zeroCO$_2$ small

Single-phase Hybrid Inverter - 5G

Operation Manual

TM011 Rev.005

This manual refer to zeroCO$_2$ small (3-6)K inverter

S5-EH1P3K-L
S5-EH1P3.6K-L
S5-EH1P4.6-K-L
S5-EH1P5K-L
S5-EH1P6K-L

Energy S.p.A.

Table of Content

Quick Guide

First Start

After making all the connections as per the diagrams provided, start the inverter according to the following instructions:

- Power the inverter on the AC side (grid connection).
- Turn on the batteries.
- Wait until inverter display is on (may occur 30")
- Turn the DC switch of the strings to the “ON” position (inverter side).

Battery configuration

- Go to Main Menu.
- Go to ADVANCED SETTINGS.
- Type the password 0010 (DOWN -DOWN – UP – ENTER).
- Go to STORAGE ENERGY SET.
- Go to BATTERY SELECT.
- Select PYLON LV.
- OverDischarge SOC: 20%.
- ForceCharge SOC: 10% (PS: set FORCECHG current to 10A or 500W).

Meter configuration

- Go to Main Menu.
- Go to ADVANCED SETTINGS.
- Type the password 0010 (DOWN -DOWN – UP – ENTER).
- Go to STORAGE ENERGY SET.
- Go to METER SET.
- Select METER SELECT.

Depending on the Meter model select the right one:

- EASTRON 1PH METER (SDM120M [option] or SDM120CTM).
- EASTRON 3PH METER (SDM630 [option] or SDM630MCT [option]).
- ACREL ACR10R-D16TE

Self use configuration

- Go to Main Menu.
- Go to ADVANCED SETTINGS.
- Type the password 0010 (DOWN -DOWN – UP – ENTER).
- Go to STORAGE ENERGY SET.
- Go to STORAGE MODE SELECT.
- Select SELF USE then ENTER.
- Select ON.
- Charging from grid: ALLOW.

Self Test CEI-0-21

- Go to Main Menu.
- Go to ADVANCED SETTINGS.
- Type the password 0010 (DOWN -DOWN – UP – ENTER).
- Go to SELF TEST CEI 0 21.
- Go to COMPLETE TEST.
- Select YES and wait for the threshold analysis to complete.
- Results are available from TEST REPORT (same menu).

Lmt by Epm mode

- Go to Main Menu.
- Go to ADVANCED SETTINGS.
- Type the password 0010 (DOWN -DOWN – UP – ENTER).
- Go to EXPORT POWER SET.
- Set On/Off → ON.
- Set Backflow power → +0000W (Maximum output power to the meter).
- Set Failsafe → OFF.

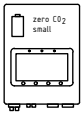
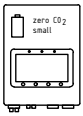
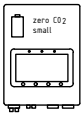
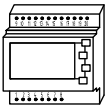
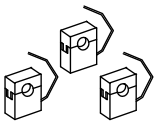
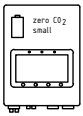
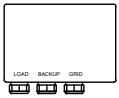
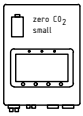
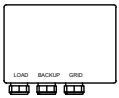
To deactivate Lmt by Epm mode set On/Off → OFF.

WiFi Configuration (site/app Solis Cloud)

To validate zeroCO_2 small warranty and extend it up to 10 years, it is necessary to navigate to the “Solis Cloud” and complete customer account registration: www.soliscloud.com.
For configuration information, refer to the WiFi guide for zeroCO_2 available on the website www.energysynt.com.

Wiring Diagrams

The following table shows the expected configurations.
By clicking on the link in the SCHEMA column you can download the corresponding electrical diagram.

INVERTER	METER	CT	EPS BOX	SCHEMA
				Meter SDM120CTM WD060
				Meter Acrel ACR10R-D16TE WD090
				Meter SDM630MCT WD061
				Meter SDM120CTM WD072
				Meter ACR10R-D16TE WD091

Tutorial

Click on the link to view the video tutorial.

- Tutorial for the correct installation of the zeroCO_2 small inverter.
- Tutorial for the correct installation of the Pylontech US series batteries.
- Tutorial for the correct installation of the Pylontech Force series batteries.

1. Introduction

1.1 Product Description

The zeroCO_2 small (3-6)K Series is designed for residential hybrid systems, which can work with batteries to optimize self-consumption.

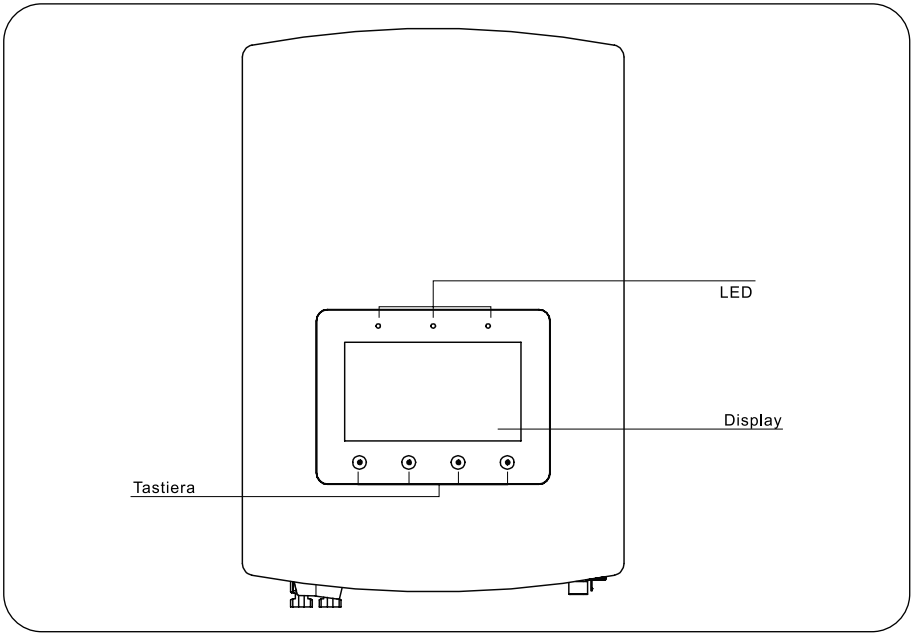


Figure 1 - Front side view

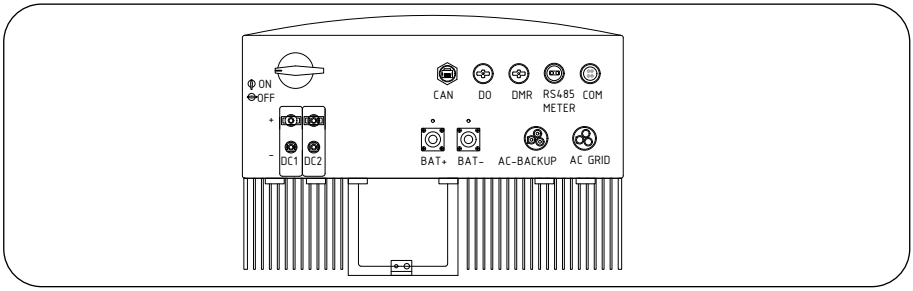
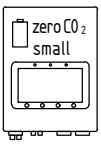


Figure 2 - Bottom side view

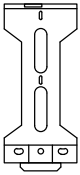
1. Introduction

1.2 Packing list

Please ensure that the following items are included in the packaging.

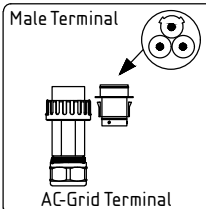


Inverter

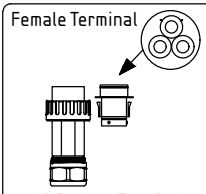


Mounting bracket

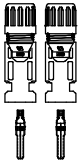
Fixing screws



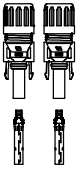
AC-Grid Terminal



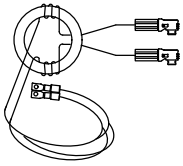
AC-Backup Terminal



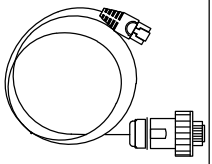
DC(-) Connector



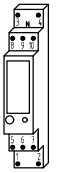
DC(+) Connector



Battery cables kit

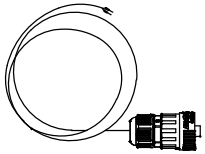


Battery CAN conn. cable



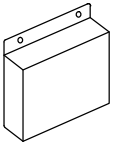
Meter SDM120CTM (100mA)

CT (100A/100mA)

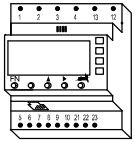


RS485 Meter conn. cable

IN ALTERNATIVA

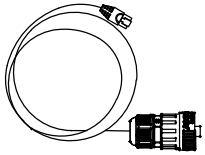


Cover



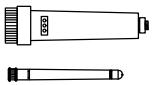
Meter ACR10R-D16TE

CT (120A/40mA)

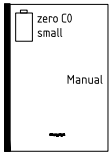


RS485 Meter conn. cable

Double RS485 connector (unused)



Antenna and wifi Module



User Manual

2. Safety & Warning

2.1 Safety

The following types of safety instructions and general information appear in this document as described below.

DANGER.
"Danger"indicates a hazardous situation which if not avoided, will result in death or serious injury.

WARNING.
"Warning" indicates a hazardous situation which if not avoided, could result in death or serious injury.

CAUTION.
"Caution" indicates a hazardous situation which if not avoided, could result in minor or moderate injury.

NOTE
"Note" provides tips that are valuable for the optimal operation of your product.

2.2 General Safety Instructions

WARNING.
Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.

WARNING.
Please don't connect PV array positive (+) or negative (-) to ground, it could cause serious damage to the inverter.

WARNING.
Electrical installations must be done in accordance with the local and national electrical safety standards.

WARNING.
Do not touch any inner live parts until 5 minutes after disconnection from the utility grid and the PV input.

WARNING.
To reduce the risk of fire, over-current protective devices (OCPD) are required for circuits connected to the inverter. The DC OCPD shall be installed per local requirements. All photovoltaic source and output circuit conductors shall have isolators that comply with the NEC Article 690, Part II. All zeroCO_2 small (3-6)K single-phase inverters feature an integrated DC switch..

2. Safety & Warning

CAUTION.
Risk of electric shock, do not remove cover. There is no user serviceable parts inside, refer servicing to qualified and accredited service technicians.

CAUTION.
The PV array supplies a DC voltage
when they are exposed to sunlight.

CAUTION.
Risk of electric shock from energy stored in capacitors of the inverter, do not remove cover for 5 minutes after disconnecting all power sources (**service technician only**). Warranty may be voided if the cover is removed without authorization..

CAUTION.
The surface temperature of the inverter can reach up to 75°C (167 F). To avoid risk of burns, do not touch the surface of the inverter while it's operating. Inverter must be installed out of the reach of children.

NOTE
PV module used with inverter must have an
IEC 61730 Class A rating

WARNING.
Operations below must be accomplished by licensed technician or zeroCO_2 small (3-6) K authorized person.

WARNING.
Operator must put on the technician's gloves during the whole process in case of any electrical hazards.

WARNING.
AC-BACKUP of zeroCO_2 small (3-6)K series is forbidden to connected to the grid.

2. Safety & Warning

WARNING.
The zeroCO_2 small (3-6)K series does not support parallel (three- and single phase) operation on the AC-BACKUP port. Parallel operation of the unit will void the warranty.

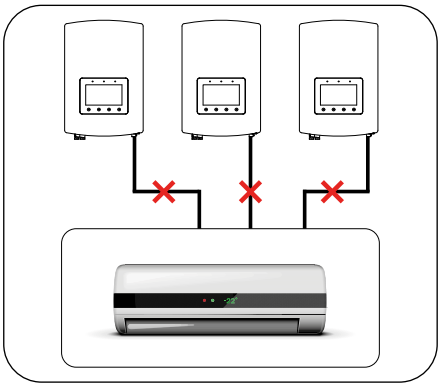


Figure 3 - Three phase Load

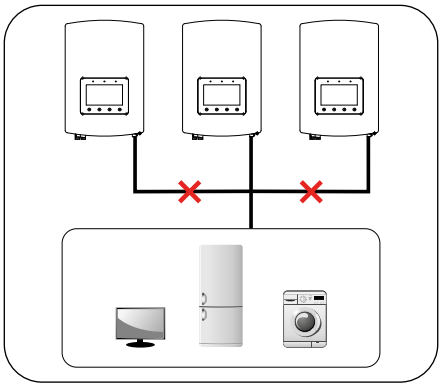


Figure 4 - Single phase Load

WARNING.
Please refer to the specification of the battery before configuration.

2.3 Usage warnings

The inverter has been constructed according to the applicable safety and technical guidelines. Use the inverter in installations that meet the following specifications ONLY:

- Permanent installation is required.
- The electrical installation must meet all the applicable regulations and standards.
- The inverter must be installed according to the instructions stated in this manual.
- The inverter must be installed according to the correct technical specifications.

3. Overview

3.1 Screen

zeroCO₂ small (3-6)K Series adopts 7 inch color screen, it displays the status, operating information and settings of the inverter.

3.2 Keypad

There are four keys in the front panel of the inverter (from left to right): ESC, UP, DOWN e ENTER. The keypad is used for:

- Scrolling through the displayed options (the UP and DOWN keys);
- Access and modify the settings (the ESC and ENTER keys).

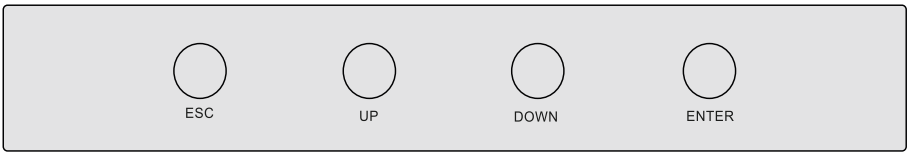


Figure 5 - Keypad

3.3 Terminal Connection

zeroCO₂ small (3-6)K series inverter is different from normal on-grid inverter, please refer to the instructions below before start connection.

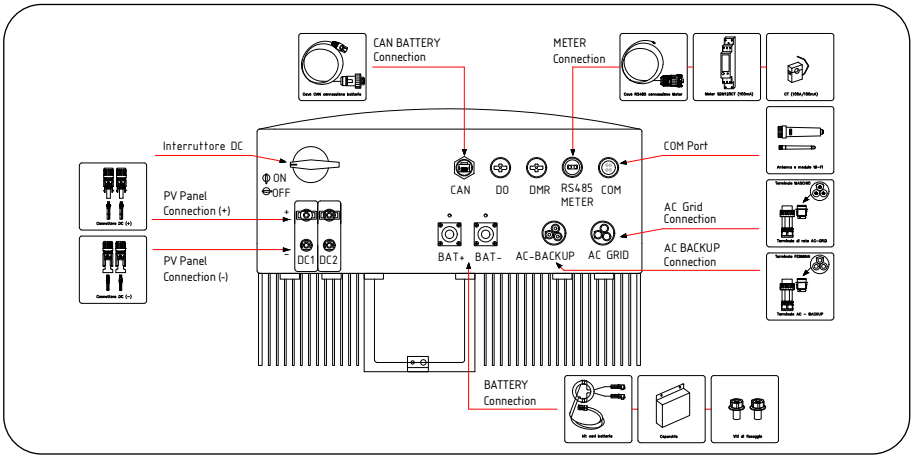


Figure 6 - Terminal connection

WARNING.
Please refer to the specification of the battery before configuration.

4. Installation

4.1 Select a Location for the Inverter

To select a location for the inverter, the following criteria should be considered:

- Exposure to direct sunlight may cause output power derating. It is recommended to avoid installing the inverter in direct sunlight.
- It is recommended that the inverter is installed in a cooler ambient which doesn't exceed 104°F / 40°C.

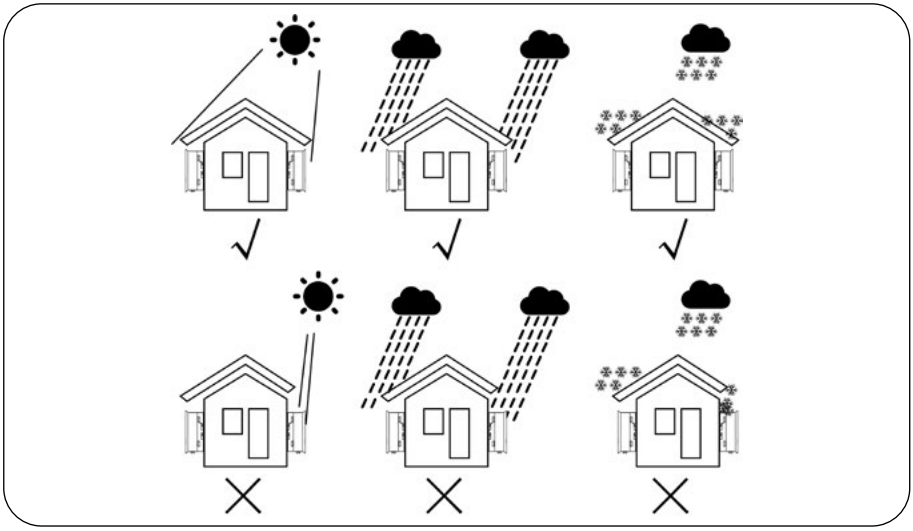


Figure 7 - Recommended Installation locations

WARNING. Risk of fire.
Despite careful construction, electrical devices can cause fires.
Do not install the inverter in areas containing highly flammable materials or gases.
Do not install the inverter in potentially explosive atmospheres.

- Install on a wall or strong structure capable of bearing the weight of the machine (17 kg).
- Install vertically with a maximum incline of ±5°C, exceeding this may cause output power derating.
- To avoid overheating, always make sure the flow of air around the inverter is not blocked. A minimum clearance of 300mm should be kept between inverters or objects and 500 mm clearance between the bottom of the machine and the ground.

4. Installation

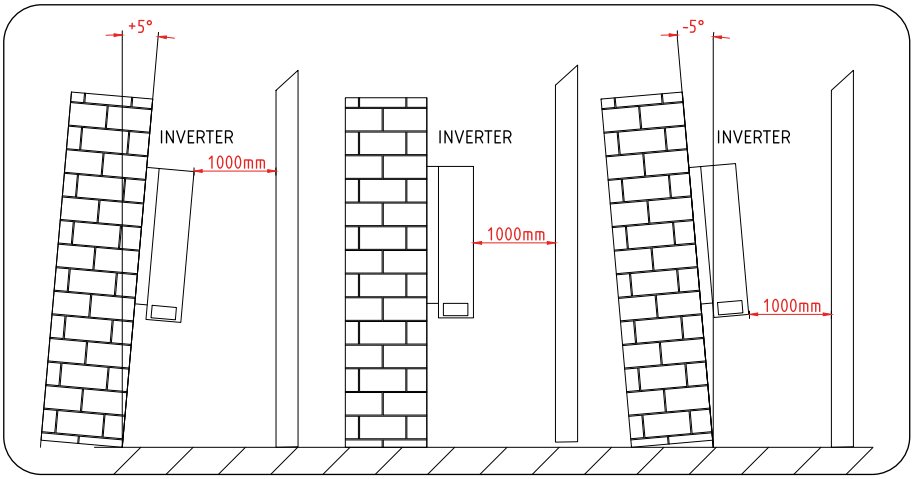


Figure 8 - Inverter Mounting clearance, side view

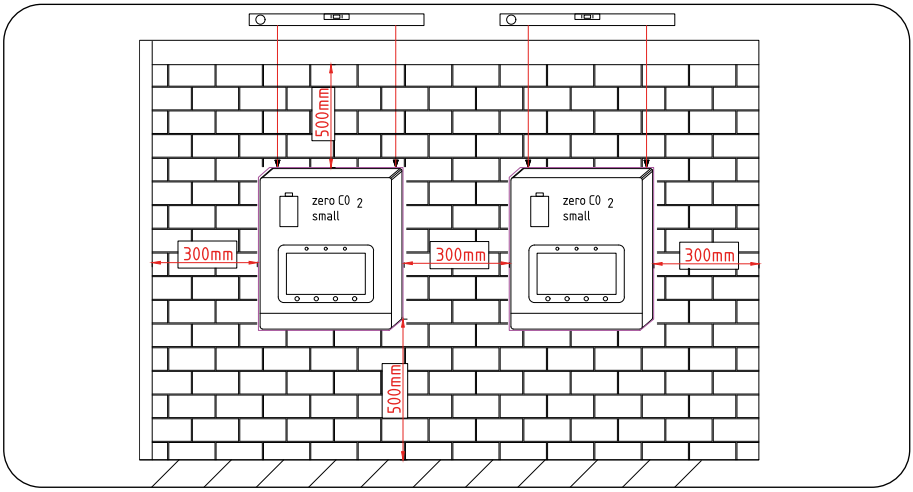


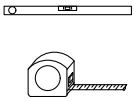
Figure 9 - Inverter Mounting clearance, front view

- Visibility of the LEDs and LCD should be considered.
- Adequate ventilation must be provided.

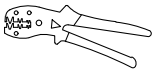
NOTE
Nothing should be stored on or placed against the inverter.

