Conext™ TL 15000 E and Conext TL 20000 E Photovoltaic Grid Tie Inverters

Installation and Operation Manual

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Schneider Electric

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About This Manual

Purpose

The purpose of this Installation and Operation Manual is to provide explanations and procedures for installing, operating, maintaining, and troubleshooting these inverters:

- Conext TL 15000 E (part number PVSNCV15000)
- Conext TL 20000 E (part number PVSNCV20000)

Scope

The manual provides safety guidelines, detailed planning and setup information, procedures for installing the inverter, as well as information about operating and troubleshooting the inverter.

Audience

The information in chapters “Introduction” (page 1–1) and “Operation” (page 3–1) is intended for the owner and operator of the inverter, and does not require any special training or qualifications. The information in chapters “Installation and Configuration” (page 2–1), “Troubleshooting” (page 4–1), and “Preventive Maintenance” (page 5–1) is intended for qualified personnel only. Qualified personnel have training, knowledge, and experience in:

- Installing electrical equipment and PV power systems (up to 1000 V).
- Applying all local installation codes.
- Analyzing and eliminating the hazards involved in performing electrical work.
- Selecting and using Personal Protective Equipment (PPE).

Installation, commissioning, troubleshooting, and maintenance of the inverter must be done only by qualified personnel.

Organization

This manual is organized into the following chapters and appendixes.

Chapter 1, “Introduction” contains information about the features and functions of Conext TL 15000 E and Conext TL 20000 E photovoltaic grid tie inverters.

Chapter 2, “Installation and Configuration” provides information and procedures for installing and configuring the inverter.

Chapter 3, “Operation” contains information on the basic operation of the inverter.

Chapter 4, “Troubleshooting” describes the error messages that might be displayed on the LCD of the inverter and recommended solutions.

Chapter 5, “Preventive Maintenance” contains information and procedures for performing preventive maintenance on the inverter.

Appendix A provides the environmental, electrical, and other specifications for the inverters.

Appendix B describes the information that can be displayed on the LCD of the inverter.

Appendix C describes the voltage and frequency disconnect settings and the reconnect time that the inverter provides for each country selectable from the user interface.

“Information About Your System” can be used to record information about your inverter package.

Conventions Used

This manual uses the following conventions for conveying important safety related information.

⚠ DANGER

DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation that, if not avoided, can result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation that, if not avoided, can result in moderate or minor injury.

CAUTION

CAUTION without the exclamation symbol indicates a potentially hazardous situation that, if not avoided, can result in equipment damage.

NOTICE
NOTICE indicates important information that you must read carefully.

Product Names

This manual includes information for two products: the Conext TL 15000 E and Conext TL 20000 E photovoltaic grid tie inverters. The following table lists the naming conventions used to differentiate information that only applies to one of the two inverters. For information common to both products, “inverter” is used.

Product Name	Usage
Conext TL 15000 E	Information provided is specific to the 15 kVA Conext photovoltaic grid tie inverter
Conext TL 20000 E	Information provided is specific to the 20 kVA Conext photovoltaic grid tie inverter

Abbreviations and Acronyms

Term	Definition/description
Cap	Capacitive
DC	Direct Current
GND	Ground
Ind	Inductive
I_{SC}	Short circuit current rating of an PV panel under STC. (See STC, below.)
L1	Line 1
L2	Line 2
L3	Line 3
LCD	Liquid Crystal Display
LED	Light Emitting Diode (indicator light)
MPP	Maximum Power Point

Term	Definition/description
MPPT	Maximum Power Point Tracking
N	Neutral
PE	Protective Earth (ground)
Pn	Real power nominal
PPE	Personal Protective Equipment
PV	Photovoltaic
Q	Reactive power
SELV	Safety Extra Low Voltage
Sn	Apparent power nominal
STC	Standard Test Conditions specific to photovoltaic panels (1000 W/m^2, light spectrum AM 1.5 and 25 °C [77 °F]); panel nameplate ratings are based on STC and may be exceeded under some conditions.
U	Voltage
VAC	Volts AC
VCC	Voltage at the Common Collector—Positive-voltage supply
VDC	Volts DC
VMPP	Voltage at Maximum Power Point
VOC	Open circuit voltage rating of a PV panel under STC

Related Information

You can find more information about Schneider Electric, as well as its products and services, at www.schneider-electric.com.

Important Safety Instructions

READ AND SAVE THESE INSTRUCTIONS - DO NOT DISCARD

This manual contains important safety instructions for Conext TL 15000 E and Conext TL 20000 E photovoltaic grid tie inverters that must be followed during the installation and maintenance of the inverter. Be sure to read, understand, and save these safety instructions.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK FROM MULTIPLE SOURCES

- To be installed and serviced only by qualified personnel equipped with appropriate PPE and following safe electrical work practices.
- This inverter is energized from the AC grid and up to four PV circuits. Before servicing the inverter or accessing the communication module, disconnect all sources and wait at least 1 minute to allow internal circuits to discharge.
- Operating the RID (Remote Inverter Disable) circuit or the switch on the inverter does not remove all power from the inverter. Internal parts and the external wiring remain live unless the PV and AC circuits have been disconnected externally.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

LIMITATIONS ON USE

- Do not use the inverter in connection with life support systems or other medical equipment or devices.
- Use the inverter only in grid-interconnected PV systems. The inverter does not support off-grid, stand-alone, power backup function.

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK, FIRE, AND EQUIPMENT DAMAGE

To prevent unsafe conditions and damage to the inverter, comply with the instructions and the electrical, physical, and environmental installation specifications listed in this manual.

Failure to follow these instructions can result in death or serious injury.

NOTICE

- Do not install or attempt to operate the inverter if it has been dropped or has received more than cosmetic damage during transport or shipping. If the inverter is damaged, or suspected to be damaged, contact Schneider Electric.
- The inverter is designed and certified for full power operation at ambient temperatures up to 40 °C (104 °F). Operation above 40 °C (104 °F) will result in reduced product performance.

Contents

Operation

Figures

Tables

1 Introduction

Chapter 1, “Introduction” contains information about the features and functions of Conext TL 15000 E and Conext TL 20000 E photovoltaic grid tie inverters.

Description of the Conext Grid Tie Solar Inverter

The inverter converts DC power to AC power. It harvests solar energy from a PV array and exports that energy directly to a three-phase electricity grid.

The inverter provides an option to collect the maximum available energy from the PV array by constantly adjusting its output power to track the maximum power point (MPPT) of the PV array. The inverter has two MPPT channels, so that two independent PV arrays, each containing up to two parallelled inputs, can be connected to the inverter. Each PV array, having one or two PV inputs, can be loaded to different peak power points, to capture the maximum possible energy. The inverter can accommodate arrays with open circuit voltage as high as 1000 VDC.

Figure 1-1 shows the major components of a typical PV grid-tie installation, the energy flow in a system using the inverter, and the placement of typical balance-of-system components.

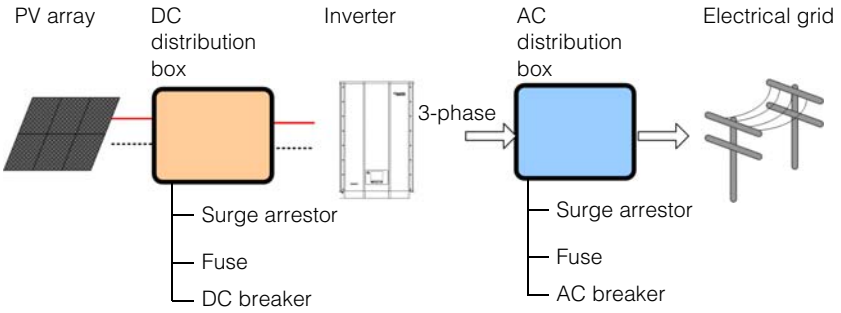


Figure 1-1 Typical installation

Installing the inverter consists of mounting it to the wall and connecting the DC input to a PV array and the AC output to the utility. For installation details, see “Installation and Configuration” on page 2–1.

Features

The inverter has the following features:

- Power rating:
  - Conext TL 15000 E inverter: 15 kVA
  - Conext TL 20000 E inverter: 20 kVA
- Three-phase (3-Phase + N + PE [ground]), grid-tie, transformerless
- Maximum power conversion efficiency: > 98%

- European weighted power conversion efficiency:
  - Conext TL 15000 E inverter: 97.3%
  - Conext TL 20000 E inverter: 97.5%
- Energy harvest (MPPT) efficiency: > 99%
- Power factor adjustment range: 0.85 capacitive to 0.85 inductive
- Low AC output current distortion (THD < 3%) @ rated power
- 2 MPP tracking channels
- Logs up to 30 events
- 5-inch (diagonally) graphical display (LCD)

Physical Features

Figure 1-2 shows the locations of important physical features of the inverter.

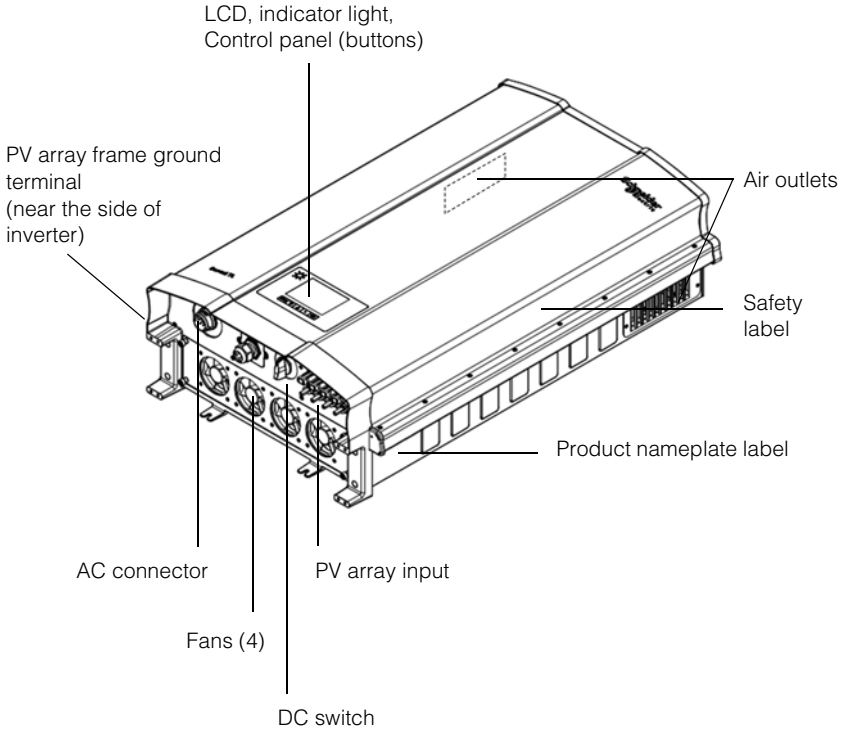


Figure 1-2 Location of important physical features

Interface Panel

The connectors are located on the bottom of the inverter, and are shown in Figure 1-3.

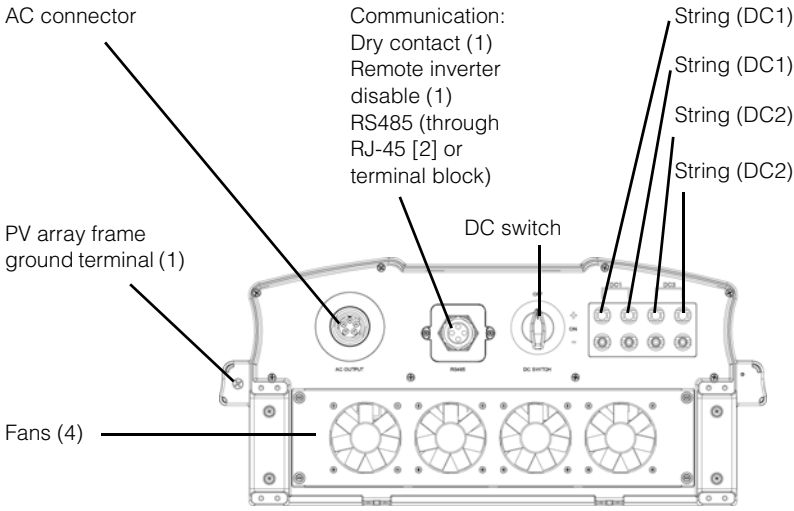


Figure 1-3 Interface panel

The following table shows you which sections of this manual contain information related to each item on the interface panel.

Item	See this section:
AC connector	“AC Grid Connection” on page 2–19
Communication connectors	“Communication Module” on page 2–29
DC switch	“Turning the Inverter On” on page 2–39
DC string connectors	“DC Wiring (From PV Array)” on page 2–26
PV array frame ground terminal	“PV Frame Ground” on page 2–27
Fans	“Semi-Annual Maintenance” on page 5–2

2 Installation and Configuration

Chapter 2, “Installation and Configuration” provides information and procedures for installing and configuring the inverter.

This chapter is for use by qualified personnel only

Installation Overview

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- The installation procedures in this manual are for use only by qualified personnel as defined in “Audience” on page iii.
- The inverter must be installed and serviced only by qualified personnel equipped with appropriate PPE. (See “Audience” on page iii).

Failure to follow these instructions will result in death or serious injury.

Planning

Planning for a system requires complete understanding of all the components that are involved to successfully install the inverter for performance and reliability, and to meet applicable installation codes.

Location

The inverter is rated and certified for both indoor and outdoor installation. See “Environmental Requirements” on page 2–7.

Clearance

Adequate ventilation and service access should be considered when installing the inverter. See “Environmental Requirements” on page 2–7.

Planning

This section provides information for you to consider before you install the inverter.

PV Planning

⚠ WARNING

HAZARD OF ELECTRIC SHOCK, FIRE, AND EQUIPMENT DAMAGE

The PV array voltage must never exceed 1000 VOC (open circuit voltage) under any condition. The PV array I_{SC} (short circuit current) must not exceed 24 A per DC tracker at STC (Standard Test Conditions) (based on array nameplate ratings).

Failure to follow these instructions can result in death or serious injury, and equipment damage.

A PV array sizing tool is available for download at www.se-renbu-docs.com/systemdesigntool.html. This software is an optional tool to help match the PV panel type and quantity to the inverter’s power rating.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

Use this inverter only with PV modules that have an IEC 61730 Class A rating.

Failure to follow these instructions can result in death or serious injury.

Requirements

CAUTION

RISK OF EQUIPMENT DAMAGE

Do not ground either the positive or negative conductor from the PV array.

Failure to follow these instructions can result in equipment damage.

NOTICE

- If two PV inputs are connected to one DC tracker (for example, DC1; see Figure 1-3 on page 1–4), the maximum power available from either string must not exceed 4250 W (for the Conext TL 15000 E inverter) or 5500 W (for the Conext TL 20000 E inverter). For maximum efficiency of the inverter, the power for each string should be balanced.
- The maximum power of an array connected to DC1 must not exceed 8.5 KW (for the Conext TL 15000 E inverter) or 11 KW (for the Conext TL 20000 E inverter).
- The maximum power of an array connected to DC2 must not exceed 8.5 KW (for the Conext TL 15000 E inverter) or 11 KW (for the Conext TL 20000 E inverter).

Make sure the following requirement is met:

- Any components installed between the PV array and the inverter (for example, fuses, breakers, wiring, and connectors) must be rated at least 1000 VDC and 1.25 times the total array short circuit current nameplate rating (at STC) unless the applicable installation codes require a higher multiplier.

Recommended Protection Devices and Conductor Sizing

It is the installer's responsibility to determine and provide the external overcurrent protection and disconnecting means required for the PV input wiring. You must determine the need for overcurrent protection, and its rating or setting, based on:

- Applicable installation codes
- Array currents involved
- Expected ambient temperatures
- Any other system parameters required by the installation codes

The MC4 connectors accept conductor sizes of 4 mm^2 or 6 mm^2. Select the conductor size in accordance with installation codes and to limit the connector temperature to less than 105 °C (221 °F). You must use the manufacturer's required crimping tool. For further information, contact the connector manufacturer.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

- Use only MC4 connectors from Multi-Contact™. Do not mix and match connectors from different manufacturers.
- Use only the crimping tool required by Multi-Contact.

Failure to follow these instructions can result in death or serious injury.

Any cable or wiring located outdoors must be outdoor rated and UV (sunlight) resistant.

PV Wiring Diagrams

For connection details, see Figure 2-1. The inverter can accept PV inputs in parallel (1 MPP tracker) or separate PV input connections (2 MPP tracker).

If you are connecting several inverters, see also Figure 2-28 on page 2–33.

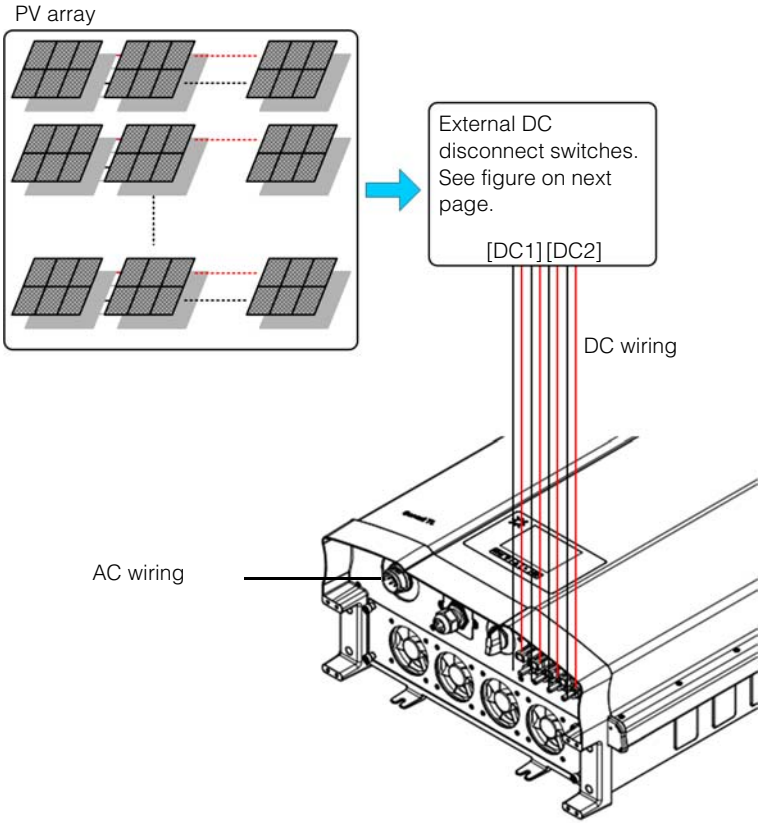
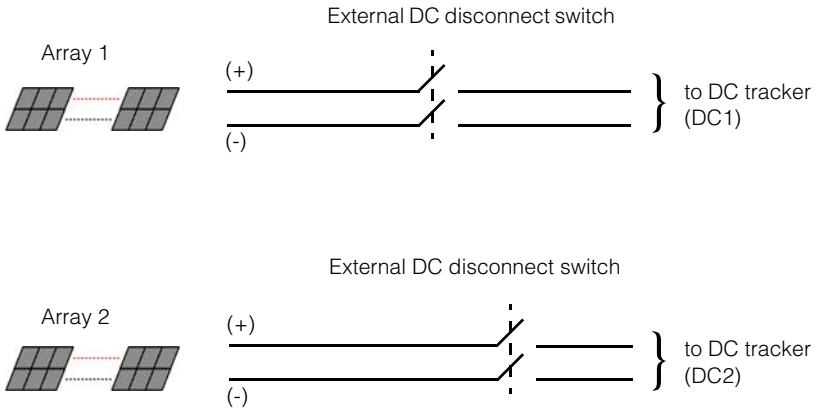


Figure 2-1 Connection diagram

Install external DC disconnect switches. Figure 2-2 shows an example with 1 PV input per DC tracker.



