

AME 15/18/20

07.25

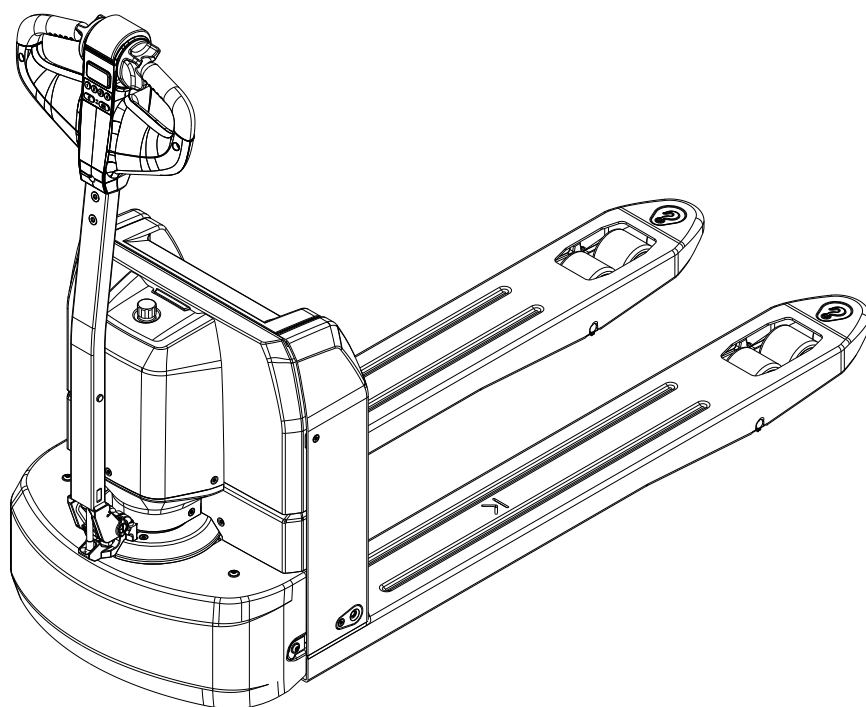
Operating instructions

en-GB

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AME 15/18/20



Declaration of Conformity



Manufacturer

Jungheinrich AG, 22039 Hamburg, Germany

Description
Industrial truck

Type	Option	Serial no.	Year of manufacture
AME 15/18/20			

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: AME 15/18/20
Serial number/type number

Manufacturer: Jungheinrich Aktiengesellschaft
22039 Hamburg, Germany

UK representative: Jungheinrich UK Ltd
Sherbourne House
Sherbourne Drive
Tilbrook
Milton Keynes
MK7 8HX

Authorised to compile documentation:

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

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

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

Supply of Machinery (Safety) Regulations 2008 No. 1597

and

Electromagnetic Compatibility Regulations 2016 No. 1091

Signed for and on behalf of:

Jungheinrich Aktiengesellschaft

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 presented in a precise and clear manner. The chapters are arranged by letter and the pages are numbered continuously.

The operating instructions detail different industrial truck models. When operating and checking the industrial truck, make sure that the particular section applies to your truck model.

Our industrial trucks are subject to ongoing development. We reserve the right to alter the design, features and technical aspects of the equipment. No guarantee of particular features of the equipment 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.

The load must be fully raised, see page 91.

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

- Lifting and lowering loads.
- Transporting lowered loads.

The following operations are prohibited:

- Carrying and lifting passengers.
- Pushing or pulling loads.

3 Approved application conditions

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.
-

- Operation in industrial and commercial environments.
- Minimum temperature for brief outdoor use (max. 30 minutes): -20 °C
- Use only on secure surfaces with sufficient capacity.
- Do not exceed the permissible surface and point loading limits on the travel paths.
- Use only on travel paths that are visible and approved by the operating company.
- Slopes of max. AME 15/18 8 % und AME 20 7 % may be negotiated with load, and 20 % without load.
- Do not travel across or at an angle on slopes. Travel with the load facing uphill.
- Use indoors and outdoors
- Temperature range: +5 °C to +40 °C
- Minimum illumination level of the traffic lanes 50 Lux.

4 Proprietor responsibilities

For the purposes of the present operating instructions the “operating company” is defined as any natural or legal person who either uses the industrial truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting) the proprietor is considered the person who, in accordance with existing contractual agreements between the owner and user of the industrial truck, is charged with operational duties.

The proprietor must ensure that the industrial truck is used only for the purpose it is intended for and that danger to life and limb of the user and third parties are excluded. Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The operating company must ensure that all users have read and understood these operating instructions.

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.

5 Adding attachments and/or optional equipment

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

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

6 Removal of components

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

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

7 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.

B Truck Description

1 Application

The AME 15/18/20 is designed to transport goods. It can lift open-bottom or stringer-board pallets beyond the area above the load wheels, as well as roll cages. The capacity is shown on the capacity plate, Qmax.

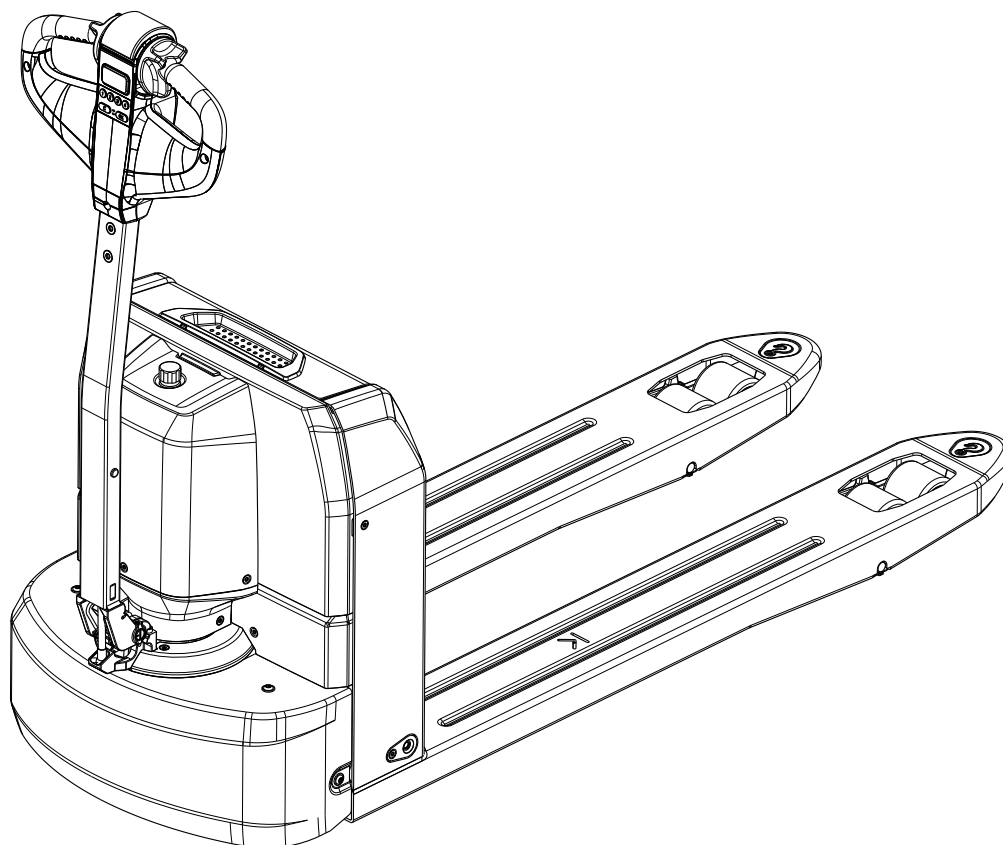
- The industrial truck is designed for light-duty operations; the maximum continuous operation time is 4 hours.

2 Truck models and rated capacity

The rated capacity can be derived from the model name.

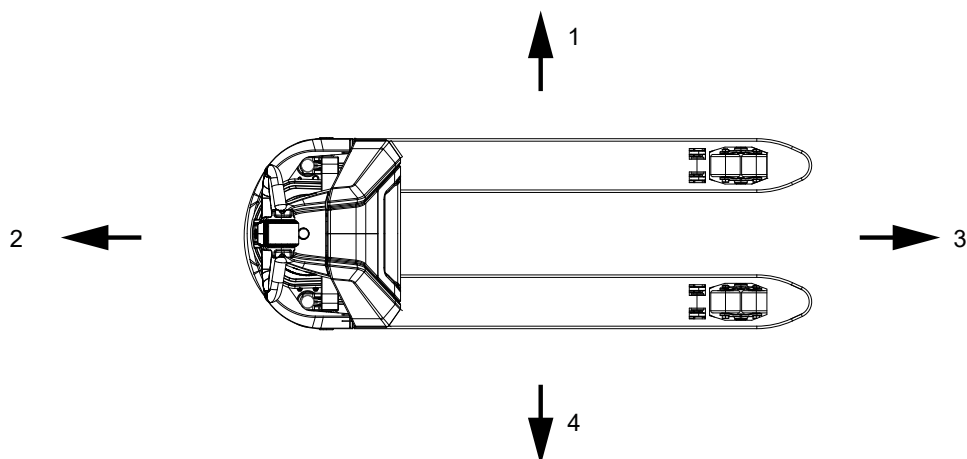
AME 15/18/20: 1500/1800/2000 kg

The rated capacity does not generally match the permissible capacity. The capacity can be found on the capacity plate attached to the truck.



3 Travel direction definition

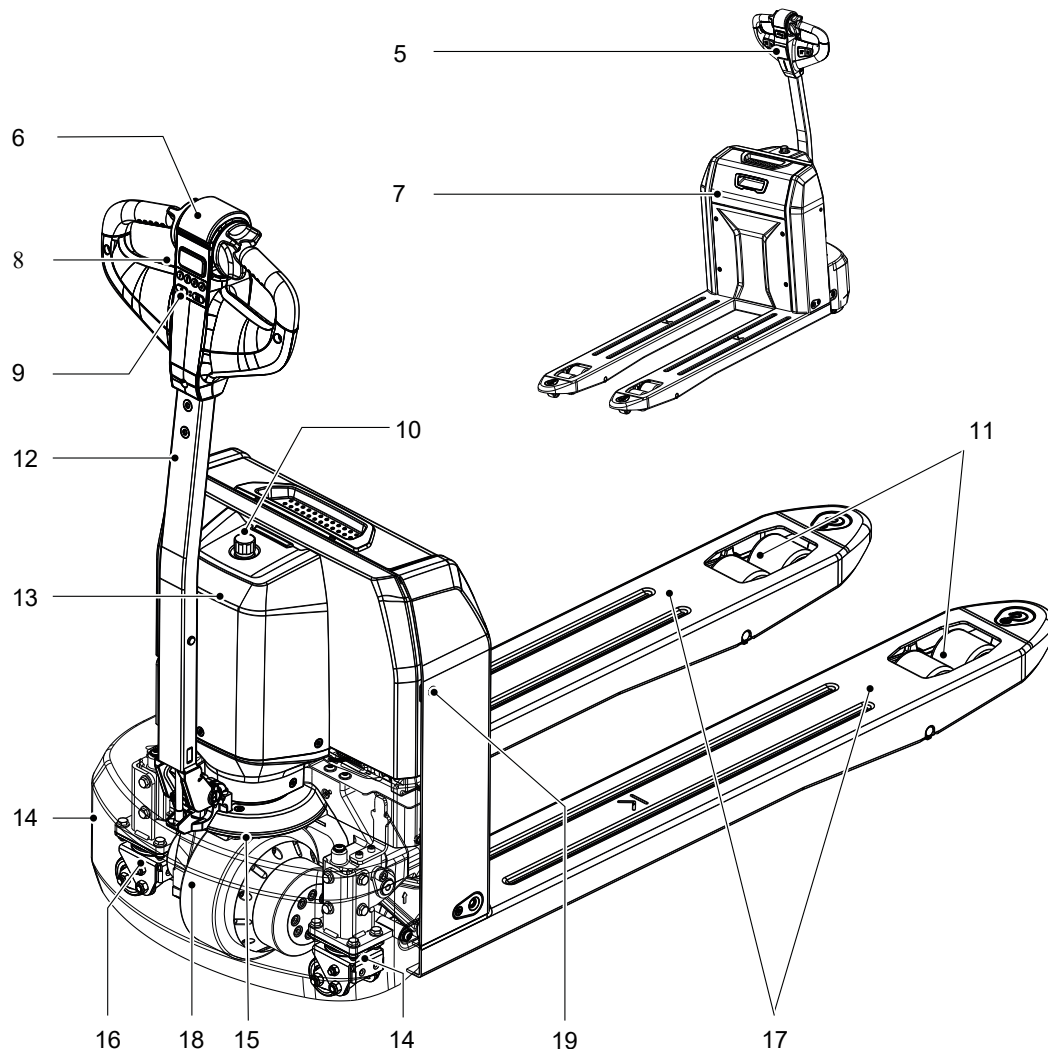
The following determinations have been made for travel direction specification:



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

4 Assemblies and Functional Description

4.1 Assembly Overview



Item	Description	Item	Description
5	Display unit	13	Cover for the hydraulic unit and electrical system
6	Collision safety switch	14	Support wheel
7	Battery	15	Drive unit
8	"Slow travel" button	16	Bumper
9	Keypad	17	Load handler
10	Emergency disconnect switch	18	Drive wheel
11	Load wheels	19	Load section
12	Tiller		

4.2 Functional Description

AME 15/18/20: Keypad

The truck is equipped with a keypad. The truck can only be started if the correct access code is entered via the keypad. This prevents any unauthorised use of the truck.

Safety equipment

An enclosed, smooth truck geometry with rounded edges ensures safe handling of the truck. The wheels are surrounded by a solid skirt offering collision protection.

When released, a gas strut pushes the tiller up and activates braking.

When travelling in the drive direction in pedestrian mode, the red collision safety switch changes the travel direction if the truck comes into contact with a person. The truck brakes, travels away from the operator and stops. This prevents the truck driving into the operator.

Activating the emergency disconnect switch rapidly cuts out all electrical functions in hazardous situations.

Emergency disconnect switch

The truck is equipped with an emergency disconnect switch. When it is pressed, all lifting and lowering operations are stopped and the fail-safe electromagnetic brake is activated, see page 84.

Operator position

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

Hydraulic system

Pressing the “Lift” button starts the pump unit, supplying hydraulic oil from the oil reservoir to the lift cylinder. The load handler is raised at even speed. Pressing the “Lower” button lowers the load handler.

Drive system

An electric motor actuates the drive wheel directly. The electric traction controller ensures smooth drive motor speed control and hence smooth travel, powerful acceleration and electrically controlled braking.

Steering

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

Electrical system

The truck has an electronic traction controller. The truck electrical system operates with a rated operating voltage of 48 V.

Control and display elements

Ergonomic controls ensure fatigue-free operation for sensitive application of the travel and hydraulic operations.

The display unit shows the operator key information such as operating hours, battery charge status and event messages.

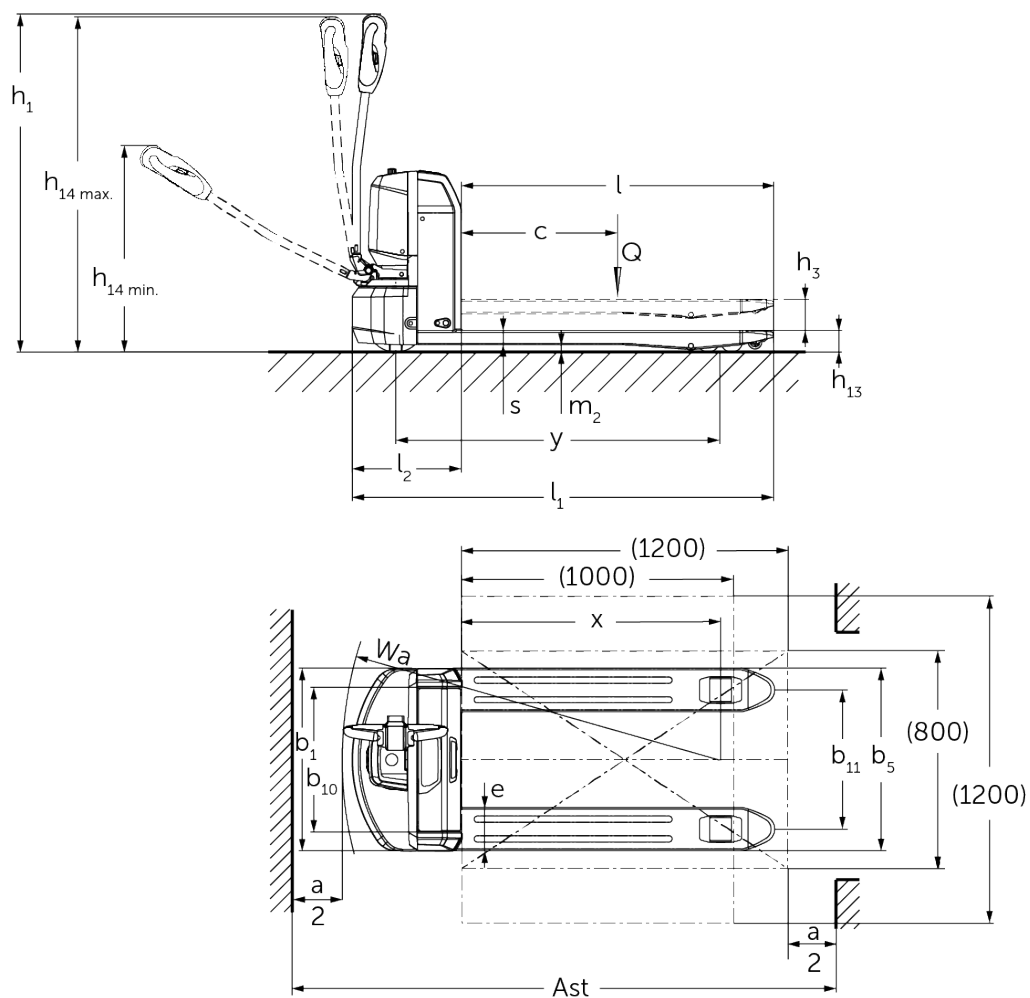
Service hours are counted while the truck is operational and one of the following operations is performed:

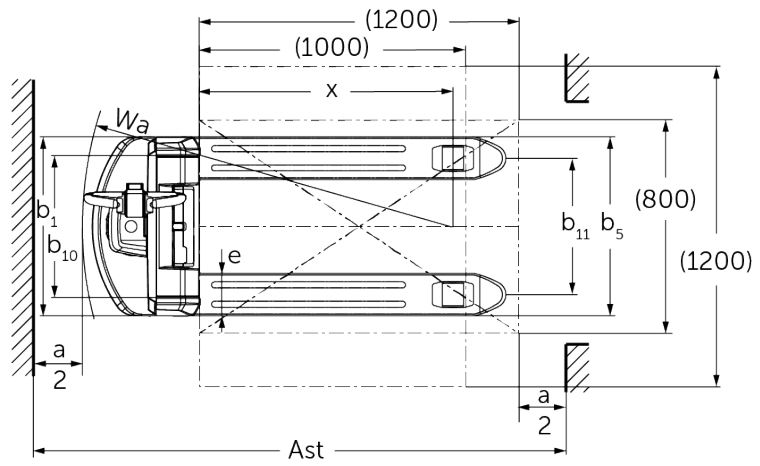
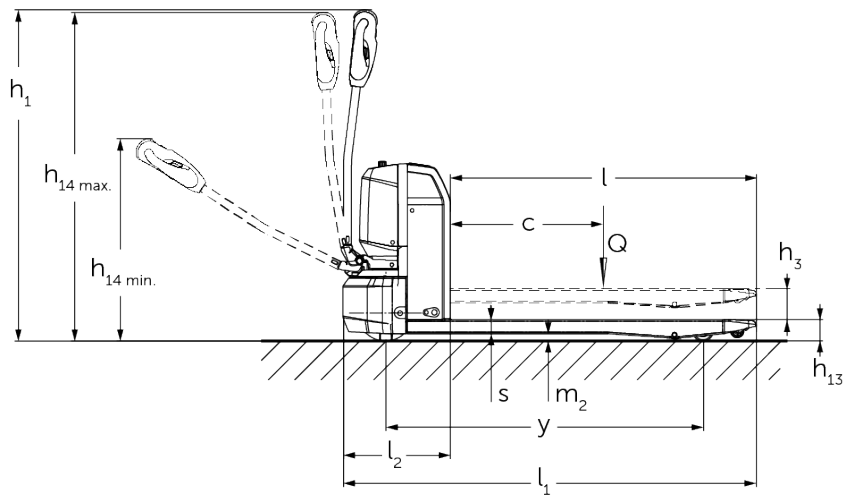
- Lifting
- Lowering
- Travel

