

ABB Solar inverters

Quick Installation Guide

TRIO-20.0/27.6-TL-OUTD

EN

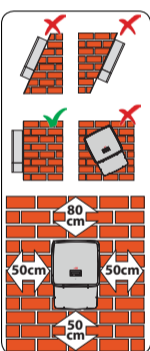


In addition to what is explained below, the safety and installation information provided in the installation manual must be read and followed. The technical documentation and the interface and management software for the product are available at the website. The device must be used in the manner described 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™



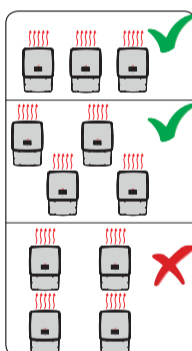
Choice of installation location



Installation position

- Install on a wall or strong structure suitable for bearing the weight
- Install in safe, easy to reach places
- If possible, install at eye-level so that the display and status LEDs can be seen easily
- Install at a height that considers the heaviness of the equipment
- Install vertically with a maximum inclination of +/- 5°
- To carry out maintenance of the hardware and software of the equipment, remove the covers on the front. Check that there are the correct safety distances for the installation that will allow the normal control and maintenance operations to be carried out
- Comply with the indicated minimum distances
- For a multiple installation, position the inverters side by side
- If the space available does not allow this arrangement, position the inverters in a staggered arrangement as shown in the figure so that heat dissipation is not affected by other inverters

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.



4.

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.

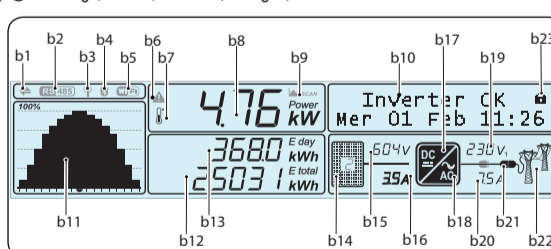
LED POWER	GREEN On if the inverter is working correctly. Flashes when checking the grid or if there is insufficient sunlight.
LED ALARM	YELLOW The inverter has detected an anomaly. The anomaly is shown on the display.
LED GFI	RED Ground fault on the DC side of the PV generator. The error is shown on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

The operating parameters of the equipment are displayed through the display (23): warnings, alarms, channels, voltages, etc.

Description of symbols and display fields:

b1	RS485 data transmission	b13	Daily energy produced
b2	RS485 line present	b14	PV voltage > Vstart
b3	Radio line present	b15	DC voltage value
b4	Bluetooth line present (*)	b16	DC current value
b5	WiFi line present (*)	b17	DC/DC circuit part
b6	Warning	b18	DC/AC circuit part
b7	Temperature derating	b19	AC voltage value
b8	Instantaneous power	b20	AC current value
b9	MPP scan running	b21	Connection to the grid
b10	Graphic display	b22	Grid status
b11	Power graph	b23	Cyclic view on/off
b12	Total energy		(*) NOT available



Lifting and transport

Transport and handling

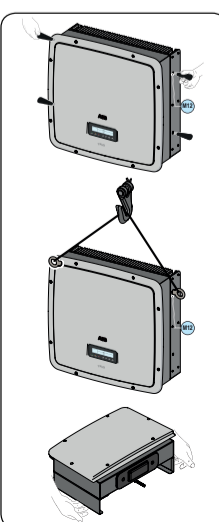
Transport of the equipment, especially by road, must be carried out with suitable ways and means for protecting the components (in particular, the electronic components) from violent shocks, humidity, vibration, etc.

Lifting
Where indicated and/or where there is a provision, eyebolts or handles, which can be used as anchorage points, are inserted and/or can be inserted. The ropes and means used for lifting must be suitable for bearing the weight of the equipment.

Unpacking and checking
The components of the packaging must be disposed of 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.

