AMC 12/12z

06.23

Operating instructions

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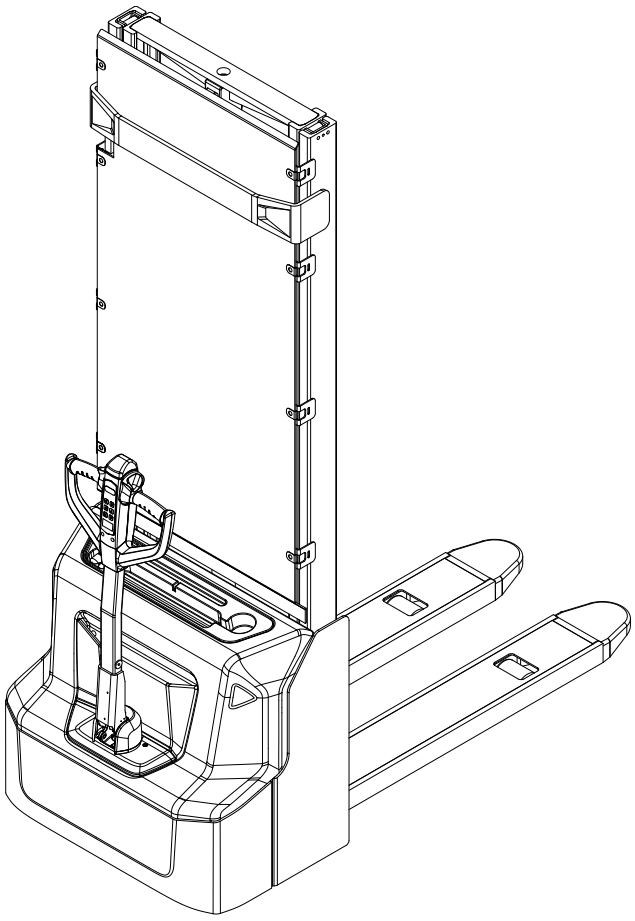
AMC 12
AMC 12z



JUNGHEINRICH

Declaration of Conformity

CE

Manufacturer

Jungheinrich AG, 22039 Hamburg, Germany

Description
Industrial truck

Type	Option	Serial no.	Year of manufacture
AMC 12 AMC 12z			

On behalf of

Date

EU DECLARATION OF CONFORMITY

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

UK CA

JUNGHEINRICH

Declaration of Conformity (○)

Product:	AMC 12/12z 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

11.23 en-GB

Foreword

Notes on the operating instructions

The present ORIGINAL OPERATING INSTRUCTIONS are designed to provide sufficient instruction for the safe operation of the industrial truck. The information is 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

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11.23 en-GB

Contents

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

⚠ CAUTION!

Danger due to excessive loads and incorrect load distribution

Overloading of the industrial truck and risk to operational stability.

- ▶ Do not exceed the maximum load that can be picked up or the maximum permissible load distance – see page 30 and see page 32.
- ▶ Pick up the load fully on the load handler.
- ▶ Use only approved attachments.
- ▶ In double-deck operation, do not raise the load handler higher than 1800 mm[1]. The bottom load must always be heavier than the top load.

⚠ CAUTION!

Danger when travelling with a raised load

Travelling with a raised load on the load fork and no load on the support arms impairs the driving characteristics of the truck and cause it to tip over.

- ▶ Travelling with a raised load on the load fork is permitted only when picking up and putting down a second load in double-deck mode.

Permissible activities

- Lifting and lowering loads
- Stacking and retrieving loads
- Transporting lowered loads

Prohibited activities

- Travelling with a raised load (> 300 mm)
- Raising the load handler above 1800 mm in double-deck operation
- Carrying and lifting passengers
- Pushing or pulling loads

[1)] In individual cases, a release can be requested from the manufacturer to increase the lift height.

3 Approved application conditions

⚠ WARNING!

Operation in extreme temperatures or conditions

Malfunctions and accidents can occur if the truck is operated in extreme temperatures or conditions.

▶ 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.

Changing the application areas and thawing

– The application areas can be changed, but in general this should be minimised due to thawing and possible corrosion.
– Thawing is permissible only if the truck can be subsequently dried thoroughly.

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

– Operation in industrial and commercial environments.
– Operation only on secure, level surfaces with sufficient capacity.
– Do not exceed the permissible surface and point load limits on the travel routes.
– Operation only on routes that are visible and approved by the operating company.
– Read the instructions in these operating instructions before travelling on slopes and inclines:
  • Truck gradeability – see page 21.
  • Notes on travelling on slopes and inclines – see page 83.

Ground conditions

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

– The ground must be level, secure and have sufficient capacity.
– The ground must be free from oil and grease.
– In accordance with EN 1081, the earthing resistance of the ground must not exceed 1 MΩ.

– The following also applies for stacking:
  • The capacity data specified on the truck applies to horizontal ground that meets the specifications in the table below.

Limit values for deviations from level

Reference	Limit values (mm) for measuring point distances (m) [1]				
Finished floors e.g. screed on its own, screed for accommodating floor coverings, floor coverings, tile coverings, smoothed and bonded surfaces	≤ 0.1 m	1 m	4 m	10 m	≥15 m
	2 mm	4 mm	10 mm	12 mm	15 mm
[1)] *Specifications in accordance with DIN 18202:2019-07 - Table 3 - row 3 - limit values for deviations from level*					

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

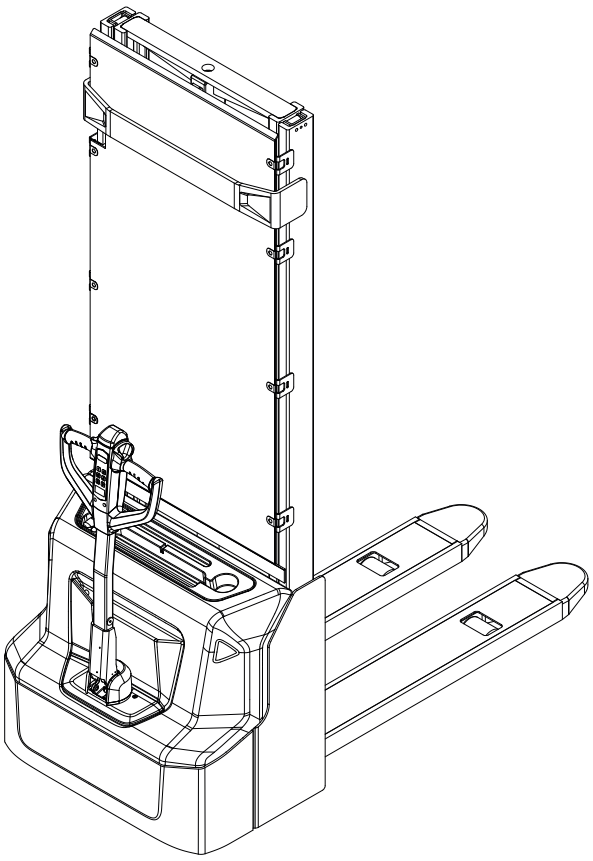
The AMC 12 and AMC 12z trucks are self-propelled, tiller-operated electric trucks with an electrically driven lifting function.

They are designed for transporting palletised loads on level surfaces and for stacking loads up to the required lift height.

The double-deck version (AMC 12z only) enables two pallets to be picked up one on top of the other.

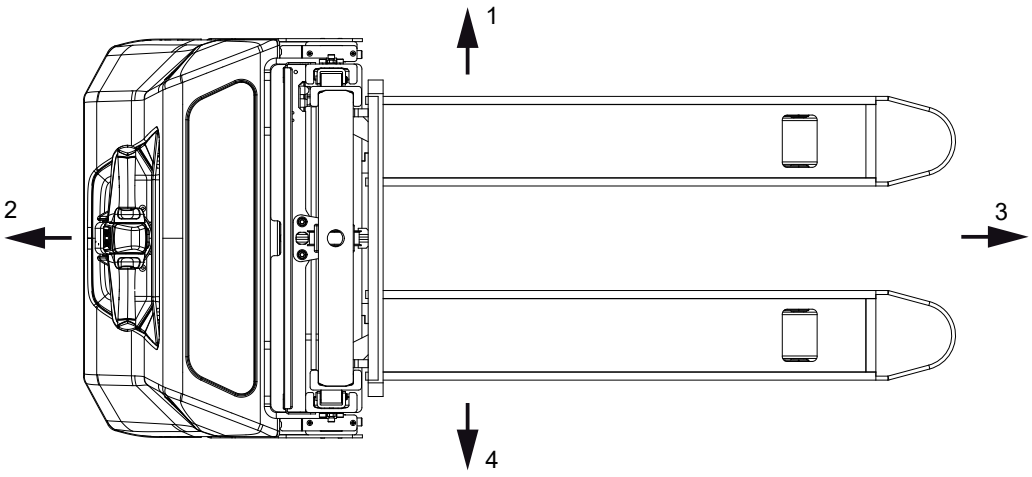
The rated capacity depends on the lift height and the load centre and the maximum is 1200 kg – see page 30.

The trucks are designed for light-duty applications. The maximum continuous operation time is 2,5...3 hours.



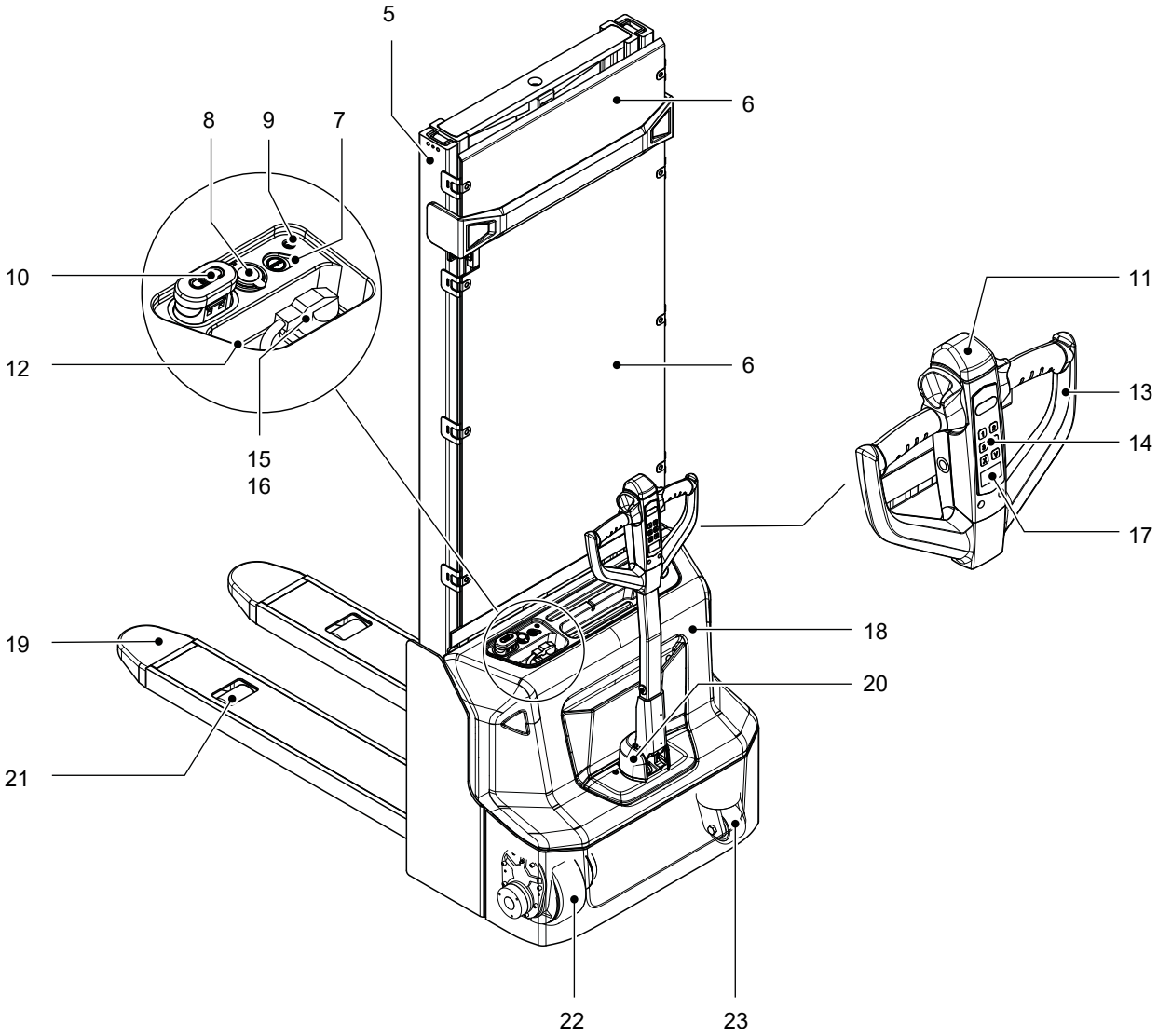
2 Travel Direction Definition

The following determinations have been made for travel direction specification:



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

3 Assembly description



Item		Description
5	●	Mast
6	●	Protective screen panel
7	●	Start button
8	●	USB charging socket
9	●	Charge status indicator
10	●	Emergency disconnect switch
11	●	Collision safety switch
12	●	Dashboard panel
13	●	Tiller
14	●	Keypad
15	●	Mains plug for on-board charger
16	●	Slot for the mains plug of the on-board charger
17	●	Display unit

Item		Description
18	●	Front panel
19	●	Load handler
20	●	Drive panel
21	●	Load wheel
22	●	Drive wheel
23	●	Support wheel

4 Functional Description

Electrical system

The truck has an electronic traction controller. The truck electrical system operates with a rated operating voltage of 24 V.

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.

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.

Operator position

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

Steering

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

Truck contour

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

➔ The truck contour must not be changed. Contact the manufacturer’s customer service department, if necessary.

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 69.

Automatic reset of the controls

When released, a gas strut pushes the swivelling tiller up and activates braking, see page 70.

The travel switch must be held in the travel position to move the truck. When released, the travel switch moves to the neutral position and the truck brakes, see page 70.

Collision safety switch

The 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.

Lift cut-out

When the maximum permissible lift height of the load handler is reached, the lift functions are deactivated.

On industrial trucks with double-deck function, the lift functions are already deactivated as of a height of 1800 mm.

curveCONTROL

The curveCONTROL assistance system helps the operator to operate the truck safely. When cornering, the maximum travel speed is reduced according to the steer angle.

Hour meter

Service hours are counted while the truck is operational and one of the following controls is actuated:
– Tiller in travel zone "F", see page 72.
– "Slow travel button", see page 74.
– Button for lifting or lowering the load handler, see page 76.

USB charging module

The USB charging module is used as a power supply for external devices.

5 Technical Specifications

Technical data specified in accordance with VDI 2189.
Technical modifications and additions reserved.

5.1 Performance data

AMC 12

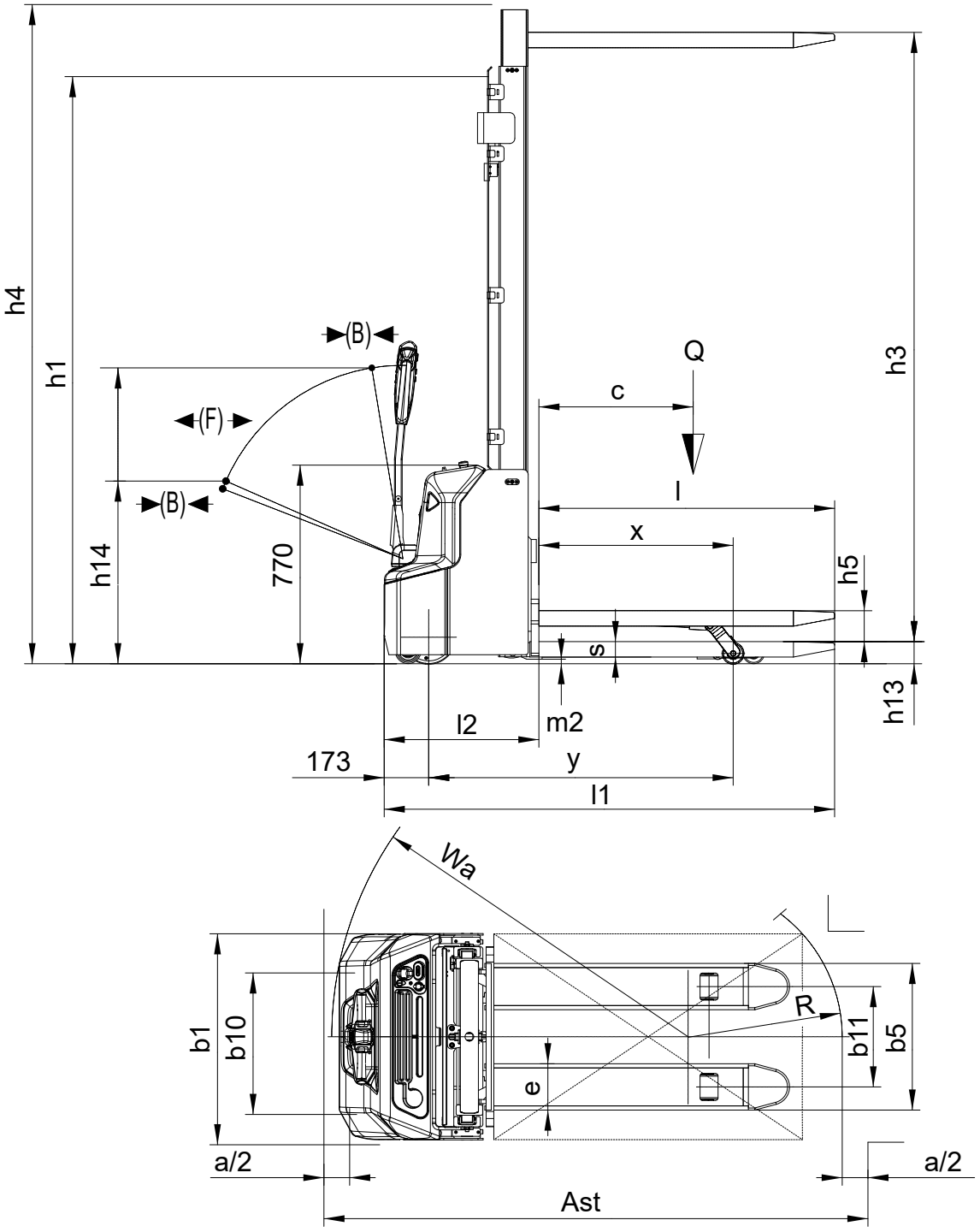
Description	AMC 12	
Capacity	1200	kg
Travel speed with / without rated load	4.2 / 4.5	km/h
Lift speed with/without rated load	0.11 / 0.14	m/s
Lowering speed with/without rated load	0.13 / 0.11	m/s
Max. gradeability with / without rated load	5 / 10	%
Drive motor, output at S2 60 min.	0.65	kW
Lift motor, output at S3 15%	2.2	kW
Battery voltage	24	V
Rated capacity K_5 (S)	60	Ah
Energy consumption in accordance with DIN EN 16796	0.6	kWh/h

AMC 12z

Description	AMC 12z	
Support arm lift capacity	1200	kg
Mast lift capacity (depending on lift height) [1)]	Max. 1200	kg
Travel speed with / without rated load	4.2 / 4.5	km/h
Lift speed with/without rated load	0.11 / 0.14	m/s
Lowering speed with/without rated load	0.13 / 0.11	m/s
Max. gradeability with / without rated load	5 / 10	%
Drive motor, output at S2 60 min.	0.65	kW
Lift motor, output at S3 7.5%	2.2	kW
Battery voltage	24	V
Rated capacity K_5 (S)	60	Ah
Energy consumption in accordance with DIN EN 16796	0.66	kWh/h

1) In double-deck operation, the load on the load handler must be smaller than the load on the support arms.

