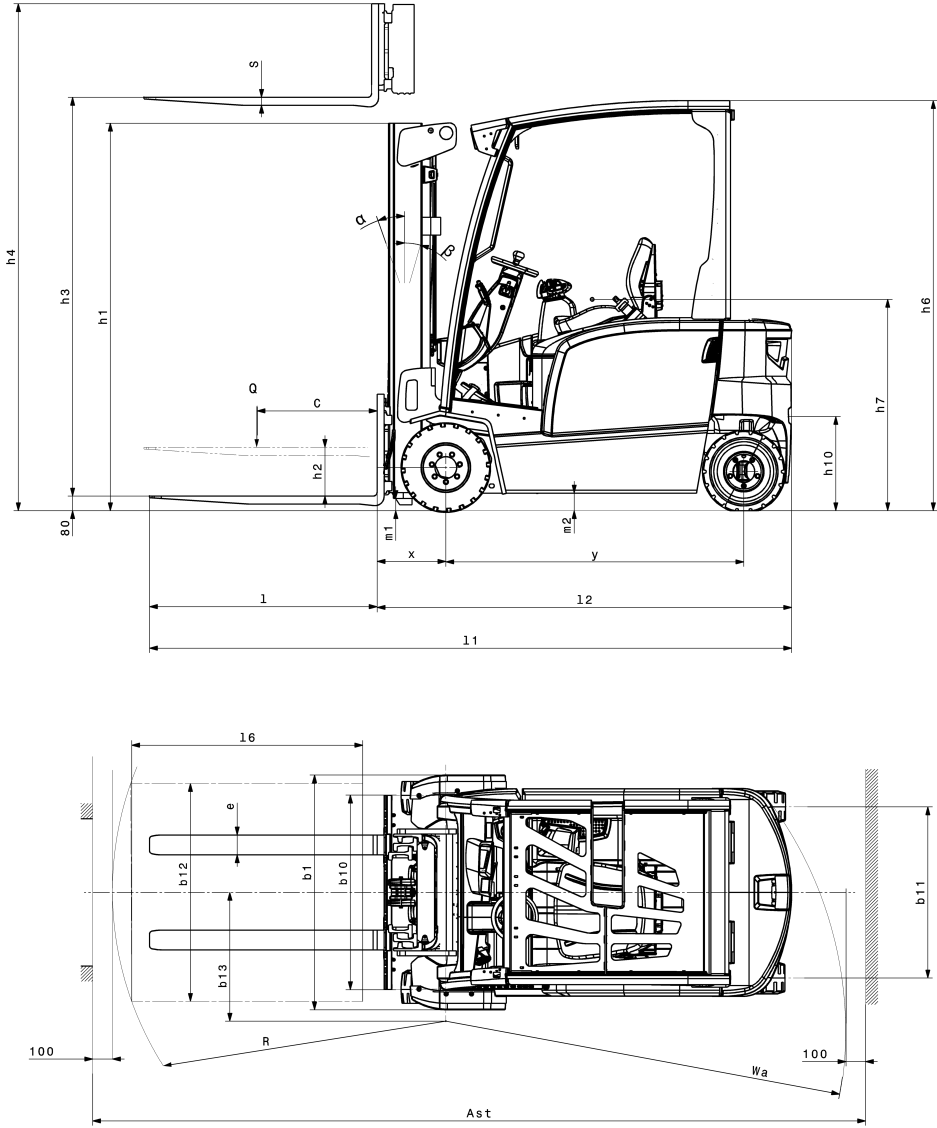
Model	EFG BC 325k	EFG BC 325	EFG BC 330	
Battery	625	750	750	Ah
Battery dimensions L/W/H	830 / 630 / 627	830 / 738 / 627	830 / 738 / 627	mm
Energy consumption according to VDI cycle	5.77	5.77	6.88	kw/h
Turnover output (performance)	172	172	196	
Energy consumption according to turnover output (performance)	8.94	8.94	7.71	
Sound pressure level at operator's ear according to EN 12053	78	78	78	db (A)
Service brake	Mechanical / Hydraulic			
Trailer coupling	Bolt			

3.2 Dimensions



	Model	EFG BA 113	EFG BA 115	
c	Load centre distance	500	500	mm
x	Load distance	387	392	mm
y	Wheelbase	1156	1249	mm
α/β	Tilt of mast/fork carriage forward/ backward	7.0 / 5.0	7.0 / 5.0	°
h1	Mast height (lowered)	2000	2000	mm
h2	Free lift	150	150	mm
h3	Lift	3000	3000	mm
h4	Extended mast height	3555	3555	mm
h6	Height of overhead guard	2080	2080	mm
h7	Seat height / stand height	1030	1030	mm
h10	Coupling height	560	560	mm
	2nd coupling height	0	0	mm
l1	Overall length	2732	2830	mm
l2	Length incl. back of forks	1732	1830	mm
b1/b2	Total width	990	990	mm
s/e/l	Fork dimensions	35/100/1000	40/100/1000	mm
	Fork carriage ISO 2328, class / type A,B	2A	2A	mm
b3	Fork carriage width	950	950	mm
m1	Floor clearance with load under mast	97	97	mm
m2	Floor clearance centre wheelbase	88	88	mm
Ast	Aisle width for pallets 1000 x 1200 sideways	3056	3154	mm
Ast	Aisle width for pallets 800 x 1200 lengthways	3182	3279	mm
Wa	Turning radius	1345	1438	mm
b13	Smallest pivot point distance	0	0	mm

	Model	EFG BB 216k	EFG BC 316	EFG BC 320	
c	Load centre distance	500	500	500	mm
x	Load distance ¹²³	352	352	352	mm
y	Wheelbase	1357	1506	1506	mm
α/β	Tilt of mast/fork carriage forward/backward	7.0 / 5.0	7.0 / 5.0	7.0 / 5.0	°
h1	Mast height (lowered)	2000	2000	2000	mm
h2	Free lift	150	150	150	mm
h3	Lift	3000	3000	3000	mm
h4	Extended mast height	3555	3555	3555	mm
h6	Height of overhead guard	2080	2080	2080	mm
h7	Seat height / stand height	1030	1030	1030	mm
h10	Coupling height	560	475	475	mm
l1	Overall length ⁴	2899	3096	3096	mm
l2	Length incl. back of forks	1899	2096	2096	mm
b1/b2	Total width	1060	1060	1120	mm
s/e/l	Fork dimensions	40/100/1000	40/100/1000	40/100/1000	mm
	Fork carriage ISO 2328, class / type A,B	2A	2A	2A	mm
b3	Fork carriage width	980	980	980	mm
m1	Floor clearance with load under mast	97	97	97	mm
m2	Floor clearance centre wheelbase	88	88	88	mm
Ast	Aisle width for pallets 1000 x 1200 lengthways	3224	3513	3513	mm
Ast	Aisle width for pallets 800 x 1200 lengthways	3348	3712	3712	mm
Wa	Turning radius	1545	1960	1960	mm
b13	Smallest pivot point distance	0	562	562	mm
¹⁾ For DZ Mast: 372 mm (+25 mm) ²⁾ With mast with integrated sideshift: +30 mm ³⁾ With sideshift attachment: +63.5 mm ⁴⁾ Assumes 1000 mm fork length					



	Model	EFG			
		BC 325k	BC 325	BC 330	
	Battery	625 Ah	750 Ah	750 Ah	
c	Load centre distance	500	500	500	mm
x	Load distance ¹²³	467	467	472	mm
y	Wheelbase	1453	1561	1700	mm
α/β	Tilt of mast/fork carriage forward/backward	7.0 / 5.0	7.0 / 5.0	7.0 / 5.0	°
h1	Mast height (lowered)	2200	2200	2200	mm
h2	Free lift	150	150	150	mm
h3	Lift	3100	3100	3100	mm
h4	Extended mast height	3700	3700	3850	mm
h6	Height of overhead guard	2080	2080	2080	mm
h7	Seat height / stand height	1030	1030	1030	mm
h10	Coupling height	475	475	475	mm
l1	Overall length Overall length ⁴	3213	3321	3469	mm
l2	Length incl. back of forks Length incl. back of forks	2213	2321	2469	mm
b1/b2	Total width Total width	1170	1170	1313	mm
s/e/l	Fork dimensions	40/100/1000	40/100/1000	40/125/1000	mm
	Fork carriage ISO 2328, class / type A,B	2A	2A	3A	mm
b3	Fork carriage width	1120	1120	1120	mm
m1	Floor clearance with load under mast	97	97	97	mm
m2	Floor clearance centre wheelbase	88	88	88	mm

¹⁾ , For DZ Mast: 372 mm (+25 mm)

²⁾ With mast with integrated sideshift: +30 mm

³⁾ With sideshift attachment: +63.5 mm

⁴⁾ Assumes 1000 mm fork length

	Model	EFG			
		BC 325k	BC 325	BC 330	
	Battery	625 Ah	750 Ah	750 Ah	
Ast	Aisle width for pallets 1000 × 1200 sideways Aisle width for pallets 1000 x 1200 sideways	3508	3727	3897	mm
Ast	Aisle width for pallets 800 × 1200 lengthways Aisle width for pallets 800 x 1200 lengthways	3807	3927	4097	mm
Wa	Turning radius	1940	2060	2225	mm
b13	Smallest pivot point distance	542	600	667	mm
¹⁾ , For DZ Mast: 372 mm (+25 mm) ²⁾ With mast with integrated sideshift: +30 mm ³⁾ With sideshift attachment: +63.5 mm ⁴⁾ Assumes 1000 mm fork length					

3.3 Weights

Model	EFG BA 113	EFG BA 115	
Battery	375 Ah	500 Ah	
Net weight incl. battery, see battery weight	3045	3221	kg
Axle load, with load, front / rear	3753 / 592	3974 / 747	kg
Axle load, without load, front / rear	1422 / 1623	142 / 1739	kg

Model	EFG BB 216k	EFG BC 316	EFG BC 320	
Battery	500 Ah	625 Ah	625 Ah	
Net weight incl. battery, see battery weight	3044	3230	3317	kg
Axle load, with load, front / rear	4102 / 544	4012 / 818	4738 / 579	kg
Axle load, without load, front / rear	1473 / 1571	1514 / 1716	1606 / 1711	kg

Model	EFG BC 325k	EFG BC 325	EFG BC 330	
Battery	625 Ah	750 Ah	750 Ah	
Net weight incl. battery, see battery weight	4351	4454	4742	kg
Axle load, with load, front / rear	6166 / 665	6259 / 655	6968 / 774	kg
Axle load, without load, front / rear	1833 / 2518	1960 / 2494	2225 / 2517	kg

3.4 Mast versions



All dimensions in mm.

Mast 1.6 t (mm)					
	h3	h1	h2	h4	a/β (°)
ZT	3000	2000	150	3555	7/5
	3300	2150	150	3855	7/5
	3600	2300	150	4155	7/5
	4000	2500	150	4555	7/5
	4500	2800	150	5055	7/5
	5000	3050	150	5555	7/5
ZZ	3300	2105	1470	3855	7/5
	3600	2255	1620	4155	7/5
	4000	2455	1820	4555	7/5
DZ	4500	2005	1360	5055	7/5
	4800	2105	1460	5355	7/5
	5000	2180	1530	5555	7/5
	5500	2355	1710	6055	7/5
	6000	2555	1910	6555	7/5
	6500	2805	2160	7055	7/5

Mast 2.0 t (mm)					
	h3	h1	h2	h4	a/β (°)
ZT	3000	2000	150	3605	7/5
	3300	2150	150	3905	7/5
	3600	2300	150	4205	7/5
	4000	2500	150	4605	7/5
	4500	2800	150	5105	7/5
	5000	3050	150	5605	7/5
ZZ	3300	2105	1470	3935	7/5
	3600	2255	1620	4235	7/5
	4000	2455	1820	4635	7/5
DZ	4500	2005	1360	5135	7/5
	4800	2105	1460	5435	7/5
	5000	2180	1530	5635	7/5
	5500	2355	1710	6135	7/5
	6000	2555	1910	6635	7/5
	6500	2805	2160	7135	7/5

Mast 2.5 t (mm)					
	h3	h1	h2	h4	a/β (°)
ZT	3100	2200	150	3700	7/5
	3300	2300	150	3900	7/5
	3500	2400	150	4100	7/5
	4000	2650	150	4600	7/5
	4500	2950	150	5100	7/5
ZZ	3100	2160	1600	3700	7/5
	3300	2260	1700	3900	7/5
	3500	2360	1800	4100	7/5
	4000	2610	2060	4600	7/5
DZ	4400	2060	1500	5000	7/5
	4700	2160	1600	5300	7/5
	5000	2260	1700	5600	7/5

Mast 3.0 t (mm)					
	h3	h1	h2	h4	a/β (°)
ZT	3100	2200	150	3850	7/5
	3300	2300	150	4050	7/5
	3500	2400	150	4250	7/5
	3700	2500	150	4450	7/5
	4000	2650	150	4750	7/5
	4500	2950	150	5250	
ZZ	3100	2160	1440	3850	7/5
	3300	2260	1540	4050	7/5
	3500	2360	1640	4250	7/5
	4000	2610	1900	4750	7/5
DZ	4400	2060	1340	5150	7/5
	4700	2160	1440	5450	7/5
	5000	2260	1540	5740	7/5

Special trucks are not included in this overview.

3.5 Tyre type

⚠ WARNING!

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

The quality of the tyres affects the operational stability and performance of the truck. Uneven wear reduces the operational stability of the truck and increases the stopping distance.

- ▶ When replacing tyres, make sure the truck is not skewed.
- ▶ Always replace tyres in pairs, i.e. left and right at the same time.
- ▶ For pneumatic tyres, only remove the steel ring when the tyre is depressurised.

- When replacing rims and tyres fitted at the factory, only use the manufacturer's original spare parts. Otherwise the manufacturer's specifications cannot be ensured. If you have any queries, contact the manufacturer's customer service department.
- During the wear test, the wear limit of the respective wheel must be observed.

EFG	EFG BA 113	EFG BA 115	
Tyre size, at front	18x6-12/1/8	18x6-12/1/8	In
Tyre size, at rear	140 / 55 - 9	140 / 55 - 9	In
Wheels, number front/rear (× = driven wheels)	2x / 2		
Track width, front (b10)	838	838	mm
Track width, rear (b11)	211	211	mm

EFG	BB 216k	BC 316	BC 320	
Tyre size, at front	18 x 7 - 8	18 x 7 - 8	200 / 50 - 10	In
Tyre size, at rear	140 / 55 - 9	16 x 6 - 8	16 x 6 - 8	In
Wheels, number front/rear (× = driven wheels)	2x / 2			
Track width, front (b10)	904	904	924	mm
Track width, rear (b11)	211	870	870	mm

EFG	BC 325k	BC 325	BC 330	
Tyre size, at front	18 x 9 - 12 1/8	18 x 9 - 12 1/8	Tandem 18 x 5 / 6 - 12 1/8	In
Tyre size, at rear	16 x 6 - 10 1/2	16 x 6 - 10 1/2	16 x 7 - 10 1/2	In
Wheels, number front/rear (× = driven wheels)	2x / 2			
Track width, front (b10)	938	938	1013	mm
Track width, rear (b11)	864	864	995	mm

*) The models listed in the table correspond to the standard version. Other tyres can be used depending on the truck's equipment.

3.6 Motor Data

Drive motor	2 x 3.7	kW
Lift motor	10	kW

3.7 EN norms

Noise emission level

- EFG BA113: 72 dB(A)
- EFG BA115: 72 dB(A)
- EFG BB216k: 75 dB(A)
- EFG BC316: 74 dB(A)
- EFG BC320: 74 dB(A)
- EFG BC325k: 78 dB(A)
- EFG BC325: 78 dB(A)
- EFG BC330: 78 dB(A)

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

in accordance with EN 12053 as harmonised with ISO 4871.

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

Vibration

Seat	BF8-4 (●)	BF2-3 (○)	MSG65 (○)	
EFG BA113	1.3	1.2	0.5	m/s ²
EFG BA115	1.1	1.0	0.4	m/s ²
EFG BB216k	1.2	1.2	0.6	m/s ²
EFG BC316-320	1.4	1.1	0.7	m/s ²
EFG BC325k-330	1.1	1.1	0.5	m/s ²

in accordance with EN 13059.

Seat	BF8-4 (●)	BF2-3 (○)	MSG65 (○)
Recommendation for use by the operator (observe national regulations)	Light application – max. 2 working hours per shift / day – Driving routes on flat /even surfaces – One shift operation	Light application – max. 3 working hours per shift / day – Driving routes on flat /even surfaces – One shift operation	Medium application – Driving routes on flat or uneven condition surfaces – One or two shift operation

in accordance with VDI 4461.

- The internal accuracy of the measuring chain for at 21°C at $\pm 0,02 \text{ m/s}^2$. 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 209.

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.

3.8 Conditions of use

Ambient temperature

- operating at -20°C to 40°C
- for parking and charging +5°C to +40°C
- Cold store version in permanent use: -5°C to -20°C
- Short period +46°C (IP 95)

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

3.9 Electrical Requirements

The manufacturer certifies compliance with the requirements for the design and manufacture of electrical equipment, according to EN 1175-1 "Industrial Truck Safety - Electrical Requirements", provided the truck is used according to its purpose.

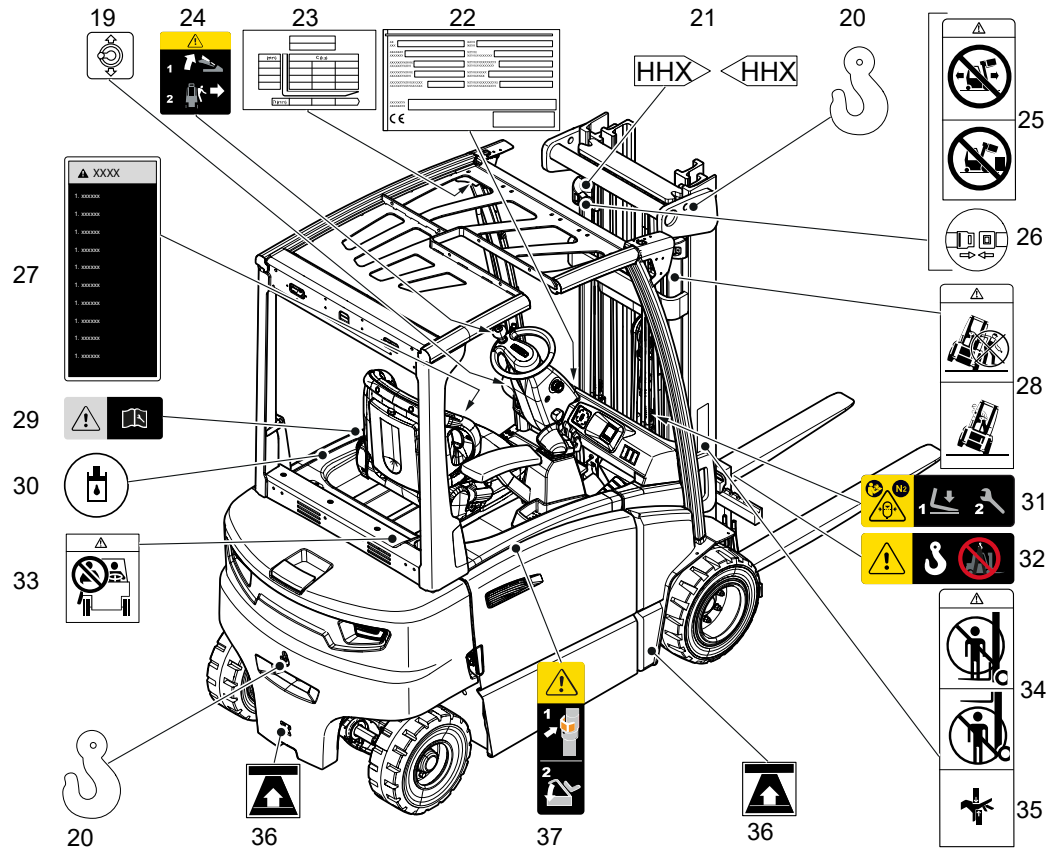
3.10 Specifications according to RED guideline (Radio Equipment Directive) for radio units

- 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.

4 Identification Points and Data Plates

4.1 Indication Points

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



Item	Description
19	Adjustment steering column
20	Strap points for crane lifting
21	Lift limit
22	Data plate
23	Rated capacity
24	Warning: apply parking brake
25	Do not travel with a raised load
26	Wear seat belt
27	General instructions
28	Tip-over warning
29	Read operating instructions
30	Hydraulic oil filler
31	Lifting load damping (○)
32	Slings point label on side shifter (○)
33	Prohibition plate, no passenger
34	Do not step onto or beneath the load
35	Risk of crushing
36	Jack points
37	Gas strut

4.2 Data plate

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

XXXXXXXXXXXXXXXXXX

XX 38 XXXX 39
XXX

XXXXXX 40 XXXXX XXXXXXXXXXXXXXXX 41
XXXXXXXXXX

XXXXXXXXXXXXXXXXXX 42 XXXXXXXXXXXXXXXXXXXXXXXX 43
XXXXXXXXXXXX

XXXXXXXXXXXXXXXXXX 44 XXXXXXXXXXXXX 45
XXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXX 46 XXXXXXXXXXXXXXXXXXXXXXXX 47
XXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXX 48
XXXXXXXXXX

XXXXXXXXXX 49
XXXXXXXXXX

50

51

52 53

Item	Description	Item	Description
38	Type	45	Output (kW)
39	Option	46	Net weight without battery (kg)
40	Serial number	47	Min./max. battery weight (kg)
41	Year of manufacture	48	Manufacturer
42	Rated capacity (kg)	50	QR code
43	Load centre distance (mm)	51	Manufacturer's logo
44	Battery voltage (V)		

- For queries regarding the truck or when ordering spare parts, always quote the truck serial number (40).

QR code

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



4.3 Truck capacity plate

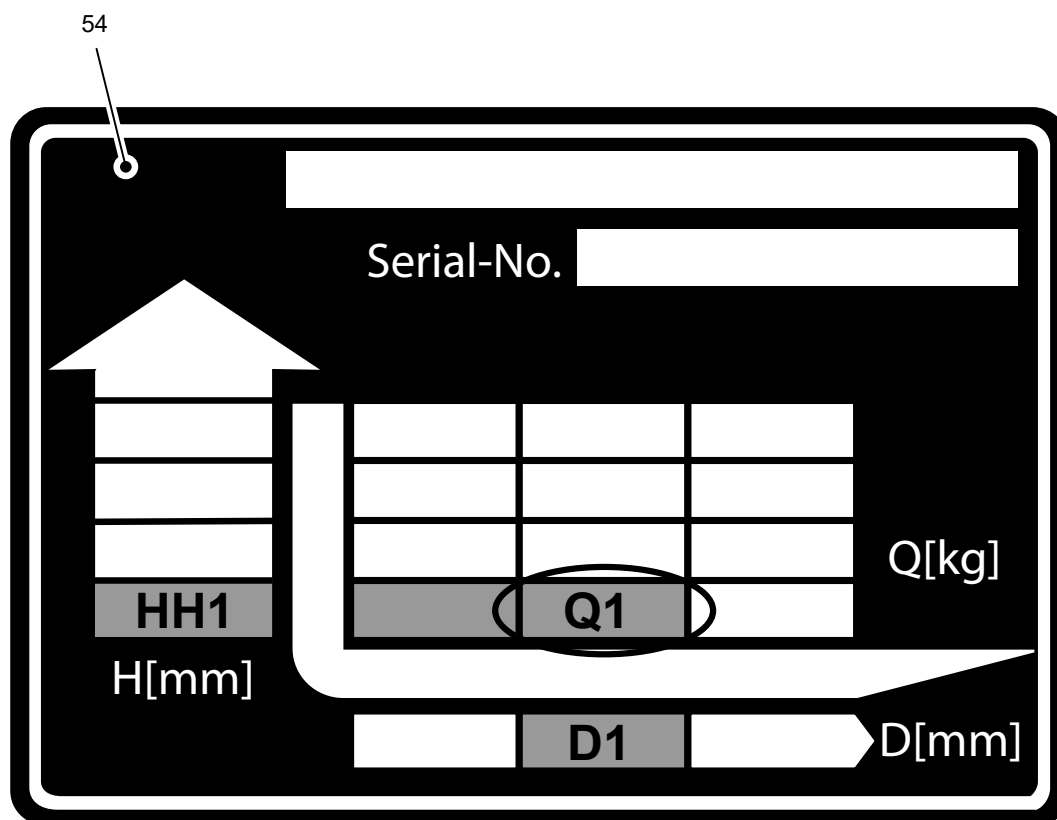
⚠ WARNING!

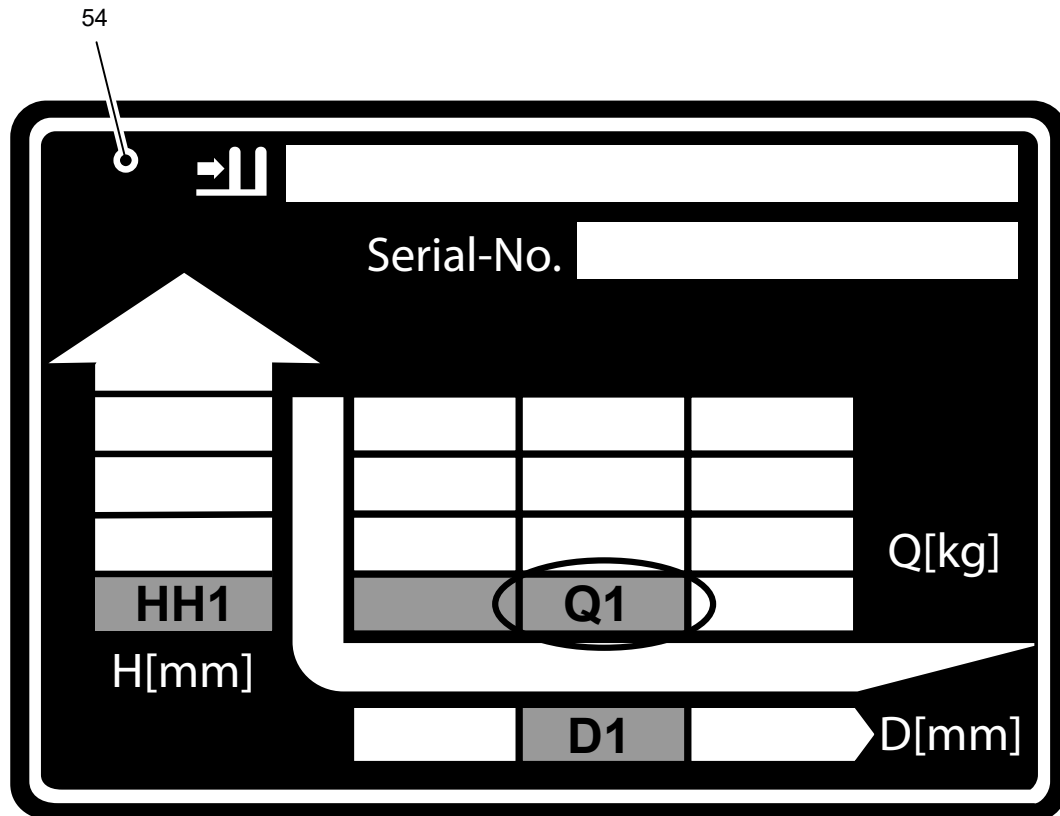
Replacing the fork arms can cause accidents

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

- ▶ An additional capacity plate must be attached to the truck when replacing the fork arms.
- ▶ The capacity of the fork arms must correspond to the capacity of the truck.
- ▶ Trucks supplied without fork arms are given a capacity plate for standard fork arms (length: 1150 mm).

The capacity plate (23) gives the capacity Q (in kg) of the truck for a vertical mast. A table indicates the maximum capacity with a given load centre distance D (in mm) and the required lift height h_3 (in mm).





The truck capacity plate specifies the type and serial number of the truck and indicates the capacity with the fork arms (●) or the fork extensions (○) in as-delivered condition.

Capacity plate version in accordance with Australian guidelines (55)

55

The diagram shows a capacity plate with a table for lift height (h₃) and capacity (Q). The table has three rows for h₃ (4250, 3600, 2900 mm) and three columns for Q (850, 1105, 1250 kg). The 3600 mm row and 1105 kg column are highlighted. Below the table is a row for load center distance (D) with values 500, 600, and 700 mm. The 600 mm value is highlighted. There are also some empty boxes at the top left and top right of the plate.

h ₃ (mm)	Q (kg)		
4250	850	850	600
3600	1105	1105	850
2900	1250	1250	850

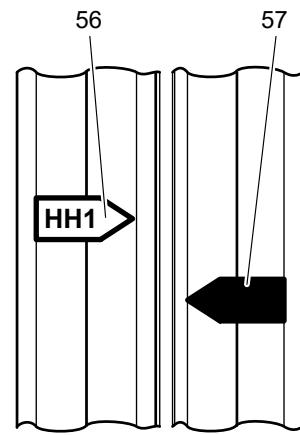
D (mm)	500	600	700

Example of how to calculate the maximum capacity

With a load centre distance (D) of 600 mm and a maximum lift height of (h₃) 3600 mm the max. capacity (Q) is 1105 kg.

Lift height limits

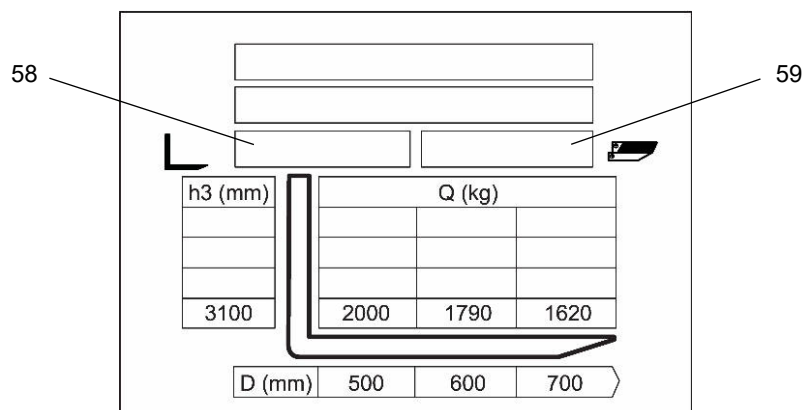
The arrow shaped markings (56 and 57) on the inner and outer masts show the operator when the prescribed lift limits have been reached.



4.4 Attachment capacity plate

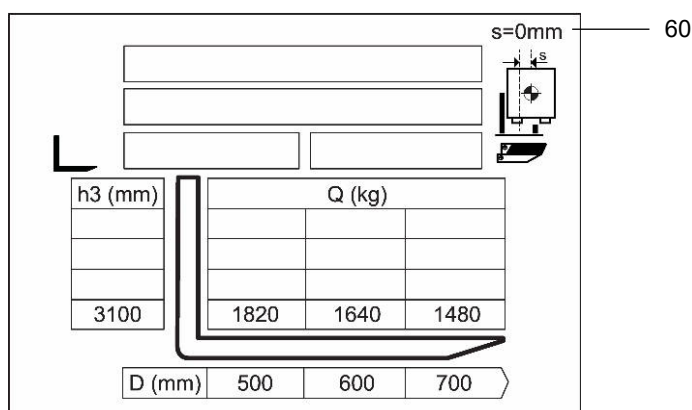
The attachment capacity plate is next to the truck capacity plate and gives the truck capacity Q (in kg) in conjunction with the attachment and the specified fork arms (●) (58) and where applicable fork extensions (○) (59).

The model name and/or serial number for the attachment indicated on the attachment capacity plate must match the data plate of the attachment.



4.4.1 Attachment with More Than 100 mm Side Shift

The capacity plate of the attachment with more than 100 mm possible side shift for a current working position in the centre position (60) or pushed out offset to max. 100 mm side shift is affixed next to the truck capacity plate.



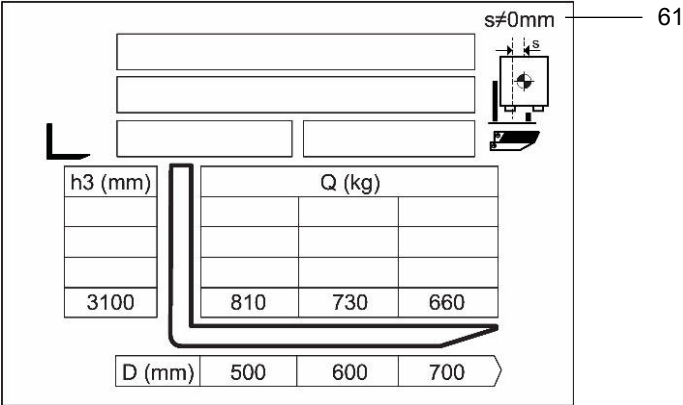
⚠ WARNING!

Risk of accident from offset load centre of gravity

The capacity of the truck is reduced when using side shifts that are more than 100 mm outside the truck centre.

► Note the capacity plate with the reduced capacity.

The capacity plate of the attachment with more than 100 mm possible side shift for a current clear offset working position with 100 mm side shift pushed out (61) is affixed separately to the other capacity plates.



5 Stability

WARNING!

Loss of stability can cause accidents

Changing the components listed will affect stability.

If the attachment sideshift is off-centre, refer to the capacity data plate with reduced capacity, see page 43.

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.

The operational stability of the truck can also be affected by factors such as:

- Tyres
- Battery weight
- Mast
- Attachment
- Transported load (size, weight and centre of gravity)

5.1 Centre of gravity

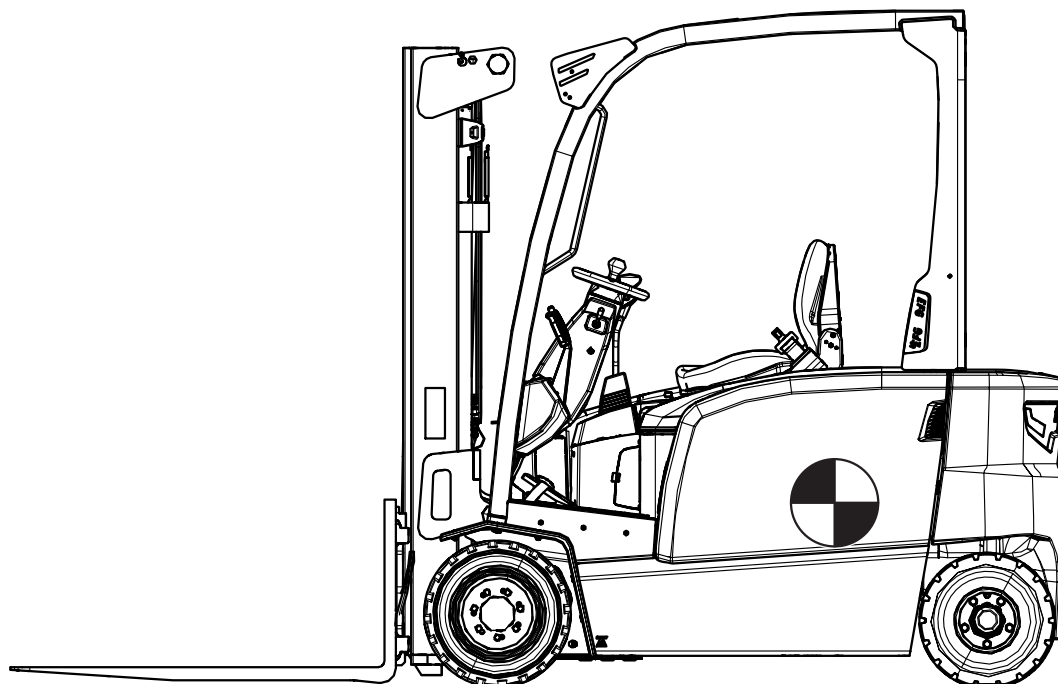
⚠ WARNING!

An altered centre of gravity can result in tipovers when cornering.

The overall centre of gravity can vary depending on the truck's equipment (especially the mast version).

For trucks without a mast the centre of gravity will move significantly in the direction of the counterweight.

► Drive carefully and with modified speed to avoid tipping over.



The picture shows the approximate centre of gravity position of the truck.

5.2 Wind loads

Wind forces can affect the stability of a truck when lifting, lowering and transporting loads with large surface areas.

Light loads must be especially secured when they are subjected to wind forces. This will prevent the load from sliding or falling.

Stop the truck in both cases.

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 assembled (for low heights)
- Vertically, with the mast removed (for large heights), all mechanical connections and all hydraulic lines between the basic unit and the mast separated.
- The manufacturer's customer service department must be consulted for installation and removal of the mast.

2 Truck laden

2.1 Lifting the truck by crane

WARNING!

Danger when using untrained personnel for crane transport

Incorrect loading by crane 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 by crane is only intended for the initial transport before the truck is used for the first time.
- ▶ 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.

DANGER!

