Let's grow together

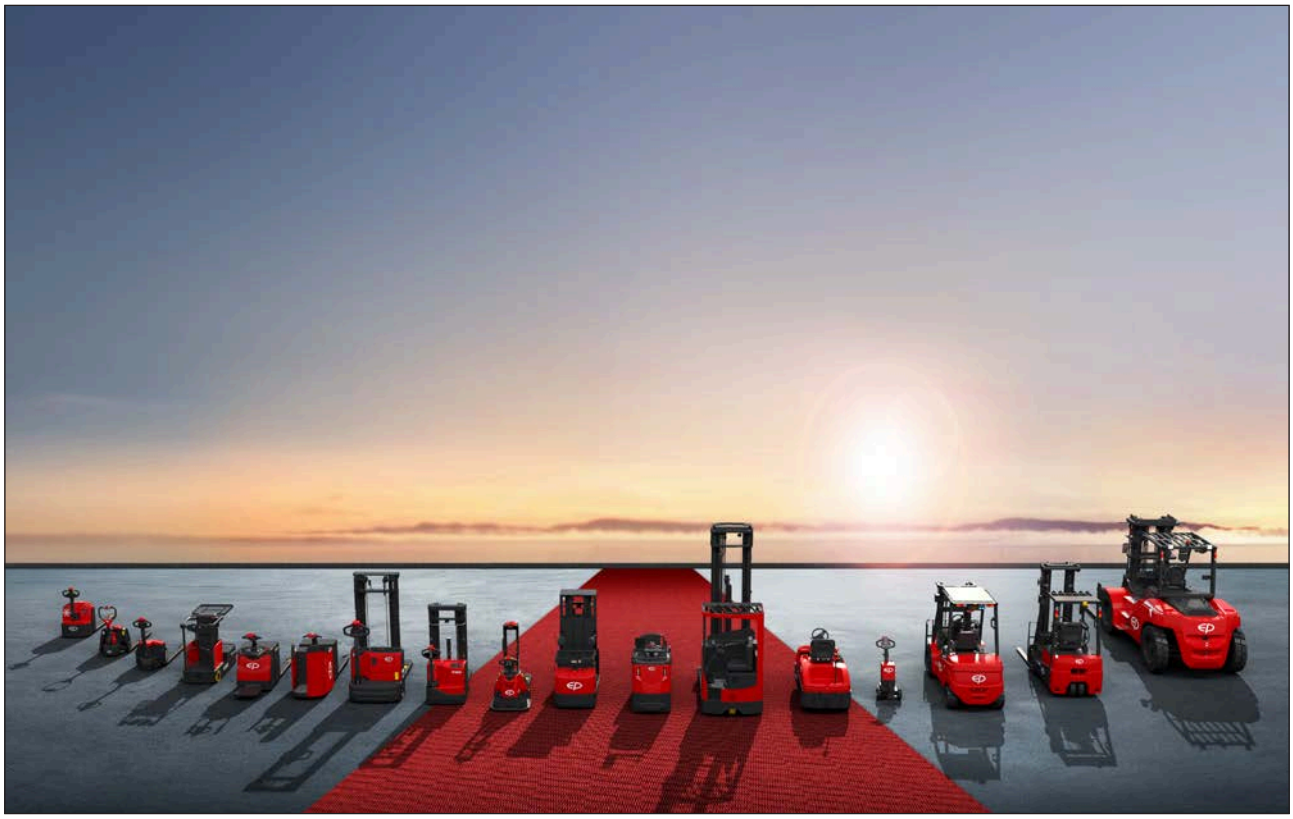
EFL803-HV
EFL903-HV
EFL1003-HV
Electric Forklift Truck

Operation Manual

Original Instruction

V3 12/2024

EP-Your Partner



EP EQUIPMENT CO.,LTD. is one of the world's leading companies manufacture, which design material handling equipment and provide related service. With over 100,000 square meters plant it produces over 100,000 trucks per year, and provides professional, effective and optimized material handling solutions worldwide, until now it has developed three major kinds of business:

- Material handling equipment: Focus on electric truck and warehouse equipment
- OEM parts: Global parts supply
- Imow industry, online: One-stop industrial products supply

Guided by our customer-oriented concept, EP has developed service centers in more than 30 countries around the world, from which customers are able to receive timely local service. Moreover, 95% of warranty parts can be shipped out within 24 hours after been ordered. Through our online after-sales service system, customers can process their warranty claims, order spare parts and consult the operation manuals, maintenance materials and spare parts catalogs.

With business all over the world, EP has thousands of employees and hundreds of agents worldwide to provide our global customers with prompt local service.

Based on the concept of sharing economy, EP also offer rental service for various logistics equipment. Adhering to the idea "Making the leasing of logistic equipment more simple", EP is devoted to providing customized one-stop leasing solutions for our customers with our high quality, reasonable price and prompt rental service.

EP's mission & vision is " Let more people apply the electrical material handling equipment to relieve the intensity of labour" and "Let's grow together".

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Foreword

This operation manual provides instructions to ensure the safe operation of the industrial truck. The instructions are clear and concise.

Our trucks are continuously being developed. EP Equipment reserves the right to make changes to the design, equipment, and technical specifications of the system. This operation manual does not provide guarantees for specific features of the truck.

➢ Safety notices and text mark-ups

Safety instructions and important explanations are indicated by the following graphics:

⚠ DANGER

Means that failure to comply can cause risk to life and/or major damage to property.

⚠ WARNING

Please strictly adhere to these safety instructions to avoid personal injury or major damage to equipment.

⚠ CAUTION

Please pay attention to the important safety instructions.

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i NOTE

Pay attention to Instruction.

2024.12 03rd EDITION

➢ Internet address and QR code of Parts manual

By entering the address http://www.ep-care.com in a web browser or by scanning the QR code, Login after registration, Select "Parts purchase" function and input part number or model name to find the truck.

NOTE: After registration, please send email to info@ ep-care.com to activate your account.

0000-00359OM

➢ Conformity marking

The manufacturer uses the conformity marking to document the conformity of the industrial truck with the relevant directives at the time of placing on the market:

- CE: in the European Union (EU)
- UKCA: in the United Kingdom (UK)

The conformity marking is applied to the nameplate. A declaration of conformity is issued for the EU and UK markets.

An unauthorised structural change or addition to the industrial truck can compromise safety, thus invalidating the declaration of conformity.

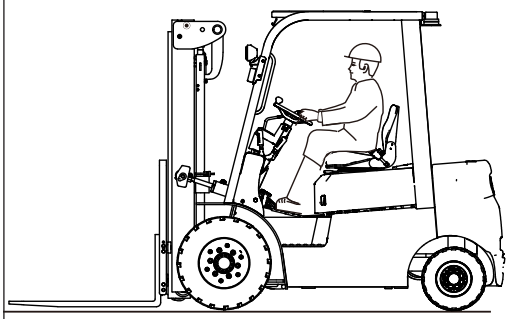
0000-00001-2OM

➢ Schematic views

View of functions and operations

This documentation explains the (usually sequential) chain of certain functions or operations. Schematic diagrams of a counterbalance truck are used to illustrate these procedures.

These schematic diagrams are not representative of the structural state of the documented truck. The diagrams are used solely for the purpose of clarifying procedures.



0000-00222OM

EC declaration of conformity

Declaration

EP EQUIPMENT CO., LTD.

Address: No.1 Xiaquan Village, Lingfeng Street, Anji, Huzhou, Zhejiang

We declare that the machine

Industrial truck type: corresponding to these this operation manual
Model: corresponding to these this operation manual
Serial No.: corresponding to these this operation manual

Fulfills all the relevant provisions of Directives
− "Machinery Directive 2006/42/EC" [1)]
− "EU directive 2014/30/EU" [1)]
− "Supply of Machinery Safety Regulations 2008(2008 No. 1597)" [2)]
− "Electromagnetic Compatibility Regulations 2016 (SI 2016 No.1091) [2)]

Personnel authorised to compile the technical documents:

See EC/EU Declaration of Conformity

EP EQUIPMENT CO., LTD.

1) For the markets of the European Union, the EU candidate countries, the EFTA States and Switzerland.
2) For the United Kingdom market.

The declaration shown explains the conformity with the provisions of the EC Machinery Directive 2006/42/EC and the Supply of Machinery Safety Regulation 2008, 2008 No. 1597. The declaration shown explains the conformity with the provisions of EU directive 2014/30/EU(Electromagnetic Compatibility - EMC) and Electromagnetic Compatibility Regulations 2016, SI 2016 No.1091.

An unauthorised structural change or addition to the industrial truck can compromise safety, thus invalidating the declaration of conformity.

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1 General

1.1 Introduction

This industrial truck is designed to lift and transport loads. You must follow the instructions in this manual when using, operating, and maintaining the truck. Any other use could cause personal injury or damage to equipment and property. Never overload the truck or load unbalanced goods. The maximum allowable load is shown on the truck's nameplate or load diagram label. All nameplates and safety signs on the truck should be cleaned regularly to maintain visibility. Lithium-ion battery trucks offer higher economic efficiency, safety and driving comfort than diesel trucks. High-voltage lithium-ion battery trucks are powerful and comparable to the performance of diesel trucks. Comparing to diesel trucks, lithium-ion battery trucks can save 30% – 50% of energy cost with lithium-ion technology. It also offers option of manufacturer's latest telematics and provides the following features to facilitate your management:

- truck location in real-time;
- reports of truck usages and diagnosis;
- Li-ion battery condition analytics;
- updates on card access registration.

⚠WARNING

High-voltage parts of the truck are very dangerous.

Before operating the truck, make sure that you have read and understood the contents of this manual, especially the safety information (See Page 55 Section "3 Safety").

1.1.1 Mounting attachments

The mounting or installation of any attachments which will interfere with, or supplement, the functions of the truck is permitted only after written approval by the manufacturer has been obtained. If necessary, the approval of local authorities has to be obtained. Any approval obtained from local authorities does not, however, make the approval by the manufacturer unnecessary.

1.1.2 Modification

Unauthorized modification to the truck can result in injury or death.

Do not remove, disable, or modify any safety or security devices. This includes all alarms, lights, mirrors, overhead guards and load backrest. An overhead guard, if present, is designed to protect the operator from falling objects, but cannot protect from all possible hazards.

Exception: Only in the event that the truck manufacturer is no longer in business and there is no successor in the interest to the business, may the user arrange for a modification or alteration to a powered industrial truck, provided, however, that the user

(a) arranges for the modification or alteration to be designed, tested and implemented by an engineer(s) expert in industrial trucks and their safety.

(b) maintains a permanent record of the design, test(s) and implementation of the modification or alteration.

(c) approves and makes appropriate changes to the capacity plate(s), decals, tags and instruction handbook.

(d) affixes a permanent and readily visible label to the truck stating the manner in which the truck has been modified or altered, together with the date of the modification or alteration and the

name and address of the organization that accomplished those tasks.

⚠WARNING

To ensure safe and reliable operation, use only the manufacturer's original spare parts.

1.1.3 Truck handover

To avoid the inconvenience of making a claim after use, check if the truck is in perfect condition, and confirm your satisfaction with the truck on the manufacturer's product qualification certificate upon handover.

1.1.4 Permissible operating conditions

- Used in specified area, such as factory, tourist attraction and recreation place.
- The truck's max operation altitude is up to 2000 m.
- The lowest environment temperature under normal outdoor conditions when operating: -20 °C.
- Average environment temperature under continuous operating condition: +25 °C.
- The highest environment temperature in a short term (≤1 h): +40 °C.
- The lowest environment temperature under normal indoor conditions when operating: +5 °C.
- If you must travel on a ramp, the gradients should be below A% at full load, or below B% without a load. (For the value of A and B, refer to the gradeability in Standard Version Specifications)

iNOTE

The working temperature of lithium-ion batteries is divided into charging and discharging temperatures:

- *Charging temperature range: 0 °C – 40 °C. High-rate charging below 0 °C may damage the battery. We recommend a charging temperature range of 5 °C – 40 °C.*
- *Discharging temperature range: -20 °C – 55 °C. At low temperatures (-20 °C – 0 °C), the battery discharge capacity will be lower than normal. Using the battery between 40 °C – 55 °C for a long time will accelerate the aging of the internal materials and shorten battery life.*
- *We recommend an optimal operating temperature range of 15 °C – 35 °C.*

⚠WARNING

Operating the truck under extreme conditions can result in malfunctions and accidents. Special equipment and authorization are required if the truck is to be used in extreme conditions, especially in dust-laden or corrosive environments. Operating in explosive atmospheres is Prohibited.

1.1.5 Intended uses

- The industrial truck is used for moving and lifting the loads. The weight of the loads shall conform to the value indicated on the load capacity plate.
- Damages and other defects of industrial trucks or attachments must be reported to the supervisor immediately. Industrial trucks and attachments must not be used until they have been properly repaired.

- Safety installations and switches must not be removed or rendered ineffective. Specified settings may only be changed with the approval of the manufacturer.
- Only the areas approved by the user or its representative can be used for transportation purposes. Loads can only be deposited or stored at the intended places.
- The slope on which the truck travels shall not exceed the manufacturer's limit, and shall be sufficiently rough.
- Danger points on driving lanes or routes shall be secured or marked by the customary road traffic signs and by additional warning signs, if necessary.
- Driving routes shall be sufficiently paved, level and free of debris.
- Drain channels and railways crossings, etc., shall be leveled and, if necessary, covered with ramps in such a way that they can be driven over without bumps as far as possible.
- The EU Directive 89/654/EEC (Minimum Regulations for Health and Safety for the workplace) shall be observed. The respective national regulations apply for non-EU countries.
- When driving on public roads, the corresponding regulations must be observed, as well as country-specific restrictions for winter road conditions.
- It is the responsibility of the user to take appropriate fire precautions around the truck.
- Industrial trucks may only be used for towing trailers if they are specifically designed for this purpose by the manufacturer. The maximum towing load specified in the operator’s manual must not be exceeded. When a truck is used for towing operations, it must ensure the driving and braking safety of the truck being towed.
- Follow safety instructions (See Page 55 Section "3.1 Safety Instructions").

1.1.6 Impermissible uses

The user or operator, not the manufacturer, is liable if the truck is used in a manner that is not permitted. The following list is exemplary and not exhaustive.

- Do not stack loads or turn when driving on a ramp.
- Do not drive sideways or diagonally on slopes.
- Do not transport loads facing downhill.
- Never park the truck where fire extinguishers, fire escapes, or aisles may be obstructed.
- Do not leave the truck unattended when the load is raised.
- Do not stand on the fork arms when lifting.
- Do not increase the truck's load capacity, e.g. by attaching an additional weight.
- Do not use the truck for personnel transportation.

1.2 Definition of responsible persons

1.2.1 Operator

This truck may only be driven by an adult operator. The operator must have been trained in driving, have demonstrated their skills in driving and handling loads to the user or an authorized representative, and have been specifically instructed to drive the truck. Specific knowledge of the truck to be operated is also required.

1.2.2 User

A user is a natural person or legal entity responsible for the truck. The user may operate the truck themselves or delegate the task of operating the truck to someone else (e.g., a driver/operator). In specific circumstances, such as leasing, responsibility will be borne by the user according to the effective contract between the owner of the truck and the personnel operating the truck.

1.2.3 Specialist

A qualified person is defined as a service engineer or a person who fulfills the following requirements:

- A completed vocational qualification that demonstrably proves their professional expertise. This proof should consist of a vocational qualification or a similar document.
- Professional experience indicating that the qualified person has gained practical experience of industrial trucks over a proven period during their career During this time, this person has become familiar with a wide range of symptoms that require checks to be carried out, such as based on the results of a hazard assessment or a daily inspection
- Recent professional involvement in the field of the industrial truck test in question and an appropriate further qualification are essential. The qualified person must have experience of carrying out the test in question or similar tests.

  Moreover, this person must be aware of the latest technological developments regarding the industrial truck to be tested and the risk being assessed.

1.2.4 Operator's rights, responsibilities and rules of conduct

Everyone operating the truck has read and understood this manual and has been approved in the relevant truck operator training. Operate the truck in a safe manner to avoid endangering the lives and health of the operator and/or others. Adhere to all warnings and instructions in this manual. This manual is available for use by drivers/operators.

1.2.5 User's rights, responsibilities and rules of conduct

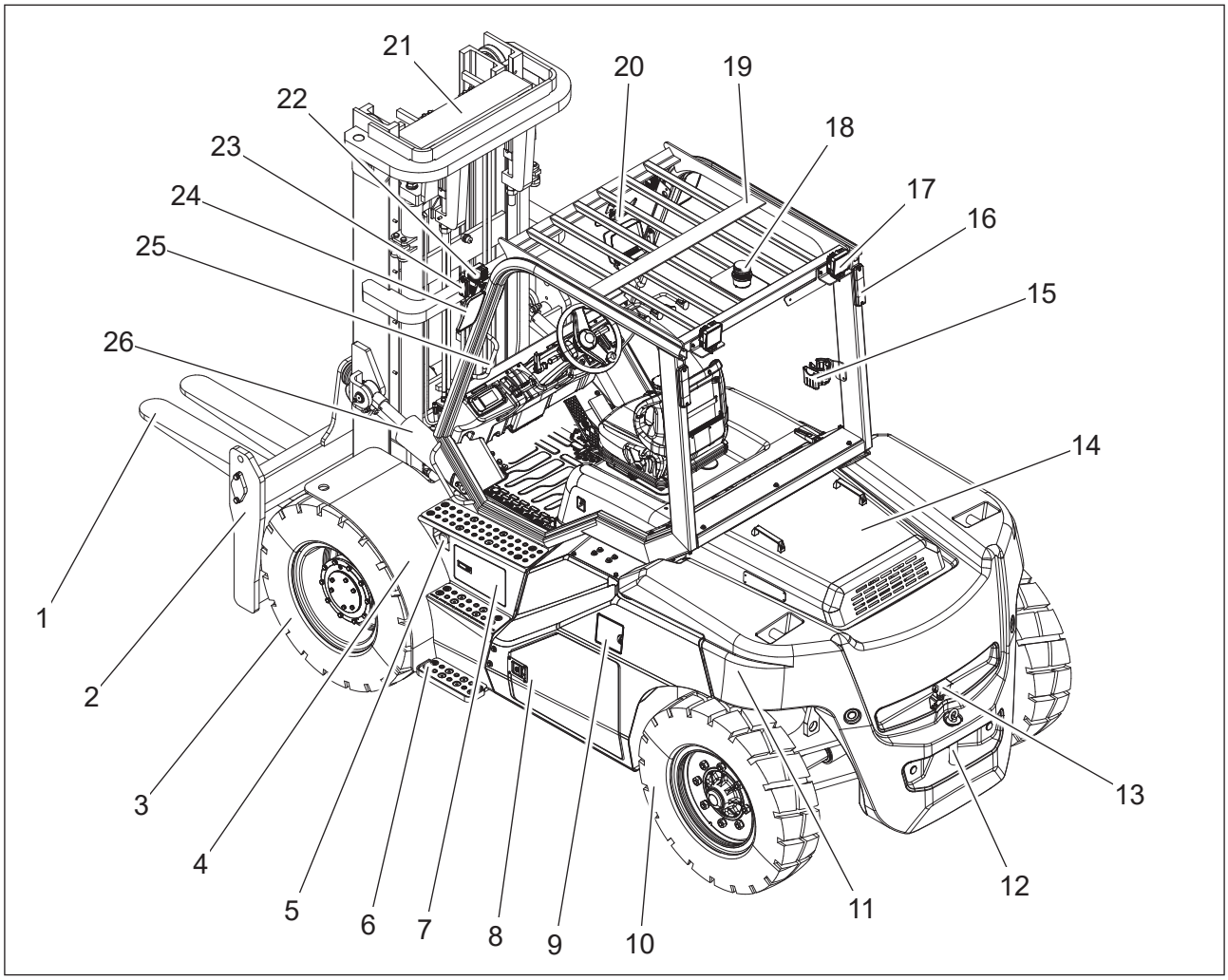
For the purposes of the present operating instructions, the operating company is defined as any natural or legal person who either uses the truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting). the operating company is considered to be the person who is to carry out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

The operating company must ensure that the truck is used only for its intended purpose and that dangers to the health and safety of the operator and third parties are prevented. Further more, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The operating company must ensure that all operator have read and understood these operating instructions.

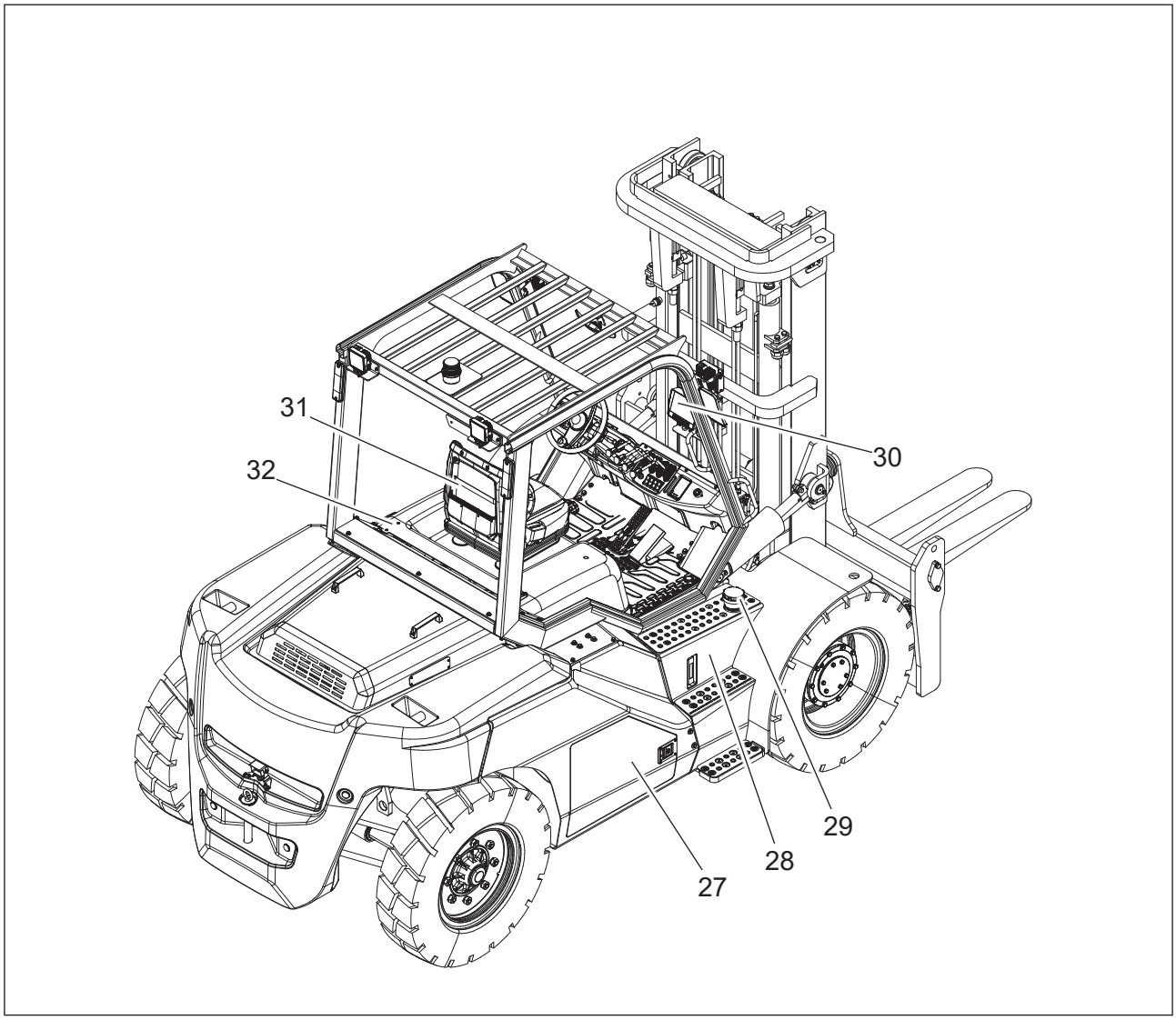
2 Truck description

2.1 Truck overview

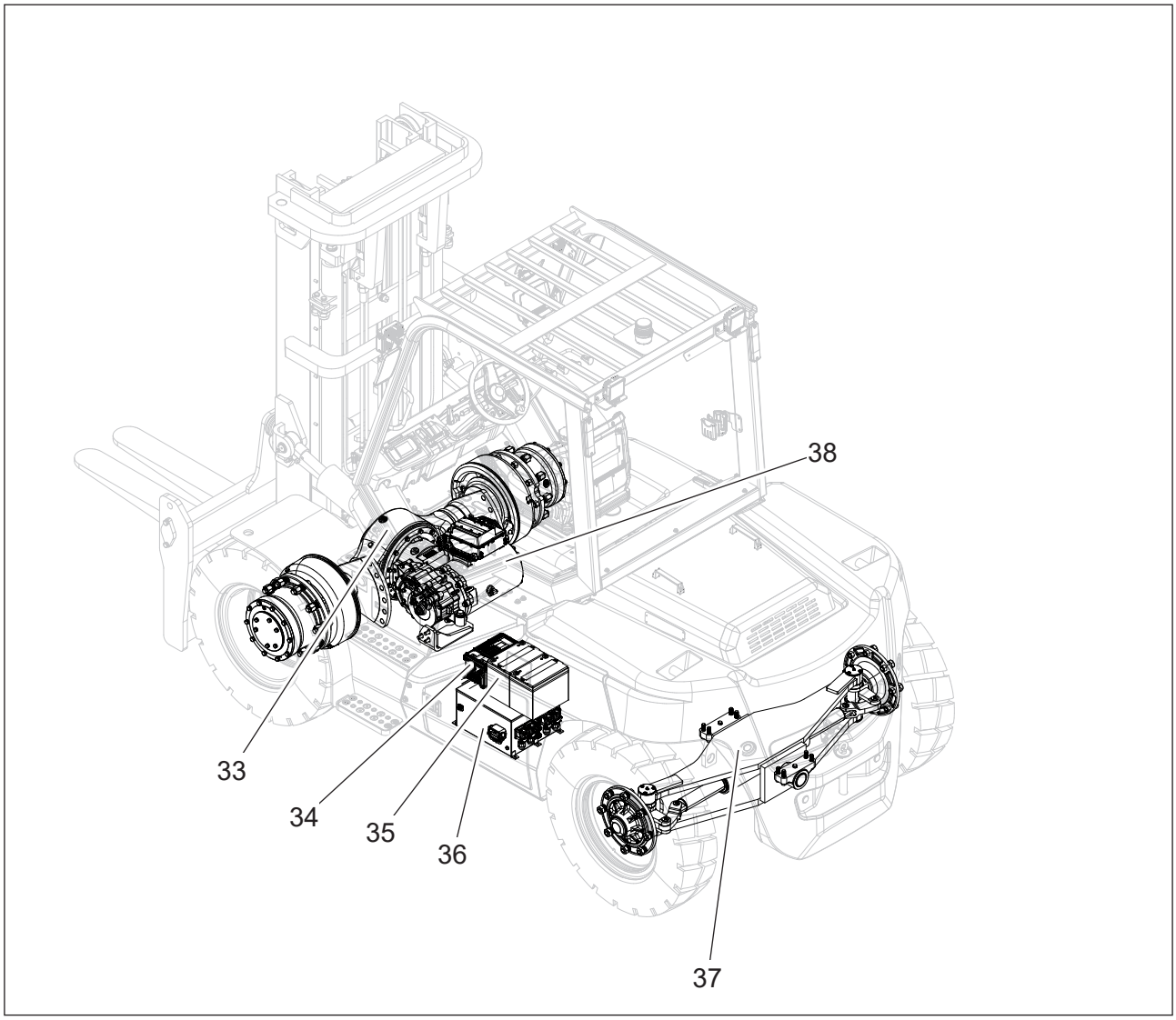
2.1.1 Truck component description



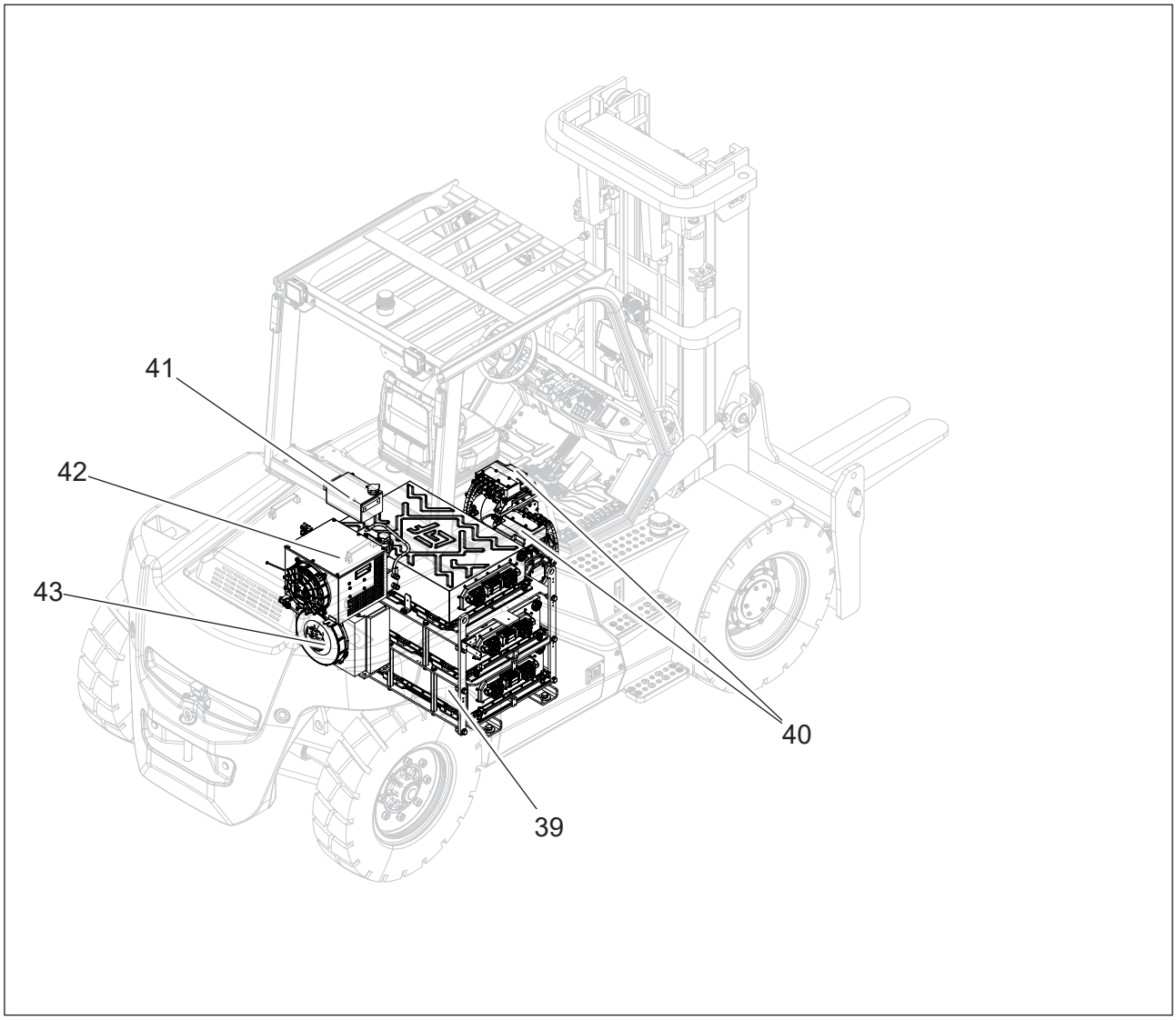
1	Fork arm	14	Hood A
2	Fork carriage	15	Cup holder
3	Front wheels (Drive wheels)	16	Rear combination lights
4	Fenders	17	Rear work lights
5	Main power switch	18	Warning light
6	Safety steps	19	Overhead guard
7	Electrical cabinet A	20	Rearview mirror A
8	Electrical cabinet B	21	Mast
9	Charging port	22	Front work lights
10	Rear wheels (Steer wheels)	23	Front turn signal lights
11	Counterweight	24	Rearview mirror B
12	Traction pin	25	Safety handrail
13	Camera	26	Tilt cylinders



27	Electrical box C	30	Reversing display
28	Hydraulic oil tank	31	Seat
29	Air filter	32	Hood B



33	Drive axle	36	High-voltage box
34	DC/DC converter	37	Steering axle
35	Low-voltage batteries	38	Drive motor



39	Lithium-ion batteries	42	TMS unit
40	Oil pump motor and controller	43	Motor radiator
41	Water tank		

2.1.2 Functional description

➢ **Chassis**

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

➢ **Operating position**

Operating position is constructed of a structural frame to withstand falling loads. The frames protects the operator from falling objects and other external influences. Truck can also be fitted with optional air conditioning to improve driving comfort. All the controls are ergonomically arranged. The steering column and operator's seat can be adjusted individually.

During the operation, the system can be monitored through the control and warning functions on the display to ensure safe operation.

➢ **Steering**

The hydraulic steering offers a high level of efficiency and ergonomics. The height and tilt angle of the steering column are adjustable and can be set to suit all operators.

The low cross-section means the operator has maximum legroom at all times.

➢ **Wheels**

The drive and steering wheels are fitted with pneumatic tyres, with solid tyres available as an option.

➢ **Transmission system**

The transmission system is composed of reduction gearbox, drive axle and traction motor. The front-wheel drive offers ideal traction.

➢ **Brake system**

Brake system is composed of service brake and parking brake. The service brake is hydraulically controlled by the brake pedal; the parking brake is mechanically controlled by the hand brake lever.

➢ **Hydraulic system**

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

➢ **Thermal management system**

The thermal management system can regulate the heat of the whole truck through cooling, heat dissipation, heating and heat retention, etc., so that different parts can work at the right temperature, to protect the functional safety, prolong the service life of the whole truck, and improve the performance in all aspects.

➢ **Mast**

Two or three-stage masts, optionally with free lift function; narrow mast sections ensure excellent visibility of the forks and attachments.

➢ **Attachments**

Hydraulically adjustable forks are available as an option. If other types of attachments are required, please contact manufacturer's customer service department.

2.1.3 Standard Version Specifications

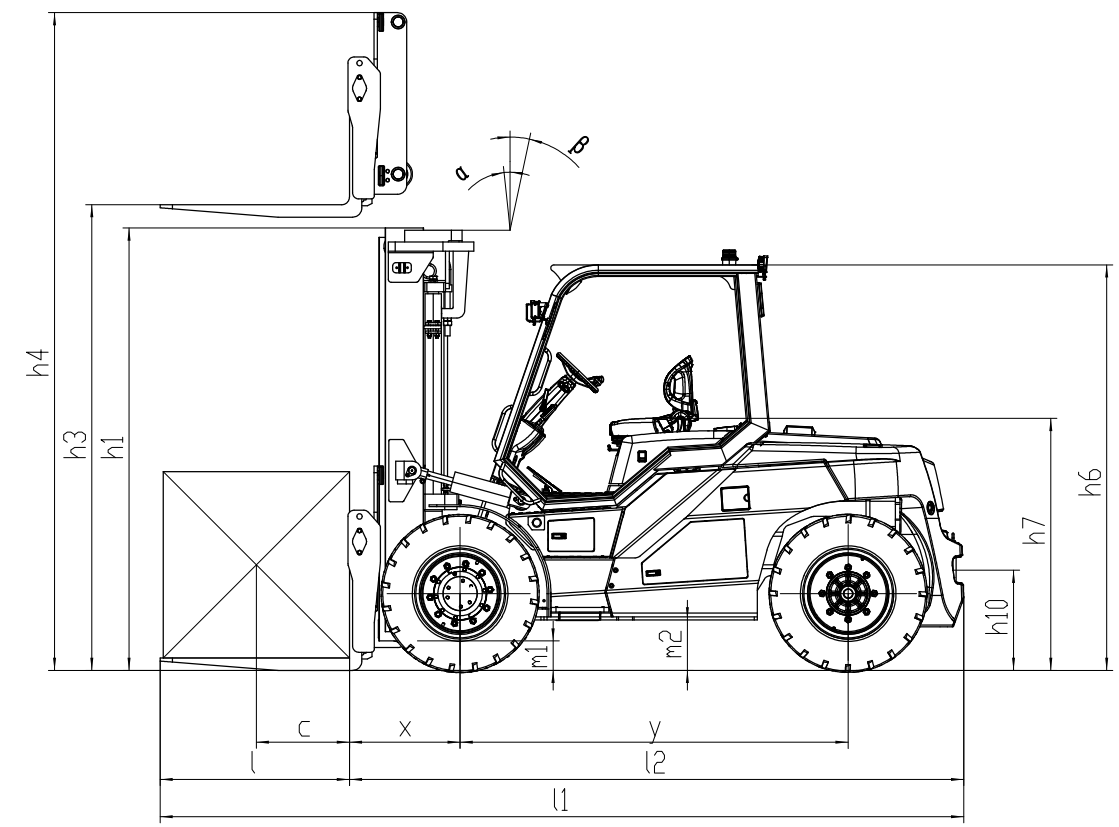
Distinguishing mark					
1.1	Manufacturer				
1.2	Model designation			EFL803-HV-6	EFL803-HV-9
1.3	Drive			Electric	Electric
1.4	Operator type			Seated	Seated
1.5	Load capacity	Q	kg	8000	8000
1.6	Load center distance	c	mm	600	900
1.8	Load distance, center of drive axle to fork	x	mm	708	718
1.9	Wheelbase	y	mm	2500	2500
Weight					
2.1	Service weight		kg	12325	13900
2.2	Axle loading, laden front/ rear		kg	18290/2035	19250/2650
2.3	Axle loading, unladen front/rear		kg	6105/6220	6090/7810
Tyres, Chassis					
3.1	Tyre type			Pneumatic	Pneumatic
3.2	Tyre size, front			9.00-20-14PR	9.00-20-14PR
3.3	Tyre size, rear			9.00-20-14PR	9.00-20-14PR
3.5	Wheels, number front/rear (x=drive wheels)		mm	4x/ 2	4x/ 2
3.6	Tread width, front	b10	mm	1600	1600
3.7	Tread width, rear	b11	mm	1700	1700
Dimensions					
4.1	Tilt of mast/fork carriage forward/backward	αβ	°	6/12	6/12
4.2	Retracted mast height	h1	mm	2850	2850
4.3	Free lift	h2	mm	200	200
4.4	Lift height	h3	mm	3000	3000
4.5	Height, mast extended	h4	mm	4310	4310
4.7	Height of overhead guard (cabin)	h6	mm	2680	2680
4.8	Seat height/standing height	h7	mm	1550	1550
4.12	Tow coupling height	h10	mm	630	630
4.19	Overall length	l1	mm	5475	5785
4.20	Length to face of forks	l2	mm	3955	3965
4.21	Overall width	b1b2	mm	2200	2200
4.22	Fork dimensions	s/e/l	mm	75×160×1520	85×160×1820
4.24	Fork carriage width	b3	mm	2130	2130

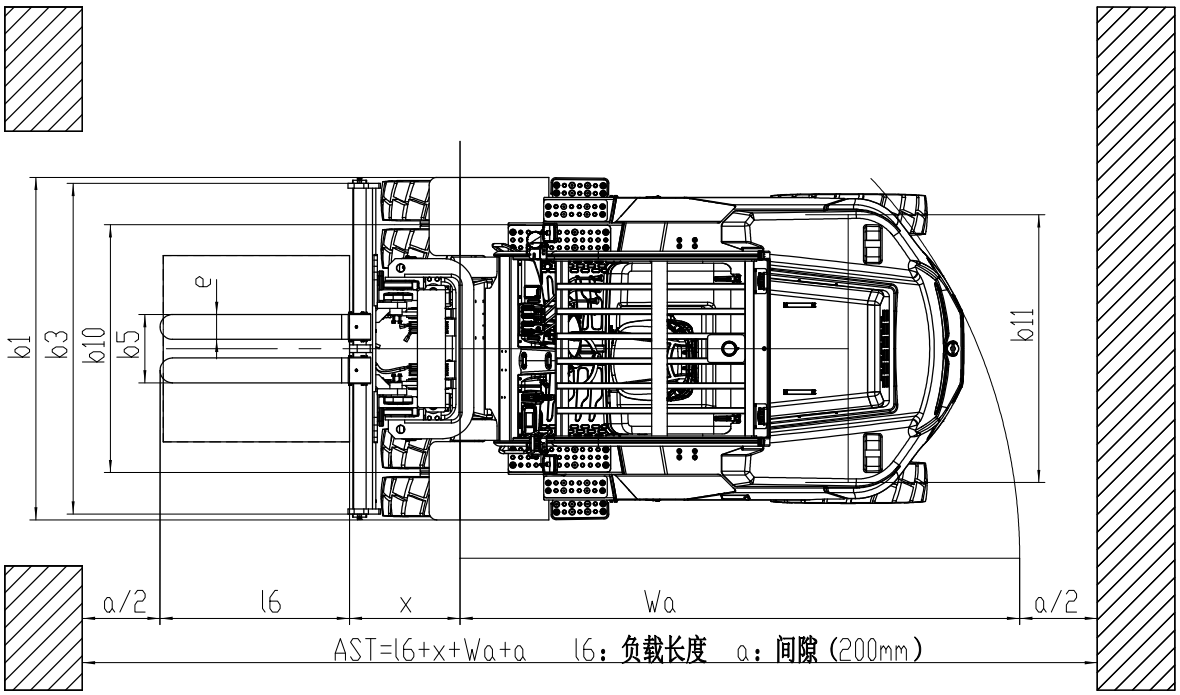
4.31	Ground clearance, laden, below mast	m1	mm	250	250
4.32	Ground clearance, center of wheelbase	m2	mm	345	345
4.34.1	Aisle width for pallets 1000 × 1200 crossways	Ast	mm	6033	6343
4.34.2	Aisle width for pallets 800 × 1200 lengthways	Ast	mm	6033	6343
4.35	Turning radius	Wa	mm	3605	3605
Performance data					
5.1	Travel speed, laden/unladen		km/h	29/30	29/30
5.2	Lifting speed, laden/unladen		m/s	0.39/0.47	0.39/0.47
5.3	Lowering speed, laden/unladen		m/s	0.46/0.4	0.46/0.4
5.8	Max.gradeability, laden/unladen		%	22/30	22/30
5.10	Service brake			Hydraulic	Hydraulic
5.11	Parking brake			Mechanical	Mechanical
Electric-engine					
6.1	Drive motor rating S2 60 min		kW	60	60
6.2	Lift motor rating at S3 15%		kW	2x27.8	2x27.8
6.4	Battery voltage/nominal capacity		V/Ah	309V/304AH	309V/304AH
6.5	Battery weight		kg	860	860
Addition data					
8.1	Type of drive control			Permanent magnet synchronous	Permanent magnet synchronous
10.5	Steering design			Hydraulic	Hydraulic
10.7	Sound pressure level at the driver's ear		dB (A)	/	/

Distinguishing mark					
1.1	Manufacturer				
1.2	Model designation			EFL903-HV-6	EFL1003-HV-6
1.3	Drive			Electric	Electric
1.4	Operator type			Seated	Seated
1.5	Load capacity	Q	kg	9000	10000
1.6	Load center distance	c	mm	600	600
1.8	Load distance, center of drive axle to fork	x	mm	713	713
1.9	Wheelbase	y	mm	2500	2500
Weight					
2.1	Service weight		kg	13150	13900
2.2	Axle loading, laden front/ rear		kg	19845/2305	21340/2560
2.3	Axle loading, unladen front/rear		kg	6105/6220	6090/7810
Tyres, Chassis					
3.1	Tyre type			Pneumatic	Pneumatic
3.2	Tyre size, front			9.00-20-14PR	9.00-20-14PR
3.3	Tyre size, rear			9.00-20-14PR	9.00-20-14PR
3.5	Wheels, number front/rear (x=drive wheels)		mm	4x/ 2	4x/ 2
3.6	Tread width, front	b10	mm	1600	1600
3.7	Tread width, rear	b11	mm	1700	1700
Dimensions					
4.1	Tilt of mast/fork carriage forward/backward	αβ	°	6/12	6/12
4.2	Retracted mast height	h1	mm	2850	2850
4.3	Free lift	h2	mm	200	200
4.4	Lift height	h3	mm	3000	3000
4.5	Height, mast extended	h4	mm	4310	4310
4.7	Height of overhead guard (cabin)	h6	mm	2680	2680
4.8	Seat height/standing height	h7	mm	1550	1550
4.12	Tow coupling height	h10	mm	630	630
4.19	Overall length	l1	mm	5480	5480
4.20	Length to face of forks	l2	mm	3960	3960
4.21	Overall width	b1b2	mm	2200	2200
4.22	Fork dimensions	s/e/l	mm	80×160×1520	80×160×1520
4.24	Fork carriage width	b3	mm	2130	2130
4.31	Ground clearance, laden, below mast	m1	mm	250	250

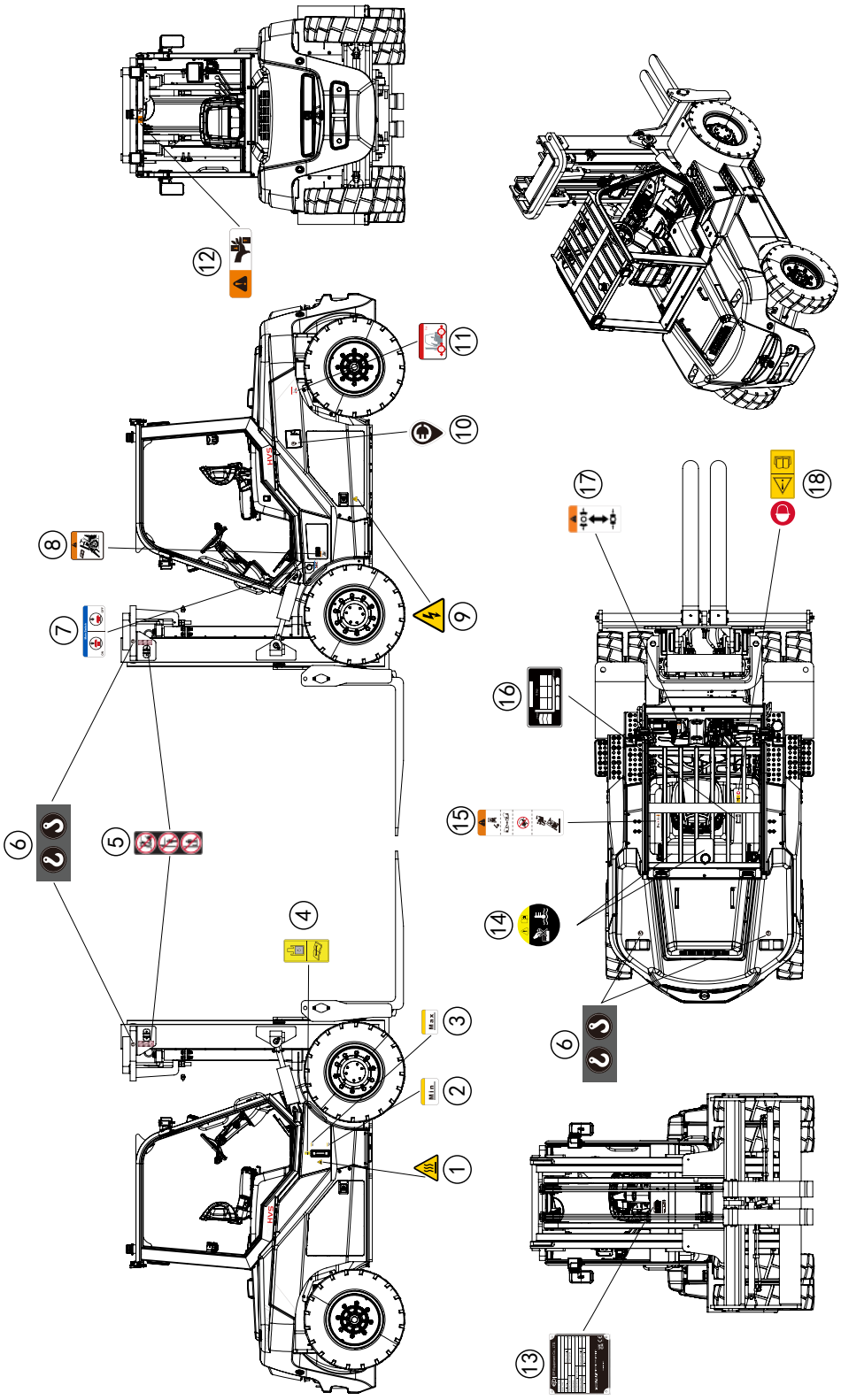
4.32	Ground clearance, center of wheelbase	m2	mm	345	345
4.34.1	Aisle width for pallets 1000 × 1200 crossways	Ast	mm	6038	6038
4.34.2	Aisle width for pallets 800 × 1200 lengthways	Ast	mm	6038	6038
4.35	Turning radius	Wa	mm	3605	3605
Performance data					
5.1	Travel speed, laden/unladen		km/h	29/30	29/30
5.2	Lifting speed, laden/unladen		m/s	0.39/0.47	0.39/0.47
5.3	Lowering speed, laden/unladen		m/s	0.46/0.4	0.46/0.4
5.8	Max.gradeability, laden/unladen		%	22/30	22/30
5.10	Service brake			Hydraulic	Hydraulic
5.11	Parking brake			Mechanical	Mechanical
Electric-engine					
6.1	Drive motor rating S2 60 min		kW	60	60
6.2	Lift motor rating at S3 15%		kW	2x27.8	2x27.8
6.4	Battery voltage/nominal capacity		V/Ah	309V/304AH	309V/304AH
6.5	Battery weight		kg	860	860
Addition data					
8.1	Type of drive control			Permanent magnet synchronous	Permanent magnet synchronous
10.5	Steering design			Hydraulic	Hydraulic
10.7	Sound pressure level at the driver's ear		dB (A)	/	/

2.1.4 Dimensions





2.1.5 Identification points

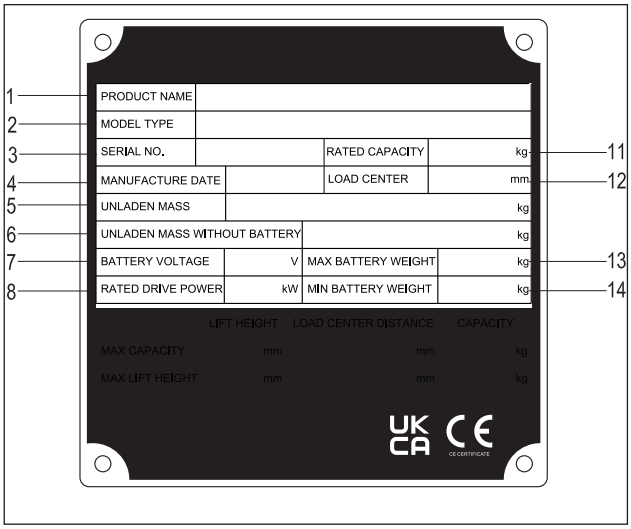


Item	Description
1	Hot surface hazard warning
2	Minimum oil level
3	Maximum oil level
4	Hydraulic oil level Read the manual before operation
5	Don't climb the masts Don't walk or stand under upraised forks or attachments Don't stand on the forks
6	Slinging point
7	Main power switch
8	See manual for bolt torque
9	Electrical hazard warning
10	Charging port
11	Pneumatic tyre pressure
12	Pinch point warning
13	Nameplate
14	High coolant temperature warning
15	When the truck is out of control: Keep your seat belt fastened; Don't jump out of the truck; Lean forward and support yourself on your feet; Tilt your body to the other side of the truck.
16	Load capacity plate
17	Handbrake
18	Wear a helmet Read the manual"

2.1.6 Truck nameplate

For queries regarding the truck or ordering spare parts please quote the truck serial number.

