MAKING MODERN LIVING POSSIBLE

SOLAR INVERTERS

Installation Guide
FLX Series

www.danfoss.com/solar

Safety and Conformity

Safety Message Types

⚠WARNING

Safety information important for human safety. Warning is used for indicating potentially hazardous situations that can cause serious injury or death.

⚠CAUTION

Caution with symbol is used for indicating potentially hazardous situations that can cause minor or moderate injuries.

CAUTION

Caution without symbol is used for indicating situations that may result in equipment or property damage.

NOTE

Note is used for indicating highlighted information that should be regarded with attention.

General Safety

All persons installing and servicing inverters must be:

- Trained and experienced in general safety rules for work on electrical equipment.
- Familiar with local requirements, rules and regulations for the installation.

NOTE

Before installation

Check for damage to equipment and packaging. If in doubt, contact the supplier before commencing installation.

CAUTION

Installation

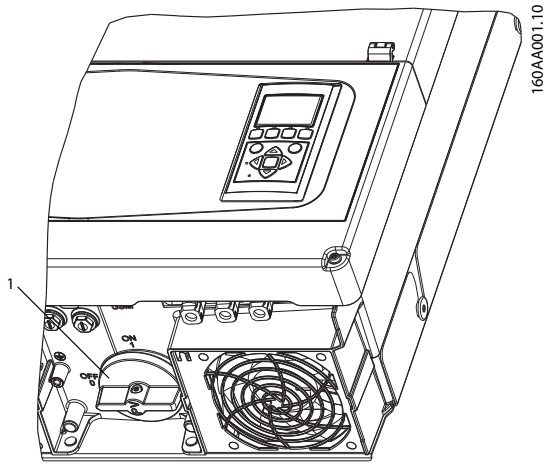
For optimum safety, follow the steps described in this document. Keep in mind that the inverter has two voltage carrying sides; the PV input and the AC grid.

⚠WARNING

Disconnecting the inverter

Before starting work on the inverter, switch off AC at the mains switch and PV using the PV load switch. Ensure that the device cannot be unintentionally reconnected. Use a voltage tester to ensure that the unit is disconnected and voltage free. The inverter can still be charged with very high voltage at hazardous levels even when it is disconnected from AC grid and solar modules. Wait at least 8 minutes following disconnection from grid and PV panels before proceeding.

For safe disconnection of DC current, turn off the PV load switch (1).



⚠CAUTION

Maintenance and modification
Only authorised personnel are permitted to modify the inverter. To ensure personal safety, use only original spare parts available from the supplier. If non-original spare parts are used, compliance with CE guidelines in respect of electrical safety, EMC and machine safety is not guaranteed.
The temperature of the cooling racks and components inside the inverter can exceed 70ºC. Observe the danger of burn injury.

DC voltages up to 1000 V are present in a PV system even when the inverter is disconnected from the AC grid. Faults or inappropriate use may lead to electric arcing.

⚠WARNING

Do not work on the inverter while disconnecting DC and AC.

The short-circuit current of the photovoltaic panels is only slightly higher than the maximum operating current and depends on the level of solar irradiation.

Conformity

Go to the download area at www.danfoss.com/solar, Approvals and Certifications, for information.

See also *5 Technical Data*.

CE	CE marking - This symbol certifies the conformity of the equipment with the requirements of the applicable EC directives

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1 Introduction

1.1 Purpose of the Manual

The *Installation Guide* provides information required to install and commission the FLX series inverter.

Additional resources available:

- *User Guide*, for information required in monitoring and setup of the inverter, via the display or web interface.
- *Design Guide*, for information required for planning use of the inverter in a diversity of solar energy applications.
- *CLX GM Quick Guide*, for information required to install and set up power management of the FLX Pro inverter using the CLX GM device.
- *CLX Home Installation Manual*, or *CLX Home GM, CLX Standard, CLX Standard GM Quick Guide*, for information required to install and set up monitoring of the FLX inverter.
- *Sensor Interface Option Installation Guide*, for installation and commissioning of the sensor interface option.
- *GSM Option Kit Installation Guide*, for information required to install a GSM option, and set up data upload or messaging from the inverter.
- *Fan Installation Instruction*, for information required to replace a fan.

These documents are available from the download area at *www.danfoss.com/solar*, or from the supplier of the solar inverter.

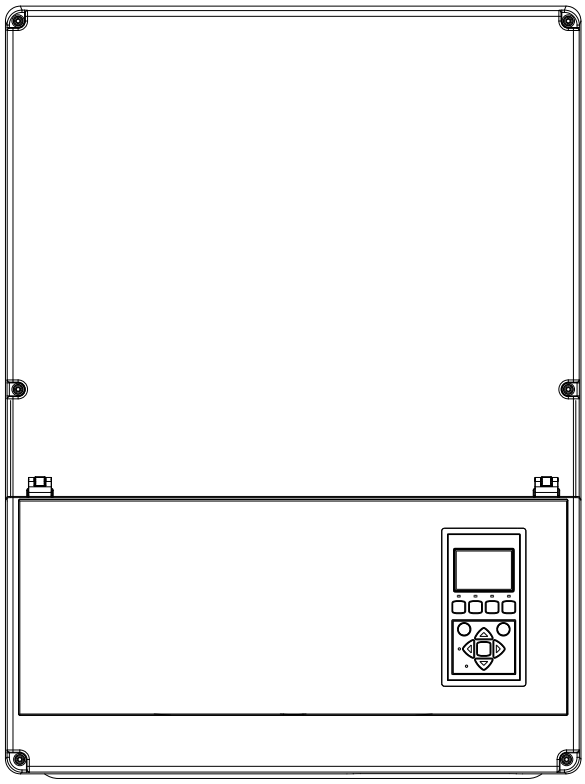

Illustration 1.1 FLX Series Inverter

The FLX series inverter range comprises the variants:

- FLX
- FLX Pro

Both variants feature:

- IP65 enclosure
- PV load switch
- Sunclix connectors for PV input
- Manual access via the display, for configuration and monitoring of the inverter
- Ancillary service functionalities. Refer to the *FLX Series Design Guide* for details.

The FLX Pro variant features:

- Access via web interface, for configuration and monitoring of the inverter.

1

1.2 Unpacking

Contents:

- Inverter
- Mounting plate
- Accessories bag, containing screws
- Installation guide, booklet format
- Quick guide, poster format

The following items are not supplied:

- Sunclix mating connectors
- Security screws, M5 x 8-12, optional

1.3 Identification of Inverter

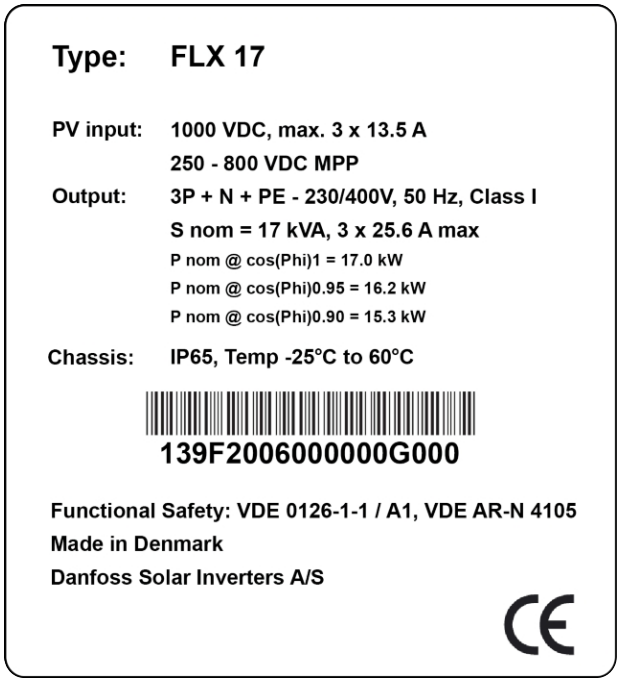

Illustration 1.2 Product Label

The product label on the side of the inverter shows:

- Inverter type
- Important specifications
- Serial number, located under the bar code, for inverter identification.

1.4 Installation Sequence

1. Pay special attention to *1.1 Safety Message Types*.
2. Install the inverter according to *2.1 Environment and Clearances*, *2.2 Mounting the Mounting Plate* and *2.3 Mounting the Inverter*.
3. Open the inverter according to *2.5 Access to the Installation Area*.
4. Install AC according to *2.6 AC Grid Connection*.
5. Install RS-485 or Ethernet, if used, according to *2.7 RS-485 or Ethernet Connections*.
6. Install options, if any, according to the installation guide supplied with the option.
7. Close the inverter according to *2.5 Access to the Installation Area*.
8. Install PV according to *2.10 PV Connection*.
9. Turn on AC at the mains switch.
10. Set language, master mode, time, date, installed PV power, country, and grid code:
    - For setup via the web interface, refer to *3.3 Web Interface*.
    - For setup via the display, refer to *3.2 Display*.
11. Turn on PV by turning on the PV load switch. Refer to *2.10.1 Connection of PV*.
12. Verify the installation by comparing with the autodetection result in the display, as described in *2.10 PV Connection*.
13. The inverter is now in operation.

For installation and setup of multiple FLX Pro inverters in master-follower configuration:

- Perform steps 2–9 and 11 for each inverter.
- Perform step 10 on the inverter planned as master.
- Perform step 12.

1.5 Overview of Installation Area

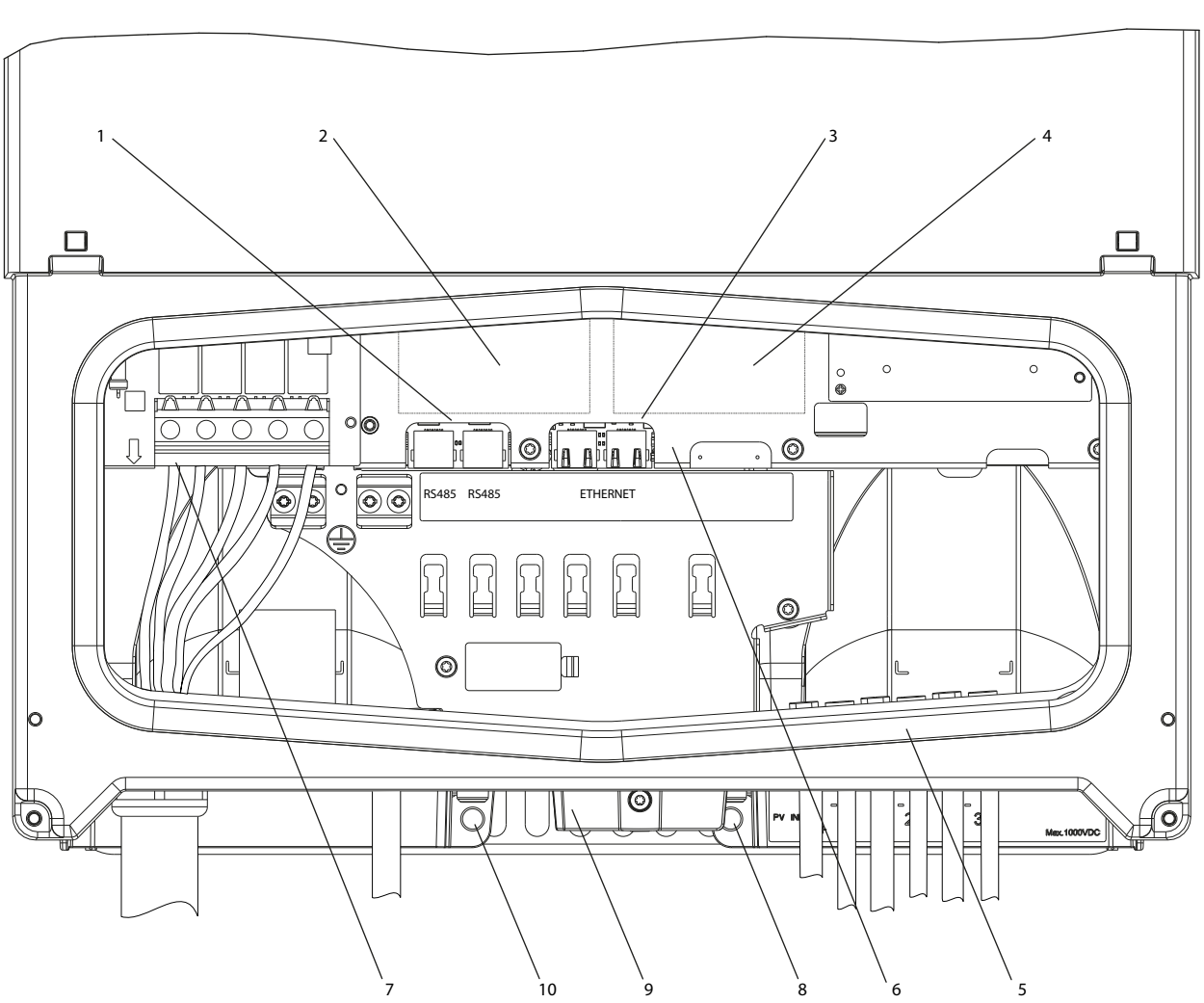

Illustration 1.3 Overview of Installation Area

PELV (Safe to touch)

1. RS-485 interface
2. Option slot for either GSM option or sensor interface option
3. Ethernet interface
4. Option slot for either GSM option or sensor interface option

