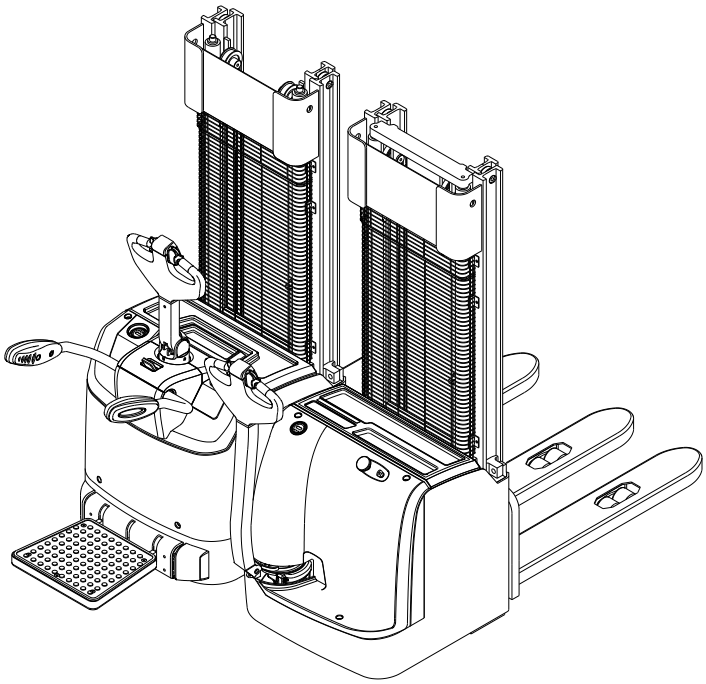
HANGCHA

Hi Range

ELECTRIC STACKER

CDD12/14/16/20-AC1
CDD12/14/16/20-AZ3
CTD12/14/16/20-AC1
CTD12/14/16/20-AZ3
CDD12/14/16/20-AC1S
CDD12/14/16/20-AZ3S
CTD12/14/16/20-AC1S
CTD12/14/16/20-AZ3S

OPERATION AND MAINTENANCE MANUAL



CE

Original Instruction

HANGCHA GROUP CO., LTD.
11/2018

FOREWORD

Thank you very much for purchasing the A series hi range electric stacker of Hangcha Group .

A series hi range electric stacker is a newly developed product for warehouse logistic, it owns characteristics as advanced performance, comfort operation, safety and security, low maintenance cost, and is an ideal tool for handling goods in warehouse, supermarket and workshop.

Part one of this manual is about the brief introduction and correct operation of the hi range electric stacker, which will tell you how to operate safely and maintain preventively; part two will tell you the structure, working principle and maintenance of the hi range electric stacker. In order to guarantee safety and utilize the truck performance to the best, relevant operator and maintainer must read this manual.

Because of the update and improvements of our products, there may be some differences between this operation manual contents and your forklift truck.

If you have any questions, please contact HANGCHA GROUP CO., LTD. sales company or the agent.

Content

Part Ⅰ: Operation and maintenance

1 Truck Introduction

1.1 General

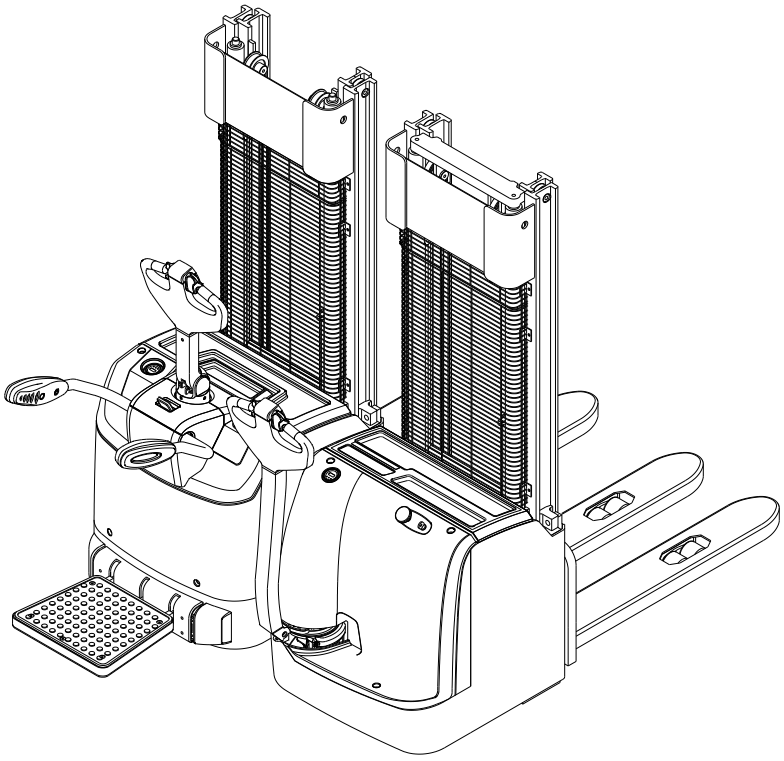
This manual introduces A series hi range electric stacker.

According to different operation way, it has two types as pedestrian-type and Stand-on type.

Users can get relevant information as rated load from the product model. Model CDD20-AC1S as an example:

CDD20-AC1S CDD20-AZ3S	Mode
CDD	Electric stacker
20	Rated load capacity×100kg
A	Product serial number
C1, Z3	Controller type
S	Stand-on type
B	Straddle legs type

Rated capacity usually does not equal the allowable lifting capacity. Please refer to the load curve chart on the truck for approved lifting capacity.



Truck body system

- Beautiful and compact outline, concise and fluent line.
- Chassis welded by high-performance steel plate guarantees enough load capacity.
- Chassis adopts 4-wheel structure, including one drive wheel, one auxiliary wheel as stabilizing and two load wheels, thus guarantee the good stability and safe travelling.
- Hang-on foldable damping pedal as optional

Driving system

- Adopted suspension design guarantees well wheel and ground contact, light turn and convenient operation.
- Divide into manual steering and electric steering.

Braking system

- It owns three emergency braking functions as release brake, reverse brake and electromagnetic brake to ensure travelling safety.
- It owns slope anti-slide function to ensure safety.

Operation steering system

- New ergonomics designed control handle owns acceleration, reversing, horn, braking, lifting/lowering, emergency reverse functions, thus makes operation easier.
- Emergency reversing button on the control handle head can prevent driver from hurt when encountering emergency in backward driving.
- Low speed travel function can move the truck slowly. It can stack goods even in very narrow place.
- Newly designed floatable suspension system makes steering more convenient.
- Steering angle +/- 90°.

Hydraulic system

- Modularization hydraulic power unit owns low noise, low vibration, stable and reliable lifting and lowering.

Mast

- Good mast vision, easy installation and maintenance.
- Mast lifting height is optional.

Electric system

- 24V Electric system
- CURTIS or ZAPI AC control system
- Multi-function instrument owns electric quantity display, time and fault diagnosis function.
- Emergency stop switch
- Own electric lift limited and controller intelligent limited function
- Electric wiring adopts waterproof connector.

1.2 Use occasion and condition

Truck in this manual is only for lifting and transporting loads.

It must be used, operated and maintained according to the information in this manual. Any other uses are outside the design envelope and can lead to injury to persons or damage to equipment or property.

Only used in specified place and condition：

- Use in specified rated load.
- Used in specified area as factory, tourist attraction and recreation place.
- Used on the flat ground, that is fixed and owns enough carrying capacity.
- It is prohibited to pass the bulge or cavity as the small wheel diameter may cause truck tipping over.
- Used on the road with good vision and equipment use license.
- Max. uphill grade when driving is 6%.
- It is prohibited to travel crosswise or obliquely. When go uphill with loads, keep the loads in front; when go downhill, keep people in front.

For truck operation, the following normal climatic conditions apply:

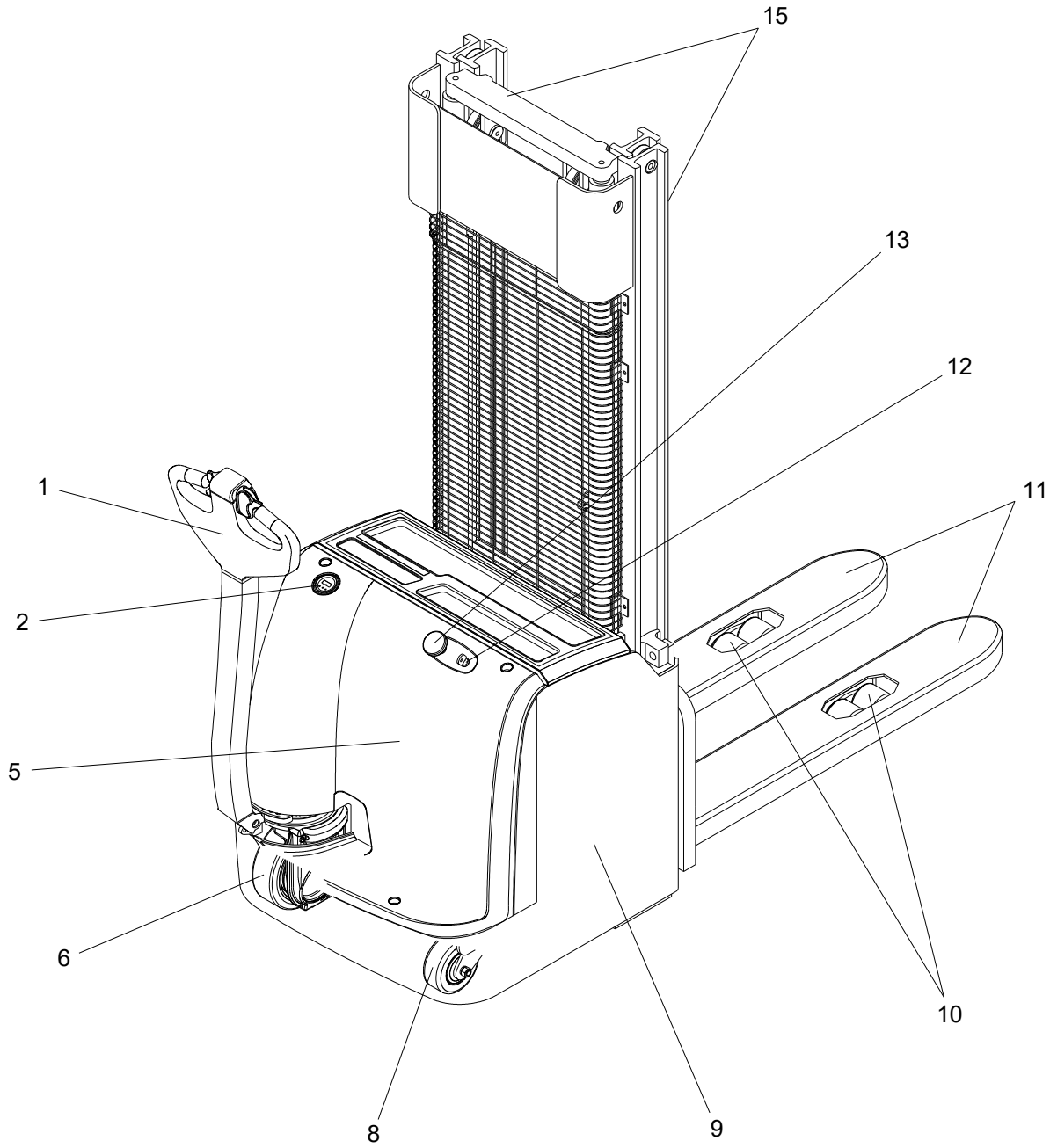
- Average ambient temperature for continuous duty: ＋25℃;
- Maximum ambient temperature, short term (up to 1h): ＋40℃;
- Lowest ambient temperature for trucks intended for use in normal indoor conditions:＋5℃;
- Lowest ambient temperature for trucks intended for use in normal outdoor conditions:－20℃;
- Altitude: up to 2000m.

Please read other safety rules in this manual, it is important to your personal safety, working staff and goods safety.

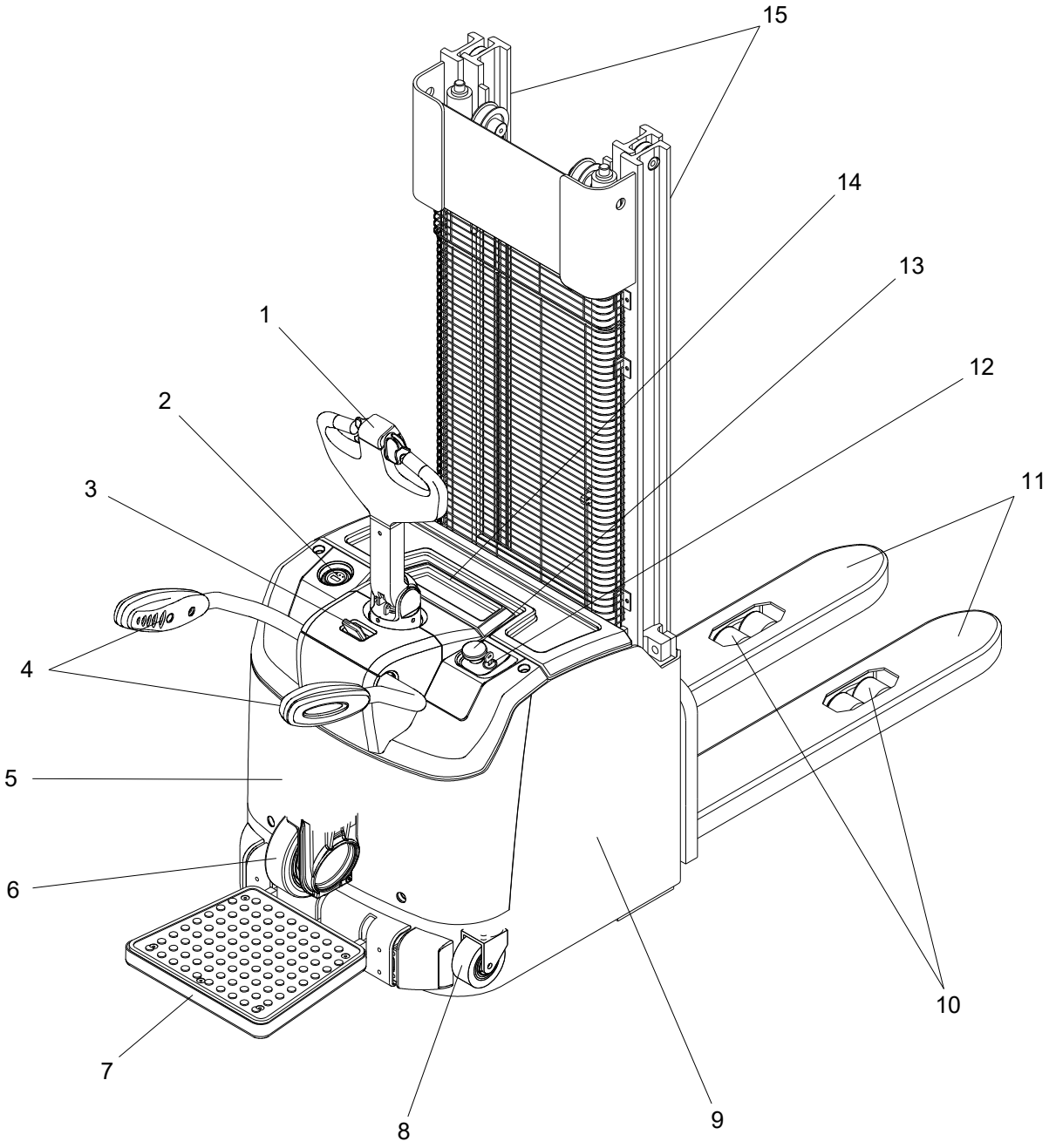
WARNING

- **Do not carry people.**
- **Do not over load.**
- **Do not push and pull loads.**

1.3 Main part name



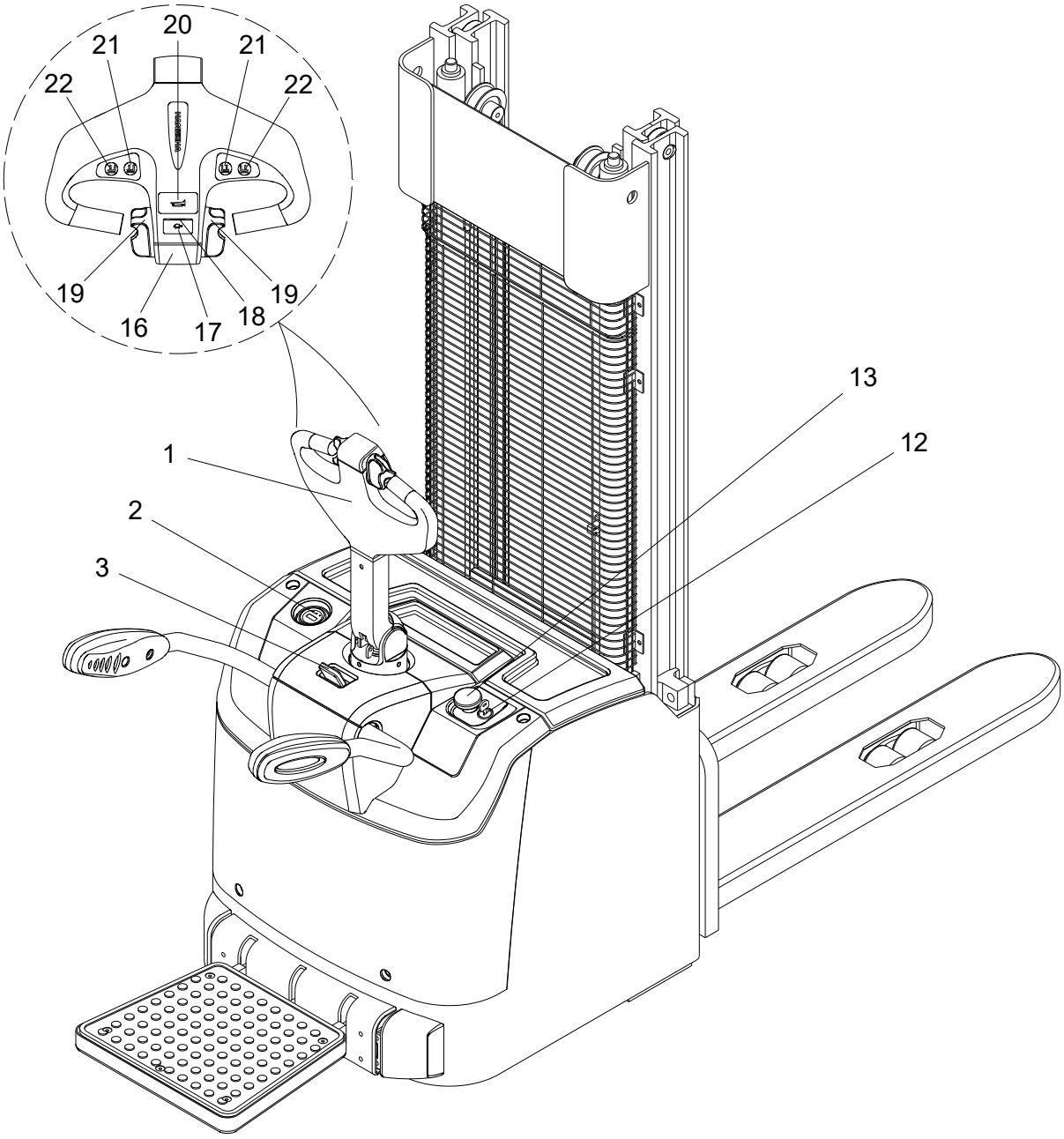
Pedestrian-type: CDD12/14/16/20-AC1, CDD12/14/16/20-AZ3



Stand-on type: CDD12/14/16/20-AC1S, CDD12/14/16/20-AZ3S

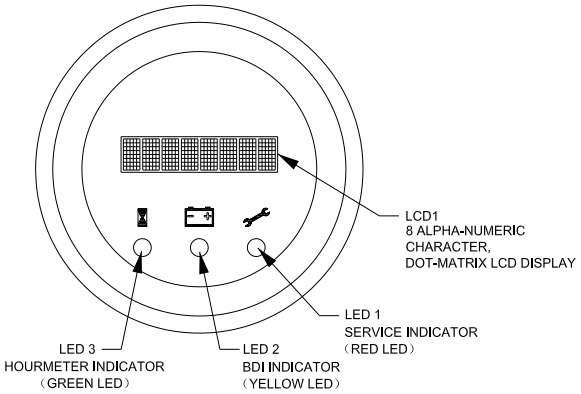
Item	Description	Item	Description
1	Control handle	9	Frame
2	Instrument	10	Load wheel
3	Arm guard lock switch	11	Fork
4	Arm guard	12	Key switch
5	Rear hood assy	13	Emergency stop switch
6	Driving wheel	14	Battery cover
7	Pedal	15	Mast
8	Auxiliary wheel		

1.4 Display and control

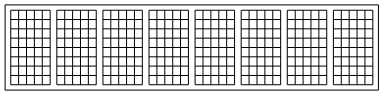


1.4.1 Display

Curtis 840 Instrument [2]



Dot-matrix LCD display



The display screen is 8 alphanumeric characters, dot-matrix LCD liquid crystal display, can display vehicles fault code, battery soc and total running time.

Vehicles when the normal operation of the display shows the battery remaining power.

Service indicator(red LED)

When the controller to detect fault information, the red LED indicator light flashing, at the same time LCD display shows two digits of the fault code.When there are multiple fault fault code alternates between interval of 2 seconds.Fault code corresponding fault information to view in this paper, the fault code table.

BDI indicator(yellow LED)

When battery remaining power less than 20%, the yellow LED indicator lights flashing, warned "depleted", at the same time LCD display shows "20%" for 1 seconds after into "Low BDI".

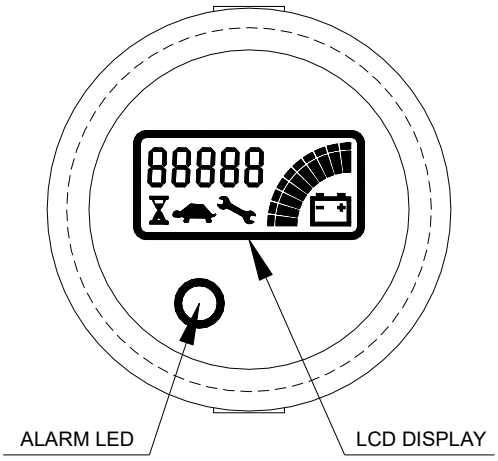
When the yellow LED indicator lights flashing, vehicle lifting by automatic locking function, running speed is reduced.At this time should be immediately available for vehicles recharged.

Hourmeter indicator(green LED)

Said when the green LED light is normally on the timer is timing, the smallest unit of time for 0.1 hours.

Every time when starting the vehicle LCD screen will display the vehicle's total run time, this time is for regular maintenance on the basis of the vehicle.

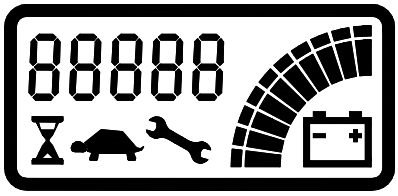
Zapi MDI-CAN Instrument [2]



LED function

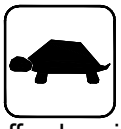
The MDI-CAN has only a LED. This LED is red and lights and blinks when an alarm is present.

Display function



Three symbols inform the operator as follows:

Turtle Symbol:



It is normally off; when it appears (fixed) it shows activation of the “soft” mode of the truck, in which maximum speed and acceleration are reduced;

Monkey Wrench Symbol:

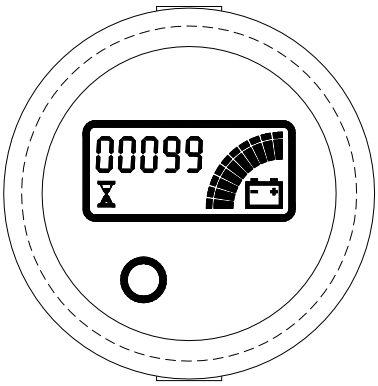
It is normally off; when it appears (fixed) it shows the request of programmed maintenance or the Alarm state. In this case the relative code will be displayed. The information supplied by the MDI-CAN can be extremely useful. Failures can be quickly identified by the Operator or Service Technician thereby finding the fastest solution to the problem.

Hourglass Symbol:

It is normally off; it blinks when the Hour Meter is working.

Hour meter

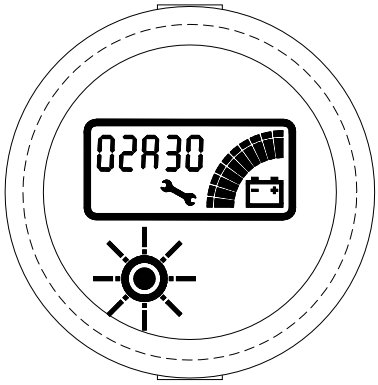
An alpha-numeric liquid crystal display is fitted in the centre of the unit that shows the Hours Worked. The display is backlight (the backlight is normally lighted).



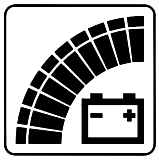
Alarms

The same display can also indicate the Alarm state, showing a Code corresponding to the type of Alarm. To attract attention, the Red LED will start blinking when an Alarm is generated.

When an Alarm is generated, the Red LED blinks to attract the attention of the operator. The symbol of Monkey Wrench also appears. The string shown on the display is XXAYY, where XX and AYY represent respectively the alarmed node and the alarm code. The alarm code meaning must be present in the controller user manual.



Battery State of charge



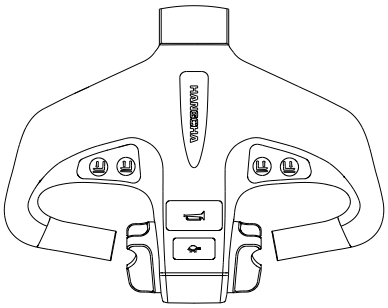
The battery's State of Charge indication is integrated in the LCD display; it is shown by ten notches. Each notch represent the 10% of the battery charge. As the battery becomes discharged, the notches turn off progressively, one after the other, in proportion to the value of the residual battery charge. This value, sent to the MDI-CAN by the controller via CANUS, is displayed in the Tester Menu of the Zapi Console connected to the controller. When BATTERY LOW alarm appears on the controller, the battery symbol which is under the notches blinks.

Low speed indicator [18]

When this light is on, the truck is in low speed mode.

1.4.2 Control

Control handle [1]



Control truck steering and braking.

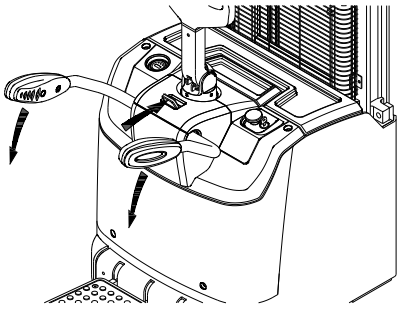
When turn the control handle right and left, it can realize the truck right and left turn. The max turning angle of this handle is about 175°.

When press the handle to horizontal position or push up to vertical position, it can realize the truck brake. These two positions are set by brake inching switch. Normal is open circuit, working status is closed, brake inching switch is normally at horizontal or vertical position is.

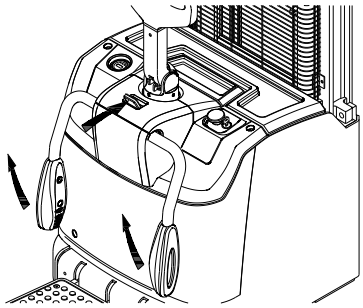
Arm guard lock switch [3]

Open or fold the arm guard, then release the lock condition.

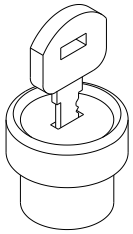
When fold the arm guard, push the arm guard lock switch with one hand and the other hand press the arm guard until it rotates to certain angle, release arm guard lock switch and press the arm guard to lock position.



When open the arm guard, push the arm guard lock switch with one hand and the other hand lift up the arm guard until it rotates to certain angle, release arm guard lock switch and lift the arm guard to lock position.

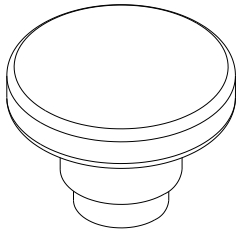


Key switch [12]



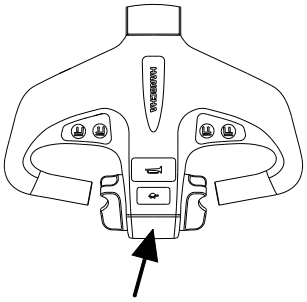
Turn on the key switch, and the power is on. Turn off the switch, and the power is off. Turn off the key switch before charging.

Emergency stop switch [13]



Press this switch, power is off. Press it when emergency or no use. If re-start needed, pull upward.

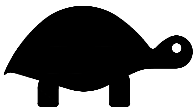
Emergency reverse button [16]



This switch is at the head of control lever, once touch this button, the truck moves forward. It is used to protect people from being clamped by the control handle.

This switch is also called belly switch.

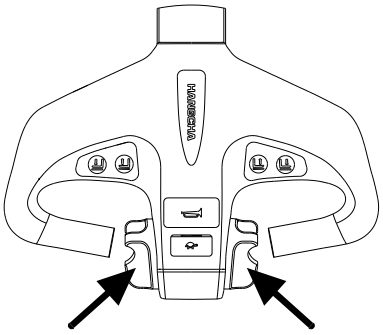
Low speed switch button [17]



Press this button and indicator light[19] is on, it means the truck changes to low speed travel mode. When in low speed mode, the truck will travel in low speed, 40% of max. travelling speed.

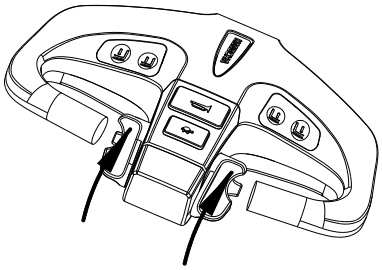
Press this button and indicator light[19] is off, it means the truck changes to normal travelling mode.

Direction and speed control button [19]



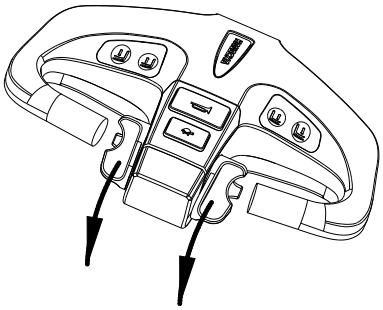
This button is at both sides of control lever head, one linkage per left and right. It is to control travelling direction and travelling speed.

Truck travels to the fork side



– Press this control handle downwards.
– Turn this button from the side of body to outside gradually with thumb.
– Truck travels to the fork side.

Truck travels to the handle side(or pedal)



– Press this control handle downwards. Turn this button towards the side of body gradually with thumb.
– Truck travels to the handle side(or pedal).

> **CAUTION**
> **After the finger is released, the direction and speed button will reset itself and the truck will stop by brake. So do not loosen the knob when the truck is requested to continue driving.**

Horn button [20]

The button is located on the front of the control handle upper surface. Press down the button, and the horn sounds.

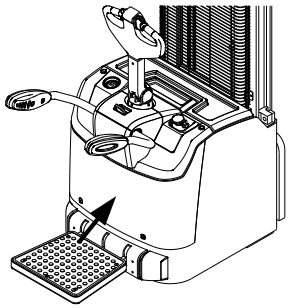
Lifting button [21], lowering button [22]

The lifting button and the lowering button are located on both side surface of the middle control handle. Press the lifting button, and the forks move up; press the lowering button, the forks go down.

When the capacity of batteries is consumed up to 80%, the lifting function will be locked.

1.4.3 Others

Rear hood assembly [5]



There install main parts as hydraulic unit, main drive unit and electric system etc. under the hood. When check or maintain, please open the rear hood.

Fork [11]

Forks can be lifted or lowered to fetch goods. Because of fourar mechanism, forks assembly will move horizontally a distance when forks lift or lower.

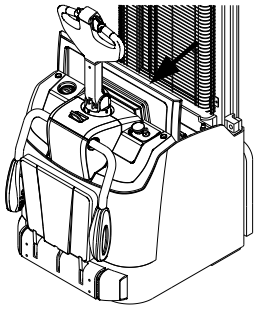
> **CAUTION**
> - **It is forbidden to put hands, feet or any part of the body between lift assy and truck frame when lifting or lowering.**

Load wheel [10]

There is one load wheel under each front outrigger to ensure longitudinal stability.

Check the load wheel to find if there is disrepair or abnormal wear according to necessity. If there is disrepair on the load wheel or its inner bearing, suspend the truck off the ground or jack the front outrigger off the ground, replace the worn load wheel or the worn bearing, and renew sufficient multi-purpose grease on the bearing.

