

ABB solar inverters

Quick installation guide
UNO-2.0/3.0/3.6/4.2-TL-OUTD
(from 2.0 to 4.2 kW)

EN



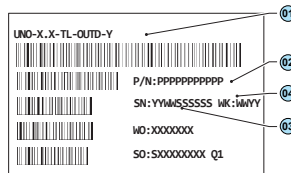
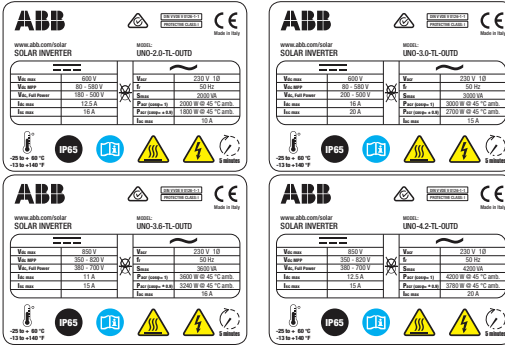
In addition to the notes below, please read and follow the safety and installation information provided in the installation manual. The technical documentation and the interface and management software for the product are available on the website.
This equipment must be used following the guidelines provided in the manual.
Failure to do so may impair the inverter safety features.

Power and productivity
for a better world™



1. Labels and Symbols

The labels on the inverter carry the branding, the main technical data and the identification of the equipment and the manufacturer



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

The labels on the equipment must absolutely 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.

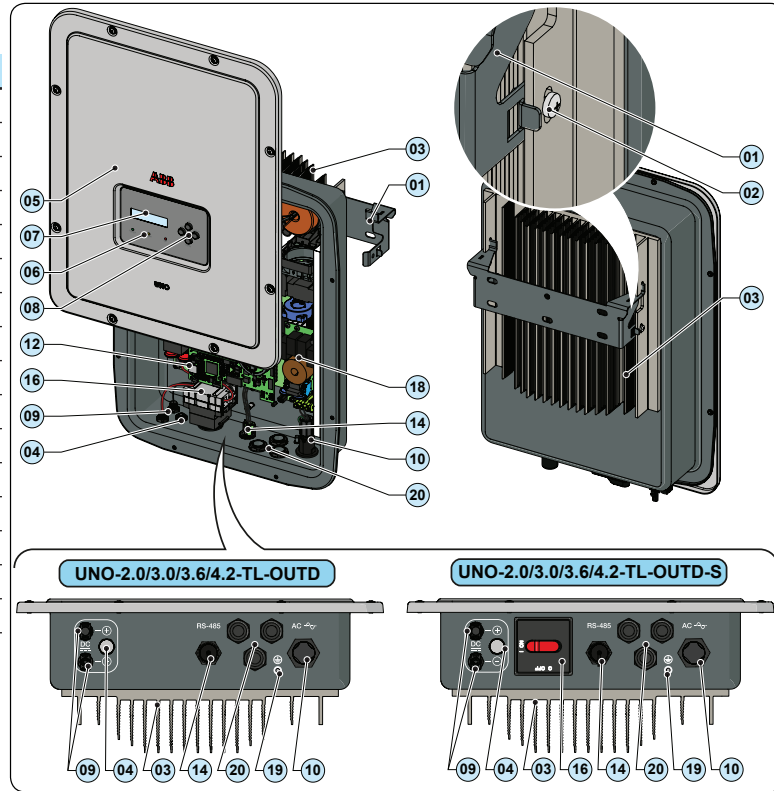
Obligation to consult manual	General warning - Important safety information	Hazardous voltage	Hot surfaces
Protection rating of equipment	Temperature range	Without insulation transformer	Direct and alternating currents, respectively
Positive pole and negative pole of the input voltage (DC)	Obligation to use safety clothing and/or personal protection equipment	Point of connection for grounding protection.	Stored energy discharge time

2.

The inverter models to which this installation guide refers are available in four power ratings: 2.0 kW, 3.0 kW, 3.6 kW and 4.2 kW.
Two types are available for each model: standard or with DC disconnect switch (Version -S).

