

ABB solar inverter

Quick Installation Guide

UNO-DM-6.0-TL-PLUS

(6.0 kW)

EN



**APPLY HERE
THE WIRELESS
IDENTIFICATION LABEL**

In addition to the information given below, it is mandatory to read and observe the safety information and installation instructions shown in the installation manual. The technical documentation and the interface and management software for the product are available on the website. The equipment must be used in accordance to what is described in this Quick Installation Guide. Otherwise, the protections guaranteed by the inverter may be affected.



3. Transportation and relocation

The transportation of the device, in particular via land transportation, must be made with adequate means and ways to protect the parts from violent impacts, humidity, vibrations, etc.

Lifting

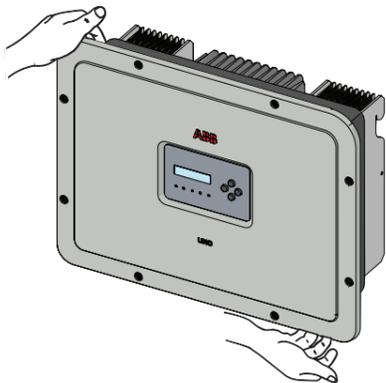
The means used for lifting must be suitable to bear the weight of the equipment. Weight of the equipment components

Model	Weight
All models	20.5 kg / 45.2 lb

Unpacking and inspection

The packaging components must be removed and disposed of according to the applicable regulations of the country where the device is installed. Upon opening the packaging, check the integrity of the equipment and verify that all the components are present. If you notice defects or deterioration, stop the operations and call the carrier, as well as inform ABB Service immediately.

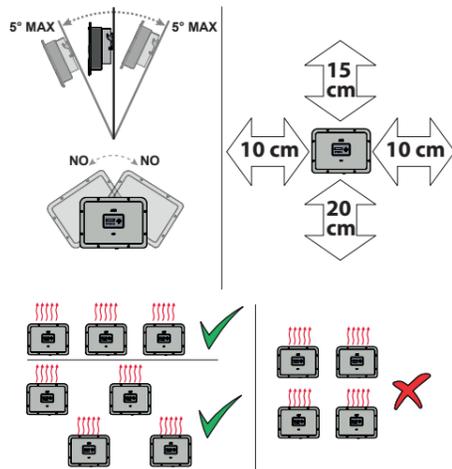
Please keep the packaging in the event it has to be returned; the use of inadequate packaging will void the warranty. Always store the Quick Installation Guide, all the supplied accessories and the AC connector cover in a safe place.



4. Place and position of installation

Refer to the technical data for the verification of the environmental conditions to be met.

- Do not install the inverter where it is exposed to direct sunlight. If necessary, use protection that minimizes the exposure, especially for ambient temperatures above 40°C/104°F.
- Do not install in small unventilated spaces where the air cannot circulate freely.
- Always ensure that the airflow around the inverter is not blocked to prevent overheating.
- Do not install near flammable substances (minimum distance 3 m/10 ft).
- Do not install on wooden walls or other flammable substances.
- Do not install inside residential premises or where a prolonged presence of people or animals is planned, due to the acoustic noise that the inverter produces during operation. The noise emission value is strongly influenced by the installation location (e.g. type of surfaces around the inverter, general properties of the room, etc.) and the quality of electricity supply.
- Install on a solid wall or structure that is suitable to support the weight of the equipment.
- Install in an upright position with a maximum inclination as shown in the figure.
- Respect the minimum distances indicated. Choose a location that allows enough space around the unit to allow easy installation and removal of the equipment from the mounting surface.
- Where possible, install at eye level for easy viewing of the display and the LEDs.
- Install at a height that takes into account the weight of the equipment.
- When installing multiple inverters, position the inverters side by side while maintaining the minimum distances (measured from the outer edge of the inverter); if the space available does not allow this provision, position the inverters in a staggered layout, as indicated in the figure, in order to make sure that the heat dissipation is not affected by the other inverters.
- All installations at altitudes above 2,000 m/6,500' must be assessed on a case by case basis with ABB Service to determine the proper derating of the input parameters.

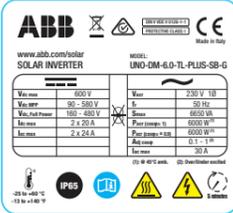


The final installation of the inverter must not compromise the access to any disconnection devices located outside. Refer to the warranty conditions to evaluate the possible exclusions related to an improper installation.