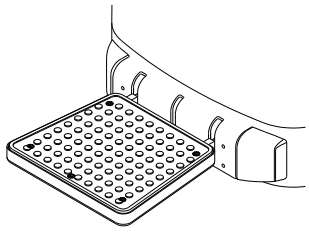
Battery cover [14]



When check battery, take out the plug, charge or replace the battery, you can easily open the battery cover.

> **CAUTION**
> - **When closing the battery cover, protect your fingers from being clamped.**

Pedal（Only for stand-on type）[7]



This pedal can be folded so that you can put down the pedal and stand on it when operating the truck for a long distance. When transporting at a narrow space, folding the pedal, stand on ground to operate the truck.

1.5 Standard technical data

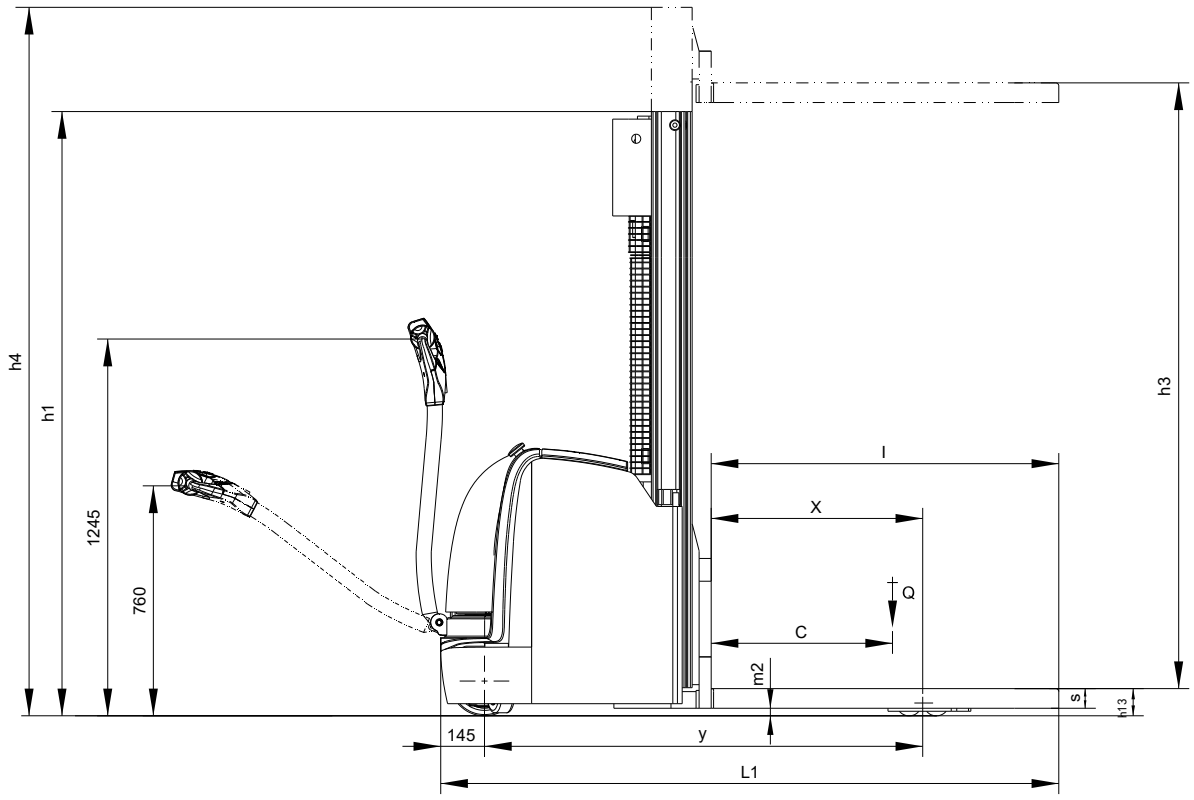
The following technical data are all standard data. Our company reserves the right of alteration and extension.

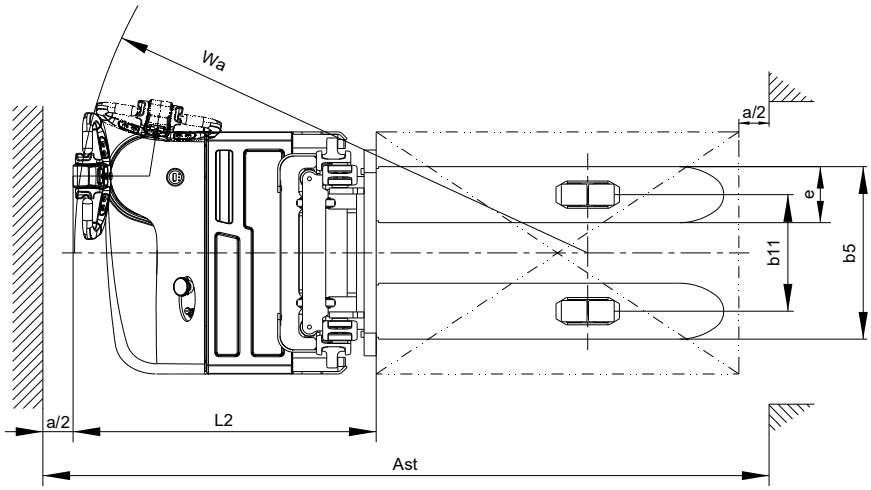
Characteristics	Model		CDD12-AC1	CDD14-AC1	CDD16-AC1	CDD20-AC1
	Operator type		Pedestrian	Pedestrian	Pedestrian	Pedestrian
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1177	1182	1215	1258
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	385	385	385	385
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	90	90	90	90
	Overall length	L1(mm)	2025[1)]	2025[1)]	2045[1)]	2045[1)]
	Overall width	b1(mm)	800	800	800	800
	Fork size	s/e/L(mm)	65×185×1150	65×185×1150	65×185×1150	65×185×1150
	Outside fork width	b5(mm)	570/680	570/680	570/680	570/680
	Ground clearance, center of wheelbase, min	m2(mm)	30	30	30	25
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2512[1)]	2512[1)]	2532[1)]	2532[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2481[1)]	2481[1)]	2501[1)]	2501[1)]
	Outer turning radius, min	Wa(mm)	1643	1643	1663	1663
Performance	Travel speed, laden/unladen	km/h	6.0/6.0	6.0/6.0	5.0/6.0	5.0/6.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	8/16	8/16	5/16	516
Motor & Battery	Drive motor power	kW	1.5	1.5	1.5	1.5
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Battery voltage, rated capacity	V/Ah	24/240	24/240	24/280	24/280
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340	24/340	24/340
	Controller mode		Curtis AC	Curtis AC	Curtis AC	Curtis AC

Note：1）Triplex Mast +21mm.

Characteristics	Model		CDD12-AZ3	CDD14-AZ3	CDD16-AZ3	CDD20-AZ3
	Operator type		Pedestrian	Pedestrian	Pedestrian	Pedestrian
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1177	1182	1215	1258
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	385	385	385	385
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	90	90	90	90
	Overall length	L1(mm)	2025[1)]	2025[1)]	2045[1)]	2045[1)]
	Overall width	b1(mm)	800	800	800	800
	Fork size	s/e/L(mm)	65×185×1150	65×185×1150	65×185×1150	65×185×1150
	Outside fork width	b5(mm)	570/680	570/680	570/680	570/680
	Ground clearance, center of wheelbase, min	m2(mm)	30	30	30	25
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2512[1)]	2512[1)]	2532[1)]	2532[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2481[1)]	2481[1)]	2501[1)]	2501[1)]
	Outer turning radius, min	Wa(mm)	1643	1643	1663	1663
Performance	Travel speed, laden/unladen	km/h	6.0/6.0	6.0/6.0	5.0/6.0	5.0/6.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	8/16	8/16	5/16	516
Motor & Battery	Drive motor power	kW	1.5	1.5	1.5	1.5
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Battery voltage, rated capacity	V/Ah	24/240	24/240	24/280	24/280
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340	24/340	24/340
	Controller mode		ZAPI AC	ZAPI AC	ZAPI AC	ZAPI AC

Note：1）Triplex Mast +21mm.


h4
h1
1245
760
h3
l
X
Q
C
m2
s
h13
145
y
L1

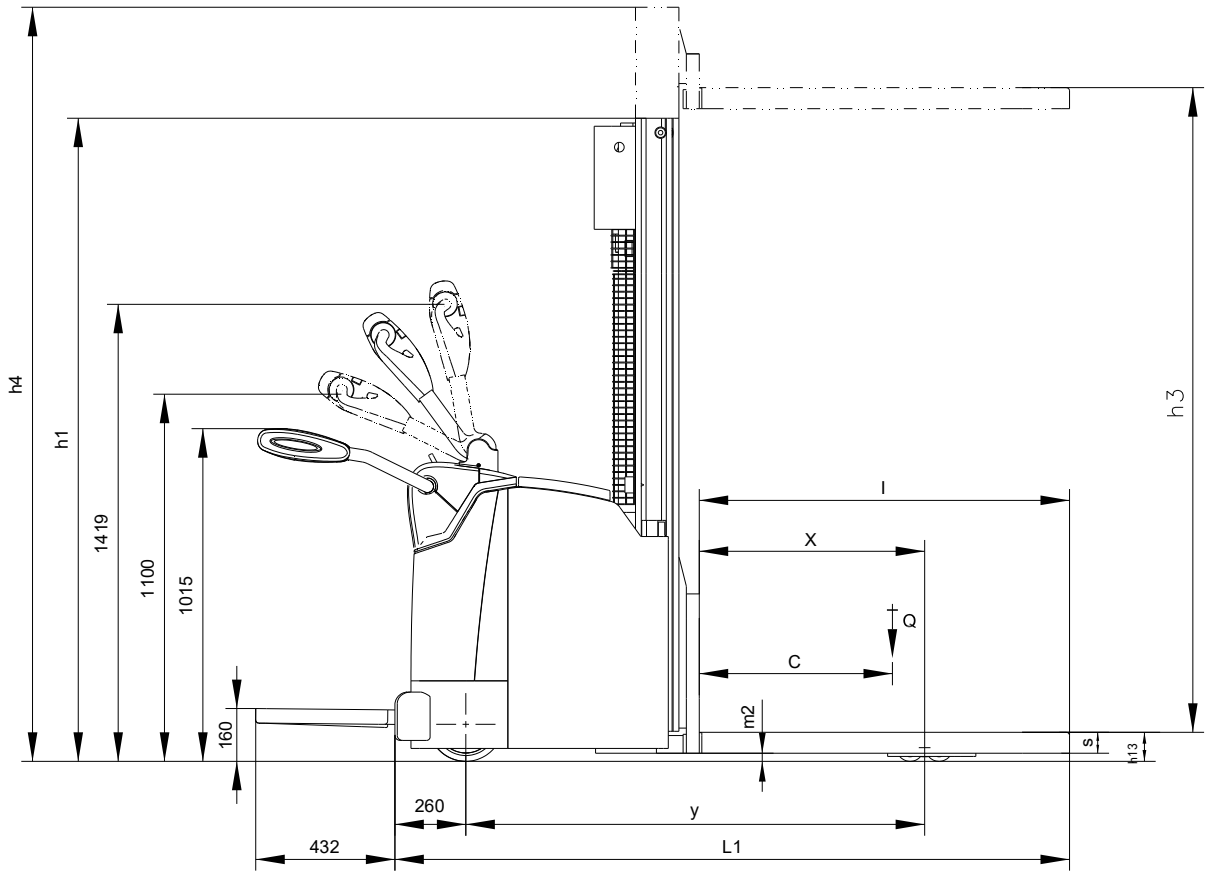

Wa
a/2
e
b11
b5
a/2
L2
Ast

Characteristics	Model		CDD12-AC1S	CDD14-AC1S	CDD16-AC1S	CDD20-AC1S
	Operator type		Stand-on	Stand-on	Stand-on	Stand-on
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1310	1315	1362	1405
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	385	385	385	385
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	90	90	90	90
	Overall length(fold the pedal)	L1(mm)	2075[1)]	2075[1)]	2095[1)]	2095[1)]
	Overall length(unfold the pedal)	L1(mm)	2507[1)]	2507[1)]	2527[1)]	2527[1)]
	Overall width	b1(mm)	800	800	800	800
	Fork size	s/e/L(mm)	65×185×1150	65×185×1150	65×185×1150	65×185×1150
	Outside fork width	b5(mm)	570/680	570/680	570/680	570/680
	Ground clearance, center of wheelbase, min	m2(mm)	30	30	30	25
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2513[1)]	2513[1)]	2533[1)]	2533[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2482[1)]	2482[1)]	2502[1)]	2502[1)]
	Outer turning radius, min	Wa(mm)	1642	1642	1662	1662
Performance	Travel speed, laden/unladen	km/h	7.0/7.0	7.0/7.0	7.0/7.0	7.0/7.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	10/16	10/16	8/16	8/16
Motor & Battery	Drive motor power	kW	2.2	2.2	2.2	2.2
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Steering motor power	kW	0.2	0.2	0.2	0.2
	Battery voltage, rated capacity	V/Ah	24/280	24/280	24/340	24/340
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340		
	Controller mode		Curtis AC	Curtis AC	Curtis AC	Curtis AC

Note：1）Triplex Mast +21mm.

Characteristics	Model		CDD12-AZ3S	CDD14-A Z3S	CDD16-A Z3S	CDD20-A Z3S
	Operator type		Stand-on	Stand-on	Stand-on	Stand-on
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1310	1315	1362	1405
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity, operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity, load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	385	385	385	385
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	90	90	90	90
	Overall length(fold the pedal)	L1(mm)	2075[1)]	2075[1)]	2095[1)]	2095[1)]
	Overall length(unfold the pedal)	L1(mm)	2507[1)]	2507[1)]	2527[1)]	2527[1)]
	Overall width	b1(mm)	800	800	800	800
	Fork size	s/e/L(mm)	65×185×1150	65×185×1150	65×185×1150	65×185×1150
	Outside fork width	b5(mm)	570/680	570/680	570/680	570/680
	Ground clearance, center of wheelbase, min	m2(mm)	30	30	30	25
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2513[1)]	2513[1)]	2533[1)]	2533[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2482[1)]	2482[1)]	2502[1)]	2502[1)]
	Outer turning radius, min	Wa(mm)	1642	1642	1662	1662
Performance	Travel speed, laden/unladen	km/h	7.0/7.0	7.0/7.0	7.0/7.0	7.0/7.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	10/16	10/16	8/16	8/16
Motor & Battery	Drive motor power	kW	2.2	2.2	2.2	2.2
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Steering motor power	kW	0.2	0.2	0.2	0.2
	Battery voltage, rated capacity	V/Ah	24/280	24/280	24/340	24/340
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340		
	Controller mode		ZAPI AC	ZAPI AC	ZAPI AC	ZAPI AC

Note：1）Triplex Mast +21mm.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h1
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1015
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h3
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X
Q
C
m2
s
h13
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y
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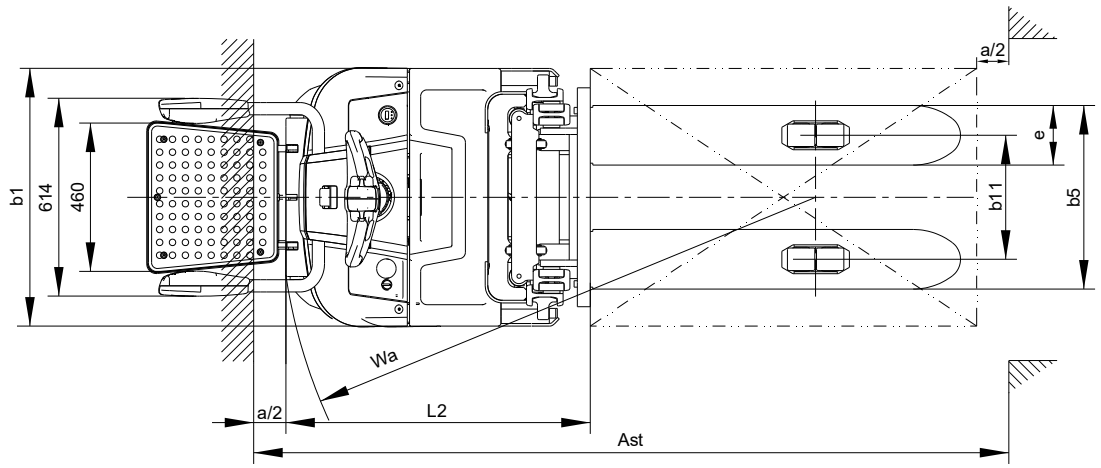
L1

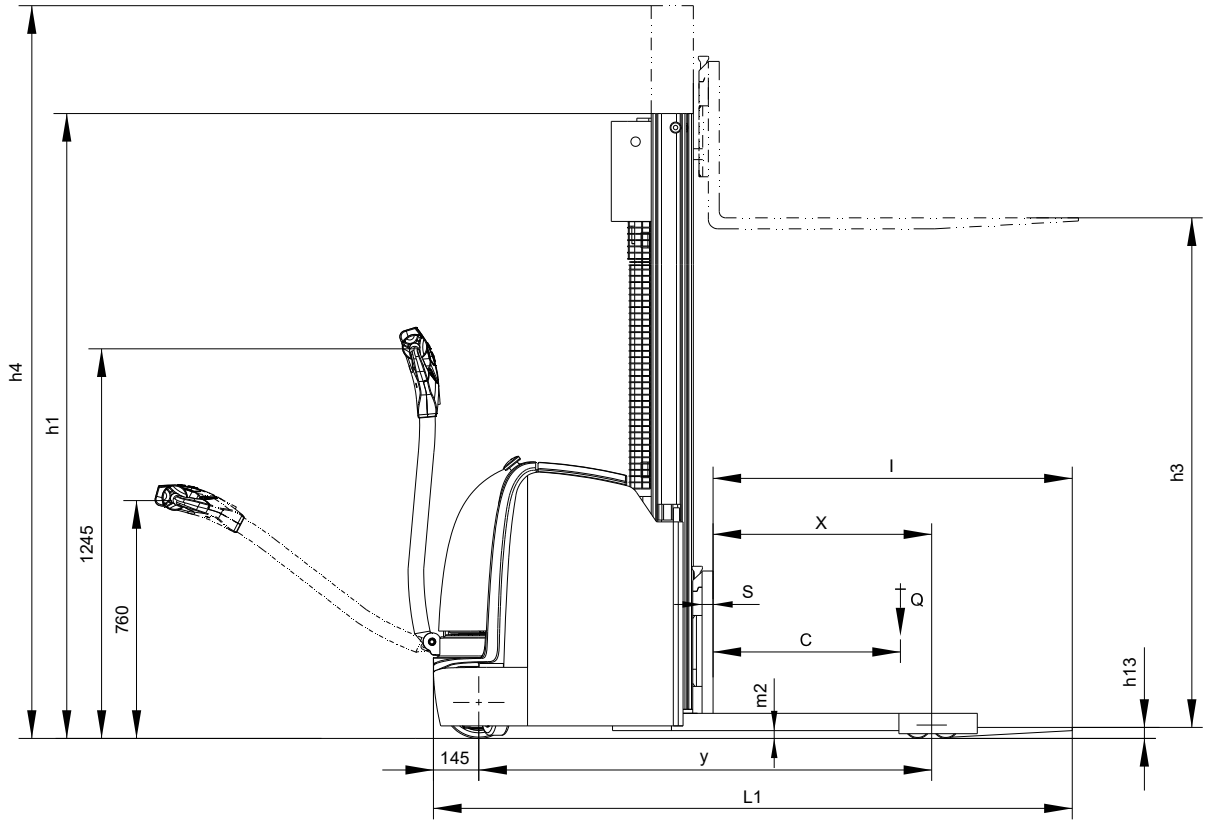

a/2
e
b1
614
460
b11
b5
Wa
a/2
L2
Ast

Characteristics	Model		CTD12-AC1	CTD14-AC1	CTD16-AC1	CTD20-AC1
	Operator type		Pedestrian	Pedestrian	Pedestrian	Pedestrian
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1247	1252	1285	1328
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	1000/1170/1370	1000/1170/1370	1000/1170/1370	1000/1170/1370
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	50	50	50	50
	Overall length	L1(mm)	1980[1)]	1980[1)]	2000[1)]	2000[1)]
	Overall width	b1(mm)	1100/1270/1470	1100/1270/1470	1100/1270/1470	1100/1270/1470
	Fork size	s/e/L(mm)	35×100×1070	35×100×1070	35×100×1070	40×122×1070
	Outside fork width	b5(mm)	210～790	210～790	210～790	210～790
	Ground clearance, center of wheelbase, min	m2(mm)	40	40	40	40
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2547[1)]	2547[1)]	2567[1)]	2567[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2516[1)]	2516[1)]	2536[1)]	2536[1)]
	Outer turning radius, min	Wa(mm)	1643	1643	1663	1663
Performance	Travel speed, laden/unladen	km/h	6.0/6.0	6.0/6.0	5.0/6.0	5.0/6.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	8/16	8/16	5/16	516
Motor & Battery	Drive motor power	kW	1.5	1.5	1.5	1.5
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Battery voltage, rated capacity	V/Ah	24/240	24/240	24/280	24/280
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340	24/340	24/340
	Controller mode		Curtis AC	Curtis AC	Curtis AC	Curtis AC

Note：1）Triplex Mast +21mm.

Characteristics	Model		CTD12-AZ3	CTD14-AZ3	CTD16-AZ3	CTD20-AZ3
	Operator type		Pedestrian	Pedestrian	Pedestrian	Pedestrian
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1247	1252	1285	1328
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	1000/1170/1370	1000/1170/1370	1000/1170/1370	1000/1170/1370
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	50	50	50	50
	Overall length	L1(mm)	1980[1)]	1980[1)]	2000[1)]	2000[1)]
	Overall width	b1(mm)	1100/1270/1470	1100/1270/1470	1100/1270/1470	1100/1270/1470
	Fork size	s/e/L(mm)	35×100×1070	35×100×1070	35×100×1070	40×122×1070
	Outside fork width	b5(mm)	210～790	210～790	210～790	210～790
	Ground clearance, center of wheelbase, min	m2(mm)	40	40	40	40
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2547[1)]	2547[1)]	2567[1)]	2567[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2516[1)]	2516[1)]	2536[1)]	2536[1)]
	Outer turning radius, min	Wa(mm)	1643	1643	1663	1663
Performance	Travel speed, laden/unladen	km/h	6.0/6.0	6.0/6.0	5.0/6.0	5.0/6.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	8/16	8/16	5/16	516
Motor & Battery	Drive motor power	kW	1.5	1.5	1.5	1.5
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Battery voltage, rated capacity	V/Ah	24/240	24/240	24/280	24/280
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340	24/340	24/340
	Controller mode		ZAPI AC	ZAPI AC	ZAPI AC	ZAPI AC

Note：1）Triplex Mast +21mm.


h4
h1
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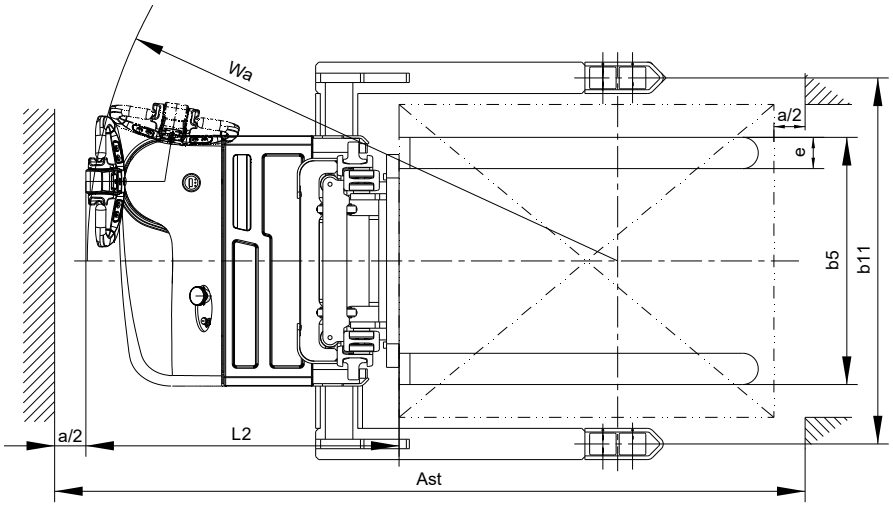
760
l
X
S
Q
C
m2
h3
h13
145
y
L1

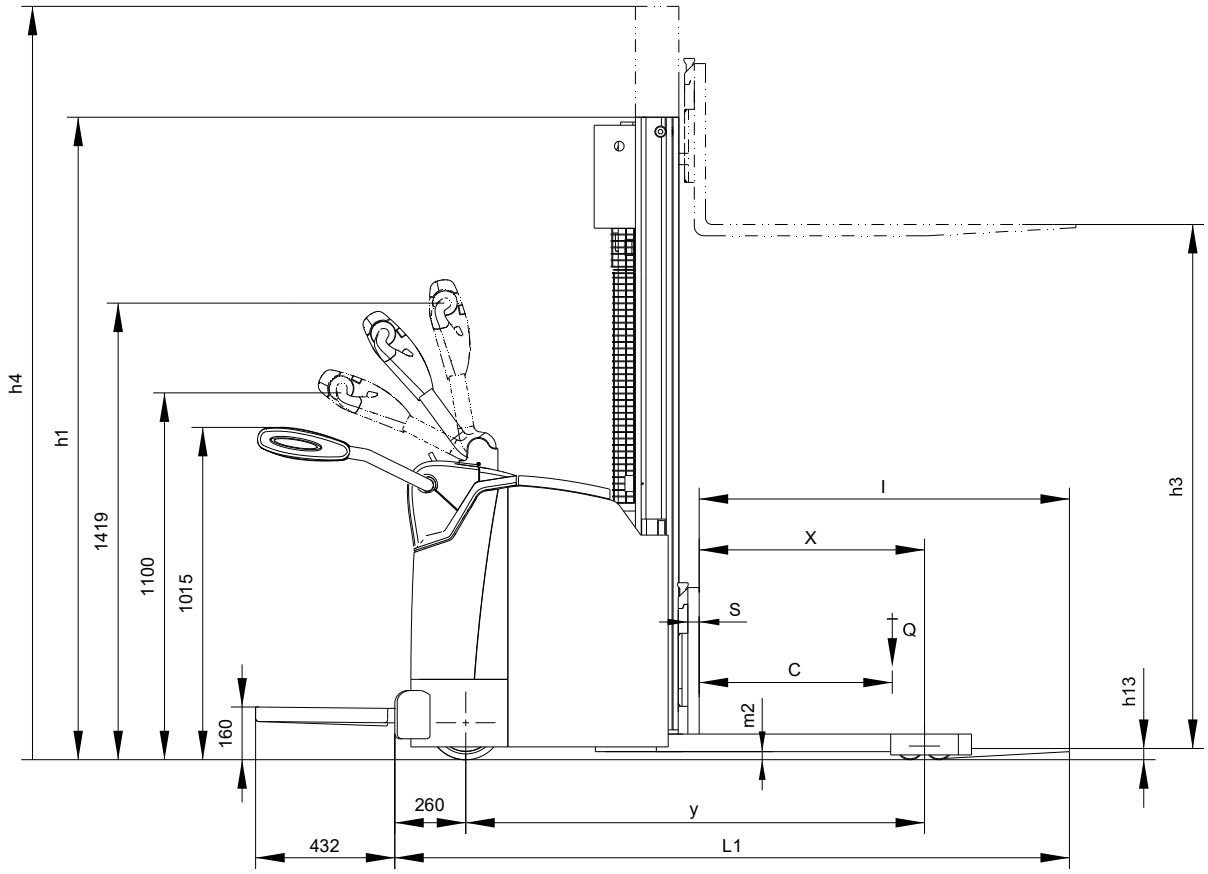

Wa
a/2
e
b5
b11
a/2
L2
Ast

Characteristics	Model		CTD12-AC1S	CTD14-AC1S	CTD16-AC1S	CTD20-AC1S
	Operator type		Stand-on	Stand-on	Stand-on	Stand-on
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1380	1385	1432	1475
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	1100/1270/1470	1100/1270/1470	1100/1270/1470	1100/1270/1470
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	50	50	50	50
	Overall length(fold the pedal)	L1(mm)	2030[1)]	2030[1)]	2050[1)]	2050[1)]
	Overall length(unfold the pedal)	L1(mm)	2462[1)]	2462[1)]	2482[1)]	2482[1)]
	Overall width	b1(mm)	1100/1270/1470	1100/1270/1470	1100/1270/1470	1100/1270/1470
	Fork size	s/e/L(mm)	35×100×1070	35×100×1070	35×100×1070	40×122×1070
	Outside fork width	b5(mm)	210～790	210～790	210～790	210～790
	Ground clearance, center of wheelbase, min	m2(mm)	40	40	40	40
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2546[1)]	2546[1)]	2566[1)]	2566[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2515[1)]	2515[1)]	2535[1)]	2535[1)]
	Outer turning radius, min	Wa(mm)	1642	1642	1662	1662
Performance	Travel speed, laden/unladen	km/h	7.0/7.0	7.0/7.0	7.0/7.0	7.0/7.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	10/16	10/16	8/16	8/16
Motor & Battery	Drive motor power	kW	2.2	2.2	2.2	2.2
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Steering motor power	kW	0.2	0.2	0.2	0.2
	Battery voltage, rated capacity	V/Ah	24/280	24/280	24/340	24/340
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340		
	Controller mode		Curtis AC	Curtis AC	Curtis AC	Curtis AC

Note：1）Triplex Mast +21mm.

