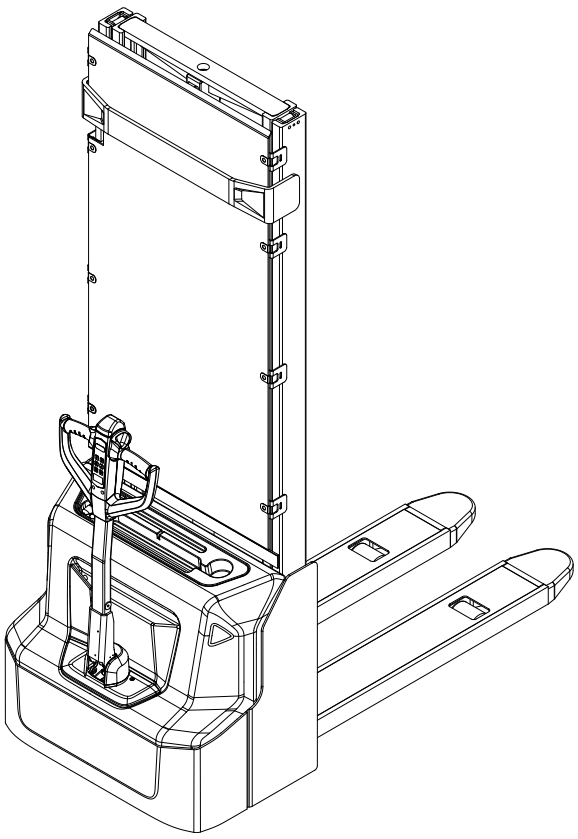
PSE1.2 Li-Ion/
PSE1.2 Li-Ion (z)

Operating instructions

en-GB



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PSE 1.2 Li-Ion
PSE 1.2 Li-Ion (z)

Declaration of Conformity

CE

Manufacturer

Noblelift Intelligent Equipment Co., Ltd., No. 528 Changzhou Road, 313100 Changxing, Huzhou, Zhejiang, People's Republic of China

Imported by (for all countries except China)/approved by (for China)

Jungheinrich AG, Friedrich-Ebert-Damm 129, 22047 Hamburg, Germany

Description
Industrial truck

Type	Option	Serial no.	Year of manufacture
PSE 1.2 Li-Ion PSE 1.2 Li-Ion (z)			

Additional information

On behalf of

Date

EU DECLARATION OF CONFORMITY

The undersigned hereby declares that the power-operated forklift truck described in detail satisfies the current versions of the applicable European directives 2006/42/EG (Machinery Directive) and 2014/30/EU (Electromagnetic Compatibility Directive (EMC)). The manufacturer is authorised to compile the technical documentation.

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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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Contents

A Correct Use and Application

1 General

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

2 Correct application

⚠ 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.

– Operation in industrial and commercial environments.
– Use only on secure surfaces with sufficient capacity.
– Do not exceed the permissible surface and point loading limits on the travel paths.
– Use only on travel paths that are visible and approved by the operating company.
– Slopes of max. 5 % may be negotiated with load, and 10 % without load.
– Do not travel across or at an angle on inclines. Travel with the load facing uphill.
– Use indoors
– Temperature range: +5 °C to +40 °C
– Minimum illumination level of the traffic lanes 50 Lux.

4 Proprietor responsibilities

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

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

NOTICE

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

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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

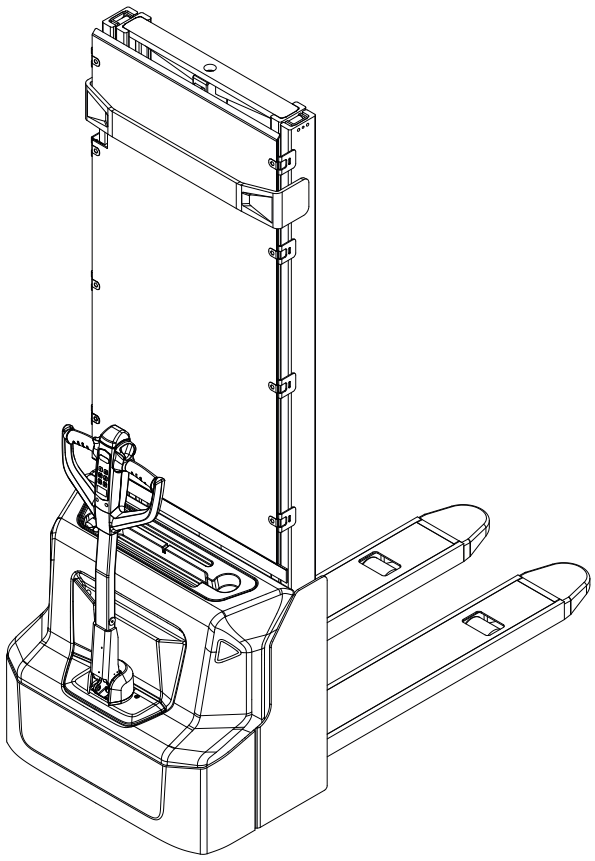
The PSE 1.2 Li-Ion and PSE 1.2 Li-Ion (z) trucks are self-propelled, tiller-operated electric trucks with an electrically driven lifting function.

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

The double-deck version (PSE 1.2 Li-Ion (z) only) enables two pallets to be picked up one on top of the other.

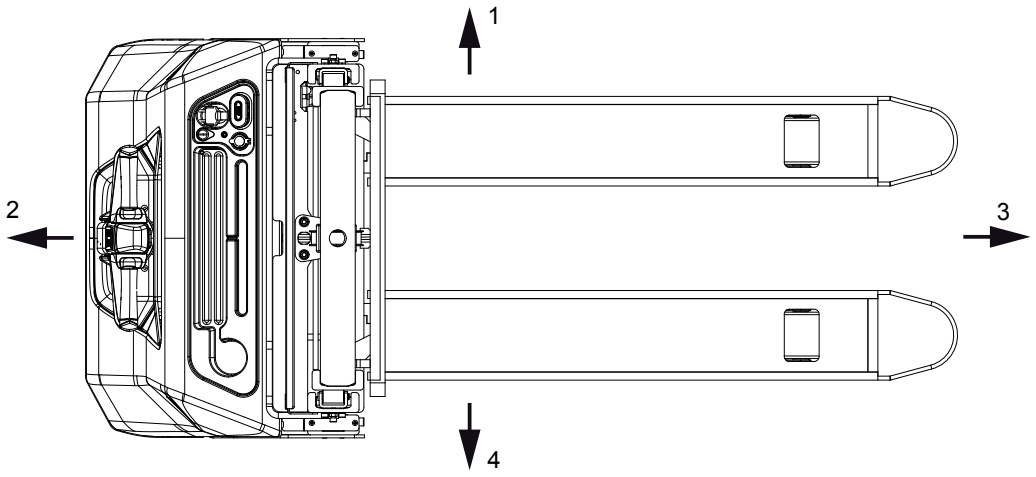
The rated capacity depends on the lift height and the load centre and the maximum is 1200 kg – see page 30.

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



2 Travel direction definition

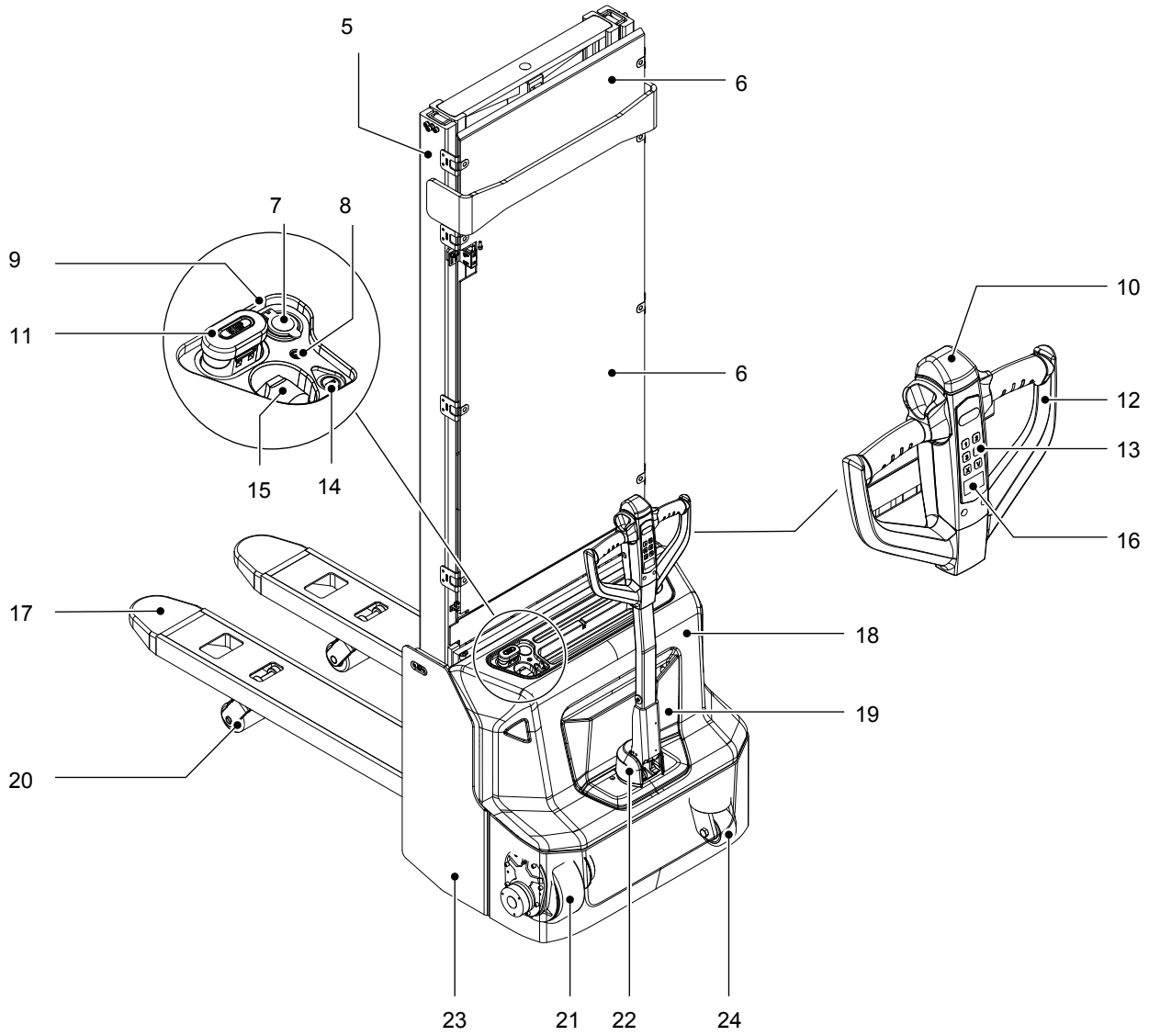
The following determinations have been made for travel direction specification:



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

3 Assemblies and Functional Description

3.1 Assembly Overview



Item	Description	Item	Description
5	Mast	15	Mains plug for the on-board charger
6	Protective screen panel (2-part)	16	Display unit
7	Service interface	17	Load handler
8	Charging LED	18	Front panel
9	Dashboard panel	19	Drive panel (2-part)
10	Collision safety switch	20	Load wheels
11	Emergency disconnect switch	21	Drive wheel
12	Tiller	22	Tiller cover
13	Keypad	23	Load section
14	Start button	24	Support wheel

3.2 Functional Description

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.

Automatic reset of the controls

When released, a gas strut pushes the swivelling tiller up and activates braking, see page 74.

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 74.

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 73.

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.

Electrical system

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

Hydraulische Anlage

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.

Controls and displays

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 capacity and event messages.

Steering

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

Operator position

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

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 76.
– "Slow travel button", see page 78.
– Button for lifting or lowering the load handler, see page 80.

4 Technical Specifications

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

4.1 Performance data

PSE 1.2 Li-Ion

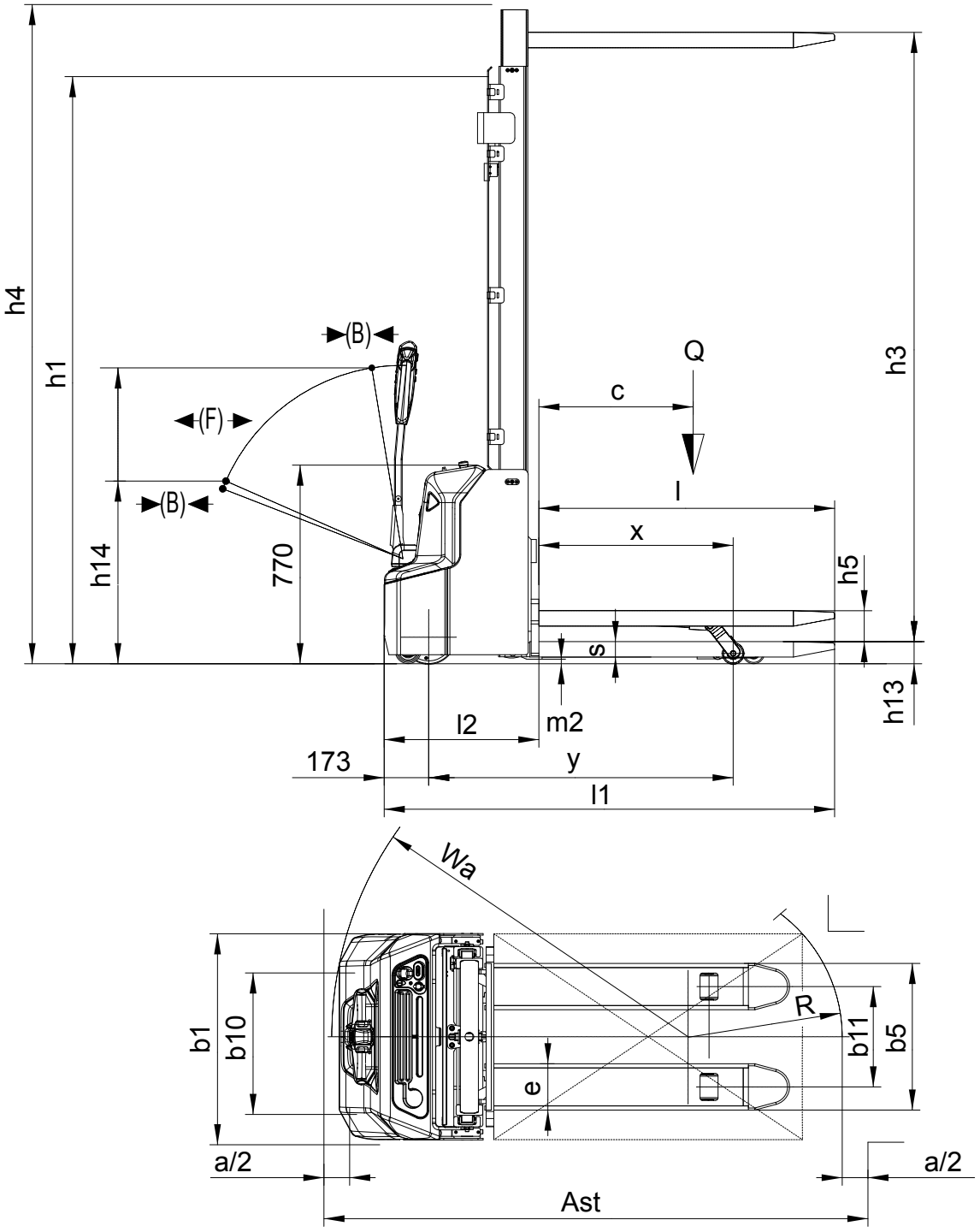
Designation	PSE 1.2 Li-Ion	
Capacity	1,200	kg
Travel speed with / without rated load	4.2 / 4.5	km/h
Lift speed with/without rated load	0.11 / 0.16	m/s
Lowering speed with/without rated load	0.13 / 0.11	m/s
Max. gradeability with / without rated load	5 / 10	%
Drive motor, output S2 60 min	0.65	kW
Lift 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	0.8	kWh/h

PSE 1.2 Li-Ion (z)

Designation	PSE 1.2 Li-Ion (z)	
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 / 0.16	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 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	0.66	kWh/h

