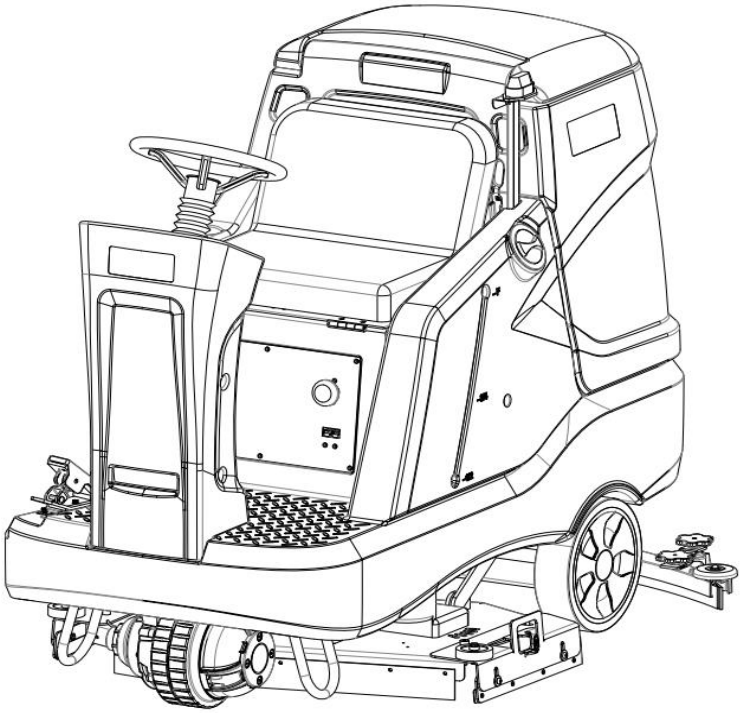
Operator Manual

NR860 Ride-on Scrubber



WARNING

Do not use the pallet 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 this manual for future reference.**

Version 12/2024

NR860-SMS-002-EN

TABLE OF CONTENTS

INTRODUCTION

NOTE

The code of related components in ( ) can be found in the chapter of machine description.

MANUAL PURPOSE AND CONTENT

- This manual is to provide the operator with the necessary information for the correct and safe use of the machine, which includes the technical data, safety, operation, storage, maintenance, accessories and dispose of the machine.
- Before performing any operation or maintenance on this machine, the operator and the qualified technicians must read this manual carefully.
- If you have any questions about the explanation of this manual or want more related information, please contact our after-sales or agency.
- The operator is not allowed to perform the steps that must be completed by the technicians. All instructions in this manual should be seriously followed, otherwise our company shall not be liable for any losses arising therefrom.

HOW TO KEEP THIS MANUAL

- The Manual must be kept near the machine, inside an adequate case or bag, away from liquids and other substances that can cause any damage to it.

DECLARATION OF CONFORMITY

- The declaration of conformity is provided with the machine to prove that the machine complies with relevant criteria and regulations.

NOTE

The copy of the original declaration of conformity is provided together the machine documentation.

ACCESSORIES AND MAINTENANCE

- All necessary operation, maintenance and repair procedures must be performed by qualified personnel or the maintenance center designated by our company. Only original spare parts and accessories are allowed to be used on the machine.
- If you need service or want to order spare parts or accessories, please contact our company's after-sales service department or the agent, and provide the model and serial number of the machine.

CHANGE AND IMPROVEMENT

- Our company is committed to the continuous improvement of the products and reserves the right to notify the improvements and changes of the products that have been sold.

INTENDED USE

- This scrubber can be used in commercial and industrial environments, and it is suitable for cleaning smooth and hard floors (washing and sewage collecting). It must be used in a safe environment by a qualified operator. This scrubber is not suitable for cleaning outdoors floors, carpets or rough floors.

MACHINE IDENTIFICATION

- The model and serial number of this machine are marked on the identification label. The information on this label is very important, which is required to be provided when you order the accessories for the machine.

TRANSPORT AND UNCRATING

- Carefully check machine for signs of damage. Report damages at once to carrier. Record the damages on paper to reserve the right for compensation.

After uncrating, check if the machine is equipped with the following items:

1. Technical documents, including operation manual;
2. Battery connecting cable.

SAFETY

- The following symbols indicate potential dangers. In any case, please read this information carefully and take necessary precautions to avoid possible injury and property loss.

VISIBLE SYMBOLS ON THE MACHINE

WARNING!
Read all the instructions carefully before performing any operation on the machine.

SYMBOLS THAT APPEAR IN THIS INSTRUCTION MANUAL

DANGER!
It indicates the danger that may cause death of the operator.

WARNING!
It indicates a potential hazard of injury to people and objects.

CAUTION!
It indicates a caution related to important or useful functions.
Pay attention to the paragraphs marked by this symbol.

NOTE
It indicates notes on important matters and useful functions.

CONSULTATION
It indicates the necessity to refer to the instructions of this manual before performing any procedures.

GENERAL SAFETY INSTRUCTION

Specific warnings and cautions for potential damages to personnel and machine are notified as follows:

DANGER !

- This machine must be operated by trained and authorized personnel according to guidance of the manual.
- Before performing any cleaning, maintenance, repair or replacement procedure, read all the instructions carefully, ensure to turn the machine OFF and disconnect the battery connector.
- Do not operate the machine near toxic, dangerous, flammable and/or explosive powders, liquids or vapors. This machine is not suitable for collecting dangerous powders.
- Do not wear jewels when working near electrical components.

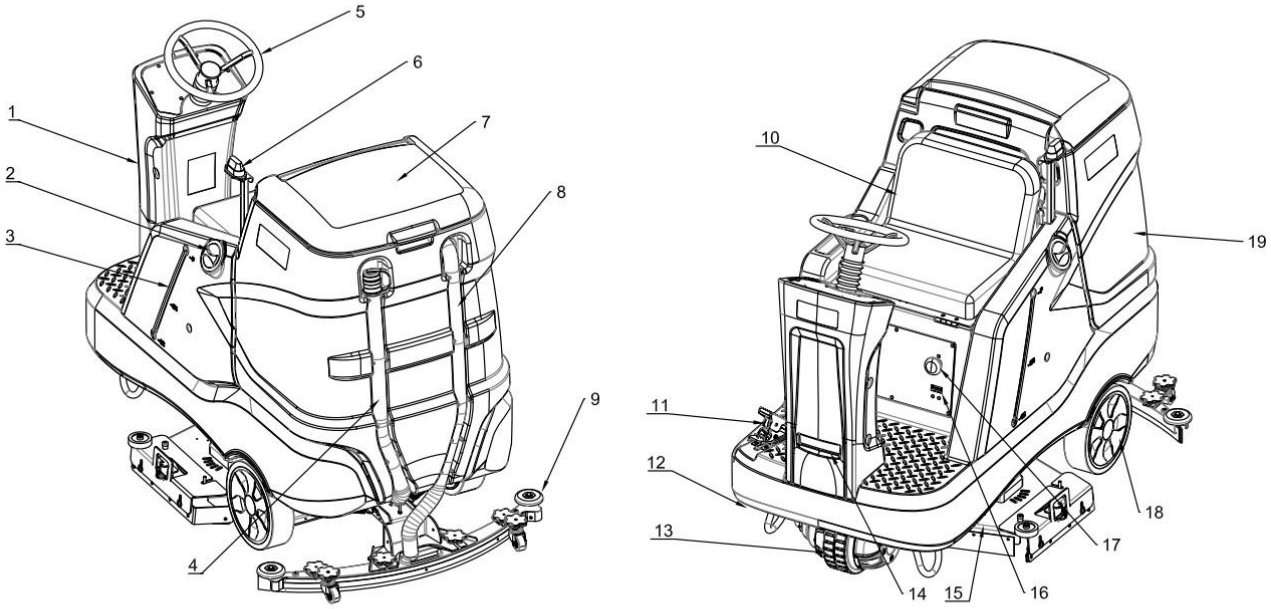
- Do not work under the lifted machine without supporting it with safety stands.
  x When using lead (WET) batteries, they may emit inflammable gas under normal use, must keep sparks, flames, smoking materials and radiating, illuminating and burning items away from the batteries.
- x When charging lead (WET) batteries, they may emit hydrogen gas which may cause explosive. Must ensure the charging environment is well ventilated and away from naked flames.