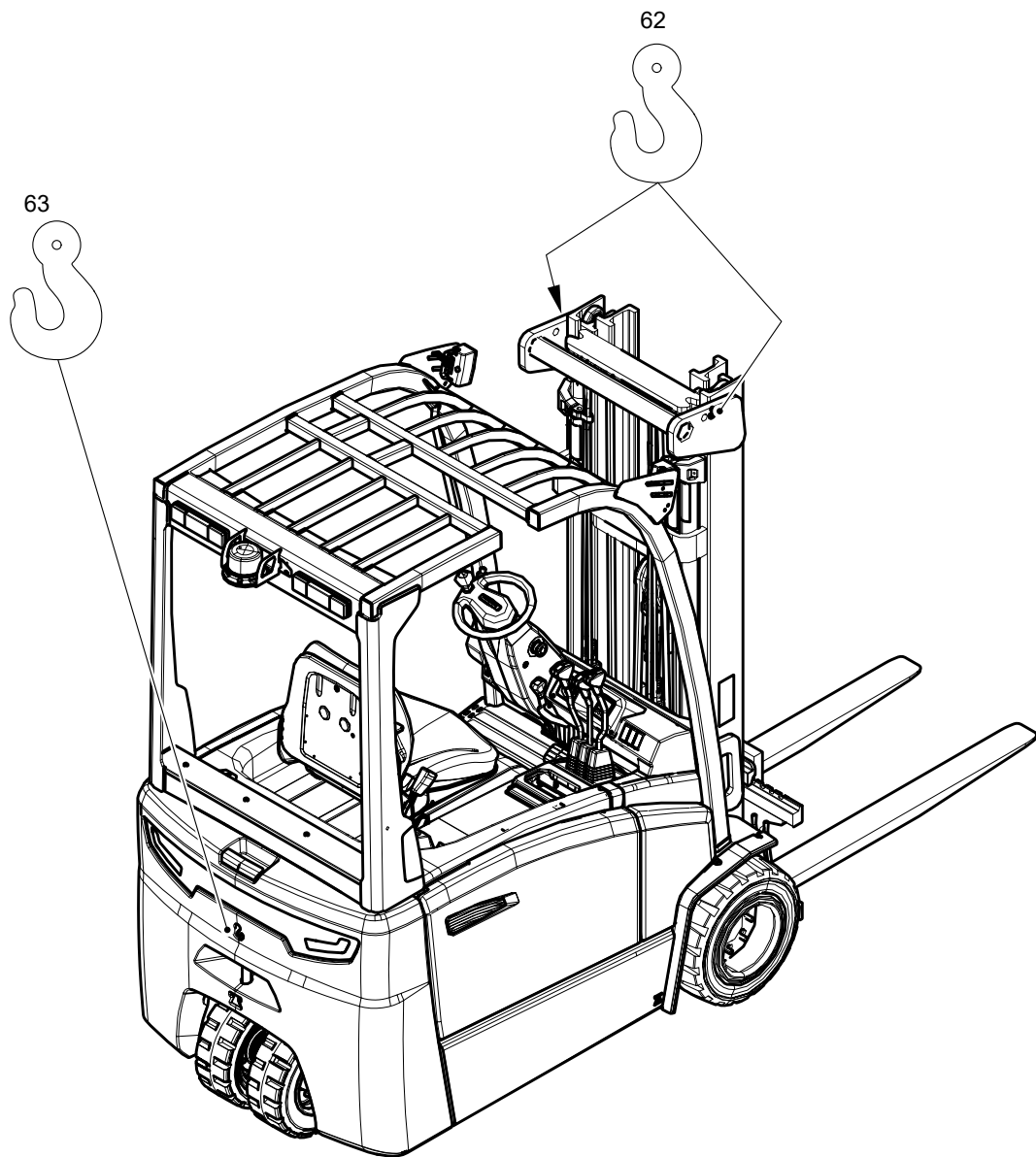
Crane lifting gear can tear, resulting in accidents

A tear in the crane lifting gear may result in severe, irreparable accidents or even death if there are persons within the hazardous area.

- ▶ Only use crane lifting gear with sufficient capacity.
- ▶ Loading weight = unladen weight of the truck (+ battery weight for electric trucks).
- ▶ The mast must be tilted back fully.
- ▶ Always secure crane lifting gear to the prescribed attachment points and prevent it from slipping.
- ▶ The crane lifting gear on the mast must have a minimum clear length of 2 m.
- ▶ The lifting accessories of the crane lifting gear should be fastened in such a way that they do not come into contact with any attachments or the overhead guard when lifting.
- ▶ Do not stand under a swaying load.
- ▶ The truck should only be loaded by people who are trained in using lifting accessories and lifting gear.
- ▶ Wear safety shoes when loading by crane.
- ▶ Do not enter or stand in the hazardous area.



Truck net weight: see page 45.



Lifting the truck by crane

Requirements

- Park the truck securely, see page 61.

Procedure

- Secure the crane slings to the attachment points (62) and (63).
- Raise and load the truck.
- Lower and deposit the truck carefully (see page 61).
- Secure the truck with wedges to prevent it from rolling away.

This concludes the loading by crane.

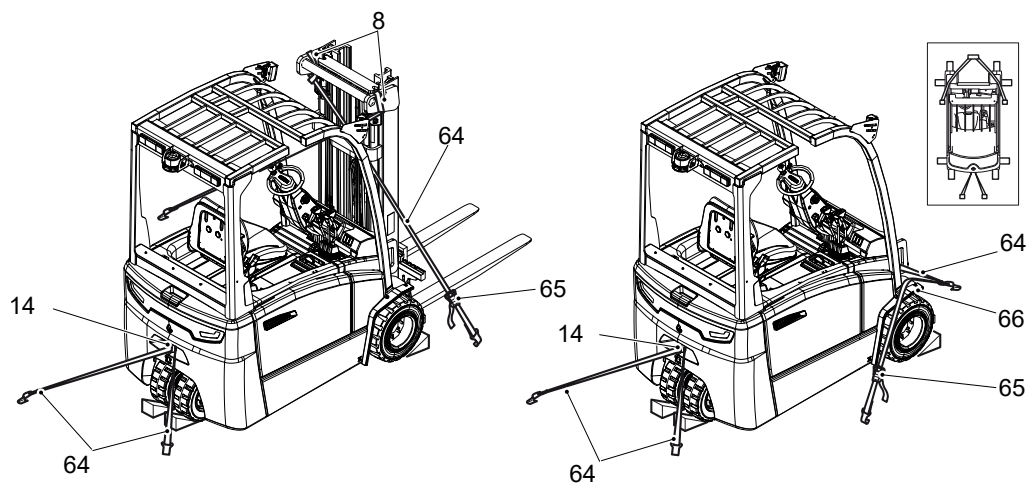
3 Securing the truck during transport

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.
-



Securing the industrial truck for transport

Requirements

- Position the industrial truck securely on a lorry or trailer, see page 124.

Tools and Material Required

- 2 fastening belts with a tensioner
- Retaining wedges.

Procedure

- Secure the truck with the fastening belt (64) at the top cross member of the mast (8) and the trailer coupling (14) or over the mud guard (66) and the trailer coupling (14).
- Tighten the fastening belt (64) with the tensioner (65).

The truck is now secured for transport.

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.

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.
-

Preparing the truck for operation after delivery or transport

Procedure

- Check the equipment is complete.
- Check the hydraulic oil level, see page 190.
- Check the transmission oil level, see page 197.
- Install the battery if necessary, see page 71.
- Charge the battery, see page 78.

The truck can now be started, see page 102.



To operate the truck without its own drive system, see page 170.

D Battery - Servicing, Recharging, Replacement

1 General notes on handling batteries

Maintenance personnel

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

The truck must be parked securely before all work on the batteries, see page 124.

Battery disposal

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

1.1 Potential hazards

WARNING!

Danger when using unsuitable batteries that have not been approved for the truck by the manufacturer

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 the manufacturer can lead to a deterioration of the braking system during energy recovery operations and also cause considerable damage to the electrical control system. In addition, overloading of and over temperature in the battery elevate the risk of fire. The use of batteries that have not been approved by the manufacturer can therefore affect the health and safety of personnel.

- ▶ Only manufacturer-approved batteries may be used on the truck.
 - ▶ Battery equipment must only be replaced with the agreement of the manufacturer.
 - ▶ 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.
-

1.2 Touch voltage hazard

WARNING!

Touch voltage hazard

Hazardous touch voltages may occur in the event of a technical or mechanical defect on the battery. Touch voltages also occur on seemingly discharged batteries. Touching the battery terminals or live attachments (battery cable, battery connector etc.) can result in dangerous current flows through the body. There is a risk of serious, irreversible or fatal injuries.

- ▶ Tag out the faulty battery and take out of service.
 - ▶ Do not touch faulty batteries.
 - ▶ Do not place any objects or tools on the lithium-ion battery to avoid short-circuiting the battery.
 - ▶ Do not short-circuit the lithium-ion battery.
 - ▶ Notify the customer service department.
-

With this kind of defect the battery must not be touched and must not come into contact with metal objects see page 62.

2 Safety Regulations 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.
-

⚠ CAUTION!

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

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 2000 mm from the truck. The room must be ventilated. Fire protection equipment must be on hand.

Battery maintenance

The battery cell covers must be kept dry and clean. Terminals and cable shoes must be clean, lightly greased with terminal grease and must be securely tightened. Batteries with non insulated terminals must be covered with a non slip insulating mat.

2.1 Particular hazard from combustion products

WARNING!

Risk due to contact with combustion products

Combustion is a chemical process by which a flammable material combines with oxygen under heat and light (fire). The resulting combustion products can occur in the form of smoke, through leaking fluids, escaping gases, debris as well decomposition products of certain chemicals. These combustion products are substances that enter the body through the respiratory tract or skin, where they can produce adverse effects such as choking.

- ▶ Avoid contact with combustion products.
- ▶ Use protective equipment.

-
- Hydrogen fluoride (HF) Hydrofluoric acid = extremely corrosive
 - Risk of toxic substances produced by pyrolysis
 - Risk of highly flammable gas mixtures.
 - Other combustion products: Carbon monoxide & - dioxide.

2.2 Special fire fighting protective equipment

- Use self-contained breathing apparatus.
- Wear protective overalls.

2.3 Additional fire fighting instructions

- Risk of metal fires.
- Fire residue, contaminated extinguishing agents or materials must be disposed of in accordance with the local official regulations.
They must not be introduced to the water system, drainage system or underground water.

Unsuitable extinguishing agents

- Water
- Foam
- Grease fire extinguishing agents
- Powder extinguishers
- Metal fire extinguisher (PM 12i extinguisher)
- Metal fire extinguisher powder PL-9/78 DIN/EN 3SP-44/95
- Dry sand

Suitable extinguishing agents

- Carbon dioxide extinguisher (CO₂)

2.4 Instructions for cooling an overheated, non physically damaged battery

This type of damage may be caused by a short circuit inside the battery, which may cause battery fire.

Endangered unopened batteries can be cooled using a water jet.

3 Battery types

⚠ CAUTION!

Always use batteries with insulated covers or live components.

Truck type	●	○	○	○
EFG BA 113	48 V - 3PzS - 375 Ah (830x414x627, 560)			
EFG BA 115	48V - 4PzS - 500Ah (830x522x627, 708)	48 V - 3PzS -375 Ah (830x414x627, 560)		
EFG BB 216k	48 V - 4PzS - 500 Ah (830x522x627, 708 kg)	48 V - 5PzS - 625 Ah (830x630x627, 856 kg)	51.2 V - Li-Ion - 300 Ah (830x630x627, 856 kg)	
EFG BC 316	48 V - 5PzS - 625 Ah (830x630x627, 856 kg)	48 V - 6PzS - 750 Ah (830x738x627, 1013 kg)	51.2 V - Li-Ion - 300 Ah (830x630x627, 856 kg)	51.2 V - Li-Ion - 450 Ah (830x630x627, 856 kg)

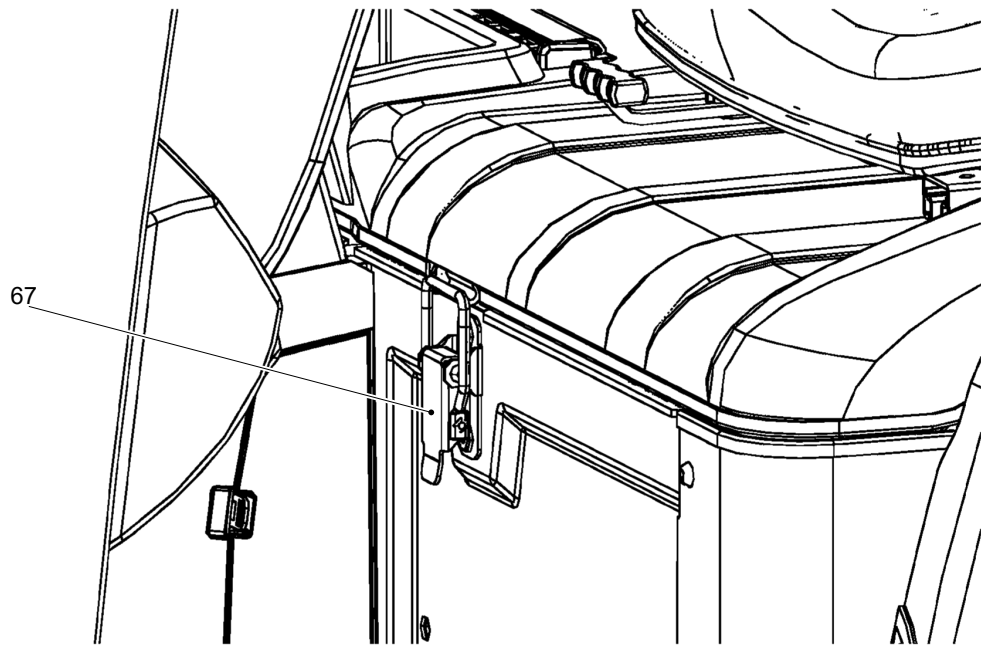
Truck type	●	○	○	○
EFG BC 320	48 V - 5PzS - 625 Ah (830x630x627, 856 kg)	48 V - 6PzS - 750 Ah (830x738x627, 1013 kg)	51.2 V - Li-Ion - 300 Ah (830x630x627, 856 kg)	51.2 V - Li-Ion - 450 Ah (830x630x627, 856 kg)
EFG BC 325	48 V - 5PzS - 625 Ah (830x630x627, 856 kg)		51.2 V - Li-Ion - 300 Ah (830x630x627, 856 kg)	51.2 V - Li-Ion - 450 Ah (830x630x627, 856 kg)
EFG BC 325	48 V - 6PzS - 750 Ah (830x738x627, 1013 kg)		51.2 V - Li-Ion - 450 Ah (830x738x627, 1013 kg)	51.2 V - Li-Ion - 525 Ah (830x738x627, 1013 kg)
EFG BC 330	48 V - 6PzS - 750 Ah (830x738x627, 1013 kg)		51.2 V - Li-Ion - 450 Ah (830x738x627, 1013 kg)	51.2 V - Li-Ion - 525 Ah (830x738x627, 1013 kg)

Truck type	○	○	○
EFG BB 216k	51.2 V - Li-Ion - 600 Ah (830x630x627, 856 kg)		
EFG BC 316	51.2 V - Li-Ion - 600 Ah (830x630x627, 856 kg)	51.2 V - Li-Ion - 450 Ah (830x738x627, 1013 kg)	51.2 V - Li-Ion - 525 Ah (830x738x627, 1013 kg)
EFG BC 320	51.2 V - Li-Ion - 600 Ah (830x630x627, 856 kg)	51.2 V - Li-Ion - 450 Ah (830x738x627, 1013 kg)	51.2 V - Li-Ion - 525 Ah (830x738x627, 1013 kg)

The battery weights are indicated on the battery data plate.

The truck will be equipped with different battery models, depending on the application.

4 Exposing the battery



Requirements

- Park the truck securely, see page 124.
- Load handler lowered.
- Key switch set to OFF.
- Key removed.
- Set the Emergency Disconnect OFF.
- If given, make sure that all bins and trays on the armrest and the cup holder are empty.

Procedure

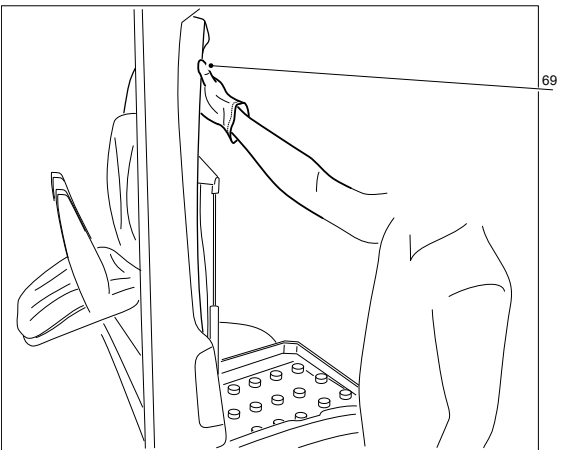
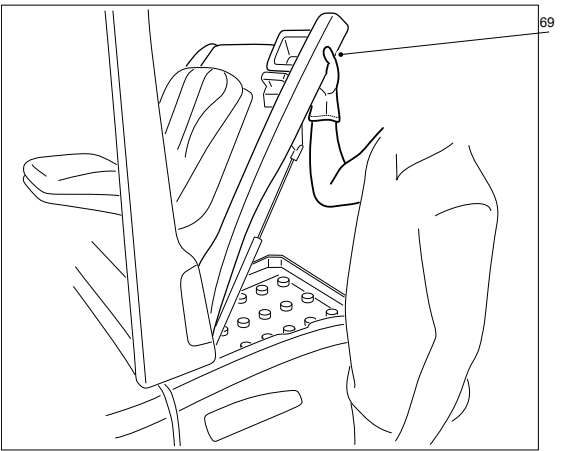
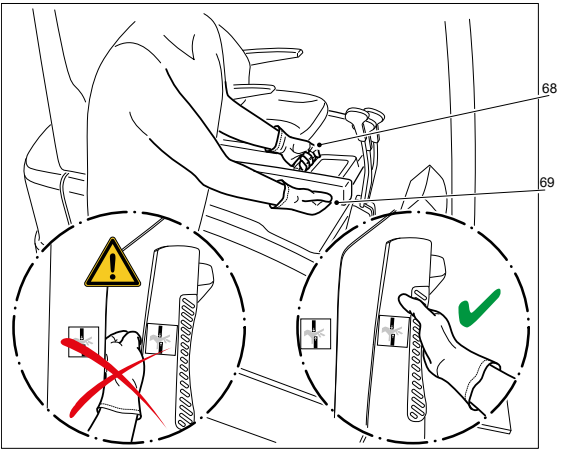
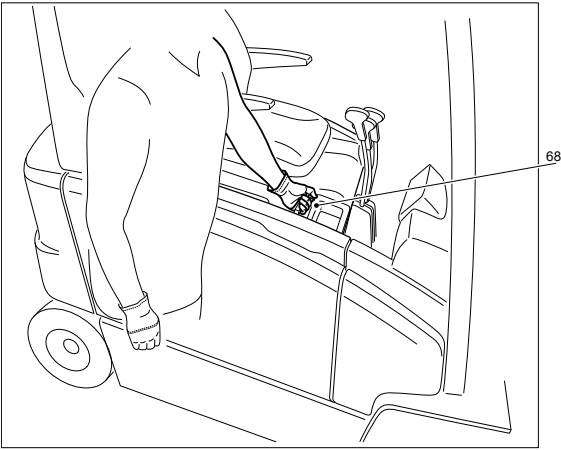
- Unlatch the seat hood (67).
- Unplug the battery connector (74).
- Turn handle (72) clockwise and pull.



The safety catch is open (73).

- Rotate the seat hood counter-clockwise with the handles (68, 69).
- Lift the hood so that it is secured.

The battery (76) is now exposed.



⚠ CAUTION!

Risk of injuries due to movable parts

There is a risk of pinching and resulting injuries to hand and fingers when approaching the open position of the seat hood.

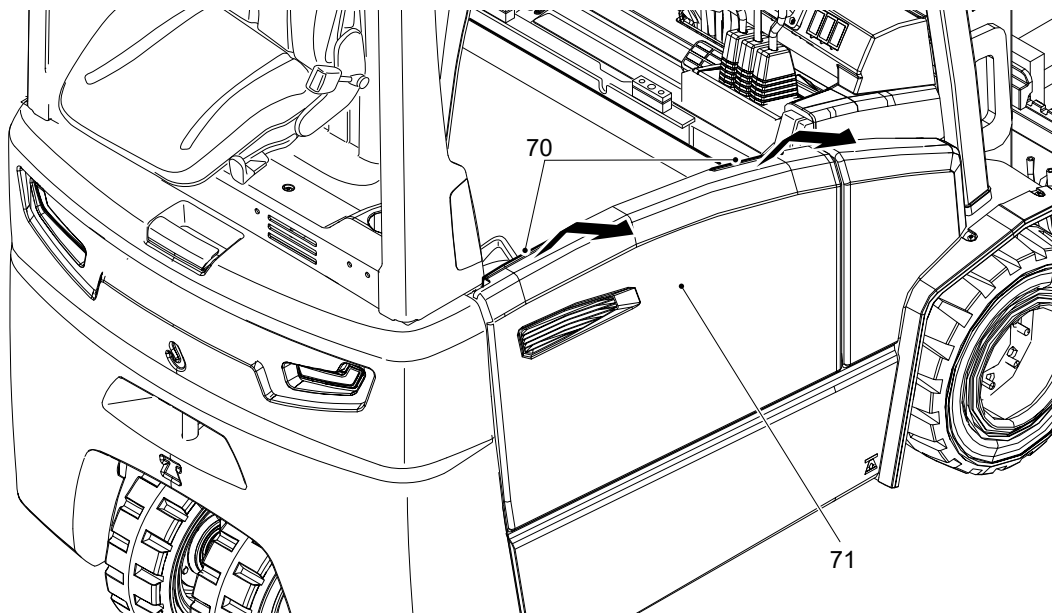
► Always be aware of hand and fingers when rotating the seat hood.

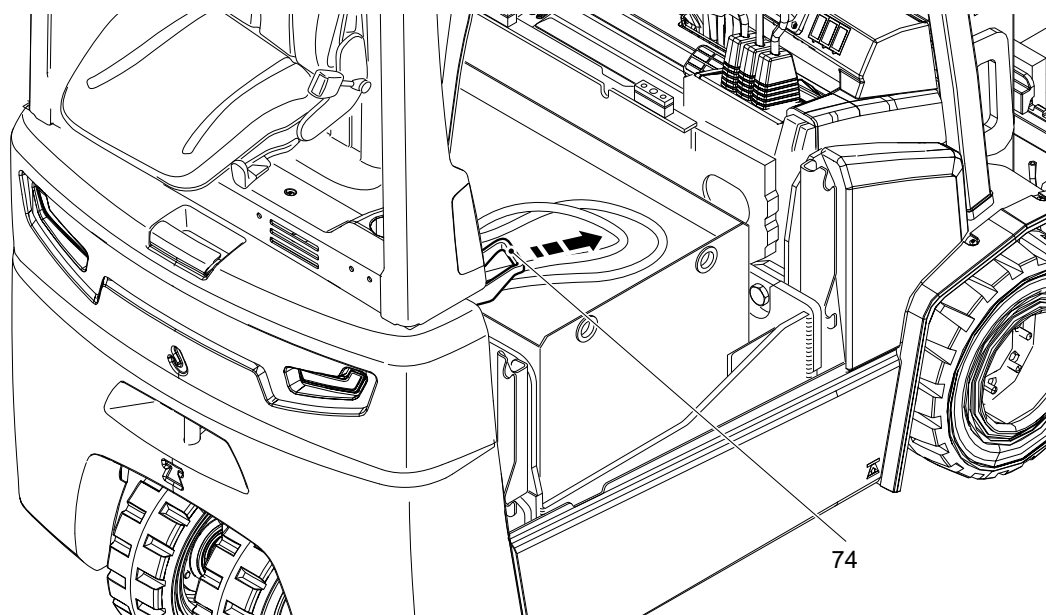
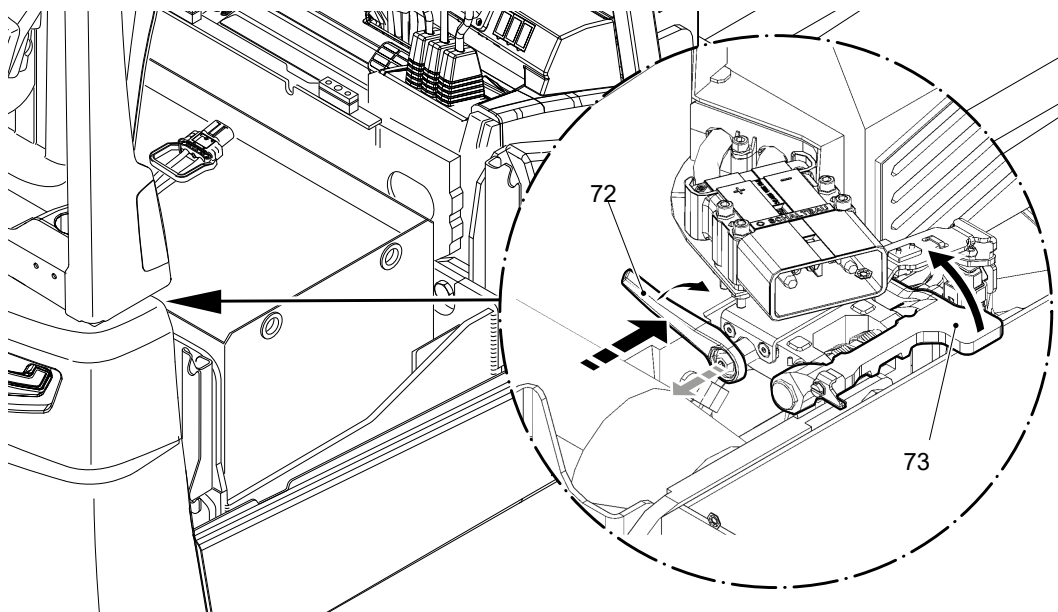
Lifting the seat hood

- Lift the seat hood on the upper handle (68) with the left hand.
- Grasp the lower handle (69) with the right hand.
- Release the upper handle (68).
- Lift up the seat hood with the help of the right hand on the lower handle (69).

Removing the side panel

- Lift the side panel (71) with the provided handles (70).
- Lift upwards and outboard to free the shafts from the truck receptacles.





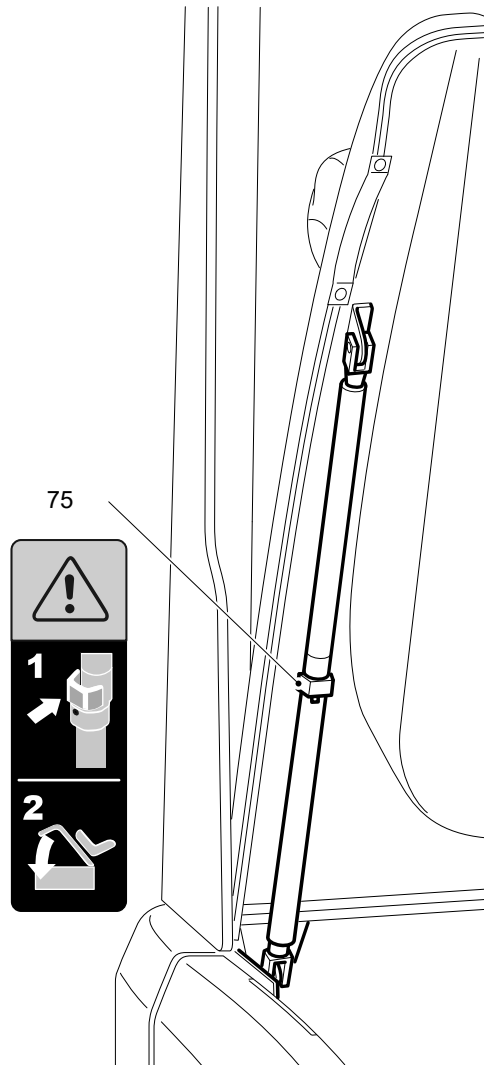
5 Removing or installing the battery

⚠ CAUTION!

Risk of pinching fingers

Due to its weight, the seat hood carries the risk of pinching fingers when closing.

- ▶ Always make sure that the lifted seat hood is retained (75).
- ▶ Close seat hood slowly and with particular care.



⚠ WARNING!

Accident risk during battery removal and installation

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

- ▶ Note the "Safety regulations for handling acid batteries" section in this chapter.
- ▶ Wear safety shoes when removing and installing the battery.
- ▶ Use only batteries with insulated cells and terminal connectors.
- ▶ Park the truck on a level surface to prevent the battery from sliding out.
- ▶ Make sure the crane slings have sufficient capacity to replace the battery.
- ▶ Use only approved battery replacement devices (battery roller stand, replacement trolley etc.).
- ▶ Make sure the battery is securely located in the truck's battery compartment.

Removing the battery

Requirements

- Truck parked securely, see page 124.
- Battery exposed, see page 67.

Procedure

- Deactivate the safety catch (73).
- Position tugger cart to truck base.
- Engage the battery box (76) and pull it out.

NOTICE

Risk of material damage

Risk of material damage to the truck chassis while the battery is being pulled out.

The battery is now removed and positioned securely for charging.

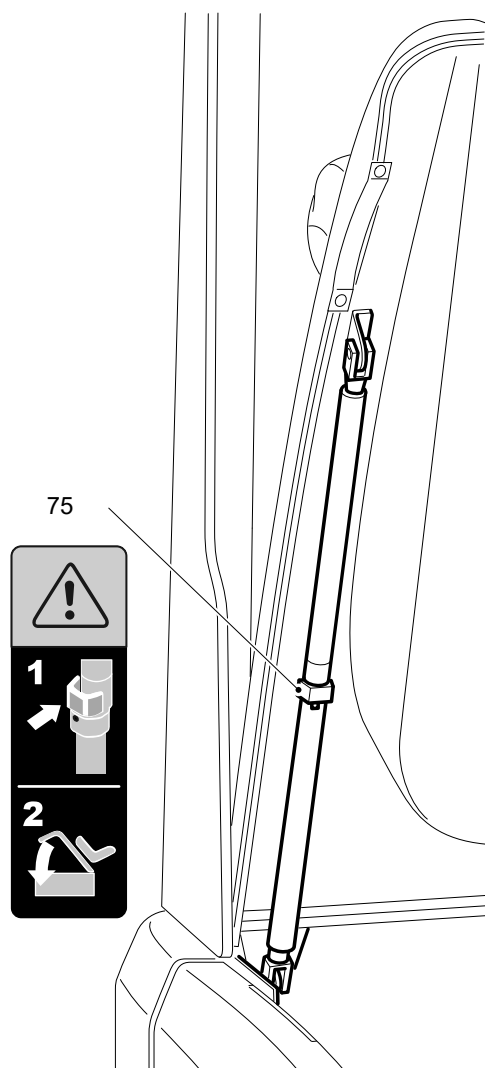
5.1 Remove the Battery with a Crane

⚠ CAUTION!

Trapping hazard

Trapping hazard when replacing the battery.

- ▶ When replacing the battery do not reach between the battery and the chassis.
- ▶ Wear safety shoes.



Removing the battery by crane

Requirements

- Truck parked securely, see page 124.
- Battery exposed, see page 67.

Tools and Material Required

- Crane

Procedure

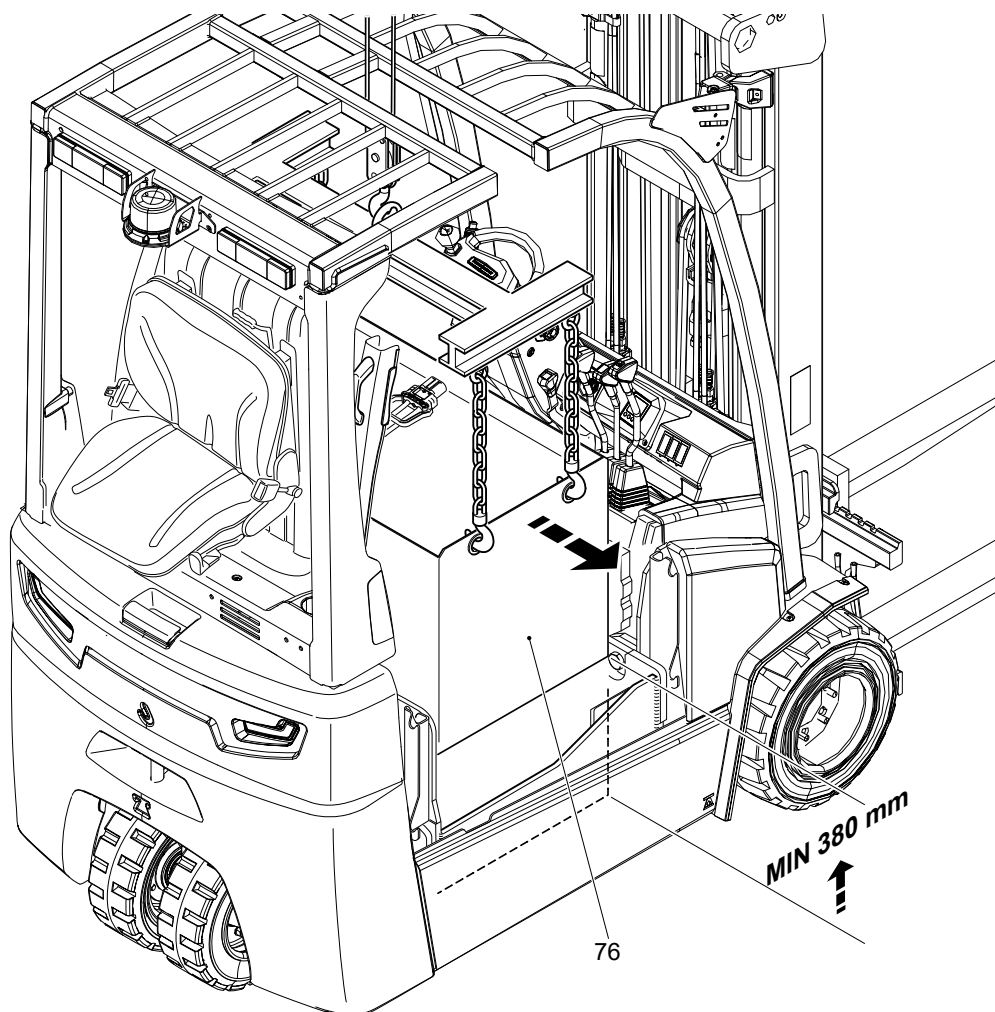
- Unlatch the seat hood (67).
- Lift the hood so that it is secured (75).
- Secure the crane slings to the attachment points (62) and (63).
- Raise and remove the battery.
- Lower and deposit the battery carefully.

Removing the battery

- Unplug the battery plug(74).
- Press handle (72) towards the center of the industrial truck and turn clock-wise.
- Lock-down mechanism will turn upwards.

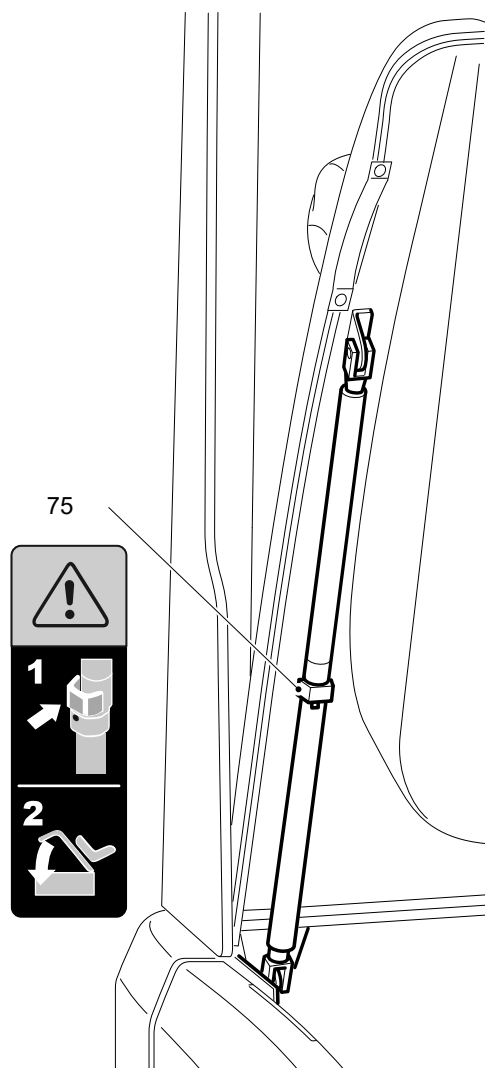
The battery can be removed vertically .

➞ *The minimum lifting distance is 380 mm.*



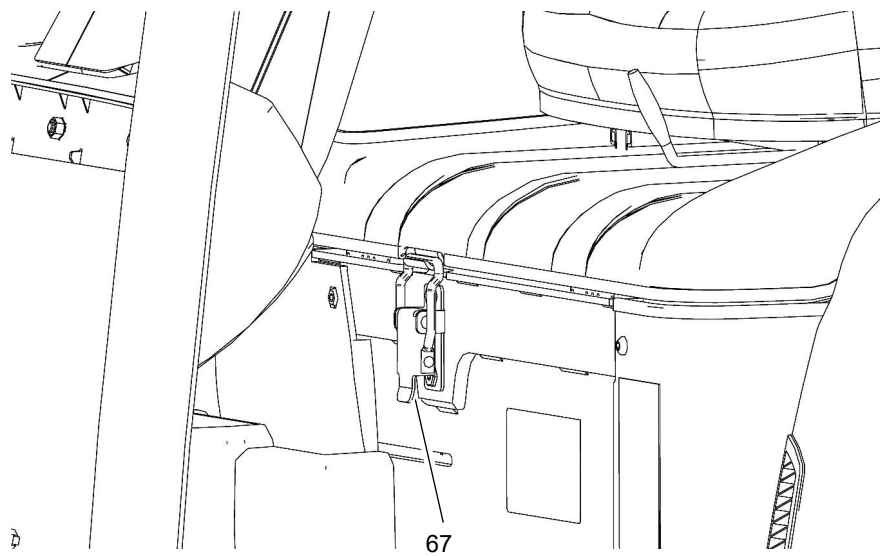
➞ After each replacement, check that the battery is properly secured by the battery lock.

5.2 Battery installation



Procedure

- Re-install the battery in reverse order.
 - Install battery to the truck base.
 - ➔ Lock down mechanism is binded to truck safety software.
- If the lock down procedure is incorrect, the truck is inoperable.
- Close seat hood
 - De-activate the gas spring (75) by pressing.
 - Rotate the seat hood clockwise with the handles (68, 69) to the closed position.
 - Latch the seat hood (67).
 - Latch the battery and battery lock device.



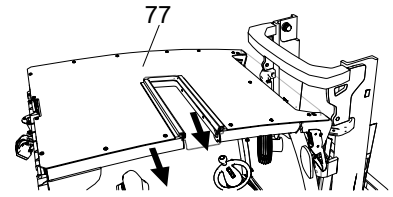
5.3 Battery Exchange with Optional Equipment involved

Covers on Overhead Guard

Plastic shield on the roof:

Procedure

- Slide away the cover (77) of the opening.
- Place the cover safely at a suitable location.



6 Charging the battery

6.1 Charging the Lead Battery

WARNING!