Main components

- 01 Bracket
- 02 Locking screws
- 03 Heat sink
- 04 Anti-condensation valve
- 05 Front cover
- 06 LED panel
- 07 Display
- 08 Keyboard
- 09 DC input connectors
- 10 AC output connector
- 12 SD Card slot
- 14 RS485 connector
- 16 DC disconnect switch
- 18 Stand-alone board (optional)
- 19 External ground connection
- 20 Service cable glands



3.

Lifting and transport

Transportation and handling

Transport of the equipment, especially by road, must be carried out using suitable ways and means in order to protect the components from violent shocks, humidity, vibration, etc.

Lifting

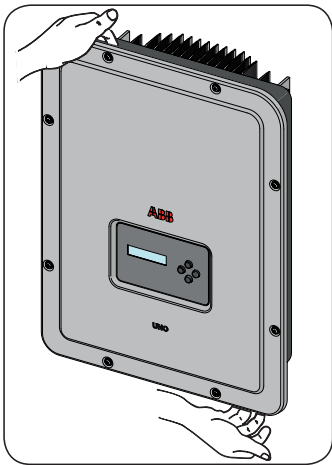
The means used for lifting must be suitable to bear the weight of the equipment.

Unpacking and checking

The components of the packaging must be removed and 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 any defects or damages are detected, please stop operating, contact the carrier and also promptly inform the ABB Service Department.

Weight of the modules of the equipment

Model	Weight
UNO-2.0/3.0-TL-OUTD	12 Kg
UNO-2.0/3.0-TL-OUTD-S	
UNO-3.6/4.2-TL-OUTD	
UNO-3.6/4.2-TL-OUTD-S	



4.

Choice of installation location

Environmental checks

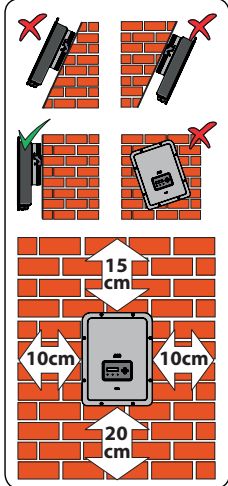
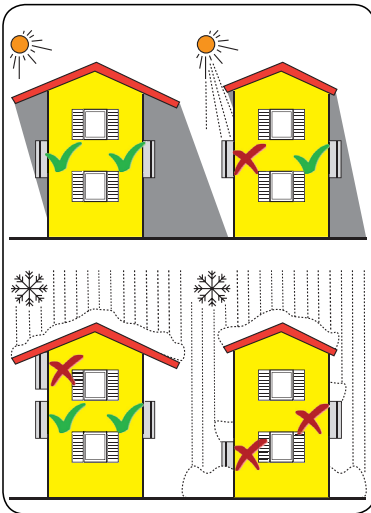
- Consult the technical data to check the environmental conditions to be observed
- Installation of the unit in a location exposed to direct sunlight must be avoided (otherwise the warranty will be cancelled) as it may cause:
 - 1. power limitation phenomena in the inverter (with a resulting decreased 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
- Always ensure that the flow of air around the inverter is not blocked so as to prevent overheating.
- 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 level that the inverter produces during operation. The level of the sound emission is heavily influenced by where the inverter is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply.

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 cause arcing (electrical discharges) that may reach the point of damaging the inverter

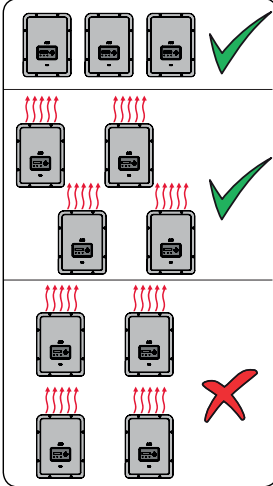
All installations at altitudes of over 2000 metres must be assessed case by case with the ABB Service department.



