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# INSTRUCTION MANUAL FOR THE INSTALLER

## TRIO-20.0-TL-OUTD-400-W

## TRIO-27.6-TL-OUTD-400-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](http://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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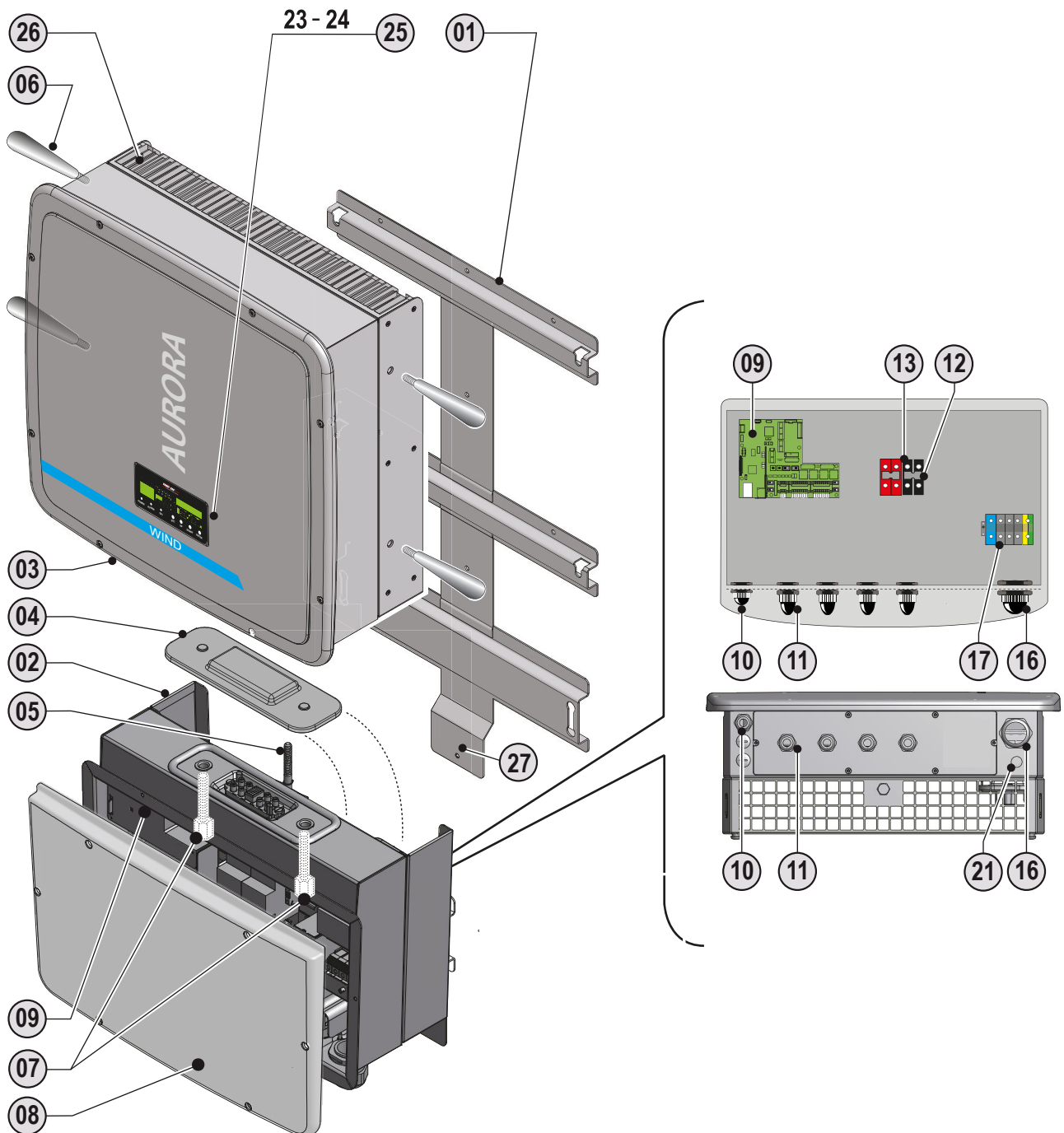


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## Reference number index

- |                        |                              |                   |
|------------------------|------------------------------|-------------------|
| 01, bracket            | 10, service cable glands     | 25, LED panel     |
| 02, wiring box         | 11, DC cable glands          | 26, heatsink      |
| 03, inverter           | 12, jumpers                  | 27, locking screw |
| 04, cover              | 13, DC input terminal board  |                   |
| 05, clamp screw        | 16, AC cable gland           |                   |
| 06, handles            | 17, AC output terminal board |                   |
| 07, connector screws   | 21, anti-condensation valve  |                   |
| 08, front cover        | 23, display                  |                   |
| 09, communication card | 24, keypad                   |                   |

## Graphical representation of references



000265AG

## The document and who it is for

### Purpose and structure of the document

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



***If the equipment is used in a manner not specified in the installer manual, the protection provided by the equipment may be impaired.***



***The language in which the document was originally written is 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 enclosed documentation is supplied:

- EC 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 that the operator has the necessary skill and training to do his/her job. Personnel in charge of using and maintaining the equipment must be expert, aware and skilled for the described tasks and must reliably demonstrate their capacity to correctly interpret what is described in the manual.***



***For safety reasons, only a qualified electrician who has received training and/or demonstrated skills and knowledge on the structure and operation of the unit may install the inverter.***



***The installation must be performed by qualified installers and/or licensed electricians in accordance with the existing regulations in the country of installation.***



***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 has civil liability for the qualification and mental or physical state of the professional figures who interact with the equipment. They must always use the personal protective equipment required by the laws of the country of destination and whatever is provided by their employer.***

## 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.
	<b>Generic hazard</b> - Important safety information. This points out operations or situations in which staff must be very careful.
	<b>Hazardous voltage</b> - This points out operations or situations in which staff must be very careful due to hazardous voltage.
	<b>Hot parts</b> - 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.

## 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.



---

## 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 is about are divided into two groups according to the maximum output power (20 kW or 27.6 kW).



*The choice of model of inverter 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.*

- **20 kW three-phase MODELS**  
TRIO-20.0-TL-OUTD-400-W

- **27.6 kW three-phase MODELS**  
TRIO-27.6-TL-OUTD-400-W

## Identification of the equipment and the manufacturer

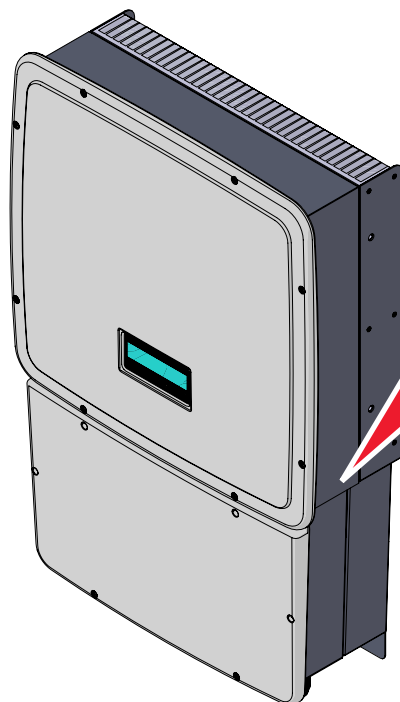
The technical data shown in this manual do not in any case replace those shown on the labels attached to the equipment.



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



N.B. The labels must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.); they must be cleaned regularly and kept visible at all times.

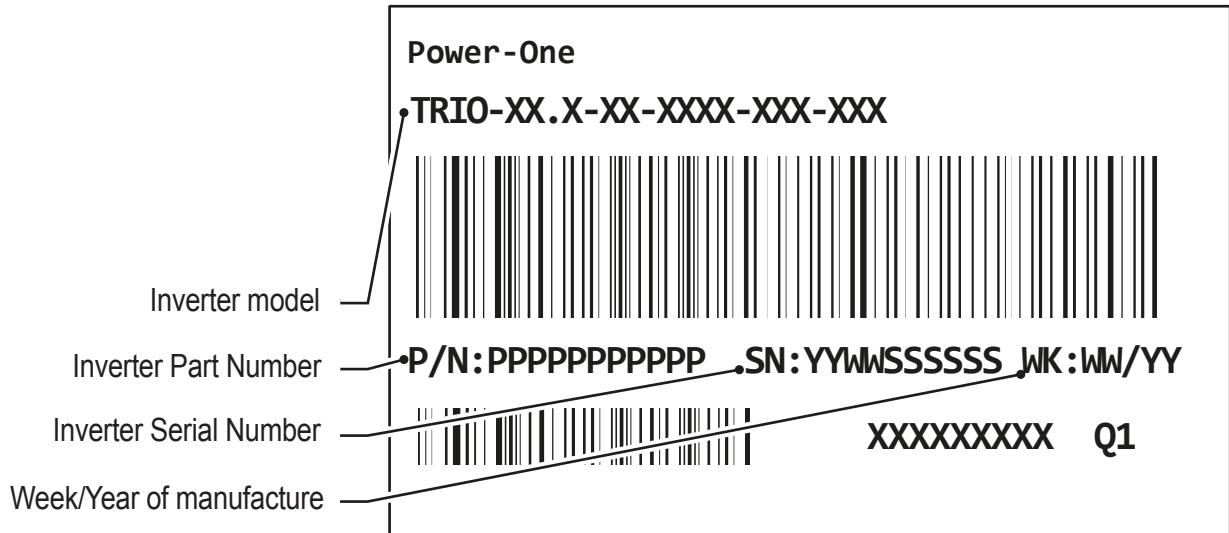


power-one <sup>®</sup>		CE	
AURORA <sup>®</sup>		Made in Italy	
WIND INVERTER		DIN V VDE 0126-1-11 PROTECTIVE CLASS: 2	
MODEL: TRIO-20.0-TL-OUTD-400-W			
V <sub>DC</sub> max	1000 V	V <sub>AC</sub> nom	400 V 3Ø, 3W+N+PE
V <sub>DC</sub> min	190 V	freq	50 Hz
V <sub>AC</sub> app	440 - 800 V	P <sub>AC</sub> nom (cosφ=1)	22000 W @ 45 °C amb.
I <sub>DC</sub> max	50 A	P <sub>AC</sub> nom (cosφ=0.9)	20000 W @ 45 °C amb.
I <sub>DC</sub> max	60 A	I <sub>AC</sub> max	33 A

power-one <sup>®</sup>		CE	
AURORA <sup>®</sup>		Made in Italy	
WIND INVERTER		DIN V VDE 0126-1-11 PROTECTIVE CLASS: 2	
MODEL: TRIO-27.6-TL-OUTD-400-W			
V <sub>DC</sub> max	1000 V	V <sub>AC</sub> nom	400 V 3Ø, 3W+N+PE
V <sub>DC</sub> min	190 V	freq	50 Hz
V <sub>AC</sub> app	500 - 800 V	P <sub>AC</sub> nom (cosφ=1)	30000 W @ 45 °C amb.
I <sub>DC</sub> max	64 A	P <sub>AC</sub> nom (cosφ=0.9)	27600 W @ 45 °C amb.
I <sub>DC</sub> max	80 A	I <sub>AC</sub> max	45 A



In addition to the label showing the specifications of the inverter, there are two part identification labels for the inverter and wiring box. These labels list the following information:



*If the service password is required, please use the details shown on the top label (inverter)*



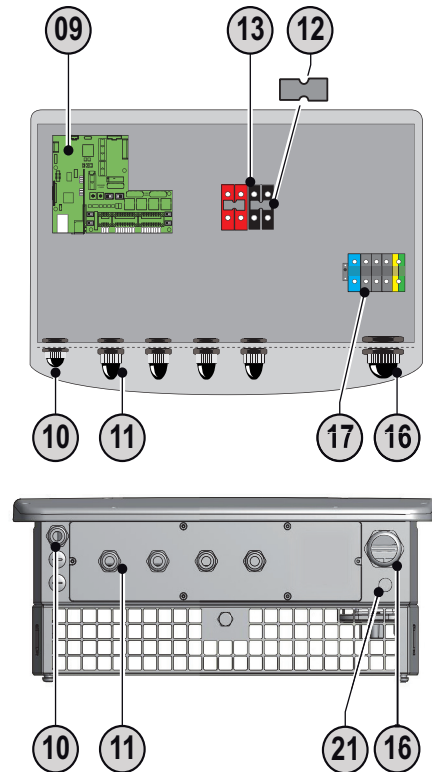
*N.B. The labels must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.); they must be cleaned regularly and kept visible at all times.*

## Wiring Box components

### Standard version

TRIO-XX.X-TL-OUTD: Standard version wiring box

#### Standard



#### Communication card

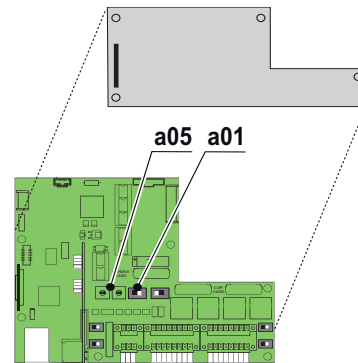


Table: electrical system components

Ref.	Description
09	communication card
10	service cable glands
11	DC cable glands
12	jumpers
13	DC input terminal board
16	AC cable gland
17	AC output terminal board
21	anti-condensation valve
a01	Switch for setting parallel-connected or independent input channels
a05	Rotary switches for setting the country and the language of the display

## Characteristics and technical data

Table: Technical data	TRIO-20.0-TL-OUTD-W	TRIO-27.6-TL-OUTD-W
<b>Input</b>		
Maximum Absolute DC Input Voltage V (V <sub>max,abs</sub> )	1000V	
Operating DC Input Voltage Range (V <sub>dcmín...V<sub>dcmax</sub></sub>	190...950V	
DC Input Voltage Range at Full Power (V <sub>fp,min...V<sub>fp,max</sub></sub>	440...800V	500...800V
Dc Power Limitation	Derating from Max to Null [800V≤V <sub>dc</sub> ≤950V]	
Maximum DC Input Current (I <sub>dcmáx</sub> )	50A	64A
Maximum Input Short Circuit Current	60A	80A
DC Connection Type	Screw Terminal Block Cable Glands	
<b>Input Protection</b>		
Reverse Polarity Protection	No	
Input Over Voltage Protection - Varistor	4	
Generator Isolation Control	According to local standard	
<b>Output</b>		
AC Grid Connection	Three phase 3W or 4W+PE	
Rated AC Power (P <sub>acr @cosφ=1</sub> )	20000W	27600W
Maximum AC Output Power (P <sub>acmáx @cosφ=1</sub> )	22000 W <sup>(3)</sup>	30000 W <sup>(4)</sup>
Maximum Apparent Power (S <sub>máx</sub> )	22200 VA	30000 VA
Rated Grid AC Voltage (V <sub>acr</sub> )	400V	
AC Voltage Range	320...480V <sup>(1)</sup>	
Maximum Output AC Current (I <sub>ac,máx</sub> )	33A	45A
Maximum output fault current	63Arms	
Rated Frequency (fr)	50Hz/60Hz	
Frequency Range (f <sub>mín...f<sub>máx</sub></sub>	47...53 Hz/57...63Hz <sup>(2)</sup>	
Nominal Power Factor (Cosφ <sub>iac,r</sub> )	> 0.995 (adj. ± 0.9, or fixed by display down to ± 0.8 with max 22 kVA )	> 0.995 (adj. ± 0.9, or fixed by display down to ± 0.8 with max 30 kVA )
Total Harmonic Distortion	< 3%	
AC Connection Type	Screw terminal block cable glands	
<b>Output Protection</b>		
Anti-islanding protection	According to local standard	
Maximum AC Overcurrent Protection	34 A	46 A
Output Over Voltage Protection - Varistor	4	
<b>Operating Performance</b>		
Maximum Efficiency (η <sub>máx</sub> )	98.2%	
Stand-by Consumption	< 8W	
Feed In Power Threshold	40W	
<b>Communication</b>		
Wired Local Monitoring (opt.)	PVI-USB-RS232_485 (opt.), PVI-DESKTOP (opt.)	
Remote Monitoring (opt.)	PVI-AEC-EVO (opt.), AURORA-LOGGER (opt.)	
Wireless Local Monitoring (opt.)	PVI-DESKTOP (opt.) con PVI-RADIOMODULE (opt.)	
User Interface	Display Grafico	
<b>Environmental</b>		
Ambient Temperature Range	-25...+60°C /-13...140°F with derating above 45°C/113°F	
Relative Humidity	0...100% condensing	
Noise Emission	< 50 db(A)	
Maximum Operating Altitude with Derating	2000 m / 6560 ft	
Environmental pollution classification for external environment	3	
<b>Physical</b>		
Environmental Protection Rating	IP 65	

Table: Technical data	TRIO-20.0-TL-OUTD-W	TRIO-27.6-TL-OUTD-W
Cooling	Natural	
Overvoltage Category in accordance with IEC 62109-1	II (DC input)	III (AC output)
Dimension (H x W x D)	1061 x 702 x 292 mm	41.7" x 27.6" x 11.5"
Weight	< 70 kg/153 lb	
<b>Safety</b>		
Isolation Level	Transformerless (TL)	
Marking	CE	
Safety and EMC standard	EN 50178, EN 62109-1, AS/NZS3100, AS/NZS 60950, EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12	EN 50178, EN 62109-1, EN 62109-2, AS/NZS3100, AS/NZS 60950, EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12

1. The AC voltage range may vary depending on specific country grid standard

2. The Frequency range may vary depending on specific country grid standard

3. Limited to 20000 W for Germany

4. Limited to 27600 W for Germany

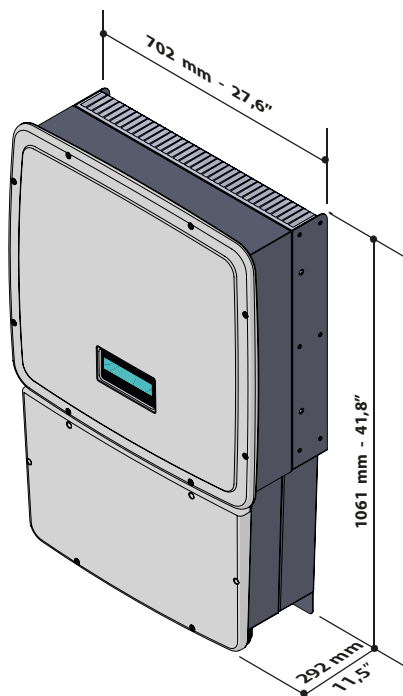
Remark. Features not specifically listed in the present data sheet are not included in the product

## Tightening torques

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

AC cable gland <b>16</b> PG36	<b>7.5 Nm</b>
Service cable glands <b>10</b> M25	<b>5.0 Nm</b>
Service cable glands <b>10</b> M20	<b>2.7 Nm</b>
DC cable glands <b>11</b> M25	<b>5.0 Nm</b>
Wiring box <b>02</b>	<b>2.4 Nm</b>
DC input terminal board <b>13</b> 50 mm <sup>2</sup>	<b>6.0 Nm</b>
AC output terminal board AC <b>17</b> 35 mm <sup>2</sup>	<b>2.5 Nm</b>

