The power behind competitiveness

Grid-tie Transformerless Solar Inverter

RPI H3A/H4A/H5A

Operation and Installation Manual

www.deltaww.com

DELTA

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1 General Information

1.1 Scope of delivery

Congratulations on the purchase of your Delta RPI H3A / H4A / H5A grid-tied solar inverter. This manual assists you in becoming familiar with this product. Please observe all safety regulations and take into account technical connection conditions required at your local grid utility.

1.2 General Warnings / Notes on Safety

Careful handling of the product will contribute to service life durability and reliability. Both are essential to ensure maximum yield from your product. As some of the solar inverter models are heavy, two people may be required for lifting purposes.

CAUTION !

During operation of electrical devices, certain parts are under dangerous voltage. Inappropriate handling can lead to physical injury and material damage. Always adhere to the installation regulations. Installation may only be conducted by certified electricians.

WARNING !

Repair work on the device should ONLY be carried out by the manufacturer. No user serviceable parts inside.
Please observe all points in the operation and installation manual. Isolate the device from the grid and the PV modules before undertaking work on the device.

DANGER!

To avoid risk of electrical shock, do not open the solar inverter. The inverter contains no user-serviceable parts. Opening the inverter will void the warranty. Dangerous voltage is present for 5 minutes after disconnecting all sources of power. Remember that the unit has a high leakage current.
The PE conductor MUST be connected prior to commencing operation.

WARNING：BURN HAZARD!

The unit may reach very high temperatures and the device surface can become quite hot. Sufficient cooling is necessary for optimal yield.

1.3 Validity

This user manual describes the installation process, maintenance, technical data and safety instructions of the following solar inverter models under the DELTA brand.

- RPI H3A
- RPI H4A
- RPI H5A

1.4 Product Description

This device is a single-phase grid-tie solar inverter. It converts direct current (DC) electricity from the PV array into single phase alternating current (AC) to feed the excess generated power back to the local grid.

This inverter allows for a wide voltage input range (100~550VDC) and has a high performance efficiency and user friendly design and operation. In addition, the special DSP (Digital Signal Processor) design reduces the complexity of the circuit and electronic components. Please note that this device does not support off-grid function. The features for RPI H3A / H4A / H5A are shown below.

Features

- Power Rating : 3kVA (RPI H3A), 4kVA (RPI H4A), 5kVA (RPI H5A)
- Single–phase (L + N + PE), Grid-tie, transformerless solar inverter
- Maximum efficiency : >97.5%
- Europe efficiency : 96.8% (RPI H3A), 97.0%(RPI H4A), 96.8%(RPI H5A)
- Reactive power capability (Cap 0.8 – Ind 0.8)
- Total harmonic distortion (THD < 3%) @ full load
- 2 MPP Trackers
- 16×2 monochrome LCD display

1.5 How it Works

The operation of a solar inverter is shown in ***Figure 1-1.***
In order to save energy and electricity, the solar inverter converts the DC input power supplied from the PV Array into single-phase AC output power to Grid.

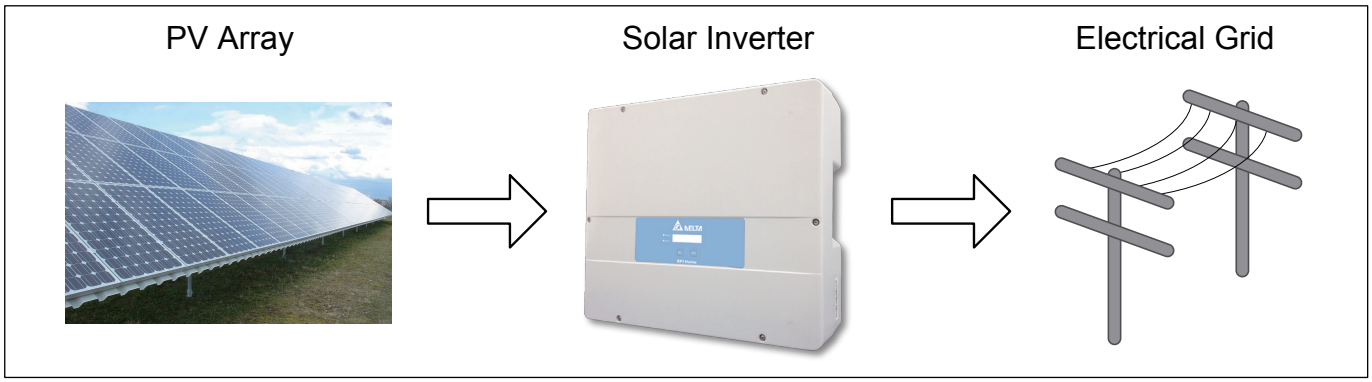


Figure 1-1: Solar system operation illustration

1.6 Additional Information

For more detailed information for RPI H3A/ H4A/ H5A or other related product information, please visit : http://www.deltaww.com.

2 Installation and Wiring

2.1 Instruction before Installation

Due to the variety of users and installation environments, it is recommended to read this manual thoroughly before installation. Installation of the unit and start-up procedures must be carried out by accredited technicians.

2.2 Unpacking

Unpacking process is shown as ***Figure 2-1.***

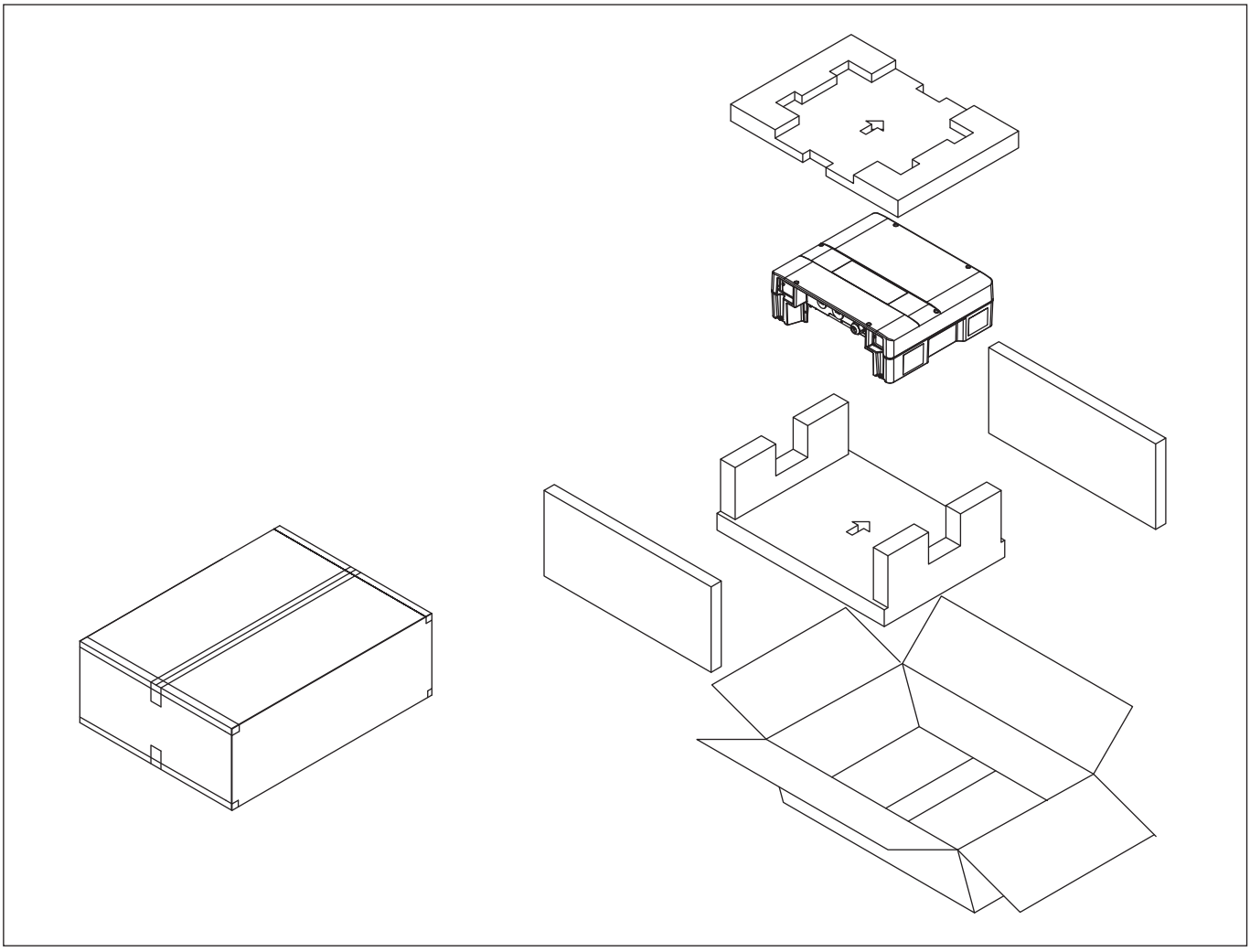


Figure 2-1: Unpacking process

Upon receiving your brand new RPI inverter, you will be required to remove its protective packaging. This packaging consists of various materials that will need to be disposed of according to the specific recycling marking printed on them. Please note that cardboard may be recycled, whereas polystyrene foam may not. Please dispose of the packaging materials in a correct manner to ensure a better environment for us all.

2.3 Package Inspection

Unforeseeable events causing damage or movement may occur during shipment. Please check for damage on the packaging upon receiving your inverter.

Please check the model number and the serial number on the packaging is identical with the model number and serial number on the unit itself.
Check if all the accessories are in the package, the standard accessories are list as ***Table 2-1:***

RPI H3A / H4A /H5A		
Object	**Qty**	**Description**
PV Inverter	1	Solar inverter
User Manual	1	The installation manual is designed to provide information on safety, installation, technical specifications and safe operation of the inverter.
AC Plug	1	AC Connector plug
DC Plug	2	DC Connector plug
Wall-Mount Bracket	1	Wall-mount bracket to mount the solar inverter securely on the wall
M4 Screw	2	To fix solar inverter on the bracket

Table 2-1: Packing list

CAUTION !

If there is any visible damage to the inverter/accesories or any damageto the packaging, please contact your inverter supplier.

2.4 Identification Label

Users can identify the model number by the information on the product label. The model number, serial number and other specifications can be located on the product label. For label location, please refer to ***Figure 2-2.***

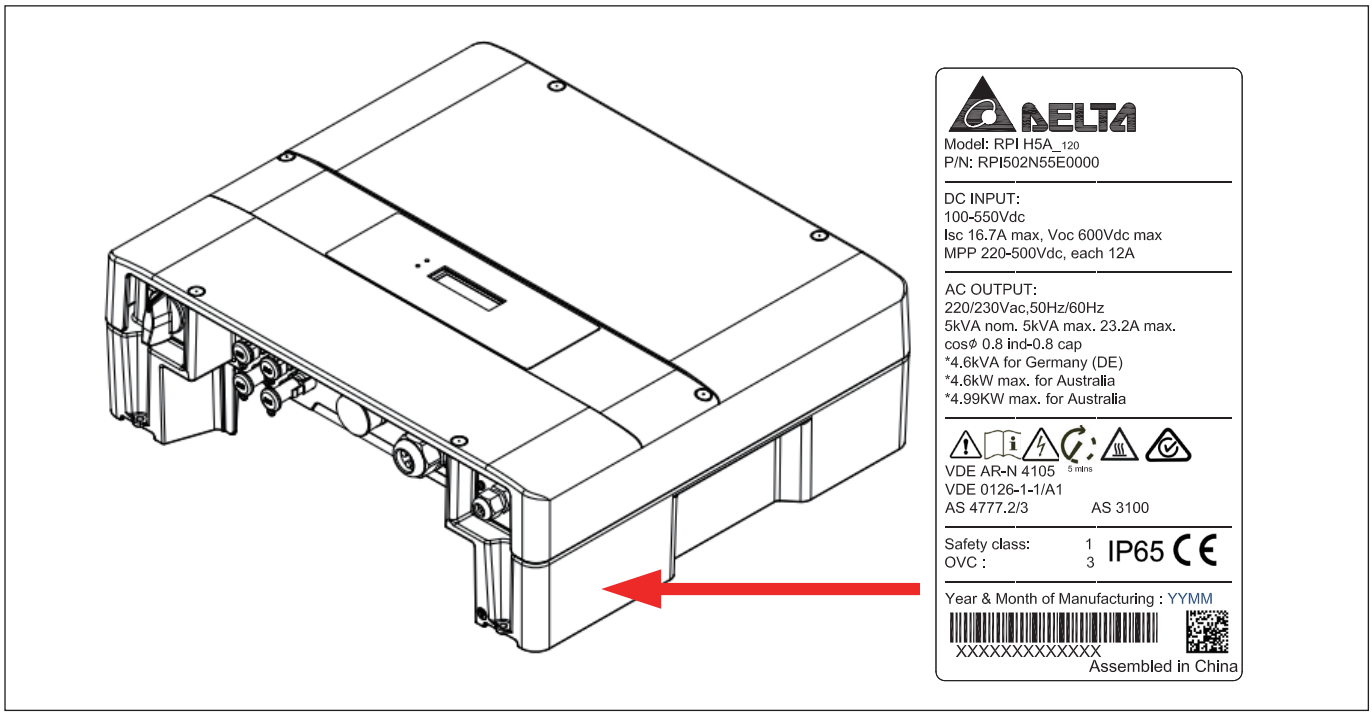


Figure 2-2: The identification label

3 Product Overview

3.1 Dimensions

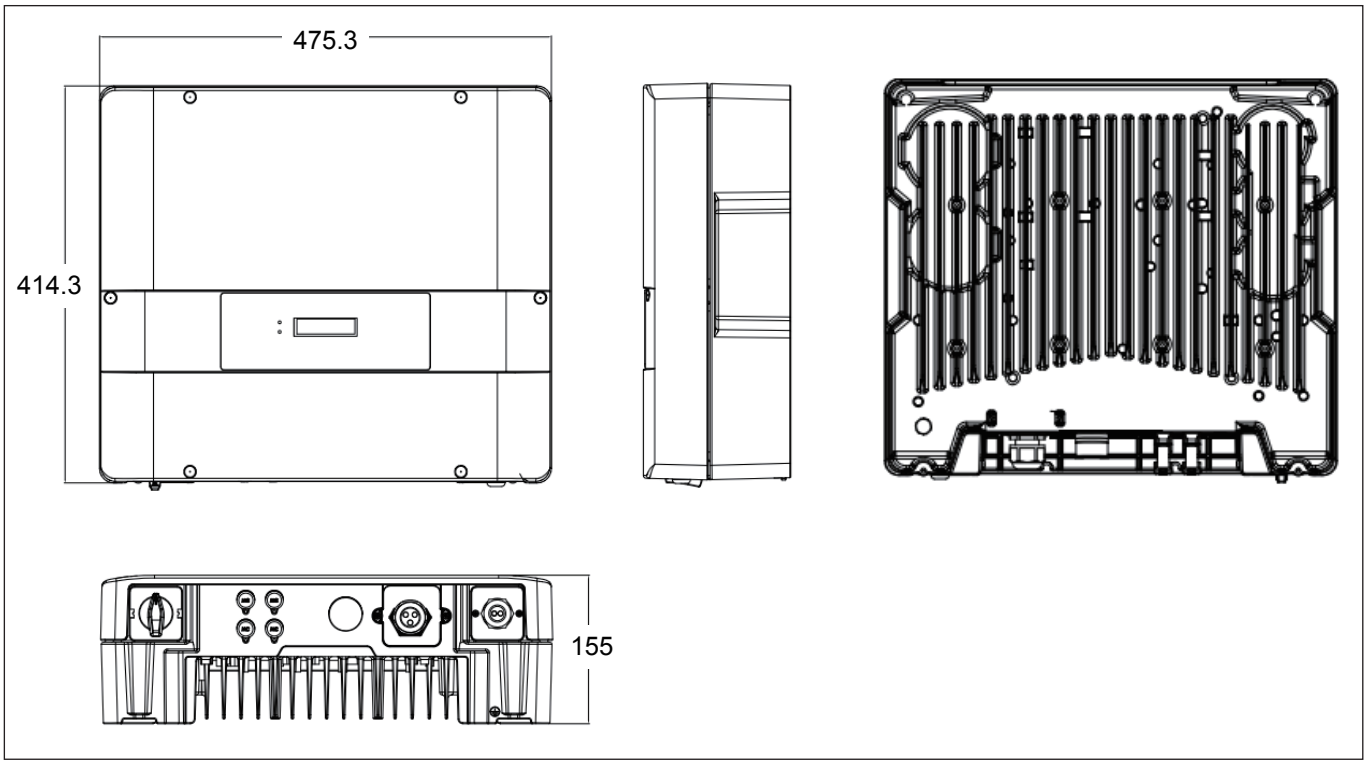


Figure 3-1: Dimensions of RPI H3A/ H4A/ H5A

3.2 Function Introduction

The Inverter's exterior is shown in ***Figure 3-2***. The description for individual objects can be found in sections 3.2.1 and 3.2.2.

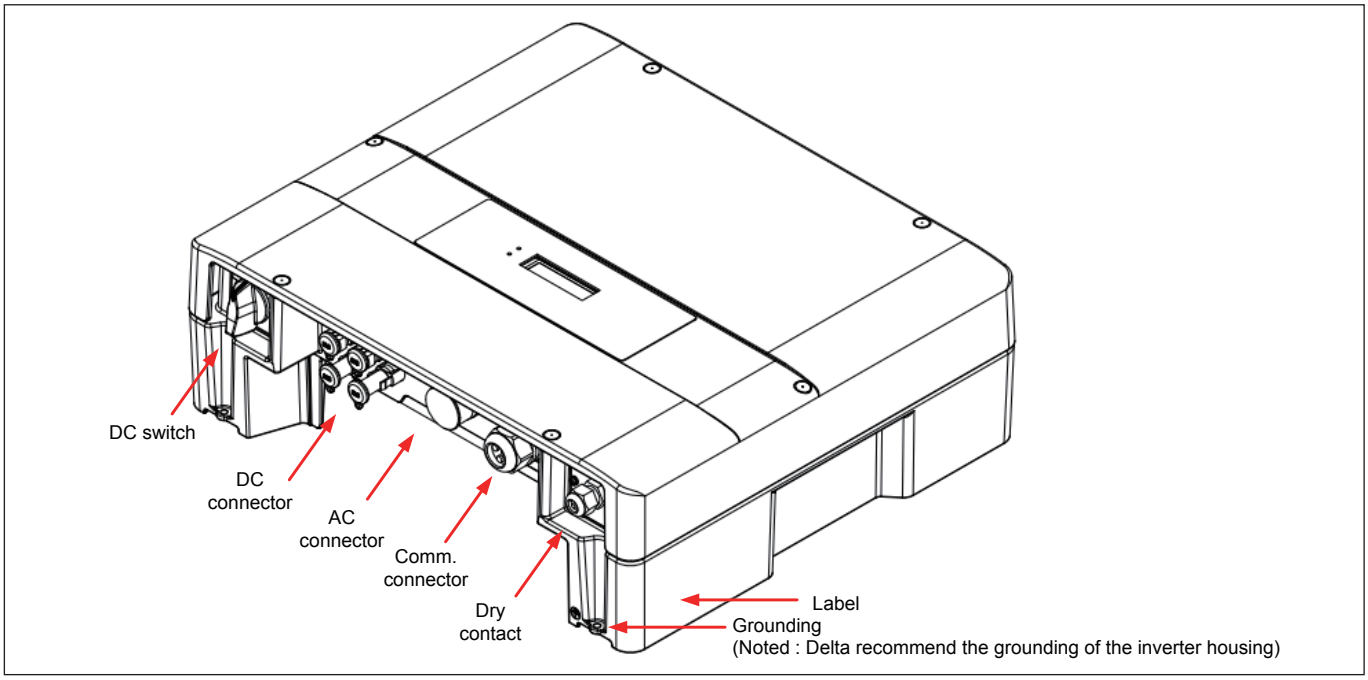


Figure 3-2: Inverter exterior objects

3.2.1 LCD Display and Buttons

Figure 3-3: LCD display and buttons

3.2.2 Inverter Input/Output Interface

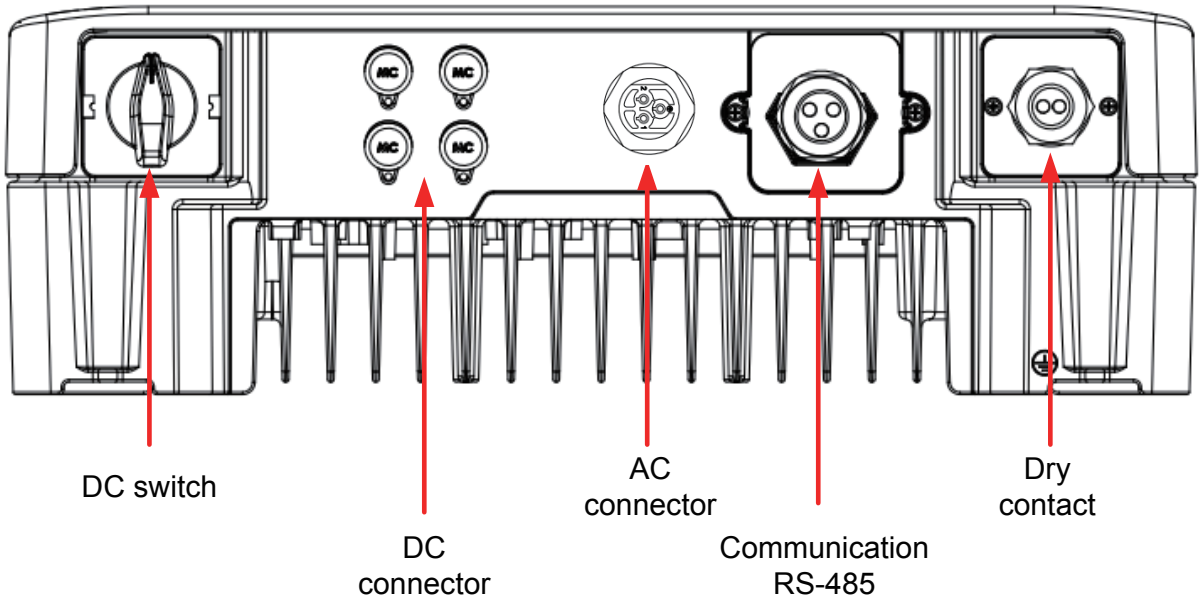


Figure 3-4: Input/output interface

NOTE

The DC switch is only presented in the -120 models. Model series -020 does not have the DC switch.

4 Installation

4.1 Installation Location

WARNING !

Do not install the unit near or on flammable surfaces.
Please mount the unit tightly on a solid/smooth surface

CAUTION !

The unit should not be installed in direct sunlight.

4.2 Mounting

This unit is designed to be wall-mounted. Please ensure the installation is perpendicular to the floor and the AC plug located at the base of the unit. Do not install the device on a slanting wall. The dimensions of the mounting bracket are shown in the figure below. 8 ofφ5.5mm screws are required for the mounting plate(hole size: φ6.5mm). Fix the supplied wall-mount plate securely on the wall before attaching the inverter onto the mounting plate.

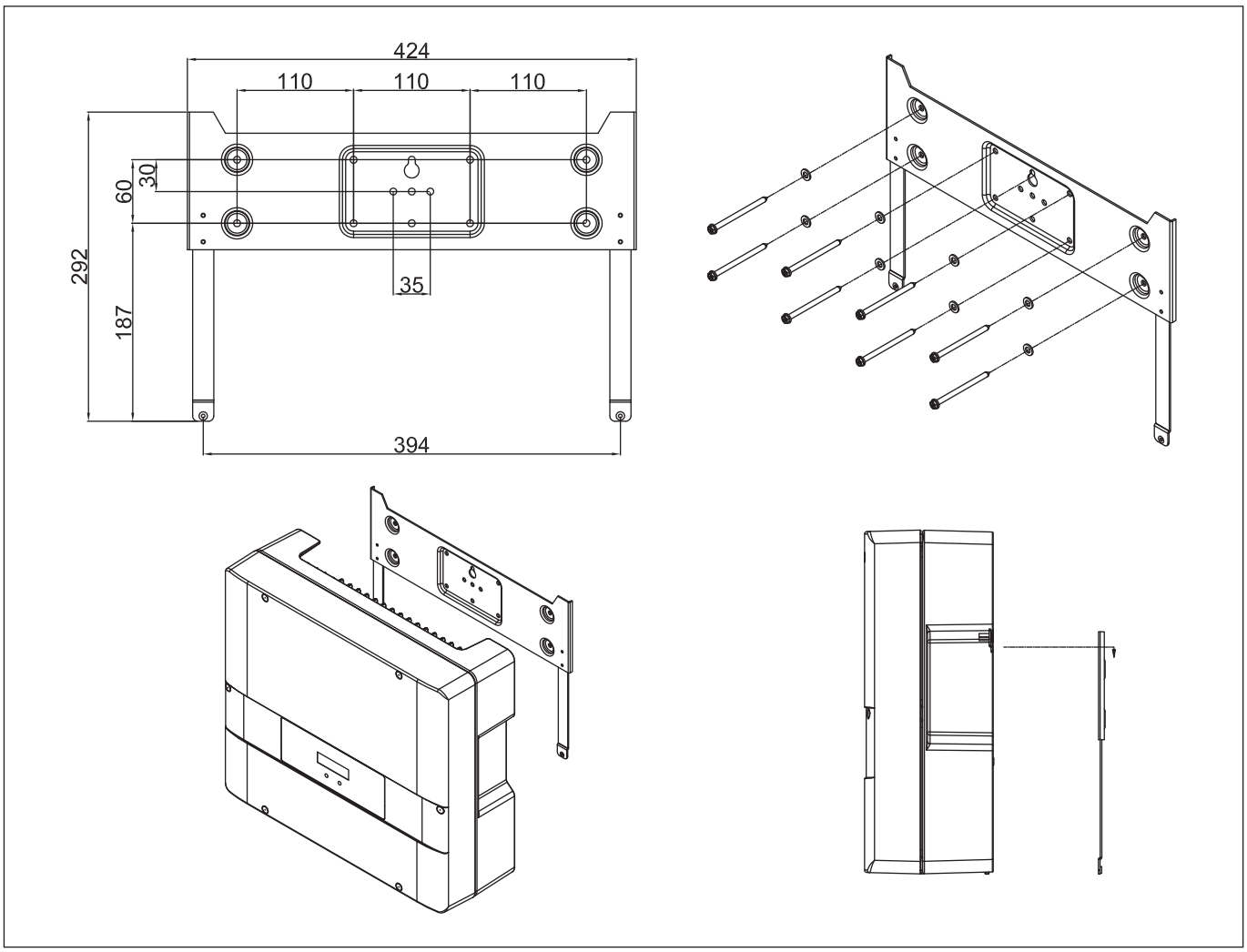


Figure 4-1: Attaching the mounting bracket for RPI H3A / H4A / H5A

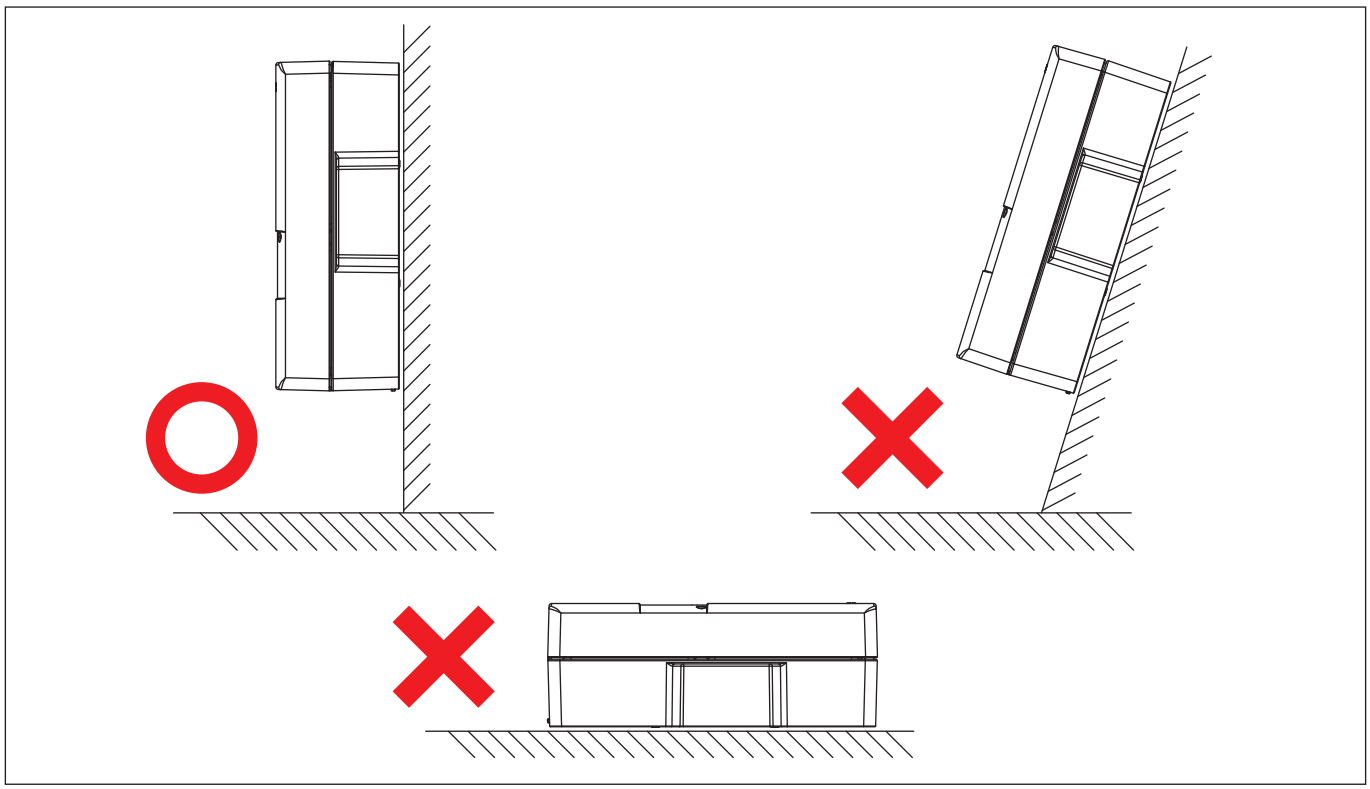


Figure 4-2: Correct and incorrect installation illustration

CAUTION !

- The bracket supplied with the unit is specially designed and should be the only mounting device used for the unit.
- It is recommended to install the inverter in a suitable location which offers easy and safe access for service and maintenance.
- Please leave an appropriate gap in between units when installing multiple solar inverter systems.
- Please install solar inverter at eye level to allow easy observation for operation and parameter setting.
- Ambient temperature for operation: -25°C~+60°C (power derating above 40°C).

Please ensure the spacing requirement to allow for sufficient convective cooling.
It is essential to ensure sufficient space for product operation as shown in ***Figure 4-3.***

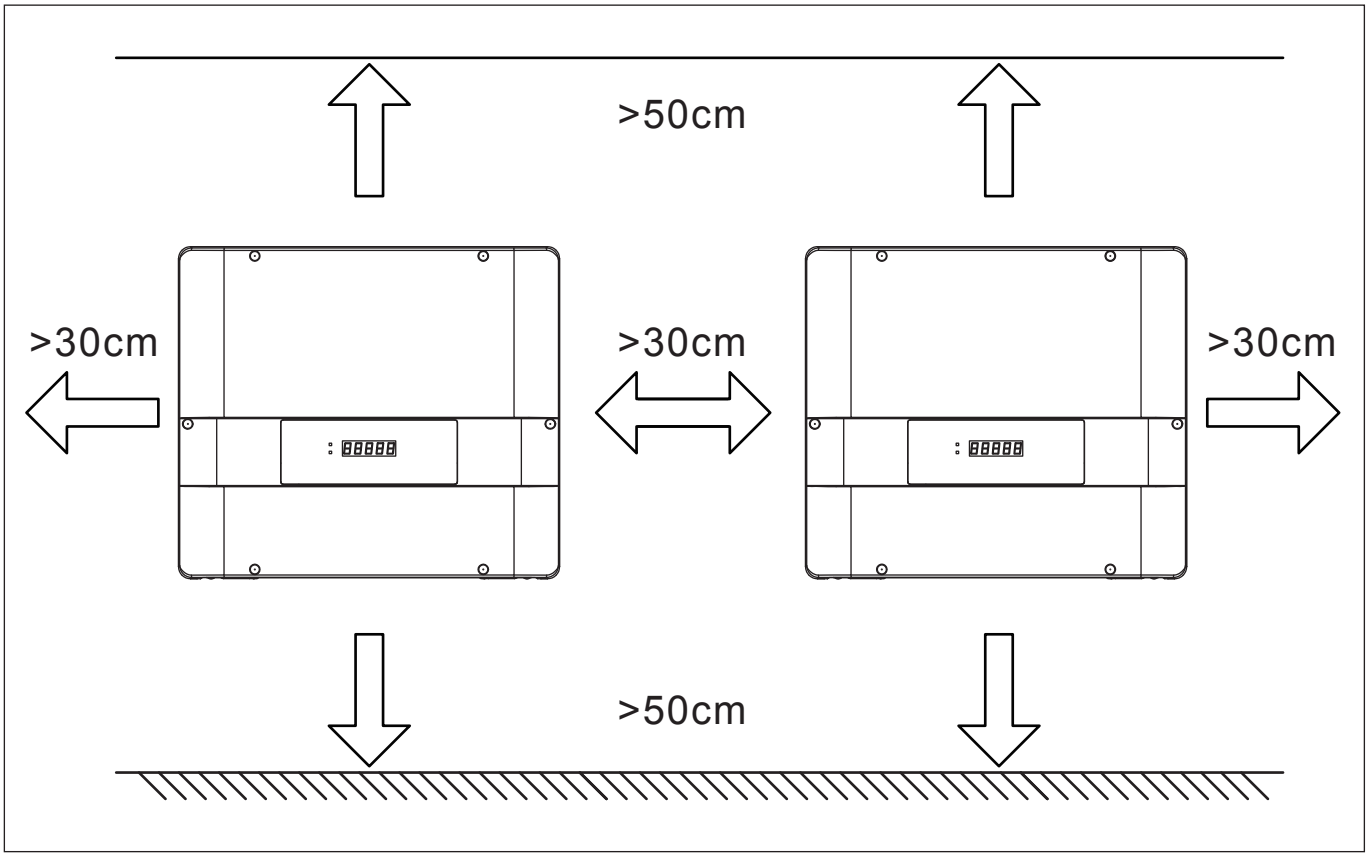


Figure 4-3: Adequate installation gap

5 Wiring

5.1 Preparation before Wiring

1. Ensure voltage values and polarities are correct.
2. When grounding the solar array, an isolation transformer is required due to the RPI H3A / H4A /H5A not having galvanic isolation between the DC-input and AC-output.
3. The ground fault detection is a fixed internal setting. It cannot be modified.
4. Whole system wiring can be seen in Figure 5-1 and Figure 5-2.
5. Please refer to Figure 5-1 for connections. Inverter can accept DC inputs in parallel (2 MPP trackers/ 2 parallel input).

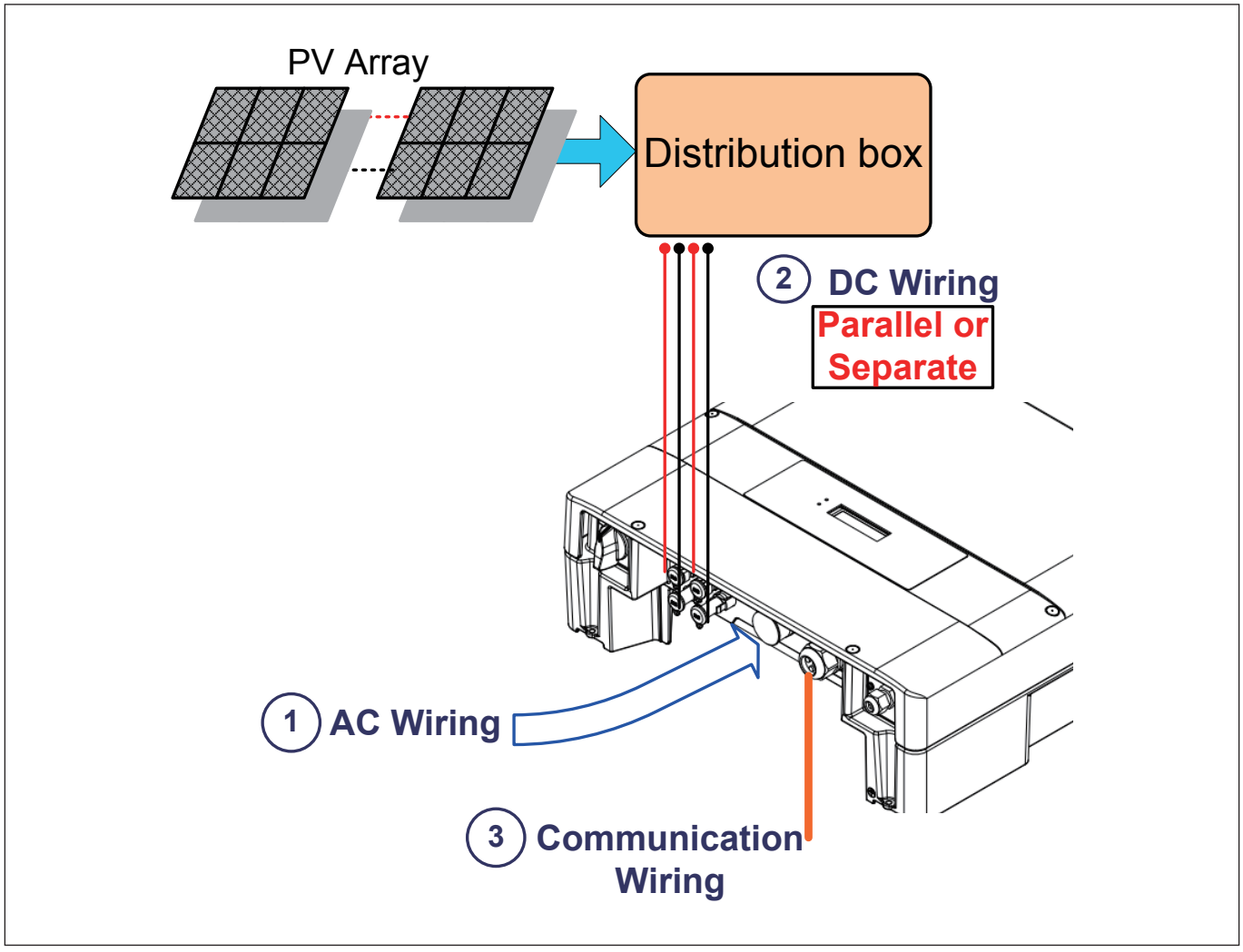


Figure 5-1: Connection of a system for floating solar array

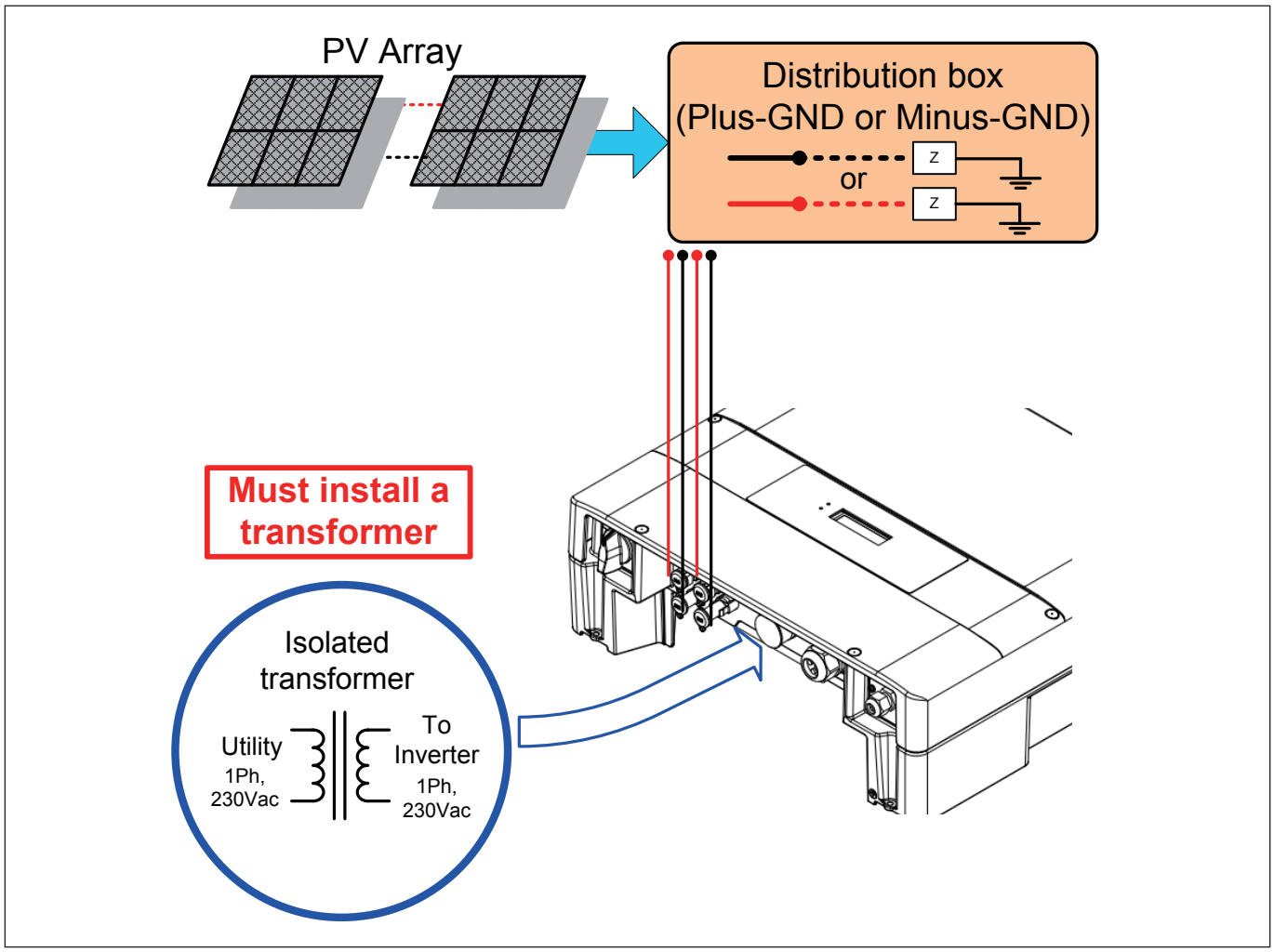


Figure 5-2: Connection of a system for solar array grounding

WARNING! SHOCK HAZARD

Whenever a PV array is exposed to sunlight, a shock hazard may exist due to output wires or exposed terminals. To reduce the risk of shock during installation, cover the array with an opaque (dark) material and ensure that the Disconnect Device in the inverter is set to OFF before commencing any wiring.

5.2 AC Grid Connection : L + N + PE

WARNING !

Before commencing AC wiring, please ensure AC breaker is switched off.

5.2.1 Required protective devices and cable cross-sections

	Power rating	Upstream circuit breaker
RPI H3A RPI H4A RPI H5A	3.75kVA 5 kVA 6.25 kVA	20A 25A 30A

Table 5-1: Recommended upstream protection

Please use appropriate wire to connect poles (According to the ***Table 5-2***).

Current Rating	Wire size	Torque
>20A (RPI H3A) >25A (RPI H4A) >30A (RPI H5A)	3-4mm^2 / 12 AWG	0.8~1Nm

Table 5-2: AC wire requirement

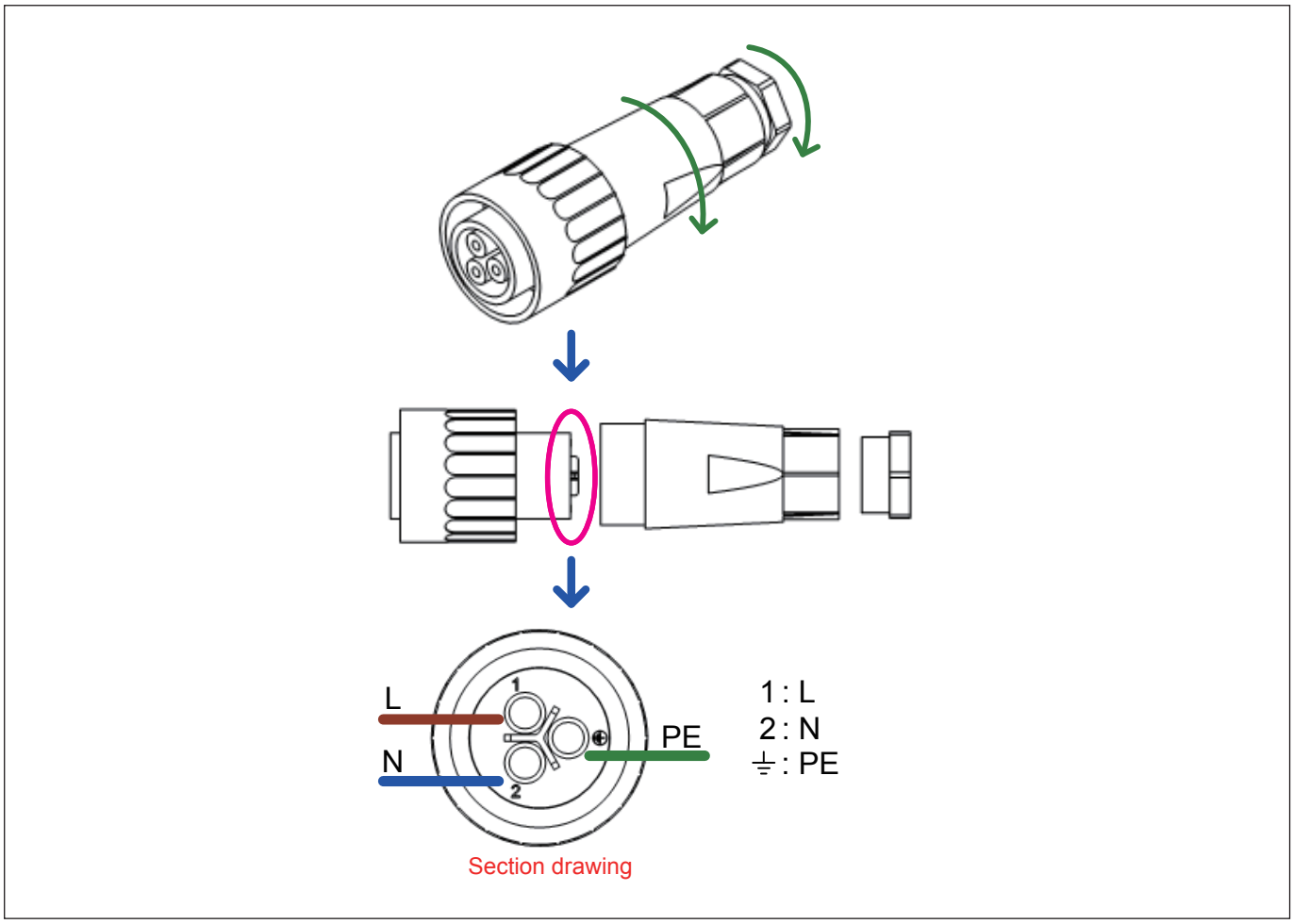


Figure 5-3: AC plug illustration (C01620E0028001, AMPHENOL CORP)

5.3 DC Connection (from PV Array)

WARNING !

- When undertaking DC wiring, please ensure the correct polarities are connected.
- When undertaking DC wiring please ensures that the DC isolator switch on the PV array is OFF.

CAUTION !

The maximum open circuit voltage of the PV Array must not exceed 600Vdc. The maximum recommended input power to the inverter is:

Type of limit	RPI H3A	RPI H4A	RPI H5A
Total input power	3200W	4320W	5280W
Per MPP tracker*	3200W	3200W	3500W

*with unbalanced input power

NOTE

The device installed between the PV Array and inverter must meet the rating of voltage higher than this device's maximum input voltage.

5.3.1 Asymmetrical Loading

The inverters operate using two separate MPP trackers that can handle both symmetrical and asymmetrical loads to allow for optimum adjustment. This allows for the requirements of complex PV system designs to be fulfilled. For example: east/west-facing roof (symmetrical load) or a south facing roof such as a dormer (asymmetrical load).

MPP range with Max. power	RPI H3A	RPI H4A	RPI H5A
Symmetrical load	160~500V	180~500V	220~500V
Asymmetrical load	320~500V	266~500V	291~500V
Max. ratio for asymmetrical load	100/0%;0/100%	80/20%;20/80%	70/30%;30/70%

The RPI range of PV inverters uses genuine Multi-Contact® MC4 connectors.

CABLE COUPLER POLARITY	WIRE SIZE 2.5 MM^2 (AWG 14)	WIRE SIZE 4.0 MM^2 - 6.0 MM^2 (AWG 12-10)	FEMALE CABLE COUPLER	MALE CABLE COUPLER	MULTI-CONTACT ORDER NUMBER
Plus coupler	•		•		32.0010P0001-UR 32.0012P0001-UR
Minus coupler	•			•	32.0011P0001-UR 32.0013P0001-UR
Plus coupler		•	•		32.0014P0001-UR 32.0016P0001-UR
Minus coupler		•		•	32.0015P0001-UR 32.0017P0001-UR

Table 5-3: Order Numbers for MC4 connectors

Current Rating		Wire size
DC 10 A (RPI H3A)	DC 12 A(RPI H4A / H5A)	2-3mm^2 / 14 AWG

Table 5-4: Minimum cable size

DC wiring polarities are divided into Plus and Minus, which are shown in ***Figure 5-4.*** The connection shall conform to the indication marked on inverter.

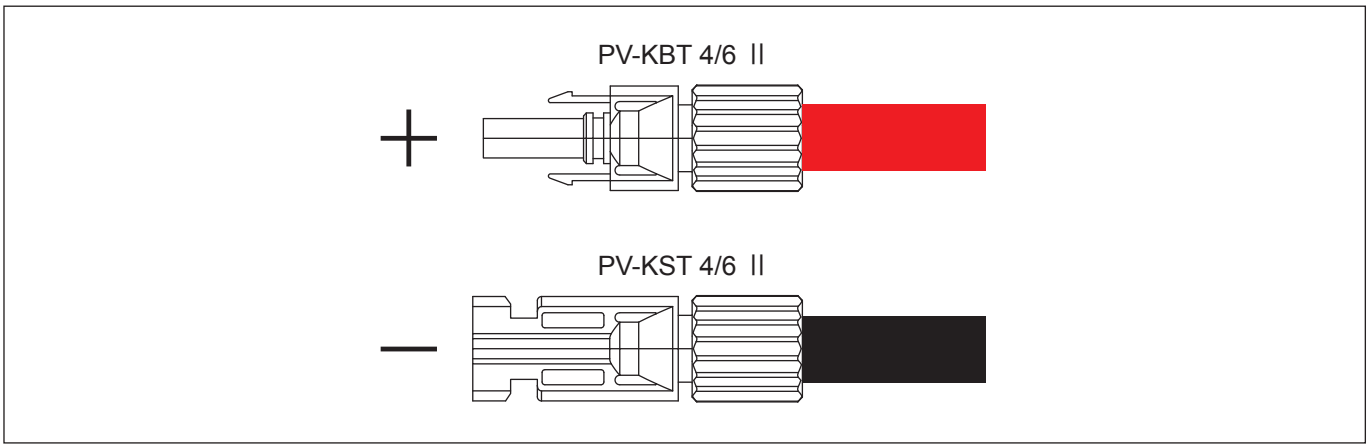


Figure 5-4: DC Wiring illustration

5.4 Communication Module

The Communication Module enables communication between the unit and a computer and provides 2 RS-485 ports. When using this module, the first step is to take off the cover located at the bottom right of inverter and pull out the RS485 socket as shown in ***Figure 5-5***.

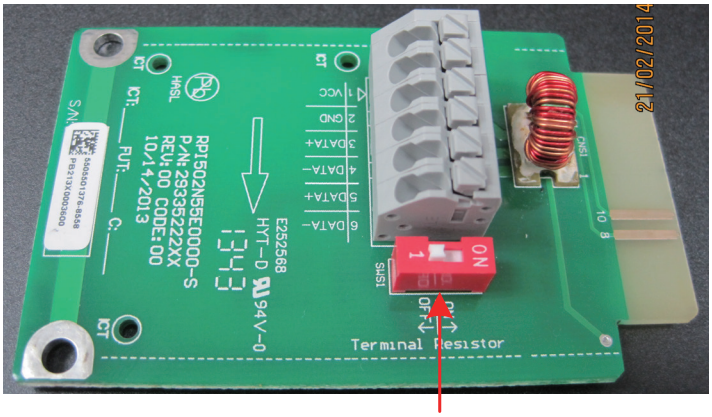


Figure 5-5: Communication module

5.4.1 RS-485 Connection

The pin definition of RS-485 shown in ***Table 5-5*** and protocol settings are listed in ***Table 5-6***. Installer must switch the terminal resistor switch to **ON** when only a single inverter is installed. The wiring of multi-inverter is shown in ***Figure 5-6***. The terminal resistor switch of the first and last inverters should be switched **ON**, and the others **OFF**.

PIN	FUNCTION
1	VCC
2	GND
3	DATA+
4	DATA–
5	DATA+
6	DATA–

Table 5-5: Definition of RS485

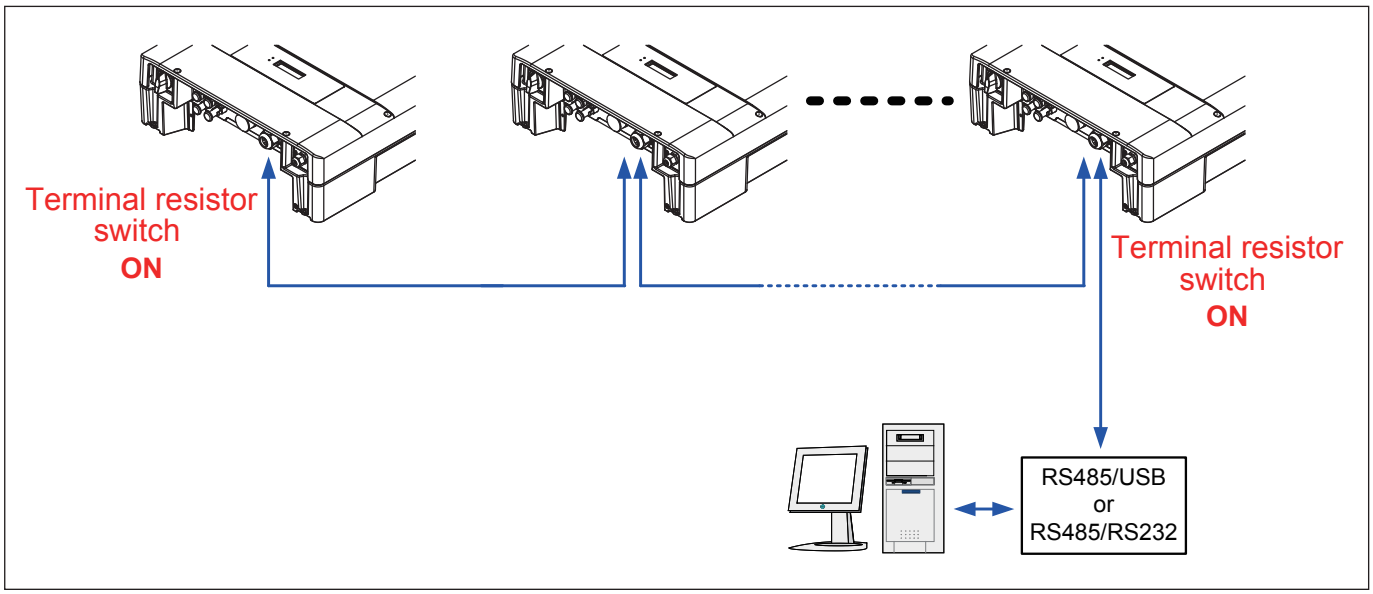


Figure 5-6: Multi-inverter connection illustration

RS-485 Data format	
Baud rate	9600 / 19200
Data bit	8
Stop bit	1
Parity	N/A

Table 5-6: RS-485 data format

6 Active/Reactive Power Control and LVRT (Optional)

There are 2 settings for active power and 4 settings for reactive power control that can be configured based on the requirement of the local network operator.

