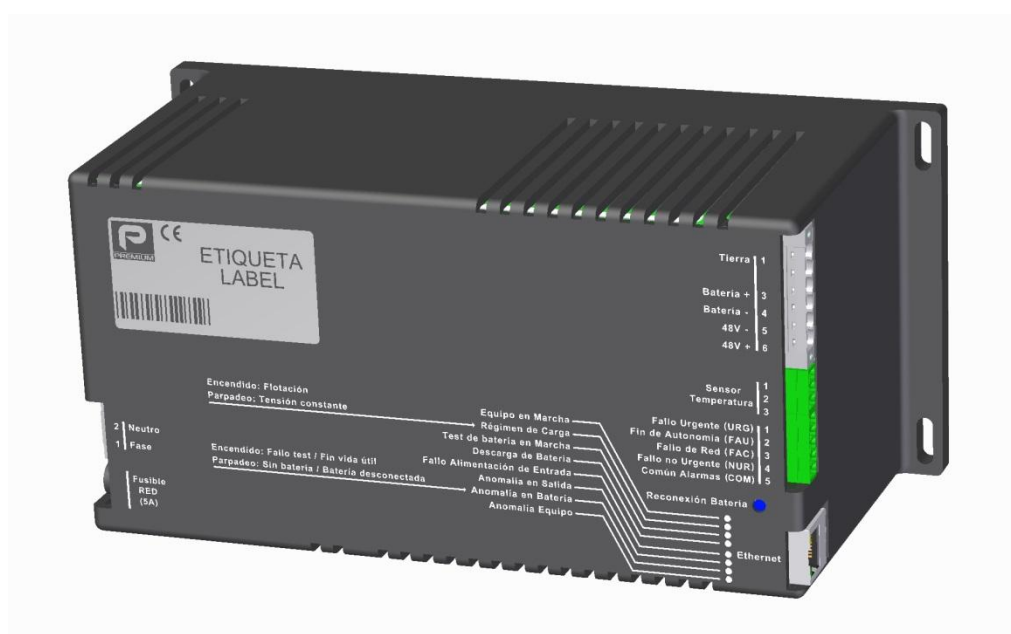


OPERATION MANUAL

EPS-120-48V

REF: NP-2719



Manufactured by **PREMIUM S.A.**
www.premium.es

PRECAUTIONS



In order to prevent accidents and injuries, the following safety instructions must be observed for handling the equipment.

For personal safety, the relevant safety instructions must be read and understood prior to working with the equipment.

Keep the safety instructions in a place accessible to all personnel working with the equipment to facilitate consultation.

Only expert personnel with corresponding authorisation should handle the equipment.

Error Messages These must be observed in all circumstances; causes must be located and remedied.



Hazard Warnings When handling or accessing the interior of the device, current conducting elements pose a potential hazard.

General voltage The device operates with a maximum operating voltage of 230 VAC. This voltage is hazardous and may cause personal injury in the event of contact with conductive elements of the equipment.

Voltage conductor elements within the equipment are considered as particularly hazardous areas. These may be: soldered points, printed conductors, mains connection terminals, relay contacts, etc. Prior to opening the equipment, disconnect the mains voltage from all poles.

External voltages. Upon disconnection of the equipment, possible external voltages, returning from powered equipment, must be taken into account.

Fuses Only original, equipment specific fuses may be used.

Use in accordance with designed purpose The device must only be used for its designed purpose. Any use not in accordance with its designed purpose is forbidden. PREMIUM S.A. shall not be responsible for damage resulting from use not in accordance with its designed purpose. In such event, the user assumes full responsibility for any possible hazard. Use in accordance with its designed purpose is defined in the documentation. The device may only be exposed to allowable environmental influences. These are specified in the equipment technical data.

Arbitrary modifications prohibited The equipment shall not be modified with respect to its construction or safety without express consent. PREMIUM S.A. shall not be responsible for any modification resulting in damage. **All repair work, soldering of printed circuit boards, replacement of components, modules and printed circuit boards are particularly prohibited without express authorisation from PREMIUM S.A. Only original PREMIUM S.A. replacement parts may be used. PREMIUM S.A. shall not be responsible for malfunction resulting from inadequate, negligent or incorrect installation or connection of the equipment.**

Due to our policy of continuous improvement, the content of this manual may change without prior notice.

