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INSTRUCTION MANUAL FOR THE INSTALLER

UNO-2.0-I-W / UNO-2.5-I-W

TRANSLATION OF THE ORIGINAL INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions that must be followed during installation and maintenance of the equipment.

SAVE THESE INSTRUCTIONS!

This manual must be considered as an integral part of the equipment, and must be available at all times to everyone who interacts with the equipment. The manual must always accompany the equipment, even when it is transferred to another user.

Operators are under an obligation to read this manual and strictly follow the instructions given in it, because ***Power-One*** cannot be held responsible for damage caused to people or property, or for damage to the equipment, if the conditions described below are not complied with.

The customer is under an obligation to keep the industrial secret, and therefore the following documentation and its annexes non may not be tampered with or modified, reproduced or transferred to third parties, without the authorization of ***Power-One***.

—1 - Introduction and general information

Conditions of warranty and supply

Warranty conditions **are described in an appropriate certificate supplied with the equipment**. Moreover, the warranty conditions are understood to be valid if the Client observes what is described in this manual; any conditions deviating from those described below must be explicitly agreed upon in the purchase order.

Power-one declares that the tool complies with legal provisions in force in the European Economic Community and releases statements of compliance (may be consulted on the www.power-one.com website or by sending a request to Service Power-One).

Exclusions from the supply

Power-one declines any responsibility in case standards for correct installation are not adhered to and it is not liable for systems upstream or downstream of the equipment supplied by it.
It is absolutely prohibited to make modifications to the equipment.
The Customer is entirely responsible for any modifications made to the system.

It is not possible to provide the multitudes of installations and environments in which the tool will be installed; for this it is necessary to checked for: adequate spaces, adapted to accept the tool; air noise produced as a function of the environment; any conditions of flammability.

Power-one CANNOT be held responsible for defects or malfunctions as a result of: improper use of the tool; alterations due to transportation or special environmental conditions; lack of or improper maintenance; tampering or poor repairs; use or installation done by non-qualified people.

Power-one CANNOT be held responsible for disposal of: displays, cables, batteries, accumulators etc. It is necessary that the Client provides, according to standards in force in the country of installation, disposal of such substances that are potentially harmful to the environment.

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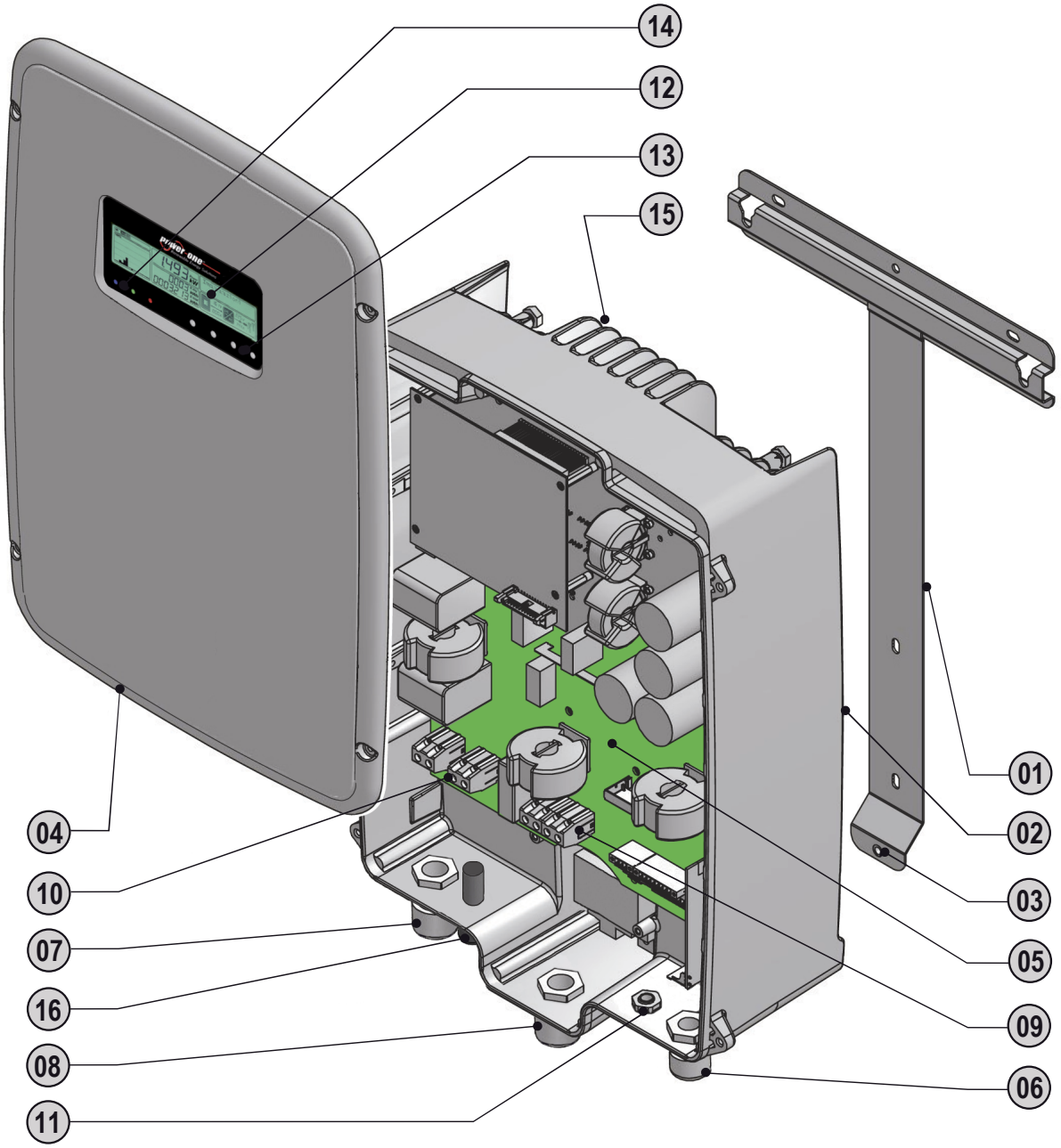
Reference number index

01, bracket
02, inverter
03, locking screw
04, front cover
05, mainboard
06, utility cable glands
07, DC cable gland
08, AC cable gland
09, AC output terminal block
10, DC input terminal block
11, anti-condensation valve
12, display
13, keyboard
14, LED panel
15, dissipator
16 fuse holder

Visual representation of the references



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The document and who it is for

Purpose and structure of the document

This operating and maintenance manual is a valid guide that will enable you to work safely and carry out the operations necessary for keeping the equipment in good working order.

The document was originally written in ITALIAN; therefore, in the event of inconsistencies or doubts please ask the manufacturer for the original document.

List of annexes

In addition to this operating and maintenance manual, (if applicable or on request) the following attached documentation are available:
- declaration of conformity
- quick installation guide
- warranty

WARNING: Part of the information given in this document is taken from the original documents of the suppliers. This document contains only the information considered necessary for the use and routine maintenance of the equipment.

Staff characteristics

The customer must make sure the operator has the necessary skill and training to do his/her job. Staff in charge of using and maintaining the equipment must be skilled, aware and mature for the described tasks and must have the reliability to correctly interpret what is described in the manual.

For Safety reason only a qualified electrician, who has received training and / or has demostrated skills and knowledge in construction and in operation of this unit, can install this inverter.

The installation is done by qualified installers and/or licensed electrician according to the applicable local code regulations

The employment of a person who is NOT qualified, is drunk or on narcotics, has a prosthetic mitral valve or a pacemaker is strictly forbidden.

The customer is civilly liable for the qualification and mental or physical condition of the persons who interact with the equipment. They must always use the personal protective equipment provided for by the laws of the country of destination and whatever is provided by their employer.

Reference regulations

The reference standards complied with in the design and manufacture of the equipment are described below.

• **2006/95/EC** Low-voltage directive (ex 73/23/EEC).

• **2004/108/EC** Electromagnetic Compatibility Directive, Italian Legislative Decree D.Lgs. 6/11/2007 no. 194 (ex 89/336/EEC).

• **EN 50178:1997** Electronic equipment for use in power installations

• **IEC EN 62109-1: 2011** Safety of power converters for use in photovoltaic power systems. Part 1: General requirements.

• **EN 61000-6-2:2005** Generic standards - Immunity for industrial environments

• **EN 61000-6-3:2007** Generic standards - Emission standard for residential, commercial and light-industrial environments

• **EN 61000-3-12:2005** Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and <= 75 A per phase

• **EN 61000-3-11:2000** Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current <= 75 A and subject to conditional connection

• **AS/NZS 3100:2009** Approval and test specification – General requirements for electrical equipment

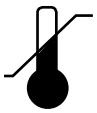
• **AS/NZS 60950.1:2011** Information technology equipment - Safety Part 1: General requirements

• **ISO 9001:2008** Quality management systems - Requirements .

Symbols and signs

Table: Symbols

In the manual and/or in some cases on the equipment, the danger or hazard zones are indicated with signs, labels, symbols or icons.

	This points out that it is mandatory to consult the manual or original document, which must be available for future use and must not be damaged in any way.
	**Generic hazard** - Important safety information. This points out operations or situations in which staff must be very careful.
	**Hazardous voltage** - This points out operations or situations in which staff must be very careful due to hazardous voltage.
	**Hot parts** - This points out a hazard due to the presence of heated areas or in any case areas that have hot parts (danger of burns).
	This points out that the examined area must not be entered or that the described operation must not be carried out.
	This points out that the equipment must not be worked on by anyone with a pacemaker, prosthetic mitral valve or prosthesis with electronic circuits.
	This points out that it is mandatory to carry out the described operations using the clothing and/or personal protective equipment provided by the employer.
	This indicates the degree of protection of the equipment according to IEC standard 70-1 (EN 60529 June 1997).
	Point of connection for grounding protection.
	This indicates the allowed temperature range
	This indicates the risk of electric shock. Time need to discharge stored energy: 5/10 minutes
	Respectively direct current and alternating current
	Isolating transformer present or not present
	Positive pole and negative pole of the input voltage (DC)
	This indicates the centre of gravity of the equipment.

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Field of use, general conditions

Power-One accepts no liability for damage of any kind that could arise from incorrect or careless operations.

The equipment must not be used for any purpose other than its intended field of use. The equipment MUST NOT be used by inexperienced staff, or even experienced staff if carrying out operations on the equipment that fail to comply with the indications in this manual and attached documents.

Intended or allowed use

This equipment is a multistring inverter designed to:
transform a direct current (DC)
from a rectifier for use on wind turbines
into an alternating current (AC)
suitable to be fed into the public distribution grid.

Limits of the field of use

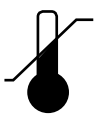
The operating current dispersed during normal operation must not exceed the limits indicated in the technical specifications.
Only one **rectifier for use on wind turbines** ***can be connected to the inverter input (do not connect batteries or other power sources).***
The inverter can be connected to the distribution grid in qualified countries only.
The inverter can only be used only if all the technical characteristics are observed.

Improper or disallowed use

IT IS STRICTLY FORBIDDEN TO:

- ***Install the equipment in environments with particular fire risk or with adverse or inappropriate environmental conditions (temperature and humidity).***
- ***Use the equipment with safety devices not working or disabled.***
- ***Use the equipment or parts of the equipment by connecting it to other machinery or equipment, unless expressly foreseen.***

- ***Modify the operating parameters that are not accessible to the operator and/or parts of the equipment to vary the performance or change its isolation.***



- ***Clean the equipment with corrosive products that may corrode parts or generate electrostatic charges.***
- ***Use or install the equipment or parts of it without having read and correctly understood the contents of the operating and maintenance manual.***

- ***Warm or dry rags and clothes on parts with a raised temperature. In addition to being dangerous, doing so would compromise component ventilation and cooling.***

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2 - Characteristics

General conditions

The description of the characteristics of the equipment allows its main components to be identified, to refine the technical terminology used in the manual.

The Characteristics chapter contains information about the models, the composition of the equipment, the characteristics and technical data, the overall dimensions and the identification of the equipment.

This manual should be read in chronological order as established by the manufacturer and the reader assumes responsibility for failure to do so. All the information is given considering each time that the information of the preceding chapters has been acknowledged.

In some cases, there may be a need to separately document the operation of the software or attach supplementary documentation to this manual for more qualified professional persons.

Models and range of equipment

The specific models of inverter that this manual deals with are divided into two groups according to their maximum output power (2 kW or 2.5 kW).

The choice of inverter model must be made by a qualified technician who knows about the installation conditions, the devices that will be installed outside the inverter and possible integration with an existing system.

• 2.0 kW Single-phase MODELS
UNO-2.0-I-OUTD-W: Universal Standard Version
UNO-2.0-I-OUTD-US-W: US Version

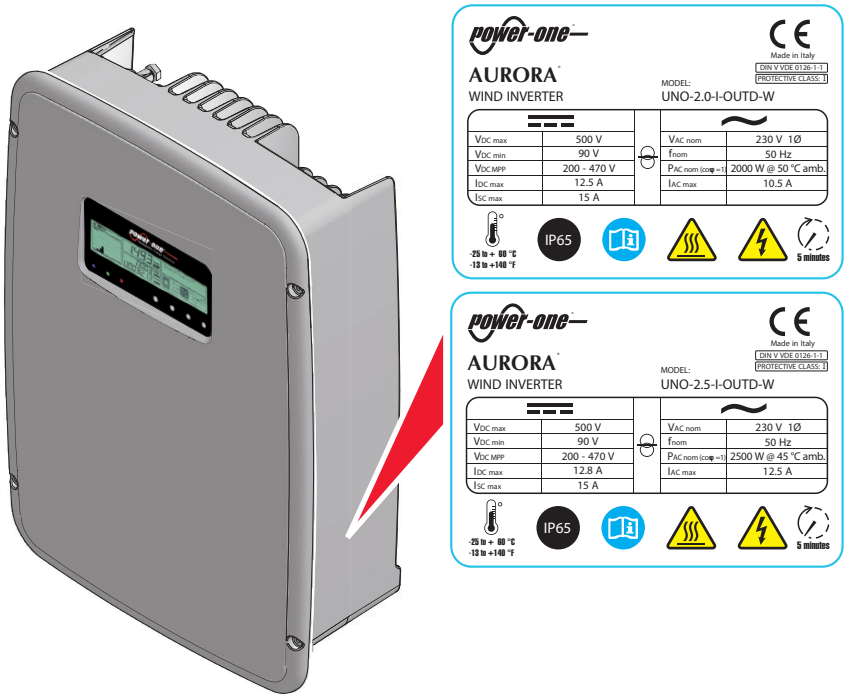
• 2.5 kW Single-phase MODELS
UNO-2.5-I-OUTD-W: Universal Standard Version
UNO-2.5-I-OUTD-US-W: US Version

Identification of the equipment and manufacturer

The technical data provided in this manual does not substitute the data supplied on
the plates affixed to the equipment.

The plates affixed to the equipment must NOT be removed, damaged, stained, hidden, etc., for any reason whatsoever.

N.B. The plates must NOT be hidden by external objects and parts (rags, boxes, equipment, etc.); they must be cleaned periodically and must always be visible.



Characteristics and technical data

Table: Technical Data	UNO-2.0-I-OUTD-W	UNO-2.5-I-OUTD-W
Input		
Absolute Maximum DC Input Voltage (Vmax,abs)	500 V	
Operating DC Input Voltage Range (Vdcmin...Vdcmax)	90...500 V	
Input Voltage Range at Full Power (Vpf,min...Vpf,max)	200...470 V	
DC Power Limitation	Power limitation at 12.5 Amax for 90 V≤Vdc≤200 V Derating from MAX to Null [470V≤Vdc≤500V]	Power limitation at 12.8 Amax for 90 V≤Vdc≤200 V Derating from MAX to Null [470V≤Vdc≤500V]
Maximum DC Input Current (Idcmax)	12.5 A	12.8 A
Maximum Input Short Circuit Current	15.0 A	
DC Connection Type	Screw terminal block Cable gland	
Input Protection		
Reverse Polarity Protection	No	
Input Over Voltage Protection - Varistor	2	
Isolation Control	According to local standard	
Output Side		
AC Grid Connection Type	Single phase	
Rated AC Power (Pacr)	2000 W	2500 W
Maximum AC Output Power (Pacmax)	2200 W (4)	2750 W (5)
Rated AC Grid Voltage (Vacr)	230 V	
AC Voltage Range	180...264 V (1)	
Maximum AC Output Current (Iac,max)	10.0 A	12.0 A
Rated Output Frequency (fr)	50 Hz	
Output Frequency Range (fmin...fmax)	47...53 Hz (2)	
Nominal Power Factor (Cosphiac,r)	> 0.990	
Total Current Harmonic Distortion	< 2%	
AC Connection Type	Screw terminal block	
Output Protection		
Anti-Islanding Protection	According to local standard	
Maximum AC Overcurrent Protection	15.0 A	
Output Overvoltage Protection - Varistor	2 (L - N / L - PE)	
Operating Performance		
Maximum Efficiency (ηmax)	96.3%	
Stand-by Consumption	< 8.0 W (3)	
Communication		
Wired Local Monitoring	PVI-USB-RS485_232 (opt.), PVI-DESKTOP (opt.)	
Remote Monitoring	PVI-AEC-EVO (opt.), AURORA-UNIVERSAL (opt.)	
Wireless Local Monitoring	PVI-DESKTOP (opt.) with PVI-RADIOMODULE (opt.)	
User Interface	Graphic display	
Environmental		
Ambient Temperature Range	-25...+60°C (-13...+ 140°F) with derating above 50°C (122°F)	-25...+60°C (-13...+ 140°F) with derating above 45°C (113°F)
Noise Emission	< 50 db(A) @ 1 m	
Maximum Operating Altitude without Derating	2000 m / 6560 ft	

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Table: Technical Data	UNO-2.0-I-OUTD-W	UNO-2.5-I-OUTD-W
Physical		
Environmental Protection Rating	IP 65	
Cooling	Natural	
Dimensions (H x W x D)	518mm x 367mm x 161mm / 20.4” x 14.4” x 6.3”	
Weight	< 17 kg / 37.4 lb	
Safety		
Isolation Level	High frequency transformer	
Marking	CE	
Safety and EMC Standard	EN 50178, AS/NZS3100, AS/NZS 60950, EN61000-6-1, EN61000-6-3, EN61000-3-11, EN61000-3-12	
Grid Standard	Enel Guideline (CEI 0-21 + Attachment A70 Terna)[6], VDE 0126-1-1, VDE-AR-N 4105[7], G83/1, EN 50438, RD1663, AS 4777	
Available Product Variants		
Standard	UNO-2.0-I-OUTD-W	UNO-2.5-I-OUTD-W

Table: Technical Data	UNO-2.0-I-OUTD-US-W			UNO-2.5-I-OUTD-US-W		
Input						
Absolute Maximum DC Input Voltage (Vmax,abs)	500 V					
Operating DC Input Voltage Range (Vdcmin... Vdcmax)	90...500 V					
Input Voltage Range at Full Power (Vfp,min... Vfp,max)	200...470 V					
DC Power Limitation	Power limitation at 12.5 Amax for 90 V≤Vdc≤200 V Derating from MAX to Null [470V≤Vdc≤500V]			Power limitation at 12.8 Amax for 90 V≤Vdc≤200 V Derating from MAX to Null [470V≤Vdc≤500V]		
Maximum DC Input Current (Idcmax)	12.5 A			12.8 A		
Maximum Input Short Circuit Current	15.0 A					
DC Connection Type	Screw terminal block Cable gland					
Input Protection						
Reverse Polarity Protection	No					
Input Over Voltage Protection - Varistor	2					
Isolation Control	According to local standard					
Output Side	**208 V**	**240 V**	**277 V**	**208 V**	**240 V**	**277 V**
AC Grid Connection Type	Single phase / Split phase					
Rated AC Power (Pacr)		2000 W			2500 W	
Maximum AC Output Power (Pacmax)		2200 W			2750 W	
Rated AC Grid Voltage (Vacr)	208 V	240 V	277 V	208 V	240 V	277 V
AC Voltage Range	183...228 V	211...264 V	244...304 V	183...228 V	211...264 V	244...304 V
Maximum AC Output Current (Iac,max)	10.0 A	10.0 A	9.0 A	12.0 A	12.0 A	10.5 A
Rated Output Frequency (fr)	60 Hz					
Output Frequency Range (fmin...fmax)	59.3...60.5 Hz[2]					
Nominal Power Factor (Cosphiac,r)	> 0.990					
Total Current Harmonic Distortion	< 2%					
AC Connection Type	Screw terminal block					

