

# NOBLELIFT



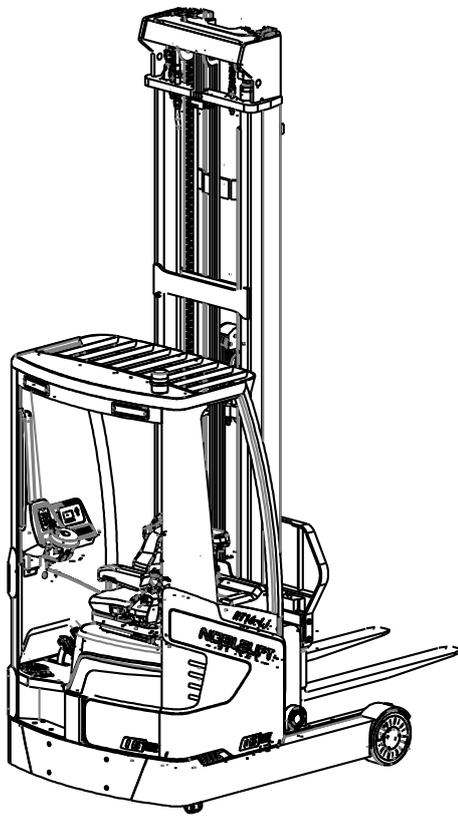
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Service Hotline: 4008-836115

## INSTRUCTION MANUAL

Lithium Battery Powered Reach Truck

### RT16Li



#### WARNING

Do not use the reach truck before reading and understanding these operating instructions.

#### NOTE:

- Please check the designation of your present type at the last page of this document as well as on the ID-plate.
- Keep it for future reference.

**This truck can only be used in factories, tourist attractions, and amusement parks.**

Version 08/2022

RT16Li-SMS-002-EN



## FOREWORD

Before operating the truck, read this ORIGINAL INSTRUCTION MANUAL carefully and understand the usage of the truck completely. Improper operation could create danger.

This manual describes the usage of different electric reach trucks. When operating and servicing the truck, make sure, that it applies to your type.



Keep this manual for future reference. If this or the warning/ caution labels are damaged or lost, please contact your local dealer for replacement.

This truck complies with the requirements according to EN 3691-1 (Industrial trucks- safety requirements and verification, part 1), EN 12895 (Industrial trucks- electromagnetic compatibility), EN 12053 (Safety of industrial trucks- test methods for measuring noise emissions), EN 1175-1 (Industrial truck safety – electrical requirements), assumed the truck is used according to the described purpose.

The sound pressure level at driver's seat for this machine is 70 dB(A) according to EN 12053.

### ATTENTION:

- Environmentally hazardous waste, such as batteries, oil and electronics, if handled incorrectly, will cause negative effect to the environment or human health.
- The waste packages should be sorted and put into solid dustbins according to the materials and be collected disposal by local special environment protection bureau. To avoid pollution, it's forbidden to throw away the wastes randomly.
- To avoid leaking during the use of the products, the user should prepare some absorbable materials (scraps of wooden or dry duster cloth) to absorb the leaking oil in time. To avoid second pollution to the environment, the used absorbable materials should be handed in to special departments in terms of local authorities.
- Our products are subject to ongoing developments. Because this manual is only for the purpose of operating/ servicing the reach truck, therefore please have understanding, that there is no guarantee out of particular features out of this manual.



**NOTE: The left sign in this manual indicates warning and caution, which can lead to death or serious injury if instructions are not followed.**

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# 1. CORRECT APPLICATION

To ensure the safety of personal and equipment, drivers shall observe the following precautions:

1. Only drivers who have been trained and hold a industrial trucks driving license can drive this truck;
2. This reach truck is suitable for hard and flat indoors floor conditions;
3. Check the control and alarm devices before driving this reach truck. If any damage or defect is found, it shall be operated after repair;
4. During handling, the load shall not exceed the specified value. Both forks should go under the goods and load should be evenly placed on the forks. Unbalanced loading is prohibited and picking up objects with single fork is not allowed;
5. Start, steer, drive, brake and stop slowly and smoothly. Slow down when steering on wet or smooth floors;
6. When driving this reach truck with goods, lower the goods as low as possible and the forks should be tilted backward;
7. Be careful when driving on the slope: move forward uphill, move backward downhill, avoid steering uphill or downhill;
8. When driving this reach truck, pay attention to pedestrians, obstacles and potholes, and pay attention to the clearance above the reach truck;
9. It is not allowed to stand on forks or truck;
10. It is not allowed to stand under or walk under the elevated part of the truck;
11. Only operate the truck from the driver's position;
12. Do not handle unsecured or loosely packed goods, and carefully handle goods in large size;
13. When driving in the racks, drive slowly, move straightly in and straightly out, when the fork is not completely removed from the racks, do not steer in case of collision.
14. For high lifted trucks, try to make the mast tilted back, and the tilting forward and backward during loading and unloading should be done within the minimum range;
15. Immediately stop using when the failure occurs, and the label shall be clearly indicated;
16. Lower the forks to the ground when leaving the truck, park the truck on level ground, turn off the power and remove the key.

It is only allowed to use this electric reach truck according to this instruction manual.

The capacity is marked on capacity sticker as well on the identification plate. The operator has to pay attention to the warnings and safety instructions.

Operating lighting must be minimum 50 Lux.

## Modification

No modifications or alterations to this reach truck which may affect, for example, capacity, stability or safety requirements of the truck, shall be made without the prior written approval of the original truck manufacturer, its authorized representative, or a successor thereof. This includes changes affecting, for example braking, steering, visibility and the addition of removable attachments. When the manufacturer or its successor approve a modification or alteration, they shall also make and approve appropriate changes to capacity plate, decals, tags and operation and maintenance manual.

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

- a) arranges for the modification or alteration to be designed, tested and implemented by an engineer(s) expert in industrial trucks and their safety,
- b) maintains a permanent record of the design, test(s) and implementation of the modification or alteration,
- c) approves and makes appropriate changes to the capacity plate(s), decals, tags and instruction handbook, and
- d) affixes a permanent and readily visible label to the truck stating the manner in which the truck has been modified or altered, together with the date of the modification or alteration and the name and address of the organization that accomplished those tasks.

By not observing these instructions, the warranty becomes void.

## 2. DESCRIPTION OF THE REACH TRUCK

### a. Overview of the main components

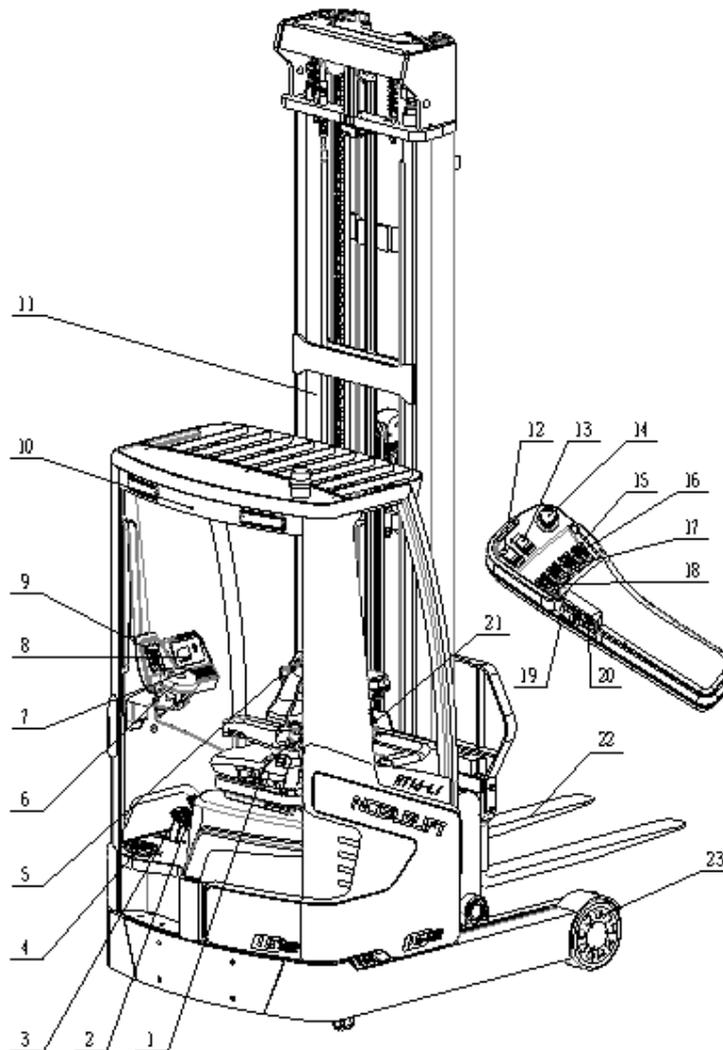


Fig. 1: Overview of main components

- |                          |  |
|--------------------------|--|
| 1. Seat assembly         | 13. Lamp switch                              |
| 2. Accelerator pedal     | 14. Emergency button                         |
| 3. Brake pedal           | 15. Side-shift control stick (left/ right)   |
| 4. Safety pedal switch   | 16. Fork tilt control stick                  |
| 5. Control unit          | 17. Mast control stick (extended/ retracted) |
| 6. Steering wheel        | 18. Lifting and lowering control stick       |
| 7. Key switch            | 19. Direction control button                 |
| 8. Display               | 20. Horn button                              |
| 9. Pin-code panel        | 21. Main power switch                        |
| 10. Overhead guard       | 22. Fork                                     |
| 11. Mast                 | 23. Load wheel                               |
| 12. Parking brake switch |  |

**b. Main technical data**

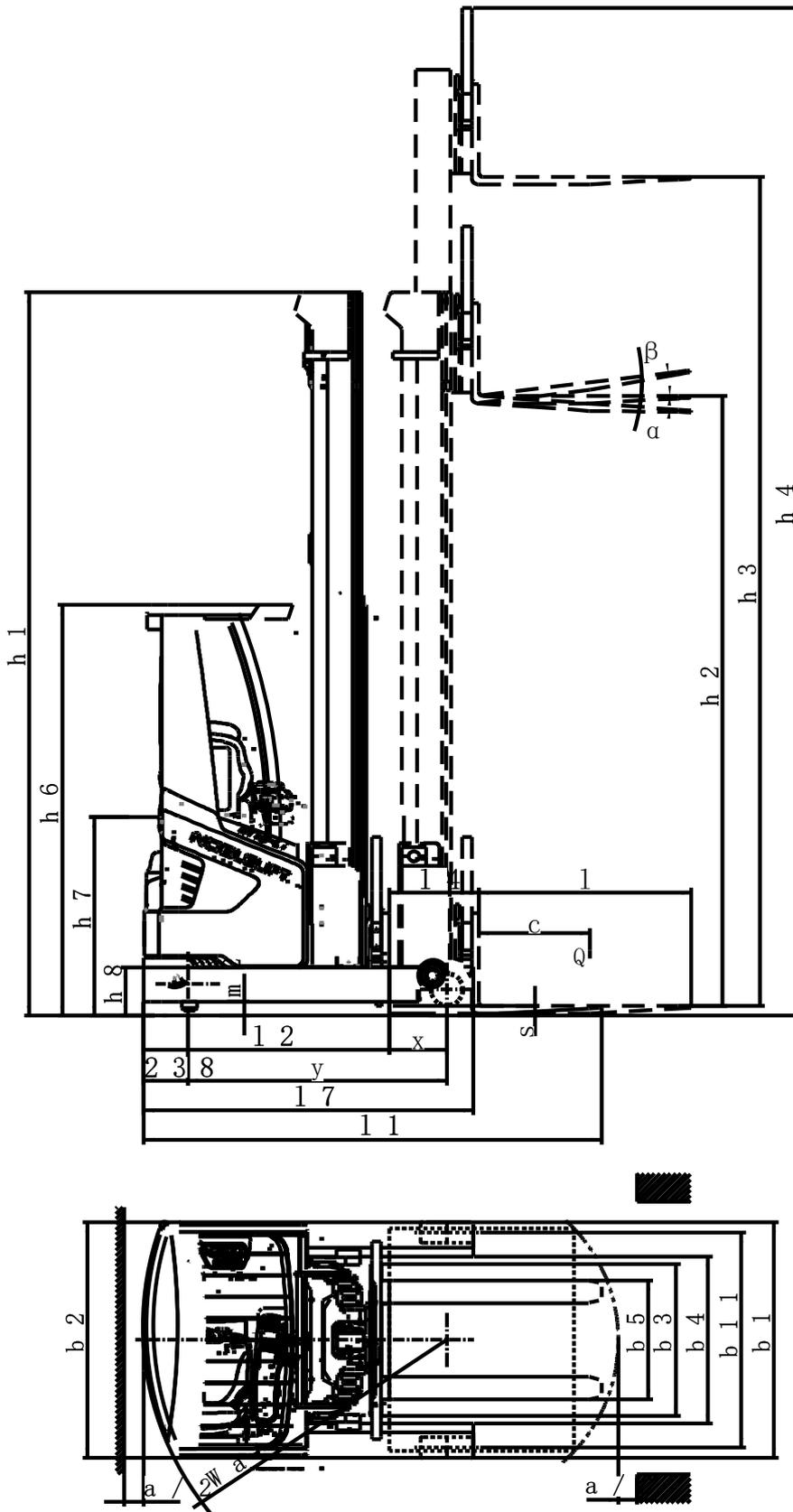


Fig 2: Structure schematic drawing

Table 1: Main technical data for standard version

Type sheet for industrial truck acc. to VDI 2198				
Distinguishing mark	1.2	Manufacturer's type designation		RT16Li
	1.3	Drive: electric (battery type, mains, ...), diesel, petrol, fuel gas		Battery
	1.4	Operator type: hand, pedestrian, standing, seated, order-picker		Seated
	1.5	Rated capacity/ rated load	Q (t)	1.6
	1.6	Load centre distance	c (mm)	600
	1.8	Load distance, centre of drive axle to fork	x (mm)	310
	1.9	Wheelbase	y (mm)	1400
Weight	2.1	Service weight (with battery)	kg	3700
Tyres	3.1	Tires		Polyurethane
	3.2	Tire size, front	∅xW (mm)	343×140
	3.3	Tire size, rear	∅xW (mm)	280×110
	3.5	Wheels, number front/ rear(x=driven wheels)		2/1x
	3.7	Tread	$b_{11}$ (mm)	1160
Dimensions	4.1	Tilt of fork carriage forward/backward	$\alpha / \beta$ (°)	4°/-2°
	4.2	Height, mast lowered	$h_1$ (mm)	3900
	4.3	Free lift	$h_2$ (mm)	3290
	4.4	Lift	$h_3$ (mm)	9500
	4.5	Height, mast extended	$h_4$ (mm)	10410
	4.7	Height of overhead guard (cabin)	$h_6$ (mm)	2200
	4.19	Overall length	$l_1$ (mm)	2410
	4.20	Length to face of forks	$l_2$ (mm)	1260
	4.21	Overall width	$b_1$ (mm)	1270
	4.22	Fork dimensions DIN ISO 2331	s/ e/ l (mm)	40/120/1150
	4.25	Fork spread	$b_5$ (mm)	240/760
	4.28	Reach distance	$l_4$ (mm)	485
	4.31	Ground clearance, laden, below mast	$m_1$ (mm)	75
	4.33	Aisle width for pallets 1000×1200 crossways	$A_{st}$ (mm)	2770
	4.34	Aisle width for pallets 800×1200 lengthways	$A_{st}$ (mm)	2830
4.35	Turning radius	$W_a$ (mm)	1650	
4.37	Length across wheel arms	$l_7$ (mm)	1780	
Performance	5.1	Travel speed, laden/ unladen	km/h	10.5/10.5
	5.2	Lift speed, laden/ unladen	m/s	0.38/0.50

	5.3	Lowering speed, laden/ unladen	m/s	0.48/0.4
	5.4	Reaching speed, laden/ unladen	m/s	0.15/0.15
	5.8	Max. gradeability, laden/ unladen	%	10/15
	5.10	Service brake		Hydraulic brake
<b>Electric-engine</b>	6.1	Drive motor rating S2 60min	kW	6.4
	6.2	Lift motor rating at S3 15%	kW	12.5
	6.4	Battery voltage/ nominal capacity K <sub>5</sub>	(V)/(Ah)	51.2/350
	6.5	Battery weight	kg	250
<b>Addition data</b>	8.1	Type of drive unit		Three-phase AC
	8.2	Operating pressure for attachments	bar	150
	8.3	Oil volume for attachments	ℓ /min	40
	8.4	Sound pressure level at driver's seat	dB (A)	<70

**Table of masts (RT 16Li)**

Designation	Lift h <sub>3</sub> mm	Free lift h <sub>2</sub> mm	Height, mast lowered h <sub>1</sub> mm	Height, mast extended h <sub>4</sub> mm
Two stage mast standard lift	3000	140	2100	3910
	3500	140	2350	4410
	4000	140	2600	4910
	4500	140	2850	5410
Three stage mast FFL (Full Free Lift)	4500	1563	2235	5410
	5000	1730	2400	5910
	5500	1897	2568	6410
	6000	2063	2735	6910
	6500	2230	2900	7410
	7000	2397	3068	7910
	7500	2563	3234	8410
	8000	2730	3400	8910
	8500	2897	3567	9410
	9000	3063	3734	9910
9500	3230	3900	10410	

**Table of masts (RT 20Li)**

Designation	Lift h <sub>3</sub> mm	Free lift h <sub>2</sub> mm	Height, mast lowered h <sub>1</sub> mm	Height, mast extended h <sub>4</sub> mm
Two stage mast standard lift	3000	140	2100	3910
	3500	140	2350	4410
	4000	140	2600	4910
	4500	140	2850	5410
Three stage mast FFL (Full Free Lift)	4500	1563	2235	5410
	5000	1730	2400	5910
	5500	1897	2568	6410
	6000	2063	2735	6910
	6500	2230	2900	7410
	7000	2397	3068	7910
	7500	2563	3234	8410
	8000	2730	3400	8910
	8500	2897	3567	9410
	9000	3063	3734	9910
9500	3230	3900	10410	

## C. Description of the safety devices and warning labels (Europe and other, excepting USA)

Warning labels:

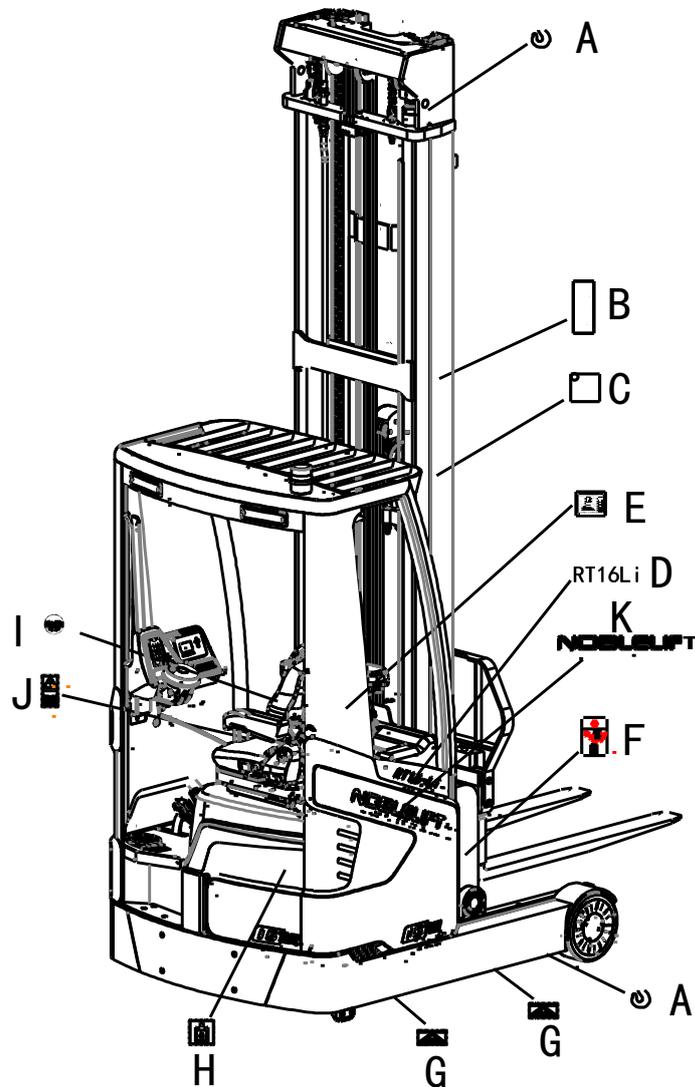
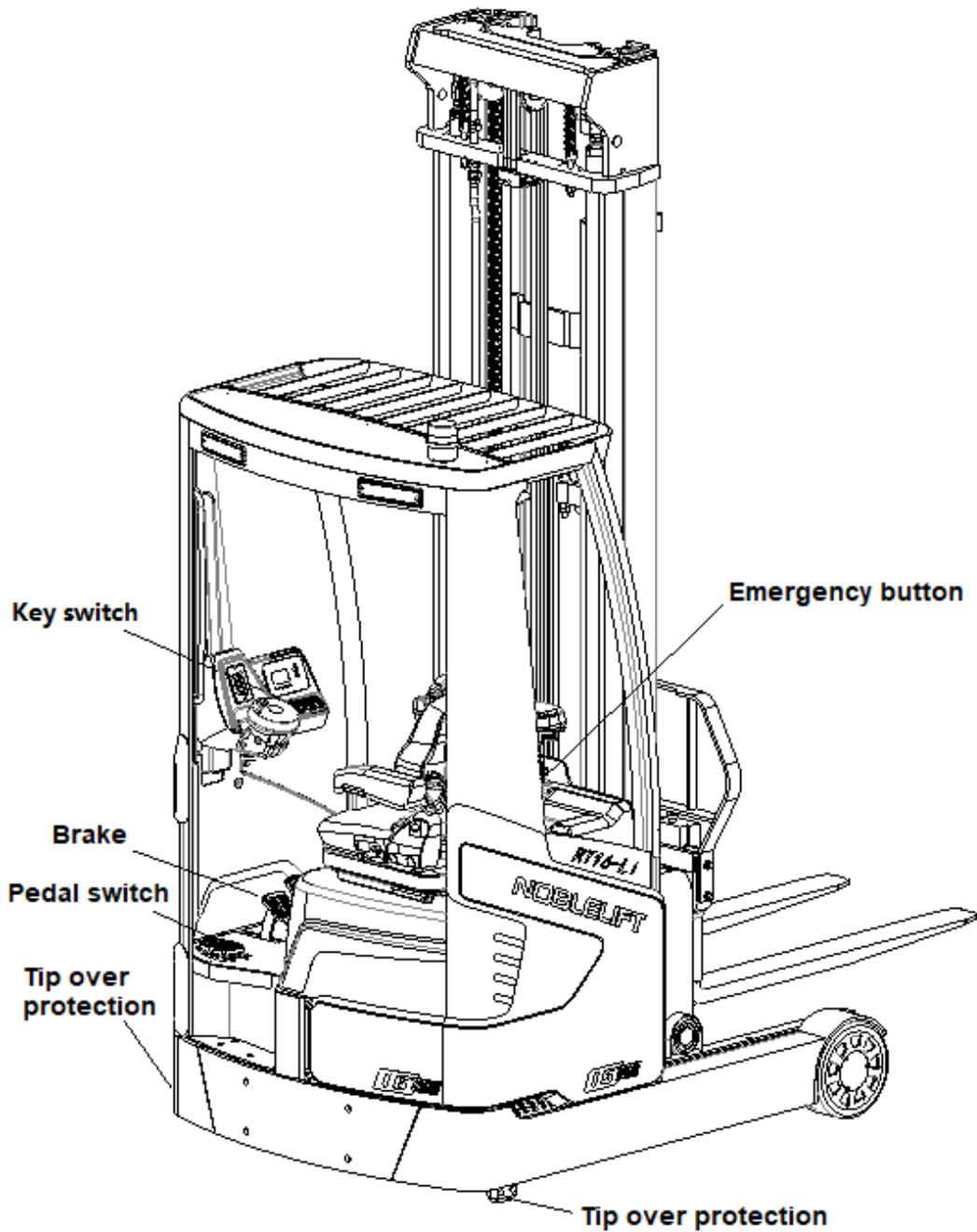


Fig 3: Warning labels

- A. Crane hook label: The place for allowed crane.
- B. Warning label: Do not stand under or on the fork, otherwise it may cause injury.
- C. Warning label: Do not stand inside mast or reach your hand inside, otherwise it may cause injury.
- D. Model sticker: Indicate the type of the truck.
- E. Identification plate (ID-plate): Indicate the basic information of truck, such as specification, production date, product number, etc.
- F. Hand pinching warning label: There is a risk of hand injury at this position.
- G. Fork loading label: The fork insertion position during loading.
- H. Oil filling sticker: Hydraulic oil should be filled at this position.
- I. Seat belt sticker: Seat belt should be fastened when driving.
- J. Reading warning label: Read and follow service manual.
- K. Logo sticker

**Safety device:**



**Fig 4:** Safety devices

**Emergency button:** Please press this button immediately to cut of the power supply when the truck is out of control, all lifting-, lowering-functions will be stopped.