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1 COMPOSITION OF THE PRODUCT

The products is comprised of the following parts:

- EPS-120-48V Charger
- 2-pole socket for mains input
- 6-pole socket connector for output and battery
- 5-pole socket connector for alarms
- Temperature sensor with cables and connection

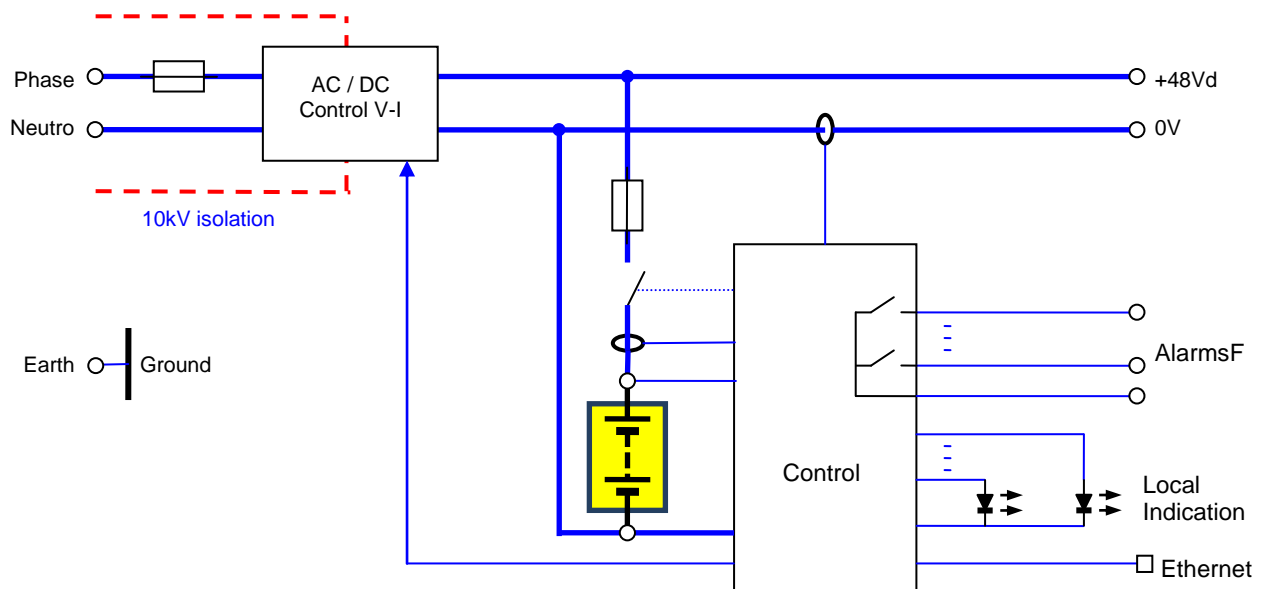
2 EPS-120-48V SYSTEM DESCRIPTION

The EPS-120-48V is a charger-rectifier for 48V batteries capable of charging 1Ah to 15Ah capacity lead-acid batteries. The overall power output that may be supplied is 120W permanently and 180W for 10 seconds each minute. Input voltage is 230VAC.

The battery charges at a constant voltage with limited current. When the battery is fully charged, the charger maintains it in floating condition, supplying a small maintenance current. When the battery is fully or partially discharged after a mains outage, the charger modifies the output voltage such that the current the battery receives is limited to a configurable charge current.

The equipment has four alarm indications using potential-free contacts (mains outage, urgent failure, non-urgent failure and end of battery life). On the front there are 8 LED indicators: 3 green: Equipment On, Charge Mode and Battery Test; 1 yellow: Battery Discharge; 4 red: Input Power Supply Failure, Output Abnormality, Battery Abnormality and Equipment Abnormality.

Block diagram:



3 CHARGER OPERATION

Charger-Rectifier

During normal operation, the equipment supplies the permanent power consumption of the installation while maintaining the battery charged at the rated float voltage. The battery maintains the output voltage prior to failure of the electrical supply mains. Once AC power is restored, the charger-rectifier automatically returns to the initial condition, being able to fully recharge the battery from fully discharged to 80% charge within 14 hours, while supplying the permanent power consumption for the assigned loads. There is no need for manual control (local or remote) during the entire charger-rectifier operating process.

The charger-rectifier is capable of operating with the AC input voltage connected, without the battery and at least one automatic disconnect element, with the rest of the equipment remaining connected without loss of functionality of the remote control or communication equipment.

In the event the batteries are disconnected for any reason (e.g., end of battery life or the rectifier was not initially energised), reconnection may be locally forced even if there is no AC input current. In any case, if the conditions leading to disconnection persist, it will re-disconnect.

When there is no battery, output voltage will be the floating voltage.

The layout of equipment elements facilitates monitoring and replacement. Maintenance is simple, requiring no removal of equipment elements (e.g., replacement of fuses).

The 48Vdc output has a potential-free contact, with no ground connection.

The equipment incorporates the following functions:

- Possibility of parameter auto-configuration.
- It provides uninterrupted power supply in the event there is no mains voltage, until the end of battery life (minimum voltage).
- It charges the battery and maintains voltage and current for different uses within the allowable range for each type of battery.
- It maintains output voltages and currents within the allowable range, protecting against overvoltages, overcurrents and voltage changes, while providing the required voltage quality to the equipment it supplies.
- It tests proper battery operation.