6.1 Active Power Control

6.1.1 Power Limit

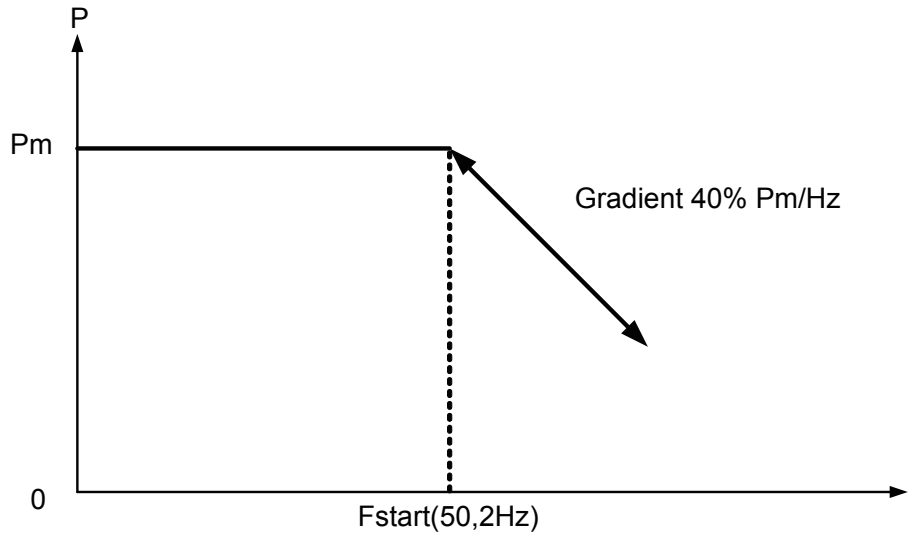
Users can reduce inverter output power by set percentage of actual or rated power.

6.1.2 Power vs. Frequency

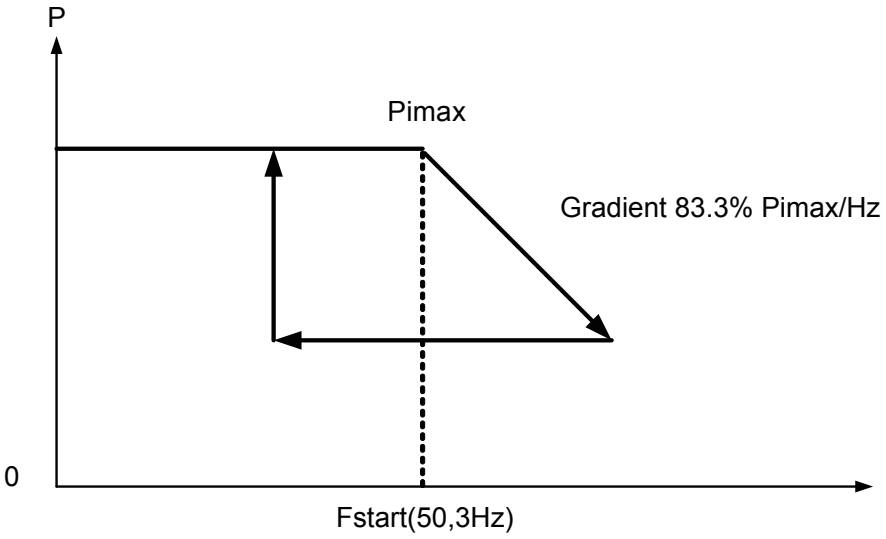
According to VDE-AR-N 4105 (5.7.3.3):
At frequencies between 50.2Hz and 51.5Hz, all adjustable power generation systems shall reduce (for frequency increase) or increase (for frequency decrease) the active power Pm generated instantaneously (at the time of exceeding the mains frequency 50.2Hz; freezing the value on the current level) with a gradient of 40% of Pm per Hertz).

According to CEI 0-21 (8.5.3.2):
Within a frequency range from 50.3Hz to 51.5Hz, all adjustable production plants equipped with static converters have to be able to reduce the currently generated active power in case of an increase of the frequency with a variable drop of 2% to 5% with a default value of 2.4% (with corresponds to a power gradient of 83.3%/Hz).

User can set all necessary settings to meet the requirements from network operator. Please refer to actual Power vs. Frequency shown in Figure 6-1 for the settings procedure.



Power vs. frequency curve for VDE-AR-N 4105



Power vs. frequency curve for CEI-021

Figure 6-1: Power vs. frequency characteristic

6.2 Reactive Power Control

With active power output, it must be possible to operate the generating plant in any operating point with at least a reactive power output corresponding to an active factor at the network connection point of the range below:

- cos φ = 0.8 under-excited to 0.8 over-excited
- (For VDE-AR-N 4105 or CEI 0-21)

cos φ = 0.9 under-excited to 0.9 over-excited

Values deviating from the above must be agreed upon by contract. With active power output, either a fixed target value for reactive power provision or a target value variably adjustable by remote control (or other control technologies) will be specified by the network operator in the transfer station.

The setting value is either：

- fixed power factor cosφ (VDE-AR-N 4105 ,CEI 0-21)
- displacement factor/active power characteristic curve cosφ(p) (VDE-AR-N 4105 ,CEI 0-21)
- fixed reactive power in Var.(CEI 0-21)
- reactive power/voltage characteristic Q(U). (CEI 0-21)

6.2.1 Fixed Power Factor cosφ (VDE-AR-N 4105,CEI 0-21)

Users can set power factor from Cap 0.8 to Ind 0.8 (inverter would stop reactive power control if output power is below 20% rated power).

6.2.2 cosφ(P) (VDE-AR-N 4105,CEI 0-21)

Once user enables this method, inverter will deliver reactive power according to output active power at that moment. Figure 6-2 is an example.

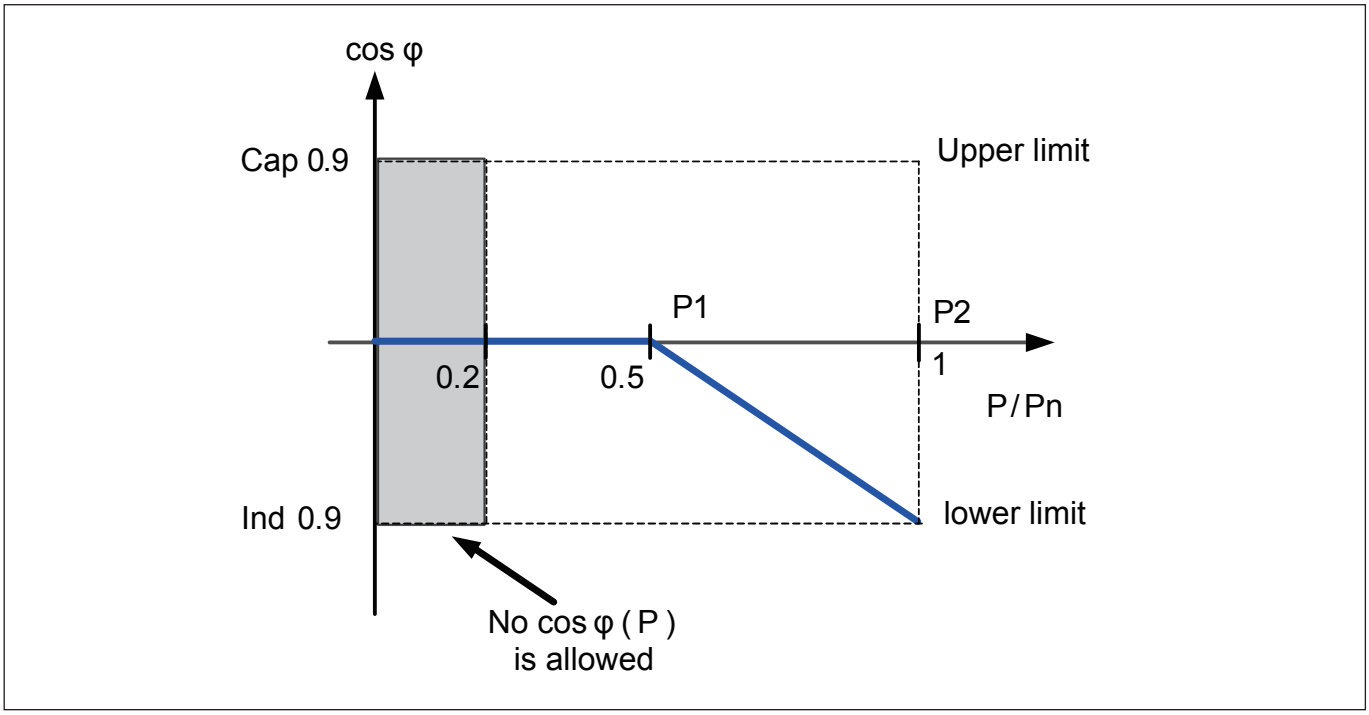


Figure 6-2: cosφ(P) characteristic

6.2.3 Fixed Reactive Power InVAR(CEI 0-21)

Once user enables this method, inverter will deliver reactive power (i.e. Q) consistent with that of the fixed reactive power setting.
The setting range is from Cap 48.4% to Ind 48.4%.

6.2.4 Reactive Power/ Voltage Characteristic Q(U)(CEI 0-21)

Once user enables this method, user can set Q vs. Grid voltage operation curve as in ***Figure 6-3*** below.

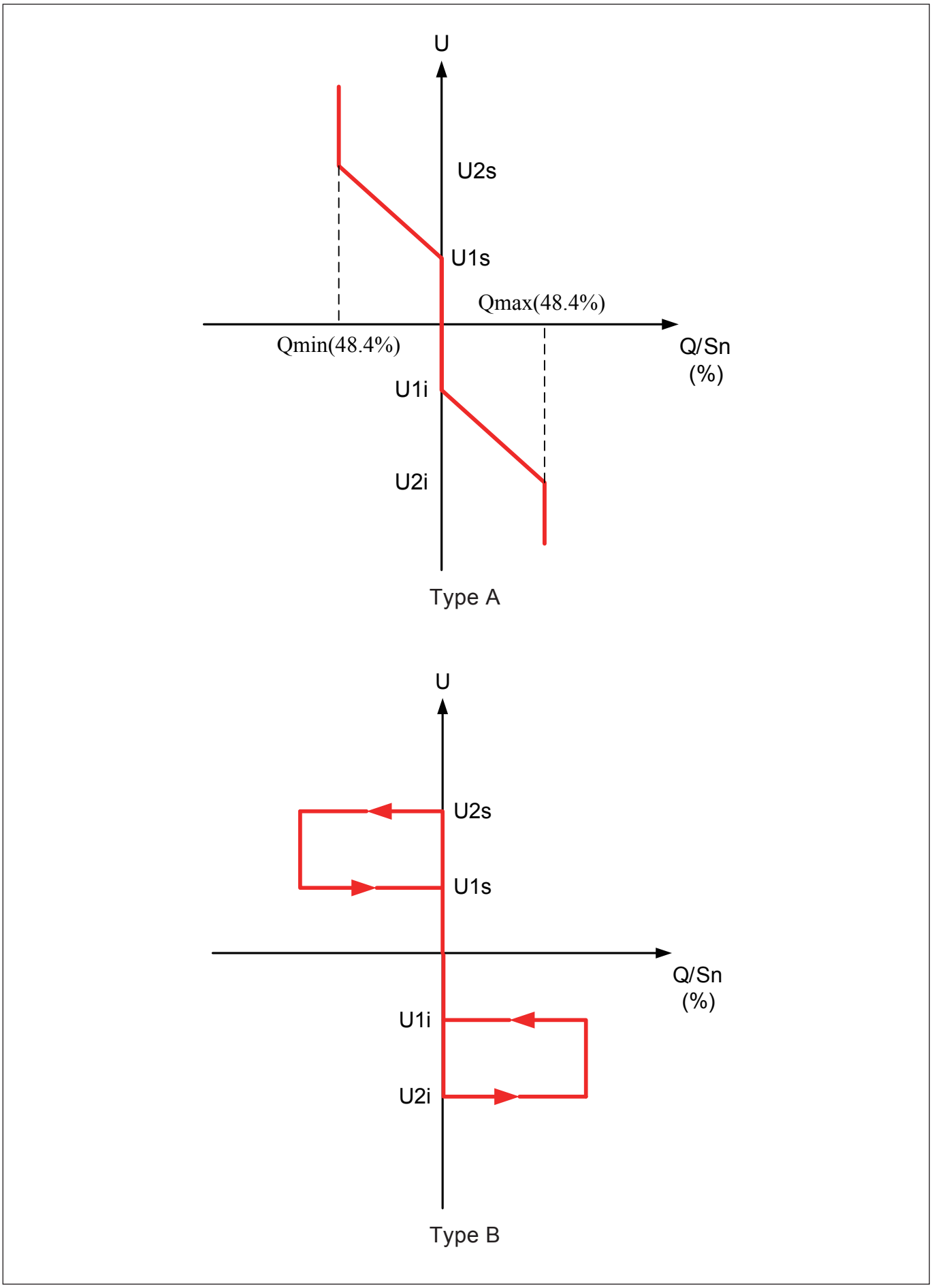


Figure 6-3: Q(U) characteristic

6.3 Low Voltage Ride Through (LVRT)

According to CEI 0-21, 8.5.1

To avoid undue separation from the network if voltage dips occur, a generation system with over 6 kW total power must be able to comply with certain functional requirements, which are known as LVRT (Low Voltage Ride Through) in international literature.

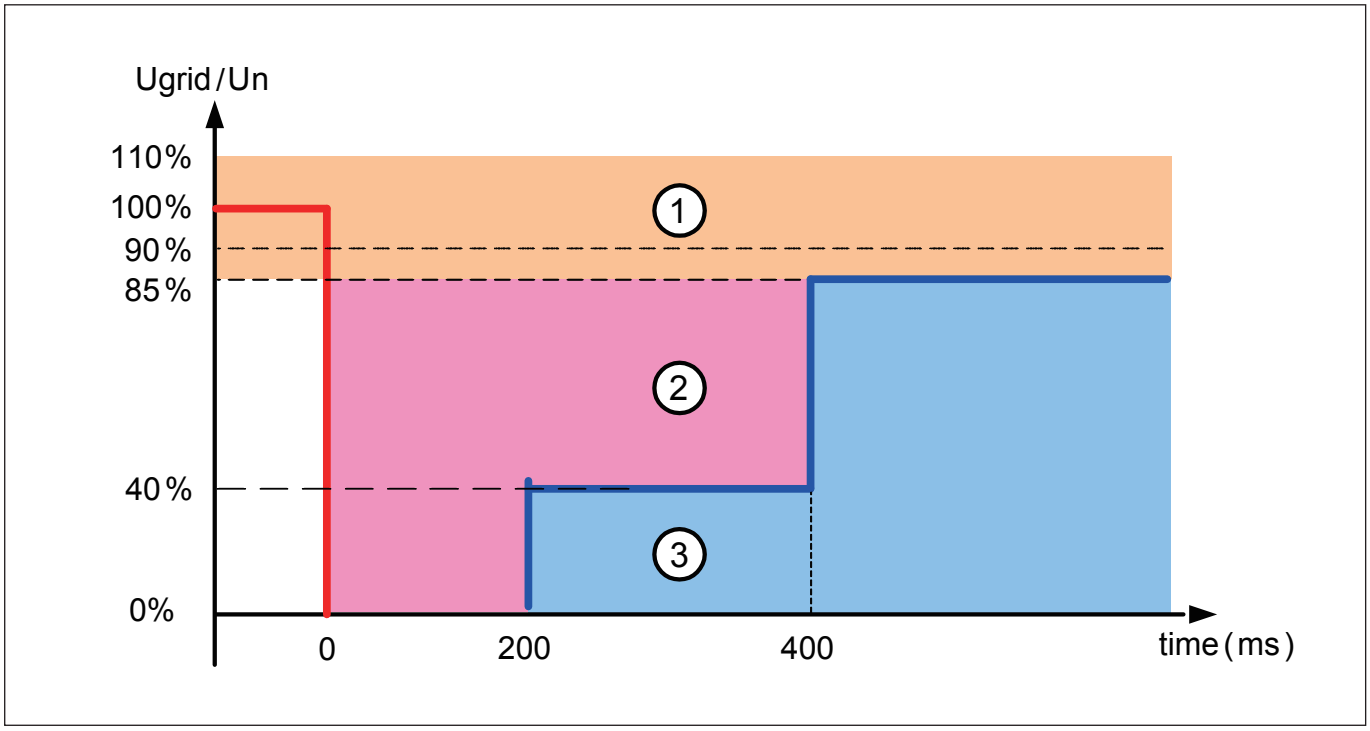


Figure 6-4: LVRT characteristic

7 Turn PV inverter on/off

WARNING：BURN HAZARD!

The internal temperature may exceed over 70°C while operating.
To avoid injury, do not touch the surface of the inverter whilst the unit is in operation.

After installation, please ensure the AC, the DC and communication connection are correct. When enough power is generated from the PV array, the device will operate automatically and will initial 'self-test'. This self-test takes approximately 2 minutes and will occur at first start-up of the day.

The display on the inverter includes 16×2 LCD display and LED indicator lights to indicate inverter status. There are green and red colour LED indicator lights to represent different inverter statuses.

7.1 Start-up Procedures

7.1.1 PV Array DC Voltage Checking

Firstly, uncover the PV arrays and expose them to full sunlight. Please note, the sunlight must be intense enough to produce the required output voltage for the inverter to start up. Measure the PV array open circuit DC voltage across the DC positive (+) and negative (-) terminals.

7.1.2 AC Utility Voltage Checking

Using an AC voltmeter, measure the AC open circuit utility voltage between L1 (L) and L2 (N) Ensure the voltage is at approximately the nominal value. The inverter operates with a line-to-line voltage range around the nominal value.
See "11. Technical data" output section for the utility voltage operating range for your inverter model.

7.1.3 Starting up the Inverter

Switch the DC and AC disconnection switches (breakers) to "ON".
Check the inverter LCD display. The start-up screen should appear in several seconds (for the first time start up, select proper country and language, see "7.3.2 Country Selection & 7.3.3 Language Selection").

7.2 Inverter Setting

7.2.1 Country Setting

Upon first start-up of the device, Country selection is required.

1. In the country setting page, press “SEL” button (NEXT) to select your country, press “ENT” button to confirm this page.
2. Press “Enter” button to confirm your country setting.

NOTE:

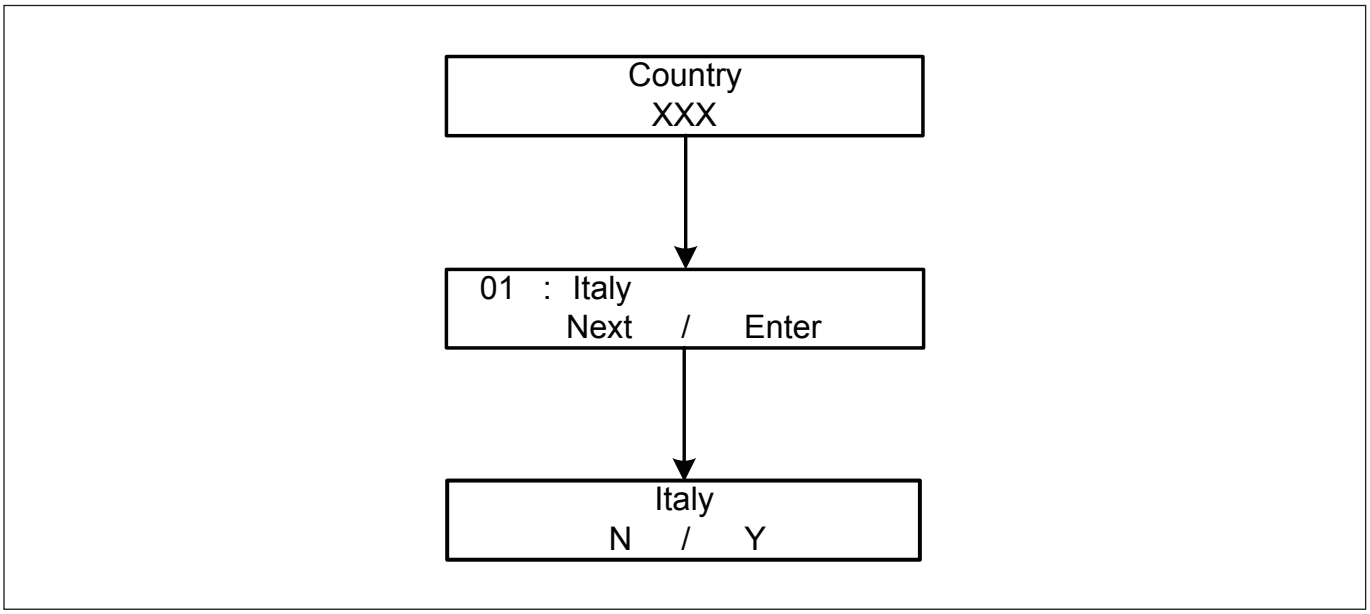


Figure 7-1: LVRT characteristic

7.2.2 Connecting the Communication Wiring

Multiple inverters can be monitored via the inverter’s RS-485 connection (Figure 5-6), but each inverter’s ID must be assigned a unique value.

NOTE

Make sure the inverter ID is different from each other in the same RS485 chain.

7.2.3 Inverter ID Setting

1. Turn on DC power and wait for the LCD display, then press “Select” button until “ Inverter ID: XX" is shown in the LCD.
2. Press and hold both buttons (“Enter” first, then “Select”) entering setting ID screen, then release both buttons and set ID by pressing “Select” button, then press “Enter” button if the ID is correct (ID = 1 ~ 254).
3. Inverter ID is changed and saved.

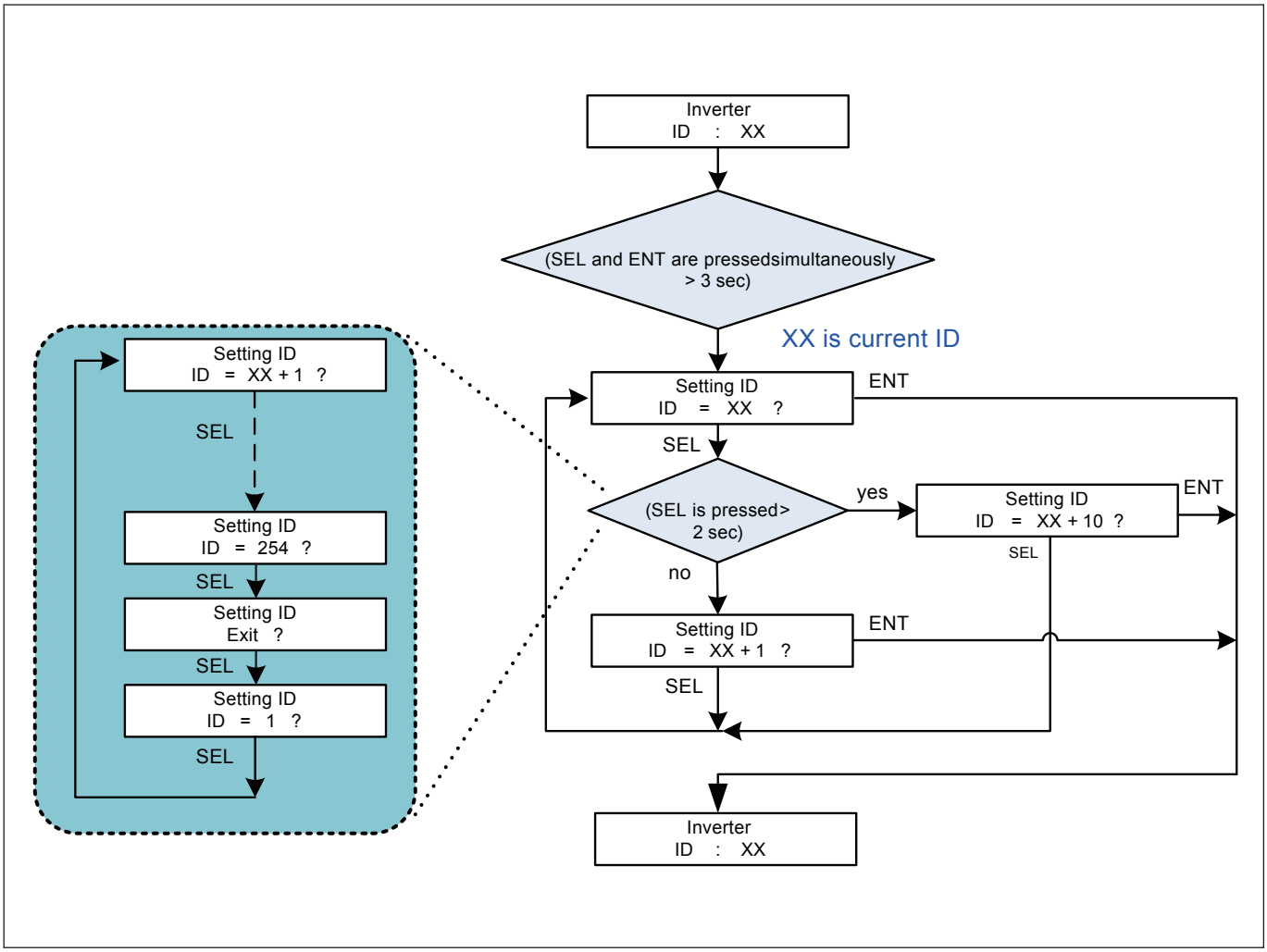


Figure 7-2: Inverter ID Setting

7.3 LCD flowchart

Pressing any button will enter main menu (***Figure 7-3***), “Output Energy (today)” is the first option on the main menu with several other items below as seen in section 7.3.1 ~ 7.3.7.

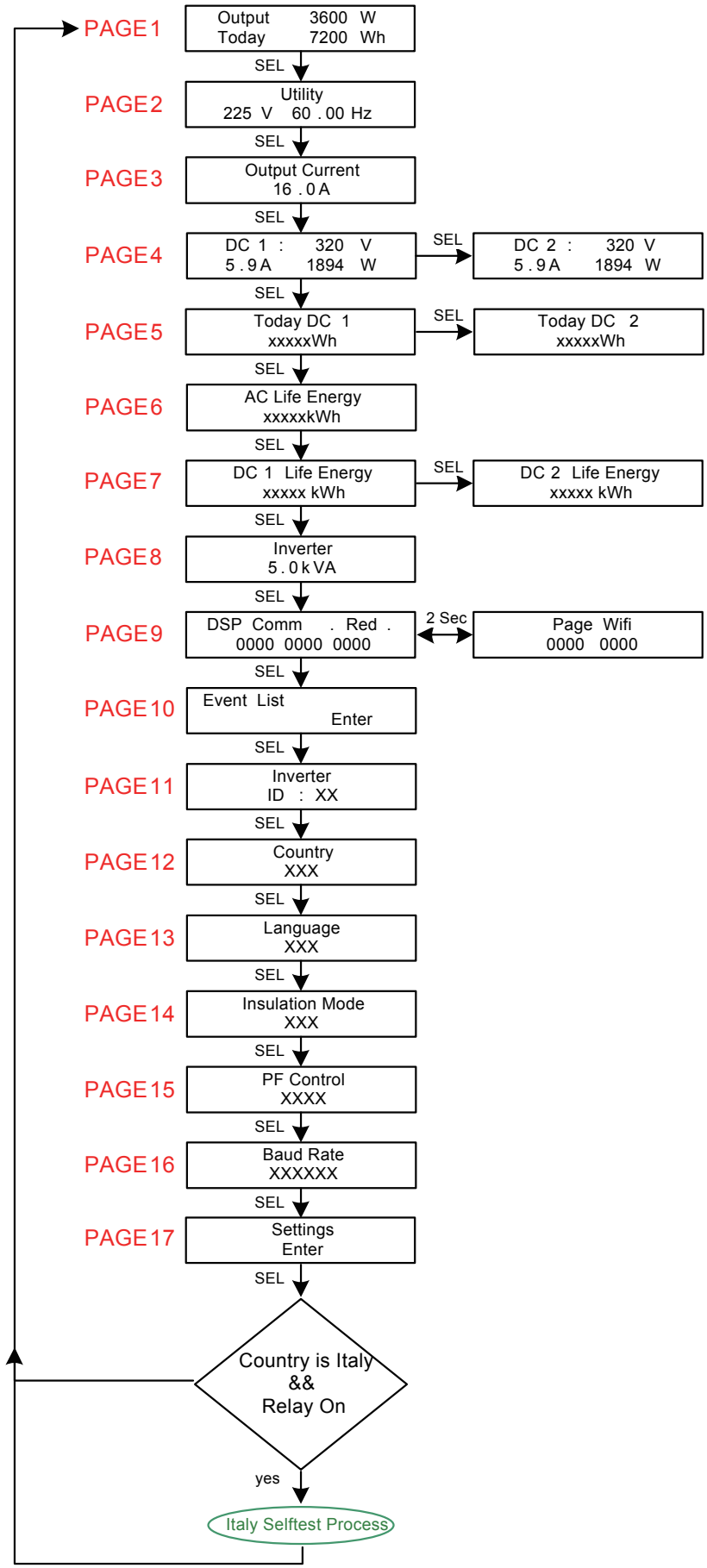


Figure 7-3: LCD flowchart

Page1 Today output energy
Page2 Grid voltage and frequency
Page3 Output current
Page4 Input voltage, current and power
Page5 Today input energy
Page6 Total output energy
Page7 Total input energy
Page8 Start page
Page9 Firmware version
Page10 Event list
Page11 Inverter ID
Page12 Country
Page13 Language
Page14 Insulation / Grounding option
Page15 PF Control
Page16 Baud Rate
Page17 Settings

7.3.1 Event List

When entering this menu, the display will show all the events (error or fault) and it can show up to 16 records at most with the latest one on the top.

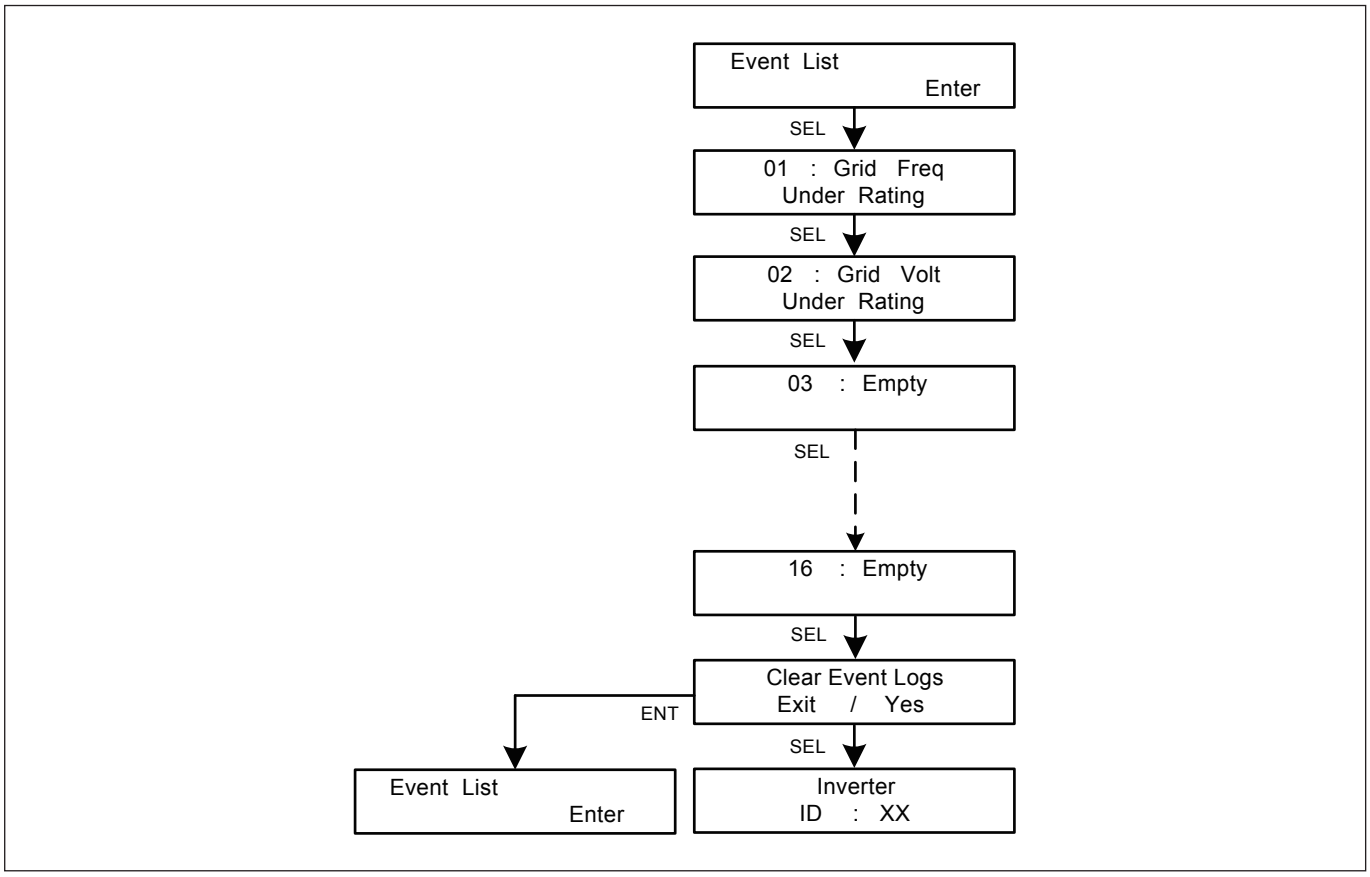


Figure 7-4: Event log flowchart

7.3.2 Country Selection

Users can select different countries in this menu.

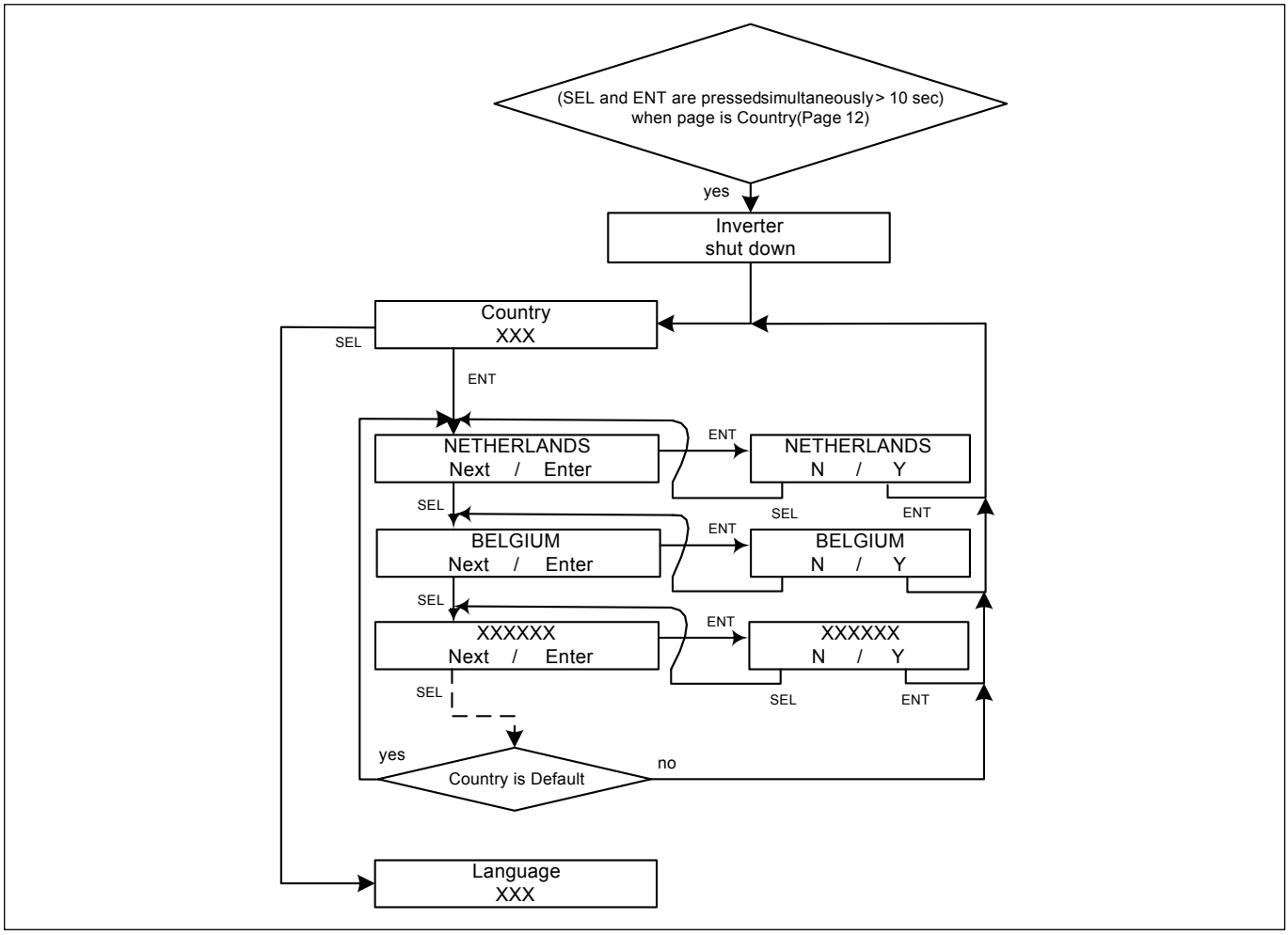


Figure 7-5: Country selection

RPI H3A/ H4A/ H5A	
Australia	Italy LV_LVRT
AU/NZ PL4K6	Italy LV_SPI
AU/NZ PL4K99	Netherlands
AU/NZ PL2K49	Spain RD661
AU/NZ PL2K99	Spain RD1699
Austria	Switzerland
Austria PL4K6	Taiwan
Belgium	Thailand MEA
Denmark	Thailand PEA
FR LV VFR2014	UK G59-3 230
FRA-Is. 50Hz	UK G59-3 240
FRA-Is. 60Hz	UK G83-2
Germany LV	Poland
India	New Zealand

Table 7-1: Country list

7.3.3 Language Selection

When entering this menu, user can set one of five different languages.

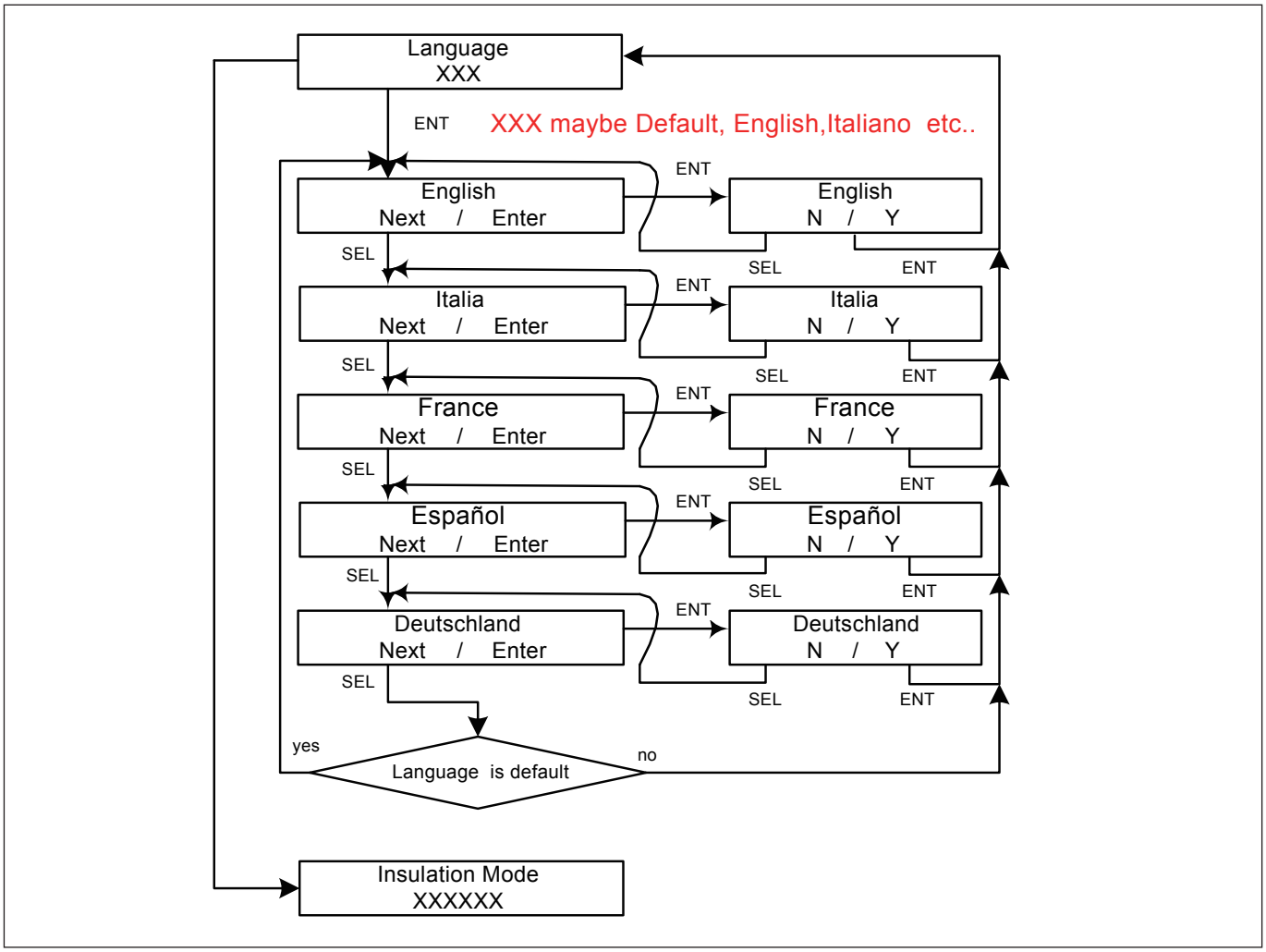


Figure 7-6: Language selection

RPI H3A/ H4A/ H5A
English
Italiano
Français
Español
Deutsch

Table 7-2: Language list

7.3.4 Insulation Mode

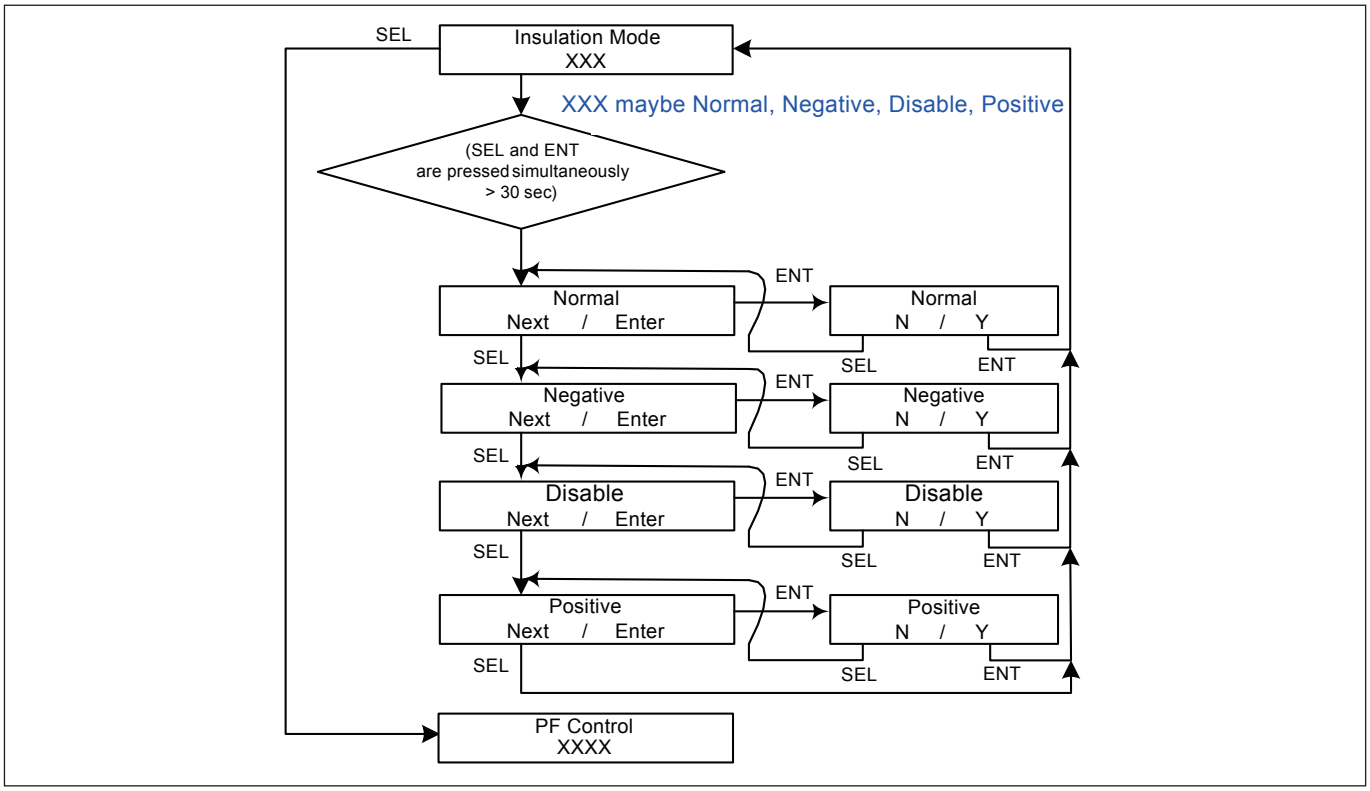


Figure 7-7: Insulation mode

7.3.5 PF Control

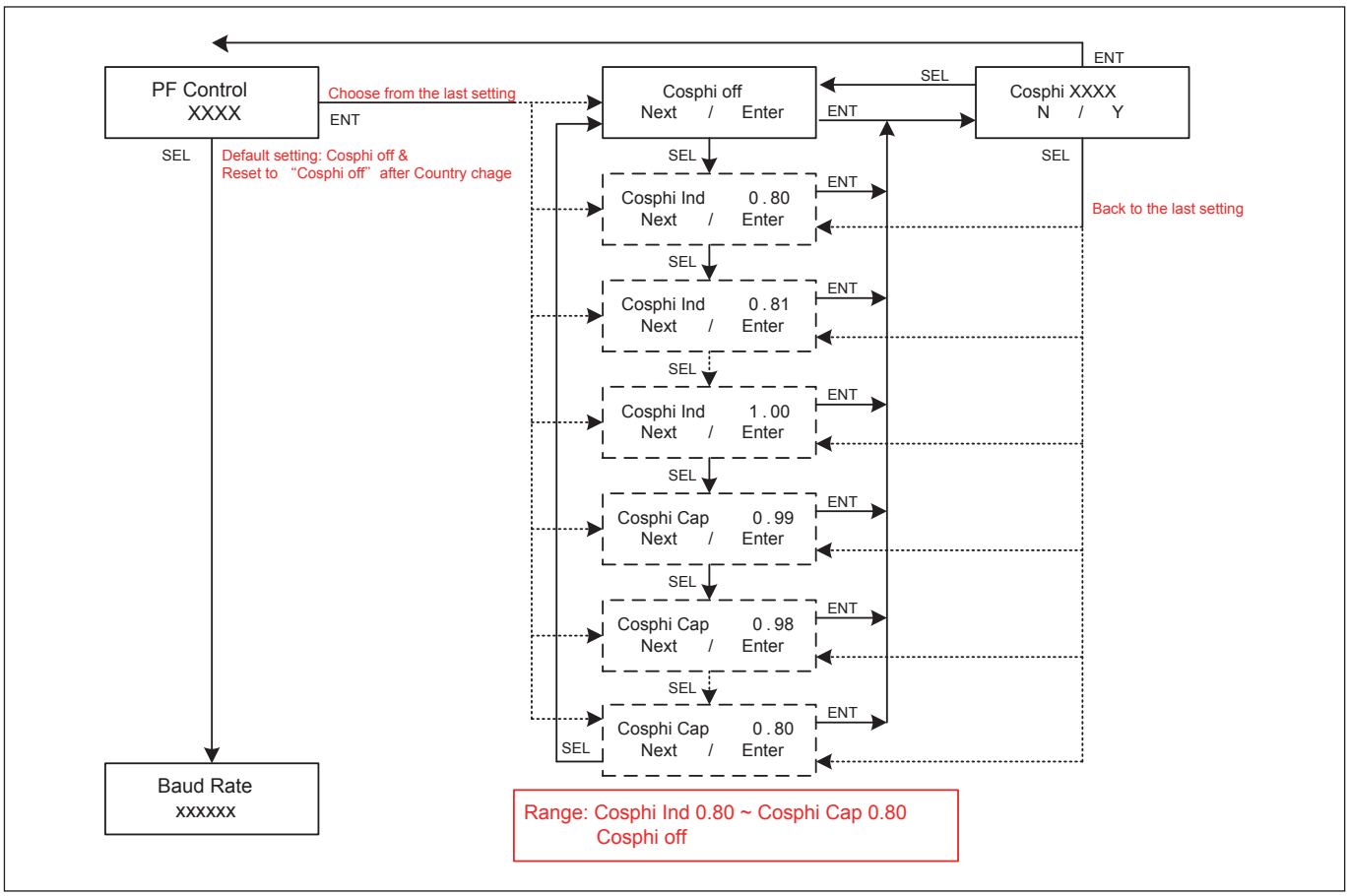


Figure 7-8: PF Control

7.3.6 Baud Rate

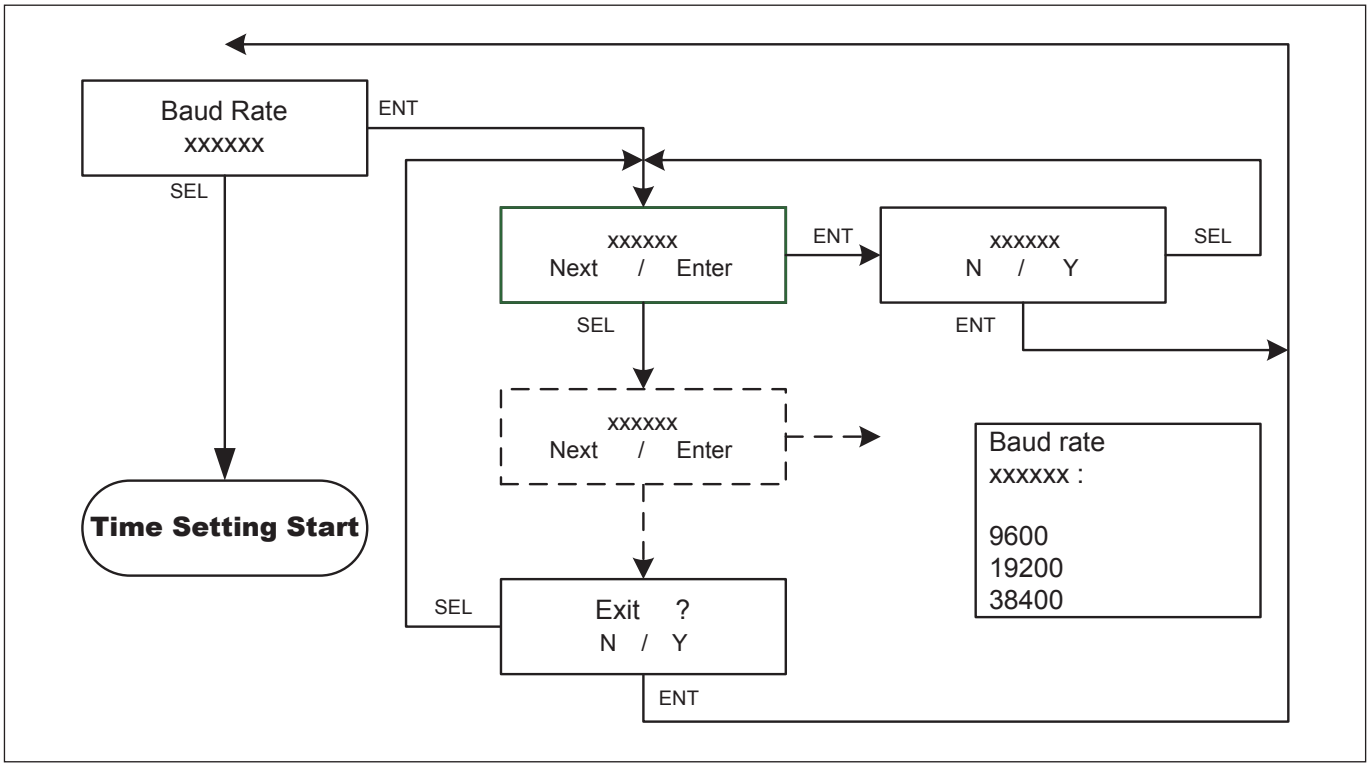


Figure 7-9: Baud Rate

7.3.7 Time Setting

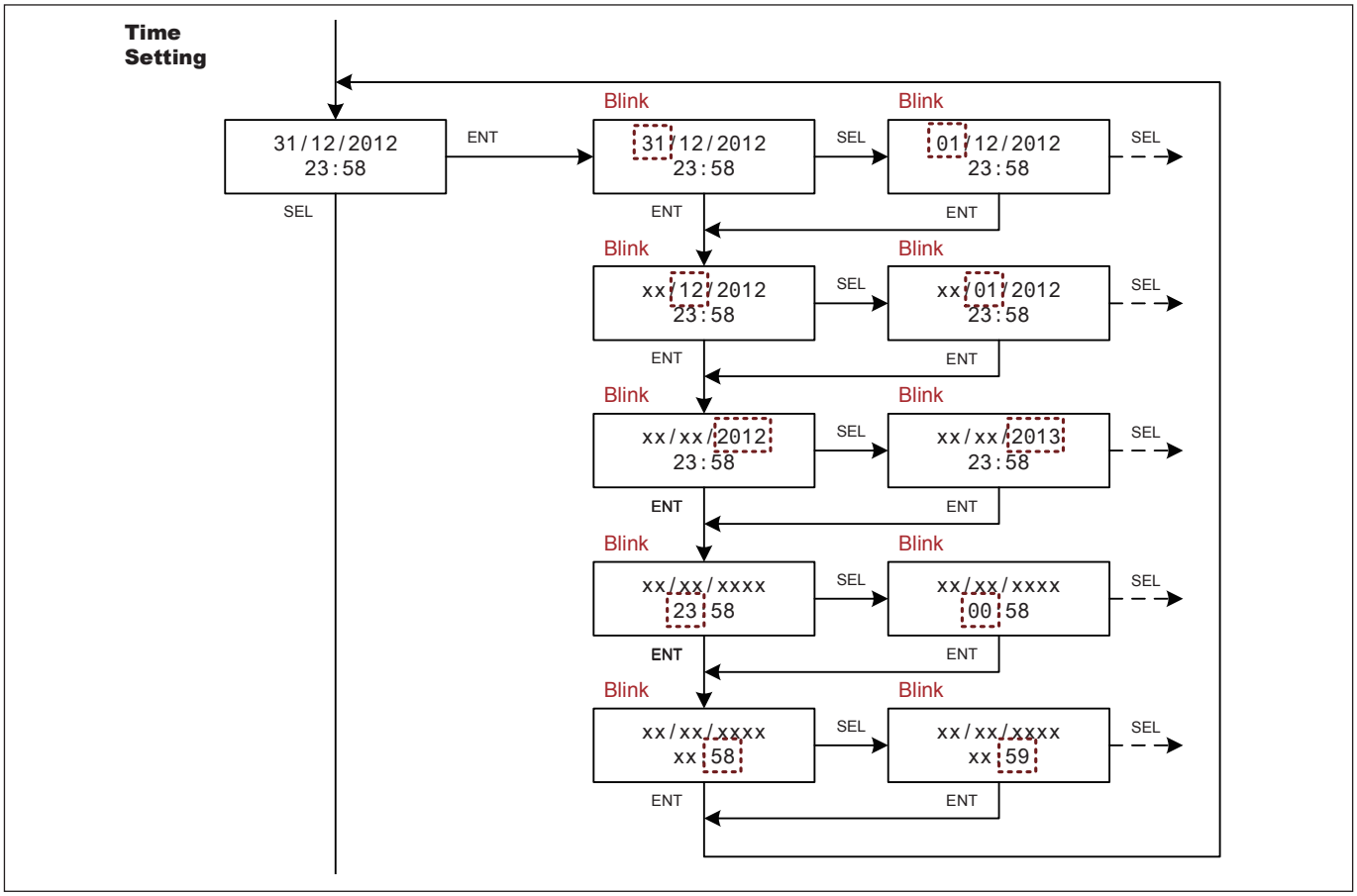


Figure 7-10: Time setting

7.3.8 Settings Page

Settings include WiFi, Ethernet IP address and WiFi IP address.

