

MONITORING



*USER MANUAL
Installation and maintenance*

**POWER PLANT
CONTROLLER**

*English 15P00EJB600_Power Plant
Controller_R03 EN
2019/10/10 R. 03*

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This product is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Enertronica Santerno S.p.A. is responsible for the product in its original setting.
- Any changes to the structure or operating cycle of the product must be performed or authorized by Enertronica Santerno S.p.A..
- Enertronica Santerno S.p.A. assumes no responsibility for the consequences resulting by the use of non-original spare-parts.
- Enertronica Santerno S.p.A. reserves the right to make any technical changes to this manual and to the product without prior notice. If printing errors or similar are detected, the corrections will be included in the new releases of the manual.
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1. GENERAL INFORMATION

This manual describes the characteristics and installation and maintenance procedures for Santerno Power Plant Controller (PPC).



WARNING

For a correct and risk-free use of the equipment, make sure that all the parameters provided by the manufacturer are respected and that all the check procedures and test procedures are carried out according to the instructions provided.

1.1. For whom this manual is intended

This manual is intended for:

- Installers
- Operators
- Person in Charge for the management of a PV plant

See section Definitions.

1.2. Attached documentation

The following documents are always provided with the Power Plant Controller:

Document name	Scope
Installation Guide	This guide. Any information related to the transport, assembly, installation and maintenance of the product is described herein.
Electrical and Mechanical Schematic	This document contains detailed information related to the internal layout and the electrical schematic of the cabinet.
Test Certificate	This document contains information on the execution and the results of the Production Test.
Conformity Declaration	Conformity Declaration to the applicable Regulations.

1.3. Preservation of the documentation

All the documents related to the Power Plant Controller cabinet shall be preserved for the entire service life of the product, along with the PV installation documentation, and shall always be easily accessible.

1.4. Test Certificate

The Test Certificate is prepared by the technicians of Enertronica Santerno S.p.A. while testing the Power Plant Controller cabinet. It contains all the information related to the execution and the results of the Production Tests.

1.5. Symbols Used in this Manual



DANGER

INDICATES AN OPERATING PROCEDURE WHICH, IF NOT CARRIED OUT CORRECTLY, MAY LEAD TO INJURIES OR EVEN DEATH CAUSED BY ELECTRIC SHOCK.



WARNING

Indicates an operating procedure which, if not carried out correctly, may cause serious damage to the equipment.



NOTE

Indicates important information concerning the use of the equipment.

1.6. Definitions

Installer

Technician responsible for setting up, positioning and installing the equipment in compliance with the system diagram and in accordance with first-class, professional criteria.

Operator

Worker who has been suitably trained and informed on the risks and relative safety procedures to be adopted. The operator can carry out routine maintenance on the equipment.

Plant manager

Person who co-ordinates or manages system management activities and is responsible for ensuring health and safety standards are adhered to.

Technical room

Place used for housing the technological systems such as the wiring, plumbing, heating, air-conditioning, lifting and telecommunications systems.

It is equipped with suitable forced-air ventilation and/or air conditioning and is also fitted with appropriate safety devices governing access, maintenance and fire-prevention.

Person in charge of running the electrical system (System Manager)

Person with the highest level of responsibility concerning operation of the electrical system. If required, some of his/her tasks may be delegated to others.

Person in charge of working activities (Works Supervisor)

Person with the highest level of responsibility concerning the execution of work. If required, some of his/her tasks may be delegated to others.

The Works Supervisor must give all persons involved in the execution of work activities the relative instructions concerning reasonably foreseeable dangers which may not be immediately apparent.

Skilled electrician

Someone who has been trained and has enough technical knowledge or experience to enable him/her to avoid the dangers which may be generated by electricity.

Instructed person

Someone who has been adequately advised or supervised by a skilled person to enable him/her to avoid the dangers which may be generated by electricity.

2. DESCRIPTION OF THE PRODUCT

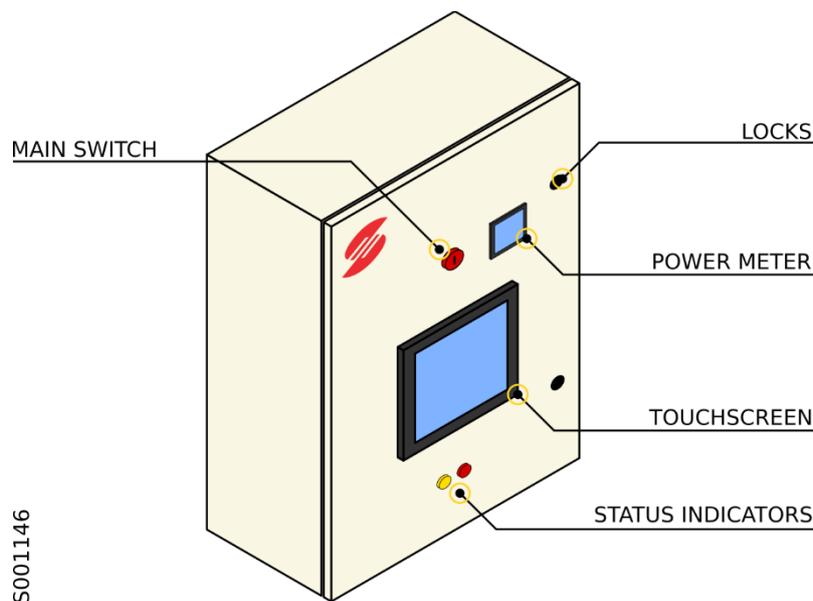
Santerno Power Plant Controller is a device meant to be installed at the point of connection of a photovoltaic plant in order to monitor active and reactive power production and regulate it according to external setpoints by controlling the photovoltaic inverters operating in the plant.

Active and reactive power measurement can take place via either an integrated power meter to be connected to external voltage and current transducers or an external Ethernet-enabled power meter.

Communication with the inverters takes place via the local area network (LAN).

The product comes with an integrated 12" touchscreen (bundled with a touch-pen) for local real-time monitoring of its functioning. It also features a web interface, fully equivalent from both content and graphics standpoints to the integrated touchscreen.

Finally, the product can also be monitored and controlled via Modbus TCP, which is the standard means to feed setpoints to the product.