Live Part

1. DC connection area
2. Communication board
3. AC connection area

Other

1. Security screw position
2. PV load switch
3. Security screw position

2 Installation

2

2.1 Environment and Clearances

Illustration 2.1 Avoid Constant Stream of Water

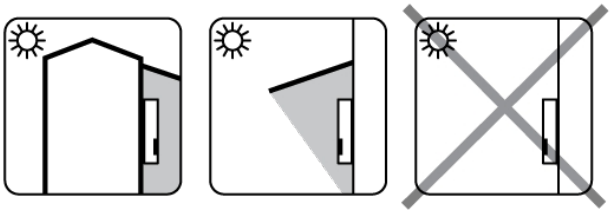

Illustration 2.2 Avoid Direct Sunlight

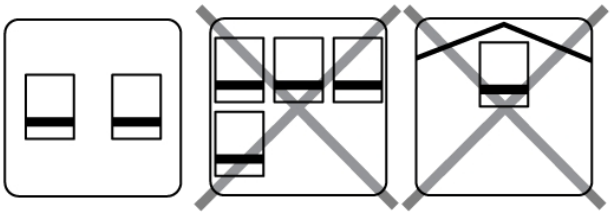

Illustration 2.3 Ensure Adequate Air Flow

Illustration 2.4 Ensure Adequate Air Flow

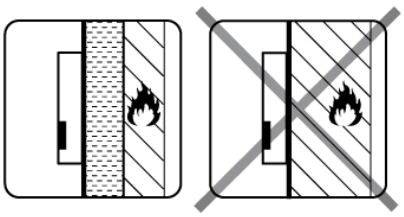

Illustration 2.5 Mount on Non-flammable Surface

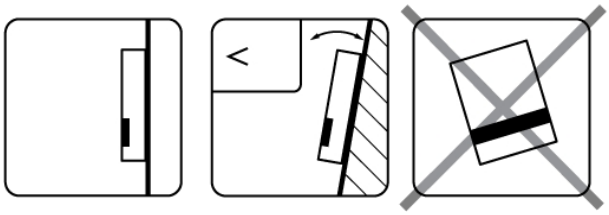

Illustration 2.6 Mount Upright on Vertical Surface. Tilt of up to 10 degrees is permitted

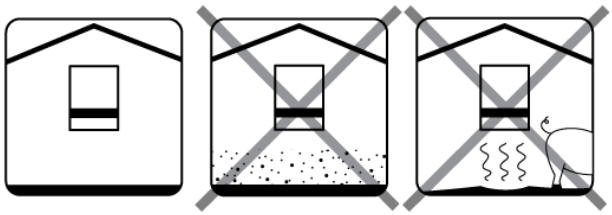

Illustration 2.7 Prevent Dust and Ammonia Gases

NOTE

When planning the installation site, ensure that inverter product and warning labels remain visible. For details, refer to *5 Technical Data*.

2.2 Mounting the Mounting Plate

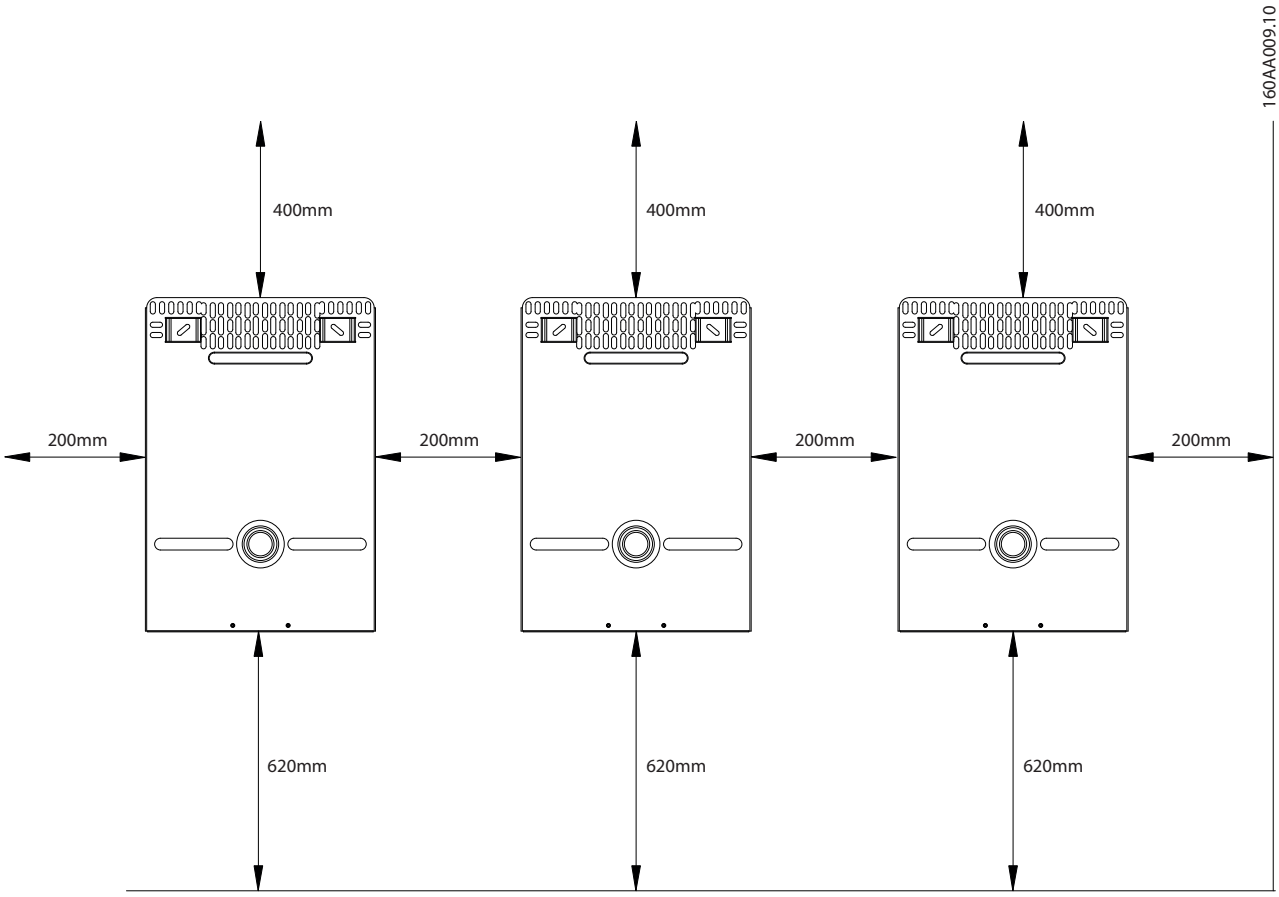

Illustration 2.8 Safe Clearances

NOTE

Ensure 620 mm base clearance for adequate airflow.

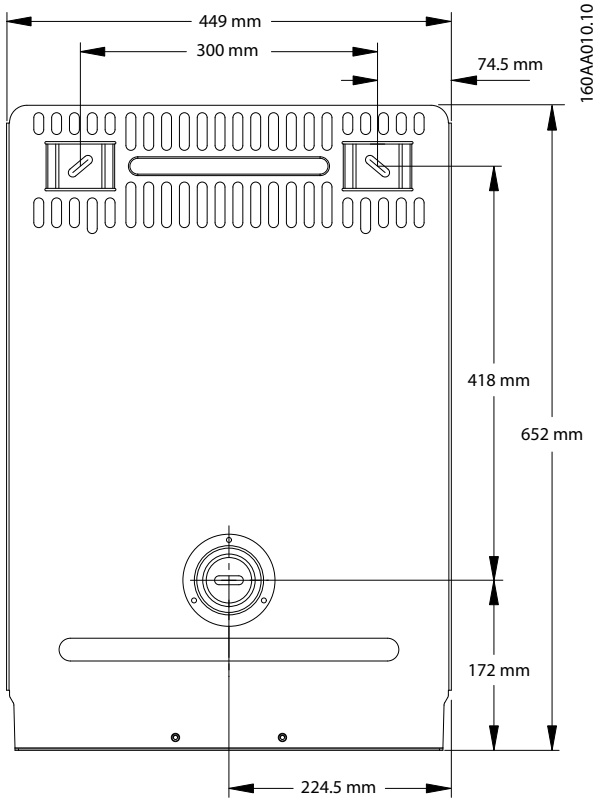

Illustration 2.9 Mounting Plate

NOTE

Use of the mounting plate delivered with the inverter is mandatory.

Mount the mounting plate:

- Mount in the defined environment.
- Use screws and rawl plugs that can safely carry the weight of the inverter.
- Ensure that the mounting plate is correctly aligned.
- Observe safe clearances when installing one or more inverters, to ensure adequate airflow. Clearances are specified in *Illustration 2.8* and the mounting plate label.
- Mounting multiple inverters in a single row is recommended. Contact the supplier for guidelines, when mounting inverters in more than one row.
- Ensure adequate clearance at the front, for service access to the inverter.

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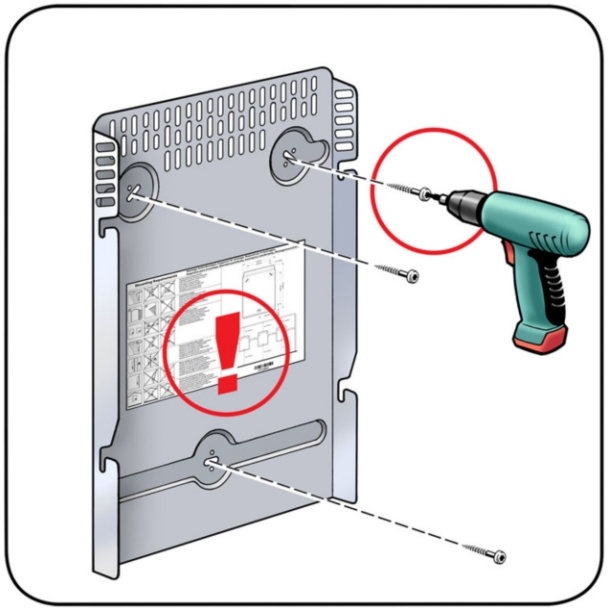

Illustration 2.10 Mounting the Mounting Plate

2.3 Mounting the Inverter

⚠CAUTION

For safe handling of the inverter, 2 people must carry the unit, or a suitable transport trolley must be used. Wear safety boots.

Procedure:

1. Lift the inverter. Locate the slots on the side of the mounting plate.

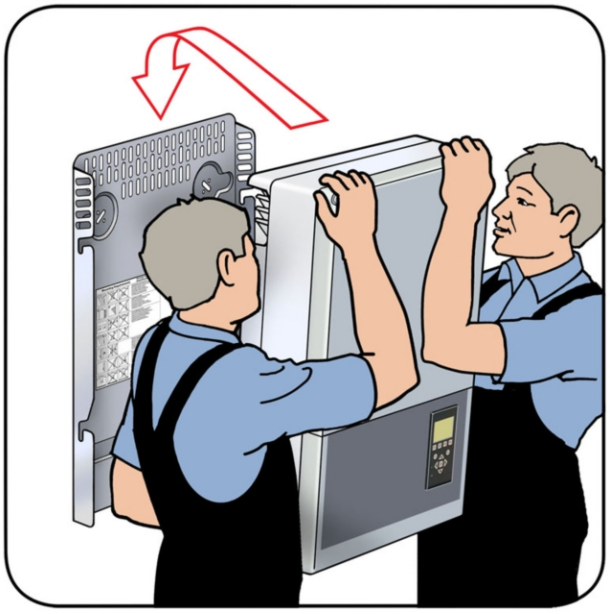

Illustration 2.11 Position the Inverter

2. On the inverter, position the side screws against the mounting plate slots.
3. Push the inverter as shown so the side screws slide into the 2 lower slots, then the 2 upper slots. See *Illustration 2.12* and *Illustration 2.13*.

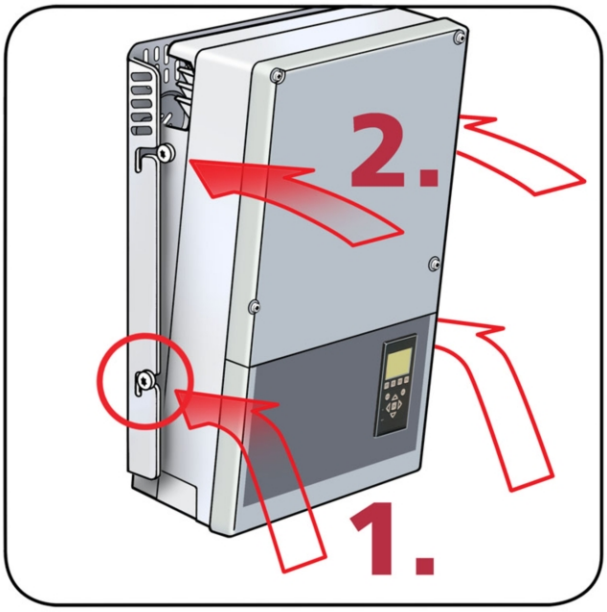

Illustration 2.12 Slide into Slots

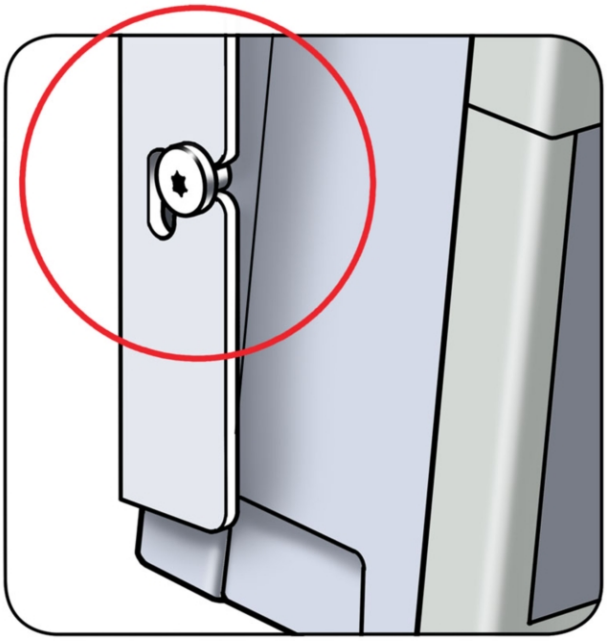

Illustration 2.13 Detail of Sliding into Slot

4. Check that the 4 side screws sit securely in the mounting plate slots.
5. Release the inverter.

Anti-theft Protection (Optional)

To protect the inverter against theft, fasten as follows:

1. Use two security screws, M5 x 8-12 (not supplied).
2. Insert screws through the pre-drilled anti-theft holes (see *Illustration 1.3*), through the mounting plate to the wall.
3. Tighten screws.