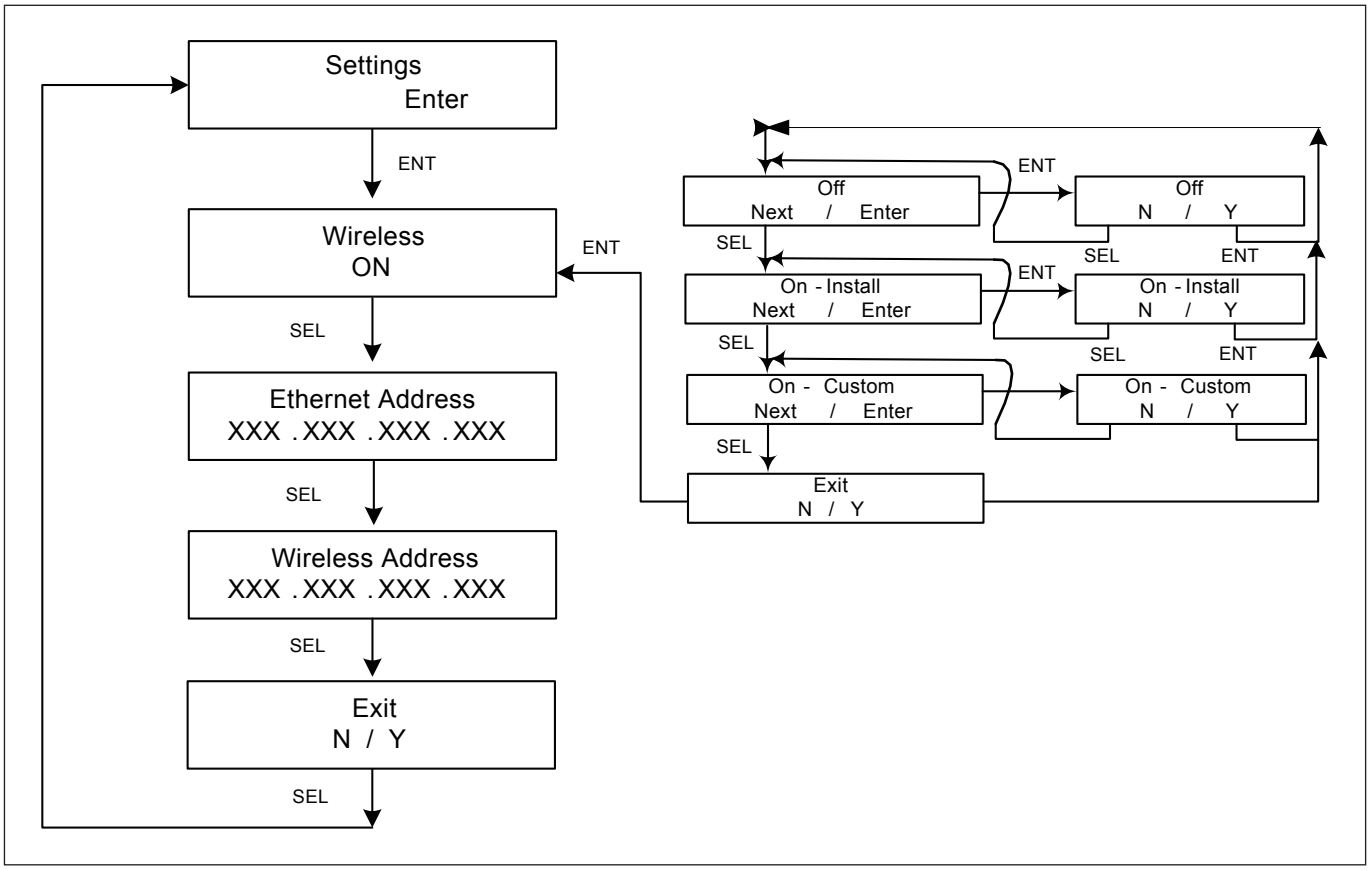


Figure 7-11: Settings page

7.3.9 Italy Self-test&Comando locale

Please note, Italy self-test setting will only exist when Italy is selected in country setting. Italy Self-test includes Uac High (UH), Uac Low(UL), Fac High(FH) and Fac Low(FL). The user can choose the selection of Uac High, Uac Low, Fac High, or Fac Low separately. The final testing result will be shown on the operating menu and saved where the user can view the results. If the Italy Self-test fail's, the inverter will not operate. Please contact Delta or your supplier.

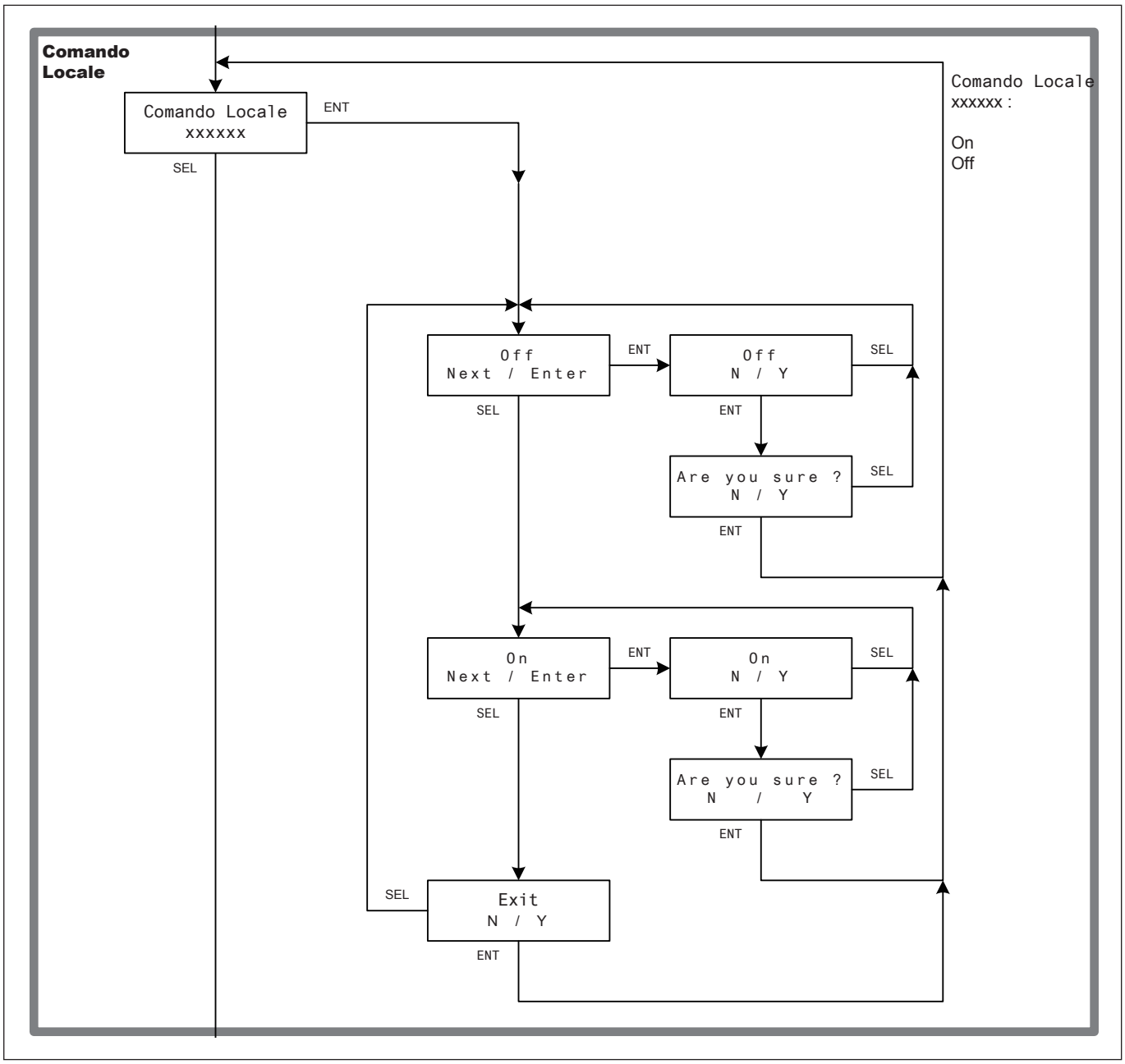


Figure 7-12: Italy Comando locale

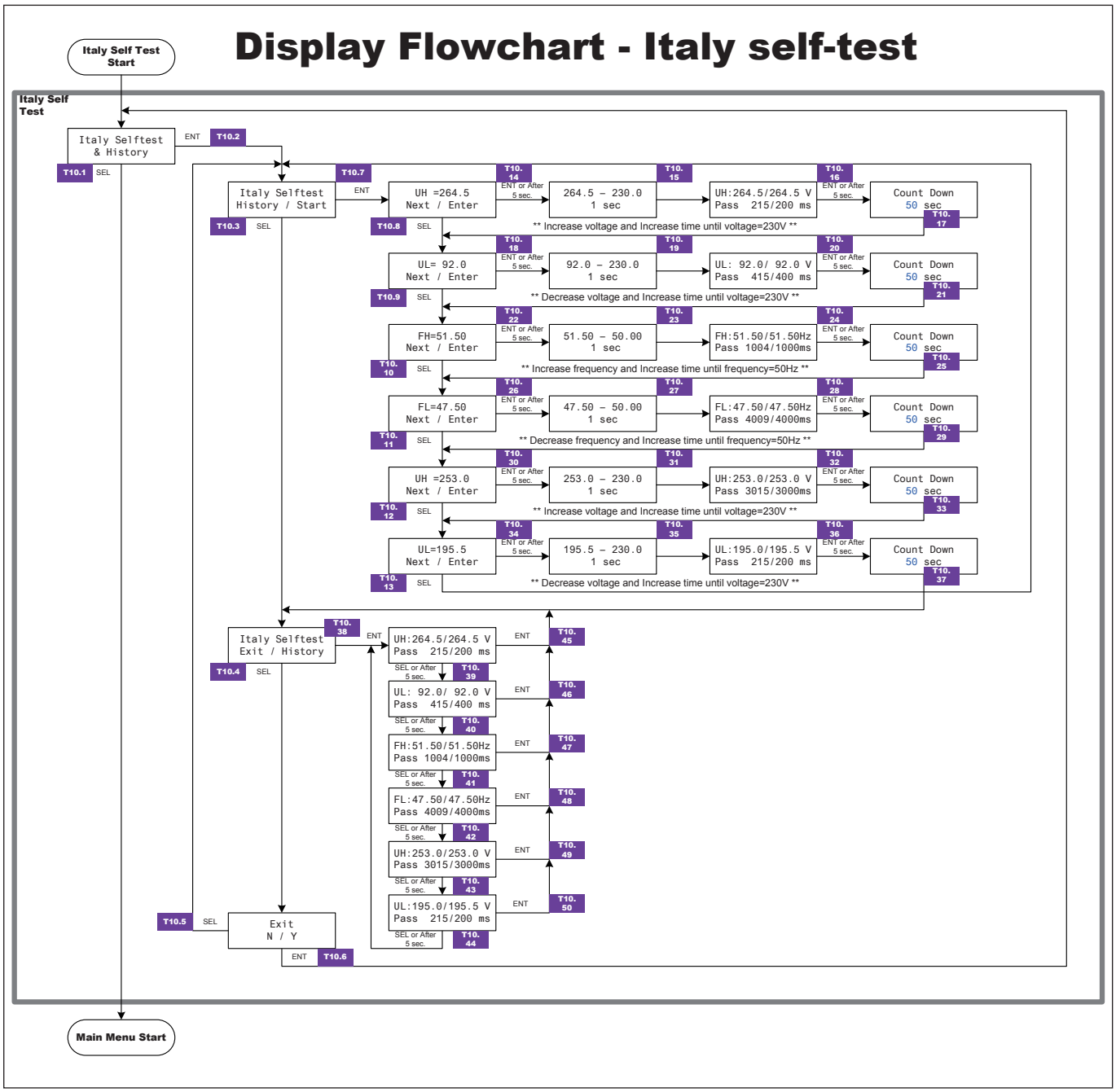


Figure 7-13: Italy self-test flowchart

8 Maintenance

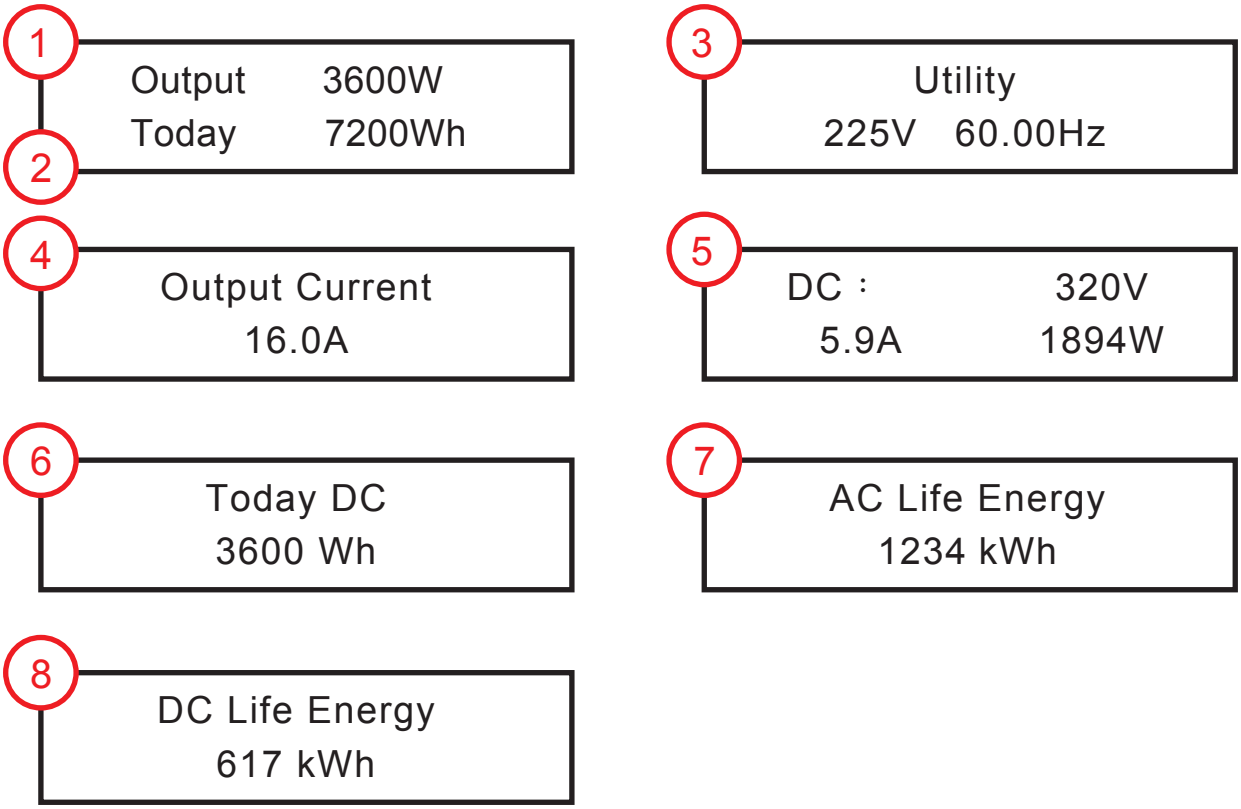
In order to ensure normal operation of the inverter, please check the unit regularly. Check that all terminals, screws and cables are connected and appeared as they did upon installation. If there are any impaired or loose parts, please contact your solar installer. Ensure that there are no foreign objects in the path of the heat outlet and keep the unit and its surroundings clean and tidy.

WARNING !

Before any maintenance, please switch AC and DC power off to avoid risk of electronic shock.

9 Measurement, Error Message and Trouble Shooting

9.1 Measurement



No.	Measurement	Meaning	Unit
1	Output	Actual power inverter is exporting	W
2	Today	Energy generated today	Wh
3	Utility	Grid Voltage and Frequency	Vac / Hz
4	Output Current	Actual Output AC current	A
5	DC	DC input Voltage, Current, Watt	Vdc, A, W
6	Today DC	Today PV array energy supply, cumulative	Wh
7	AC Life Energy	Total Energy generated, cumulative	kWh
8	DC Life Energy	Total PV array energy supply, cumulative	kWh

Table 9-1: Measurement and message

9.2 Error Message & Trouble Shooting

ERROR		
Message	**Possible cause**	**Action**
E01: Grid Freq. Over Rating	1. Actual utility frequency is higher than the OFR setting 2. Incorrect country setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country setting 3. Check the detection circuit inside the inverter
E02: Grid Freq. Under Rating	1. Actual utility frequency is lower than the UFR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E07:Grid Quality	Non-linear load in Grid and close to inverter	Grid connection of inverter need to be away from non-linear load if necessary
E09: No Grid	1. AC breaker is OFF 2. AC plug Disconnected 3. Internal fuses are broken	1. Switch on AC breaker 2. Check the connection in AC plug and make sure it connects to inverter 3. Replace fuses and check all switching devices in boost & inverter stages
E10: Grid Volt Under Rating	1. Actual utility voltage is under the UVR setting 2. Utility voltage is under the Slow UVR setting during operation 3. Incorrect country or Grid setting 4. Detection circuit malfunction	1. Measure the utility AC voltage to the inverter terminal. 2. Check the utility AC voltage connection to the inverter terminal. 3. Check country & Grid setting 4. Check the detection circuit inside the inverter
E13: Slow Over Voltage Range	1. Actual utility voltage is over the OVR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility voltage on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E26:Slow Over Frequency Range	1. Actual utility frequency is over the OFR setting 2. Incorrect country or grid setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country setting 3. Check the detection circuit inside the inverter
E27:Slow Under Frequency Range	1. Actual utility frequency is under the UFR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter

ERROR		
Message	**Possible cause**	**Action**
E28: Slow Under Voltage Range	1. Actual utility voltage is under the UVR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility voltage on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E30: DC Volt Over Rating	1. Actual Solar1 voltage is higher than 550Vdc 2. Detection circuit malfunction	1. Modify the solar array string layout and reduce the Voc below 550Vdc 2. Check the detection circuit inside the inverter
E34: Ground Fault	1. PV array insulation fault 2. Large PV array capacitance between Plus to Ground or Minus to Ground or both. 3. Detection circuit malfunction	1. Check the insulation of Solar inputs 2. Check the capacitance, dry PV panel if necessary 3. Check the detection circuit inside the inverter

FAULT		
Message	**Possible cause**	**Action**
F01: DC Offset Over Rating	1. Utility waveform is abnormal 2. Detection circuit malfunction	1. Check the utility waveform. Grid connection of inverter need to be away from non-linear load if necessary 2. Check the detection circuit inside the inverter
F05: NTC Over Temp	1. The ambient temp. is above 60°C 2. Detection circuit malfunction	1. Check the installation ambient temp. and environment 2. Check the detection circuit inside the inverter
F06: Inside NTC Circuit Fail	1. Ambient temp. >100°C or <-24°C 2. Detection circuit malfunction	1. Check the installation ambient and environment 2. Check the detection circuit inside the inverter
F08: Heat Sink NTC1 Fail	1. Boost heat sink temp. >100°C or <-24°C 2. Detection circuit malfunction	1. Check the installation ambient and environment 2. Check the detection circuit inside the inverter.
F09: Heat Sink NTC2 Fail	1. Inverter heat sink temp. >100°C or <-24°C 2. Detection circuit malfunction	1. Check the installation ambient and environment 2. Check the detection circuit inside the inverter
F15:DSP ADC V_{grid} / I_{out} Fail	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F16:DSP ADC V_{in} / V_{bus} Fail	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F17:DSP ADC I_{in} / I_{boost} Fail	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F18:RED. ADC V_{grid} Fail	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F19:DSP ADC I_{out_dc} Fail	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter

FAULT		
Message	**Possible cause**	**Action**
F20: Efficiency Inconsistent	1. The calibration is incorrect 2. Current feedback circuit is defective	1. Check the accuracy of current and power 2. Check the current feedback circuit inside the inverter
F22: Internal Comm Fault_R	1. Red. CPU is idling 2. The communication connection is disconnected	1. Check reset and crystal in Red. CPU 2. Check the connection between Red. CPU and DSP
F23: Internal Comm Fault_D	1. DSP is idling 2. The communication connection is disconnected 3. The communication circuit malfunction	1. Check reset and crystal in DSP 2. Check the connection between DSP and COMM 3. Check the communication circuit
F24: Residual Curr Over Rating	1. PV array insulation fault 2. Large PV array capacitance between Plus to Ground or Minus to Ground 3. Either side of boost driver or boost choke malfunction 4. Detection circuit malfunction	1. Check the insulation of Solar inputs 2. Check the capacitance (+ <-> GND & - <-> GND), must < 2.5uF. Install an external transformer if necessary 3. Check boost driver & boost choke 4. Check the detection circuit inside the inverter
F27: RCMU Circuit Fail	1. RCMU is disconnected 2. Detection circuit malfunction	1. Check the RCMU connection inside the inverter 2. Check the detection circuit inside the inverter
F28: Relay Short	1. One or more relays are sticking 2. The driver circuit for the relay malfunction	1. Replace the defective relay(s) 2. Check the driver circuit inside the inverter
F29: Relay Open	1. One or more relays are abnormal 2. The driver circuit for the relay malfunction 3. The detection accuracy is not correct for Vgrid and Vout	1. Replace the defective relay(s) 2. Check the driver circuit inside the inverter 3. Check the Vgrid and Vout voltage detection accuracy
F35: Bus Volt Over Rating	1. Driver for boost is defective 2. Voc of PV array is over550Vdc 3. Surge occurs during operation 4. Detection circuit malfunction	1. Check the driver circuit for boost inside the inverter 2. Modify the solar array setting, and make the Voc less than 550Vdc 3. N/A 4. Check the detection circuit inside the inverter

FAULT		
Message	**Possible cause**	**Action**
F36:Output Curr Transient Over	1. Surge occurs during operation 2. Driver for inverter stage is defective 3. Switching device is defective 4. Detection circuit malfunction	1. N/A 2. Check the driver circuit in inverter stage 3. Check all switching devices in inverter stage 4. Check the detect circuit inside the inverter
F37: AC Curr Over Rating	Detection circuit malfunction	Check the detect circuit inside the inverter
F42: CT Current Sensor Fail	1.Inverter choke Fail 2.Output Filter Fail 3. Detection circuit malfunction	1. Check Inverter choke inductance. 2. Check output filter capacitance. 3. Check the detection circuit inside the inverter
F50:Zero Cross Circuit Fail	The detection circuit for synchronous signal malfunction	Check the detection circuit for synchronous signal inside the inverter
F56:Hardware Incompatibility	HW power rating incorrect	Check comm. HW power rating info.
F60: DC1 Curr Over Rating	1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction	1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit
F61: DC2 Curr Over Rating	1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction	1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit
F70: DC1 Curr Transient Over	1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction	1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit
F71: DC2 Curr Transient Over	1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction	1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit

Table 9-2: Error message

10 De-Commissioning

De-Commissioning Procedure:
If necessary to put the device out of operation for maintenance and/or storage, please follow the instructions below.

WARNING !

To avoid injuries, please follow the procedures

- Switch off AC circuit breaker to disconnect from electricity grid.
- Switch off the PV Array switch to disconnect from PV Array.
- Use proper voltage meter to confirm that the AC and DC power are disconnected from the unit.
- Remove the AC wiring immediately to completely disconnect from electricity grid.
- Remove the DC wiring to disconnect from PV Array.
- Remove the communication module RS-485 connection from the computer connection.
- After completing the above steps, the inverter can be removed.

11 Technical Data

11.1 Specifications

Model	RPI H3A	RPI H4A	RPI H5A
GENERAL			
Enclosure	Powder-coated aluminium		
Operating temperature	-25~60°C, full power up to 40°C		
Operating Altitude	2000m		
Relative humidity	0% – 95% non-condensing.		
Environmental category	Outdoor, wet locations		
Galvanic isolation	No (TL Topology)		
Safety class	Class I metal enclosure with protective earth		
Pollution degree	Internal: II, External: III		
Overvoltage category	AC output: III, DC input: II		
Flicker impedance	Z = 0.4 + j 0.25 Ω (total impedance)		
Three-phase combinations	No		
DC INPUT (Solar side)			
Nominal input power	3150W	4200W	5250W
Maximum input power	3200 W	4320 W	5280 W
Max. input voltage	600Vdc		
Operating voltage range	100~550 Vdc		
MPP voltage range			
Symmetrical load	160~500 Vdc	180~500 Vdc	220~500 Vdc
Asymmetrical load	320~500 Vdc	266~500 Vdc	291~500 Vdc
Max. ratio for asymmetrical load	100/0%;0/100%	80/20%;20/80%	70/30%;30/70%
Nominal voltage	350Vdc		
MPP Tracker	2		
Max. input current (each MPPT)	10A	12A	12A
Max. short circuit current per MPPT	13.9A	16.7A	16.7A
Max. inverter backfeed current to the array	0A		
Startup voltage	100Vdc		
Input connection	2 pairs Multi-Contact® MC4 connectors		

Model	RPI H3A	RPI H4A	RPI H5A
AC OUTPUT (Grid side)			
Nominal output power	3000VA(#1)	4000VA	5000VA(#2)
Maximum power	3000VA	4000VA	5000VA
Voltage	230Vac -20%~+22%		
Nominal output current	13A	17.3A	21.7A
Max. output current	13.9A	18.2A	23.2A
Maximum output fault current	16A	20A	32A
Maximum output over current protection	16A	20A	32A
Current (inrush) (A, peak and duration)	30A peak, 1ms.		
Frequency	50/60Hz		
Total harmonic distortion	<3% @ Rated power(#3)		
Power factor	>0.99@Rated power(#3)		
Peak efficiency	97.50%	97.50%	97.50%
EU efficiency	96.80%	97.00%	96.80%
Output connection	IP 67 single-phase		
Fuse	Internal fuse, 20A/ 250V*2	Internal fuse, 20A/ 250V*2	Internal fuse, 20A/ 250V*2
MECHANICAL			
Housing	Die cast		
Cooling	convection cooling		
IP rating	IP65		
External communication	2 x RS-485 connection		
Weight	21 kg		
Dimensions	414.3 × 475.3 × 155 mm		

Model		RPI H3A	RPI H4A	RPI H5A
REGULATIONS & DIRECTIVES				
Safety		IEC 62109-1 / -2 AS 3100 CE compliance		
Grid interface		VDE V 0126-1-1 AS4777 (#4) C10/C11 2012 EN50438:2013 UTE-C-15-712-1 VDE V 0126-1-1 G83-2	VDE V 0126-1-1 AS4777 (#4) C10/C11 2012 EN50438:2013 UTE-C-15-712-1 VDE V 0126-1-1 G59-3	
Emission		IEC 61000-6-4, IEC 61000-6-3		
Harmonics		EN 61000-3-12		
Variations and flicker		EN 61000-3-11		
Immunity		EN 61000-6-2		
Immunity	ESD	IEC 61000-4-2		
	RS	IEC 61000-4-3		
	EFT	IEC 61000-4-4		
	Surge	IEC 61000-4-5		
	CS	IEC 61000-4-6		
	PFMF	IEC 61000-4-8		

#1:

(a) 2.49kW max. for Australia (AU / NZ PL2K49) (H3A)
(b) 2.99kW max. for Australia (AU / NZ PL2K99) (H3A)
(c) 3kW max. for Australia (AU / NZ) (H3A)

#2:

(a) 4.6kW max. for Australia (AU / NZ PL4K6) (H5A)
(b) 4.99kW max. for Australia (AU / NZ PL4K99) (H5A)
(c) 5kW max. for Australia (AU / NZ) (H5A)

#3: reactive power control disabled

#4: not support AS4777.2:2015 Single-phase inverters used in three-phase combinations

Appendix A

Multi-function Relay

The Inverter supports one multi-function relay, the multi-function relay is available to external devices. External devices can be: flashing lights, Buzzer Etc. the multi-function relay allows following configuration:

- Fault indicator or Grid status indicator
- Power production
- Control of external loads
- Fan control

A.1 Multi-function relay output connection

The dry contact connection provides a remote indication of inverter status. When the inverter is operating normally, the dry contact is closed. The user can use the Monitor MODBUS SW tool, the multi-function relay will be configured as mentioned in the event setting. Please refer to ***Figure A-1***

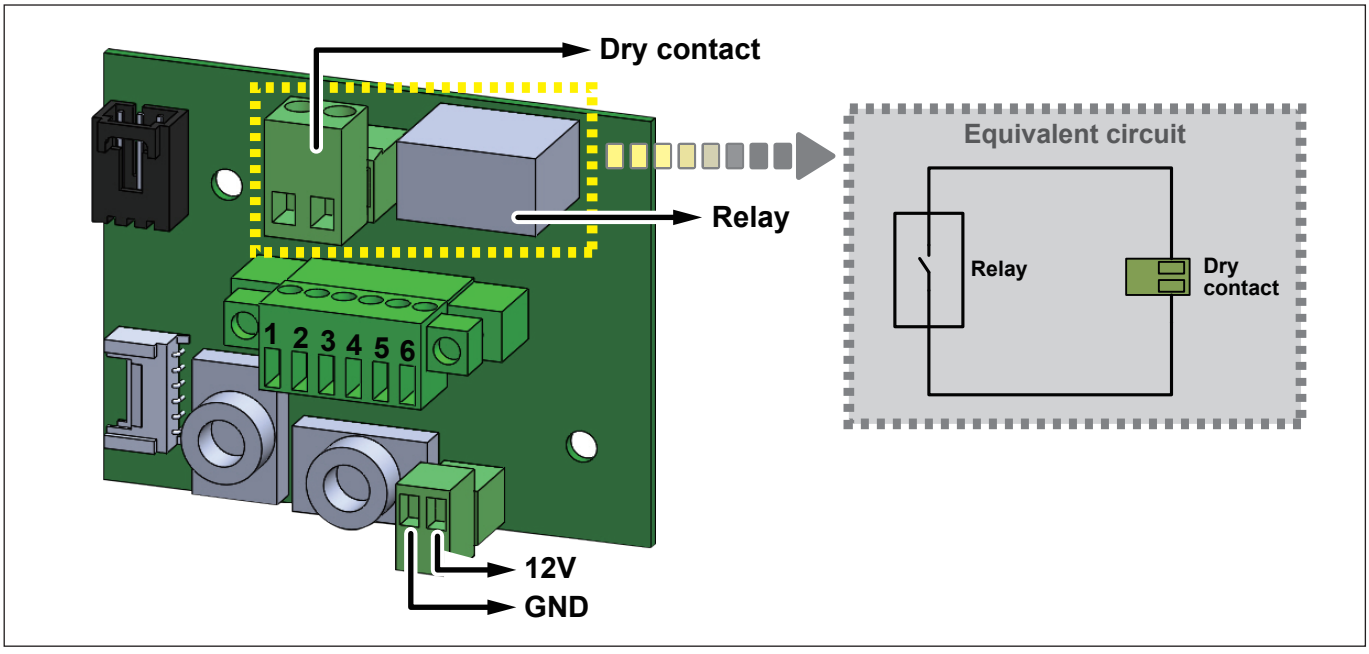


Figure A-1: Multi-function Relay location

Danger! Hazard of Electric shock.

Touching of electronic components can damage the components through electrostatic discharge.

Appendix B

Digital Input

To implement power management, the digital input interface receives the specifications of the network operator via a ripple control receiver.

- Germany : The active power limitation in the stages 0%, 30%, 60% and 100%
- Italy : Power output of Max 6KW for PV plant installation.
  Remote shutdown
  Narrow Frequency limits between 49.5 Hz to 50.5Hz.
- Australia and New Zealand:
  The inverter support the demand response mode(DRMs).
  DRM 0 - Operate the disconnection device.
  DRM 5 - Do not generate power.
  DRM 6 - Do not generate at more than 50% of rated power.
  DRM 7 - Do not generate at more than 75% of rated power.
  And sink reactive power.
  DRM 8 - Increase power generation.
  (subject to constraints from other active DRMs)
- Customer : User defined.

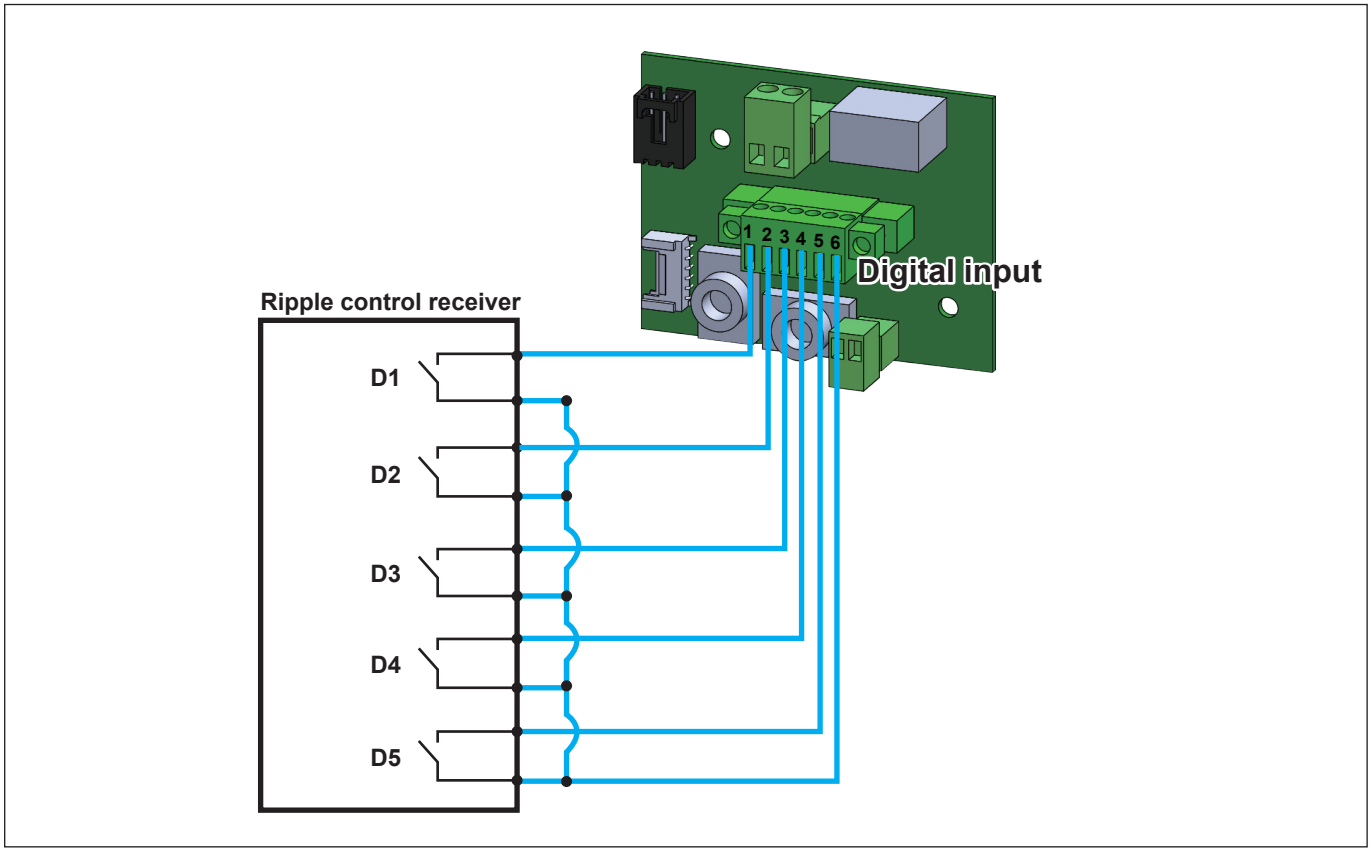


Figure B-1: Pin assignment at ripple control receiver

The inverter gives a voltage to the Output (6) and measure Digital Input (1 to 5). The inverter can detect the status of the relay of the ripple control receiver. The information which relay shall be controlled parameter by the network operator.

Pin	Function
1	Digital input 1
2	Digital input 2
3	Digital input 3
4	Digital input 4
5	Digital input 5
6	Output

Country =Italy LV/SPI

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
Remote off	1#	0#	0	0	0	1
Narrow frequency limit.	0	1	0	0	0	1

#1: Relay is closed, 0: Relay is open.

Country = Germany

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
Active power = 0%	1#	0#	0	0	0	1
Active power = 30%.	0	1	0	0	0	1
Active power = 60%	0	0	1	0	0	1
Active power = 100%	0	0	0	1	0	1

#1: Relay is closed, 0: Relay is open.

Country = Australia or New Zealand

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
DRM 0 Disconnection device	1#	0#	0	0	0	1
DRM 5 Active power = 0	0	0	0	0	1	1
DRM 6 Active power < 50%	0	0	0	1	0	1
DRM 7 Active power < 75% Sink reactive power	0	0	1	0	0	1
DRM 8 Active power < 100% Sink reactive power	0	1	0	0	0	1

#1: Relay is closed, 0: Relay is open.

The power behind competitiveness

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操作手冊

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DELTA
Smarter. Greener. Together.

目 录

Figure

Table

1 概 要

1.1 手册简介

此手册内提供太阳能逆变器RPI H3A / H4A / H5A的规格、安装程序及相关功能设定，关于安装人员对于太阳能发电系统需经过训练及认证，并于安装时遵照安规及安装程序作业。

1.2 安规图示说明

小心搬运您的产品可以使产品的使用寿命更长, 可靠度更佳, 使您的产品达到最大效益。产品有时可能会过重, 需要两个人一起搬运。

注 意！

电子组件在逆变器正常工作时存有危险电压，不良的搬运方式可能导致机器和人身的损毁。确切遵守本手册之规定，任何安装步骤只可以由合格安装人员来进行。

警 告！

电子组件的维修工作只可由制造商进行， 机器内部并无提供任何可由用户操作的组件。确切遵守本手册之规定，机器进行任何操作之前务必将本逆变器从市网以及太阳能板隔离。

危 险！

为避免电击，请勿打开逆变器，机器内部并无提供任何可由用户操作的组件。擅自打开机器会使保固失效。任何电源切断五分钟内仍存有危险电压。
本机器存有高漏电电流，任何操作前确认PE导线已经接妥。

警 告：高温危险！

当机器运转时温度可能超过摄氏70度，高温环境易造成危险发生，禁止触摸!!

1.3 合法性

此使用手册由台达电子公司之品牌提供以下机种的安装程序、维修保养与安规信息。

- RPI H3A
- RPI H4A
- RPI H5A

1.4 产品概述

本机为单相市电并网太阳能逆变器，此装置将自太阳能板发出的直流电流(DC)转换为单相AC交流电流输出，并提供至市电网络。

本机设计时为方便使用者，提供了大范围的输入电压 (100~550Vdc)和高转换效率，并使用专用的DSP(Digital Signal Processor)来简化电路设计及电子组件的数量。
请特别注意此装置并不支持独立发电功能，以下为RPI H3A / H4A / H5A特性介绍。

产品特性

- 额定功率：3kVA(RPI H3A), 4kVA(RPI H4A), 5kVA(RPI H5A)
- 单相 (L + N + PE)，并网型非变压器隔离型太阳能逆变器
- 最大效率：> 97.5 %
- 欧洲效率: 96.8% (RPI H3A) , 97.0%(RPI H4A), 96.8%(RPI H5A)
- 虚功容量 (Cap 0.8 – Ind 0.8)
- 满载时总谐波失真率(THD < 3%)
- 2 组最大功率追踪
- 16×2 LCD 显示面板

1.5 逆变器动作原理

太阳能逆变器之操作如下图1-1，此装置将自太阳能板发出的DC电流转换为单相AC电流输出以达到节省能量与电力的功效。

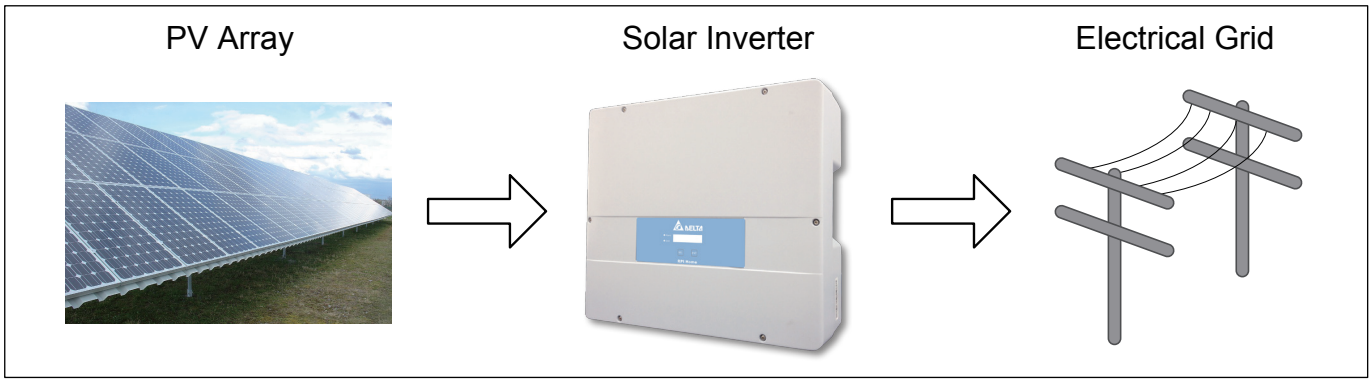


图1-1 : 太阳能逆变器系统操作图解

1.6 其他相关信息

若需要关于RPI H3A / H4A / H5A其他细节信息或其他产品信息内容，
可参考台达电子网站 : http://www.deltaww.com.

2 安装与配线

2.1 安装前指南

因客户端设备环境的多变，建议安装前须完整阅读操作手册，且所有安装程序和开机动作需由合格之专业人员来着手进行。

2.2 拆除包装

拆装程序如图2-1。

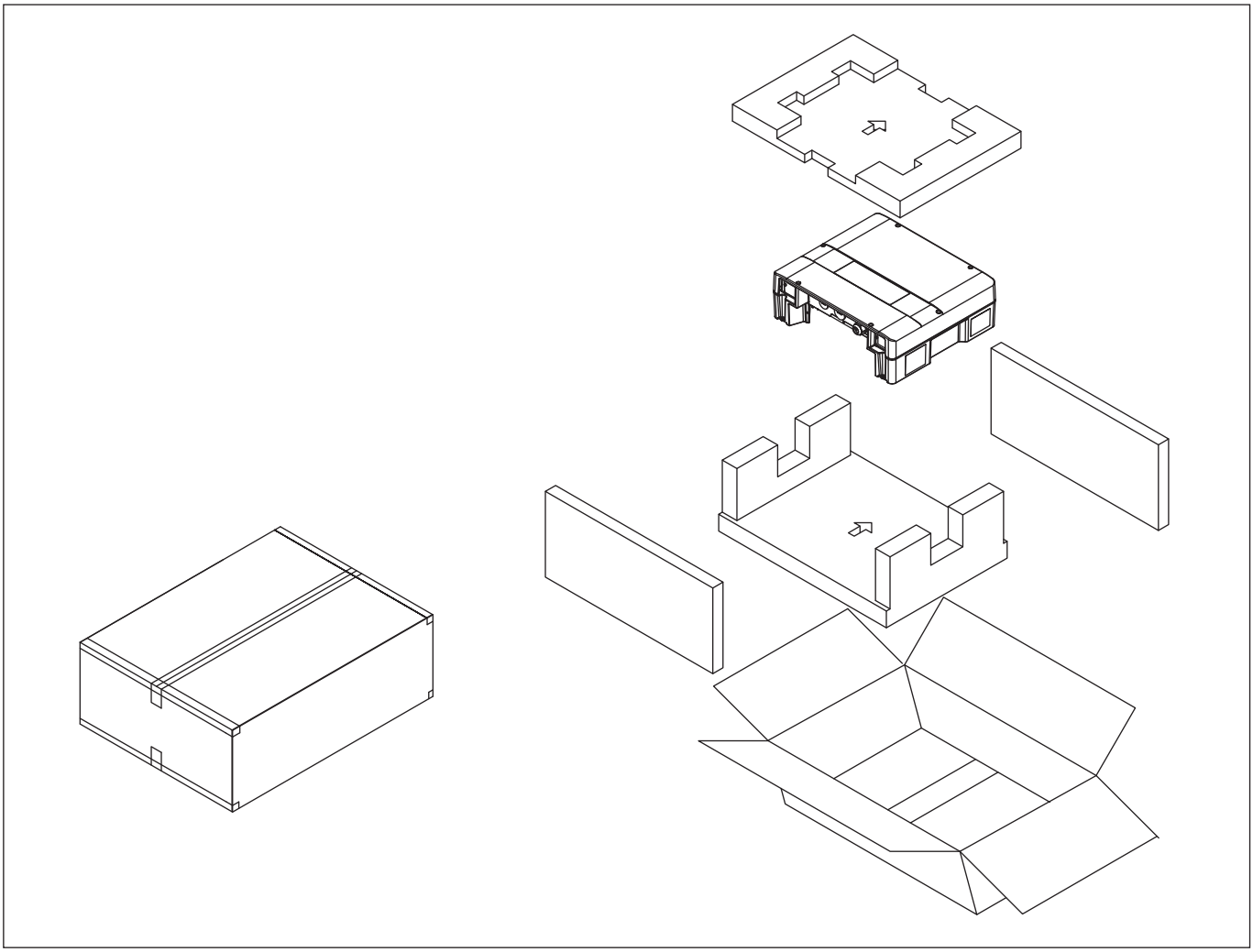


图2-1 : 拆除包装流程

当您收到全新的逆变器时, 会需要拆除其外包装。这些包装由不同材质所组成，在不同材质上有打印不同的回收方式：例如纸箱可以回收, 但是保丽龙不可以。为了共同营造一个更好的生活环境, 请确实回收这些包装材料。

2.3 包装检验

由于在产品运输过程中可能有无法预期之状况产生，请先确认包装外观是否有任何毁损。拆装后，依以下程序逐步检查产品之内外部：

检查产品外壳右侧之产品型号及产品规格是否符合购买型号，检查是否有组件松脱，检查下表内所有附件是否有缺少，标准配件详见表2-1。

RPI H3A / H4A /H5A		
品　名	**数量**	**描　述**
太阳能逆变器	1	太阳能逆变器本体
使用手册	1	提供安规、安装、规格等相关信息
AC 插头	1	做AC端的连结
DC Plug	2	做DC端的连结
壁挂板	1	固定逆变器于墙上用
M4螺丝	2	固定逆变器于壁挂板用

表2-1：内容物清单

注　意！

当产品内部或外部及配件有任何不完整或毁损状况发生时，
请与逆变器之供货商联系。

2.4 规格卷标

识别逆变器时，用户可利用产品卷标上的信息，卷标上列有产品序号及型号，卷标位置如下图所示：

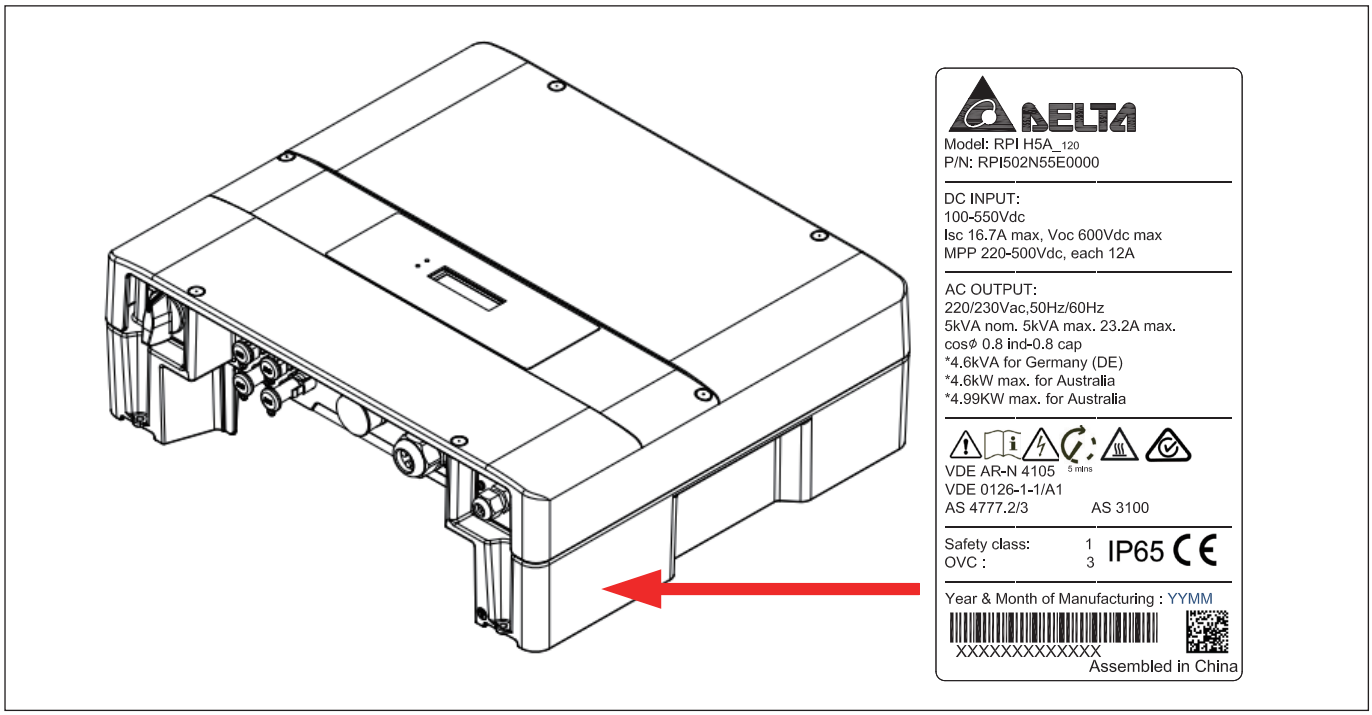


图2-2：规格卷标

3 产品概观

3.1 尺寸规格

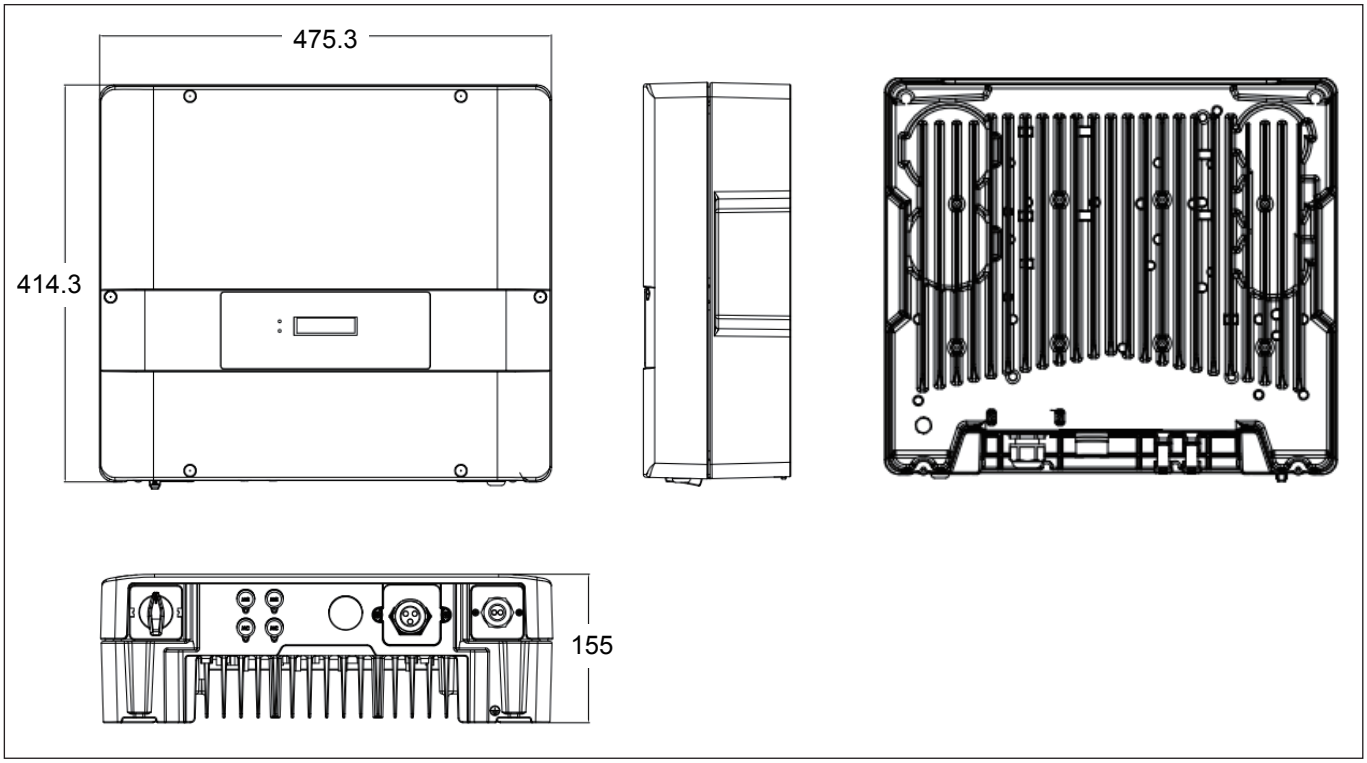


图3-1：尺寸规格

3.2 功能介绍

逆变器外部对象如图3-2所示，在3.2.1至3.2.2章节中有详细功能介绍。

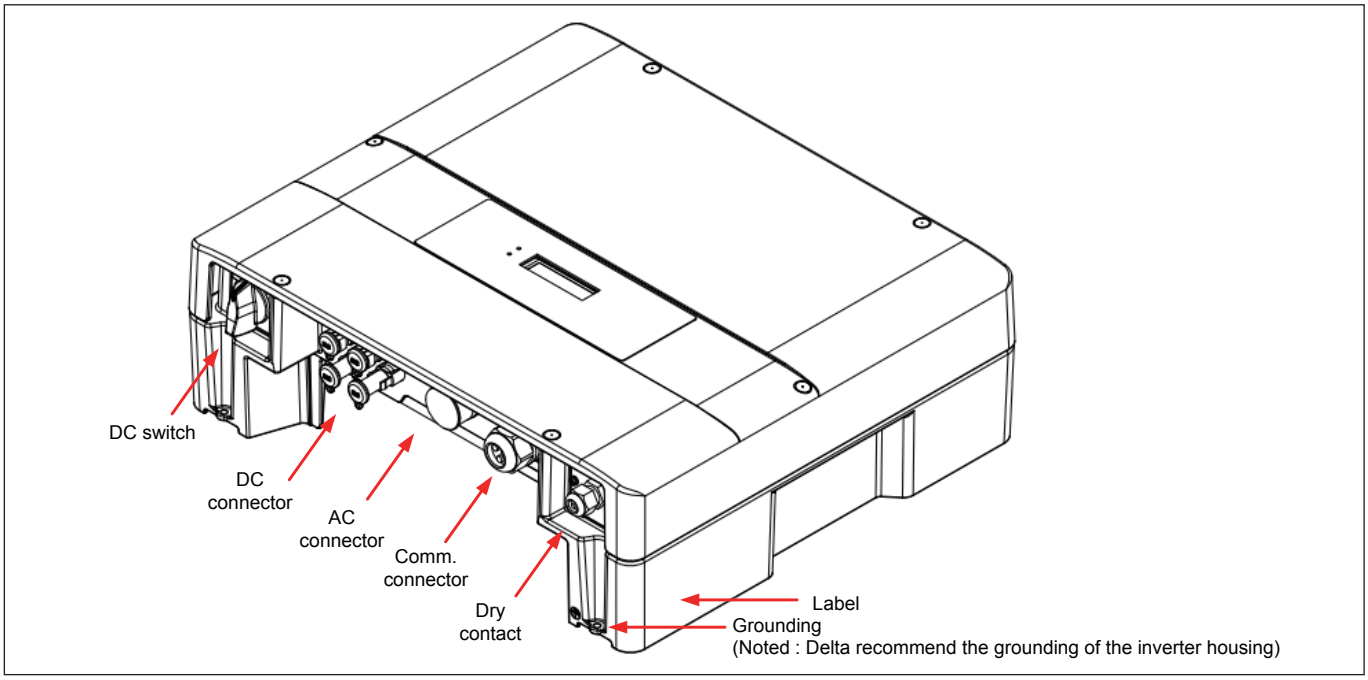


图3-2：逆变器外观

3.2.1 LCD 显示面板与按键

图3-3：显示面板与按键

3.2.2 逆变器输入与输出接口

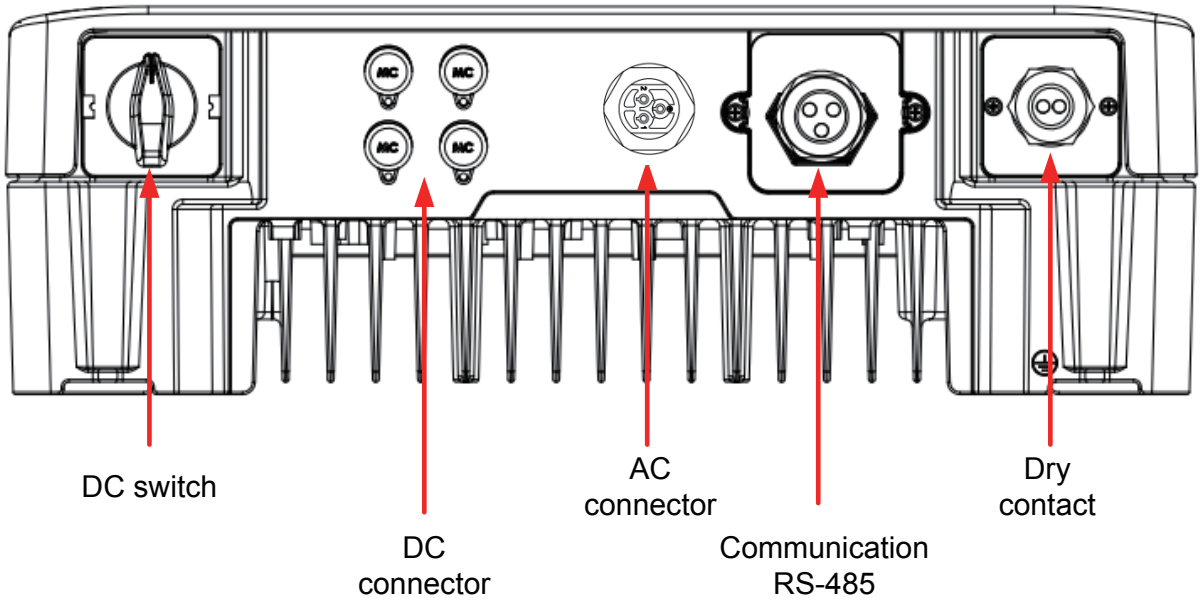


图3-4：输入与输出接口

说 明

DC SWITCH只在-120系列机种才有提供;-020系列机种没有提供。

4 安 装

4.1 安装地点

警 告！

请勿安装于可燃物附近。
请将产品确实固定于坚固平坦的墙上。

注 意！

请勿将产品安装于阳光可直接曝晒的地方。

4.2 壁挂作业

本机属于壁挂式系统，安装时请确保产品与地面保持垂直，AC插头在产品之底部，勿将产品架设于倾斜之墙面，壁挂板尺寸规格列于下图所示，壁挂板所需共有8 个φ5.5螺丝，逆变器架设前应确实锁紧壁挂板。

