power-one®
Renewable Energy Solutions

AURORA®

PHOTOVOLTAIC INVERTER

INSTALLATION AND CONFIGURATION MANUAL

SAVE THIS DOCUMENT IN A SAFE PLACE!

IMPORTANT SAFETY INSTRUCTIONS!

This manual contains important safety instruction that must be followed during the installation and start-up of the device. It's recommended to give special attention to the installation instructions in order to reduce the risks of electric shock and prevent damage to the device.

Any changes /modification not approved by the responsible party could void the user authority to operate the equipment.

BCM.00101.4 REV. 3.3 **22-04-2013**

INSTALLATION AND CONFIGURATION MANUAL FOR AURORA PHOTOVOLTAIC INVERTERS

This document describes the installation and configuration procedure for Power-One Aurora Photovoltaic Inverters.

The models this document refers to are shown in the table below.

SINGLE PHASE	THREE PHASE
PVI-3.0-TL-OUTD	PVI-8.0-TL-OUTD
PVI-3.0-TL-OUTD-S	PVI-8.0-TL-OUTD-S
	PVI-8.0-TL-OUTD-FS
PVI-3.6-TL-OUTD	PVI-8.0-TL-OUTD-Q
PVI-3.6-TL-OUTD-S	PVI-8.0-TL-OUTD-Q-S
	PVI-8.0-TL-OUTD-Q-FS
PVI-4.2-TL-OUTD	
PVI-4.2-TL-OUTD-S	PVI-10.0-TL-OUTD
	PVI-10.0-TL-OUTD-S
PVI-5000-TL-OUTD	PVI-10.0-TL-OUTD-FS
PVI-5000-TL-OUTD-S	
	PVI-12.5-TL-OUTD
PVI-6000-TL-OUTD	PVI-12.5-TL-OUTD-S
PVI-6000-TL-OUTD-S	PVI-12.5-TL-OUTD-FS

Power-One reserves the right to amend this manual with no prior notice.
The technical documentation and the interface and management software for the product are available at the website: http://www.power-one.com

CONTENTS

APPENDIX

1. USEFUL INFORMATION AND SAFETY REGULATIONS

This manual contains important safety instructions which must be carefully followed during the installation and commissioning of the device. It is advisable to pay particular attention to the paragraphs marked with the symbol ⚠, this will reduce the risk of electric shock and prevent damage to the device.

All the operations described below must be carried out exclusively by qualified staff in compliance with national and local safety regulations.

For all stages of installation, the instructions and warnings shown in the various chapters must be followed step by step so as to avoid dangerous situations or the possibility of damaging the equipment. Any operation that does not comply with these instructions will lead to the immediate loss of the warranty.

There can be live parts, uninsulated parts and hot surfaces while the inverter is working. Unauthorized removal of the required protections, improper use, faulty installation or inappropriate operation and tampering with the unit (e.g. adding extra holes) give rise to the risk of serious damage to persons and things and lead to the immediate loss of the warranty.

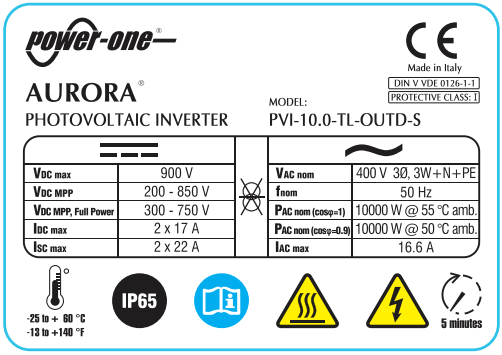
The system must be connected to the mains distribution system only after the Body appointed to distribute electricity has given its approval, as required by the national regulations in force.

Check the national regulations and local standards so that the electric installation diagram complies with them.

Always respect the nominal voltage and current data when planning the system (see the technical data table in Appendix E).

1.1. Certification label and symbols used

Shall a verification of the specifications or of the main features of the purchased model be needed, it is possible to check the certification label, as the one shown in the example below, on the right side of the inverter.



The following table contains a description of the symbols used in the certification label.

MEANING OF THE SYMBOLS	
-25 to + 60 °C -13 to +140 °F	Indicates the temperature range admissible for the operation of the inverter. Values are expressed in Celsius and Fahrenheit degrees.
IP65	Indicates the environmental protection.
	Indicates the need to look up the documentation provided with the inverter to obtain further information.
	Signals danger due to hot surfaces (risk of burns).
5 minutes	Signals danger due to electrical shock and indicates the time to allow after the inverter has been turned off and disconnected to ensure safety in any installation operation.
	Indicates that no isolation transformer is present between the DC input and the AC output of the inverter (transformerless).
	Indicates a direct current (DC).
	Indicates an alternating current (AC).

2. PACKAGE CONTENTS INSPECTION

Check that the package contents comply with the following list:

- **PVI-xx-TL-OUTD-yy Inverter [1 piece]**
- **Wall mounting bracket [1 piece]**
- **Installation Manual [1 piece]**
- **CD with communication SW and documentation in electronic format [1 piece]**
- **Kit consisting of:**

	PVI-3.0-TL-OUTD PVI-3.6-TL-OUTD	*PVI-4.2-TL-OUTD*	*PVI-5000-TL-OUTD PVI-6000-TL-OUTD*	*PVI-8.0-TL-OUTD PVI-10.0-TL-OUTD PVI-12.5-TL-OUTD*
Screw 6.3x70	2	2	3	5
Dowel SX10	2	2	3	5
WAGO flat head angled screwdriver	/	/	1	/
M20 cable gland	1	1	1	1
M25 cable gland	1	1	/	/
M32 cable gland	/	/	1	/
M40 cable gland	/	/	/	1
M25 cable gland nut	1	1	/	/
M32 cable gland nut	/	/	1	/
M40 cable gland nut	/	/	/	1
70 mm black cable	/	/	2	/
Red AWG10 cable with insulated female fastons	1	1	1	/
Black AWG10 cable with insulated female fastons	1	1	1	/
Black AWG12 cable with insulated female fastons	/	/	/	2
36A3M20 type gasket	1	1	1	1
TGM58 cylinder	1	1	1	1
T20 TORX wrench	1	1	1	1
M6x10 screw	1	1	1	/
D.18 washer	3	3	4	5
Perforated screw for front panel lead sealing	/	/	2	/
Signal terminal board counterparts	2	2	/	*
Positive-input connector counterparts	2	3	4	**
Negative-input connector counterparts	2	3	4	**

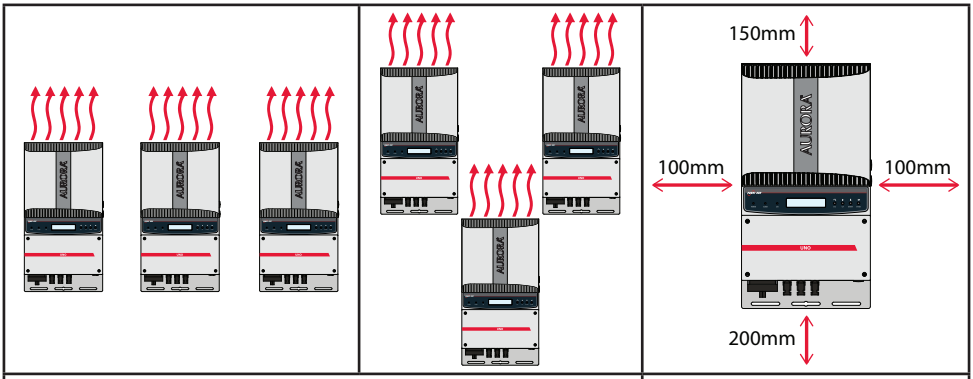
** 3-way terminal board counterparts (ALARM): 2 pieces; 8-way terminal board counterparts (signals): 2 pieces.*

*** For PVI-8.0/10.0/12.5-TL-OUTD-S models: 4 pieces; for PVI-8.0/10.0/12.5-TL-OUTD and PVI-8.0/10.0/12.5-TL-OUTD-FS models: 6 pieces.*

3. SELECTION OF INSTALLATION LOCATION

The installation location of the AURORA inverter must be chosen taking in account the followings:

- Choose a location sheltered from direct sunlight or other sources of heat; installation of the unit in a location exposed to direct sunlight must be avoided as it may cause:
  - power limitation phenomena in the inverter (with a resulting decreased energy production by the system)
  - premature damaging of the electrical/electromechanical components
  - premature damaging of the mechanical components (gaskets) and of the user interface (display)
  - damaging of paint coating and other minor cosmetic flaws.
- Choose a well ventilated place so as to allow good circulation of air around the unit; avoid places where air cannot circulate freely around the unit.
- Choose a place with enough space around the unit to permit easy installation and removal of the object from the mounting surfaces.
- If more than one unit is installed, avoid placing one unit above the other so as to prevent overheating of the unit installed above through the heat given off by the one below. Some examples of multi-inverter installations are shown in the picture below.



ARRANGEMENTS OF UNITS

MINIMUM CLEARANCES AROUND THE UNIT

Please refer to the warranty terms and conditions available on the website at www.power-one.com and evaluate any possible warranty exclusion due to improper installation.

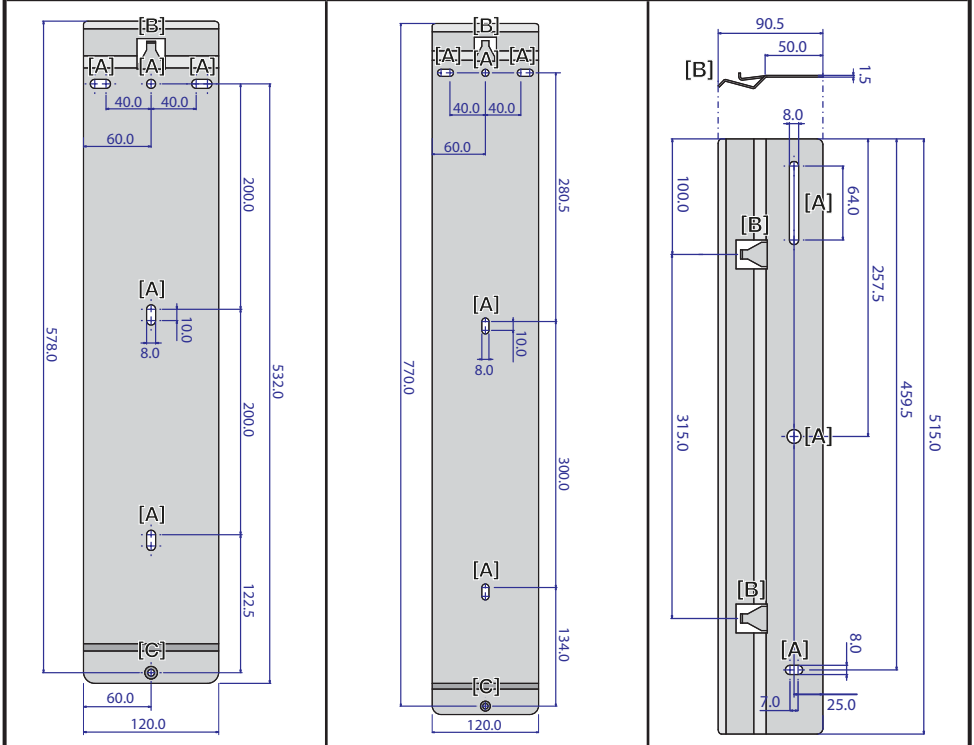
4. WALL MOUNTING

The AURORA inverter should be mounted vertically, with a maximum inclination from the vertical of 5°. Any larger inclination from the vertical could reduce the power conversion capability with a consequent reduction in energy harvesting.

To correctly wall mount the inverter, follow the following procedure:

- Drill Ø 10 mm holes to a depth of 75 mm in line with the support bracket's fixing holes (det. **[A]**).