Item	Description
1	PRODUCT NAME
2	MODEL TYPE
3	SERIAL NO.
4	MANUFACTURE DATE
5	UNLADEN MASS
6	UNLADEN MASS WITHOUT BATTERY
7	BATTERY VOLTAGE
8	RATED DRIVE POWER
9	MAX CAPACITY
10	MAX LIFT HEIGHT
11	RATED CAPACITY
12	LOAD CENTER
13	MAX BATTERY WEIGHT
14	MIN BATTERY WEIGHT

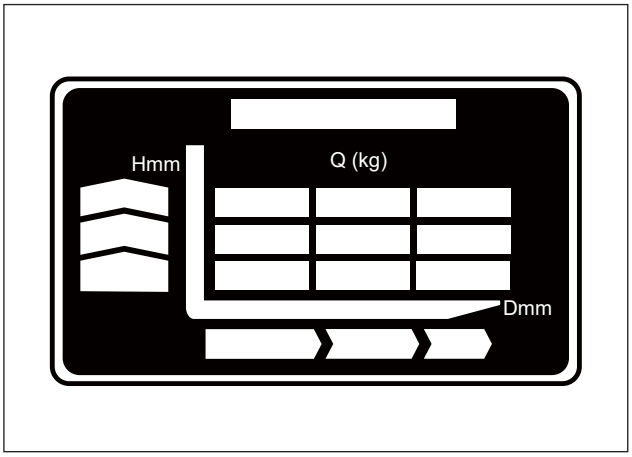


2.1.7 Load capacity plate and rated capacity plate

Load capacity plate gives the capacity (Q) of the truck in kg for a vertical mast.

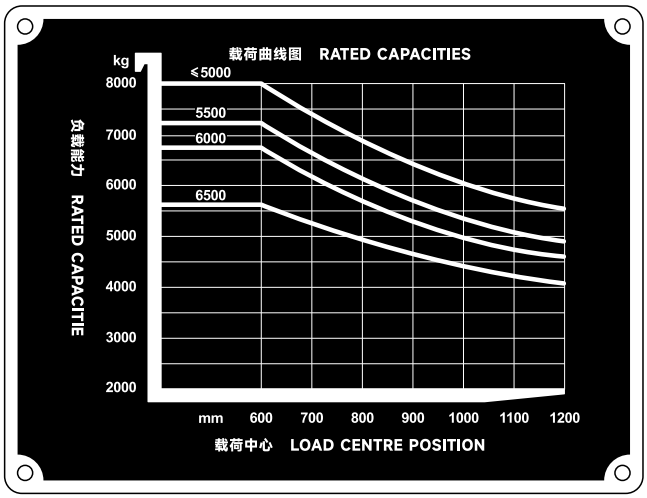
The maximum capacity is shown as a table with a given load center of gravity D (in mm) and the required lift height H (in mm).

Load capacity plate of the truck indicates the truck's capacity with the forks as originally supplied.

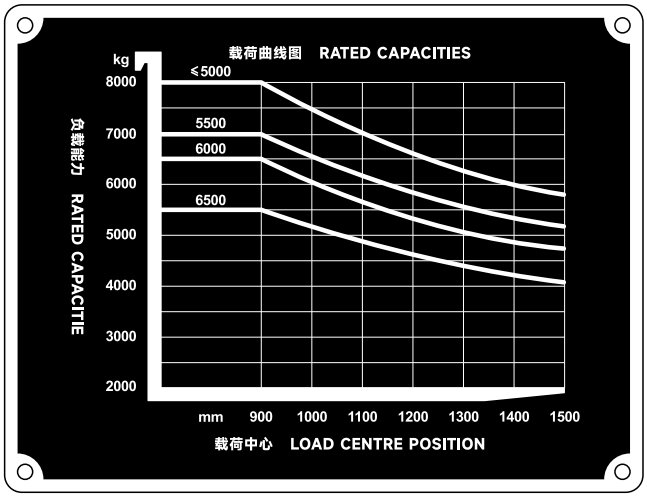


➢ Rated capacity plate

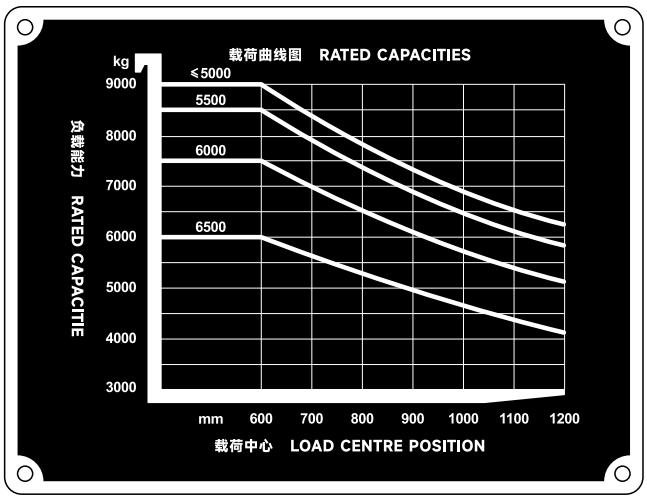
EFL803-HV-6



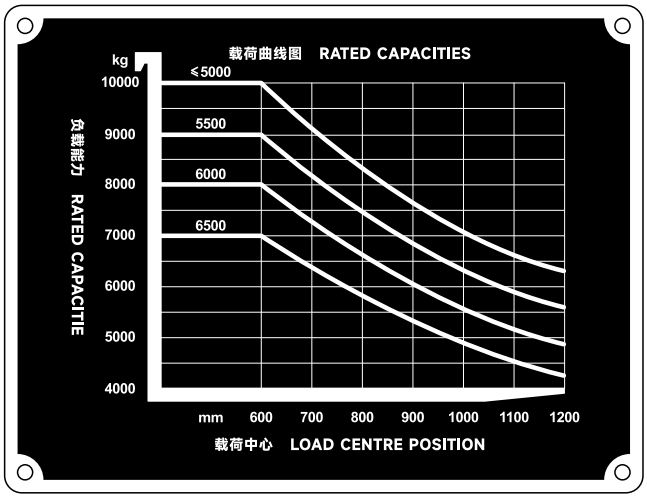
EFL803-HV-9



EFL903-HV-6

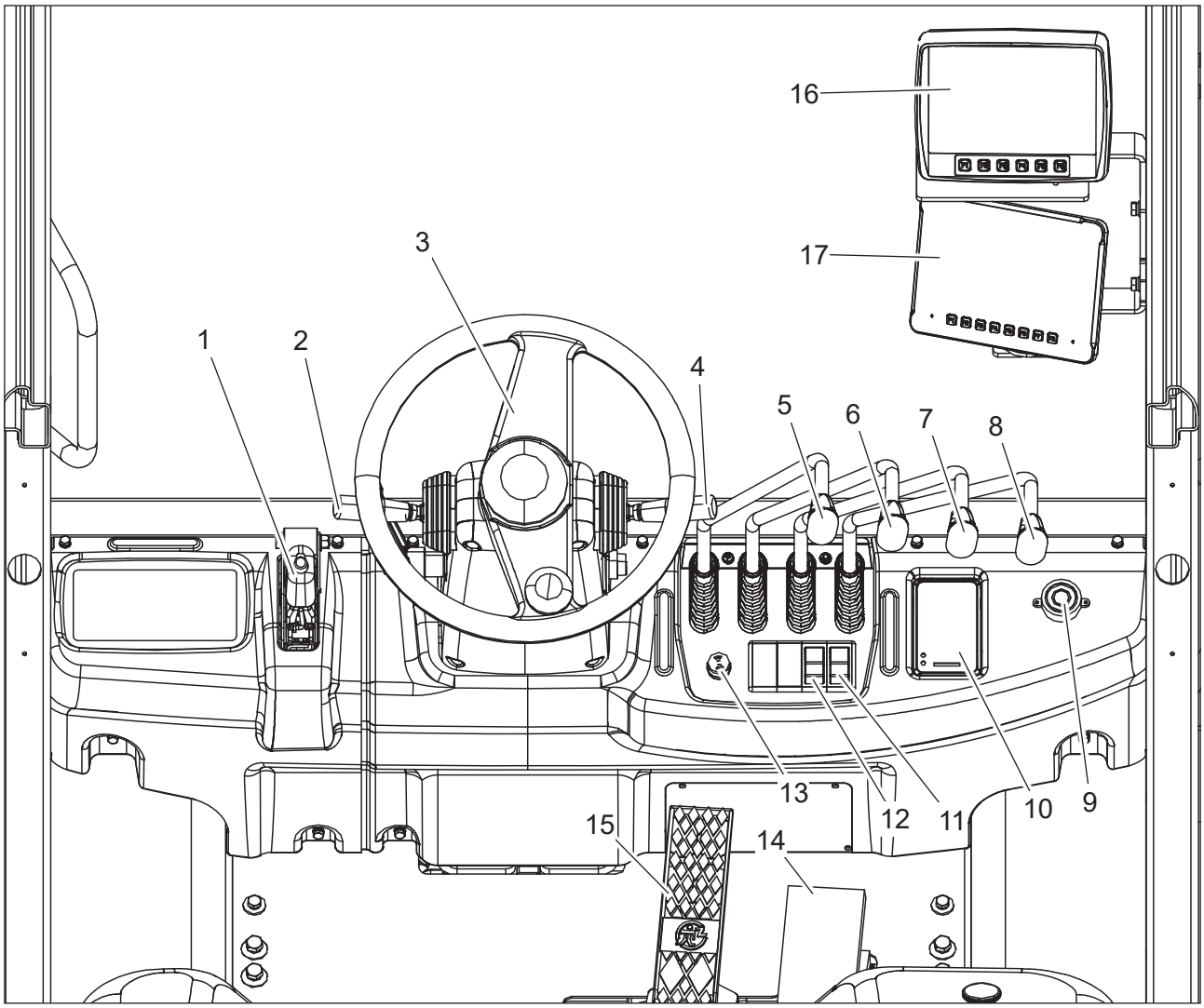


EFL1003-HV-6


载荷曲线图 RATED CAPACITIES
kg
10000
9000
8000
7000
6000
5000
4000
负载能力 RATED CAPACITIE
≤5000
5500
6000
6500
mm
600
700
800
900
1000
1100
1200
载荷中心 LOAD CENTRE POSITION

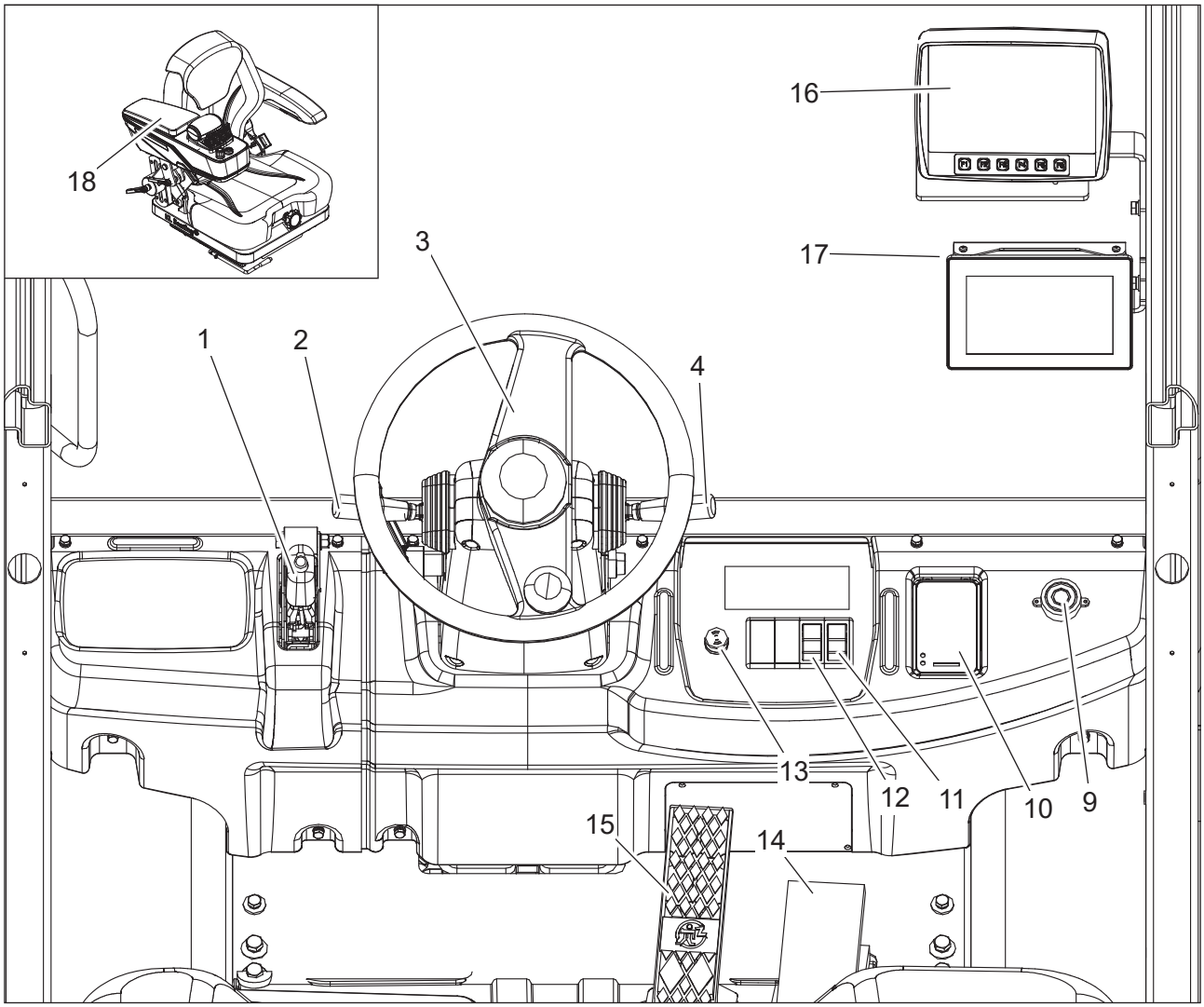
2.2 Components and controls

➢ **Mechanical valve**



1	Hand brake lever	10	Card reader
2	Travel combination switch	11	Front work light switch
3	Steering wheel	12	Warning light switch
4	Light combination switch	13	Flashing buzzer
5	Lifting control lever	14	Brake pedal
6	Tilting control lever	15	Accelerator pedal
7	Sideshift control lever	16	Reversing display
8	Attachment control lever	17	Display instrument
9	Reversing buzzer		

➢ Electro-proportional valve



1	Hand brake lever	12	Warning light switch
2	Travel combination switch	13	Flashing buzzer
3	Steering wheel	14	Brake pedal
4	Light combination switch	15	Accelerator pedal
9	Reversing buzzer	16	Reversing display
10	Card reader	17	Display instrument
11	Front work lights switch	18	Armrest

2.2.1 Display Instrument

➢ **Display (Mechanical Valve)**

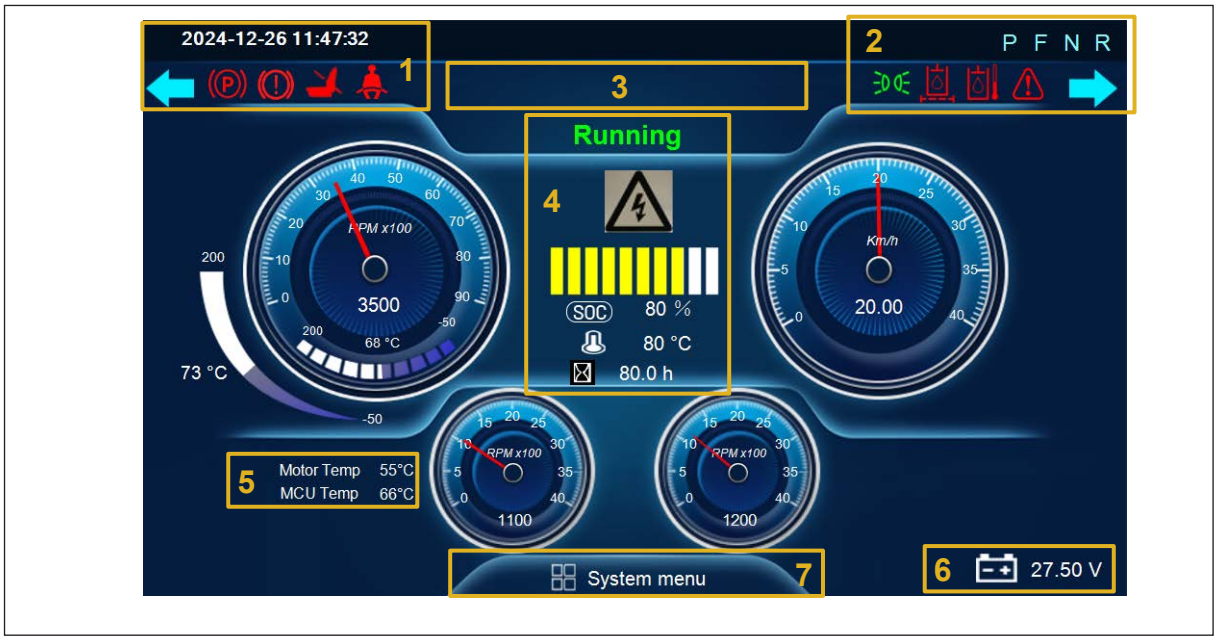
The model is equipped with a 7-inch high-resolution touch LCD display, and the display is located on the right side of the overhead guard.

The display can show truck speed, working time, battery power, Chinese and English display, password protection, error code and other information, can view and set electronic control parameters, can adapt to a variety of complex working environments, supports Chinese and English language switching.

Its appearance is shown below:

Main Page

The Main Page is the default display interface after the display is powered on, displaying important data information of the whole truck, and the Main Page is shown below.



Functions and Explanations

(1) The meanings of the icons in area 1 and area 2 of the Main Page are as follows

ICON	EXPLANATION	ICON	EXPLANATION
	Left turn indicator		Hydraulic oil high temperature warning indicator
	Taillight indicator		Right turn indicator
	Parking brake indicator		Hydraulic oil level temperature warning indicator
	Low brake pressure indicator		Gear indicator
	OPS Indicator		Seat belt indicator
	Fault alarm indicator		Current time

(2) In area 3, the current fault information is displayed.

(3) In area 4, "Running" means that the high voltage of the truck has been switched on, and the truck is running normally; there are also "Ready" and "Error" in this position: "Ready" means that the truck has no alarm and can be switched on; "Error" means that the truck has a fault.

"SOC 80%" refers to the current power level, depending on the power level, the yellow indicator light will gradually turn into red, when it turns red to remind the operator to charge.

refers to the hydraulic fluid temperature.

refers to the time the truck has been in operation.

(4) In area 5, it refers to the temperature of the motor controller in the master oil pump motor and the temperature of the motor.

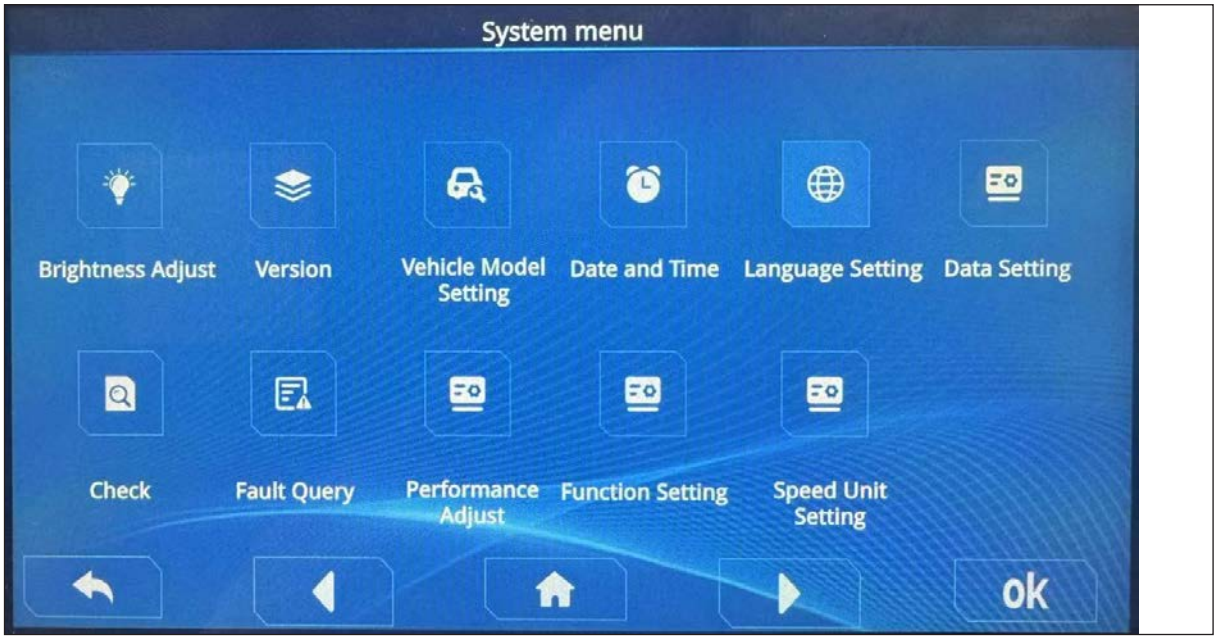
(5) In area 6, it refers to the current low-voltage battery voltage. When the display shows 27.5V, the high-voltage lithium-ion battery charges the low-voltage battery. If this voltage is lower than 22 V, the battery must be charged.

(6) In other area, "3500" in the dial on the left represents the current rotational speed of the driving motor; "68 °C" represents the current temperature of the driving motor; "73 °C" represents the current temperature of the driving motor controller;

"Km/h" in the upper right dial represents the truck travel speed unit; "15.00" represents the current speed.

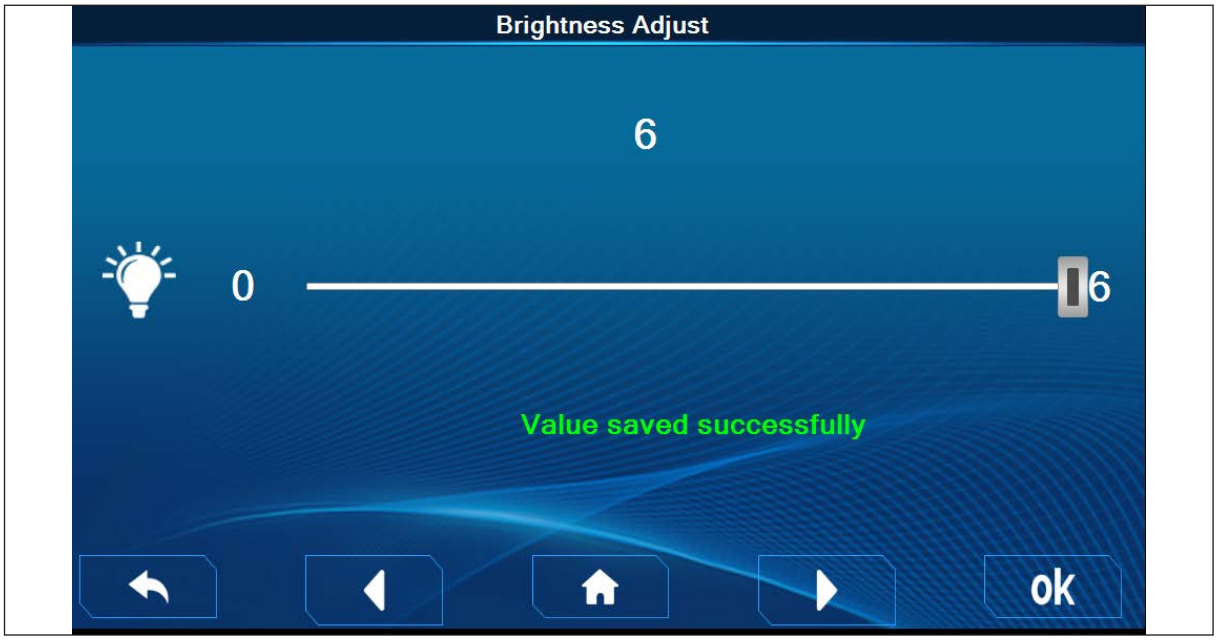
The lower left dial represents the actual speed of the current master oil pump motor; the lower right dial represents the actual speed of the current slave oil pump motor.

(7) In area 7, press "System menu" to access the following interface:



System Menu Introduction

(1) Press "Brightness Adjust" to access the following interface:



In this interface, the brightness of the display can be adjusted.

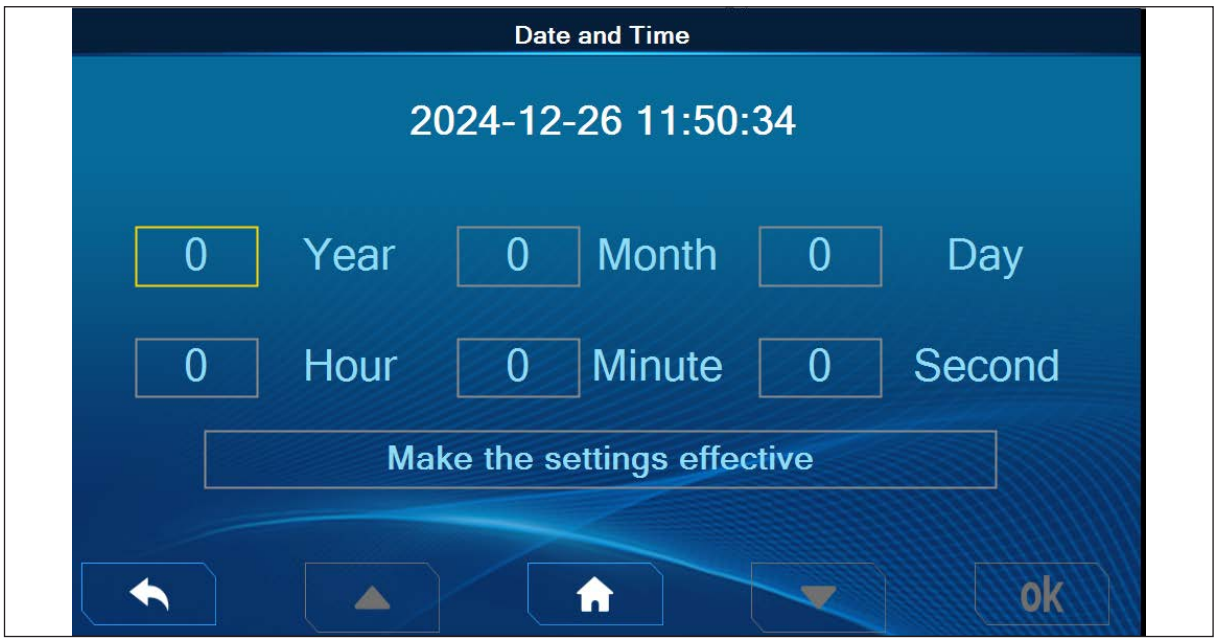
(2) Press "Version" to access the following interface:

In this interface, the app version can be seen.

(3) Press "Vehicle Model Setting" to access the following interface:

This interface is not available to users.

(4) Press "Date and Time" to access the following interface:



This interface displays the current time and can be set manually if the current time does not match.

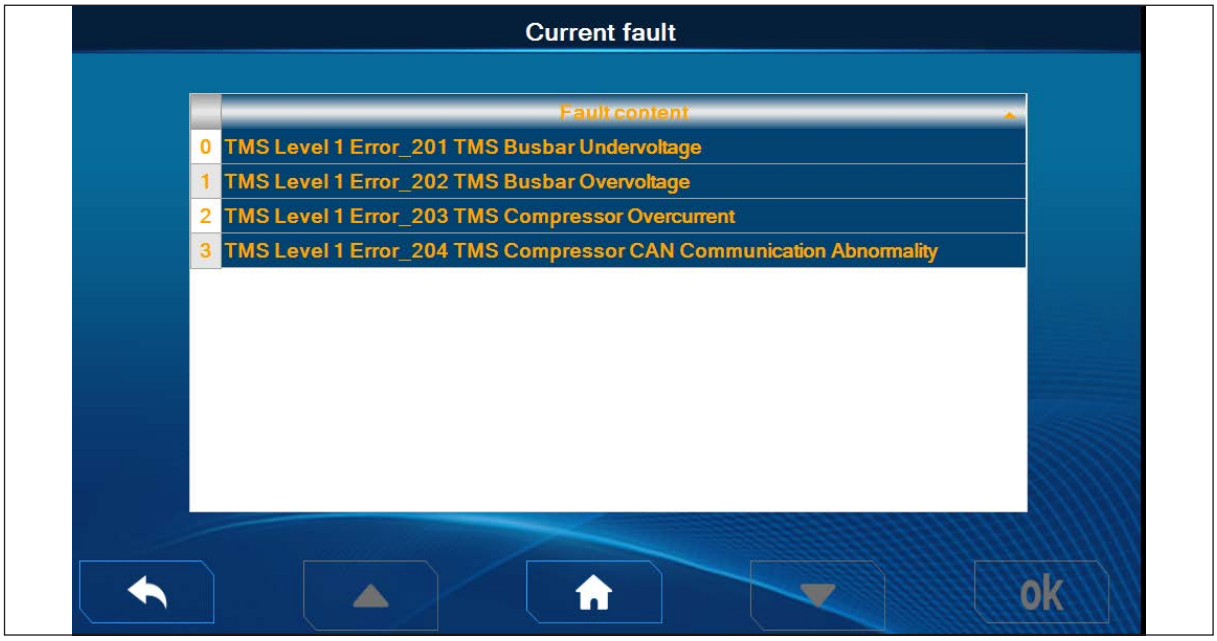
(5) Press "Language Setting" to access the following interface:

You can switch the language in this interface, currently only open to switch between Chinese and English.

(6) Press "Data Setting" to access the following interface:

This interface is not available to users.

(7) Press "Fault Query" to access the following interface:



This interface displays the current fault alarm information.

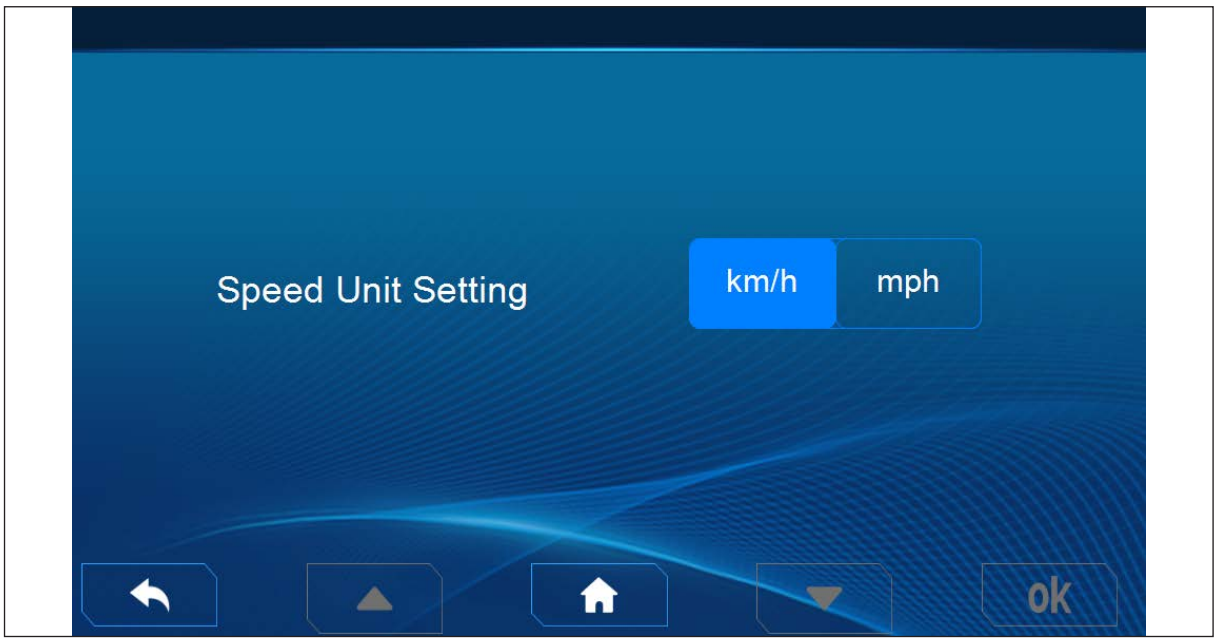
(8) Press "Performance Adjust" to access the following interface:

This interface is not available to users.

(9) Press "Function Setting" to access the following interface:

This interface is not available to users.

(10) Press "Speed Unit Setting" to access the following interface:



This interface can select the speed unit, the default factory speed unit is “Km/h”, when you select “mph”, the upper right dial of the main interface will be changed accordingly.

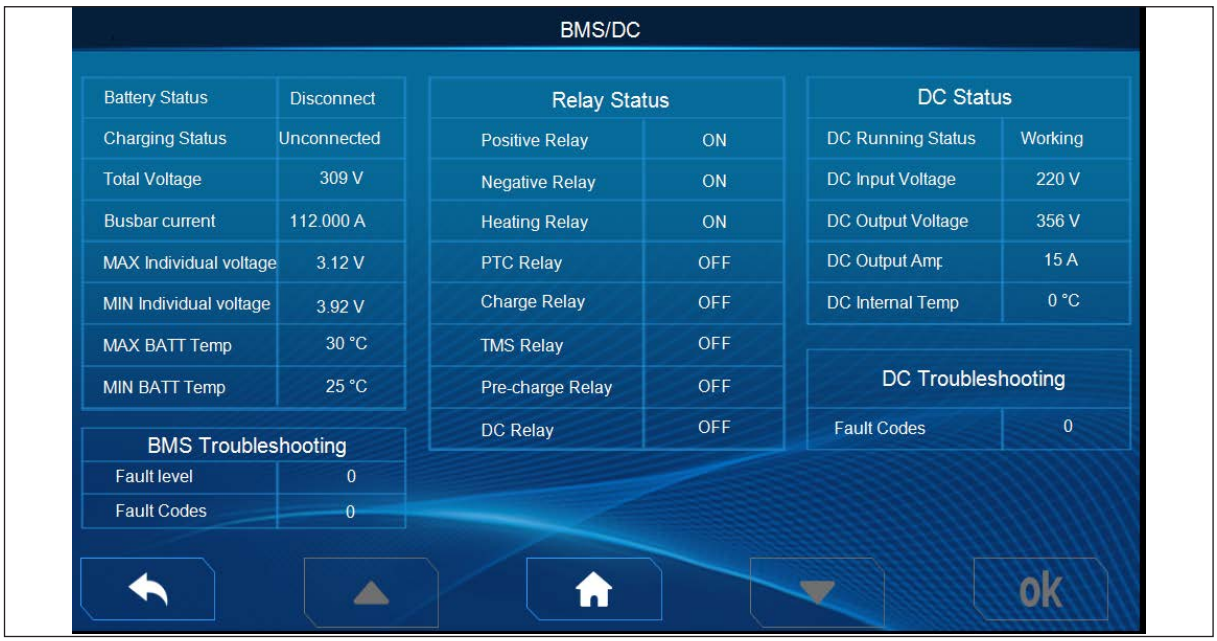
(11) Press "Check" to access the following interface:

This interface allows you to jump to the status interface of major electrical components for querying.

Electrical Component Interface

At the bottom of the display there are “F1-F8 buttons”, different buttons have different functions.

(1) Press "F1" or "BMS/DC" to access the following interface:



This interface displays the status information of the battery, the status information of various relays, and the status information of the DC.

When the battery or DC is faulty, the corresponding fault code will be displayed at the fault diagnosis.

(2) Press "F2" or "MCU_T" to access the following interface:

This interface displays the status information of the driving motor. When the driving motor or driving motor controller is faulty, the corresponding fault code will be displayed at the fault diagnosis.

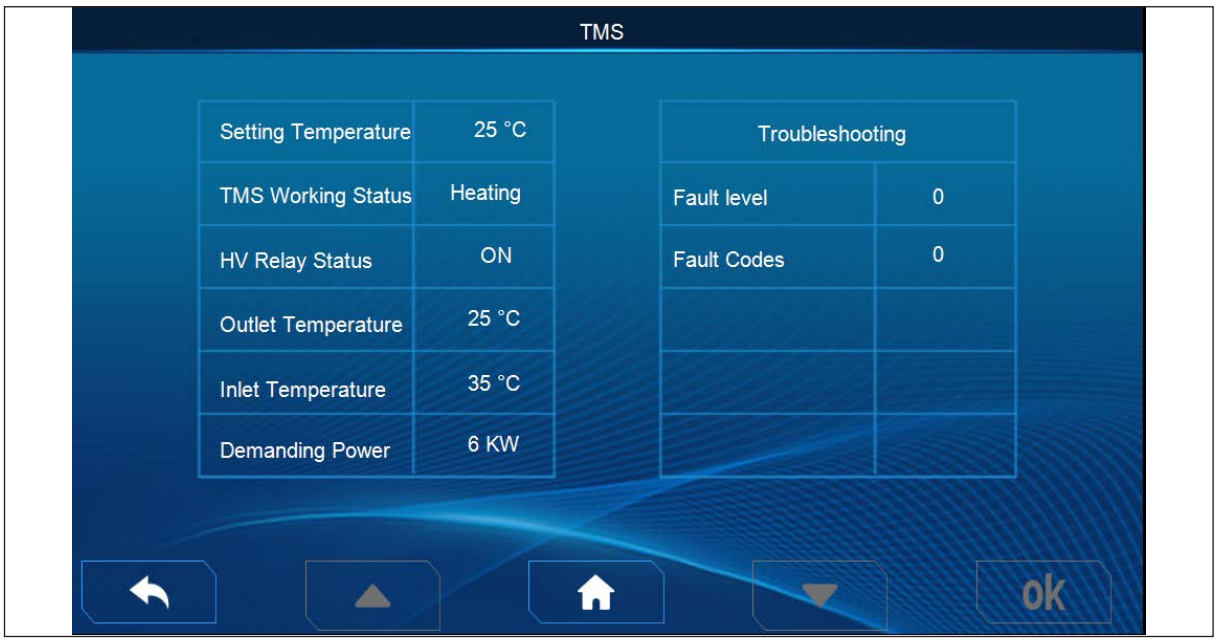
(3) Press "F3" or "MCU_P1" to access the following interface:

This interface displays the status information of the master oil pump motor. When the master oil pump motor or the master oil pump motor controller fails, the corresponding fault code will be displayed at the fault diagnosis.

(4) Press "F4" or "MCU_P2" to access the following interface:

This interface displays the status information of the slave oil pump motor. When the slave oil pump motor or the slave oil pump motor controller fails, the corresponding fault code will be displayed at the fault diagnosis.

(5) Press "F5" or "TMS" to access the following interface:



This interface displays the status information of the TMS. When the TMS fails, the corresponding fault code will be displayed at the fault diagnosis.

(6) Press "F6" or "IO_1" to access the following interface:

This interface shows the information of solenoid valve signal,
When “OPS EV 1” signal is not triggered, the truck cannot move;
when using the first control lever, the value at “Lift Potentiometer” will change;
when using the second control lever, the dot at “Tilt SW” will light up;
when using the third control lever, the dot at “AUX 1 SW” will light up;
when using the fourth control lever, the dot at “AUX 2 SW” will light up.

(7) Press "F7" or "IO_2" to access the following interface:

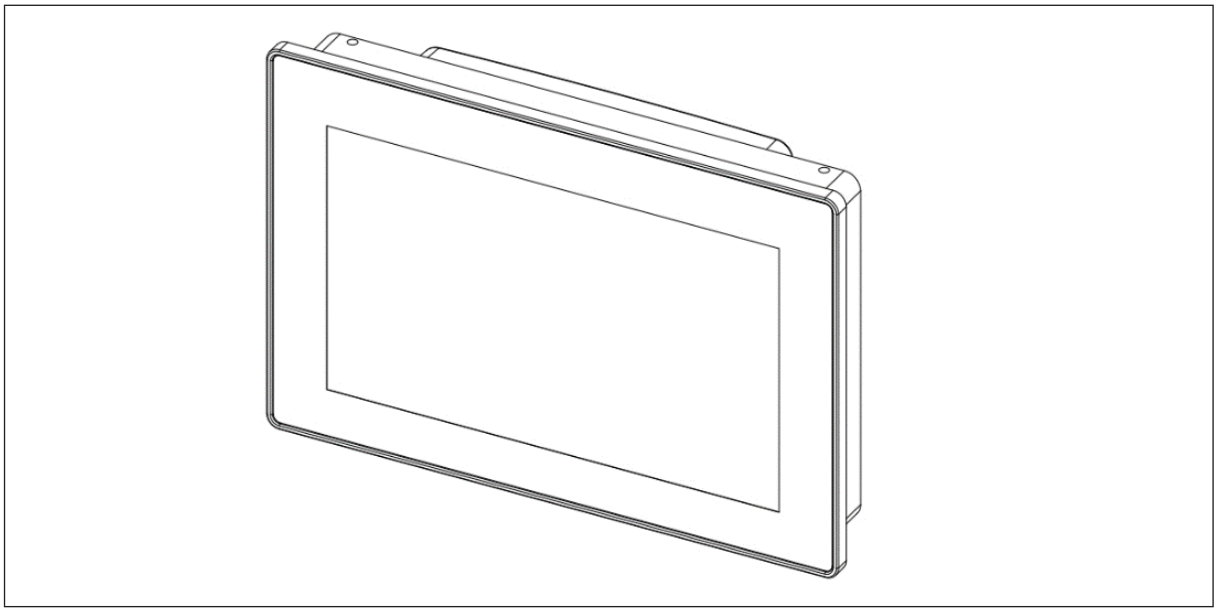
This interface displays the status of electrical components during normal truck operation.

➢ Display (Electro-Proportional Valve)

The model is equipped with a 7-inch high-resolution touch LCD display, and the display is located on the right side of the overhead guard.

The display can show truck speed, working time, battery power, Chinese and English display, password protection, error code and other information, can view and set electronic control parameters, can adapt to a variety of complex working environments, supports Chinese and English language switching.

Its appearance is shown below:

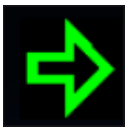


Main Page

The Main Page is the default display interface after the display is powered on, displaying important data information of the whole truck, and the Main Page is shown below.

Functions and Explanations

(1) The meanings of the icons in area 1 and area 2 of the Main Page are as follows

ICON	EXPLANATION	ICON	EXPLANATION
	Left turn indicator		OPS Indicator
	Taillight indicator		Fault alarm indicator
	Parking brake indicator		Hydraulic oil high temperature warning indicator
	Low brake pressure indicator		Right turn indicator

(2) In area 3, 10:12:47 represents the current time and 1.0 h represents the truck running time.