Note: DC1 and DC2 can combine (parallel) up to 2 PV inputs.

Figure 2-2 External DC disconnect switches

AC Grid Connection Planning

This section describes requirements regarding the AC output wiring.

Recommended Protection Devices, Conductor Type and Sizing

It is the installer's responsibility to determine and provide the external overcurrent protection and disconnecting means required for the AC output wiring. You must determine the rating or setting of the overcurrent protection, and the size of the conductors used, based on:

- Applicable installation codes
- Currents involved (see “Specifications” on page A–1)
- Expected ambient temperatures
- Any other system parameters required by the installation codes.

The AC cable must be jacketed and carry five insulated copper conductors to allow connection to L1, L2, L3, N, and PE (protective earth). Any cable or wiring located outdoors must be outdoor rated and UV (sunlight) resistant.

The AC connector provided is designed for AC cable outer diameters from 11 mm to 20 mm. The recommended AC cable diameter is 16 to 20 mm.

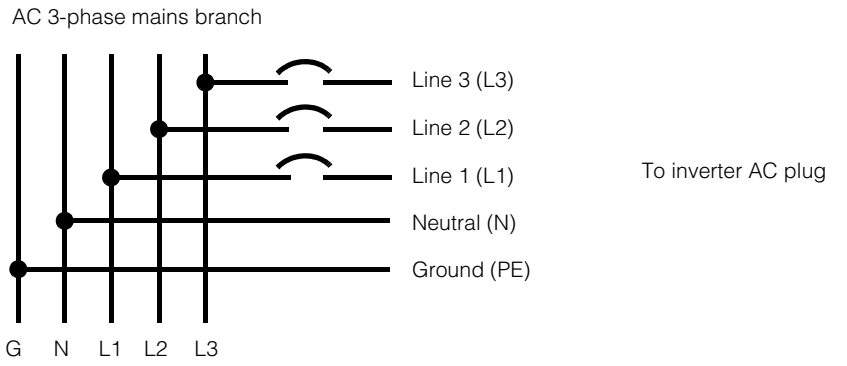


Figure 2-3 AC connection details

Environmental Requirements

See “Environmental Specifications” on page A–2.

- The inverter’s enclosure can tolerate some ingress of dust; however, minimizing the exposure to dust may extend the life of the inverter.
- While the inverter’s IP65 enclosure[1] protects the inverter from rain and water sprayed at the inverter from a nozzle, it is recommended that outdoor installations be located away from lawn sprinklers and other sources of spray such as a hose or pressure washer.
- The inverter is designed to operate in a -20 °C to 60 °C (-4 °F to 140 °F) ambient environment. Optimal power harvest is achieved at ambient temperature between -20 °C and 40 °C. Above 40 °C, power will derate.

Choosing the Right Location for Mounting

⚠ WARNING

HAZARD OF FIRE

Keep the area under and around the inverter clear of flammable material and debris.

Failure to follow these instructions can result in death or serious injury.

1.The IP65 enclosure is for electronics only; the balance of the enclosure is rated IP55 (for example, the ventilation cavity).

⚠ CAUTION

HEAVY OBJECT

The inverter weighs approximately 67 kg (148 lbs). Make sure the surface on which the inverter will be mounted, and the mounting hardware used, are strong enough to support this weight.

Failure to follow these instructions can result in moderate or minor injury, or equipment damage.

NOTICE

- The enclosure of the inverter protects internal parts from rain; however, outdoor installations must be located away from lawn sprinklers and other sources of spray such as a garden hose or a pressure washer.
- Direct sunlight on the inverter could raise internal temperatures, causing a reduction of output power during hot weather. Where possible, install the inverter in an area shaded from exposure to direct sunlight.
- Product performance might be impaired without adequate ventilation. Allow at least 600 mm (23.6 in.) clearance at the sides, top, and bottom of the inverter.
- Do not obstruct the air intakes and outlets.
- The inverter does not require any clearance at the rear and it may be mounted flush on a surface.

Unpacking

Before you install the inverter, perform the steps in this section.

Verify the Package Contents

Before you remove the inverter, verify that the package includes all the items listed in Table 2-1.

Table 2-1 Packing list

Item	Quantity	Description
Inverter	1	Conext TL 15000 E (15 kVA) or Conext TL 20000 E (20 kVA) inverter
Installation and operation manual	1	This document
AC plug	1	Connector for AC connection

Table 2-1 Packing list (Continued)

Item	Quantity	Description
Mounting plate	1	Wall mounting plate to mount the inverter on the wall

Unpack the Inverter

⚠ CAUTION

HEAVY OBJECT

Use caution and correct procedures when lifting, moving, or mounting the inverter.

Failure to follow these instructions can result in moderate or minor injury.

CAUTION

When removing the inverter, put it on cardboard, to prevent the back surface from cosmetic damage.

Failure to follow these instructions can result in equipment damage.

To unpack the inverter:

- With the help of another person, carefully remove the inverter and place it on a flat surface. See Figure 2-4.

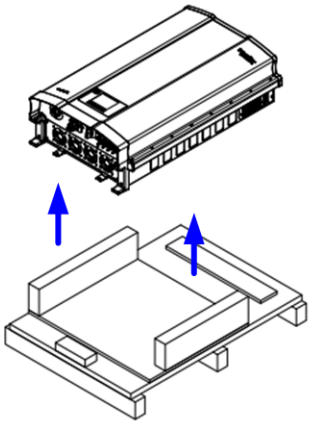


Figure 2-4 Lifting the inverter out of the box

Check the Inverter

To check the inverter:

1. Check the inverter for damage from shipping. If it is damaged, contact Schneider Electric.
2. Check the nameplate label on the inverter to make sure it is the model you ordered. For the location of the label, see Figure 2-5.

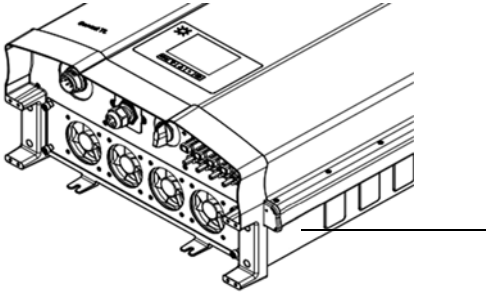


Figure 2-5 Location of nameplate label

3. Fill in “Information About Your System” on page D–1.

Tools Required

You will need the following tools to install the inverter.

- ❒ Slotted screwdriver
- ❒ #2 Phillips screwdriver
- ❒ Tools for preparing and connecting the wiring. See the user instructions from the connectors’ manufacturers.

Views and Dimensions

The views and dimensions of the inverter are shown in Figure 2-6.

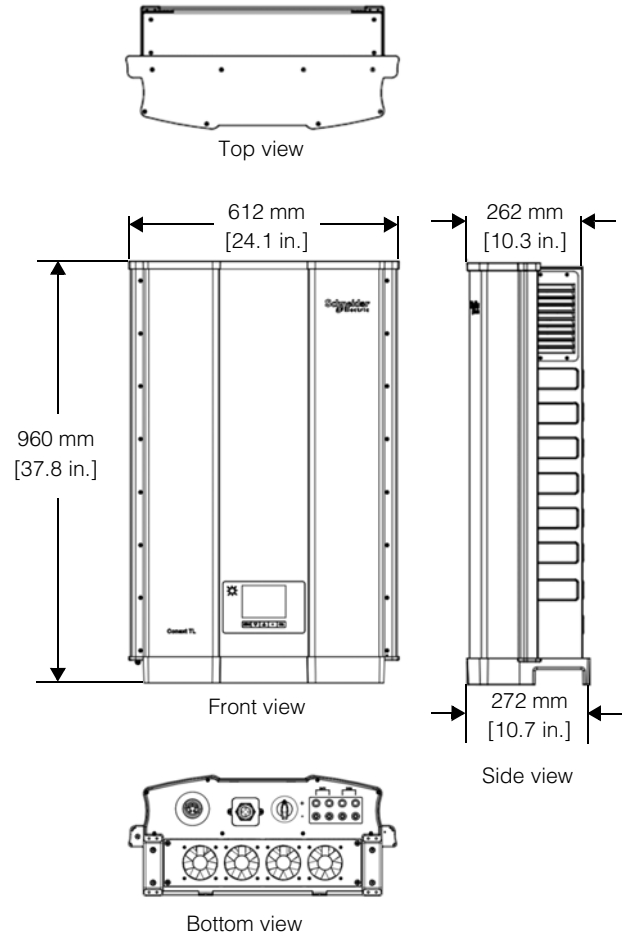


Figure 2-6 Views and dimensions

Ventilation

The air intakes are located on the bottom of the inverter, and the outlets are on the sides at the top of the inverter, as shown in Figure 2-7.

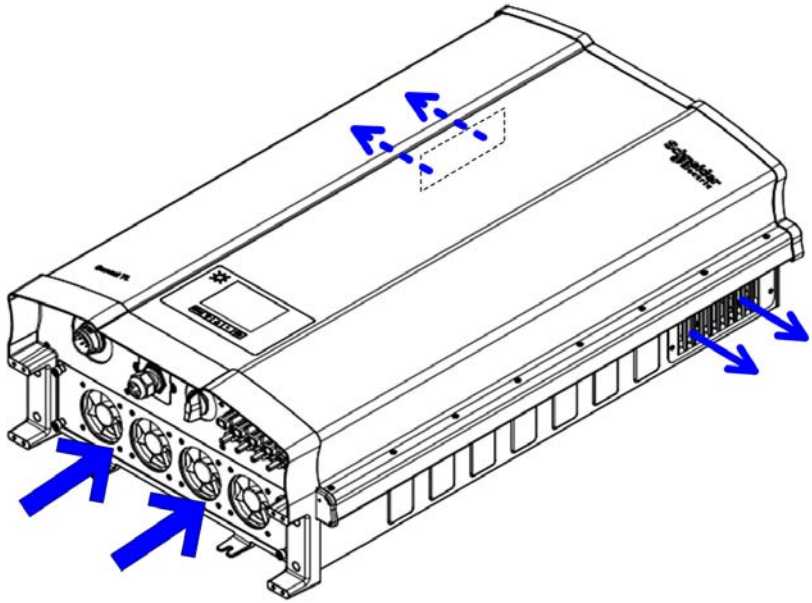


Figure 2-7 Airflow

Mounting

This section describes how to mount the inverter.

Correct Mounting Position

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

To prevent the entry of water, mount the inverter only upright (fan openings facing downward) and only on a vertical surface.

Failure to follow these instructions will result in death or serious injury.

The correct mounting position is shown in Figure 2-8. Examples of incorrect positions are shown in Figure 2-9.

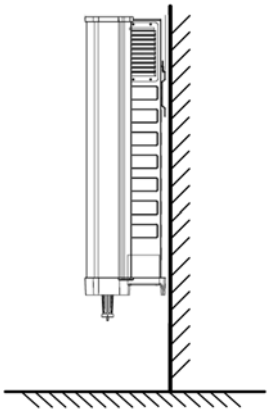


Figure 2-8 Correct mounting position

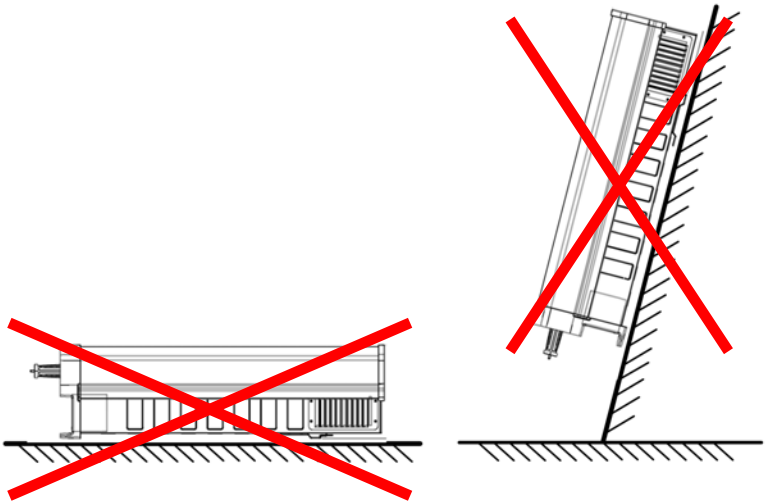


Figure 2-9 Incorrect mounting positions

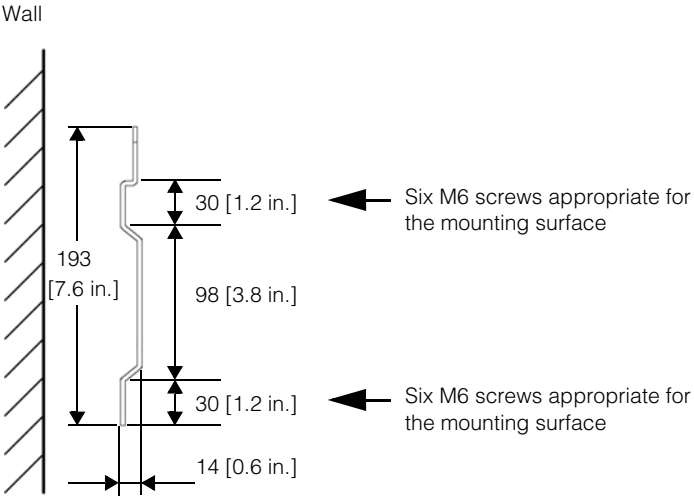
Mounting Plate

This section describes the mounting plate used to mount the inverter to the wall.

Dimensions of the Mounting Plate

The dimensions of the mounting plate are shown in Figure 2-10.

Side view



Plan view

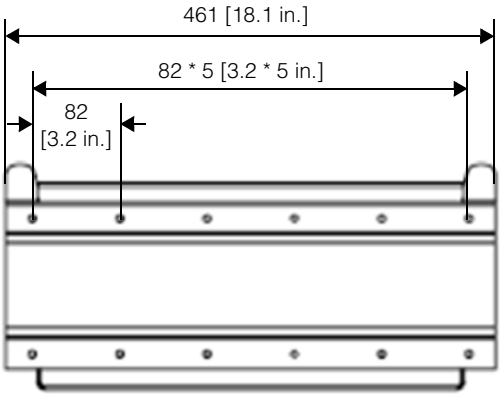


Figure 2-10 Mounting plate dimensions

Correct Position of the Mounting Plate

The correct position of the mounting plate (in relation to the inverter) is shown in Figure 2-11.

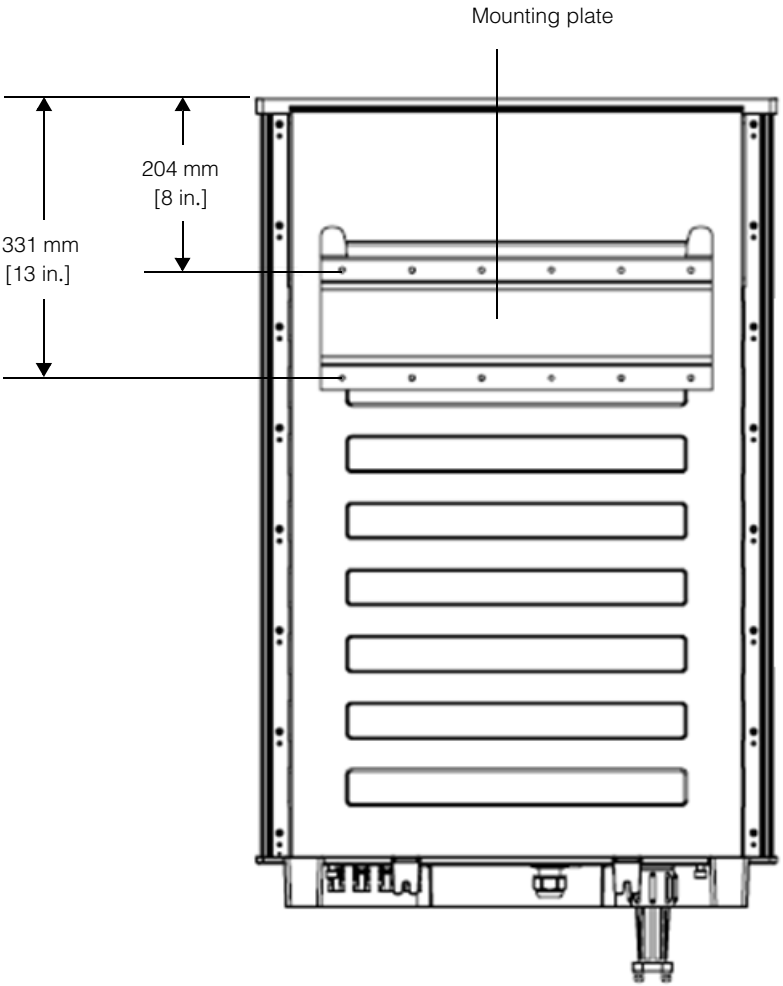
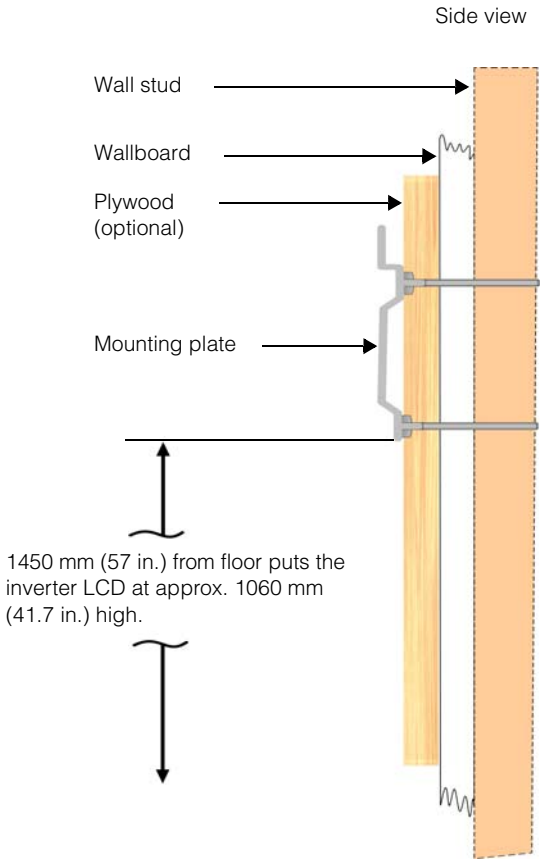


Figure 2-11 Position of mounting plate (rear view of the inverter)

Fastening the Mounting Plate to the Wall

To fasten the mounting plate to the wall:

1. Select a wall or other suitable, solidly-built vertical surface capable of supporting the weight of the inverter and the mounting plate.
2. Using twelve M6 screws appropriate for the mounting surface you have chosen (for example, wood, concrete, or brick), securely attach the mounting plate to the mounting surface. An example of mounting on plywood, wallboard, and wall studs is shown in Figure 2-12 on page 2–17.