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Table: Technical Data	UNO-2.0-I-OUTD-US-W			UNO-2.5-I-OUTD-US-W		
Output Protection	**208 V**	**240 V**	**277 V**	**208 V**	**240 V**	**277 V**
Anti-Islanding Protection	According to local standard					
Maximum AC Overcurrent Protection	15.0 A	15.0 A	12.0 A		15.0 A	
Output Overvoltage Protection - Varistor	2 (L_1 - L_2 / L_1 - PE)					
Operating Performance						
Maximum Efficiency (ηmax)	96.3%					
Stand-by Consumption	< 8.0 W(3)					
Communication						
Wired Local Monitoring	PVI-USB-RS485_232 (opt.), PVI-DESKTOP (opt.)					
Remote Monitoring	PVI-AEC-EVO (opt.), AURORA-UNIVERSAL (opt.)					
Wireless Local Monitoring	PVI-DESKTOP (opt.) with PVI-RADIOMODULE (opt.)					
User Interface	Graphic display					
Environmental						
Ambient Temperature Range	-25...+60°C (-13...+ 140°F) with derating above 50°C (122°F)			-25...+60°C (-13...+ 140°F) with derating above 45 (113°F)		
Noise Emission	< 50 dB(A) @ 1 m					
Maximum Operating Altitude without Derating	2000 m / 6560 ft					
Physical						
Environmental Protection Rating	NEMA 4X					
Cooling	Natural					
Dimensions (H x W x D)	518mm x 367mm x 161mm / 20.4” x 14.4” x 6.3”					
Weight	< 17 kg / 37.4 lb					
Safety						
Isolation Level	High frequency transformer					
Marking	cCSAus					
Safety and EMC Standard	UL 1741, CSA - C22.2 N. 107.1-01					
Grid Standard	IEEE 1547 and Hawaii variant					
Available Product Variants						
Standard	UNO-2.0-I-OUTD-US-W			UNO-2.5-I-OUTD-US-W		

1. The AC voltage range may vary depending on the specific country grid standard
2. The Frequency range may vary depending on the specific country grid standard
3. Consumption in Sleep Mode < 0.6W
4. Limited to 2000 W for Germany
5. Limited to 2500 W for Germany
6. From the dates of application, restricted to systems ≤3kW
7. Restricted to systems ≤3.68kVA

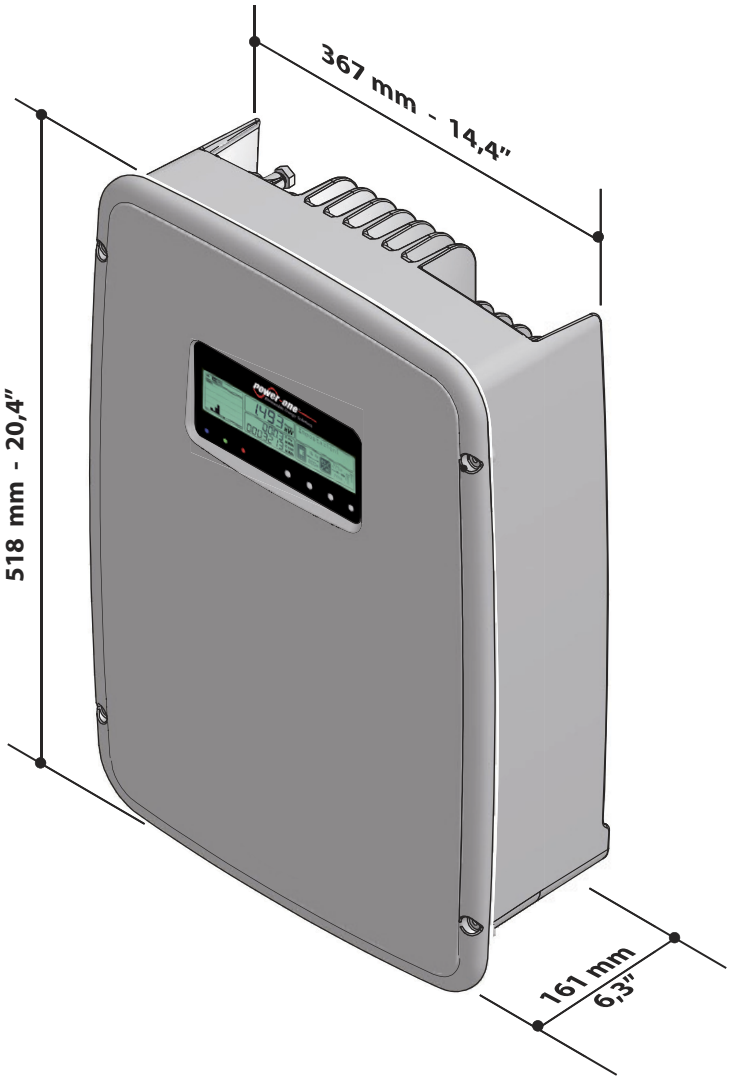
Tightening torques

To maintain the IP65 protection of the system and for optimal installation, the following tightening torques must be used:

Front cover screws **04**	**2.2 Nm**
AC cable gland **08** M25	**5.0 Nm**
Service cable glands **06** M20	**2.7 Nm**
AC output terminal block**09** 6 mm^2	**1.5 Nm**
Signals terminal blocks	**0.25 Nm**
DC Input terminal block **10**	**1.5 Nm**
DC cable gland **07** M25	**5.0 Nm**

Overall dimensions

The overall dimensions are expressed in millimetres and inches.



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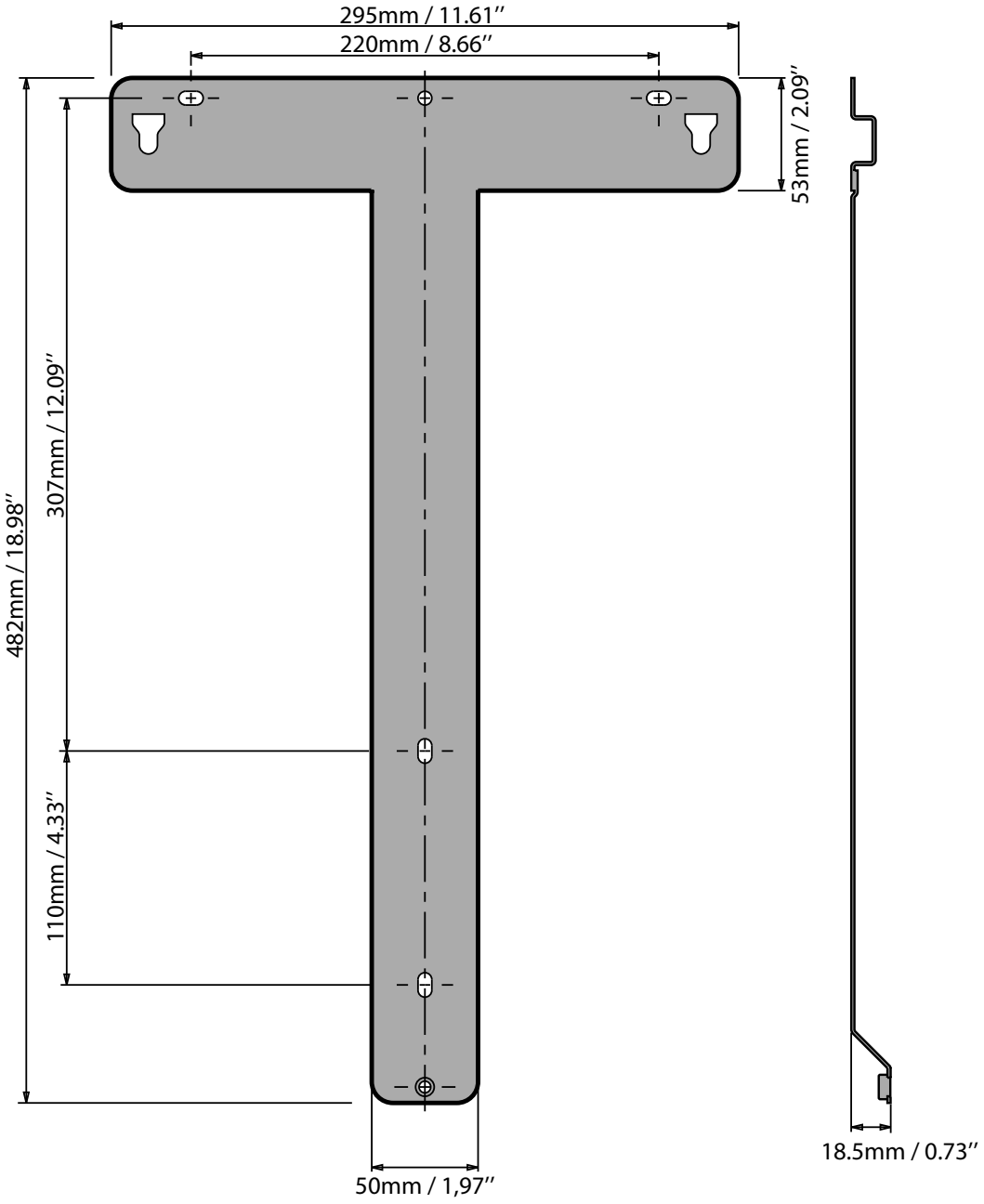
Bracket dimensions

The overall dimensions are expressed in millimetres and inches.

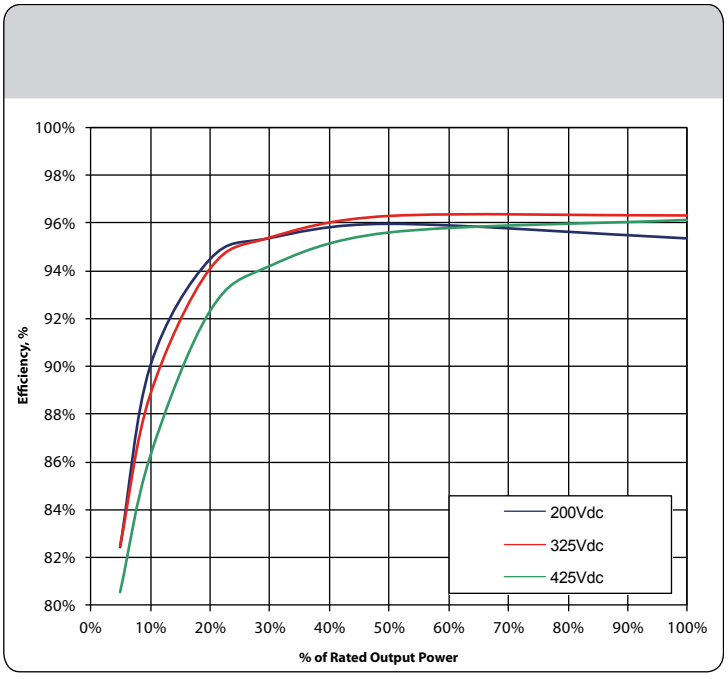


Efficiency curves

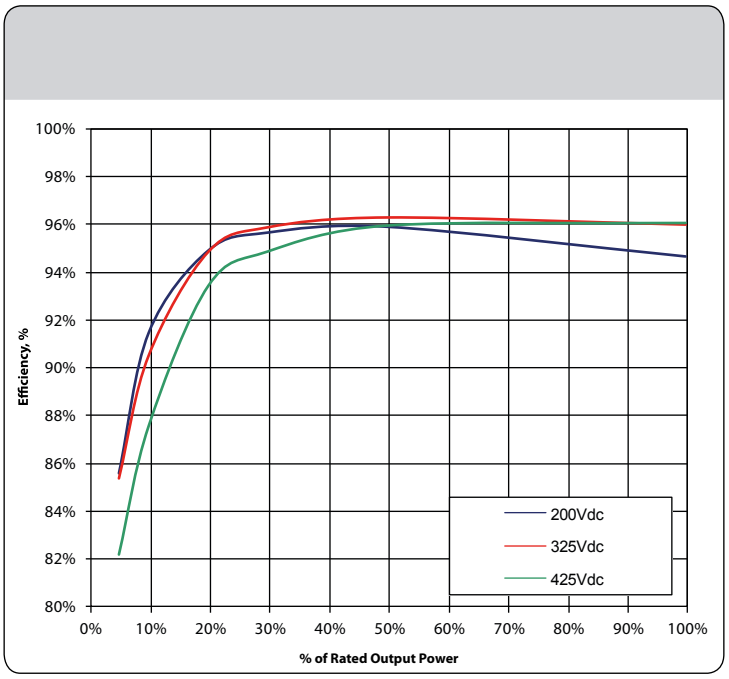
The equipment was designed in compliance with energy saving standards, to avoid waste and unnecessary leakage.
The manufacturer has taken into due consideration the current energy saving standards in Italy.
Graphs of the efficiency curves of all models of inverter described in this manual are shown below.

The efficiency curves are linked to technical parameters that are continually being developed and improved and should therefore be considered approximate.

UNO-2.0-I-OUTD-W
UNO-2.0-I-OUTD-US-W



UNO-2.5-I-OUTD-W
UNO-2.5-I-OUTD-US-W



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Power Derating

In order to allow inverter operation in safe thermal and electrical conditions, the unit automatically reduces the value of the power fed into the grid.
Power derating can take place due to adverse environmental conditions or due to unsuitable input voltage values.

The conditions for power reduction due to environmental conditions and input voltage can also occur at the same time, but the power reduction will always relate to the lower value measured.

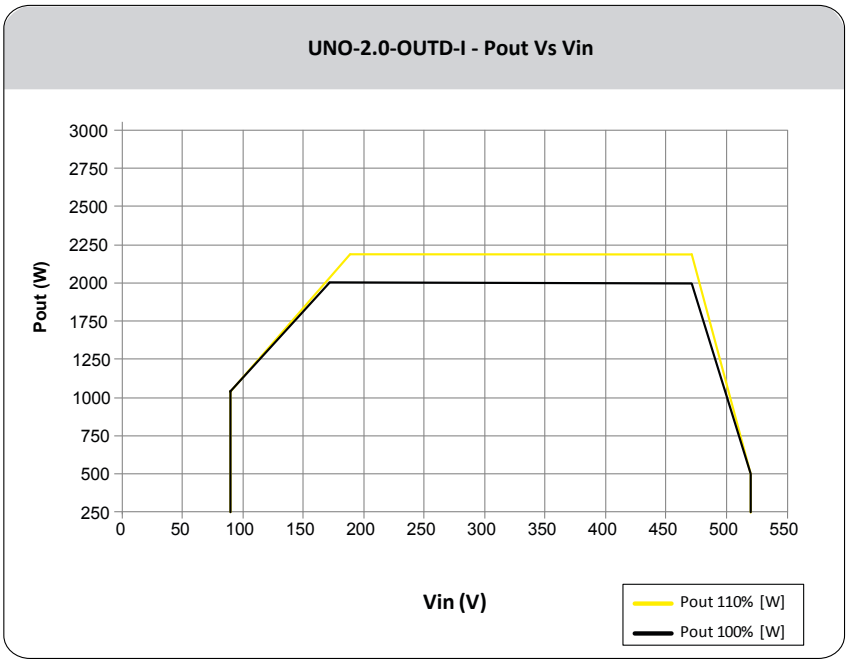
Power reduction due to environmental conditions

The power reduction value and the inverter temperature at which it occurs depend on the ambient temperature and on many operating parameters. Example: input voltage, grid voltage and power available from the photovoltaic field.
The inverter can therefore reduce the power during certain periods of the day according to the value of these parameters.

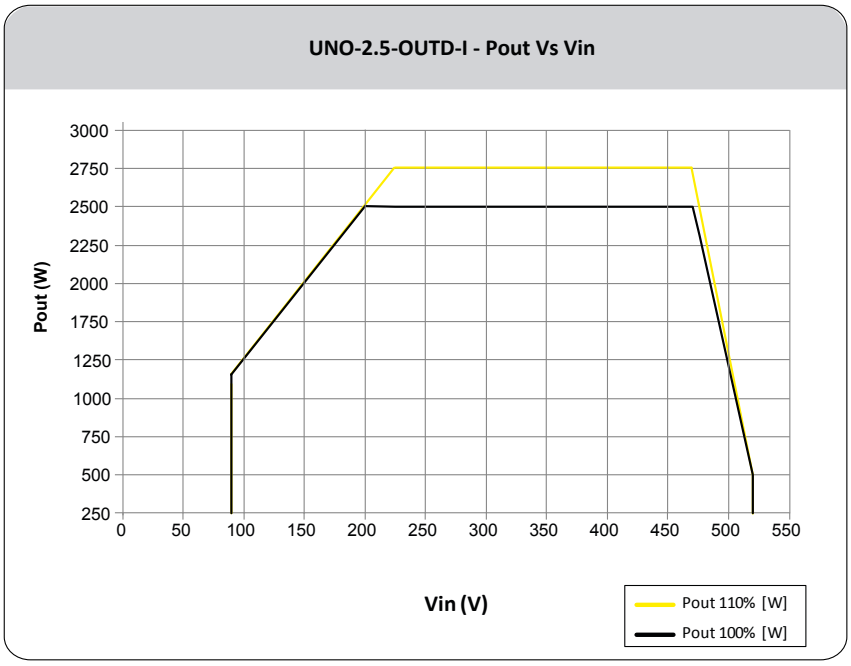
Power reduction due to the input voltage

The graphs show the automatic reduction of supplied power when input voltage values are too high or too low.

UNO-2.0-I-OUTD-W
UNO-2.0-I-OUTD-US-W

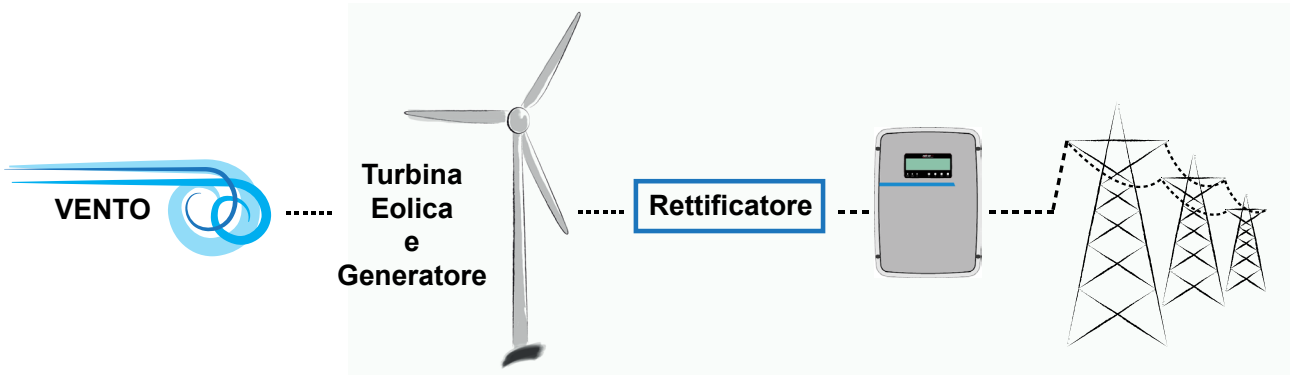


UNO-2.5-I-OUTD-W
UNO-2.5-I-OUTD-US-W



Wind power system characteristics

A wind power system is a set of components (hydraulic, mechanical and electrical) which combine to convert wind energy into a directly usable energy form. In Wind Electric Conversion Systems (WECS), wind energy is converted into electricity with a conversion system known as a Wind Turbine Generator.



A WECS for Mini and Micro wind power systems normally comprises:

- **Wind Turbine**

A hydrodynamic device which converts wind energy into mechanical energy. The turbine is equipped with a number of blades (usually 2 or 3) coupled to a driveshaft. This can either be horizontal or vertical: these configurations are referred to as HAWT (Horizontal Axis Wind Turbine) and VAWT (Vertical Axis Wind Turbine).

- **Generator**

The generator converts the mechanical power furnished by the turbine into electricity. Mini wind power systems normally use a synchronous permanent magnet generator (PMG). The voltage produced by the PMG has an amplitude and frequency that depends on the rotational speed of the turbine. Thus, before being connected to the power distribution grid, this generated power must first be transformed to have a fixed amplitude and frequency compatible with the grid.

- **Rectifier**

The rectification unit rectifies and filters the alternating current (AC), thus producing a direct current (DC) output.

- **Inverter**

The conversion from direct current (DC) to alternating current (AC), compatible with grid standards, is efficiently carried out by the inverter.
When connected in parallel with the grid, the alternating current from the inverter flows directly into the domestic distribution circuit, which is in turn connected to the public distribution grid.

Equipment functions and components

Data transmission and control
The inverter, or a network of several inverters, can also be monitored remotely through an advanced communications system based on an RS-485 serial interface. The range of optional Power-One devices that can be connected to this communication line allow the device to be monitored locally or remotely via internet access.
In addition, and again as an option, it is possible to use a radio monitoring system by installing the “PVI-Radiomodule” radio board on the inverter itself in order to have a remote data visualization terminal with a wireless connection.

Radio module
The radio module board is an accessory that is used to add a radio communication line to the inverter. It can be used in parallel to the RS-485 line for data transmission to the monitoring device.

Configurable Relays
The inverter has a configurable switching relay that can be used in various working configurations that are set using a dedicated menu. A typical example of application is switching of the contact when an alarm is triggered.

Remote on/off switching
This command can be used to disconnect/connect the inverter to the grid via an external (remote) command.
This function must be enabled in the relevant menu and if it is operating, the connection of the inverter on the grid, besides being dictated by the presence of normal parameters, also depends on the external switching on/off control.

Input poles grounding
The inverter circuit type “isolated by a high-frequency transformer” allows one of the two DC input poles (positive or negative) to be grounded by means of special wiring located inside the inverter.
It is also possible to have both the input DC poles “floating” and as such not grounded.