5.2 Dimensions



AMC 12

	Description	AMC 12				
	Double mast ... ZT	**250**	**280**	**310**	**350**	
c	Load centre distance	600				mm
x	Load distance	710				mm
y	Wheelbase	1097				mm
h1	Mast height retracted	1780	1930	2080	2280	mm
h3	Lift	2514	2814	3114	3514	mm
h4	Mast height extended	3037	3337	3637	4037	mm
h5	Support arm lift	-				mm
h13	Lowered height	90				mm
h14	Tiller height in min./max. travel position.	710 / 1150				mm
l1	Overall length	1710				mm
l2	Load fork length including fork shank	560				mm
b1	Overall width	800				mm
b5	Width across forks	570				mm
s/e/l	Fork arm dimensions	60 / 180 / 1150				mm
b10	Track width, front	550				mm
b11	Track width, rear	400				mm
m2	Ground clearance, centre of wheelbase	24				mm
Ast	Aisle width for pallets 1000 x 1200 crossways	2167				mm
Ast	Aisle width for pallets 800 x 1200 lengthways	2133				mm
Wa	Turning radius	1300				mm

AMC 12z

	Description	AMC 12z				
	Double mast ... ZT	**250**	**280**	**310**	**350**	
c	Load centre distance	600				mm
x	Load distance [1)]	763 / 680				mm
y	Wheelbase [1)]	1192 / 1109				mm
h1	Mast height retracted	1820	1970	2120	2320	mm
h3	Lift	2514	2814	3114	3514	mm
h4	Mast height extended	3077	3377	3677	4077	mm
h5	Support arm lift	120				mm
h13	Lowered height	90				mm
h14	Tiller height in min./max. travel position.	710 / 1150				mm
l1	Overall length	1752				mm
l2	Load fork length including fork shank	602				mm
b1	Overall width	800				mm
b5	Width across forks	570				mm
s/e/l	Fork arm dimensions	60 / 180 / 1150				mm
b10	Track width, front	550				mm
b11	Track width, rear	400				mm
m2	Ground clearance, centre of wheelbase	26				mm
Ast	Aisle width for pallets 1000 x 1200 crossways [1)]	2241 / 2192				mm
Ast	Aisle width for pallets 800 x 1200 lengthways [1)]	2188 / 2169				mm
Wa	Turning radius [1)]	1395 / 1312				mm

[1)] Load section raised/load section lowered

5.3 Weights

AMC 12

Description	AMC 12	
Net weight	620	kg
Axle load with load - front/rear	520 / 1300	kg
Axle load without load - front/rear	440 / 180	kg
Battery weight	17	kg

AMC 12z

Description	AMC 12z	
Net weight	710	kg
Axle load with load - front/rear	670 / 1240	kg
Axle load without load - front/rear	490 / 220	kg
Battery weight	17	kg

5.4 Tyre type

Description	AMC 12 AMC 12z	
Tyre size, drive system	Ø 210 x 75	mm
Tyre size, load section	Ø 84 x 93	mm
Additional wheels	Ø 100 x 50	mm
Wheels, number front/rear (x = driven)	1x + 1/2	mm

5.5 Laws, standards and guidelines

Continuous sound pressure level

– AMC 12/12z: < 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)

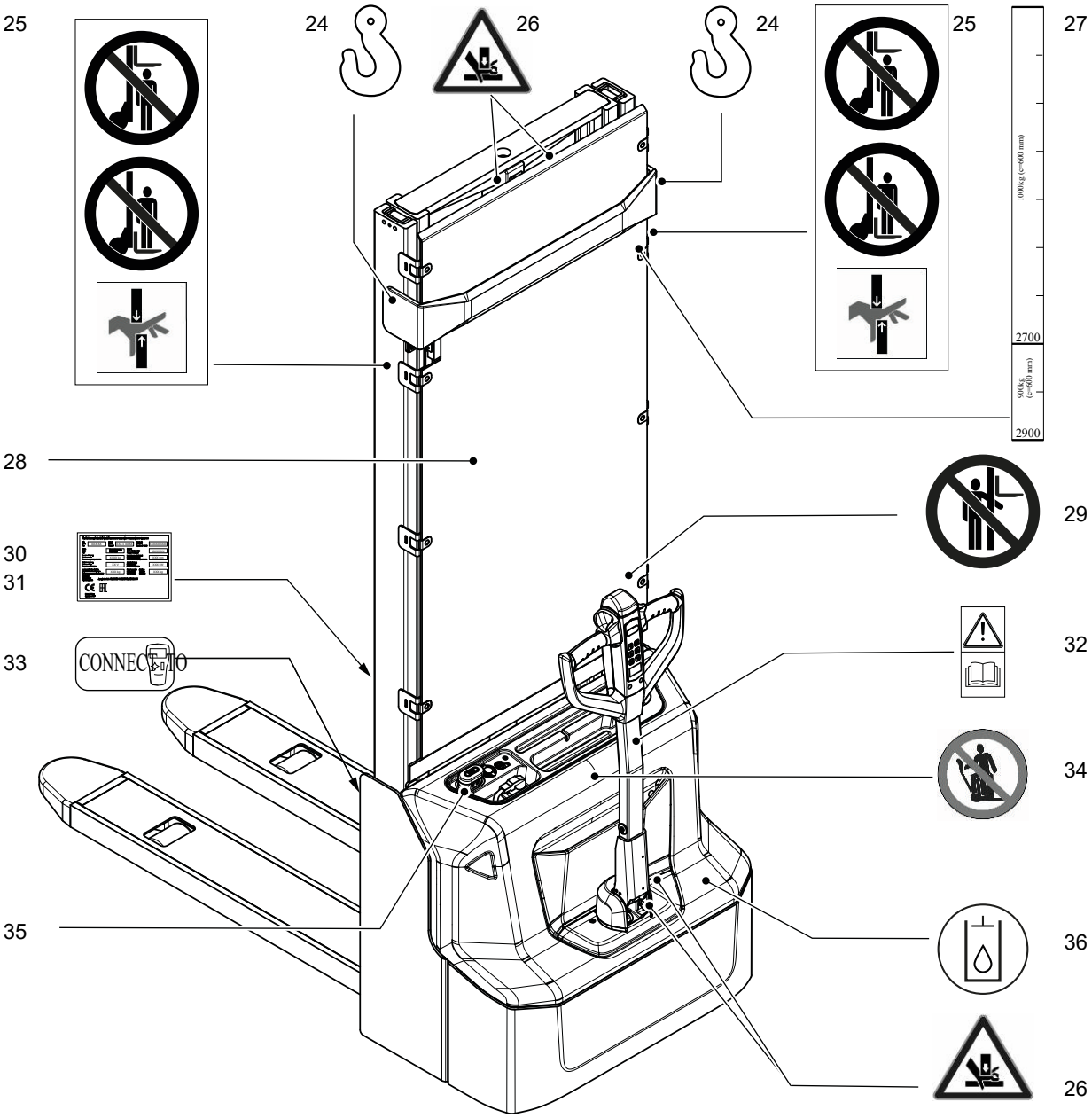
The manufacturer confirms that the truck adheres to the limits for electromagnetic emissions and resistance as well as the static electricity discharge test in accordance with EN 12895 as well as the standardised instructions contained therein.

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

6 Identification Points and Data Plates

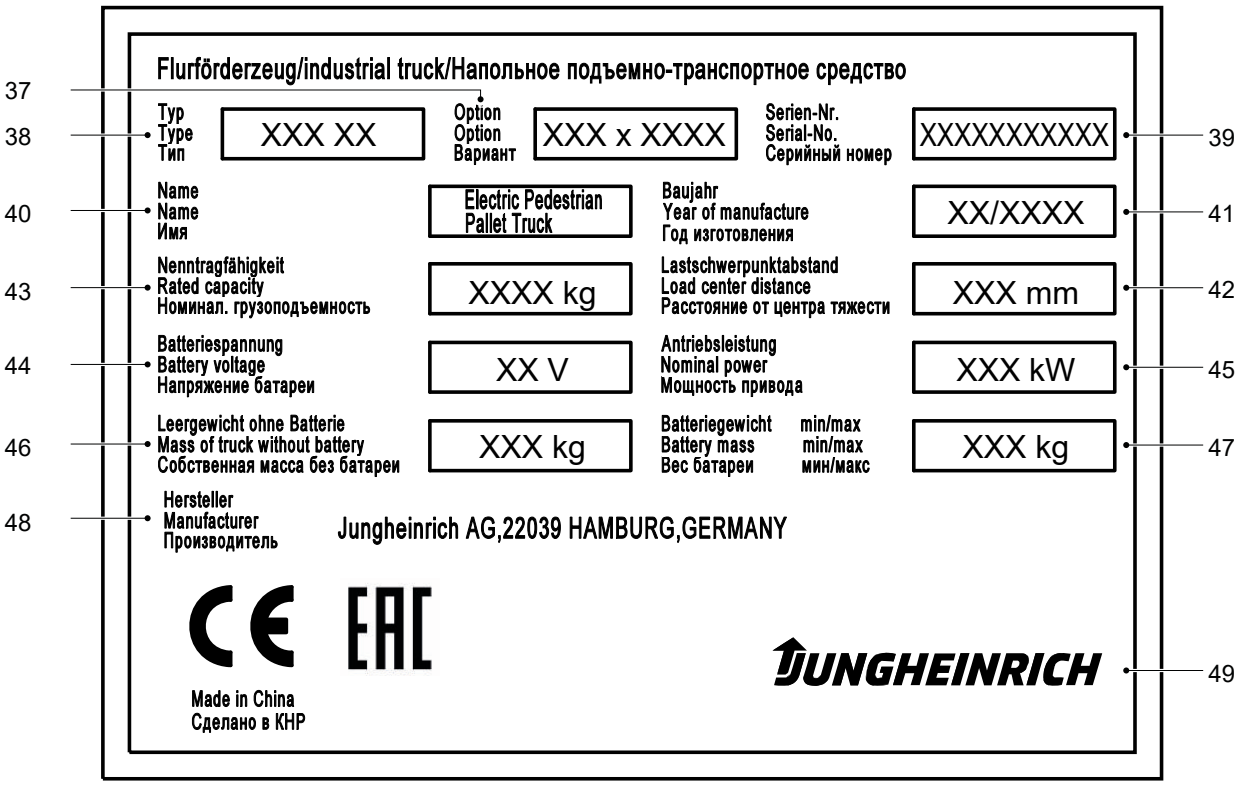
Warnings and notices such as capacity plates, attachment points and data plates must be legible at all times. Replace if necessary.

6.1 Indication Points



Item	Description
24	Attachment point for loading by crane
25	Combined plate: - Prohibition plate: "Do not step under the load fork" - Prohibition plate: "No standing under the load fork" - Risk of trapping
26	Warning notice: "Trapping hazard"
27	Lift height markings according to capacity plate
28	Capacity chart
29	Prohibition plate: "Do not reach through the mast"
30	Data plate
31	Serial number
32	Information sign: "Observe operating instructions"
33	Service interface
34	Prohibition plate: "No passengers"
35	"Emergency disconnect switch" marking
36	Oil filling

6.2 Data plate

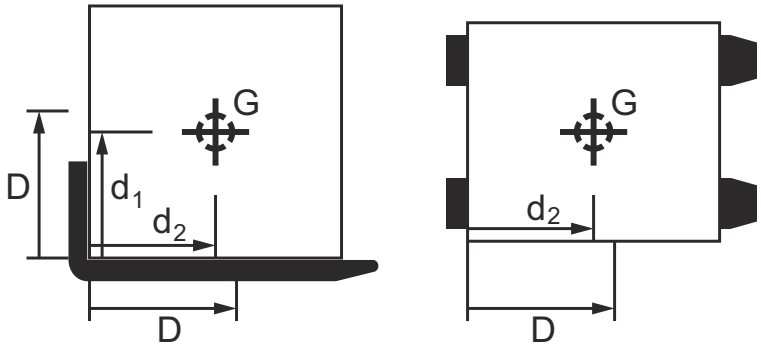


Item	Description	Item	Description
37	Option	44	Battery voltage
38	Type	45	Nominal power
39	Serial number	46	Mass of truck without battery
40	Name	47	Battery mass
41	Year of manufacture	48	Manufacturer
42	Load centre distance	49	Logo
43	Rated capacity		

For queries regarding the industrial truck or ordering spare parts always quote the truck serial number (39).

6.3 Truck capacity plate

Load centre distance

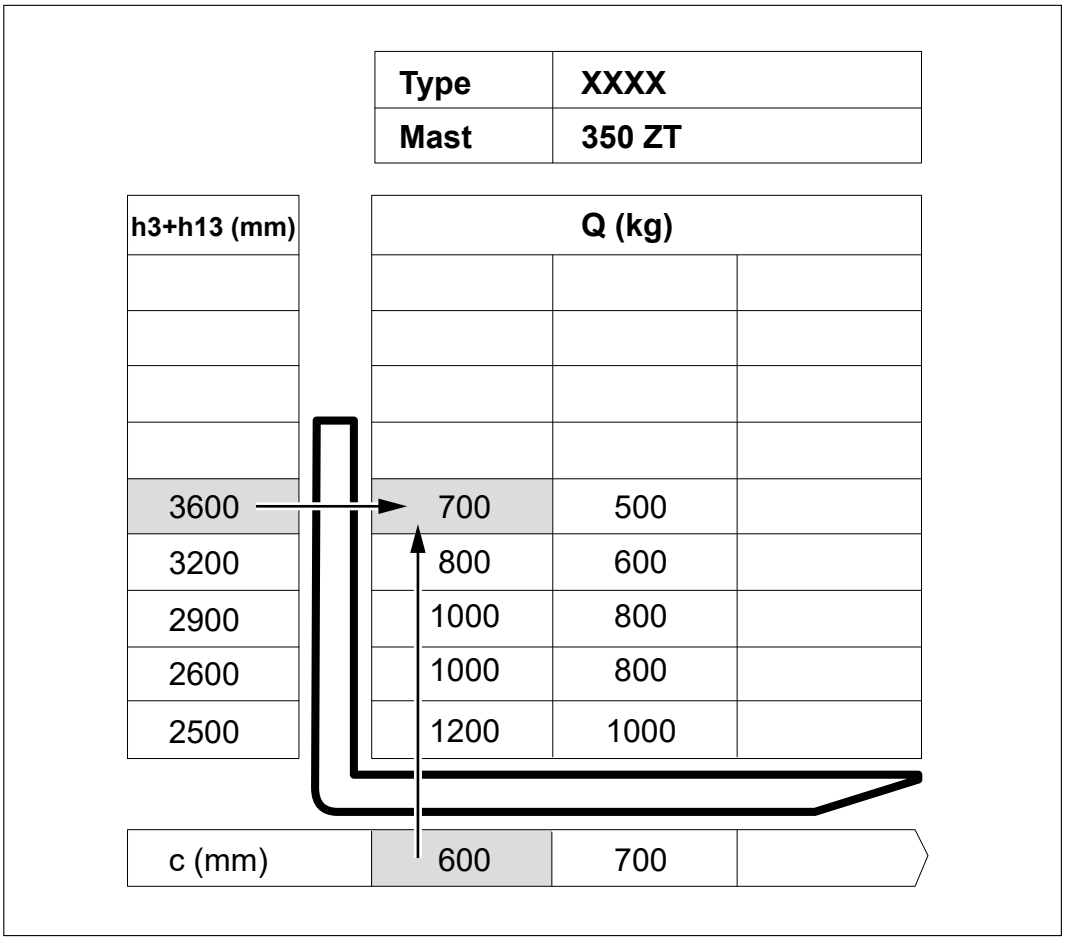


The load centre distance D of the load handler is specified horizontally from the front edge of the back and vertically from the upper edge of the load handler.

The distances d_1 and d_2 depicted in the illustration between the load handler and the actual centre of gravity G of the load must be less than or equal to the load centre distance D ($d_1 \leq D$ and $d_2 \leq D$) to avoid the risk of tipover – see page 79.

In accordance with VDI 2189, the load centre is indicated by the letter "c" in this section. In the other sections and on the capacity plate, the letter "D" is used in accordance with EN ISO 3691-1.

AMC 12



Type	XXXX
Mast	350 ZT

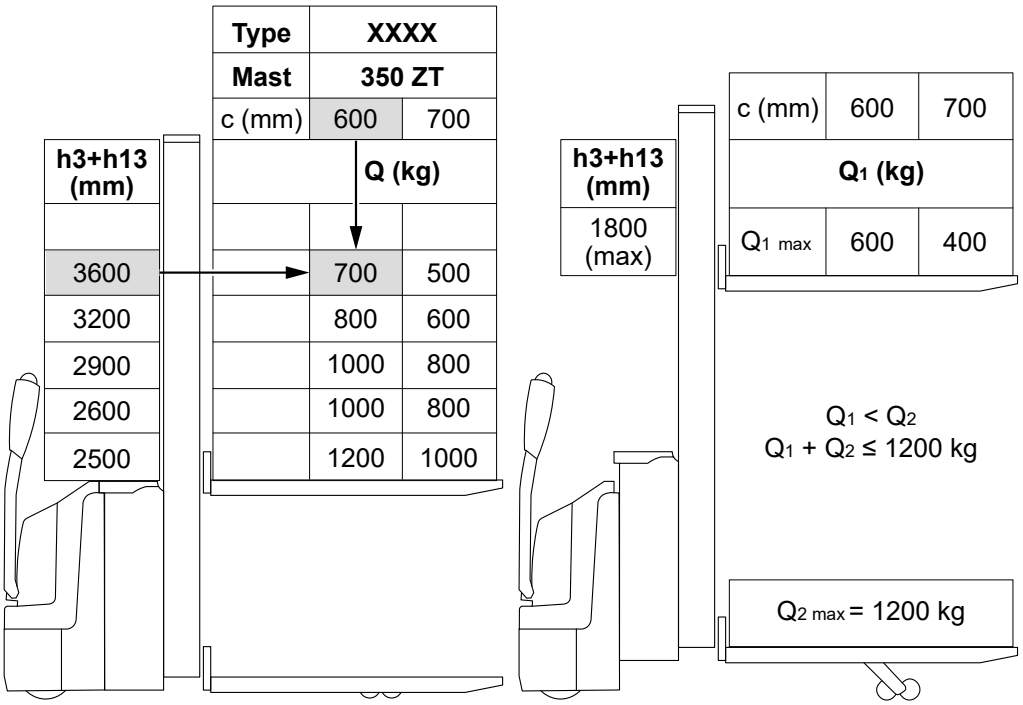
h3+h13 (mm)	Q (kg)		
3600	700	500	
3200	800	600	
2900	1000	800	
2600	1000	800	
2500	1200	1000	
c (mm)	600	700	

The capacity plate specifies the maximum capacity Q [kg] of the truck for a specified load centre c [mm] and the corresponding lift height (h3+h13) [mm].

Example:
For a load centre distance c of 600 mm and a lift height (h3+h13) of 3600 mm, the maximum capacity Q is 700 kg.

6.4 Double Decker Mode Capacity Plate

AMC 12z



The load chart specifies the maximum capacity Q [kg] of the truck for a specified load centre c [mm] and the corresponding lift height (h3+h13) [mm].