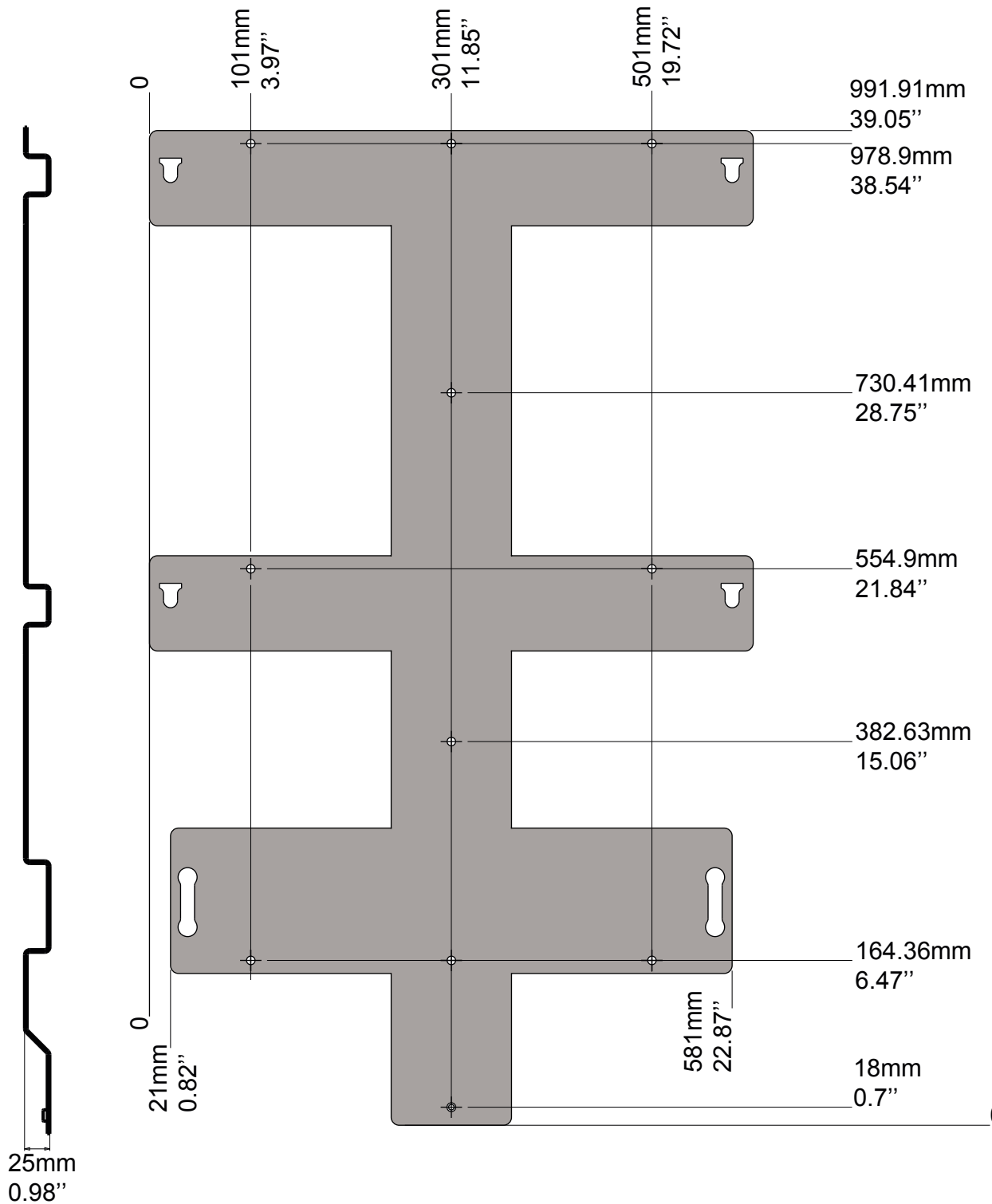
## Overall dimensions



The overall dimensions are expressed in mm and in inches

## Bracket dimensions

The overall dimensions are expressed in mm and in inches



## Efficiency curves

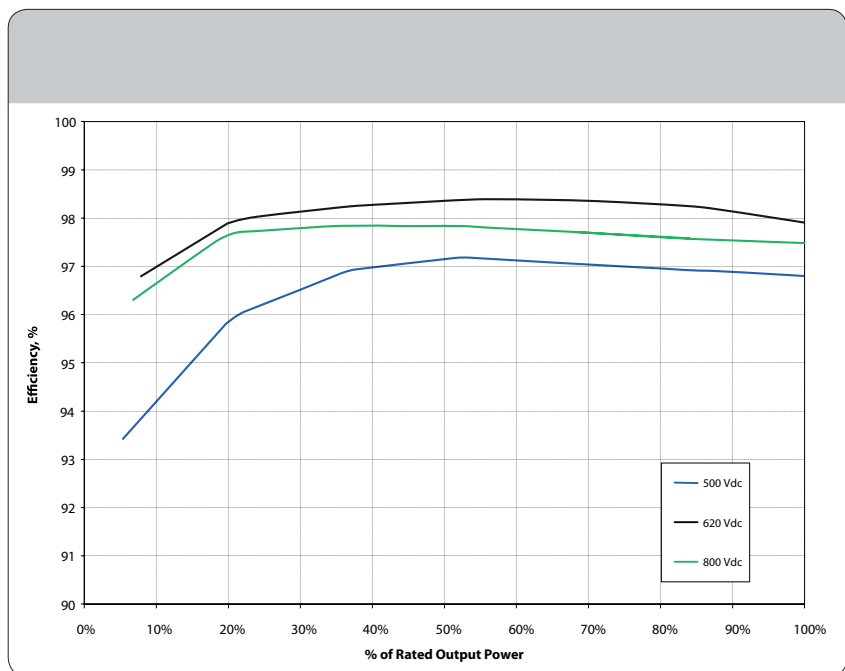
The equipment was designed in compliance with energy conservation standards, to avoid waste and unnecessary leakage.

The manufacturer has taken into due consideration the current energy saving standards in Italy.

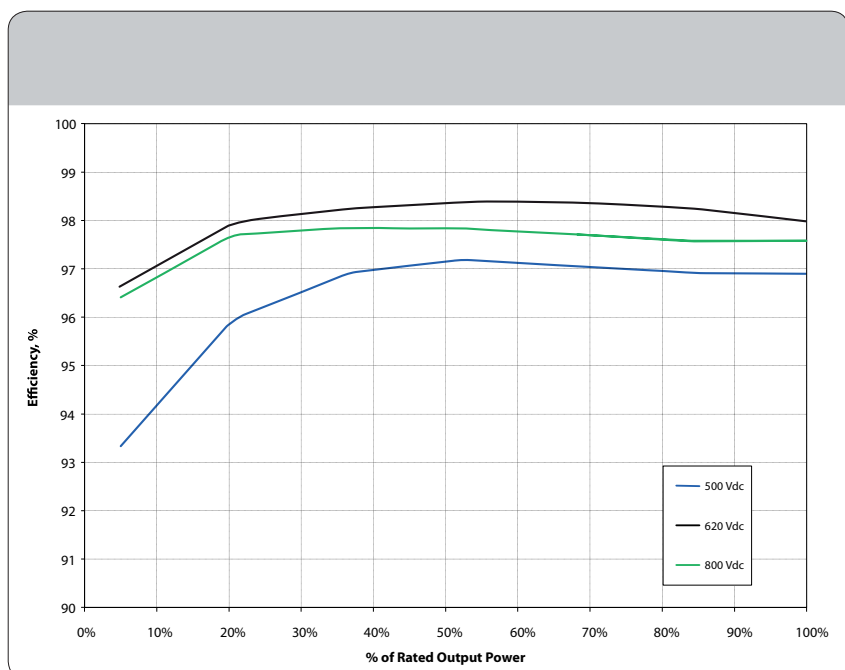
Graphs of the efficiency curves of all the models of inverter described in this manual are shown below.

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

### TRIO-20.0-TL-OUTD-400-W



### TRIO-27.6-TL-OUTD-400-W



## 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.*

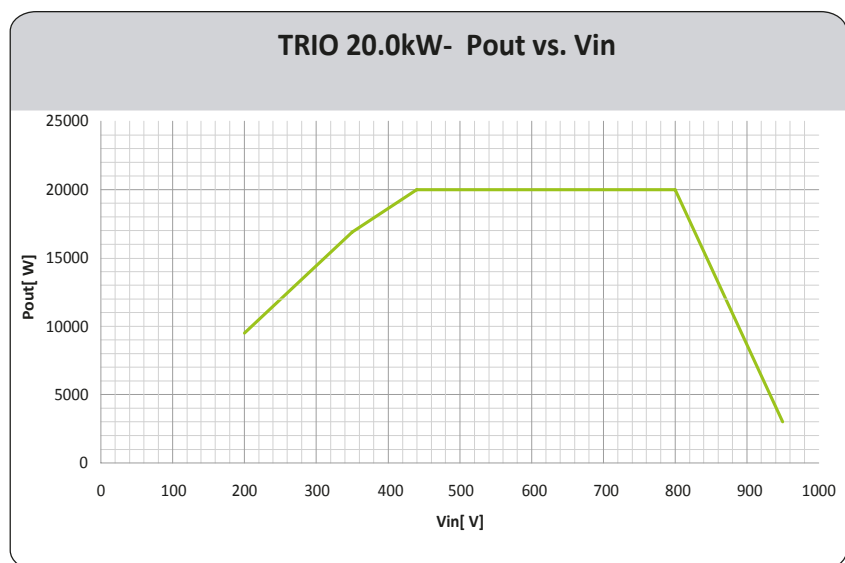
### Power reduction due to environmental conditions

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. The inverter can therefore reduce the power during certain periods of the day and according to the value of these parameters. In any case, the inverter guarantees the maximum output power even at high temperatures, provided the sun light is not shining directly on it.

### Power reduction due to the input voltage

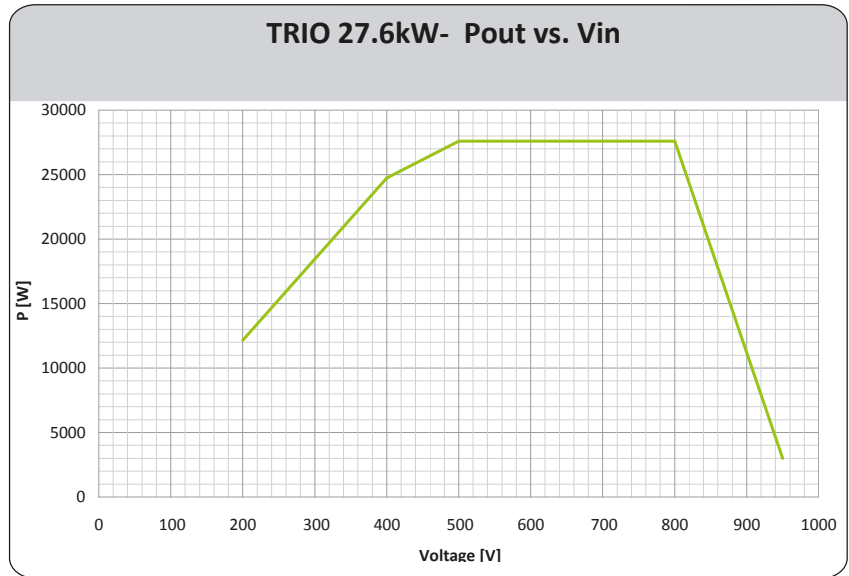
The graphs show the automatic reduction of supplied power when input voltage values are too high or too low.

TRIO-20.0-TL-OUTD-400-W



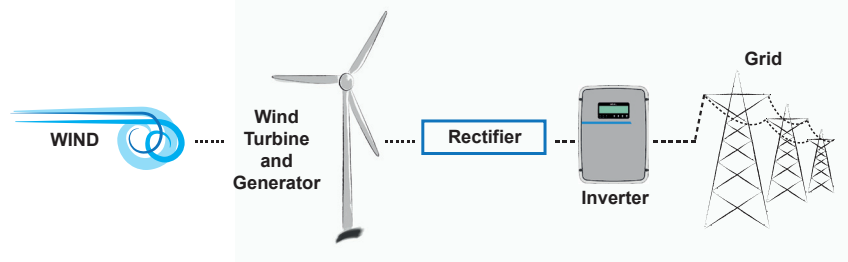


TRIO-27.6-TL-OUTD-400-W



## 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.

## Functionality and components of the equipment

### **Analogue inputs**

External analogue sensors for monitoring the environmental conditions (temperature, sunlight, etc.) can be connected to the inverter.

The analogue sensors are set directly from the display menus.

### **Configurable relay**

The inverter has a configurable switching relay that can be used in various operating conditions set in the dedicated menu. A typical application example is the closing of the contact when an alarm occurs.

### **Remote switching on/off**

This control can be used to switch the inverter on/off through an external (remote) control.

This function must be enabled in the menu, and if activated, the switching on of the inverter depends on the external switching on/off control as well as being dictated by the presence of the normal parameters that allow the inverter to connect to the grid.

### **Feeding reactive power into the grid**

The inverter is able to produce reactive power and can therefore feed it into the grid through the setting of the phase shift factor. Feed-in management can be controlled directly by the grid company through a dedicated RS485 serial interface or set on the display, or through the Aurora Manager LITE configuration software.

The feed-in management methods vary according to the country of installation and the relevant grid companies. For detailed information about the parameters and characteristics of this function, please contact **Power-One** directly.

### **Limiting the active power fed into the grid**

The inverter, if enabled and set using the display or the Aurora Manager configuration software, can limit the amount of active power fed into the grid by the inverter to the desired value (expressed as a percentage).

### **Data transmission and control**

The inverter or a grid of inverters may also be monitored remotely through an advanced communications system based on an RS-485 serial interface. The range of optional Power-One devices that may be connected to the communication line permit monitoring of the device either locally, or remotely via the internet.

As another option, it is possible to use a radio monitoring system by installing a "PVI-RADIOMODULE" radio card on the inverter to use a remote terminal for displaying the data, connected wirelessly.

**Radiomodule**

The PVI-RADIOMODULE card is an accessory which may be used to add a radio communication line to the inverter. It may be used in parallel with the RS-485 line for data transmission to the monitoring device.

**SD card**

This is used for updating the firmware (functionality implemented in a future revision of the firmware).

## Topographic diagram of the equipment

The diagram shown is a topographic diagram of the operation of the inverter.

The main blocks are the input DC-DC converters (called “boosters”) and the output inverter. Both the DC-DC converters and the output inverter operate at a high switching frequency and so enable a compact size and relatively light weight to be achieved.

The two boosters work in parallel, to handle power and/or current levels higher than those a single tracker can handle.

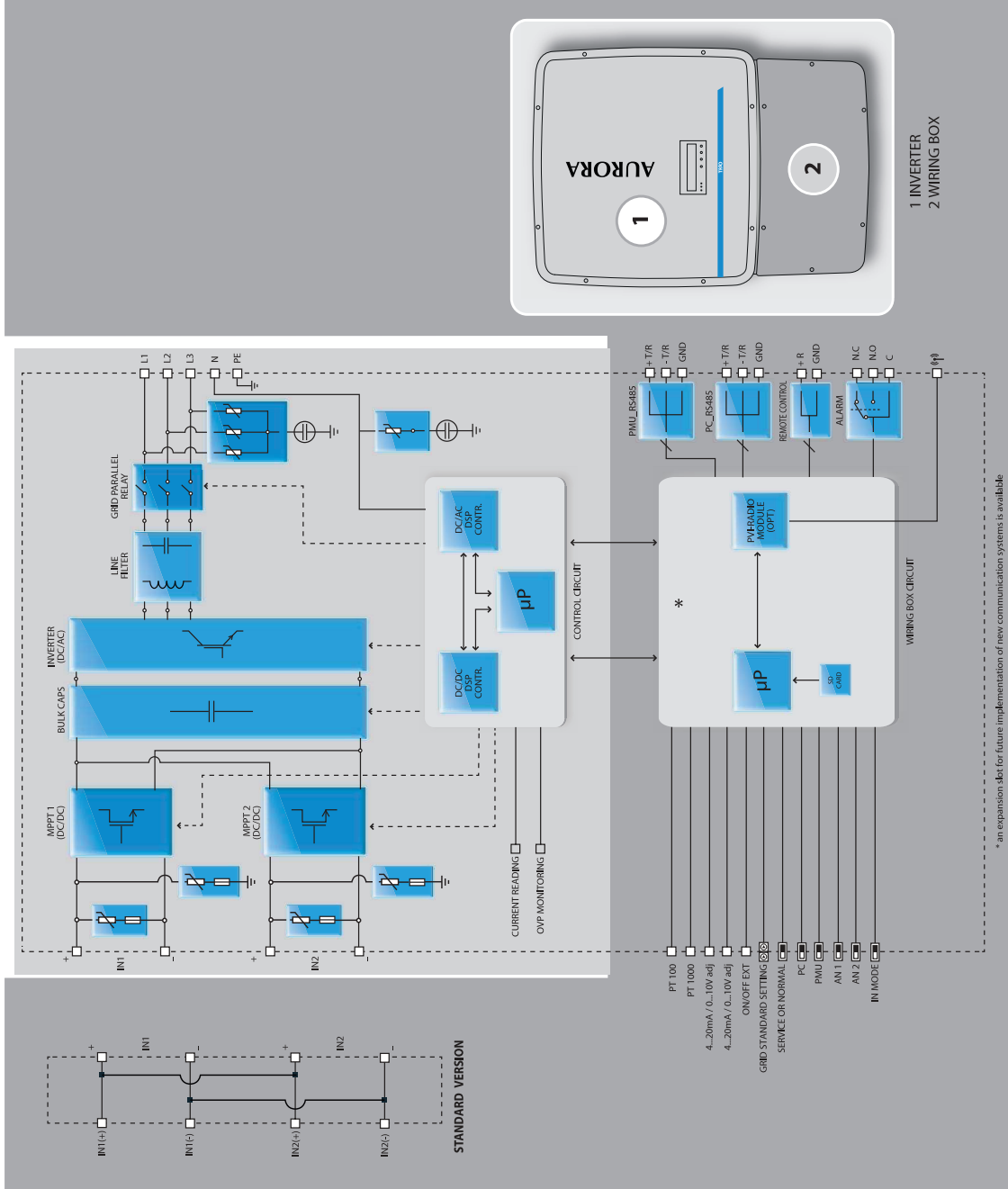
This version of inverter is transformerless, meaning it has no galvanic isolation between input and output, which enables a further increase in conversion efficiency. The inverter is already equipped with all the necessary protective devices for safe operation in compliance with the regulations.

The inverter is controlled by two independent DSPs (Digital Signal Processors) and a central microprocessor.

The connection to the electricity grid is therefore controlled by two independent computers, in full compliance with electrical standards regarding system powering and safety.

The operating system performs the operation of communicating with the relevant components to carry out data analysis.

**BLOCK DIAGRAM OF TRIO-20.0/27.6-TL-OUTD-W**



\* an expansion kit for future implementation of new communication systems is available

## Protective devices

### 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 the relevant national standards and laws. To prevent possible islanding, the inverter is equipped with an automatic protective disconnection system called “Anti-Islanding”.

### Ground fault in the wind generator

This inverter must be used with inputs connected with “floating” connections, that is, with positive and negative terminals without ground connections. An advanced ground fault protection circuit continuously monitors the ground connection and disconnects the inverter when a ground fault is detected. The ground fault condition is indicated by a red LED on the front panel.