4. Installation

4.2 Equipment list to be used

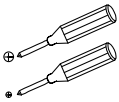


Level and meter

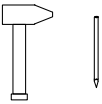


PV Connector crimping tool

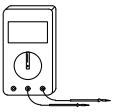
3mm Allen key for AC connectors fixing screws



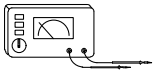
Electrician screwdriver with insulated handles



Dowel insertion hammer and Pencil

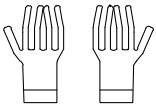


Digital multimeter

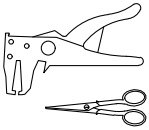


Grounding measuring tool

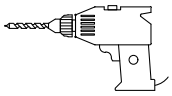
Torque wrench



Dielectric gloves



Wire stripper and electrician scissor



Drill with bits

For bricks wall

3 dowel and 3 screws (6mm)

4. Installation

4.3 Mounting the Inverter

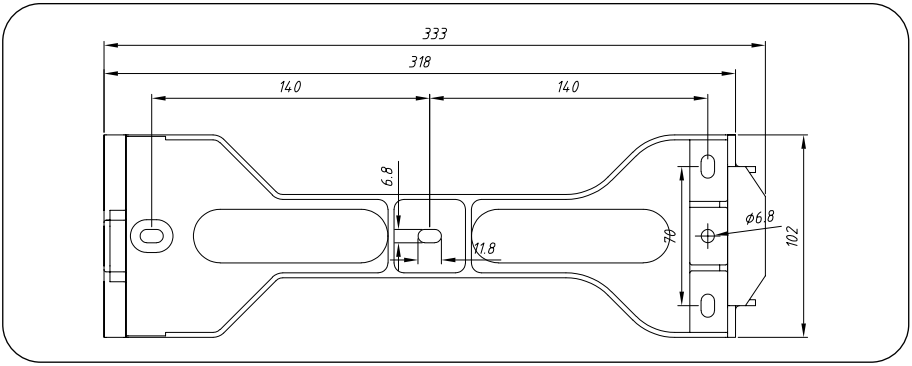


Figure 10 - Dimensions of mounting bracket

Once a suitable location has be found (accordingly to “4.1 Select a Location for the Inverter” at page 16) using Figure 10 and Figure 11, mount the wall bracket to the wall.
The inverter must be mounted vertically. The steps to mount the inverter are listed below:

- Select the mounting height of the bracket and mark the mounting holes.
- Drill holes in the previously marked points using drill and suitable bit.
- Insert the dowells into the wall (if brick wall) and, with the help of the screwdriver and 3 screws, fix the mounting bracket.

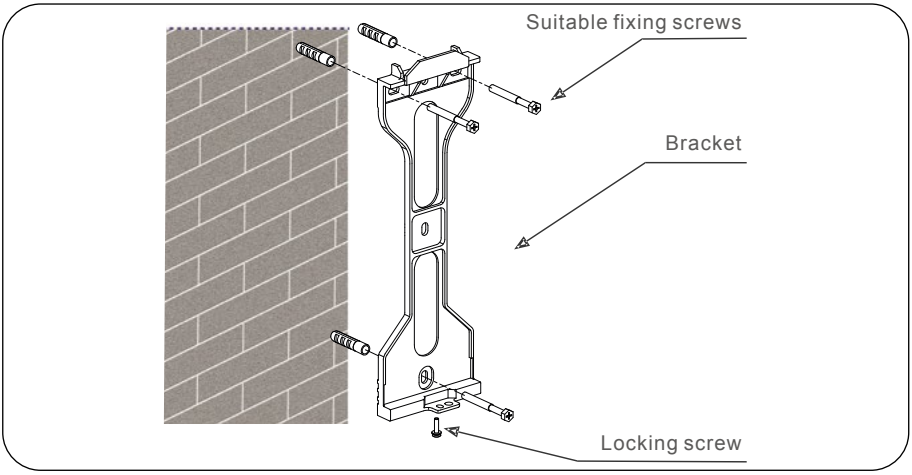


Figure 11 - Fix bracket on the wall

4. Installation

WARNING.
The inverter must be mounted vertically.

- Lift up the inverter (be careful to avoid body strain) and align the back bracket on the inverter with the convex section of the mounting bracket. Hang the inverter on the mounting bracket and make sure the inverter is secure (see Figure 12).
- After positioning the inverter on the bracket, lock it with the screw supplied in the lower part as shown in Figure 11.

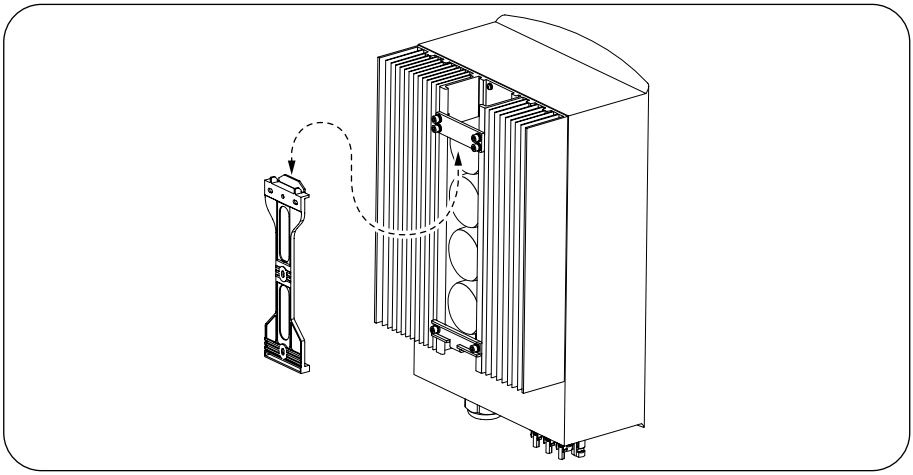


Figure 12 - Wall Mounting Bracket

4.4 PV Input Terminal Assembly

Please ensure the following before connecting the inverter:

- Make sure the voltage of the PV string will not exceed the max DC input voltage (600V DC). Violating this condition will void the warranty.
- Make sure the polarity of the PV connectors are correct.
- Make sure the DC-switch and AC-Grid are all in off-states.
- Make sure the PV resistance to ground is higher than 20K ohms.

The zeroCO_2 small (3-6)K Series inverter uses the MC4 connectors.
Please follow the picture below (Figure 13) to assemble the MC4 connectors.
PV wire diameter requirements: 2,5 ~ 4 mm².

4. Installation

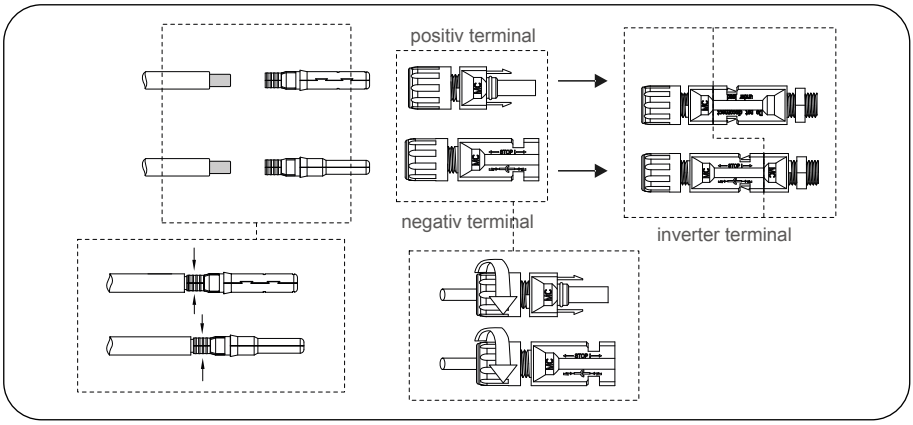


Figure 13 - Use appropriate crimping tools

4.5 Battery Terminal Components

- Ensure the correct polarity of batteries before connecting to the inverter.

WARNING.
Power cables use water-proof AMPHENOL connectors. When pull out the power cable, you must press the button as indicated in the right figure. The battery terminals may be live. Remove the connectors with suitable dielectric gloves. The two terminals (positive and negative) must not be short-circuited.

Connect the battery cable to the inverter and make sure the positive and negative poles are correct. A “Click” sound means fully connection and fasten the cables with the terminal protection cover as indicated Figure 14.

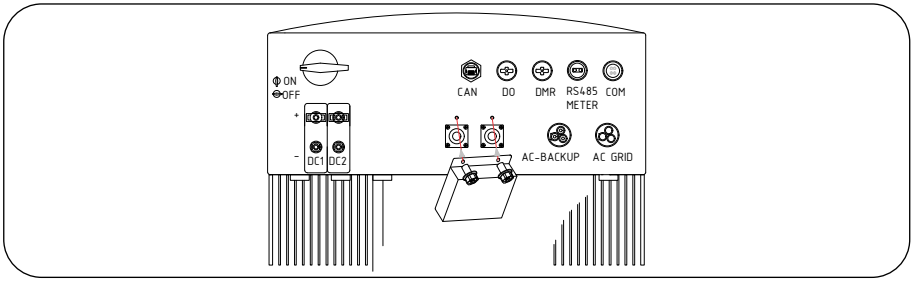


Figure 14 - Installation of Terminal Protection Cover.
Secure the cover with provided screws

4. Installation

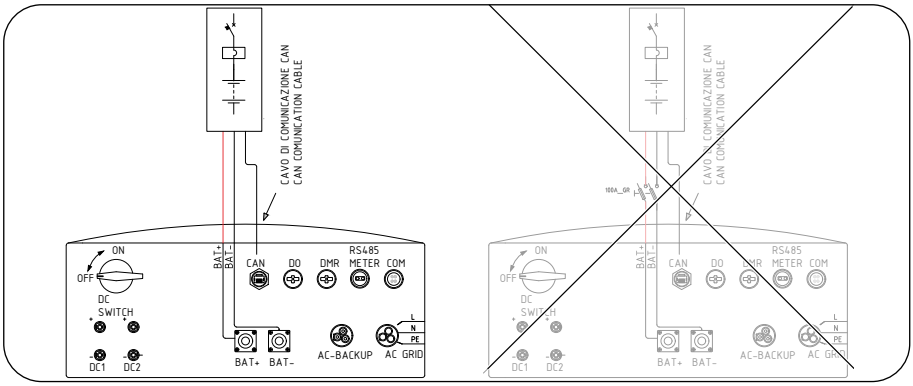


Figure 15 - Storage system (Force-L model)

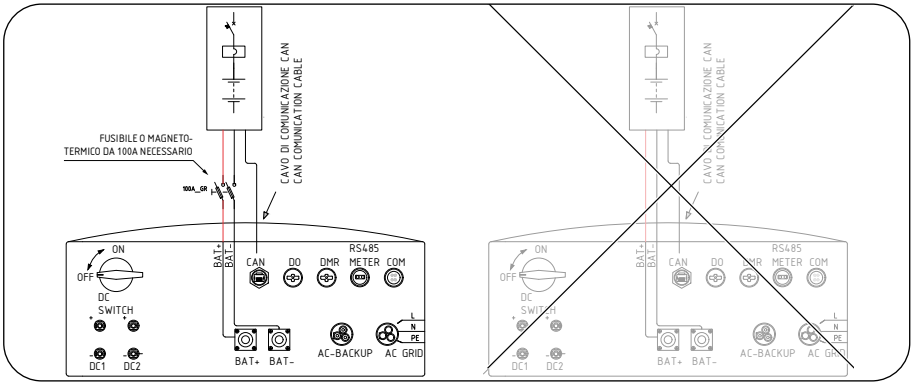


Figure 16 - Storage system (US2000C, US3000C, US5000 models)

NOTE
Before connecting the battery, please carefully read the user manual of the battery and perform the installation exactly as the battery manufacturer requests.

WARNING.
It is mandatory to install a bipolar fuse holder with 100A type Gr fuses or an equivalent circuit breaker where US2000C, US3000C, US5000 type batteries are also installed.

For the FORCE-L battery models the protections are already integrated and no further protections must be provided.

All installations that do not follow these indications are excluded from the guarantee conditions.

4. Installation

4.6 Assembling the AC Connector

There are two AC terminals: the assembly steps for both are the same.
Take out the AC connector parts from the packaging.

- Make sure you use a cable within the correct specifications as shown in the table below:

CABLE SPECIFICATION	
Wire diameter [mm]	10 ~ 12
Traverse cross sectional area [mm²]	2,5 ~ 6
Exposure Lenght [mm]	(8 ~ 15) 12

- Lead the AC cable through the cable gland and the housing.

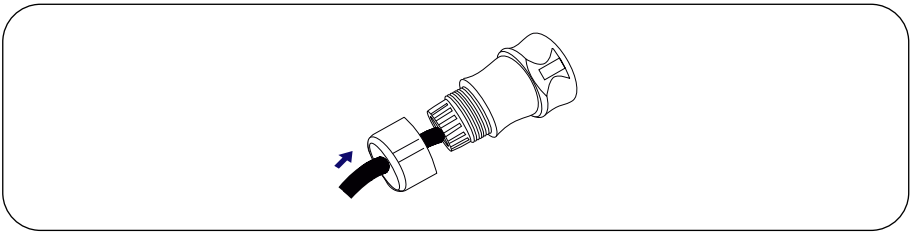


Figure 17

- Remove a length of 40 mm of the cable jacket (be careful not to cut through the sheath, damaging the insulation) and strip the wire insulation to a length of 8-15mm (see Figure 18).

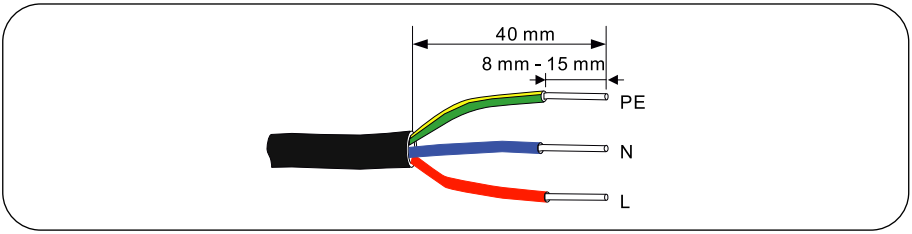


Figure 18

4. Installation

- Each of the terminals are labeled. Ensure that the correct conductor is fastened (1.2 N.m. torque) to the correct terminal.

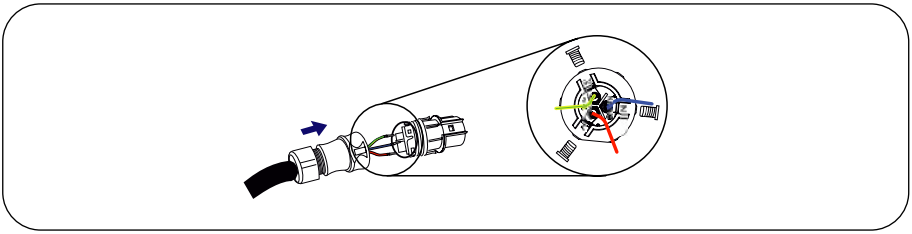


Figure 19

WARNING.
Observe the terminal layout of terminal block. Do not connect the phase lines to “PE” terminal, otherwise the inverter will not function properly.

- Make sure the rib of the terminal block and the groove on the housing engage perfectly until a “click” is heard to felt..

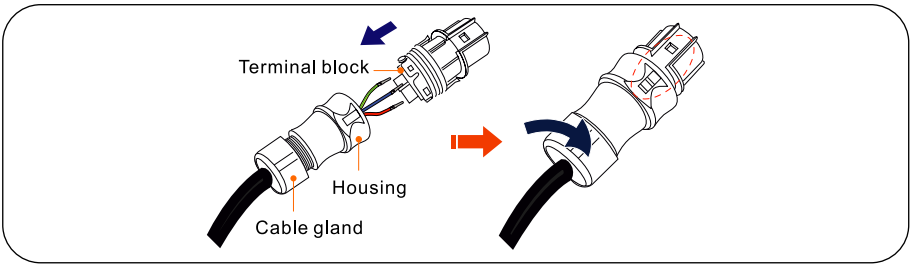


Figure 20

4. Installation

4.7 Meter installation

zeroCO_2 small (3-6)K series inverter is able to connected Acrel meters or Eastron meters to fulfill the control logic of the self-consumption mode, export power control, monitoring, etc.

Meter models
Eastron 1ph meter (with CT), SDM120CTM or Acrel 1ph meter (with CT) ACR10R-D16TE (included in the kit).
Eastron 1ph meter (direct insertion): SDM120M (Optional)
Eastron 3ph meter (direct insertion): SDM630M (Optional)
Eastron 3ph meter (insertion with CT): SDM630MCT (Optional)

If you install the zeroCO_2 small (3-6)K series single-phase inverter with the zeroCO_2 sun charger, refer to the wallbox operation manual downloadable at this link.

4. Installation

4.7.1 Single-phase Meter installation with CT

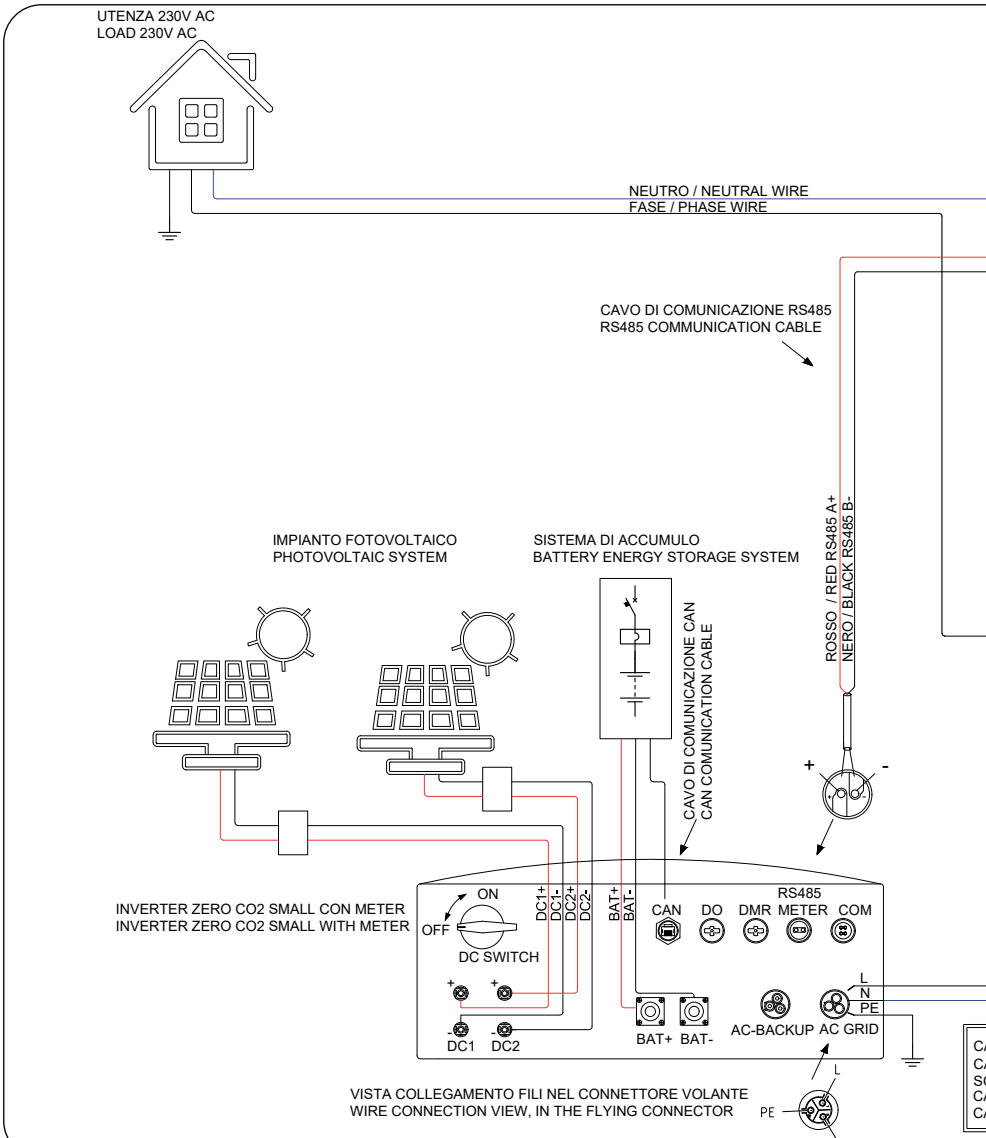
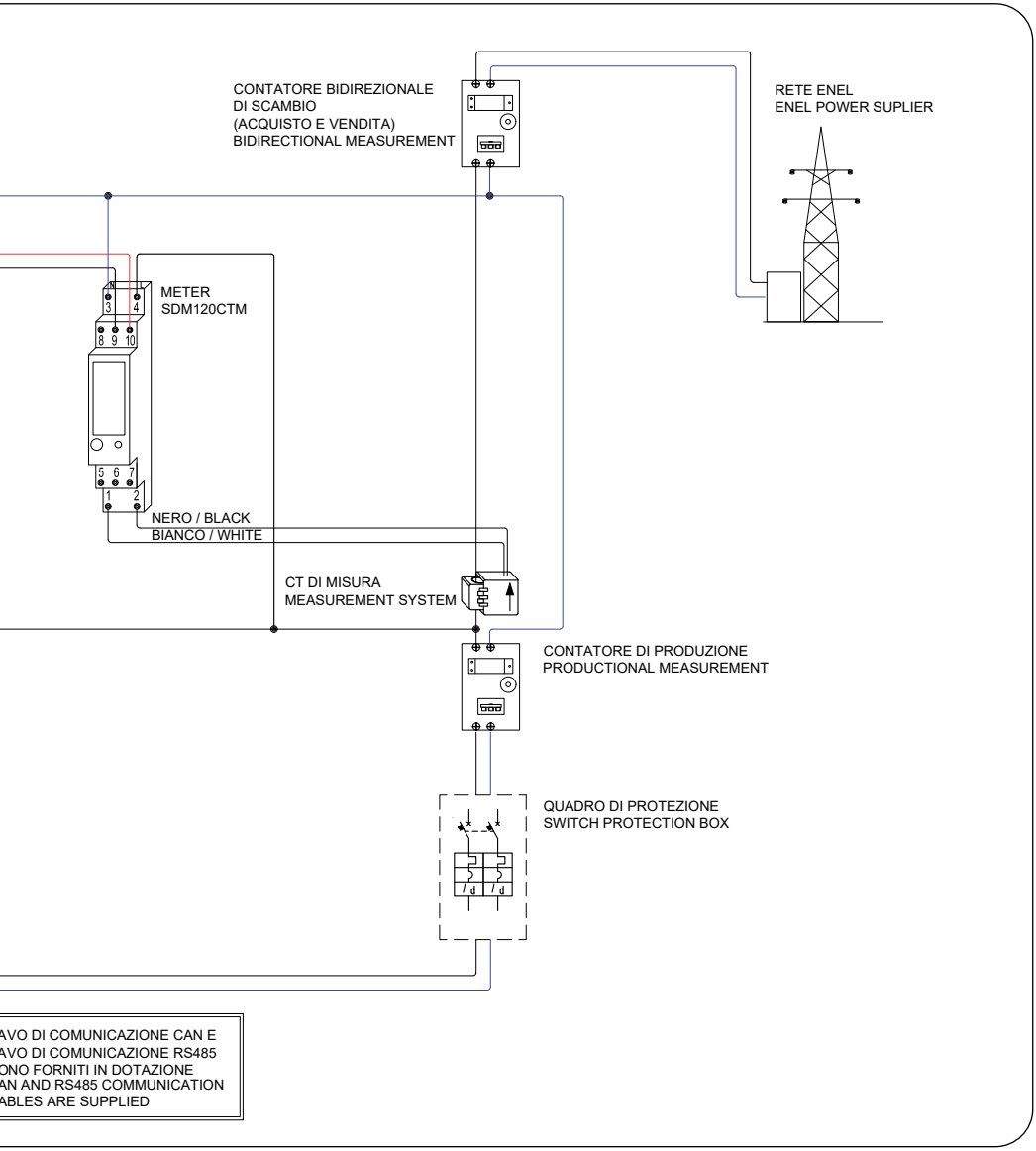


Figure 21 - Connection diagram

4. Installation



of the Eastron SDM120CTM 1ph meter (with CT) included in the kit.