Installation site

- 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 can be seen easily
- Install at a height that takes account of the weight of the equipment
- Install vertically with a maximum inclination of 5° (forward or backward)
- Choose a place that enables sufficient space to be left around the unit to enable easy installation and removal of the object from the assembly surface; respect the minimum distances indicated
- In the case of multiple installation position the inverters alongside each other; 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 exclusions due to improper installation.



5.

List of components supplied

Available components	Quantity	Available components	Quantity
Bracket for wall mounting	1	Securely sealed connection to connect AC cable	1
Plug, screw and washer for wall mounting	2 + 2 + 2	Securely sealed connection to connect RS485 serial line cable	1
M5x10 screw and M5 washer to lock bracket	2 + 2	TORX TX25 L-key	1
M5x10 screw and M5 contact washer for external ground connection	1 + 2	Technical documentation	1
Two-hole gasket for M20 signal cable gland and TGM58 cover	1 + 1		

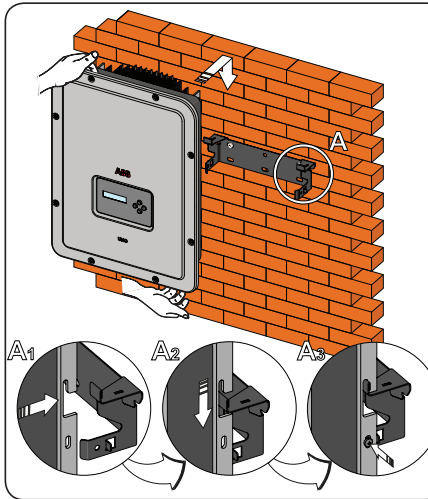
6.

Wall mounting

During installation do not place the inverter with the front cover 05 facing towards the ground.

- Position the bracket 01 so that it is perfectly level on the wall and use it as a template for drilling.
- Make the 2 holes necessary, using a drill with a 10 mm. diameter bit. The depth of the holes must be around 70 mm.
- Secure the bracket to the wall with the two 10 mm wall plugs supplied with it.
- Attach the inverter by inserting the two tabs on the bracket 01 into the 2 slots on the inverter (figures A1 and A2).
- Secure the inverter to the bracket by screwing the lock screws 02 on both sides of the inverter (figure A3).
- If necessary unscrew the 8 screws and open the front cover 05 to make all accessory connections.

Do not open the inverter in the case of rain, snow or a high level of humidity (>95%)
Once the connections have been made proceed to closing the cover by tightening the 8 screws on the front, adhering to the tightening sequence and torque (2.5Nm).



7.

Input connection (DC)

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 referred to in this document are TRANSFORMERLESS. This typology implies the use of insulated photovoltaic panels (IEC61730 Class A Rating) and the need to keep the photovoltaic generator floating with respect to the ground: no terminal of the generator must be grounded.

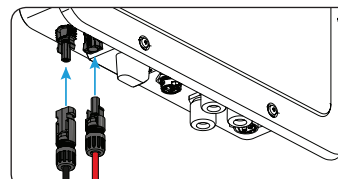
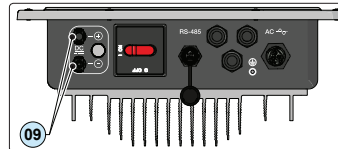
The inverter has a single input channel (MPPT) and is equipped with a pair of quick fit connectors 08 to connect the PV generator

If the input strings should be connected in parallel, they must have the same installation conditions (number of panels in series, type of panels, orientation and inclination).
Comply with the maximum input current relating to the quick fit connectors.

- Refer to the document "String inverter – Product Manual appendix" available at www.abb.com/solarinverters to know the brand and the model of the quick fit connector. Depending on the model of the connector of the own inverter, it is necessary to use the same model and the respective counterpart (check the compliant counterpart on the website of the manufacturer or in ABB).

Using corresponding parts that are not compliant with the quick fit connector models on the inverter could cause serious damage to the unit and lead to invalidation of the warranty.