Characteristics	Model		CTD12-AZ3S	CTD14-AZ3S	CTD16-AZ3S	CTD20-AZ3S
	Operator type		Stand-on	Stand-on	Stand-on	Stand-on
	Load capacity	Q (kg)	1200	1400	1600	2000
	Load center	c(mm)	600	600	600	600
	Wheelbase	y(mm)	1405	1405	1425	1425
Weight	Service weight with battery	kg	1380	1385	1432	1475
Wheels & Tyres	Tyre type		PU	PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ230×75/1	Φ230×75/1	Φ230×75/1	Φ230×75/1
	Tyre size/Quantity,load side	mm	Φ85×70/4	Φ85×70/4	Φ85×70/4	Φ85×70/4
	Auxiliary wheel size/Quantity	mm	Φ140×55/1	Φ140×55/1	Φ140×55/1	Φ140×55/1
	Tread, operator side	b10(mm)	525	525	525	525
	Tread, load side	b11(mm)	1100/1270/1470	1100/1270/1470	1100/1270/1470	1100/1270/1470
Dimensions	Lift height	h3(mm)	2700	2700	2700	2700
	Fork height, lowered	h13(mm)	50	50	50	50
	Overall length(fold the pedal)	L1(mm)	2030[1)]	2030[1)]	2050[1)]	2050[1)]
	Overall length(unfold the pedal)	L1(mm)	2462[1)]	2462[1)]	2482[1)]	2482[1)]
	Overall width	b1(mm)	1100/1270/1470	1100/1270/1470	1100/1270/1470	1100/1270/1470
	Fork size	s/e/L(mm)	35×100×1070	35×100×1070	35×100×1070	40×122×1070
	Outside fork width	b5(mm)	210～790	210～790	210～790	210～790
	Ground clearance, center of wheelbase, min	m2(mm)	40	40	40	40
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	2546[1)]	2546[1)]	2566[1)]	2566[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	2515[1)]	2515[1)]	2535[1)]	2535[1)]
	Outer turning radius, min	Wa(mm)	1642	1642	1662	1662
Performance	Travel speed, laden/unladen	km/h	7.0/7.0	7.0/7.0	7.0/7.0	7.0/7.0
	Lift speed, laden/unladen	mm/s	87/133	129/198	108/160	98/160
	Lowering speed, laden/unladen	mm/s	155/158	213/200	185/155	195/155
	Max Gradeability, laden/unladen	%	10/16	10/16	8/16	8/16
Motor & Battery	Drive motor power	kW	2.2	2.2	2.2	2.2
	Lift motor power	kW	2.2	3.0	3.0	3.0
	Steering motor power	kW	0.2	0.2	0.2	0.2
	Battery voltage, rated capacity	V/Ah	24/280	24/280	24/340	24/340
	Optional battery voltage, rated capacity	V/Ah	24/340	24/340		
	Controller mode		ZAPI AC	ZAPI AC	ZAPI AC	ZAPI AC

Note：1）Triplex Mast +21mm.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1100
1015
160
h3
l
X
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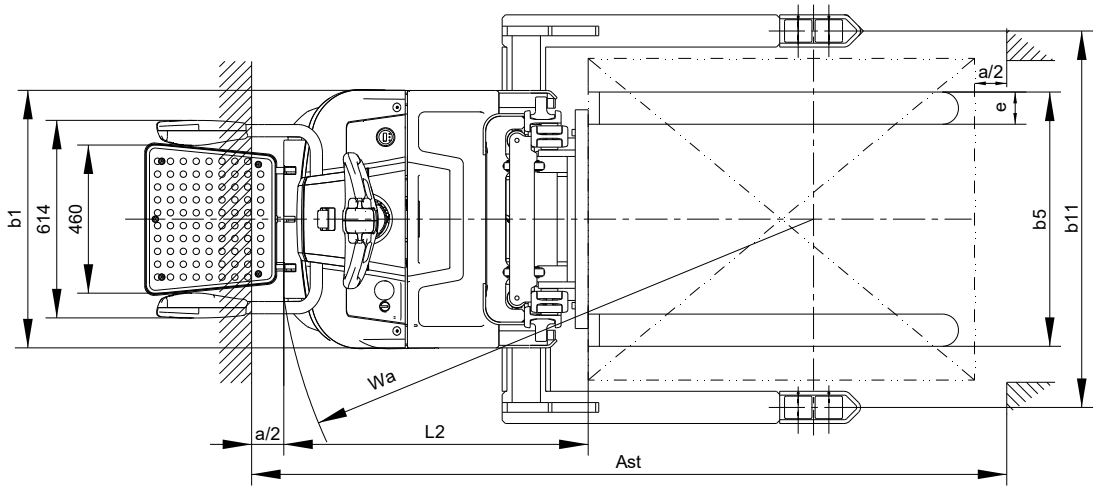
Q
C
m2
h13
260
y
432
L1


b1
614
460
a/2
e
b5
b11
Wa
a/2
L2
Ast

Mast Specification：1.2t/1.4t/1.6t

Mast type	Max Lifting Height h3	Ground Clearance,fork (h3+h13)	Lowered Height h1	Extended Height h4	Free lift
	mm	mm	mm	mm	mm
Double cylinders duplex wide view	2000	2090	1542	2542	90
	2500	2590	1792	3042	90
	2700	2790	1892	3242	90
	3000	3090	2042	3542	90
	3300	3390	2192	3842	90
	3500	3590	2292	4042	90
	3600	3690	2342	4142	90
	3800	3890	2442	4342	90
	4000	4090	2642	4642	90
	4300	4390	2792	4942	90
Duplex full-free wide view	2000	2090	1595	2595	1090
	2500	2590	1845	3095	1340
	2700	2790	1945	3295	1440
	3000	3090	2095	3595	1590
	3300	3390	2245	3895	1740
	3500	3590	2345	4095	1840
	3600	3690	2395	4195	1890
Triplex full-free wide view	3500	3590	1844	4214	1220
	3700	3790	1909	4409	1290
	4000	4090	2009	4709	1390
	4300	4390	2109	5009	1490
	4500	4590	2159	5159	1590
	4700	4790	2259	5459	1590
	5000	5090	2354	5744	1700
	5200	5290	2409	5909	1790

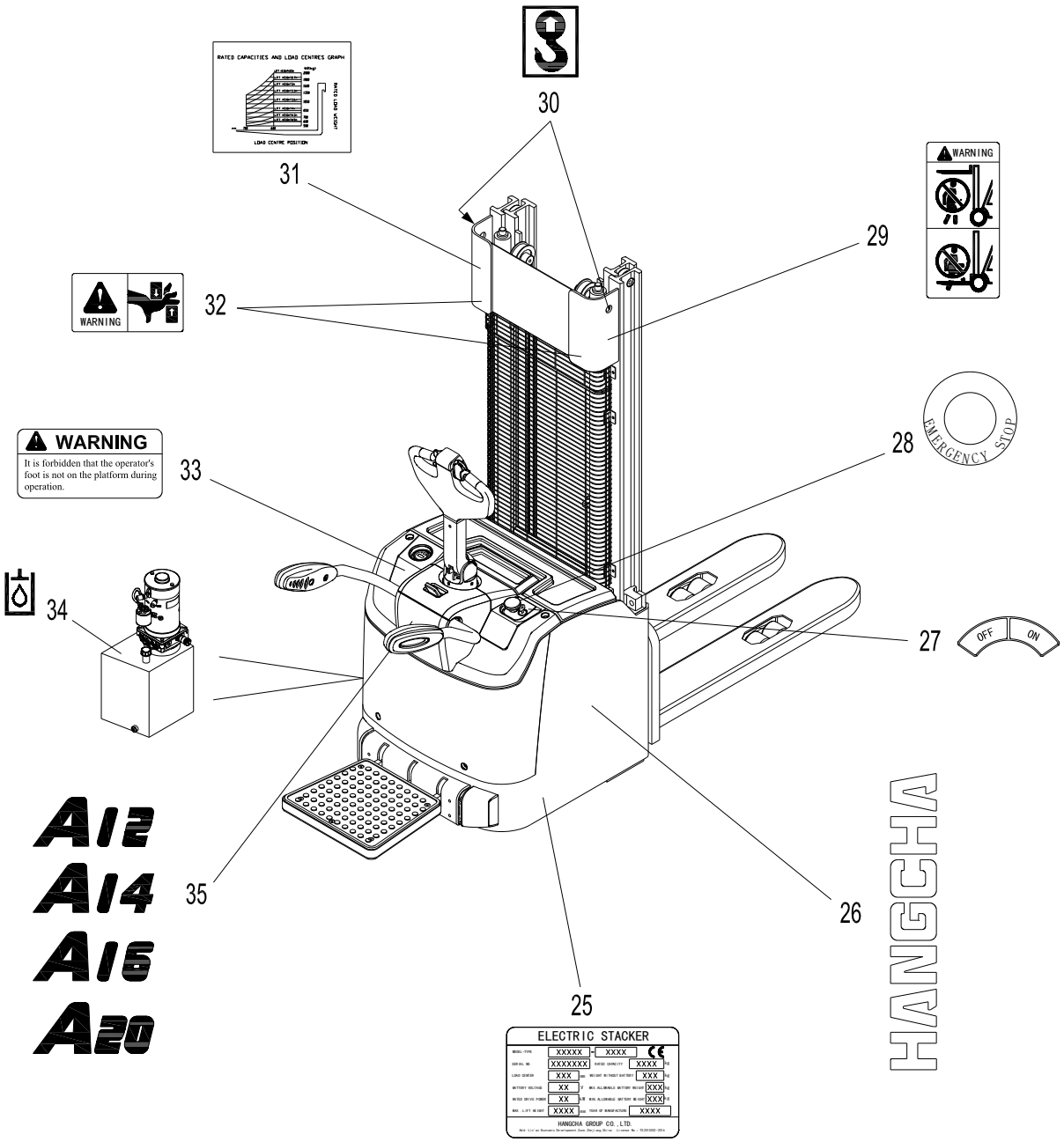
Mast Specification：2.0t

Mast type	Max Lifting Height h3	Ground Clearance,fork (h3+h13)	Lowered Height h1	Extended Height h4	Free lift
	mm	mm	mm	mm	mm
Double cylinders duplex wide view	2000	2090	1647	3647	90
	2500	2590	1897	3147	90
	2700	2790	1997	3347	90
	3000	3090	2147	3647	90
	3300	3390	2297	3947	90
	3500	3590	2397	4147	90
	3600	3690	2447	4247	90
Duplex full-free wide view	2000	2090	1700	2700	1090
	2500	2590	1950	3200	1340
	2700	2790	2050	3400	1440
	3000	3090	2200	3700	1590
	3300	3390	2350	4000	1740
	3500	3590	2450	4200	1840
	3600	3690	2500	4300	1890
Triplex full-free wide view	3500	3590	1944	4314	1130
	3700	3790	2009	4509	1200
	4000	4090	2109	4809	1300
	4300	4390	2209	5109	1400
	4500	4590	2259	5259	1500
	4700	4790	2359	5559	1500

1.6 Product plates and warning labels location

Plates and labels, such as nameplate, load curve plate, warning labels must be legible, if identification is unclear, and must be replaced.

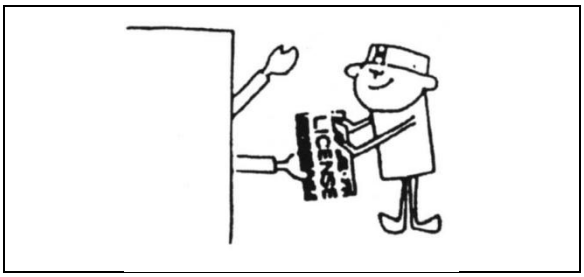
The figure below shows the approximate location of the various identity resides. Before operating the truck, please understand the meaning of the various identities.



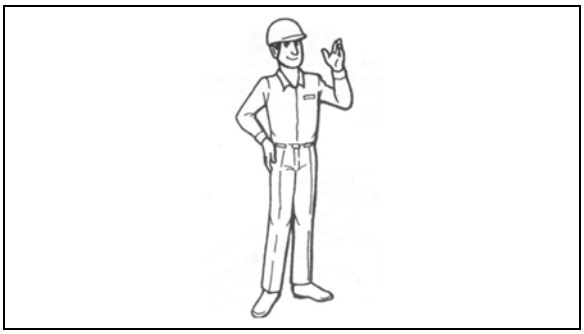
Item	Description
25	Nameplate: The rated capacity on the nameplate is the max. load capacity by the label listed equipment. Any change to the forklift or other equipment may change rated capacity.
26	Manufacturer’s logo
27	Key switch：“OFF” position is off，“ON” position is on.
28	Emergency stop label：“O” means disconnect, “I” means connect
29	Warning label: It’s prohibited to carry people or stand under the forks.
30	Hoist label: Fixed point when using the crane to handle equipment.
31	Load curve label
32	Hazard label: Risk of trapping when mast extended.
33	Warning label: it is forbidden that the operator`s foot is not on the platform during operation.
34	Hydraulic oil label: Add hydraulic oil.
35	Series tonnage label: A series, rated capacity is X×100kg

2 Safety Rules

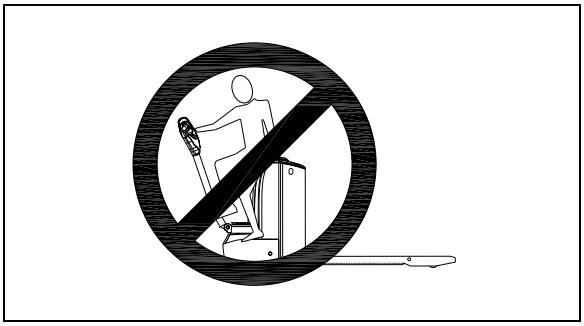
1) Only trained and authorized operator shall be permitted to operate the forklift.



2) Operator must wear helmet, working shoes and uniform.



3) Never take people.



4) It is not allowed to reconfigure the truck without manufacturer's permission.

5) Do not work in flammable and combustible environment.

6) Check the oil, fluid leakage, deformation, flexibility in certain time. If neglected, service life of forklift will be shortened and in serious condition there will be accident.

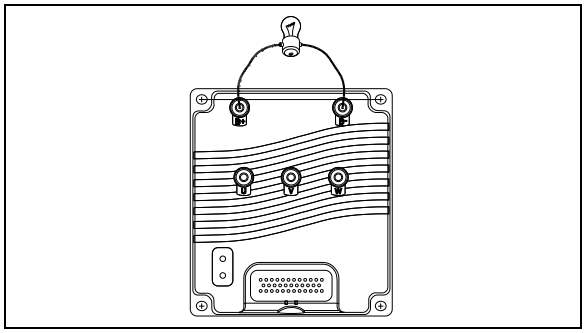
– Make sure change the "safety parts" during the schedule maintenance.

– Wipe off the oil, grease or water on the soleplate, foot pedal and control stick.

– No smoking or any spark, smoke near the battery when checking.

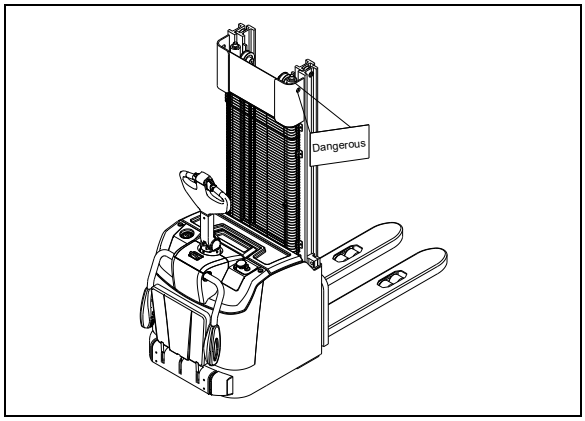
– Be careful of scald when checking motor and controller.

7) The controller equips with energy accumulator, do not touch between B+ and B- to avoid electric injury. If you need check or clean the controller, connect load(like contactor coil or horn) between controller B+ and B- to discharge the controller capacity.



8) Whenever you find the forklift abnormal, stop the truck, put on the DANGEROUS or FAULT sign to the truck, remove the key, and report to the managing person. Only after eliminating the fault can you use the truck.

– If there occurs to fault, battery electrolyte, hydraulic oil or brake fluid leakage when lifting loads, going up and down the slope, please organize staff to repair.



9) Internal battery may generate explosive gas, it's prohibited any flame close the battery. Never allow the tools close two

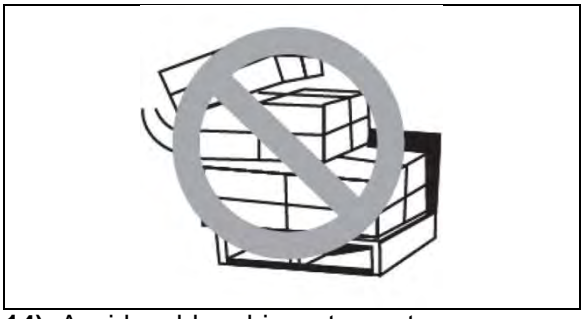
poles of the battery to avoid spark or short circuit.

10) The work ground of forklift shall be solid and smooth concrete surface or similar ones. Pre-check the ground condition of working site. Tidy the working site, clean obstacle, sweep macadam, muddy sand and wipe off greasy dirt.

11) Do not overload. Before operation, first know the curve chart on the load curve plate well, which indicates the relation between rated load and load center.

12) Before start, press the horn and make sure no people around.

13) Goods are not allowed to deviate the fork center, when goods is deviating the fork center, turn or pass uneven road, you are easily to fall. Meanwhile, possibility of turnover will increase.



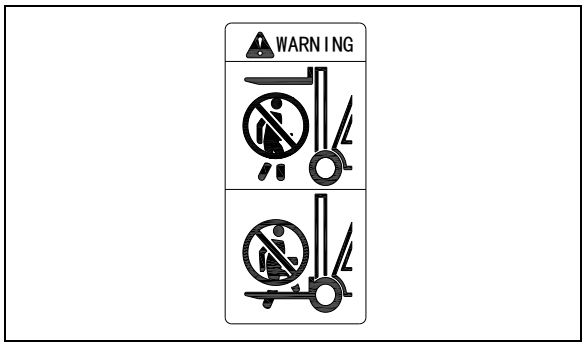
14) Avoid sudden drive, stop or turn.

15) Do not drive the truck when the forks in high position.

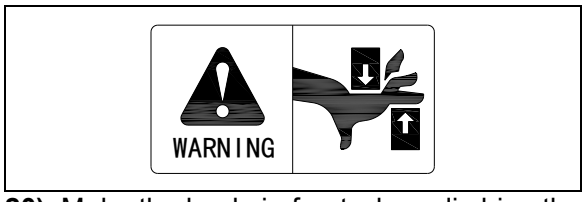
16) When handling bulky loads, which restrict your vision, please operate the machine in reverse or have a guide.

17) Cause the wheels of pallet truck is small, it is not allowed to run on the street, and only for driving in specified stacking place.

18) It's forbidden to put the head, hand, foot or body under the forks. Never stand on the fork.



19) It's forbidden to put the head, hand, foot or body into the space between the chassis and lifting component, once clipped, it is dangerous to your life. It's forbidden to put the head, hand, foot or body into the space between fork and link mechanism. Crushing and shearing hazards for the operator of pedestrian-controlled trucks featuring foldable platforms and reach trucks, between parts of the environment and the truck during travelling forward



20) Make the loads in front when climbing the slope. It's prohibited to turn on the slope, or there's danger of tipping over. Avoid working on the slope.

21) Do not use truck under the weather of sand, snow, thunder, storm, typhoon, etc. Avoid using the truck when the wind speed is larger than 5m/s.

– The weather condition: temperature: -5℃～40℃, wind speed: less than 5m/s;

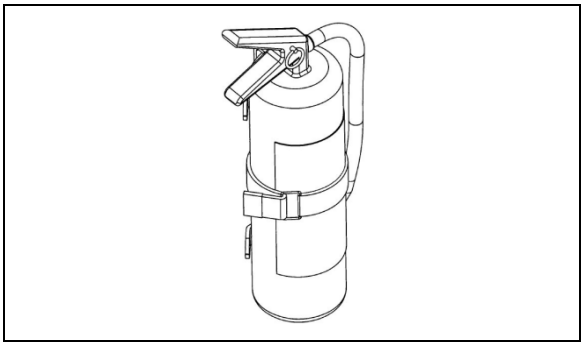
air relative humidity: less than 90%（20℃）. Altitude should not exceed 2000m.

22) After power off, brake works and the truck can not be towed(dragged)

23) As to stand-on truck, stand on firmly and hold the handle tightly. When turning, the speed should be lower than 3km/h.

24) There's warning and operation method on truck label. Please obey the requirement in this manual and the truck label when operation. Check label, identification plate, replace damaged or fallen ones.

25) Fire extinguisher shall be equipped at the work site. Users can choose truck equipped with fire extinguisher. Driver and manger should be familiar with the fire extinguisher position and application method.



26) Use tray when carrying small items, do not place on the fork directly

27) Do not wash the inner of the truck, do not place the truck outdoors and exposed to the rain.

28) Before dismantle or repair the truck, remove the battery plug firstly.

29) The truck should be used under the environment of the light is enough.

30) 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, however, that the user must do the following:

- Arrange for the modification or alteration to be designed, tested and implemented by an engineer(s)；
- Maintain a permanent record of the design, test(s) and implementation of the modification or alteration;
- Make appropriate changes to the capacity plate(s), decals, tags and instruction manual;
- Affix 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.

3 Transport

The forklift truck is designed for short-distance lifting, lowering and transporting load units, not suitable for long-distance travel. If needed, the forklift truck must be transported by using lifting device or platform to place on truck or trailer.

3.1 Lifting by crane

⚠ WARNING

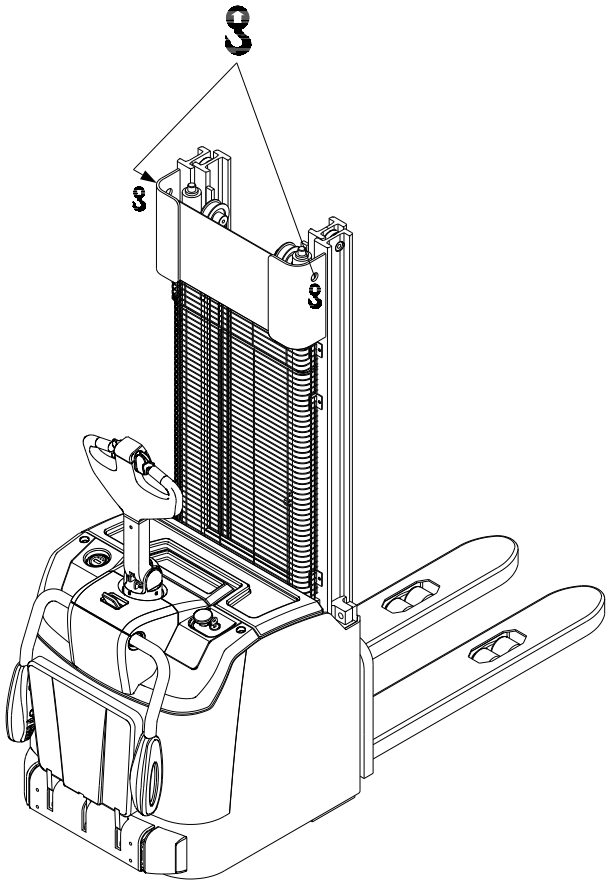
- **Only use lifting gear with sufficient capacity (for truck weight see truck nameplate).**
- **Do not stay under the truck when hoisting the truck.**
- **When hoisting or laying down, it should be stable and slow to avoid collision or accident.**

Procedure:

– Park the truck securely.

– Secure the lifting slings to the strap point, and prevent them from slipping. Crane slings should be fastened in such a way that they do not come into contact with any attachments when lifting.

– Load the truck and park it securely at its destination.

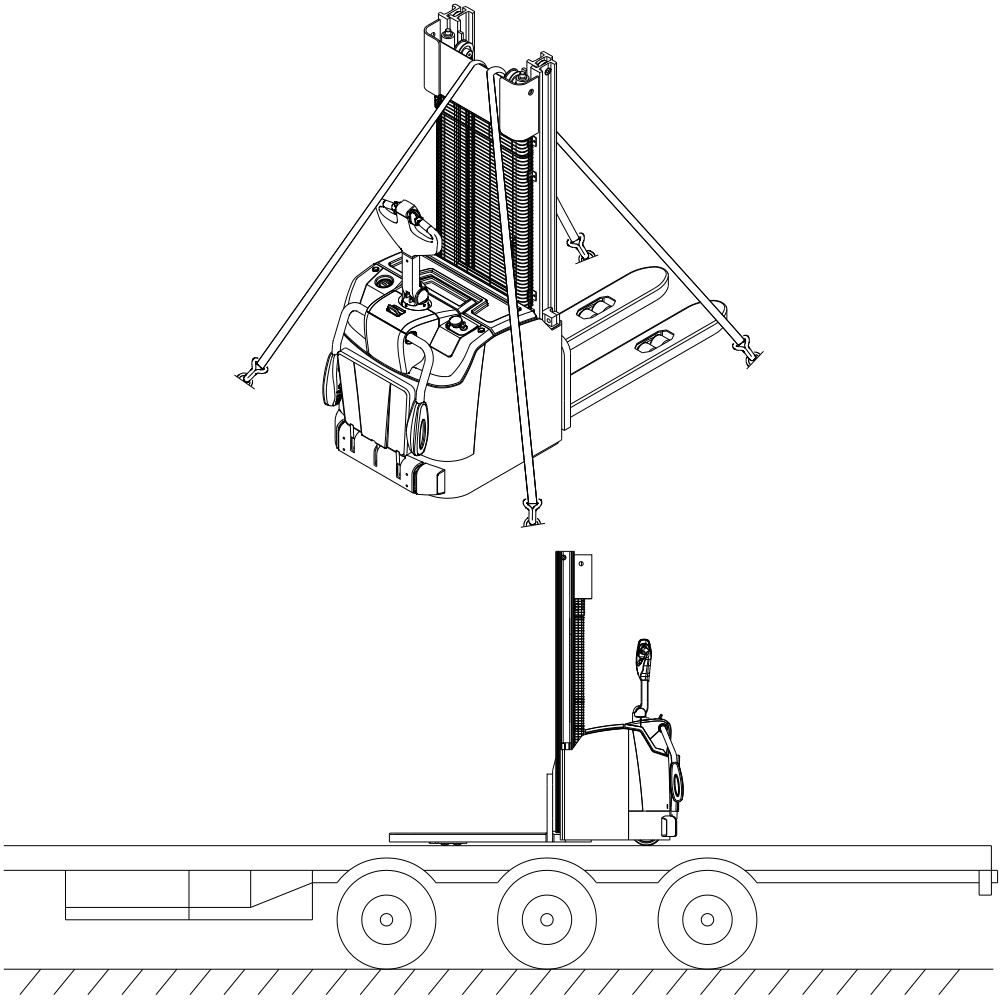


3.2 Securing the truck during transport

Correctly fix the forklift truck to avoid move when using truck or trailer.

Procedure:

- Park the truck securely.
- Sling the tensioning belt around the truck and attach it to the fastening rings of the transporting vehicle.
- Use wedges to prevent the truck from moving.
- Tighten the tensioning belt with the tensioner.

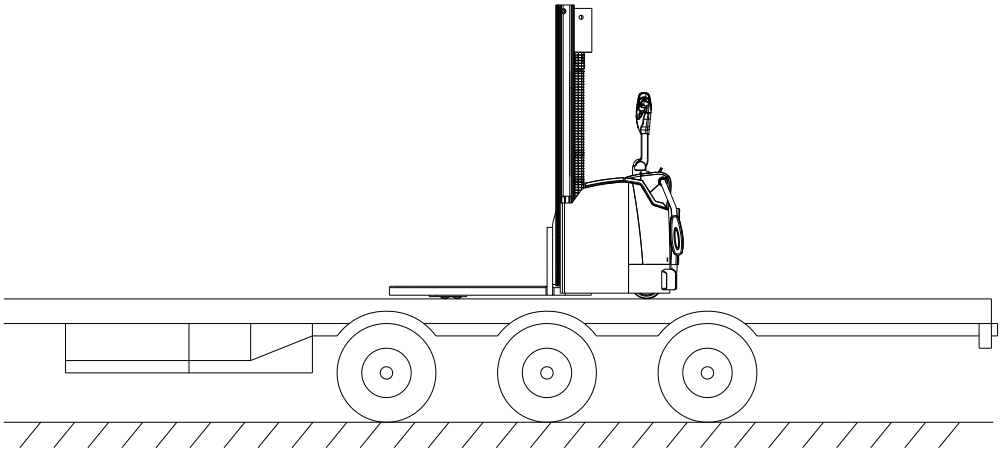


WARNING

- **The truck or trailer must have fastening rings.**
- **Use wedges to prevent the truck.**
- **Only use tension belt or fastening belt of good nominal strength.**

3.3 How to remove a broken truck

It’s not allowed to tow the forklift truck on the ground directly when the truck is broken down or damaged since the brake of the truck is closed under normal circumstances. Appropriate vehicles should be used to remove the broken trucks.



WARNING

- **Do not tow the broken trucks on the ground directly, or else the braking system would be damaged.**

4 Battery

4.1 Attention for using battery

1) No firing

Explosive gas can be produced in the internal of storage battery, smoking, flame and sparkle can easily cause storage battery explosion.

2) Protection against electric shock

CAUTION

- **Storage battery has high voltage and energy.**
- **Do not bring short circuit.**
- **Do not approach tools to the two poles of the storage battery, which can cause the sparkle or short circuit.**

3) Correct wire connection

Never allow wrong connect of battery anode and cathode, otherwise it may cause sparkle, burning or explosion.

4) Do not over-discharge

– Never charge only when the stacker can't move, this will shorten the battery working hours.

– When two flashing lights of the power indicator flash, please charge immediately.

5) Inspection for electrolyte

– It is forbidden to use the stacker when the electrolyte is in shortage.

– Inspect electrolyte level every week. When electrolyte level is low, you must add distilled water to the level appointed.

WARNING

- **The shortage of the electrolyte will cause the storage battery overheated, even cause the system part of storage battery and electric combustion.**
- **Vitriol include in the electrolyte can create burns, see doctor for emergency treatment quickly if touch it un-carefully.**

  Splashing to the skin or eyes：wash with water 15~20 minutes;

  Splashing to the clothes：take it off immediately.

  Careless drinking：drink plenty of water and milk.
- **Wearing glasses, rubber overshoes and rubber glove.**

Keep battery clean

Keep dryness and cleanness on the surface of storage battery. The poles for connection are also dry and clean. Operator must screw down the vent-cover of storage battery.

CAUTION

- **Do not use dry cloth or fiber cloth to clean the storage battery, avoid static to cause the explosion.**
- **Pull out storage battery plug.**
- **Clean with wet cloth.**
- **Wearing glasses, rubber overshoes and rubber glove.**

Measures in summer

In summer, water in the electrolyte is easy to evaporate, therefore, electrolyte must often be inspected if electrolyte is low, you must add distilled water to the level appointed.

CAUTION

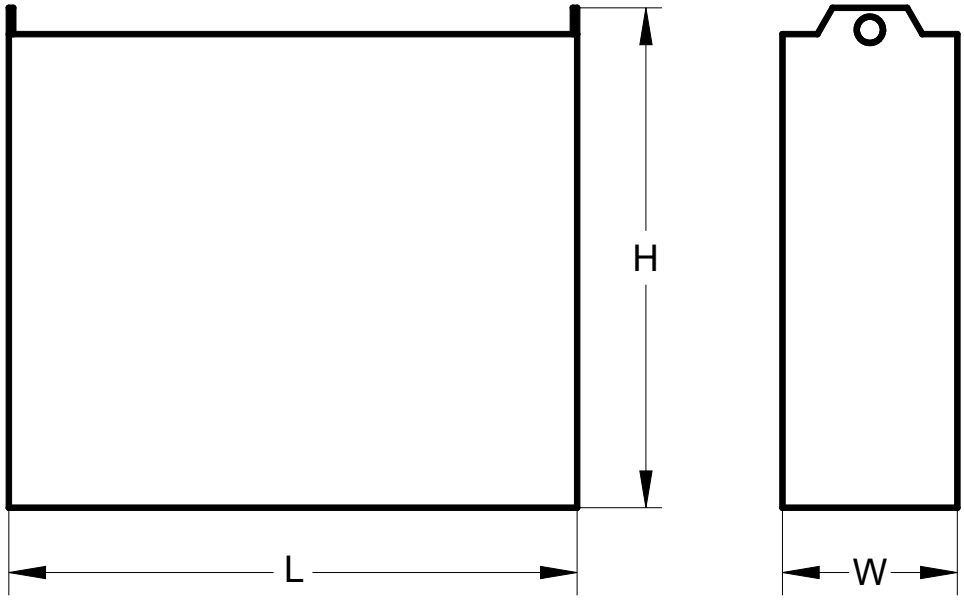
- **Do not over fill distilled water. Spilt electrolyte will cause corrosion and electricity leakage.**

Measures in winter

- Keep effective and good surrounding for charging.
- When it is cold, pull out the storage battery pin to prevent discharging.
- Take measures such as covering storage battery for warmth.
- Don’t park the truck in cold outdoor or cold storage for a long time.
- Charge in time after work.

4.2 Dimension/Service Weight

Item		CDD12/14/16/20-AC1() CDD12/14/16/20-AZ3() CDD12/14/-AC1S() CDD12/14/-AZ3S()	CDD16/20-AC1S() CDD16/20-AZ3S()
Length（L）	mm	650	650
Width（W）	mm	249	249
Height（H）	mm	625	625
Allowable lightest	kg	200	260
Allowable heaviest	kg	295	295



WARNING

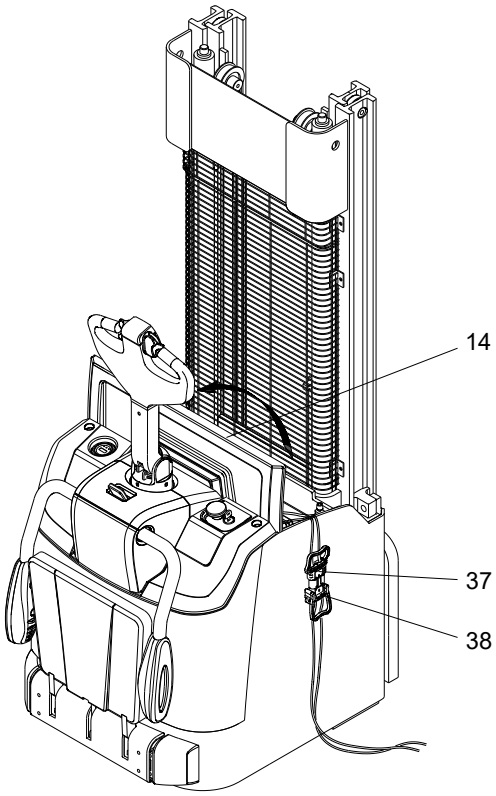
- **Battery weight and dimensions have considerable influence on operational safety of the truck.**
- **When installing or replacing battery, be sure that battery in the fixed position.**

4.3 Charging the battery

Charging steps

- Drive the truck to appointed charging place, park the truck and render if safe.
- Open the battery cover (10).
- Remove the battery plug from the truck socket （31）.
- Connect the charging plug (32) to battery plug (31).
- Plug the charger plug into proper power socket.
- Start the charging procedure according to the charger operation instructions.
- End charging according to the charger operation instructions after the battery fully charged.
- Remove the battery plug (31) from the charger.
- Connect the battery plug（31）with truck socket and cover the battery hood(10).

After charging, the truck can be used.