The white markings on the mast indicate whether the specific lift limits have been reached.

Example:
For a load centre distance c of 600 mm and a lift height (h3+h13) of 3600 mm, the maximum capacity Q is 700 kg.

If the truck is used in double-deck operation, the capacity of the support arms and load handler combined is 1200 kg. The load on the load handler (top) must always be smaller than the load on the support arms (bottom).

If the lift height of the support arms is within 120 mm, the maximum lift height (h3+h13) is 1800 mm.

C Transport and Commissioning

1 Loading the truck

⚠ 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.

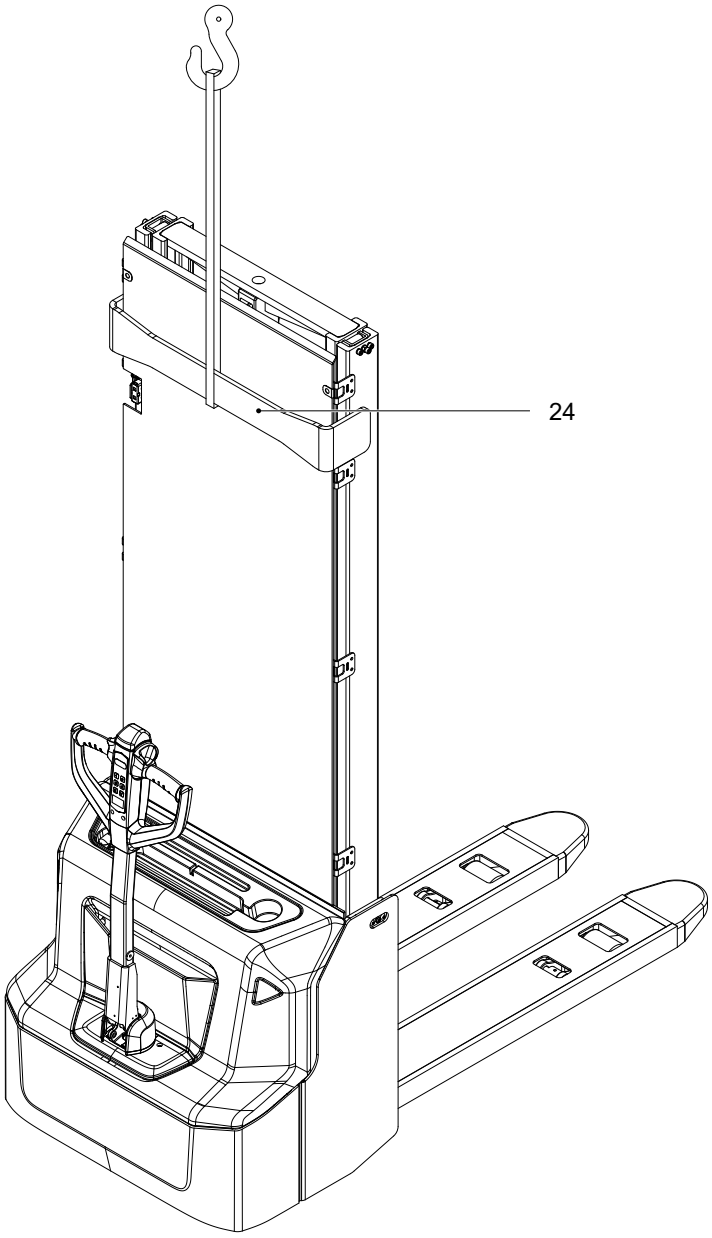
- ▶ Prevent the truck from hitting other objects during lifting, and avoid uncontrolled movements. If necessary, secure the truck with guide ropes.
- ▶ Loading by crane may only be performed by persons who have been trained in the use of the lifting accessories.
- ▶ Wear personal protective equipment (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.

⚠ CAUTION!

Danger of injury from swinging truck

The truck may swing when suspended.

- ▶ Raise the truck carefully and allow to swing.
- ▶ Keep the hazardous area around the truck clear.



Loading the truck by crane

Requirements

– Truck parked securely – see page 66.

Tools and Material Required

– Lifting gear
– Crane lifting gear

Procedure

• Secure the crane lifting gear to the attachment points (24).

The truck can be loaded by crane.

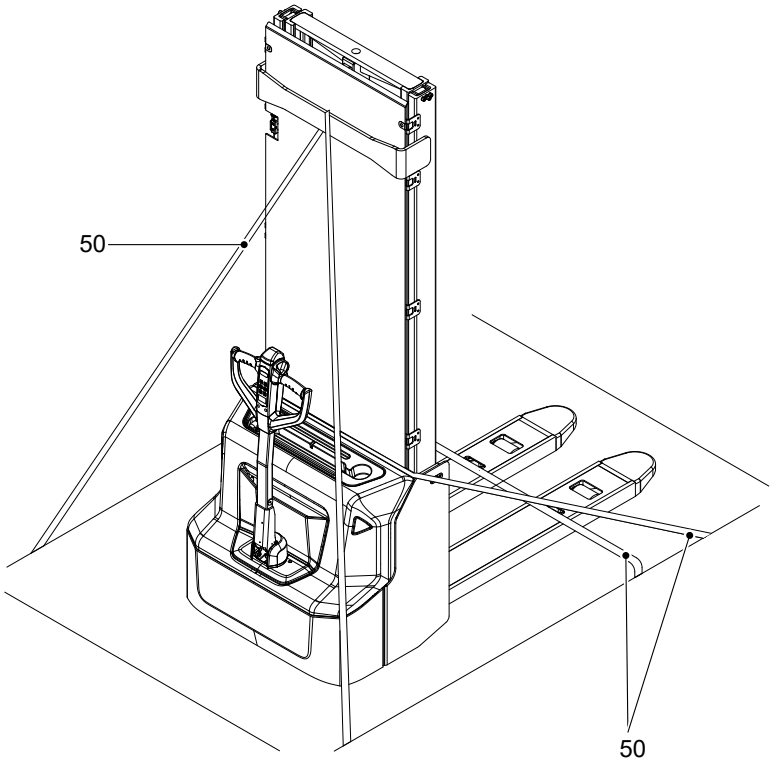
2 Securing the truck during transport

⚠ WARNING!

Uncontrolled movement during transport

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

- ▶ Loading is only to be carried out by specially trained staff. The specialist personnel must be instructed in the securing of loads on road vehicles and in the use of load-securing equipment. When securing the truck, the appropriate measures must be determined and applied for each individual case.
- ▶ The truck must be securely fastened when transported on a lorry or a trailer.
- ▶ The lorry or trailer must have lashing rings.
- ▶ Use wedges to prevent the truck from moving.
- ▶ Use only lashing straps with sufficient load rating.
- ▶ Use anti-slip material to secure loading aids (pallets, wedges,...), e. g. anti-slip mats.



Securing the truck for transport

Requirements

– The truck is now loaded.
– Truck parked securely – see page 66.

Tools and Material Required

– Lashing straps

Procedure

• Attach the lashing straps (50) to the truck, strap them to the transport vehicle and tension sufficiently.

The truck can be transported.

3 Commissioning

If the truck is delivered in multiple parts, setup and commissioning must only be performed by trained, authorised personnel.

⚠ CAUTION!

Poor visibility through the protector

The mast protection pane protector can impair the operator's visibility.

▶ Remove the protector (transport retainer) from both sides of the mast protection pane.

Carrying out initial commissioning

Procedure

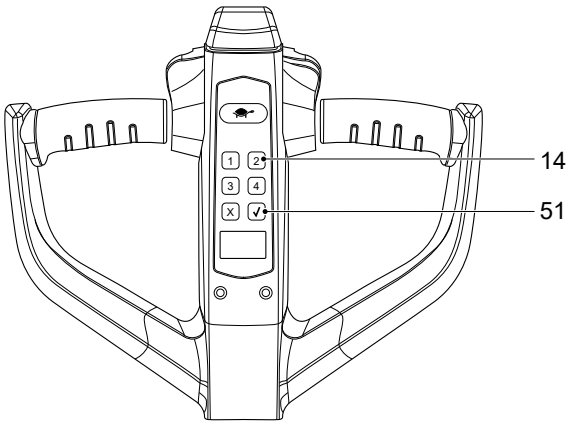
- Check the equipment is complete.
- Install the battery (if required) – see page 57.
- Charge battery fully (100%) – see page 54.
- Check the hydraulic oil level and correct if necessary – see page 110.

The truck can now be started – see page 65.

Wheel flattening

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

4 Adjusting the access code



➔ The truck can only be started with the correct access code.

The truck is delivered with the access code 1234, which can be used for immediate start. A new access code can be generated using the administrator password 3232. The code is entered via the keypad (14).

Changing the access code

Requirements

– Truck parked securely – see page 66.

Procedure

- Enter access code 3232 and press the RETURN key (51).
- Enter the previous access code and press the RETURN key.
- Enter the new access code and press the RETURN key.

The access code has been changed.

Resetting the access code

Requirements

– Truck parked securely – see page 67.

Procedure

- Enter access code 123 and press the RETURN key.
- Enter access code 123 once more and press the RETURN key.

The access code has been reset to 1234.

D Battery - Servicing, Recharging, Replacement

1 Description of the lithium-ion battery

The 24 V lithium-ion battery is a maintenance-free battery with rechargeable high-performance energy cells. The battery's daily operating time can be extended through intermediate charges.

Temperatur range for using the battery

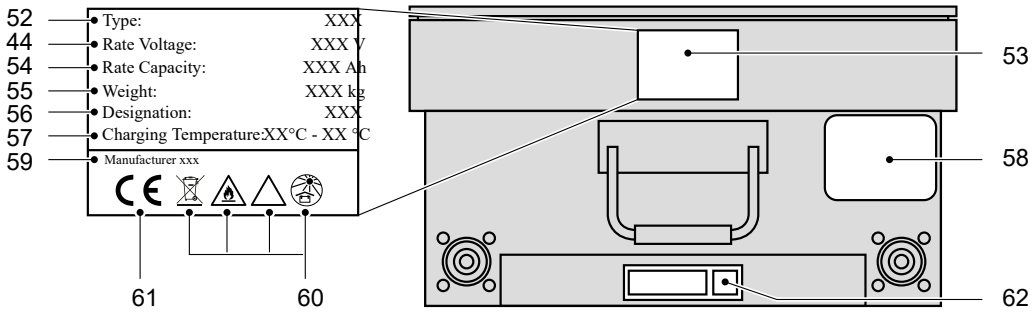
Optimum battery useful life is achieved at the battery temperatures of +5 °C to +40 °C.

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

Temperature range for charging the battery

The temperature range for charging the battery is between 5°C and +40 °C.

2 Battery Decals



Item	Description
44	Battery voltage (V)
52	Battery type
53	Battery data plate
54	Battery capacity (Ah)
55	Battery weight
56	Designation
57	Charging temperature range
58	Warnings
59	Manufacturer
60	Safety and warning information – see page 42
61	CE mark
62	QR code

3 Safety Instructions, Warning Indications and other Notes

3.1 Safety regulations for handling lithium-ion batteries

Do not carry out any repairs on the lithium-ion battery.

Replace defective lithium-ion battery by customer service.

⚠ 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.

NOTICE

Intermediate charging of the lithium-ion battery

Lithium-ion battery intermediate charging is possible. A battery that is not fully discharged can be partially or fully charged at any time.

- ▶ The lithium-ion battery must be fully charged before first use.
- ▶ To ensure reliable operation, a lithium-ion battery that undergoes frequent intermediate charging must be fully charged at least once a week.

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.

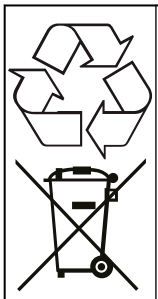
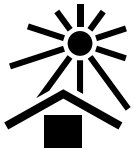
To avoid hazards due to emission of harmful substances, fire or explosion, the following must be observed:

– 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

	Used batteries are recyclable commodities. These batteries must be treated as hazardous waste. As indicated by the marking showing the recycling symbol and a crossed-out waste bin, batteries must not be disposed of as domestic 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.
	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 batteries away from strong heat sources.
	Hot surfaces – Battery cells can generate very high short-circuit currents, causing them to become hot.
	Hazardous electrical voltage – The metal parts of the battery cells are permanently live. Therefore, do not place any foreign objects or tools on the battery. – Observe the accident prevention regulations and DIN EN 62485-3.
	Safety instructions – Wear personal protective equipment (e.g. safety gloves, respirator mask, safety shoes) when handling damaged battery cells and 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 process the battery, strike, crush, compress, notch, dent or modify it in any way. – Do not open, damage, penetrate, bend, heat the 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.
	Observe the operating instructions – The operating instructions must be clearly visible at the charging location. – If any faults are identified on the battery, the battery must no longer be used. Immediately tag out the faulty battery and take it out of service. Contact the manufacturer's customer service department. – Do not attempt to rectify faults independently. – Do not open the battery.
	Protect the battery against heat and solar radiation.

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

63

64

Item	Description
63	Danger label class 9A for lithium-ion batteries
64	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

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 Special fire fighting protective equipment

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

3.2.3.3 Additional fire fighting instructions

To prevent secondary fires from occurring, the lithium-ion battery must be cooled from the outside. Fluids or solids must never be directed into the lithium-ion battery.

Suitable extinguishing agents
– Carbon dioxide extinguisher (CO_2)
– Water (not on mechanically opened or damaged batteries!)

Unsuitable extinguishing agents
– Foam
– Grease fire extinguishing agents
– Powder extinguishers
– Metal fire extinguishers (PM12i extinguishers)
– Metal fire powder PL-9/78 (DIN EN 3SP-44/95)
– Dry sand

3.2.3.4 Instructions for cooling an overheated, non physically damaged battery

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

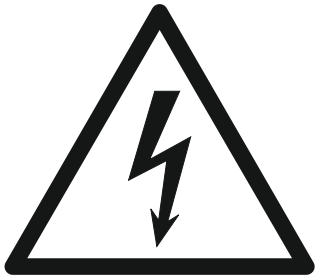
⚠ WARNING!

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 41.



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

⚠ WARNING!

Damage and other defects in the on-board charger or live attachments can result in accidents

If any damage or other defects in the on-board charger or live attachments (current collector, network cables, plugs, etc.) are discovered, the truck must be taken out of service until it has been repaired.

- ▶ Report any defects immediately to your supervisor.
- ▶ Inform the manufacturer's customer service department or a customer service organisation authorised by the manufacturer.
- ▶ Tag out the defective truck and take it out of service.
- ▶ Do not return the truck to service until the fault has been identified and rectified.

The charger is designed solely to charge lithium ion accumulators. The charger is unsuitable for all other accumulators and non-rechargeable batteries.

NOTICE

Full discharge can damage the battery

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

- ▶ Before a long period of inactivity, the battery must be fully charged.
- ▶ Charge the battery at least every 12 weeks, see page 54.

➔ If the battery is deeply discharged or if the battery temperature is below the permissible level (5°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 5°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

Discharge can damage the battery

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

▶ Before a long period of inactivity, the battery must be fully charged.

▶ To ensure a long battery life, we recommend checking and charging the battery every 4 weeks when it is not being used.

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 at least 60...70 %.

– 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!

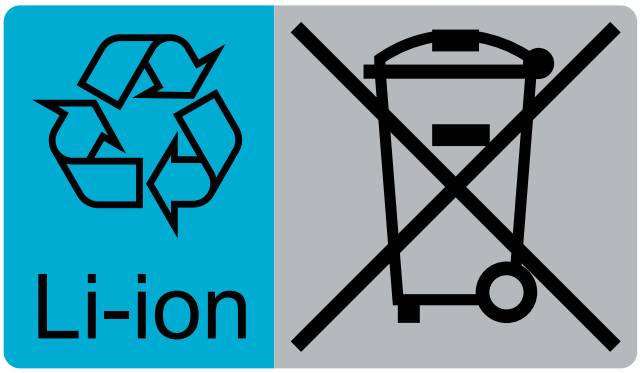
Do not open the battery.

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.

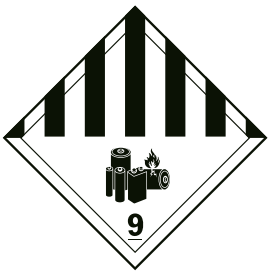
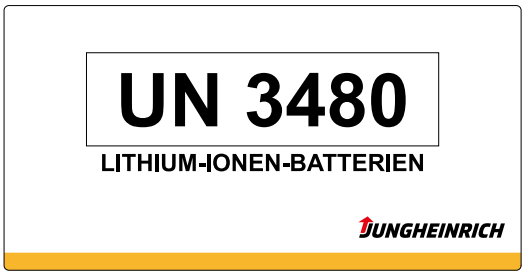
3.6.2 Shipping information

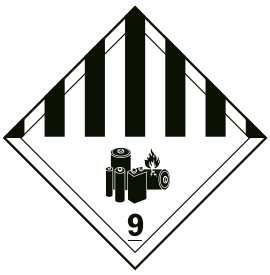
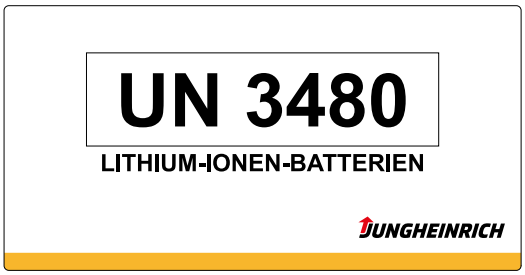
The lithium-ion battery is a hazardous material. The applicable ADR regulations must be observed during transport.

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

3.6.2.1 Shipping functional batteries

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

Classification according to ADR (road transport)	UN 3480 lithium-ion battery class 9
- Classification code	M4 lithium battery
- Danger label	 
- ADR limited quantity	LQ:0

IMDG classification (sea transport)	UN 3480 lithium-ion battery class 9
- EMS	F-A, S-I
- Danger label	 
- IMDG limited quantity	LQ: -

IATA classification (air transport)	UN 3480 lithium-ion battery class 9
- Danger label	

Exposure scenario	Not specified.
Substance safety rating	Not specified.
Marking	Product does not require marking under EC Directive / HazMatR.

NOTICE

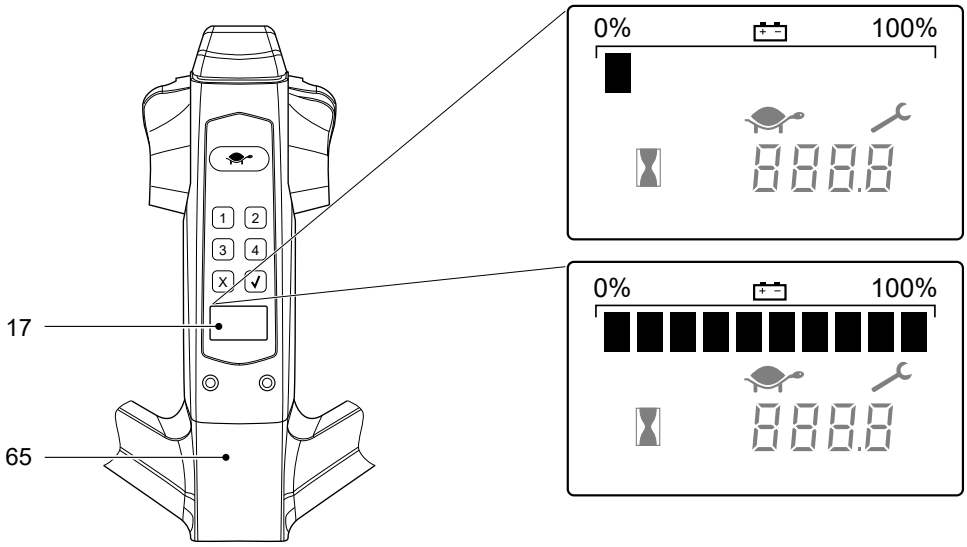
New lithium-ion batteries are transported with a charge status of at least 60...70 %.