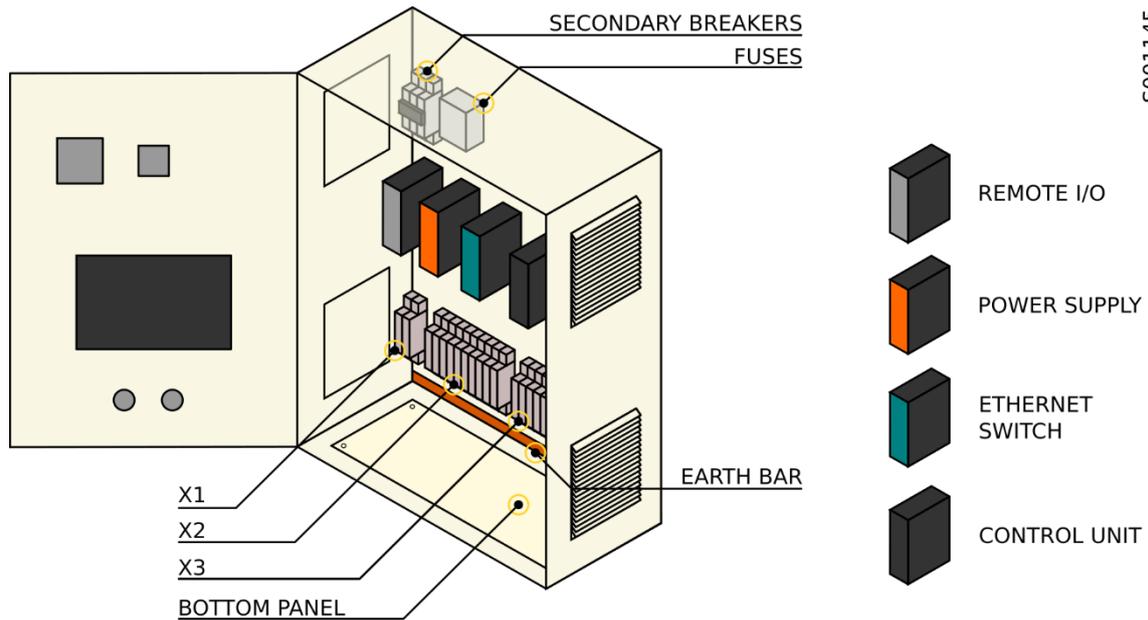
2.1. Front panel components

The cabinet front interface includes the following:

- Lockable master switch. The lock slot may house maximum 3 locks (not included).
- Power meter. It can be used to monitor the Point of Interconnection by connecting it to external voltage and current transducers.
- White status indicator. It signals that product is powered (internal 24 V_{DC} supply is on).
- Red status indicator. It signals that an alarm is active.
- 12" touchscreen with touch-pen.

2.2. Internal components

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2.2.1. External connections terminal blocks

The product features 3 terminal blocks for external connections.

X1	Power supply
1	Line
2	Neutral

X2	External current and voltage transducers
1	Voltage transformer L1 (fuse protected)
2	Voltage transformer L2 (fuse protected)
3	Voltage transformer L3 (fuse protected)
4	Neutral of the star centre of the Voltage transformer L1, L2 and L3 (fuse protected)
5	Current transformer secondary S1 phase L1
6	Current transformer secondary S2 phase L1
7	Current transformer secondary S1 phase L2
8	Current transformer secondary S2 phase L2
9	Current transformer secondary S1 phase L3
10	Current transformer secondary S2 phase L3

X3	Digital inputs and outputs
1	Digital Input 1 – Signal (Reserved for stop controller)
2	Digital Input 1 – Ground (Reserved for stop controller)
3	Digital Input 2 – Signal
4	Digital Input 2 – Ground
5	Digital Input 3 – Signal
6	Digital Input 3 – Ground
7	Digital Input 4 – Signal

8	Digital Input 4 – Ground
9	Digital Input 5 – Signal
10	Digital Input 5 – Ground
11	Digital Input 6 – Signal
12	Digital Input 6 – Ground
13	Digital Input 7 – Signal
14	Digital Input 7 – Ground
15	Digital Input 8 – Signal
16	Digital Input 8 – Ground
17	Relay output 1 – NC (Reserved)
18	Relay output 1 – Common (Reserved)
19	Relay output 1 – NO (Reserved)
20	Relay output 2 – NC
21	Relay output 2 – Common
22	Relay output 2 – NO
23	Relay output 3 – NC
24	Relay output 3 – Common
25	Relay output 3 – NO
26	Relay output 4 – NC
27	Relay output 4 – Common
28	Relay output 4 – NO
29	Relay output 5 – NC
30	Relay output 5 – Common
31	Relay output 5 – NO
32	Relay output 6 – NC
33	Relay output 6 – Common
34	Relay output 6 – NO
35	Relay output 7 – NC
36	Relay output 7 – Common
37	Relay output 7 – NO
38	Relay output 8 – NC (Reserved for alarm indicator)
39	Relay output 8 – Common (Reserved for alarm indicator)
40	Relay output 8 – NO (Reserved for alarm indicator)

2.2.2. Stop Controller

Positions 1 and 2 of terminal block X3 are allocated to the “Stop Controller” functionality. This enables customers to trigger the product to send all inverters at once a stop command:

- If X3.1 is short-circuited to X3.2, product does not send stop command to the inverters
- If X3.1 is not short-circuited to X3.2 (open circuit), product sends a stop command to the inverters every 10 seconds

X3.1,2 are scanned every 100 ms. Short-circuiting X3.1 to X3.2 does not result in the product sending a start command to the inverters, but in not sending any commands only. Plant must be restarted by pressing a dedicated button in the touchscreen or web interface.

X3.1,2 come short-circuit by factory default. Factory short-circuit may be removed for an external normally closed contact to be connected and used to trigger the “Stop controller”.

2.2.3. Switches

Identifier	Poles	Characteristic	Rating (A)	Function
10Q2	2P	K	6	230 V _{AC} power supply circuit breaker
24Q1	2P	K	6	230 V _{AC} /24 V _{DC} power supply upstream circuit breaker
24Q2	2P	K	6	230 V _{AC} /24 V _{DC} power supply upstream circuit breaker

2.2.4. Managed Ethernet switch

The product integrates a managed Ethernet switch to enable connection to local area network with the widest range of networking configurations, including VLANs.

For advanced networking configuration, please contact Enertronica Santerno S.p.A..

2.3. Nameplate

The product nameplate bears information regarding the product, including the power supply specifications and the serial number.