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

4.2 Dimensions



PSE 1.2 Li-Ion

	Designation	**PSE 1.2 Li-Ion**				
	Double mast ... ZT	**250**	**280**	**310**	**350**	
c	Load centre distance	600				mm
x	Load distance	760				mm
y	Wheelbase	1147				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	Initial lift	-				mm
h13	Lowered height	86				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	2197				mm
Ast	Aisle width for pallets 800 x 1200 lengthways	2145				mm
Wa	Turning radius	1350				mm

PSE 1.2 Li-Ion

	Designation	**PSE 1.2 Li-Ion**		
	Single stage mast ... ZT	**150**	**190**	
c	Load centre distance	600		mm
x	Load distance	760		mm
y	Wheelbase	1147		mm
h1	Mast height retracted	1930	2330	mm
h3	Lift	1514	1914	mm
h4	Mast height extended	1930	2330	mm
h5	Initial lift	-		mm
h13	Lowered height	86		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	2197		mm
Ast	Aisle width for pallets 800 x 1200 lengthways	2145		mm
Wa	Turning radius	1350		mm

PSE 1.2 Li-Ion (z)

	Designation	PSE 1.2 Li-Ion (z)				
	Double mast ... ZT	**250**	**280**	**310**	**350**	
c	Load centre distance	600				mm
x	Load distance	752				mm
y	Wheelbase [1)]	1264 / 1181				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	Initial lift	120				mm
h13	Lowered height	86				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	24				mm
Ast	Aisle width for pallets 1000 x 1200 crossways [1)]	2234 / 2290				mm
Ast	Aisle width for pallets 800 x 1200 lengthways [1)]	2185 / 2209				mm
Wa	Turning radius	1384				mm

1) Load section raised/load section lowered

4.3 Weights

PSE 1.2 Li-Ion

Designation	**PSE 1.2 Li-Ion**				
Double mast ... ZT	**250**	**280**	**310**	**350**	
Net weight incl. battery	555	565	575	595	kg
Axle load with load - front/rear	560 / 1225				kg
Axle load without load - front/rear	440 / 145				kg
Battery weight	19				kg

Designation	**PSE 1.2 Li-Ion**		
Single stage mast ... ZT	**150**	**190**	
Net weight incl. battery	480	500	kg
Axle load with load - front/rear	560 / 1225		kg
Axle load without load - front/rear	440 / 145		kg
Battery weight	19		kg

PSE 1.2 Li-Ion (z)

Designation	**PSE 1.2 Li-Ion (z)**				
Double mast ... ZT	**250**	**280**	**310**	**350**	
Net weight incl. battery	650	640	650	670	kg
Axle load with load - front/rear	670 / 1200				kg
Axle load without load - front/rear	485 / 185				kg
Battery weight	19				kg

4.4 Tyre type

Designation	**PSE 1.2 Li-Ion** **PSE 1.2 Li-Ion (z)**	
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 EN norms

Continuous sound pressure level

– PSE1.2 Li-Ion/PSE1.2 Li-Ion (z): < 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)

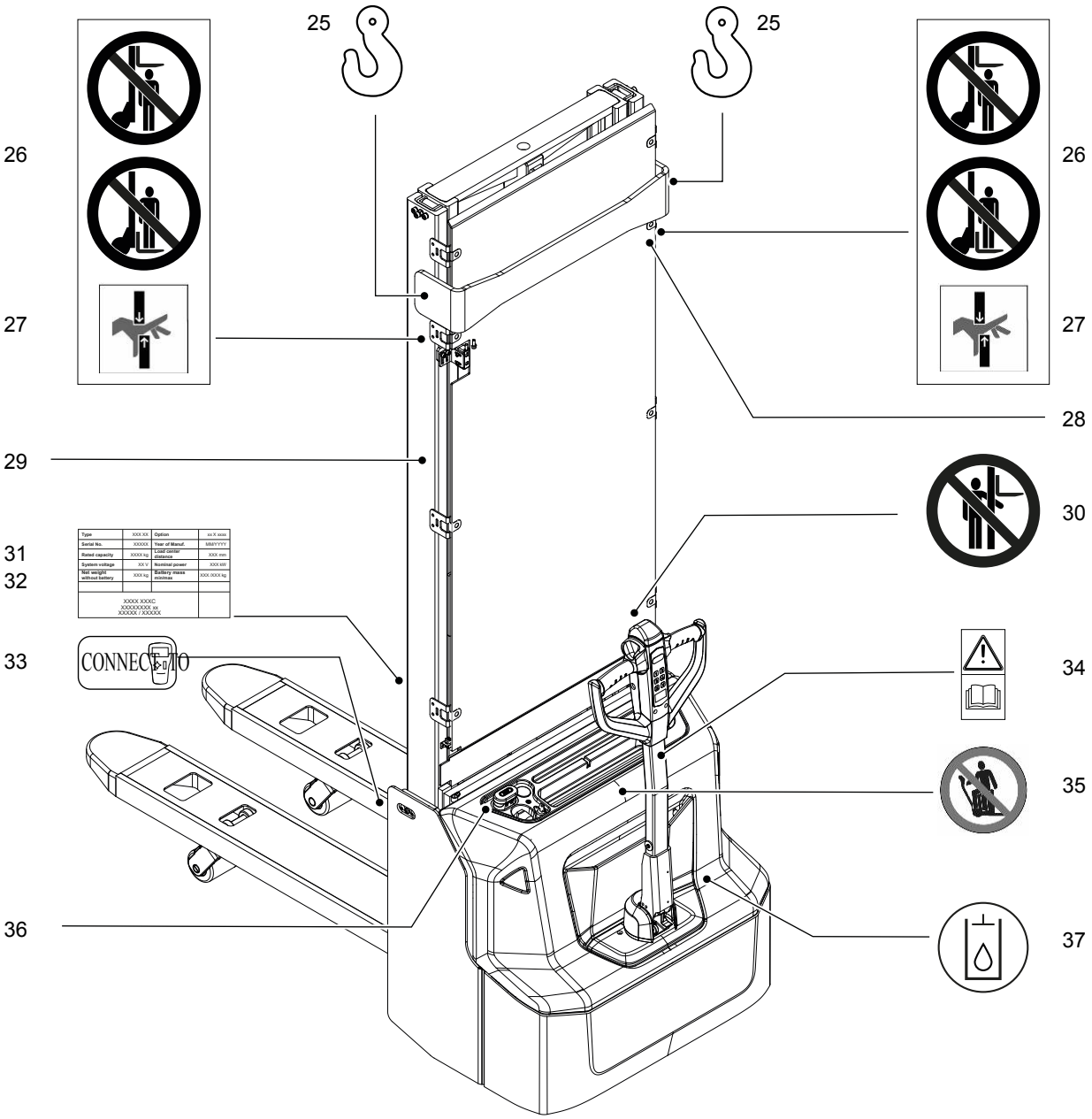
The manufacturer confirms that the truck adheres to the limits for electromagnetic emissions and resistance as well as the static electricity discharge test in accordance with EN 12895 as well as the standardised instructions contained therein.

➔ 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

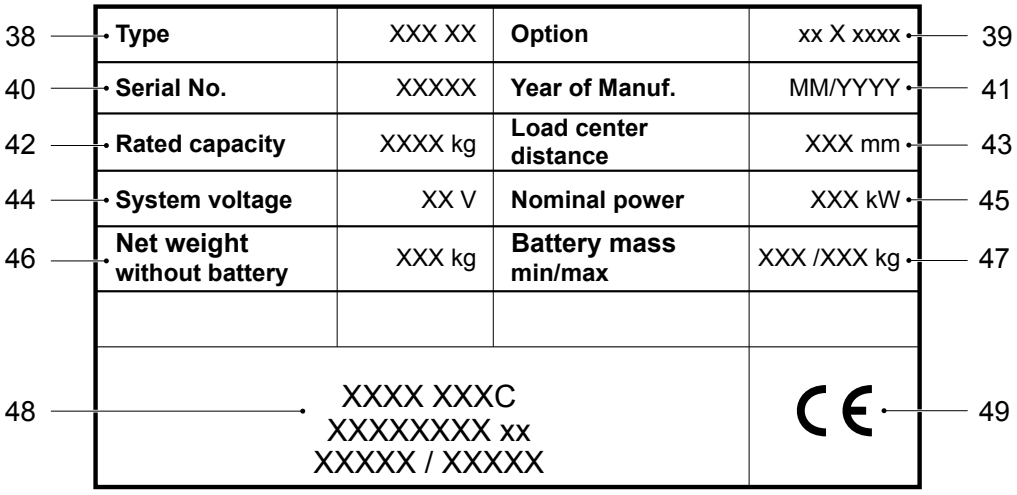
➔ Warnings and notices such as capacity charts, strap points and data plates must be legible at all times. Replace if necessary.

6.1 Indication Points



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

6.2 Data plate

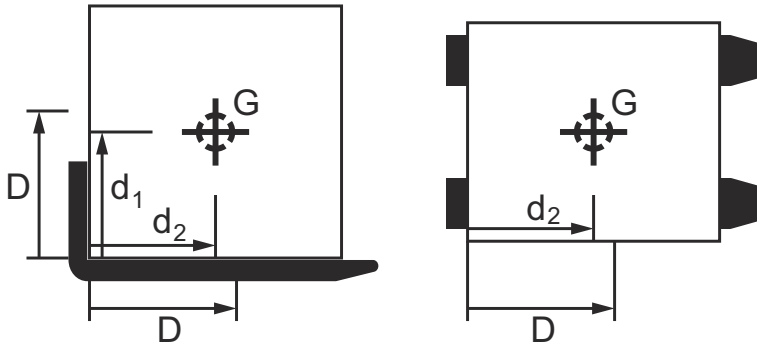


Item	Description
38	Type
39	Option
40	Serial number
41	Year of manufacture
42	Rated capacity
43	Load centre distance
44	Battery voltage (V)
45	Output (kW)
46	Weight without battery
47	Battery weight
48	Manufacturer's details
49	CE mark

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

6.3 Truck capacity plate

Load centre distance

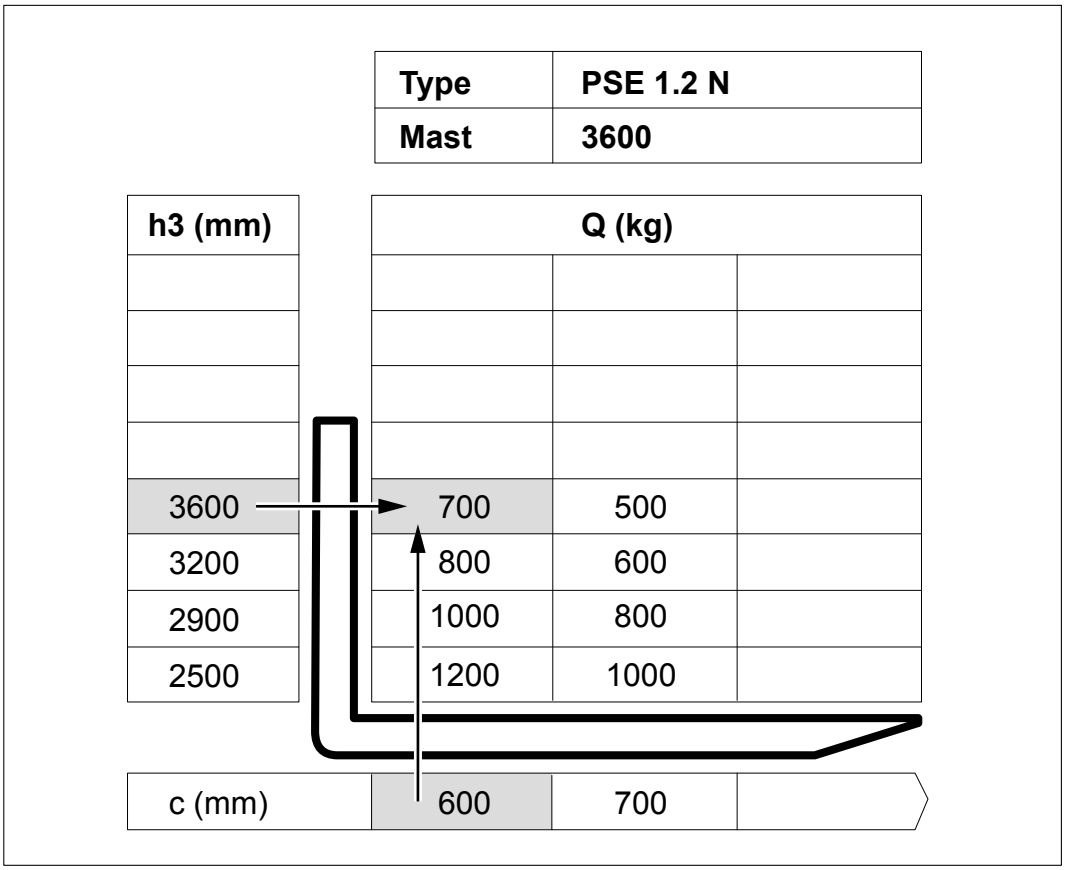


The load centre distance D of the load handler is specified horizontally from the front edge of the back and vertically from the upper edge of the load handler.

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 83.

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.

PSE 1.2 Li-Ion

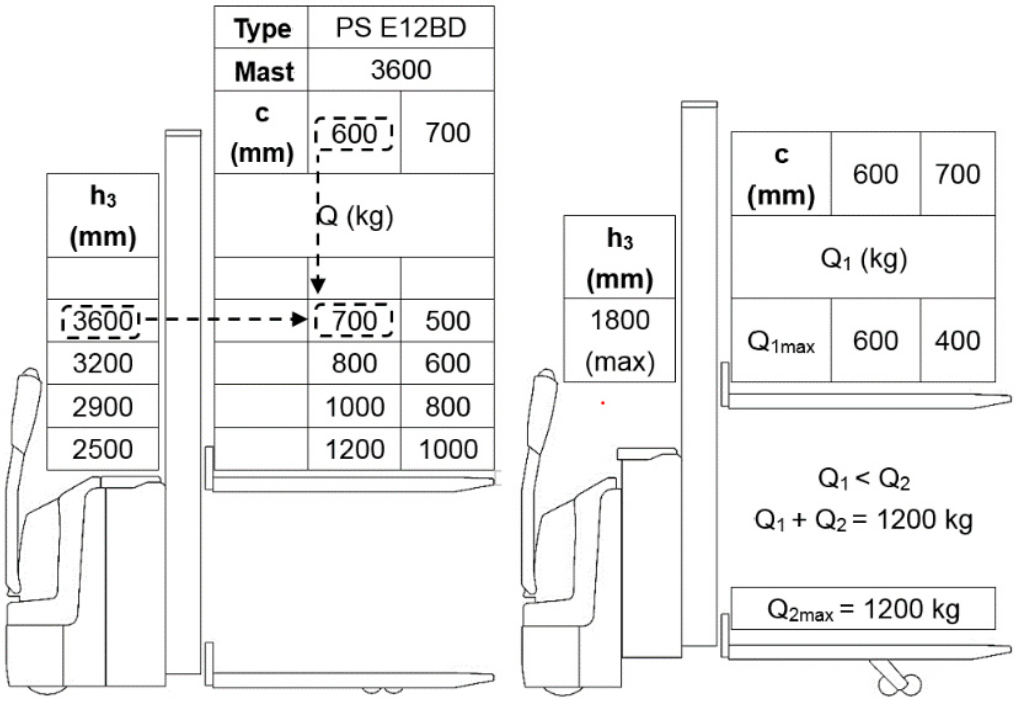


The capacity plate specifies the maximum capacity Q [kg] of the truck for a specified load centre c [mm] and the corresponding lift height H [mm].

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

6.4 Double Decker Mode Capacity Plate

PSE 1.2 Li-Ion (z)



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 [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 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 is 1800 mm.

C Transport and Commissioning

1 Lifting by crane

⚠ WARNING!

All persons involved in loading by crane must be trained

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

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

⚠ WARNING!