Weight of the equipment units

	Mass weight	Lifting points n°#	Minimum rope height	Holes or Eyebolts UNI2947
INVERTER unit	TRIO-20.0: 60 kg TRIO-27.6: 65 kg	4	1.200 mm	M 12 - assembly kit with 4 handles and 2 eyebolts (to order: TRIO HANDLING KIT)
WIRING BOX unit	Standard / -S2: 7 kg -S2F / -S2X: 15 kg	2	-	-



Labels and Symbols

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

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: YYYWSSSSSS- shown on the label affixed to the top (inverter) 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

Inverter Models and Components

The models of inverter to which this guide refers are available in 2 power ratings: 20 kW / 27.6 kW. For inverters of equal output power, the variant between the various models is the layout of the wiring box.

TRIO-XX.X-TL-OUTD	TRIO-XX.X-TL-OUTD-S2	TRIO-XX.X-TL-OUTD-S2F	TRIO-XX.X-TL-OUTD-S2X
Standard wiring box version: - DC cable infeed cable gland - DC cable connection terminal block	S2 wiring box version: - DC cable infeed cable gland - DC cable connection terminal block - AC+DC disconnect switch	S2F wiring box version: - Quick fit connectors - String protection fuses - AC+DC disconnect switch	S2X wiring box version: - Quick fit connectors- - String protection fuses - DC overvoltage surge arresters - AC overvoltage surge arresters - AC+DC disconnect switch

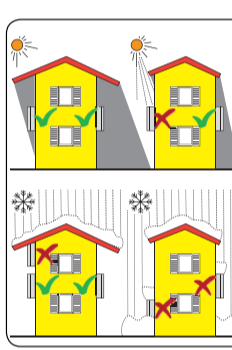
Main components			
09	Communication board	13	DC input terminal board
10	Service cable glands	14	AC+DC disconnect switch
11	DC cable glands	15	DC overvoltage surge arresters
12	Jumpers	16	AC cable gland
		17	AC output terminal board
		18	AC overvoltage surge arresters
		19	Input connectors
		22	String fuses

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
- Avoid electromagnetic interference that can compromise the correct operation of electronic equipment, with consequent situations of danger.

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.



List of supplied components

Components available for all models	Quantity	Components available for all models	Quantity
Connector for connecting the configurable relay	2	Bracket for wall mounting	1
Connector for the connection of the communication	4	Quick Installation Guide	1
L-key, TORX TX20	1	Additional components for (-S) models	
Two-hole gasket for M25 signal cable glands and cap	2 + 2	Female quick fit connectors	8 (20.0kW) 10 (27.6kW)
Two-hole gasket for M20 signal cable glands and cap	1 + 1	Male quick fit connectors	8 (20.0kW) 10 (27.6kW)
Bolts and screws for wall mounting	10 + 10		
Jumpers for configuration of the parallel input channels	2		

Assembly Instruction

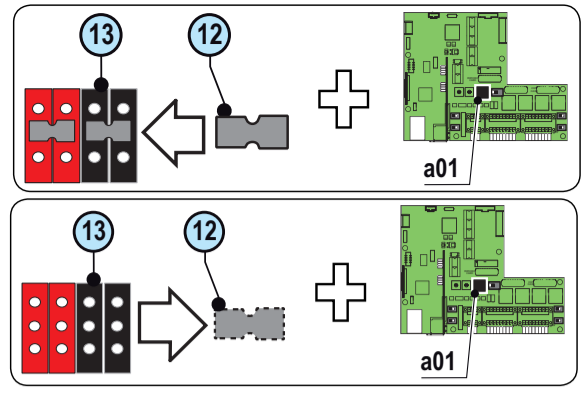
01	Bracket	10	Service cable glands	19	Input connectors (MPPT1)
02	Wiring box	11	DC cable glands	20	Input connectors (MPPT2)
03	Inverter	12	Jumpers	21	Anti-condensation valve
04	Cover	13	DC input terminal board	22	String fuses
05	Clamp screw	14	AC+DC disconnect switch	23	Display
06	Handles	15	DC overvoltage surge arresters	24	Keypad
07	Connector screws	16	AC cable gland	25	LEDpanel
08	Front cover	17	AC output terminal board	26	Heatsink
09	Communication board	18	AC overvoltage surge arresters	27	Locking screw