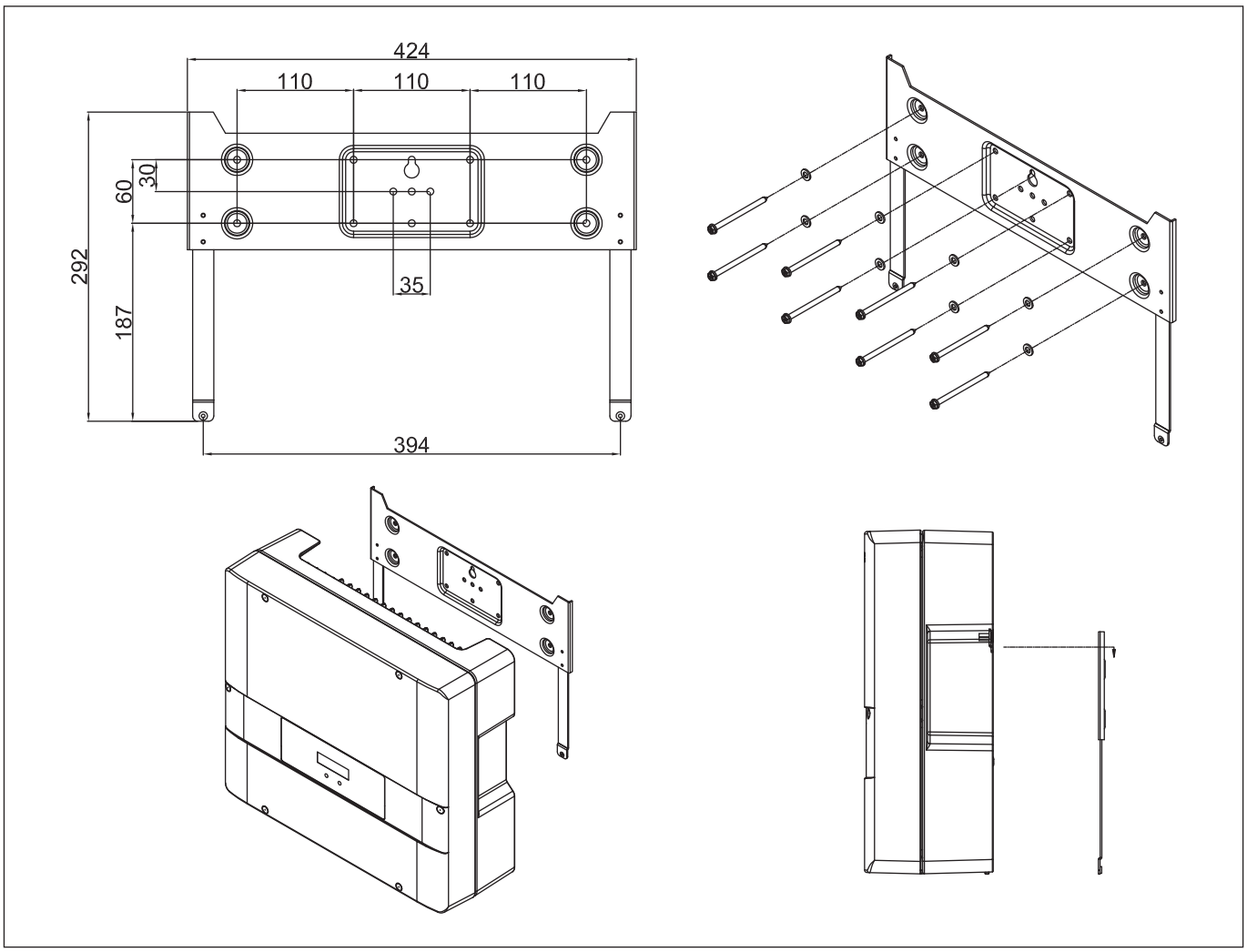


图4-1 : RPI H3A / H4A / H5A壁挂板安装方式

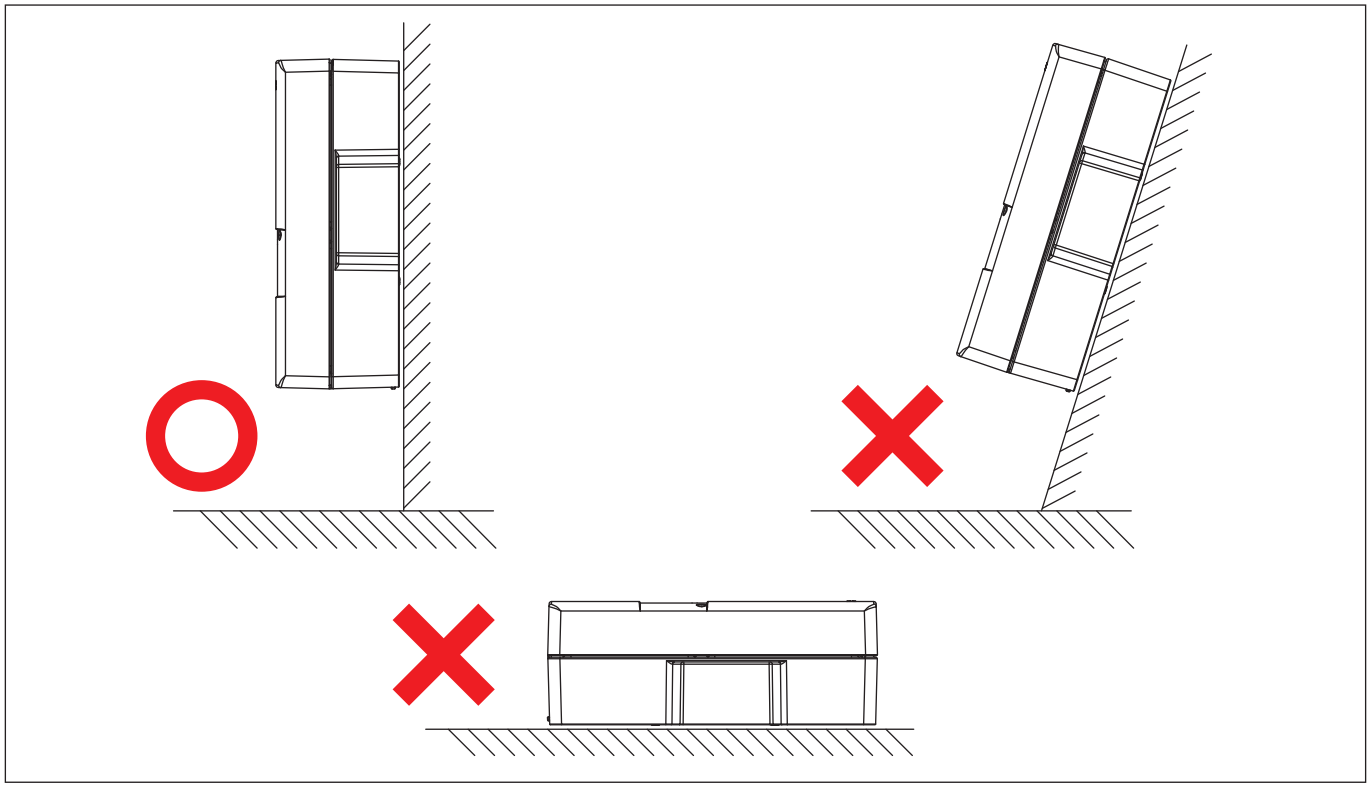


图4-2 正确与不正确之安装图解

警 告！

- 壁挂板是专为逆变器安装而设计，逆变器只可安装在壁挂板上。
- 安装地点以坚固平面为佳，以承受逆变器之重量。
- 建议安装于进出畅通而且安全的地点，以利后续服务与维护保养。
- 安装多台逆变器时产品之间请保持适当距离。
- 请将产品安装于视线容易观察之地点以利操作与设定。
- 环境温度介于 -25℃到60℃之间.(40℃以上会发生功率降额)。

产品架设之前要确认空间足够以利散热，建议安装的空间尺寸请参考图4-3，安装人员若需要可自行加大间隙以利产品安装。

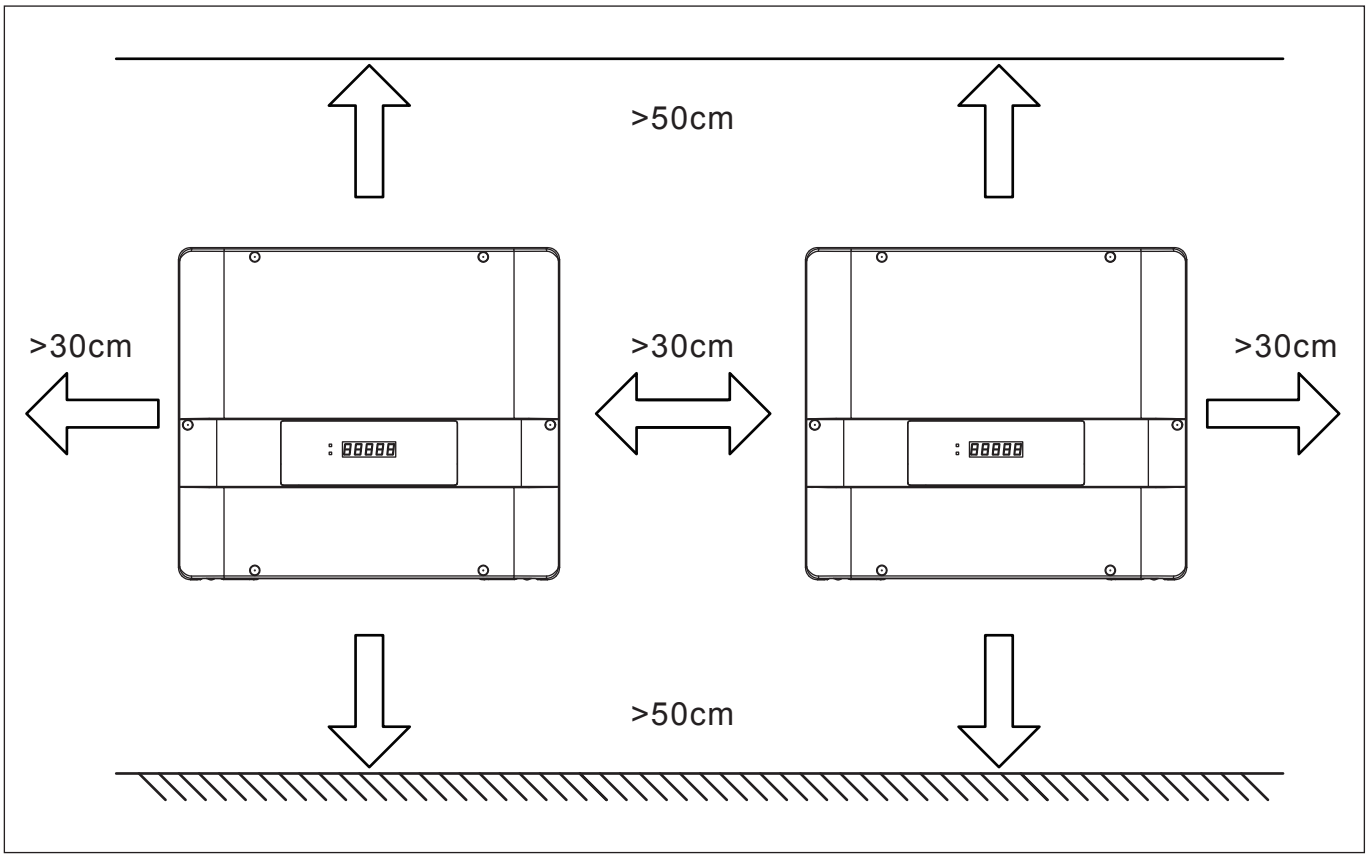


图4-3 : 安装之适当间隙

5 配 线

5.1 配线前准备

1. 确认电压值、电压极性是否正确。
2. 由于本机器RPI H3A / H4A / H5A在直流输入和交流输出之间并无做直流隔离，当太阳能板需要接地时，产品须另接隔离变压器。
3. 接地阻抗侦测线路为内部固定功能设定，不能被更改。
4. 系统配线图如图5-1或图5-2所示。
5. 如图5-1所示，产品可接受2组DC并联输入(2组最大功率追踪和2组并联输入)。

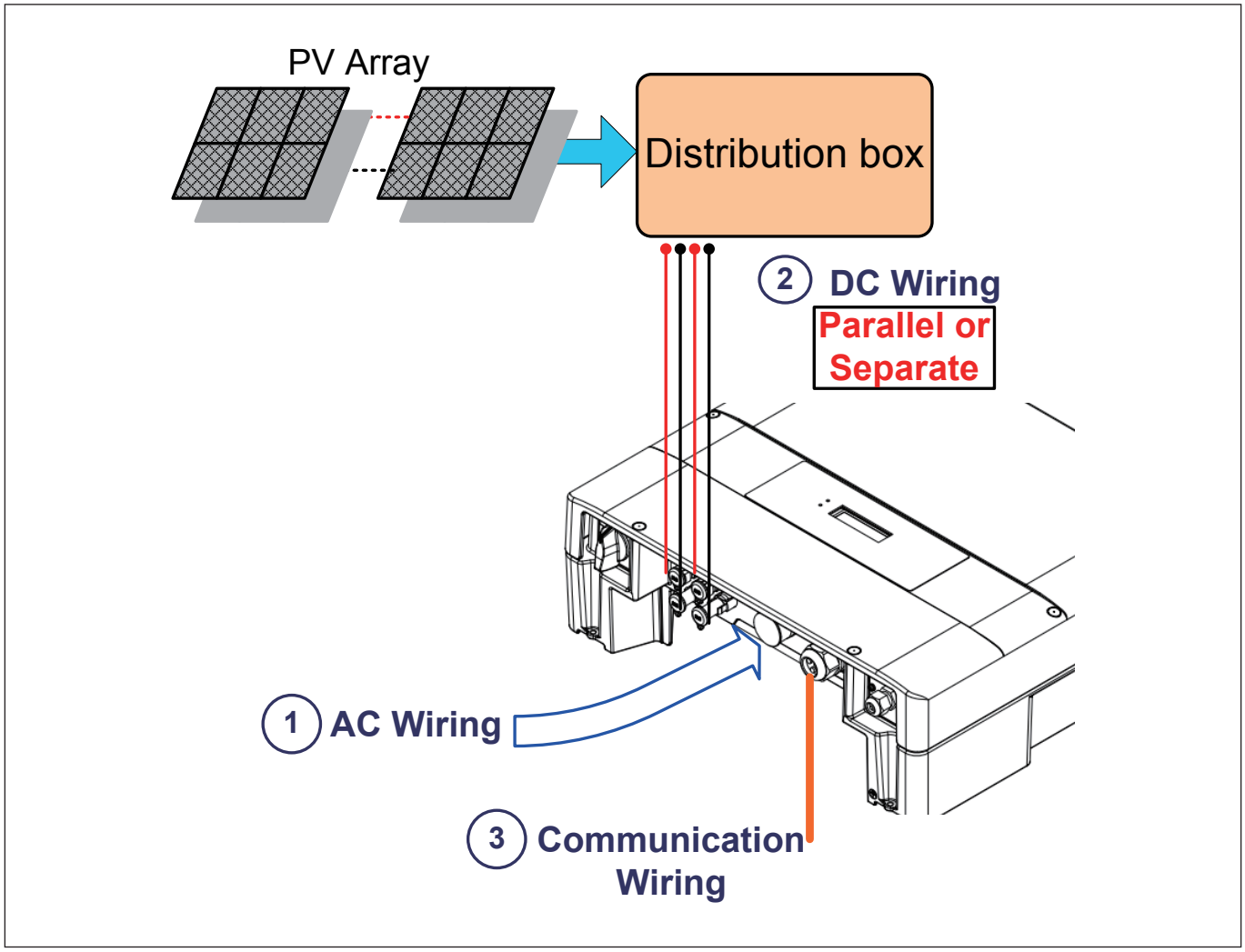


图5-1：太阳能逆变器配线图(DC侧不接地)

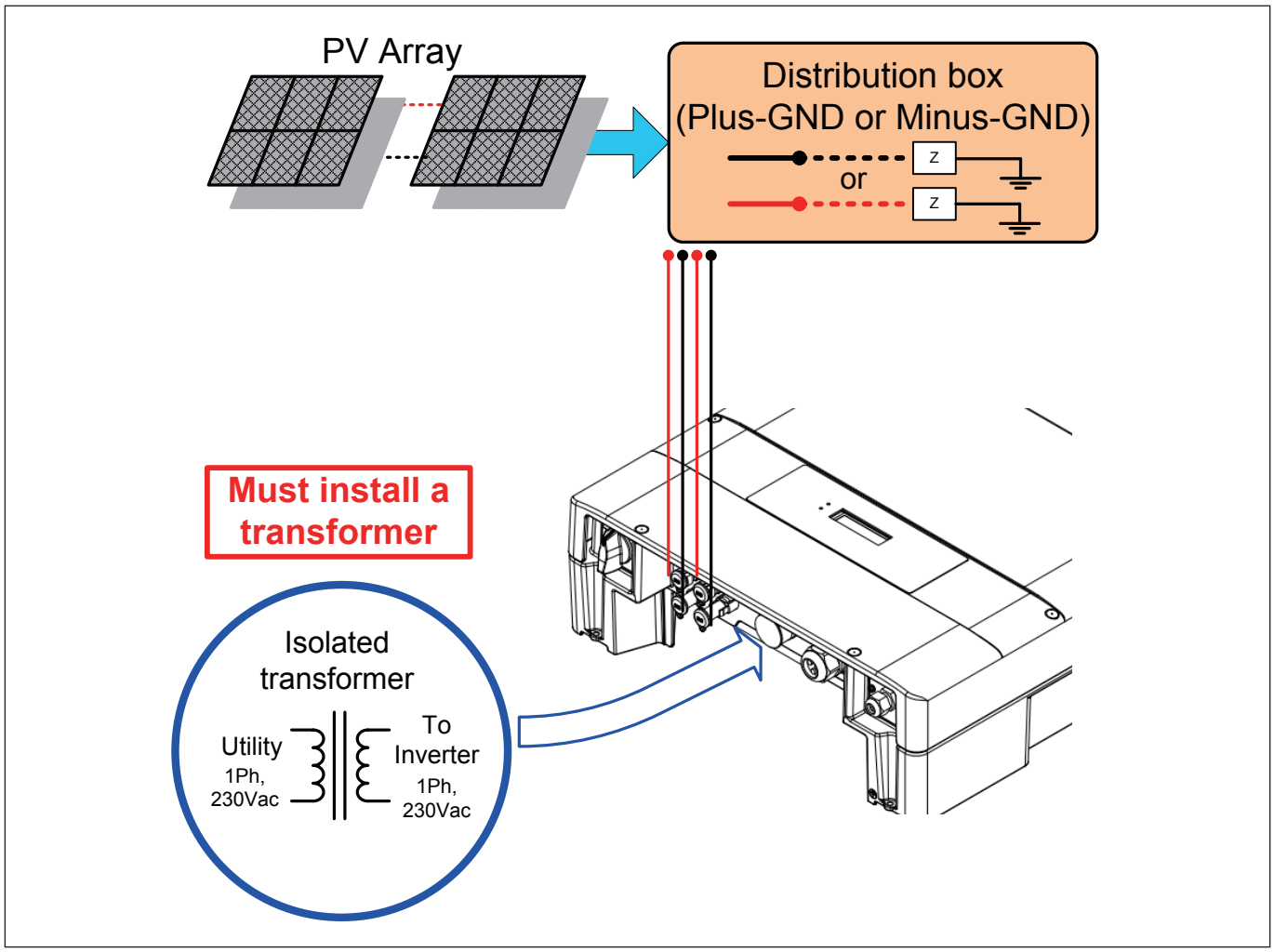


图5-2：太阳能逆变器配线图(DC侧正接地或负接地)

警 告：触电危险！

当太阳能板暴露于阳光时，输出电线与金属端子会有触电的危险，为了降低安装时触电之风险，在开始配线之前以绝缘物质覆盖于太阳能板之上并确认断路装置设定在OFF。

5.2 AC连接: L + N + PE

警 告：可能导致人员伤亡！

在AC配线之前，先确认AC断路器已切换至OFF。

5.2.1 保护装置及导线规格

建议前端保护装置

	额定功率	前端电路断路器
RPI H3A RPI H4A RPI H5A	3.75kVA 5 kVA 6.25 kVA	20A 25A 30A

表5-1：前端电路保护

配线时请参考表5-2，使用合适的导线

额定电流	导线规格	力矩
>20A (RPI H3A) >25A (RPI H4A) >30A (RPI H5A)	3-4mm^2 / 12 AWG	0.8~1Nm

表5-2：AC导线规格

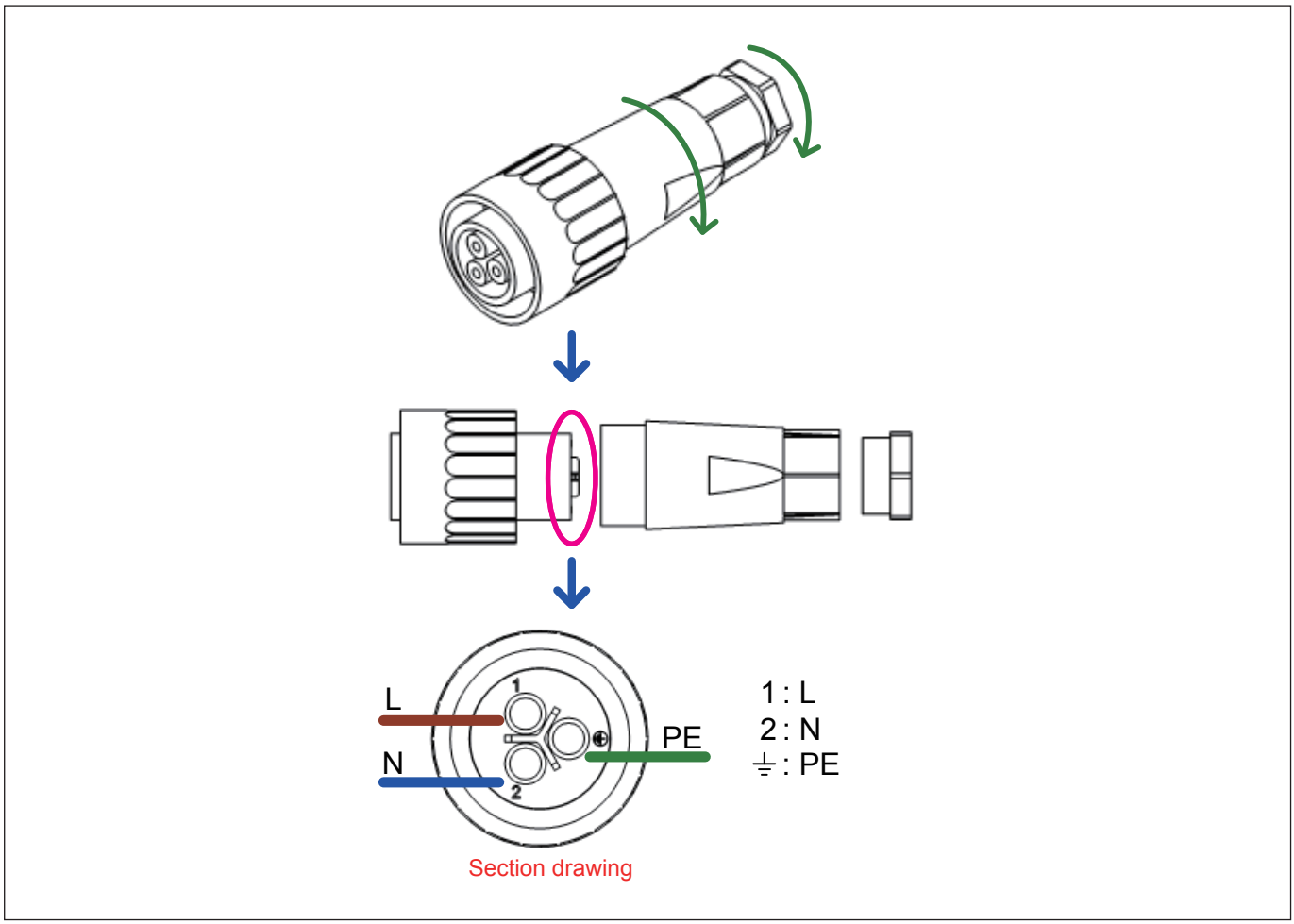


图5-3：AC插头图解(C01620E0028001, AMPHENOL CORP)

5.3 DC连接 (从太阳能板)

警 告 !

- 在DC配线时请选择适当布线连结至正确极性。
- 在DC配线时请确认太阳能板的开关已关闭。

注 意!

太阳能板的最大开路电压不能超过600Vdc。
太阳能板输入功率建议值为

Type of limit	RPI H3A	RPI H4A	RPI H5A
Total input power	3200W	4320W	5280W
Per MPP tracker*	3200W	3200W	3500W

*with unbalanced input power

NOTE

The device installed between the PV Array and inverter must meet the rating of voltage higher than this device's maximum input voltage.

5.3.1 非对称加载

逆变器使用两组独立MPP追踪来优化调整对称与非对称性系统之负载。以此来达成复合发电系统设计的要求。
例如：东/西向屋顶（对称负载）或南向屋顶，如天窗（非对称负载）。

MPP range with Max. power	RPI H3A	RPI H4A	RPI H5A
Symmetrical load	160~500V	180~500V	220~500V
Asymmetrical load	320~500V	266~500V	291~500V
Max. ratio for asymmetrical load	100/0%;0/100%	80/20%;20/80%	70/30%;30/70%

The RPI range of PV inverters uses genuine Multi-Contact® MC4 connectors.

CABLE COUPLER POLARITY	WIRE SIZE 2.5 MM² (AWG 14)	WIRE SIZE 4.0 MM² - 6.0 MM² (AWG 12-10)	FEMALE CABLE COUPLER	MALE CABLE COUPLER	MULTI-CONTACT ORDER NUMBER
Plus coupler	●		●		32.0010P0001-UR 32.0012P0001-UR
Minus coupler	●			●	32.0011P0001-UR 32.0013P0001-UR
Plus coupler		●	●		32.0014P0001-UR 32.0016P0001-UR
Minus coupler		●		●	32.0015P0001-UR 32.0017P0001-UR

表 5-3 : MC4接头的购买序号

电流额定值		线径尺寸
DC 10 A (RPI H3A)	DC 12 A(RPI H4A / H5A)	2-3mm² / 14 AWG

表 5-4 : 导线尺寸规格

DC 接头配线极性可区分为正极与负极如图5-4。

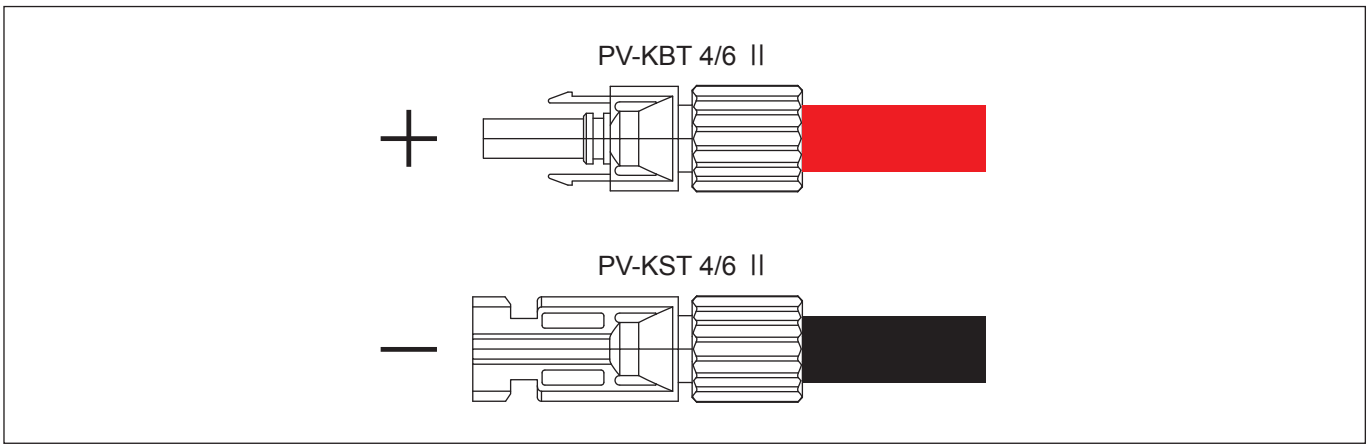


图5-4 : DC接头配线图

5.4 通讯模块

通讯模块提供本逆变器与计算机之间的通讯功能，并提供2个RS-485埠位，当要使用此模块时须先取下底部右方的外盖再拉出RS-485模块如图5-5

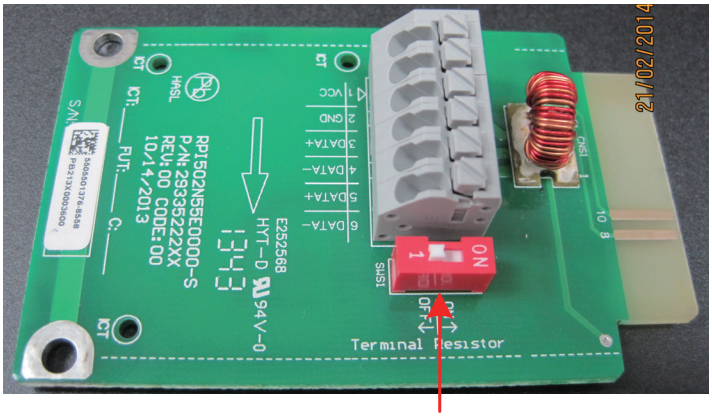


图5-5 : 通讯模块

5.4.1 RS-485 通讯连接

RS-485的pin脚定义如表 5-5所列，通讯协议设定则列于表5-6，安装单一台逆变器时终端电阻应该设成ON, 安装多台逆变器串联时需将第一台和最后一台终端电阻设为ON, 其余的终端电阻则设成OFF, 串联配线图如图5-6

PIN	FUNCTION
1	VCC
2	GND
3	DATA+
4	DATA–
5	DATA+
6	DATA–

表5-5 : RS-485脚位定义

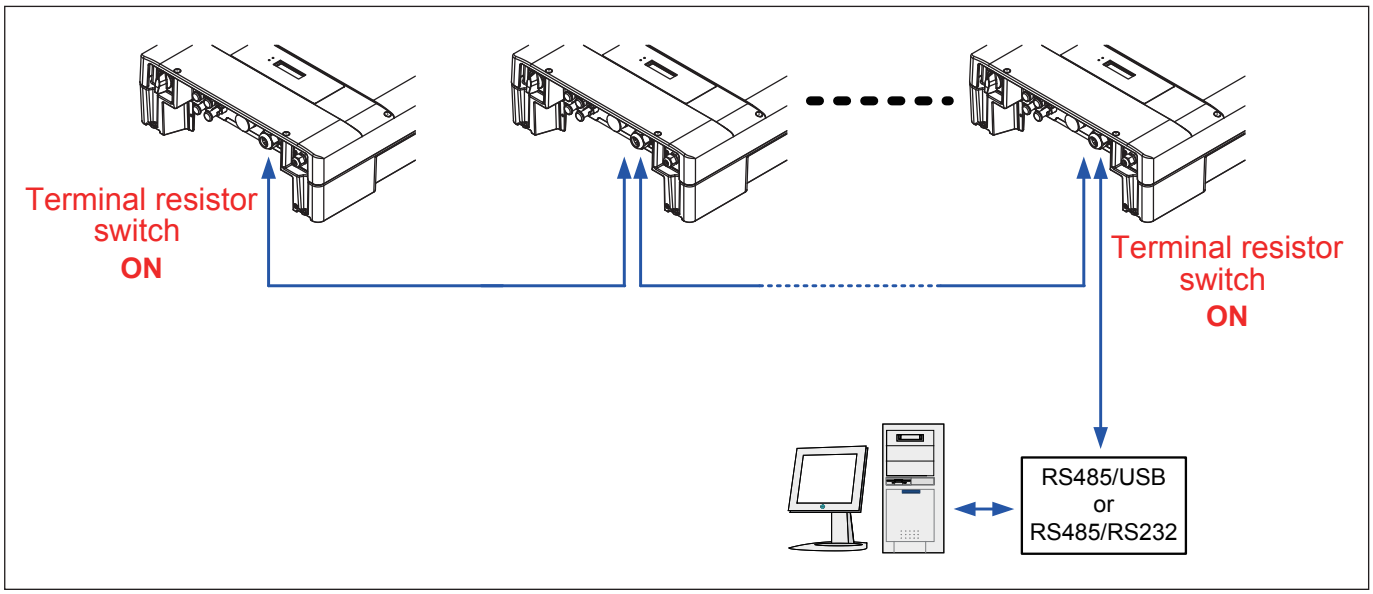


图5-6 : 多台串联配线图

RS-485 Data format	
Baud rate	9600 / 19200
Data bit	8
Stop bit	1
Parity	N/A

表5-6 : RS-485通讯协议设定

6 实功与虚功控制及低压穿越(非必要选项)

依据VDE-AR-N 4105及CEI 0-21，使用者有2种实功控制设定及4种虚功控制设定。

6.1 实功控制

6.1.1 功率限制

使用者可用百分比的方式降低逆变器输出功率。
设定方式有两种：

1. 以额定功率为100%。
2. 依当下输出功率为100%。

6.1.2 功率vs.频率

根据VDE-AR-N 4105 (5.7.3.3)：

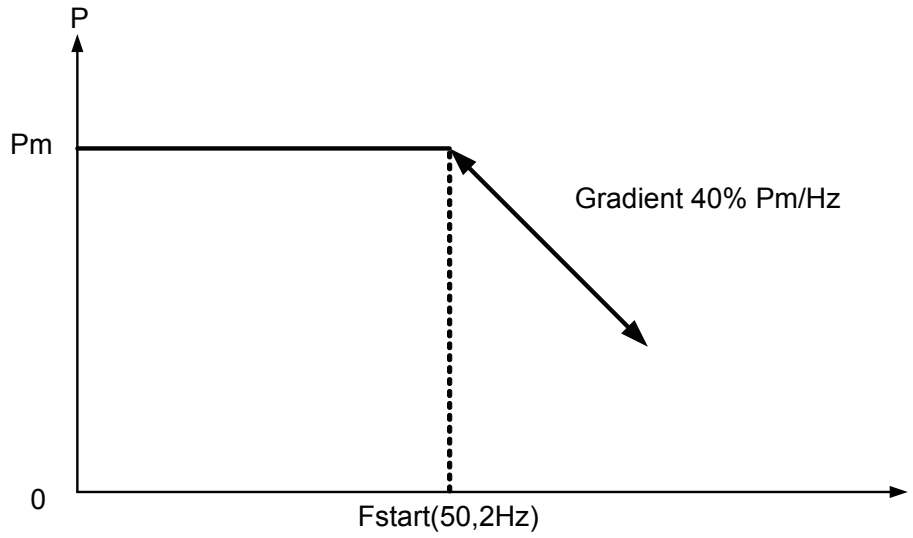
参考图6-1。当频率介于50.2Hz至51.5Hz之间，输出功率会随着频率上升(下降)而下降(上升)。输出功率上升(下降)的斜率为40%Pm/1Hz。Pm为50.2Hz时的输出功率。

详细的动作原理可参考VDE-AR-N 4105 (5.7.3.3)

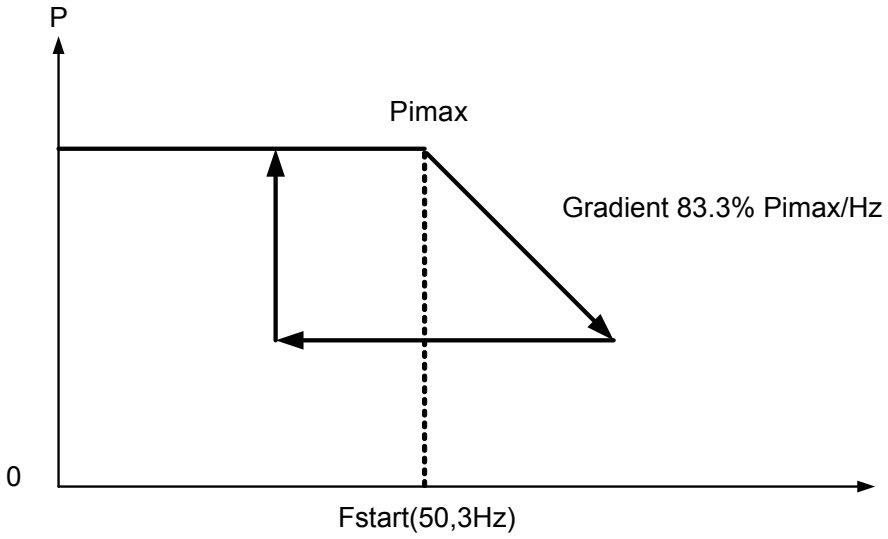
根据CEI 0-21 (8.5.3.2)：

参考图6-1。当频率介于50.3Hz至51.5Hz之间，输出功率会随着频率上升而下降。输出功率下降的斜率为83.3%Pm/1Hz。Pm为50.3Hz时的输出功率。

详细的动作原理可参考CEI 0-21 (8.5.3.2)



功率vs.频率曲线 (VDE-AR-N 4105)



功率vs.频率曲线 (CEI-021)

图6-1 : 功率vs.频率特性

6.2 虚功控制

使用者有以下四种虚功控制方式：

- 固定功率因数cosφ (VDE-AR-N 4105 ,CEI 0-21)
- displacement factor/active power characteristic curve cosφ(p) (VDE-AR-N 4105 ,CEI 0-21)
- 固定虚功量(Var)(CEI 0-21)
- 虚功 / 电压特性Q(U). (CEI 0-21)

6.2.1 Fixed Power Factor cosφ (VDE-AR-N 4105,CEI 0-21)

使用者可设定输出功率因子从Cap 0.8到Ind 0.8 (若输出功率低于额定功率20%，逆变器将停止虚功控制)。

6.2.2 cosφ(P) (VDE-AR-N 4105,CEI 0-21)

使用者可设定P1，P2，Cap 0.9，Ind 0.9四个参数来决定输出功率因子与输出功率关系。如图6-2

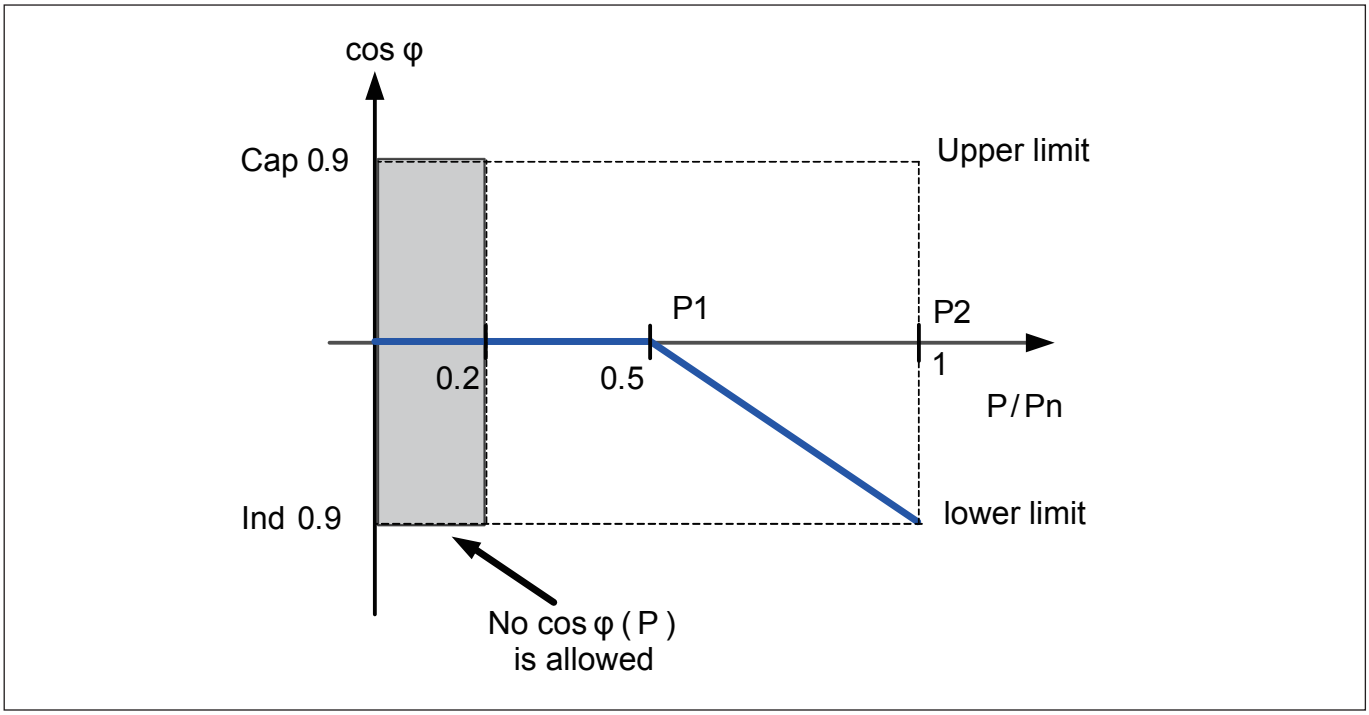


图6-2 : cosφ(P)特性

6.2.3 Fixed Reactive Power InVAR(CEI 0-21)

使用此种方式时，逆变器将依照固定虚功设定值来输出虚功。
使用者可设定输出范围从Cap 48.4% 到 Ind 48.4%.。

6.2.4 虚功 / 电压特性 Q(U) (CEI 0-21)

使用者可设定U1s，U1i，U2s，U2i，Qmin，Qmax六个参数来决定输出。
Q与市电电压关系，如图6-3

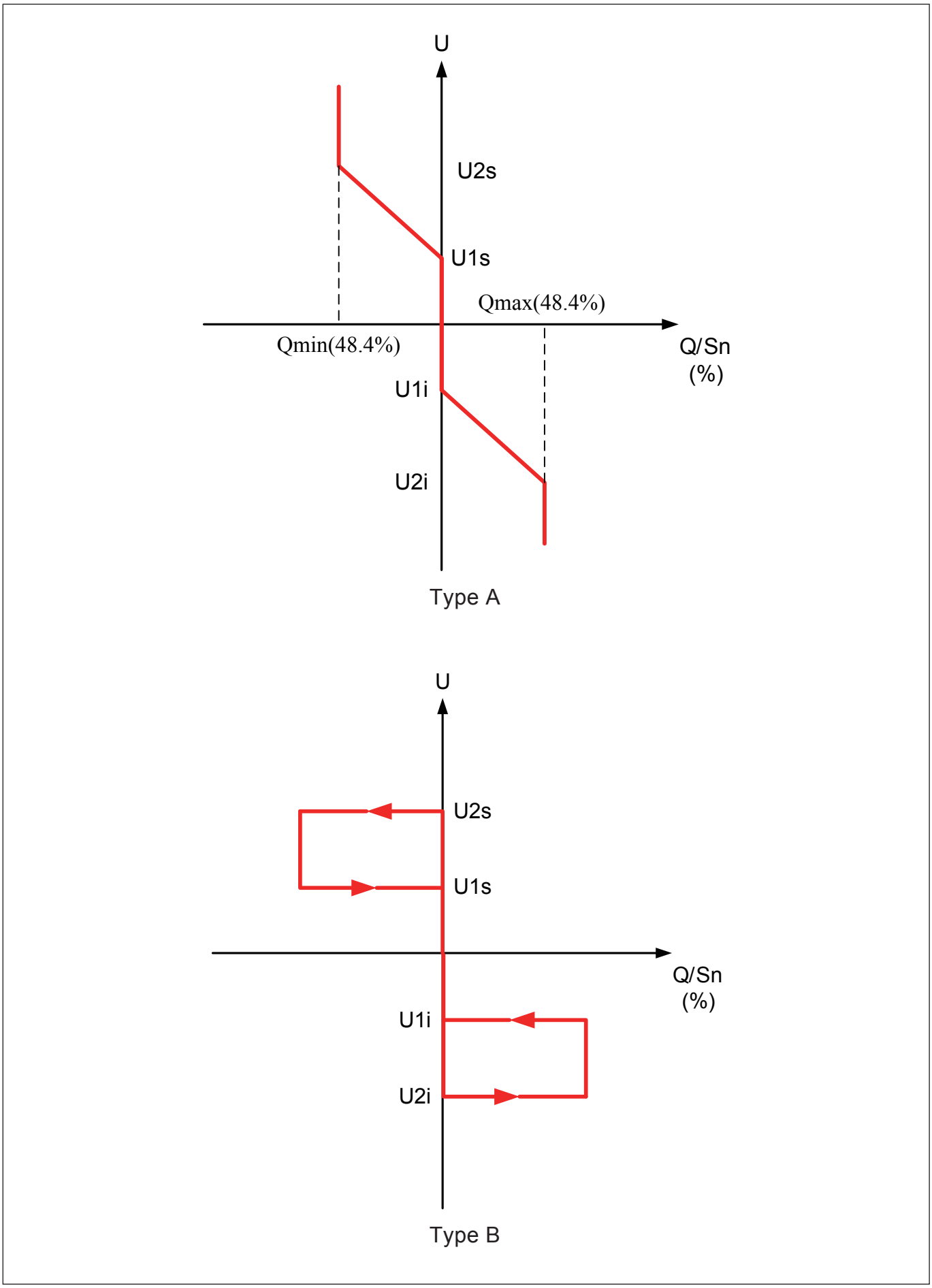

U
U2s
U1s
Qmax(48.4%)
Qmin(48.4%)
Q/Sn
(%)
U1i
U2i
Type A
U
U2s
U1s
Q/Sn
(%)
U1i
U2i
Type B

图6-3 : Q(U)特性

6.3 低压穿越 (LVRT)

根据CEI 0-21, 8.5.1

当电压下降现象发生时，为了避免与网络不正常脱离，总功率超过6千瓦的发电系统必须符合一定的功能性需求，就是国际上一般通称的低压穿越LVRT(Low Voltage Ride Through)。

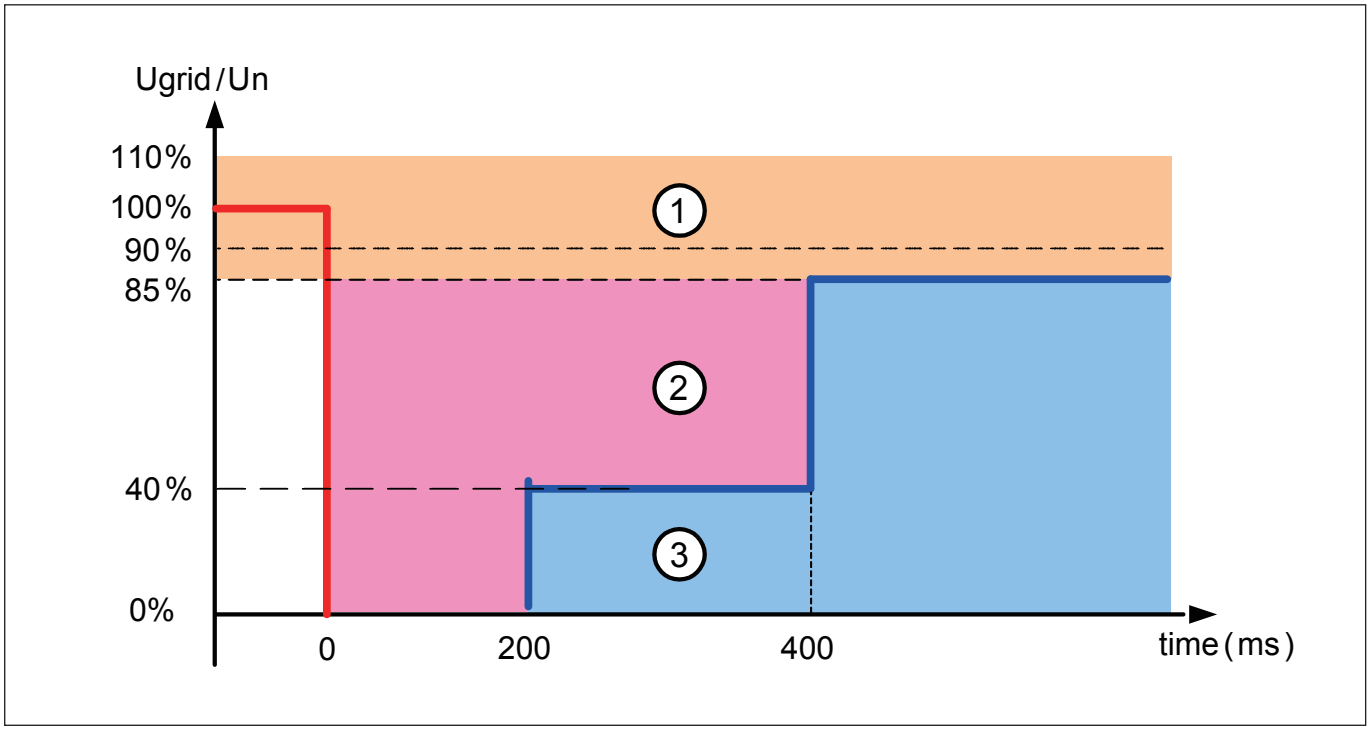


图6-4 : LVRT特性

7 逆变器的开启与关闭

警 告：高温危险！

产品运作时外壳温度可能超过70℃，导致表面产生高温烫伤的危险，请勿触摸！

安装完成后，请确认AC、DC及通信链接状况是否正确，若日照充足，且自我测试(每日第一次启动约2分钟)未出现异常状况，逆变器将自动开始运作，此产品含16×2 LCD显示屏幕及LED指示灯显示逆变器之运作状态，LED指示灯含绿灯及红灯分别代表逆变器不同运作状况。

7.1 产品激活程序

7.1.1 检查太阳能板的DC电压

1. 将太阳能板直接曝晒于阳光之下，阳光必须大到可以产生足够的输出电压。
2. 量测太阳能板正负两端子间的开路直流电压。

7.1.2 检查AC市电电压

使用AC 伏特计量测L1 (L) 和L2 (N) 之间市电开路电压，确保电压落于大约正常值，逆变器将工作在一个近似市电的弦波的一般电压值，请参照 “11. 技术数据” 的输出部分以了解本机器市电电压操作范围。

7.1.3 开启逆变器

1. 将DC和AC断路器切换到ON的位置。

2. 检查逆变器LCD显示屏幕，需等待几秒后屏幕亮起(产品第一次开启时需选择国别以及语言参照 “7.3.2国别选择&7.3.3语言选择”)。

7.2 逆变器设定

7.2.1 国别设定

产品第一次开启时需选择国别

1. 在国别选择页面，按 “NEXT” 按钮选择所在地国家后，按下 “Enter” 按钮确认选择。

2. 按下 “Enter” 按钮确认选择。

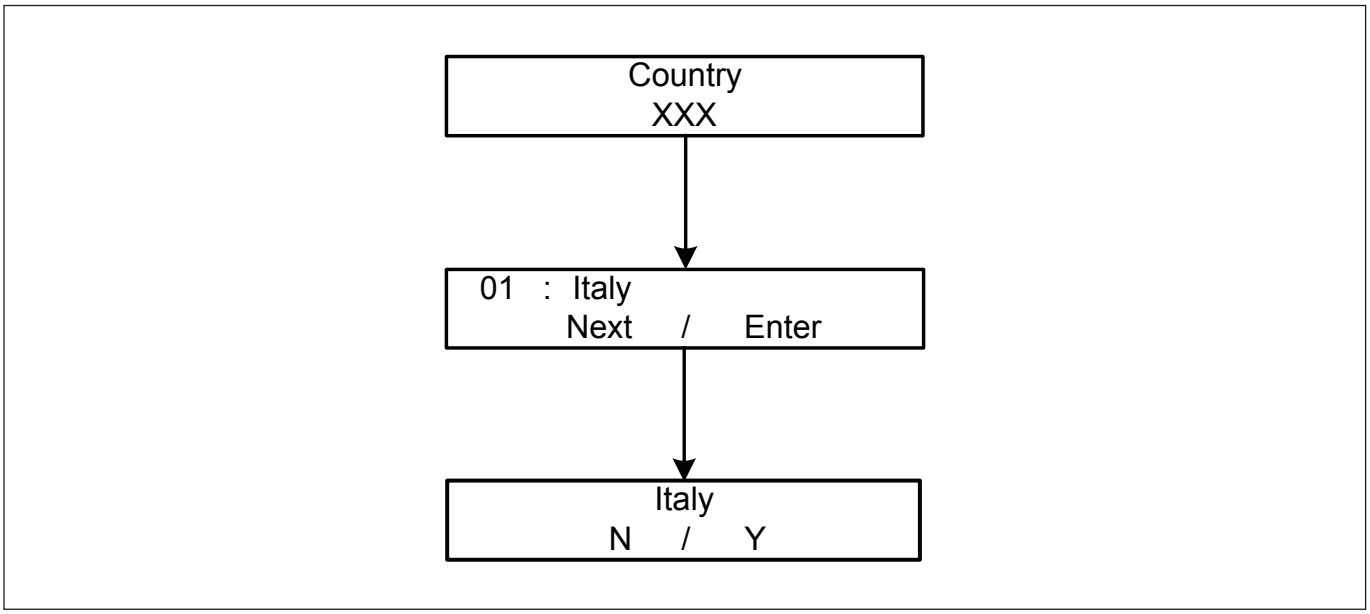


图7-1 : 国别设定

7.2.2 连接通讯配线

多台逆变器并联连接可同时由RS-485进行监控(见图 5-6)，但逆变器ID 需个别进行设定。

说 明

确认在同一并联串中各逆变器间ID皆无重复，单一台逆变器也可由RS-485监控。

7.2.3 选择逆变器ID

1. 开启DC输入电源，待数秒后LCD 显示屏幕开启，在 “Inverter ID: XX"显示后按下 “SEL” 按键。

2. 长按 “ENT” 及 “SEL” (先按 “ENT” 不放再同时按 “SEL”)两按键直到进入ID 选择页面，放开两按键，按 “SEL” 键选择ID(1 ~ 254)后，按下 “ENT” 键确认ID 已选择。