1. Locate the wall studs.
2. If necessary, enhance the support surface with a plywood panel (at least 20 mm [0.8 in.] thick) secured to the wall studs. Plywood should span three wall studs.
3. Use hardware sized to support a minimum of 70 kg (approximately 154 lbs) (not supplied) to secure the plywood to the wall.
4. Using a level, secure the mounting plate to the wall. Use recommended anchoring hardware to secure the plate.

Figure 2-12 Example of fastening the mounting plate to the wall

Mounting the Inverter

To mount the inverter:

1. Place the inverter on the mounting plate, making sure that the upper edge of the mounting plate engages the flange on the back of the inverter.
2. Using two M6 screws appropriate for the mounting surface, fasten the bottom of the inverter to the wall. For the location of the mounting tabs, see Figure 2-13.

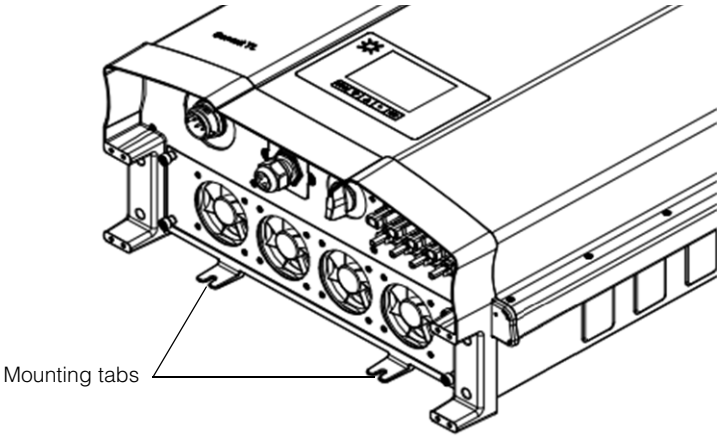


Figure 2-13 Location of mounting tabs (for fastening the bottom of the inverter to the wall)

Wiring

This section describes how to connect the AC wiring (to the grid) and DC wiring (from the PV array) to the inverter.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK FROM MULTIPLE SOURCES

- All electrical work must be done in accordance with local electrical codes.
- To be installed and serviced only by qualified personnel equipped with appropriate PPE and following safe electrical work practices.
- Before installation, de-energize the AC and PV sources using external disconnecting means provided in the installation, and test using a meter rated at least 1000 V AC and DC to make sure all circuits are de-energized. If possible, follow a lock-out tag-out procedure.

Failure to follow these instructions will result in death or serious injury.

AC Grid Connection

This section describes how to connect the inverter to the AC grid.

AC Plug Wiring

Many 3-phase AC distribution systems in Europe follow the IEC color-code to identify the different conductors and the phase sequence (phase rotation). When in doubt, use a phase rotation meter to verify.

Table 2-2 IEC color-coding to identify the phase sequence (phase rotation)

Component of AC wiring	Color
Line 1 (phase 1)	Brown
Line 2 (phase 2)	Black
Line 3 (phase 3)	Grey
Neutral	Blue
Protective earth	Green-yellow striped

NOTICE

The inverter supports positive and negative phase sequences. The sequence of L1 ~ L3 can be reversed; however, N and PE must be connected to the correct pins regardless of phase sequence.

To connect the AC plug:

1. Separate the AC plug into three parts, as shown in Figure 2-14 on page 2–20.
   a) Holding the middle (central) part of the female insert, rotate the back shell to loosen it, and then detach it from the female insert.
   b) Remove the cable nut (with rubber insert) from the back shell.

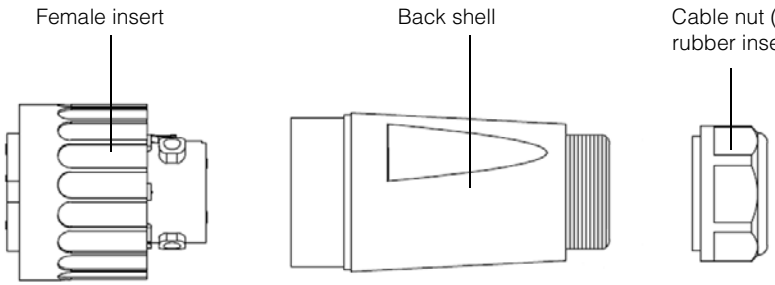


Figure 2-14 AC plug (exploded view)

2. If the diameter of the AC cable you are using is 16 mm or larger:

   - Using a flat screwdriver, carefully break the connection between the two rubber rings that make up the rubber insert, as shown in Figure 2-15 on page 2–21. Discard the inner ring (to increase the inner diameter of the rubber insert).

CAUTION
RISK OF EQUIPMENT DAMAGE If you have damaged the outer ring and the inverter will be used outdoors, obtain a replacement rubber insert from Schneider Electric, and then repeat the above steps. **Failure to follow these instructions can result in equipment damage.**

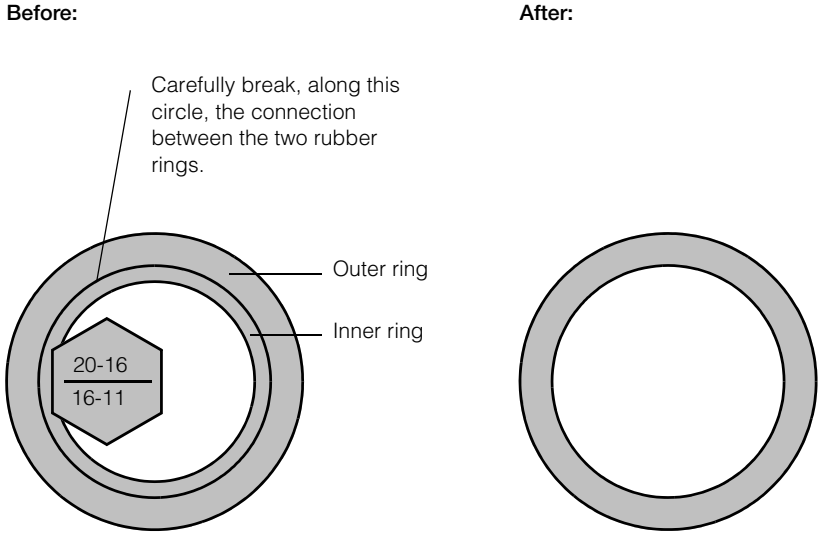


Figure 2-15 Increasing the inner diameter of the rubber insert

3. Slide the cable nut and then the back shell onto the cable, as shown in Figure 2-16.

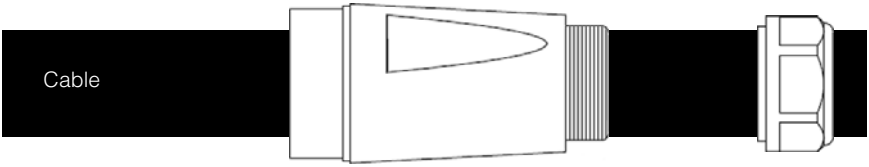


Figure 2-16 Sliding the cable nut and the back shell onto the cable

4. Using the appropriate tool, strip the wires:

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

- Make sure you do not accidentally cut the wire insulation and expose the wires (other than the stripped ends).
- Make sure you follow the recommended specifications of stripping/trimming of the wires.

Failure to follow these instructions can result in death or serious injury.

a) Remove 55 mm (2.2 in.) of the outer jacket (shown in Figure 2-17).

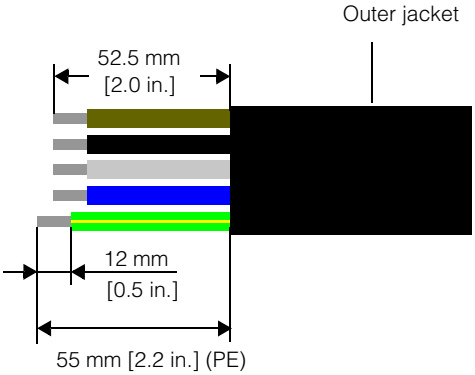
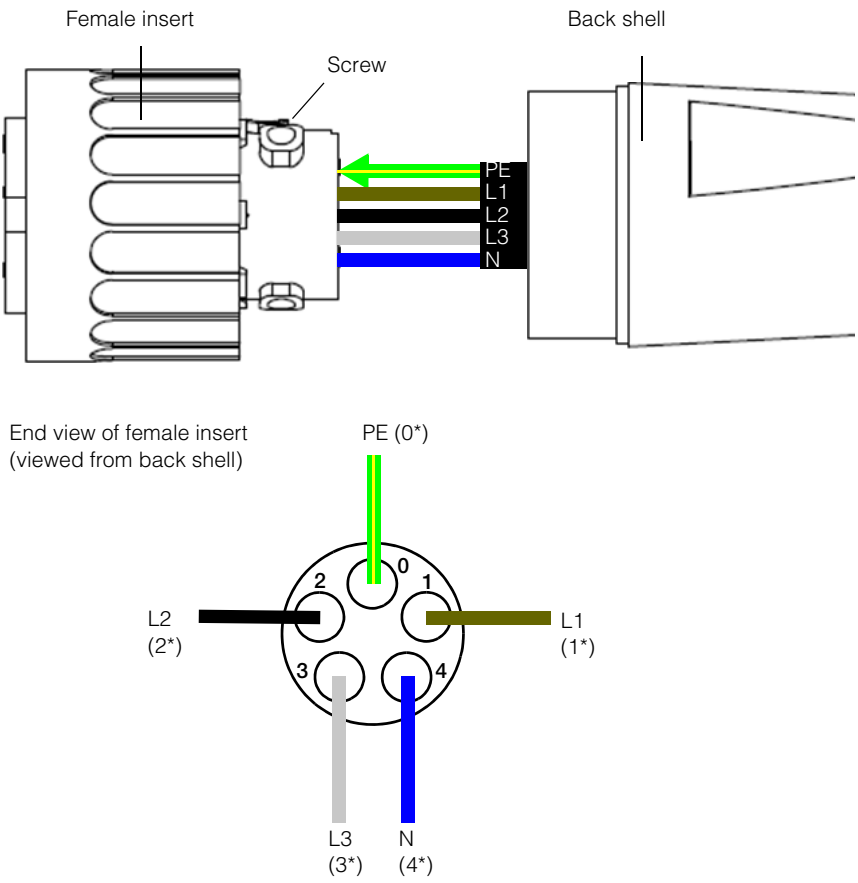


Figure 2-17 Stripping the wires

b) Trim all the wires, except the PE wire, to 52.5 mm (2.0 in.).

c) Using the appropriate tool, strip 12 mm (0.5 in.) of insulation from all wire ends, as shown in Figure 2-17 (above).

5. Insert the stripped end of each of the five wires into the appropriate hole in the female insert, and then tighten each screw to 0.7 Nm (to hold each wire in place). See Figure 2-18 on page 2–23.



* Numbers are embossed on the connector.

Figure 2-18 Plug wiring

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

Make sure you do not mistakenly connect a phase conductor to the PE terminal (#0)—otherwise the chassis will be energized at 230 VAC.

Failure to follow these instructions will result in death or serious injury.

6. Slide the back shell towards the female insert.
7. Holding the middle (central) part of the female insert, rotate the back shell to connect it to the female insert and then tighten it, as shown in Figure 2-19.

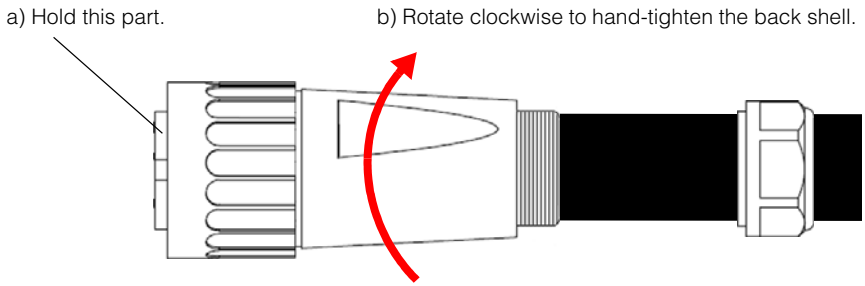


Figure 2-19 Tightening the back shell

8. Slide the cable nut towards the back shell.
9. Rotate the cable nut to secure the cable, as shown in Figure 2-20.

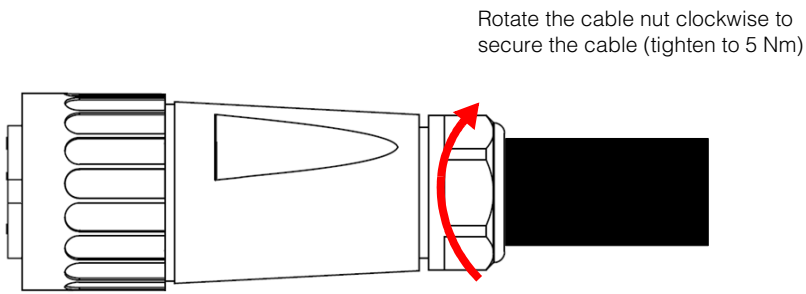


Figure 2-20 Securing the AC cable

⚠WARNING

HAZARD OF FIRE

To prevent damaged wire strands and their subsequent overheating, make sure you properly install and tighten the cable nut onto the AC plug assembly.

Failure to follow these instructions can result in death or serious injury.

NOTICE
Make sure the AC plug and cable are fully assembled before you connect them to the inverter.

10. Connect the AC plug to the inverter, and then rotate the locking ring of the female insert to secure the plug to the inverter. See Figure 2-21.

⚠ WARNING
HAZARD OF ELECTRIC SHOCK AND FIRE Ensure the AC plug is properly connected with the locking ring tightened. **Failure to follow these instructions can result in death or serious injury.**

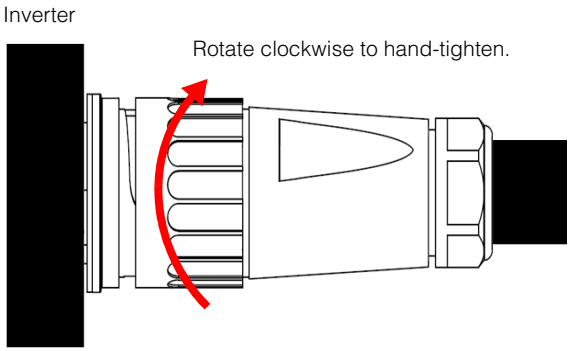


Figure 2-21 Connecting the AC plug to the inverter and rotating the locking ring

11. Using insulated cable clamps, secure the cable to the wall or structure.

⚠ WARNING
HAZARD OF ELECTRIC SHOCK Make sure the clamp nearest the inverter is at a distance that: • Allows the AC plug to be connected and disconnected from the inverter. • Does not allow the AC plug to reach the ground or other surface under the inverter where water might collect. **Failure to follow these instructions can result in death or serious injury.**

DC Wiring (From PV Array)

⚠ WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

- Use only MC4 connectors from Multi-Contact™. Do not mix and match connectors from different manufacturers.
- Use only the crimping tool required by Multi-Contact.

Failure to follow these instructions can result in death or serious injury.

DC Wiring Polarity

CAUTION

RISK OF EQUIPMENT DAMAGE

- Make sure the correct polarity is used for all power connections.
- Do not ground either the (+) or the (-) conductor of the PV array.

Failure to follow these instructions can result in equipment damage.

The PV wiring connects to the inverter using polarized connectors. The polarity of the connectors to be used on the wiring to the inverter is shown in Figure 2-22. Your inverter has the correct connectors to mate with the connectors shown.

Type: PV-KBT4/6 II, from Multi-Contact AG (www.multi-contact.com)

\+

Type: PV-KST4/6 II, from Multi-Contact AG

\-

Figure 2-22 DC wiring polarity and connector types, for the array wiring

Connection

To connect the PV wires:

1. Follow the manufacturer's instructions to assemble the MC4 connectors onto the PV wiring. Make sure you use the right connector polarities, as shown in Figure 2-22 on page 2–26.
2. Connect the wires to the DC1 and DC2 connectors of the inverter.
3. Using insulated cable clamps, secure the PV cables to the wall or structure.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

Make sure the clamps nearest the inverter are at a distance that:

- Allows the plugs to be connected and disconnected from the inverter.
- Does not allow the plugs to reach the ground or other surface under the inverter where water might collect.

Failure to follow these instructions can result in death or serious injury.

PV Frame Ground

For some types of PV arrays, and in some PV installation codes, the array frames must be bonded to protective earth (ground). This may be done at the inverter or elsewhere in the installation. It is the installer's responsibility to determine the array frame grounding requirements in the applicable installation codes.

NOTICE

This section applies only if the user documentation for your PV array or the applicable installation codes specify that the PV array frame should be grounded.

To bond the metal frame of the PV array to protective earth at the inverter:

◆ Using the provided M6 screw with star washer (pre-installed on the inverter), connect the PV array frame grounding conductor to the inverter, as shown in Figure 2-23 on page 2–28.

The location of the PV array frame ground terminal is shown in Figure 1-3 on page 1–4.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

If the array frame grounding is done at the inverter, removal of the inverter or disconnection of the AC plug from the inverter will leave the array frame not grounded; you must provide temporary additional grounding.

Failure to follow these instructions can result in death or serious injury.

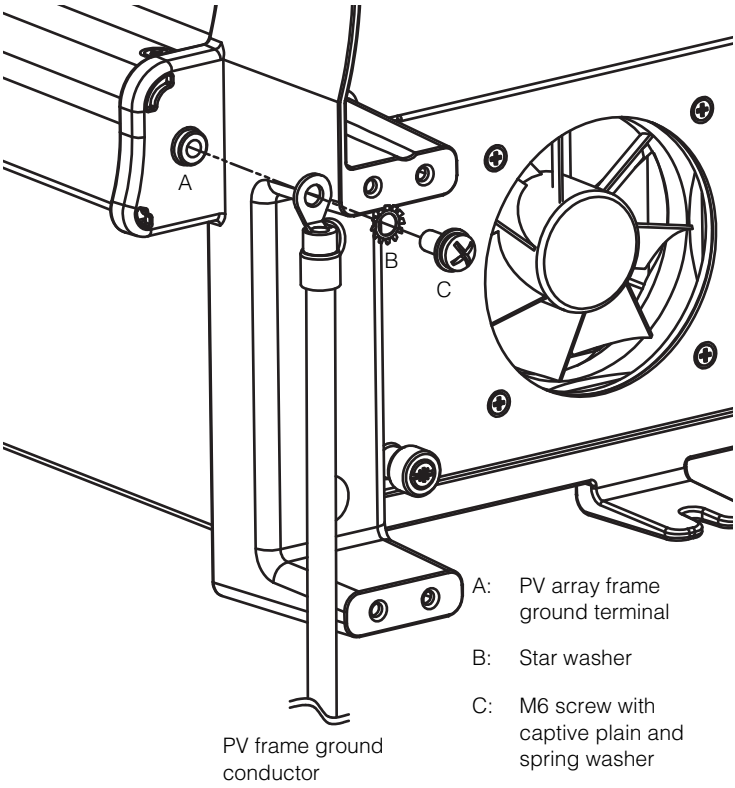


Figure 2-23 Connecting PV frame ground

Communication Module

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

- Connect only to SELV circuits.
- The circuits provided for use with external communications and control equipment are designed to provide isolation from neighboring hazardous circuits within the inverter. The communications and control circuits are classified as Safety Extra Low Voltage (SELV) and must only be connected to other SELV circuits of the types described in this manual.
- Physical and electrical separation of the communications and control circuits from non-SELV electrical circuits must be maintained both within the inverter and external to the inverter.