WARNING !

- This machine is intended for COMMERCIAL USE, for example in hotels, schools, hospitals, factories, shops, offices and rental businesses.
- Machines left unattended shall be secured against unintentional movement.
- In order to prevent unauthorized use of the machine, the power source shall be switched off or locked, for example by removing the key of the main switch or the ignition key.
- Check the machine carefully before each use. Ensure that all the components have been well assembled before use. Or it may cause damages to people and properties.
- Before using the battery charger, ensure that the values of frequency and voltage indicated on the machine serial number label match those of mains.
- Never move the machine by pulling the battery charger cable. Do not let the cable through a closed door, or winding on sharp edges or corners.
- Do not run the machine on the battery charger cable.
- Keep the battery charger cable away from heated surfaces.
- Do not charge the batteries if the battery charger cable or the plug are damaged.
- To reduce the risk of fire, electric shock, or injury, make sure machine is off before leaving.
- Use or store the machine indoors in dry conditions, it is not allowed for outdoor use.
- The machine both storage and working temperature must be between 0 °C and +40 °C, the humidity of air must be between 30% - 95%.
- Do not use the machine on slopes with a gradient exceeding as specification show.
- When using and handling floor cleaning detergents, follow the instructions on the labels of the detergent bottles and wear suitable gloves and protections.
- Use brushes and pads supplied with the machine or defined in the manual. Using other brushes or pads could reduce safety.
- In case of machine malfunctions, ensure that these are not due to lack of maintenance. If necessary, request assistance from the authorized personnel or from an authorized Service Center.
- Take all necessary precautions to prevent hair, jewels and loose clothes from being caught by the machine moving parts.
- Do not use the machine in particularly dusty areas.
- Do not wash the machine with direct or pressured water jets, or with corrosive substances.
- Do not bump into shelves or scaffoldings, especially where there is a risk of falling objects.
- Do not lean liquid containers on the machine, use the relevant can holder.
- To avoid damaging the floor, do not allow the brush/pad to operate while the machine is stationary.
- In case of fire, use a dry powder fire extinguisher. Do not use liquid fire extinguishers.
- Do not remove or modify the machine stickers.

- Do not tamper with the machine safety guards and follow the ordinary maintenance instructions scrupulously.
- Pay attention during machine transportation when temperature is below freezing point. The water in the recovery tank and in the hoses could freeze and cause seriously damage to the machine.
- If spare parts need be replaced, order ORIGINAL spare parts from an Authorized Dealers or Retailers.
- Return the machine to the Service Center if it doesn't work as usual or is in condition such as damaged, placed outdoors, dropped into water.
- To ensure machine proper and safe operation, the scheduled maintenance shown in the relevant chapter of this Manual, must be performed by the authorized personnel or an authorized Service Center.
- The machine must be properly disposed of, because the presence of toxic-harmful materials (batteries, etc.), which are subject to standards that require disposal in special centers (see Scrapping chapter).
- This machine as a cleaning tool only, not for any other purpose use.
- Always keep the openings free from dust, hairs and any other foreign material which could reduce the air flow. Do not use the machine if the openings are clogged.
- Use the machine only where a proper lighting is provided.
- This machine is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.
- Close attention is necessary when used near children.
- Children should be supervised to ensure that they do not play with the machine.
- While using this machine, take care not to cause damage to people or objects.

MACHINE DESCRIPTION



MAIN COMPONENTS

Figure 1

1. Front column
2. Water injection lid
3. Solution tank
4. Drain hose
5. Steering wheel
6. Waring lamp
7. Recovery tank cover
8. Vacuum hose
9. Squeegee assembly
10. Seat cushion
11. Accelerator pedal
12. Drain water lid
13. Driving wheel
14. Front LED lamp
15. Brush system
16. Controller box & charging socket
17. E-Stop button
18. Rear wheel
19. Recovery tank

CONTROL PANEL FUNCTION DESCRIPTION (as shown in Figure 2)

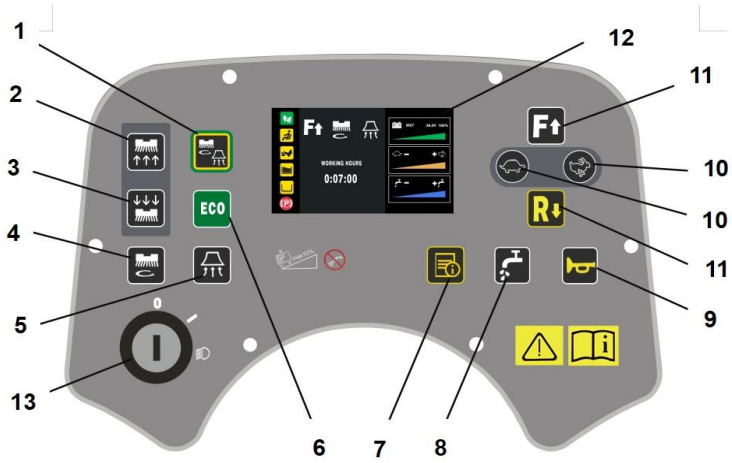


Figure 2

NO.	Description	Function
1	Start button	Press the button to start working.
2	Brush load button	Press the button to load brush/pad automatically.
3	Brush unload button	Press the button to unload brush/pad automatically.
4	Brush motor button	Press the button and the brush motor works (in walking mode).
5	Vacuum motor button	Press the button and the vacuum motor works (in walking mode).
6	ECO mode	Press the button into ECO mode
7	Page-turning button	Monitor the working status of the machine
8	Solution flow button	Press the button to adjust the amount of liquid, the flow increases step by step.
9	Horn button	Press the button to beep
10	Acceleration/deceleration button	Control the speed, turtle for slow down and rabbit for speed up.
11	Forward/reverse button	Press the button to adjust machine to forward/reverse.
12	Display	Real-time display all the function status.
13	Key switch/front lamp	Control the main power supply and front lamp.