4. Installation

4.7.2 Single-phase Meter installation (with CT)

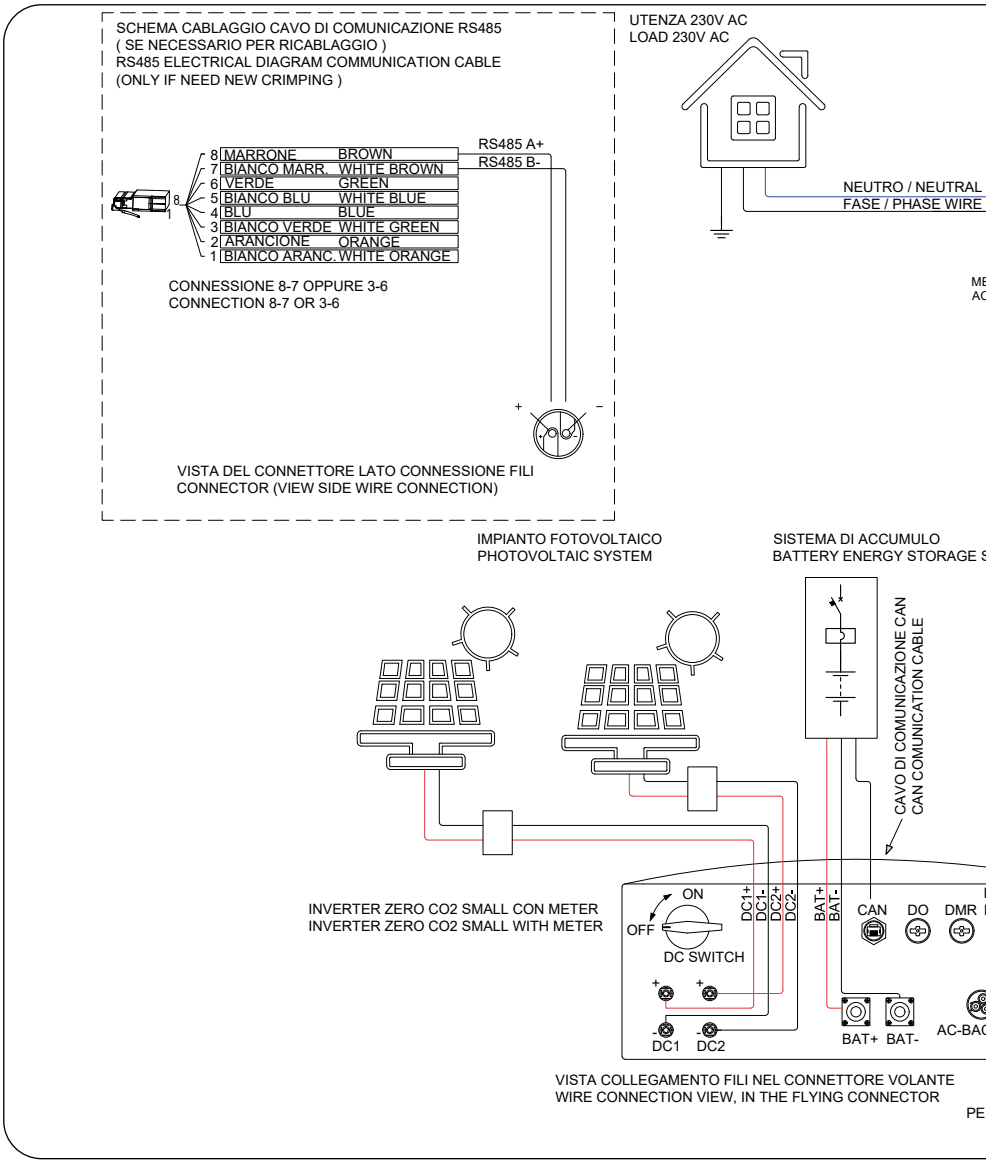
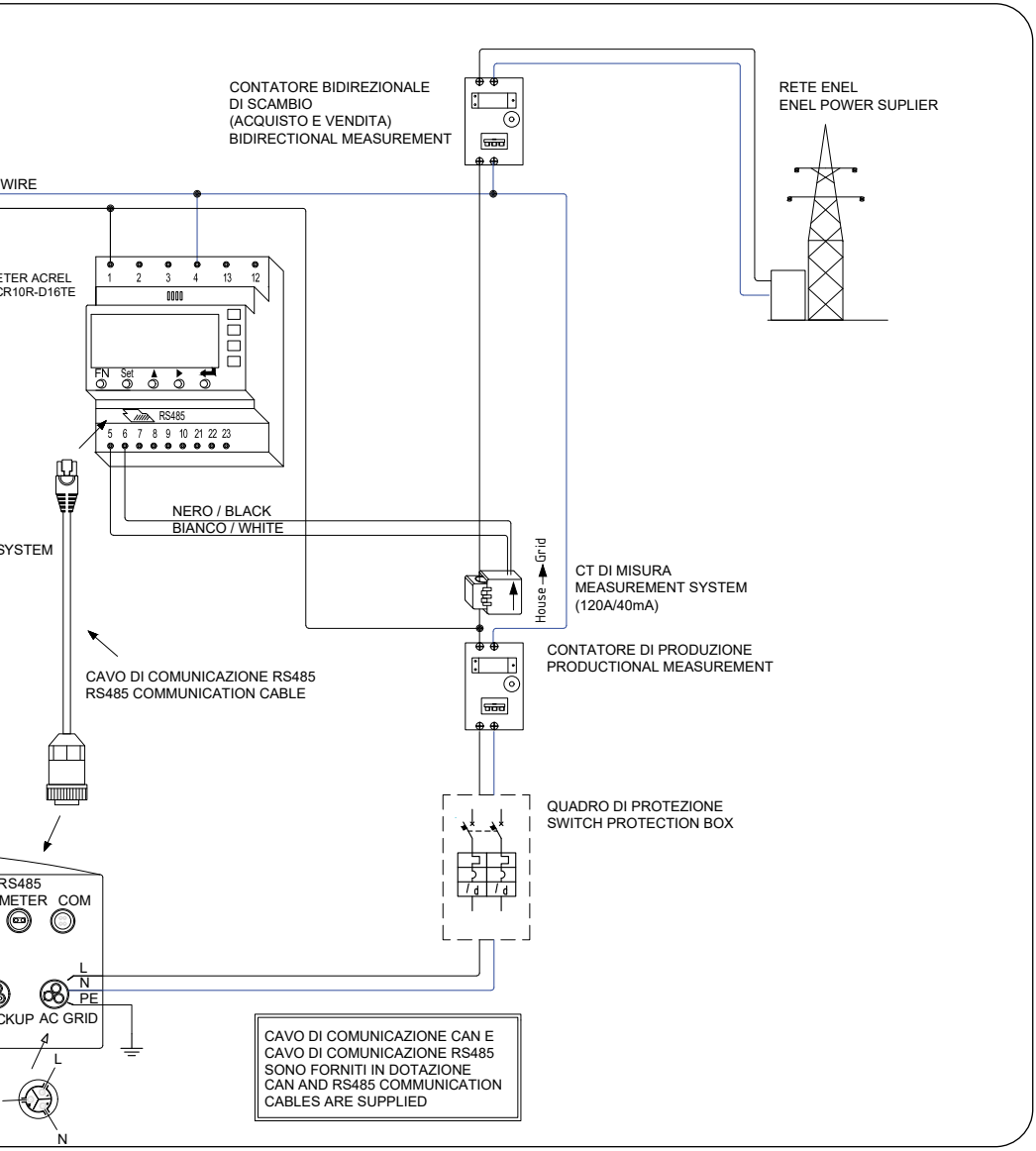


Figure 22 - Connection diagram of the Acrel ACR10

4. Installation



0R-D16TE 1ph meter (insertion with CT) supplied in the kit.

4. Installation

4.7.3 Three-phase meter installation (insertion with CT)

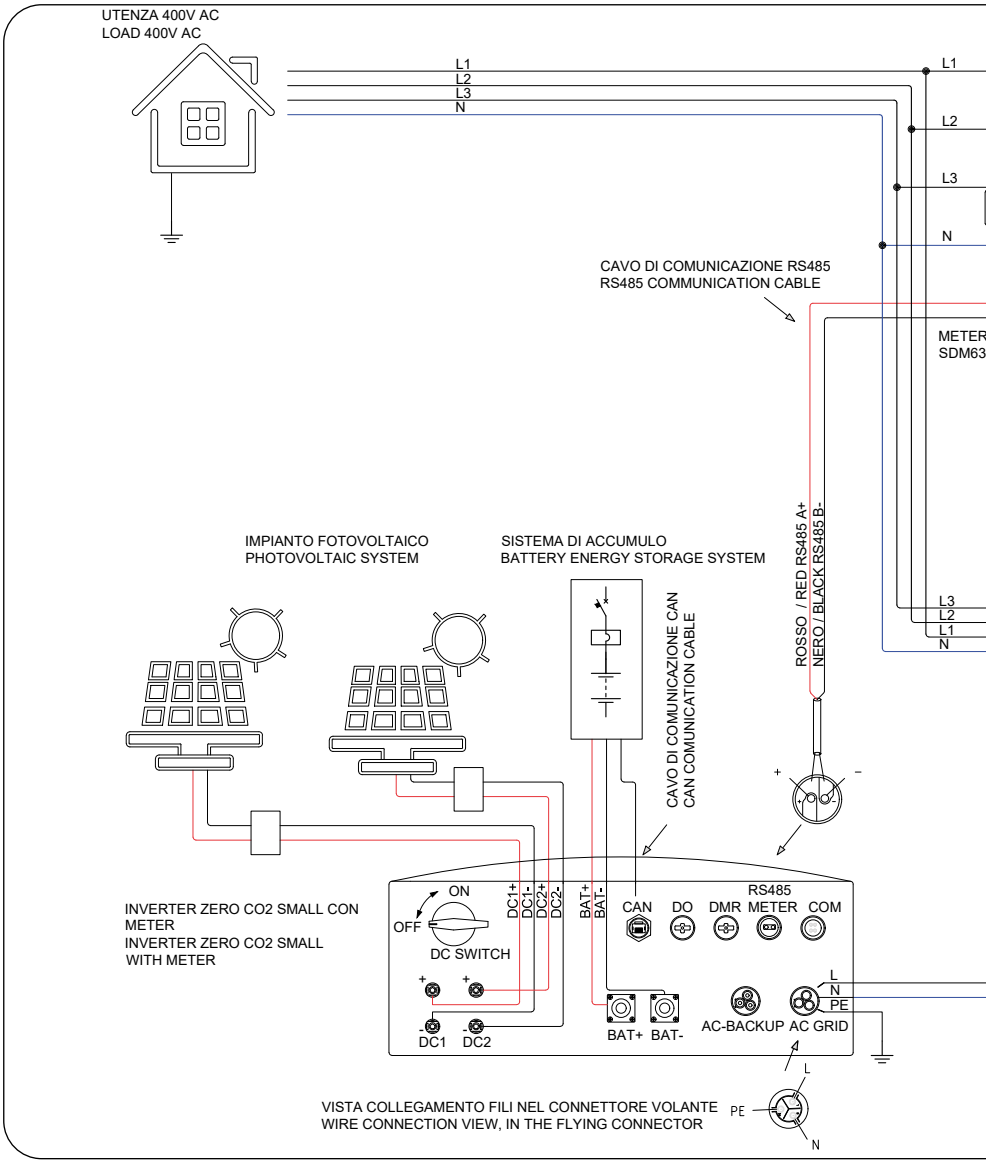
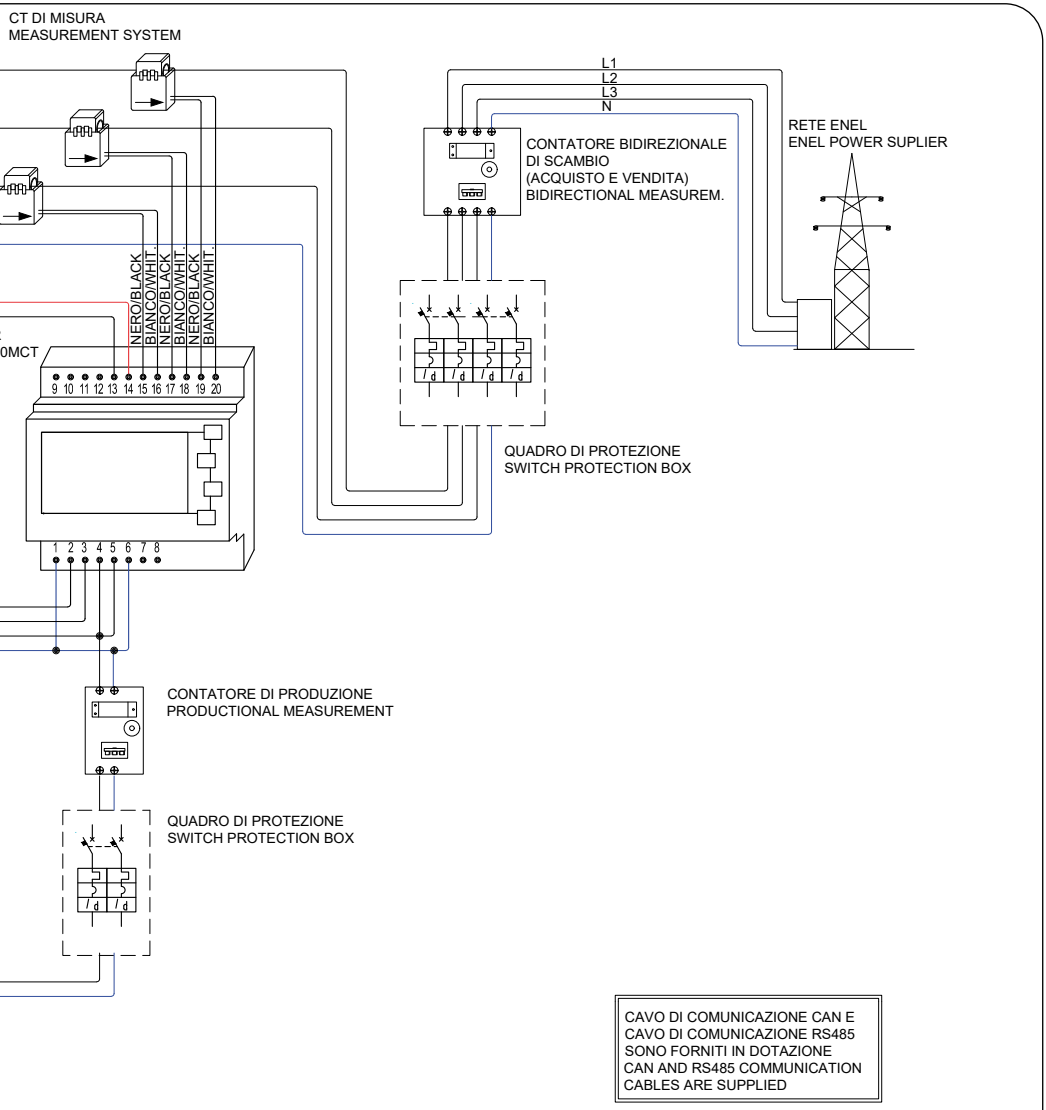


Figure 23 - Connection diagram of the three-phase Ea

4. Installation



astron SDM120M Meter (direct insertion) not supplied in the kit

4. Installation

4.8 External ground connection

An M4 screw is provided on the right side of the inverter for the earth connection. Connect a yellow/green wire of suitable section (2.5~6mm²) with M4 eyelet crimped with suitable equipment. Tighten the screw with a torque of 2Nm

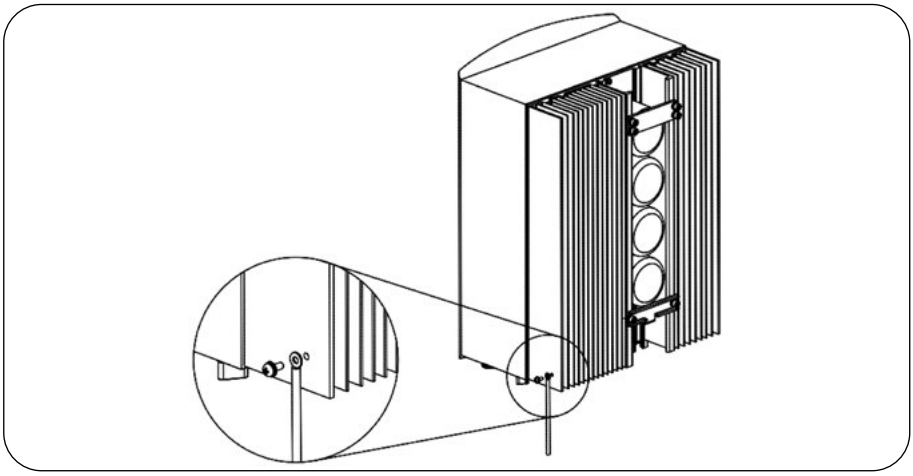


Figure 24 - Connect the external grounding conductor

4.9 Preparation of Commissioning

Ensure all the devices are accessible for operation, maintenance and service.

- Check and confirm that the inverter is firmly installed.
- Space for ventilation is sufficient for one inverter or multiple inverters.
- Nothing is left on the top of the inverter or battery module.
- Inverter and accessories are correctly connected.
- Cables are routed in safe place or protected against mechanical damage.
- Warning signs and labels are suitably affixed and durable.

4.10 Commissioning procedure

If all the items mentioned above meet the requirements, proceed as follows to start up the inverter for the first time.

- Switch on the AC-backup and AC-grid.
- Select grid standard.
- Configure parameters.
- Before switch on DC inverter switch, switch on DC battery switch and check polarity.
- Switch on DC inverter switch.
- Check inverter initialization.

4. Installation

4.11 Inverter monitoring connection

The inverter can be monitored via Wi-Fi or LAN (optional). For connection instructions, please refer to the Quick Guide, paragraph “WiFi Configuration (site/app Solis Cloud)” at page 7.

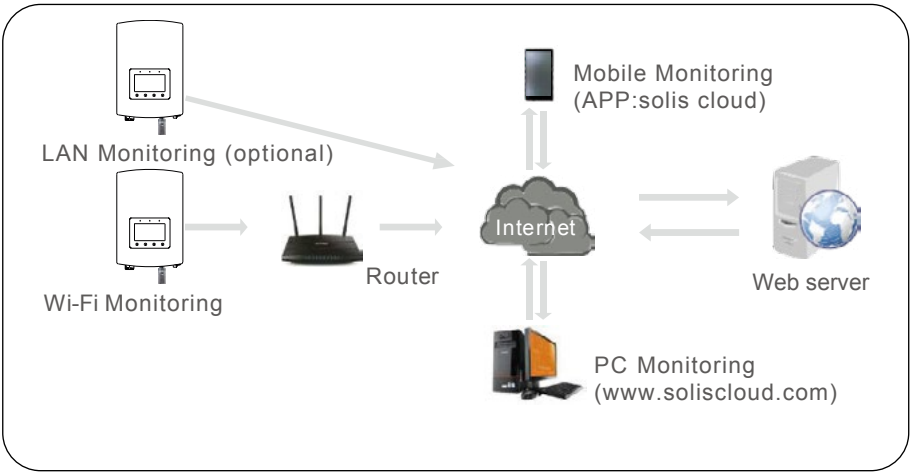


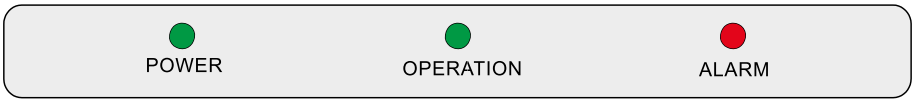
Figure 25 - Wi-Fi or LAN communication function

NOTE
Connect the inverter online to ensure you receive the latest firmware version available and extend the warranty from 2 to 10 years. Please refer to the Quick Guide, paragraph “WiFi Configuration (site/app Solis Cloud)” at page 7.

5. Operation

5.1 LED indicators

There are three LED indicators on the zeroCO_2 small (3-6)K inverter (green, green and red) which indicate the working status of the inverter.



LIGHT	STATUS	DESCRIPTION
POWER	ON	The inverter is ON
	OFF	No DC power.
OPERATION	ON	The inverter is fully operational.
	OFF	The inverter has stopped operating.
	FLASHING	The inverter is initializing.
ALARM	ON	Fault condition is detected.
	OFF	No fault condition detected.
	FLASHING	Fault condition is detected.