**Key switch:** To prevent against unauthorized access, turn the key counterclockwise and pull it out.

**Brake:** To stop the truck when it is driving.

**Tip over protection:** To reduce the risk of side tip over of the truck. It's forbidden to remove the protection.

**Pedal switch:** Operate the truck with left foot on the foot pedal switch, otherwise it will be failed.

Attention: Emergency button, drive key switch, brake, rollover protection, pedal switch and hydraulic circuit explosion-proof valve are safety devices of the truck. Safety devices and labels above must be kept in good condition, please replace in time in case of damage or absence.

## d. Identification plate (ID-plate)

Reach Truck			
Special Equipment Manufacturing License No. TS2510350-2021 Tel: 4008-836115			
Type	xxxx	Rated Capacity	xxxx kg
Nominal Voltage	xx V	Self Weight	xxxx kg
Max Battery Weight	xxx kg	Min Battery Weight	xxx kg
Own Mass without Battery	xxx kg	Max Lifting Height	xxxx mm
Serial Number		Manufacturing Date	
Device Code		Manufacturer Art.No	
<p>This truck is only used in factories, tourist attractions and tourist sites.            Noblelift Intelligent Equipment Co. Ltd            1888 Zhongyang Road, Taihu Sub-district, Changxing city of Zhejiang province</p>			

Fig 5: Identification plate

## 3. WARNINGS, RESIDUAL RISK AND SAFETY INSTRUCTIONS



- Do not use truck in environments with explosive gas, explosive dust or acid and alkali corrosion;
- Do not use truck in the environment with poor outdoor or ground conditions;
- Do not put feet or hands under or inside the lifting mechanism;
- Do not stand in front or behind the truck while driving or lifting/lowering;
- Do not overload, the load weight and lifting height must meet load curve requirements;
- Do not put foot outside the truck when driving which may cause injuries;
- Do not lift people may which may cause people falling down and severe injury suffering;
- Do not push or pull goods;
- Do not drive the truck on slopes;
- Do not use truck with unstable, loose or unbalanced load, gravity center must be between two forks;
- To prevent against unauthorized access, park the truck, turn off the power and pull out the key;
- Do not make any truck modification without written consent from manufacturer;
- Do not lift the cargo in the case of wind. Lifting will be unstable under the wind influence.

Watch difference in floor levels when driving. Load could fall down or the truck could get uncontrollable.

Keep watching the condition of load. Stop operating the truck if load becomes unstable.

Brake the truck and activate the emergency button by pushing when sliding load on or off the truck. If the truck has any malfunctions, follow chapter 8.



- The truck is intended to be used on hard and flat ground indoors whose roughness should be within 1cm/m<sup>2</sup>;
- The operator should hold driving license and have been trained;
- When operating the truck, the operator has to wear safety shoes.
- The truck is intended to be used with ambient temperatures between +5°C~+40°C;
- The operating lighting must be minimum 50 Lux.

## 4. COMMISSIONING, TRANSPORTING, DECOMMISSIONING

### a. Commissioning

After receiving our new reach truck or for re-commissioning you have to do following before (firstly) operating the truck:

- Check if all parts are included and not damaged
- Mast installation (please follow the instructions to install mast);
- Do the work according to the daily inspections as well as functional checks.
- Check battery installation and charge instructions (follow chapter 7).

#### **Mast assembling:**

Mast assembling required equipment:

#### **Lifting equipment:**

Driving ( 5 tons maximum load ) or fork lifting ( 3 tons load capacity and 4.5 m lifting height)

**Assistant tools:** S24 wrench, crowbar.

Safety precautions:

Assembling operators must take appropriate training or be trained by professional personnel on-site to guide the assembling operation.

Operators for lifting equipment must get appropriate operating qualifications.

If the truck is directly forked on the crossbeam of the mast, the mast and the fork carriage must be tied together with the protection rope to avoid the risk of slipping.

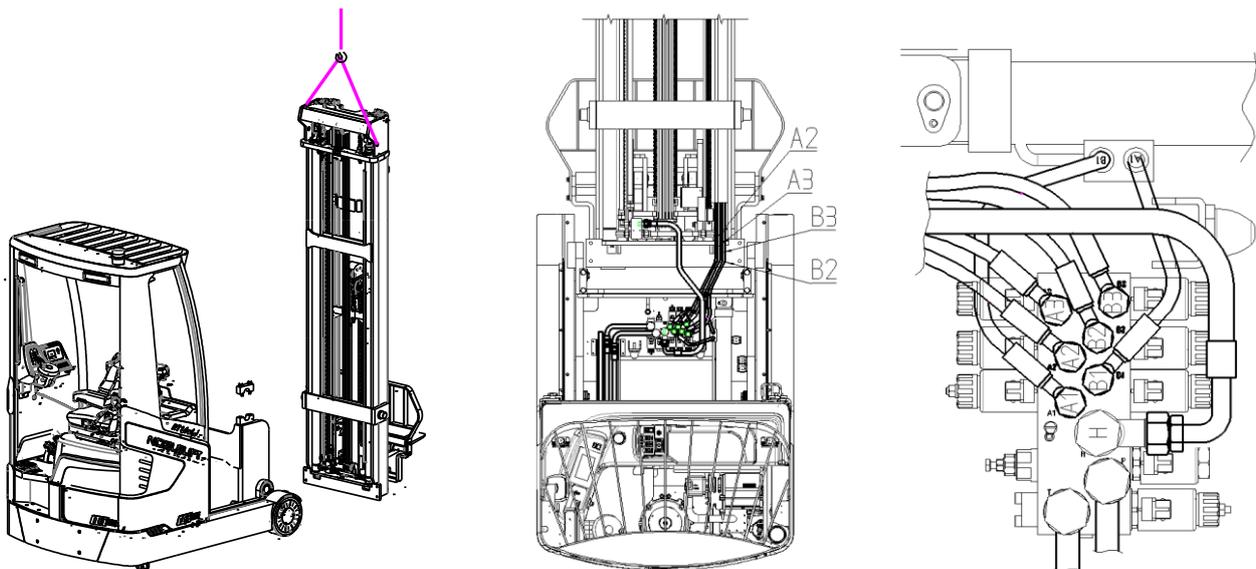


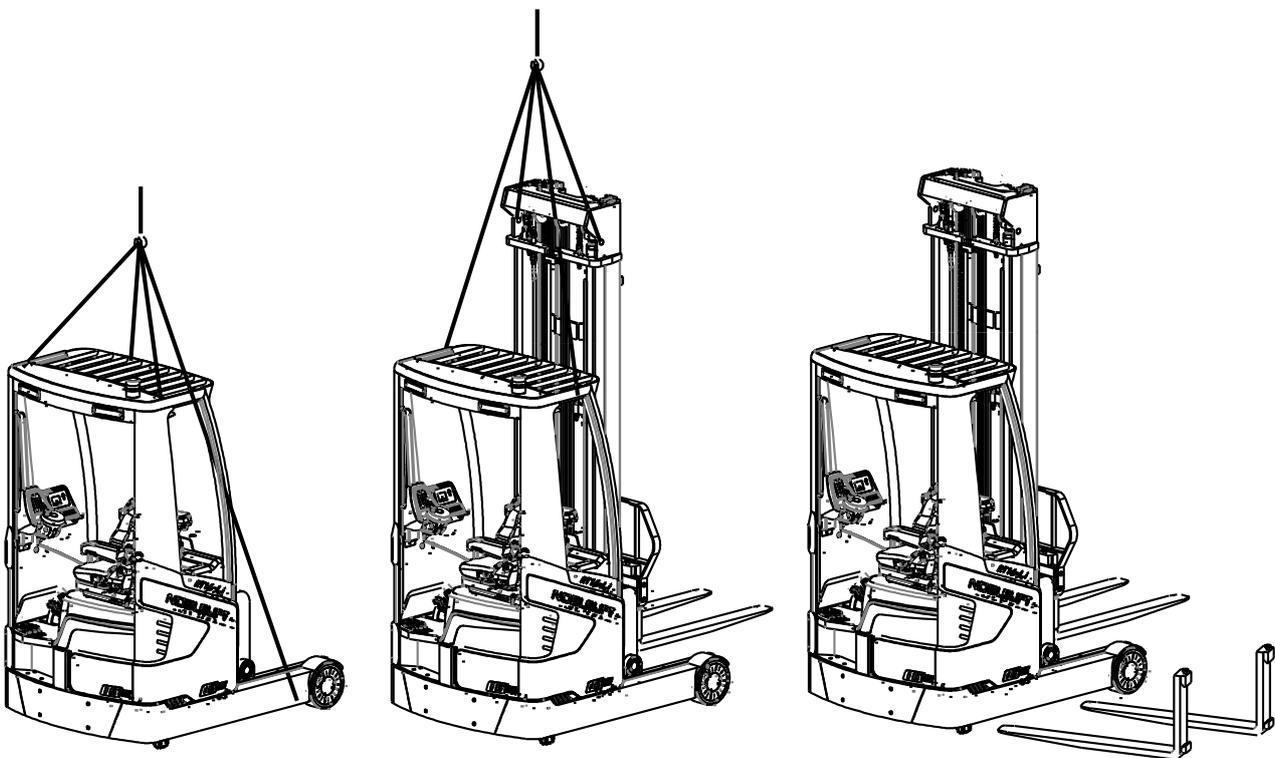
Fig 6: Mast assembling

**Table 2:** Weight of truck chassis and mast

Type	RT16Li		
Truck carriage pack weight [kg]	2100		
Truck carriage pack size [mm]	1800x1300X2200		
Lift height H3 [mm]	5500	7500	9500
Mast pack weight [kg]	1240	1420	1600
Mast pack size [mm]	3900x1000X700	3900x1000X700	3900x1000X700

### b. Loading and unloading/ transportation

When load and unload the truck, refer to the guide diagram below. The weight for chassis and mast is shown in table 2, for the whole truck weight, please the ID plate.



Hoist truck chassis

Hoist whole truck

Fork position for loading the truck

**Fig 7:** Loading and unloading

#### Loading and unloading



USE DEDICATED CRANE AND LIFTING EQUIPMENT.  
DO NOT STAND UNDER THE SWAYING LOAD.  
DO NOT WALK INTO THE HAZARDOUS AREA DURING LIFTING.  
PLACE THE TRUCK ON A LEVEL GROUND.

## Transportation



DURING TRANSPORTATION ON A LORRY OR TRUCK, ALWAYS FASTEN THE TRUCK SECURELY.

Lower the forks and park the truck securely.

Fasten the truck according to Fig. 8, put the wood blocks under the driving cab to prevent damage to the driving wheel in transporting.

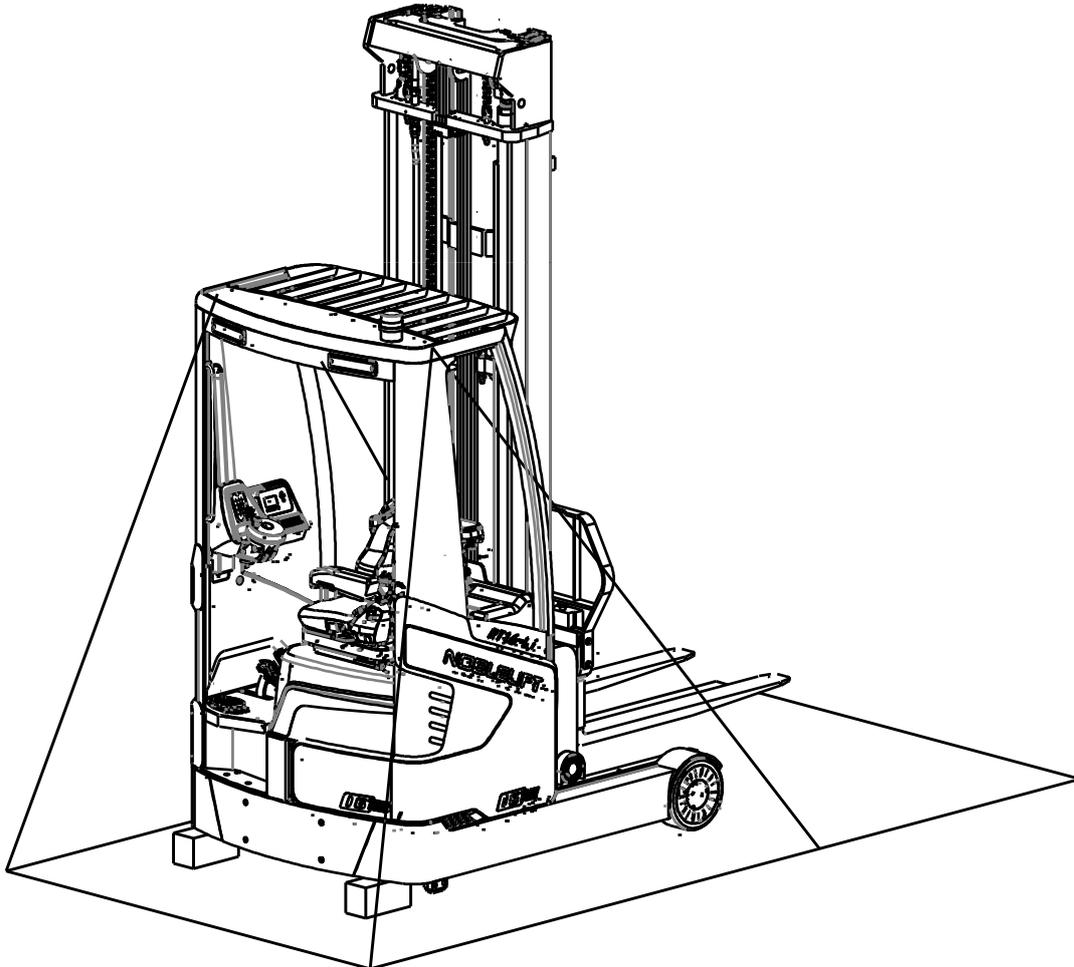


Fig 8: Fixing points

## C. Storage

Lower the forks to the lowest position, as shown in Figure 8, padded the cabin with sleepers to lift the drive wheel to prevent damage due to long-term storage.

Apply grease to all lubrication points mentioned in this manual (regular inspection) to prevent rust and dust accumulation on the truck.

Charge trucks that have been out of service for a long time once a month to prevent damage to battery. For trucks that are eventually scrapped and out of service, please hand them to the relevant recycling company. According to regulations, oil, batteries and electronic components are recycled or treated in a harmless manner.

## 5. REGULAR INSPECTION

This chapter describes pre-shift checks before putting the truck into operation.

Regular inspection is effective to find the malfunction or fault on this truck. Check the truck on the following points before operation.



**REMOVE LOAD FROM TRUCK AND LOWER THE FORKS.**

**DO NOT USE THE TRUCK IF ANY MALFUNCTION IS FOUND.**

- Check for scratches, deformation or cracks.
- Check if there is any oil leakage from the cylinder.
- Check the function of driving in both directions
- Check the chain and rollers are without damage or corrosion.
- Check the smooth movement of the wheels.
- Check the function of the emergency brake by activating the emergency button.
- Check the functions of foot brake.
- Check the lifting and lowering functions.
- Check the seat is assembled tightly.
- Check the function of horn.
- Check if all bolts and nuts are tightened firmly.
- Check the function of key switch.
- Check the function of speed limitation.
- Visual check if there are any broken electric wires.
- If supplied with a backrest extension, check it for damages and correct assembling.

## 6. OPERATIONAL INSTRUCTIONS



### a. Operational control devices

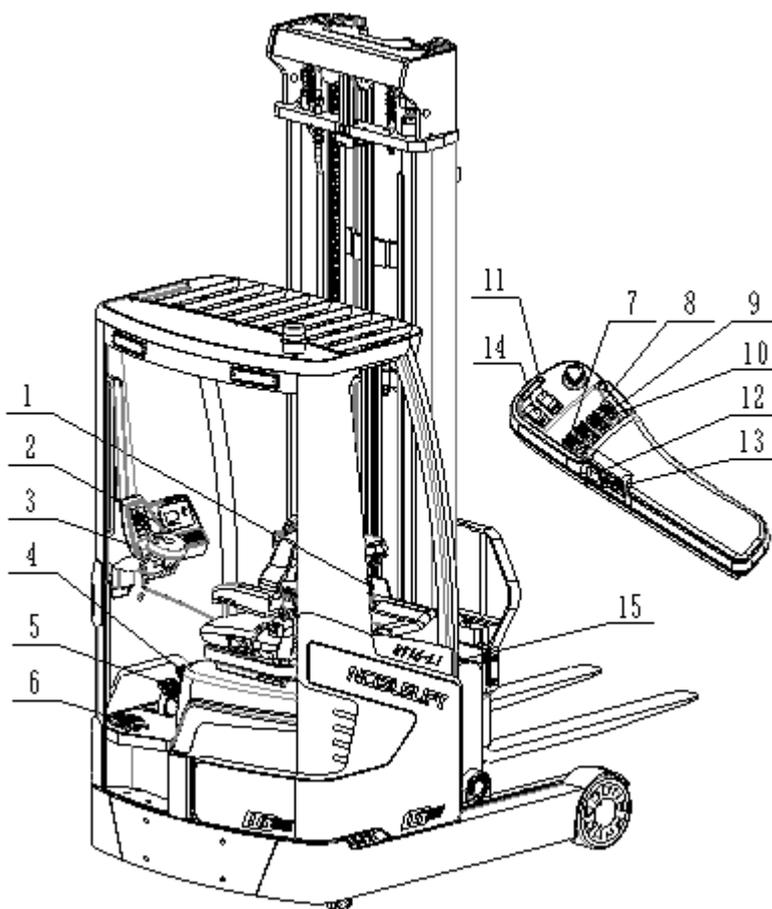


Fig. 9: Operational control devices

### b. Power-on the truck

Before operating this truck, please make sure that the load or other equipment will not cause insufficient visibility, and ensure that the load is level and placed stably.

Pull the emergency button (1), insert the key switch (2), and turn it clockwise to "ON" position, then step on the safety pedal switch (6). Before start the truck, please activate the horn button (13) by pressing it to warn others if necessary. The truck is power on.

Note: please set the direction switch in the neutral position before power-on the truck, otherwise the operation sequence fault will occur.

### c. Travelling

After starting the truck by turning the inserted key to "ON" position, firstly step the safety pedal switch (6), then put your hand on the operating area. Move the switch to the forward or backward direction, and adjust the travelling speed by controlling the accelerator pedal

(4) carefully until it reaches your desired speed. The speed will be slower if you release the accelerator pedal, control the speed to ensure safety. If you need abrupt deceleration, please stamp the brake pedal (5).

Carefully drive the truck to the destination. Observe the route conditions and adjust the travelling speed by operating the accelerator pedal.

This truck is equipped with adequate safety equipment to avoid accidents. When the height of the fork is higher than the free lifting height, the speed of the truck will be reduced for smooth travelling and safe work. When the forks lower below the free lifting height, the lower the fork height, the slower the truck.

Please keep the lifting height of the fork below 0.5m when you need to travel over a longer distance.