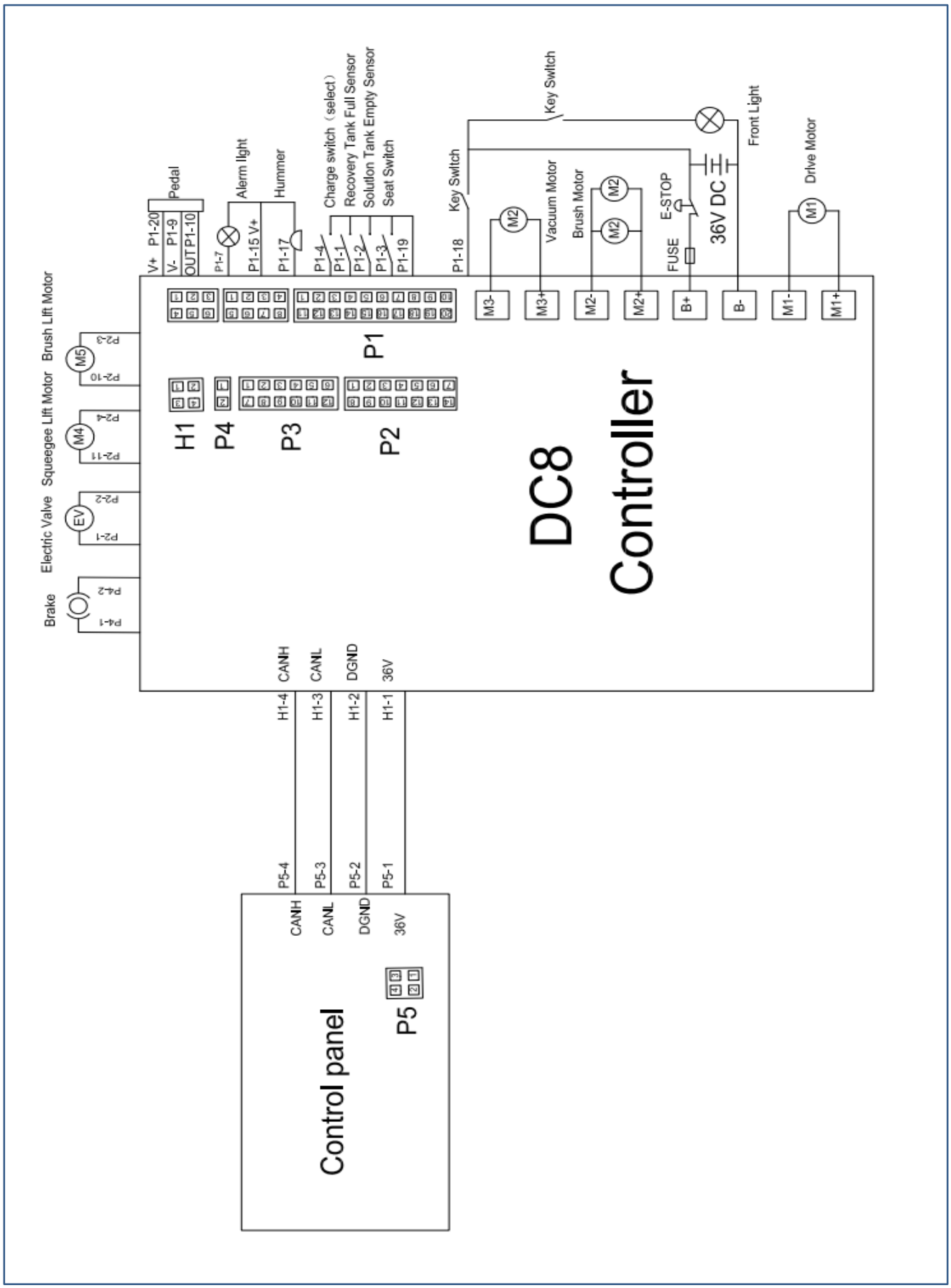
DISPLAY PANEL INFORMATION

NO.	Description	Function
1	ECO mode	Green indicates ECO mode, white normal mode.
2	Seat switch	White indicates seat switch connected and working, yellow indicates disconnected.
3	Accelerator pedal	White indicates normal, yellow abnormal. Do not step on the pedal when starting the machine.
4	Recovery tank	Yellow indicates that the recovery tank is full and must be emptied to work. White indicates normal.
5	Solution tank empty	Yellow indicates that the solution tank is empty. White indicates normal.
6	Electromagnetic brake	Red indicates brake engaged, white indicates brake released, and exclamation mark indicates brake failure.
7	Information display	Indicates working hours when normal, and error code if abnormal.
8	Solution flow button	Indicates solution flow status, three levels.
9	Speed button	Indicates walking speed, three levels.
10	Battery status	Indicates the real-time power of the machine.
11	Battery type	Indicates battery type applied. AGM, LFP and LIT for optional.
12	Vacuum motor	Indicates vacuum motor status, white means normal and red abnormal.
13	Brush motor	Indicates brush motor status, white means brush loading/unloading normal and red abnormal.
14	Drive motor	Indicates drive motor status, F for forward, R for reverse, and red for abnormal.

TECHNICAL DATA

Model		NR860
Rated power	W	2350
Brush motor rated power	W	550*2
Drive motor rated power	W	36V 650W
Vacuum motor rated power	W	600
Vacuum capacity	kPa	>17
Voltage (DC)	V	36
Sound pressure level	dB (A)	68±3
Max. speed	km/h	6.5
Dimensions (L*W*H)	mm	1650*860*1315
Brush speed	rpm	180
Solution/ Recovery tank capacity	L	160/160
Brush pressure	kg	55
Cleaning path	mm	860
Max. gradeability	%	10
Clean productivity	m²/h	5590
Brush/ Pad diameter	mm	430*2
Net weight (without batteries, empty tank)	kg	260
Continuous working time (12V150AH*3)	H	3-4h
Battery compartment size (L*W*H)	mm	520*500*350
Gross weight (with batteries, empty tank)	kg	410
Brush disk quantity		2 Disc

CIRCUIT DIAGRAM



OPERATION INSTRUCTIONS

WARNING!

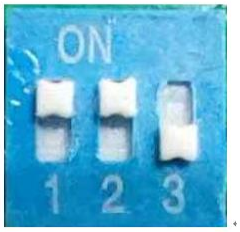
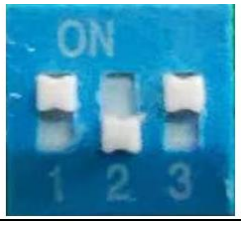
If the battery is installed or wired incorrectly, the electrical components of the machine may be seriously damaged. The battery must be installed by qualified personnel. Equip the machine with correct charger according to the battery. Please check if the battery is damaged before assembling. Disconnect the battery connector and charger plug. Handle the batteries with great care.