Setup

Basic equipment setup is carried out by Ethernet, via exclusively standard software means from proprietary applications, requiring no measuring devices.

Basic setup is considered as the modification of settings such as: floating voltage, voltage step by °C temperature, charging voltage, etc.

Each parameter range is broad enough to cover every possible case of batteries available on the market.

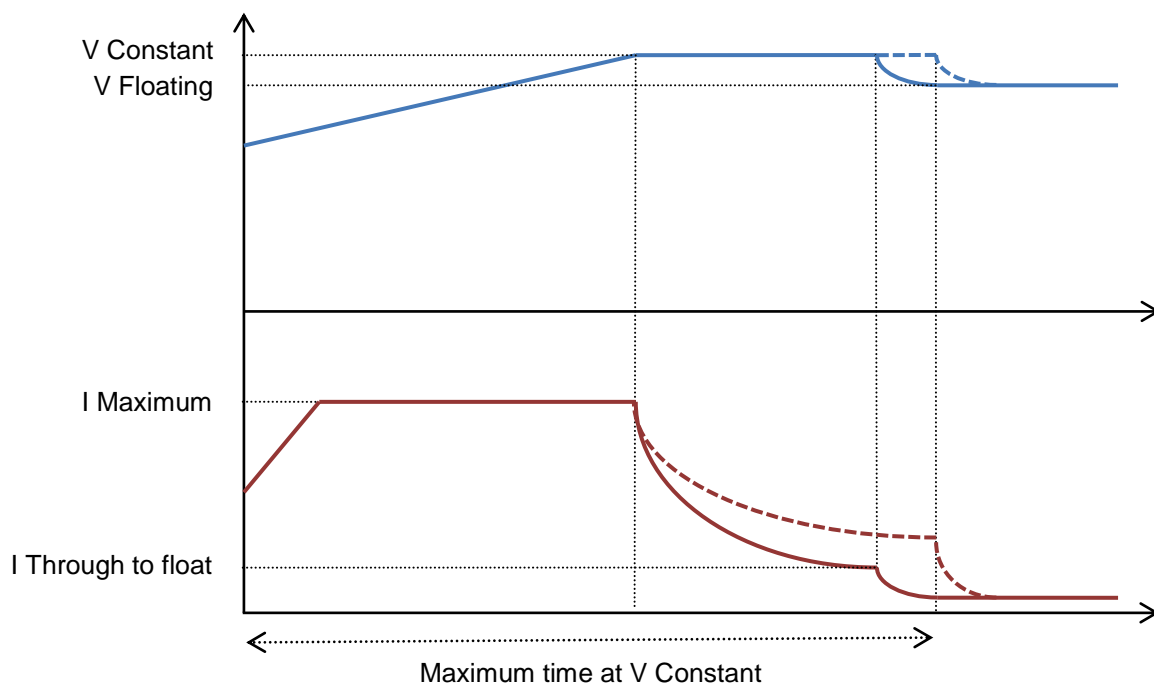
Battery Charging

The charger-rectifier continuously maintains the battery within the voltage and current range indicated by the manufacturer, with the following features:

- When the battery reaches the preset discharge limit: by minimum voltage (configurable), the charge is disconnected in order to prevent depth of discharge.

- When the voltage applied to the battery exceeds the maximum voltage preset value (configurable), a non-urgent charger-rectifier alarm is activated and the battery disconnects.
- When the charging voltage applied exceeds the maximum or minimum voltage preset values (configurable), a non-urgent charger-rectifier alarm is activated.
- Battery charging is performed at a constant voltage (configurable) in order to reduce the overall charging time.
- When the battery is fully charged, the charger applies and maintains the floating voltage (as indicated by the manufacturer, configurable).
- Floating status is achieved when the charging current is lower than the through to float current or the maximum constant voltage time has been exceeded.
- Floating voltage is modified based on temperature with the compensation specified by the battery manufacturer, configurable (mV/°C). The temperature sensor is firmly connected to the battery.
- The charger limits the maximum battery charging current such that it never exceeds the value preset by the battery manufacturer, configurable for different battery capacities and/or limitations specified by each manufacturer.

