ABB small wind inverters

Quick installation guide
PVI-3.0/3.6/4.2-TL-OUTD-W

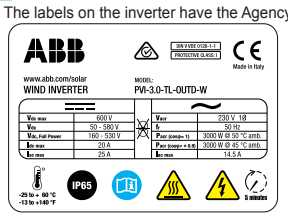
EN

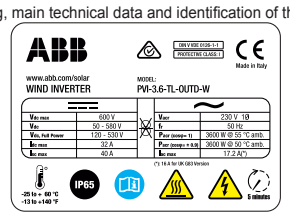
In addition to what is explained below, the safety and installation information provided in the installation manual must be read and followed. The technical documentation and the interface and management software for the product are available at the website.
The device must be used in the manner described in the manual. If this is not the case the safety devices guaranteed by the inverter might be ineffective.

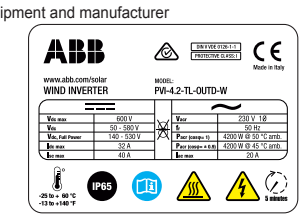
Power and productivity for a better world™ ABB

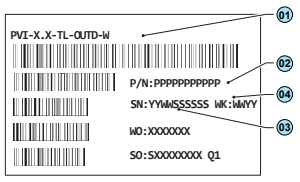
1. Labels and Symbols

The labels on the inverter have the Agency marking, main technical data and identification of the equipment and manufacturer









01 Inverter model
02 Inverter Part Number
03 Inverter Serial Number
04 Week/Year of manufacture

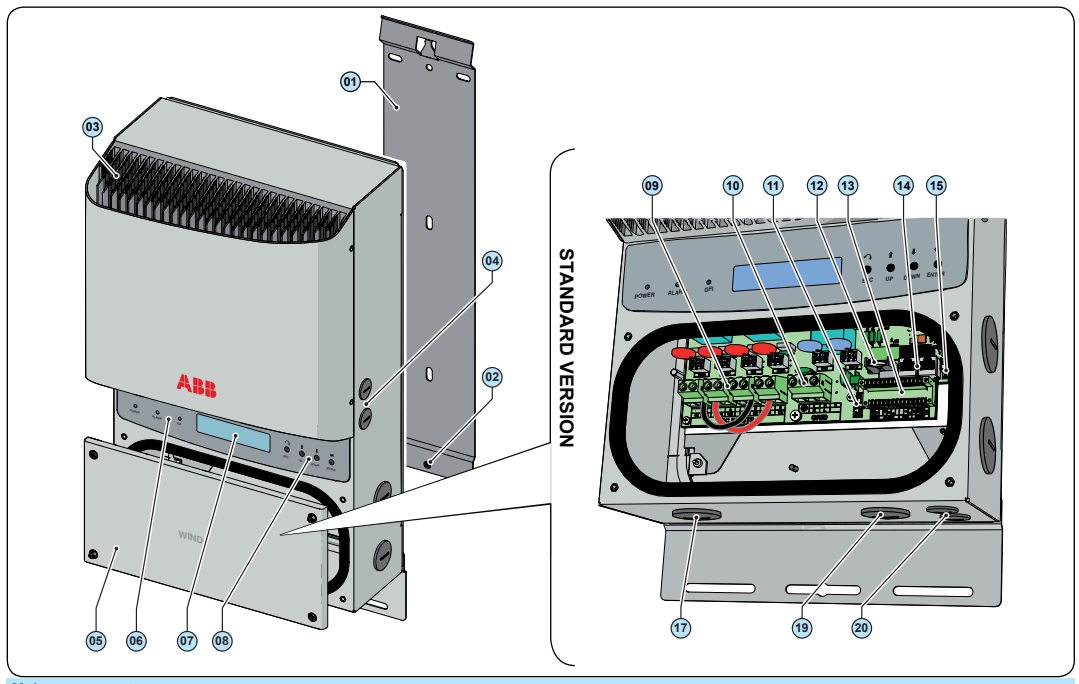
The labels attached to the equipment must NOT be removed, damaged, dirtied, hidden,etc...
If the service password is requested, the field to be used is the serial number -SN: WWYYSSSSSS-

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

Always refer to instruction manual	General warning - Important safety information	Hazardous voltage	Hot surfaces
IP65 Protection rating of equipment	Temperature range	Without isolation transformer	Direct and alternating currents, respectively
+ − Positive pole and negative pole of the input voltage (DC)	Always use safety clothing and/or personal safety devices	Point of connection for grounding protection	Time need to discharge stored energy

2. Inverter Models and Components

The models of inverter to which this guide refers are available in 3 power ratings: 3.0 kW, 3.6 kW and 4.2 kW.