Failure to follow these instructions can result in death or serious injury.

The communication module supports the Modbus communication protocol via an RS485 interface. The module also provides an RID (Remote Inverter Disable) input and a dry (not energized) contact for signalling purposes. The module is shown in Figure 2-24.

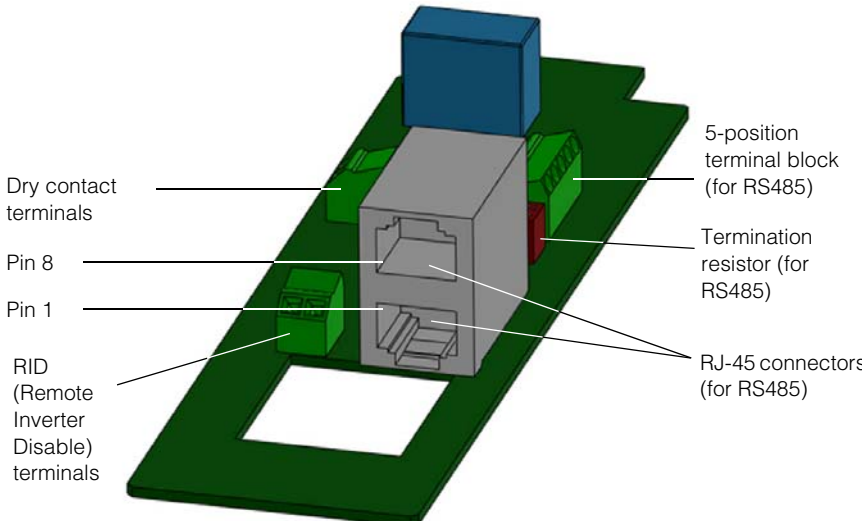


Figure 2-24 Communication module

Removing the Communication Module

⚠ DANGER

HAZARD OF ELECTRIC SHOCK FROM MULTIPLE SOURCES

- This inverter is energized from the AC grid and up to four PV circuits. Before accessing the communication module, disconnect all sources of electricity and wait at least 1 minute to allow internal circuits to discharge.
- Operating the RID (Remote Inverter Disable) circuit or the switch on the inverter does not remove all power from the inverter. Internal parts and the external wiring remain live unless the PV and AC circuits have been disconnected externally.

Failure to follow these instructions will result in death or serious injury.

To remove the communication module:

1. Turn the DC switch to the “OFF” position. For the switch location, see Figure 1-3 on page 1–4.
2. Wait at least 1 minute for internal voltages to discharge, and then disconnect the AC plug and all PV connectors from the inverter, being careful not to allow water or dirt to contact any of connectors.
3. Remove the two screws—one on each side of the connector labeled “RS485” (above the second fan on the interface panel). For the connector location, see Figure 1-3 on page 1–4.
4. Pull the cover off.
5. Remove the communication module.

Connecting Cables to the Communication Module

NOTICE
The drawings in this section show one cable being connected. You can connect several cables to the communication module.

To connect the cables:

1. For each cable you will be connecting, pull one of the plugs out of the end of the seal, as shown by the arrow in Figure 2-25.

CAUTION
RISK OF EQUIPMENT DAMAGE To make sure the seal is not compromised, remove only the number of plugs equal to the number of cables you will be connecting. **Failure to follow these instructions can result in equipment damage.**

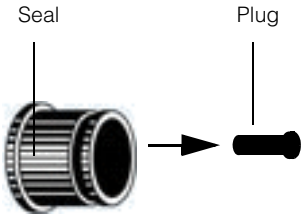


Figure 2-25 Removing a plug from the end of the seal

2. Insert the cables into the seal, and then assemble the claw and seal, as shown in Figure 2-26 on page 2–32.

   The outside of the seal has one cut, down the length of the seal, for each of the plugs. This is for easy insertion of the cable.

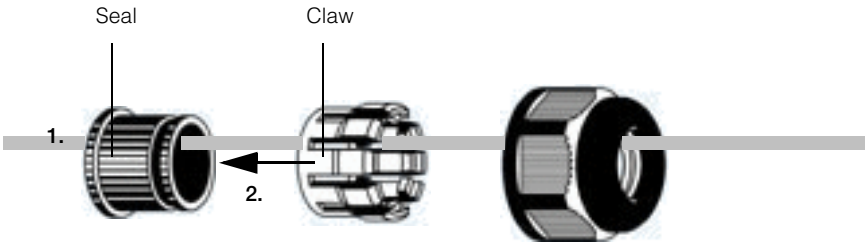


Figure 2-26 Inserting the cables into the seal and assembling the claw and seal

3. For each cable, leave 100 to 170 mm (3.9 to 6.7 in.) from the end of the cable to the seal. This is to provide enough cable to reach the connector on the communication module when the module is inserted in the inverter.
4. Connect the body of the cable gland to the claw and seal, as shown in the left part of Figure 2-27.

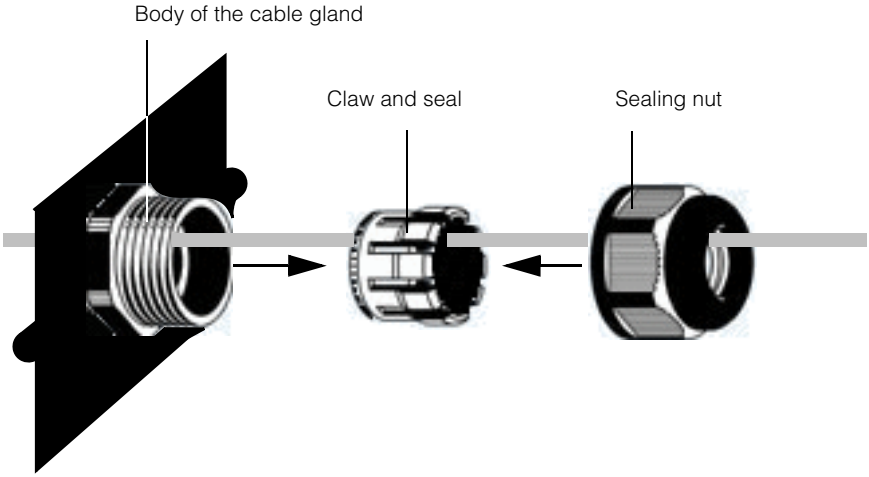


Figure 2-27 Connecting the body of the cable gland, the claw and seal, and the sealing nut

5. Slide the sealing nut towards the body of the cable gland with claw and seal (as shown in the right part of Figure 2-27), and then hand-tighten the sealing nut onto the body.
6. Connect the end of each cable to the appropriate connector on the communication module.
7. Insert the communication module into the inverter.

8. Attach the cover of the communication module slot to the inverter. Tighten each of the two captive screws to 0.7 Nm.

RS485 Connection

CAUTION

RISK OF EQUIPMENT DAMAGE

Make sure the other end of the RS485 connection is also RS485. Connection to any other type of communication port, such as Ethernet, may result in equipment damage.

Failure to follow these instructions can result in equipment damage.

Two options are available for implementing the RS485 connection:

- Using either or both of the two RJ-45 connectors. See the following section.
- Using the 5-position terminal block. See “RS485 Connection Using the 5-Position Terminal Block” on page 2–34.

The wiring when using multiple inverters is shown in Figure 2-28.

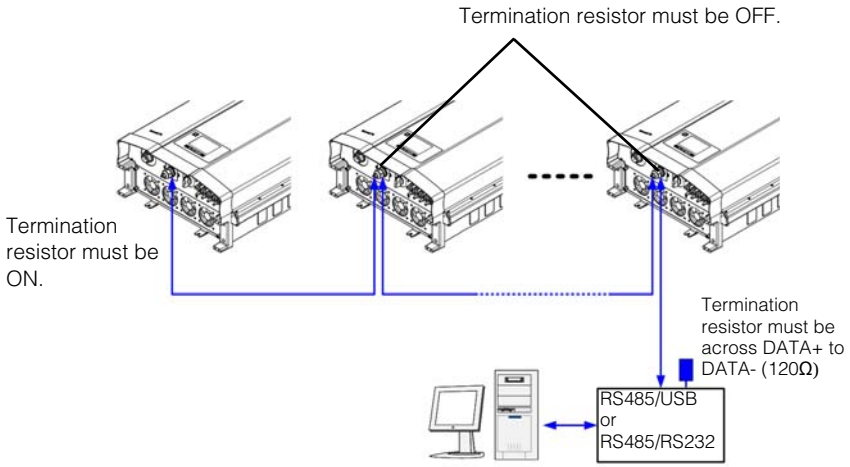


Figure 2-28 RS485 wiring: multiple inverters

The data format for the RS485 connection is shown in Table 2-3.

Table 2-3 RS485 data format

Parameter	Value
Baud rate	9600
Data bits	8
Stop bits	1
Parity	None

RS485 Connection Using the RJ-45 Connectors

The pin definitions of the RJ-45 connection are shown in Table 2-4.

Table 2-4 RJ-45 pin definitions

Pin	Function
4	DATA+
5	DATA-
7	NC (Not connected)
8	Modbus ground

RS485 Connection Using the 5-Position Terminal Block

The pin definitions of the 5-position terminal block are shown in Table 2-5.

Table 2-5 5-position terminal block pin definitions

Pin	Function
1	DATA+
2	DATA-
3	Chassis ground
4	Modbus ground
5	NC (Not connected)

The location of the terminal block is shown in Figure 2-24 on page 2–29.

For pin numbering, see Figure 2-29.

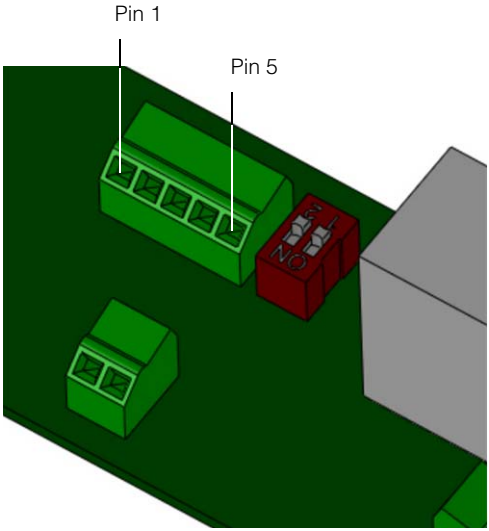


Figure 2-29 RS485 terminal block—pin numbering

Termination Resistor

If the inverter is the first or the last device of the RS485 chain, set the termination resistor to on; otherwise, set it to off. The location of the termination resistor is shown in Figure 2-30. The settings are shown in Table 2-6.

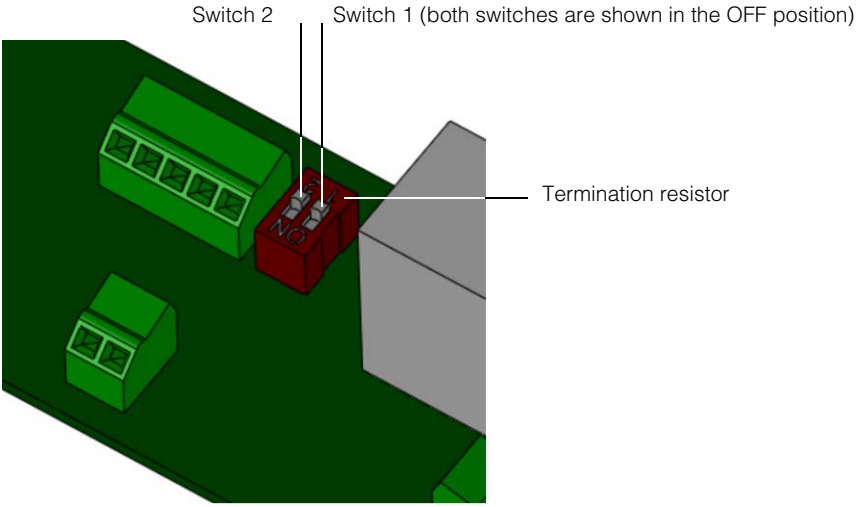


Figure 2-30 Termination resistor—switch numbering

Table 2-6 Termination resistor settings

Switch 1	Switch 2	Result
Off	Off	The termination resistor is off.
Off	On	The termination resistor is on.
On	Off	The termination resistor is on.
On	On	The termination resistor is on.

RID (Remote Inverter Disable) Input Connection

The inverter has one optional Remote Inverter Disable (RID) connection available from a two-terminal screw terminal block. This input is intended to be connected to dry (non-energized) switch or relay contacts. The external contacts must be capable of switching 30 mA at 12 VDC. The location of the RID connection is shown in Figure 2-24 on page 2–29.

NOTICE

On the communication module, the RID connection is labeled as “EPO.”

During inverter operation, these pins are normally not connected together. With the RID feature, connecting these pins together (by the use of a remote contact, such as a relay or switch) causes the internal AC power contactors of the inverter to open and the inverter to shut down.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

Do not remove any covers. Operating the RID (Remote Inverter Disable) circuit or the switch on the inverter does not remove all power from the inverter. Internal parts and the external wiring remain live unless the PV and AC circuits have been disconnected externally.

Failure to follow these instructions can result in death or serious injury.

If you do not want to use the RID feature, do not connect anything to the RID terminals. This will leave the inverter operating normally, controlled by the DC switch of the inverter, by the inverter controls, and by RS485 communication.

Dry Contact Output Connection

⚠ WARNING

HAZARD OF SHOCK. RISK OF EQUIPMENT DAMAGE.

Do not connect circuits exceeding 28 VDC and 3 A to the dry contact output. Use of a 3 A / 32 VDC certified fuse is recommended.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

One set of dry contact connections is provided to give a remote indication of inverter status. When the inverter is operating normally, the contact is closed. If the inverter is not operating, the contact is open.

For the location of the connection, see Figure 2-31.

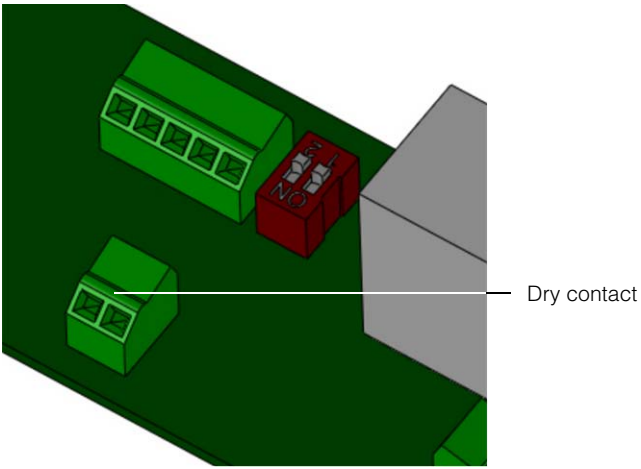


Figure 2-31 Dry contact location

Turning the Inverter On

To turn the inverter on:

1. Make sure the AC wiring and DC wiring have been completed. See “AC Plug Wiring” on page 2–19 and “DC Wiring (From PV Array)” on page 2–26.
2. Make sure the cover of the communication module slot is back in place.
3. Turn on the external AC and DC disconnect switches.
4. Turn the DC switch to the “ON” position. For the switch location, see Figure 1-3 on page 1–4.
5. Check the status of the indicator light (LED; see Table 3-2 on page 3–4). The LED should be solid green.
6. If the LED is not solid green, check that:
   - All the connections are correct.
   - All external disconnect switches are closed.
   - The DC switch of the inverter is in the “ON” position.

Navigating the LCD Menus and Screens

Use the four buttons below the LCD to navigate the LCD menus and screens, as shown in Table 2-7.

Table 2-7 Buttons below the LCD

Button	Result
ESC	Go to the previous screen.
▼	Go to the next item in a menu or to the next screen (in a series of screens).
▲	Go to the previous item in a menu or to the previous screen (in a series of screens).
OK	Executes the selected menu item, accepts the changes, or takes you to the next screen (in a series of screens).

Figure 2-32 shows an example of the effects of the buttons.

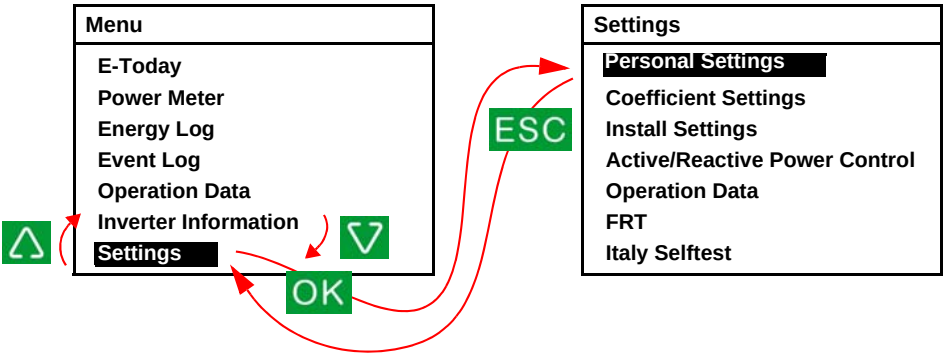


Figure 2-32 Navigating the LCD menus and screens

Selecting the Country

The first time the inverter is energized and turned on, the Select Country screen is displayed. The window is shown in Figure 2-33. (To display this screen at a later time, use the technician password to access the Install Settings menu, as described in "Install Settings Menu" on page 2–46**,** select **Country/Grid**, and then press OK. Select **Country/System**, and then press OK.)

NOTICE
For information on specific approvals that the inverters have, see Appendix A, "Regulations and Directives" on page A–5.

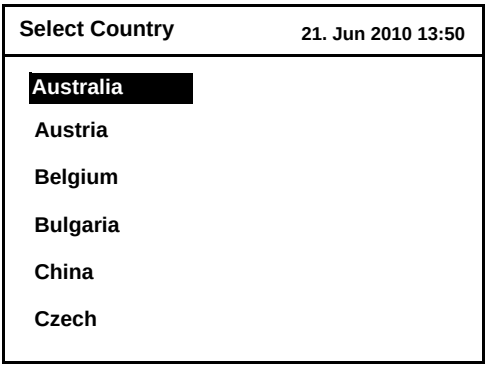


Figure 2-33 Select Country screen

The country selection sets specific parameters for protection and other features, according to country-specific requirements. For a listing of settings contained in each country selection, see Appendix C, “Country-Specific Settings”.

To specify the country:

1. Use the ▼ and ▲ buttons to select the country, and then press OK.
   - Custom: Select this value if you want to change the Grid Setting. See “Grid Setting” on page 2–50.
2. In the Confirm Country screen, press OK to confirm your selection, or press ESC to go to the previous screen.

   After you press OK, the Select Language screen is displayed.

Selecting the Language

In the Select Language screen you can specify what language is used in all of the screens, as shown in Figure 2-34.

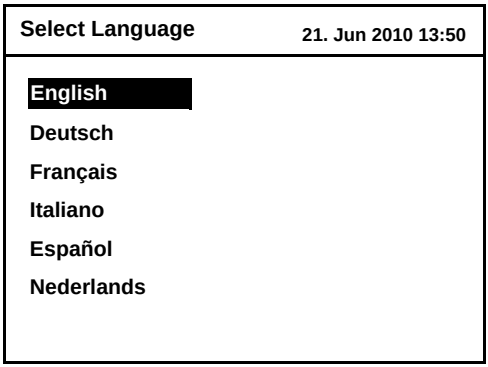


Figure 2-34 Select Language screen

To specify the language:

◆ Use the ▼ and ▲ buttons to select the language, and then press OK.