WARNING!

Before opening the recovery tank, ensure that the it is empty in case of any damage to the tank.

NOTE

The machine requires 3pcs 12V batteries or one 36V lithium battery. The battery type can be set through the lever switch on the control panel. Let professionals to set it. After setting the switch, the battery type is changed after turning it on again.

Battery type	Switch status
LIT	
LFP	
AGM	

INSTALLING BATTERIES

1. Open the recovery tank lid. check if the recovery tank is empty, if not, drain it through the drain hose .
2. Disconnect the vacuum motor and recovery tank full sensor plug.
3. Disassemble the recovery tank from solution tank.
4. Carefully and correctly place the battery into the battery compartment.
5. Complete the wiring as shown in the right figure. Tighten the lock screw on the battery.
6. Connect the battery with machine though the connector.
7. Assemble the recovery tank onto solution tank.
8. Connect the plug of vacuum motor and recovery tank full sensor.

NOTE

When assemble the recovery tank in case of hand-pinching.

EMERGENCY BRAKING

If there is any emergency during operation, press the emergency button on the solution tank (under the seat, then all functions of machine will stop, nothing will be displayed on the control panel. Press emergency button again to restore the power supply.

INSTALLING AND REMOVING THE DISK BRUSHES/PADS

NOTE

According to the conditions of the floor to choose the appropriate brush disc or pad driver for cleaning.

CAUTION

Before manually installing or uninstalling the brush disc or pad driver, ensure that all switches of the machine are off. Protective gloves must be worn during operation to avoid injury by debris.

NOTE

Automatic load/unload of brush disc/pad driver can be achieved. Do not sit on the machine during this operation. The specific installation and uninstallation steps are as follows:

1. Turn the key to the key switch and turn it to "ON" position (the brush disk and squeegee assembly will automatically return to the original position).
2. Open the brush deck apron and insert the brush disk/ pad driver. The outer surface of the brush disc is fitted to that of the machine brush disc cover.
3. Press the brush load button, lower the brush deck and the brush motor starts gradually.
4. The brush motor rotates for 5 seconds, the brush disc/pad driver is automatically connected to the motor flange.

5. Press the brush unload button, the brush motor stops and the brush unloading can be achieved.

WARNING

Do not operate this machine until the brush disk/pad driver is installed.

CAUTION!

Brush loading and unloading shall be carried out without the seat.

ATTACHING THE SQUEEGEE ASSEMBLY

1. Unscrew the two knobs on the squeegee assembly and lock it into the groove on the squeegee holder.
2. Tighten the knobs on the squeegee assembly and connect the vacuum hose (8, Fig. 1) to the squeegee assembly.

FILLING THE SOLUTION TANK

1. Open the fill-port lid in the front of the machine.
2. Fill the cleaning water or suitable detergent with hose. The solution tank water level can be checked by the indicator pipe on the side. When the float ball reaches "F" position, indicating that the solution water tank is full. The temperature of the filling water or detergent shall not exceed +104F (+40°C).
3. Or pull out the solution tank water filling hose on the machine and connect it with the water tap to add water to the tank. The length of the water hose is 1.5 meters.

WARNING

Use only low-foam and non-flammable detergent, which should be applicable to the scrubber.

START AND STOP OF MACHINE

1. Prepare the machine as shown in previous paragraph. Operator sits on the seat and turn the key switch to "ON" position. If the BDI display 100% of battery charge, it means that the battery is fully charged and available for use. If the BDI displays 10%, the battery needs to be charged. Turn the key switch to "OFF" and charge the battery fully. (See Maintenance Chapter)
2. Press "start button", the brush motor and vacuum motor indicator light will be on, the squeegee and the brush will be automatically lowered to the ground. Brush motor and vacuum motor start running.
3. Press “brush motor button” and “vacuum motor button” can achieve separate operation.
4. According to the cleaning demand, the solution liquid flow can be adjusted by operating the "solution

flow button" on the control panel, three different flows are available. Three indicator lights on indicates the maximum flow. After the solution water tank is empty, the indicator on the panel will on for adding water.

5. The speed of the machine can be adjusted through the "tortoise/rabbit button" on the panel. Press the "tortoise button" to decelerate, and press the "rabbit button" to accelerate. Three levels of speed are available, which is shown on the panel. Speed can be adjusted by operating the accelerator pedal, the more force applied on the pedal, the faster machine travels. Reduce the force applied on the accelerator pedal slowly, move the steering wheel and start scrubbing.
6. Press button “F”/”R” can control machine forward/reverse. Press "R" button to move the machine backwards and the machine will issue a "beep" sound. When the machine moves backwards, the squeegee assembly and brush deck will be automatically lifted and the machine will stop cleaning automatically.
7. The seat switch indicates yellow if no one seated on and the machine cannot move.
8. If work in the dark area, turn the key switch to “front lamp” to turn on the front LED lamp.
9. Release the accelerator pedal to stop the machine.
10. Press the “start button” again after works finished. The brush motor shuts down and the vacuum motor shuts down after a few seconds. Press “brush motor button” or “vacuum motor button” again can also stop it.
11. After the brush and vacuum motors stop, make sure to park the machine steadily and turn the key switch to "OFF" position.

CAUTION!
To avoid any damage to the floor surface, turn off the brush/pad driver when the machine stops in an area.

CAUTION!
Do not use the machine when the battery charge is low, to avoid damaging the batteries and reducing the battery life.

DRAINING TANKS

1. When the recovery tank is full, the sensor of the recovery tank will work, the indicator of recovery tank full will turn yellow, the brush deck and the squeegee assembly will be lifted automatically, and the machine cannot clean the floor.
2. Move the machine to the designated drainage area, restart the machine after draining the recovery tank to empty.
3. Drain the recovery tank through the drain hose, then rinse the recovery tank with clean water.

WARNING!
When the recovery tank is full, please stop working immediately to avoid the sewage entering the vacuum motor.

SOLUTION TANK EMPTY AND CLEANING FILTER

1. The indicator of solution tank on panel will turn yellow if it gets empty. Please add water.
2. When the filter needs to be cleaned, pull off the quick connect on the left side of the solution tank to empty the water, and then unscrew the cover of the tank to clean the internal filter.

AFTER USE

After working, complete the following steps before leaving the machine:

3. Remove the brush disk/pad driver according to the procedures shown in previous chapter.
4. Drain the solution tank and recovery tank according to the procedures described above.
5. Perform the daily maintenance procedures (see the maintenance chapter).
6. Lift or remove the brush disk/ pad driver and the squeegee assembly, and store the machine in a clean and dry area.

LONG-TERM INACTIVITY

If the machine is not going to be used for more than 30 days, proceed as follows:

1. Perform the procedures shown in chapter of After Use.
2. Disconnect the battery and the machine.

USING THE MACHINE FOR THE FIRST TIME

After using this machine for 8 hours for the first time, check if the fixing and connecting parts of the machine are loose, and check for visible damage and leakage.