2.4 Removing the Inverter

Procedure:

1. Perform removal in the reverse order of mounting.
2. Lift the inverter. 2 people must carry the unit.
3. With a firm grip at the base of the inverter, lift and slide the inverter out of the mounting plate slots.
4. Lift the inverter free of the mounting plate.

2.5 Access to the Installation Area

⚠CAUTION

Observe ESD safety regulations. Discharge any electrostatic charge by touching the grounded enclosure, before handling any electronic component.

Procedure:

1. To open the cover, loosen the 2 lower front screws using a TX 20 screwdriver. The screws cannot fall out.
2. Lift the cover 180 degrees. A magnet holds the cover open.
3. To close the cover, lower it into place and fasten the two front screws.

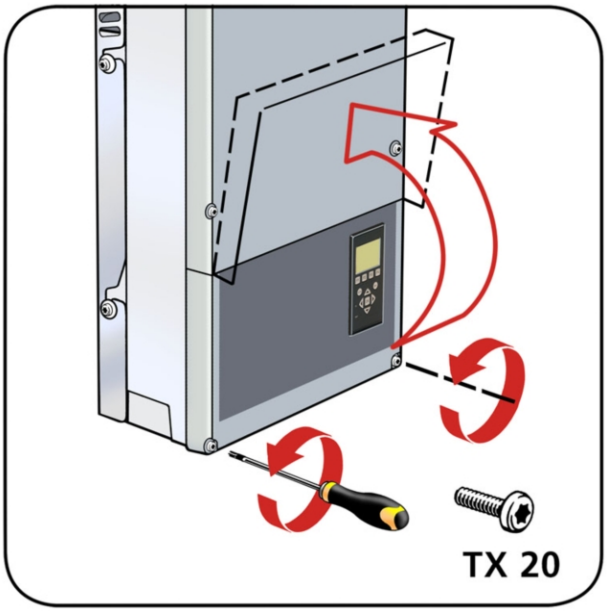

Illustration 2.14 Loosen Front Screws and Lift Cover

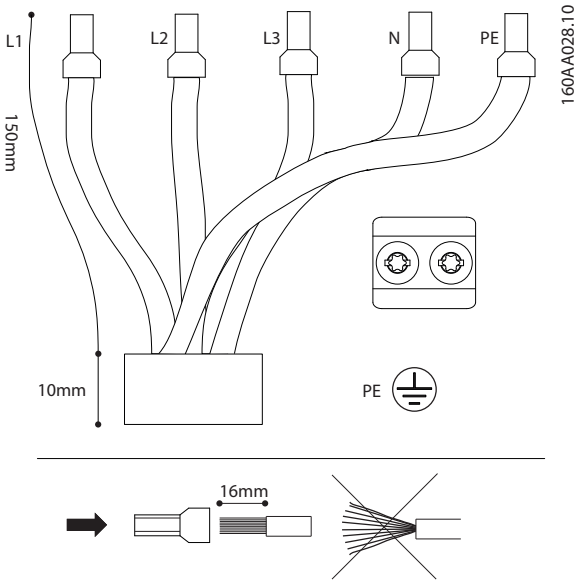

Illustration 2.16 AC Cable Wire Strip

2.6 AC Grid Connection

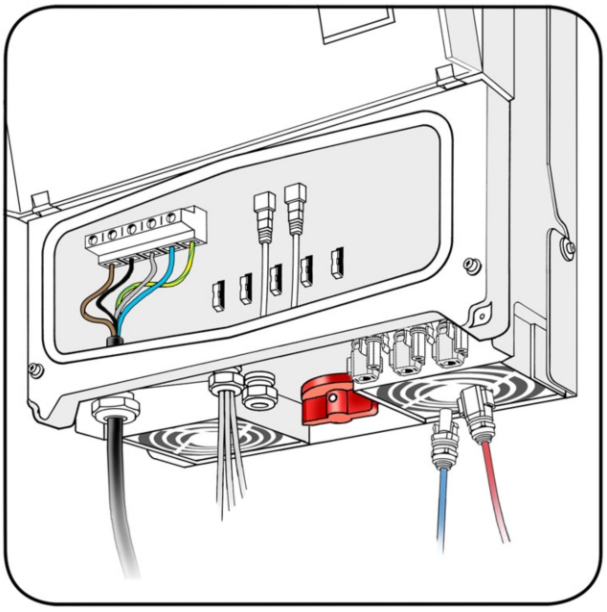

Illustration 2.15 Installation Area

On the AC cable, strip insulation on all 5 wires. The PE wire must be longer than the mains and neutral wires. See *Illustration 2.16*.

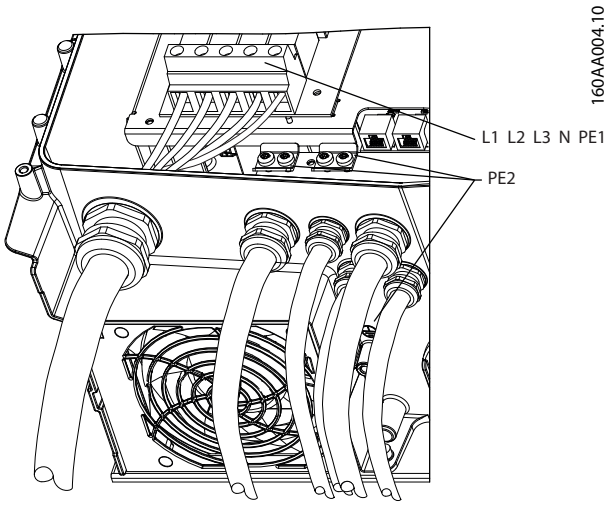

Illustration 2.17 AC Connection Area

L1, L2, L3	3 mains wires
N	Neutral wire
PE1	Primary protective earth
PE2	Secondary protective earth

1. Verify that the inverter rating matches the grid.
2. Ensure that main circuit breaker is released, and take precautions to prevent reconnection.
3. Open the front cover.

4. Insert the cable through the AC gland to the terminal blocks.
5. Connect the 3 mains wires (L1, L2, L3), the neutral wire (N) and the protective earth wire (PE) to the terminal block with the respective markings.
6. Optional: Make an extra PE connection at the secondary PE earthing points.
7. All wires must be properly fastened with the correct torque. See *5.6 Torque Specifications*.

⚠CAUTION

Check that all wiring is correct. Connecting a phase wire to the neutral terminal may permanently damage the inverter.

NOTE

For fuse and RCD information, refer to *5 Technical Data*.

2.7 RS-485 or Ethernet Connections

Before connecting RS-485 or Ethernet cables, refer to requirements in *5.9 RS-485 and Ethernet Connections*.

Procedure:

1. Do not remove the RJ-45 connector.
2. Guide the cables through the base of the inverter via cable glands. See *Illustration 2.18*.
3. Plug into the RS-485 or Ethernet connector.
4. Fasten cables with cable ties to ensure a durable connection over time. See *Illustration 2.19*.

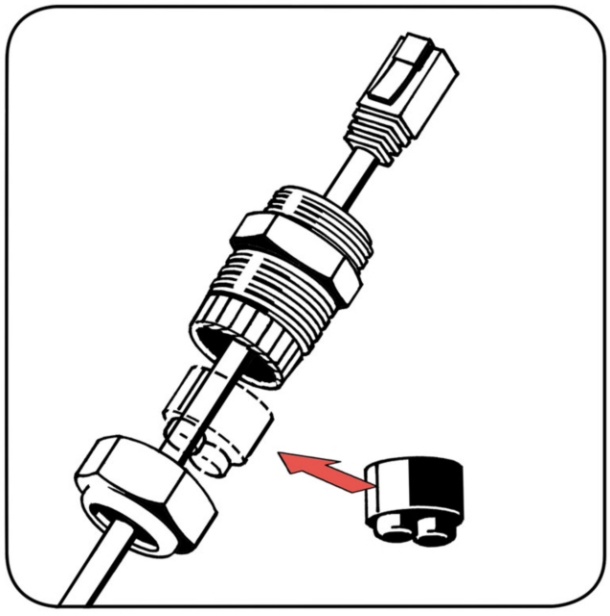

Illustration 2.18 Guide Through Cable Glands

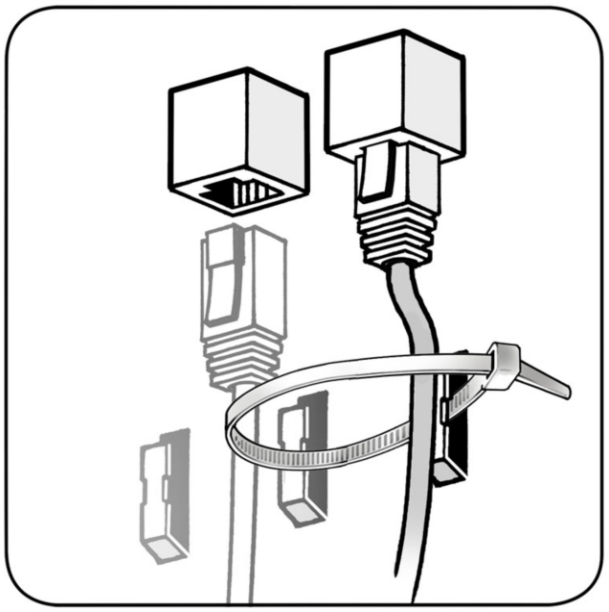

Illustration 2.19 Fasten with Cable Ties

2.8 Options

To install options, refer to the respective option installation guide.

2.9 Closure

1. Close the cover of the inverter installation area. Fasten the two front screws.
2. Turn on AC power.

2

2.10 PV Connection

⚠CAUTION

Do NOT connect PV to earth!

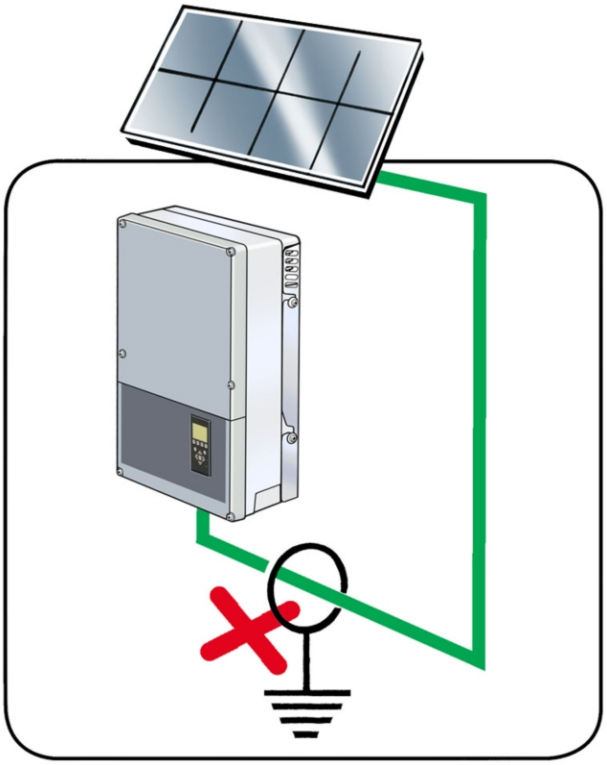

Illustration 2.20 Do Not Connect PV to Earth

Use a suitable voltmeter that can measure up to 1000 V DC.

1. Mount Sunclix connectors (not supplied) on the PV cables, according to *Illustration 2.21*.
2. Verify the polarity and maximum voltage of the PV arrays by measuring the PV open-circuit voltage. See *Illustration 2.21*.
   - The PV open-circuit voltage must not exceed 1000 V DC. The inverter is protected against reversed polarity and will not generate power until the polarity is correct. Reversed polarity damages neither the inverter nor the connectors.

