

User Manual

Polaris Lithium Series



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1. General aspects of the battery.



ATTENTION

Keep the instructions for future reference and the manual within easy reach of anyone who will be using the battery. the battery. Installation may only be carried out by Endurance Motive S.A. authorised personnel.

1.1 Composition.

The energy storage of our Polaris Lithium batteries is based on Lithium Ferrophosphate (LiFePO₄) cells, certified by UN38.3/MSDS, RoHS, CE, TUV and UL with high safety. The cell cover material is flame retardant and has a ceramic diaphragm pressure valve for increased safety.

It also has a BMS (battery management system) that provides intelligent action for charging, discharging and monitoring.

The BMS monitors that limit values are respected, and in case of malpractice, protects the battery against critical conditions.

Our batteries are designed for electric forklift trucks and material handling equipment for indoor use.

It has its own IP65 steel enclosure designed to withstand the temperatures and pressures encountered during normal use.

It is delivered with the ballasted case, designed for a specific forklift truck model, which complies with the forklift truck manufacturer's recommendations.



CARE

The Polaris Lithium battery is designed for a specific model of forklift truck and should not be used in other models.

1.2 Configuration of the charger with the battery.

The batteries mentioned in this manual are supplied together with a CAN charger, which are pre-configured.

A specific charger supplied by Endurance Motive S.A. must be used for charging which, in turn, will be controlled from the Polaris Lithium battery via the CAN interface.

If you own or purchase a charger with CAN Bus communication protocol, there should be no incompatibility, as long as the CAN Bus standard between the battery and the charger is respected

In case of incompatibility and/or problems, Endurance Motive S.A. will be able to provide information on the communication protocol used.

In general, the capacity demand of a lithium-ion battery is lower than that of an equivalent lead-acid battery. This is because it has fewer losses.

2. Declaration of conformity.



Maker: Endurance Motive SA
Address: C/ La Bernia 1, 46529 Canet de Berenguer - Valencia – Spain

Endurance Motive SA declares that the list of products indicated below complies with the relevant European Union legislation on harmonization and bears the CE marking in accordance with the following directives:

Electromagnetic Compatibility (EMC) 2014/30/EU
RoHS Directive 2011/65/EU
Low Voltage Directive 2014/35/EU
Product safety device 2001/95/C
Regulación UE 2023/1542

References to the relevant harmonized standards used or references to other technical specifications against which conformity is declared:

UNE-EN 62619:2022
IEC 62620:2015/ A1:2023
EN 61000-6-3:2021
UN 38.3

Kind of team:

Lithium – Iron Phosphate (LiFePO₄) Battery.

Kind of product:

PL24V (105-735Ah)
PL48V (210-1050Ah)
PL80V (315-1575Ah)

Carlos Navarro
CEO

Aitor Pascual
CTO

Date: 02-01-2024

3. Security.



The Polaris Lithium battery system is non-hazardous when used in accordance with the recommendations in this manual. All staff must receive adequate information and training on the correct use and operation of these.

ATTENTION

Please note the following warnings before using the battery.

- The Polaris Lithium battery must only be used in the appropriate forklift truck, with the weight and voltage described on the label and in accordance with the forklift truck manufacturer's requirements. Improper use may result in damage to both the forklift truck and the user of the forklift truck.
- It is important that the battery is correctly anchored to the vehicle. Damage to the battery could occur if the battery is hit due to improper anchoring to the vehicle. Avoid driving over potholes or obstacles. The battery may be damaged by repeated impacts or high vibrations. Our batteries have an acceleration meter (accelerometer) that allows us to monitor in Grafana the impacts or vibrations that the batteries receive in the three axes x, y, and z. Below we detail the normal accelerations and the maximum allowed accelerations according to the battery voltage: (revisar gabi)

Battery model	Maximum allowable acceleration (G)	Normal acceleration values /G)
24V	10 G	< 4G
36V	8 G	< 3G
48V	8 G	< 3G
80V	6 G	< 2G

- Do not use the Polaris Lithium battery if it is damaged. Do not handle damaged parts and contact Endurance Motive S.A. service personnel.
- Use extreme caution when handling the external battery connection cables to avoid short circuits between the external battery terminals and the contacts. A short circuit can cause fire, property damage and serious injury.
- The external connector is designed to mate with the machine and charger in the correct way; therefore, avoid:
 - Forcing the connections.
 - Removing the connector by pulling on the cable.
 - Tampering with the connector by unauthorised personnel.
 - Because it has an IP21 degree of protection, it must not get wet.
- The Polaris Lithium battery must only be connected to the appropriate charger that has been configured for charging the Polaris Lithium battery. Do not use any other charger, as this may damage the Polaris Lithium battery and/or cause injury.
- Do not stand or lean on the Polaris Lithium battery.
- Do not open the Polaris Lithium battery to gain access to the interior.
- Use only the cables supplied by Endurance Motive S.A. In the event of damage to the cables, replacement cables must be ordered from Endurance Motive S.A.

- Only authorised personnel must carry out the installation or removal of the battery.
- The product must not be disassembled.



DANGER

Do not short-circuit, puncture, incinerate, crush, immerse in water or expose to temperatures outside the range specified by the manufacturer. If this occurs, electrolyte leakage, explosion or fire of the battery may occur, depending on the circumstances. In the event of a prolonged short-circuit, the battery may reach high temperatures, emitting gases and a fire may be generated.



ATTENTION

Any damage to the battery caused by the actions described above will invalidate the use of the warranty.

If, due to external influences such as violence, fire, flooding, etc., it is not possible to operate the system safely. In case of irregular phenomena, the following must be taken into account:

- The cells contain substances that are flammable when they reach the oxygen in the air.
- The cells contain substances that can form a flammable mixture with the air after evaporation.
- Cells contain substances that can react with water as soon as they reach the humidity in the air or if water enters a cell.
- These substances can be expelled if a cell is exposed to high pressure or external fire, or if it is damaged by mechanical force.
- The amount of these substances is so small that caution should only be exercised in the immediate vicinity of the energy system.