MAINTENANCE

WARNING!

The procedures must be carried out after the machine is turned off and the battery charging cable is disconnected. Moreover, carefully read the instructions of Safety Chapter in this manual before performing any maintenance procedures.

REGULAR MAINTENANCE CHECKLIST

CAUTION!

The check items marked with (1) must be performed when the machine is used for 8 hours for the first time. The check items marked with (2) must be performed by an authorized service center.

Check Item	Daily (after use)	Each week	Semi--yearly	Each year
Charge the battery				
Clean the squeegee				
Clean the brush/pad				
Clean the solution tank and recovery tank				
Check the seal of tanks				
Check the squeegee, replace if necessary				
Clean the solution tank filter				
Clean the vacuum motor filter				
Check if all screws and nuts are tightened			1	
Check the brush/ pad driver, replace if necessary				2
Check the carbon brush of vacuum motor, replace if necessary				2
Check the carbon brush of drive motor, replace if necessary				2

CHARGING THE BATTERY

NOTE

When the fault codes of EA2 and EA3 appear on the display, the battery needs to be charged, or charge the battery after every use.

CAUTION

Keep the battery fully charged to extend the service life of the battery.

CAUTION

Charge the battery as soon as possible when the battery is low, otherwise the service life of the battery will be reduced. Check the battery charge at least once a week.

1. Move the machine to designated charging area.
2. According to the type of the battery, choose the appropriate charger for charging.
3. Connect the charger connector to the socket under the seat of the machine, and then connect the charger plug to the power supply.
4. After charging the battery, disconnect the charger plug from the power supply, and then disconnect the connector from the machine.

CLEANING THE DISK BRUSH/ PAD

CAUTION!
Wear protective gloves when cleaning the brush/pad in case of the injury caused by the sharp debris.

1. Remove the brush disk/ pad driver from the machine, as shown in the previous chapter.
2. Clean the brush disk (pad driver) and brush (pad) with cleaning solution and water.
3. Check the condition of the brush/pad for wear, and replace it if necessary.

CLEANING AND STORING THE SQUEEGEE

NOTE
The squeegee must be clean and its blades must be in good conditions in order to have better scrubbing performance.

CAUTION
It is advisable to wear protective gloves when cleaning the squeegee in case of the injury caused by the sharp debris.

1. Loosen the knobs on the squeegee assembly and remove the vacuum hose from the squeegee.
2. Clean the aluminum squeegee bracket and the vacuum hose. Check the front blade and the rear blade for integrity, cuts and tears; replace them if necessary.
3. Assemble the squeegee in the reverse order of disassembly.

CHECKING AND REPLACING THE SQUEEGEE BLADE

1. Check the front blade and the rear blade for integrity, cuts and tears; if the bottom edge of the front blade or the bottom edge of the rear blade is worn while the top edge (the other edge) is intact, turn it upside down. If the top edge is also worn, replace the blade according to the following procedures:

2. Loosen the knob and remove the lock block from aluminum bracket, then replace the front blade / rear blade or turn the blade upside down. Assemble the front blade / rear blade in the reverse order of removal.

CLEANING THE RECOVERY TANK AND CHECKING THE SEAL

1. Drain the recovery tank by the drain hose.
2. Open the recovery tank and remove the recovery tank lid, then rinse the recovery tank lid and recovery tank with clean water.
3. Check if the bearing surface of the seal of the recovery tank is intact and sealed, remove the sealing from the groove of the tank and replace if necessary.
4. Fit the recovery tank lid in place.

TROUBLE SHOOTING

Trouble	Possible Cause	Remedy
The machine doesn't work and the LCD display doesn't light up	Battery connector is disconnected	Connect the battery connector
	Battery is completely discharged	Charge the battery
The machine doesn't work, and the battery charge is displayed at 10%	Low battery	Charge the battery
The machine cannot go-forwards/ backwards	Control circuit board failure	Replace the control circuit board
	Operator is not on the seat or seat switch is defective	Sit on the seat or replace seat switch
	Accelerator pedal is unconnected or damaged	Check the cable or replace the accelerator pedal
The brush motor doesn't work	Control circuit board failure	Replace the control circuit board
	Brush motor overload	Replace the brush disc with soft brush to be applicable to the floor being cleaned
	Brush motor carbon brush is worn out	Contact after-sales service
	Obstacles prevent the brush rotating	Clean the brush holder
The vacuum motor doesn't work	Vacuum motor damage	Check and replace vacuum motor
	Control circuit board failure	Replace the control circuit board
Insufficient suction, sewage cannot be sucked in	Recovery tank is full	Empty the recovery tank
	Drain hose and squeegee are not well-connected	Connect the drain hose and squeegee correctly
	Squeegee is dirty or worn	Check and clean the squeegee
	Recovery tank lid is not closed properly, or the seal is damaged, or the hose is clogged	Close the lid correctly, or replace the seal or clean the hose.
	Recovery tank is dirty	Clean the recovery tank
Insufficient solution supply to brush disk	Solution filter is dirty	Clean the filter
	Dirty solution tank or a clogged pipeline	Clean the solution tank and pipeline
Squeegee leaves scratch on the floor	There are debris under the squeegee blade	Remove the debris
	Squeegee blade is worn, cracked, brittle	Replace the squeegee blades

LCD DISPLAY FAULT CODE

Fault Code	Fault Name	Possible Causes	Remedy
E[01]	Pre-charge 1	1. Brake output short circuit 2. Drive motor or brake controller MOS failure	1. If the fault code is eliminated after dismantling the brake from the controller, check if the brake is short circuit. If not, it's the failure within the controller.
E[02]	Pre-charge 2	1. Other outputs short circuit except brake (P1-15/P2-1/P2-8/ P3-4/P3-5) 2. Positive pole of the other motors short circuit except drive motor (brush/vacuum) (P2-3/P2-10/P2-4 / P2-11/ P3-4/ P3-10 /P3-5 / P3-11/P3-6/P3-12) 3. Controller failure	1. Unplug P1, P2 and P3 from controller and short circuit P1-8 and P1-18. Measure the voltage between P1-15 and B- after controller restarts. If it is -5V larger than that of P1-18, short circuit may occur amont P1, P2 or P3, and should check one by one (P1-7/P1-15/P1-17/ P2-2/P2-9/P2-1/P2-8/P3-4/P3-10/ P3-5/P3-11). If -5V smaller, dismantle brush and vacuum motors in turn. If fault is eliminated, check them. If the fault still exists, it's the failure within the controller.
E[03]	PVDD1 Overvoltage	P4-1 voltage over 45V	
E[04]	PVDD1 Undervoltage	P4-1 voltage below 12V	
E[05]	12V-Front Overvoltage	Failure within the controller	
E[06]	12V-Front Undervoltage	Failure within the controller	
E[07]	12V-CPU Overvoltage	Failure within the controller	
E[08]	12V-CPU Undervoltage	Failure within the controller	