- Connect the DC input and always check the tightness of the connectors



Load protection breaker (AC disconnect switch) and line cable sizing

To protect the inverter AC connection line, it is recommended to install a device to protect against maximum current and leakage to ground, with the following characteristics:

	UNO-2.0-TL-OUTD	UNO-3.0-TL-OUTD	UNO-3.6-TL-OUTD	UNO-4.2-TL-OUTD
Type	Automatic circuit breaker with differential thermal-magnetic protection			
Nominal voltage	230 V AC			
Nominal current	16 A	20 A	20 A	25 A
Magnetic protection characteristic	B/C			
Number of poles	2			
Differential protection type	A/AC			
Differential sensitivity	300 mA			

ABB states that ABB high frequency transformerless inverters are not such in terms of their construction to input continuous ground fault current and therefore it is not required that the differential installed downstream of the inverter is of type B in accordance with IEC 60755/A 2.

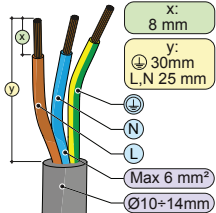
Characteristics and sizing of the line cable

The cable to be used must be tripolar. 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 which connects the inverter to the power supply.

Line conductor cross section	Line conductor maximum length (m.)			
	PVI-2.0-TL-OUTD	PVI-3.0-TL-OUTD	PVI-3.6-TL-OUTD	PVI-4.2-TL-OUTD
1.5 mm ²	10 m	6 m	5 m	4 m
2.5 mm ²	15 m	11 m	10 m	8 m
4 mm ²	25 m	19 m	16 m	13 m
6 mm ²	38 m	29 m	24 m	20 m

The values are calculated in nominal power conditions, considering:

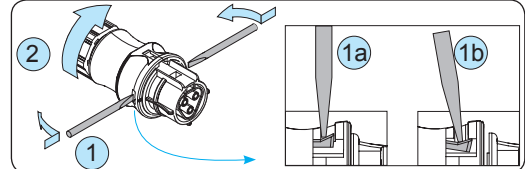
- a power loss of not more than 1% along the line.
- use of copper cable, with HEPR rubber insulation and positioned in open air



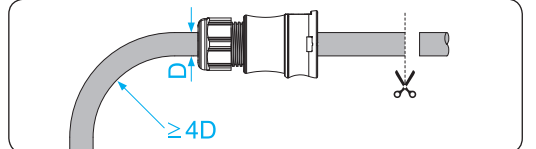
Warning! Before performing any of the operations described below, ensure the AC line downstream from the inverter has been correctly disconnected.

For the connection of the inverter to the grid you need 3 connections: ground, neutral and phase. In any case, connection of the inverter to ground is mandatory. The connection of the grid cable to the inverter is realized through the dedicated AC output connector. **10** by undertaking the following operations:

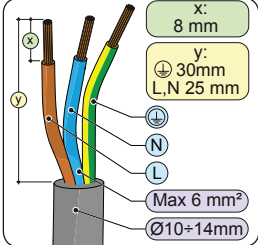
- Remove the head of the connector by pressing on the two holding clips and subsequently loosen the cable gland.



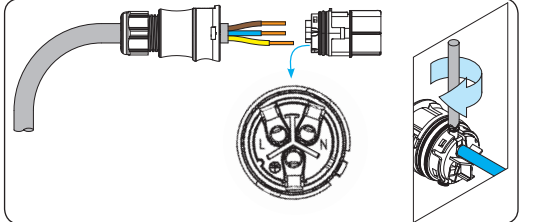
- Feed the cable through the connector and cut the cable to correct length *Ensure that the cable's radius of curvature is more than 4 times the diameter of the cable*



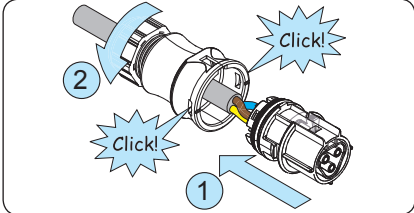
- Prepare the cable respecting the following measurements.