After you have set the language, the main menu is displayed in the selected language, as shown in Figure 2-35.

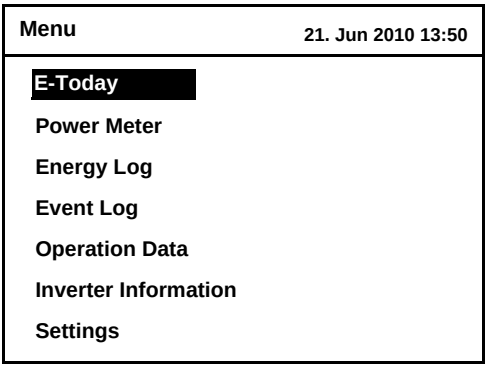


Figure 2-35 Main menu

Menu Structure

Figure 2-36 and Figure 2-37 show the items that are available from each menu.

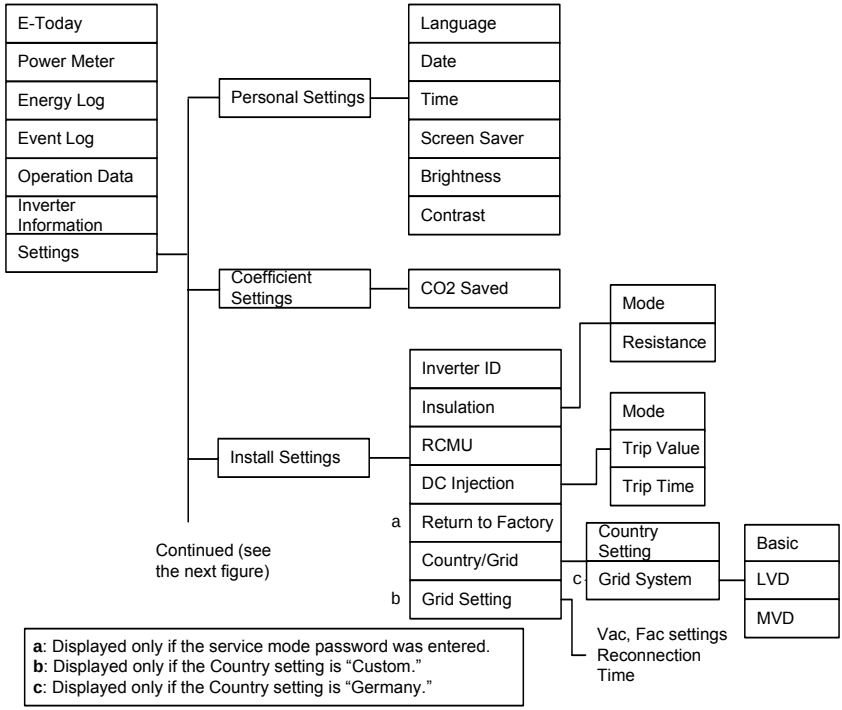


Figure 2-36 Main menu (figure 1 of 2)

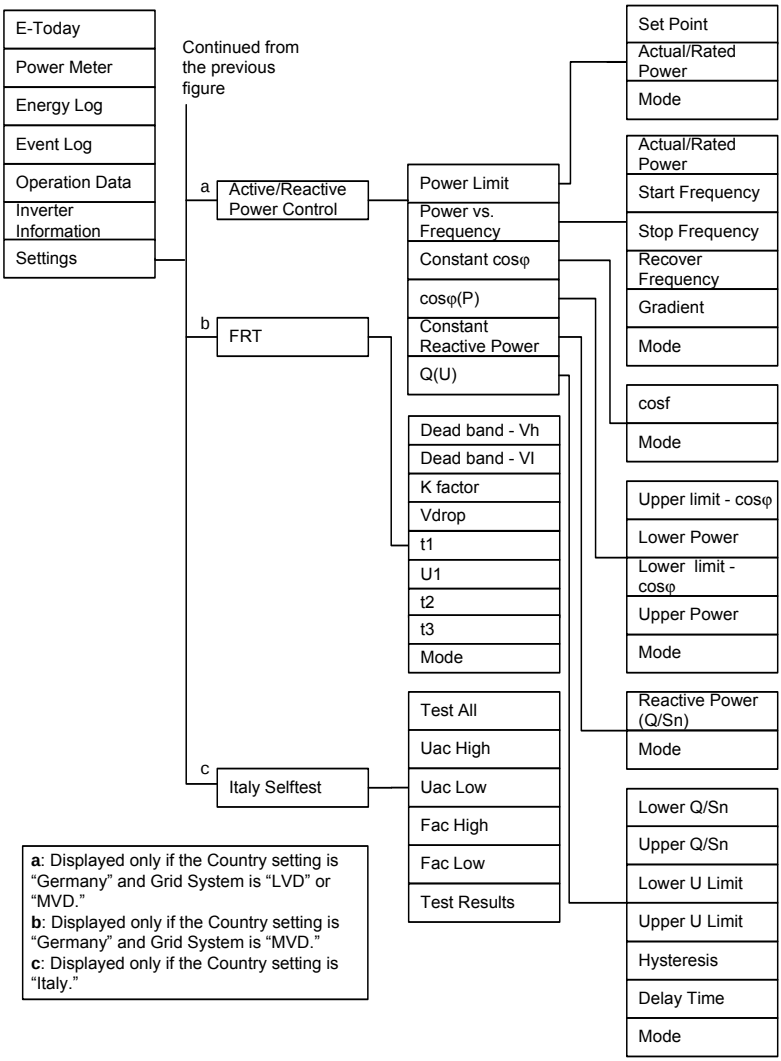


Figure 2-37 Main menu (figure 2 of 2)

Changing the Settings (Settings Menu)

From the Settings menu, adjust the following settings or perform these tests:

- Personal settings. See the next section, “Setting the Date and Time.”
- Coefficients settings. See page 2–45.
- Install settings. See page 2–46.
- Active/reactive power control settings. See page 2–50.
- Low voltage ride through. See page 2–58.
- Italy selftest (available only if the Country setting is “Italy”; for more information, see “Selecting the Country” on page 2–40). For more information on Italy selftest, see page 2–61.

To view the Settings menu:

◆ From the main menu, select **Settings**, and then press OK.

Setting the Date and Time

To set the date and time:

1. Display the Settings menu as described above.
2. Select **Personal Settings**, and then press OK.
3. Use the ▼ button to select the Date, and then press OK.
4. Use the ▼ and ▲ buttons to adjust the date, month, and year; press OK to move from date to month to year. Once done, press OK.
5. Use the ▼ and ▲ buttons to adjust the time (hour and minutes). Once done, press OK.

Coefficient Settings Menu

From the Coefficient Settings menu, you can set the following:

- CO2 Saved: Amount of CO2 (in kg) generated when producing, from non-renewable energy sources, 1 kWh. This coefficient is used to approximate and display, in the Power Meter and Energy Log screens, the reduction of CO^2 production as a result of using the inverter.

To view the Coefficient Settings menu:

1. From the main menu, select **Settings**, and then press OK.
   The Settings menu is displayed.
2. Select **Coefficient Settings**, and then press OK.

Install Settings Menu

⚠ WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

Some settings available in the Install Settings menu and submenus are related to safety functions and must only be adjusted by authorized personnel aware of the impact of changing the settings, and only with the agreement of the local authority.

Failure to follow these instructions can result in death or serious injury.

From the Install Settings menu, you can configure these settings:

- Inverter ID: Used to distinguish each inverter if you have several of them installed.
- Insulation: See “Insulation Setting” on page 2–47.
- RCMU: See “RCMU Setting” on page 2–48.
- DC Injection: See “DC Injection Setting” on page 2–48.
- Return to Factory: See “Restoring the Inverter to its Default Settings” on page 2–62.
- Country/Grid: See “Grid System Setting” on page 2–49.
- Grid Setting: See “Grid Setting” on page 2–50.

To display the Install Settings menu:

1. From the main menu, select **Settings**, and then press OK.
2. Select **Install Settings**, and then press OK.
3. Use the ▼ and ▲ buttons to set each of the four digits in the password. Press OK after each digit is entered, and then press OK.

   Two types of passwords are available:

   - Technician password: Gives access to some items that are hidden from the day-to-day user of the inverter.
   - Service mode: Gives access to all the items that are accessed using the technician password and additionally gives access to this menu item:
     - Return to Factory

   If you require these access levels and do not know the passwords, contact Schneider Electric. The passwords will be provided only to qualified installers and service personnel.

Insulation Setting

The inverter uses an array-to-ground insulation resistance test to detect a ground fault in the array. You can set the test mode and resistance value. Whenever DC is not detected, and at least once a day, the inverter runs the test, using the specified settings.

To specify the insulation detection method:

1. Access the Install Settings menu, using the technician password. See “Install Settings Menu” on page 2–46.
2. Select **Insulation**, and then press OK.
3. From the Insulation menu, select a value for Mode, and then press OK.
   Specify a value depending on the DC wiring conditions:
   - ON: Enables the measurement of impedance between the PV array and PE. The inverter does not connect to the grid if this test fails.
   - DC1 Only: Uses only DC1. See Figure 1-3 on page 1–4.
   - DC2 Only: Uses only DC2. See Figure 1-3 on page 1–4.
   - Disable: Disables the measurement of impedance between the PV array and PE.

⚠ WARNING

HAZARD OF FIRE

If you select “Disable” or incorrectly set “DC1 Only” or “DC2 Only”, you are turning off a fire prevention feature. You must provide external ground fault protection.

Failure to follow these instructions can result in death or serious injury.

4. From the Insulation menu, select the desired resistance value (default value is 1200 Kohms), and then press OK.

NOTICE

Local PV installation codes may specify the minimum resistance value for this feature.

RCMU Setting

The RCMU setting enables the Residual Current Monitoring Unit, which shuts down the inverter if the residual current exceeds the sudden change or steady state thresholds (these values are not adjustable).

Residual Current refers to the leakage current to ground from the array during inverter operation. The RCMU detects two types of residual current event:

- Excessive steady-state residual current—detection of slowly changing current, to reduce fire hazard.
- Sudden change of residual current—fast detection to reduce shock hazard to personnel.

To specify the RCMU setting:

1. Access the Install Settings menu, using the technician password. See “Install Settings Menu” on page 2–46.
2. Select **RCMU**, and then press OK.
3. Select a value:
   - ON: The inverter shuts down if the residual current goes over either the steady state or sudden change limit.
   - OFF: The Residual Current Monitoring Unit does not monitor either limit.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

- If you select “OFF”, you are turning off a shock and fire protection feature.
- Do not select “OFF” without providing equivalent protection elsewhere in the system.

Failure to follow these instructions can result in death or serious injury.

4. Press OK.

DC Injection Setting

The DC Injection setting specifies whether the inverter shuts down if the DC component in AC current goes over the limit.

To specify the DC Injection setting:

1. Access the Install Settings menu, using the service mode password. See “Install Settings Menu” on page 2–46.
2. Select **DC Injection**, and then press OK.
3. Select a value:
   - ON (default): The inverter shuts down if the DC component in AC current goes over the limit.

- OFF: The inverter does not shut down if the DC component in AC current goes over the limit.

4. Specify a value for Trip Value and Trip Time.

   Valid range for Trip Value is 0.0 to 1.0 A. The default value is 0.7 A.

   Valid range for Trip Time is 0.0 to 5.0 seconds. The default value is 0.2 seconds.

NOTICE
Local grid interconnection codes may specify the maximum DC injection value and trip time for this feature.

5. Press OK.

Grid System Setting

To specify the Grid System setting:

1. Access the Install Settings menu, using the technician password. See “Install Settings Menu” on page 2–46.
2. Select **Country/Grid**, and then press OK.

   The Country/Grid screen is displayed.
3. Select **Grid System**, and then press OK.

NOTICE
The Grid System menu item is available only if the Country setting is “Germany.” See “Selecting the Country” on page 2–40.

4. Select the grid connection type:
   - Basic (VDE0126-1-1)
   - LVD. For settings that you can configure, see “Active/Reactive Power Menu” on page 2–50.
   - MVD. For settings that you can configure, see “Active/Reactive Power Menu” on page 2–50 and “Low Voltage Ride Through” on page 2–58.

NOTICE
The Active/Reactive Power menu (page 2–50) is available only if Grid System is “LVD” or “MVD.”

Grid Setting

NOTICE
The Grid Setting menu is available only if the Country setting is “Custom.” See “Selecting the Country” on page 2–40.

To specify the Grid Setting parameters:

1. Access the Install Settings menu, using the service mode password. See “Install Settings Menu” on page 2–46.
2. Select **Grid Setting**, and then press OK.
   The following items can be set (over several screens):

- Vac High Off
- Vac High On
- Vac High Off T (disconnect time)
- Vac Low Off
- Vac Low On
- Vac Low Off T (disconnect time)
- Vac High Off Slow
- Vac High On Slow
- Vac High Off Slow T (disconnect time)
- Vac Low Off Slow
- Vac Low On Slow
- Vac Low Off Slow T (disconnect time)
- Fac High Off
- Fac High On
- Fac High Off T (disconnect time)
- Fac Low Off
- Fac Low On
- Fac Low Off T (disconnect time)
- Reconnect Time

Active/Reactive Power Menu

NOTICE
The menu is available only if Grid System (in Settings > Install Settings > Country/Grid) is “LVD” or “MVD”; these values are available only if the Country setting is “Germany.” For more information, see “Grid System Setting” on page 2–49. A checkmark (✓) is displayed next to a menu item if the feature is enabled.

To display the Active/Reactive Power menu:

1. From the main menu, select **Settings**, and then press OK.
2. Select **Active/Reactive Power Control**, and then press OK.
3. Use the ▼ and ▲ buttons to enter each of the four digits in the password, and then press OK.
   If you have entered the correct password, the Active/Reactive Power menu is shown.

Setting the Active Power Control

NOTICE
Two options are available. Both can be enabled at the same time.

Setting the Power Limit

You can limit the output power of the inverter to a percentage of actual or rated power.

To set the power limit:

1. Display the **Active/Reactive Power** menu (see above).
2. Select **Power Limit**, and then press OK.
3. In the Set Point field, use the ▼ and ▲ buttons to specify the percentage that you want to use as the limit.
4. In the Actual/Rated Power field, select Rated or Actual.
   If you select Actual, the current available power value is used as the value to which the percentage (specified by the Set Point field) is applied.

   If you select Rated, the percentage is applied to the full rated output power of the inverter (15 kW or 20 kW).
5. To enable the power limit, set the Mode field to ON.
   To disable the power limit and to use MPP tracking, set the Mode field to OFF.

Setting the Frequency-Dependent Active Power Control

You can turn this feature on or off, and adjust the settings to meet the utility requirements.

To set the frequency-dependent active power control:

1. Display the **Active/Reactive Power** menu (see page 2–50).
2. Select **Power vs. Frequency**, and then press OK.
3. In the Active Power Control window, specify the desired frequencies and gradient. See Figure 2-38 on page 2–52.

	Active Power Control	21. Jun 2010 13:50	
	Actual/Rated Power	[Actual]	
(A)	Start Frequency	[50.20]	Hz
(B)	Stop Frequency	[51.50]	Hz
(C)	Recover Frequency	[50.05]	Hz
(D)	Gradient	[40]	%
	Mode	[OFF]	

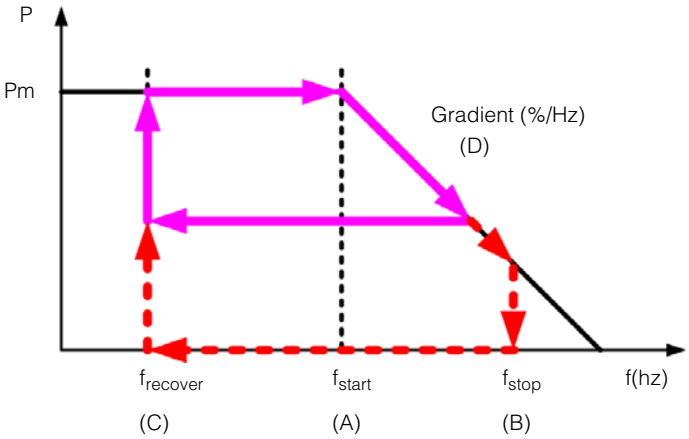


Figure 2-38 Frequency-dependent active power control

NOTICE
See local grid interconnection codes for the need to turn this feature on or off, and the allowed values for each of the parameters shown in the above figures.

4. To enable the settings, set the Mode field to ON.

Setting the Reactive Power Control

Four methods of reactive power control are available.

NOTICE
• Only one of the four methods can be enabled at a time. • See local grid interconnection codes for the need to turn this feature on or off, the characteristic to select, and the allowed values for the various parameters.

The available methods are:

- Fixed power factor (constant cosφ). See below.
- Power factor as a function of active power (cosφ(P)). See below.
- Constant reactive power (Q). See page 2–55.
- Reactive power as a function of voltage (Q(U)). See page 2–56.

The inverter stops reactive power flow when the output power is below 10% of rated.

Setting the fixed power factor (Constant cosφ)

With this method, the inverter delivers reactive power determined by the available active power and the power factor you specify.

To set the fixed power factor (Constant cosφ):

1. Display the **Active/Reactive Power** menu (see page 2–50).
2. Select **Constant cosφ**, and then press OK.
3. In the cosφ field, specify the value (from 0.85 capacitive to 0.85 inductive).

   The adjustment resolution is 0.01.
4. To enable the fixed power factor (constant cosφ), set the Mode field to ON.

Setting a power factor as a function of active power (cosφ(P))

With this method, the inverter delivers reactive power determined by the available active power and the power factor. The power factor varies, depending on the output active power at that moment.

To set cosφ(P):

1. Display the **Active/Reactive Power** menu (see page 2–50).
2. Select **cosφ(P)**, and then press OK.
3. Specify the desired limits (upper and lower) for cosφ and for power. See Figure 2-39 on page 2–54.

   The adjustment resolution for cosφ is 0.01.

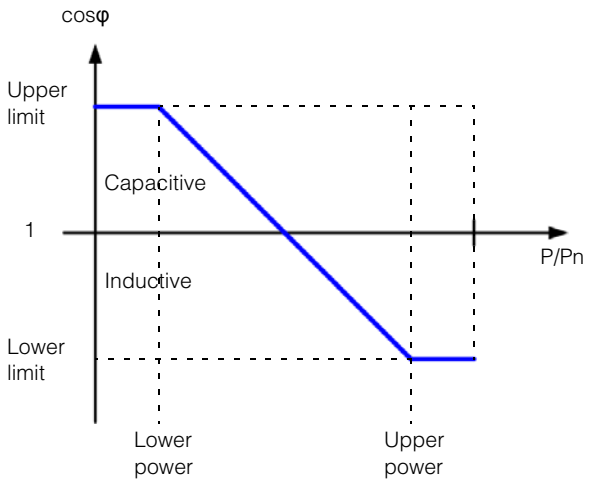


Figure 2-39 cosφ(P)

4. To enable the settings, set the Mode field to ON.

Setting Constant Reactive Power (Q)

With this method, the inverter delivers reactive power (Q) at a constant, specific level. As shown in Figure 2-40, Q is constant (fixed) when the active power is within 53% to 89% of full power. Q will change only when it is less than 53% or greater than 89% of full power.