4. Information on composition

The battery consists of a metal casing containing several sealed cells of lithium-ion phosphate and other materials, which could be potentially hazardous if released.

SUBSTANCE	INDEX ca. %	CAS-Nr.
LITHIUM IRON PHOSPHATE	49,0	15365-14-7
ALUMINIUM	6,0	7429-90-5
GRAFITO	24,0	7782-42-5
COPPER WIRE	13,0	7440-50-8
LITHIUM HEXAFLUOROPHOSPHATE	3,0	21324-40-3
POLYPROPYLENE	5	9003-07-0

5. First-aid measures in case of exposure to internal battery components.

Lithium-ion batteries contain compounds of lithium salts, organic solvents, etc. If used improperly or in extreme environments, dangerous situations such as leakage, smoke, overheating and opening of the safety valve (with spraying of black substance), fire may occur. To protect the safety of personnel and reduce economic losses, you must take urgent protective measures in case of danger.



Please read and carefully observe the following protection recommendations:

ATTENTION

SMOKE INHALATION	When smoke is present, use protective measures (such as covering your nose and mouth with a wet towel or wearing a professional gas mask) to prevent smoke inhalation. Since smoke and other noxious gases can damage the respiratory system, administer oxygen if necessary. Move the victim to fresh air and remove the source of contamination from the area. In severe cases, seek medical treatment.
EYE CONTACT	Rinse immediately with plenty of water for at least 15 minutes, lifting the upper eyelid while rinsing. Rinse with saline solution if possible. In severe cases, seek medical treatment.
SKIN CONTACT	Remove any clothing you are wearing, wash thoroughly with water. Seek medical treatment in severe cases.
INGESTIÓN	Drink milk/water and induce vomiting; seek medical care.

6. Measures in case of fire.

GENERAL DANGER	A destructive impact can cause the battery to release internal energy in an instant, causing a pressure release of the safety valve, smoke, etc. At temperatures above 120°C, the pressure valve may burst and flammable gases may escape. At this point, fire extinguishing measures must be taken.
LIGHT or LARGE FIRE	In case of fire, flames or smoke: <ul style="list-style-type: none"> ▪ while driving: stop, turn off the truck and leave the area

	<ul style="list-style-type: none"> ▪ During charging: stop the charger or remove the charging cable and leave the area. ▪ Move the power system outdoors or to a well-ventilated area and move people away from the area when possible. ▪ Establish a 5 metre safety perimeter around the battery ▪ Use extinguishing systems to isolate the system from the air such as masking sand, carbon dioxide or dry powder extinguishers or other extinguishers, and disconnect the system at the same time. Avoid using water as it may produce hydrogen fluoride. ▪ Call the emergency services and report that the fire has been caused by a Lithium Ion battery.
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DANGER

After extinguishing the fire, do not use the battery again. Contact the after-sales service department.

7. Accidental release measures.

MEASURES TO BE TAKEN IN THE EVENT OF SPILLAGE OR LEAKAGE OF MATERIALS	<ul style="list-style-type: none"> ▪ If material is released from the battery, remove personnel from the area until fumes dissipate. ▪ Provide maximum ventilation to remove hazardous fumes. ▪ Leave area and allow batteries to cool and vapours to dissipate. ▪ Avoid contact with skin and eyes or inhalation of vapours. Remove spilled liquid with a cloth, then dispose of in a plastic bag and place in a steel box.
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DANGER

Batteries must not be opened, destroyed or set on fire, as they may leak or rupture and release the ingredients contained in the hermetically sealed container into the environment.

MANIPULATION	<ul style="list-style-type: none"> ▪ No special protective clothing is required for handling. ▪ ▪ The battery must be transported in its original packaging or equivalent. The battery system must not be opened, destroyed or set on fire.
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	<ul style="list-style-type: none"> Follow the manufacturer's recommendations for maximum recommended currents and operating temperature range using a dedicated charger.
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8. Use of personal protective equipment.

8.1 Under normal conditions.

RESPIRATORY PROTECTION	Not necessary under normal conditions of use.
PROTECTIVE GLOVES	Not necessary under normal conditions of use.
EYE PROTECTION	Not necessary under normal conditions of use.
OTHER CLOTHING	Not necessary under normal conditions of use.

8.2 After an incident.

RESPIRATORY PROTECTION	In the event of battery failure, provide as much ventilation as possible. Avoid confined areas where batteries are vented.
PROTECTIVE GLOVES	Use polypropylene, polyethylene, rubber or Viton gloves when handling broken or leaking items.
EYE PROTECTION	Wear safety goggles with side shields or a full face mask when handling broken or leaking items.
OTHER CLOTHING	Wear a rubber apron and protective clothing when handling broken or leaking items.

9. Stability and reactivity.

REACTIVITY	None, beyond normal conditions
CONDITIONS TO AVOID	Heating, mechanical and electrical abuse
MATERIALS TO AVOID	None, beyond normal conditions
HAZARDOUS DECOMPOSITION PRODUCTS	None, beyond normal conditions

10. Toxicological information.

Inhalation, skin and eye contact is possible when the battery is open. If exposed to internal contents, corrosive vapours will be very irritating to skin, eyes and mucous membranes. Overexposure may cause symptoms of non-fibrous lung damage and membrane irritation.