- Install the single wires (phase, neutral and ground) on the head of the connector respecting the indications printed on each of the three connection terminals (tightening torque 0.8...1Nm)

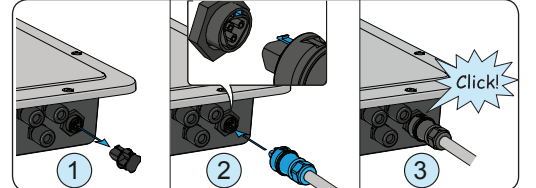


- Close the connector and tighten the cable gland respecting the torque (4+1Nm) in order to guarantee the IP65 protection level



- Remove the pre-installed protective cover from the inverter.

Insert the corresponding part in the AC output connector **10** being careful to align the reference points (present on both connectors) which prevent connection errors.



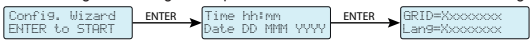
Warning! In order to maintain the inverter's level of IP protection, the corresponding part must be obligatorily installed with the connected AC cable or the protective cover, on the AC output connector. In addition, the connector must not be subject to tensile forces (examples: do not connect weights to the AC cable, do not leave excess cable windings hanging, etc).

The inverter commissioning procedure is as follows:

- Close the DC disconnect switch to supply the inverter with the photovoltaic generator voltage. If the inverter is equipped with a DC disconnect switch (-S models), turn the DC disconnect switch **19** to the ON position.

- When the inverter is connected to the power supply, the display will show a guided configuration procedure. Press ENTER to set the following:

Inverter date and time
Grid standard and corresponding display language



Warning! The settings become fixed after 24 hours of operation of the inverter (the inverter simply has to be powered by PV generator).

- After you have set the grid standard, the message "Initializing...Please Wait" is displayed. Regardless of the input voltage value, the inverter displays various messages and changes the behaviour of the three LEDs **05**:

INPUT VOLTAGE	DISPLAYED MESSAGE	LED STATUS	DESCRIPTION
Vin < Vstart	Waiting sun	Green = FLASHING Yellow = OFF Red = OFF	The input voltage is not sufficient to enable connection to the grid.
Vin > Vstart	Vac Absent	Green = FLASHING Yellow = ON Red = OFF	The input voltage is sufficient to enable connection to the grid: the inverter waits for the grid voltage to be present to make the parallel connection.

The inverter is powered SOLELY by the voltage generated by the photovoltaic generator: the current in the attachment to the grid voltage is NOT SUFFICIENT to switch on the inverter on its own.

- With the inverter in the "Missing Grid" status, close the AC switch downstream of the inverter thus applying the grid voltage to the inverter: the inverter checks the grid voltage, measures the insulation resistance of the photovoltaic array with respect to ground and performs other auto-diagnostic tests. During the preliminary checks on the parallel connection with the grid, the green LED keeps flashing, the others are off.

During the check on the grid voltage and the measurement of the insulation resistance, the voltage, grid frequency and insulation resistance values measured by the inverter are displayed. The inverter ONLY creates a parallel connection with the grid if the grid and insulation resistance parameters fall within the ranges foreseen by current regulations.