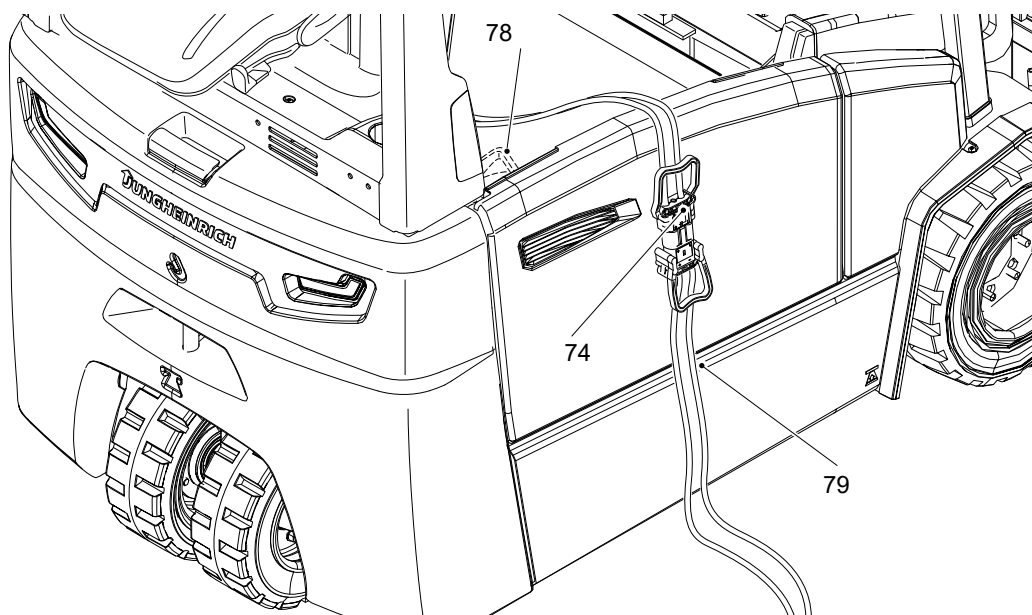
Risk of explosion due to gases produced while charging

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, plug connections and coding pins for visible signs of damage.
 - ▶ Ventilate the room in which the truck is being charged.
 - ▶ 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 must be no combustible material or consumables capable of creating sparks within a minimum distance of 2000 mm 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.
-

6.1.1 Charging the Lead Battery with a Stationary Battery Charger

- When charging, the seat hood must be opened or the side panel must be disassembled.



Requirements

- Truck parked securely, see page 124.
- Battery exposed, see page 67.
- Battery charger switched off.
- Disconnect the battery connector (74) from the truck connector (78).

Procedure

- Connect the battery connector (74) to the charger cable (79) of the stationary battery charger and switch on the battery charger.

The battery is charged.

6.2 Charging lithium-ion batteries (○)

Lithium-ion batteries are charged independently of equipment in accordance with the operating instructions for the lithium-ion battery.

For information on charging the lithium-ion battery with a stationary battery charger, see the operating instructions for the lithium-ion battery.

- The lithium-ion battery can only be charged with a specially equipped stationary battery charger.

WARNING!

Risk of use of unsuitable battery charger on trucks with comfort charging socket

Voltage peaks may occur when using a battery charger with an incompatible voltage, charging capacity and battery technology. Voltage peaks can permanently damage the battery charger, truck and battery. Spark formation and uncontrolled movement of electronically controlled components may cause personal injury and material damage.

- ▶ The battery must only be charged with the Jungheinrich battery charger designed for this battery.
 - ▶ Use only battery chargers approved by the manufacturer.
-

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!

Danger when charging with an unsuitable battery charger

The use of an unsuitable charger can cause the battery to overheat. Using unsuitable chargers can result in serious personal injury and material damage.

- ▶ Charge the lithium-ion battery with a stationary charger approved by the manufacturer.
 - ▶ Charge the lithium-ion battery with an on-board charger approved by the manufacturer.
-

WARNING!

Risk of accidents and injuries when handling lithium-ion batteries

Improper use can result in overheating, fire or explosion.

- ▶ Do not expose the lithium-ion battery during charging.
 - ▶ Do not use the lithium ion battery cable connected to the truck for charging.
 - ▶ Do not place any metallic objects on the lithium-ion battery.
-

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.
-

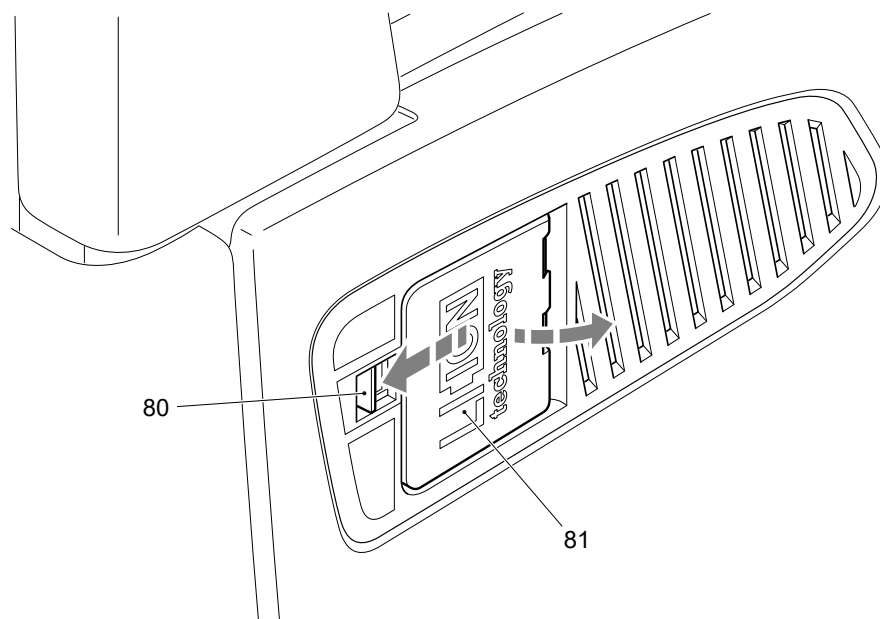
NOTICE

Intermediate charging

A lithium-ion battery that is not fully discharged can be recharged at any time either in part or in full. In order to ensure the reliable operation of the lithium-ion battery, the following must be borne in mind:

- ▶ In the event of frequent intermediate charging, charge the lithium-ion battery fully every 4 weeks. If the battery charger has a “balancing” function, ensure that the balancing phase is completed at the end of charging. Further information on “balancing” can be found in the operating instructions for the battery charger.
 - ▶ Turn off the battery charger before disconnecting the lithium-ion battery from the battery charger.
-

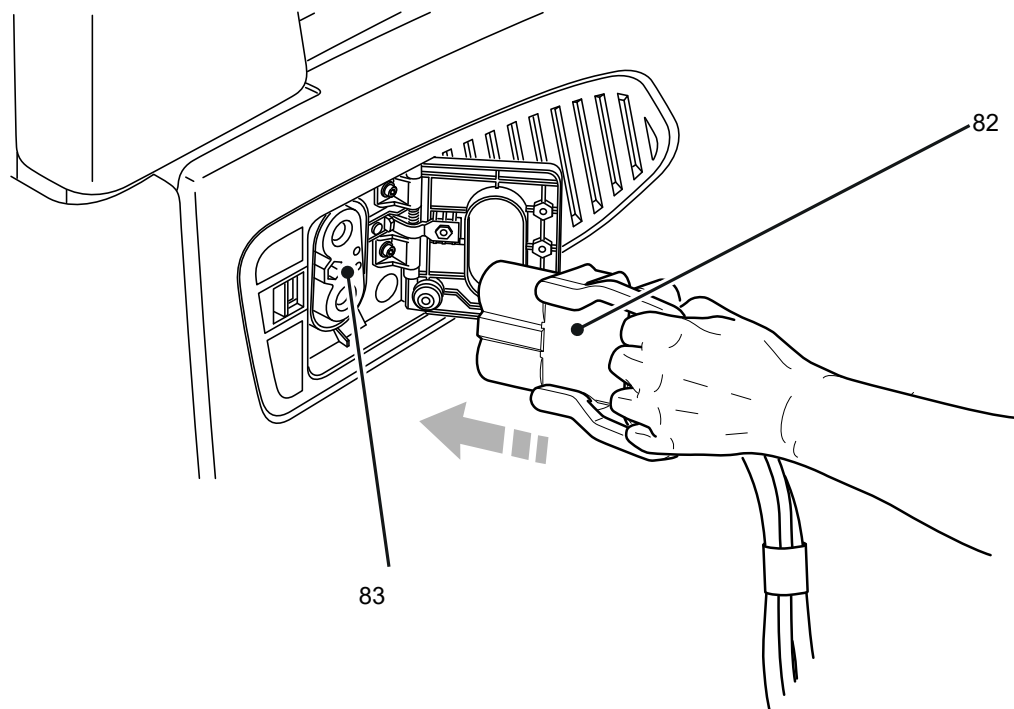
6.2.1 Charging Lithium-Ion Batteries with Convenience Plug



Opening Charging Flap Door

Procedure

- Open the lock (80) of the flap door using left hand thumb
The flap door (81) opens by the action of the spring

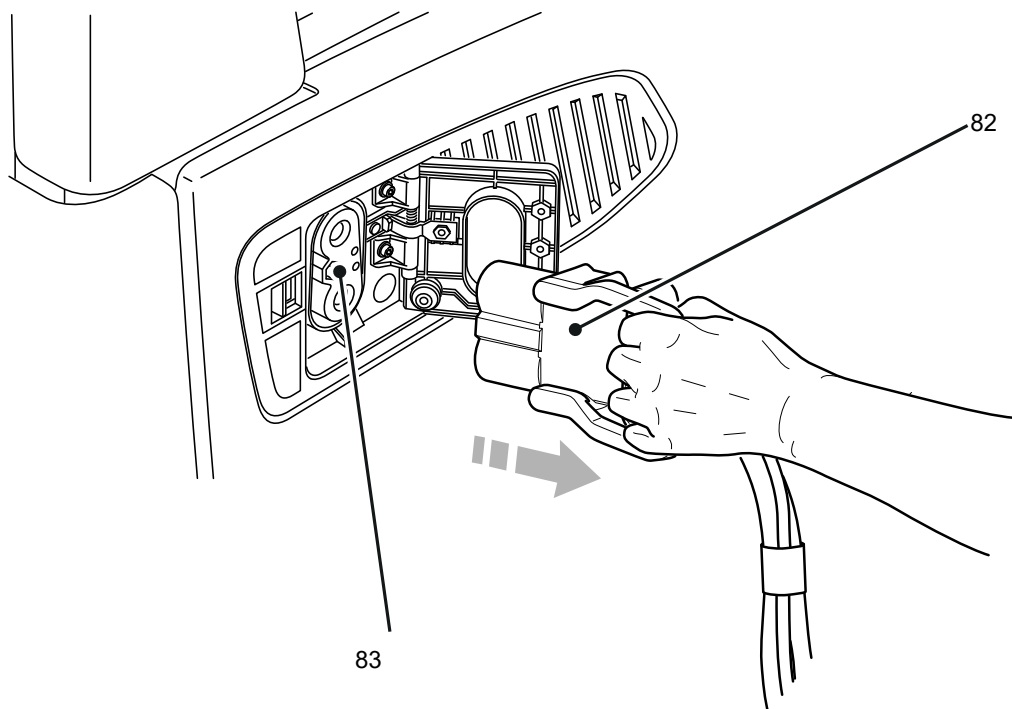


Inserting Charging Plug

Procedure

- Grasp the charging plug (82) from the handle
- Insert it in the exposed socket (83).

The charging wire is ready to start the charging process

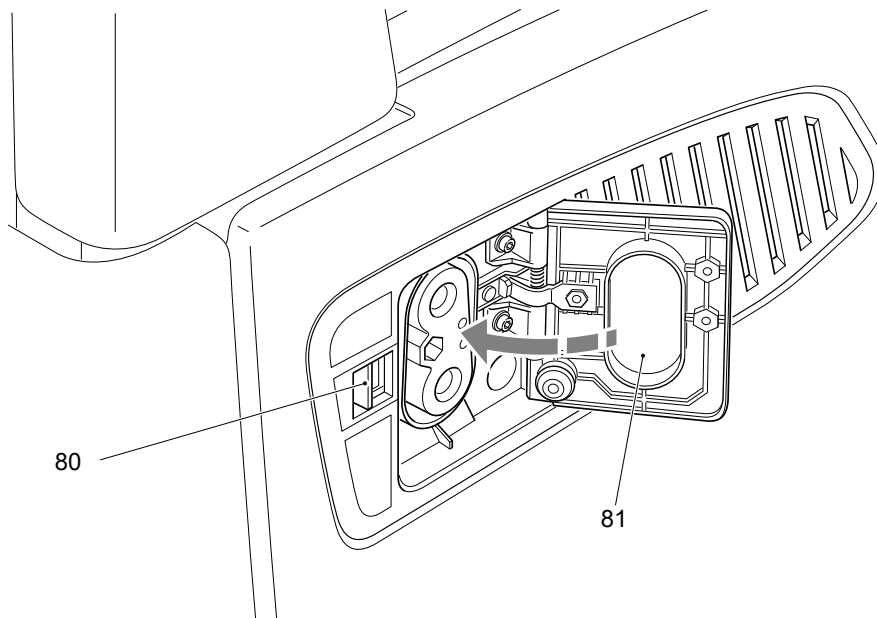


Removing Charging Plug

Procedure

- Grasp the charging plug (82) from the handle
- Pull it out from the socket (83).

The convenient plug can be closed



Closing Charging Flap Door

Procedure

- Close the flap door (81) using the right hand
- Close the lock (80) of the flap door using right hand index finger

The charging socket is closed

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.

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.

Hazardous area

WARNING!

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

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

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

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.
-

Safety devices, warning signs and warning instructions

Safety devices, warning signs (see page 43) and warning instructions in the present operating instructions must be strictly observed.

CAUTION!

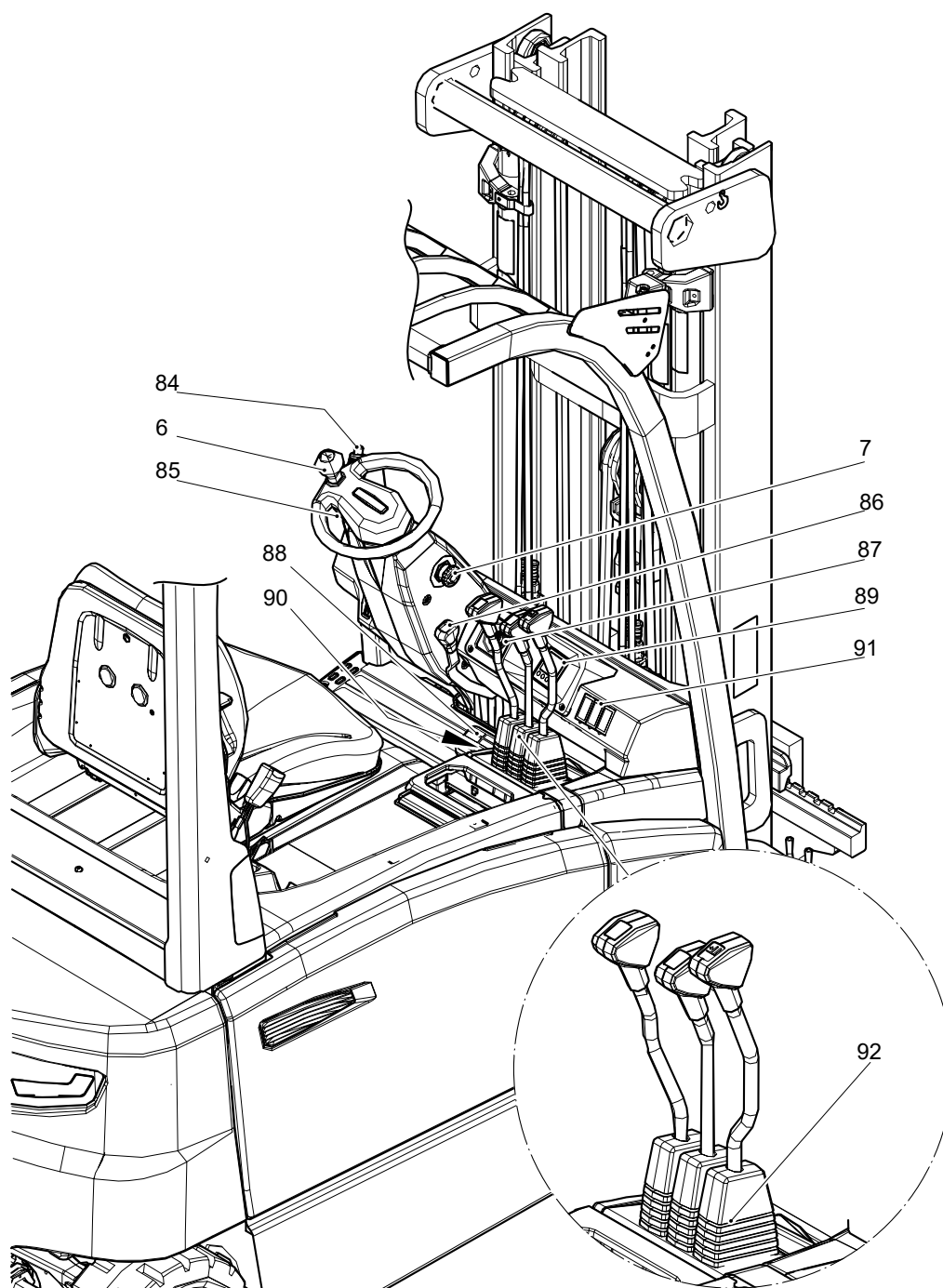
Reduced headroom can cause injuries

Trucks with reduced headroom are equipped with a warning label within the operator's line of sight.

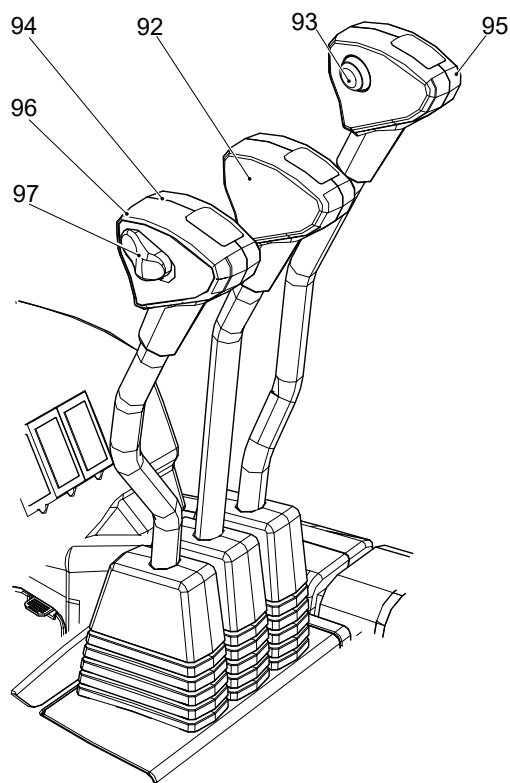
- ▶ The max. recommended body size indicated on this warning sign must be observed.
 - ▶ The headroom is also reduced when you wear a protective helmet.
-

2 Displays and Controls

2.1 Controls



Item	Control/ display element		Function
6	Steering wheel	●	Steering the industrial truck.
7	Emergency disconnect switch	●	Disconnects the main power supply; all truck operations are disabled.
85	Flashing lever	●	Flashes in the required travel direction.
84	Parking brake lever	●	Applies / releases parking brake.
87	Key switch	●	Switches control current on and off. Removing the key prevents the truck from being switched on by unauthorised personnel.
	ISM access module*	○	Switches the truck on and off.
	Keypad	○	Switches the truck on. Switch off via the control panel.
	Transponder reader		
89	Dashboard control panel	●	Displays the battery capacity, service hours, errors, key warning indicators, wheel position, travel direction and the operation of options (○)
91	Armrest control panel	●	Switches electrical optional equipment on and off.
88	Brake pedal	●	Provides infinitely variable braking control.
117	Accelerator pedal	●	Provides infinitely variable travel speed control
	Twin pedal control "Reverse" accelerator pedal	○	The truck reverses when the accelerator pedal is applied. Provides infinitely variable travel speed.
	Twin pedal control "Forward" accelerator pedal	○	The truck travels forward when the accelerator pedal is applied. Provides infinitely variable travel speed.
92	Lever	●	Controls the following functions:
		○	– Fwd/rev. travel direction
		○	– Load handler lift/lower
		○	– Mast forward/reverse tilt
		○	– "Horn" button
			– Sideshifter left/right (○)
			– Auxiliary hydraulics (○)



Item	Control / Display		Function
93	ZH2 activation button	○	ZH2 function activation button
94	Basic hydraulic functions lever	●	Lever for operating the basic lift/tilt hydraulic functions
95	Sideshifter/auxiliary hydraulics 1 optional button / lever	●	Sideshifter or auxiliary hydraulics 1 button
96	"Horn" button	●	Activates an audible warning
97	Travel direction switch (not available with dual pedal control)	●	Selects travel direction / neutral position

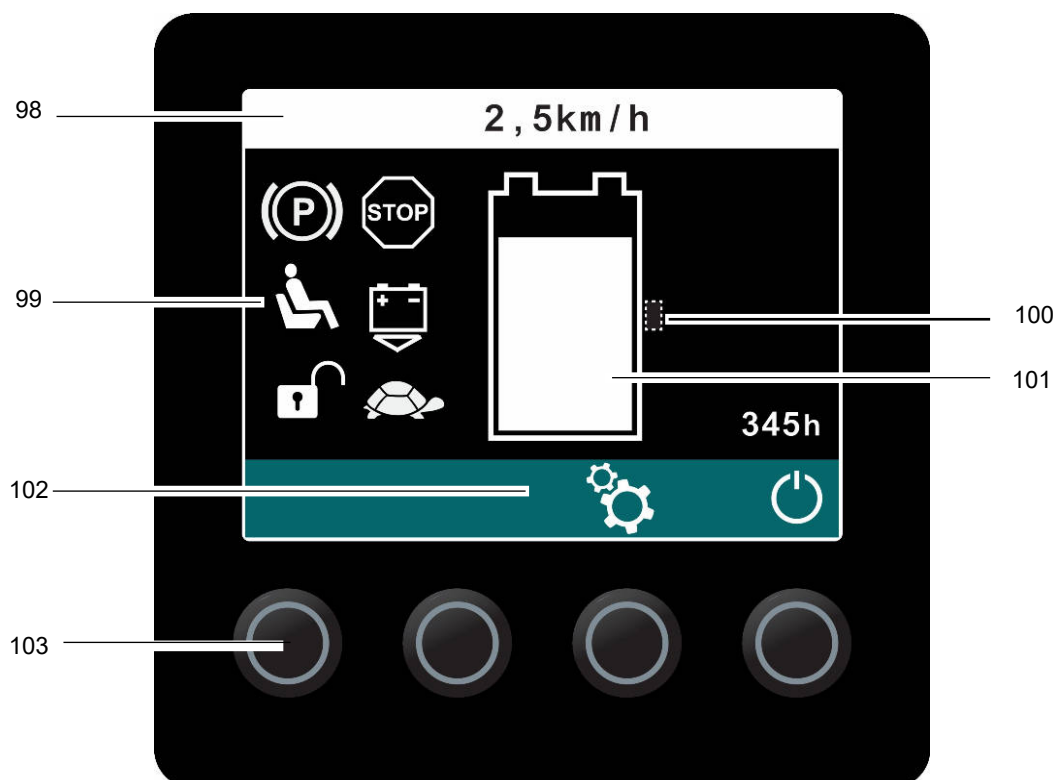
2.2 Function symbols for the Pilots

→ The symbols shown are examples. The actual direction of movement of the hydraulic functions must be determined from the labels on the levers of the Pilots.

Symbol	Meaning
	Lift
 	Tilt
 	Side shift

2.3 Control panel with display unit

2.3.1 2-Inch Display



Item	Control/display	Function
98	Information line	Displays event messages and speed
99	Symbol field	Displays the icons see page 96.
100	Battery Type	Empty = standard battery; 1 = Dry battery
101	Battery capacity display	Battery discharge status.
102	Button allocation	see page 94.
103	Buttons	Selection buttons for the functions shown above them.

2.4 Button allocation of the display

Symbol	Meaning
	Information field toggle: Allows the information displayed in the information field to be changed.
	Slow travel: Switches slow travel on and off.
	Operating programme down: Switches the operating programme down.
	Operating programme up: Switches the operating programme up.
	Settings: Switches to setting mode. Set time and access authorisations (optional).
	Switch off (optional): Allows the truck to be switched off (where option is available).

Button allocation in menu for managing codes or transponders (○)

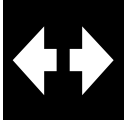
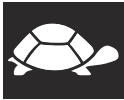
Symbol	Meaning
	Back: Cancels the current procedure and returns to the previous menu.
	Log-in history: Displays the chronological log-in history
	Change set-up code: To change the set-up code and to activate the keypad or the transponder reader.
	Edit access code / transponder: To add or delete access codes or transponders

Button allocation in the submenus

Symbol	Meaning
	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 access codes selected
	Add: To add a new access code
	Confirm: To confirm an entry or a transponder code

2.5 Symbols in the display

Any number of pictograms can be displayed in the pictogram field (99). Which pictograms are shown in the pictogram field depends on the operating and truck status.

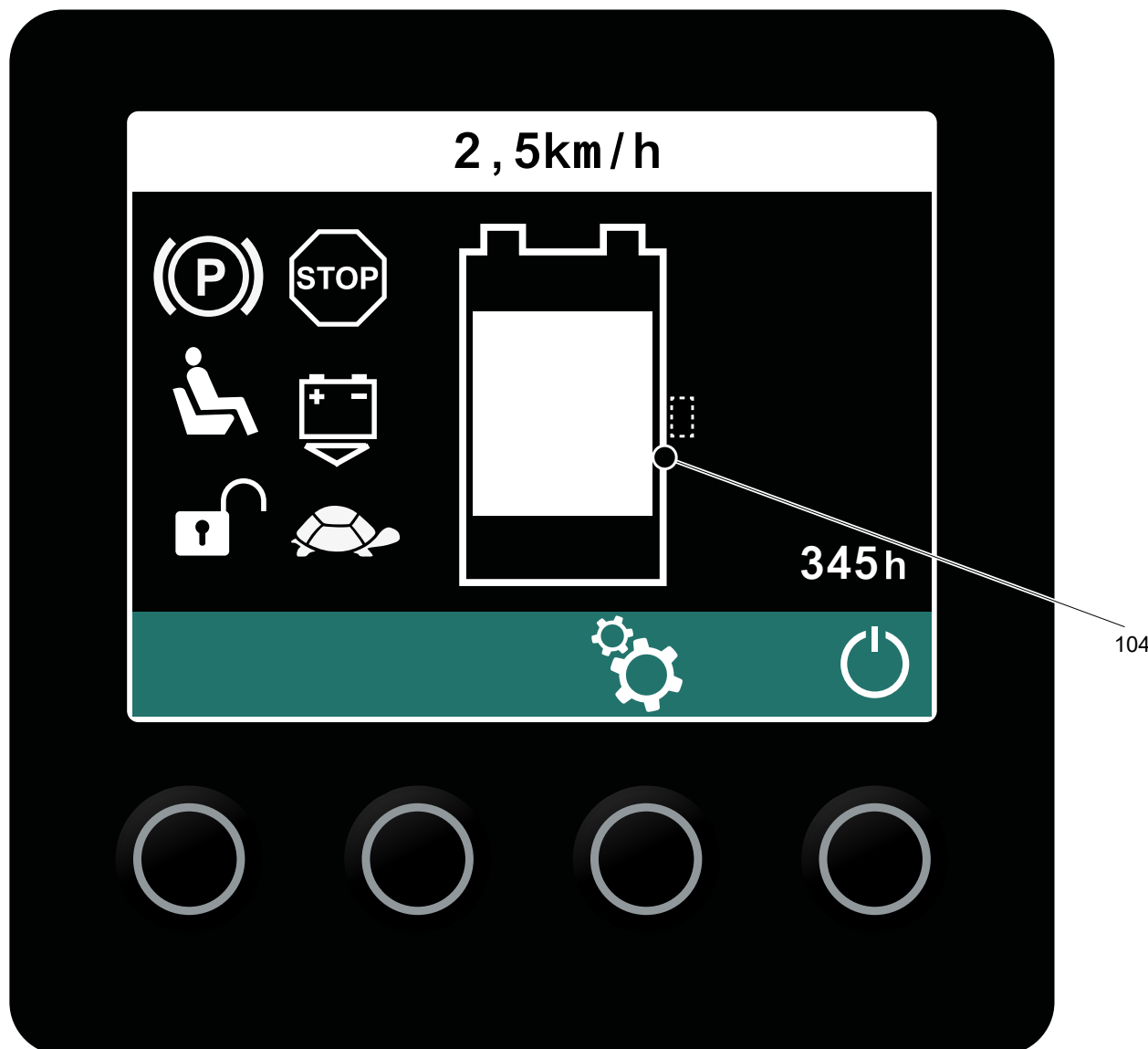
Symbol	Meaning	Colour	Function
	Indicator (warning indicator)	Green	Indicator and warning indicator active
	Slow travel	Green	Slow travel activated by operator
		Yellow	Slow travel activated by truck
		Red	Emergency recovery mode active (travel speed 2 km/h)
	Service note	Yellow	Maintenance due
		Red	Safety inspection due
	Warning	Yellow	Operating error
		Red	Truck malfunction
	Stop notice	Red	Functions deactivated due to truck malfunctions
	Impact display	Yellow	Medium impact
		Red	Severe impact
	Overtemperature	Red	Overtemperature detected
	Regenerative brake fault	Red	Regenerative brake is not operational Special attention when on inclines: do not travel faster than crawl speed.

Symbol	Meaning	Colour	Function
	Automatic parking brake	Green	Automatic parking brake active Comfort feature, displayed when the automatic parking brake indicator lights up. Truck prevented from rolling away but not parked securely. The automatic parking brake is automatically activated a set time (0 - 60 sec) after the truck stops. The factory setting for this is 30 sec. Automatic parking brake release when accelerator pedal applied.
	Manual parking brake	Red	Manual parking brake engaged
	Cabin door open	Yellow	Door not closed correctly
	Seat switch	Yellow	Seat switch not applied or seat switch applied for more than 6 hours uninterrupted
		Red	Error on seat switch
	Seat belt lock monitoring	Yellow	Seat belt lock not locked
		Red	Wrong activation sequence of seat switch and seat belt lock
	Acknowledgement active	Green	Acknowledgement active
	Acknowledgement feature: incorrect operation	Yellow	Acknowledgement feature, incorrect operation: Hydraulic function requiring acknowledgement activated without acknowledgement
	Toggle function	Green	Second hydraulic control lever function activated
		Red	Second hydraulic control lever function deactivated
	Side shift centred	Green	Side shift centred

Symbol	Meaning	Colour	Function
	Lift limit switch	Green	Lift cut-off overridden
		Yellow	Lift cut-off initiated
	Battery latch / battery door	Red	Battery latch / door open
	Battery acid level	Red	Battery acid level low

2.6 Battery discharge indicator

The battery charge status is shown on the truck display via a battery symbol (101). When a battery is discharged to the permissible discharge level, the battery symbol (101) is displayed empty.



2.7 Battery discharge monitor

NOTICE

Deep discharge can damage the battery

The standard setting for the battery discharge indicator and discharge monitor is based on standard batteries (PzS). When using other types of battery, the display and cut-off points must be set anew. If this adjustment is not made, the battery may become damaged due to deep discharge.

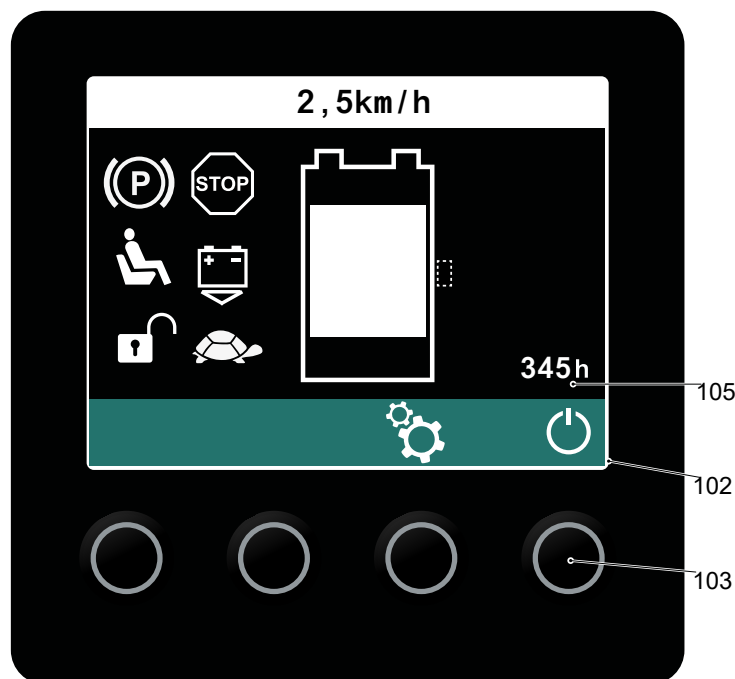
- ▶ This adjustment should only be made by the manufacturer's customer service department.
- ▶ The battery discharge indicator shows the battery's residual capacity.
- ▶ Charge the battery, see page 78.

The power of the truck is progressively reduced under the set residual capacity limit: the travel functions are continuously reduced until separate slow travel, the lift

functions are continuously reduced until cut-off.
Appropriate messages are shown on the display.

- ➔ The battery temperature influences the usable residual capacity of the battery.

2.8 Residual time display



Setting the residual time display

The residual time display (105) is switched on and off via the display toggle button (102/103).

2.9 Operating Programs

Five operating programs with different performance levels are available to adapt the travel and operating functions to the application at hand.

Operating program	Travel speed	Lift speed	Behaviour
Operating program 1	Significantly reduced	Extremely reduced	Very slow
Operating program 2	Reduced	Significantly reduced	Slow
Operating program 3 "efficiency plus"	Significantly reduced	Maximum	Consumption-optimised
Operating program 4	Maximum	Slightly reduced	Fast
Operating program 5	Maximum	Maximum	Maximum

If necessary, the operating programs can also be adapted or restricted to suit the customer. Contact the manufacturer's customer service department.

2.10 Hourmeter

The service hours are counted when the truck is switched on and the seat switch is closed.

3 Preparing the Truck for Operation

3.1 Checks and Operations to Be Performed Before Starting Daily Work

WARNING!

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

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

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

CAUTION!

Risk of accident due to slippery surfaces

There is a risk of accident due to slipping when walking on slippery surfaces with unsuitable footwear.

- ▶ Wear safety shoes or sturdy footwear with non-slip soles.
- ▶ Use the non-slip step and the floor mat for entry and exit.
- ▶ Look out for snow and ice when boarding and alighting the truck in cold temperatures. There is a risk of slipping.

-  Safety shoes, and where applicable additional personal protective equipment, must be worn for some activities.

Checks before daily operation

Procedure

- Visually inspect the entire truck (in particular wheels, wheel bolts and load handler) for damage.
- Check the fork stop (106) and fork-retaining mechanism (107).

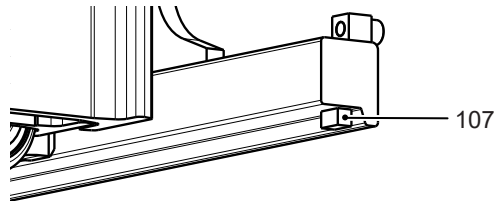
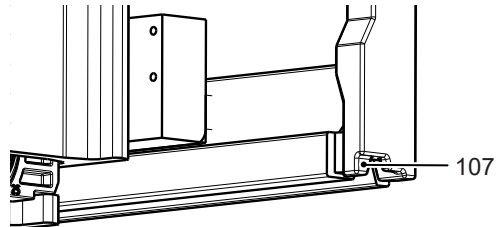
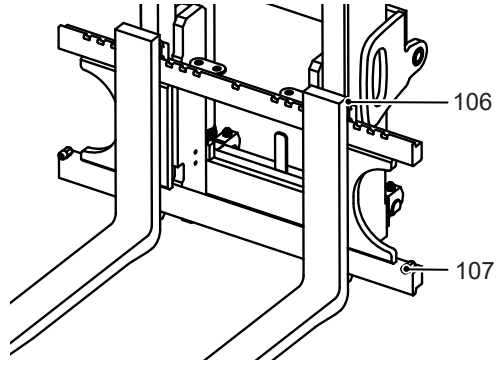


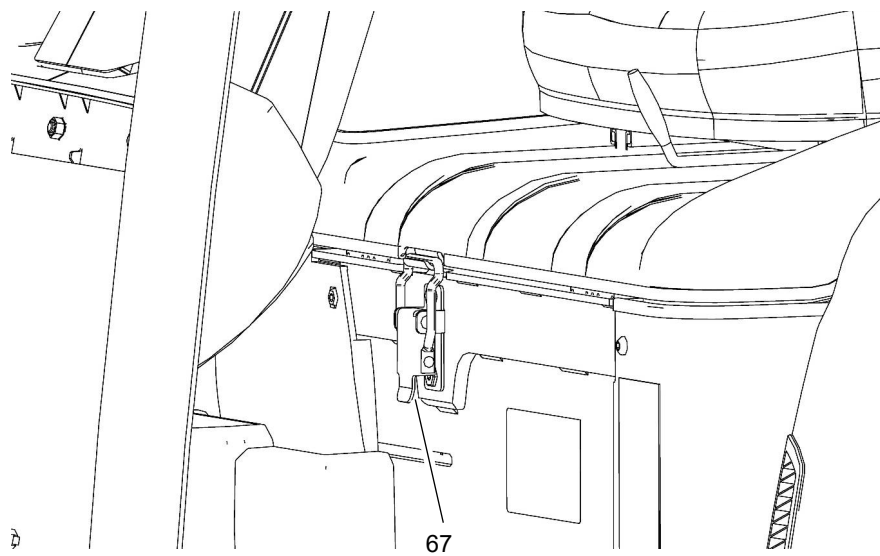
Depending on the fork carriage, the fork-retaining mechanism (107) will be either via retaining bolts (85 Nm) or fixed stops.

- Visually inspect the hydraulic system in the visible area for damage and leaks.
- Make sure the driver's seat is locked in position.
- Test the horn and reversing buzzer (○) where applicable.
- Check that the capacity plate and warning notices are legible.
- Test the controls and displays.
- Test the steering.
- Check the steer angle display (○), turn the steering wheel in both directions as far as the stop and check that the wheel position is displayed on the control panel.
- Make sure the load chains are evenly tensioned.
- Test the seat belt. (The belt should jam if extracted suddenly.)
- Test the seat switch: when the driver's seat is vacated, it should not be possible to activate the hydraulic functions.
- Test the restraint system (○).
- Test the driveCONTROL (○).
 - Raise the fork carriage without load beyond the reference point on the mast. The slow travel symbol lights up on the display.
 - Slowly apply the accelerator pedal on a clear route with good visibility. The maximum speed should be reduced to walking pace (3 km/h).
- Test the hydraulic functions for lifting/lowering, tilting and, if applicable, the attachment.
- Check the accelerator pedal can move freely while the parking brake lever is pulled and the truck is idling, by pressing it several times.
- Visually inspect the battery attachment and cable connections.
- Check the battery latch is present and working.
- Check the load damper hydraulic accumulator for damage (○).
- Check if the battery latch (67) is tight.