Improper loading by crane can result in accidents

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

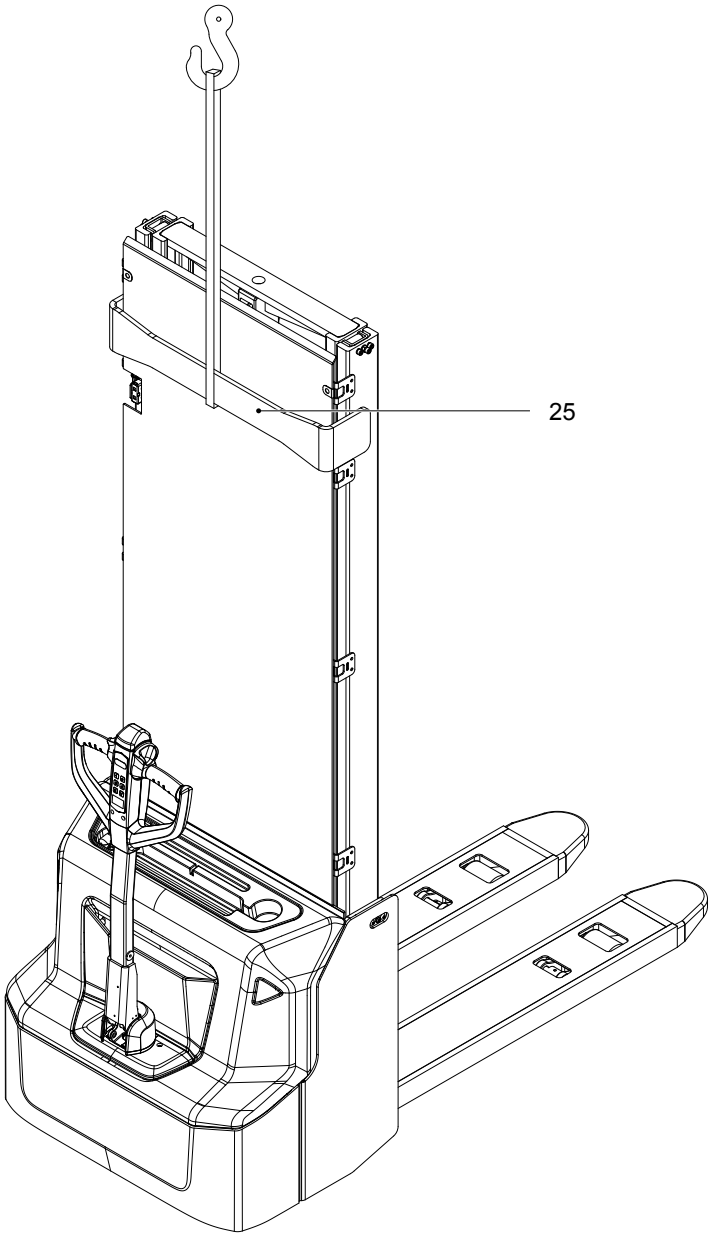
- ▶ Prevent the truck from hitting other objects during lifting, and avoid uncontrolled movements. If necessary, secure the truck with guide ropes.
- ▶ Loading by crane may only be performed by persons who have been trained in the use of the lifting accessories.
- ▶ Wear personal protective equipment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

⚠ 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.



Lifting the truck by crane

Requirements

– Park the truck securely, see page 70.

Tools and Material Required

– Lifting gear
– Crane lifting gear

Procedure

• Secure the lifting slings to the strap points (25).

The truck can now be lifted by crane.

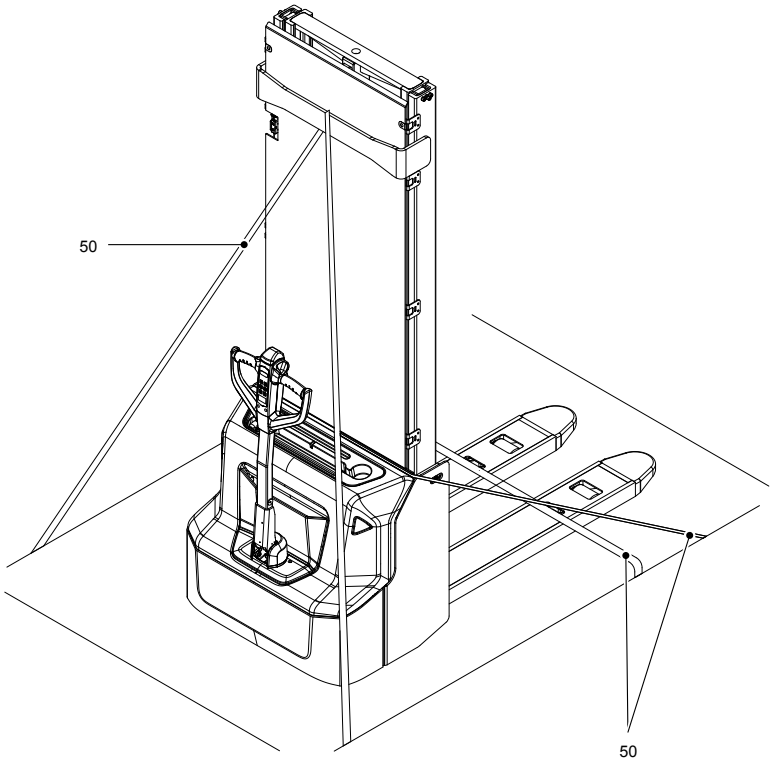
2 Transport

⚠ 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 loaded.
– The truck is parked securely, see page 70.

Tools and Material Required

– Lashing straps

Procedure

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

The truck can now be transported.

3 Using the Truck for the First Time

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 60.
- Charge the battery – see page 57.
- Check the hydraulic oil level and correct if necessary – see page 114.

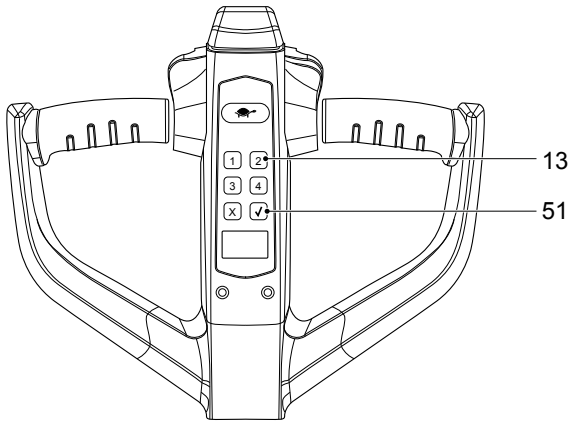
The truck can now be started – see page 69.

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 Keyless Access System

4.1 Changing 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 (13).

Changing the access code

Requirements

– The truck is parked securely, see page 70.

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

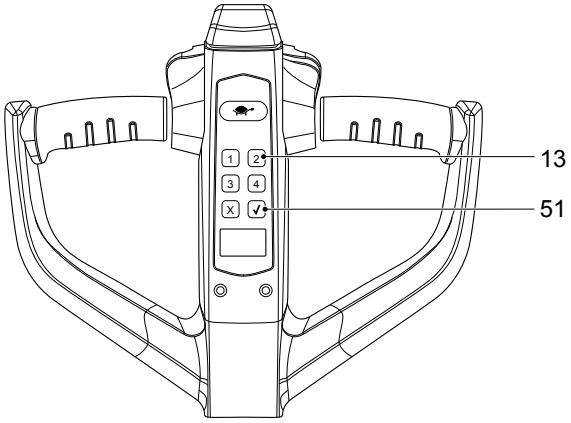
– The truck is parked securely, see page 70.

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.

4.2 Setting up the ID Card



The truck can be started with valid ID cards. The number of ID cards is limited to 5.

Setting up an additional ID card

Requirements

– The truck is parked securely – see page 70.

Procedure

- Enter access code 3434 and press the RETURN button (51).
- Place a new ID card on the unit within 5 seconds.

The ID card is set up.

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.

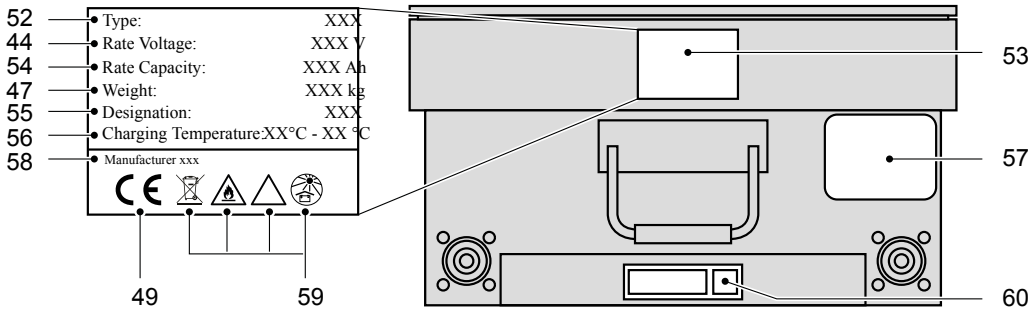
Low temperatures reduce the available battery capacity, high temperatures reduce the batteries useful life.

Variable "Batterie_Temperatur_Max_VarJH" not defined. is the maximum temperature for batteries, at which point the truck can be operated.

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)
47	Battery weight
49	CE mark
52	Battery type
53	Battery data plate
54	Battery capacity (Ah)
55	Designation
56	Charging temperature range

Item	Description
57	Warnings
58	Manufacturer
59	Safety and warning information – see page 45
60	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.

The following hazards can arise in the event of improper use:

– Physical damage:
  This can occur if a battery falls or is deformed through pressure (e.g. truck forks penetrate the battery housing).
  Mechanical damage includes cracks, breakage, splinters or holes in the battery housing. 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.
– Short circuits:
  These may be caused by connecting the two battery terminals (e.g. battery immersed in water)
– Temperature effects:
  High temperatures caused for example by sunlight or being store in warm locations (e.g. near ovens) can result in harmful materials leaking, fire or battery explosion.

In order to avoid fire, explosion and leakage of harmful materials, a safe place for storing batteries until the manufacturer's customer service department arrives on site must satisfy the following criteria:

– Do not store in places often frequented by personnel.
– Do not store in places where valuable objects (e.g. cars) are stored.
– A PM12i burning metal fire extinguisher or a Co2 fire extinguisher must be available to put out any fires.
– There should not be any fire or smoke detectors in the vicinity in order to ensure that an automatic fire detection system is only activated in the event of actual danger (e.g. naked flames).
– Small amounts of discharge from a single battery are not critical to the environment. Above-average natural ventilation is required in this case.
– No ventilation intake pipes should be in the vicinity, as discharged content could spread within a building.

Examples of where to store a non-functional battery:

– Roofed outdoor position.
– Ventilated container.
– Covered box with pressure and smoke discharge option.

3.2.1 Symbols - Safety and Warnings

	Used lithium-ion batteries must be treated as hazardous waste. Lithium-ion batteries marked with the recycling symbol and the sign showing a crossed-out waste bin must not be disposed of with ordinary household waste. Buy-back terms and type of recycling are to be agreed with the manufacturer in example to accordance with the Battery Directive 2006/66/EG, for example.
	Avoid fire and short circuits due to overheating. Do not ignite or position an open flame, glowing embers, or sparks near the lithium-ion battery. Keep lithium-ion batteries away from strong heat sources.
	Hot surfaces. Battery cells can generate very high short-circuit currents, causing them to become hot.
	Dangerous electrical voltage! Battery cells can generate very high short-circuit currents, causing them to become hot. Caution! The metal parts of the battery cells are constantly under voltage, so do not place any foreign objects or tools on the lithium-ion battery. Observe the accident prevention regulations and EN 50272-3.
	Wear personal protective equipment (e.g. safety goggles and safety gloves) when handling damaged battery cells and lithium-ion batteries. Use only insulated tools. If the contents leak out, do not inhale the fumes. Always wash your hands after completing the work. Do not mechanically machine the lithium-ion battery, strike, crush, compress, notch, dent or modify it in any way. Do not open, damage, penetrate, bend, heat the lithium-ion battery or allow it to become hot, do not throw it into a fire, short circuit it or immerse it in water. Do not store it or operate it in pressurised containers.
	Follow the operating instructions and keep them in a visible position in the charging area. If any faults are found on the lithium-ion battery, contact the manufacturer's customer service department immediately. Do not carry out any actions on your own. Do not open the lithium-ion battery.
	Protect the lithium-ion battery from solar radiation or other forms of heat radiation. Do not expose the lithium-ion battery to heat sources.

3.2.2 Marking of packages with lithium-ion batteries

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

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

61

62

UN 3171

Item	Description
61	Danger label class 9A for lithium-ion batteries
62	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 & -dioxide, manganese, nickel and cobalt oxides.

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 (PM 12i 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 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

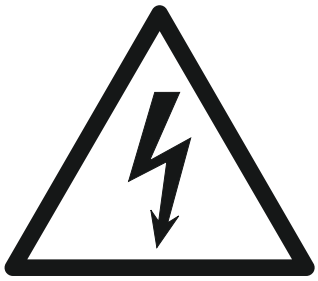
⚠ WARNING!

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 44.



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 57.

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

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

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.

⚠ WARNING!

Do not open the battery.

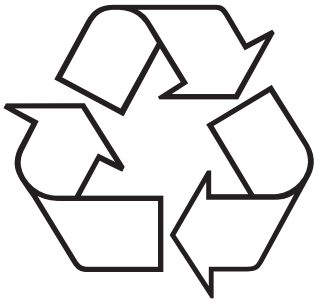
3.6 Disposal and transport of a lithium-ion battery

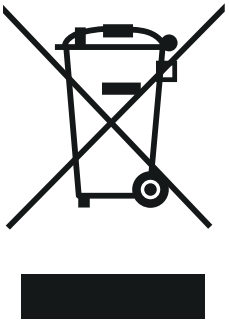
3.6.1 Instructions for disposal

NOTICE

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.





Used lithium-ion batteries are recyclable commodities. These 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.

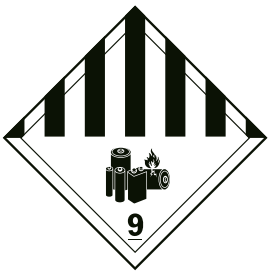
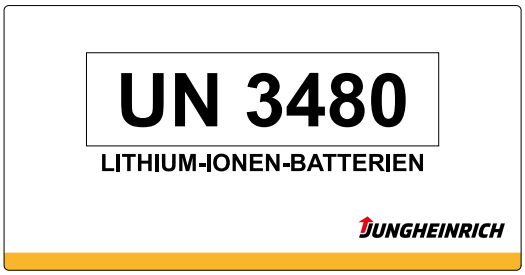
3.6.2 Shipping information

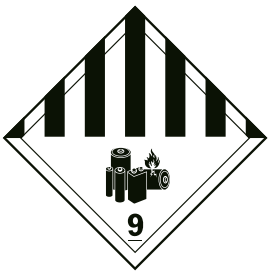
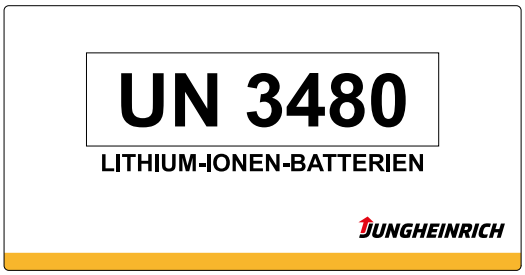
The lithium-ion battery is a hazardous material. The applicable ADR regulations must be observed during transport.