BATTERY CHARGING VOLTAGE AND CURRENT CHARACTERISTICS



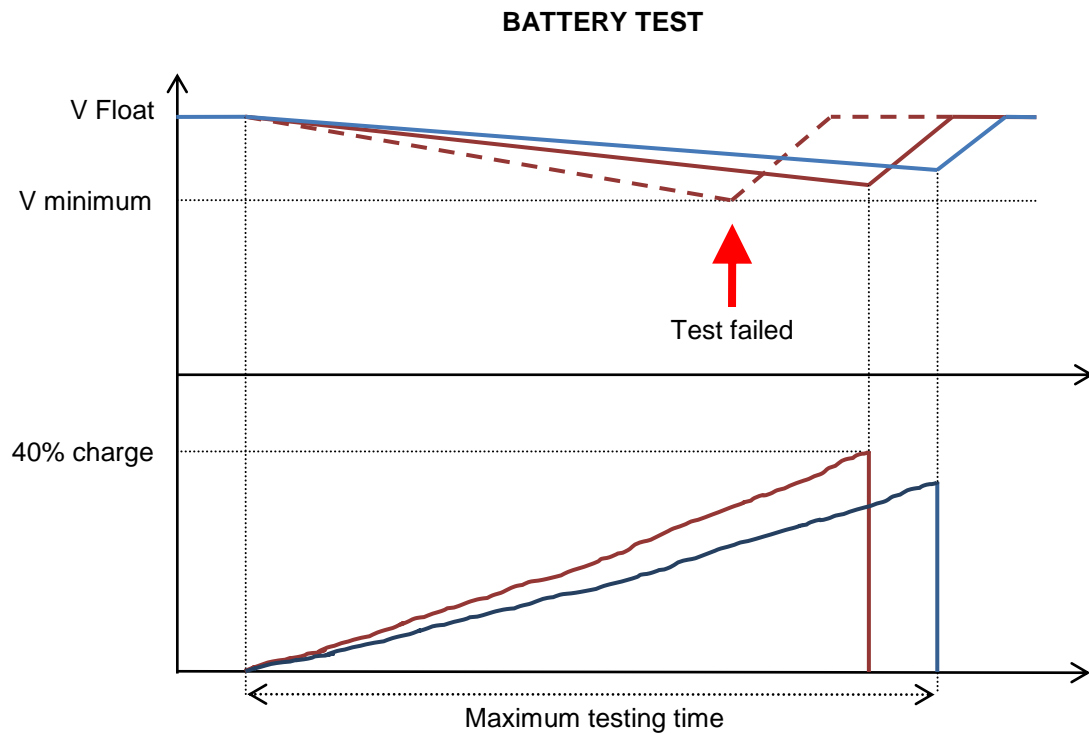
Battery Test

The equipment has an automatic, periodic battery status testing system.

The testing begins from the floating charge status. At the moment the battery requires testing, the charger-rectifier verifies that the battery is in floating charge; if not, an internal timer is activated and if after 48 hours the battery does not reach floating charge status with the correct AC input voltage, the battery is considered as being defective.

The battery is tested at least until a depth of discharge of 40% is reached. The evolution of voltage of the battery is measured while the test is in progress so that if the voltage drops below the minimum threshold (configurable), the battery is considered as being defective; therefore the test fails. Once testing (with the reattempts required in order to verify reliability of the analysis, configurable) has failed, a battery failure alarm is activated.

The duration of the test is time limited, after which the result is processed.



4 ELECTRICAL, MECHANICAL AND ENVIRONMENTAL CHARACTERISTICS

INPUT (AC Power Supply)

Mains input voltage	230Vac
Mains voltage range	-20%...+20%
Mains frequency range	47...63Hz
Start up current	< 12A
Power factor	>0.6

DC OUTPUT

1

Rated output voltage	48	V
Maximum continuous current (Io)	3.077	A
Peak current (10sec each minute)	4.61	A
Line regulation	0.1	%
Output regulation	39(*)...60	V (*) Low battery shutdown voltage
Ripple	50	mVpp
Noise (BW 20MHz)	100	mVpp
Total output power (Po):	120	W
Total peak output power (Popk):	180	W

CHARGER

Type of battery	Sealed lead-acid
Rated battery voltage	48V
Battery capacity	1Ah-15Ah
Maximum battery charge current	3.077A (configurable)
Battery power consumption at standby	< 0.25mA

ENVIRONMENT

Operating temperature	-10...60°C
Relative humidity	5...90% no condensation
Cooling	Natural convection
Environmental requirements	RoHS per Directive 2002/95/CE

4.1 DIELECTRIC STRENGTH

In order to specify dielectric strength, the following groups have been defined:

GROUP	SIGNAL
G1	AC Input
G2	Alarms
G3	Temperature sensor + 48V Output + Battery + NC
G4	Ethernet port
G5	Earth

Dielectric strength between groups is as follows:

Test poles		Lightning impulse 1.2/50µs	Dielectric strength 50Hz 1 minute	Isolation level with impulse
Pole-1	Pole-2			
G1	G2 + G3 + G4 + G5	± 20 kV	10 kVac	± 5 kV
G2	G1 + G3 + G4 + G5	± 2 kV	1 kVac	± 2 kV
G3	G1 + G5 (G2 + G4 together without connection to G5)	± 5 kV	2 kVac	± 5 kV

G4	G1 + G3 + G4 + G5	$\pm 2 \text{ kV}$	1 kVac	$\pm 2 \text{ kV}$
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4.2 PROTECTIONS

The mains input is protected by a fuse, sized for extreme cases where internal equipment could be damaged, requiring specialised technical service.