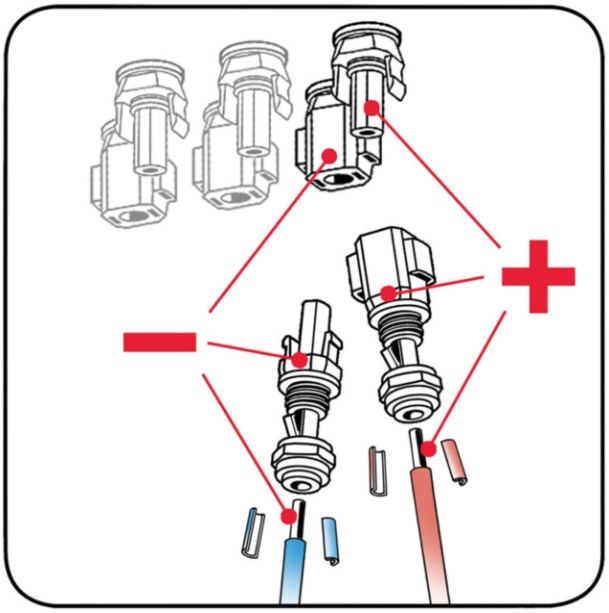

Illustration 2.21 Correct Polarity: Mounting Sunclix Connector on Cable

1. Measure the DC voltage between the positive terminal of the PV array and earth (or the green/yellow PE cable).
   - The voltage measured should approximate zero. If the voltage is constant and not zero, there is an insulation failure somewhere in the PV array.
2. Locate and fix the failure before continuing.
3. Repeat this procedure for all arrays. Uneven distribution of input power on the PV inputs is permitted, if:
   - The individual input is not overloaded. The maximum permissible load per input is 8000 W.
   - The maximum short-circuit current of the PV modules at STC (Standard Test Conditions) does not exceed 13.5 A per input.

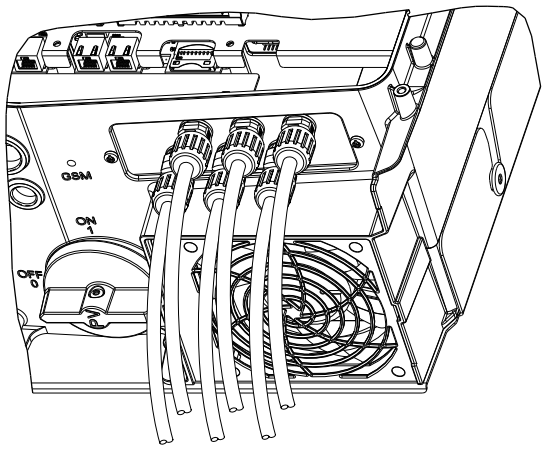

Illustration 2.22 DC Connection Area

1. On the inverter turn the PV load switch into off position.
2. Connect the PV cables using Sunclix connectors. Ensure correct polarity, see *Illustration 2.21*.
    - Attach Sunclix mating part to PV cable.
    - Connect to each PV input in the PV connection area with a 'click'.

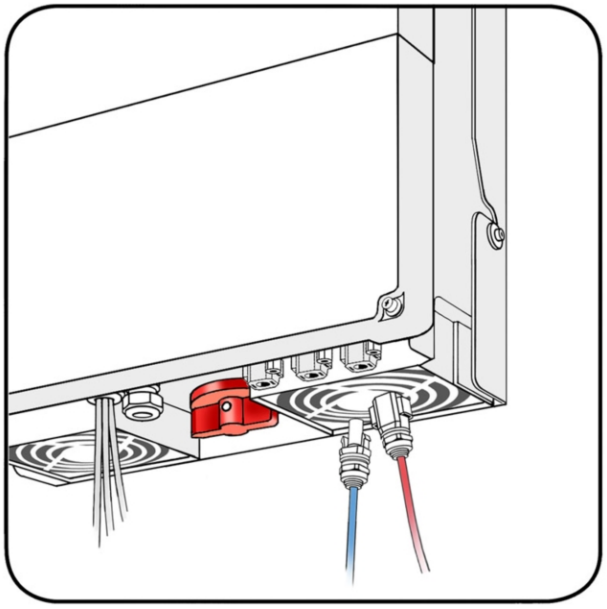

Illustration 2.23 Connect to PV Input

3 Initial Setup and Start

3.1 User Interface

The user interface comprises:

- Local display, for all inverter variants. The local display enables manual setup of the inverter.
- Web interface, for the FLX Pro variant only. The web interface enables access to multiple inverters via Ethernet.

Choose an interface to set up and start the inverter, either via

- Display

  3.2 Display

  3.2.1 Initial Setup via Display

or

- Web interface

  3.3 Web Interface

  3.3.4 Web Interface

Do not touch the other interface during the setup and start-up processes.

For access and menu information, refer to the *User Guide*.

3.1.1 Operation Modes

The inverter has 4 operation modes, indicated by LEDs. For more information on the LEDs, refer to the *FLX Series Design Guide*.

Off grid (LEDs off)
When no power has been delivered to the AC grid for more than 10 minutes, the inverter disconnects from the grid and shuts down. 'Off grid - standby' is the default night mode. 'Off grid - sleep' is the night mode for lowest energy consumption.

- **Off grid - standby mode** (LEDs off)
  The inverter is disconnected from grid. User and communication interfaces remain powered for communication purposes.
- **Off grid - sleep mode** (LEDs off)
  The inverter is disconnected from grid. User, communication, and option interfaces are powered down.

Connecting (Green LED flashing)
The inverter starts up when the PV input voltage reaches 250 V. The inverter performs a series of internal self-tests, including PV autodetection and measurement of the resistance between the PV arrays and earth. Meanwhile, it also monitors the grid parameters. When the grid parameters have been within the specifications for the required amount of time (depends on grid code), the inverter starts to energise the grid.

On grid (Green LED on)
The inverter is connected to the grid and energises the grid. The inverter disconnects when:

- it detects abnormal grid conditions (dependent on grid code),
- an internal event occurs, or
- insufficient PV power is available (no power is supplied to the grid for 10 minutes).

The inverter then enters connecting mode or off grid mode.

Fail Safe (Red LED flashing)
If the inverter detects an error in its circuits during the self-test (in connecting mode) or during operation, the inverter goes into fail safe mode, disconnecting from PV. The inverter will remain in fail safe mode until PV power has been absent for a minimum of 10 minutes, or the inverter has been shut down completely (AC+PV).

3.1.2 Security Level

3 predefined security levels filter user access to menus and options.

Security levels:

- Level [0]: General access. No password is required.
- Level [1]: Installer or service technician. Password access required.
- Level [2]: Installer or service technician. Password extended access required.

Throughout the manual, a [0], [1] or [2] inserted after the menu item indicates the minimum security level required for access.

When logged on to the web interface as Admin, access is at security level [0].

Access to levels [1] and [2] requires a service logon, comprising a user ID and a password.

- The service logon provides direct access to a specific security level for the duration of the current day.
- Obtain the service logon from Danfoss.
- Enter the logon via the display, or the web interface logon dialog.
- When the service task is complete, log off at [Setup → Security].
- The inverter automatically logs the user off after 10 minutes of inactivity.

Security levels are similar on the display and the web interface.
A security level grants access to all menu items at the same level as well as all menu items of a lower security level.

3.1.3 Preparation for Master Inverter

The Master mode feature allows 1 inverter to be appointed as master inverter for the inverter network. Master mode is available for networks of FLX Pro inverters only.
The master inverter accesses the other inverters in the network, enabling:

- Settings and data replication to the rest of the network, enabling easy commissioning and data management.
- Control of power at plant level (control of ancillary services).
- Data retrieval from the network, for graphical display on the web interface, upload to a data warehouse, or export to a PC.

Before enabling master mode, ensure that the following requirements are met:

- No other master inverters are present in the network.
- Ethernet connection from PC to inverter RJ-45 interface, using a patch cable (network cable cat5e, crossed or straight through). See *2.7 RS-485 or Ethernet Connections*.
- Installed sensor interface option, with sensors installed, when sensor data are required.
- Location closest to the router, in a daisy chain network topology.

After enabling master mode, perform a network scan to verify that all follower inverters are connected to the master inverter. To initiate the scan, go to [Setup → Inverter details → Master mode → Network].

3.1.4 Manual PV Configuration

Set up the inverter for manual PV configuration:

- Via the display, security level 1, at [Setup → Setup details → PV configuration].
- Via the web interface, security level 0, at [Inverter level: Setup → Setup details → PV configuration].

When the inverter is set to manual PV configuration, the autodetection is subsequently overridden.

To set the configuration manually via the display:

1. Turn on AC to start the inverter.
2. Obtain the installer password from the distributor. Go to [Setup → Security → Password], and enter the password.
3. Press [Back]. Use the arrows to navigate to [Setup → Setup details → PV configuration].
4. Select manual PV configuration mode, at: [Setup → Setup details → PV configuration → Mode: Manual].
5. Set up the PV input configuration to match the wiring, at: [Setup → Setup details → PV configuration].
    - PV input 1: Individual, Parallel or Off
    - PV input 2: Individual, Parallel or Off
    - PV input 3: Individual, Parallel or Off

3.2 Display

NOTE

The display activates up to 10 seconds after power up.

The integrated display on the inverter front gives the user access to information about the PV system and the inverter.

The display has 2 modes:

1. **Normal:** The display is in use.
2. **Power saving:** After 10 minutes of display inactivity the back light of the display turns off to save power. Reactivate the display by pressing any key.

3

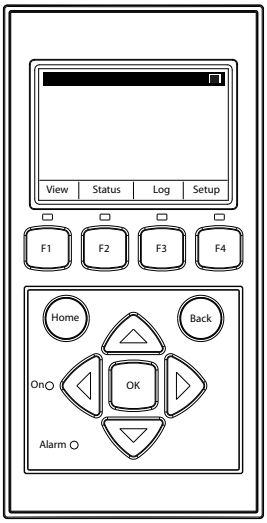

Illustration 3.1 Overview of Display Buttons and Functionality

Key	Function	LED
F1	View 1/View 2 - Screen	When keys F1-F4 are selected, the LED above the key will light up
F2	Status Menu	
F3	Production Log Menu	
F4	Setup Menu	
Home	Return to View Screen	
OK	Enter/select	
Arrow up	A step up/increase value	
Arrow Down	A step down/decrease value	
Arrow Right	Moves cursor right	
Arrow Left	Moves cursor left	
Back	Return/de-select	
On - Green LED		On/flashing=On grid/ Connecting
Alarm - Red LED		Flashing=Fail safe
	The inverter is configured as master. This icon appears in the top right corner.*	
	The inverter is a follower, connected to a master. This icon appears in the top right corner.*	

Table 3.1 Overview of Display Buttons and Functionality, *Illustration 3.1*

**FLX Pro only.*

NOTE

The contrast level of the display can be altered by pressing the arrow up/down button while holding down the F1 button.

The menu structure is divided into 4 main sections:

1. **View** - presents a short list of information, read only.
2. **Status** - shows inverter parameter readings, read only.
3. **Log** - shows logged data.
4. **Setup** - shows configurable parameters, read/ write.

See the following sections for more detailed information.

3.2.1 Initial Setup via Display

The inverter is shipped with a predefined set of settings for different grids. All grid-specific limits are stored in the inverter and must be selected at installation. It is always possible to see the applied grid limits in the display.
After installation, check all cables and then close the inverter.
Turn on AC at the mains switch.

When prompted by the display select language. This selection has no influence on the operating parameters of the inverter and is not a grid code selection.

Illustration 3.2 Select Language

The language is set to English at initial start-up. To change this setting press the [OK] button. Press [▼] to scroll down through the languages. Select language by pressing [OK].

NOTE

To use the default language (English) simply press the [OK] button twice to select and accept.

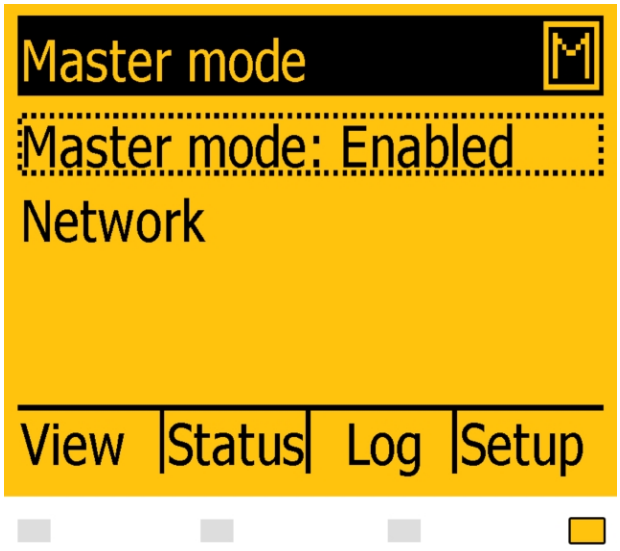

Illustration 3.3 Master Mode

To enable Master Mode go to the *Inverter details* menu [Setup → Inverter details → Master mode] and set Master Mode to *Enabled.*

Illustration 3.4 Set Time

Set time as prompted by the display. Press [OK] to select number. Press [▲] to scroll up through the numbers. Select by pressing [OK].
The clock is 24-hour format. The inverter accounts for daylight saving automatically.

NOTE

Set the time and date accurately. The inverter uses this information for logging. If an incorrect time/date is accidentally set, correct it immediately in the set date and time menu [Setup → Inverter details → Set date and time].