INVERTER WALL MOUNTING BRACKETS

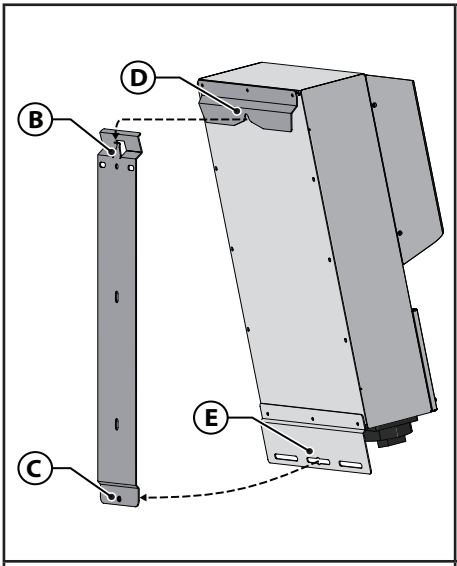


PVI-3.0/3.6/4.2-TL-OUTD | ***PVI-5000/6000-TL-OUTD*** | ***PVI-8.0/10.0/12.5-TL-OUTD***

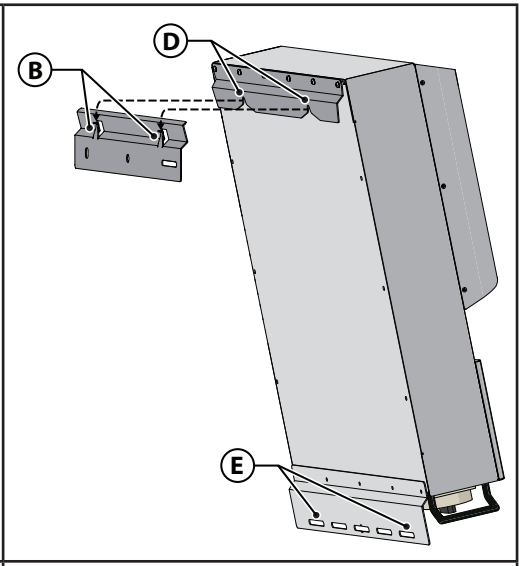
- Secure the inverter's support bracket using the SX10 dowels and 6.3x70 screws provided. The inverter's spring hook (det. **[B]**) must be positioned at the top; the fixing PEM M6 (det. **[C]**) must be positioned at the bottom.

- Hook the inverter to the bracket spring (det. **[B]**) by the screw holes in the bracket on the back of the inverter (det. **[D]**). Secure the lower part of the inverter to the PEM M6 on the bracket (det. **[C]**) using the M6x10 screw, the D.18 washer and the slot in the inverter's lower flange (det. **[E]**).

Note: *In the PVI-8.0/10.0/12.5-TL-OUTD models the support bracket only permits the upper part of the inverter to be secured through the procedure previously described; to secure the lower part of the inverter, in the absence of the PEM M6, you must make additional holes in line with the slot in the inverter's lower flange (det. **[E]**), and then use the SX10 dowels and 6.3x70 screws to secure the part to the wall.*



PVI-3.0/3.6/4.2/5000/6000-TL-OUTD



PVI-8.0/10.0/12.5-TL-OUTD

5. ELECTRICAL CONNECTIONS (AC, DC SIDE AND PE CONNECTION)

Warning! The inverters to which this document relates to are WITHOUT ISOLATION TRANSFORMER (transformer-less). This type involves the use of insulated photovoltaic panels (IEC61730 Class A Rating) and the need to maintain the photovoltaic generator floating with respect to earth: no pole of the generator must be connected to earth.

Warning! Aurora inverters should be earthed (PE) via the terminal with the protective earth label ⏚, using a cable with an appropriate cross-section of the conductor for the maximum ground fault current that the generating system might experience. Any damage caused to an inverter which is not earthed via the appropriate terminal is not covered by the warranty.

Warning! Unauthorized removal of necessary protections, improper installation or tampering with the unit (for example, the creation of additional holes, changes not covered in the guide below), cause the risk of serious personal injury and / or property and entails the immediate loss of warranty.

Warning! Aurora inverters cannot be powered by unlimited sources of current, e.g. batteries. Powering the device with this type of energy source can cause irreparable damage to the unit, with consequent invalidity of the warranty conditions.

Warning! Aurora inverters are supplied with an internal protection system able to detect any ground fault occurring on the DC side of the equipment or inside the inverter. This protection system, designed to disconnect the inverter in the event of an accidental indirect contact or a breach of the insulation, is not capable of protecting the inverter from a dead short of one of the poles of the solar array when the equipment is connected to the AC grid (such an event could damage the inverter and such damage is not covered by the warranty); further, this protection system is not capable of protecting the AC line to which the inverter is connected, for which you are recommended to install an automatic circuit breaker which will cut out in the event of a leakage on that line. The following table shows the characteristics of such a device that would be required for the various inverter models. The ratings (nominal current) for the switches reported in the table below are given as approximate values: the selection of the device to be used must be based on installation choices, such as any possible deratings due to the operative temperature of the switch.

Automatic circuit breaker characteristics	*Inverter Model*							
	PVI-3.0-TL-OUTD	PVI-3.6-TL-OUTD	PVI-4.2-TL-OUTD	PVI-5000-TL-OUTD	PVI-6000-TL-OUTD	PVI-8.0-TL-OUTD	PVI-10.0-TL-OUTD	PVI-12.5-TL-OUTD
Type	AUTOMATIC CIRCUIT BREAKER WITH MAGNOTHERMIC-DIFFERENTIAL PROTECTION							
Rated Voltage	230Vac					400Vac		
Rated Current	20 A	20 A	25 A	32 A	40 A	16 A	20 A	25 A
Magnetic Protection Characteristics	B/C							
Differential Protection Type	A/AC							
Differential Sensitivity	300mA							
Number of Poles	2					3/4		

5.1. Selection of the AC grid connection cable

The AC grid connection cable must be selected based on the criteria below.

- Cable type:

The choice of the type of cable for the connection to the AC grid depends on the type of inverter to be installed (single-phase or three-phase) and on the protective earth (PE) wiring; this may be integrated in a single sheath with the conduction line (phase or phases + neutral) or it can be on a separate wiring.

For the three-phase models the wiring choice also depends on the selected configuration type for the AC grid connection (delta or star): in case of delta configurations (pure three-phase) the neutral conductor is not required.

Inverter type / configuration	*Cable type*
Single-phase inverter	Three-way cable (L+N+PE) or Two-way cable (L+N) and PE cable
Three-phase inverter with delta grid connection	Four-way cable (R+S+T+PE) or Three-way cable (R+S+T) and PE cable
Three-phase inverter with star grid connection	Five-way cable (R+S+T+N+PE) or Four-way cable (R+S+T+N) and PE cable

- Cross-section of the internal conductor:

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 (seen by the inverter) that, on reaching the limit set by the regulations of the country of installation, causes the inverter to switch off. The following table reports the minimum and maximum cross-sections of the internal conductor of each individual AC cable for each inverter model.

	Inverter model							
	PVI-3.0-TL-OUTD	PVI-3.6-TL-OUTD	PVI-4.2-TL-OUTD	PVI-5000-TL-OUTD	PVI-6000-TL-OUTD	PVI-8.0-TL-OUTD	PVI-10.0-TL-OUTD	PVI-12.5-TL-OUTD
Minimum cross-section	4 mm^2	6 mm^2	6 mm^2	10 mm^2	10 mm^2	6 mm^2	6 mm^2	6 mm^2
Maximum cross-section	16 mm^2	16 mm^2	16 mm^2	10 mm^2	10 mm^2	16 mm^2	16 mm^2	16 mm^2

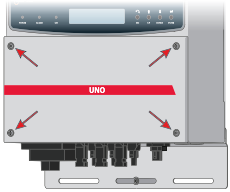
- External diameter:

To ensure environmental protection for the inverter, the external diameter of the line wiring (and of the PE wiring, if any) must not exceed the mounting range prescribed for the cable glands provided with the inverter.

Cable gland	*Mounting range*
M20	7 - 13 mm
M25	10 - 17 mm
M32	13 - 21 mm
M40	19 - 28 mm

5.2. AC side connections

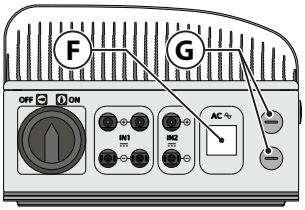
Warning! Before performing any of the operations described below, ensure the AC line downstream the inverter has been correctly disconnected.



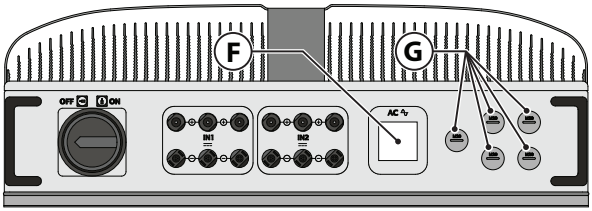
- Remove the inverter's front panel by unscrewing the screws on the panel with the Torx T20 wrench provided.

- Remove the protective film located on the hole to be used for the AC cables (det. **[F]**).

LOWER PART OF THE INVERTER



SINGLE-PHASE INVERTER



THREE-PHASE INVERTER

- Insert the M25/M32/M40 cable gland in the hole and secure it using the special M25/M32/M40 lock nut.

Note: *If you are using a yellow-green protective earth (PE) cable which is separate from the grid connection cable, pass it through the provided M20 cable gland inserted in one of the additional holes (det. **[G]**).*

Warning! To ensure environmental protection IP65 it is necessary to fix the cable gland(s) to the inverter chassis observing the minimum tightening torque requirements indicated below.

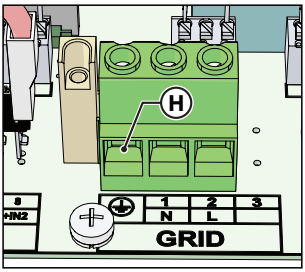
Cable gland	*Tightening torque (min.)*
M20	7,0 Nm
M25	7,5 Nm
M32	8,0 Nm
M40	8,0 Nm

- Insert the AC grid and PE connection cables into the inverter, passing them through the previously mounted cable glands.
- Strip back the AC grid and PE connection cables: 10 mm for PVI-3.0/3.6/4.2/8.0/10.0/12.5-TL-OUTD models, 12-13 mm for PVI-5000/6000-TL-OUTD models.
- Connect the protective earth (yellow-green) cable to the contact labelled with the ⏚ symbol on the terminal block (det. **[H]**).
- Connect the neutral cable (normally blue) to the terminal labelled with the letter **N**.

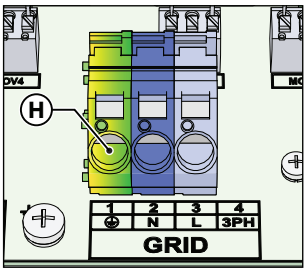
Note: *In the PVI-8.0/10.0/12.5-TL-OUTD models the connection of neutral conductor (N) is optional and depends on the system in which the inverter is installed. If the AC Grid to which the inverter is connected includes single-phase devices or inverters which could create an imbalance in the three-phase system, you are recommended to use a star configuration (three-phase +N). However, where the circuit only includes 3ph inverters you are recommended to use a delta configuration (neutral not connected).*

- Single-phase inverter: Connect the phase cable to the terminal labelled with the letter **L**.
  Three-phase inverter: Connect the phase cables to the terminals labelled with the letters **R**, **S** and **T**.

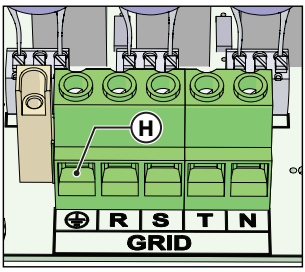
AC TERMINAL BLOCK



PVI-3.0/3.6/4.2-TL-OUTD



PVI-5000/6000-TL-OUTD

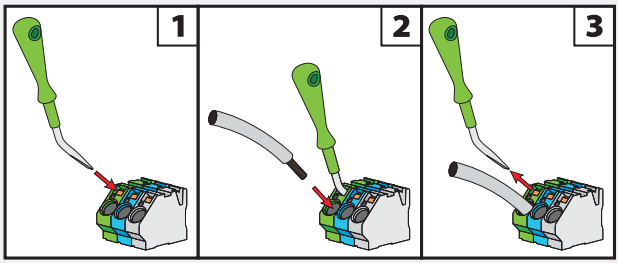


PVI-8.0/10.0/12.5-TL-OUTD

Warning! Models PVI-3.0/3.6/4.2/8.0/10.0/12.5-TL-OUTD require the AC cables to be tightened on the terminal block with a minimum torque of 1.5 Nm.

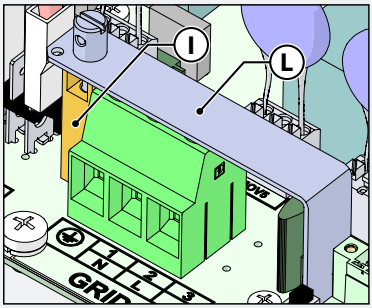
Note: *In the PVI-5000/6000-TL-OUTD models, a WAGO screwdriver allowing the terminal block's contacts to be opened is provided in the special kit. The procedure for opening the contacts and tightening cables is as follows:*

1) *Insert the screwdriver in slot with the screwdriver facing downwards; lightly press the screwdriver from the top to the bottom; insert the screwdriver until the clamp opens.*
2) *Insert the cable in the clamp.*
3) *Remove the screwdriver.*



Warning! Any damage to an inverter caused by wrong grid cable connections on the AC terminal block is not covered by the warranty.

Note: *In the PVI-3.0/3.6/4.2/8.0/10.0/12.5-TL-OUTD models there is a metal turret (det. **[I]**) which, by means of the special bracket and perforated screw (det. **[L]**), allows the contacts to be closed with the related lead sealing.*



- Tighten the cable gland making sure that it grips the surface of the cable so that the seal is ensured and hence the level of environmental protection.