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.

4 Charging the battery

4.1 Charge Status Indicator



The charge status indicator of the battery is integrated in the display unit (17) on the tiller head (65).

The charge status is displayed in ten increments. Each is represented by a rectangle that corresponds to 10% battery charge.

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

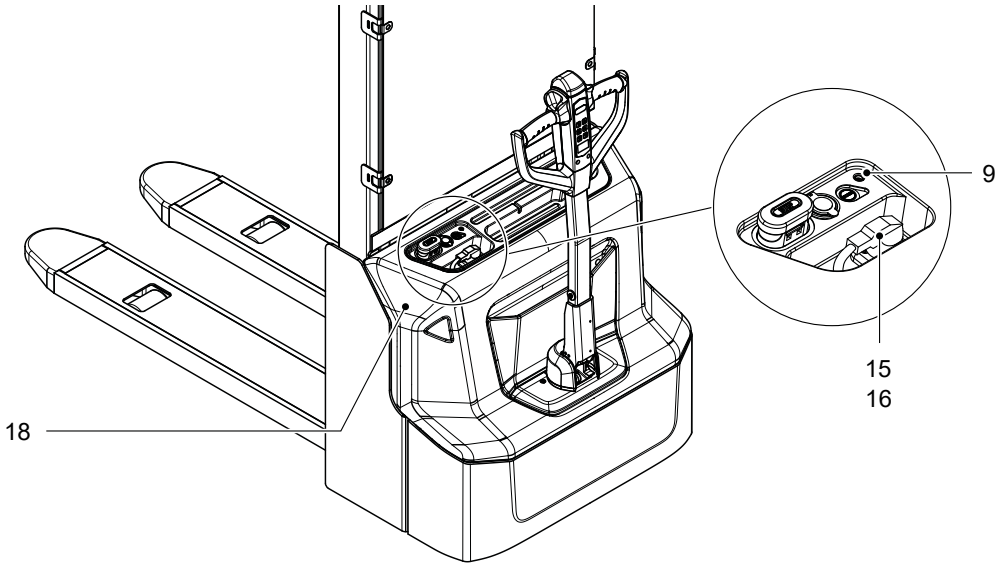
Code	The error code appears if ...	Effect
0	The battery charge is too low.	Lift function is deactivated.
91	Operation of the truck continues without first charging the battery.	Travel speed is reduced.

4.2 Charging the battery with an on-board charger

Mains connection

Mains voltage: 230 V
Mains frequency: 50 Hz

The mains cable and mains connector (15) of the on-board charger are stowed in a storage compartment in the front panel (18).



Commencing charging with an on-board charger

Charging the battery

Requirements

– Truck parked securely – see page 66.

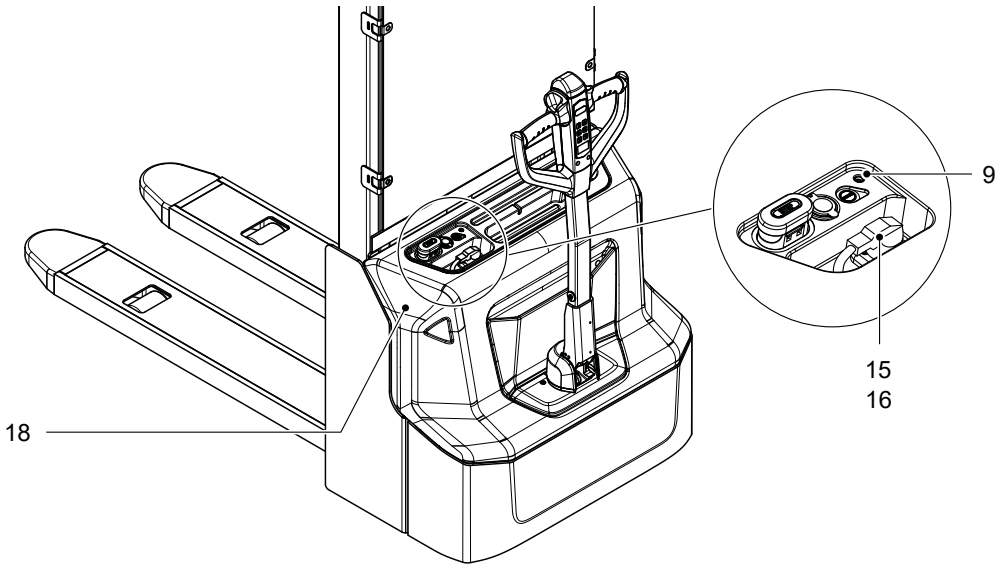
Procedure

• Plug the mains plug (15) into a mains socket.

➔ The charge status is indicated by the colour of the charge status indicator (9).
- Green: battery is charged
- Flashing green: battery is charging
- Red: fault

The battery is being charged.

➔ When the mains plug (15) is attached to the mains, all the truck electrical functions are disconnected (electric immobiliser). The truck cannot be operated.



Completing the battery charge

Requirements

– The battery is partially or fully charged.

Procedure

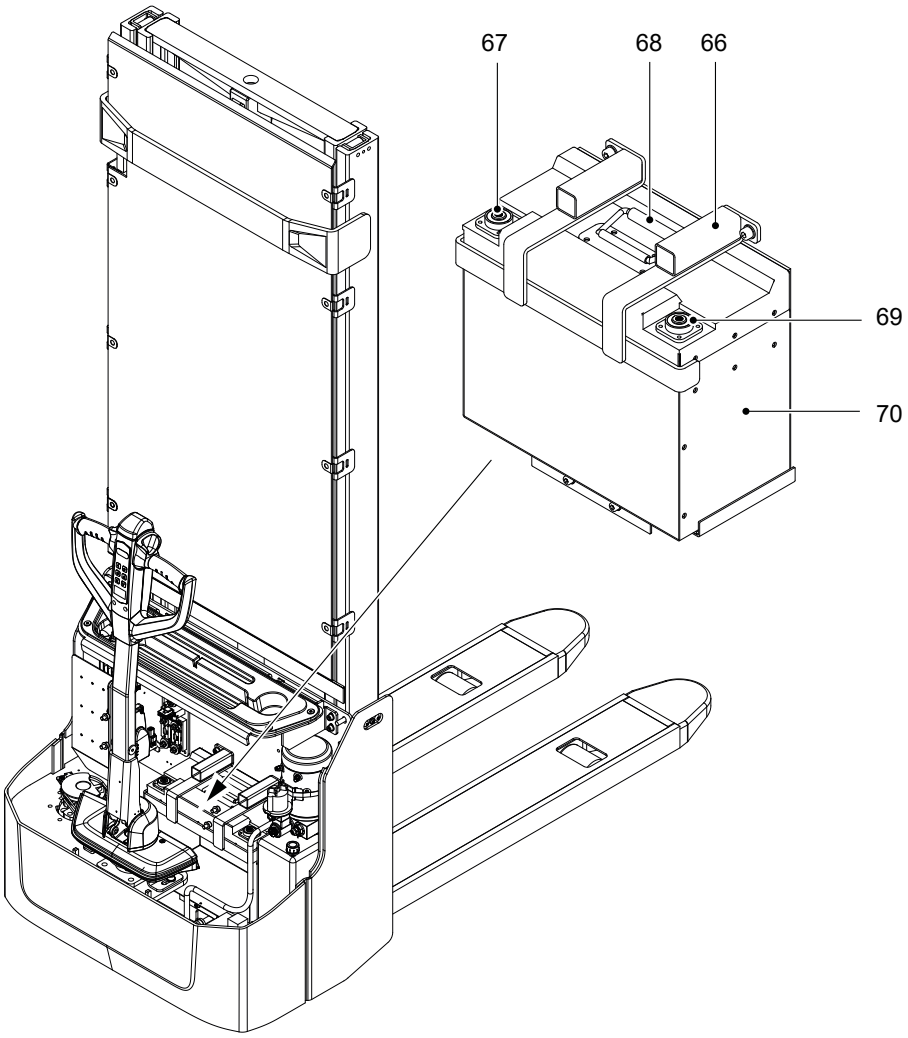
- Disconnect the mains plug (15) from the mains socket.
- Stow the charging cable completely in the storage compartment of the front panel (18).
- Insert the mains plug (15) into the slot (16).

➔ The industrial truck cannot be started until the mains plug (15) is plugged into the slot (16).

- Establish operational readiness.

The truck is operational.

5 Removing or installing the battery



Removing the battery

Requirements

– Truck parked securely – see page 66.
– Emergency disconnect switch pressed – see page 69.
– Front panel removed – see page 106.

Procedure

- First remove the negative terminal (69) of the battery.
- Then remove the positive terminal (67) of the battery.
- Remove the support frame (66) of the battery and set down securely.
- Lift up the battery (70) by the battery handle (68) and lift out.

The battery is now removed.

Installing the battery

Procedure

- Lift the battery (70) by the battery handle (68) and insert in the housing.
- Fit the support frame (66) of the battery.

➔ Torque 17 Nm ± 10%

- Fit the positive terminal (67) of the battery.

➔ Torque 17 Nm ± 10%

- Fit the negative terminal (69) of the battery.

➔ Torque 17 Nm ± 10%

- Place the caps on the terminals.
- Fit the front panel – see page 106.

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.

Unauthorised use of truck

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

Damage and 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 27) and warning instructions in the present operating instructions must be strictly observed.

⚠ WARNING!

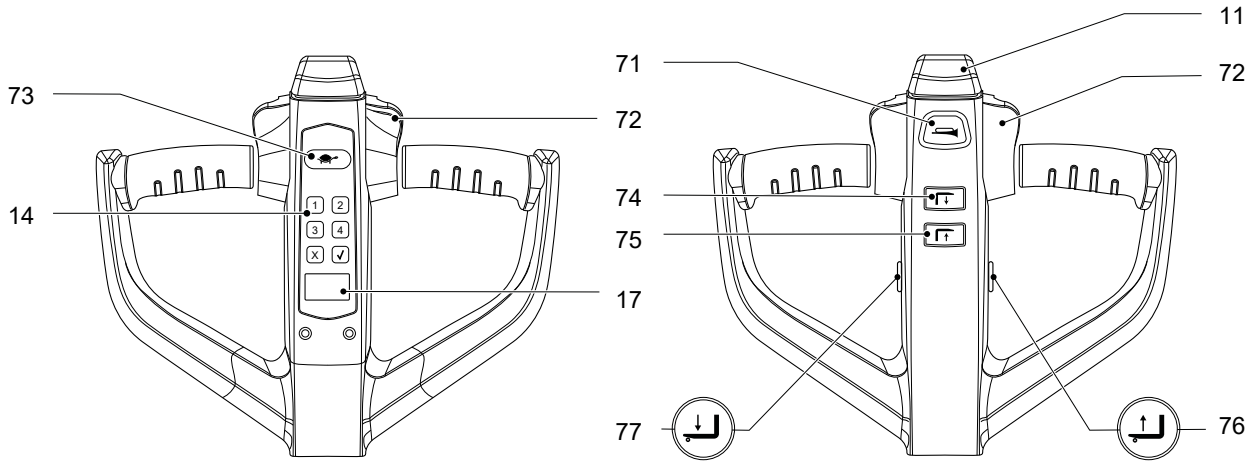
Removing or disabling safety devices can cause accidents

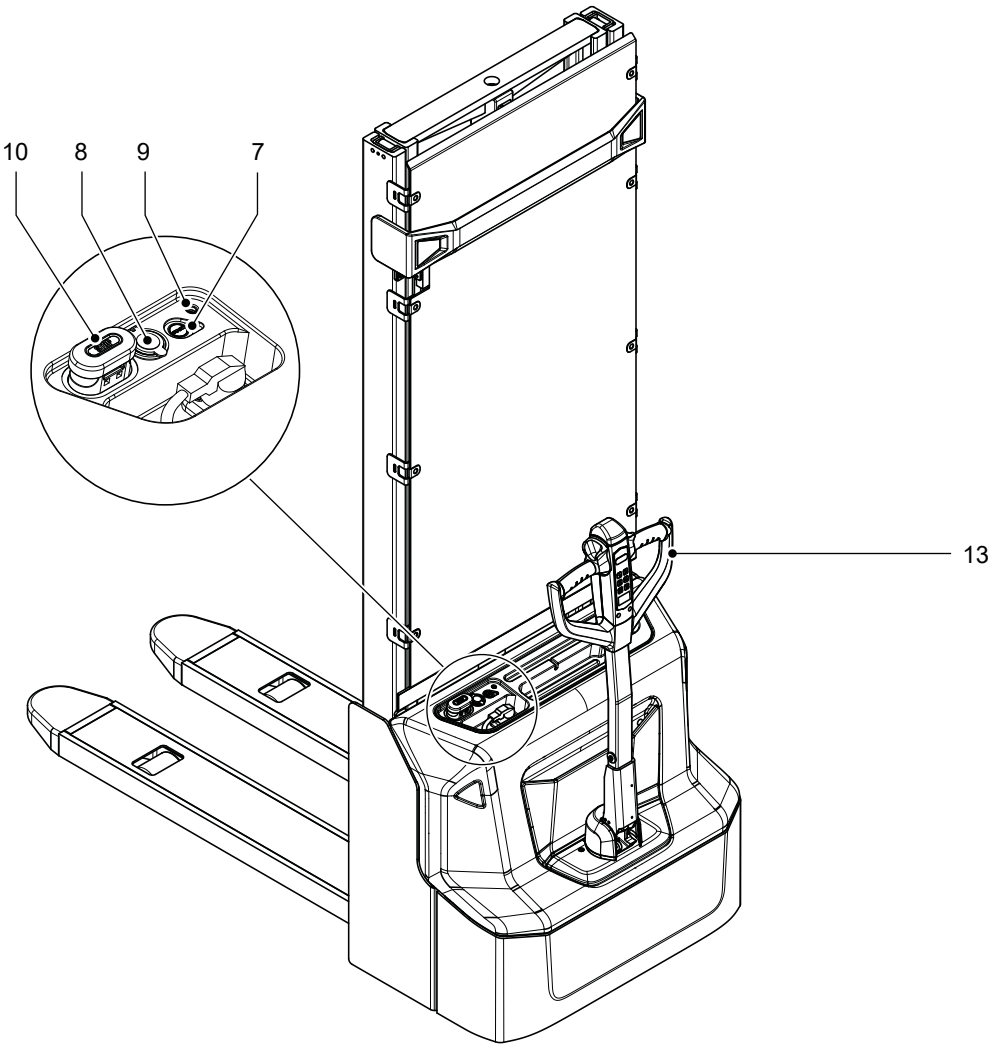
Removing or disabling safety devices such as the Emergency Disconnect switch, key switch, buttons, horn, strobe lights, mast protection pane, mast grille, sensors, panels etc. can result in accidents and injury.

- ▶ 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.

2 Displays and Controls

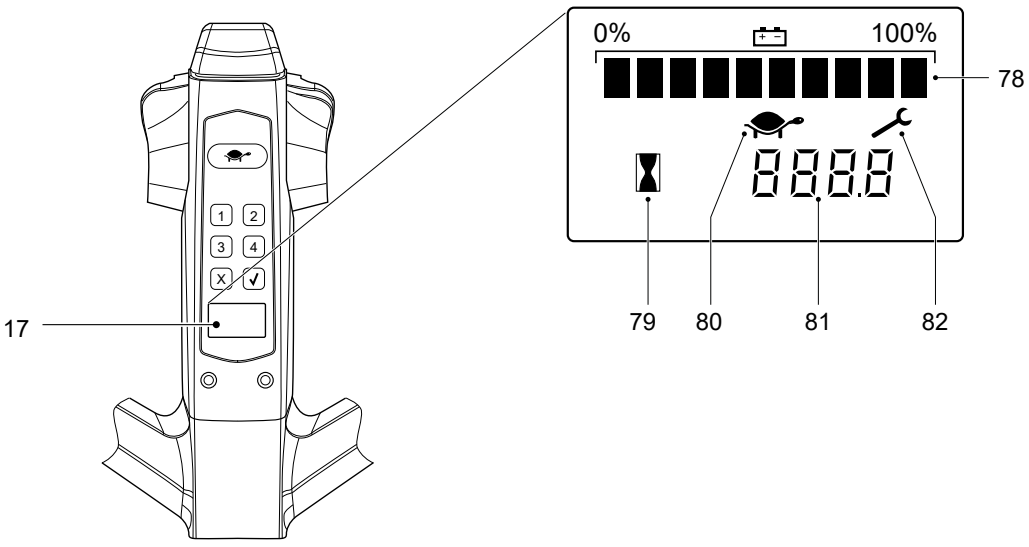
2.1 Controls





Item	Control/display element		Function
7	Start button	●	Used to start the truck – see page 65.
8	USB charging module	●	Used to supply power to external devices.
9	Charge status indicator	●	Displays the battery status during charging – see page 54.
10	Emergency disconnect switch	●	Used to brake the truck with maximum force and to interrupt the truck functions in an emergency – see page 69. Activating the emergency disconnect switch disables all electrical functions in hazardous situations.
11	Collision safety switch	●	Safety feature that is active when travelling in drive direction. When applied, the truck travels for approx. 3 seconds in load direction. The parking brake is then applied. The truck remains switched off until the travel switch is returned to neutral.
13	Tiller	●	For operating the travel and lift functions of the truck.
17	Display unit	●	Used to display various truck data – see page 63.
71	"Warning signal" button (horn)	●	Used to trigger the warning signal (horn).
72	Travel switch	●	Controls travel direction and travel speed.
73	“Slow travel” button	●	If the tiller is in the upper braking zone, braking can be overridden by pressing the switch, and the truck can move at reduced speed (slow travel), see page 74.
74	“Raise load fork” button	●	Raises the load fork at a variable speed.
75	“Lower load fork” button	●	Lowers the load fork at a variable speed.
76	"Lift support arms" button	○	Raises the support arms at a constant speed.
77	"Lower support arms" button	○	Lowers the support arms at a constant speed.

2.2 Display unit



Item	Control/display element		Function
17	Display unit	●	Displays: – Battery charge status – Service hours – Error messages – Slow travel – Maintenance Keypad – Enter the access code – Lock the industrial truck – Change the access code
78	Charge status indicator	●	Shows the battery charge status.
79	Hourglass	●	Flashes when the hour meter is active.
80	Tortoise	●	Appears when "slow travel" mode is active.
81	Number field	●	Displays operating hours or fault codes.
82	Service symbol	●	Appears when scheduled maintenance is required or if faults exist. Fault codes are displayed in the number field.

3 Preparing the truck for operation

3.1 Checks and operations to be performed before starting daily operation

⚠ WARNING!

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

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

▶ Report any defects immediately to your supervisor.

▶ Mark defective truck and take out of service.