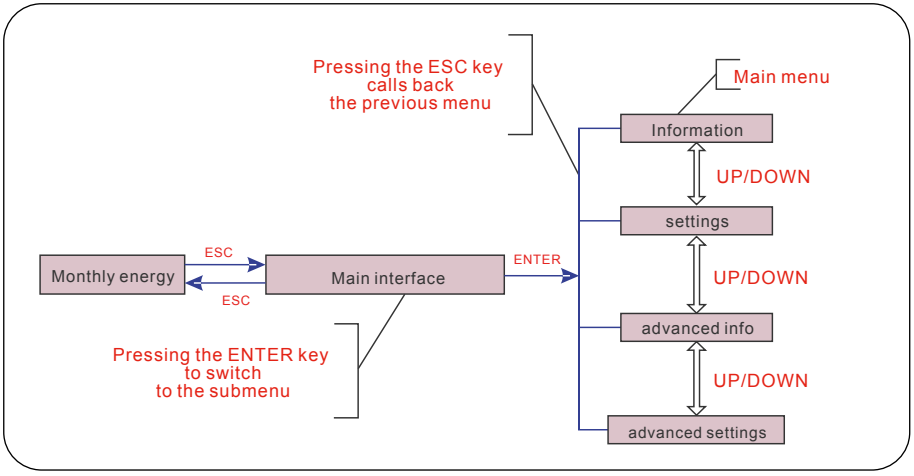


Figure 26 - Operation Overview

5. Operation

5.2 Initial Display

When powering up the inverter for the first time, it is required to set the language. Choose option are Entglish or Chinese.
Press “ENT” to select.

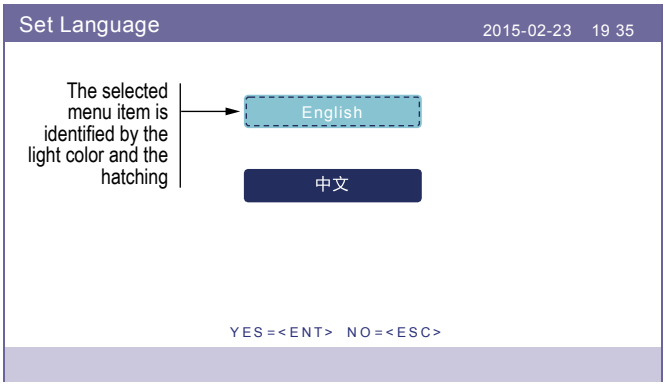


Figure 27 - Set language

After setting the language, press “ESC” to access the main page.

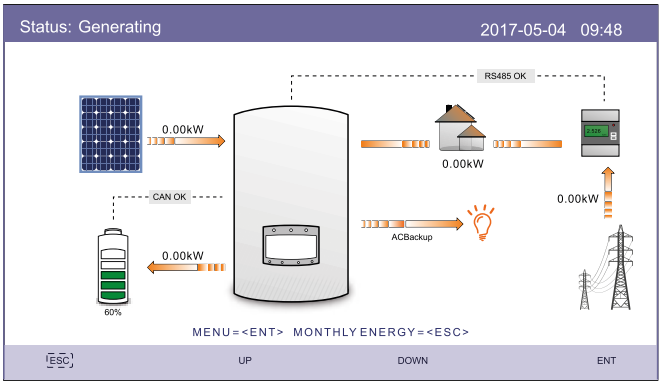


Figure 28 - Main page

On the main page:
Press “ESC”: View the yield data on a monthly bar charts. Then use “UP” and “DOWN” to change the date and “ENT” to move the cursor.
Press “UP” or “DOWN”: View different status on the top left of the main page.
Press “ENT”: Enter the main menu.

5. Operation

	Solar Power: When solar power is generated, an arrow indicates the direction of the power flow and the value is shown above the arrow.
	Battery: When the battery is connected successfully, it will display “CAN OK”, meanwhile, battery SOC, arrow and value of power flow is shown. Otherwise, it will display “CAN Fail”.
	Non-Critical Loads: Loads connected to the AC Grid port which will shutdown if the grid is in malfunction.
	Smart Meter: When the smart meter is connected successfully, it will display “RS485 OK”, otherwise “RS485 Fail”.
	Critical Loads: Loads connected to the AC Backup port which will be supported by battery and solar even if the grid is in malfunction.
	Grid: The arrow and value indicate the export/import power of the hybrid system.

Figure 29

5.3 Main Menu

There are four submenu i the Main Menu:

1. Information
2. Settings
3. Advanced Information
4. Advanced Settings

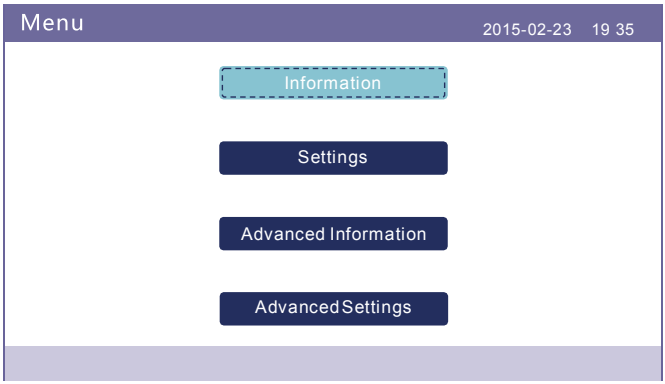


Figure 30 - Main Menu

5. Operation

5.4 Information

In the “Information” section, operating data and information can be viewed.
Three pages of information can be checked by press “UP” or “DOWN”.
The example display is shown in the following Figure 31, Figure 32 e Figure 33.
Values are for reference only. The “Charge Power” indication can be replaced with “Discharge” depending on the system charge or discharge..

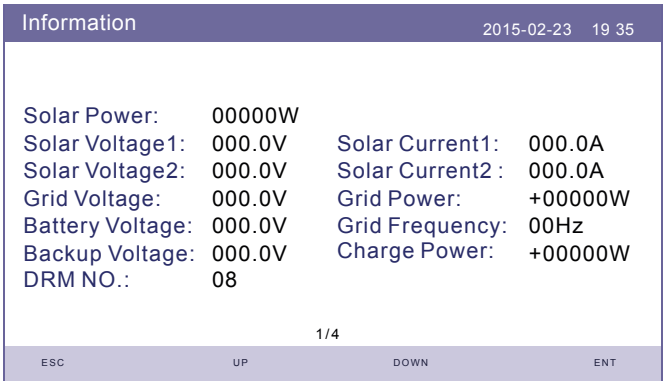


Figure 31 - Main Menu

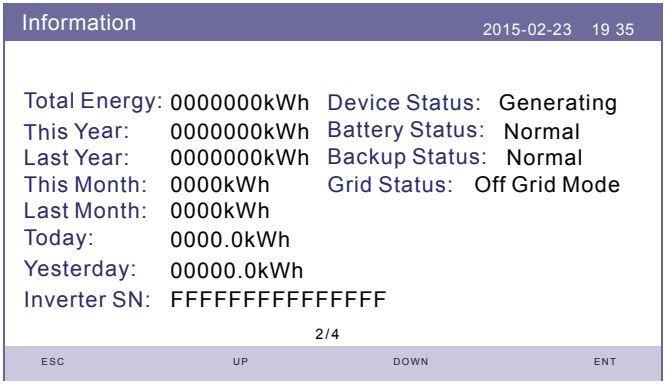


Figure 32 - Information Page 2

5. Operation

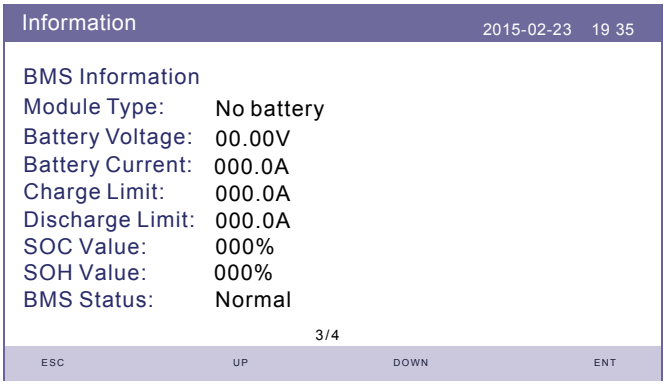


Figure 33 - Information Page 3

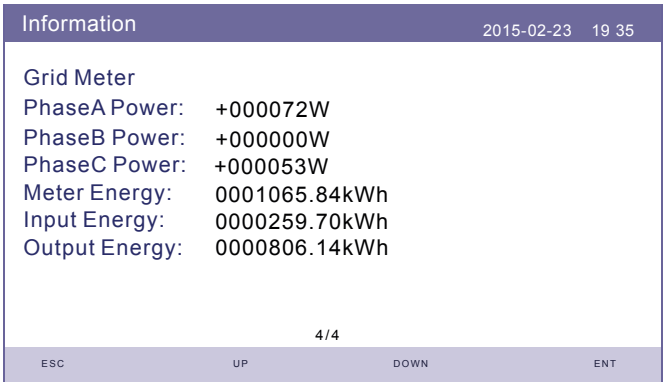


Figure 34 - Information Page 4

NOTE
Meter Power/Grid Power: Positive value indicates exporting power to the grid, negative value indicates importing power from the grid. Charge Power: Positive value indicates charging, negative value indicates discharging.

NOTE
Information for “PV Inverter Meter” is only available when two Eastron meters are used and Meter Placement is selected as “Grid+PV Meter”. Details please consult Energy service department.

5. Operation

5.5 Settings

In the “Settings” section, Time/Date, Slave address and language can be modified.

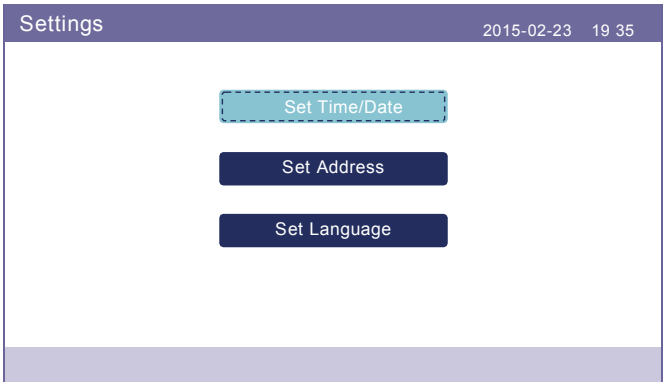


Figure 35 - Settings

5.5.1 Set Time/Date

Set the time and date on the inverter. Must set this according to local time as it affects the daily yield calculation. (If Solis monitoring system is used, must set the correct time zone of the system, otherwise datalogger will update the inverter time based on the time zone of the system.)

Press “UP” and “DOWN” to change the value.

Press “ENT” to move the cursor (from left to right).

Press “ESC” to save the change and back to previously menu (Figure 36)

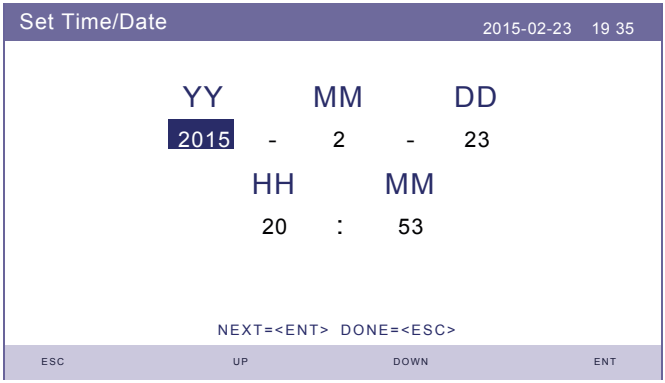


Figure 36 - Set Time/Date

5. Operation

If any data is updated press Save & Send in the screen below to confirm changes.

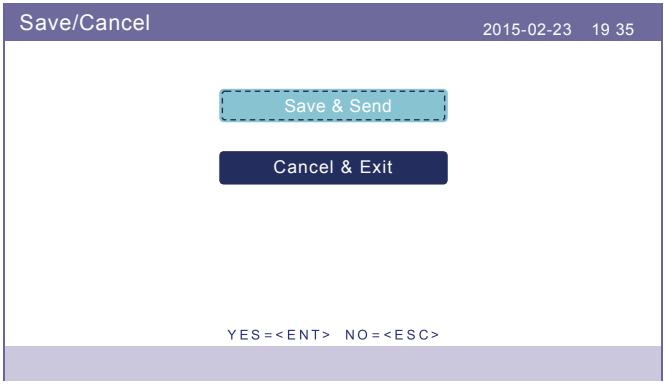


Figure 37 - Set Time/Date

5.5.2 Set Address

Set the slave address of the inverter. The default address is 01.

Figure 38 - Set Address

5. Operation

5.5.3 Set Language

Set system language. Chinese and English are available.

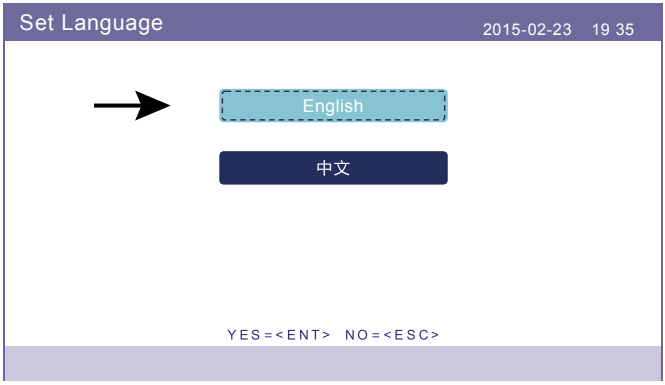


Figure 39 - Set Language

5.6 Advanced Information

Detailed information can be viewed in this section:

1. Alarm Message
2. Running Message
3. Version
4. Communication Data
5. Daily Power
6. Monthly Energy
7. Yearly Energy
8. Total Energy
9. Warning Message
10. Inspection

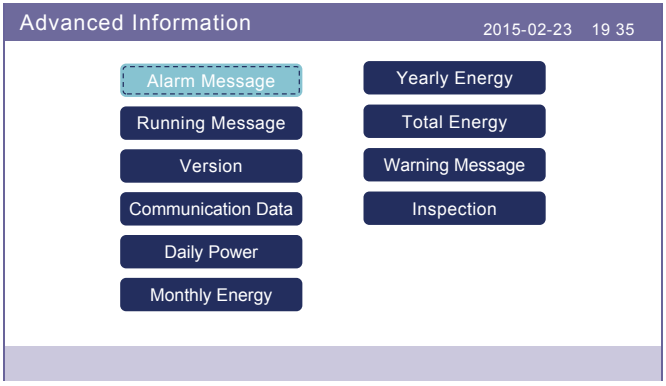


Figure 40 - Advanced Information

5. Operation

5.6.1 Alarm Message

The screen show the 40 pages of latest alarm messages (Figure 41) 5 per page.
Alarm message shows:

- Message;
- Date/Time;
- Date (alarm ID for Energy technical service).

Press UP or DOWN to show next page.

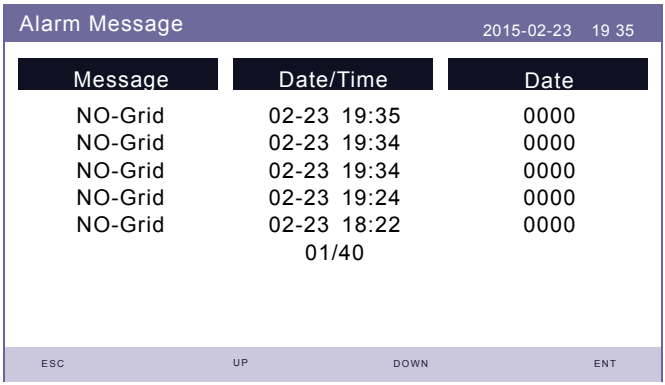


Figure 41 - Alarm Message

5.6.2 Running Message

This function is for maintenance person to get running message such as internal temperature, Standard NO. etc (values are for reference only).

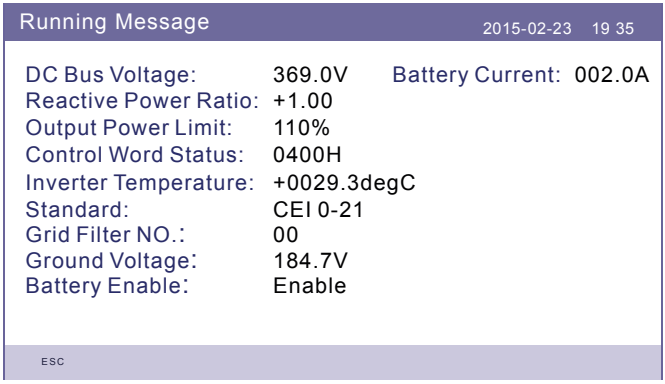


Figure 42 - Running Message

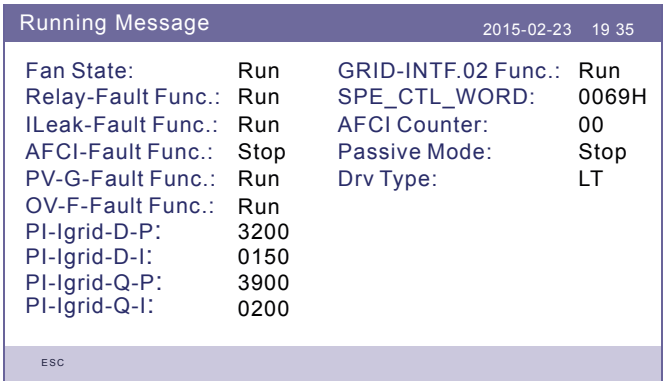


Figure 43 - Running Message

5.6.3 Version

Inverter model number and software version can be viewed in this section. Values are for reference only.

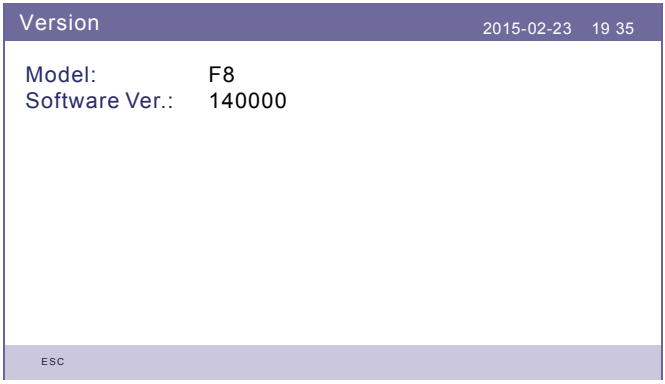


Figure 44 - Model Version and Software Version

NOTE
Connect the inverter online to ensure you receive the latest firmware version available and extend the warranty from 2 to 10 years. Please refer to the Quick Guide, paragraph "WiFi Configuration (site/app Solis Cloud)" at page 7.

5. Operation

5.6.4 Communication Data

Internal communication data can be viewed in this section. For maintenance person only. Values are for reference only.

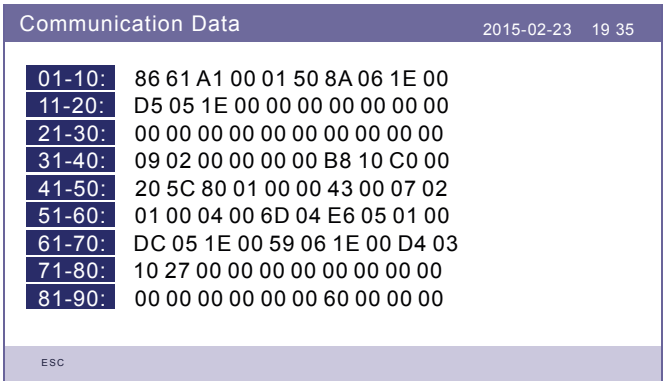


Figure 45 - Communication data

5.6.5 Daily Energy

The screen shows the daily energy detail of the inverter.

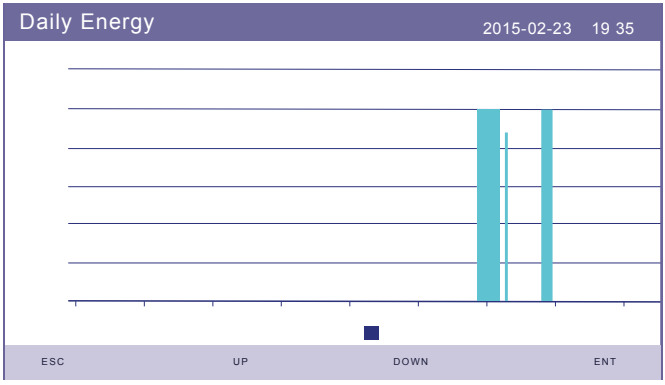


Figure 46 - Daily Energy

5. Operation

5.6.6 Monthly Energy

The screen shows the inverter monthly energy detail.

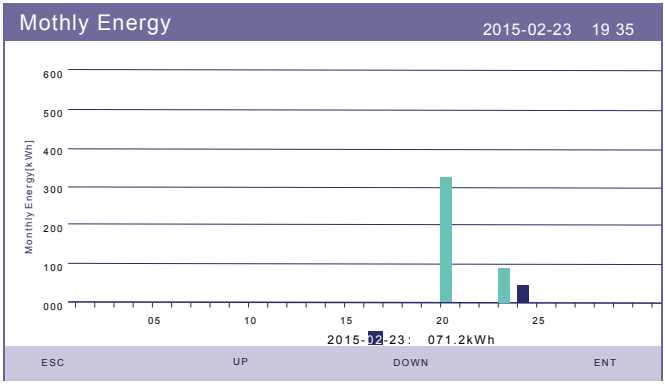


Figure 47 - Monthly Energy

5.6.7 Yearly Energy

The screen shows the inverter yearly energy detail.

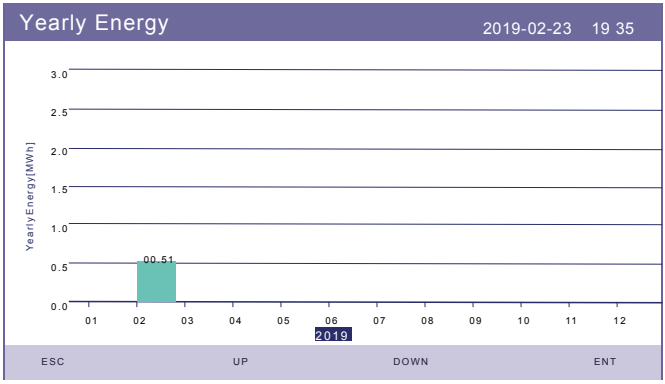


Figure 48 - Yearly Energy

5. Operation

5.6.8 Total Energy

The screen shows the inverter total energy detail.