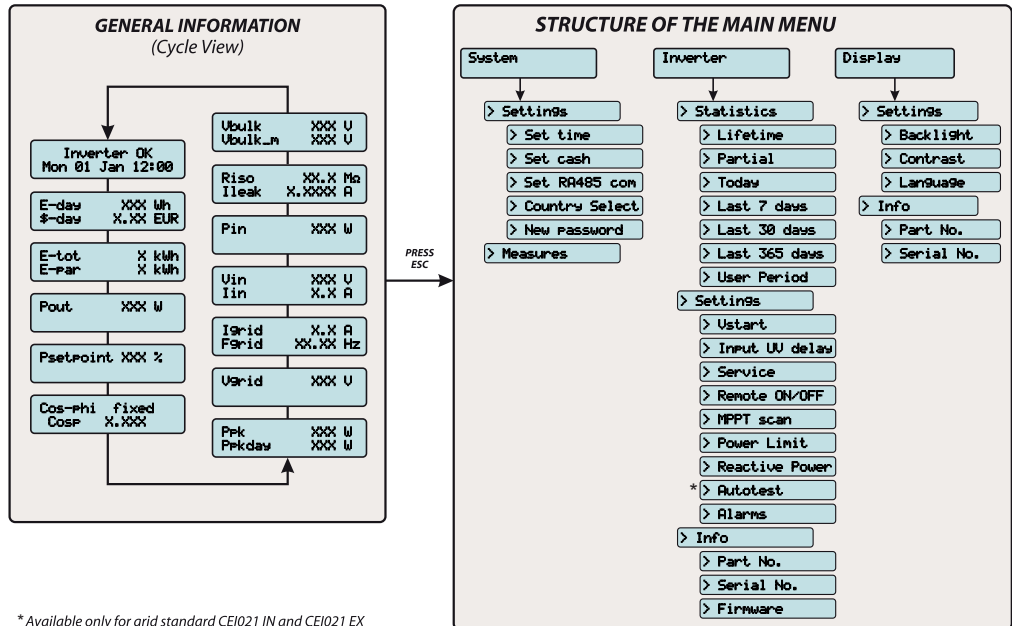
- If the outcome of the preliminary checks on the grid parallel is positive, the inverter connects to the grid and starts to export power to the grid. The green LED remains constantly lit while the others are off.

The ABB inverters are equipped with a graphic display **07**, consisting of 2 lines of 16 characters each, which can be used to:

- View the operating status of the inverter and the statistical data
- View service messages for the operator
- View alarm and fault messages
- Change the inverter settings

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 block scrolling on a screen so that it is constantly displayed.

Press **ESC** to access the main menu which is structured as follows:



* Available only for grid standard CEI021 IN and CEI021 EX

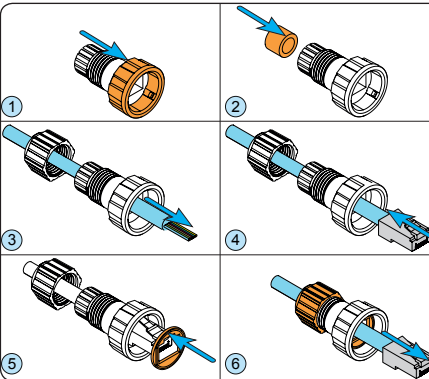
Refer to the manual for details regarding use and functions available in the menu.

Connection of the communication signals (RS485 line)

On the inverter there is a RS485 communication line for connecting the inverter to monitoring devices. The line may also be used to store settings with the dedicated advanced configuration software.

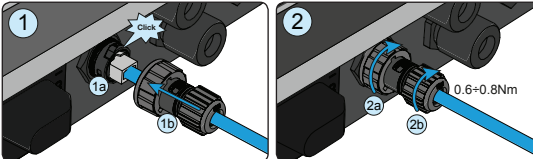
The connection of the serial communication cable must be made to the specific RS485 connector **19** present on the lower side of the inverter. An RJ45 connector must be installed on the cable and the connector in its turn must be placed in the specific corresponding part (provided) which allows the inverter to maintain its level of IP protection.

- Install the blocking ring nut on the connector body
- Install the gasket inside the connector body
- Feed the cable through the holding ring nut and the connector body
- Install the RJ45 connector on the cable and push it inside the connector body until it fits into place.
- Insert the gasket through the RJ45 connector and position it seated on the connector body
- Extract the cable from the corresponding part just enough to enable connection with the connector on the inverter.



At the end of the cable preparation stage, it is possible to proceed with connecting the communication line to the inverter.

