

ABB Solar inverters
Quick Installation Guide
PVI-3.0/3.6/4.2-TL-OUTD

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**

3.

List of supplied components

Available components	Quantity	Available components	Quantity
Bracket for wall mounting	1	Two-hole gasket for M20 signal cable glands and cap TGM58	1 + 1
Bolts and screws for wall mounting	2 + 2	Jumpers for configuration of the parallel input channels	2
M6x10 screw	1	Connector for the connection of the communication and control signals	2
D.18 Washer	3	Male quick fit connectors	2 (3.0/3.6 kW) 3 (4.2 kW)
L-key, TORX TX20	1	Female quick fit connectors	2 (3.0/3.6 kW) 3 (4.2 kW)
M20 Cable gland	1	Technical documentations	1
M25 Cable gland	1		

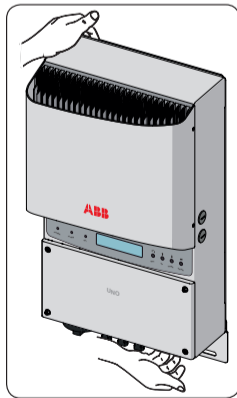
4.

Lifting and transport

Transport and handling
 Transport of the equipment, especially by road, must be carried out with 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.

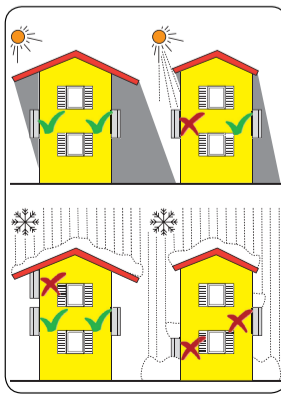


5.

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.



1.

Labels and Symbols

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

① Inverter model
 ② Inverter Part Number
 ③ Inverter Serial Number
 ④ Week/Year of manufacture

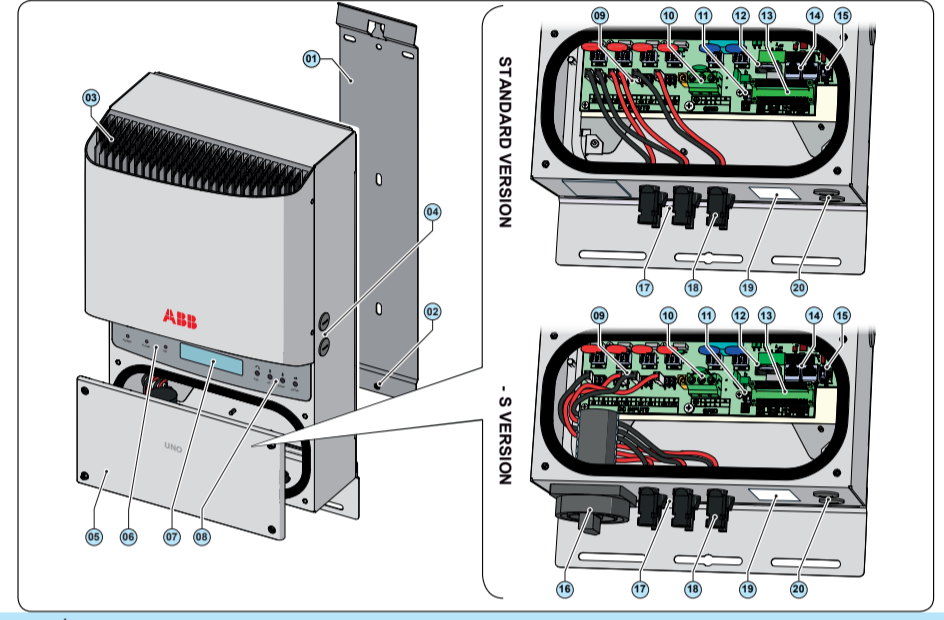
The labels attached to the equipment must NOT be removed, damaged, dirtied, hidden, etc...
 If the service password is requested, the field to be used is the serial number -SN: YYWWSSSSSS-
 In the manual and/or in some cases on the equipment, the danger or hazard zones are indicated with signs, labels, symbols or icons.

Always refer to instruction manual	General warning - Important safety information	Hazardous voltage	Hot surfaces
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. The only difference in terms of components between the three power levels is the number of input connectors: 2 pairs in PVI-3.0/3.6-TL-OUTD models; 3 (2x MPPT1 and 1x MPPT2) pairs in PVI-4.2-TL-OUTD models. Two types are available for each model: Standard or with DC disconnect switch (Version -S).



Main components

① Bracket	⑤ Front cover	⑨ DC Input terminal block	⑬ Signal terminal block	⑰ Input connectors (MPPT1)
② Locking screw	⑥ LED Panel	⑩ AC Output terminal block	⑭ RJ45 Connectors	⑱ Input connectors (MPPT2)
③ Heat sink	⑦ Display	⑪ Channel configuration switch	⑮ RS485 line termination switch	⑲ AC cable gland
④ DSP Reprogramming connectors	⑧ Keyboard	⑫ Internal battery	⑯ DC Disconnect switch	⑳ Service cable glands

6.