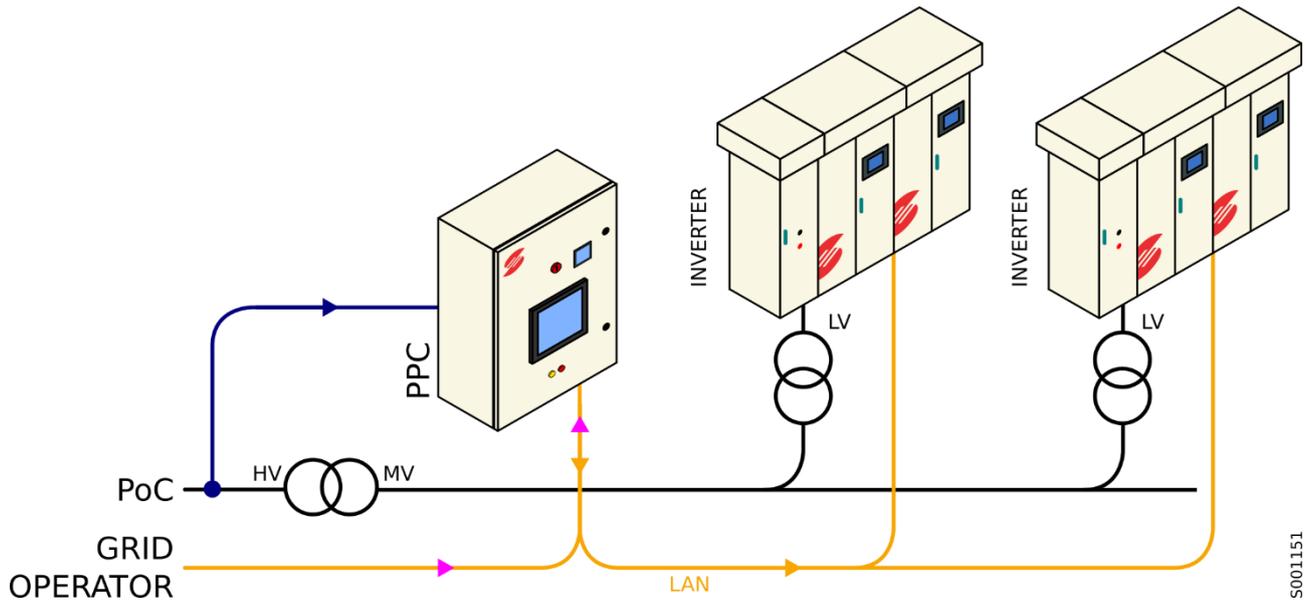
ZZEJQCN058 Extended PPC

Tensione nominale (Un) / Rated voltage (Un)	120 to 230 V ~ ±15%
Frequenza nominale (fn) / Rated frequency (fn)	50/60 Hz
Corrente nominale (In) / Rated current	1.5 A
Corrente corto circuito condizionata (Icc) / Rated conditional short-circuit current	4 kA
Tensioni di comando / Control voltage	24 Vdc
Normativa / Regulations	IEC 61439-1
Colore armadio / Cabinet color	RAL7035
Grado di protezione / IP rating	IP 44
Grado di prot.interno / Internal degree of prot.	IP 20
Segregazione / Segregation	Forma 1 / Form 1
Elettronica Santerno SpA Enertronica Group Via della conchia 7, Castel Guelfo (BO) www.santerno.com	
Serial Number 1900920	
 MADE IN ITALY	

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2.4. Closed loop control modes

Santerno Power Plant Controller works as a closed loop controller observing the point of connection, via either the internal power meter connected to external current and voltage transducers or an external Ethernet-enabled power meter, and dispatching setpoints to all inverters to regulate the parameters of choice so that they match externally-fed (e.g. by the grid operator) setpoints at the point of connection.



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The product features three different control modes:

- P/Q. In this mode, the product regulates active and reactive power at the point of connection.
- P/cosφ. In this mode, the product regulates active power and cosφ at the point of connection.
- P/V. In this mode the product regulates active power and voltage at the point of connection. Voltage regulation can be further tuned to work a simple droop controller or a closed-loop controller.

3. WARNING STATEMENTS

This section covers safety statements. The non-observance of the safety instructions below may cause serious injury or death and equipment failure. Carefully read the instructions below before installing, starting and operating the equipment.

Only competent personnel must carry out the equipment installation.

SAFETY RECOMMENDATIONS TO FOLLOW DURING USE AND INSTALLATION OF THE EQUIPMENT:



NOTE

Always read this instruction manual thoroughly before starting the equipment.



WARNING

The Power Plant Controller cabinet is to be used only as described in this manual. Any use other than that described in this manual is to be considered inappropriate and therefore improper.



DANGER

ALWAYS EARTH THE EQUIPMENT.

ELECTRIC SHOCK HAZARD: AVOID TOUCHING ELECTRICAL PARTS WHEN THE EQUIPMENT IS POWERED ON.

NEVER WORK ON THE EQUIPMENT WHEN POWERED ON.

EXPLOSION AND FIRE RISKS

THE RISK OF EXPLOSION OR FIRE MAY EXIST IF THE EQUIPMENT IS INSTALLED IN A ROOM CONTAINING FLAMMABLE VAPOURS. DO NOT INSTALL THE EQUIPMENT WHERE THERE IS A RISK OF EXPLOSION OR FIRE.



WARNING

Do not connect supply voltages which exceed the rated voltage. If voltage exceeding the rated value is applied, the internal circuits may be damaged.

Do not carry out isolation tests between the power terminals or between the control terminals.

Make sure that the screws on the connection terminal board have been tightened correctly.

Observe the ambient conditions for installation.

The electronic boards contain components which are sensitive to electrostatic charges. Do not touch the boards unless absolutely necessary. Should this be the case, take all the necessary actions to prevent damages caused by electrostatic charges.

3.1. Intended use

The Power Plant Controller cabinet must only be used as described in this manual.

Any use other than that described in this manual is to be considered improper and therefore non-compliant.

3.2. Qualified technical personnel

All work on the cabinets must be carried out by skilled technical personnel only. By skilled personnel it is intended persons who have been suitably trained to carry out the work in question.

To commission and use the self-power supply cabinet, personnel must know and understand the instructions for installation and use. In particular, all safety warnings must be strictly observed.

3.3. Execution of work

Maintenance, configuration modifications and management operations require the involvement of all production and maintenance personnel. These activities **must be carried out in observance of health and safety regulations**.

The Standards and Laws governing this aspect vary depending on the personnel involved, methods of access and/or the tasks which may be carried out on the product and envisage constructive measures aimed at guaranteeing adequate levels of safety.

Standard EN 50110-1, second edition, identifies the people who are granted access to the product:

- Person in charge of running the electrical system (System Manager).
- Person in charge of work activities (Works Supervisor).
- Skilled electrician.
- Instructed person.

Please refer to section Definitions.

Standard EN 50110-1 governs the way work in a plant is carried out and the relationship between the aforementioned persons who may work on the plant to maintain the electrical safety conditions stipulated by European Directives.

4. INSTALLATION AND USE



WARNING

For safety reasons and to ensure correct operation, it is strictly **PROHIBITED** to tilt the cabinet forwards, backwards or upside down.



WARNING

Product is for indoor installation only. Do not install outdoor or in direct sunlight. Front panel door must be kept close at all times except for installation and maintenance.