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

Inspection before daily operation

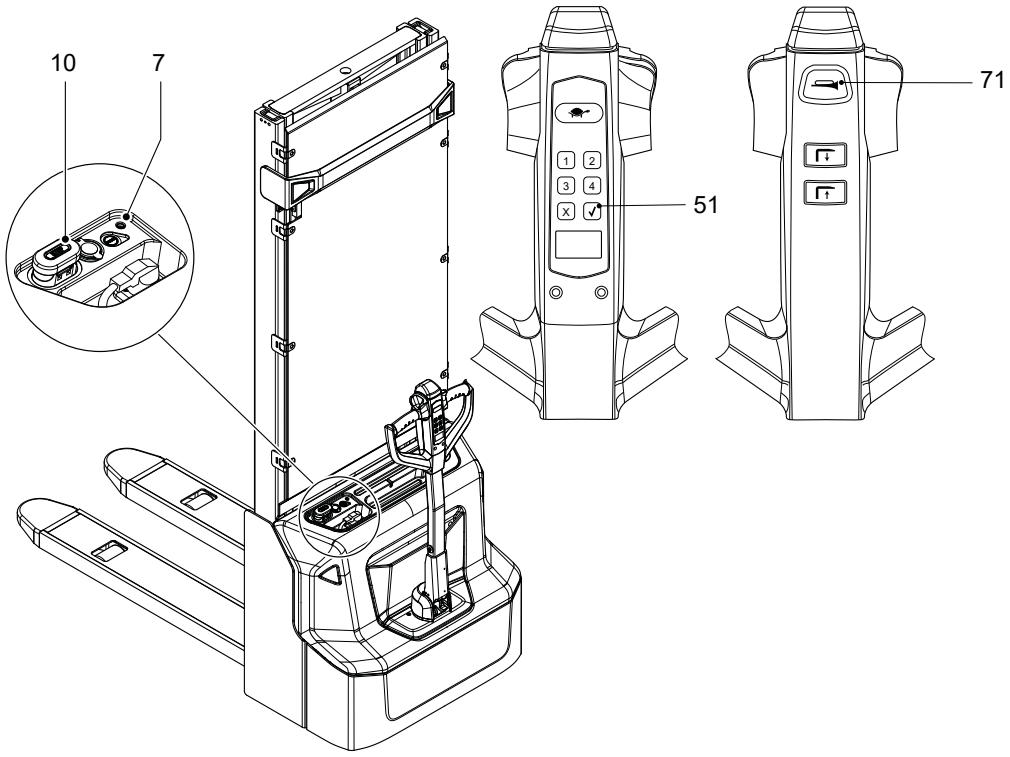
Requirements

– Truck parked securely – see page 66.

Procedure

- Check the whole of the outside of the truck for signs of 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 110.
- Check the drive wheel and load wheels for damage and freedom of movement – see page 109.
- Check the markings and labels for completeness and legibility – see page 27.
- Check that the controls return automatically to the neutral position after being used – see page 72.
- Switch on the truck – see page 65.
- Check the battery charge status – see page 54.
- Test the warning signal – see page 61.
- Test the brake – see page 70.
- Test the travel functions – see page 72.
- Test the lifting and lowering functions – see page 79.
- Test the emergency disconnect switch – see page 69.
- Test the collision safety switch – see page 19.

3.2 Preparing the truck for operation



Switching on the truck

Requirements

– Checks and operations before starting daily work completed, see page 64.
– Load correctly palletised and secured – see page 79.

Procedure

- Release the emergency disconnect switch (10) – see page 69.
- Switch on the truck. To do this:
  - Press the start button (7).

➔ A green ring illuminates on the start button.

  - Enter the access code – see page 38.
  - Press the RETURN button (51).
- Press the "warning signal" button (71).

The truck is ready for operation.

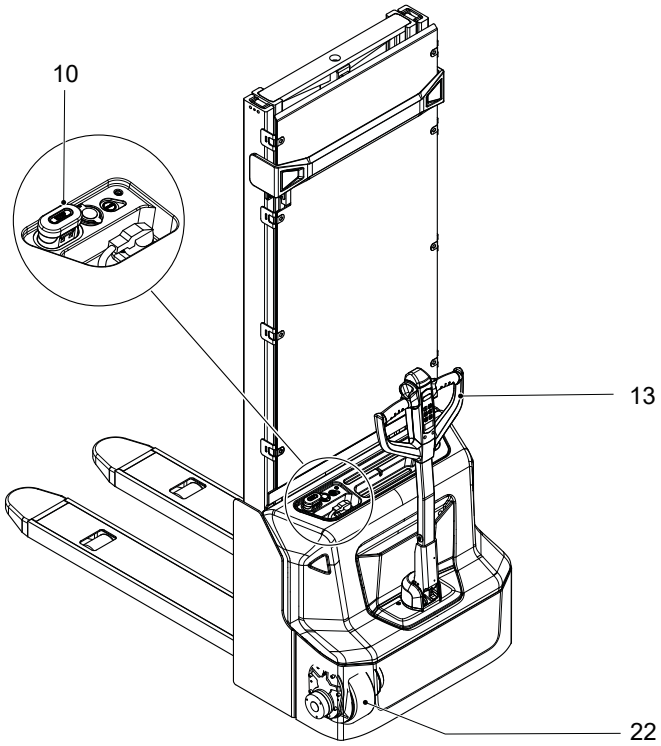
3.3 Parking the truck securely

⚠ 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 79.
- Turn the drive wheel (22) to the straight-ahead position using the tiller (13).
- 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 truck traffic. Unauthorised third parties must stay away from work areas. Loads must only be stored in places specially designated for this purpose.
The truck must only be operated in work areas with sufficient lighting to avoid danger to personnel and materials. Additional equipment is necessary to operate the truck in areas of insufficient lighting.

⚠ DANGER!

Do not exceed the permissible surface and point loading on the travel lanes.
At blind spots get a second person to assist.
The driver must ensure that the loading dock /dock leveller cannot be removed or come loose during loading/unloading.

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.

Negotiate slopes and inclines

Do not negotiate slopes and inclines (permissible slope and incline values see page 21) unless they are marked as traffic lanes. The slopes and inclines must be clean and non-slip and it must be possible to negotiate them safely in accordance with the truck's technical specifications. The travel direction when negotiating slopes and inclines is dependent on several factors, see page 83. The 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.

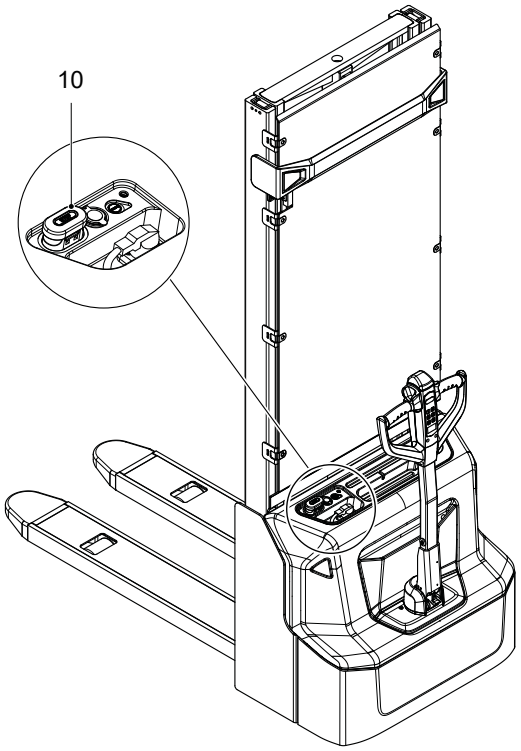
⚠ WARNING!

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 Actuating or unlocking the emergency disconnect switch



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.

Release the emergency disconnect switch

Procedure

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

As long as the truck was ready for operation before the emergency disconnect switch was actuated, all electrical functions are now switched back on.

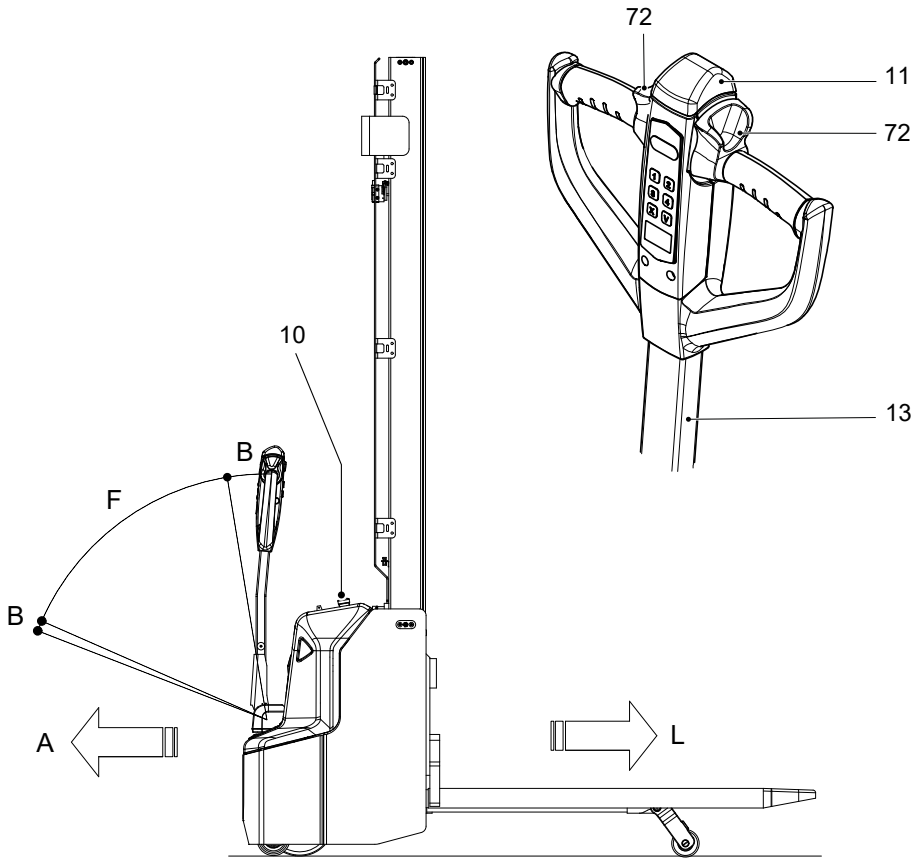
4.3 Braking the truck

⚠ 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 be 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 (72) to the neutral "0" position.	The regenerative brake is activated. The truck brakes to a halt.
Travel switch reverse		
	Turn the travel switch (72) in the opposite direction.	The regenerative brake is activated. The truck brakes and begins travelling in the opposite direction.
Coasting brake		
	Move the tiller (13) to the brake zone "B". ➔ When the tiller is released, it automatically returns to vertical position.	The truck brakes to a halt.
Safety brake		
	Operate the collision safety switch (11). ➔ This function is also active if the truck is stationary and the tiller is in the travel zone "F".	The truck brakes and travels a short distance in the opposite direction to protect the operator.
Emergency brake		
	Press the emergency disconnect switch (10). ➔ Only do this in an emergency, as damage to the drive wheel may occur.	The truck brakes to a halt at the maximum rate.

4.4 Travelling with the truck

⚠ WARNING!

Risk of injury or trapping from the truck

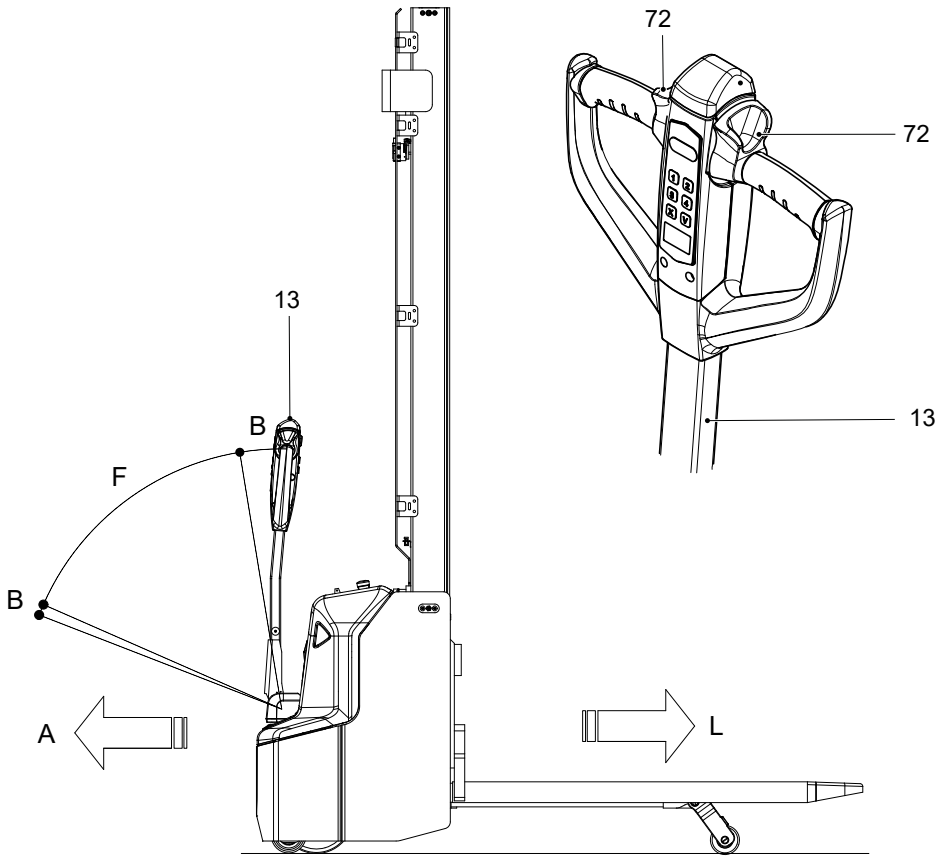
Be extremely careful when driving and steering, especially if parts of your body extend beyond the truck. The operator's legs and feet could get injured or trapped.

▶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.

4.4.1 Travelling with the truck



Requirements

– Truck has been prepared for operation – see page 64

Procedure

- Set the tiller (13) to the travel zone (F).
- Control the travel direction with the travel switch (72):
  - 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 (72):
  - The further the travel switch is turned, the higher the speed.

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

4.4.2 Changing the direction of travel

⚠ CAUTION!

Danger when changing direction during travel

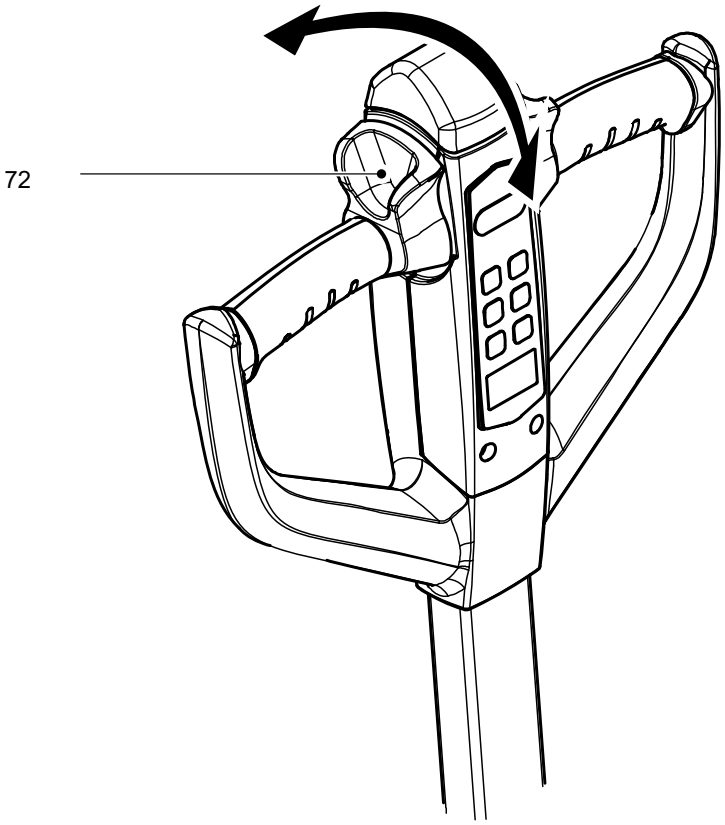
Changing direction during travel causes the truck to decelerate sharply. When the truck changes direction, it can start travelling at high speed in the opposite direction unless the travel switch is released in time.

▶ After setting off in the opposite direction, apply the travel switch gently or not at all.

▶ Do not perform any sudden steering operations.

▶ Always face in the direction of travel.

▶ Maintain an adequate overview of the route you are travelling.



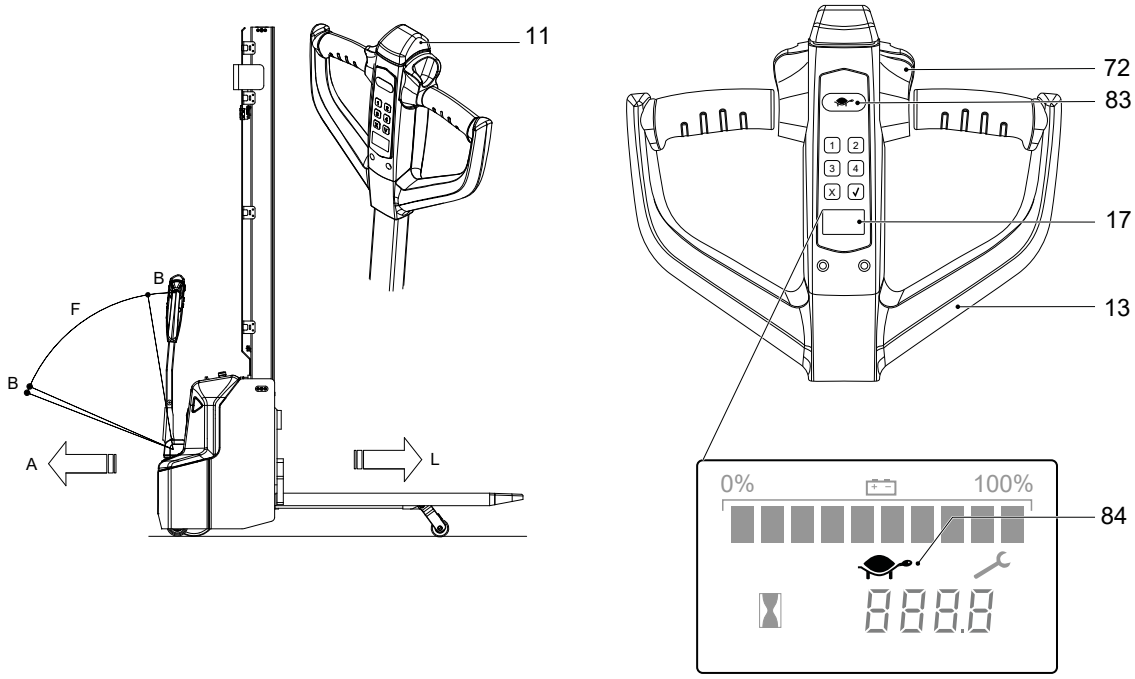
Changing direction during travel

Procedure

- Set the travel switch (72) to the opposite direction while travelling.

The truck decelerates until it starts to travel in the opposite direction.

4.4.3 Slow travel



Operating the truck at slow speed

Requirements

– Truck has been prepared for operation – see page 65.

Procedure

- Slow travel with tiller (13) in travel zone "F":
  - Press the "slow travel" button (83).
  - Set the travel switch (72) to the desired direction.
  - Press the "slow travel" button again to resume travelling at normal speed.
- Slow travel with tiller (13) in vertical position in confined spaces:
  - Do not actuate the travel switch.
  - Hold down the "slow travel" button (83) for at least 2 seconds.

➔ In this tiller position, slow travel is active only when the "slow travel" button is being pressed.