5.3. DC side connections

- Check the polarity of each couple of cables that must be connected to the inverter input: mark the cable corresponding to the positive pole so as to be able to distinguish it from the one corresponding to the negative pole. In the case of several strings, observe the correspondence between the negative and positive of each string.
- Check the open circuit voltage of each pair of cables which must be connected in input to the inverter: the value must in no case exceed the maximum input voltage of the inverter.

Warning! Voltage values which exceed the permitted levels may irreparably damage the unit. Any consequential damage to the inverter is not covered by the warranty.

Warning! The maximum allowed current for each input connector is 20 A; for models equipped with input fuses (suffix "-FS") this limit is set by the fuse current rating. The sizing of the fuses must therefore be carefully assessed during installation. Refer to Chapter 16.1 for information on the sizing and installation of the input fuses.

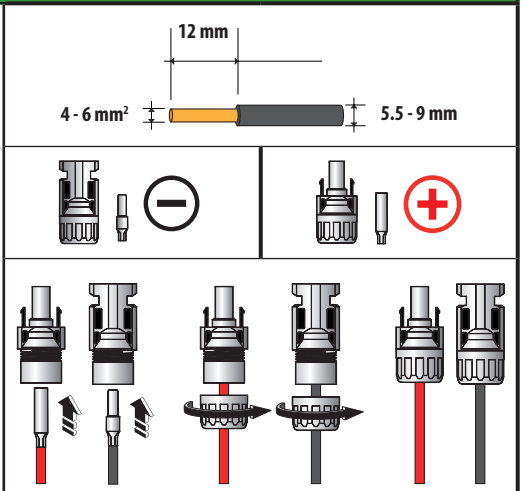
Warning! The exposure to sunlight of photovoltaic panels generates dangerous voltages to the ends of the cables of the PV generator. Before connecting the cables coming from the photovoltaic generator to the inverter DC inputs, the DC line MUST be disconnected by opening the integrated disconnect switch (-S/-FS versions) and any external disconnect switch on the DC line or by obscuring the photovoltaic panels.

- Crimp the Multicontact/Weidmüller MC4/WM4 quick fit connector counterparts to the string cables or to the cables wired to the string disconnect switches (external), paying attention to the voltage polarity and to the connector / terminal, following the procedure below:

MOUNTING PROCEDURE FOR MULTICONTACT QUICK FIT CONNECTORS

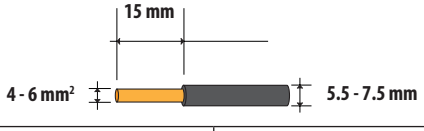
- Strip back the cable to which the connector will be applied (after verifying it complies with the connector limitations).
- Apply the terminal to the conductor using the special tweezers.
- Fit the cable with the terminal inside the connector until it snaps, indicating that the terminal is securely fitted inside the connector.
- Firmly tighten the cable gland in order to prevent humidity infiltration in the connector, which may lead to increased ground leakage.

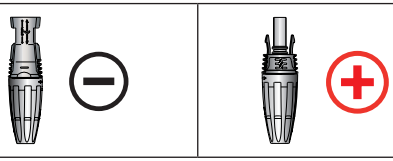
Warning! Tightening the cable gland is of crucial importance. Humidity infiltrations cause increased ground leakage and may give rise to low insulation resistance alarms signalled by the inverter.



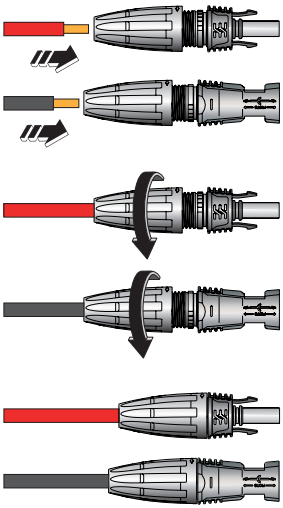
MOUNTING PROCEDURE FOR WEIDMÜLLER QUICK FIT CONNECTORS

- Strip back the cable to which the connector will be applied (after verifying it complies with the connector limitations).





- Insert the cable in the connector until a locking "click" is heard.



- Fully tighten the knurled ring nut to prevent humidity infiltrations in the connector which cause increased ground leakage.

Warning! Tightening the knurled ring nut is of crucial importance. Humidity infiltrations cause increased ground leakage and may give rise to low insulation resistance alarms signalled by the inverter.

Note: *In countries that require compliance with the UTE-15-712-1 standard, supplementary retaining clips must be mounted on the quick fit connectors to avoid accidental disconnection. Refer to* ***Appendix D*** *for further information.*

- Ensure that the integrated switch (versions –S and –FS) is in the OFF position or that the external switches are open.
- Connect the connectors that you previously crimped to the input connectors in the lower part of the inverter, paying attention to the polarity.

6. CONFIGURATION OF INPUT CHANNEL OPERATING MODE

The two input channels can be configured in two modes: independent mode and parallel mode.

The selection of the configuration of the input channels depends on the photovoltaic generator features and on the power and current limitations of the inverter, as well as design choices and installation needs. Refer to the system design documentation for information on the selection of the configuration of the inverter input channels.

Warning! For the two channels to be used in independent mode, it is a NECESSARY condition that the photovoltaic generator connected to each input has a maximum current and power below the channel's current and power limit.

Warning! For the two channels to be used in parallel mode, it is RECOMMENDED that the photovoltaic generator connected to the two inputs has strings with the same number of modules in series and that all the modules have the same installation conditions (inclination / orientation).

Refer to the technical data table in **Appendix E** to find out the current and power limits of each input channel for the various inverter models.

Warning! If the string's current or power is above the current or power limit of the input channel to which it is connected, the two input channels MUST be configured in parallel. This condition also concerns the case where the photovoltaic generator comprises only one string with power above the inverter's single input channel power limit.

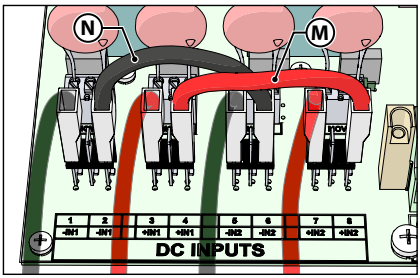
Note: *The inverters are pre-set in the factory with INDEPENDENT input channels.*

Warning! If the conditions shown above are not met, consult the photovoltaic system's designer immediately.

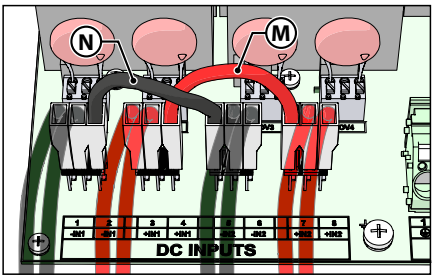
6.1. Configuration of the input channels in parallel mode

In case the input channels have to be used in parallel mode, follow the procedure below:

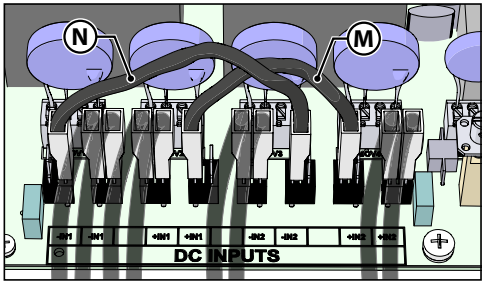
- Remove the front panel of the inverter.
- Using the AWG10/12 cables with insulated female fastons, connect the positive terminal of input 1 to a positive terminal of input 2 (det. **[M]**). Repeat the connection for the negative terminals (det. **[N]**).



PVI-3.0/3.6/4.2-TL-OUTD



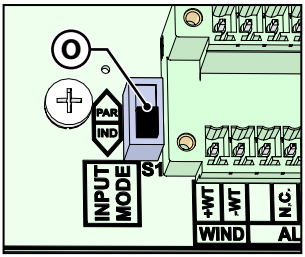
PVI-5000/6000-TL-OUTD



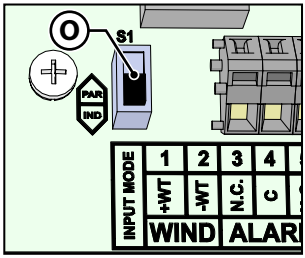
PVI-8.0/10.0/12.5-TL-OUTD

- Act on the dip-switch identified by the **INPUT MODE** printing and put in on the **PAR** position (det. **[O]**).

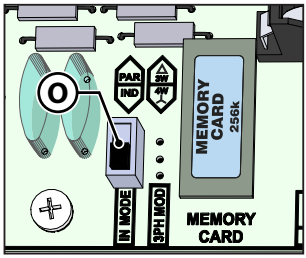
CONFIGURATION DIP-SWITCH FOR INPUT CHANNEL OPERATION MODE



PVI-3.0/3.6/4.2-TL-OUTD



PVI-5000/6000-TL-OUTD



PVI-8.0/10.0/12.5-TL-OUTD

7. SIGNALS TERMINAL BLOCKS

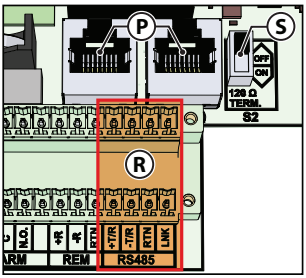
7.1. RS485 communication line connection

The RS485 communication port is the inverter's communication port. AURORA uses a HALF-DUPLEX RS485 communication line made up of two transmission reception lines (+T/R and –T/R) and a reference communication line (RTN): all three lines must be wired in a daisy-chain ("in-out"). It is advisable to use a twisted-pair screened cable for the communication line: the screen must be earthed at only one point (typically near the monitoring system) and continuity inside each element of the chain must be given to the screen. Refer to **Appendix C**.

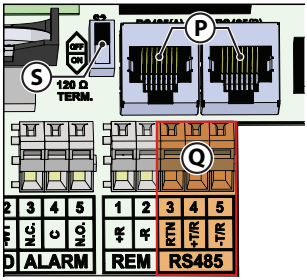
The chain connection can be made without distinction by using the connector couples (one for in and one for out – det. **[P]**) or the terminal block (det. **[Q]** or det. **[R]**). The connectors are identified by the printing "RS485(A)" and "RS485(B)": use of connector "A" as in and "B" as out is not compulsory (both connectors can be used as in or out). Refer to **Appendix A** for the PIN-OUT of the RJ45 connectors.

The last inverter in the daisy chain must be "terminated" or the 120 Ohm communication line termination resistance must be activated by switching the dip-switch (det. **[S]**).

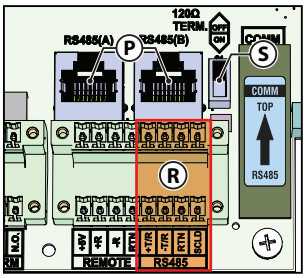
COMMUNICATION LINE TERMINATION SWITCH AND RS485 CONNECTORS



PVI-3.0/3.6/4.2-TL-OUTD



PVI-5000/6000-TL-OUTD



PVI-8.0/10.0/12.5-TL-OUTD

The PVI-3.0/3.6/4.2/8.0/10.0/12.5-TL-OUTD models are equipped with a two-level terminal block allowing one level to be used for line-in connection and the other for line-out connection. The terminal block is also equipped with the LNK terminal for the PVI-3.0/3.6/4.2-TL-OUTD models and SCLD for the PVI-8.0/10.0/12.5-TL-OUTD models allowing continuity to be given to the cable screen.

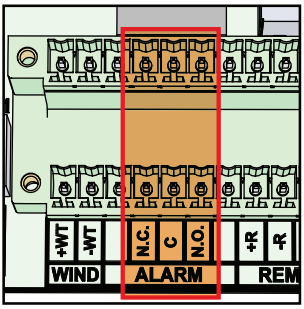
On the other hand the PVI-5000/6000-TL-OUTD models are equipped with a one-way terminal block (det. **[Q]**) and therefore it is necessary to couple the line-in and line-out leads in the same clamp.

With regard to the communication interface, the use of the dedicated Power-One PVI-RS485_RS232 or PVI-USB-RS485_232 type converter is strongly recommended in order to prevent compatibility problems that can sometimes be encountered with the standard models on the market.

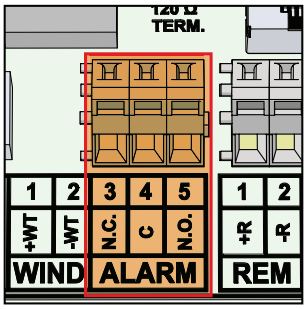
7.2. Using the alarm terminal block

The alarm terminal block makes the contacts of a relay available to indicate configurable alarm conditions.