E[09]	CAN-Overvoltage	Failure within the controller	
E[0A]	CAN-Undervoltage	Failure within the controller	
E[10]	PVDD2 Overvoltage	BM+ voltage over 45V	
E[11]	PVDD2 Undervoltage	BM+ voltage below12V	
E[12]	Key switch Overvoltage	P1-18 voltage over 45V	
E[13]	Key switch Undervoltage	P1-18 voltage below 12V	
E[14]	Battery Undervoltage	BAT+ voltage over 45V	
E[15]	Battery Overvoltage	BAT+ voltage below 12V	
E[16]	Battery voltage extreme low	BAT+ voltage below 12V	
E[17]	Battery voltage extreme high	BAT+ voltage over 47V	
E[18]	12V drive voltage Overvoltage	Failure within the controller	
E[19]	12V drive voltage Undervoltage	Failure within the controller	

E[1A]	12V Output Overvoltage	Failure within the controller	
E[20]	12V Output Undervoltage	Failure within the controller	
E[21]	VQEP1 Overvoltage	Failure within the controller	
E[22]	VQEP1 Undervoltage	Failure within the controller	
E[23]	5V Output Overvoltage	Failure within the controller	
E[24]	5V Output Undervoltage	Failure within the controller	
E[25]	UART Overvoltage	Failure within the controller	
E[26]	UART Undervoltage	Failure within the controller	
E[27]	VQEP2 Overvoltage	Failure within the controller	
E[28]	VQEP2 Undervoltage	Failure within the controller	
E[29]	Relay 1 connection failure	Drive motor relay disconnected. Check with other faults	
E[2A]	Relay 2 connection failure	Clean function relay disconnected. Check with other faults	

E[30]	NTC of drive motor phase A failure		
E[31]	NTC of drive motor phase B failure	Failure within the controller	
E[32]	Brush motor NTC failure	Failure within the controller	
E[33]	Vacuum motor NTC failure	Failure within the controller	
E[34]	Drive motor A over temperature	Drive motor A over temperature	
E[35]	Drive motor A extreme over temperature	Drive motor A extreme over temperature	
E[36]	Drive motor B over temperature	Drive motor B over temperature	
E[37]	Drive motor B extreme over temperature	Drive motor B extreme over temperature	
E[38]	Brush motor over temperature	Brush motor controller over temperature	
E[39]	Brush motor controller over temperature	Brush motor controller extreme over temperature	
E[3A]	Vacuum motor over temperature	Vacuum motor controller over temperature	
E[40]	Vacuum motor extreme over temperature	Vacuum motor controller extreme over temperature	

E[41]	MOS of drive motor phase A overvoltage failure	Drive motor phase A overvoltage	1. Disconnect drive motor wire from controller and restart controller. If fault still exists, it's failure within the controller. If not, check if there is short circuit between drive motor and battery +.
E[42]	MOS of drive motor phase A undervoltage failure	Drive motor phase A undervoltage	1. Disconnect drive motor wire from controller and restart controller. If fault still exists, it's failure within the controller. If not, check if there is short circuit between drive motor and battery +.
E[43]	MOS of drive motor phase B overvoltage failure	Drive motor phase B overvoltage	1. Disconnect drive motor wire from controller and restart controller. If fault still exists, it's failure within the controller. If not, check if there is short circuit between drive motor and battery +.
E[44]	MOS of drive motor phase B undervoltage failure	Drive motor phase B undervoltage	1. Disconnect drive motor wire from controller and restart controller. If fault still exists, it's failure within the controller. If not, check if there is short circuit between drive motor and battery +.
E[45]	MOS of brush motor overvoltage failure	None	
E[46]	MOS of brush motor undervoltage failure	Brush motor BM- undervoltage	1. Dismantle brush motor from controller and restart controller. If fault is eliminated, check if brush motor is short circuit. If not, it's the failure within the controller.
E[47]	MOS of vacuum motor overvoltage failure	None	
E[48]	MOS of vacuum motor undervoltage failure	Vacuum motor undervoltage	1. Dismantle vacuum motor from controller and restart controller. If fault is eliminated, check if vacuum motor is short circuit. If not, it's the failure within the controller.
E[49]	Brush lifting MOS-1 overvoltage failure		1. Dismantle brush lifting motor (P2-3/P2-10) from controller. If fault is eliminated, check if the motor is short circuit to B+/PVDD2. If not, it's the failure within the controller.

E[4A]	Brush lifting MOS-A overvoltage failure		1. Dismantle brush lifting motor (P2-3/P2-10) from controller. If fault is eliminated, check if the motor is short circuit to earth. If not, it's the failure within the controller.
E[50]	Brush lifting MOS-B overvoltage failure		1. Dismantle brush lifting motor (P2-3/P2-10) from controller. If fault is eliminated, check if the motor is short circuit to B+/PVDD2. If not, it's the failure within the controller.
E[51]	Brush lifting MOS-B undervoltage failure		1. Dismantle brush lifting motor (P2-3/P2-10) from controller. If fault is eliminated, check if the motor is short circuit to earth. If not, it's the failure within the controller.
E[52]	Squeegee lifting MOS-A overvoltage failure		1. Dismantle squeegee lifting motor (P2-4/P2-11) from controller. If fault is eliminated, check if the motor is short circuit to B+/PVDD2. If not, it's the failure within the controller.
E[53]	Squeegee lifting MOS-A undervoltage failure		1. Dismantle squeegee lifting motor (P2-4/P2-11) from controller. If fault is eliminated, check if the motor is short circuit to earth. If not, it's the failure within the controller.
E[54]	Squeegee lifting MOS-B overvoltage failure		1. Dismantle squeegee lifting motor (P2-4/P2-11) from controller. If fault is eliminated, check if the motor is short circuit to B+/PVDD2. If not, it's the failure within the controller.
E[55]	Squeegee lifting MOS-B undervoltage failure		1. Dismantle squeegee lifting motor (P2-4/P2-11) from controller. If fault is eliminated, check if the motor is short circuit to earth. If not, it's the failure within the controller.
E[63]	Drive motor open circuit failure		1. Check if drive motor is open. Dismantle drive motor from controller, measure the motor wires connection 2. Check if wire connection between drive motor and controller is correct.
E[64]	Drive motor MOS-A short circuit failure		1. Drive motor is short circuited. Restart and check if the fault is eliminated. If it occurs every time, check if motor is damaged or any short circuit.