Choice of installation location

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.

7.

Assembly Instruction

Wall/Pole mounting
During installation, do not place the inverter with its front facing towards the ground.
 - Position the bracket ① 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 ① 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 ② or to the pole ③ with the no. 2 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 ① by tightening the locking screw ② located on the lower side (Step 3).
 - Unscrew the 4 screws and open the front cover ⑥ 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.

Input configuration (DC)

All versions of the inverter are equipped with two input channels (therefore with double maximum power point tracker MPPT) independent of each other, which can however be connected in parallel using a single MPPT.

Configuration of independent channels (default configuration)
 This configuration involves the use of the two input channels (MPPT) in independent mode. This means that the jumpers between the two channels (positive and negative) of the DC input terminal block ⑨ must not be installed and the switch ⑪ located on the main board must be set to "IND".

Configuration of parallel-connected channels
 This configuration uses the two input channels (MPPT) connected in parallel. This means that the jumpers between the two channels (positive and negative) of the DC input terminal block ⑨ must be installed and the switch ⑪ located on the main board must be set to "PAR".

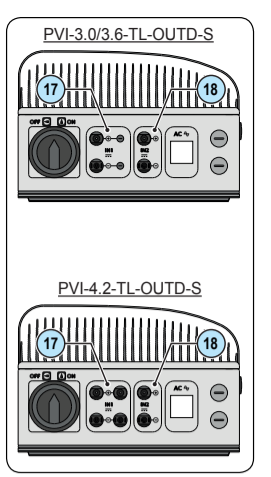
Check for correct polarity in the input strings and absence of any leakage to ground in the PV generator. When exposed to sunlight, the PV panels supply DC direct voltage to the inverter. The inside of the inverter may only be accessed after the equipment has been disconnected from the grid and from the photovoltaic generator.

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.

For the string connections it is necessary to use the quick fit connectors (multicontact or weidmüller) located on the bottom of the mechanic (17, 18).

Table with 3 columns: PVI-3.0-TL-OUTD, PVI-3.6-TL-OUTD, PVI-4.2-TL-OUTD. Rows: No. of input channels, No. of quick fit connectors.

- Crimp the Multicontact/Weidmüller MC4/WM4 quick fit connector counterparts (supplied) to the string cables or to the cables wired to the DC disconnect switches (external)
- Connect all the strings included in the design of the system and always check the tightness of the connectors
- If some of the string inputs should not be used you must proceed to verify the presence of covers on DC input connectors and then install them should they be absent: this operation is necessary for the tightness of the inverter and to avoid damaging the free connector that could be used at a later date.



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:

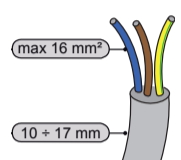
Table with 3 columns: PVI-3.0-TL-OUTD, PVI-3.6-TL-OUTD, PVI-4.2-TL-OUTD. Rows: Type, Nominal Voltage, Nominal Current, Magnetic protection characteristic, Number of poles, Type of differential protection, Differential sensitivity.

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.

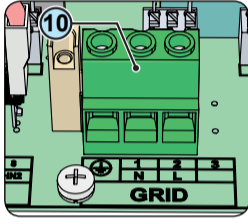
Table with 3 columns: PVI-3.0-TL-OUTD, PVI-3.6-TL-OUTD, PVI-4.2-TL-OUTD. Rows: Cross-section of the line conductor (mm²), Maximum length of the line conductor (m).

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



Warning! Before performing any of the operations described below, ensure the AC line downstream the inverter has been correctly disconnected
- Remove the protective film located on the hole to be used for the AC cables (19)
- Insert the M25 cable gland in the hole and secure it using the special M25 lock nut (supplied)

Warning! To ensure environmental protection IP65 it is necessary to fix the cable gland to the inverter chassis with a minimum tightening torque of 7.5 Nm
- 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 (20)



Warning! ABB inverters should be earthed (PE) via the terminal with the protective earth label (21), 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 (20) is complete, screw in the cable gland firmly (tightening torque 5.0Nm) and check the tightness.

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.