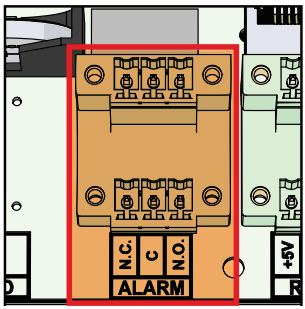
The alarm contact is available under normally open (N.O.) or normally closed (N.C.) operation compared to the common terminal (C). The maximum rating for voltage / current that the relay can support is 230V / 1A.



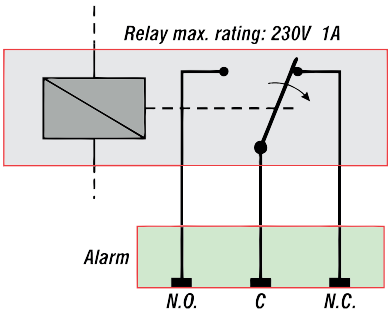
"ALARM" TERMINAL BLOCK IN PVI-3.0/3.6/4.2-TL-OUTD



"ALARM" TERMINAL BLOCK IN PVI-5000/6000-TL-OUTD



"ALARM" TERMINAL BLOCK IN PVI-8.0/10.0/12.5-TL-OUTD



FUNCTIONAL DIAGRAM FOR THE ALARM CONTACT

Note: *The ALARM contact can be used only with systems that ensure a safety isolating additional at least (supplementary insulation in relation to the DC input voltage).*

8. PRE-COMMISSIONING CHECKS

Warning! Carrying out preliminary checks before commissioning the inverter is always recommended; this way you avoid possible damage to the unit that could be caused by its faulty installation.

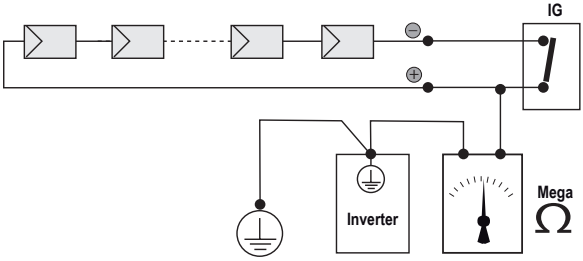
The main checks to be performed are summarised in the following chapters.

8.1. Electrical checks

- PE connection check: check the inverter has an earth connection.

Warning! Aurora inverters should be earthed (PE) via the terminal with the protective earth label ⏚, using a cable with an appropriate cross-section of the conductor for the maximum ground fault current that the generating system might experience. Any damage caused to an inverter which is not earthed via the appropriate terminal is not covered by the warranty.

- Check of the input voltage values: check that the inverter's input voltage does not exceed the permitted limits (ref. technical data table in **Appendix E**). **Voltage values above the specifications can irreparably damage the unit**. **Any consequent failure of the inverter is to be considered outside the warranty**.
- Check of the input voltage polarity: make sure the input voltage has the correct polarity. **The polarity inversion at the input may irreversibly damage the unit.**
- Checking of earth insulation of the photovoltaic generator: Using a correctly sized disconnect switch, short the positive and negative poles of the photovoltaic generator, then measure the insulation resistance (R_{ISO}) using a megohmmeter between the two short-circuited photovoltaic generator poles and the protective earth (PE) terminal of the inverter.

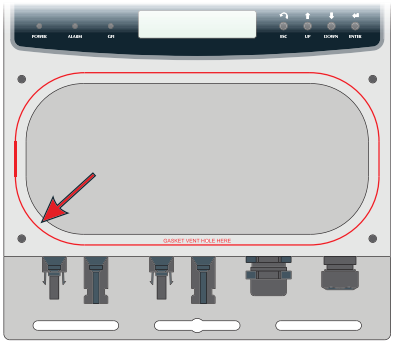


Warning! If the measured insulation resistance (R_{ISO}) is lower than 1 MOhm, the inverter will not connect to the grid as ground leakage is detected on the photovoltaic generator (refer to chapter 12 to address the problem).

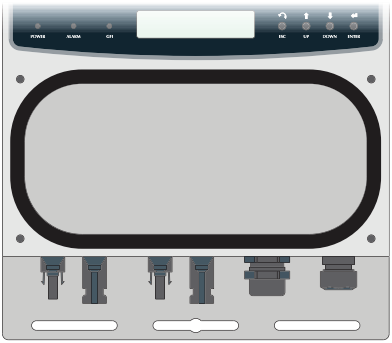
- Check of the grid voltage: check that the voltage of the grid to which the inverter will be connected complies with the values shown in the technical data table in **Appendix E**.
  Voltage values above the specifications can irreparably damage the unit.

8.2. Mechanical checks

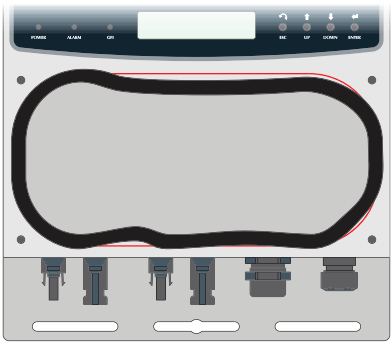
- Make sure the cable glands are mounted properly. The cable glands must be adequately locked and prevent any movement of the cable. Also make sure the cable glands are solidly fixed to the inverter's chassis.
- Make sure that the gasket on the front panel has been correctly mounted. The gasket must completely cover the red line on the front of the inverter.



REFERENCE LINE



CORRECT MOUNTING



INCORRECT MOUNTING

- Fasten the inverter's front panel by screwing the screws on the panel with the Torx T20 wrench provided.

Warning! To ensure the inverter is waterproof, the front panel screws must be tightened to a torque wrench setting of at least 1.5 Nm (13.2 in-lbs).

9. USER INTERFACE AND USE OF THE DISPLAY

Aurora inverters are equipped with an LCD display, four buttons for menu navigation and three LEDs indicating the device status.

9.1. Status LEDs

Aurora inverters are equipped with three LEDs that indicate real-time device status and any faults or errors: a green "POWER" LED, a yellow "ALARM" LED and a red "GFI" LED. All possible activation combinations of the LEDs relative to the status of the device are listed below.

LED BEHAVIOUR		
⊗ = LED Off ● = LED On ◪ = Flashing LED ○ = Any condition		
LED STATUS	***INVERTER OPERATING STATE***	***STATE DESCRIPTION***
Green: ⊗ Yellow: ⊗ Red: ⊗	Inverter off (typically during the night).	The input voltage and/or power are not sufficient to switch on the internal logic circuits of the inverter.
Green: ◪ Yellow: ⊗ Red: ⊗	Inverter initialization (loading of settings and wait for grid check).	This is a transition state during verification of the operating conditions. During this phase, the input power is sufficient and the inverter checks the conditions necessary for the connection to the grid (for example: input voltage, insulation resistance RISO, 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 seeks and analyses the maximum power point (MPPT) available from the photovoltaic generator.
Green: ○ Yellow: ○ Red: ●	Ground fault detected on DC side.	The inverter signals the detection of a low insulation resistance (RISO) level during the preliminary stage or of a ground leakage on the DC side during operation in parallel with the grid. The inverter disconnects from the grid, thus NOT supplying any power. The problem may be due to an insulation fault in the PV modules or in the connections on the DC side.
Green: ⊗ Yellow: ● Red: ⊗	Warning: W warning codes Error: E warning codes.	Whenever the control system of the inverter detects an anomaly (W) or a fault (E) in the operation of the monitored system, a message indicating the type of problem found appears on the display. The error can originate inside or outside the inverter.
Green: ⊗ Yellow: ◪ Red: ⊗	Autotest stage: the inverter is not connected to the grid.	During the Autotest stage the tripping threshold for voltage and frequency limits is measured.
Green: ● Yellow: ◪ Red: ⊗	Internal fan fault.	The inverter does not disconnect and stays operational, supplying power to the grid: critical environmental conditions may however give rise to over-temperature conditions with possible power limitations.
Green: ◪ Yellow: ● Red: ⊗	Grid disconnection	Indicates that the grid voltage for allowing the inverter to connect to the grid is not present. The inverter shows the "*Missing Grid*" message on the display.

9.2. Use of the display

The display allows to set the initial system configuration (Selection of grid standard, date/time, language, RS485 address, activation voltage, MPPT scanning, etc.), the advanced configurations of the grid parameters and of the interface protections and to view real-time or historical energy production data.

It is possible to access such features by using the four buttons on the front of the inverter.

USING THE BUTTONS	
	"**ENTER**" button. It can be used to confirm an action, to access the submenu for the selected option (indicated by the **>** symbol) or to switch to the next digit to be edited.
	"**DOWN**" button. It is used to scroll down the menu options or to shift the numerical scale in descending order.
	"**UP**" button. It is used to scroll up the menu options or to shift the numerical scale in ascending order.
	"**ESC**" button. It is used to access the main menu, to go back to the previous menu or to go back to the previous digit to be edited.

10. COMMISSIONING

After performing the preliminary checks for the commissioning it is possible to switch on and connect the inverter to the grid, following the procedure below.

- Switch the integrated switch (versions –S and –FS) to the ON position or close the external switches: If the input voltage applied to one of the two input channels is greater than the minimum starting voltage, the inverter will start up.

10.1. Selection of grid standard ("Nation")

When the inverter starts up for the first time it asks you to select the "Nation" of the country where it has been installed. This selection allows the inverter to automatically configure its parameters to ensure that compliance with local standards; the default language corresponding to the selected "Nation" will also be set.

Warning! Select the grid standard carefully to avoid any problems with the grid connection.

The list of the available Nations is reported in table below:

MONO-PHASE INVERTER		THREE-PHASE INVERTER	
NATION (SHOWN ON DISPLAY)	DEFAULT LANGUAGE	NATION (SHOWN ON DISPLAY)	DEFAULT LANGUAGE
No Nation	English	VDE0126	English
AS4777	English	ENEL	English
Brazil	English	RD 1699	Spanish
C10-11 100%	French	UK G83 [6]	English
C10-11 110%	French	UK G59 [7]	English
Corsica	French	IRELAND	English
Czech	Czech	AS 4777	English
CEI021 EXT [1]	Italian	ISRAEL	English
CEI021 INT [1]	Italian	BDEW [7]	German
France	French	FRANCE	French
Greece	English	NETHERL.	Dutch
Hungary [2]	English	GREECE	English
Ireland	English	PORTUGAL	English
Israel	English	CORSICA	French
Netherl.	Dutch	HUNGARY	English
Portugal	English	TAIWAN	English
RD 1699	Spanish	CZECH	Czech
Romania	English	VDE 4105	German
Taiwan	English	CEI021 IN	Italian
Turkey HV	English	CEI021 EX	Italian
Turkey LV	English	S.AFRICA [7]	English
UKG59/2 [3]	English	RD 1565	Spanish
UKG83/1 [3]	English	C1011 100	French
UK [4]	English	C1011 110	French
VDE 0126	English	BRASIL	English
VDE 4105 [5]	German	TURKEY LV	English
		TURKEY HV	English
		ROMANIA	English

[1] Select the "CEI021 INT" Nation if you wish to use the interface protections integrated in the inverter for systems with a power lower than 6kW; Select "CEI021 EXT" if the inverter is connected to a system with a power greater than 6kW or if you wish to use external interface protections for systems with a power lower than 6kW.

[2] Nation not selectable for models PVI-5000/6000-TL-OUTD.

[3] Nation selectable for model PVI-3.6-TL-OUTD only.

[4] Nation not selectable for model PVI-3.6-TL-OUTD.

[5] Invalid nation for models PVI-5000/6000-TL-OUTD installed in Germany.

[6] Nation not selectable for models PVI-10.0/12.5-TL-OUTD.

[7] Nation not selectable for model PVI-8.0-TL-OUTD.

Note: *The list of the grid standards available in the inverter might comprise other entries not shown in the table. Please contact Power-One for further information.*

To set the Nation, perform the following:

NATION SELECTION PROCEDURE – SINGLE-PHASE INVERTER (PVI-3.0/3.6/4.2/5000/6000-TL-OUTD)

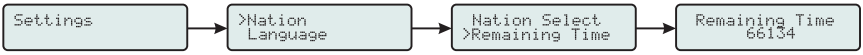
- When the inverter starts up for the first time the list of selectable Nations is shown on the display.

- Select the Nation corresponding to your country, then press "ENTER": you will be then requested to confirm your choice by holding down the "ENTER" button for 5 seconds.

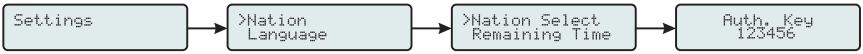
Warning! After the grid standard was set you have 24 hours to make any changes to the grid standard value; 24 hours later the "Nation Select" functionality will be blocked, and any subsequent changes can only be made using a password provided on request by Power-One.

Note: *In the event that an error is made in the selection of the Nation value, it is possible, during the first 24 hours when the inverter is powered*, to modify the Nation value by selecting:* ***SETTINGS > NATION > NATION SELECT****.*

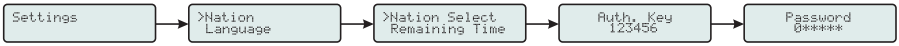
- You can check how much time remains before the "**Nation Select**" button is blocked, by selecting **SETTINGS > NATION > REMAINING TIME**.