Stand by Mode
This function allows the inverter to remain on and connected to the grid even with an input voltage of less than 70Vdc. It is particularly useful in conditions of low wind and when the wind is variable and would cause continuous connection and disconnection to the grid. Instead, with this function, the inverter starts to deliver power as soon as the input voltage exceeds 80 Vdc without having to repeat the grid connection sequence. The time during which the inverter remains in this state can be set by accessing the Settings menu and activating the time for Input Undervoltage Protection (TprotUV). If within the set time the conditions to export

power to the grid (i.e. Vin>80Vdc) do not occur again, the inverter disconnects from the grid and goes into SLEEP Mode.

Sleep Mode

This function turns the inverter off completely and the power absorption is reduced to a minimum (0.6W).
In this mode, the inverter allows display of the information available even in the absence of input voltage and therefore in the absence of sufficient wind. In fact, the display can be “woken up” by pressing any button on the display, except for ESC.
After 30 seconds of inactivity the display will once again switch off automatically.

Topographic diagram of the equipment

This diagram summarises inverter operation.
The main blocks are the DC-DC input converter (called "booster") and the DC-AC output inverter. Both work at a high switching frequency, which means they are small and relatively light.
This inverter is equipped with a high frequency transformer, that is to say with galvanic isolation of the primary (DC side) from the secondary (AC side), while maintaining very high performance in terms of energy yield and exportation. This type of circuit allows for grounding of the inputs, both positive and negative, where required by the solar panel type used or by the rules in the country of installation.
Thanks to the high efficiency and the large heat dissipation system, operation at maximum power is guaranteed over a wide range of ambient temperatures without the use of external cooling fans.
The inverter is controlled by two independent DSPs (Digital Signal Processors) and a central microprocessor.
Connection to the power grid is thus kept under control by two independent monitors, in full compliance with electrical standards both regarding power supply to the systems and regarding safety.
The inverter is already equipped with all the protections necessary for safe operation and compliance with the standards.

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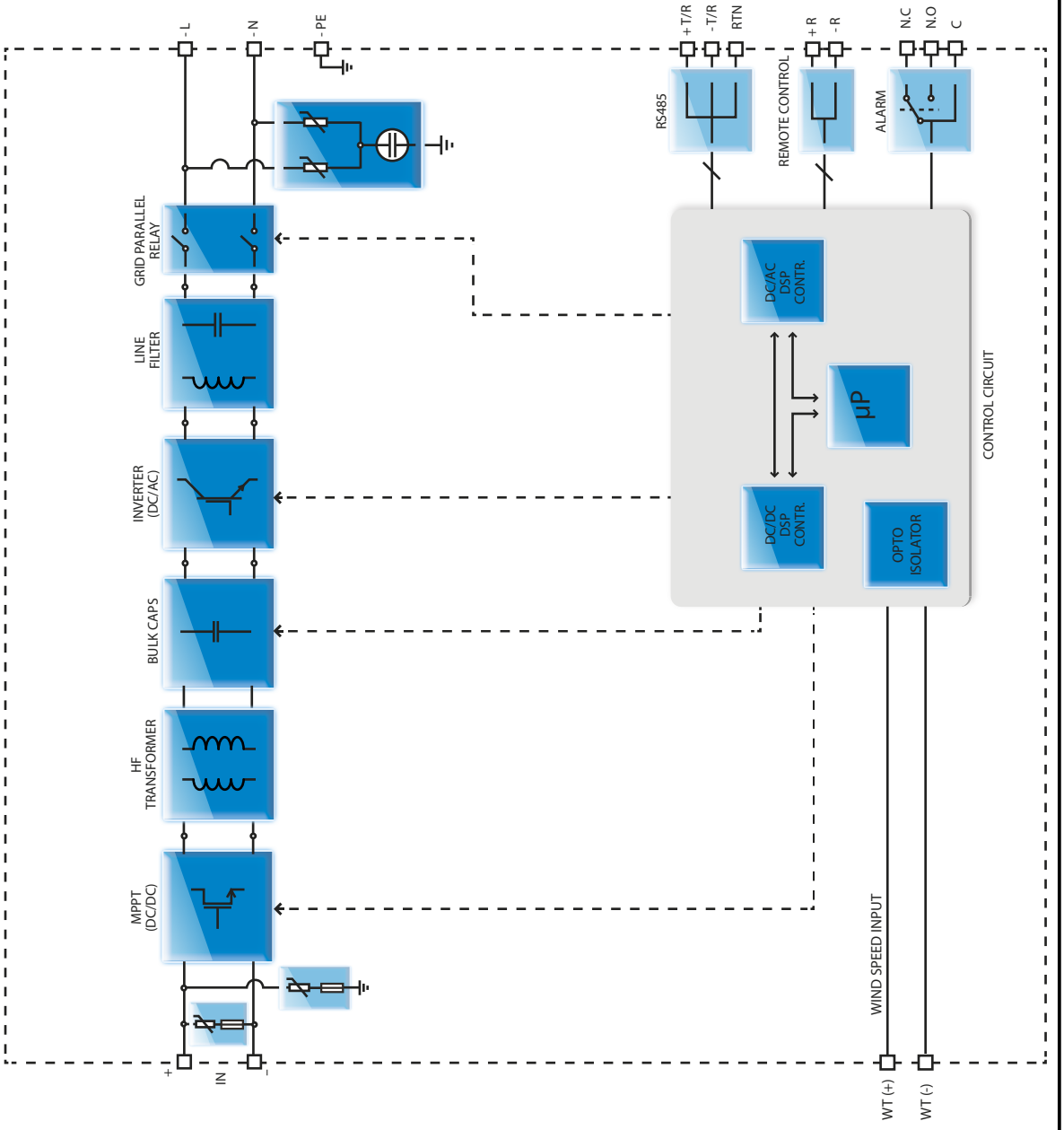
BLOCK DIAGRAM OF UNO-2.0-I-W AND UNO-2.5-I-W



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Safeguards

Anti-Islanding

In the event of a local grid outage by the electricity company, or when the equipment is switched off for maintenance operations, the inverter must be physically disconnected safely, to ensure protection of people working on the grid, all in accordance with related national standards and laws. To prevent possible off-grid operation, the inverter has an automatic protective disconnection system called “Anti-Islanding”.

Ground fault in the wind turbine

The WIND version of the UNO inverter envisages various DC input grounding configurations, in particular:

“Negative Ground” or “Positive Ground” operation
The safeguarding circuit monitors the grounding connection of the positive or negative terminal constantly (see the paragraph “Grounding configuration of DC inputs” for further details). If the leakage current is higher than 900mA (non-modifiable default value) the red LED on the GFI display lights up, but the inverter continues to export energy to the grid. If the current is sufficient to trip the fuse (1A), a message indicating “GFI fuse Open” will be notified in the events log and the inverter will disconnect from the grid.

“Floating” operation
The safeguard circuit is disabled. The inverter shows the “Sys. Ungrounded” message on the display. Even in the case of high leakage the inverter will continue to export energy to the grid.

Other safeguards

The inverter is equipped with additional safeguards to ensure safe operation in any circumstance. These safeguards include:
- Constant monitoring of grid voltage to ensure that voltage and frequency values remain within operating limits;
- Internal temperature control to automatically limit the power when necessary to ensure that the unit does not overheat (derating).

The numerous control systems determine a redundant structure to ensure safe operation.

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3 - Safety and accident prevention

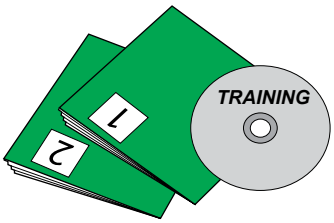
Safety instructions and general information

The equipment has been manufactured in accordance with the strictest accident-prevention regulations and supplied with safety devices suitable for the protection of components and operators.

For obvious reasons, it is not possible to anticipate the great number of installations and environments in which the equipment will be installed; it is therefore necessary for the customer to appropriately inform the manufacturer about particular installation conditions.

Power-one accepts no liability for failure to comply with the instructions for correct installation are cannot be held responsible for the systems upstream or downstream of the equipment it has supplied.

It is essential to provide operators with correct information. They must therefore read and comply with the technical information given in the manual and in the attached documentation.



The instructions given in the manual do not replace the safety devices and technical data for installation and operation stuck on the product, and they certainly do not replace the safety regulations in force in the country of installation and common sense rules.
The manufacturer is willing to train staff, at its premises or on site, in accordance with conditions to be set out in the contract.

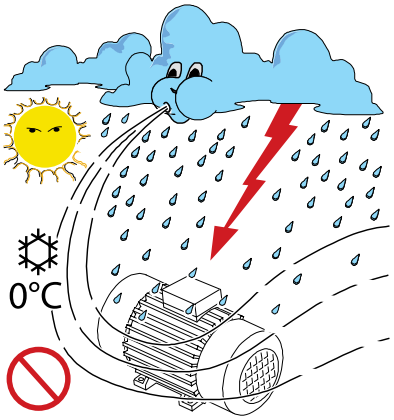
Do not use the equipment if you find any operating anomalies.

Avoid temporary repairs. All repairs should be carried out using only genuine spare parts, which must be installed in accordance with their intended use.

Liabilities arising from commercial components are delegated to the respective manufacturers.

Hazardous areas and operations

Environmental conditions and risks

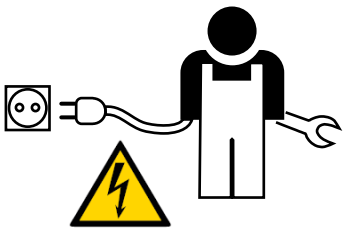


The equipment can be installed outdoors, but only in environmental conditions that do not prevent its regular operation. These conditions are reported on the thecnical data and on installation chapter.

Power-One CANNOT be held responsible for disposal of the equipment: displays, cables, batteries, accumulators, etc., and therefore the customer must dispose of these substances, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.

The same precautions should be adopted for dismantling the equipment.

The equipment is not equipped to operate in environments that have particular flammability or explosive conditions.



The customer and/or installer must appropriately train operators or anyone who may come near the equipment, and highlight, if necessary with notices or other means, the hazardous areas or operations at risk if required: ***magnetic fields, hazardous voltages, high temperatures, possibility of discharges, generic hazard, etc.***

Signs and Labels

The labels attached to the equipment must absolutely NOT be removed, damaged, dirtied, hidden, etc.

The labels must be cleaned regularly and kept visible at all times, that is, they must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.)
The technical data shown in this manual do not in any case replace those shown on the labels attached to the equipment.

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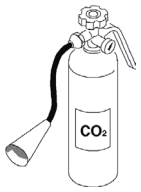
Thermal hazard

WARNING: removal of guards or covers is allowed only **10 minutes after the voltage has been removed**; ; this is to let components cool down and allow any electrostatic charges and parasitic voltages to be discharged.

When the equipment has just been switched, it may have hot parts, as a result of overheating of the surfaces at temperature (e.g.: transformers, accumulators, coils, etc.) so be careful where you touch.



In the event of fire, use CO_2 foam extinguishers and use auto extraction systems to fight fire in closed environments.

Clothing and protective devices for staff

Power-One has eliminated sharp edges and corners, but in some cases it is not possible to do anything, and we therefore advise wearing the clothing and personal protective devices provided by the employer.

Staff must not wear clothes or accessories that can start fires or generate electrostatic charges or, in gener, clothing that can impede personal safety.

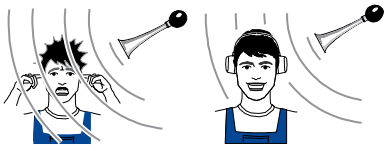
All operations on the equipment should be performed with suitably insulated clothes and instruments.
E.g.: Insulated gloves (class 0, category RC)

Maintenance operations must be carried out with the equipment disconnected from the grid and from the photovoltaic generator.

Staff must NOT go near the equipment with bare feet or wet hands.

The maintenance technician must in any case make sure no one else can switch on or operate the equipment during the maintenance operations, and must report any anomaly or damage due to wear or ageing so that the correct safety conditions can be restored.

The installer or maintenance technician must always pay attention to the work environment, so that it is well lit and has sufficient spaces to ensure they have an escape route.



In the installation, consider or make sure the ***noise emitted based on the environment*** is not such that it exceeds thresholds allowed by law (less than 80 dBA).

Residual risks

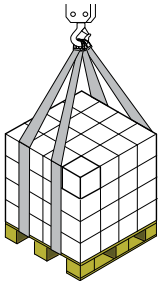
Despite the warnings and safety systems, there are still some residual risks that cannot be eliminated.
These risks are listed in the following table with some suggestions to prevent them.

Table of residual risks

RISK ANALYSIS AND DESCRIPTION	SUGGESTED REMEDY
Noise pollution due to installation in unsuitable environments or where staff work permanently.	Reassess the environment or the place of installation.
Suitable local ventilationthat does not cause overheating of the equipment and is sufficient not to create discomfort to people in the room.	Restore suitable ambient conditions and air the room.
External weather conditions, such as water seepage, low temperatures, high humidity, etc.	Maintain ambient conditions suitable for the system.
Overheating of surfaces at temperature (transformers, accumulators, coils, etc.) can cause burns. Also be careful not to block the cooling slits or systems of the equipment.	Use suitable protective equipment or wait for the parts to cool down before switching on the equipment.
Inadequate cleaning: compromises cooling and does not allow the safety labels to be read.	Clean the equipment, labels and work environment adequately.
Accumulation of electrostatic energy can generate hazardous discharges.	Ensure the devices have discharged their energy before working on them.
Inadequate training of staff.	Ask for a supplementary course.
During installation, temporarily mounting the equipment or its components may be risky.	Be careful about and disallow access to the installation area.
Accidental disconnections of the quick-fit connectors with the equipment in operation, or wrong connections, may generate electric arcs	Be careful about and disallow access to the installation area.

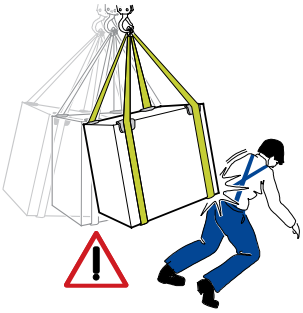
4 - Lifting and transport

General conditions



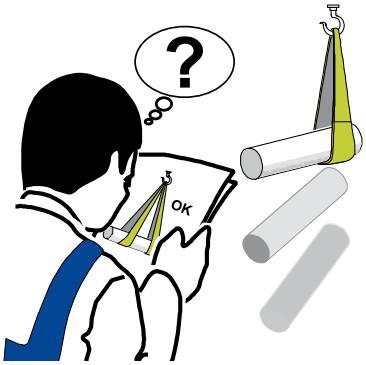
Some recommendation apply only to large size product or multiple small size packings.

Transport and handling



Transport of the equipment, especially by road, must be carried out with by suitable ways and means for protecting the components (in particular, the electronic components) from violent shocks, humidity, vibration, etc.
During handling, do not make any sudden or fast movements that can create dangerous swinging.

Lifting



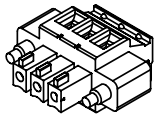
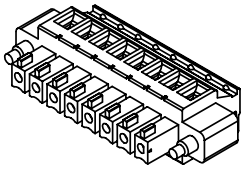
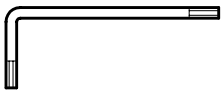
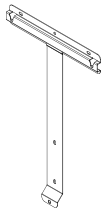
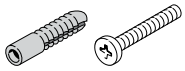
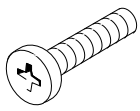
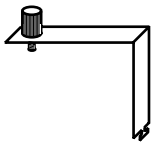
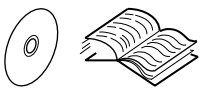
Power-One usually stores and protects individual components by suitable means to make their transport and subsequent handling easier, but as a rule it is necessary to turn to the experience of specialized staff in change of loading and unloading the components.
Where indicated and/or where there is a provision, eyebolts or handles, which can be used as anchorage points, are inserted and/or can be inserted.
The ropes and means used for lifting must be suitable for bearing the weight of the equipment.
Do not lift several units or or parts of the equipment at the same time, unless otherwise indicated.

Unpacking and checking

We remind you that the packaging elements (cardboard, cellophane, staples, adhesive tape, straps, etc.) may cause cuts and/or injuries if not handled with care. They should be removed by suitable means and not left in the hands of irresponsible people (e.g., children).
The components of the packaging must be disposed on in accordance with the regulations in force in the country of installation.
When you open the package, check that the equipment is undamaged and make sure all the components are present.
If you find any defects or damage, stop unpacking and consult the carrier, and also promptly inform the ***Service Power-One***.

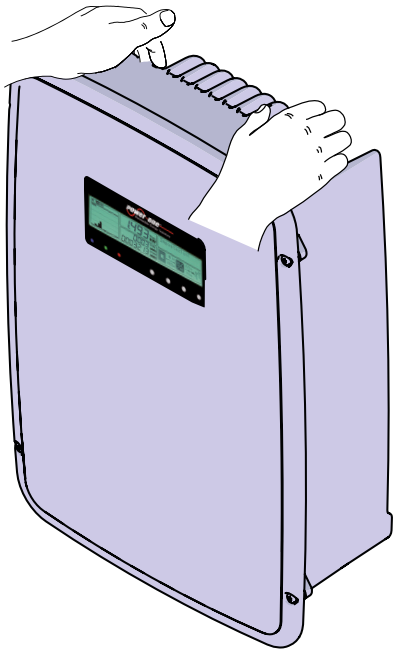
List of components supplied

Table: Components supplied with the equipment

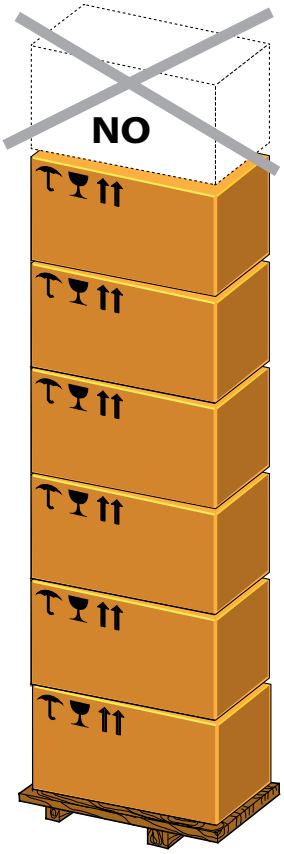
	Components available for all models	Quantity
	Connector for connection of the configurable relay	2
	Connector for connection of the communication and control signals	2
	Male key TORX TX25	1
	Two-hole gasket for M20 signal cable glands and cover	2 + 2
	Bracket for wall mounting	1
	Bolts and screws for wall mounting	3
	Lock screws **03** for fastening of the inverter to the bracket	1
	Bracket and screws for AC connector lead sealing	1
	User manual and CD-ROM	1

Equipment weight

Mass (weight in kg) UNO-2.0 / UNO-2.5: 17 kg
Lifting points: 2



If the packaging is stored correctly, it can withstand a **maximum load of 6 stacked devices.** DO NOT stack with equipment or products other than those indicated.



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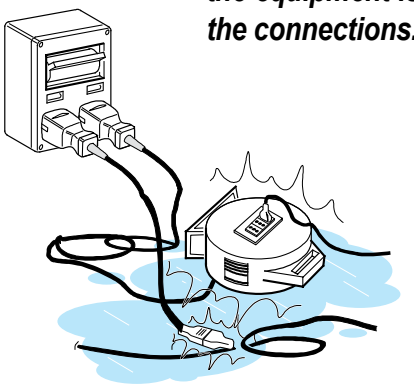
5 - Installation

General conditions

Installation of the equipment is carried out based on the system and the place in which the equipment is installed; therefore, its performance depends on the correctness of the connections.

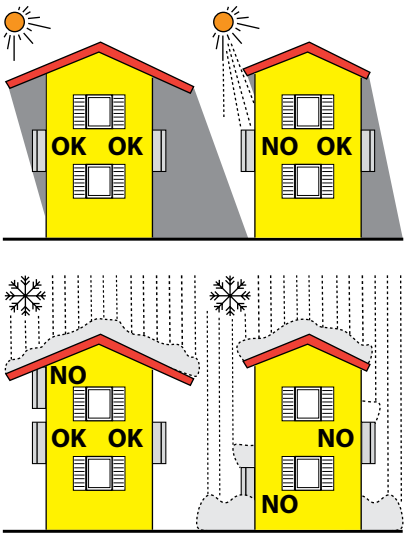


Staff authorised to carry out the installation must be specialised and experienced in this job; they must also have received suitable training on equipment of this type.

The operation must be carried out by specialised staff; it is in any case advisable to comply with what is written in this manual and adhere to the diagrams and attached documentation.

The installation must be carried out with the equipment disconnected from the grid and from the photovoltaic generator.