The equipment protections are as follows:

- Mains overvoltage protection varistors.
- Secondary overvoltage protection.
- Output overload and short circuit protection by limiting current.

The battery has different protection levels:

- Electronic limiting of charging current.
- Short circuit protection by means of an auto-reset fuse.
- Battery depth of discharge protection by using series-connected relays, in order to ensure disconnection when terminal voltage reaches the minimum preset value.
- Battery reverse polarity protection.

4.3 INDICATIONS

This module is equipped with 8 LED indicators on the front for local indication:



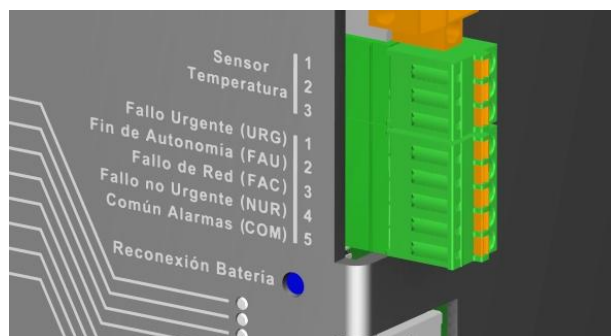
LED Name	Colour	Mode	Indication
Equipment in operation	Green	Steady light	Charger in operation
Charge mode	Green	Steady light	Battery charge in floating mode
		Blinking	Battery charge in constant voltage mode
Battery test in operation	Green	Steady light	Battery test in operation
Battery discharge	Yellow	Steady light	Battery charging
Input power supply malfunction	Red	Blinking	Mains input voltage out of range
Output abnormality	Red	Blinking	DC output voltage out of range
Battery abnormality	Red	Steady light	Battery test failure, degraded batteries
		Blinking	Battery voltage out of range
Equipment abnormality	Red	Blinking	Internal charger error

4.4 ALARMS

There are 4 alarm outputs by potential free contacts with the following characteristics:

- Maximum switchable voltage 60Vdc
- Maximum current: 100mA

Name of Alarm	Status	Operating logic
Urgent malfunction	NC	In normal operation the charger is open. It remains closed upon battery or internal equipment malfunction.
End of battery life	NA	It closes when the battery is discharging and the voltage drops to its minimum preset value.
Mains malfunction	NA	It closes if the mains AC voltage is out of margin
Non-urgent malfunction	NA	It closes when the output voltage is out of range, the battery or internal temperature is out of range.



4.5 CONFIGURATION

Basic equipment configuration is carried out via the Ethernet port.

The following parameters are configurable:

- Floating voltage
- Charging voltage compensation with temperature
- Constant charging voltage
- Maximum charging current
- Through to float current
- Maximum time at Constant voltage
- Battery disconnection: Minimum voltage
- Battery disconnection: Maximum voltage
- Battery disconnection: Minimum immediate disconnect voltage
- Battery test: Time between testing cycles
- Battery test: Voltage limit for test failure
- Battery test: Battery discharge capacity
- Battery test: Time limit for each test attempt
- Battery test: Num. of retries
- Output voltage: Minimum value
- Output voltage: Maximum value
- Overload: Num. of connection retries
- Overload: Time between retries

4.6 COMMUNICATION

Carried out via Ethernet.