Wall mounting

- Position the bracket (01) perfectly level on the wall and use it as a drilling template.
- Drill the 10 holes required using a drill with 10mm bit. The holes must be about 70mm deep.
- Fix the bracket to the wall with the 10 wall anchors, 10mm in diameter, supplied.
- Hook on the wiring box (02) by inserting the head of the rear screws in the slots in the bracket, remove the front cover (08) and make all the necessary connections. N.B. It is not necessary to install the inverter (03) at this stage.
- Unscrew the connector screws (07) and remove the cover (04) so that you can reach the connector between the wiring box and the inverter. Put the cover in the special pocket provided at the back of the wiring box.
- Hook the inverter (03) to the bracket by inserting the head of the rear screws in the slots as shown in the figure. To make lifting easier, handles (06) or eyebolts (M12) can be attached to the side holes provided.
- Join the two parts by tightening the coupling screw (05) working from the lower part of the wiring box (02).
- Once the parts are connected, screw in the two connector screws (07) situated inside the wiring box.
- Anchor the inverter to the bracket (01), tightening the locking screw (27) located on the lower side.

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 parallel-connected channels This configuration involves the use of the two input channels (MPPT) connected in parallel. This means that the jumpers (12) between the two channels (positive and negative) of the DC input terminal board (13) must be installed and that the switch a01 situated on the communication card (10) must be set to "PAR".



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 (12) between the two channels (positive and negative) of the DC input terminal board (13) must not be installed and that the switch a01 situated on the communication card (10) must be set to "IND".

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. The inverter is only to be used with photovoltaic units with ground insulated input poles unless accessories allowing grounding of the inputs have been installed. In this case it is compulsory to install an isolation transformer on the AC side of the inverter.

- Connection of inputs on the Standard and S2 models For these two models, connection with the DC input terminal board (13) is made by inserting the cables in the DC cable glands (11). The maximum accepted cable cross-section ranges from 10 to 17 mm, whereas each individual terminal of the terminal board accepts a cable with cross-section of up to 50 mm² (tightening torque 6Nm).

- Connection of inputs on the S2F / S2X model Reversing polarity may result in serious damage. Always check the polarity before connecting up each string! Each input is equipped with protection fuses: check that the fuse current rating is properly sized for the photovoltaic modules installed.

For string connections using the S2F / S2X wiring box, the quick fit connectors (multicontact or weidmuller) situated at the bottom of the mechanics are used. For each input channel, there are two groups of connectors: - Input connectors (MPPT1) (14) with codes 1A, 1B, 1C, ... - Input connectors (MPPT2) (20) with codes 2A, 2B, 2C, ...

In these versions of the wiring box, you MUST directly connect the individual strings coming into the inverter (do not make field switchboards for parallel strings). This is because the string fuses (22), situated on each input, are not sized to take strings in parallel (array).

If some string inputs are not used, check that there are covers on the connectors and install them if they are missing. 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 columns for TRI0-20.0-TL-OUTD and TRI0-27.6-TL-OUTD, listing Type, Voltage/Current rating, Magnetic protection characteristic, Number of poles, Type of differential protection, and 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 For the connection of the inverter to the grid, you can choose between a star connection (3 phases + neutral) and a delta connection (3 phases). 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 showing cross-section of the line conductor (mm²) and maximum length of the line conductor (m) for TRI0-20.0-TL-OUTD and TRI0-27.6-TL-OUTD models.

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 EPR/XLPE insulation, laid in free air

The inverter commissioning procedure is as follows: - Turn the AC+DC disconnect switch (14) to the ON position. If there are two separate external disconnect switches (one for DC and the other for AC), first close the AC disconnect switch and then the DC disconnect switch. There is no order of priority for opening the disconnect switches.