(3) In area 4, P stands for Park; F stands for Forward; N stands for Neutral; R stands for Reverse.

(4) In area 5, 1384 rpm represents the current speed of the drive motor; Motor Temp 42 °C represents the current temperature of the drive motor is 42 °C; MCU Temp 51 °C represents the current temperature of the drive motor controller is 51 °C.

(5) In area 6, Ready represents that the current state of the truck is ready, when Running is displayed, it means that the whole truck has been powered up and the truck is running, when Fault is displayed, it means that there are faults in the truck that need to be investigated; SOC represents the current power of the truck, when the power is less than 20%, the instrument prompts to be recharged; Batt Temp 35°C represents the current temperature of the Lithium-ion battery is 35°C.

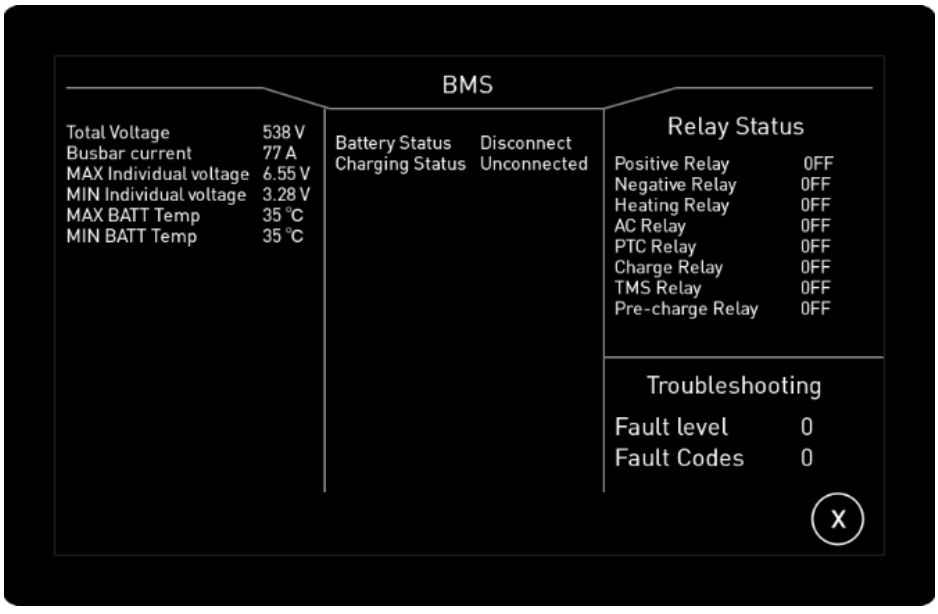
(6) In area 7, 10 km/h indicates the current truck speed.

(7) In area 8, Motor Temp 47 °C represents that the current temperature of fuel pump motor No.2 is 47 °C; MCU Temp 60 °C represents that the current temperature of fuel pump motor No.2 controller is 60°C; above the area shows the speed of oil pump motor No.2.

(8) In area 9, Motor Temp 47 °C represents that the current temperature of oil pump motor No.1 is 47 °C; MCU Temp 56 °C represents that the current temperature of oil pump motor No.1 controller is 56°C; above the area shows the speed of oil pump motor No.1.

(9) In area 10, click the button to enter the setting interface as shown below:

(10) In area 11, press F1 to enter the BMS (lithium-ion battery) interface

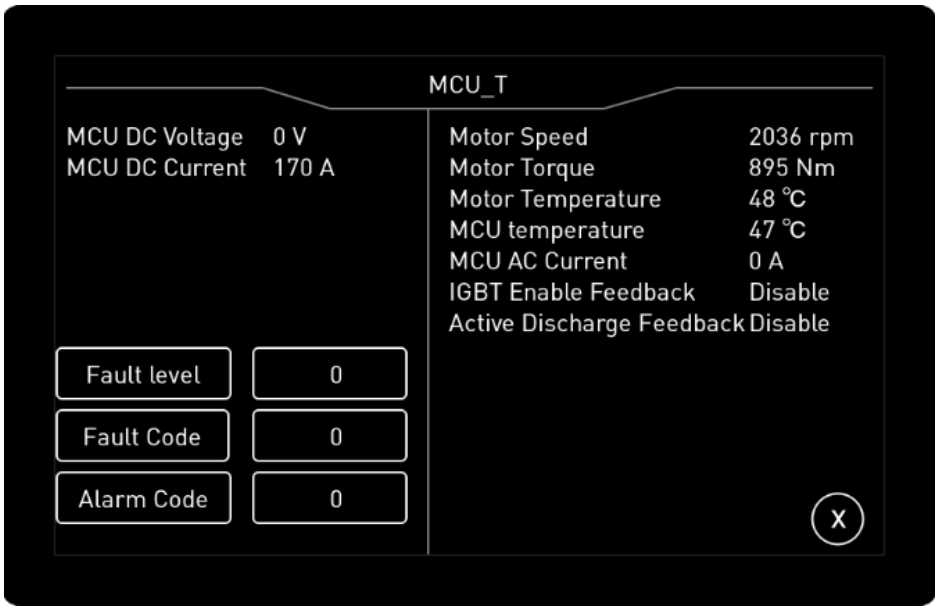


In the BMS interface, the left side shows the current state of the battery, the center shows the battery charging state, the upper half of the right side shows the state of each relay, and the lower half shows the fault level of the Lithium-ion battery as well as the error code. See 1.12 Lithium-ion battery Error codes for details.

NOTE

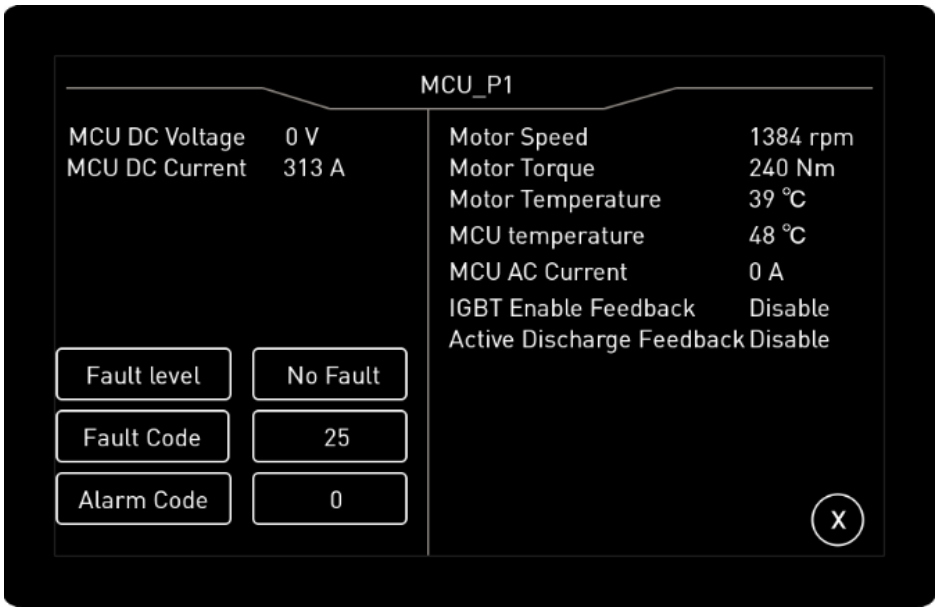
If the truck malfunctions, return the error code on the display to the manufacturer for technical assistance from the manufacturer's service department.

Press F2 to enter MCU_T (drive motor) interface

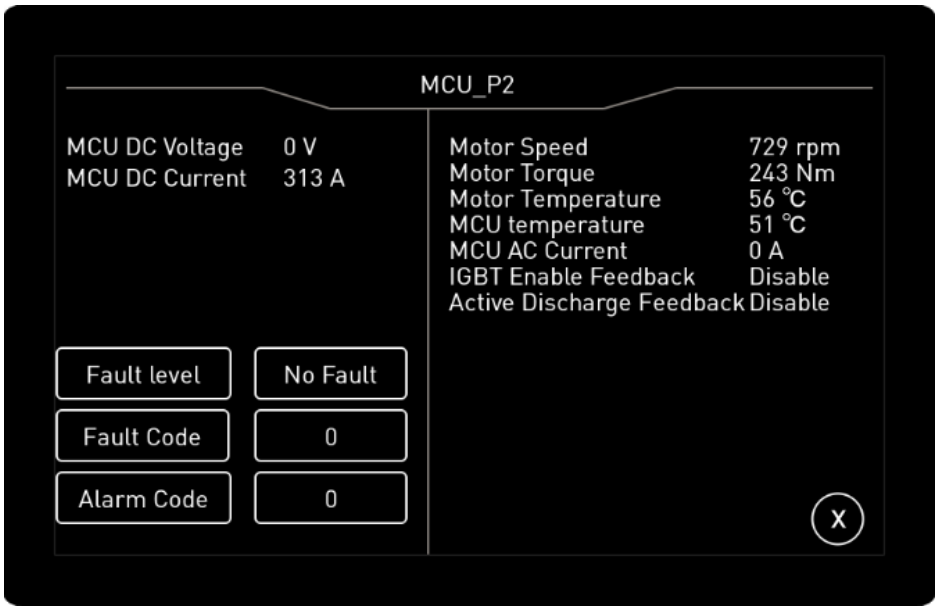


In the Driving Motor interface, the left side shows the current and voltage of the input motor as well as the motor's fault level and error code, see 2.7 Motor Error codes for details; the right side shows the current real-time parameters of the motor.

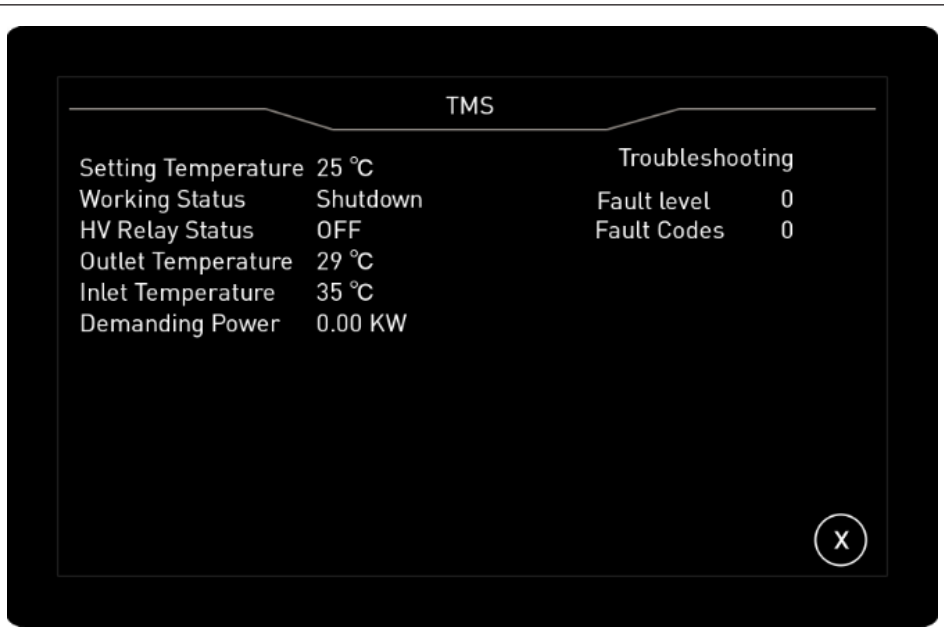
Press F3 to enter MCU_P1 (pump motor 1) interface



Press F4 to enter the MCU_P2 (Pump Motor 2) interface

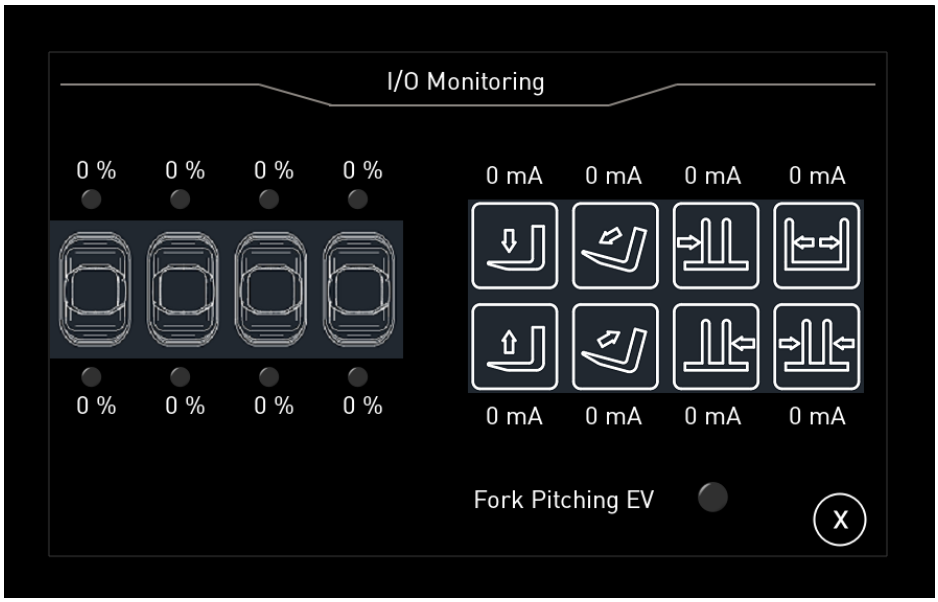


The contents of the Pump Motor page are similar to the Drive Motor page. Press F5 to enter the TMS (Thermal Management System) interface.



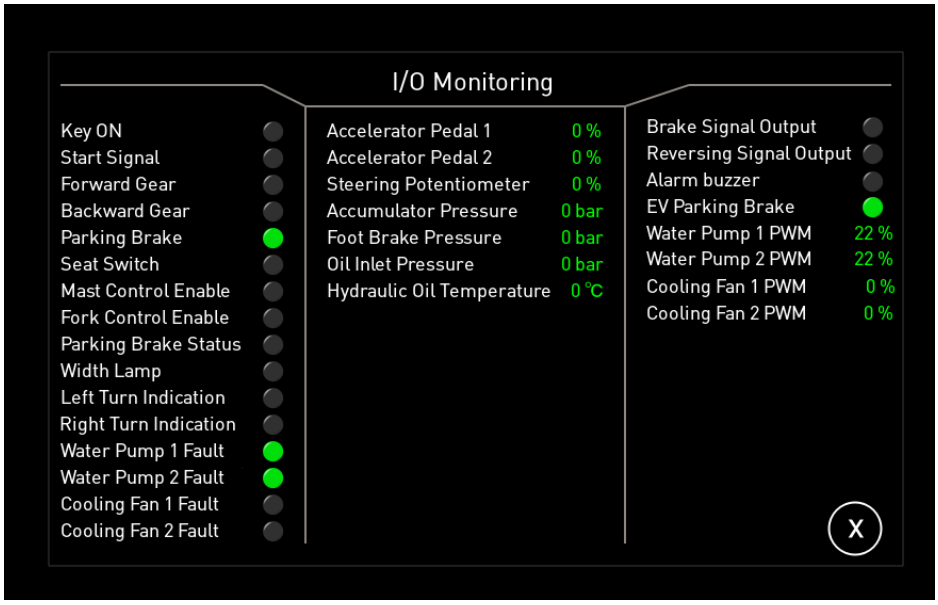
In the thermal management interface, the parameters set for the cooling unit and the current working status are displayed on the left side, and the fault levels and error codes are displayed on the right side.

Press F6 to enter the fork I/O interface



This interface displays the real-time current output to the forward and backward tilt, lift and lower, left and right shift solenoid valves.

Press F7 to enter the I/O interface of the whole truck.



This interface integrates most of the input and output signals of the whole truck, which is convenient for troubleshooting.

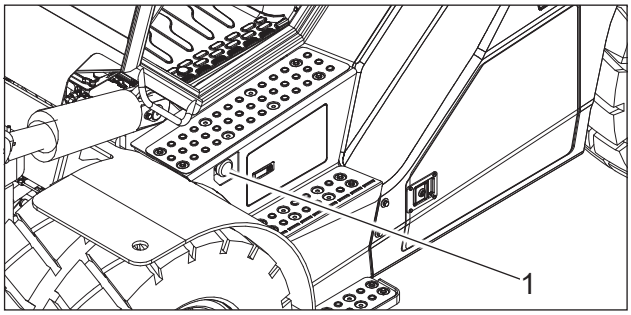
Switching between Chinese and English

(1) Press  to enter the setting interface.

(2) Press Preferences to enter the settings selection interface.

(3) Press Language to enter the language selection interface.

2.2.2 Main power switch



- Press the main power switch (1) to disconnect the power supply;
- Pull out the main power switch (1) to connect the power supply.

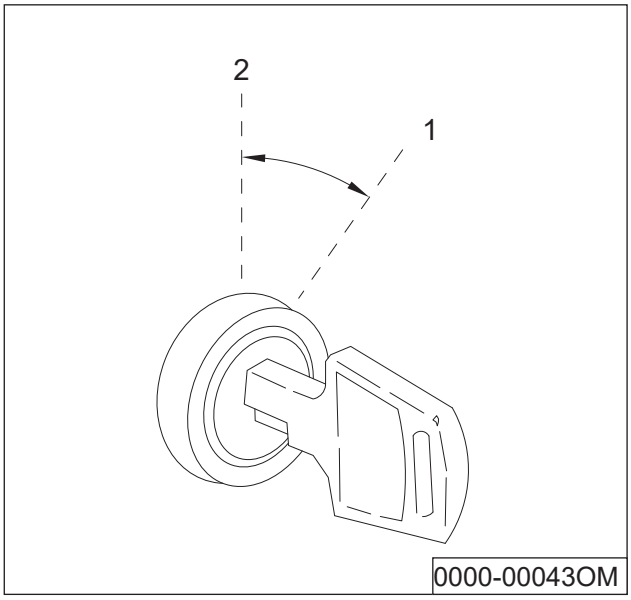
NOTE

If the truck is not operated for a long period of time, the main power switch needs to be pressed to disconnect power to the entire truck, otherwise the battery may be drained and the truck may not start.

WARNING

Key switch must be switched off before switching off the main power switch.

2.2.3 Key switch



The key switch has two positions: ON (1) and OFF (2).

The truck power supply is cut off when the key is turned to ‘OFF’.

The truck power supply is on when the key is turned to ‘ON’.

When starting the truck to drive, set the combination switch to the neutral position, then take your foot off the accelerator pedal.

Turn the key clockwise to the ON position.

Remove the key to prevent the truck from being switched on by unauthorized personnel.

WARNING

If the combination switch is not in neutral or the accelerator pedal is depressed, the truck will not start when the key switch is turned to ON. At this point a error code will be displayed. Return the combination switch to the neutral position and take your foot off the accelerator pedal before attempting to start the truck. The error code will then disappear.

2.2.4 Combination switches

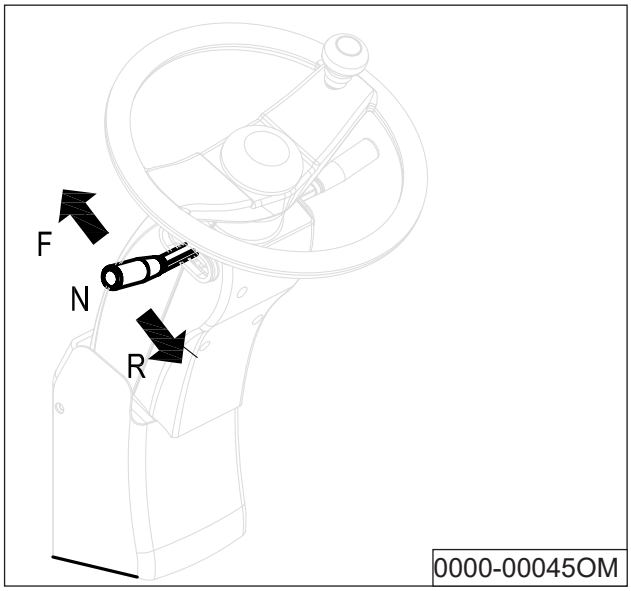
➢ **Travel combination switch (Mechanical valve)**

The truck's driving directions are as follows:

Switch to F position: forward;

switch to N position: parking;

switch to R position: backward.



NOTE

Travel combination switch is located on the seat armrest on trucks with electro-proportional valve, see Page 46 Section "2.2.9 Armrest (Electro-proportional valve)"

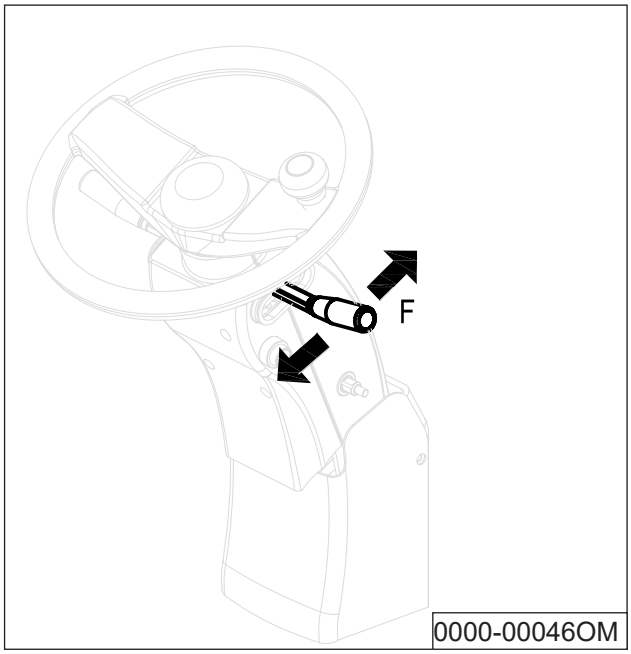
➢ **Light combination switch**

The light combination switch includes turn signal indicator and light switch.

Turn signal indicator

Push or pull this lever, the corresponding signal light flashes.

Push Forward	⬅	Left turn light flashes
Neutral		Off
Pull back	➡	Right turn light flashes



⚠ CAUTION

The turn signal lever does not automatically return to the neutral position, reset it manually.

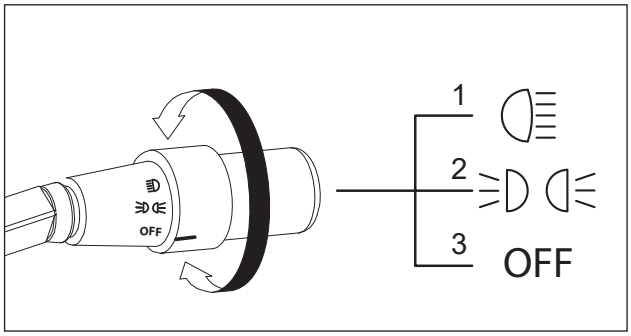
Light switching knob

Turn the knob to switch the lights. The lights corresponding to the numbers in the diagram are:

(1) front work lights and side lights;

(2) side lights;

(3) OFF.

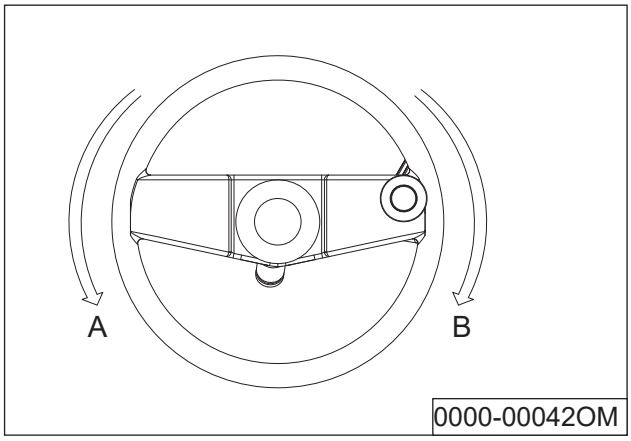


2.2.5 Steering wheel

- When the steering wheel is turned right (B), the truck will turn to the right;
- When the steering wheel is turned left (A), the truck will turn to the left.

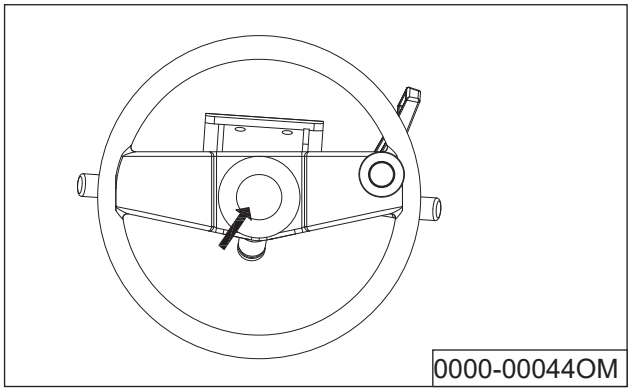
⚠ WARNING

The rear end of the truck swings out when turning.



➢ **Horn**

Press the horn button in the middle of the steering wheel and the horn sounds.

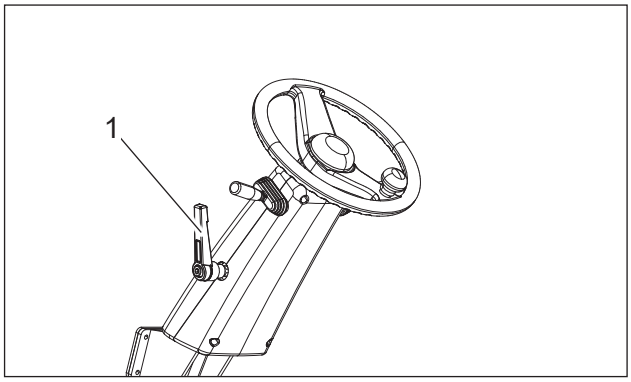


➢ **Steering column tilt adjuster**

The tilting angle of the steering column is adjustable to suit individual operators.

Push the adjustment handle (1) forward to unlock the steering column, then adjust the steering column angle.

After adjusting the steering column, release the handle (1) and the steering column will lock automatically.



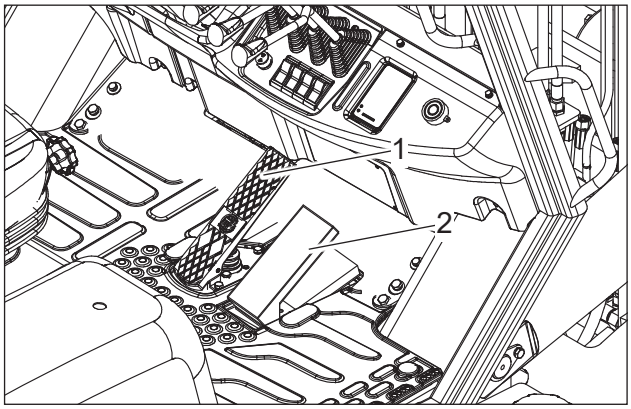
2.2.6 Pedals

➢ **Brake pedal**

After pressing the brake pedal (1), the truck will slow down until it comes to a stop.

⚠ CAUTION

Do not depress the accelerator and brake pedals at the same time, as this will damage the drive motor.



➢ **Accelerator pedal**

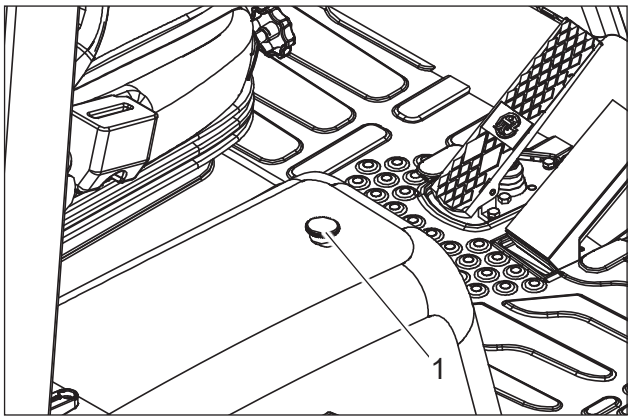
Slowly depress the accelerator pedal (2), the drive motor will start running and the truck will move off.

The travelling speed of the truck can vary depending on the force applied to the accelerator pedal.

2.2.7 Emergency stop switch

In case of emergency, press the emergency stop switch (1), the high voltage power will be cut off and the whole truck will stop working.

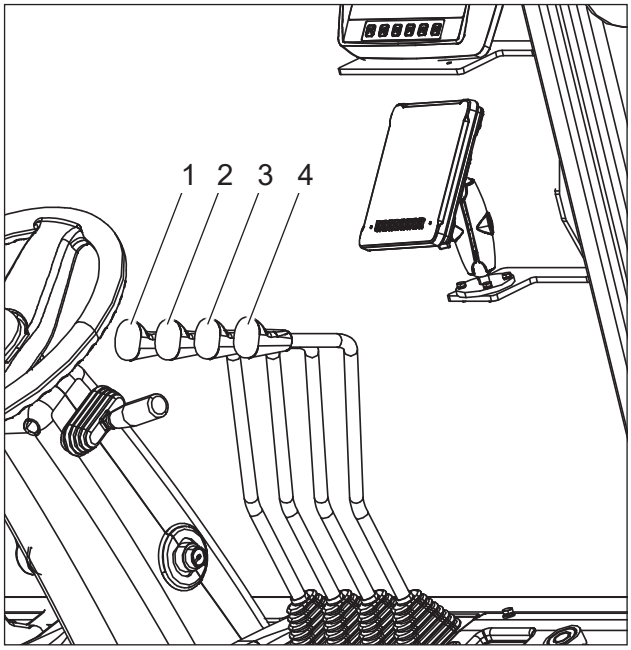
To start the truck again, the emergency stop switch needs to be reset.



NOTE

Emergency stop switch is located on the seat armrest on trucks with electro-proportional valve, see Page 46 Section "2.2.9 Armrest (Electro-proportional valve)"

2.2.8 Control levers (Mechanical valve)



(1) Control lever 1

Push the lever forward — mast lowering;

pull the lever backward — mast lifting;

(2) Control lever 2

Push the lever forward — mast tilts forward;

pull the lever backward — mast tilts backward;

(3) Control lever 3

Push the lever forward — forks move to the left;

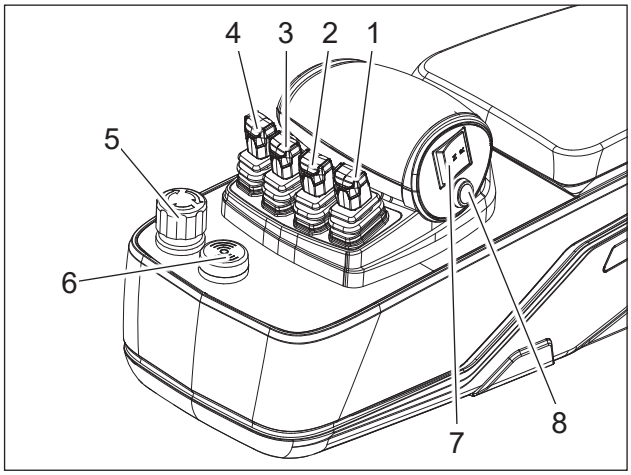
pull the lever backward — forks move to the right;

(4) Control lever 4

Push the lever forward — increase the distance between the forks;

pull the lever backward — reduce the distance between the forks;

2.2.9 Armrest (Electro-proportional valve)



(1) Finger switch 1

Push the switch forward — mast lowering;

pull the switch back — mast lifting;

(2) Finger switch 2

Push the switch forward — mast tilts backward;

pull the switch back — mast tilts forward;

(3) Finger switch 3

Push the switch forward — forks move to the left;

pull the switch back — forks move to the right;

(4) Finger switch 4

Push the switch forward — increase the distance between the forks;

pull the switch back — reduce the distance between the forks;

(5) Emergency stop switch

In case of emergency, press the emergency stop switch, the high voltage power will be cut off and the whole truck will stop working.

To start the truck again, the emergency stop switch needs to be reset.

(6) Alarm buzzer

During truck operation, if there is a component alarm, a beeping sound will appear to remind the operator to check the truck.

(7) Travel combination switch

Switch to F position: forward;

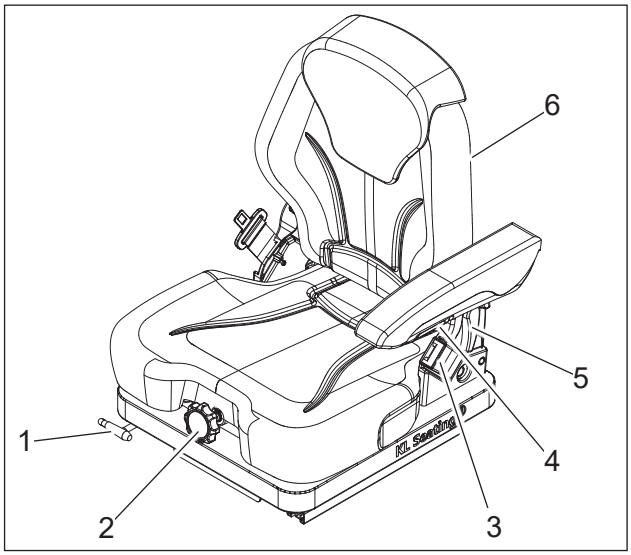
switch to N position: parking;

switch to R position: backward.

(8) Horn

Press the button to sound the horn.

2.2.10 Seat



➢ **Seat position adjustment**

Lift the handle (1) to release the seat, and move the seat forward or backward to the appropriate position.

Release the handle (1) to lock the seat.

⚠WARNING

Lock the operator seat forward-backward adjusting lever on the set position. Never adjust seat when driving.

➢ **Operator weight setting**

Adjusting the operator's weight correctly optimises damping.

Use the handwheel (2) to adjust the operator's weight until it matches the operator's weight.

➢ **Seat armrest adjustment**

Turn the roller (4) to adjust the angle of the armrest.

➢ **Seat back adjustment**

Pull the handle (5) upward to unlock the seat back, and adjust the back inclination. Release the handle (5) to lock the seat back.

➢ **Document box**

There is a documents box (6) on the back of the seat which can be used for paper documents etc.

➢ **Safety belt**

Fasten safety belt (3) before driving. It protects operator when accidents happen.

If the seat belt is not buckled, the truck will not start.

Correct use of safety belt

- Sit on the seat correctly.
- Check if the safety belt twisted.
- Fasten the safety belt and check safety belt lock.

Periodical inspection of safety belt

- Check if safety belt is damaged or cracked.
- Check if the metal pieces of safety belt (including anchor point) are worn or damaged.
- Check if lock catch for safety belt or traction machine functions normally.

⚠WARNING

- *In any case, if the seat belt is damaged or defective, etc., please repair or replace it immediately.*
- *Never do any changes to the safety belt. Replace it with a new one after each accident.*

⚠ DANGER

Fasten your seat belt when using a truck! Seat belts can only be used by one person. For the safety of the operator, if the truck is equipped with cab doors (rigid or folding doors), the doors must be closed when the truck is in operation.

➢ OPS System

OPS (Operator Presence Sensing) system is a safeguard system that detects whether the operator is sitting in the correct position. If the operator does not sit on the seat correctly, driving force will be cut off, and all loading and unloading operations will be stopped. It helps to reduce accident when the operator leaves. When the operator does not sit correctly, the operator cannot drive the truck or operate the loading and unloading, thus the accidents by maloperation will be reduced.

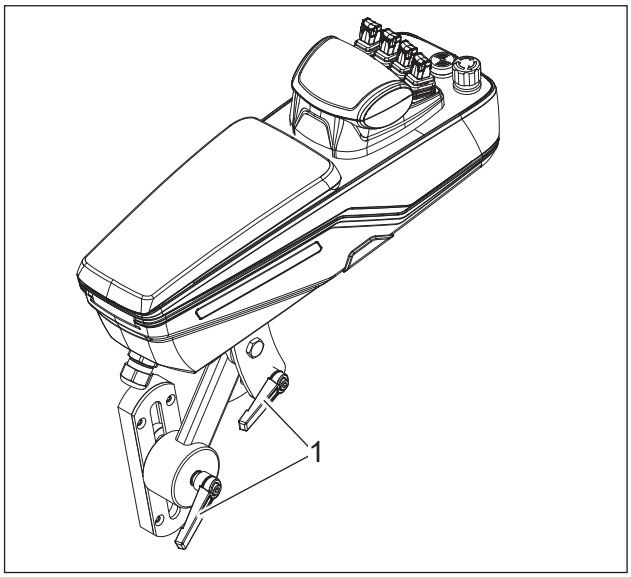
➢ Armrest adjustment (Electro-proportional valve)

Angle adjustment

Rotate the handle (1) counterclockwise to release the armrest;

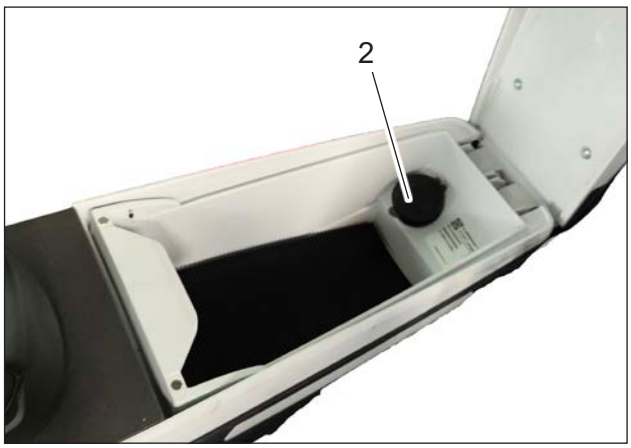
adjust the height and angle of the armrest;

rotate the handle (1) clockwise to lock it.



➢ USB ports

There are two QC3.0 USB ports (2) inside the armrest box.



2.2.11 Forks

➢ **Adjusting the fork spacing**

⚠WARNING

Fork spacing should be adjusted symmetrically to the truck centerline.

In order to guarantee safe operation of picking loads, before operation, adjust the fork spacing to proper position according to the tray dimension.

Fork carriage with manually movable forks

(a) Pull the fork locating pin upward, and rotate 180° in either direction to unlock the fork;

(b) adjust the fork position symmetrically from the center line of the carriage;

(c) after adjusting fork spacing, make sure the forks are positioned correctly and rotate pin until it drops into place.

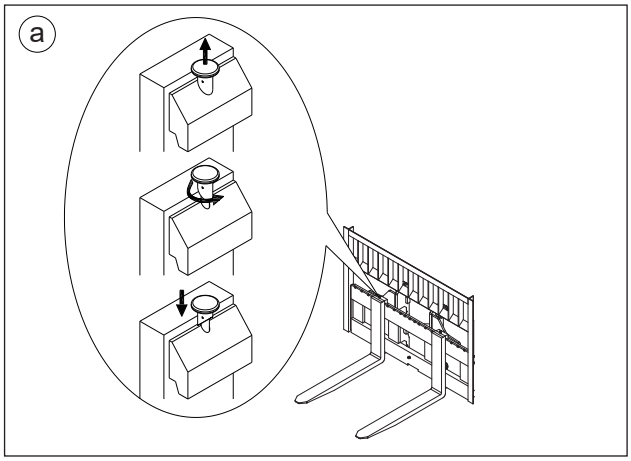
⚠WARNING

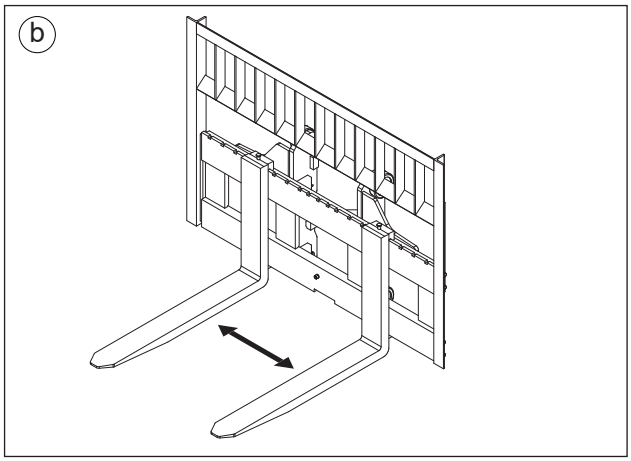
Secure the forks in position after adjustment.

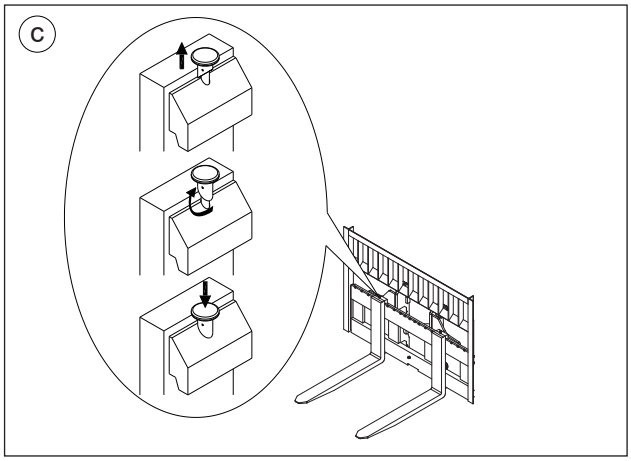
There is a slot in the lower crossbar for removing and installing forks.

Do not position the forks in the lower crossbar slot to prevent them from coming off the carriage.

A bolt is mounted in the center to limit the fork position, if this bolt is damaged please replace it.



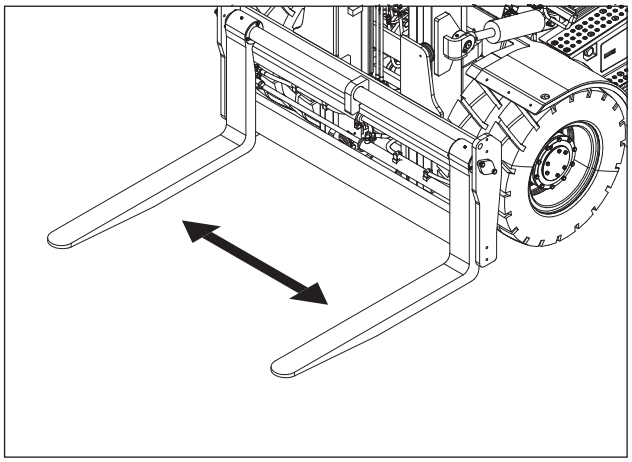




Side shift carriage with fork spreading

In order to guarantee safe operation of picking loads, before operation, adjust the forks to proper position according to the pallet dimension.

Use the Hydraulic cylinder to adjust fork spacing (See Page 45 Section "2.2.8 Control levers (Mechanical valve)" or Page 46 Section "2.2.9 Armrest (Electro-proportional valve)").



⚠WARNING

Fork spacing should be adjusted symmetrically to the truck centerline.

⚠WARNING

The forks can only be adjusted when the truck is unloaded.

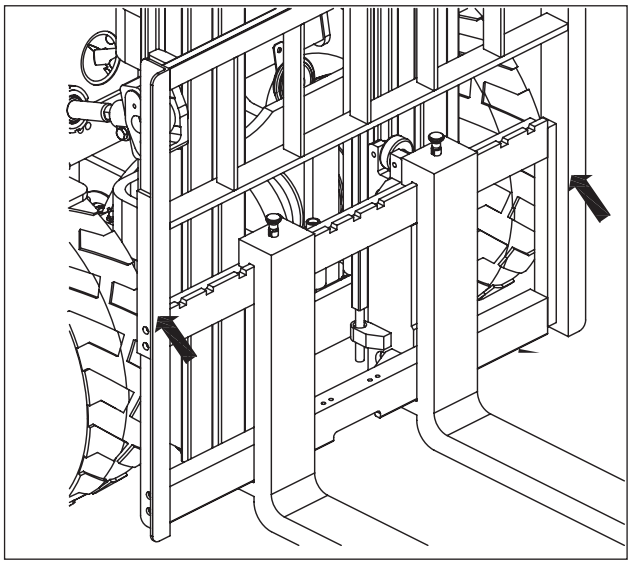
➢ **Fork removal and installation**

See Page 122 Section "5.5.11 Fork maintenance".

➢ **Load backrest**

The load backrest is an important safety component that prevents loads from falling. To protect against falling objects, ensure that the load backrest extension is correctly fitted and in good condition.

To remove the load backrest, unscrew the bolts on both sides.



⚠DANGER

Loads should not exceed the edge of the load backrest.

Loads should be placed in a stable position.

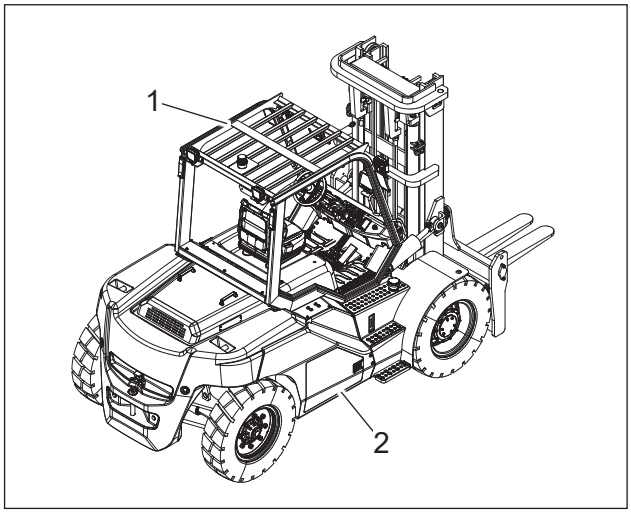
2.2.12 Other component

➢ **Overhead guard**

The overhead guard (1) protects the operator against injury from falling objects. It must have sufficient impact strength. Do not use the truck without the overhead guard.

NOTE

Trucks configured with cabs may vary in structure and function, please contact customer services department for assistance.

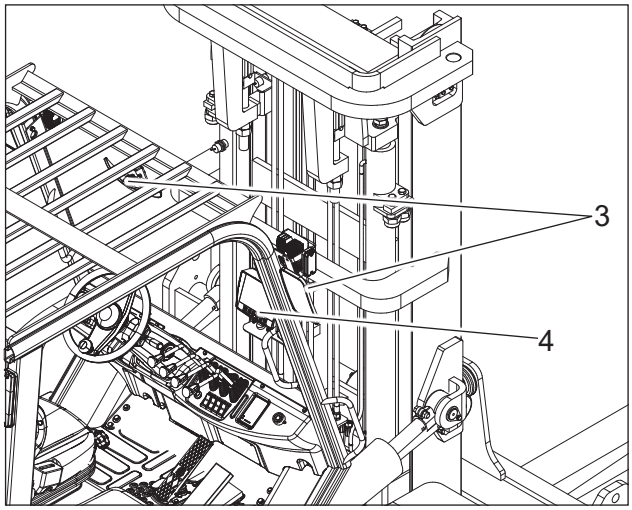


➢ **Chassis**

The chassis (2), in conjunction with the counterweight, forms the supporting base structure of the truck. It is used to support the main components.