5 Technical Specifications

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

5.1 Dimensions





Description		AME 15						
		530				670		
Load centre distance with standard fork length	c (mm)	600						
Load distance	x (mm)	602	802	952	1012	802	952	1012
Wheelbase	y (mm)	843	1043	1193	1253	1043	1193	1253
Track width, front	b10 (mm)	390				530		
Track width, rear	b11 (mm)	370				510		
Lift	h3 (mm)	115						
Tiller height in the travel position min./max.	h14 (mm)	700/1190						
Load handler lowered	h13 (mm)	80						
Overall length	l1 (mm)	1200	1400	1550	1610	1400	1550	1610
Length including fork shank	l2 (mm)	400						
Fork width	b1 (mm)	530				670		
Fork cross-section\fork length	s / e / l (mm)	53 x 160 x 800	53 x 160 x 1000	53 x 160 x 1150	53 x 160 x 1210	53 x 160 x 1000	53 x 160 x 1150	53 x 160 x 1210
Width across forks	b5 (mm)	530				670		
Ground clearance, centre of wheelbase	m2 (mm)	27						
Working aisle width, pallets 800x1200 length	Ast (mm)	1958	2003	2060	2090	2003	2060	2090
Turning radius	Wa (mm)	1039	1239	1389	1449	1239	1389	1449

Description		AME 18						
		530				670		
Load centre distance with standard fork length	c (mm)	600						
Load distance	x (mm)	602	802	952	1012	802	952	1012
Wheelbase	y (mm)	843	1043	1193	1253	1043	1193	1253
Track width, front	b10 (mm)	390				530		
Track width, rear	b11 (mm)	370				510		
Lift	h3 (mm)	115						
Tiller height in the travel position min./max.	h14 (mm)	700/1190						
Load handler lowered	h13 (mm)	80						
Overall length	l1 (mm)	1200	1400	1550	1610	1400	1550	1610
Length including fork shank	l2 (mm)	400						
Fork width	b1 (mm)	530				670		
Fork cross-section\fork length	s / e / l (mm)	53 x 160 x 800	53 x 160 x 1000	53 x 160 x 1150	53 x 160 x 1210	53 x 160 x 1000	53 x 160 x 1150	53 x 160 x 1210
Width across forks	b5 (mm)	530				670		
Ground clearance, centre of wheelbase	m2 (mm)	27						
Working aisle width, pallets 800x1200 length	Ast (mm)	1958	2003	2060	2090	2003	2060	2090
Turning radius	Wa (mm)	1039	1239	1389	1449	1239	1389	1449

Description		AME 20						
		530				670		
Load centre distance with standard fork length	c (mm)	600						
Load distance	x (mm)	602	802	952	1012	802	952	1012
Wheelbase	y (mm)	843	1043	1193	1253	1043	1193	1253
Track width, front	b10 (mm)	390				530		
Track width, rear	b11 (mm)	370				510		
Lift	h3 (mm)	115						
Tiller height in the travel position min./max.	h14 (mm)	700/1190						
Load handler lowered	h13 (mm)	80						
Overall length	l1 (mm)	1200	1400	1550	1610	1400	1550	1610
Length including fork shank	l2 (mm)	400						
Fork width	b1 (mm)	530				670		
Fork cross-section\fork length	s / e / l (mm)	53 x 160 x 800	53 x 160 x 1000	53 x 160 x 1150	53 x 160 x 1210	53 x 160 x 1000	53 x 160 x 1150	53 x 160 x 1210
Width across forks	b5 (mm)	530				670		
Ground clearance, centre of wheelbase	m2 (mm)	27						
Working aisle width, pallets 800x1200 length	Ast (mm)	1958	2003	2060	2090	2003	2060	2090
Turning radius	Wa (mm)	1039	1239	1389	1449	1239	1389	1449

5.2 Performance data

Description	AME 15	AME 18	AME 20	
Rated capacity Q	1500	1800	2000	kg
Travel speed with / without rated load	5.0/5.5			km/h
Lift speed with / without rated load	0.03/0.04			m/s
Lowering speed with / without rated load	0.06/0.05			m/s
Drive motor, output S2 60min	0.75	1.00		kW
Lift motor, output at S3 15 %	0.8			kW
Max. gradeability with / without rated load	8/20		7/20	%

5.3 Battery

The battery used in this truck is a lithium-ion model. This is an environmentally friendly battery without chemical mercury or cadmium.

The truck must only be operated with an approved lithium-ion battery.

Technical parameter	Battery specification	
	48 V 15 Ah	48 V 25 Ah
Rated voltage	48 V	
Nominal capacity ¹⁾	20 Ah	25 Ah
Weight	7,5 kg	10,5 kg
Dimensions	420 x 300 x 80 mm	
Standard charging current	8 A	10 A
Charging temperature	0 °C to +45 °C	
Discharge temperature	-20 °C ¹⁾ to +65 °C	
Storage temperature range	20 °C to +45 °C (less than 6 months)	
	-20 °C to +45 °C (less than 1 month)	

¹⁾ Briefly up to 30 minutes

5.4 Battery charger

Model	Specification	Input	Output
ELH 015i	48 V 8 A	110 VAC -240 VAC ~ 5.0 A max	42-58 V 8.0 A
SLH 015i	48 V 10 A	110 VAC -240 VAC ~ 5.0 A max	42-58 V 8.0 A

The permissible temperature range for charging the battery is between 0 °C and +45 °C.

5.5 Weights

Description	AME 15	AME 18	AME 20	
	530 x 1150	670 x 1150		
Net weight	145			kg
Axle load, laden front/rear	630/1015	700/1250	815/1335	kg
Axle load without load front/rear	100/45	100/50		kg

5.6 Tyre type

Description	AME 15	AME 18	AME 20	
Tyre size, front	ø 210 x 70			mm
Tyre size, rear	ø 80 x 70 (ø 80 x 93)			mm
Wheels Number front / rear (x = driven)	1x2/ 4 (1x +2/2)			

5.7 EN norms

Continuous sound pressure level

– AME 15/18/20: < 70 dB(A)

in accordance with EN 12053 as harmonised with ISO 4871.

- The continuous sound pressure level is calculated according to standard procedures and takes into account the sound pressure level when travelling, lifting and idling. The sound pressure level is measured at the operator's ear.
- Noise levels can fluctuate depending on the floor composition and wheel lining.

Electromagnetic compatibility (EMC)

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

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

WARNING!

Damage to medical equipment due to non-ionising radiation

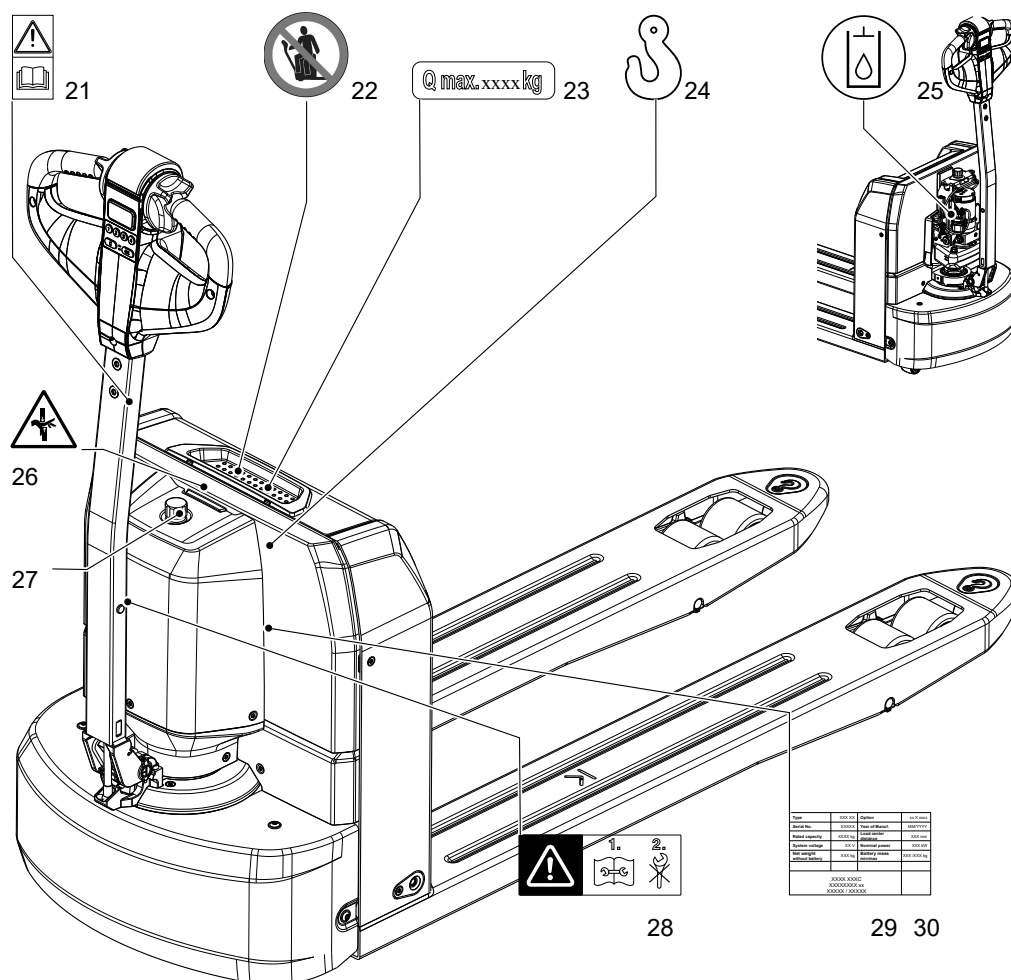
Electrical equipment on the truck emitting non-ionising radiation (e.g. wireless data transmission) can affect operators' medical equipment (pacemakers, hearing aids etc.) and result in malfunctions.

- Consult a doctor or the manufacturer of the medical equipment to clarify whether the medical equipment can be used near the industrial truck.

5.8 Electrical Requirements

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

6 Identification Points and Data Plates



Item	Description
21	Information sign: "Observe operating instructions"
22	Prohibition plate: "No passengers"
23	Truck capacity plate
24	Attachment point for loading by crane
25	Oil filling
26	Warning notice: "Trapping hazard"
27	"Emergency disconnect switch" marking
28	Repair notice
29	Data plate
30	Punched serial number

6.1 Data plate

	Flurförderzeug/Industrial truck				
32	Typ Type	XXX XX	Baujahr Year of Manufacture	XX/XXXX	31
34	Serial-Nr. Serial No.	XXXXXXXXXXXX	Option Option	XXX x XXXX	33
36	Nenntragfähigkeit Rated capacity	XXXX kg	Lastschwerpunktstand Load centre distance	XXX mm	35
38	Batteriespannung Battery Voltage	XX V	Antriebsleistung Drive output	XXX kW	37
40	Leergewicht ohne Batterie Net truck weight w/o battery	XXX kg	Batteriegewicht min/max Min./max. battery weight	XXX kg	39
41	Hersteller Manufacturer Importiert von Imported by	XXX XX XXXXXXXXXXXX			42
					

Item	Description	Item	Description
33	Option	38	Battery voltage
32	Type	37	Nominal power
34	Serial number	40	Mass of the truck without battery
31	Year of manufacture	39	Battery mass
35	Load centre distance	41	Manufacturer
36	Rated capacity	42	Logo

- When making enquiries about the truck or ordering spare parts, always state the vehicle's serial number (34).
- For queries regarding the truck or when ordering spare parts, always quote the serial number (34).
- The illustration shows the standard version for EU member states. The data plate may differ in other countries.

C Transport and Commissioning

1 Lifting by crane

WARNING!

All persons involved in loading by crane must be trained

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

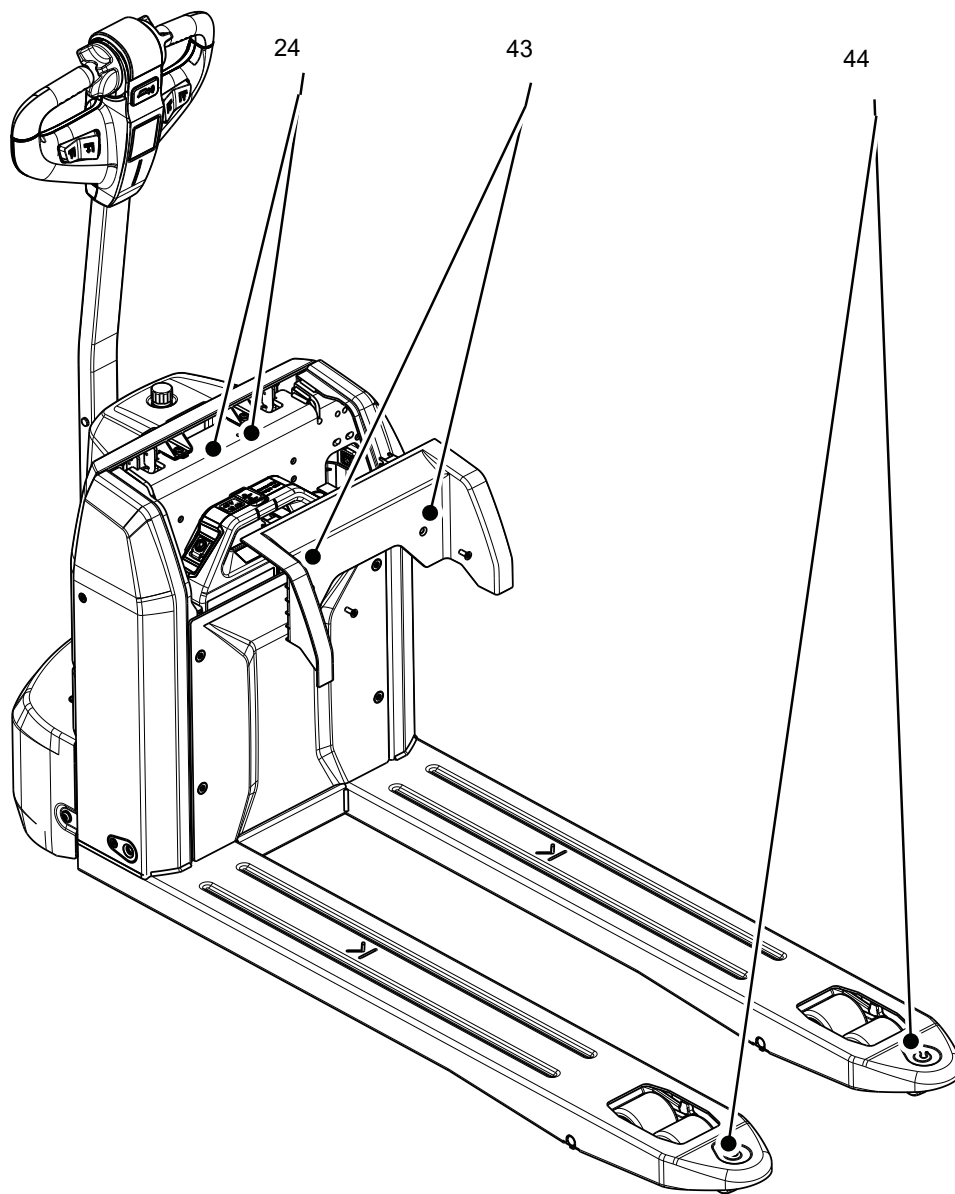
- ▶ Loading must only be performed by specialist personnel trained for this purpose. The specialist personnel must be instructed in securing loads on road vehicles and handling load securing devices. In each case correct measurements must be taken and appropriate safety measures applied.

WARNING!

Improper loading by crane can result in accidents

Improper use or use of unsuitable lifting gear can cause the truck to fall when being loaded by crane.

- ▶ Prevent the truck from hitting other objects during lifting, and avoid uncontrolled movements. If necessary, secure the truck with guide ropes.
- ▶ Loading by crane may only be performed by persons who have been trained in the use of the lifting accessories.
- ▶ Wear personal protective equipment (e.g. safety shoes, hard hat, hi-vis jacket, protective gloves) when loading by crane.
- ▶ Do not stand under suspended loads.
- ▶ Do not enter or stand in the hazardous area.
- ▶ Always use lifting gear with sufficient capacity (observed truck weight in accordance with truck data plate – see page 29).
- ▶ Always secure crane lifting gear to the prescribed attachment points and prevent it from slipping.
- ▶ Use the lifting accessories only in the prescribed load direction.
- ▶ Lifting slings should be fastened in such a way that they do not come into contact with any attachments when lifting.



Loading the truck by crane

Requirements

- Truck parked securely – see page 80.

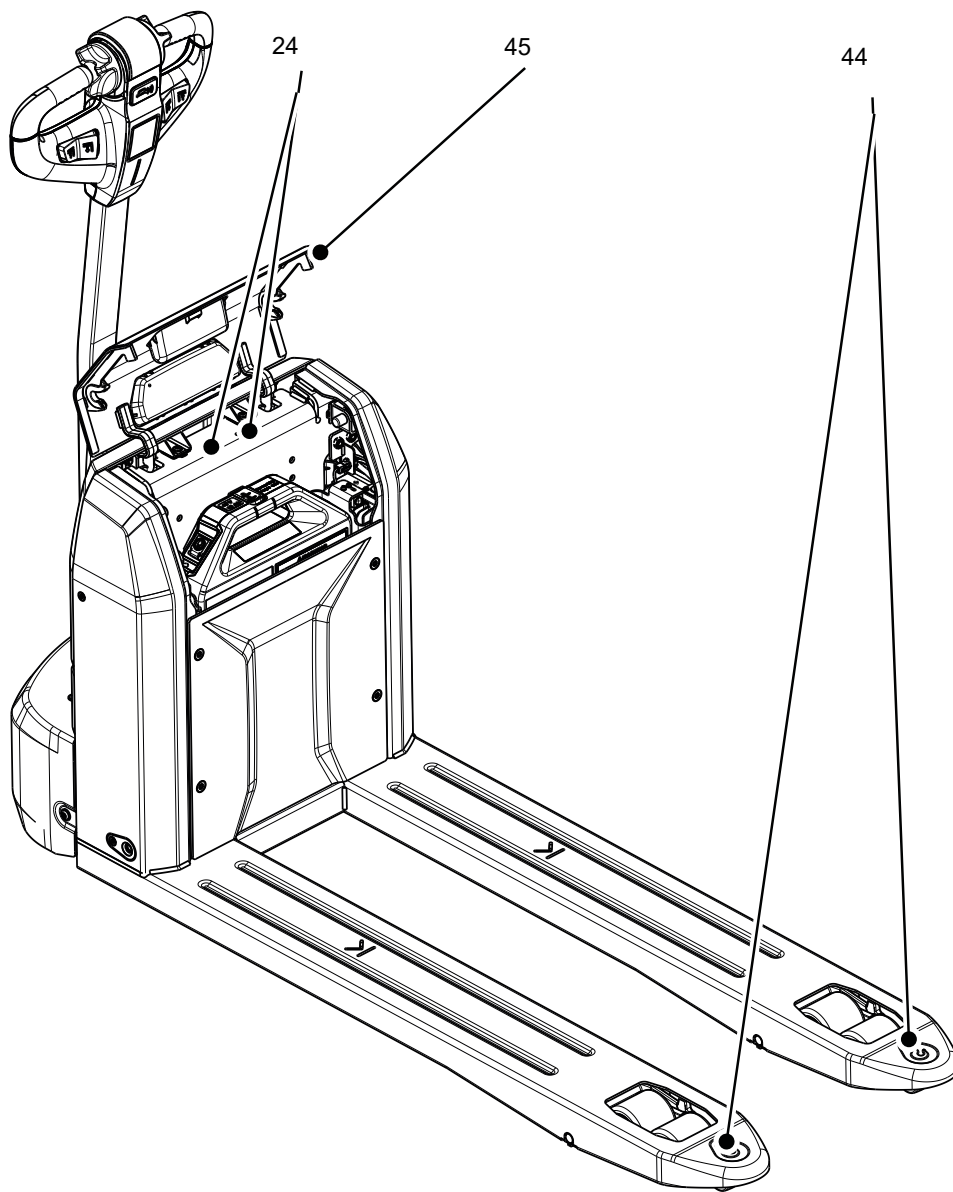
Tools and Material Required

- Lifting equipment
- Crane lifting gear
- Ring bolts

Procedure

- Remove two screws from the cover (43).
- Mount eyebolts at the attachment points (24) .
- Attach the crane lifting gear to the eyebolts (24) and attachment points of the forks (44).

