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Grid-tie Transformerless Solar Inverter

RPI-M15A/M20A

Operation and Installation Manual

English 1

简体中文 53

繁體中文 103

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Safety Instructions

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

CAUTION !



Machine and equipment damage may occur if this hazardous situation is not avoided.

WARNING !



Death and serious injury may occur if this hazardous situation is not avoided.

Repair work on the device should **ONLY** be carried out by the manufacturer. No user serviceable parts inside.

In Australia, installation and maintenance work shall be conducted by qualified electrician and shall comply with Australian Regulations.

DANGER !



To avoid risk of electrical shock, do not open the solar inverter. Death and serious injury will occur if this hazardous situation is not avoided.

WARNING ! BURN HAZARD



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

1.General Information

1.1. About this Manual

This manual is to provide the explanation and procedures for installing, operating, maintaining, and troubleshooting the below solar inverters: RPI-M15A/ RPI-M20A.

1.2. Product Description

This device is a 3-phase grid-tied solar inverter which does not support off-grid functionality.

The operation of solar inverter is shown as the **Figure 1-1**. Inverters convert the DC input power supplied from the PV Array into 3-phase AC output power to Grid.

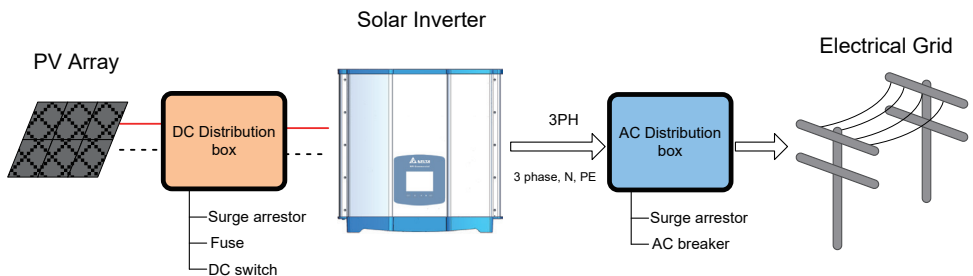


Figure 1-1 Solar system operation illustration

1.3. Additional Information

For more detailed or other related product information, please visit <http://www.deltaww.com>

2.Product Overview

2.1. Unpack the Inverter

The unpacking procedure of RPI-M15A / M20A is shown as **Figure 2-1**.

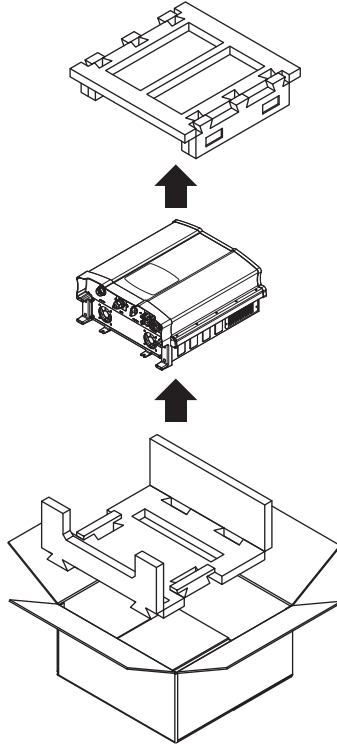


Figure 2-1 Unpack the inverter

2.2. Checking Unit and Accessories

Unforeseeable events causing damage or movement may occur during shipment. Please check following items upon receiving your inverter.

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

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

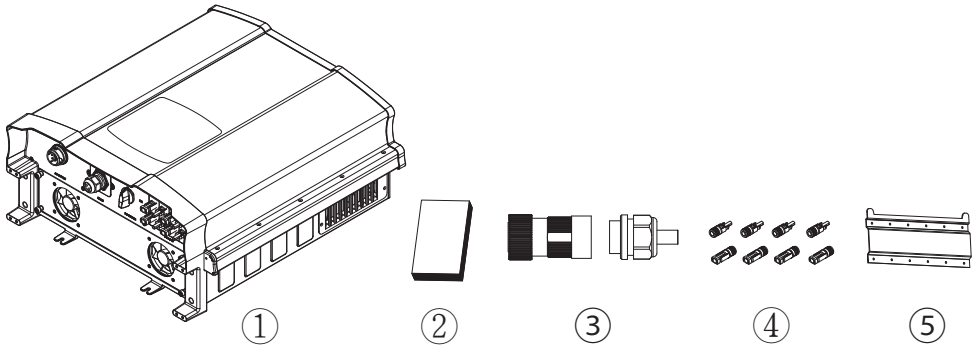


Figure 2-2 Packing list

RPI-M15A/ RPI-M20A			
	Object	Qty	Description
1	PV Inverter	1 pcs	RPI series solar inverter
2	User Manual	1 pcs	The Instruction to provide the information of safety, Installation, specification, etc.
3	AC Plug	1 pcs	Connector for AC connection
4	DC Plug	4 sets	Connector for DC connection
5	Mounting Bracket	1 pcs	Wall mounting bracket to mount the solar inverter on the wall.

Table 2-1 Packing list

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

2.3. Product Label

Users can identify the model number and the specifications by the information on the product label. The location for the label please see **Figure 2-3**.