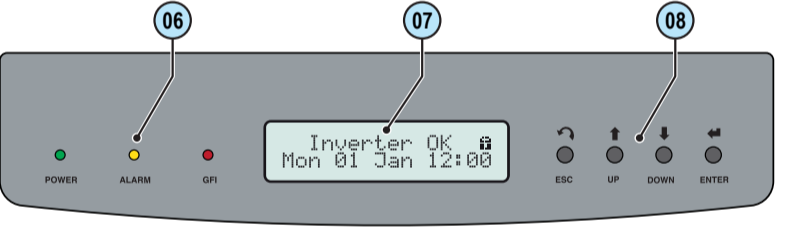
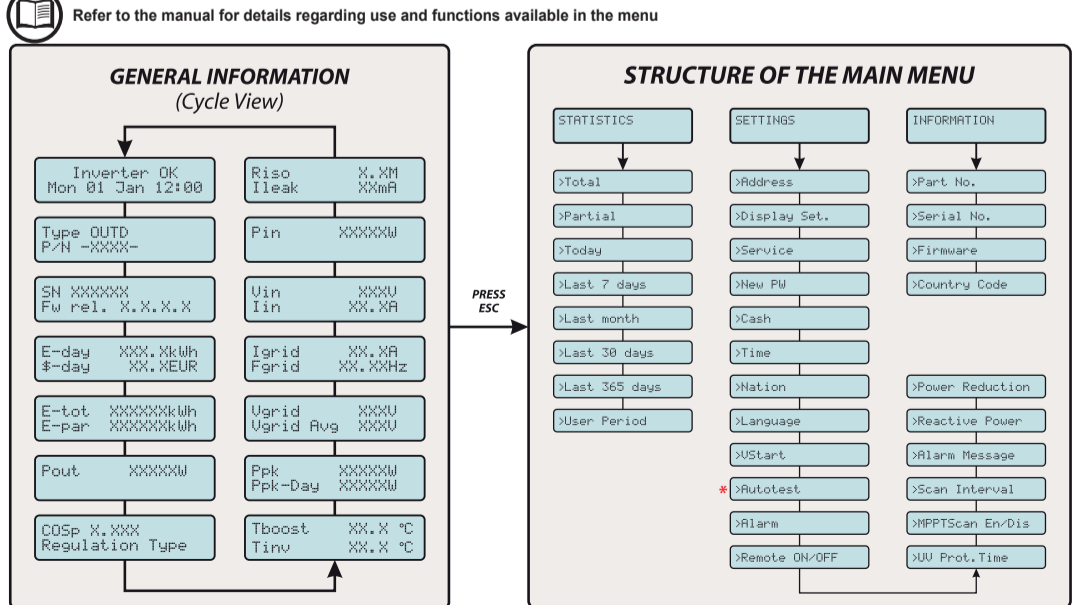


Table mapping LED colors (GREEN, YELLOW, RED) and buttons (ESC, UP, DOWN, ENTER) to their functions.

ABB inverters are equipped with a graphic Display (20), consisting of 2 lines of 16 characters each, which can be used to:
- Display the operating state of the inverter and the statistical data
- Display the service messages for the operator
- Display the alarm and fault messages for the operator
- Changing the settings of the inverter

During the normal operation of the inverter the display cycles through the GENERAL INFORMATION. This information relates to the input and output parameters and the inverter identification parameters. By pressing ENTER it is possible to lock scrolling on a screen to be constantly displayed.

Press ESC to access the three main menus, which have the following functions:
- STATISTICS: Displays the statistics
- SETTINGS: Modify the settings of the inverter
- INFO: View service messages for the operator

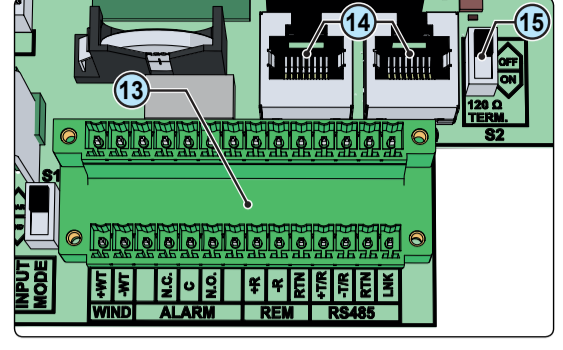


* Available only for grid standard CEI021 IN and CEI021 EX

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 (that takes cables from 7 mm to 13 mm in diameter) and a gasket with two holes to insert into the cable gland which enables two separate cables of a maximum diameter of 5 mm to be accommodated, are available.

Warning! To ensure environmental protection IP65 it is necessary to fix the cable glands to the inverter chassis with a minimum tightening torque of 7 Nm

Connection to the RS485 communication line
The RS485 communication port is the inverter's communication port. The ABB inverters use an RS485 HALF-DUPLEX communication line made up of two transmission and reception cables (+T/R and -T/R) and a communication reference cable (RTN): all three cables must be connected in daisy-chain configuration. The chain connection can be made without distinction by using the RJ45 connector couples (14) (one for in and one for out) or the terminal block (13). 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 (15).



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

The inverter commissioning procedure is as follows:
- Switch the integrated switch (16) (version -S) 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.

- 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

- After you have set the "Nation" value, the message "Initializing...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):

Table with 4 columns: INPUT VOLTAGE, DISPLAY MESSAGE, LED STATUS, DESCRIPTION. Rows: Vin < Vstart, Vin > Vstart.

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.

- 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 photovoltaic generator 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.

Large table of technical specifications for PVI-3.0-TL-OUTD, PVI-3.6-TL-OUTD, and PVI-4.2-TL-OUTD models, covering input, output, and environmental parameters.

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

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