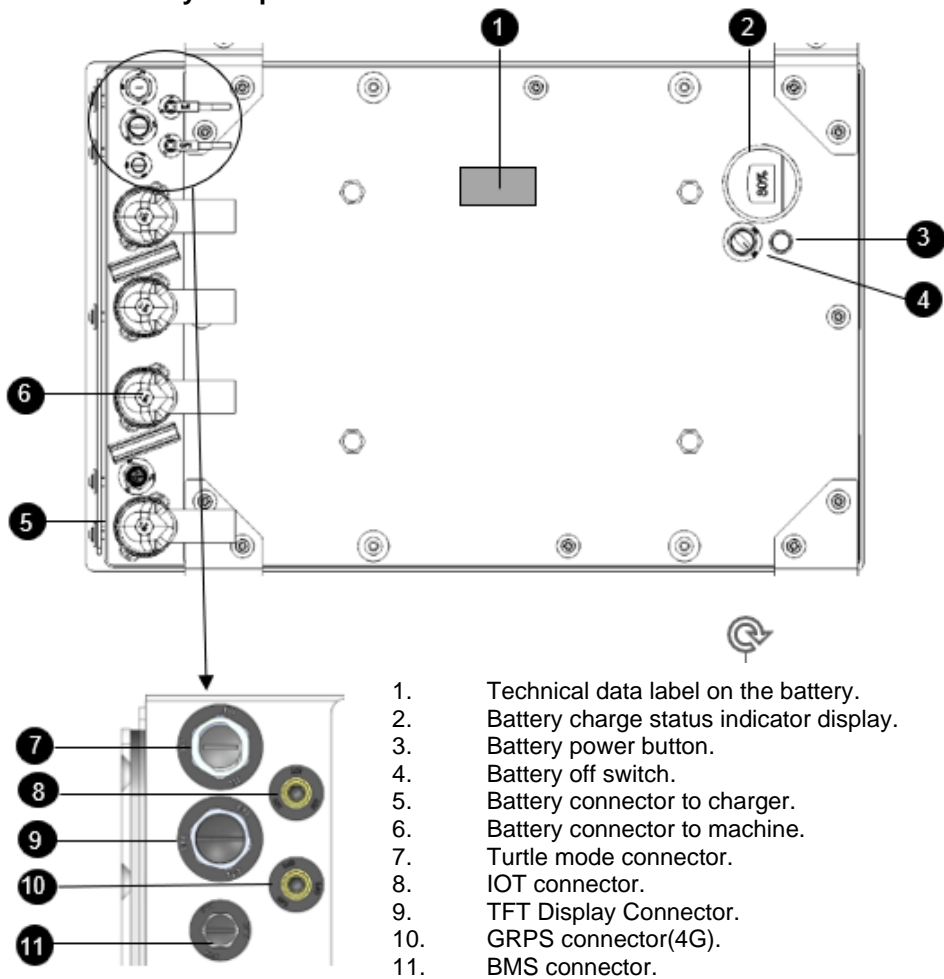
11. Transport information.

If the watt-hour capacity of the battery exceeds 100Wh, this lithium-ion battery must be declared and shipped as "Class 9" DANGEROUS GOODS. According to IATA DGR Packing Instruction 965 (UN 3480) or 966/967 (UN 3481), IATA DGR Section I - Fully Regulated Class 9 Lithium-ion Cells and Batteries - and ADR Packing Instruction P903 and the IMDG Code. The "Class 9" dangerous goods label is required.

Codes and classification according to international transport standards		
Air	IATA/CAD	UN 3480
Maritime	IMDG	UN 3480
Land	ADR/RID	UN 3480

12. Battery specifications.

12.1 Battery components.



1. Model, internal reference and serial number.
2. Battery specifications.
3. Warning symbology, company information and safety warnings.

12.2 Battery types.

Nominal Energy	25,6V	38,4V	51,2V	73,6V	83,2V	96,0V	121,6V
Nominal capacity	105 Ah						
Nominal energy	Rated capacity x Rated voltage = Rated energy						
Measures	on demand						
Cell composition	Lithium / Iron Phosphate						
Operating temperature	-20°C à 55°C (no cold storage longer than 5h)						
Operating temperature under load	-20 to 55 (no almacenamiento en frío más de 5h)						
IP Protection	IP65						
DOD Life Cycles 70%	4.000						
Charging period	>1h						

12.3 Labelling.



Warning Signal.

Danger: The battery contains cells. Avoid short-circuit.



Prohibition Sign.

Do not expose the battery to high temperatures. The Polaris Lithium battery is designed for use at ambient temperatures up to +55 °C. For safety reasons, the battery should not be exposed to temperatures above +85 °C.



Information signal.




Read the user manual before installing and using the Polaris Lithium battery.



Recycle bin crossed out.

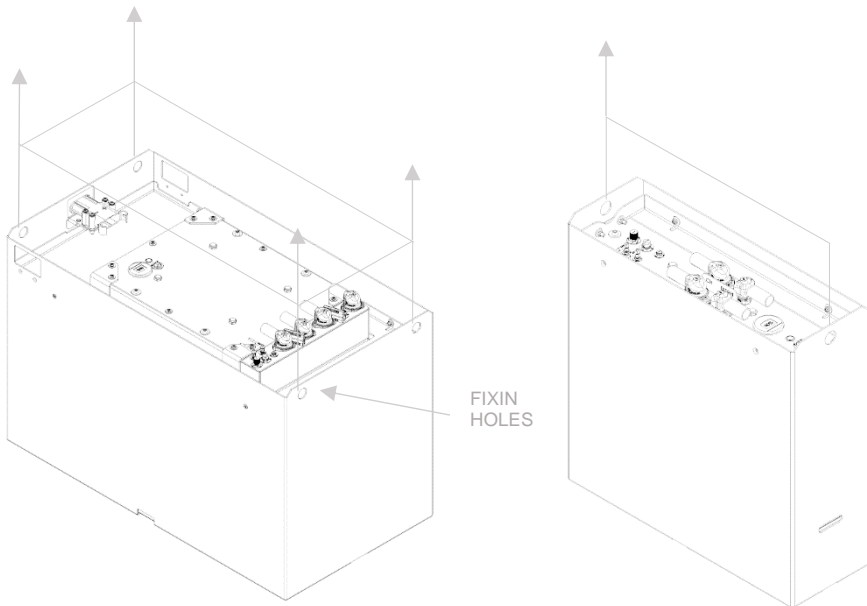
This product must be properly recycled.

