

ABB solar inverters

Quick installation guide
UNO-DM-6.0-TL-PLUS-US
(6.0 kW)

EN



Before starting installation, download the product manual from www.abb.com/solarinverters. Choose the correct country, string inverters, single phase, choose the product and proceed to the "download" section. Read and follow all safety and installation instructions to avoid disabling any safety features or making the warranty invalid.



1. Labels and Symbols

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS -- KEEP IN A SAFE PLACE!

The installer must read this document in its entirety before installing or commissioning this equipment.
For more detailed information regarding proper installation and use of this product, refer to the product manual located at www.abb.com/solarinverters. The labels on the inverter have the markings, main technical data and identification of the equipment and manufacturer. The technical data shown in this quick installation guide does not replace that shown on the labels attached to the equipment.

Symbols used in the guide and on the products

	These are nationally recognized test laboratory marks showing certification to UL 1741 and CSA C22 No. 107.1		Phase
	Hazardous voltage		Direct and alternating currents, respectively
	General warning - Important safety information		Positive pole and negative pole of the input voltage (DC)
	Hot surfaces		Stored energy discharge time
	System earth conductor (main grounding protective earth, PE)		Consult product manual
	Equipment Grounding Conductor (EGC)		

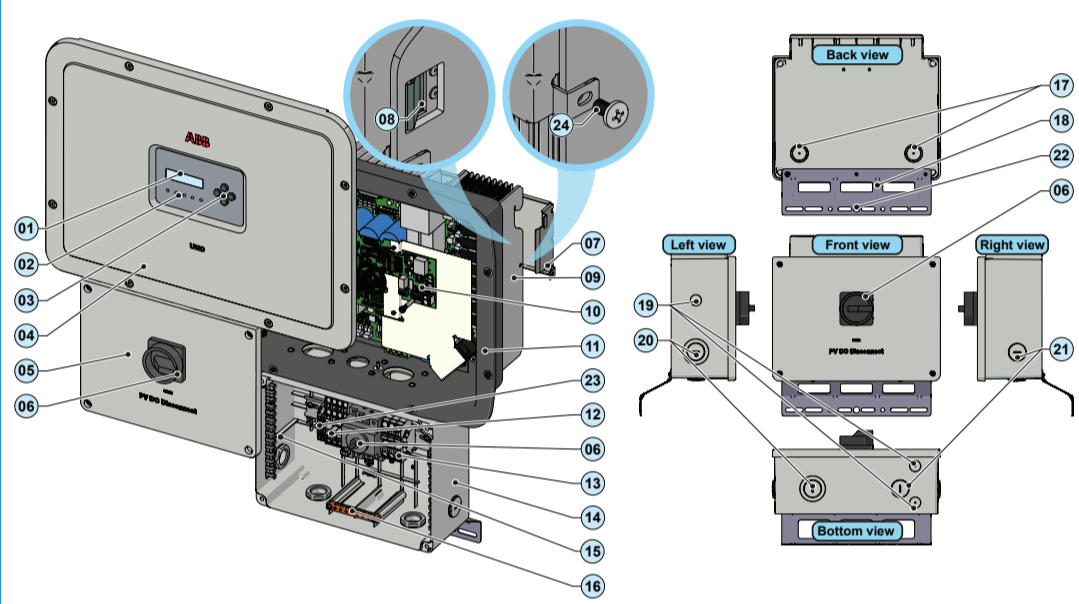
- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2. Inverter Models and Components

This installation guide covers the inverter model UNO-DM-6.0-TL-PLUS-US (6 kW).