### Further protective devices

The inverter is equipped with additional protective devices to guarantee safe operation. These protective devices include:

- Continuous monitoring of the grid voltage to ensure the voltage and frequency values stay within operating limits;
- Control of internal temperatures to automatically limit the power if necessary to ensure the unit does not overheat (derating).

***The numerous control devices produce a replete structure to guarantee totally safe operation.***



## 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.

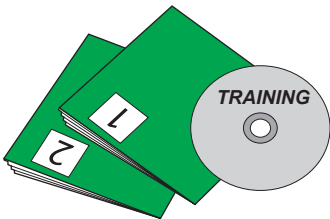


***For obvious reasons, it is not possible to anticipate the great number of installations and environments in which the equipment will be installed; it is therefore necessary for the customer to appropriately inform the manufacturer about particular installation conditions.***

***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.



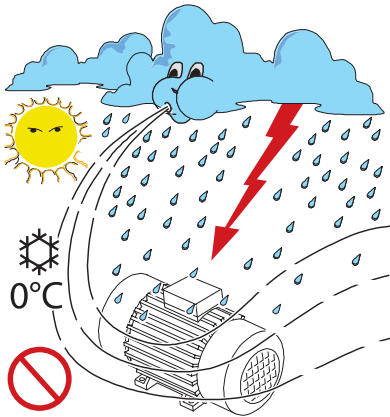
***Do not use the equipment if you find any operating anomalies.***

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



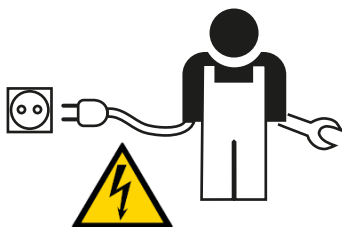
*The equipment can be installed outdoors, but only in environmental conditions that do not prevent its regular operation. These conditions are reported on the technical data and on installation chapter.*

**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.)

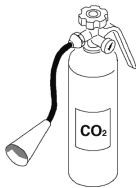
The technical data shown in this manual do not in any case replace those shown on the labels attached to the equipment.

## 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<sub>2</sub> 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.

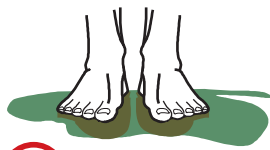


**Staff must not wear clothes or accessories that can start fires or generate electrostatic charges or, in gener, clothing that can impede personal safety.**



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.

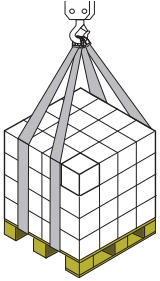
These risks are listed in the following table with some suggestions to prevent them.

### Table of residual risks

<b>RISK ANALYSIS AND DESCRIPTION</b>	<b>SUGGESTED REMEDY</b>
Noise pollution due to installation in unsuitable environments or where staff work permanently.	Reassess the environment or the place of installation.
Suitable local ventilation that 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.

## 4 - Lifting and transport

### General conditions



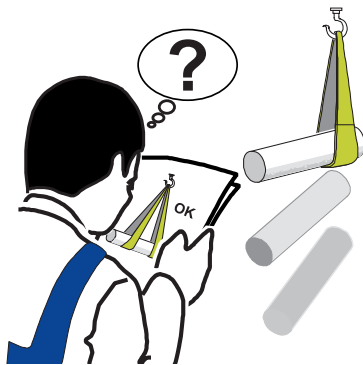
Some recommendation apply only to large size product or multiple small size packings.

### Transport and handling



### Lifting

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.**



**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).

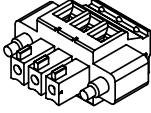
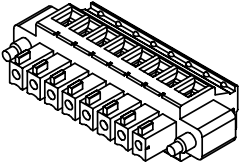
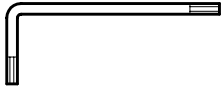



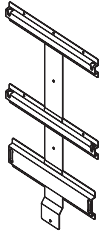
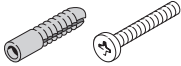

**The components of the packaging must be disposed on in accordance with the regulations in force in the country of installation.**

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 supplied components

Table: Components supplied with the equipment

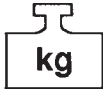
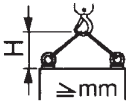
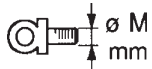
	Components available for all models	Quantity
	Connector for connecting the configurable relay	2
	Connector for the connection of the communication and control signals	4
	L-key, TORX TX20	1
	Two-hole gasket for M25 signal cable glands and cap	2 + 2
	Two-hole gasket for M20 signal cable glands and cap	1 + 1
	Jumpers for configuration of the parallel input channels	2
	Bracket for wall mounting	1
	Bolts and screws for wall mounting	10 + 10
	User manual and CD-ROM	1 + 1

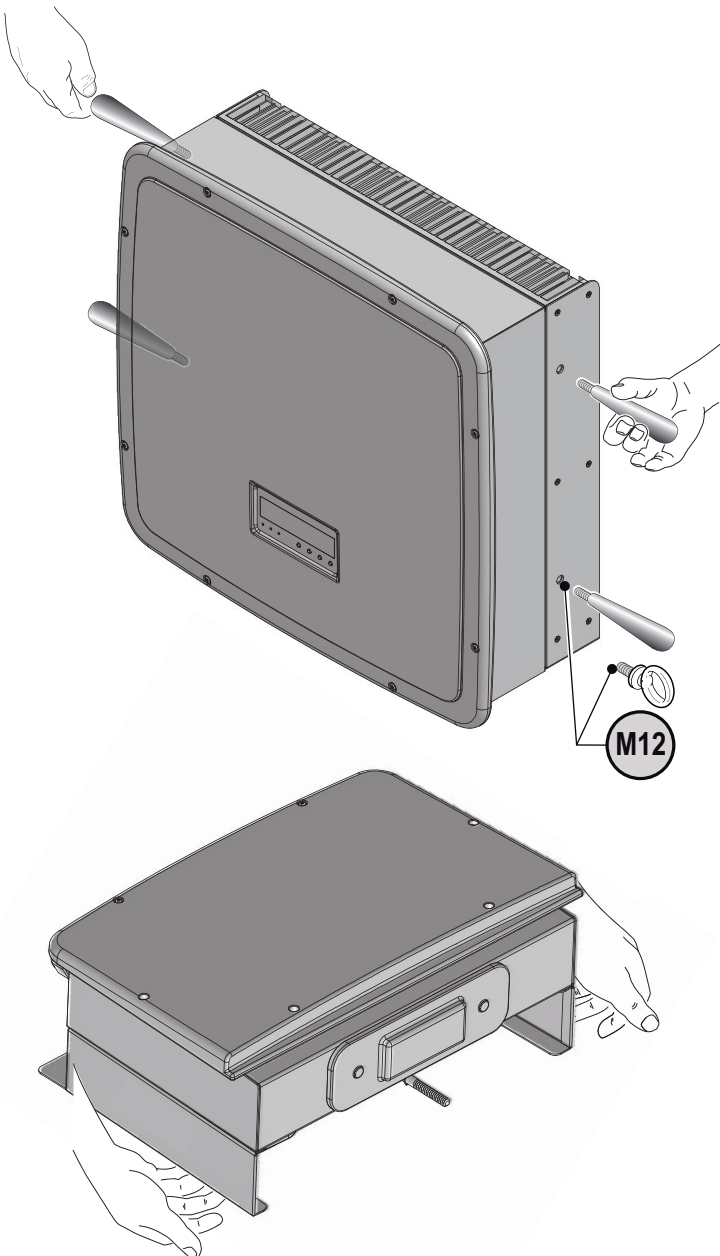
## Kit of recommended spare parts

A list of spare parts that are compatible with the TRIO inverter and in stock at the **Power-One** warehouse is given below.

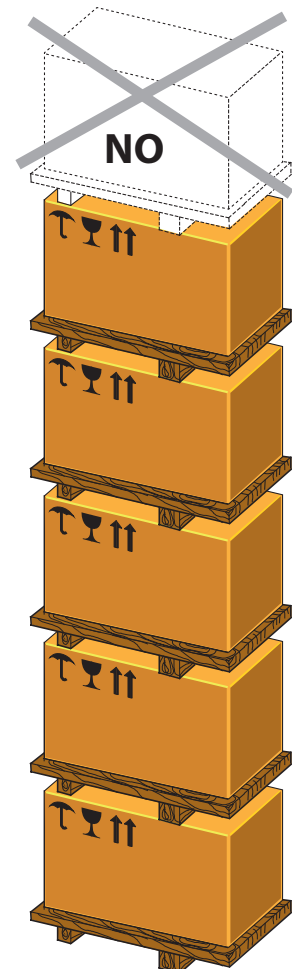
Code	Description	Quantity
TRIO HANDLING KIT	Kit of handles and eyebolts for lifting the inverter part	4 handles 2 eyebolts

## Weight of the equipment units

Table: Weights	Mass weight in kg 	Lifting points n°#	Minimum rope height 	Holes or Eyebolts UNI2947 
INVERTER unit	TRIO-20.0: 60 kg TRIO-27.6: 65 kg	4	1.200	<b>M 12</b> mounting kit with handles <b>06</b> and eyebolts (to order)
WIRING BOX unit	Basic 7 kg	2	-	-



If the package is stored correctly, it can withstand a **maximum load of 5 pieces of equipment**. DO NOT stack with equipment or products other than those indicated.

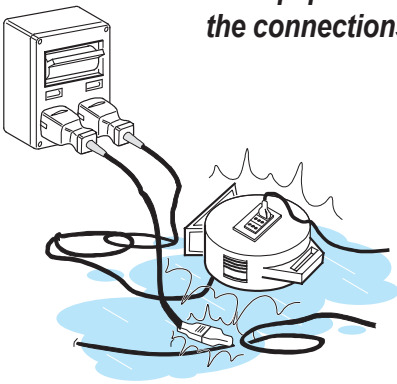




## 5 - Installation

### 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.



**For Safety reason 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**

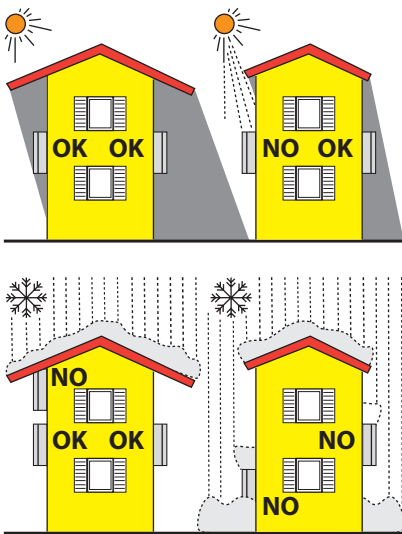


***The connection of an inverter energy system to an electrical installation connected to the electricity distribution network shall be approved by the appropriate electrical distributor.***



***The installation must be carried out with the equipment disconnected from the grid and with the wind generator in safety.***

## Environmental checks



- Consult the technical data to check the environmental parameters to be observed (degree of protection, temperature, humidity, altitude, etc.)
- The installation to direct sunlight must be avoid because it may cause:
  - phenomena of power limitation by the inverter (with consequent reduction of energy production)
  - premature aging of electronic/electromechanical components
  - premature aging of mechanical components (gaskets) and user interface (display)
- Do not install in small closed rooms where air cannot circulate freely.
- To avoid overheating, always make sure the flow of air around the inverter is not blocked.
- 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 noise (about 50dB(A) at 1 m) that the inverter makes during operation.
- Avoid electromagnetic interference that can compromise the correct operation of electronic equipment, with consequent situations of danger.



***The final installation of the inverter should not prevent access to any outside disconnection means.***

***Refer to the warranty conditions available on the website [www.power-one.com](http://www.power-one.com) to evaluate the possible exclusions from warranty related to improper installation.***

## 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 place of installation:***

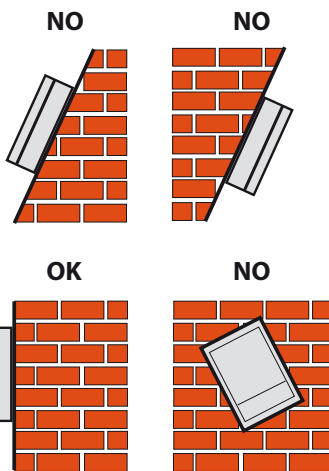
- Less efficient cooling and therefore a greater likelihood of the device going into derating because of high internal temperatures.
- Reduction in the dielectric resistance of the air that, in the presence of high operating voltages (DC input), can create electric arcs (discharges) that can reach the point of damaging the inverter.

As the altitude increases, the failure rate of some electronic components increases exponentially because of cosmic radiation.



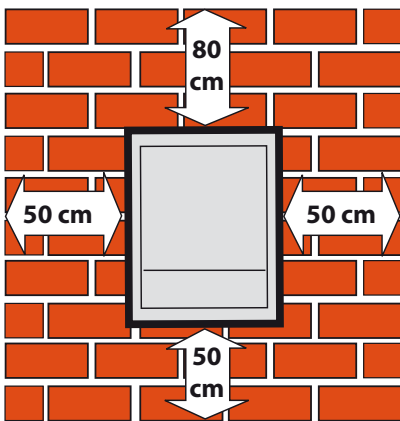
***All installations at altitudes of over 2000 metres must be assessed case by case considering the aforesaid criticalities.***

## Installation position

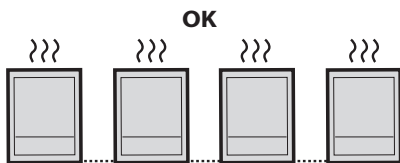


When choosing the place of installation, comply with the following conditions:

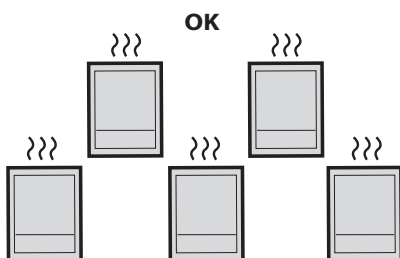
- Install on a wall or strong structure suitable for bearing the weight.
- Install in safe, easy to reach places.
- If possible, install at eye-level so that the display and status LEDs can be seen easily.
- Install at a height that considers the heaviness of the equipment. If this condition is not complied with, it can create problems in the event of servicing unless suitable means are provided to carry out the operation.
- Install vertically with a maximum inclination of  $\pm 5^\circ$ . If this condition is not complied with, the inverter could go into temperature derating because of the worsening of heat dissipation.



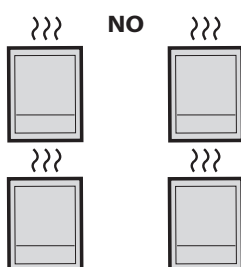
- To carry out maintenance of the hardware and software of the equipment, remove the covers on the front. Check that there are the correct safety distances for the installation that will allow the normal control and maintenance operations to be carried out.
- Comply with the indicated minimum distances.



- 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 mounting

- Position the bracket **01** perfectly level on the wall and use it as a drilling template.
- Drill the 10 holes required using a drill with 10mm bit. The holes must be about 70mm deep.
- Fix the bracket to the wall with the 10 wall anchors, 10mm in diameter, supplied.
- Hook on the wiring box **02** by inserting the head of the rear screws in the slots in the bracket, remove the front cover and make all the necessary connections.

**N.B.** It is not necessary to install the inverter **03** at this stage.

- Unscrew the connector screws **07** and remove the cover **04** so that you can reach the connector between the wiring box and the inverter.

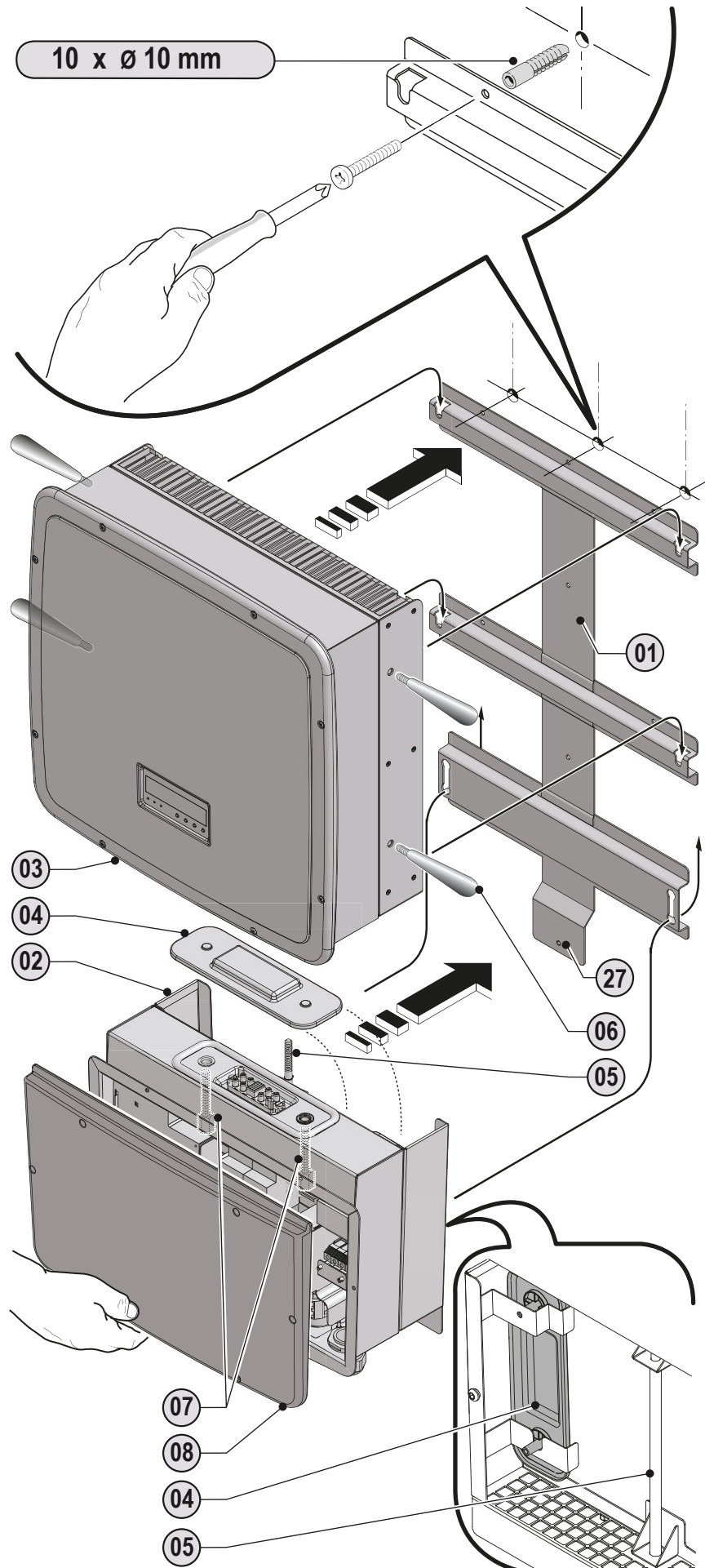
Put the cover in the special pocket provided at the back of the wiring box.

- Hook the inverter to the bracket by inserting the head of the rear screws in the slots as shown in the figure. To make lifting easier, handles **06** or eyebolts (M12) can be attached to the side holes provided.