Main components

01 Bracket	05 Front cover	09 DC Input terminal block	13 Signal terminal block	19 AC cable inlet
02 Locking screw	06 LED Panel	10 AC Output terminal block	14 RJ45 Connectors	20 Service cable inlet
03 Heat sink	07 Display	11 Channel configuration switch	15 RS485 line termination switch	
04 DSP Reprogramming connectors	08 Keyboard	12 Internal battery	17 DC cable inlet	

3. List of supplied components

Available components		Quantity
	Bracket for wall mounting	1
	Bolts and screws for wall mounting	2 + 2
	M6x10 screw	1

Available components		Quantity
	D.18 Washer	3
	L-key, TORX TX20	1
	Connector for the connection of the communication and control signals	2
	Technical documentations	1

4. Lifting and transport

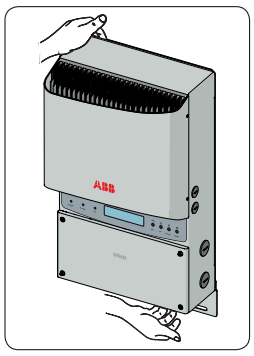
Transport and handling
Transport of the equipment, especially by road, must be carried out with by suitable ways and means for protecting the components from violent shocks, humidity, vibration, etc.

Lifting
The means used for lifting must be suitable to bear the weight of the equipment.

Unpacking and checking
The components of the packaging must be disposed on in accordance with the regulations in force in the country of installation.
When you open the package, check that the equipment is undamaged and make sure all the components are present.
If you find any defects or damage, stop unpacking and consult the carrier, and also promptly inform the Service ABB.

Equipment weight

Model			Mass weight
PVI-3.0-TL-OUTD-W	PVI-3.6-TL-OUTD-W	PVI-4.2-TL-OUTD-W	17.5 Kg



5. Choice of installation location

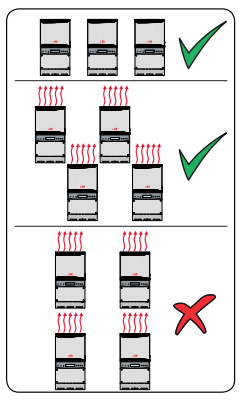
Environmental checks
- Consult the technical data to check the environmental parameters to be observed
- Installation of the unit in a location exposed to direct sunlight must be avoided as it may cause:
  1. power limitation phenomena in the inverter (with a resulting decreased energy production by the system)
  2. premature wear of the electrical/electromechanical components
  3. premature wear of the mechanical components (gaskets) and of the user interface (display)
- Do not install in small closed rooms where air cannot circulate freely
- To avoid overheating, always make sure the flow of air around the inverter is not blocked
- Do not install in places where gases or flammable substances may be present
- Do not install in rooms where people live or where the prolonged presence of people or animals is expected, because of the noise (about 50dB(A) at 1 m) that the inverter makes during operation

Installations above 2000 metres
On account of the rarefaction of the air (at high altitudes), particular conditions may occur:
- Less efficient cooling and therefore a greater likelihood of the device going into derating because of high internal temperatures
- Reduction in the dielectric resistance of the air that, in the presence of high operating voltages (DC input), can create electric arcs (discharges) that can reach the point of damaging the inverter

All installations at altitudes of over 2000 metres must be assessed case by case with the ABB Service department.

Installation position
- Install on a wall or strong structure capable of bearing the weight of the equipment
- Install in safe, easy to reach places
- If possible, install at eye-level so that the display and status LEDs can be seen easily
- Install at a height that considers the heaviness of the equipment
- Install vertically with a maximum inclination of +/- 5°
- Choose a place with enough space around the unit to permit easy installation and removal of the object from the mounting surfaces; comply with the indicated minimum distances
- For a multiple installation, position the inverters side by side; if the space available does not allow this arrangement, position the inverters in a staggered arrangement as shown in the figure so that heat dissipation is not affected by other inverters

Final installation of the inverter must not compromise access to any disconnection devices that may be located externally.
Please refer to the warranty terms and conditions available on the website and evaluate any possible exclusion due to improper installation.