Please drive the truck to the safe storage area and lower the forks to the lowest position after every use. Turn the key counterclockwise to "OFF" position and remove the key.

Attention: Turn on the power, the system will start self-inspection. When there is something wrong with the electrical system, such as open circuit, short circuit, or active button, if you stamp the pedal switch, speed control device is not in the neutral position, and the truck cannot be operated and a fault code appears, only when the fault from electrical system is solved, the truck can be operated normally.

#### **d. Steering**

The truck is equipped with an electric steering system. Take care by operating a truck with this kind of system.

Steer the truck by turning the steering wheel clockwise and counterclockwise. Turn the steering wheel to make the drive wheel move straightly forward, truck will reach full speed. Turn the steering wheel a certain angle to turn the drive wheel to achieve steering. During steering, when the turning angle is larger than  $\pm 10^\circ$ , comparing with straight driving, the steering speed is different, the larger the turning angle, the slower the speed, which ensures the smooth steering and safe operation.

#### **e. Braking**

The braking performance depends on the track conditions and the load conditions of the truck.

- When driving the truck, if the right foot releases the accelerator pedal, the truck begins to decelerate. If you need a shorter braking distance, please directly step on the brake pedal until the truck stops;
- Release the safety pedal switch (6), the braking function is activated and the truck will be stopped.
- Press the emergency button (1), the braking function is activated and the truck will be stopped..

Attention: when there is load on the forks, the brake should be activated slowly. Do not use emergency braking to prevent the load from falling.

## f. Residual lift diagram

The residual lift diagram indicates the maximum capacity  $Q$  [kg] for a given load centre  $c$  [mm] and the corresponding lift height  $h_3$  [mm] for the truck with horizontal load.

The white mark on the mast indicates the possible lifting limits.

For instance, the truck RT16Li, with a load centre of gravity distance ( $c$ ) of 600mm and a maximum lift height ( $h_3$ ) of 9500mm, the maximum capacity ( $Q$ ) is 600 kg.

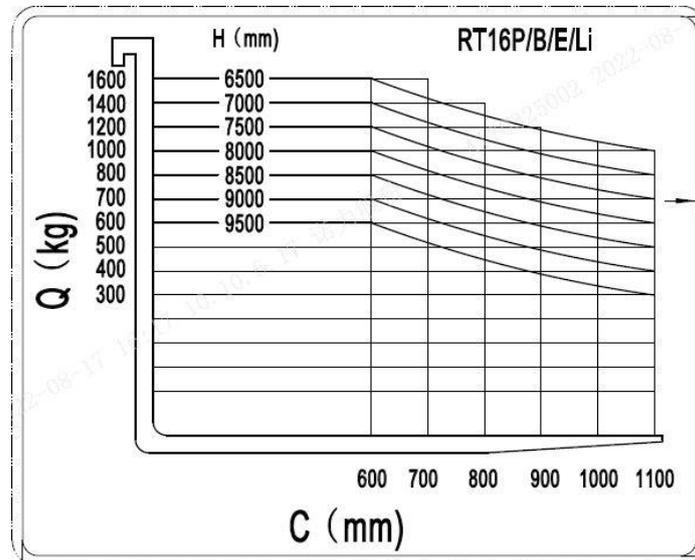


Fig. 10: Residual lift diagram

## g. Lifting



DO NOT OVERLOAD THE TRUCK! THE MAXIMUM CAPACITY IS 1600KG OR 2000KG REFERRING TO THE IDENTIFICATION PLATE.

LIFT THE LOAD THAT IS INDICATED AND ALLOWED IN RESIDUAL LIFT DIAGRAM ONLY, OTHERWISE IT MAY DAMAGE THE TRUCK.

Push the lifting control stick (7) backwards until it reaches your desired lifting height.

When the lifting height of the unladen truck is more than 3m or the lifting height of the laden truck is more than 1m, please reduce the speed of the truck. Be careful of operation during steering, no sharp start, stop or steering.

Be cautious in lifting work in racks, pay attention to the gap between load and rack.

## h. Lowering

If the forks are in the racking, firstly travel out of the racking carefully with or without the pallet.

Push the lifting and lowering control stick (7) forwards for lowering.

Lower the load until the forks are clear of the pallet, then move the truck carefully out of the load.

## i. Mast movement (extended/ retracted)

Push the mast control stick (8) forwards, the mast shifts forward and extends

Pull the mast control stick (8) backwards, the mast shifts backward and retracts.

## j. Fork side-shift (left/ right)

Push the control stick (10) forwards, the forks shifts to the left.

Pull the control stick (10) backwards, the forks shifts to the right.

## k. Fork tilts (up/ down)

Push the tilt control stick (9) forwards, the forks tilt downward.

Pull the control stick (9) backwards, the forks tilt upward.

## l. Malfunctions

If there are any malfunctions or the truck is inoperative, please stop using the truck and activate the emergency button (1) by pushing it. If possible, park the truck in a safe area, turn the key switch (2) counterclockwise and remove the key. Immediately inform the manager or call your service. If necessary, remove the truck out of the operating area by using dedicated towing/ lifting equipment.

When the truck breaks down, stop using it immediately and put a label for indication;

When the truck breaks down, the wrench indicator at the bottom of the display will be on. CURTIS hand-held unit can help to find out the fault cause.

## m. Emergency

In emergencies, press the emergency button (1) immediately in case of loss of control and other emergencies. All electrical functions will stop.

If the truck fails to lower the lifted forks, please use a 6mm Allen-wrench to unscrew the screw (emergency descent) shown in the figure below to lower the forks.

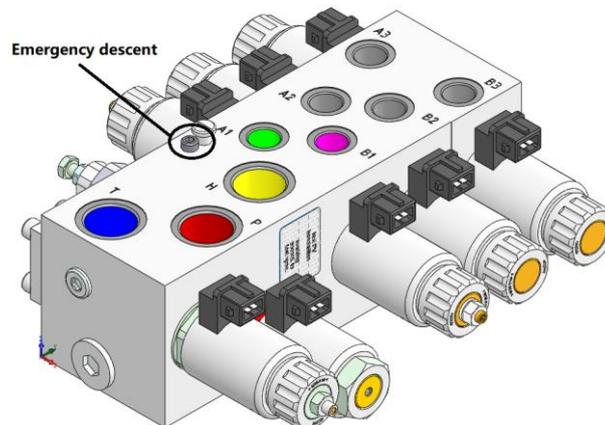


Fig. 11: Emergency descent

## 7. BATTERY CHANGES AND REPLACEMENT



- Only qualified personnel are allowed to service or charge the batteries. Instructions of this manual and from the battery's manufacturer must be observed.
- The battery type for this truck is lithium battery.
- Battery recycling undergoes national regulations. Please follow these regulations.
- In the area of battery charging neither burning materials nor burning liquids are allowed.
- Park the truck securely before starting charging or installing/replacing the battery.
- Before finishing the maintenance work, make sure, that all cables are connected correctly and that there are no disturbing towards other components of the truck.

### a. Charging



- Before charging ensure that you are using an appropriate charger for charging the installed battery!
- Please fully understand the instructions of the charger manual before using.
- Please follow these instructions.
- The room for charging must be ventilated.

Park the truck at a specific secured area with a dedicated power supply. Lower forks and remove load. Turn the truck off and connect the battery and the charger. The charger starts charging the battery. Disconnect the battery and the charger when charging is completed.

## 8. REGULAR MAINTENANCE



- Only qualified and trained personnel are allowed to do maintenance to this truck.
- Remove the load from the forks and lower the forks to the lowest position before maintenance.
- If you need to lift the truck, follow chapter 4b by using designated lashing or jacking equipment. Before working, put safety devices (for instance designated lift jacks, wedges or wooden blocks) under the truck to protect against accidental lowering, movement or slipping.
- If you need to remove the high-pressure oil hose, lower the forks and turn off the power. After 10 minutes, release the pressure in each hose and remove the hose.
- Use approved and from your dealer released original spare parts.
- Please consider that oil leakage of hydraulic fluid can cause failures and accidents.
- It is allowed to adjust the pressure valve only from trained service technicians.

If you need to replace the wheels, please follow the instructions above. The casters must be round and free of abnormal wear.

Check the key items on the maintenance list.

### a. Maintenance checklist

Table 3: Maintenance checklist table

		Interval (Month)			
		1	3	6	12
	Hydraulic system				
1	Check the hydraulic cylinder(s), piston for damage noise and leakage		•		
2	Check the hydraulic joints for damage and leakage		•		
3	Inspect the hydraulic oil level, refill if necessary		•		
4	Refill the hydraulic oil ( 12 month or 1500 working hours )				•
	Mechanical system				
5	Inspect the forks for deformation and cracks		•		
6	Check the chassis for deformation and cracks		•		
7	Check if all screws are fixed		•		
8	Check mast and chain for deformation and damages, replace if necessary	•			
9	Check the gearbox for abnormal sound, noise and leakage		•		
10	Check the wheels for deformation and damages, replace if necessary		•		
11	Check and lubricate the mast and chain	•			
12	Check and fill the brake fluid if necessary	•			
13	Lubricate the grease nipples		•		
14	Check the function of brake	•			
	Electrical system				
15	Inspect the electric wiring for damage		•		

16	Check the electric connections and terminals		•		
17	Test the Emergency switch function		•		
18	Check the electric drive motor for noise and damages		•		
19	Test the display		•		
20	Check, if correct fuses are used		•		
21	Test the warning signal		•		
22	Check the contactor (s)		•		
23	Check the frame leakage (insulation test)		•		
24	Check function and mechanical wear of the accelerator		•		
25	Check the electrical system of the drive motor		•		
Braking system					
26	Check brake performance, if necessary replace disc or adjust air gap		•		
Battery					
27	Check the battery electrolytic liquid proportion		•		
28	Clean and grease the terminals and check for corrosion and damage		•		
29	Check the battery housing for damages		•		
Charger					
30	Check the main power cable for damages			•	
31	Check the start-up protection during charging			•	
Function					
32	Check the horn function	•			
33	Check the air gap of the electromagnetic brake	•			
34	Test the emergency braking	•			
35	Test the reverse and regenerative braking	•			
36	Check the steering function	•			
37	Check the lifting and lowering function	•			
38	Check the tiller arm switch function	•			
39	Check the key switch for damage or normal work	•			
40	Check the speed limitation switch function	•			
General					
41	Check if all decals are legible and complete	•			
42	Check if the protective screen and or guarding is not damaged	•			
43	Inspect the castors, adjust the height or replace these if worn out.		•		
44	Carry out a test run	•			

## b. Lubricating points

Lubricate the marked points according to the maintenance checklist. The required grease specification is: DIN 51825, standard grease.

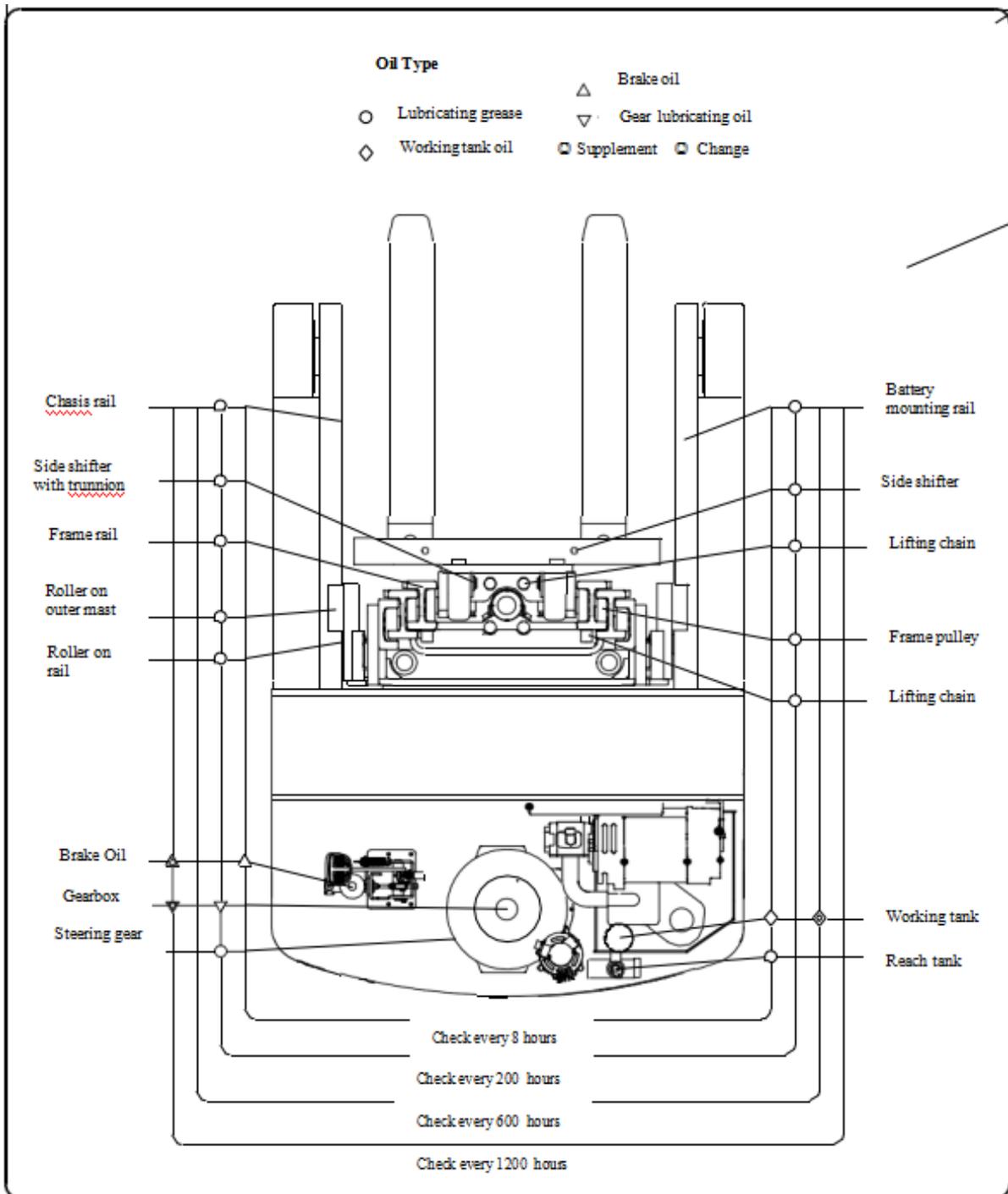


Fig 12: Lubricating points

## c. Check and refill hydraulic oil

It is recommended to use the hydraulic oil:

- Type: H-LP 46, DIN 51524
- Viscosity: 41.4 – 47

Waste material like oil, used batteries or others must be probably disposed and recycled according to the national regulations and if necessary brought to a recycling company.

The oil level in the oil tank should not be under the minimum mark for lifting load.

If necessary add oil from the filling point.

## d. Checking electrical fuses

Remove the plastic cover, the location of fuses is shown in figure 13 below. Specification of the fuses is shown in Table 4 below.

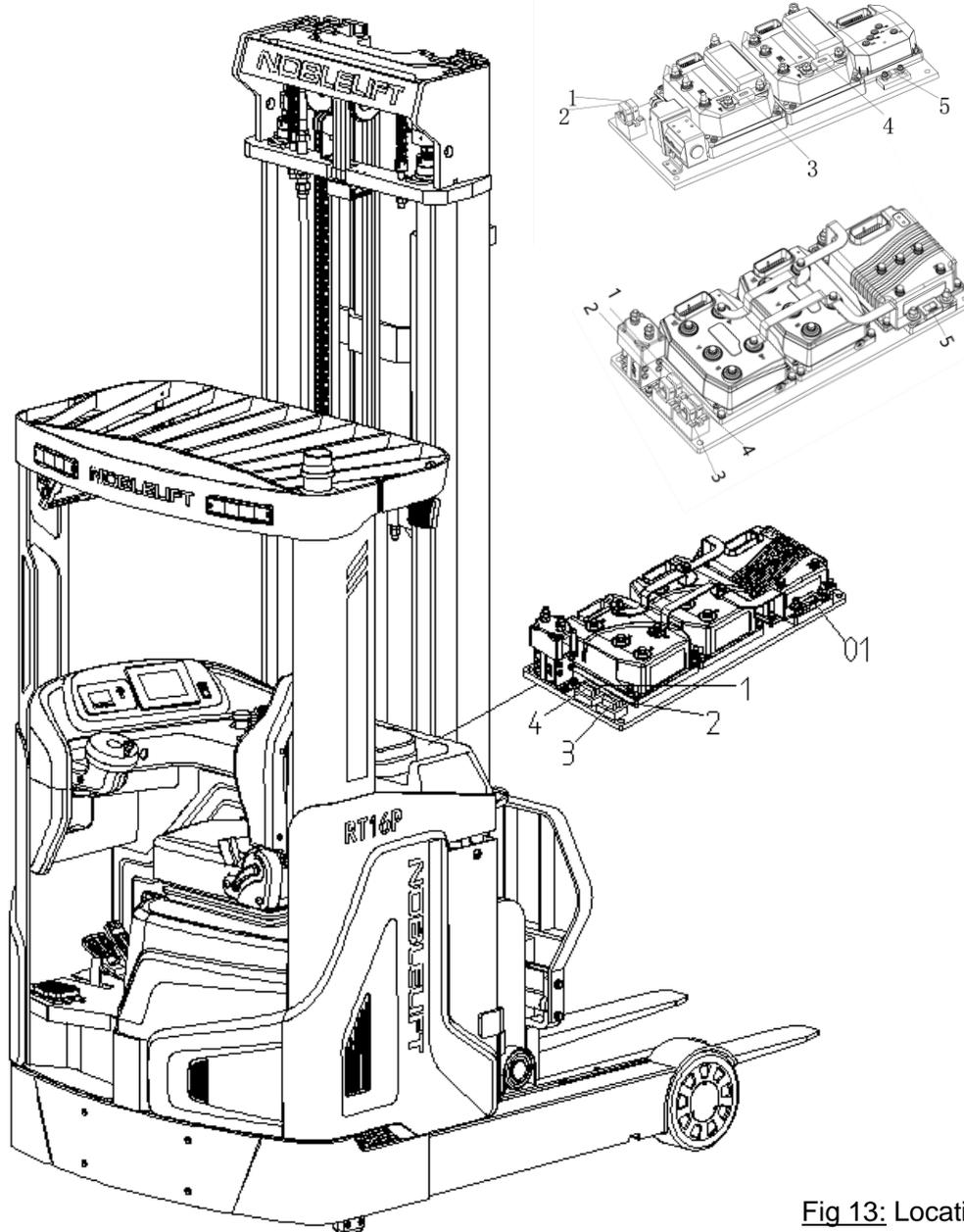


Fig 13: Location of fuses

**Table 4:** Specification of the fuses

Truck with Inmotion Controller	Fuse Specification	Truck with F4A Controller	Fuse Specification	Truck with 1232SE Controller	Fuse Specification
FU 1	10A	FU 1	10A	FU 1	10A
FU 2	10A	FU 2	10A	FU 2	10A
FU 3	10A	FU 3	10A	FU 3	10A
FU 4	30A	FU 4	30A	FU 4	30A
FU 5	500A	FU 5	500A	FU 01	500A

## 9. TROUBLE SHOOTING



- If the truck has malfunctions, follow the instructions mentioned in chapter 6.

**Table 5:** Trouble shooting

TROUBLE	CAUSE	MAINTENANCE
Load lifting failure	Load weight too high	Lift only the max. capacity, mentioned on the ID-plate.
	Battery discharged	Charge the battery.
	Lifting fuse failure	Check and eventually replace the lifting fuse.
	Hydraulic oil level too low	Check and eventually refill hydraulic oil.
	Oil leakage	Repair the hoses and/or the sealing of the cylinder.
Oil leakage from air suction	Excessive quantity of oil	Reduce oil quantity.
Truck operating failure	Battery is charging	Charge the battery completely and remove the main power plug from the socket.
	Battery not connected	Connect the battery correctly.
	The fuse is faulty	Check and eventually replace fuses.
	Battery discharged	Charge the battery.
	Emergency button is activated	Deactivate the button by inserting and pulling the knob.
Only travelling in one direction	The accelerator and the connections are damaged.	Check the accelerator and the connections.
The truck only travels very slowly	The battery is discharged.	Check the battery status at the discharge indicator.
	The electromagnetic brake is engaged.	Check the electromagnetic brake.

	The relating tiller cables are disconnected or damaged	Check the tiller cables and connections.
	Electric system overheated	Stop using and cool down the truck.
	Heat sensor failure	Check and if necessary replace the heat sensor.
The truck starts up suddenly	The controller is damaged.	Replace the controller.
	The accelerator not moves back to its neutral position.	Repair or replace the accelerator.

If the truck has malfunctions and can't be operated out of the working zone, jack the truck up and go with a load handler under the truck and safe the truck securely. Then move the truck out of the aisle.