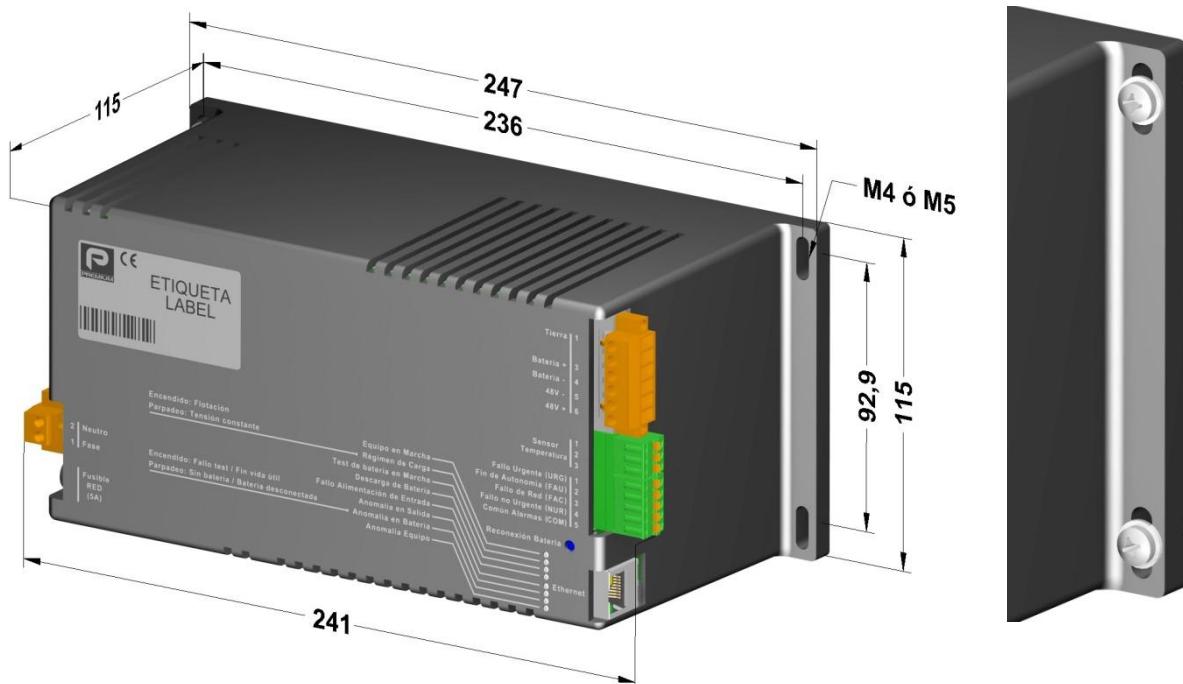
This system has the following characteristics:

- Compatibility with IPv4 with automatic IP (DHCP) assignment
- Web Services: Load XML files, firmware and websites
- Check/modify firmware, alarms and configuration remotely from a website
- User authentication using LDAP
- Time synchronization using SNTP protocol

In addition to the characteristics indicated, the system is equipped with a function, which allows equipment startup using a specified IP address. This is achieved by pressing the button on the front while the equipment starts up. The button is located behind the bore hole located on the front.

5 INSTALLATION

This is a wall-mounted device, cooled via natural convection, which must be installed in the position displayed in the figure. It is important to not cover the ventilation slots in order that air may circulate freely.



Charger weight, including connectors, is less than 1.3kg.

Attachment is recommended using four M4 or M5 screws with standard flat washers, applying a maximum torque of 1Nm.

Entry of liquids and/or objects through the ventilation slots must be prevented; otherwise equipment integrity may be compromised.

6 START UP

Connections must be made with correctly sized cables.

Function	Connection	Recommended minimum copper cross section	Maximum copper cross section allowable
Mains input	1-Phase, 2-Neutral	0.75 mm ²	2.5 mm ²
Earth	1-Earth	1 mm ²	2.5 mm ²
Battery	3-Battery +, 4-Battery -	1 mm ²	2.5 mm ²
Output 48V	5-48V-, 6-48V+	1 mm ²	2.5 mm ²
Alarms	1-URG, 2-FAU, 3-FAC, 4-NUR, 5-COM	0.25 mm ²	0.5 mm ²

Prior to starting the equipment, ensure that all connections are correct, in accordance with the polarities indicated on the front.

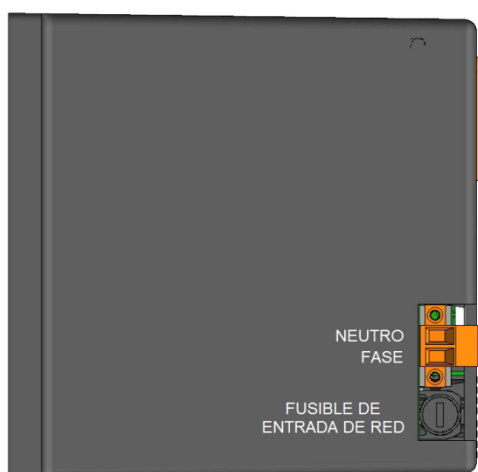
The temperature sensor provides to the charger the battery ambient temperature in order to configure the charging parameters. This must be installed in the same housing or compartment as the battery, as close as possible. Direct contact between both is not necessary.

This equipment has no On switch, therefore, once input voltage is supplied to the 1 Phase and 2 Neutral terminals, it starts operation.

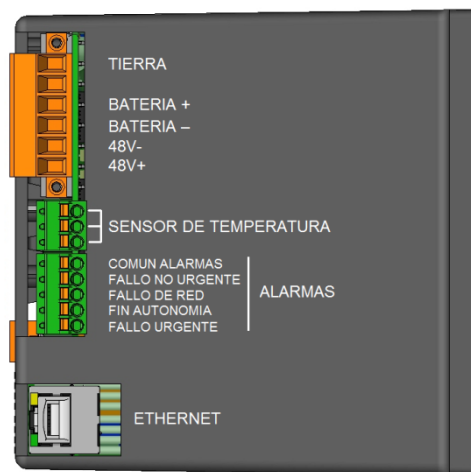
If everything is correct, after 5 seconds from connection, the green "Equipment in Operation" LED and the green "Charge Mode" LED (steady or blinking, according to the battery charge status) light up. All other LEDs must remain off in normal operation.