E[65]	Drive motor MOS-B short circuit failure		1. Drive motor is short circuited. Restart and check if the fault is eliminated. If it occurs every time, check if motor is damaged or any short circuit.
E[66]	Drive motor overload failure		
E[67]	Brush motor open circuit failure		1. Check if brush motor is open circuit. Dismantle brush motor from controller and measure the motor wires connection.
			2. Check if the connection between brush motor and controller is correct.
E[68]	Brush motor short circuit failure	Brush motor short circuit	Restart and check if fault is eliminated. If it occurs every time, check if motor is damaged or any short circuit.
E[69]	Brush motor overload failure	Operation current and time of brush motor exceed the set parameters.	Check if any locked-rotor or other cases.
E[6A]	Vacuum motor open circuit failure		1. Check if vacuum motor is open circuit. Dismantle vacuum motor from controller and measure the motor wires connection.
			2. Check if the connection between vacuum motor and controller is correct.
E[70]	Vacuum motor short circuit failure	Vacuum motor short circuit	1. Restart and check if the fault is eliminated. If it occurs every time, check if motor is damaged or any short circuit.
E[71]	Vacuum motor overload failure	Operation current and time of vacuum motor exceed the set parameters.	Check if any locked-rotor or other cases.
E[72]	Brush lifting motor open circuit failure		1. Check brush motor lifting motor (P2-3/P2-10) is open circuit. Dismantle brush lifting motor from controller and measure the motor wires connection.
			2. Check if the connection between brush lifting motor and controller is correct.
E[73]	Brush lifting motor short circuit failure	Brush lifting motor (P2-3/P2-10) short circuit	1. Restart and check if the fault is eliminated. If it occurs every time, check if motor is damaged or any short circuit.

E[74]	Brush lifting motor overload failure	Operation current and time of brush lifting motor (P2-3/P2-10) exceed the set parameters.	Check if any locked-rotor or other cases.
E[75]	Squeegee lifting motor open circuit failure		1. Check whether squeegee lifting motor (P2-4/P2-11) is open circuit. Dismantle squeegee lifting motor from controller and measure the motor wires connection.
			2. Check if the connection between squeegee lifting motor and controller is correct.
E[76]	Squeegee lifting motor short circuit failure	Squeegee lifting motor (P2-4/P2-11) short circuit	Restart and check if the fault is eliminated. If it occurs every time, check if motor is damaged or any short circuit.
E[77]	Squeegee lifting motor overload failure	Operation current and time of squeegee lifting motor (P2-4/P2-11) exceed the set parameters.	Check if any locked-rotor or other cases.
E[86]	Outpoint 1 open circuit failure	Outpoint 1 (P1-6) not in use	
E[87]	Outpoint 1 short circuit failure	Outpoint 1 (P1-6) not in use	
E[88]	Outpoint 2 open circuit failure	Outpoint 2 (P1-7) warning lamp not connected.	1. Dismantle warning lamp and check if it open circuit (adopt a diode to measure, mind the positive and negative anodes)
			2. Check if the connection is correct or any open circuit
E[89]	Outpoint 2 short circuit failure	Outpoint 2 (P1-7) warning lamp short circuit.	1. Resistance is very small. Check if warning lamp wire is short circuit
			2. Check warning lamp is short circuit to B- or B+
E[8A]	Outpoint 3 open circuit failure	Outpoint 3 (P1-17) horn not connected.	1. Dismantle horn and check if it open circuit (adopt a diode to measure, mind the positive and negative anodes)
			2. Check if the connection is correct or any open circuit
E[90]	Outpoint 3 short circuit failure	Outpoint 3 (P1-17) horn short circuit	1. Resistance is very small. Check if horn wire is short circuit
			2. Check horn is short circuit to B- or B+

E[91]	Outpoint 4 open circuit failure	Outpoint 4 (P2-2) not connected to magnetic valve.	1. Dismantle magnetic valve and check if it open circuit
			2. Check if the connection is correct or any open circuit
E[92]	Outpoint 4 short circuit failure	Outpoint 4 (P2-2) magnetic valve short circuit.	1. Resistance is very small. Check if magnetic valve wire is short circuit
			2. Check magnetic valve is short circuit to B- or B+
E[93]	Outpoint 5 open circuit failure	Outpoint 5 (P2-9) front lamp not connected.	1. Dismantle front lamp and measure if it open circuit
			2. Check if the connection is correct or any open circuit
E[94]	Outpoint 5 short circuit failure	Outpoint 5 (P2-9) front lamp short circuit	1. Resistance is very small. Check if front lamp wire is short circuit
			2. Check front lamp is short circuit to B- or B+
E[95]	Outpoint 6 open circuit failure	Outpoint 6 (P4-2/P3-7) EM brake not connected.	1. Dismantle EM brake and check if it open circuit
			2. Check if the connection is correct or any open circuit
E[96]	Outpoint 6 short circuit failure	Outpoint 6 (P4-2/P3-7) EM brake short circuit.	1. Resistance is very small. Check if EM brake wire is short circuit
			2. Check EM brake is short circuit to B- or B+
E[97]	CAN offline failure	Connection between controller and CAN offline.	1. Check if CAN connection is correct
E[98]	UART offline failure		
E[99]	Throttle connection failure		1. Check if throttle input voltage (P1-10) is within the input voltage range configured for the controller (0.3~5.6).
E[A0]	Throttle limiter connection failure		Throttle limit potentiometer
E[A1]	High pedal prohibition failure	High pedal is prohibited. Machine is in drive state when turned on.	1. check direction gear and throttle input. Check if throttle input voltage (P1-10) is within the input voltage range configured for the controller (0.3~5.6V).

E[A2]	Brush motor undervoltage failure	Battery voltage below set protection voltage according to battery type.	
E[A3]	Vacuum function undervoltage failure	Battery voltage below set vacuum protection voltage according to battery type.	
E[A4]	System time storage failure		
E[A5]	Parameter storage failure		
E[A6]	System info storage faiure		
E[A7]	PFC file storage failure		
E[A8]	Program file failure		

CAUTION!
When there is a fault alarm, please turn off the power and wait 5 seconds before restarting.

SCRAPPING AND DISPOSING

1. Have the machine scrapped by a qualified disposal institution.
2. Before scrapping the machine, remove and separate the following materials, which must be properly disposed of according to relevant laws and regulations:

- Battery
- Brush disk/pad driver
- Plastic hoses and plastic components
- Electrical and electronic components (*)

LITHIUM BATTERY

Temperature range for using the battery is from +5°C to +40°C. Low temperatures reduce the effective battery capacity, high temperatures reduce the battery's life time. The temperature difference between the two sides of the battery shall not exceed 5°C.

Only approved battery chargers must be used to charge the lithium battery.

Do not try to make any repairs or servicing of lithium batteries. Replacement of parts is not assumed.

Risk of electric shock and burning

The battery's charging and discharging connectors have open terminals, avoid any body contacts, contamination or direct contacts with objects which can cause short circuit connection of terminals. Use necessary pre-cautions and protective caps to secure the open terminals. The connectors should be maintained in clean and dry conditions.

Use only batteries designed and approved by the manufacturer for the truck.

Do not try to modify or alter the battery.

Any damage or defects to the charger can result in accidents. Use only charger approved by the manufacturer of the truck, which is suitable for used battery.

In case charger has any damages or defects, exclude the charger from operation and contact your service provider. Do not modify or try to repair the charger.

Improper use of charger or use of wrong charger can cause damages to a battery or charger. Follow the required charger specifications; If the operation voltage of the charger is out of the applicable voltage range, the charger or battery may be damaged causing serious safety risks. The charger in use must be approved by the battery (truck) manufacturer.