- 1a. Install the cable on the RS485 connector on the inverter.
- 1b. Slide the corresponding part on to the cable until it is snug with the RS485 connector of the inverter. The insertion of the corresponding part is guided by reference points which enable its correct positioning.
- 2a. Turn the fixing ring nut until the two connectors are blocked and check the correctness of the installation.
- 2b. Turn the holding ring nut to a tightening torque of 0.6÷0.8Nm



Connection of the control signals

The connection of the control signals must be done on the specific signal terminal block **13** inside the inverter using a flat screwdriver as shown in the figure:

Each cable which must be connected to a signal terminal block **13** must pass through one of the three service cable glands **20**. Each cable gland (M20) can take a cable with diameter from 7 mm to 13 mm. 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 is available.

Warning! To ensure environmental protection rating IP65 it is necessary to tighten the cable gland with a torque of 2.5Nm

Use of the configurable relay

The inverter has a relay, the activation of which is configurable; it is possible to connect external devices which, depending on the mode selected on the dedicated menu (Inverter > Settings > Alarms > Set alarm type) can, for example, signal malfunctions. The operating modes that can be set are: Production, Alarm, Alarm Configurable, Crepuscular, Alarm Configurable Latch, Alarm Configurable ext, GoGo relay (Auto), GoGo relay (Slave).

The ALARM contact can only be used with systems which guarantee at least additional safety insulation (additional insulation in relation to the input DC voltage)

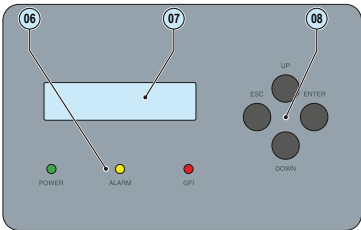
Use of the remote ON/OFF signal

The connection and disconnection of the inverter to and from the grid can be controlled through an external control. If the remote control function is operating, besides being dictated by the presence of the normal parameters that allow the inverter to connect to the grid, start-up of the inverter also depends on the state of the terminal **R+** compared to the terminal **R-** present on the connector **13**. When the **R+** signal is brought to the same potential as the **R-** signal (that is to say when a short-circuit is created between the two connector terminals) the inverter is disconnected from the grid.

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

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.

LEDs	POWER	GREEN	It lit if the inverter is working correctly. Flashes when checking the grid or if there is insufficient sunlight.
LEDs	ALARM	YELLOW	The inverter has detected an anomaly. The anomaly is shown on the display.
LEDs	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 in order 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 main menu or the submenu for the selected option (indicated by the > symbol) or to switch to the next digit to edit.