Otherwise, see Section 4.3 "Indications" for troubleshooting. If finding the cause is not possible, see Section 9 "Diagnostics".

The following figure displays the layout of connections



Left side view



Right side view

7 STANDARDS

EI EPS-120-48V is a product carrying the CE marking, which complies with the Directives indicated as follows:

Low voltage	Level	Standard
European Low Voltage Directive	73/23/CEE-93/68/CEE	UNE-EN 50178 (98)

Electromagnetic interference	Level	Standard
Conducted emissions on power terminals	Class A, Class B	UNE EN 55022
Measurement of radiated radioelectric emissions	Class B	UNE EN 55022

Isolation	Level	Standard
Measurement of dielectric strength		
AC terminal, active parts and earth, industrial frequency	10 kVac	UNE EN 60255-5
AC terminal, between active parts and earth, industrial frequency	10 kVac	UNE EN 60255-5
AC terminal, active part and earth, lightning impulse	20kV	UNE EN 60255-5
AC terminal, active parts, lightning impulse	20kV	UNE EN 60255-5
DC terminal, industrial frequency	2.5 kVac	UNE EN 60255-5
DC terminal, lightning impulse	5kV	UNE EN 60255-5
COM terminals, industrial frequency	1kVac	UNE EN 60255-5
COM terminals, lightning impulse	2kV,	UNE EN 60255-5
Measurement of isolation resistance	>10MΩ	UNE EN 60255-5
Isolation measurement with voltage impulse		
Voltage between each group and earth. Standard mode	± 5kV	UNE EN 60255-5
Voltage between each group. Differential mode	± 1kV	UNE EN 60255-5

Immunity	Level	Standard
Electrostatic discharge	Level 4	UNE EN 6100-4-2
Radio-frequency electromagnetic field	Level 3	UNE EN 61000-4-3
Fast Transients / Bursts	Level 4	UNE EN 61000-4-4
Shock wave (lightning impulse)	Level 4	UNE EN 61000-4-5
Conducted disturbances, induced by radio-frequency fields	Level 3	UNE EN 61000-4-6
Industrial frequency electromagnetic field	Level 5	UNE EN 61000-4-8
Damped oscillatory magnetic field	Level 5	UNE EN 61000-4-10
Cushioned oscillatory wave	Level 3	UNE EN 61000-4-18
Low frequency harmonics	Level 4	UNE EN 61000-4-13

Electrical	Level	Standard
AC voltage drops, variations, and zeros	Level 4	UNE EN 61000-4-11
Power supply voltage	230Vac ±20%	---
Current peaks (startup at nominal power)	<12A	---

Mechanical	Level	Standard
IP Degree of Protection	IP20	UNE EN 20324
IK Degree of Protection	IK05	UNE EN 50102
Vibration	Class 2.3	ETSI EN 300 019-2-2
Drop	Class 2.3	ETSI EN 300 019-2-2

Climate	Level	Standard
Damp heat	40°C/ 93%/ 4 days	UNE EN 60068-2-78

Dry heat	70°C/16h	UNE EN 60068-2-2
Cold	-25°C/16h	UNE EN 60068-2-1
Temperature Variation	-25°C/70°C/ 5cycles/3h	UNE EN 60068-2-14

8 GUARANTEE

PREMIUM S.A, except where otherwise agreed, guarantees the manufacture of the equipment against defects for a period of 2 years, from the date of delivery to the customer.

9 PREVENTATIVE MAINTENANCE

The equipment requires no specified preventive maintenance.

For correct operation it is important that air flow is not restricted. It is recommended to clean any noticeable accumulation of grime or lint from the ventilation slots.

10 DIAGNOSTICS

The following table details possible malfunctions and corresponding alarm indications (Mains Outage, Urgent Failure, Non-Urgent Failure and End of Battery Life).

Active Alarm	Cause of Failure	LED Indication	Auto-recoverable
Mains Outage	<ul style="list-style-type: none"> Input voltage out of range 	Blinking Mains input failure	Yes
Urgent Failure	<ul style="list-style-type: none"> Battery out of range 	Blinking Battery abnormality	No NOTE 1
	<ul style="list-style-type: none"> Battery has not achieved floating charge Battery Test Failure 	Steady Battery abnormality	No NOTE 2
	<ul style="list-style-type: none"> Internal charger failure 	Blinking Equipment abnormality	No NOTE 3
Non-urgent failure	<ul style="list-style-type: none"> Battery temperature out of range Internal temperature out of range 	No LED indication	Yes
	<ul style="list-style-type: none"> Battery temperature sensor failure 	No LED indication	No NOTE 4
	<ul style="list-style-type: none"> Output out of range 	Blinking "Output abnormality"	Yes/No NOTE 5
End of Battery Life	<ul style="list-style-type: none"> Battery at minimum voltage 	No LED indication	Yes

NOTE 1: Verify that the voltage of the connected batteries has the correct value (overall voltage 48V, 4 batteries of 12V in series). Otherwise, connect suitable batteries to the equipment

NOTE 2: Battery must be changed as soon as possible, as it is nearing the end of its service life. Reset equipment in order to restore normal operation.