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

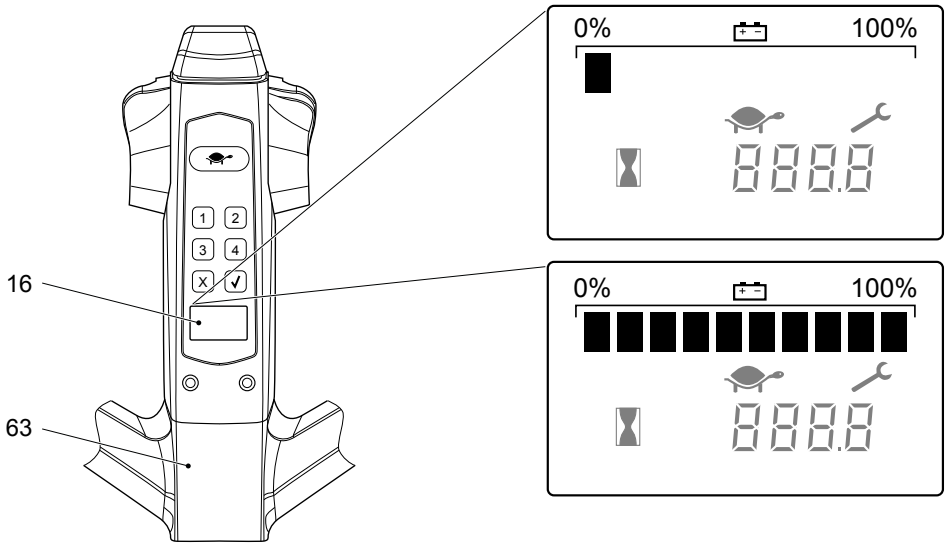
New lithium-ion batteries are transported with a charge status of at least 60...70 %.

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 (16) on the tiller head (63).

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

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

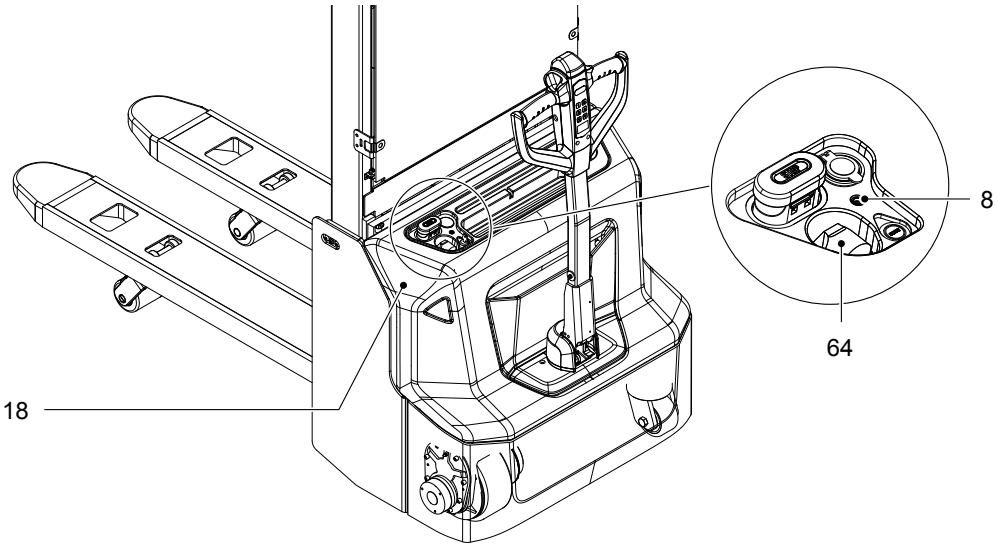
Code	The error code appears if ...	Effect
0	The battery charge is too low.	Lift function is deactivated.
91	Operation of the truck continues without first charging the battery.	Travel speed is reduced.

4.2 Charging the battery with the on-board charger

Mains connection

Mains voltage: 230 V
Mains frequency: 50 Hz

The mains cable and mains connector (64) of the battery charger are stowed in a storage compartment in the front panel (18).



Starting charging with an on-board charger

Charging the battery

Requirements

– The truck is parked securely – see page 70.

Procedure

• Plug the mains plug (64) into a mains socket.

➔ The charge status is indicated by the colour of the charging LED (8).
- Red: The battery is discharged
- Orange: The battery is charging
- Green: The battery is fully charged

The battery is being charged.

➔ When the mains plug (64) is attached to the mains, all the truck electrical functions are disconnected (electric immobiliser). The truck cannot be operated.

Ending battery charging

Requirements

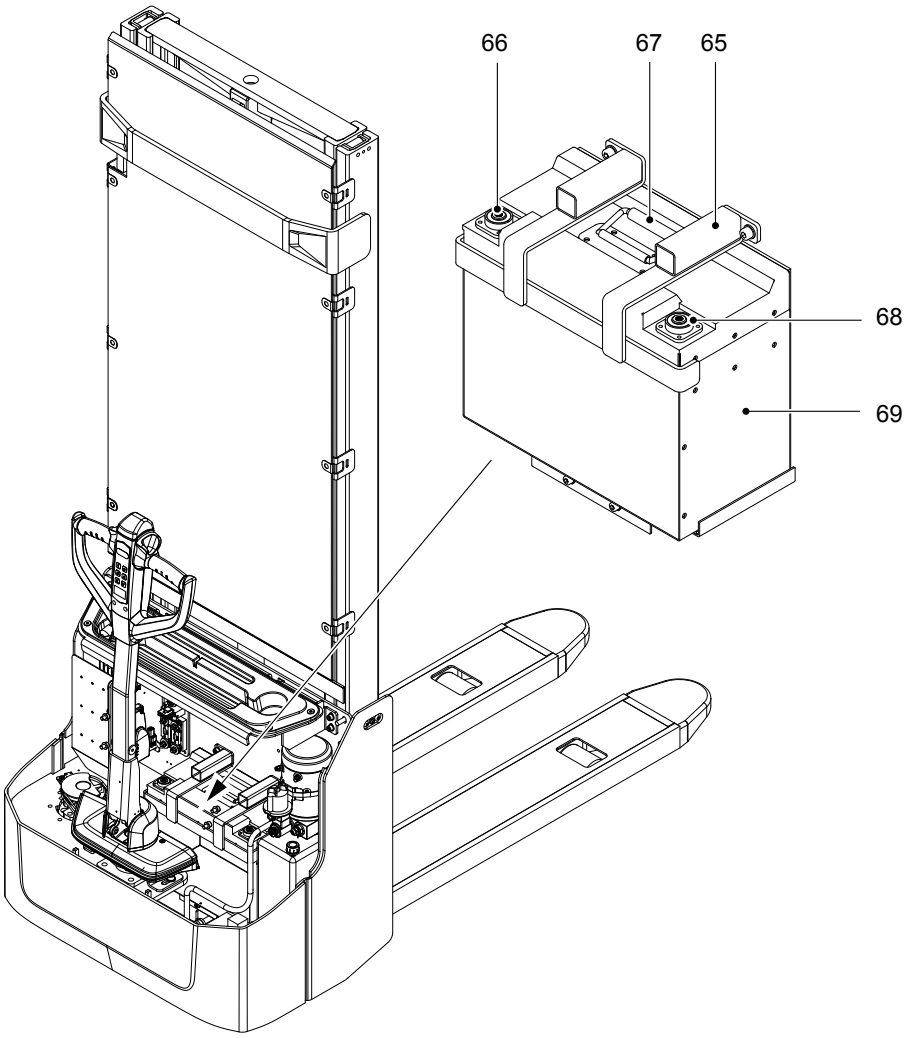
– The battery is partially or fully charged.

Procedure

• Remove the mains plug (64) from the mains socket and store it fully along with the cable in the storage compartment in the front panel (18).
• Establish operational readiness.

The truck is operational.

5 Battery removal and installation



Removing the battery

Requirements

– The truck is parked securely – see page 70.
– The emergency disconnect switch is actuated – see page 73.
– The front panel has been disassembled – see page 110.

Procedure

- First remove the negative terminal (68) of the battery.
- Then remove the positive terminal (66) of the battery.
- Remove the support frame (65) of the battery and set down securely.
- Lift up the battery (69) by the battery handle (67) and lift out.

The battery is now removed.

Installing the battery

Procedure

- Lift the battery (69) by the battery handle (67) and insert in the housing.
- Fit the support frame (65) of the battery.

➔ Torque 17 Nm ± 10%

- Fit the positive terminal (66) of the battery.

➔ Torque 17 Nm ± 10%

- Fit the negative terminal (68) of the battery.

➔ Torque 17 Nm ± 10%

- Place the caps on the terminals.
- Fit the front panel – see page 110.

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 26) 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.

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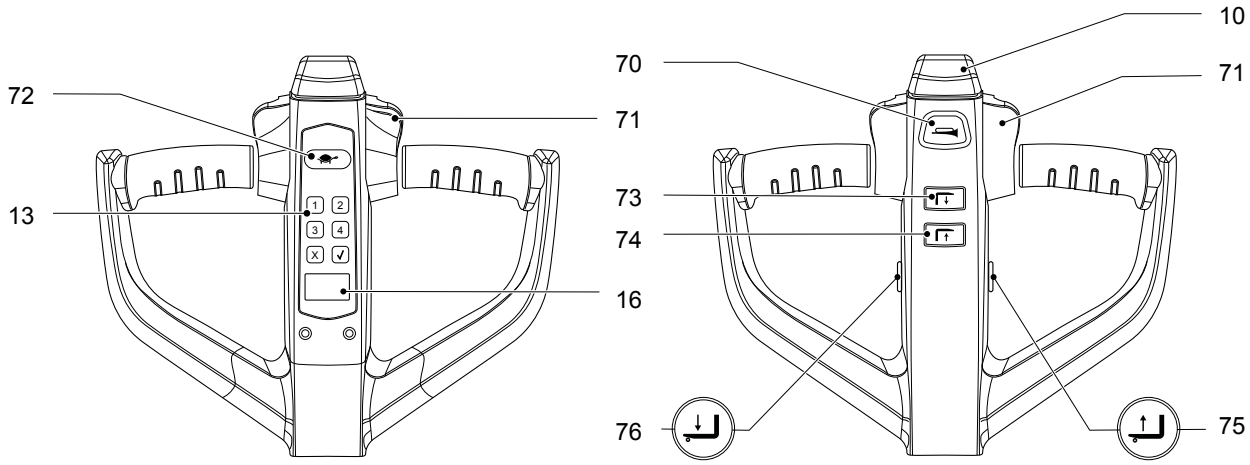
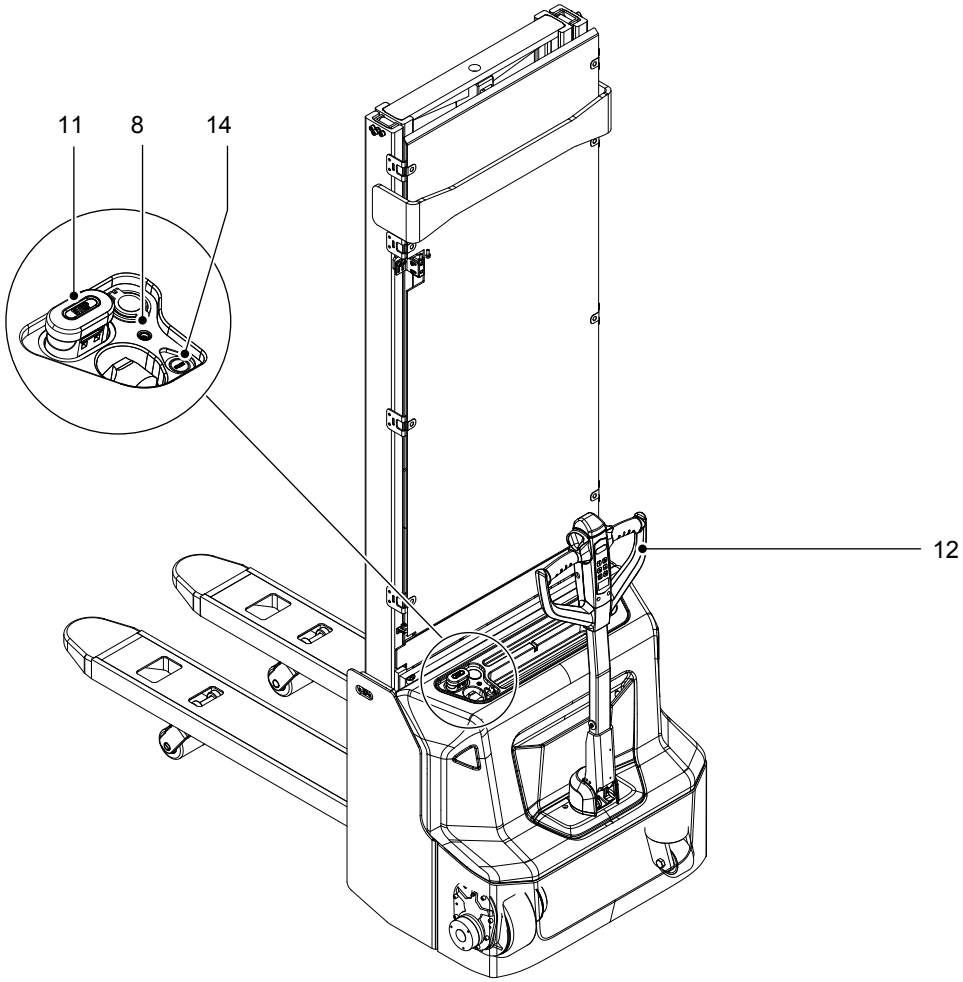
2 Displays and Controls

2.1 Controls

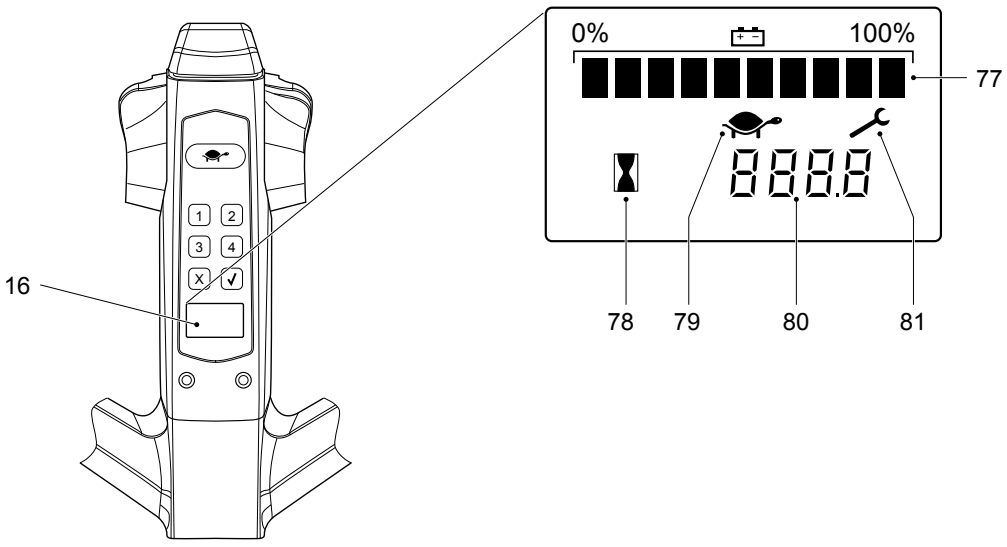




Item	Description	Function
8	LED charging display	Indicates the charge status during battery charging – see page 57.
10	Collision safety switch	Safety feature When the collision safety switch is activated, the truck travels a short distance away from the operator in load direction, thus protecting the operator. The truck is then braked – see page 18.
11	Emergency disconnect switch	Stops all electrical functions (travel, lifting, lowering) and activates the electromagnetic brake – see page 73.
12	Tiller	Steers the truck via corresponding movements – see page 79.
13	Keypad	Entry of access code for starting the truck – see page 38.
14	Start button	Starts the truck – see page 69.
16	Display unit	Displays various items of truck data – see page 67.
70	"Warning signal" button	Activates an audible signal.
71	Travel switch	Controls the travel direction and the travel speed – see page 76.
72	"Slow travel" button	Toggles between slow travel and travel at normal speed. Switches to slow travel when the tiller is in vertical position – see page 78.
73	"Load handler raise" button	Raises the load handler – see page 83.
74	"Load handler lower" button	Lowers the load handler – see page 83.
75	"Support arm raise" button [1)]	Raises the support arms.
76	"Support arm lower" button [1)]	Lowers the support arms.

[1)] PSE 1.2 Li-Ion (z) only

2.2 Display unit



Item	Designation	Function
16	Display unit	Displays symbols for: - Battery charge status - Slow travel - Hour meter - Service and fault messages.
77	Charge status indicator	Shows the battery charge status – see page 57.
78	Hourglass	Flashes when the hour meter is active.
79	Tortoise	Only appears when slow travel mode is active.
80	Number field	Displays operating hours or fault codes.
81	Service symbol	Only appears when scheduled maintenance is required or if faults exist. Fault codes are displayed in the number field.