6. Assembly Instruction

Wall/Pole mounting

During installation, do not place the inverter with its front facing towards the ground.

- Position the bracket (01) so that it is perfectly level on the wall and use it as a boring template.

- Make the 2 holes required, using a drill with a 10 mm diameter bit. The depth of the holes should be about 70 mm. On the bracket (01) there are 5 holes with which to secure it: just 2 are enough to support the inverter if installed on stable, robust supports.

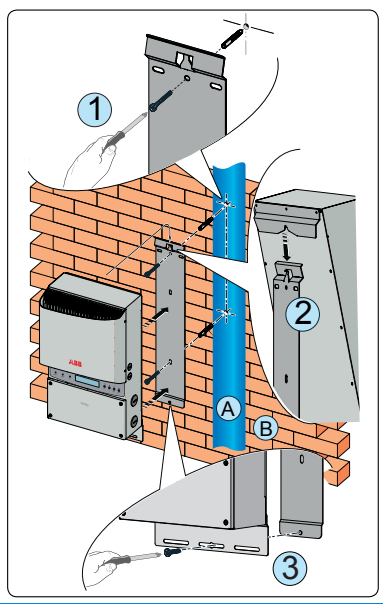
- Secure the bracket to the wall (B) or to the pole (A) with the no. 2x 10 mm wall plugs supplied with it (Step 1). Check the stability of the bracket and if necessary use all the fixing points (5) there are on the bracket

- Hook the inverter to the bracket spring corresponding with the insertion point in the bracket on the back of the inverter (Step 2).

- Proceed to anchor the inverter to the bracket (01) by tightening the locking screw (02) located on the lower side (Step 3).

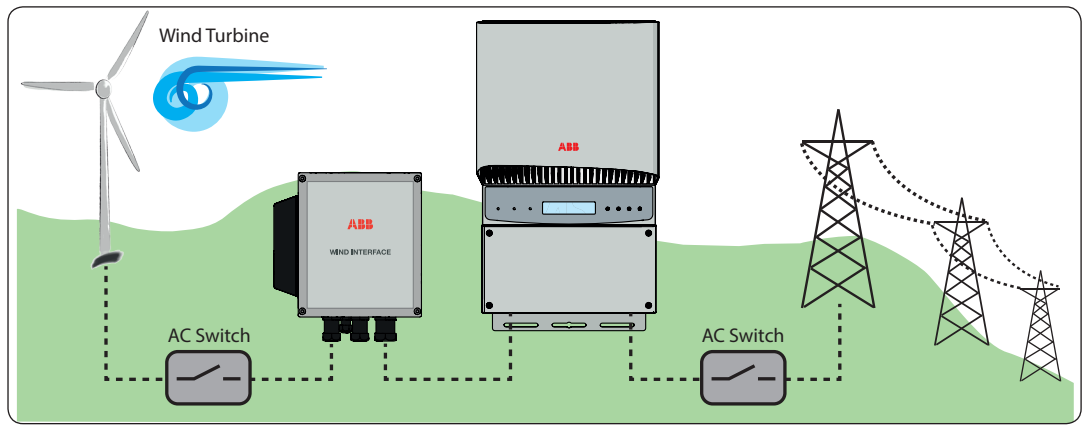
- Unscrew the 4 screws and open the front cover (05) in order to make all the necessary connections.

- Once the connections have been made, close the cover by tightening the 4 screws on the front to a minimum tightening torque of 1.5 Nm.



7. Block diagram of the wind power system

The following is a block diagram of a wind power system comprising the 7200-WIND-INTERFACE-EU rectifier.



For further information regarding connections between the rectifier and the wind turbine, as well as installation of the protection devices required in the plant, please see the manual for the installer for the 7200-WIND-INTERFACE-EU rectifier

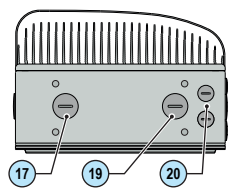
8. Input connection (DC)

Warning! Rotation of the wind turbine generates hazardous voltages in the cables coming from the wind generator. Before connecting up the cables to the inverter DC inputs you MUST put the wind turbine into a safe state (mechanically blocked) and then disconnect the DC line by opening any external disconnect switches

- Remove the protective plug from the hole used for the DC cables (17).
- Insert an M32 cable gland (or compatible – hole diameter 33.8 mm) in the hole to be used for the DC input cables (17).