The truck can now be loaded by crane.



Loading the truck by crane

Requirements

- Truck parked securely – see page 80.

Tools and Material Required

- Lifting equipment
- Crane lifting gear
- Ring bolts

Procedure

- Open the cover (45).
- Mount eyebolts at the attachment points (24) .
- Attach the crane lifting gear to the eyebolts (24) and attachment points of the forks (44).

The truck can now be loaded by crane.

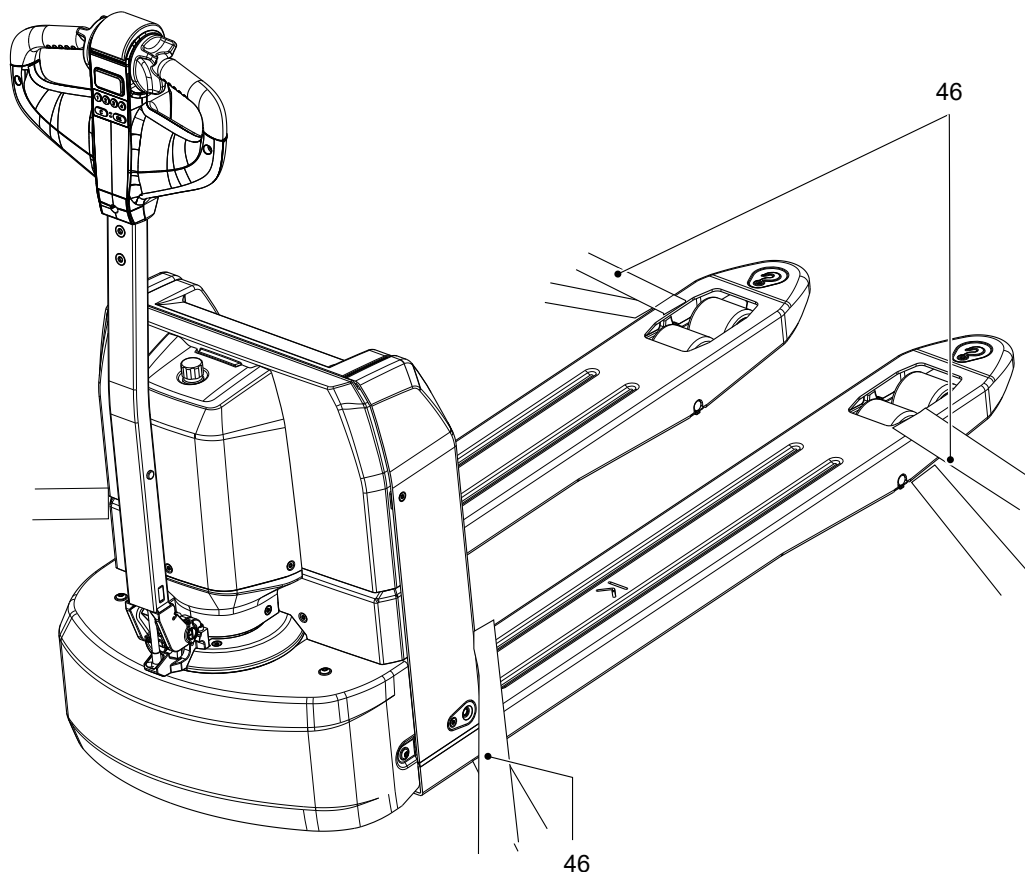
2 Transport

⚠ WARNING!

Uncontrolled movements during transport

Improper fastening of the truck during transport can result in serious accidents. Slipping lashing straps can lead to uncontrolled movements of the truck 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 must be securely fastened when transported on a lorry or a 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.
 - ▶ Use non-slip materials to secure the transport aids (pallet, wedges, etc.), e.g. non-slip mats.
-



Securing the truck for transport

Requirements

- The truck is now loaded.
- Truck parked securely – see page 80.

Tools and Material Required

- Lashing straps

Procedure

- Attach the lashing straps (46) to the truck, strap them to the transport vehicle and tension sufficiently.

The truck can be transported.

3 Using the Truck for the First Time

WARNING!

The use of unsuitable energy sources can be hazardous

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

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

► The truck must only be operated with battery current.

Procedure

- Check the truck for completeness, see page 17.
- Check the tiller, see page 39.
 - If the tiller is fitted: verify correct assembly of all electrical and mechanical components.
 - If the tiller was supplied separately: Fit the tiller.
- Insert the battery, see page 68.
- Check the battery charge status, see page 60.
- Visual inspections and operations to be performed before starting daily operation, see page 78.

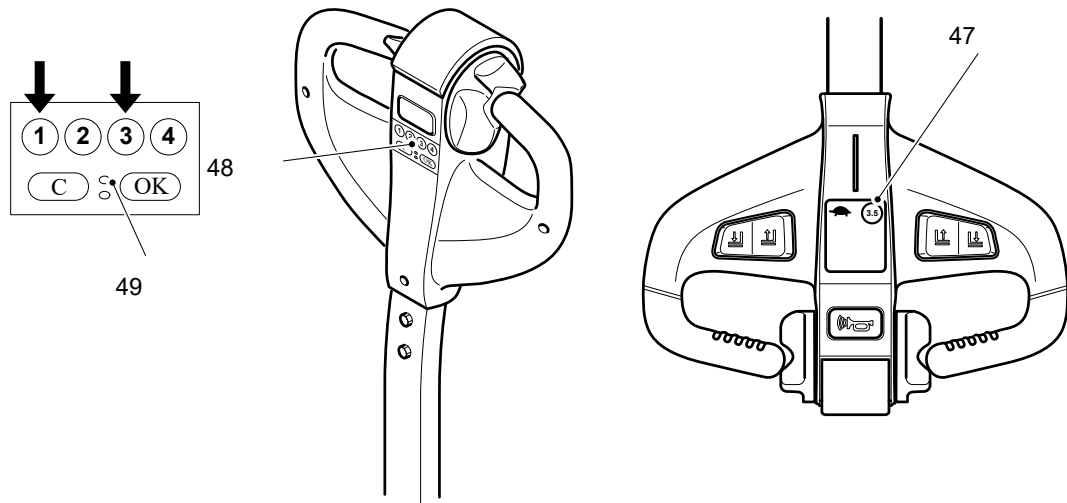
The truck can now be started, see page 78.

Wheel flattening

If the truck has been parked for a long time, flattening may occur on the treads of the wheels. The flattening does not have a negative impact on the safety or stability of the truck. After the industrial truck has covered a certain distance, the flattening disappears.

-  The battery must be fully charged before first use.

4 Access code



1, 2, 3 and 4 are the password setting keys. They can be set repeatedly and can be set to 16 different 4-digit user passwords.

The interactive display of red and green LED indicators represents the setting and use process.

When the password is not entered after the tiller is started, the red light (49) remains on.

When the forklift encounters a fault code or charges, the red light flashes.

When entering the correct password or charging is completed, the green light will remain on.

Procedure

- Switch off the truck.
- Enter administrator password (standard: 22222), press “OK”.

Correct → red LED flashes.

Wrong → red LED flashes three times.

- Enter function code 1 → green LED flashes and stays on.
- Enter user ID (e.g. 11, 12, ..., 44) → press “OK” → green LED flashes.
- Enter 4-digit password (digits 1 – 4, repetition allowed) → “OK”

New → green LED flashes twice, then stays on.

Already present → red LED flashes three times.

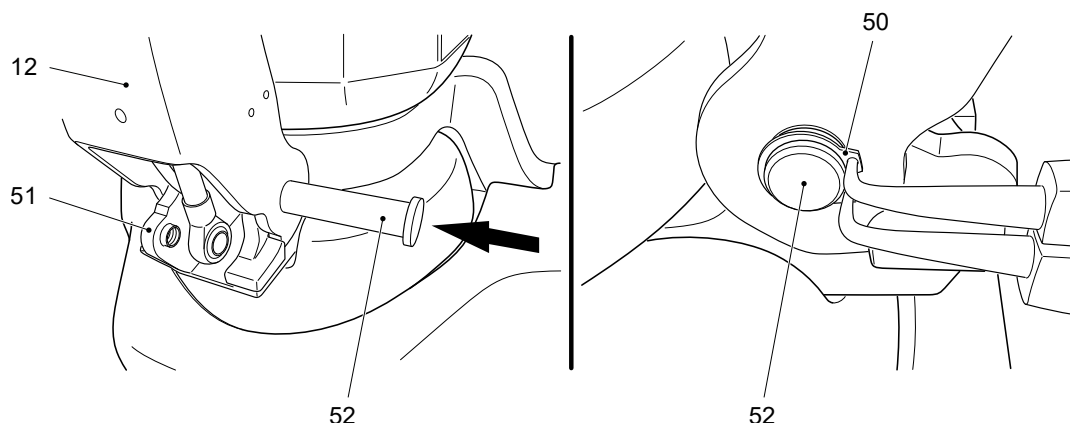
- Go back to step 4 to add more users.
- Cancel → press “Cancel” → red LED flashes twice.



User passwords must not be repeated.

5 Assembling the tiller

- If the tiller is supplied separately, the tiller must be installed by authorised and trained personnel prior to commissioning.



Fitting the tiller

Requirements

- The truck is parked securely, see page 80.

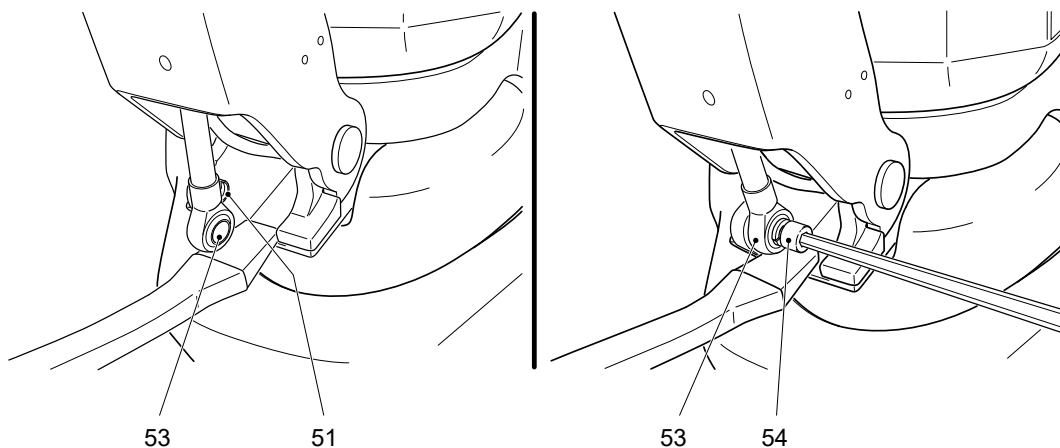
Tools and Material Required

- Circlip pliers
- Tyre lever
- Screwdriver, PH2
- The following materials are supplied with the truck:
- King pin (52)
- Retaining ring (50)

Procedure

- Position the tiller (12) vertically to the tiller mount (51) and fit the king pin (52).
- Secure the tiller in this vertical position until the gas strut has been fitted.
- Fit the retaining ring (50).

The tiller has been fitted and is ready for the gas strut assembly.



Fitting the gas strut

Requirements

- Tiller has been fitted.

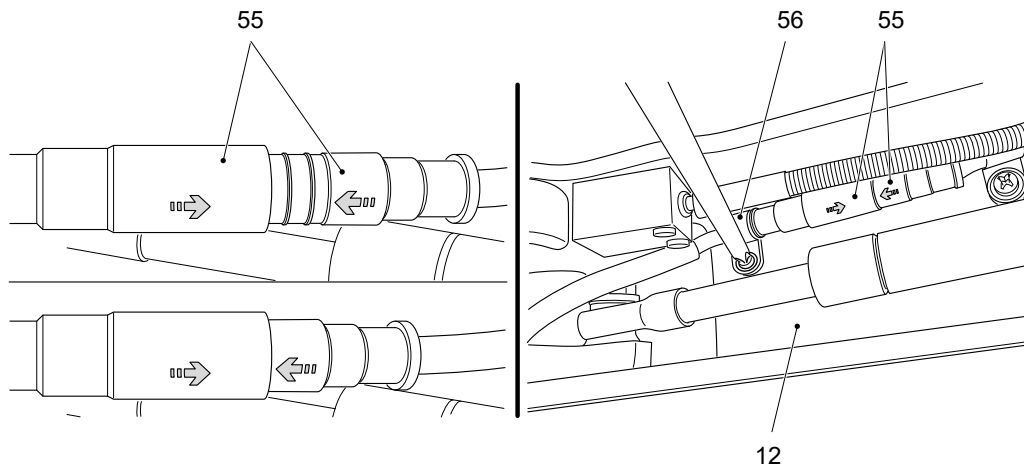
Tools and Material Required

- Allen key, key width 6 mm
- Tyre lever
- Screwdriver, PH2
- The following materials are supplied with the truck:
- Screw and washer for gas strut (54)

Procedure

- Use the tyre lever and the screwdriver to position the strut (53) such that the hole on the strut (53) is aligned with the threaded hole on the tiller mount (51).
- ➔ Risk of trapping: The gas strut is placed under tension during this process. Hold the gas strut in this position until final assembly.
- Fit the gas strut with the screw and washer such that the front face of the screw thread is flush with the outside of the tiller mount.
- Press the tiller down and check for freedom of movement.
- Test the function of the gas strut.
- ➔ When the tiller is released, the gas strut must return the tiller to its vertical position.

The gas strut has been fitted. The electrical connection of the tiller can be established.



Establishing the electrical connection of the tiller

Requirements

- The tiller and gas strut have been fitted.

Tools and Material Required

- Screwdriver, PH2
- The following materials are supplied with the truck:
- Plastic clamp (56) with screw and washer

Procedure

- Press the tiller (12) down and hold it in this position.
- Before assembly, align the plug connections (55) such that the arrows on both parts are in line.
- Establish the connection (55).
- Align and install the plastic clamp (56) as shown.

The electrical connection has been established. The tiller assembly process is completed.

D Battery - Servicing, Recharging, Replacement

1 Description of the lithium-ion battery

The lithium-ion battery is a battery with rechargeable high-performance energy cells.

The battery is designed for industrial trucks and can withstand heavy vibrations and knocks.

The battery features special connections for charging and discharging in order to prevent the use of incorrect batteries and chargers.

The battery has an intelligent battery management system, which includes safety functions such as voltage, temperature detection, undervoltage, overvoltage, overtemperature, overcurrent and short-circuit.

The internal resistance of the battery is very low, which minimises heat generation and maximises the power available to the truck.

Temperatur range for using the battery

Optimum battery useful life is achieved at the battery temperatures of +5 °C to +40 °C.

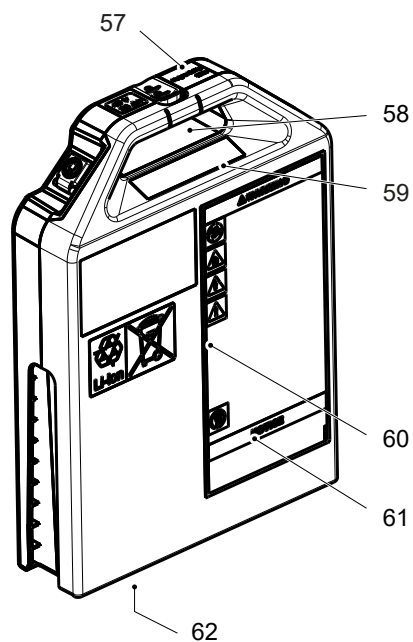
Low temperatures reduce the available battery capacity, high temperatures reduce the batteries useful life.

Temperature differences on both sides of the battery must not exceed 5 °C.

Battery chargers

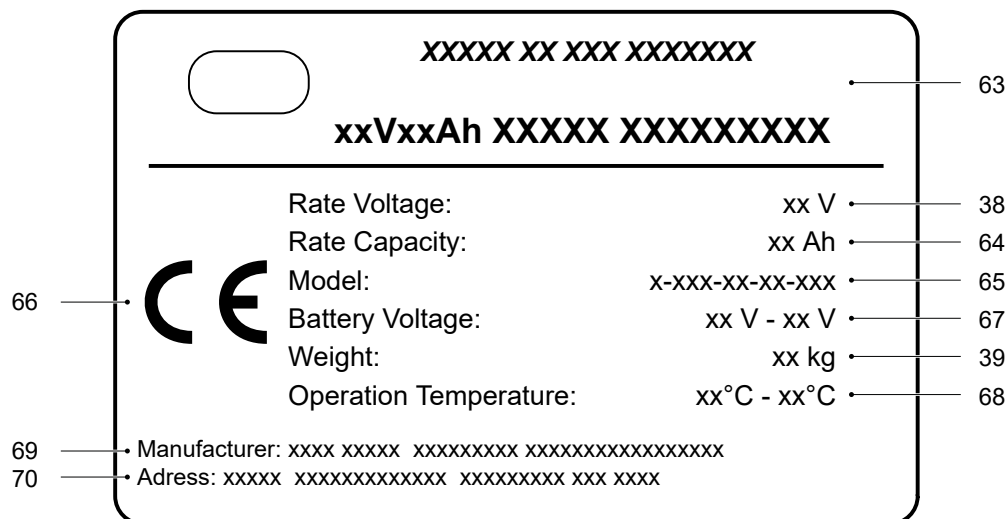
Only approved battery chargers must be used to charge the lithium-ion battery, see page 26.

2 Battery Decals



Item	Description	Item	Description
57	Sign: "Capacity and nominal voltage"	60	Safety information
58	Data plate	61	Battery
59	Warning notice: "Avoid collision"	62	Serial number

2.1 Battery data plate



Item	Description	Item	Description
38	Rated voltage	66	CE mark
39	Battery weight	67	Voltage range
63	Manufacturer logo and type designation	68	Operating temperature range
64	Battery capacity	69	Battery manufacturer
65	Model designation	70	Manufacturer address



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

2.2 Battery serial number



Item	Description	Item	Description
71	Barcode	73	Month of manufacture
72	Year of manufacture	74	Day of manufacture

3 Safety Instructions, Warning Indications and other Notes

3.1 Safety regulations for handling lithium-ion batteries



Faulty lithium-ion battery

Do not perform any repairs on the lithium-ion battery.

- ▶ A faulty lithium-ion battery should be replaced by the customer service department.

⚠ WARNING!

Risk of electric shock and burning

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

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

⚠ WARNING!

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

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

- ▶ Only manufacturer-approved batteries may be used on the truck.
- ▶ Battery equipment may 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.

⚠ WARNING!