3 Starting up the truck

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

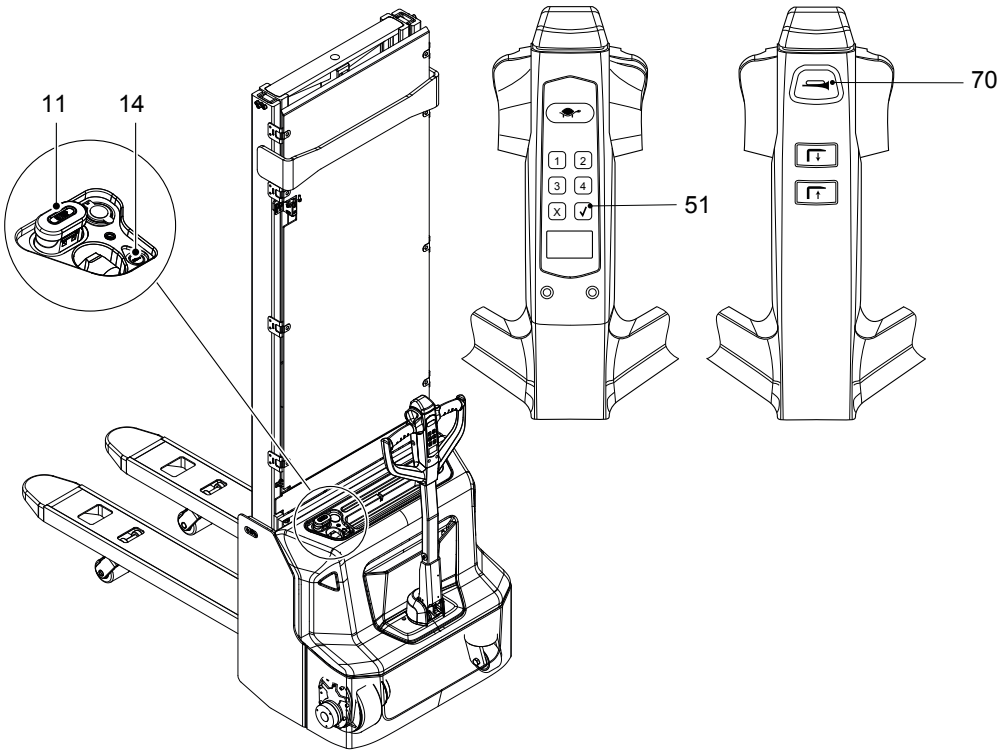
Requirements

– The truck is parked securely – see page 70.

Procedure

- Check the entire truck from the outside for damage and leaks.
- Check the load handler for visible signs of damage such as cracks, bent or severely worn forks.
- Check the hydraulic system for leaks – see page 114.
- Check the drive wheel and load wheels for damage and freedom of movement – see page 113.
- Check the markings and labels for completeness and legibility – see page 26.
- Check that the controls return automatically to the neutral position after being used – see page 76.
- Switch on the truck – see page 69.
- Check the battery charge status – see page 57.
- Test the warning signal – see page 65.
- Test the brake – see page 74.
- Test the travel functions – see page 76.
- Test the lifting and lowering functions – see page 83.
- Test the emergency disconnect switch – see page 73.
- Test the collision safety switch – see page 18.

3.2 Preparing the truck for operation



Switching on the truck

Requirements

– Checks and operations before starting daily work have been completed – see page 68.
– Load is correctly palletised and secured – see page 83.

Procedure

- Release the emergency disconnect switch (11) – see page 73.
- Switch on the truck. To do this:
  - Press the start button (14).

➔ A green ring illuminates on the start button.

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

➔ Alternatively, an ID card can be used – see page 39.

- Press the "warning signal" button (70).

The truck is ready for operation.

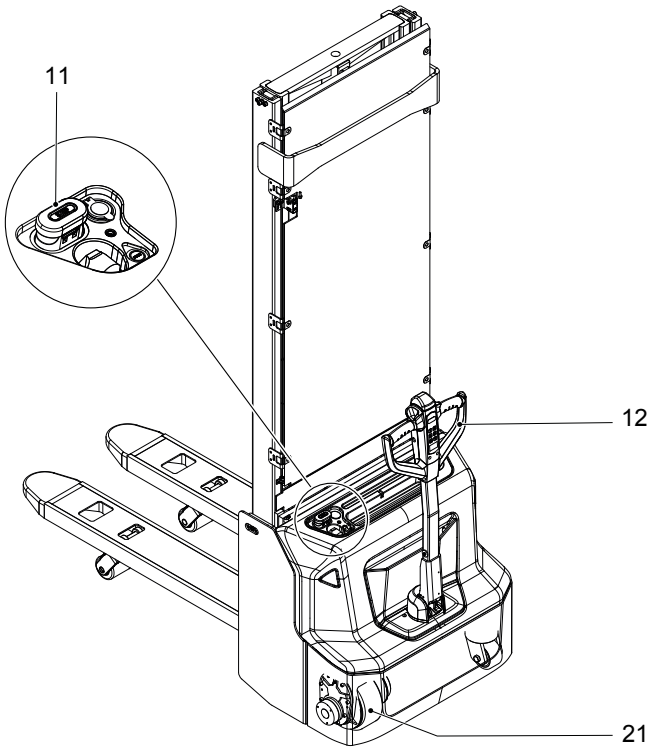
3.3 Parking the truck securely

⚠ 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 83.
- Turn the drive wheel (21) to the straight-ahead position using the tiller (12).
- Press the emergency disconnect switch (11).

Truck is parked securely.

4 Industrial Truck Operation

4.1 Safety regulations for truck operation

Travel routes and work areas

Only use lanes and routes specifically designated for truck traffic. Unauthorised third parties must stay away from work areas. Loads must only be stored in places specially designated for this purpose.
The truck must only be operated in work areas with sufficient lighting to avoid danger to personnel and materials. Additional equipment is necessary to operate the truck in areas of insufficient lighting.

⚠ DANGER!

Do not exceed the permissible surface and 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 20) 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 86. 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.

Type of loads to be carried

The operator must make sure that the load is in a satisfactory condition. Loads must always be positioned safely and carefully. Use suitable precautions to prevent parts of the load from tipping or falling down. Prevent liquid loads from sloshing out.

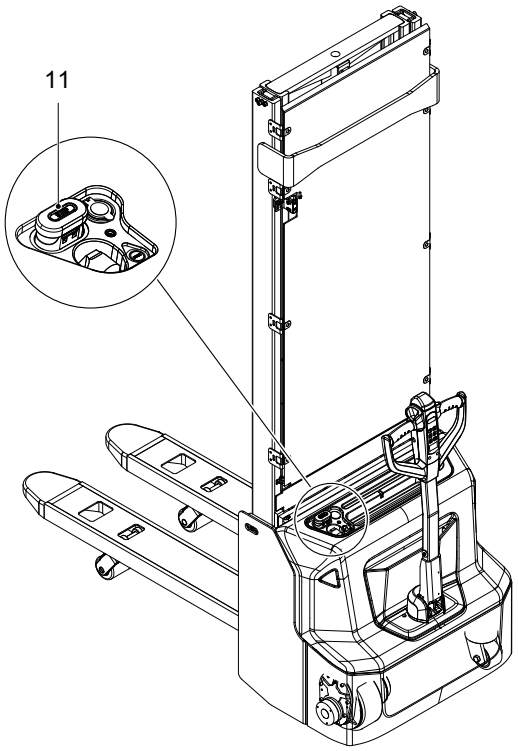
⚠ WARNING!

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 Emergency Disconnect



Pressing the Emergency Disconnect switch

Procedure

- Press the Emergency Disconnect (11).

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 (11) 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.

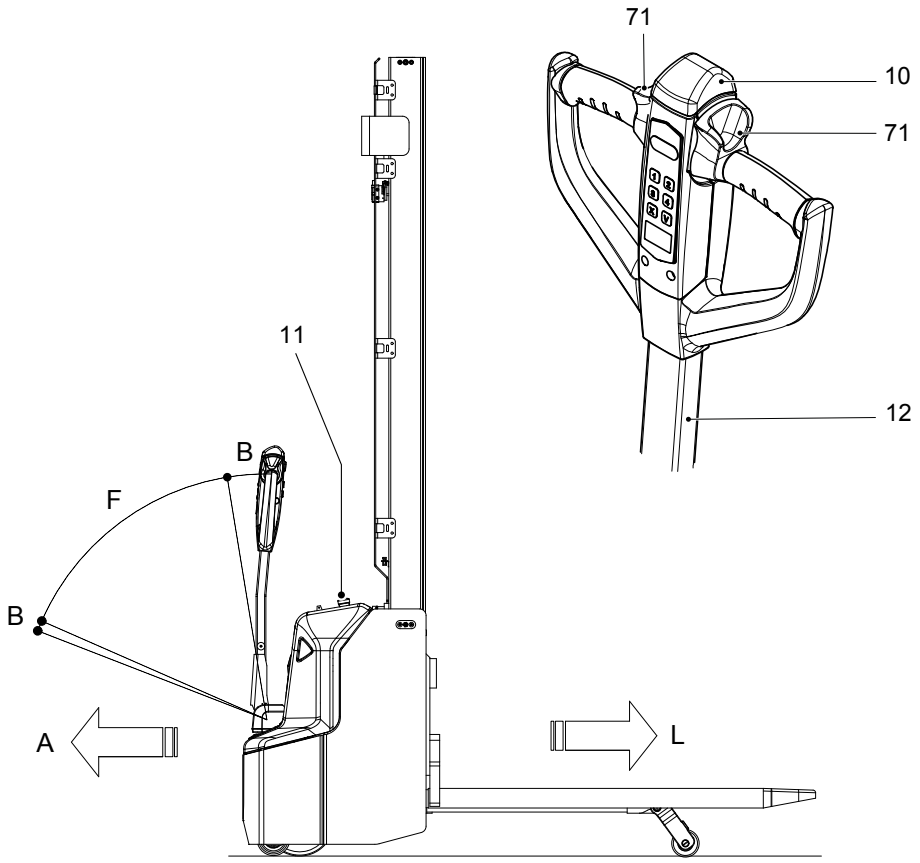
4.3 Brakes

⚠ WARNING!

Risk of collision due to a defective tiller

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

- ▶ If the tiller returns to the brake position slowly or not at all, the truck must be taken out of service until the cause of this fault is 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 (71) to the neutral "0" position.	The regenerative brake is activated. The truck brakes to a halt.
Travel switch reverse		
	Turn the travel switch (71) in the opposite direction.	The regenerative brake is activated. The truck brakes and begins travelling in the opposite direction.
Coasting brake		
	Move the tiller (12) to the brake zone "B". ➔ When the tiller is released, it automatically returns to vertical position.	The truck brakes to a halt.
Safety brake		
	Operate the collision safety switch (10). ➔ 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 (11). ➔ 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 Travel

⚠ WARNING!

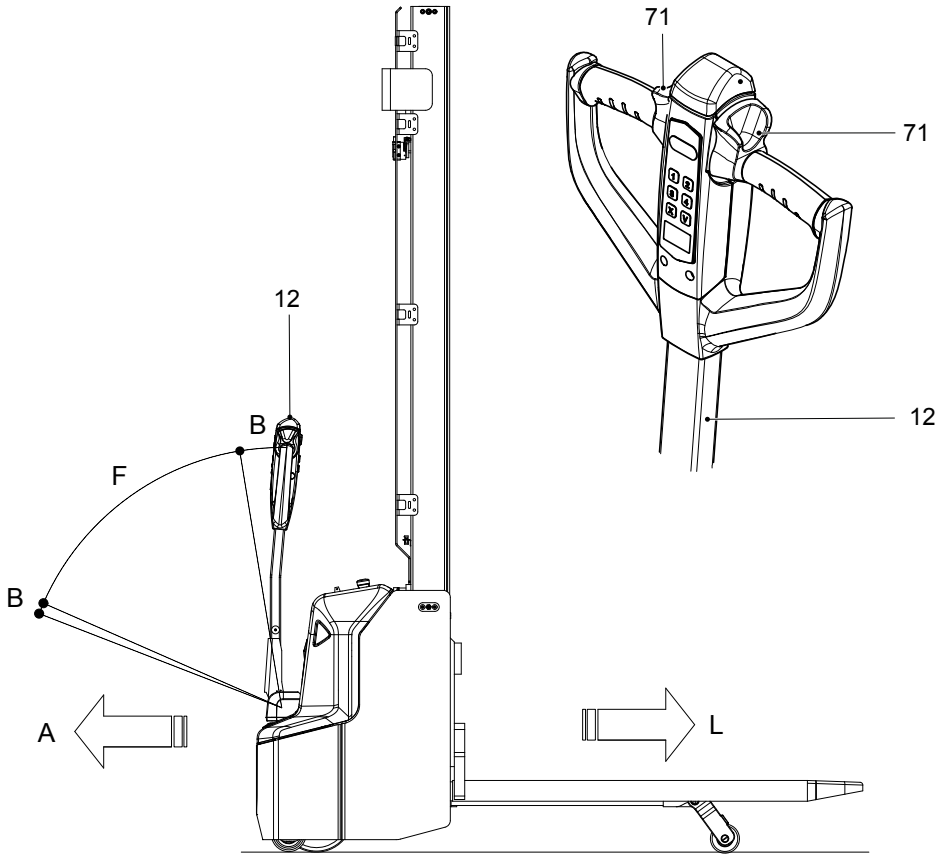
Risk of injury or trapping from the truck

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

▶Wear personal protective equipment (e.g. safety shoes, ...).

▶In pedestrian mode make sure you have sufficient distance from the truck.

▶Make sure there is nobody between the truck and any obstacles.



Requirements

– Truck is ready for operation – see page 68

Procedure

- Set the tiller (12) to the travel zone (F).
- Control the travel direction with the travel switch (71):
  - 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 (71):
  - The further the travel switch is turned, the higher the speed.

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

4.5 Changing direction during travel

⚠ CAUTION!

Danger when changing direction during travel

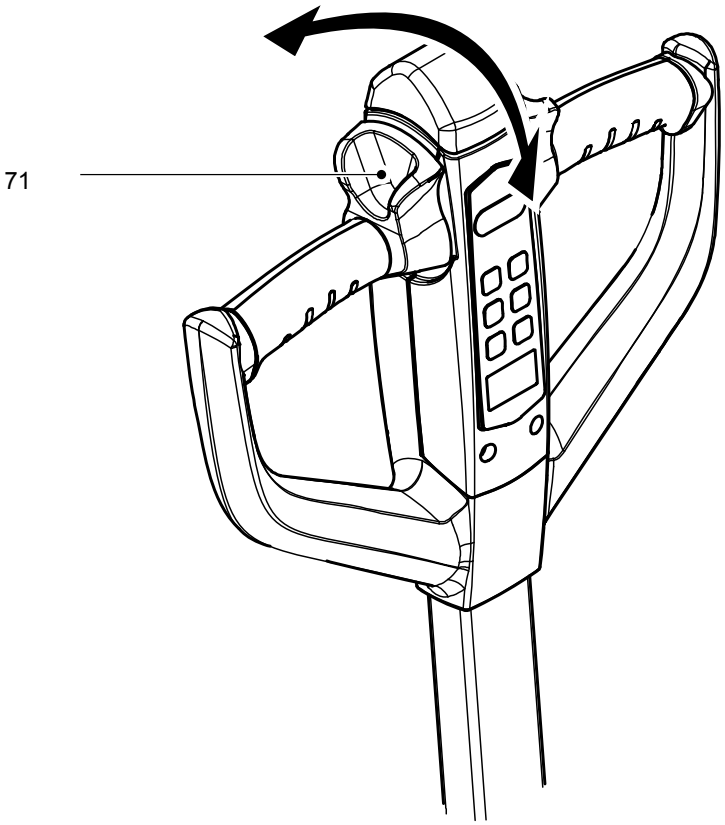
Changing direction during travel causes the truck to decelerate sharply. When the truck changes direction, it can start travelling at high speed in the opposite direction unless the travel switch is released in time.