DANGER

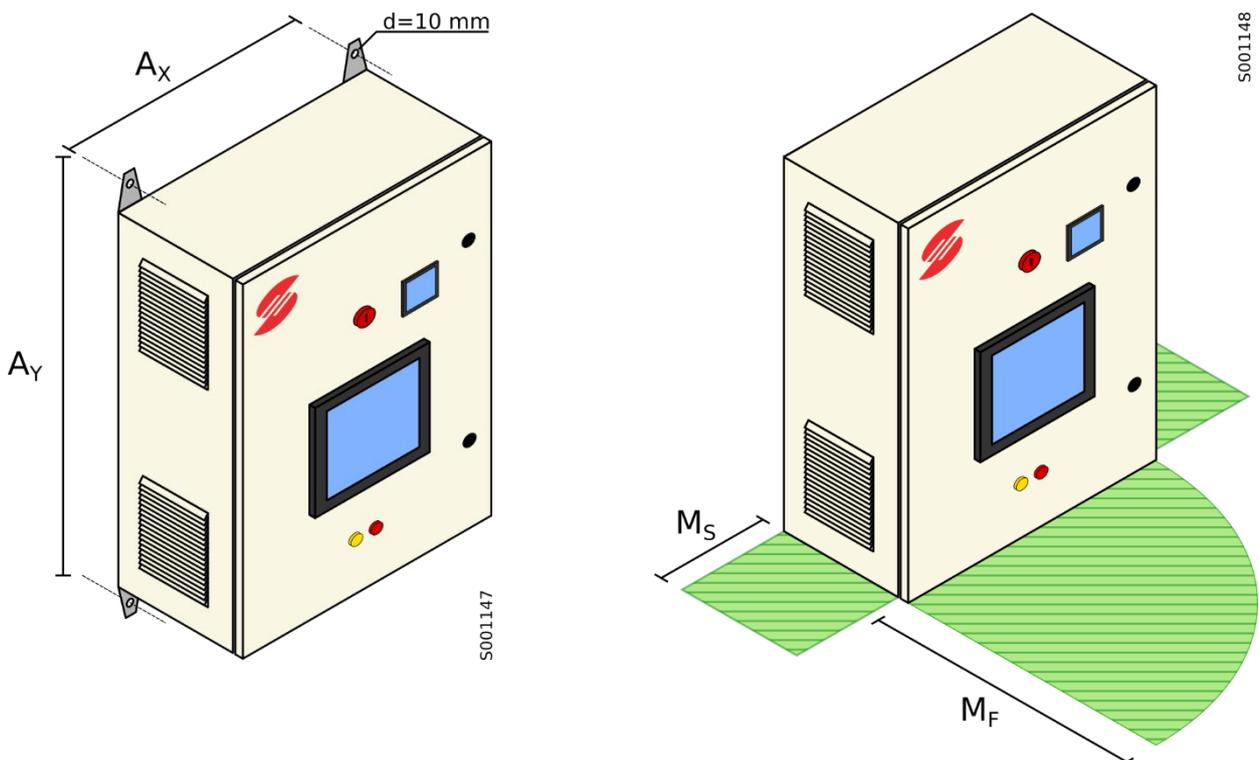
ALWAYS GROUND THE EQUIPMENT!

Installation of Santerno Power Plant Controller requires:

- Wall-mounting
- Grounding
- External power supply connection
- Network connection
- External transducers connection

4.1. Wall-mounting

The product is bundled with 4 wall-mount brackets featuring 10 mm-diameter holes.



Some free space must be left all around the product to allow for proper ventilation and unobstructed opening of the front panel, which can swing by 120°. Based on the cables used and their bending radius, some free space must also be left below the product not to impede external connections.

Dimension	Value [mm]
A _x	558
A _y	850
M _s	300
M _f	650

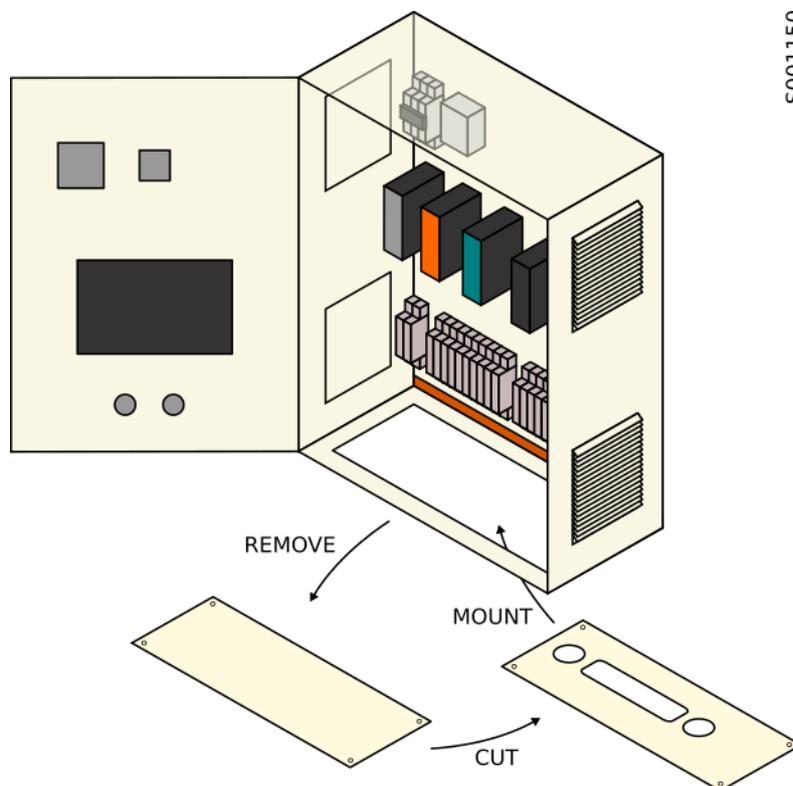
4.2. Connections

The minimum set of connections to perform in order to put the product in service includes:

- Grounding
- External power supply
- Network connection
- If the internal power meter is used as a measurement device at point of connection, external transducers must also be connected to the product.

Please refer to 6 for details about terminal characteristics.

Cables are to be routed through the removable bottom panel, to be cut at customer's discretion.



4.2.1. Grounding

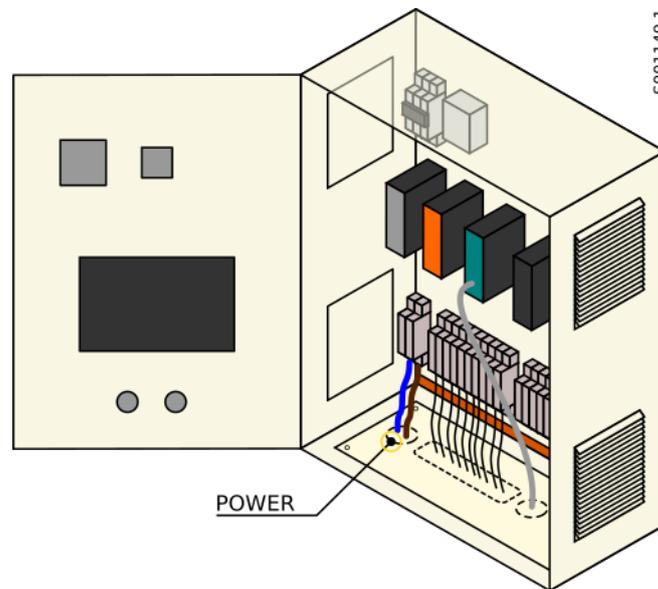


DANGER
ALWAYS GROUND THE EQUIPMENT!