- After 24 hours* the inverter is powered, you can only change the Nation setting using a password provided on request by Power-One. To request this password, contact the Service Power-One and communicate the serial number (S/N) of the inverter and its "Authorization Key" code, which can be obtained by selecting **SETTINGS > NATION > NATION SELECT**.



- After obtaining the password, select **SETTINGS > NATION > NATION SELECT**, press ENTER and digit the password supplied by Power-One.



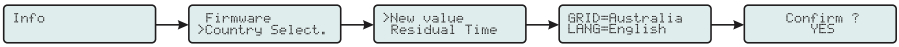
- After you have entered the password, the "Nation" value can be changed for a further period of 24 hours*.

** The 24 hour period begins (and continues) when you select a Nation.*

NATION SELECTION PROCEDURE – THREE-PHASE INVERTER (PVI-8.0/10.0/12.5-TL-OUTD)

- When the inverter starts up for the first time the following message is shown on the display:

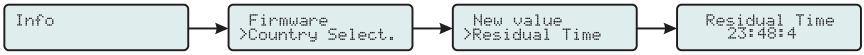
- Press the "ESC" button to access the main menu, then choose **INFO > COUNTRY SELECT. > NEW VALUE**, then select the Nation corresponding to your country and press the "ENTER" button; you will be prompted to confirm your selection: choose "YES" and press the "ENTER" button.



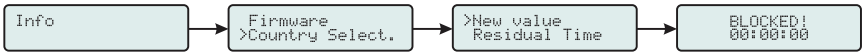
Warning! After the grid standard was set you have 24 hours to make any changes to the grid standard value; 24 hours later the "Country Select." functionality will be blocked, and any subsequent changes can only be made using a password provided on request by Power-One.

Note: *In the event that an error is made in the selection of the Nation value, it is possible, during the first 24 hours when the inverter is powered*, to modify the Nation value by selecting:* ***INFO > COUNTRY SELECT. > NEW VALUE****.*

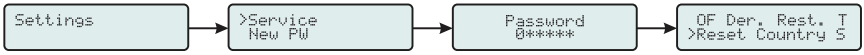
- You can check how much time remains before the "Country Select" button is blocked, by selecting **INFO > COUNTRY SELECT. > RESIDUAL TIME**.



- After 24 hours* of operation, the "**Country Select.**" function will be blocked and the Nation can only be changed via the "**SERVICE**" advanced configuration menu, which requires a second-level password. To obtain the second-level password, refer to the procedure described in chapter **11.2**.



- After obtaining the second-level password, select **SETTINGS > SERVICE**, choose the "**Reset country s**" option and press "ENTER".



- After resetting the Nation, the "**Country Select.**" function will be available again for a further period of 24 hours*.

** The 24 hour period begins (and continues) when you select a Nation.*

10.2. Connection to the grid

- After you have set the Nation value, the message "*Inizializing...Please Wait*" is displayed. Depending on the input voltage value, the inverter will show various messages on the display and change the behaviour of the three LED:

INPUT VOLTAGE	DISPLAY MESSAGE	LED STATUS	DESCRIPTION
Vin < Vstart	*Waiting sun*	Green = FLASHING Yellow = OFF Red = OFF	The input voltage is not sufficient to permit connection to the grid.
Vin > Vstart	*Missing Grid*	Green = FLASHING Yellow = ON Red = OFF	There is sufficient input voltage to permit connection to the grid: the inverter waits until there is grid voltage to carry out the parallel connection.

Note: *The inverter is powered ONLY by the voltage coming from the photovoltaic generator: presence of grid voltage alone IS NOT SUFFICIENT to permit the inverter to start up.*

Note: *The inverter start-up voltage (Vstart) is the input voltage value though which the inverter connects to the grid. This value avoids repeated connection and disconnection in periods of reduced radiation (typically in the morning). It is possible to modify the start-up voltage within a set range via the display and the four keys (**Ref. Par. 9.2** and the technical data table in **Appendix E**). You are recommended to reduce the start-up voltage only when absolutely necessary, i.e. when the Configurator software indicates that the parameter needs to be changed to avoid repeated connection and disconnection to the AC Grid which could impact the reliability of the AC grid relays.*

Note: *The start-up voltage also sets the minimum voltage for the inverter to operate in MPPT. The inverter turns itself off because of input undervoltage when the input voltage (for each channel) drops below 70% of the start-up voltage (for the channel).*

- With the inverter in "*Missing Grid*" status, close the AC switch downstream the inverter so as to apply the grid voltage to the inverter: the inverter performs the grid voltage check, measures the photovoltaic field's insulation resistance against earth and carries out other self-diagnosis checks. During the checks before the parallel with the grid, the green LED keeps flashing, the others are off.

Note: *During the grid voltage check and measurement of the insulation resistance, the values for the grid voltage and frequency and the insulation resistance measured by the inverter are shown on the display. The inverter completes parallel connection with the grid SOLELY if the grid parameters meet the ranges provided for by the regulations in force and if the insulation resistance is greater than 1Mohm.*

- If the preliminary checks for parallel connection to the grid are successful, the inverter connects to the grid and begins to export power to the grid. At this stage, the display shows the inverter's parameters in cycles. The green LED stays lit whereas the others are off.
- Turning off the unit: follow the operations described for commissioning in reverse order. Opening the switch downstream the inverter will light up the yellow LED and display message W003 and then "*Missing Grid*"; opening the built-in disconnection switch or the external disconnection switches will completely turn off the unit (LED off and display off).

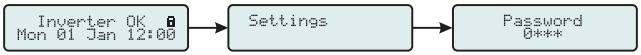
Note: *During the night, or more generally when the input voltage (DC) is insufficient to turn on the internal auxiliary power supply, the inverter will be completely off.*

11. CONFIGURATION

11.1. Configuration of basic parameters

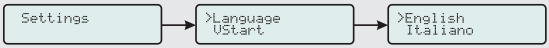
The display allows to access the configuration of the basic parameters, available in the "**SETTINGS**" menu.

To access the configuration menu from the initial screen, press the "ESC" button and select the "**SETTINGS**" menu; you will be prompted to enter the administration password (Default: **0000**).



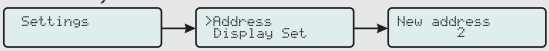
The following table reports a list of the parameters that can be configured.

- **Language setting (Language):** If required, you can change the default language, set automatically when "Nation" was selected, to one of the following: ENGLISH, ITALIAN, GERMAN, SPANISH, FRENCH, CZECH or DUTCH. To change the language, select the **Language** submenu.

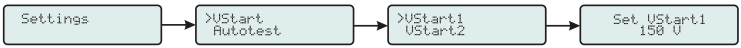


- **Date/Time Settings (Time):** On first start-up of the inverter, it is necessary to configure the date and time by accessing the **Time** sub-menu.

- **Configuration of the RS458 port address (Address):** When there are several inverters wired on the same RS485 line (Ref. **Par. 7.1**), the RS485 port address must be different for each inverter (N.B. "Auto" is not permitted as an address); to modify the address you have to access the **Address** sub-menu.



- **Start-up voltage (Vstart):** The start-up voltage can be regulated by accessing the **Vstart** sub-menu and, in the case of independent channel configuration, it is possible to configure the Vstart for channel 1 and channel 2 separately.



- **MPPT Scanning (MPPTScan EN/DIS):** The inverter uses the **MPPT Scan EN/DIS** function to search periodically for an absolute power peak from the relative peaks that are formed when part of the solar array is shaded.

MPPT SCAN EN/DIS on PVI-3.0/3.6/4.2/5000/6000-TL-OUTD

MPPT SCAN EN/DIS on PVI-8.0/10.0/12.5-TL-OUTD

- **Scan interval (Scan Interval):** The **Scan Interval** function determines the time interval between consecutive MTTP scans.

SCAN INTERVAL on PVI-3.0/3.6/4.2/5000/6000-TL-OUTD

SCAN INTERVAL on PVI-8.0/10.0/12.5-TL-OUTD

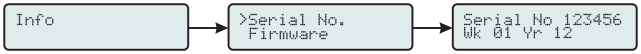
11.2. Advanced configurations from the "SERVICE" menu

The display allows access to the advanced configurations of the grid parameters and interface protections, available through the "**SERVICE**" menu.

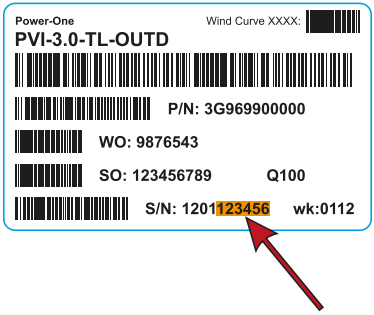
Accessing the "**SERVICE**" menu requires a second-level password that can be obtained by registering on the ***https://registration.power-one.it*** website and submitting a request through the form available in the "**REQUEST PASSWORD INVERTER**" section.

Select the model and enter the Serial Number (S/N) and the week/year of production (WK/YR) in the relevant fields relative to each inverter for which "**SERVICE**" menu access is requested (max 50 units).

This information is available both on the inverter display by accessing the **INFO > SERIAL NO.** menu,



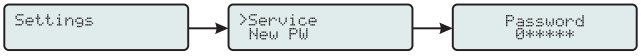
and on the product label placed on the side of the inverter (use the last six digits of the S/N only).



After submitting your request, the passwords will be displayed in a pop-up window and sent to the e-mail address entered in the registration form.

Once the second-level password has been obtained, it is possible to access the "**SERVICE**" menu by following the procedure below:

- Access the main menu and select **SETTINGS > SERVICE**.



- Enter the second-level password obtained from the registration website: the list of editable parameters is now shown on the display.

The following table reports a list of the parameters that can be configured.

DISPLAY PARAMETERS	DESCRIPTION
Amorph. Mode*	Enabling/disabling the negative pole grounding mode (to be enabled only if a "negative grounding kit" is installed on the inverter)
Set U>>	Setting the "permissive" threshold for grid overvoltage
Set U<<	Setting the "permissive" threshold for grid under-voltage
Set U>	Setting the "restrictive" threshold for grid overvoltage
Set U> (10 min)	Setting the "restrictive" threshold for grid overvoltage (average over 10 minutes)
Set U<	Setting the "restrictive" threshold for grid under-voltage
Set F>>	Setting the "permissive" threshold for grid over-frequency
Set F<<	Setting the "permissive" threshold for grid under-frequency
Set F>	Setting the "restrictive" threshold for grid over-frequency
Set F<	Setting the "restrictive" threshold for grid under-frequency
Set Uconn>	Setting the maximum voltage value allowed for the connection to the grid
Set Uconn<	Setting the minimum voltage value allowed for the connection to the grid
Set Fconn>	Setting the maximum frequency value allowed for the connection to the grid
Set Fconn<	Setting the minimum frequency value allowed for the connection to the grid
Set Time U>>	Setting the "permissive" overvoltage protection tripping time
Set Time U<<	Setting the "permissive" under-voltage protection tripping time
Set Time U>	Setting the "restrictive" overvoltage protection tripping time
Set Time U<	Setting the "restrictive" under-voltage protection tripping time
Set Time F>>	Setting the "permissive" over-frequency protection tripping time
Set Time F<<	Setting the "permissive" under-frequency protection tripping time
Set Time F>	Setting the "restrictive" over-frequency protection tripping time
Set Time F<	Setting the "restrictive" under-frequency protection tripping time
Set Time Conn 1	Setting the grid check time before the first-time grid connection or re-connection after a generic fault (not a grid fault)
Set Time Conn 2	Setting the grid check time before the connection after a grid fault
Disable U>>	Enabling/disabling the "permissive" overvoltage protection
Disable U<<	Enabling/disabling the "permissive" under-voltage protection

DISPLAY PARAMETERS	DESCRIPTION
Disable U>	Enabling/disabling the "restrictive" overvoltage protection
Dis. U> (10 min)	Enabling/disabling the "restrictive" overvoltage protection (average over 10 minutes)
Disable U<	Enabling/disabling the "restrictive" under-voltage protection
Disable F>>	Enabling/disabling the "permissive" over-frequency protection
Disable F<<	Enabling/disabling the "permissive" under-frequency protection
Disable F>	Enabling/disabling the "restrictive" over-frequency protection
Disable F<	Enabling/disabling the "restrictive" under-frequency protection
U>(10 min) Der.**	Enabling/disabling the power limitation for overvoltage (average over 10 minutes)
Slow ramp	Enabling/disabling the gradual power feeding function to the grid
UAvg Derating*	Enabling/disabling the power limitation for overvoltage (average over 10 minutes)
OF Derating	Enabling/disabling the power limitation for over-frequency
OF Der. Rest. T**	Setting the reset time after a power limitation due to over-frequency
Amorph. Enable**	Enabling/disabling the negative pole grounding mode (to be enabled only if a "negative grounding kit" is installed on the inverter)
Reset Country s**	Resetting the selected Nation and the remaining time for selection (24 hours)

* *Available only in PVI-3.0/3.6/4.2/5000/6000-TL-OUTD models.*
** *Available only in PVI-8.0/10.0/12.5-TL-OUTD models.*

12. START-UP TROUBLESHOOTING

Start-up Troubleshooting concerns the solving of the main problems that can occur during the first start-up phase.