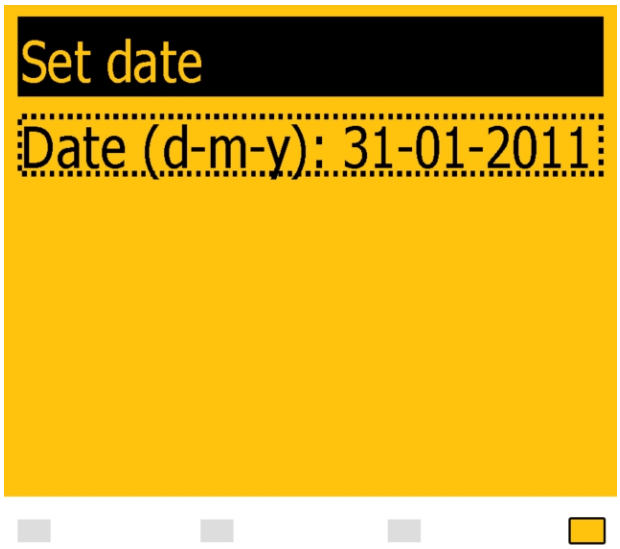

Illustration 3.5 Set Date

Set date as prompted by the display. Press [OK] to select. Press [▲] to scroll up through the numbers. Select by pressing [OK].

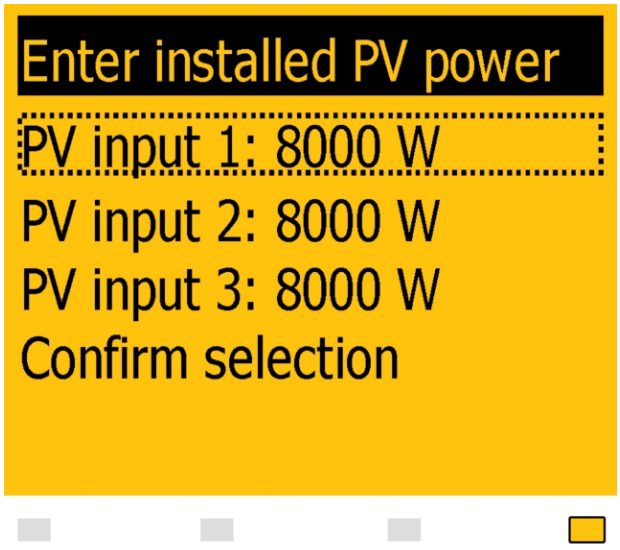

Illustration 3.6 Installed PV Power

Enter the amount of installed PV power for each of the PV inputs. When a group of PV inputs are connected in parallel, enter average installed PV power for each PV input, as shown in the examples.

3

PV String Configuration	*Enter this value for "Installed PV power"*
Example 1: PV1, PV2 and PV3 are each set to individual mode. Nominal PV power installed: PV 1: 6000 W PV 2: 6000 W PV 3: 3000 W	 PV 1: 6000 W PV 2: 6000 W PV 3: 3000 W
Example 2: PV1 and PV2 are set to parallel mode and have a total of 10 kW PV power installed. PV3 is set to individual mode and has nominal 4 kW PV power.	PV 1: 5000 W PV 2: 5000 W PV 3: 4000 W
Example 3: PV1 and PV2 are set to parallel mode and have a total of 11 kW PV power installed. PV3 is set to [Off] and has no PV installed.	PV 1: 5500 W PV 2: 5500 W PV 3: 0 W

Table 3.2 Examples of Installed PV Power

The display will now show 'Select country'. The setting is 'undefined' at initial start-up. Press [▼] to scroll down through the list of settings. To select the desired setting, press [OK].

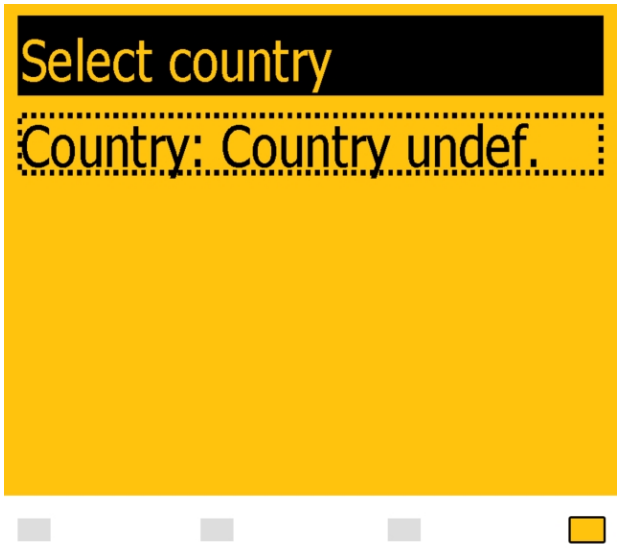

Illustration 3.7 Select Country

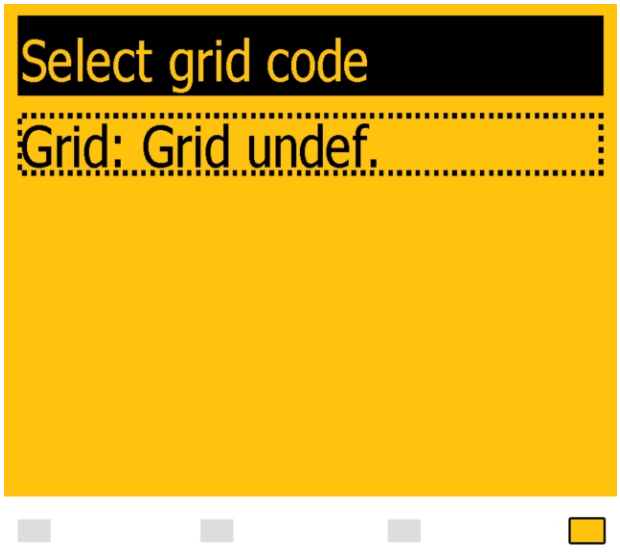

Illustration 3.8 Select Grid Code

The display will now show 'Select grid code'. The grid code is set to 'undefined' at initial start-up. To select the grid code, press [OK]. Press [▼] to scroll down through the list. Select the grid code for the installation by pressing [OK]. It is very important to choose the correct grid code.

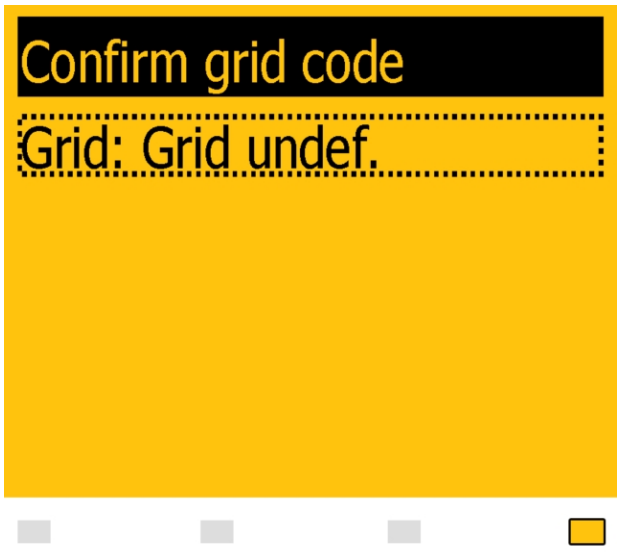

Illustration 3.9 Confirm Grid Code Selection

To confirm, select the grid code again and press [OK]. The settings for the chosen grid code have now been activated.

⚠WARNING

Correct selection of grid code is essential to comply with local and national standards.

NOTE

If the two grid code selections do not match, they will be cancelled and it will be necessary to repeat this step. If an incorrect grid code is accidentally accepted at the first selection, simply accept the "Grid: Undefined" in the confirm grid code screen. This cancels the grid code selection and enables a new selection. If an incorrect grid code is selected twice, call the service hotline.

3.2.2 Turn PV Load Switch On

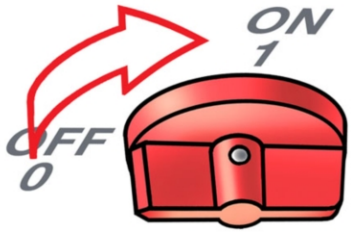

Illustration 3.10 Turn the PV Load Switch On

3.2.3 Start-up

The inverter starts automatically if sufficient solar irradiation is available. The start-up will take a few minutes. During this period, the inverter performs a self-test.

NOTE

The inverter is protected against reversed polarity. The inverter does not generate power until any reversed polarity is corrected.

3.2.4 Autotest Procedure

For certain grid codes, an automatic test of the inverter can be initialised by activating the inverter autotest procedure:

- Via the display, go to [Setup → Autotest] and press [OK].

3.3 Web Interface

These instructions describe the web interface, which facilitates remote access to the inverter.
The web interface is available in the FLX Pro inverter only. Refer to the download area at *www.danfoss.com/solar* for the newest instructions.

For all text entries, the software supports characters compatible with Unicode.

For inverter name, no spaces are permitted.

For plant, group and inverter name, only the following characters are supported:

Letters	abcdefghijklmnopqrstuvwxyz
Capital letters	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Numbers	0123456789
Special characters	- _.

3.3.1 Prepare for Setup

Ensure that the following items are ready before commencing setup:

- Master inverter is designated and prepared, see *3.1.3 Preparation for Master Inverter*.
- Ethernet connection from PC to inverter is established, see also *2.7 RS-485 or Ethernet Connections*.

3.3.2 Initial Setup via Web Interface

⚠CAUTION

Change the Web Server logon and password of the master inverter immediately for optimal security when connecting to the Internet. To change the password go to [Setup → Web Server → Admin].

Setup Sequence

1. Ensure that the master inverter is designated and prepared, see *3.1.3 Preparation for Master Inverter*.
2. On the PC, wait until Windows reports limited connectivity (if no DHCP is present). Open the Internet browser and ensure that pop-ups are enabled.
3. Type http://invertername in the address field:

3

- where 'invertername' is the final 10 digits of the serial number.
- Find the serial number marked on the product label on the side of the inverter enclosure.

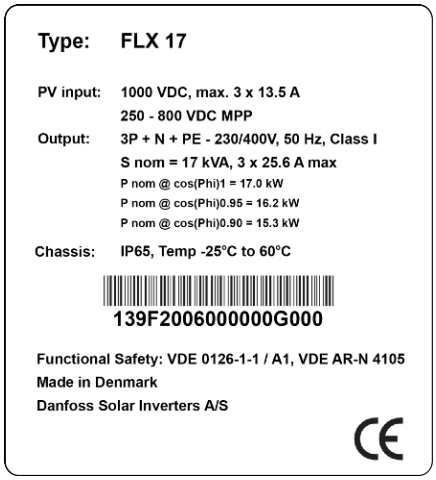

Illustration 3.11 Product Label

1. The web interface logon dialog opens.
2. Type 'admin' in the user and password fields, and click 'Log in'.
3. At initial logon the inverter runs a setup wizard.

3.3.3 Setup Wizard

Step 1 of 8: Display language
Select display language.

- The default language is English.

NOTE

This selection defines the language in the display, not the grid code.

Illustration 3.12 Step 1 of 8: Display Language

To change the language setting later, refer to *Setup, Setup Details*.

Step 2 of 8: Master setting
To set up a master inverter, click on 'Set as master'.

- A scan runs to identify inverters in the network.
- A pop-up window shows the inverters successfully identified.

Click [OK] to confirm that the correct number of inverters has been found.

Illustration 3.13 Step 2 of 8: Master Setting

To change this setting later, go to [Inverter level: Setup → Inverter details].

Step 3 of 8: Time and date
Enter:

- Time in 24-hour format
- Date
- Time zone

Accuracy is important, because date and time are used for logging purposes. Adjustment for daylight savings is automatic.

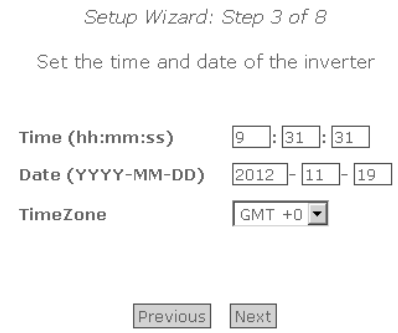

Illustration 3.14 Step 3 of 8: Time and Date

To change these settings later, go to [Inverter level: Setup → Set date and time].

Step 4 of 8: Installed power
For each PV input, enter installed PV power.

The installed PV power values are used to calculate performance ratio. For more information refer to the *FLX Series Design Guide*.

⚠CAUTION

Incorrect setting can have serious consequences for production efficiency.

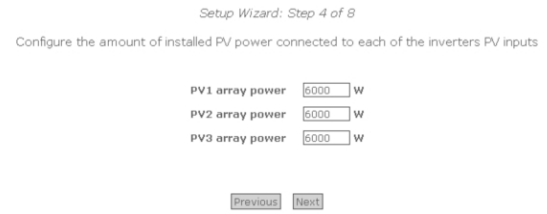

Illustration 3.15 Step 4 of 8: Installed Power

To change the installed power, go to [Inverter level: Setup → Calibration, PV Array].

Step 5 of 8: Country of Installation

Select the setting to match the location of the installation.

⚠CAUTION

Correct selection is essential to comply with local and national standards.

Illustration 3.16 Step 5 of 8: Country of Installation

Step 6 of 8: Grid code

Select the grid code to match the location of the installation.

- The default setting is [undefined].

Select the grid code again, to confirm.

- The setting is activated immediately.

⚠CAUTION

Correct selection is essential to comply with local and national standards.