3. 逆变器 ID 已成功选择并储存。

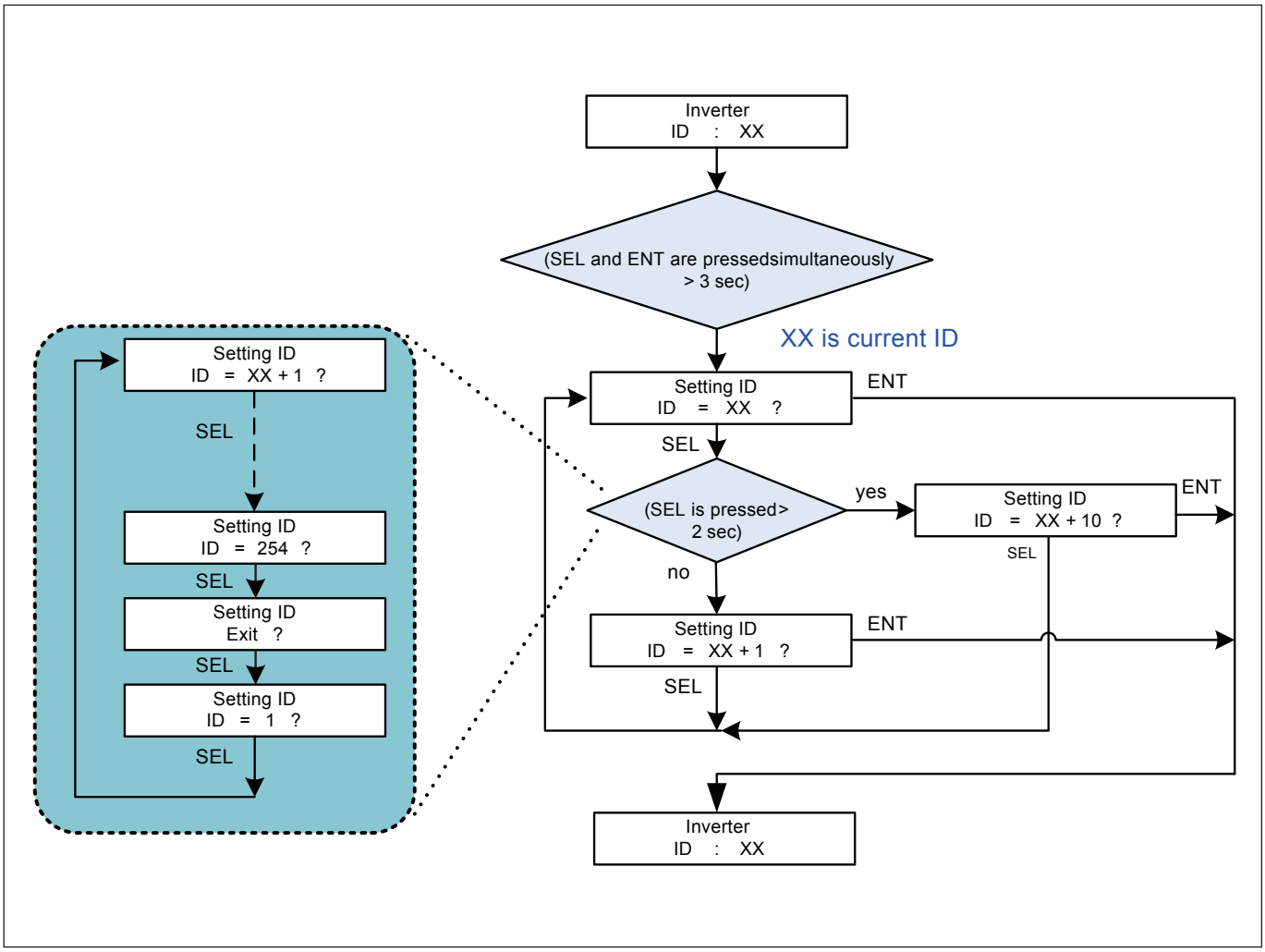


图7-2 : 选择逆变器ID

7.3 LCD流程图

按下任何键可进入选单页面 (如图7-3)，今日输出能量主页面，其他页面项目在以下7.3.1 ~ 7.3.7章节介绍。

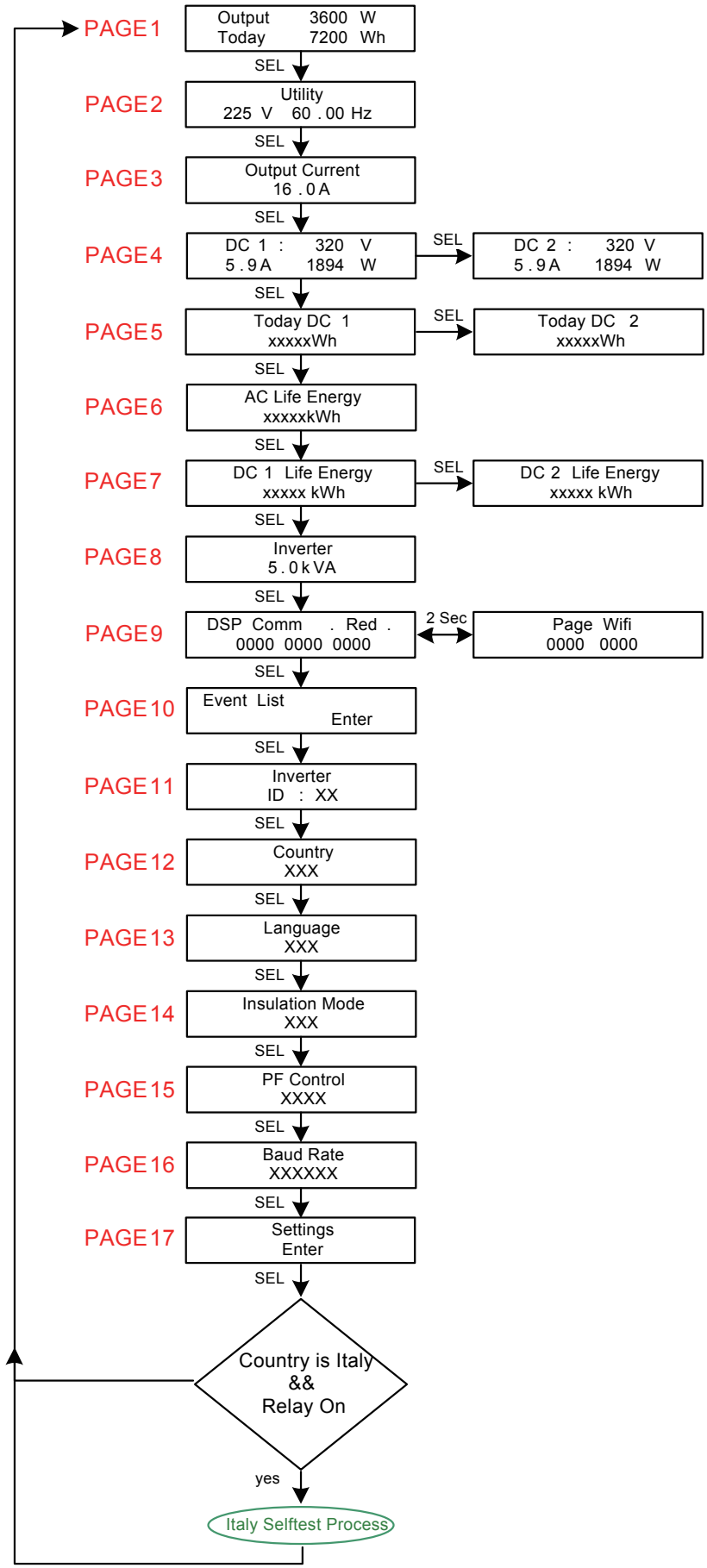

PAGE1
Output 3600 W
Today 7200 Wh
SEL
PAGE2
Utility
225 V 60 . 00 Hz
SEL
PAGE3
Output Current
16 . 0 A
SEL
PAGE4
DC 1 : 320 V
5 . 9 A 1894 W
SEL
DC 2 : 320 V
5 . 9 A 1894 W
SEL
PAGE5
Today DC 1
xxxxxWh
SEL
Today DC 2
xxxxxWh
SEL
PAGE6
AC Life Energy
xxxxxkWh
SEL
PAGE7
DC 1 Life Energy
xxxxx kWh
SEL
DC 2 Life Energy
xxxxx kWh
SEL
PAGE8
Inverter
5 . 0 k VA
SEL
PAGE9
DSP Comm . Red .
0000 0000 0000
2 Sec
Page Wifi
0000 0000
SEL
PAGE10
Event List
Enter
SEL
PAGE11
Inverter
ID : XX
SEL
PAGE12
Country
XXX
SEL
PAGE13
Language
XXX
SEL
PAGE14
Insulation Mode
XXX
SEL
PAGE15
PF Control
XXXX
SEL
PAGE16
Baud Rate
XXXXXX
SEL
PAGE17
Settings
Enter
SEL
Country is Italy
&&
Relay On
yes
Italy Selftest Process

图7-3：LCD流程图

Page1 今日输出能量
Page2 市电电压与频率
Page3 输出电流
Page4 输入电压、电流与功率
Page5 今日输入能量
Page6 总输出能量
Page7 总输入能量
Page8 起始页面
Page9 韧体版本
Page10 事件记录
Page11 逆变器ID
Page12 国别
Page13 语言
Page14 絕緣模式
Page15 虚功控制
Page16 波特率
Page17 设定

7.3.1 事件记录

当进入此页面，屏幕会显示出所有故障与错误纪录，至多可显示最新的16笔纪录，最新的事件置于顶部，越往下面时间越久。

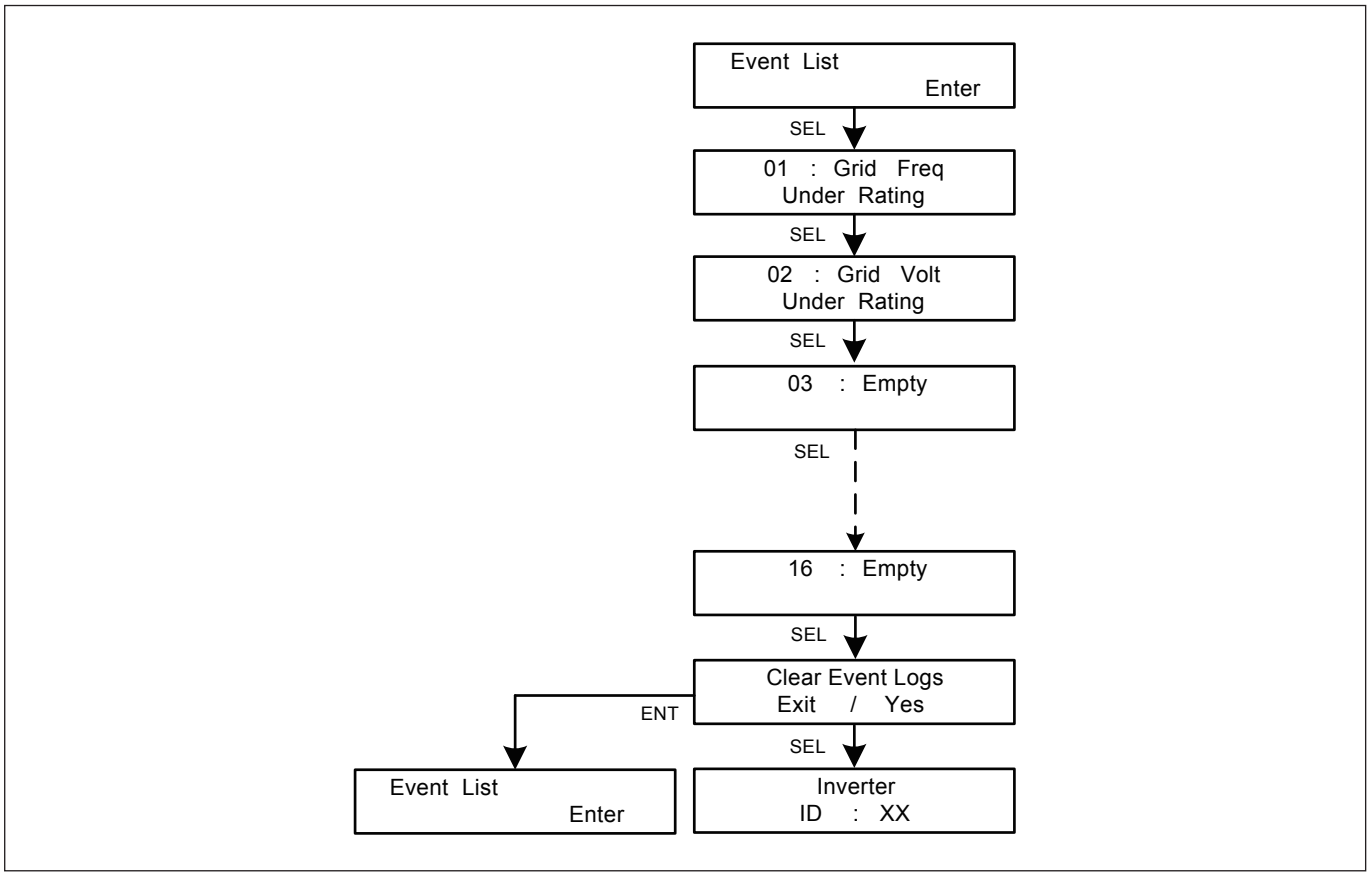


图7-4：事件纪录流程图

7.3.2 国别选择

使用者可在此页面选择国别

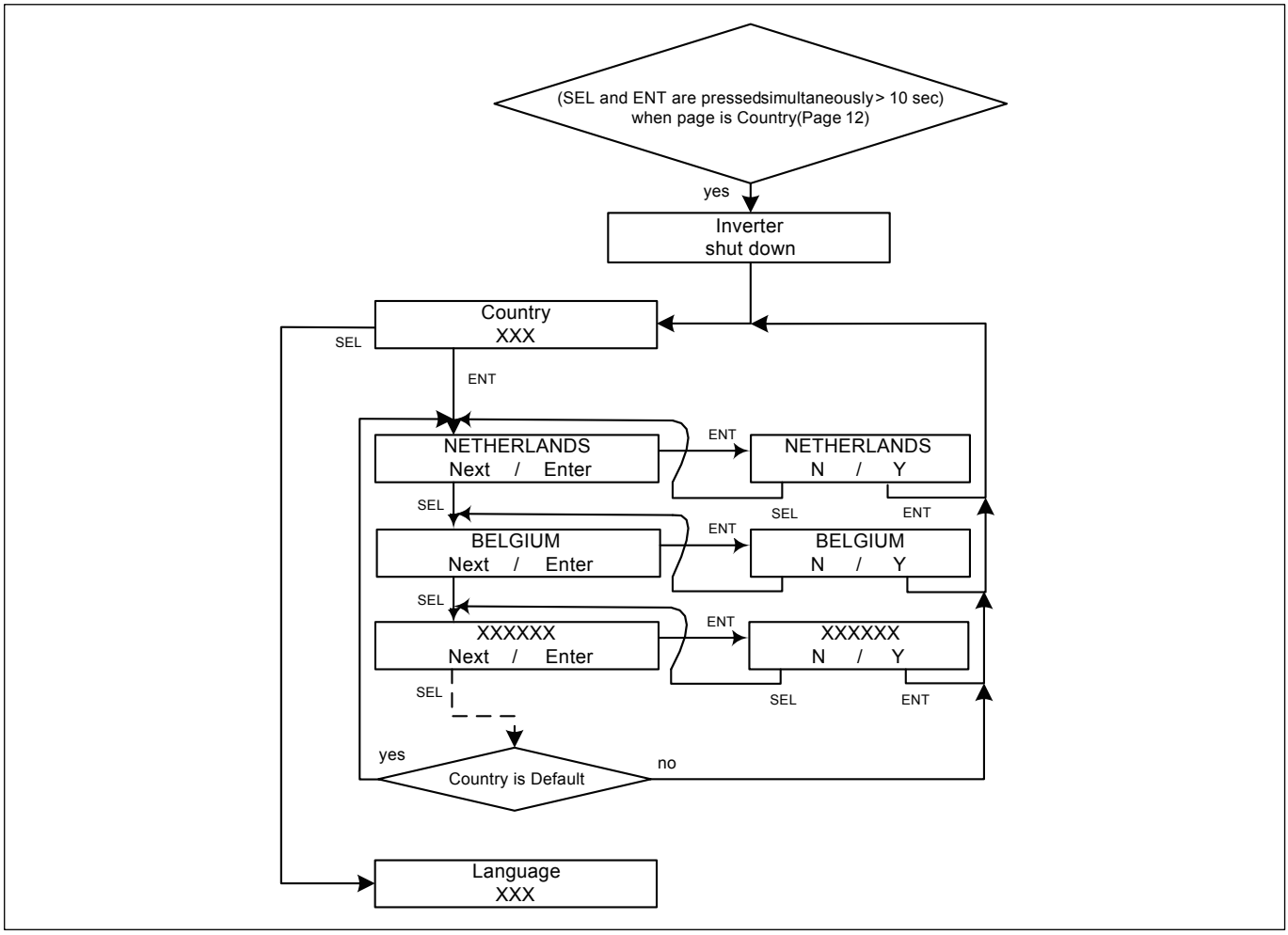


图7-5：国别选择

RPI H3A/ H4A/ H5A	
Australia	Italy LV_LVRT
AU/NZ PL4K6	Italy LV_SPI
AU/NZ PL4K99	Netherlands
AU/NZ PL2K49	Spain RD661
AU/NZ PL2K99	Spain RD1699
Austria	Switzerland
Austria PL4K6	Taiwan
Belgium	Thailand MEA
Denmark	Thailand PEA
FR LV VFR2014	UK G59-3 230
FRA-Is. 50Hz	UK G59-3 240
FRA-Is. 60Hz	UK G83-2
Germany LV	Poland
India	New Zealand

表7-1：国别

7.3.3 语言选择

当进入此页面可选择5种不同语言

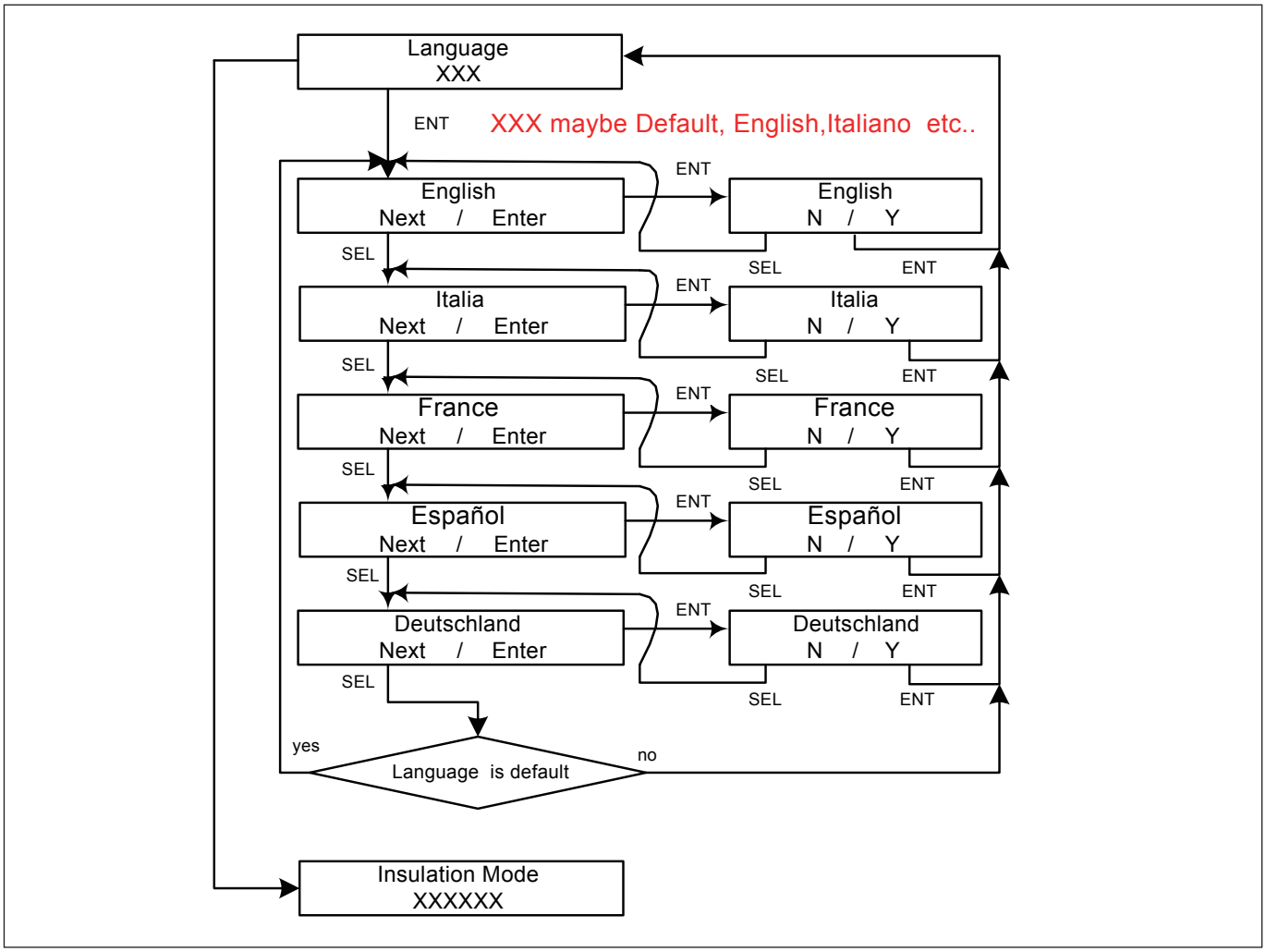


图7-6：语言选择

RPI H3A/ H4A/ H5A
English
Italiano
Français
Español
Deutsch

表7-2：语言

7.3.4 绝缘模式

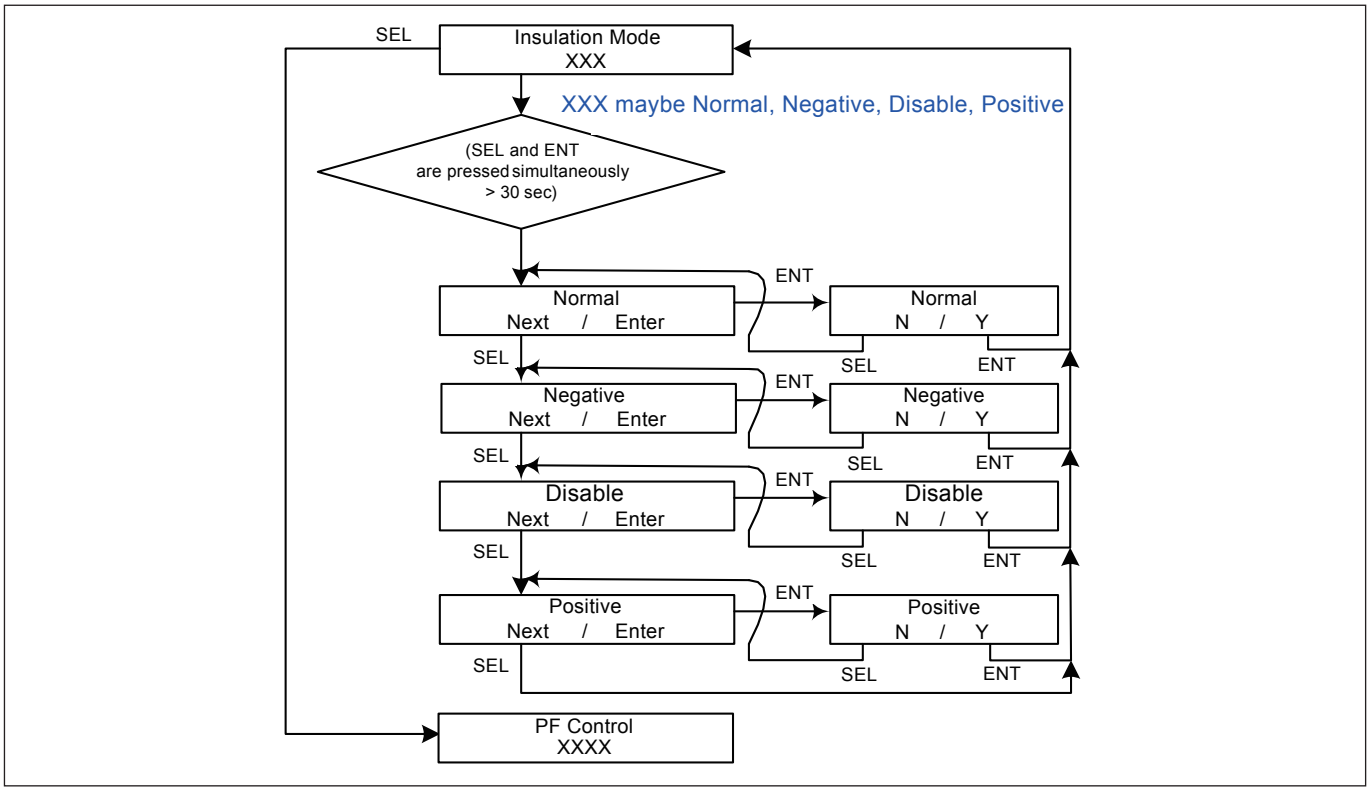


图7-7：绝缘模式

7.3.5 虚功控制

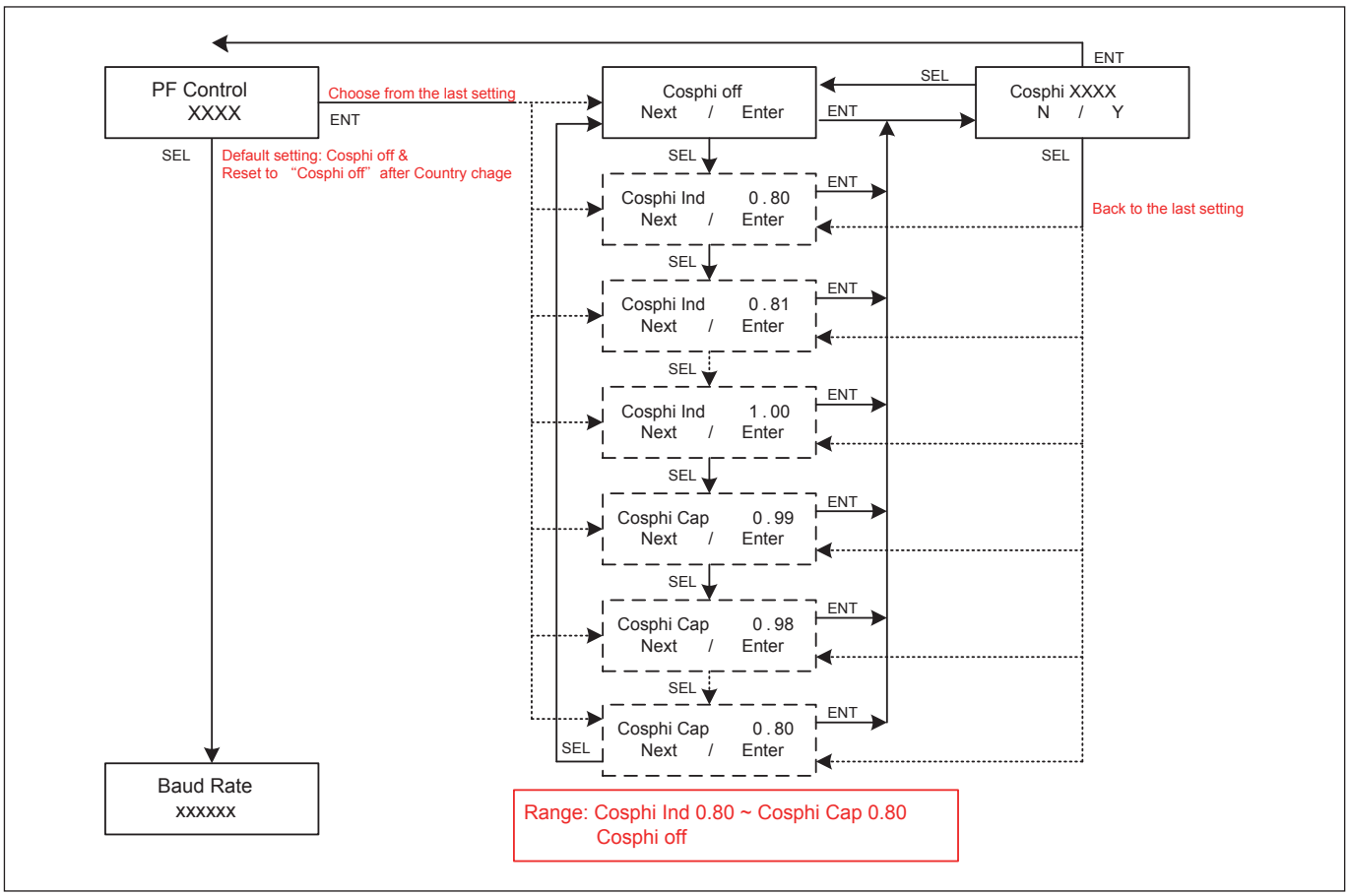


图7-8：虚功控制

7.3.6 波特率

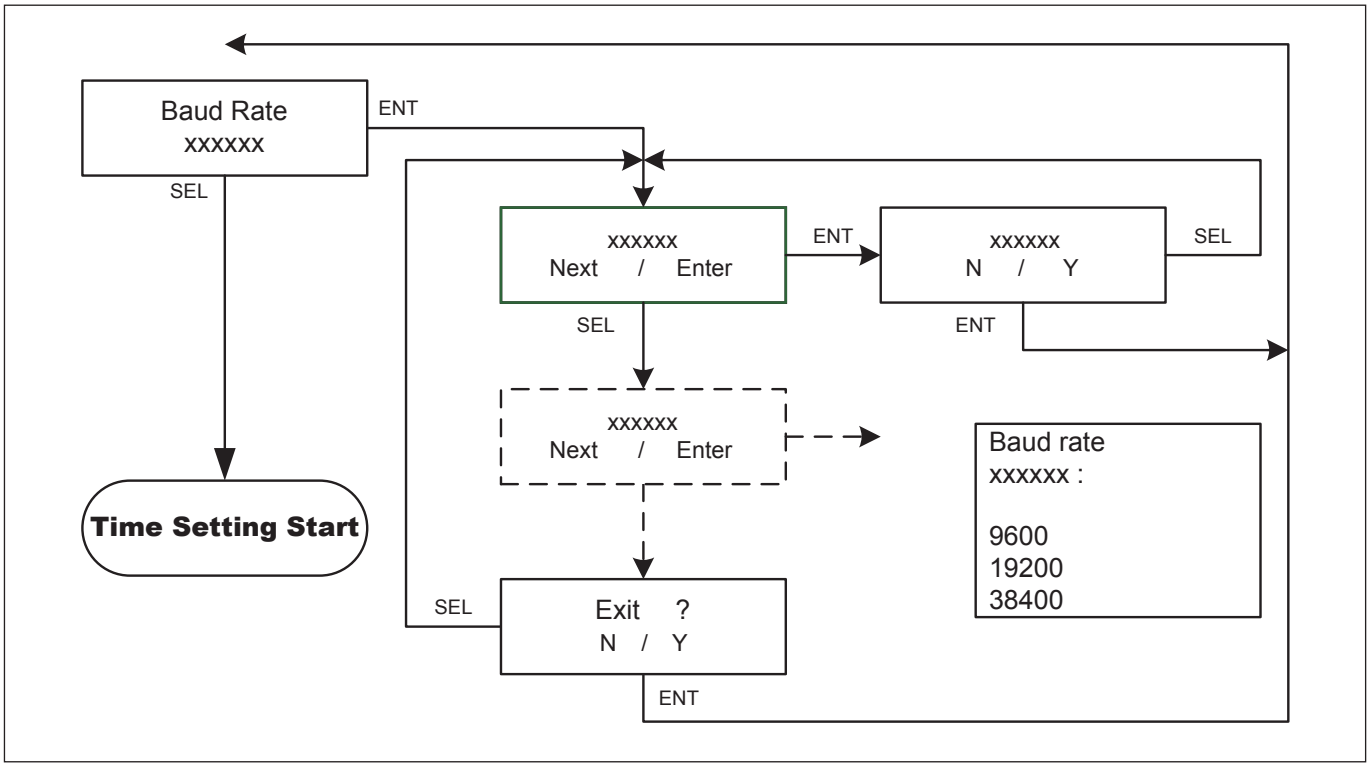


图7-9 : 波特率

7.3.7 时间设定

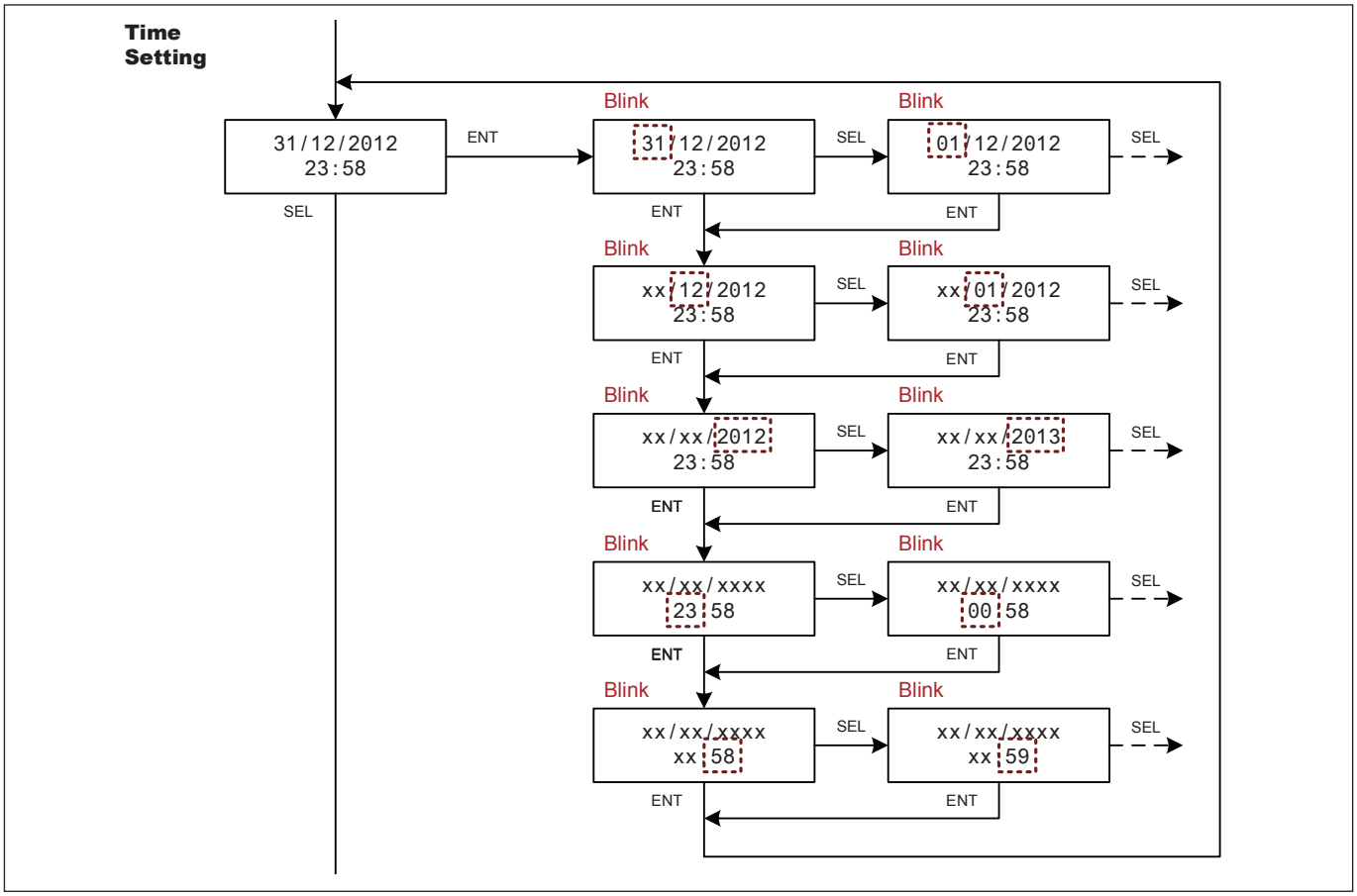


图7-10 : 时间设定

7.3.8 设定页面

可以设定的项目包含WiFi、Ethernet IP address和WiFi IP address。

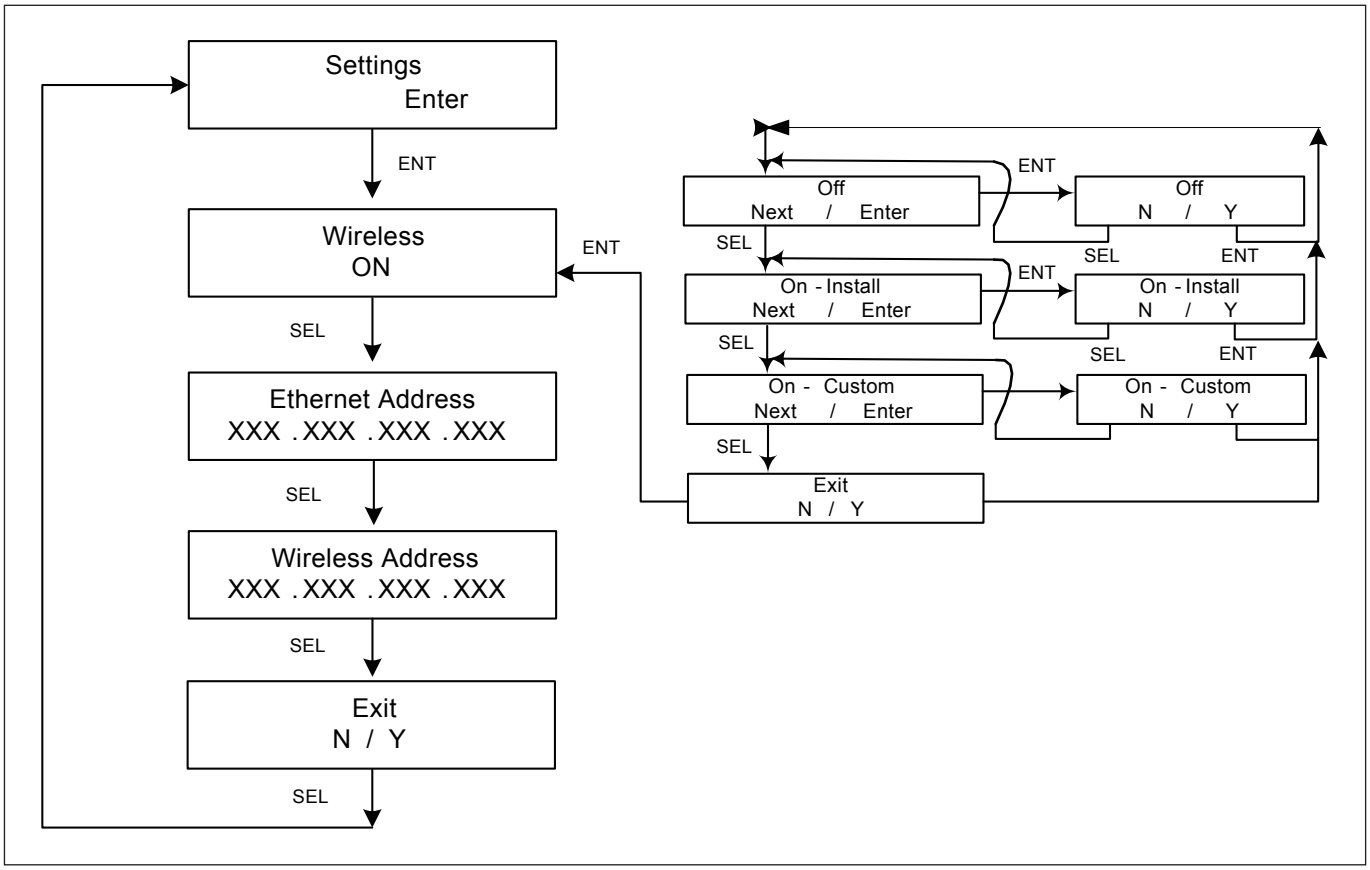


图7-11：设定页面

7.3.9 意大利自我测试和Comando locale

意大利自我测试和Comando locale 只有在国别选择为意大利时才能进行相关设定。意大利自我测试包含Uac High(UH)、Uac Low(UL)、Fac High(FH) and Fac Low(FL) ，使用者可个别选择Uac High，Uac Low，Fac High，or Fac Low的内容，最后的测试结果将会显示在操作页面并储存供使用者检查，若未通过意大利自我测试，逆变器将无法操作，请连系台达电子或供货商。

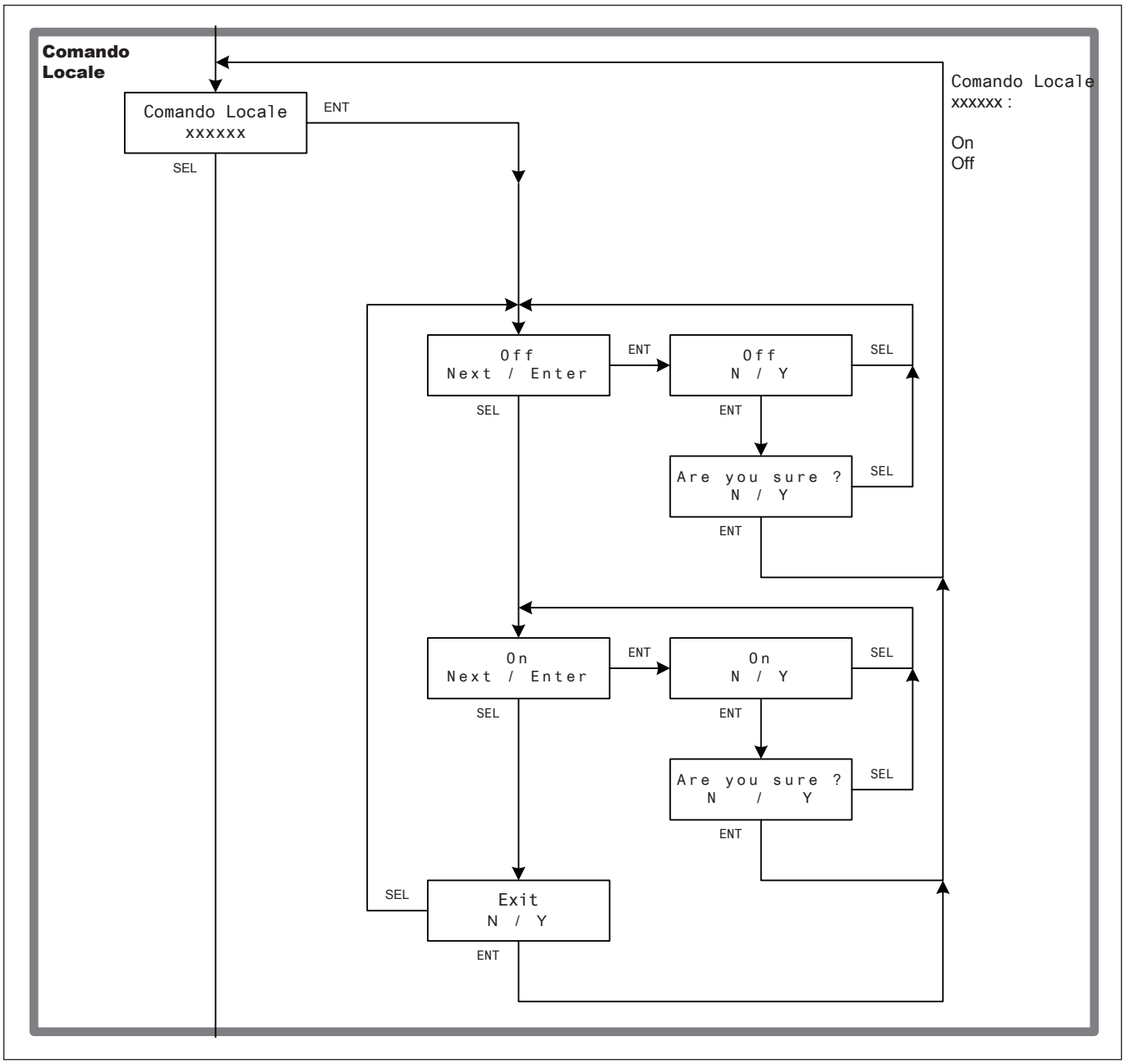


图7-12 : 意大利 Comando locale

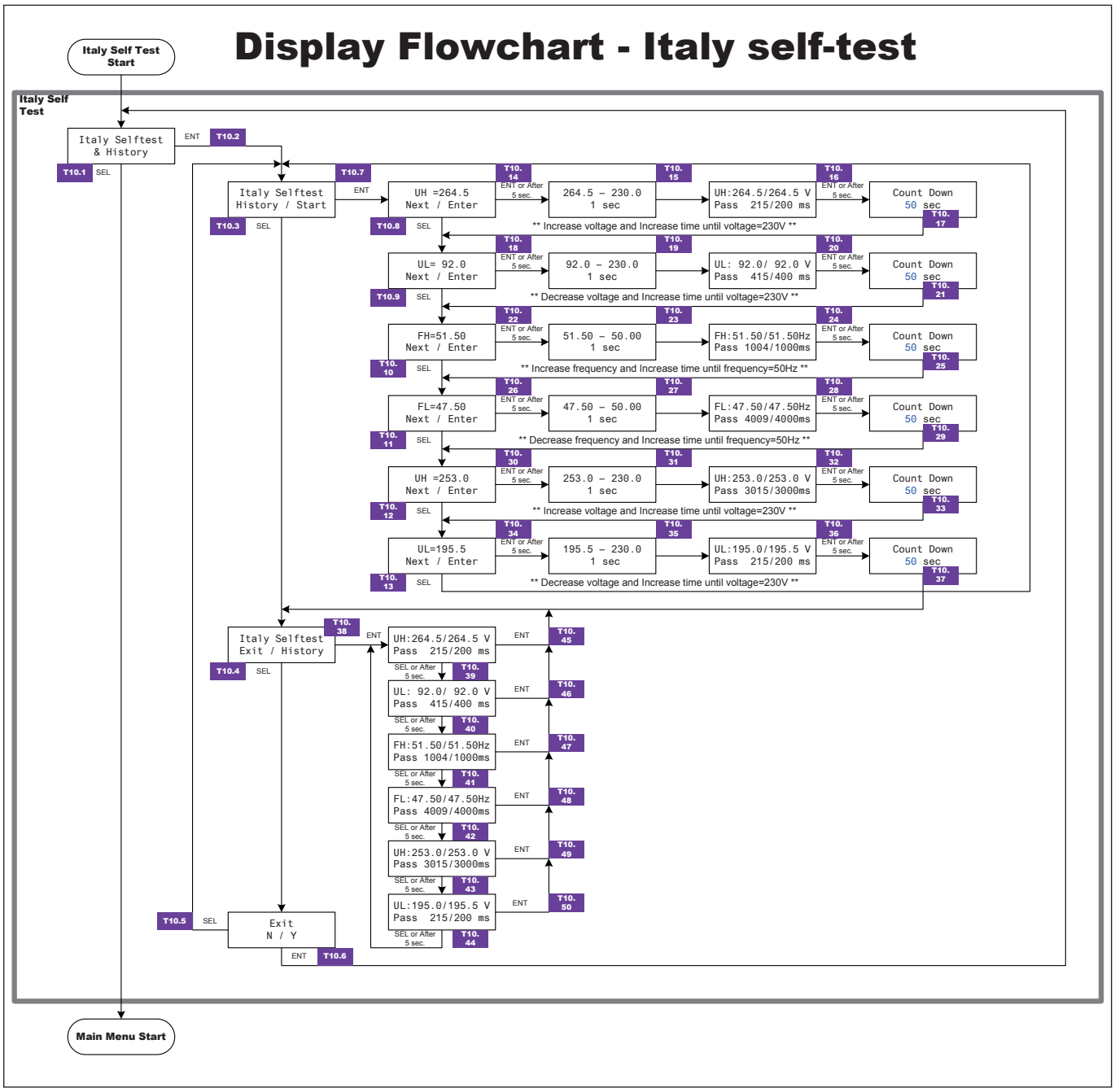


图7-13：意大利自我测试流程图

8 保养维护

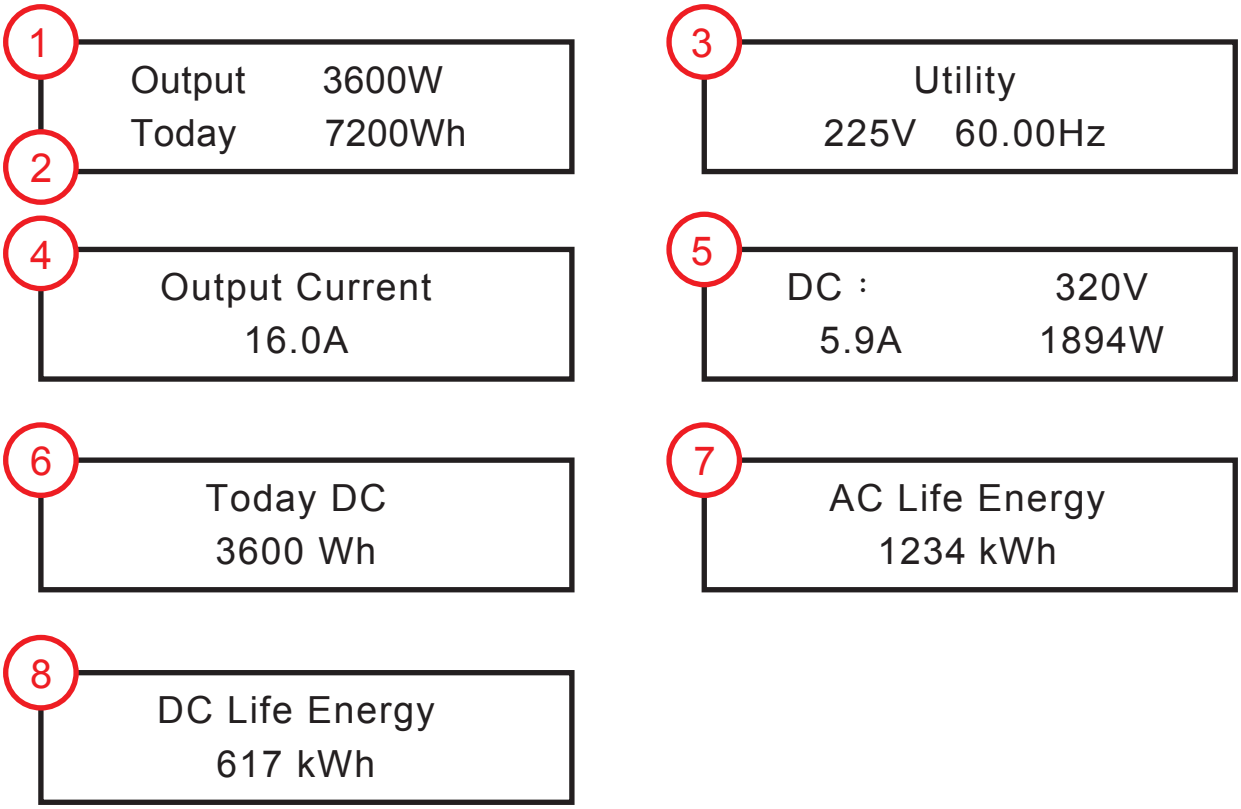
为了使本机器可以永久保持正常运作，请固定至少半年或是一年检查一次，包含所有的金属端子，螺帽，电缆线是否接妥，如果有发现受损的组件，请联络合格的技工来维修或是置换新组件，还有散热片部分必须请合格技工至少一年清理一次。

警 告：可能导致人员伤亡！

保养之前请先将DC和AC断路，避免电击导致危险。

9 量测讯息、故障讯息和疑难解答

9.1 量测讯息



No.	项目	信息	單位
1	Output	目前输出功率	W
2	Today	今日输出能量	Wh
3	Utility	市电电压和频率	Vac / Hz
4	Output Current	AC 输出电流	A
5	DC	DC 输入电压、电流、功率	Vdc, A, W
6	Today DC	今日太阳能板供应能量	Wh
7	AC Life Energy	总输出能量	kWh
8	DC Life Energy	太阳能板总供应能量	kWh

表9-1：量测讯息

9.2 错误讯息和故障排解

错误讯息		
资讯显示	可能原因	排除方式
E01: Grid Freq. Over Rating	1. 实际市电频率超过OFR设定值 2. 国别设定错误 3. 侦测线路异常	1. 检查逆变器AC端子的市电频率 2. 检查国别设定 3. 检查逆变器内部侦测线路
E02: Grid Freq. Under Rating	1. 实际市电频率低于UFR设定值 2. 国别设定或市电保护设定错误 3. 侦测线路异常	1. 检查逆变器AC端子的市电频率 2. 检查国别设定或市电保护设定 3. 检查逆变器内部侦测线路
E07:Grid Quality	市电端非线性负载太靠近逆变器	若必要将非线性负载远离逆变器市电端
E09: No Grid	1. AC断路器已跳开 2. AC接头脱落 3. 内部保险丝毁损	1. 开启AC断路器 2. 检查AC接头确实连结至逆变器 3. 更换内部保险丝并检测内部其他切换式装置是否有异常
E10: Grid Volt Under Rating	1. 市电实际电压低于UVR设定值 2. 国别设定或市电保护设定错误 3. 侦测线路异常	1. 检查逆变器AC端子的市电电压 2. 检查国别或市电保护设定值 3. 检查逆变器内部侦测线路
E11: Grid Volt Over Rating	1. 市电实际电压高于OVR设定值 2. 国别设定或市电保护设定错误 3. 侦测线路异常	1. 检查逆变器AC端子的市电电压 2. 检查国别或市电保护设定值 3. 检查逆变器内部侦测线路
E13: Slow Over Voltage Range	1. 实际市电电压高于OVR设定值 2. 逆变器运作时实际市电电压高于Slow OVR设定值 3. 国别设定或市电保护设定错误 4. 侦测线路异常	1. 检查连接至逆变器的市电实际电压 2. 检查连接至逆变器的市电实际电压 3. 检查国别或市电设保护设定值 4. 检查逆变器内部侦测线路
E26:Slow Over Frequency Range	1. 市电实际频率高于OFR设定值 2. 国别或市电设定值错误 3. 侦测线路异常	1. 检查逆变器端子的实际市电频率 2. 检查国别或市电保护设定值 3. 检查逆变器内部侦测线路

错误讯息		
资讯显示	可能原因	排除方式
E27:Slow Under Frequency Range	1. 市电实际频率低于UFR 设定值 2. 国别或市电设定值错误 3. 侦测线路异常	1. 检查逆变器端子的实际市电频率 2. 检查国别或市电保护设定值 3. 检查逆变器内部侦测线路
E28: Slow Under Voltage Range	1. 实际市电电压低于UVR设定值 2. 逆变器运作时实际市电电压低于 Slow UVR设定值 3. 国别设定或市电保护设定错误 4. 侦测线路异常	1. 检查连接至逆变器的市电实际电压 2. 检查连接至逆变器的市电实际电压 3. 检查国别或市电设保护设定值 4. 检查逆变器内部侦测线路
E30: DC Volt Over Rating	1. 实际Solar1 电压高于550Vdc (RPI-H3) 或1000Vdc (RPI-H5) 2. 侦测线路异常	1. 修改太阳能板设定，确保输出开路电压低于550Vdc 2. 检查逆变器内部侦测线路
E34: Ground Fault	1. 太阳能板的绝缘状况异常 2. 太阳能板的正端对地或负端对地的电容过大 3. 侦测线路异常	1. 检查DC 输入的绝缘状况 2. 检查太阳能板的正端对地或负端对地的电容 3. 检查逆变器内部侦测线路

故 障		
资讯显示	**可能原因**	**排除方式**
F01: DC Offset Over Rating	1. 市电波形异常 2. 侦测线路异常	1. 检测市电波形，非线性负载需远离逆变器市电端 2. 检查逆变器内部侦测线路
F05: NTC Over Temp	1. 环境温度高于60℃ 2. 侦测线路异常	1. 检查安装位置周遭环境 2. 检查逆变器内部侦测线路
F06: Inside NTC Circuit Fail	1. 环境温度高于100℃ 或低于-24℃ 2. 侦测线路异常	1. 检查安装位置周遭环境 2. 检查逆变器内部侦测线路
F08: Heat Sink NTC1 Fail	1. Boost 电路散热片温度高于100℃或低于-24℃ 2. 侦测线路异常	1. 检查安装位置周遭环境 2. 检查逆变器内部侦测线路
F09: Heat Sink NTC2 Fail	1. Inverter 电路散热片温度高于100℃ 或低于-24℃ 2. 侦测线路异常	1. 检查安装位置周遭环境 2. 检查逆变器内部侦测线路
F15:DSP ADC V_{grid} / I_{out} Fail	1. 辅助电源电路异常 2. 侦测线路异常	1. 检测辅助电源电路 2. 检查逆变器内部侦测线路
F16:DSP ADC V_{in} / V_{bus} Fail	1. 辅助电源电路异常 2. 侦测线路异常	1. 检测辅助电源电路 2. 检查逆变器内部侦测线路
F17:DSP ADC I_{in} / I_{boost} Fail	1. 辅助电源电路异常 2. 侦测线路异常	1. 检测辅助电源电路 2. 检查逆变器内部侦测线路
F18:RED. ADC V_{grid} Fail	1. 辅助电源电路异常 2. 侦测线路异常	1. 检测辅助电源电路 2. 检查逆变器内部侦测线路
F19:DSP ADC I_{out_dc} Fail	1. 辅助电源电路异常 2. 侦测线路异常	1. 检测辅助电源电路 2. 检查逆变器内部侦测线路

故 障		
资讯显示	可能原因	排除方式
F20: Efficiency Inconsistent	1. 指示电表未校正 2. 电流回授电路损坏	1. 检测电流及功率的正确性 2. 检查逆变器内部电流回授线路
F22: Internal Comm Fault_R	1. Red. CPU 闲置 2. 通讯连结中断	1. 检查Red. CPU 中的 reset and crystal 2. 检测Red. CPU 和 DSP 之间的连结状况
F23: Internal Comm Fault_D	1. DSP 闲置 2. 通讯连结中断 3. 通讯电路异常	1. 检查Red. CPU 中的 reset and crystal 2. 检测DSP 和 COMM 之间的连结状况 3. 检测通讯电路
F24: Residual Curr Over Rating	1. 太阳能板的绝缘状况异常 2. 太阳能板的正端对地或负端对地的电容过大 3. boost 电路的驱动电路或boost 电感异常 4. 侦测线路异常	1. 检查DC 输入的绝缘状况 2. 检查太阳能板的正端对地或负端对地的电容，需小于2.5uF. (必要时安装外部变压器) 3. 检查boost 电路的驱动电路或 boost 电感 4. 检查逆变器内部侦测线路
F27: RCMU Circuit Fail	1. 漏电流侦测电路未连接 2. 侦测线路异常	1. 检查逆变器内部RCMU 的联机 2. 检查逆变器内部侦测线路
F28: Relay Short	1. 一个或一个以上继电器异常 2. 继电器的驱动电路异常	1. 更换继电器 2. 检测继电器的驱动电路
F29: Relay Open	1. 一个或一个以上继电器异常 2. 继电器的驱动电路异常 3. Vgrid 和 Vout 侦测的精确度不正确	1. 更换继电器 2. 检测继电器的驱动电路 3. 检查Vgrid 和 Vout 电压侦测的精确度
F35: Bus Volt Over Rating	1. boost 电路的驱动电路异常 2. 太阳能板的开路电压超过550Vdc (RPI-H3) 或1000Vdc(RPI-H5) 3. 产品运作时有突波发生 4. 侦测线路异常	1. 检测boost 电路的驱动电路 2. 修正太阳能板的设定值，使开路电压低于550Vdc (RPI-H3) 或 1000Vdc (RPI-H5) 3. N/A 4. 检查逆变器内部侦测线路