Warning! To ensure environmental protection IP65 it is necessary to fix the cable gland to the inverter chassis with the minimum tightening torque specified in the cable gland manufacturer's datasheet.

- Strip 10 mm of sheathing from the DC input connection cables
- Plug the DC input cables into the inverter, passing it through the previously installed cable gland
- Connect the positive cable from the positive terminal of the rectifier to cable connector "+IN" (09)
- Connect the negative cable from the negative terminal of the rectifier to cable connector "-IN" (09)



Warning! The DC cables must be tightened on the terminal block with a minimum torque of 1.5 Nm

- Once the connection to the input terminal block (09) has been made, firmly screw the cable gland and check the tightness.

9. Line cable and protection devices

Load protection breaker (AC disconnect switch) and line cable sizing
To protect the AC connection line of the inverter, we recommend installing a device for protection against over current and leakage with the following characteristics:

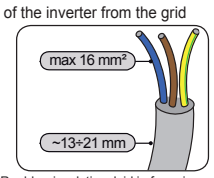
	PVI-3.0-TL-OUTD-W	PVI-3.6-TL-OUTD-W	PVI-4.2-TL-OUTD-W
Type	Automatic circuit breaker with differential thermal magnetic protection		
Nominal Voltage	230 Vac		
Nominal Current	20 A		25 A
Magnetic protection characteristic	B/C		
Number of poles	2		
Type of differential protection	A/AC		
Differential sensitivity	300 mA		

ABB declares that the ABB transformerless inverters, in terms of their construction, do not inject continuous ground fault currents and therefore there is no requirement that the differential protection installed downstream of the inverter be type B in accordance with IEC 60755 / A 2.

Characteristics and sizing of the line cable
Three-pole cable required. 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.

Cross-section of the line conductor (mm²)	Maximum length of the line conductor (mt)		
	PVI-3.0-TL-OUTD-W	PVI-3.6-TL-OUTD-W	PVI-4.2-TL-OUTD-W
4 mm²	19 m	16 m	14 m
6 mm²	29 m	24 m	21 m
10 mm²	48 m	41 m	35 m
16 mm²	77 m	65 m	56 m

The values are calculated in nominal power conditions, taking into account: 1. a power loss of not more than 1% along the line. 2. copper cable, with HEPR rubber insulation, laid in free air



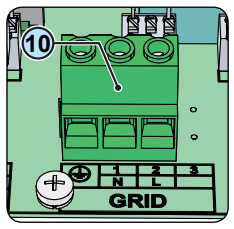
10. Output connection (AC)

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

- Remove the protective cap on the hole (19) used to pass the AC cable into the inverter.
- Insert an M32 cable gland (or compatible - hole diameter 33.8 mm) in the hole to be used for the AC output cable (19)

Warning! To ensure environmental protection IP65 it is necessary to fix the cable gland to the inverter chassis with the minimum tightening torque specified in the cable gland manufacturer's datasheet.

- Strip 10 mm of sheathing from the AC grid connection cables
- Plug the AC line cable into the inverter, passing it through the previously installed cable gland
- Connect the protective earth (yellow-green) cable to the contact labelled with the ⏚ symbol on the terminal block (10)



Warning! ABB 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

- Connect the neutral cable (normally blue) to the terminal labelled with the letter **N**
- Connect the phase cable to the terminal labelled with the letter **L**

Warning! The AC cables must be tightened on the terminal block with a minimum torque of 1.5 Nm

Once the connection to the terminal board (10) is complete, screw in the cable gland firmly and check the tightness.

11. Connection of the communication and control signals

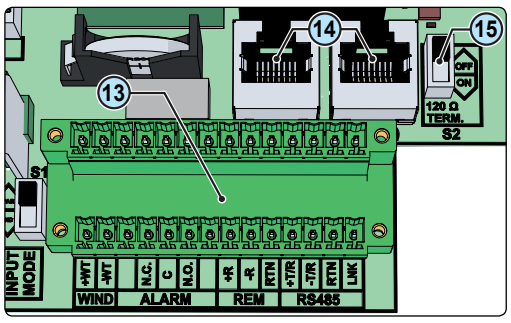
Each cable which must be connected to the connectors of the communication and control signals must pass through one of the two service cable glands (20). An M20 cable gland (or compatible – hole diameter 20.3 mm) must be inserted in one of two of the service cable glands holes (20).