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

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

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

NOTICE

Risk of material damage due to improper charging

Improper use of external charger can cause material damage

- ▶ It is necessary to apply the lithium-ion charger of our company.
 - ▶ The operation voltage of the charger is 48 V; the maximum charging voltage is 58 V, the charging current is 5,0 / 10,0 A.
 - ▶ The charger must only be used for batteries supplied by the manufacturer or other approved batteries provided it has been adapted by the manufacturer's service department.
 - ▶ Reverse charge of the battery is prohibited.
 - ▶ If the battery is heated obviously during charging, stop charging immediately. Charge again after it has been cooled down.
 - ▶ Hold the puller when pulling the connectors. It is not allowed to pull the wires directly.
-

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 16 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.
-

3.2 Potential hazards

No hazards are anticipated if the equipment is used correctly.

Hazards due to improper use

Mechanical damage:

- Damage to the battery housing due to mechanical effects (e.g. the battery falling)
- Cracks, fractures, splinters or holes in the battery housing

Short circuit:

- Short circuit due to cracks, fractures, splinters or holes in the battery housing
- Emission of harmful substances, battery fire or explosion
- Short-circuit caused by connecting both battery terminals, e.g. if the battery is immersed in water

Temperature damage:

- Emission of harmful substances, battery fire or explosion due to high solar radiation or storage in a hot environment (e.g. near ovens)

Storing damaged batteries

A damaged battery must be stored safely until the customer service department arrives.

To avoid hazards due to emission of harmful substances, fire or explosion, the following must be observed:

- Do not store in places often frequented by personnel
- Do not store in places where valuable objects (e.g. vehicles) are stored
- An automatic fire detection system should trigger only in case of danger (e.g. open fire)
- Good ventilation of the storage location
- No connection of the storage location with a ventilation system, so that any escaping harmful substances are not distributed within a building

Examples of where to store a non-functional battery:

- Roofed outdoor position
- Ventilated container
- Closed box with pressure and smoke discharge option

3.2.1 Symbols - Safety and Warnings

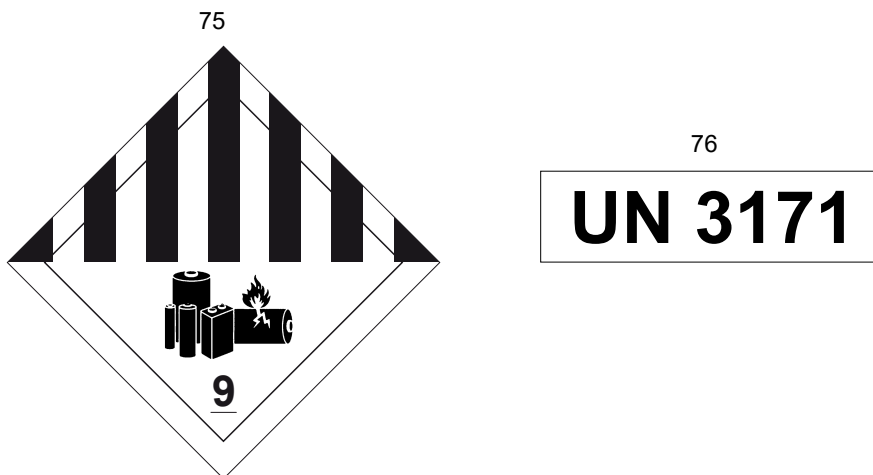
3.2.1.1 Safety and warning information

	Used lithium-ion batteries must be treated as hazardous waste. Lithium-ion batteries marked with the recycling symbol and the sign showing a crossed-out waste bin must not be disposed of with ordinary household waste. Buy-back terms and type of recycling are to be agreed with the manufacturer in accordance with the Battery Directive 2006/66/EG, for example.
	Avoid fire and short circuits due to overheating. Do not ignite or position open flames, glowing embers or sparks near the lithium-ion battery. Keep lithium-ion batteries away from strong heat sources.
	Hot surfaces. Battery cells can generate very high short-circuit currents, causing them to become hot.
	Dangerous electrical voltage! Battery cells can generate very high short-circuit currents, causing them to become hot. Caution! The metal parts of the battery cells are constantly under voltage, so do not place any foreign objects or tools on the lithium-ion battery. Observe the accident prevention regulations and DIN EN 62485-3.
	Wear personal protective equipment (e.g. safety goggles and safety gloves) when handling damaged battery cells and lithium-ion batteries. Use only insulated tools. If the contents leak out, do not inhale the fumes. Always wash your hands after completing the work. Do not mechanically machine the lithium-ion battery, strike, crush, compress, notch, dent or modify it in any way. Do not open, damage, penetrate, bend, heat the lithium-ion battery or allow it to become hot, do not throw it into a fire, short circuit it or immerse it in water. Do not store it or operate it in pressurised containers.
	Follow the operating instructions and keep them in a visible position in the charging area. If any faults are found on the lithium-ion battery, contact the manufacturer's customer service department immediately. Do not attempt to rectify faults independently. Do not open the lithium-ion battery.
	Protect the lithium-ion battery from solar radiation or other forms of heat radiation. Do not expose the lithium-ion battery to heat sources.

3.2.2 Marking of packages with lithium-ion batteries

The lithium-ion battery is a hazardous material. The applicable ADR regulations must be observed during transport.

- ADR = Accord européen relatif au transport international des marchandises Dangereuses par Route



Item	Description
75	Danger label class 9A for lithium-ion batteries
76	Marking of packages with lithium-ion batteries in accordance with the dangerous goods regulations GGVS/ADR appendix 9 for the transport of hazardous goods

3.2.3 Explosion and fire hazard

WARNING!

Physical damage, thermal effects or incorrect storage in the event of a defect can result in explosions or fire.

The battery materials can be flammable.



3.2.3.1 Particular hazard from combustion products

- Fire-fighting measures may only be carried out on a burning lithium-ion battery by trained and specially equipped fire-fighting personnel (e.g. by a member of the fire brigade).

► If possible, drive the truck outside before fighting the fire.

The lithium ion battery may be damaged by a fire in the vicinity of the lithium ion battery. When fighting a lithium-ion battery fire, the following dangers and information must be taken into consideration.

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 and carbon dioxide as well as manganese oxide, nickel oxide and cobalt oxide

3.2.3.2 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 result in harmful materials leaking, fire or battery explosion.

Endangered unopened batteries can be cooled using a water jet.

3.2.4 Material discharge

⚠ WARNING!

Hazard from liquid or gaseous contents from the battery

In the event of a technical defect or mechanical damage to the lithium-ion battery, as well as an overheated lithium-ion battery, electrolyte fluid can escape in liquid or gaseous form. Electrolyte fluid is hazardous to health. If the electrolyte fluid comes into contact with the skin or eyes, this can result in chemical burns and visual impairment. Inhaling the contents of electrolyte fluid can lead to respiratory illness.

- ▶ Wear personal protective equipment (e.g. safety gloves, safety shoes, respirator mask).
 - ▶ In the case of contact with the skin or eyes, rinse the affected areas with plenty of water and seek medical assistance immediately.
 - ▶ If the contents leak out, do not inhale the fumes.
 - ▶ If contents have been inhaled, seek medical assistance immediately. The affected person should also be taken to the fresh air.
 - ▶ Cordon off the affected area.
 - ▶ Ensure there is adequate ventilation.
 - ▶ Remain upwind of the area.
 - ▶ Keep persons away.
-



3.2.4.1 Precautionary measures for personnel

- Keep personnel away and facing the wind.
- Block off the affected area.
- Ensure there is adequate ventilation.
- Wear personal protective equipment.
- If vapours / dust / aerosols are present, use self-contained breathing apparatus.

3.2.4.2 Precautionary measures for the environment

Do not allow spilled fluids to enter the water system, drainage system or the underground water.

3.2.4.3 Cleaning measures

The leaked fluid must be removed professionally by the operating company on the basis of a risk assessment and disposed of in the correct manner. The fire brigade, the Agency for Technical Relief or similar institutions must be used. Absorb residues with liquid-absorbent material (such as vermiculite, sand, universal binders and pebble grain).

3.2.5 Touch voltage hazard

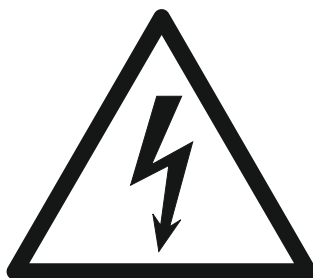
WARNING!

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 48.



3.3 Battery lifetime and maintenance

The lithium-ion battery is wear-free. The components are maintenance-free, as a result there are no maintenance intervals planned for this battery.

3.4 Charging the battery

DANGER!

Explosion risk when charging unsuitable battery types

Charging a battery that is not suitable for this charger can result in damage to the charger and battery. The battery could expand or burst.

- ▶ The lithium-ion battery must only be charged with the battery charger provided for this 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.

WARNING!

The use of a different charger can result in overheating, fire or a battery explosion.

NOTICE

Deep discharge can damage the battery

Self-discharge can cause deep discharge of the battery. Deep discharge shortens the service life of the battery.

- ▶ Before a long period of inactivity, the battery must be fully charged.
- ▶ The battery must be fully charged at least every 16 weeks, see page 55.

→ If the battery is deeply discharged or if the battery temperature is below the permissible level (0 °C), the battery will not charge. Deeply discharged batteries cannot be charged by the operator (faulty). Contact the manufacturer's customer service department.

→ Due to the risk of condensate formation, batteries that have been stored at temperatures below 0 °C must only be charged after spending at least 4 hours in a warm environment.

3.5 Storage / safe handling / faults

3.5.1 Storing the battery

NOTICE

Damage to the lithium-ion battery due to discharge

If the lithium-ion battery is not used for a long period of time, it can become damaged through discharge.

- ▶ Fully charge the battery before extended downtimes.
- ▶ To ensure a long service life of the lithium-ion battery, it must be fully charged every 16 weeks when not in use.

The temperature range for storing the battery is 0 °C to +30 °C.

3.5.2 Instructions for safe handling

NOTICE

Charge status of the lithium-ion battery on leaving the manufacturer's plant

New lithium-ion batteries are transported and stored with a charge status of approximately < 100 %.

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

Failure to comply with these safety instructions can result in fire and explosion or the leakage of harmful materials.

3.5.3 Faults

WARNING!

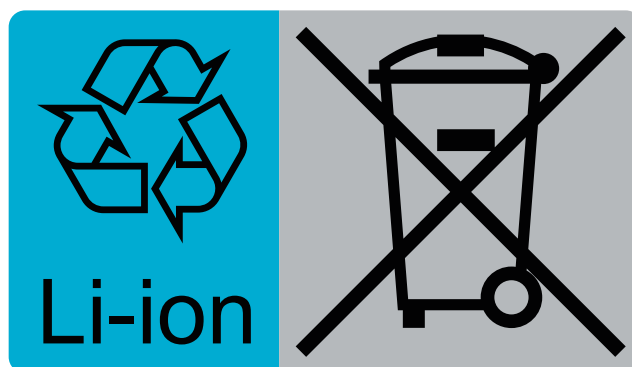
Do not open the battery.

If any damage is found to the battery or battery charger contact the manufacturer's customer service department immediately. The operating company must not carry out any remedial work on its own.

Independent attempts to tamper with or repair the battery may invalidate the warranty. A service agreement with the manufacturer will help identify faults.

3.6 Disposal and transport of a lithium-ion battery

3.6.1 Instructions for disposal



Used lithium-ion batteries are recyclable commodities. These lithium-ion batteries must be treated as hazardous waste.

Lithium-ion batteries marked with the recycling symbol and the sign showing a crossed-out waste bin must not be disposed of with ordinary household waste.

Return or recycling of batteries must be ensured, for example, in accordance with the Battery Directive 2006/66/EG. Buy-back terms and the manner of recycling must be agreed with the manufacturer.



Instructions for disposal

Lithium-ion batteries must be disposed of in accordance with the relevant national environmental protection regulations.

- For lithium-ion battery disposal, contact the manufacturer's customer service department.
-

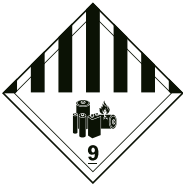
3.6.2 Shipping information

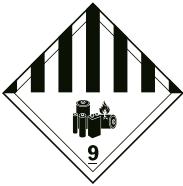
The lithium-ion battery is a hazardous material. The applicable ADR regulations must be observed during transport.

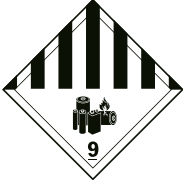
- ADR = Accord européen relatif au transport international des marchandises Dangereuses par Route

3.6.2.1 Shipping functional batteries

Functioning lithium-ion batteries can be shipped in accordance with the following regulations:

Land transport – classification according to ADR (road/rail)	
Classification code	M4 lithium battery
Danger label	UN 3480 LITHIUM-ION-BATTERY 
	UN 3480 lithium-ion battery class 9
ADR limited quantity	LQ:0

Sea transport – classification according to IMDG	
EmS	F-A, S-I
Danger label	UN 3480 LITHIUM-ION-BATTERY 
	UN 3480 lithium-ion battery class 9
IMDG limited quantity	LQ: -

Air transport – classification according to IATA	
Danger label	UN 3480 LITHIUM-ION-BATTERY 
	UN 3480 lithium-ion battery class 9
Exposure scenario	Not specified.
Substance safety rating	Not specified.
Marking	Product does not require marking under EC Directive / HazMatR.

NOTICE

New lithium-ion batteries are transported with a charge status of at least < 100 %.

3.6.2.2 Shipping faulty batteries

To transport these faulty lithium-ion batteries, contact the manufacturer's customer service department. Faulty lithium-ion batteries must not be transported independently.

⚠ 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.

4 Charging the battery

4.1 Correct Use and Application

The operating instructions are a major component of the charger.

The owner shall ensure that the operating instructions are kept permanently in the vicinity of the charger, and that operating personnel shall be aware of the guidelines mentioned in the instructions.

The owner shall add further instructions regarding national accident prevention and environmental protection regulations to the operating instructions, including information on supervisory and reporting obligations, taking into account particular company practices e.g. in terms of work organization, work processes and the personnel employed.

Apart from the operating instructions and the current accident prevention regulations in force in the country and place of use, generally recognised technical regulations for safe and proper use shall be observed.

Charging the battery

- The lithium-ion battery may only be charged with an approved charger within the permissible temperature range, see page 26.

The truck should not be stored without battery compensation charge for more than 16 weeks.

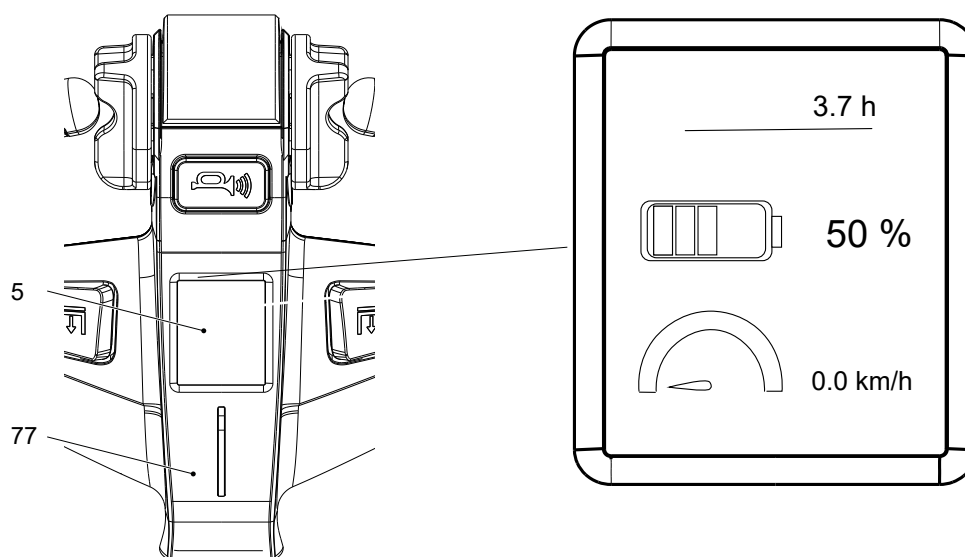
NOTICE

Damage to the lithium-ion battery due to improper connection

Unsuitable connector plugs of industrial trucks or battery chargers used with the lithium-ion battery can damage the battery connector.

► Operate the lithium-ion battery only with appropriate trucks and battery chargers.

4.2 Charge Status Indicator



The charge status indicator of the battery is integrated in the display unit (5) on the tiller head (77).

The rectangles gradually disappear as the battery discharges. Special statuses appear in the display unit as error codes.

Code	The error code appears if ...	Effect
0	The battery charge is too low.	Lift function is deactivated.
91	Operation of the truck continues without first charging the battery.	Travel speed is reduced.

4.3 Charging the Battery with External Charger

Maintenance personnel

Batteries may only be charged, serviced or replaced by trained personnel. These operating instructions and the battery manufacturer's instructions must be observed when performing these operations.

The truck must be parked securely before all work on the batteries, see page 80.

General information

- The charge status of the battery is indicated by LEDs on the battery charger.
- The charging time depends on the battery charge status. The time it takes to charge an almost fully depleted battery depends both on the battery capacity and the charge current. The approximate duration can be calculated as follows:
Charging time = capacity of battery / charge current of battery charger.
- The lithium-ion battery can also be used when not fully charged. In this case, the remaining operating time is reduced.
- Charging continues automatically after a mains failure. Charging can be interrupted by pulling out the mains connector and continued as a partial charge.

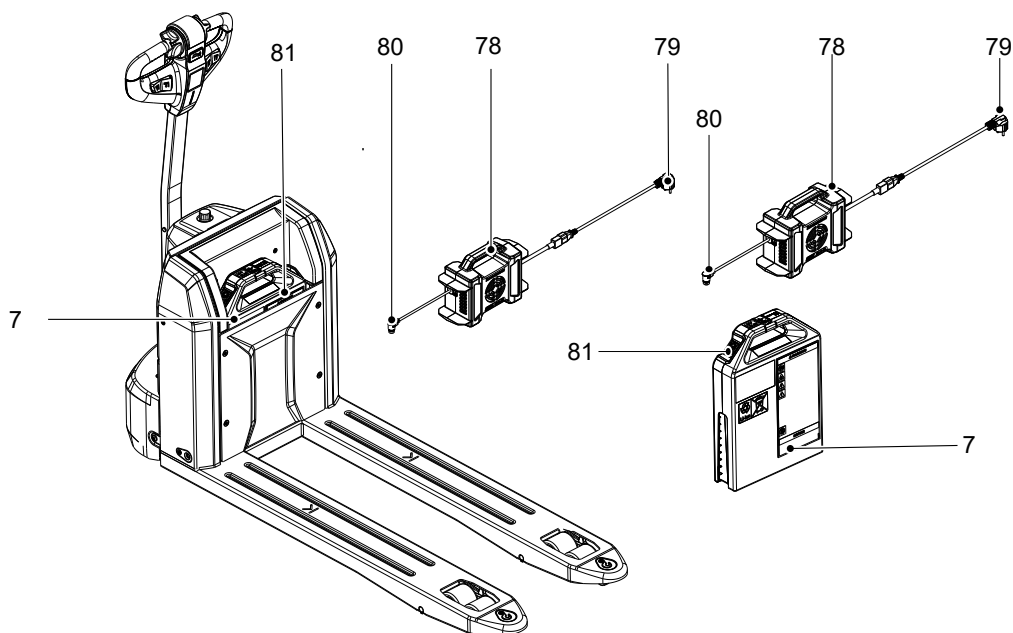
NOTICE

The battery temperature rises by approx. 13 °C during charging. Battery charging should only start when the battery temperature is below 50 °C. The battery temperature before charging should be at least 0 °C as otherwise it will affect the charge.

Meaning of the LEDs on the battery charger

When the battery charger is connected to the battery and to the power supply, the LEDs on the charger indicate the following:

LED lit	Meaning
Green	The battery is fully charged
red	battery is charging
Flashing red	There is a problem - see page 95.



Charging the battery

Requirements

- The truck is parked securely, see page 80.
- The battery charger is approved for the battery type, see page 26.