NOTE 3: Temporarily, very unlikely, it could display this error for a few seconds at startup if for any reason the battery voltage is higher than the output voltage for the product. In this case, the equipment will recover. If this is not the problem, it will persist and the system will require manual reset.

NOTE 4: Verify that the battery sensor is connected. If connected, replace it.

NOTE 5: This may be caused by output overload; if so, the equipment will periodically check if the overload persists. If the overload disappears, the equipment will recover. This may also be caused by equipment regulation malfunction. In the event the problem persists, replace with new equipment in order to verify if this is due to output overload or equipment malfunction.

11 SOFTWARE

Please, see OPERATION - COMMUNICATION MANUAL to understand software details, such as:

- Protocols
- Types of users
- Web structure
- Firmware updates

12 PACKAGING, HANDLING, TRANSPORT, RECEPTION AND STORAGE

Packaging

Individual packaging is comprised of a box with bubble wrap and retention using 2 Instapack foam bags.

The product is comprised of the following parts:

- EPS-120-48V Charger
- 2-pole socket connector for mains input
- 6-pole socket connector for output and battery
- 5-pole socket connector for alarms
- Temperature sensor with cables and connection





The dimensions and weight of the packaged product are:

- Height: 190mm
- Width: 260mm
- Length: 350mm
- Weight: < 2.3kg

The box is sealed using adhesive tape and plastic strapping.

Handling

If the product is in its original packaging, take into account the following:

- Do not stack more than 8 boxes.
- Prevent packaging from becoming wet.

Out of its packaging, the product is sufficiently robust in general, however it may become damaged due to impact or being dropped.

Transport

The EPS-120-48V requires no specified transport process. Shipping shall be carried out in individual boxes.

- Prior to shipping, all equipment functionalities have been verified.
- All packaging shall have an indicative packing slip or note.
- Boxes must be secured during transport in order to prevent impact.
- Transport is guaranteed for a dry environment with a humidity range between 5% and 90% without condensation.
- Packaging shall have no visible damage after transport.
- Do not stack more than 8 boxes.
- Unloading shall be carried out using suitable means: forklift, pallet jack, etc.

Reception

Upon reception of the EPS-120-48, the following must be carried out:

Verify purchase order

- Check that the packing slip matches the purchase order
- Check that the product No. matches with the purchase order
- Check quantity

Any incorrect data must be reported immediately

Visual inspection in order to verify the following:

- Integrity of packaging
- Proper sealing
- Correct shipping documentation

Imperfections must be reported immediately, preferably with photos.

Storage

The EPS-120-48V allows for the stacking of 8 boxes under severe storage conditions -40 to 85°C; however, the severity reduces the maximum storage time.

For prolonged storage, due to degradation of certain components due to lack of use, the equipment should be operated for at least 8 hours every 2 years. A charging voltage need not be applied to the output.



If ambient temperature conditions are <15°C or >35°C, equipment operation must be carried out more frequently. Once per year.

Labelling

Each shipment is identified using adhesive destination labels. These labels are located on the exterior of each box.

Power Supply
Output ☐

Serial No.
Manufacturing
MAC address





PREMIUM S.A.
EPS-120-48V

Country of origin:
SPAIN

Input: 230V~ 0.7A 50/60Hz
Output: 48V= 2.5A
Power: 120W

S/N: 071900001
Date: 2014/10
MAC: 0C:EF:AF:50:00:01



Manufacturer
Model

Data matrix

Data matrix Content:

{Manufacturer}
{Model}
{Characteristics}
{Serial No.}
{Date}
{MAC}



Premium S.A., in order to provide an acceptable level of protection for persons and property, while taking into consideration applicable environmental recommendations, designs and manufactures its products in accordance with the principle of integrated safety, based on the following criteria:

- Elimination of hazards whenever possible.
- When this is neither technically nor economically feasible, the equipment is incorporated with suitable protections.

-
- Reporting of residual risks to facilitate the development of operational procedures in order to prevent such risks, training of operators, and the use of suitable personal protection means.
 - Use of recyclable materials and establishing procedures for the handling of equipment and corresponding components, which, once having reached the end of their service lives, the environmental criteria established by relevant authorities.