▶ 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.



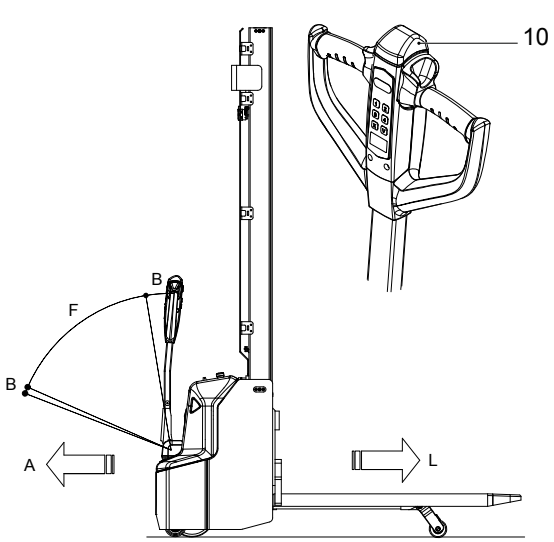
Changing direction during travel

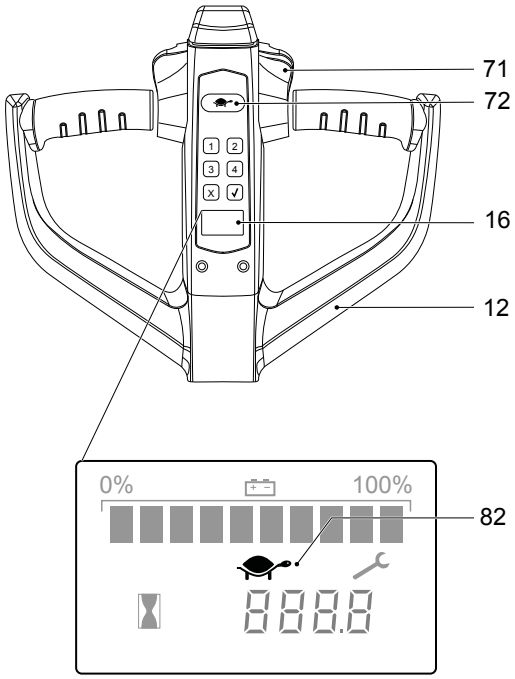
Procedure

- Set the travel switch (71) to the opposite direction while travelling.

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

4.6 Slow travel





Operating the truck at slow speed

Requirements

– Truck prepared for operation – see page 69.

Procedure

- Slow travel with tiller (12) in travel zone "F":
  - Press the "slow travel" button (72).
  - Actuate the travel switch (71) in the desired direction.
  - Press the "slow travel" button again to resume travelling at normal speed.
- Slow travel with tiller (12) in vertical position in confined spaces:
  - Do not actuate the travel switch.
  - Hold down the "slow travel" button (72) for at least 2 seconds.

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

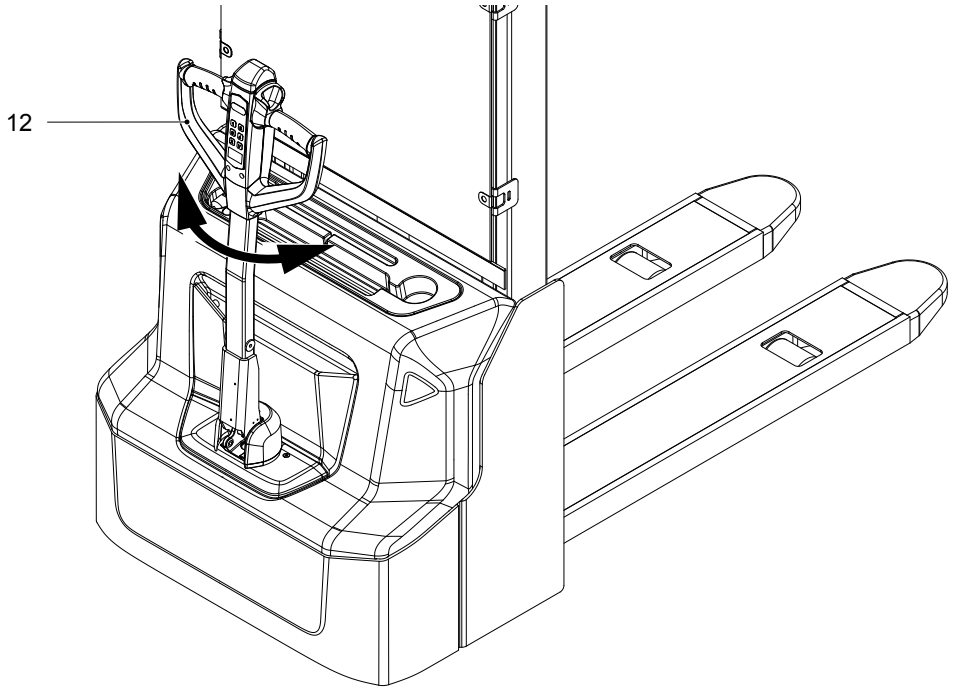
- Actuate the travel switch (71) in the desired direction.

➔ 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 (16) by the tortoise symbol (82).

4.7 Steering



Procedure

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

The truck is steered in the required direction.

4.8 Load handler raise/lower

⚠ 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.

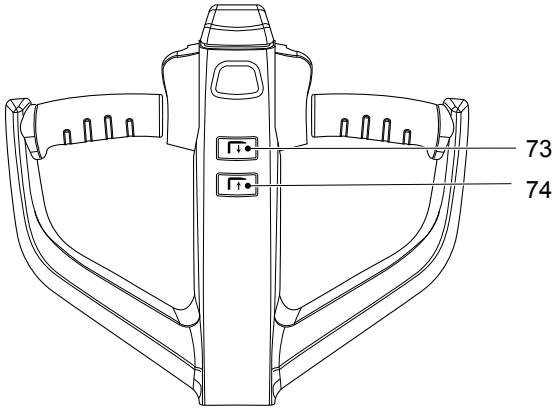
NOTICE

Adapt a slower speed when stacking and retrieving.

4.8.1 Raising the load handler

Requirements

– Truck operational, see page 69.



Raising the load handler

- Actuate the "load handler raise" button (73) until you reach the desired lift height.

The load handler is raised.

4.8.2 Lowering the load handler

Requirements

– Truck is ready for operation – see page 69.

Procedure

- Press the "load handler lower" button (74) until you reach the desired lift height.

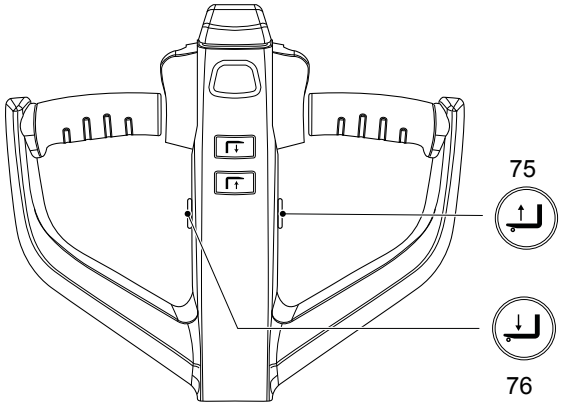
The load handler is lowered.

4.8.3 Raising the wheel arms

PSE 1.2 Li-Ion (z)

Requirements

– Truck operational, see page 69.



Procedure

- Press the “support arm raise” button (75) until you reach the desired support arm lift.

The support arms are raised.

4.8.4 Lowering the wheel arms

PSE 1.2 Li-Ion (z)

Requirements

– Truck operational, see page 69.

Procedure

- Press the “support arm lower” button (76) until you reach the desired support arm lift.

The support arms are lowered.

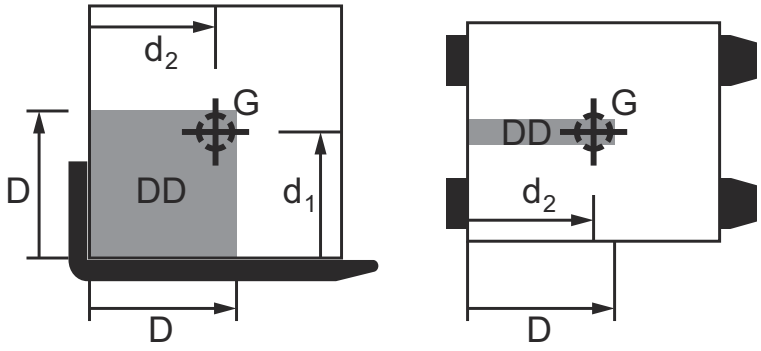
4.9 Lifting, transporting and depositing loads

⚠ 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.



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.

⚠ WARNING!

Unsecured and incorrectly positioned loads can cause accidents

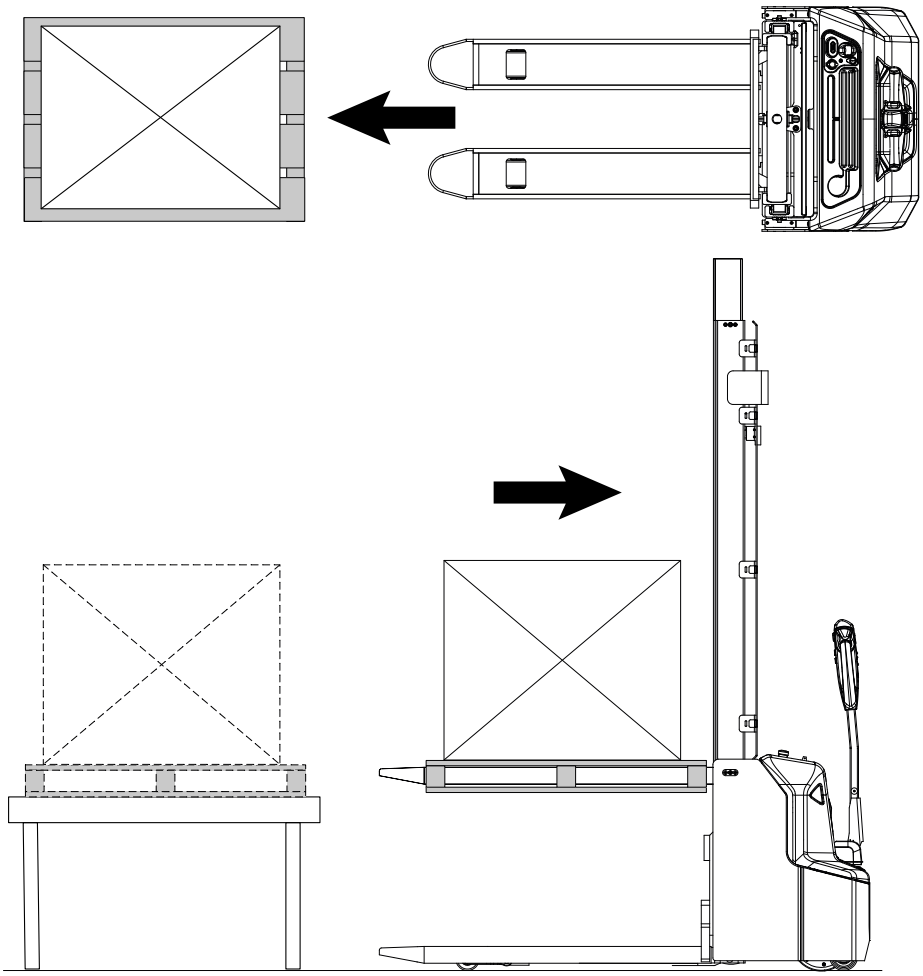
Before lifting a load, the operator must make sure that it has been correctly palletised and does not exceed the truck's capacity.

- ▶ 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.

4.9.1 Raising a load



Requirements

– Load correctly palletised.
– Load weight matches the truck's capacity.
– Load handler evenly loaded for heavy loads.

Procedure

• Drive the truck carefully up to the load.
• Slowly insert the load handler into the load until the load is resting against the back of the load handler.

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

• Raise the load handler until you reach the desired lift height (see page 85).

The load is raised.

NOTICE

Risk of material damage to the hydraulic unit.

When the mechanical stops of the load handler have been reached, release the "load handler raise" button. Otherwise, the hydraulic unit may suffer material damage.

Lifting two palletised loads on top of each other see page 88.

4.9.2 Transporting a load

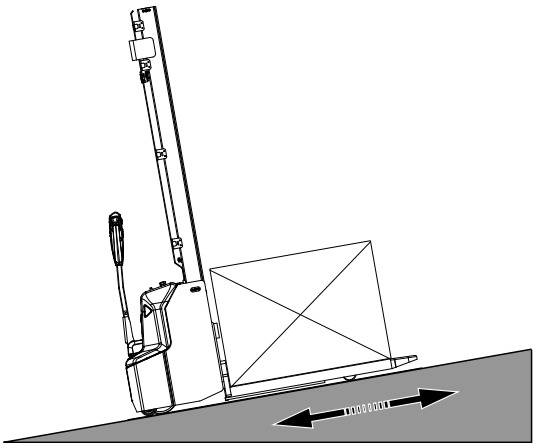
Requirements

– 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 handler lowered as far as possible but without touching the lower load – see page 89.
– Faultless ground conditions.

Procedure

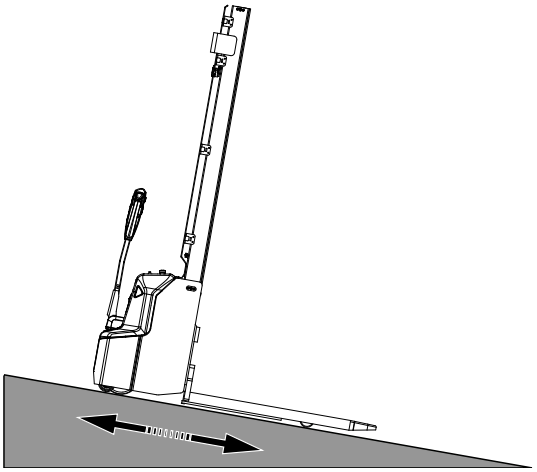
- Accelerate and decelerate with care.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Travel at a constant speed.
- Be prepared to brake at all times.
  - Brake gently in normal circumstances.
  - Only stop abruptly in hazardous situations.
- Watch out for other traffic at crossings and passageways.
- You must use a lookout at blind spots.
- Do not travel across or at an angle on inclines.
- Observe the information on travelling on slopes and inclines – see page 71.

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.

4.9.3 Depositing a 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.
- Lower the load handler so that the load handler is clear of the load (see page 81).
- Carefully remove the load handler from the pallet.

The load is deposited.

Depositing two palletised loads on top of each other see page 90.

4.9.4 Lifting two palletised loads

⚠ 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.

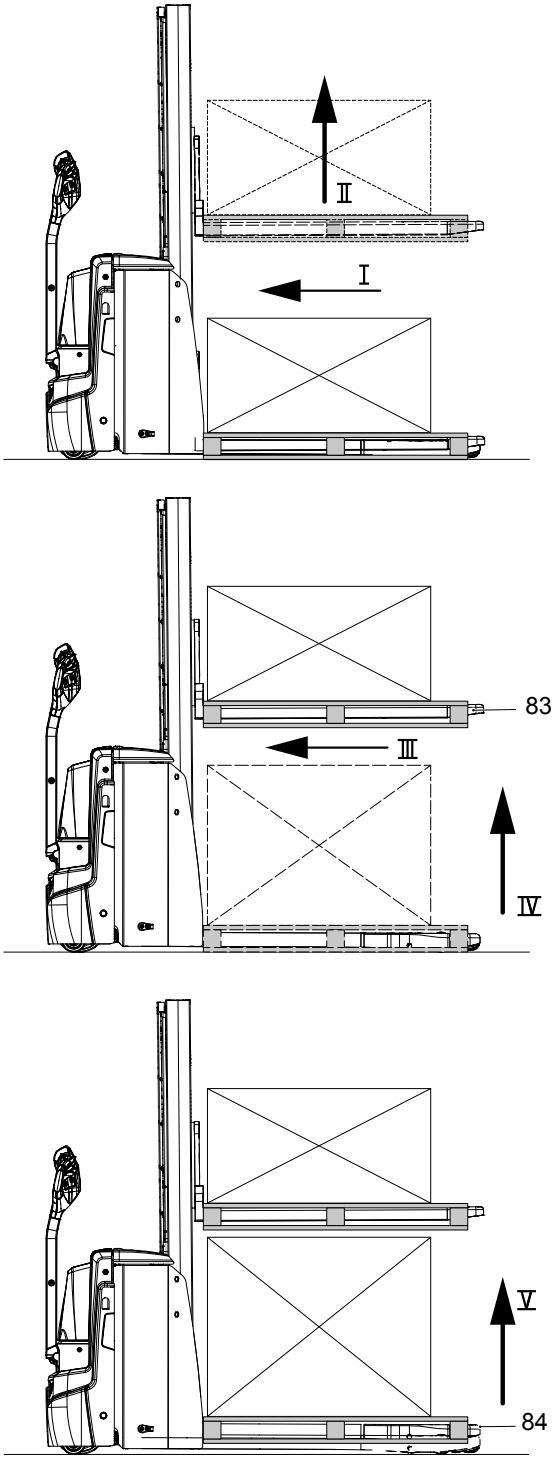
Requirements

– Load is correctly palletised.
– Capacity of the truck is sufficient for the load, see page 30.
– Load handler evenly loaded for heavy loads.