Tools and Material Required

- Battery charger

Procedure

- Expose the charging socket (81) of the battery and start by connecting it to the charge connector (80) of the battery charger (78).
- Then connect the mains plug (79) of the battery charger (78) to the power supply.

→ The charging process is indicated by the illumination of the red LED.

- Check the charge status; also refer to the instructions on the battery charger (78).

→ The charging process is completed when the green LED lights up.

- Once the battery (7) is charged, disconnect the battery charger (78) from the power supply before unplugging it from the battery.
- Close the charging socket (81) with the cap.

Battery is charged.

→ Alternatively, the battery can also be charged outside the truck, see page 68. The process for charging the battery remains the same.

4.4 Charging the battery with an on-board charger

4.4.1 Safety information

DANGER!

Risk of electric shock and fire

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

- ▶ Always use mains cables with a maximum length of 30 m.
Local regulations must be observed.
- ▶ **Unwind the cable reel fully when using it.**
- ▶ Always use original manufacturer's mains cables.
- ▶ Insulation classes and resistance to acids and alkalis must correspond to those of the manufacturer's mains lead.
- ▶ The mains connector must be dry and clean when used.

WARNING!

Danger due to damage to the on-board charger or live attachments

Damage to the on-board battery charger or live attachments (mains cable, plug) can cause a short circuit or electric shock.

- ▶ Report any defects immediately to your supervisor.
- ▶ Notify the customer service department.
- ▶ Mark the defective truck accordingly and take it out of service.
- ▶ Do not return the truck to service until the fault has been identified and rectified.

WARNING!

Moving of a connected industrial truck with the mains socket switched off

If an industrial truck is being charged at an external mains socket, the automatic immobiliser detects this process and deactivates the truck travel functions. When charging an industrial truck at a mains socket that can be switched off, the industrial truck can start moving when the socket is switched off because the immobiliser detects only live mains sockets. This can cause damage to the electrical building installation as well as electric shocks and electrically induced fires.

- ▶ Before commissioning the truck, disconnect the mains cable from the mains socket and stow away in the designated position on the truck.
- ▶ If no additional protective measures have been taken ¹, do not charge the industrial truck at a mains socket that can be switched off.
- ▶ This warning must be taken into account by the operating company when analysing the risk.

¹) One possible protective measure is the "mains plug detection, immobiliser" function.

NOTICE

Improper use of the on-board charger

Material damage to the industrial truck

- ▶ Do not open the on-board charger.
 - ▶ Only use the on-board charger to charge the battery installed in the industrial truck.
 - ▶ Only use other batteries after installation and approval by the manufacturer's customer service department.
 - ▶ Do not install the on-board charger in other industrial trucks.
-

4.4.2 Charging Times

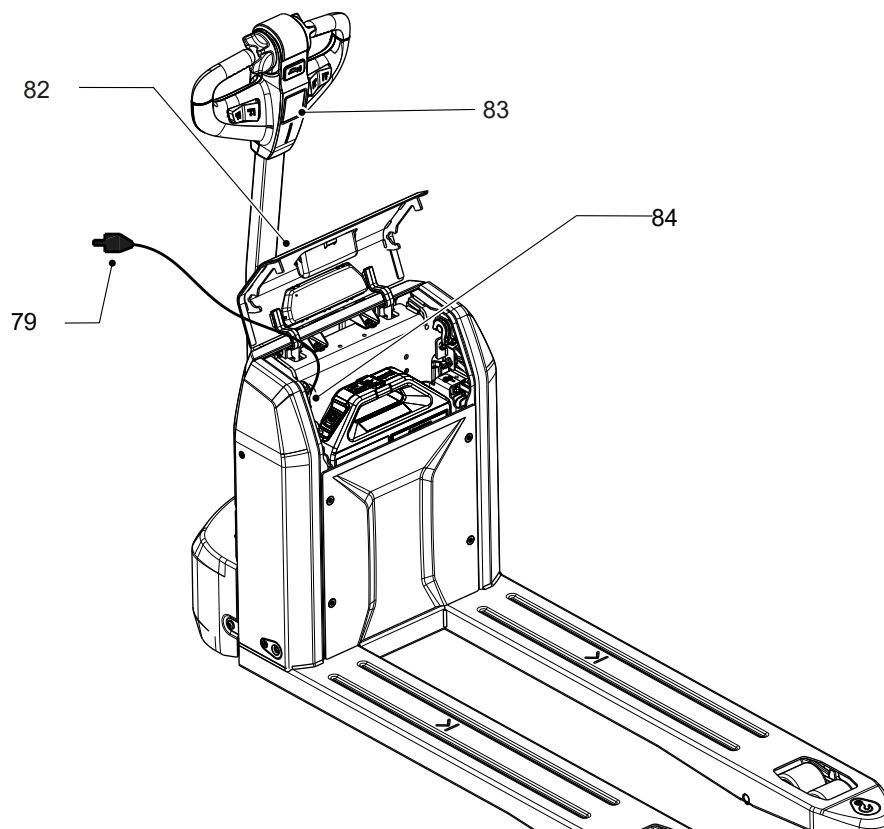
- The charging times apply to discharged lithium-ion batteries. Partial charging can be carried out at any time to bring forward the use of the industrial truck.

In the event of **high** or **low** battery temperature, the charging time of the lithium-ion battery is extended due to a reduction in the charge current.

35 A on-board charger (○)

Battery capacity	Charging time for a discharged battery
50 Ah	1 hour 25 minutes
100 Ah	2 hours 50 minutes
105 Ah	3 hours
150 Ah	2 hours 20 minutes
200 Ah	5 hours 40 minutes

4.4.3 Charging the battery



Charging the battery

Requirements

- Truck parked securely – see page 80.

Procedure

- Check the cable and mains plug (79) of the on-board charger for visible damage before charging.
- ➔ If damage is identified, mark the truck accordingly and take it out of service. Have the truck repaired by the manufacturer or by a specialist authorised by the manufacturer.
- Plug the mains plug (79) into a mains socket.
- If the charge status is to be displayed on the industrial truck, unlock the emergency disconnect switch (82) – see page 84.
- ➔ The display unit (83) shows the charge status, symbols in connection with the charging stop or a fault – see page 73.

Charging starts and ends automatically. The battery is charging.

Completing the battery charge

Requirements

- The battery is partially or fully charged.

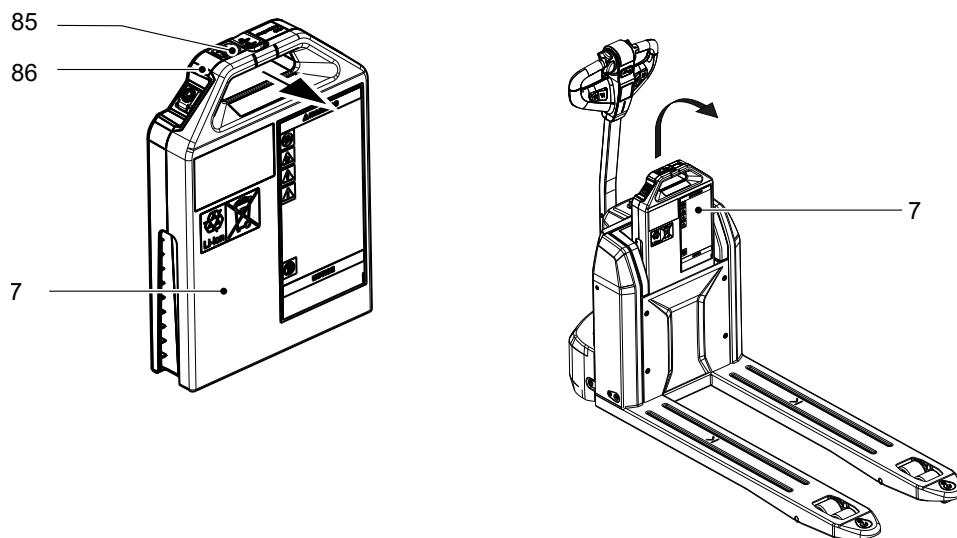
Procedure

- Press the "charging stop" function button on the display unit to stop charging safely.
- ➔ The display unit shows the "unplugging main plug allowed" display symbol – see page 75.
- Unplug the mains plug (79) by pulling the plug (not the cable) out of the mains socket.
- **Always** stow the entire charger cable in the storage compartment (84).
- ➔ Only if equipped with the “mains plug detection, immobiliser” function (○); otherwise, a display symbol will appear on the display unit, see page 75. With this equipment, the truck can be started only when the mains plug is fully stowed in the storage compartment.
- Establish operational readiness.

The truck is operational.

5 Removing or installing the battery

5.1 Removing the battery



Removing the battery

Requirements

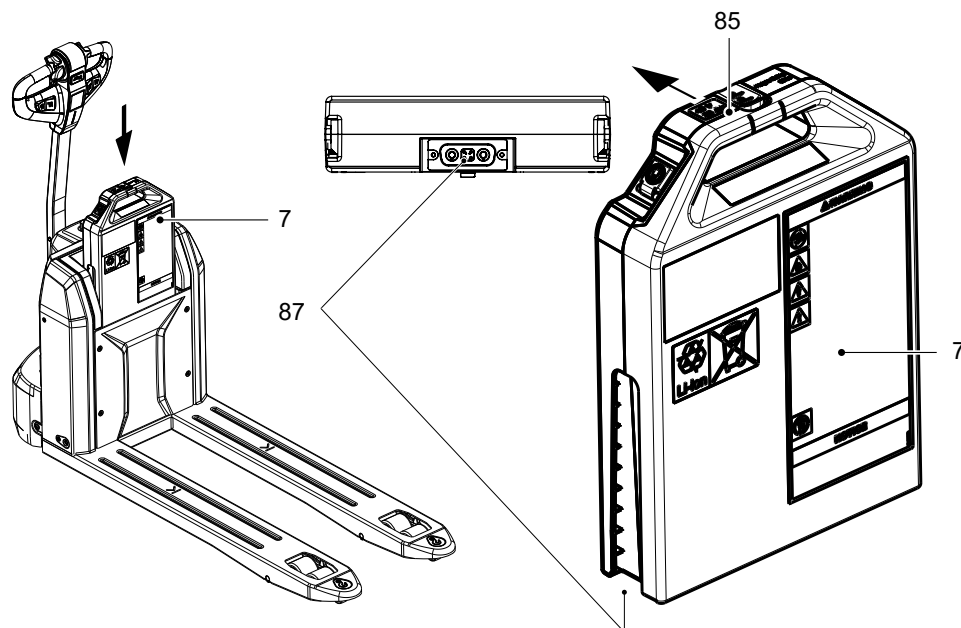
- The truck is parked securely, see page 80.
- The emergency disconnect switch is actuated, see page 84.

Procedure

- Unlock the battery latch (85).
- Lift the battery (7) up by the battery handle (86).

The battery has been removed.

5.2 Battery installation



Installing the battery

Requirements

- The truck is parked securely, see page 80.

Procedure

- Insert the battery (7) into the battery compartment.
- ➔ The plug connection (87) between the battery and truck must be fully connected.
- Lock the battery latch (85).
 - Release the emergency disconnect switch, see page 84.

The battery is now installed.

E Operation

1 Safety Regulations for the Operation of Forklift Trucks

Driver authorisation

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

Operator's rights, responsibilities and rules of conduct

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

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.

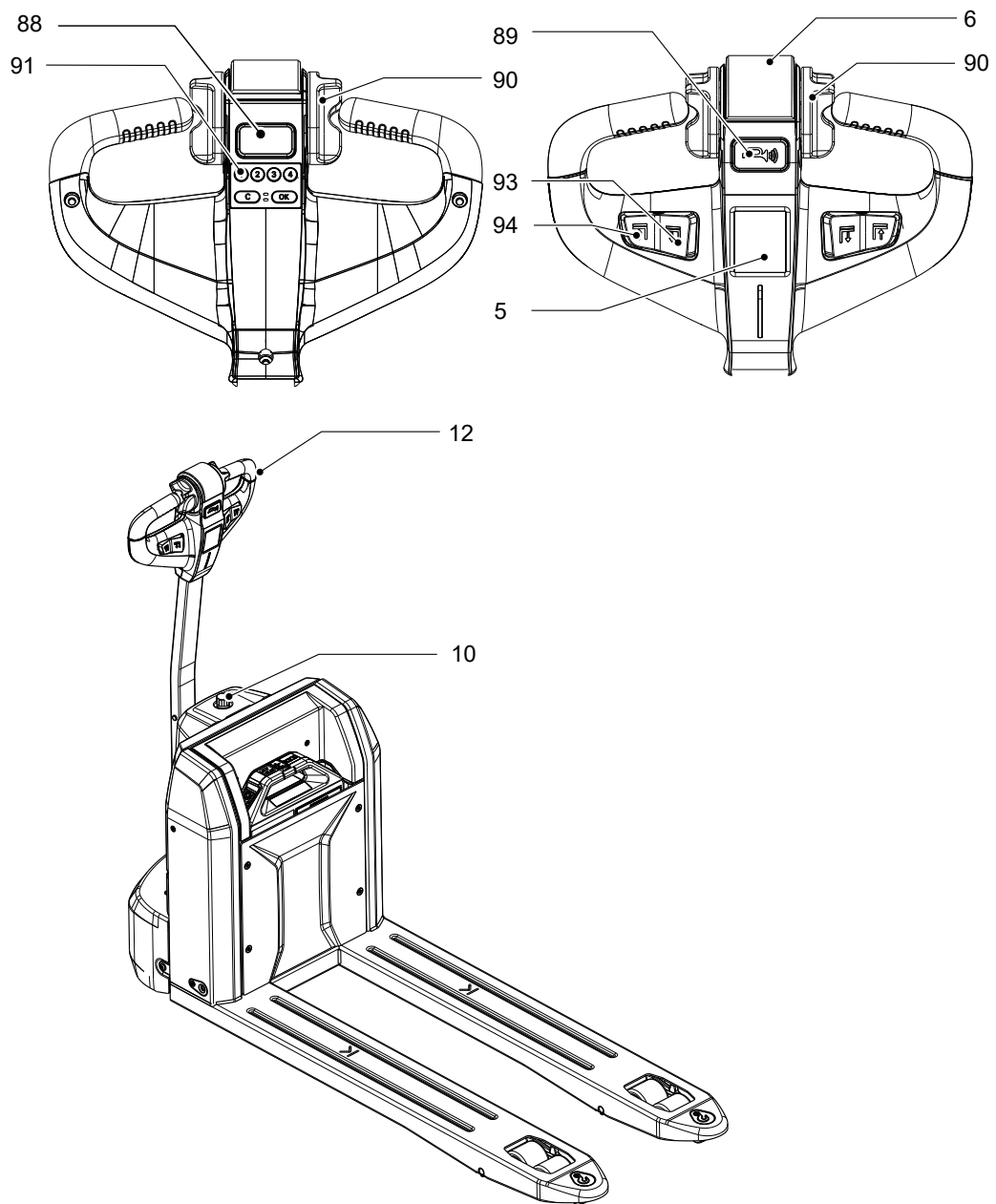
- ▶ Instruct unauthorised persons to leave the hazardous area.
 - ▶ In case of danger to third parties, give a warning signal in good time.
 - ▶ If unauthorised persons are still within the hazardous area, stop the truck immediately.
-

Safety devices, warning signs and warning instructions

Safety devices, warning signs (see page 28) and warning instructions in the present operating instructions must be strictly observed.

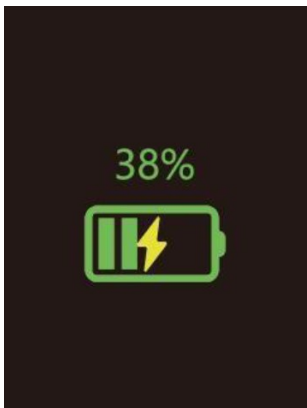
2 Displays and Controls

2.1 Controls



Item	Description	Function
5	Display unit	Displays various truck data, see page 75.
6	Collision safety switch	Safety feature When the collision safety switch is activated, the truck travels a short distance away from the operator in load direction, thus protecting the operator. The truck is then braked, see page 18.
10	Emergency disconnect switch	Stops all electrical functions (travel, lifting, lowering) and activates the electromagnetic brake, see page 84.
12	Tiller	Steers the truck via corresponding movements, see page 90.
89	Warning signal button	Activates an audible signal.
90	Travel switch	Controls the travel direction and the travel speed, see page 87.
91	Keypad	Entry of access code for starting the truck, see page 37.
92	Slow travel button	Toggles between slow travel and travel at normal speed. Switches to slow travel when the tiller is in vertical position, see page 88.
93	Lift button	Raises the load handler, see page 91.
94	Lower button	Lowers the load handler, see page 91.

2.2 Display symbols

Function	Symbol	Declaration
Battery power display		– Displays symbol and percentage of battery power. – Charging mode: in charging mode, switch to the charging interface, the indicator light is the indicator lights up red, and the indicator light is always green when fully charged
Power shortage prompt		– When there is 10 % remaining power, the power alarm icon flashes once every second.
Battery power percentage vehicle speed		– Digital display of the current accumulated working time of the vehicle, with a maximum of 6 digits, unit:h. – Battery SOC in percentage. – Real time display of vehicle speed
Fault code display		– Fault code display in case of fault.

Turtle mode		– The turtle icon in the upper left corner is lit, indicating that it is currently in turtle speed mode.
Speed limit mode		– Press the buttons 1 and 3 at the same time, the green light will turn on, and the speed limit icon will appear in the upper right corner.

3 Starting up the truck

3.1 Checks and operations to be performed before starting daily operation

WARNING!

Truck damage or defects can result in accidents

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

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

Inspection before daily operation

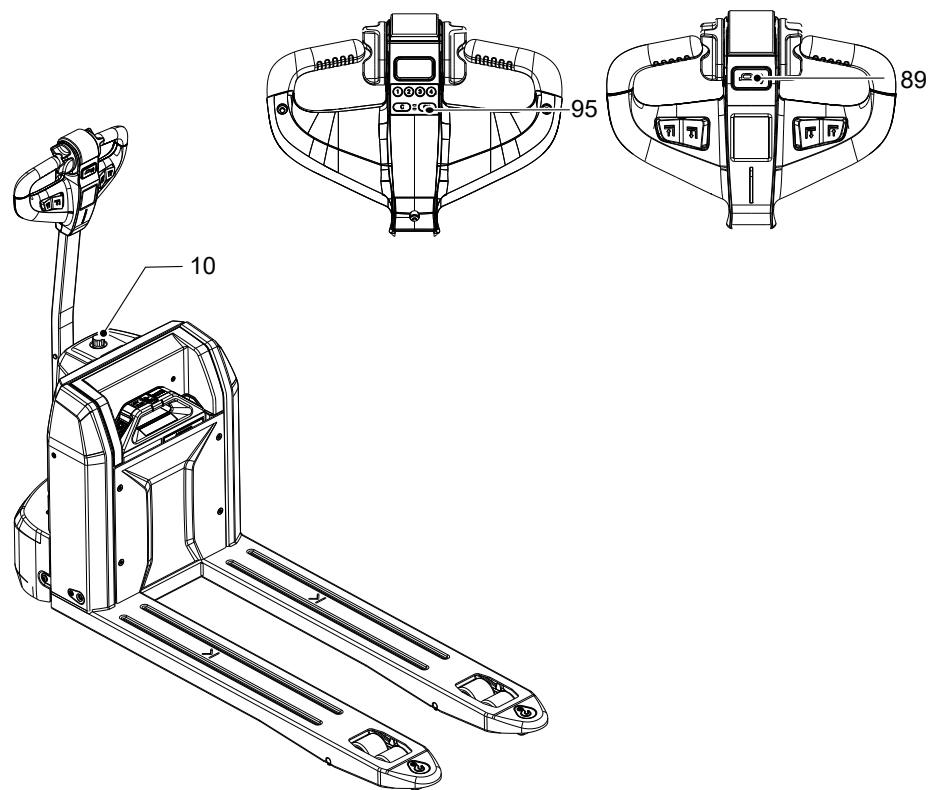
Requirements

- The truck is parked securely, see page 80.