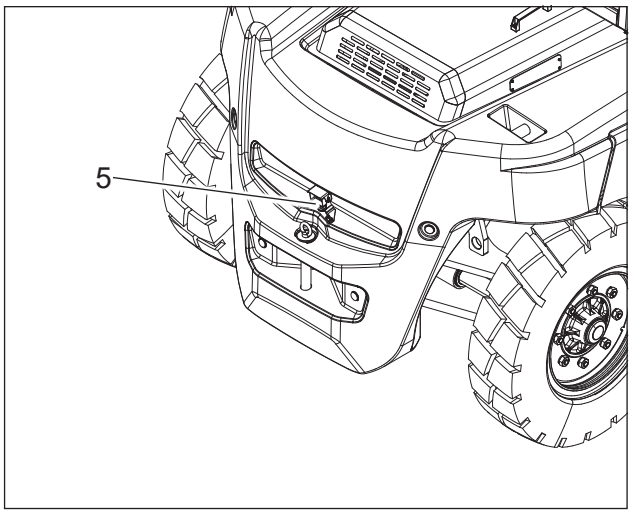
➢ **Rearview mirror**

Adjust rearview mirrors (3) to get the best view.



➢ **Rearview camera (optional)**

A camera (5) is mounted on the rear counterweight to improve visibility to the rear. The rear of the truck can be monitored via the display (4).



➢ Front turn signal lights

The front turn signals (1) are controlled by the light combination switch and indicate the direction of travel of the truck.

➢ Work lights

The work lights consist of front work lights (2) and rear work lights (3), which can illuminate the working area.

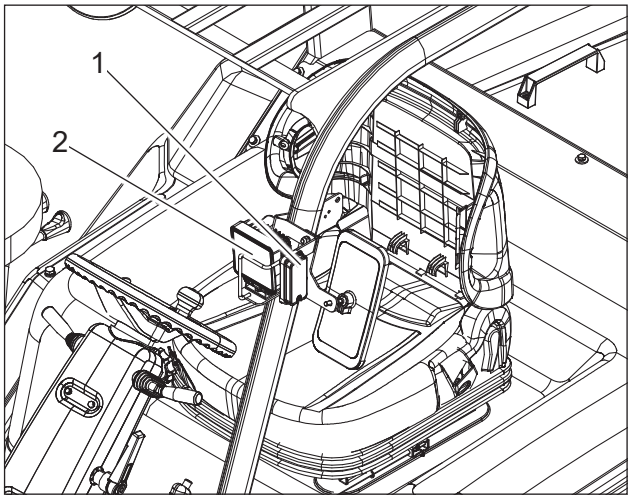
The work lights are illuminated when the work light switch is turned on.

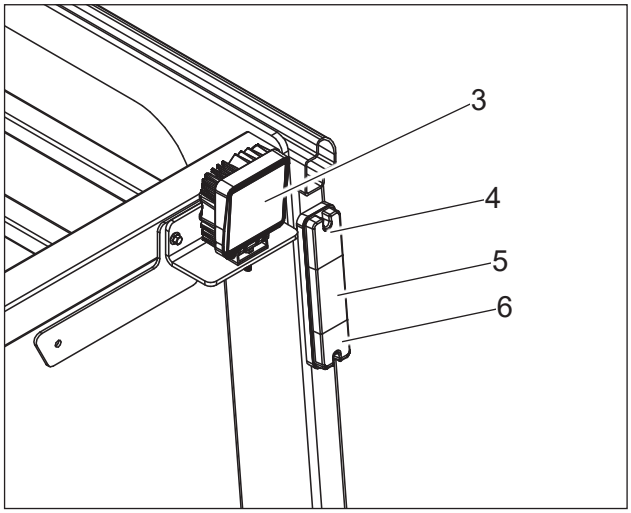
NOTE

Any damaged lights must be replaced.

The replacement of the lamp requires trained personnel.

Please contact the truck manufacturer when the lights are damaged.





➢ Rear combination lights

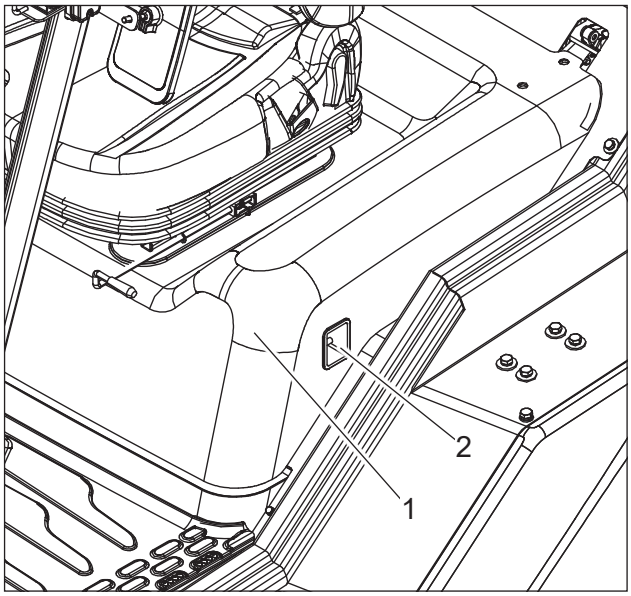
The rear combination lights include reversing lights (4), side lights (5) and brake lights (6). The side lights are turned on automatically when the truck is started, the brake lights come on when the brake is applied, and the reversing lights come on when the truck is reversing.

➢ Blue light (optional)

Blue lights provide visual warning, alerting people to the proximity or movement of the truck.

➢ Seat hood

Lift the latch (2) to unlock the seat hood (1).



⚠WARNING

When servicing under the hood (1), always turn off the key switch and the main power switch to avoid electric shock.

➢ Air spring

When the seat hood is fully open, the air spring will be locked in place to support the seat hood.

To close the seat hood, press the air spring button and pull the hood down until it is fully closed.

2.3 Related Safety Instruction and Standard (For CE)

The design and manufacture of electrical element comply with the low voltage standard 2006/95/EC.

➢ **Electrical requirements**

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

➢ **Noise emission level**

EFL803-HV, EFL903-HV, EFL1003-HV: <74 dB(A)

Noise will be according with EN12053:2001 and 2000/14/EC.

Sound pressure level on the operator's position is lower than 75 dB(A), measurement uncertainty is 1.5 dB(A).

➢ **Vibration and acceleration**

Vibration parameters are measured according to standards of ISO5349-2:2001, EN13059:2002, ISO2631-1:1997, and the result meets the requirement of 2002/44/EC.

Whole body vibration is lower than 1.1 m/s^2.

➢ **Structural tests**

Structural tests has been performed on a sample that is representative of series production in accordance with EN ISO 3691-1:2015+A1:2020.

The static test coefficient used for lifting accessories is 1.33.

➢ **EMC-Electromagnetic compatibility**

Electromagnetic compatibility (EMC) is a key quality feature of the truck.

EMC involves limiting the emission of electromagnetic interference to a level that ensures the trouble-free operation of other equipment in the environment.

- Ensuring sufficient resistance to external electromagnetic interference so as to guarantee proper operation at the planned usage location under the electromagnetic interference conditions to be expected there An EMC test thus firstly measures the electromagnetic interference emitted by the truck and secondly checks it for sufficient resistance to electromagnetic interference with reference to the planned usage location. A number of electrical measures are taken to ensure the electromagnetic compatibility of the truck.
- Our truck has been successfully tested according to EN12895 as well as the standardized instruction contained there in.

⚠CAUTION

- *The EMC regulations for the truck must be observed.*
- *When replacing truck components ts for repair the protective EMC components must be installed and connected again.*

3 Safety

3.1 Safety Instructions

➢ **Working condition**

Make sure to operate the truck on fairly stable and even road surface.

If there is snow, ice accretion, or other obstacles, clean it before you operate the truck, or the truck may be out of control and even cause safety incidents.

Truck cannot be operated in potentially explosive environment.

➢ **Operation permissions**

Only trained and authorized operator shall be permitted to operate the truck.

➢ **Make periodic checks**

Inspect the truck at periodic intervals for oil leak, deformation, looseness, etc. If neglected, short life of components will be caused and in the worst case a fatal accident would occur.

Make sure to replace "key safety parts" during periodic check.

Wipe off oil, grease or water from the floor, foot and hand levers, if any.

Strictly prohibit smoking, fire and spark nearby the battery when checking it.

If maintenance is performed on high position, such as mast, front and rear lamp, please be careful of falling off or being clamped.

Be careful not to be scalded when inspect the motor, controller etc.

➢ **Stop using the truck when it malfunctions**

Whenever malfunctions arise, you must stop the truck, hang a sign of "danger" or "malfunction" and take off the key, then report the malfunction immediately.

Only after the malfunction is eliminated, you may use the truck.

➢ **Protect yourself**

Operator must wear helmet, safety shoes and work (protective) clothes, whenever you operate and maintain the truck, handle the consumables etc.

➢ **Prevent explosion**

Because there will be explosive gas in the bosom of the battery, prohibit any flame or sparks nearby it strictly.

Don’t let any metal tools contact the terminals of the battery to avoid sparks or short circuit.

➢ **Know your truck sufficiently**

For the purpose of doing material handling job, the truck is different from general passenger carrying vehicles in structure as follows:

View is partially obstructed due to the hoist system.

Rear wheel steering makes the rear of the truck swing outwards when going round comers.

Read the operator’s manual and nameplates on the truck, and become familiar with your truck and operating procedures. If there is anything in the manual you do not understand, ask your service-partner to explain it to you.

➢ **Start safely**

Before starting up (starting the truck), make sure the following tasks are completed:

- Your safety belt is fastened;
- The truck doors is closed tightly.
- The parking brake is applied.
- The travel switch is in neutral.
- No one is under, on and close to (in the vicinity of) the truck.
- Don't step (depress) the accelerate pedal or control (operate) the lifting switch or tilting switch before turning on the power.
- Start slowly and never travel at excessive speed.

➢ **Stacking safely**

Don't tilt the mast carrying high load.

Use minimum forward and reverse tilt angle when stacking and unstacking loads. Never tilt forward unless load is slightly above the stack or at low lift height.

When stacking loads on a high place, make the mast vertical at a height of 15 to 20 cm above the ground and then lift the load. Never attempt to tilt the mast beyond vertical when the load is raised high.

To unstack loads from a high place, insert forks into the pallet, lift slightly and drive backwards, then lower the load. Tilt the mast backwards after lowering. Never attempt to tilt the mast with the load raised high.

➢ **How to handle bulky, long loads**

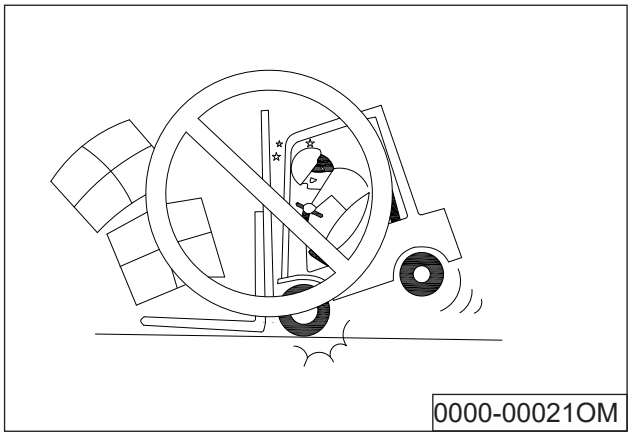
When handling bulky loads, which restrict your vision, operate the machine in reverse or have a guide to help you, and when you are guided, make sure you understand the meaning of the guide's gesture, flag, whistle or other signals.

When operating with long loads such as lumber, pipe, etc., or in the case of the Large-sized model or the truck with spreader (load or truck with fork extension attachment), be extremely careful of load at corners or in narrow aisles. Be alert for fellow workers.

➢ **Sudden stops, starts or sharp turns**

Operate the controls smoothly. Avoid sudden stops, starts or sharp turns.

It is dangerous to make an emergency brake. For it may cause the truck to overturn.



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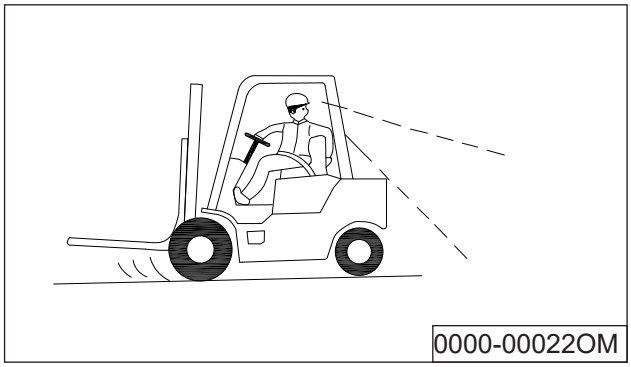
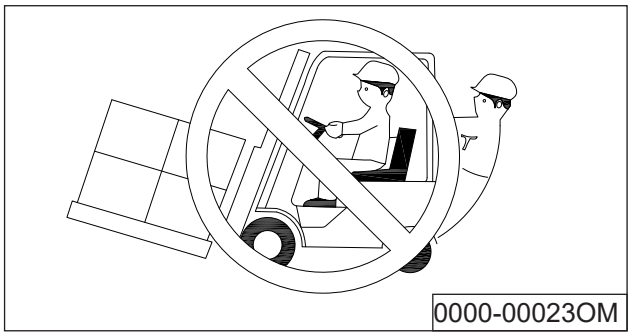
➢ **Focus on the travelling route**

Pay attention to the route of the truck, be sure to keep a clear view of it and look in the direction of traveling.



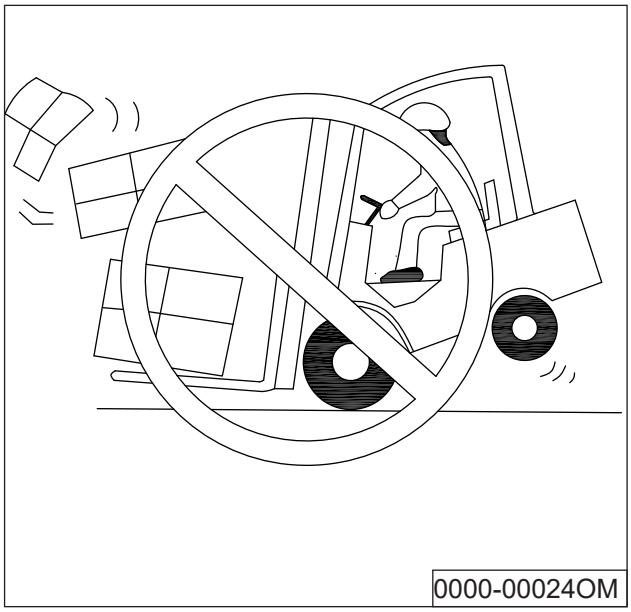
➢ **Never allow other person to ride on the forks, pallets or on the truck.**

Do not allow other people to get on the fork, tray or truck. Do not use people as additional counterweights.



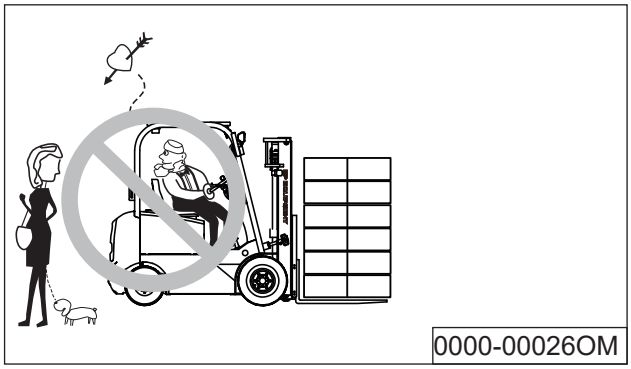
➢ **Carry the loads in a proper manner**

- Taking account of the shape and material of loads to be handled, use a proper attachment and tools.
- Avoid hoisting the load with wire rope suspended from the forks or attachment, since the wire rope may slide off. If needed, a qualified personnel (should perform the slinging), making use of a lifting hook or crane arm attachment.
- Take care not to protrude the forks out of the load. The protruded fork tips may damage, turn over or bump the adjacent load.
- Be careful not to let the forks touch the floor, so as to avoid damaging the fork tips or driving surface.



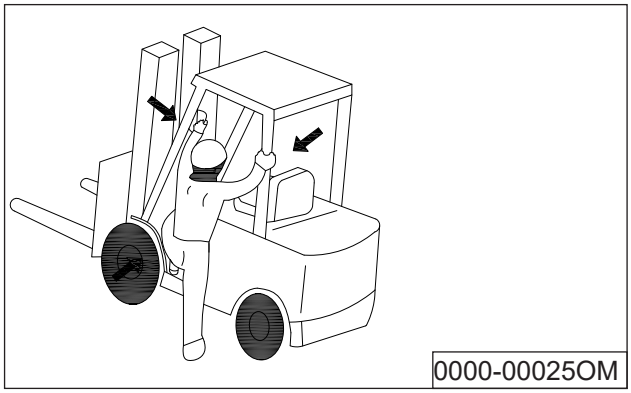
➢ **Concentrate on your work**

Keep your mind on your work. Learn to estimate danger before it arises.



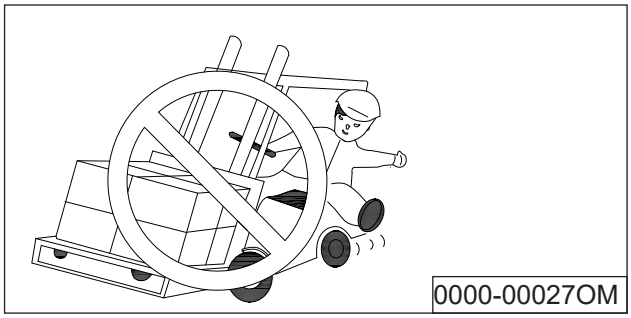
➢ **Mount and dismount properly**

Never mount or dismount the moving truck. Use the safety steps and safety handrail, and face the truck when mounting or dismounting the truck. Don't jump off!



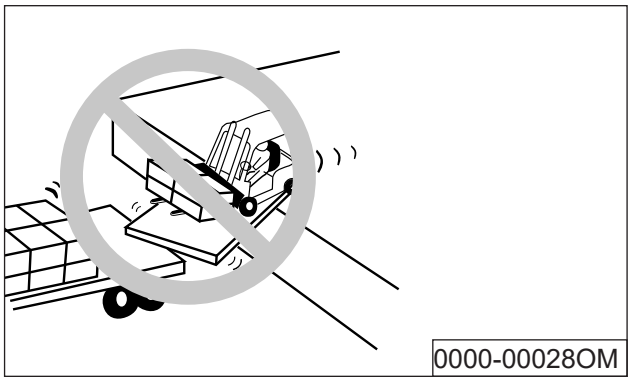
➢ **Location of the intended operator positions**

Keep your head, hands, arms, feet and legs within the confines (cab) of the operator's compartment (truck). Never (stick your hands or any other parts of your body out of it) for any reason.



➢ **Driving over a dock-board or bridge plate**

Before driving over a dock-board or bridge-plate, be sure that it is properly secured and strong enough to sustain the weight.



➢ **Never climb the masts.**

It is forbidden to stand or walk under the upraised fork or the attachments.

It is also forbidden to walk up or stand on the forks.

➢ **Overhead guard and load backrest**

Safeguard protects you not to be hurt by the goods fallen. Load backrest can keep the load stable. It is forbidden to use truck without overhead guard or load backrest.

Any additional bores or weldment to the overhead guard on the overhead guard will compromise its rigidity. It is therefore strictly prohibited to drill holes in the overhead guard or to weld to it.

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➢ **Avoid being clamped by the mast**

It is forbidden to put your hands, arms or head between the mast and overhead guard.

It is forbidden to put your hands between inner and outer masts.

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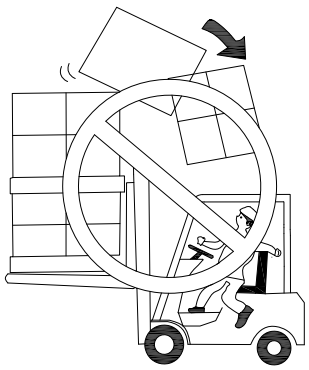
➢ **Don’t stack load too high on forks**

Don’t stack loads on forks in such a way that the top of loads exceeds the load backrest height. If unavoidable, make the load stable securely. When handling bulky loads that restrict your vision operate the truck in reverse or have a guide.



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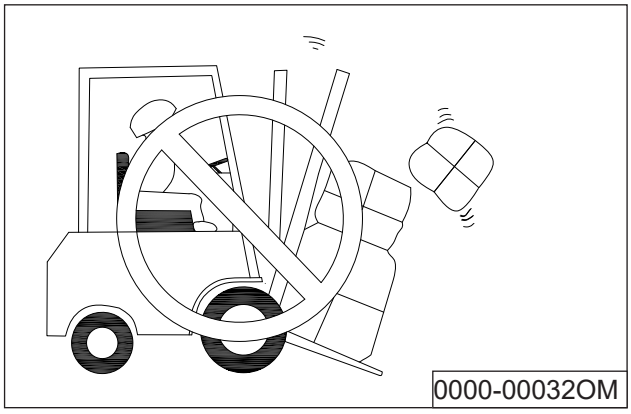
➢ **Tilt backwards when loaded**

Travel with load as low as possible and tilt back. If operating with steel pallet or the like, be sure to tilt back the mast to prevent it from slipping off the forks.

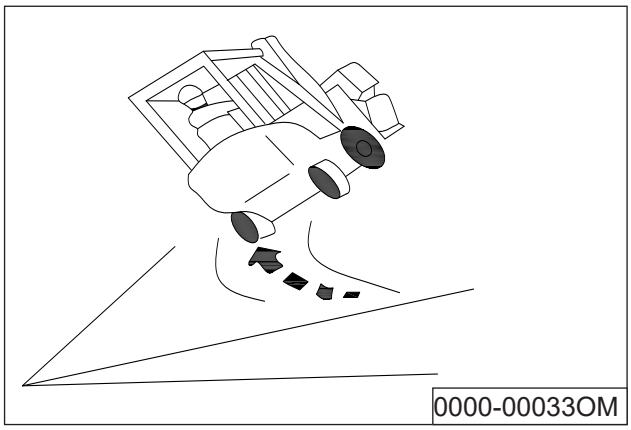


➢ **Watch for entrances and slow down at corners**

Watch for branches, cables, doorways, and hanging objects. Be cautious when working in crowded area.

Slow down and sound the horn at the entrances and exits of the aisles and other locations where vision is restricted.

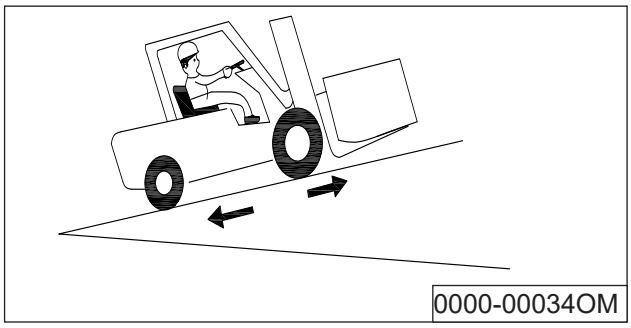
When make a turn, be sure the speed of the truck is lower than the 1/3 of the max. allowable speed.

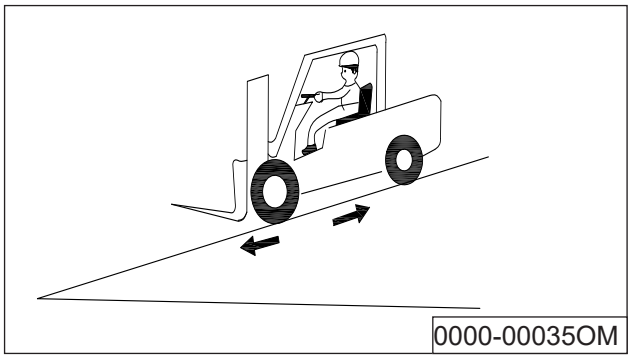


➢ **Do not turn or travel in a horizontal direction when moving up a ramp in case of toppling over.**

When operating loaded truck, have the rear end of your machine pointing downhill.

When operating unloaded truck, have the rear end of your machine pointing uphill.





➢ **Avoid lifting loads on a grade**

Never lift loads with the truck inclined. Avoid loading and unloading on a grade.

In the case of tip-over

The stability of your truck is ensured if used properly and as intended. But once it tips over during unapproved applications or incorrect operation, always follow the instructions below:

- stay buckled up;
- don't jump;
- hold on tight;
- brace feet;
- lean away.

➢ **Never operate the truck unless the operator is properly seated**

Before starting the truck, adjust the seat so you can get easy access to all hand and foot controls.

➢ **Know the capacity of your truck**

Know the rated capacity of your lift truck and its attachments, and never exceed it.

Do not use a man as an additional counterweight. It's quite dangerous.

➢ **Use proper attachments**

We afford all types of attachments, such as rotating roll clamp, bale clamp, sideshift, and crane jib. You should refit the truck under ours license if you want (Modifications to the truck must be authorized by the manufacturer). Only specialists are permitted to mount attachments and connect the energy supply for power-driven attachments.

It is forbidden to refit the truck by yourself.

➢ **No off-center loads**

The goods is easy to drop when turning or passing rough road for off-center loads. And the truck may topple over more probably.

➢ **Keep some distance from the roadside and the kerb**

➢ **Ensure adequate lighting**

The industrial truck working area must be adequately lit. Turn on the headlamps and work lights when working in the dark area to make sure the operator can see clearly.

➢ **Don't operate the truck if the protection device is removed.**

➢ **Small loads handling safety**

Small loads should be carried on a pallet and not placed directly on the forks.

➢ **Appropriate equipment and tools safety**

After the protective device like overhead guard and mast load bracket is dismantled, it is prohibited to operate the truck or carry loads.

➢ **The following conditions can increase the risk of tip-overs**

- failure to slow down to a safe speed before making a turn both laden and unladen;
- quick turning;
- emergency brake;
- driving with a side shifted load;
- turning on or traversing across a ramp;
- load facing downhill when travelling on a ramp;
- driving with wide loads;
- driving with swinging loads;
- driving on the ramp edge or step;
- tilting the mast forward with elevated load;
- driving on uneven roads;
- overloading;
- handling loads in strong winds;
- when transporting liquids, the center of gravity within a picked-up container can change because of the effect of inertia (e.g. when starting, braking, cornering).

➢ **Never lift a load over anyone**

Never permit anyone to stand on or walk under upraised forks or other attachments if equipped. If unavoidable, use a safety stand or block to prevents a possibility of fork attachments falling down or moving unexpectedly.

➢ **Check the ground of the work area**

Inspect the surface over which you will drive on. Look for potholes, drops, obstacles, and protrusions. Look for anything that might cause the truck to lose control or jolt.

Clear away trash and debris. Pick up anything that might puncture a tyre or let the load lose balance.

Slow down for wet and slippery roads.

Stay away from the edge of the road.

Do not drive the truck up or down steps.

If the ground is bumpy, it will cause the truck jolt and bring much noise.

Do not operate the truck when the weather is inclement, such as wind, thunder storm, snow etc. Especially when the wind speed exceeds 10 m/s, don’t operate the truck outdoors.

➢ **Carry the load low**

It is dangerous to travel with forks higher than appropriate position whether loaded or not. Maintain a good traveling posture. (When traveling, the forks should be 15 to 30 cm above the ground or floor, and the mast should be tilted backwards)

Do not operate the sideshift assembly, if equipped, when the forks are raised and loaded, this will cause the truck to be unbalanced.

➢ **Fire extinguishers**

The workplace should be equipped with fire extinguishers. User can also select a truck equipped with a fire extinguisher which is usually placed on the frame.

Make sure operators know the fire extinguisher's location and are familiar with how to use it in an emergency situation. Relevant handling information is provided on the fire extinguisher.

➢ **Hydraulic system risks**

The hydraulic system is under pressure, and it is important to be aware of the risk of injury and wear protective equipment during any inspection or maintenance.

Before connecting hydraulic lines or hydraulic joints, the hydraulic system must be depressurized.

➢ **Braking distance**

Taking into account the specified minimum braking distance, do not use trucks on long ramps with gradients exceeding specified values. If you need to use the truck on slopes with higher gradients, please first consult your dealer. The gradeability given in the type sheet are calculated based on the truck's traction and are only applicable to situations in which the truck must surmount small obstacles or when driving on fairly even road surfaces.

➢ **Residual risks**

In spite of careful work and compliance with all applicable and regulations, the possibility of other dangers when using the industrial truck cannot be entirely excluded.

Residual dangers can include:

Escape of consumables due to leakages or the rupture of lines, hoses or containers;

Risks of accident when driving over uneven ground, wet, icy or greasy ground, gradients, irregular surfaces, or with poor visibility;

Risks of fire and explosion due to the battery and electrical voltage;

Risk caused by insufficient maintenance or testing;

Risk caused by using the wrong consumables;

Disregarding the safety regulations.

➢ **Battery Safety**

⚠WARNING

Batteries can produce explosive gases.

- Remain aware of the following information.
- Remove any metal rings, bracelets, wristbands, or other jewelry before working with or near batteries or electrical components.
- Never expose batteries to open flame or sparks.
- Shorting of battery terminals can cause burns, electrical shock, or explosion. Do not allow metal parts to contact the top surface of the battery. Make sure all terminal caps are in place and in good condition.
- Batteries may only be charged, serviced, or changed by properly trained personnel.
- Always follow all instructions provided by the manufacturers of the battery, charger, and trucks.

3.2 High-voltage electric safety operation regulations

Special trucks require specially defined operating procedures. High-voltage lithium-ion battery trucks have the potential danger of high voltage electricity, which can cause serious electric shock or bodily injury if improper or negligent treatment is used when servicing the electric truck; strong alkaline/acid battery electrolyte is hazardous to the human body.

Keep in mind that all orange cables are high voltage devices.

Carefully implement high voltage safety procedures to minimize risk.

⚠WARNING

For the following inspections, maintenance and repairs, please be sure to consult and have a specialized maintenance technician from manufacturer make an on-site service:

- *Involving the inspection, maintenance repair, and replacement of high voltage parts, components, and wiring;*
- *Inspection and maintenance repair of non-high voltage components and wiring, but affected by the assembly and disassembly of high voltage parts, components and wiring;*
- *Faults may be caused by high voltage or non-high voltage crossovers;*
- *It is not possible to determine whether the fault is caused by high voltage or non-high voltage;*
- *Others that require touching or may touch high voltage components or high voltage lines.*

⚠WARNING

The inspection and maintenance of high-voltage components should be carried out by personnel who have received specialized training in high-voltage electrical knowledge and obtained corresponding certificates. The inspection and maintenance of the internal lithium-ion battery must be completed by a specialized manufacturer.

⚠WARNING

Any inspection and maintenance repairs should strictly comply with the relevant high-voltage electric truck safety precautions, operating specifications safety rules and the use of safety protective equipment and tools in this manual.

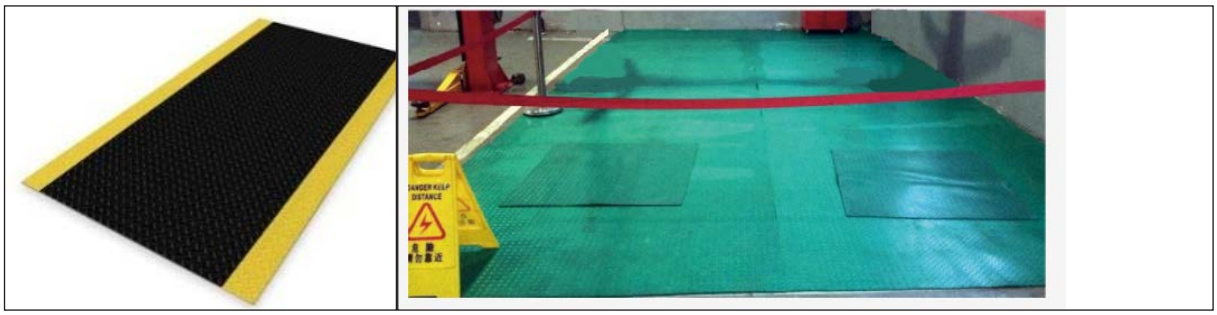
3.2.1 Site Requirements and Preparation for High Voltage Maintenance

Ensure that the site is well ventilated, dry, well-lit, level and spacious; equipped with commonly used maintenance tools, complete and safe gas and electric circuits; and no high-power electrical equipment, flammable items and metal items not related to work are placed around the site.

Before checking and repairing, make sure that there is no water (stagnant water, water drop) on the repair and maintenance floor and on the body of the truck. Do not operate in a wet environment. Do not perform high-voltage work with wet hands. Do not operate with water on the high-voltage parts. If the humidity on the ground or in the surrounding area is too high, stop work immediately.

Dry powder fire extinguishers shall be provided in the work area. No other fire extinguishers shall be used.

During maintenance, dry insulating mats should be laid on the lower part of the truck body and the standing area of the maintenance personnel to eliminate the risk of electric shock.



Site work area should be set up to warn the restricted area and warning signs, warning lines and markings should be clear, and isolation distance should be within the normal range, at the same time, the surrounding area should be pulled up a cordon, the isolation spacing is maintained at 1 – 1.5 m, and prohibit unrelated personnel from entering the area.

High-voltage maintenance sites should be placed in the danger warning signs, posted labeling "danger high voltage", "electric danger", "prohibit the closing of the gate" and other warning signs to prevent others from accidentally touching.

The site should be equipped with fire-fighting and high-voltage protective emergency equipment, such as firefighting scissors, firefighting sand, dry powder fire extinguishers, gas masks, insulating rods (hooks), etc., to ensure that the fire-fighting facilities are effective, e.g., fire extinguishers should be set up in a location that is clearly located and easy to access, and placed securely, and the extinguisher box should not be locked.

3.2.2 Personal Protection for High Voltage Maintenance

For specific diagnostic or repair operations, service personnel may be required to operate near exposed high-voltage parts. If an electrically conductive object falls onto an exposed high voltage circuit, a dangerous short circuit could result.

Prior to servicing a high-voltage lithium-ion truck, the service technician should remove all jewelry and metal objects from them, such as rings, watches, necklaces, and badges.

To prevent high-voltage electrocution accidents during operations, it is necessary to check and wear high-voltage insulating gloves. When using high-voltage insulating gloves, maintenance personnel must inspect and test the gloves before performing maintenance work on new energy trucks.

To protect the eyes from impact or liquid splashes, service personnel must wear the appropriate standard goggles with side shields.

A common protective gear to prevent electrocution of the head is an insulating helmet.

Select the appropriate grade of insulating shoes according to the operating environment or the voltage of the equipment.

Additionally, wearing anti-static clothing provides additional safety protection. Electrocution is usually associated with burning, so static clothing is recommended when servicing high voltage equipment.

High voltage maintenance personal safety protection is shown below:

3.2.3 Precautions for the safe use of high voltage and safe operating procedures

Safety precautions and safe operating procedures for high voltage are extremely important safety rules. Please make it a point for you and the relevant personnel to go through them and master them:

➢ **High voltage electrical safety Procedure**

(1) High-voltage parts and battery parts are carried out by the manufacturer or by organiza-

tions and personnel who have been specially trained (different from ordinary truck training) and authorized to do so.

(2) High-voltage components and high-voltage cables should not be touched at will, otherwise there is a risk of electric shock causing injury or death. There are high voltage markings on the high voltage components of the whole truck; in addition, the high voltage cable has an orange bellows jacket, which is easy to recognize.

(3) Before repairing high-voltage components, please connect the truck body with a grounding wire to the grounding wire of the maintenance station dedicated to the counterweight electric truck to prevent short circuits from occurring.

(4) When performing maintenance, the high voltage system must be disconnected: unplug the MSD connector on the high voltage box and wait 15 – 20 minutes for the high voltage system to be completely de-energized. Alternatively, disconnect the main power switch and unplug the Lithium-ion battery positive and negative power cables.

(5) Do not touch the energized parts in the high-voltage cable connector with your fingers to prevent electric shock. In addition, small metal tools should be prevented from touching the energized parts of the connector to prevent short-circuiting.

(6) Inspection and maintenance personnel are prohibited from carrying or wearing metal conductive objects during maintenance.

(7) Ensure that all cables are properly connected and tightened when maintenance is completed for power-up. Ensure that no one else is working on the truck's high voltage when powering up.

(8) Maintenance tools used for repair and maintenance must be insulated before use.

(9) Do not operate the truck with water or moisture on hands, truck body, parts, or environment.

(10) When carrying out maintenance on high voltage electricity, two or more persons are required to operate. In case of abnormal accidents and fires, the operator should immediately cut off the high-voltage circuit, and other personnel should immediately use fire extinguishers to put out the fire (use dry powder fire extinguishers; water-based fire extinguishers are strictly prohibited).

(11) When servicing high-voltage cables, any high-voltage cables removed shall be immediately wrapped with insulating tape to prevent personal injury from electric shock.

(12) When performing maintenance on high-voltage components, remove the truck key and keep it in a safe place to avoid starting the truck.

(13) When battery electrolyte leaks, do not touch it directly with your hands. It is necessary to wear self-contained breathing apparatus and fire protective clothing to handle.

(14) When repairing and maintaining high-voltage components, pay attention to the meaning of the color representation of each component decal, and always pay attention to whether the surrounding environment is humid and whether there is sweat on the body. Ensure that the body is dry during operation.

3.2.4 High voltage lithium-ion truck maintenance process

Step 1: Turn off the key switch and unplug the key, and disconnect the main power switch, thus cutting off the low voltage power to the entire truck;

Step 2: Check to make sure you are wearing insulating gloves, insulating shoes, and other personal safety equipment;

Step 3: Remove the MSD connector (MSD connector location is described later in the lithium-ion battery section) and wait 15 to 20 minutes for the capacitors in the high voltage components to discharge;

Step 4: Measure the high voltage system (busbar) voltage to confirm it is 0 V;

Step 5: Wrap the disconnected high voltage line connector with insulating vinyl tape;

3.2.5 First aid for high voltage accidents

When rescuing injured persons in an electrical accident, do not touch persons who are still in contact with electricity. If possible, immediately de-energize the electrical system (turn off the key switch or pull out the MSD connector immediately). Separate the person to be rescued or the conductive body from the discharging body with a non-conductive object (wooden stick, bamboo pole, etc.).

When administering first aid after an electric shock accident, if the person being rescued is unresponsive, the following rescue measures should be taken: first make sure that the victim shows signs of life, such as pulse and breathing; call an emergency physician immediately or have a bystander do so immediately; perform artificial respiration and cardiopulmonary resuscitation until a physician arrives; and, if the breathing stops, resuscitate with the use of a AED (if available).

If the person being rescued is able to respond to the questioning, the following first-aid measures should be taken: cool the burn and bandage it with a disinfected, lint-free cloth; even if the person being rescued refuses, ask for medical treatment (to avoid long-term after-effects).

3.3 Regulations for the Operation of Trucks

Operating safely is every operator’s obligation and responsibility. The "Safety Instructions" cover basic safety procedures and warnings of general application to the trucks. However, safety precautions given on the following pages are also applicable to lift trucks that have special specifications or attachments.

Read this manual carefully and become completely familiar with your truck to make sure the operator understands all the information, directives and safety guidelines that are applicable to your industrial truck are complied with.

3.3.1 Operator Authorization

The truck may only be used by trained personnel who have demonstrated that they can drive, handle loads, and are authorized to operate the truck.

3.3.2 Unauthorized Use of Truck

The operator is responsible for the truck during the time it is in use and should prevent unauthorized persons from driving or operating the truck. Do not carry passengers or lift personnel.

3.3.3 Damage and Faults

The supervisor must be immediately informed of any damage or faults to the truck. If the truck is not safe for operation (e.g., wheel or brake problems) it must not be used until it has been repaired.

3.3.4 Repairs

The operator must not perform any repairs or alterations to the truck. Repairs must only be done by an authorized, trained technician. The operator must never disable or adjust safety mechanisms or switches.

3.3.5 Hazardous area

A hazardous area is defined as the area in which a person is at risk due to truck movement, lifting operations, the load handler (e.g. forks or attachments) or the load itself. This also includes areas which can be reached by falling loads or lowering operating equipment. Unau-

thorized persons must be kept away from the hazardous area.

Where there is danger to personnel, a warning must be sounded with sufficient notice.

Give a warning signal with plenty of time for people to leave.

If unauthorized personnel are still within the hazardous area stop the truck immediately.

3.3.6 Safety Devices and Warning Signs

The safety devices, warning signs and warning instructions in the present operating instructions must be strictly observed.

3.3.7 Travel routes and work areas

Only use lanes and routes specifically designated for truck traffic. Unauthorized parties must stay away from work areas. Loads must only be stored in places specially designated for this purpose.

3.3.8 Driving conduct

The operator must adapt the travel speed to workplace conditions. The truck must be driven at slow speed when negotiating bends or narrow aisles, when passing through swing doors and at blind spots. The operator must always observe an adequate braking distance in front of the truck. The operator must always be in control of the truck. Abrupt stopping (except in emergencies), rapid U turns and passing at blind spots are not permitted. It is forbidden to lean out of the truck or reach beyond the working and operating area.

Nature of loads to be carried: The operator must make sure that the load is in a satisfactory condition. Only carry loads that are positioned safely and securely. Use suitable precautions to prevent parts of the load from tipping.

3.3.9 Nature of loads to be carried

The operator must make sure that the load is in a satisfactory condition. Only carry loads that are positioned safely and securely. Use suitable precautions to prevent parts of the load from tipping.

3.4 The structure and stability of truck

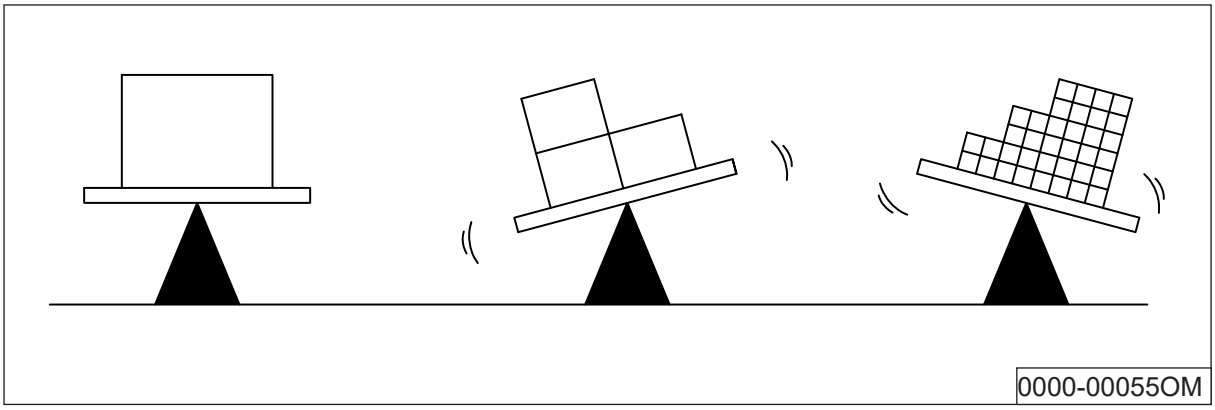
It is important for the operator to be clear about the structure and stability of the truck in order to operate the truck safely.

3.4.1 The structure of the truck

The basic structure of the truck is mast (include mast and forks) and body (include tyre)

3.4.2 Load Center of Gravity

There are differences in Center of Gravity because of the loads' shape, such as box, board and long object. It is very important to distinguish the difference of the Load Center of Gravity for evaluating the truck's stability.



3.4.3 Stability and Center of Gravity

The stability of the truck depends on the Combined Center of Gravity, which is a combination of the Truck Center of Gravity and the Load Center of Gravity.

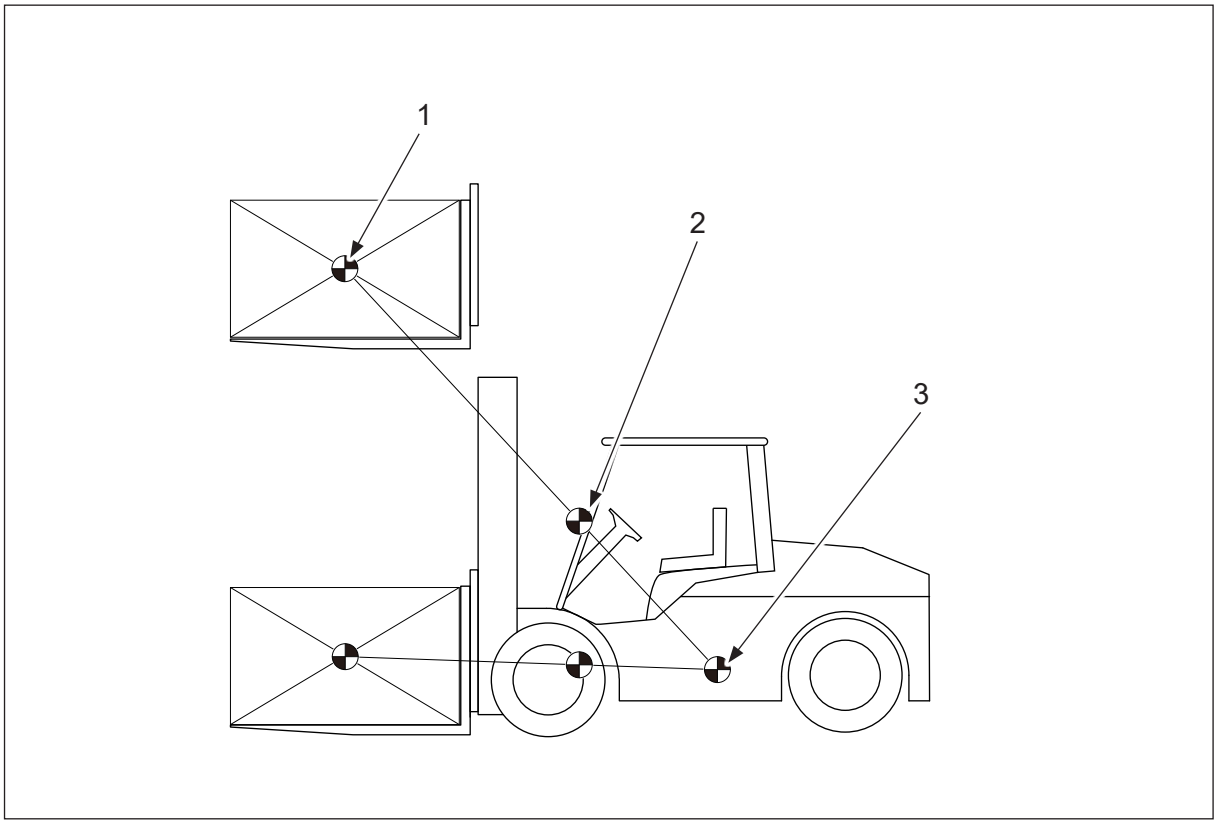
When the truck is not loaded, only the Truck Center of Gravity exists;

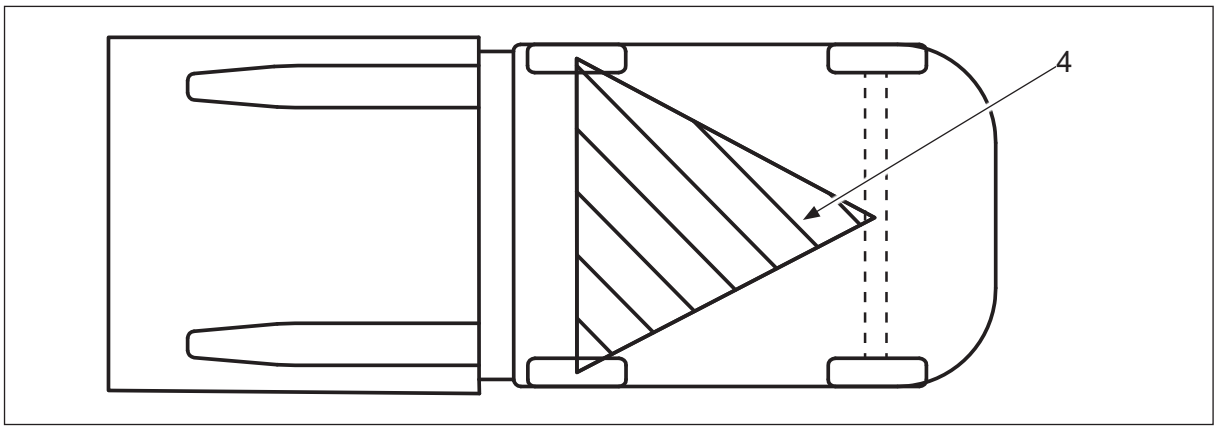
When loaded, the stability of the truck depends on the Combined Center of Gravity, which is a combination of the Truck Center of Gravity and the Load Center of Gravity.