## 10. Hydraulic circuit diagram

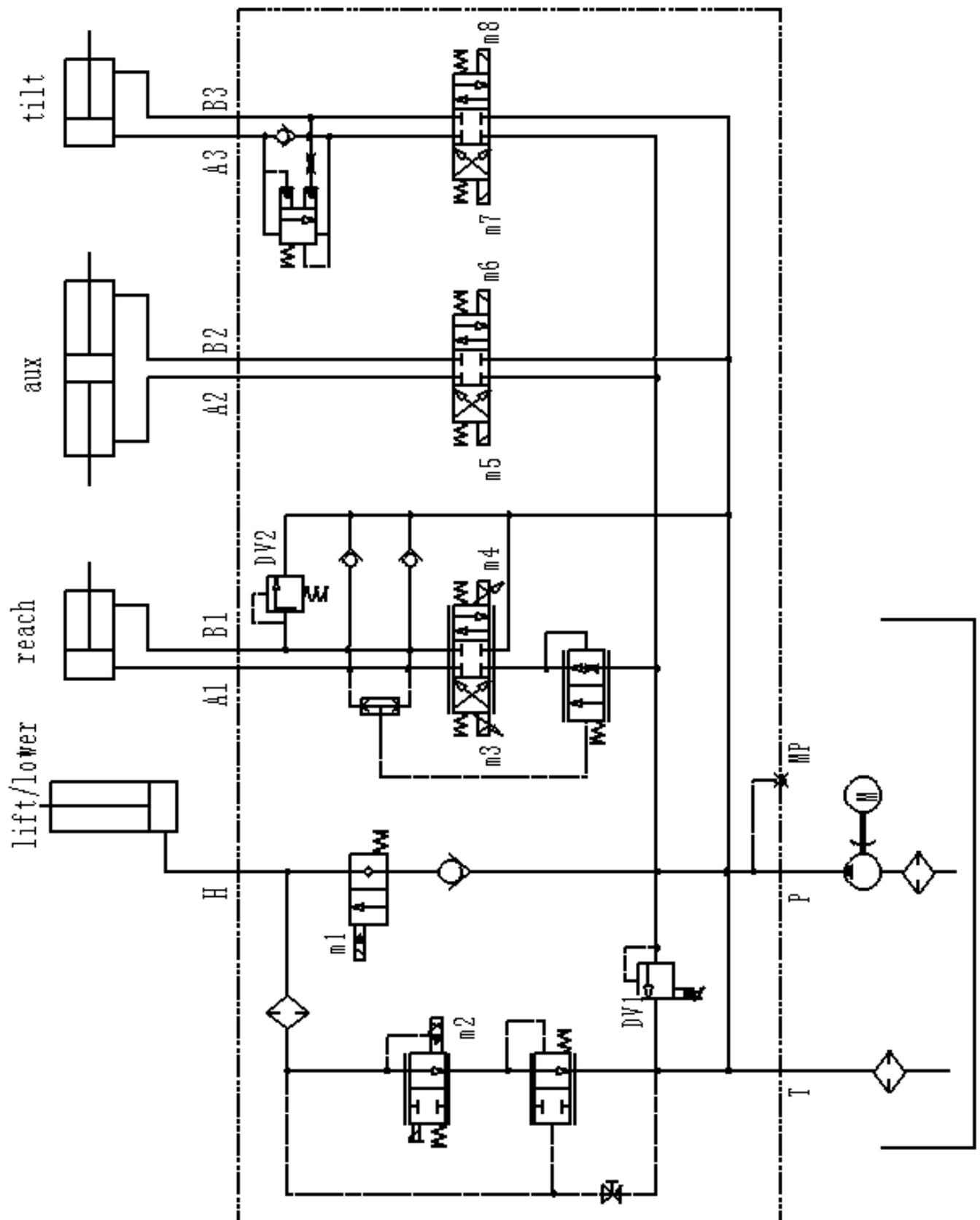


Fig. 15: Hydraulic circuit diagram

# 11. DIAGNOSTICS AND TROUBLESHOOTING, DISPLAY, AND WIRING DIAGRAM

These controllers detect a wide variety of faults or error conditions. Faults can be detected by the operating system or by the VCL code. This section describes the faults detected by the operating system. Diagnostics information can be obtained in either of two ways:

- (1) by reading the display on a hand-held or PC programmer or
- (2) by observing the fault codes issued by the Status LEDs. See Table 4 for a summary of LED display formats.

The pair of LEDs built into the controller (one red, one yellow) produce flash codes displaying all the currently set faults in a repeating cycle. Each code consists of two digits. The red light flashes once, indicating that the number of times the yellow light flashes below is the first digit of the fault code, and the red light flashes twice, indicating that the number of times the yellow light flashes below is the second digit of the fault code.

Example: red light flashes once, followed by yellow light flashes four times. Then the red light blinks twice, then the yellow light blinks twice, so the fault code is 42. Please refer to the list of fault information in this manual for relevant fault codes and causes.

In the fault menu of the programmer, the words **Throttle Wiper Low** will be displayed if the accelerator output is low.

The controller's two LEDs will display this repeating pattern:



The numerical codes used by the yellow LED are listed in the troubleshooting table, which also lists possible fault causes and describes the conditions that set and clear each fault.

## Summary of LED display formats

The two LEDs have four different display modes, indicating the type of information they are providing:

DISPLAY	STATUS
Neither LED illuminated	Controller is not powered on/ vehicle has dead battery/ or severe damage.
Yellow LED flashing	Controller is operating normally.
Yellow and red LEDs both on solid	Controller is in Flash program mode.
Red LED light on solid	No software loaded, or an internal hardware fault detected by the Supervisor or Primary microprocessor. Cycle KSI to clear. Reload software or replace controller if necessary.
Red LED and yellow LED flash alternately	Controller has detected a fault. 2-digit code flashed by yellow LED identifies the specific fault; one or two flashes by red LED indicate whether first or second code digit will follow.

## Troubleshooting

The troubleshooting chart provides the following information on all the controller faults:

- fault code
- fault name as displayed on the programmer's LCD
- the effect of the fault
- possible causes of the fault
- fault set conditions
- fault clear conditions.

Whenever a fault is encountered and no wiring or vehicle fault can be found, shut off KSI and turn it back on to see if the fault clears. If it does not, shutoff KSI and remove the 35-pin connector. Check the connector for corrosion or damage, clean it if necessary, and re-insert it.

### a. Display (truck with 1232SE controller)

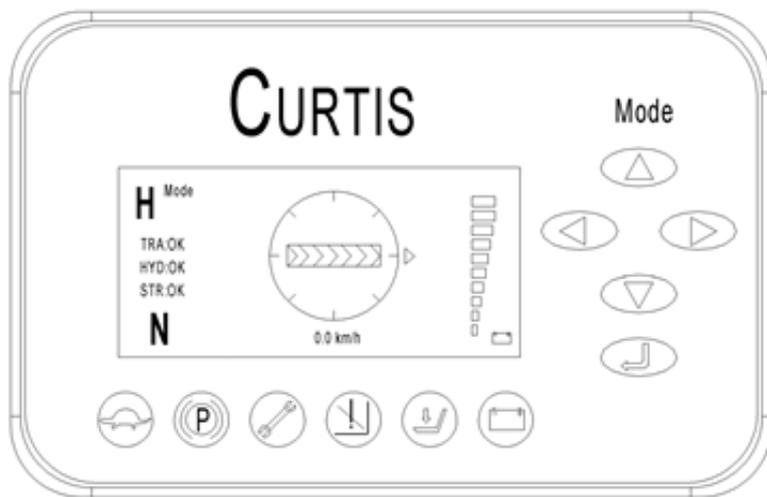


Fig. 15: CURTIS-3501 Display

State of charge (SOC) of the battery is displayed on the right side of the indicator, if the battery is fully charged, the indicator displays 100% (10 segments), when SOC of battery is 20%, the battery symbol will light on (the sixth one from left in Fig 15), indicating the battery needs charging. When SOC of the battery is 10%, the prohibition symbol will light on (the fourth one from left in figure 11), the lifting function is not available but slow travelling is available.

When the battery is removed, the indicator will display TRA: 5.7, the travelling is not available but mast movement (reach forward/backward) is available.

There are keys on the right of the display for different “modes”, you can switch the mode by operating different “mode” keys, as shown in Fig 15:

H Mode	high speed mode	top speed drive 10 Km/h
S Mode	normal mode	top speed drive 8.4 Km/h
E Mode	economic mode	top speed drive 6.3 Km/h

When switch to economic mode, slow speed (turtle) symbol is on (the first one from left in Fig 15).

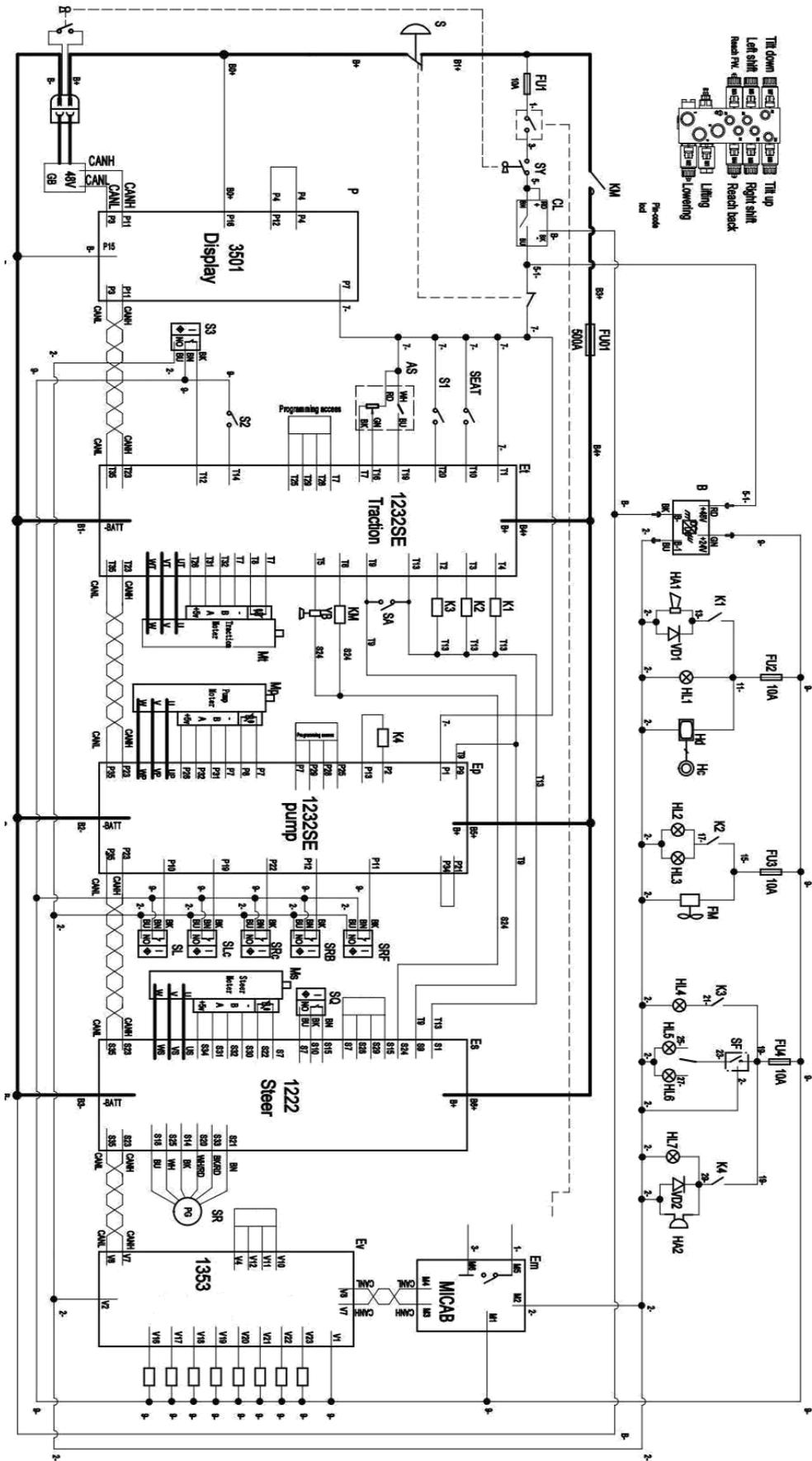


Fig. 16: Electrical diagram (truck with 1232SE controller)

**Table 6:** Description of electrical components (truck with 1232SE controller)

Code	Item	Code	Item
GB	Battery 51.2V/350AH	S6	Battery position monitor switch
S	Emergency button	SL	Mast limit switch
Mt	Traction motor	SLC	Mast speed limit switch
Mp	Pump motor	SRF	Reach forward limit switch
Ms	Steering motor	SRB	Reach backward limit switch
Et	Traction controller	SRC	Reach FW./BW. speed limit switch
Ep	Pump controller	S7	Lithium battery switch
Es	Steering controller	D	Diode
Ed	Display	HA1	Horn
SQ	0° proximity switch	HL1	Warning signal light
SR	Steering wheel	HL2, HL3	Front lamp
SEAT	Seat switch	HL4	Brake signal light
FU01	Fuse 500A	FM	Fan
AS	Accelerator	HD	Display
SY	Key switch	HC	Camera
Kmt	Main contactor	SF	Flasher
YV	Lowering electromagnetic valve coil	HL5	Left signal light
YB	Electromagnetic brake	HL6	Right signal light
B	AC converter	HL7	Reversing light
SA	Pedal switch	HA2	Buzzer
FU1~FU4	Fuse 10A	K1	Brake relay
S1	Horn button	K2	Astern relay
S2	Lamp button	EM	CAN communication
S3	180°/ 360° switch	EV	Valve controller
S4	Brake switch		
S5	Travel speed limit switch		

## 1232SE controller (drive/ pump motor) troubleshooting table

NO.	PROGRAMMER LCD DISPLAY	CODE	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
	EFFECT OF FAULT			
1	<b>Controller Overcurrent</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	12	1. External short of phase U,V, or W motor connections. 2. Motor parameters are mis-tuned. 3. Controller defective.	<i>Set: Phase current exceeded the current measurement limit.</i> <i>Clear: Cycle KSI.</i>
2	<b>Current Sensor Fault</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	13	1. Leakage to vehicle frame from phase U, V, or W (short in motor stator). 2. Controller defective.	<i>Set: Controller current sensors have invalid offset reading.</i> <i>Clear: Cycle KSI.</i>
3	<b>Precharge Failed</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	14	1. See Monitor menu » Battery: Capacitor Voltage. 2. External load on capacitor bank (B+ connection terminal) that prevents the capacitor bank from charging.	<i>Set: Precharge failed to charge the capacitor bank to the KSI voltage.</i> <i>Clear: Cycle Interlock input or use VCL function Enable_ Precharge</i> .
4	<b>Controller Severe Undertemp</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	15	1. See Monitor menu » Controller: Temperature. 2. Controller is operating in an extreme environment.	<i>Set: Heatsink temperature below -40°C.</i> <i>Clear: Bring heatsink temperature above -40°C, and cycle interlock or KSI.</i>
5	<b>Controller Severe Overtemp</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	16	1. See Monitor menu » Controller: Temperature. 2. Controller is operating in an extreme environment. 3. Excessive load on vehicle. 4. Improper mounting of controller.	<i>Set: Heatsink temperature above +95°C.</i> <i>Clear: Bring heatsink temperature below +95°C, and cycle interlock or KSI.</i>
6	<b>Severe Undervoltage</b> <i>Reduced drive torque.</i>	17	1. Battery Menu parameters are misadjusted.	<i>Set: Capacitor bank voltage dropped below the Severe</i>

			<p>2. Non-controller system drain on battery.</p> <p>3. Battery resistance too high.</p> <p>4. Battery disconnected while driving.</p> <p>5. Blown B+ fuse or main contactor did not close.</p>	<p>Undervoltage limit with FET bridge enabled.</p> <p><i>Clear: Bring capacitor voltage above Severe Undervoltage limit.</i></p>
7	<p><b>Severe Overvoltage ShutdownMotor;</b>  <b>ShutdownMainContactor;</b>  <b>ShutdownEMBrake;</b>  <b>ShutdownThrottle;</b>  <b>FullBrake;</b>  <b>ShutdownPump.</b></p>	18	<p>1. See Monitor menu » Battery: Capacitor Voltage.</p> <p>2. Battery menu parameters are misadjusted.</p> <p>3. Battery resistance too high for given regen current.</p> <p>4. Battery disconnected while regen braking.</p>	<p><i>Set: Capacitor bank voltage exceeded the Severe Overvoltage limit with FET bridge enabled.</i></p> <p><i>Clear: Bring capacitor voltage below Severe Overvoltage limit, and then cycle KSI.</i></p>
8	<p><b>Controller Undertemp Cutback</b></p>	21	<p>1. Controller works under restricted conditions.</p> <p>2. Controller is operating in an extreme environment.</p>	<p><i>Set: Heatsink temperature below -25°C.</i></p> <p><i>Clear: Bring heatsink temperature above -25°C.</i></p>
9	<p><b>Controller Overtemp Cutback</b>  <i>Reduced drive and regenerative brake torque.</i></p>	22	<p>1. See Monitor menu » Controller: Temperature.</p> <p>2. Controller is operating in an extreme environment.</p> <p>3. Excessive load on vehicle.</p> <p>4. Improper mounting of controller.</p>	<p><i>Set: Heatsink temperature exceeded 85°C.</i></p> <p><i>Clear: Bring heatsink temperature below 85°C.</i></p>
10	<p><b>Undervoltage Cutback</b>  <i>Reduced drive torque.</i></p>	23	<p>1. Normal operation. Fault shows that the batteries need recharging.</p> <p>2. Battery parameters are misadjusted.</p> <p>3. Non-controller system drain on battery.</p> <p>4. Battery resistance too high.</p> <p>5. Battery disconnected while driving.</p> <p>6. See Monitor menu » Battery: Capacitor Voltage.</p> <p>7. Blown B+ fuse or main contactor did not close.</p>	<p><i>Set: Capacitor bank voltage dropped below the Undervoltage limit with the FET bridge enabled.</i></p> <p><i>Clear: Bring capacitor voltage above the Undervoltage limit.</i></p>
11	<p><b>Overvoltage Cutback</b>  <i>Reduced regenerative brake torque.</i>  <i>Note: This fault is</i></p>	24	<p>1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking.</p>	<p><i>Set: Capacitor bank voltage exceeded the Overvoltage limit with the FET bridge enabled.</i></p> <p><i>Clear: Bring capacitor voltage</i></p>

	<i>declared only when the controller is running in regen.</i>		Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Battery resistance too high for given regen current. 4. Battery disconnected while regen braking. 5. See Monitor menu » Battery: Capacitor Voltage.	<i>below the Overvoltage limit.</i>
12	<b>+5V Supply Failure</b> <i>None, unless a fault action is programmed in VCL.</i>	25	1. External load impedance on the +5V supply is too low. 2. See Monitor menu » outputs: 5 Volts and Ext Supply Current.	<i>Set: +5V supply outside the +5V±10% range. Clear: Bring voltage within range.</i>
13	<b>Digital Out 6 Failure</b> <i>Digital Output 6 driver will not turn on.</i>	26	1. External load impedance on Digital Output 6 driver is too low.	<i>Set: Digital Output 6 current exceeded 15 mA. Clear: Remedy the overcurrent cause and use the VCL function Set_DigOut() to turn the driver on again.</i>
14	<b>Digital Out 7 Overcurrent</b> <i>Digital Output 7 driver will not turn on.</i>	27	1. External load impedance on Digital Output 7 driver is too low.	<i>Set: Digital Output 7 current exceeded 15 mA. Clear: Remedy the overcurrent cause and use the VCL function Set_DigOut() to turn the driver on again.</i>
15	<b>Motor Temp Hot Cutback</b> <i>Reduced drive torque.</i>	28	1. Motor temperature is at or above the programmed Temperature Hot setting, and the current is being cutback. 2. Motor Temperature Control Menu parameters are mis-tuned. 3. If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off.	<i>Set: Motor thermistor input is at 0V or above 10V. Clear: Bring the motor thermistor input voltage within range.</i>
16	<b>Motor Temp Sensor Fault</b> <i>MaxSpeed reduced (LOS, Limited Operating Strategy), and motor temperature cutback</i>	29	1. Motor thermistor is not connected properly. 2. If the application doesn't use a motor thermistor, Motor Temp Sensor Enable should be programmed Off.	<i>Set: Motor thermistor input is at 0V or above 10V. Clear: Bring the motor thermistor input voltage within range.</i>

	<i>disabled.</i>			
17	<b>Coil 1 Driver Open/Short</b> <i>ShutdownDriver1.</i>	31	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	<i>Set: Driver 1 (pin 6) is either open or shorted. This fault can be set only when Main Enable = Off. Clear: Correct open or short, and cycle driver</i>
18	<b>Main Open/Short</b> <i>ShutdownMotor; ShutdownMainContactor; ShutdownEMBrake; ShutdownThrottle; FullBrake; ShutdownPump.</i>	31	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	<i>Set: Main contactor driver (pin 6) is either open or shorted. This fault can be set only when Main Enable = On. Clear: Correct open or short, and cycle driver</i>
19	<b>Coil2 Driver Open/Short</b> <i>ShutdownDriver2</i>	32	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring	<i>Set: Driver 2 (pin 5) is either open or shorted. This fault can be set only when EM Brake Type = 0. Clear: Correct open or short, and cycle driver.</i>
20	<b>EMBrake Open/Short</b> <i>ShutdownEMBrake; ShutdownThrottle; FullBrake.</i>	32	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring	<i>Set: Electromagnetic brake driver (pin 5) is either open or shorted. This fault can be set only when EM Brake Type &gt; 0. Clear: Correct open or short, and cycle driver.</i>
21	<b>Coil3 Driver Open/Short</b> <i>ShutdownDriver3</i>	33	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	<i>Set: Driver 3 (pin 4) is either open or shorted. Clear: Correct open or short, and cycle driver.</i>
22	<b>Coil4 Driver Open/Short</b> <i>ShutdownDriver4</i>	34	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	<i>Set: Driver 4 (pin 3) is either open or shorted. Clear: Correct open or short, and cycle driver.</i>
23	<b>PD Open/Short</b> <i>ShutdownPD.</i>	35	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	<i>Set: Proportional driver (pin 2) is either open or shorted. Clear: Correct open or short, and cycle driver.</i>
24	<b>Encoder Fault</b>	36	1. Motor encoder failure. 2. Bad crimps or faulty wiring.	<i>Set: Motor encoder phase failure detected. Clear: Cycle KSI.</i>
25	<b>Motor Open</b> <i>ShutdownMotor; ShutdownMainContactor; ShutdownEMBrake;</i>	37	1. Motor phase is open. 2. Bad crimps or faulty wiring	<i>Set: Motor phase U, V, or W detected open. Clear: Cycle KSI.</i>