4.	UNO-2.0-TL-OUTD(-S)		UNO-3.0-TL-OUTD(-S)	UNO-3.6-TL-OUTD(-S)	UNO-4.2-TL-OUTD(-S)			
Characteristics and Technical Data	Input							
	Absolute maximum input voltage ($V_{max,abs}$)		600 V		850 V			
	Input start-up voltage (V_{start})		100...300 V (default 150 V)		300...600 V (default 380 V)			
	Operating DC input voltage range ($V_{domin}...V_{dcmx}$)		0.7xV _{start} ...580 V (min 80V)		350...820 V			
	Rated DC input voltage (V_{dc})		400 V		500 V	600 V		
	Input DC nominal power (P_{dc})		2200 W		3200 W	3900 W	4500 W	
	Number of Independent MPPT		1					
	DC Voltage MPPT interval ($V_{MPPT\ min} \dots V_{MPPT\ max}$) a P_{ac}		180...500 V		200...500 V		380...700 V	
	Maximum DC input current ($I_{dc\ max}$)		12.5 A		16.0 A		11.0 A	12.5 A
	Maximum return current (AC side vs. DC side)		< 5 mA				4.7 A	
	Maximum short circuit current ($I_{sc\ max}$)		15.0 A		20.0 A		15.0 A	15.0 A
	Number of DC connection pairs in input		1					
	DC connection type		Quick fit PV connector ⁽¹⁾					
	Type of photovoltaic panels that can be connected at input according to IEC 61730		Class A					
	Input protection							
	Reverse Polarity Protection		Yes, from current limited source					
	Input overvoltage protection - Varistors		Yes					
	Insulation check		Complying with the local standard					
	Characteristics of DC disconnect switch (version with DC disconnect switch)		600 V, 25A		1000 V, 16A			
	Output							
	AC grid connection type		Single phase					
	Nominal AC output power ($P_{ac@cos\phi=1}$)		2000 W		3000 W		3600 W	4200 W
	Maximum AC output power ($P_{ac,max@cos\phi=1}$)		2000 W		3000 W		3600 W	4200 W
	Maximum apparent power (S_{max})		2000 VA		3000 VA		3600 VA	4200 VA
	Nominal AC output voltage (V_{ac})		230 V					
	Output AC voltage range ($V_{ac,min}...V_{ac,max}$)		180...264 Vac ⁽²⁾					
	Maximum AC output current ($I_{ac\ max}$)		10.0 A		15.0 A		16.0 A	20.0 A
	Maximum fault current		18.3 A rms (20ms)		18.0 A		22.9 A rms (20ms)	
	Contribution to short-circuit current		12.0 A		17.0A		18.0A	22.0A
	Inrush current		Negligible					
	Nominal output frequency (f)		50 Hz / 60 Hz					
	Output frequency range ($f_{min}...f_{max}$)		47...53 / 57...63 Hz ⁽³⁾					
	Nominal power factor and adjustability interval		> 0.995, adj. ±0.8 with max S _{max}					
	Total current harmonic distortion		<3%					
	AC connections type		Female connector from panel					
Output Protection								
Anti-islanding protection		Complying with the local regulations						
Maximum AC overcurrent protection		16.0 A		20.0 A		20.0 A	25.0 A	
Output overvoltage protection - Varistor		2 (L - N / L - PE)						
Operating Performance								
Maximum efficiency (η_{max})		97.3%		98.4%				
Weighted efficiency (EURO/CEC)		96% / -		97.5% / -				
Power supply threshold		8.0 W						
Night-time consumption		< 0.1W						
Communication								
Remote monitoring		VSN300 Wifi Logger Card (opt.), VSN700 Data Logger (opt.)						
Wireless local monitoring		VSN300 Wifi Logger Card (opt.)						
User interface		Display LCD with 16 characters x 2 lines						
Wired Local Monitoring		PVI-USB-RS232 485 (opt.)						
Environmental								
Ambient temperature		-25...+60°C / -13...140°F with derating above 45°C / 113°F		-20...+60°C / -4...140°F with derating above 45°C / 113°F				
Relative Humidity		0...100% condensing						
Typical noise emission pressure		50 dB(A) @ 1 m						
Maximum operating altitude without derating		2000 m / 6560 ft						
External environment pollution rating		3						
Environmental class		Outdoor						
Physical								
Degree of environmental protection		IP 65						
Cooling system		Natural						
Dimensions (H x W x D)		553mm x 418mm x 175mm / 21.8" x 16.5" x 6.9"						
Weight		12 kg / 26.5 lb						
Assembly system		Wall bracket						
Overvoltage rating compliant with IEC 62109-1		II (DC input) III (AC output)						
Safety								
Insulation level		Without insulation transformer (TL)						
Marking		CE (50Hz only)						
Safety class		I						
1. Refer to the document "String inverter – Product Manual appendix" available at www.abb.com/solarinverters to know the brand and the model of the quick fit connector								
2. The output voltage range may vary according to the grid standard of the country of installation								
3. The output frequency range may vary according to the grid standard of the country of installation								
Note. Features not specifically mentioned in this data sheet are not included in the product								

1. Refer to the document "String inverter – Product Manual appendix" available at www.abb.com/solarinverters to know the brand and the model of the quick fit connector

2. The output voltage range may vary according to the grid standard of the country of installation

3. The output frequency range may vary according to the grid standard of the country of installation

Note. Features not specifically mentioned in this data sheet are not included in the product

Contact us

www.abb.com/solarinverters

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