Should problems arise in the unit's commissioning phase, it is possible to solve the problem by looking for the corresponding problem in the table and following the instructions.

Warning! Tampering with the unit, even to solve a problem, leads to the loss of the unit's warranty. Before undertaking any tampering that could cause the loss of warranty, contact the Power-One customer assistance service.

PROBLEM	POSSIBLE CAUSES	CHECKS/POSSIBLE SOLUTIONS
The inverter does not start. Display message: *None* Green LED: OFF Yellow LED: OFF Red LED: OFF	There is no input voltage (DC) present or it is present but with reversed polarity.	• Check the status of the built-in disconnecting switch or the external disconnecting switches. • Check the state of any internal or external fuses (Ref. Par. 14.1). • Check the inverter's input voltage polarity (Ref. Par. 5.3). • Check that the input voltage is greater than the inverter start-up voltage.
The inverter does not establish parallel connection with the grid. Display message: *Missing Grid* Green LED: FLASHING Yellow LED: ON Red LED: OFF	There is no grid voltage.	• Check the status of the AC side disconnecting switch. • Check the inverter's AC side connections (Ref. Par. 5.2) and repeat the commissioning procedure (Ref. Par. 10).
The inverter does not establish parallel connection with the grid. Display message: *Out of range* Green LED: FLASHING Yellow LED: ON Red LED: OFF	Faulty grid cable connection.	• Check the inverter's AC side connections (Ref. Par. 5.2) and repeat the commissioning procedure (Ref. Par. 10).
The inverter does not establish parallel connection with the grid. Display message: *W003 Grid Fail* Green LED: FLASHING Yellow LED: ON Red LED: OFF	Faulty grid cable connection. One or more grid parameters are outside the range permitted for connection to the grid.	• Check the inverter's AC side connections (Ref. Par. 5.2) and repeat the commissioning procedure (Ref. Par. 10). • Check that the grid voltage measured on the AC terminal block falls within the preset voltage and frequency ranges admissible for the operation of the inverter, then repeat the commissioning procedure (see Par. 10). • If the error frequently recurs, contact the Power-One support service.

PROBLEM	POSSIBLE CAUSES	CHECKS/POSSIBLE SOLUTIONS
The inverter does not establish parallel connection with the grid. Display message: *W003 Grid Fail* Green LED: FLASHING Yellow LED: ON Red LED: OFF	The grid voltage exceeds the maximum value allowed for the grid connection.	• Reduce the power of the photovoltaic generator (by disconnecting one or more strings or creating shading on the photovoltaic generator). If the phenomenon disappears, but you still note an increase in the grid voltage, the problem is to be found in high line impedance.
The inverter does not establish parallel connection with the grid. Display message: *E013 Wrong Mode* Green LED: FLASHING Yellow LED: ON Red LED: OFF	Incorrect configuration of the input channels: the operation mode selection switch of the input channels is set to **PAR** (channels in parallel) but the inputs of the inverter are not short-circuited (independent channels).	• Check the status of selection switch for the input channel operating mode and for jumpers between the input channels (Ref. Par. 6.1).
Intervention of the magneto-thermal differential switch downstream the inverter. Display message: *W003 Grid Fail* Green LED: FLASHING Yellow LED: ON Red LED: OFF	Faulty grid cable connection. Differential magneto-thermal circuit breaker wrongly sized. Intervention of the devices external to the inverter for protection from transitory overvoltage. Damage to the devices for protection against transitory overvoltage on the inverter's AC side.	• Check the inverter's AC side connections (Ref. Par. 5.2). • Check the appropriateness and the conditions of the magneto-thermal circuit breaker used in the system (see Par. 5). If the check is passed, yet the problem persists, remove the magneto-thermal circuit breaker and repeat the commissioning procedure (see Par. 10). • Check the conditions of the output varistors of the inverter. If they are in good condition, remove them and repeat the commissioning procedure (see Par. 10).
The inverter does not establish parallel connection with the grid. Display message: *Waiting Sun* Green LED: FLASHING Yellow LED: ON Red LED: OFF	The inverter's input voltage is less than the start-up voltage.	• Check that the input voltage is greater than the start-up voltage. • Check that the radiation conditions are sufficient to operate the system. • Check the inverter's DC side and string connections (see Par. 5.3). • Check the documentation on the sizing of the photovoltaic system and evaluate a possible change to the start-up voltage on the display (Ref. Par. 11.1).

PROBLEM	POSSIBLE CAUSES	CHECKS/POSSIBLE SOLUTIONS
The inverter does not establish parallel connection with the grid. Display message: *E025 Riso Low* Green LED: OFF Yellow LED: OFF Red LED: ON	Insulation resistance to the photovoltaic field <1Mohm.	• Check the inverter's AC side connections (Ref. Par. 5.2) and repeat the commissioning procedure (Ref. Par. 10). • Check the appropriateness and the conditions of the external transient overvoltage protection devices. If the check is passed, yet the problem persists, remove the external transient overvoltage protection devices and repeat the commissioning procedure (see Par. 10). • Measure the insulation resistance (Riso) using a megohmmeter positioned between the photovoltaic field (positive terminal short-circuited to the negative pole) and ground (as described in paragraph 8.1): if the measured insulation resistance value is lower than 1MOhm, then the PV module suffers from a ground leakage: contact a technician/installer to check the photovoltaic generator and identify and solve the problem; if the measured value of the insulation resistance is greater than 1 MOhm and the error warning persists, contact the Power-one support service.
The inverter does not establish parallel connection with the grid. Display message: *E018* Green LED: OFF Yellow LED: OFF Red LED: ON	The inverter detects excessive dispersion current to earth.	• Carry out the same checks as in the previous point.
The inverter does not communicate through the RS485 port. Display message: *None*	Faulty communication line connection. Faulty assignment of addresses to the inverters. Faulty assignment of communication speed (baud-rate). Use of an inappropriate signal converter.	• Check the connections between the inverters and those with the monitoring system (see Par. 7.1). • Check that the termination of the communication line has been activated via the corresponding switches on the inverter (120Ω TERM.) and on the monitoring system. • Check that each inverter is set to a unique address, different from the others. • Check that each inverter is set to a 19200bps baud-rate. • Power One recommends the purchase of the PVI-RS485_RS232 or PVI-USB-RS485_232 converter. If a PVI-USB-RS485_232 converter is used, check that the output is correctly set.

13. ROUTINE MAINTENANCE

Warning! It is recommended that maintenance operations be only performed by qualified personnel or Power-One personnel (under a servicing contract).

Routine maintenance, although not mandatory, is recommended to maintain efficient operation of the photovoltaic installation. The following table reports the recommended periodic maintenance operations.

ROUTINE MAINTENANCE	
Annual visual inspections	• Check that the inverter is correctly operational, with no alarms being signalled. • Check that all labels and safety symbols are visible. • Check that wirings, connectors and cable glands external to the inverter are undamaged. • Check that the environment conditions have not drastically changed from those recorded during the installation.
Annual operations	• Check that the cable glands and the screw terminal blocks are correctly tightened. • Check that the front cover is correctly fitted. • If no monitoring system is present, check the alarm and error history to identify any recently signalled malfunction.
Annual cleaning	• Clean the equipment; verify, in particular, that no obstructions are present on the fins of the heat sink.

Note: *The maintenance schedule may vary depending on the environmental conditions of the installation premises.*

14. SPECIAL MAINTENANCE

Warning! It is recommended that maintenance operations be only performed by qualified personnel or Power-One personnel (under a servicing contract).

Warning! Before performing any of the operations described below, ensure the AC and DC lines have been correctly disconnected from the inverter, then wait for at least 5 minutes.

Warning! Always use insulating gloves to perform any maintenance operation in order to avoid electrical shock risks.

14.1. Replacing the input fuses

Warning! Using fuses with inappropriate specifications may irreparably damage the unit. Any consequential damage to the inverter is not covered by the warranty.

Warning! In case of damage of one or more input fuses, the inverter (not being able to monitor the status of fuses) will continue to export energy to the grid without signaling any alarm.

The input fuses must be replaced when:

- One or more input fuses have been damaged.
- The fuses fitted on the inverter are not appropriate for the employed photovoltaic system.

The following table shows the specifications of the replacement fuse.

Mechanical dimensions	10x38mm
Nominal voltage	1000Vdc
Nominal current	20A max.
Standard	IEC60269-6

If updating is required for compliance with the employed photovoltaic system, to determine the correct rating (nominal current) of the input fuses two aspects have to be taken into account:

- The fuse nominal current (I_{RATED}) must NEVER exceed the "Maximum Series fuse rating" shown on the photovoltaic panels.

$$I_{RATED} < \text{Maximum Series Fuse Rating}$$

- The fuse nominal current (I_{RATED}) must be determined based on the string current and on the sizing guidelines provided by the manufacturer to avoid untimely tripping. As a general direction, based on the photovoltaic modules' short circuit current (I_{SC}), it is possible to calculate the rating of the fuse with the following formula:

$$I_{RATED} > (1.4 \approx 1.5) * I_{SC}$$

Fuses must thus be chosen among the standard commercially available ratings, selecting the value that is closest to the obtained result.

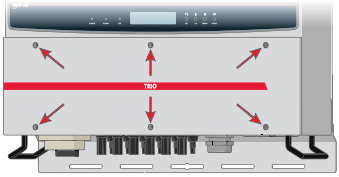
Warning! For effective calculation taking real installation conditions into account, refer to the documents supplied by the fuse manufacturer.

To replace the input fuses on models equipped with such components (PVI-8.0/10.0/12.5-TL-OUTD-FS), follow the procedure below:

- Disconnect the AC line by opening any external disconnect switches.
- Disconnect the DC line by opening the disconnect switch integrated in the inverter.

Warning! By only opening the integrated DC disconnect switch in the inverter, the fuse board is still maintained at the input voltage. Disconnect any external disconnect switches on the DC line or obscure the photovoltaic panels, then disconnect the input quick fit connectors.

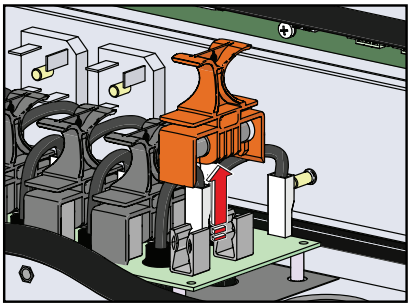
- Remove the inverter's front panel by unscrewing the screws on the panel with the Torx T20 wrench provided.



- Use a multimeter to ensure that no voltage is present between the positive and negative poles of the DC inputs.
- Depending on the presence of fuse holder extractors or safety caps, follow the corresponding procedure:

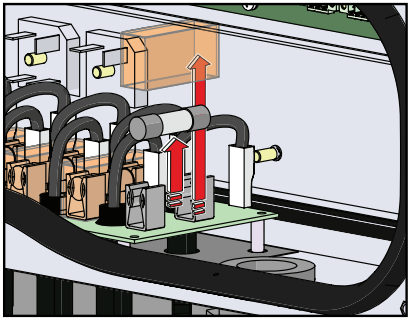
PROCEDURE FOR THE REPLACEMENT OF INPUT FUSES (MODELS EQUIPPED WITH FUSE HOLDER EXTRACTORS)

- Remove the fuse holder by pressing its handle.
- Extract the fuse to be replaced from the fuse holder by releasing the retaining clip.
- Insert the replacement fuse into the fuse holder, checking that it is secured by the retaining clip.
- Insert the fuse holder back in its original position.



PROCEDURE FOR THE REPLACEMENT OF INPUT FUSES (MODELS EQUIPPED WITH SAFETY CAPS)

- Remove the safety cap.
- Extract the fuse to be replaced from the fuse holder.
- Insert the replacement fuse into the fuse holder, checking that it is correctly fitted.
- Replace the safety cap back in position



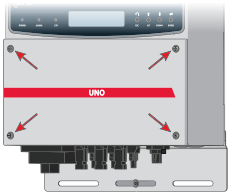
14.2. Replacing the internal battery

The replacement of the internal battery must be carried out when:

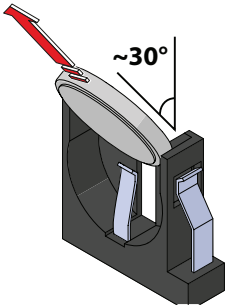
- The display shows the error W012 "*Battery Low*".
- The settings of current date / time are frequently reset.