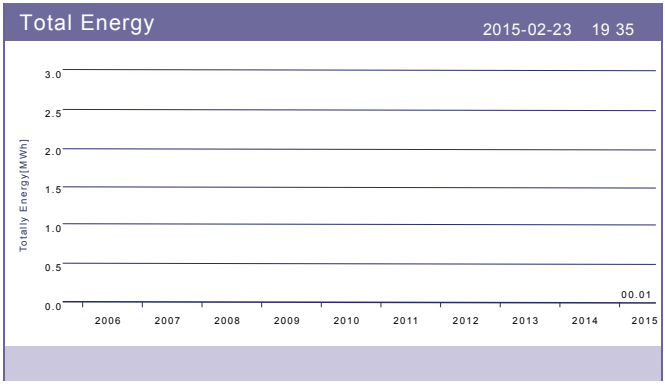


Figure 49 - Total Energy

5.6.9 Warning Message

The screen shows the 10 pages of latest warning message (5 per page).
Warning message shows the warning that is abnormal but will not lead to inverter shutdown.
Warning message shows:

- Message;
- Date/Time;
- Date (alarm ID for Energy technical service).

Press UP or DOWN to show next page.

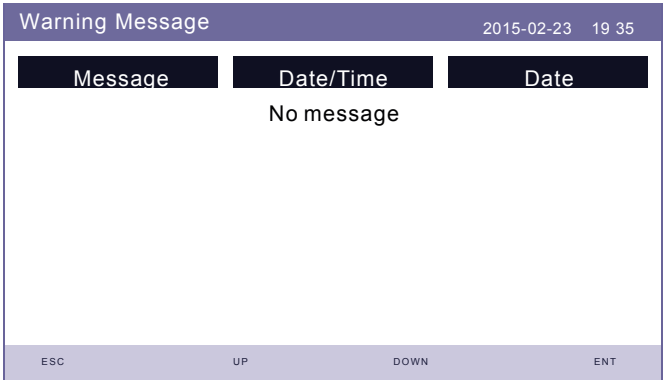


Figure 50 - Alarm Message

5.6.10 Inspection

The screens display the operating parameters which guarantee compliance of the inverter with the CEI 0-21 standard. With UP and Down you can view further pages.

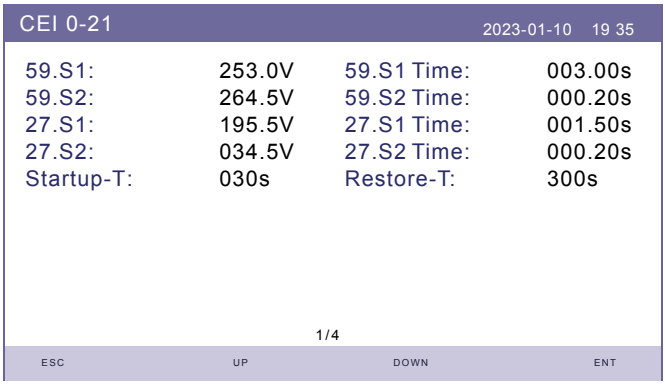


Figure 51 - CEI 0-21

5. Operation

5.7 Advanced Settings - **Technicians Only**

NOTE
This function is for authorized technicians only. Improper access and operation may result in abnormal results and damage to the inverter.
Password required - restricted access - authorized technicians only, Un-authorized access may void the warranty. (Password “0010”).

Select Advanced settings from main menu, the LCD screen show the password is needed:

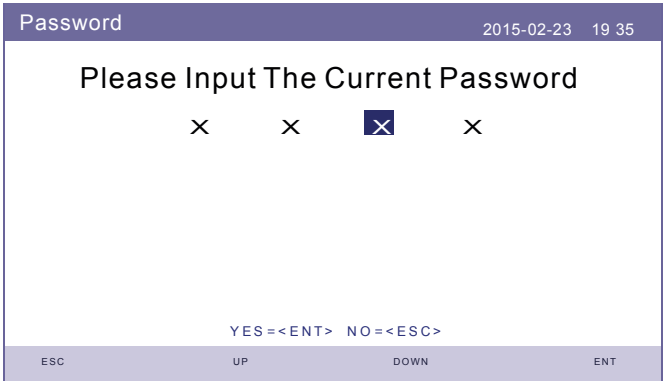


Figure 52 - Enter password

Press “DOWN” to move the cursor.
Press “ENT” to enter the restricted section.

5. Operation

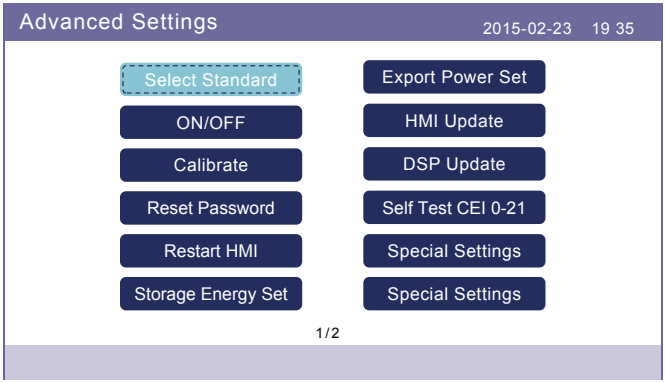


Figure 53 - Advanced Settings

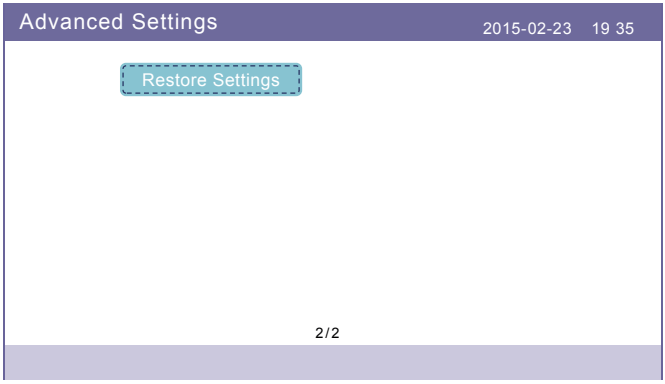


Figure 54 - Advanced Settings

5. Operation

5.7.1 Select Standard

This function is used to select corresponding grid standards.
Please refer to the actual LCD setting for the grid standards options..

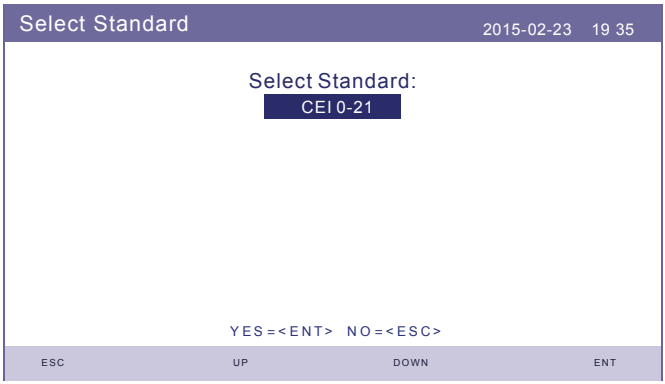


Figure 55 - Select Standard

Press “UP” and “DOWN” to go through the list.
Press “ENT” to check the parameters, press “ENT” again to select the standard.
For the Italian market, the pre-set CEI0-21 standard is selected. For other settings, refer to “9.2 Grid standard selection guide” at page 88.

5.7.2 ON/OFF

This function is used to start or stop the generation of the inverter.

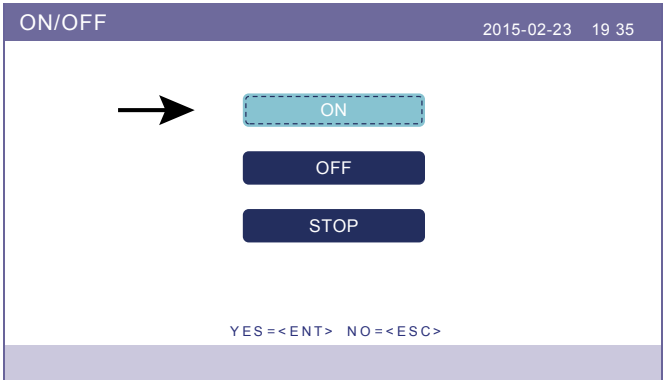


Figure 56 - Imposta ON/OFF

5. Operation

5.7.3 Calibrate

Warranty or maintenance may result in resetting total generating data, this function allow the maintenance personnel to amend the total generating data of replacement inverter to the original one.

By using our data monitoring hardware, the data on monitoring website can automatically synchronize with the preset total generating power of inverter.

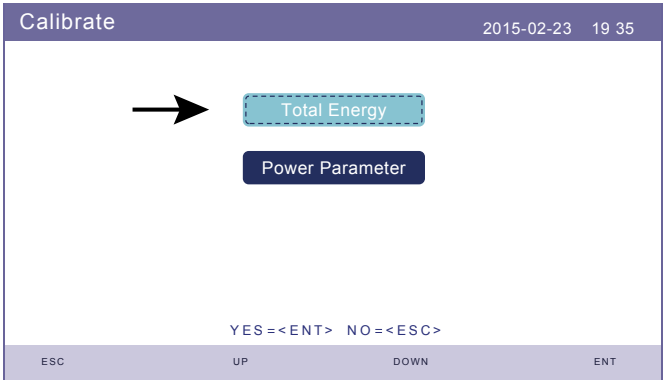


Figure 57 - Calibrate

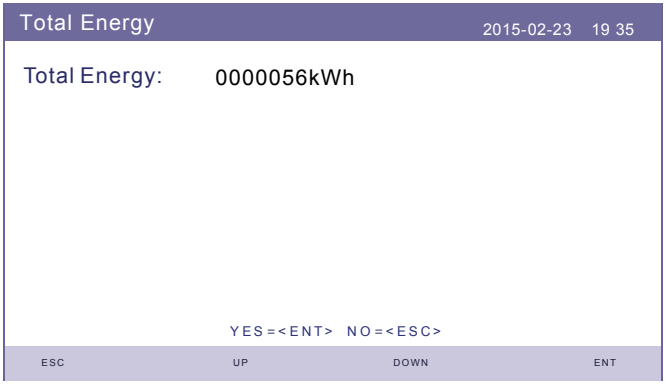


Figure 58 - Total Energy

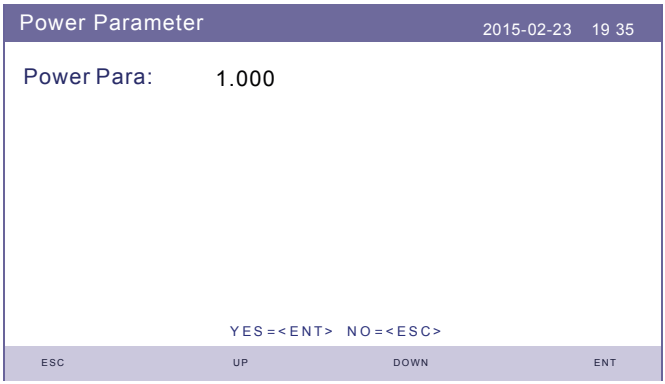


Figure 59 - Power Parameter

5.7.4 Reset Password

Reset password: In this page, user can reset the inverter password, but the admin password is always valid.

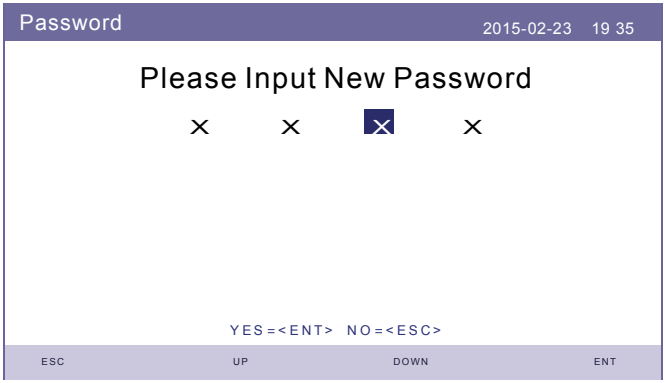


Figure 60 - Reset Password

5.7.5 Restart HMI

This function is to reboot the LCD screen.

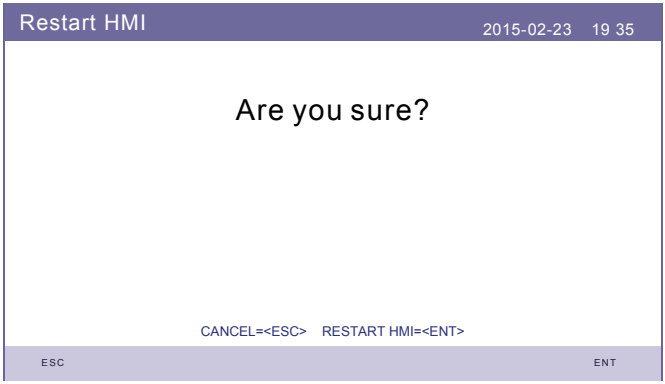


Figure 61 - Restart HMI

- Press ENT to restart.

5.7.6 Storage Energy Set

This section contains working mode setting, battery control setting, etc.

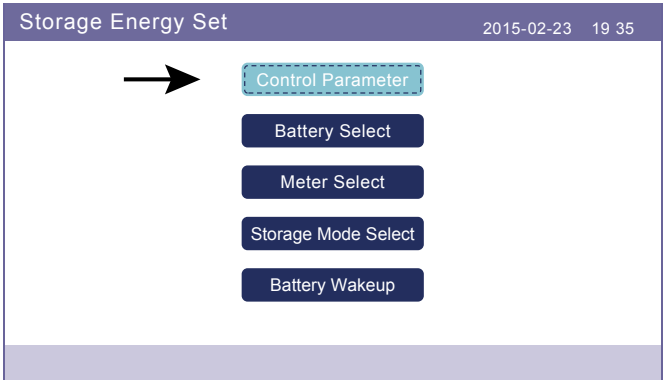


Figure 62 - Storage Energy Set

5. Operation

5.7.6.1 Control Parameter

Enter the Control Parameter menu as shown below:
Don't change the settings without the permission of Energy S.p.A. technicians.

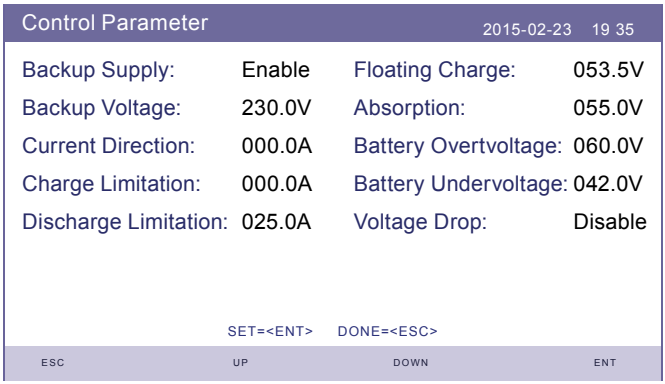


Figure 63 - Control Parameter

5.7.6.2 Battery Select

This product is compatible with the following battery modules:

Brand	Model	Settings
LG Energy Solution	RESU 3.3/6.5/10/13 (CEI 0-21)	Select "LG Chem"
Pylontech	US2000 (CEI 0-21) / US3000(CEI 0-21) / ForceL1(CEI 0-21) / ForceL2 (CEI 0-21) / Phantom-S / US2000C / US3000C / UP5000	Select "Pylon"
Dyness	B4850ESS Unit	Select "Dyness"

NOTE
If hybrid inverter is not connected to a battery, select "No Battery" to avoid alarms.

For above compatible battery modules, only two parameters need to be defined:

- **OverDischg SOC (10%~40%, default 20%).**
  Inverter will not discharge the battery when the OverDischg SOC is reached.
  Battery self-discharge is unavoidable, SOC may go lower than the limit if the battery can't get charged for a long period of time.
- **ForceCharge SOC (5%~OverDischg SOC, default 10%).**
  To prevent the battery going into sleep mode, when the ForceCharge SOC is reached, inverter will charge the battery using the power from either PV or Grid.
  To limit the charging power during the ForceCharge SOC it is possible to change the ForceCHG Limit value: current or power.

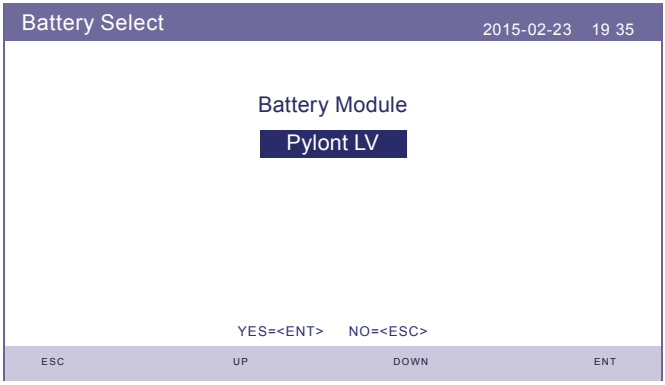


Figure 64 - Battery Select

NOTE
After selecting the battery type press Enter and the sections below will be displayed.

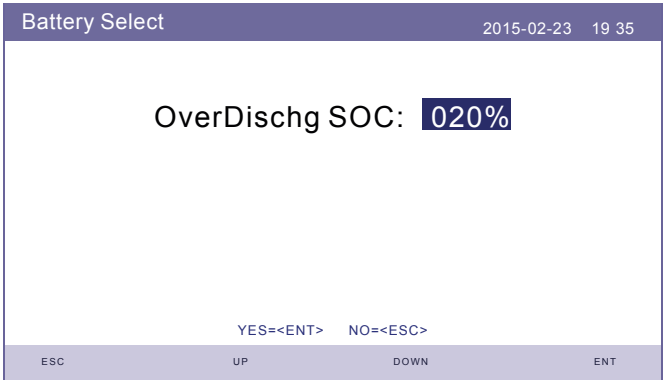


Figure 65 - Over Discharge SOC

5. Operation

Depending on the firmware installed, the screen in Figure 66 or the one in Figure 67 will appear.

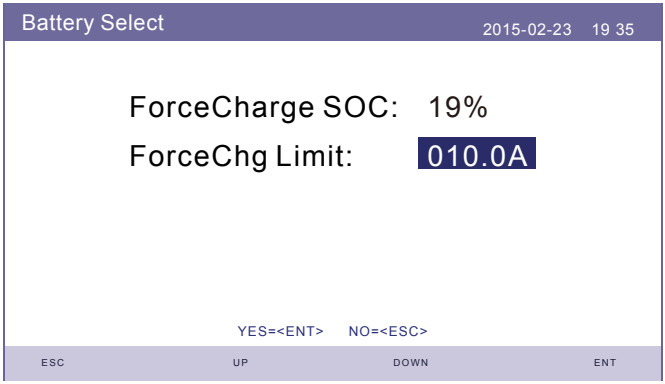


Figure 66 - ForceCharge SOC

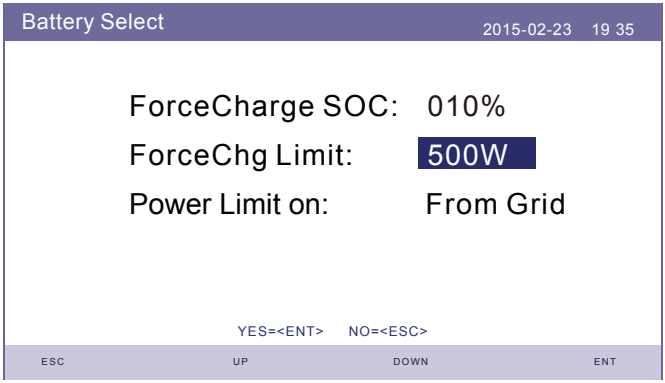


Figure 67 - ForceCharge SOC

Caution.
Set the ForceChg Limit to 500W (Figure 67).

NOTE
The same parameters displayed above must also be entered if Dyness batteries are used.

5.7.6.3 Meter Set

These settings are used to select the meter types and meter installed locations based on the actual configuration. Before this configuration please see chapter “5.7.6.3.2 Meter Placement” at page 58.

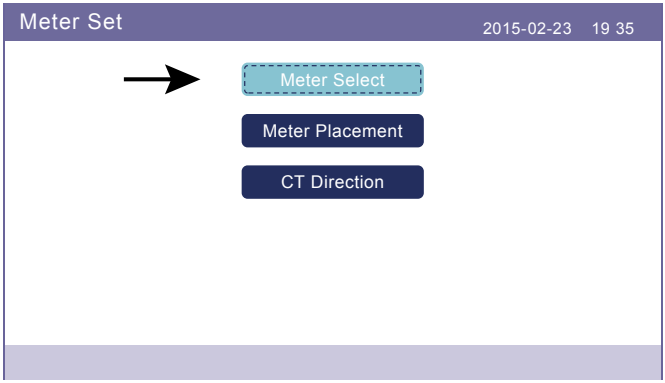


Figure 68 - Meter Set

5.7.6.3.1 Meter Select

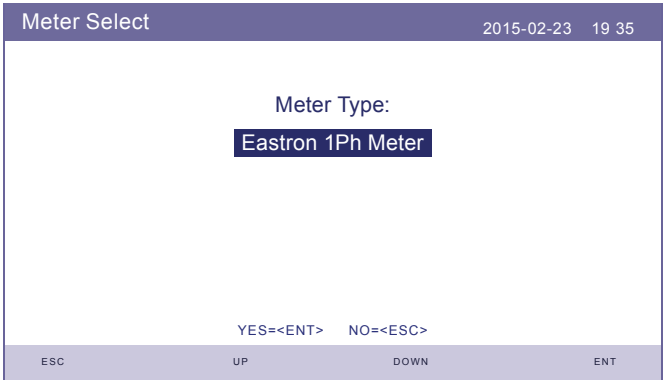


Figure 69 - Meter Select

5. Operation

Meter Model	Meter Type options
Acrel 1ph meter (with CT): ACR10R-D16TE (included in kit)	"Acrel 1ph meter"
Eastron 1ph meter (insertion with CT): SDM120CTM (included in kit)	"Eastron 1ph meter"
Eastron 1ph meter (direct insertion): SDM120M (Optional)	"Eastron 1ph meter"
Eastron 3ph meter (direct insertion): SDM630M (Optional)	"Eastron 3ph meter"
Eastron 3ph meter (insertion with CT): SDM630MCT (Optional)	"Eastron 3ph meter"
No meter is connected	"NoMeter"

NOTE: Eastron 1ph meter (with CT), SDM120CTM or Acrel 1ph meter (with CT) ACR10R-D16TE (included in kit).