Environmental checks



• Consult the technical data to check the environmental conditions to observe (protection level, temperature, humidity, altitude, etc.)
• Do not expose to direct sunlight, in order to avoid unwanted power derating due to an increase in the inverter's internal temperature
• Do not install in small closed rooms where air cannot circulate freely
• Always ensure that the flow of air around the inverter is not blocked so as to prevent overheating.
• Do not install in places where gases or flammable substances may be present
• Do not install in rooms where people live or where the prolonged presence of people or animals is expected, because of the highnoise that the inverter produces during operation
• Avoid electromagnetic interference that can compromise the correct operation of electronic equipment, with the consequent hazards;

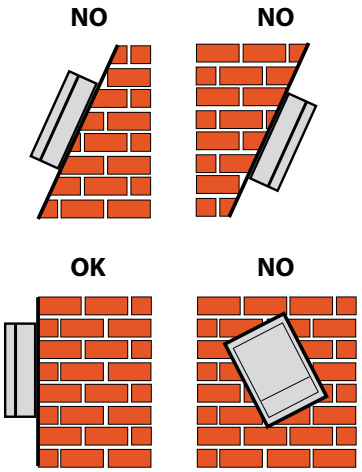
Installations above 2000 metres

On account of the rarefaction of the air (at high altitudes), particular conditions may occur that should be considered when choosing the installation site:

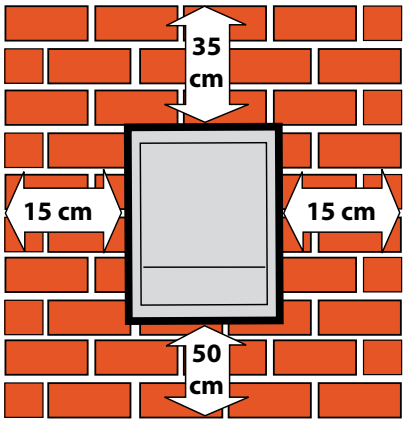
• Less efficient cooling and therefore a greater likelihood of the device going into derating because of high internal temperatures.
• Reduction in the dielectric resistance of the air that, in the presence of high operating voltages (DC input), can create electric arcs (electrical discharges) that may reach the point of damaging the inverter.
As the altitude increases, the failure rate of some electronic components increases exponentially because of cosmic radiation.

All installations at altitudes of over 2000 metres must be assessed case by case considering the aforesaid criticalities.

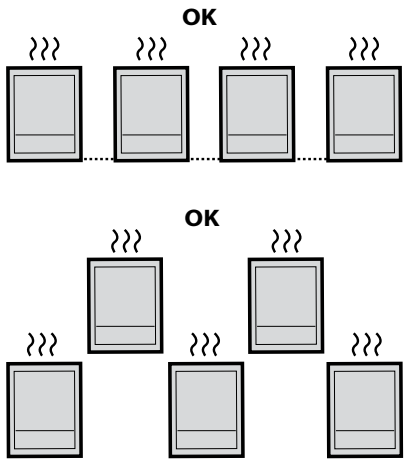
Installation site



When choosing the installation site, observe the following conditions:
• Install on a wall or strong structure suitable to bear the weight
• Install in safe, easy to reach places
• If possible, install at eye-level so that the display and status LEDs can be seen easily
• Install vertically with a maximum inclination of 5° (forward or backward). If this condition cannot be met, the inverter could undergo derating due to high temperature because of poor heat dissipation.



• Maintenance on device hardware and software entails removing the front covers. Check the correct safety clearances for installation that will allow the normal control and maintenance operations to be carried out.
• Comply with the minimum distances indicated



• For a multiple installation, position the inverters side by side.

• If the space available does not allow this arrangement, position the inverters in a staggered arrangement as shown in the figure so that heat dissipation is not affected by other inverters.

Wall/Pole mounting

During installation do not place the inverter 02 with the front cover 04 facing towards the ground.

• Position the bracket **01** perfectly level on the wall and use it as a drilling template.

• Drill the 3 holes required using a drill with 10mm bit. The holes must be about 70mm deep.
On bracket **01** there are 5 fastening holes, but only 3 are used depending on the type of installation: on a pole **holes A**, on a wall **holes B**.

• Fix the bracket to the wall with the 3 wall anchors, 10mm in diameter, supplied.

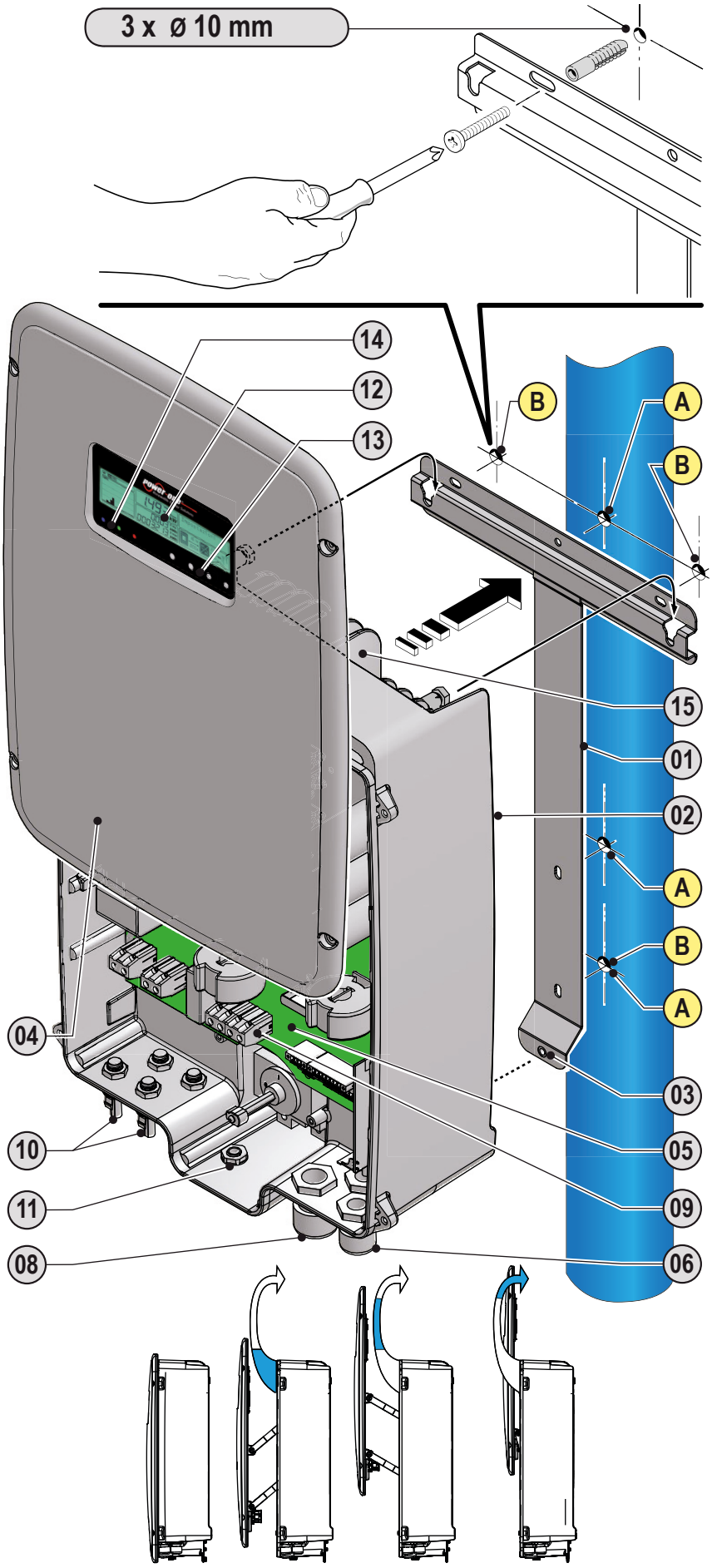
• Hook the inverter to the bracket by inserting the head of the rear screws in the slots as shown in the figure.

• Proceed to anchor the inverter to the bracket by tightening the locking screw **03** located on the lower side.

• Unscrew the 4 screws and open the front cover **04** upwards in order to make all the necessary connections. **The cover is equipped with fixed hinges and cannot be removed.**

• Once the connections have been made proceed to closing the cover by tightening the 4 screws on the front to the torque indicated in the specifications.

• Remove the protective film located on the front.



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Operations preparatory to wind turbine connection

Selection of differential protection downstream of the inverter

Based on the current **CEI 64-8** Standards and Variant 4 (V4) of September 2006, which in Section 712: "Solar photovoltaic power systems (PV)" addresses photovoltaic applications, with particular reference to paragraph **712.413**: "Protection against indirect contact", the following may be noted:
712.413.1.1.1.2 When an electric system includes a PV power supply system without at least a simple separation between the AC side and the DC side, the differential device installed to provide protection against indirect contact by automatic disconnection of the power supply must be of type B in accordance with **IEC 60755/A 2**.

When the PV inverter is not in terms of its construction such as to put continuous ground fault current (cc) into the electrical system, a differential switch of type B is not required according to IEC 60755/A 2".

Note: The first section of the article, in reference to the "simple separation between the AC side and the DC side", considers isolation transformers that operate at low frequency (grid frequency).

Aurora Power-One inverters with a high frequency transformer are equipped with an isolation transformer for each of the DC/DC converters which operates at high frequency (switching frequency of the converter). This transformer allows for high frequency galvanic isolation between the DC and AC side of the system. In addition to this the inverters include protection mechanisms so that they cannot input ground fault currents.

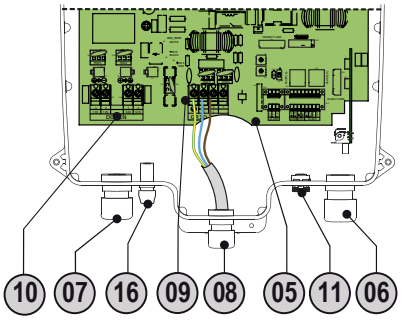
Power-One Italy S.p.A. declares that the Power-One Aurora high-frequency isolated inverters are in terms of their construction continuous ground fault currents and therefore, in accordance with Article 712.413.1.1.1.2 of Section 712 of CEI 64-8/7 Standards there is no requirement that the differential installed downstream of the inverter is type B in accordance with IEC 60755 / A 2.

Power-One recommends the use of a switch with type A or AC differential magneto-thermal protection with IΔn=30mA sensitivity.

Inverter Components

The table shows the components present in both models of inverter **02** (2 kW or 2.5 kW).

UNO-X.X-I-OUTD-W: Universal Standard Version
UNO-X.X-I-OUTD-US-W: US Version



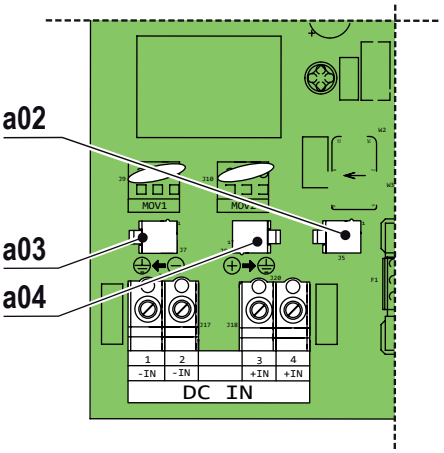
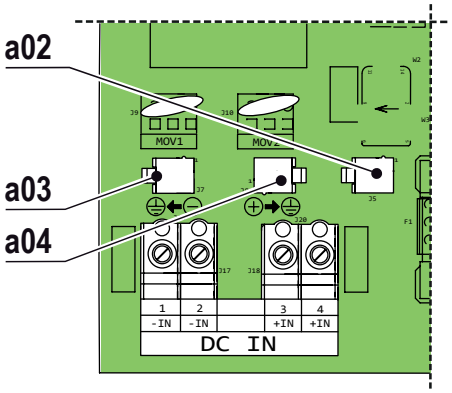


Table: electrical system components

Ref.	Description
05	mainboard
06	service cable gland
07	DC cable gland
08	AC cable gland
09	AC output terminal block
10	DC input terminal block
11	anti-condensation valve
16	fuse holder
a02	Connector for floating grounding of the inputs
a03	Connector for negative grounding of the inputs
a04	Connector for positive grounding of the inputs

Grounding configuration of the DC inputs



Grounding of the inputs **is set to negative by default.**
In order to achieve this, it is possible to vary the default configuration, moving the connector installed in a03 (**negative grounding**) to a04 (**positive grounding**) or removing the fuse from the connector a02 and inserting the connector installed in a03 (**floating configuration**). In this new configuration the equipment will show the "Sys. Ungrounded" message on the display when it is turned on.

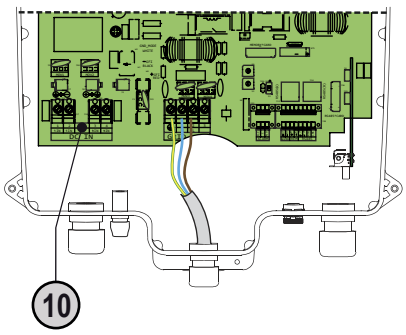
Configuration of input grounding must be done before any connections or testing takes place.

To prevent risk of fires, substitute the fuse with one of same type and with the same electric rating (1A, 600VDC).

Input connection to the wind turbine (DC Side)

After undergoing preliminary checks and therefore after ensuring that there are no problems in the wind turbine it is possible to connect the inputs to the inverter.

To prevent electrocution hazards, all the connection operations must be carried out with the external disconnect switch open and locked.



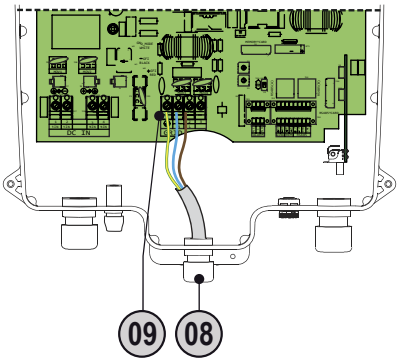
To connect the rectifier output to the inverter inputs, use the screw connectors **10**.

EN

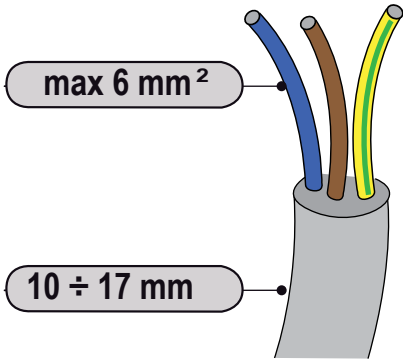
Output connection to the grid (AC side- EU version)

To connect the inverter to the grid you need 3 connections: ground, neutral and phase. **The ground connection to the inverter is obligatory.** Plug the grid cable into the inverter using the specific AC cable gland **08** and connect to the AC terminal block **09**.

Use a properly sized tripolar cable and check the tightness of the AC cable gland 08 when installation has been completed.



Characteristics and dimensions of the line cable



The cross-section of the AC line cable must be of a size that will avoid undesired disconnection of the inverter from the distribution grid due to high impedance in the line connecting the inverter to the power supply point. If the impedance is too high it will cause a rise in AC voltage which, on reaching the limit set by the standards for the country of installation, will turn the inverter off.
The table gives the maximum width of the line cable according to the cross-section of the cable itself:

Line cable cross-section (mm^2)	Maximum length of the line cable (m)	
	UNO-2.0-I-OUTD-W	UNO-2.5-I-OUTD-W
2,5	15	12
4	25	20
6	38	30

The values are calculated taking into account (in rated power conditions) an energy loss not exceeding 1% along the line.

The temperature rating of the line cable must be at least 20° C above the maximum expected ambient temperature.

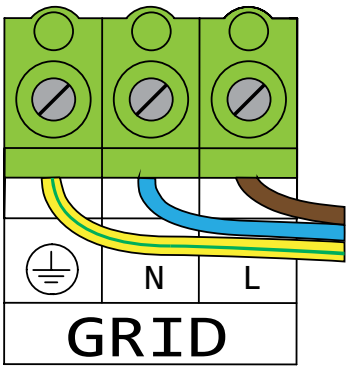
Load protection switch (AC disconnect switch)

To protect the AC connection line of the inverter, it is recommended that a device be installed to protect against over current and dispersion, with the following characteristics:

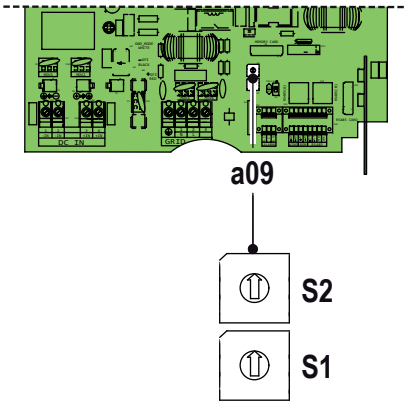
	UNO-2.0-I-OUTD-W	UNO-2.5-I-OUTD-W
Type	Automatic circuit breaker with differential thermal magnetic safeguard	
Voltage/Current rating	230Vac/16A	230Vac/16A
Magnetic safeguard characteristics	B/C	B/C
Differential safeguard type	A/AC	A/AC
Differential sensitivity	30mA	30mA
Number of poles	2	2

Connection to the AC side terminal block

To prevent electrocution hazards, all the connection operations must be carried out with the disconnect switch downstream of the inverter (grid side) open and locked.



For all models you connect the AC output terminal block **09** by passing the cables through the AC cable gland **08**.
The maximum diameter accepted by the cable gland is from 10 to 17 mm^2 while each terminal of the terminal block accepts a cable with cross-section which can vary from 0.6 up to 16 mm^2.
Unscrew the AC cable gland **08**, remove the cover, insert the cable of suitable cross-section and connect the conductors (Ground, Neutral, and Phase) to the terminals on the AC output terminal block **09**.
Once the connection to the terminal block has been made, tighten the cable gland firmly and check the seal.



Before connecting the inverter to the distribution grid it is necessary to set the country standard by turning the two rotary switches a09 and following the table provided in the relevant section.

NOTE: For installations carried out in Italy it is required to lead seal the AC connector. To this end a bracket must be fixed on top of the AC output terminal block 09 by tightening the screw on the appropriate turret. During connection to the grid, the grid company will ensure that the lead seal is applied.

EN

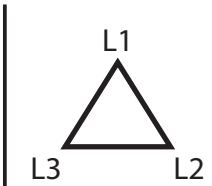
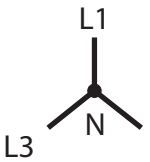
Output connection to the grid (AC side- US version)

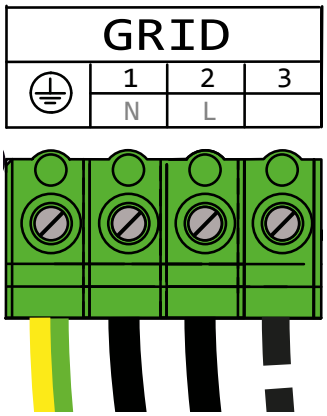
For safety reasons only a qualified electrician, who has received training and/or has demonstrated skills and knowledge in construction and in operation of this unit, can install this inverter.

The installation is done by qualified installers and/or licensed electrician according to the applicable local code regulations (National Electric Code NEC and CEC, or other local code wiring regulations).

The connection of an inverter energy system to an electrical installation connected to the electricity distribution network shall be approved by the appropriate electrical distributor.

Below are the utility voltage configurations on which the inverter should be connected.

	 208V~ 3PH - Δ			 240V~ SPLIT-PHASE			 277V~ 3PH - Y		
TERMINAL	1	2	3	1	2	3	1	2	3
WIRE	L1	L2	-	L1	L2	N	N	L1	-



The AC wires should be connected based on the above table of utility voltage configuration.
Three terminal positions (1, 2, and 3) are present on the inverter AC terminal block as in the illustration above.

Characteristics and dimensions of the line cable

The cross-section of the AC line conductor must be sized correctly in order to prevent unwanted disconnections of the inverter from the grid due to high impedance of the line that connects the inverter to the power supply point. If the impedance is too high, it causes an increase in the AC voltage that, on reaching the limit set by the country of installation, causes the inverter to switch OFF.

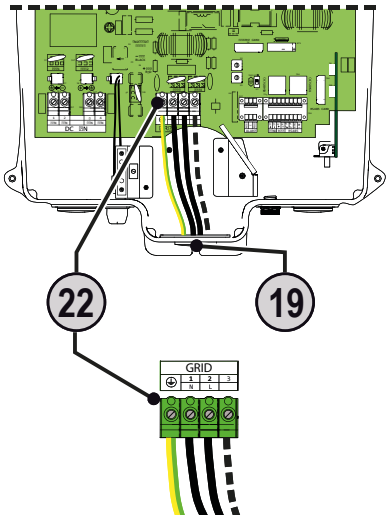
Connection to the AC side terminal block

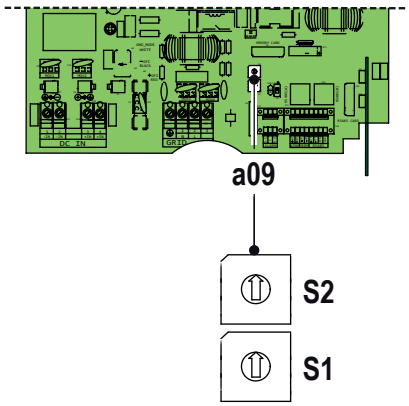
To prevent electrocution hazards, all the connection operations must be carried out with the disconnect switch downstream of the inverter (grid side) open and locked.

Connect the AC wires on the inverter AC terminal block (1, 2, 3) based on the utility voltage configuration table above.
In order to plug the input cables into the inverter is necessary to replace the AC Knockout Plug (19) with an EMT FITTING 3/4" (thread 14 NPSM). This is a standard NEMA ¾" box connector that matches the wiring method used (EMT, RMT, etc)

NOTE: EMT Fitting 3/4" is equivalent to PG 21 - EMT Fitting ½ is equivalent to PG 16.