- Join the two parts by tightening the coupling screw **05** working from the lower part of the wiring box.

- Once the parts are connected, screw in the two connector screws **07** situated inside the wiring box.

- Anchor the inverter to the bracket, tightening the locking screw **27** located on the lower side.



## Operations preparatory to PV generator connection

### Choice of differential protection downstream of the inverter

All **Power-One** Aurora string inverters marketed in Europe are equipped with a device for protection against ground faults in accordance with the safety standard set in Germany by Standard VDE V 0126-1-1:2006-02 (please refer to section 4.7 of the Standard).

In particular, **Power-One** Aurora inverters are equipped with a redundancy on the reading of the ground leakage current sensitive to all components of both direct and alternating current. Measurement of the ground leakage current is carried out at the same time and independently by 2 different processors: it is sufficient for one of the two to detect an anomaly to trip the protection, with consequent separation from the grid and stopping of the conversion process.

There is an absolute threshold of 300 mA of total leakage current AC+DC with protection tripping time at a max. of 300 msec.

In addition, there are another three tripping levels with thresholds respectively at 30 mA/sec, 60 mA/sec and 150 mA/sec to cover the "rapid" changes in fault current induced by accidental contact with leaking live parts. The max. tripping times are progressively shortened as the speed of change in the fault current increases and, starting from the 300 msec/max for the 30 mA/sec change, they are shortened respectively to 150 msec and 40 msec for 60 mA and 150 mA changes.

It should in any case be noted that the integrated device only protects the system against ground faults that occur upstream of the AC terminals of the inverter (namely towards the DC side of the wind generator). The leakage currents that can occur in the AC section between the draw/feed in point and the inverter are not detected and require an external protection device.

**For protection of the AC line**, on the basis of the aforesaid with regard to the differential protection integrated in **Power-One** Aurora inverters, **it is not necessary to install a type B ground fault interrupter.**

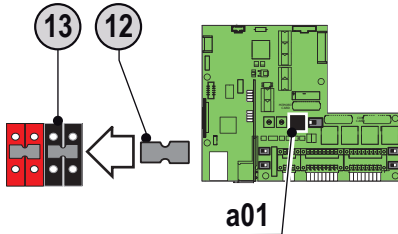
*In accordance with article 712.413.1.1.1.2 of Section 712 of IEC Standard 64-8/7, we hereby declare that, because of their construction, Power One Aurora inverters do not inject ground fault direct currents.*



*The use of an AC type circuit breaker with differential thermal magnetic protection with tripping current of 300 mA is advisable so as to prevent false tripping, due to the normal capacitive leakage current of the wind generator.*

## Configuration of input channels

### Configuration of parallel-connected channels



This configuration involves the use of the two input channels (MPPT) connected in parallel. This means that the jumpers **12** between the two channels (positive and negative) of the DC input terminal board **13** **must be installed** and that the switch **a01** situated on the communication card **09** must be set to “PAR” (see user interface).

*The connection of parallel channels is mandatory for the operation of the inverter. In case this configuration is not made, the inverter will notify the error **WRONG MODE**.*

## Input connection to the wind turbine (DC side)

Once the preliminary checks have been made and it has therefore been verified that there are no problems on the system, the inputs can be connected to the inverter.

The connections can also be made with the wiring box **02** detached from the inverter **03** that can be connected later for commissioning.

*When working with the wiring box **02** detached, pay particular attention to outdoor installations, where the coupling connector must always be protected by installing the cover **04** on its housing.*

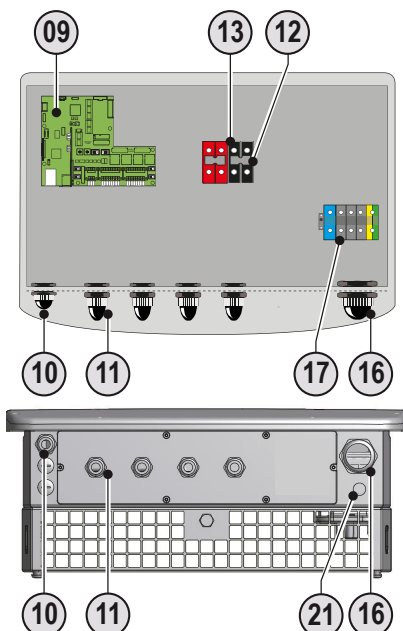


*To prevent electrocution hazards, all the connection operations must be carried out with the AC+DC disconnect switch open and locked (installed outside of the inverter).*



*A device for limiting the current must be foreseen/inserted between the generator and the DC side of the inverter (for the characteristics reference to “Maximum input current” from table “Characteristics and technical data”)*

### Connection of inputs



The connection with the DC input terminal board **13** is made by inserting the cables in the DC cable glands **11**.

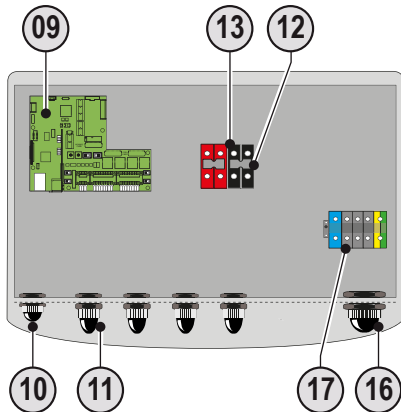
The maximum accepted cable cross-section ranges from 10 to 17 mm, whereas each individual terminal of the terminal board accepts a cable with cross-section of up to 50 mm<sup>2</sup>.

Unscrew the cable gland, remove the cover, insert the cable of suitable cross-section and connect it to the terminals on the DC input terminal board **13**.

Once the connection to the terminal board is complete, screw in the cable gland firmly and check the tightness.



## Grid output connection (AC side)



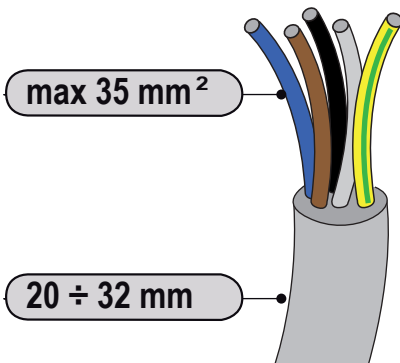
For the connection of the inverter to the grid, you can choose between a star connection (3 phases + neutral) and a delta connection (3 phases). **In any case, connection of the inverter to ground is mandatory.**

The cable you use can be 5-pole (star configuration) or 4-pole (delta configuration) and must pass through the AC cable gland **16** to make the connections to the AC output terminal board **17**.

The connections can also be made with the wiring box **02** detached from the inverter **03** that can be connected later to be put in service.

**When working with the wiring box 02 detached, pay particular attention to outdoor installations, where the coupling connector must always be protected by installing the cover 04 on its housing.**

## Characteristics and sizing of the line cable



The cross-section of the AC line conductor must be sized 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; In fact, 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.

The table shows the maximum length of the line conductor based on the cross-section of this conductor:

Cross-section of the line conductor (mm <sup>2</sup> )	Maximum length of the line conductor (m)	
	TRIO-20.0-TL-OUTD-W	TRIO-27.6-TL-OUTD-W
10	42m	30m
16	70m	50m
25	100m	78m
35	138m	98m

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

## Load protection switch (AC disconnect switch)

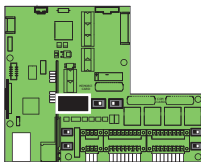
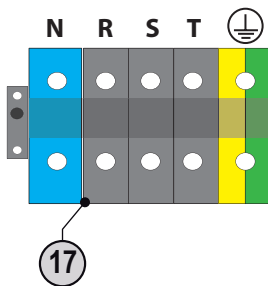
To protect the AC connection line of the inverter, we recommend installing a device for protection against over current and leakage with the following characteristics:

	TRIO-20.0-TL-OUTD-W	TRIO-27.6-TL-OUTD-W
Type	Automatic circuit breaker with differential thermal magnetic protection	
Voltage/Current rating	40A/400V	63A/400V
Magnetic protection characteristic	B/C	B/C
Type of differential protection	A/AC	A/AC
Differential sensitivity	300mA	300mA
Number of poles	3/4	3/4

## Connection to the AC side terminal board



**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, connection with the AC output terminal board **17** is made by inserting the cables in the AC cable gland **16**.

The maximum accepted cable cross-section ranges from 20 to 32 mm, whereas each individual terminal of the terminal board accepts a cable with cross-section of up to 35 mm<sup>2</sup>.

Unscrew the cable gland, remove the cover, insert the cable of suitable cross-section and connect the conductors (Neutral, R, S, T and Ground) to the terminals on the AC output terminal board **17**.

The connection of the inverter to the grid can be with three wires (delta configuration) or with four wires (star configuration).

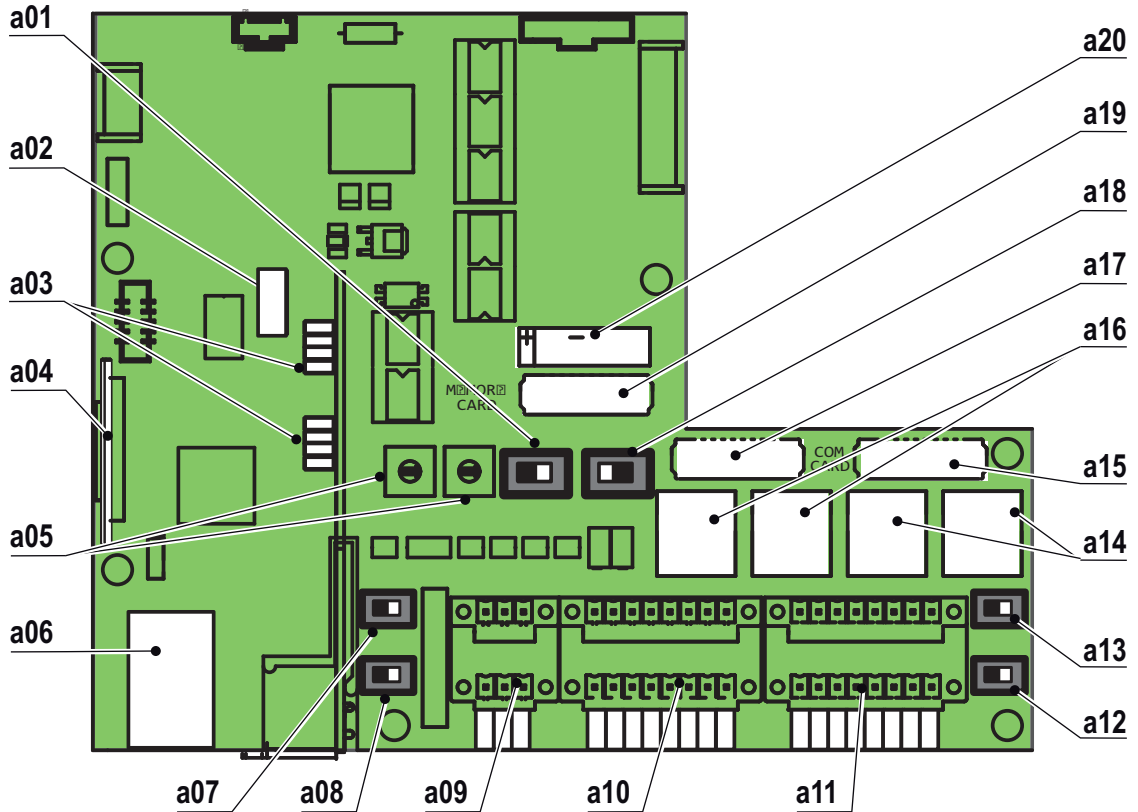
**Be careful not to change round one of the phases with neutral!**

Once the connection to the terminal board is complete, screw in the cable gland firmly and check the tightness.

**Before connecting the inverter to the national grid, the standard of the country must be set. To do this, turn the two rotary switches a05 following the table shown in the relevant chapter.**



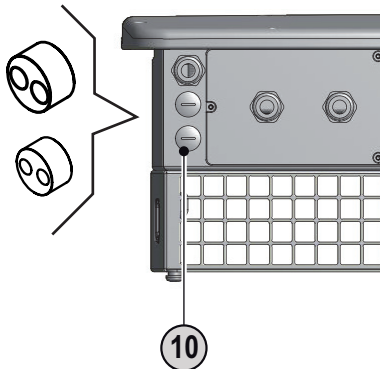
## Communication card



communication card 09

Ref. inverter	Ref. manual	Description
S5	a01	Switch for setting parallel-connected or independent input channels
J16	a02	Connector for the installation of WIFI modules ( <b>NOT ACTIVE</b> )
J11 e J14	a03	Connectors for radiomodule card installation
A1	a04	Housing for memory card SD CARD
S7 e S8	a05	Rotary switches for setting the standard of the country and the language of the display
J1	a06	Ethernet port ( <b>NOT ACTIVE</b> )
S3	a07	Switch for setting analogue sensor 1 to Volts or mA
S1	a08	Switch for setting analogue sensor 2 to Volts or mA
J2	a09	Connection to the multi-function relay
J3	a10	Connectors for environmental sensors: AN1, AN2, PT100, PT1000, tachymeter (wind version only) and power supply for environmental sensors (24 V DC)
J4	a11	Connection of the RS485 (PC) line, RS485 (PMU) line, of the auxiliary 5V and of the remote ON/OFF
S2	a12	Switch for setting the termination resistance of the RS485 (PMU) line
S4	a13	Switch for setting the termination resistance of the RS485 (PC) line
J7 e J8	a14	Connection of the RS485 (PC) line on RJ45 connector
J10	a15	RS485 (PC) communication card housing
J5 e J6	a16	Connection of the RS485 (PMU) line on RJ45 connector
J9	a17	RS485 (PMU) communication card housing
S6	a18	Switch for setting the inverter in normal or service mode
J12	a19	Inverter data memory card housing
BT1	a20	Battery housing

## Connections to the communication card



Each cable that must be connected to the communication card **09** must go through the three service cable glands **10**.

- One of size M25 that accepts a cable with cross-section of between 10mm and 17mm. Two-hole gaskets are supplied for insertion in the cable gland, which allow two separate cables with cross-section of up to 6mm to go through.
- Two of size M20 that accept a cable with cross-section of between 7mm and 13mm. Two-hole gaskets are supplied for insertion in the cable gland, which allow two separate cables with cross-section of up to 5mm to go through.

## Serial Communication Connection (RS485)

There are two RS485 communication lines on the inverter:

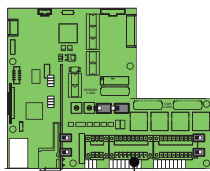
**PC** - dedicated line for connecting the inverter to monitoring devices or for making the daisy-chain connection (“in-out”) of several inverters. The line can also even accept power management controls.

**PMU** (power management unit) - dedicated line for power management by the power distributor in the country where the inverter is installed.

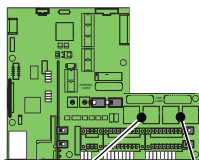
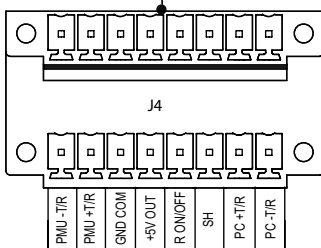
Cables connecting the RS485 line (PC) and RS485 line (PMU) may use two different types of connection:

- **Connection of the conductors using the terminal connectors a11 (+T/R, -T/R, GND COM and SH)**

The LNK connection must be used for connecting the shielding boot(s) of the cable(s).

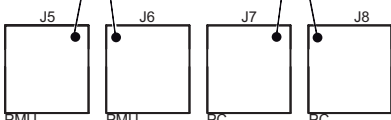


**a11**



**a16**

**a14**



- **Connessione dei conduttori con connettori RJ45 a12**

The RJ45 connectors (A) and (B) available for the RS485 communication, are equivalent to each other and can be used interchangeably for the arrival or for the output of the line in realising the daisy chain connection of the inverters.

The same is true for connections made using the terminal connectors a11.

**Table: crimping scheme connectors RJ45**

	Pin N°	Function
	1	not used
	2	not used
	3	+T/R
	4	not used
	5	-T/R
	6	not used
	7	GND COM
	8	not used

**Use a connector with metal body to provide cable shield continuity!**

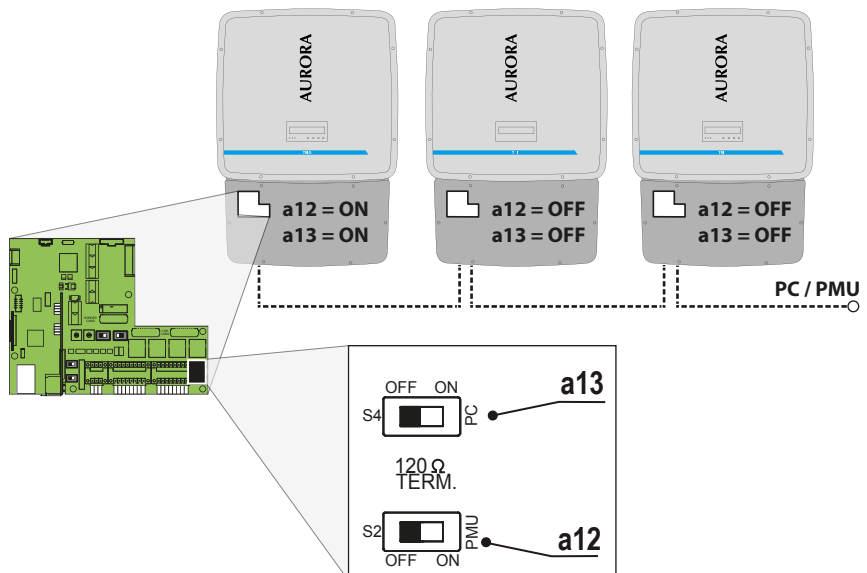
For long distance connections, the connection on terminal connector is preferable using a shielded twisted pair cable with characteristic impedance of  $Z_0=120$  Ohm like the one shown in the following table:

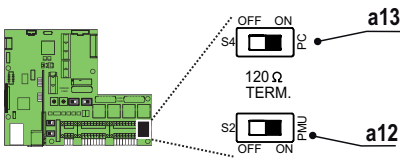
	Signal	Symbol	Pair	Cable
	Positive data	+T/R	A	1
	Negative data	-T/R	A	2
	Reference	GND COM	B	1+2

**Shield continuity must be provided along the communication line using the SH terminal and must be grounded at a single point.**

## Procedure for connection to a monitoring system

Connect all the units of the RS485 chain in accordance with the “daisy-chain” arrangement (“in-out”) observing the correspondence between signals, and activate the termination resistance of the communication line in the last element of the chain by switching switch a12 or a13 (to ON position) being careful to switch the switch of the serial line used (PC or PMU).



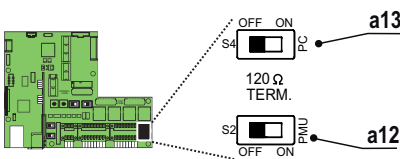


If a single inverter is connected to the monitoring system, activate the termination resistance of the communication line by switching switch a12 or a13 (to ON position).

Set a different RS485 address on each inverter of the chain. **No inverter should have “Auto” as its address.** An address can be chosen freely from out of 2 to 63.