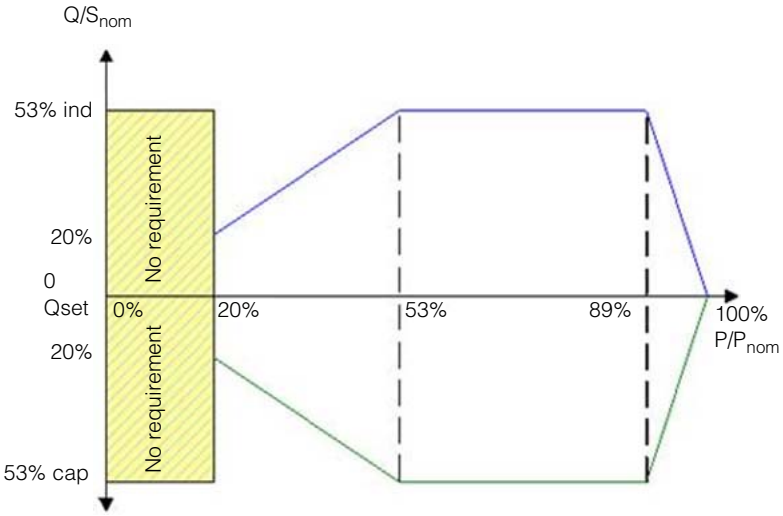


Figure 2-40 Constant Reactive Power (Q)

To set constant reactive power (Q):

1. Display the **Active/Reactive Power** menu (see page 2–50).
2. Select **Constant Reactive Power**, and then press OK.
3. In the Reactive Power (Q/Sn) field, select the desired setting.
   The valid range is Cap 53% ~ Ind 53%.
4. To enable constant reactive power, set the Mode field to ON.

Setting reactive power as a function of voltage (Q(U))

This setting allows the inverter to vary reactive power flow as a function of AC voltage.

NOTICE
This item is available only if Grid System is “MVD.” For more information, see “Grid System Setting” on page 2–49.

Q/Sn (%) has these characteristics:

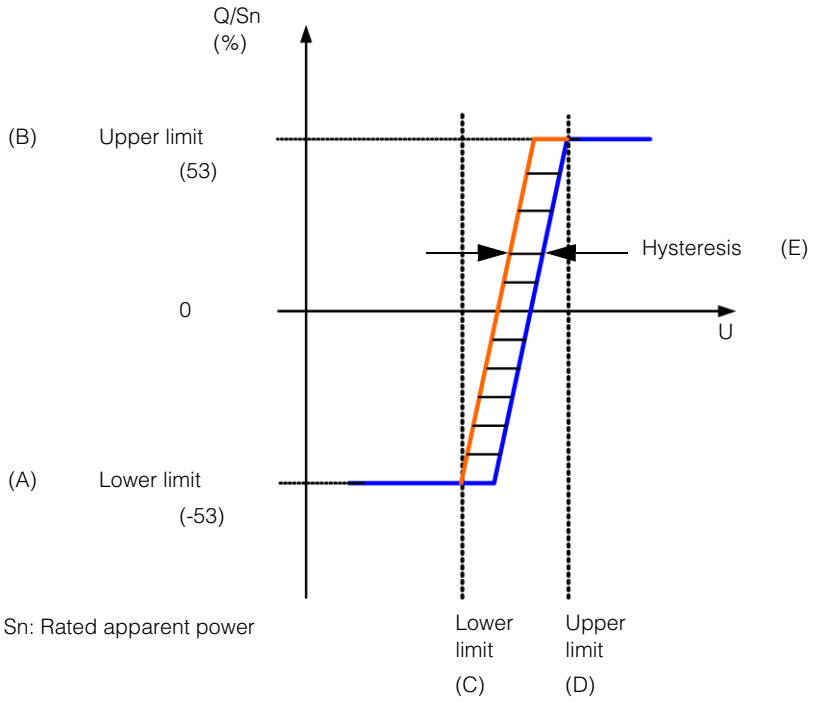
- Cap 53% ~ Ind 53%
- Resolution is 1%
- U limit: 184 ~ 276 VAC (line to neutral)
- Response time: 0 ~ 60 s

To set reactive power as a function of voltage (Q(U)):

1. Display the **Active/Reactive Power** menu (see page 2–50).
2. Select **Q(U)**, and then press OK.
3. Specify the desired limits (upper and lower) of the ratio of reactive power (Var) to rated apparent power (VA) expressed as a percentage ("Q/Sn(%)"). This is the dependent variable of this function. The independent variable is the grid voltage ("U"). You can also specify the hysteresis and delay time. See Figure 2-41 on page 2–57.

   The hysteresis can be between 3 and 20 V (resolution of 0.1 V).

   The delay time can be between 10 and 60 seconds.



	Reactive Power Control	21. Jun 2010 13:50	
(A)	Lower Q/Sn	[Cap 30]	%
(B)	Upper Q/Sn	[Ind 30]	%
(C)	Lower U Limit	[207.0]	V
(D)	Upper U Limit	[253.0]	V
(E)	Hysteresis	[3.0]	V
	Delay Time	[10]	s
	Mode	[OFF]	

Figure 2-41 Q(U)

4. To enable Q(U), set the Mode field to ON.

Low Voltage Ride Through

NOTICE
Low Voltage Ride Through (LVRT) is also known as Fault Ride Through (FRT), and refers to a feature that keeps the inverter online during short-duration voltage dips, to help support the grid.

From the FRT screen, you can set the following:

- Dead band - V_h: 1.1*V_n
- Dead band - V_l: 0.9*V_n
- K factor: Reactive current ratio during FRT.
- V_{drop}: If the grid voltage drops below this value, the inverter immediately trips.
- t1: If the grid voltage drops and does not come back to U1 within t1 seconds, the inverter trips.
- U1: 0.3*V_n
- t2: If the grid voltage drops and does not come back to 0.9*V_n within t2 seconds, the inverter trips.
- t3: If the grid voltage drops and does not come back to 0.9*V_n within t3 seconds, the inverter trips. The inverter might trip for a short time or for a long time.
- Mode: ON or OFF

NOTICE
The screen is available only if the Country setting is “Germany” and Grid System (in Settings > Install Settings > Country/Grid) is “MVD.”

To display the FRT screen:

1. From the main menu, select **Settings**, and then press OK.
2. Select **FRT**, and then press OK.

Figure 2-42 on page 2–59 and Figure 2-43 on page 2–60 show graphs related to LVRT.

	FRT - 1/2				
(A)	**Dead band - Vh**	**[**	**+10**	**]**	**%**
(B)	**Dead band - Vl**	**[**	**-10**	**]**	**%**
(C)	**K factor**	**[**	**2.0**	**]**	
	Vdrop	**[**	**5**	**]**	**%**
	t1	**[**	**150**	**]**	**ms**
	U1	**[**	**20**	**]**	**%**
	t2	**[**	**1.5**	**]**	**s**

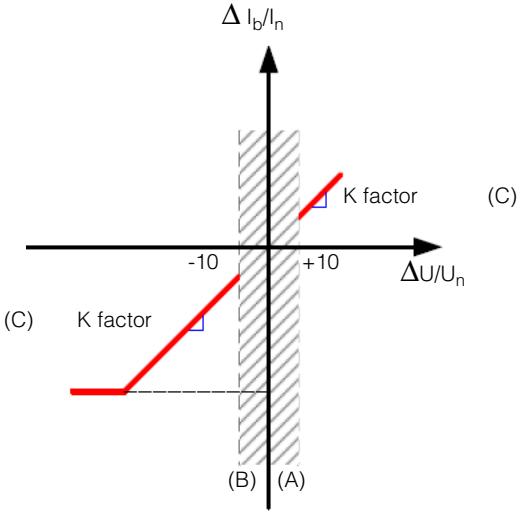


Figure 2-42 Low Voltage Ride Through (LVRT) (figure 1 of 2)

	FRT - 1/2				
	Dead band - Vh	[	+10	]	%
	Dead band - Vl	[	-10	]	%
	K factor	[	2.0	]	
(D)	Vdrop	[	5	]	%
(E)	t1	[	150	]	ms
(F)	U1	[	20	]	%
(G)	t2	[	1.5	]	s

	FRT - 2/2				
(H)	t3	[	3.0	]	s
	Mode	[	ON	]	%

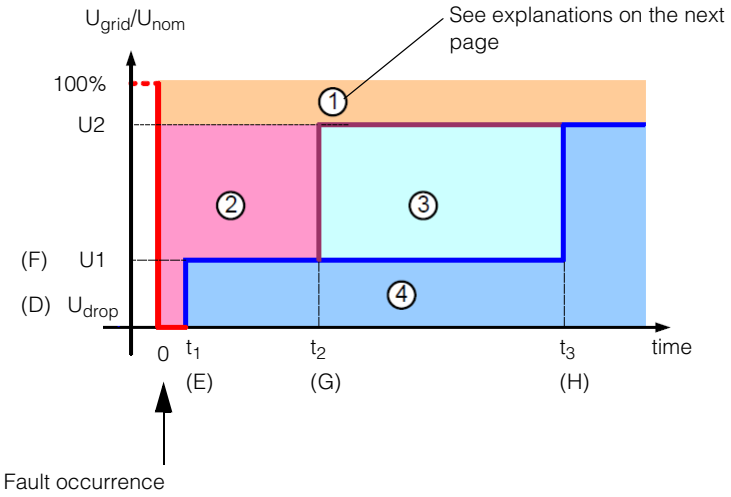


Figure 2-43 Low Voltage Ride Through (LVRT) (figure 2 of 2)

Additional information on the areas indicated by ①, ②, ③, and ④ in Figure 2-43 on page 2–60:

- ①: Does not lead to disconnection from network.
- ②: Pass through fault without disconnecting from network, feed in short circuit current.
- ③: Short-term disconnect from network.
- ④: Disconnects from network.

Italy Selftest Menu

NOTICE
This item is available only if the Country setting is “Italy.” For more information, see “Selecting the Country” on page 2–40. It may take several minutes for a test to complete. Failure of any of the selftests listed below indicates that a required protection function is not working properly, and the inverter will no longer operate. Contact Schneider Electric customer service.

To display the Italy Selftest menu:

1. From the main menu, select **Settings**, and then press OK.
2. Select **Italy Selftest**, and then press OK.
3. Use the ▼ and ▲ buttons to select an option, and then press OK.
   - Test All: Executes all of the tests listed below, and displays the results on one screen.
   - Uac High: AC Voltage High
   - Uac Low: AC Voltage Low
   - Fac High: AC Frequency High
   - Fac Low: AC Frequency Low

Exiting Technician or Service Mode Level of Security Access

After you have finished the configuration, exit the technician or service mode level of security access to prevent others users from having access to password-protected menu items.

To exit the technician or service mode level of security access:

◆ Press the ESC button to go up one level in the menu structure, until the main menu is shown.

Restoring the Inverter to its Default Settings

To delete all records of events (logs) and energy and restore the inverter to its default settings:

1. From the main menu, select **Settings**, and then press OK.
2. Select **Install Settings**, and then press OK.
3. Use the ▼ and ▲ buttons to enter each of the four digits in the service mode password, and then press OK.
4. Select **Return to Factory**, and then press OK.
5. Select **Yes**, and then press OK.

3 Operation

Chapter 3, “Operation” contains information on the basic operation of the inverter.

Turning the Inverter On

To turn the inverter on:

- Turn the DC switch to the “ON” position.

When there is sufficient sunlight, the inverter starts normal operation after a power-on self-test, which may take several minutes. If the LCD displays an error message, see “Troubleshooting” on page 4–1.

LCD and Control Panel

The inverter has an LCD and control panel, shown in Figure 3-1. Their locations are shown in Figure 1-2 on page 1–3.

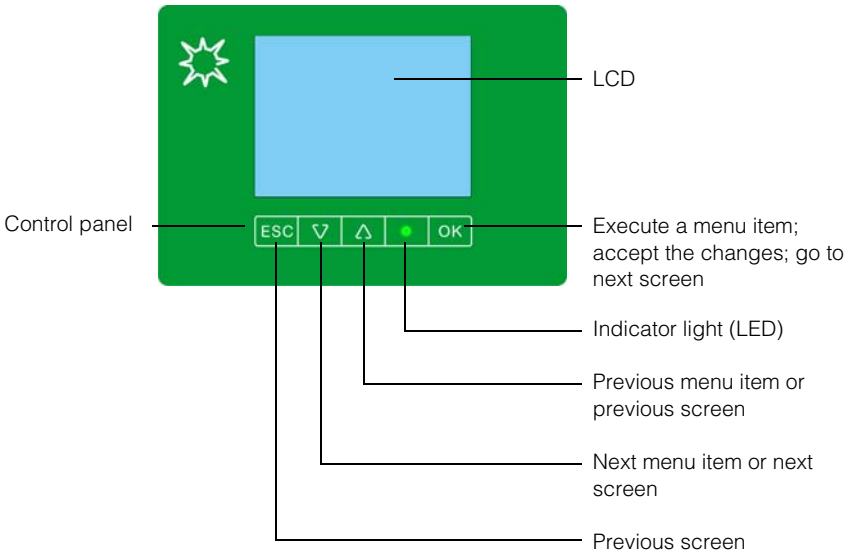


Figure 3-1 LCD and control panel

Navigating the LCD Menus and Screens

Use the four buttons below the LCD to navigate the LCD menus and screens, as shown in Table 3-1 on page 3–3.

If you press any of these buttons from the home page (“E-Today”), the main menu is displayed. See “Home Page (E-Today)” on page 3–4 and “Main Menu” on page 3–5.

Table 3-1 Buttons below the LCD

Button	Result
ESC	Go to the previous screen.
▼	Go to the next item in a menu or to the next screen (in a series of screens).
▲	Go to the previous item in a menu or to the previous screen (in a series of screens).
OK	Executes the selected menu item, accepts the changes, or takes you to the next screen (in a series of screens).

Figure 3-2 shows an example of the effects of the buttons.

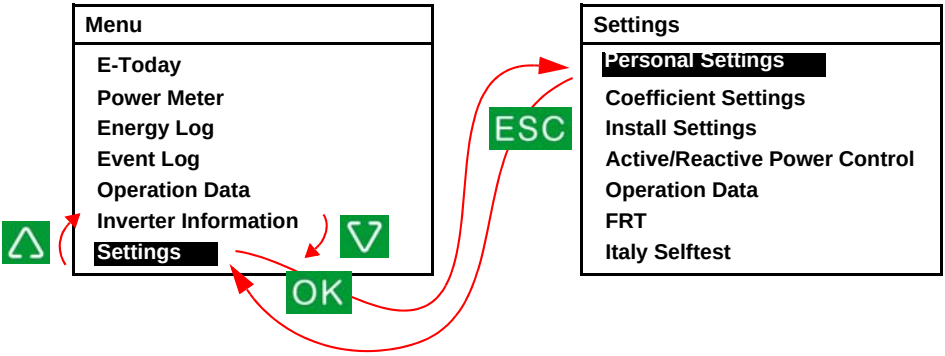


Figure 3-2 Navigating the LCD menus and screens

Indicator Light

Below the LCD is the indicator light (LED), which indicates the inverter status, as shown in Table 3-2.

Table 3-2 Indicator light

State of indicator light	Inverter status
Green, flashing[a]	Standby or countdown.
Green, solid	Power on.
Red, solid	Error or fault detected. Check the LCD for the message. See Table 4-1 on page 4–2.
Off	Night time (no DC).

a. Cycling on for one second, and then off for one second.

Home Page (E-Today)

When the inverter is operating normally, the LCD shows the home page as shown in Figure 3-3 on page 3–5. The home page shows:

- Energy harvested today (“E-Today”)
- The current date and time
- Run time for today
- Output power (“Power:”)
- Status of the inverter (for example, “On Grid”)
- Today’s power curve

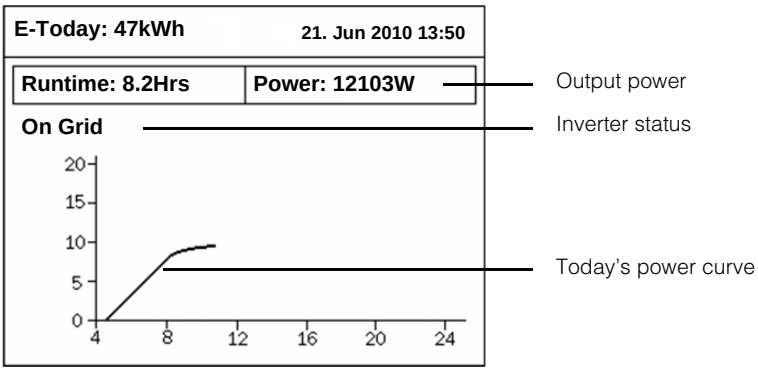


Figure 3-3 Home page (E-Today)

From the home page, if you press any of the four buttons below the LCD, the main menu is displayed.

Main Menu

From the main menu you can display the home page (E-Today), view various reports and logs, and access other menus.

To display the main menu:

- When the LCD shows the home page (see Figure 3-3), press any of the four buttons below the LCD.
- From any screen or menu, press the ESC button to go to the previous screen or higher-level menu, until the main menu is shown.

Figure 3-4 on page 3–6 shows the main menu.

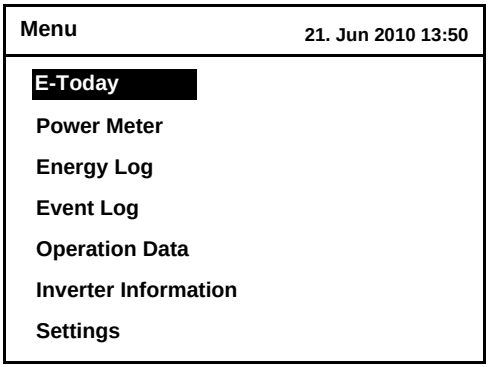


Figure 3-4 Main menu

Menu Structure

Figure 3-5 shows the items that are available from each menu.

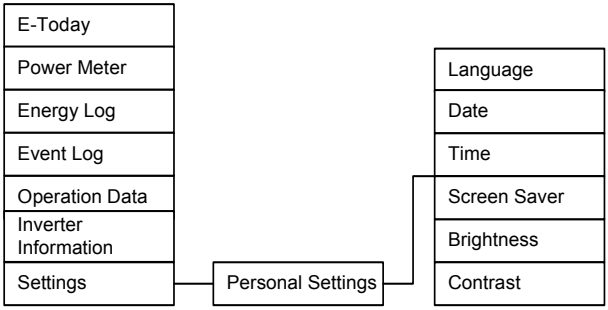


Figure 3-5 Menu organization

Selecting a Language

The language setting specifies the language used in the screens. You can specify the language in the Select Language screen.

To specify the language:

1. From the main menu, select **Settings**, and then press OK.
2. Select **Personal Settings**, and then press OK.
3. Select **Language**, and then press OK.
4. Use the ▼ and ▲ buttons to select the language, and then press ESC.

Viewing Performance Values

You can view present values and accumulated highest values (over the lifetime of the inverter).

Power Meter

From the Power Meter screens, you can view DC input, AC output, total power, and frequency.