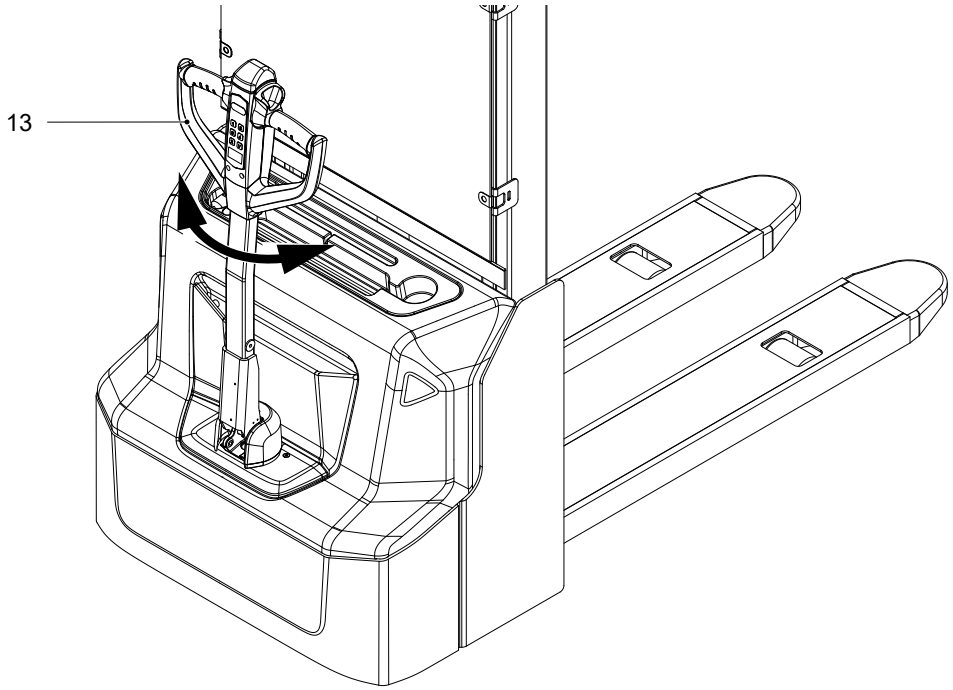
- Set the travel switch (72) to the desired direction.

➔ Releasing the "slow travel" button causes the truck to stop immediately.

The truck can be steered with precision at slow speed and in tight spaces.

➔ Slow travel is indicated on the display unit (17) by the tortoise symbol (84).

4.5 Steering



Procedure

- Move the tiller (13) to the left or right.

The truck is steered in the required direction.

4.6 Lifting or lowering processes of the load handler

⚠ WARNING!

Risk of accidents during lifting and lowering

People can be injured in the hazardous area of the truck.
The hazardous area is defined as the area in which people are at risk from movements of the truck including the load handler etc. This also includes areas which can be reached by falling loads, operating equipment etc.
Apart from the operator (in the normal operating position), no other people are permitted in the hazardous area of the truck.

- ▶ Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- ▶ If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- ▶ Only carry loads that have been secured and positioned in accordance with regulations. Use suitable precautions to prevent parts of the load from tipping or falling off.
- ▶ Never exceed the maximum loads specified on the capacity chart.
- ▶ Never walk or stand underneath a raised load handler.
- ▶ Do not stand on the load handler.
- ▶ Do not lift other people on the load handler.
- ▶ Never reach or climb into moving truck parts.
- ▶ Do not climb onto parts of the building or other trucks.

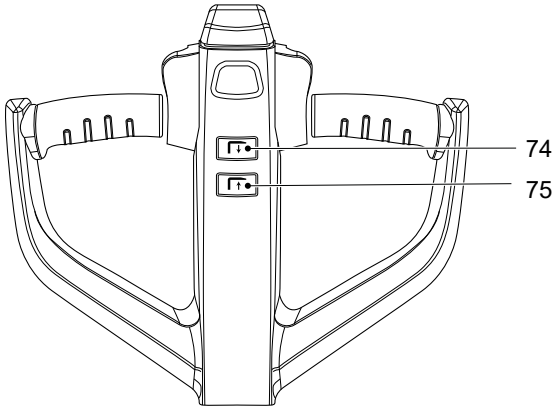
NOTICE

Adapt a slower speed when stacking and retrieving.

4.6.1 Lifting the load fork

Requirements

– Truck operational, see page 65.



Raising the load fork

- Actuate the "raise load fork" button (74) until the desired lift height is reached.

The load fork is raised.

4.6.2 Lowering the load fork

Lowering the load fork

Requirements

– Truck operational, see page 65.

Procedure

- Actuate the "lower load fork" button (75) until the desired lift height is reached.

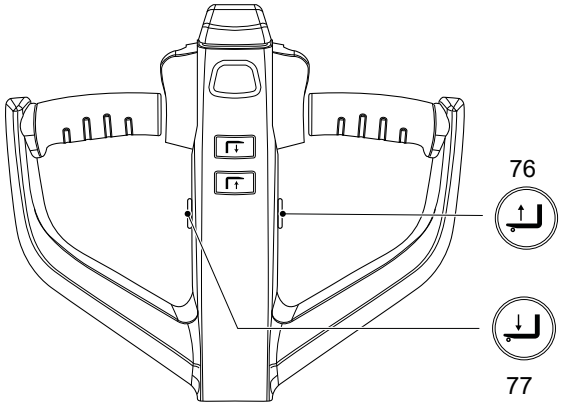
The load fork is lowered.

4.6.3 Lifting the support arms

AMC 12z

Requirements

– Truck operational, see page 65.



Procedure

- Press the "raise support arms" button (76) until you reach the desired support arm lift.

The support arms are raised.

4.6.4 Lowering the support arms

AMC 12z

Requirements

– Truck operational, see page 65.

Procedure

- Press the "lower support arms" button (77) until you reach the desired support arm lift.

The support arms are lowered.

4.7 Lifting, transporting and depositing loads

4.7.1 Safety information

⚠ WARNING!

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

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

- ▶ Observe load centre distances and capacities of the load handler, see page 30.
- ▶ Pick up the load so that its centre of gravity lies between the load arms of the load handler.
- ▶ Preferably, the load should be configured and picked up so that its centre distance lies within the load centre distance of the load handler ($d_1 \leq D$ and $d_2 \leq D$, see area DD in the illustration).
- ▶ A load with a centre of gravity outside of the load centre distance of the load handler ($d_1 > D$ and/or $d_2 > D$) should only be moved very carefully, as this load case has not been checked on a truck tested according to the test guideline.

⚠ WARNING!

Unsecured and incorrectly positioned loads can cause accidents

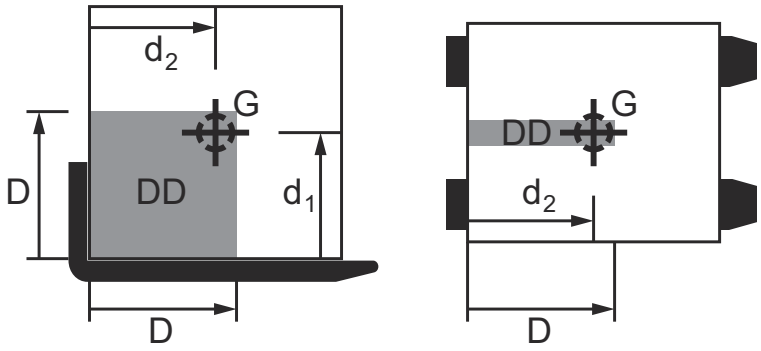
Before lifting a load, the operator must make sure that it has been correctly palletised and does not exceed the truck's capacity.

- ▶ Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- ▶ Only carry loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping over or falling off the truck.
- ▶ Damaged loads must not be transported.
- ▶ Never exceed the maximum loads specified on the load diagram.
- ▶ Never stand underneath a raised load handler.
- ▶ Do not stand on the load handler.
- ▶ Do not lift other people on the load handler.
- ▶ Insert the load handler as far as possible underneath the load.
- ▶ Cornering should be avoided when stacking and retrieving due to the risk of tipover.

⚠ CAUTION!

- ▶ Do not lift long loads at an angle.

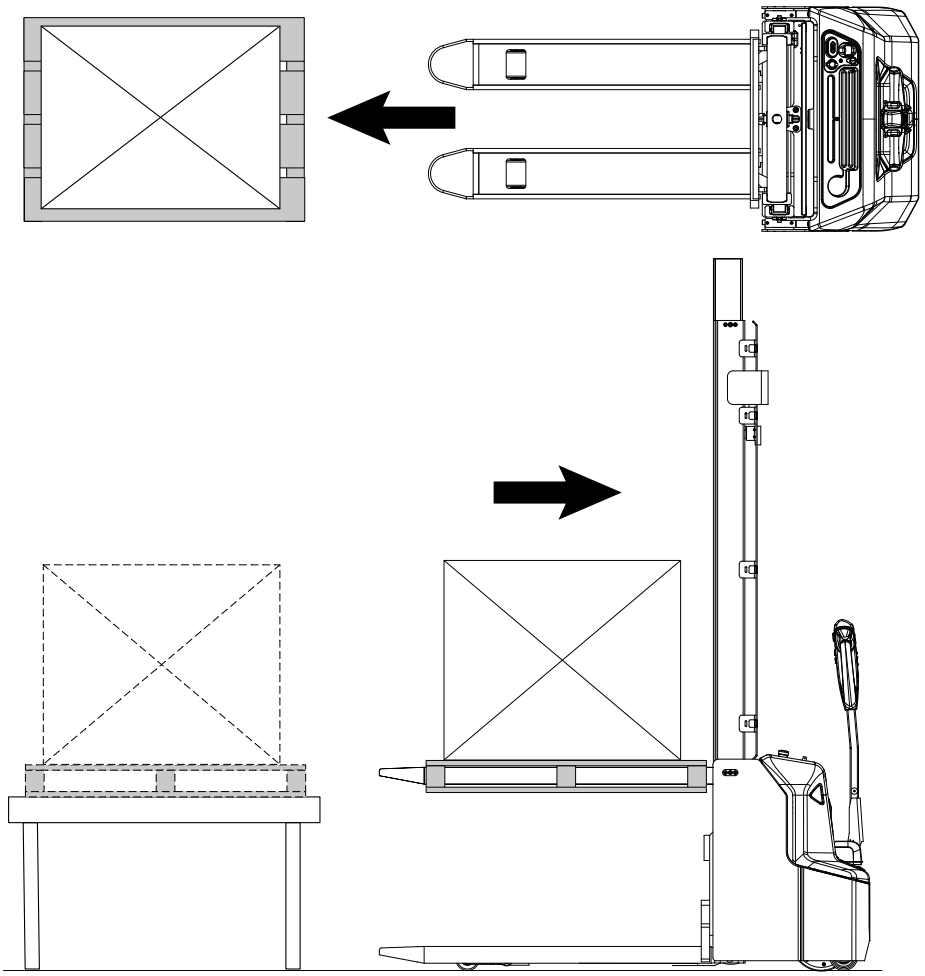
4.7.2 Load centre distance



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

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

4.7.3 Picking up the 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 load.
- Slowly insert the load fork into the load until the load is resting against the back of the load fork.

➔ The load must not protrude more than 50 mm beyond the tips of the load fork.

- Raise the load fork until you reach the desired lift height (see page 81).

The load is raised.

NOTICE

Risk of material damage to the hydraulic unit

Once you have reached the mechanical limit position of the load fork, do not press the "raise load fork" button any longer. Otherwise, the hydraulic unit may suffer material damage.

➔ Lifting two palletised loads on top of each other see page 82.

4.7.4 Picking up the load in double-deck operation

⚠ CAUTION!

Risk to operational stability

In order not to jeopardize the operational stability, pay attention to the weight when transporting two pallets so that the truck does not tip over.

▶ In order not to jeopardize the operational stability, the heavier pallet should always be transported underneath.

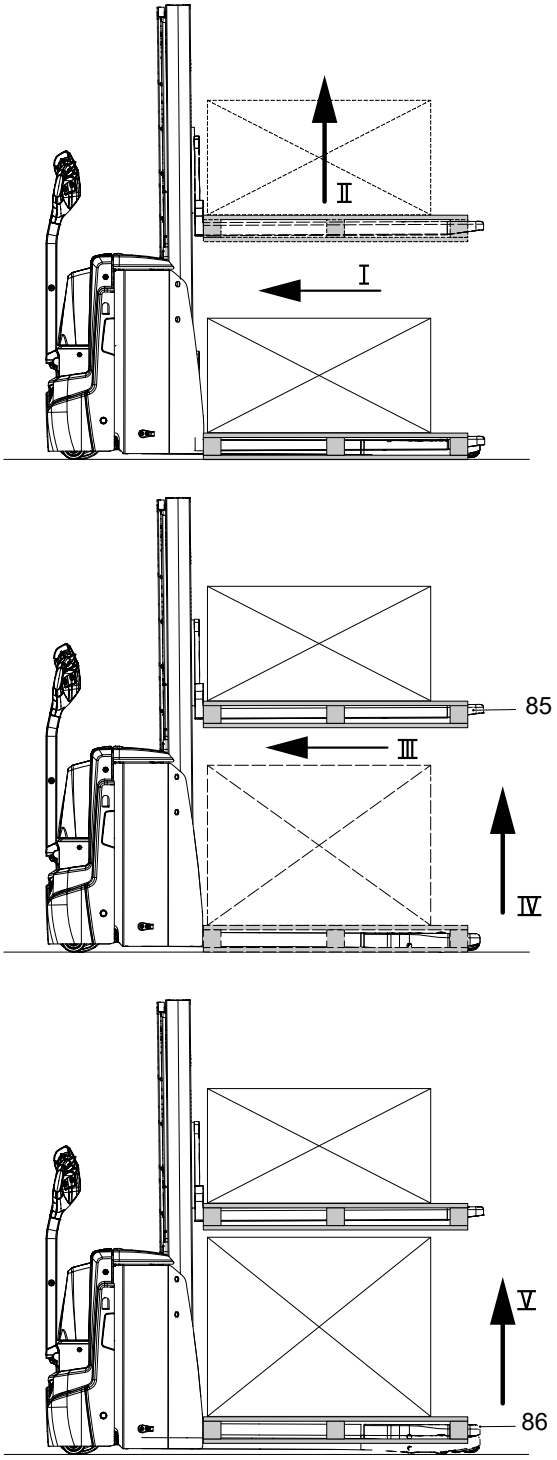
Requirements

– Load correctly palletised.
– The total weight of the load corresponds to the capacity of the industrial truck – see page 32.
– Load handler evenly loaded for heavy loads.

Procedure

- Drive the truck carefully up to the pallet.
- Insert the load fork (85) slowly into the pallet until the pallet is resting against the back (see figure).
- Raise the load fork until you reach the desired lift height – see page 77.
- Drive into the second pallet with the support arms (86).
- Raise the support arms – see page 78.
- Lower the load forks as far as possible without the load coming into contact with the support arms.

Both pallets are raised.



4.7.5 Transporting the load

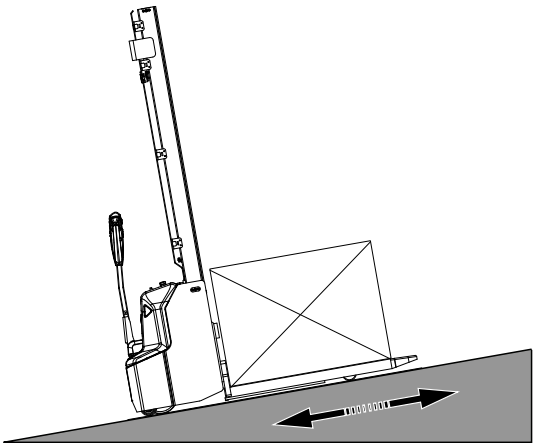
Requirements

– Load raised correctly.
– Mast lowered for correct transport (approx. 150 - 300 mm above the ground). Do not travel with a raised load (> 300 mm).
  In double-deck operation: Load fork lowered as far as possible but without touching the lower load – see page 84.
– Perfect ground conditions.

Procedure

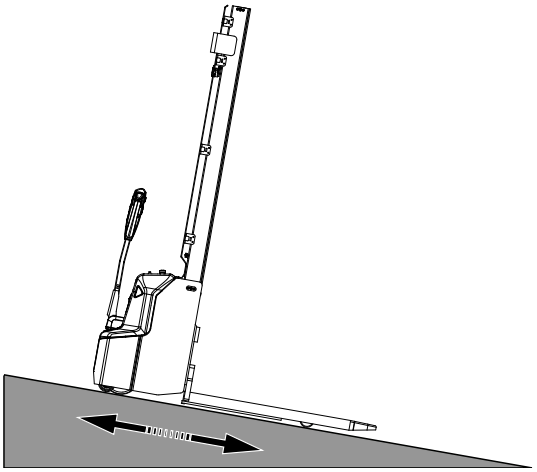
- Accelerate and decelerate the truck carefully.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Travel at a constant speed.
- Always be ready to brake:
  - Brake the truck gently in normal circumstances.
  - Only stop abruptly in hazardous situations.
- 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 slopes.
- Observe the information about travelling on slopes and inclines – see page 67.

Transport run



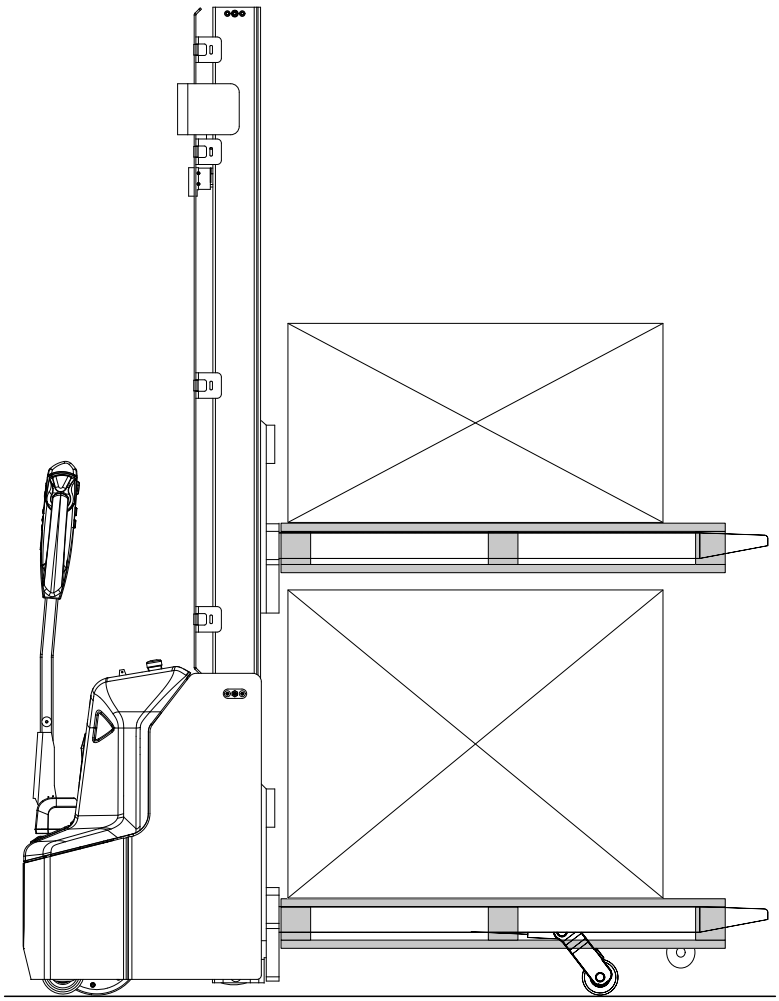
When travelling laden in pedestrian mode, the load handler must be oriented towards the upslope, irrespective of the travel direction.