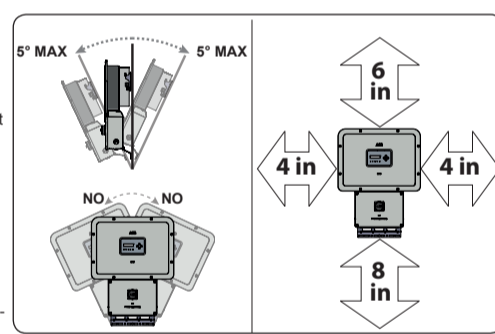
Main components

01 Display	07 Wall bracket	13 AC output terminal blocks	19 1/2" communication conduit drill out
02 LED panel	08 Lock spring (where present)	14 Wiring box	20 Markings for 3/4" or 1" conduit drill outs
03 Keypad	09 Heatsink	15 Wi-Fi antenna (-B models only)	21 Opening for 3/4" AC conduit
04 Inverter front cover	10 UNO-DM-PLUS Ethernet COM KIT or UNO-DM-COM KIT board (optional)	16 Protective Earth (PE) connection point	22 Lock screw position
05 Wiring box front cover	11 Inverter	17 Conduit drill out sizes 3/4", 1" (drill out markings on back side)	23 Power supply for rapid shutdown (RSD) terminal blocks
06 DC disconnect switch	12 DC input terminal blocks (two MPPT)	18 lower flange	24 Locking Screw



3. Installation location

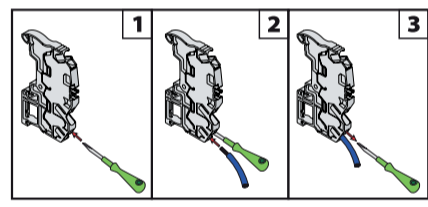
- Installation site and position**
- Refer Datasheet/Manual to confirm that the environmental specifications have been met
 - Do not install the inverter in full sun. If needed, use a sun shade to minimize solar irradiation, especially for temperatures over 104°F/40°C.
 - Do not install in closed spaces where air does not circulate freely
 - Always ensure that the flow of air around the inverter is not blocked, so as to prevent overheating.
 - Do not install the equipment near flammable substances (minimum distance: 10 ft).
 - Do not install the equipment on wooden walls or other flammable substances.
 - Do not install in inhabited rooms or where the prolonged presence of people or animals is expected, because of the inverter's noise level during operation. The sound level is heavily influenced by its location (for example, the surface around the inverter, the environment, etc.) and grid quality.
 - Install on a wall or strong structure capable of bearing weight
 - Install vertically with a maximum inclination as indicated in the figure
 - Maintain minimum clearance from objects blocking air circulation and spacing between inverter as indicated in the figures
 - Ensure sufficient working area in front of the inverter for wiring box access
 - If possible, install at eye level so that the display and LEDs can be seen easily
 - Install at a height that takes account of the weight of the equipment
 - Position multiple inverters side-by-side, maintaining minimum clearances (measured from the outermost edge of the inverter)
 - Multiple inverters can also be placed in a staggered arrangement. Minimum clearances for staggered arrangements include width of the inverter cover plus additional allowances for inverters arranged above or below
 - All installations over 6500' high (2,000 meters) must be assessed by ABB Technical Sales to determine the proper datasheet derating



Do not block access to the external AC and DC disconnects. Please refer to the warranty terms and conditions and avoid voiding the warranty with improper installation.

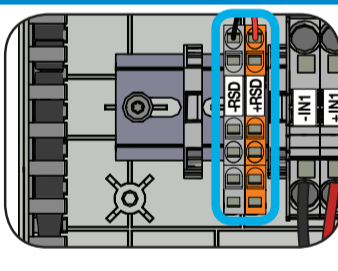
5. Clamps terminal use

- All power conductors will be inserted in spring clamp terminals.
- The figure shows an example of how to make the wire connection:
- 1) Insert a small flat screwdriver in the slot and lightly press the screwdriver from top to bottom; insert the screwdriver until the spring opens.
 - 2) Insert the cable in the spring clamp.
 - 3) Remove the screwdriver.
 - 4) When connections are complete, give each wire a pull test