	<i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>			
26	<b>Main Contactor Welded</b> <i>ShutdownMotor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	38	<ol style="list-style-type: none"> <li>1. Main contactor tips are welded closed.</li> <li>2. Motor phase U or V is disconnected or open.</li> <li>3. An alternate voltage path (such as an external precharge resistor) is providing a current to the capacitor bank (B+ connection terminal).</li> </ol>	<i>Set: Just prior to the main contactor closing, the capacitor bank voltage (B+ connection terminal) was loaded for a short time and the voltage did not discharge.</i> <i>Clear: Cycle KSI.</i>
27	<b>Main Contactor Did Not Close</b> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	39	<ol style="list-style-type: none"> <li>1. Main contactor did not close.</li> <li>2. Main contactor tips are oxidized, burned, or not making good contact.</li> <li>3. External load on capacitor bank (B+ connection terminal) that prevents capacitor bank from charging.</li> <li>4. Blown B+ fuse.</li> </ol>	<i>Set: With the main contactor commanded closed, the capacitor bank voltage (B+ connection terminal) did not charge to B+.</i> <i>Clear: Cycle KSI.</i>
28	<b>Throttle Wiper High</b> <i>ShutdownThrottle.</i>	41	<ol style="list-style-type: none"> <li>1. See Monitor menu » Inputs: Throttle Pot.</li> <li>2. Throttle pot wiper voltage too high.</li> </ol>	<i>Set: Throttle pot wiper (pin 16) voltage is higher than the high fault threshold (can be changed with the VCL function). Setup_Pot_Faults()</i> <i>Clear: Bring throttle pot wiper voltage below the fault threshold.</i>
29	<b>Throttle Wiper Low</b> <i>ShutdownThrottle.</i>	42	<ol style="list-style-type: none"> <li>1. See Monitor menu » Inputs: Throttle Pot.</li> <li>2. Throttle pot wiper voltage too low.</li> </ol>	<i>Set: Throttle pot wiper (pin 16) voltage is lower than the low fault threshold (can be changed with the VCL function Setup_Pot_Faults() ).</i> <i>Clear: Bring throttle pot wiper voltage above the fault threshold.</i>
30	<b>Pot2 Wiper High</b> <i>FullBrake.</i>	43	<ol style="list-style-type: none"> <li>1. See Monitor menu » Inputs: Pot2 Raw.</li> <li>2. Pot2 wiper voltage too high.</li> </ol>	<i>Set: Pot2 wiper (pin 17) voltage is higher than the high fault threshold (can be changed with the VCL function Setup_Pot_Faults() ).</i> <i>Clear: Bring Pot2 wiper voltage</i>

				<i>below the fault threshold</i>
31	<b>Pot2 Wiper Low</b> <i>FullBrake.</i>	44	1. See Monitor menu » Inputs: Pot2 Raw. 2. Pot2 wiper voltage too low.	<i>Set: Pot2 wiper (pin 17) voltage is lower than the low fault threshold (can be changed with the VCL function Setup_Pot_Faults() ). Clear: Bring Pot2 wiper voltage above the fault threshold.</i>
32	<b>Pot Low Overcurrent</b> <i>ShutdownThrottle; FullBrake</i>	45	1. See Monitor menu » Outputs: Pot Low. 2. Combined pot resistance connected to pot low is too low.	<i>Set: Pot low (pin 18) current exceeds 10mA. Clear: Clear pot low overcurrent condition and cycle KSI.</i>
33	<b>EEPROM Failure</b> <i>ShutdownMotor; ShutdownMainContactor; ShutdownEMBrake; ShutdownThrottle; ShutdownInterlock; ShutdownDriver1, 2, 3, 4; ShutdownPD; FullBrake; ShutdownPump.</i>	46	1. Failure to write to EEPROM memory. This can be caused by EEPROM memory writes initiated by VCL, by the CAN BUS, by adjusting parameters with the programmer, or by loading new software into the controller.	<i>Set: Controller operating system tried to write to EEPROM memory and failed. Clear: Download the correct software (OS) and matching parameter default settings into the controller and cycle KSI.</i>
34	<b>HPD/Sequencing Fault</b> <i>ShutdownThrottle</i>	47	1. KSI, interlock, direction, and throttle inputs applied in incorrect sequence. 2. Faulty wiring, crimps, or switches at KSI, interlock, direction, or throttle inputs.	<i>Set: HPD (High Pedal Disable) or sequencing fault caused by incorrect sequence of KSI, interlock, direction, and throttle inputs. Clear: Reapply inputs in correct sequence.</i>
35	<b>Emer Rev HPD</b> <i>ShutdownThrottle.</i>	47	1. Emergency Reverse operation has concluded, but the throttle, forward and reverse inputs, and interlock have not been returned to neutral.	<i>Set: At the conclusion of Emergency Reverse, the fault was set because various inputs were not returned to neutral. Clear: If EMR_Interlock = On, clear the interlock, throttle, and direction inputs. If EMR_Interlock = Off, clear the throttle and direction inputs.</i>
36	<b>Parameter Change Fault</b> <i>ShutdownMotor; ShutdownMainContactor; ShutdownEMBrake; ShutdownThrottle;</i>	49	1. This is a safety fault caused by a change in certain parameter settings so that the vehicle will not operate until KSI is cycled.	<i>Set: Adjustment of a parameter setting that requires cycling of KSI. Clear: Cycle KSI.</i>

	<i>FullBrake;</i> <i>ShutdownPump.</i>		For example, if a user changes the Throttle Type this fault will appear and require cycling KSI before the vehicle can operate.	
37	<b>OEM Faults</b> (See OEM documentation.)	51-6 7	1. These faults can be defined by the OEM and are implemented in the specific application VCL code. See OEM documentation	
38	<b>VCL RunTime Error</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1, 2, 3, 4;</i> <i>ShutdownPD;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	68	1. VCL code encountered a runtime VCL error. 2. See Monitor menu » Controller: VCL Error Module and VCL Error. This error can then be compared to the runtime VCL module ID and error code definitions found in the specific OS system information file.	<i>Set: Runtime VCL code error condition.</i> <i>Clear: Edit VCL application software to fix this error condition; flash the new compiled software and matching parameter defaults; cycle KSI.</i>
39	<b>External Supply Out of Range</b> <i>None, unless a fault action is programmed in VCL.</i>	69	1. External load on the 5V and 12V supplies draws either too much or too little current. 2. Fault Checking Menu parameters Ext Supply Max and Ext Supply Min are mis-tuned. 3. See Monitor menu » Outputs: Ext Supply Current.	<i>Set: The external supply current (combined current used by the 5V supply [pin 26] and 12V supply [pin 25]) is either greater than the upper current threshold or lower than the lower current threshold. The two thresholds are defined by the External Supply Max and External Supply Min parameter settings (page 54).</i> <i>Clear: Bring the external supply current within range.</i>
40	<b>OS General</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1, 2, 3, 4;</i> <i>ShutdownPD;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	71	1. Internal controller fault.	<i>Set: Internal controller fault detected.</i> <i>Clear: Cycle KSI.</i>

41	<b>PDO Timeout</b> PDO Timeout <i>ShutdownInterlock;</i> <i>CAN NMT State set to Pre-operational</i>	72	1. Time between CAN PDO messages received exceeded the PDO Timeout Period.	<i>Set: Time between CAN PDO messages received exceeded the PDO Timeout Period.</i> <i>Clear: Cycle KSI or receive CAN NMT message.</i>
42	<b>Stall Detected</b> <i>ShutdownEMBrake;</i> <i>Control Mode changed to LOS (Limited Operating Strategy).</i>	73	1. Stalled motor. 2. Motor encoder failure. 3. Bad crimps or faulty wiring. 4. Problems with power supply for the motor encoder. 5. See Monitor menu » Motor: Motor RPM.	<i>Set: No motor encoder movement detected.</i> <i>Clear: Either cycle KSI, or detect valid motor encoder signals while operating in LOS mode and return Throttle Command = 0 and Motor RPM = 0.</i>
43	<b>Motor Characterization Fault</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	87	1. Motor characterization failed during characterization process. See Monitor menu » Controller: Motor Characterization Error for cause: 0=none; 1=encoder signal seen, but step size not determined; set Encoder Step Size manually; 2=motor temp sensor fault; 3=motor temp hot cutback fault; 4= controller overtemp cutback fault; 5=controller undertemp cutback fault; 6=undervoltage cutback fault; 7=severe overvoltage fault; 8=encoder signal not seen, or one or both channels missing; 9=motor parameters out of characterization range.	<i>Set: Motor characterization failed during the motor characterization process.</i> <i>Clear: Correct fault; cycle KSI.</i>
44	<b>Motor Type Fault</b>	89	1. The Motor_Type parameter value is out of range.	<i>Set: Motor_Type parameter is set to an illegal value.</i> <i>Clear: Set Motor_Type to correct value and cycle KSI.</i>
45	<b>VCI/OS Mismatch</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i>	91	1. The VCL software in the controller does not match the OS software in the controller.	<i>Set: VCL and OS software do not match; when KSI cycles, a check is made to verify that they match and a fault is issued when they do not.</i>

	<i>ShutdownInterlock;</i> <i>ShutdownDriver1, 2, 3, 4;</i> <i>ShutdownPD;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>			<i>Clear: Download the correct VCL and OS software into the controller.</i>
46	<b>EM Brake Failed to Set</b> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle.</i>	92	1. Vehicle movement sensed after the EM Brake has been commanded to set. 2. EM Brake will not hold the motor from rotating.	<i>Set: After the EM Brake was commanded to set and time has elapsed to allow the brake to fully engage, vehicle movement has been sensed.</i> <i>Clear: Activate the throttle.</i>
47	<b>Encoder LOS (Limited Operating Strategy)</b> <i>Enter LOS control mode</i>	93	1. Limited Operating Strategy (LOS) control mode has been activated, as a result of either an Encoder Fault (Code 36) or a Stall Detect Fault (Code 73). 2. Motor encoder failure. 3. Bad crimps or faulty wiring. 4. Vehicle is stalled.	<i>Set: Encoder Fault (Code 36) or Stall Detect Fault (Code 73) was activated, and Brake or Interlock has been applied to activate LOS control mode, allowing limited motor control.</i> <i>Clear: Cycle KSI or, if LOS mode was activated by the Stall Fault, clear by ensuring encoder senses proper operation, Motor RPM = 0, and Throttle Command = 0.</i>
48	<b>Emer Rev Timeout</b> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle.</i>	94	1. Emergency Reverse was activated and concluded because the EMR Timeout timer has expired. 2. The emergency reverse input is stuck On.	<i>Set: Emergency Reverse was activated and ran until the EMR Timeout timer expired.</i> <i>Clear: Turn the emergency reverse input Off.</i>
49	<b>Illegal Model Number</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i> <i>ShutdownPump.</i>	98	1. Model_Number variable contains illegal value. 2. Software and hardware do not match. 3. Controller defective.	<i>Set: Illegal Model_Number variable; when KSI cycles, a check is made to confirm a legal Model_Number, and a fault is issued if one is not found.</i> <i>Clear: Download appropriate software for your controller model.</i>
50	<b>Dualmotor Parameter Mismatch</b> <i>ShutdownController;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake;</i>	99	1. Dual Motor Enable parameter is set On and Control Mode Select parameter not set to 1 (Speed Mode Express) or 2 (Speed Mode). 2. Motor Technology and	<i>Set: When the Dual Drive software is enabled, the controller must be set to either Speed Mode Express or Speed Mode; otherwise this fault is set.</i> <i>Motor Techology=0 must be paired</i>

	<i>ShutdownPump.</i>		Feedback Type parameters do not match.	with Feedback Type=1, and Motor Technology=1 must be paired with Feedback Type=2; otherwise this fault is set. <i>Clear: Adjust parameters to appropriate values and cycle KSI.</i>
<b>OEM Faults</b>				
CODE	POSSIBLE CAUSE	SET/CLEAR CONDITIONS		NOTE
51	<b>Steering CAN Comm failure</b>	EPS CAN Communication Timeout		
52	<b>Severe Steering Fault</b>	Severe Steering Failure		
53	<b>Steering Fault</b>	Steering Failure		
54	<b>Pedal Switch Short</b>	Accelerator pedal switch=on before power-on (normally it should be Off).		
55	<b>VCL HPD Fault</b>	The power-on acceleration signal exceeds the dead zone.		
56	<b>VCL SRO Fault</b>	The interlock switch is not activated, the accelerator outputs.		
57	<b>Battery unlock</b>	Battery is not locked.		
58	<b>Display Config Fault</b>	3501 display interface configuration failed.		
59	<b>Steer angle changed</b>	EPS 180°/360° mode switching.		
61	<b>Tillerhead Pdo timeout</b>	1356P/CAN Tillerhead Communication Timeout.		

## 1222 Steering motor controller troubleshooting table

FLASH CODE	SUB CODE	NAME	POSSIBLE CAUSE	CLEAR CONDITION	STEER FAULT ACTION	TRACTION FAULT ACTION
11	1	Hardware Fault	An internal hardware error has been detected; controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
12	1	Controller Overcurrent 1	1. External short of phase U, V, or W motor connection. 2. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
12	2	Controller Overcurrent 2	1. External short of phase U, V, or W motor connection. 2. Motor parameters are mis-tuned. 3. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
13	1	Current Sensor Fault	1. Leakage to vehicle frame from phase U, V, or W (short in motor stator). 2. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
14	1	Precharge	1. External load on capacitor	Cycle KSI.	Shutdown.	1 = Stop.

			bank (B+ connection terminal) that prevents the capacitor bank from charging. 2. Controller defective.			
15	1	Controller Severe Undertemp	Controller is operating in an extreme environment.	Bring heatsinktemp above -35°C.	Warning Only.	3 = No action.
16	1	Controller Severe Overtemp	1. Improper mounting of controller. 2. Excessive load on vehicle. 3. Controller is operating in an extreme environment.	Cycle KSI.	Shutdown.	1 = Stop.
17	1	Severe Undervoltage	1. Battery or battery cables or battery connections defective. 2. Excessive non-controller system drain on battery. 3. Battery disconnected while driving. 4. Blown B+ fuse or steer contactor did not close.	Cycle KSI.	Shutdown.	1 = Stop.
18	1	Severe Overvoltage	1. Battery or battery cable resistance too high for a given regen current. 2. Battery disconnected while regen braking.	Cycle KSI.	Shutdown.	1 = Stop.
22	1	Controller Overtemp	1. Improper mounting or cooling of controller. 2. Excessive load on vehicle. 3. Controller is operating in an extreme environment.	Heatsink temp < 85°C.	Warning Only.	2 = Reduce speed. (Max speed reduced linearly from 100% at 85°C to 0% at 95°C.)
25	1	5V Supply Failure	External load impedance on the +5V supply is too low.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
26	1	10V Supply Failure	External load impedance on the +10V supply is too low.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
27	1	Severe Motor Over Temp	1. Motor is operating in an extreme environment. 2. Motor Temperature Control parameters are mis-tuned.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
28	1	Motor Temp Hot Cutback	1. Motor is operating in an extreme environment. 2. Motor Temperature Control	Steer motor temperature <	Warning Only.	2 = Reduce speed.

			parameters are mis-tuned.	programmed Temperature Hot.		
29	1	Motor Temp Sensor Fault	1. Motor thermistor is not connected properly. 2. If the application does not use a motor thermistor, the Motor Temperature Sensor Enable parameter should be programmed Off.	Motor temp input within the normal operating range.	Warning Only.	2 = Reduce speed. (Max speed reduced to Sensor Fault Traction Cutback.)
31	1	Contactors Open/Short	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
35	1	Fault Output Open/Short	1. External load impedance on the fault output is too low. 2. Controller defective.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
36	1	Motor Stalled	1. Stalled steer motor. 2. Steer motor encoder failure. 3. Bad crimps or faulty wiring. 4. Problems with power supply of the steer motor encoder.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
37	1	Motor Open	1. Motor phase is open. 2. Bad crimps or faulty motor cable wiring. 3. Controller defective.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
38	1	Contactors Welded	1. Steer contactor tips are welded closed. 2. An alternative voltage path (such as an external precharge resistor) is providing a current to the capacitor bank (B+ terminal).	Cycle KSI.	Shutdown.	1 = Stop.
39	1	Contactors Opened	1. Steer contactor was closed temporarily, but then opened. 2. Steer contactor tips are oxidized. 3. An external load on the capacitor bank (B+ terminal) that prevents the bank from charging.		Warning then Shutdown.	
39	2	Contactors Did Not Close	1. Steer contactor did not close. 2. Steer contactor tips are	Cycle KSI.	Shutdown.	1 = Stop.

			oxidized. 3. An external load on the capacitor bank (B+ terminal) that prevents the bank from charging.			
41	1	Command Analog1 Out of Range	Command input device's Analog 1 input (pin 8) is out of range.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
42	1	Command Analog3 Out of Range	Command input device's Analog 3 input (pin 19) is out of range.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
43	1	Feedback Analog5 Out of Range	Command input device's Analog 5 input (pin 16) is out of range.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
44	1	Feedback Analog6 Out of Range	Command input device's Analog 6 input (pin 17) is out of range.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
45	1	CANNot Operational	1222 CAN NMT State did not go operational within 80 ms of interlock being applied.	Cycle KSI.	Warning and drop fault output.	1 = Stop.
46	1	EEPROM CRC Fault	1. New software loaded into EEPROM memory. 2. Try using function "Restore to Factory Defaults" to clear fault. 3. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
47	1	Sin/Cos command sensor	1. Sin/Cos Sensor defective. 2. Sin/Cos Sensor parameters are mis-tuned.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
47	2	Sawtooth Command Sensor	1. Sawtooth Sensor defective. 2. Sawtooth Sensor parameters are mis-tuned.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
48	1	Sin/Cos Feedback sensor	1. Sin/Cos Sensor defective. 2. Sin/Cos Sensor parameters are mis-tuned.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
48	2	Sawtooth Feedback Sensor	1. Sawtooth Sensor defective. 2. Sawtooth Sensor parameters are mis-tuned.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
49	1	Parameter Change Fault	A parameter value or the software was changed that required a power cycle. This fault is set automatically to force the vehicle operator to	Cycle KSI.	Shutdown.	1 = Stop.

			cycle power, for safety purposes.			
51	1	Interlock Switch Supervision	1. When the interlock switch inputs are a crossed configuration (N.O. and N.C.), the two inputs are checked. A fault is set if Switch 1 (pin 9) =Switch 3 (pin 11). 2. Interlock switch defective.	Interlock Input 1 <> Interlock Input 3.	Interlock = Off.	1 = Stop.
52	1	Home Switch Supervision	1. When the wheel position is not close to home, the redundant home switch inputs are checked and a fault is set if they disagree. 2. Home switch defective. 3. For 360° steering, parameter Homing Cam Angle (deg) not set correctly.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
53	1	Home Position Not Found	Home switch defective.	Cycle KSI.	Shutdown.	1 = Stop.
54	1	Home reference Tolerance Fault	1. Home switch defective. 2. For 360° steering, parameter Homing Cam Angle (deg) not set correctly.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
55	1	Steer Command Supervision	Command input device defective.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
56	1	Wheel Position Supervision	Position feedback device defective.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
69	1	5V Current Out of Range	The external load on the 5V supply is drawing either too much or too little current.	Cycle KSI.	Hold then Shutdown.	1 = Stop.
71	1	Software Fault 1	Reserved for future use.			
71	2	Software Fault 2	1. Software defective. 2. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
71	3	Software Fault 3	Reserved for future use.			
71	4	Software Fault 4	1. Software defective. 2. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
71	5	Software Fault 5	1. Software defective. 2. Controller defective.	Cycle KSI.	Shutdown.	1 = Stop.
72	1	PDO1 Timeout	Communication between the traction controller and the	Cycle KSI.	Warning then	1 = Stop.

			1222 has halted.		Shutdown.	
72	2	PDO2 Timeout	Communication from the CAN device sending the PDO2 message to the 1222 has halted.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
72	3	PDO3 Timeout	Communication from the CAN device sending the PDO3 message to the 1222 has halted.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
72	4	PDO4 Timeout	Communication from the CAN device sending the PDO4 message to the 1222 has halted.	Cycle KSI.	Warning then Shutdown.	1 = Stop.
73	1	Following Error	<ol style="list-style-type: none"> <li>1. Position feedback device defective.</li> <li>2. Steer motor stalled.</li> <li>3. Steer motor encoder failed.</li> </ol>	Cycle KSI.	Warning then Shutdown.	1 = Stop.
74	1	Hardware Software Mismatch	<ol style="list-style-type: none"> <li>1. New software loaded.</li> <li>2. Controller hardware cannot use the loaded software.</li> </ol>	Cycle KSI.	Shutdown.	1 = Stop.
75	1	Parameter Conflict	<ol style="list-style-type: none"> <li>1. Parameter settings are in conflict with each other.</li> <li>2. Parameter setting out of range.</li> </ol>	Cycle KSI.	Shutdown.	1 = Stop.

## b. Display (truck with F4A controller)

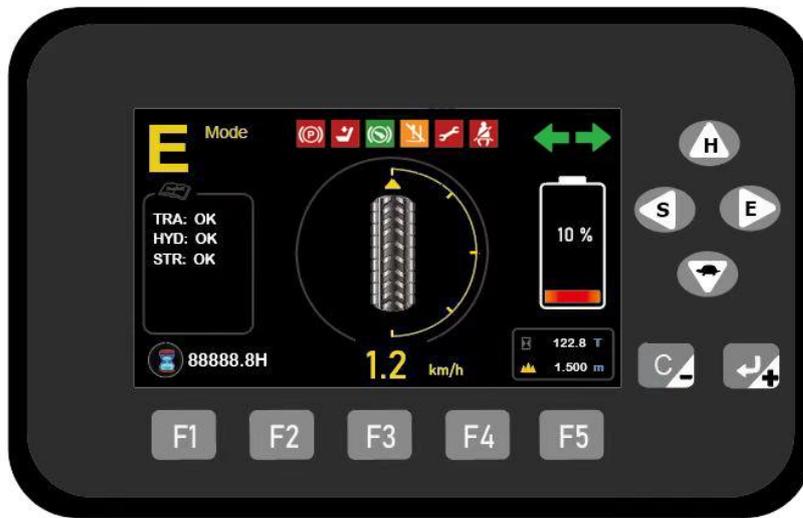


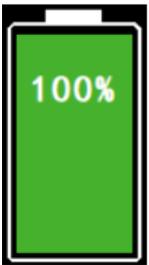
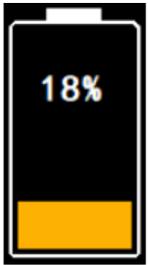
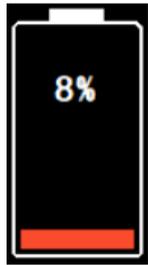
Fig. 17: CURTIS-3401 Display

The indications of the icons below:

	Left turn		Right turn		Battery charge is below 10% battery, lift lockout is activated.
	Parking		Safety pedal		Seat
	Seat belt		Fault active		Turtle speed mode

### BDI

The BDI area uses the following gauges to indicate the battery's state of charge (0~100%). The battery voltage also may be displayed, as shown in the example below for lead-acid batteries. The gauge colors depend upon the BDI percentage:

Icon			
BDI Status	Okay	Warning	Low
BDI Percentage	20–100%	10–19%	0–9%
Note	Green battery icon is on.	Yellow battery icon flashes.	Red battery icon flashes and the  icon displays.