Reversed connection of charging plug is prohibited. Follow the instruction for correct connection. For disconnection of charging plug use dedicated grip and never pull out the plug by means of cable.

Stop charging immediately if any abnormalities are detected, e.g. severe temperature increase, deformation of battery case, smoke, noise etc.

Intermediate charging

Lithium batteries support so called opportunity charging. The lithium battery, which is not fully discharged can be charged in any time. However, frequent opportunity charging not to the full charging state and stop of charging process before the appearance of corresponding indication of charger may result in dis-balance voltage of cells which increases the battery BMS calculation error. In order to effectively deal with this phenomenon, charge the battery in full allowing the automotive balancing process to be completed at least once a week.

Do not charge a fully charged battery

Note that in order to prevent the battery from continuing restart of charging under fully charged condition causing reduction of battery lifetime, the BMS has a protection function that prohibits recharging of fully charged battery.

Potential hazards

If equipment is used according to its design purpose, following the correct operations procedures, there are no hazards anticipated.

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

- Physical damage to the battery in case a battery falls or is deformed through impacts. Mechanical damages can cause leakages of harmful materials, fire or battery explosion.
- Short circuits may be caused by short connection of battery terminals, for instance, by water or other intentional/unintentional short connections.
- Temperature damages caused by placing of batteries in overheated environment conditions or being exposed to impact of fire, open sunlight etc. can cause leakages of harmful materials, fire or battery explosion.

In order to avoid fire, explosion and/or leakage of harmful materials, a safe place for storing non-functional or damaged batteries until the service arrives on site must satisfy the following criteria:

- Do not store in places where personnel is located.
- Do not store in places with valuable objects and close to valuable objects.
- A Class D fire extinguisher must be available on demand.
- There should not be any fire or smoke detectors in the storage area in order to ensure that an automatic fire detection system is only activated in the event of actual danger (e.g. flames).
- No ventilation intake pipes should be in the facility to exclude spreading of discharged content within a building.

Examples of where to store a non-functional battery:

- Roofed outdoor position.
- Ventilated container.
- Covered fire resistant box with pressure and smoke discharge option.

Symbols - Safety and Warnings

	Used lithium-ion batteries must be treated as hazardous waste. Lithium-ion batteries marked with the recycling symbol and the sign showing a crossed-out waste bin must not be disposed of with ordinary household waste.
	Avoid fire and short circuits causing overheating. Do not ignite or locate batteries close to open flame, heat sources or sparks. Keep lithium-ion batteries away from heat sources.
	Caution! Battery short-circuit is prohibited.
	Protect the lithium-ion battery from solar radiation or other forms of heat radiation. Do not expose the lithium-ion battery to heat sources.

Explosion and fire hazard

Physical damage, thermal impacts or incorrect storage in the event of a defect can result in explosions or fire. The battery materials can be flammable.

Particular hazard from combustion products

The lithium batteries may be damaged by a fire. When extinguishing a lithium battery fire, the following information must be taken into consideration.

Contact with combustion products can be hazardous

Fire produces combustion products, which can occur in the form of smoke, through leaking fluids, escaping gases, debris as well decomposition products of certain chemicals. These combustion products are substances that enter the body through the respiratory tract and/or the skin, can produce and adverse effects such as choking.

- **Avoid contact with combustion products.**
- **Use protective equipment.**

Special firefighting protective equipment

Use self-contained breathing apparatus.
Wear protective equipment.

Additional firefighting instructions

To prevent secondary fires, the lithium-ion battery must be cooled from the outside.
Suitable extinguishing agents

- Carbon dioxide extinguisher (CO2)
- Water (not on mechanically opened or damaged batteries) •

Unsuitable extinguishing agents

- Foam
- Grease fire extinguishing agents
- Powder extinguishers
- Metal fire extinguishers (PM 12i extinguishers)
- Metal fire powder PL-9/78 (DIN EN 3SP-44/95)
- Dry sand

Instructions for cooling an overheated, non-physically damaged battery

This type of damage may be caused by a short circuit inside the battery, which may result in leakage of harmful materials, fire or battery explosion.

Material discharge

Battery electrolyte fluid can be hazardous

Electrolyte fluid can be discharged if the battery is physically damaged. Avoid its contact with skin or eyes. If the contact happened:

- Rinse the affected parts with big amount of water and request for medical assistance immediately.
- In case of skin irritation or if any substances are breathed in request the medical assistance

immediately.

Precautionary measures for personnel

- Keep personnel away, avoid any contact with smoke or discharged materials.
- Block off the affected area and ensure its reasonable ventilation.
- Wear personal protective equipment. If vapors, dust or aerosols are presented use self-contained breathing apparatus.

Precautionary measures for the environment

Do not allow spilled fluids to enter the water system, drainage system or the underground water.

Cleaning measures

The leaked fluid must be removed professionally following the related protocols.

Battery lifetime, maintenance and storage

The lithium-ion batteries are maintenance-free.

Deep discharge can damage the battery

Self-discharge without periodical recharge can lead the battery to fully discharged state. Full discharge shortens the service life of the battery and can cause deep discharge and activation of related safety protocols when battery will not be able to be charged anymore.

Before a long period of inactivity, the battery must be charged to 40%~60%.
Control the level of battery charge at least every 12 weeks and re-charge if necessary.
The temperature range for storing of the battery should be within the range of 0°C to 30°C.

If the battery is deeply discharged or if the battery temperature is below the permissible level, the battery cannot be charged. Deeply discharged batteries can never be charged. Due to the risk of condensate formation, batteries that have been stored at 0°C or below must only be charged after natural warming up to at least +5°C, forced heating is forbidden.

Instructions for safe handling of batteries

- Do not modify the battery.
- Do not open, damage, drop, penetrate or deform the battery.
- Do not throw the battery into a fire.
- Protect the battery from overheating.
- Protect the battery from direct sun light.
- Follow storage and charging procedures
- Protect the battery from water damages and other impacts

Failure to comply with these safety instructions can result in fire and explosion or the leakage of harmful materials.

Pre-shift checks before the system is put into operation

Check that the battery is in its normal condition, has no evidence of damages, leakages, abnormal findings, e.g. high temperature, smell, smoke etc. The surface of the battery should be clean and dry, without evidence of water damages, marks of rust on terminals and housing (if applicable). Connecting cables and plugs are in good condition.

Faults

If any damage is found to the battery or battery charger contact the service provider immediately.

Do not open the battery or attempt to repair it.

Disposal and transport of a lithium-ion battery

Instructions for disposal

Lithium-ion batteries must be disposed in accordance with the relevant national environmental protection regulations. Batteries must be treated as hazardous waste. Batteries must not be disposed with ordinary waste.

Shipping information

The lithium-ion battery is a hazardous material. The applicable regulations must be fulfilled during transportation.

Shipping functional batteries

Functioning batteries can be shipped in accordance with the related regulations

Shipping faulty batteries

To transport faulty lithium-ion batteries, contact the service provider. Faulty lithium batteries require following of special transporting procedures.