1

Lithium Energy System		Polaris Lithium 24V 300Ah Ref: PL24V300CB- S NS: EM10519A101	
		2	
V Nom: 24V Cap. Nom : 300Ah Energía: 7.680 Wh Tª de uso: De - 10°C a + 55°C Tª de carga: De 0°C a + 45°C Protección IP: IP21 Peso: 372 Kg			
		Dirección: C / En proyecto, N8, Sector 10. 46393- LORIGUILLA- VALENCIA- SPAIN www.endurancemotive.com	
		Advertencias de seguridad: No golpee la batería. Evitar un cortocircuito. No abra la batería para acceder al interior. No exponer la batería a temperaturas superiores a + 85°C. Lea el manual de usuario antes de utilizar la batería	

13 Manipulation.

Use the corresponding holes and lifting equipment that exerts pressure towards the vertical load at the fixing points. The lifting system varies depending on the battery model. The position of the fixing holes may vary depending on the battery model.



14 Installation.

The battery must be installed by authorised personnel. Check that the safety conditions of the installation are complied with.



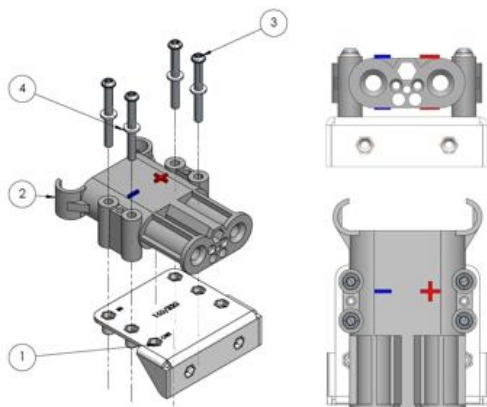
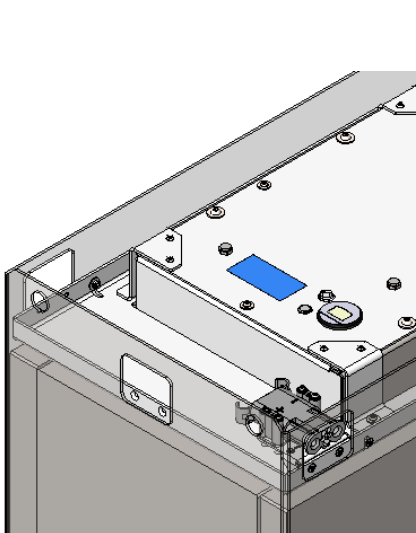
For the installation of the battery, follow the instructions in the Quick Guide document supplied with the battery.

ATENTION

14.1 Installation of charging connector anchored to the box.

The battery can be optionally supplied with the DIN160-320 charging connector support kit (reference 16090), which is used to anchor the charging connector to the box.

The box comes with 3 windows, to facilitate the mounting of the charging connector in the most optimal area according to the model of the machine.



N° DE ELEMENTO	Referencia	Descripcion	Cantidad
1	15458	Conjunto Anclaje Carga	1
2	10287	Conector Hembra DIN320 95/120mm2 REMA	1
3	16600	TORNILLO TORX SEBO M6x55 ISO-7380 INOX	4
4	10404	ARANDELA PLANA M6 DIN 125 INOX	4



DANGER

If the anchor kit is not used to secure the connector to the box, never route the charging or discharging cable inside the hood window, as this could damage the cable by chafing, and could cause a short circuit..



ATENTION

Any damage to the battery caused by the actions described above will invalidate the use of the warranty.

15 Start up.

To start up the Polaris Lithium battery, ensuring that the machine is switched off, switch on the battery by pressing the power button on the top of the housing for two (2) seconds. Once pressed, the battery will turn on and the sound produced by the activation of the battery's internal contactors will be heard.



ATTENTION

Make sure that the machine is switched off before switching on the battery, as the battery discharge contactor may be damaged by the machine receiving high current peaks. Damage to the discharge contactor due to non-compliance with this point will not be covered by the warranty. Evidence of such misuse will be monitored by Grafana.

The Polaris Lithium battery is delivered at approximately 30% charge. In order to guarantee the correct balancing of the battery, it is mandatory that before the first use, a first full balancing charge lasting up to 48 hours is carried out. After the first full charge the battery can be used.

After the first full charge it is normal to observe that the SOC does not reach 100%. As soon as it is possible, perform a second full swing charge lasting up to 48h, this will balance to a SOC of 100% within the first two weeks of use.

To protect against discharging, the Polaris Lithium battery is equipped with a control system called "Auto-Off". The "Auto-Off" system will disconnect the internal contactors and turn off the battery when one hour (1 h) has elapsed since the last use.



ATTENTION

Battery shutdown differs depending on the battery model. The model you have purchased is specified on the cover of your user manual.

15.2 S-BMS Model.

If your battery is the S -BMS model, there is no switch-off switch, as the battery is automatically switched off by the "Auto-Off" system.

15.3 C-BMS Model.

If your battery is the C-BMS model, the battery is switched off by pressing the same power switch for 2 seconds.

After the 2 seconds have elapsed, release the on/off button and the battery will switch off.

16 Operation.

The battery protects itself when it detects an abnormal parameter and goes into protection mode, disconnecting the DC output terminals and not allowing any power input or output. This may be an indicator that there is a problem, due to use of the battery outside normal parameters, or as a self-protection measure to prevent deep discharge and damage to the battery.

In the event of a fault on the forklift, this will be displayed on the forklift's control panel (refer to the forklift's user manual).

In addition, a low state of charge (SOC) warning output is available to anticipate a deep discharge. This is a voltage free output with one normally open (NO) and one normally closed (NC) contact which should be connected to the machine.

16.1 Connecting the display.

To switch on the display, connect the plug connector at the end of the cable to the receiver connector on the battery housing. Press the button on the front of the device for one second until the battery starts to operate. The TFT screen will then light up.



16.2 Operation.

When the TFT Display is switched on, the product marking is shown next to a loading bar which will be completed once all components have been started, as shown in Figure 1.



Figure 1. Loading screen

Immediately after loading, it will display the main interface, where you can see:

- The state of charge of the battery (soc, state of charge).
- The current date and time.
- The remaining range or charging time (if in charging mode).
- The current battery consumption in kWh. as shown in Figure 2.



Figure 2. Principal interface

16.3 Icons.

On the right hand side of Figure 2, two icons can be seen, one referring to CAN communication, which will be green when CAN communication is present, and red when CAN communication is failing. Figure 3.