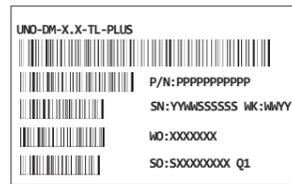
Components supplied with the inverter	Quantity	Components supplied with the inverter	Quantity
Bracket for wall fixing	1	(Spare part) T20 screw for front cover	1
M25 Cable glands	1	M5x10 screw for the external ground connection	1
Wireless antenna	1	M5 contact washers for the external ground connection	2
Cable with faston isolated for the configuration of the input channels in parallel	1 + 1	T20 Wall bracket locking screw (to be used when lock springs are missing)	2
		Technical documentation	1

Supplied component list

The labels on the inverter show the markings, main technical data and the identification of the equipment and of the manufacturer. The below labels are intended as example only: in fact other models are available.



Regulatory Label



Product Label (In case of a service password request, it is necessary to have the serial number available (SN: YYYWSSSSSS))



Wireless Identification Label (The label is divided in two separate parts by a dashed line; take the bottom part and apply it on the cover of this quick installation guide)

The labels on the equipment absolutely MUST NOT be removed, damaged, dirtied, hidden, etc.

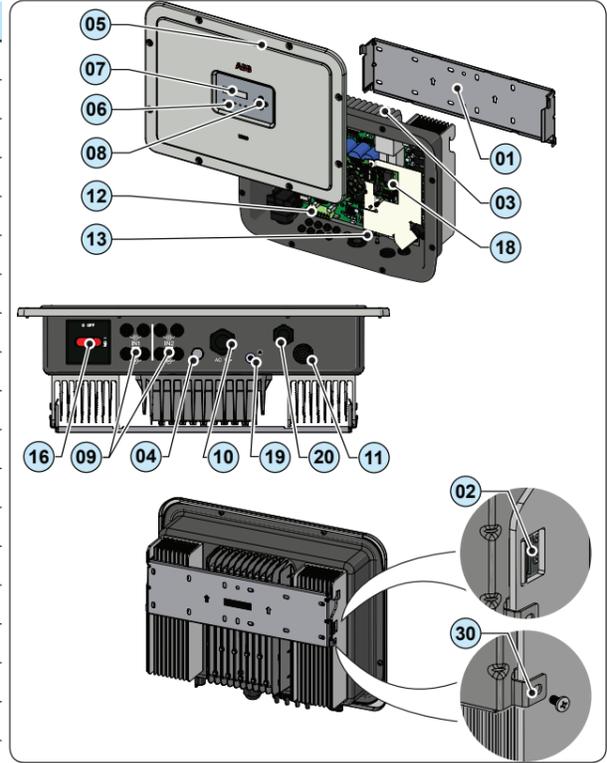
In the manual, and/or in some cases on the equipment, the danger or attention zones are indicated by signs, labels, symbols or icons.

Obligation to consult the manual	General warning - Important safety information	Dangerous voltage	Hot parts
Degree of protection of the device	Temperature interval	Without isolating transformer	Direct and alternating current respectively
Positive and negative pole of the input voltage (DC)	Obligation to use protective clothing and/or personal protective equipment	Point of connection of the protective ground	Discharge time of the stored energy

The following variants are available (suffix could be combined):

- Models with "B" suffix (e.g. UNO-DM-6.0-TL-PLUS-B). Models equipped with Wireless communication.
- Models with "S" suffix (e.g. UNO-DM-6.0-TL-PLUS-S). Models equipped with DC disconnecting switch.
- Models with "E" suffix (e.g. UNO-DM-6.0-TL-PLUS-E). Models equipped with Wireless communication and Accessory Board equipped with Ethernet board (UNO-DM-PLUS-COM Ethernet KIT).
- Models with "X" suffix (e.g. UNO-DM-6.0-TL-PLUS-X). Models equipped with Accessory Board (UNO-DM-COM KIT).
- Models with "G" suffix (e.g. UNO-DM-6.0-TL-PLUS-G). Models equipped with AC connection with cable gland and terminal block.

Main components	
01	Bracket
02	Lock spring (where present)
03	Heatsink
04	Anti-condensation valve
05	Front Cover
06	LED panel
07	Display
08	Keypad
09	DC Input Connectors
10	AC cable gland
11	Wireless antenna connector
12	DC Input terminal block
13	AC Output terminal block
16	DC disconnect switch (only -S models)
18	UNO-DM-COM KIT or UNO-DM-PLUS Ethernet COM kit board (optional)
19	External ground connection
20	Service cable gland
30	Locking Screw



3.