To view the Power Meter screens:

1. From the main menu, select **Power Meter**, and then press OK.
2. To navigate through the Power Meter screens, press OK.
   The first screen shows P, U, and `I` values for DC tracker 1 (“Input1”) and DC tracker 2 (“Input2”).

   The second screen shows the values for AC output, total power, and frequency.

   The third screen shows the amount of electricity generated today and today’s runtime.
3. To return to the main menu, press ESC from any screen.

Operation Data

From the Operation Data screens, you can view the current values of the:

- Maximum DC input (voltage, current, and power).
- Maximum AC output (voltage, current, and power).
- Maximum and minimum temperature inside the inverter.

To view the operation data:

1. From the main menu, select **Operation Data**, and then press OK.
   The first of four screens is displayed.
2. To go to the next screen, press the ▼ button or press OK. To go to the previous screen, press the ▲ button.

To clear the data:

1. Display any of the Operation Data screens (described above).
2. Press and hold the ▼ and ▲ buttons.
3. Without releasing the ▼ and ▲ buttons, press and hold the OK button. Hold all three buttons for at least 3 seconds.

Logs

You can view power generation logs and event logs.

Viewing Power Generation Logs ("Energy Log")

From the Energy Log screen, you can view or clear data for power generation over the current or last year, month, and day.

To view the power generation logs:

1. From the main menu, select **Energy Log**, and then press OK.
   A summary screen ("Energy Log - Total") is displayed.
2. To view graphs of power generation for the current time period, press OK.
   Each OK button press displays a graph for a different time period—the current year, month, or day.
   To display a graph for the previous time period (for example, last year), press the ▼ button. To return to the graph of the current time period (this year, in our example), press the ▲ button.
3. To return to the summary screen ("Energy Log - Total"), press ESC.
4. From the summary screen, press ESC to return to the main menu.

To clear the power generation logs:

1. Display the Energy Log - Total screen (described above).
2. Press and hold the ▼ and ▲ buttons.
3. Without releasing the ▼ and ▲ buttons, press and hold the OK button. Hold all three buttons for at least 3 seconds.
4. Check the Energy Log screens (year, month, day) to verify that the logs have been cleared (the values should be 0).

Event Log

The event log shows 30 of the most recent events (errors or faults). The most recent event is shown at the top of the list.

To view the Event Log screens:

1. From the main menu, select **Event Log**, and then press OK.
   The Event Log screen is shown.
2. Press OK to view the Event Summary screen, which displays a count for each type of event that occurred.
3. To return to the previous screen, press ESC.

To clear the event log:

1. Display the Event Log or Event Summary screen (described above).
2. Press and hold the ▼ and ▲ buttons.
3. Without releasing the ▼ and ▲ buttons, press and hold the OK button. Hold all three buttons for at least 3 seconds.

Inverter Information

The Inverter Information screen displays the following information about the inverter:

- Serial number
- DSP-Version: Firmware version
- Red.-Version: Redundant firmware version
- Comm.-Version: Version of communication software
- Installation date
- Inverter ID

To view the Inverter Information screen:

◆ From the main menu, select **Inverter Information**, and then press OK.

Changing the Settings (Settings Menu)

From the Settings menu, you can adjust the following settings:

- Personal settings. (See below.)

To view the Settings menu:

◆ From the main menu, select **Settings**, and then press OK.

Personal Settings Menu

From the Personal Settings menu, you can set the following:

- Language
- Date and the date format
- Time
- Screen saver (between 5 and 60 minutes): Specifies the amount of time, after which the LCD goes dim. (To restore the LCD brightness, press any button.)
- LCD brightness: A value from 1 (low) to 5 (high)
- LCD contrast: A value from 1 (low) to 5 (high)

To view the Personal Settings menu:

1. From the main menu, select **Settings**, and then press OK.
   The Settings menu is displayed.
2. Select **Personal Settings**, and then press OK.

4 Troubleshooting

Chapter 4, “Troubleshooting” describes the error messages that might be displayed on the LCD of the inverter and recommended solutions.

Error Messages

Table 4-1 describes error messages that might be displayed on the LCD of the inverter.

NOTICE
The third column (“Number”) refers to the error code that can be read from the Modbus communications.

Table 4-1 Error message descriptions

Message	Description and Solution	Number
No Alarm	No active alarms	0000
AC Switch Response	Relay open • Contact Schneider Electric customer service.	0010
Current Sensor	CT current sensor Fail_A, Fail_B, or Fail_C • Contact Schneider Electric customer service.	0031
Thermal Sensor 1	Heat sink NTC 1 circuit fail • Contact Schneider Electric customer service.	0032
Thermal Condition (LTP)	Low temperature protection. After the inverter temperature returns to normal, the inverter resumes normal operation.	0080
Thermal Condition (OTP)	Over-temperature protection. After the inverter temperature returns to normal, the inverter resumes normal operation. • Verify the air inlet and/or outlets are free of objects. • Verify the inverter is not exposed to direct sunlight.	0084
HW COMM2	An internal communication service interruption has occurred • If the error persists for more than a few hours, contact Schneider Electric customer service.	0095

Table 4-1 Error message descriptions (Continued)

Message	Description and Solution	Number
Thermal Sensor 2	Heat sink NTC 2 circuit fail • Contact Schneider Electric customer service.	0103
Thermal Sensor 3	Heat sink NTC 3 circuit fail • Contact Schneider Electric customer service.	0104
Thermal Sensor 4	Heat sink NTC 4 circuit fail • Contact Schneider Electric customer service.	0105
Analog Input Bias 1	DSP ADC Vgrid/Iout bias fail. (The current and voltage values Vgrid/Iout (of the digital signal processor of the analog-to-digital converter) have deviated from reference values.) • Contact Schneider Electric customer service.	0120
Analog Input Bias 2	DSP ADC Vin/Vbus bias fail. (The voltage input values Vin/Vbus (of the digital signal processor of the analog-to-digital converter) have deviated from reference values.) • Contact Schneider Electric customer service.	0121
Analog Input Bias 3	DSP ADC Iin/Iboost bias fail. (The current input values Iin/Iboost (of the digital signal processor of the analog-to-digital converter) have deviated from reference values.) • Contact Schneider Electric customer service.	0122
Analog Input Bias 4	Redundant ADC Vgrid/Vinv bias fail. (The voltage values Vgrid/Vinv (of the redundant analog-to-digital converter) have deviated from reference values.) • Contact Schneider Electric customer service.	0123

Table 4-1 Error message descriptions (Continued)

Message	Description and Solution	Number
Analog Input Bias 5	Redundant ADC Iout_dc bias fail. (The current value Iout_dc (of the redundant analog-to-digital converter) has deviated from reference values.) • Contact Schneider Electric customer service.	0124
HW Efficiency	Efficiency abnormal • Contact Schneider Electric customer service.	0130
RCMU Fault	The RCMU has failed its self-test and is not working properly, so it has disabled the inverter. For information on RCMU, see “RCMU Setting” on page 2–48. • Contact Schneider Electric customer service.	0140
Relay Test S/C	Relay test short • Contact Schneider Electric customer service.	0150
Relay Test O/C	Relay test open • Contact Schneider Electric customer service.	0151
HW ZC Fail	Zero cross circuit fail • Contact Schneider Electric.	0160
HW COMM1	Internal communication service interruption has occurred • If the error persists for more than a few hours, contact Schneider Electric customer service.	0195
AC Current High	Output current exceeds the rated value. • If the error occurs frequently, contact Schneider Electric customer service.	0460

Table 4-1 Error message descriptions (Continued)

Message	Description and Solution	Number
AC Over Current	HW OOCP (Output Over Current Protection) circuit • If the error occurs frequently, contact Schneider Electric customer service.	0461
Overvoltage DC	Bus voltage, Bus Positive, or Bus Negative over voltage rating • Have a qualified installer verify the PV array installation is correct. • Have a qualified installer check whether DC wiring is done according to this manual. • Contact Schneider Electric customer service.	0601
DC Overcurrent	PV1 current, PV2 current, PV1 current transient, or PV2 current transient over rating • Contact Schneider Electric customer service.	0620
Bus Unbalance	Bus unbalance • Have a qualified installer check whether DC wiring is done according to this manual. • Contact Schneider Electric customer service.	0650
DC Injection	DC Injection Phase A, DC Injection Phase B, or DC Injection Phase C • If the error occurs frequently, contact Schneider Electric customer service.	0701
Ground Current High	RCMU tripped. Excessive steady-state residual current or sudden change in residual current. For information on RCMU, see “RCMU Setting” on page 2–48. • Have a qualified installer check the PV array for ground faults. • If the error occurs frequently, contact Schneider Electric customer service.	0702

Table 4-1 Error message descriptions (Continued)

Message	Description and Solution	Number
HW Connect Fail	No connection to AC grid • Have a qualified installer verify the AC plug connection and AC wiring are correct.	2110
AC Freq Low	Under frequency range. Some of the parameters of the grid are temporarily out of normal range. After the parameters return to normal, the inverter resumes normal operation; the green LED is solid. • Wait for the inverter to resume power production.	2401
AC Freq High	Over frequency range. Some of the parameters of the grid are temporarily out of normal range. After the parameters return to normal, the inverter resumes normal operation. • Wait for the inverter to resume power production.	2402
AC Volt Low	Under Voltage error Some of the parameters of the grid are temporarily out of normal range. After the parameters return to normal, the inverter resumes normal operation. • Wait for the inverter to resume power production.	2406
AC Volt High	Slow Over Voltage Range error. Some of the parameters of the grid are temporarily out of normal range. After the parameters return to normal, the inverter resumes normal operation. • Wait for the inverter to resume power production.	2407

Table 4-1 Error message descriptions (Continued)

Message	Description and Solution	Number
Grid Quality	Voltage Total Harmonic Distortion is > 3%. Some of the parameters of the grid are temporarily out of normal range. After the parameters return to normal, the inverter resumes normal operation. • Wait for the inverter to resume power production.	2440
No Grid	Grid voltage or frequency is out of range or not present at all. • If this message persists, have a qualified installer verify the AC plug connection and AC wiring are correct.	2450
PV Voltage High	String1 or String 2 PV input voltage too high • Have a qualified installer verify the PV array voltage is within the allowed specifications for the inverter.	2606
Isolation Impedance Error	Array impedance to ground in either input is below the Insulation test setpoint (default value 1200 kOhms) • Have a qualified installer check the PV array for ground faults.	2616
Fan Rotation	Fan warning. Possible reasons: • One or more fans are defective. (Have a qualified installer replace the fan bracket, as described in “Semi-Annual Maintenance” on page 5–2.) • One or more fans are disconnected. (See “Periodic Maintenance” on page 5–2 before checking the fan connections. See Figure 5-2 on page 5–3.)	4005
PV OC Voltage Low	The input voltage of DC1 or DC2 is below the threshold to produce power. This occurs, for example, during the night, during snow storms, and during a total solar eclipse.	6627

5 Preventive Maintenance

Chapter 5, “Preventive Maintenance” contains information and procedures for performing preventive maintenance on the inverter.

This chapter is for use by qualified personnel only

Periodic Maintenance

⚠ DANGER

HAZARD OF ELECTRIC SHOCK FROM MULTIPLE SOURCES

- To be serviced only by qualified personnel equipped with appropriate PPE and following safe electrical work practices.
- This inverter is energized from the AC grid and up to four PV circuits. Before servicing the inverter or accessing the communication module, disconnect all sources of electricity and wait at least 1 minute to allow internal circuits to discharge.
- Operating the RID (Remote Inverter Disable) circuit or the switch on the inverter does not remove all power from the inverter. Internal parts and the external wiring remain live unless the PV and AC circuits have been disconnected externally.

Failure to follow these instructions will result in death or serious injury.

To ensure reliable operation of the inverter, a semi-annual maintenance cycle is recommended.

This schedule is based on less-than-severe environment site conditions. For sites with blowing dust or other particulate matter or for sites subject to temperature extremes, you might need to increase the frequency of the maintenance cycle.

NOTICE

For problems associated with the inverter, contact Schneider Electric.

Semi-Annual Maintenance

Have qualified personnel (as defined on page iii) perform the following semi-annual maintenance:

1. Visually inspect all conductors and connectors at the bottom of the inverter for signs of corrosion or overheating.
2. Check that all the connectors, screws, and cables are connected properly and are tightened to the proper torque specified in this manual.
3. If there are any defective parts (for example, the communication module or one of the fans is not working), contact Schneider Electric.
4. Clean the fans:
   a) Loosen the four screws of the fan bracket (one screw at each of the corners of the bracket, as shown by the arrows in Figure 5-1 on page 5–3).

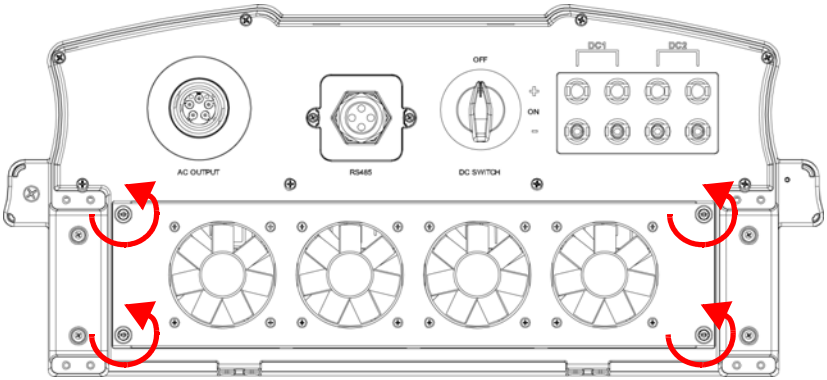


Figure 5-1 Loosening the screws of the fan bracket

b) Pull the fan bracket slightly, to view the connector of each of the four fans.

c) Disconnect the connector for the first fan. Figure 5-2 shows the first fan being disconnected.

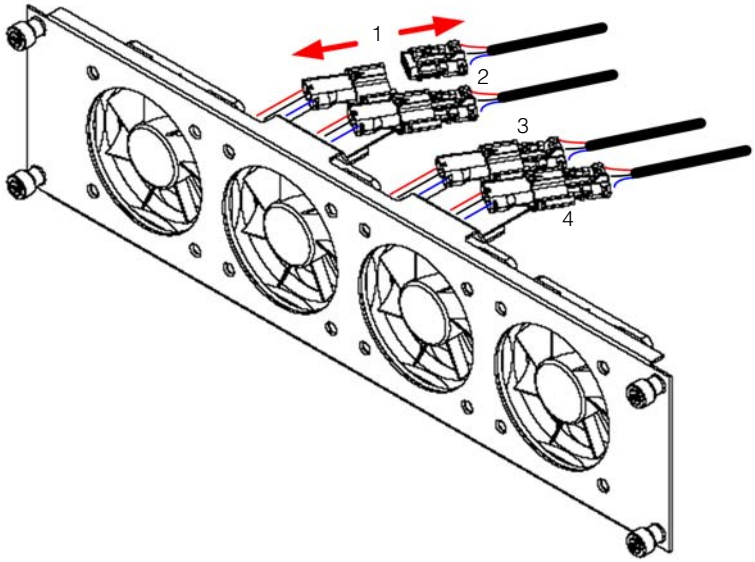


Figure 5-2 Disconnecting the fan connectors

d) Repeat step c for the three remaining fans.

e) Remove the fan bracket from the inverter, as shown in Figure 5-3.

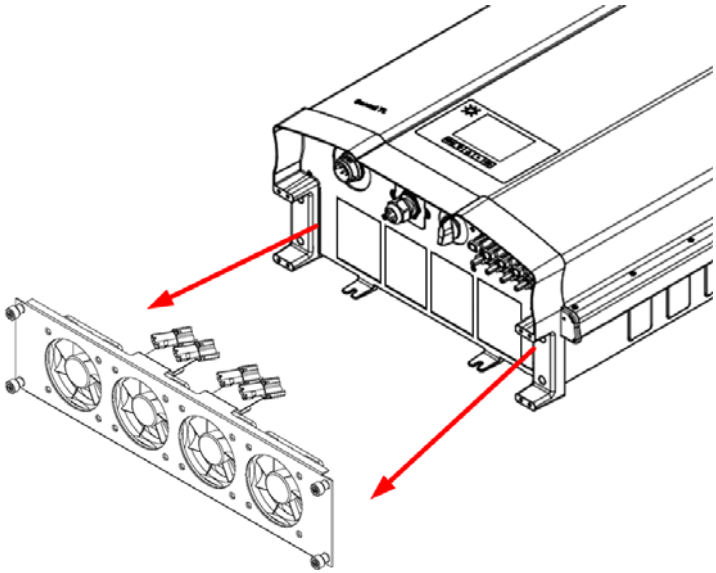


Figure 5-3 Removing the fan bracket

f) Use a clean, dry rag or brush to clean the fans.

CAUTION
RISK OF EQUIPMENT DAMAGE Do not use liquids (for example, water) or compressed air to clean the fans. **Failure to follow these instructions can result in equipment damage.**

g) If any fan has failed, replace the entire fan bracket.

h) Reconnect the four fan connectors.

i) Install the fan bracket onto the inverter.

j) Tighten each of the four screws of the fan bracket to 1.0 Nm. Their location is shown in Figure 5-1 on page 5–3.

5. Clean the two air outlets:

a) Disassemble the four screws of each of the two air outlet covers, as shown by the circles in Figure 5-4 on page 5–5.

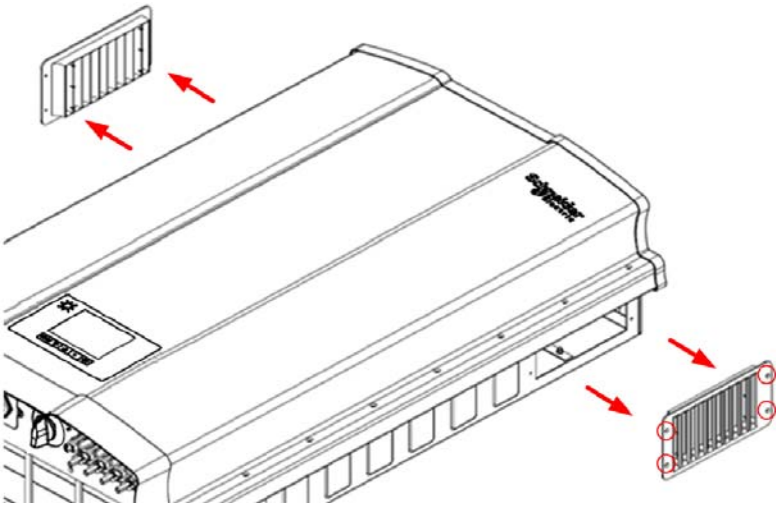


Figure 5-4 Removing the air outlet covers

b) Remove the covers, as shown by the arrows in Figure 5-4.

c) Remove any dust or objects.

CAUTION
RISK OF EQUIPMENT DAMAGE Do not drop any objects into the air outlet openings. **Failure to follow these instructions can result in equipment damage.**

d) Using the screws, reattach the covers to the air outlets. Tighten each screw to 0.8±0.2 Nm.

A Specifications

Appendix A provides the environmental, electrical, and other specifications for the inverters.