The second icon refers to the WiFi connection. It will appear in red if you are not connected to any network, in green when you are, and finally in red, but with a transparent centre when you are in configuration mode, indicating that the WiFi network configuration is available. Figure 4.

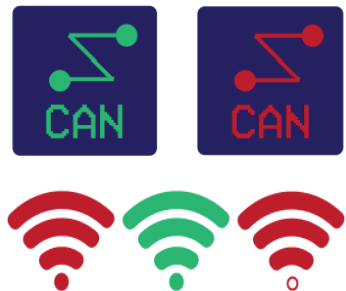


Figure 4. Loading screen

16.4 Wifi hotspot configuration.

When the WiFi network icon is red with a transparent centre, it means that it is in configuration mode. We must connect to the WiFi network that is generated by a mobile phone. Figure 5.



Figure 5. Example of Display Wifi Network.

Once the connection has been made, go to the browser (Google Chrome, Safari, Firefox, Opera...) and in the address bar type: 192.168.4.1 then you will be redirected to the configuration portal. Figure 6.

In this portal you configure the time zone (+1 by default), the orientation of the display, where "-O" refers to the position of the button with respect to the screen. Finally, enter the SSID and password of the WiFi network to which you want to connect the display. When everything is ready, click on "Save".



Figure 6. Example of access to the configuration portal.

16.5 Data verification.



Figure 7. Example of database graphs

Ask the manufacturer for the username and password to access the database of your device.

Once inside the window of your Logger you should be able to see the data being updated with a frequency of 10 seconds.

18. Charge.

The Polaris Lithium battery uses an external charger for charging. The charging interface also has a CAN Bus communication link that ensures optimal charging control. For more detailed information about charging and the functionality (e.g. indications and behaviour) of the charger, please refer to the chargers user manual.

The Polaris Lithium battery is delivered with approximately 30% of charge, it is mandatory before its first use, to make a full charge in order to be balanced. After this first charge it is normal to observe that the charge does not reach 100%, after several full charges it will be balanced until it reaches 100%.

In general, the capacity demand of a lithium-ion battery is lower than that of an equivalent lead-acid battery. This is because it has fewer losses during use, better durability properties and the ability to charge faster and more frequently.

The Polaris Lithium battery can be charged at any time when the machine is not in use. Whenever the machine is not in use, it is recommended to connect the battery to the charger.

The Polaris Lithium battery is not damaged by short, intermittent charging. However, it is recommended to perform a full charge at least once a month to keep the battery balanced (see Maintenance sub-section).

The charging time depends on the output current of the charger, the nominal capacity of the battery and the current state of charge (SOC), as well as the internal temperature.

For batteries designed for simultaneous charging with two chargers (which have dual charging connectors), a time interval of 30 seconds is set to give the operator time to connect the two chargers. After this time from which the first charger is connected, current will be injected into the battery. If the 30 second interval has been exceeded, and only one charger has been connected, charging from the charger must be stopped, the two charging connectors disconnected and the connection of both charging connectors repeated within 30 seconds.

Before connecting the battery for charging, make sure that the machine is switched off, the charger is connected to the power supply and the battery is switched on.



ATTENTION

Make sure that the machine is switched off before charging the battery, as this may damage the battery charging contactor due to high current peaks from the machine. Damage to the charging contactor due to non-compliance with this point will not be covered by the warranty. Evidence of such misuse will be monitored by Grafana.

When connecting your Lithium battery, check the charging start on the charger display. Charging will start automatically.



ATTENTION

For your safety, stop charging from your charger before disconnecting the charging connector from the battery. Press STOP on your charger.

Charging is recommended at a temperature between +5 °C and +40 °C. Outside this range, the charging current will be limited and charging will take longer.



ATTENTION

Do not discharge the battery below 15%, this could damage the chemical structure of the cells, lowering their capacity and cycle life.



ATTENTION

The battery is designed to be protected against deep discharge (SOC 0%) and will stop working. Endurance is exonerated in the event of battery failure due to deep discharge caused by user misuse, this failure will not be covered by the warranty. Call for service in case of deep discharge failure.

19. Storage.

ELECTRICAL HAZARD, we recommend storing batteries at a height between 15cm and 120 cm.

Store in a cool, dry, well-ventilated place at a temperature between 0 and 40°C to preserve shelf life.

Indicate in the storage area that access should be strictly limited to personnel who are aware of the hazards and safety instructions.

STORAGE PERIOD LESS THAN 2 WEEKS	<ul style="list-style-type: none">▪ No special care is required.▪ During this period, the Polaris Lithium battery will not go into self-discharge protection mode.
STORAGE PERIOD LONGER THAN 2 WEEKS	<ul style="list-style-type: none">▪ Full charge is mandatory before storing.▪ Check the charge level every 6 months to keep the charge level above 50%. Recharge the battery to 100% if necessary.▪ (Higher ambient temperatures increase the discharge process).

20. Maintenance.

20.1 Preventive.



ATTENTION

Maintenance may only be carried out by qualified personnel with knowledge of high capacity batteries.