The illustrations below show the AC connection

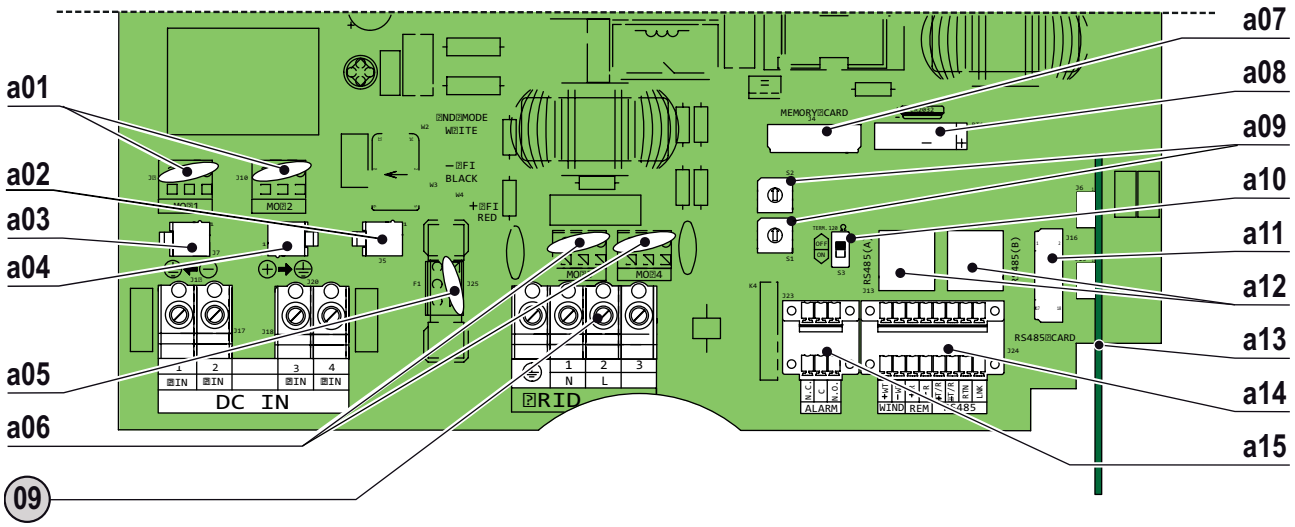




Before connecting the inverter to the distribution grid it is necessary to set the country standard by turning the two rotary switches a09 and following the table provided in the relevant section.

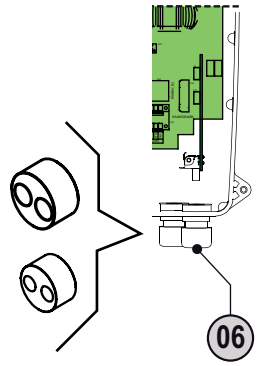
EN

Main board



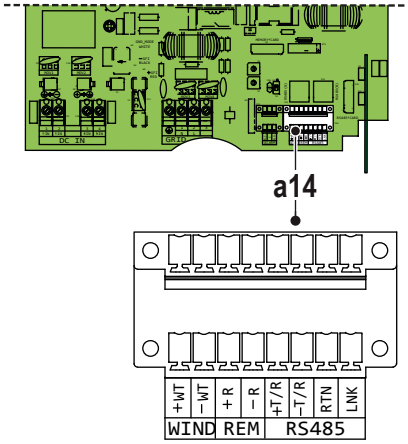
		main board 05
Ref. manual	**Ref. inverter**	**Description**
a01	**J9 - J10**	Input varistors
a02	**J5**	Connector for floating grounding of the inputs
a03	**J7**	Connector for negative grounding of the inputs
a04	**J8**	Connector for positive grounding of the inputs
a05	**F1 - J25**	PTC
a06	**J11 - J12**	Output varistors
a07	**J4**	Memory card slot
a08	**BT1**	Battery slot
a09	**S1 - S2**	Rotating switches to set grid standard
a10	**S3**	Switch to set the RS485 line resistance terminal
a11	**J16**	Comunication card slot
a12	**J13 - J14**	RS485 line connection on RJ45 connector
a13	**J6 - J15**	Radiomodule board slot
a14	**J24**	Speed sensor connections, remote control, RS485
a15	**J23**	Configurable relay connections
09	**J21 - J22**	AC output terminal block

Connection of the signals to the main board



Each cable which must be connected to the communication and control signal connectors must pass through the two service cable glands **06** (marked in the figure).
The available cable glands are two M20s that can take a cable with a diameter of 7 mm to 13 mm. Two-hole gaskets are supplied for insertion in the cable gland, which allow two separate cables with cross-section of up to 5 mm to go through.
The signal cables are connected to the main card **05** inside the inverter by means of the terminal connectors supplied.

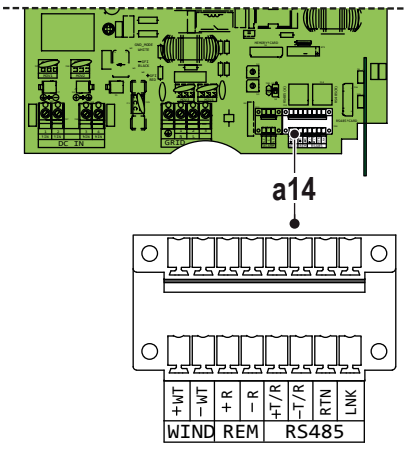
Connection of the frequency input signal



Connect, through apposite cables, terminal blocks –WT and +WT, found on terminal board a14, to the Wind-interface-box terminal blocks labeled as “WindSpeed+” and “WindSpeed-“.

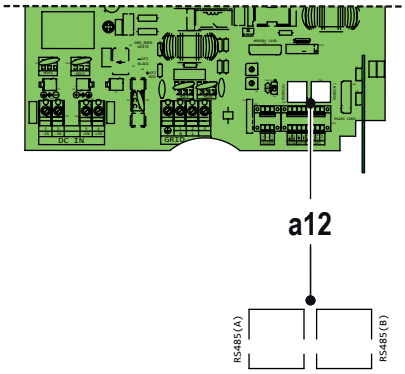
The connection is necessary only if the power curve of the turbine is expressed in function of the RPM frequency of the generator. For more details view the paragraph “Loading of the power curve on the inverter”.

Serial Communication connection (RS485)



On the inverter there is a RS485 communication line, dedicated to connecting the inverter to monitoring devices or to carrying out “daisy-chain” (“in-out”) connection of multiple inverters.
The RS485 line connection cables can use both the terminal connectors a14 and the RJ45 connectors to be connected to the dedicated port a12.

Connection of the conductors using the terminal connectors a14 (+T/R, -T/R, RTN and LNK).
The LNK connection must be used for connecting the cable(s) shielding braid(s).

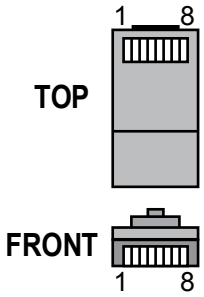


Connection of conductors with RJ45 connectors a12

The RJ45 connectors (A) and (B) available for the RS485 communication are equivalent to each other and can be used interchangeably for the incoming or outgoing line when carrying out daisy chain connection of the inverters.

The same is true for connections made using the terminal connectors a14.

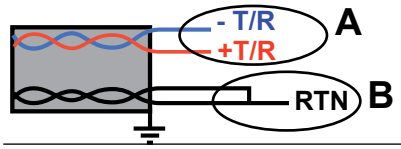
Table: RJ45 connectors crimping diagram



Pin No.	Function
1	not used
2	not used
3	+T/R
4	not used
5	-T/R
6	not used
7	RTN
8	not used

Use a connector with a metal body to give continuity to the cable screening!

For long distance connections it is preferable to connect to a terminal connector using a shielded twisted pair cable with characteristic impedance of Z0=120 Ohm like the one shown on the following table:

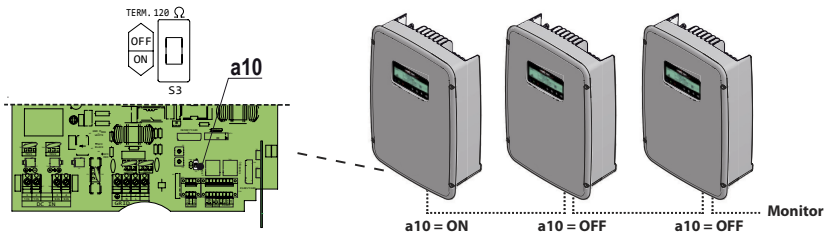


Signal	Symbol	Pair	Cable
Positive data	+T/R	A	1
Negative data	-T/R	A	2
Reference	RTN	B	1+2

The screening must be given continuity along the communication line using the LNK terminal, and it must be grounded in one point only.

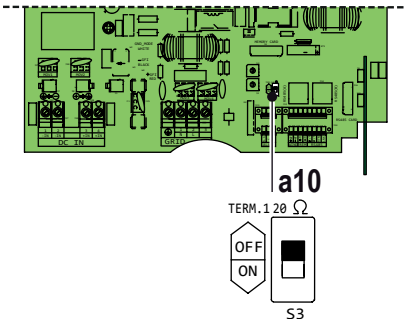
Procedure for connection to a monitoring system

Connect all the units in the RS485 chain in “daisy-chain” (“in-out”) configuration, respecting corresponding signals, and activate the communication line resistance terminal in the last element in the chain by setting switch a10 (to the ON position).



When connecting a single inverter to the monitoring system, activate the communication line resistance terminal by setting the switch a10 (to the ON position).
Set a different RS485 address for each inverter in the chain. **None of the inverters must have the address "Auto"**. An address between 2 and 63 can be selected freely.
The address on the inverter is set through the display and the keyboard (see relevant chapter).

You should never exceed 1000m in length for the communication line.
The maximum number of inverters that can be connected to the same RS485 line is 62.



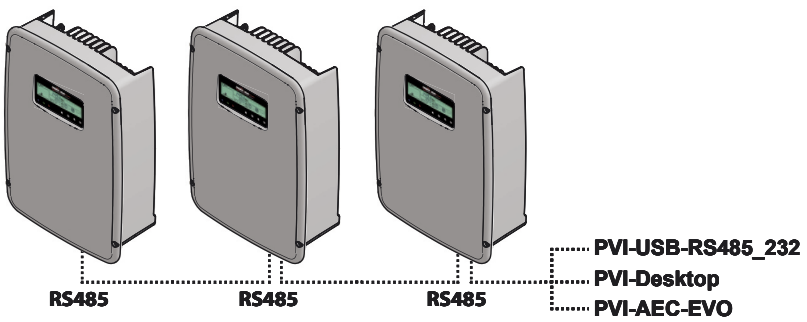
When using an RS-485 connection, if one or more inverters are added to the system at a later date you must remember to set the resistance terminal used by the inverter that was previously last in the system back to the OFF position.
Each inverter is shipped with the RS485 address pre-set to two (2) and with the resistance terminal setting Switch a10 in the OFF position.

Serial monitoring systems (RS485)

The RS485 line can be connected to various monitoring devices that can be either **local** or **remote**:
• **Local monitoring from PC** with **PVI-USB-RS485_232** adaptor and **Aurora Comunicator** software
• **Local monitoring from a remote display** with **PVI-DESKTOP** device
• **Remote monitoring** with **PVI-AEC-EVO**monitoring system and **P1 Portal**
For local monitoring, ***Power-One*** recommends that its PVI-USB-RS485_232 adapter be connected between the first unit in the daisy-chain and the computer.

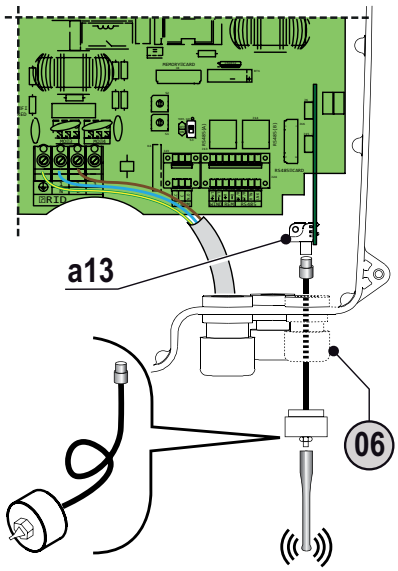
It is also possible to use equivalent commercially available devices for the same purpose, but bearing in mind that they have never been specifically tested for this use Power-One does not guarantee the connection will work properly.

It should be noted that these latter devices may require an external terminal impedance, something that is **not required** in the case of the Aurora PVI-USB-RS485_232.

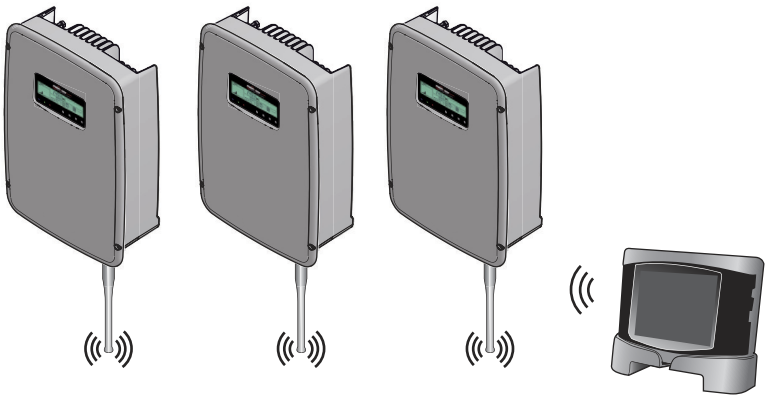


EN

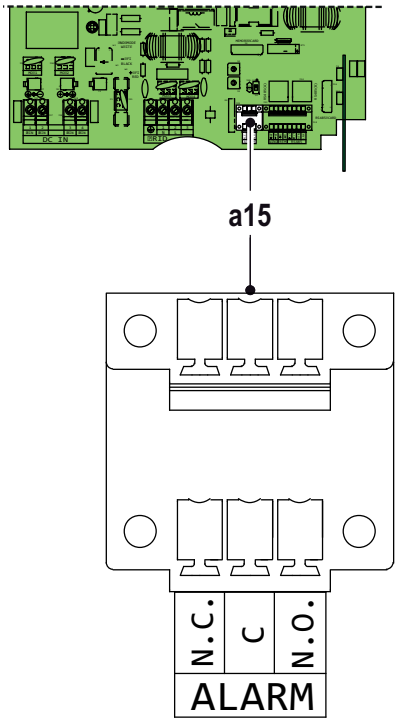
Monitoring system using the radiomodule



The radiomodule board is an accessory for the trasmission of data via radio waves to a monitoring device.
The radiomodule board is installed on the main board **05** vertically, by connecting the two a13 connectors and tightening the anchoring screw.
In turn the radiomodule is connected to a cable terminating with an antenna that is installed outside the inverter:
The part of the inverter on which the antenna will be installed will be in the place of one of the service cable glands **06** size M20.
Monitoring is carried out using the **PVI-DESKTOP** device.



Configurable relay connection



NC = Normally closed
C = Common contact
NO = Normally open

The inverter has a multipurpose relay a15, switching of which can be configured. It can be connected both with a normally open contact (being connected between the NO terminal and the common contact C) and with a normally closed contact (being connected between the NC terminal and the common contact C).
This contact can be used in four different working configurations, which can be set in the dedicated menu.

Operating modes

• **Production**: the relay switches every time a connection to (and consequently a disconnection from) the distribution grid takes place.
Thus, if the NO (or NC) contact is selected, the contact will remain open (or closed) for as long as the inverter is not connected to the grid; once the inverter connects to the grid and starts to export power, the relay will change status and close (or open).
When the inverter disconnects from the grid the relay contact will return to its rest position, that is to say open (or closed).

• **Alarm** (configurable): the relay switches every time an alarm (Error) or notification (Warning) from among those selected in advance by the user from the dedicated menu occurs.
Thus, if the NO (or NC) contact is selected, the contact will remain open (or closed) for as long as the inverter does not signal an error or warning

from among those selected in the menu; once the inverter signals one of the errors or warnings selected, the relay will change status and close (or open). The relay remains switched from its rest position until the alarm or warning has been dealt with.

• **Crepuscular**: the relay only switches when the voltage from the photovoltaic generator exceeds/drops below the threshold set for grid connection.
If the NO (or NC) contact is selected, the contact will remain open (or closed) for as long as the inverter does not have an input voltage exceeding the one selected for grid connection. The relay remains switched from its rest position for as long as the inverter is turned on (even if it is not connected to the grid). This mode is useful to disconnect any large output transformers that might consume power unnecessarily during the night.

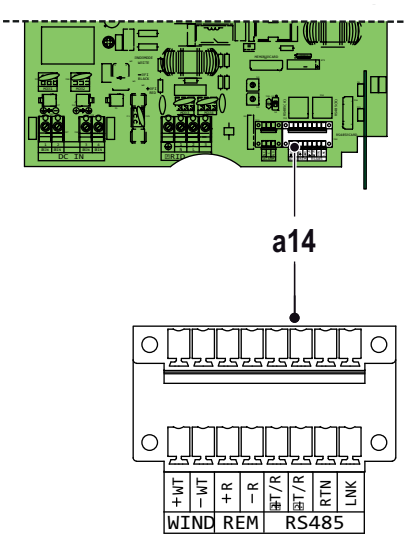
The device that is to be connected to the relay may be of various types (luminous, acoustic, etc) but it must comply with the following requirements:

Alternate current
Maximum Voltage: 240 Vac Maximum Current: 1 A

Direct Current
Maximum Voltage: 30 Vdc Maximum Current: 0.8 A

Cable requirements
External diameter: from 5 to 17 mm
Wire cross-section: from 0.14 to 1.5 mm^2

Remote control connection



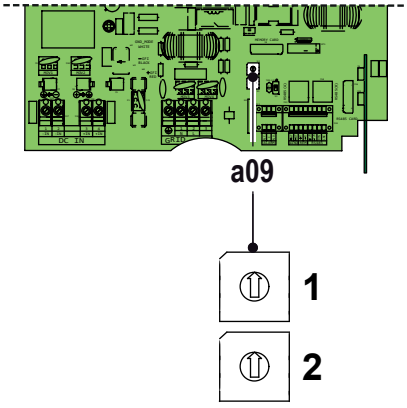
Connection and disconnection of the inverter from the grid can be commanded using a remote control.
This function must be enabled in the menu provided, if the remote control function is disabled start-up of the inverter will be dictated by the presence of the normal parameters that allow the inverter to connect to the grid.
If the remote control function is operating, besides being dictated by the presence of the normal parameters that allow the inverter to connect to the grid, start-up of the inverter will also depend on the state of the +R terminal compared to the –R terminal present on connector a14 della on the main card **05**.
When the +R signal is brought to the same potential as the –R signal (that is to say when a short-circuit is created between the two connector terminals) the inverter is disconnected from the grid.
When the remote control is OFF this condition is shown on the display.
Connections for this command are made between input “+R” and “-R”.
As this is a digital input there are no particular requirements as to the cable section to be used (as long as it complies with the size of cable that can be passed through the cable glands and inserted into the terminal connector).

EN

Setting the country grid standard and display language

According to the country in which the inverter is installed there are different grid parameters (dictated by the distributor).

It is essential that you set the grid standard for the country of installation before commissioning, and the installer must be aware of which is the right standard to be set.



The inverter is configured using the rotating switches a09.
Before adjusting the rotating switches, make sure that the inverter is turned off!
When setting the grid standard, **the display menu language** is also set.

The table below shows which country grid standard and which menu language are assigned to the various positions of rotating switches a09

Table: country standard and language

Switch 1	Switch 2	Country Grid Standard	Display menu language
0	0	NOT-ASSIGNED	ENGLISH
0	1	GERMANY – VDE 0126 @ 230V Single Phase	GERMAN
0	2	UL 1741 @ 208V Single Phase	ENGLISH
0	3	UL 1741 @ 240V Split Phase	ENGLISH
0	4	UL 1741 @ 277V Single Phase	ENGLISH
0	5	ENEL GUIDA @ 230V Single Phase	ITALIAN
0	6	SPAIN @ 230V	SPANISH
0	7	UK – G83 @ 230V	ENGLISH
0	9	IRELAND @ 230V	ENGLISH
0	A	AUSTRALIA @ 230V	ENGLISH
0	B	ISRAEL @ 230V	ENGLISH
0	D	FRANCE @ 230V	FRENCH
0	E	BELGIUM @ 230V	FRENCH
0	F	GREECE @ 230V	ENGLISH
1	0	PORTUGAL @ 230V	ENGLISH
1	1	CORSICA @ 230V	FRENCH
1	2	HUNGARY @ 230V	ENGLISH
1	3	CHINA @ 230V	ENGLISH
1	4	KOREA @ 220V	ENGLISH
1	5	TAIWAN @ 230V	ENGLISH
1	6	CHECA Republic @ 230V	ENGLISH
1	7	GERMANY – VDE AR-N-4105 @ 230V	GERMAN
1	8	ENEL CEI-021 @ 230V Single Phase	ITALIAN
8	8	Reserved (Debug USA)	-
F	F	Reserved (Debug USA)	-

The default setting is **0 / 0** which means that no grid standard has been selected and the display language is English (in this case the message "Set Country" will be displayed)

If one of the switch positions that has not been assigned is selected, the display **12** will show the message "Invalid Selection".

Saving the country grid standard and display language

The settings are frozen after the inverter has been in operation for 24 hours (it does not matter whether or not it is connected to the grid, it only has to be under power).
The time remaining before the settings are frozen can be viewed from the dedicated menu, if the time has expired a notice will appear.