故 障		
资讯显示	可能原因	排除方式
F36:Output Curr Transient Over	1. 产品运作时有突波发生 2. inverter电路的驱动电路异常 3. 切换式装置异常 4. 侦测线路异常	1. N/A 2. 检测inverter电路的驱动电路 3. 检测inverter电路的切换式装置异常 4. 检查逆变器内部侦测线路
F37: AC Curr Over Rating	侦测线路异常	检查逆变器内部侦测线路
F42: CT Current Sensor Fail	1. Inverter 端电感失效 2. 输出滤波器失效 3. 侦测线路异常	1. 检测Inverter 端电感值 2. 检测输出滤波电容值 3. 检查逆变器内部侦测线路
F50:Zero Cross Circuit Fail	同步讯号的侦测线路失效	检查逆变器内部同步讯号的侦测线路
F56:Hardware Incompatibility	硬体功率额定值不正确	检查硬体功率额定值
F60: DC1 Curr Over Rating	1. boost 电路的切换式装置异常 2. boost 电路的驱动电路异常 3. 输入电流侦测线路异常	1. 检测boost 电路的切换式装置 2. 检测boost 电路的驱动电路 3. 检测输入电流侦测线路
F61: DC2 Curr Over Rating	1. boost 电路的切换式装置异常 2. boost 电路的驱动电路异常 3. 输入电流侦测线路异常	1. 检测boost 电路的切换式装置 2. 检测boost 电路的驱动电路 3. 检测输入电流侦测线路
F70: DC1 Curr Transient Over	1. boost 电路的切换式装置异常 2. boost 电路的驱动电路异常 3. 输入电流侦测线路异常	1. 检测boost 电路的切换式装置 2. 检测boost 电路的驱动电路 3. 检测输入电流侦测线路
F71: DC2 Curr Transient Over	1. boost 电路的切换式装置异常 2. boost 电路的驱动电路异常 3. 输入电流侦测线路异常	1. 检测boost 电路的切换式装置 2. 检测boost 电路的驱动电路 3. 检测输入电流侦测线路

Table 9-2: Error message

10 拆 机

拆卸程序
如有需要将本逆变器停机拆卸，请务必遵守以下指令：

警 告！

为了避免人员受伤，请遵守以下步骤：

- 将AC断路器切换到OFF，解除和市电端的连接。
- 将太阳能板断路器开关切换到OFF，解除和太阳能板的连接。
- 使用合适的电压表量测，确认AC和DC都已经完全断除。
- 拔除和市电端连接的AC配线。
- 拔除和太阳能板连接的DC配线。
- 取出通讯模块RS-485模块。

待完成以上所有步骤之后，即可将本机卸下。

11 技术数据

11.1 规 格

Model	RPI H3A	RPI H4A	RPI H5A
GENERAL			
Enclosure	Powder-coated aluminium		
Operating temperature	-25~60°C, full power up to 40°C		
Operating Altitude	2000m		
Relative humidity	0% – 95% non-condensing.		
Environmental category	Outdoor, wet locations		
Galvanic isolation	No (TL Topology)		
Safety class	Class I metal enclosure with protective earth		
Pollution degree	Internal: II, External: III		
Overvoltage category	AC output: III, DC input: II		
Flicker impedance	Z = 0.4 + j 0.25 Ω (total impedance)		
Three-phase combinations	No		
DC INPUT (Solar side)			
Nominal input power	3150W	4200W	5250W
Maximum input power	3200 W	4320 W	5280 W
Max. input voltage	600Vdc		
Operating voltage range	100~550 Vdc		
MPP voltage range			
Symmetrical load	160~500 Vdc	180~500 Vdc	220~500 Vdc
Asymmetrical load	320~500 Vdc	266~500 Vdc	291~500 Vdc
Max. ratio for asymmetrical load	100/0%;0/100%	80/20%;20/80%	70/30%;30/70%
Nominal voltage	350Vdc		
MPP Tracker	2		
Max. input current (each MPPT)	10A	12A	12A
Max. short circuit current per MPPT	13.9A	16.7A	16.7A
Max. inverter backfeed current to the array	0A		
Startup voltage	100Vdc		
Input connection	2 pairs Multi-Contact® MC4 connectors		

Model	RPI H3A	RPI H4A	RPI H5A
AC OUTPUT (Grid side)			
Nominal output power	3000VA(#1)	4000VA	5000VA(#2)
Maximum power	3000VA	4000VA	5000VA
Voltage	230Vac -20%~+22%		
Nominal output current	13A	17.3A	21.7A
Max. output current	13.9A	18.2A	23.2A
Maximum output fault current	16A	20A	32A
Maximum output over current protection	16A	20A	32A
Current (inrush) (A, peak and duration)	30A peak, 1ms.		
Frequency	50/60Hz		
Total harmonic distortion	<3% @ Rated power(#3)		
Power factor	>0.99@Rated power(#3)		
Peak efficiency	97.50%	97.50%	97.50%
EU efficiency	96.80%	97.00%	96.80%
Output connection	IP 67 single-phase		
Fuse	Internal fuse, 20A/ 250V*2	Internal fuse, 20A/ 250V*2	Internal fuse, 20A/ 250V*2
MECHANICAL			
Housing	Die cast		
Cooling	convection cooling		
IP rating	IP65		
External communication	2 x RS-485 connection		
Weight	21 kg		
Dimensions	414.3 × 475.3 × 155 mm		

Model		RPI H3A	RPI H4A	RPI H5A
REGULATIONS & DIRECTIVES				
Safety		IEC 62109-1 / -2 AS 3100 CE compliance		
Grid interface		VDE V 0126-1-1 AS4777 (#4) C10/C11 2012 EN50438:2013 UTE-C-15-712-1 VDE V 0126-1-1 G83-2	VDE V 0126-1-1 AS4777 (#4) C10/C11 2012 EN50438:2013 UTE-C-15-712-1 VDE V 0126-1-1 G59-3	
Emission		IEC 61000-6-4, IEC 61000-6-3		
Harmonics		EN 61000-3-12		
Variations and flicker		EN 61000-3-11		
Immunity		EN 61000-6-2		
Immunity	ESD	IEC 61000-4-2		
	RS	IEC 61000-4-3		
	EFT	IEC 61000-4-4		
	Surge	IEC 61000-4-5		
	CS	IEC 61000-4-6		
	PFMF	IEC 61000-4-8		

#1:

(a) 2.49kW max. for Australia (AU / NZ PL2K49) (H3A)
(b) 2.99kW max. for Australia (AU / NZ PL2K99) (H3A)
(c) 3kW max. for Australia (AU / NZ) (H3A)

#2:

(a) 4.6kW max. for Australia (AU / NZ PL4K6) (H5A)
(b) 4.99kW max. for Australia (AU / NZ PL4K99) (H5A)
(c) 5kW max. for Australia (AU / NZ) (H5A)

#3: reactive power control disabled

#4: not support AS4777.2:2015 Single-phase inverters used in three-phase combinations

附 录 A

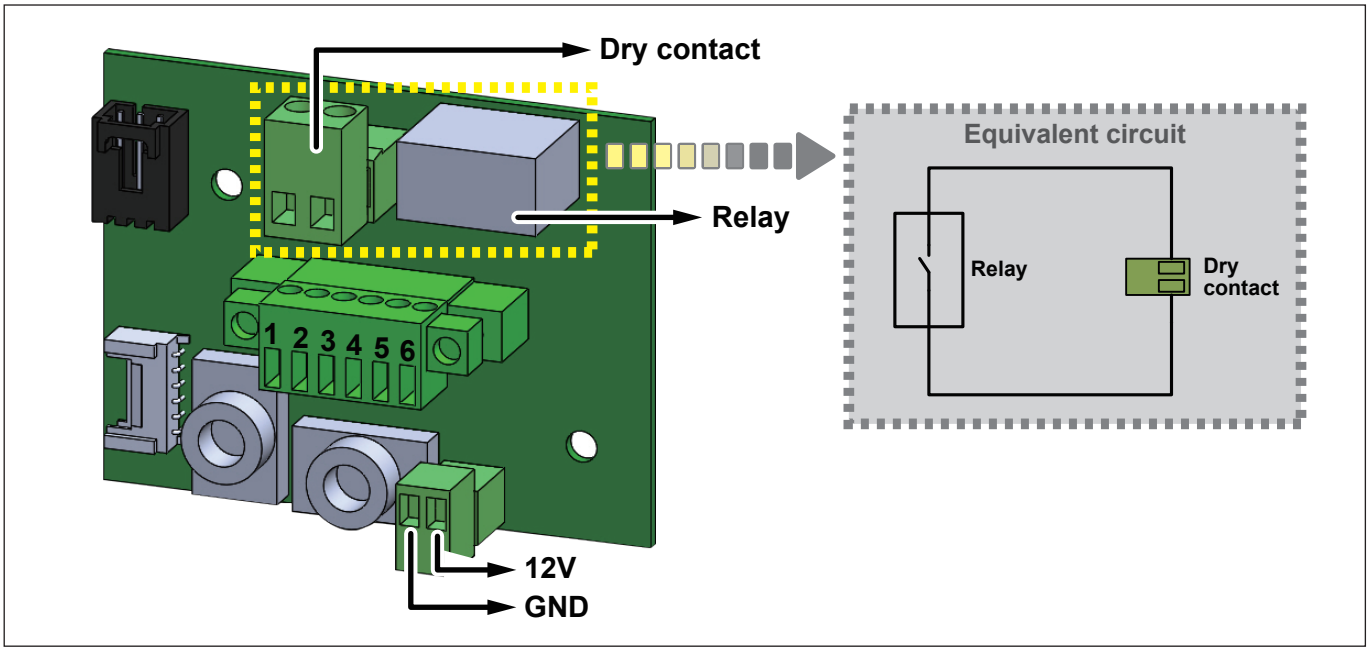
多功能继电器

本机另有支持一个多功能继电器，透过它您可以自行外接一些设备，例如闪光灯或是蜂鸣器...等等设备。此继电器可以使用的组态设定控制有以下几种：

- 逆变器异常的指示或市电状态指示
- 功率控制
- 外接负载的控制
- 风扇控制

A.1多功能继电器的输出接线方式

干接点提供了一个逆变器状态的远程指示，当逆变器正常动作时，干接点会呈现关闭状态，此时用户可以透过软件工具Monitor modbus的使用，即可操作先前所提过的几项组态设定。
干接点位置图请参照图A-1



图A-1：干接点位置图

警 告！

触摸电子组件可能会产生静电进而损毁该电子组件！

附 录 B

数 位 输 入

要达成功率控制的目的，数字输入接口会经由一个涟波控制接收器接收电厂发出的讯息，在不同国家有不同的控制内容。

德国 ：实功控制分成四个阶层 0%, 30%, 60% and 100%

意大利 : 太阳能板安装的功率输出最大6KW

a. 远程控制关机

b. 窄频率跳脱点在49.5 Hz到50.5Hz之间

澳洲与纽西兰:

逆变器支援需求响应模式(DRMs).

DRM 0 - 断开装置

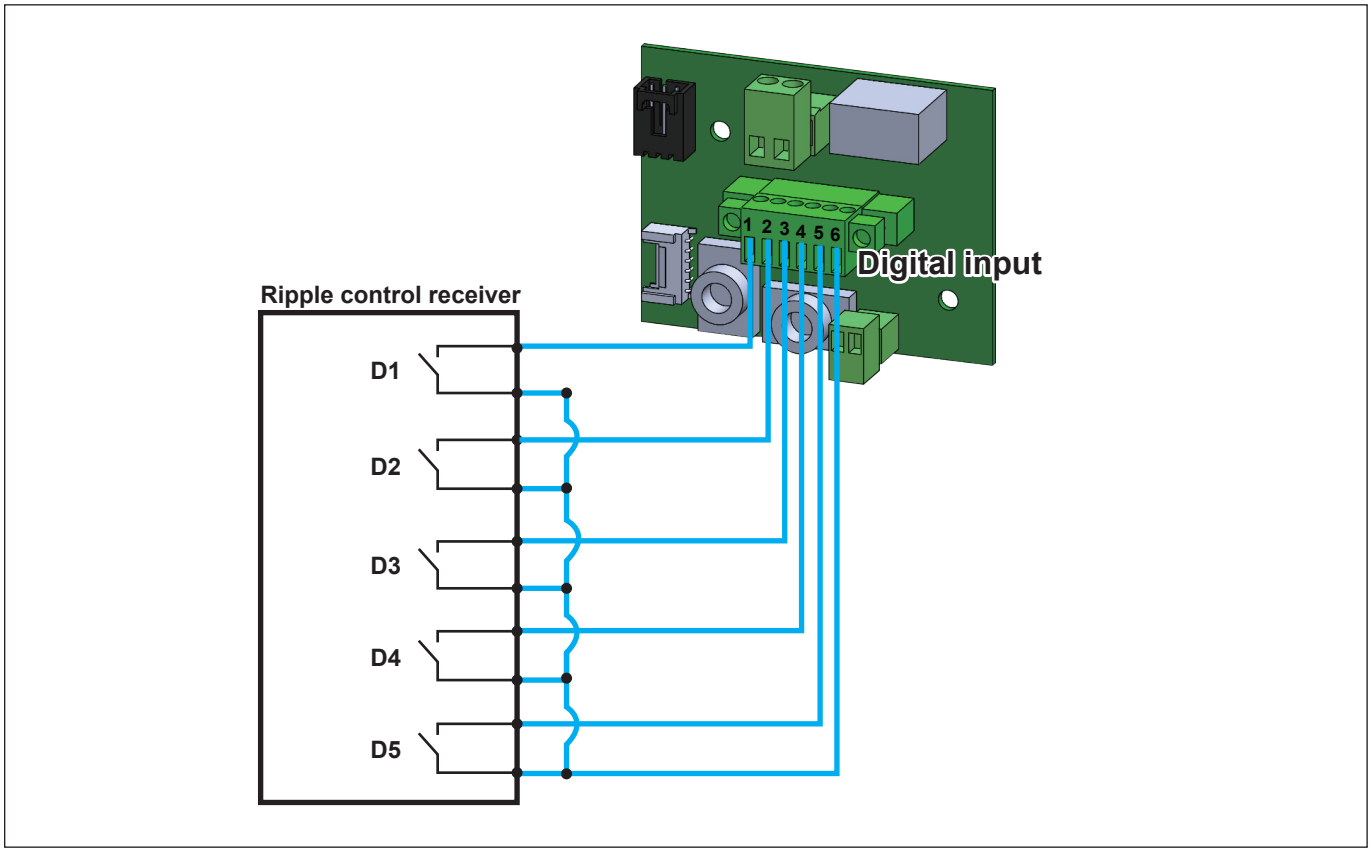
DRM 5 - 不发电

DRM 6 - 输出功率小于总功率之50%

DRM 7 - 输出功率小于总功率之75%。并允许虚功控制

DRM 8 - 不限制输出功率。并允许虚功控制

客制化 : 使用者自行定义



图B-1 : 涟波控制接收器的接脚说明

逆变器提供了一个输出电压(位置6)，以及侦测5个数位输入讯号(位置1到5)。此时逆变器可以侦测到涟波控制接收器上继电器的状态，电厂的讯息将透过此继电器来控制功率。

Pin	Function
1	Digital input 1
2	Digital input 2
3	Digital input 3
4	Digital input 4
5	Digital input 5
6	Output

Country =Italy LV/SPI

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
Remote off	1#	0#	0	0	0	1
Narrow frequency limit.	0	1	0	0	0	1

批注: 1表示继电器关闭；0表示继电器打开。

Country = Germany

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
Active power = 0%	1#	0#	0	0	0	1
Active power = 30%.	0	1	0	0	0	1
Active power = 60%	0	0	1	0	0	1
Active power = 100%	0	0	0	1	0	1

批注: 1表示继电器关闭；0表示继电器打开。

Country = Australia or New Zealand

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
DRM 0 Disconnection device	1#	0#	0	0	0	1
DRM 5 Active power = 0	0	0	0	0	1	1
DRM 6 Active power < 50%	0	0	0	1	0	1
DRM 7 Active power < 75% Sink reactive power	0	0	1	0	0	1
DRM 8 Active power < 100% Sink reactive power	0	1	0	0	0	1

批注: 1表示继电器关闭；0表示继电器打开。

The power behind competitiveness

單相並網型逆變器

RPI H3A/H4A/H5A
操作手冊

www.deltaww.com

DELTA
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目 錄

Figure

Table

1 概 要

1.1 手冊簡介

此手冊內提供太陽能逆變器RPI H3A / H4A / H5A的規格、安裝程式及相關功能設定，關於安裝人員對於太陽能發電系統需經過訓練及認證，並于安裝時遵照安規及安裝程式作業。

1.2 安規圖示說明

小心搬運您的產品可以使產品的使用壽命更長, 可靠度更佳, 使您的產品達到最大效益。產品有時可能會過重, 需要兩個人一起搬運。

注 意！

電子元件在逆變器正常工作時存有危險電壓，不良的搬運方式可能導致機器和人身的損毀。確切遵守本手冊之規定，任何安裝步驟只可以由合格安裝人員來進行。

警 告！

電子元件的維修工作只可由製造商進行， 機器內部並無提供任何可由使用者操作的元件。確切遵守本手冊之規定，機器進行任何操作之前務必將本逆變器從市網以及太陽能板隔離。

危 險！

為避免電擊，請勿打開逆變器，機器內部並無提供任何可由使用者操作的元件。擅自打開機器會使保固失效。任何電源切斷五分鐘內仍存有危險電壓。
本機器存有高漏電電流，任何操作前確認PE導線已經接妥。

警 告：高溫危險！

當機器運轉時溫度可能超過攝氏70度，高溫環境易造成危險發生，禁止觸摸!!

1.3 合法性

此使用手冊由台達電子公司之品牌提供以下機種的安裝程式、維修保養與安規資訊。

- RPI H3A
- RPI H4A
- RPI H5A

1.4 產品概述

本機為單相市電並網太陽能逆變器，此裝置將自太陽能板發出的直流電流(DC)轉換為單相AC交流電流輸出，並提供至市電網路。

本機設計時為方便使用者，提供了大範圍的輸入電壓 (100~550Vdc)和高轉換效率，並使用專用的DSP(Digital Signal Processor)來簡化電路設計及電子元件的數量。請特別注意此裝置並不支援獨立發電功能，以下為RPI H3A / H4A / H5A特性介紹。

產品特性

- 額定功率：3kVA(RPI H3A), 4kVA(RPI H4A), 5kVA(RPI H5A)
- 單相 (L + N + PE)，並網型非變壓器隔離型太陽能逆變器
- 最大效率：> 97.5 %
- 歐洲效率: 96.8% (RPI H3A) , 97.0%(RPI H4A), 96.8%(RPI H5A)
- 虛功容量 (Cap 0.8 – Ind 0.8)
- 滿載時總諧波失真率(THD < 3%)
- 2 組最大功率追蹤
- 16×2 LCD 顯示面板

1.5 逆變器動作原理

太陽能逆變器之操作如下圖1-1，此裝置將自太陽能板發出的DC電流轉換為單相AC電流輸出以達到節省能量與電力的功效。

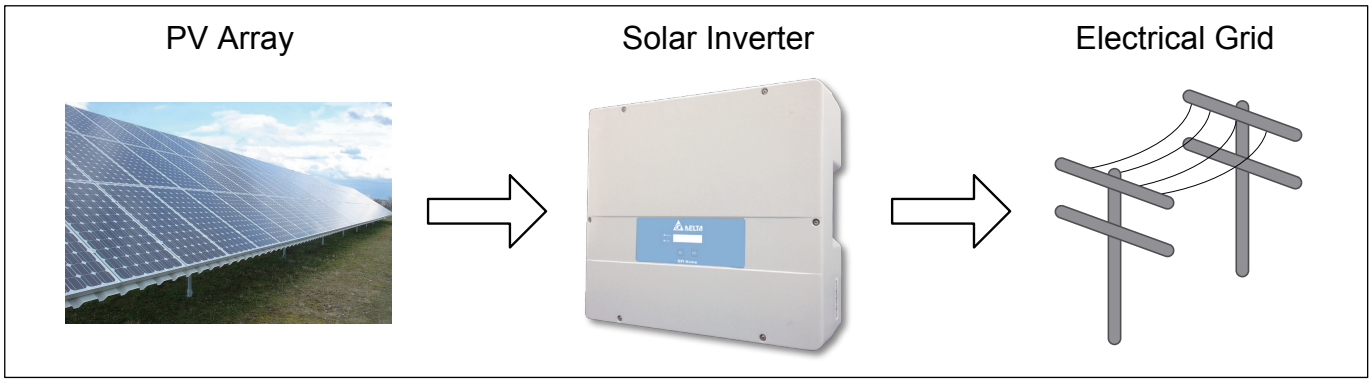


圖1-1 : 太陽能逆變器系統操作圖解

1.6 其他相關資訊

若需要關於RPI H3A / H4A / H5A其他細節資訊或其他產品資訊內容，
可參考台達電子網站 : http://www.deltaww.com.

2 安裝與配線

2.1 安裝前指南

因用戶端設備環境的多變，建議安裝前須完整閱讀操作手冊，且所有安裝程式和開機動作需由合格之專業人員來著手進行。

2.2 拆除包裝

拆裝程式如圖2-1。

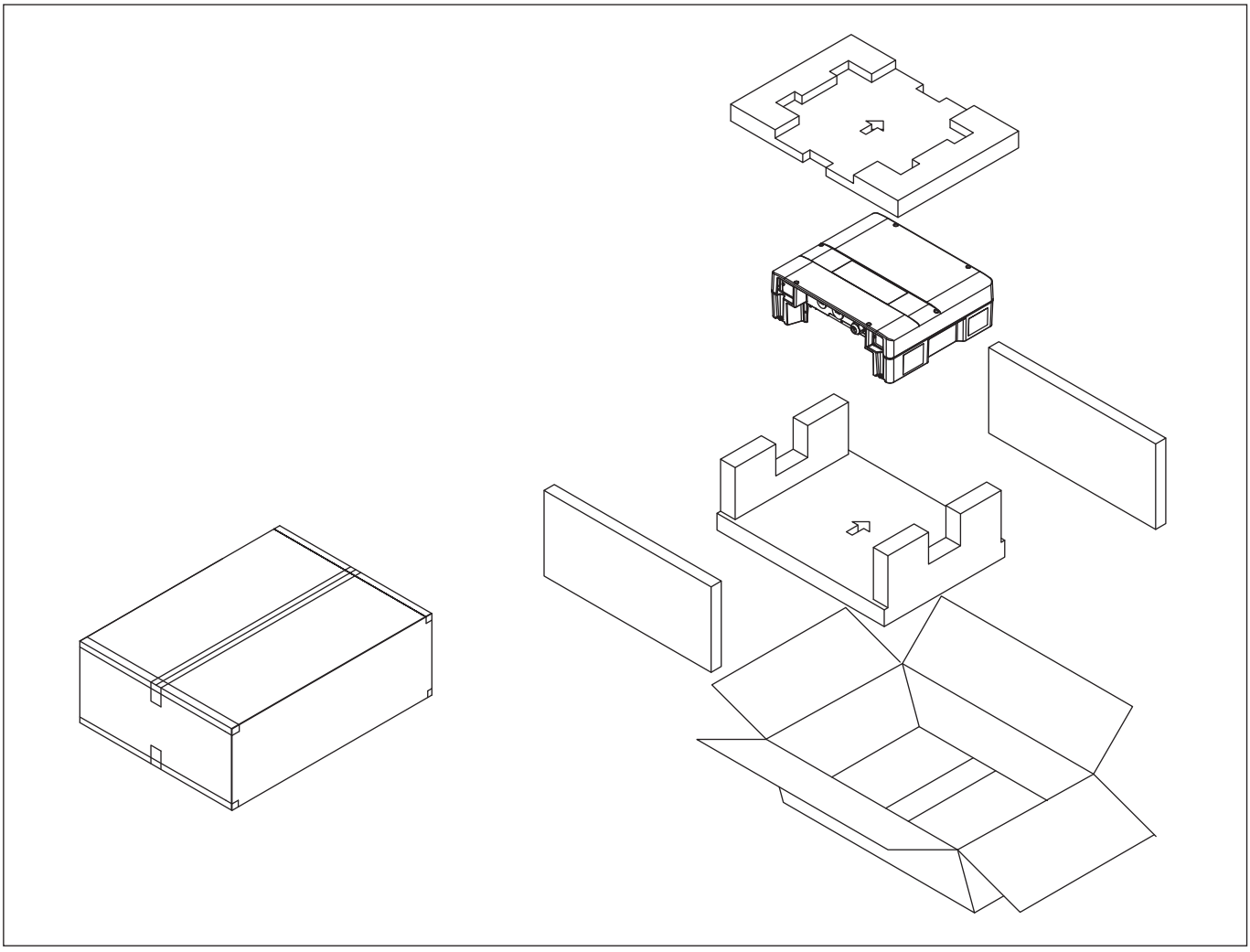


圖2-1 : 拆除包裝流程

當您收到全新的逆變器時, 會需要拆除其外包裝。這些包裝由不同材質所組成, 在不同材質上有列印不同的回收方式：例如紙箱可以回收, 但是保麗龍不可以。為了共同營造一個更好的生活環境, 請確實回收這些包裝材料。

2.3 包裝檢驗

由於在產品運輸過程中可能有無法預期之狀況產生，請先確認包裝外觀是否有任何毀損。拆裝後，依以下程式逐步檢查產品之內外部：

檢查產品外殼右側之產品型號及產品規格是否符合購買型號，檢查是否有元件松脫，檢查下表內所有附件是否有缺少，標準配件詳見表2-1。

RPI H3A / H4A /H5A		
品　名	**數量**	**描　述**
太陽能逆變器	1	太陽能逆變器本體
使用手冊	1	提供安規、安裝、規格等相關資訊
AC 插頭	1	做AC端的連結
DC 插頭	2	做DC端的連結
壁掛板	1	固定逆變器於牆上用
M4螺絲	2	固定逆變器於壁掛板用

表2-1：內容物清單

注　意！

當產品內部或外部及配件有任何不完整或毀損狀況發生時，
請與逆變器之供應商聯繫。

2.4 規格標籤

識別逆變器時，使用者可利用產品標籤上的資訊，標籤上列有產品序號及型號，標籤位置如下圖所示：

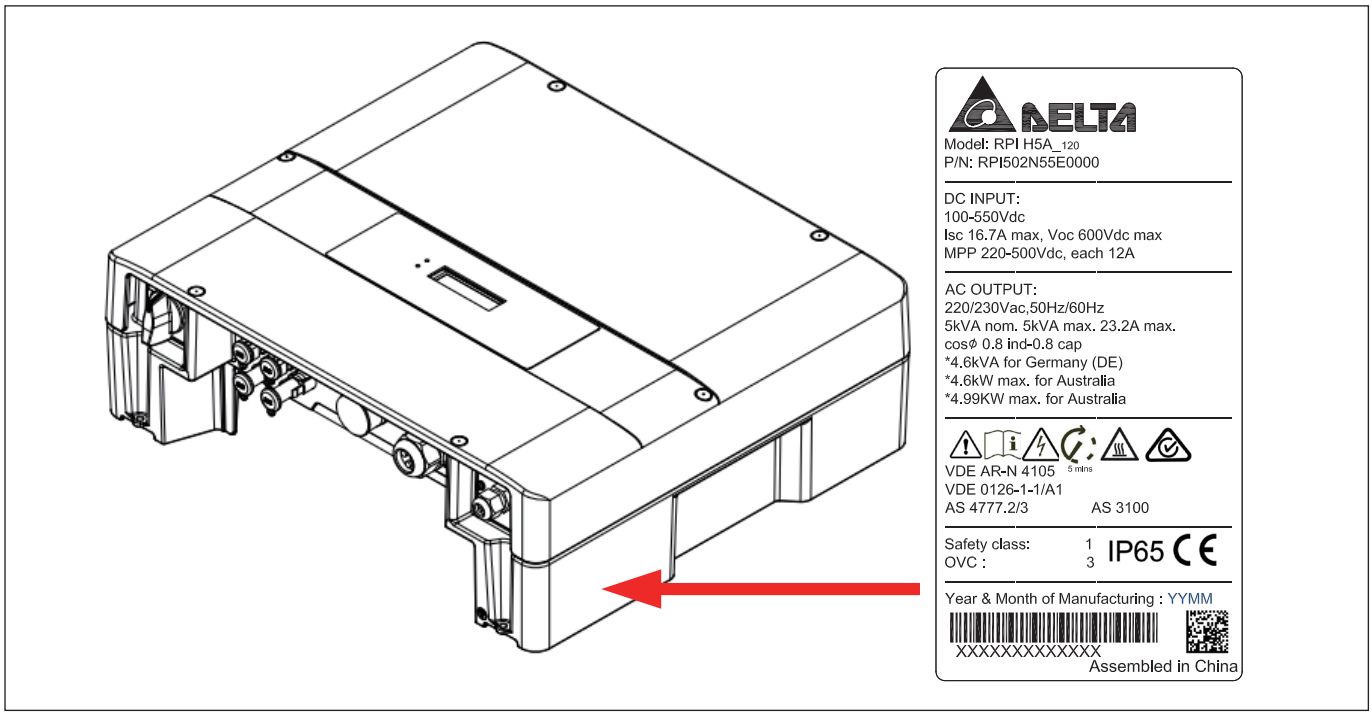


圖2-2：規格標籤

3 產品概觀

3.1 尺寸規格

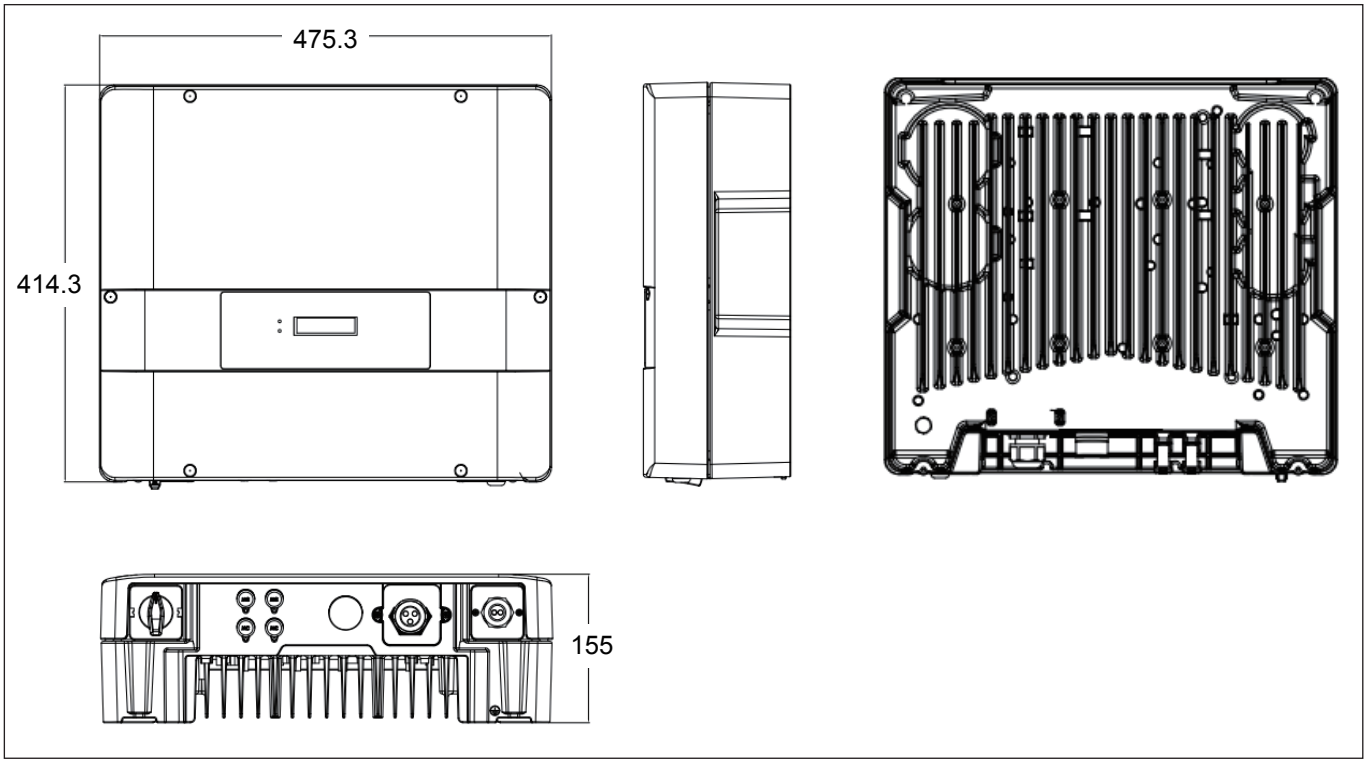


圖3-1：尺寸規格

3.2 功能介紹

逆變器外部物件如圖3-2所示，在3.2.1至3.2.2章節中有詳細功能介紹。

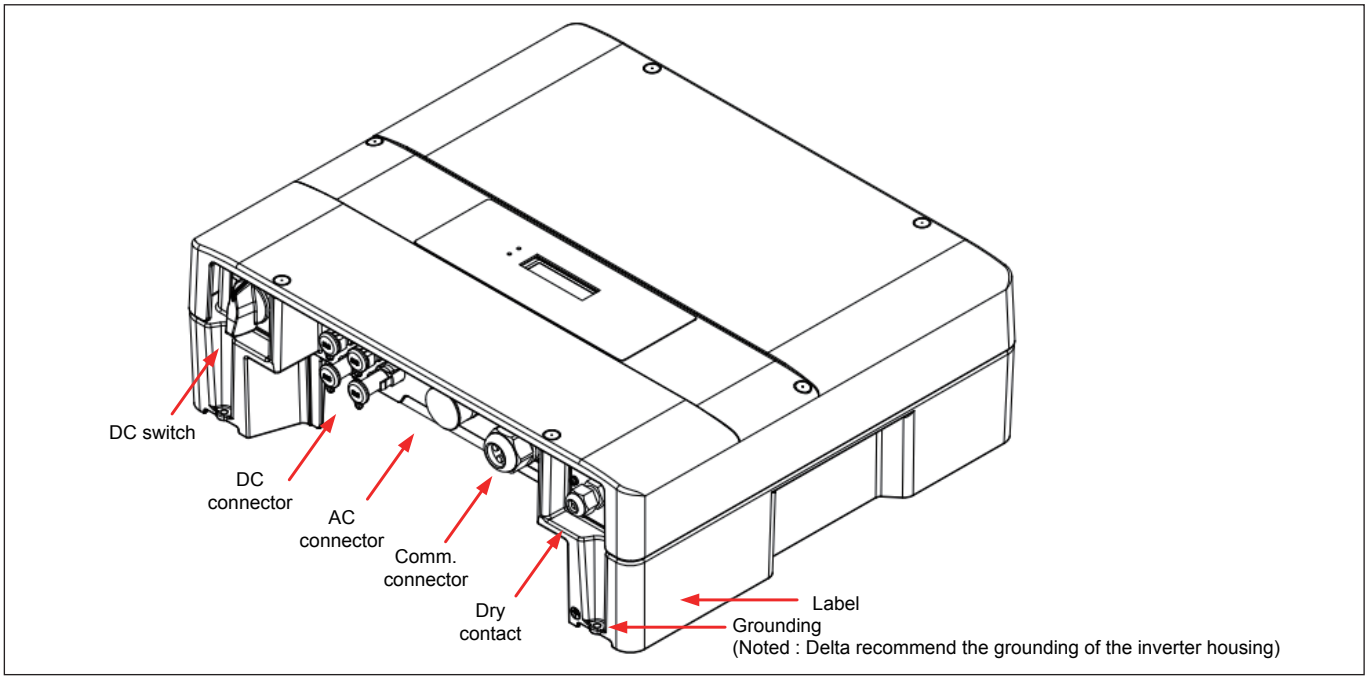


圖3-2：逆變器外觀

3.2.1 LCD 顯示面板與按鍵

圖3-3 : 顯示面板與按鍵

3.2.2 逆變器輸入與輸出介面

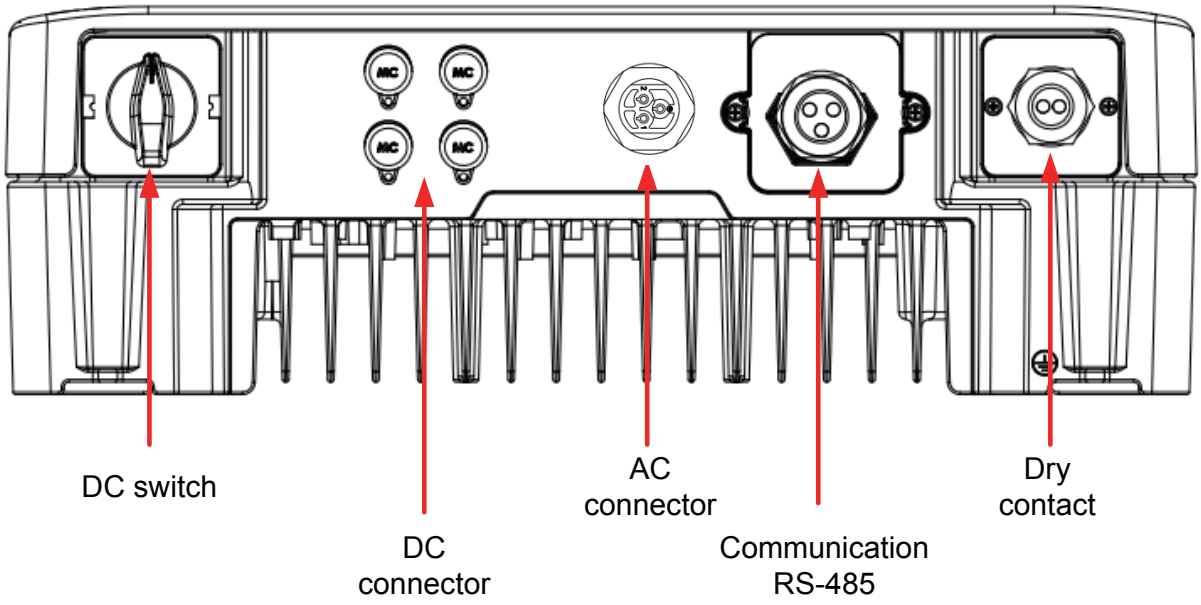


圖3-4 : 輸入與輸出介面

說 明

DC SWITCH只在-120系列機種才有提供;-020系列機種沒有提供。

4 安 裝

4.1 安裝地點

警 告！

請勿安裝於可燃物附近。
請將產品確實固定於堅固平坦的牆上。

注 意！

請勿將產品安裝于陽光可直接曝曬的地方。

4.2 壁掛作業

本機屬於壁掛式系統，安裝時請確保產品與地面保持垂直，AC插頭在產品之底部，勿將產品架設於傾斜之牆面，壁掛板尺寸規格列於下圖所示，壁掛板所需共有8 個φ5.5螺絲，逆變器架設前應確實鎖緊壁掛板。

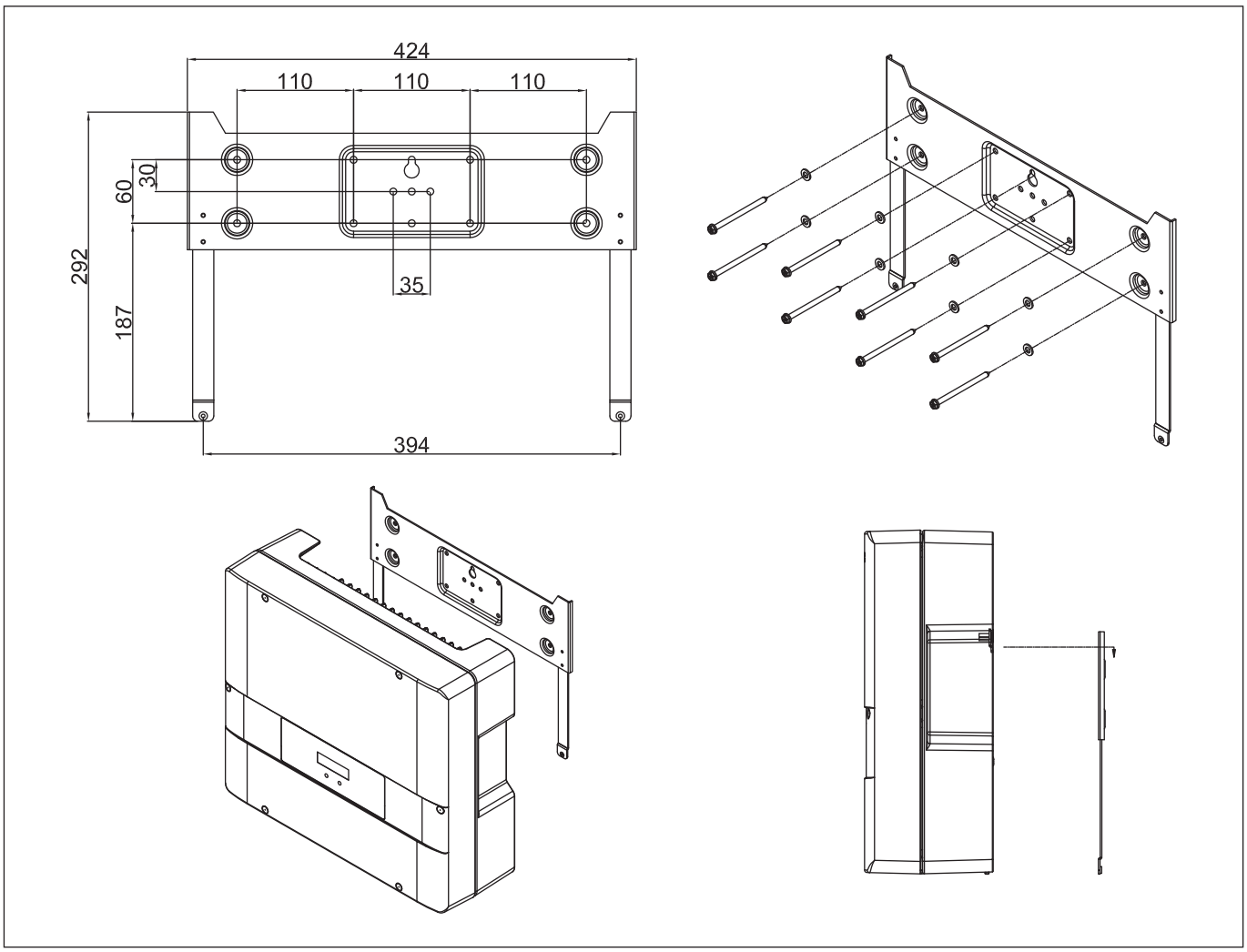


圖4-1 : RPI H3A / H4A / H5A壁掛板安裝方式

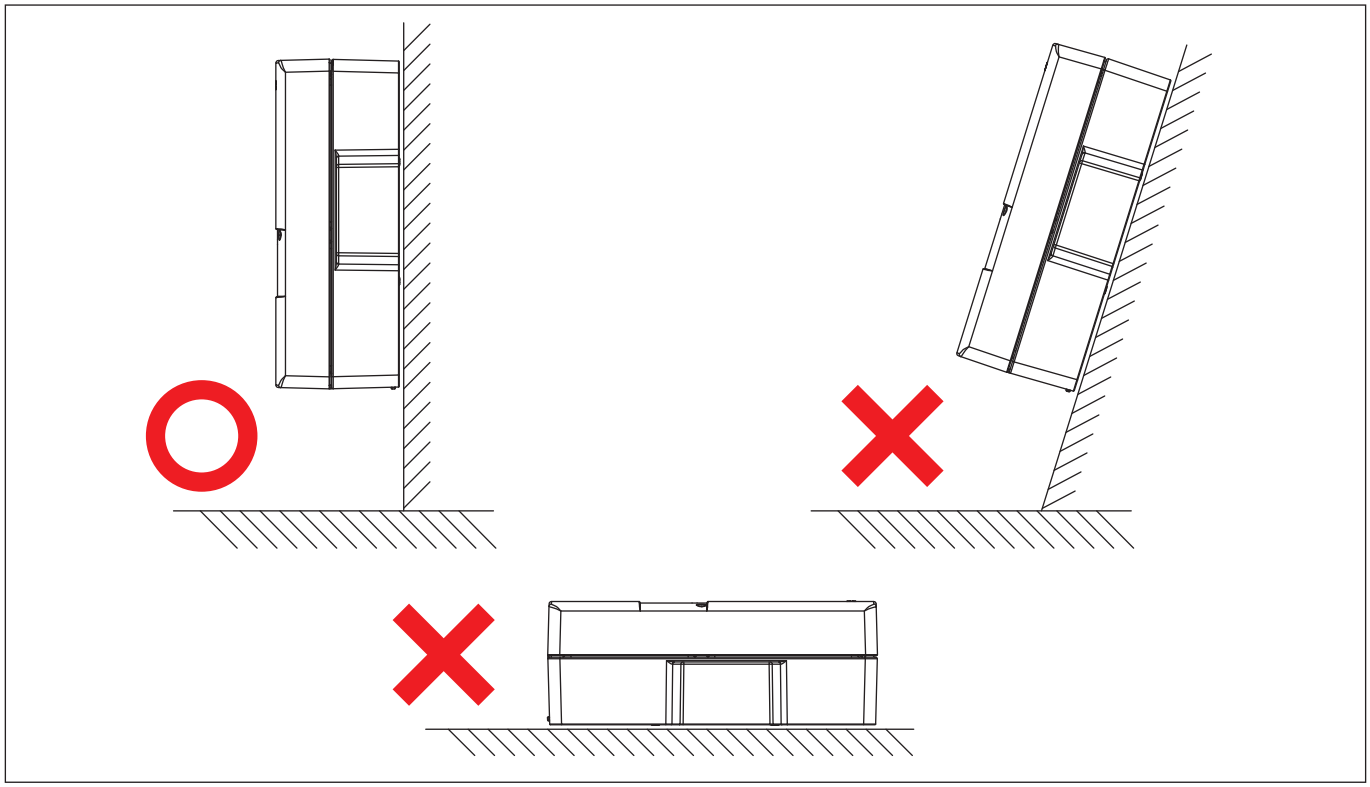


圖4-2 : 正確與不正確之安裝圖解

警 告！

- 壁掛板是專為逆變器安裝而設計，逆變器只可安裝在壁掛板上。
- 安裝地點以堅固平面為佳，以承受逆變器之重量。
- 建議安裝于進出暢通而且安全的地點，以利後續服務與維護保養。
- 安裝多台逆變器時產品之間請保持適當距離。
- 請將產品安裝於視線容易觀察之地點以利操作與設定。
- 環境溫度介於 -25℃到60℃之間。(40℃以上會發生功率降額)

產品架設之前要確認空間足夠以利散熱，建議安裝的空間尺寸請參考圖4-3，安裝人員若需要可自行加大間隙以利產品安裝。

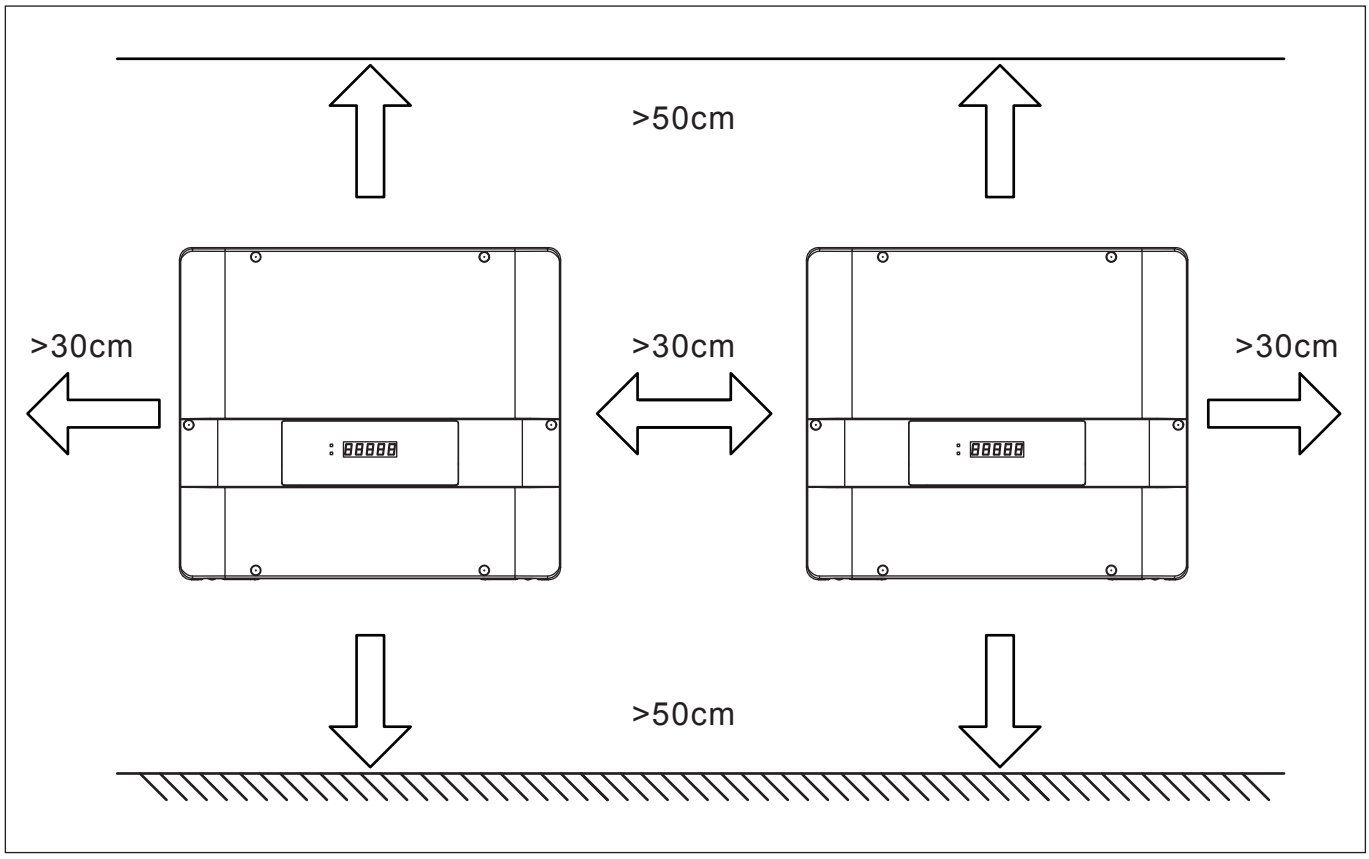


圖4-3 : 安裝之適當間隙

5 配 線

5.1 配線前準備

1. 確認電壓值、電壓極性是否正確。
2. 由於本機器RPI H3A / H4A / H5A在直流輸入和交流輸出之間並無做直流隔離，當太陽能板需要接地時，產品須另接隔離變壓器。
3. 接地阻抗偵測線路為內部固定功能設定，不能被更改。
4. 系統配線圖如圖5-1或圖5-2所示。
5. 如圖5-1所示，產品可接受2組DC並聯輸入。(2組最大功率追蹤和2組並聯輸入)

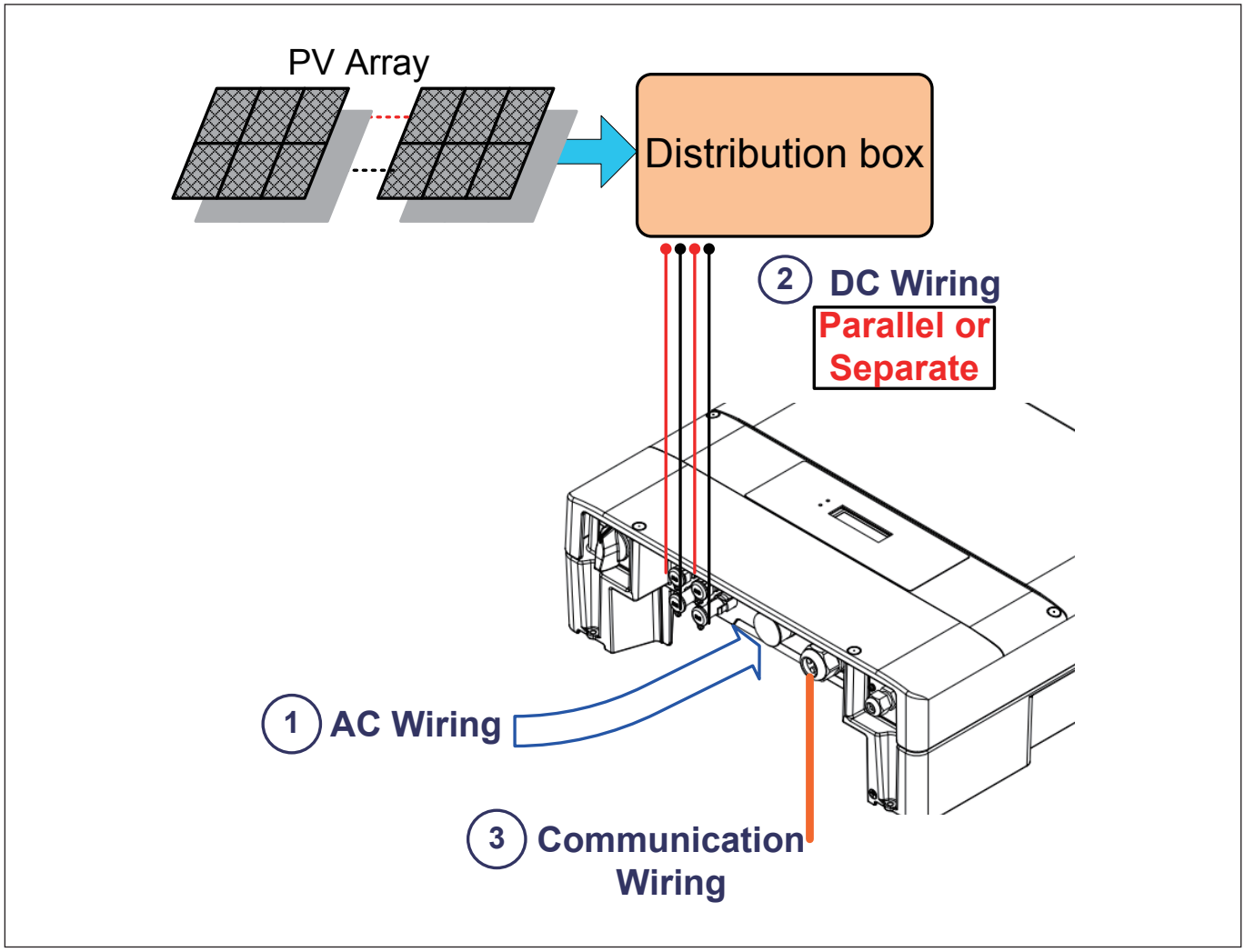


圖5-1 : 太陽能逆變器配線圖(DC側不接地)

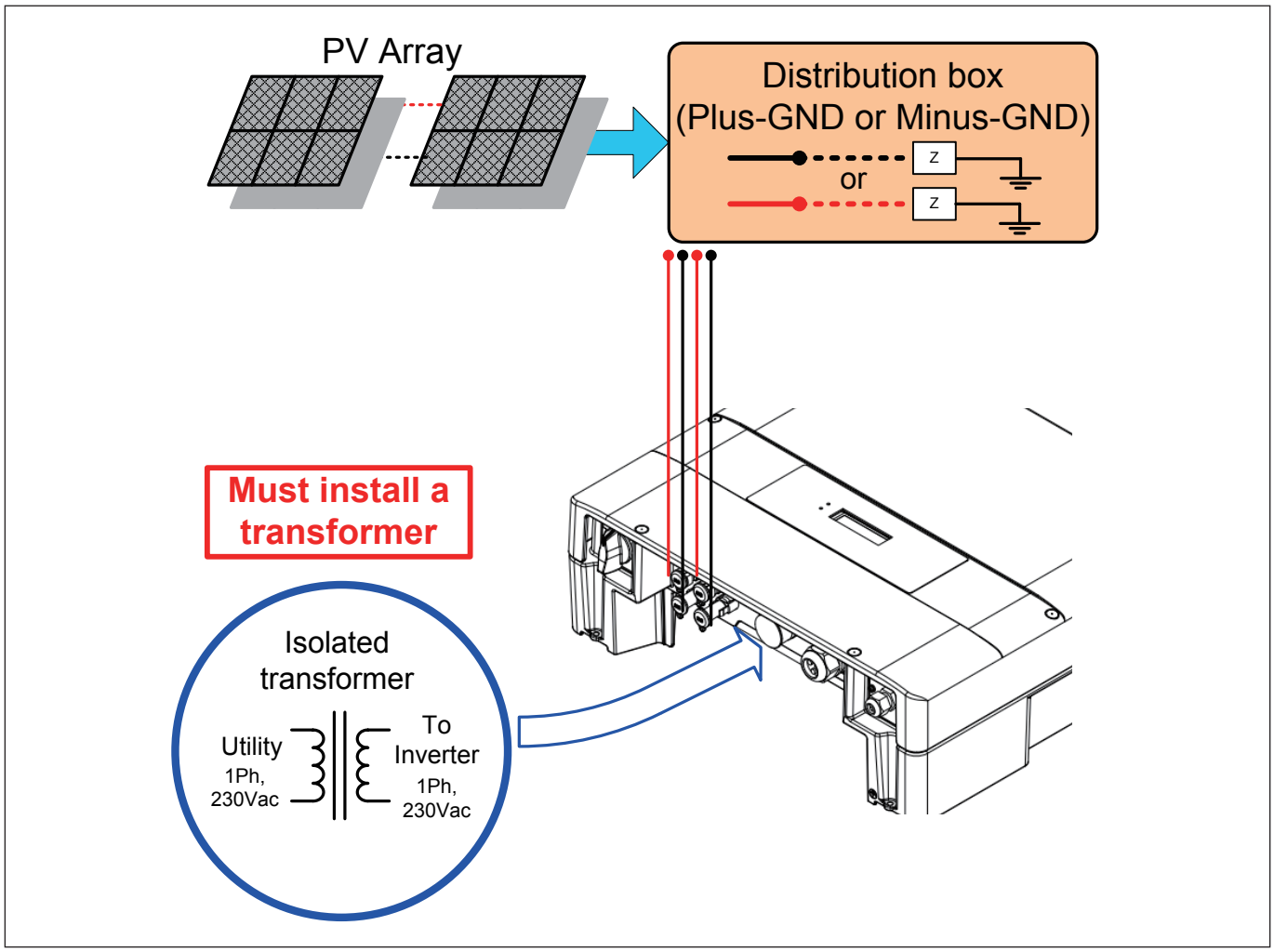


圖5-2：太陽能逆變器配線圖(DC側正接地或負接地)

警 告：觸電危險！

當太陽能板暴露于陽光時，輸出電線與金屬端子會有觸電的危險，為了降低安裝時觸電之風險，在開始配線之前以絕緣物質覆蓋於太陽能板之上並確認斷路裝置設定在OFF。

5.2 AC連接: L + N + PE

警 告：可能導致人員傷亡！

在AC配線之前，先確認AC斷路器已切換至OFF。

5.2.1 保護裝置及導線規格

建議前端保護裝置

	額定功率	前端電路斷路器
RPI H3A RPI H4A RPI H5A	3.75kVA 5 kVA 6.25 kVA	20A 25A 30A

表5-1 : 前端電路保護

配線時請參考表5-2，使用合適的導線

額定電流	導線規格	力矩
>20A (RPI H3A) >25A (RPI H4A) >30A (RPI H5A)	3-4mm^2 / 12 AWG	0.8~1Nm

表5-2 : AC導線規格

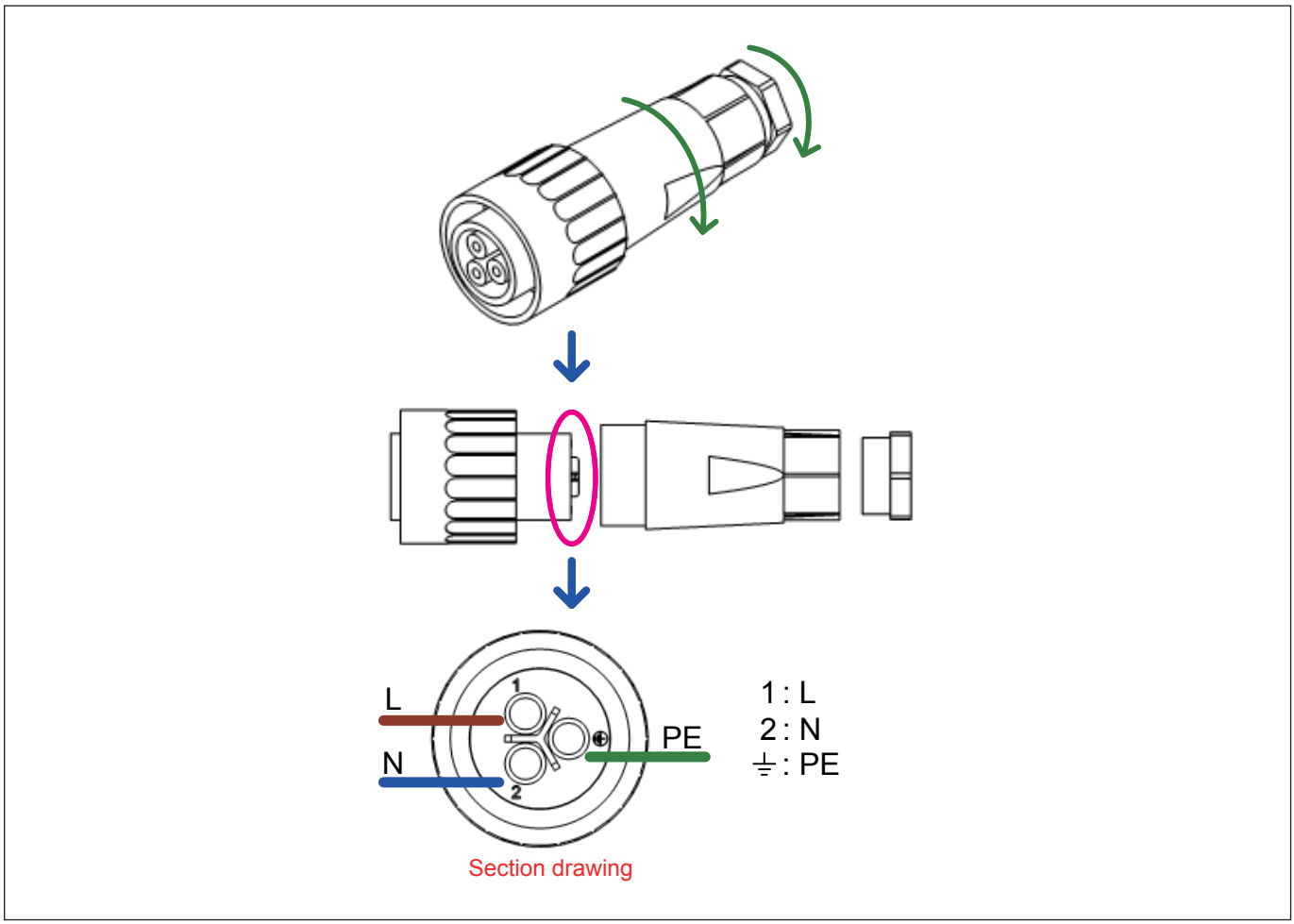


圖5-3 : AC插頭圖解(C01620E0028001, AMPHENOL CORP)

5.3 DC連接 (從太陽能板)

警 告！

在DC配線時請選擇適當佈線連結至正確極性。

在DC配線時請確認太陽能板的開關已關閉。

注 意！

太陽能板的最大開路電壓不能超過600Vdc。
太陽能板輸入功率建議值為

Type of limit	RPI H3A	RPI H4A	RPI H5A
Total input power	3200W	4320W	5280W
Per MPP tracker*	3200W	3200W	3500W

*with unbalanced input power

NOTE

The device installed between the PV Array and inverter must meet the rating of voltage higher than this device's maximum input voltage.