Warning! To ensure environmental protection IP65 it is necessary to fix the cable gland to the inverter chassis with the minimum tightening torque specified in the cable gland manufacturer's datasheet.

Connection of the tachometer signal
The tachometer signal allows the 7200-WIND-INTERFACE-EU to drive the inverter. It is therefore necessary to connect up the two cables from the 7200-WIND-INTERFACE-EU (**WIND SPEED+** and **WIND SPEED-**) to the tachometer signal terminal block (13) in correspondence with terminals **+WT** and **-WT**.

Connection to the RS485 communication line
The RS485 communication line (identified by the pair of connectors RJ45 (14) and by the terminal block (13)) must necessarily be connected to the 7200-WIND-INTERFACE-EU. For further details on connection of the RS485 line please see the 7200-WIND-INTERFACE-EU manual.

Using the ALARM terminal block
Terminal block (13) connecting to the configurable relay that allows connection of external devices which, according to the mode selected in the menu "**SETTINGS > Alarm**" can, for example, signal malfunctions. The operating modes that can be set are: Production and Alarm.



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)

Using the REM terminal block
The REM terminal block (13), if suitably configured, allows the "Remote ON/OFF" function to be used: this function allows remote disconnection of the inverter from the grid

For further information regarding the configuration and use of the communication and control signals terminal block, please see the manual

12. Commissioning

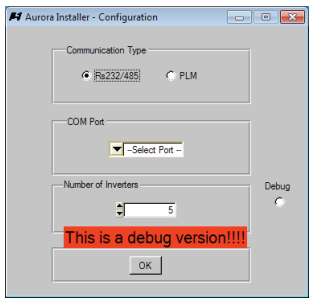
The inverter commissioning procedure is as follows:
- Close the external switches: If the input voltage is greater than the minimum starting voltage, the inverter will start up.
- When the inverter is turned on for the first time you will be asked to select the "Nation" of installation. This selection 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! 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 ABB

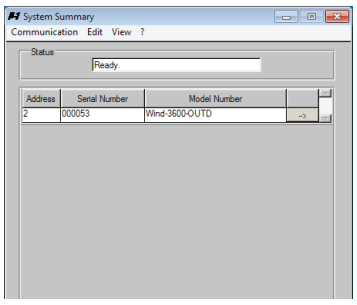
Loading the Power Curve of eolic generator
After you have set the "Nation" value, the error message "W009 Empty Table" will be displayed. This message indicates that the wind turbine power curve has not yet been loaded into the inverter. Thus, before connecting the inverter into the power grid, you must load the curve using the Aurora Installer software. Follow the following step-by-step procedure for upload the power curve:

- Inverters can use a power curve defined either in terms of the input voltage to the inverter (P(Vin)) or as a function of the wind turbine frequency (P(f)). Where a frequency power curve has been chosen (P(f)), ensure that the tachymetric signal has been correctly connected.
- Install the Aurora Installer application on your PC
- Supply a limited input voltage to the inverter which is just sufficient to start up the inverter (50V / 1A). The wind turbine itself can be used to supply this voltage, provided it can produce at least 50V
- Connect the inverter to your PC using the PVI-USB-RS485_232 converter (for details of the connection, see the PVI-USB-RS485_232 converter manual)
- Launch the Aurora Installer application

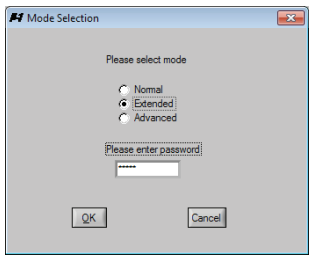
1. In the **"Configuration"** window select the COM port from the pull-down menu, enter the number of inverters you have connected to the PC and click OK.



2. The application will scan the communication line looking for the connected inverters. The discovered inverters will be displayed in a table. Click **"-->"** to select the inverter you want to work with.