Once the settings have been frozen nothing will happen if the rotating switches are turned. In this condition it is still possible to change the language from the dedicated menu.

At any time and for any reason it is possible to set the display menu language to ENGLISH by pressing the "ESC" and "ENTER" keys simultaneously and holding them for at least 3 seconds.

Should it be necessary to change the national standard once the switches have frozen (after 24 hours in operation) please contact the Power-One technical department, giving the inverter part number and serial number.

Loading the power curve into the inverter

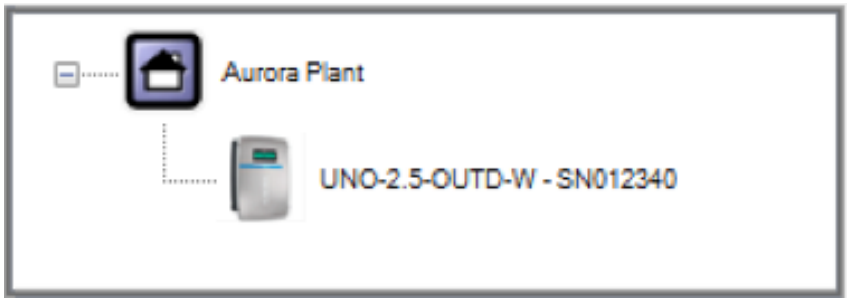
After setting the grid standard, the inverter, during the first switch on, will show the message "Warning! Empty Table W009". Follow the illustrated guide to proceed with the loading of the power curve on the inverter.

As for all Power-One wind inverters, the UNO inverter accepts power curves defined both in terms of input power (P=g(Vin)) and in function of the frequency of the generator (P=g(f)). If a power curve defined as P=g(f) has been chosen it is necessary to assure that the connection of the frequency input signal has been carried out as described in the paragraph (Connection of the frequency input signal).

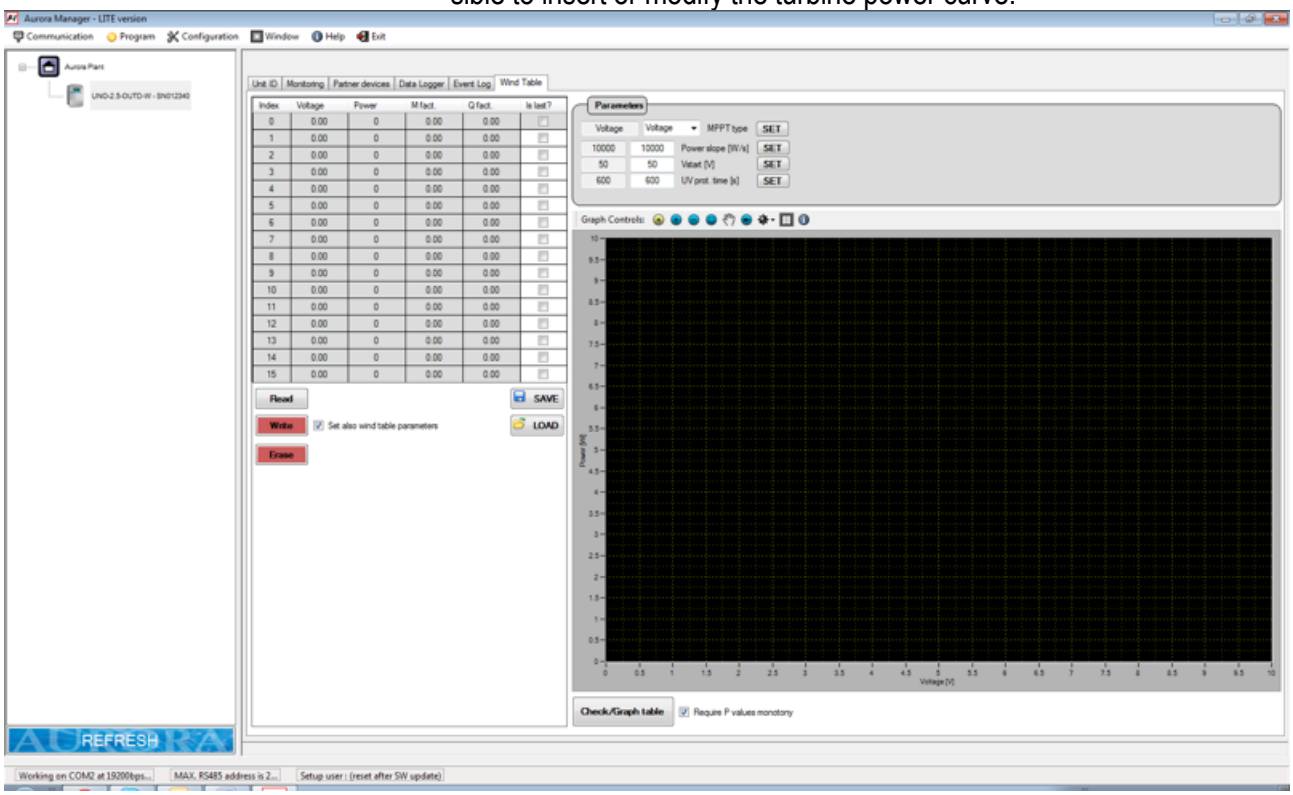
1. Install the Aurora Manager LITE software on your PC.
2. Power the inverter through the grid (AC side)
3. Connect the PC to the inverter through a RS485 communication line using a PVI-RS232_RS485 or PVI-USB-RS485_232 converter. To verify which COM port the convertor has been associated with refer to procedure "Test of the COM port associated to signal converter" (reference to the software manual for more details).
4. Open the Aurora Manager LITE software.
5. Adjust the configuration settings of the communication (reference to the software manual for more details).

6. Push the REFRESH button to scan the RS485 bus

The identified inverters are show in the plant's tree structure.



7. By choosing the inverter and accessing the tab "Wind Table" it is possible to insert or modify the turbine power curve.



8. Set the MTTP parameter, by selecting "Voltage" or "Frequency" based on the type of curve to load; click on the SET button to save the settings.

9. Enable the editing of the chart by ticking the "IS LAST ?" square, relative to the last point of interest. Proceed with the insertion of the values in the chart and press on the "Write" button to save.

10. It is possible to modify a series of values such as Power Slope, Vstart, UV prot. Time, by working on their relative values and pressing the "SET" button.

See table below for more details on the use of the parameters.

Parameters	
Power Slope [W/s]	Represents the inverter's speed of response that is how rapidly the inverter follows the work point of the turbine. The value must be between a minimum of 275 W/s and a maximum of 10000 W/s. If an unstable behavior of the system is noticed during the calibration phase, it's advisable to reduce the "Power Slope" value.
Vstart [V]	Represents the value of the input voltage above which the inverter connects to the grid. The minimum value is of 90 V. For optimal functioning, the software suggests a certain value of Vstart. The use of such value is highly recommended.
UV Prot. time [s]	Represents the time in which the inverter remains in standby mode after that the tension has gone below the vstart value. This parameter allows keeping the inverter reactive and ready to input power in the grid when the wind starts to blow again, without the necessity to repeat the start-up process. The value must be between a minimum of 1 s and a maximum of 3599 s.

1. Available on https://registration.power-one.it
2. Available on https://aurora.power-one.it/

6 - Instruments

General conditions

One of the first rules for preventing damage to the equipment and to the operator is to have a thorough knowledge of the INSTRUMENTS. We therefore advise you to read this manual carefully. If you are not sure about anything or there is discrepancy in information, please ask for more detailed information.

Do not use the equipment if:
- you do not have suitable qualifications to work on this equipment or similar products;
- you are unable to understand how it works;
- you are not sure what will happen when the buttons or switches are operated;
- you notice any operating anomalies;
- there are doubts or contradictions between your experience, the manual and/or other operators.

Power-One cannot be held responsible for damage to the equipment or the operator if it is the result of incompetence, insufficient qualifications or lack of training.

Display and keyboard

Description of display symbols and fields

Using the display **12** it is possible to view the equipment's operating parameters: signals, alarms, channels, voltages, etc.
During operation, the display behaves dynamically, which allows certain information to be displayed cyclically (see the relevant chapter).

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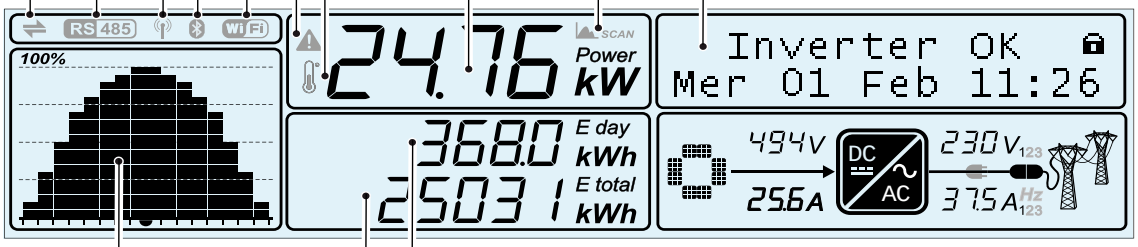
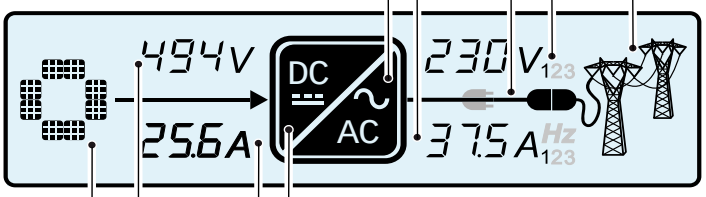
b1 - Signals transmission and reception of data using the RS485 line
b2 - Signals the presence of the RS485 communication line
b3 - Signals the presence of the radio communication line (Radiomodule board installed)
b4 - Signals the presence and enabling of the bluetooth communication line**(NOT available)**
b5 - Signals the presence and enabling of the WiFi communication line**(NOT available)**
b6 - Signals a derating of active power due to input voltage out of range or power limitation imposed by the grid or display operator
b7 - Signals a derating of power due to high internal temperature
b8 - Instantaneous power generated for the grid
b9 - MPPT SCAN function activated
23 **b10** - Lines of text for the cyclic display of inverter parameters, error codes and for menu navigation



b13 - Displays the energy produced during the course of the day
b12 - Displays the total energy produced since installation of the inverter
b11 - Graph of the power fed into the grid (from 0 to 100%). The time scale is settable to 8/16/24 hours

b18 - Indicates the DC to AC conversion circuit
b20 - Output current from the highlighted phase. After display of the currents the grid frequency (Hz) is displayed.
b21 - Connection to the grid:
Inverter not connected
Inverter connected
b19 - Output voltage of the highlighted phase
b22 - Status of the grid voltage:
Icon absent: grid voltage absent
Icon Flashing: grid voltage present but outside the parameters set by the grid standard
Icon present: Grid voltage present and within the parameters set by the grid standard



b17 - Indicates the DC/DC input circuit (Booster)
b16 - Input current (DC)
b15 - Input voltage (DC)
b14 - Indicates that the wind turbine voltage is higher than the inverter's Vstart.

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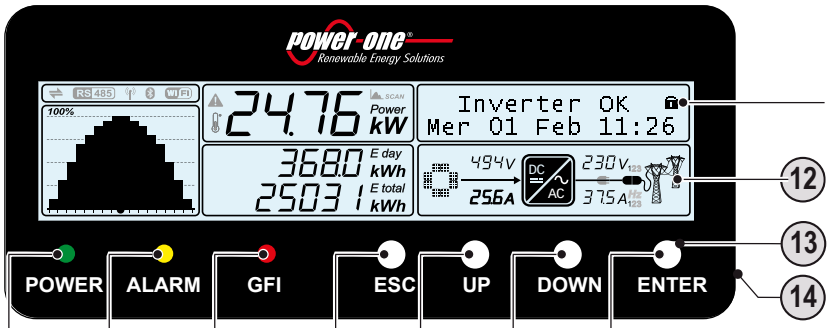
Description of the keyboard

Using the combination of keys on the LED panel **14**, located under the display **12,** it is possible to set the values or scroll through the data and view them.
The keyboard **13** also contains LEDs to show machine status.



When the ENTER key is pressed, cyclic display of the parameters can be:
- Locked
- Cyclic

Allows you to confirm the operation or to enter the set data item.

This allows you to read the data on the display by scrolling downwards, or to decrease the set value to correct it during data entry.

This allows you to read the data on the display by scrolling upwards, or to increase the set value to correct it during data entry.

This key allows you to exit the current mode.

The “GFI” (ground fault) LED indicates that the inverter has detected a ground fault on the DC side of the wind turbine. When this fault is detected the inverter immediately disconnects from the grid and the relevant error message is shown on the LCD display.

Indicates that the inverter has detected an anomaly. The type of problem is shown on the display

Indicates that the inverter is working correctly.
When the unit is commissioned, this LED flashes while the grid is being checked. If a valid grid voltage is detected, the LED remains on fixed, provided there is sufficient sunshine to activate the unit. If this is not the case, the LED will continue to flash until there is sufficient sunlight for activation. During this phase, the LCD will show the message “Waiting Wind….”

With various multiple combinations possible, the LEDs can indicate conditions that are different from the original single one; see the various descriptions given in the manual.

With various multiple combinations possible, the buttons allow actions that are different from the original single one; see the various descriptions given in the manual.

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7 - Operation

General conditions

Before checking the operation of the equipment, it is necessary to have a thorough knowledge of the INSTRUMENTS chapter and the functions that have been enabled in the installation.
The equipment operates automatically without the aid of an operator; operating state is controlled through the instruments.

The interpretation or variation of some data is reserved exclusively for specialized and qualified staff.

The incoming voltage must not exceed the maximum values shown in the technical data in order to avoid damaging the equipment.
Consult the technical data for further details.

Even during operation, check that the environmental and logistic conditions are correct (see installation chapter).
Make sure that the said conditions have not changed over time and that the equipment is not exposed to adverse weather conditions and has not been isolated with foreign bodies.

Monitoring and data transmission

As a rule, the inverter operates automatically and does not require special checks. When the wind is not strong enough to supply power for export to the grid, it disconnects automatically.
In this mode it is possible to view data on the display **12** (when you press and hold any key on the keyboard **13** the display is activated).
The operating cycle is automatically restored when there is sufficient wind. At this point the indicator lights on the LED panel **14**, will notify this status.

User interface mode

The inverter is able to provide information about its operation through the following instruments:
• LED lights
• LCD display showing operating data
• Data transmission via dedicated RS-485 serial line. Data may be collected by a PC (using signal converter PVI-USB-RS485_232) or a data logger with an RS-485 port (PVI- DESKTOP / PVI-AEC-EVO). Contact ***Power-One*** assistance for any doubts about the compatibility of devices.

Types of data available

The inverter provides two types of data, which are usable through the relevant interface software and/or through the display **12**.

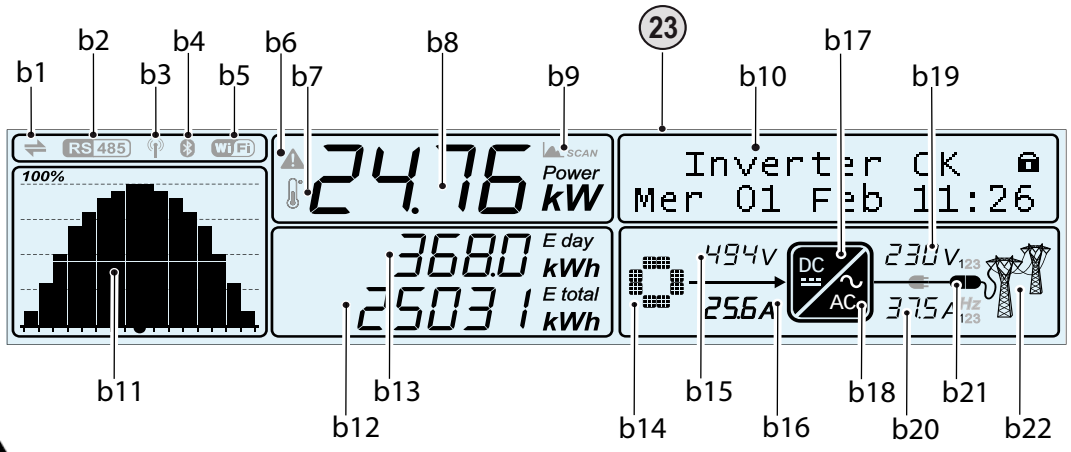
Real-time operating data
Real-time operating data can be transmitted on request through the communication lines and are not recorded in the inverter.

Internally stored data
The inverter internally stores a set of data that are necessary for processing statistical data and an error log with time stamp.

Commissioning

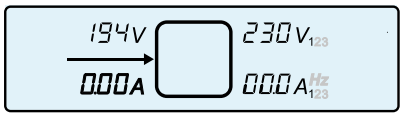
Never place any kind of object on the inverter when it is in operation!
Never touch the dissipator when the inverter is in operation!

Some parts may be very hot and could cause burns.

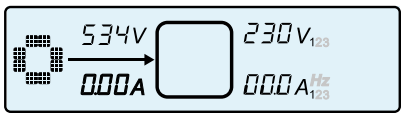


NOTE: Before proceeding with commissioning make sure that all the checks and controls indicated in the paragraph on preliminary checks have been carried out.

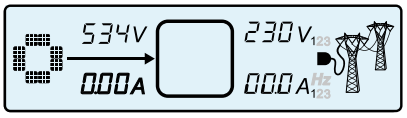
Vin < Vstart



Vin > Vstart



Vgrid OK



The inverter commissioning procedure is as follows:

• Turn the DC switch on the outside of the inverter to ON.
If there is an external AC switch it should be turned on first, and then the DC switch should be turned on. There is no order of priority when turning the switches off.

• When the inverter is powered up, the first check performed is on the input voltage:
- If the DC input voltage is lower than the Vstart voltage (voltage required to begin the inverter grid connection) the icon b14 remains off and the message “Waiting wind” is displayed on b10.
- If the DC input voltage is higher than the Vstart voltage the icon b14 is displayed and the inverter moves on to the next stage in the controls.
In both cases the voltage levels and input current are displayed in the fields b15 and b16.

• The inverter performs a control of grid parameters. The icon b22, which represents the grid distribution, can have different statuses:
- Not present, if the mains voltage results as absent.
- flashing, if the mains voltage is present but outside the parameters dictated by the standard of the country of installation.
- On, if the mains voltage is present and within the parameters dictated by the standard of the country of installation. In this condition, the inverter starts the sequence for connection to the grid.
This verification can take several minutes (from a minimum of 30 seconds up to several minutes), depending on grid conditions and the country standard settings

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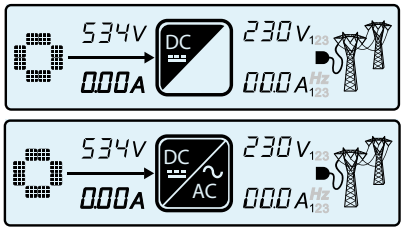
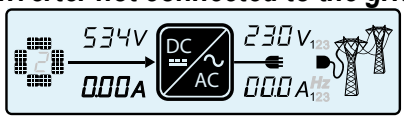
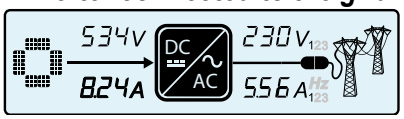


• At this point the icon b17 will flash, this indicates start-up of the DC-DC circuit (booster) part. This icon will remain permanently switched on while the DC-DC is operating at steady state (the icon usually flashes for just a few seconds).
Immediately after this, the icon b18, which indicates the DC-AC circuit (inverter) part, will also behave normally.

Inverter not connected to the grid

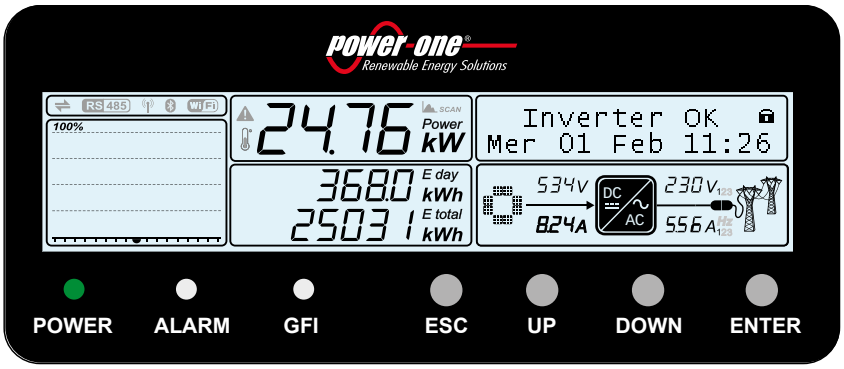


Inverter connected to the grid



• Immediately after this the grid connection phase will start. During this phase the icons on line b21 will be displayed in sequence until connection of the inverter. After the inverter is connected, the icons on the whole line b21 will come on steady.
If the inverter disconnects from the grid, the icons of the left side (cable and plug) of the line b21 will stay on.

• Once the connection sequence has terminated the inverter will be commissioned, and proper operation will be indicated by a beep and fixed light-up of the green LED on LED panel **14**. This means that there is sufficient wind to allow energy to be fed into the grid.




BEEP

• If the grid check is not successful the unit will repeat the procedure again until all the parameters allowing connection to the grid (grid voltage and frequency, isolation resistance) are within the range. During this phase the green LED will flash.