⚠ WARNING

- **Please charge in the well-ventilated and appointed site.**
- **Mark 'No smoking' when charging and prepare extinguisher.**
- **Before charging, please examine wire and electrical outlet for damage, otherwise do not charge.**
- **Open the hood and storage battery lid to release the explosive gas when charging.**
- **Never place metal object on the battery.**
- **In the progress of charging, do not pull out power switch and battery plug, otherwise it may damage plug and electrical units. Generally press down the stopping button firstly, and then take out the plug.**

Daily charging

·The storage battery that has been made first charging and used in normal condition, then charged again, it is named daily charging.

·Its way is almost same as the first charging.

·The recharging volume is 1.2 times than the last electric discharging. But the new storage battery's former five times' charging volume should be 1.5 times than the last electric discharging.

·During any charge, the temperature of electrode should not exceed 45℃, otherwise it should be taken measures such as reducing artificially charging current or lowing the temperature. If the temperature still does not drop, you should stop charging till the temperature drops down.

Adopt intelligent charging to do daily charge, the former five times of new battery should do equalizing charging according to operation instructions of intelligent charger.

Equalizing charging

·During using of the storage battery, it often occurs to disequilibrium among the voltage, density and capacity.

·Compared to most of the batteries, several storage batteries' proportion of voltage and electrolyte rises slowly during the course of charge and discharge, its storage battery's proportion of voltage and electrolyte declines faster than most of other batteries.

·Make equalizing charging in the following case：

a. discharge voltage often drop down final voltage;
b. discharge current is often larger;
c. not charge in time after discharge;
d. the electrolyte is mixed with impurity with a little harm;
e. It often be charged deficient or has not been used for a long time;
f. Check or clean sediment after taking out the storage battery group

The way of equalizing charging：

(PCA Automatic Charger Operation Instruction)

① Firstly, charge the storage battery normally, and then rest for 1 hour after the end of charge.

② Charge it again with the second phase current of normally charge until the electrolyte gives off a large number of bubbles, and then stop charging for 1 hour.

③ Do it several times as mentioned above until the voltage and the density keep invariable and the storage battery gives off a large number of bubbles immediately when charge again.

Additional charge

·If one day's work cannot be fulfilled in one charge, carry out additional charge during breaks.

·When the temperature of circumstance is low, carry out additional charge.

Charge for long-term storage

·Carry out equalizing charging before storing.

·Carry out equalizing charging once every 15 to 30 days during the storage period.

The proportion and level of electrolyte

WARNING

- If the level of the electrolyte is low, using the storage battery will cause the storage battery over-heat and shorten the storage battery's service life.

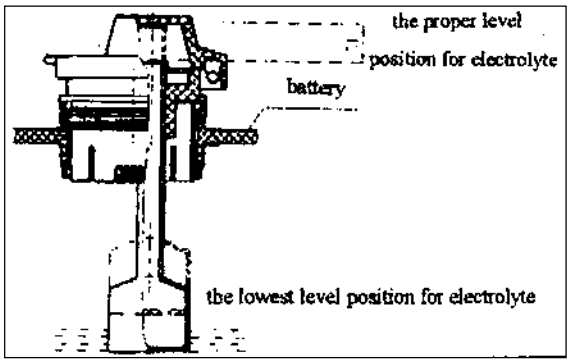
1. Inspect electrolyte

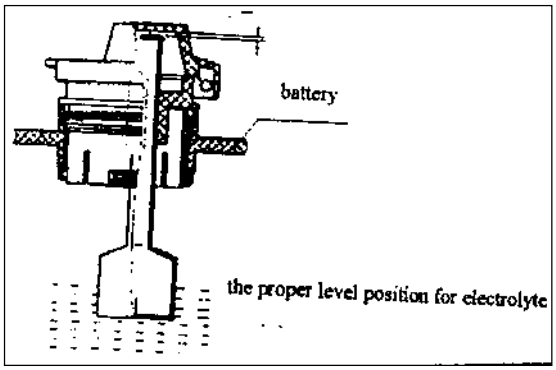
The storage battery without a dobber

It is proper to pour the electrolyte 15-20mm above the electrode plate.

The storage battery with a dobber

According to the dobber of the ventilation cover, read the level position of the electrolyte.





2. Replenish the distilled water

·Wear the blinkers, rubber shoes and rubber glove.

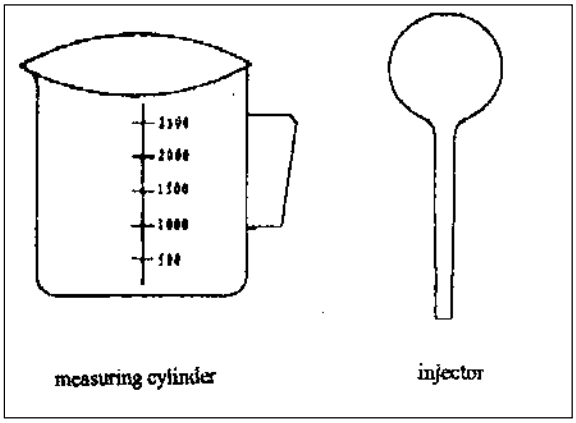
① Use the measuring cylinder to take out the distilled water with a certain quantity.

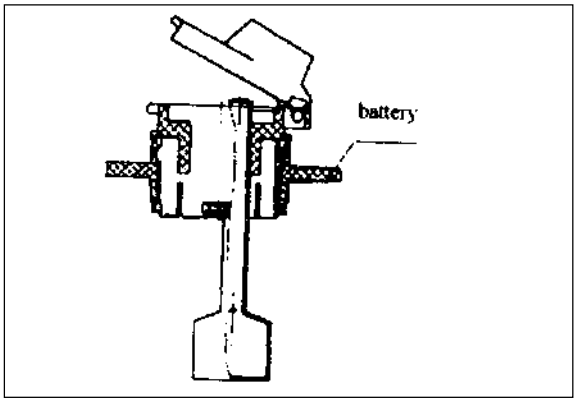
② Open the battery ventilation cover or fill cap.

③ Imbibe distilled water with injector and then supply it into the storage battery.

The storage battery with a dobber

When the red dobber rises, the white line appears, please stop replenishing.





The storage battery without a dobber

When the electrolyte is above 15-20mm of the electrode plate, stop replenishing

④ After replenishing the distilled water, close the ventilation cover and box cap.

⑤ Use the damp cloth to clean the surface of storage battery cells.

⚠ WARNING

- **It is not permitted to exceed the appointed top level when replenishing the distilled water. Adding too much will result in leakage of electrolyte, and it will damage the truck when charging or discharging.**
- **Draw it out with injector if adding too much.**

3. Reading the specific gravity

1）The specific gravity of the electrolyte will change as the temperature changes.

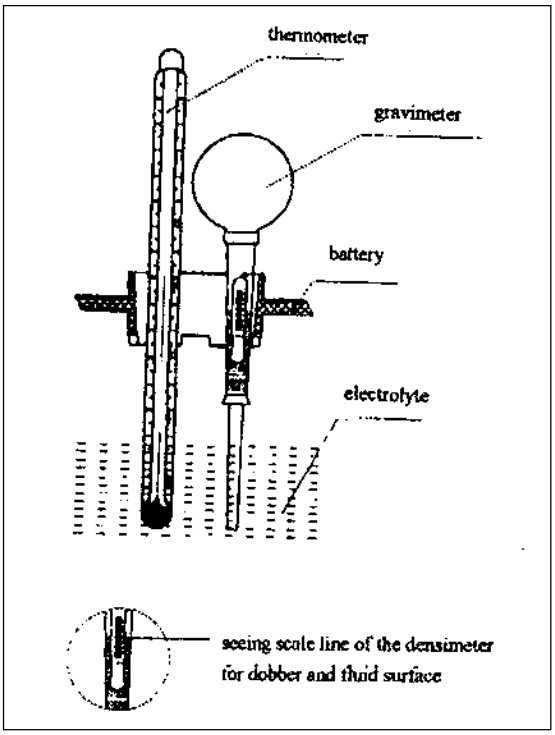
① Use thermometer to measure the temperature for electrolyte.

② Put the straw of densimeter into electrolyte uprightly, extrude rubber tube with hand and the electrolyte will be sucked into the glasses tube and then the floater of the densimeter will float.

③ Numerate the reading of the densimeter.

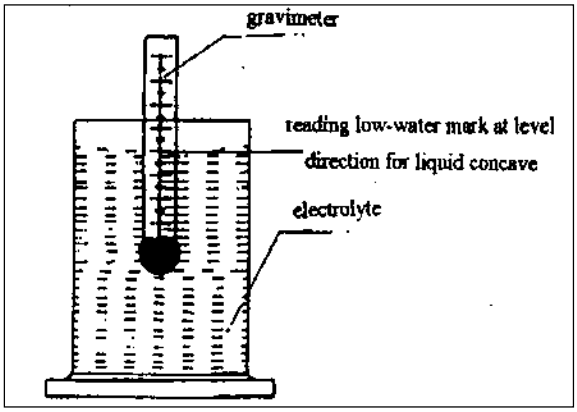
CAUTION

- The dobber of densimeter must rise uprightly without depending on the glass pipe.



2） Measuring the proportion

Use gravimeter to calculate the electrolyte proportion.



3） Conversion of the specific gravity

The specific gravity at the standard temperature of 30^0C should be converted as follow:

$D_{30} = D_t + 0.0007(t - 30)$

Therein to：D30 ——the specific gravity at the standard temperature of 30^0C

Dt ——the specific gravity at the temperature of t0C.

t ——the temperature of the distilled water during convert.

·The specific gravity referred in this book is measured all at the temperature of 30℃.

Charger：

Storage battery of this truck equips with PCA Automatic Charger Operation Instruction.

1. The charger is automatic high frequency charger. The capacity voltage is 220V AC. The input current is not less than 15A. The output voltage is DC 36V. Maximum charge current is 35A. The total charge procedure is automatic. For more information please refer to charger manual.
2. Connection with earth wire for using.
3. When replace the fuse, first plug out the plug.
4. Non-specialized person can’t open the hood to check or repair.
5. Do not rebuild or disassembly charger.
6. Prevent charger overheat in high

temperature seasons, that will hurt charger, if necessary can pause charge.

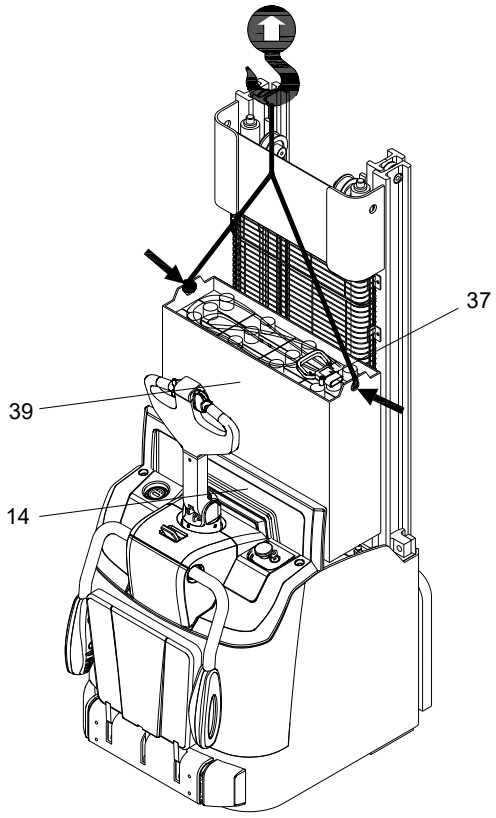
If you don’t want use automatic option, you should adjust the charge current, charge voltage, charge time and etc. manually. And you should measure the specific gravity of electrolyte on time to assure the battery can be charge at best state. To adjust the parameter of charger, please see the following battery charging.

4.4 Replacing the battery

Battery replacing steps：

- Park the truck and render it safe.
- Open the battery cover（14）.
- Remove the battery plug (37) from truck socket, and place the battery plug and cable into the battery tank (39), ensure that it does not scratch cable when removing the battery.
- Hang the hoisting tool to the two hoisting hole of the battery tank (39) and fix it.
- Use the crane to hoist the battery vertically.

Installation is in the reverse order of operations. Check for correct mounting position and connection of the battery.



WARNING

- **Battery box is very heavy, be careful to avoid damage.**
- **Make sure the lifting capacity of the crane is larger than battery weight.**
- **Disposal to the waste battery should accord with local environment regulation.**
- **When replacing the battery, ensure that the battery of the same specification, dimension and weight is fitted.**

5 New truck breaking-in

We recommended operating the truck 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 truck is in a stage of 100 hours of operation：

- Avoid the new battery over discharging in early period.
- Perform specified preventive maintenance services completely.
- Avoid sudden stop, start or turn.
- Limited load is 70%～80% of the rated load.
- Often check and fasten the fasteners of each joint part in running-in period
- After running-in finished, replace hydraulic oil and gear oil.

6 Operation

6.1 Check before operation

In order for the safety truck operation and keep the truck in good condition, before starting the truck, you must check it carefully.

1) Oil leak and liquid leak check

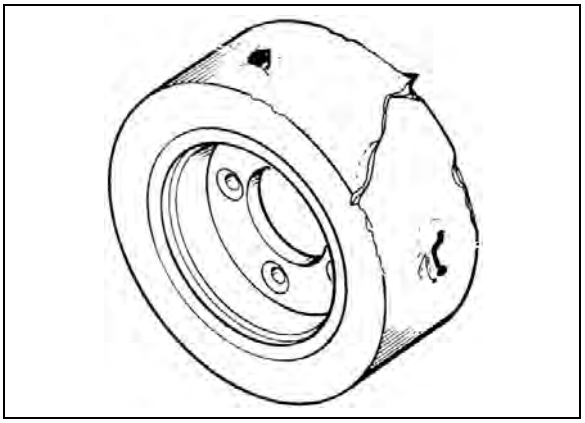
Park the truck, and check the truck for hydraulic oil, gear oil or electrolyte leak.

2) Fork check

Check the fork and see whether bending or crazed.

3) Front/rear wheel and balance wheel check

Check the wheel and see whether there is any crazed, damaged, or abnormal wearing. Check the wheel fasteners for looseness. Inspect whether there is rope on the wheel.



4) Check front fork and linkage mechanism

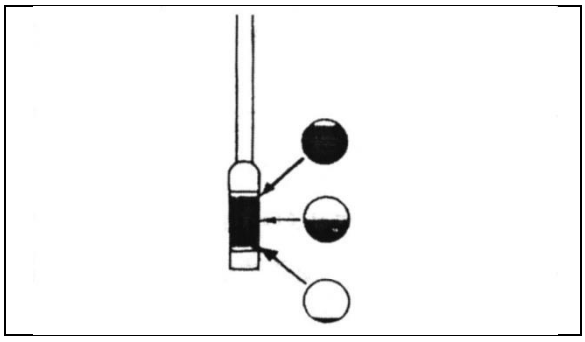
Check the fork and linkage mechanism, see whether bending or crazed.

Whether appear interfere when move, movement point wear whether severe.

5) Hydraulic oil check

Open the hood

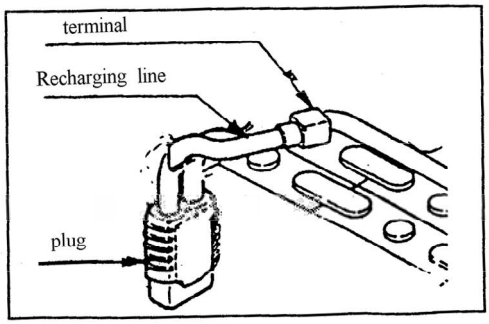
Loosen the hydraulic oil filler cap, pull out dipstick, and check if the oil level within the scales. Add oil when insufficient.



Close the hood, and open the battery cover

6) Battery check

- Check the battery cover board. See whether the battery fixed reliably.
- Check proportion of electrolyte. Refer to “battery” section.
- Check the terminal for loose or damage. Otherwise adjust or replace.



Plug in and turn on the key switch.

7) Instrument display check

Refer to instrument part.

8) Lifting and lowering button

Press the lifting button and check the fork lifting condition. Press the lowering button, check the fork lowering condition. Check if the lifting system has abnormal sound.

9) Forward and reverse running condition

Tilt the handle to some degree, gradually press the accelerator button to the outside of the body with thumb, and inspect the forward running condition; gradually press the accelerator button to the inside of the body with thumb, and inspect the reverse running condition.

10) Brake system

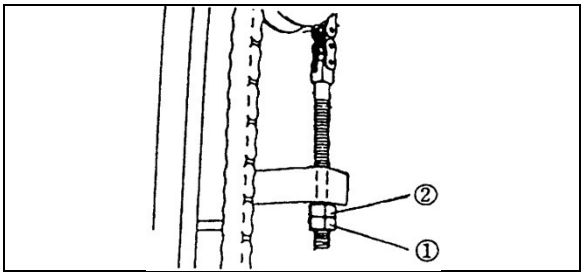
When the truck run forward or backward, push the handle to vertical position or press to level position to check the brake condition.

11) Steering system

Left or right turn the handle to make the truck run around 3 turns, and then check if the steering system is normal.

12) Check chain tensity

- Lift forks up 10～15cm.
- Press the middle of the chain and see if the left & right tensity is the same.
- Tensity adjustment：screw off the nut①, adjust nut ② to keep the same tensity of the two chains, and then tighten the nut ①.



13) Horn

Press the horn button to check sound.

14) Appearance

Check the truck appearance for clean, rust or paint spalling.

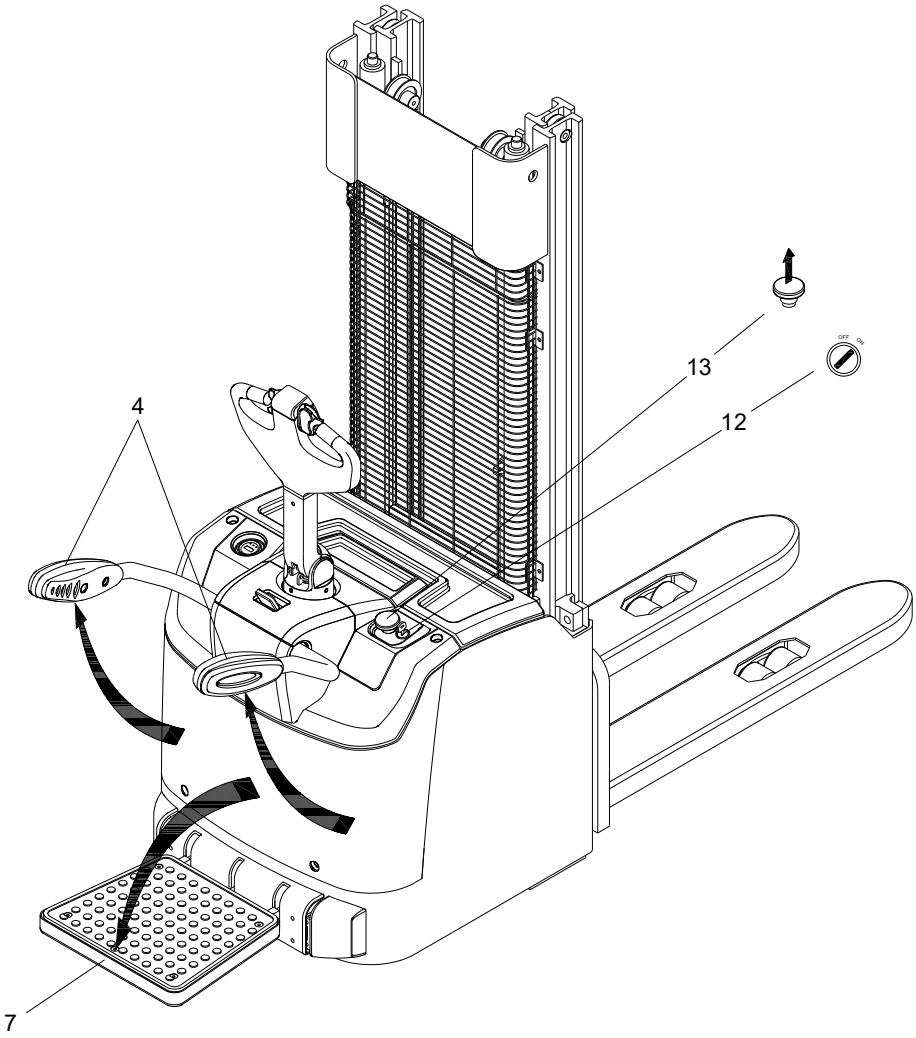
15) Others

Check whether there is any abnormal noise, whether wiring is regular or fastener loosens etc.

6.2 Starting up

Procedure:

- Plug into the plug.
- Turn on the key switch（3）.
- Pull up the emergency disconnect switch（11）.
- If you need to stand on the pedal to operate for the stand-on type truck, you need open the pedal



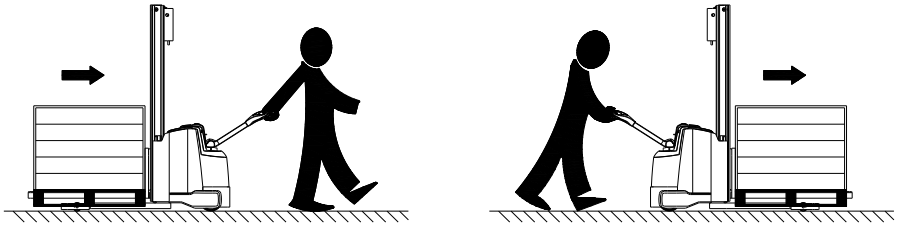
CAUTION

- **Make sure the work ground is hard enough to support the truck.**
- **Be careful to control the truck's speed.**

6.3 Travelling

Pedestrian-type

Driver should walk in front of the truck and keep at the side front of the truck when travelling. One hand holds the handle, and operate travel switch with thumb. Always watch moving direction and guide truck. Or hold the handle with both hands and push the truck go forward.

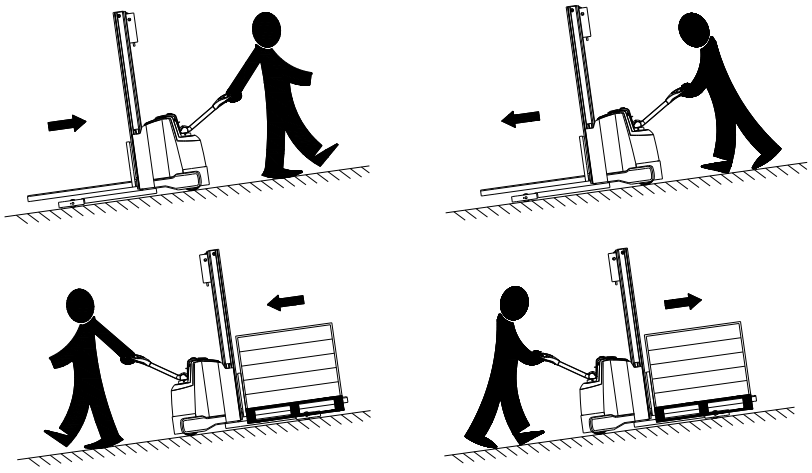


CAUTION

- **Operator must wear protective boots.**
- **When enter narrow area as lift, first get fork go.**
- **Keep road clean and wipe greasy dirt, water or other easily causes slipping dirty.**
- **Crushing and shearing hazards for the operator of pedestrian-controlled trucks featuring foldable platforms and reach trucks, between parts of the environment and the truck during travelling forward.**

Travelling on the slope：

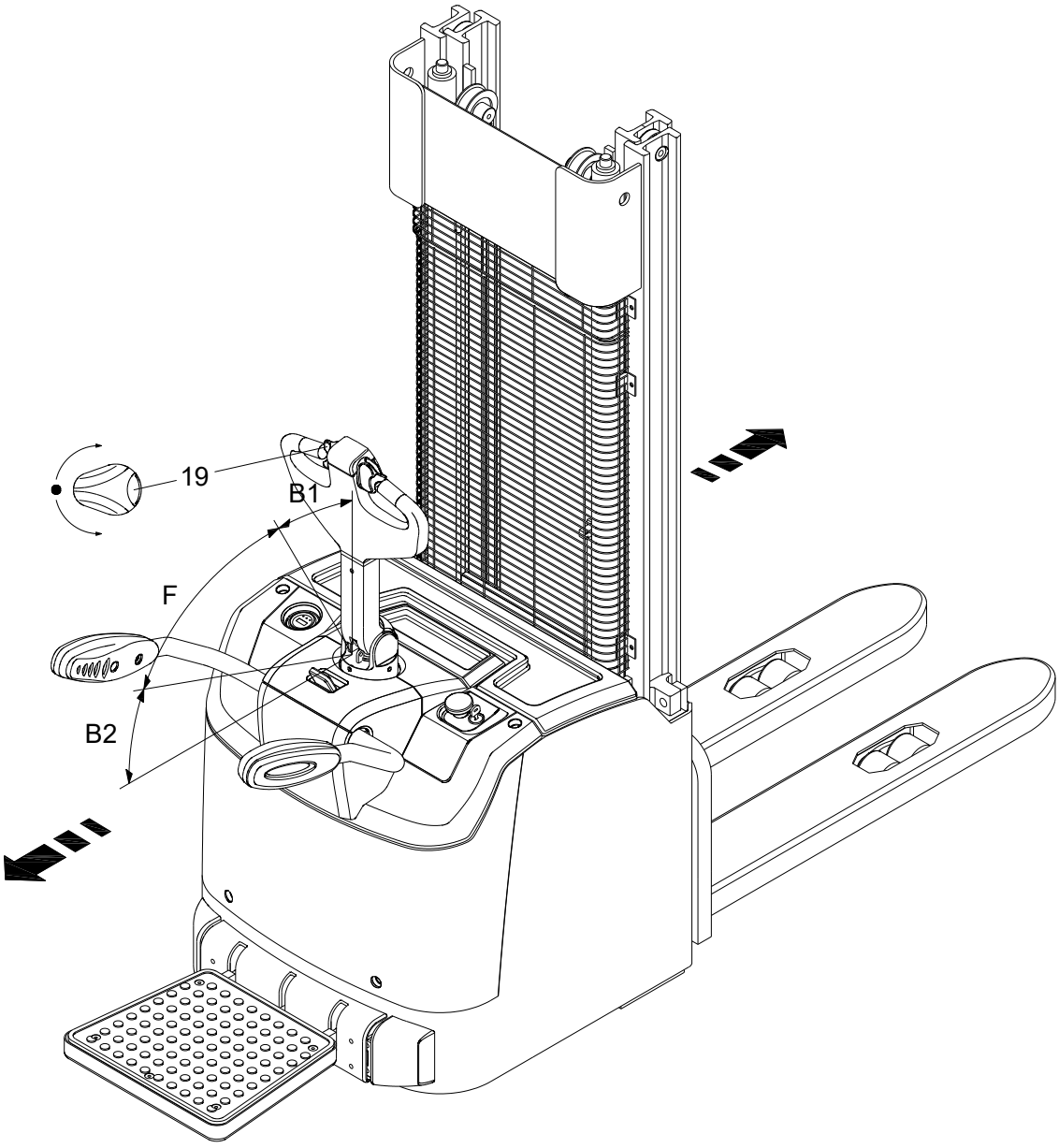
When going uphill and downhill without load, keep the fork to downhill direction; when going uphill and downhill with load, keep the fork to uphill direction.



WARNING

- **No turn, inclines when going uphill and downhill.**
- **Never park on the slope.**
- **Slow down when going downhill and ready for braking.**
- **Travel according to regulated route.**
- **The road should keep clean, no slipping**

Stand-on type



Slow down

– Slowly loosen the thumb, the direction speed control button will return automatically and the truck slows down.

Stand-on type

– Start up the truck
– Open the pedal
– Step on the pedal
– Swivel the control handle to driving range (F).
– Adjust the direction speed control button (17) to the desired direction
– Control truck speed by direction speed control button (17). Speed is controlled by rotating the driving switch, and the maximum rotation can get fast speed.

Others refer to pedestrian-type contents.

6.4 Braking

– When the thumb off the direction speed control button, pull the handle to braking range (B1 or B2) position or vertical position, the truck brakes.

> ⚠ **CAUTION**
>
> - **When release the control handle, the handle swivel into the braking range slowly or nor enter braking range, do check the reason and eliminate the fault. Replace gas spring if necessary.**

6.5 Steering

– Hold the left and right handle of control handle with both hands, and decline to some degree, move the handle to left or right to release truck steering.
When turn to left, the truck turns left.
When turn to right, the truck turns right.

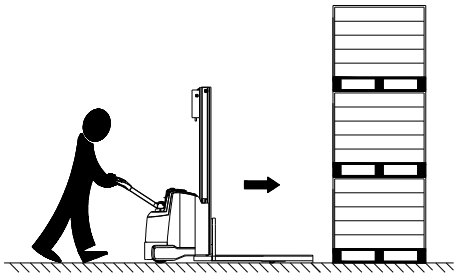
6.6 Stopping

– Release the direction-speed knob. Decrease the speed.
– Return the control handle to vertical position.
– Drop the fork to the lowest position.
– Turn off the switch to “OFF” position, press down the emergency disconnect switch, pull out the battery plug, and take off the key.
– Fold up.

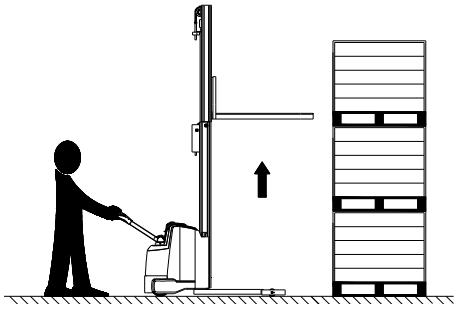
6.7 Loading

Procedure:

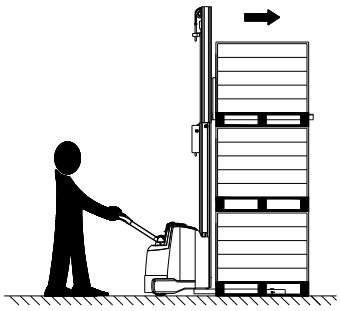
– Drive the truck carefully up to the loads.



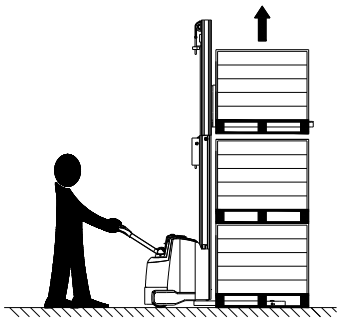
– Adjust fork height to make the forks in the tray.



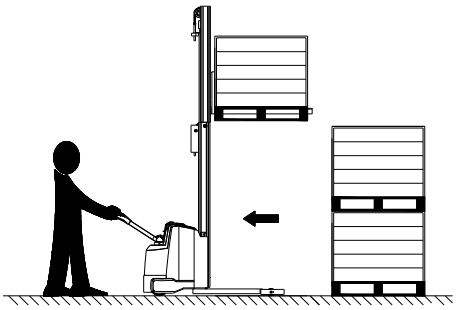
– Go forward and make the forks in the tray.



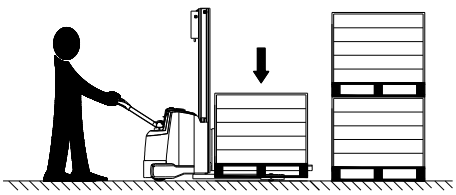
– Raise the loads several centimeters to make sure if the loads are firm.



– Travel the truck off the area.



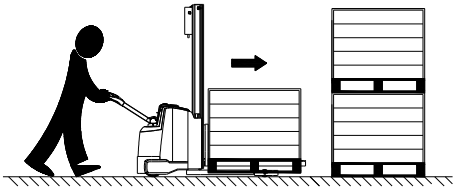
– Drop the load to lower position



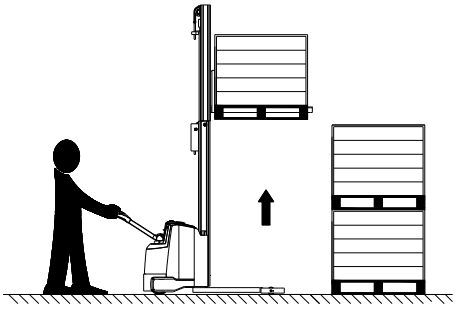
6.8 Unloading

Procedure:

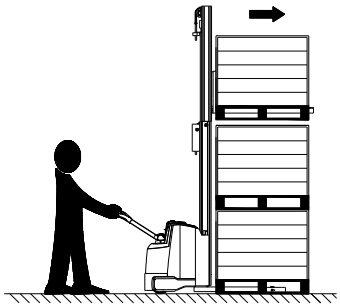
– Approach the deposit area.