Empty journey



When travelling unladen in pedestrian mode, the load handler can be oriented towards the downslope, irrespective of the travel direction.

4.7.6 Transporting the load in double-deck operation



⚠ CAUTION!

Risk to operational stability

In order not to jeopardize the operational stability, pay attention to the weight when transporting two pallets so that the truck does not tip over.

▶ In order not to jeopardize the operational stability, the heavier pallet should always be transported underneath.

Requirements

– Load raised correctly.
– Lower the load forks as far as possible without the load coming into contact with the support arms.
– Perfect 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.
- Watch out for other traffic at crossings and passageways.
- You must use a lookout at blind spots.
- Observe the information on travelling on slopes and inclines – see page 67.

4.7.7 Setting down the load

⚠ CAUTION!

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

NOTICE

Avoid depositing the load suddenly to avoid damaging the load, load handler and the rack.

Requirements

– Storage location suitable for storing the load.

Procedure

- Drive carefully up to the storage location.
- Lower the load handler so that the load handler is clear of the load, see page 77.
- Carefully remove the load handler from the pallet.

The load is deposited.

Depositing two palletised loads on top of each other see page 86.

4.7.8 Setting down the load in double-deck operation

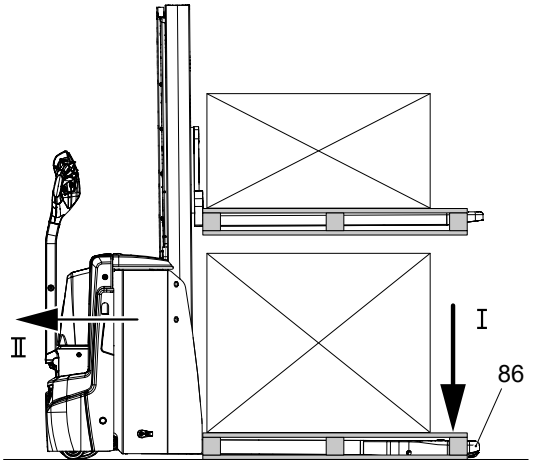
Requirements

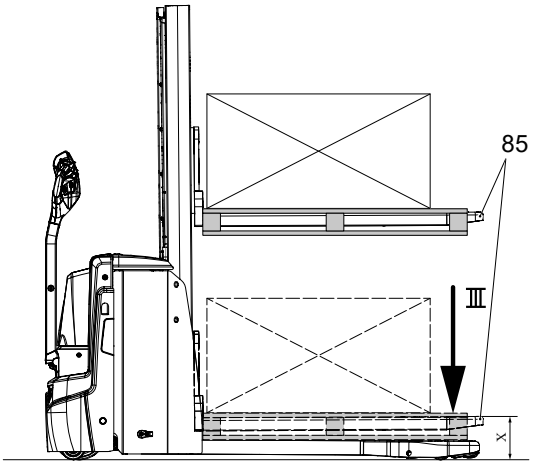
– Storage location suitable for storing the load.

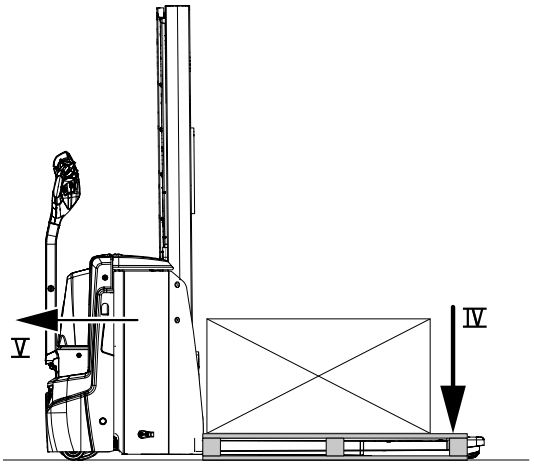
Procedure

- Drive the truck carefully up to the first storage location.
- Lower the load support arms until the load rests.
- Carefully withdraw the truck from the pallet.
- Lower the load fork to transport height, approx. 150 - 300 mm above the ground.
- Drive the truck carefully up to the second storage location.
- Lower the load fork so that the load fork is clear of the load – see page 83.
- Carefully withdraw the truck from the pallet.

Both pallets have been set down.







4.7.9 Using the load handler as an elevated work table

⚠ WARNING!

A raised load handler can cause accidents

A stationary truck with a raised load handler is potentially hazardous in work areas.

- ▶ Prevent any risk to personnel and materials.
- ▶ Never load or discharge loads manually with a raised load handler in areas that are hazardous, with limited visibility or insufficient lighting.
- ▶ Park the truck securely when leaving it, see page 66.

The load handler can remain in a raised position to be used as a lift work table when the truck is switched off, provided the operator is close to the truck.

Immediate vicinity of the truck is when the operator is able to respond to malfunctions or attempts to use the truck by unauthorised persons immediately.

Observe national regulations and local operating conditions.

⚠ WARNING!

Risk of injury from falling loads

Falling loads can cause injuries.

▶ Never stand underneath a raised load handler.

▶ Never manually load or unload loads that could fall on the operator without additional safety devices at heights greater than 1800 mm.

▶ Always load loads so that they cannot fall off or accidentally shift.

▶ Secure low or small-item loads e.g. by wrapping them in film.

▶ Do not manually load or unload loads that are not correctly packed or have shifted as well as loads with damaged pallets or damaged stacking containers.

⚠ CAUTION!

Risk of accident when the raised load handler slowly lowers of its own accord

The raised load handler can lower independently due to internal leakage. According to EN ISO 3691-1 the load handler may lower by up to 100 mm during the first 10 minutes at the rated capacity with the hydraulic oil at normal operating temperature.

▶ Never stand underneath a raised load handler.

Use as an elevated work table

Requirements

– Storage spare suitable for manual loading or discharging of loads.

Procedure

- Drive the truck carefully up to the storage location.
- Raise the load handler to the desired lift height.
- Switch off the truck.

Loads can be loaded or discharged manually with the load handler raised.

4.8 Troubleshooting

This chapter enables the operator to localize and rectify basic faults or the results of incorrect operation himself. When trying to locate a fault, proceed in the order shown in the remedy table.

If, after carrying out the following remedial action, the truck cannot be restored to operation or if a fault in the electronics system is displayed with a corresponding error code, contact the manufacturer’s service department.
Troubleshooting must only be performed by the manufacturer’s customer service department. The manufacturer has a service department specially trained for these tasks.
In order for customer services to react quickly and specifically to the fault, the following information is essential:
- Truck serial number
- Event message from the display unit (if applicable)
- Error description
- Current location of truck.

If a malfunction is sufficiently serious to render subsequent operation of the truck impossible, mark the truck accordingly, park the truck securely (see page 66) and take it out of service. Do not return the truck to service until the fault has been identified and rectified.

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 54.
Fuse is defective.	Check the fuse and replace if necessary – see page 111.
Hydraulic oil level is too low.	Check the hydraulic oil level and top up if necessary – see page 110.
Leak in hydraulic system.	Contact the manufacturer's customer service department.
Lifting stops at a lift height of approx. 1800 mm	AMC 12z only: The support arms are raised. Lower the support arms – see page 78.
	Check the height sensor. 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 110.

Truck does not start	
Cause	**Remedy**
On-board charger is still connected to the power supply.	Fully charge the battery and disconnect the on-board charger from the power supply – see page 49.
Mains plug of the on-board charger has not been secured.	Insert the mains plug of the on-board charger into the slot in the dashboard panel – see page 55.
Battery is not connected correctly.	Check that the battery is correctly attached and locked in place and adjust if necessary – see page 57.
Fuses faulty.	Check the fuses and replace if necessary – see page 111.
Battery charge status is too low.	Charge the battery – see page 54.
Emergency disconnect switch activated.	Release the emergency disconnect switch – see page 69.
Tiller in travel zone "F".	Move tiller to brake zone "B" – see page 72.

Truck moves only in one direction	
Cause	**Remedy**
Travel switch is faulty.	Contact the manufacturer's customer service department.

Truck moves only very slowly	
Cause	**Remedy**
Battery charge status is too low.	Charge the battery – see page 54.
The electromagnetic brake is activated.	Check the electromagnetic brake (see page 70) or contact the manufacturer's customer service department.
Cable connections within the tiller loose or faulty.	Contact the manufacturer's customer service department.
Height sensor for reduced speed at lift heights > 300 mm is defective.	Contact the manufacturer's customer service department.
Electrical system has overheated.	Park the truck securely (see page 66) and allow it to cool down.
Temperature sensor is faulty.	Contact the manufacturer's customer service department.

Truck starts suddenly	
Cause	**Remedy**
Control unit is faulty.	Contact the manufacturer's customer service department.
The travel switch does not return to the neutral position.	Contact the manufacturer's customer service department.

4.9 Emergency recovery of the truck

⚠ 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 69.
– 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 33.
• Load the truck onto a suitable transport aid, secure it and transport it away, see page 35

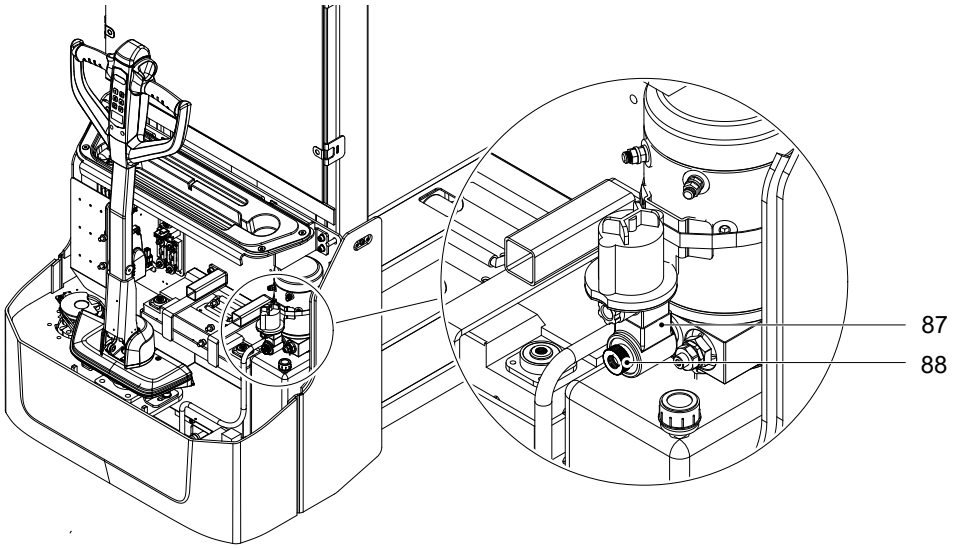
Truck has been recovered.

4.10 Emergency lowering of the load handler

⚠ WARNING!

Load handler emergency lowering

- ▶ Instruct other people to move out of the hazardous area of the truck during emergency lowering.
- ▶ Never step or stand underneath a raised load handler.
- ▶ Only operate the emergency lowering valve when standing next to the truck.
- ▶ When the load handler is in the racking, emergency lowering is not permitted.
- ▶ 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.



Emergency lowering of the load handler

Requirements

– Load handler can be lowered unimpeded.
– Truck parked securely – see page 66.
– Front panel removed – see page 106.

Tools and Material Required

– 3 mm diameter pin/tool
– 5 mm Allen key

Procedure

• Loosen the yellow screw (88) on the valve (87).

The load handler is lowered.

➔ Once the load handler has been lowered, screw the valve screw (88) back in.

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.

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 115.

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 93.

⚠ WARNING!

Risk of accidents and component damage

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

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

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

NOTICE

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

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

➔ On completion of inspection and service work, carry out the operations listed in the “Recommissioning the truck after cleaning or maintenance work section, see page 112.

3 Maintenance Safety Regulations

3.1 General information

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 personal of the operating company has the technical expertise and experience to perform the activities in the maintenance check list for the operating company. The maintenance and repair work to be performed by the operating company are also written down, see page 93.

3.2 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 66).
- ▶ Disconnect the battery, see page 57.
- ▶ Remove any rings, metal wristbands etc.

3.3 Consumables and used parts

⚠ CAUTION!

Consumables and used parts are an environmental hazard

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

- ▶ Note the safety regulations when handling these materials.

3.4 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 93.

3.5 Lift Chains

⚠ WARNING!

Risk of accident from non-lubricated and incorrectly cleaned lift chains

Lift chains are safety-critical parts. Lift chains must not show signs of serious contamination. Lift chains and pivot pins must always be clean and sufficiently lubricated.

▶ The lift chains are cleaned by wiping or brushing. Significant contamination can be softened by a paraffin derivative such as petroleum.

▶ Do not clean lift chains with high-pressure steam jets or chemical cleaning agents.

▶ Immediately after cleaning, dry the lift chain with compressed air and apply a chain spray.

▶ Lift chains must be unloaded when lubricated; to do this, fully lower the load handler.

▶ Lubricate a lift chain with particular care around the pulleys.

3.6 Hydraulic system

⚠ WARNING!

Leaky hydraulic systems can result in accidents

Hydraulic oil can escape from leaky and faulty hydraulic systems.

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

⚠ WARNING!

Faulty hydraulic hoses can result in injury and infection

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

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

NOTICE

Checking and replacing hydraulic hoses

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

- ▶ Check the hydraulic hoses at least once per year and replace if necessary.
- ▶ In the case of heavy-duty operation, the inspection intervals must be reduced accordingly.
- ▶ Under normal operating conditions, preventive replacement of the hydraulic hoses is recommended after 6 years. The owner must carry out a risk assessment to ensure safe, prolonged use. The resulting protection measures must be observed and the inspection interval reduced accordingly.

3.7 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

⚠ 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.

⚠ 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!

Spilled consumables can cause slipping and endanger the environment

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

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

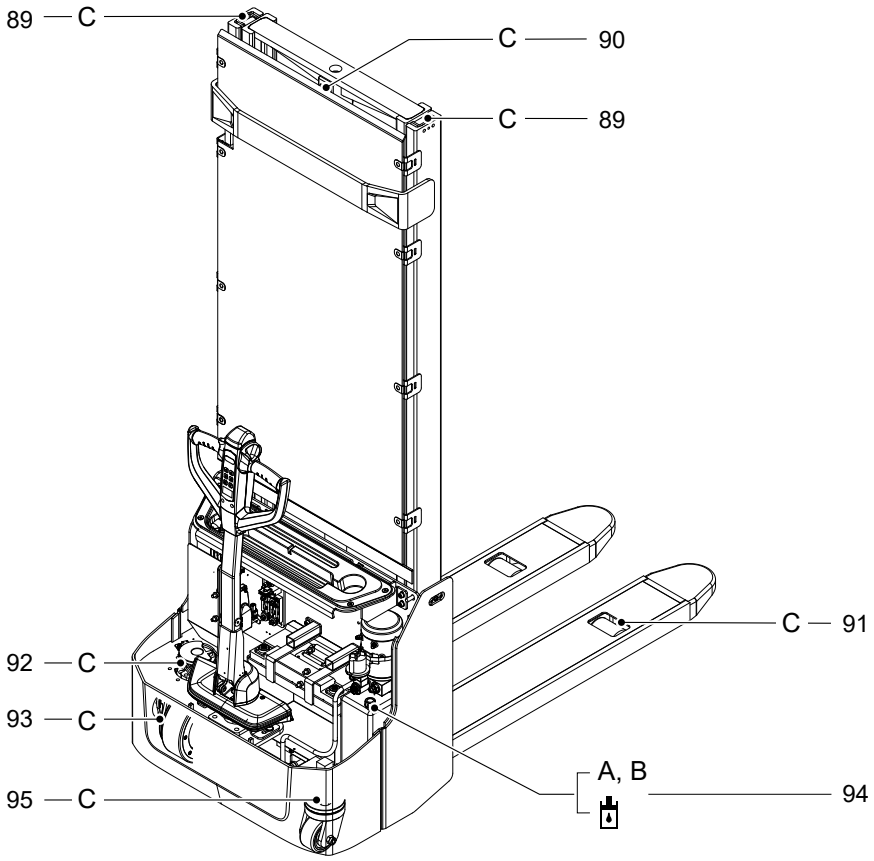
⚠ CAUTION!

Consumables and used parts are an environmental hazard

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

▶Note the safety regulations when handling these materials.

4.2 Lubrication Schedule



Item	Component	Item	Component
89	Mast (⬇)	93	Transmission (⬇)
90	Chain (⬇)	94	Filler plug for hydraulic oil (⛽)
91	Load wheel bearing (⬇)	95	Support wheel bearing (⬇)
92	Steering bearing (⬇)		

Lubricate the truck according to the lubrication schedule

Requirements

– Truck parked securely – see page 66.
– Truck prepared for maintenance and repair work – see page 103.
– Maintenance interval reached – see page 115.

Tools and Material Required

– Lubricants according to lubrication schedule – see page 102

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 110.
- Start up the truck – see page 64.

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 to 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 66.
- Disconnect the battery – see page 57.

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 33. 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

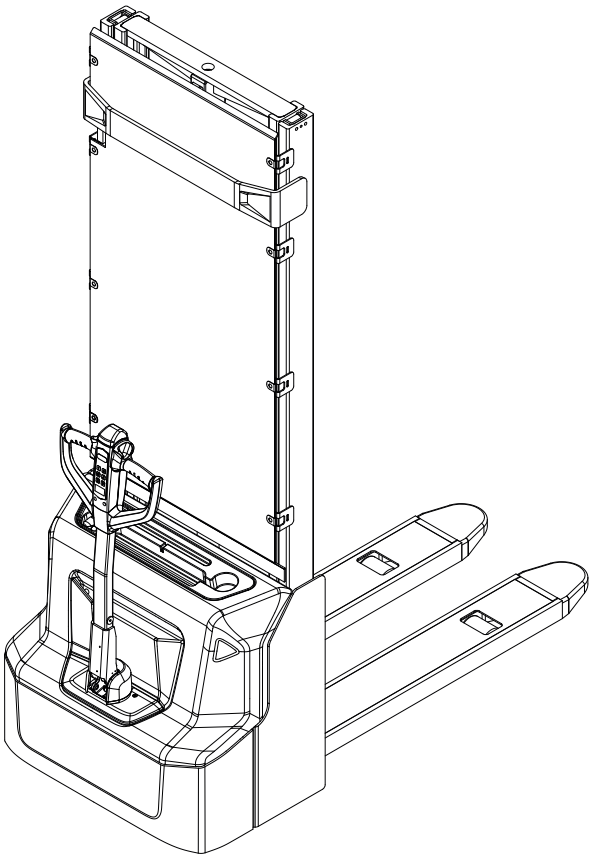
In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose.

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 33.



Raising and jacking up the truck securely

Requirements

– Prepare the truck for maintenance and repairs (see page 103).