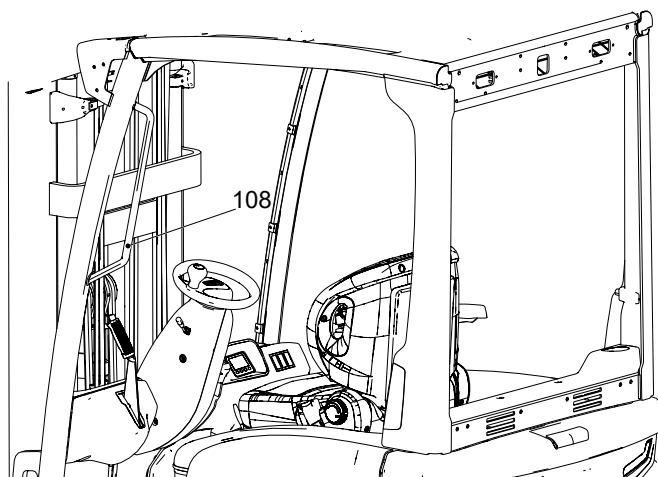


If the battery is not latched, the industrial truck is inoperable.





3.2 Entering or exiting



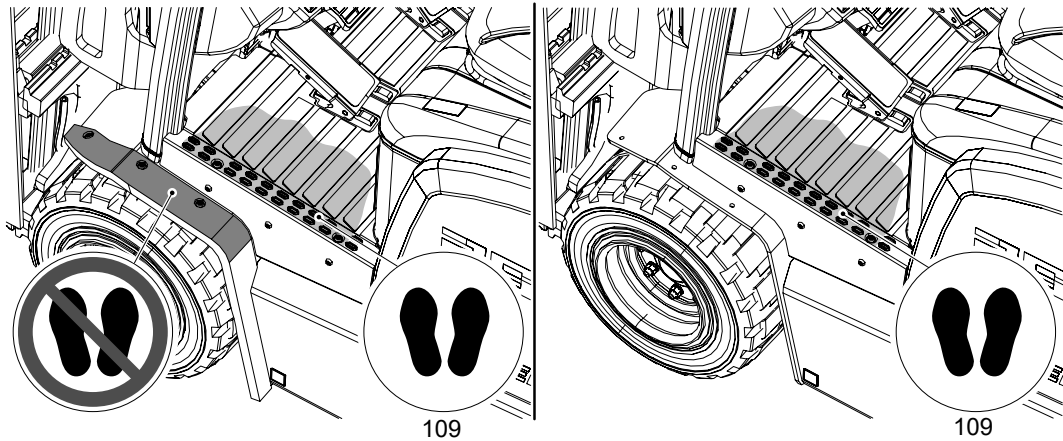
Requirements

- Truck stationary.

Procedure

- Open the cab door (○).
- To enter and exit the cab, hold onto the handle (108).
- Always face the truck when entering and exiting.

- ➔ Always use the entry aid (108) provided to climb onto the truck.
- ➔ An additional step is provided for the operator position extension (○).



→ Step only on the intended places (109).

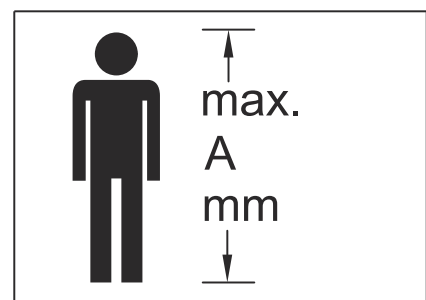
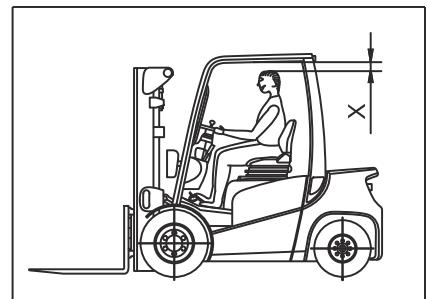
3.3 Trucks with reduced headroom (○)

⚠ WARNING!

An unsuitable workplace can damage your health

Failure to observe the recommended body size can cause stress and endanger the operator and may lead to lasting ill health due to an unhealthy posture and excessive strain on the operator.

- ▶ The operating company must ensure that truck operators do not exceed the maximum body size indicated.
- ▶ The operating company must check that the operators can sit in a normal and upright position without having to strain.



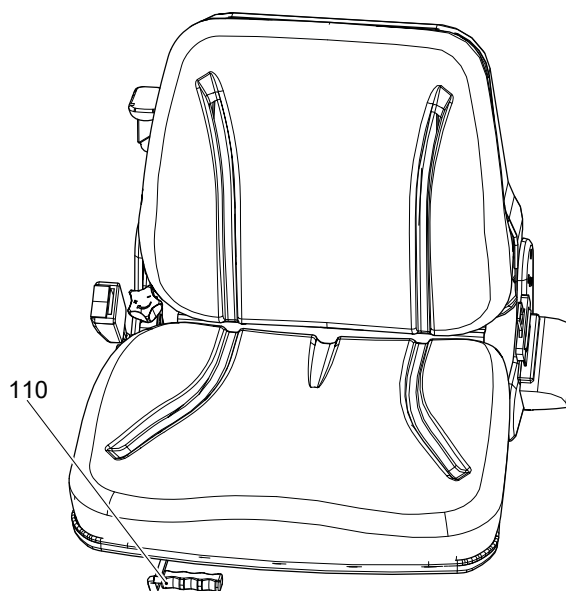
3.4 Setting up the operator position

⚠ WARNING!

Accidents can occur if the driver's seat, steering column and armrest are not engaged

The driver's seat, steering column and armrest can accidentally adjust during travel and therefore cannot be operated safely.

► Do not adjust the driver's seat, steering column or armrest while travelling.



Procedure

- Before starting to travel, adjust the driver's seat, steering column and armrest (if necessary) so that all the controls are within reach and can be applied without having to strain.
- ➔ Pull up the driver's seat locking lever (110) in the unlocked position to adjust the seat.
- 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

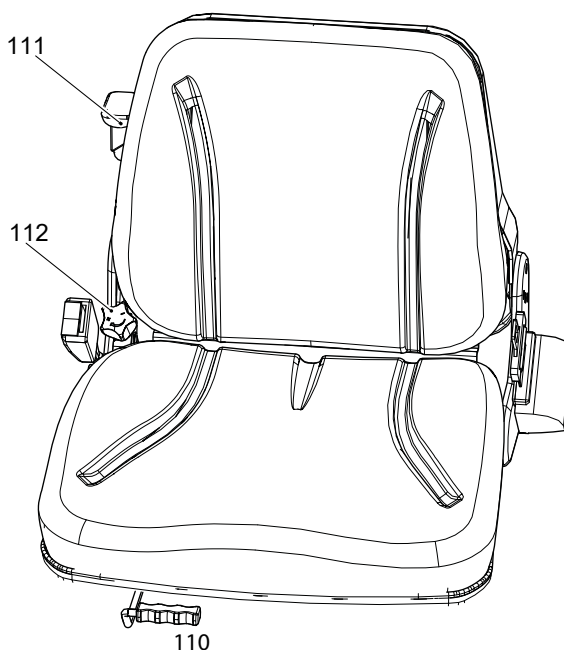
⚠ WARNING!

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.
- ▶ Check and, if necessary, adjust the individual seat setting and driver's weight setting before starting up the truck.
- ▶ Hold the weight setting lever only by the recess; do not reach through underneath the lever.

3.4.1.1 BF8-4



Adjusting the backrest

Procedure

- Sit on the driver's seat.
- Turn the rotary knob (112) to adjust the backrest.
- Adjust the backrest tilt.

The backrest is now set.

Setting the driver's weight

NOTICE

Incorrectly adjusted seat cushioning can damage your health

To achieve optimal seat cushioning, the driver's seat must be adjusted according to the driver's weight.

- ▶ Set the driver's weight when the seat is not occupied.
- ▶ Set the weight adjuster (111) to optimise the cushioning.



The seat is adjustable for a driver's weight from 40 to 120 kg.

Adjusting the seat position

⚠ CAUTION!

An unsecured driver's seat can cause injury

An unsecured driver's seat can slide out of its guide during travel, resulting in accidents.

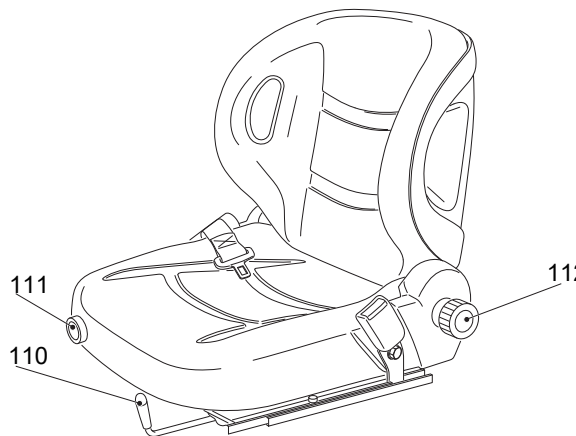
- ▶ The driver's seat must be locked in position.
- ▶ Do not adjust the driver's seat while travelling.

Procedure

- Sit on the driver's seat.
- Pull up the driver's seat locking lever (110) in the direction of the arrow.
- Push the driver's seat forwards or backwards to the desired position
- Engage the driver's seat locking lever (110) in position.

The seat position is now correctly set.

3.4.1.2 BF2-3 (O)



Adjusting the backrest

Procedure

- Sit on the driver's seat.
- Turn the rotary knob (112) to adjust the backrest.
- Adjust the backrest tilt.

The backrest is now set.

Setting the driver's weight

NOTICE

Incorrectly adjusted seat cushioning can damage your health

To achieve optimal seat cushioning, the driver's seat must be adjusted according to the driver's weight.

- ▶ Set the driver's weight when the seat is not occupied.
- ▶ Turn the weight adjuster knob (111) to adjust the optimal cushioning.



The seat is adjustable for a driver's weight from 40 to 120 kg.

Adjusting the seat position

⚠ CAUTION!

An unsecured driver's seat can cause injury

An unsecured driver's seat can slide out of its guide during travel, resulting in accidents.

- ▶ The driver's seat must be locked in position.
- ▶ Do not adjust the driver's seat while travelling.

Procedure

- Sit on the driver's seat.
- Pull up the driver's seat locking lever (110) in the direction of the arrow.
- Push the driver's seat forwards or backwards to the desired position
- Engage the driver's seat locking lever (110) in position.

The seat position is now correctly set.

3.4.1.3 MSG65 (O)

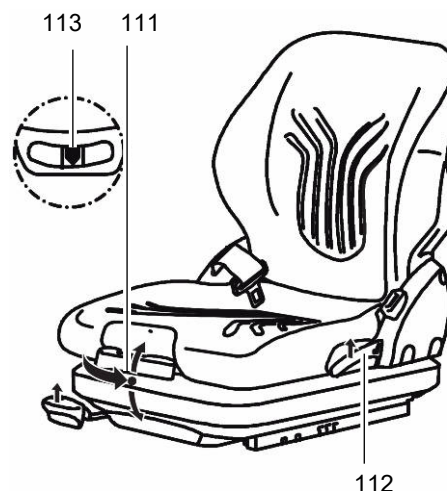
Setting the driver's weight

⚠ WARNING!

Incorrectly adjusted seat cushioning can damage your health

To achieve optimal seat damping, the driver's seat must be adjusted according to the driver's weight.

- ▶ Set the driver's weight when the seat is occupied.
- ▶ Hold the weight setting lever only by the recess; do not reach through underneath the lever.



Procedure

- Fold out the weight setting lever (111) as far as it will go in the direction of the arrow.
- Move the weight adjuster (111) up to set the seat to a higher weight.
- Move the weight adjuster (111) down to set the seat to a lower weight.

- The driver's weight is set when the arrow is in the middle of the display window (113). The minimum or maximum weight setting is reached when you can feel a return stroke on the lever.
- After setting the weight, fold in the weight setting lever (111) completely.

The driver's weight is now set.

Adjusting the backrest

Procedure

- Sit on the driver's seat.
- Pull the lever (112) to adjust the backrest.

- Adjust the backrest tilt.
- Release the lever (112) again. The backrest is locked.

The backrest is now set.

- Hold the weight setting lever (111) only by the recess, never reach through underneath the lever.

Adjusting the seat position

⚠ CAUTION!

An unsecured driver's seat can cause injury

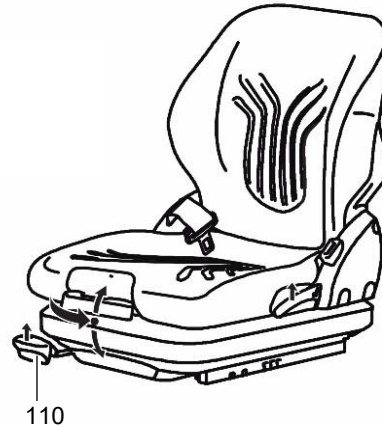
An unsecured driver's seat can slide out of its guide during travel, resulting in accidents.

- ▶ The driver's seat must be locked in position.
- ▶ Do not adjust the driver's seat while travelling.

Procedure

- Sit on the driver's seat.
- Pull up the driver's seat locking lever 110 in the direction of the arrow.
- Push the driver's seat forwards or backwards to the desired position
- Engage the driver's seat locking lever (110) in position.

The seat position is now correctly set.



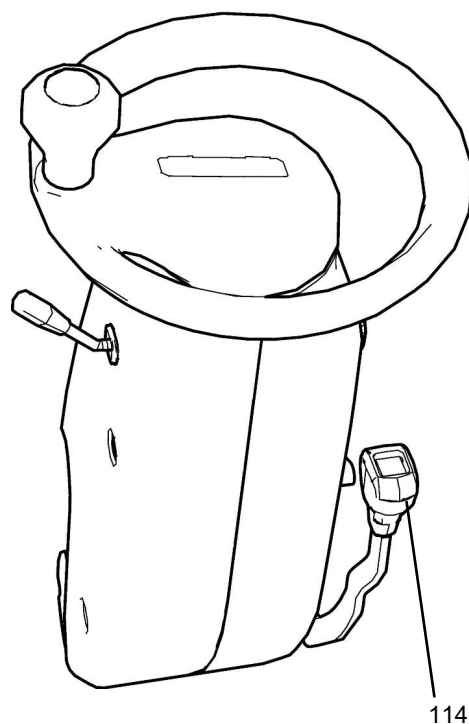
3.4.2 Adjusting the steering column

Adjusting the steering column

Procedure

- Move lever (114) upward for clamping, closing and locking.
- Move lever (114) downward to unlock and adjust.

The steering column is now positioned.



3.5 Seat Belt

DANGER!

A faulty seat belt can cause injury

Using a faulty seat belt can result in injury.

- ▶ Only operate the truck with the seat belt intact. A faulty seat belt should be replaced immediately.
 - ▶ The truck must remain decommissioned until a functional seat belt has been fitted.
-

WARNING!

Travelling without a seat belt increases the risk of injury.

Accidents or personal injury can result if the seat belt is not worn or is modified.

- ▶ Always put the seat belt on before starting the industrial truck.
 - ▶ Do not modify the seat belt.
 - ▶ Damaged or non-operational seat belts must be replaced by trained personnel.
 - ▶ Seat belts must always be replaced after an accident.
 - ▶ Only original spare parts must be used for retrofits or repairs.
 - ▶ Report any defects immediately to your supervisor.
 - ▶ Remove the truck from service until a functional seat belt has been fitted.
-

- ➔ Protect the seat belt from contamination (e.g. cover it when out of use) and clean it regularly. Frozen seat belt locks or pulleys must be thawed out and dried to prevent them from freezing up again. The warm air temperature must not exceed +60 °C.
-

Starting the industrial truck on steep slopes

The automatic blocking system locks the belt in the retractor when the truck is positioned on a steep slope. This prevents the belt from being pulled out of the retractor.

- ➔ Carefully drive the truck off the slope and then put on the belt.

Checking the seat belt

Procedure

- Check the attachment points for wear and damage.
- Check the cover for damage.
- Pull the belt out fully from the retractor and check for damage (loose seams, fraying and nicks).
- Test the belt buckle and make sure the belt returns correctly into the retractor.

Check the automatic locking system

Procedure

- Park the truck on a level surface.
- Jerk the seat belt out suddenly.

 The locking system should prevent the belt from coming out.

The seat belt has now been checked.

4 Working with the truck

4.1 Safety regulations for travel mode

WARNING!

Magnetic fields can cause accidents

Electronic components can be affected or damaged by external magnetic fields. This can lead to malfunctions or accidents.

- Do not use or keep magnets or clamping magnets in the immediate vicinity of the controls.

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 point loading on the travel lanes.

At blind spots get a second person to assist.

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

Travel conduct

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

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

What to do in hazardous situations

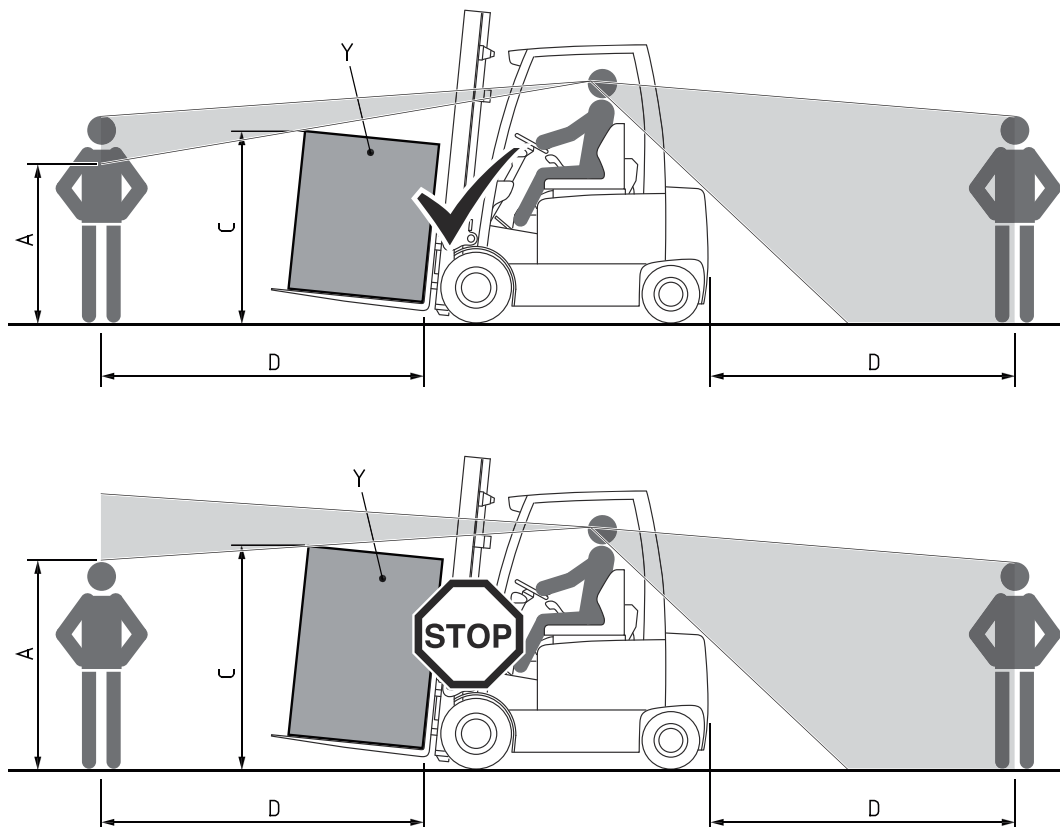
If the truck is about to tip over, do not loosen the seat belt. The operator must not jump off the truck. The operator must lean his upper body over the steering wheel and hold on with both hands. Tilt your body in the opposite direction of the tipping.

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 visibility

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



At a distance (D) of 4000 mm between the rear of the load (Y) and a person or obstacle, the non-visible area (A) must not be larger than 1085 mm. If the height (C) impairs visibility to the extent that A 1085 mm is exceeded, the truck must travel in the opposite direction to the load direction.

Depending on the operating conditions and application of the truck, the operating company or its representative is obligated to define a visible area which is appropriate to the prevailing hazard(s).

Negotiating slopes and inclines

Negotiating slopes and inclines is only permitted up to a gradeability if they are specifically designed as travel routes, are clean and have a non-slip surface and providing they can be safely travelled along in accordance with the truck's technical specifications, see page 23. The truck must always be driven with the load facing uphill. The industrial truck must not be turned, operated at an angle or parked on inclines and slopes. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment. Particular care is required when travelling near slopes and quay walls.

WARNING!

Danger of accidents due to regenerative braking fault

Regenerative braking faults can result in extended stopping distances and accidents, particularly when travelling on inclines. Other persons can be injured in the truck's hazardous area.

- ▶ Keep all persons out of the hazardous area during travel operations.
- ▶ 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.
- ▶ The truck must travel carefully and not faster than crawl speed when the "Regenerative braking fault" warning notice appears on the display unit.
- ▶ In emergencies, use the service brake via the brake pedal for braking.

CAUTION!

Risk of injury when striking the side window or the rear windscreen

Striking the side window or the rear windscreen can result in facial injuries due to splinters of glass.

- ▶ Before striking the side window or the rear windscreen, turn your face away and close your eyes.

CAUTION!

Risk of injury due to broken glass from the smashed window

When leaving the driver's cab through the smashed window, the operator's body can be cut and injured by broken glass.

- ▶ Carefully remove the broken glass before leaving the driver's cab through the smashed window.
- ▶ Use hand protection when removing the broken glass.

Negotiating lifts, loading ramps and docks

Lifts may only be negotiated if they have sufficient capacity, are suitable for driving on and authorised for truck traffic by the owner. The driver must satisfy himself of the above before entering these areas. The truck must enter lifts with the load in front and must take up a position which does not allow it to come into contact with the walls of the lift shaft. Persons riding in the lift with the forklift truck must only enter the lift after the truck has come to a rest and must leave the lift before the truck. The driver must ensure that the loading ramp / dock cannot move or come loose during loading / unloading.

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.

Inflammable liquids (e.g. molten metal etc.) may only be transported with suitable auxiliary equipment. Contact the manufacturer's customer service department.



For safety instructions on the nature of loads to be carried with attachments, see page 137.

Work platforms

WARNING!

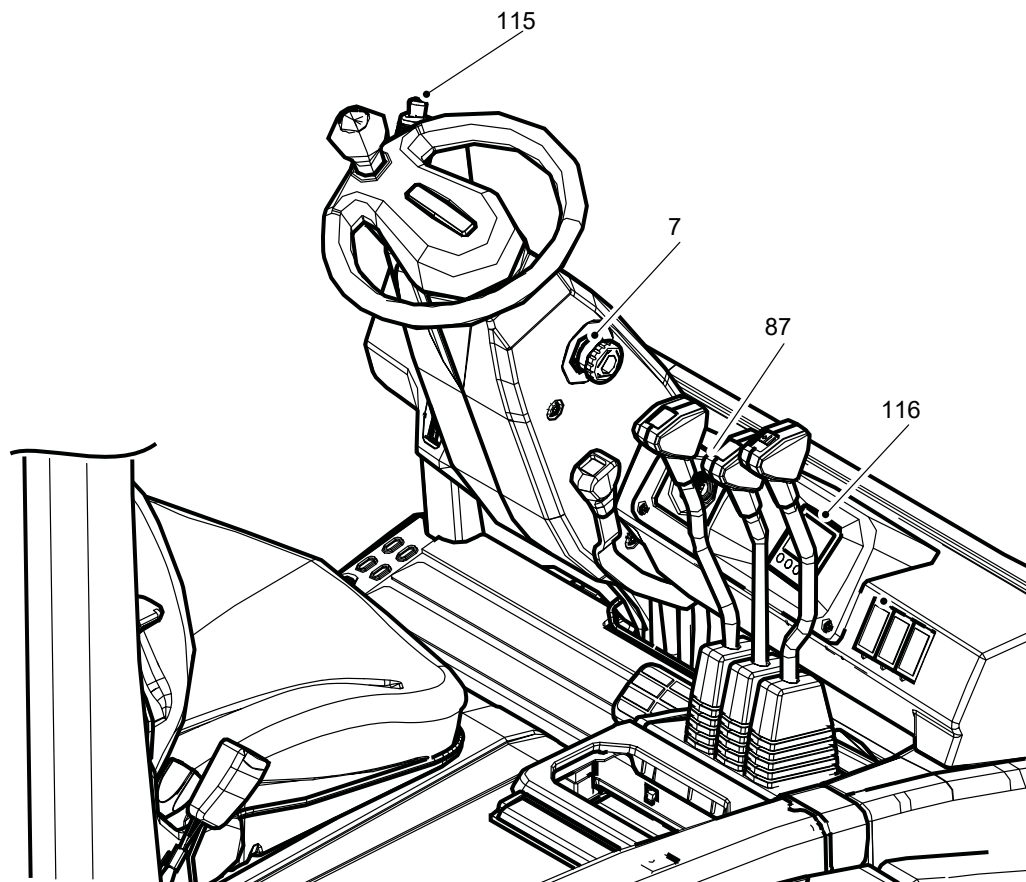
The use of working platforms is governed by national law. In some states the use of working platforms is prohibited on industrial trucks. Observe the applicable law. Working platforms can only be used in the country of application if the law permits it.

► Contact the national authorities before using a working platform.

Towing trailers

Only use the truck for towing lightweight trailers internally, see page 151.

4.2 Preparing the truck for operation



Switching on the truck

Requirements

- Checks and operations to be performed before starting daily work, see page 102.

Procedure

- Unlock the emergency disconnect switch (7), see page 126.
- Insert the key in the key switch (87) and turn it clockwise as far as it will go to the "I" position.
- Test the parking brake by pulling and releasing the mechanical brake lever (115) light up.
- Test the service brake (brake pedal).

The truck is ready for operation. The display unit (116) shows the remaining battery capacity.



- When you have pulled the Emergency Disconnect and turned the key switch to the right, the truck carries out a self test for approx. 3-4 seconds (tests the controllers and motors). During this time the truck cannot move or lift. If the accelerator or a lift mechanism lever is applied during this time, an information message will be displayed.

4.3 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.

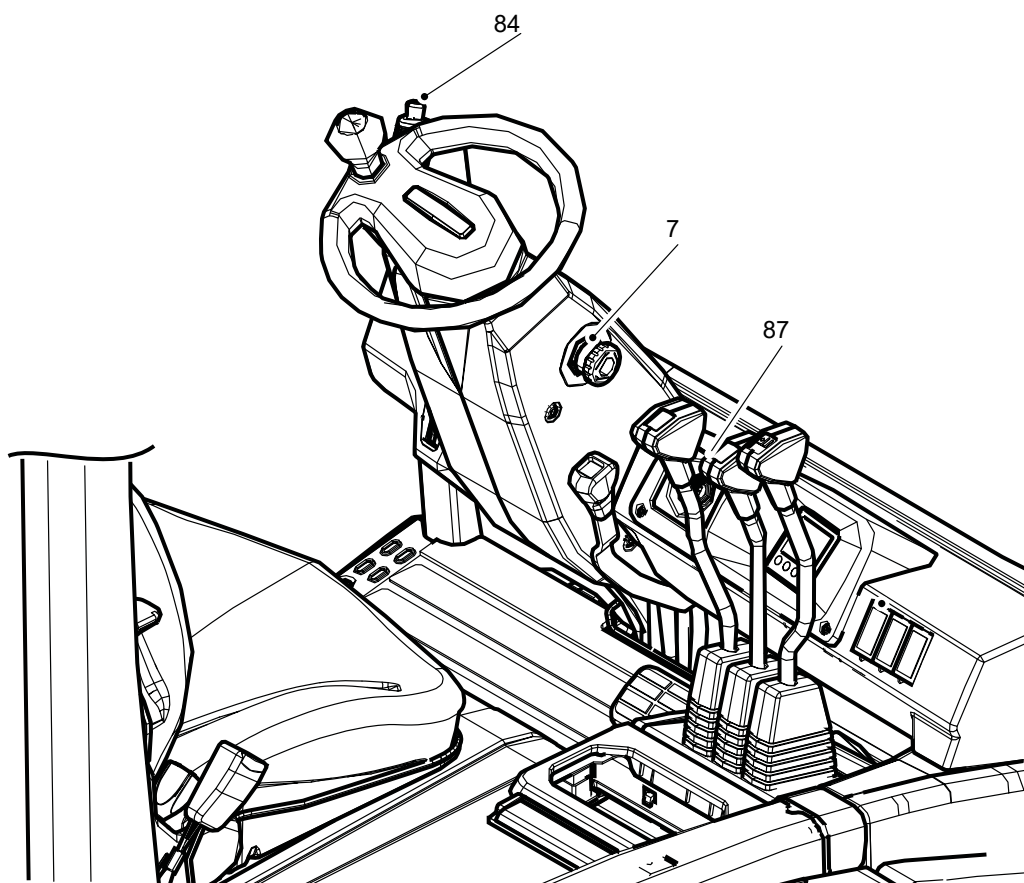
4.4 Parking the truck securely

⚠ WARNING!

An unsecured truck can cause accidents

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

- ▶ Always park the truck on a level surface. In special cases the truck may need to be secured with wedges.
 - ▶ Always fully lower the mast and load handler.
 - ▶ Tilt the mast forward.
 - ▶ Always apply the parking brake button before parking the truck.
 - ▶ Choose a place to park where no other people are at risk of injury from lowering forks.
 - ▶ Do not park and abandon a truck on an incline.
-



Parking the Truck Securely

Procedure

- Lower the load handler.
- Apply the parking brake lever (84).
- Turn the key in the key switch (87) to the "0" position.
- Remove the key from the key switch (87).
- Press the Emergency Disconnect switch (7) down.

The truck is now parked securely.

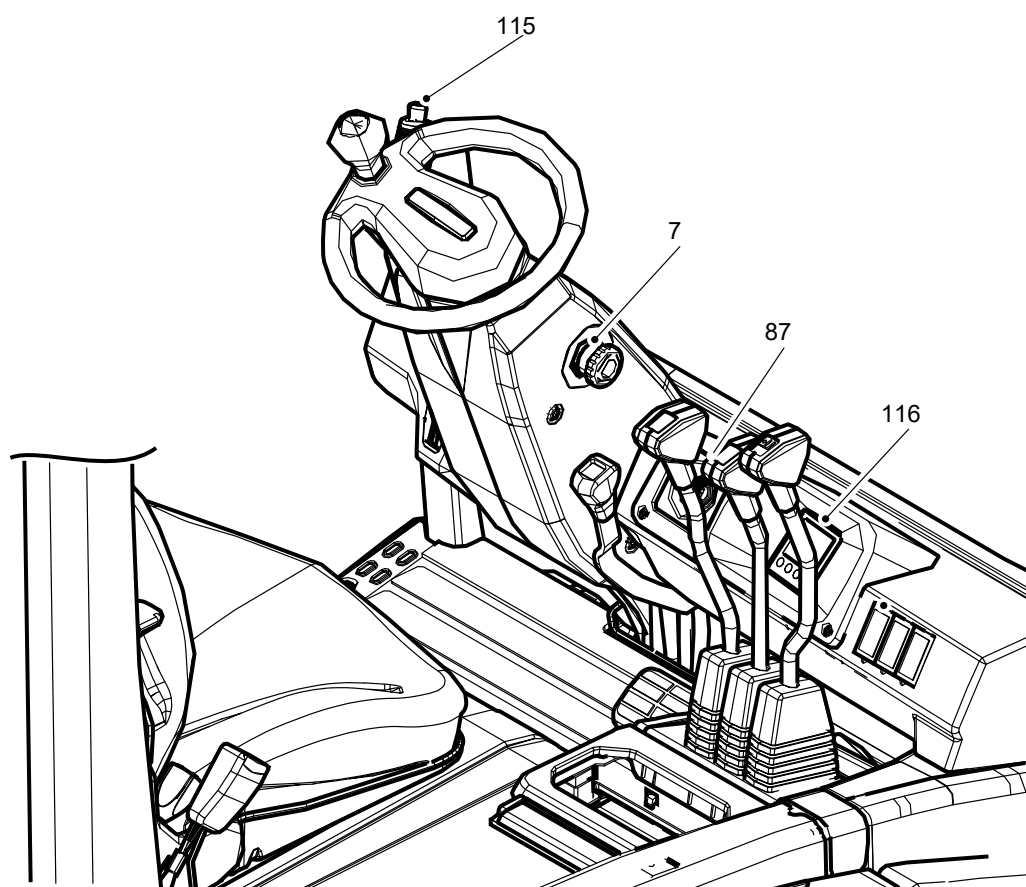
4.5 Emergency Disconnect

⚠ CAUTION!

Faulty or non-accessible emergency disconnect switches can cause accidents

A faulty or non-accessible emergency disconnect switch can cause accidents.

- ▶ 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 the defective truck accordingly and take it out of service.
 - ▶ Do not return the truck to service until you have identified and rectified the fault.
-



Operating the emergency disconnect switch

Procedure

- Press the emergency disconnect switch (7).

All electrical travel, steering and hydraulic functions are cut out.

The functions of the parking brake and the service brake are still available to the operator.

With the manual backup steering, the operator can still control the steering angle by turning the steering wheel with higher force.

Applying the emergency disconnect switch

Procedure

⚠ CAUTION!

Risk of accident

The operation of the emergency disconnect switch must not be affected by any objects placed in its way.

- ➞ Do not use the emergency disconnect switch (7) as a service brake.

Press the emergency disconnect switch (7).

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

Releasing the emergency disconnect switch

Procedure

- Pull or turn the emergency disconnect switch (7) to unlock it again.

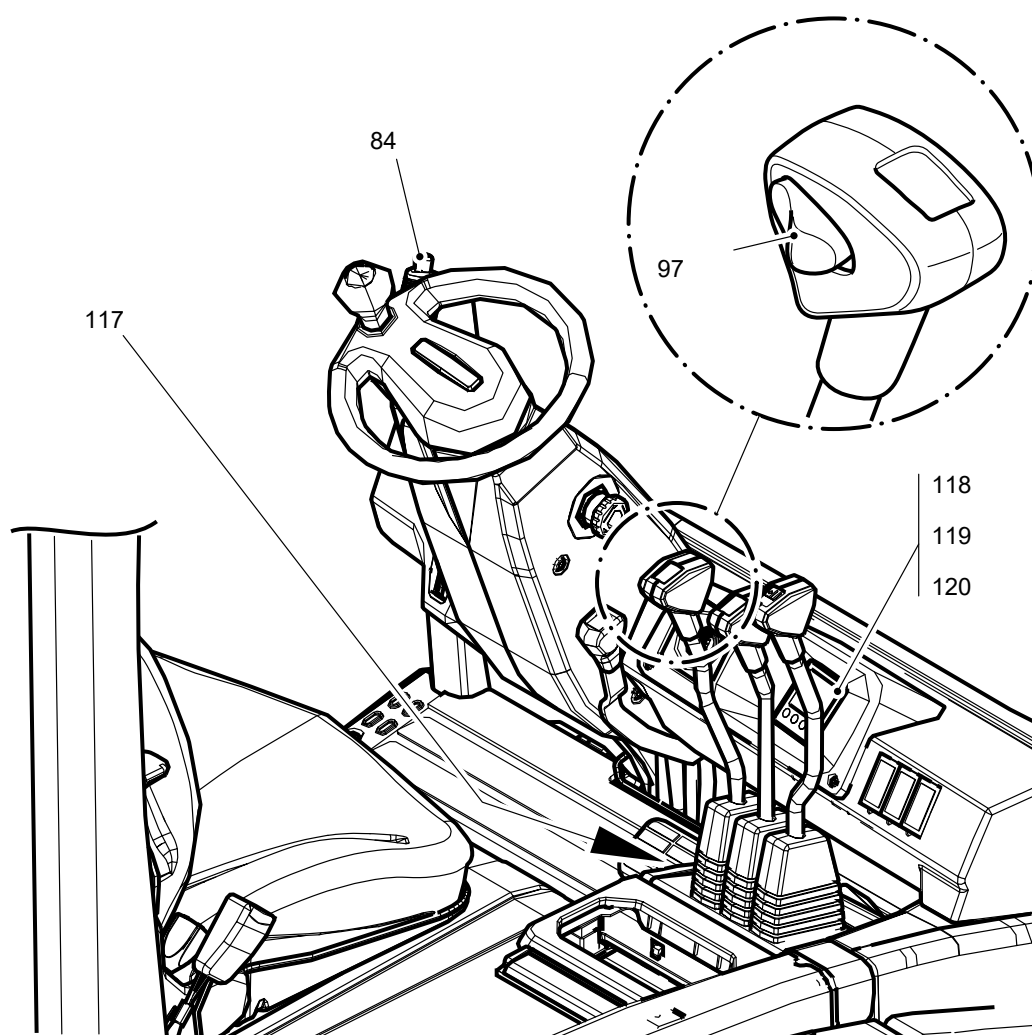
All electrical functions are enabled and the truck is operational again (assuming the truck was operational before the emergency disconnect switch was pressed). With transponder, keypad and Easy Access, the truck is still switched off.

4.6 Travel

⚠ WARNING!

Improper travel can result in accidents

- ▶ Do not get up from the driver's seat during travel.
- ▶ Do not drive the truck unless you are wearing a seat belt and the panels and doors are properly locked.
- ▶ Do not lean out of the truck while travelling.
- ▶ Make sure that the travel area is clear.
- ▶ Adapt your travel speed to the route conditions in the work area and the load.
- ▶ Tilt the mast back and raise the fork carriage approx. 680 mm.
- ▶ Make sure you have sufficient visibility when reversing.



Travel

Requirements

- Truck prepared for operation, see page 121.

Procedure

- Release the parking brake, to do this apply the parking brake lever (84).
- Select the travel direction with the travel direction switch (97).
- Select the travel speed if necessary, to do this press the slow travel button (118) or the program selector (119/120).

- Raise the load handler approx. 680 mm.
- Tilt the mast back.
- Apply the accelerator pedal (117). The travel speed is governed by the accelerator pedal (117).

The truck travels in the direction selected.

4.7 Steering

WARNING!

Risk of accident and personal injury due to incorrect travel and loss of operational stability

Incorrect travel can lead to the truck tipping over and accidents, as well as personal injury.

A laden or unladen industrial truck can tip over if the operator does not decelerate to a safe speed before a bend. Tyre slip, side tilt or lifting of a wheel indicate that an industrial truck was traveling too fast on a bend.