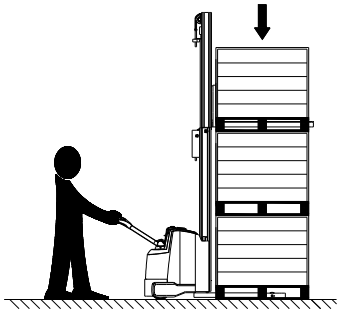
– Raise the loads to correct height.



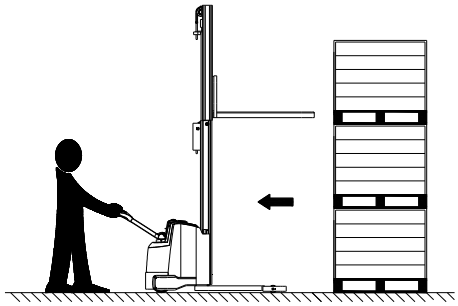
– Travel forward, put the load on the unloading position and then stop.



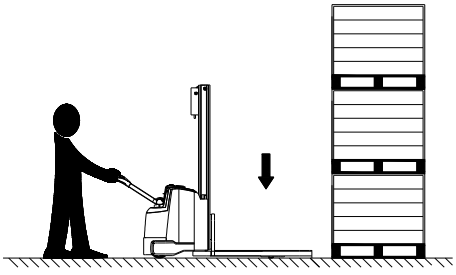
– Make sure the loads are right above, drop the forks slowly until the forks are out of the load.



– Travel backward and make the fork out of the load.



– Drop down the forks to proper position.



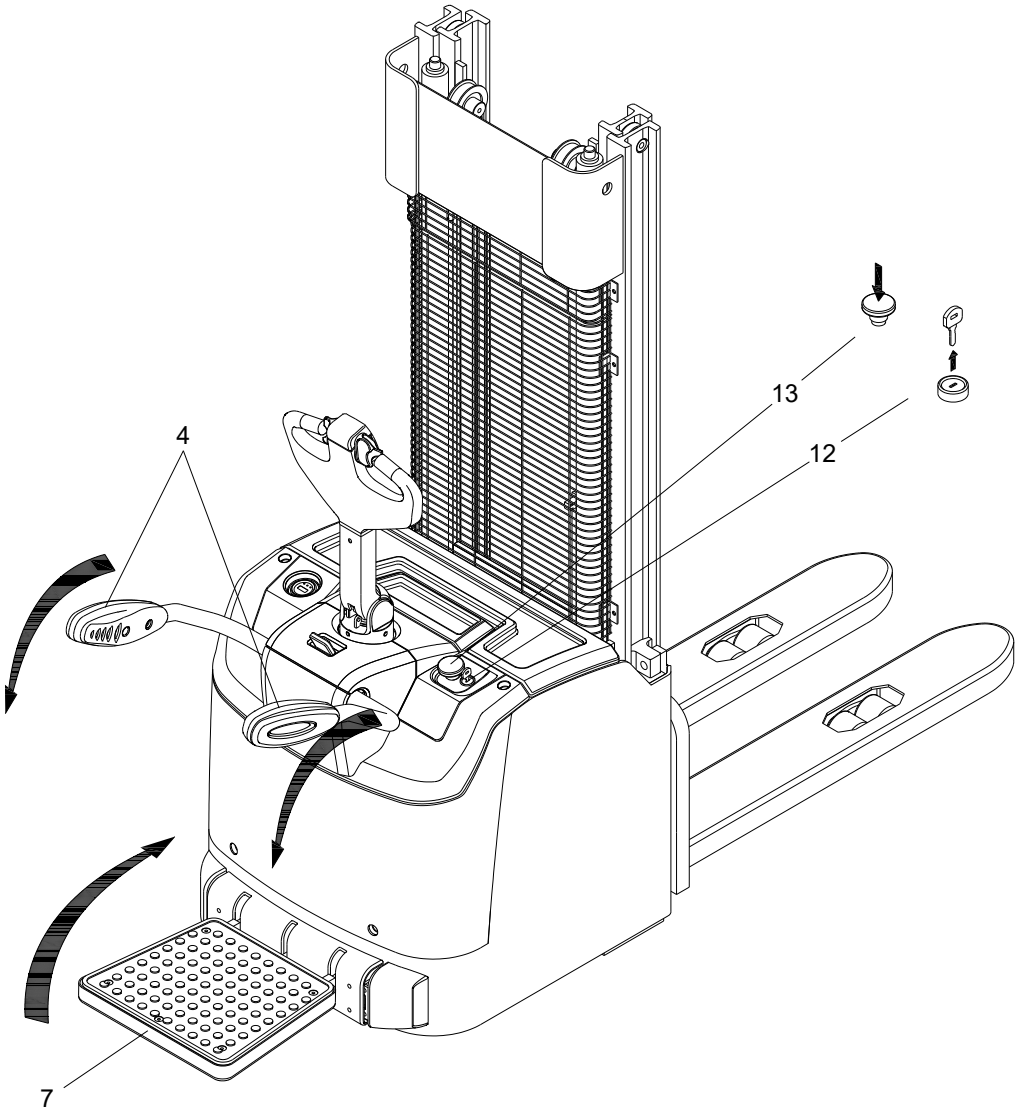
CAUTION

- **Hi-range models (with Triplex full free masts) need to lower the side protective armrests before lifting the mast when lifting above 1.8 meters**

6.9 Parking

Procedure:

- Drive the truck to safe area or appointed area.
- Fully lower the forks.
- Turn off the key switch(3), and remove the key.
- If park for long time, press the emergency disconnect switch(11) and take out the battery plug.



7 Deposit the truck

7.1 Deposit the truck for long time

- Fully check the truck, especially check the wheel damage.
- Check fluid oil and electrolyte for leakage.
- Apply lubrication grease.
- Check the joint face of cylinder piston rod for looseness, and if scratch on the piston rod surface. Apply anti-rust oil to piston rod or easily rusty axle.
- Cover the whole truck.
- Check specific gravity of electrolyte and liquid level once a month.
- Do equalizing charge to the battery once a month.

7.2 Start running after deposit for a long time

- Remove rust preventive oil on exposed parts.
- Clean impurity and water of the hydraulic oil tank.
- Recharge battery, fit on truck and connect.
- Carefully check before start. Inspect starting, travelling, slowing down, steering, braking and parking etc. function.

8 Maintenance

8.1 Maintenance general

- The forklift truck needs inspection and maintenance periodically, to make it in good working condition.
- Inspection and maintenance are usually ignored, you'd better find the problems early and solve it in time.
- Use authentic parts of Hangcha Group.
- Don't use different oil when changing or adding oil. Don't rave about oil and electrolyte used at will, and carry on handling according to the local environmental protection laws and regulations.
- Draw up complete maintenance plan.
- After you make maintenance, you'd better make a record.
- Forbid to repair the forklift truck if you haven't been trained.

CAUTION

- **No fire.**
- **You should shut off key switch and pull off the plug before service.（except some trouble shooting）.**
- **Clean the electric part with compress air, and do not with water.**
- **Do not stretch your hands, feet or any part of body into the gap between the lifting assembly.**
- **When the working environment is severe, maintain in advance.**

8.2 Periodic maintenance schedule

D= work every 8 hours(or per day)

W= work every 40 hours(or per week)

M= work every166 hours(or per month)

T= work every 500 hours(or 3 months)

S= work every 1000hours(or 6 months)

○ —Check, revise, adjust

× —Replace

Battery

Service item	Service required	Tools	D	W	M	T	S
Storage battery	Electrolyte level	Eyeballing		○	○	○	○
	Electrolyte proportion	Densimeter		○	○	○	○
	Battery quantity		○	○	○	○	○
	Terminal looseness		○	○	○	○	○
	Looseness of connecting wire		○	○	○	○	○
	Cleanness of the battery surface			○	○	○	○
	If there are tools on the battery		○	○	○	○	○
	The tightness and smoothness of air cap			○	○	○	○
	Far away from firing		○	○	○	○	○

Controller

Service item	Service required	Tools	D	W	M	T	S
Controller	Check wear condition of connector					○	○
	Check the running condition of contactor					○	○
	Check interlock inching switch for running			○	○	○	○
	Check the connection among motor, battery and power unit					○	○

Motor

Service item	Service required	Tools	D	W	M	T	S
DC motor	Clean the foreign body on the motor			○	○	○	○
	Clean or replace the bearing						○
	Check the carbon brush and commutater for worn, whether spring is normal				○	○or×	○or×
	Whether the connection is correct and firm.				○	○	○
	Brush carbon powder on shift plate and shift device.					○	○
AC motor	Clean the foreign body on the motor			○	○	○	○
	Clean or replace the bearing						○
	Check if there is abnormal vibration, noise, if pedestal is firm.				○	○or×	○or×
	Whether the connection is correct and firm.				○	○	○
	Check if the temperature or current is normal.				○		○

Driving system

Service item	Service required	Tools	D	W	M	T	S
Reduction box	Check for noise		○	○	○	○	○
	Check for leakage		○	○	○	○	○
	Add lubricating grease						Two years
Steering mechanism	Bearing lubrication			○	○	○	○
	Check if the steering flexible		○	○	○	○	○
	Check for noise		○	○	○	○	○
	Control handle swivel angle		○	○	○	○	○

Wheel（Drive wheel, auxiliary wheel, load wheel）

Service item	Service required	Tools	D	W	M	T	S
Wheel	Check for abrasion or cracks	Eyeballing	○	○	○	○	○
	Check for bolt fastening and re-tighten.			○	○	○	○
	Check if there is foreign body like rope on the wheel		○	○	○	○	○

Brake system

Service item	Service required	Tools	D	W	M	T	S
Brake inching switch	Check for brake condition when the control handle on horizontal position and vertical position.		○	○	○	○	○
	Check the inching switch for looseness or damage.				○	○	○
Electromagnetic brake	Check the installation for fastening.				○	○	○
	Check the surface abrasion for equality.					○	○
	Check if the clearance is proper and adjust, if necessary.					○	○
	Check the brake for flexibility and effective.		○	○	○	○	○

Hydraulic system

Service item	Service required	Tools	D	W	M	T	S
Hydraulic reservoir	Check for oil level, change oil		○	○	○	○	×
	Clean suction strainer						○
	Clean foreign matter						○
solenoid valve	Check for block, return spring stuck or damage				○	○	○
	Check for wiring looseness.				○	○	○
Safety valve	Check for oil leakage		○	○	○	○	○
	Check for safety valve operation condition.				○	○	○
	Measure safety valve pressure	Oil pressure gauge					○
Piping, joint	Check for oil leak, looseness, collapse, deformation and damage				○	○	○
	Replace hoses.						× 1-2years
Hydraulic pump	Check hydraulic pump for oil leakage or noise		○	○	○	○	○
	Check pump drive gear for wear						○
Lifting inching switch	Check for inching switch work condition.				○	○	○
	Check inching switch for looseness or damage.				○	○	○

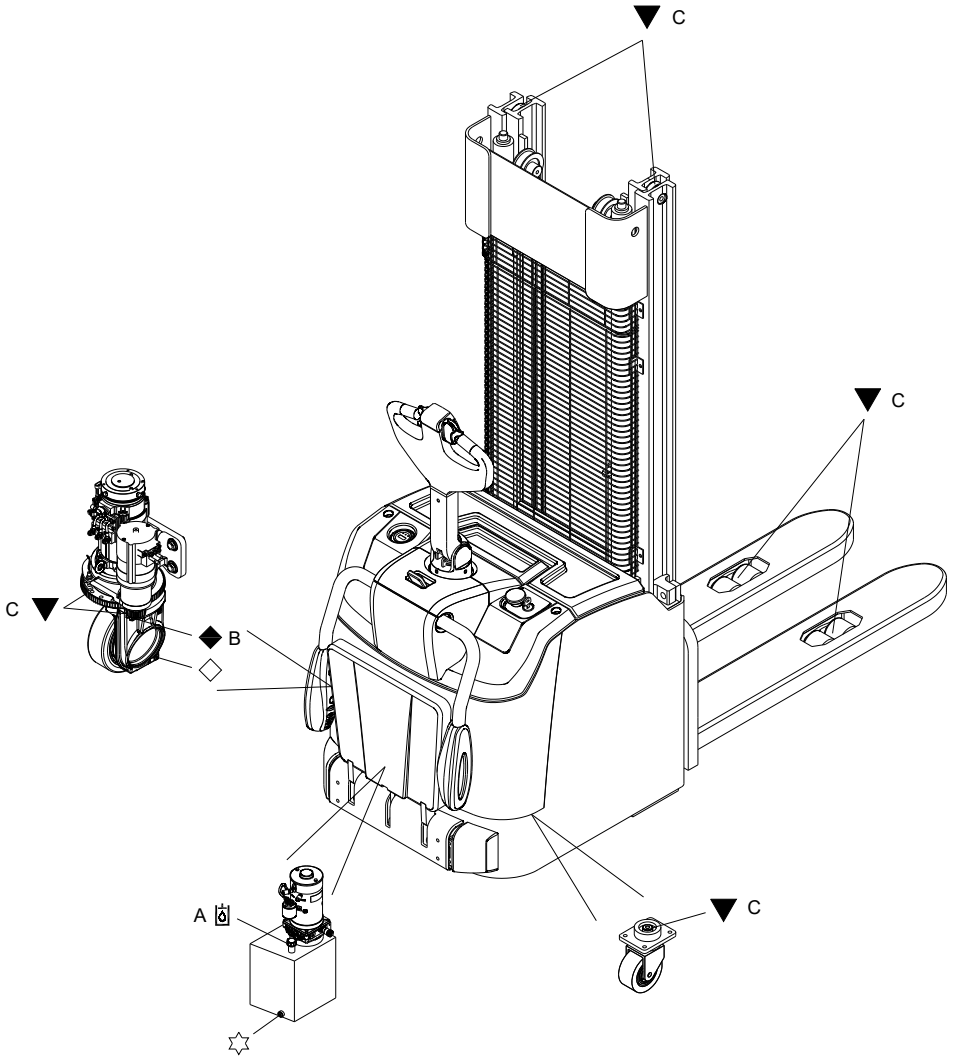
Lifting assembly

Service item	Service required	Tools	D	W	M	T	S
Chain & chain wheel	Check chain for tension, damage or rust		○	○	○	○	○
	Add lubrication for chains				○	○	○
	Check chain wheel for deformation or damage				○	○	○
	Check chain wheel bearing for looseness				○	○	○
	Pin shaft lubrication				○	○	○
Lifting cylinder	Check piston rod, rod screw and connection for looseness, deformation or damage	Test hammer	○	○	○	○	○
	Check for operation		○	○	○	○	○
	Check for oil leak		○	○	○	○	○
	Check lifting cylinder fixed bolt for looseness.					○	○
Mast & fork carriage	Check welded parts of beam and outer and inner masts for defective, cracks or damage				○	○	○
	Check outer and inner masts for defective weld, cracks or damage				○	○	○
	Check for defective weld, cracks or damage of fork carriage				○	○	○
	Check roller bearings for looseness				○	○	○
	Check rollers, roller pins and welded parts for cracks or damage				○	○	○
Fork	Check forks for damage, deformation or wear				○	○	○
	Check fork base and hook welding for defective cracks or wear				○	○	○

Others

Service item	Service required	Tools	D	W	M	T	S
Wire	Wire damage or looseness			○	○	○	○
	Looseness of circuit joint				○	○	○
Emergency disconnect switch	Check for work condition		○	○	○	○	○
Direction and speed control button	Check for work condition		○	○	○	○	○
Lifting, lowering switch	Check for work condition		○	○	○	○	○
Horn	Check for work and installation condition		○	○	○	○	○
Meters	Check meters for proper operation		○	○	○	○	○
Pedal(only for stand-on type)	Check the pedal if folded up and down normally.		○	○	○	○	○

8.3 Truck used oil and lubrication



Filler plug for hydraulic oil

Hydraulic oil drain plug.

Gear oil add plug

Gear oil drain plug

Lubrication part

Grease nipples

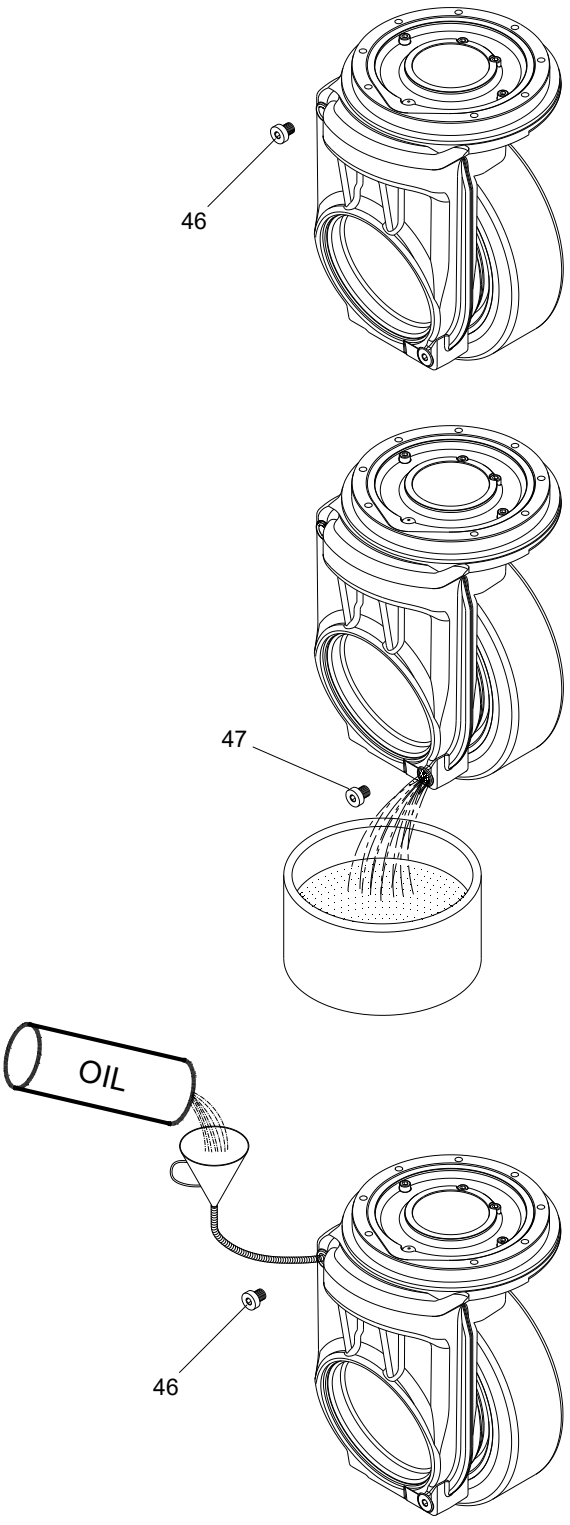
Code	Designation	Mark, code	Remark
A	Hydraulic oil	Normally：L- HM32 High and cold environment：L-HV32	Hydraulic system
B	Gear oil	GL-5 85W/90	Reduction box
C	Grease	Automobile general 3 # lithium base lubricant	Nozzle and lubrication

Replace gear oil

- Park the truck at level ground.
- Wipe off oil add and drain plug.
- Unscrew oil add plug（46）.
- Place an appropriate container under oil drain plug(47), unscrew oil drain plug(47), and drain the oil to the container.
- After oil in the reduction box drains, re-tighten the drain plug（47）.
- Add appointed gear oil（GL-5 85W/90）. In order to add oil easily, add with help of funnel and tube. When oil overflows from the oil filler, it means oil is enough.
- Re-tighten oil add plug(46), and clean the residual oil on the reduction box surface.

Warning

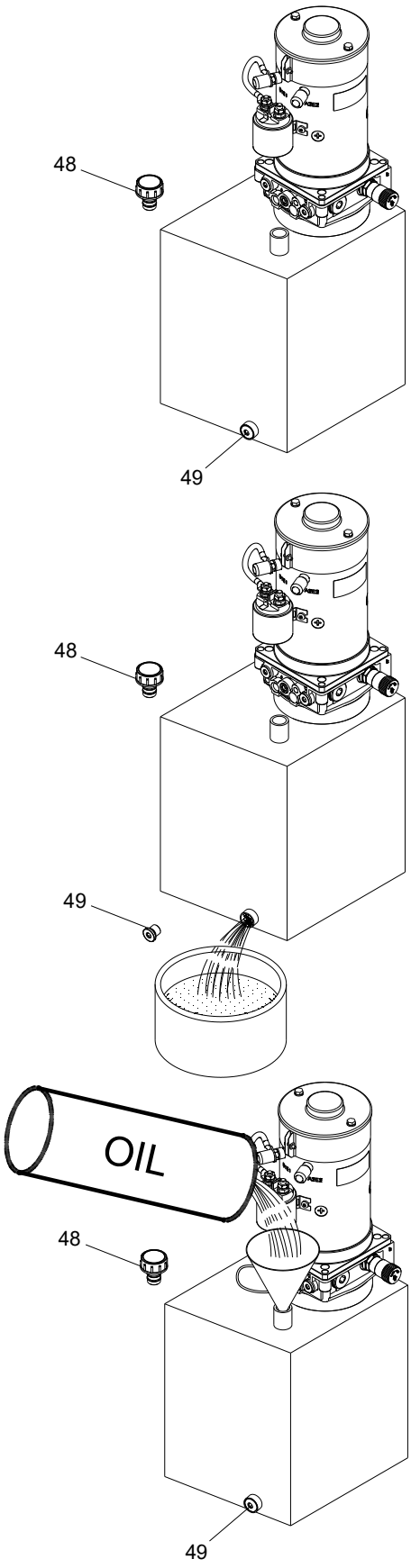
- **Handle the exhaust oil according to relevant rules of the state and never dump at will.**



Replace hydraulic oil

- Park the truck at level ground.
- Wipe off oil add and drain plug.
- Unscrew oil add plug（48）
- Place an appropriate container under oil drain plug(49), unscrew oil drain plug(49), and drain the oil to the container.
- After oil in the reduction box drains, re-tighten the drain plug（49）
- Add appointed gear oil（L- HM32）to allowable scale range. In order to add oil easily, add with help of funnel and tube.
- Re-tighten oil add plug(48), and clean the residual oil on the reduction box surface.

> **WARNING**
> - **Handle the exhaust oil according to relevant rules of the state and never dump at will.**



8.4 Replace the key safe parts periodically

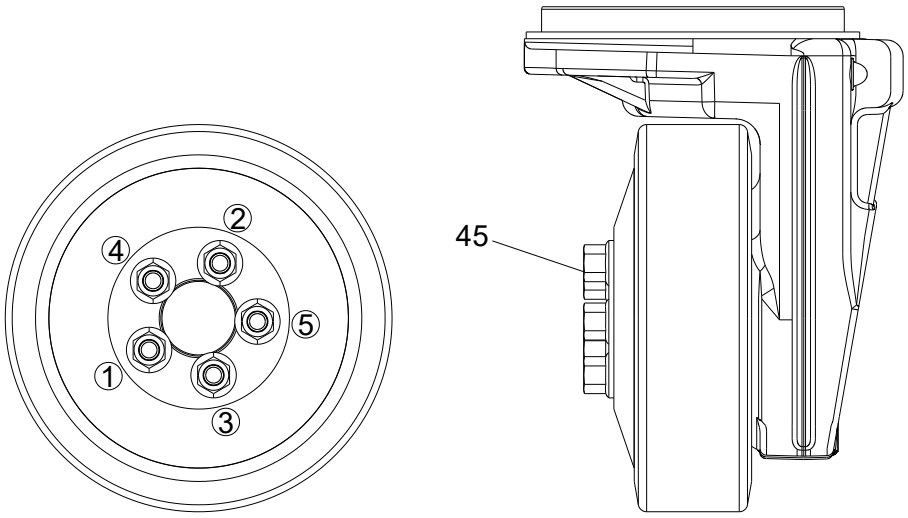
Users should replace the parts periodically according to the following table. If the part is abnormal before the replacing time, it should be replaced immediately.

Key safe part's description	Term of using (year)
Hydraulic hose for lifting system	1～2
High-pressure hose, hose for hydraulic system	2
Inner sealing element, rubber matter of the hydrulic system	2

8.5 Screw down the wheel retaining nut

Re-tighten the wheel retaining nut after break-in ends. Check and tighten wheel retaining nut periodically.

- Screw down the wheel retaining nut with torque spanner to specified order（45）.
- Screw down with 10N.m torque.
- Screw down with 80N.m torque.



8.6 Removing the hood

Procedure:

– Park the truck securely.

– Open the arm guard(4).Only for the stand on type

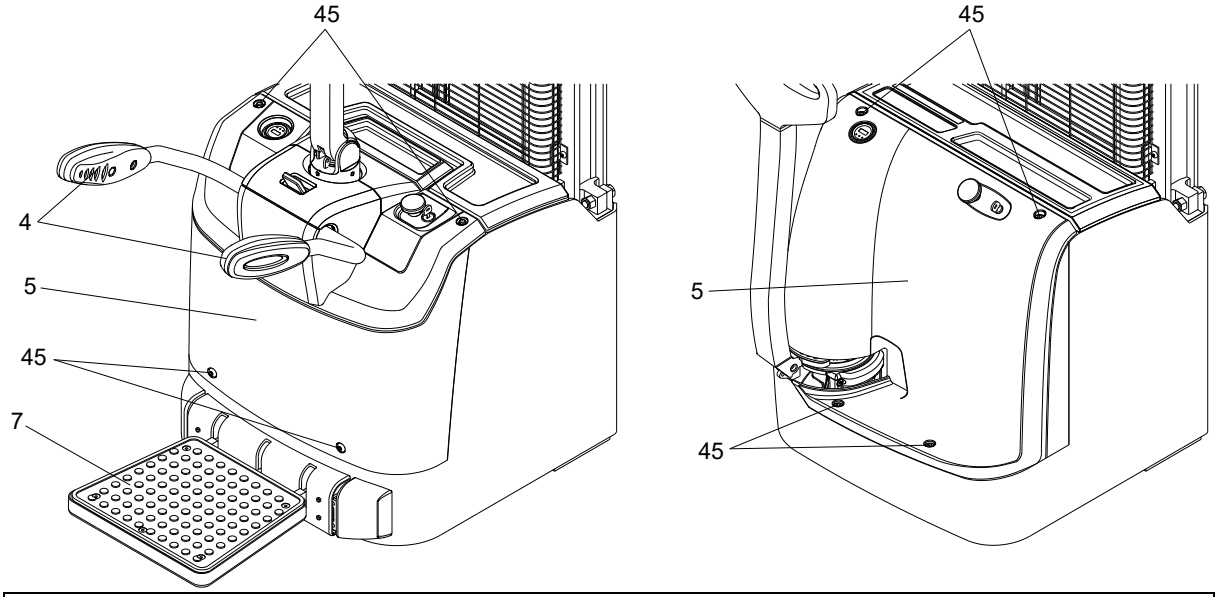
– Put down the folding pedal (7).Only for the stand on type

– Undo the four groups of bolts(45)on the panel(5)with a wrench.

– Lift the hood(5),remove it from the truck and place it securely next to the truck.

The panel is now disasdembled.

Instead of the installation sequence and disassembly sequence.



Warning

- **When hood was removed, Prohibited operating forklift .**
- **When hood was removed, before the repair, must to discharge (such as controller) energy storage components.**

8.7 Remove the fence

Procedure:

– Park the truck securely.

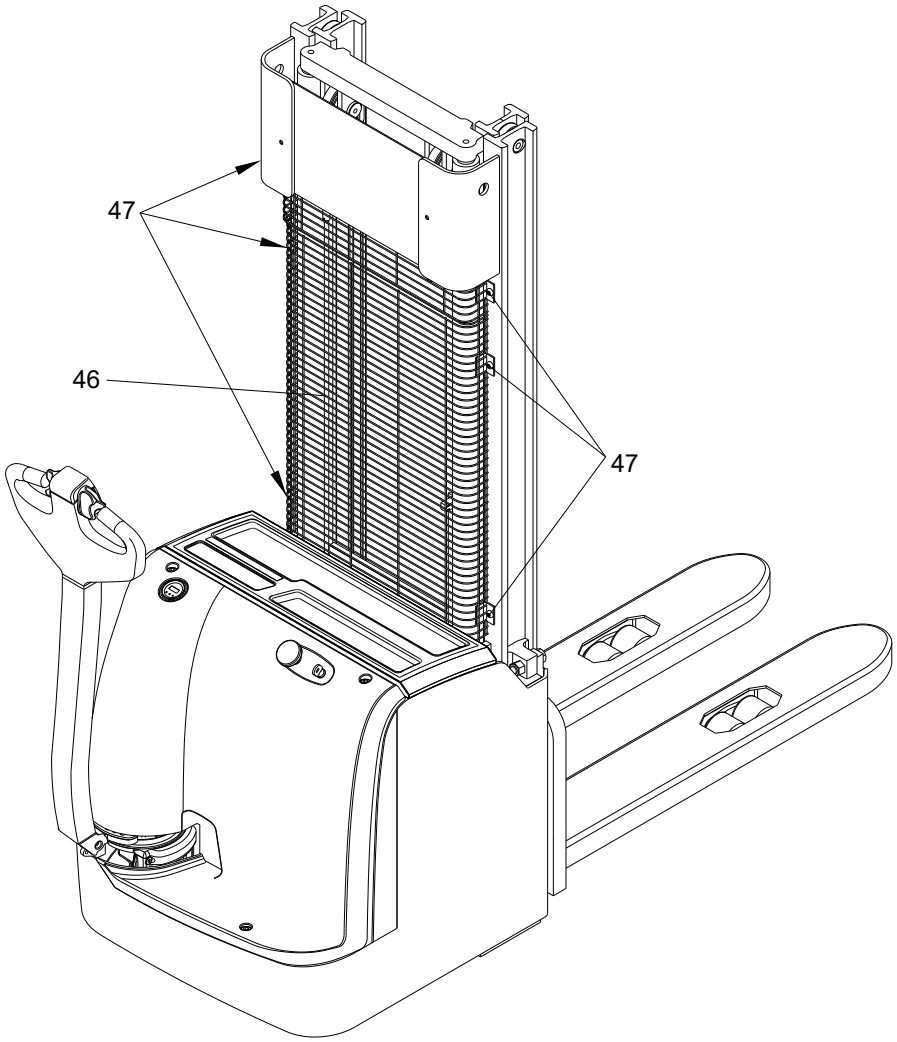
– Undo the six groups of screws(47) on the fence(46) with a wrench.

– Lift the fence(46),remove it from the truck and place it securely next to the truck.

The fence(46) is now disasdembled.

Instead of the installation sequence and disassembly sequence.

> **WARNING**
>
> - **When the fence removed, there is a risk of trapping when mast extended. It is forbidden to any parts of the body reach through the mast.**

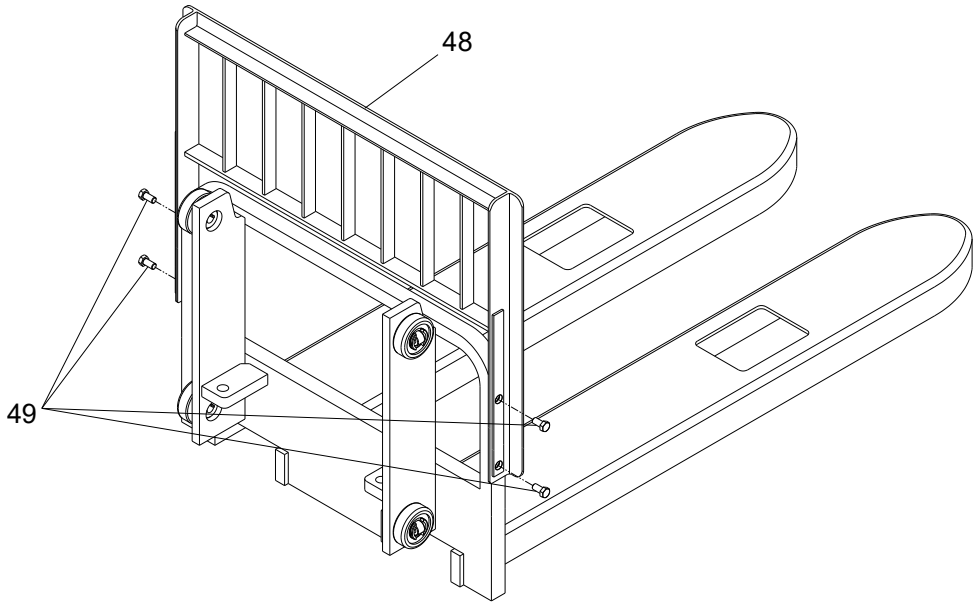


8.8 The installation of the load backrest

The electric stacker without load backrest,but with four installed threaded hole. If you want to install load backrest(48), only need to use four composite bolt(49) and tighten.