The address on the inverter is set through the display and the push-button panel (see relevant chapter).

**We recommend not exceeding a length of 1000m for the communication line. No more than 62 inverters can be connected to the same RS485 line.**



When using an RS-485 connection, if one or more inverters are added later to the system, you must remember to return to OFF position the switch of the termination resistance used (PC or PMU) of the inverter that was previously the last one of the system.

Each inverter is dispatched with two (2) as the predefined RS485 address and with switch for setting termination resistance a12 or a13 to OFF position.

## Monitoring system via serial (RS485)

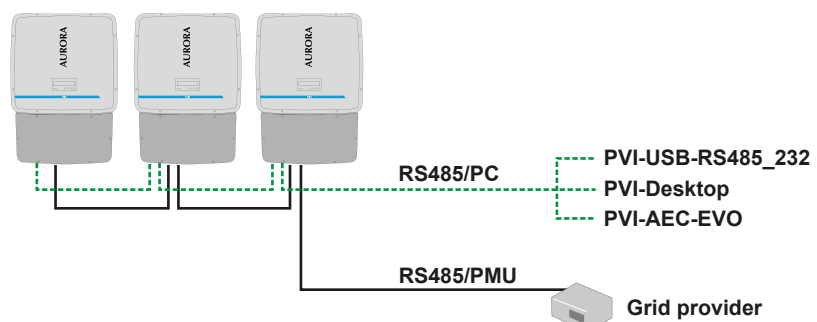
The RS485 line can be connected to various monitoring devices that can be in **local** or **remote** mode:

- **Local monitoring from PC** with **PVI-USB-RS485\_232** adaptor and **Aurora Communicator** software
- **Local monitoring from remote display** with **PVI-DESKTOP** device
- **Remote monitoring** with **PVI-AEC-EVO** monitoring system and **Portal P1**

For local monitoring, **Power-One** recommends connecting its PVI-USB-RS485\_232 adaptor between the first unit of the daisy-chain and the computer.

**Equivalent devices found on the market can also be used for the same purpose, but, bearing in mind that they have never been specifically tested, Power-One cannot guarantee correct operation of the connection.**

Please note that these devices may also require an external termination impedance, whereas this is **not necessary** with the Aurora PVI-USB-RS485\_232.



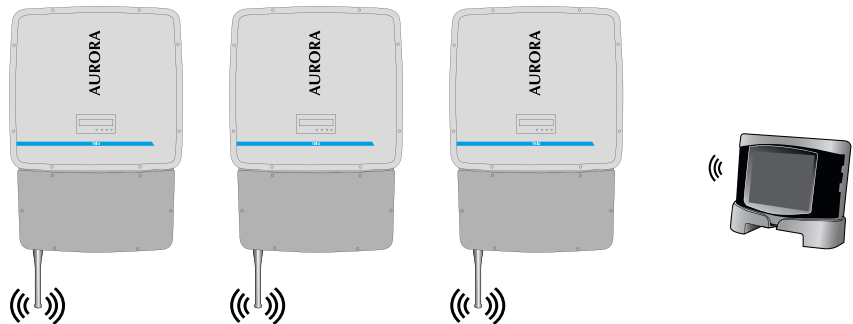
## Monitoring system via Radiomodule

The radiomodule card is an accessory used to replace the RS485 line for data transmission to the monitoring device.

The radiomodule card is installed vertically on the communication card **09** by connecting the two **a03** connectors. In turn, wiring ending with an antenna installed outside the wiring box is connected to the radiomodule:

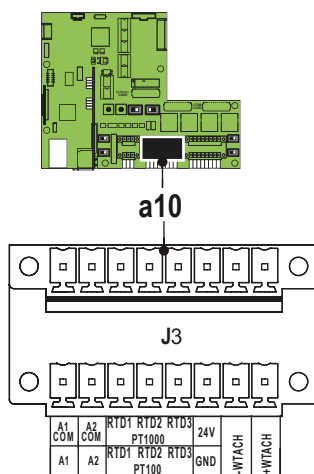
The part of the wiring box where the antenna will be installed will be in place of one of the service cable glands **10** of size M20.

Monitoring is carried out using PVI-DESKTOP software.

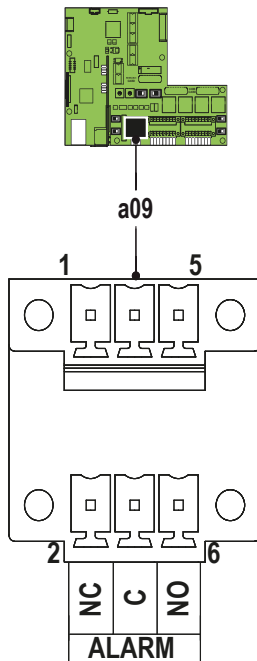


## Connection of the frequency input signal

Connect, through apposite cables, terminal blocks **-WTACH** and **+WTACH**, found on terminal board **a10**, to the 25kW-WIND-INTERFA-CE terminal blocks labeled as **"REF1"** and **"FC1"**.



## Configurable relay connection



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

The inverter has a multi-function relay **a09**, whose switching can be configured. It can be connected with normally open contact (being connected between the NO terminal and the common contact C) and with normally closed contact (being connected between the NC terminal and the common contact C).

This contact can be used in four different operating configurations that can be set in the dedicated menu.

### Operating modes

- **Production**: the relay switches whenever a connection to (and therefore a disconnection from) the grid occurs.

So if the NO (or NC) contact is chosen, the contact will stay open (or closed) until the inverter is connected to the grid; once the inverter connects to the grid and starts to export power, the relay switches state and therefore closes (or opens).

When the inverter disconnects from the grid, the relay contact returns to its position of rest, namely open (or closed).

- **Alarm**: the relay switches whenever there is an alarm on the inverter (Error). No switching occurs when there is a Warning.

So if the NO (or NC) contact is chosen, the contact will stay open (or closed) until the inverter reports an error; once the inverter reports an error, the relay switches state and therefore closes (or opens).

The contact remains switched from its rest condition until normal operation is restored.

- **Alarm (configurable)**: the relay switches whenever there is an alarm (Error) or a Warning, which have been previously selected by the user through the dedicated menu.

If the NO (or NC) contact is chosen, the contact will stay open (or closed) until the inverter reports an error or a warning out of those selected from the menu; once the inverter displays an error or a warning out of those selected, the relay switches state and therefore closes (or opens) the contact. The relay remains switched from its rest condition until the alarm or warning has disappeared.

- **Crepuscular**: the relay usually switches when the voltage from the wind generator exceeds/falls below the threshold set for grid connection. If the NO (or NC) contact is chosen, the contact will stay open (or closed) until the inverter has an input voltage higher than the one selected for grid connection. The contact remains switched from its rest condition for as long as the inverter is switched on (even if not connected to the grid). This mode is useful for disconnecting large output transformers that could have unnecessary consumption during periods of absence of wind..



The operating mode can be selected by going to **SETTINGS** → **Alarms**

The device to be connected to the relay can be of different types (light, sound, etc) but must comply with the following requirements:

**Alternating current**

Maximum Voltage: 240 Vac

Maximum Current: 1 A

**Direct current**

Maximum Voltage: 30 Vdc

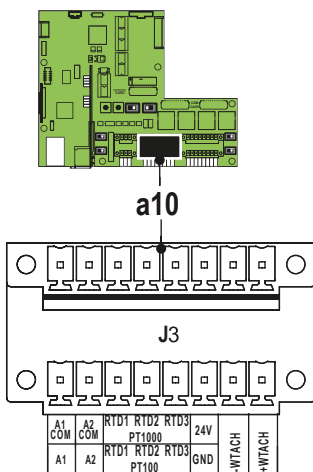
Maximum Current: 0.8 A

**Cable requirements**

External diameter: from 5 to 17 mm

Conductor cross-section: from 0.14 to 1.5 mm<sup>2</sup>

**Connecting environmental sensors**



External sensors for monitoring environmental conditions can be connected to the connectors of the environmental sensors a10:

The sensor cables are connected to communication card **09** through the terminal connectors supplied.

**AN1** - Analogue sensor 1 connection

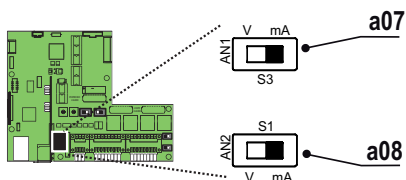
**AN2** - Analogue sensor 2 connection

**PT100** - Connection of a PT100 temperature sensor

**PT1000** - Connection of a PT1000 temperature sensor

Setting of the connected analogue sensors must be carried out by setting the following values in the relevant menu:

- **GAIN**
- **OFFSET**
- **Unit of measure**



For each analogue sensor, AN1 and AN2, it is also necessary to set the switch, a07 or a08, to select whether the reading is in Volts or mA.

**Each sensor model has precise configuration values that must be set meticulously. If the analogue sensors require an external power supply, use terminals 24V (positive) and GND (negative) on connector a10.**

## Specifications of environmental sensors

Tables with the technical data of the main sensors marketed by **Power-One** are shown below:

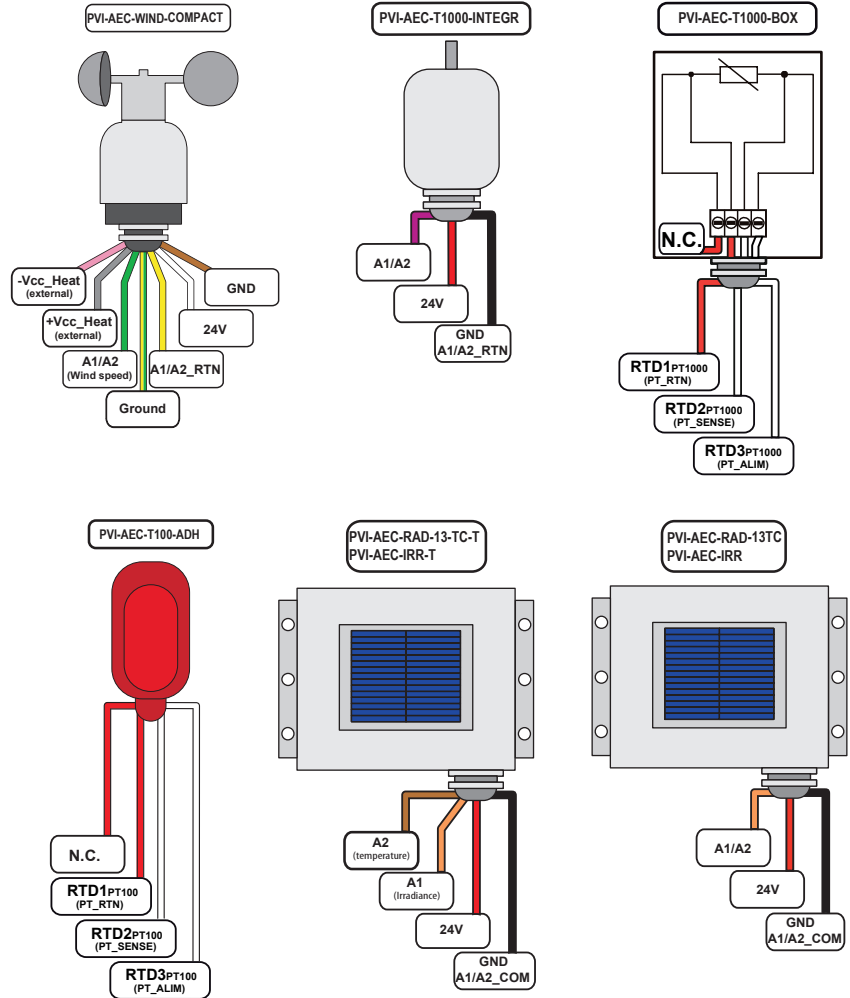
Model	Type	Gain	Offset	Unit of Measurement
PVI-AEC-IRR	Irradiation sensor	120	0	W/mq
PVI-AEC-IRR-T	Irradiation sensor with integrated cell temp. sensor	Irradiation: 120 Cell temp.: 10.869	Irradiation: 0 Cell temp.: -20	Irradiation: W/m2 Cell temp.: °C
PVI-AEC-RAD-13TC	Irradiation sensor	130	0	W/m2
PVI-AEC-RAD-13-TC-T	Irradiation sensor with integrated cell temp. sensor	Irradiation: 130 Cell temp.: 11.507	Irradiation: 0 Cell temp.: -26.1	Irradiation: W/m2 Cell temp.: °C
PVI-AEC-CONV-T100	PT100/0...10V converter	15	-50	°C a 0...10V
PVI-AEC-T1000-INTEGR	Ambient temperature sensor with integrated converter	10	-50	°C
PVI-AEC-WIND-COMPACT	Wind speed sensor	5	0	m/s
PVI-AEC-PYR-1300	Pyranometer (0...1300W/m2)	65	0	W/m2
PVI-AEC-T100-ADH	Adhesive PT100 module temperature sensor (back cell)	N/A	N/A	N/A
PVI-AEC-T1000-BOX	PT1000 ambient temperature sensor	N/A	N/A	N/A

Model	Output signal	Power supply needed (24Vdc)	TRIO 20/27.6 compatibility	EVO compatibility
PVI-AEC-IRR	0...10Vdc	YES	YES	YES
PVI-AEC-IRR-T	0...10Vdc	YES	YES	YES
PVI-AEC-RAD-13TC	0...10Vdc	YES	YES	YES
PVI-AEC-RAD-13-TC-T	0...10Vdc	YES	YES	YES
PVI-AEC-CONV-T100	0...10Vdc	YES	YES	YES
PVI-AEC-T1000-INTEGR	0...10Vdc	YES	YES	YES
PVI-AEC-WIND-COMPACT	0...10Vdc	YES	YES	YES
PVI-AEC-PYR-1300	0...20mA	YES	NO	YES
PVI-AEC-T100-ADH	3-wire connection on terminals: RTD1PT100 RTD2PT100 RTD3PT100	NO	YES	YES
PVI-AEC-T1000-BOX	3-wire connection on terminals: RTD1PT1000 RTD2PT1000 RTD3PT1000	NO	YES	YES

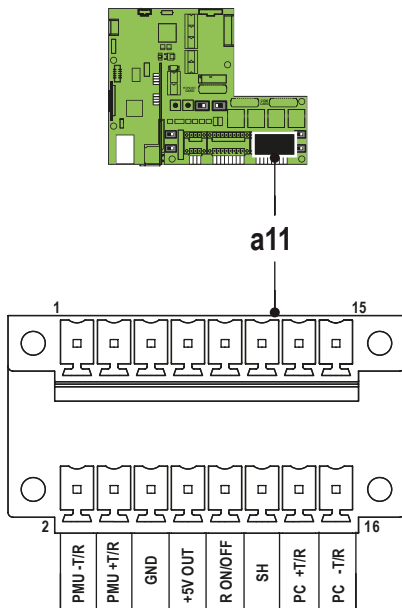


## Connection diagrams for environmental sensors

Connection diagrams for the main sensors marketed by **Power-One** are shown below: For non-conventional installations or additional information about the connections, please contact the technical support department.



## Remote control connection



The connection and disconnection of the inverter to and from the grid can be controlled through an external control.

The function must be enabled in the relevant menu. If the remote control function is disabled, the switching on of the inverter is 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, the switching on of the inverter also depends on the state of the R ON/OFF terminal compared to the GND terminal present on the connector a11 of the communication card **09**.

When the R ON/OFF signal is brought to the same potential as the GND signal (i.e. by making a short circuit between the two terminals of the connector), this causes the inverter to disconnect from the grid.

The remote control OFF condition is shown on the display.

The connections of this control are made between the “R ON/OFF” input and “GND”. Since this is a digital input, there are no requirements to be observed as regards cable cross-section (it only needs to comply with the sizing requirement for passing cables through the cable glands and the terminal connector).

## 5 V auxiliary output connection

There is an auxiliary 5 V output on connector a11. The maximum allowed absorption by this auxiliary supply voltage is 100 mA.

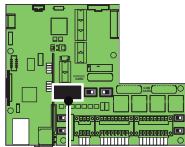
## SD card

The inverter is equipped with a slot for insertion of an SD Card memory. The maximum size of the SD Card is 4 GB. The SD Card is not supplied with the inverter; the functionalities of the SD Card will be implemented with subsequent versions of the Firmware of the communication card.

## Grid standard setting of the country and language display

There are different grid parameters (dictated by the electricity distributor) according to the country in which the inverter is installed.

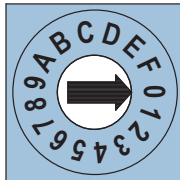
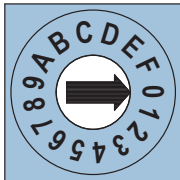
**Setting the grid standard for the country of installation is a necessary operation before commissioning, and the installer must know the correct standard to be configured.**



a05

1

2



The inverter is configured using the rotary switches a05.

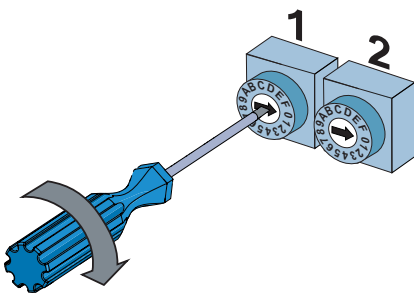
**Before turning the rotary switches, make sure the inverter is switched off!**

At the same time as the grid standard is set, **the language of the display menus** is also set.

The table below shows which country grid standard and menu language are assigned to the various positions of the rotary switches a05

**Table: country standard and language**

Switch		Country Grid Standard	Display language
1	2		
0	0	Standard de-selected	-
0	1	GERMANY VDE 0126 @ 400V	ENGLISH
0	5	ENEL @ 400V	ITALIAN
0	6	SPAIN @ 400V	SPANISH
0	7	UK – G83 @ 400V	ENGLISH
0	8	UK - G59 @ 400V	ENGLISH
0	9	IRELAND @ 400V	ENGLISH
0	A	AUSTRALIA @ 400V	ENGLISH
0	B	ISRAEL @ 400V	ENGLISH
0	C	GERMANY - BDEW @ 400V	GERMAN
0	D	FRANCE @ 400V	FRENCH
0	E	NETHERLANDS @ 400V	DUTCH
0	F	GREECE @ 400V	ENGLISH
1	0	PORTUGAL @ 400V	ENGLISH
1	1	CORSICA @ 400V	FRENCH
1	2	HUNGARY @ 400V	ENGLISH
1	3	CHINA @ 400V	ENGLISH
1	4	KOREA @ 380V	ENGLISH
1	5	TAIWAN @ 400V	ENGLISH
1	6	CHECA Republic @ 400V	CZECH
1	7	GERMANY-VDE AR-N-4105@400V	GERMAN
1	8	CEI-021 @ 400V EXTERNAL Prot.	ITALIAN
1	9	CEI-021 @ 400V INTERNAL Prot.	ITALIAN
1	B	SOUTH AFRICA @ 400V	ENGLISH
1	C	SPAIN RD 1565 @ 400V	SPANISH
1	D	BELG C10-11 100% @ 400V	FRENCH
1	E	BELG C10-11 110% @ 400V	FRENCH



Switch		Country Grid Standard	Display language
1	2		
1	F	BRAZIL @ 380V	ENGLISH
2	0	TURKEY LV @400V	ENGLISH
2	1	ROMANIA @400V	ENGLISH
2	2	SLOVENIA @400V	ENGLISH
2	3	TURKEY HV @400V	ENGLISH
2	4	CEI-016 @ 400V	ITALIAN

**The standard for the Italian grid which must be set during installation is 1 -8 (ENEL CEI-021 @ 400V EXTERNAL Prot.)**

The predefined setting is **0 / 0** and means no grid standard is selected and the display language is English (in this case, the “Set Country” message will appear on the display).