Procedure

- Check the entire truck from the outside for damage and leaks.
- Check the load handler for visible signs of damage such as cracks, bent or severely worn forks.
- Check the hydraulic system for leaks, see page 113.
- Check the battery attachment and cable connections for damage and make sure they are secure.
- Check the drive wheel and load wheels for damage and freedom of movement, see page 112.
- Check that the markings and labels are all present and legible, see page 28.
- Check that the controls automatically return to the neutral position after use, see page 87.
- Switch on the truck, see page 78.
- Check the battery charge status, see page 61.
- Test the warning signal, see page 73.
- Test the brakes, see page 85.
- Test the travel functions, see page 87.
- Test the lifting and lowering functions, see page 91.
- Test the emergency disconnect switch, see page 84.
- Test the collision safety switch, see page 18.

3.2 Preparing the truck for operation



Switching on the truck

Requirements

- Checks and operations before starting daily work have been completed, see page 78.
- Load is correctly palletised and secured, see page 91.

Procedure

- Release the emergency disconnect switch (10), see page 84.
- Switch on the truck. To do this:
 - Enter the access code, see page 37.
 - Press the RETURN key (95).
- Press the warning signal button (89).

The truck is ready for operation.

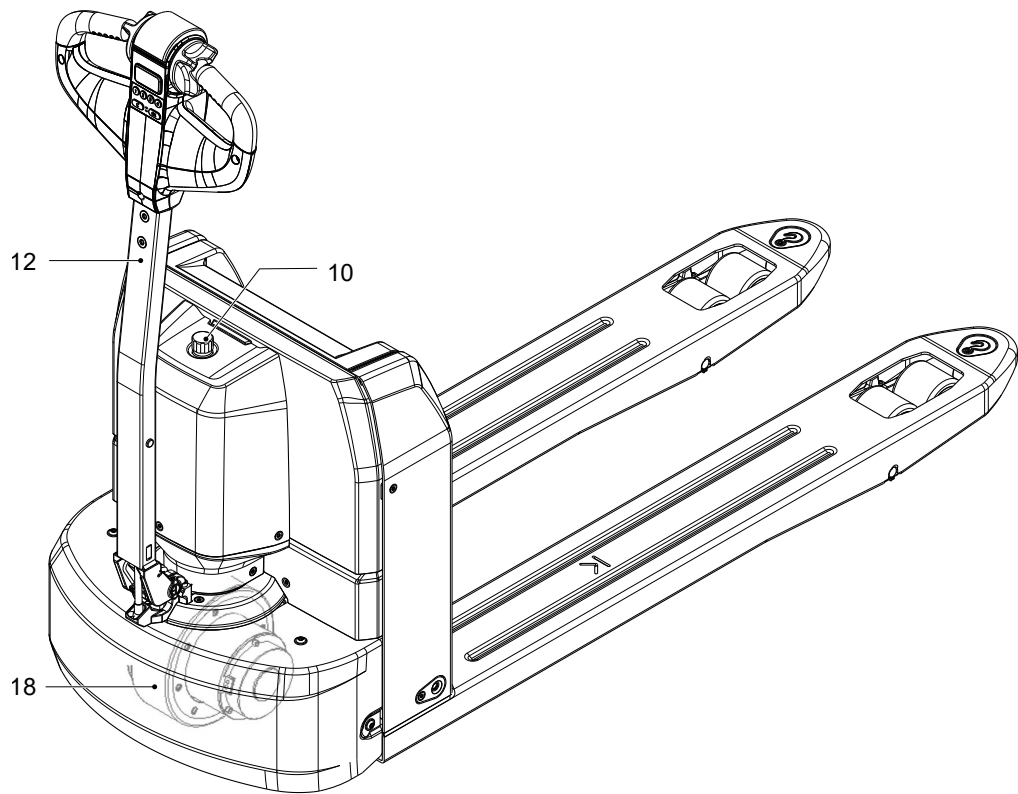
3.3 Parking the truck securely

WARNING!

An unsecured truck can cause accidents

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

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



Parking the truck securely

Procedure

- Park the truck on a level surface.
- Fully lower the load handler, see page 91.
- Turn the drive wheel (18) to the straight-ahead position using the tiller (12).
- Press the emergency disconnect switch (10).

Truck is parked securely.

4 Working with the truck

4.1 Safety regulations for travel mode

Travel routes and work areas

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

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

DANGER!

Do not exceed the permissible surface and 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.

Conduct while travelling

The operator must adapt the travel speed to local conditions. The operator must drive slowly e.g. on corners and in narrow spaces, when driving through swinging doors, in blind spots. The operator must always observe an adequate braking distance between the forklift truck and the vehicle in front and must be in control of the truck at all times. Abrupt stopping (except in emergencies), rapid U turns and overtaking at dangerous or blind spots are not permitted.

Travel visibility

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

Negotiating slopes and inclines

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

Negotiating lifts, loading ramps and docks

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

Types of load to be carried

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

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

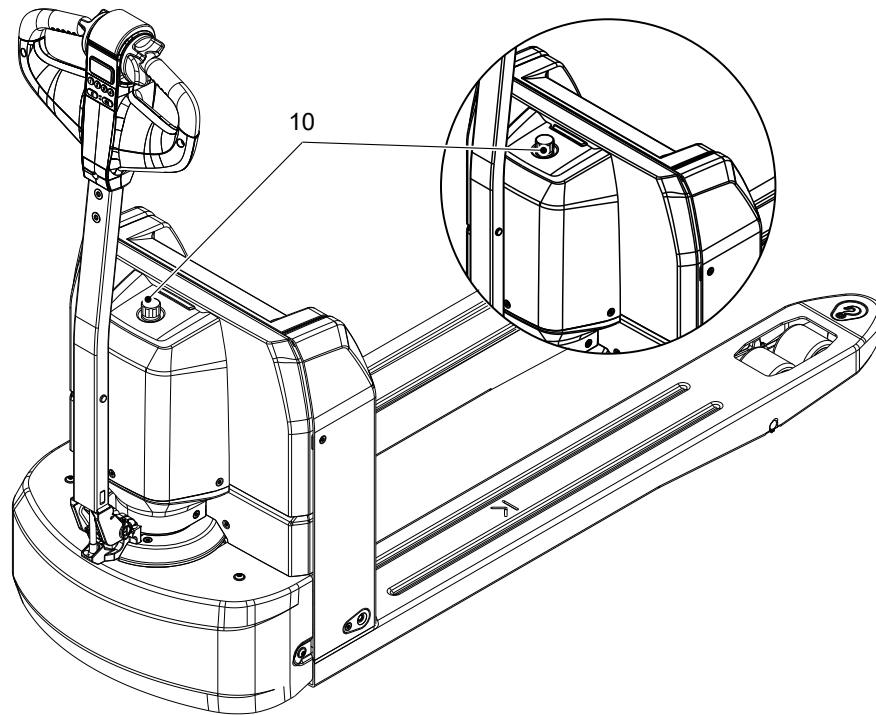
WARNING!

Electromagnetic influence can result in accidents

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

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

4.2 Emergency Disconnect



Pressing the Emergency Disconnect switch

Procedure

- Press the Emergency Disconnect (10).

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

Releasing the emergency disconnect switch

Procedure

- Turn the emergency disconnect switch (10) to unlock it.

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



The emergency disconnect switch must be activated to enable the battery.

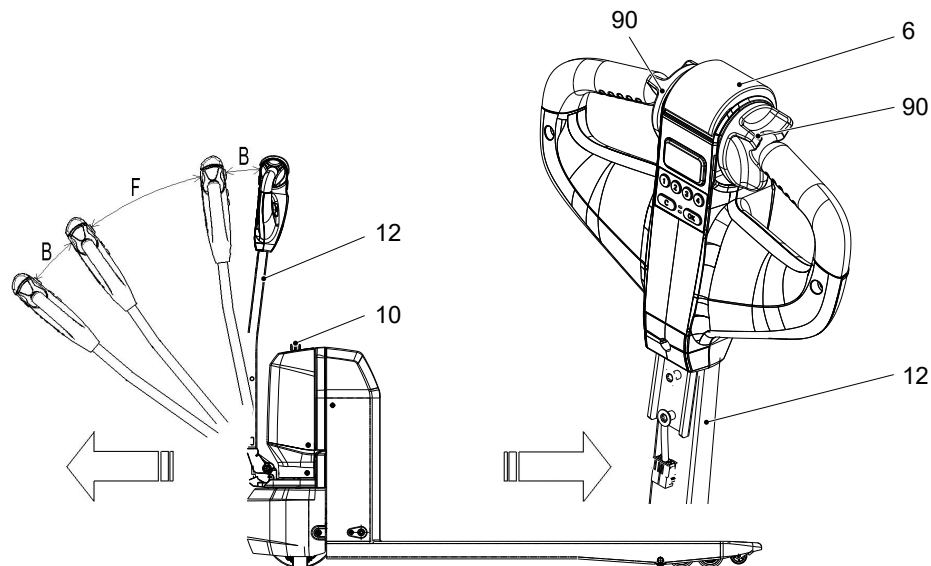
4.3 Brakes

⚠ WARNING!

Risk of collision due to a defective tiller

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

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



The braking behaviour of the truck largely depends on the ground conditions and the truck load. The operator must take this into account.

The truck can brake in different ways:

Braking type		
	Action	Effect
Service brake		
	Set the travel switch (90) to the neutral "0" position.	The regenerative brake is activated. The truck brakes to a halt.
Travel switch reverse		
	Turn the travel switch (90) in the opposite direction.	The regenerative brake is activated. The truck brakes and begins travelling in the opposite direction.
Coasting brake		
	Move the tiller (12) to the brake zone "B".	The truck brakes to a halt.
	→ When the tiller is released, it automatically returns to vertical position.	
Safety brake		
	Operate the collision safety switch (6).	The truck brakes and travels a short distance in the opposite direction to protect the operator.
	→ This function is also active if the truck is stationary and the tiller is in the travel zone "F".	
Emergency brake		
	Press the emergency disconnect switch (10).	The truck brakes to a halt at the maximum rate.
	→ Only do this in an emergency, as damage to the drive wheel may occur.	

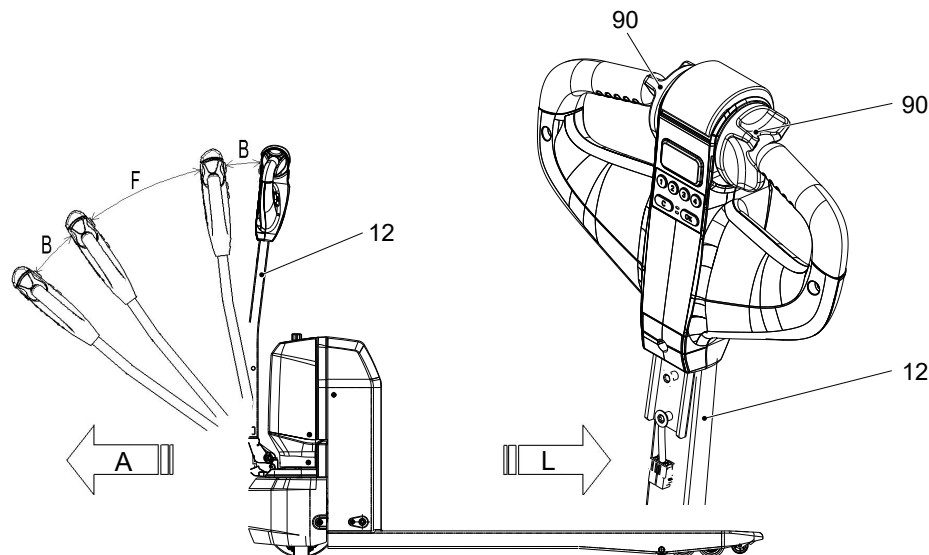
4.4 Travel

⚠ WARNING!

Risk of injury or trapping from the truck

Be extremely careful when driving and steering, especially if parts of your body extend beyond the truck. The operator's legs and feet could get injured or trapped.

- ▶ Wear personal protective equipment (e.g. safety shoes, ...).
- ▶ In pedestrian mode make sure you have sufficient distance from the truck.
- ▶ Make sure there is nobody between the truck and any obstacles.



Requirements

- Truck has been prepared for operation – see page 78.

Procedure

- Set the tiller (12) to the travel zone (F).
- Control the travel direction with the travel switch (90):
 - Slowly turn the travel switch in the load direction (L):
Travel in load direction.
 - Slowly turn the travel switch in the drive direction (A):
Travel in drive direction.
- Control the travel speed with the travel switch (90):
 - The further the travel switch is turned, the higher the speed.

The brake is released and the truck moves in the selected direction.

4.5 Slow travel

CAUTION!

The driver must be particularly careful when using the "slow travel" button (8). The brake is only activated when the "slow travel" button is released.

- ▶ In hazardous situations brake by immediately releasing the slow travel button (8) and the travel switch (90).
- ▶ During "slow travel" you can only brake by inversion braking (travel switch (90)).

The truck can be operated with an upright tiller (12) (e.g. in enclosed spaces/lift):

Switching on slow travel

Procedure

- Press the slow travel switch (8).
- Set the travel switch (90) to the required travel direction (fwd. or rev.).

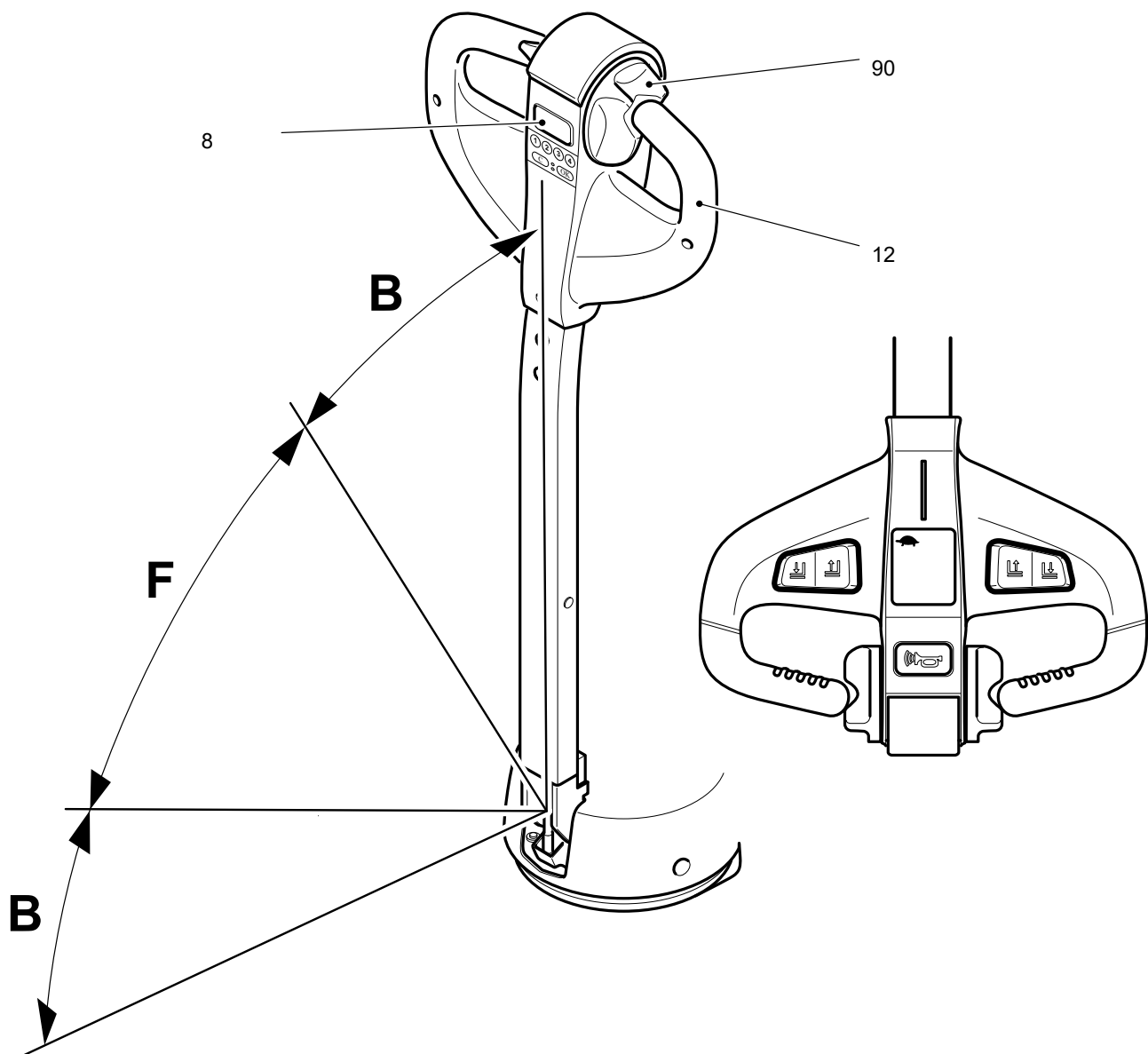
The brake is released. The truck travels at slow speed.

Switching off slow travel

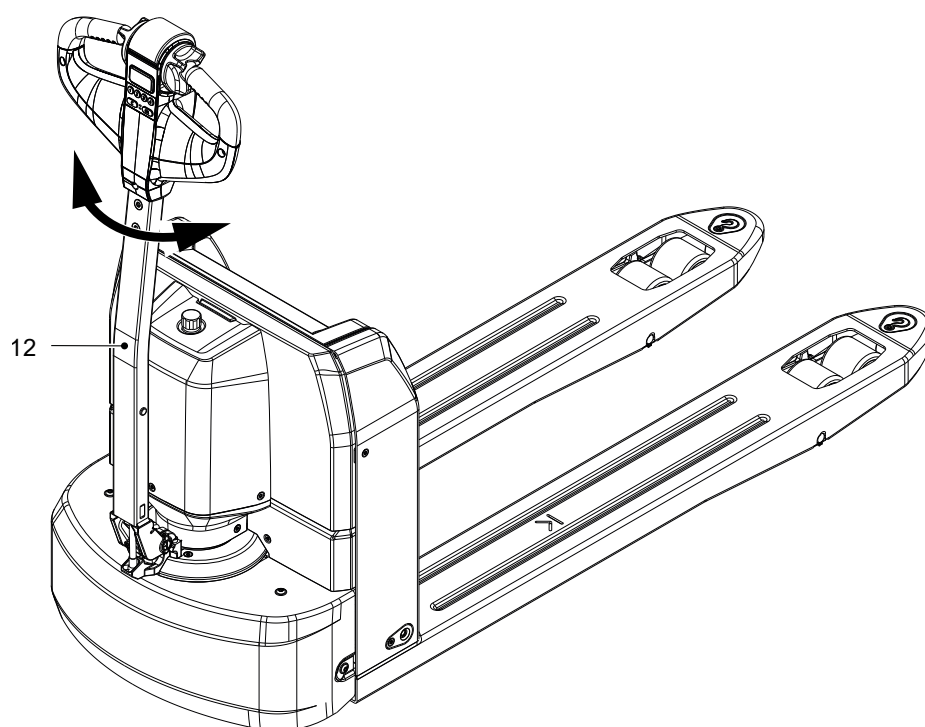
Procedure

- Release the slow travel button (8).
 - In zone "B", the brake applies and the truck stops.*
 - In zone "F", the truck continues at slow travel speed.*
- Release the travel switch (90).

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



4.6 Steering



Procedure

- Swivel the tiller (12) to the left or right.

The truck is steered in the required direction.



The steering direction of the truck corresponds to the swivel direction of the tiller, as shown by the figure.

The curve radius is determined by the swivel angle of the tiller.

4.7 Lifting, transporting and depositing loads

WARNING!