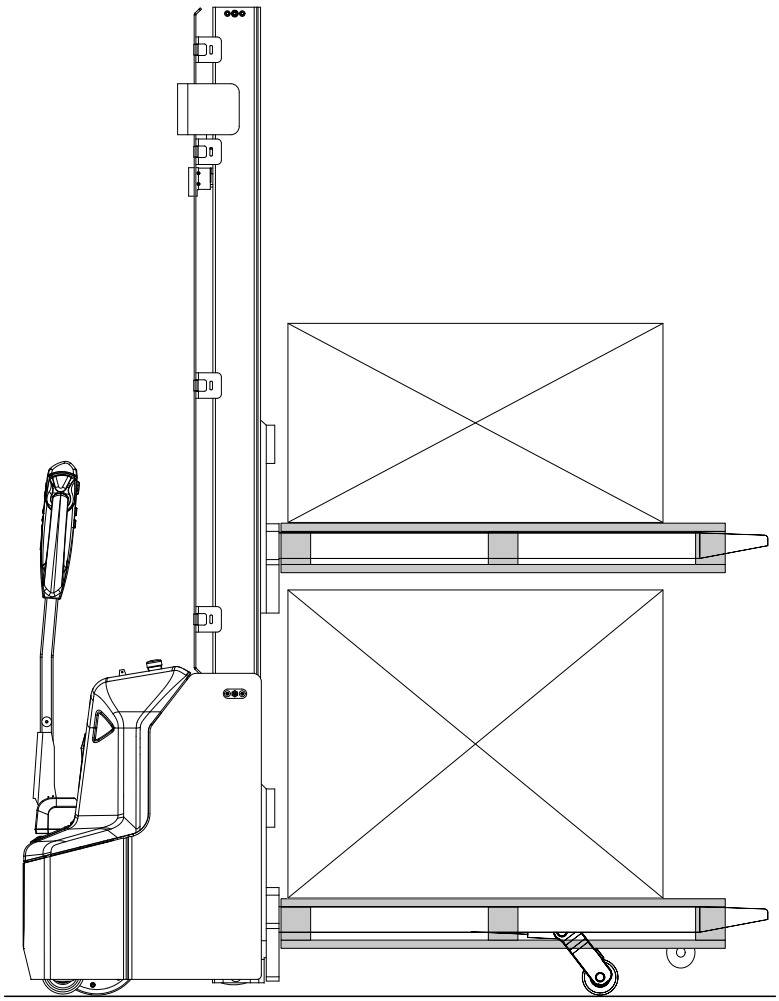
Procedure

- Drive the truck carefully up to the pallet.
- Insert the load fork (83) 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 81.
- Drive into the second pallet with the support arms (84).
- Raise the support arms – see page 82.
- Lower the load forks as far as possible without the load coming into contact with the support arms.

Both pallets are raised.



4.9.5 Transporting two palletised loads above each other



⚠ 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 71.

4.9.6 Lowering two palletised loads in turn

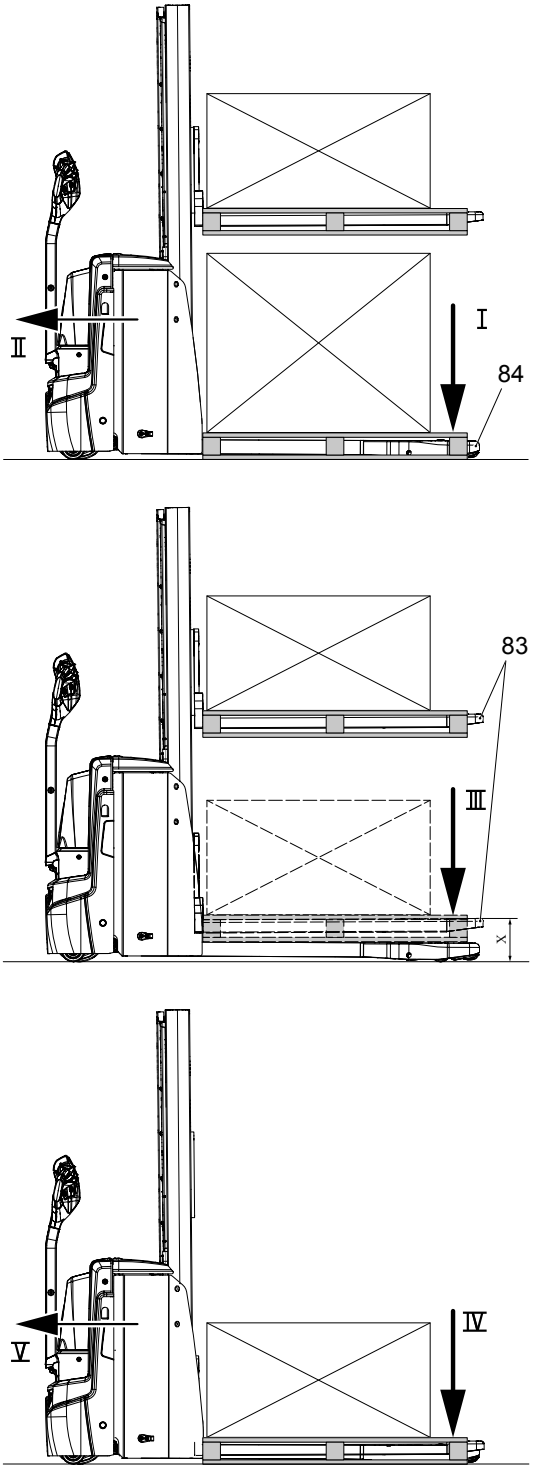
Requirements

– Storage location is suitable for storing the load.

Procedure

- Drive the truck carefully up to the first storage location.
- Lower the support arms (84) until the load is resting.
- Carefully withdraw the truck from the pallet.
- Lower the load fork (83) 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 86.
- Carefully withdraw the truck from the pallet.

Both pallets have been set down.



4.9.7 Use as a Lift 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 70.

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.

4.10 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 70) 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 57.
Fuse is defective.	Check the fuse and replace if necessary – see page 115.
Hydraulic oil level is too low.	Check the hydraulic oil level and top up if necessary – see page 114.
Leak in hydraulic system.	Contact the manufacturer's customer service department.
Lifting stops at a lift height of approx. 1800 mm	PSE 1.2 Li-Ion (z) only: The support arms are raised. Lower the support arms – see page 82.
	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 114.

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 52.
Battery is not connected correctly.	Check that the battery is correctly attached and locked in place and adjust if necessary – see page 60.
Fuses faulty.	Check the fuses and replace if necessary – see page 115.
Battery charge status is too low.	Charge the battery – see page 57.
Emergency disconnect switch activated.	Release the emergency disconnect switch – see page 73.
Tiller in travel zone "F".	Move tiller to brake zone "B" – see page 76.

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 57.
The electromagnetic brake is activated.	Check the electromagnetic brake (see page 74) 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 70) 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.

4.11 Operating the truck without its own drive system

⚠ WARNING!

Accidental truck movement

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

▶Do not release the brake on slopes or inclines.

▶Do not park the truck with the brake released.

▶Apply the brake again when you reach your destination.

Recovering the truck

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

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

Requirements

– Truck cannot be moved with its own drive system.
– The emergency disconnect switch is actuated, see page 73.
– Working area is 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

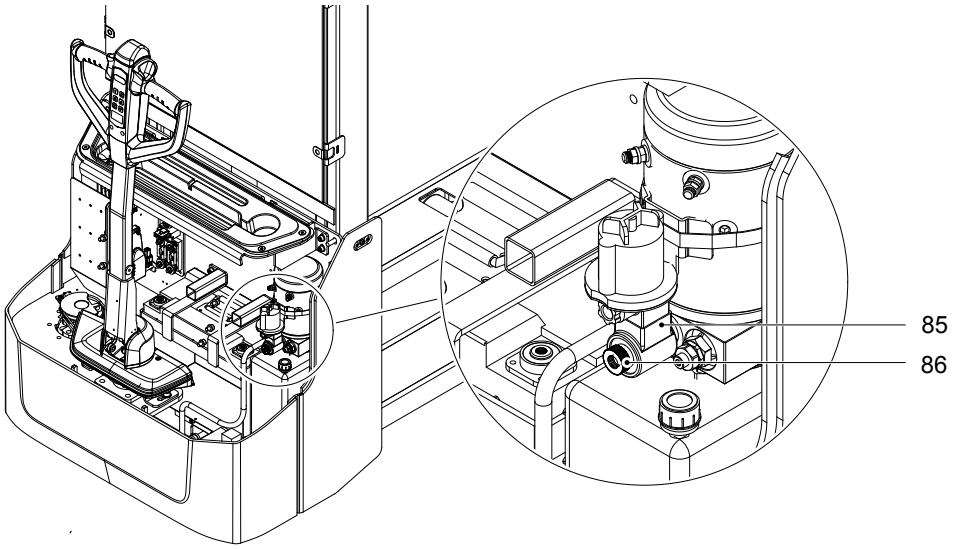
Truck has been recovered.

4.12 Load handler emergency lowering

⚠ 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.
– The truck is parked securely – see page 70.
– The front panel has been disassembled – see page 110.

Tools and Material Required

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

Procedure

• Loosen the yellow screw (86) on the valve (85).

The load handler is lowered.

→ Once the load handler has been lowered, screw the valve screw (86) 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 119).

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 97).

⚠ 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 116).

3 Maintenance Safety Regulations

Maintenance and repair personnel

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

Truck maintenance, repair work and changing of parts requiring replacement must only be carried out by specialist personnel. The activities to be carried out are divided into the following target groups.

Customer Services

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

Operating company

The maintenance 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 97.

3.1 Working on the electrical system

⚠ WARNING!

Electrical current can cause accidents

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

- ▶ Only suitably trained electricians may operate on the truck's electrical system.
- ▶ Before working on the electrical system, take all precautionary measures to avoid electric shocks.
- ▶ Park the truck securely (see page 70).
- ▶ Disconnect the battery, see page 60.
- ▶ Remove any rings, metal wristbands etc.

3.2 Consumables and used parts

⚠ CAUTION!

Consumables and used parts are an environmental hazard

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

- ▶ Note the safety regulations when handling these materials.

3.3 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 97.

3.4 Hydraulic system

⚠ WARNING!

Leaky hydraulic systems can result in accidents

Hydraulic oil can escape from leaky and faulty hydraulic systems.

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

⚠ 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.

3.5 Energy saving components

⚠ CAUTION!

Risk of accidents due to energy saving components

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

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

3.6 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.

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.

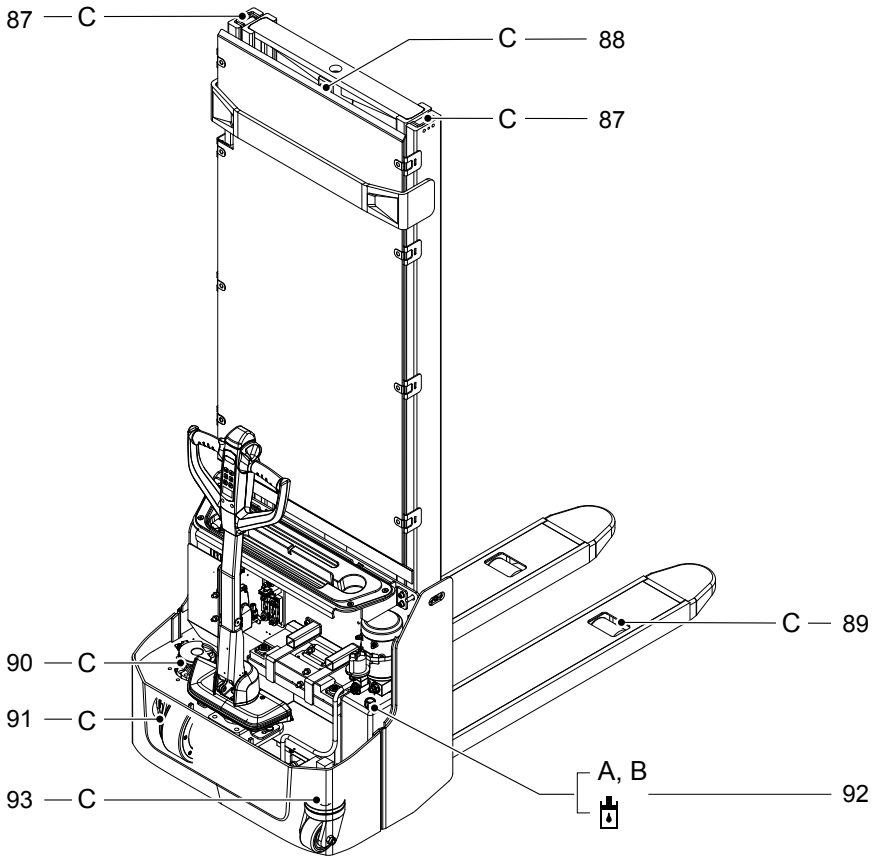
⚠ CAUTION!

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
87	Mast (⬇)	91	Transmission (⬇)
88	Chain (⬇)	92	Filler plug for hydraulic oil (⛽)
89	Load wheel bearing (⬇)	93	Support wheel bearing (⬇)
90	Steering bearing (⬇)		

Lubricate the truck according to the lubrication schedule

Requirements

– The truck is parked securely, see page 70.
– Truck is prepared for maintenance and repair work, see page 107.
– Maintenance interval has been reached, see page 119.

Tools and Material Required

– Lubricants according to lubrication schedule, see page 106

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 114.
- Start up the truck, see page 68.

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 repairs

Procedure

- Unload the truck.
- Park the truck securely, see page 70.
- Disconnect the battery, see page 60

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

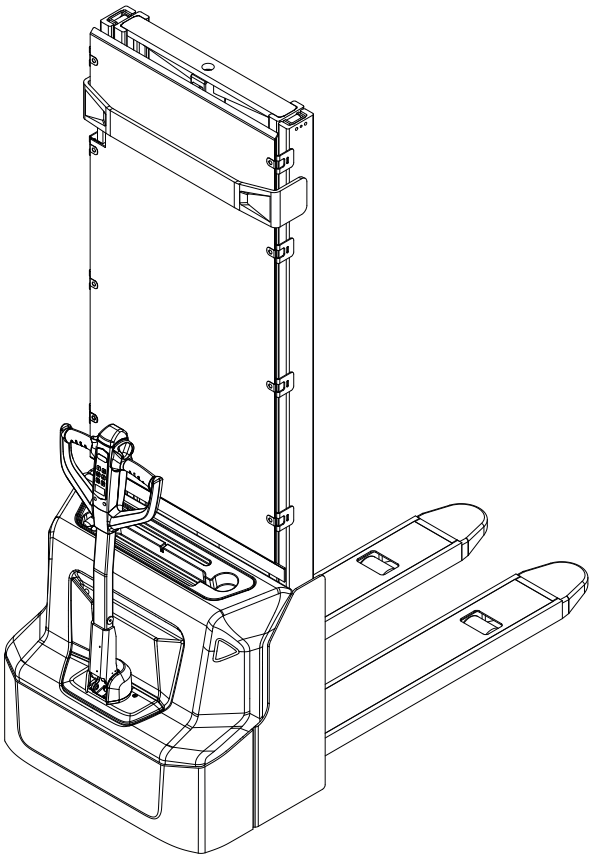
In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose.