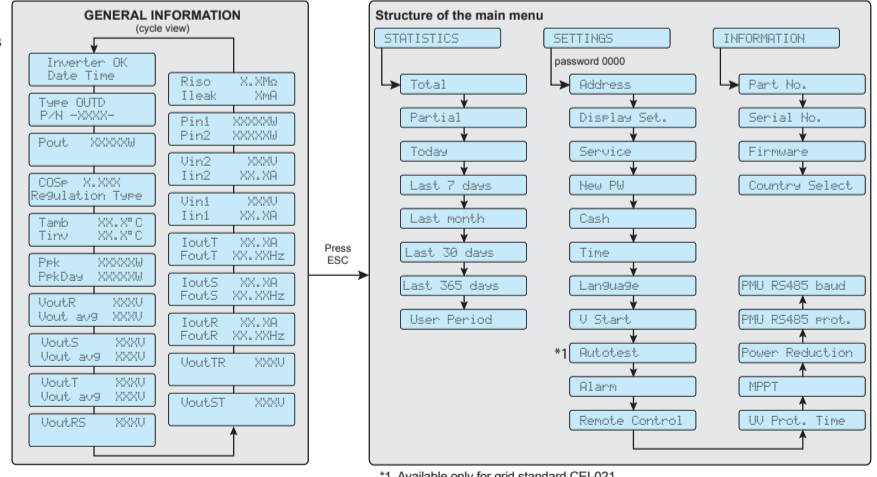
- When the inverter has power, the first check performed is the one relating to the input voltage: 1. If the DC input voltage is lower than the Vstart voltage (voltage required to begin the inverter's grid connection) the b14 icon remains off and the "Waiting sun" message is displayed b10. 2. If the DC input voltage is higher than the Vstart voltage the b14 icon is displayed and the inverter goes to the next stage of the controls. In both cases the voltage levels and input current are displayed in the b15 and b16 fields. - The inverter performs a control of grid parameters. The b22 icon, which represents the grid distribution, can have different statuses: 3. not present, if the mains voltage results as absent. 4. flashing, if the mains voltage is present but outside the parameters dictated by the standard of the country of installation. 5. turns on, if the mains voltage is present and within the parameters dictated by the standard of the country of installation. In this condition, the inverter starts the sequence of grid connection.

If the input voltage and the grid voltage are within the inverter operating intervals, connection to the grid will commence. After the inverter is connected, the icons on the whole line b21 will come on steady.

Once the connection sequence has been completed, the inverter starts to operate and indicates its correct operation by making a sound and by the green LED coming on steady on the LED panel (25).

If the inverter signals any errors/warnings the messages and their codes will be indicated on the display (26). This state will also cause switching of the multi-function relay (set to alarm mode in the menu SETTINGS>Alarm) which activates any external signalling device that may be connected.

The display (26) has a section b10 (graphic display) for moving through the menu using the buttons of the LED panel (25). Section b10 consists of 2 lines with 16 characters per line:



Viewing of the GENERAL INFORMATION is cyclic. 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

Refer to the manual for details regarding use and functions available in the menu.

Table comparing TRI0-20.0-TL-OUTD and TRI0-27.6-TL-OUTD models across various technical specifications like Input, Rated Input Power, Maximum Input Power, Rated Input Voltage, Input Activation Voltage, Input operating range, Maximum Input Power for each MPPT, Input voltage Range for Operation at rated power with configuration of the MPPTs in parallel, DC Power Limitation for each MPPT with Independent Configuration of MPPT at Pacr,max unbalance example, Absolute Maximum Input Voltage (Vmax.abs), Power derating vs. Input voltage (parallel or independent MPPT configuration), Number of Independent MPPTs, Maximum current for each MPPT, and Maximum Backfeed current (from AC to DC side).

For the connection of the inverter to the grid, you can choose between a star connection (3 phases + neutral) and a delta connection (3 phases). In any case, connection of the inverter to ground is mandatory. To prevent electrocution hazards, all the connection operations must be carried out with the disconnect switch downstream of the inverter (grid side) open and locked.