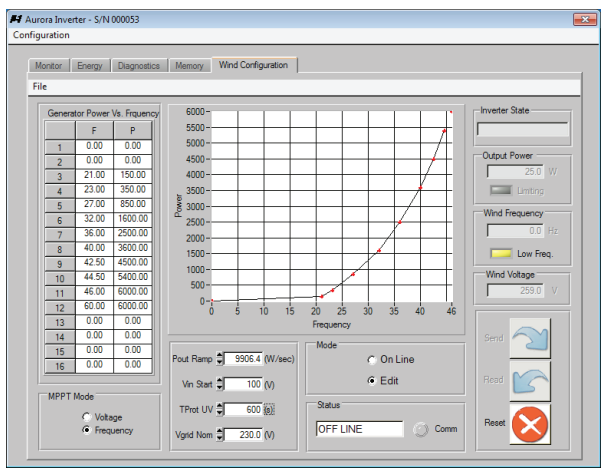


3. In the **"Mode Selection"** window select **"Extended"** and enter the following password: **05591**. Then click OK.



4. Go to the **"Wind Configuration"** tab: the application will read the power curve table in the inverter (this will happen even if no table has yet been loaded, in which case no curve will be shown in the graph);

5. From **"Online"** mode go to **"Edit"** mode to compile the power curve (see the "Parameters" table for information about compiling the power curve) Alternatively, to load a file in .mpp format created previously, click **"File"** and select the .mpp file to load.



6. From **"Edit"** mode go to **"On Line"** mode again and click **"Send"** to send the table to the inverter.

Note: If you want to apply the same curve to more than one inverter, click "File" and "Save As" to export the curve to your PC in .mpp format so that it is available for other inverters.

13. Configuration parameter of power curve

The following parameters must be provided, with the power curve, by turbine's manufacturer. See table below for more details about the parameters:

PARAMETERS	
Output Power Ramp (Pout Ramp)	This is the response speed of the inverter, i.e. how quickly the take-off point of the inverter follows the take-off point of the turbine. The value must be between 275 W/sec and 10,000 W/sec. In the commissioning phase of the system, if an instability is detected, try reducing the "Pout Ramp" value.
Inverter Activation Voltage (Vin Start)	This is the input voltage above which the inverter connects to the grid. The value must be between 50V and 200V.
Undervoltage protection time (Tprot UV)	This is the length of time the inverter remains switched on after the voltage has dropped below the "Vin Start" value. This parameter allows you to keep the inverter connected to the grid even if the input voltage drops below "Vin Start". It can then start exporting energy again to the grid whenever the wind pickups, without having to repeat the inverter start-up process. The value must be between 1 sec and 3600 sec.
Nominal Grid Voltage (Vgrid Nom)	Indicates the rated voltage of the grid to which the inverter is connected.

- After having loaded the wind turbine power curve, 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 (06):

INPUT VOLTAGE	DISPLAY MESSAGE	LED STATUS	DESCRIPTION
Vin < Vstart	Waiting Wind	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.

The inverter is powered ONLY by the voltage coming from the wind power system: presence of grid voltage alone IS NOT SUFFICIENT to permit the inverter to start up.

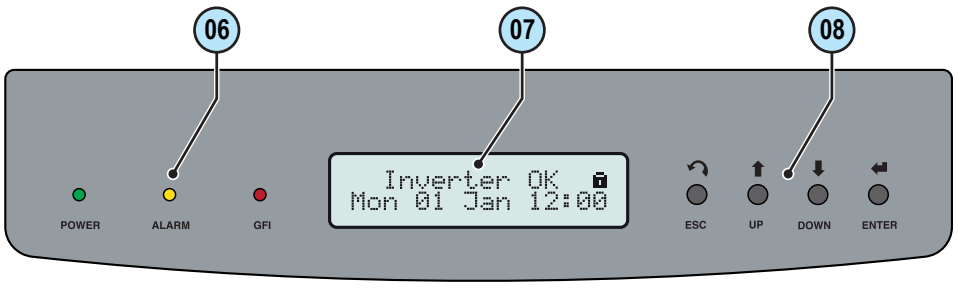
- With the inverter in "Missing Grid" status, close the AC switch downstream the inverter so as to supply the grid voltage to the inverter: the inverter performs the grid voltage check, measures the wind power system insulation resistance against earth and carries out other self-diagnosis checks. During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

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.

14. Instruments

LEDs and BUTTONS, in various combinations, can be used to view the status or carry out complex actions that are described more fully in the manual.



LED POWER	**GREEN** On if the inverter is working correctly. Flashes when checking the grid or if there is insufficient wind.
LED ALARM	**YELLOW** The inverter has detected an anomaly. The anomaly is shown on the display.
LED GFI	**RED** Ground fault on the DC side of the PV generator. The error is shown on the display.