5.7.6.3.2 Meter Placement

Grid: Meter is installed at the grid connection point.

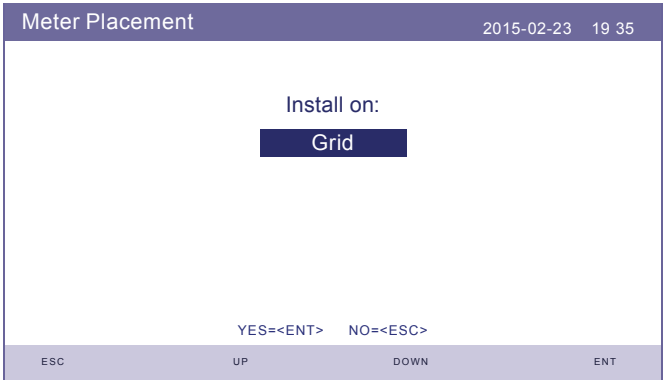


Figure 70 - Meter Placement

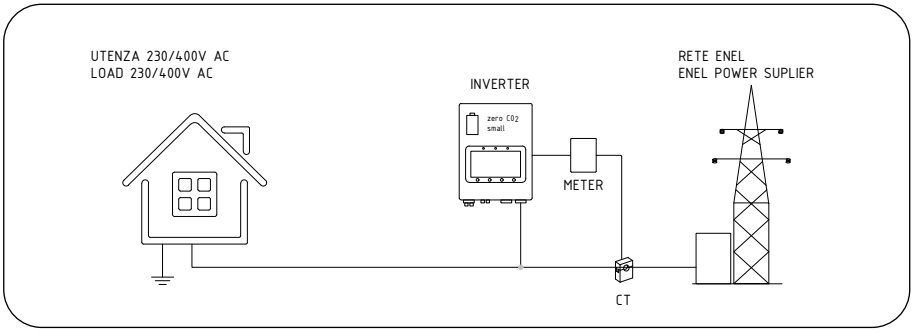


Figure 71 - Grid

5. Operation

Load: Meter is installed at the load branch circuit.

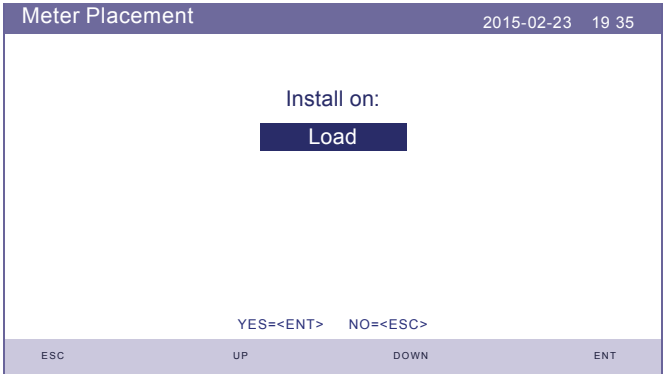


Figure 72 - Meter Placement

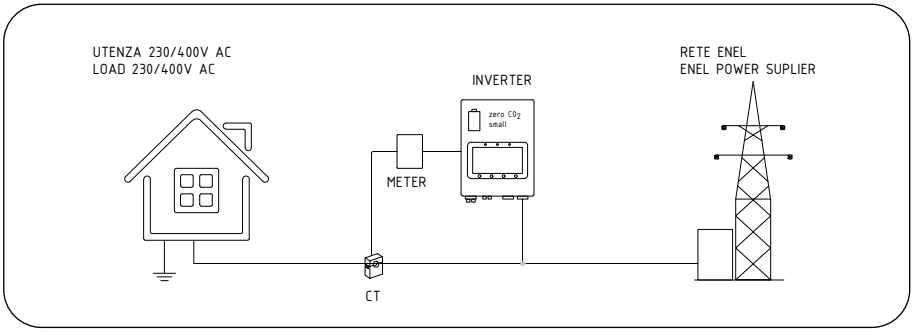


Figure 73 - Grid

5. Operation

Grid+PV Inverter : One meter is connected at the grid connection point, the other meter is connected at the AC output port of an extra PV inverter (Eastron Meter supported).

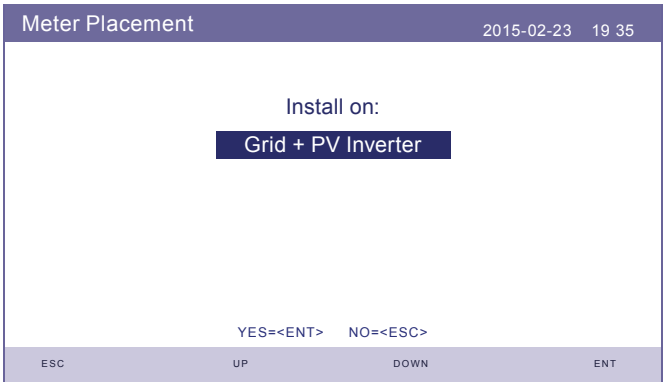


Figure 74 - Meter Placement

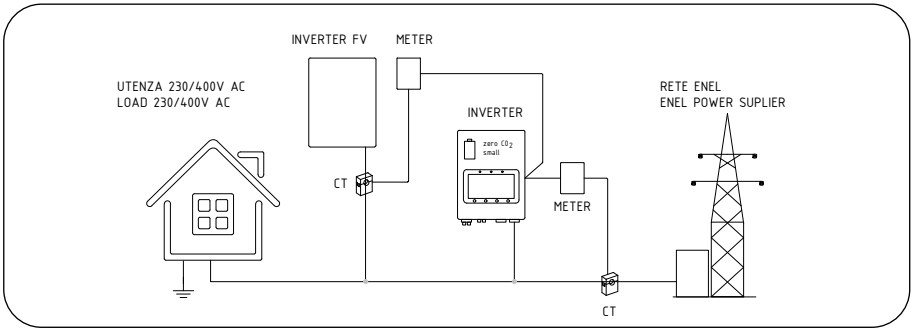


Figure 75 - Grid + PV Inverter

5. Operation

NOTE
Do not install the meter in this configuration. The data collected will not be correct.

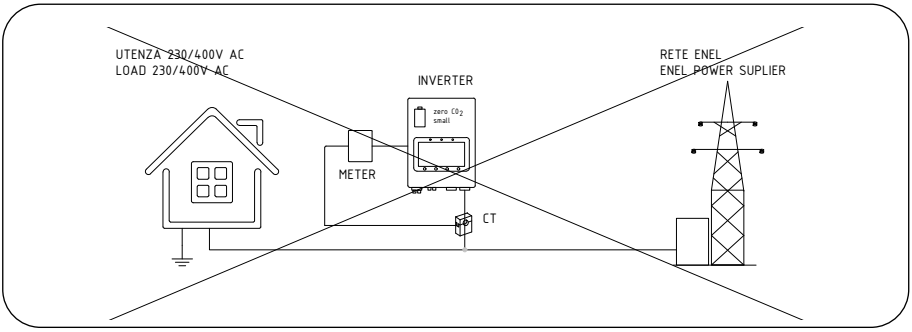


Figure 76

5.7.6.3.3 Meter Direction

This selection must be changed from “Forward” to “Reverse” only when using the inverter and the wallbox zeroCO_2 sun charger.

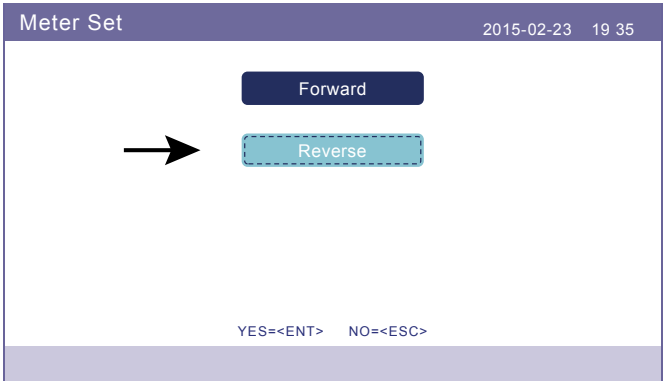


Figure 77 - Meter Direction

5.7.6.4 Storage Mode Select

There are 4 working modes available:

1. Self Use Mode
2. Feed in Priority Mode
3. Backup Mode
4. Off Grid Mode

Only one mode can be enabled at the same time.

- **Mode 1: Self-Use Mode Logic (Maximize the usage of PV)**
  In “Self use” mode (self-consumption), sequence is: load, battery, grid.

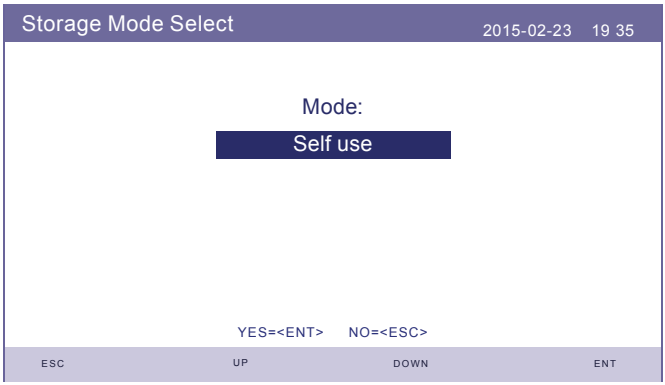


Figure 78 - Storage Mode

Time of Use

Path: Advanced Settings → Storage Energy Set → Storage Mode Select → Self-Use Mode → ON → Time of use.

Mode 2: Feed In Priority Mode Logic (Feed the excess PV to Grid in order to gain subsidies)
In “Feed in priority” mode sequence is: grid, load, battery. Leave OFF if “Self use” is active.

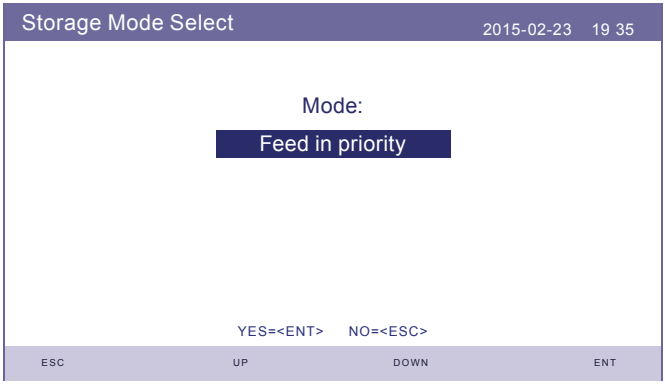


Figure 79 - Storage Mode

- **Mode 3: Backup Mode Logic (Keep the Battery at a certain SOC and only use it during power outage)**.
  In the “Backup” mode (network priority), the maintenance function is of the battery. Leave OFF if “Self use” is active.

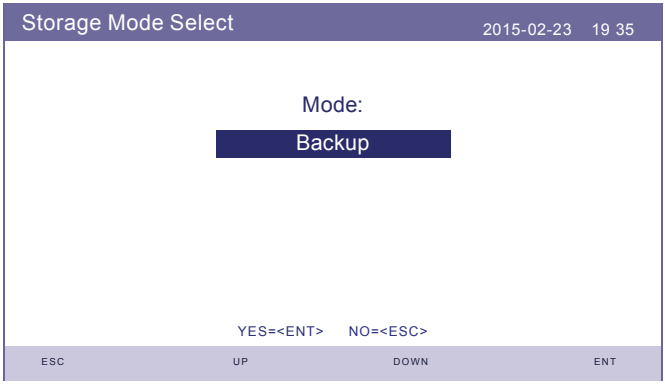


Figure 80 - Storage Mode

Backup Mode Logic: Keep the Battery at a certain SOC and only use it during power outage.
Backup SOC Setting Range: From Battery “Overdischarge SOC” to 100%.

PV Power Using Priority: Battery>Load>Grid

Battery Charging Power comes from PV (if “Charging From Grid” is allowed, it can also come from Grid).
The “Backup Mode” is not applicable for Lead-acid batteries.

Charging from grid for Backup mode.
Path: Advanced Settings → Storage Energy Set → Storage Mode Select → Backup Mode → ON → Backup SOC → Charging from gird for Backup mode.

- **Mode 4: Off-Grid Mode Logic (For Off-grid use and AC-Grid port disconnected).**
  The “Off grid” mode cannot be activated in Italy. Leave OFF if “Self use” is active.

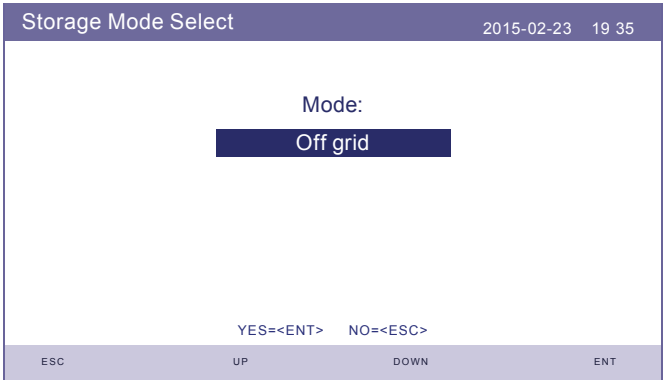


Figure 81 - Storage Mode

5.7.6.5 Battery WakeUp

This function should be activated only if required by Energy S.p.A. service technicians.

5.7.7 Export power Set

This function is to set the export power control. There are three option in the submenu:

1. Backflow Power;
2. ON / OFF;
3. FailSafe ON / OFF.

Settings 2 and 3 are only valid when Setting 1 is set to “ON”.

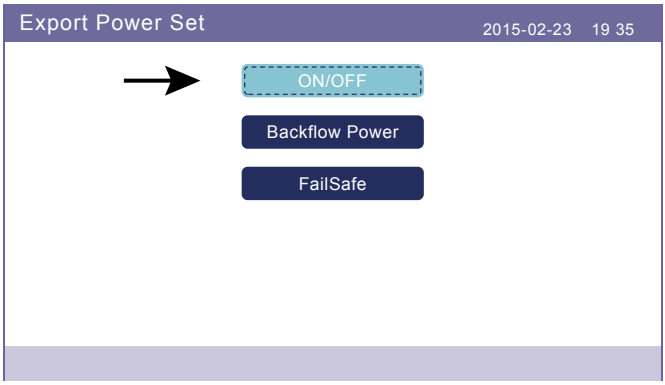


Figure 82 - Export Power Set

5. Operation

5.7.7.1 ON/OFF

Enable/Disable the function.

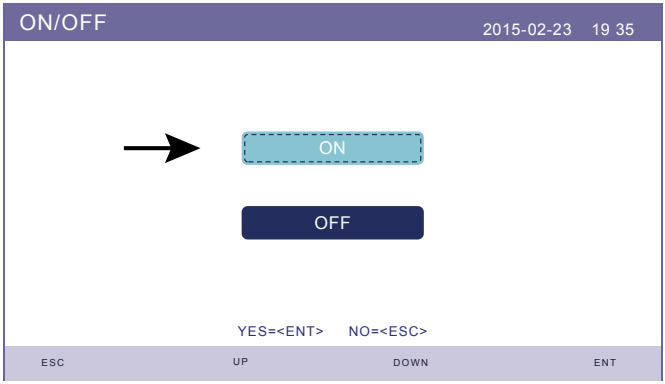


Figure 83 - ON/OFF

5.7.7.2 Backflow Power

Determine the allowed backfeed power (system export to the grid).

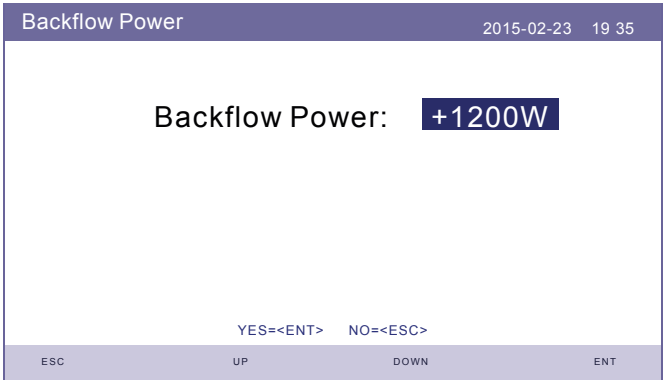


Figure 84 - Backflow Power

5.7.7.3 Failsafe ON/OFF (not used in Italy)

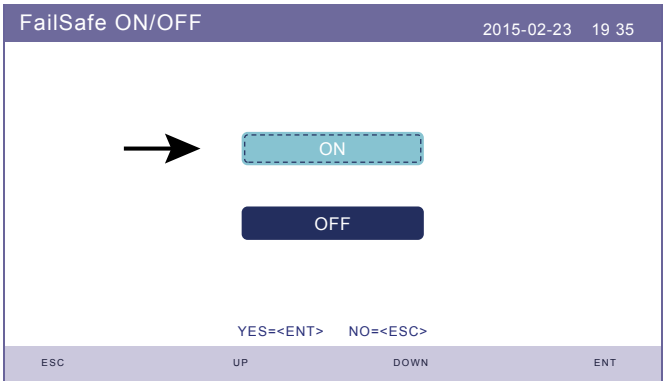


Figure 85 - FailSafe ON/OFF

When this FailSafe function is ON, the inverter will shutdown once it loses communication with the meter in case of any backflow power exceeding the limit.

5.7.8 HMI Update

WARNING.
Contact Energy S.p.A. service technicians. Violating this condition will void the warranty.

This function is used to update HMI software. Values are for reference only.

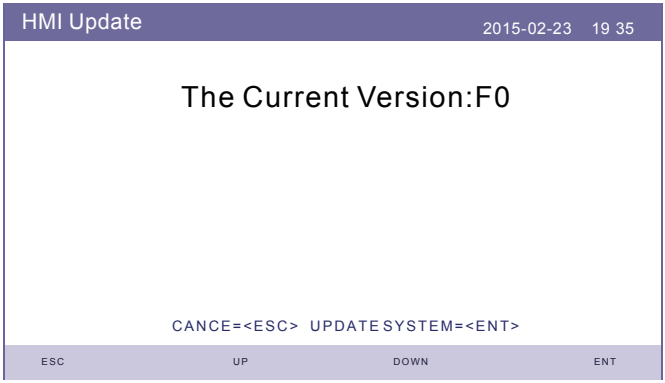


Figure 86 - HMI Update

5.7.9 DSP Update

This function is used to update DSP software. Values are for reference only.

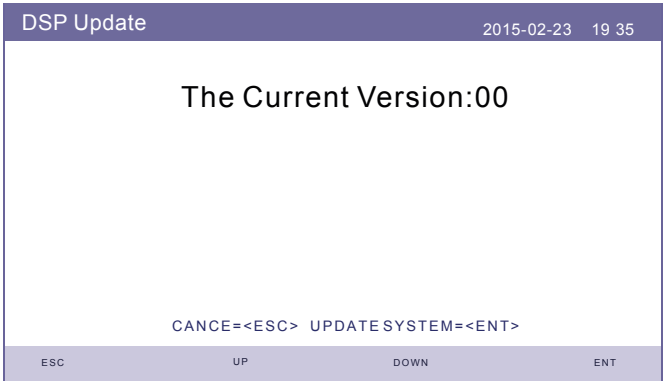


Figure 87 - DSP Update

5.7.10 CEI 0-21 Self Test

Select “Complete Self test”.

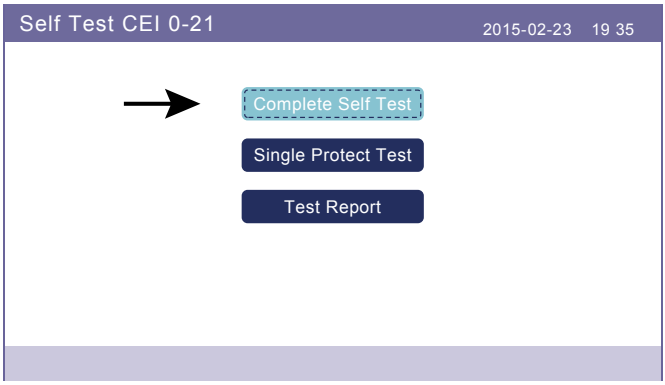


Figure 88 - Test CEI 0-21

Selecting “Test Report” must show similar data as in Figure 89.

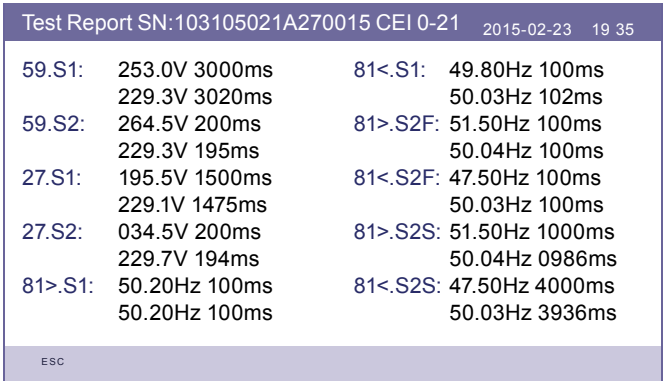


Figure 89 - Test Report

5.7.11 Special setting Function

5.7.11.1 AFCI Set

Inverters have the built-in AFCI function which can detect the arc fault on the DC circuit and shut down the inverter to prevent a fire disaster.
The AFCI function can be enabled in the following menu:

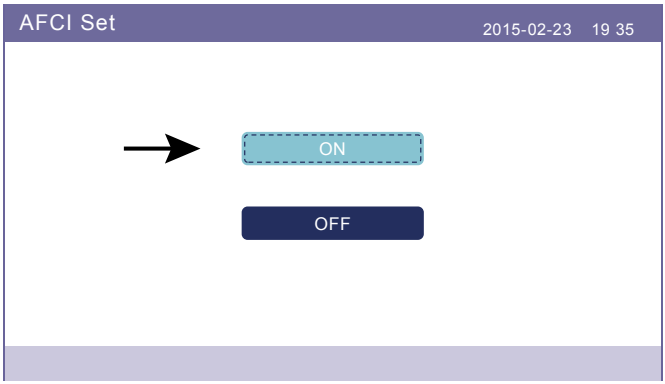


Figure 90 - AFCI Set

WARNING.
The “AFCI Level” is reserved for technicians ONLY. Do not change the sensitivity otherwise it will lead to frequent false alarms or malfunctions. Manufacturer is not responsible for any further damages caused by unauthorized modifications.