Connect the cabinet to the equipotential bonding. An earth bar is provided inside the cabinet, at the bottom, which collects all the internal equipotential bonding connections. Such bar must be connected to earth via a dedicated external cable.

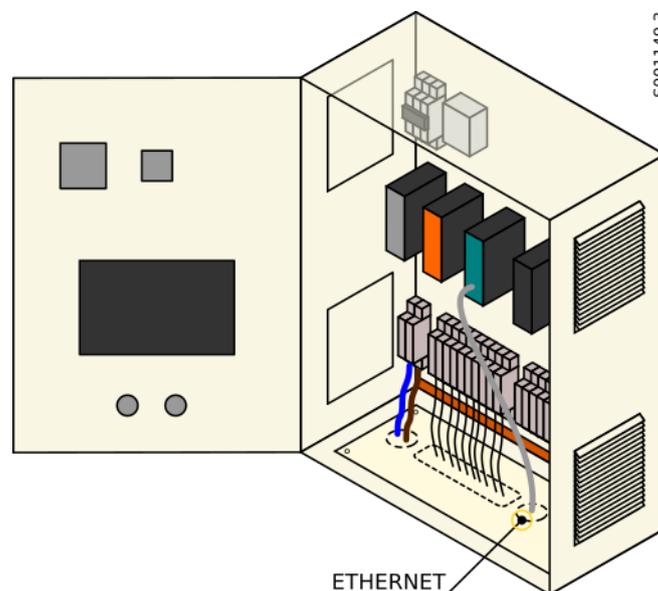
4.2.2. External power supply

Product must be powered by an external power supply complying with the specifications listed in 0. External power supply must be connected to terminal block X1.



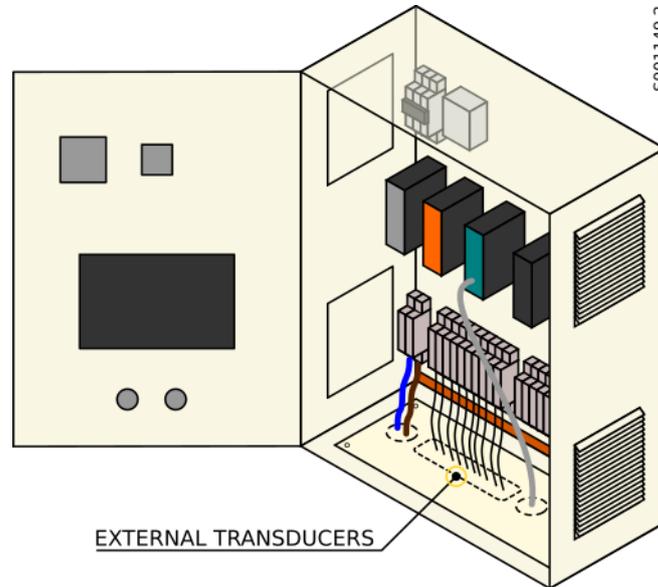
4.2.3. Network connection

Product must be connected to the local area network by means of an Ethernet cable, to be plugged into one of the spare ports of the integrated managed ethernet switch.



4.2.4. External transducers

If the internal power meter is used as a measurement device at point of connection, external transducers must also be connected to the product. Transducers must be connected to terminal block X2.



4.3. Turning on and off

4.3.1. Turning on

Product can be turned on by switching closed the front panel main switch.

If product does not turn on after switching closed the front panel main switch:

- Switch front panel main switch open
- Open the product door
- Check all switches in the top left corner of the product are closed
- Check all fuses in the top left corner of the product are in place and in good conditions
- Close the product door
- Close the front panel main switch

If the product does not turn on yet, please verify the external power supply status.

4.3.2. Turning off

Product can be turned off by switching open the front panel main switch.

4.4. Safety procedure



DANGER

CIRCUITS MAY BE LIVE EVEN WHEN THE MAIN SWITCH IS IN OPEN POSITION.

Always put the equipment in safety conditions before carrying out any operation inside the product. To do this, switch open the front panel main switch.

Internal and external circuits upstream of front panel main switch are energized even after main switch is switched open. To remove hazardous voltage from all internal circuits, included those upstream of the front panel main switch, cut off the upstream external switch.

4.5. HMI

This section covers the operating modes available from the touch panel.