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 107).

Tools and Material Required

– Jack
– Hard wooden blocks

Procedure

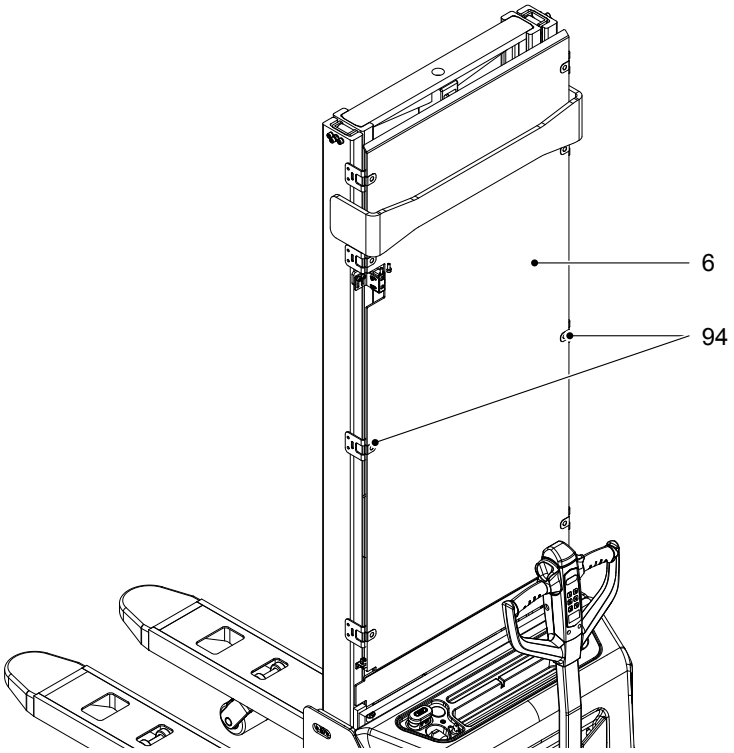
• Place the jack against the contact point.

➔ 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/assembling the safety devices



Disassembling the protective screen panel

Requirements

– The truck is parked securely, see page 70

Procedure

- Remove the retaining clips (94) 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.

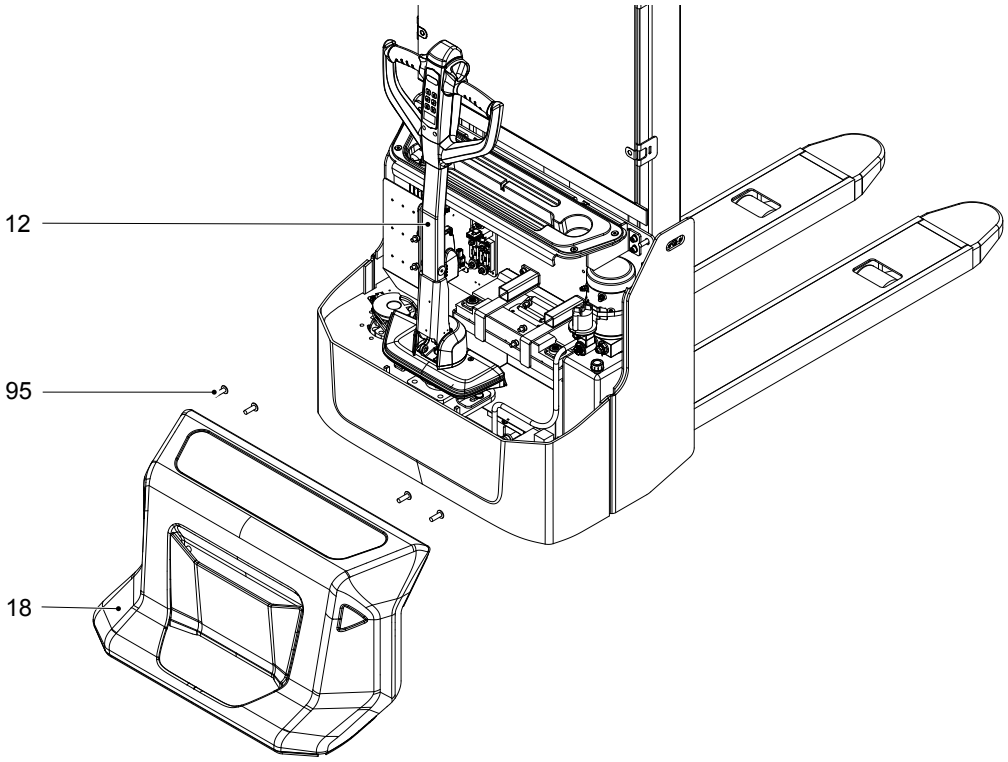
Assembling the protective screen panel

Procedure

- Insert the protective screen panel (6).
- Secure the protective screen panel with retaining clips (94).

The protective screen panel has been assembled.

5.4 Front panel disassembly and assembly



Front panel disassembly

Requirements

– Truck is prepared for maintenance and repair work, see page 107.

Tools and Material Required

– Allen key, size 6 mm

Procedure

- Remove the screw connections (95) from the front panel (18).
- Release the front panel from the connection, tip slightly and turn to remove over the tiller (12).
- Place the front panel (18) safely to one side.

The front cover has been removed.

Front panel assembly

Tools and Material Required

– Allen key, size 6 mm

Procedure

- Guide the front panel (18) over the tiller (12), insert into the lower guides and engage in the top section.
- Fit the screw connections (95) 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 107).

Tools and Material Required

– Water-based solvents
– Sponge or cloth

Procedure

- Clean the surface of the truck with water-based solvents and water. Use a sponge or cloth to clean.
- In particular, clean the following areas:
  - Window(s)
  - Oil filler ports and their surroundings
  - Grease nipples (before lubrication)
- Dry the truck after cleaning, e.g. with compressed air or a dry cloth.
- Carry out all the tasks in the section "Recommissioning the truck after cleaning or maintenance work" (see page 116).

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 107.

Tools and Material Required

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

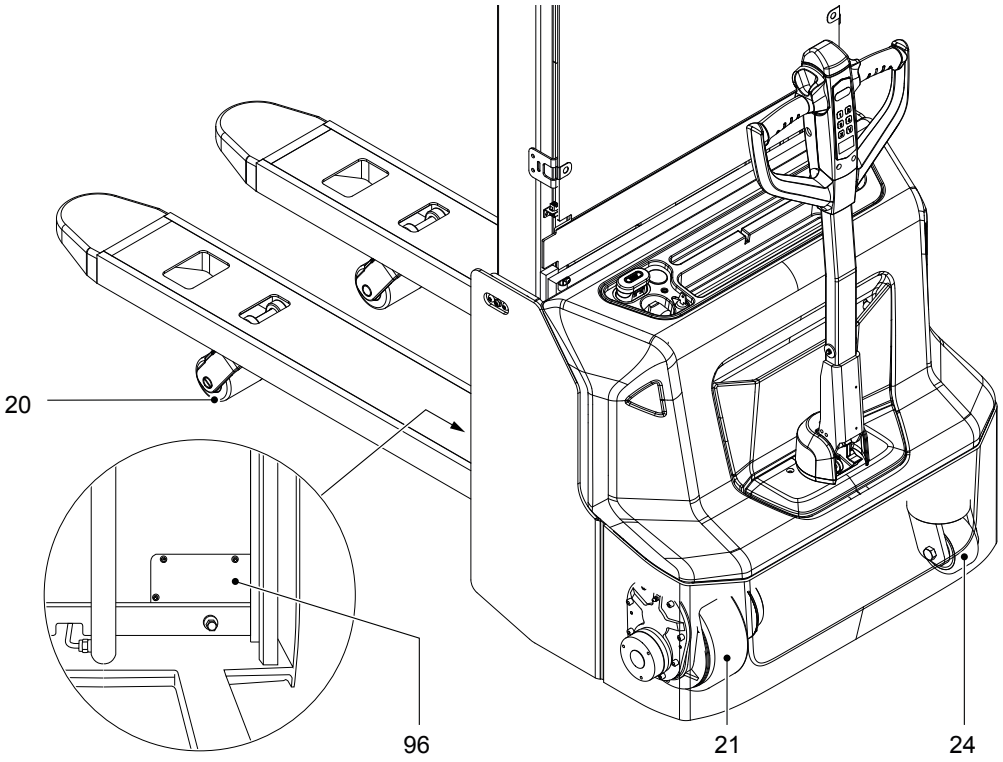
Procedure

- Expose the electrical system – see page 110.
- 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 110.
- Carry out all the tasks listed in the section "Recommissioning the truck after cleaning or maintenance work" – see page 116.

The electrical-system assemblies are now clean.

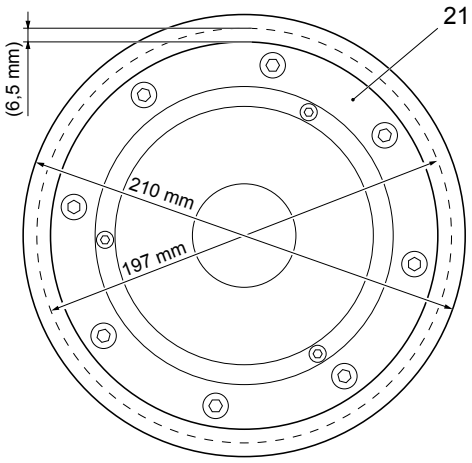
5.6 Checking the drive wheel and load wheels

➔ Wheels must only be replaced by authorised service personnel.



Procedure

- Park the truck on a level surface.
- Jack up the truck – see page 107.
- Raise the lift carriage approx. 1 m to expose the inspection cover.
- Secure the load carriage against inadvertent lowering.
- Remove the inspection cover (96).
- Check the drive wheel (21) for wear, damage and freedom of movement.



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

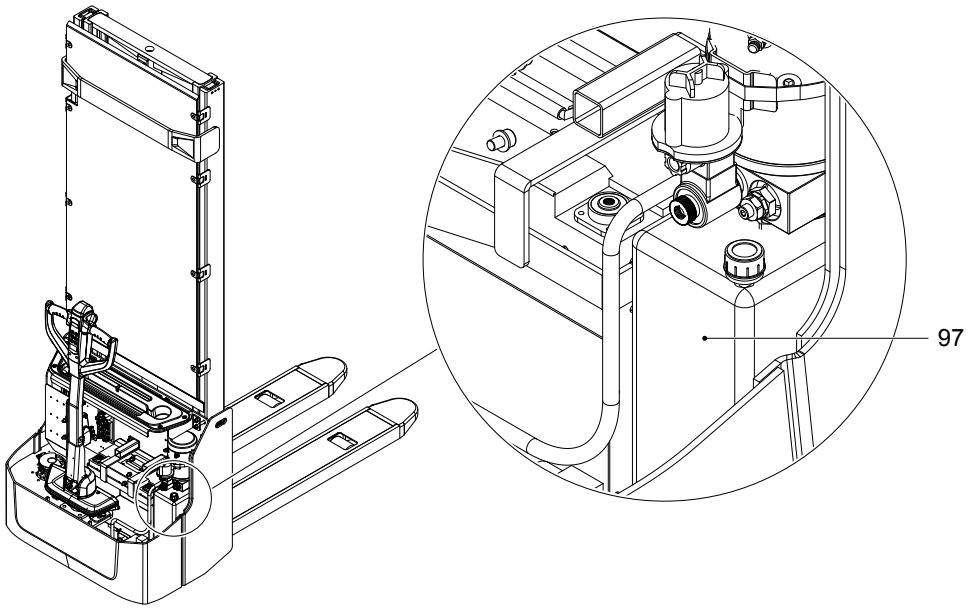
➔ The drive wheel must be replaced when it has reached a diameter of 197 mm or a residual thickness of 6.5 mm.

- Fit the inspection cover (96).
- Check the load wheels (20) and support wheel (24) 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



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

– Lower the load handler.
– Prepare the truck for maintenance and repairs, see page 107.

Procedure

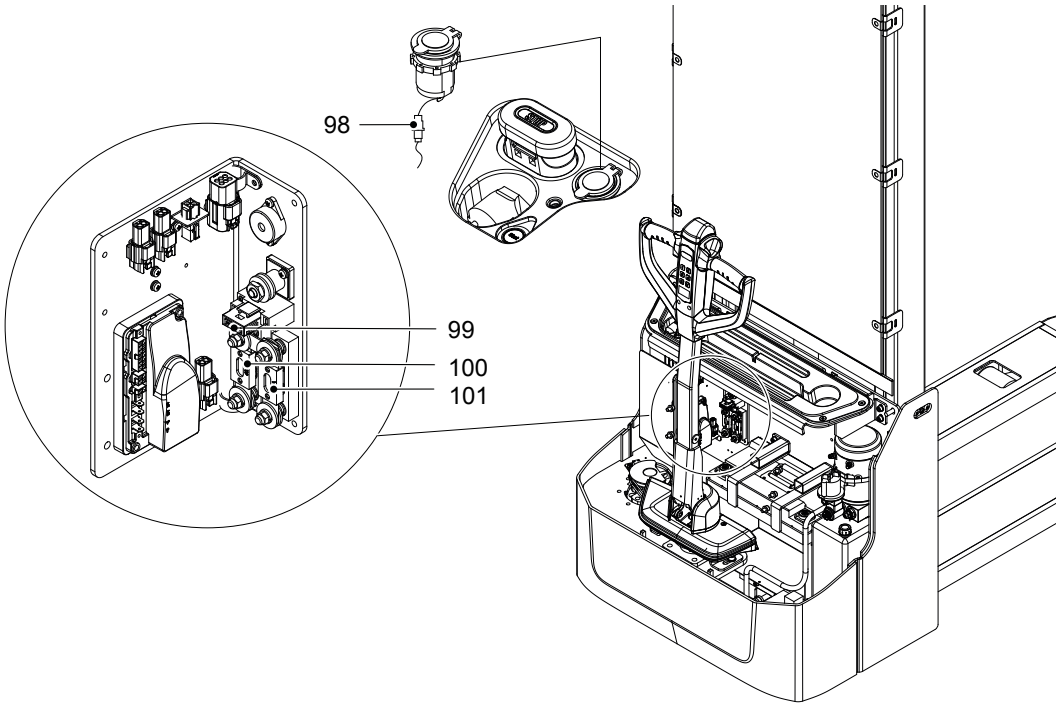
• Disassemble the front panel, see page 110.
• Check the oil level in the hydraulic reservoir (97).

➔ 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 106.

The oil level has now been checked.

5.8 Checking electrical fuses



Item	Description	Rating	Item	Description	Rating
98	FU 2	1.5 A	100	FU 02	60 A
99	FU 1	10 A	101	FU 01	150 A

Checking fuses

Requirements

– Truck prepared for maintenance and repair work, see page 107.
– Front panel removed, see page 110.

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 111.
- Lubricate the truck according to the lubrication diagram, see page 105.
- Charge the battery, see page 57.
- Start up the truck, see page 68.

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 107.

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

5.10.1 Prior to decommissioning

Procedure

- Park the truck securely, see page 70.
- Clean the truck, see page 111.
- Check the hydraulic oil level and replenish if necessary, see page 114.
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck according to the lubrication diagram, see page 105.
- Charge the battery, see page 57.
- Drive the truck to the storage location and jack it up, see page 107.
- Remove the battery, see page 117.
- Check the battery charge at regular intervals, see page 117.

→ 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 Action to be taken 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 57.

5.10.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck, see page 111.
- Lubricate the truck according to the lubrication diagram, see page 105.
- Charge the battery, see page 57.
- Start up the truck, see page 68.

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 PSE 1.2

Issued on: 2021-08-12 08:00

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 PSE 1.2 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.
Carry out a frame leakage test.

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