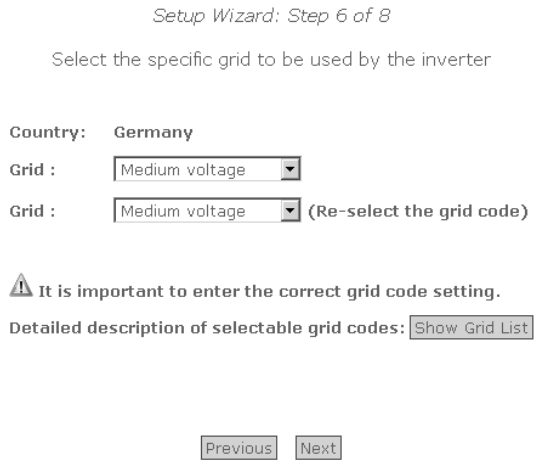

Illustration 3.17 Step 6 of 8: Grid Code

NOTE

If the initial and confirmation settings are different,

- **grid code selection is cancelled, and**
- **the wizard recommences step 5.**

If initial and confirmation settings match, but are incorrect, contact service.

Step 7 of 8: Replication

This step is available for a master inverter with followers connected. To replicate the settings from steps 1–6 to other inverters in the same network:

- Select inverters.
- Click [Replicate].

NOTE

When the PV configuration, installed PV power and PV array area of follower inverters in the network differ from that of the master, do not replicate. Set up the follower inverters individually.

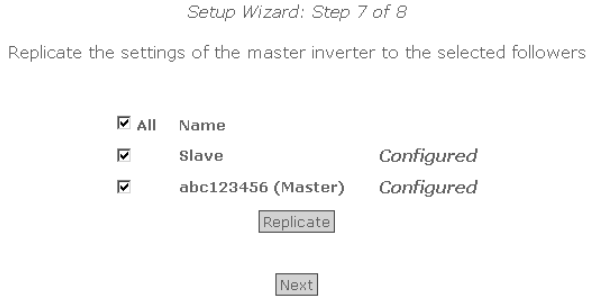

Illustration 3.18 Step 6 of 7: Replication

Step 8 of 8: Inverter start-up

The wizard displays an overview of the setup configuration.

Click on [Finish] to start up the inverter. Start-up will commence when solar irradiation is sufficient.

The start-up sequence, including self-test, takes a few minutes.

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Illustration 3.19 Step 8 of 8: Inverter start-up

To change the setup later, access the inverter via the web interface or the display, at inverter level.

- To change the name of the inverter, go to [Inverter level: Setup → Inverter details].
- To enable master mode, go to [Inverter level: Setup → Inverter details].

3.3.4 Web Interface

The web interface overview is structured as follows.

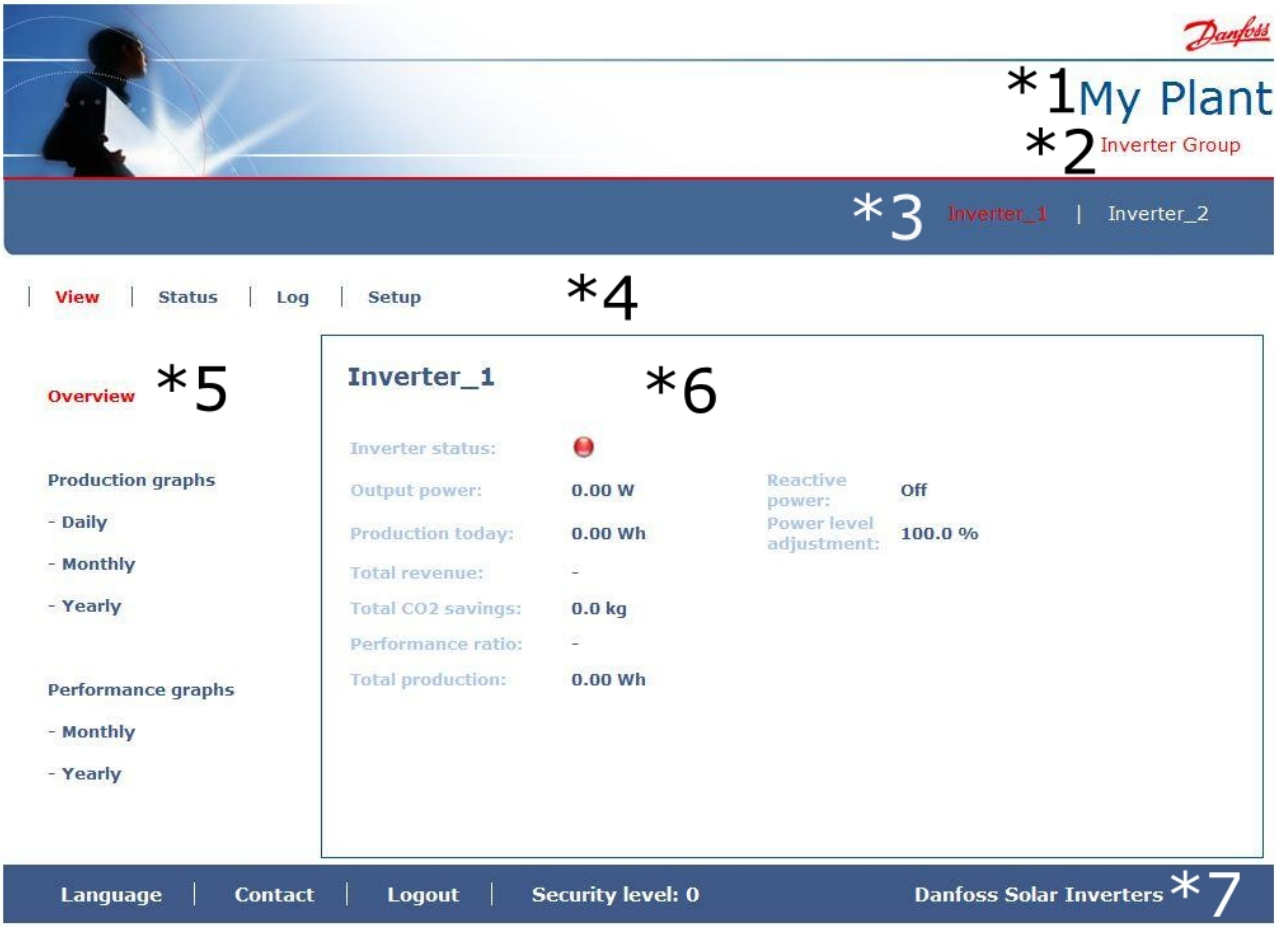

Illustration 3.20 Overview

1. **Plant name:** Displays the current plant name:
   - Click on the plant name to display the plant view.
   - Change the plant name at [Setup → Plant details].
2. **Group menu:** Displays groups of inverters:
   - Inverters join group 1 by default.
   - Click on a group name to display the group view, and a list of inverters in the group.
   - Change the group name via [Setup → Inverter details] in the inverter view.
3. **Group members:** Displays the inverter names in the group currently selected. The default inverter name is based on the serial number.
   - Click on an inverter name to display the inverter view.
   - Change the name of the inverter via [Setup → Inverter details] in the inverter view.
4. **Main menu:** This menu corresponds to the inverter display main menu.
5. **Sub menu:** The sub menu corresponds to the main menu item currently selected. All sub menu items belonging to a particular main menu item are displayed here.
6. **Content area:** The main menu and sub menus of the web interface are identical to the menus in the inverter display. The sub menu content displayed here corresponds to the sub menu selected: [Overview]. On some pages, a horizontal menu is provided for improved readability.

3

7. **Footer:** Options on the footer bar:
    - **Language:** Opens a pop-up window. Click on the country flag to change the language of the web interface to the desired language for the active session.
    - **Contact:** Opens a pop-up window which displays Danfoss contact information.
    - **Logout:** Opens the login/logout dialog box.
    - **Security level:** Displays the current security level as explained in the section *Security Levels*.

NOTE

The content of the main menu changes depending on which view is currently selected: the plant, a group of inverters, or an individual inverter. Text in red indicates the active view.

3.3.5 Plant, Group and Inverter Views

The overview screens for plant view, group view, and inverter view display the same overall status information.

Illustration 3.21 Plant View, Overview Screen

Item	Unit	View		Description
		Plant and Group	Inverter	
Overall plant status	-	x		**Red:** Plant PR <50%, or: Any inverter in the network - in *fail safe* mode, or - missing from the scan list, no contact with the master **Yellow:** Any inverter in the network - with PR <70%, or - in *Connecting* or *Off grid* mode **Green:** Plant PR ≥70%, and - all inverters with PR ≥70%, and - all inverters in *On grid* mode
			x	**Red:** Inverter PR <50%, or inverter has an error **Yellow:** Inverter PR between 51% and 70%, or inverter in *Connecting* mode **Green:** No errors, and - inverter PR ≥70%, and - inverter in *On grid* mode
Current production	kW	x	x	Real time energy production level
Yield today	kWh	x	x	Cumulative yield for the day
Total revenue	Euro	x	x	Cumulative revenue earned since initial startup
Total CO_2 saving	kg	x	x	Cumulative CO_2 saved since initial startup
Performance ratio	%	x	x	Real time performance ratio
Total yield	kWh	x	x	Cumulative yield since initial startup
Power limit adjustment	%		x	Maximum power limit as % of nominal inverter AC output rating

Table 3.3 Information Displayed in Plant View, Overview Screen

NOTE

To calculate performance ratio PR, an irradiation sensor is required, see [Setup → Calibration].

3.3.6 Autotest Procedure

For certain grid codes, an automatic test of the inverter can be initialised by activating the inverter autotest procedure:

- Via the web interface, go to [Inverter level: Setup → Setup details → Autotest] and click on [Start → Test].

4 Service

4.1 Troubleshooting

This guide provides tables showing messages appearing in the inverter display, known as events. The tables contain descriptions as well as which actions to take, when an event arises. For the full event list, refer to the FLX *Series User Guide*.

To view events, go to the Log menu and enter the Eventlog menu. The latest event registered by the inverter, as well as a list of the 20 most recent events, is shown here. When the inverter enters the *On grid* mode, the most recent event is cleared and is shown as 0.

The event code is made up of two elements: the group classifier and the event ID. The group classifier describes the general type of the event, while the event ID is used to identify the specific event.

Table 4.1 is an overview of how the tables of inverter events are constructed and how to use them.

Event Type						
-						
ID	**Status message**	**Description**	**Action**	**DNO**	**Hotline**	**PV**
201	Tpower_high.	The internal temperature of the inverter is too high.	Check the inverter is not covered and that the ventilation duct is not blocked. If not, call installer.	-	x	-

Table 4.1 How to Read the Event Tables

Event Type	Indicates whether the event relates to grid, PV, internal or fail safe issues.
ID	The specific event ID.
Display	Text shown in display.
Description	Description of the event.
Action	Description of which action to take prior to contacting any other parties.
DNO	If the prescribed action has not identified the malfunction, contact the DNO for further assistance.
Hotline	If the prescribed action has not identified the malfunction, contact the inverter hotline for further assistance.
PV	If the prescribed action has not identified the malfunction, contact the PV supplier for further assistance.

Grid-related Events

ID	Status message	Description	Action	DNO	Hotline	PV
1–6		Grid voltage too low.	Call the installer and inform about the grid-phase voltage. Check voltage and AC installation, if the voltage is zero check the fuses.	x	-	-
7–9		Grid voltage average over 10 minutes too high.	Call the installer and inform about the grid-phase voltage. Check that the installation is correct according to the installation guide. If so, then increase the mean voltage limit according to section *Functional Safety*.	x	-	-
10–15		Grid voltage too high.	Call the installer and inform about the grid-phase voltage.. Check voltage and AC installation.	x	-	-
16–18		The inverter has detected a voltage peak on the grid.		x	-	-
19–24		Grid frequency too low or too high.	Call the installer and inform about the grid frequency..	x	-	-
25–27		Loss of mains, Phase-to-phase voltages too low.	Call the installer and inform about the voltage on all three phases. Check the phase-to-phase voltages and the AC installation.	x	-	-
28–30		Loss of mains, ROCOF out of range.	If the event reoccurs several times each day, contact the DNO.	x	-	-
31–33		DC grid current too high.	For occurrence several times daily, contact installer. Installer: Perform on-site grid analysis.	-	x	-

ID	Status message	Description	Action	DNO	Hotline	PV
34–37		Residual Current Monitoring Unit (RCMU) has measured an excessive current.	Turn both DC and AC off and wait until the display turns off. Then turn on DC and AC and observe if the event reoccurs. If the event reoccurs, call the installer. Installer - visual inspection of all PV cables and modules.	-	x	-
40	AC grid not OK	The AC grid has been out of range for more than 10 minutes (frequency and/or voltage).	Call the installer and inform about Frequency, SW version and Grid code setting Installer - Check the AC installation.	x	-	-
41–43		The inverter has detected that grid voltage was below a certain level.	If this event is reported several times each day, contact the installer. Installer - Perform on-site grid analysis.			
47	PLA below threshold	The inverter disconnects from grid if PLA is below 3% of nominal power.	Contact the DNO and obtain status on active power reduction (PLA).	x	-	-
48–53	Grid frequency too low or too high		Call the installer and inform about the grid frequency. Check the AC installation.	x	-	-
54–56		DC grid current too high (stage 2).	For occurrence several times daily, contact installer. Installer: Perform on-site grid analysis.	x	-	-
246		A grid event was detected and inverter was stopped by the redundant safety circuit.	A grid event was detected and inverter was stopped by the redundant safety circuit. Check the event log. If the majority of entries are of type 246, call the service department. Otherwise wait 24 hours and check again.	-	x	-