To replace the internal battery follow the procedure below:

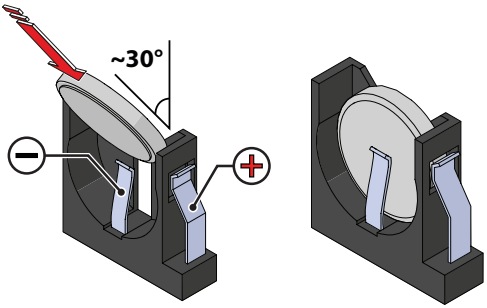
- Disconnect the AC line by opening any external disconnect switches.
- Disconnect the DC line by opening the disconnect switch integrated in the inverter.
- Disconnect any external disconnect switches on the DC line or obscure the photovoltaic panels, then disconnect the input quick fit connectors.
- Remove the inverter's front panel by unscrewing the screws on the panel with the Torx T20 wrench provided.



- Extract the battery from its housing with a 30° tilt relatively to the vertical axis, as shown in the figure on the side.



- Insert the replacement battery (CR2032 type) into the housing with a 30° tilt relatively to the vertical axis, as shown in the figure on the side, making sure that the polarity is correct.



15. TROUBLESHOOTING HELP

If the problem is not solved with the start-up troubleshooting (see **Par. 12**) nor with the complete troubleshooting provided in the user manual, follow the procedure below:

- Check that connections between the AURORA, the photovoltaic generator and the grid have been correctly carried out.
- Carefully observe which of the LED is flashing or is stably lit and the notice text appearing on the display, with particular reference to the error code.

If you have not been able to remove the malfunction, contact customer service or the installer to request assistance.

Before contacting customer service make sure the following information is available in order to maximize the effectiveness of the intervention.

- **INFORMATION ON THE INVERTER:**
  - **AURORA inverter model**
  - **Serial number**
  - **Week of production**
  - **Input channel configuration (parallel / independent)**

- **INFORMATION ON THE PHOTOVOLTAIC GENERATOR:**
  - **Brand and model of photovoltaic panels**
  - **Number of strings**
  - **Number of panels per string**

Note: *It is advisable to use the special "**SYSTEM STRUCTURE**" form on the next page to collect this information so the information is always available in case of need.*

- **Brief description of the fault.**
- **Can the fault be reproduced? If so, how?**
- **Does the fault repeat itself in cycles? If so, how often?**
- **Was the fault apparent at the moment of installation? If so, has it got worse?**
- **What are the atmospheric conditions when the fault occurs?**

15.1. System structure

You are recommended to fill in this page with the information relating to the system and possibly supplement it with a copy of the system's wiring diagram. The information on this page could be very handy, should it be necessary to contact the Power-One customer service.

AURORA INVERTER	
Model (*):	
Serial Number (*):	
Week of production (*):	
Input channel configuration (parallel / independent):	
MPPT1 PV GENERATOR	
Module brand:	
Module model:	
Number of modules in series/string:	
Number of strings in parallel:	
MPPT2 PV GENERATOR(**)	
Module brand:	
Module model:	
Number of modules in series/string:	
Number of strings in parallel:	

(*): Refer to the product's identification label on the right side of the inverter.
(**): To be filled only in case of configuration of the input channels in independent mode.

DATE OF INSTALLATION: .....

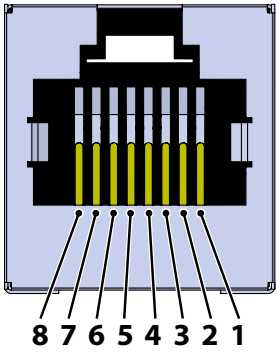
DATE OF COMMISSIONING: .....

STAMP / SIGNATURE OF INSTALLER (***):

(***): This document has no contractual value between the owner of the system and the installer.

APPENDIX A
PIN-OUT OF RJ45 CONNECTORS

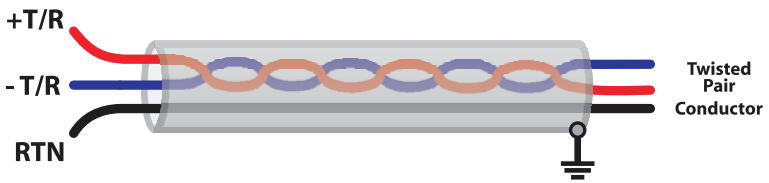
RJ45 CONNECTOR



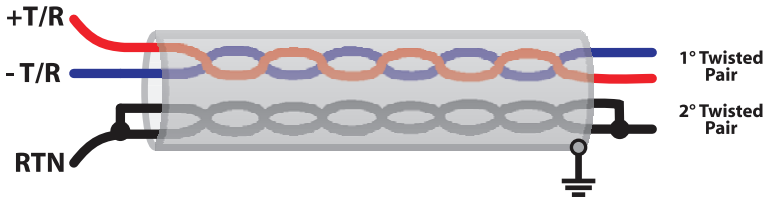
PIN #	*SIGNAL NAME*	*DESCRIPTION*
1	Not Used	-
2	Not Used	-
3	**+TR**	**+ Data Line** Required for RS485 communication
4	**+R**	**Remote OFF** Required for Remote OFF control
5	**-TR**	**- Data Line** Required for RS485 communication
6	Not Used	-
7	**RTN**	**Signal Return** Common reference for logical signals
8	Not Used	-

APPENDIX B
RS485 CABLE SPECIFICATION

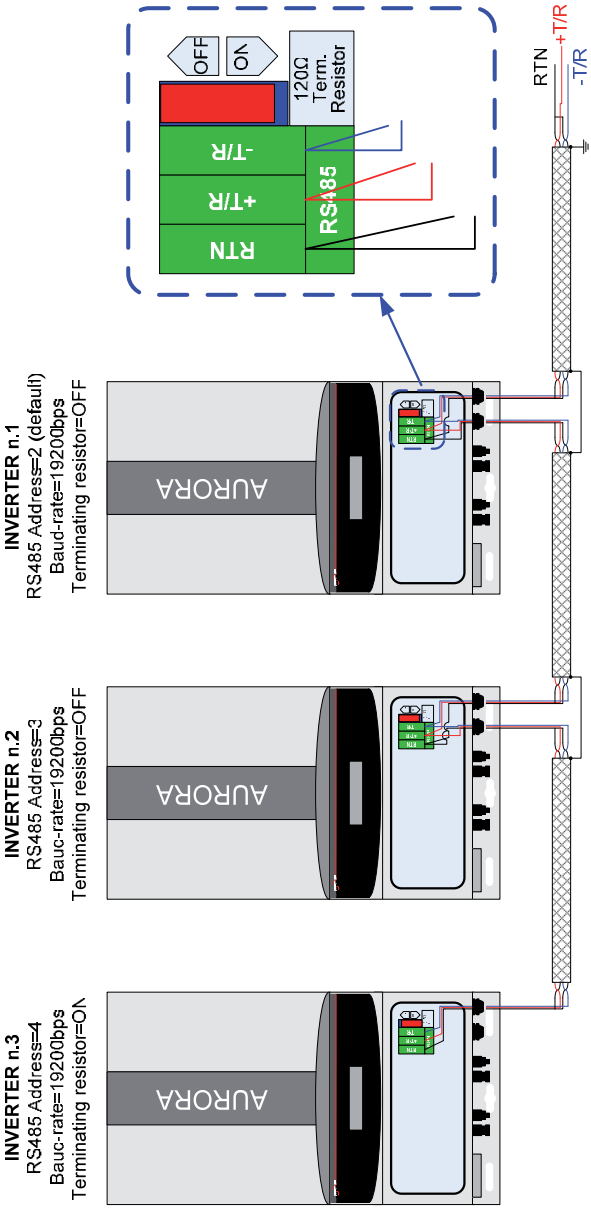
SINGLE TWISTED PAIR RS485 CABLE SPECIFICATION	
Type of Cable	RS485 EIA Application
Cable Structure	1 twisted pair + 1 single conductor, shielded
AWG	22 - 24
Charateristic Impedance	120 Ω
Working Frequency	1 kHz / 1 MHz



DOUBLE TWISTED PAIR RS485 CABLE SPECIFICATION	
Type of Cable	RS485 EIA Application
Cable Structure	2 twisted pair, shielded
AWG	22 - 24
Charateristic Impedance	120 Ω
Working Frequency	1 kHz / 1 MHz



APPENDIX C
CABLE WIRING DIAGRAM FOR RS485 LINE



APPENDIX D

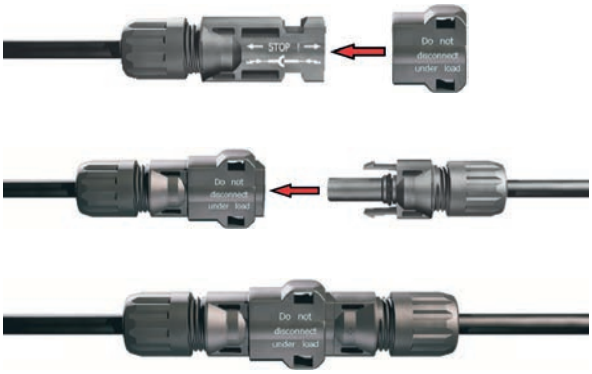
RETAINING CLIPS FOR MULTICONTACT / WEIDMÜLLER QUICK FIT CONNECTORS

For countries that require compliance with the UTE-15-712-1 directive is necessary to use additional retaining clips to assemble on the quick fit connectors in order to prevent accidental disconnection.

These retaining clips are not supplied in the accompanying assembly kit and they can be ordered directly from Power-One, quoting the following codes:

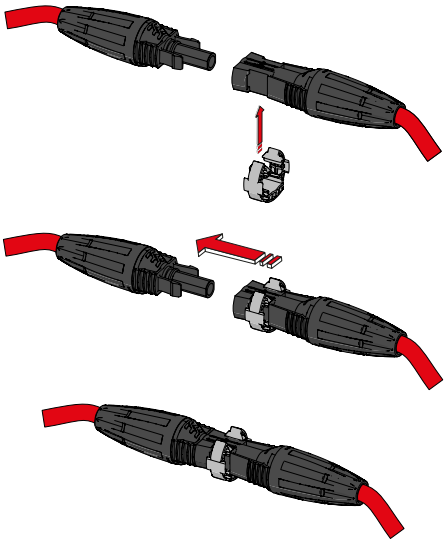
3G830020000 *for Multicontact quick fit connectors*
3G830010000 *for Weidmüller quick fit connectors*

Follow the procedure below for assembly the retaining clips on the quick fit connectors:

PROCEDURE FOR ASSEMBLING RETAINING CLIPS ON MULTICONTACT QUICK FIT CONNECTORS	
● Insert the retaining clip as shown in the figure. ● Fit the male connector into the female connector.	

PROCEDURE FOR ASSEMBLING RETAINING CLIPS ON WEIDMÜLLER QUICK FIT CONNECTORS

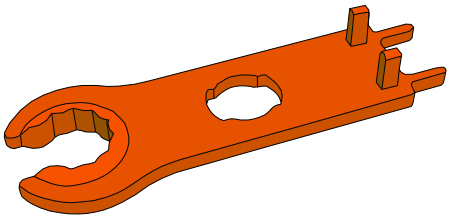
- Insert the retaining clip as shown in the figure.
- Fit the male connector into the female connector.