If a position of switches not assigned on the display **23** is selected, “Invalid Selection” appears.

## Grid standard of the country and display language saving



Set Country

The settings become fixed after 24 hours of operation of the inverter (it does not need to be connected to the grid, and only needs to be powered).

The time remaining before the settings become fixed can be seen in the dedicated menu, and a notice appears if the time has expired.

**Once the settings are fixed, turning the rotary switches will produce no effect. In this condition, only the language can be changed through the dedicated menu.**

**At any time and for any reason, the ENGLISH language of the display menu can be set by simultaneously pressing the “ESC” and “ENTER” buttons for at least 3 seconds.**

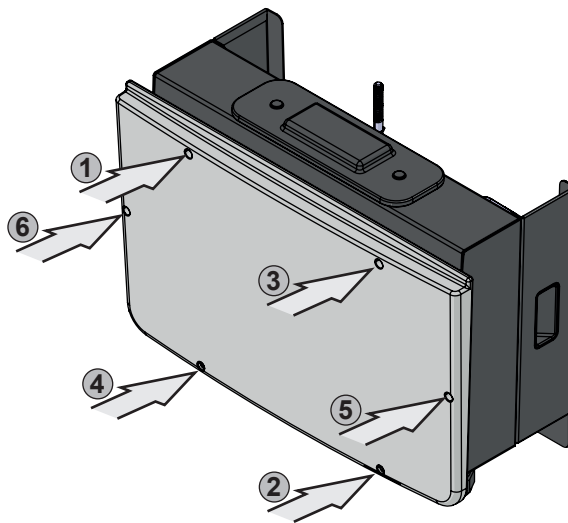
## Installing the Wiring Box cover

When you have finished connecting and configuring the inverter, and before you start it up, you must install the Wiring Box cover.

**IP65**

*During installation of the cover, perform the operations listed in order and use the specified torque for tightening the 6 screws (show in the technical data section) to maintain the inverter's IP level*

Insert the 6 anchoring screws and give them a few turns.  
Then tighten the screws, following the order and torque shown.



When you have finished installing the Wiring Box cover you may start up the inverter.

## 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:**

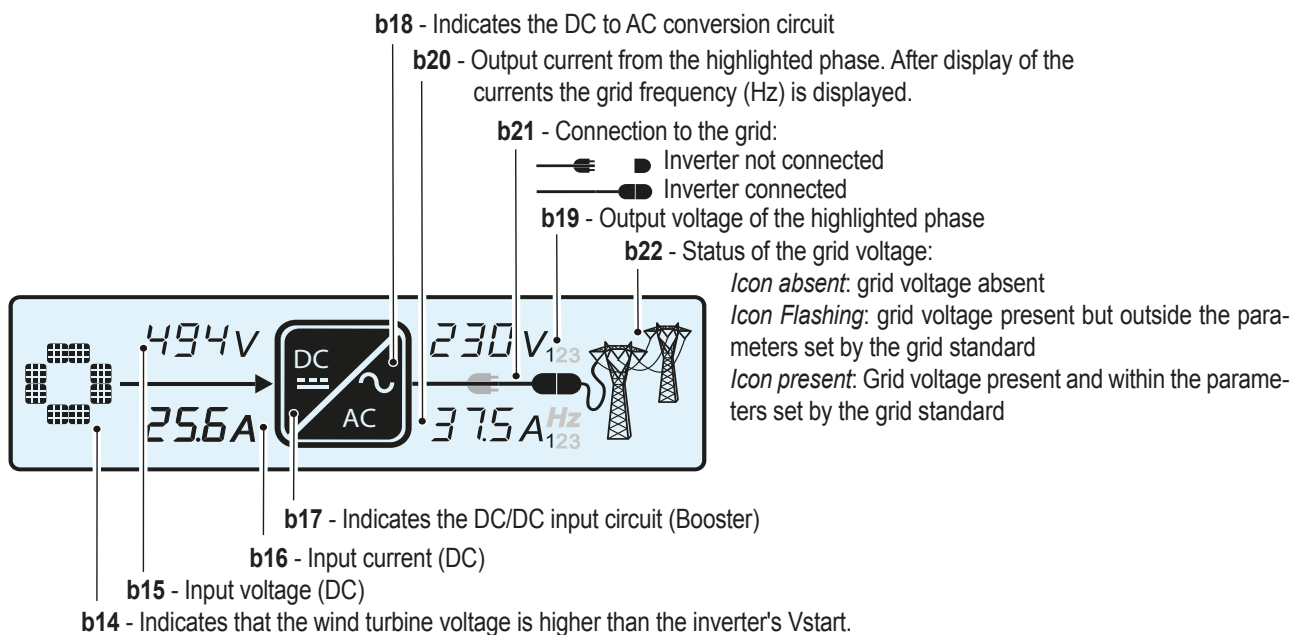
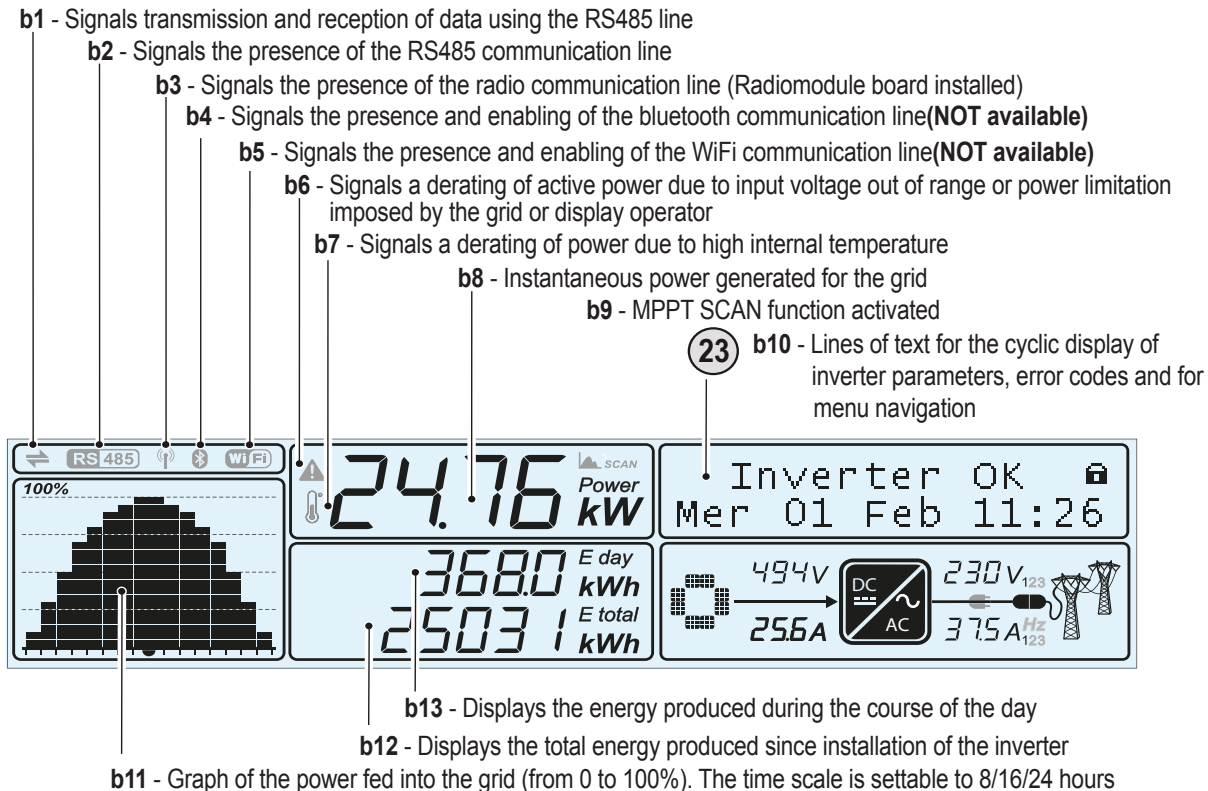
- ***you do not have suitable qualifications to work on this equipment or similar products;***
- ***you are unable to understand how it works;***
- ***you are not sure what will happen when the buttons or switches are operated;***
- ***you notice any operating anomalies;***
- ***there are doubts or contradictions 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

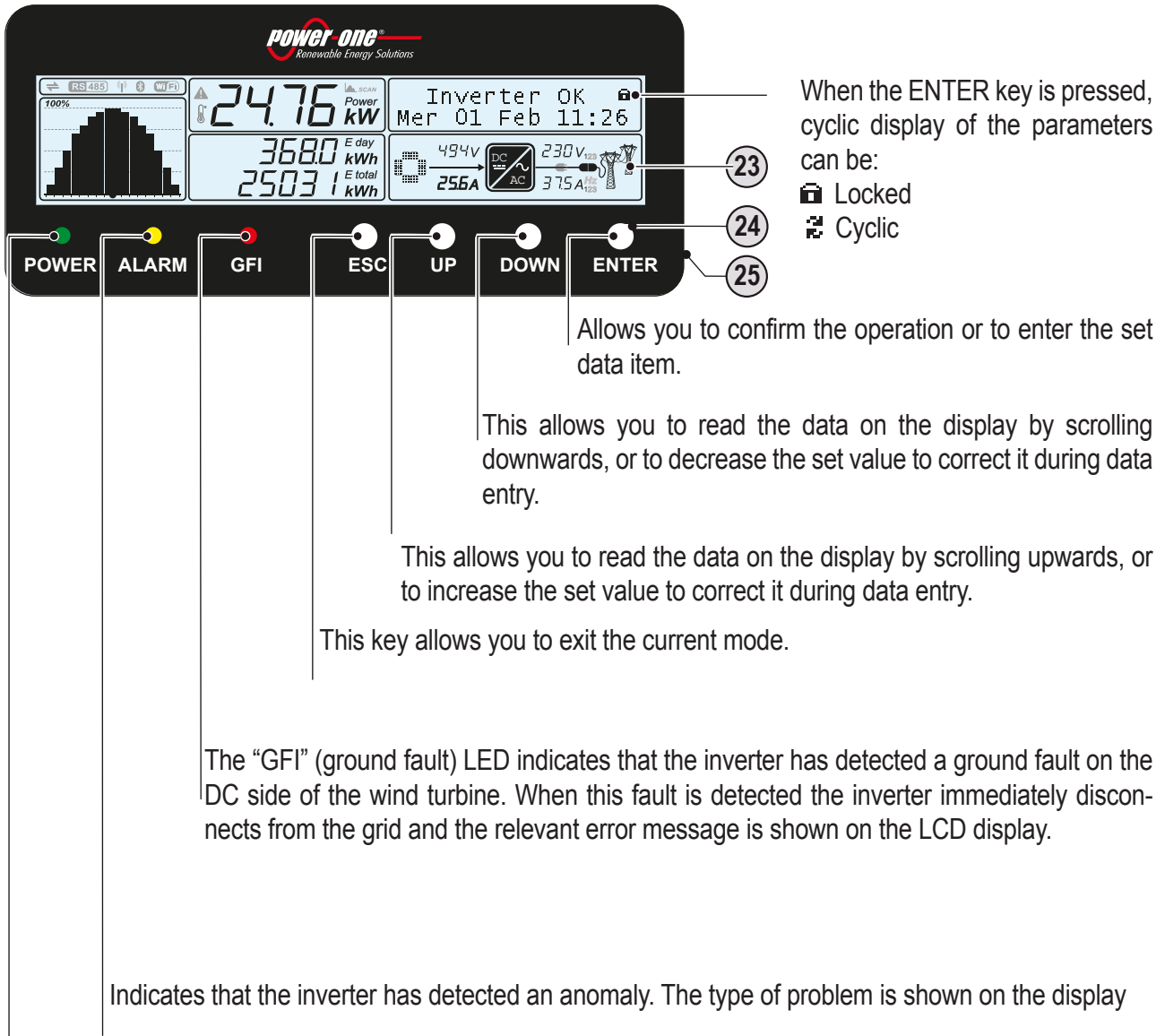
Using the display **23** it is possible to view the equipment's operating parameters: signals, alarms, channels, voltages, etc.  
During operation, the display behaves dynamically, which allows certain information to be displayed cyclically (see the relevant chapter).



## Description of the keyboard

Using the combination of keys on the LED panel **25**, located under the display **23**, it is possible to set the values or scroll through the data and view them.

The keyboard **24** also contains LEDs to show machine status.



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 wind energy to activate the unit. If this is not the case, the LED will continue to flash until there is sufficient wind energy 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.**



## 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 **23** (when you press and hold any key on the keyboard **24** 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 **25**, 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 **23**.

#### 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

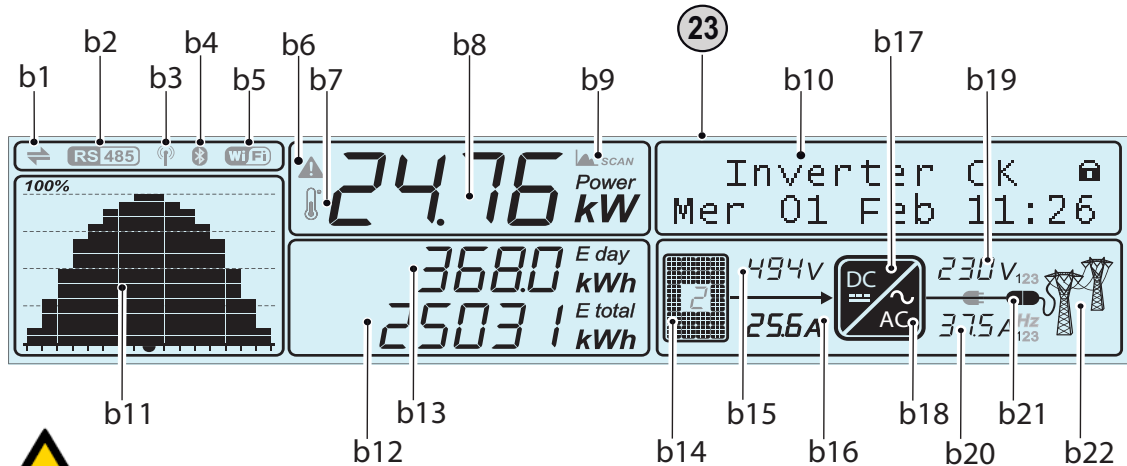
The inverter internally stores a set of data that are necessary for processing statistical data and an error log with time stamp.

# Commissioning



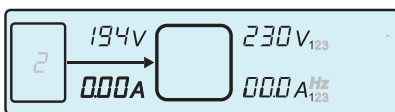
**Do not place objects of any kind on the inverter during operation!**

**Do not touch the heatsink while the inverter is operating!  
Some parts may be very hot and cause burns.**

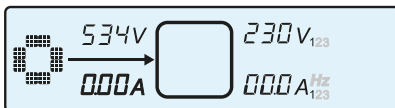


**NOTE: Before proceeding with commissioning, make sure you have carried out all the checks and verifications indicated in the section on preliminary checks.**

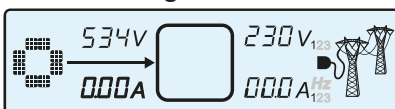
**V<sub>in</sub> < V<sub>start</sub>**



**V<sub>in</sub> > V<sub>start</sub>**

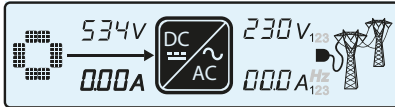
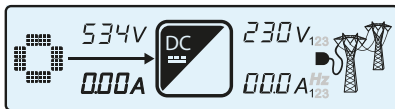


**V<sub>grid</sub> OK**

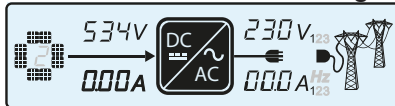


The inverter commissioning procedure is as follows:

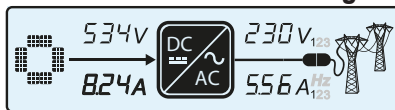
- First close the AC external disconnect switch and then the DC external disconnect switch. There is no order of priority for opening the disconnect switches.
- When the inverter has power, the first check performed is the one relating to the input voltage:
  - If the DC input voltage is lower than the V<sub>start</sub> voltage (voltage required to begin the inverter's grid connection) the **b14** icon remains off and the "Waiting for the wind" message is displayed **b10**.
  - If the DC input voltage is higher than the V<sub>start</sub> voltage the **b14** icon is displayed and the inverter goes to the next stage of the controls. In both cases the voltage levels and input current are displayed in the **b15** and **b16** fields.
- The inverter performs a control of grid parameters. The **b22** icon, 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.
  - Turns 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 of grid connection. This verification can take several minutes (from a minimum of 30 seconds up to several minutes), depending on grid conditions and settings relative to the standard of the country
- At this point the **b17** icon will flash, this indicates the start-up of the DC-DC circuit (booster) part. This icon will remain permanently switched



**Inverter not connected to the grid**



**Inverter connected to the grid**



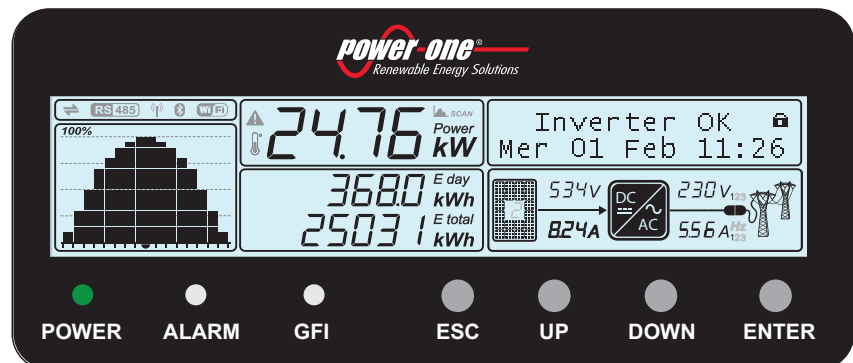
on when the DC-DC will be operating at steady state (the flashing of the icon usually lasts a few seconds).

Immediately after this, the b18 icon, which indicates the AC-DC circuit (inverter) part, will also behave normally.

- Immediately after this the grid connection will start. During this phase the icons will be displayed in sequence on the b21 board until the 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 been completed, the inverter starts to operate and indicates its correct operation by making a sound and by the green LED coming on steady on the LED panel **25**. This means there is wind energy radiation to feed power into the grid.



- If the checking of the grid does not give a positive result, the unit will repeat the procedure until all the parameters that allow connection to the grid (grid voltage and frequency, insulation resistance) are within the range. During this procedure, the green LED flashes.