Tools and Material Required

– Jack
– Hard wooden blocks

Procedure

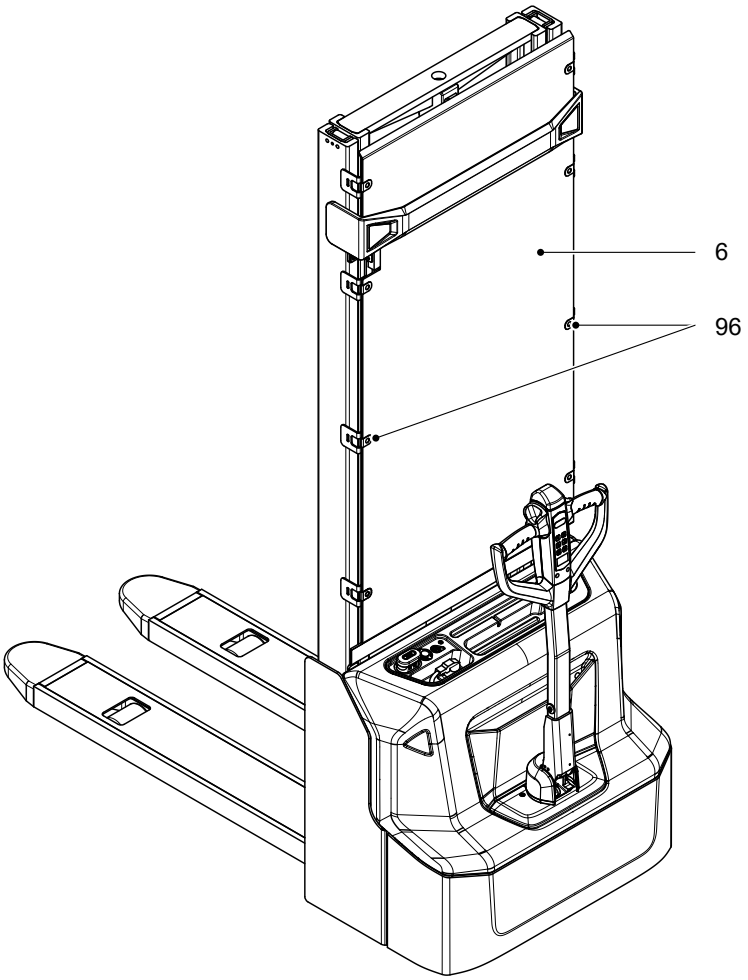
• Place the jack against the contact point.

➔ 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 safety devices



Disassembling the protective screen panel

Requirements

– Truck parked securely – see page 66

Procedure

- Remove the retaining clips (96) of the protective screen panel (6).
- Lift out the protective screen panel and store in a safe place.

The protective screen panel has been disassembled.

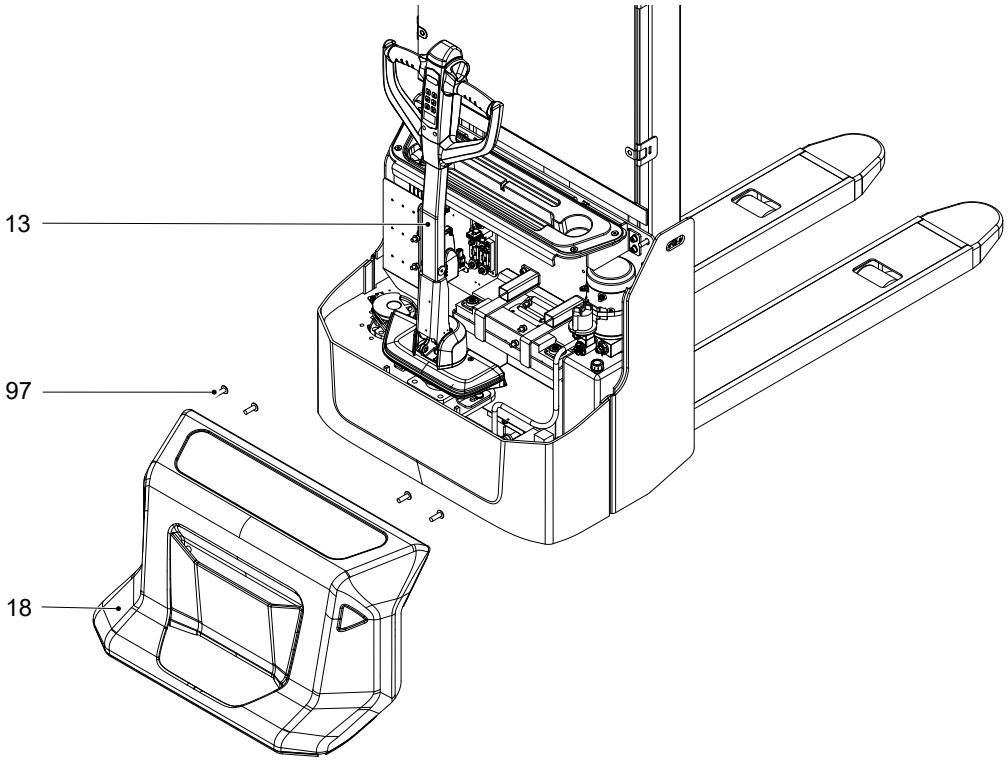
Assembling the protective screen panel

Procedure

- Insert the protective screen panel (6).
- Secure the protective screen panel with retaining clips (96).

The protective screen panel has been assembled.

5.4 Disassembling or assembling the front panel



Removing the front panel

Requirements

– Truck prepared for maintenance and repair work – see page 103.

Tools and Material Required

– Allen key, size 6 mm

Procedure

- Remove the screw connections (97) from the front panel (18).
- Release the front panel from the connection, tip slightly and turn to remove over the tiller (13).
- Set the front panel (18) down safely.

The front panel has been removed.

Front panel assembly

Tools and Material Required

– Allen key, size 6 mm

Procedure

- Guide the front panel (18) over the tiller (13), insert into the lower guides and engage in the top section.
- Fit the screw connections (97) for the front panel with a torque of 6 Nm.

The front panel is now assembled.

5.5 Cleaning

5.5.1 Cleaning the truck

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

⚠ CAUTION!

Risk of fire due to use of flammable cleaning agents

Using flammable cleaning agents increases the risk of fire.

▶ Do not use any flammable cleaning agents when cleaning.

▶ Before cleaning, take necessary safety measures to prevent spark formation (e.g. due to short circuits).

Requirements

– Truck prepared for maintenance and repair work – see page 103.

Tools and Material Required

– Water-based cleaning agents
– Sponge or cloth

Procedure

- Clean the surface of the truck with water-based solvents and water. Use a sponge or cloth to clean.
- In particular, clean the following areas:
  - Window(s)
  - Oil filler caps and their surroundings
  - Grease nipples (before lubrication)
- Dry the truck after cleaning, e.g. with compressed air or a dry cloth.
- Carry out all the tasks in the section "Recommissioning the truck after cleaning or maintenance work" – see page 112.

The truck is now clean.

5.5.2 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 103.

Tools and Material Required

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

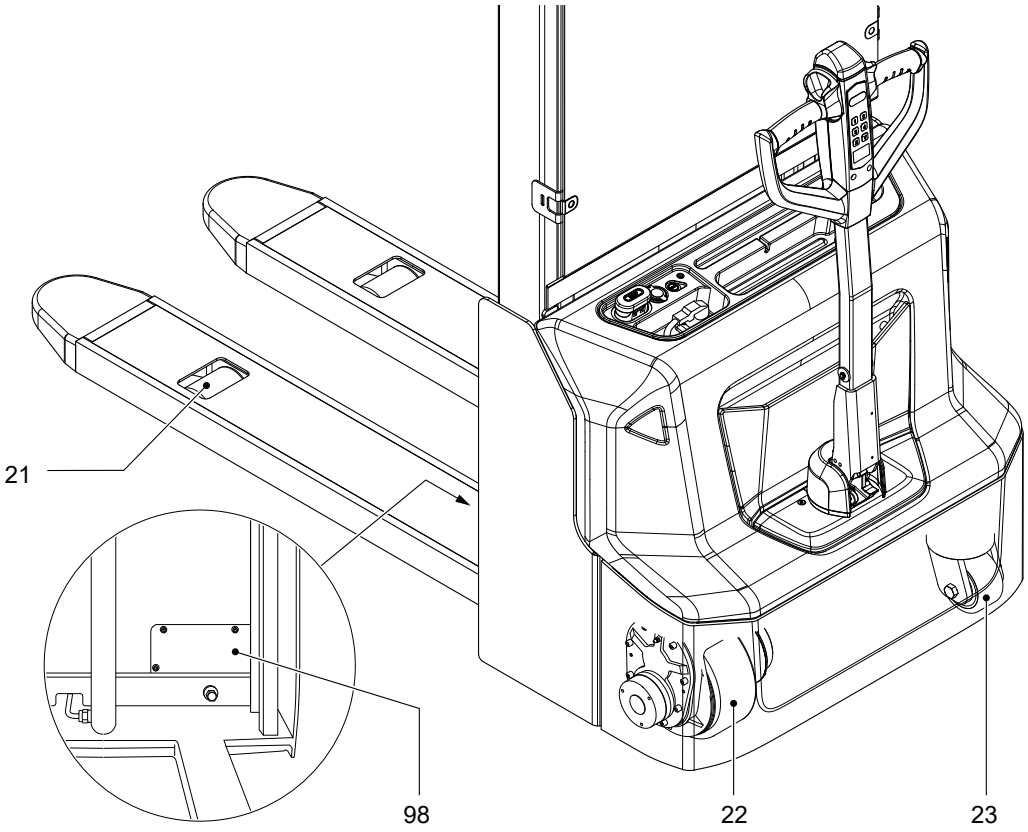
Procedure

- Expose the electrical system – see page 106.
- 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 106.
- Carry out all the tasks listed in the section "Recommissioning the truck after cleaning or maintenance work" – see page 112.

The electrical-system assemblies are now clean.

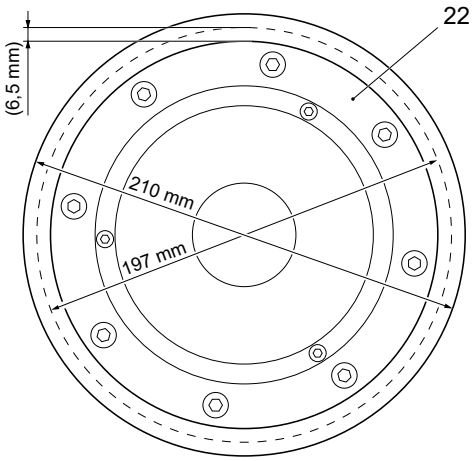
5.6 Checking the attachment of the wheels

➔ Wheels must only be replaced by authorised service personnel.



Procedure

- Park the truck on a level surface.
- Jack up the truck – see page 103.
- Raise the lift carriage approx. 1 m to expose the inspection cover.
- Secure the load carriage against inadvertent lowering.
- Remove the inspection cover (98).
- Check the drive wheel (22) for wear, damage and freedom of movement.



➔ A new drive wheel has a diameter of 210 mm.

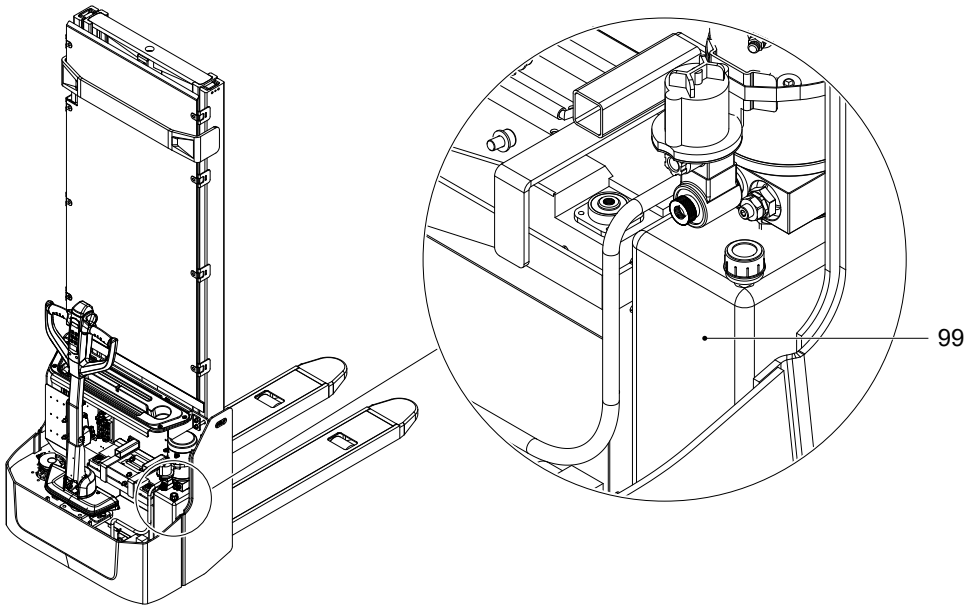
➔ The drive wheel must be replaced when it has reached a diameter of 197 mm or a residual thickness of 6.5 mm.

- Fit the inspection cover (98).
- Check the load wheels (21) and support wheel (23) for wear, damage and freedom of movement.

➔ The wheels must be round and must not have excessive abrasion.

- Lower the load carriage.
- Lower the truck.

5.7 Checking the hydraulic oil level and refilling the hydraulic oil



NOTICE

There are markings on the hydraulic reservoir. Check the hydraulic oil level only when the load handler has been fully lowered.

Checking the oil level

Requirements

– Load handler lowered.
– Truck prepared for maintenance and repair work – see page 103.

Procedure

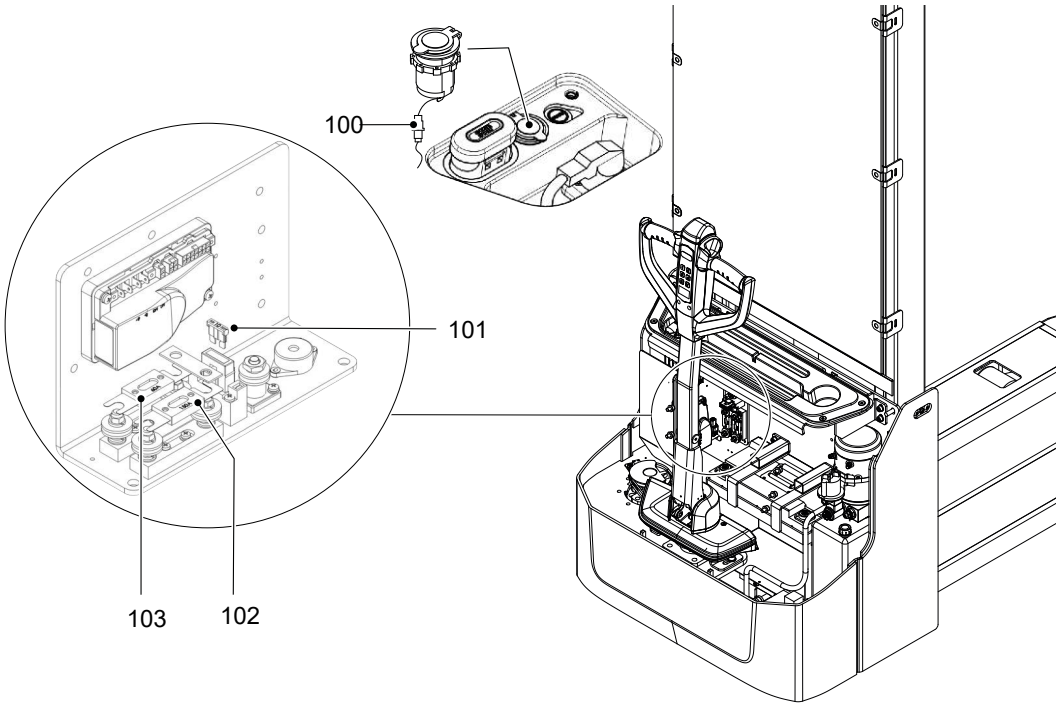
- Remove the front panel – see page 106.
- Check the oil level in the hydraulic reservoir (99).

➔ With the load handler lowered, the hydraulic oil level in the hydraulic reservoir must be at roughly the "MAX" marking.

- If necessary, add hydraulic oil of the correct grade – see page 102.

The oil level has now been checked.

5.8 Checking the electrical fuses



Item	Description	Rating	Item	Description	Rating
100	FU 2	1.5 A	103	FU 02	60 A
101	FU 1	10 A	102	FU 01	150 A

Checking fuses

Requirements

– Truck prepared for maintenance and repair work, see page 103.
– Front panel removed, see page 106.

Procedure

• Check the fuse ratings against the table and their condition, and replace if necessary.

The fuses have been checked.

5.9 Restoring the truck to service after maintenance and repairs

Procedure

- Thoroughly clean the truck, see page 107.
- Lubricate the truck according to the lubrication diagram, see page 101.
- Charge the battery, see page 54.
- Start up the truck, see page 64.

5.10 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 103.

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

5.10.1 Prior to decommissioning

Procedure

- Park the truck securely, see page 66.
- Clean the truck, see page 107.
- Check the hydraulic oil level and replenish if necessary, see page 110.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck according to the lubrication diagram, see page 101.
- Charge the battery, see page 54.
- Drive the truck to the storage location and jack it up, see page 103.
- Remove the battery, see page 113.
- Check the battery charge at regular intervals, see page 113.

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

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

5.10.2 During decommissioning

NOTICE

Full discharge can damage the battery

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

▶Before a long period of inactivity, the battery must be fully charged.

▶Charge the battery at least every 12 weeks, see page 54.

5.10.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck, see page 107.
- Lubricate the truck according to the lubrication diagram, see page 101.
- Charge the battery, see page 54.
- Start up the truck, see page 64.

5.11 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.

5.12 Final de-commissioning, disposal

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

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

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 AMC 12/12z

Issued on: 2023-06-16 14:00

1.1 Owner

To be performed every 50 service hours, but at least once a week.

1.1.1 Maintenance contents

1.1.1.1 Standard equipment

Brakes
Test the brake.

Hydraulic operations
Lubricate the load chains.
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

Travel
Collision safety switch for functionality and damage
Check wheels for wear and damage

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

Hydraulic operations
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

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 AMC 12/12z 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 with the tiller in the maximum vertical and horizontal positions.
Measure the air gap of the magnetic brake.

Electrical system
Test key switch or alternative access system including the access rights.
Test the contactors and/or relays.
Perform insulation inspection.

Chassis/structure
Check that the panels and covers as well as mounting brackets are secure. Ensure they function correctly and are safe.

Hydraulic operations
Test the lift sensors in the mast.
Adjust the slide pieces.
Adjust the load chains.
Lubricate the load chains.
Test emergency lowering.
Correct the hydraulic-oil level.
Test 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.
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 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

Power supply
Battery latch and battery attachment for correct function 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
Industrial truck for damage and leaks
Check chassis connections and screw connections are securely attached and check for damage
Check labels for legibility, completeness and plausibility
Check mast is securely attached
Mechanism to protect against trapping and shearing is present, secure, functions correctly and is free of dirt and 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
Check lateral play of the mast sections and fork carriage
Check slide pieces and stops for wear and damage

Hydraulic operations
Load chains and chain guides for wear and damage
Check load chain mounting elements and chain pins for wear and damage
Check mast rollers and their running surfaces for wear and damage
Test hydraulic system
Check hydraulic connections, hoses and pipes are securely attached and check for leaks and damage
Check fork arms or load handler for wear and damage
Check mast and fork carriage stops are present and secure
Tie/plunger rods for uniform adjustment, wear and damage
Check the hoses, pipes and connections are securely attached and check for wear, leaks, damage, blisters and kinks

Steering
Tiller for lateral play
Steering components for play and damage

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

1.2.2.2 Optional Equipment

Protective screen panel/grille

Chassis/structure
Check the presence and secure seating of the protective screen panel or protective grille and check for damage

1.2.3 Maintenance parts

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

1.2.3.1 Standard equipment

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