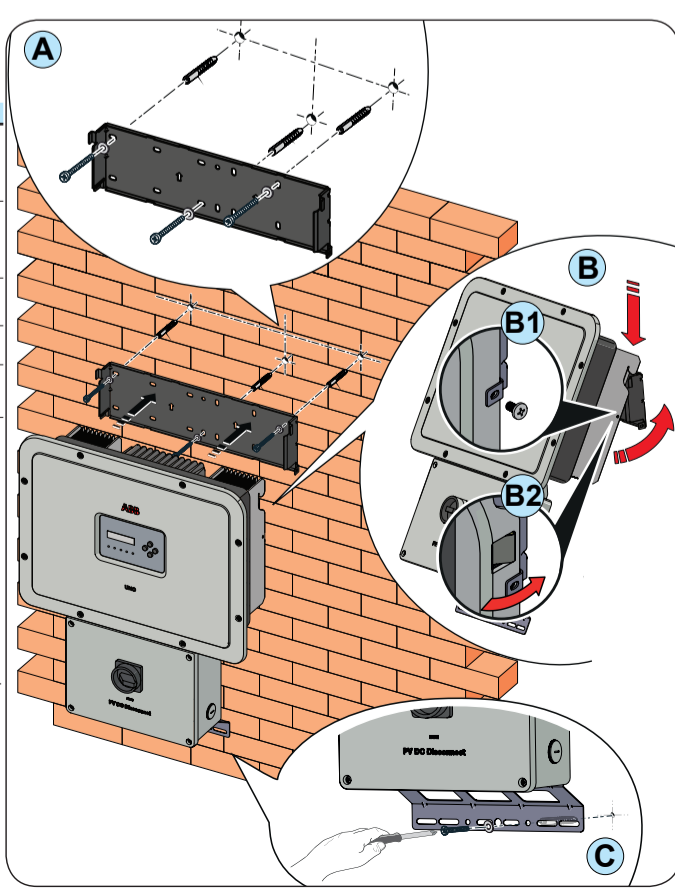
6. Rapid Shutdown

- NOTE: If a RSD device was installed into the plant, it also will need to connect the AC grid to allow the inverter to power-up!**
- The installer must use an external rapid shutdown device compliant with the 2014 NEC. Automatic shutdown occurs at the rooftop box when utility power is lost or when the PV system's AC disconnect switch is opened. In jurisdictions requiring a dedicated activation switch, install an emergency stop button external to the inverter.
- The wiring box has 24Vdc (0.4A max) on a spring-loaded terminal block to the left of the PV input area, which is designed to be used to power a RSD device.
- RSD wiring terminals accommodate a wire size range of 26-12 AWG.
- Install RSD device wires in the RSD terminal block;
 - +24V wire to +RSD terminal, - 24V wire to - RSD terminal



4. Mounting instructions

- Mount the inverter following the step-by-step procedure below.
- Do not remove the inverter chassis cover in adverse weather conditions (e.g. rain, snow) or during periods of high humidity (>95%).**
- | Components included in mounting kit | Q.TY |
|---------------------------------------------------------------------------|-------|
| Wall bracket | 1 |
| T20 Wall bracket locking screw (to be used when lock springs are missing) | 2 |
| (Spare part) T20 screw for front cover | 1 |
| Jumpers for configuring paralleled inputs. | 1 + 1 |
| Quick installation guide (QIG) | 1 |