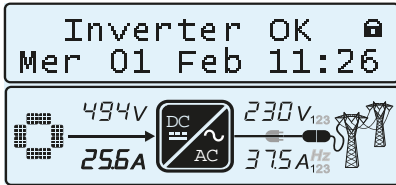
**Once the inverter has been started for the first time the wiring box must be configured by means of the dedicated Aurora Manager LITE software.**

## Display access and settings

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

- **Date and Time:** These must be set for the inverter to operate and store its log data correctly
- **Address RS485:** settings required in the case of system monitoring using the RS485 board
- **Vstart:** setting required in the case it is requested by the configuration during the system requirement phase (“Vstart” parameter)
- **Analogue inputs setting (where present):** allows you to set the parameters of the analogue sensors connected as the input (“Analogue Inputs”).
- **Reactive power input setting (where present):** setting necessary to manage the reactive power input into the grid in different ways (“Reactive Power parameter”)
- **Limitation active power setting (where present):** setting necessary to set a limit on active power output of the inverter (“Power reduction” parameter)

## Dynamic behaviour of the display



- During operation, the following values are displayed in rotation:
  - Voltage and current (b15 and b16) from the wind generator.
  - 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 considered is shown on the right side of the voltage and current values.

At the end of the aforesaid display, the grid frequency will be indicated in field b20 and the line voltage will be indicated in field b19.

At the same time, the main readings made by the inverter will be displayed in rotation on the graphic display b10.

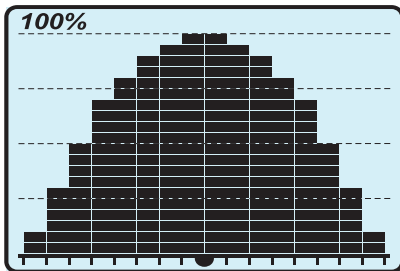
- Display of the power graph b11

The histogram includes 16 horizontal units and 20 vertical units.

The period of time is represented by the horizontal axis of the graph and can be set by the user to 8, 16 or 24 hours; therefore, each horizontal unit can represent 30, 60 or 120 minutes.

The vertical axis represents the maximum power derating and therefore 100% corresponds to this outgoing exported power value.

Finally, bear in mind that the power value expressed by each column of the graph represents the average value of the power during the period relating to the horizontal unit.



## LED behaviour

- = LED on
- ⊗ = LED flashing
- ⊗ = LED off

(x) = Any one of the conditions described above

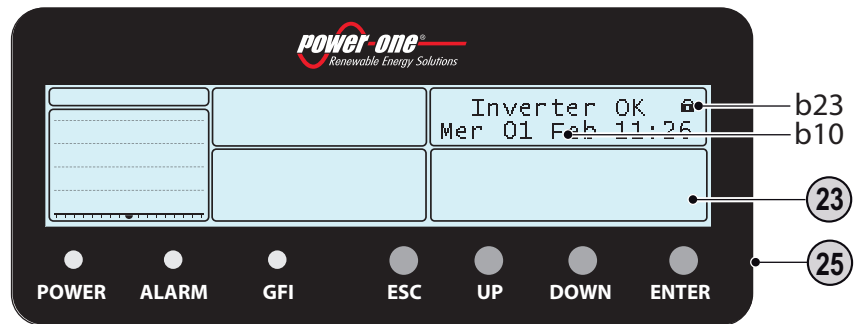
The following table shows all the possible combinations of activation of the LEDs on the LED panel **25** in relation to the operating state of the inverter.

**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 <b>23</b> . 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.

## Specifications on the behaviour of the LEDs

Next to each state of the inverter, indicated through the steady or intermittent lighting of the relevant LED, a message that identifies the operation it is carrying out or the detected fault/anomaly is also shown on the display **23**, section **b10**, (see relevant chapter).



***In the event of malfunctioning, it is extremely dangerous to try to eliminate the fault personally. The instructions given below must be strictly followed; if you do not have the experience and necessary qualification to work safely, please contact a specialized technician.***

## Insulation fault LED

### What to do after an insulation fault warning

When the red LED comes on, first try to reset the warning through the multi-function button ESC on the LED panel **25**.

If the inverter duly reconnects to the grid, the fault was due to temporary phenomena.

***We advise having the system inspected by the installer or a specialized technician if this malfunctioning occurs frequently.***

If the inverter does not reconnect to the grid, make it safe by isolating it (by means of the disconnect switches) on the both the DC side and the AC side, and then contact the installer or an authorized service centre to have the photovoltaic generator fault repaired.

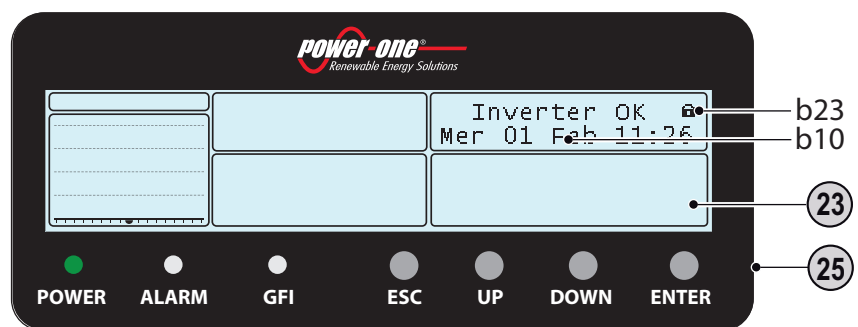


## Description of the menus

The display **23** has a section **b10** (graphic display) for moving through the menu using the buttons of the LED panel **25**.

Section **b10** consists of 2 lines with 16 characters per line and can be used to:

- display the operating state of the inverter and the statistical data;
- display the service messages for the operator;
- display the alarm and fault messages for the operator;
- changing the settings of the inverter.



## Using the panel buttons

- The UP and DOWN buttons of the LED panel **25** are used to move around a menu or to increase/decrease the settable values.

- The ESC button allows access to the three main sub-menus, STATISTICS, SETTINGS and INFORMATION. This allows you to return to the previous sub-menu while moving through the menus.

- The ENTER button allows access to the required sub-menu while moving through the menus and allows the main menu scroll mode to be changed (icons **b23** are activated):

- **🔄 CYCLIC:** Cyclic display of the main parameters of the inverter.

- **🔒 LOCKED:** Display locked on the screen you want to monitor continuously.

## Statistics menu

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

STATISTICS	
1.	Lifetime
2.	Partial
3.	Today
4.	Last 7 days
5.	Last month
6.	Last 30 days
7.	Last 365 days
8.	User Period

### 1. Lifetime

This section of the menu allows you to display the Total statistics:

- **Time:** Total operating time
- **E-tot:** Total energy produced
- **Val. :** Total production value, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved compared to fossil fuels

### 2. Partial

This section of the menu allows you to display the partial statistics:

- **Time:** Partial operating time
- **E-par:** Partial energy produced
- **PPeak:** Peak power value
- **Val. :** Partial production value, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Partial amount of CO<sub>2</sub> saved



*To reset all the counters of this sub-menu, press the ENTER button for more than 3 seconds. At the end of this time, you will hear a sound repeated 3 times.*

### 3. Today

This section of the menu allows you to display the daily statistics:

- **E-day:** Daily energy produced
- **Ppeak:** daily peak power value
- **Val. :** Daily production value, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved daily

### 4. Last 7 days

This section of the menu allows you to display the statistics for the last 7 days:

- **E-7d:** Energy produced over the last 7 days
- **Val. :** Value of production for the last 7 days, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved over the last 7 days

**5. Last month**

This section of the menu allows you 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 with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved during the current month

**6. Last 30 days**

This section of the menu allows you to display the statistics for the last 30 days:

- **E-30d:** Energy produced over the last 30 days
- **Val. :** Value of production for the last 30 days, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved over the last 30 days

**7. Last 365 days**

This section of the menu allows you to display the statistics for the last 365 days:

- **E-365:** Energy produced over the last 365 days
- **Val. :** Value of production for the last 365 days, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved over the last 365 days

**8. User period**

This section of the menu allows the statistics for a period selected by the user to be displayed:

Once the start and end dates for the period have been set, the following data are available:

- **E:** Energy produced during the selected period
- **Val. :** Value of production for the selected period, calculated with the currency and conversion coefficient set in the relevant section of the SETTINGS menu
- **CO<sub>2</sub>:** Amount of CO<sub>2</sub> saved during the selected period

## Settings menu

When SETTINGS is selected from the three main sub-menus, the first screen for the password is displayed in the display.

**The default password is “0000”.**

This can be changed using the display buttons, always following the same procedure:

- Use ENTER to scroll the digits (from left to right)
- Use ESC to return to the previous digit (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 entering the password, press ENTER to access the information gathered in this section:

<b>SETTINGS</b>	
	<b>Password 0000</b>
	1. <b>Address</b>
	2. <b>Display Set</b>
	3. <b>Service</b>
	4. <b>New PW</b>
	5. <b>Cash</b>
	6. <b>Time</b>
	7. <b>Language</b>
	8. <b>Vstart Set</b>
	(*) <b>Autotest</b>
	9. <b>Alarm</b>
	10. <b>Remote Control</b>
	11. <b>UV Prot. Time</b>
	(**). <b>MPPT</b>
	12. <b>Reactive power</b>
	13. <b>Power reduction</b>
	14. <b>Analog Inputs</b>

(\*) *Available for the Italian standard only. Refer to the section on this topic in the manual.*

(\*\*) *Not used*

### 1. Address

This section of the menu allows you to set the address for the serial communication of single inverters connected to the RS485 line.

The addresses that can be assigned are 2 to 63. Use the UP and DOWN buttons to scroll the numerical scale.

At present, the 'AUTO' selection cannot be used

### 2. Display Set

This section of the menu allows you to set the characteristics of the display:

- **Light:** setting of the mode and adjustment of the brightness of the display

**Mode:**

**On:** Light always on

**Off:** Light always off

**AUTO:** Automatic light control. The light comes on whenever a button is pressed and stays on for 30 sec, after which it gradually goes out.

Intensity: adjustment of display brightness (scale from 1 to 9)

- **Contrast:** adjustment of display contrast (scale from 1 to 9)

- **Buzzer:** button sound setting

**On:** the sound of the buttons is activated

**Off:** the sound of the buttons is deactivated

### 3. 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

When you have a password you can set the parameters in the menu.



***Due to the variation of the above mentioned parameters it is possible that the disconnection from the grid does not take place if the values exceed those mentioned in the standards of the country of installation. If these parameters exceed the standard values, install an interface protection, external to the inverter, which is compliant with the requirements of the country of installation.***

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

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

#### 4. New PW

This section of the menu allows you to change the password for accessing the settings menu (default 0000).



**We ADVISE you to be very careful in memorizing the new password. If the Password is misplaced, it will not be possible to access the inverter, since there is no Reset function for security reasons.**

#### 5. Cash

This section of the menu allows you to set the name of the currency and the value given to 1 kWh of energy produced. The correct setting of these parameters allows you to display the actual earning/saving given by the system.

- **Name:** the chosen value is set (default is Euro)
- **Val/KWh:** indicates the cost/incentive of 1 kWh expressed in the chosen currency (default is 0.50).

#### 6. Time

Allows you to set the current date and time (daylight saving time not included)

#### 7. Language

Allows you to set the required menu language

#### 8. Vstart Set

This section of the menu allows you to set the Vstart voltage (separately for both channels if they are configured in independent mode), to adapt it to the requirements of the system.



**We advise changing the activation voltage only if really necessary and to set it to the correct value: the photovoltaic generator sizing instrument available on the Internet site of Power-One indicates whether it is necessary to change the Vstart and the value to set.**

#### 9. Alarm

This section of the menu allows you to set the switching of a relay contact (available as a normally open contact – N.O. – and also as a normally closed contact – N.C.).

This contact can be used, for example, to: activate a siren or a visual alarm, control the disconnect device of an external transformer, or control an external device. Maximum ratings of the alarm contact: 240Vac/1A and 30Vdc/0.8A

The switching of the relay can be set in 4 different modes:

- **PRODUCTION:** the relay switches when the inverter connects to the grid.
- **ALARM:** the relay switches when there is an alarm (code E).
- **ALARM (conf.):** the relay switches if there are alarms (code E) or warnings (code W) chosen by the user from a list (the list may also show choices that are not envisaged for the specific model).
- **CREPUSCULAR:** the relay switches only when it exceeds the input voltage set for connection to the grid.

### 10. Remote Control

This section of the menu allows you to enable/disable the connection/disconnection of the inverter to/from the grid through the relevant control signal (R ON/OFF).

- **Disable:** the connection/disconnection of the inverter to/from the grid is dictated by the input (voltage from the photovoltaic generator) and output (grid voltage) parameters of the inverter.
- **Enable:** the connection/disconnection of the inverter to/from the grid is dictated by the state of the R ON/OFF signal compared to the GND signal as well as by the input (voltage from the photovoltaic generator) and output (grid voltage) parameters of the inverter.

### 11. UV prot. Time

This section of the menu allows you to set the time for which the inverter stays connected to the grid after the input voltage has dropped below the Under Voltage limit (set at 70% of Vstart). Power-One sets the time at 60 sec. The user can set it at from 1 to 3600 sec.

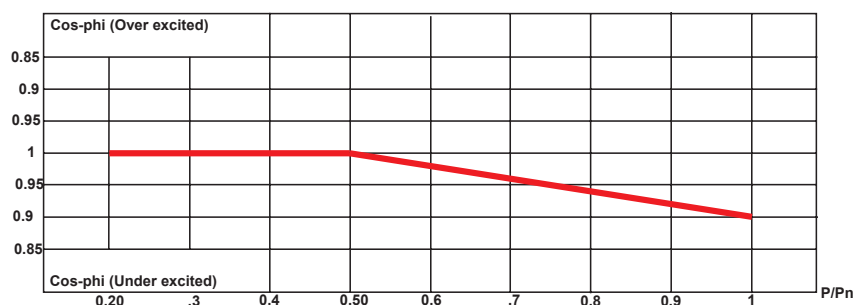
Example: with the UV Prot.time set at 60 seconds, if the Vin drops below 70% of Vstart at 9:00, the inverter stays connected to the grid (taking power from it) until 9:01.

### 12. Reactive power

This section of the menu may be used to manage the input of reactive power to the grid. There are 5 possible types of management:

- **No regulation:** no regulation of reactive power. To enable this mode, select **Enable** and then **OK** (using the UP / DOWN arrows)
- **Fixed cos-phi:** Sets power factor to a fixed value. To enable this mode, select **Enable** and then **OK** (using the UP / DOWN arrows). When enabled, **Set value** will appear on the display permitting you to set the value of Cos-Phi (either Over or Under excited from 1.000 to 0.800)
- **Cos-phi = f(P):** Power factor as a function of active power generated by the inverter. To enable this mode, select **Enable** and then **OK** (using the UP / DOWN arrows). When it has been enabled, **Use def curve** will appear on the display, allowing you to set the following control curve:

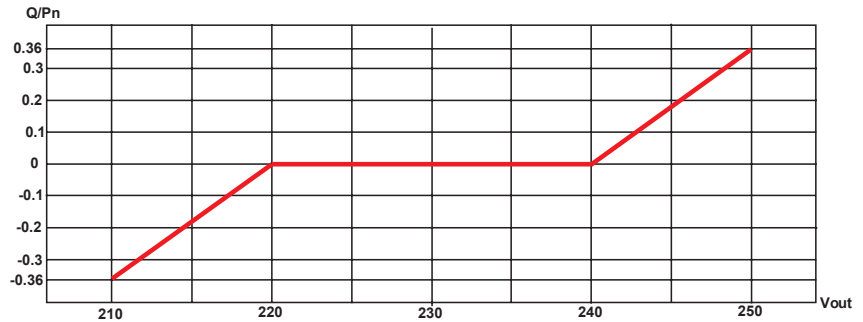
(\*) The curve may be edited using the Aurora Manager LITE configuration software



- **Q = f(U):** Reactive power as a function of the grid voltage measured by the inverter. To enable this mode, select **Enable** and then **OK** (using the UP / DOWN arrows). When it has been enabled, **Use def curve** will appear on the display, allowing you to set the following control curve (\*):



(\*) The curve may be edited using the Aurora Manager LITE configuration software



### 13. Power reduction

This section of the menu may be used to adjust the limits on active power which the inverter can input to the grid by setting the percentage of rated power at which the limit should be tripped.

If it is set to 100%, the default maximum power is restored, which in some standards in certain installation countries may be 110% of rated power.

### 14. Analogue Inputs

This section of the menu allows you to set the analogue sensors connected at the input (AN1 and AN2)

**Setting of Gain:** Allows you to set the gain of the sensor

**Setting of Offset:** Allows you to set the offset of the sensor

**Setting of Unit of M.:** Allows you to set the unit of measure of the sensor

*For further details, specifications and connection diagrams of compatible Power-One sensors, consult the Installation chapter.*

#### SENSORS PT100 AND PT1000

(can be directly connected to the corresponding analogue input; the PT100/PT1000 inputs of the acquisition card do not require the configuration of gain and offset)

- **PVI-AEC-T100-ADH:** adhesive PT100 sensor for module temperature measurement
- **PVI-AEC-T100-BOX:** PT100 sensor for ambient temperature measurement in IP65 container.
- **PVI-AEC-T1000-BOX:** PT1000 sensor for ambient temperature measurement in IP65 container.

## Info menu

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

INFO	
1.	Part No.
2.	Serial No
3.	Firmware
4.	Country Select.
5.	Analog Inputs

### 1. Part No.

May be used to display the model code and the **T.ID** code identifying the inverter's hardware level.

### 2. Serial No.

Allows you to display the serial number of the equipment.

### 3. Firmware

Allows you to display the revision of the firmware installed in the equipment and the "update version" field required to request a second level password for the Utility menu (along with the Serial Number and Week of Production).

### 4. Country Select.

Allows you to display information regarding the grid standard set with the rotary selectors.

- **Actual value:** Displays the set grid standard.
- **New value:** If the position of the rotary switches is changed (a new grid standard is therefore selected) during operation, the new standard selected will be displayed but will be made effective only after the equipment has been switched off and then on again and only if the time remaining for carrying out this operation has not expired (24h of operation).
- **Set new value:** Allows you to confirm/set the new grid standard set in the "New value" section of the previous menu. When this function is used, there will be no correspondence between the standard selected on the display and the position of the rotary selectors.
- **Residual time:** Displays the time remaining in which it is still possible to set a new grid standard. When the time expires, "Locked" will be displayed, which indicates it is not possible to change the grid standard again.

### **5. Analogue Inputs**

Allows you to display the reading of the measurements associated with the two analogue inputs A1/A2.

## 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>>R, U>>S, U>>T ; U>R, U>S, U>T ;**

**U> (10Min)R, U> (10Min)S, U> (10Min)T**

Disconnection from the distribution grid due to “Over-voltage”

**UV Test – parameters:**

**U<<R, U<<S, U<<T : U<R, U<S, U<T**

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>> S

U>> T

U<< R

U<< S

U<< T

F>>

F<<

U>(10min) R

U>(10min) S

U>(10min) T

U> R

U> S

U> T

U< R

U< S

U< T

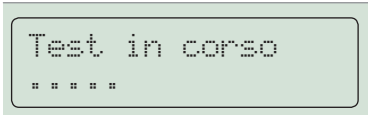
F>

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.