ONCE A WEEK	<ul style="list-style-type: none">▪ Check that the charging connections are not damaged.▪ The charging connections have an IP21 rating, in environments with grade 4 contamination (conductive dust), it is necessary to check the cleanliness of the connector. In companies with grade 4 contamination, when the charging connector is not in use, it is recommended that it is protected with a specific plug for the connector.
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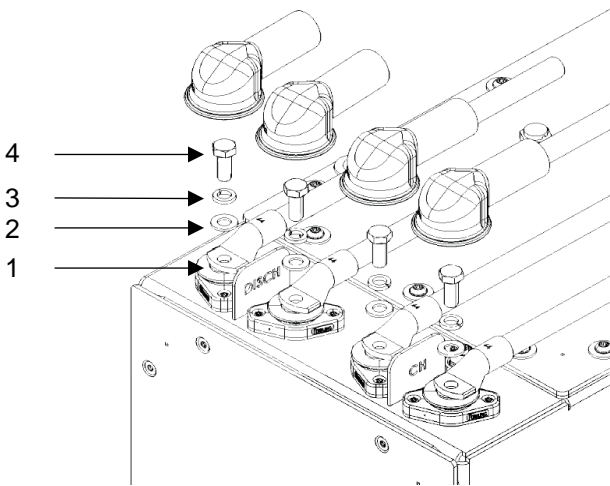
	<ul style="list-style-type: none"> ▪ If necessary, clean the Polaris Lithium battery with a damp cloth. Never clean it under a jet of water or with a high-pressure jet. 										
ONCE A MONTH	<ul style="list-style-type: none"> ▪ Leave the charger connected to the Polaris Lithium battery until it indicates that it is fully charged. Repeat this operation at least once a month to keep it balanced. ▪ After a period of time of incomplete charging and charging cycles, it may need to be balanced. This will ensure that all cells are fully charged and that you can enjoy the full capacity of the cells. This process is automatic and is done when necessary with the help of the charger, at the end of the charge cycle. 										
Every 6 months	<ul style="list-style-type: none"> ▪ Perform visual inspection of all external battery bolts, battery junction box, charging and discharging connectors. Check that the torque markers have not become misaligned. If any bolts are found to be loose, they shall be tightened with a torque tool with torque control according to the following tightening criteria: <table border="1"> <thead> <tr> <th>Metric Screw</th> <th>Tightening torque</th> </tr> </thead> <tbody> <tr> <td>M5</td> <td>5 Nm</td> </tr> <tr> <td>M6</td> <td>6 Nm</td> </tr> <tr> <td>M8</td> <td>8 Nm</td> </tr> <tr> <td>M10</td> <td>10 Nm</td> </tr> </tbody> </table> <p>Caution: for the charging and discharging cable screws, apply the tightening torque indicated in section 20.2.1 of this manual.</p>	Metric Screw	Tightening torque	M5	5 Nm	M6	6 Nm	M8	8 Nm	M10	10 Nm
Metric Screw	Tightening torque										
M5	5 Nm										
M6	6 Nm										
M8	8 Nm										
M10	10 Nm										

20.2 Corrective

20.2.1 Replacement of charging or discharging cables

To replace the charging or discharging cables, make sure that the battery is switched off and follow the order of assembly shown in the picture below:

- 1 - Steel terminal.
- 2 - Ordinary washer.
- 3 - Stainless steel washer.
- 4 - Hexagonal head screw, stainless steel, DIN 933 A2-70.



The following table indicates which type of screw to use depending on the battery current, it is important to use the type of screw and apply the torque given in the table below:

▪ **Battery current from 105 to 210 Ah:**

cable section	16-35-50-70-95 (mm ²)
Screw material	Stainless steel, DIN 933, A2-70.
Metric screw	M8
Screw length	14 mm

Tightening torque	25 Nm
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▪ **Battery current from 315 to 525 Ah:**

cable section	16-35-50-70-95-120 (mm ²)	240 (mm ²)
Screw material	Stainless steel, , DIN 933, A2-70.	Stainless steel, DIN 933, A2-70.
Metric screw	M8	M8
Screw length	14 mm	20 mm
Tightening torque	25 Nm	25 Nm

▪ **Battery current from 630 to 945 Ah:**

cable section	16-35-50-70-95-120 (mm ²)	240 (mm ²)
Screw material	Stainless steel , DIN 933, A2-70.	Stainless steel , DIN 933, A2-70.
Metric screw	M10	M10
Screw length	16 mm	20 mm
Tightening torque	25 Nm	25 Nm



ATENCIÓN

Once the connector has been assembled and tightened to the torque indicated in the table, check the impedance at the junction of the terminal and the rebling. It should be < 0.45 (mΩ).




ATENCIÓN

It is important that every 6 months the correct tightening of the screws to the torque indicated in the table is checked, an incorrect tightening could generate a risk due to excess temperature in the connector joint, which could burn the connector.

21. Resolution of errors.

<p>BATTERY WON'T START</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Display or peripheral failure in the power supply. ▪ Fuse failure. ▪ Battery on/off switch failure. ▪ Push button failure ▪ Autooff or multi-connection failure <p>WHAT TO DO: Test the battery from the display push button, then from the battery push button. Press and hold for 10 sec. for the possibility of carrying BMS WATTIUS.</p> <p>If the ignition problem persists, contact Endurance Motive S.A. service personnel.</p>
<p>BATTERY TURNS ON, BUT DOES NOT LOCK</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Autooff or multi-connection failure ▪ BMS failure ▪ Wiring <p>WHAT TO DO: Contact Endurance Motive S.A. technical service personnel.</p>
<p>BATTERY TURNS ON, BUT TURNS OFF AFTER A SHORT TIME (30-60sec)</p>	<p>POSSIBLE CAUSES: Voltage or temperature probe failure Internal error (BMS protection) Deep discharge</p> <p>WHAT TO DO:</p> <p>In the event of a deep discharge, the BMS blocks the operation of the battery to protect the chemistry of the cells, if after a few hours it is possible to restart the battery, it means that the voltage of one of the cells is just at the lower limit of the allowed voltage. If it is not possible to restart the battery within a few hours of shutdown, it means that the voltage of one of the cells is well below the lower allowable voltage limit. Please contact Endurance Motive S.A. service personnel.</p>
<p>BATTERY ON DOES NOT CHARGE</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Charger or battery charging connectors damaged. ▪ CAN communication failure <p>WHAT TO DO: Check that the battery is discharging. If it does not discharge (See symptom Battery on, neither charging nor discharging).</p>