The location of the Load Center of Gravity depends on whether the mast is tilted forward or backward, raised or lowered. Therefore, when the mast is tilted forward or backward, raised or lowered, the Combined Center of Gravity also changes.

The Combined Center of Gravity is determined by the following factors:

- Load's size, weight and shape;
- The lifting height;
- The tilting angle;
- The acceleration;
- The tyre pressure;
- The radius of turning;
- Road surface condition and grade;
- The attachments.





(1) Load Center of Gravity;
(2) Combined Center of Gravity;
(3) Truck Center of Gravity;
(4) Stability Triangle.

⚠ WARNING

In order for the truck to be stable, the Combined Center of Gravity must be located within the area bounded by the front tire landing spot and the center of the steering axle.

If the Combined Center of Gravity is outside the stability triangle, the truck could tip over.

3.4.4 Wind load

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.

4 Operation

4.1 Daily checks

Daily checks of the truck are essential to ensure that it is safe for both the operator and the workplace.

It is necessary to carry out daily checks of the truck at the beginning of each shift, as the truck may have malfunctioned during the previous shift. Daily checks prevent faults that occurred during the previous shift from affecting later use of the truck.

⚠ WARNING

Never start the truck until all damage and faults have been settled.

If a truck malfunction is detected, immediately notify relevant personnel such as supervisors, safety officers or emergency responders.

4.1.1 Operator's Daily Checklist

The "Operator's Daily Checklist" is a sample list of daily operator checks. The key informations listed in this table are formulated according to the "Maintenance Checklist", and can also be added according to user' requirements. It is necessary to print and record the contents related to the truck for your safety and longer use of the truck.

i NOTE

Maintenance operations listed in the "Operator's Daily Checklist" do not require special training.

More complicated maintenance, such as battery replacement, wheel replacement, etc., should be performed by an authorized service center.

i NOTE

For detailed maintenance information, see Page 105 Section "5.3.1 Maintenance Checklist"

Operator's Daily Checklist

Date _____ Operator _____

Truck No. _____ No. _____

Department _____

Runtime
Meter Reading _____

Daily Check Items	OK(√)	Remark
Visually inspect the entire truck (in particular wheels) for obvious damage		
Visually inspect the battery accessory and cable connections		
Check the entire truck for fluid leakage		
Check wheels for wear and damage		
Check tyre pressure		
Check the mast, load backrest and forks for visible damage such as cracks		
Check warning label condition		
Check truck lights		
Check glass and mirrors for dirt and breakage		
Adjust vision aids (mirrors, camera systems, etc)		
Check fluid level (hydraulic oil, coolant, etc)		
Check controls and display components		
Check battery level		
Test service brake and parking brake		
Test the emergency stop switch		
Test truck steering function		
Test forward and reverse travel		
Test lifting and lowering function		
Test horn and buzzer		
Test the OPS system		
Check the condition and function of the seat and seat belt		

4.2 Using the truck

4.2.1 Using the truck for the first time

➢ **Safety instructions for assembly and commissioning**

Truck components may be transported in several parts.

Assembly of the truck on site, commissioning and operator training must only be carried out by the manufacturer's service personnel who have been specially trained for these tasks.

⚠WARNING

Incorrect assembly can lead to accidents.

⚠WARNING

The use of unsuitable energy sources can be hazardous.

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

The truck must only be operated with battery current.

➢ **Preparing the truck for operation after delivery or transport.**

Procedure:

- Check that the truck is complete.
- Fully charge the battery (See Page 94 Section "4.5.3 Charging the battery with an external charger").
- The truck can now be put into operation (See Page 73 Section "4.1.1 Operator's Daily Checklist").

iNOTE

Commissioning and driver/operator training must only be performed by trained personnel. If several trucks are supplied, make sure that only load lifting devices, masts and trucks with the same serial number are assembled.

4.2.2 Environmental considerations

➢ **Packaging**

During delivery of the truck, certain parts are packaged to provide protection during transport. This packaging must be removed completely prior to initial start-up.

iNOTE

The packaging material must be disposed of properly after delivery of the truck.

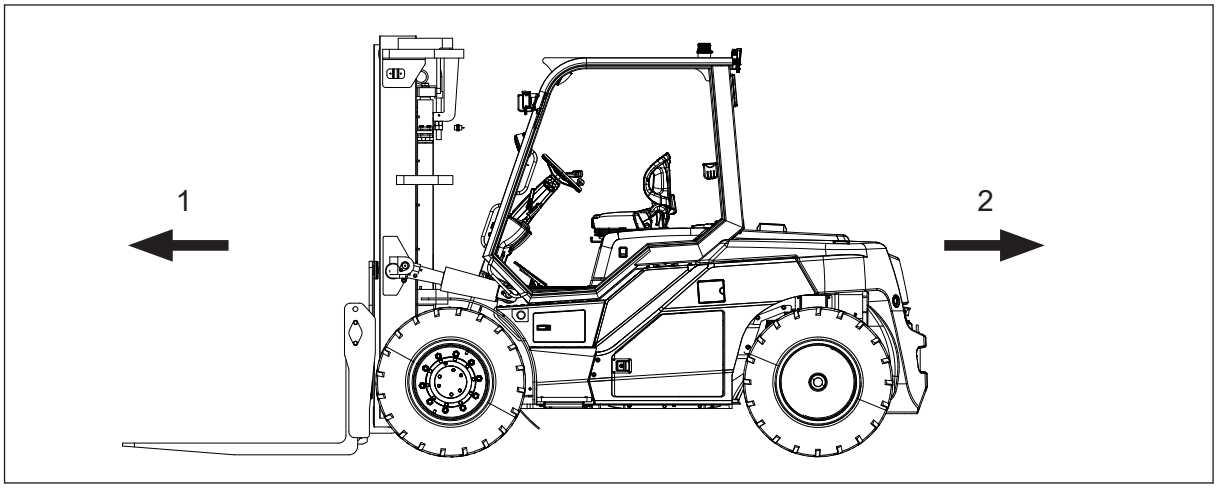
4.2.3 During running-in

- We recommended operating the machine under light load conditions for the first stage of operation to get the most from it. Especially the requirements given below should be observed while the machine is in a stage of 100 hours of operation.
- Must prevent the new battery from over discharging when early used. Please charge when remain power is less than 20%.
- Perform specified preventive maintenance services carefully and completely.
- Avoid sudden stop, starts or turns.
- Oil changes and lubrication are recommended to do earlier than specified.
- Carry only 70% – 80% of the rated load.

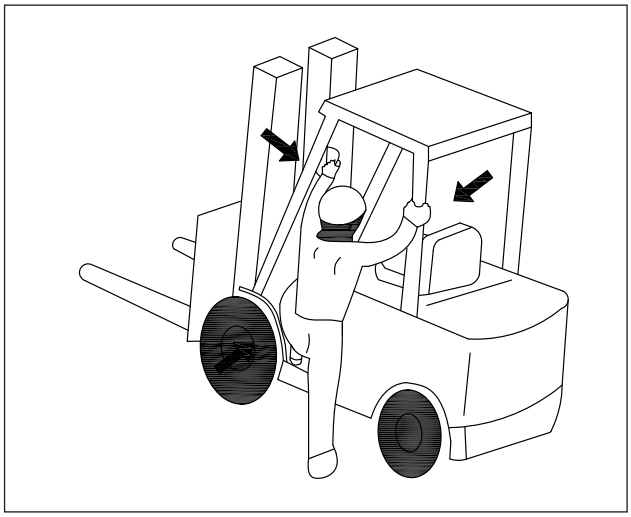
4.2.4 Defining directions

(1) Forward;

(2) Reverse.



4.2.5 Entering or exiting



When entering or exiting, please

- hold onto the handle;
- step on the safety steps.

⚠ WARNING

Do not enter or exit the truck when it's moving.

When entering or exiting, do not step on any part of the truck other than the safety steps.

i NOTE

When using the truck on a daily basis, exit from the left side of the truck.

In special cases, e.g. if the exit on the left side of the truck is blocked, you may exit the truck from the right side. There are also handles and safety steps on the right side of the truck.

The cab with doors is equipped with a special escape exit, please contact the manufacturer's after-sales service department for information.

4.2.6 Truck starting

- Pull out the main power switch;
- Slightly rotate and pull out emergency stop switch;
- Place the travel switch in neutral position;
- Insert the key in the key switch and turn it clockwise;
- Test the brake pedal and parking brake;

  The display shows the status of the truck, and the truck is now ready for operation.

⚠WARNING

The travel switch must be in neutral position before the truck is started.

Please do not open the rear window if the truck equipped with cab when driving, to avoid the risk of broken glass.

4.2.7 Driving

- Tilt the mast back: Operate the lifting control lever to raise the forks 300 mm off the ground. Then operate the tilt lever to tilt the mast back to the end.
- Select travel direction: Place the travel switch in F (forward) position to move the truck forward; Place the travel switch in R (reverse) position to reverse the truck.
- Drive the truck: Drive the truck with both hands on the steering wheel, and slowly step on the accelerator with your right foot.
- Change the direction of travel: Release the accelerator pedal or press the brake pedal to slow down the truck, then press the brake pedal, turn the travel switch to the opposite direction, release the brake pedal and slowly press the accelerator pedal to drive the truck.

⚠WARNING

Do not change the direction of travel at speeds greater than 1 km/h.

⚠WARNING

Driving is prohibited if the distance from the operator's head to the overhead guard is less than 30 mm.

For trucks with cab, the doors must be closed before driving the truck.

4.2.8 Driving on ascending and descending gradients

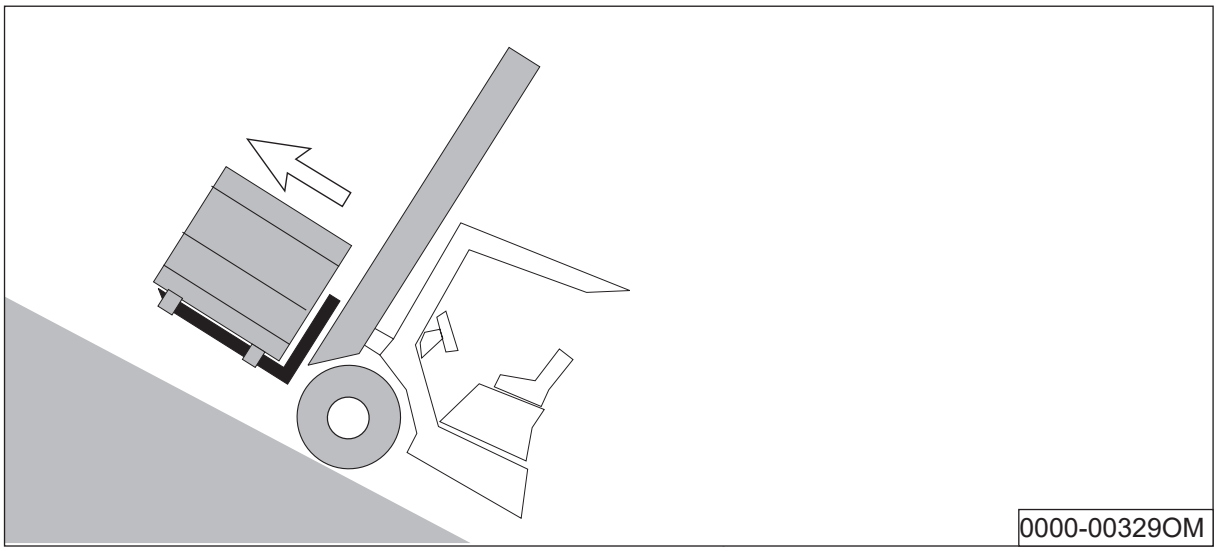
⚠ DANGER

Driving on ascending and descending gradients carries special dangers!

Always follow the operating instructions when ascending and descending gradients.

➢ **Operating instructions:**

- Reduce the driving speed on descending gradients. Apply the service brake to stabilize the truck.
- On ascending and descending gradients, the load must be carried facing uphill.
- It is only permitted to drive on ascending and descending gradients that are marked as traffic routes and that can be used safely.
- Do not drive on ramps that exceed the specified values. Otherwise, the braking effect and stability of the truck will be affected.
- Do not drive diagonally or turn when driving on a ramp.



4.2.9 Steering

Unlike normal vehicles, forklift trucks are rear-wheel steered. This means that the counter-weight at the rear of the truck swings outwards when turning and the truck has to slow down when steering. Turning the steering wheel counter-clockwise turns the truck to the left; turning the steering wheel clockwise turns the truck to the right.

4.2.10 Braking

Service brake: Step on the brake pedal to decelerate or stop.

Parking brake: In order to avoid accident move of the truck, apply the parking brake.

⚠WARNING

- *Never use parking brake instead of service brake in normal traveling.*
- *Emergency stop is unavoidable in travel. The parking brake should only be applied to stop the truck if the service brake is disabled.*
- *Be careful when braking to avoid load sliding.*

4.2.11 Parking

➢ **Procedure**

- Depress the brake pedal and the truck will slow down until it stops.
- Place the travel switch in neutral position.
- Apply the parking brake to prevent the truck from moving.
- Lower the forks to the bottom, and tilt the mast forward until the forks touch the ground.
- Set the key switch to "OFF" to stop the truck, remove the key and keep it in a secure place.
- Press the main power switch to shut down the power.

⚠WARNING

An unsecured truck may cause accidents.

The truck can only be parked on level surface, and its wheels may need to be secured with wedges.

Never park the truck in the traffic lane, as it may interfere with other trucks.

The truck must be parked in a frost-free, clean, dry location and 0 – 40 °C condition. Parking the truck in an environment below 0 °C for a long time is forbidden.

⚠WARNING

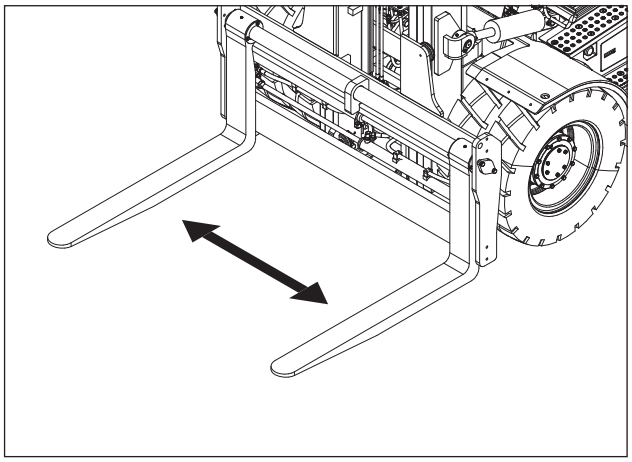
Prohibit long-term parking on slopes greater than 15%;

During temporary parking, operators are prohibited from leaving their seats.

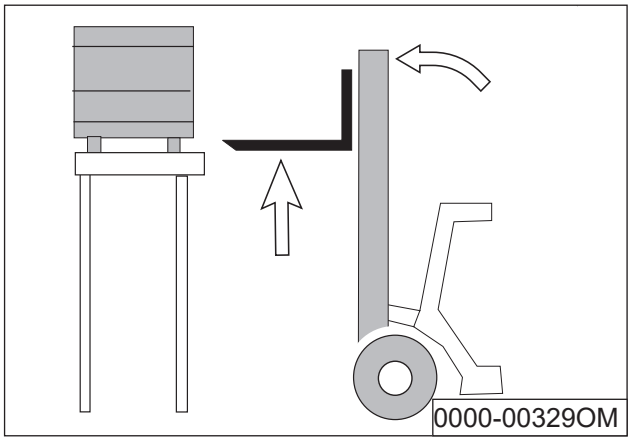
4.3 Handling loads

4.3.1 Adjusting the fork spacing

In order to guarantee safe operation of picking loads, before operation, adjust the fork spacing to proper position according to the tray dimension (See Page 49 Section "Adjusting the fork spacing").



4.3.2 Lifting loads



⚠ CAUTION

Loads should not extend beyond the edge of the truck's loading surface.

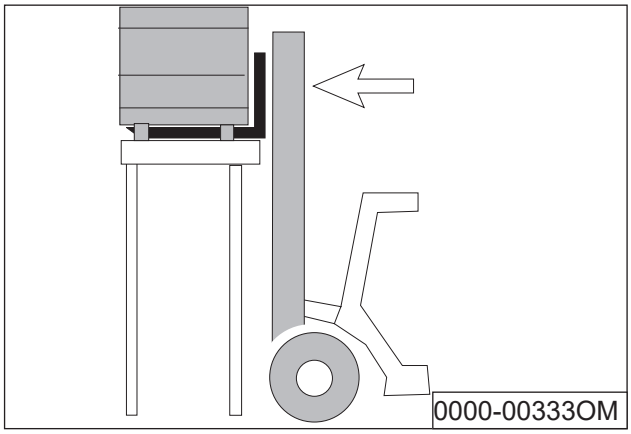
Do not handle loads that are taller than the load backrest unless the load is secured to prevent it from falling off.

- Carefully approach the load to be lifted.
- Depress the brake pedal to slow down and stop the truck in the proper position.
- Set the mast vertical.
- Raise the forks to a proper height.
- Release the brake pedal, and drive the truck forward and insert the fork arms beneath the goods, then depress the brake pedal.

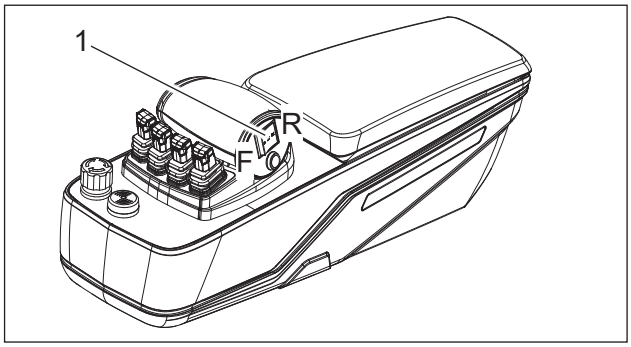
i NOTE

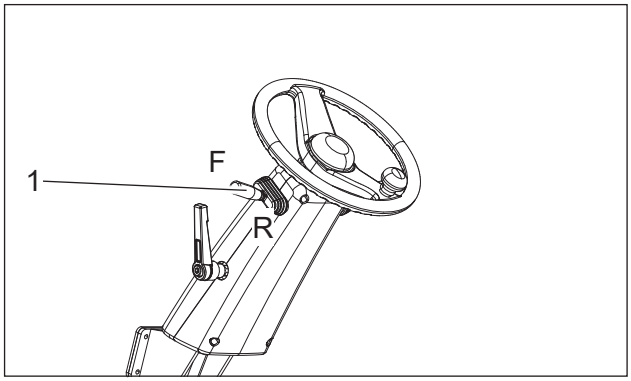
At least two thirds of their length must extend into the load.

- Raise the fork carriage until the load rests freely on the forks.



- Set the travel switch (1) to reverse (R) and release the brake pedal.

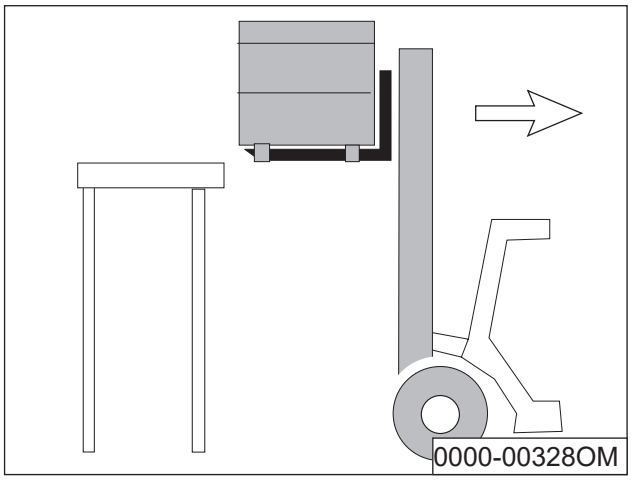




- Reverse carefully and slowly until the load is outside the stacking area.
- Tilt the mast back.

⚠ CAUTION

Do not stand underneath the raised load.



- Lower the load until the bottom of the forks are approximately 300 mm from the ground, then tilt the mast back.

4.3.3 Transporting loads

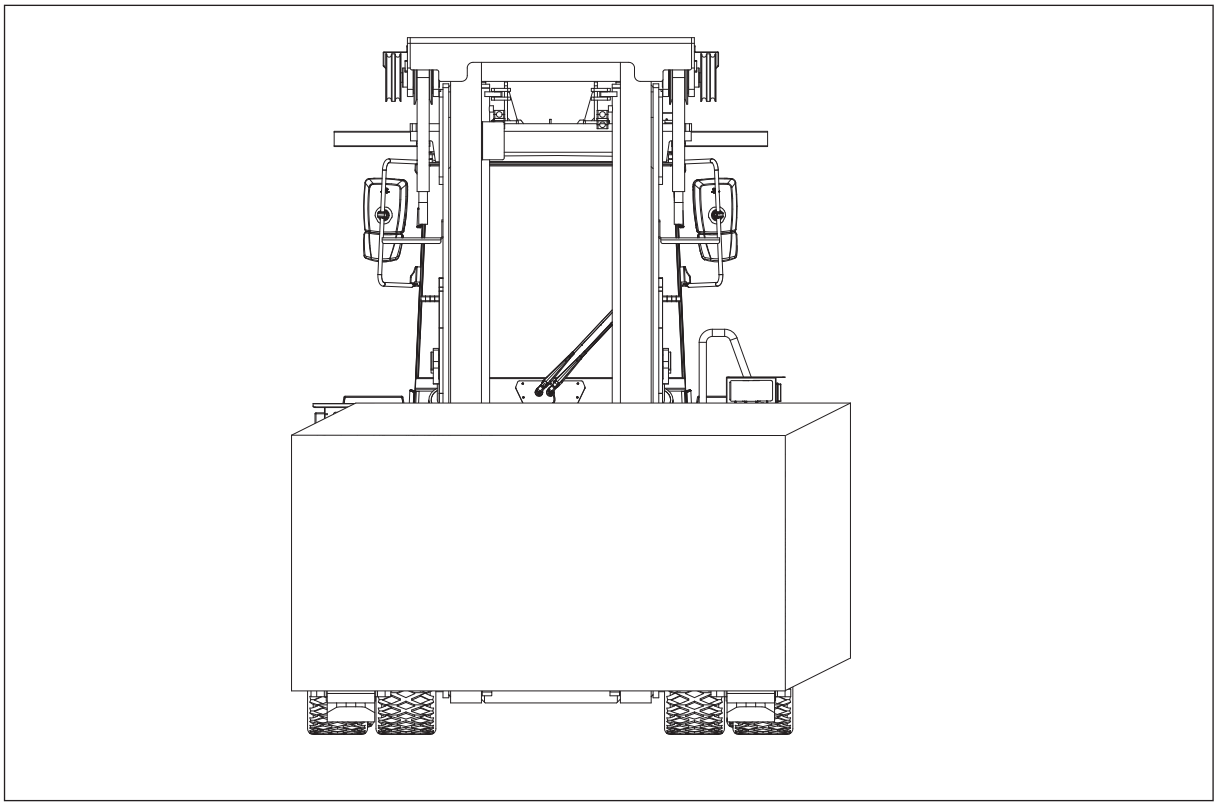
Do not drive diagonally or turn when driving on a ramp.

Gently accelerate with the accelerator pedal and slowly brake with the brake pedal. Be ready to brake at all times.

Adapt your travel speed to the conditions of the route and the load you are transporting.

Watch out for other traffic at crossings and passageways.

If your vision is obstructed, you must be guided by others.



4.3.4 Depositing loads

- Drive the truck carefully up to the load handler.
- Depress the brake pedal to slow down and stop the truck in the proper position.
- Keep the mast vertical.
- Raise the forks to a proper height.
- Release the brake pedal.
- Drive the truck to the location where the load needs to be placed
- Depress the brake pedal.
- Slowly lower the goods until the fork arms can separate from the goods.
- Release the brake pedal.
- Reverse the truck.

⚠WARNING

Do not operate too fast when placing the load, and take care to protect the load and lifting equipments from damage.

4.3.5 Operating the load handler and integrated attachments

Operating the lifting device and integrated attachments can be hazardous

Other people can be injured in the truck's hazardous area (Page 68 Section "3.3.5 Hazardous area").

Apart from the operator (in the normal operating position) there should be no other

people in the truck's hazardous area.

- Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- If people do not leave the hazardous area despite the warning, prevent the truck from being used by unauthorised people.
- Only carry loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping or falling down.
- Do not exceed the maximum loads specified on the capacity plate.
- Do not stand underneath a raised load handler.
- Do not stand on the load handler.
- Do not lift other people on the load handler.
- Do not reach through the mast.
- The controls should only be operated from the operator’s seat, and never suddenly.
- The operator must be trained to handle the load handler and the attachments.

⚠ WARNING

An offset load center can result in accidents.

The capacity of the truck is reduced when using sideshift off center.

Observe the capacity plate with the reduced capacity.

4.3.6 Safety instructions for operating additional attachments

Optionally, trucks can be fitted with one or more auxiliary hydraulic functions to operate attachments.

⚠ DANGER

Mounting attachments can result in accidents.

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

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

⚠ WARNING

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

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

⚠ CAUTION

Risk of slipping and environmental damage due to leaked hydraulic oil

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

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

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

➢ **Safety instructions for sideshifter and fork positioner attachments**

⚠WARNING

Restricted visibility and reduced tilt resistance can cause accidents.

When using sideshifters and fork positioners, the change in center of gravity can result in reduced lateral tilt resistance and accidents.

Note that this affects visibility as well.

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

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

⚠WARNING

Risk of accidents due to falling loads

Operating errors can occur and the load can fall accidentally.

- *Clamping attachments may only be added to trucks which have a button to enable additional hydraulic functions.*
- *When connecting the attachment, make sure that the hydraulic lines of the attachment are connected to the correct ports.*
- *Do not use clamping attachments for clamping purposes or in clamping operation while fork extensions are in use.*

➢ **Safety instructions for rotary attachments**

⚠WARNING

A non-centerd load center of gravity can result in accidents

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

- *Adapt the travel speed to the load.*
- *Lift the load from the center.*

➢ Safety instructions for telescopic attachments

⚠WARNING

Accident risk due to increased tipover hazard and reduced residual capacity

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

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

➢ Safety instructions for attachments when transporting suspended loads

⚠WARNING

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

Transporting hanging loads can reduce the stability of the truck.

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

➢ Safety instructions for using loading buckets as attachments

⚠WARNING

Increased mast loading can cause accidents.

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

➢ **Safety instructions for fork extensions**

⚠WARNING

Unsecured and oversized fork extensions can cause accidents.

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

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

4.3.7 Fitting additional attachments

Incorrectly connected attachments can cause accidents.

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

⚠WARNING

Observe the manufacturer's operating instructions.

Attachments must only be assembled and commissioned by trained, specialist personnel.

4.4 Transport

4.4.1 Location for lifting and/or sling points

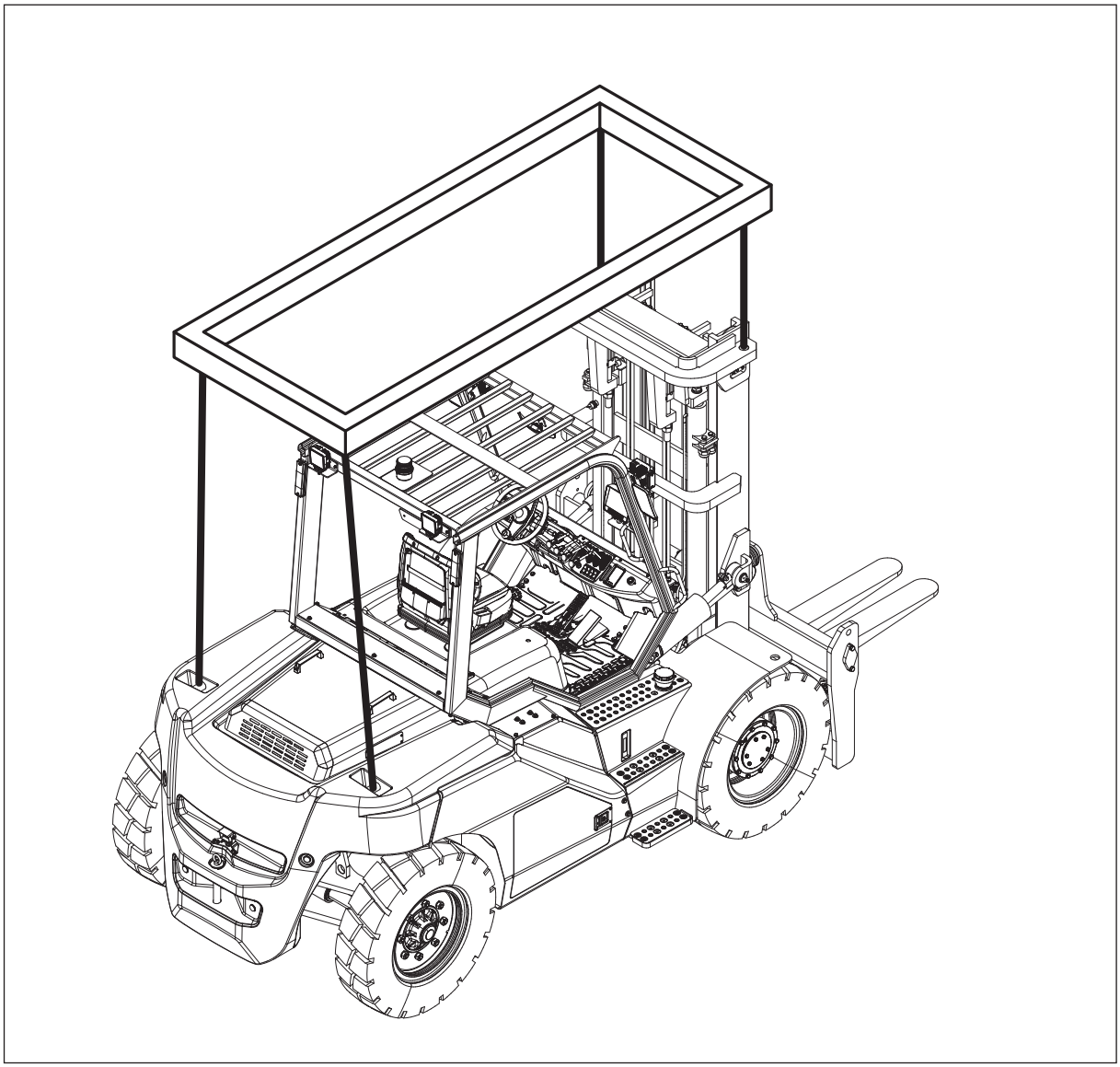
The truck must be lifted as follows:

(a) Ensure the mast is vertical;

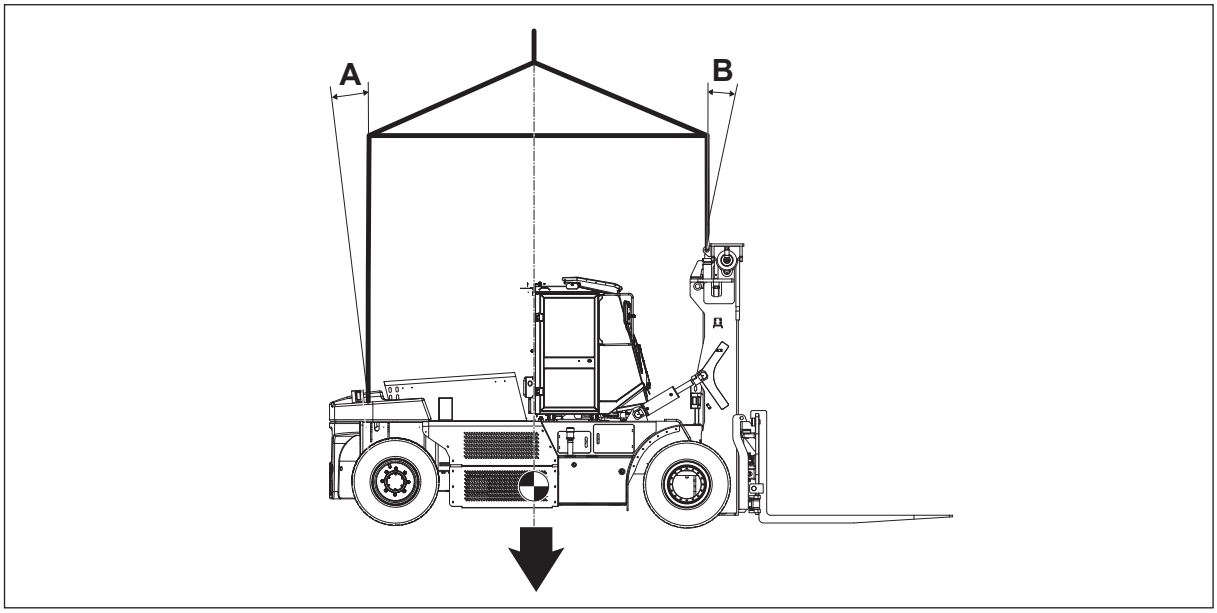
(b) Place the truck in the maintenance position;

(c) Attach two lifting hooks to the lifting point on the counterweight;

(d) Attach two lifting hooks to the lifting point on the mast;



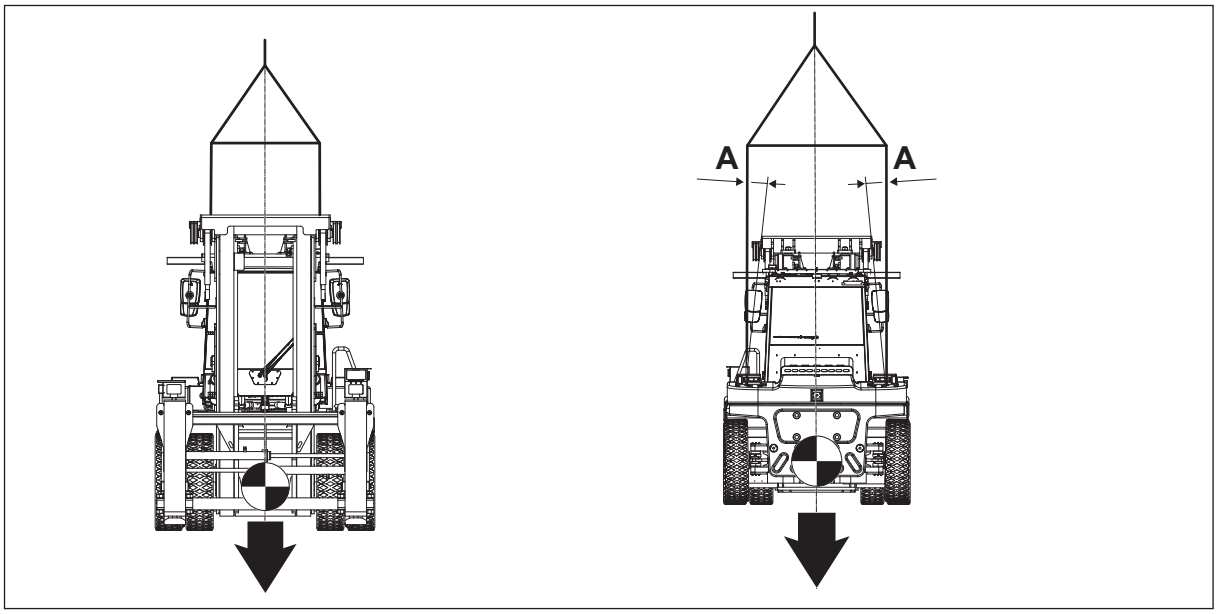
(e) Align the lifting device lengthwise. The slings must be vertical or inclined outward by a maximum of 5° (A and B).



NOTE

The slings must not be inclined inward toward the truck, as this could damage the battery box. Align the lifting device laterally to the mast. The slings must be vertical.

(f) Align the lifting device laterally to the rear part of the truck. The slings must be vertical or inclined toward the truck by a maximum of 5° (A).



NOTE

The slings must not be inclined outward, as they could slide on the counterweight.

(g) Finally, the lifting device must be adjusted so that the lifting point is exactly above the truck's center of gravity.

4.4.2 Securing the truck for transport

For machines with a high lifting height, the mast must be disassembled to comply with applicable regulations.

➢ **Anchoring for Transport**

The machine must be transported on a trailer that is sufficiently wide to support the inner wheel of the drive axle.

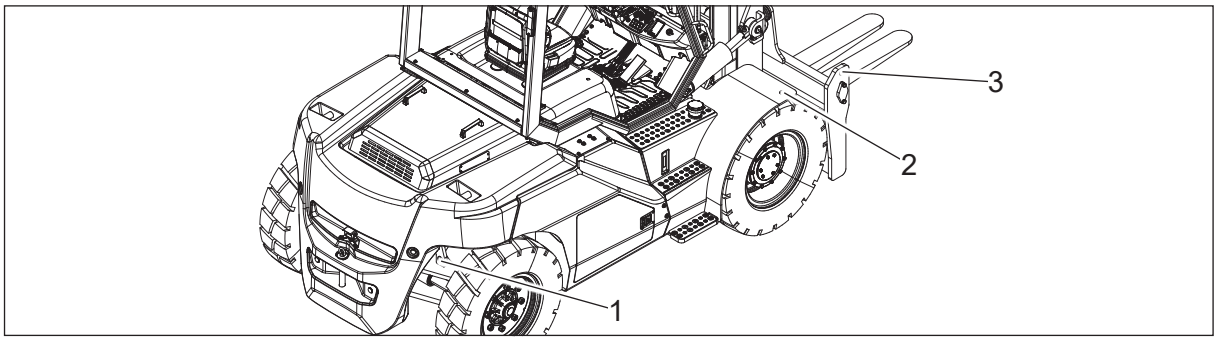
(a) Drive the machine backward onto the trailer;

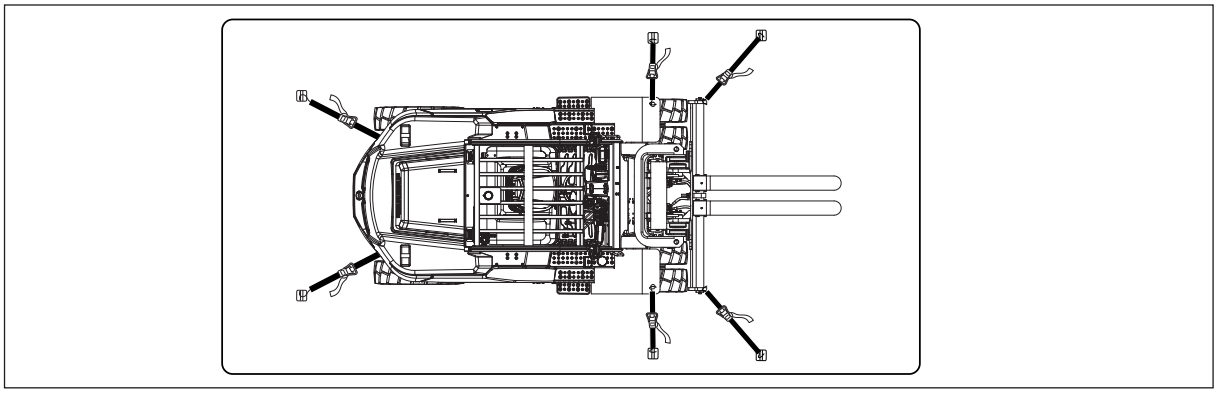
(b) Park the truck securely (See Page 80 Section "4.2.11 Parking");

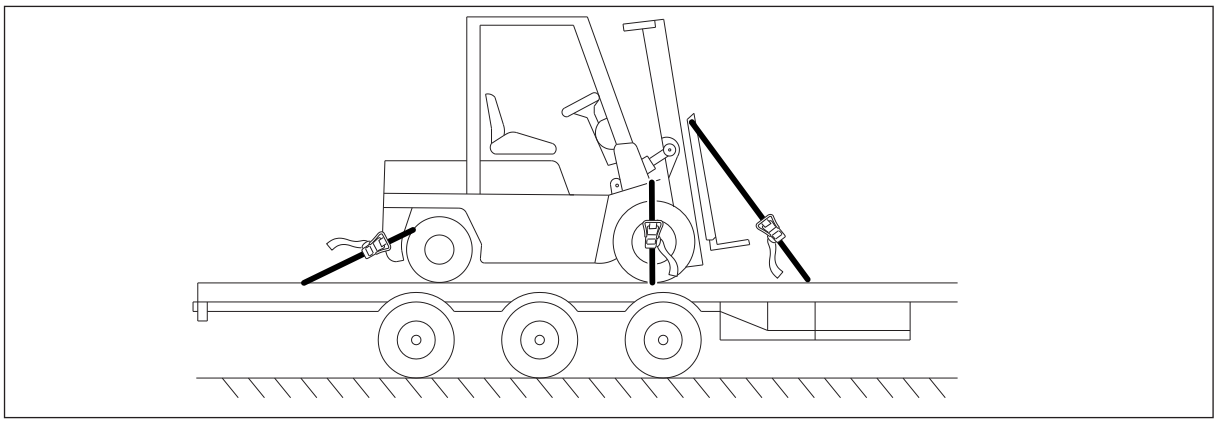
(c) Attach the tension belts to the holes (1) in the steering axle, and install it to the designated tie-down point on the trailer;

(d) Attach the tension belts to the holes (2) in the fenders, and install it to the designated tie-down point on the trailer;

(e) Attach the tension belts to the fork carriage sling points (3), and install it to the designated tie-down point on the trailer.

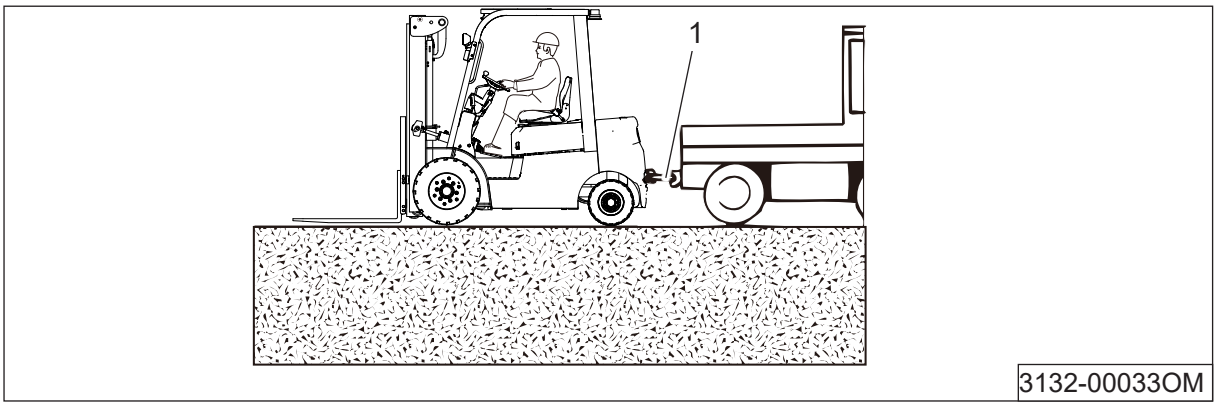






4.4.3 Towing

When the truck needs to be moved, a drawbar can be attached to the traction pin (1).



⚠ CAUTION

Braking can only be performed by the brake pedal during towing.

You can tow the truck to the safe place with traction pin (1) when the truck can't move.
Do not tow a truck with a damaged steering or braking system.

➢ **Procedure**

- Place the travel combination switch in neutral;
- Lower the forks, but do not allow the fork arms to touch the ground;
- Apply the parking brake;
- Check the traction and braking force of the towing truck;
- With the help of a guide, maneuverer the towing truck to the truck;
- Secure the drawbar to towing truck and the traction pin on the truck;
- Sit in the operator's seat of the truck being towed and fasten the seat belt;
- Release the parking brake;
- Tow the truck;
- After towing, secure the truck so that it cannot roll away (e.g. by applying the parking brake or by using wheel chocks);
- Disconnect the drawbar.

i NOTE

The operator should operate the steering wheel during towing, and brake when necessary.

⚠ DANGER

If a rigid connection has not been used for power transmission in two directions during towing, the truck may drive into the towing truck when the towing truck brakes. To be safe, use a drawbar that has been tested.

4.5 Battery and Charger

4.5.1 Information for battery and charger

Truck model	Battery type	voltage/ rated capacity	Charger output power	Charging time
EFL803-HV EFL903-HV EFL1003-HV	Lithium-ion Battery	309 V/ 304 Ah	20kW	3 h 45 min
			30kW	2 h 30 min
			40kW	1 h 50 min
			60kW	1 h 10 min
		309 V/ 228 Ah	20kW	2 h 40 min
			30kW	1 h 50 min
			40kW	1 h 20 min
			60kW	50 min

i NOTE

The charging time in the table is the theoretical maximum time, the actual charging time will be shorter.

4.5.2 Safety regulations for Charging the battery

- Avoid the existence of any metal object in the surface of the battery;
- Do not pierce the battery case with nails or other sharp objects.
- Do not short-circuit the battery with wires or other metal objects!
- The plug connection parts should be inspected in terms of obvious damages before charging;
- Fire-fighting equipment must be kept in the charging place;
- Before charging, check if there is damage on cable connection and plug connection pieces.
- Do not use irregular charging sockets;
- Charging in non-charging area is prohibited;
- No flammable or spark-generating materials are present or stored within 2 meters of the truck parked for battery charging.
- No smoking or open fire around when charging.
- When charging, do not wrongly connect the battery polarity, otherwise it may damage the battery.
- Battery and charger safety regulations must be strictly adhered to.

4.5.3 Charging the battery with an external charger

➢ **Charging Procedure**

⚠CAUTION

- *The truck's cooling water should be maintained at a sufficient level to ensure that the battery does not alarm due to high charging temperatures.*
- *Before charging, check that there are no other abnormal alarms on the truck's instrumentation, especially those related to the battery. If there are alarms, they must be cleared before charging.*

⚠CAUTION

Keep the charging interface clean and free of particles, dust, and other debris.