Lifting and transportation

4.

Choice of the place of installation

5.

Supplied component list

6.

Assembly instructions

7.

Opening the cover

8.

Input connection (DC) and input configurations

Do not open the inverter in case of rain, snow or high humidity (>95%). During the installation, do not place the inverter with the front cover facing the ground.

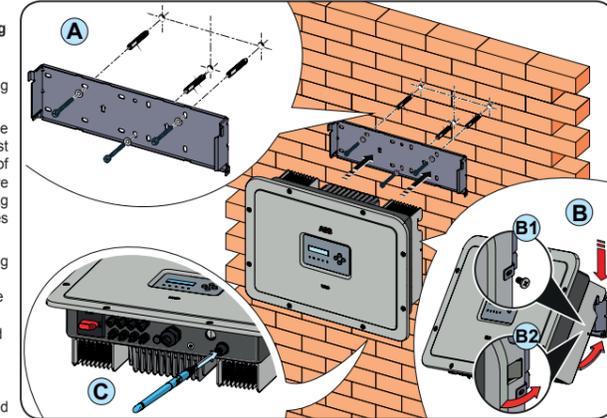
Install the inverter by following this procedure:

- Place the bracket level on the wall and use it as a drilling template.

- The selection of the appropriate number and distribution of the anchors is the responsibility of the installer. The choice must be made according to the type of wall, frame or other type of support, and should be sized considering a total load of more than 4 times the weight of the inverter (total 4x20.5=82 kg total). Depending on the type of anchor chosen, drill the holes required for the fixing of the bracket (Figure 6).

- Carefully lift the inverter and hook it onto the bracket by inserting the two supports in the slots on the inverter (Figure 6).
- Proceed to anchor the inverter to the bracket by installing the two (one each side) locking screws (Figure 6).
- If on the bracket are present the lateral lock springs, proceed to lock the inverter by pressing the lower part toward the wall or structure until the two springs on the bracket set the inverter in position (Figure 6).

- Install wireless antenna by screwing it into the dedicated connector located on the bottom part of inverter (Figure 6).

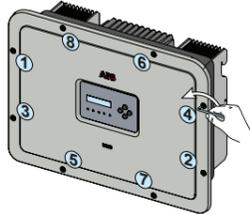


WARNING! ELECTRIC SHOCK HAZARD! Hazardous voltages may be present inside the inverter. The access to the internal zones of the inverter must be carried out after a minimum waiting time of 5 minutes since the inverter was disconnected from the grid and from the photovoltaic generator.

- The main connections are made on the lower part (outside) of the inverter. To install the accessories and make the necessary connections, unscrew the 8 screws using a TORX T20 key and open the front cover, while removing the screws, pay special attention since additional screws are not supplied.

Caution! It is necessary to hold the front cover during the removal of screws to avoid the cover falling (the front cover is not secured to the inverter's chassis).

- After making the connections, close the cover by tightening the 8 screws on the front, while respecting the sequence and tightening torque (2.5 Nm).



Check the correct polarity of the input strings and the absence of earth leakages of the PV generator. When the PV panels are exposed to sunlight, they provide a continuous voltage (DC) to the inverter. Access to the internal inverter zones must be carried out with the equipment disconnected from the grid and from the PV generator.

Caution! The inverters referred to in this document are WITHOUT AN ISOLATION TRANSFORMER (transformer-less). This type involves the use of PV panels of an isolated type (IEC61730 Class A Rating) and the need to maintain the PV generator floating with respect to earth; no generator pole must be connected to the ground.

If multiple strings are connected to the same input, they must have the same type and number of panels in series. ABB also recommend they have the same orientation and inclination.

Observe the maximum input current with respect to quick-coupling connectors. Refer to "String inverters - Product manual appendix" document available on the site www.abb.com/solarinverters, to find out the make and model of the quick-coupling connector used on the inverter. Depending on the model of the connectors installed on your inverter, it will be necessary to use the same model for the corresponding counterparts (by checking the manufacturer's website or via ABB for the compliant counterpart).

The use of non-compliant counterparts with respect to the quick-coupling connectors models present on the inverter, may cause serious damage to the unit and result in the immediate loss of warranty.