Table 4.2 Grid-related Events

PV-related Events

ID	Status message	Description	Action	DNO	Hotline	PV
100-102	PV negative	Input current is negative, polarity incorrect.	Call the installer. Installer: Check polarity, if correct, call service.	-	-	x
103-105	PV current is too high/waiting.	Too many PV modules connected in parallel. Should only appear on newly installed systems.	Call the installer. Installer: Check no. of strings in parallel and current ratings. Has the current limit been exceeded? Has the inverter derated on PV current? Reconnect strings in parallel, possibly install a second inverter.	-	x	x
112-114		PV config fault	Call the installer. Installer: Call service.	-	-	x
115	PV ISO too low	The resistance between ground and PV is too low for the inverter to start up. This will force the inverter to make a new measurement after 10 minutes have passed.	Make a visual inspection of all PV cables and modules for correct installation according to the installation guide. The event could indicate that the PE connection is missing.	-	x	x
116-118		PV wrong polarity	Call the installer. Installer: Call service.	-	x	x
121-123, 125		PV ISO low PV1, PV2, PV3, multiple (related to 115)	Call the installer. Installer: Call service.	-	x	x
258	PV voltage too high/waiting	PV voltage is too high.	Check that installation and layout correspond to recommendations in the manuals.	-	x	x

Table 4.3 PV-related Events

4

Internal Events

ID	Status message	Description	Action	DNO	Hotline	PV
201–208		The internal temperature of the inverter is too high.	Check the inverter is not covered and that the ventilation duct is not blocked. If not, call the installer.	-	x	-
209, 210		Voltage on DC bus is too high.	Reset the inverter by disconnecting DC and AC, using the switches. If the event is repeated, call the installer. Installer: Check the maximum PV voltage using the display to see if it is above the limits.	-	x	-
211	Fan rpm low	Fan speed is too low.	Is the inverter fan blocked? Yes: Clean the fan, No: Call the installer.	-	x	-
212	DC bus balance timeout	Inverter unable to balance DC bus.	Call the installer. Installer: Call service.	-	x	-
213–215		Internal error Voltage measured before and after the relay differs by more than 20 V.	Call the installer. Installer: Call service.	-	x	-
216–218		Current measured on AC side is too high.	Call the installer. Installer: Call service.	-	x	-
224	RCMU over range	A wire is broken in the RCMU.	Call the installer. Installer: If self-test does not complete successfully, call service partner.	-	x	-
225–240		Failure in Memory/ EEPROM.	Restart the inverter. If event persists, call the installer. Installer: Call service.	-	x	-
241, 242, 249		Internal communication error.		-	x	-
243, 244		Internal error.		-	x	-
247	FSP plausibility fault	A plausibility fault has occurred in the functional safety processor.	Check event log for other grid events (1-55) and follow the instructions for these events. If the event persists, call the installer.	-	x	-
248, 251	Self test failed FSP fail safe	The self-test has failed.		-	x	-
252-254		Current measured on AC side is too high.	Call the installer. Installer: Call service.	-	x	-
255–257		Islanding protection trip.	Call the installer. Installer: Call service.	-	x	-
260		The resistance between ground and PV is too low for the inverter to start up. This will force the inverter to make a new measurement after 10 minutes have passed.	Call the installer. Installer: Call service.	-	x	-
261-262		PV current measurements failed.	Call the installer. Installer: Call service.	-	x	x

Table 4.4 Internal Events

Events Caused by the Self-test

ID	Description	Action	DNO	Hotline	PV
264-271	Measurement circuit test failed.	Restart the inverter. If event persists, call the installer. Installer: Call service.	-	x	-
352	RCMU self-test failed.	Call the installer. Installer: Call service.	-	x	-
353	Current sensor test failed.		-	x	-
356-363	Transistor and relay test failed, or inverter relay has failed (contact assumed welded).		-	x	-
364	Neutral connection is damaged or missing.	Call the installer. Installer: Check AC installation for failures on neutral connection. Call service.	-	x	-
365	Earth wire failed.	Call the installer. Installer: Call service.	-	x	-

Table 4.5 Events Caused by the Self-test

4.2 Maintenance

Normally, the inverter needs no maintenance or calibration.

Ensure that the heat sink at the rear of the inverter is not covered.

Clean the contacts of the PV load switch once per year. Clean by cycling the switch to on and off positions ten times. The PV load switch is located at the base of the inverter.

For correct operation and long service life, ensure free air circulation

- around the heat sink at the top and side of the inverter where the air exhausts, and
- to the fan at the inverter base.

To clear obstructions, clean using pressurised air, a soft cloth, or a brush.

⚠WARNING

Temperature of the heat sink can exceed 70 °C.

5 Technical Data

5.1 Specifications

Nomen-clature	Parameter	FLX Series		
		12.5k	15k	17k
	AC			
|S|	Rated apparent power	12500 VA	15000 VA	17000 VA
$P_{ac,r}$	Rated active power[1)]	12500 W	15000 W	17000 kW
	Active power at cos(phi)=0.95	11900 W	14300 W	16200 W
	Active power at cos(phi)=0.90	11300 W	13500 W	15300 W
	Reactive power range	0-7.5 kVAr	0-9.0 kVAr	0-10.2 kVAr
$V_{ac,r}$	Nominal AC voltage (AC voltage range)	3P+N+PE - 230/400 V (+/- 20%)		
	Rated current AC	3x18.2 A	3x21.7 A	3x24.7 A
I_{acmax}	Max. current AC	3x18.8 A	3x22.6 A	3x25.6 A
	AC current distortion (THD at nominal output power, %)	<4%		
$cosphi_{ac,r}$	Power factor at 100% load	>0.99		
	Controlled power factor range	0.8 over-excited 0.8 under-excited	0.8 over-excited 0.8 under-excited	0.8 over-excited 0.8 under-excited
	Standby consumption	≤2.7 W		
	Night time power consumption[2)]	<0.5 W		
f_r	Nominal grid frequency (range)	50 (±5 Hz)		
	DC			
	Nominal power DC	12900 W	15500 W	17600 W
$V_{dc,r}$	Nominal voltage DC	700 V		
V_{mppmin} - V_{mppmax}	MPP voltage - nominal power [3)]	360-800 V	430-800 V	485-800 V
	MPP efficiency, static	99.9%		
	MPP efficiency, dynamic	99.7%		
V_{dcmax}	Max. DC voltage	1000 V		
$V_{dcstart}$	Turn on voltage DC	250 V		
V_{dcmin}	Turn off voltage DC	220 V		
I_{dcmax}	Max. MPP current	12 A per PV input		
	Max. short-circuit current DC (at STC)	13.5 A per PV input		
	Min. on grid power	20 W		
	Efficiency			
	Max. efficiency	98%		
	Euro efficiency, V at $_{dc,r}$	97.3%	97.4%	97.4%
	Other			
	Dimensions (H, W, D), inverter / incl. packaging	667 x 500 x 233 mm / 749 x 546 x 350 mm		

Nomen-clature	Parameter	FLX Series		
		12.5k	15k	17k
	Mounting recommendation	Mounting plate		
	Weight, inverter / incl. packaging	39 kg / 45 kg		
	Acoustic noise level[4]	55 dB(A)		
	MPP trackers	3		
	Operation temperature range	-25..60 °C		
	Nom. temperature range	-25..45 °C		
	Storage temperature	-25..60 °C		
	Overload operation	Change of operating point		

Table 5.1 Specifications

1) At rated grid voltage ($V_{ac,r}$), Cos(phi)=1.

2) When activated, communication cannot be accessed during night time.

3) At identical input voltages. At unequal input voltages, V_{mppmin} can be as low as 250 V depending on total input power.

4) SPL (Sound Pressure Level) at 1.5 m under normal operation conditions.

Parameter	FLX Series	
	FLX	FLX Pro
Connector type	Sunclix	
Parallel mode	Yes	
Interface	Ethernet (Service interface), RS-485	Ethernet (Web interface), RS-485
Options	GSM Option Kit, Sensor Interface Option	
PV Sweep	Yes	
Overload operation	Change of operating point	
Grid supportive functionality	Fault ride-through	
Active power control[5)]	Integrated, or via external device	
Reactive power control	No	Yes
DC short-circuit protection	Yes	

Table 5.2 Inverter Features and Functionalities

5) Remote control via external device.

Parameter		FLX Series
Electrical		
	Safety (protective class)	Class I (grounded)
	PELV on the communi-cation and control card	Class II
Functional		
	Islanding detection - loss of mains	Three-phase monitoring, ROCOF
	Voltage magnitude	Disconnection, included
	Frequency	Disconnection, included
	DC content of AC current	Disconnection, included
	Insulation resistance	Disconnection, included
	RCMU - Type B	Disconnection, included

Table 5.3 Safety Specifications

5.2 Derating Limits

To ensure that the inverters can produce the rated power, measurement inaccuracies are taken into account when enforcing the below inverter limits.
(Limit = rated value + tolerance).

	FLX Series		
	12.5k	15k	17k
Grid current, per phase	18.8 A	22.6 A	25.6 A
Grid power, total	12875 W	15450 W	17510 W

Table 5.4 Derating Limits

5.3 Conformity

International Standards	FLX Series		
	12.5k	15k	17k
Directive LVD	2006/95/EC		
Directive EMC	2004/108/EC		
Safety	IEC 62109-1/IEC 62109-2		
Integrated PV load switch	VDE 0100-712		
Functional Safety	IEC 62109-2		
EMC immunity	EN 61000-6-1		
	EN 61000-6-2		
EMC emission	EN 61000-6-3		
	EN 61000-6-4		
Utility interference	EN 61000-3-2/-3	EN 61000-3-11/-12	
CE	Yes		
Utility characteristics	IEC 61727		
	EN 50160		
S0 Energy Meter (option)	EN62053-31 Annex D		

Table 5.5 International Standards Compliance

5.4 Installation Conditions

Parameter	Specification
Temperature	−25 °C - +60 °C (>45 °C derating)
Environmental class according to IEC	IEC60721-3-3 3K6/3B3/3S3/3M2
Air quality - general	ISA S71.04-1985 Level G2 (at 75% RH)
Air quality - coastal, heavy industrial and agricultural zones	Must be measured and classified acc. to ISA S71.04-1985
Vibration	1G
Observe product ingress protection class	IP65
Max. operating altitude	3000 m above sea level. PELV protection is effective up to 2000 m above sea level only.
Installation	Avoid constant stream of water. Avoid direct sunlight. Ensure adequate air flow. Mount on non-flammable surface. Mount upright on vertical surface. Prevent dust and ammonia gases.

Table 5.6 Conditions for Installation

Parameter	Condition	Specification
Mounting Plate	Hole diameter	30x9 mm
	Alignment	Perpendicular ±5° all angles

Table 5.7 Mounting Plate Specifications

5.4.1 France UTE Requirements

NOTE

In France, observe the UTE C 15-712-1 and NF C 15–100 requirements.

For installation in France, apply warning label to front of inverter.

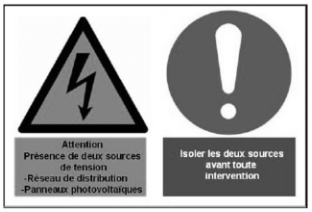

Illustration 5.1 Warning Label

5.5 Cable Specifications

Specification		FLX Series		
AC cable maximum length [m]	AC cable size	12.5k	15k	17k
	2.5 mm^2	-	-	-
	4 mm^2	48 m	-	-
	6 mm^2	60 m	52 m	45 m
	10 mm^2	71 m	65 m	60 m
	16 mm^2	78 m	74 m	71 m
AC cable type		5-wire copper cable		
AC cable outer diameter		18-25 mm		
AC cable insulation strip		Strip 16 mm length of insulation from all 5 wires		
PE cable diameter		Equal to or greater than diameter of AC phase cables		

Table 5.8 AC Cable Specifications

Specification		FLX Series
DC cable type		Max. 1000 V, 12 A
DC cable length	DC cable size 4 mm^2 - 4.8 Ω /km	< 200 m*
	DC cable size 6 mm^2 - 3.4 Ω /km	200-300 m*
Mating connector		Sunclix PV-CM-S 2,5-6(+) / PV-CM-S 2,5-6(-)

Table 5.9 DC Cable Specifications

** The distance between inverter and PV array and back, plus the cumulative length of the cables used for PV array installation.*

Consider also the following when choosing cable type and cross-sectional area:

- Ambient temperature
- Layout type (inside wall, under ground, free air etc.)
- UV resistance

NOTE

Avoid power loss in cables greater than 1% of the nominal inverter rating.