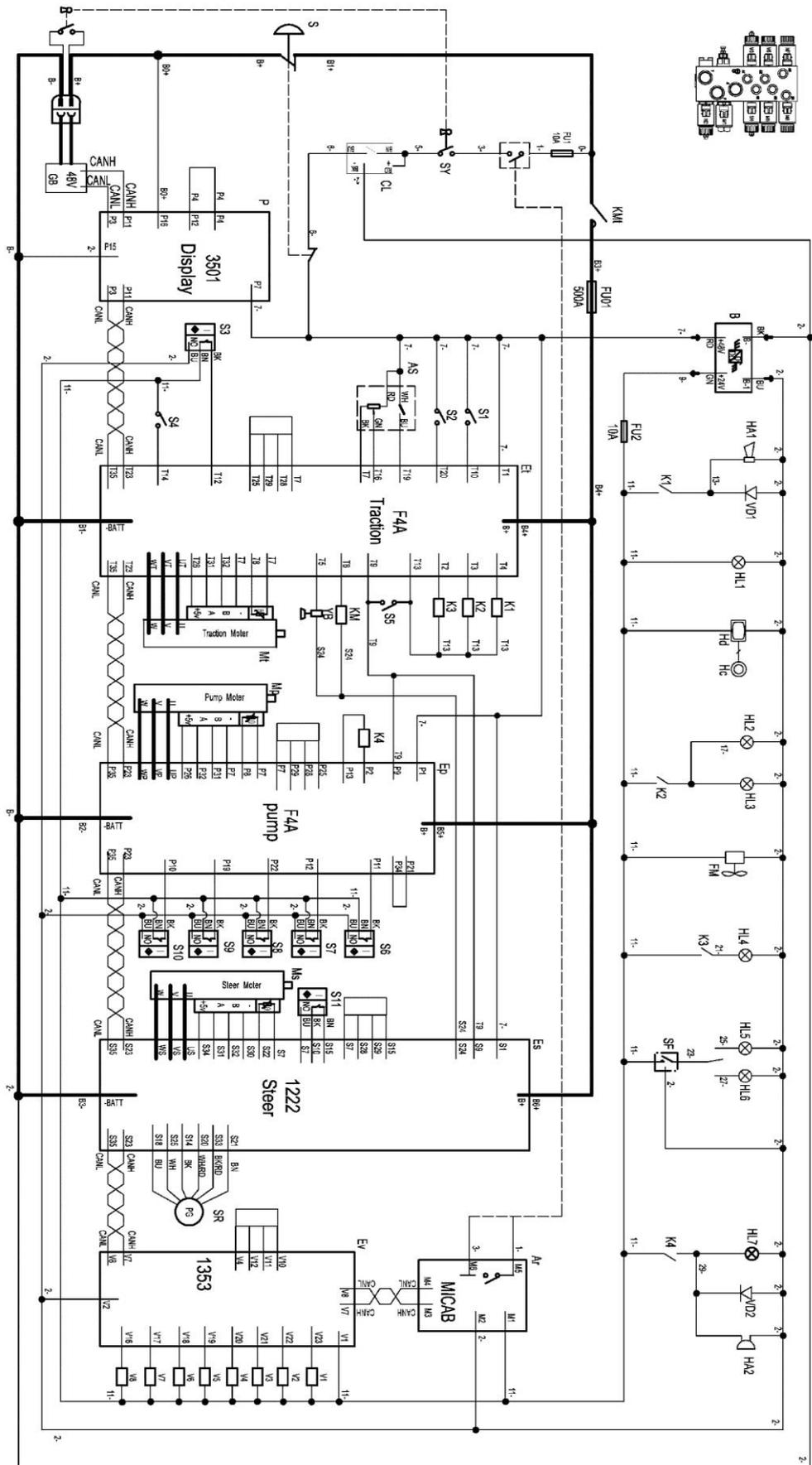


Fig. 18: Electrical diagram (truck with F4A controller)

Table 7: Description of electrical components (truck with F4A controller)

Code	Item	Code	Item
GB	Battery 48V/480AH	S9	Mast lift speed limit switch
S	Emergency button	S10	Mast lift height limit switch
Mt	Traction motor	VD1	Diode
Mp	Pump motor	HA1	Horn
Ms	Steering motor	HL1	Warning signal light
Et	Traction controller	HL2	Left front lamp
GB	Battery 48V/480AH	HL4	Brake signal light
P	Display	FM	Fan
S11	0° proximity switch	HD	7-inch display
SR	Dual channel encoder	HC	Camera
FU1-FU2	Fuse	HL5	Left signal light
FU01	Fuse	HL7	Reversing light
EP	Pump controller	HA2	Buzzer
AS	Accelerator	K1	Horn relay
SY	Key switch	VD2	Diode
KMt	Contactora	K2	Main lamp relay
CL	Pin-code lock	K3	Brake relay
YB	Electromagnetic brake	K4	Astern relay
B	DC converter	Ar	Armrest box
EV	Valve control	HL3	Right front lamp
S1	Seat switch	V1	Lifting valve
S2	Brake switch	V2	Lowering proportional valve
S3	Travel speed limit switch	V3	Reach backward proportional valve
S4	180°/ 360° switch	V4	Tilt forward proportional valve
S5	Pedal switch	V5	Tilt up valve
S6	Mast reach forward limit switch	V6	Tilt down valve
S7	Mast reach backward limit switch	V7	Tilt right valve
S8	Mast reach FW./BW. speed limit switch	V8	Tilt left valve

## F4A controller (pump motor) troubleshooting table

NO.	FLASH CODE	FAULT NAME	FAULT ACTIONS	POSSIBLE CAUSES	FAILURE CAUSE
				SET/CLEAR CONDITIONS	NOTE
1	1-2	<b>Controller Overcurrent</b> Fault Type(s): 1 = Controller OverCurrent Phase U 2 = Controller OverCurrent Phase W 3 = Controller OverCurrent Phase V 4 = Irms > 120 % Current Limit	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. External short of phase U, V, or W motor connections. 2. Speed encoder noise problems. 3. Motor parameters are mistuned. 4. Controller defective.	Controller
2	1-3	<b>Current Sensor</b> Fault Type(s): 1	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Leakage to vehicle frame from phase U, V, or W (short in motor stator). 2. Controller defective. Clear: Reset Controller.	Controller
3	1-4	<b>Precharge Failed</b> Fault Type(s): 1 = Abort. 2 = Energy Limit Exceeded 3 = Time Limit Exceeded	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. An external load on the capacitor bank (B+ connection terminal) that prevents the capacitor bank from charging. 2. See Programmer » System Monitor menu » Controller » Capacitor Voltage. Clear: Reset Controller.	Controller
4	1-5	<b>Controller Severe Undertemp</b> Fault Type(s): 1	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Controller is operating in an extreme environment. 2. See Programmer » System Monitor menu » Controller » Controller Temperature. Clear: Bring the heatsink temperature above -40°C and then Cycle KSI or Interlock, if fault is still there, Reset Controller.	Controller
5	1-6	<b>Controller Severe Overtemp</b> Fault Type(s): 1	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Controller is operating in an extreme environment. 2. Excessive load on vehicle. 3. Improper mounting of controller. 4. See Programmer » System Monitor menu » Controller » Controller Temperature.	Controller

				Clear: Bring heatsink temperature below +95°C and then Cycle KSI or Interlock, if fault is still there, Reset Controller.	
6	1-7	<b>Severe B+ Undervoltage</b>	No drive torque.	<ol style="list-style-type: none"> <li>1. Non-controller system drain on battery.</li> <li>2. Battery resistance too high.</li> <li>3. Battery disconnected while driving.</li> <li>4. Blown B+ fuse or main contactor did not close.</li> <li>5. Battery parameters are misadjusted.</li> <li>6. See Programmer » Monitor menu » Controller » Capacitor Voltage.</li> </ol>	Controller
7		<b>Severe KSI Undervoltage</b>	<u>Fault Action:</u> None, unless a fault action is programmed in VCL.	<ol style="list-style-type: none"> <li>1. Non-controller system drain on battery/keyswitch circuit wiring.</li> <li>2. Resistance in low power (KSI) circuit is too high.</li> <li>3. KSI disconnected while driving.</li> <li>4. Blown fuse.</li> <li>5. See Programmer»System Monitor menu» Battery» Keyswitch Voltage.</li> </ol>	Controller
8	1-8	<b>Severe B+ Overvoltage</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	<ol style="list-style-type: none"> <li>1. Battery parameters are misadjusted.</li> <li>2. Battery resistance too high for given regen current.</li> <li>3. Battery disconnected while regen braking.</li> <li>4. See Programmer» System Monitor menu » Controller » Capacitor Voltage.</li> </ol>	Controller
9		<b>Severe KSI Overvoltage</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	<ol style="list-style-type: none"> <li>1. Battery-voltage applied to KSI (pin 1) exceeds the Severe Overvoltage limit.</li> <li>2. See Programmer » Monitor menu » Battery » Keyswitch Voltage.</li> </ol>	Controller
10	1-9	<b>Speed Limit Supervision</b>	ShutdownInterlock ShutdownEMBrake	<ol style="list-style-type: none"> <li>1. Motor speed detected that exceeds the limit set by the Max Speed. Supervision parameter.</li> <li>2. Misadjusted Max Speed Supervision parameters.</li> <li>3. See: Programmer » Application Setup » Max Speed Supervision menu.</li> </ol>	Controller

11	1-10	<p><b>Motor Not Stopped</b></p> <p>Fault Type(s):</p> <p>1 = The motor moved more revolutions than the parameter, Motor_Not_Stopped_Position_Error setting.</p> <p>2 = The motor moved faster than the parameter, Motor_Not_Stopped_Speed_Error (RPM) for 160ms.</p> <p>3 = The three-phase drive has applied an electrical frequency greater than the Motor_Not_Stopped_Max_Frequency parameter, and applied an RMS current greater than the Motor_Not_Stopped_Max_Current parameter for 64 ms.</p>	<p>ShutdownMotor</p> <p>ShutdownMainContactor</p> <p>ShutdownEMBrake</p> <p>ShutdownThrottle</p> <p>FullBrake</p>	<p>1. Misadjusted Motor Not Stopped parameters.</p> <p>2. See: Programmer » Application Setup » Motor Not Stopped menu.</p> <p>3. Internal Controller fault or conflict allowing the motor to rotate when in the stopped state.</p>	Controller
12	1-11	<p><b>Critical OS General</b></p> <p>Fault Type(s):</p> <p>(&lt;100) Internal Fault. Contact Curtis support.</p> <p>(&gt;100) An ill-formed or corrupted application package was loaded into controller.</p>	<p>ShutdownMotor</p> <p>ShutdownMainContactor</p> <p>ShutdownEMBrake</p> <p>ShutdownThrottle</p> <p>ShutdownInterlock</p> <p>ShutdownDriver1-7</p> <p>ShutdownPD</p> <p>FullBrake</p> <p>ShutdownPump</p> <p>ShutdownCoilSupply</p>	<p>1. (&lt;100) Internal Fault.</p> <p>2. (&gt;100) CIT version is too old to fully support the FOS version.</p>	Controller
13	1-12	<p><b>OS General 2</b></p> <p>Fault Type(s):</p> <p>(&lt;100) Internal Fault. Contact Curtis support.</p> <p>(&gt;100) An ill-formed or corrupted application package was loaded into controller.</p>	<p>NO ACTION</p> <p>(controller is not operable)</p>	<p>1. (&lt;100) Internal Fault.</p> <p>2. (&gt;100) CIT version is too old to fully support the FOS version.</p>	Controller
14	1-13	<p><b>Reset Rejected</b></p> <p>Fault Type(s): 1</p>	<p>ShutdownInterlock</p> <p>ShutdownThrottle</p>	<p>Clear: Cycle KSI.</p>	Controller
15	1-14	<p><b>Motor Short</b></p> <p>Fault Type(s): 1</p>	<p>NO ACTION</p> <p>(controller is not operable)</p>	<p>Clear: Reset controller.</p>	Controller

16	2-2	<b>Controller Overtemp Cutback</b>	Reduced drive torque. Reduced regen-braking torque.	<ol style="list-style-type: none"> <li>1. Controller is operating in an extreme environment.</li> <li>2. Excessive load on vehicle.</li> <li>3. Improper mounting of controller which is preventing controller cooling.</li> <li>4. Controller is performance-limited at this temperature.</li> <li>5. See Programmer » System Monitor menu » Controller » Temperature.</li> </ol> <p>Clear: Bring heatsink temperature below 85°C and then Cycle KSI or Interlock, if fault is still there, Reset Controller.</p>	Controller
17	2-3	<b>Undervoltage Cutback</b> Fault Type(s): 1	Reduced drive torque.	<ol style="list-style-type: none"> <li>1. Batteries need recharging. Controller is performance limited at this voltage.</li> <li>2. Battery parameters are misadjusted.</li> <li>3. Non-controller system- drain on battery.</li> <li>4. Battery resistance too high.</li> <li>5. Battery disconnected while driving.</li> <li>6. Blown B+ fuse or main contactor did not close.</li> <li>7. See Programmer » System Monitor menu » Controller » Cutbacks» Undervoltage Cutback.</li> <li>8. See Programmer» System Monitor menu » Controller » Capacitor Voltage.</li> </ol>	Controller
18	2-4	<b>Overvoltage Cutback</b> Fault Type(s): 1	Reduced brake torque. Note: This fault is declared only when the controller is running in regen.	<ol style="list-style-type: none"> <li>1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage.</li> <li>2. Battery parameters are misadjusted.</li> <li>3. Battery resistance too high for given regen current.</li> <li>4. Battery disconnected while regen braking.</li> <li>5. See Programmer » System Monitor menu » Controller » Cutbacks » Overvoltage Cutback.</li> <li>6. See Programmer» System</li> </ol>	Controller

				Monitor menu » Controller » Capacitor Voltage.	
19	2-5	<b>Ext 5V Supply Failure</b> Fault Type(s): 1 = 5V Supply's voltage is out- of-range 2 = 5V Supply's current is out- of-range	Disables the 5V Supply.	1. External load impedance on the +5V supply (pin 16) is too low. 2. See the System Monitor » Outputs menu: External_5V_Supply, Ext_5V_Current.	Controller
20	2-6	<b>Ext 12V Supply Failure</b> Fault Type(s): 1 = 12V Supply's voltage is out-of-range 2 = 12V Supply's current is out-of-range	Disables the 12V Supply.	1. External load impedance on the +12V supply (pin 23) is too low. 2. See Programmer» System Monitor menu » Outputs: External_ 12V_Supply, Ext_ 12V_Current.	Controller
21	2-8	<b>Motor Temp Hot Cutback</b>	1. Torque is reduced. 2. If MotorBraking Thermal CutBack_ Enable = On, then Regen Braking.	1. Motor temperature is at or above the programmed Temperature Hot setting— resulting in a reduction of controller drive current. 2. The motor temperature and sensor control parameters are misadjusted. 3. See Programmer » AC Motor Setup » Temperature Sensor.	Controller
22	2-9	<b>Motor Temp Sensor</b>	Enter LOS mode. Motor speed is reduced. Motor temperature cutback disabled.	1. Motor thermistor is not connected properly. 2. Sensor polarity (between pin 9 and pin 12) is incorrect. 3. The motor temperature and sensor parameters are misadjusted. 4. See Programmer» System Monitor menu » AC Motor » Temperature.	Controller
23	3-1	<b>Main Driver</b> Fault Type(s): 1 = Drive short. 2 = Drive Overcurrent. 3 = Driver open/ short (Voltage measured high, should be low.) 4 = Drive open/ short (Voltage measured low, should be high.) 5 = Wiring disabled.	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring.	Controller
24	3-2	<b>EM Brake Driver Fault</b> Fault Type(s): 1 = Drive short.	ShutdownEMBrake ShutdownThrottle FullBrake	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil.	Controller

		2 = Drive Overcurrent. 3 = Driver open/ short (Voltage measured high, should be low.) 4 = Drive open/ short (Voltage measured low, should be high.) 5 = Wiring disabled.		3. Bad connector crimps or faulty wiring.	
25	3-4	<b>Load Hold Diver Fault</b>	The assigned driver is open.	Same as Driver 1 Fault	Controller
26	3-5	<b>Lower Driver Fault</b>	Shutdown the assigned driver.	Same as Driver 1 Fault	Controller
27	3-6	<b>Encoder Fault</b> Fault Type(s): 1. Checksum loss. 2. Pulse loss due to Overcurrent. 3. Speed pulse signal loss. 4. Motor matching. 5. Encoder supply failed.	ShutdownEMBrake ShutdownThrottle FullBrake	1. Motor encoder failure. 2. Bad crimps or faulty wiring. 3. See Programmer» System Monitor Menu » AC Motor » Motor RPM. 4. See Programmer» System Monitor menu » Hardware Inputs: Analog 3 and 4.	Controller
28	3-7	<b>Motor Open</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Motor phase is open. 2. Bad crimps or faulty wiring.	Controller
29	3-8	<b>Main Contactor Welded</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Main contactor tips are welded closed. 2. Motor phase U or V is disconnected or open. 3. An alternate voltage path (such as an external circuit to B+) is providing a current to the capacitor bank (B+ connection terminal).	Controller
30	3-9	<b>Main Contactor Did Not Close</b> Fault Type(s): 1 = Main did not close when commanded. 2 = Main disconnected during operation.	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	Type 1: 1. Main contactor did not close. 2. Main contactor tips are oxidized, burned, or not making good contact. 3. An external load on the capacitor bank (B+ connection terminal) is preventing the capacitor bank from charging. 4. Blown B+ fuse. 5. Main Contactor parameters mistuned; Type 2:	Controller

				<p>1. Main contactor opened during operation (while commanded closed).</p> <p>2. Driver wiring to contactor's coil (e.g., pin wiring) removed during operation.</p> <p>3. Contactor/coil defective.</p>	
31	4-2	<p><b>Throttle Input</b>  Fault Type(s): *  1 = Outside the Low or High parameter.</p>	ShutdownThrottle	<p>1. Throttle voltage exceeded the Analog Low or Analog High parameters for the analog input defined for the throttle input.</p> <p>2. See Programmer » Controller Setup » Inputs » Analog 1 Type.</p> <p>3. See Programmer » Controller Setup » Inputs » Configure.</p>	Controller
32	4-4	<p><b>Brake Input</b></p>	FullBrake	<p>Triggered by the respective fault diagnostic associated with the brake input source (assigned analogX input).</p> <p>Note: An Input fault diagnostics may be out of range if it is configured as a voltage input.</p>	Controller
33	4-6	<p><b>NV Memory Failure</b>  Fault Type(s):  1 = Invalid checksum.  2 = NV write failed.  3 = NV read failed.  4 = NV write did not complete during power down.</p>	<p>ShutdownMotor  ShutdownMainContactor  ShutdownEMBrake  ShutdownThrottle  ShutdownInterlock  ShutdownDriver1-5  ShutdownPD  FullBrake</p>	<p>1. Failure to read or write to nonvolatile (NV) memory.</p> <p>2. Internal controller fault.</p>	Controller
34	4-7	<p><b>HPD Sequencing</b></p>	ShutdownThrottle	<p>1. Incorrect sequence in application of KSI, Interlock, Direction, or Throttle.</p> <p>2. Faulty wiring, crimps, or switches at KSI, Interlock, Direction, or Throttle.</p> <p>3. Moisture in above-noted digital input switches causing invalid (real) On/Off state.</p> <p>4. Verify input switch status. See Programmer » System Monitor menu » Hardware Inputs » Switch Status.</p> <p>5. Verify Throttle. See Programmer » System Monitor menu » Hardware Inputs » Throttle Command.</p>	Controller
35		<p><b>EMR Rev HPD</b></p>	<p>ShutdownThrottle  ShutdownEMBrake</p>	<p>Emergency Reverse operation has concluded, but the throttle,</p>	Controller

				forward and reverse, and interlock inputs have not been returned to neutral.	
36		<b>Pump HPD</b> Fault Type(s): 1. Only lifting 2. Only lowering 3. Lifting and lowering	ShutdownPump	Incorrect lifting/lowering throttle input condition (>25%) Parameters setting errors: 1. Hydraulic suppression type 2. HPD/SRO judgment time Pump throttle hardware fault	Controller
37	4-9	<b>Parameter Change</b> Fault Type(s): Reports the CAN Object ID of parameter.	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	While the Interlock was On, a safety- based parameter was changed. Parameters with this property are marked with a [PCF] (Parameter Change Fault) in the Parameter listings.	Controller
38	4-10	<b>EMR Switch Redundancy</b>	ShutdownInterlock ShutdownEMBrake	1. Either or both Emergency Reverse input switches are inoperative, resulting in an invalid state. 2. Ingress of dirt or moisture in switch(es).	Controller
39	5-1	<b>Pump_SRO_Fault</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake ShutdownPump	Follow the correct sequence of operations.	Controller
					OEM Faults
40	5-2	<b>Lift_Pot_Open_Fault</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake ShutdownPump	Check lifting sensor.	Controller
					OEM Faults
41	5-3	<b>Arm_PDO_Fault</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake ShutdownPump	Clear communication issues with the controller (matching, protocols, wiring, etc.)	Controller
					OEM Faults
42	6-8	<b>VCL Run Time Error</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle ShutdownInterlock ShutdownDriver1-5 ShutdownPD	1. Runtime errors are defined using the VCL Error Module and VCL Error. 2. Using driver control commands in VCL can lead to VCL runtime errors if the VCL command and the driver assignment do not	Controller