Equipment and mast version can influence the centre of gravity and operational stability.

- ▶ Do not exceed permissible loads and load centre distances.
 - ▶ Drive the truck around bends carefully and at an appropriate speed.
 - ▶ Do not make any sudden or jerky steering movements.
 - ▶ Avoid heavy braking or acceleration.
 - ▶ Avoid cornering when stacking and retrieving.
-

Requirements

- Truck prepared for operation, see page 121.

Procedure

- To negotiate a right-hand bend:
 - Turn the steering wheel clockwise to match the desired steering radius.
- To negotiate a left-hand bend:
 - Turn the steering wheel anti-clockwise to match the desired steering radius.

The truck travels in the required travel direction.

4.8 Brakes

WARNING!

Accident risk

The brake pattern of the truck depends largely on the ground conditions.

- ▶ The operator must take into account the travel route conditions when braking.
 - ▶ Brake with care to prevent the load from slipping.
 - ▶ Allow for increased braking distance when travelling with an attached load.
 - ▶ Use the service brake in emergencies.
-

WARNING!

Risk of injury from falling loads

Incorrectly or inappropriately secured and applied loads can slip and fall during heavy braking.

- ▶ Tilt the mast back when transporting loads.
 - ▶ Only carry loads that have been correctly secured and positioned. Take suitable additional precautions to prevent parts of the load from tipping or falling down.
 - ▶ Secure loads containing small items, e.g. by wrapping them in film.
 - ▶ During travel, you must only brake forcefully in an emergency.
-

WARNING!

Danger of accidents due to regenerative braking fault

Regenerative braking faults can result in extended stopping distances and accidents, particularly when travelling on inclines. Other persons can be injured in the truck's hazardous area.

- ▶ Keep all persons out of the hazardous area during travel operations.
 - ▶ 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.
 - ▶ The truck must travel carefully and not faster than crawl speed when the "Regenerative braking fault" warning notice appears on the display unit.
 - ▶ In emergencies, use the service brake via the brake pedal for braking.
-

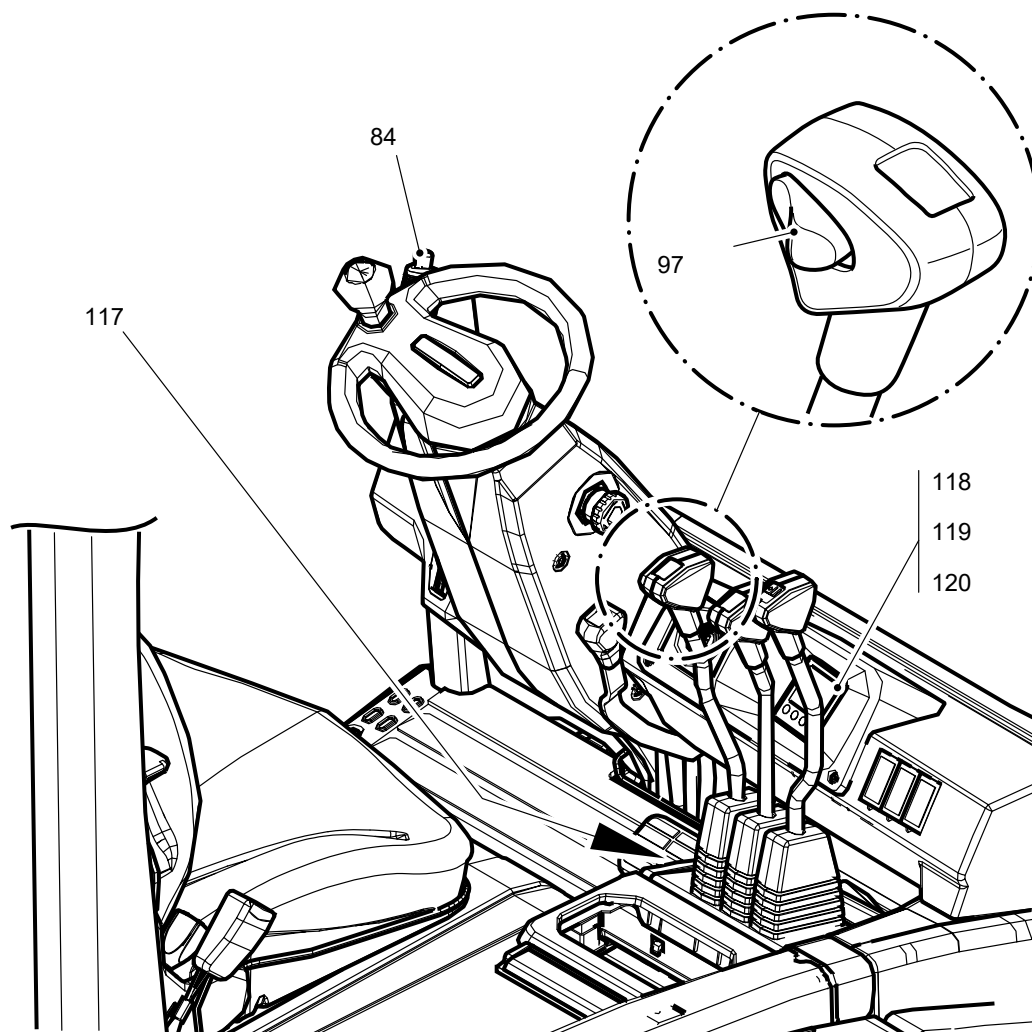
The truck can brake in three different ways:

- Coasting brake
- Service brake

and for secure parking:

- Parking brake

4.8.1 Coasting Brake



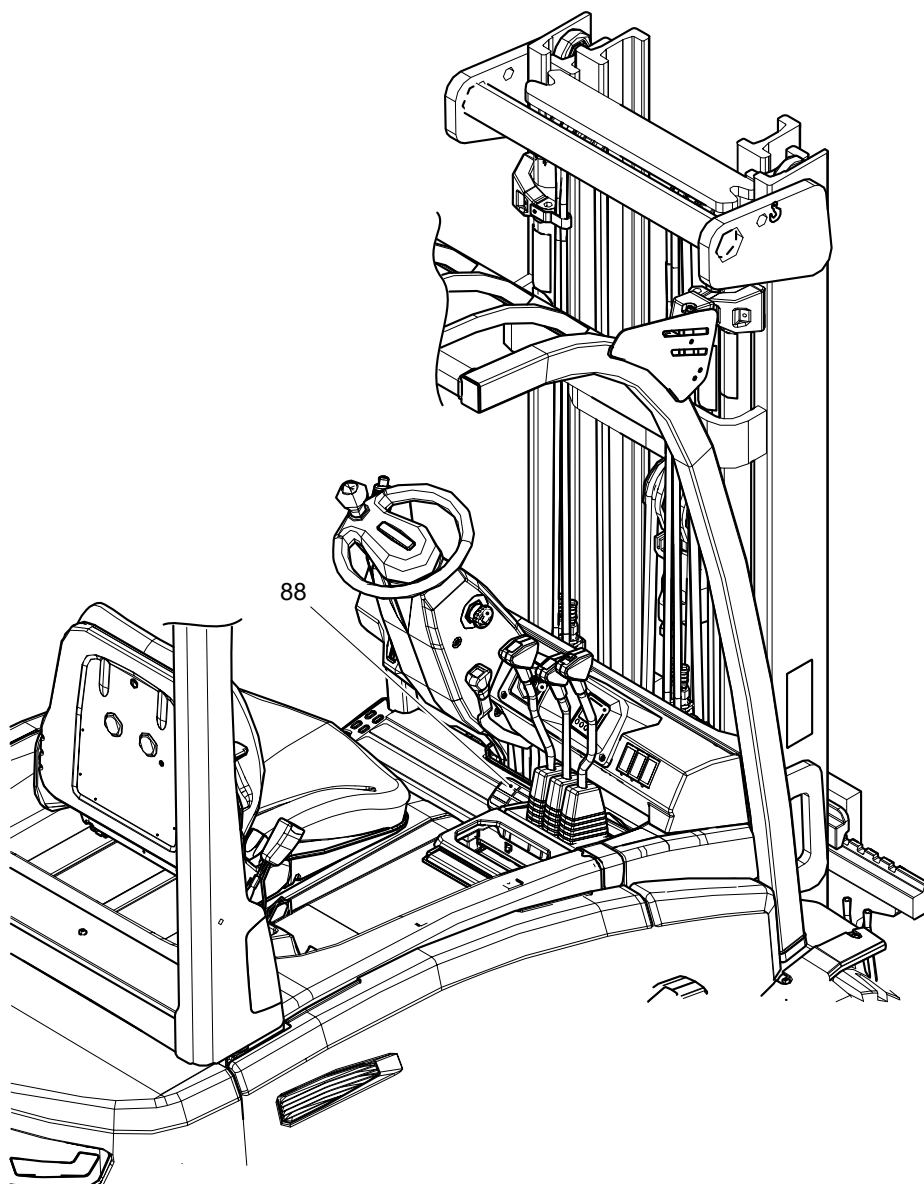
Braking with the coasting brake

Procedure

- Take your foot off the accelerator pedal (117).

The truck decelerates.

4.8.2 Service brake



Braking with the service brake

Procedure

- Depress the brake pedal (88) until you feel the brake pressure.

The truck decelerates depending on the brake pedal position.

4.8.3 Manual parking brake

DANGER!

Accident risk

- ▶ The parking brake will hold the truck with maximum load on a clean ground surface, on inclines of up to 15%.
- ▶ Do not park and abandon the truck on an incline.
- ▶ Applying the parking brake during travel will cause the truck to brake to a halt at a very high force. This may cause the load to slide off the forks. There is a greater risk of accidents and injury.

NOTICE

- ▶ The parking brake can be used as an emergency brake.
-

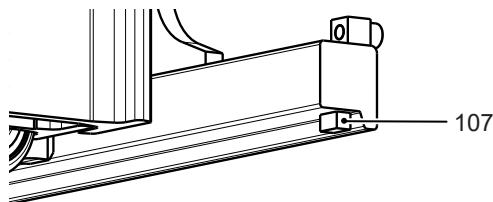
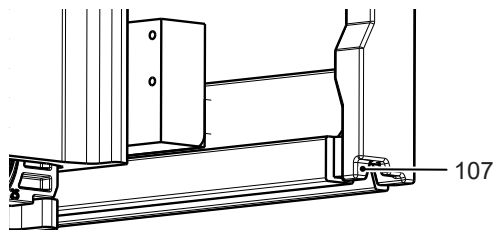
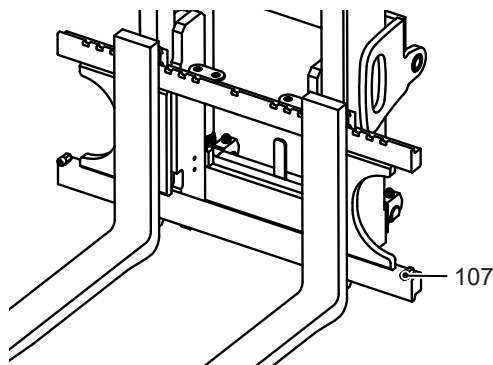
4.9 Adjusting the forks

⚠ WARNING!

Unsecured and incorrectly adjusted forks can cause accidents

Make sure that the fork retaining mechanisms (107) are fitted before adjusting the forks. Depending on the fork carriage, the fork-retaining mechanism (107) will be either via retaining bolts (85 Nm) or fixed stops.

- ▶ Adjust both forks so that they are equidistant from the outside edges of the fork carriage.
- ▶ Engage the locking pin in a groove to prevent the forks from moving accidentally.
- ▶ The load centre must lie centrally between the forks.



⚠ WARNING!

Trapping hazard

There is a trapping hazard when you perform this operation.

- ▶ Wear work gloves and safety shoes.

Adjusting the forks

Requirements

- Park the truck securely, see page 124.

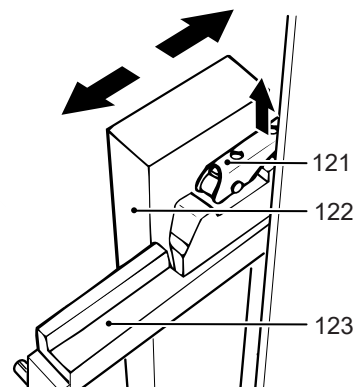
Procedure

- Lift up the locking lever (121).
- Push the forks (122) into the correct position on the fork carriage (123).



To lift the load securely, the forks (122) must be spread as far apart as possible and positioned centrally with respect to the fork carriage. The load centre must lie centrally between the forks (122).

- Push the locking lever down (121) and move the forks until the locking pin engages in a slot.



The forks are now adjusted.

4.10 Replacing the forks

⚠ WARNING!

Risk of injury due to unsecured fork arms

There is a risk of injury and trapping when replacing the fork arms.

- ▶ Wear work gloves and safety shoes.
- ▶ Ensure that the fork arms have sufficient capacity.
- ▶ Never pull the fork arms towards your body.
- ▶ Always push the fork arms away from your body.
- ▶ Secure heavy fork arms with lifting accessories and a crane before pushing them down from the fork carriage.
- ▶ After replacing the fork arms, fit the retaining bolts (107) and make sure that the bolts are seated correctly.
- ▶ Retaining bolt torque: 85 Nm.

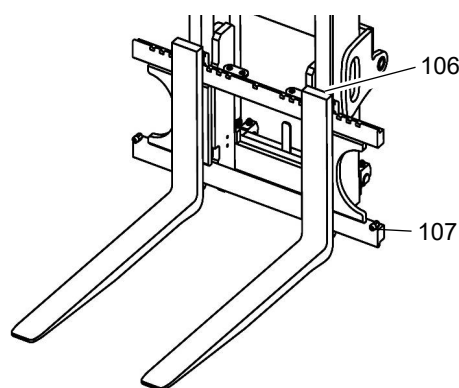
Replacing the forks (fork carriages with retaining bolts)

Requirements

- Load handler lowered and fork tines not touching the ground.

Procedure

- Disassemble the retaining bolts (107).
- Loosen the fork stop (106).
- Carefully push the fork tines off the fork carriage.



The fork tines are now dismantled from the fork carriage and can be replaced.

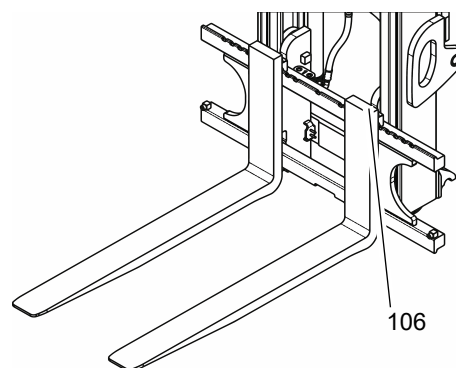
Replacing the forks (fork carriages with fixed stops)

Requirements

- Load handler lowered and forks not touching the ground.

Procedure

- Loosen the fork stop (106).
- Carefully push the forks over the recess on the lower cross beam of the fork carriage.
- Raise the fork tips and lift them out of the top guide.



The fork tines are now dismantled from the fork carriage and can be replaced.

4.11 Lifting, transporting and depositing loads

⚠ WARNING!

Risk of accident due to unsecured and incorrectly positioned loads

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

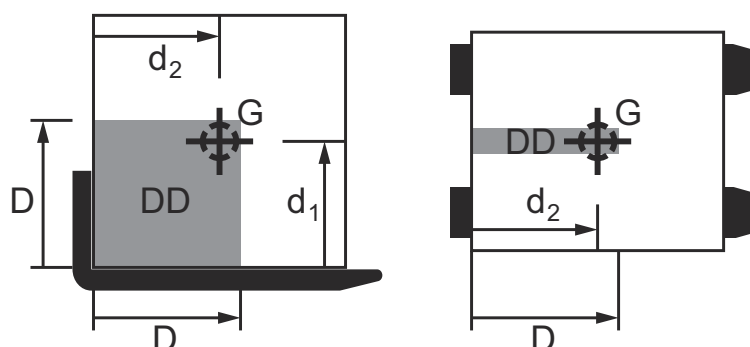
- ▶ Instruct people to move out of the hazardous area of the truck. Stop using the truck immediately if people do not vacate the hazardous area.
- ▶ Only transport loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping or falling down.
- ▶ Do not transport loads other than on the authorised load handler.
- ▶ Damaged loads must not be transported.
- ▶ If the stacked load obscures forward visibility, then you must reverse the truck.
- ▶ Do not exceed the maximum loads specified on the capacity plate.
- ▶ Check the fork spread before lifting the load and adjust if necessary.
- ▶ Insert the forks as far as possible underneath the load.
- ▶ Tilting the mast forward when the load handler is raised >300 mm beyond the vertical position is permissible only in front of or above the load/rack.

⚠ WARNING!

Risk of accident when the load centre is outside the load centre distance

If the centre of gravity G of a raised load lies outside the load centre distance D specified for the load handler in the horizontal or vertical planes, under unfavourable conditions the raised load and also the truck can tip over while working.

- ▶ Observe load centre distances and capacities of the load handler, see page 47.
- ▶ Pick up the load so that its centre of gravity lies between the load arms of the load handler.
- ▶ Arrange and pick up the load so that the load centre lies within the load centre distance of the load handler ($d_1 \leq D$ and $d_2 \leq D$, see area DD in the illustration).
- ▶ Do not pick up a load with a load centre outside the load centre distance of the load handler ($d_1 > D$ and/or $d_2 > D$), as this load case has not been checked on a truck tested according to the test guideline.



For loads with an even weight distribution, the load centre distance lies in the geometric centre of the volume.

For rectangular loads with an even weight distribution over the entire volume the load centre distance is in the middle, i.e. half the length, half the height and half the width of the load.

Lifting loads

Requirements

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

Procedure

- Drive the truck carefully up to the pallet.
- Set the mast vertical.
- Slowly insert the forks into the pallet until the fork shank touches the pallet.
- Raise the load handler.
- Reverse carefully and slowly until the load is outside the storage area. Make sure you have enough clear space to reverse into.

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.

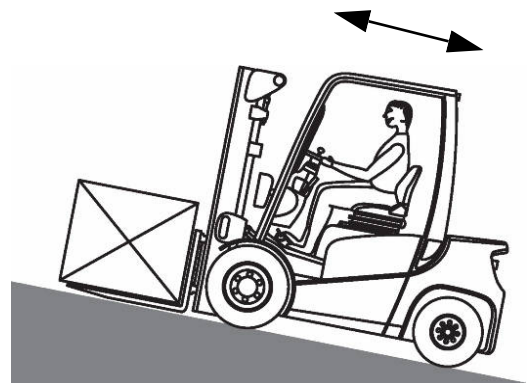
Transporting loads

Requirements

- Load raised correctly.
- Load handler lowered for transport (approx. 150 - 200 mm above the ground).
- Mast tilted back fully.

Procedure

- On slopes and inclines always carry the load facing uphill, never approach at an angle or turn.
- Accelerate and decelerate with care.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Watch out for other traffic at crossings and passageways.
- Always travel with a lookout at blind spots.



Depositing loads

Requirements

- Storage location suitable for storing the load.

Procedure

- Set the mast vertical.
- Drive the truck carefully up to the storage location.
- Carefully lower the load handler so that the forks are clear of the load.

 Avoid depositing the load to prevent damage to the load and the load handler.

- Lowers the load handler.
- Carefully remove the forks from the pallet.

The load is deposited.

4.12 Operating the lift mechanism and integrated attachments

WARNING!

Operating the lifting device and integrated attachments can be hazardous

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 or lowering operating equipment.

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 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.
 - ▶ Only carry loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping or falling down.
 - ▶ Do not 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 through the mast.
 - ▶ The controls should only be operated from the driver's seat, and never suddenly.
 - ▶ The operator must be trained to handle the lift mechanism and the attachments.
-

WARNING!

An offset load centre can result in accidents

The capacity of the truck is reduced when using side shifts that are more than 100 mm outside the truck centre.

- ▶ Observe the capacity plate with the reduced capacity.
-

4.13 Safety instructions for operating additional attachments

- Optionally, trucks can be fitted with one or more auxiliary hydraulic functions to operate attachments. The auxiliary hydraulics are indicated with ZH1, ZH2 and ZH3. Auxiliary hydraulic functions for exchangeable equipment are fitted with replacement couplings on the fork carriage. To fit exchangeable equipment see page 145.

DANGER!

Attaching exchangeable equipment can result in accidents

Other people can be injured when attaching exchangeable equipment. Use only exchangeable equipment that has been deemed safe after a risk analysis carried out by the owner.

- ▶ Only use attachments that have been approved by the manufacturer of the truck.
- ▶ Only use attachments that have been designed by the attachment manufacturer for use with the respective truck.
- ▶ Only use attachments that are suitable for the operating pressure and oil flow available at the hydraulic port, see page 22.
- ▶ Only use attachments that have been fitted for the purpose by the owner.
- ▶ Make sure the operator has been instructed in the use of the attachment and that he uses it for its correct purpose.
- ▶ Re-assess the residual capacity of the truck and, if it has been altered, attach an additional capacity plate to the truck.
- ▶ Note the attachment manufacturer's operating instructions.
- ▶ Use only attachments that do not restrict visibility in the travel direction.

WARNING!

Risk of accident due to overload and failure of the attachment or the load falling or becoming damaged.

When using attachments that are not suitable for the operating pressure and oil flow available, overload may give rise to damage and failure of the attachment, as well as the load falling or becoming damaged.

- ▶ Only use attachments that are suitable for the operating pressure and oil flow available at the hydraulic port, see page 22.

CAUTION!

Risk of slipping and environmental damage due to leaked hydraulic oil

When using attachments that are not suitable for the operating pressure and oil flow available, overload may give rise to leaks or broken lines with the potential for hydraulic oil leaks.

Risk of slipping due to leaked hydraulic oil. The risk is greater when combined with water.

- ▶ Only use attachments that are suitable for the operating pressure and oil flow available at the hydraulic port, see page 22.

- If visibility in the travel direction is impaired, the operating company must determine and apply suitable measures to ensure the safe operation of the truck. A lookout may have to be used or certain hazardous areas may have to be cordoned off. The truck can also be equipped with optional visual aids such as a camera system or mirrors. Travelling with visual aids requires plenty of practice at slow speed.

Safety instructions for sideshifter and fork positioner attachments

WARNING!

Restricted visibility and reduced tilt resistance can cause accidents

When using sideshifters and fork positioners, the change in centre of gravity can result in reduced lateral tilt resistance and accidents. Note that this affects visibility as well.

- ▶ Adapt the travel speeds to the visibility and load.
 - ▶ Make sure you have sufficient visibility when reversing.
-

Safety instructions for clamping attachments (bale clamps, barrel clamps, grabs, etc.)

WARNING!

Risk of accidents due to falling loads

Operating errors can occur and the load can fall accidentally.

- ▶ Clamping attachments may only be added to trucks which have a button to enable additional hydraulic functions.
 - ▶ Clamping attachments must only be operated on trucks with ZH1, ZH2, ZH3 or higher auxiliary hydraulics requiring acknowledgement.
 - ▶ When connecting the attachment, make sure that the hydraulic lines of the attachment are connected to the correct ports – see page 145.
 - ▶ Do not use clamping attachments for clamping purposes or in clamping operation while fork extensions are in use.
-



The highest auxiliary hydraulics after ZH2 must be released by the acknowledgement button.

Safety instructions for rotary attachments

WARNING!

A non-centred load centre of gravity can result in accidents

When using rotary devices and non-centred loads, the centre of gravity can be displaced from the centre with a high risk of accidents.

- ▶ Adapt the travel speed to the load.
 - ▶ Lift the load from the centre.
-

Safety instructions for telescopic attachments

WARNING!

Accident risk due to increased tipover hazard and reduced residual capacity

An increased risk of tipover exists with extended telescopic attachments since incorrectly carried loads can reduce the stability of the truck. When the residual capacity is reduced, a risk of serious material damage and personal injury due to falling loads exists in the vicinity of the truck.

- ▶ Do not exceed the maximum loads specified on the capacity charts.
 - ▶ Loads must only be transported when resting against the back of the fork arms. The load centre distance must be no more than half the fork length.
 - ▶ Do not transport loads solely on the front fork. Moving and transporting the load with the telescopic fork extended is not permitted if the load is located solely on the front fork.
 - ▶ Travelling without a load on the forks is only permitted with the forks retracted.
 - ▶ Reduce the travel speed according to the altered load centre.
-

Safety instructions for attachments when transporting suspended loads

WARNING!

Swinging loads and a reduced residual capacity can result in accidents.

Transporting hanging loads can reduce the stability of the truck.

- ▶ Adapt the travel speed to the load, less than walking pace.
 - ▶ Secure swinging loads for example with lifting slings.
 - ▶ Reduce the residual capacity and have it certified by a expert.
 - ▶ If the truck is to be operated with hanging loads, proof of sufficient safety distance under local operating conditions must be obtained from a specialist assessor.
-

Safety instructions for using loading buckets as attachments

WARNING!

Increased mast loading can cause accidents.

- ▶ When carrying out the daily checks and operations before starting, see page 102, check in particular check the fork carriage, mast rails and mast rollers for damage.
-

Safety instructions for fork extensions

WARNING!

Unsecured and oversized fork extensions can cause accidents.

- ▶ Only use fork extensions that are suitable and have been approved for the base forks of the truck. Observe the data on the data plates of the fork extensions and truck.
 - ▶ The basic fork length must be at least 67% of the length of the fork extension.
 - ▶ Push out the fork extensions fully and lock onto the basic fork arms.
 - ▶ Lay the load as close to the fork shanks as possible. The distance between the overall centre of gravity of the load and the fork shank must not exceed 50% of the length of the fork extension.
 - ▶ When carrying out checks and operations before daily commissioning, see page 102, check the fork extension lock.
 - ▶ Mark any fork extensions with an incomplete or faulty lock and take them out of service.
 - ▶ Do not use trucks with an incomplete or faulty fork extension lock. Replace the fork extension.
 - ▶ Only restore the fork extension to service when the fault has been rectified.
 - ▶ Use only fork extensions which are free of dirt and foreign bodies near the entry opening point. Clean the fork extensions as required.
-



The weight of the fork extensions reduces the residual capacity of the truck. When determining the residual capacity, the increased load distance must be taken into account, see the data plate and capacity plate of the fork extension.

4.14 Fitting additional attachments

⚠ WARNING!

Incorrectly connected attachments can cause accidents.

Attachments that are incorrectly hydraulically or mechanically connected can result in accidents. There is a risk of fingers or hands being crushed.

- ▶ Attachments must only be assembled and commissioned by trained, specialist personnel.
- ▶ Observe the manufacturer's operating instructions.
- ▶ Before starting, check the fasteners are positioned correctly and securely and make sure they are complete.
- ▶ Before starting, make sure the attachment is working correctly.

Depressurise hydraulic plug-in couplings (2-inch display)

Requirements

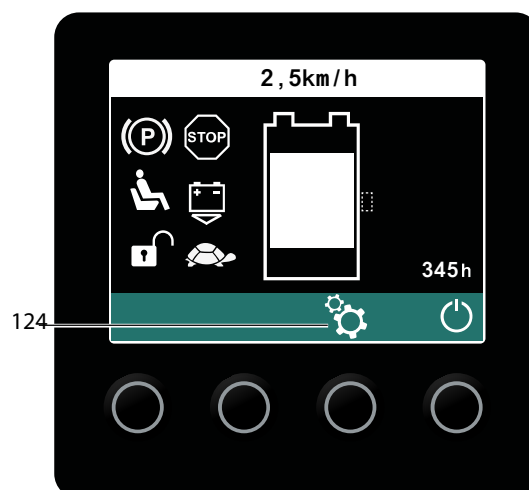
- The operator is in the operating position.
- Parking brake activated.
- Travel direction switch in neutral.
- All controls in neutral.

Procedure

- Press the button (124) for more than 5 seconds.
- Move the auxiliary hydraulics lever in both directions and hold it briefly, see page 92.
- For auxiliary hydraulic functions requiring acknowledgement, the acknowledgement button must also be actuated in order to depressurise, see page 92.

Hydraulic hoses and plug-in couplings are depressurised.

- Press the button (124) for more than 5 seconds to return to normal operating mode.



Depressurise hydraulic plug-in couplings (4-inch display)

Requirements

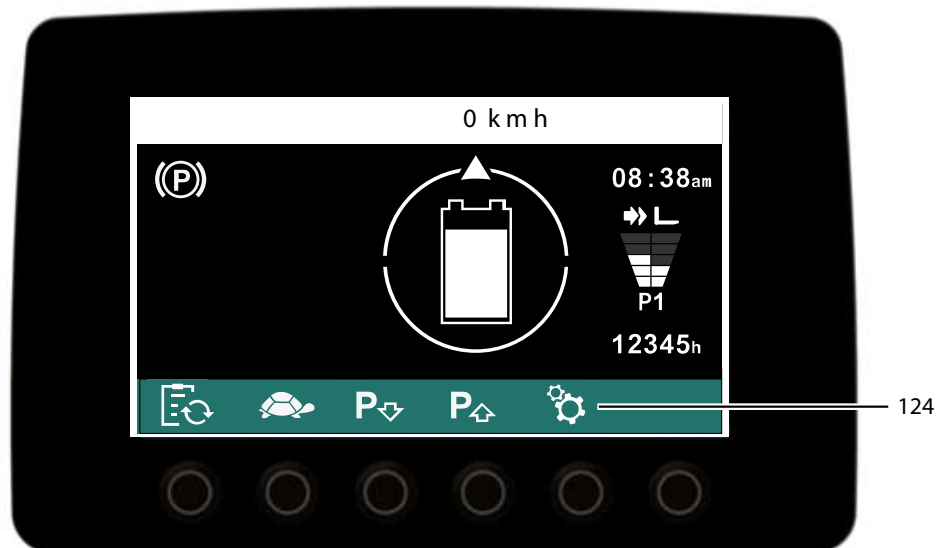
- The operator is in the operating position.
- Parking brake activated.
- Travel direction switch in neutral.
- All controls in neutral.

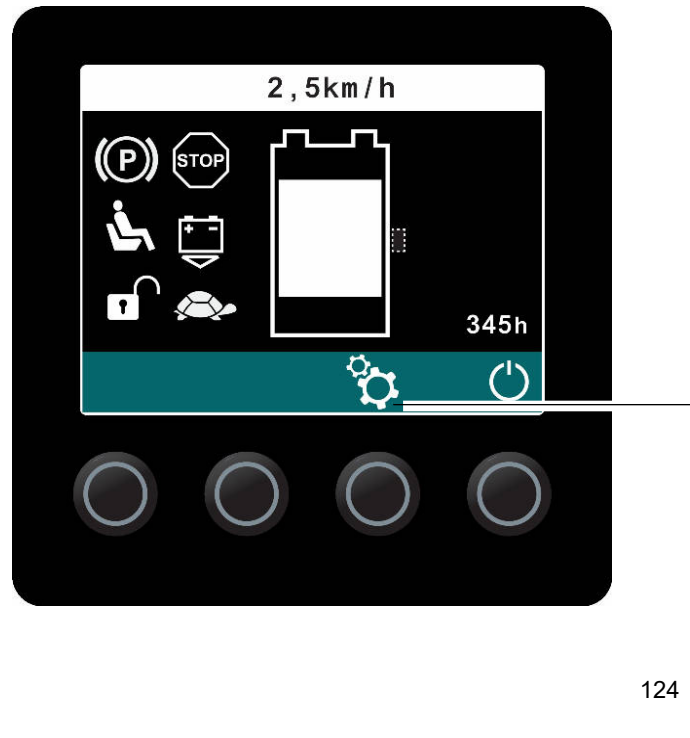
Procedure

- Actuate the "depressurise auxiliary hydraulics" button, see page 94. Warning triangle in the display lights up flashing yellow, see page 89.
- Move the auxiliary hydraulics lever in both directions and hold it briefly, see page 92.
- For auxiliary hydraulic functions requiring acknowledgement, the acknowledgement button must also be actuated in order to depressurise, see page 92.

Hydraulic hoses and plug-in couplings are depressurised.

- Actuate the "depressurise auxiliary hydraulics" button, see page 94, to return to normal operating mode.





⚠ WARNING!

Unsecured hydraulic functions can cause accidents

Failure to secure hydraulic functions for releasing functions on attachments that hold loads using force (e.g. paper clamps, load holder) can result in accidents.

- ▶ Hydraulic functions for releasing functions that hold loads using force must be secured such that they can be used only after actuation of the acknowledgement button.
 - ▶ Before starting, make sure the pilot is set up correctly.
-

⚠ WARNING!

Incorrectly labelled hydraulic functions can cause accidents

Labels on the pilot that do not match the directions of movement and hydraulic functions on the attachment can result in accidents.

- ▶ Before starting, make sure the pilot is correctly labelled and adjust if necessary.
-

Connecting an attachment hydraulically

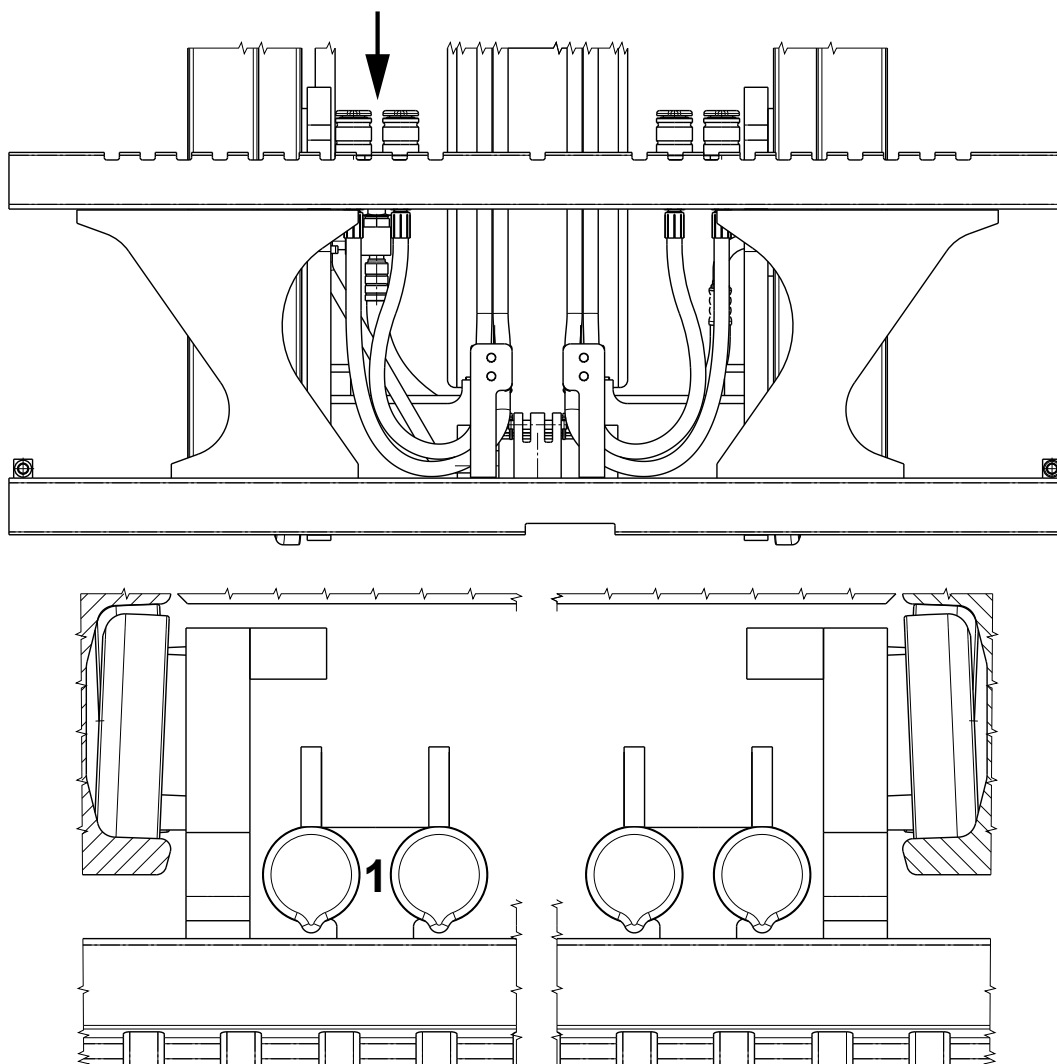
Requirements

- Non-pressurised hydraulic hoses and plug-in couplings.
- The adapters on the truck are marked "1" for ZH1 and "2" for ZH2; see example diagram.
- Attachment directions of movement defined to match the actuation direction of the controls.

Procedure

- Connect the plug-in couplings and engage in position.
- Mark the controls with symbols that clearly indicate the function of the attachment.

The attachment is now hydraulically connected.



- ➔ Spilled hydraulic oil must be set using a suitable agent and disposed of in accordance with environmental regulations.
If hydraulic oil comes into contact with the skin, wash it off immediately with soap and water. If it comes into contact with the eyes rinse them immediately with flowing water and call for a doctor.
- ➔ The manufacturer's customer service department can correctly connect the attachment, adjust the controls and actuation directions on the pilot to the connections and directions of movement of the attachment, and label the pilot accordingly.

5 Operating additional attachments

- Depending on the attachments used the lever (95) is assigned the function of the attachment. Unused levers have no function. For connections see page 145.

Procedure

- Keep the lever (95) in neutral position.
- Hold the lever (95) and press the ZH2 activation button (93).

Toggle function symbol is shown green in the display.

- Push or pull lever (95) to activate ZH2 movements.

- ZH2 movements will be stopped if the ZH2 activation button (93) is released.

Toggle function symbol is shown red in the display.

- In order to reactivate ZH2 function, set lever (95) in neutral position

Symbol	Meaning	Colour	Function
	Toggle function	Green	Second hydraulic control lever function activated
		Red	Second hydraulic control lever function deactivated

6 Towing trailers

DANGER!

Inappropriate speeds and excessive trailer loads can be dangerous

If you do not adapt your speed and / or use an excessive trailer load, the truck can pull apart when cornering and braking.

- ▶ The truck should only be used occasionally to tow trailers.
 - ▶ The overall weight of the trailer should not exceed the capacity indicated on the capacity plate, see page 43. If a load is also transported on the load handler, the trailer load must be reduced by the same amount.
 - ▶ Do not exceed the maximum speed of 5 km/h.
 - ▶ A special trailer coupling must be used for frequent trailer operation.
 - ▶ Do not use supporting loads.
 - ▶ Towing must only be performed on level, secure travel routes.
 - ▶ The owner must test trailer operation with the permissible trailer load by means of a trial run under the applicable operating conditions on site.
 - ▶ Special approvals on request.
-

DANGER!