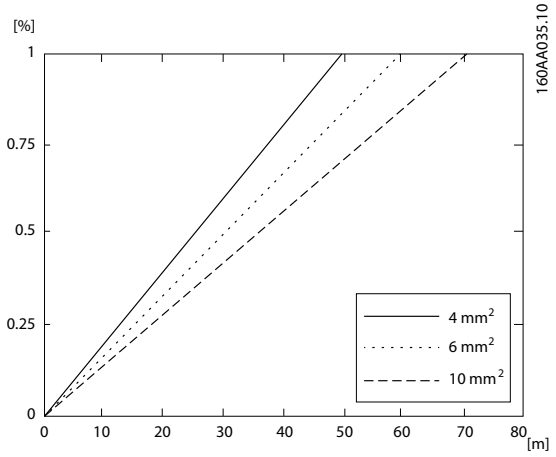

Illustration 5.2 FLX Series 12.5k Cable Losses [%] versus Cable Length [m]

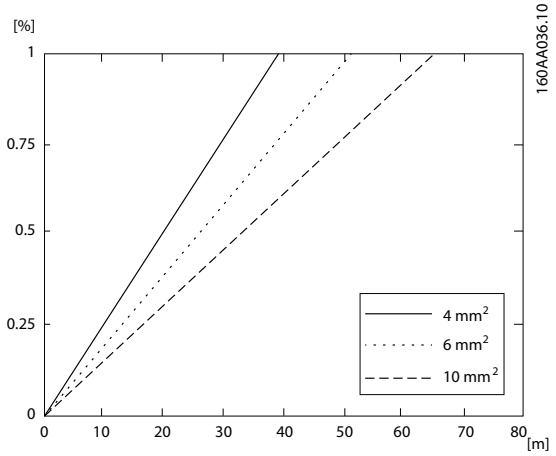

Illustration 5.3 FLX Series 15k Cable Losses [%] versus Cable Length [m]

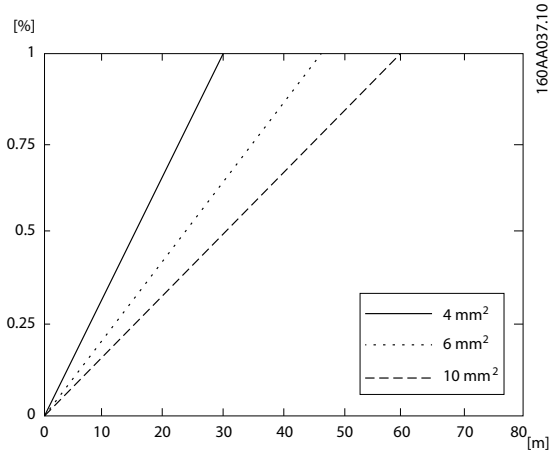

Illustration 5.4 FLX Series 17k Cable Losses [%] versus Cable Length [m]

5.6 Torque Specifications

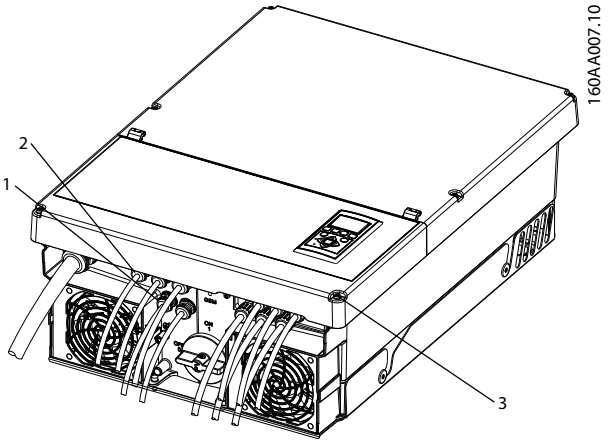

Illustration 5.5 Overview of Inverter with Torque Indications 1

	Parameter	Tool	Tightening Torque
1	M16 cable gland body	Wrench 19 mm	3.75 Nm
	M16 cable gland, compression nut	Wrench 19 mm	2.5 Nm
2	M25 cable gland body	Wrench 27 mm	7.5 Nm
	M25 cable gland, compression nut	Wrench 27 mm	5.0 Nm
3	Front screw	Torx TX 20	1.5 Nm

Table 5.10 Nm Specifications

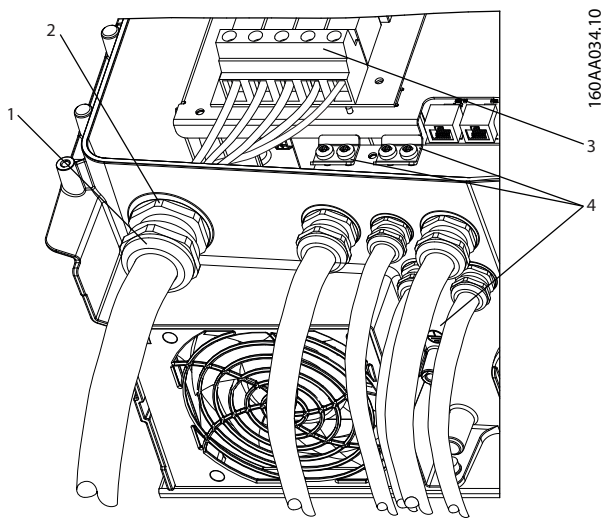

Illustration 5.6 Overview of Inverter with Torque Indications 2

	Parameter	Tool	Tightening Torque
1	M32 cable gland body	Wrench 42 mm	7.5 Nm
2	M32 cable gland, compression nut	Wrench 42 mm	5,0 Nm
3	Terminals on AC terminal block	Pozidriv PZ2 or Straight slot 1.0 x 5.5 mm	Min. 1.2 Nm
4	PE	Torx TX 20 or Straight slot 1.0 x 5.5 mm	2.2 Nm

Table 5.11 Nm Specifications

5.7 Mains Circuit Specifications

	FLX Series		
	12.5k	15k	17k
Maximum inverter current, I_{acmax}	19 A	23 A	26 A
Recommended blow fuse type gL/gG	20 A	25 A	32 A
Recommended automatic fuse type B or C	25 A	25 A	32 A

Table 5.12 Mains Circuit Specifications

5.8 Auxiliary Interface Specifications

Interface	Parameter	Parameter Details	Specification
RS-485 and Ethernet	Cable	Cable jacket diameter (⌀)	2x5-7 mm
		Cable type	Shielded Twisted Pair (STP CAT 5e or SFTP CAT 5e) [2]
		Cable characteristic impedance	100 Ω – 120 Ω
	RJ-45 connectors: 2pcs RJ-45 for RS-485 2pcs RJ-45 for Ethernet	Wire gauge	24-26 AWG (depending on mating metallic RJ-45 plug)
		Cable shield termination	Via metallic RJ-45 plug
	Galvanic interface insulation		Yes, 500 Vrms
	Direct contact protection	Double/Reinforced insulation	Yes
	Short-circuit protection		Yes
RS-485 only	Cable	Max. cable length	1000 m
	Max. number of inverter nodes		63
Ethernet only	Communication	Network topology	Star and daisy chain
	Cable	Max. cable length between inverters	100 m
	Max. number of inverters		100[1]

Table 5.13 Auxiliary Interface Specifications

[1] Max. number of inverters are 100. If GSM modem is used for portal upload, the number of inverters in a network is limited to 50.

[2] For outdoor use, we recommend outdoor burial type cable (if buried in the ground) for both Ethernet and RS-485.

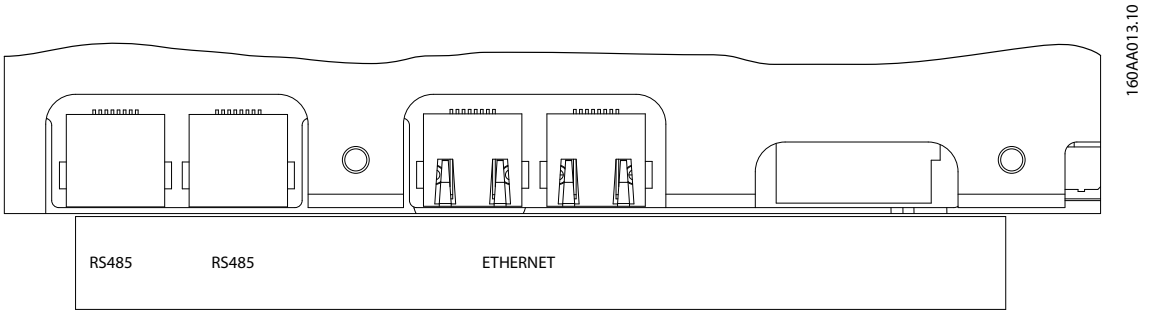

Illustration 5.7 Auxiliary Interfaces

5

5.9 RS-485 and Ethernet Connections

RS-485

Terminate the RS-485 communication bus at both ends.

- Termination is automatic when no RJ-45 plug is inserted into the socket. The absence of a mating connector enables both termination and bias.
- In rare cases, bias is unwanted, but termination is required. To terminate the RS-485 bus, mount a 100 Ω termination resistor into an RJ-45 field mountable connector. Then insert the connector (with resistor) into the unused RJ-45 connector.

The RS-485 address of the inverter is unique, and defined at the factory.

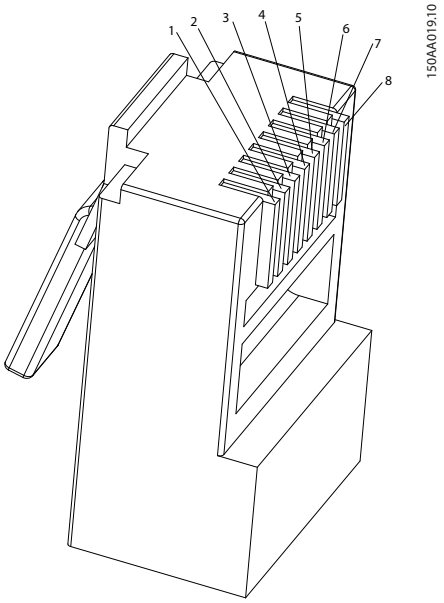

Illustration 5.8 RJ-45 Pinout Detail for RS-485

1.	**GND**
2.	GND
3.	**RX/TX A (-)**
4.	BIAS L
5.	BIAS H
6.	**RX/TX B (+)**
7.	Not connected
8.	Not connected

Bold *= Compulsory, Cat5 cable contains all 8 wires.*
For Ethernet: 10Base-TX and 100Base-TX auto cross-over.

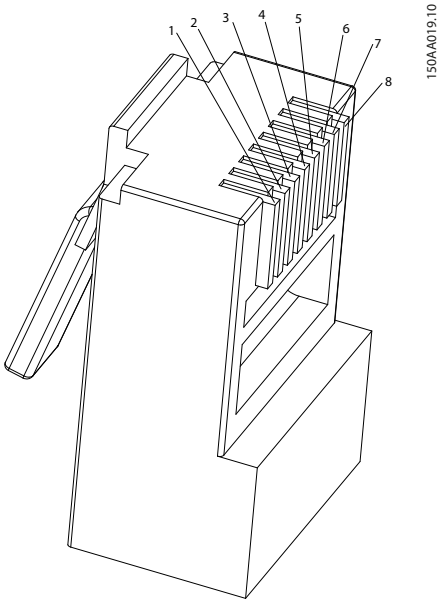

Illustration 5.9 RJ-45 Pinout Detail for Ethernet

Pinout Ethernet	Colour Standard	
	Cat 5 T-568A	Cat 5 T-568B
1. RX+	Green/white	Orange/white
2. RX	Green	Orange
3. TX+	Orange/white	Green/white
4.	Blue	Blue
5.	Blue/white	Blue/white
6. TX-	Orange	Green
7.	Brown/white	Brown/white
8.	Brown	Brown

5.9.1 Network Topology

The inverter has two Ethernet RJ-45 connectors enabling the connection of several inverters in a line topology as an alternative to the typical star topology. The two ports are similar and may be used interchangeably. For RS-485, only linear daisy chain connections can be used.

NOTE

Ring topology is not permitted.

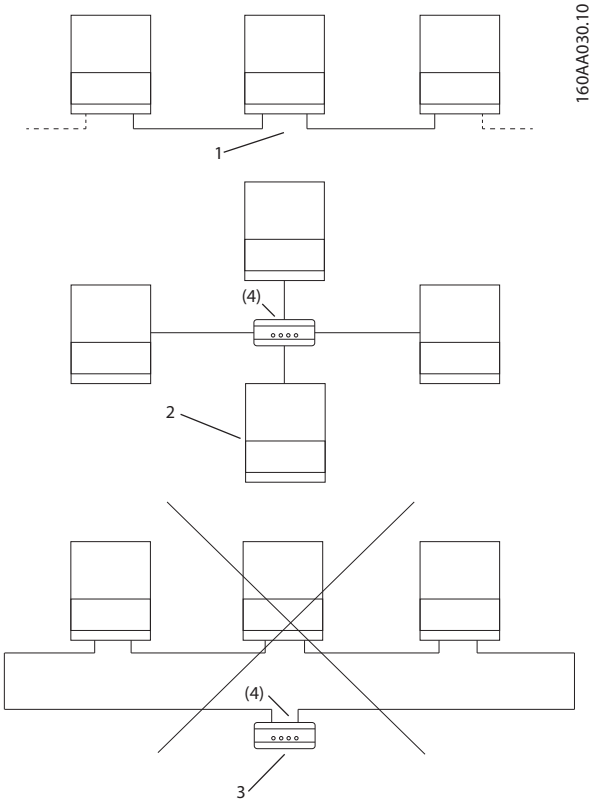

Illustration 5.10 Network Topology

1	Linear Daisy Chain
2	Star Topology
3	Ring Topology (not permitted)
(4)	(Ethernet Switch)

NOTE

The two network types cannot be mixed. The inverters can only be connected in networks which are either solely RS-485 or solely Ethernet.

NOTE

Ethernet is recommended for faster communication. RS-485 is required when a weblogger or datalogger is connected to the inverter.

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