WARNING

- **Install retaining load backrest clamp hand danger. Be careful.**



9 Relevant safety directive or standard (CE)

After CE certificated, the truck meets the following directive and standard:

- 2006/42/EC machinery directive（namely *Directive of the council of the laws of the member states concerning machinery*）, 2000/14/EC Noise Directive（Namely *Directive of the council of the laws of the member states concerning noise radiation of outdoor equipment*）;
- EN ISO3691-1:2015 *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

  EN16307-1:2013+A1:2015 (I*ndustrial trucks. Safety requirements and verification. Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*)
- EN1175-1:1998+A1:2010 *Safety of industrial trucks - Electrical requirements - Part 1: General requirements for battery powered trucks*, EN1726-1:199 *Safety standard for machinery industrial vehicle*, EN1757-2:2001 harmonized standard;
- Main safety elements are in accordance with 2006/42/EC machinery directive as well as EN1175-1:1998+A1:2010, EN1726-1:1998, EN1757-2:2001 standard;

Electronic components design and manufacture meet low-voltage apparatus directive 2006/95/EC;

Noise is calculated according to EN12053:2001+A1:2008：pallet truck noise, sound pressure value

Lifting: right ear73.4dB, left ear72.5dB

Going forward: right ear72.4dB, left ear71.5dB

- Vibration data are according to the EN13059:2002+A1:2008 *Safety of industrial trucks - Test methods for measuring vibration*, determined by ISO5349-2:2001, ISO2631-1:1997standard, meet 2002/44/EC directive：handle vibration amplitude is 0.2977m/s^2.
- Electromagnetic compatibility is calculated according to EN12895:2000 and meet 2004/108/EC directive.

DECLARATION OF CONFORMITY
EG-KONFORMITÄTSERKLÄRUNG

Business name of the manufacturer: *Hangcha Group Co., Ltd.*
Firmenbezeichnung des Herstellers:

Full address of the manufacturer: *88 Donghuan Road, Lin'an Economic Development Zone, Zhejiang 311305, P. R. China*
Vollständige Adresse des Herstellers:

Name and address of the person (established in the Community) compiled the technical file:
Name und Adresse der Person (innerhalb der Gemeinschaft), die das technische Datenblatt erstellt hat
Saamuk Lift Truck Ltd.
Toddington, Bedfordshire, LU56HJ, UK. Tel: 0044-1525-877700

We declare that the machinery
Wir erklären hiermit, dass die Maschine

product name: *Electric Stacker*
Produktbezeichnung:

commercial name:
Handelsbezeichnung:

function:
Funktion:

model: *CDD12/14/16/20-AC1, CDD12/14/16/20-AC1S, CDD12/14/16/20-AZ3, CDD12/14/16/20-AZ3S*
Modell:

type:
Typ:

serial number: *above mentioned products*
Seriennummer:

fulfills all the relevant provisions of Directives
entspricht allen relevanten Anforderungen folgender Richtlinien

2006/42/EC

tested in accordance with below standards
wurde gemäß folgender Normen geprüft

EN ISO 3691-1:2015
EN 16307-1:2013+A1:2015
EN 1175-1:1998+A1:2010

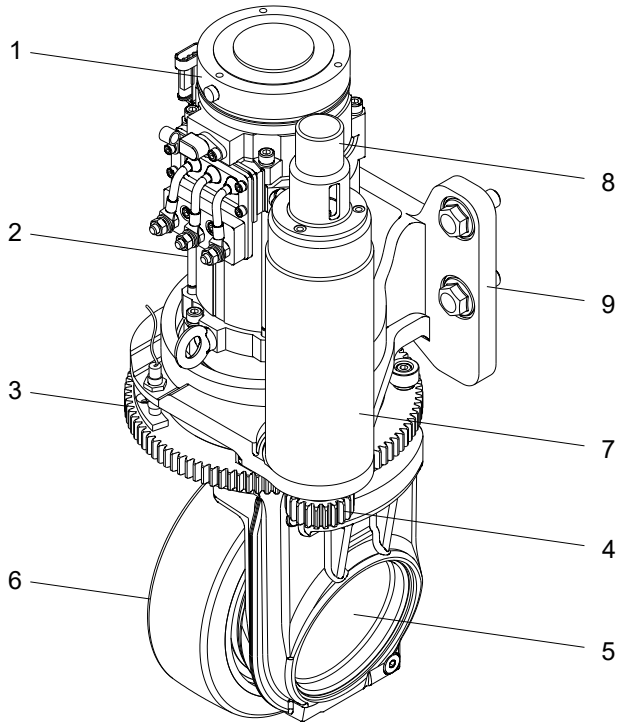
place and date of the declaration: *Hangzhou, 2016.04.09*
Ausstellungsort und Datum der Erklärung

signature of the person:
Unterschrift des Ausstellers

Part Ⅱ：Structure, Principle and Maintenance

1 Drive system

Drive system is vertically arranged and rigid coupled with the frame. Drive system is mainly consisted of drive seat, reduction box, drive wheel, drive motor and electromagnetic brake etc..

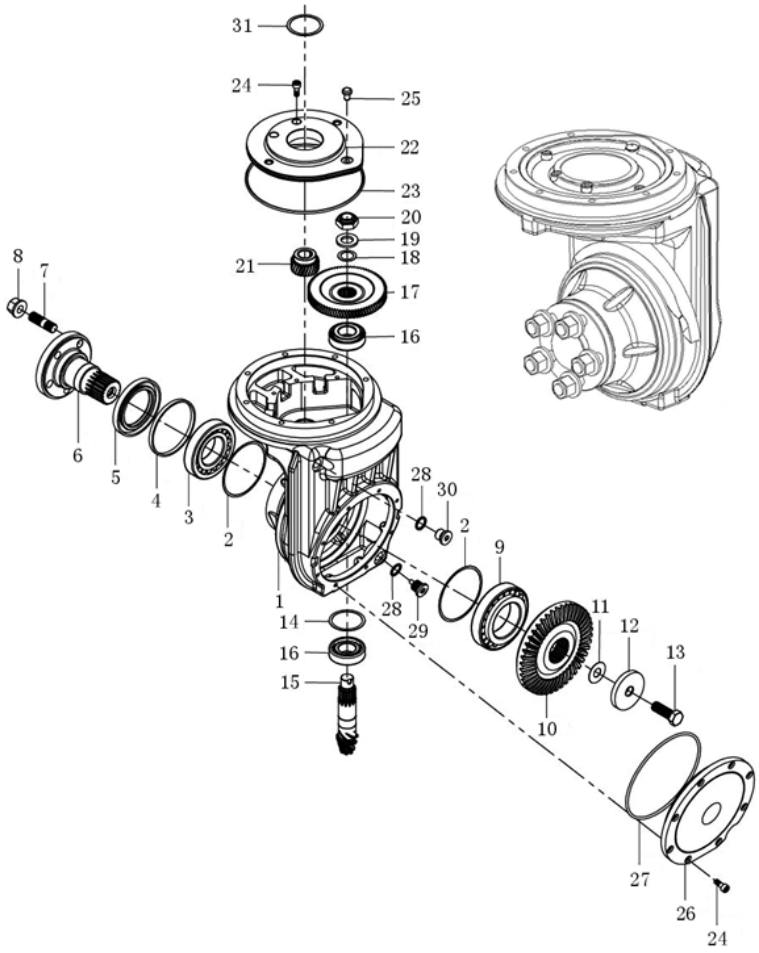


1. Electromagnetic brake
2. Drive motor
3. Steering gear wheel（only for electric steering）
4. Steering pinion（only for electric steering）
5. Reduction box
6. Drive wheel
7. Steering motor（only for electric steering）
8. Encoder
9. Drive seat

Fig. 2-1 Drive diagram of drive unit

1.1 Reduction box

The truck used reduction box, light and controllable vehicle driving device, which adopts two grades reduce speed gear, namely grade-one cylindrical gear and grade-two spiral bevel gear. This reduction gear box owns traits like small size, light weight, large transmission ratio, small radius of gyration, high efficient and simple structure, which enables turn on site and equip with motor vertically that cause the radius of gyration on the carriage is small. Moreover, this reduction gear box does not need to shift, but realize direction shift (forward or reverse) directly by motor positive inversion, and is easy to use and maintain.

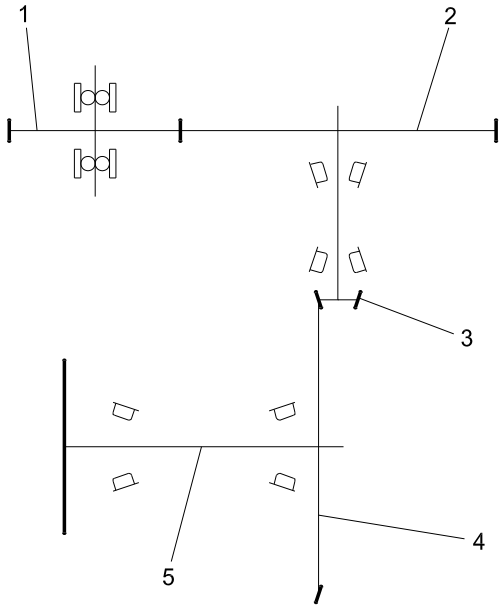


1. Housing	12.Gasket	22.Connection tray
2. Adjusting shim	13.Hexagon bolt	23.O-ring
3. Tapered roller bearing	14. Adjusting shim	24.Hexagonal socket cap screw
4. Gasket	15. Driving spiral bevel	25.Air plug assembly
5. Oil seal	gear	26.Cover plate
6. Connecting flange	16. Tapered roller bearing	27.O-ring
7. Stud	17.Driven gear	28.Sealer
8. Hexagon nuts with flange	18. Adjusting shim	29. Magnetic plug
9. Tapered roller bearing	19.Gasket	30. Hexagonal socket head plug
10. Driven spiral bevel gear	20.Nut	31. O-ring
11.Adjusting shim	21.Driving gear	

Fig.2-1 Structure diagram of reduction box

1.1.1 Working principle

Simple figure of reduction box is as Fig.2-1, motor driving gear 1 drives driven gear 2, driven gear 2 drives driving spiral bevel gear 3 to transfer to driven spiral bevel gear 4, then the driven spiral bevel gear 4 drives the output of output flange 5. Power transmission order is that 1(driving motor), 2(driving gear), 3(driven gear), 4(gear shaft), 5(annual gear) drive the wheel output. Moreover, this reduction box does not need to shift, but realize direction shift (forward or reverse) directly by motor positive inversion, and is easy to use and maintain.



1. Driving gear(pinion gear)
2. Driven gear
3. Driving spiral bevel gear
4. Driven spiral bevel gear
5. Output flange

Fig.2-1 Drive picture of reduction box

1.1.2 Dismount and assemble order

Dismount and disassemble the reduction box according to the following order:

- Dismantle driving wheel (wheels);
- Open oil discharging bolt and discharge the oil;
- Disassemble swing bearing and top shell articles;
- Disassemble driven cylindrical gear
- Open the cover, disassemble driven spiral bevel gear and output flange etc.

1.1.3 Notice to installment and use

- Before installing, you should wipe the oil on the surface of the shell.
- In case that the oil leaks during use, you are not allowed to dismount and disassemble the product.
- Prevent the assembling surface and exposed flange from being knocked or damaged, otherwise it may influence the installment and use precision.
- Working oil should keep clean, the new machine should change new oil in 50 hours for the first use and every 1000 hours later.
- Working oil should in accordance with brand no.（GL-5 85W/90）.

1.1.4 Fault and troubleshooting

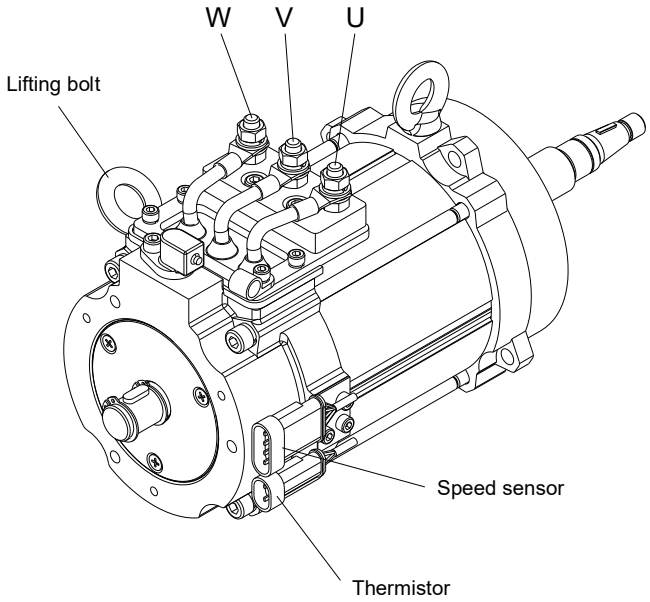
Fault	Probably cause	Method of Fault eliminating
Low efficient transmission and overheat oil temperature	① Lack of oil	Add oil
	② Quantity of the oil is ineligible	Replace
	③ Gear or bearing is damaged	Replace
Unstable running	①Gear or bearing is damaged	Replace
Oil leakage	① Wear or damage of oil seal	Replace
	②Leakage from the gasket	Screw bolt or replace

1.2 Motor

Traction motor

Traction motor is three phase AC motor, maintenance-free, but needs periodical check and clean. When tighten the upper nut on the wiring board, lock the lower nut to avoid looseness, and the suggested tightening torque is T=10.2～12.4N.m.

Rated power kW	Rated voltage V	Rated current A	Max. current A	Rated speed r/min	Insulation grade	Frequency Hz	Quota min	Temp. ℃	Remark
1.5	16	90	170	2295	H	79.6	S2-60	40	Pedestrian
2.2	16	125	235	2985	H	103	S2-60	40	Stand-on



Steering motor

DC steering motor is permanent magnet brush motor with planetary reduction box.

①Output shaft
②Output shaft bearing
③Annular gear
④Second stage planet gear
⑤Split type planet carrier
⑥First stage planet gear
⑦Motor shaft
⑧Motor shaft bearing
⑨Motor housing
⑩Motor stator
⑪Motor rotor
⑫Motor rear cover

Technical parameter

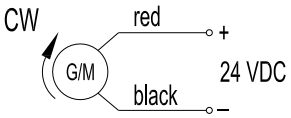
Rated power kW	Rated voltage V	Rated current A	Rated speed r/min	Brush service life h	Rated torque N.m	Quota min	Insulation grade	Protection grade	Temperature ℃
0.2	24	13	3300	2000	0.562	S2-10	B	IP20	-10～40

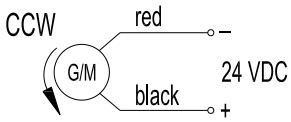
Motor wiring and direction of rotation

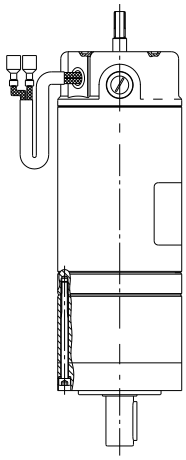
Check motor turn from motor output shaft：

Red outgoing line connects power positive, black outgoing line connects power negative, output shaft rotates in clockwise.

Red outgoing line connects power negative, black outgoing line connects positive power, output shaft rotates in counterclockwise.



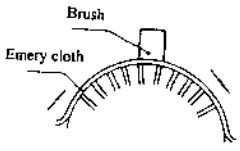




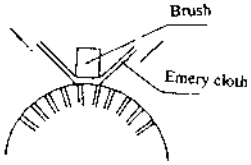
CORRECT

Replace brush

Brush service life is 2000hrs. When replace brush, use “00” thin emery cloth to burnishing it. During burnishing you can haul the emery cloth leftward or rightward. After burnish the brush and clean the commutator with emery cloth, the motor with load should run with low voltage and limited speed, in order for safety, till the brush’s working face is shined.



WRONG

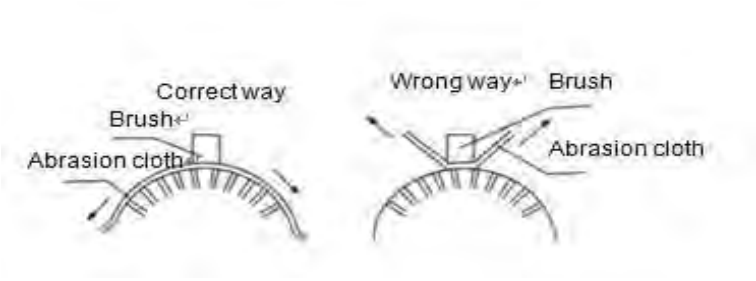


Motor use notice

- Parts of stator have been adjusted; users mustn't unpack and adjust randomly.
- Keep clean and dry around the motor, place no other material on its inner or outer.
- Wipe off the sand and other adhesion on the housing in order not to affect heat dissipation.
- It's prohibited to use with overload.
- It's prohibited to coexist with strong magnetic object.
- Make sure the correct of input voltage grade.
- If there is abnormal odor in use, park to check immediately.
- The cabling between motor and controller should be as short as possible.
- During motor travelling, if there happen electric leakage, speed drops suddenly, severely vibrate, too hot with smoke, or electric contact sparking smoke, turn off the power immediately for check.
- Often check if the motor over heats.
- Often check motor wiring contact screw for looseness, sparking smoke or insulation aging.

Replace brush：

Brush service life is 2000hrs. When replace brush, use "00" thin emery cloth to burnishing it. During burnishing you can haul the emery cloth leftward or rightward. After burnish the brush and clean the commutator with emery cloth, the motor with load should run with low voltage and limited speed, in order for safety, till the brush's working face is shined.



AC Motor fault diagnosis

Fault	Probable cause
After power is on, the motor does not rotate, but without noise, odor or smoke.	①Power is not on(at least two phase off)
	②Fuse fusing(at least two phase fusing)
	③Overcurrent relay adjusts too small
	④Wiring error of control equipment
After power is on, the motor does not rotate and fuse burnout.	①Lack one phase power, or reverse connection of stator coil one phase
	②Short circuit of stator winding
	③Grounding of stator winding
	④Wiring error of stator winding
	⑤Fuse section too small.
After power is on, the motor does not rotate but with buzzing noise.	①Open circuit of stator, rotor winding(one phase disconnection) or one phase power is off.
	②Start and end of the winding outgoing line wrongly connect or internal winding oppositely connect.
	③Power return contact loosens and contact resistance is large.
	④Motor load too large or rotator locks.
	⑤Power voltage too low.
	⑥Small motor assembles too tight or bearing grease too hard.
	⑦Bearing seizing-up.
Motor starts hard, and the motor speed is much lower than rated speed with rated load.	①Power voltage too low.
	②△Motor wrongly connected to Y
	③Cage rotor open weld or crack
	④Local coil of stator and rotor wrongly or oppositely connected.
	⑤Add too much number of windings when repair motor winding.
	⑥Motor overload.
Current is unbalance when motor without load and three phases differ a lot.	①When rewind, numbers of stator three-phase winding is not equal.
	②Two ends of winding wrongly connected
	③Unbalance power voltage.
	④There is interturn short circuit or coil oppositely connected in the winding.
Motor without load, while loaded, ammeter indicator is unstable and swings.	①Guide bar of cage rotor open weld or crack
	②Wound rotor fault(one phase open circuit) or bad brush and collecting ring short circuiting device contact.

Fault	Probable cause
Motor without load, current is balance, but the value is large	①Reduce too much number of stator windings when repair motor winding.
	②Power voltage too high.
	③Y connected motor wrongly connect to Δ
	④During motor assemble, rotor oppositely connects, make stator core unaligned, effective length shortens.
	⑤Air gap over large or uneven.
	⑥When remove old winding for overhaul, use improper way that burn the iron core.
Abnormal noise when motor runs	①Insulation paper of rotor and stator or slot wedge rubs.
	②There is foreign body as sand in oil or bearing wear.
	③Stator and rotor core loosen.
	④Bearing lack oil.
	⑤Air duct stuffing or fan rubs the fan housing.
	⑥Stator and rotor core rub.
	⑦Power voltage too high or imbalance.
	⑧Wrongly stator winding or short circuit.
Big motor vibration during running	①Too big wear bearing clearance
	②Uneven air gap
	③Rotor imbalance
	④Revolving shaft bend.
	⑤Iron core deforms or loosens.
	⑥Housing or basic capacity is insufficient.
	⑦Motor foot screw loosen
	⑧Open circuit of cage rotor open welding, open circuit of wound rotor, or winding fault with stator.
Bearing overheat.	①Over much or few grease
	②Bad oil quantity and contains impurity.
	③Mismatch between bearing and journal or end cap(too loose or too tight)
	④Eccentricity of bearing bore, rub with the axle.
	⑤Motor end cap or bearing cap not even assembled
	⑥Coupling between motor and load not adjust
	⑦Too large or too small bearing clearance
	⑧Motor axle bend.
Motor overheating or smoking	①Too high power voltage, greatly increase the core heating.

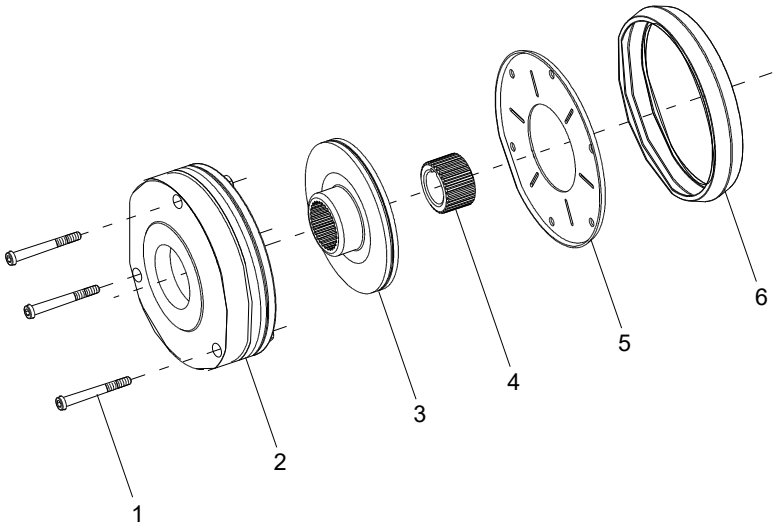
Fault	Probable cause
	②Too low power voltage, the motor drives rated load, over large current heats the winding.
Motor overheating or smoking	③When remove winding for overhaul, use improper way that burn the iron core.
	④Rotor and stator core rub.
	⑤Motor overloads or start up frequently.
	⑥Cage rotor break.
	⑦Motor lacks phase, two phases run.
	⑧After rewinding, dipping paint of stator winding is improper.
	⑨In high temperature, much dirt on the motor surface or ventilation duct block.

DC Motor fault diagnosis

Fault	Probable cause	Correctives
Large spark	Small brush contact surface	Grind brush
	Over brush wear	Replace new brush
	Oil stain on commutator surface	Clean commutator surface
	Commutator decentration or commutator segment extrusion	Process commutator outer circle
	Motor overload	Motor overload
	Large mechanical vibration	Eliminate vibration source
	The welding of armature coils is not good or open weld	Repair welding
	Short circuit armature coils or commutator segment	Eliminate short circuit.
Abnormal speed	Large loading moment	Reduce loading moment
	Brush is not in neutral position	Adjust brush to neutral position
Coil overheat	Overload run	Reduce overload
	Armature coils short circuit	Eliminate short circuit and reinforce insulation
Large vibration	Basis unstable or motor fixed on the basis unstable	Reinforce basis firmness and fix the motor.
	Decentraction of axis	Adjust concentricity
	Armature imbalance	Re-adjust armature balance
	Overload or overspeed	Reduce loading moment or reduce speed

1.3 Electromagnetic brake

The adopted brake of this truck is spring weighted electromagnetic brake. This brake is one-chip brake, owns two friction surfaces. It can generate strong brake torque through compressed spring in the state of power off, and electromagnetic induction realizes brake release.

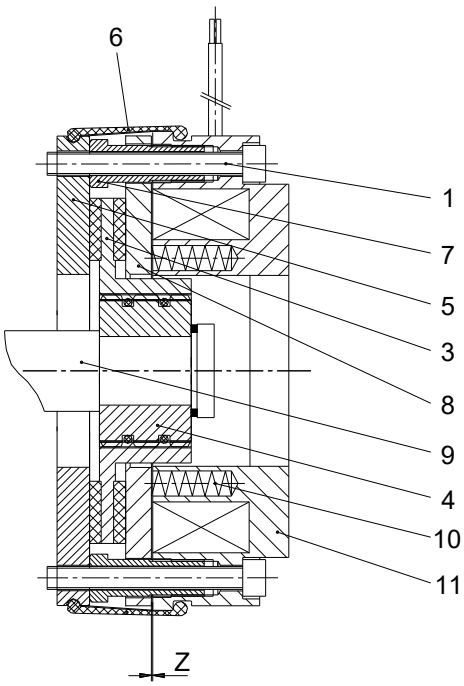


1. Mounting screw 2.Stator
3. Friction disk assembly 4.Shaftsleeve
5. Friction disk 6.Dust cover

Fig. 2-1 Parts of electromagnetic brake

1.3.1 Working principle

Shaft(9) connects shaft sleeve(4)through flat key; shaft sleeve(4) connects friction disk assembly(3) through spline. When the stator (11) is off power, spring (10) generated force works on the armature(8), friction disk assembly(3) that drives the shaft(9) to rotate, grips between armature(8) and friction disk(5), thus generates braking torque. For this moment, there will be a gap “Z” between armature(8) and friction disk assembly(3) . When need to release the brake, stator(11) connects the DC, then the generated magnetic field draws the armature(8) move to the stator(11), spring(10) is compressed when armature(8) moves, at this time, friction disk assembly (3) is loosened, brake is released.



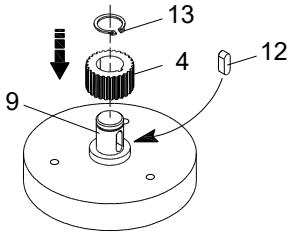
1. Mounting screw
3. Friction disk assembly
4. Shaft sleeve
5. Friction disk
6. Dust cover
7. Hollow screw
8. Armature
9. Motor shaft
10. Spring
11. Stator

Z. Air gap

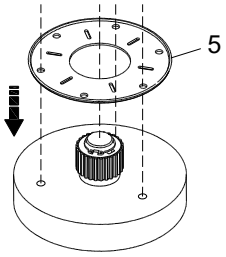
Fig.2-5 Structure chart of electromagnetic brake

1.3.2 Brake installment

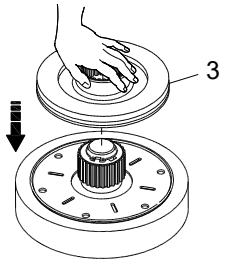
– Place flat key(12) to the key groove of motor shaft(9), press shaft sleeve(4) to the shaft(9), and fix with inner snap ring(13).



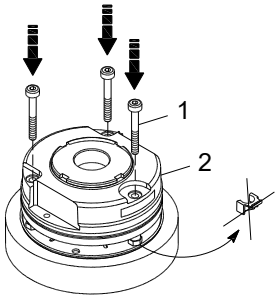
– Place friction disc(5) on the end face of motor.



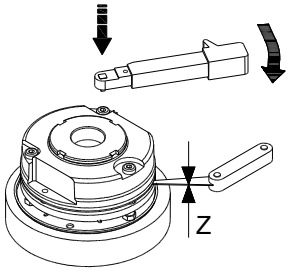
– Cover friction brake disc(3) to the shaft sleeve.



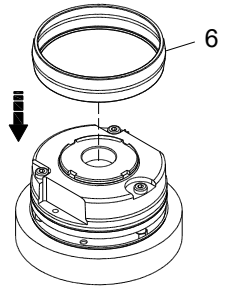
– Install stator module(2) and three mounting screws(1). Note: remove three fixed rubber gasket on the stator module(2) before install.



– Screw down three mounting screws(1) with spanner, and check air gap ”Z”.



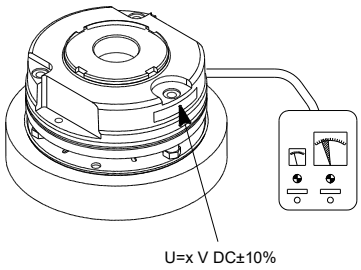
– Put dust cover（6）.

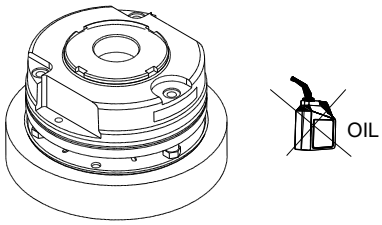


– Connect brake wiring.

WARNING

- **No damage on the outer of wire to avoid circuit damage.**
- **Never process the locating face and hold of the product to avoid magnetic return path.**
- **Mount on the motor shaft lightly, no damage the friction surface, get rid of burr from mounting hold and face, install shaft sleeve on the shaft, and fix with snap spring.**
- **Measure brake connected DC voltage and compare it with the voltage given on the nameplate. Deviation within 10% is allowable.**
- **During brake install and use, do not stain oil.**





1.3.3 Brake air gap adjustment

Rated air gap ”Z” will be large for wear. Make sure the brake get enough brake torque, readjust air gap before the air gap reach the largest air gap value. Air gap can be adjusted repeatedly, when the thickness of friction braking plate reaches the allowable minimum thickness (refer to specification table), replace the friction disk assembly.

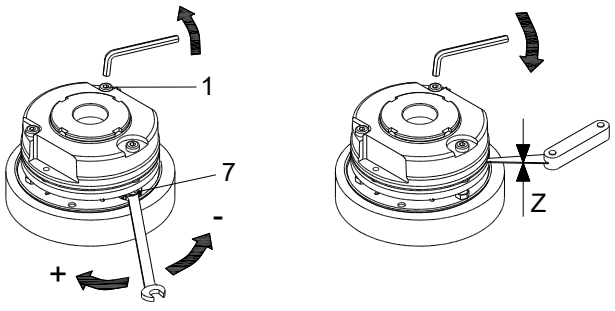
When the air gas exceeds maximum air gas value, it may cause the brake unable to release, friction braking plate burn out, braking force or retentivity decreases, noises increase, or even cause severe accident. So it needs periodic check and re-adjust the air gap, and it must cut off the truck general power.

Specifications

Rated torque	Rated power	Rated air gap	Max. air gap	Rotor min. thickness	Tightening torque of mounting screw
16 N.m	30 W	0.2 mm	0.5 mm	8.1mm	9.0 N.m

When the brake is off power, adjust three hollow screw(7), with the help of feeler gauge, adjust the air gap between armature and friction plate to rated value “Z”, ensure that air gap of each direction is the same. Here follows the adjusting procedure:

- Screw off three mounting screws（1）.
- Rotate three hollow screws(7) with spanner in clockwise.
- Screw down three mounting screws（1）.
- Use feeler gauge to check if air gap ”Z” is rated air gap value. Repeatedly adjust “Z” to specified value.



In general working condition, the first air gap adjustment should proceed after brake working for 1500～2000hours, frequency of air gap adjustment is every 6 months. In severe working condition, like frequently brake, repeatedly sudden brake, the first adjustment can be shortened and adjust the interval.

1.3.4 Maintenance

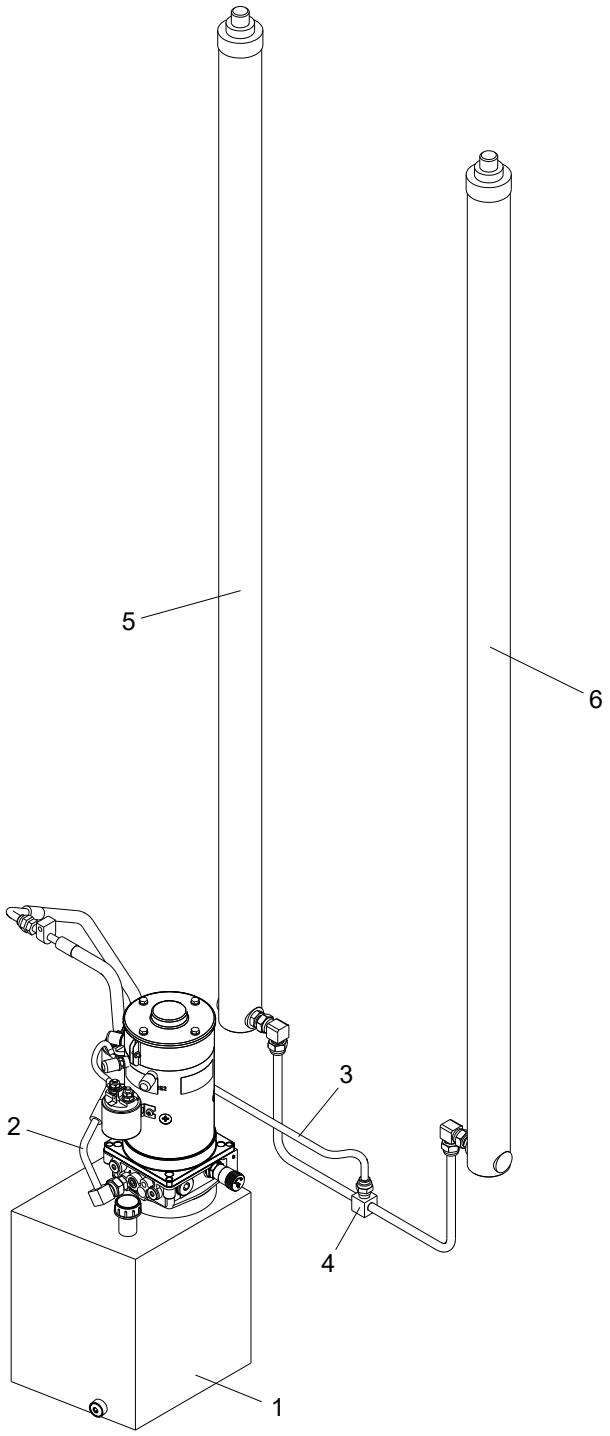
- If work in high temperature environment for long time, please prevent rust, it may influence use if there is rust on the suction surface.
- Do not touch the friction surface with hand, no oil stain, otherwise it cannot reach the maximum torque.
- General use environment temperature is -10℃～+40℃.
- Please check periodically, and the check item : if the switch motion is normal; if there is noise; if there is abnormal heating; if any impurity, oil stain mixed into friction part or rotating part; if clearance of friction part is proper, exciting voltage normal.