5.3.1 非對稱加載

逆變器使用兩組獨立MPP追蹤來優化調整對稱與非對稱性系統之負載。以此來達成複合發電系統設計的要求。
例如：東/西向屋頂（對稱負載）或南向屋頂，如天窗（非對稱負載）。

MPP range with Max. power	RPI H3A	RPI H4A	RPI H5A
Symmetrical load	160~500V	180~500V	220~500V
Asymmetrical load	320~500V	266~500V	291~500V
Max. ratio for asymmetrical load	100/0%;0/100%	80/20%;20/80%	70/30%;30/70%

The RPI range of PV inverters uses genuine Multi-Contact® MC4 connectors.

CABLE COUPLER POLARITY	WIRE SIZE 2.5 MM² (AWG 14)	WIRE SIZE 4.0 MM² - 6.0 MM² (AWG 12-10)	FEMALE CABLE COUPLER	MALE CABLE COUPLER	MULTI-CONTACT ORDER NUMBER
Plus coupler	●		●		32.0010P0001-UR 32.0012P0001-UR
Minus coupler	●			●	32.0011P0001-UR 32.0013P0001-UR
Plus coupler		●	●		32.0014P0001-UR 32.0016P0001-UR
Minus coupler		●		●	32.0015P0001-UR 32.0017P0001-UR

表 5-3 : MC4接頭的購買序號

電流額定值		線徑尺寸
DC 10 A (RPI H3A)	DC 12 A(RPI H4A / H5A)	2-3mm² / 14 AWG

表 5-4 : 導線尺寸規格

DC 接頭配線極性可區分為正極與負極如圖5-4。

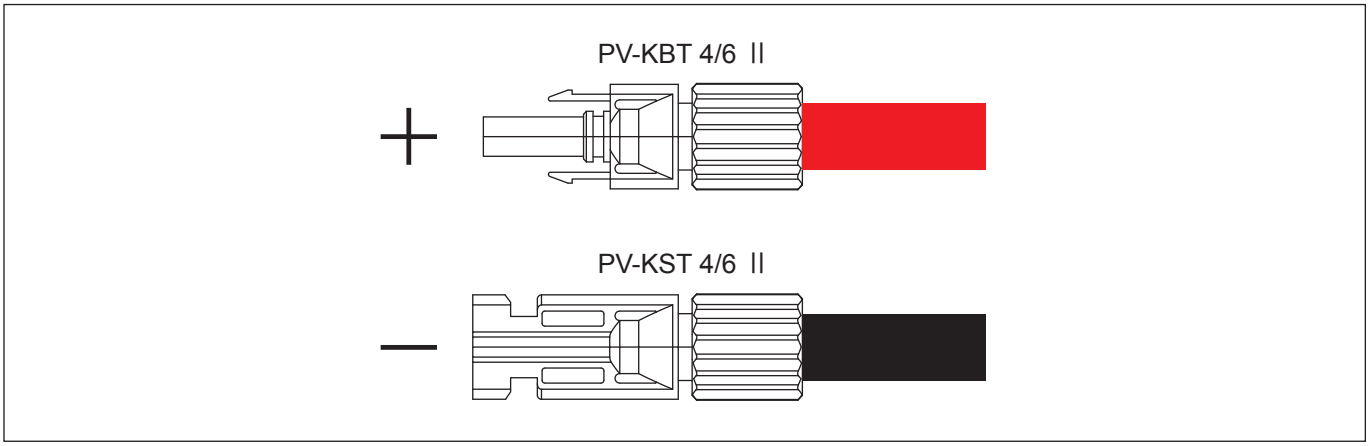


圖5-4 : DC接頭配線圖

5.4 通訊模組

通訊模組提供本逆變器與電腦之間的通訊功能，並提供2個RS-485埠位，當要使用此模組時須先取下底部右方的外蓋再拉出RS-485模組如圖5-5。

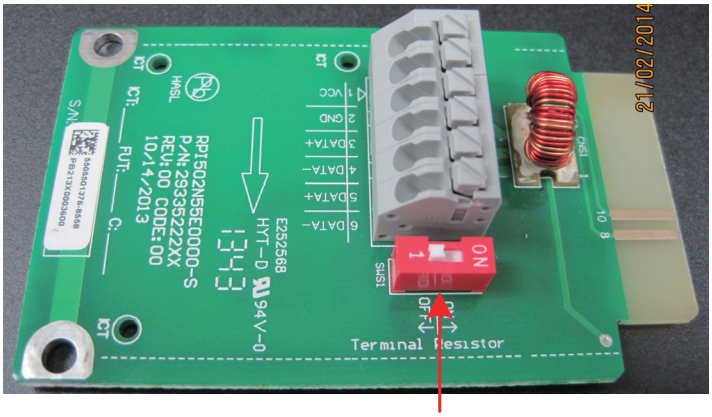


圖5-5 : 通訊模組

5.4.1 RS-485 通訊連接

RS-485的pin腳定義如表 5-5所列，通訊協定設定則列於表5-6，安裝單一台逆變器時終端電阻應該設成ON, 安裝多台逆變器串聯時需將第一台和最後一台終端電阻設為ON, 其餘的終端電阻則設成OFF, 串聯配線圖如圖5-6。

PIN	FUNCTION
1	VCC
2	GND
3	DATA+
4	DATA–
5	DATA+
6	DATA–

表5-5 : RS-485腳位定義

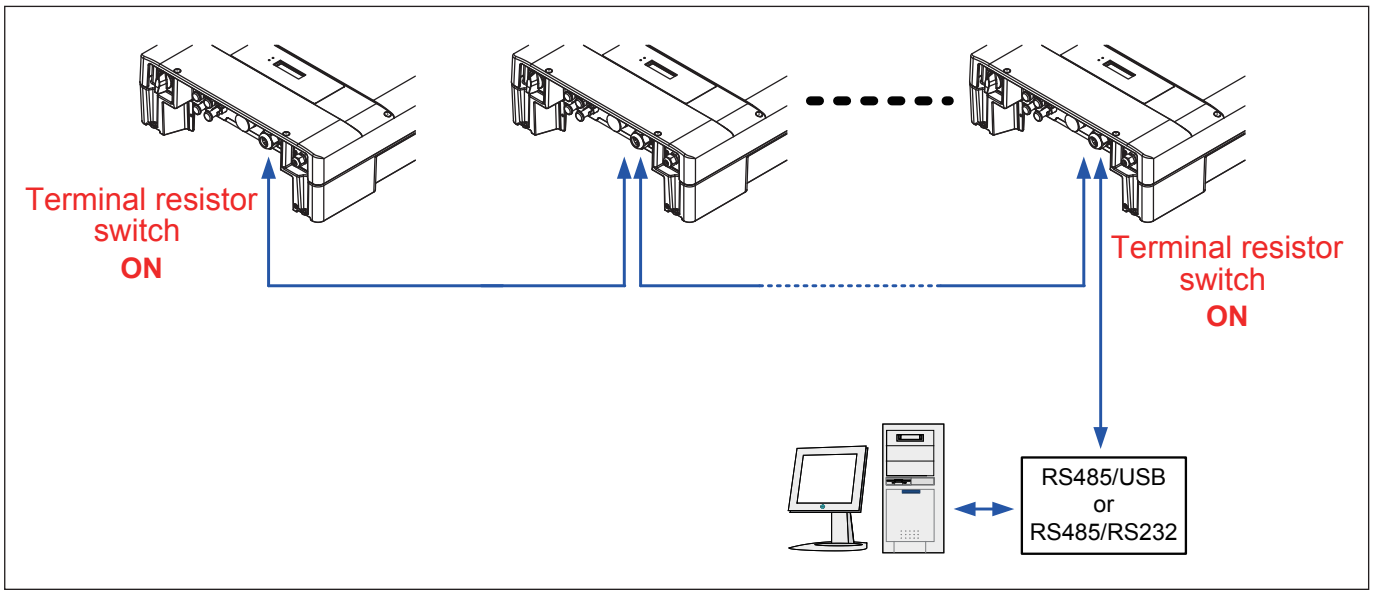


圖5-6 : 多台串聯配線圖

RS-485 Data format	
Baud rate	9600 / 19200
Data bit	8
Stop bit	1
Parity	N/A

表5-6 : RS-485通訊協定設定

6 實功與虛功控制及低壓穿越(非必要選項)

依據VDE-AR-N 4105及CEI 0-21，使用者有2種實功控制設定及4種虛功控制設定。

6.1 實功控制

6.1.1 功率限制

使用者可用百分比的方式降低逆變器輸出功率。
設定方式有兩種：

1. 以額定功率為100%。
2. 依當下輸出功率為100%。

6.1.2 功率vs.頻率

根據VDE-AR-N 4105 (5.7.3.3)：

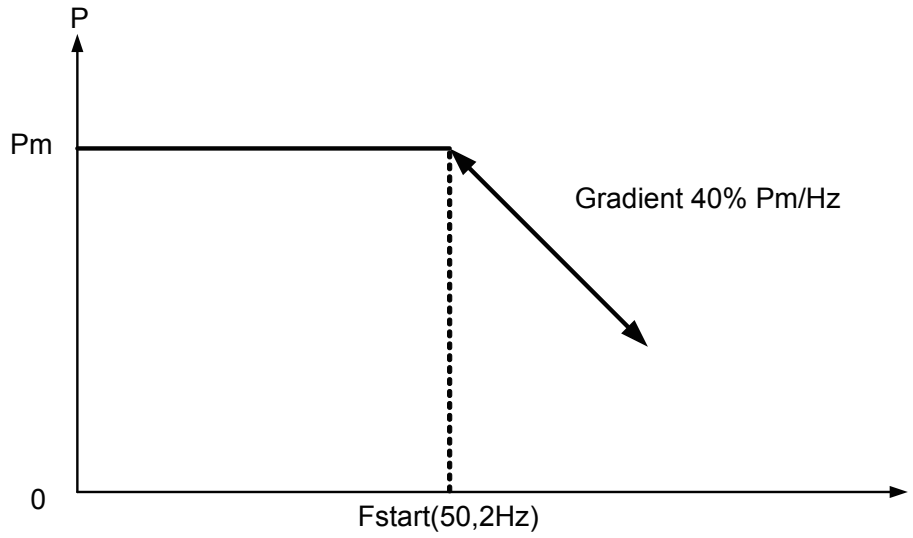
參考圖6-1。當頻率介於50.2Hz至51.5Hz之間，輸出功率會隨著頻率上升(下降)而下降(上升)。輸出功率上升(下降)的斜率為40%Pm/1Hz。Pm為50.2Hz時的輸出功率。

詳細的動作原理可參考VDE-AR-N 4105 (5.7.3.3)

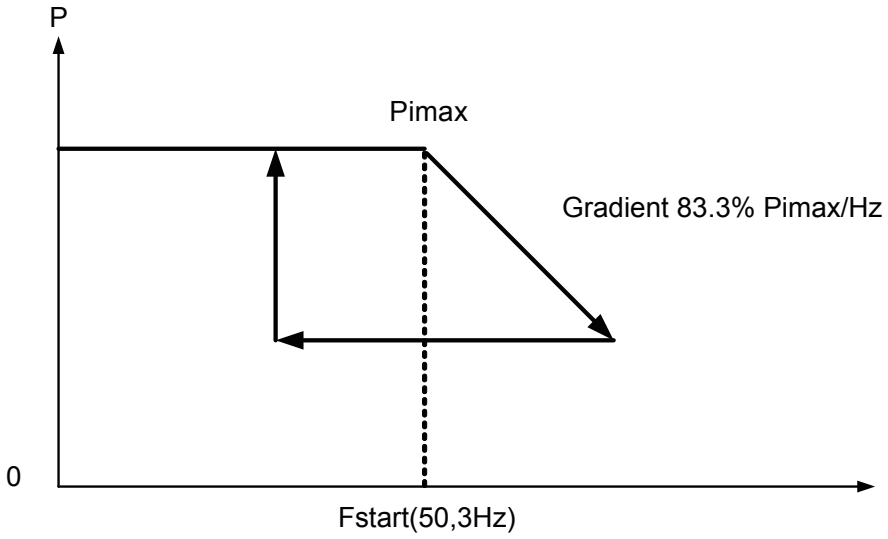
根據CEI 0-21 (8.5.3.2)：

參考圖6-1。當頻率介於50.3Hz至51.5Hz之間，輸出功率會隨著頻率上升而下降。輸出功率下降的斜率為83.3%Pm/1Hz。Pm為50.3Hz時的輸出功率。

詳細的動作原理可參考CEI 0-21 (8.5.3.2)



功率vs.頻率曲線 (VDE-AR-N 4105)



功率vs.頻率曲線 (CEI-021)

圖6-1 : 功率vs.頻率特性

6.2 虛功控制

使用者有以下四種虛功控制方式：

- 固定功率因數cosφ (VDE-AR-N 4105 ,CEI 0-21)
- displacement factor/active power characteristic curve cosφ(p) (VDE-AR-N 4105 ,CEI 0-21)
- 固定虛功量(Var)(CEI 0-21)
- 虛功 / 電壓特性Q(U). (CEI 0-21)

6.2.1 Fixed Power Factor cosφ (VDE-AR-N 4105,CEI 0-21)

使用者可設定輸出功率因數從Cap 0.8到Ind 0.8 (若輸出功率低於額定功率20%，逆變器將停止虛功控制)。

6.2.2 cosφ(P) (VDE-AR-N 4105,CEI 0-21)

使用者可設定P1，P2，Cap 0.9，Ind 0.9四個參數來決定輸出功率因數與輸出功率關係。如圖6-2。

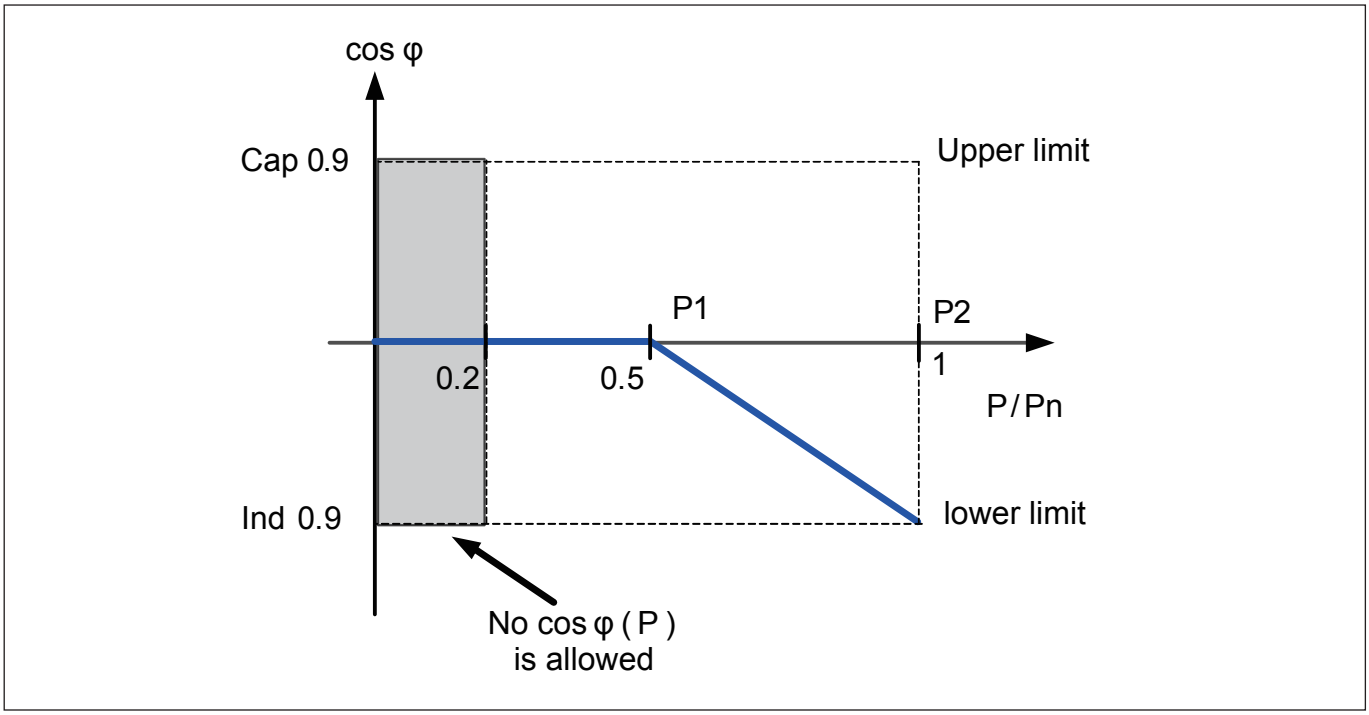


圖6-2 : cosφ(P)特性

6.2.3 Fixed Reactive Power InVAR(CEI 0-21)

使用此種方式時，逆變器將依照固定虛功設定值來輸出虛功。
使用者可設定輸出範圍從Cap 48.4% 到 Ind 48.4%.。

6.2.4 虛功 / 電壓特性 Q(U) (CEI 0-21)

使用者可設定U1s，U1i，U2s，U2i，Qmin，Qmax六個參數來決定輸出。
Q與市電電壓關係，如圖6-3。

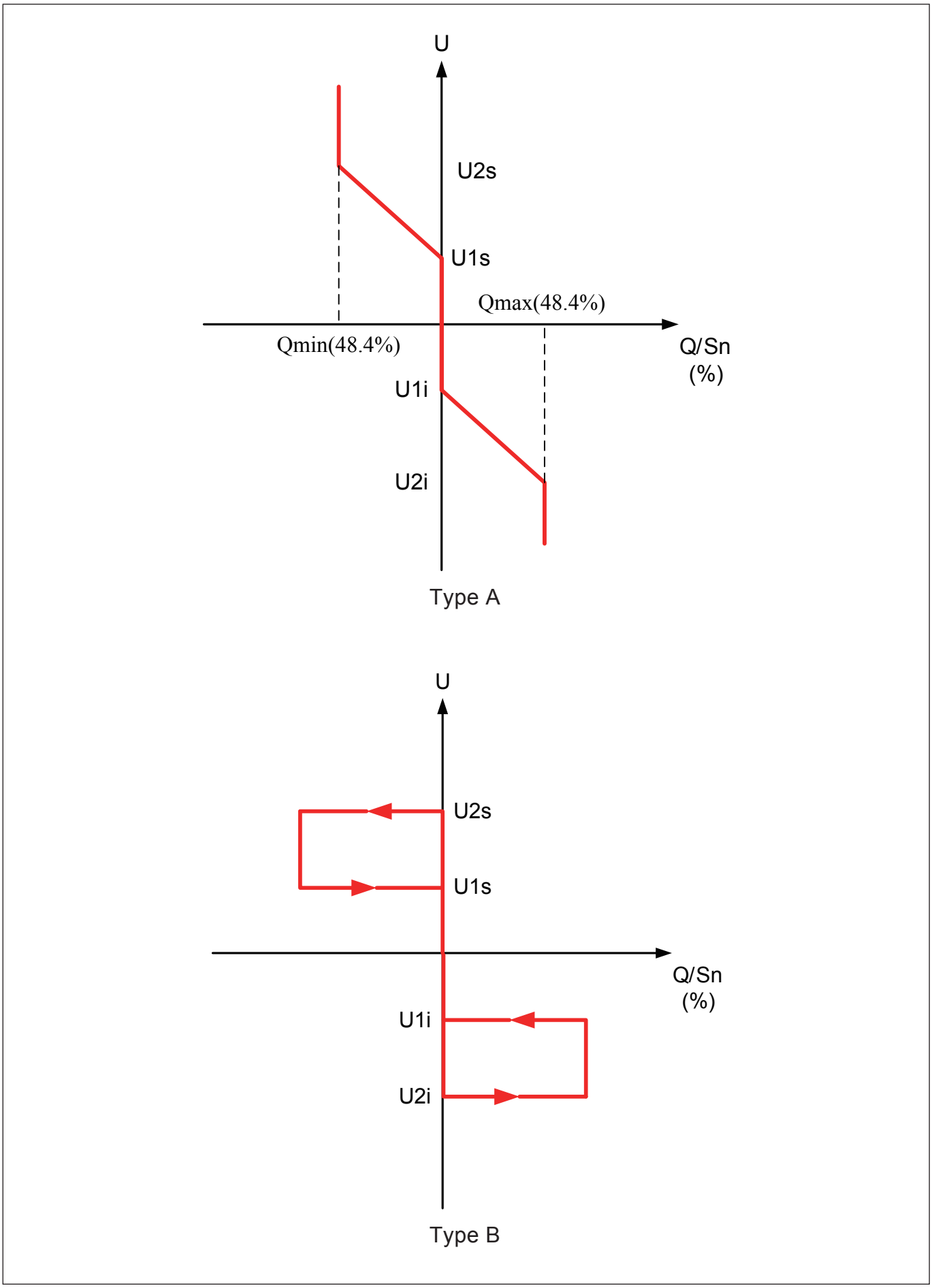

U
U2s
U1s
Qmax(48.4%)
Qmin(48.4%)
Q/Sn
(%)
U1i
U2i
Type A
U
U2s
U1s
Q/Sn
(%)
U1i
U2i
Type B

圖6-3 : Q(U)特性

6.3 低壓穿越 (LVRT)

根據CEI 0-21, 8.5.1

當電壓下降現象發生時，為了避免與網路不正常脫離，總功率超過6千瓦的發電系統必須符合一定的功能性需求，就是國際上一般通稱的低壓穿越LVRT(Low Voltage Ride Through)。

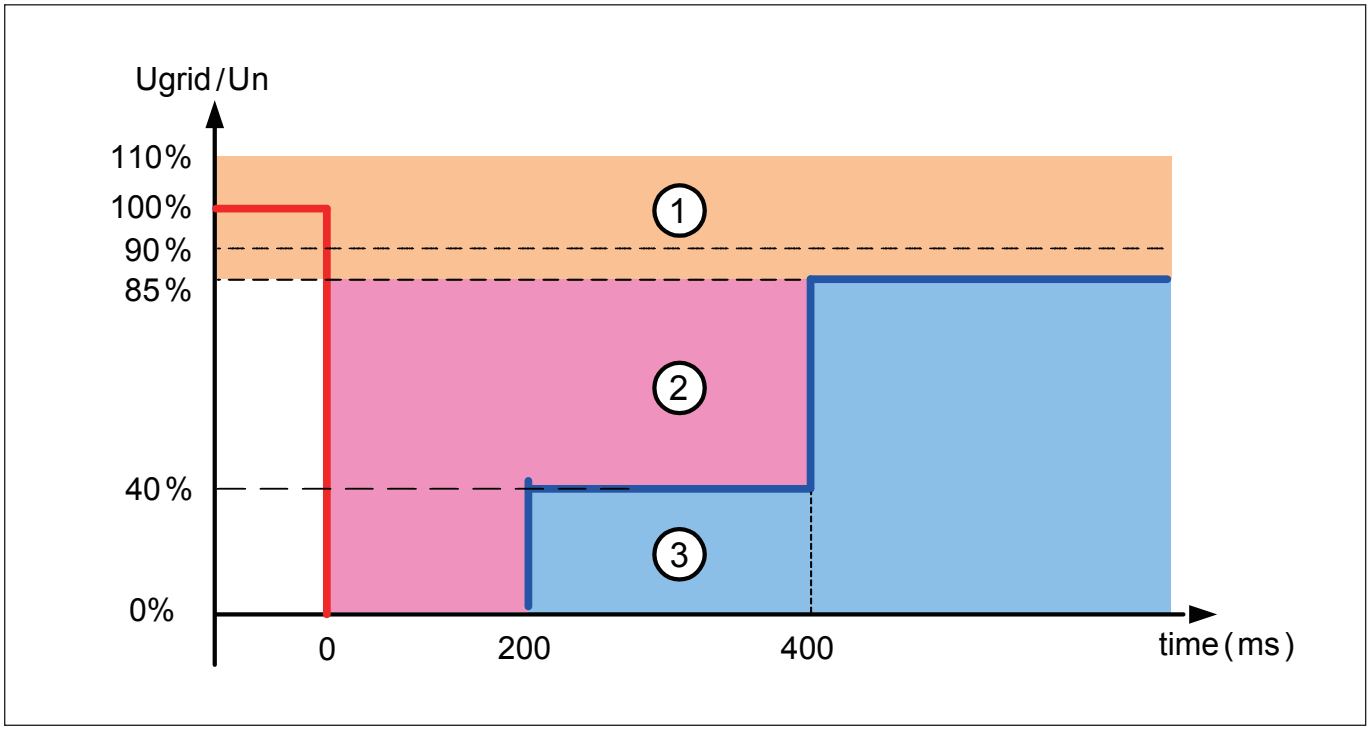


圖6-4 : LVRT特性

7 逆變器的開啟與關閉

警 告：高溫危險！

產品運作時外殼溫度可能超過70℃，導致表面產生高溫燙傷的危險，請勿觸摸！

安裝完成後，請確認AC、DC及通訊連結狀況是否正確，若日照充足，且自我測試(每日第一次啟動約2分鐘)未出現異常狀況，逆變器將自動開始運作，此產品含16×2 LCD顯示幕幕及LED指示燈顯示逆變器之運作狀態，LED指示燈含綠燈及紅燈分別代表逆變器不同運作狀況。

7.1 產品啟動程式

7.1.1 檢查太陽能板的DC電壓

1. 將太陽能板直接曝曬于陽光之下，陽光必須大到可以產生足夠的輸出電壓。
2. 量測太陽能板正負兩端子間的開路直流電壓。

7.1.2 檢查AC市電電壓

使用AC 伏特計量測L1（L）和L2（N）之間市電開路電壓，確保電壓落于大約正常值，逆變器將工作在一個近似市電的弦波的一般電壓值，請參照 “11. 技術資料” 的輸出部分以瞭解本機器市電電壓操作範圍。

7.1.3 開啟逆變器

1. 將DC和AC斷路器切換到ON的位置。
2. 檢查逆變器LCD顯示幕幕，需等待幾秒後螢幕亮起(產品第一次開啟時需選擇國別以及語言參照 “7.3.2國別選擇&7.3.3語言選擇”）。

7.2 逆變器設定

7.2.1 國別設定

產品第一次開啟時需選擇國別

1. 在國別選擇頁面，按 “NEXT” 按鈕選擇所在地國家後，按下 “Enter” 按鈕確認選擇。

2. 按下 “Enter” 按鈕確認選擇。

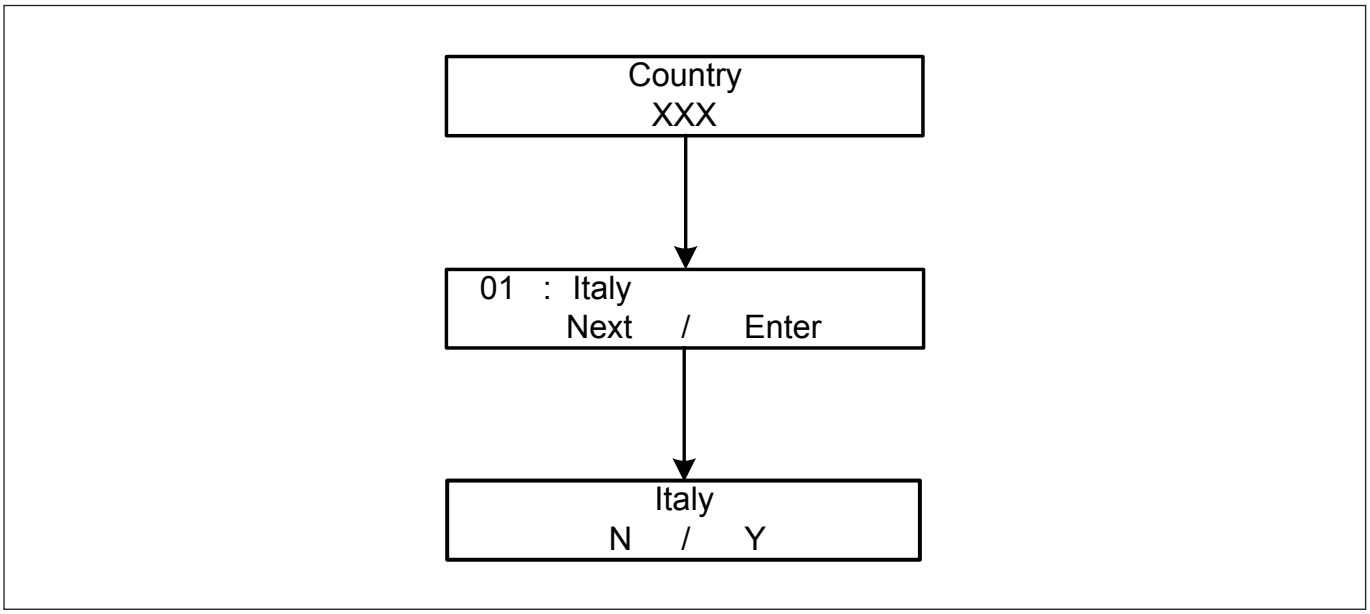


圖7-1 : 國別設定

7.2.2 連接通訊配線

多台逆變器並聯連接可同時由RS-485進行監控(如圖 5-6)，但逆變器ID 需個別進行設定。

說 明

確認在同一並聯串中各逆變器間ID皆無重複，單一台逆變器也可由RS-485監控。

7.2.3 選擇逆變器ID

1. 開啟DC輸入電源，待數秒後LCD 顯示幕幕開啟，在 “Inverter ID: XX"顯示後按下 “SEL” 按鍵。

2. 長按 “ENT” 及 “SEL” (先按 “ENT” 不放再同時按 “SEL”)兩按鍵直到進入ID 選擇頁面，放開兩按鍵，按 “SEL” 鍵選擇ID(1 ~ 254)後，按下 “ENT” 鍵確認ID 已選擇。

3. 逆變器 ID 已成功選擇並儲存。

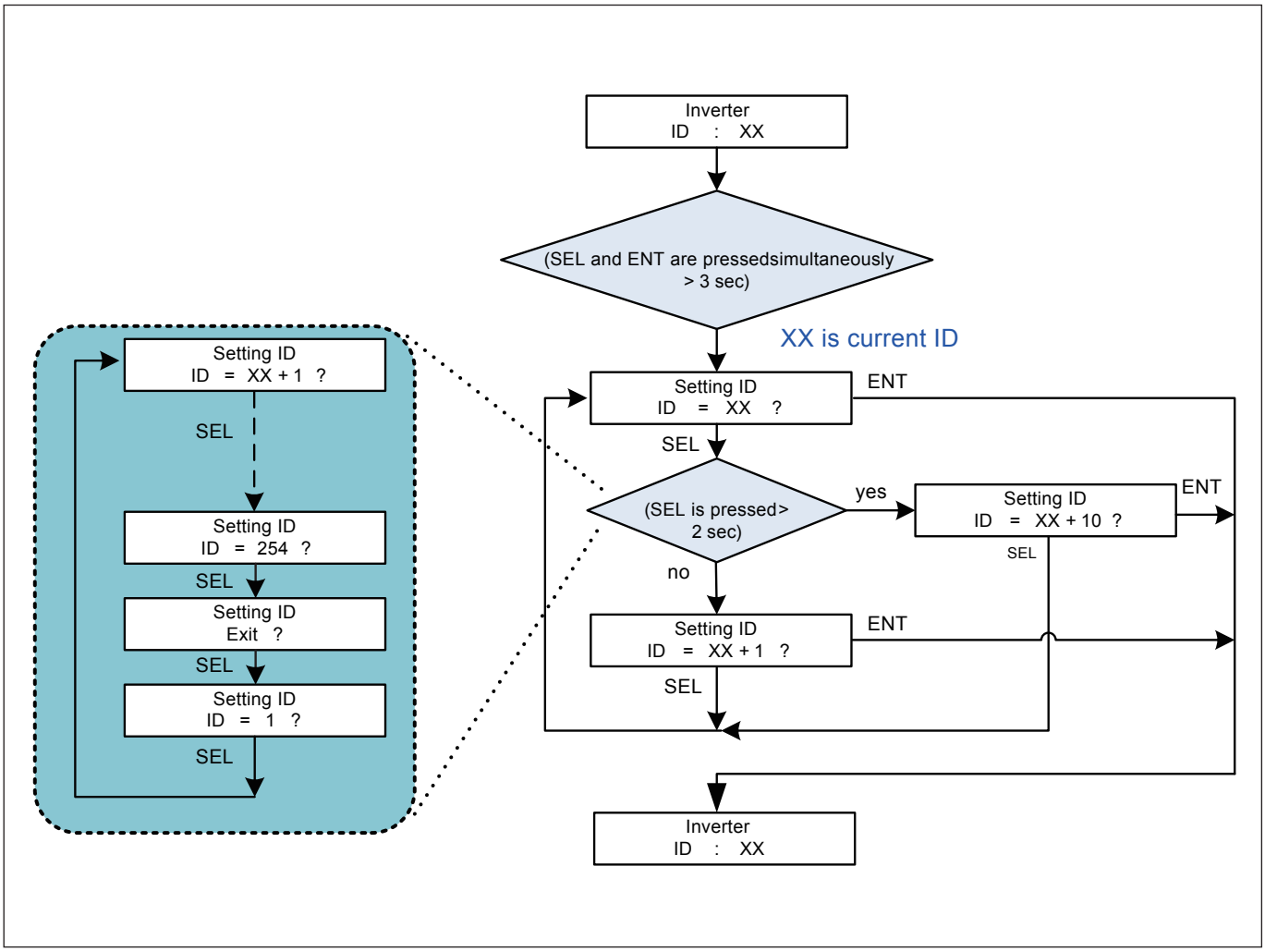


圖7-2 : 選擇逆變器ID

7.3 LCD流程圖

按下任何鍵可進入選單頁面 (如圖7-3)，今日輸出能量主頁面，其他頁面專案在以下7.3.1 ~ 7.3.7章節介紹。

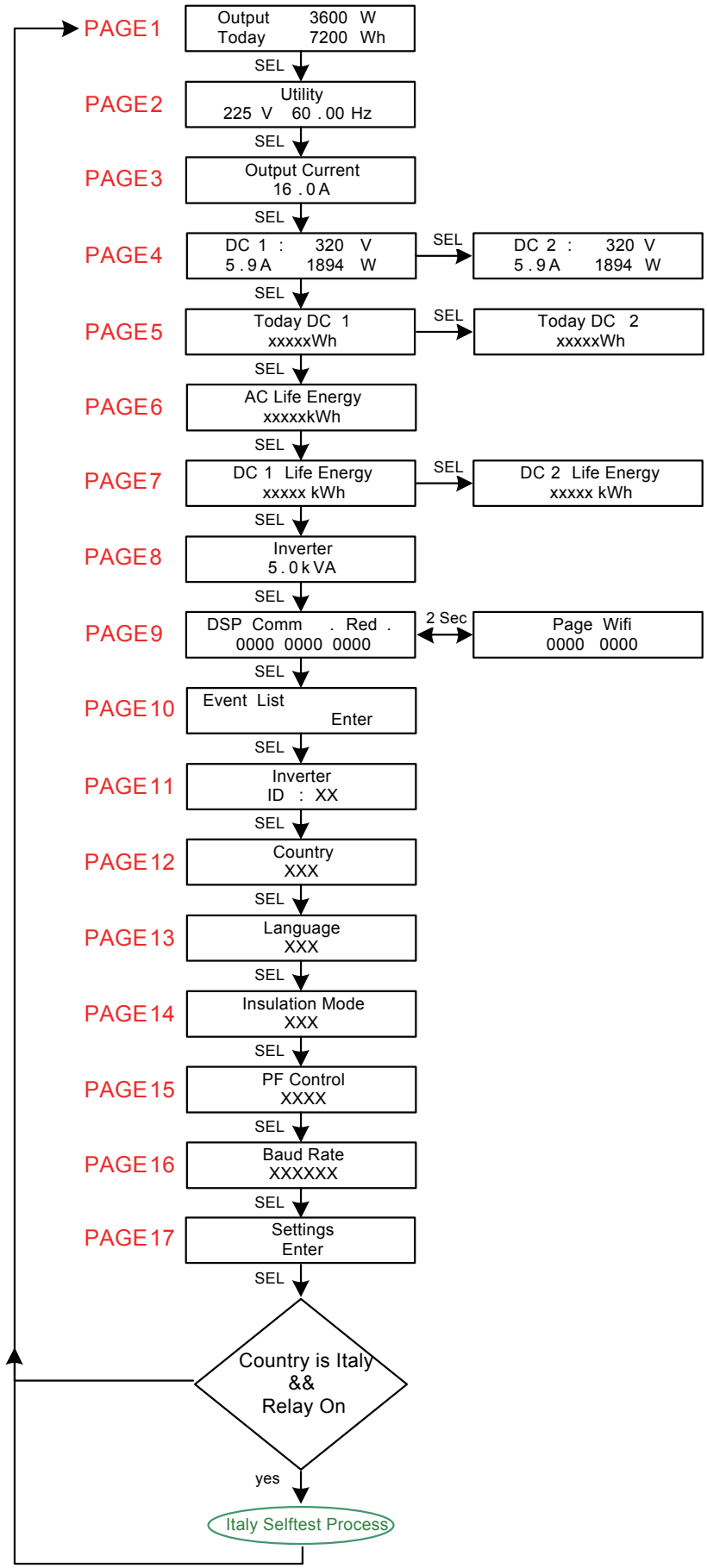

PAGE1
Output 3600 W
Today 7200 Wh
SEL
PAGE2
Utility
225 V 60 . 00 Hz
SEL
PAGE3
Output Current
16 . 0 A
SEL
PAGE4
DC 1 : 320 V
5 . 9 A 1894 W
SEL
DC 2 : 320 V
5 . 9 A 1894 W
SEL
PAGE5
Today DC 1
xxxxxWh
SEL
Today DC 2
xxxxxWh
SEL
PAGE6
AC Life Energy
xxxxxkWh
SEL
PAGE7
DC 1 Life Energy
xxxxx kWh
SEL
DC 2 Life Energy
xxxxx kWh
SEL
PAGE8
Inverter
5 . 0 k VA
SEL
PAGE9
DSP Comm . Red .
0000 0000 0000
2 Sec
Page Wifi
0000 0000
SEL
PAGE10
Event List
Enter
SEL
PAGE11
Inverter
ID : XX
SEL
PAGE12
Country
XXX
SEL
PAGE13
Language
XXX
SEL
PAGE14
Insulation Mode
XXX
SEL
PAGE15
PF Control
XXXX
SEL
PAGE16
Baud Rate
XXXXXX
SEL
PAGE17
Settings
Enter
SEL
Country is Italy
&&
Relay On
yes
Italy Selftest Process

圖7-3：LCD流程圖

Page1 今日輸出能量
Page2 市電電壓與頻率
Page3 輸出電流
Page4 輸入電壓、電流與功率
Page5 今日輸入能量
Page6 總輸出能量
Page7 總輸入能量
Page8 起始頁面
Page9 韌體版本
Page10 事件紀錄
Page11 逆變器ID
Page12 國別
Page13 語言
Page14 絕緣模式
Page15 虛功控制
Page16 波特率
Page17 設定

7.3.1 事件紀錄

當進入此頁面，螢幕會顯示出所有故障與錯誤紀錄，至多可顯示最新的16筆紀錄，最新的事件置於頂部，越往下面時間越久。

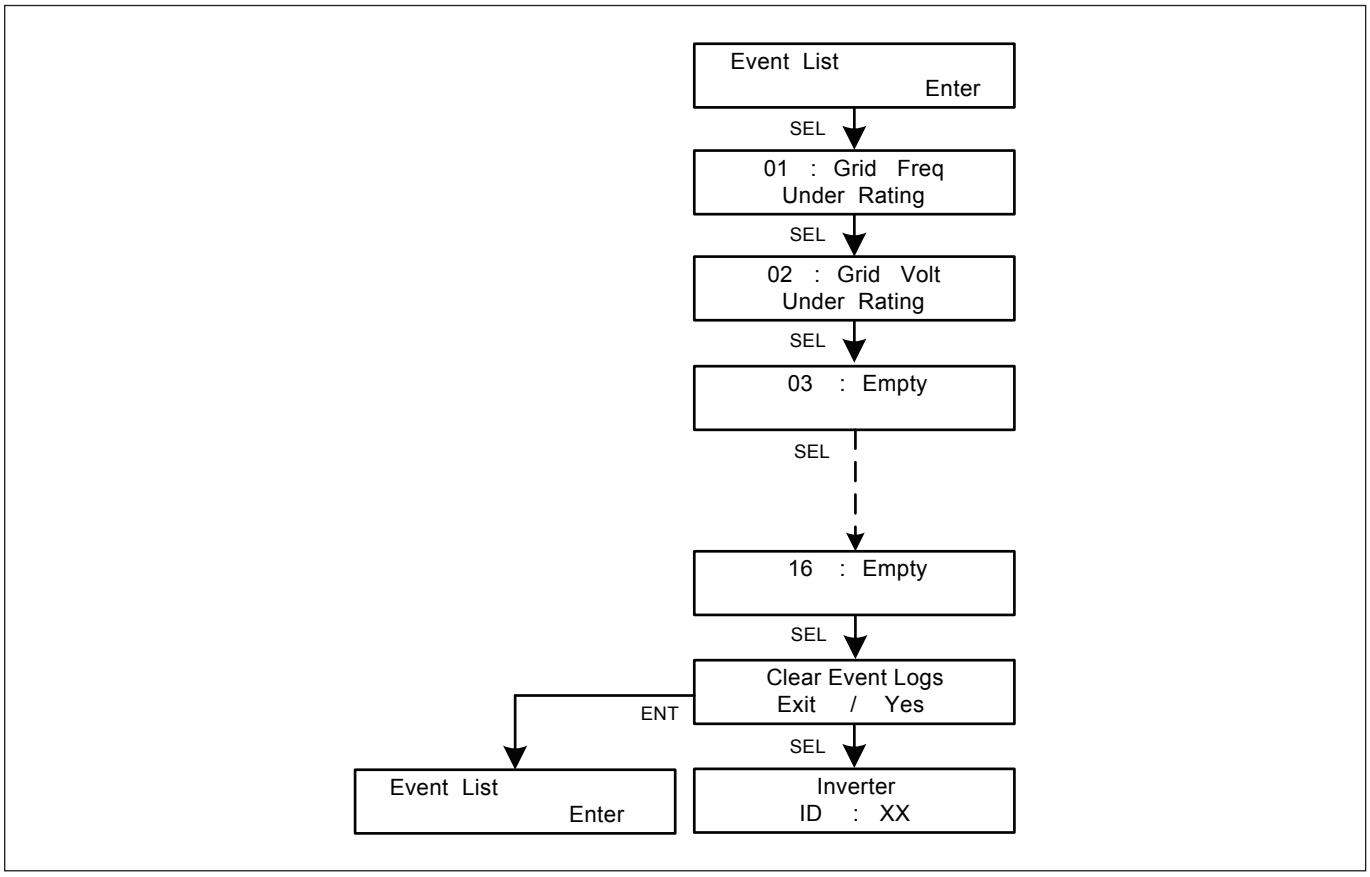


圖7-4 : 事件紀錄流程圖

7.3.2 國別選擇

使用者可在此頁面選擇國別

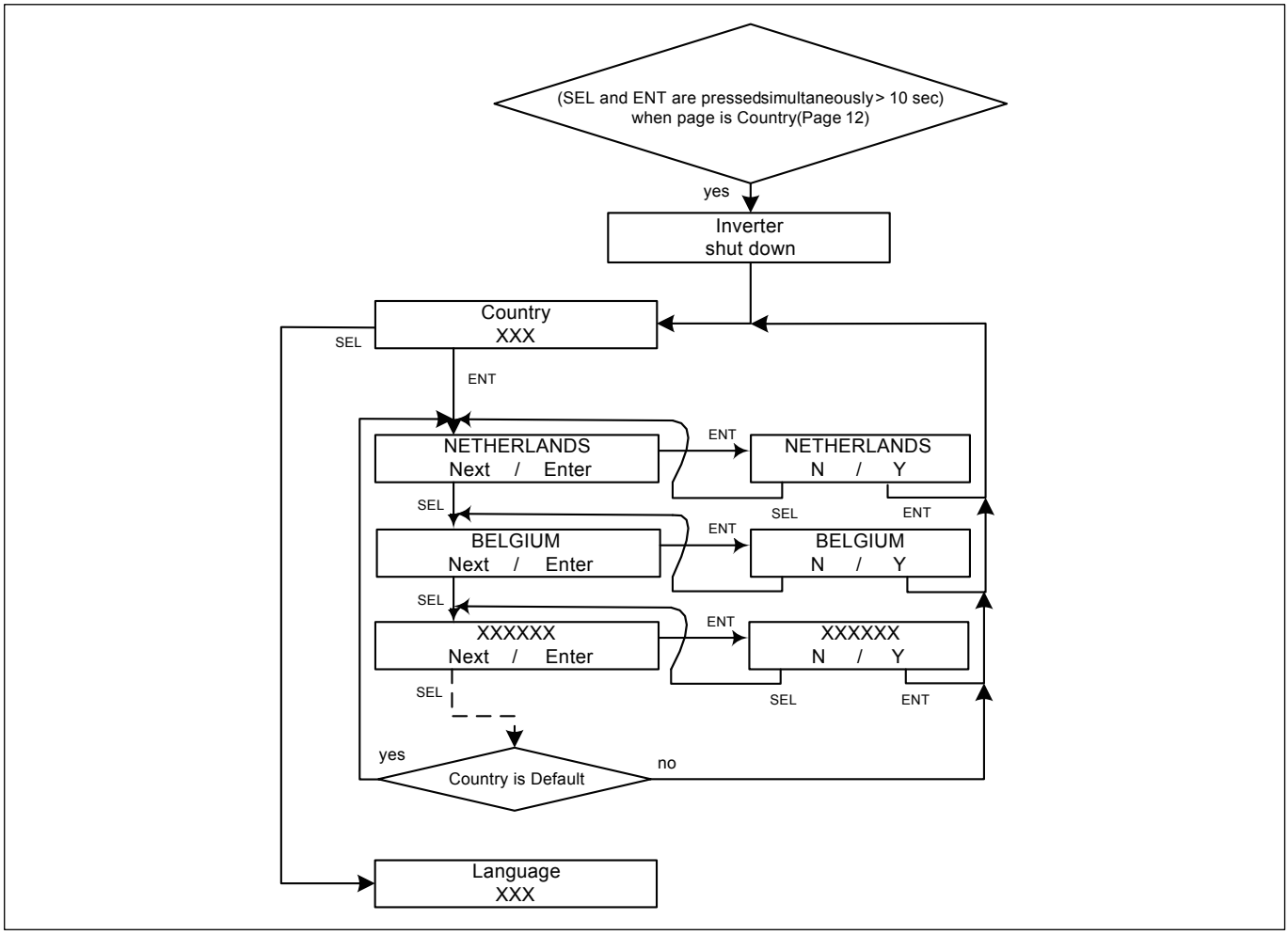


圖7-5：國別選擇

RPI H3A/ H4A/ H5A	
Australia	Italy LV_LVRT
AU/NZ PL4K6	Italy LV_SPI
AU/NZ PL4K99	Netherlands
AU/NZ PL2K49	Spain RD661
AU/NZ PL2K99	Spain RD1699
Austria	Switzerland
Austria PL4K6	Taiwan
Belgium	Thailand MEA
Denmark	Thailand PEA
FR LV VFR2014	UK G59-3 230
FRA-Is. 50Hz	UK G59-3 240
FRA-Is. 60Hz	UK G83-2
Germany LV	Poland
India	New Zealand