Danger from falling tiller

If the tow pin on the tiller is removed, the tiller is no longer secured and there is a risk that the tiller will fall when the brakes are not applied.

- ▶ Hold the tiller while releasing the tow pin and place it securely in the inactive position.
-

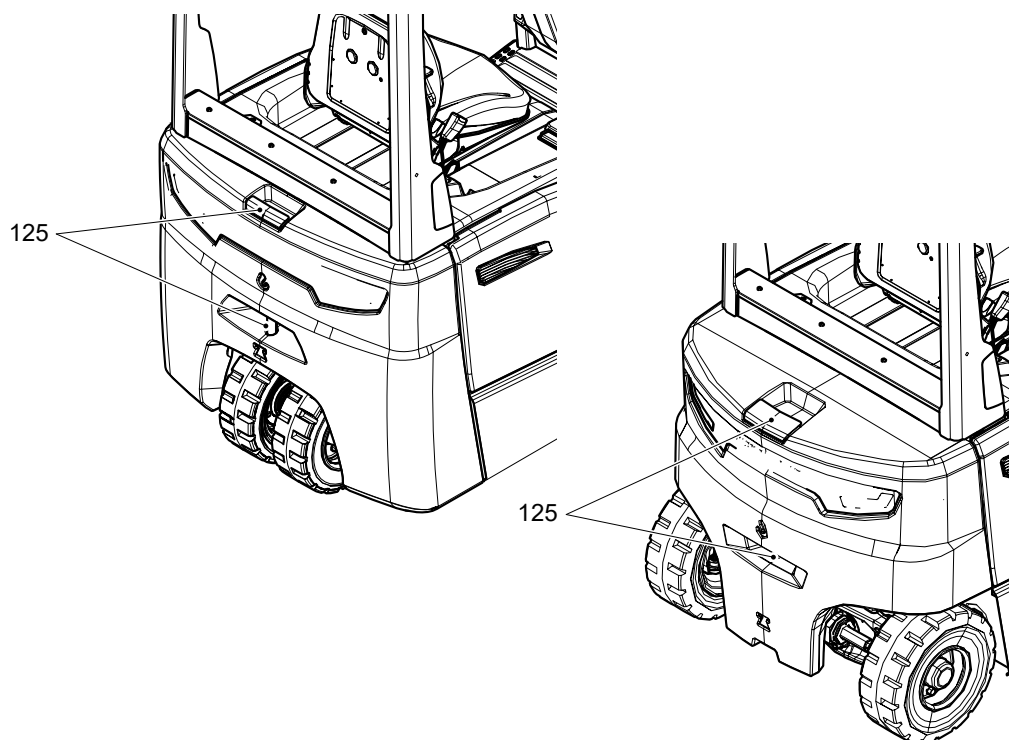
Attaching the trailer

⚠ CAUTION!

Trapping hazard

There is a trapping risk when you attach a trailer.

- ▶ Follow the instructions of the coupling manufacturer if using special trailer couplings.
- ▶ Secure the trailer to prevent it from rolling away before coupling it.
- ▶ Do not get caught between the truck and the tiller when coupling the trailer.
- ▶ The tiller must be horizontal, tilted down by no more than 10° and never facing up.



Attaching the trailer

Requirements

- Truck and trailer are on a level surface.
- Trailer prevented from rolling away.

Procedure

- Lift the tow pin (125) up.
- Insert the tiller of the trailer into the opening.



Reverse the truck for coupling until the tow pin of the coupling and the hole in the tiller are flush.

- Insert the tow pin and engage it.

The trailer is now attached to the truck.

7 Optional Equipment

7.1 Assistance systems

The Access, Drive and Lift Control systems help the driver operate the truck with regard to safety regulations, see page 116 of the present operating instructions.

Travel conduct

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

7.1.1 accessCONTROL

The truck is only released for operation if:

1. The operator is seated.
2. The truck is switched on via the key switch.
3. The operator wears the seat belt.

→ If the driver vacates the seat for a short while, the truck can be operated again when he returns (seat occupied) and puts the seat belt back on again.

→ If travel is not released, depending on the malfunction either the seat switch or seat belt lock warning indicators light up. Items 1 to 3 must be performed again in the order listed.

Symbol	Meaning	Colour	Function
	Seat switch	Yellow	Seat switch not applied or seat switch applied for more than 6 hours uninterrupted
		Red	Error on seat switch
	Seat belt lock control	Yellow	Seat belt not latched
		Red	Wrong activation sequence of seat switch and belt lock

7.1.2 Drive Control

This option restricts the travel speed of the truck as a function of the lift height. From a factory-set lift height the maximum travel speed is reduced to walking pace (approx. 3 km/h) and the slow travel indicator (yellow symbol colour) is activated. When the forks fall below this height with the accelerator pedal applied, the truck accelerates at reduced levels to the speed prescribed by the accelerator pedal to prevent sudden acceleration when changing from slow travel to normal travel. Normal acceleration is only activated again when the speed prescribed by the accelerator pedal has been reached.



In addition to the daily checks before starting, see page 102 the driver must carry out the following checks:

- Lift the empty load handler beyond the reference lift height and check if the slow travel indicator lights up.

7.1.3 curveCONTROL

- Automatic speed reduction depending on the steer angle. curveCONTROL limits the travel speed and acceleration when cornering. This reduces the risk of oscillation or tipping over.

7.2 Operator position extension

DANGER!

Altering the tilt resistance can be dangerous

The lateral tilt resistance reduces with a higher truck centre of gravity.

The height above the overhead guard (h_6) increases by 300 mm, see page 27.

► Adapt the travel speed of the truck, in particular when cornering.



For entry and exit see page 105.

7.3 Adjusting the Backrest Extension

Adjusting the backrest extension (O)

CAUTION!

Accident risk when adjusting the backrest during travel

► Do not adjust the backrest extension while travelling.

Procedure

- The backrest extension height can be adjusted by changing the detent.
- Pull the backrest up and lock it in place to extend the backrest.
- Push the backrest down and lock it in place to shorten the backrest.

7.4 Load damping

⚠ WARNING!

Risk of injury from energy-storing pressure vessels

The hydraulic accumulator is a pressure vessel connected to the hydraulic line with a membrane and a compressed gas (nitrogen) under pre-charge pressure. Pressurised components and fluids can cause severe injury.

If the pressure in the hydraulic line increases, the pressure on the membrane also increases and the gas is further compressed. If the pressure in the hydraulic line falls, the energy created during the additional compression of the gas is released and the pressure in the hydraulic line rises again.

- ▶ Do not touch pressurised hydraulic lines.
- ▶ 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.
- ▶ Depressurise the hydraulic system before carrying out repair or maintenance work on the load damping components, see page 184.
- ▶ Repair and maintenance work on the hydraulic accumulator may only be carried out by a customer service department trained by the manufacturer:
Do not change the gas or pre-filling pressure of the hydraulic accumulator. Do not open the hydraulic accumulator. Replace damaged or defective hydraulic accumulators.

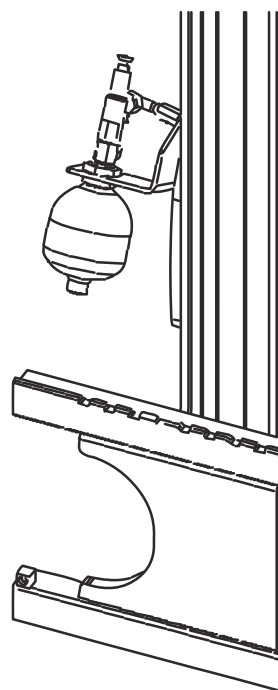
Load damping reduces the shocks and impacts acting on the load to be moved by means of a hydraulic accumulator. If pressure fluctuations occur in the hydraulic system e.g. due to potholes, they will be absorbed and minimised by the hydraulic accumulator. The lift mast damping consists of a hydraulic accumulator and a hydraulic hose connecting this unit to the hydraulic system.



For the hydraulic accumulator observe the regulations at the assembly site before commissioning and during operation.

Commissioning and operation

Before commissioning the truck, check the hydraulic accumulator, the hose for damage. Remove the truck from service immediately if you detect any damage or faults.



7.5 Removable load backrest

⚠ CAUTION!

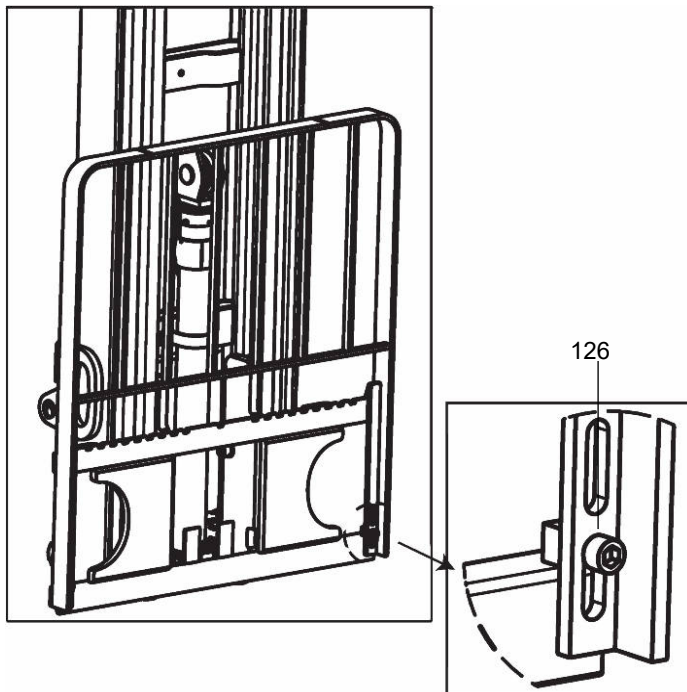
Trapping hazard and heavy load backrest weight

- ▶ Wear safety gloves and safety shoes when carrying out this operation.
- ▶ Two people are required to remove and attach the load backrest.

Load backrest disassembly

Procedure

- Loosen the screws (126).
- Remove the load backrest from the fork carriage and put it down securely.
- Fit the fork retaining screws.



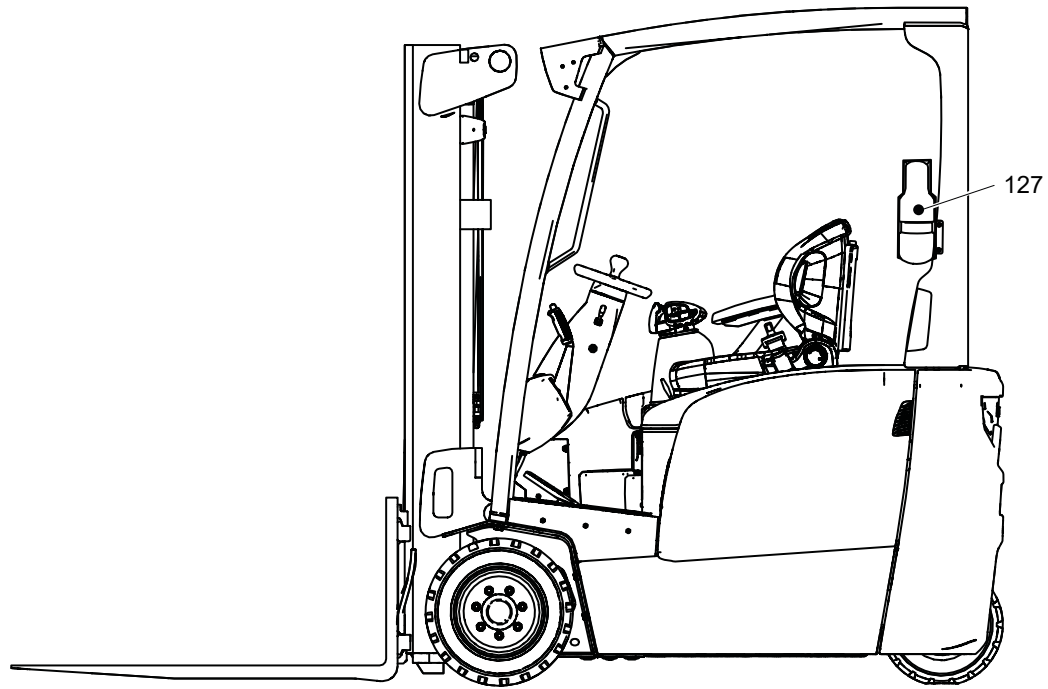
Load backrest assembly

Procedure

- Attach the load backrest to the top rail of the fork carriage.
- Fit the bolts and tighten them with a torque wrench.

→ Tightening torque = 85 Nm

7.6 Fire extinguisher



Procedure

- Pull the fire extinguish (127) out of its bracket.



To operate, refer to the illustrations on the fire extinguisher.

7.7 Lighting

Lighting (○)

The manufacturer provides various types of optional lights. Connection to the electrical system shall be only conducted by authorised service personnel.

7.7.1 Floor-Spot

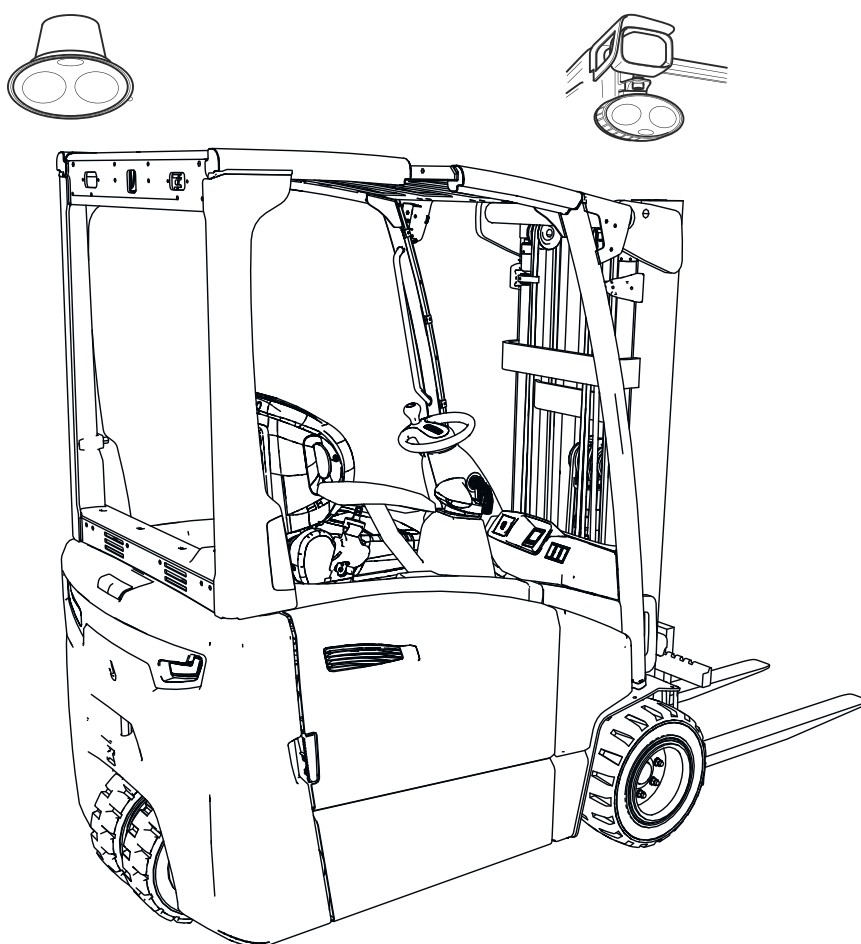
⚠ CAUTION!

Risk of accident due to dazzling

Looking directly into the light beam of the Floor-Spot can dazzle and temporarily impair eyesight.

- ▶ Do not look directly into the light beam of the Floor-Spot.
- ▶ Do not adjust the position and alignment of the Floor-Spot on the truck.

The floor spot serves as an auxiliary device and, with the travel direction switch engaged, projects a coloured dot on the floor at a distance of 5 m. When the truck travels forward, the coloured dot is in front of the truck. When reversing, it is behind the truck.



➞ Only for Floor-Spot blue (51466740/51631731)

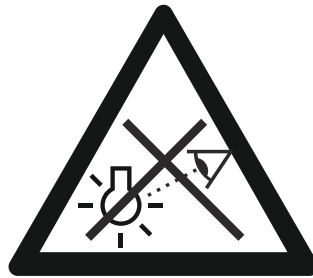
The activated Floor-Spot gives persons advance warning of the travel path of the forklift truck by projecting a blue dot onto the ground at a set distance.

⚠ 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 "Caution! Potentially dangerous optical radiation" is attached to the side of the chassis or to the overhead guard. Small warning notices are attached to the side of the Floor-Spot.

7.8 Additional equipment for road traffic

WARNING!

Risk of accidents in public traffic areas

The use of public traffic areas and travel on public roads in particular requires utmost caution at all times as well as consideration and awareness for other traffic participants in order to avoid dangerous situations and accidents.

In public spaces (public roads, public traffic areas), all lighting systems (lights, reflectors) and other mandatory equipment must be fully functional and comply with national regulations.

- ▶ Only use lighting systems and other mandatory equipment that complies with national regulations.
- ▶ Before entering public traffic areas, verify the correct condition of the lighting systems and other equipment.
Lighting equipment must be configured and used such that other traffic participants are not dazzled (e.g. deactivate work lights and additional lighting equipment such as Floor Spot, warning beacon, strobe light before entering public traffic areas and do not use these systems in public traffic areas).
- ▶ Do not make any unauthorised modifications to the function, position, orientation, colour or output of lighting equipment.

CAUTION!

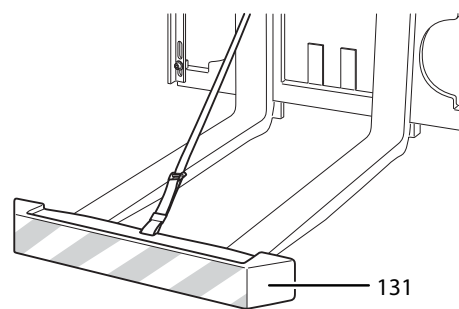
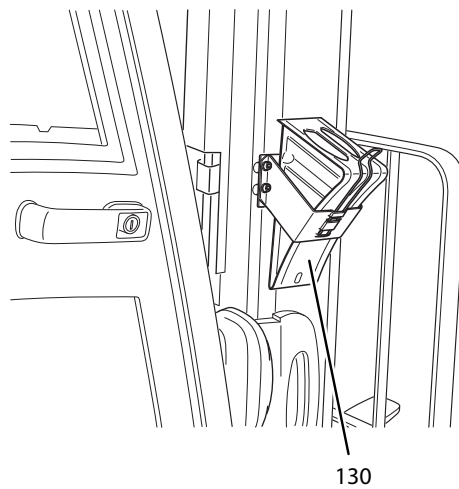
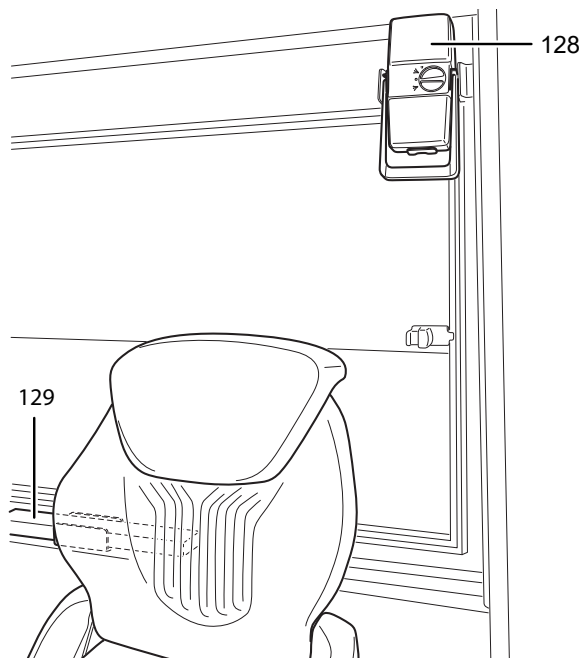
Requirement to use winter tyres when driving the truck on public highways (StVZO, German road traffic regulations)

The StVZO requires the use of winter tyres on trucks used on public highways.

- ▶ Either pneumatic or SE tyres with a minimum profile depth of 4 mm may meet the requirement.

The following assemblies are available as optional equipment for road traffic:

- Warning indicator (128)
- Warning triangle (129)
- Fork cover (131)
- Wheel chock (130)



7.9 Truck Terminal

7.9.1 Application

The truck terminal is a data radio PC with a WLAN port for mobile use.

- Operation in industrial and commercial environments.
- Permissible temperature range: -30 °C to +50 °C at a relative air humidity of 10 % to 95 %, non-condensing.
- Operation in areas at risk of explosion is not permitted.



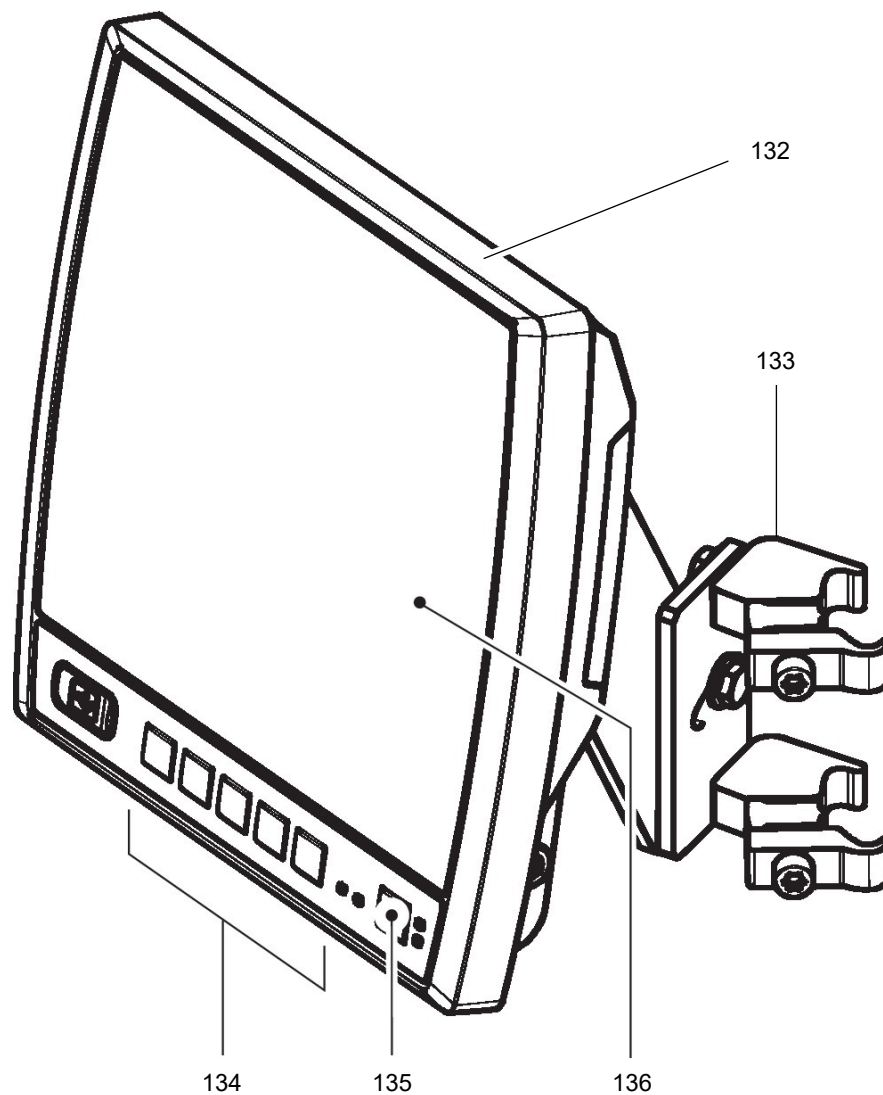
The truck terminal is approved for use in cold stores.

The truck terminal offers a wide range of applications:

- Recording goods arrivals at goods inward and subsequent depositing in the warehouse.
- Immediate booking of goods arrivals in the warehouse management system / enterprise resource management system. Communicating jobs to the warehouse management system / enterprise resource management system and booking goods arrivals into the warehouse management system / enterprise resource management system is performed in real time by radio link (WLAN / wireless local network).
- Order picking: Communicating and checking the picking location with specification of the items to be picked.
- Recording goods deliveries at goods outward and the associated goods retrieval.

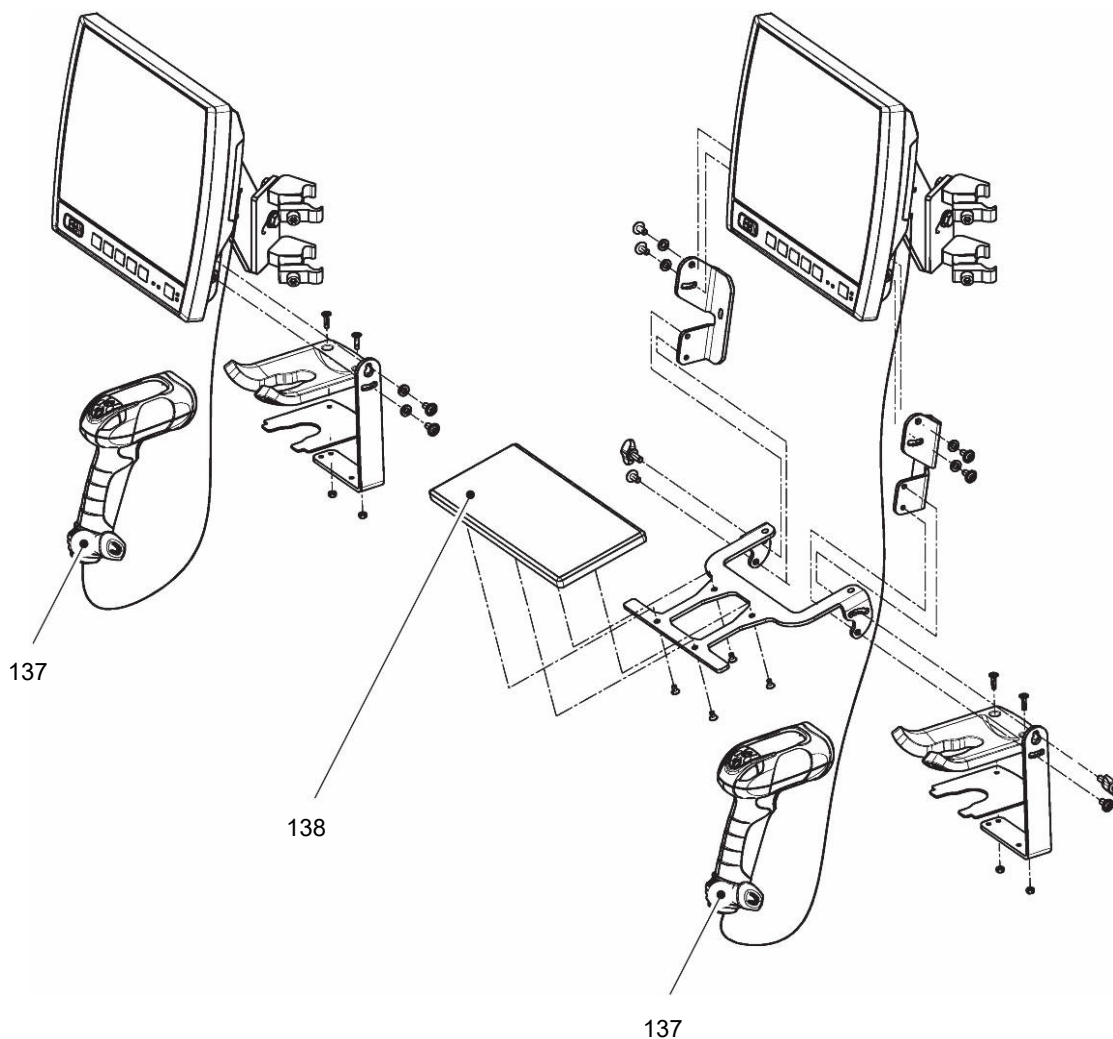
7.9.2 Assembly description

The truck terminal is operated via the touchscreen and the front buttons. The front buttons can be used to perform most tasks of a typical operation.



WMT 110 truck terminal with bracket

Item		Description
132	●	Truck terminal
133	●	Bracket
134	●	Front-buttons keypad
135	●	On/off switch at the bottom right on the front of the casing
136	●	Touchscreen



Optional equipment for the WMT 110 truck terminal

Item		Description
137	☐	Wired barcode scanner (51130909), mounted with support
138	☐	External keyboard in DE layout (51513774), fastened with support
	☐	External keyboard in US layout (51513777), fastened with support



The manufacturer's customer service department is responsible for the connection of the optional equipment and the adjustment of the truck terminal.

WARNING!

Risk of collision when using the truck terminal

Use of the truck terminal, keyboard or barcode scanner during travel or hydraulic operations can lead to collisions with persons and objects.

- ▶ Do not use the truck terminal, keyboard or barcode scanner during travel or hydraulic operations.
 - ▶ Adapt the brackets for the truck terminal, keyboard and barcode scanner to the operator such that injury during normal operation is ruled out.
 - ▶ Adjust the operator's seat such that impact with the truck terminal, keyboard and barcode scanner during normal operation is ruled out.
-

WARNING!

Risk of collision due to accidental load movement

Use of the barcode scanner can give rise to accidental actuation of the controls due to the free length of the device's spiral cable. Accidental actuation of controls can lead to load movement and collisions with persons and objects.

- ▶ Increased attention required when using the barcode scanner.
 - ▶ Avoid contact with controls when using the barcode scanner.
 - ▶ In the event of accidental load movement when using the barcode scanner, press the emergency disconnect button.
 - ▶ Store the barcode scanner in the designated support only.
 - ▶ Do not use the barcode scanner if the free length of the spiral cable exceeds 900 mm.
-

WARNING!

Risk of collision due to restricted visibility or distraction

The truck terminal restricts the view of the operator. A restricted view or distraction can lead to collisions with persons and objects.

- ▶ Increased attention required during travel and hydraulic operations.
 - ▶ Ensure that the operating area and working area are clear.
 - ▶ Adjust the travel speed and load operations to the visibility.
 - ▶ Do not alter the mounting position of the truck terminal.
 - ▶ Check the secure fit of the truck terminal, bracket and accessories on a weekly basis.
-

7.9.4 Operation of the truck terminal WMT 110

The truck terminal is suitable for connection to the Jungheinrich warehouse management system and to all common warehouse management systems. The software supplier is responsible for the connection to the enterprise resource management system / warehouse management system.

The truck terminal is operated via:

- the touchscreen,
- an external keyboard (○) or
- a barcode scanner (○).

NOTICE

The touchscreen of the truck terminal should be operated only with the fingers or a suitable plastic stylus. The use of sharp-edged objects to operate the truck terminal can damage the touchscreen.



Further instructions and details including additional programs can be found on the disk provided.

7.9.5 Cleaning

⚠ CAUTION!

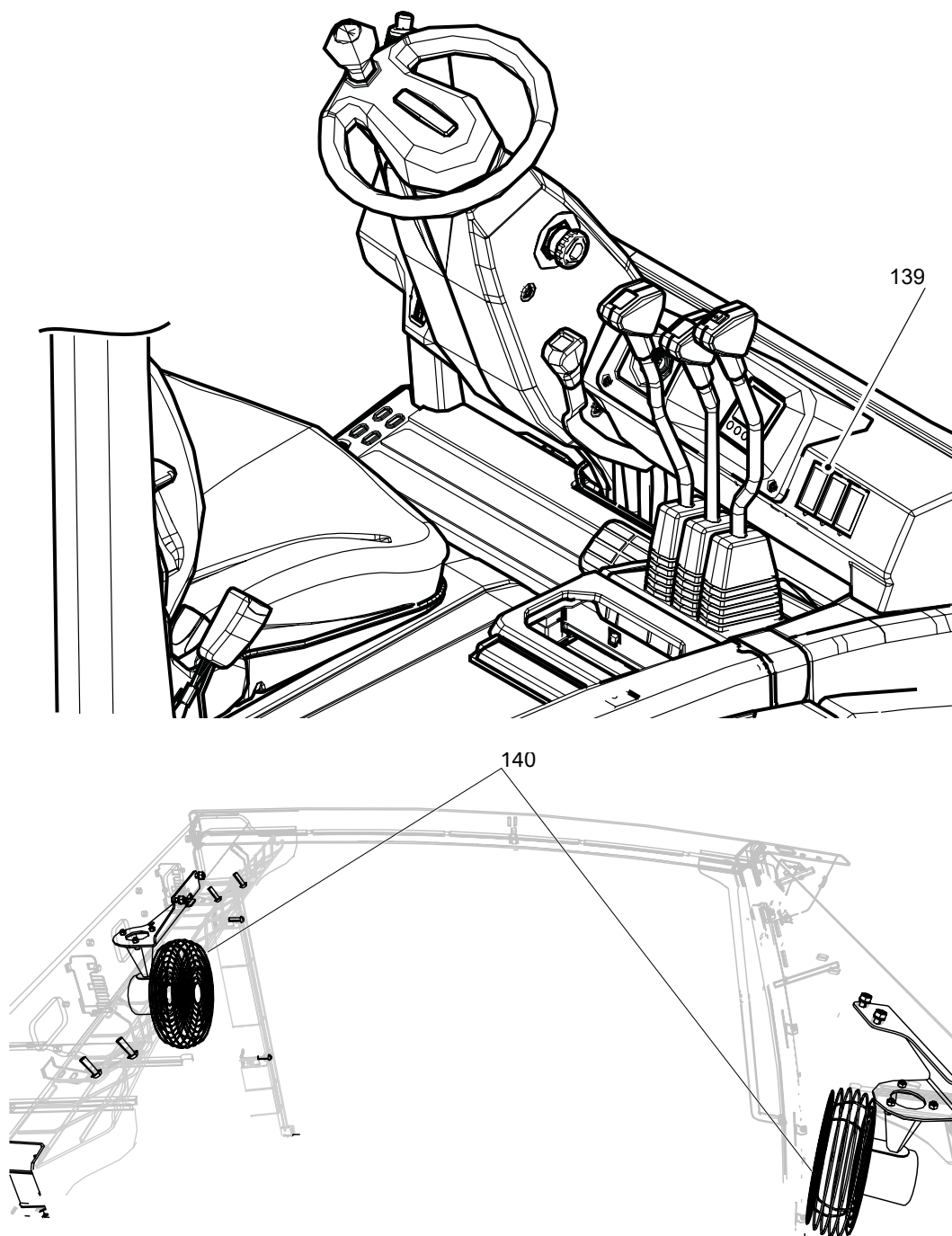
Risk of damage to the truck terminal and truck as well as injuries

Wet cleaning of the truck can result in damage to the truck terminal and the truck due to liquids penetrating as well as injuries.

The truck terminal can be damaged if cleaned with unsuitable cloths.

- ▶ Do not wet clean the truck terminal with a water jet or anything similar.
- ▶ For damp cleaning use a standard commercial glass cleaner with a low alcohol content.
- ▶ Spray the housing and touchscreen for damp cleaning and wipe dry with a clean, soft cotton cloth, microfibre cloth or a new soft disposable paper towel.
- ▶ Do not use dirty or large-fibre cleaning cloths as these can scratch the touchscreen.

7.10 Fan



Press switch (139) to operate the fans (140).

8 Troubleshooting

8.1 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.

Info messages

Display	Meaning
0915.2	Truck not operational, battery door open (○).
0938.1	Battery flat (0%).
1901.1	Accelerator pedal applied during power up.
1904.1	No travel direction selected when accelerator pedal applied.
1908.1	Seat switch or seat belt lock not engaged when accelerator pedal applied.
1909.1	Accelerator pedal applied when parking brake not released.
1917.1	Accelerator pedal and brake pedal pressed simultaneously.
1918.1	Truck operational but cabin door open (○).
2908.1	Seat switch or seat belt lock not engaged when a hydraulic function is applied.
2937.3	Simultaneous actuation of several hydraulic functions that can be operated only as a single function.
2951.1	Hydraulic function applied during power-up.
5409.1	Battery temperature too high (○).
5393.1	Battery cell faulty (○).
5915.2	Battery door open when stationary.

8.2 Emergency recovery of the truck

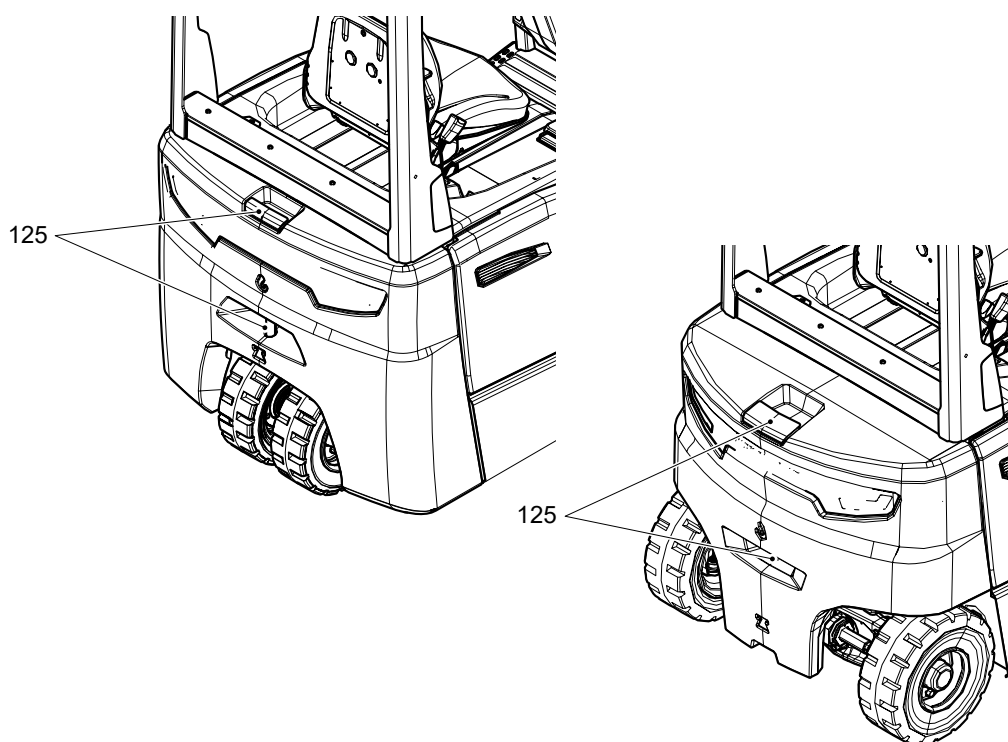
8.2.1 Towing the truck

⚠ WARNING!