1.3.5 Common fault and troubleshooting

Fault	Probable cause	Corrective action
Brake does not work	Power is obstructed	Connect
	Too low exciting voltage	Check voltage and adjust.
	Improper air gap	Adjust air gap
	Stator coil breaks	Replace stator
	Oil dirt mixed in	Clean oil dirt
Long brake time	Switch installed to AC circuit	Install the switch to the DC circuit after rectifying
	Improper air gap	Adjust air gap
	Oil dirt mixed in	Clean oil dirt
Slipping	Unstable operation in previous	Running-in for a while
	Oil dirt mixed in	Clean oil dirt
	Large load	Reduce load or replace large specification
	Large load change	Adjust load peak or large the specification
High temperature	Too high exciting voltage	Check voltage and adjust.
	Clutch or motor interfere to the brake	Check control circuit, eliminate interference
	High environment temperature	Set ventilation
	High operating frequency	Adjust to proper frequency
	Over large load	Reduce load
Large noise	Product service environment needs silence	Silence design
	Impurity mixed in.	Clear away the impurity
	Bad mounting	Replace mounting surface or shaft
	Large rotational inertia or dynamic unbalance value	Reduce rotational inertia or dynamic unbalance value

2 Hydraulic system

Hydraulic system is mainly composed of hydraulic unit, lifting cylinder and rubber tube etc.



1. Hydraulic unit
2. Rubber tube assembly
3. Rubber tube assembly
4. Pipeline assembly
5. Left lifting cylinder
6. Right lifting cylinder

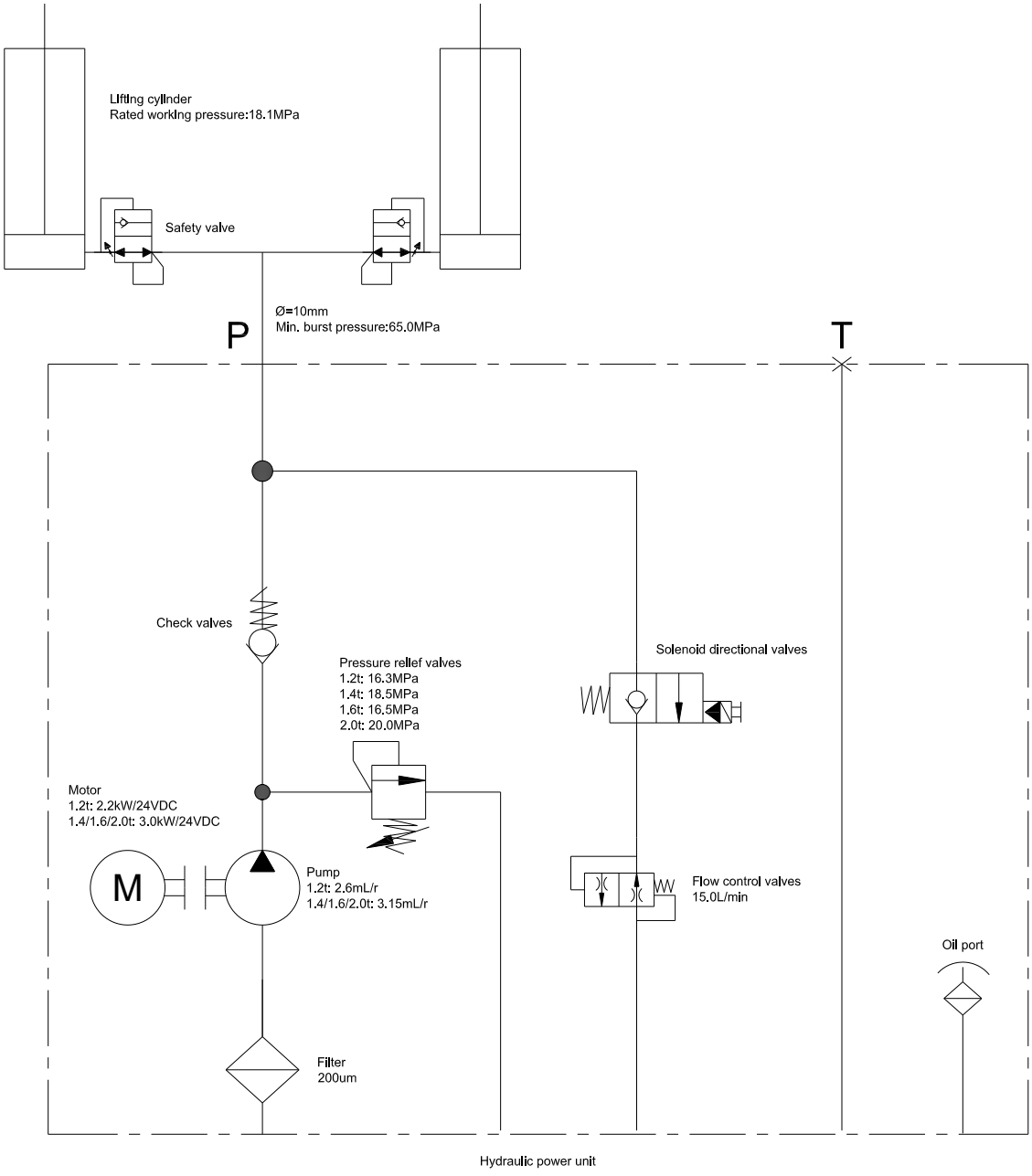
Fig. 2-1 Hydraulic system

2.1 Hydraulic system working principle

Brief introduction to the working principle of hydraulic system：

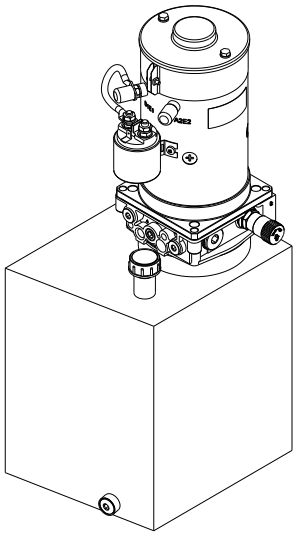
When press the lifting button of the control handle, lifting motor works, drive the hydraulic pump through coupling device, hydraulic oil enters lifting cylinder through one-way valve, and forks lift.

When press the lowering button of the control handle, lifting motor does not rotate, the solenoid valve open by this time, hydraulic oil in the lifting cylinder through solenoid valve and governor valve returns to the oil tank, and the forks drop.



2.2 Hydraulic unit

The truck adopts combined hydraulic unit, and is composed of DC motor, relay, coupling, valve seat and valves (solenoid directional valve, safety valve, one-way valve, governor valve and oil blockage), gear pump, pipeline, oil filter and fuel tank etc.



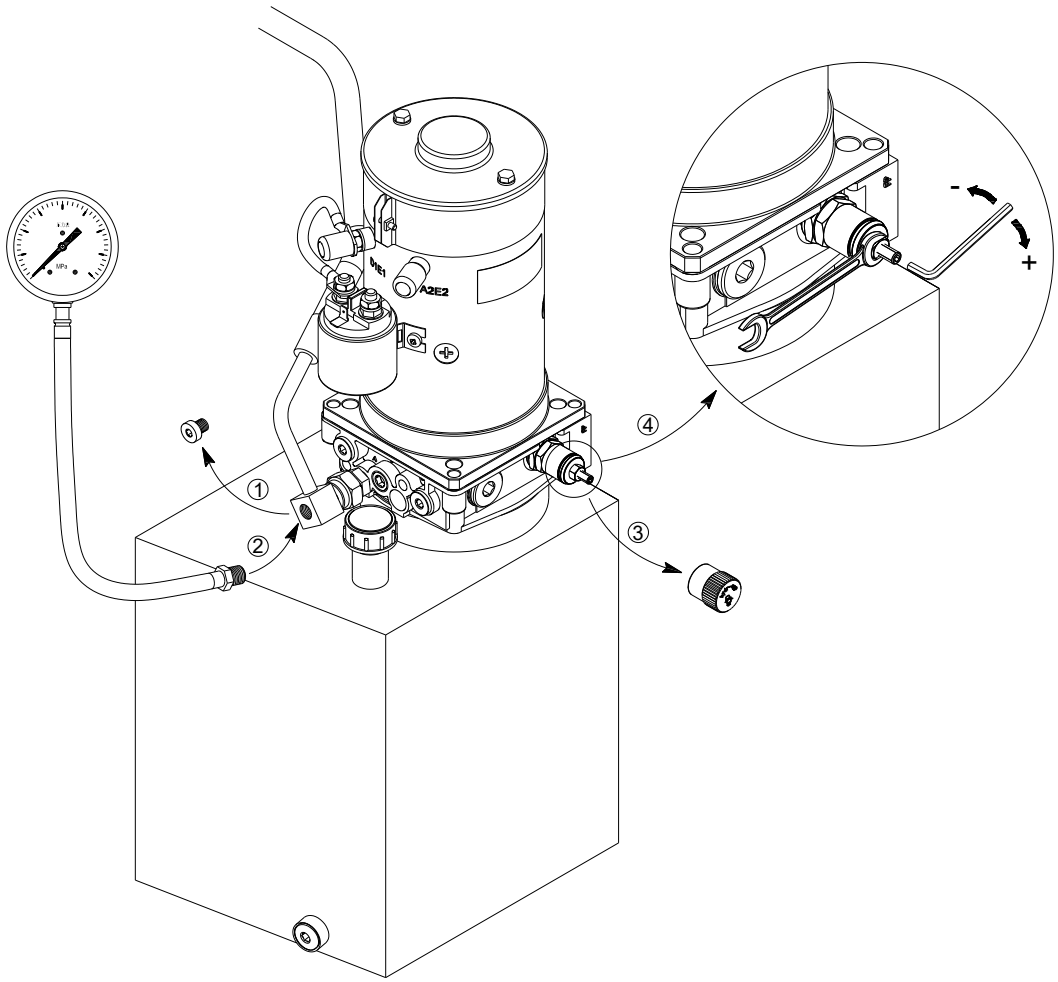
Data

Motor	Rated power	2.2 kW /3.0 kW
	Rated voltage	24 VDC
	Rated current	180 A
	Rated speed	3500 r/min
	Working system	S2=3.5min
	Working system	S3=15%ED
	Rotation direction	Rotate in counterclockwise
Relay	Rated voltage	24 VDC
	Rated current	150 A
Gear pump	Certified capacity	2.6 ml/r / 3.15 ml/r
Solenoid valve		24V DC normally-closed valve element with mergency unloading
Drop throttle valve		15 L/min
Thread		G1/4
Safety valve(overflow valve)	Set pressure	16.3MPa /18.5MPa /16.5MPa /20MPa
Hydraulic oil	Type	L-HM32 or L-HV32
	Oil temperature	-10℃～+70℃

Pressure adjustment of safety valve

Set pressure of safety valve a is 20.0MPa. The pressure has been adjusted before sold, and users do not need adjust under in general conditions. If needed, user can adjust the pressure through pressure regulating valve knob according to the actual condition, but should not exceed the nominal pressure.

- Take apart the cover.
- Connect oil pressure gauge to the pressure mouth
- Loosen main safety valve locking nut, screw the adjusting screw in clockwise, and increase the main safety valve pressure. Screw the adjusting screw in counterclockwise, and reduce the main safety valve pressure.
- Adjust to meet the requirement.
- Re-lock the locknut, and install into the cover.

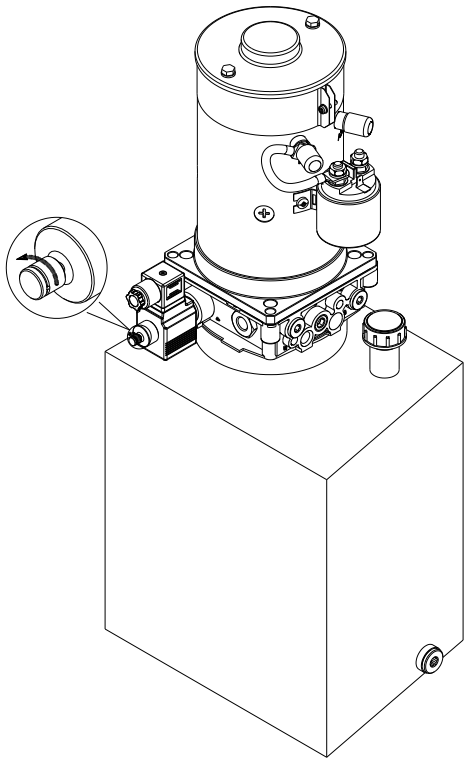


Manually Lowering the Unloading

When the battery runs out or the electromagnetic valve fails to work , and the loading can not be lowered mechanically, the emergency lowering device of the hydraulic unit can be applied manually to lower the loading.

Procedure:

- Park the truck securely.
- Take down the hood.
- Screw out the bolts of the valve counterclockwise which can make the hydraulic oil flow back to the fuel tank.
- After emergency lowering of the forks, screw up the bolts of valve clockwise and assemble the engine hood back.



Notice

- Examine motor and solenoid valve wiring, virtual earth is prohibited.
- When install for the first time, notice inner oil in the oil tank, add enough oil after one working cycle
- When wiring motor and solenoid valve, notice the power voltage is in accordance with the marked one. AC motor shell should ground reliably and never run un-grounded. Prevent water and humidity to motor connection box. When connect for the first time, start motor and check motor direction, it rotates in counterclockwise seen from the rear motor. It is strictly prohibited motor reverse rotation and no oil rotation.
- When add oil, hydraulic oil must be filtered and the filter fineness is no lower than 25μm.
- Power unit cannot filter out the impurity in the inner cylinder, so the inner cylinder should keep clean to avoid control valve invalid. Pipeline should also be clean.

Maintenance

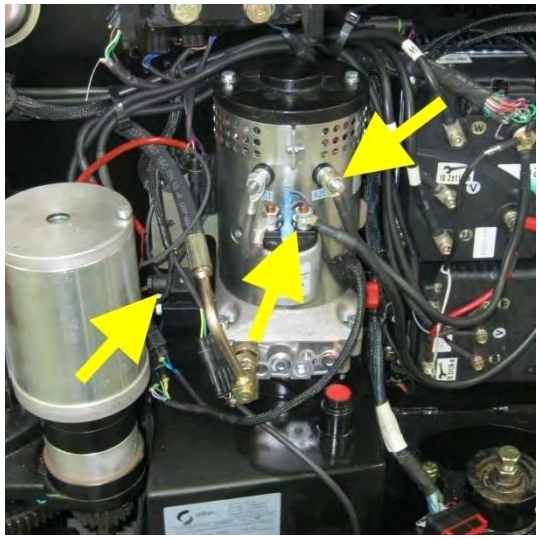
- Keep clean on the element and the pipeline, avoid dirty go into the system.
- Keep the oil level in the oil tank, add oil after certain working cycle. If pump absorbs air, it may damage the pump and the sealer.
- Replace new oil after truck adds hydraulic oil for the first time and travel 100 hours. And then replace new oil every year(about 1500hrs).
- Hydraulic oil viscosity is 22～46mm^2/s.
- Working temperature with high temperature needs oil with high viscosity and low temperature needs oil with low viscosity

2.3 Hydraulic unit dismantle

– Dismantle the hood.

– Dismantle the connector of the hydraulic unit and the cylinder.

– Remove the wiring on the motor, contactor and control valve.



– Remove the tightening bolt that fix hydraulic unit.

– Take out hydraulic unit.

Assembling order is opposite to the disassembling order.

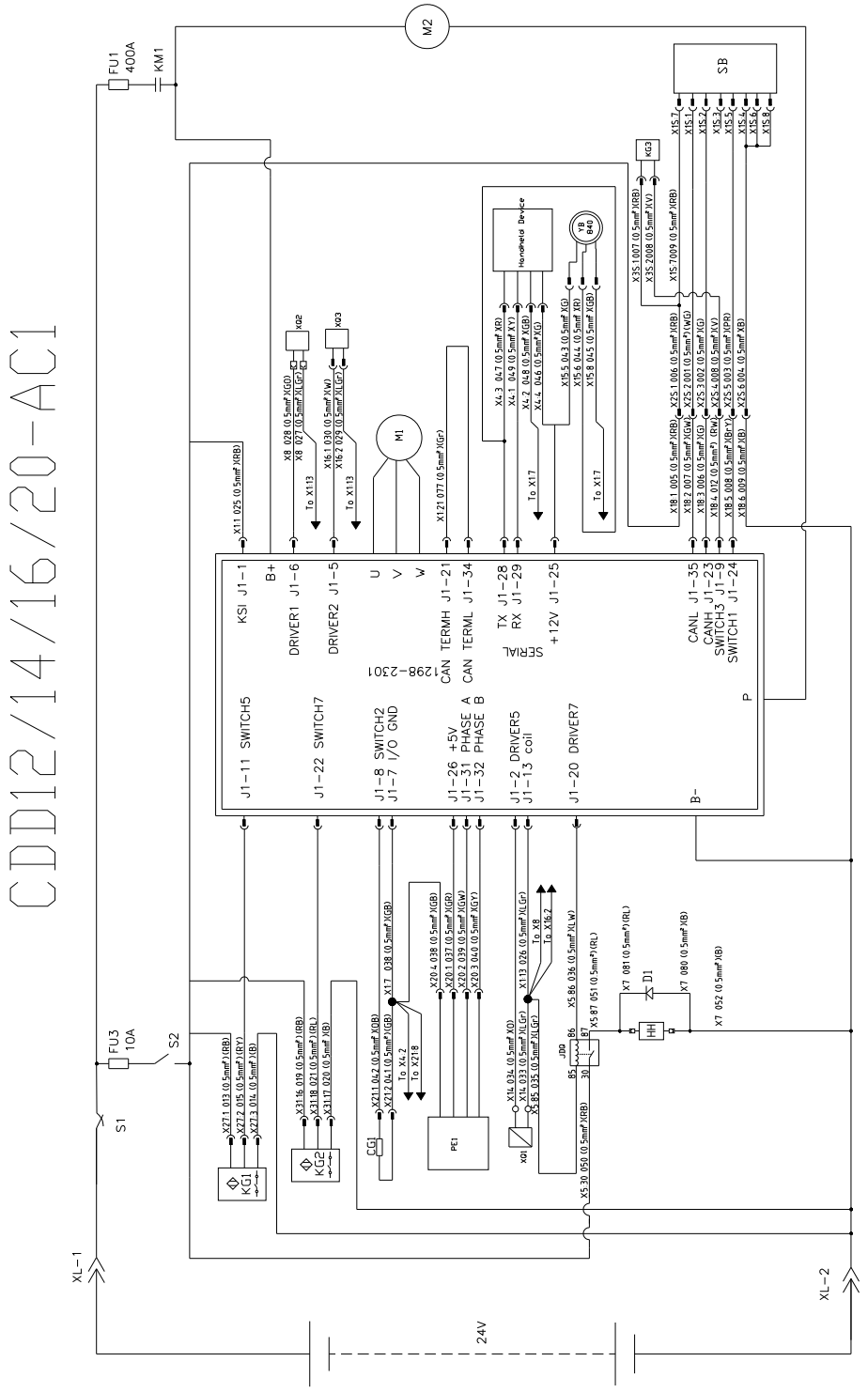
2.4 Hydraulic system fault diagnosis and correction

Fault		Probable cause	Corrective action
No oil pumps from the pump		Low oil level	Fill to the specified oil level
		Blocking of strainer	Clean oil pipe and oil tank. If hydraulic oil is dirty, please change it.
Low oil pressure of oil pump output		Bearing worn; retainer, O-ring damage	Change the bad spare parts
		Adjustment failure of safety valve	Rise pressure with pressure gage
		Air in the oil pump	Fill hydraulic oil to the oil tank, use the pump after bubble vanishing
Noise of oil pump		Cavitation arising from the strainer blocking	Adjust or replace soft tube and clean the strainer
		Cavity caused by the high viscosity of hydraulic oil	Replace new hydraulic oil, whose viscosity suits pump running speed. Work only when the oil temperature is normal
		Bubble in the hydraulic oil	Check the reason for the bubble and then take measures
Forks can't lift	Gear pump works	Oil way block or damage	Repair or replace
	Gear pump no work	Lifting inching switch loosen or damage	Re-fix or replace
		Motor or circuit fault	Repair
Forks do not drop down		Solenoid valve block or damage	Repair or replace
Pressure of safety valve is unstable or can't be adjusted		Pressure adjusting screw loosen	Re-adjust and lock.
		Pressure adjusting spring deformation or damage.	Replace
		Safety valve spool wear or sticking	Replace or clean to reassemble.
		Pump failure	Repair pump

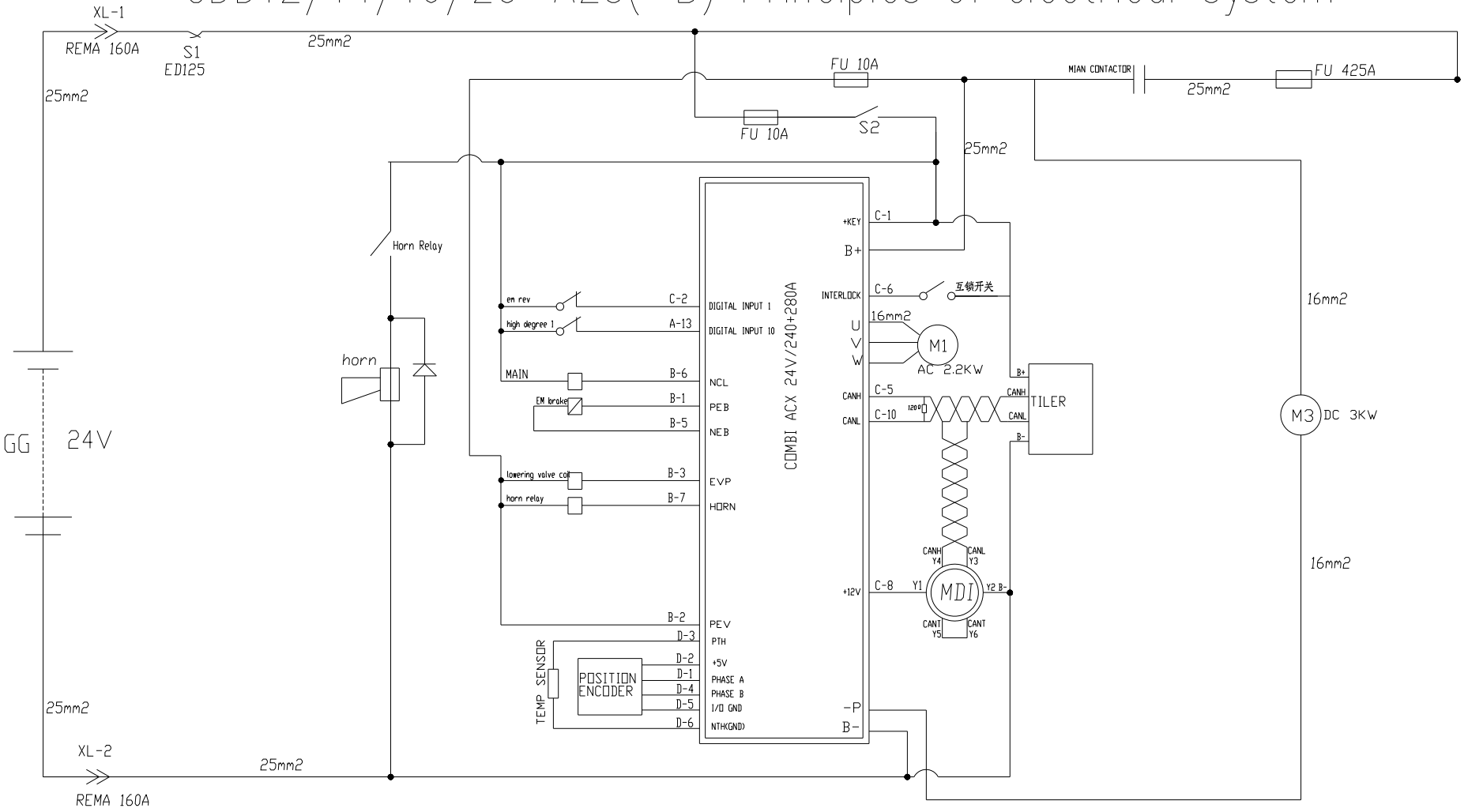
3 Electric system

Electric system of this truck is double wire system, all circuits do not ground. Working voltage is DC24V.

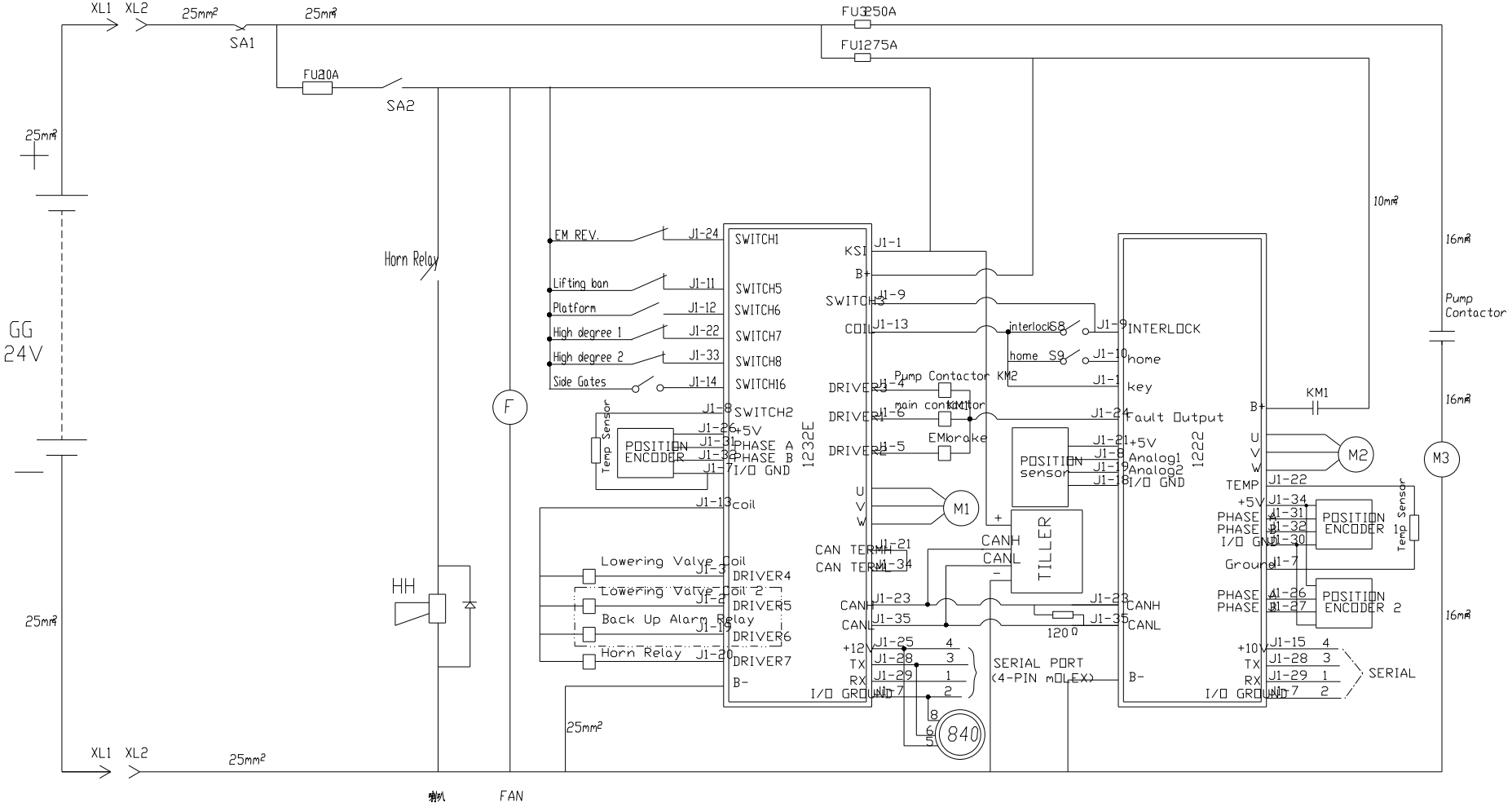
3.1 Principles of electrical system



CDD12/14/16/20-AZ3(-B) Principles of electrical system



CDD12/14/16/20-AC1S(-B) Principles of electrical system



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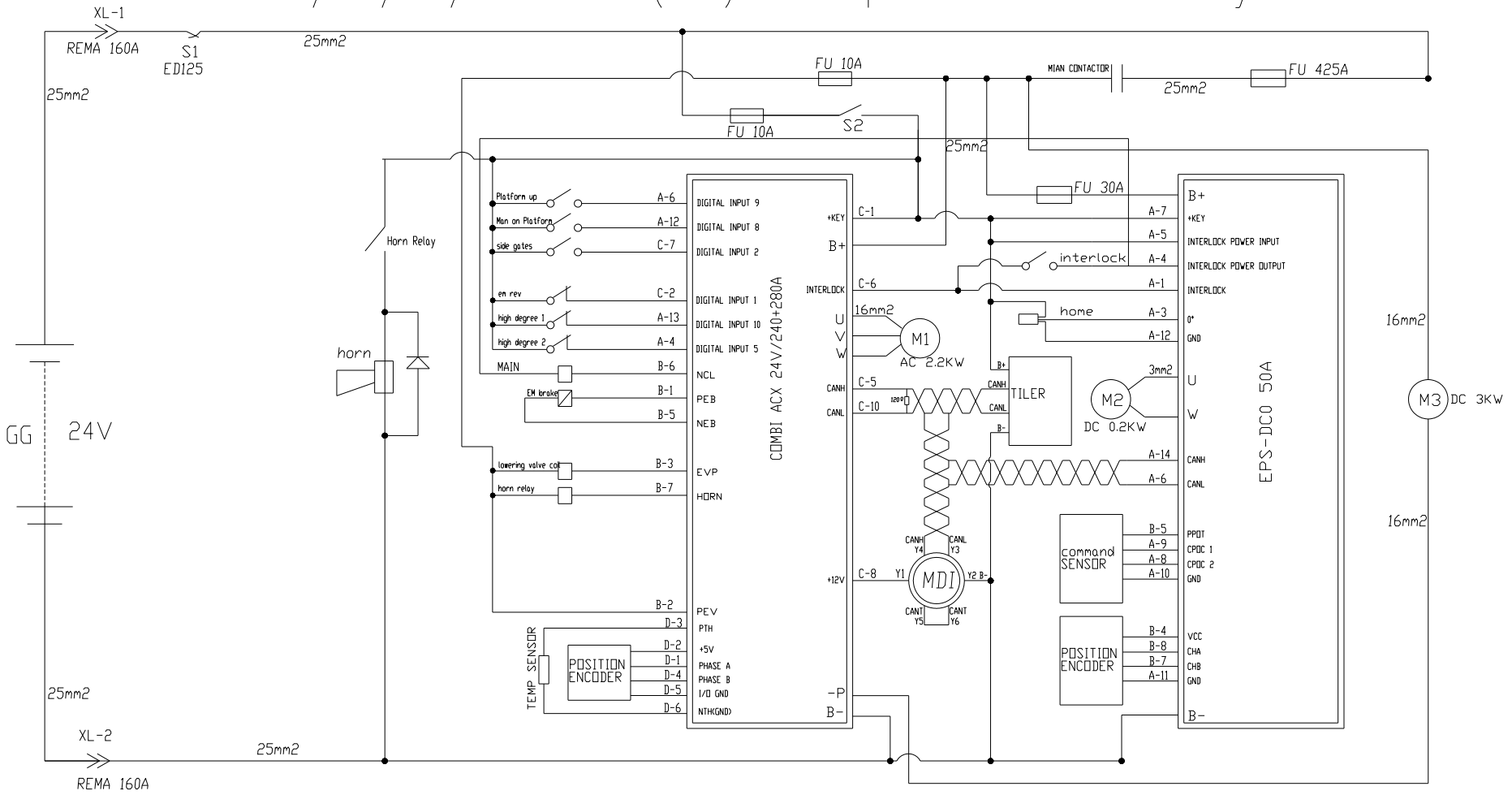


3.2 AC motor controller

3.2.1 Maintenance

AC motor controller, fuse protector and fuse are installed on the electronic control mounting bracket, when mounting the controller, apply heat conduction silicon grease to its bottom.