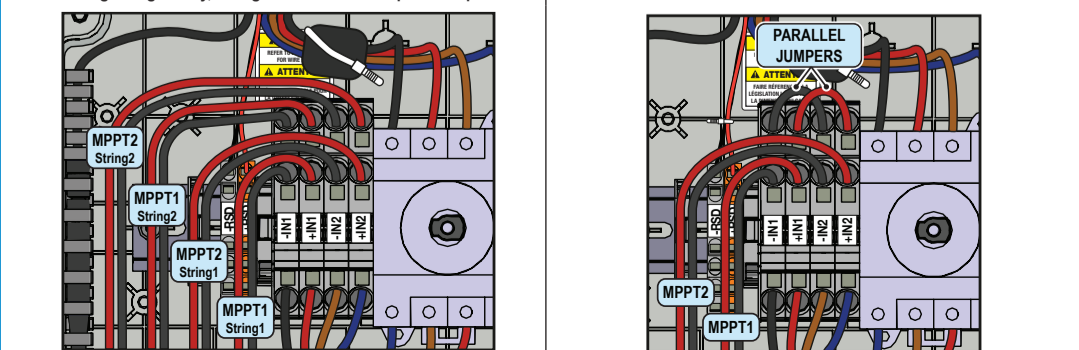


- Position the bracket (07) so that it is level on the wall or pole
- It is the installer's responsibility to choose an appropriate number and distribution of attachment points. The choice must be based on the type of wall, frame or other support, the type of anchors to be used, and their ability to support 4 times the inverter's weight (4x33lbs=132lbs for all models).
- Depending on the type and number of attachment points, drill the required holes to mount the bracket (see figure detail A)
- Secure the bracket to the wall or frame
- If needed, make conduit cutouts in the wiring box chassis, before the wiring box is put on the wall
- Carefully lift the inverter and hook it onto the bracket by inserting the two supports in the slots on the inverter (Figure B)
- Proceed to anchor the inverter to the bracket by installing the two (one each side) locking screws (Figure C)
- 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 C)
- Secure the inverter chassis bottom flange to the mounting surface using another screw (see Figure detail C). Note that the bottom flange is not a load-bearing component.

7. Input connection (DC)

- Confirm the correct polarity in the input strings.
- Confirm there is no ground leakage current in the PV array.
- When exposed to sunlight, the PV panels supply DC direct voltage to the inverter.
- The inverter's DC switch disconnects the DC current from the PV panels. In the "OFF" position the inverter will stop producing power, but DOES NOT disconnect the AC from the grid. To prevent electrocution hazards, all the connection operations must be carried out with the external AC disconnect switch, downstream of the inverter (grid side), open and locked out.
- The transformerless design requires that the PV array to be floating with respect to ground per NEC 690.35.
- DC PV string wire must be listed PV wire per NEC 690.35 rated minimum 600V.
- PV output conductors (wiring) must consist of sheathed (jacketed) multi-conductor cables or single insulated conductors (wires) which must be installed in an approved raceway. These conductors must be isolated from the enclosure and system grounding, as required by NEC 690.35. This is the responsibility of the installer.
- Confirm that the maximum PV array short circuit current for each DC input channel is within the inverter specification (see table in Section 14). Array equipment grounding must be installed per the requirements of the NEC and is the responsibility of the installer. A configuration program that can help to correctly size the photovoltaic system is available on <http://www.stringsizer.abb.com>.
- Turn the DC switch OFF
- Loosen the four captive screws on the wiring box cover (Torx 20) and remove the cover
- Pass the DC wires through the openings dedicated to the DC conduit.
- Conduit must be sealed using water-tight fittings to maintain NEMA Type 4X enclosure integrity.
- Installer should follow conduit manufacturers' guidelines and best practices.
- Connect the DC wiring to DC input terminal blocks (12). DC wiring terminals are spring pressure type and accommodate a wire size range of 20-8 AWG.
- Connect the strings in either independent or parallel mode, following the appropriate set of instructions below:

Independent mode configuration	Parallel mode configuration
In case of two PV arrays, if each of them has a current rating lower than the maximum current rating for a single inverter channel, they may be connected as "IND" array, each with its own MPPT. In this case, do nothing with the jumper wires which came with the inverters.	If a PV array's output current is more than the rating for a single inverter channel:
- Connect the positive side of the first PV array to +IN1, and its negative side to -IN1.	- connect the red jumper wire between the +IN1 and +IN2 terminal block inputs. Then connect the jumper wire black wire between the -IN1 and -IN2 terminals. Remember later to set the input mode to PAR from the display (Settings>Input Mode>Parallel).
- Connect the positive side of the second PV array to +IN2 and its negative side to -IN2.	- Connect the array to the IN1 (MPPT1) and IN2 (MPPT2) input positions, running separate wires for positive (+) and negative (-) for each array.
Up to four strings can be connected in independent mode.	
- During commissioning, confirm that the input mode is set to IND. The input mode is set using the display menu. Settings>Input Mode>Independent.	
If connecting a single array, configure the inverter for parallel input mode.	