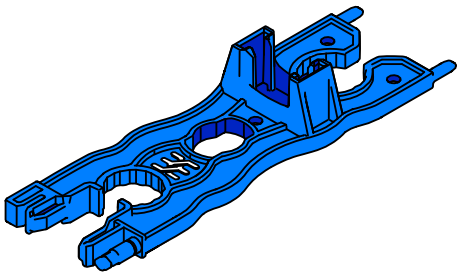
Note: *After assembly, the retaining clip cannot be removed.*

Once the male connector has been fitted to the female connector equipped with the clip, they can only be disconnected using the specific tool illustrated in the figure below:

DISCONNECTION TOOL FOR RETAINING CLIPS



MULTICONTACT



WEIDMÜLLER

Note: *The disconnection tool for MC/WM connectors can be obtained from any Power-One products distributor.*

APPENDIX E
TECHNICAL DATA

MODEL	PVI-3.0-TL-OUTD	PVI-3.6-TL-OUTD	PVI-4.2-TL-OUTD
INPUT PARAMETERS			
Nominal DC Power [kW]	3,12	3,75	4,375
Max. Recommended DC Power [kW]	3,5	4,15	4,82
Operating Input Voltage Range [V]	0,7xVstart - 580		
Full Power MPPT input voltage range (symmetrical load) [V]	160-530	120-530	140-530
Full Power MPPT input voltage range (asymmetrical load) [V]	200-530 (@ 2kW) / 112-530 (@ 1,12kW)	190-530 (@ 3kW) / 90-530 (@ 0,75kW)	190-530 (@ 3kW) / 90-530 (@ 1,38kW)
Absolute Max. Input Voltage [V]	600		
Activation voltage "Vstart" [V]	200 nominal (adjustable within the range 120Vdc-350Vdc, independently/each input)		
No of independent MPPT trackers	2		
Max. Input Power, each MPPT [kW]	2	3	
No. of DC Inputs	2 (1 each MPPT)		3 (2 for MPPT1, 1 for MPPT2)
Max. DC Current, each MPPT [A]	10	16	
Absolute Max. input short circuit current (ISC) [A]	12,5	20	
DC Connection	4 (2 positive, 2 negative)		6 (3 positive, 3 negative)
	Weidmüller / Multicontact Ø 4mm (male - positive input + female - negative input); Mating cable connector included		
	Conductor cross section: 4-6mm2 (AWG12-10)		
	Cable Ø w/insulator: 5,5-9mm (Multicontact), 5,5-7,5mm (Weidmüller)		
Max. inverter Backfeed Current to the array [A]	Negligible		
INPUT PROTECTION			
Reverse polarity protection	Yes, from limited current source		
Fuse rating, each input (-FS suffix versions only) [A]	NA	NA	NA
Thermally Protected DC side varistor	4 (2 for each MPPT)		
PV array Insulation Control	according to local standard		
DC Switch (-S/-FS suffix versions only)	Integrated (Rating : 600Vdc / 25A)		
OUTPUT PARAMETERS			
Nominal AC Power [kW]	3 (up to 50 °C)	3,6 (up to 55 °C)	4,2 (up to 50 °C)
Max. AC Power [kW]	3,3(*)	4(**)	4,6(***)
AC Grid Connection	Single Phase (Live, Neutral, PE)		
Nominal AC Voltage [V]	230		
AC Voltage Range [V]	180-264 (may vary to comply with regulations in each country)		
Nominal AC Frequency [Hz]	50 / 60		
AC Frequency Range [Hz]	47-53 / 57-63 (may vary to comply with regulations in each country)		
Max. AC Line Current [A]	14,5 (16 short circuit)	17,2(****) (19 short circuit)	20 (22 short circuit)
Maximum output fault current (a.c. A, peak and duration or RMS)	<25 A rms (100ms)		
AC Connection	Screw terminal block		
	Cable Gland: M25 - Cable Ø: 10-17mm		
Nominal Power Factor and adjustable range	> 0.995, adj. ± 0.9 with P_{ACR} = 3.0 kW	> 0.995, adj. ± 0.9 with P_{ACR} = 3.6 kW	> 0.995, adj. ± 0.9 with P_{ACR} = 4.2 kW
Inrush Current (a.c. A, peak and duration)	Negligible		
AC Current Distortion [THD%]	<3,5% at rated power with sine wave voltage		
OUTPUT PROTECTION			
AC side varistors	2 (Live - Neutral / Live - PE)		
Ground fault protection (AC + DC leakage current)	according to local standard		
ENVIRONMENTAL PARAMETERS			
Cooling	Natural cooling		
Ambient Temp. Range [°C]	-25 / +60 (out. power der. above 50 °C)	-25 / +60 (out. power der. above 55 °C)	-25 / +60 (out. power der. above 50 °C)
Opertaing Altitude [m]	2000		
Acoustical Noise [dBA]	< 50 @ 1mt		
Environmental IP Rating	IP65		
Relative Humidity	0-100% condensing		
Environmental pollution classification for external enviroment	3		
MECHANICAL			
Dimensions [H x W x D]	547 x 325 x 210		
Overall Dimensions (with flanges) [H x W x D]	618 x 325 x 222		
Weight [kg]	17,5		
Protective Class	I		
Overvoltage Category in accordance with IEC 62109-1	II (DC Input); III (AC Output)		

(*) Limited to 16A (up to a Max. Output Power of 3680kW) for UK G83/1 Version.
(**) Limited to 3000W for Germany (***) Limited to 3600W for Germany (****) Limited to 4200W for Germany

MODEL	PVI-5000-TL-OUTD	PVI-6000-TL-OUTD
INPUT PARAMETERS		
Nominal DC Power [kW]	5,15	6,2
Max. Recommended DC Power [kW]	5,75	6,9
Operating Input Voltage Range [V]	0,7xVstart - 580	
Full Power MPPT input voltage range (symmetrical load) [V]	150-530	180-530
Full Power MPPT input voltage range (asymmetrical load) [V]	220-530 (@ 4kW) / 90-530 (@ 0,8kW)	220-530 (@ 4kW) / 120-530 (@ 2,2kW)
Absolute Max. Input Voltage [V]	600	
Activation voltage "Vstart" [V]	200 nominal (adjustable within the range 120Vdc-350Vdc, independently/each input)	
No of independent MPPT trackers	2	
Max. Input Power, each MPPT [kW]	4	
No. of DC Inputs	4 (2 each MPPT)	
Max. DC Current, each MPPT [A]	18	
Absolute Max. input short circuit current (ISC) [A]	22	
DC Connection	8 x Weidmüller / Multicontact Ø 4mm (4 male - positive input + 4 female - negative input); mating cable connector included	
	Conductor cross section: 4-6mm2 (AWG12-10)	
	Cable Ø w/insulator: 5,5-9mm (Multicontact), 5,5-7,5mm (Weidmüller)	
Max. inverter Backfeed Current to the array [A]	Negligible	
INPUT PROTECTION		
Reverse polarity protection	Yes, from limited current source	
Fuse rating, each input (-FS suffix versions only) [A]	NA	NA
DC side varistors	4 (2 for each MPPT), thermally protected	
PV array Insulation Control	according to local standard	
DC Switch (-S/-FS suffix versions only)	Integrated (Rating: 600Vdc / 25Adc)	
OUTPUT PARAMETERS		
Nominal AC Power [kW]	5 (up to 60 °C)	6 (up to 50 °C)
Max. AC Power [kW]	5	6,2
AC Grid Connection	Single Phase (Live, Neutral, PE)	
Nominal AC Voltage [V]	230	
AC Voltage Range [V]	180-264 (may vary to comply with regulations in each country)	
Nominal AC Frequency [Hz]	50 / 60	
AC Frequency Range [Hz]	47-53 / 57-63 (may vary to comply with regulations in each country)	
Max. AC Line Current [A]	25 (32 short circuit)	30 (40 short circuit)
Maximum output fault current (a.c. A, peak and duration or RMS)	<40 A rms (100ms)	
AC Connection	Cage-clamp terminal block	
	Cable Gland: M32 - Cable Ø: 13-21mm	
Nominal Power Factor and adjustable range	> 0.995, adj. ± 0.9 with P_{ACR} = 5 kW	> 0.995, adj. ± 0.9 with P_{ACR} = 6 kW
Inrush Current (a.c. A, peak and duration)	Negligible	
AC Current Distortion [THD%]	<3,5% at rated power with sine wave voltage	
OUTPUT PROTECTION		
AC side varistors	2 (Live - Neutral / Live - PE)	
Ground fault protection (AC + DC leakage current)	according to local standard	
ENVIRONMENTAL PARAMETERS		
Cooling	Natural cooling	
Ambient Temp. Range [°C]	-25 / +60	-25 / +60 (output power derating above 50 °C)
Opertaing Altitude [m]	2000	
Acoustical Noise [dBA]	<50 @1mt	
Environmental IP Rating	IP65	
Relative Humidity	0-100% condensing	
Environmental pollution classification for external enviroment	3	
MECHANICAL		
BOX Dimensions [H x W x D]	740 x 325 x 210	
Overall Dimensions (with flanges) [H x W x D]	810 x 325 x 222	
Weight [kg]	< 26	
Protective Class	I	
Overvoltage Category in accordance with IEC 62109-1	II (DC Input); III (AC Output)	

MODEL	PVI-8.0-TL-OUTD	PVI-10.0-TL-OUTD	PVI-12.5-TL-OUTD
INPUT PARAMETERS			
Nominal DC Power [kW]	8,25	10,3	12,8
Max. Recommended DC Power [kW]	11	11,4	14,3
Operating Input Voltage Range [V]	0,7xVstart - 850		
Full Power MPPT input voltage range (symmetrical load) [V]	270-750	300-750	360-750
Full Power MPPT input voltage range (asymmetrical load) [V]	320-750 (@ 5,5kW) / 175-750 (@ 2,75kW)	380-750 (@ 6,5kW) / 225-750 (@ 3,8kW)	445-750 (@ 8kW) / 270-750 (@ 4,8kW)
Absolute Max. Input Voltage [V]	900		
Activation voltage "Vstart" [V]	360 nominal (adjustable within the range 250Vdc-500Vdc, independently/each input)		
No of independent MPPT trackers	2		
Max. Input Power, each MPPT [kW]	5,5	6,5	8
No. of DC Inputs	6 (3 each MPPT, optionally fused) in PVI-8.0/10.0/12.5-TL-OUTD and in PVI-8.0/10.0/12.5-TL-OUTD-FS version, 4 (2 each MPPT) in PVI-8.0/10.0/12.5-TL-OUTD-S version		
Max. DC Current, each MPPT [A]	17		18
Absolute Max. input short circuit current (I_{sc}) [A]	22		
DC Connection	12 x Weidmüller / Multicontact Ø 4mm (6 male - positive input + 6 female - negative input) in PVI-8.0/10.0/12.5-TL-OUTD and in PVI-8.0/10.0/12.5-TL-OUTD-FS version (Mating cable connector included), 8 x Weidmüller / Multicontact Ø 4mm (4 male - positive input + 4 female - negative input) in PVI-8.0/10.0/12.5-TL-OUTD-S version (Mating cable connector included)		
	Conductor cross section: 4-6mm2 (AWG12-10)		
	Cable Ø w/insulator: 5,5-9mm (Multicontact), 5,5-7,5mm (Weidmüller)		
Max. inverter Backfeed Current to the array [A]	Negligible		
INPUT PROTECTION			
Reverse polarity protection	Inverter protection only, from limited current source, for standard and -S versions, and for -FS version when max 2 strings are connected		
Fuse rating, each input (-FS suffix versions only) [A]	12 (1000V)		
Thermally Protected DC side varistor	4 (2 for each MPPT)		
PV array Insulation Control	according to local standard		
DC Switch (-S/-FS suffix versions only)	Integrated (Rating : 1000Vdc / 25A)		
OUTPUT PARAMETERS			
Nominal AC Power [kW]	8 (up to 60 °C)	10 (up to 55 °C)	12,5 (up to 50 °C)
Max. AC Power [kW]	8,9 (*)	11 (**)	13,8 (***)
AC Grid Connection	Three Phase (3W+PE or 4W+PE)		
Nominal AC Voltage [V]	400		
AC Voltage Range [V]	320-480 (may vary to comply with regulations in each country)		
Nominal AC Frequency [Hz]	50 / 60		
AC Frequency Range [Hz]	47-53 / 57-63 (may vary to comply with regulations in each country)		
Max. AC Line Current [A]	13 (15 short circuit)	16,6 (19 short circuit)	20 (22 short circuit)
Maximum output fault current (a.c. A, peak and duration or RMS)	<25 A rms (100ms)		
AC Connection	Screw terminal block		
	Cable Gland: M40 - Cable Ø: 19-28mm		
Nominal Power Factor and adjustable range	> 0.995, adj. ± 0.9 with P_{ACR} = 8.0 kW adj. ± 0.8 with max. 8.9 kVA	> 0.995, adj. ± 0.9 with P_{ACR} = 10.0 kW adj. ± 0.8 with max. 11.5 kVA	> 0.995, adj. ± 0.9 with P_{ACR} = 12.5 kW adj. ± 0.8 with max. 13.8 kVA
Inrush Current (a.c. A, peak and duration)	Negligible		
AC Current Distortion [THD%]	<2% at rated power with sine wave voltage		
OUTPUT PROTECTION			
AC side varistors	3, star connected to common point, plus gas arrester to ground		
Ground fault protection (AC + DC leakage current)	according to local standard		
ENVIRONMENTAL PARAMETERS			
Cooling	Natural cooling		
Ambient Temp. Range [°C]	-25 / +60	-25 / +60 (out. power der. above 55 °C)	-25 / +60 (out. power der. above 50 °C)
Opertaing Altitude [m]	2000		
Acoustical Noise [dBA]	< 50 @ 1mt		
Environmental IP Rating	IP65		
Relative Humidity	0-100% condensing		
Environmental pollution classification for external enviroment	3		
MECHANICAL			
Dimensions [H x W x D]	690 x 645 x 211		
Overall Dimensions (with flanges) [H x W x D]	716 x 645 x 224		
Weight [kg]	< 41		
Protective Class	I		
Overvoltage Category in accordance with IEC 62109-1	II (DC Input); III (AC Output)		

(*) Limited to 8000W for Germany. (**) Limited to 10000W for Belgium and Germany. (***) Limited to 12500W for Germany.