System Specifications

Environmental Specifications

Table A-1 Environmental specifications

Specification	Description
Pollution degree	II
Operation altitude	< 2000 m
Enclosure	Powder coated aluminum. Color: RAL 9003.
Operating temperature	-20 to 60 °C (-4 to 140 °F), full power up to 40 °C (104 °F)
Cooling	Four internal fans
Relative humidity	5–90% non-condensing
Protection degree	IP65 (electronics) IP55 (balance of the enclosure)
Galvanic isolation	No electrical isolation between AC grid and PV. Dry contacts, RID (Remote Inverter Disable), and RS485 signal lines are protectively separated from PV and AC circuits.
Safety class	Class I metal enclosure with protective earth
Overvoltage category	Category III
Weight	67.2 kg (approximately 148 lbs)
Dimensions	960 × 612 × 272 mm (37.8 × 24.1 × 10.7 in.)
Connectors	Weather-resistant AC and DC connectors

Electrical Specifications

Table A-2 Electrical specifications

Parameter	Conext TL 15000 E	Conext TL 20000 E
DC (PV) input		
Recommended PV power	17 kW	22 kW
Nominal voltage	630 VDC	
Operating voltage	200–1000 VDC	
Standby power	40 W	
Night time power	< 2 W	
MPP tracker	Parallel inputs: 1 MPP tracker (DC1 and DC2 paralleled) Separate inputs: 2 MPP trackers (DC1 and DC2 connect to separate PV arrays)	
Absolute maximum voltage	1000 VDC	
Vmpp range @ nominal power	350–800 VDC	
Number of inputs	4 inputs (2 inputs per DC tracker)	
Array I_{SC} at STC (maximum per DC tracker)	24 A	
Array I_{SC} absolute maximum under any condition (maximum per DC tracker)	30 A	
Maximum operating current (per DC tracker)	23 A * 2	30 A * 2
AC output (grid side)		
Nominal power	15 kVA	20 kVA
Nominal voltage	230/400 VAC (3-phase + N + PE)	
Maximum current	22 A	29 A
Frequency range	50/60 Hz Adjustable	
Total harmonic current distortion	< 3% @ rated power	
Power factor	> 0.99 @ full power. Adjustable: Cap 0.85 – Ind 0.85	

Table A-2 Electrical specifications (Continued)

Parameter	Conext TL 15000 E	Conext TL 20000 E
DC current injection	Adjustment range: 0.0 to 1.0 A (default 0.7 A). Adjustment range for response time: 0.0 to 5.0 seconds (default 0.2 seconds).	
Maximum efficiency	98%	
European weighted efficiency	> 97.3%	> 97.5%
AC connector	5 wire, solderless; IP67	
Fuse	N/A. External over-current protection must be provided as part of installation.	
Acoustic noise level	55 dBA at 1 meter	

System Information and Communication Specifications

Table A-3 System information and communication

Feature	Description
User interface	Black-on-white graphical LCD 365-day data logger and real-time clock 30 events record
External communication	Modbus (RS485)
Dry contact output connection	For remote indication of inverter status. Connected circuits must not exceed 28 VDC and 3 A.
RID (Remote Inverter Disable)	Two-terminal screw terminal block, for connection to dry (non-energized) switch or relay contacts. The contacts must be capable of switching 30 mA at 12 VDC.

Regulations and Directives

Table A-4 Regulations and directives

Feature	Description
CE conformity	Self-declared with a Declaration of Conformity Product complies with the EMC directive 2004-108-EC and the Low-voltage directive 2006-95-EC
EMC emissions	IEC 61000-6-3; IEC 61000-6-4
EMC immunity	IEC 61000-6-2
National grid requirements	AS4777; BDEW; DK5940; G59; RD1663; VDE0126-1-1
Electrical safety	EN 50178; IEC 62109-1; IEC 62109-2

Dimensions

See “Views and Dimensions” on page 2–11.

B Descriptions of LCD Information

Appendix B describes the information that can be displayed on the LCD of the inverter.

Description of Information Displayed on the LCD

Table B-1 describes text that is displayed on the LCD.

For a description of error messages, see Table 4-1 on page 4–2.

Table B-1 Text displayed on the LCD

LCD text	Description
Comm.-Version	Version of communication software
Day CO2 saved	Total CO^2 emission prevented over the calendar day
DSP-Version	Firmware version
E-Day	Total electricity generated over the calendar day
E-Month	Total electricity generated over the calendar month
E-Today	Total energy generated today
E-Year	Total electricity generated over the calendar year
Fac High	The accumulated highest AC frequency (over the lifetime of the inverter)
Fac Low	The accumulated lowest AC frequency (over the lifetime of the inverter)
Heatsink-1, Max.	The accumulated highest temperature of heatsink-1 (over the lifetime of the inverter)
Heatsink-1, Min.	The accumulated lowest temperature of heatsink-1 (over the lifetime of the inverter)
Heatsink-2, Max.	The accumulated highest temperature of heatsink-2 (over the lifetime of the inverter)
Heatsink-2, Min.	The accumulated lowest temperature of heatsink-2 (over the lifetime of the inverter)
Heatsink-3, Max.	The accumulated highest temperature of heatsink-3 (over the lifetime of the inverter)
Heatsink-3, Min.	The accumulated lowest temperature of heatsink-3 (over the lifetime of the inverter)
Input 1 I	Current of DC tracker 1

Table B-1 Text displayed on the LCD (Continued)

LCD text	Description
Input 1 I maximum	The accumulated highest DC tracker 1 current (over the lifetime of the inverter)
Input 1 P	Power of DC tracker 1
Input 1 P maximum	The accumulated highest DC tracker 1 power (over the lifetime of the inverter)
Input 1 V	Voltage of DC tracker 1
Input 1 Volt. maximum	The accumulated highest DC tracker 1 voltage (over the lifetime of the inverter)
Input 2 I	Current of DC tracker 2
Input 2 I maximum	The accumulated highest DC tracker 2 current (over the lifetime of the inverter)
Input 2 P	Power of DC tracker 2
Input 2 P maximum	The accumulated highest DC tracker 2 power (over the lifetime of the inverter)
Input 2 V	Voltage of DC tracker 2
Input 2 Volt. maximum	The accumulated highest DC tracker 2 voltage (over the lifetime of the inverter)
Inside, Max.	The accumulated highest internal temperature of the inverter (over the lifetime of the inverter)
Inside, Min.	The accumulated lowest internal temperature of the inverter (over the lifetime of the inverter)
L1 I maximum	The accumulated highest AC L1 phase current (over the lifetime of the inverter)
L1 P maximum	The accumulated highest AC L1 phase power (over the lifetime of the inverter)
L1 Volt. maximum	The accumulated highest AC L1 phase voltage (over the lifetime of the inverter)
L2 I maximum	The accumulated highest AC L2 phase current (over the lifetime of the inverter)
L2 P maximum	The accumulated highest AC L2 phase power (over the lifetime of the inverter)

Table B-1 Text displayed on the LCD (Continued)

LCD text	Description
L2 Volt. maximum	The accumulated highest AC L2 phase voltage (over the lifetime of the inverter)
L3 I maximum	The accumulated highest AC L3 phase current (over the lifetime of the inverter)
L3 P maximum	The accumulated highest AC L3 phase power (over the lifetime of the inverter)
L3 Volt. maximum	The accumulated highest AC L3 phase voltage (over the lifetime of the inverter)
Life Energy	Total electricity generated (to present time)
Life Runtime	Total operation time
Month co2 saved	Total CO^2 emission prevented in a month
Output I	Current of AC output
Output I maximum	The accumulated highest AC 3-phase current (over the lifetime of the inverter)
Output P	Power of AC output
Output P maximum	The accumulated highest AC 3-phase power (over the lifetime of the inverter)
Output V	Voltage of AC output
Output Volt. maximum	The accumulated highest AC 3-phase voltage (over the lifetime of the inverter)
Peak Day	The peak day of electricity generated in the past month
Peak Hour	The peak hour of electricity generated in the last 24 hours
Peak Month	The peak month of electricity generated in the past year
Power	Actual power harvested
Red.-Version	Redundant firmware version
Runtime	Total inverter operation time for today

Table B-1 Text displayed on the LCD (Continued)

LCD text	Description
Today CO2 saved	Total CO^2 emission prevented today
Today Energy	Total electricity generated today
Today Runtime	Total operation time today
Total Power	Total real-time power (at that instant)
Uac High	The accumulated highest AC voltage (over the lifetime of the inverter)
Uac Low	The accumulated lowest AC voltage (over the lifetime of the inverter)
Year CO2 saved	Total CO^2 emission prevented in a year

C Country-Specific Settings

Appendix C describes the voltage and frequency disconnect settings and the reconnect time that the inverter provides for each country selectable from the user interface.

Description of Settings Specific to the Selected Country

The tables in this section list the voltage and frequency disconnect settings, and the reconnect time, that the inverter loads after you select a particular country in the Select Country screen (page 2–40).

Use Table C-1 to find the table that has your country settings.

Table C-1 Lookup table for country settings

Country	See this table:	On this page:
Australia	Table C-2	page C–3
Austria	Table C-3	page C–3
Belgium	Table C-4	page C–4
Czech	Table C-5	page C–5
Denmark	Table C-6	page C–6
England	Table C-7	page C–6
France	Table C-8	page C–7
Germany	Table C-9	page C–8
Greece	Table C-10	page C–9
Ireland	Table C-11	page C–10
Israel	Table C-12	page C–10
Italy	Table C-13	page C–11
Netherlands	Table C-14	page C–12
Portugal	Table C-15	page C–13
Spain	Table C-16	page C–13

Table C-2 Country-specific settings for Australia

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	270	2
	Vac High On	265	N/A
	Vac Low Off	200	2
	Vac Low On	205	N/A
Voltage Slow (VAC)	Vac High Off Slow	264.0	600
	Vac High On Slow	262.0	N/A
	Vac Low Off Slow	200	5
	Vac Low On Slow	205	N/A
Frequency Fast (Hz)	Fac High Off	55	2
	Fac High On	54.95	N/A
	F Low Off	45	2
	F Low On	45.05	N/A
Reconnect Time (s)		20	N/A

Table C-3 Country-specific settings for Austria

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	264.0	0.2
	Vac High On	259.0	N/A
	Vac Low Off	196.0	0.2
	Vac Low On	201.0	N/A

Table C-3 Country-specific settings for Austria (Continued)

Category	Item	Setting	Trip time (s)
Voltage Slow (VAC)	Vac High Off Slow	257.0	600
	Vac High On Slow	255.0	N/A
	Vac Low Off Slow	196.0	5
	Vac Low On Slow	201.0	N/A
Frequency Fast (Hz)	Fac High Off	51.00	0.2
	Fac High On	50.95	N/A
	F Low Off	49.7	0.2
	F Low On	49.75	N/A
Reconnect Time (s)		20	N/A

Table C-4 Country-specific settings for Belgium

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	253.0	0.1
	Vac High On	248.0	N/A
	Vac Low Off	207.0	0.1
	Vac Low On	212.0	N/A
Voltage Slow (VAC)	Vac High Off Slow	253.0	1.5
	Vac High On Slow	248.0	N/A
	Vac Low Off Slow	207.0	1.5
	Vac Low On Slow	212.0	N/A

Table C-4 Country-specific settings for Belgium (Continued)

Category	Item	Setting	Trip time (s)
Frequency Fast (Hz)	Fac High Off	50.5	0.1
	Fac High On	50.45	N/A
	F Low Off	47.5	0.1
	F Low On	45.55	N/A
Reconnect Time (s)		30	N/A

Table C-5 Country-specific settings for Czech

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	264	0.2
	Vac High On	259	N/A
	Vac Low Off	196	0.2
	Vac Low On	201	N/A
Voltage Slow (VAC)	Vac High Off Slow	264	5
	Vac High On Slow	259	N/A
	Vac Low Off Slow	196	5
	Vac Low On Slow	201	N/A
Frequency Fast (Hz)	Fac High Off	50.5	0.2
	Fac High On	50.45	N/A
	F Low Off	49.5	0.2
	F Low On	49.55	N/A
Reconnect Time (s)		180	N/A

Table C-6 Country-specific settings for Denmark

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	259.0	0.2
	Vac High On	254.0	N/A
	Vac Low Off	207	10
	Vac Low On	212	N/A
Voltage Slow (VAC)	Vac High Off Slow	253	40
	Vac High On Slow	251	N/A
	Vac Low Off Slow	207	5
	Vac Low On Slow	212	N/A
Frequency Fast (Hz)	Fac High Off	52.00	0.2
	Fac High On	51.95	N/A
	F Low Off	47.5	0.2
	F Low On	47.55	N/A
Reconnect Time (s)		20	N/A

Table C-7 Country-specific settings for England

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	276.0	0.5
	Vac High On	271.0	N/A
	Vac Low Off	192.0	0.5
	Vac Low On	197.0	N/A

Table C-7 Country-specific settings for England (Continued)

Category	Item	Setting	Trip time (s)
Voltage Slow (VAC)	Vac High Off Slow	264	1
	Vac High On Slow	259	N/A
	Vac Low Off Slow	208.0	2.5
	Vac Low On Slow	213.0	N/A
Frequency Fast (Hz)	Fac High Off	52.00	0.5
	Fac High On	51.95	N/A
	F Low Off	47	0.5
	F Low On	47.05	N/A
Frequency Slow (Hz)	Fac High Off	51.50	90.00
	Fac High On	51.45	N/A
	F Low Off	47.50	20.00
	F Low On	47.55	N/A
Reconnect Time (s)		180	N/A

Table C-8 Country-specific settings for France

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	264.0	0.2
	Vac High On	259.0	N/A
	Vac Low Off	184.0	0.2
	Vac Low On	189.0	N/A

Table C-8 Country-specific settings for France (Continued)

Category	Item	Setting	Trip time (s)
Voltage Slow (VAC)	Vac High Off Slow	253.0	600
	Vac High On Slow	251.0	N/A
	Vac Low Off Slow	184.0	5
	Vac Low On Slow	189.0	N/A
Frequency Fast (Hz)	Fac High Off	50.20	0.2
	Fac High On	50.15	N/A
	F Low Off	47.50	0.2
	F Low On	47.55	N/A
Reconnect Time (s)		30	N/A

Table C-9 Country-specific settings for Germany

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	264	0.2
	Vac High On	259	N/A
	Vac Low Off	184	0.2
	Vac Low On	189	N/A
Voltage Slow (VAC)	Vac High Off Slow	253	600
	Vac High On Slow	251	N/A
	Vac Low Off Slow	184	5
	Vac Low On Slow	189	N/A

Table C-9 Country-specific settings for Germany (Continued)

Category	Item	Setting	Trip time (s)
Frequency Fast (Hz)	Fac High Off	50.2	0.2
	Fac High On	50.15	N/A
	F Low Off	47.5	0.2
	F Low On	47.55	N/A
Reconnect Time (s)		30	N/A

Table C-10 Country-specific settings for Greece

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	264	0.5
	Vac High On	259	N/A
	Vac Low Off	184	0.5
	Vac Low On	189	N/A
Voltage Slow (VAC)	Vac High Off Slow	264	600
	Vac High On Slow	259	N/A
	Vac Low Off Slow	184	5
	Vac Low On Slow	189	N/A
Frequency Fast (Hz)	Fac High Off	50.5	0.5
	Fac High On	50.45	N/A
	F Low Off	49.5	0.5
	F Low On	49.55	N/A
Reconnect Time (s)		180	N/A

Table C-11 Country-specific settings for Ireland

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	253	0.5
	Vac High On	248	N/A
	Vac Low Off	207	0.5
	Vac Low On	212	N/A
Voltage Slow (VAC)	Vac High Off Slow	253	5
	Vac High On Slow	248	N/A
	Vac Low Off Slow	207	5
	Vac Low On Slow	212	N/A
Frequency Fast (Hz)	Fac High Off	50.5	0.5
	Fac High On	50.45	N/A
	F Low Off	48.00	0.5
	F Low On	48.05	N/A
Reconnect Time (s)		180	N/A

Table C-12 Country-specific settings for Israel

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	270.0	2
	Vac High On	265.0	N/A
	Vac Low Off	200.0	2
	Vac Low On	205.0	N/A

Table C-12 Country-specific settings for Israel (Continued)

Category	Item	Setting	Trip time (s)
Voltage Slow (VAC)	Vac High Off Slow	264.0	600
	Vac High On Slow	262.0	N/A
	Vac Low Off Slow	200	5
	Vac Low On Slow	205	N/A
Frequency Fast (Hz)	Fac High Off	55.00	2
	Fac High On	54.95	N/A
	F Low Off	45.00	2
	F Low On	45.05	N/A
Reconnect Time (s)		300	N/A

Table C-13 Country-specific settings for Italy

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	276.0	0.1
	Vac High On	271.0	N/A
	Vac Low Off	184.0	0.2
	Vac Low On	189.0	N/A
Voltage Slow (VAC)	Vac High Off Slow	276.0	5
	Vac High On Slow	271.0	N/A
	Vac Low Off Slow	184.0	5
	Vac Low On Slow	189.0	N/A

Table C-13 Country-specific settings for Italy (Continued)

Category	Item	Setting	Trip time (s)
Frequency Fast (Hz)	Fac High Off	50.3	0.1
	Fac High On	50.25	N/A
	F Low Off	49.7	0.1
	F Low On	49.75	N/A
Reconnect Time (s)		60	N/A

Table C-14 Country-specific settings for Netherlands

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	253.0	2
	Vac High On	249.0	N/A
	Vac Low Off	184.0	2
	Vac Low On	189.0	N/A
Voltage Slow (VAC)	Vac High Off Slow	253.0	5
	Vac High On Slow	249.0	N/A
	Vac Low Off Slow	184.0	5
	Vac Low On Slow	189.0	N/A
Frequency Fast (Hz)	Fac High Off	51.00	2
	Fac High On	50.95	N/A
	F Low Off	48.00	2
	F Low On	48.05	N/A
Reconnect Time (s)		180	N/A

Table C-15 Country-specific settings for Portugal

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	264	0.2
	Vac High On	259	N/A
	Vac Low Off	196	1.5
	Vac Low On	201	N/A
Voltage Slow (VAC)	Vac High Off Slow	264	5
	Vac High On Slow	259	N/A
	Vac Low Off Slow	196	5
	Vac Low On Slow	201	N/A
Frequency Fast (Hz)	Fac High Off	51	0.5
	Fac High On	50.95	N/A
	F Low Off	47	0.5
	F Low On	47.05	N/A
Reconnect Time (s)		180	

Table C-16 Country-specific settings for Spain

Category	Item	Setting	Trip time (s)
Voltage Fast (VAC)	Vac High Off	253.0	0.2
	Vac High On	248.0	N/A
	Vac Low Off	196.0	0.2
	Vac Low On	201.0	N/A

Table C-16 Country-specific settings for Spain (Continued)

Category	Item	Setting	Trip time (s)
Voltage Slow (VAC)	Vac High Off Slow	253.0	5
	Vac High On Slow	248.0	N/A
	Vac Low Off Slow	196.0	5
	Vac Low On Slow	201.0	N/A
Frequency Fast (Hz)	Fac High Off	51.00	0.2
	Fac High On	50.95	N/A
	F Low Off	48.00	0.2
	F Low On	48.05	N/A
Reconnect Time (s)		180	N/A

Information About Your System

As soon as you open your Conext TL 15000 E or Conext TL 20000 E photovoltaic grid tie inverter package, record the following information and be sure to keep your proof of purchase.

- ❒ Serial Number _____
- ❒ Part Number _____
- ❒ Purchased From _____
- ❒ Purchase Date _____

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