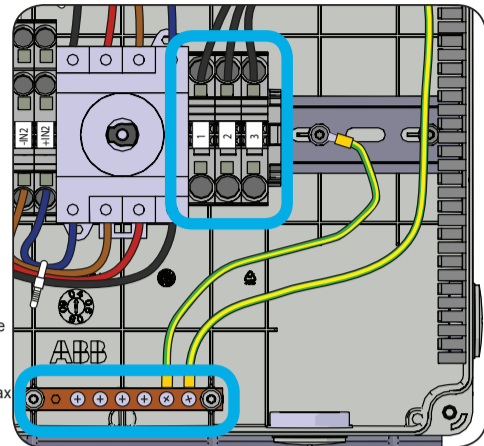
To prevent electrocution hazards, open and lock out the external AC disconnect switch before connecting the AC conductors, and any time the AC wiring box cover is to be removed. Proper PPE is required. AC output overcurrent protection is not provided with the inverter; it is the responsibility of the end user to provide overcurrent protection for the AC output circuit.

Run an approved raceway between the inverter and external AC disconnect switch. Pass the AC wires through the openings dedicated to the AC conduit.

When complete, seal conduit with water-tight fittings to maintain the NEMA type 4X enclosure rating. Installer should follow conduit manufacturers' guidelines and best practices.

Determine which AC output is applicable for the inverter model being installed. The AC wiring connections based on the AC grid type are shown in the table (also found on a label in the wiring box).

Table with columns: GRID STANDARD / TYPE DE RESEAU, TERMINAL BORNE, WIRE CABLE. It lists configurations for 208V-3PH-Δ and 240V-SPLIT-PHASE.



Connect wiring to the numbered terminals based on selected grid type. AC wiring terminals are spring pressure type and accommodate a wire size range of 20-6 AWG.

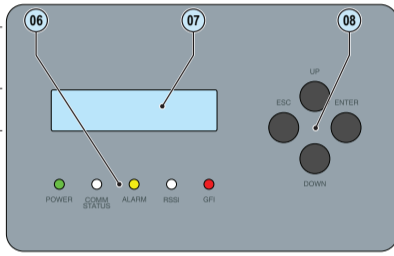
Connect the protective earth (PE) cable to wiring box busbar. Screws the cable (max 4 wires 8AWG to 4AWG, copper) with 2.0Nm (1.5ft-lb) torque.

The default 240V split-phase connection requires the grid Neutral to be connected to the inverter for proper operation. Before connecting the inverter to the grid, the grid type must be selected during the commissioning phase.

When all connections are complete, reinstall the front covers and tighten the cover screws with 1.5Nm (13.2 in-lbs) torque.

LED and KEYS, in various combinations, may display the status conditions or perform complex actions to be explored by consulting the product manual.

Table titled 'LEDs' with columns: POWER, COMM STATUS, ALARM, RSSI, GFI. It lists LED colors and their corresponding status indicators.



The LCD has two visible text lines and the UP and DOWN control keys are used to scroll through the menu items. An arrow on the left side of the display highlights the current selection.

Press the ESC key. Press the DOWN key to open the menus. Use the DOWN key to scroll the submenus. The default password for Setting menus is 0000.

Table titled 'Keys' with columns: ESC, UP, DOWN, ENTER. It describes the function of each key.

Abnormal grid conditions: The inverter is programmed to respond to abnormal grid conditions, as specified in the below table:

Table with columns: Condition, Voltage (V), Utility source, Frequency (Hz), Max. time (sec) at 60Hz before cessation of current. It lists various grid fault conditions and their response times.

Reconnection 300s (Default setting³). Adjustable 20s to 1000s. 1. Vnom is the nominal output voltage rating. 2. Trip limit and trip time accuracy specification is as follows: Voltage: +/-2%, Frequency: +/-0.10Hz, Time: 2 grid cycles (33ms @ 60Hz). 3. Default settings aligned with IEEE 1547-2003 requirements.

To adjust voltage and frequency and disconnect times to meet local utility requirements, make modifications are made using: - The inverter embedded web user interface. The Token is required to unlock the "Admin Plus" functionalities (contact ABB solar inverter technical support 1-877-261-1374).

Table titled 'Fault currents and durations' with columns: Utility voltage (V), 1 cycle, 3 cycle, 5 cycle. It shows fault current RMS values for different voltage levels.