5.7.11.2 EPS Mode

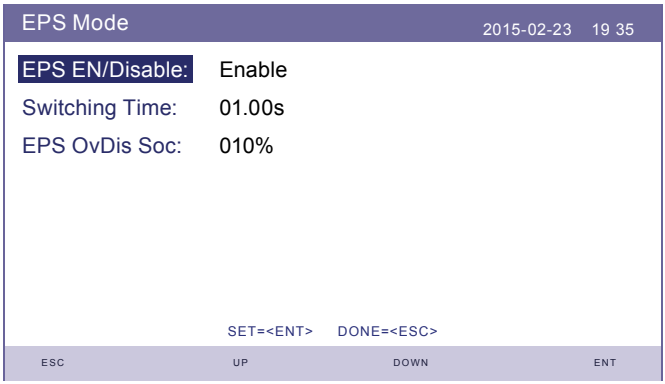


Figure 91 - EPS Mode

WARNING.
The data shown in Figure 91 must only be modified by qualified Energy S.p.A. technicians.

To use the EPS mode, it is necessary to use the EPS Box, an optional external device that allows you to power all the connected loads, partially or simultaneously, in the event of a power failure, if the system is equipped with batteries. If the network is available and the network port is enabled, the load can be supported through the EPS Box.
When the connection to the network is lost, the network port is automatically disabled and, after the “Switching Time”, the backup port will be enabled to support loads via the EPS Box.

EPS Mode.
Path: Advanced Settings → Storage Energy Set → Storage Mode Select → EPS Mode → EPS En/Disable → Enable.

5.7.12 STD Mode Settings

WARNING.
The data shown in next figures must only be modified by qualified Energy S.p.A. technicians.

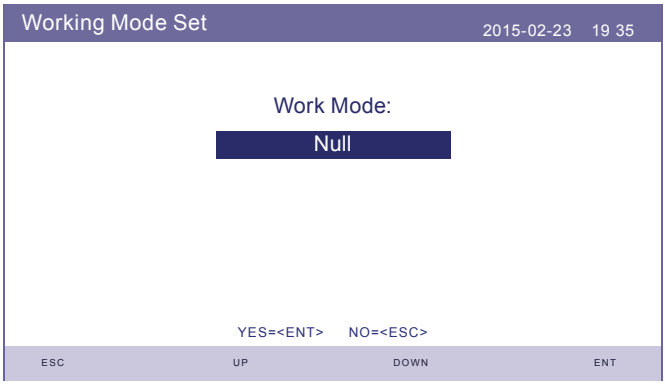


Figure 92 - Working Mode

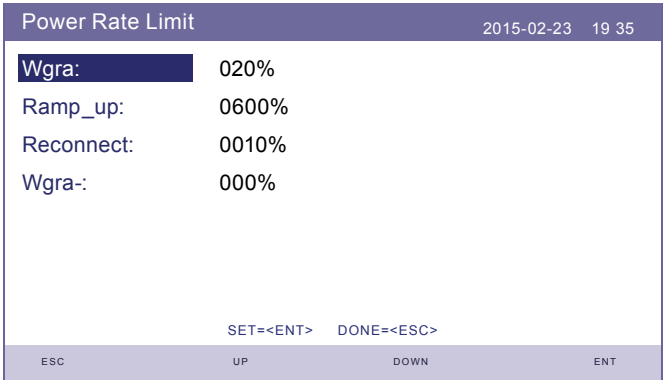


Figure 93 - Power Rate Limit

5. Operation

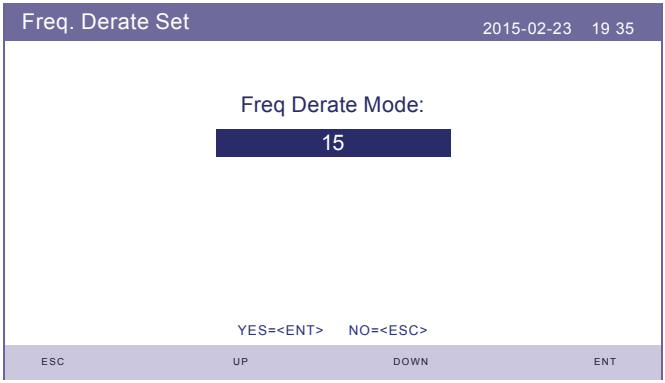


Figure 94 - Freq. Derate Set

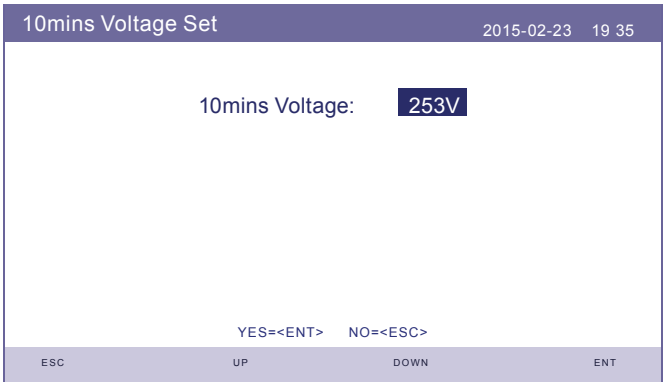


Figure 95 - 10mins Voltage Set

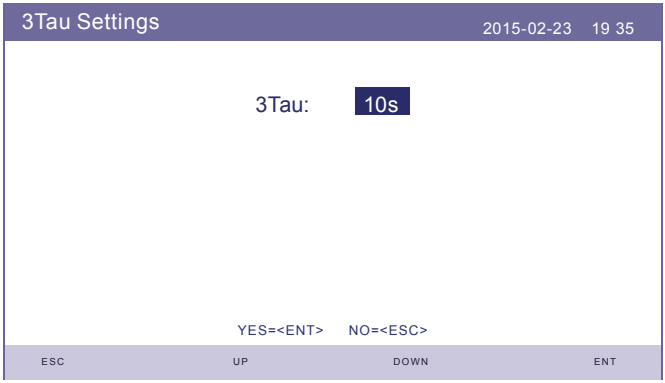


Figure 96 - 3Tau Settings

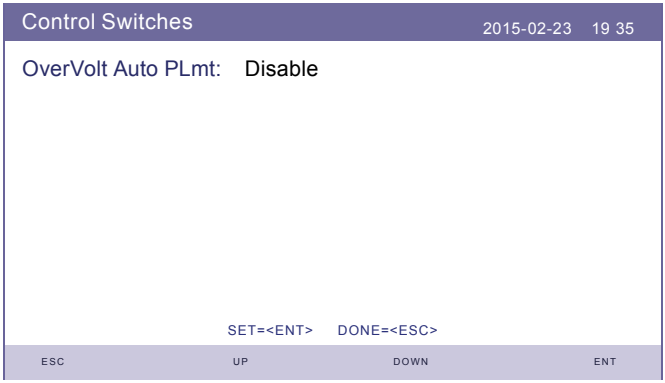


Figure 97 - Control Switches

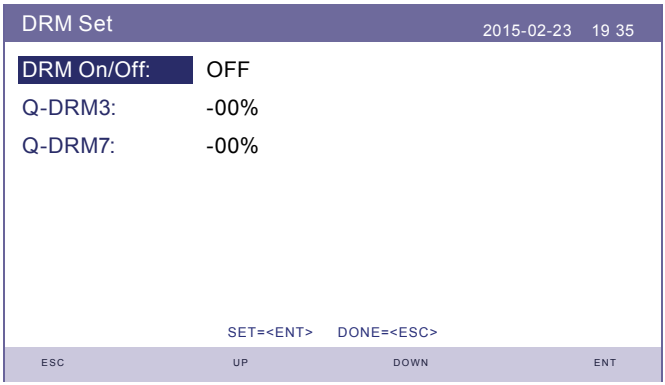


Figure 98 - DRM Set

5. Operation

Below function are enabled:

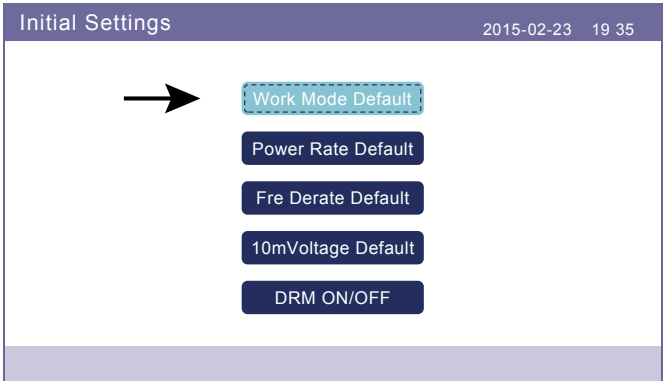


Figure 99 - Initial Settings

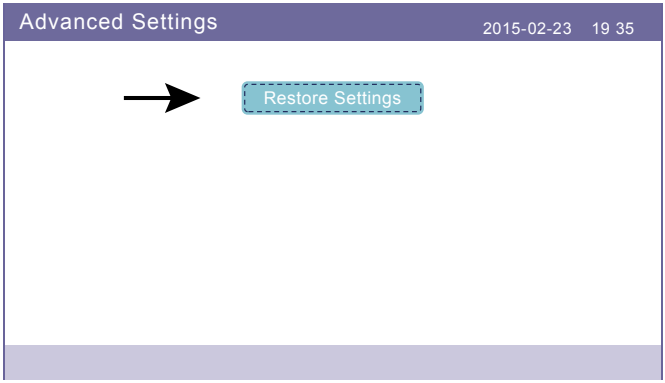


Figure 100 - Advanced Settings

6. Maintenance

6.1 Cleaning

zeroCO_2 small (3-6)K series inverter does not require any regular maintenance. However, cleaning the heatsink will help inverter dissipating heat and increase the lifetime of inverter. The dirt on the inverter can be cleaned with a soft brush.
The LCD and the LED status indicators lights can be cleaned with cloth if they are too dirty to be read.

CAUTION.
Do not touch the surface when the inverter is operating. Some parts may be hot and cause burns. Turn OFF the inverter and let it cool down before you do any maintenance or cleaning of inverter.

NOTE
Never use any solvents, abrasives or corrosive materials to clean the inverter.

7. Troubleshooting

7.1 Error messages and solutions

The inverter has been designed in accordance with international grid tied standards for safety, and electromagnetic compatibility requirements. Before delivering to the customer the inverter has been subjected to several test to ensure its optimal operation and reliability.
In case of a failure the LCD screen will display an alarm message. In this case, the inverter may stop feeding energy into the grid. The alarm descriptions and their corresponding alarm messages are listed in “Tab. 1 - Error messages” at page 77.
When faults occur, the “Fault” state will be shown on the main screen:
Path: Enter → Down → Advanced Information → Password (UP_UP_DOWN_ENTER) Enter → Alarm Message.

- **STEP1:** Press Enter.

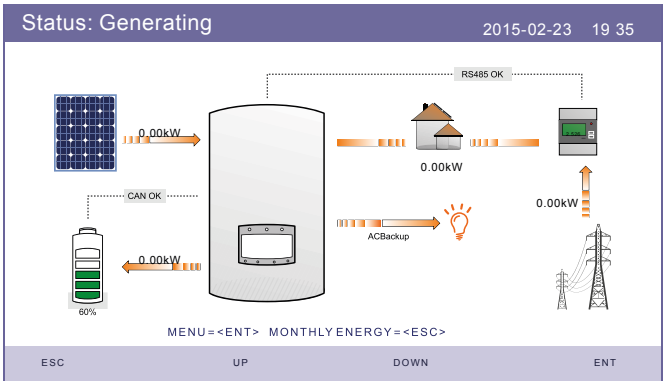


Figure 101 - Status: Generating

- **STEP2:** Press DOWN to select “Advanced Information”, then press ENTER.

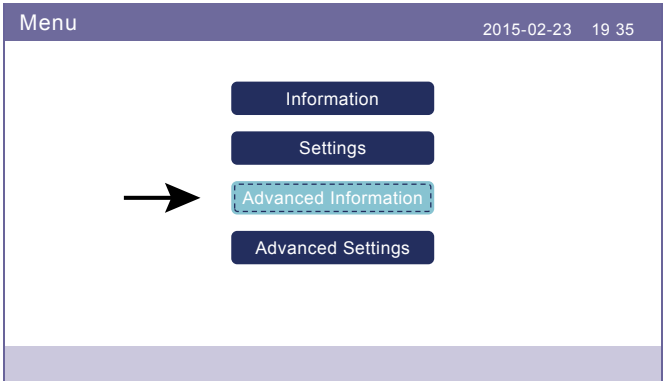


Figure 102 - Menu

7. Troubleshooting

- **STEP3:** Press DOWN to select “Alarm Message”, then press ENTER.

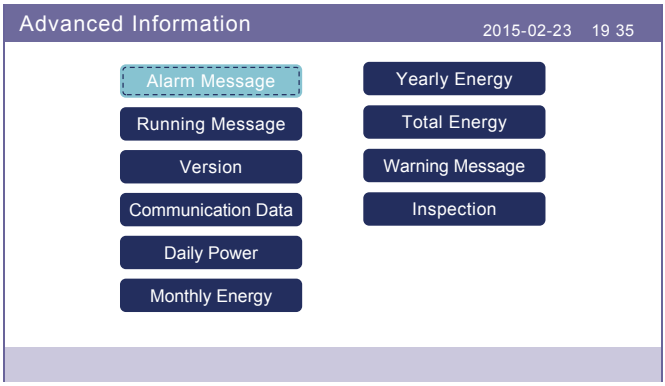


Figure 103 - Advanced Information

Alarm Message	Failure description	Solution
ARC-FAULT	ARC detected in DC circuit	Check if there's arc in PV connection and restart inverter.
AFCI Check FAULT	AFCI module self check fault	Restart inverter or contact installer.
DCinj-FAULT	High DC injection current	Restart inverter or contact installer.
DSP-B-FAULT	Comm. failure between main and slave DSP	Restart inverter or contact installer.
DC-INTF	DC input overcurrent	Restart inverter. Identify and remove the string to the fault MPPT.
G-IMP	High grid impedance	Use user define function to adjust the protection limit if it’s allowed by electrical company.
GRID-INTF01/02	Grid interference	Restart inverter. Change power board.
IGBT-OV-I	Over IGBT current	
IGFOL-F	Grid current tracking fail	Restart inverter or contact installer.
IG-AD	Grid current sampling fail	
ILeak-PRO 01/02/03/04	leakage current protection	Check AC and DC connection. Check inverter inside cable connection.
INI-FAULT	Initialization system fault	Restart inverter or contact installer.
LCD show initial-izing all the time	Can not start-up	Check if the connector on main board or power board are fixed. Check if the DSP connector to power board are fixed.

Tab. 1 - Error messages

7. Troubleshooting

Alarm Message	Failure description	Solution
NO-Battery	Unconnected battery	Check the wire of battery power is connected correctly or not. Check the output voltage of battery is correctly or not.
No power	Inverter no power on LCD	Check PV input connections. Check DC input voltage single phase >120 V, three phase >350 V). Check if PV +/- is reversed.
NO-GRID	No grid voltage	Check connections and grid switch. Check the grid voltage inside inverter terminal.
OV-BUS	Over DC bus voltage	Check inverter inductor connection. Check driver connection.
OV-DC01/02/03/04	Over DC voltage	Reduce the number of PV modules in series.
OV-DCA-I	DC input overcurrent	Restart inverter. Identify and remove the string to the fault MPPT.
OV-G-V01/02/03/04	Over grid voltage	Resistant of AC cable is too high. Change bigger size grid cable. Adjust the protection limit if it's allowed by electrical company.
OV-G-I	Over grid current	Restart inverter. Change power board.
OV-G-F01/02	Over grid frequency	Use user define function to adjust the protection limit if it's allowed by electrical company.
OV-IgTr	AC side transient overcurrent	Restart inverter. Return-factory repair.
OV-ILLC	LLC hardware overcurrent	
OV-VBackup	Backup overvoltage	
OV-TEM	Over temperature	Check inverter surrounding ventilation. Check if there's sunshine direct on inverter in hot weather.
OV-Vbatt1	Battery overvoltage	Check the accumulation and restart the inverter.
OV-Vbatt-H	Battery overvoltage hardware fault	
Over-Load	Overload	Check the load of backup port is over or not. Reduce the load of backup port, then restart inverter.
PV ISO-PRO01/02	PV isolation protection	Remove all DC input, reconnected and restart inverter one by one. Indentify which string cause the fault and check the isolation of the string.
RelayChk-FAIL	Relay check fail	Restart inverter or contact installer.

Tab. 1 - Error messages

7. Troubleshooting

Alarm Message	Failure description	Solution
UN-BUS01/02	Under grid voltage	Check the inverter inductor connection. Check driver connection.
UN-G-F01/02	Under grid frequency	Use user define function to adjust the protection limit if it's allowed by electrical company.
UN-G-V01/02	Under DC bus voltage	
12Power-FAULT	12V power supply fault	Restart inverter or contact installer.
AFCI self-detection (model with AFCI module)	AFCI module self-detect fault	Restart inverter or connect technician.
Arcing protection (model with AFCI module)	Detect arc in DC circuit	Check inverter connection whether arc exist and restart inverter.

Tab. 1 - Error messages

NOTE
If the inverter displays any alarm message as listed in Table 8.1; please turn off the inverter and wait for 5 minutes before restarting it. If the failure persists, please contact Energy S.p.A. service center.

Please keep ready with you the following information before contacting us.

- Serial number of zeroCO_2 small (3-6)K single-phase inverter;
- The distributor/dealer of zeroCO_2 small (3-6)K Single Phase Inverter (if available);
- Installation date;
- The description of the problem, i.e. the alarm message displayed on the LCD and the status of the LED status indicators lights. Other readings obtained from the Information submenu (please refer to "Main Menu" at page 36) will also be helpful. If the error was reported via the cloud, please contact the Energy S.p.A. assistance center directly. and indicate the error screen;
- The PV array configuration, e.g.: number of panels, capacity of panels, number of strings, etc.;
- Your contact details.

8. Specifications

8.1 Technical Data

Model	S5-EH1P3K-L	S5-EH1P3.6K-L
Input DC (PV side)		
Recommended max. PV power [W]	4800	5700
Max. input voltage [V]	600	
Rated voltage [V]	330	
Start-up voltage [V]	120	
MPPT voltage range [V]	90-520	
Full load MPPT voltage range [V]	100-520	120-520
Max. input current [A]	15.0/15.0	
Max. short circuit current [A]	22.5/22.5	
MPPT number / Max. input strings number	2/2	
Battery		
Battery Type	Li-ion/Lead-acid	
Battery Voltage range [V]	42 - 58	
Battery Capacity [Ah]	50 - 2000	
Maximum Charging Power [kW]	3	
Maximum Charge / Discharge current [A]	62.5	
Communication	CAN/RS485	
Output AC (Back-up)		
Rated output power [kW]	3	
Max. apparent output power [kVA]	4.5, 10 SEC	
Back-up switch time [ms]	<20	
Rated output voltage [V]	1/N/PE, 220/230	
Rated frequency [Hz]	50/60	
Rated output current [A]	14.0/13.5	
THDv (@linear load) [%]	<2%	
Input AC (Grid side)		
Voltage Range [V]	187-265	
Max. input current [A]	20.5 A/20.0	25.0 A/23.5
Frequency range [Hz]	45-55/55-65	
Output AC (Lato Grid)		
Rated output power [kW]	3	3.6
Max. apparent output power [kVA]	3.3	4
Operation phase	1/N/PE	
Rated grid voltage [V]	220 V/230	
The grid voltage range [V]	187-265	
Rated grid frequency [Hz]	50/60	

8. Specifications

Model	S5-EH1P3K-L	S5-EH1P3.6K-L
Output AC (Lato Grid)		
AC grid frequency range [Hz]	45-55/55-65	
Rated grid output current [A]	13.7/13.1	16.4/15.7
Max. output current [A]	15.0/14.5	18.5/17.5
Power Factor	>0.99 (0.8 leading... 0.8 lagging)	
THDi [%]	<2	
Efficiency		
Max. efficiency [%]	>97.1	
EU efficiency [%]	>96.5	
Protection		
Ground fault monitoring	Yes	
Residual current monitoring unit	Yes	
Integrated AFCI (DC arc-fault circuit protection)	Yes	
DC reverse polarity protection	Yes	
Protection Class / Over voltage category	I/II	
General Data		
Dimensions [WxHxD mm]	333x505x249	
Weight [kg]	17	
Topology	High frequency insolation (for battery)	
Operation temperature range [°C]	-25 ~ +60	
Ingress protection	IP65	
Noise emission [dB]	<20	
Cooling concept	Natural convection	
Max. operation altitude [m]	3000	
Grid connection standard	G98 or G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1, VDE 0126 / UTE C 15 / VFR:2019, RD 1699 / RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, MEA, PEA	
Safety / EMC standard	IEC/EN 62109-1/-2, EN61000-6-2/-3	
Features		
DC connection	MC4 connector	
AC connection	Quick connector plug	
Display	7.0"LCD color screen display	
Communication	RS485, Optional: WiFi, LAN	
Warranty [years]	5 standard (extendable to 20)	