Maintenance

Controller has no user repair parts. Do not try to open, repair or alter the controller. Otherwise it may damage the controller and also invalid the guarantee.

It's suggested to keep the controller clean and dry, periodically check and get rid of diagnose historical files.

Cleaning

Periodically clean the outside controller is good for preventing corrosion or other controller fault from dirty, dust and chemical, which is part of the environment and always exist in battery power supply system.

Be careful when operating the truck power supplied by battery. Including but not limit to the following: correct training, wear goggles, do not wear loose clothing and jewelry.

Carry out maintenance according to the following cleaning procedure. Never clean the controller with high pressure washer.

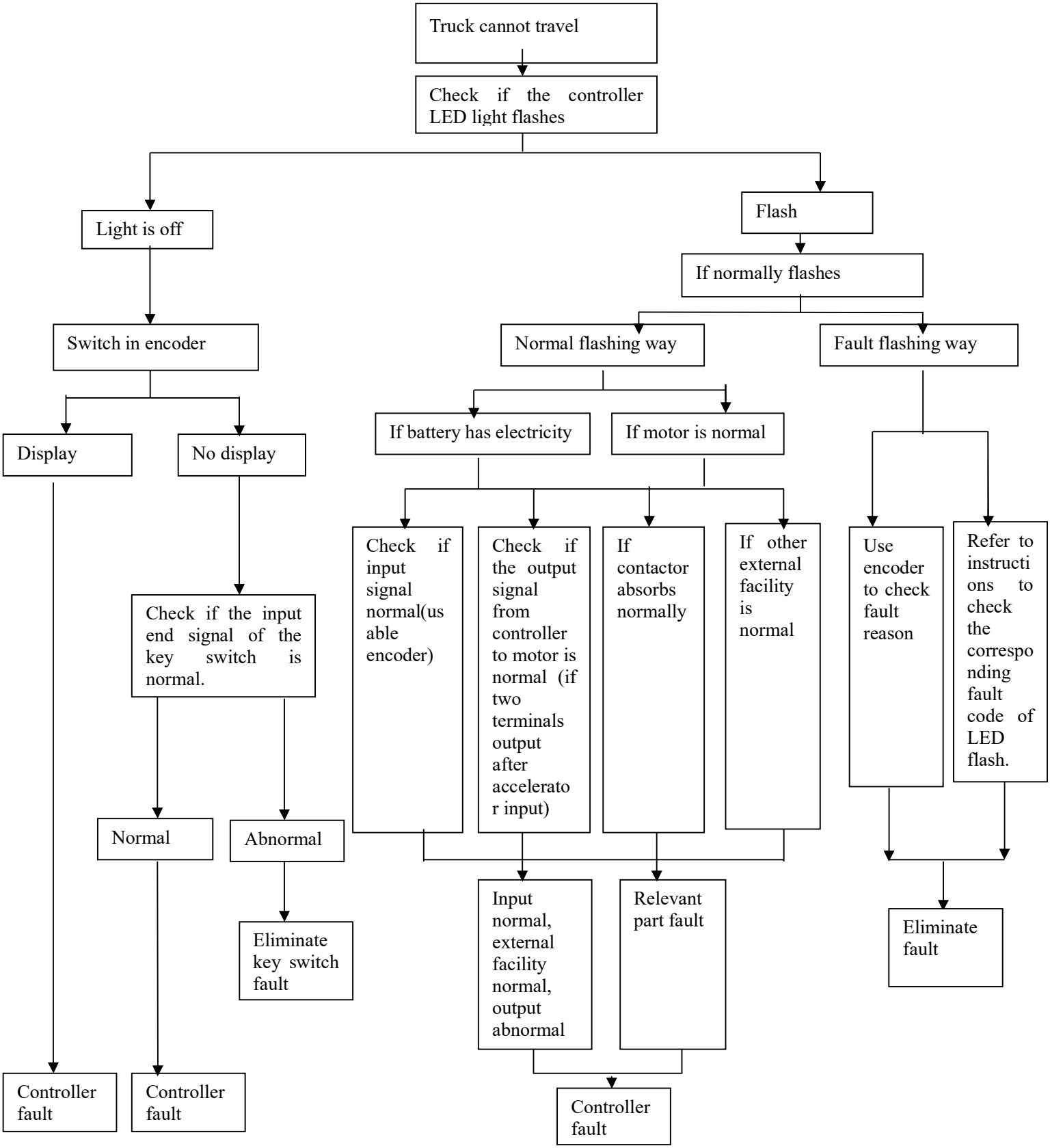
- Remove battery to disconnect power.
- Connect load(like contactor coil or horn) between controller B+ and B- to discharge controller capacity.
- Clean dirt or corrosive on the power and signal binding post. Wipe the controller with wet cloth, dry the controller before connecting the battery. Controller can't suffer the water impact with pressure.
- Make sure the wiring is correct and fastened.

WARNING

- **Strictly prohibit water in the product. Strictly prohibit operating with electricity. Strictly prohibit reverse polarity. Strictly prohibit motor short circuit.**

3.2.2 Diagnosis and troubleshooting

Diagnosis procedure



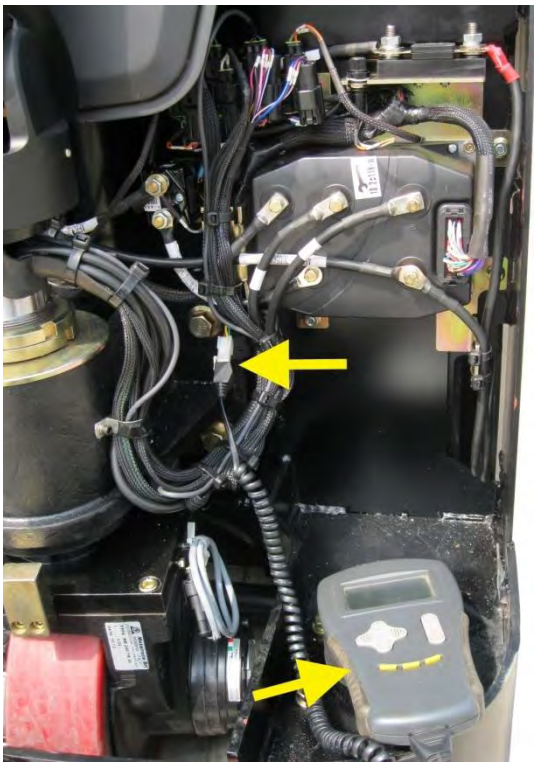
Get the fault information from three ways：

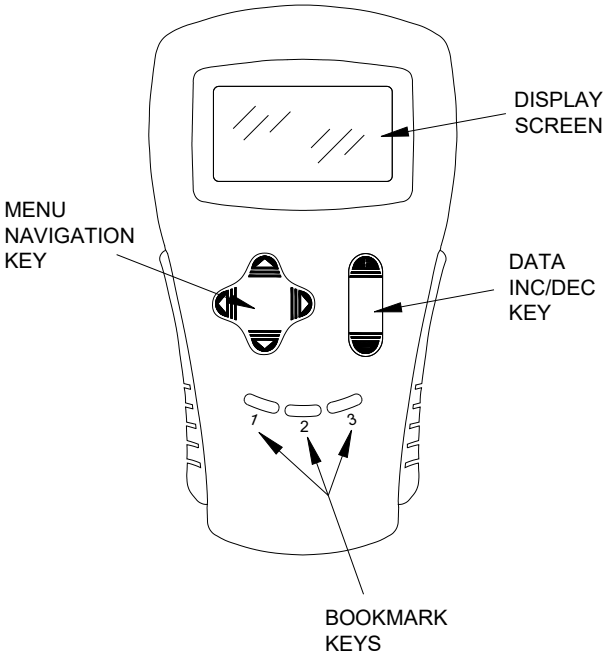
- Get fault information from the instrument: When the truck has fault, the LED3(RED) indicator light is on, LCD displays fault type and code.
- Get fault information by switching in handheld programmer. Refer to Handheld Programmer.
- Get fault information by observe controller built-in LED indicator lights. Refer to LED Status Indicator.

1311 Handheld Programmer

1311Handheld Programmer is a handheld tool that allows user programming, testing and diagnosing the traction motor controller, refer to the following picture. Program setting handheld terminal owns one menu navigation key, one data Inc/Dec key and three bookmark keys to control all programmable functions.

Display window includes a seven-line 128 × 64 pixel LCD screen, this screen can show the test and pictures at the same time, visible in the lightest condition, and adjust program to set menu. Program is driven by the menu, and enters the next menu by pressing menu navigation button. When the program is connected to motor controller, all motor controller information uploads to the handheld programmer.





Display screen： It can show seven-line test and pictures at the same time.

Menu navigation key： Move the cursor on the screen up or down to pass the menu list(up or down arrow),open or close submenu(right or left arrow)

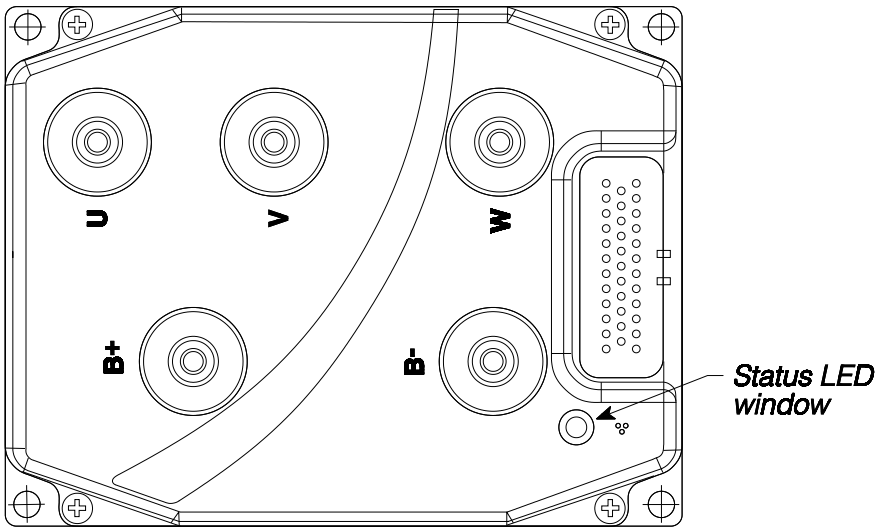
Data Inc/Sec key： Alter data values by display cursor.

Bookmark key： Three bookmark keys allow you to return fast or reach your favor or often use menu interface without through the menu navigation. Press on the relevant bookmark button for 4 seconds, it can store relevant menu interface to this button. Press the relevant bookmark key, it

can skip to the corresponding menu interface of your chosen bookmark. After close the programmer, the bookmark button will not be kept.

3.2.3 LED Status Indicator

Controller built in one LED status indicator light(display red or yellow)



Display	Information
LED light is off	Controller power is not on; or vehicle has dead battery; or other severe damage.
LED light flashes yellow	Controller is in normal working status.
LED light is often red	Controller failed to supervise or did not load software. Restart KSI cycle, load software if necessary.
LED flashes yellow or red alternately	Controller has detected a fault.

Red and yellow lights flash alternately in a repeated interval when there detects fault. Each code consists of two digits. The red LED flashes once to indicate that the first digit of the code will follow; the yellow LED then flashes the appropriate number of times for the first digit. The red LED flashes twice to indicate that the second digit of the code will follow; the yellow LED flashes the appropriate number of times for the second digit.

Example，fault code“23”LED status indicator light shows as follows：

Red Yellow Red Yellow

（the first digit）（2） （the second digit）（3）

3.2.4 Fault code table

This fault codes provide the following information:

- Fault code
- Display fault name on the Curtis programmer
- Display caused by the fault
- Probable fault reason
- Fault deep reason
- Troubleshooting

When there is fault, if it's affirmed not the wiring error or truck malfunction, you can try to restart through key switch. If fault still exists, please turn down key switch, check if the connector of pin 35 connects right or gets dirt, after repair and clean , reconnect, and then start again.

Fault code table

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
12	**Controller Overcurrent** Motor stops working Main connector disconnects EM brake shutdown Throttle invalid Brake Pump stops working	1. External short of phase U,V,W motor connections 2. Motor parameters do not match.。 3. Controller malfunction	Reason：Phase current exceeds limited current Troubleshooting：restart the key switch
13	**Current Sensor Fault** Motor stops working Main connector disconnects Electromagnetic brake disconnects Throttle invalid Brake, Pump stops working	1. Leakage to vehicle frame from phase U,V, or W 2. Controller malfunction	Reason：Deviation reads out to controller current sensor. Troubleshooting：restart the key switch
14	**Precharge Failed** Motor stops working Main connector disconnects Electromagnetic brake disconnects Throttle invalid Brake Pump stops working	1. External load on positive terminal of the capacitor that prevents the capacitor from charging.	Reason：Key switch input voltage failed to charge the capacitor. Troubleshooting： Reset or re-input interlock switch through VCL function precharge().
15	**Controller Severe Undertemp** Motor stops working Main contactor disconnects Electromagnetic brake disconnects Throttle failure Brake	1. Severe controller working environment.	Reason：Radiator temperature is lower than -40℃. Troubleshooting：Raise the temp above -40℃, restart the key switch or interlock switch.

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
	Pump stops working		
16	**Controller Severe Overtemp** Motor stops working Main contactor disconnects Electromagnetic brake disconnects Throttle failure Brake, pump stops working	1. Severe controller working environment. 2. Truck overloads. 3. Incorrect controller mounting	Reason：Radiator temperature is higher than 95℃. Troubleshooting：Drop the temp below 95℃. Restart the key switch or interlock switch.
17	**Severe Undervoltage** Driving torque reduce	1. Setup error of battery parameter. 2. Power consumption of non controller system. 3. Too large battery impedance. 4. Battery disconnects. 5. Fuse protector disconnect, or the main contactor disconnect.	Reason： When MOSFEET axle working, capacitor voltage is lower than the minimum voltage limit. Troubleshooting ： Raise the capacitor voltage.
18	**Severe Overvoltage** Motor stops working Main contactor disconnects Electromagnetic brake disconnects Throttle invalid Brake Pump stops working	1. Setup error of battery parameter. 2. High battery impedance. 3. Battery disconnects when regenerative breaking.	Reason：When MOSFEET axle working, capacitor voltage exceeds the minimum voltage limit. Troubleshooting ： Reduce the voltage and then restart the key switch.
21	**Controller Undertemp Cutback** No fault(unless VCL set the incurred fault)	1. Controller works in limited condition. 2. Severe controller working environment.	Reason：Radiator temperature is lower than-25℃. Troubleshooting ： Make the radiator temperature higher than -25℃.
22	**Controller Overtemp Cutback** Drive or regenerative braking torque reduces.	1. Severe controller working environment. 2. Truck overloads. 3. Incorrect controller mounting	Reason： Radiator temperature exceeds 85℃. Troubleshooting ： Reduce the temperature.
23	**Undervoltage Cutback** Driving torque reduces	1. Insufficient battery power. 2. Setup error of battery parameter. 3. Power consumption of non controller system. 4. Too large battery impedance. 5. Battery disconnects. 6. Fuse protector disconnects or main contactor disconnects.	Reason ： Too low capacitor voltage. Troubleshooting：Raise capacitor voltage.
24	**Overvoltage Cutback** Regenerative braking torque reduces.	1. During regenerative braking, regenerative braking current cause the raising of battery voltage. 2. Setup error of battery parameter.	Reason：When MOSFEET axle working, capacitor voltage exceeds the maximum voltage limit.

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
		3. Too large battery impedance. 4. When regenerating braking, battery disconnects.	Troubleshooting ： Reduce capacitor voltage.
25	**+5V Supply Failure** No fault(unless VCL set the incurred fault)	1. External load impedance is too low.	Reason： 5V supply outside the 5V±10% range Troubleshooting ： Bring voltage within range.
26	**Digital Out 6 Failure** **Digital Out 6 driver is not active.**	1. External load impedance is too low.	Reason： Digital Output 6 current exceeds15mA. Troubleshooting：Adjust load, set “set_digout()” by VCL, and restart.
27	**Digital Out 7 Overcurrent** **The Digital Out 7 driver is not active**	1. External load impedance is too low.	Reason：Digital Output 7 current exceeds15mA. Troubleshooting：Adjust load, set “set_digout()” by VCL, and restart.
28	**Motor Temp Hot Cutback** Driving torque reduced.	1. Motor temperature reaches or exceeds parameter limit, thus cause current output reduce. 2. Motor temperature parameters incorrect. 3. If motor does not apply temperature sensor, programming parameter “Temp compensation” and “Temp cutback” must set “OFF”.	Reason：Input voltage value of motor temperature sensor is 0 or larger than 10V. Troubleshooting ： Return the motor temperature to be within the permitted limits.
29	**Motor Temp Sensor Fault** Max. speed drops to LOS status and motor temperature cutback invalid.	1. Motor temperature sensor is connected wrongly. 2. If motor does not apply temperature sensor, programming parameter “Temp compensation” and “Temp cutback” must set “OFF”.	Reason：Input voltage value of motor temperature sensor is 0 or larger than 10V. Troubleshooting: Adjust input voltage value of motor temperature sensor to the normal scope.
31	**Coil 1 Driver Open/Short** Driver 1 output shut	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason： Driver 1 (pin 6) is either open or shorted. This fault can be set only when “Main Enable” set to “OFF”. Troubleshooting：Correct open or short circuit, restart output.
31	**Main Contactor Coil Open/Short** Motor stops working Main contactor disconnects Electromagnetic brake disconnects	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason： Main contactor driver (pin 6) is either open or shorted. This fault can be set only when “Main Enable” set to “ON”.

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
	Throttle invalid Brake Pump stops working		Troubleshooting：Correct open circuit/short circuit, restart output.
32	**Coil2 Driver Open/Short** Driver 2 output shut	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason： Driver 2 output(pin 5) is either open or shorted. This fault can be set only when “EM brake Type” set to 0. Troubleshooting：Correct open or short circuit, restart output.
32	**EM Brake Open/Short** Electromagnetic brake disconnects Throttle invalid Brake	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason： EM Brake output(pin 5) is either open or shorted. This fault only occurs when “EM brake Type” set to 0. Troubleshooting：Correct open or short circuit, restart output.
33	**Coil3 Driver Open/Short** Driver 3 output shut	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason：Driver 3 output (pin 4) is either open or shorted Troubleshooting：Correct open or short circuit, restart output.
34	**Coil4 Driver Open/Short** Driver 4 output shut	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason：Driver 3 output (pin 3) is either open or shorted Troubleshooting：Correct open or short circuit, restart output.
35	**PD Open/Short** PD shut	1. Connected load open or short. 2. Connecting pin stained. 3. Wrong wiring.	Reason：PD(pin 2) is either open or shorted Troubleshooting：Correct open or short circuit, restart output.
36	**Encoder Fault** Electromagnetic brake disconnects	1. Motor encoder error. 2. Wrong wiring.	Reason：Encoder fault Troubleshooting：Restart key switch.
37	**Motor Open** Motor stops working Main contactor disconnects Electromagnetic brake disconnects Throttle invalid Brake Pump stops working	1. Motor phase is open. 2. Wrong wiring.	Reason：Motor phase, U,V,W detected open Troubleshooting：Check phase and restart the key switch.
38	**Main Contactor Welded** Motor stops working Main contactor disconnects Electromagnetic brake disconnects Throttle invalid	1. Main contactor tips are welded. 2. Motor phases U and V is disconnected or open. 3. An alternate voltage path is providing a current to capacitor(B+	Reason：Main contactor keep too much connecting, capacitor voltage can’t discharge. Troubleshooting：Restart the key switch

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
	Brake Pump stops working	connection terminal)	
39	**Main Contactor Did Not Close** Motor stops working Main contactor disconnects Electromagnetic brake disconnects Throttle invalid Brake Pump stops working	1. Main contactor does not close 2. Contactor contacts have oxidized, melted, or connection status is unstable. 3. External load on the capacitor. 4. Fuse protector disconnects.	Reason：When the main contactor is closed, capacitor voltage does not charge B+ voltage. Troubleshooting：Check the contactor, restart the key switch.
41	**Throttle Wiper High** Throttle invalid	1. Throttle pot wiper voltage too high	Reason： Throttle pot wiper(pin 16) voltage is higher than the high fault threshold(can be changed with the VCL function setup_pot_faults()） Troubleshooting： Reduce the throttle pot wiper voltage
42	**Throttle Wiper Low** Throttle invalid	1. Throttle pot wiper voltage too low	Reason： Throttle pot wiper(pin 16) voltage is lower than the low fault threshold(can be changed with the VCL function setup_pot_faults()） Troubleshooting： Raise the throttle pot wiper voltage
43	**Pot 2 Wiper High** Full brake	1. Pot 2 wiper voltage too high	Reason：Pot 2 wiper(pin 17) voltage is higher than the high fault threshold(can be changed with the VCL function setup_pot_faults()） Troubleshooting：Reduce the pot wiper voltage
44	**Pot2 Wiper Low** Full brake	1. Pot 2 wiper voltage too low.	Reason： Pot 2 wiper(pin 17) voltage is lower than the low fault threshold(can be changed with the VCL function setup_pot_faults()） Troubleshooting：Increase the pot wiper voltage
45	**Pot Low Overcurrent** Throttle invalid Full brake	1. Potentiometer impedance is too low.	Reason： Pot low end (pin 18) exceeds 10mA. Troubleshooting: Reduce low end current, restart the key switch
46	**EEPROM Failure**	1. Error writing to the EEPROM. It	Reason：Controller system tries to

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
	Motor stops Main contractor stops. EM brake stops Throttle stops Interlock stops Driver1-4 stop PD stops Brake Pump stops	may be caused by VCL writing to EEPROM, or CANBUS, or incorrect parameter editing.	write into EEPROM but failed. Troubleshooting：Download correct software(OS), set correct parameter, and then restart the key switch.
47	**HPD/Sequencing Fault** Throttle invalid	1. Wrong sequence setting of key start, interlock, direction and throttle input sequence setting. 2. Wiring, switch key, interlock, direction or throttle input fault.	Reason：The wrong input of key start, interlock, direction and throttle cause HPD and sequencing fault. Troubleshooting ： Re-input according to correct sequence.
47	**Emer Rev HPD** Throttle invalid	1. Emer Rev already finished, but the throttle, forward or reverse input and interlock do not return to neutral.	Reason：After Emer Rev finishes, each input does not return to neutral, that cause the fault. Troubleshooting ： Re-input according to correct sequence.
49	**Parameter Change Fault** Motor stops working Main contractor stops working EM brake stops working Throttle invalid Brake Pump stops working	1. In order to protect truck safety, change of certain special parameter is only valid after restart the key switch.	Reason：Parameter change needs restart of the key switch. Troubleshooting：Restart the key switch
52	**TH PDO Timeout** Motor stops Pump stops Handle control button all failure	1. Communication failures.	Handle damaged or poor contact communication circuit。
68	**VCL RunTime Error** Motor stops Main contactor stops EM brake stops Accelerator stops Interlock stops Driver 1-4 stop PD stops Brake Pump stops	1. VCL runtime.	Reason：VCL runtime error. Troubleshooting：Edit VCL software and correct, check new software to make correct parameter matching; restart the key switch.
69	**External Supply Out of Range**	1. External load on 5V and 12V	Reason：Upper limit of external

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
		supplies too high or too low. 2. Parameter error in the Checking Menu, like “ExtSupply Max”，,“Ext Supply Min”	power supply(total current: 5V(pin 26) and 12V(pin 25) is defined by External Supply Max and lower limit is defined by External Supply Min Troubleshooting：Adjust external current.
71	**OS General** Motor stops Main contactor stops EM brake stops Accelerator stops Interlock stops Driver 1-4 stop PD stops Brake Pump stops	1. Inner controller invalid.	Reason：Inner controller invalid. Troubleshooting：Restart the key switch.
72	**PDO Timeout** Interlock stops CAN NMT State set to Preoperational	1. Time between CAN PDO messages received exceeds PDO Timeout Period	Reason：Time between CAN PDO messages received exceeds PDO Timeout Period Troubleshooting：Restart the key switch, or accept CAN NMT message
73	**Stall Detected** EM brake stops Switch the control mode to LOS(Limited operation status)	1. Motor is stalled. 2. Motor encoder fault. 3. Wiring damaged. 4. Problem with power supply for motor encoder.	Reason：No motor encoder is detected. Troubleshooting：Throttle Command=0,Motor RPM=0 Restart the key switch, or detect the effective signal of motor encoder in LOS mode, and set the parameter to Throttle Command=0,Motor RPM=0.
74	**Fault On Other Traction conteoller**	Dual Drive fault: see Dual Drive manual.	
75	**Dual Severe Fault**	Dual Drive fault: see Dual Drive manual	
77	**Supervisor Fault** ShutdounMotor Shutdown MainContactor Shutdown EMBrake Shutdown Throttle Shutdown Interlock	1.The Supervisor has detected a mismatch in redundant readings 2.Internal damage to Supervisor microprocessor. 3.Switch inputs allowed to be within upper and lower thresholds for over	Set: Mismatched redundant readings; damaged Supervisor; illegal switch inputs. Clear: Check for noise or voltage drift in all switch inputs; check connections;cycle KSI.

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
	Shutdown Driver1 Shutdown Driver2 Shutdown Driver3 Shutdown Driver4 Shutdown PD FullBrake	100 milliseconds.	
78	**Supervisor Fault** ShutdounMotor Shutdown MainContactor Shutdown EMBrake Shutdown Throttle Shutdown Interlock Shutdown Driver1 Shutdown Driver2 Shutdown Driver3 Shutdown Driver4 Shutdown PD FullBrake	1.The main OS is not compatible with the Supervisor OS	Set: Incompatible software. Clear: Load properly matched OS code or update the Supervisor code; cycle KSI.
82	**Bad Calibrations** ShutdounMotor Shutdown MainContactor Shutdown EMBrake Shutdown Throttle FullBrake	1. Internal controller fault.	Set: Internal controller fault detection. Clear: Cycle KSI
83	**Driver Supply** ShutdounMotor Shutdown MainContactor Shutdown EMBrake Shutdown Throttle FullBrake	1. Internal controller fault in the voltage supply for the driver circuits.	Set: Internal controller fault detection. Clear: Cycle KSI
87	**Motor Characterization Fault** Motor stops Main contactor stops EM brake stops Accelerator stops Brake Pump stops	1. Refer to the following code during motor matching： 0=Normal 1= Controller receives encoder signal, but pulse value not defined. Set pulse value manually 2= Motor temperature sensor failure 3= Motor high temperature cutback failure 4= Motor overtemp cutback failure 5= Motor low temperature cutback	Reason： Motor matching process failure. Troubleshooting：Correct the fault and restart the key switch.

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
		failure 6= Low voltage cutback failure 7= High pressure cutback f failure 8= Controller can't detect encoder signal and passage signal disappears. 9= Motor parameter setting exceeds the scope.	
89	**Motor Type Fault**	1. Motor type parameter values exceed the range	Reason：Motor Type parameter setting value is an illegal value. Troubleshooting：Reset and restart the key switch.
91	**VCI/OS Mismatch** Motor stops Main contactor stops EM brake stops Accelerator stops Interlock stops 1-4 output stops PD stops Brake Pump stops	1. The controller VCL does not match OS.	Reason：The controller VCL does not match OS. Troubleshooting：Update new VCL and OS.
92	**EM Brake Failed to Set** EM Brake failure Throttle invalid	1. Truck continues to move after the EM brake has been commanded to set 2. Small EM braking force.	Reason：After EM brake locks, the truck still moves. Troubleshooting：Check if the throttle works normal.
93	**Encoder LOS (Limited Operating Strategy)**	1. LOS activated due to motor installing or encoder fault. 2. Wrong wiring. 3. Truck is stalled	Reason：LOS activated due to motor installing or encoder fault. Troubleshooting：Restart the key switch，if it is caused by motor installing, make sure encoder work under normal condition, Throttle Command=0,Motor RPM=0.
94	**Emer Rev Timeout** EM Brake failure Throttle invalid	1. Emer Rev timeout activated due to EMR Timer overdue 2. Emer Rev switch is always at ON position.	Reason：Emer Rev function activated to operate until Emer Rev timing end. Troubleshooting：Check Emer Rev switch.
98	**Illegal Model Number** Motor stops Main contactor stops	1. Controller model can't be identified. 2. Software and hardware do not	Reason：Controller model can't be identified Troubleshooting：Choose correct

Code	Programmer display Fault display	Probable fault reason	Deep fault reason/troubleshooting
	EM brake stops Throttle stops Brake Pump stops	match. 3. Controller damage.	controller, and download correct controller software.
99	**Dualmotor Parameter Mismatch** Close main contactor Close EM brake Close accelerator Brake and close the pump	Enable parameter of dualmotor is set as ON, and control mode selecting parameter not set as 0（Speed Mode Express) or 1（Speed Mode）	Reason：When the dual drive software enabled, control mode should set as 0（Speed Mode Express) or 1（Speed Mode）, otherwise there will be fault. Troubleshooting：Adjust to proper value and switch KSI.

Curtis controller 1220 diagnosis and troubleshooting

1220 controller is capable of detecting faults of various kinds of cases.As shown in troubleshooting table, steering controller failure usually affect the traction controller.

You can get controller fault information in two ways: ① through the instrument display on two two fault code to obtain the fault information (the first two fault code for walking controller, the second two fault code for steering controller); ②by reading the display of information on the handheld programmer.

Handheld programmer will be cleared after shows that since the last time to now all the history of the fault information.The programmer shows wrong name.

For example, the Command Analog1 Out of Range (41) code.

In the handheld programmer error menu will display the word "Command Analog1 Out of Range".Actual voltage according to the monitor menu (the Command Input » Analog Input » Analog to 1).

1220 controller fault code table

Code	Programmer display Fault display	Probable fault reason
23	**Motor Polarity Fault** Steering stops Drive stops	1.Steering motor is the cathode. 2.The encoder phase sequence counter.
36	**Motor Stalled** Steering stops Drive stops	1.Steering system resistance is too large. 2.To meet the mechanical limit. 3.The median detection switch failure.
37	**Motor Open** Steering stops Drive stops	1.Steering motor cable connector contact is not good. 2.The steering motor carbon brush poor contact.
41	**Command Analog1 Out Of Range** Steering stops Drive stops	1.Direction Angle sensor connection line open circuit 2.Direction Angle sensor is damaged
42	**Command Analog2out Of Range** Steering stops Drive stops	1.Direction Angle sensor connection line open circuit. 2.Direction Angle sensor is damaged.
47	**Encoder Fault** Steering stops Drive stops	1.The encoder connection line open circuit. 2.To encoder interference. 3.To damage of the encoder.
53	**Home Position Not Found** Steering stops Drive stops	1.Home switch in the distance detection distance too far. 2.The damage of a switch
73	**Following Error** Steering stops Drive stops	1.Steering resistance is too large. 2.The steering motor fault.

Attachment：Table for bolt's tightening torque

Unit：N·m

Bolt's diameter	Grade			
	4.6	**5.6**	**6.6**	**8.8**
6	4～5	5～7	6～8	9～12
8	10～12	12～15	14～18	22～29
10	20～25	25～31	29～39	44～58
12	35～44	44～54	49～64	76～107
14	54～69	69～88	83～98	121～162
16	88～108	108～137	127～157	189～252
18	118～147	147～186	176～216	260～347
20	167～206	206～265	245～314	369～492
22	225～284	284～343	343～431	502～669
24	294～370	370～441	441～539	638～850
27	441～519	539～686	637～784	933～1244

Note： ·Use entirely 8.8 grade bolt in the important joint position.

·Bolt's grade can be found in the head of the bolt, if it can't be found, the grade is 8.8.

Maintenance Record

Date	Repair, maintenance content	Serviceman

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