Incorrectly secured or unsecured load units

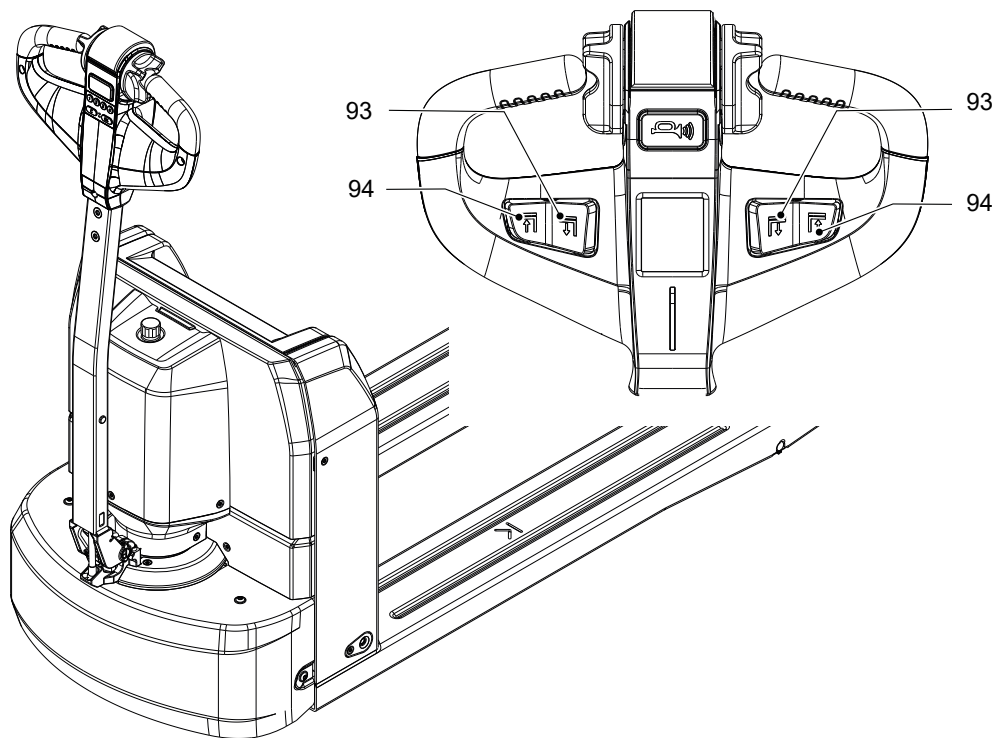
There is a risk of accidents due to tipping or falling load units.

- ▶ Only transport loads that have been correctly secured and positioned.
 - ▶ Do not exceed the approved rated capacity of the industrial truck.
 - ▶ Insert the load handler as far as possible underneath the load.
 - ▶ Do not step on the load handler.
 - ▶ Do not lift people.
 - ▶ Do not pick up any longitudinal goods (e.g. pipes) crosswise.
 - ▶ Instruct other people to move out of the hazardous area of the truck.
 - ▶ Do not continue working until the persons have left the hazardous area.
-

NOTICE

Adapt a slower speed when stacking and retrieving.

4.7.1 Raising a load



Requirements

- Load correctly palletised.
- The weight of the load corresponds to the capacity of the industrial truck.
- Load handler evenly loaded for heavy loads.

Procedure

- Drive the truck carefully up to the pallet.
- Slowly insert the load handler into the pallet until the fork shank touches the pallet.

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

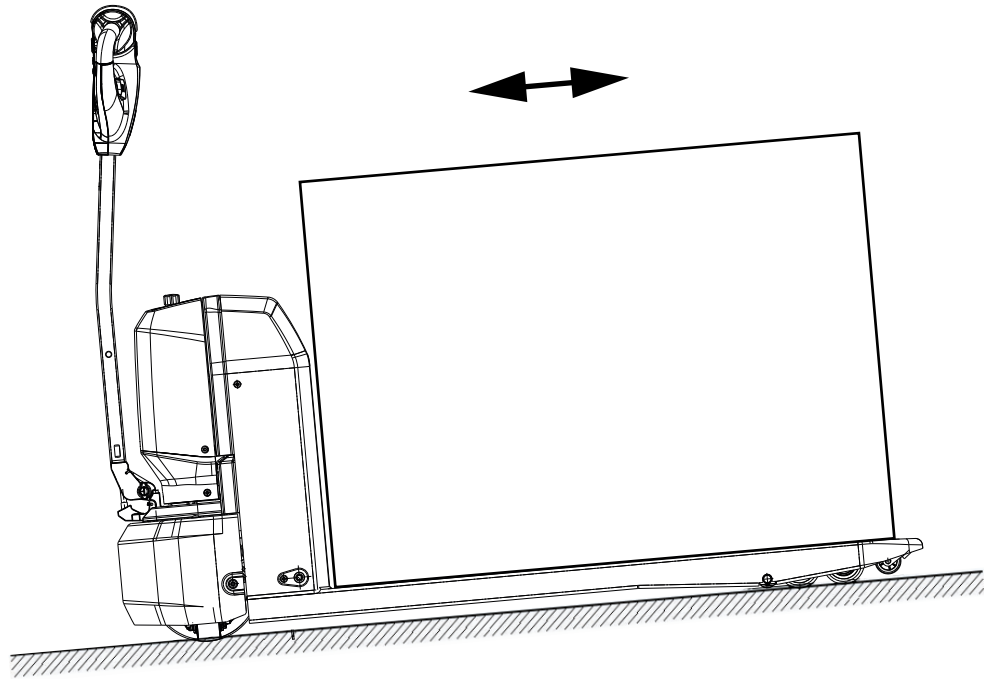
- Press the "Lift" button (93) until you reach the desired lift height.

The load is raised.

⚠ CAUTION!

Release the button as soon as the load handler reaches its end stop.

4.7.2 Transporting a load



Transporting Load Units

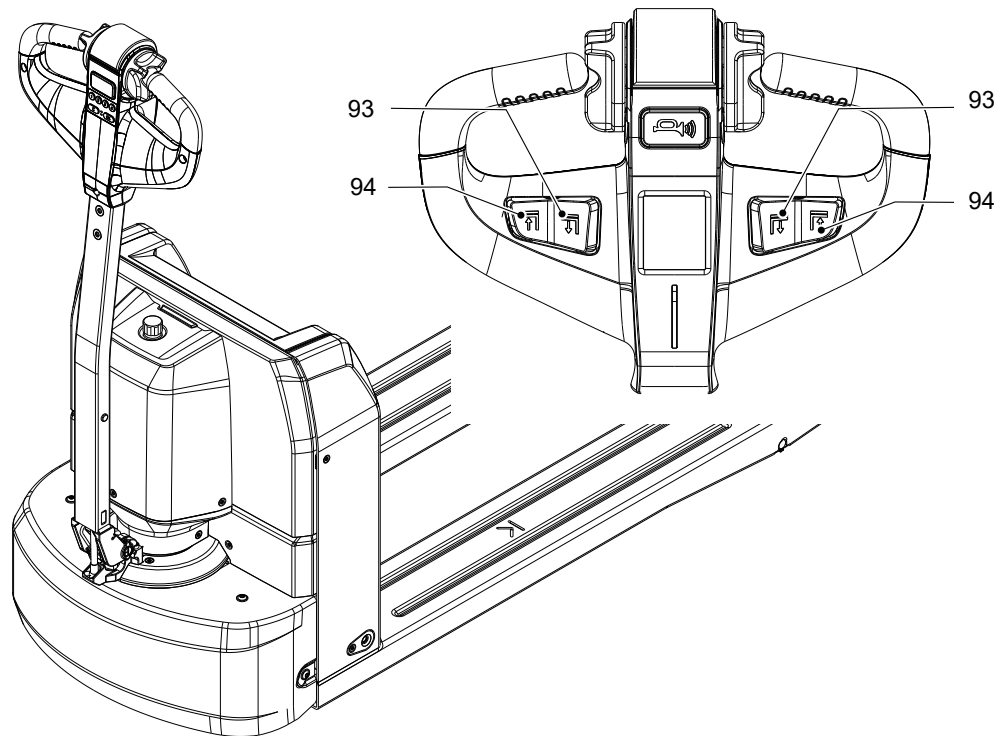
Requirements

- Load raised correctly.
- Good ground conditions.

Procedure

- Accelerate and decelerate with care.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Travel at a constant speed.
- Be prepared to brake at all times.
 - Brake gently in normal circumstances.
 - Only stop abruptly in hazardous situations.
- Watch out for other traffic at crossings and passageways.
- You must use a lookout at blind spots.
- Do not travel across or at an angle on inclines. Do not turn on slopes and inclines, and always drive with the load facing uphill.

4.7.3 Depositing a load



⚠ CAUTION!

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

Depositing the load

Requirements

- Storage location suitable for storing the load.

Procedure

- Drive carefully up to the storage location.
- Press the “Lower” button (94).
- Lower the load handler until it is clear of the load.
- Carefully remove the load handler from the pallet.

The load is deposited.

5 Troubleshooting

This chapter allows operators to identify and rectify simple faults or the results of incorrect operation themselves. When trying to locate a fault, proceed in the order shown in the remedy table.



If, after carrying out the following remedial action, the industrial truck cannot be restored to operation or if a fault in the electronics system is displayed with a corresponding error message, contact the manufacturer's customer service department.

Subsequent troubleshooting must only be performed by the manufacturer's customer service department. The manufacturer has a customer service department specially trained for these tasks.

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

- Truck serial number
- Event message on the display unit (if present)
- Error description
- Current location of truck.

Load cannot be lifted	
Cause	Remedy
Load weight too high.	Only lift loads up to the maximum capacity, as specified on the type plate, see page 29.
Charge status of the battery is low.	Charge the battery, see page 62.
Contactor is faulty.	Contact the manufacturer's customer service department.
Hydraulic oil level is too low.	Check the hydraulic oil level and top up if necessary, see page 104.
Leak in hydraulic system.	Contact the manufacturer's customer service department.

Hydraulic oil leaking from the breather filter	
Cause	Remedy
Hydraulic oil level too high.	Check the hydraulic oil level and drain if necessary, see page 104.

Truck does not start	
Cause	Remedy
Battery still connected to the battery charger.	Fully charge the battery and disconnect the charger from the battery, see page 60.
Battery is not connected correctly.	Check that the battery is correctly attached and locked in place and adjust if necessary, see page 69.
Fuses faulty.	Check the fuses and replace if necessary, see page 114.
Battery charge status is too low.	Charge the battery, see page 60.
Emergency disconnect switch activated.	Release the emergency disconnect switch, see page 84.
Tiller in travel zone "F".	Move tiller to brake zone "B", see page 87.



Do not use the emergency disconnect switch as a service brake; otherwise, wear of the drive wheel will increase significantly.

6 Moving a truck without its own drive system

WARNING!

Accidental truck movement

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

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

Recovering the truck

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

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

Requirements

- Truck cannot be moved with its own drive system.
- Emergency disconnect switch pressed – see page 84.
- Working area secured.

Tools and Material Required

- Lifting gear
- Crane lifting gear

Procedure

- Unload the truck.
- Secure the lifting gear to the attachment points – see page 31.
- Load the truck onto a suitable transport aid, secure it and transport it away, see page 34

Truck has been recovered.

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 29.



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 117.

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 117.

WARNING!

Risk of accidents and component damage

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

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

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



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 115.

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 99.

3.1 Working on the electrical system

WARNING!

Electrical current can cause accidents

Make sure the electrical system is voltage-free before starting work on it. The capacitors in the controller must be completely discharged. The capacitors are completely discharged after approximately 10 minutes. Before starting maintenance on the electrical system:

- ▶ Only suitably trained electricians may operate on the truck's electrical system.
 - ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
 - ▶ Park the truck securely (see page 80).
 - ▶ Disconnect the battery.
 - ▶ Remove any rings, metal wrist bands etc.
-

3.2 Consumables and used parts

CAUTION!

Consumables and used parts represent an environmental hazard

- ▶ Dispose of used operating materials and used parts in accordance with the applicable environmental protection regulations.
 - ▶ Oil changes may only be performed by the manufacturer's customer service department.
 - ▶ Note the safety regulations when handling these substances.
-

3.3 Wheels

WARNING!

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

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

Uneven wear reduces truck stability and increases the stopping distance.

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

-  When replacing wheels fitted at the factory, only use the manufacturer's original spare parts. Otherwise the truck's rated performance cannot be ensured, see page 99.

3.4 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.
-

3.5 Energy saving components

CAUTION!

Risk of accidents due to energy saving components

The tiller contains components that store mechanical energy. Improper opening may result in an accident.

- ▶ Do not dismantle the tiller.
 - ▶ The tiller may only be dismantled by authorised service personal.
-

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.

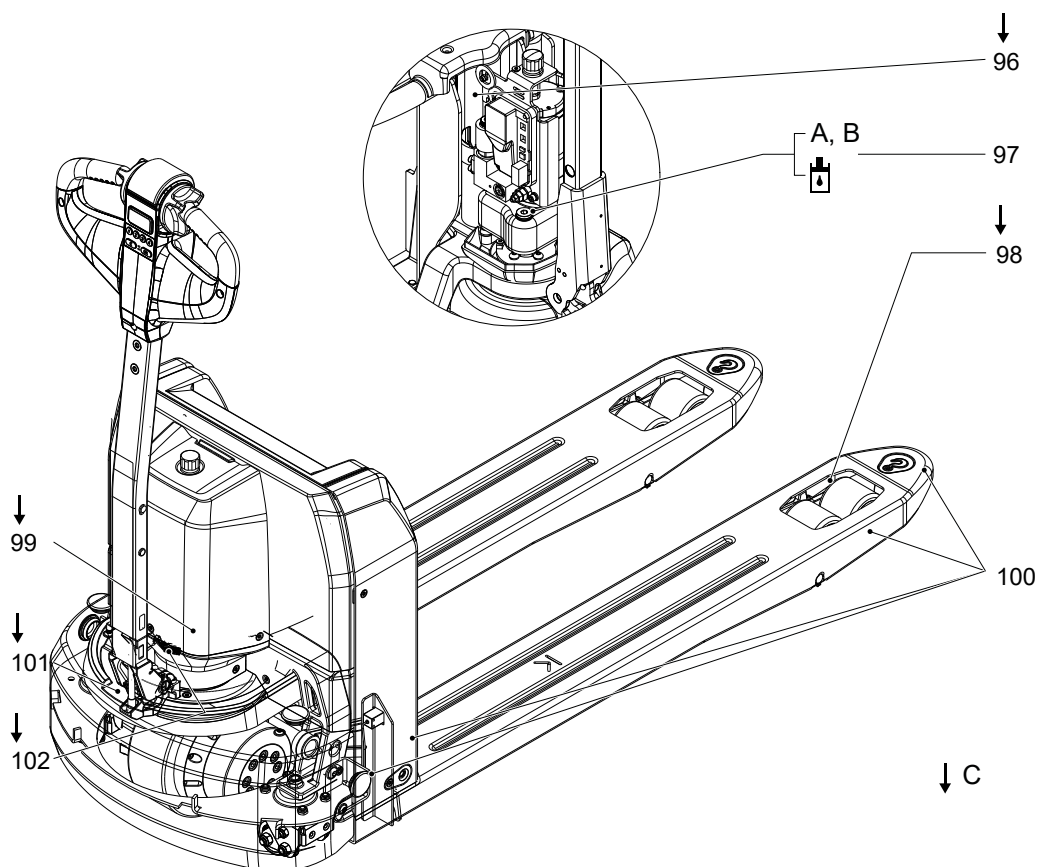
⚠ CAUTION!

Consumables and used parts represent an environmental hazard

- ▶ Dispose of used operating materials and used parts in accordance with the applicable environmental protection regulations.
- ▶ Oil changes may only be performed by the manufacturer's customer service department.
- ▶ Note the safety regulations when handling these substances.

4.2 Lubrication Schedule

- The truck is equipped with lubrication-free bushes. As such, no lubrication is required as part of maintenance.



Item	Component	Item	Component
96	Lift cylinder (↓)	100	Lift kinematics (↓)
97	Filler plug for hydraulic oil (⚙)	101	Transmission (↓)
98	Load wheel bearing (↓)	102	Tiller bolt (↓)
99	Tiller bearing (↓)		

Lubricate the truck according to the lubrication schedule

Requirements

- Truck parked securely – see page 80.
- Truck prepared for maintenance and repair work – see page 106.
- Maintenance interval reached – see page 117.

Tools and Material Required

– Lubricants according to lubrication schedule – see page 105

Procedure

- Lubricate the lubrication points (↓) according to the lubrication schedule.



Some lubrication points are only lubricated when required.

- Check the hydraulic oil level and top up if necessary (⬆) – see page 113.
- Start up the truck – see page 115.

Truck is lubricated.

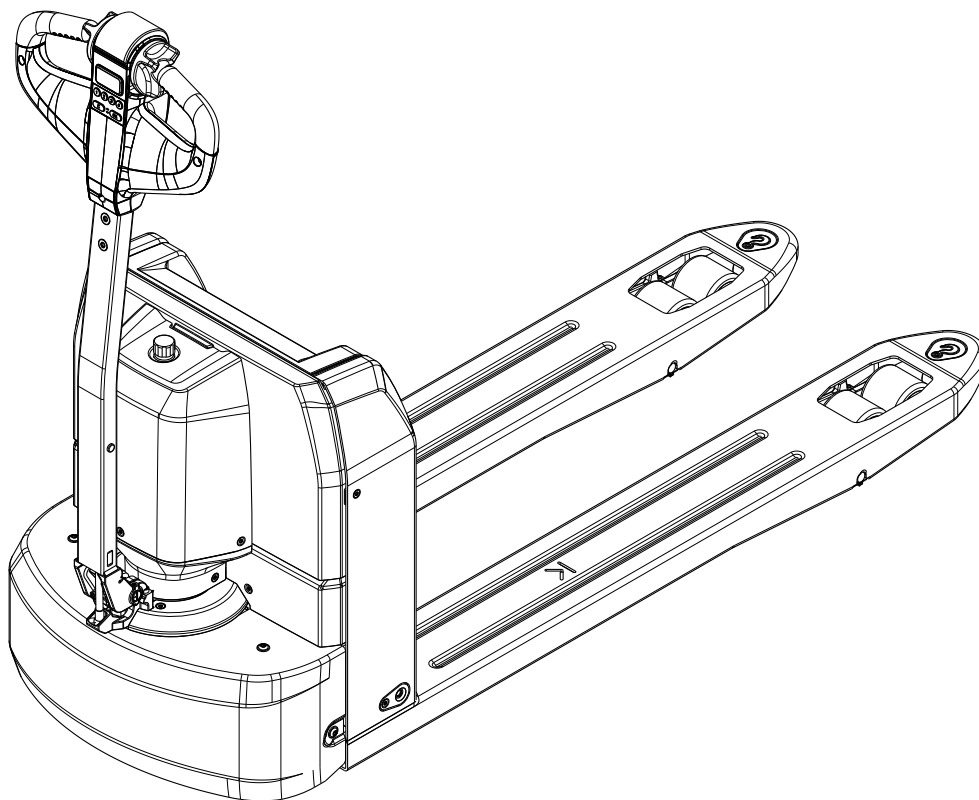
4.3 Consumables

Code	Order no.	Description	Used for	Volume
A	51207593	Hydraulic oil HVLP 32, DIN 51524	Hydraulic system -5 °C...+25 °C ¹⁾	0,4 l
B	50459855	Hydraulic oil HLP 46, DIN 51524	Hydraulic system > 25 °C ¹⁾	0,4 l
C	29200430	Lubricating grease DIN 51825	Various bearing points	As required

¹⁾ Ambient temperature

5 Maintenance and repairs

5.1 Preparing the truck for maintenance and repair work



Procedure

- Unload the truck.
- Park the truck securely – see page 80.
- Disconnect the battery – see page 68.

5.2 Lifting and jacking up the truck safely

WARNING!