At the end of initial commissioning it is possible/necessary to configure the inverter using the display menu or the dedicated software Aurora Manager. The software and the relevant configuration manual can be downloaded from the address https://registration.power-one.it

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Display access and settings

After commissioning of the inverter, it is possible/necessary to set the inverter configuration by accessing the “settings menu” from the display. The following are the main adjustable parameters (see the section dedicated to the “**Menu descriptions**”)

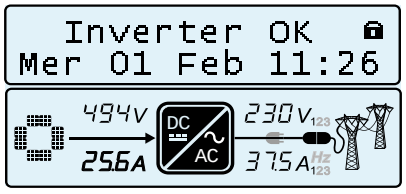
• **RS485 Address:** settings required in the case of system monitoring using the RS485 board

• **Analogue inputs setting (if any):** allows you to set the parameters of the analog sensors connected at the input (“Analog Inputs”).

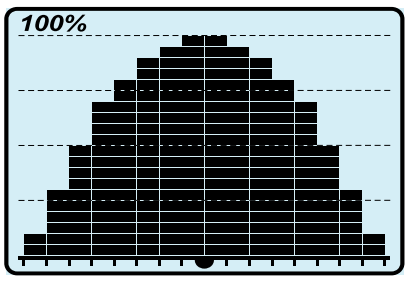
• **Reactive power input setting (where present):** setting necessary to manage the reactive power input into the grid in different ways (parameter “Reactive Power”)

• **Active power limitation setting (where present):** setting necessary to set a limit on active power output from the inverter (parameter “Power reduction”)

Dynamic behaviour of the display



• During operation the following values are displayed in rotation:
- Voltage and current (b15 and b16) from the wind turbine. The input channel taken into consideration is indicated by the value entered on the icon b14.
- Voltage and current (b19 and b20) on the various phases. According to the model of inverter the voltages and currents of one (1) or three phases (1,2,3) will be displayed. The phase being taken into consideration is highlighted on the right side of the voltage and current values.
At the end of this display the grid frequency will be indicated in field b20 and the chained voltage in field b19.
At the same time, the main readings made by the inverter will be shown in rotation on the graphic display b10.



• Displaying the power graph b11.
The histogram has 16 horizontal units and 20 vertical ones.
The time lapse is represented by the horizontal axis of the graph and can be set by the user to 8, 16 or 24 hours; as a result each horizontal unit can represent 30, 60 or 120 minutes.
The vertical axis represents the maximum power limit (2.2kW for model UNO-2.0-I-OUTD-W and 2.75kW for model UNO-2.5-IOUTD) so that 100% corresponds to that value of power exported at the output.
Finally, it must be remembered that the power value expressed by each column in the graph represents the average power value for the period represented by the horizontal unit.

LED behaviour

● = LED on
⊗ = LED flashing
⊗ = LED off
(x) = Any one of the conditions described above

The following table shows all the possible combinations of activation of the LEDs on the LED panel **14** in relation to the operating state of the inverter.

Table: LED behaviour

LED Status	Operating state	Notes
green: ⊗ **yellow:** ⊗ **red:** ⊗	OFF(Auto switch-off of the inverter)	The inverter is in switch-off mode (input voltage 70% less than the start-up voltage set for both inputs).
green: ⊗ **yellow:** ⊗ **red:** ⊗	Inverter initialization (loading of settings and wait for grid check)	This is a transition state due to verification of the operating conditions. During this phase, the input power is sufficient and the inverter checks the conditions necessary for connection to the grid (for example: value of the input voltage, value of the isolation resistance, etc.).
green: ● **yellow:** ⊗ **red:** ⊗	The inverter is connected and feeds power into the grid	The machine is operating normally. During this phase the inverter automatically follows the turbine power curve.
green: (x) **yellow:** (x) **red:** ●	Anomaly in the wind turbine isolation system	The inverter indicates that a low isolation resistance (R iso) level has been detected (presence of a leakage to ground from the wind turbine); the inverter continues to feed the power extracted from the generator into the grid. The problem may be connected to an isolation fault in the generator or in the connections (DC side).
green: ⊗ **yellow:** ● **red:** ⊗	We have: Anomaly (warning: W warning codes) Error (error: E warning codes)	Whenever the inverter control system detects an anomaly (W) or fault (E) in operation of the monitored system, the yellow LED comes on steady and a message indicating the type of problem found appears on the display **12**. The error can be inside or outside the inverter (see Alarm messages).
green: ⊗ **yellow:** ⊗ **red:** ⊗	Internal ventilation anomaly	Indicates an operating anomaly in the internal ventilation. This does not cause much of a problem to the inverter because the fan only starts at high temperatures combined with high output powers.
green: ⊗ **yellow:** ● **red:** ⊗	Disconnection from the grid	Indicates that the grid voltage allowing the inverter to connect to the grid is not present. The inverter shows the No Vac message on the display.

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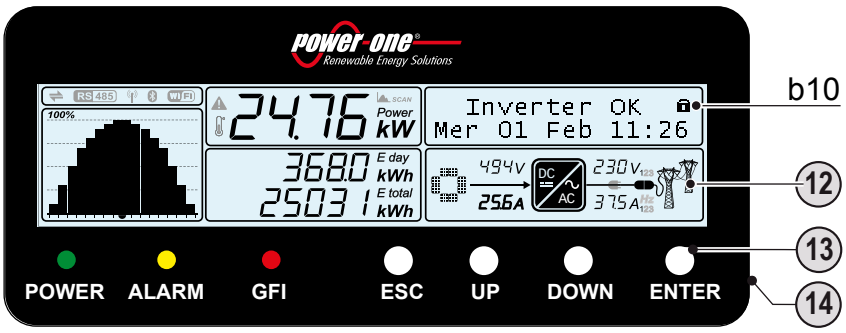
Specifications on operation of the LEDs

In correspondence to each inverter status indicated by the constant or intermittent lighting of the specific LED, the display **12**, section b10, also shows a message identifying the operation which is being carried out or the fault/anomaly detected (see specific chapter).



In the case of malfunction it is extremely dangerous to intervene personally to try and eliminate the fault. The instructions provided must be followed scrupulously; if you do not have the necessary experience and training to intervene safely, please contact a specialist.

GFI LED

Interventions after an isolation fault warning
When the red LED lights up, first of all try to reset the alarm using the ESC button on the LED panel **14**
Should the inverter duly reconnect to the network the fault was due to temporary phenomena.

You are advised to have the plant inspected by the installer or specialist should this malfunction occur repeatedly.

Should the inverter not reconnect to the grid it is necessary to isolate it on both the DC side and on the AC side (using the switches), then contact the installer or authorised centre to repair the fault in the wind turbine.

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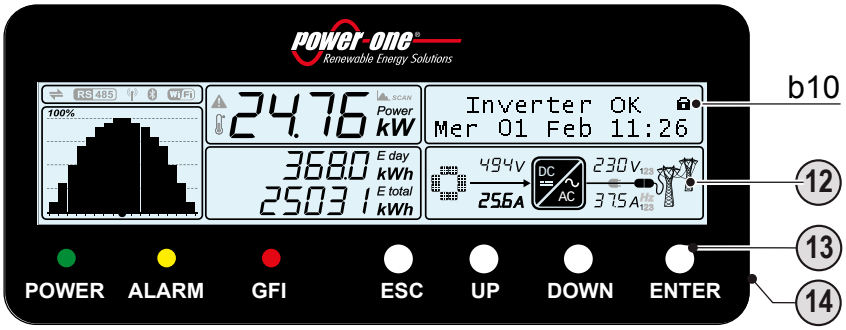
Description of the menus

The display **12** has a section b10 (Graphic Display) in which it is possible to navigate the menu using the keys on the LED panel **14**.
Section b10 comprises 2 rows with 16 characters each, which can be used to:

- View the operating status of the inverter and the statistics;
- View service messages for the operator;
- View alarm and fault messages.
- Modify the inverter settings



Using the panel keys

- The UP and DOWN keys on the LED panel **14** are used to move around a menu or to increase/decrease the settable values.

- The ESC key gives access to the three main sub-menus: STATISTICS, SETTINGS and INFORMATION.
During navigation it is used to return to the previous sub-menu.

- The ENTER button, when used during navigation, gives access to the sub-menu required and allows modification of the main menu scrolling mode (the icons b23 are activated):
CYCLIC: Cyclic display of the main inverter parameters.
LOCKED: Display locked to the screen to be monitored constantly.

Statistics Menu

Selecting STATISTICS from the three main sub-menus gives access to:

• **Total**
This section of the menu is used to display Total statistics:
Time: Total operating time
E-tot: Total energy produced
Val.: Total value of production, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved with respect to fossil fuels

• **Partial**
This section of the menu is used to display partial statistics:
Time: Partial operating time
E-par: Partial energy produced
PPeak: Peak power value
Val.: Partial value of production, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Partial amount of CO_2 saved

* All the counters in this sub-menu can be reset by pressing and holding ENTER for more than 3 seconds. At the end of this time a sound will be emitted three times.

• **Today**
This section of the menu is used to display daily statistics:
E-day: Daily energy produced
Ppeak: daily peak power value
Val.: Daily value of production, calculated using the currency and conversion coefficient
set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved daily

• **Last 7 days**
This section of the menu is used to display statistics for the Last 7 days:
E-7d: Energy produced over the last 7 days
Val.: Value of production over the last 7 days, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved over the last 7 days

• **Last month**
This section of the menu is used to display the statistics for the Last month:
E-mon: Energy produced during the current month
Val.: Value of production for the last month, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved over the current month.

• **Last 30 days**
This section of the menu is used to display statistics for the Last 30 days:
E-30d: Energy produced over the last 30 days
Val.: Value of production over the last 30 days, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved over the last 30 days.

• **Last 365 days**
This section of the menu is used to display statistics for the Last 365 days:
E-365: Energy produced over the last 365 days.
Val.: Value of production over the last 365 days, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved over the last 365 days

• **User Period**
This section of the menu is used to display statistics for a period selected by the user.
Once the start date and end date for the period have been entered the following data is available:
E: Energy produced during the selected period
Val.: Value of production for the selected period, calculated using the currency and conversion coefficient set in the relevant section of the SETTINGS menu
CO_2: Amount of CO_2 saved during the selected period

Settings Menu

Selecting SETTINGS from the three main sub-menus will bring up the first screen relating to the password.
The default password is "0000".
This can be modified using the display keys and following the usual procedure:
• Use ENTER to scroll from on figure to another (from left to right)
• Use ESC to return to the previous figure (from right to left)
• Press ESC several times to return to the previous menus
• Use DOWN to progressively scroll the numerical scale downwards (from 9 to 0)
• Use UP to progressively scroll the numerical scale upwards (from 0 to 9)
After typing the password, press ENTER to access the various information collected in this section:

• Address
This section of the menu allows you to set the address for serial communication of the individual inverters connected to the RS485 line.
The addresses that can be assigned are from 2 to 63. Use the UP and DOWN keys to scroll through the numbers.
The 'AUTO' option cannot be used at present

• Display Set
This section of the menu is used to set the display characteristics:
1. Light: used to set and adjust the display lighting mode
Mode:
ON: Light is always on
OFF: Light is always off
AUTO: Automatic light management. The light comes on every time a key is pressed and remains on for 30 seconds, after which it gradually dims and goes out.
Intensity: adjusts display brightness (scale from 1 to 9)
2. Contrast: adjusts display contrast (scale from 1 to 9)
3. Buzzer: sets key sounds
ON: key sounds are enabled
OFF: key sounds are disabled
4. Power Graph: Allows you to set the time scale of the power graph (8/16/24h)

• Service
This section of the menu is reserved for installers. To access this, it is necessary to have a dedicated password which may be obtained from the website https://registration.power-one.it.
Before connecting to the site, make sure you have all the information required to calculate your password:
Inverter model
Serial Number and Week of Production
Update field

The table below shows the parameters and the range of values that may be set:

Parameter	Parameter description	Setting range
Set U>>	Grid Over-voltage (OV) threshold (extended range)	Unom … Unom x 1.3
Set U<<	Grid Under-voltage (UV) threshold (extended range)	10V … Unom
Set F>>	Grid Over-Frequency (OF) threshold (extended range)	Fnom … Fnom + 5Hz
Set F<<	Grid Under-Frequency (UF) threshold (extended range)	Fnom - 5Hz … Fnom
Set U>	Grid Over-voltage (OV) threshold (strict range)	Unom … Unom x 1.3
Set U> (10Min)	Grid Over-voltage (OV) threshold (measure of the averagevalue of the mains voltage)	Unom … Unom x 1.3
Set U<	Grid Under-voltage (UV) threshold (strict range)	10V … Unom
Set F>	Grid Over-Frequency (OF) threshold (strict range)	Fnom … Fnom + 5Hz
Set F<	Grid Under-Frequency (UF) threshold (strict range)	Fnom - 5Hz … Fnom
Set Uconn>	Max voltage admissible during grid pre-connection phase	Unom … Unom x 1.3
Set Uconn<	Min voltage admissible during grid pre-connection phase	10V … Unom
Set Fconn>	Max frequency admissible during grid pre-connection phase	Fnom … Fnom + 5Hz
Set Fconn<	Min frequency admissible during grid pre-connection phase	Fnom - 5Hz … Fnom
Set Time U>>	Intervention time of Over Voltage (U>>) protection	0 … 327670mS
Set Time U<<	Intervention time of Under Voltage (U<<) protection	0 … 327670mS
Set Time F>>	Intervention time of Over Frequency (F>>) protection	0 … 327670mS
Set Time F<<	Intervention time of Under Frequency (F<<) protection	0 … 327670mS
Set Time U>	Intervention time of Over Voltage (U>) protection	0 … 327670mS
Set Time U<	Intervention time of Under Voltage (U<) protection	0 … 327670mS
Set Time F>	Intervention time of Over Frequency (F>) protection	0 … 327670mS
Set Time F<	Intervention time of Under Frequency (F<) protection	0 … 327670mS
Set time conn 1	Time lag, of grid parameters control, before connection	0 … 65535mS
Set time conn 2	Time lag, of grid parameters control, before connection after grid fault	0 … 65535mS
Disable U>>	U>> protection threshold disabling	Enable/Disable
Disable U<<	U<< protection threshold disabling	Enable/Disable
Disable F>>	F>> protection threshold disabling	Enable/Disable
Disable F<<	F<< protection threshold disabling	Enable/Disable
Disable U>	U> protection threshold disabling	Enable/Disable
Disable U> (10Min)	U> (10Min) protection threshold disabling	Enable/Disable
Disable U<	U< protection threshold disabling	Enable/Disable
Disable F>	F> protection threshold disabling	Enable/Disable
Disable F<	F< protection threshold disabling	Enable/Disable
U> (10Min) Der.	Enabling of power derating due to high average grid voltage value	Enable/Disable
Slow Ramp	Enabling gradual power immission into the grid after connection	Enable/Disable
OF Derating	Selection of power derating mode due to high value of grid frequency	0 Derating disable 1 Derating BDEW 2 Derating VDE-AR-N 3 Derating CEI
Reset Country S.	Allow to unlock the selection of the grid standard via rotary switches	
Accept boards	Allow to associate a new inverter board (when replacing)	

Changing the above parameters may mean that disconnection from the grid does not take place when the values indicated in the installation country standards are exceeded. If these parameters are changed to values outside the standard ones, an interface safeguard must be fitted outside the inverter in compliance with the requirements in the country of installation.

• New PW
This section of the menu is used to change the password giving access to the settings menu (default 0000).

Great care MUST be taken when storing the new password.
If the Password is lost it will not be possible to access the inverter, as no Reset function has been provided for security reasons

• Currency
This section of the menu is used to set the name of the currency and the value assigned to 1 kWh of energy produced. Proper setting of these parameters allows the actual gain/saving produced by the system to be displayed. **Name:** enter the value required (the default value is Euro)
Val/KWh: indicates the cost/incentives for 1 KWh expressed in the selected currency (default is 0.50).

• Date/Time
Enables adjustment of the current time and date (daylight saving time not included)

• Language
Allows you to set the required menu language

• Vstart
This section of the menu is used to set the voltage Vstart (separate for both channels if they are configured independently or available), to adapt it to the needs of the system.

• Alarm
This section of the menu is used to set switching of a relay contact (available both as a normally open contact – N.O. – and as a normally closed contact – N.C.). This contact can be used, for example, to: activate a siren or a visual alarm; to command the disconnect device in an external transformer or to command an optional external device. Maximum ratings for the alarm contact: 240Vac/1A and 30Vdc/0.8A
Switching of the relay can be set to 4 different modes:
PRODUCTION: the relay switches when the inverter connects to the grid.
ALARM: the relay switches in the event of an alarm (E code).
ALARM (conf.): the relay switches in the case of alarms (E code) or warnings (W code) selected by the user from a list (the list may show options that are not foreseen for the specific model).

CREPUSCULAR: the relay only switches when it exceeds the input voltage set for the grid connection.

• Remote Control

This section of the menu is used to enable / disable connection/disconnection of the inverter from the grid using the special control signal (+R/-R).

Disable: connection/disconnection of the inverter from the grid is dictated by the inverter input (voltage from the photovoltaic generator) and output parameters (grid voltage)

Enable: connection/disconnection of the inverter from the grid is dictated (as well as by the inverter input - voltage from the photovoltaic generator - and output parameters - grid voltage) by the state of the signal +R with respect to the signal –R.

• UV Prot. Time

This section of the menu is used to set the time that the inverter remains connected to the grid after the input voltage drops below the Under Voltage limit (set at 70% of Vstart). Power-One sets the time to 60 sec. The user can set it to between 1 and 3600 sec.

Example: after having set the function UV Prot. Time to 60 seconds, if the voltage Vin drops to below 70% of Vstart at 9.00 a.m., the inverter will stay connected to the grid (receiving power from it) until 9.01 a.m.

• Alarm Message

This section of the menu is used to enter a customised message that is shown on the display immediately after the specific error message has been shown.

Enable/Disable: Enables/Disables display of customised messages

Compose Message: it is possible to write the customised message, which can take up two lines of 16 characters each. The UP/DOWN arrows are used to select the character to be inserted, followed by ENTER to confirm.

Information menu

• Product ID
Allows you to view the product identification code

• Serial No
Allows you to view the equipment serial number.

• Firmware
Allows you to view the firmware version installed on the equipment

• Country Select.
Used to display information on the grid standard set using the rotating switches.
- Actual value: Displays the grid standard set.
- New value: If the position of the rotating switches is changed (and therefore a new grid standard is selected) during operation, the new standard selected will be displayed. This will only become effective the next time the equipment is turned off and then on again, and provided the time remaining to carry out that operation has not expired (24h in operation)
- Set new value: Used to confirm/set the new grid standard set in the previous menu section “New value”. Using this function the standard selected from the display and the position of the rotating switches will not correspond
- Residual time: Displays the residual time within which it is still possible to set a new grid standard. When the time expires the message “Blocked” will be displayed, indicating that it is not possible to modify the grid standard any further.

AUTOTEST procedure conforming to standard CEI 0-21

The autotest in accordance with the **CEI-021** grid standard may be started using the menu on the display or using an RS485/USB converter with the dedicated interface software (Aurora Communicator).
The conditions required to perform the Autotest are:
• You must have set grid standard **CEI-021**.
• You must not intervene in any way while the test is underway
• You must check that the device has a stable network connection.

Performing the tests that may be conducted using the menu appearing on the display

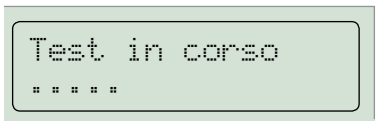
In the SETTINGS section of the Autotest menu, select the type of test the device is to start, from the following:
OV Test – parameters U>>, U>, U> (10Min). Disconnection from the distribution grid due to "Over-voltage"
UV Test – parameters U<<, U<. Disconnection from the distribution grid due to "Under-voltage"
OF Test – parameters F>> and F>. Disconnection from the distribution grid due to "Over-frequency"
UF Test – parameters F<< and F<. Disconnection from the distribution grid due to "Under-frequency"

Go to the SETTINGS > Autotest > menu

U>> R
U<< R
F>>
F<<
U>(10min) R
U> R
U< R
F>
F<

If one of the protections is disabled (by the utility menu) N/A (not applicable) will appear next to the name of the test.

While the test is being performed, the set limits will be gradually increased/reduced (depending on the type of test) until the threshold at which the inverter is disconnected from the grid is reached. Autotest methods are as stated by current legislation.
The start of the test is shown on the display with the message "Test in progress"



At the end of the test, when the inverter has disconnected from the grid, the results and values of the test performed will appear on the display. You can move from one screen to another using the UP/DOWN arrow keys.