(a) Park the truck securely (See Page 80 Section "4.2.11 Parking");

(b) Pull out the main power switch (4);

i NOTE

The main power switch should be pulled out while charging.

(c) Open the connector cover (1);

(d) Turn on the charger;

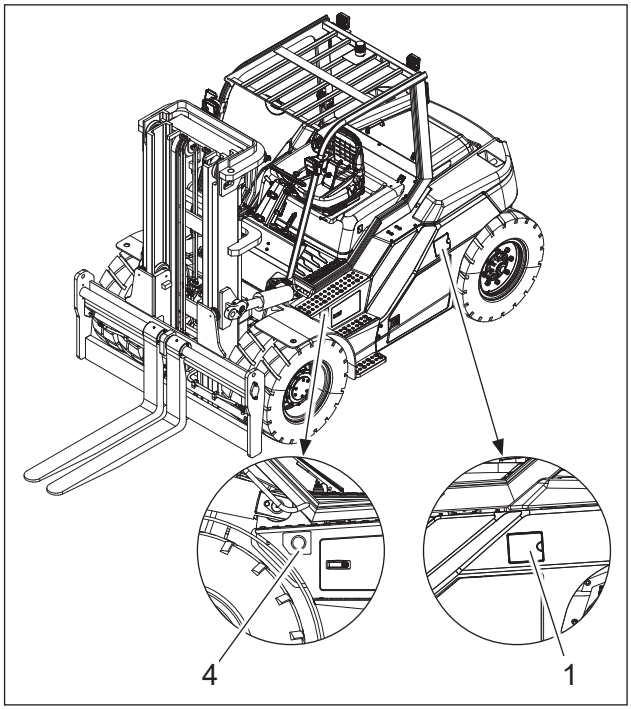
(e) Pull out the emergency stop switch of the charger;

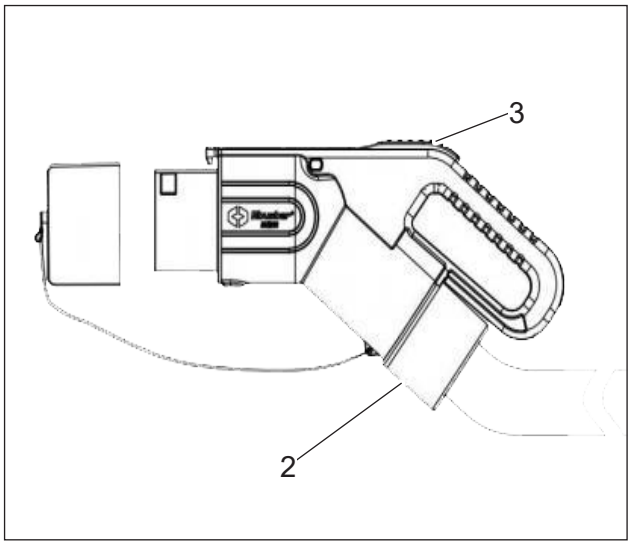
(f) Confirm that there is no alarm message on the charger interface.

(g) Switch the charge mode to "Turn on";

(h) Insert the charging gun (2) into the socket;

(i) After the battery establishes a communication connection with the charger, the status information of the battery will be displayed on the charger interface, and charging will start automatically at this time.





➢ Stop charging

- When the battery is fully charged, the charger will automatically stop charging. Press the pause button, then press the button (3) on the charging gun (2) to unlock it, and pull out the charging gun (2) from the charger;
- When the battery is not fully charged, press the pause button first. After the charging current drops to 0 A, press the button (3) on the charging gun (2) to unlock it, and pull out the charging gun (2) from the charger;

⚠ CAUTION

Charging gun can only be pulled out properly when the electromagnetic lock is unlocked;

i NOTE

The battery charging station should be plugged into a standard 380 V, 3-phase, 50/60 Hz wall outlet. Maximum input power is 40 kW. Please strictly implement the above data to prevent equipment damage and accidental risks such as fire.

⚠ WARNING

The battery plug may only be withdrawn or connected when the main power switch and the charging equipment are switched off.

⚠ WARNING

Damage to battery and charger!

- *The charger must be matched to the battery in terms of voltage and charging capacity!*
- *Observe the correct combination of battery and charger to avoid overheating and fire hazard.*
- *Only use the charger that is suitable for the corresponding battery.*

⚠ WARNING

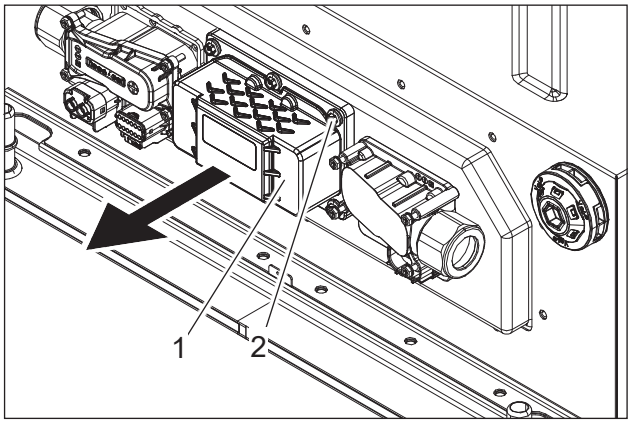
- *If the truck equipped with heating system can be charged at low temperature. After plugging the battery into the charger, it will be heated above 0 before charging.*
- *Output voltage, current and application range of the charger must match the battery, otherwise it will influence the volume and service life of the battery.*
- *Charging cable polarity must match the charger output terminal polarity.*

➢ Storage

If the battery is not used for a long period of time, it must receive a supplementary charge every two month to prevent permanent damage to the battery.

4.5.4 Battery power fuse

If the repair involves the battery and high voltage box, in addition to disconnecting the MSD connector (see Page 112 Section "5.5.2 MSD connector"), remove the battery power fuses.



➢ **Battery power fuse removal procedure**

(a) Unscrew the bolts (2);

(b) Remove battery power fuses (1);

(c) Place the removed battery power fuses (1) in a safe place.

⚠WARNING

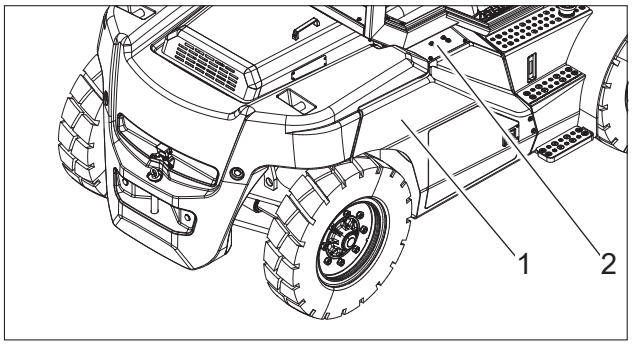
- *For any inspection, maintenance or repair of the high voltage components of the truck, please make sure to cut off the power supply of the high voltage system, i.e. pull out the MSD connector on the high voltage box and wait for 15 – 20 minutes, during which no operation is allowed, or it will lead to personal safety incidents;*
- *Before the maintenance work, please adopt safety isolation measures (using the guardrail isolation), and place high-voltage warning signs, and make sure that there is no water on the maintenance ground and in the body of the truck;*
- *It is not allowed to work in a wet environment, in the ground or the surrounding humidity is too high, the operation should be stopped, do not carry out high-pressure work when the high-voltage parts and hands are wet;*
- *Inspection or maintenance personnel should wear insulating shoes and 1000 V insulating gloves. The lower part of the truck body and the standing area of the maintenance personnel should be covered with dry insulating mats;*

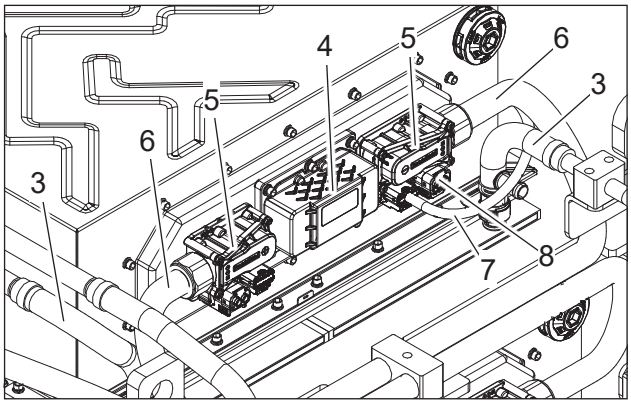
4.5.5 Lithium-ion battery removal and installation

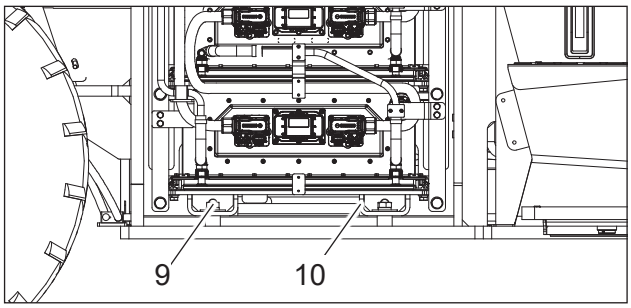
- Place the battery connectors and cables in the appropriate position to prevent them from getting caught by the truck when removing the battery
- When transporting batteries with the aid of a crane, ensure that the crane is of adequate capacity (the battery weight is indicated on the battery identification plate at the battery trough). The lifting gear must exert a vertical pull so that the battery container is not compressed. Attach the hooks to the battery hand (or battery strap) in such a way that the lifting gear, when slack, cannot collapse on the battery cells.
- When removing the battery, make sure it does not get caught on the battery panel, causing the truck to tip over.
- After installing the battery, check all cables and plug connections for visible signs of damage. Ensure that the battery is firmly secured in the truck to prevent any damage caused by sudden movements of the truck. Whenever you replace the battery make sure it cannot slide. The battery cover must be securely closed and locked.

➢ **Lithium-ion battery pack removal procedure**

- Park the truck securely (See Page 80 Section "4.2.11 Parking")
- Remove the MSD connector of the high-voltage box (See Page 112 Section "5.5.2 MSD connector");
- Wait 15 – 20 minutes until the high voltage system is completely de-energized.
- Disconnect the communication cable (7);
- Disconnect the heating cables (8);
- Remove the coolant lines (3) from each battery;
- Remove the battery fuses (4) on each battery;
- Open the connectors (5) and remove all positive and negative cables (6);
- Remove all hose clamps on the front and sides of the battery;
- Unscrew four bolts (9) holding the battery bracket;
- Insert the forks of another forklift into the U-steel (10) and remove the battery pack.







NOTE

Inserted forks up to 125 mm wide and 45 mm high.

➢ **Lithium-ion battery pack installation procedure**

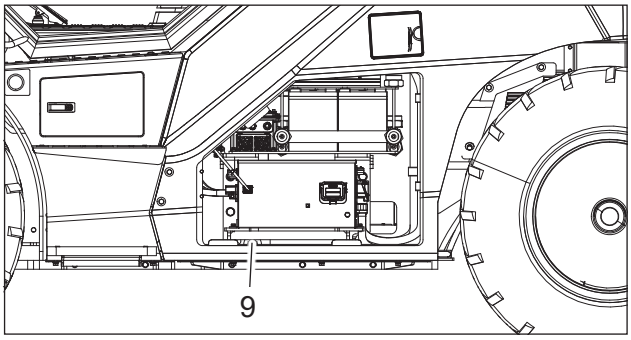
- Install according to the reverse order of removal.

⚠WARNING

Check the weight before removing the battery (Page 10 Section "2.1.3 Standard Version Specifications"), use appropriate tools to remove the battery.

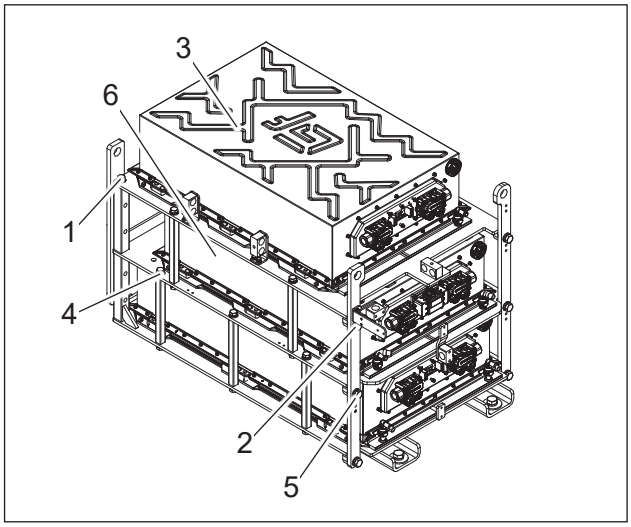
The battery must be secured. Otherwise it will fall off.

Prevent injuries during installation.



➢ **Lithium-ion battery removal procedure**

- Remove the lithium-ion battery pack from the truck (see Page 97 Section "Lithium-ion battery pack removal procedure")
- Unscrew the top six bolts (1);
- Unscrew the three bolts (2) on the side;
- Remove the lithium-ion battery (3) ;
- Unscrew the top six bolts (4);
- Unscrew the three bolts (5) on the side;
- Remove the lithium-ion battery (6).

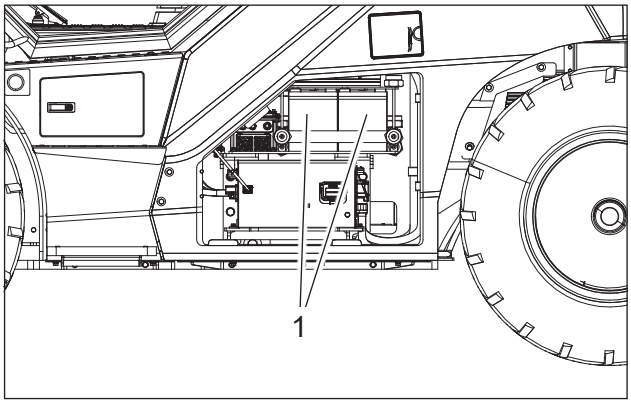


➢ **Lithium-ion battery installation procedure**

- Install according to the reverse order of removal.

4.5.6 Low-voltage battery

The truck is equipped with two maintenance-free batteries connected in series to provide 24 V low-voltage power. No water can be added to this battery type. The cell covers are fixed tight and must not be opened. Opening the covers will damage the battery.



NOTE

If the truck can not start due to a loss of low-voltage battery power, the batteries needs to be replaced.

➢ **Low-voltage battery removal procedure**

- Park the truck securely (See Page 80 Section "4.2.11 Parking")
- Open the electrical box door on the left side of the truck body.
- Remove the MSD connector of the high-voltage box (See Page 112 Section "5.5.2 MSD connector");
- Wait 15 – 20 minutes until the high voltage system is completely de-energized.
- Disconnect all cables from the batteries (1);
- Remove the fixings that hold the batteries;
- Remove the battery.

➢ **Low-voltage battery installation procedure**

- Install according to the reverse order of removal.

4.6 Cleaning

4.6.1 Cleaning the truck

➢ **Cleaning operations:**

Do not use flammable liquids when cleaning the truck. Before cleaning, take necessary safety measures to prevent spark formation (e.g. due to short circuits). For battery-powered trucks, the battery plug must be removed. Only weak pressure, weak compressed air and non-conducting, antistatic brushes must be used for the cleaning of electric or electronic assemblies.

⚠ WARNING

- *Risk of fire due to flammable cleaning materials!*
- *Flammable cleaning materials can be ignited by hot components.*
- *Do not use any flammable cleaning materials.*

⚠ CAUTION

- *There is a risk of short circuit if water enters the electrical system!*
- *Excessive water pressure or water and steam that are too hot can damage truck components.*
- *Abrasive cleaning materials can damage the surfaces of components!*
- *Using abrasive cleaning materials that are unsuitable for plastics can cause plastic parts to dissolve or become brittle. The screen on the display-operating unit could become cloudy.*

Adhere strictly to the following steps:

- Park the truck securely (See Page 80 Section "4.2.11 Parking").
- Do not spray electric motors and other electrical components or their covers directly with water.
- Use only high-pressure cleaners with a maximum output power of up to 50 bar and 85 °C.
- If a high-pressure cleaner is used, maintain a distance of at least 20 cm between the nozzle and the object being cleaned.
- Do not aim the cleaning nozzle directly at adhesive labels or decal information.
- Remove all deposits and accumulations of foreign materials in the vicinity of hot components.
- Use only non-flammable fluids for cleaning.
- Clean plastics only with cleaning materials intended for plastics.
- Clean the truck exterior using water-soluble cleaning materials and water. Cleaning with a sponge or a cloth is recommended.
- Clean all accessible areas.
- Before lubrication, clean the oil filling openings and the area around the oil filling openings, as well as the grease nipples.

4.6.2 Cleaning the electrical system

- Danger of electric shocks due to residual capacity!
- Never reach into the electrical system with your bare hands.
- Cleaning electrical system parts with water can damage the electrical system.
- Cleaning electrical system parts with water is forbidden!

Clean the electrical system parts with a metal-free brush and blow the dust off with low-pressure compressed air.

⚠ WARNING

- *For any inspection, maintenance or repair of the high voltage components of the truck, please make sure to cut off the power supply of the high voltage system, i.e. pull out the MSD connector on the high voltage box and wait for 15 – 20 minutes, during which no operation is allowed, or it will lead to personal safety incidents;*
- *Before carrying out any maintenance work, please follow the safety isolation procedure (using the guardrail isolation), and place high-voltage warning signs, and make sure that there is no water on the maintenance ground and in the body of the truck;*
- *It is not allowed to work in a wet environment, in the ground or the surrounding humidity is too high, the operation should be stopped, do not carry out high-pressure work when the high-voltage parts and hands are wet;*
- *Inspection or maintenance personnel should wear insulating shoes and 1000 V insulating gloves. The lower part of the truck body and the standing area of the maintenance personnel should be covered with dry insulating mats;*

⚠ WARNING

The use of cold/chemical cleaners or fluids that are corrosive or contain acid or chlorine can damage the chains and is forbidden!

4.6.3 Cleaning load chains

- Place a collection vessel under the lift mast.
- Clean with paraffin derivatives, such as benzine.
- When using a steam jet, do not use additional cleaning agents.
- Remove any water in the chain links using compressed air immediately after cleaning.
- Move the chain several times during this procedure.
- Immediately after drying the chain, spray it with chain spray. Move the chain several times during this procedure.

5 Maintenance

NOTE

If you want to carry out maintenance on the truck yourself, we recommend that maintenance be carried out by technicians appointed by the dealer at least for the first three times. Your maintenance personnel should also be present, in order to receive appropriate training.

5.1 Operational safety and environmental protection

- The servicing and inspection operations contained in this chapter must be performed in accordance with the intervals indicated in the service checklists.
- Only use original spare parts that have been certified by our quality assurance.
- Used parts, oils and fuels must be disposed of in accordance with the applicable environmental protection regulations.
- Upon completion of inspection and servicing, carry out the activities to recommission the truck (See Page 134 Section "5.5.14 Restoring the truck to service after maintenance and repairs").

5.2 Maintenance Safety Regulations

➢ **Lifting and jacking up**

When a truck is to be lifted, the lifting gear must only be secured to the points specially provided for this purpose.

When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

➢ **Service plan**

Maintenance work must be carried out according to the hour meter. Please consult the truck's maintenance plan.

The service plan is followed by advice to facilitate work.

Maintenance intervals must be reduced if the truck is used under harsh conditions (extreme heat or extreme cold, large quantities of dust).

➢ **Work on the electric system:**

Work on the electric system of the truck must only be performed by personnel specially trained for such operations. Before commencing any work on the electric system, all measures required to prevent electric shocks have to be taken. Take off the metal accessories from the hand before checking the truck electrical system.

➢ **Settings**

When repairing or replacing hydraulic, electric or electronic components or assemblies, always note the truck specific settings.

➢ **Grade and quantity of lubricants and other consumables**

Only lubricants and other consumables specified in these operating instructions are authorised for use during maintenance work.

Lubricants and other consumables required for truck maintenance are listed in the maintenance specifications table.

Never mix different qualities of grease or oil.

If it is absolutely necessary to change brands, make sure to flush thoroughly beforehand.

Before changing any filters or working on the hydraulic system, thoroughly clean the surface

and the areas around the part. All containers used to pour oil must be clean.

➢ **Working on the hydraulic equipment**

The hydraulic system must be depressurised prior to all work on the system.

The maximum life of the high-pressure hose is six years, and it must be replaced at that time.

Unsealed or damaged hydraulic lines can cause hydraulic fluid to leak and must be serviced immediately upon discovery and before restarting the truck.

Small holes or tiny cracks in the hydraulic lines can allow pressurized hydraulic fluid to seep through the skin and cause serious personal injury.

Spills and leaks should be cleaned up immediately with an appropriate absorbent. Seek immediate medical attention if necessary.

➢ **Stored energy components**

When removing stored energy components such as accumulators, air springs, and hand brake lever springs, it is important to first release their energy.

➢ **Safety devices**

After maintenance and repair work, all safety devices must be reinstalled and tested for operational reliability.

➢ **Servicing and maintenance personnel:**

Only qualified personnel authorized by the owner are permitted to perform maintenance or repair work. All items listed in the Scheduled Maintenance Charts must be performed by qualified technicians only. They must have knowledge and experience sufficient to assess the condition of a truck and the effectiveness of the protective equipment according to established principles for testing trucks. Any evaluation of safety must be unaffected by operational and economic conditions and must be conducted solely from a safety standpoint.

➢ **Maintenance operations that do not require special training**

Simple maintenance operations such as checking the hydraulic oil level or checking the battery electrolyte level (if necessary) can be carried out by persons with no special training. A specific qualification is not necessary. Complicated maintenance operations such as replacing the battery, replacing the wheels and so on should be carried out by the authorised service center. Refer to the maintenance section of this manual for further information.

➢ **Battery maintenance staff**

Batteries must only be recharged, maintained and changed by specially trained personnel.

Personnel must follow the manufacturer's instructions of the battery, the battery charger and the truck.

It is essential to follow the battery maintenance instructions and the battery charger operating instructions.

➢ **Ordering spare parts and consumables**

Only original spare parts have been certified by our quality assurance department. To ensure safe and reliable operation of the truck, use only the manufacturer's spare parts. Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. For oil changes, contact the manufacturer’s specialist department.

5.3 Servicing and inspection

Thorough and expert servicing is one of the most important requirements for the safe operation of the industrial truck. Failure to perform regular servicing can lead to truck failure and poses a potential hazard to personnel and equipment.

The service intervals stated are based on single shift operation under normal operating conditions. They must be reduced accordingly if the truck is to be used in conditions of extreme dust, temperature fluctuations or multiple shifts.

The following maintenance checklist states the tasks and intervals after which they should be carried out. Maintenance intervals are defined as:

A = Every 8 service hours, at least once a day;

B = Every 50 service hours, at least once a week

C = Every 250 operating hours, at least once every month and a half;

D = Every 500 operating hours, at least once every three months;

E = Every 1000 operating hours, at least once every six months;

F = Every 2000 operating hours, at least once a year.

In the run-in period - after approx. 100 service hours - or after repair work, the owner must check the wheel nuts/bolts and re-tighten if necessary.

5.3.1 Maintenance Checklist

		Maintenance interval●					
		A	B	C	D	E	F
Before starting maintenance work	Park the truck securely (see Page 80 Section "4.2.11 Parking")						
	Remove the MSD connector (See Page 112 Section "5.5.2 MSD connector").						
	Use wooden blocks to prevent wheels from moving.						
	Clean the fork lift truck if necessary						
	Check the time and date settings on the display unit; adjust if necessary.						
	Check for error codes on diagnostic software and repair.						
Electrical System	Visually inspect the battery attachment and cable connections	●					
	Visual inspect the connection of the motor and controller	●					
	Check the charging ports for damage	●					
	Clean the charging ports			●			
	Check display and switch cables for damage			●			
	Check display and switch cable connections			●			
	Check fault information records and operating hours					●	
	Check and tighten the controllers and contactors						●
	Check switch and display functions	●					
	Check alarm system functions	●					
	Check horn functions	●					
	Check the battery pack for damage					●	
	Check battery connectors					●	
	Check the battery cables for damage					●	
	Check the emergency switch functions	●					
	Check battery temperature					●	
	Check battery mounting					●	
	Check lighting functions	●					
	Check low voltage cable for damage and aging		●				
	Check low voltage cable for connection		●				
	Check high voltage cable for damage and aging			●			
	Check high voltage cable for connection			●			

		Maintenance interval●					
		A	B	C	D	E	F
Thermal Management System	Check coolant level		●				
	Check for leaks		●				
	Replace coolant					●	
	Clean the outside of the water tank (cannot be rinsed with water)		●				
	Check water tank cap installation		●				
	Check inlet and outlet pipes for deterioration				●		
	Check antifreeze level				●		
	Replace antifreeze	Every two years					
	Check dust accumulation in cooling unit				●		
	Check heating function of battery charging						●
Frame System	Check mast and tilt cylinders mounting				●		
	Check the counterweight, motors, chassis, speed reduction gearbox, overhead guard and steering axle mounting				●		
	Check and lubricate pins and pivots.				●		
	Check the chassis for cracks or damage						●
Transmission System	Check motor cable connections						●
	Check bearing rotation					●	
	Check and lubricate bearings					●	
	Check seals for wear					●	
	Check seal mating surfaces for wear						●
	Check gear oil level					●	
	Replace gear oil	After 100 hours of first use After 500 hours of second use Every 1000 hours after					
	Check that the drive axle vent is clear			●			
	Check brake friction disc thickness		●				
	Check the transmission for abnormal noises or leaks					●	
	Check the driving speed					●	
Wheels	Check tyres and rims for wear or damage	●					
	Check tyre pressure	●					
	Check for foreign objects in the tyre tread		●				
	Tighten wheel nuts to specified torque		●				

		Maintenance interval●					
		A	B	C	D	E	F
Steering System	Check the steering wheel for looseness	●					
	Check steering wheel operation	●					
	Check for loose steering column mounting bolts			●			
	Check steering axle cylinder for leaks		●				
	Check steering axle kingpin for looseness or damage			●			
	Check steering axle bearings for looseness or noise			●			
	Clean and lubricate steering axle			●			
	Check for steering axle deflection, deformation, cracks or damage			●			
	Check for loose steering axle mounting bolts			●			
Hydraulic System	Visually inspect for damage and leaks	●					
	Checking the functions		●				
	Check hoses, pipes and connections for tightness, sealing or damage					●	
	Check the connections of pump motor connectors						●
	Check and tighten pump motor mounting bolts						●
	Check gear pump for abnormal noise					●	
	Check the fixing of the gear pump					●	
	Check the gear pump for leaks					●	
	Check cylinder for leaks					●	
	Check cylinder for damage						●
	Check the fixing of the cylinders						●
	Check hydraulic oil level	●					
	Clean or replace hydraulic oil						●
	Replace the oil tank filters						●
	Check the relief pressure						●
Brake System	Test service brake operation	●					
	Test parking brake operation	●					
	Check braking performance	●					
	Check accumulator pressure						●
	Check brake pad wear					●	
	Check brake drum wear					●	
	Check brake clearance					●	
	Check brake pump and pipe connections for leaks					●	

		Maintenance interval●					
		A	B	C	D	E	F
Lifting system	Visually inspect the mast, backrest, pins, fork carriage and forks for damage such as cracks.	●					
	Visual inspection of rollers, sliders and stoppers	●					
	Test fork sideshift	●					
	Test attachment functions	●					
	Clean and lubricate the rolling surface of the mast column			●			
	Check and lubricate mast rollers				●		
	Check the fixing of the mast					●	
	Check the tubes on the mast for connections and leaks				●		
	Check and lubricate the lifting chains				●		
	Adjust the lifting chains					●	
	Check the fork carriage for wear and damage					●	
	Check the mast for damages						●
	Check the lifting and lowering speed						●
Operating Position	Check displays	●					
	Check seat adjustment functions	●					
	Check the air conditioning function		●				
	Check instrument panel functions				●		
	Test the OPS system	●					
	Test the lift/lower, tilt and the attachment hydraulic control functions	●					
	Test brake pedal operation	●					
	Test accelerator pedal operation	●					
	Check and lubricate the pedal mechanism			●			
	Test the seat belt	●					
Others	Visually inspect the entire truck for obvious damage	●					
	Check decals and nameplate condition	●					
	Carry out a functional test and test drive.					●	
	Check covers for damage						●
	Check if the optional features are functioning properly		●				
	Test the forward and reverse functions	●					
	Test steering function	●					
	Adjust the visibility aid equipment	●					

⚠ DANGER

Maintenance and inspection may involve high voltage components.

Work on the electric system of the truck must only be performed by personnel specially trained for such operations.

Before starting maintenance and inspection, disconnect all power to the truck and remove all MSD connector.

For detailed information on high-voltage electrical safety, see Page 64 Section "3.2 High-voltage electric safety operation regulations"

i NOTE

If the truck is used in an extreme environment (such as excessive heat, excessive cold or areas with high dust concentrations), the time intervals given in the maintenance tables should be reduced accordingly.

5.3.2 Periodic replacement of safety-critical parts

- Some parts are difficult to inspect during periodic maintenance. Therefore, in order to further improve safety, user should carry out periodic replacement of the parts listed in the following table.
- If any of these parts are found to be damaged or faulty before they are due for replacement, they should be replaced immediately.

Name of safety-critical part	Useful life (years)
Brake hose or rigid pipe	1 – 2
Lifting system hydraulic hoses	1 – 2
Lifting chain	2 – 4
Hydraulic system high-pressure hoses	2
Hydraulic system inner seals and rubber parts	2

i NOTE

Only original spare parts have been certified by our quality assurance department. To ensure safe and reliable operation of the truck, use only the manufacturer's spare parts.

5.4 Consumables

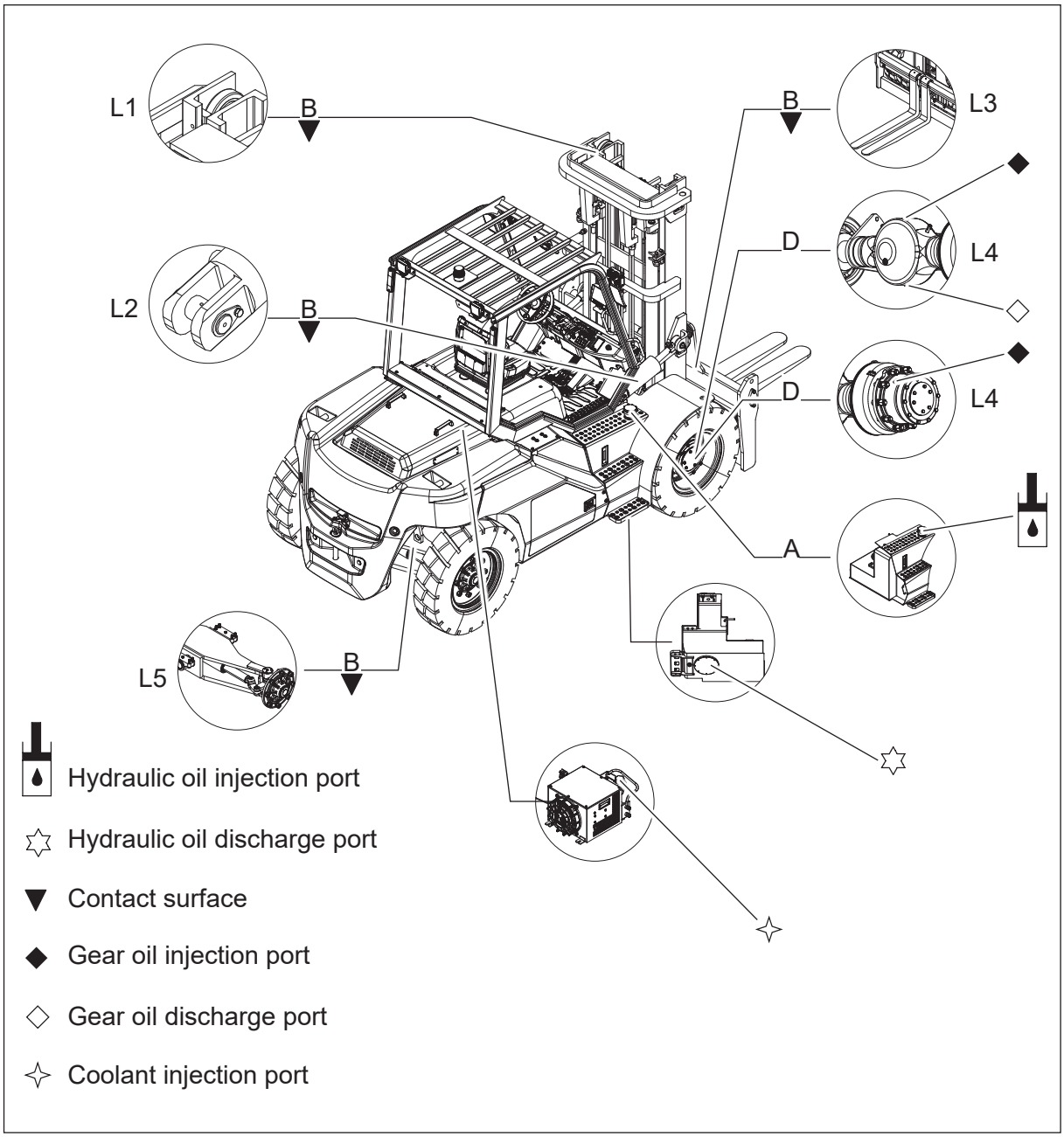
5.4.1 Consumables chart

Improper operations may pose hazards to the operator's health and life, as well as to the surrounding environment.

When storing or adding consumables, use clean containers. It is strictly forbidden to mix different types and specifications of consumables (except for those can be mixed under clear statement).

⚠CAUTION

The use and disposal of consumables must be carried out in strict accordance with the manufacturer's regulations.



5.4.2 Consumables table

Consumables				
Code	**Type**	**Specification**	**Amount**	**Position**
A	Anti-wear hydraulic oil	L-HM46	135 L	Hydraulic System
B	Multi-purpose grease	3# Lithium grease	1 kg	Contact Surface (See Contact Surface Lubrication Table)
C	Coolant	50 percent water and 50 percent ethylene glycol	20 L	Thermal Management System
D	Heavy duty gear oil	GL-5 85W-90	18 L (Main reducer) 1.5 – 2 L (Each Planetary Assy, two in total)	Drive Axle

⚠ WARNING

Be careful when adding and avoid dropping when lubricating on high position. Chain lubrication, Coat the lift guide wheel and the contact surfaces on the inner and outer sides of the mast with a layer of grease etc.

Contact Surface Lubrication Table	
Code	**Position**
L1	Channel steel, Rollers
L2	lubricating port for Tilt cylinder
L3	Fork Carriage
L4	lubricating port for driving axle
L5	lubricating port for Steering axle

5.5 Maintenance Instructions

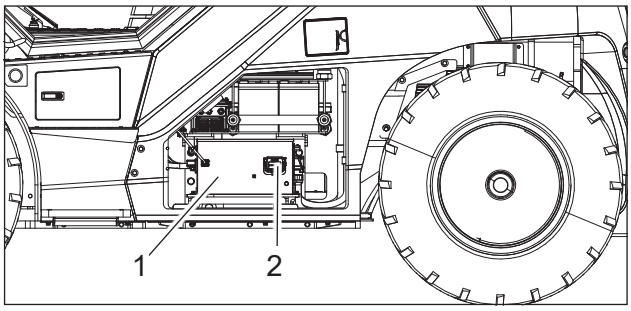
5.5.1 Preparing the truck for maintenance and repairs

All necessary safety measures must be taken to avoid accidents when carrying out maintenance and repairs.

The following preparations must be made:

- Park the truck securely (See Page 80 Section "4.2.11 Parking").
- When maintenance involves the electrical system, remove the MSD connector (See Page 112 Section "5.5.2 MSD connector").
- When working under a raised lift truck, secure it to prevent it from tipping or sliding away.

5.5.2 MSD connector



The MSD connector on the lithium-ion battery is located in the upper left position on the front side of the lithium-ion battery, and the MSD connector can be seen by opening the door of the lithium-ion battery cabinet.

The purpose of the MSD connector is to cut off the high-voltage power supply. When the truck is being serviced, inspected, repaired, or in other emergencies (e.g., electric shock, rain, flood, etc.), please remove the MSD connector.

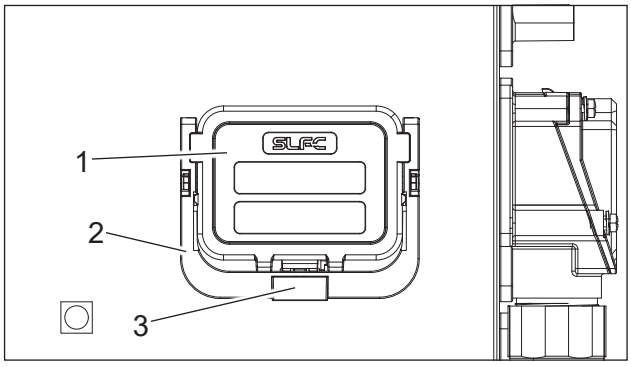
➢ **MSD connector removal procedure**

(a) Park the truck securely (See Page 80 Section "4.2.11 Parking").

(b) Pull out the locking terminal (3);

(c) Turn the handle (2) to the vertical position;

(d) Pull out the MSD connector (1).



⚠WARNING

For any inspection, maintenance or repair of the high voltage components of the truck, please make sure to cut off the power supply of the high voltage system, i.e. pull out the MSD connector on the high voltage box and wait for 15 – 20 minutes, during which no operation is allowed, or it will lead to personal safety incidents.

NOTE

Place the removed MSD connector in a safe place.

➢ **MSD connector installation procedure**

Install according to the reverse order of removal.

5.5.3 Jacking up the truck

⚠WARNING

Note the weight of the truck on the nameplate.

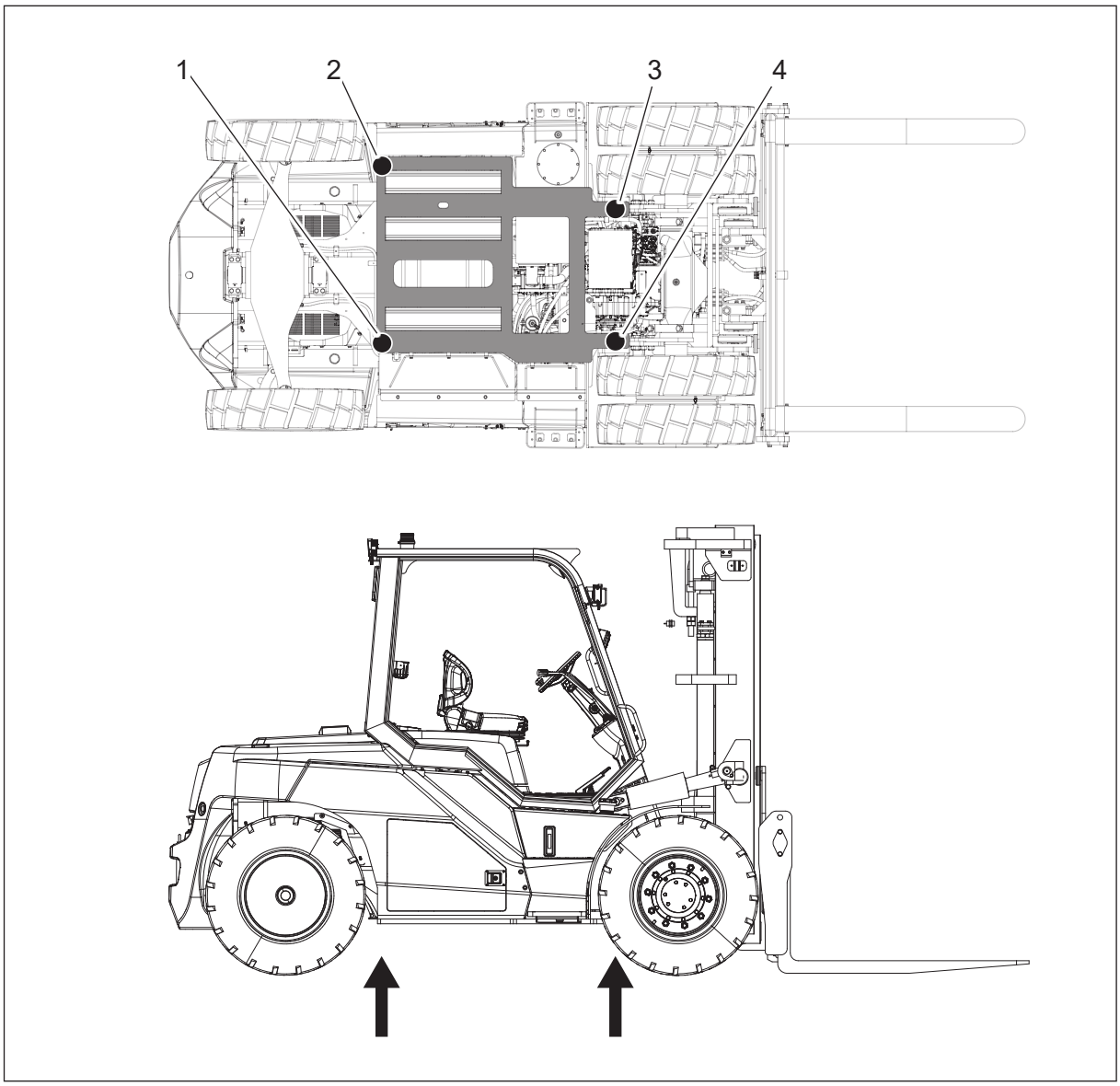
Use only jacks with sufficiently large load ratings.

Raise the unladen truck on a level surface.

When raising the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

➢ **Jack point**

Place the jack against the jack point (1) / (2) / (3) / (4).



➢ **Procedure for jacking up the truck**

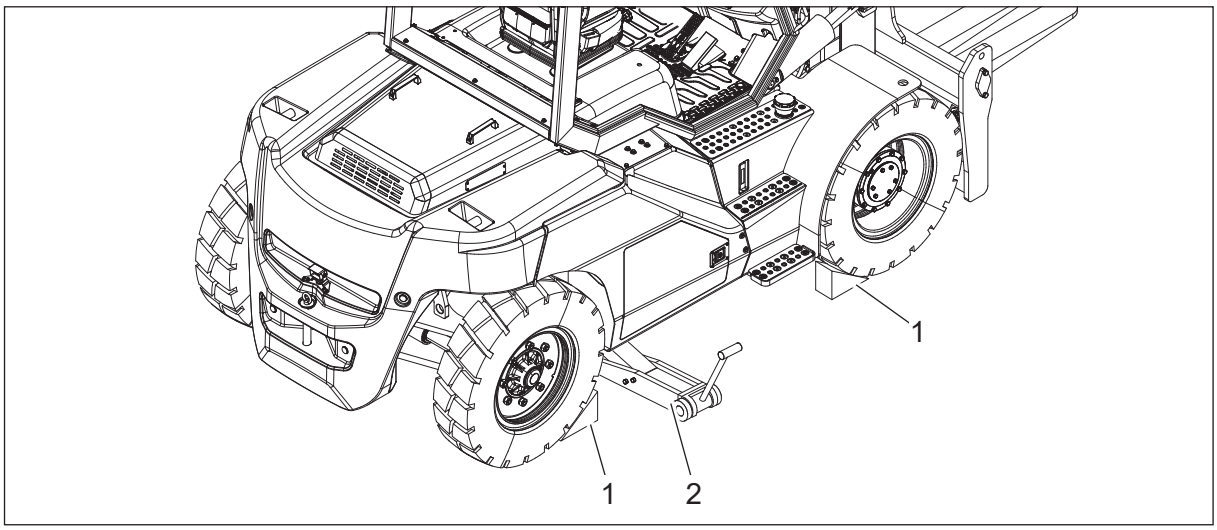
- Park the truck securely (see Page 80 Section "4.2.11 Parking").
- Place a wedge under each wheel (1);
- Place the jack (2) against the jack point;
- Jack up the truck;

  The truck is now jacked up.

  After jacking up the truck, a sufficiently strong hardwood support can be padded next to the jack point to prevent the jack from slipping out of place.

➢ **Procedure for lowering the truck**

Proceed in reverse order.



5.5.4 Checking the electrical cables, connections and plugs

- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs").
- Open the covers.
- Check that the motor terminals are tight and that there is no oxidation or rust.
- Check that the battery cables are secure.
- Check the cables for damage to the insulation and the tightness of the connections.

NOTE

Oxidized and rusted connections and broken cables will lead to a drop in voltage, causing the truck to malfunction.

Remove the oxidized rust then lubricate, or replace the broken cables.

WARNING

For any inspection, maintenance or repair of the high voltage components of the truck, please make sure to cut off the power supply of the high voltage system, i.e. pull out the MSD connector on the high voltage box and wait for 15 – 20 minutes, during which no operation is allowed, or it will lead to personal safety incidents.

5.5.5 Checking the gear oil level and replace gear oil

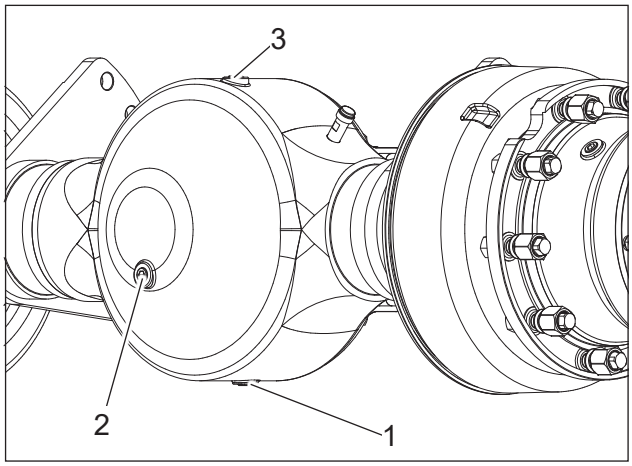
Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs").

Check the oil drain port (1) on the bottom of the drive axle.

If there is leakage, please contact your dealer.

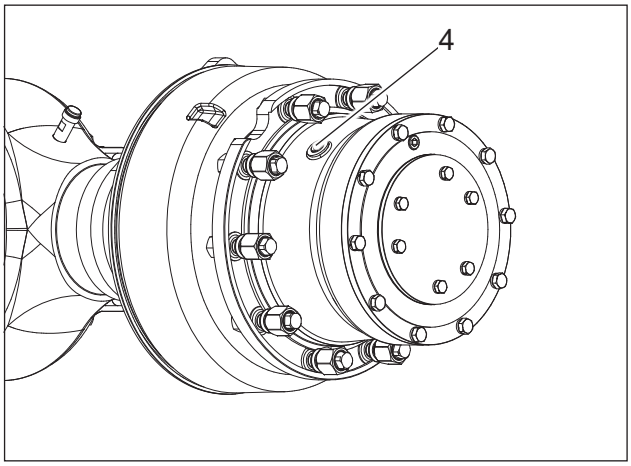
➢ **Replacing the Main reducer gear oil**

- Operate the truck until the speed reduction gearbox is slightly warm;
- jack up the truck (see Page 113 Section "5.5.3 Jacking up the truck");
- clean the oil plugs (1) (2) (3), and surrounding areas;
- place a container under the oil drain plugs (1);
- remove the plugs (1) (2) (3), and completely drain the gear oil;
- clean the plugs (1) (2) (3);
- tighten the oil plug (1);
- pour approximately 18 l of gear oil into the speed reduction gearbox from the oil port (2) until the oil overflows from the oil port (2);
- tighten the oil plug (2) (3);
- lower the truck.