表7-1：國別

7.3.3 語言選擇

當進入此頁面可選擇5種不同語言

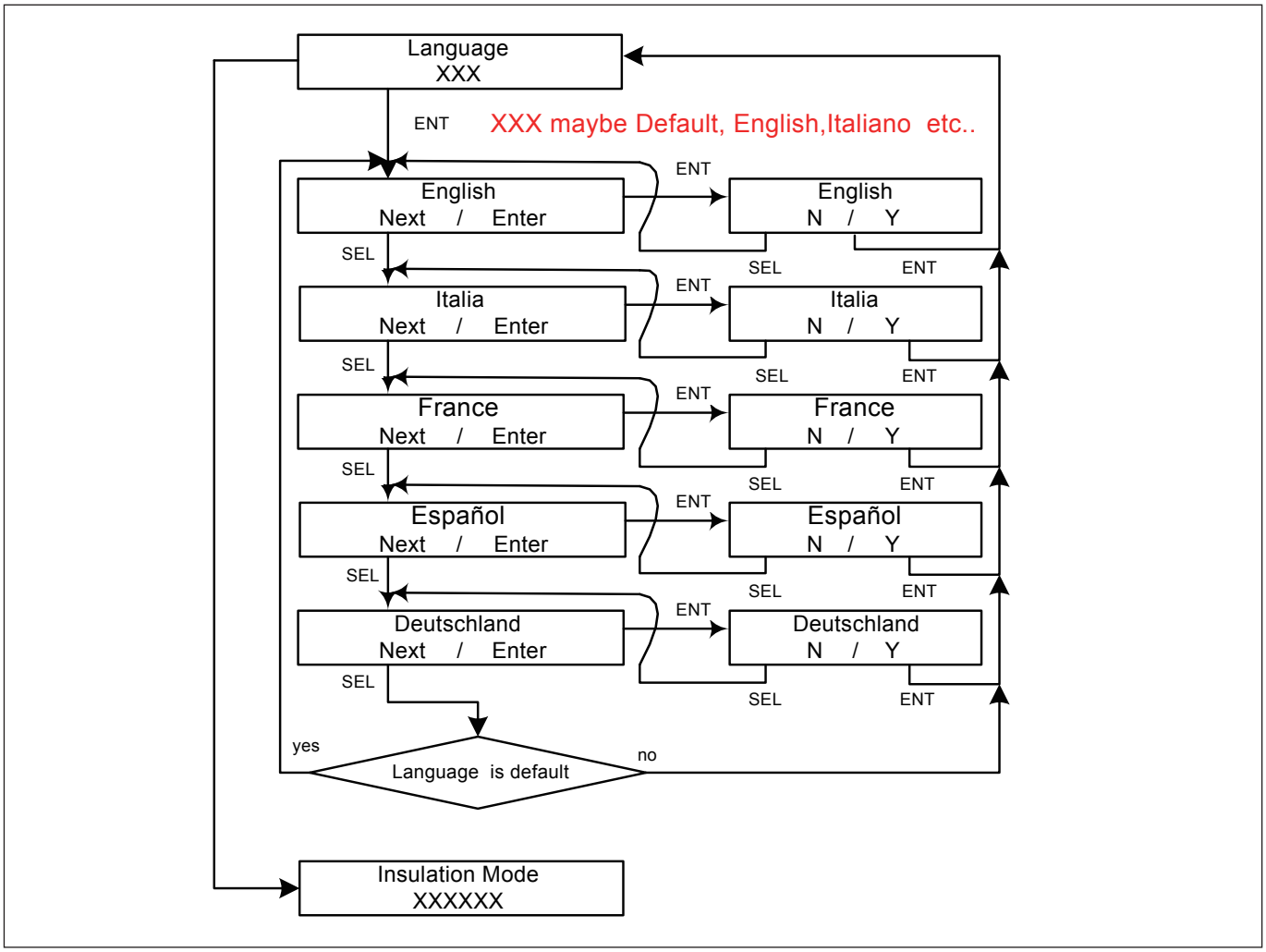


圖7-6：語言選擇

RPI H3A/ H4A/ H5A
English
Italiano
Français
Español
Deutsch

表7-2：語言

7.3.4 絕緣模式

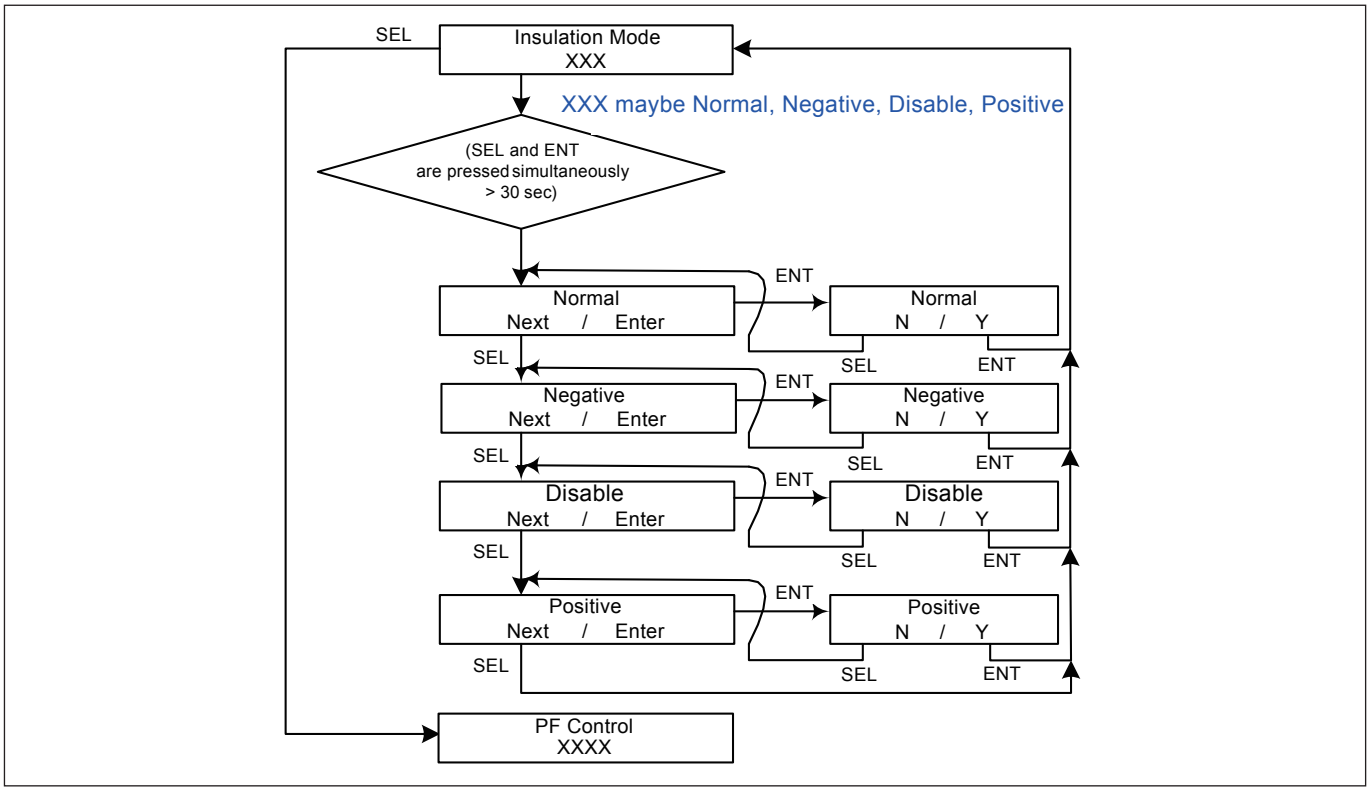


圖7-7：絕緣模式

7.3.5 虛功控制

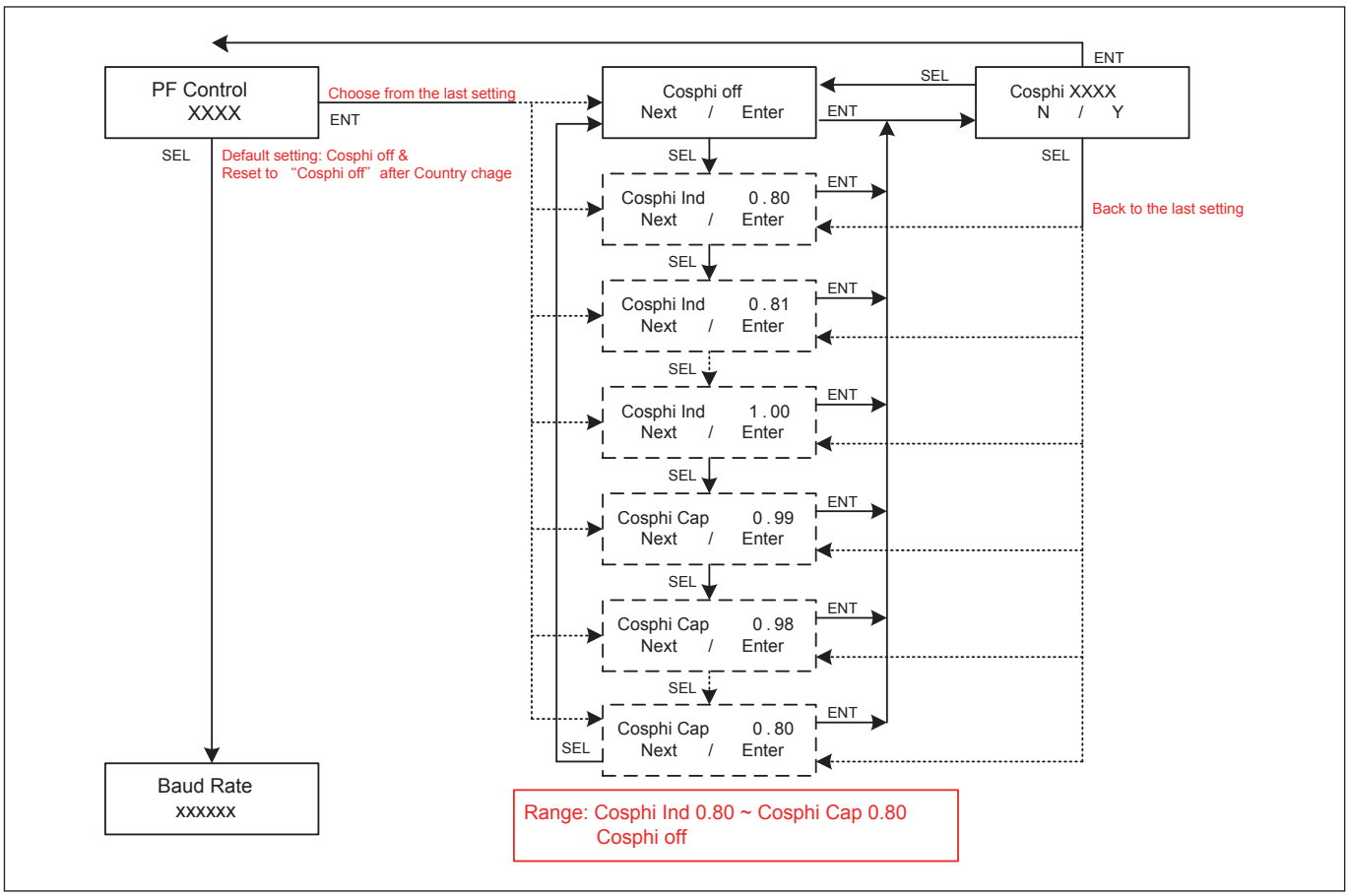


圖7-8：虛功控制

7.3.6 波特率

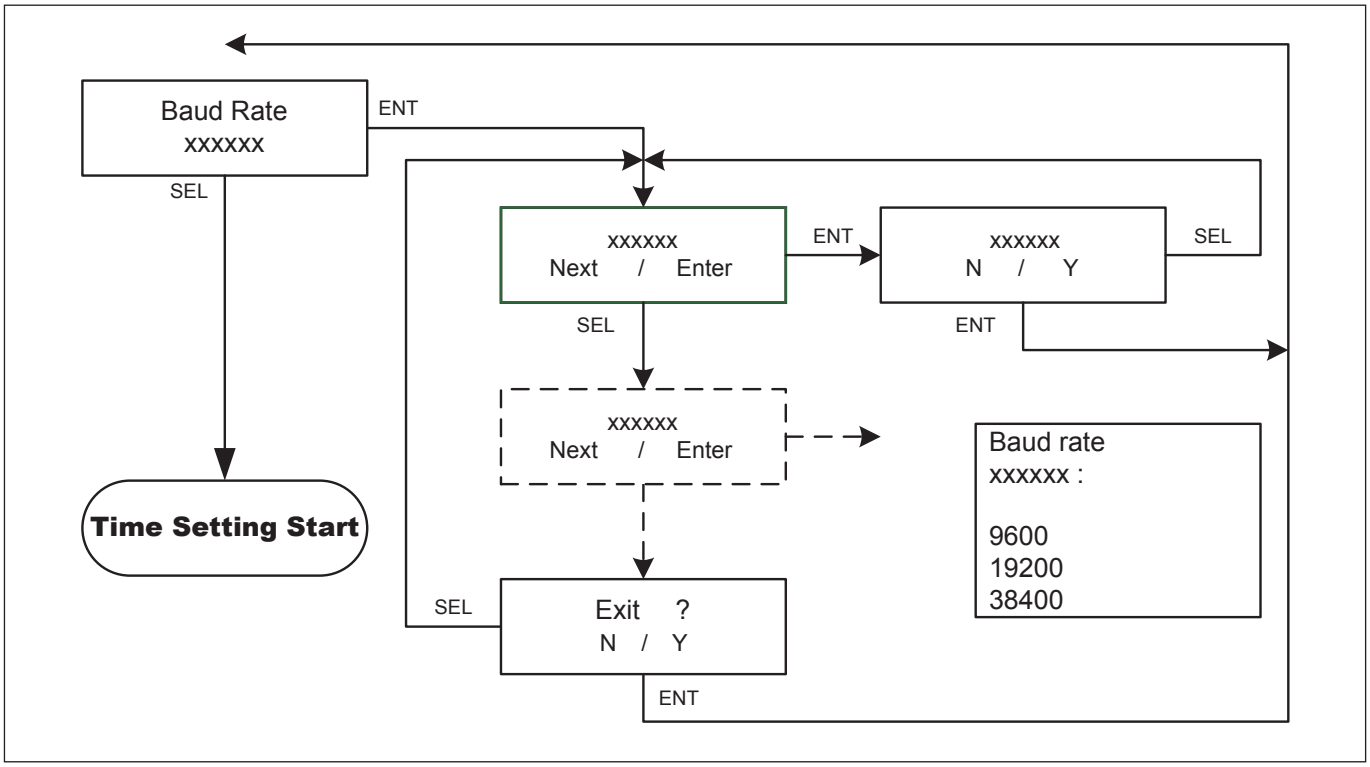


圖7-9 : 波特率

7.3.7 時間設定

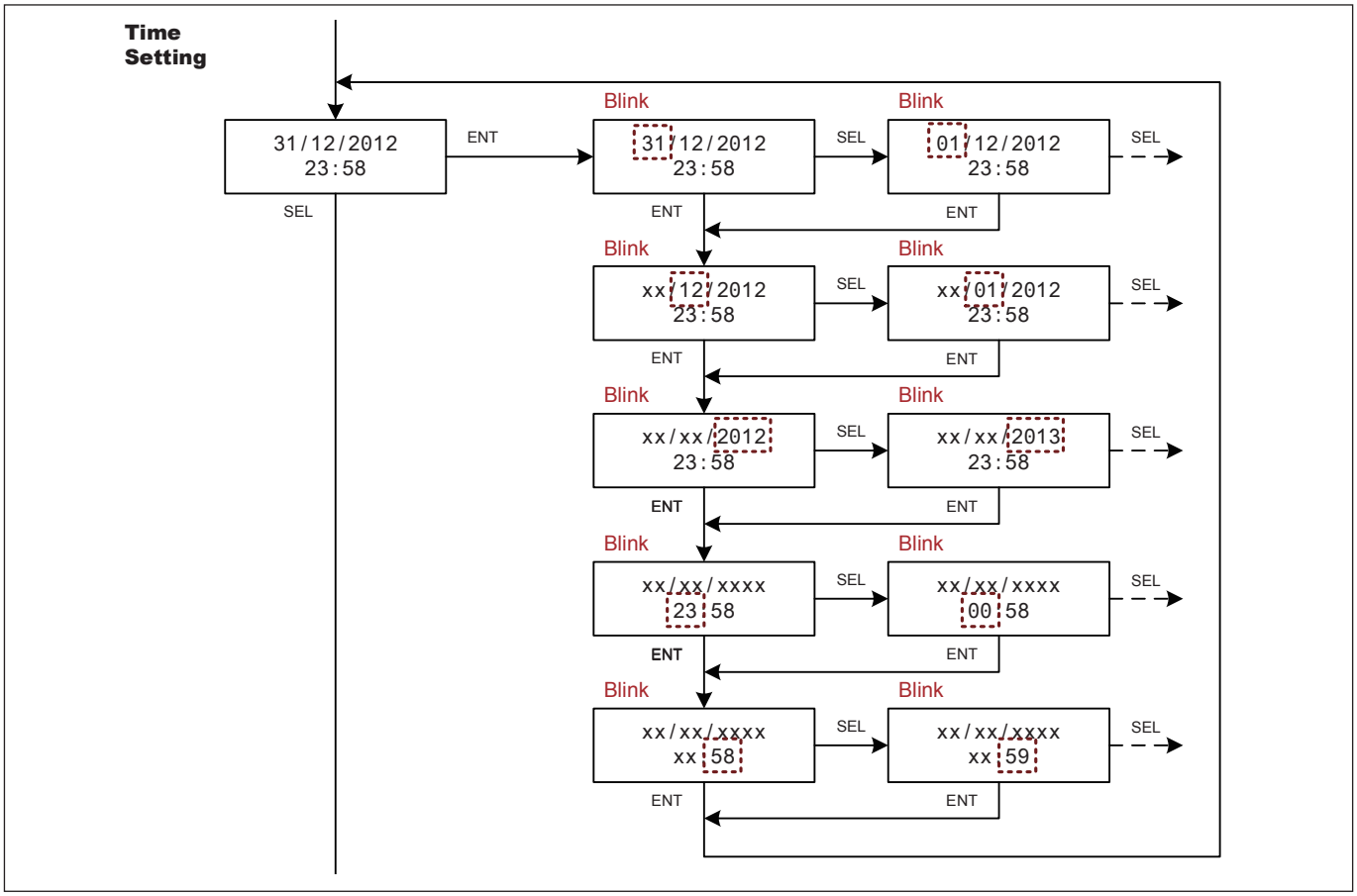


圖7-10 : 時間設定

7.3.8 設定頁面

可以設定的項目包含WiFi、Ethernet IP address和WiFi IP address。

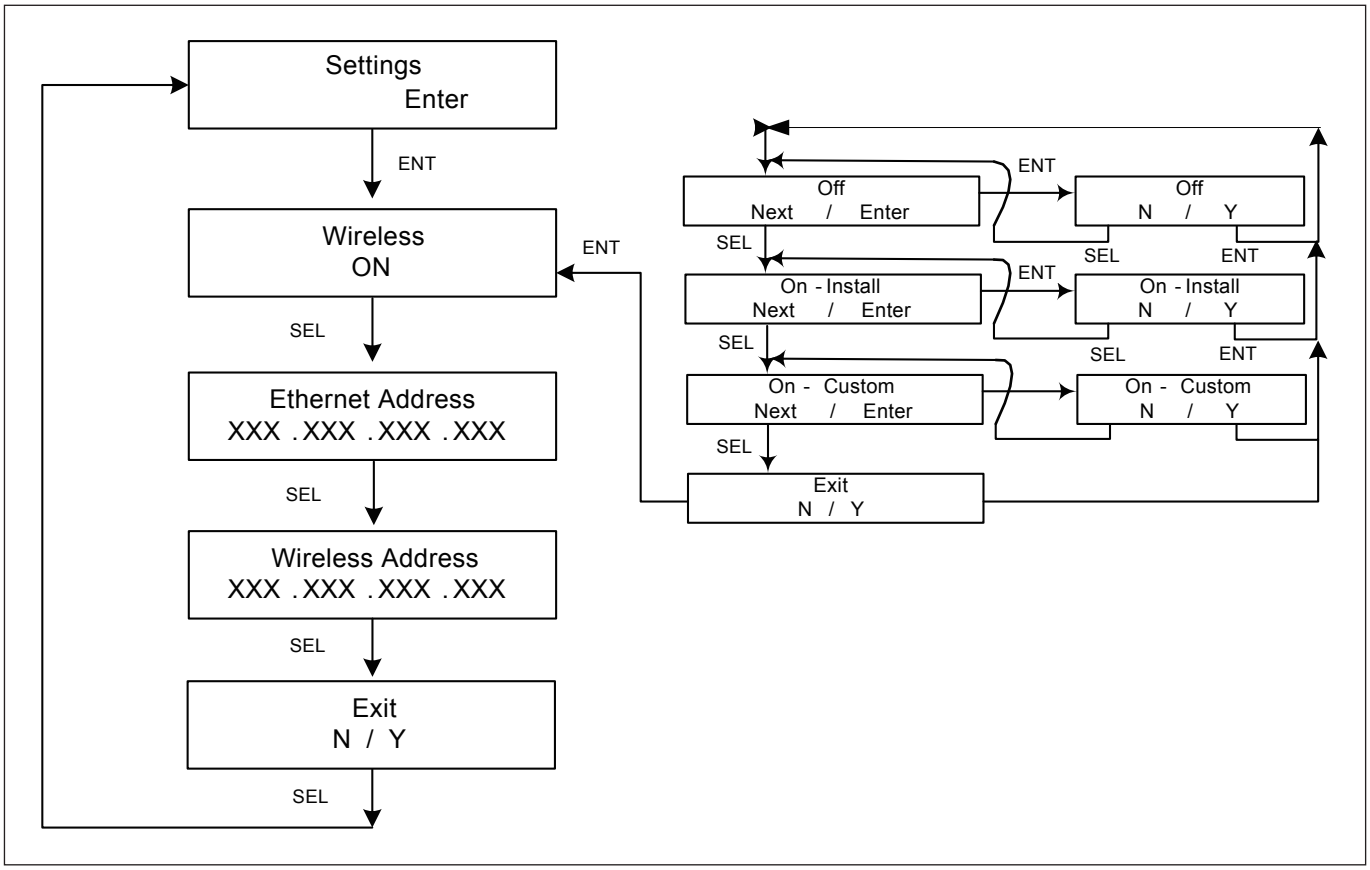


圖7-11：設定頁面

7.3.9 義大利自我測試和Comando locale

義大利自我測試和Comando locale 只有在國別選擇為義大利時才能進行相關設定。義大利自我測試包含Uac High(UH)、Uac Low(UL)、Fac High(FH) and Fac Low(FL) ，使用者可個別選擇Uac High，Uac Low，Fac High，or Fac Low的內容，最後的測試結果將會顯示在動作頁面並儲存供使用者檢查，若未通過義大利自我測試，逆變器將無法操作，請連系台達電子或供應商。

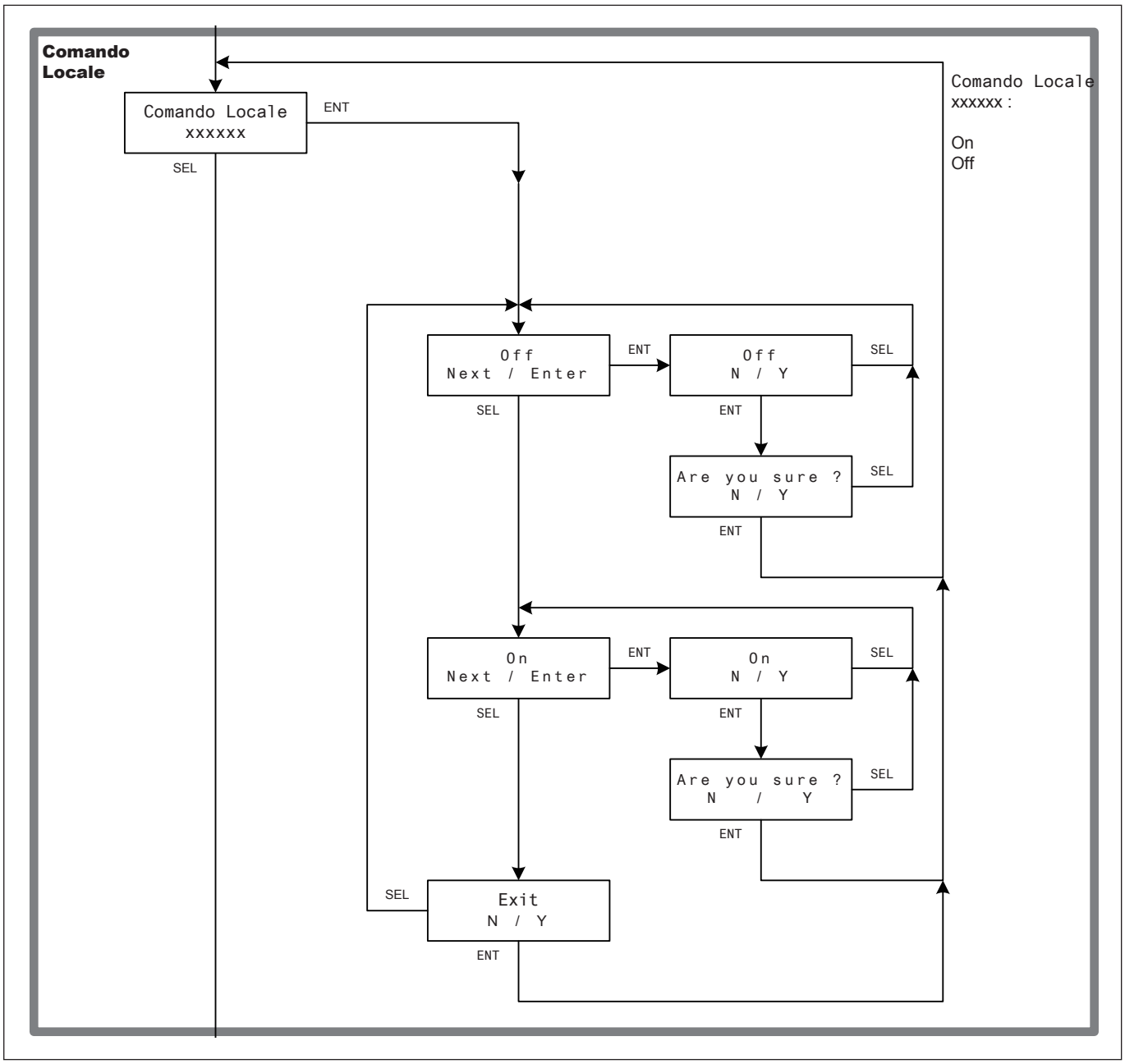


圖7-12 : 義大利Comando locale

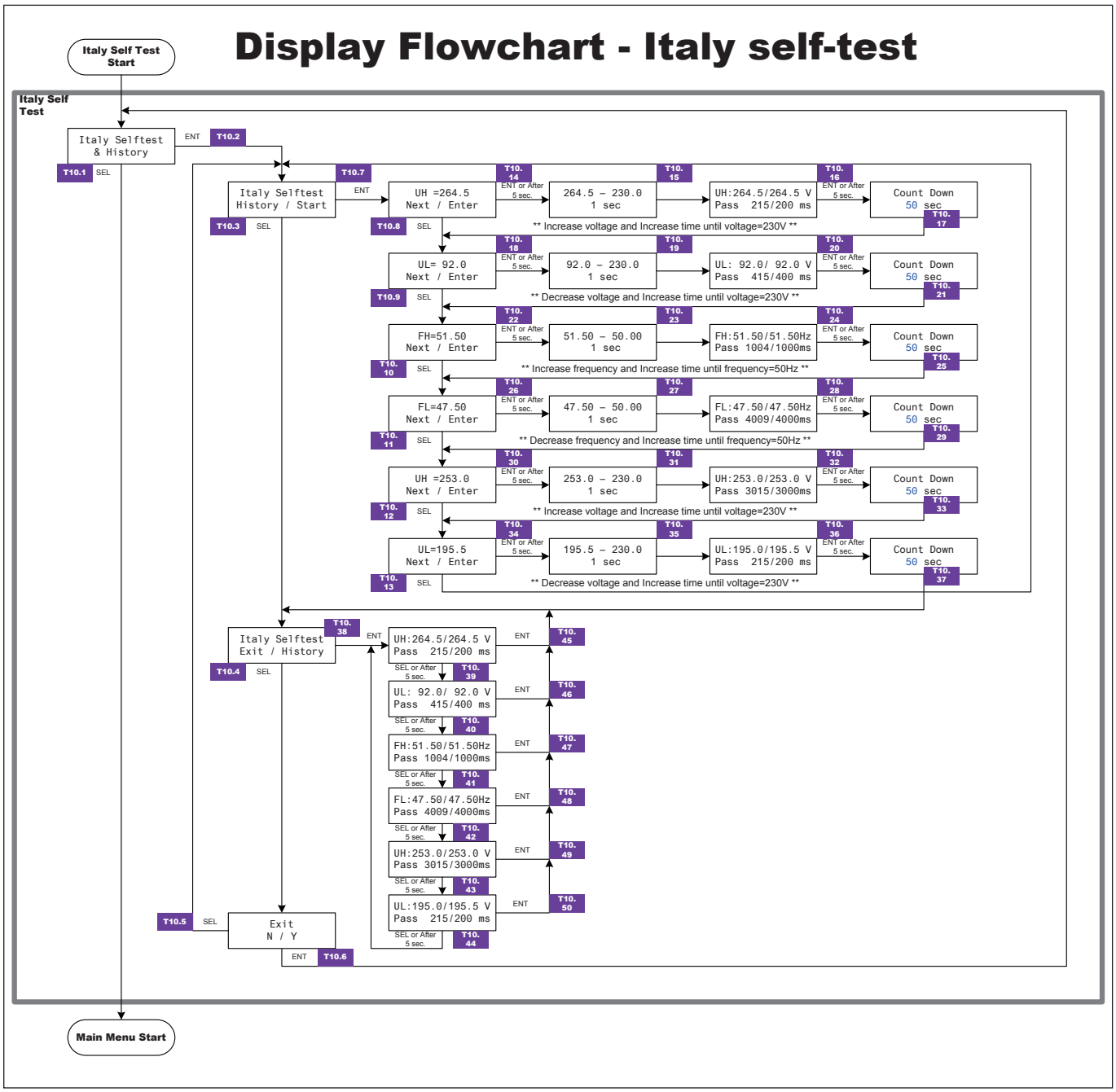


圖7-13：義大利自我測試流程圖

8 保養維護

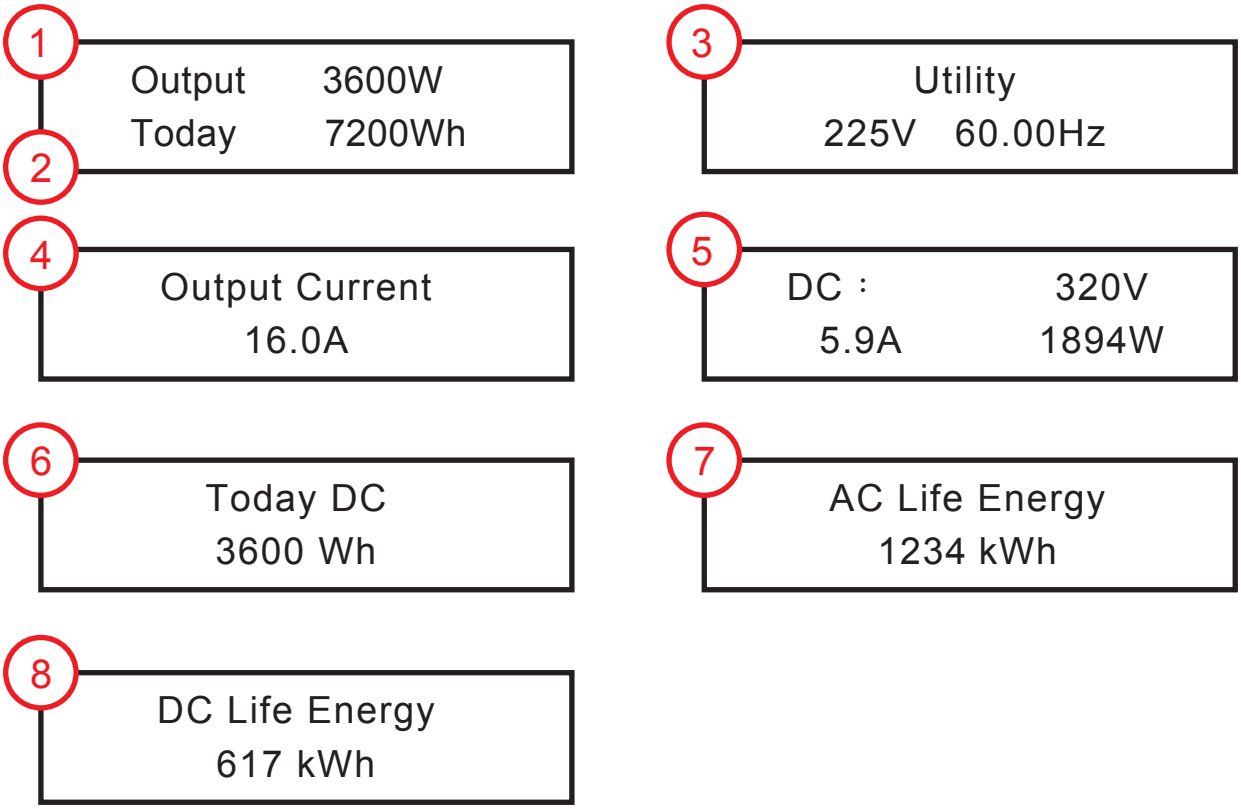
為了使本機器可以永久保持正常運作，請固定至少半年或是一年檢查一次，包含所有的金屬端子，螺帽，電纜線是否接妥，如果有發現受損的元件，請聯絡合格的技工來維修或是置換新元件，還有散熱片部分必須請合格技工至少一年清理一次。

警 告：可能導致人員傷亡！

保養之前請先將DC和AC斷路，避免電擊導致危險。

9 量測訊息、故障訊息和疑難排解

9.1 量測訊息



No.	項目	信息	單位
1	Output	目前輸出功率	W
2	Today	今日輸出能量	Wh
3	Utility	市電電壓和頻率	Vac / Hz
4	Output Current	AC 輸出電流	A
5	DC	DC 輸入電壓、電流、功率	Vdc, A, W
6	Today DC	今日太陽能板供應能量	Wh
7	AC Life Energy	總輸出能量	kWh
8	DC Life Energy	太陽能板總供應能量	kWh

表9-1：量測訊息

9.2 錯誤訊息和故障排解

錯誤訊息		
資訊顯示	**可能原因**	**排除方式**
E01: Grid Freq. Over Rating	1. 實際市電頻率超過OFR設定值 2. 國別設定錯誤 3. 偵測線路異常	1. 檢查逆變器AC端子的市電頻率 2. 檢查國別設定 3. 檢查逆變器內部偵測線路
E02: Grid Freq. Under Rating	1. 實際市電頻率低於UFR設定值 2. 國別設定或市電保護設定錯誤 3. 偵測線路異常	1. 檢查逆變器AC端子的市電頻率 2. 檢查國別設定或市電保護設定 3. 檢查逆變器內部偵測線路
E07:Grid Quality	市電端非線性負載太靠近逆變器	若必要將非線性負載遠離逆變器市電端
E09: No Grid	1. AC斷路器已跳開 2. AC接頭脫落 3. 內部保險絲毀損	1. 開啟AC斷路器 2. 檢查AC接頭確實連結至逆變器 3. 更換內部保險絲並檢測內部其他切換式裝置是否有異常
E10: Grid Volt Under Rating	1. 市電實際電壓低於UVR設定值 2. 國別設定或市電保護設定錯誤 3. 偵測線路異常	1. 檢查逆變器AC端子的市電電壓 2. 檢查國別或市電保護設定值 3. 檢查逆變器內部偵測線路
E11: Grid Volt Over Rating	1. 市電實際電壓高於OVR設定值 2. 國別設定或市電保護設定錯誤 3. 偵測線路異常	1. 檢查逆變器AC端子的市電電壓 2. 檢查國別或市電保護設定值 3. 檢查逆變器內部偵測線路
E13: Slow Over Voltage Range	1. 實際市電電壓高於OVR設定值 2. 逆變器運作時實際市電電壓高於Slow OVR設定值 3. 國別設定或市電保護設定錯誤 4. 偵測線路異常	1. 檢查連接至逆變器的市電實際電壓 2. 檢查連接至逆變器的市電實際電壓 3. 檢查國別或市電設保護設定值 4. 檢查逆變器內部偵測線路
E26:Slow Over Frequency Range	1. 市電實際頻率高於OFR設定值 2. 國別或市電設定值錯誤 3. 偵測線路異常	1. 檢查逆變器端子的實際市電頻率 2. 檢查國別或市電保護設定值 3. 檢查逆變器內部偵測線路

錯誤訊息		
資訊顯示	**可能原因**	**排除方式**
E27:Slow Under Frequency Range	1. 市電實際頻率低於UFR 設定值 2. 國別或市電設定值錯誤 3. 偵測線路異常	1. 檢查逆變器端子的實際市電頻率 2. 檢查國別或市電保護設定值 3. 檢查逆變器內部偵測線路
E28: Slow Under Voltage Range	1. 實際市電電壓低於UVR設定值 2. 逆變器運作時實際市電電壓低於 Slow UVR設定值 3. 國別設定或市電保護設定錯誤 4. 偵測線路異常	1. 檢查連接至逆變器的市電實際電壓 2. 檢查連接至逆變器的市電實際電壓 3. 檢查國別或市電設保護設定值 4. 檢查逆變器內部偵測線路
E30: DC Volt Over Rating	1. 實際Solar1 電壓高於550Vdc (RPI-H3) 或1000Vdc (RPI-H5) 2. 偵測線路異常	1. 修改太陽能板設定，確保輸出開路電壓低於550Vdc 2. 檢查逆變器內部偵測線路
E34: Ground Fault	1. 太陽能板的絕緣狀況異常 2. 太陽能板的正端對地或負端對地的電容過大 3. 偵測線路異常	1. 檢查DC 輸入的絕緣狀況 2. 檢查太陽能板的正端對地或負端對地的電容 3. 檢查逆變器內部偵測線路

故 障		
資訊顯示	**可能原因**	**排除方式**
F01: DC Offset Over Rating	1. 市電波形異常 2. 偵測線路異常	1. 檢測市電波形，非線性負載需遠離逆變器市電端 2. 檢查逆變器內部偵測線路
F05: NTC Over Temp	1. 環境溫度高於60℃ 2. 偵測線路異常	1. 檢查安裝位置周遭環境 2. 檢查逆變器內部偵測線路
F06: Inside NTC Circuit Fail	1. 環境溫度高於100℃ 或低於-24℃ 2. 偵測線路異常	1. 檢查安裝位置周遭環境 2. 檢查逆變器內部偵測線路
F08: Heat Sink NTC1 Fail	1. Boost 電路散熱片溫度高於100℃或低於-24℃ 2. 偵測線路異常	1. 檢查安裝位置周遭環境 2. 檢查逆變器內部偵測線路
F09: Heat Sink NTC2 Fail	1. Inverter 電路散熱片溫度高於100℃ 或低於-24℃ 2. 偵測線路異常	1. 檢查安裝位置周遭環境 2. 檢查逆變器內部偵測線路
F15:DSP ADC V_{grid} / I_{out} Fail	1. 輔助電源電路異常 2. 偵測線路異常	1. 檢測輔助電源電路 2. 檢查逆變器內部偵測線路
F16:DSP ADC V_{in} / V_{bus} Fail	1. 輔助電源電路異常 2. 偵測線路異常	1. 檢測輔助電源電路 2. 檢查逆變器內部偵測線路
F17:DSP ADC I_{in} / I_{boost} Fail	1. 輔助電源電路異常 2. 偵測線路異常	1. 檢測輔助電源電路 2. 檢查逆變器內部偵測線路
F18:RED. ADC V_{grid} Fail	1. 輔助電源電路異常 2. 偵測線路異常	1. 檢測輔助電源電路 2. 檢查逆變器內部偵測線路
F19:DSP ADC I_{out_dc} Fail	1. 輔助電源電路異常 2. 偵測線路異常	1. 檢測輔助電源電路 2. 檢查逆變器內部偵測線路

故 障		
資訊顯示	**可能原因**	**排除方式**
F20: Efficiency Inconsistent	1. 指示電錶未校正 2. 電流回授電路損壞	1. 檢測電流及功率的正確性 2. 檢查逆變器內部電流回授線路
F22: Internal Comm Fault_R	1. Red. CPU 閒置 2. 通訊連結中斷	1. 檢查Red. CPU 中的 reset and crystal 2. 檢測Red. CPU 和 DSP 之間的連結狀況
F23: Internal Comm Fault_D	1. DSP 閒置 2. 通訊連結中斷 3. 通訊電路異常	1. 檢查Red. CPU 中的 reset and crystal 2. 檢測DSP 和 COMM 之間的連結狀況 3. 檢測通訊電路
F24: Residual Curr Over Rating	1. 太陽能板的絕緣狀況異常 2. 太陽能板的正端對地或負端對地的電容過大 3. boost 電路的驅動電路或boost 電感異常 4. 偵測線路異常	1. 檢查DC 輸入的絕緣狀況 2. 檢查太陽能板的正端對地或負端對地的電容，需小於2.5uF. (必要時安裝外部變壓器) 3. 檢查boost 電路的驅動電路或 boost 電感 4. 檢查逆變器內部偵測線路
F27: RCMU Circuit Fail	1. 漏電流偵測線路未連接 2. 偵測線路異常	1. 檢查逆變器內部RCMU 的聯機 2. 檢查逆變器內部偵測線路
F28: Relay Short	1. 一個或一個以上繼電器異常 2. 繼電器的驅動電路異常	1. 更換繼電器 2. 檢測繼電器的驅動電路
F29: Relay Open	1. 一個或一個以上繼電器異常 2. 繼電器的驅動電路異常 3. Vgrid 和 Vout 偵測的精確度不正確	1. 更換繼電器 2. 檢測繼電器的驅動電路 3. 檢查Vgrid 和 Vout 電壓偵測的精確度
F35: Bus Volt Over Rating	1. boost 電路的驅動電路異常 2. 太陽能板的開路電壓超過550Vdc (RPI-H3) 或1000Vdc(RPI-H5) 3. 產品運作時有突波發生 4. 偵測線路異常	1. 檢測boost 電路的驅動電路 2. 修正太陽能板的設定值，使開路電壓低於550Vdc (RPI-H3) 或 1000Vdc (RPI-H5) 3. N/A 4. 檢查逆變器內部偵測線路

故 障		
資訊顯示	**可能原因**	**排除方式**
F36:Output Curr Transient Over	1. 產品運作時有突波發生 2. inverter 電路的驅動電路異常 3. 切換式裝置異常 4. 偵測線路異常	1. N/A 2. 檢測inverter電路的驅動電路 3. 檢測inverter電路的切換式裝置異常 4. 檢查逆變器內部偵測線路
F37: AC Curr Over Rating	偵測線路異常	檢查逆變器內部偵測線路
F42: CT Current Sensor Fail	1. Inverter 端電感失效 2. 輸出濾波器失效 3. 偵測線路異常	1. 檢測Inverter 端電感值 2. 檢測輸出濾波電容值 3. 檢查逆變器內部偵測線路
F50:Zero Cross Circuit Fail	同步訊號的偵測線路失效	檢查逆變器內部同步訊號的偵測線路
F56:Hardware Incompatibility	硬體功率額定值不正確	檢查硬體功率額定值
F60: DC1 Curr Over Rating	1. boost 電路的切換式裝置異常 2. boost 電路的驅動電路異常 3. 輸入電流偵測線路異常	1. 檢測boost 電路的切換式裝置 2. 檢測boost 電路的驅動電路 3. 檢測輸入電流偵測線路
F61: DC2 Curr Over Rating	1. boost 電路的切換式裝置異常 2. boost 電路的驅動電路異常 3. 輸入電流偵測線路異常	1. 檢測boost 電路的切換式裝置 2. 檢測boost 電路的驅動電路 3. 檢測輸入電流偵測線路
F70: DC1 Curr Transient Over	1. boost 電路的切換式裝置異常 2. boost 電路的驅動電路異常 3. 輸入電流偵測線路異常	1. 檢測boost 電路的切換式裝置 2. 檢測boost 電路的驅動電路 3. 檢測輸入電流偵測線路
F71: DC2 Curr Transient Over	1. boost 電路的切換式裝置異常 2. boost 電路的驅動電路異常 3. 輸入電流偵測線路異常	1. 檢測boost 電路的切換式裝置 2. 檢測boost 電路的驅動電路 3. 檢測輸入電流偵測線路

Table 9-2: Error message

10 拆 機

拆卸程式
如有需要將本逆變器停機拆卸，請務必遵守以下指令：

警 告！

為了避免人員受傷，請遵守以下步驟：

- 將AC斷路器切換到OFF，解除和市電端的連接。
- 將太陽能板斷路器開關切換到OFF，解除和太陽能板的連接。
- 使用合適的電壓表量測，確認AC和DC都已經完全斷除。
- 拔除和市電端連接的AC配線。
- 拔除和太陽能板連接的DC配線。
- 取出通訊模組RS-485模組。

待完成以上所有步驟之後，即可將本機卸下。

11 技術資料

11.1 規 格

Model	RPI H3A	RPI H4A	RPI H5A
GENERAL			
Enclosure	Powder-coated aluminium		
Operating temperature	-25~60°C, full power up to 40°C		
Operating Altitude	2000m		
Relative humidity	0% – 95% non-condensing.		
Environmental category	Outdoor, wet locations		
Galvanic isolation	No (TL Topology)		
Safety class	Class I metal enclosure with protective earth		
Pollution degree	Internal: II, External: III		
Overvoltage category	AC output: III, DC input: II		
Flicker impedance	Z = 0.4 + j 0.25 Ω (total impedance)		
Three-phase combinations	No		
DC INPUT (Solar side)			
Nominal input power	3150W	4200W	5250W
Maximum input power	3200 W	4320 W	5280 W
Max. input voltage	600Vdc		
Operating voltage range	100~550 Vdc		
MPP voltage range			
Symmetrical load	160~500 Vdc	180~500 Vdc	220~500 Vdc
Asymmetrical load	320~500 Vdc	266~500 Vdc	291~500 Vdc
Max. ratio for asymmetrical load	100/0%;0/100%	80/20%;20/80%	70/30%;30/70%
Nominal voltage	350Vdc		
MPP Tracker	2		
Max. input current (each MPPT)	10A	12A	12A
Max. short circuit current per MPPT	13.9A	16.7A	16.7A
Max. inverter backfeed current to the array	0A		
Startup voltage	100Vdc		
Input connection	2 pairs Multi-Contact® MC4 connectors		

Model	RPI H3A	RPI H4A	RPI H5A
AC OUTPUT (Grid side)			
Nominal output power	3000VA(#1)	4000VA	5000VA(#2)
Maximum power	3000VA	4000VA	5000VA
Voltage	230Vac -20%~+22%		
Nominal output current	13A	17.3A	21.7A
Max. output current	13.9A	18.2A	23.2A
Maximum output fault current	16A	20A	32A
Maximum output over current protection	16A	20A	32A
Current (inrush) (A, peak and duration)	30A peak, 1ms.		
Frequency	50/60Hz		
Total harmonic distortion	<3% @ Rated power(#3)		
Power factor	>0.99@Rated power(#3)		
Peak efficiency	97.50%	97.50%	97.50%
EU efficiency	96.80%	97.00%	96.80%
Output connection	IP 67 single-phase		
Fuse	Internal fuse, 20A/ 250V*2	Internal fuse, 20A/ 250V*2	Internal fuse, 20A/ 250V*2
MECHANICAL			
Housing	Die cast		
Cooling	convection cooling		
IP rating	IP65		
External communication	2 x RS-485 connection		
Weight	21 kg		
Dimensions	414.3 × 475.3 × 155 mm		

Model		RPI H3A	RPI H4A	RPI H5A
REGULATIONS & DIRECTIVES				
Safety		IEC 62109-1 / -2 AS 3100 CE compliance		
Grid interface		VDE V 0126-1-1 AS4777 (#4) C10/C11 2012 EN50438:2013 UTE-C-15-712-1 VDE V 0126-1-1 G83-2	VDE V 0126-1-1 AS4777 (#4) C10/C11 2012 EN50438:2013 UTE-C-15-712-1 VDE V 0126-1-1 G59-3	
Emission		IEC 61000-6-4, IEC 61000-6-3		
Harmonics		EN 61000-3-12		
Variations and flicker		EN 61000-3-11		
Immunity		EN 61000-6-2		
Immunity	ESD	IEC 61000-4-2		
	RS	IEC 61000-4-3		
	EFT	IEC 61000-4-4		
	Surge	IEC 61000-4-5		
	CS	IEC 61000-4-6		
	PFMF	IEC 61000-4-8		

#1:

(a) 2.49kW max. for Australia (AU / NZ PL2K49) (H3A)
(b) 2.99kW max. for Australia (AU / NZ PL2K99) (H3A)
(c) 3kW max. for Australia (AU / NZ) (H3A)

#2:

(a) 4.6kW max. for Australia (AU / NZ PL4K6) (H5A)
(b) 4.99kW max. for Australia (AU / NZ PL4K99) (H5A)
(c) 5kW max. for Australia (AU / NZ) (H5A)

#3: reactive power control disabled

#4: not support AS4777.2:2015 Single-phase inverters used in three-phase combinations

附 錄 A

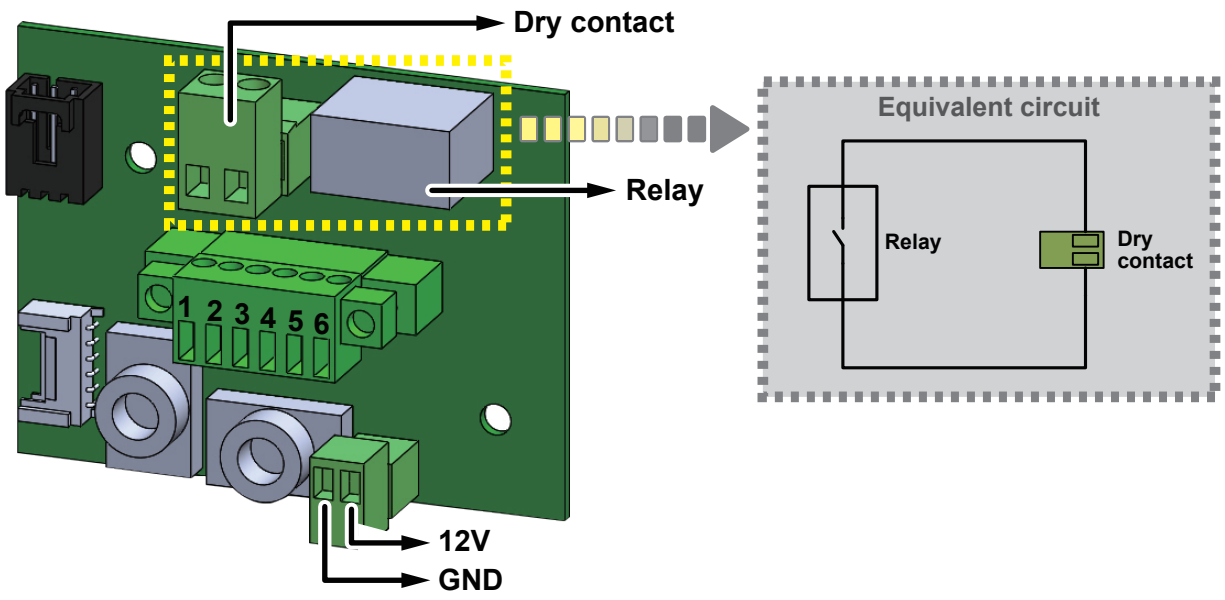
多功能繼電器

本機另有支持一個多功能繼電器，透過它您可以自行外接一些設備，例如閃光燈或是蜂鳴器...等等設備。此繼電器可以使用的組態設定控制有以下幾種：

- 逆變器異常的指示或市電狀態指示
- 功率控制
- 外接負載的控制
- 風扇控制

A.1多功能繼電器的輸出接線方式

乾接點提供了一個逆變器狀態的遠端指示，當逆變器正常動作時，乾接點會呈現關閉狀態，此時使用者可以透過軟體工具Monitor modbus的使用，即可操作先前所提過的幾項組態設定。乾接點位置圖請參照圖A-1



圖A-1：乾接點位置圖

警 告！

觸摸電子元件可能會產生靜電進而損毀該電子元件！

附 錄 B

數 位 輸 入

要達成功率控制的目的，數位輸入介面會經由一個漣波控制接收器接收電廠發出的訊息，在不同國家有不同的控制內容。

德國 : 實功控制分成四個階層 0%, 30%, 60% and 100%

義大利 : 太陽能板安裝的功率輸出最大6KW

a. 遠程控制關機

b. 窄頻率跳脫點在49.5 Hz到50.5Hz之間

澳洲與紐西蘭:

逆變器支援需求響應模式(DRMs).

DRM 0 - 斷開裝置

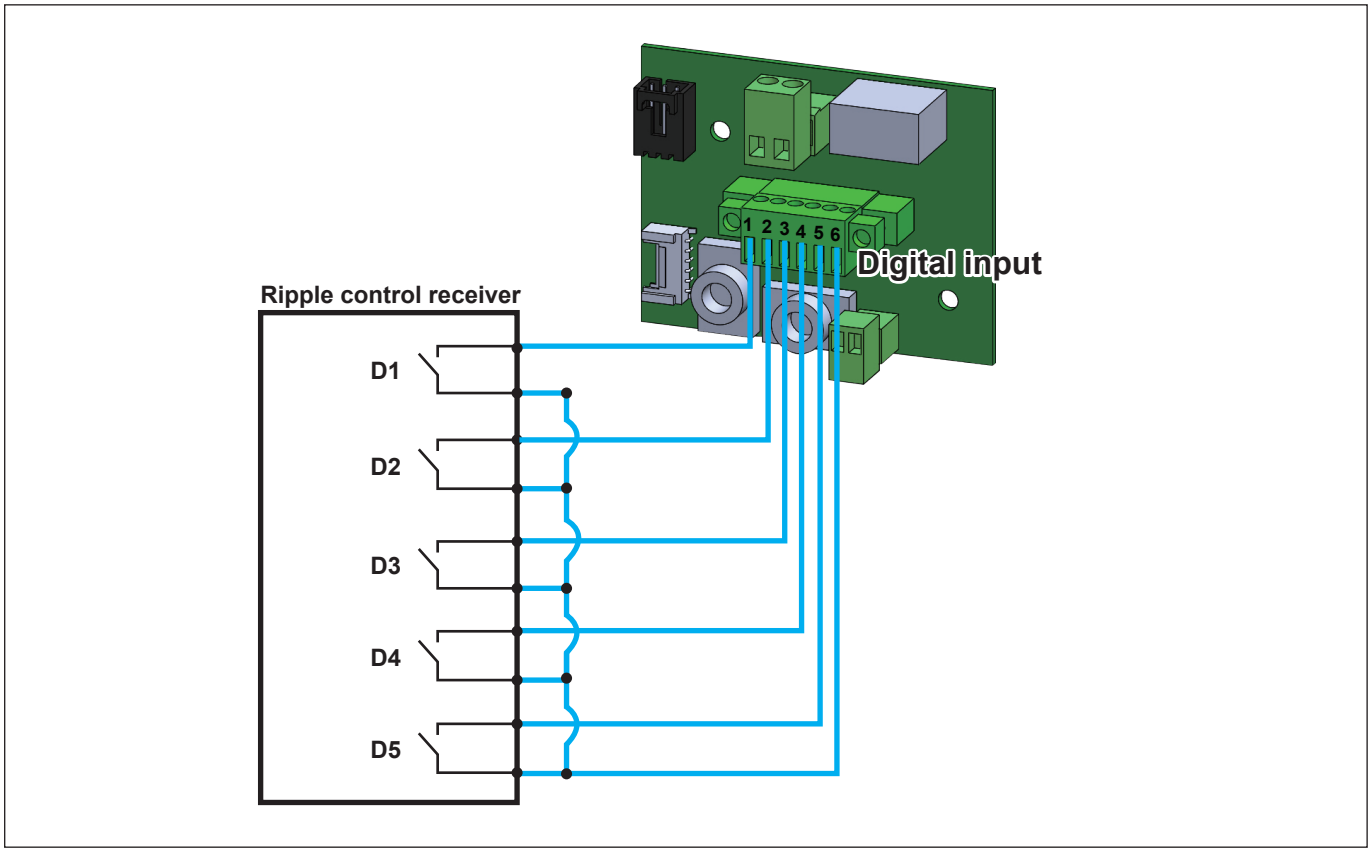
DRM 5 - 不發電

DRM 6 - 輸出功率小於總功率之50%

DRM 7 - 輸出功率小於總功率之75%。並允許虛功控制

DRM 8 - 不限制輸出功率。並允許虛功控制

客制化 : 使用者自行定義



圖B-1 : 漣波控制接收器的接腳說明

逆變器提供了一個輸出電壓(位置6)，以及偵測5個數位輸入訊號(位置1到5)。此時逆變器可以偵測到漣波控制接收器上繼電器的狀態，電廠的訊息將透過此繼電器來控制功率。

Pin	Function
1	Digital input 1
2	Digital input 2
3	Digital input 3
4	Digital input 4
5	Digital input 5
6	Output

Country =Italy LV/SPI

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
Remote off	1#	0#	0	0	0	1
Narrow frequency limit.	0	1	0	0	0	1

備註 : 1表示繼電器關閉；0表示繼電器打開。

Country = Germany

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
Active power = 0%	1#	0#	0	0	0	1
Active power = 30%.	0	1	0	0	0	1
Active power = 60%	0	0	1	0	0	1
Active power = 100%	0	0	0	1	0	1

備註 : 1表示繼電器關閉；0表示繼電器打開。

Country = Australia or New Zealand

Function	D1	D2	D3	D4	D5	Output
No function	0	0	0	0	0	1
DRM 0 Disconnection device	1#	0#	0	0	0	1
DRM 5 Active power = 0	0	0	0	0	1	1
DRM 6 Active power < 50%	0	0	0	1	0	1
DRM 7 Active power < 75% Sink reactive power	0	0	1	0	0	1
DRM 8 Active power < 100% Sink reactive power	0	1	0	0	0	1

備註 : 1表示繼電器關閉；0表示繼電器打開。

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