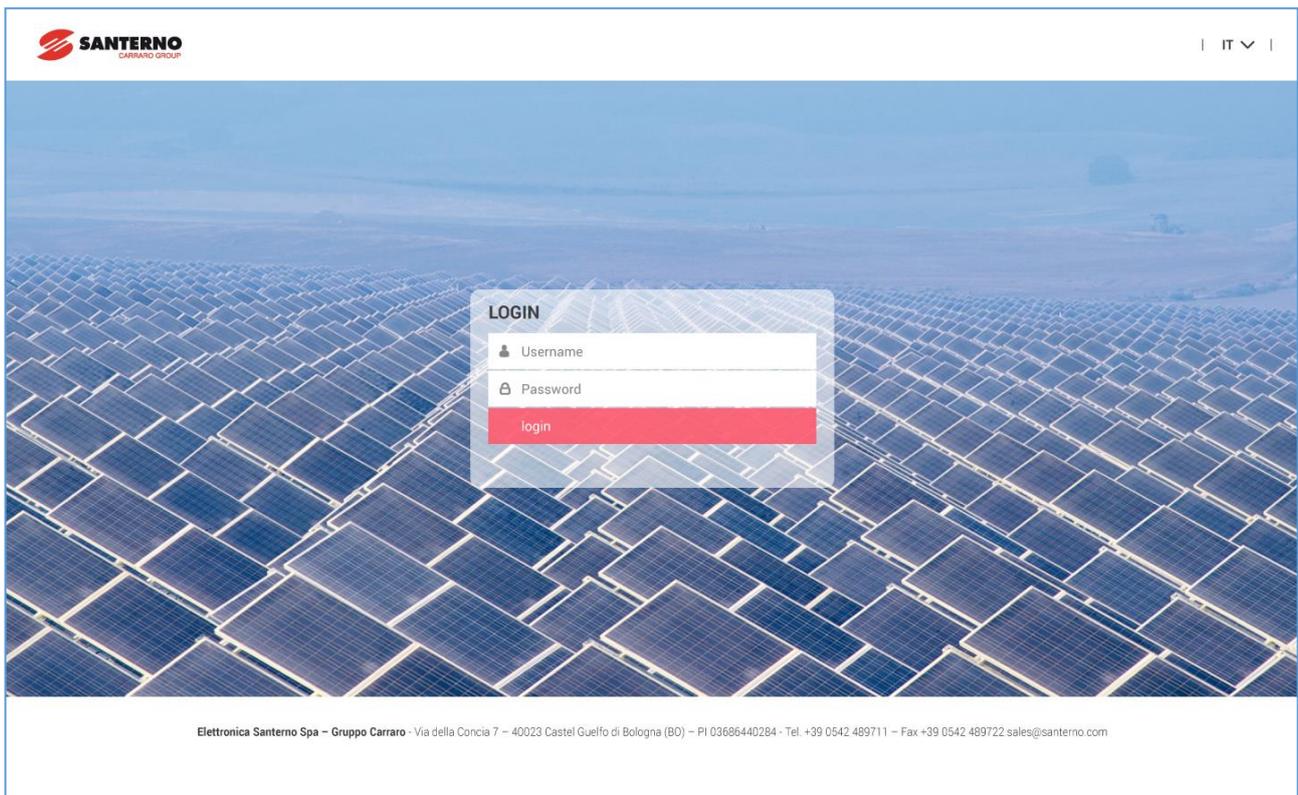


NOTE

The illustrations in this manual may be modified at the manufacturer's discretion both from a technical point of view and in appearance, hence they are not binding to the end customer.

4.5.1. Login

At power on and whenever the user logs off, the screen below is displayed, requiring entering the username and password.



4.5.2. Status

The "Status" page displays the main information on the Plant Controller status, in the top bar:

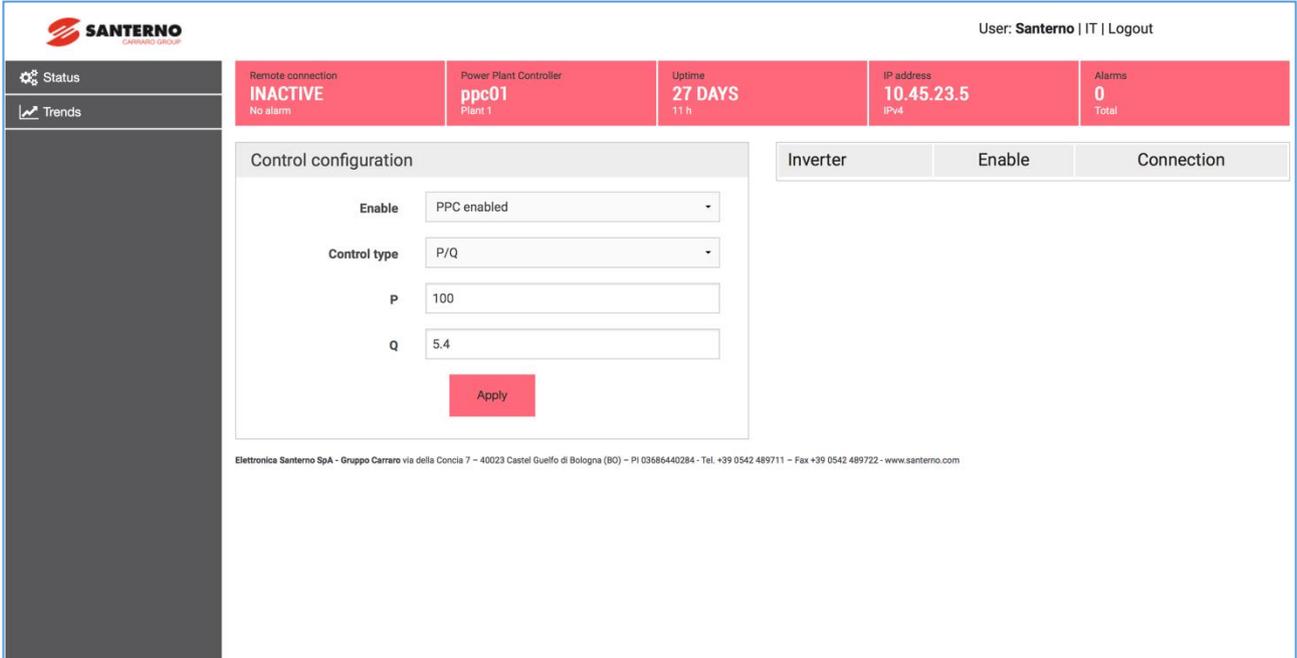
- Remote connection status
- Product serial code
- Uptime
- Local IP address
- Number of active faults

The behaviour of the Power Plant Controller may be dynamically adjusted from the "Control configuration" pane by changing the values in the fields displayed and by pressing "Apply".

The active options are the following:

- Enable or disable the active loop control. If disabled, no commands will send to the inverters.
- Select the type of active control. The active selection allows choosing among:
 - P, Q
 - P, cos phi
 - P, V
- Set the operation setpoints.

The new settings will become effective only when pressing the “Apply” button.



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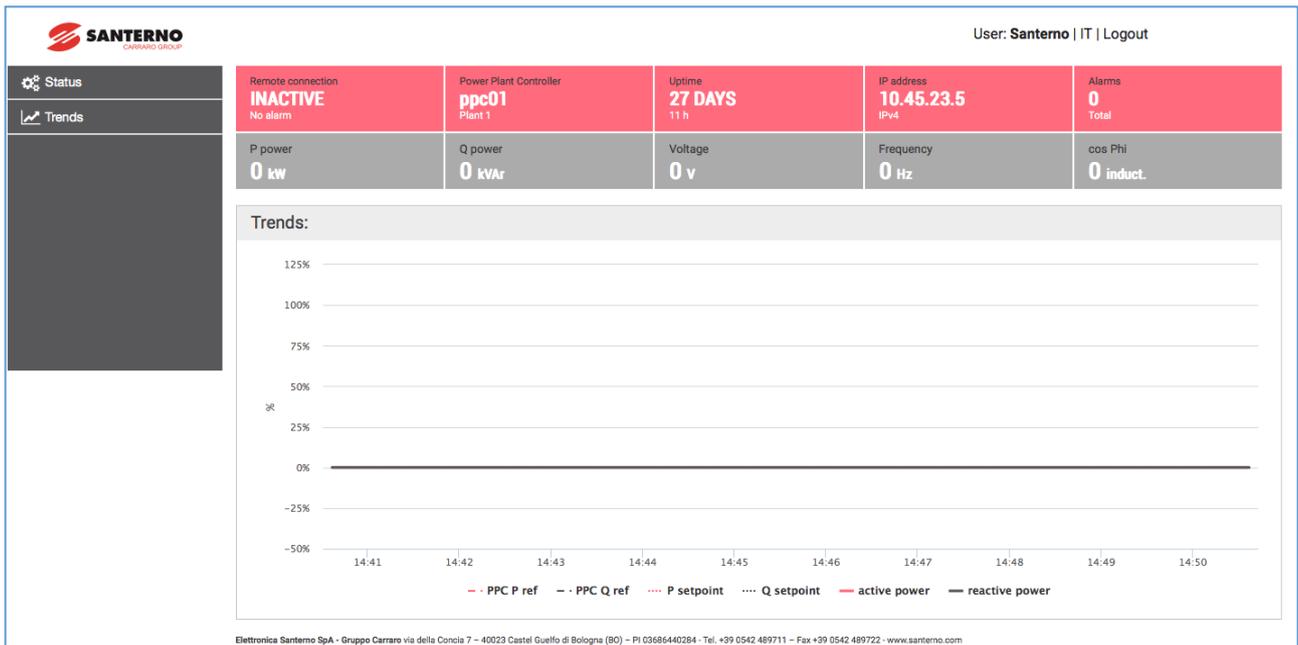
4.5.3. Trends