Output power derating at high ambient temperature: Under high ambient temperatures, the inverter is designed to automatically reduce its output power. Detailed derating curves by model are provided in the product manual found on www.abb.com/solarinverters.

The inverter is equipped with advanced grid support functionality that is useful to support reactive loads and also assist in reliable operation of the utility grid in the presence of a large number of distributed energy generation sources. This section provides an overview of the available grid support functions.

The parameters related to the grid support functions that are in this inverter can be modified by: - Accessing the embedded Web User Interface.

- Accessing to settings under the Service menu requires a time-limited password, which can be obtained by calling ABB solar inverter technical support at 1-877-261-1374.

1. Voltage ride-through This inverter provides parameters to respond to undervoltage and overvoltage events. The inverter is designed to operate normally within the specified operating range.

2. Frequency ride-through This inverter provides parameters to respond to underfrequency and overfrequency events. If frequency excursions occur, the inverter is designed to continue operating normally for a specified delay.

3. Reactive power control The inverter provides several modes of operation for reactive power control and are described below: - Disable: This is the default setting. Under this setting, the inverter exports with a power factor of 1.0.

- Fixed power factor control (Cosφ set): In this mode, the operator can set the output power factor to a fixed value. When enabled, a new value will be set in the inverter.

- Q Fixed (Q Set): Sets the reactive power to a fixed value. When enabled, a new value will be set in the inverter.

- Power factor as function of output power (Watt/Cosφ Settings: Cosφ(P)): In this mode, the inverter reduces the power factor (cos-phi) as a function of the output power at a given operating point.

4. Active Power Control This inverter offers several modes for active power reduction. - Active Power Curtailment: Sets a new value of active power as % of Pmax. When enabled, a new value will be set in the inverter.

5. Ramp control The inverter is designed to control the rate at which output power is increased, either at startup, or after a temporary low power condition on the PV array (such as fast shading).

Refer to the dedicated application note in the ABB Solar website for more details about the grid support functions.

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 (06) was properly closed!

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.

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 (16) and 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.
2. 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.
3. 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 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).
4. When prompted, type the "product key" (including the dashes. Example: 1234-1234-1234-1234) 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.
5. 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
6. 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").
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.

Any inverters installed, or commissioned, in California after September 8, 2017 must be set to the Rule 21 country code USA - RULE21 @ 240 single [R21 240sp] or USA - RULE21 @ 208 single [R21 208sl].

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 PV array insulation resistance against earth and carries out other self-diagnosis checks.

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.

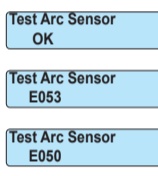
The DC AFD fault circuit interrupter automatically runs a self test every morning when sunlight is sufficient for connection. The inverter display area shows the results of the selftest:

- If the self-test results are OK, the inverter will continue with the AC grid connection. - If a potential problem on the Arc Fault Detection (AFD) board is detected, the self-test will result in an error.

Press the ESC key to clear the error and start the restart selftest. If self-test results are OK, the inverter will reconnect to the AC grid.

If the DC arc fault is still present, the self test will result in error code E050. Refer to the product manual which must be downloaded at www.abb.com/solarinverters for troubleshooting suggestions.

The AFD self-test can be manually started anytime using the following procedure: 1. Turn off the inverter (switching off both DC and AC switches) and, 2. Turn on both the DC and AC switches and wait for the self-test results on the display.



UNO-DM-6.0-TL-PLUS-US

Large technical data table for the UNO-DM-6.0-TL-PLUS-US inverter. It includes sections for Input, Output Protection, Output, Input Protection, Output Protection, Operating Performance, Auxiliary Output, and Communication. It lists various electrical and operational parameters.

Continuation of the technical data table for the UNO-DM-6.0-TL-PLUS-US inverter, covering sections like Environmental, Mechanical specifications, Safety, and Safety approval.

1. The auxiliary output is used to supply the RSD contactors when required. 2. WLAN IEEE 802.11 b/g/n @2.4GHz 3. When equipped with DC switch and wiring box 4. Plant Viewer per Mobile available remotely only, not for local commissioning. Note: Features 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-US-Quick Installation Guide EN-RevB EFFECTIVE 2018-02-15

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