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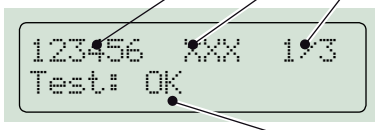
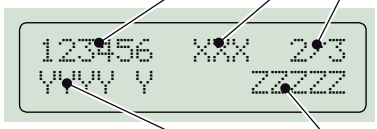
Details of the data available in each screen are provided below:

Screen 1 of 3



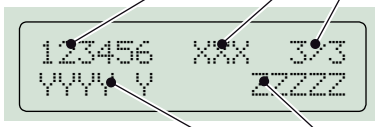
03 Inverter serial number
02 Parameter tested (E.g.: U>>)
01 Screen number
04 Test result

Screen 2 of 3



03 Inverter serial number
02 Parameter tested (E.g.: U>>)
01 Screen number
04 Value of the grid parameter detected when the protection was tripped
05 Measured protection tripping time

Screen 3 of 3



03 Inverter serial number
02 Parameter tested (E.g.: U>>)
01 Screen number
04 Protection tripping value
05 Set protection tripping time

The test results should be considered valid on the basis of the following tolerances, as reported in the applicable legislation:

- **≤ 5 % for voltage thresholds**
- **± 20 mHz for frequency thresholds**
- **≤ 3 % ± 20 ms for tripping times**

Press ESC to go to the Autotest menu again, from which you may select the next test to be performed.

8 - Maintenance

General conditions

Checking and maintenance operations must be carried out by specialized staff assigned to carry out this work.

Maintenance operations must be performed with the apparatus disconnected from the grid (power switch open) and the photovoltaic panels obscured or isolated, unless otherwise indicated.

For cleaning, DO NOT use rags made of filamentary material or corrosive products that may corrode parts of the equipment or generate electrostatic charges.
Avoid temporary repairs. All repairs should be carried out using only genuine spare parts.
The maintenance technician is under an obligation to promptly report any anomalies.

DO NOT allow the equipment to be used if problems of any kind are found, and restore the normal conditions correctly or otherwise make sure that this is done.

Always use the personal protective equipment provided by the employer and comply with the safety conditions of the Accident prevention chapter.

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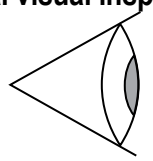
Routine maintenance

Scheduled maintenance operations are not mandatory, but are recommended to preserve the efficiency of the PV plant.

We recommend that maintenance operations be carried out by qualified personnel or by the personnel of Power-One (as set forth in a maintenance contract).

The periodicity of the maintenance operations may vary in accordance with local environmental conditions and the installation

Table: routine maintenance

Annual visual inspection 	• Check that the inverter is operating correctly, and that no fault alarms are present • Ensure all the labels and safety symbols are visible • Test the integrity of the cables, connectors, and plugs external to the inverter • Check that the environmental conditions have not changed drastically since the installation of the system
Annual operations 	• Check that cable glands and connection block screws are tight • Check that the cover is properly closed • If no monitoring system is present, check the history log of alarms and errors using the instructions given in the manual in order to look for recent malfunction warnings
Annual cleaning 	• Clean the equipment (in particular the heat sink)

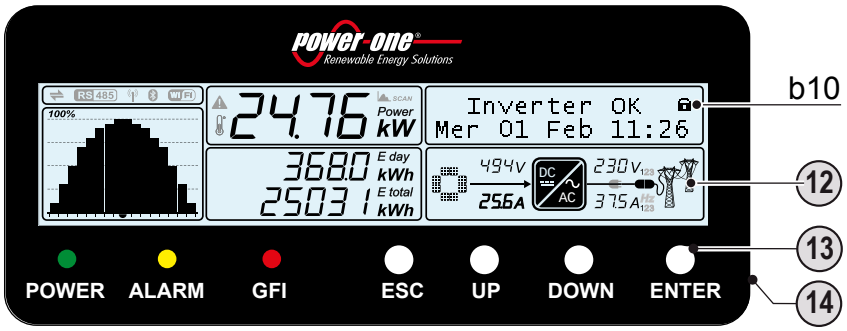
Troubleshooting

Follow the table shown in the following paragraph in order to understand and resolve warning (Wxxx) and error (Exxx) messages displayed by the inverter

The operations carried out on the inverter in order to identify and resolve malfunctions may be carried out only by the organization that carried out the installation or by qualified personnel

Alarm Messages

The equipment is only able to signal errors/warnings on the display if the la input voltage is higher than Vdcmin (POWER LED flashing or on; see the chapter on operation)
Any messages and related codes are displayed on the part of the display **12** marked b10.



The table below gives a full list of the error/warning messages relating to string inverters. Some of the error/warning codes may not be used, according to the model of inverter installed.

Message displayed	Codes displayed	Alarm	Cause	Solution
Ground Fault	Red LED	Ground Fault	The alarm is triggered when a ground dispersion current is detected in the DC section of the system. The alarm is accompanied by light-up of the red LED on the front of the inverter.	Check the connections on the DC side of the inverter and repeat the commissioning procedure. Check that the safeguards used to protect against transitory external over voltages are adequate and in a proper state of repair. Remove them and try again. Replace them if necessary. If the error is repeated frequently, consult the AN “Riso and Ileak Troubles Solving Guide” on the Power-One web portal (www.power-one.com).
Degauss error	---	Degaussing state fail		
Input OV	E002	Input Over voltage	This alarm is triggered when the inverter input voltage (from the wind turbine) exceeds the threshold set for proper operation. The alarm is triggered before reaching the absolute threshold beyond which the inverter will be damaged. When the inverter input voltage exceeds the Over Voltage threshold, the inverter will not start because the alarm is triggered.	It is necessary to measure the input voltage inside the inverter using a voltmeter. If it is higher than the maximum operating range voltage the alarm is genuine and the configuration of the wind turbine must be checked. If it is lower than the maximum operating range voltage the alarm is induced by an internal malfunction and you should contact the ***Power-One Service***
No Parameters	E003	Internal Parameters Error	The main microcontroller is not able to initialise the two DSPs (booster stage and inverter stage) properly. This is usually due to communication problems on the inverter’s internal bus.	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
Bulk OV	E004	Bulk Over voltage	Internal error in the inverter. The alarm is triggered when the voltage at the ends of the bulk condensers exceeds the Over Voltage threshold.	The alarm may be due to causes external to the inverter. an excessive inverter input voltage may be read as a state of over voltage for bulk capacities. In this case it is advisable to check the inverter input voltage. If the value is close to the input OV threshold the wind turbine configuration should be adjusted. The alarm may also be due to causes internal to the inverter, and in this case it is necessary to contact the ***Power-One Service.***

Message displayed	Codes displayed	Alarm	Cause	Solution
Ground Fault	Red LED	Ground Fault	The alarm is triggered when a ground dispersion current is detected in the DC section of the system. The alarm is accompanied by light-up of the red LED on the front of the inverter.	Check the connections on the DC side of the inverter and repeat the commissioning procedure. Check that the safeguards used to protect against transitory external over voltages are adequate and in a proper state of repair. Remove them and try again. Replace them if necessary. If the error is repeated frequently, consult the AN "Riso and Ileak Troubles Solving Guide" on the Power-One web portal (www.power-one.com).
Degauss error	---	Degaussing state fail		
Input OV	E002	Input Over voltage	This alarm is triggered when the inverter input voltage (from the wind turbine) exceeds the threshold set for proper operation. The alarm is triggered before reaching the absolute threshold beyond which the inverter will be damaged. When the inverter input voltage exceeds the Over Voltage threshold, the inverter will not start because the alarm is triggered.	It is necessary to measure the input voltage inside the inverter using a voltmeter. If it is higher than the maximum operating range voltage the alarm is genuine and the configuration of the wind turbine must be checked. If it is lower than the maximum operating range voltage the alarm is induced by an internal malfunction and you should contact the ***Power-One Service***
No Parameters	E003	Internal Parameters Error	The main microcontroller is not able to initialise the two DSPs (booster stage and inverter stage) properly. This is usually due to communication problems on the inverter's internal bus.	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
Bulk OV	E004	Bulk Over voltage	Internal error in the inverter. The alarm is triggered when the voltage at the ends of the bulk condensers exceeds the Over Voltage threshold.	The alarm may be due to causes external to the inverter. an excessive inverter input voltage may be read as a state of over voltage for bulk capacities. In this case it is advisable to check the inverter input voltage. If the value is close to the input OV threshold the wind turbine configuration should be adjusted. The alarm may also be due to causes internal to the inverter, and in this case it is necessary to contact the ***Power-One Service.***
Comm.Error	E005	Internal Commun-ication Error	This alarm is triggered when there are communication problems between the control devices inside the inverter	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
IGBT Sat	E007	IGBT Saturation	The alarm is triggered when one of the active inverter devices is in a state of saturation.	Every time the error occurs, the inverter attempts to restore normal operation. If the error only occurs sporadically it may be induced by a sudden transition in the grid voltage or in the input voltage, but it is not due to a malfunction in the inverter. If the error relates to an internal malfunction it will continue to occur, and it is therefore necessary to contact the ***Power-One Service.***
Internal error	E009	Internal Error	Internal error in the inverter	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
Bulk Low	E010	Low Bulk Voltage	The alarm may be due to causes external to the inverter. a reduced input voltage in the inverter (only slightly higher than the activation voltage) that is not accompanied by a sufficient supply of power from the wind turbine (a state typical of periods of low wind).	If the error message is triggered sporadically this may be due to causes outside the inverter (low wind and therefore low availability of power for the wind turbine). If the problem is repeated systematically even in the presence of high wind and with an input voltage significantly higher than the activation voltage, contact the ***Power-One Service.***
Ramp Fail	E011	Bulk ramp timeout	Internal error in the inverter relating to the time required by the DC-DC (Booster) circuit to operate at steady state	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
DcDc Fail	E012	Booster module error revealed by Inverter	Internal error in the inverter relating to operation of the DC-DC (Booster) circuit	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.

Over Temp.	E014	Over-temperature	External temperature exceeds 60°C. This parameter also depends on the power to be delivered by the inverter, as measurement of temperature is carried out internally and is influenced by the heat dissipation from components in the inverter itself.	Wait until the temperature to which the inverter is exposed has returned to the proper operating range and the inverter is able to cool itself. If the problem persists (even after the ambient temperature has returned within the range), contact the ***Power-One Service***.
Bulk Cap Fail	E015	Bulk Capacitor Fail	Error inside the inverter relating to a problem with the bulk capacitors.	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
Inverter Fail	E016	Inverter module error revealed by Booster	The alarm is triggered when a problem is detected in the inverter circuit (DC/AC)	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***
Start Timeout	E017	Inverter module start-up timeout	Internal error in the inverter relating to the time required by the DC-AC (Inverter) circuit to operate at steady state	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.
Ground Fault	E018	Leakage current fail	The alarm is triggered when a ground dispersion current is detected in the DC section of the system during normal operation of the inverter. The alarm is accompanied by light-up of the red LED on the front of the inverter.	Check the connections on the DC side of the inverter and repeat the commissioning procedure. Check that the safeguards used to protect against transitory external overvoltages are adequate and in a proper state of repair. Remove them and try again. Replace them if necessary. If the error is repeated frequently, consult the AN "Riso and Ileak Troubles Solving Guide" on the Power-One web portal (www.power-one.com).
Self Test Error 3	E019	Leakage current sensor self-test fail	Before connecting to the grid the inverter performs a self-test that relates to the leakage current sensor. The test is carried out by "forcing" a current with a know value into the leakage current sensor: the microprocessor compares the value read with the known value. The error is triggered if the comparison between value read and known value during the test does not fall within the allowed tolerance.	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the Power-One Service. Due to its nature, this alarm is only triggered before connection to the grid
Self Test Error 1	E020	Booster relay self-test fail	Before connecting to the grid the inverter performs some internal tests. One of these tests relates to proper operation of the booster relay. The test is carried out by "forcing" switching of the relay and checking its operation. The error is triggered if a problem is found when activating the relay.	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***. Due to its nature, this alarm is only triggered before connection to the grid
Self Test Error 2	E021	Inverter relay self-test fail	Before connecting to the grid the inverter performs a test that relates to operation of the inverter relay. The test is carried out by "forcing" switching of the relay and checking its operation. The error is triggered if a problem is found when activating the relay.	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***. Due to its nature, this alarm is only triggered before connection to the grid.
Self Test Error 4	E022	Relay self-test timeout	Time required to perform the self-test carried out on the DC_AC (inverter) circuit relay is too high. This may indicate a problem connected to the relays.	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***.

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DC inj error	E023	Dc-Injection out of range	The error is generated if the direct component in the current delivered on the grid exceeds the threshold of 0.5% of the rated operating current. In any case the inverter does not block when error E023 is triggered, but attempts to connect to the grid again. Sporadic repetition of the error is a sign of high grid distortion or rapid changes in the wind, while systematic repetition of the error indicates a fault in the inverter.	In the presence of high grid voltage distortion this problem should be notified to the grid company so that the problem can be solved. If the inverter is faulty, contact the ***Power-One Service***.
Internal error	E024	Internal Error	Internal error in the inverter	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***
Riso Low	E025 (not shown on the display)	Low isolation resistance	Before connecting to the grid the inverter measures the wind turbine isolation resistance with respect to ground. If the isolation resistance measured by the inverter is less than 1Mohm, the inverter will not connect to the grid and the error "Riso Low" will be displayed. The possible causes are: - Damaged wind turbine; - Rectifier (controller) not properly sealed, resulting in infiltration of water and/or humidity; - Connection problems); - Poor quality cable joints; - Presence in the DC section of unsuitable or damaged overvoltage surge arresters outside the inverter (trigger voltage lower than the characteristics of the wind turbine); - Presence of damp within the generator or rectifier	Check the connections on the DC side of the inverter and repeat the commissioning procedure. Check that the safeguards used to protect against transitory external overvoltages are adequate and in a proper state of repair. Remove them and try again. Replace them if necessary. If the error is repeated frequently, consult the AN "Riso and Ileak Troubles Solving Guide" on the Power-One web portal (www.power-one.com).
Vref Error	E026	Bad internal reference voltage	Bad internal reference voltage measurement	Internal error that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***
Error Meas V	E027	VGrid Measures Fault	Error in internal measurement of the grid voltage (set in the standard) to give a redundant measurement (2 measurements of the same parameter carried out by two different circuits).	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***
Error Meas F	E028	FGrid Measures Fault	Error in internal measurement of the grid frequency (set in the standard) to give a redundant measurement (2 measurements of the same parameter carried out by two different circuits).	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service.***
Error Meas Z	E029	ZGrid Measures Fault	Error in internal measurement of the PV generator isolation resistance with respect to ground (set in the standard) to give a redundant measurement (2 measurements of the same parameter carried out by two different circuits).	Internal error in the inverter that cannot be verified externally. The error occurs if the internal measurement is carried out before connection to the grid. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service.***
Error Meas Ileak	E030	ILeak Measures Fault	Error in internal measurement (carried out when the inverter is connected to the grid) of the ground leakage current on the DC side (generator) (set in the standard) to give a redundant measurement (2 measurements of the same parameter carried out by two different circuits).	This is an internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service.***

Error Read V	E031	Wrong V Measure	Measurement of the voltage at the relay terminals is outside the range. There is too much difference in voltage between the output relay input and output.	This is an internal error in the inverter that cannot be verified externally. If the problem occurs repeatedly it will be necessary to contact the ***Power-One Service.***
Error Read I	E032	Wrong I Measure	Output voltage imbalance measurement (taken between the three phases) outside range (only in three-phase models).	This is an internal error in the inverter that cannot be verified externally. If the problem occurs repeatedly it will be necessary to contact the ***Power-One Service***
UTH	E033	Under Tempera-ture	Temperature outside the inverter lower than –25°C.	Wait until the temperature to which the inverter is exposed returns within the operating range. If the problem persists, contact the Power-One Service. Remember to wait for long enough to allow the inverter to warm up.
Interlock fail	E034	IGBT not ready	Internal error in the inverter.	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service***
Remote Off	E035 (not shown on the display)	Waiting remote ON	The inverter has been turned off using the remote (remote OFF) and is waiting for the signal that will turn it on again (Remote ON).	Turn the inverter back on using the remote. If the unit does not start up, disable the ON/OFF from remote function and then shut the equipment down completely and start it up again. If the problem persists (even after the Remote ON/OFF has been turned off from the display), contact the ***Power-One Service.***
Vout Avg errror	E036	Average Vout out of range	The average grid voltage value (every 10 minutes) does not fall within the allowed range. The grid voltage at the point in which the inverter is connected is too high. This may be caused by excessively high grid impedance. During the final phase of the timeout the inverter limits power to check whether the grid voltage stabilises to within normal parameters. If this does not happen the inverter will disconnect from the grid.	Check the grid voltage at the inverter connection point. If the grid voltage is outside the range due to the state of the distribution grid, ask the grid company to rectify the grid voltage. If the grid company authorises modification of the inverter parameters, the new limits must be agreed with the ***Power-One Service***.
Mid Bulk OV	E038	Mid bulk OV	Internal error in the inverter.	Internal error in the inverter that cannot be verified externally. If the problem persists (even after the inverter has been turned off and then on again), contact the ***Power-One Service.***
Wind Low	W001	(Low input voltage during start-up of the inverter)	Insufficient wind. The wind turbine is not configured properly.	Check the inverter input voltage. If it does not exceed Vstart check that there is sufficient wind and that the system composition is correct. If it exceeds Vstart contact the ***Power-One Service.***
Input UV	W002	(Low input voltage during shut-down of the inverter)	Insufficient wind. The wind turbine is not configured properly.	Check the inverter input voltage. If it does not exceed Vstart check that there is sufficient wind and that the system composition is correct. If it exceeds Vstart contact the ***Power-One Service.***
Grid Fail	W003	Grid Fail (the grid voltage parameters are outside the limits)	This error is signalled when the grid parameters are outside the limits set by the grid company during normal operation of the inverter. Grid voltage absent (after signalling the problem the inverter switches to "Vac Absent") Unstable grid voltage (values too low or too high) Unstable grid frequency.	Check the grid voltage in the inverter. If it is absent, check whether the supply grid voltage is absent. If the voltage tends to rise (when the inverter is connected) there is a problem of high line or grid impedance. Check the grid voltage at the point of supply; if it is high this means there is a high grid impedance. In this case, request the grid company to adjust the voltage. If the grid company authorises modification of the inverter parameters, the new limits must be agreed with the Power-One Service If the voltage at the supply point is much lower than the one measured in the inverter, the line (inverter-counter) must be adjusted. If the grid voltage and frequency are within limits (even when the inverter is connected to the grid) contact the ***Power-One Service.***
Table fail	W009	Empty Wind Table	Absence of turbine power curve in the inverter.	Load the power curve into the inverter (follow the procedure described in the relevant chapter).

Fan Fail	W010 (not shown on the display)	Fan Fail	This error occurs in the presence of a failure in the fan/fans inside the inverter. In this state the yellow LED on the front panel flashes.	Internal error in the inverter that cannot be solved externally. If the alarm persists, contact the ***Power-One Service.*** **(Alarm not shown on the display, only the yellow LED flashes).**
Bulk UV	W011	Bulk Under-voltage	Reading of the internal voltage on the bulk condensers carried out when the inverter is connected to the grid	Check the inverter input voltage. If it does not exceed Vstart check that there is sufficient sun and that the system composition is correct. If it exceeds Vstart contact the ***Power-One Service.***
Battery low	W012	Low internal clock battery voltage	The internal battery used to maintain the date/time settings is low or damaged.	Change the battery with the inverter completely off (AC and DC sides disconnected), making sure that you respect the polarity.
Clk fail	W013	Internal clock fail	This alarm is triggered when there is a difference of more than 1 minute between the time shown on the display and the internal microprocessor clock, and it indicates a malfunction in the clock circuit.	Internal error in the inverter that cannot be solved externally. If the alarm persists, contact the ***Power-One Service.***
SPD DC protection open	W018	SPD DC protection open	Overvoltage surge arresters on the DC side damaged.	Check the inspection window on each of the overvoltage surge arresters (DC side). If it is red the overvoltage surge arrester is damaged and the cartridge must be replaced. If the alarm continues to be present even if all the surge arresters have a green inspection window, contact the ***Power-One Service.***
SPD AC protection open	W019	SPD AC protection open	Overvoltage surge arresters on the AC side damaged.	Check the inspection window on each of the overvoltage surge arresters (AC side). If it is red the overvoltage surge arrester is damaged and the cartridge must be replaced. If the alarm continues to be present even if all the surge arresters have a green inspection window, contact the ***Power-One Service.***

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Storage and dismantling

Storage of the equipment or prolonged stop

If the equipment is not used immediately or is stored for long periods, check that it is correctly packed and contact ***Power-One*** for storage instructions.
The equipment must be stored in well-ventilated indoor areas that do not have characteristics that might damage the components of the equipment.

Restarting after a long or prolonged stop requires a check and, in some cases, the removal of oxidation and dust that will also have settled inside the equipment if not suitably protected.

Dismantling, decommissioning and disposal

Power-One CANNOT be held responsible for disposal of the equipment: displays, cables, batteries, accumulators, etc., and therefore the customer must dispose of these substances, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.

If the equipment is dismantled, in order to dispose of the products that it is composed of, you must adhere to the regulations in force in the country of destination and in any case avoid causing any kind of pollution.

Dispose of the various types of materials that the parts of the equipment consist of in dumps that are suitable for the purpose.

Table: disposal of components

COMPONENT	MATERIAL OF CONSTRUCTION
Frame, brackets, supports	Arc-welded steel FE37
Casing or covers	ABS, plastic
Paint and	RAL .....
Gaskets and seals	Rubber / Teflon / Viton
Electrical cables	Copper / Rubber
Polyethylene / Nylon	Conduits
Back-up battery	Nickel / Lead/ Lithium