ESC	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
UP	It is used to scroll up the menu options or to shift the numerical scale in ascending order
DOWN	It is used to scroll down the menu options or to shift the numerical scale in descending order
ENTER	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

15. Characteristics and technical data

	PVI-3.0-TL-OUTD-W	PVI-3.6-TL-OUTD-W	PVI-4.2-TL-OUTD-W
Input			
Absolute Maximum Input Voltage ($V_{max,abs}$)		600 V	
Input Activation Voltage (V_{start})		50 V (adj. 50...350 V)	
Input Operating Range (V_{dcmin}...V_{dcmax})		50...580 V	
Input DC Voltage Range ($V_{min,f}$ ... $V_{max,f}$) at P_{acr}	160...530 V	120...530 V	140...530 V
Maximum DC Input Current ($I_{dc\,max}$)	20.0 A	32.0 A	32.0 A
Maximum Input Short Circuit Current	25 A	40.0 A	40.0 A
Maximum Backfeed current (from AC to DC side)		Negligible	
DC Connection Type		Screw terminal block	
Input protection			
Reverse Polarity Protection		Yes, from limited current source	
Input Overvoltage Protection - Varistor		2	
Photovoltaic Array Isolation Control		According to local standard	
Output			
AC Grid Connection Type		Monophase	
Rated AC Power (P_{acr})	3000 W	3600 W	4200 W
Maximum AC Output Power ($P_{ac\,max}$)	3300 W (1)	4000 W (2)	4600 W (3)
Rated AC Grid Voltage (V_{acr})		230 V	
AC Voltage Range		180...264 Vac (4)	
Maximum AC Output Current ($I_{ac\,max}$)	14.5 A	17.2 A (5)	20.0 A
Inrush Current		Negligible	
Maximum Output Fault Current		<25 A rms (100mS)	
Rated Output Frequency (f_r)		50 Hz	
Output Frequency Range (f_{min}....f_{max})		47...53 / 57...63 Hz (6)	
Nominal Power Factor ($Cosphi_{acr}$)	>0.995 adj. ± 0.9 with Pacr= 3.0 kW	>0.995 adj. ± 0.9 with Pacr= 3.6 kW	>0.995 adj. ± 0.9 with Pacr= 4.2 kW
Total Harmonic Distortion of Current		< 3.5%	
AC Connection Type		Screw terminal block	
Output protection			
Anti-Islanding Protection		According to local standard	
Maximum AC Overcurrent Protection	16.0 A	19.0 A	22.0 A
Output Overvoltage Protection - Varistor		2 (L - N / L - PE)	
Operating performance			
Maximum Efficiency (η_{max})		96.8%	
Power Input Treshold		10.0 W	
Stand-by Consumption		< 8.0 W	
Communication			
Wired Local Monitoring		PVI-USB-RS232_485 (opt.)	
Remote Monitoring		WIFI LOGGER CARD (opt.), PVI-AEC-EVO (opt.), VSN700 Data Logger (opt.)	
Wireless Local Monitoring		WIFI LOGGER CARD (opt.)	
User Interface		LCD Display with 16 characters x 2 line	
Environmental			
Ambient Temperature Range	-25...+60°C /-13...140°F with derating above 50°C/122°F	-25...+60°C /-13...140°F with derating above 55°C/131°F	-25...+60°C /-13...140°F with derating above 50°C/122°F
Storage Temperature		-40...80°C (-40...+176°F)	
Relative Humidity		0...100% condensing	
Environmental pollution classification for external environment		3	
Noise Emission		< 50 dB(A) @ 1 m	
Maximum Operating Altitude without Derating		2000 m / 6560 ft	
Environmental Category		External	
Physical			
Environmental Protection Rating		IP 65	
Cooling		Natural	
Dimension (H x W x D)		618 x 325 x 222 mm / 24.3 x 12.8 x 8.7 inch	
Weight		17.5 kg / 38.6 lb	
Mounting System		Wall bracket	
Overvoltage Category in accordance with IEC 62109-1		II (DC input) III (AC output)	
Safety			
Isolation Level		Transformerless (TL)	
Safety Class		I	
Marking		CE (50Hz only)	

1. Limited to 3000 W for Germany
2. Limited to 3600 W for Germany
3. Limited to 4200 W for Germany
4. The AC voltage range may vary depending on specific country grid standard
5. Restricted to 16 A (up to the maximum output power of 3680 W) for the standard UK G83/1.
6. The Frequency range may vary depending on specific country grid standard

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

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