- Connect the DC input, always checking the tightness of the connectors.

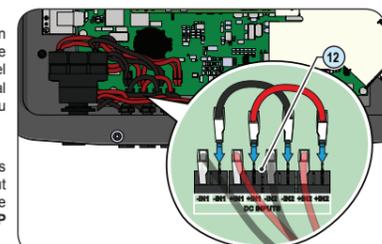
- Versions of the inverter which are equipped with two independent input channels (i.e. dual maximum power point tracker, MPPT), can be configured as parallel (i.e. single MPPT).

Configuring Input Mode to Independent (default configuration)

This configuration is set at the factory and involves the use of the two input channels (MPPT) in an independent mode. This means that the jumpers (supplied) between the positive and negative poles of the two DC input channels **must not be installed**, and that the independent channel mode should be set during the commissioning phase, in the dedicated section of the internal webserver "SETTINGS > SETUP DC SIDE > INPUT MODE" or through the inverter display menu "SETTINGS > INPUT MODE".

Configuring Input Mode to Parallel

This configuration involves the use of the two input channels (MPPT) connected in parallel. This means that the jumpers (supplied) between the positive and negative poles of the two DC input channels **must be installed**, and that the parallel channel mode should be set during the commissioning phase, in the dedicated section of the internal webserver "SETTINGS > SETUP DC SIDE > INPUT MODE" or through the inverter display menu "SETTINGS > INPUT MODE".



Protection switch under load (AC switch) and sizing of the line cable
To protect the AC connection line of the inverter, we recommend the installation of a protection device against overcurrent and earth leakages with the following features:

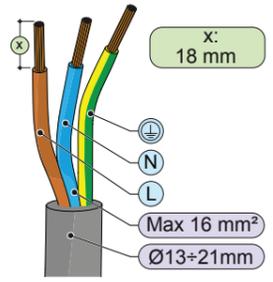
UNO-DM-6.0-TL-PLUS	
Type	Circuit breaker with differential magnetic-thermal protection
Nominal voltage	230 Vac
Nominal current	40.0 A
Magnetic protection feature	B/C
Number of poles	2
Type of differential protection	A/AC
Differential sensitivity	300 mA

ABB declares that the ABB high frequency inverter without a transformer are not manufactured to inject continuous currents of ground fault, and therefore, the differential installed downstream of the inverter, type B according to IEC 60755/A 2, is not required.

Characteristics and sizing of the line cable
The cable should be three-pole. The section of the AC line conductor must be sized in order to avoid unwanted disconnections of the inverter from the distribution network due to high impedances of the line that connects the inverter to the point of supply of electricity.

Line conductor cross-section	Maximum length of the line conductor (m)
4 mm ²	8 m
6 mm ²	12 m
10 mm ²	20 m
16 mm ²	30 m

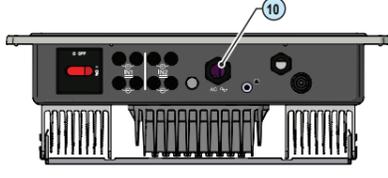
The values are calculated in nominal power condition considering:
1. a power loss along the line of not more than 1%.
2. copper cable used, with HEPR rubber insulation and placed in open air



Caution! Before performing the operations described below, make sure that you have properly disconnected the AC line downstream of the inverter!

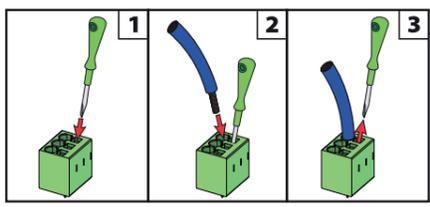
For the grid connection of the inverter, 3 connections are needed: ground, neutral and phase. In any case, the earth connection of the inverter is mandatory. The connection of the network cable to the inverter is performed by means of the AC cable gland (10) and the dedicated AC output terminal block (13), by doing the following:

- Strip 18 mm of sheathing from the AC grid connection cables
- Plug the AC line cable into the inverter, passing it through the AC cable gland (10)



The procedure for opening the contacts of AC output terminal block (13) and tightening cables is as follows:

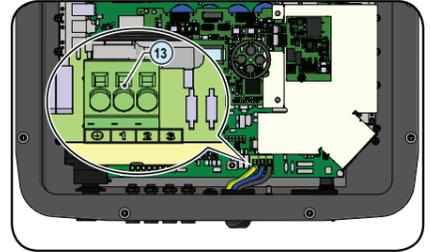
- 1) Insert a flat screwdriver in the slot behind the contacts until the clamp opens.
- 2) Insert the cable in the clamp with the screwdriver inserted in the slot.
- 3) Remove the screwdriver and check the tightness.