8. Specifications

Modello	S5-EH1P4.6K-L	S5-EH1P5K-L	S5-EH1P6K-L
Input DC (lato PV)			
Recommended max. PV power [W]	8000		
Max. input voltage [V]	600		
Rated voltage [V]	330		
Start-up voltage [V]	120		
MPPT voltage range [V]	90-520		
Full load MPPT voltage range [V]	155-520	170-520	200-520V
Max. input current [A]	15.0/15.0		
Max. short circuit current [A]	22.5/22.5		
MPPT number / Max. input strings number	2/2		
Battery			
Battery Type	Li-ion/Lead-acid		
Battery Voltage range [V]	42 - 58		
Battery Capacity [Ah]	50 - 2000		
Maximum Charging Power [kW]	5		
Maximum Charge / Discharge current [A]	100		
Communication	CAN/RS485		
Output AC (Back-up)			
Rated output power [kW]	5		
Max. apparent output power [kVA]	7, 10 SEC		
Back-up switch time [ms]	<20		
Rated output voltage [V]	1/N/PE, 220/230		
Rated frequency [Hz]	50/60		
Rated output current [A]	23.0/22.0		
THDv (@linear load) [%]	<2		
Input AC (Grid side)			
Voltage Range [V]	187-265		
Max. input current [A]	31.5/30.0	34.5/33.0	
Frequency range [Hz]	45-55 / 55-65		
Output AC (Grid side)			
Rated output power [kW]	4.6	5	
Max. apparent output power [kVA]	4.6	5.5	6
Operation phase	1/N/PE		
Rated grid voltage [V]	220/230		
The grid voltage range [V]	187-265		
Rated grid frequency [Hz]	50/60		

8. Specifications

Modello	S5-EH1P4.6K-L	S5-EH1P5K-L	S5-EH1P6K-L
Output AC (Grid side)			
AC grid frequency range [Hz]	45-55/55-65		
Rated grid output current [A]	20.9/20.0	22.8/21.7	27.3 A/26.1
Max. output current [A]	21.0/20.0	25.0/24.0	30.0 A/29.0
Power Factor	>0.99 (0.8 leading... 0.8 lagging)		
THDi [%]	<2		
Efficiency			
Max. efficiency [%]	>97.1		
EU efficiency [%]	>96.5		
Protection			
Ground fault monitoring	Yes		
Residual current monitoring unit	Yes		
Integrated AFCI (DC arc-fault circuit protection)	Yes		
DC reverse polarity protection	Yes		
Protection Class / Over voltage category	I/II		
General Data			
Dimensions [WxHxD mm]	333x505x249		
Weight [kg]	17		
Topology	High frequency insolation (for battery)		
Operation temperature range [°C]	-25 ~ +60		
Ingress protection	IP65		
Noise emission [dB]	<20dB (A)		
Cooling concept	Natural convection		
Max. operation altitude [m]	3000		
Grid connection standard	G98 or G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1, VDE 0126 / UTE C 15 / VFR:2019, RD 1699 / RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, MEA, PEA		
Safety / EMC standard	IEC/EN 62109-1/-2, EN61000-6-2/-3		
Features			
DC connection	MC4 connector		
AC connection	Quick connector plug		
Display	7.0"LCD color screen display		
Communication	RS485, Optional: WiFi, LAN		
Warranty [years]	5 standard (extendable to 10)		

9. Appendix

9.1 EPS Box Installation

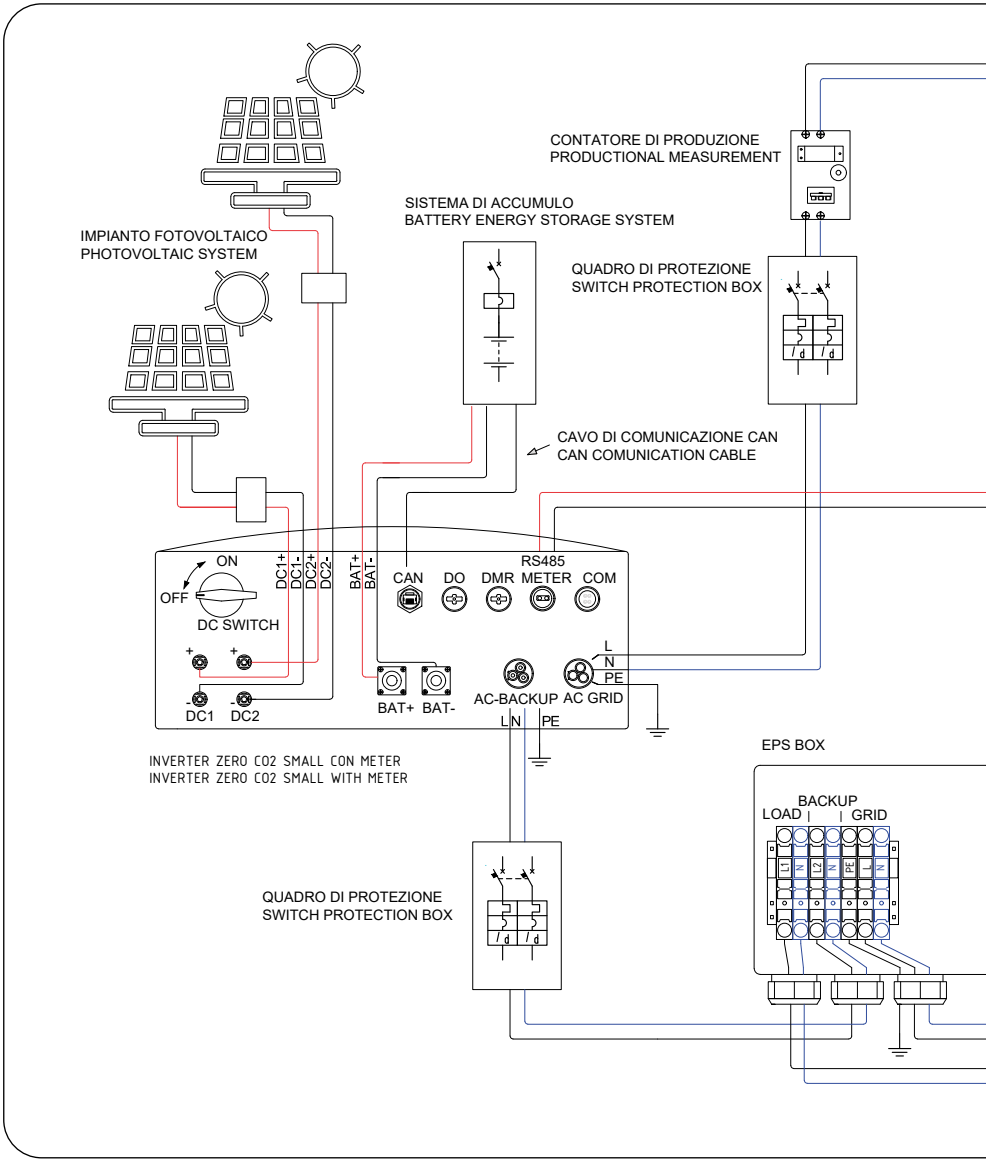
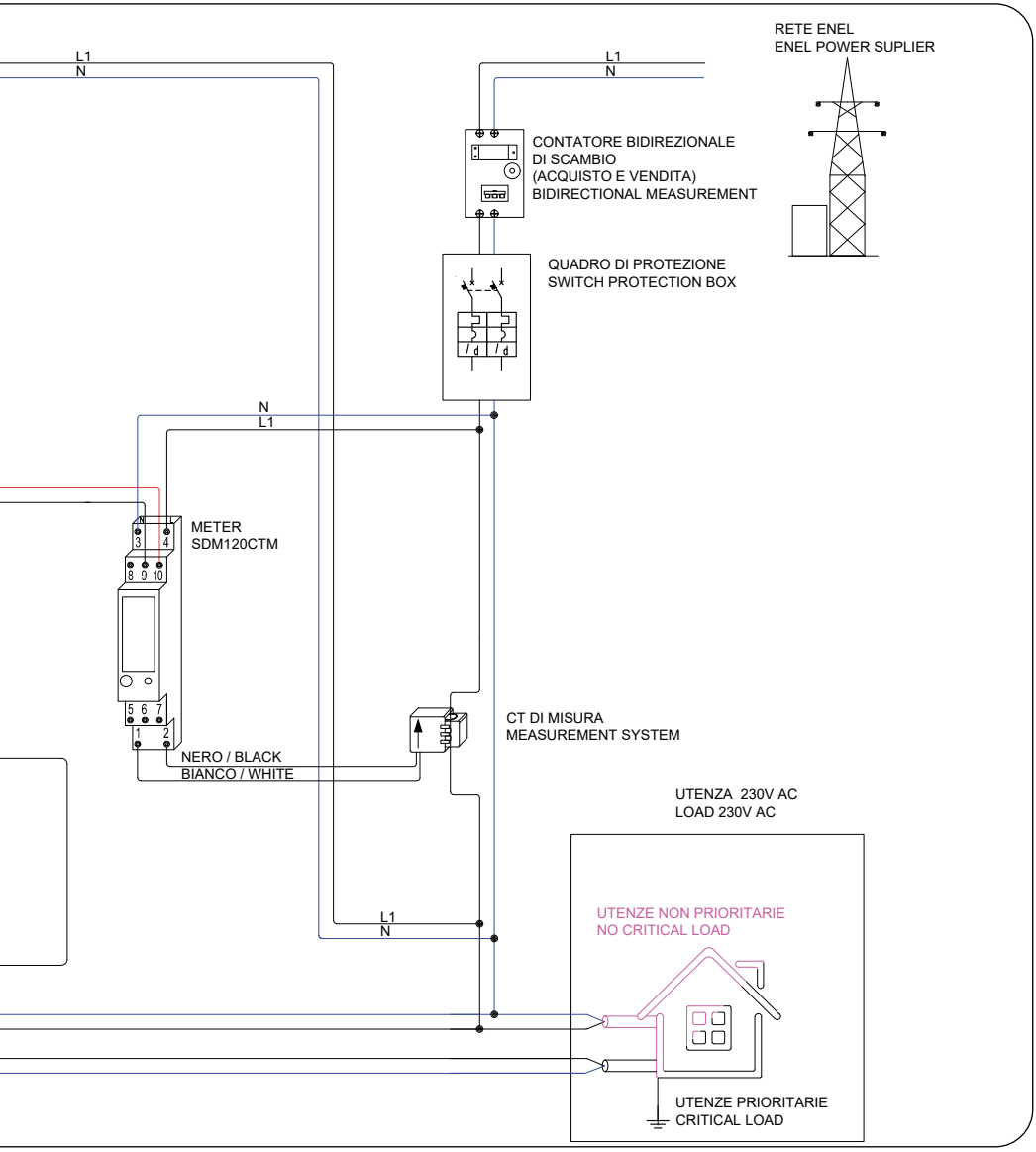


Figure 104 -

9. Appendix



EPS Box Installation

Appendix

9.1.1 Acrel Meter Installation

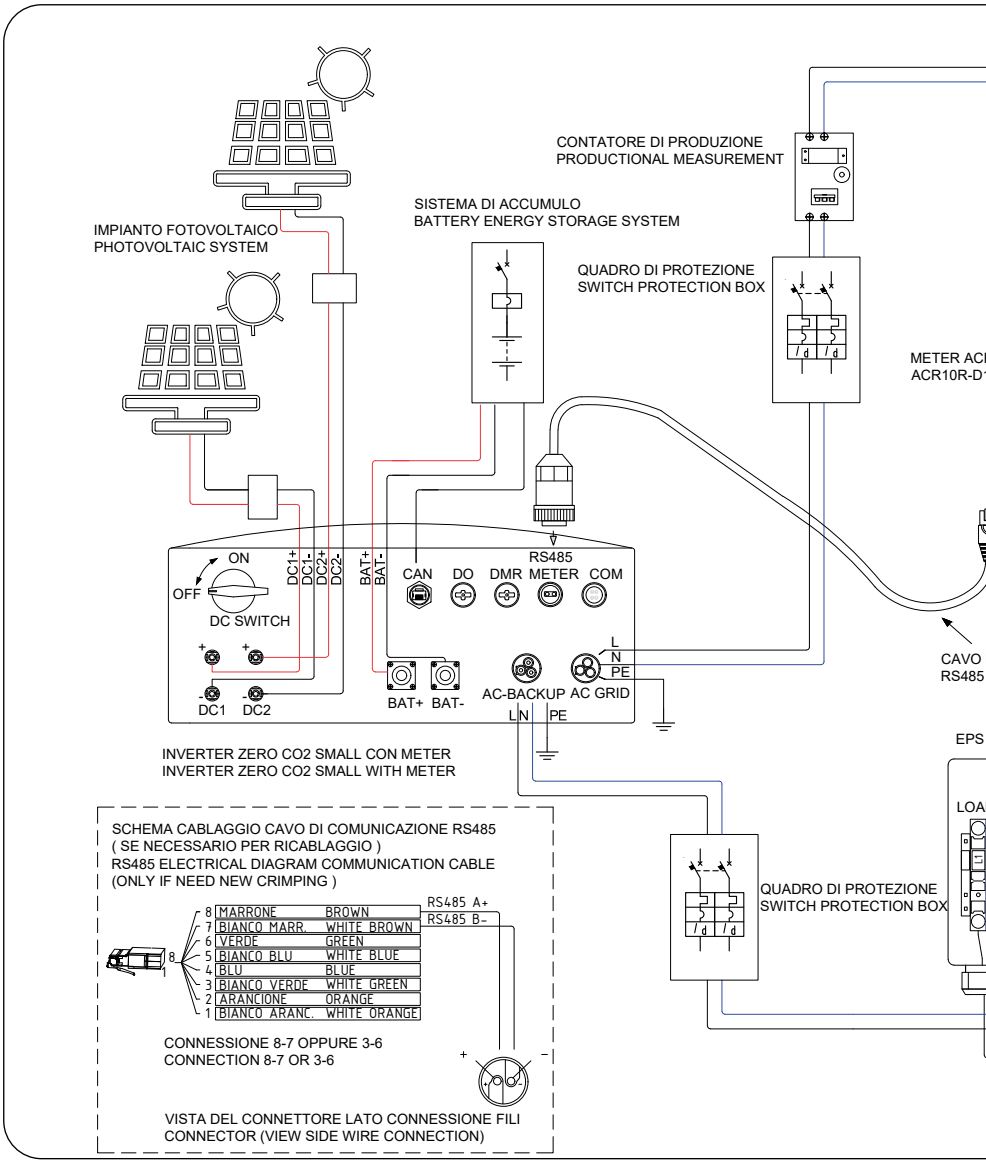
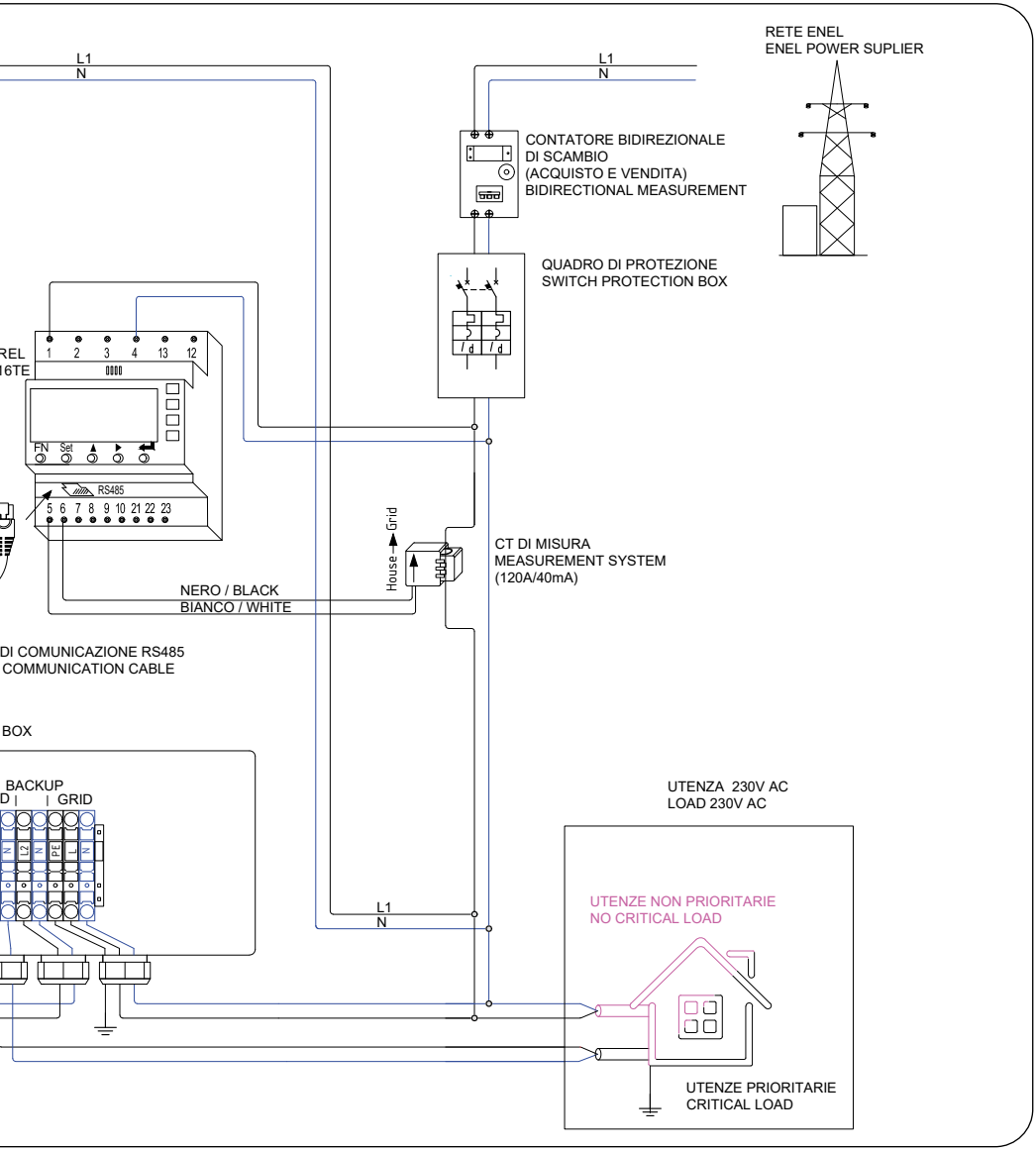


Figure 105 - A

Appendix



Acrel Meter Installation

9. Appendix

EPS box, in compliance with the standard (cf. CEI 0-21 ed 2019 - Par. 8.4.3), allows the inverter to be used for emergency services in the absence of grid, allowing the load to be powered both from the public grid, and from the product system, ensuring that it does not operate in parallel with the Distributors's grid, by means of interlocked contactors.

Intelocked is electrically and mechanically, in accordance with the provisions of the above-mentioned standard.

In order to ensure safety in island operation, the EPS box grounding the neutral during operation alone in the absence of a grid.
For details of the electrical connections inside the EPS Box, please refer to the instruction sheet and to the correct accessory.

For some markets such as Italy, etc., the backup port and grid port should not be powered at the same time.
When the grid is present, the grid port should be used to support the loads.
When the grid is lost, the backup port should be used to support the loads.
An interlocking function between the backup port and grid port is necessary.
Therefore, a separate EPS box and firmware upgrade is needed to achieve this function.
Please consult Energy S.p.A. technicians for details and refer to the EPS box installation manual.

9.2 Grid standard selection guide

NOTE
Please check if the grid code setting comply with local requirement.

For different countries and regions, corresponding grid code needs to be selected in the inverter LCD to meet the requirements of local network provider.
This instruction indicates how to change the grid code and what code should be selected in different places.
This following list illustrates the grid standard options in the inverter which are subject to change. It is for your reference only. If customer has any doubts or uncertainty, please consult service department for confirmation.

To set the corrects grid code,please enter the following path: Advanced Settings → Password:0010 → Select Standard.

Detailed protection limits can be viewed when choosing the code.
Please select "Save&Send" to enforce the code.

9. Appendix

NO.	Code in LCD	Country/Region	Comments
1	VDE4015	Germany	For German Low Voltage Grid.
2	EN50549 PO	Poland	For Polish Low Voltage Grid.
3	EN50549 NL	Netherland	For Dutch Low Voltage Grid.
4	EN50438 L	—	General EN50438 Requirement. Possible to be used in Austria, Cyprus, Finland, Czech Republic, Slovenia, etc.
5	EIFS- SW	Sweden	For Swedish Low Voltage Grid.
6	France	France	For Franch Low Voltage Grid.
7	C10/11	Belgium	For Belgian Low Voltage Grid.
8	NRS097	South Africa	For South African Low Voltage Grid.
9	CEI0-21	Italy	For Italian Low Voltage Grid (default).
10	EN50549L (EN50549-1)	—	General EN50549-1 requirement which meets local requirements of most European countries
11	G98	UK	For UK Low Voltage Grid <16A
12	G99	UK	For UK Low Voltage Grid <16A
13	G98 NI	North Ireland	For North Ireland Low Voltage Grid <16A
14	G99 NI	North Ireland	For North Ireland Low Voltage Grid >16A
15	User-define	—	Customized Protection Limits
16	Gen50	—	Generator Connected, frequency-Derating, 50Hz
17	Gen60	—	Generator Connected, frequency-Derating, 60Hz
18	DK1	East Denmark	For East Danish Low Voltage Grid
19	DK2	West Denmark	For West Danish Low Voltage Grid
20	50438IE	Ireland	For Irish Low Voltage Grid
21	RD1699	Spain	For Spanish Low Voltage Grid
22	EN50549 L	—	General EN50549 Requirement. Possible to be used in Cyprus, Finland, Czech Republic, Slovenia, Jamaica

Tab. 2 - Selezione delle normative di rete

Imported by:
Energy S.p.A.
Piazza Manifattura 1
38068 Rovereto (TN) - Italy
Tel: +39 049 2701296
email: service@energysynt.com
web: www.energyspa.com

Product by:
Ginlong Technologies Co., Ltd
No. 57 Jintong Road, Binhai Industrial Park
Xiangshan, Ningbo, Zhejiang,
315712, P.R.China
Tel: +86 (0)574 6578 1806
Fax: +86 (0)574 6578 1606
email: info@ginlong.com
web: www.ginlong.com

In case of problems with the inverter, please write down the inverter serial number and contact technical assistance on +39 049 2701296 or write to the email service@energysynt.com.