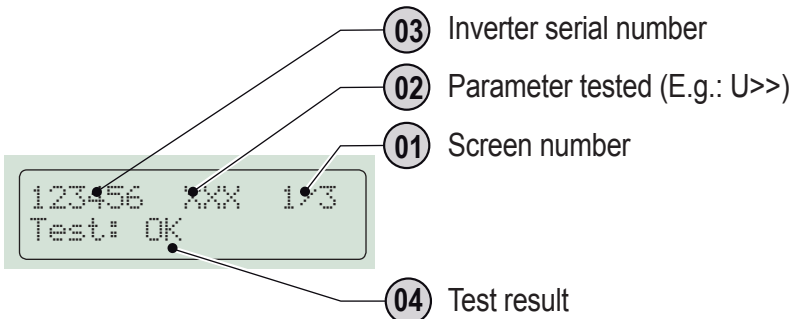
The start of the test is shown on the display with the message "Test in progress"



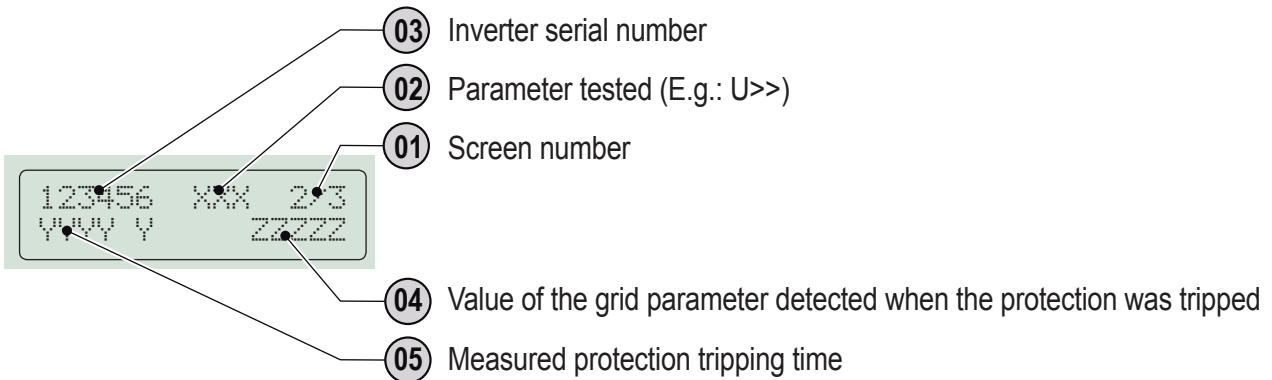
At the end of the test, when the inverter has disconnected from the grid, the results and values of the test performed will appear on the display. You can move from one screen to another using the UP/DOWN arrow keys.

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

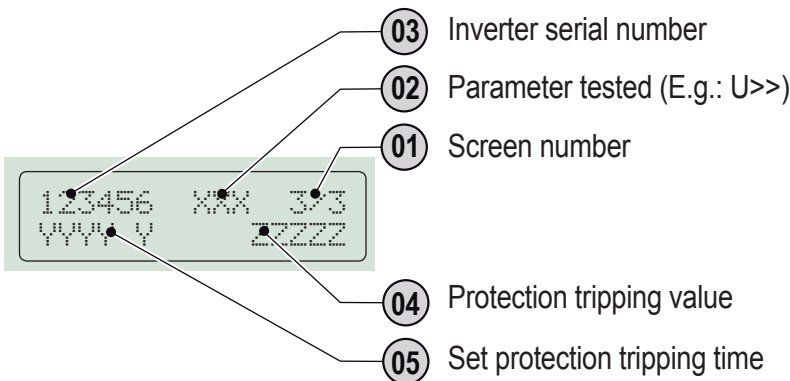
**Screen 1 of 3**



**Screen 2 of 3**



**Screen 3 of 3**



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

- $\leq 5\%$  for voltage thresholds
- $\pm 20$  mHz for frequency thresholds
- $\leq 3\% \pm 20$  ms for tripping times

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

## Turning off the inverter



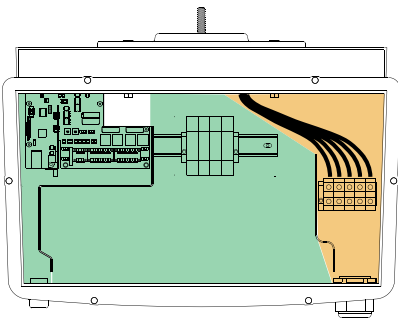
*Some parts may be very hot and could cause burns.*



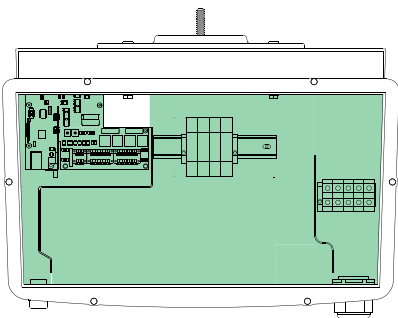
*Some inverter parts may be subject to voltages that could be hazardous for the operator. Before performing any work on the inverter, follow the procedure for turning off the inverter.*

### Standard Wiring Box Version

- Disconnect any power supplies that may be connected to the configurable relay.



- Switch off the DC switch on the outside of the inverter.  
**Under this condition the wiring box has hazardous voltages, identified by the colour ORANGE (400V AC). Green areas may be freely accessed.**



- Disconnect grid voltage (by switching off the protective device upstream of the inverter) .  
**Under these conditions the wiring box does not have any hazardous voltages and all areas may be freely accessed.**



*Wait enough time for it to discharge before performing any operations on the inverter*

## 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.***



## 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	<ul style="list-style-type: none"> <li>• Check that the inverter is operating correctly, and that no fault alarms are present</li> <li>• Ensure all the labels and safety symbols are visible</li> <li>• Test the integrity of the cables, connectors, and plugs external to the inverter</li> <li>• Check that the environmental conditions have not changed drastically since the installation of the system</li> </ul>
Annual operations	<ul style="list-style-type: none"> <li>• Check that cable glands and connection block screws are tight</li> <li>• Check that the wiring box cover is properly closed</li> <li>• 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</li> </ul>
Annual cleaning	<ul style="list-style-type: none"> <li>• Clean the equipment; in particular the bottom grille of the wiring box and the heat sink</li> </ul>

## 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 able to indicate errors/warnings on the display only if the input voltage is higher than the V<sub>dcm</sub>in voltage (POWER LED flashing or on; see operation chapter).

The messages and their codes are indicated on the highlighted part **b10** of the display **23**.

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 Leak Troubles Solving Guide" on the Power-One web portal ( <a href="http://www.power-one.com">www.power-one.com</a> ).
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 <b>Power-One Service</b>
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
Comm.Error	E005	Internal Communication 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 <b>Power-One Service</b> .
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 is repeated frequently, consult the AN "Riso and Leak Troubles Solving Guide" on the Power-One web portal ( <a href="http://www.power-one.com">www.power-one.com</a> ). If the error relates to an internal malfunction it will continue to occur, and it is therefore necessary to contact the <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .

Message displayed	Codes displayed	Alarm	Cause	Solution
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b>
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 <b>Power-One Service</b> .
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 leak Troubles Solving Guide" on the Power-One web portal ( <a href="http://www.power-one.com">www.power-one.com</a> ).
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 <b>Power-One Service</b> . 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 <b>Power-One Service</b> . 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 <b>Power-One Service</b> .

Message displayed	Codes displayed	Alarm	Cause	Solution
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b>
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 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 leak Troubles Solving Guide" on the Power-One web portal ( <a href="http://www.power-one.com">www.power-one.com</a> ).
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 <b>Power-One Service</b>
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 <b>Power-One Service</b>
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .

Message displayed	Codes displayed	Alarm	Cause	Solution
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
UTH	E033	Under Temperature	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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
Vout Avg error	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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .

Message displayed	Codes displayed	Alarm	Cause	Solution
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> . <b>(Alarm not shown on the display, only the yellow LED flashes).</b>
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .
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 <b>Power-One Service</b> .



## Dismantling the inverter

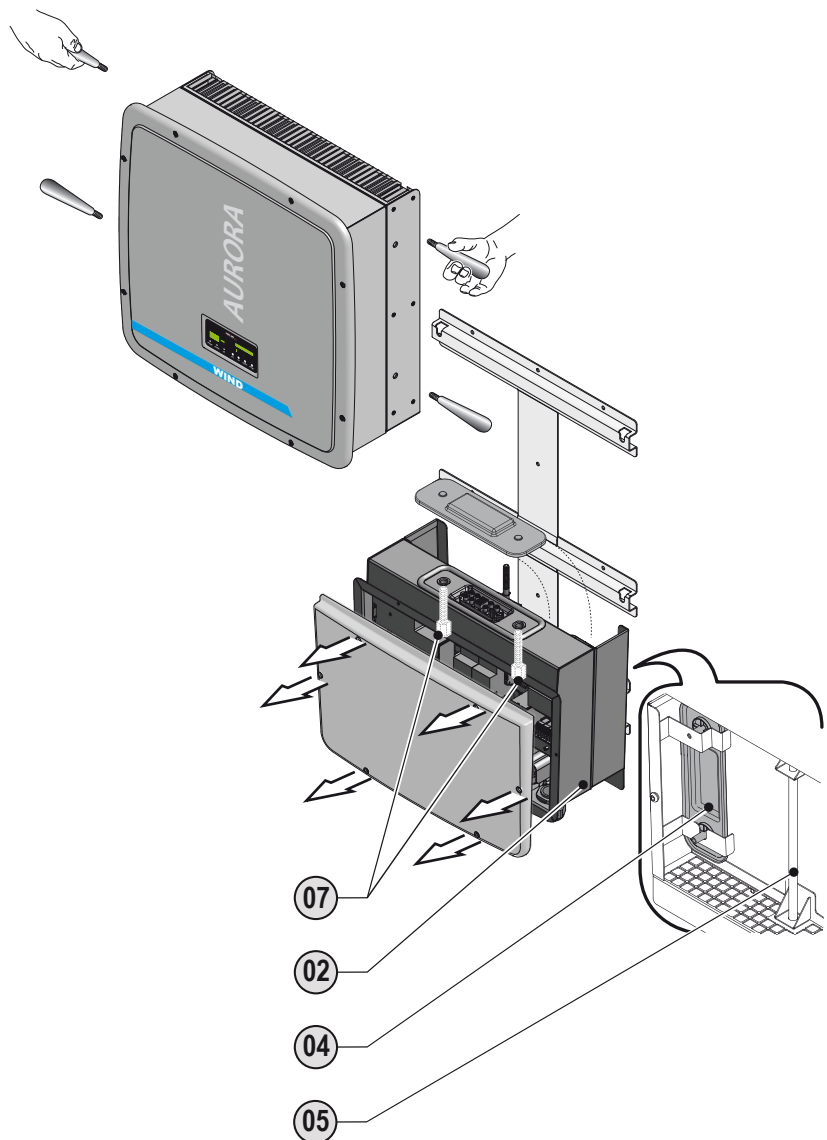
The inverter is composed of an **Inverter** part and a **Wiring Box** which may be dismantled separately. The paragraphs that follow describe dismantling procedures.

*Perform the steps for “Turning off the inverter” before dismantling one or both inverter parts.*

## Dismantling the inverter

Procedure for dismantling the inverter part only:

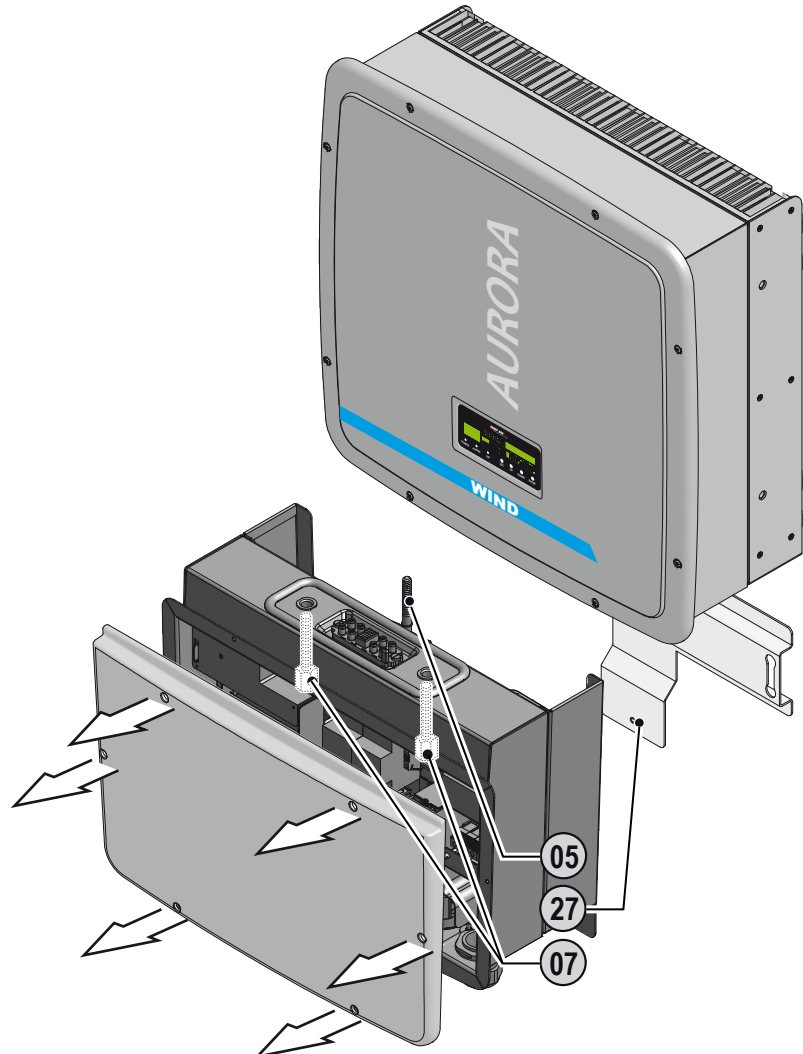
- Slacken the lock screw **27** on the underside
- Slacken the 6 screws holding the cover of the Wiring Box
- Slacken the two screws on connector **07** inside the Wiring Box
- Separate the two parts, unscrewing the screw holding them together **05**
- Lift and remove the inverter part, releasing it from the bracket
- If the Wiring Box is to remain installed on the bracket separately from the inverter part, install the cap **04** to protect the coupling connector.
- Put the Wiring Box cover back in place and tighten the 6 screws holding it in place



## Dismantling the Wiring Box

Procedure for dismantling the Wiring Box only:

- Slacken the lock screw **27** on the underside
- Slacken the 6 screws holding the cover of the Wiring Box
- Remove all connecting cables coming from outside the box.
- Slacken the two screws on connector **07** inside the Wiring Box
- Separate the two parts, unscrewing the screw holding them together **05**
- Remove the Wiring Box, detaching it from the bracket
- Put the Wiring Box cover back in place and tighten the 6 screws





## Resetting the time remaining to change the grid standard

From the time a valid grid standard is entered and the inverter is turned on, a period of 24 hours is available to modify the grid standard setting.



The 24 hours are counted only when the inverter is turned on. Check that the date and time are set correctly. Otherwise it may not be possible to access the “Service” menu to reset the timer.

After this period of time the system will block changes to the standard; and it will be necessary to carry out the following procedure to reset the remaining time and obtain another 24 hours to select a new grid standard:

Settings

1. Access the “SETTINGS” menu by entering the first-level password (default 0000)

Service

2. Access the “Service” sub-menu by entering the second-level password



*The password to access the “Service” menu can be obtained by registering at the site <https://registration.power-one.it>.*

*Before accessing the site it will be necessary to locate the information utilized to compute the password:*

*Inverter model*

*Serial number and week of manufacture*

*Update field*

*The “Update” field is available only if the firmware of the inverter has been previously updated. If not available leave the field blank when requesting the password*

*The password obtained is valid for a period of 15 days*

Reset Country S.

3. Select “Reset Country S.” to reset the 24 hours of operation in which the grid standard may be modified..

## Associating a “new component” after replacement

NEW SYSTEM PART  
REFUSED!

The two parts that comprise the equipment (inverter and wiring box) are logically associated with one another. When the parts are dissociated from one another due to the wiring box or inverter being replaced (perhaps because of a failure, etc.), a message is displayed to indicate that the new component must be associated with the original part.

The association of the parts comprising the inverter is carried out as follows:

Settings

1. Access the “SETTINGS” menu by entering the first-level password (default 0000)

Time

2. Set the date and time in the “Date/Time” sub-menu

Service

3. Access the “Service” sub-menu by entering the second-level password



*The password to access the “Service” menu can be obtained by registering at the site <https://registration.power-one.it>.*

*Before accessing the site it will be necessary to locate the information utilized to compute the password:*

*Inverter model*

*Serial number and week of manufacture*

*Update field*

*The “Update” field is available only if the firmware of the inverter has been previously updated. If not available leave the field blank when requesting the password*

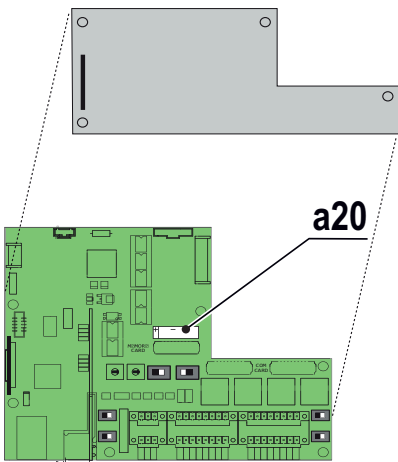
*The password obtained is valid for a period of 15 days.*

Accept Boards

4. Select “Accept Boards” to associate the two parts of the device

Once the above steps have been carried out the association of the two parts is concluded and the inverter will resume its normal operation automatically.

## Replacing the back-up battery



The back-up battery may need to be replaced when:

1. An error message is displayed
2. The date and time settings are reset

The battery is of the CR2032 type and is installed on the communication board, but is accessible only by removing the protective plastic cover installed over the DC high-voltage sections.

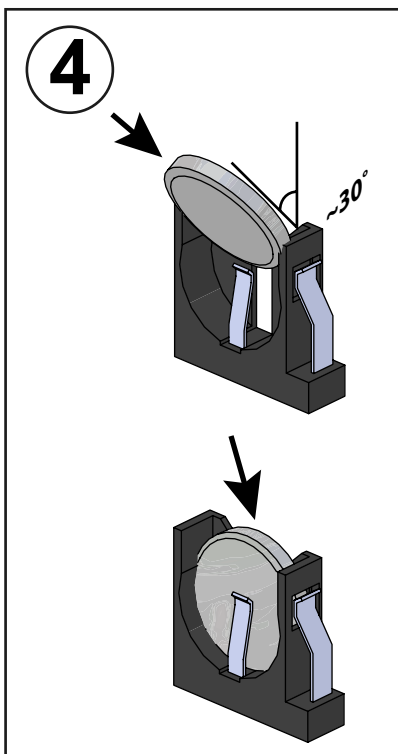
Back-up battery replacement procedure:

1. Disconnect the strings by opening the AC and DC disconnect switches external to the inverter.

2. Remove the plastic cover installed over the communication board

3. Remove the battery to be replaced

4. Install the new battery taking care to handle it with insulating gloves to ensure it is not discharged and respecting the polarity displayed on the communication board silkscreen



5. Replace the plastic cover over the communication board

## 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