	<p>Perform a charge with another charger to rule out faults in the charger connector and disconnect all peripherals from the battery except for the charge control cable. Contact Endurance Motive S.A. technical service personnel.</p>
<p>BATTERY ON, BUT DOES NOT DISCHARGE</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Charging connector of the charger or damaged battery. ▪ Battery discharge connector damaged. ▪ Internal BMS error or electronic fault. <p>WHAT TO DO: Check that the battery is charging. If it does not charge (See symptom Battery on, neither charging nor discharging). Check if the discharge connector is in perfect condition. Measure continuity in the charging cable, between the pins of the pilot pin 3 and 4, to rule out that it is not short-circuited.</p>  <p>If all of the above works correctly, it is an electronic fault, contact Endurance Motive S.A. technical service personnel.</p>
<p>BATTERY ON DOES NOT CHARGE OR DISCHARGE</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Internal BMS error or electronic failure <p>WHAT TO DO: If the battery does not charge or discharge contact Endurance Motive S.A. service personnel.</p>
<p>BATTERY SWITCHED OFF HAS VOLTAGE AT THE CHARGING CONNECTOR</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Charging contactor failure. <p>WHAT TO DO: With the battery switched off, measure the voltage at the charging connector. If we read voltage, it means that the contactor is closed when it should be open, therefore, it is a failure in the charging contactor. Contact Endurance Motive S.A. service personnel.</p>
<p>THE BATTERY IS SWITCHED OFF, HAS VOLTAGE AT THE DISCHARGE CONNECTOR AND IS SUPPLYING</p>	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Failure of the discharge contactor. <p>WHAT TO DO: With the battery switched off, measure voltage at the discharge connector. If we read voltage it means that the charge</p>

POWER TO THE MACHINE.	<p>contactor is closed when it should be open. In this case contact Endurance Motive S.A. technical service personnel.</p>
BATTERY DISCHARGING FAST	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Incorrect current reading, due to a faulty connection in the wiring from the BMS to the SHUNT. ▪ Battery out of balance. <p>WHAT TO DO: Contact Endurance Motive S.A. technical service personnel.</p>
BATTERY DOES NOT UPLOAD DATA TO GRAPH	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Loose or untightened antennas. ▪ Coverage failure ▪ GPRS failure. <p>WHAT TO DO: Connect to the wifi network of a phone and check if it uploads data to Grafana. If it does upload data, the problem is in the local WIFI network. In case of not uploading data, contact Endurance Motive S.A. technical service staff.</p>
BATTERY CHARGES SLOWLY	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Temperature close to 0°C or above 45°C. <p>WHAT TO DO: Place the machine in covered or indoor areas insulated from cold or heat.</p> <p>Contact Endurance Motive S.A. technical service personnel.</p>
BATTERY CHARGING DOES NOT REACH 100%.	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Unbalanced battery (perform monthly equalisation charges). <p>WHAT TO DO: To raise and balance the voltage of all cells to the optimum operating voltage, leave the battery charging 24 to 48 hours until it reaches 100% SOC. If it still does not reach 100%, contact Endurance Motive S.A. service personnel.</p>
CAN FAULT (CURTIS SHOWS A LINE)	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ CANBUS wiring fault. <p>WHAT TO DO: Check the charging connector and peripheral connections (DISPLAY, GPRS, CUSTOM1, MT, etc.). Disconnect one at a time until CAN reading returns.</p>

	Contact Endurance Motive S.A. technical service personnel.
CAN FAILURE (DISPLAY SHOWS SOC -1)	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ CANBUS wiring fault. <p>WHAT TO DO:</p> <p>Check the charging connector and disconnect all peripherals (GPRS, CUSTOM1, MT, etc.).</p> <p>Check the tightness of the display connector and replace with a similar battery to discard the display.</p> <p>Contact Endurance Motive S.A. technical service personnel.</p>
CAN FAULT (COMMUNICATION WITH CHARGER)	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ CANBUS wiring fault. ▪ Failure in charger configuration. <p>WHAT TO DO:</p> <p>Perform a charge with another charger to rule out faults in the charger connector and release all peripherals from the battery except for the charge control cable.</p> <p>Check the battery charging connector</p> <p>Contact Endurance Motive S.A. technical service personnel.</p>
DISPLAY BLANK SCREEN	<p>POSSIBLE CAUSES:</p> <ul style="list-style-type: none"> ▪ Display fault. <p>WHAT TO DO:</p> <p>Contact Endurance Motive S.A. spare parts staff.</p>

22. Repairs.

If a Polaris Lithium battery needs to be repaired, Endurance Motive S.A. service personnel can replace some of the parts, but any damage to internal parts must be repaired at the Endurance Motive S.A. service centre.



Always contact Endurance Motive S.A. technical service when you suspect that the Polaris Lithium battery is damaged.



Please read this manual carefully. Any damage to the battery resulting from failure to comply with the recommendations described in this manual will invalidate the use of the warranty.

23. Procedure for disposal of lithium-ion batteries.

- Before disposal make sure that the battery is fully discharged.
- Batteries must be neutralised by an authorised secondary treatment facility before disposal as hazardous waste.
- Recycling of batteries can be done at an authorised facility through an authorised waste carrier.
- Batteries must be returned to the manufacturer or recycled in accordance with the environmental regulations and recycling laws of the country concerned.
- Cell identification according to IEC 62620: ICNMP/28/149/95/H/-30+55/95.
- Please note that the Polaris Lithium battery must be treated as dangerous goods in accordance with UN3480, Class 9 during transport. External terminals must be protected against short circuits.
- Batteries, whether normal or expired, must be packed in accordance with P903.
- The packaging and marking of the goods must only be carried out by personnel trained in the transport of dangerous goods (training 1.3, according to UN 38.3).

24. Warranty.

This limited warranty ("the warranty") specified below applies to the family of POLARIS LITHIUM batteries (hereinafter, "batteries") and accessories supplied by ENDURANCE MOTIVE, SA ("Endurance") to the original buyer ("the buyer") directly or through an authorized reseller.

24.1 Purpose.

The primary purpose of this warranty is to clearly define the issues relating to the warranty policy for POLARIS LITHIUM products.

The guarantee conditions indicated in this section are considered exclusive of any other condition or guarantee provided for in the Law.

24.2 Product and performance warranty.

Endurance guarantees the Polaris Lithium batteries and accessories it supplies against any material or manufacturing defect and guarantees that they comply with the quality and performance advertised.

Endurance guarantees battery performance of at least 70% of nominal energy for 5 years from the date of delivery and/or 4,000 complete cycles, whichever comes first ("warranty period"), understood as a complete cycle. The sum of Ah of charge/discharge that is equal to the nominal amperage of the battery.