Risk of accidents when working under the load handler and lift truck

- ▶ When working under a raised load handler or a raised truck, secure them to prevent the truck from lowering, tipping or sliding away.
 - ▶ When raising the truck, follow the instructions, see page 31. When working on the parking brake, prevent the truck from accidentally rolling away (e.g. with wedges).
-

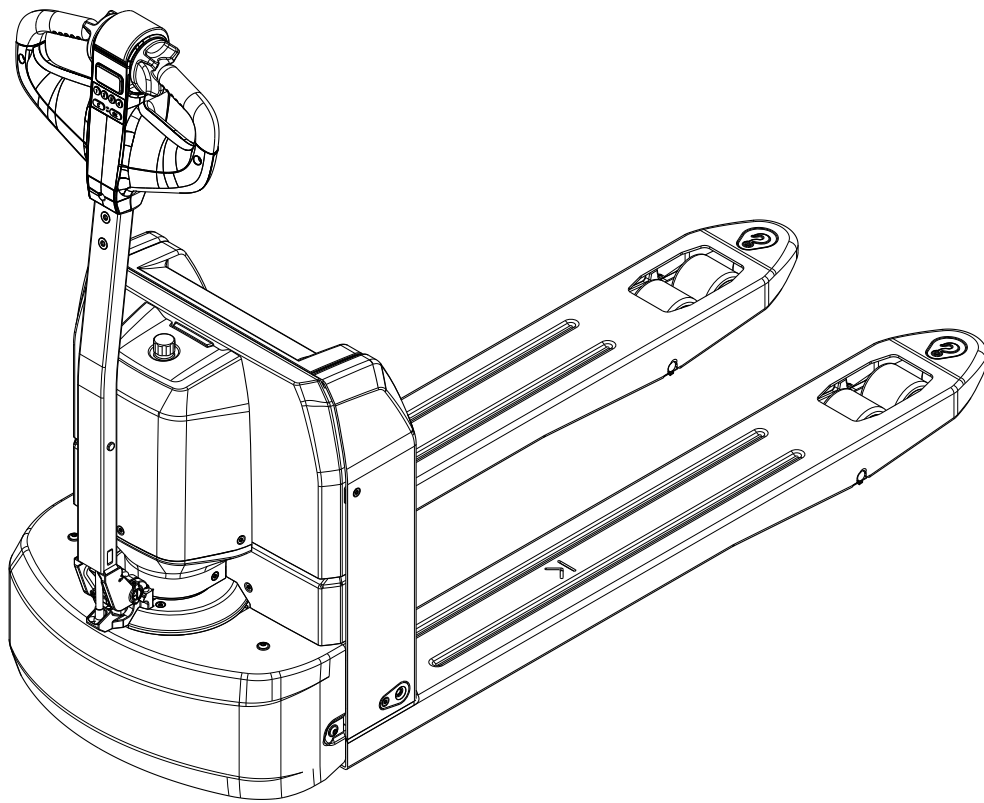
WARNING!

Lifting and jacking up the truck safely

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

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

- ▶ Jack up the truck only on a level surface and prevent it from moving accidentally.
 - ▶ Always use a jack with sufficient capacity. When jacking up the burden carrier, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
 - ▶ In order to raise the truck, the lifting accessories must only be secured to the points specially provided for this purpose, see page 31.
-



Raising and jacking up the truck securely

Requirements

- Prepare the truck for maintenance and repairs (see page 106).

Tools and Material Required

- Jack
- Hard wooden blocks

Procedure

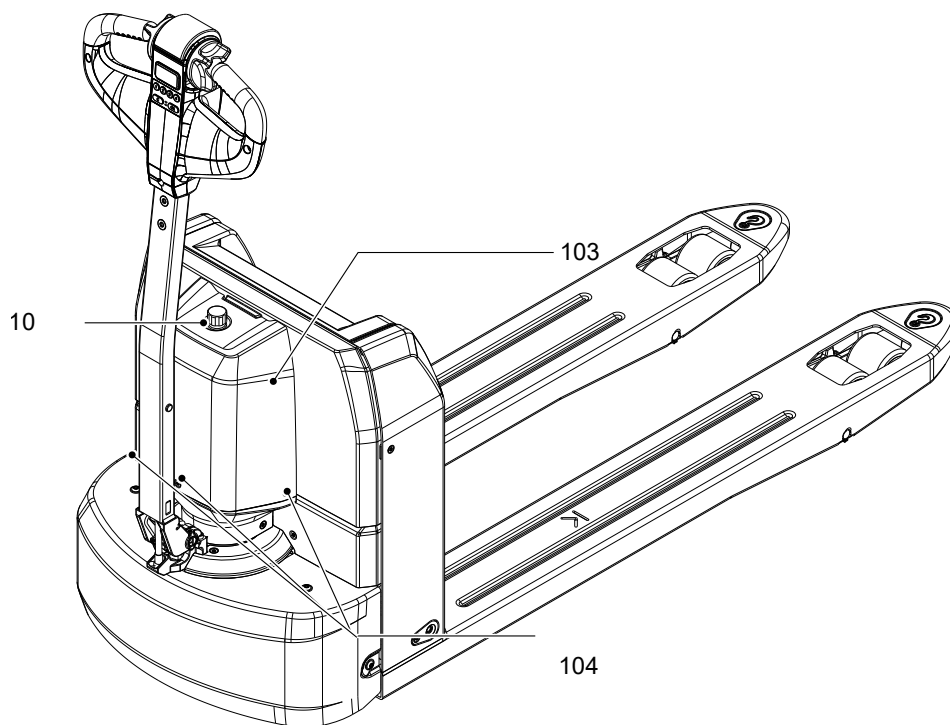
- Place the jack against the contact point.

➔ For jacking the truck, make sure to use the structural parts of the truck as contact point for the jack (e.g. truck chassis).

- Raise the truck.
- Support the truck with hard wooden blocks.
- Remove the jack.

The truck is now securely raised and jacked up.

5.3 Disassembling or assembling the cover



Removing the cover for the hydraulic unit and electrical system

Requirements

- The truck is parked securely, see page 80.

Tools and Material Required

- Hexalobular wrench, size 30

Procedure

- Remove 2 hexalobular screws (104).
- Lift the cover (103) over the emergency disconnect switch (10) and place it safely.

Cover for the hydraulic unit and electrical system has been removed.

5.4 Cleaning

5.4.1 Cleaning the truck

CAUTION!

Fire hazard

Do not use flammable liquids to clean the industrial truck.

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



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

Cleaning the truck

Requirements

- Truck prepared for maintenance and repair work, see page 106.

Tools and Material Required

- Water-based solvents
- Sponge or cloth

Procedure

- Clean the surface of the truck with water-based solvents and water. Use a sponge or cloth to clean.
- 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 115).

The truck is now clean.

5.4.2 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 106.

Tools and Material Required

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

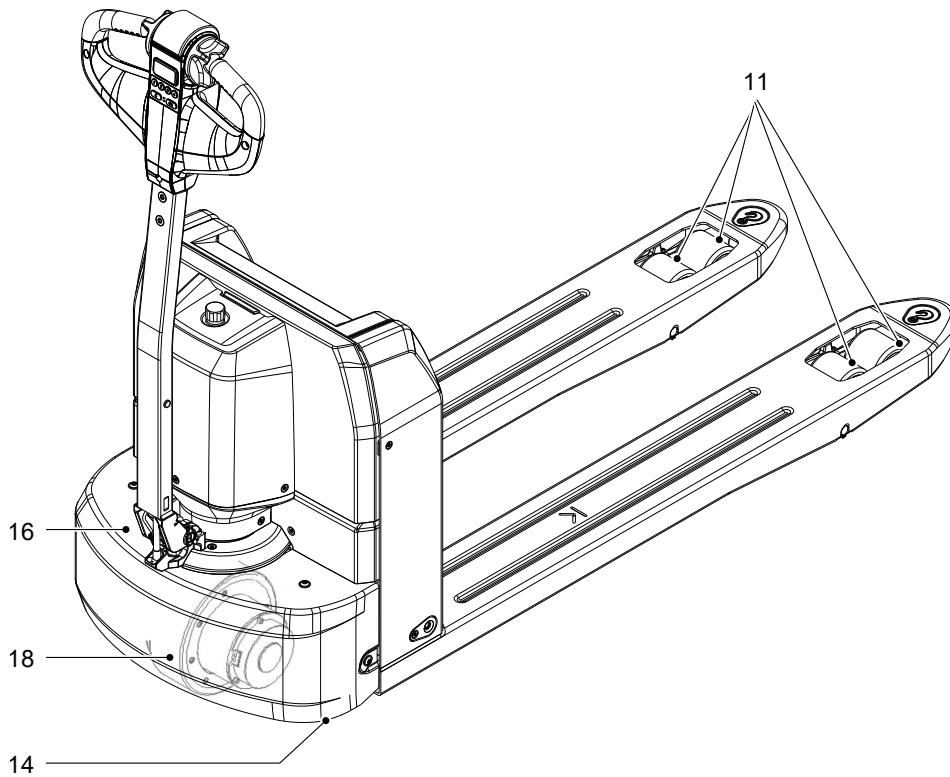
Procedure

- Expose the electrical system – see page 109.
- 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 109.
- Carry out all the tasks listed in the section "Recommissioning the truck after cleaning or maintenance work" – see page 115.

The electrical-system assemblies are now clean.

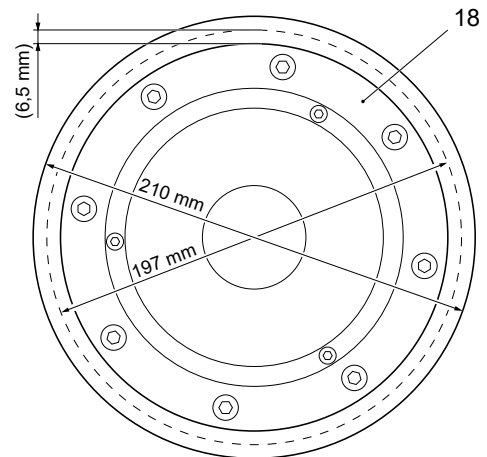
5.5 Checking the drive wheel and load wheels

- The drive wheel / load wheels and support wheels can be replaced either by authorised service personnel or by the owner of the industrial truck. The replacement instructions are delivered together with the spare parts package.

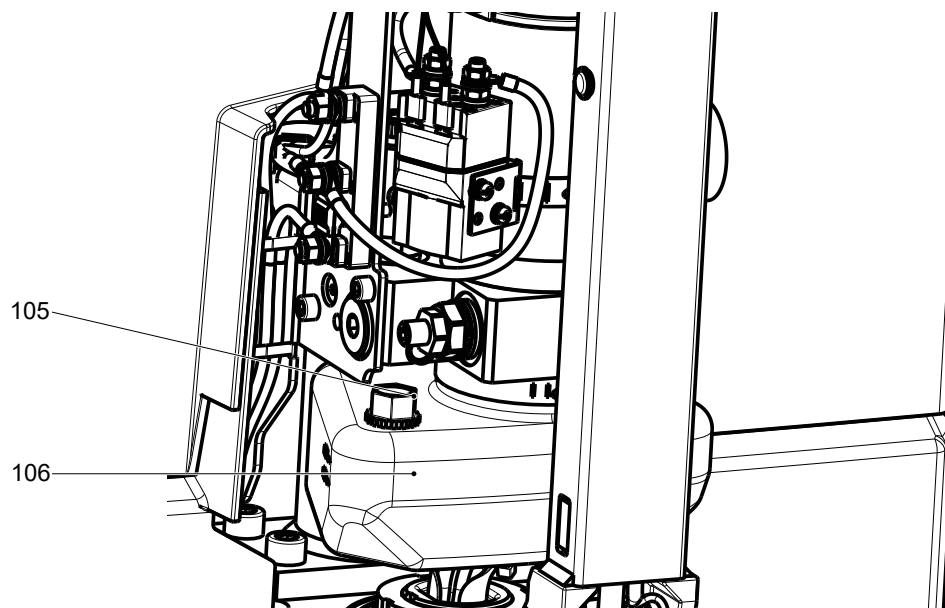


Procedure

- Remove the bumper (16) – see page 109.
- Check the drive wheel (18) for wear, damage and freedom of movement.
- Replace the drive wheel if one of the following statements applies:
 - The diameter of the drive wheel is ≤ 197 mm (new condition 210 mm).
 - The lining has only a residual thickness of $\leq 6,5$ mm.
 - The drive wheel is no longer round.
- Check the load wheels (11) for wear, damage and freedom of movement.
- Replace all load wheels if necessary.
- Check the support wheels (14).
- Replace both support wheels if necessary.
- Fit the bumper.



5.6 Checking the hydraulic oil level and refilling the hydraulic oil



Checking the hydraulic oil level and replenishing if necessary

Requirements

- Load handler is fully lowered.
- Truck is prepared for maintenance and repair work, see page 106.

Procedure

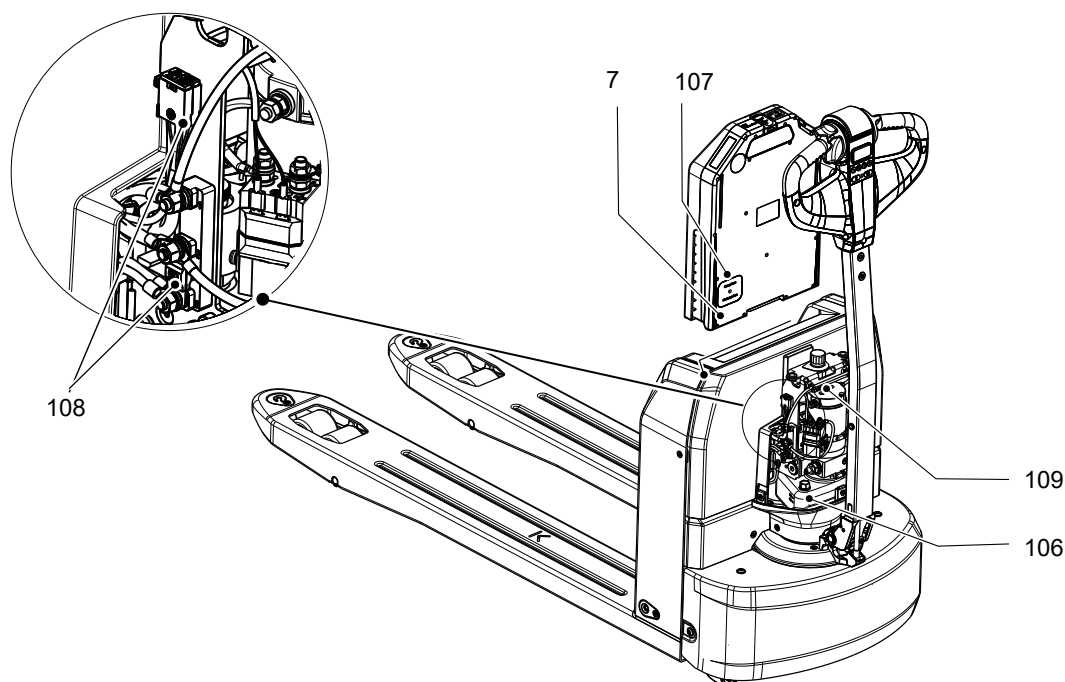
- Remove the cover for the hydraulic unit, see page 109.
- Check the oil level in the hydraulic reservoir (106).

- ➔ When the load handler is fully lowered, the hydraulic oil level must be between the min and max markings.
- Add hydraulic oil if necessary:
 - Unscrew the cap (105) from the hydraulic reservoir (106).
 - Add hydraulic oil of the correct grade until the hydraulic oil level lies within the target range (see page 105).
 - Screw the cap (105) onto the hydraulic reservoir (106).
 - Fit the cover onto the hydraulic unit, see page 109.
 - Restore the truck to service after maintenance and repairs, see page 115.

The hydraulic oil level is correct.

- ➔ If a leak is detected in the hydraulic system, the truck must be decommissioned and repaired by specialist personnel.

5.7 Checking the electrical fuses



Fuse	Value	Installation location
F8 (107) Main fuse	10 A	between hydraulic reservoir (106) and control (109)
F16 F23	2 A 2 A	
FU 01 (108) Battery	70 A 20 A	on the back of the battery (7)

Checking electrical fuses

Requirements

- Truck is prepared for maintenance and repair work, see page 106.
- The cover of the hydraulic unit and the electrical system is removed, see page 109.

Procedure

- Check fuses F8, F16, F23 (107) for correct value and condition and replace if necessary.
- Fit the cover.
- Remove the battery (7), see page 68.
- Check fuse FU01 (108) for correct rating and condition, and replace if necessary.
- Install the battery – see page 69.

The fuses have been checked.

6 Restoring the truck to service after maintenance and repairs

Procedure

- Thoroughly clean the truck, see page 110.
- Lubricate the truck according to the lubrication diagram, see page 104.
- Charge the battery, see page 60.
- Start up the truck, see page 78.

- The manufacturer's customer service department is specially trained to carry out this task.

7 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 107.

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

7.1 Prior to decommissioning

Procedure

- Park the truck securely, see page 80.
- Clean the truck, see page 110.
- Check the hydraulic oil level and replenish if necessary, see page 113.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck according to the lubrication diagram, see page 104.
- Charge the battery, see page 60.
- Drive the truck to the storage location and jack it up, see page 107.
- Remove the battery, see page 116.
- Check the battery charge at regular intervals, see page 116.

- 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.

7.2 Action to be taken during decommissioning

NOTICE

Deep discharge can damage the battery

Self-discharge can cause deep discharge of the battery. Deep discharge shortens the service life of the battery.

- ▶ Before a long period of inactivity, the battery must be fully charged.
 - ▶ The battery must be fully charged at least every 16 weeks, see page 60.
-

7.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck, see page 110.
- Lubricate the truck according to the lubrication diagram, see page 104.
- Charge the battery, see page 60.
- Start up the truck, see page 78.

8 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.

9 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.

G Maintenance, Inspection and Changing of Maintenance Parts Requiring Replacement

⚠ WARNING!

Lack of maintenance can result in accidents

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

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

NOTICE

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

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

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

1 Maintenance Contents AME 15 / 18 / 20 / 15 (NA) / 20 (NA)

Issued on: --

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
Correct the hydraulic-oil level.
Steering
Test the tiller return function.

1.1.2 Inspection contents

1.1.2.1 Standard equipment

The following points must be checked:

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 connector for secure fit, functionality and damage

Chassis/structure
Check labels for legibility, completeness and plausibility
Check doors or covers for damage

Hydraulic operations
Test hydraulic system
Check fork arms or load handler for wear and damage

Battery charger
Mains plug and mains cable for damage

1.1.2.2 Optional Equipment

The following points must be checked:

1.2 Customer Service

In accordance with the AME 15 / 18 / 20 / 15 (NA) / 20 (NA) 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.
Measure the air gap of the magnetic brake.

Electrical system
Adjust the microswitches.
Test key switch or alternative access system including the access rights.
Test the contactors and/or relays.
Perform insulation inspection.
Clean the motor with compressed air.

Power supply
Measure the battery voltage.

Hydraulic operations
Adjust the lift mechanism.
Correct the hydraulic-oil level.
Test and adjust the pressure relief valve.

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
Test the tiller return function.

Battery charger
Test the immobiliser on trucks with an on-board charger.
Clean the fan.
Carry out a potential measurement on the chassis while charging is in progress.

1.2.2 Inspection contents

The following points must be checked:

1.2.2.1 Standard equipment

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
Check electrical wiring for damage (insulation damage, connections) and check whether the fuse ratings are correct
Check carbon brushes for wear
Check connections and cables are securely attached and check for insulation damage and other signs of 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
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 labels for legibility, completeness and plausibility
Check doors or covers for damage

Hydraulic operations
Test hydraulic controls and check their labels for legibility, completeness and plausibility
Lift mechanism for wear, functionality and damage
Check cylinders and piston rods are securely attached and check for 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
Tie/plunger rods for uniform adjustment, wear and damage

Steering
Check the mechanical parts of the steering column for wear and damage

Battery charger
Mains plug and mains cable for damage
Fan for correct functionality and damage
Cables and electrical connections for secure fit and damage

1.2.3 Maintenance parts

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

1.2.3.1 Standard equipment

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