- Connect the protective earth (yellow-green) cable to the contact labelled with the symbol on the terminal block (13)

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 number 1
- Connect the phase cable to the terminal labelled with the number 2

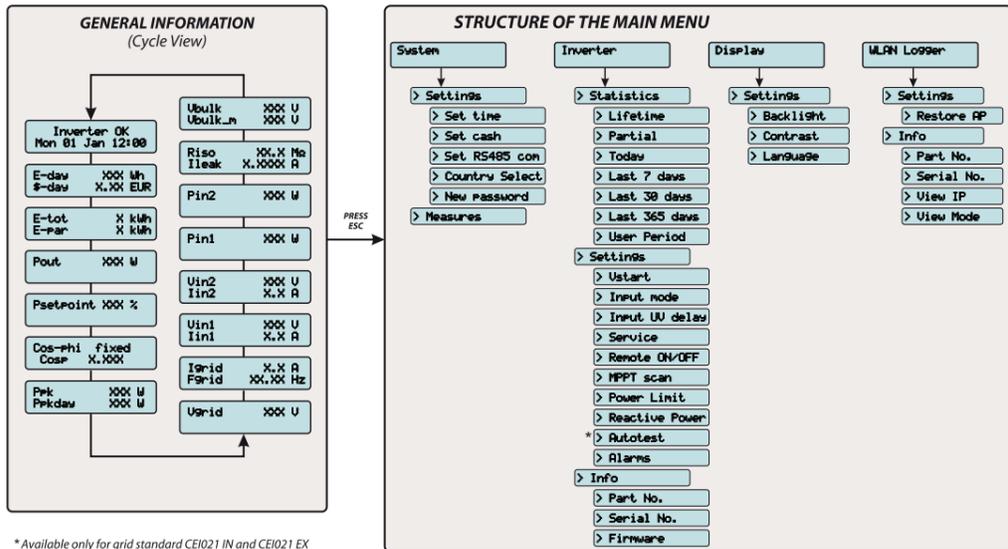


Once the connection to the terminal block (13) is complete, screw in the cable gland firmly (tightening torque 5.0Nm) and check the tightness.

The ABB inverters are equipped with a 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 automatic scrolling on a screen so that it is locked to this screen.

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



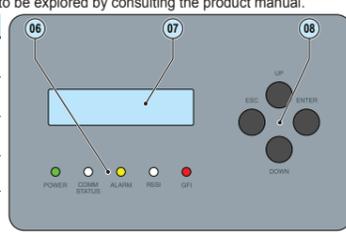
Display menu may differ from previous structure depending on firmware installed in the inverter. Firmware version can be displayed accessing to the display menu **Inverter > Info > Firmware**.

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

UNO-DM-6.0-TL-PLUS	
Input	
Absolute maximum input voltage (V _{max,abs})	600 V
Input activation voltage (V _{start})	200 V (adj. 120...350V)
DC input voltage operating range (V _{dc,min} ...V _{dc,max})	0.7xV _{start} ...580 V (min 90 V)
Rated input DC voltage (V _{dc,r})	360 V
Rated input DC power (P _{dc,r})	6200 W
Number of independent MPPTs	2
Maximum input power for each MPPT (P _{MPPT,max})	4000 W
DC input voltage range (V _{MPPT,min} ...V _{MPPT,max}) with parallel configuration of MPPT at P _{dc,r}	160...480 V
Numbe DC power limitation with parallel configuration of MPPT	Linear derating from Max to 500W [480V/5VMPPT/580V]
DC power limitation for each MPPT with independent configuration of MPPT	4000 W [220V/5VMPPT/480V]
at P _{dc,r} max unbalance example	the other channel: P _{dc,r} 4000W [120V/5VMPPT/480V]
Maximum DC input current (I _{dc,max}) / for each MPPT (I _{MPPT,max})	40.0 A / 20.0 A
Maximum return current (AC side vs DC side)	< 5 mA (In the event of a fault, limited by the external protection on the AC circuit)
Maximum short circuit current (I _{sc,max}) / for each MPPT	50.0 A / 25.0 A
Number of input DC connection pairs for each MPPT	2
DC connection type	Quick fit PV connector (1)
Type of PV panels connected in input in accordance with Standard IEC 61730	Class A
Input protection	
Reverse polarity protection	Yes, from a current limited source
Input overvoltage protection for each MPPT- Varistors	Yes
Photovoltaic array insulation control	According to local standard
DC disconnect switch characteristics (version with DC disconnect switch)	600 V / 25.0 A