Endurance guarantees the components that make up the battery for a period of 24 months from the date of delivery ('the Warranty Period').

The accessories supplied together with the battery such as Display, charge and discharge connection cables, and GPRS will have a warranty period of 12 months from the date of delivery ("the warranty Period").

The warranty entitles the buyer to have the battery and accessories repaired free of charge at Endurance's premises, including parts, labour and excluding transport costs incurred in making use of the warranty. In the event that the client requires that the repair be carried out at their facilities, the guarantee will not cover the displacements and diets that are produced by the application of the same.

If the battery has been exported outside the European Union, the warranty does not cover the transport costs incurred from the battery's location to Endurance's premises.

Replaced or repaired products will maintain the warranty period for the rest of the warranty period of the original product. In no case will the replacement justify the renewal or extension of the warranty period.

The guarantee will expire at the end of the term even if the Products have not been put into operation for whatever reason.

24.3 Conditions of enforceability of warranty.

They will be essential conditions and constitute requirements for the enforceability of the Guarantees, which:

- a. The buyer undertakes to provide Endurance with all the information on the machine necessary to design the battery. This information is requested using the validation plan form, which will be signed by the customer as confirmation that the data provided is correct.
- b. Observe and follow the instructions for starting up and operating the products in accordance with the instructions provided by Endurance or Endurance designated suppliers.
- c. The battery is operated under normal use in accordance with the specifications and manual provided by Endurance.
- d. The battery is operated under normal use in accordance with the specifications and the current user manual published and provided by Endurance.
- e. The ambient temperature during discharge must not fall below -20°C and must not exceed 55°C.
- f. The ambient temperature while charging the battery must not fall below 0°C and must not exceed 55°C.
- g. Endurance has been allowed to monitor the battery online in order to know its use at all times. If this monitoring is not possible, the Product and Performance Guarantee will be reduced to 2 years.
- h. In case of sending the machine and battery outside European Union, before export, the buyer agrees to validate the correct operation of the battery with your machine. Endurance may ask the buyer for evidence of validation.
- i. Our batteries comply, as far as necessary, with the legal requirements only within the European Union. The purchaser is solely responsible

for compliance with legal or other regulations when using our batteries with their machine, and for performing the necessary tests to ensure compliance.

24.4 Warranty exclusion.

This limited warranty does NOT cover damage to products caused by one of the following activities:

- a. Improper transport, storage, installation or wiring by the buyer.
- b. Cleaning, adjustments or other periodic maintenance tasks.
- c. Modifications, alterations, disassembly, repairs or substitutions by personnel not certified by Endurance.
- d. Modifications required by changes in legislation.
- e. Non-compliance with the current user manual published and provided by Endurance.
- f. External influences, including unconventional physical or electrical stresses (current fault spikes, inrush currents, floods, fires, accidental breaks, etc.)
- g. Using an incompatible charger.
- h. What may be considered normal wear and tear due to use of the Product.
- a. Elements not manufactured by Endurance that will have those established by their manufacturers. Said Guarantees will be assigned to the buyer, who will remain as their beneficiary, without Endurance assuming any responsibility in relation to said elements from the date of the assignment, which will occur with the delivery of the Product.

At the order approval stage, the buyer must review and validate that the data provided for the battery design is correct and is necessary for the correct operation of the battery with the machine. Endurance does not guarantee errors in the dimensions, weight or operation of the battery with the machine because the data provided and validated by the customer in the validation plan are not correct or are insufficient.

The customer must review the delivery of the product immediately upon receipt. If, upon receipt of the Products, the client verifies their non-conformity due to apparent flaws, produced during transport, the client must sign the non-conformity of the delivery on the carrier's delivery note and the claim will be communicated as indicated in point 8 of this guarantee, immediately upon receipt. After this period Endurance will be exonerated from the damages produced during said transport.

Any claim or litigation will not entitle the Customer to suspend or, in any case, delay payment of the Products in dispute, or dispute or other supplies.

In any case, the liability of Endurance and/or distributors and/or any other intermediary of Endurance, is limited to the maximum amount of the sale price of the Product. Compensation for consequential damages is excluded.

In no case will it be compensated for consequential damages or for costs derived from the interruption in the operation of the Product (loss of profit).

24.5 Out-of-warranty policy.

In the case of products out of warranty Endurance will offer a technical assistance service charged to the buyer, which will cover, among others, the costs of materials, laboratory, warehouse, transport, customs, analysis, management, business benefits, disposal costs (if necessary). In providing this service, Endurance will apply its rate policy.

24.6 About support products/parts.

Support products/parts can be used new or refurbished, with similar or better performance than the defective products, with the Endurance warranty.

In the event that the products are no longer available on the market, Endurance may choose between (i) replacing them with others with equivalent functions and performance or (ii) returning the remaining annual value with the depreciation of the purchase price of the products during the Performance Guarantee period, as indicated in the following compensation scheme:

- CLASS I:60% of the purchase price from the date of initial installation to 24 months
- CLASS II :40% of the purchase price from 25 to 36 months
- CLASS III :20% of the purchase price from 37 to 48 months

For the above purposes, the purchase price shall be understood as the list price that the buyer actually paid for the acquisition.

24.7 Claims in use of the warranty.

Claims in use of the Guarantees will be notified to Endurance only by email to: postventa@endurancemotive.com or to the distributor from whom the Product was purchased, within the Guarantee Period, accompanied by:

- a. Number and date of the delivery note or invoice for the product.
- b. The serial number of the corresponding product.
- c. Detailed description of the problem and under what circumstances it occurred.

Buyers who cannot contact the dealer from whom they purchased the product should contact Endurance by mail: postventa@endurancemotive.com.

24.8 Countries in which it applies.

This guarantee covers incidents in the countries of the European Union, excluding all liability in the case of different countries.

24.9 Execution of the rights of the warranty.

For any claim, you can contact us through our email postventa@endurancemotive.com. You must handle the claim as specified in point 8 of this warranty.

24.10 Entry into force.

In general, the guarantees to which Endurance undertakes in this document will be valid from the date of delivery.



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