The “Trends” page displays the same red bar as the “Status” page along with an additional bar displaying the values detected by the power meter, i.e.:

- Active power
- Reactive power
- Voltage
- Frequency
- Cos phi

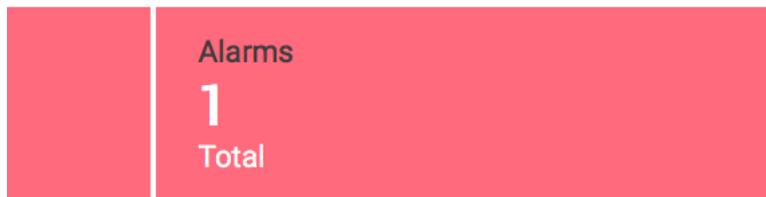
The chart shows the trend over time of the main control variables, progressing dynamically. For instance, the trends below are plotted in P/Q mode:

- PPC P_ref and PPC Q-ref, i.e. the two PPC configuration setpoints
- P setpoint and Q setpoint, i.e. the values that the PPC sends to the inverters
- Active power and reactive power, i.e. the values read from the power meter



4.5.4. Alarms

The Plant Controller promptly displays the active alarms on the HMI, from the top bar and from the dedicated page in the left-hand menu.



The alarm list is given below:

Alarm	Possible cause	Possible remedy
Too many inverters offline	Alarm tripped when the total number of the offline inverters exceed the configuration threshold	Check offline inverters (wiring and configuration) Check the PPC configuration Check that the local Ethernet network is operative
Power meter communication	Alarm tripped in case of communication failure with the power meter.	Check if the power meter is powered and properly configured Check the PPC configuration Check that the local Ethernet network is operative

Power meter consistency	Alarm tripped when the values read by the power meter have no physical consistency, i.e. 100Hz frequency.	Check if the power meter is properly configured Check the PPC configuration
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4.6. Identifying the functional voltage of the circuits

Users may identify the operating voltages of the internal circuits based on the colours of the isolating sheath of the cables.

Color	Circuit
Black Light blue	AC, DC power wiring >120V, or for cables other than those mentioned in this table
Blue	24 Vdc auxiliary circuit wiring
Orange	 Wiring of the circuits supplied by external power supply sources and not cut off from the master switch
Yellow/green	Wiring of the safety equipotential circuit

5. MAINTENANCE

Adequate maintenance ensures that performance and reliability is maintained over time.

This heading describes all the activities required to keep the cabinet parts which are subject to wear and deterioration and/or components which are essential for guaranteeing safety and optimum performance in good condition.

Access to products for the purpose of maintenance, modifications and management involves all persons responsible for production and maintenance. It must be carried out in observance of the health and safety regulations described in section Execution of work.

The minimum maintenance interval is indicated in the Maintenance Sheet.

Equipment installed in an environment where there is a high concentration of dust requires more frequent maintenance than generally indicated.



DANGER

DEATH FROM ELECTROCUTION AND BURNS DUE TO CONTACT WITH LIVE COMPONENTS.

MAKE SURE THAT NO VOLTAGE IS APPLIED TO THE EQUIPMENT. POWER MUST BE CUT OFF.

BEFORE ACCESSING THE CABINET, FOLLOW THE INSTRUCTIONS GIVEN IN SECTION SAFETY PROCEDURE.

DO NOT TOUCH ANY COMPONENTS OTHER THAN THOSE MENTIONED IN THIS INSTRUCTION MANUAL.



WARNING

Failure to observe maintenance prescriptions may result in the product warranty conditions being nullified.



NOTE

In the event of any fault, please contact the CUSTOMER SERVICE of Enertronica Santerno S.p.A. for instructions on the necessary corrective actions to be taken.

5.1. Maintenance Sheet

Maintenance tasks	Minimum frequency
Check the external/internal conditions of the electrical cabinet	6 months
Air filter maintenance	6 months
Check gaskets	12 months
Check locks and hinges	12 months
Check control and auxiliary voltages (230 V and 24 V)	6 months
Check relays and modular switches	12 months
Check cable tightening	12 months
Check product labels, nameplates and warning signs	24 months
The frequency of scheduled maintenance may need to be increased depending on the location in which the equipment is installed and the relative ambient conditions.	

5.2. Check the conditions of the cabinet

To check the external and internal conditions of the electrical cabinet, proceed as follows:

OVERALL CONDITION OF THE CABINET:

- Check the external condition of the cabinet.
- Check the state of the insulating sheaths on the conductors.
- Check that there are no signs of overheating on the power conductors (especially near the connection points on the equipment).
- Check that there are no signs of cable gnawing caused by rodents.
- Check the state of all the signs/nameplates affixed to the equipment. Signs must always be in good condition and legible.

GENERAL CABINET CLEANING:

- Check the interior of the cabinet for the build-up of dust, dirt, humidity and infiltration of water from the outside.
- Check that the ventilation ducts on the inductors and transformers are clear.

Should it be necessary to clean the cabinet, always adopt adequate measures.

5.3. Air filter maintenance

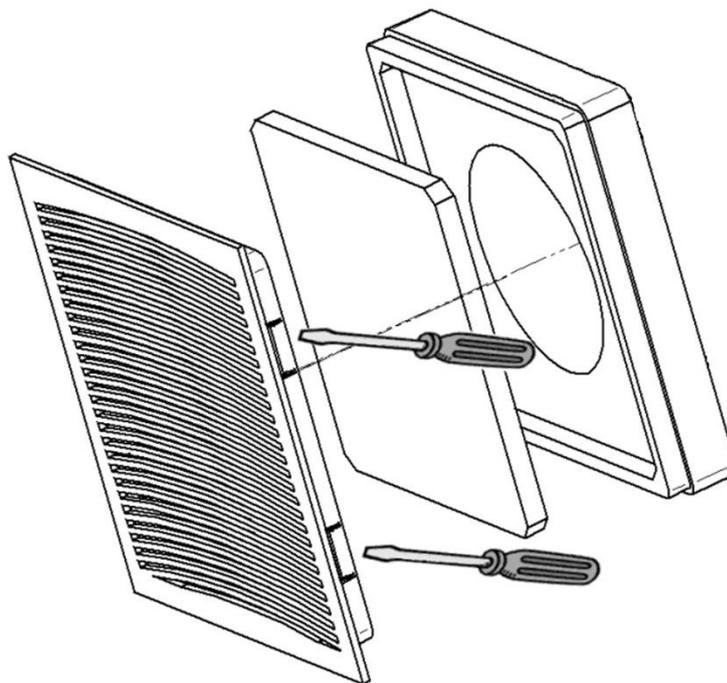
The cabinet is equipped with air intake grilles fitted with felt filters (efficiency class EN 779: G2). Maintenance activities consist of replacing the felt filters.