			FullBrake	match.	
43	7-1	<b>OS General</b>	ShutdownAll	Clear: Reset Controller.	Controller
44	7-2	<b>PDO Timeout</b>	Set: Time between CAN PDO messages received exceeded the PDO Timeout Period. Clear: Receive CAN NMT message, or Reset Controller.	1. The time between CAN PDO messages received exceeded the PDO Timeout Period as defined by the Event Timer parameter. 2. Adjust PDO Settings. See Programmer » Application Setup » CAN Interface » PDO Setups.	Controller
45	7-3	<b>Stall Detected</b>	ShutdownMotor ShutdownEMBrake ShutdownThrottle Control Mode changed to LOS (Limited Operating Strategy)	1. Stalled motor. 2. Motor encoder failure. 3. Bad crimps or faulty wiring. 4. Problems with power supply for the motor encoder. 5. See Programmer » System Monitor menu » AC Motor » Motor RPM.	Controller
46	7-7	<b>Supervision</b> Fault Type(s): Curtis supervision code.	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle ShutdownInterlock ShutdownDriver1-5 ShutdownPD FullBrake	Set: Internal controller failure.	Controller
47	7-9	Supervision Input Check	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle ShutdownInterlock ShutdownDriver1-5 ShutdownPD FullBrake	Set: Internal controller failure.	Controller
48	8-2	PDO Mapping Error	PDO message disabled.	1. The PDO Map has too many data bytes assigned or has objects mapped that are not compatible. 2. Adjust PDO Settings. See Programmer » Application Setup » CAN Interface » PDO Setups.	Controller
49	8-3	<b>Internal Hardware</b> Fault Type(s): Curtis hardware code.	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	Set: Internal controller fault detected.	Controller
50	8-4	<b>Motor Braking Impaired</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle	Battery overcharged, excessive motor or controller heating, or misadjusted parameters. Clear: Reset interlock.	Controller

			FullBrake		
51	8-7	<b>Motor Characterization Error</b> Fault Type(s): 1 Write to memory RAM failure 72 Temp sensor fault 73 Motor hot 74 Controller temperature cutback 76 Undervoltage cutback 77 Overvoltage cutback 78 Encoder not reading properly 79 Current Regulator Tuning out of range 80 Current Regulator Tuning out of range 81 Encoder signal seen but step size not auto-detected, it must be set manually. 82 Aborted auto-commissioning 90/98 PMAC Motor feedback sine/cosine signal not detected 91 PMAC motor not rotating or motor type incorrect 92 PMAC Motor not accelerating. Or low acceleration 94-97 PMAC lag compensation out of range 99 PMAC Motor rotating when starts characterization 102 PMAC motor temp sensor fault 103 PMAC motor temp hot cutback 104 PMAC motor	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	Motor characterization failed during characterization process.	Controller

		controller temp cutback 106 PMAC motor controller Undervoltage cutback 107 PMAC motor controller overvoltage cutback			
52	8-8	<b>Encoder Pulse Error</b>	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Encoder Steps parameter does not match the actual motor encoder. 2. Verify parameter settings: AC Motor Setup » Quadrature Encoder » Encoder Steps. 3. Motor loses IFO control, and motor increase rotation without throttle signal input.	Controller
53	8-9	<b>Parameter Out of Range</b> Fault Type(s): Reports the CAN Object ID	ShutdownMotor ShutdownMainContactor ShutdownEMBrake ShutdownThrottle FullBrake	1. Parameter value detected outside of the limits. 2. Use CIT to view the parameter's range and adjust the parameter's value.	Controller

### c. Display (truck with Inmotion controller)

State of charge (SOC) of the battery is displayed on the right side of the indicator, if the battery is fully charged, the indicator displays 100% (10 segments), when SOC of battery is 20%, the battery symbol will light on (the sixth one from left in Fig .19), indicating the battery needs charging. When SOC of the battery is 10%, the prohibition symbol will light on (the fourth one from left in Fig .19), the lifting function is not available but slow travelling is available.

When the battery is removed, the indicator will display code 133, the travelling is not available but mast movement (reach forward/ backward) is available.

There are keys on the right of the display for different “modes”, you can switch the mode by operating different “mode” keys, as shown in Fig .19:

P Mode	high speed mode	top speed drive 10.5 Km/h
E Mode	normal mode	top speed drive 8.4 Km/h
S Mode	economic mode	top speed drive 6.3 Km/h

When switch to economic mode, slow speed (turtle) symbol is on (the first one from left in Fig .19).



Fig. 19: Inmotion display

Turtle Speed Symbol: Lights up when the truck is running in Slow (Turtle) Speed Mode.

Wrench Symbol: Lights up when the truck is in neutral.

Battery Symbol: Lights up when the battery charge is lower than or equal to 20%.

Lift Lock Symbol: Lights up when the battery charge is lower than or equal to 10%.

Seat Symbol: Lights up when the driver leaves the seat.

Handbrake Symbol: Lights up when the driver operates the handbrake.

Key	Key Name	Key functions
	UP	Press the key to scroll the cursor up on the screen or increase the selected writable parameter value; It specifies "S Mode" (economic mode) when the display is in the Menu Screen.
	LEFT	Press the key to move the cursor to the left on the screen; It specifies "P Mode" (high speed mode) when the display is in the Menu Screen.
	RIGHT	Press the key to move the cursor to the right on the screen; It specifies "E Mode" (normal mode) when the display is in the Menu Screen.
	DOWN	Press the key to move the cursor down on the screen or decrease the selected writable parameter value; It specifies "Turtle Mode" when the display is in the Menu Screen.
	CANCEL	Press the key to cancel the entered content; when a menu is selected, it navigates to the the previous menu.
	CONFIRM	Press the key to confirm the entered content; when a menu is selected, it enters the menu.

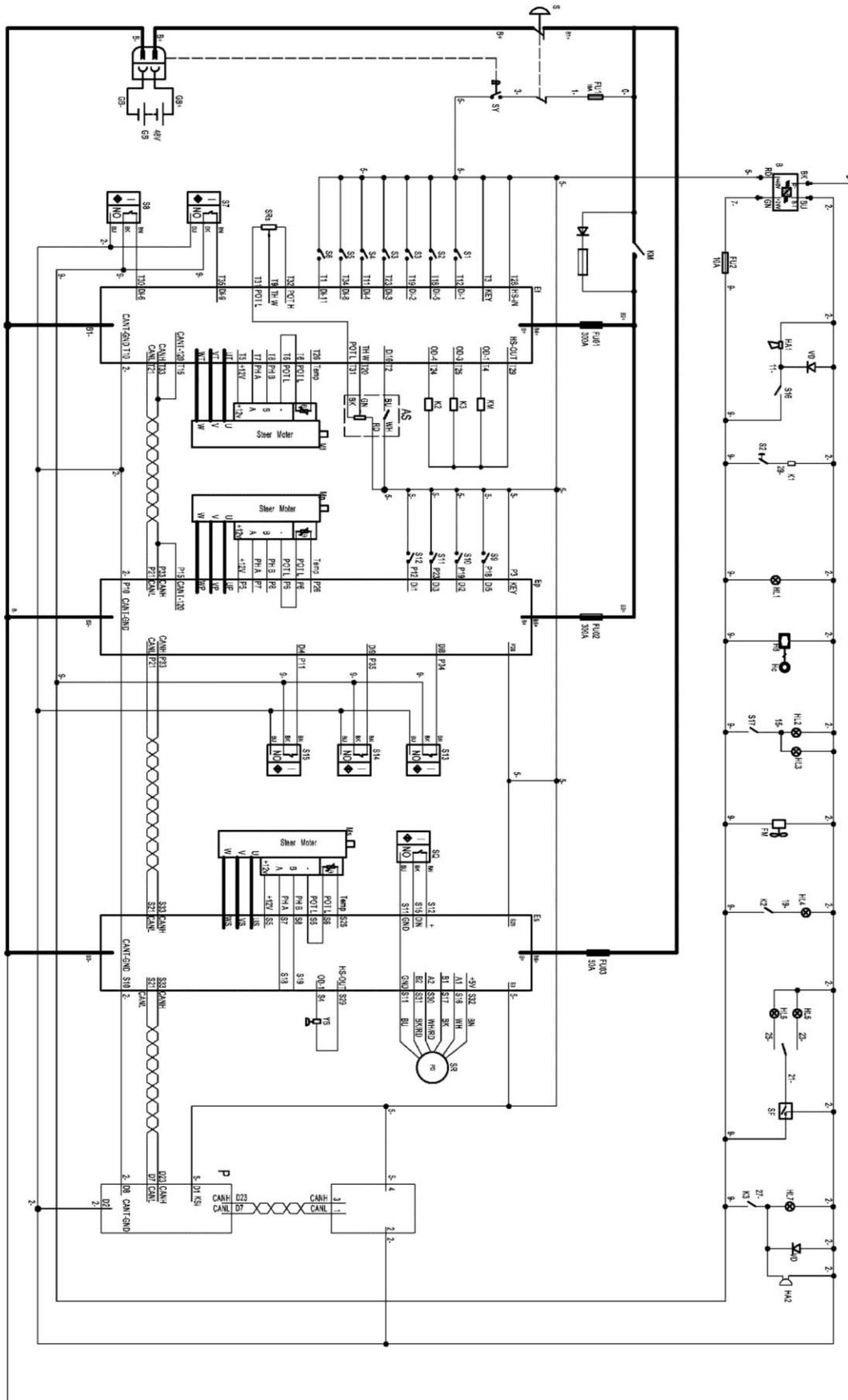


Fig. 20: Electrical diagram (truck with Inmotion controller)

**Table 8:** Description of electrical components (truck with Inmotion controller)

Code	Item	Code	Item
GB	Battery 48V/480AH	S13	Turn signal switch
S	Emergency button	HA1	Horn
Mt	Traction motor	HA2	Buzzer
Mp	Pump motor	FU1/FU2	10A fuse
Ms	Steering motor	FU01/FU02	250A fuse
Es	Traction controller	FU03	30A fuse
Et	Display	HL1	Warning signal light
P	Fan	HL2	Left front lamp
FM	Battery 48V/480AH	HL3	Right front lamp
SR	Dual channel encoder	HL4	Left brake signal light
HD	7-inch display	HL5	Right brake signal light
HC	Camera	HL6	Left signal light
EP	Pump controller	HL7	Right signal light
AS	Accelerator	HL8	Left reversing light
SY	Key switch	HL9	Right reversing light
Ar	Armrest box	SF	Flasher
YB	Electromagnetic brake	V1	Lifting valve
B	DC converter	V2	Lowering proportional valve
CL	Pin-code lock	V3	Reach forward proportional valve
S1	Seat switch	V4	Reach backward proportional valve
S2	Pedal switch	V5	Left shift proportional valve
S3	Brake switch	V6	Right shift proportional valve
S4	180°/ 360° switch	V7	Tilt forward proportional valve
S5	Travel speed limit switch	V8	Tilt backward proportional valve
KM	Main contactor coil	S13	Turn signal switch
S7	Mast lift height limit switch	VD1/VD2	Diode
S8	Mast lift speed limit switch	K1	Horn relay
S9	Mast reach FW./BW. speed limit switch	K2	Main lamp relay
S10	Mast reach forward limit switch	K3	Astern relay
S11	Mast reach backward limit switch	K4	Brake relay
S12	0° proximity switch		

## Inmotion controller troubleshooting table

FAULT CODE	FAULT DISPLAYED ON SCREEN	CLEAR CONDITIONS
20	ERROR Incorrect start Accelerator pedal switch active before key on	Release pedal switch
21	ERROR Incorrect start Accelerator pedal switch active before key on	Turn off the direction switch
22	ERROR Forward switch and reverse switch active at the same time	Direction switch fault
23	ERROR Throttle analog value out of range	Throttle fault or analog need to be calibrated
24	ERROR Throttle analog fault	Throttle fault or analog need to be calibrated
31	ERROR Traction controller CAN communication fault	<p>1. Check whether the insulation of CAN communication line 33/ 21 is good and whether the resistance between line 33 and 21 is 60Ω;</p> <p>2. If there is a remote module, remove it first and then test it;</p> <p>3. Check whether each controller does not work (for example, check whether the controller fault indicator is on);</p> <p>4. Monitor whether there are error frames in the can system. If so, eliminate the error frames (such as lithium battery can interference). If there is interference in DC pump control, shield the communication fault;</p> <p>[other communication problems can also be detected by this method, such as the vehicle is in normal use but the instrument direction display is stuck, or there is no lifting tilt but the walking is normal and the instrument has no fault code]</p>
32	ERROR Battery voltage low	Charge the battery.
34	ERROR CPU fault	Abnormal 12V/ 5V power supply line of controller.
35	ERROR Multiple pump action switches are activated at the same time	Reset the pump control switch

36	ERROR Incorrect start Tilt switch active before key on	Reset tilt switch
37	ERROR Incorrect start Side switch active before key on	Reset side switch
38	ERROR Incorrect start Attachment switch active before key on	Reset attachment switch
39	ERROR Incorrect start Lift switch active before key on	Reset lift switch
40	ERROR Incorrect start Reach In/Out switch active before key on	Reset Reach In/Out switch
41	ERROR Lift analog value out of range	Lift analog fault or need to be calibrated
42	ERROR Reach pot analog value out of range	Reach pot analog fault or need to be calibrated
43	ERROR Tilt pot analog value out of range	Tilt pot analog fault or need to be calibrated
44	ERROR Side Pot analog value out of range	Side Pot analog fault or need to be calibrated
81	WARNING Traction controller temperature is low	1. Compare whether the monitored temperature of the controller is significantly different from the actual temperature; 2. The controller is defective.
82	WARNING Traction controller temperature is high	1. Compare whether the monitored temperature of the controller is significantly different from the actual temperature; 2. Check whether sufficient silicone grease is applied between the controller and the electric control aluminum plate and between the electric control aluminum plate and the truck; 3. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel); 4. The controller is defective.
83	ERROR Traction controller temperature sensor fault	Traction controller temperature sensor fault

84	WARNING Traction motor temperature is low	[refer to the inspection method when ACS controller reports 86 fault]
85	WARNING Traction motor temperature is high	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>5. The controller is defective.</li> </ol>
86	ERROR Traction motor temperature sensor fault	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. The controller is defective.</li> </ol>
87	ERROR Traction motor encoder fault	<ol style="list-style-type: none"> <li>1. Check the wiring from motor encoder to controller for open circuit or poor insulation;</li> <li>2. Check whether the encoder is installed in place or installed in the opposite direction;</li> <li>3. Replace the encoder (for the newly replaced encoder, confirm whether the wiring definition is consistent with the original encoder);</li> <li>4. The controller is defective.</li> </ol>
88	WARNING DC bus voltage of traction controller is high	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>

89	WARNING DC bus voltage of traction controller is low	1. Measure the battery voltage; 2. Check the cable for looseness or poor insulation.
90	WARNING The default value of the traction controller is updated	For protection after refreshing the program, restart the key.
91	WARNING Traction drive limit	Low battery power, low voltage, motor over temperature or controller over temperature, and the vehicle limits the output. Find out the cause according to other fault codes reported at the same time.
97	ERROR Open drain of traction output open or short	1. Measure whether there is battery voltage on the 28 pin line of the controller (it is necessary to turn on the key switch for measurement); 2. Measure whether the insulation of line 29 / 4 / 16 / 24 / 25 is good; 3. Measure the resistance between pin 29 and line 4/ 16/ 24/ 25 respectively (the normal resistance value is determined according to the specific wiring); 4. The controller is defective.
98	WARNING Traction controller over current or short	[refer to the inspection method when ACS controller reports 101 fault]
101	ERROR Traction controller short	1. Check whether the motor line has open circuit or poor insulation; 2. Controller failure.
102	ERROR Traction controller temperature is high cutback	1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature; 2. Check whether sufficient silicone grease is applied between the controller and the electric control aluminum plate and between the electric control aluminum plate and the truck; 3. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel); 4. The controller is defective.

103	ERROR Traction motor temperature is high cutback	<ol style="list-style-type: none"> <li>1. Compare whether the monitored temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>5. The controller is defective.</li> </ol>
104	ERROR Traction controller over current	[refer to the inspection method when ACS controller reports 101 fault]
105	ERROR Traction controller precharge failed	<ol style="list-style-type: none"> <li>1. Check whether the battery voltage is too low;</li> <li>2. Check whether the precharge resistance is normal;</li> <li>3. Measure whether the insulation between the motor line and the truck is normal;</li> <li>4. Check whether there are other wiring (including the power line connected to the pump control) on the controller B+ terminal except the normal contactor copper bar. If so, remove it first and then test;</li> <li>5. The controller is defective.</li> </ol>
110	ERROR DC bus voltage of traction controller is low cutback	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>
111	ERROR DC bus voltage of traction controller is high cutback	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>
113	ERROR The safety pedal switch is activated at start-up	Reset the safety pedal switch.

114	<p><b>ERROR</b> Internal power supply error</p>	<ol style="list-style-type: none"> <li>1. Check whether the wiring from the accelerator to the controller has poor insulation, unplug the accelerator plug-in, and test whether there is still code 114 (if yes, go to the next step, if not, it is accelerator fault);</li> <li>2. Check whether the wiring from the motor encoder to the controller has poor insulation, unplug the motor encoder plug-in, and test whether there is 114 code (if yes, proceed to the next step; if not, it is the motor encoder fault);</li> <li>3. Check whether the wiring from the lifting speed regulation sensor to the controller has poor insulation, unplug the lifting speed regulation sensor plug-in, and test whether there is still code 114 (if there is, proceed to the next step, if there is no, it is accelerator fault) [it is not necessary to check if there is no lifting speed regulation function or semi AC vehicle];</li> <li>4. Controller failure.</li> </ol>
121	<p><b>WARNING</b> Pump controller temperature is low</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitored temperature of the controller is significantly different from the actual temperature;</li> <li>2. The controller is defective</li> </ol>
122	<p><b>WARNING</b> Pump controller temperature is high</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check whether sufficient silicone grease is applied between the controller and the electric control aluminum plate and between the electric control aluminum plate and the truck ;</li> <li>3. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>4. The controller is defective.</li> </ol>
123	<p><b>ERROR</b> Pump controller temperature sensor fault</p>	<p>Pump controller temperature sensor fault</p>

124	<p>WARNING</p> <p>Pump motor temperature is low</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. The controller is defective.</li> </ol>
125	<p>WARNING</p> <p>Pump motor temperature is high</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>5. The controller is defective.</li> </ol>
126	<p>ERROR</p> <p>Pump motor temperature sensor fault</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. The controller is defective.</li> </ol>

127	ERROR Pump controller encoder fault	<ol style="list-style-type: none"> <li>1. Check the wiring from motor encoder to controller for open circuit or poor insulation;</li> <li>2. Check whether the encoder is installed in place or installed in the opposite direction;</li> <li>3. Replace the encoder (for the newly replaced encoder, confirm whether the wiring definition is consistent with the original encoder);</li> <li>4. The controller is defective.</li> </ol>
128	WARNING DC bus voltage of pump controller is high	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>
129	WARNING DC bus voltage of pump controller is low	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>
130	WARNING The default value of the pump controller is updated	For protection after refreshing the program, restart the key.
133	Battery safety switch failure	Check whether the battery safety switch is damaged or improperly installed.
134	ERROR CPU fault	<ol style="list-style-type: none"> <li>1. Check whether the wiring from the accelerator to the controller has poor insulation, unplug the accelerator plug-in, and test whether there is still code 114 (if yes, go to the next step, if not, it is accelerator fault);</li> <li>2. Check whether the wiring from the motor encoder to the controller has poor insulation, unplug the motor encoder plug-in, and test whether there is 114 code (if yes, proceed to the next step; if not, it is the motor encoder fault);</li> <li>3. Check whether the wiring from the lifting speed regulation sensor to the controller has poor insulation, unplug the lifting speed regulation sensor plug-in, and test whether there is still code 114 (if there is, proceed to the next step, if there is no, it is accelerator fault) [it is not necessary to check if there is no lifting speed regulation function or semi AC vehicle];</li> <li>4. Controller failure</li> </ol>

137	<p>ERROR</p> <p>Open drain of pump output open or short</p>	<ol style="list-style-type: none"> <li>1. Measure whether there is battery voltage on the 28 pin line of the controller (it is necessary to turn on the key switch for measurement);</li> <li>2. Measure whether the insulation of line 29/ 4/ 16/ 24/ 25 is good;</li> <li>3. Measure the resistance between pin 29 and line 4/ 16/ 24/ 25 respectively (the normal resistance value is determined according to the specific wiring);</li> <li>4. The controller is defective.</li> </ol>
138	<p>WARNING</p> <p>Pump controller over current or short</p>	<ol style="list-style-type: none"> <li>1. Check whether the motor line has open circuit or poor insulation;</li> <li>2. Controller failure</li> </ol>
141	<p>ERROR</p> <p>Pump controller short</p>	<ol style="list-style-type: none"> <li>1. Check whether the motor line has open circuit or poor insulation;</li> <li>2. Controller failure</li> </ol>
142	<p>ERROR</p> <p>Pump controller temperature is high cutback</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitored temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check whether sufficient silicone grease is applied between the controller and the electric control aluminum plate and between the electric control aluminum plate and the truck;</li> <li>3. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>4. The controller is defective.</li> </ol>
143	<p>ERROR</p> <p>Pump motor temperature is high cutback</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>5. The controller is defective.</li> </ol>