Accident risk

Other people can be injured if the truck is towed incorrectly.

- ▶ Only use vehicles to tow the truck which have sufficient tow and brake forces for the trailer load without its own braking system.
- ▶ Always use a pull rod to tow.
- ▶ Always tow the truck at walking pace.
- ▶ Do not park the truck with the parking brake released.
- ▶ One person must be seated in the recovery truck to steer it and one person must be seated on the towed truck.



Towing the truck

Requirements

- Park the truck securely.
- Equipped with lithium-ion battery(○):
 - disconnect the truck-side control line from the connection on the battery trough or from the interface converter (○) on the battery.
 - Open the battery connector lock: loosen the bolted bar.
- Disconnect the battery.

Procedure

- Connect the pull rod to the trailer coupling (125) of the towing truck and attach it to the truck to be towed.
- Release the parking brake, see page 134.
- Tow the truck to its destination.

- Apply the parking brake, see page 134.
- Undo the tow connection.

The truck has now reached its destination and is secure.

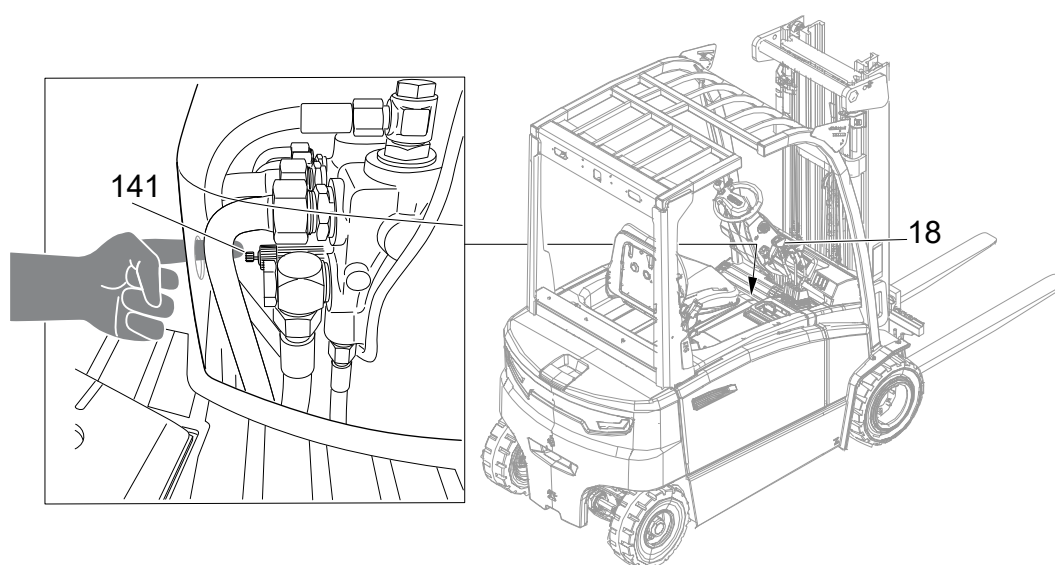
8.3 Emergency lowering (○)

→ The load handler can be lowered manually if a fault occurs in the hydraulic controller.

⚠ WARNING!

Lowering the mast can result in injuries

- ▶ Instruct other people to move out of the hazardous area of the truck during emergency lowering.
- ▶ Never stand underneath a raised load handler.
- ▶ Apply the emergency lowering valve from a position next to the truck.
- ▶ Emergency lowering of the mast cannot be applied when the load handler is in the rack.
- ▶ 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.



Mast emergency lowering

Requirements

- Load handler is not in the rack.
- Turn the Emergency Disconnect switch and key switch off.
- Disconnect the battery.

Procedure

- Apply the valve (141) and the lever (18) simultaneously.
 - *The mast and load handler will lower slowly.*

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 45.



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 211.

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 211.

WARNING!

Risk of accidents and component damage

Any modification to the truck is prohibited.

- ▶ Safety equipment must not be modified.
- ▶ The operating speeds of the truck must not be changed.
- ▶ Laminating over the front window 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, control devices and wire guidance sensors (antennae). These components (computers, control devices, 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 206.

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.

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.

Operating company

The maintenance personnel 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 173.

3.1 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.

3.2 Wheels

WARNING!

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

The quality of the tyres affects the operational stability and performance of the truck. Uneven wear reduces the operational stability of the truck and increases the stopping distance.

- When replacing tyres, make sure the truck is not skewed.
 - Always replace tyres in pairs, i.e. left and right at the same time.
 - For pneumatic tyres, only remove the steel ring when the tyre is depressurised.
-

- When replacing rims and tyres fitted at the factory, only use the manufacturer's original spare parts. Otherwise the manufacturer's specifications cannot be ensured. If you have any queries, contact the manufacturer's customer service department.
- During the wear test, the wear limit of the respective wheel must be observed.

3.3 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.
-

3.4 Lift 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.
-



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.

3.5 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.
-

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 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.

⚠ WARNING!

Improper handling of oils can be hazardous

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

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

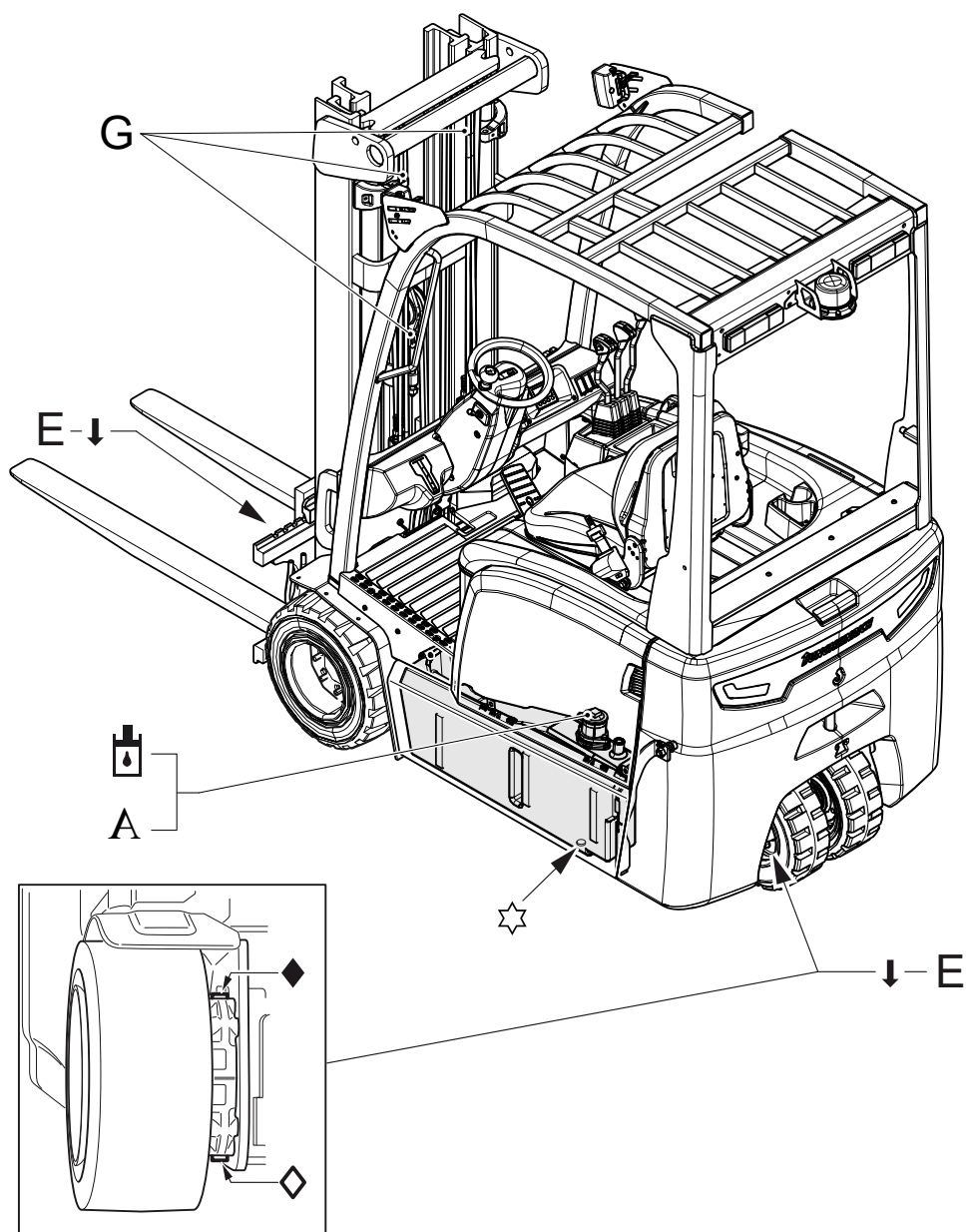
CAUTION!

Consumables and used parts are an environmental hazard

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

► Note the safety regulations when handling these materials.

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

Cod e	Order no.	Volum e	Quantit y	Description	Used for
A	51132826	L tank=2	1 l 5 l	Oil hydraulic/ HVLP 32 ¹	Hydraulic system
	51132827	8 l S tank=2		Oil hydraulic/ HVLP 32 ¹	
	51081367	4 l		Renolin MR 310 ²	
D	29201570	0.2 l	1l	Fluid-brake	Hydraulic brake system
	29201580		5l	Fluid-brake	
E	50354629		400g	Renolit LX- PEP2	Front and rear wheel bearings
G	29201280			Chain spray	Chains
N	50124052	2x0.35l	5l	TITAN ATF 3000	Gear unit
	51179944		205l	TITAN ATF 3000	
1) Applicable for temperature range -5/+30 °C					
2) Applicable for temperature range -20/-5 °C					



*The trucks are factory-equipped with a special manufacturer's hydraulic oil (the Jungheinrich hydraulic oil with a blue colouration) or the Plantosyn 46 HVI bio hydraulic oil. This special hydraulic oil can only be obtained from the manufacturer's customer service department. The use of named alternative hydraulic oils is not prohibited, but may lead to a decline in functionality. This hydraulic oil may be mixed with one of the named alternative hydraulic oils.

⚠ WARNING!

Industrial trucks are factory-equipped with "HLP D22/32" hydraulic oil or "Plantosyn 46 HVI" BIO hydraulic oil.

You cannot change from "Plantosyn 46 HVI" BIO hydraulic oil to the manufacturer's hydraulic oil. The same applies to changing from the manufacturer's hydraulic oil to "Plantosyn 46 HVI" bio hydraulic oil.

Do not mix the Plantosyn 46 HVI bio hydraulic oil with the manufacturer's hydraulic oil or one of the named alternative hydraulic oils.

Grease guidelines

Code	Saponification	Dew point °C	Worked penetration at 25 °C	NLGI class	Application temperature °C
E	Lithium	185	265 - 295	2	-35 / +120

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

- Park the truck securely, see page 124.
- Make sure that the hydraulic system is depressurised.
- Equipped with lithium-ion battery and comfort charging socket (○):
 - Disconnect the truck-side control line from the connection on the battery trough or the interface converter (○) on the battery.
 - Open the battery connector lock: Unscrew the screwed-on latch.
 - Open the battery connector lock: loosen the bolted bar.
- Disconnect the battery to prevent the truck from being switched on accidentally.

5.2 Lifting and jacking up the truck safely

WARNING!

A truck tipover can cause accidents

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

- ▶ Note the weight of the truck on the data plate.
- ▶ Always use a jack with a minimum capacity of 2500 kg.
- ▶ Raise the unladen truck on a level surface.
- ▶ When raising the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

Raising and jacking up the truck securely

Requirements

- Prepare the truck for maintenance and repairs (see page 184).

Tools and Material Required

- Jack
- Hard wooden blocks

Procedure

- Place the jack against the contact point.

 Jack contact point, see page 43.

- 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.

5.3 Checking the attachment of the wheels

⚠ WARNING!

Using different tyres can cause accidents

The quality of the tyres affects the operational stability and performance of the truck.

- ▶ The diameter of the wheels must differ by no more than 15 mm.
- ▶ After changing the tyres, check that the wheel nuts/wheel bolts are secure after 10 operating hours.
- ▶ Always replace tyres in pairs, i.e. left and right at the same time. Always use tyres of the same make, model and profile.
- ▶ For pneumatic tyres, only remove the steel ring when the tyre is depressurised.

Checking the mounting of wheels

Requirements

- Truck prepared for maintenance and repair work – see page 184.

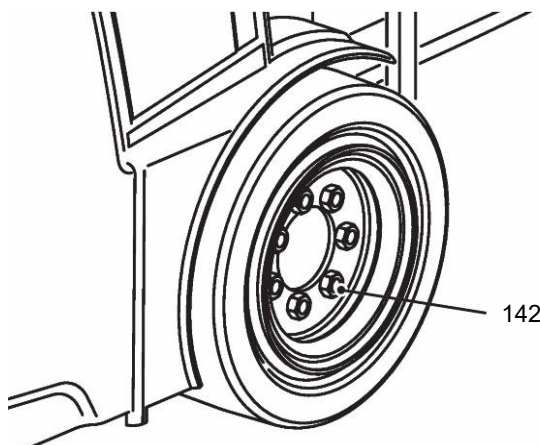
Tools and Material Required

- Torque wrench

Procedure

- Torque the wheel nuts (142) crosswise with a torque wrench.

➔ Tightening torque: 145 Nm



The mounting of wheels is now checked.

➔ When using pneumatic tyres check the air pressure, for the air pressure see page 39

5.4 Replacing the wheels

⚠ WARNING!

A truck tipover can cause accidents

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

- ▶ Note the weight of the truck on the data plate.
- ▶ Always use a jack with a minimum capacity of 2500 kg.
- ▶ Raise the unladen truck on a level surface.
- ▶ When raising the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

⚠ WARNING!

Falling wheels can cause injury

- ▶ The wheels of the truck are very heavy. A single wheel can weigh up to 150 kg.
- ▶ Always replace wheels with a suitable tool and protective equipment.

Removing the wheels

Requirements

- Truck prepared for maintenance and repair work – see page 184.

Tools and Material Required

- Jack
- Hard wooden blocks
- Mounting lever
- Torque wrench

Procedure

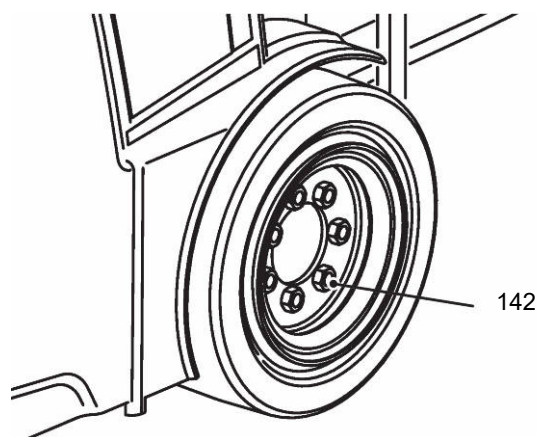
- Place the jack against the contact point.



Jack contact point, see page 43.

- Raise the truck.
- Support the truck with hard wooden blocks.
- Undo the wheel attachment (142).
- Remove the wheel, using a suitable mounting lever if necessary.

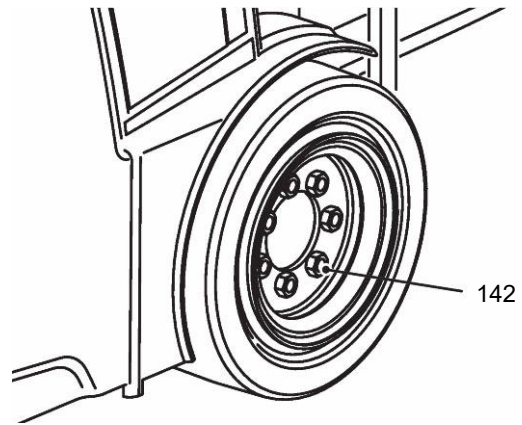
The wheel has now been removed.



Fitting the wheels

Procedure

- Fit the wheel using a suitable mounting lever if necessary.
- Fit the wheel attachment.
- Remove the hard wooden blocks.
- Lower the truck.
- Torque the wheel attachment (142) crosswise with a torque wrench; tightening torques see page 39.



The wheel has now been fitted.



When using pneumatic tyres check the air pressure, for the air pressure see page 39

5.5 Hydraulic system

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.
-

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 level

⚠ WARNING!

Hot hydraulic oil can cause injury

Hot hydraulic oil can cause serious injuries such as burns or scalds.

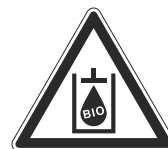
- ▶ Wait until the hydraulic oil has cooled down.
 - ▶ Do not drain or pump hot hydraulic oil out of the system.
 - ▶ In the case of injuries, seek medical assistance immediately.
 - ▶ Remove any spilled hydraulic oil immediately with an appropriate bonding agent.
-

⚠ CAUTION!

The use of unsuitable hydraulic oils can cause damage

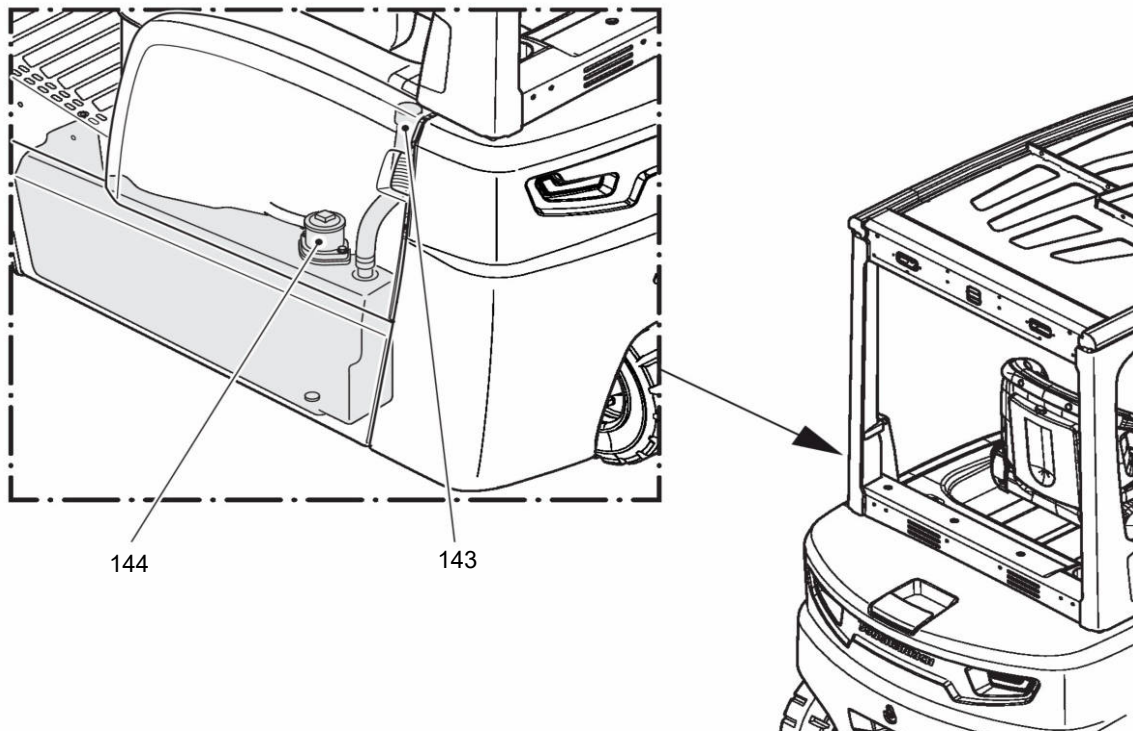
Trucks with bio hydraulic oil have a warning notice on the hydraulic reservoir: "Add hydraulic oil only".

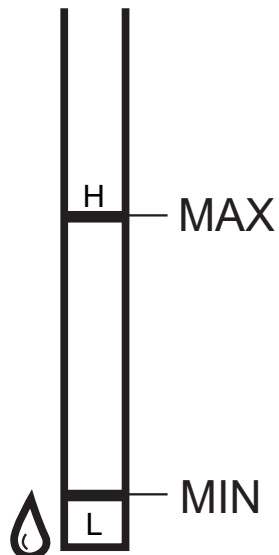
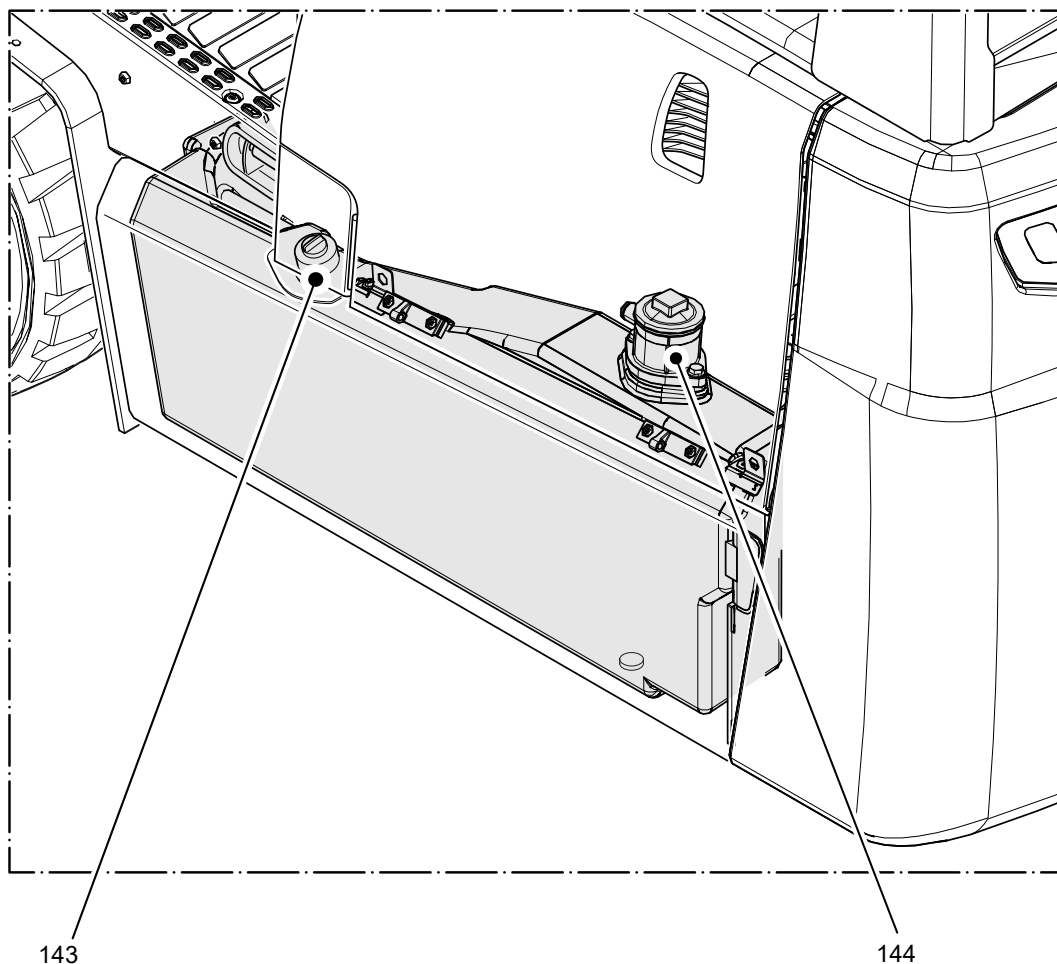
- ▶ Use only BIO hydraulic oil.
-



EFG BB216k-BB220

EFG BC316k-BC330





Requirements

- Park the truck on a level surface.
- Prepare the truck for maintenance and repair work (see page 67).
- Seat hood open, see page 67

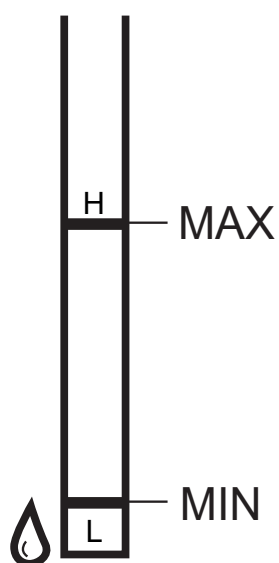
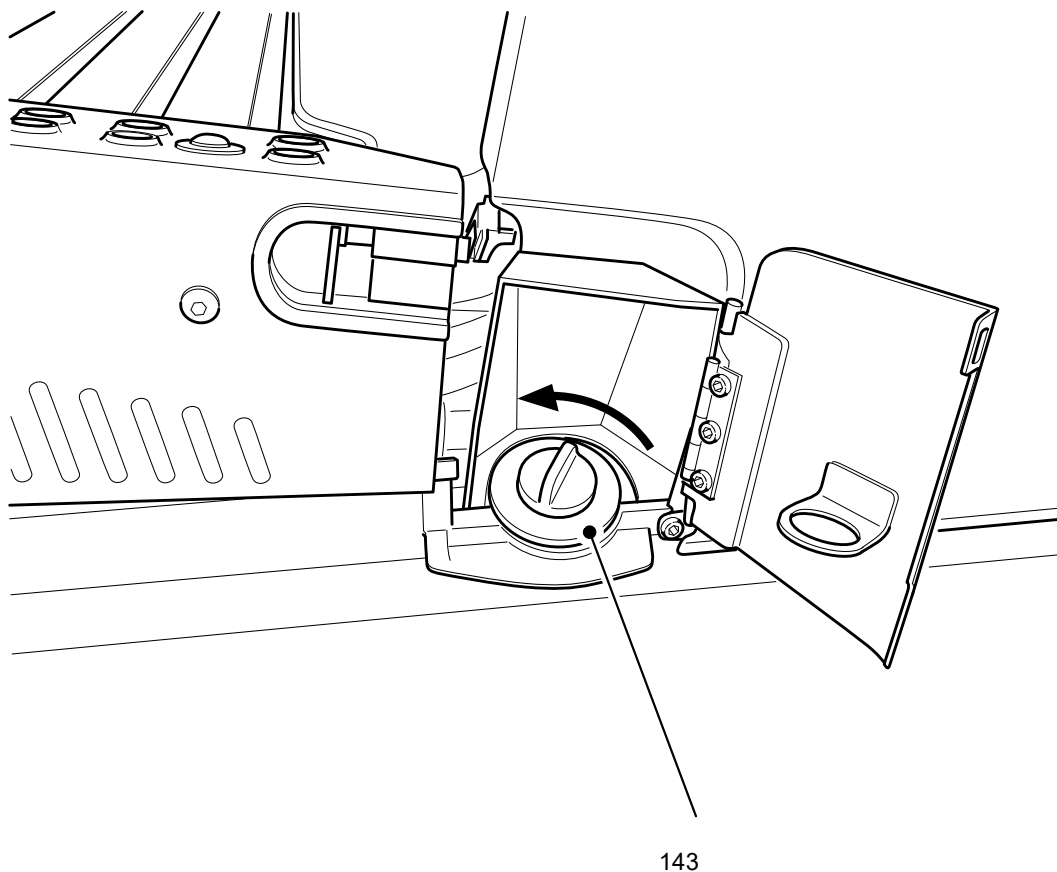
Procedure

- Open the breezer cap (143).
- Remove the hydraulic oil dipstick, wipe it with a clean cloth and put it back.
- Insert and screw in the hydraulic oil dipstick, remove it and check the hydraulic oil level.

- For cold oil: the oil level should lie between the “Min.” and “Max.” mark. For hot oil: the oil level should lie just above the “Max” mark.
- If necessary, add hydraulic oil (144).
 - Repeat the test.
 - When the oil level is correct, fully insert the hydraulic oil dipstick again.

The hydraulic oil level has now been checked.

EFG BA113-BA115



5.5.2 Adding hydraulic oil

Procedure

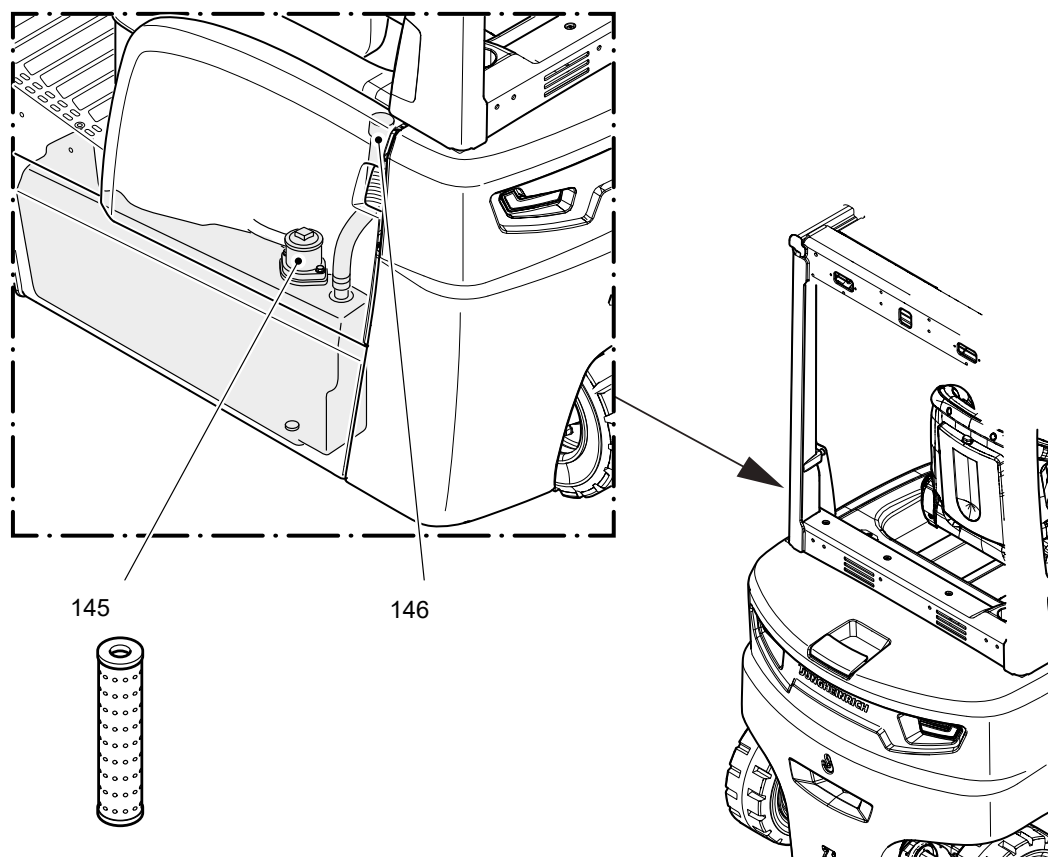
- Unscrew the lid (144) of the hydraulic filter.
- Add hydraulic oil to the MAX mark on the hydraulic oil dipstick.



Use only approved hydraulic oil, see page 182.

- Check the hydraulic oil level with the dipstick and top up as required.
- Screw the lid back on (15 Nm).
- Insert the dipstick back in fully.

5.6 Replacing the hydraulic oil filter



Replacing the oil filter

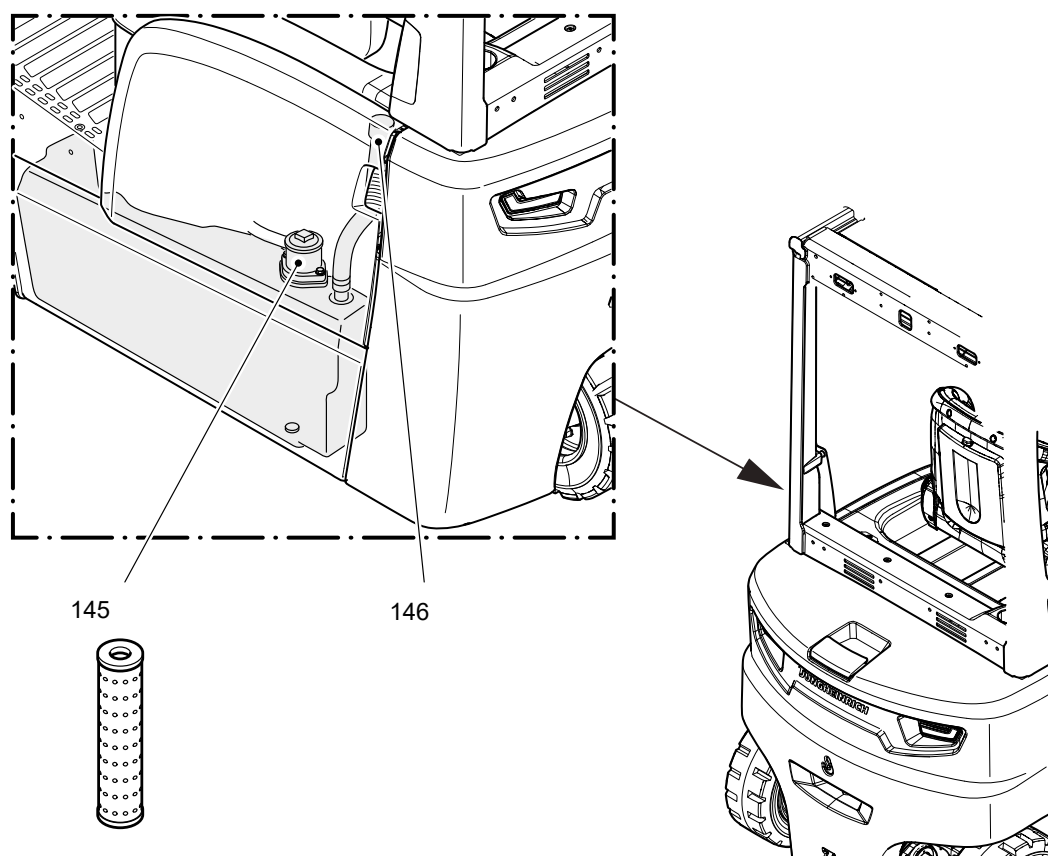
Requirements

- Park the truck on a level surface.
- Prepare the truck for maintenance and repair work (see page 184).

Procedure

- Unscrew the hydraulic oil filter cap (145). The filter element is located on the cap.
- Replace the filter insert; if the O ring is damaged it will also need to be replaced. Apply a thin layer of oil to the O ring on assembly.
- Refit the cap with the new filter element in place.

5.7 Replacing the ventilation and discharge filter



Requirements

- Park the truck on a level surface.
- Prepare the truck for maintenance and repairs (see page 184).
- Panel open, see page 195

Procedure

- Untwist the breather filter lid (146).
- Replace the breather filter.

→ Collect any spilled hydraulic oil. Dispose of the hydraulic oil and hydraulic oil filter and fuel in accordance with environmental regulations.

5.8 Checking the gear oil level

⚠ 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.

NOTICE

Damage to the transmission due to incorrect oil level

The oil functions as lubricant and coolant. A low oil level leads to transmission damage as a result of overheating.

- Always check the transmission oil level at operational temperature.
- Only use clean, fresh oil from clean containers to fill or top up the transmission. Damage will arise from contamination or water entering the transmission.

Check the gear oil level

Requirements

- Park the truck securely, see page 124

Tools and Material Required

- Oil sump

Procedure

- Place the oil sump underneath the transmission
- Unscrew the oil dipstick (148).
- Check gear oil level, top up if necessary through the filler hole (147).

→ The oil level should reach the bottom mark of the oil check hole (148).

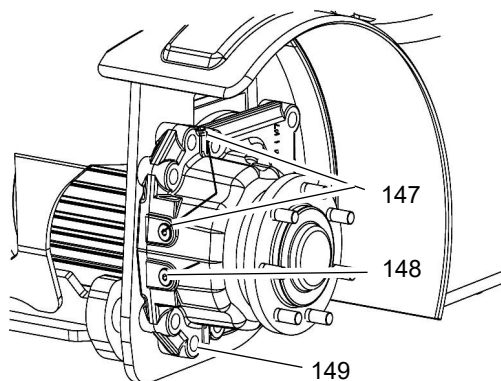
The transmission oil level is now checked.

Draining the oil

Procedure

- Drain oil at operating temperature.
- Place the oil sump underneath the transmission
- Unscrew the oil drain plug (149) and drain the transmission oil.

→ To ensure swift and complete draining of the transmission oil, unscrew the oil dipstick (148).



The oil is now drained.

Adding oil

Procedure

- Insert the oil drain plug (149).
- Unscrew the oil control screw (148) and add new gear oil in the filler hole (147).

The oil has now been added.

5.9 Checking the electrical fuses

⚠ WARNING!

Electrical current can cause accidents

Ensure the electrical system is de-energised before starting work. Before starting maintenance on the electrical system:

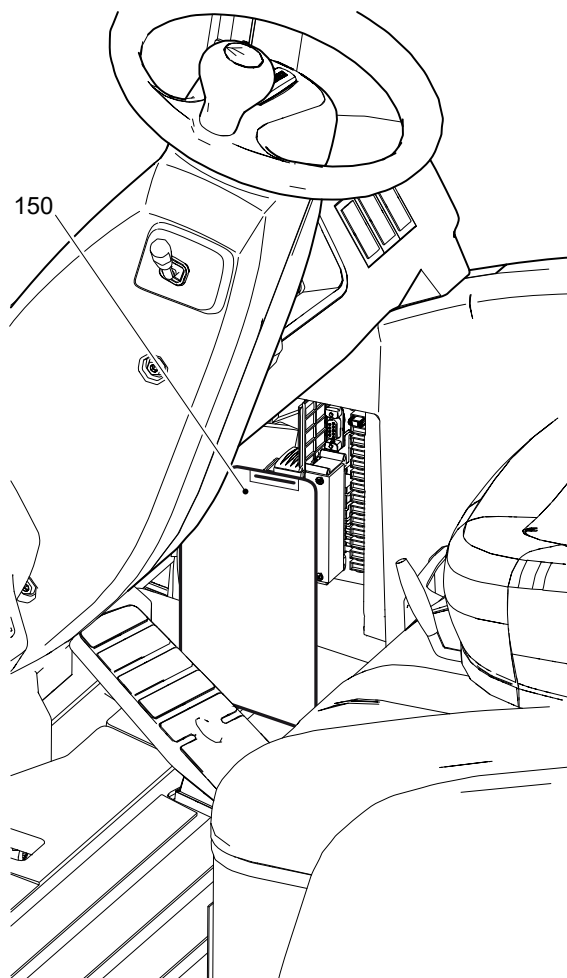
- ▶ Park the truck securely (see page 124).
- ▶ Press the emergency disconnect switch.
- ▶ Equipped with lithium-ion battery (○): disconnect the truck-side control line from the connection on the battery trough or the interface converter (○) on the battery.
Open the battery connector lock: loosen the bolted bar.
- ▶ Disconnect the battery.
- ▶ Remove any rings or metal bracelets etc. before working on electrical components.

⚠ 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 200.