The front air intake grille can be removed by inserting a screwdriver in the point indicated and gently levering it out. The felt is held in a cavity in the air intake grille which is securely fastened to the cabinet door.

The type of felt filters used must be suitable for the application.

The spare felts may be purchased from Enertronica Santerno S.p.A..

The figure shows how to replace the filter felt.



S000717

5.4. Checking the seals, locks and hinges

To check the cabinet door seals, locks and hinges, proceed as follows:

- Visually inspect the cabinet seals for any signs of cracking or damage. Any seals showing signs of damage in the areas of door contact must be completely replaced.
- It is suggested that talc be used to stop the seals from sticking to the sheet metal of the cabinet over time.
- Check correct operation of the cabinet locks by locking and unlocking the doors.

- Check if the door hinges operate smoothly.
- Spray all movable parts and parts subject to wear with a water-free lubricant.

5.5. Checking external power and auxiliary voltages

To check the cabinet control and auxiliary voltages, follow the instructions provided below.

The exact position of the control points can be seen on the Electrical and Mechanical Schematic.

To check the 24 Vdc power supply proceed as follows:

- Open the cabinet door
- Check the presence of 24 Vdc control voltage on the terminals on switch 24Q2
- Close the cabinet door

To check the external power supply proceed as follows:

- Open the cabinet door
- Check the presence of external power supply voltage on the terminals on switch 10Q2.
- Close the cabinet door

5.6. Checking the relays and switches

This section refers to all relays and switches located inside the cabinet.

- Visually inspect the installed fuses, making sure that they are correctly inserted into their holders. Check the presence of the fixing springs on the fuse holder socket.
- Visually inspect the modular switches installed. Check their mechanical and electrical functionality.

5.7. Checking the tightening torque

- Check the tightness of all the terminal clamps for connecting the power wiring and tighten, if necessary.
- Pay particular attention to any colour variations or anomalies concerning the insulation and the terminals.

The minimum tightening torques to be used can be gathered from the Manufacturer's technical notes.

6. TECHNICAL DATA

6.1. Environmental requirements



WARNING

Environmental conditions significantly affect the life-expectancy of the product; consequently, **DO NOT** install the product in a location which does not meet the required specifications.

Feature	Value
Operating ambient temperature	0 - 40°C
Ambient temperature in storage and transport environment	- 15°C to +60°C
Installation site	Pollution degree 2 or better. Do not install the equipment in direct sunlight and in areas which may be subject to conductive powders, corrosive gases, vibrations and water jets and leaking, in case the IP rating does not provide for suitable protection. Do not install in saline environments.
Altitude	Up to 1000 m a.s.l.
Operating ambient humidity	5% to 95%, 1g/m ³ to 25g/m ³ , without condensation or ice formation (class 3k3 according to EN 50178).
Ambient humidity in storage environment	5% to 95%, 1g/m ³ to 25g/m ³ , without condensation or ice formation (class 1k3 according to EN 50178).
Ambient humidity during transport	Maximum 95%, up to 60g/m ³ , condensation may appear when the equipment is off (class 2k3 according to EN 50178).
Atmospheric pressure for operation and storage	86 to 106 kPa (class 3k3 and class 1k4 according to EN 50178).
Atmospheric pressure during transport	70 to 106 kPa (class 2k3 according to EN 50178).

6.2. Electrical specifications

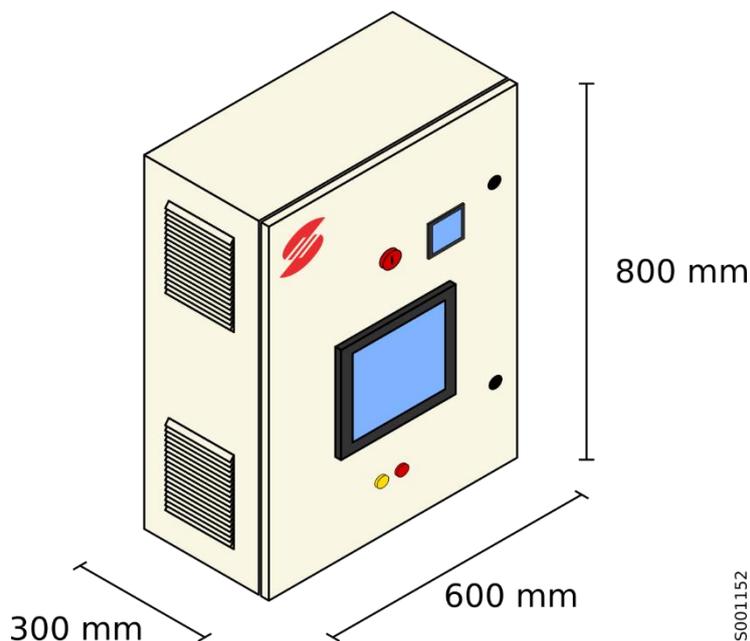
Feature	Value
Supply voltage	120 to 230 V _{AC} ±15% (100 to 264 V _{AC})
Frequency	50 Hz to 60 Hz
Rated current (I _n)	1.5 A
Terminal block X1 – Positions	2
Terminal block X1 – Cross-section	0.5 to 4 mm ²
Terminal block X2 – Positions	10

Terminal block X2 – Cross-section	0.5 to 2.5 mm ²
Terminal block X3 – Positions	40
Terminal block X3 – Cross-section	0.5 to 2.5 mm ²
Earth bar – holes diameter	M5
Power meter – voltage input fuse	2A, 38x10, 4 items (L1, L2, L3, N)
Power meter – power input fuse	0.8A, 38x10, 2 items (L, N)

6.3. Electric and communications interface

Electric and Communications Interface	
Power Meter interface	3 Voltage transformers and 2 Current transformers
Communications interface	10/100 Ethernet RJ 45 Modbus TCP/IP
Digital inputs (terminal block X3)	Compliant with IEC61113-2 24Vdc with internal power supply
Digital outputs (terminal block X3)	Compliant with IEC61113-2, voltage-free relay outputs, 24Vdc max 6A

6.4. Mechanical specifications



Feature	Value
Dimensions	600 x 800 x 300 mm (not including wall-mount brackets) 600 x 870 x 300 mm (including wall-mount brackets)

Weight	45 kg
Degree of protection	IP44
Colour	RAL7035, orange peel. Phosphate conversion coating followed by epoxy polyester powder coating.
Main switch – lock holes	3
Main switch – lock diameter	5 to 8 mm