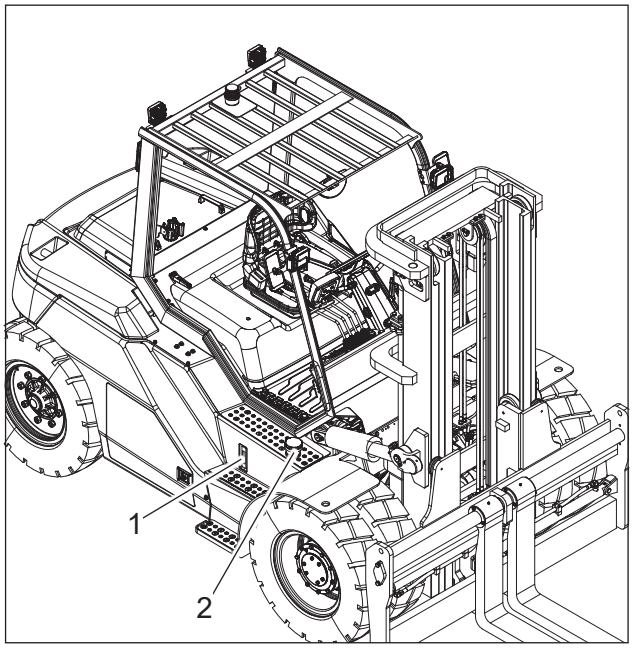


Replacing the Planetary Assy gear oil

- Operate the truck until the speed reduction gearbox is slightly warm;
- drive the truck until the oil fill/drain port (4) is facing down;
- jack up the truck, and secure the wheels with wooden blocks;
- remove the outer front wheel on one side (See Page 131 Section "Front wheel removal and installation");
- clean the oil plugs (4), and surrounding areas;
- place a container under the oil drain plug (4);
- remove the oil plug (4), and completely drain the gear oil;
- clean the oil drain plugs (4);
- turn the wheels and make the oil port (4) facing up;
- pour 1.5 – 2 L of gear oil through the oil port (4);
- tighten the oil plugs (4);
- reinstall the wheels and lower the truck;
- replace the gear oil on the other side.



5.5.6 Checking and replacing the hydraulic oil



➢ **Checking the hydraulic oil**

- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs").
- Observe the level gauge (1) and check the hydraulic oil level;
- Remove the oil cover (2), inspect hydraulic oil.
- Fill the hydraulic oil up to the proper amount (See Page 111 Section "5.4.2 Consumables table").
- Reinstall the oil cover (2).

⚠ WARNING

Please follow the procedures for the safe handling of oil and lubricating grease.

⚠ WARNING

High temperature hydraulic fluid can cause serious injury.

Follow the instructions below when handling hydraulic fluid:

- *Wait for the hydraulic fluid to cool before inspecting it.*
- *Do not drain or pump hot hydraulic fluid from the system.*
- *If you are injured, you must go to a hospital immediately for treatment.*
- *Spilled hydraulic fluid must be removed immediately with an appropriate absorbent.*

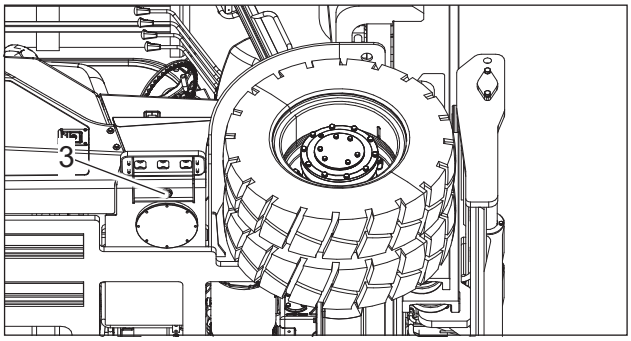
i NOTE

The oil level can only be checked after lowering the lift mast.

i NOTE

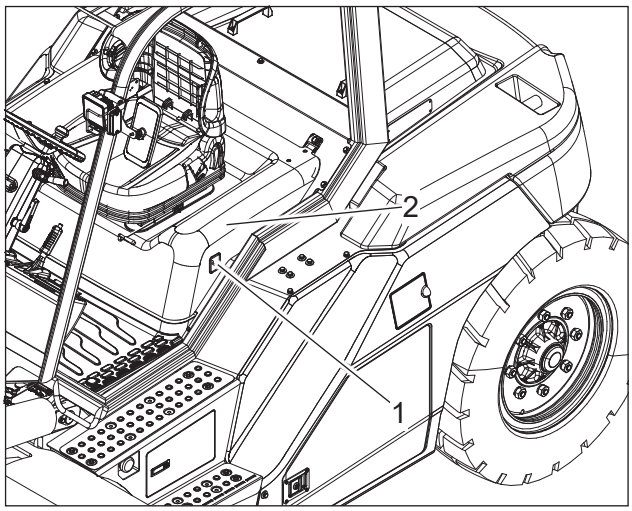
Hydraulic oil should be changed every 2000 h;

➢ **Replacing hydraulic oil**



- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs");
- Remove the oil cover (2) of the tank;
- Put one container under the truck frame, remove oil plug (3), and drain oil;
- Take away the container, dispose waste oil according to local environmental law, and do not dump at will;
- Screw back the drain plug (3), add new hydraulic oil and check for leakage;
- Reinstall the oil cover (2);
- Start truck, raise forks for 3 – 5 times, and tilt the mast forward or backward for 3 – 5 times;
- Add oil to specified scale.

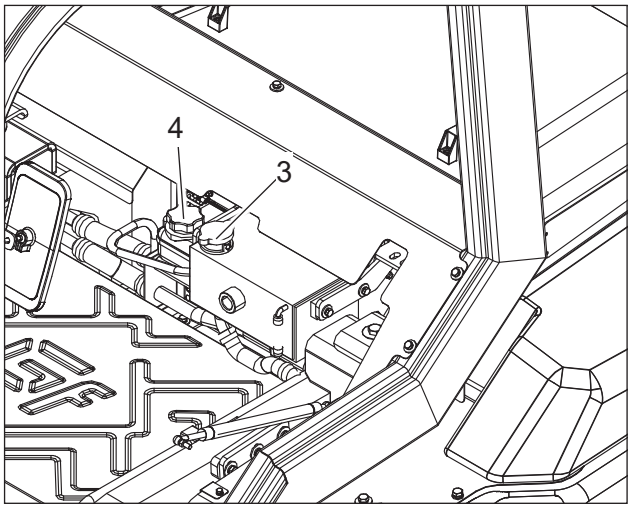
5.5.7 Adding coolant



- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs");
- Pull the lock buckle (1), open the cover (2);
- Open the cap (3) (4), add appropriate amount of coolant (see Page 111 Section "5.4.2 Consumables table");

NOTE

The coolant is made up of 50 percent water and 50 percent ethylene glycol.



WARNING

The cooling system is pressurized. Steam or hot coolant may spray out.

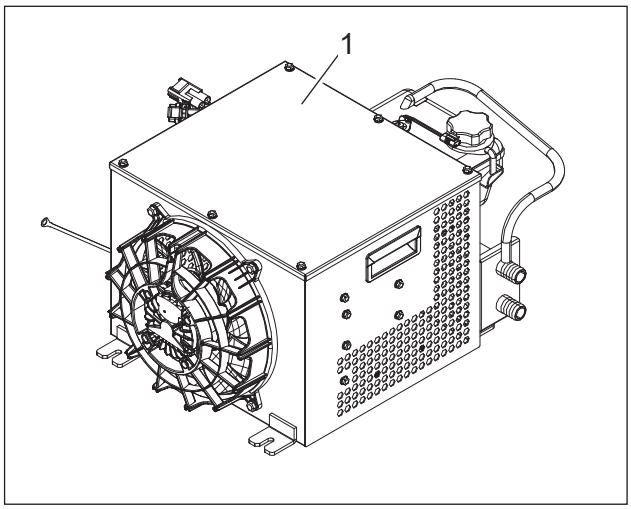
Open the pressure cap very carefully when the engine is hot. Wait until the coolant has cooled down before refilling.

⚠ WARNING

Glycol and anti corrosion agents are health hazards.

Handle with care. Avoid skin contact, use protective eyewear and protective gloves. In case of skin contact, wash your hands.

5.5.8 Adding refrigerant



The refrigerant adding port is located inside the TMS unit (1).

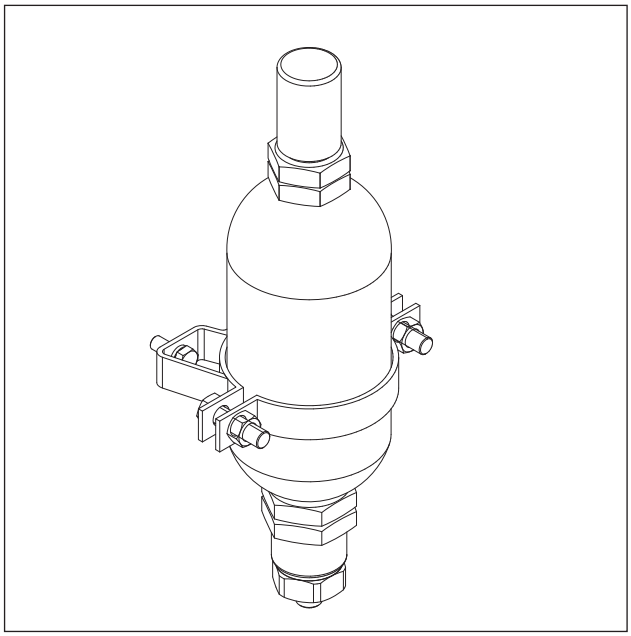
The refrigerant is normally replenished once every 2-3 years of operation.

If the TMS unit requires maintenance or is in poor operating condition, please contact the manufacturer's after-sales service department.

⚠ WARNING

The TMS unit is a high-voltage component and it is strictly forbidden for user to disassemble it for maintenance purposes. In the event of a fault, please report the error code on the truck display to the manufacturer, who will arrange for technical service engineers to visit you for repair.

5.5.9 Checking accumulators



The function of the accumulator is to maintain even brake pressure and also to retain brake pressure, and thus braking action, a short time if hydraulic pressure is lost.

The accumulator is pre-charged with nitrogen gas.

➢ **Checking accumulator function**

Check the seal as follows if the error code for low brake pressure is shown in the control and monitoring system display:

(1) Start the truck and let it run until the accumulator is filled.

(2) Stop the truck and then turn the key to position "OFF".

(3) Press on the brake pedal with long pumping brake strokes, with a slight delay between each braking action. It should be possible to brake at least 3 times before the brake fails.

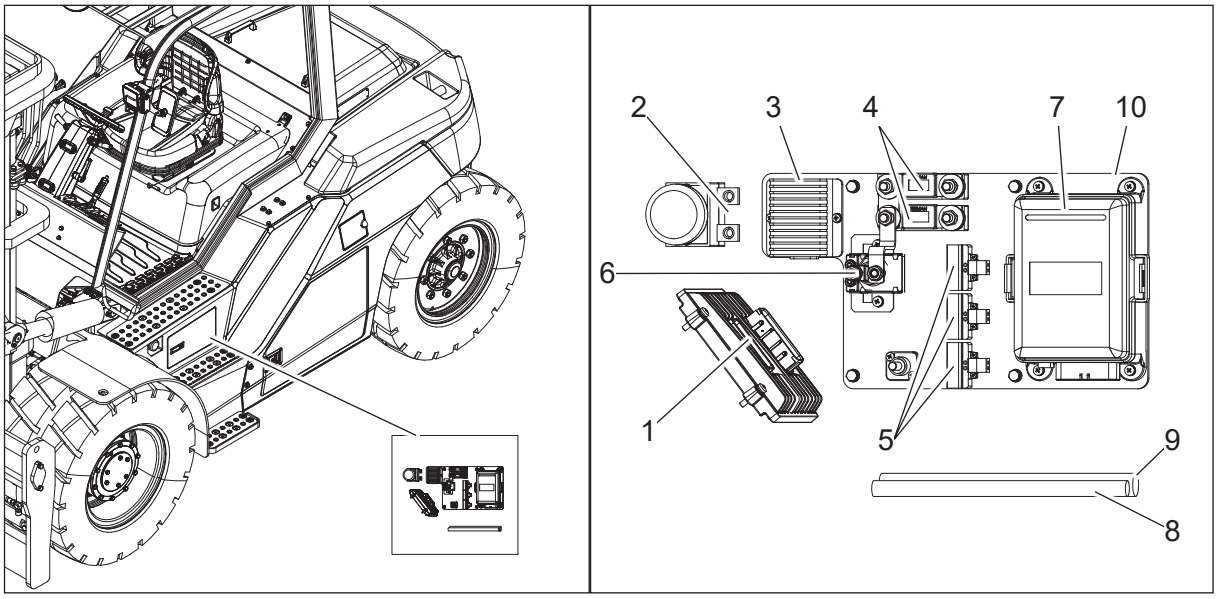
(4) Start the engine, allow the accumulator to charge and repeat the test a couple of times. If it is not possible to brake at least 3 times before the brake fails, there is a defect in the accumulator. Contact service for troubleshooting and appropriate action as soon as possible.

➢ **Maintenance of the accumulator:**

Before servicing or replacing the accumulator, relieve the internal pressure. After the truck has stopped, depress the brake pedal several times to relieve the accumulator pressure.

5.5.10 Checking electrical box

The electrical box is located on the left front of the truck. It contains important electrical components such as relay boxes, truck controllers, main power switch, relays and fuses. The internal locations are shown in the following diagram.



1	MC43 Controller (VCU)	6	Relay
2	Main power switch	7	Fuse and Relay Box
3	24V to 12V Power Supply	8	Electrical cabinet wiring harness
4	50 A Fuses	9	Electrical box communication harness
5	Junction Box	10	Mounting base plate

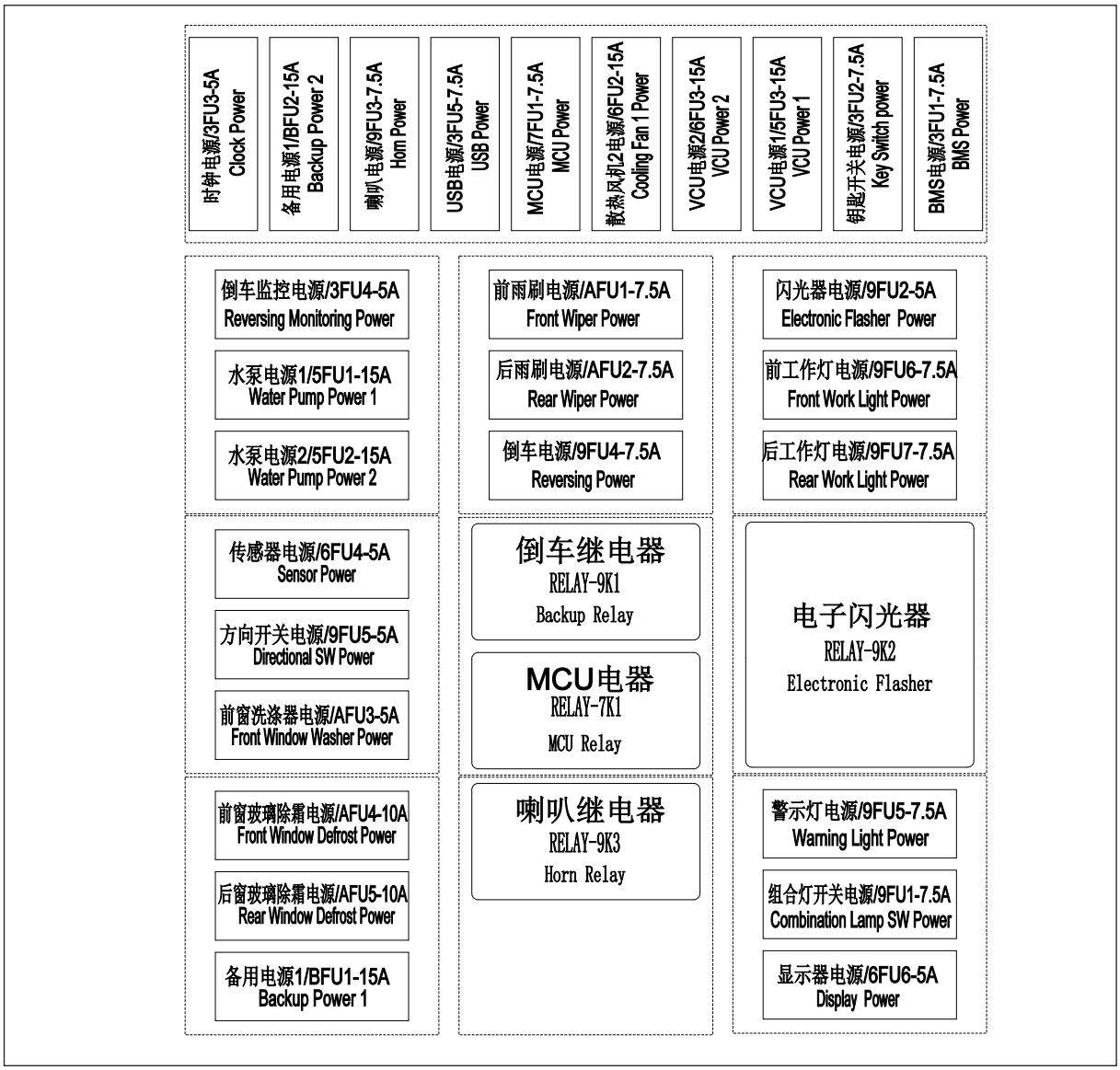
➢ Checking the fuse and relay box

The fuse and relay box integrates the truck's relays, fuses, and electronic flashers, as shown in the schematic diagram. The cover of the fuse and relay box has functional labels for each component.

- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs");
- Open the electrical box;
- Open the fuse and relay box;
- A melting fusible link can be easily seen or touched, if you are unsure whether it has melted, use a multimeter or lamp to test.

⚠WARNING

- *When replacing for new fuses, please choose the fuse of same capacity as the old one.*
- *If fusible links is melted, maybe because of short circuit (power or current is too high). No matter which reason, please check and eliminate fault.*
- *Fusible links can cause heat, do not enlace with adhesive tape. Do not put fusible links near other rubber or wiring assembly.*



➢ 50 A fuses

Two 50 A fuses installed in the electrical box.

50 A Fuses Funtion Table			
Number	**Functions**	**Number**	**Functions**
6FU1	Motor water cooling fan power supply fuse	6FU2	TMS unit power supply fuse

➢ Vehicle Control Unit (VCU)

The Vehicle Control Unit (VCU) is the main controller of the whole truck control system, managing the battery system, electric drive system, hydraulic system, thermal management system, etc. via CAN bus or hardwire.

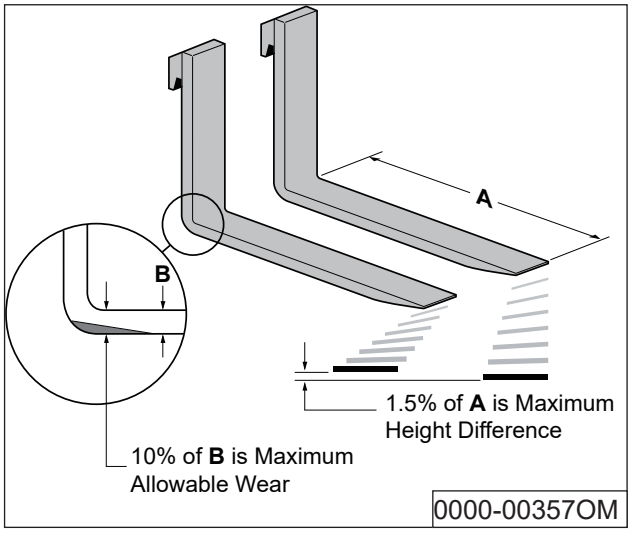
⚠WARNING

VCU diagnostics and program upgrades must be performed using specialized diagnostic tools and by the manufacturer's technical service technicians. If the VCU has an activated error message or error code, do not use the truck.

5.5.11 Fork maintenance

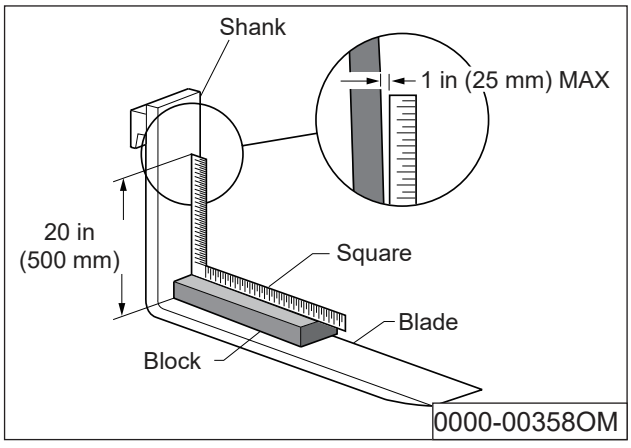
➢ Inspecting the load forks for wear

- The top surfaces of the forks should be level with each other.
- If the height difference between the fork tips is greater than 1.5% of the blade length (A), then the forks must be replaced.
- If the fork heel is worn by more than 10% of the thickness (B) of the fork blade, then the forks must be replaced. The load capacity of the forks is reduced when the forks have experienced excessive wear.



➢ Inspecting the forks for twists and bends

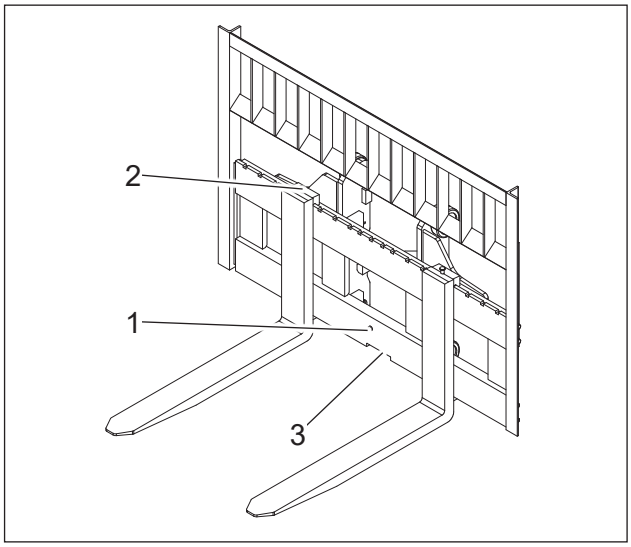
- Position a 50 mm thick block, at least 100 mm wide and 600 mm long, on the blade of the fork with the 100 mm surface against the blade.
- Position a 600 mm square on the top of the block and against the shank.
- Check the fork gap at 500 mm above the blade. If the gap distance is greater than 25 mm, then the forks must be replaced.



⚠WARNING

Do not operate a lift truck with bent, damaged, or worn forks.

➢ Fork removal and assembly (Fork carriage with manually movable forks)



Fork removal

- Screw off the fixed bolt (1) in the middle of the fork carriage;
- pull the fork locating pin (2) upward, and rotate 180° in either direction to unlock the fork;
- move the fork to the middle slot (3);
- tilt the mast forward (see Page 45 Section "2.2.8 Control levers (Mechanical valve)" or Page 46 Section "2.2.9 Armrest (Electro-proportional valve)");
- lower the forks until they are off the fork carriage;
- reverse the truck.

Fork assembly

- Place the forks in front of the truck;
- lower the fork carriage to the bottom;
- drive the truck forward slowly, align the carriage slot (3) with the fork;
- lift the forks off the ground;
- screw the bolt (1) back in;
- adjust the position of the fork, and lock the pin (2).

⚠ WARNING

Fork spacing should be adjusted symmetrically to the truck centerline.

⚠ WARNING

Secure the forks in position after adjustment.

There is a slot in the lower crossbar for removing and installing forks.

Do not position the forks in the lower crossbar slot to prevent them from coming off the carriage.

A bolt is mounted in the center to limit the fork position, if this bolt is damaged please replace it.

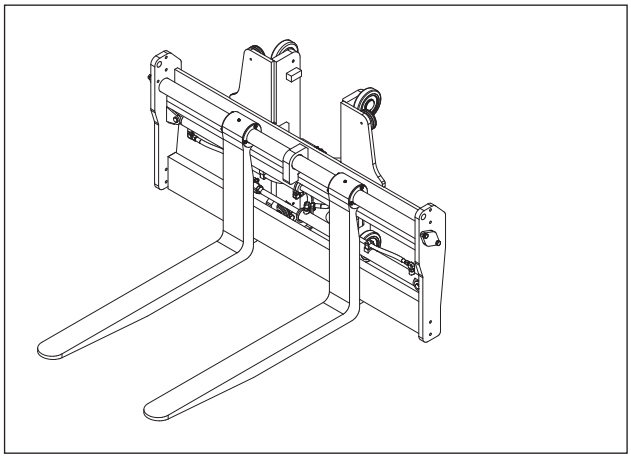
➢ **Fork removal and assembly (Side shift carriage with fork spreading)**

Fork removal

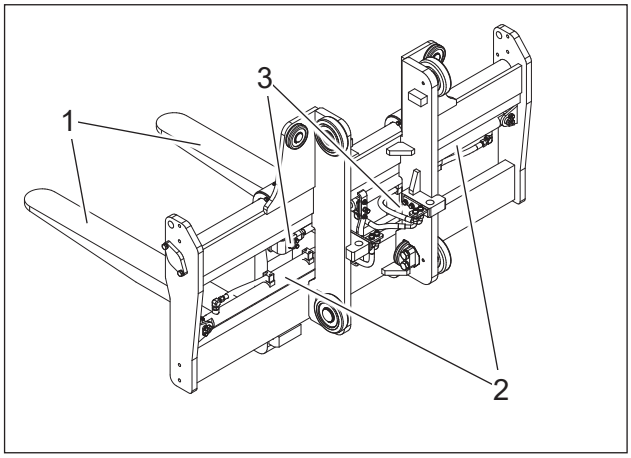
⚠ CAUTION

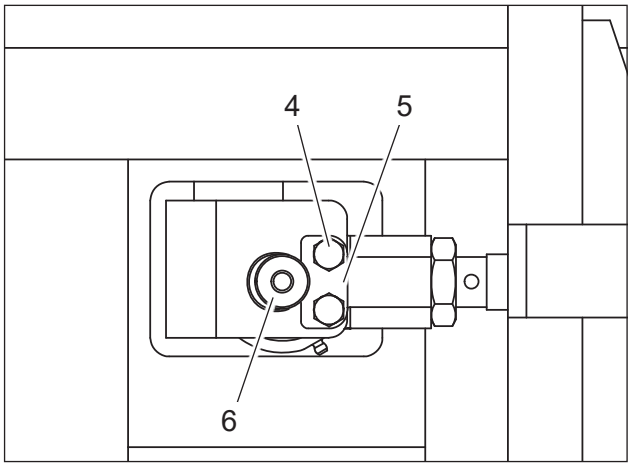
Components should be secured with straps, blocks, etc. before removal.

Adjust the fork spacing to an appropriate size as shown in the diagram on the right.

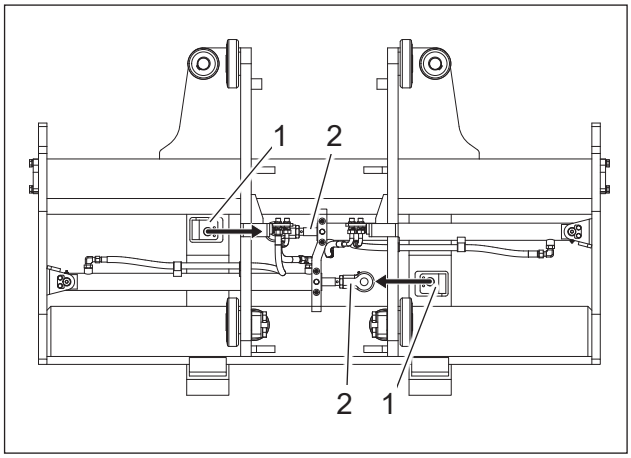


Remove the bolts (4), plates (5) and pin shafts (6) from the cylinder and fork joint (3) to disconnect the forks (1) from the cylinder (2);



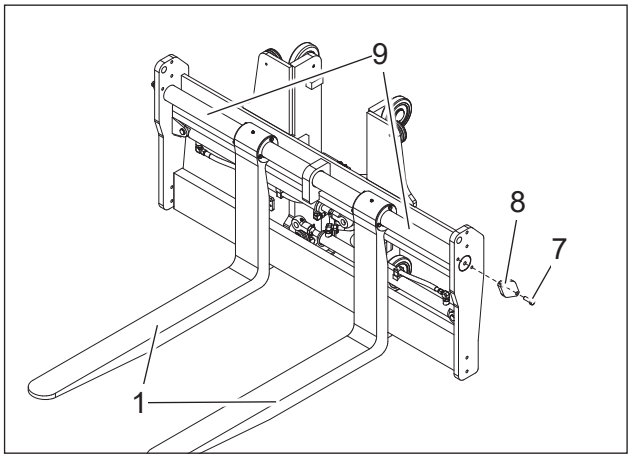


Retract the piston rods of the oil cylinders (see Page 45 Section "2.2.8 Control levers (Mechanical valve)" or Page 46 Section "2.2.9 Armrest (Electro-proportional valve)") until the cylinders (2) are completely separated from the forks (1);

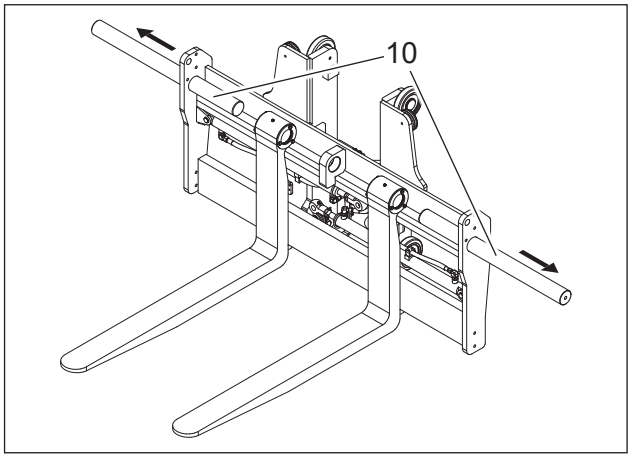


Unscrew the bolts (7) and remove the plate (8);

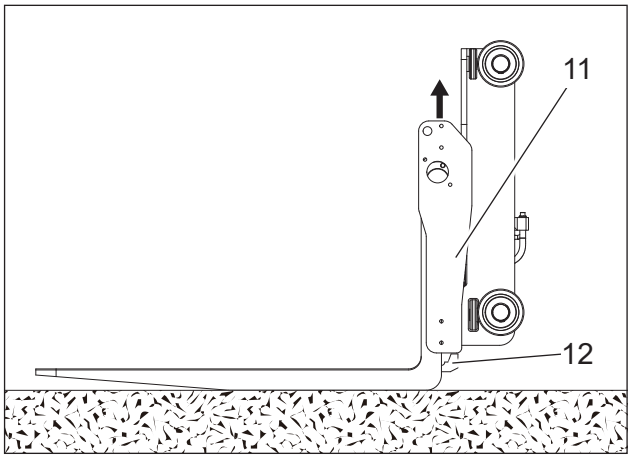
Lower the forks (1) so that they touch the ground and do not weigh on the axle (9);



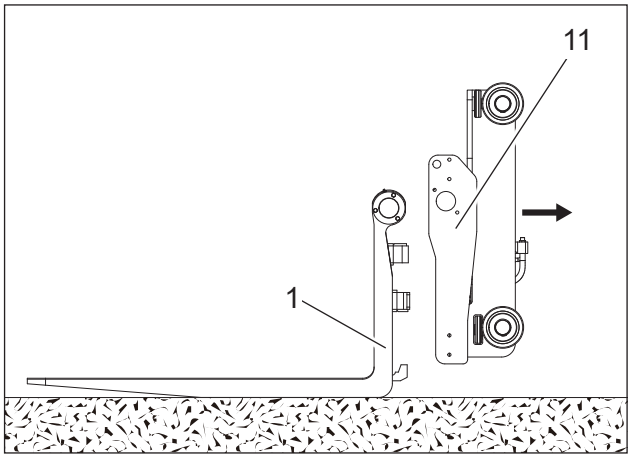
Withdraw the shaft (10) through the tapped hole in the shaft end;



Lift the fork carriage (11) slightly (see Page 45 Section "2.2.8 Control levers (Mechanical valve)" or Page 46 Section "2.2.9 Armrest (Electro-proportional valve)") until the lower crossbar of the fork carriage separates from the fork hooks (12);



Reverse the truck so that the forks (1) and the fork carriage (11) are completely separated.



Fork installation

Install according to the reverse order of removal.

5.5.12 Lift Chain Inspection and Lubrication

During normal operating conditions, inspect and lubricate the lift chains every 450 to 500 hours. If operating in corrosive or extreme working conditions, inspect more frequently.

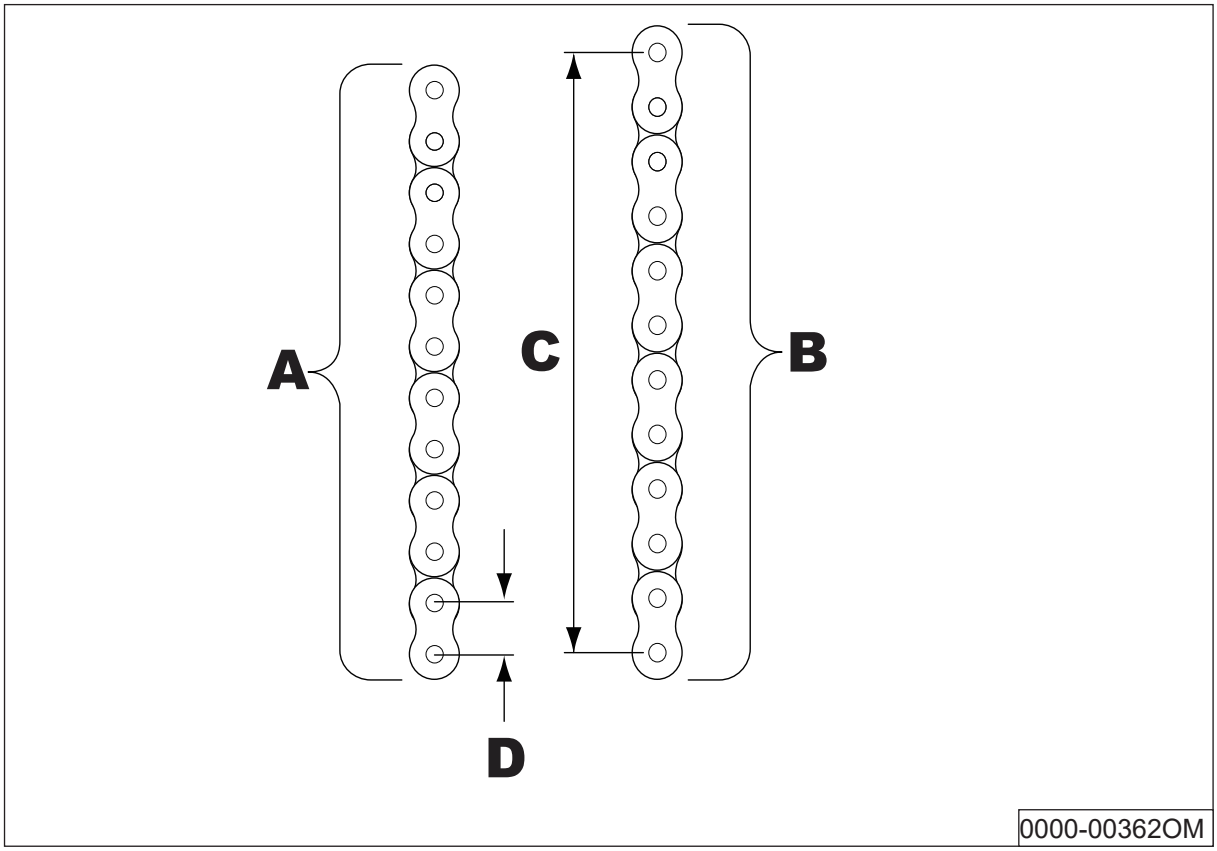
When inspecting, check for: rust and corrosion, cracked plates, raised or turned pins, tight joints, excessive wear, and worn pins and holes.

Lift chain lubrication is a crucial step of your Planned Maintenance program. The correct and timely lubrication of the lift chains will maximize their service life.

Lift Chain Wear and Replacement Criteria:

The lift chain will gradually stretch over time during normal operation. When a section of chain has stretched 3% or more, it is considered excessively worn and must be replaced. When checking for chain stretch, always measure a segment of chain that moves over a sheave.

- New Chain Length (A): distance from the first pin counted to the last pin counted in a span while the chains are lifting a small load.
- Worn Chain Length (B): distance from the first pin counted to the last pin counted in a span while the chains are lifting a small load.
- Span (C): number of pins in the segment of chain to be measured.
- Pitch (D): distance from the center of one pin to the center of the next pin.



⚠WARNING

Do not attempt to repair a worn or broken lift chain.

5.5.13 Servicing wheels and tyres

⚠ DANGER

Replacing tyres is very dangerous.

Fatal danger!

Only service personnel with sufficient competence and authority should handle and replace tyres!

⚠ DANGER

Penetrating objects such as crushed glass, woodchips, metal shavings, etc. and mechanical defects, such as uneven brake wear, can cause tyre damage.

Risk of tyre explosion! Fatal danger!

Check the tyres at regular intervals for external damage and tyre pressure.

⚠ WARNING

Spare and replacement tyres shall be from approved manufacturers.

⚠ WARNING

Wheels, Tyres and rims are sized and selected for each machine type so that the maximum wheel loads and driving speeds are not exceeded. Therefore, tyre size, tyre make, tyre type, rim type or rim manufacturer must not be changed without specific approval from truck manufacturer.

⚠ DANGER

When changing tyres, deflate first.

Risk of tyre explosion! Fatal danger!

Deflate tyres by loosening and removing the valve.

⚠ DANGER

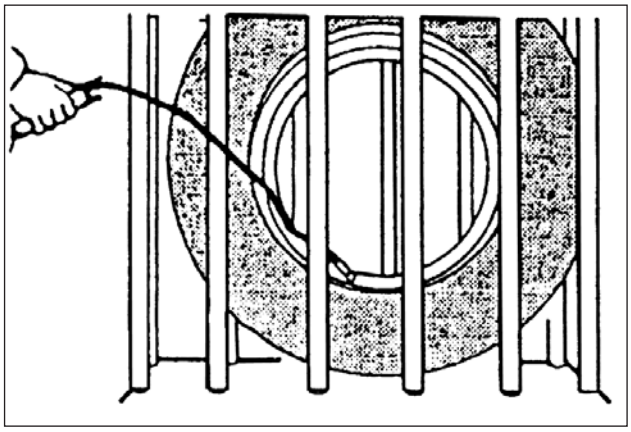
Rim damage makes wheel handling extremely dangerous!

Risk of tyre explosion! Fatal danger!

Let service personnel change tyres, they have the competence and authority to handle tyres!

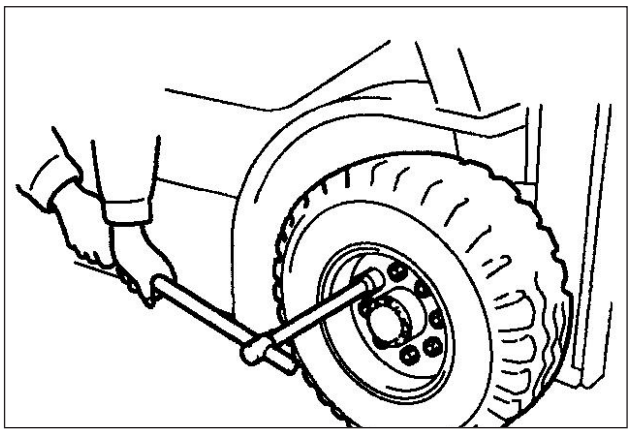
➢ Checking tyre pressure

Unscrew the cap counterclockwise and measure the tyre air pressure with a gauge. Compensate the air pressure to the specified value when it is insufficient. After confirming that there is no air leakage, install the cap and check whether the tyre is broken and whether the rim is deformed.



⚠WARNING

- *Truck tyres require high air pressure to carry the load, and very small deformations of the rims or broken tyres can cause accidents.*
- *When using an air compressor, the pressure should first be adjusted, as an accident can occur if the maximum output pressure of the compressor is too high above the value specified for the tyre.*
- *To ensure safety, place the tyre in a protective frame or tie it down with a chain when inflating.*



➢ Checking wheel fixation

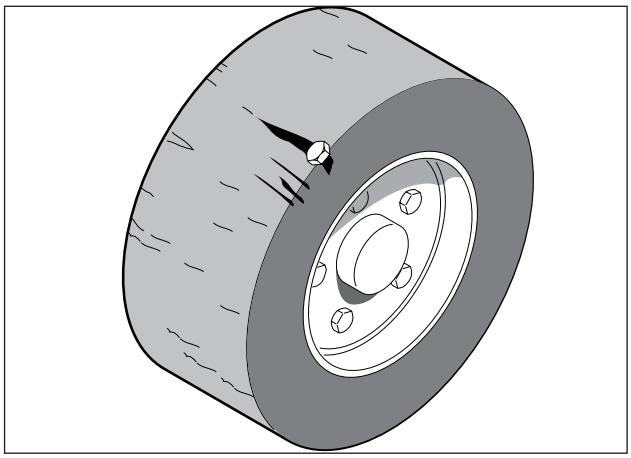
Check whether the wheel tightening torque meets the requirements.

Procedure

- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs").
- Screw down wheel retaining nut with spanner crosswise, tighten to the desired torque.

➢ Checking tyres (Solid tyres)

The following precautions should be taken when checking the wheels and tyres:



- Check if the tyres are excessively worn; if they are excessively worn, they must be replaced.
- Remove any foreign objects from the tyres.
- Inspect the tyres for large cracks or detached tyre blocks.
- Check for missing tyre bolts.
- Check for loose fasteners. Tighten any loose or replaced bolts to the proper torque.

➢ Rear wheel removal and installation

Removal

⚠DANGER

When changing tyres, deflate first.

⚠WARNING

After disassembling the seal, the sealing function will be weakened.

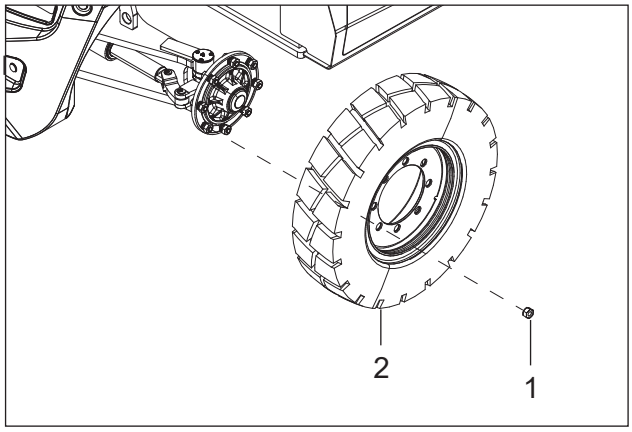
Replace all disassembled seal parts.

- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs").
- Jack up the truck (see Page 113 Section "5.5.3 Jacking up the truck"), make the rear wheel off the ground.

⚠CAUTION

When jacking up the truck from the rear, pay attention to the position of the front of the forks to avoid hitting the ground.

- Deflate the tyre by loosening and removing the valve.
- Unscrew eight nuts (1);
- Remove the rear wheel (2).



Installation and Commissioning

Install according to the reverse order of removal.

NOTE

When installing the wheels, tighten the nuts crosswise.

⚠WARNING

When replacing wheels, be sure that the truck won't tilt.

⚠ WARNING

Make sure that wooden blocks used to support truck are solid, one-piece units.

Never get under the truck when the truck is only supported with wood block.

⚠ WARNING

Do not take out wheel nuts before the wheel leave the ground.

i NOTE

The wheels must only be replaced by authorized service personnel.

➢ Front wheel removal and installation

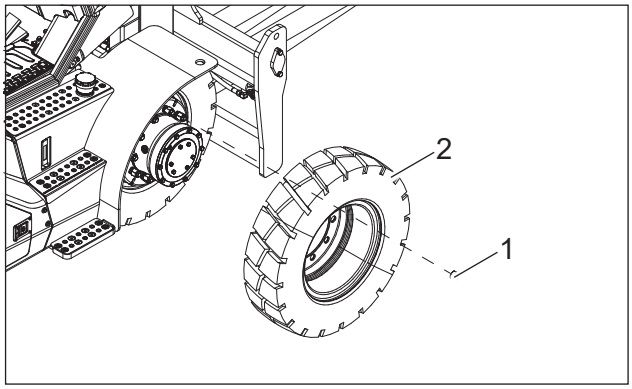
⚠DANGER

When changing tyres, deflate first.

⚠WARNING

After disassembling the seal, the sealing function will be weakened.

Replace all disassembled seal parts.



- Prepare the truck for maintenance and repairs (See Page 112 Section "5.5.1 Preparing the truck for maintenance and repairs");
- Jack up the truck (see Page 113 Section "5.5.3 Jacking up the truck"), make the front wheel off the ground;
- Deflate the tyre by loosening and removing the valve;
- Remove the sixteen lock nuts (1) on the drive axle assembly;
- Remove the front wheel (2).

Installation and Commissioning

Install according to the reverse order of removal.

i NOTE

When installing the wheels, tighten the nuts crosswise.

⚠WARNING

When replacing wheels, be sure that the truck won't tilt.

⚠WARNING

Make sure that wooden blocks used to support truck are solid, one-piece units.

Never get under the truck when the truck is only supported with wood block.

⚠WARNING

Do not take out wheel nuts before the

wheel leave the ground.

NOTE

The wheels must only be replaced by authorized service personnel.

➢ Wheel Installation Precautions

- Tighten the rear wheel nuts to the following torque: 480 – 550 Nm.
- Tighten the front wheel nuts to the following torque: 440 – 480 Nm.
- Turn the wheel to check that it turns smoothly and that it is not blocked.
- Run the truck to see if the wheels are functioning properly. If there is blocking or noise, please check if the wheel bearings are functioning properly.

NOTE

When installing the wheels, tighten the nuts crosswise.

CAUTION

Quality of tyres directly affects the stability and driving performance of the device.

If you need to replace the factory-fitted tyres, please use original spare parts provided by the equipment manufacturer to reach the original design performance of the truck.

CAUTION

The nuts must be tightened at least once every 50 operating hours.

➢ Inflating tyres

Never stand in front of a tyre when inflating it.

Do not exceed the specified tyre pressure.

When changing tyre or rim version, another tyre pressure may apply, contact the manufacturer.

DANGER

The plate for tyre air pressure must be replaced with a plate with the applicable tyre pressure!