144	ERROR Pump driver internal power failure	<ol style="list-style-type: none"> <li>1. Check whether the wiring from the accelerator to the controller has poor insulation, unplug the accelerator plug-in, and test whether there is still code 114 (if yes, go to the next step, if not, it is accelerator fault);</li> <li>2. Check whether the wiring from the motor encoder to the controller has poor insulation, unplug the motor encoder plug-in, and test whether there is 114 code (if yes, proceed to the next step; if not, it is the motor encoder fault);</li> <li>3. Check whether the wiring from the lifting speed regulation sensor to the controller has poor insulation, unplug the lifting speed regulation sensor plug-in, and test whether there is still code 144 (if there is, proceed to the next step, if there is no, it is accelerator fault) [it is not necessary to check if there is no lifting speed regulation function or semi AC vehicle];</li> <li>4. Controller failure.</li> </ol>
145	ERROR Pump controller pre-charge failed	<ol style="list-style-type: none"> <li>1. Check whether the battery voltage is too low;</li> <li>2. Check whether the precharge resistance is normal;</li> <li>3. Measure whether the insulation between the motor line and the truck is normal;</li> <li>4. Check whether there are other wiring (including the power line connected to the pump control) on the controller B+ terminal except the normal contactor copper bar. If so, remove it first and then test;</li> <li>5. The controller is defective.</li> </ol>
150	ERROR DC bus voltage of pump controller is low cutback	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>
151	ERROR DC bus voltage of pump controller is high cutback	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>
152	WARNING Enter energy limiting mode	Both the travel and pump enter the energy limiting mode.
201	ERROR Steer controller short	<ol style="list-style-type: none"> <li>1. Check whether the motor line has open circuit or poor insulation;</li> <li>2. Controller failure.</li> </ol>

202	<p>ERROR</p> <p>Steer controller temperature is high cutback</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check whether sufficient silicone grease is applied between the controller and the electric control aluminum plate and between the electric control aluminum plate and the truck;</li> <li>3. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>4. The controller is defective.</li> </ol>
203	<p>ERROR</p> <p>Steer motor temperature is high cutback</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>5. The controller is defective.</li> </ol>
204	<p>ERROR</p> <p>Internal power supply error</p>	<p>[refer to the inspection method when ACS controller reports 114 fault]</p>
205	<p>ERROR</p> <p>Steer controller precharge failed</p>	<ol style="list-style-type: none"> <li>1. Check whether the battery voltage is too low;</li> <li>2. Check whether the precharge resistance is normal;</li> <li>3. Measure whether the insulation between the motor line and the truck is normal;</li> <li>4. Check whether there are other wiring (including the power line connected to the pump control) on the controller B+ terminal except the normal contactor copper bar. If so, remove it first and then test;</li> <li>5. The controller is defective.</li> </ol>
206	<p>ERROR</p> <p>DC bus voltage of Steer controller is low cutback</p>	<ol style="list-style-type: none"> <li>1. Measure the battery voltage;</li> <li>2. Check the cable for looseness or poor insulation.</li> </ol>

207	ERROR DC bus voltage of steer controller is high cutback	1. Measure the battery voltage; 2. Check the cable for looseness or poor insulation.
208	ERROR VehicleSpeed counter Error	There is a large difference between the output of the steering wheel sensor and the output pulse number of the steering motor. It is necessary to check the encoder of the steering motor and the steering wheel sensor.
209	ERROR Wheel steering encoder error	Steering wheel sensor error.
210	ERROR Steer controller encoder fault	1. Check the wiring from motor encoder to controller for open circuit or poor insulation; 2. Check whether the encoder is installed in place or installed in the opposite direction; 3. Replace the encoder (for the newly replaced encoder, confirm whether the wiring definition is consistent with the original encoder); 4. The controller is defective.
211	ERROR Steer motor temperature sensor fault	1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature; 2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation; 3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal; 4. The controller is defective.
212	ERROR Steer controller temperature sensor fault	Steer controller temperature sensor fault.
213	ERROR	The steering contactor cannot be closed or the line from the drive line of the steering contactor to the controller is damaged. It is necessary to check the line.
214	ERROR	
215	ERROR Startup calibration of position has timedout.	After startup, the steering controller cannot find the zero position, and it needs to check the proximity switch.
217	ERROR Open drain of steer output open or short	[refer to the inspection method when ACS controller reports 97 fault]

218	<p>WARNING Steer motor temperature is low</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. The controller is defective.</li> </ol>
219	<p>WARNING Steer motor temperature is high</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check the wiring from the controller to the motor temperature sensor for open circuit or poor insulation;</li> <li>3. Measure whether the resistance value of the motor temperature sensor is normal (the resistance value is about 600Ω at room temperature), and whether the insulation with the motor line and truck is normal;</li> <li>4. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>5. The controller is defective.</li> </ol>
220	<p>WARNING Steer controller temperature is low</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. The controller is defective.</li> </ol>
221	<p>WARNING Steer controller temperature is high</p>	<ol style="list-style-type: none"> <li>1. Compare whether the monitoring temperature of the controller is significantly different from the actual temperature;</li> <li>2. Check whether sufficient silicone grease is applied between the controller and the electric control aluminum plate and between the electric control aluminum plate and the truck;</li> <li>3. Check whether the operating current of the controller is significantly higher than the commissioning current (it can be asked from relevant technical personnel);</li> <li>4. The controller is defective.</li> </ol>

222	WARNING DC bus voltage of steer controller is high	1. Measure the battery voltage; 2. Check the cable for looseness or poor insulation.
223	WARNING DC bus voltage of steer controller is low	1. Measure the battery voltage; 2. Check the cable for looseness or poor insulation.
231	ERROR CAN traction controller CAN communication fault	[refer to the inspection method when ACS controller reports 31 fault]
232	ERROR CAN Pump controller CAN communication fault	[refer to the inspection method when ACS controller reports 31 fault]
233	ERROR CAN Steer controller CAN communication fault	[refer to the inspection method when ACS controller reports 31 fault]
234	ERROR CPU fault	1. Check whether the wiring from the accelerator to the controller has poor insulation, unplug the accelerator plug-in, and test whether there is still code 114 (if yes, go to the next step, if not, it is accelerator fault); 2. Check whether the wiring from the motor encoder to the controller has poor insulation, unplug the motor encoder plug-in, and test whether there is 114 code (if yes, proceed to the next step; if not, it is the motor encoder fault); 3. Check whether the wiring from the lifting speed regulation sensor to the controller has poor insulation, unplug the lifting speed regulation sensor plug-in, and test whether there is still code 234 (if there is, proceed to the next step, if there is no, it is accelerator fault) [it is not necessary to check if there is no lifting speed regulation function or semi AC vehicle]; 4. Controller failure
235	WARNING The default value of the steer controller is updated	For protection after refreshing the program, restart the key

## 12. Declaration of Conformity (valid for sale in the EU)

### **[GB] CE Declaration of Conformity**

The signatory hereby declares that the specified machine conforms to the EU Directive 2006/42/EC (Machine Directive) and 2014/30/EU (Electro-Magnetic Compatibility, EMC) including their amendments as translated into national legislation of the member countries. The signatory is individually authorized to compile the technical documents.

### **[D] EG-KONFORMITÄTSEKTLÄRUNG**

Der Unterzeichner bescheinigt hiermit, dass die im Einzelnen bezeichnete Maschine den Europäischen Richtlinien 2006/42/EG (Maschinenrichtlinie) und 2014/30/EU (Elektromagnetische Verträglichkeit - EMV) einschließlich deren Änderungen sowie dem entsprechenden Rechtsersatz zur Umsetzung der Richtlinien in nationales Recht entspricht. Der Unterzeichner ist bevollmächtigt, die technischen Unterlagen zusammenzustellen.

### **[E] DECLARACIÓN DE CONFORMIDAD CE**

El signatario certifica por medio de la presente que la máquina especificada cumple con las Normas Europeas 2006/42/CE (Normativa para maquinarias) y 2014/30/EU (Compatibilidad electromagnética), incluyendo sus respectivas modificaciones, así como con el decreto-ley para la adaptación de las normas al derecho nacional. El signatario dispone de una autorización individual que le permite compilar la documentación técnica.

### **[F] DECLARATION DE CONFORMITE CE**

Par la présente déclaration, les soussignés certifient que le machines spécifié ci-dessus est conforme à la loi et aux directives européennes 2006/42/CE (directive sur les machines) et 2014/30/EU (compatibilité électromagnétique - CEM), y compris aux modifications qui y sont apportées et à l'arrêté autorisant sa transposition en droit national. Chaque signataire est habilité à établir individuellement la documentation technique.

### **[NL] EG-CONFORMITEITSVERKLARING**

Ondergetekenden verklaren hierbij dat - volgens de nationale wetgeving van de Lidstaten - de hierboven vermelde opgegeven machina beantwoordt aan de bepalingen qua veiligheid bij machines (EG richtlijn 2006/42/EC) en electro-magnetische compatibiliteit (EG richtlijn 2014/30/EU). Ondergetekenden zijn ieder individueel gemachtigd het technisch dossier samen te stellen.

### **[P] DECLARAÇÃO DE CONFORMIDADE CE**

Pela presente, os signatários certificam que o máquina especificado está conforme às Directivas Europeias 2006/42/CE („Máquinas“) e 2014/30/EU („Inocuidade Electromagnética - IEM“), incluindo as alterações das mesmas e o respectivo decreto-lei para a transposição em lei nacional. Cada um dos signatários está autorizado a proceder à elaboração da documentação técnica.

### **[I] DICHIARAZIONE DI CONFORMITÀ CE**

I sottoscritti dichiarano che il veicolo per trasporti interni a macchina specificato soddisfa le Direttive Europee 2006/42/EC (Direttiva Macchine) e 2014/30/EU (Compatibilità elettromagnetica - EMV) comprese le relative modifiche, come pure il rispettivo decreto legislativo per la conversione delle direttive in diritto nazionale. I sottoscritti sono singolarmente autorizzati alla creazione della documentazione tecnica.

### **[BG] ЕВРОПЕЙСКА ОБЩНОСТ - ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ**

Подписаните удостоверяват с настоящето, че подробно описаното машина средство отговаря на европейския норматив 2006/42/EG (норматив за машини) и на 2014/30/EU (електро-магнетична съвместимост), включително с техните промени, както и на съответния указ за прилагане на нормативите в националното право. Подписаните при това са упълномощени поотделно да съставят техническата документация.

### **[CZ] EG - PROHLÁŠENÍ O SHODĚ**

Níže podepsaný tímto potvrzuje, že podrobný popis uvedené stroje odpovídá Evropským směrnicím 2006/42/EC (směrnice pro stroje) a 2014/30/EU (elektromagnetická interference - EMV) včetně jejich pozdějších úprav, jakož i příslušným právním výnosům pro uplatnění příslušné směrnice v rámci národního práva. Každý z podepsaných jsou jednotlivě způsobilí k vytvoření technických podkladů.

### **[DK] EF-OVERENSSTEMMELSESEKTLÆRING**

Undertegnede attesterer hermed, at det specificerede maskine stemmer overens med de Europæiske Direktiver 2006/42/EU (maskindirektiv) og 2014/30/EU (elektromagnetisk kompatibilitet - EMC) samt med den modsvarende lovgivning til implementering af direktiver i den nationale lovgivning. De undertegnede er hver for sig beføjede til at sammenstille de tekniske dokumenter.

### **[EST] EL vastavusavaldus**

Allakirjutatud tõendavad käesolevaga, et üksikasjaliselt kirjeldatud täpsustatud masin vastab Euroopa direktiividele 2006/42/EÜ (Direktiiv masinate kohta) ja 2014/30/EU (Elektromagnetiline sobivus - EMS) kaasa arvatud nende muudatused ja nende vastavatele õigusmäärustele direktiivide muutmiseks siseriiklikuks õiguseks. Iga allakirjutanu üksikult on volitatud koostama tehnilist dokumentatsiooni.

### **[FIN] EU-YHDENMUKAISUSSELOSTUS**

Allekirjoittaneet todistavat täten, että kukin erikseen mainittu omalla voimalla laitteella varustettu tehdaskone vastaa EU-direktiivien 2006/42/EC (koneenrakennusdirektiivi) ja 2014/30/EU (sähkömagneettinen yhteensopivuus – EMC) määräyksiä sekä niiden muutoksia ja niiden kansalliseen lainsäädäntöön soveltamista koskevaa oikeussäätöä. Jokaisella allekirjoittaneista on oikeus itsenäisesti laatia asiaankuuluvia teknisiä asiakirjoja.

### **[GR] ΔΗΛΩΣΗ ΣΥΜΜΟΡΦΩΣΗΣ ΕΟΚ**

Οι υπογράφωντες βεβαιώνουν διά της παρούσης ότι το συγκεκριμένο μηχάνημα συμμορφώνεται προς την Κοινοτική Οδηγία 2006/42/ΕΚ («Μηχανήματα») και 2014/30/ΕU (Ηλεκτρομαγνητικής Συμβατότητας, ΗΜΣ), καθώς και οι τροποποιήσεις τους, όπως μεταφράστηκε στην εθνική νομοθεσία των χωρών μελών. Οι υπογράφωντες είναι σε κάθε περίπτωση εξουσιοδοτημένοι ατομικά να καταρτίσουν τα τεχνικά έγγραφα.

### **[H] EU KONFORMITÁSI NYILATKOZAT**

Alulírottak ezennel igazolják, hogy a részletesen leírt a megadott gép megfelel a 2006/42/EC (Gép-Irányelv) és a 2014/30/EU (Elektromágneses összeférhetőség - EMV) Európai Irányelveknek, beleértve azok módosításait, valamint az irányelvek nemzeti jogba történő átültetésére irányuló megfelelő jogi rendelkezést. Továbbá az alulírottak mindegyike rendelkezik meghatalmazással arra nézve, hogy összeállíthatja a műszaki dokumentációt.

### **[LT] ES atitikimø deklaracija**

Žemiau pasirašę asmenys patvirtina, kad atskirai aprašytas nurodyta mašina atitinka Europos Sąjungos direktyvas 2006/42/EB (Mašinų direktyva) ir 2014/30/EU (Elektromagnetinis suderinamumas – EMS) įskaitant jų pakeitimus, o taip pat ir atitinkamą teisės aktą dėl direktyvų įgyvendinimo nacionalinėje teisėje. Kiekvienas iš pasirašiusių asmenų turi teisę ruošti techninę dokumentaciją.

### **[LV] ES atbilstības deklarācija**

Ar zemāk redzamajiem parakstiem tiek apliecināts, ka norādīts mašīna atbilst Eiropas Savienības normatīvam 2006/42/EG (Mašīnu normatīvas) un 2014/30/EU (Elektromagnētiskā atbilstība – EMV), ieskaitot to izmaiņas, kā arī atbilstošos tiesiskos rīkojumus normatīvu pielāgošanai nacionālajai likumdošanai. Parakstu īpašnieki ir atsevišķi pilnvaroti sastādīt tehniskās dokumentācijas.

### **[N] EU-KONFORMITETSEKTLÆRING**

Undertegnede bekræfter hermed at de enkelte betegnede maskin med kraftdrift tilsvare de europeiske retningslinjene 2006/42/EC (maskinretningslinje)

og 2014/30/EU (elektromagnetisk fordraglighet - EMV) inklusiv disses endringer og den tilsvarende rettsforordning til omsetning av nasjonal rett. Hver undertegnede er fullmektig til å sette sammen de tekniske dokumentene.

### **[PL] DEKLARACJA ZGODNOŚCI WE**

Niżej podpisani deklarują, że poniżej opisana maszyna spełnia wymagania określone w dyrektywach Europejskich 2006/42/EC (Dyrektywa Maszynowa) i 2014/30/EU (Kompatybilności elektromagnetycznej - EMC) wraz z ich późniejszymi zmianami oraz odpowiednimi rozporządzeniami mającymi na celu przeniesienie tych dyrektyw do prawa krajów członkowskich. Sygnatariusz jest indywidualnie upoważniony do zestawiania dokumentacji technicznej.

### **[RO] DECLARAȚIE DE CONFORMITATE CE**

Subsemnații adevăresc prin prezenta că vehiculul de specificat mașină descris individual corespunde directivelor europene 2006/42/CE (Directiva privind mașinile) și 2014/30/EU (Compatibilitatea electromagnetică - CEM) inclusiv modificărilor lor precum și actului legislativ corespunzător prentu transpunerea directivelor în drept național. Subsemnații sunt fiecare în parte împuterniciți să întocmească documentația tehnică.

### **[RU] Декларация соответствия стандартам ЕС**

Настоящим лица, подписавшие документ, удостоверяют, что машина с указанной спецификацией соответствует европейским стандартам 2006/42/EG (Транспортная директива) и 2014/30/EU (Электромагнитная совместимость - EMC), включая изменения в них, а также соответствующим национальным стандартам и нормам. Каждое по отдельности лицо, подписавшее документ, имеет полномочия для составления технической документации.

### **[S] EG-KONFORMITETSFÖRKLARING**

Underteckarna intygar härmed att det i detalj betecknade maskin uppfyller de Europeiska direktiven 2006/42/EG (Maskindirektiv) och 2014/30/EU (Elektromagnetisk tålighet - EMV), inklusive ändringarna i detta och den motsvarande rättsförordningen för att omsätta direktiven i nationell rätt. Underteckarna har var för sig fullmakt att sammanställa den tekniska dokumentationen.

### **[SK] vyhlásenie o zhode**

Dolu podpísaní týmto potvrdzujeme, že podrobný popis uvedené stroje zodpovedá Európskym smerniciam 2006/42/EC (ernica pre stroje) a 2014/30/EU (elektromagnetická tolerancia – EMV) vrátane jeho neskorších úprav, rovnako zodpovedá aj príslušným právnym nariadeniam na uplatnenie smerníc v rámci národného práva. Každý z podpísaných je jednotlivo splnomocnený na vytvorenie technických podkladov.

### **[SLO] EU IZJAVA O SKLADNOSTI**

Podpisani s tem potrjujemo, da posamično označeno določeno stroj vozilo odgovarja Evropski direktivi 2006/42/EC (Direktiva o strojih) in 2014/30/EU (Elektromagnetna skladnost - EMV) vključno z njihovimi spremembami ter ustrezno pravno uredbo o prevzemu smernic v nacionalno pravo. Podpisniki so vsakokrat posamezno pooblašteni za izdajanje tehnične dokumentacije.

### **[TR] AB Uygunluk Açıklaması**

İmza sahibi şahıslar, ayrıntıları belirtilen makine aracının, 2006/42/EC (Makine Yönergesi) ve 2014/30/EU (Elektromanyetik Uyumluluk – EMC) no'lu Avrupa Yönergelerine ve bunların değişiklik sonucu oluşan metinlerine ve yönergelerin milli hukuk hükümlerine dönüştürülmesine dair ilgili hukuk karamamesine uygun olduğunu tasdik ederler. İmza sahibi şahıslar teknik dosyaları bir araya getirmek için münferiden vekil tayin edildi.

- (1) Type/ Typ/ Tipo/ Modello/ Тууппи/ Tipo / ΤΥΠΟΣ/ Típus/ Tip/ Тип/ Tips/ Tipas/ Tüüp:
- (2) Serial No./ Serien-Nr./ N°. de série/ Seriennummer/ N° de serie/ Numero di serie/ Serienr./ Sarjanro/ αυξάνων αριθμός/ Seriové číslo/ Szériaszám/ Nr. Seryjny/ Serijska številka/ Výrobné číslo/ Серийный номер/ Seri No./ Seerianr./ Sērijas Nr./ Serijos numeris:
- (3) Year of constr./ Baujahr/ Année de constr./ Bouwjaar/ Año de constr./ Anno di costruzione/ Produktionsår/ Byggeår/ Tillverkningsår/ Valmistusvuosi / Ano de fabrico / έτος κατασκευής/ Rok výroby/ Gyártási év/ Rokprodukcji / Letnik / Год изготовления / Üretim yılı / Väijalaskaasta / Izgatavošanas gads / Gamybosmetai
- (4) Manufacturer or his authorized representative in Community/ Hersteller oder in der Gemeinschaft ansässiger Vertreter/ Fabricant ou son mandataire établi dans la Communauté/ Fabrikant of zijn in de Gemeenschap gevestigde gemachtigde/ Fabricante o representante establecido en la Comunidad/ Construtor ou Representante estabelecido na Comunidade/ Costruttore oppure il suo rappresentante nella Comunità/ Fabrikant eller dennesi Fællesskabet etablerede befuldmægtigede/ Produsent eller agent innen felleskapet/ Tillverkare eller representant inom EU/ Valmistaja tai yhteisömaassa oleva edustaja / V`robce nebo jeho zastoupení/ Gyártó / producent albo jego przedstawiciel w EG (Wspólnota Europejska)/ Κατασκευαστής ή όκνηνο ηνπηθώλ αληπηνζώπσλ/ Üretici ya da Bölgedeki Yetkili Temsilci/ Proizvajalec ali pooblašteni zastopnik s sedežem v EU/ Výrobca alebo zástupca so stálym bydliskom v EÚ / Изготовитель или его представитель, зарегистрированный в стране Содружества/ Tootja või organisatsioonis paiknev esindaja/ Ražotājs vai vietējais uzņēmuma pārstāvis / Gamintojas arba šalyje reziduojantis atstovas:
- (5) Date/ Datum/ Data/ Fecha/ datum/ Dato/ päiväys/ Kuupäev/ Datums/ дата / Dátum/ dátum/ tarih/ ημερομηνία
- (6) Authorised signatory/ Im Auftrag/ pour ordre/ Incaricat/ Por orden de/ por procuração/ op last van/ på vegne af/ på uppdrag/ Etter oppdrag/ psta./ Ülesandel / pavedus / v.i. / По поручению / megbízásából / длъжностно лице / z pověřeni / z poverenia / po nalogu / na polecenie / din sarcina / adina / θαη' εληνη

- Example text for a copy*
- (1) Type: **XX XX – Self-propelled industrial truck**
- (2) Serial No: **XXXXXXXX**
- (3) Year of constr.: **YYYY**
- (4) Manufacturer or his authorized representative in Community:  
**Company name/ Street / Postal code Town/ Country**
- (5) Date: **YYYY-MM-DD**
- (6) Authorized signatory: **Mr. Sample**