For all models, connection with the AC output terminal board (17) is made by inserting the cables in the AC cable gland (16). The maximum accepted cable cross-section ranges from 20 to 32 mm, whereas each individual terminal of the terminal board accepts a cable with cross-section of up to 35 mm² (tightening torque 2.5Nm).

Unscrew the cable gland, remove the cover, insert the cable of suitable cross-section and connect the conductors (Neutral, R, S, T and Ground) to the terminals on the AC output terminal board (17). Be careful not to change round one of the phases with neutral! Once the connection to the terminal board is complete, screw in the cable gland firmly (tightening torque 7.5Nm) and check the tightness. Before connecting the inverter to the distribution grid it is necessary to set the country standard by manipulating the two rotary switches a05.

Before connecting the inverter to the distribution grid it is necessary to set the country standard by manipulating the two rotary switches a05: Table: country standard and language

Two tables showing Switch 1 and 2 settings for Country Grid Standard (name displayed) and Display language for various countries like Spain, Belgium, France, etc.

The settings become fixed after 24 hours of operation of the inverter (the PV generator simply has to be under power). The standard for the Italian grid which must be set during installation is 1-8 (CEI-021 @ 400V EXTERNAL Protection)

The following table shows the main components and the connections available on the control and communication board. Each cable that must be connected to the communication board must go through the three service cable glands (10).

Table listing components like S5, S7 e S8, S3, S1, J2, J3, J4, S2, S4, J7 e J8, J5 e J6 with their Ref. manual and Description, including switches for parallel connection, rotary switches for country standard, and terminal blocks for RS485 and sensor connections.

The RS485 PMU communication line can be configured to operate with a ModBus communication protocol.

Please refer to the manual for details of the connections and functions available on the control and communication board

Characteristics and technical data Table: TRI0-20.0-TL-OUTD and TRI0-27.6-TL-OUTD

Large table of technical data including Number of Pairs of DC Connections at Input, Type of Input DC Connectors, Type of photovoltaic panels that can be connected at input according to IEC 61730, Input protection, Reverse Polarity Protection, Input Overvoltage Protection - Varistors, Input Overvoltage Protection - DIN rail surge arrester (-S2X version), Maximum short-circuit current for each MPPT, Isolation Control, Characteristics of DC disconnect switch for each MPPT (Version with DC disconnect switch), Fuses (-S2F and -S2X versions), Output, AC connection to the Grid, Rated output voltage (Vacr), Output Voltage Range (Vacmin...Vacmax), Rated Output Power (Pacr), Maximum Output Power (Pacmax), Maximum apparent Output Power (Sacmax), Maximum Output Current (Iacmax), Inrush Current, Maximum output fault current, Rated Output Frequency (fr), Output Frequency Range (fmin...fmax), Nominal Power Factor (Cosphiac,r) and adjustable range, Total Harmonic Distortion of Current, Type of AC Connections, Output protection, Anti-islanding Protection, Maximum AC Overcurrent protection, Output Overvoltage Protection - Varistors, Output Overvoltage Protection - DIN Rail surge arrester (-S2X version), Operating performance, Maximum Efficiency (ηmax), Weighted Efficiency (EURO/CEC), Stand-by Consumption, Night-time Consumption, Communication, Wired Local Monitoring, Remote Monitoring, Wireless Local Monitoring, User Interface, Environmental, Ambient Temperature, Relative Humidity, Noise Emission, Maximum Operating Altitude, Environmental pollution classification for external environment, Environmental Category, Physical, Environmental Protection Rating, Cooling system, Overvoltage Category in accordance with IEC 62109-1, Dimensions (H x W x D), Weight, Safety, Safety Class, Isolation Level, Marking.

Contact us TRI0-20.0_27.6-TL-OUTD-Quick Installation Guide EN-RevC EFFECTIVE 2014-02-12 © Copyright 2014 ABB. All Rights Reserved. Specifications subject to change without notice.