Checking electrical fuses

Requirements

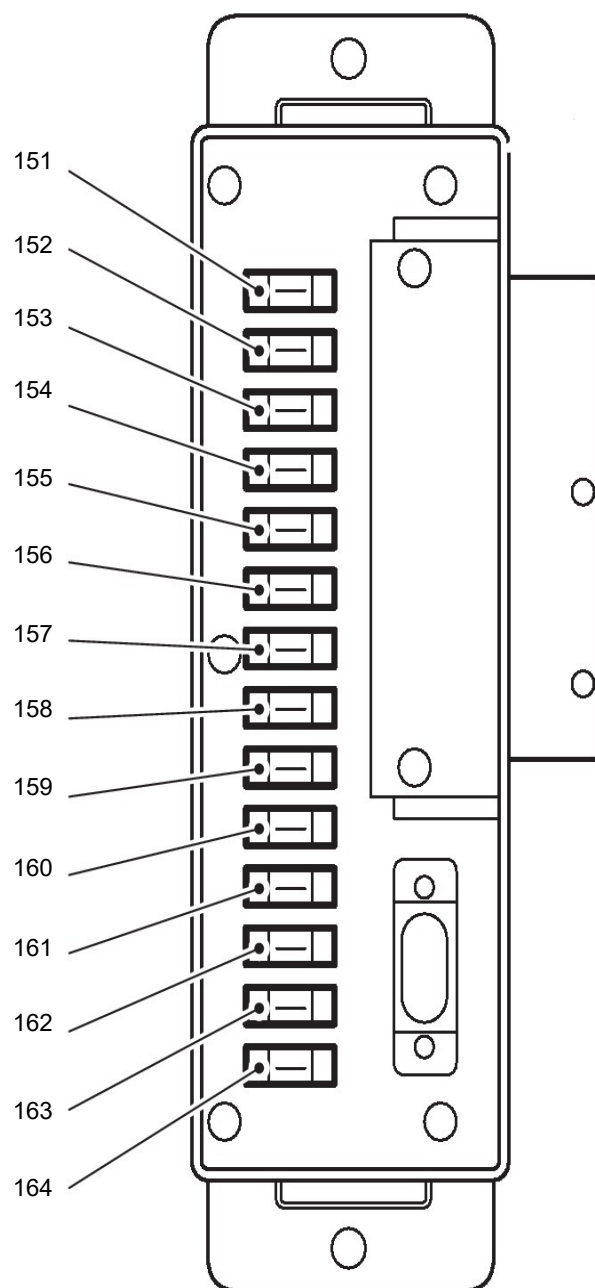
- Prepare the truck for maintenance and repair work (see page 184).

Procedure

- Before opening, clean the electrical-system cap (150) and the area around the cap.
- Remove the electrical-system cap (150).
- Check condition and rating of the fuses in accordance with the table.
- Replace any damaged fuses in accordance with the table.
- Close the electrical system cap (150).

The electrical fuses are now checked.

5.9.1 Fuse ratings



Electrical system fuses

Item	Description	Designation	Rating / type
151	1F14	MFC brake	10 A
152	2F18	MFC hydraulics	10 A
153	3F13	Left load wheel steering	3 A
154	9F2	Seat heating	7.5 A
155	3F2	Steering control	3 A
156	1F12	Drive control	2A
157	4F10	Fan	3 A
158	2F16	Lift control	2A
159	1F13	MFC brake	7.5 A
160	3F14	Right load wheel steering	3 A
161	2F17	MFC hydraulics	2A
162	5F7	Overhead guard options fuse	10 A
163	4F11	Onboard computer	5 A
164	F17	Radio data transmission	7.5 A

Checking electrical fuses

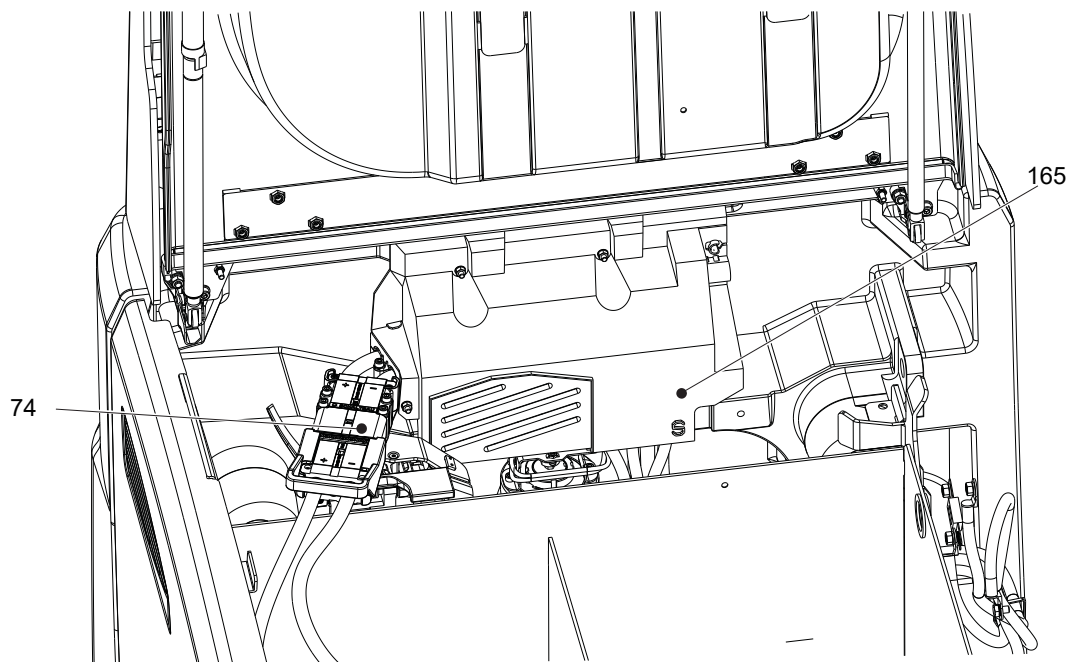
Requirements

- Prepare the truck for maintenance and repair work (see page 184).

Procedure

- Before opening, clean the contactor cover (165) and the area around the cap.
- Remove the contactor cover (165).
- Check condition and rating of the fuses in accordance with the table.
- Replace any damaged fuses in accordance with the table.
- Attach the contactor cover (165).

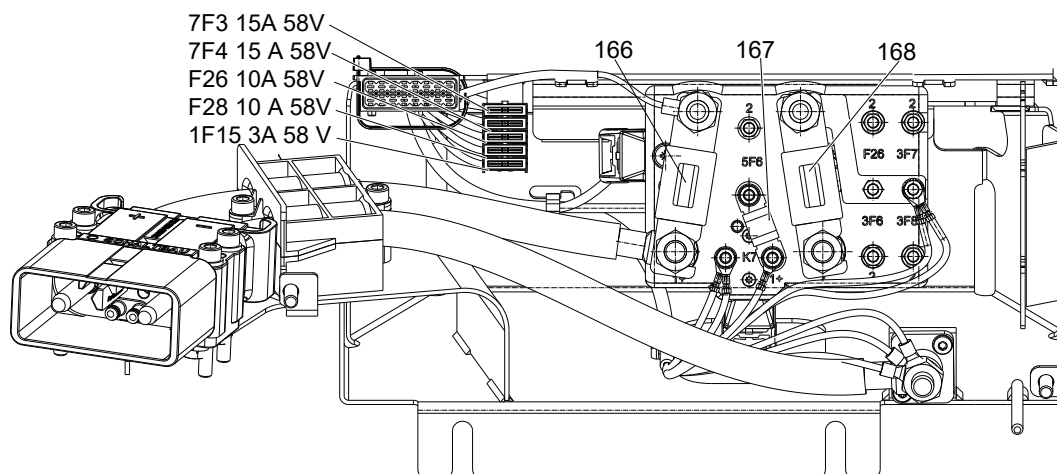
The electrical fuses are now checked.



Contactor cover

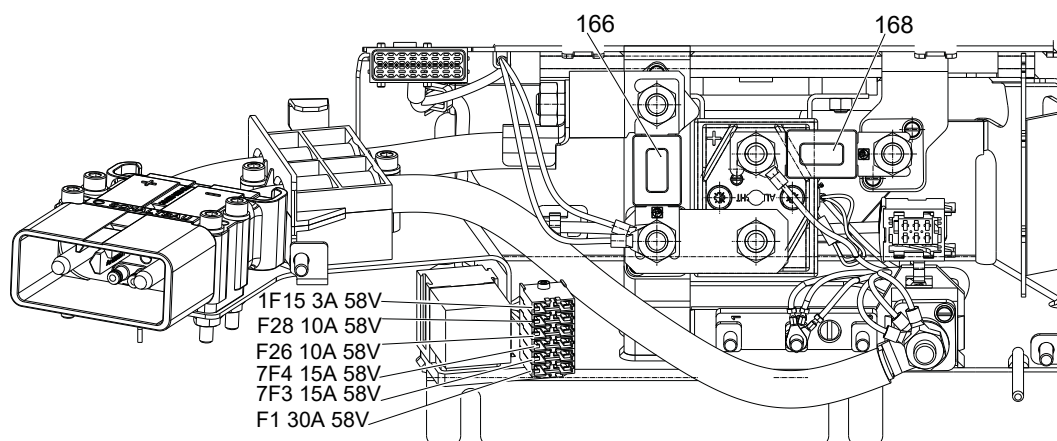
Never connect the battery (74) to the industrial truck without the connector cover (165) mounted.

EFG BB216k-BC320

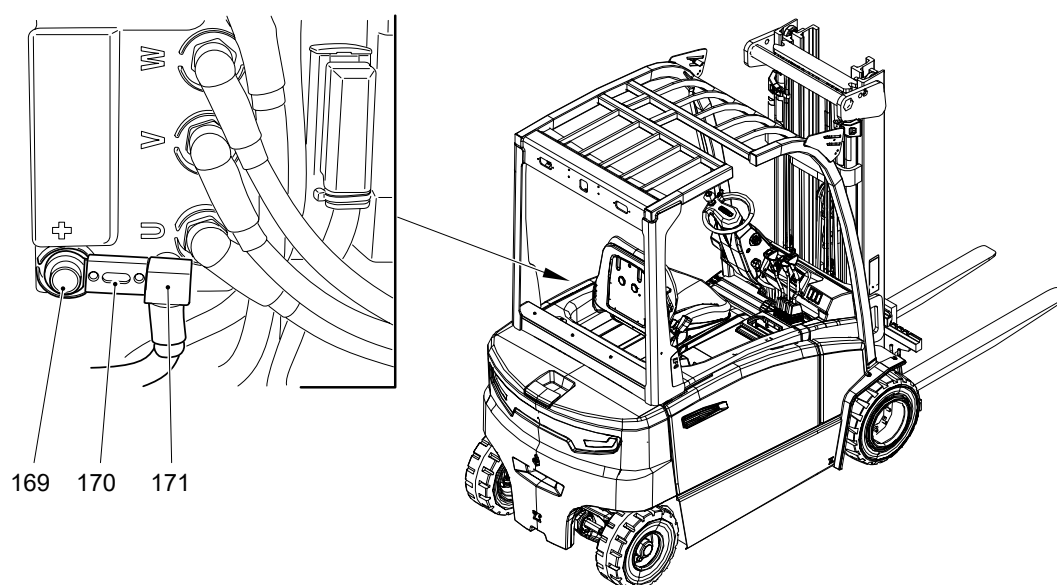


Fuse board

Item	Description	Designation	Rating / type
166	F8	Main fuse	500 A
167	F1	MFC/ seat heater/ DC/DC converter	30 A
168	F15	Drive / Lift	355 A
170	F27	Travel right	250 A



5.9.1.1 Controller



Item	Description	Designation	Rating / type
170	F27	Travel right	250 A

Checking electrical fuse

Requirements

- Prepare the truck for maintenance and repair work (see page 184).

Procedure

- Remove rubber caps (169).
- Check condition and rating of the fuse in accordance with the table.
- If the fuse is damaged, replace it in accordance with the table.
- Put rubber caps (169) on the fuse.

The electrical fuse is now checked.

5.10 Cleaning

- Cleaning tasks may only take place in the designated locations, which adhere to the stipulations of the country of use.

5.10.1 Cleaning the truck

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 43.
- ▶ Do not clean the truck with a steam jet.

⚠ 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 43.
- ▶ Do not clean the truck with a steam jet.

Cleaning the truck

Requirements

- Truck prepared for maintenance and repair work (see page 184).

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 208).

The truck has been cleaned.

NOTICE

Risk of damage when cleaning the truck with a high-pressure cleaner

Cleaning with a high-pressure cleaner can cause discolouration or other damage on coated or painted surfaces.

- ▶ Do not clean the truck with hot water or steam jets.
- ▶ Do clean the truck using acidic or aggressive cleaning agents such as insect removers.
- ▶ Do not clean the truck with insufficiently diluted cleaning agents.
- ▶ Before using a cleaning agent, read the manufacturer's instructions. Test an inconspicuous or concealed part of the coated or painted truck surface for potential reactions to the cleaning agent.
- ▶ Thoroughly rinse off any road salt before cleaning the truck.
- ▶ The counterweight of the truck should ideally be cleaned using cold water and a clean, soft cotton cloth.

5.10.2 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 184.

Tools and Material Required

- Compressor with water separator
- Non-conductive, antistatic brush

Procedure

- Expose the electrical system – see page 199.
- 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 199.
- Carry out all the tasks listed in the section "Recommissioning the truck after cleaning or maintenance work" – see page 208.

The electrical-system assemblies are now clean.

5.11 Working on the electrical system

WARNING!

Electrical current can cause accidents

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

Before starting maintenance on the electrical system:

- ▶ Only suitably trained electricians may work on the truck's electrical system.
 - ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
 - ▶ Park the truck securely (see page 124).
 - ▶ Equipped with lithium-ion battery (○):
disconnect the truck-side control line from the connection on the battery trough or the interface converter (○) on the battery.
Open the battery connector lock: loosen the bolted bar.
 - ▶ Disconnect the battery.
 - ▶ Remove any rings, metal wristbands etc.
-

5.12 Restoring the truck to service after maintenance and repairs

Procedure

- Connect the battery connector to the truck.
- Equipped with lithium-ion battery (○):
 - Close the battery connector lock: tighten the bolted bar.
 - Insert the truck-side control line into the connection on the battery trough or into the interface converter (○) on the battery.
- Commission the truck, see page 121.

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 185.

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

6.1 Prior to decommissioning

Procedure

- Thoroughly clean the truck, see page 204.
- Prevent the truck from rolling away accidentally.
- Check the hydraulic oil level and top up if necessary, see page 190.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the forklift truck according to the lubrication schedule, see page 181.
- Charge the battery – see page 78.
- 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.

- Equipped with lead-acid battery (●): Disconnect the battery, clean it and grease the battery terminal screws with terminal grease.
- Equipped with lithium-ion battery (○) without interface converter on the battery: Disconnect the truck-side control line from the connection on the battery trough.
- Equipped with lithium-ion battery (○) with interface converter on the battery:
 - Disconnect the truck-side control line from the connection on the interface converter on the battery.
 - Pull the battery forward.
 - Disconnect the control line from the battery connection at the top of the battery, or from the inside of the trough.
 - Slide the battery back in.

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 78.

6.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck – see page 204.
- Lubricate the forklift truck according to the lubrication schedule – see page 181.
- Equipped with lead-acid battery (●):
Clean the battery, grease the terminals 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 78.
- Commission the forklift truck – see page 102.

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 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.

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

1 Maintenance Contents EFG BA113/115/ BB 216k/BC316/BC320/BC325/BC330

Issued on: 2023-10-17 11:00

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.
Lubricate the contact surfaces of the mast.
Correct the hydraulic-oil level.

1.1.1.2 Optional Equipment

Fork positioner

Hydraulic operations
Clean and lubricate the attachment.

Clamping device

Hydraulic operations
Clean and lubricate the attachment.

Side shift

Hydraulic operations
Clean and lubricate the attachment.

Telescopic forks

Hydraulic operations
Clean and lubricate the attachment.

Windscreen washing system

Chassis/structure
Correct the fill level of the windscreen washer reservoir.

Electrical heating

Chassis/structure
Clean heater breather filter.

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

Power supply
Check battery and battery components for damage
Battery latch and battery attachment for correct function and damage
Battery connector for secure fit, functionality and damage

Travel
Check wheels for wear and damage

Chassis/structure
Check labels for legibility, completeness and plausibility
Check doors or covers for damage
Test driver's seat restraint system and check for damage
Check the overhead guard and/or the driver's cab for secure attachment and damage

Hydraulic operations
Check cylinders and piston rods are securely attached and check for damage
Hose guide for functionality and damage
Check contact surfaces of the mast for wear and damage
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:

Windscreen washing system

Chassis/structure
Check windscreen washer reservoir for leaks and damage

Road traffic approval (StVZO)

Electrical system
Test lighting and check for damage

Work lights

Electrical system
Test lighting and check for damage

Electrical heating

Chassis/structure
Test the heater

Weather protection

Chassis/structure
Test doors 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

Strobe light/warning beacon

Electrical system
Test strobe light/warning beacon and check 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 EFG BA113/115/ BB 216k/BC316/BC320/BC325/BC330 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.
Adjust and lubricate the brake mechanism.

Electrical system
Test the contactors and/or relays.
Clean the fan.
Perform insulation inspection.

Travel
Correct the transmission oil level or grease filling of the transmission.
Hydraulic operations
Adjust the slide pieces.
Adjust the load chains.
Lubricate the load chains.
Lubricate the contact surfaces of the mast.
Test emergency lowering.
Correct the hydraulic-oil level.
Test and adjust the pressure relief valve.
Where two tilt cylinders with the same stroke are used, measure their relative adjustment.
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.
Steering
Grease the steer axle.

1.2.1.2 Optional Equipment

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.

Clamping device

Hydraulic operations
Adjust the attachment.
Clean and lubricate the attachment.
Adjust the axial play of the front and rear rollers.
Check that the attachment and retainer to protect against accidental displacement and unhinging are present and function correctly.
Clean and grease attachment bearings, guides and stops.

Side shift

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.
Test the side shift adjustment.

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.

Windscreen washing system

Chassis/structure
Correct the fill level of the windscreen washer reservoir.

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.

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
Test brake mechanism and check for 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 microswitches and check for damage
Test emergency disconnect switch and check for damage
Contactors and/or relays for wear and damage
Test fan and check for damage
Check electrical wiring for damage (insulation damage, connections) and check whether the fuse ratings are correct
Power supply
Check battery and battery components for damage
Battery latch and battery attachment for correct function and damage
Battery connector for secure fit, functionality and damage
Travel
Drive system bearings for wear 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
Check chassis connections and screw connections are securely attached and check for damage
Check driver's seat for damage
Check driver's seat is securely attached and test adjustment mechanism
Check doors or covers for damage
Check the counterweight is securely attached
Check mast is securely attached
Check mast bearings for wear
Test trailer coupling stop or tow mechanism stop and check for damage
Check operator mat and steps are non-slip and free of damage
Test driver's seat restraint system and check for damage
Check the overhead guard and/or the driver's cab for secure attachment and damage

Hydraulic operations
Check "Hydraulic" control elements for correct assignment
Test hydraulic controls and check their labels for legibility, completeness and plausibility
Check cylinders and piston rods are securely attached and check for damage
Hose guide for functionality and damage
Check lateral play of the mast sections and fork carriage
Check slide pieces and stops for wear and damage
Check load chain mounting elements and chain pins for wear and damage
Check mast rollers and their running surfaces for wear and damage
Check contact surfaces of the mast for wear and damage
Test hydraulic system
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Check fork arms or load handler for wear and damage
Check piston rod screw depth and counter-fixing/clamping
Check tilt cylinders and mounting for leaks, wear and damage

Steering
Check hydraulic steering for leaks and damage
Check steering hoses and pipe lines for leaks and damage
Check the steer axle and stub axle for wear and damage
Test the electric/hydraulic steering and its components and check for leaks and damage
Check the mechanical parts of the steering column for wear and damage

1.2.2.2 Optional Equipment

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

Load backrest

Hydraulic operations
Check the load backrest is secure and check for damage

Battery refill system

Power supply
Refill system for functionality and leaks

Fork positioner

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 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

Clamping device

Hydraulic operations
Test acknowledgement button
Test hose pulley and check for leaks and damage
Test attachment and check for 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
Check cylinder seals for leaks and damage
Check cylinder rods and their bushings for wear and damage

Side shift

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 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
Side shift 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 hydraulic connections are securely attached and check for leaks
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

Crane hook

Hydraulic operations
Check the attachment is securely attached to the truck and check the load-bearing components for secure fit 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

Windscreen washing system

Chassis/structure
Check windscreen washer reservoir for leaks and damage
Test windscreen wipers and check for damage

Trailer coupling

Chassis/structure

Test trailer coupling stop or tow mechanism stop and check for damage

Seat heating

Electrical system

Check connections and cables are securely attached and check for insulation damage and other signs of 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

Road traffic approval (StVZO)

Electrical system

Test lighting 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

Electrical heating

Chassis/structure

Test the heater

Weather protection

Chassis/structure

Test window heating and check for damage
--

Test doors and check for damage

Optional electrical equipment

Electrical system

Fuses for correct ratings

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

Strobe light/warning beacon

Electrical system

Test strobe light/warning beacon and check for damage

Overhead guard cover

Chassis/structure

Check overhead guard cover is present and securely attached and check for damage
--

Audible warning devices

Electrical system

Check buzzer/warning alarm is securely attached, test and check for damage
--

Belt lock monitoring

Chassis/structure

Test seat belt monitoring and check for damage
--

Discharge strap

Electrical system
Check presence of electrostatic discharge strap or chain and check for damage

Restraint system / summer door

Chassis/structure
Check restraint system is complete, test and check 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

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
Brake fluid	2000	24
Gear oil	10000	
Hydraulic system breather filter	2000	12
Hydraulic oil	2000	12
Hydraulic oil filter	2000	12

1.2.3.2 Optional Equipment

Cold store application

maintenance part	service hours	months
Hydraulic oil	1000	12

H Traction Battery Appendix

1 Correct Use and Application

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

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

2 Data plate

172	Typ Type	48 V 5 PzS 775	Produktionswoche/-jahr Week/Year of Manufacture	40/2012	41
174	Serien-Nr. Serial-No	80882194	Lieferanten Nr. Supplier-No	17769	173
44	Nennspannung Nominal Voltage	48 V	Kapazität C5 Capacity C5	775 Ah	175
177	Zellenanzahl Number of Cells	24	Gewicht ± 5% Weight ± 5%	1118 kg	176
179	Sachnummer Part-No	50297157	Säuremenge Acid volume	189,4 l	178
48	Hersteller Manufacturer	Jungheinrich AG, 22039 HAMBURG, GERMANY			
180		JUNGHEINRICH			51
					181

Item	Description
41	Week/year of manufacture
44	Nominal voltage
48	Manufacturer
51	Manufacturer's logo
172	Type (battery designation)
173	Supplier number
174	Serial number
175	Capacity
176	Weight
177	Number of cells
178	Acid volume
179	Part no.
180	CE marking (only batteries ≥ 75 V)
181	Safety and warning information

3 Safety Instructions, Warning Indications and other Notes

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

4 Lead acid batteries with armour plated cells and liquid electrolyte

4.1 Description

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

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

Electrolyte

The rated density of the electrolyte assumes a temperature of 30°C and the rated electrolyte level is fully charged. Higher temperatures will reduce the electrolyte density; lower temperatures will increase the electrolyte density.

The corresponding adjustment factor is ± 0.0007 kg/l per K, e. g. electrolyte density 1.28 kg/l at 45 °C corresponds to a density of 1,29 kg/l at 30 °C.

The electrolyte must comply with the purity regulations of DIN 43530 Part 2.

4.1.1 Technical data of battery

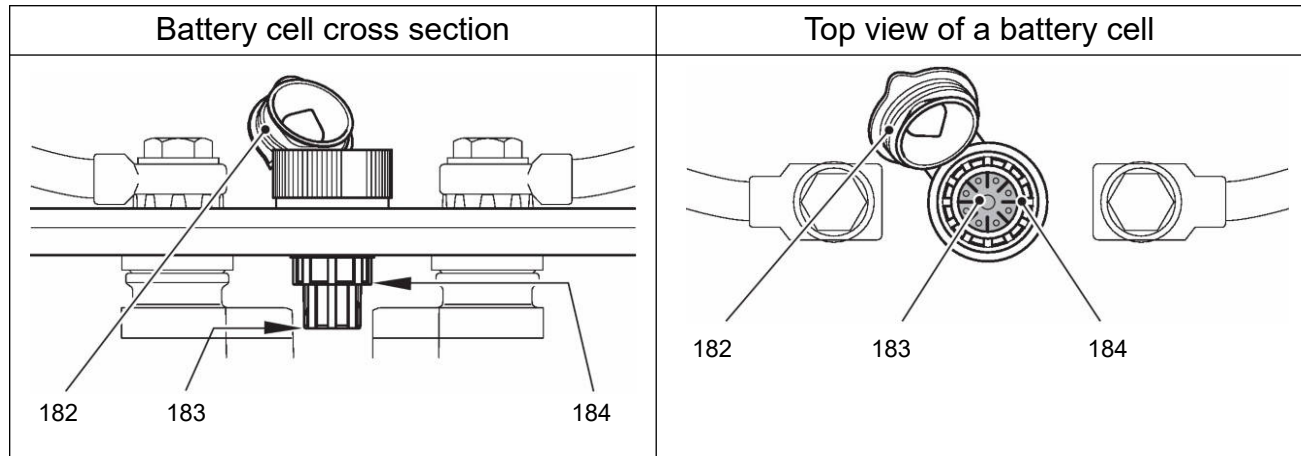
Product	Traction battery
Nominal voltage	2.0 V x number of cells
Rated capacity C5	See data plate
Discharge current	C5/5h
Rated density of the electrolyte ¹⁾	1.29 kg/l
Rated temperature ²⁾	30°C
System rated electrolyte level	Up to "Max" electrolyte level marking
Temperature limit ³⁾	55°C
¹⁾ Reached within the first 10 cycles. ²⁾ Higher temperatures shorten the service life; lower temperatures reduce the available capacity. ³⁾ Not permissible as operating temperature.	

4.2 Operation

4.2.1 Commissioning unfilled batteries

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

4.2.2 Commissioning filled and charged batteries



Checks and operations to be performed before starting daily work

Procedure

- Make sure the battery is in physically good condition.
- Make sure the terminals are correct (positive to positive and negative to negative) and check that contacts on the battery terminal conducting system are secure.
- Check the M10 terminal screws of the conductors and connectors are secure and if necessary torque to 23 ± 1 Nm.
- Charge the battery, see page 230.
- Check the electrolyte level of each battery cell after charging and top up if necessary:

- Open the plug (182).

- The electrolyte level should not be less than the "Min" electrolyte marking (183) and must not exceed the "Max" (184) marking.

- If necessary, add electrolyte with pure water up to the "Max" electrolyte level marking (184), see page 232.
- Close the plug (182).

The test is now complete.

4.2.3 Discharging the battery

- To achieve an optimum useful life avoid operational discharge of more than 80% of nominal capacity (full discharge). This corresponds to a minimum electrolyte density of 1.13 kg/l at the end of the discharge.
Fully or partially discharged batteries must be re-charged immediately and not left unattended.

4.2.4 Charging the battery

⚠ WARNING!

The gases produced during charging can cause explosions

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

- ▶ Always disconnect the charger and truck before connecting or disconnecting the charger and battery.
- ▶ The charger must be adapted to the battery in terms of voltage, charge capacity and battery technology.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶ Battery cell surfaces must remain exposed during charging in order to ensure sufficient ventilation, see truck operating instructions, chapter D, Charging the Battery.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2000 mm from the truck.
- ▶ Fire protection equipment must be available.
- ▶ Do not place any metallic objects on the battery.
- ▶ Always follow the safety regulations of the battery and charger station manufacturers.

NOTICE

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

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

Charging the battery

Requirements

- Permissible electrolyte temperature 10°C to 45°C).

Procedure

- Open or take off the tray lid or covers from the battery compartment.

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

The battery is charged.

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

Compensation charging

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

- Compensation charging should be carried out weekly.

Trickle charging

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

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

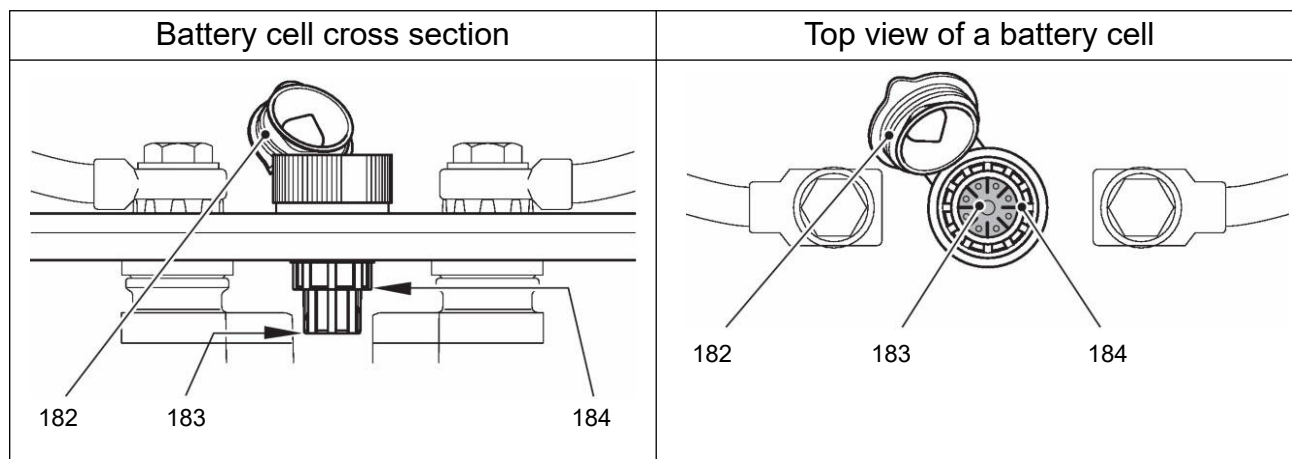
4.3 Servicing lead-acid batteries with armour plated cells

4.3.1 Quality of Water for Adding Electrolyte

Water quality

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

4.3.2 Daily



- Charge the battery after each discharge.
- After charging, check the electrolyte level of each battery cell and replenish as required:
 - Open the plug (182).
 - If necessary, add electrolyte with pure water up to the "Max" electrolyte level marking (184).
 - Close the plug (182).

- The electrolyte level should not be less than the "Min" electrolyte marking (183) and must not exceed the "Max" (184) marking.

4.3.3 Weekly

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

4.3.4 Monthly

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

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

4.3.5 Annually

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

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

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

5.1 Description

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

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

Electrolyte

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

Designation	Explanation
PzV	– Lead-acid battery with "Standard" closed positive tubular plate cells and electrolyte in gel compound – Battery cell width: 198 mm
PzV-BS	– Lead-acid battery with "British Standard" closed positive tubular plate cells and electrolyte in gel compound – Battery cell width: 158 mm

5.1.1 Technical data of battery

Product	Traction battery
Nominal voltage	2.0 V x number of cells
Rated capacity C5	See data plate
Discharge current	C5/5h
Rated temperature	30°C
Temperature limit ¹⁾	45°C, not permissible as operating temperature
Rated density of the electrolyte	Cannot be measured
System rated electrolyte level	Cannot be measured
¹⁾ Higher temperatures shorten the service life; lower temperatures reduce the available capacity.	

5.2 Operation

5.2.1 Commissioning

Checks and operations to be performed before starting daily work

Procedure

- Make sure the battery is in physically good condition.
- Make sure the terminals are correct (positive to positive and negative to negative) and check that contacts on the battery terminal conducting system are secure.
- Check the M10 terminal screws of the conductors and connectors are secure and if necessary torque to 23 ± 1 Nm.
- Charge the battery, see page 235.

The test is now complete.

5.2.2 Discharging the battery

- To achieve an optimum useful life avoid operational discharges of more than 60% of nominal capacity.
- If the battery is discharged during operation by more than 80% of rated capacity the useful life of the battery will reduce significantly. Fully or partially discharged batteries must be re-charged immediately and not left unattended.

5.2.3 Charging the battery

⚠ WARNING!

The gases produced during charging can cause explosions

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

- ▶ Always disconnect the charger and truck before connecting or disconnecting the charger and battery.
- ▶ The charger must be adapted to the battery in terms of voltage, charge capacity and battery technology.
- ▶ Before charging, check all cables and plug connections for visible signs of damage.
- ▶ Ventilate the room in which the truck is being charged.
- ▶ Battery cell surfaces must remain exposed during charging in order to ensure sufficient ventilation, see truck operating instructions, chapter D, Charging the Battery.
- ▶ Do not smoke and avoid naked flames when handling batteries.
- ▶ Wherever an industrial truck is parked for charging there must be no inflammable material or consumables capable of creating sparks within a minimum distance of 2000 mm from the truck.
- ▶ Fire protection equipment must be available.
- ▶ Do not place any metallic objects on the battery.
- ▶ Always follow the safety regulations of the battery and charger station manufacturers.

NOTICE

Charging the battery incorrectly can result in material damage.

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

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

Charging the battery

Requirements

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

Procedure

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

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

The battery is charged.

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

Compensation charging

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

- Compensation charging should be carried out weekly.

Trickle charging

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

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

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

 Do not add water!

5.3.1 Daily

- Charge the battery after each discharge.

5.3.2 Weekly

- Visually inspect for dirt and physical damage.

5.3.3 Every three months

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

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

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

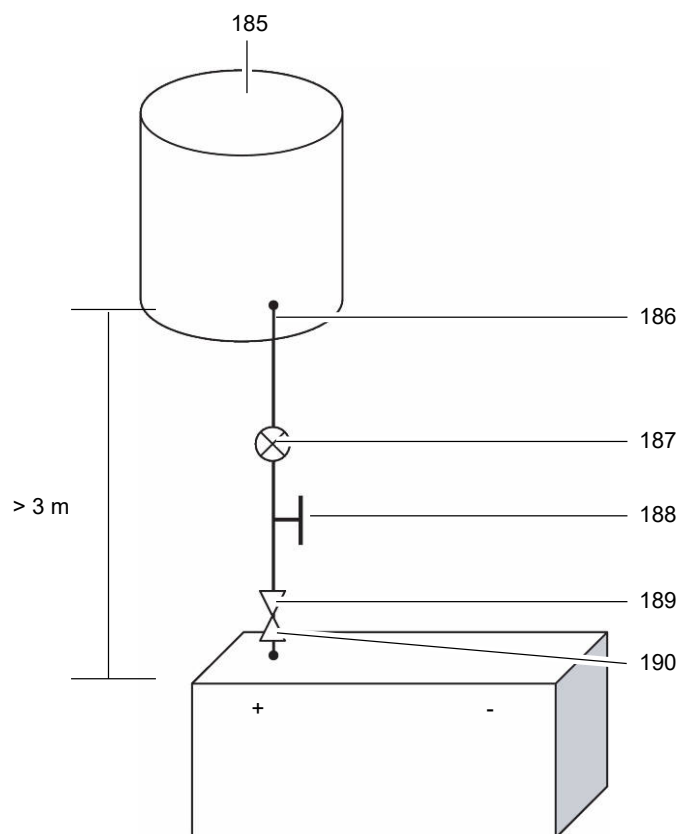
5.3.4 Annually

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

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

6 Aquamatik water replenishment system

6.1 Water replenishment system design



185	Water container
186	Tap connection with ball cock
187	Flow indicator
188	Shut-off cock
189	Locking coupling
190	Battery lock connector

6.2 Functional Description

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

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

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

6.3 Adding water

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

6.4 Water pressure

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

Water drop

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

Pressure water

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

6.5 Filling time

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

6.6 Water quality

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

6.7 Battery tubing

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

6.8 Operating temperature

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

6.9 Cleaning measures

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

6.10 Service mobile vehicle

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

7 Electrolyte circulation

7.1 Functional Description

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

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

Pump

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

Battery connection

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

Pressure-monitoring module

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

In the event of malfunctions, a visual error message appears on the battery charger. Some examples of malfunctions are listed below:

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

NOTICE

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

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

Schematic illustration

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

8 Cleaning batteries

Batteries and trays must be cleaned in order to

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

Instructions for cleaning batteries

- Select a cleaning site close to a drainage system for processing the electrolytic rinsing water.
- Observe all regulations for occupational health and safety, accident prevention as well as water and waste disposal when disposing of used electrolyte, rinsing water or aids (e.g. cloths for cleaning and drying).
- Wear safety goggles and protective clothing.
- Do not remove or open cell plugs.
- Clean the plastic components of the battery, in particular the cell containers, only with water or water-based cloths without any additives.
- After cleaning, dry the battery surface with suitable materials e.g. with compressed air or cleaning cloths.
- Use suction to remove liquid from the battery tray, observing the aforementioned regulations.

Cleaning the battery with a high pressure cleaner

Requirements

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

Procedure

- Follow the high pressure cleaner's user instructions.
- Do not use any cleaning additives.
- Observe the permissible cleaning device temperature setting of 140°C.

→ This generally ensures that the temperature does not exceed 60°C at a distance of 30cm behind the outlet nozzle.

- Observe the maximum operating pressure of 50 bar.
- Observe a minimum distance of 30 cm from the top of the battery.
- The battery should be sprayed over its entire surface to avoid localised overheating.

→ Do not clean one spot for more than 3 seconds with the jet to avoid exceeding the maximum battery surface temperature of 60°C.

- After cleaning dry the battery surface with suitable materials e.g. compressed air or cleaning cloths.

Battery cleaned.

9 Storing the battery

NOTICE

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

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

- Monthly compensation charge for PzS and PzB batteries or 4-monthly full charge for PzV batteries.
- Trickle charge for a charging voltage of $2.23 \text{ V} \times \text{number of cells}$ for PzS, PzM and PzB batteries or $2.25 \text{ V} \times \text{number of cells}$ for PzV batteries.

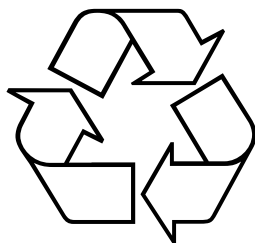
If the battery is to be taken out of service for a long period (> 3 months), it should, as far as possible, be charged to 50% of its charge level and stored in a dry room protected from frost.

10 Troubleshooting

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

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

11 Disposal



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

Buy-back terms and type of recycling are to be agreed with the manufacturer e.g. in accordance with Battery Directive 2006/66/EG.