LEDs (06)		
POWER	Green	Solid when the inverter is working correctly. Flashes when checking the grid or if there is insufficient sunlight.
COMM STATUS	Multicolor	Operation status of wireless communication line.
ALARM	Yellow	The inverter has detected an anomaly. The anomaly is shown on the "EVENTS" section of the internal webserver and on the display.
RSSI	Multicolor	Quality of the wireless communication signal.
GFI	Red	Ground fault on the DC side of the PV generator. The error is shown on the "EVENTS" section of the internal webserver and on the display.

Keys (08)	
ESC	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	Used to scroll upwards the menu options or to shift the numerical scale in ascending order.
DOWN	Used to scroll downwards through the menu options or to shift the numerical scale in descending order.
ENTER	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.



Before proceeding with commissioning, make sure you have carried out all the operations and checks indicated in the previous sections of this quick installation guides, and verify that the inverter cover (05) was properly closed!

Commissioning and configuration of the inverter can be made using a wireless capable device such as a smartphone, tablet or laptop. The steps for commissioning are listed below:

1. Set the inverter's DC disconnect switch (19) (for -S version) or any external DC switches to "ON" position: If the input voltage applied to one of the two input channels is greater than the minimum starting voltage, the inverter will start up. **The inverter is powered ONLY by the voltage coming from the photovoltaic generator: the presence of grid voltage alone IS NOT SUFFICIENT to allow the inverter to power up.**
2. Enable Wireless on the device that is being used for the inverter commissioning (tablet, smartphone or PC) and connect it to the Access Point created by the inverter: a network with the name **ABB-XX-XX-XX-XX-XX-XX** will appear in the list of networks, where "X" is a hex digit of the MAC address (MAC address can be found on the "Wireless Identification Label" placed on the side of the inverter or previously applied to this quick installation guide - see cover page).
3. When prompted, type the "product key" (including the dashes. Example: 1234-1234-1234) as the network password to access the inverter's access point. The product key is printed on the "wireless identification label" on the side of the inverter.
4. Open the internet browser (recommended browser: Chrome versions from v.55, Firefox versions from v.50, Safari versions from v.10.2.1) and enter the pre-set IP address to access the configuration wizard page: **192.168.117.1**
5. A configuration wizard will open, consisting of a sequence of steps in which all the required fields must be completed correctly (language of the wizard can be selected in the upper status bar). The steps and information required by the configuration wizard are:

STEP 1 - Set the Administrator/User login credentials (minimum 8 character for password). User and password are CASE SENSITIVE.

STEP 2 (OPTIONAL) - Enter the required information (IP selection mode, SSID and Password) to connect the inverter to the residential wireless network with "Station Mode" (*Note: This step can be skipped to continue operating with the point-to-point connection "AP mode"*). Once the inverter is connected to the wireless network, a new message will provide you the IP Address assigned by the router to the inverter that can be used each time you want to access the internal webserver. **TAKE NOTE OF IT.**

STEP 3 - Set the Date, Time and Time zone (The inverter will propose these fields when available).

STEP 4 - Set the inverter country standard, Input channel configuration and Meter configuration (if installed). Clicking the "END" button the wizard will be completed (after confirmation the inverter will reboot).

From the moment that the grid standard is set, you have 24 hours to make any changes to the value, after which the "Country Select" functionality is blocked and the remaining time will have to be reset in order to have the 24 hours of operation available again. To select a new grid standard follow the procedure "Resetting the remaining time for grid standard variation" described in the product manual.

6. Set the external AC disconnect switch downstream to the inverter to "ON" position. Once both AC and DC switches are closed and the wizard commissioning procedure is finished, the inverter starts the grid connection sequence: 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 "Power" LED keeps flashing, the "Alarm" and "GFI" LEDs are off. If there is not sufficient sunlight to connect to the grid, the inverter will repeat the connection procedure until all the parameters are within range.