Always follow the instructions for inflating tyres to avoid serious accidents.

NOTE

If the tyre has been completely deflated, the rim must be dismantled and checked for any damage. Let service personnel with the right competence and authority perform tyre changes and tyre handling!

5.5.14 Restoring the truck to service after maintenance and repairs

➢ **Procedure**

- Thoroughly clean the truck.
- Clean the battery. Grease the pole screws using pole grease and reconnect the battery.
- Recharge the battery.
- Check if the hydraulic oil contains condensed water and change if necessary.
- Follow the daily checklist.

5.6 Decommissioning the trucks

The truck must be parked in a frost-free, clean, dry location and 0 – 40 °C condition. Parking the truck in an environment below 0 ° C for a long time is forbidden.

5.6.1 Daily storage

Park the truck securely (See Page 80 Section "4.2.11 Parking").

5.6.2 Long-term storage

If the truck is to be out of service for more than a month, it must be stored as described in this section.

i NOTE

If the truck is to be out of service for more than 6 months, contact the manufacturer's service department for further information.

➢ **Prior to decommissioning**

- Lift and lower the fork carriage to its full extent and tilt the lift mast forwards and backwards several times. Repeat the same operation several times on attachments if they exist;
- Park the truck securely (See Page 80 Section "4.2.11 Parking");
- Clean the truck thoroughly.;
- Check the brakes;
- Check the hydraulic oil level and top up if required;
- Apply a thin layer of lubricating oil or grease to all unpainted mechanical components;
- Apply anti-corrosion agent to shafts, rods and other exposed parts;
- Lubricate the truck (see Page 110 Section "5.4.1 Consumables chart");
- Clean the battery;
- Make sure that no metal parts of the battery, such as the terminals and cables, are exposed;
- Jack up the truck (see Page 113 Section "5.5.3 Jacking up the truck") and support it with a block of wood strong enough to reduce the load on the wheels;
- Cover the ventilation hole and other openings where moisture may enter;
- Fully cover the truck with a sheet or similar.

i NOTE

Do not cover the truck with plastic film as it may gather water vapour.

⚠WARNING

The wooden blocks must be single pieces that are sturdy enough to support the weight of the truck.

Use wooden blocks of appropriate height.

Raise the truck just enough to allow it to be placed onto the wooden support blocks.

Place wooden blocks of identical size under left and right sides of the frame.

After supporting the truck with the wooden blocks, move the truck back and forth from all four sides to make sure that it is safely secured.

⚠WARNING

Charge the battery every two months to avoid depletion of the battery through self-discharge.

➢ **During decommissioning**

Trucks must be inspected and maintained regularly while in storage to avoid damage to the trucks.

Maintenance interval	Items
Every 2 months	Charge the battery (see Page 94 Section "4.5.3 Charging the battery with an external charger")
Every 3 months	Check the hydraulic oil level and top up if necessary; Inflate the wheels to the specified pressure (pneumatic tires); Start the truck and drive at low speed for a while; Drive the truck until the wheels have regained their shape (solid tires); Slowly raise and lower the load carriage and tilt the mast back and forth several times. If there are attachments, repeat the same procedure for the attachments.
Every 6 months	Perform a complete maintenance on the truck (see Page 105 Section "5.3.1 Maintenance Checklist").

iNOTE

If the truck is to be out of service for more than 6 months, contact the manufacturer's service department for further information.

⚠ CAUTION

- *Self-discharge of the battery may cause the battery to become too low and the truck will not start.*
- *A low battery charge will shorten the battery life.*
- *If the truck is not used for a long time, the inside of the cylinder, transmission and other parts may dry out.*
- *After a long term storage, operate the truck at a slow speed first, operate the truck at a slow speed to avoid damage to parts.*
- *Irreversible deformation of pneumatic tires due to prolonged inflation. If the tires are irreversibly deformed, they must be replaced.*

5.7 Restoring the truck after decommissioning

➢ **Procedure**

- Thoroughly clean the truck;
- Clean the battery. Grease the pole screws using pole grease and reconnect the battery;
- Charge the battery;
- Check if the gear oil contains condensed water and change if necessary;
- Check if the hydraulic oil contains condensed water and change if necessary;
- Carry out daily checks (see Page 73 Section "4.1 Daily checks").

⚠ CAUTION

When starting the truck for the first time after long-term storage, operate at low speeds to avoid damage to parts.

5.8 Final decommissioning, disposal

Final, proper decommissioning or disposal of the truck must be performed in accordance with the regulations of the country of application. In particular, regulations governing the disposal of batteries, fuels, hydraulic oil, plastic and electronic and electrical systems must be observed.

6 Troubleshooting

If an accident or malfunction occurs with the truck, the following steps should be taken:

Immediately cease operation of the truck and park it in a safe area.

In the event of an accident, promptly notify relevant personnel such as supervisors, safety officers, or emergency personnels.

In case of a malfunction, report the issue according to company protocols and seek repair or maintenance services.

For accidents involving injury, administer first aid promptly and notify medical personnel for assistance. Ensure that no further harm is caused to others while addressing the accident or malfunction. Fill out and submit accident or malfunction reports as per company policies, and follow relevant procedures. After appropriate handling of the accident or malfunction, inspect, repair, and test the truck as necessary to ensure its safe operation.

This chapter is designed to help the user identify and rectify basic faults or the results of incorrect operation. When locating a fault, proceed in the order shown in the table.

If the fault cannot be rectified or a fault in the electronics system is displayed with a corresponding error code after carrying out the remedial procedure, notify the manufacturer ' s service department, as any further troubleshooting can only be performed by specially trained and qualified service personnel. The manufacturer has a customer service department specially trained for these tasks.

Fault	Fault Symptom	Troubleshooting Order *	Troubleshooting Measures
Power supply failure	1. Whole truck power outage	a. Power supply failure b. Fuse failure c. Emergency stop switch or circuit failure d. Main power switch or circuit failure e. Key switch or circuit failure	1. Check the voltage of storage battery 2. Check the fuses 3. Check emergency stop switch and its circuit 4. Check main power switch and its circuit 5. Check key switch and its circuit
Travel Fault	1. Forward and reverse moving failures of the truck, but other functions are normal	a. Seat switch or its circuit connection failure b. Gearbox failure c. Travel switch or its circuit connection failure d. Drive motor or its circuit connection failure e. Controller failure f. High-voltage circuit failure	Controller failure error, carry out troubleshooting according to the error code information on the instrument. 1) Check if seat switch or the connection of its circuit is normal; 2) Check the gearbox; 3) Check the travel switch and its connection circuit; 4) Check the drive motor and its connection circuit; 5) Replace the controller; 6) Check the high-voltage circuit

Fault	Fault Symptom	Troubleshooting Order *	Troubleshooting Measures
	2. The truck can travel at low speed, but cannot travel at high speed	Failures due to external factors: a. Motor bearing blocked b. Gearbox bearing blocked Failures due to internal factors: a. Drive motor speed encoder failure b. Controller failure	Controller failure error, carry out troubleshooting according to the error code information on the instrument. 1) Check if the motor rotation is normal; 2) Check the speed encoder and its connection circuit; 3) Remove the gearbox, check if the gear rotation is smooth and if there is blocking; 4) Replace the controller
Hydraulic Failure	1. The truck cannot lift	1. Pump motor does not work: a. Parking brake switch and seat switch or its circuit connection failure. b. Pump motor or its circuit connection failure. c. Control switch or its circuit connection failure. d. Controller failure. 2. Pump motor works: a. Overload. b. Insufficient hydraulic oil. c. Hydraulic pipeline leakage. d. Pump motor reverse rotation. e. Cylinder failure (blocked). f. Solenoid valve blocked and cannot reset. g. Valve body failure: excessive wear of gear pump, serious internal leaks, insufficient pressure of relief valve or blocked, check valve blocked	1. Pump motor does not work: 1) Check if parking brake switch and seat switch or the connection of its circuit is normal; 2) Check the pump motor and its connection circuit; 3) Check the control button and its connection circuit; 4) Replace the controller. 2. Pump motor works: 1) Refer to the rated capacity marked on the nameplate; 2) Lower the mast to the bottom, check if the amount of oil in the oil tank can meet the requirements; 3) Check the pipe and hydraulic components for oil leaks; 4) Check the pump motor wiring; 5) Check the cylinder for damage or deformation, remove the cylinder to check for wear or aged seals inside; 6) Wash or replace the solenoid spool. 7) Wash or replace the valve body

Fault	Fault Symptom	Troubleshooting Order *	Troubleshooting Measures
	2. The truck cannot be lowered	a. Solenoid valve (or manual valve) or its circuit connection failure b. Lowering switch or its circuit connection failure c. Valve failure; d. Cylinder deformation or blocked e. Explosion-proof valve blocked	1) Check the lowering button and its connection circuit; 2) Check the solenoid valve and its connection circuit; 3) Check the cylinder for deformation, remove the cylinder to check if the internal assembly is normal 4) Clean or replace the valve; 5) Replace the explosion-proof valve.
Lift Failure	3. Slow Lifting of Truck	a. Overload b. Hydraulic pipeline leakage c. Valve failure: Gear pump wear, internal leakage occurs; Insufficient relief valve pressure or blocked	1) Refer to the rated capacity marked on the nameplate; 2) Check the pipe and hydraulic components for oil leaks; 3) Wash or replace the valve body
	4. Slow Lowering of Truck	a. Solenoid valve blocking b. Valve body failure: throttle valve failure or blocked	1) Wash or replace the solenoid spool 2) Wash or replace the valve body
	5. Unstable Lifting / Lowering of Truck	a. Chain loosening; b. Poor lubrication between channel steel and rollers; c. Improper adjustment of rollers, or blocked.	1) Adjust the chain tension; 2) Check if the channel steel grease is normal, clean and re-lubricate channel steel and rollers; 3) Adjust the side roller spacing through roller screw; or replace the roller.
* Under the circumstances of normal lifting and lowering, if failure occurs to any of other hydraulic actions (forward/backward shifting, forward/backward tilting and left/right shifting), perform troubleshooting to the corresponding control switch and its control circuit.			

Fault	Fault Symptom	Troubleshooting Order *	Troubleshooting Measures
Steering Fault	1. The truck cannot be steered (the truck can travel)	a. Steering redirector or the tubings connection failure b. Steering bridge or the tubings connection failure c. Pump motor failure d. Gear pump failure e. Pump controller failure	Controller failure error, carry out troubleshooting according to the error code information on the instrument; 1) Check the redirector or the tubings connection; 2) Check the steering bridge or the tubings connection. 3) Check the pump motor or its connection circuit; 4) Check the pump; 5) Replace the controller.
Brake Failure	1. Parking brake cannot be released	a. Parking brake switch failure b. Fuse failure or circuit connection failure	1) Repair or replace; 2) Repair or replace.
Other Failures	1. Lights do not light	a. Light failure or circuit not conducted b. Lighting combination switch or its circuit connection failure c. Fuse failure	1) Check the light and its circuit connection; 2) Check Lighting combination switch and its connection circuit; 3) Check fuse and its connection circuit;
	2. Horn does not sound	a. Horn switch or its circuit connection failure b. Horn failure c. Fuse failure	1) Check the horn button and its connection circuit; 2) Check the horn and its connection circuit; 3) Check fuse and its connection circuit;

Carry out troubleshooting in accordance with the order listed in the table, it can help you quickly identify problems and resolve accordingly.

- To provide targeted and rapid response to faults, the following details are useful and important to provide for the customer service department:
- Truck serial number
- Display unit error number (if present)
- Error description
- Current location of truck.

⚠ WARNING

For the following inspections, maintenance and repairs, please be sure to consult and have a specialized maintenance technician from the manufacturer make an on-site service:

- *Involving the inspection, maintenance repair, and replacement of high voltage parts, components, and wiring;*
- *Inspection and maintenance repair of non-high voltage components and wiring, but affected by the assembly and disassembly of high voltage parts, components and wiring;*
- *Faults may be caused by high voltage or non-high voltage crossovers;*
- *It is not possible to determine whether the fault is caused by high voltage or non-high voltage;*
- *Others that require touching or may touch high voltage components or high voltage lines.*

6.1 Error codes

When a malfunction occurs during operation, a error code will be shown in the corresponding screen on the display.

Level 1: faults that do not affect the use of the truck.

If a level 1 fault occurs, the truck should be shut down and inspected immediately to prevent the fault from expanding.

Level 2: faults that will limit the output power.

If a level 2 fault occurs, the truck should be shut down immediately for inspection and trouble-shooting.

Level 3: faults that could shutdown the truck.

If a level 3 fault occurs, the truck will stop in 30 seconds and should be moved immediately to a safe place to rectify the fault.

Please provide the details of the error code to the service department for accurate solutions.

➢ **Lithium-ion Battery Error codes**

Error code	Fault	Parameter	Fault Level
101	Total Voltage Too High	≥355.2V and <364.8V	Level 1
102	Total Voltage Too Low	≤268.8V and >240V (≤240V and >220.8V)	
103	Single Cell Voltage Too High	≥3.7V and <3.8V	
104	Single Cell Voltage Too Low	≤2.8V and >2.5V (≤2.5V and >2.3V)	
105	Excessive Cell Voltage Difference	≥400mV and <500mV	
106	Temperature Too High	≥50 °C and <55 °C	
107	Temperature Too Low	/	
108	Excessive Temperature Difference	≥15 °C and <20 °C	
109	Sustained Overcurrent	≥260A for 300S	
111	Discharge Current Too High	≥500A for 5S	
112	Charge Current Too High	≥260A for 5S	
113	Insulation Fault	≤500Ω/V	
116	Fast-Charge Socket Overheating	≥75 °C and <85 °C	
131	Low SOC	≤15%	

Error code	Fault	Parameter	Fault Level
51	Total Voltage Too High	≥364.8V and <374.4V	Level 2
52	Total Voltage Too Low	≤240V and >230.4V (≤220.8V and >211.2V)	
53	Single Cell Voltage Too High	≥3.8V and <3.9V	
54	Single Cell Voltage Too Low	≤2.5V and >2.4V (≤2.3V and >2.2V)	
55	Excessive Cell Voltage Difference	≥500mV and <600mV	
56	Temperature Too High	≥55 °C and <60 °C	
57	Temperature Too Low	≤-15 °C and >-20 °C	
58	Excessive Temperature Difference	≥20 °C and <25 °C	
59	Sustained Overcurrent	≥280A for 180S	
60	Regenerative Overcurrent	≥450A for 5S	
61	Discharge Current Too High	≥600A for 5S	
62	Charge Current Too High	≥270A for 5S	
63	Insulation Fault	≤300Ω/V	
66	Fast-Charge Socket Overheating	≥85 °C and <90 °C	
81	Low SOC	≤10%	

Error code	Fault	Parameter	Fault Level
1	Total Voltage Too High	≥374.4V	Level 3
2	Total Voltage Too Low (Low Temp < 0 °C)	≤230.4V (≤211.2V)	
3	Single Cell Voltage Too High	≥3.9V	
4	Single Cell Voltage Too Low (Low Temp < 0 °C)	≤2.4V (≤2.2V)	
5	Excessive Cell Voltage Difference	≥600mV	
6	Temperature Too High	≥60 °C	
7	Temperature Too Low	≤-20 °C	
8	Excessive Temperature Difference	≥25 °C	
9	Sustained Discharge Overcurrent	≥300A for 120S	
10	Regenerative Overcurrent	≥500A for 5S	
11	Discharge Current Too High	≥700A for 5S	
12	Charge Current Too High	≥280A for 2S	
13	Insulation Fault	≤100Ω/V	
14	Internal Communication Fault	/	
15	Current Sensor Fault	/	
16	Fast-Charge Socket Overheating	≥90 °C	
17	Charger Communication Fault	/	
18	Pre-Charge Failure Fault	/	
19	Heating Fault	/	
20	Communication Fault with Vehicle Controller	/	
21	High Voltage Interlock Fault	/	
22	Low Voltage Power Abnormality	/	
23	Thermal Runaway Fault	/	
24	Voltage Wiring Disconnected	/	
25	Temperature Sensor Wiring Disconnected	/	
26	Abnormal Temperature at Charging Port	/	
27	Abnormal Current	/	
28	BMS Initialization Fault	/	
29	Relay Fault	/	
30	High SOC	/	
31	Low SOC	≤5%	
32	CC2 Connection Fault	/	

➢ Motor Error codes

Error code	Fault	Fault Description	Fault Level
0	Controller Overcurrent Level 2 Fault	Overload Power Reduction	Level 2
0.1	Controller Overcurrent Level 3 Fault	AC Hardware Overcurrent Fault	Level 3
0.2	Current Sensor Level 3 Fault	Phase Current Sensor Upper Limit Exceeded Fault Phase Current Sensor Lower Limit Exceeded Fault	Level 3
0.3	Controller Overtemperature Level 2 Fault	IGBT Overtemperature Fault	Level 2
0.4	Controller Overtemperature Level 3 Fault	IGBT Overtemperature Power Reduction	Level 3
0.5	DC Bus Undervoltage	Bus Undervoltage Power Reduction	Level 2
0.6	DC Bus Overvoltage	Bus Overvoltage Power Reduction	Level 2
0.7	Pre-Charge Failure	Customer-Defined Switch-Off Fault	Level 3
1	Internal CAN Transmission Timeout	CAN Message Loss Fault	Level 3
1.1	E2 Data Out of Range	E2 Read/Write Fault	Level 3
1.2	Auxiliary Power 12V Undervoltage Level 2 Fault	Customer-Defined Alarm	Level 2
1.3	Auxiliary Power 12V Undervoltage Level 3 Fault	Low Voltage Battery Undervoltage Fault	Level 3
1.4	Motor Overtemperature Level 2 Fault	Motor Overtemperature Fault	Level 2
1.5	Motor Overtemperature Level 3 Fault	Motor Overtemperature Power Reduction	Level 3
1.6	Motor Temperature Sensor Fault	Motor Temperature Sensor Open/Short Circuit Power Reduction	Level 2
1.7	Motor Stall	Motor Stall Power Reduction	Level 3
2	IGBT Module Fault	IGBT Fault	Level 3
2.1	Speed Sensor Fault	Excessive Acceleration Fault Sudden Excessive Speed Fault	Level 3
2.2	Motor Open Circuit	Motor Phase Loss Fault	Level 3
2.3	Initial Position Detection Fault	Resolver Direction Fault	Level 3
2.4	Active Discharge Failure Fault	Active Discharge Failure Fault	Level 3
2.5	Controller Temperature Sensor Fault	IGBT Temperature Sensor Open/Short Circuit Power Reduction	Level 2
2.6	Motor Overspeed Level 3 Fault	Motor Overspeed Fault	Level 3
2.7	Motor Overspeed Level 2 Fault	Motor Overspeed Power Reduction	Level 2
3	Internal Controller Power Supply Fault	5V Undervoltage/Overvoltage Fault	Level 3

➢ DC/DC Error codes

Error code	Fault	Parameter	Remarks
91	Input Over-voltage	370 ± 10V	Input overvoltage shuts down output, recovers after 5 seconds if the fault disappears, latch-off after 5 input overvoltage protections.
92	Input Under-voltage	230 ± 10V	Input undervoltage shuts down output, recovers immediately when the fault disappears.
93	Output Over-voltage	31 ~ 33V	Output overvoltage shuts down output, recovers after 5 seconds if the fault disappears, latch-off after 5 output overvoltage protections.
94	Output Un-dervoltage	15 ~ 17V	Output undervoltage shuts down output, recovers after 5 seconds if the fault disappears, latch-off after 5 output undervoltage protections.
95	Output Over-current	155 ± 5A	Output overcurrent shuts down output, recovers after 5 seconds if the fault disappears, latch-off after 5 output overcurrent protections.
96	Overtem-perature	94 °C	Overtemperature protection shuts down output, recovers after 5 seconds if the fault disappears, latch-off after 5 overtemperature protections.
97	CS Overcur-rent	/	/
98	Output Short-circuit	/	Hardware short-circuit protection results in latch-off.
99	Overload	/	/

7 Lithium-ion battery instructions

7.1 Precautions for the use of lithium-ion batteries

⚠CAUTION

When the ambient temperature is low, the battery system charging time will be extended, which is normal. The battery management system will automatically adjust the charging time with temperature changes to ensure the best performance of the battery system.

(1) The best working temperature of Lithium-ion battery is 35°C.

(2) Check the whole truck's power level before using the truck. After the key switch of the whole truck is closed, make sure there is no battery system alarm message in the instrument panel. Please check the remaining power before use, it is recommended that the SOC is between 50% – 100%. SOC below 30% is not recommended for further use, please charge as soon as possible.

(3) When battery system SOC is lower than 20%, please charge in time. Please use the special charging equipment designated by the manufacturer's authorisation for charging. If there is a fault alarm during charging, both the battery system and the charger will stop charging and the charger will display a error message. The charging environment should be dry and ventilated, with no flammable or explosive objects around. It should be ensured that the Lithium-ion battery is fully charged at least once a week.

(4) Before long-term storage, it should be confirmed that the battery system charge is not less than 50%. Charging maintenance should be carried out every two months: fully charge the battery. If the battery has been stored for more than two months, before using again, please confirm that the power battery system has no fault alarm. If there is a fault alarm, please contact our after-sales service department for maintenance. Keep the storage environment as dry and ventilated as possible, away from heat sources.

7.2 Maintenance and storage

Daily maintenance:

Check whether the appearance is deformed, whether the surface is oxidized and depainted, whether the installation position is offset, whether the case is damaged, etc.

Weekly maintenance:

Use dry cloth or compressed air to clean the Lithium-ion battery and charger.

Monthly maintenance:

(1) Check whether there is water or foreign matter in the plug and socket, and check whether it is rusted or burnt, etc.

(2) Check the cables for breakage, loose joints, etc.

(3) Check the battery case for cracks, deformation, bulging and other abnormalities.

Storage:

(1) Store the battery in a clean, dry and ventilated indoor environment with an ambient temperature of 0°C – 40°C and a relative humidity of not more than 75%, not inverted, and avoiding mechanical shock and heavy pressure.

(2) Charge every two months.

(3) The positive and negative terminals of the battery box are wrapped with high-voltage insulating sleeves or other insulating materials to ensure that no metal parts are exposed to avoid short circuit. The diagnostic port is free of dust and wrapped or covered.

7.3 Installation precautions

(1) When installing, follow the sequence strictly.

(2) Before connecting the positive and negative battery output copper rows, check repeatedly to make sure there is no error.

(3) The wiring harness connector and bolts should be checked to see if they are installed in place, and the bolts should be tightened and marked according to the specified torque.

(4) Confirm that all high and low voltage connectors of the power battery box are connected in the correct state before allowing the connection to be powered up.

(5) After installation and inspection, connect the diagnostic instrument (upper computer) to check whether the battery pack parameter information is normal.

⚠ WARNING

- *All disassembling and assembling process need to wear protective gears and use insulating tools; before repairing, you must unplug the MSD connector on the high voltage box and wait for 15 – 20 minutes for the high-voltage system to be disconnected.*
- *It is forbidden to wear any metal jewellery during the battery system maintenance process to avoid accidental short-circuiting which may cause personal injury or death.*
- *When disassembling and assembling, you need to mark well and install in order.*
- *If there is a battery failure alarm, the power supply should be cut off immediately.*

7.4 First aid for accidents

(1) In the event of a truck or high voltage battery fire, perform the following operations as appropriate:

- Turn the truck key switch off and disconnect the low-voltage battery if conditions permit.
- Disconnect the MSD connector.
- Find a fire extinguisher nearby (do not use a water-based fire extinguisher).
- If the truck is on fire and the fire is small and slow, use a dry powder fire extinguisher and call for help immediately.
- If the fire is large and growing fast, stay away from the truck immediately and call the fire alarm to wait for help.

(2) If the high-voltage battery leaks (with obvious liquid coming out), please operate the truck as follows:

- Turn the truck key switch off and disconnect the low-voltage battery if conditions permit.
- Disconnect the MSD connector.
- When a small amount of leakage occurs, please keep away from fire source, use absorbent cloth to adsorb it and place it in an airtight container, or dispose of it by incineration, and wear anti-acid and alkali gloves before operation.
- When a large amount of leakage occurs, please collect it uniformly and treat it according to dangerous chemicals, and add calcium gluconate solution to deal with the gas produced.
- When the human body accidentally touches the leaked liquid, it should be immediately flushed with a large amount of water for 10 to 15 minutes, if there is pain, it can be applied with 2.5% calcium gluconate ointment, or soaked with 2% to 2.5% calcium gluconate solution to relieve the pain, if there is no improvement or uncomfortable symptoms, please consult a doctor immediately.

7.5 Common faults and solutions

Faults	Causes	Solutions
No output from battery system	Incorrect connection of output cables	Connect the output cables correctly according to the instructions
	Battery system exceeds discharge protection voltage	Charging the battery system
	Battery system single unit failure	Replacing the battery system
Indicator light does not come on (optional)	Charger AC input incorrectly connected	Plug the AC end of the charger correctly into the AC outlet
	Wire fault or battery system fault	Troubleshoot wiring or battery system
	Charger fault	Replace the charger
Battery system cannot be charged	Loose charger output	Check charger connections are secure
	Battery system exceeds charge protection voltage	Battery system is fully charged and ready for use
	Faulty charger	Replace the charger
Battery system temperature alarm	Ambient or module temperature exceeds/falls below the set protection temperature	Cool down/heat up
Undervoltage alarm	Battery system unit voltage below protection voltage	Consult a specialist
Battery system voltage jump	Battery system fastener loose or BMS communication failure	Consult a specialist
Abnormal power rise/fall	BMS communication failure or battery system failure	Consult a specialist

8 Lithium-ion battery operating instructions

8.1 Lithium-ion battery Use and Maintenance Manual

➢ **Information on the conformity of lithium-ion batteries**

The manufacturer of the lithium-ion battery and the manufacturer group provider declares that: the lithium-ion battery conforms with the provisions of the following

EU directive 2014/30/EU in accordance with EN12895.

This declaration of conformity with EU directives applies only to battery use that conforms to the recommendations described in the operating instructions.

➢ **Special lithium-ion safety rules**

⚠DANGER

There is a risk of fire.

Use water-based extinguishers,CO2, dry chemical fire extinguishers.

⚠DANGER

Electrical danger.

Do not open the battery. Electrical risk.

Only the After-Sales Service Center technicians can open the battery.

It is necessary to respect the following guidelines:

Read the documents provided with the battery carefully.

Only persons who have been trained to work with lithium-ion technology are permitted to work on the batteries (for example After-Sales Service Center technicians).

Do not place lithium-ion batteries on or near flames or hot heat sources (> 65°C). This may cause the batteries to overheat or burst into flames. This type of use also impairs the performance of the batteries and reduces their service life.

Improper use may cause overheating or serious injury. Respect the following safety rules:

Never short circuit the battery terminals

Do not reverse the battery polarity

Do not open the battery

Do not submit the battery to excessive mechanical constraints

➢ **Intended use**

Operational application temperature 0° C-40° C, humidity□ 80%;

Charging application temperature 5° C-40° C;

The battery's maximum operation altitude is up to 2000m;

Do not disconnect the battery for emergency stopping, use instead the emergency switch.

The truck shall not be used in a potentially explosive atmosphere or in an especially dusty environment.

➢ **Reasonably foreseeable misuse**

Never short circuit the battery terminals.

Do not reverse the battery polarity.

Do not overcharge.

➢ **Accessories**

Do not use a charger that is not released by your manufacturer for lithium-ion battery.

➢ **BMS (Battery Management System)**

The battery is permanently monitored by the BMS (Battery Management System).

This provides the communication with the truck.

The BMS continually monitors items such as the cell temperature, the voltage and the charge status of the cells.

8.2 Safety and warning

➢ **Safety Precautions**

(1) It is prohibited to open the lid of the Lithium-ion battery case for maintenance, and contact the manufacturer in time when the Lithium-ion battery is faulty.

(2) It is strictly prohibited to reverse charge the battery.

(3) Battery system occurs a sharp rise in temperature, smell abnormal, etc., should immediately stop the car, turn off the power supply. If there is smoke or fire, stop the car, switch off the power supply and use dry powder fire extinguishers to extinguish the fire while ensuring the safety of personnel.

(4) Before contacting the Lithium-ion battery in special circumstances, put on insulating gloves and insulating shoes.

(5) Whether charging or discharging, should ensure that the battery management system is correctly connected and under normal working conditions, to ensure that the battery management system communication is normal.

(6) It is prohibited to place the battery pack in water or high humidity to avoid leakage or insulation failure.

(7) It is prohibited to use it in the place of strong static electricity and strong magnetic field, otherwise it is easy to destroy the battery safety protection device.

(8) Prohibit unauthorised modification or dissection of the battery system and battery box to avoid danger. Non-professionals are not allowed to disassemble without authorisation, so as to avoid foreign objects entering the battery pack and causing combustion and explosion.

(9) It is prohibited to connect the positive and negative terminals of the battery box or battery system directly with metal or other conductors to avoid fire or short circuit; it is also prohibited to put the battery pack in contact with and mixed with items that can cause short circuit.

(10) When working in a low-temperature environment, the capacity of the battery system is slightly reduced, which is a normal phenomenon, and the performance will be restored after the ambient temperature rises.

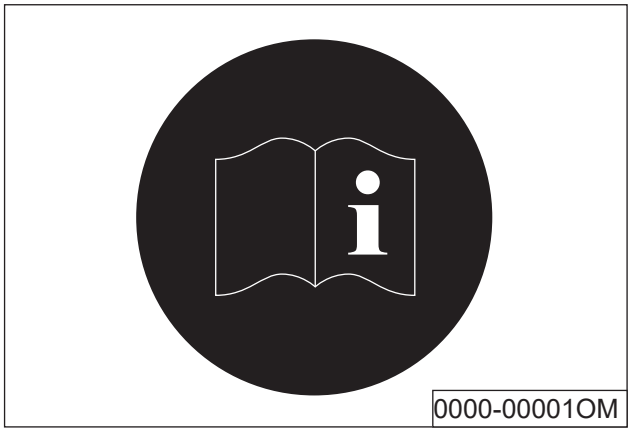
(11) If there is dust, metal shavings or other debris on the top cover and poles of the battery pack, use compressed air or dry cloth to clean them up in time. Prohibit the use of water or water-soaked objects for cleaning.

(12) Please charge in a well-ventilated, dry environment.

➢ Warning

Abide by the operation manual!

All the operations related to the battery must be implemented under the instruction of professionals!



Always wear protective clothing (e.g. safety goggles and safety gloves) when working on cells and batteries.

•No smoke and fire!

•Avoid the existence of open fire, fiery metal wire or sparks around the battery, otherwise explosion or fire disaster may occur!

Don’t trample on the battery to prevent it from fierce shaking or shacking!

Do not place the battery on top of conductive objects.

Explosion or fire disaster is likely to occur; avoid short circuit!

Keep the battery away from all fire sources, heat sources, flammable and explosive items.

Don’t knock over the storage battery!

Using lifting and delivery devices as specified. Prevent the storage battery cell, interface and connection cable from being damaged by the lifting hook!

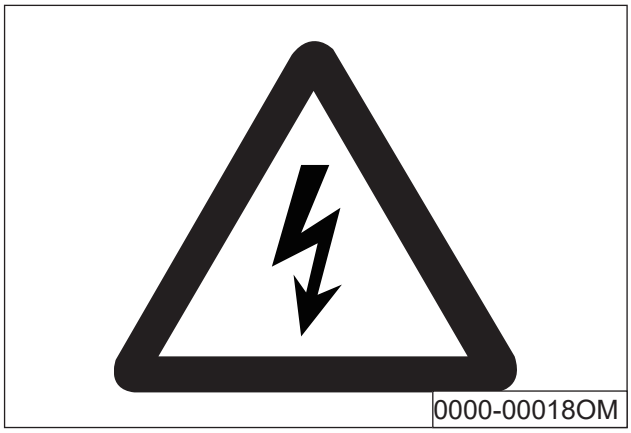
If the materials leak out, do not inhale the fumes. Wear safety

gloves.

Dangerous voltage!

Avoid hot plugging!

Notice: the metal part of the storage battery cell is electrified, so don’t place any external object or tool on the battery cell!



Keep the battery away from all fire sources, heat sources and flammable or explosive materials.

Avoid the battery becoming corroded by water or corrosive liquid.

➢ **Operational specification**

(1) This battery operates at high current when used. Its high-voltage connection cable is covered with orange bellows and the high-voltage parts are marked with warning signs.

(2) Maintenance personnel must be authorised by the manufacturer; have relevant professional certificates. In addition, maintenance personnel must strictly follow the operating requirements of the standard operation. In addition, the maintenance personnel must operate in strict accordance with the operating requirements.

(3) Before overhauling, a safety restricted area should be set up and a warning sign should be erected to warn relevant personnel to avoid safety incidents.

(4) Before overhauling the battery pack, make sure that all interfaces of the truck have been disconnected from the external high-voltage power supply.

(5) Before overhauling the battery pack, gloves, shoes, goggles, etc. consisting of insulating protective equipment must be worn.

(6) The overhaul site should be equipped with fire extinguishing equipment, and the battery pack storage area is ventilated, dry, and free of combustible materials around.

(7) It is strictly prohibited to wear bracelets, rings and other metal decorations to work when overhauling.

(8) Before overhauling the battery pack, turn off the key switch, unplug the MSD connector, and be sure to disconnect the high-voltage power battery power output line to prevent short circuit.

(9) If the repair cannot be completed in a short time, stick a 'High Voltage Danger' label on the high-voltage system parts when not repairing. To prevent unintentional electric shock to other unknowing persons.

(10) If the power battery is seriously damaged, deformed, broken or cracked, do not touch the power battery without wearing insulating protective equipment.

(11) Keep the power battery box clean and dry during maintenance Mark the disassembled parts so that they can be installed accurately and without error.

(12) Immediately after disconnecting the high-voltage components, wrap the exposed ports of the connecting copper rows and the exposed ports of the high-voltage components with electrician's insulating cloth for good insulation treatment.

(13) It is strictly prohibited to check and repair the power battery box with the high voltage relay closed to prevent personnel from being electrocuted.

(14) Be sure to disassemble the power battery box according to the correct steps, and the disassembled components shall be properly stored in the special area.

8.3 Hazard of faulty or discarded battery

Please monitor the battery status when in use and in storage. If you find any broken batteries, electrolyte leakage, abnormal expansion or pungent odors due to shipping damage or abnormal vibration, please stop use immediately and keep at least a 5 meter perimeter around the effected batteries. Please dispose of the damaged batteries properly and contact a recycling company to recycle the batteries. For batteries that are under the manufacturer warranty policy, the manufacturer will access the warranty claim according to your submission of the battery nameplate photo .

During the period waiting for disposal or recycle, please stock damaged and old batteries carefully by following instructions:

(1) Damaged and discarded battery temporary storage needs to be placed in an iron or plastic container with water that can cover whole battery at least 5 days (The battery may emit smoke when immersed in water. This is the process of consuming energy by the leaking battery, which is a normal reaction).

- Keep the container and batteries outdoors and 5 meters away from other things, especially flammable items.
- Use protective gloves when putting batteries in or out of water.
- Do not stack damaged or old batteries.

(2) For big battery with inner and outer boxes structure, Keep the batteries outdoors at least 5 days. And contact a recycling company to recycle the batteries.

8.4 Instructions

⚠ CAUTION

When the ambient temperature is low, the battery system charging time will be extended, which is normal. The battery management system will automatically adjust the charging time with temperature changes to ensure the best performance of the battery system.

Before the first use, charge battery completely with original charger.

The lithium-ion battery should be used at an ambient temperature of 0 – 40°C, do not use or store the battery near a fire source/heat source where the temperature exceeds the safety range;

When the battery is low, please charge the battery in time to avoid over-discharge; the replaced battery should also be charged in time to avoid damage caused by over-discharge of the battery after self-discharge.

Do not place metal objects (such as wrenches, knives) on the lithium-ion battery, or other objects that may cause short-circuiting of the battery to avoid short circuit between the positive and negative terminals;

Do not bump or strike the lithium-ion battery during use, If leakage is found on the battery, stop using it right away, pull out all the plugs connected to it, place it in open and well-ventilated space, and contact the after-sales service.

If the battery life is significantly shortened, please contact the after-sales for check;

If the lithium-ion battery fails and cannot be used, please remove the battery from the material handling equipment, the trained personnel can use our BMS special reading instrument to read the information for preliminary judgment; for problems that cannot be solved, please contact the after-sales service department for solutions;

Before installing and removing the battery, be sure to read the user manual; the weight of the battery body is evenly distributed, please pay attention to the installation and removal when there is an external weight; please use two hooks to hang on the lifting rings during the lifting process, and gently lift it to keep it stable and not inclined;

The operator must read the instructions carefully before use and receive relevant safety training to be able to handle emergencies;

8.4.1 Lithium-ion battery Nameplate

The lithium-ion battery nameplate reads as follows:

Product Name		Part number	
Product Model		Working Temperature	
Nominal Voltage		Voltage Range	
Rated Capacity		Rated Energy	
Manufacture Date		Battery Weight	
Batch NO.			
Manufacturer			
Address			

8.4.2 Charging

During the charging operation, it is necessary to have professional personnel to operate and care, in order to ensure that the charging plug and socket work normally without heat, to ensure that the charging device works normally, to ensure that the battery pack and its protection circuit work normally, and the whole power supply system has no sign of short circuit, overcurrent, over temperature or overcharge.

- Charging in non-charging area is prohibited;
- No modification of truck;
- Do not use irregular charging sockets;

⚠ WARNING

Lithium batteries are strictly prohibited from overcharging and over discharging.

⚠ CAUTION

1. The normal charging temperature range of the battery is: 5 °C – 40 °C.

2. The voltage difference between the maximum and minimum cell voltages during charging is less than 0.1 V.

3. The lithium-ion battery voltage matches the charger voltage.

4. The charger should be periodically checked for charging over voltage protection device.

➢ **Charging procedure**

See Page 93 Section "4.5 Battery and Charger"

8.5 Storage

Try to ensure that the battery or battery pack's power is ≥50% before long-term storage as the battery has the function of self-discharge, be sure to charge the battery once every 2 months to ensure the battery power is ≥50%;

Storage temperature range within one month: -20 – 45°C, storage temperature range within one year: 0 – 35°C, storage humidity range: <90%

The battery in a dry, ventilated and cool environment, avoid direct sunlight, high temperature, high humidity, corrosive gas, severe vibration, etc.

DO NOT stack, stacking of the batteries is not allowed.

Disconnect the batteries from other electrical items before storage, it is prohibited to have any form of discharge behavior during storing;

If the battery is found to be bulged, cracked, or has a low voltage value after long-term storage, the battery may be damaged; please contact the relevant technical department of the company for technical support.

After not using the battery for a long time, do not charge or discharge the battery if the smell of leakage is found near the battery.

⚠WARNING

Dispose of used batteries in time;

Do not store used batteries for a long time.

No load bearing, squeezing and contact stacking when storing batteries;

Do not place batteries near warehouses or near flammable and explosive dangerous goods.

8.6 Transportation

Before transporting any lithium-ion battery, check the current regulations on the transport of dangerous goods. Comply with these when preparing the packaging and transport. Train authorised staff to dispatch lithium-ion batteries.

⚠WARNING

During loading, unloading and transport, avoid severe vibration, external shocks, throwing, tumbling, overturning and squeezing;

Protect from rain during transport;

Ensure that the batteries or battery packs have been disconnected from the load or charger without any form of charging or discharging behaviour prior to transport.

i NOTE

It is recommended that the original packaging is kept for any subsequent dispatch.

A lithium-ion battery is a special product.

Special precautions should be taken when:

- *Transporting a truck equipped with a lithium-ion battery;*
- *Transporting only the lithium-ion battery.*

NOTE

A class 9 danger label must be affixed to the packaging for transport.

It is different if the battery is transported on its own or in a truck. An example of a label appears in this supplement. Refer to the latest current regulations before dispatch as the information might have changed since this supplement was written.

Special documents must be sent with the battery. Refer to the applicable standards or regulations.

For UN3480	Lithium-ion Batteries	 class 9 danger label
For UN3481	Lithium-ion Batteries packed with Equipment or Lithium batteries built into Equipment	

NOTE

Recharge the lithium-ion battery before transporting it taking account of the transport mode (boat, road). Excessive discharge on arrival could damage the performance of the battery.

8.6.1 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.

8.7 Instructions for disposal

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

Used cells and batteries are recyclable economic goods. In accordance with the

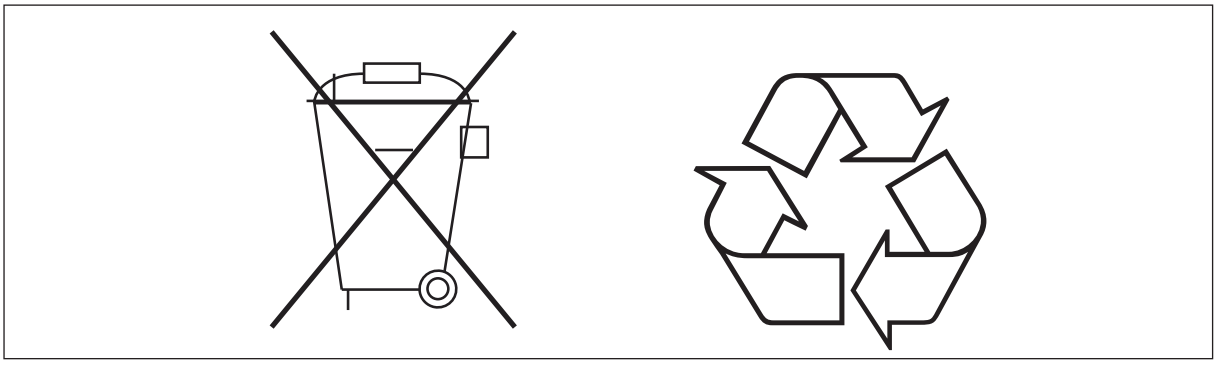
mark showing a crossed rubbish bin, these batteries may not be disposed of as

domestic waste. Return and / or recycling must be ensured as required by the

Batteries Legislation.

The method of battery recovery and reuse can be discussed with our company.

We reserve the right to change the technology.



The requirements of recycling

- Only authorized dealers who have attended the after sales training, are authorized to do repairs on batteries;
- All Li-ion battery should be placed in safe place according to the Li-ion battery Manual;
- The transport of Li-ion battery must meet local regulation, the manufacturer will supply UN38.3 and MSDS
- files according with UN and ADR regulation;
- The package of Li-ion battery before delivery must meet the UN 3480 or local carrier regulation.

⚠WARNING

Used cells and batteries are recyclable economic goods. In accordance with the mark showing a crossed rubbish bin, these batteries may not be disposed of as domestic waste. Return and / or recycling must be ensured as required by the Batteries Act (Act regarding the commissioning, return and environmentally responsible disposal of batteries and accumulators). For battery disposal please contact the manufacturer's customer service department.

8.8 Common Problems and Solutions

During the use and maintenance of the lithium-ion battery, the battery or battery system may have one or more of the following abnormal conditions, please organize the professional engineers and technicians to perform the necessary processing according to the instructions in this manual; if you have any questions about the status or solutions, please contact your dealer or after-sales service department of the company to obtain professional technical support.

If the battery is found to have abnormal mechanical characteristics such as swelling,cracked casing, melted casing deformation,and distortion of the casing before and during installation, stop using the battery immediately and store it separately;

If abnormalities such as looseness, cracks, in the insulation layer, burn marks, etc. of the battery's pole pressing bolts, earthing straps, main circuit wires and connectors are found before and during the installation, stop using the battery immediately, check the reason for analysis and give it a fix;

If the polarity of the positive and negative terminals of the battery is found not match the polarity identification before installation, please stop using the battery immediately and contact the after-sales service department to replace the battery or obtain other solutions;

If the temperature of the battery exceeds 65 °C before and during installation, stop using the battery immediately and leave it separately, if the temperature continues torise, it needs to be buried with sand;

If there is fire or smoke happens to the battery, move it to the open air immediately, evacuate people in time,and contact a recycling company to recycle the batteries.

8.9 Service

No.	Maintenance content	Method of operation	Note	Frequency
1	Check if battery capacity is too low	Check instrumentation SOC display	Make sure the battery is not stored without charge for a long time. If the battery system needs to be put on hold for a long time, it is best to keep the battery in half power state and charge the battery every 3 months to ensure that the battery system is in half power state.	Everyday
2	The battery pack charge and discharge current	Check instrumentation display	Make sure battery pack charge and discharge current meet with operation manual	Everyday
3	Connector pins at the bottom of the battery(if necessary)	Perform a visual inspection	If any ablation or deformation occurs in daily inspection, the battery connector pins should be replaced in time.	Everyday
4	Check whether the appearance is deformed, whether the surface is oxidized, paint removing, the mounting position is offset, and the cabinet is damaged;	Perform a visual inspection	Check the reason for analysis and give it a fix	Everyday
5	Check the entire battery as well as the surface beneath it for signs of fluid leakage.	Perform a visual inspection	Check the reason for analysis and give it a fix	Everyday
6	Clean the lithium-ion battery and charger with a dry cloth or compressed air.	Perform a visual inspection, Wear insulating gloves and shake it gently	Make sure it tight	Weekly
7	Whether the external wiring harness has worn, imprint, creases and exposed line core	Perform a visual inspection	Make the wiring harness fixed well	Weekly
8	Check that the surface of lithium-ion battery looks clean	No dust, no water, no corrosion, oxidation, rust, etc.	Clean surface if you found dust, corrosion, oxidation, rust by using dustless cloth or air compressor ,water battery is strictly prohibited to use	Weekly

No.	Maintenance content	Method of operation	Note	Frequency
9	Check that the outside screws of the battery are fastened	Torque wrench correction requires no loosening	Reinforce screws	Weekly
10	Check for water or foreign matter in the plug and connector and check for rust or charring(if necessary)	Perform a visual inspection	Check the reason for analysis and give it a fix	Monthly
11	Check the cable for damage and loose joints(if necessary)	Perform a visual inspection	Check the reason for analysis and give it a fix	Monthly
12	Check the battery case for abnormalities such as cracks, deformation, and bulging.	Perform a visual inspection	Check the reason for analysis and give it a fix	Monthly

➢ **Cleaning**

We recommends to only use compressed air at less than 207 kPa (30 psi) or a slightly damp towel to clean the battery. The battery, or its charging station, may be equipped with fans, heat sinks, or other cooling devices that require periodic cleaning. Always know and follow the battery manufacturer's recommendations for cleaning and service.

➢ **Optimize Battery Life**

Always use and follow the battery management system (BMS). The BMS is the electronic system that monitors battery data and use that data to its operating environment to influence the battery's safety, performance, and service life. It also functions as a safety cut-off device in case of overcharging, overcurrent, or overheating. Lithium-ion battery life is greatly reduced if used outside a temperature range of 0 ºC to 40 ºC (32 ºF to 104 ºF) or in an environment with greater than 85% humidity. the manufacturer recommends to opportunity charge lithium-ion batteries.

This is when the battery is recharged for short intervals during a shift period. It reduces or eliminates the need for long charging periods, changing batteries during a shift, and extending shift periods.