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. The "Power" LED remains fixed on while the "Alarm" and "GFI" LEDs are off

Refer to the product manual for further information about the configuration and the use of the functionality of the internal Webserver. Commissioning and configuration of the inverter can also be done with the display (07). Consult the product manual for more information.

UNO-DM-6.0-TL-PLUS	
Output	
AC connection type	Single phase
Nominal output AC power (P _{ac,nom})	6000 W
Maximum output AC power (P _{ac,max})	6000 W
Maximum apparent power (S _{max})	6650 VA
Nominal output AC voltage (V _{ac,n})	230 V
Output AC voltage range (V _{ac,min} ...V _{ac,max})	180...264 Vac (1)
Maximum AC output current (I _{ac,max})	30.0 A
Maximum fault current	<40 A rms (100 ms)
Short circuit current contribution	40.0 A
Inrush current	Negligible
Nominal output frequency (f)	50 / 60 Hz (4)
Output frequency range (f _{min} ...f _{max})	47...53 / 57...63 Hz (4)
Nominal power factor and adjustability interval	> 0.995; 0.1 - 1 Over/Under excited
Total harmonic current distortion	< 3.5%
AC connections type	Screw terminal block, Cable Gland M32
Output Protection	
Anti-islanding protection	According to local standard
Maximum external AC overcurrent protection	40.0 A
Output overvoltage protection - Varistor	2 (L - N / L - PE)
Operational Performances	
Maximum efficiency (η _{max})	97.4%
Weighted efficiency (EURO/CEC)	97.0% / -
Power threshold of the power	8.0 W
Nighttime consumption	< 0.4 W
Communication	
Embedded Communication Interface	Wireless (4)
Embedded Communication Protocol	ModBus TCP (SunSpec)
Commissioning tool	Web user interface, Display, Aurora Manager Lite
Firmware Update Capabilities	Locally and remotely
Monitoring	Plant Portfolio Manager, Plant Viewer, Plant Viewer for Mobile (7)
Optional board UNO-DM-COM kit	RS485 (use with meter for dynamic feed-in control), Alarm/Load manager relay, Remote ON/OFF
Optional Communication protocol	ModBus RTU (SunSpec), Aurora Protocol
Optional board UNO-DM-PLUS Ethernet COM kit	Ethernet, RS485 (use with meter for dynamic feed-in control), Alarm/Load manager relay, Remote ON/OFF
Optional Communication protocol	ModBus TCP (SunSpec), ModBus RTU (SunSpec), Aurora Protocol
Environmental	
Ambient temperature range	-25...+60°C / -13...140°F
Ambient temperature derating	above 45°C/113°F
Relative humidity	0...100% condensing
Typical noise emission pressure	< 50 dB(A) @ 1 m (10)
Maximum operating altitude without derating	2000 m/6560 ft
Classification of environmental pollution degree for the external environment	3
Environmental category	Outdoor
Physical	
Environmental protection degree	IP 65
Cooling system	Natural
Dimensions (H x W x D)	418 mm x 553 mm x 180 mm/16.5" x 21.8" x 7.1"
Weight	20.5 kg / 45.2 lb
Mounting system	Wall brackets
Overvoltage category in conformity with IEC 62109-1	II (DC input) III (AC output)
Safety	
Isolation level	Transformerless (TL)
Certifications	CE, RCM
Safety class	I
Safety and EMC standard	EN 50178, IEC/EN 62109-1, IEC/EN 62109-2, AS/NZS 3100, EN 61000-6-1, EN 61000-6-3, EN 61000-3-11, EN 61000-3-12
Grid standard (8) (check your sales channel for availability)	CEI 0-21, DIN V VDE V 0126-1-1, G59/3, EN 50438 (not for all national appendices), RD 1699, ITC-BT-40, AS 4777, C10/11, IEC 61727, IEC 62116

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 AC voltage range may vary depending on specific country grid standard.
3. The AC voltage range may vary depending on specific country grid standard. CE, 50Hz only.
4. As per IEC 60211 b/g/n standard.
5. Available for custom version only.
6. Plant Viewer per Mobile available remotely only, not for local commissioning.
7. Further grid standard will be added, please refer to ABB Solar page for further details.
8. @ Pure sine wave condition.
Note: The features that are not specifically mentioned in this data sheet are not included in the product

Contact us
www.abb.com/solarinverters
UNO-DM-6.0-TL-PLUS-Quick Installation Guide EN-RevB
EFFECTIVE 01-02-2018
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