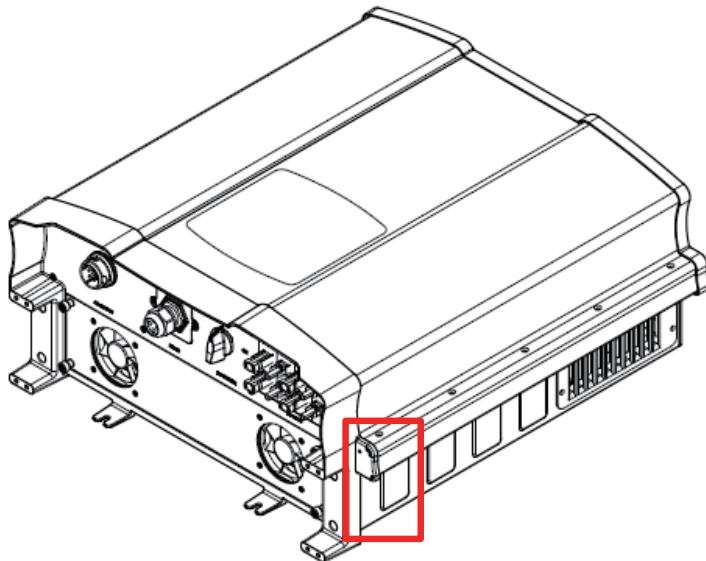


Figure 2-3 Product label

2.4. Exterior Objects

The Inverter's exterior objects are shown in **Figure 2-4**. The detailed input/output interfaces illustration is shown in **Figure 2-5**. Different models have different number of DC input strings.

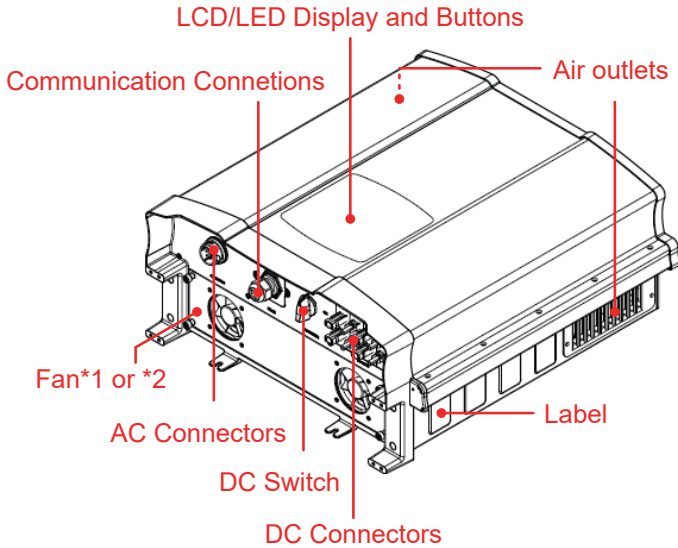


Figure 2-4 Inverter's exterior objects

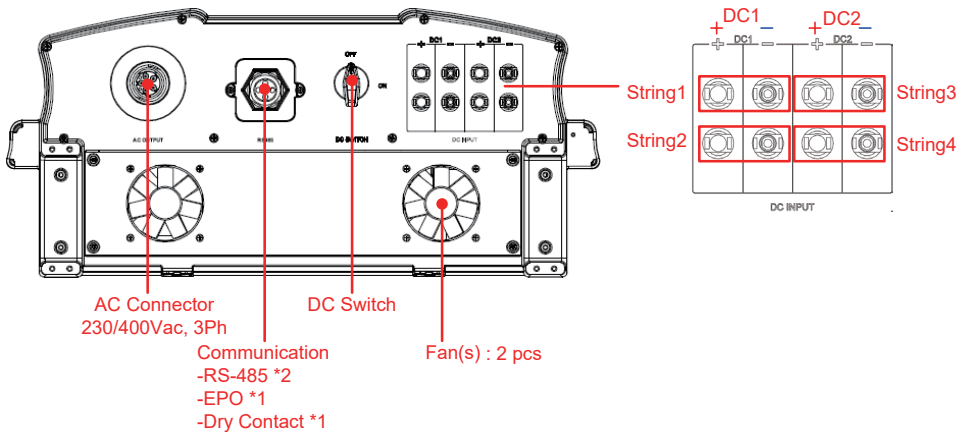


Figure 2-5 Input/output panel

3.Installation

CAUTION !



The unit should not be installed in direct sunlight.

WARNING !



- Do not install the unit near or on flammable surfaces.
- Please mount the unit tightly on a solid/smooth surface.
- PV array that have an IEC 61730 Class A rating, or external insulation transformer shall be installed at grid side.

This unit is designed to be wall-mounted. Please ensure the installation is perpendicular to the floor and the AC plug at the bottom. Do not install the device on a slanting wall.

To mount the inverter on the wall, please follow the procedure below:

- 1.Screw the mounting bracket on the wall with 12 M6 Phillips head screws.
Please refer to **Figure 3-3**.
- 2.Attach the inverter to the mounting bracket.
- 3.Fix the inverter with 2 M6 Phillips head screws.
Please refer to **Figure 3-4**.

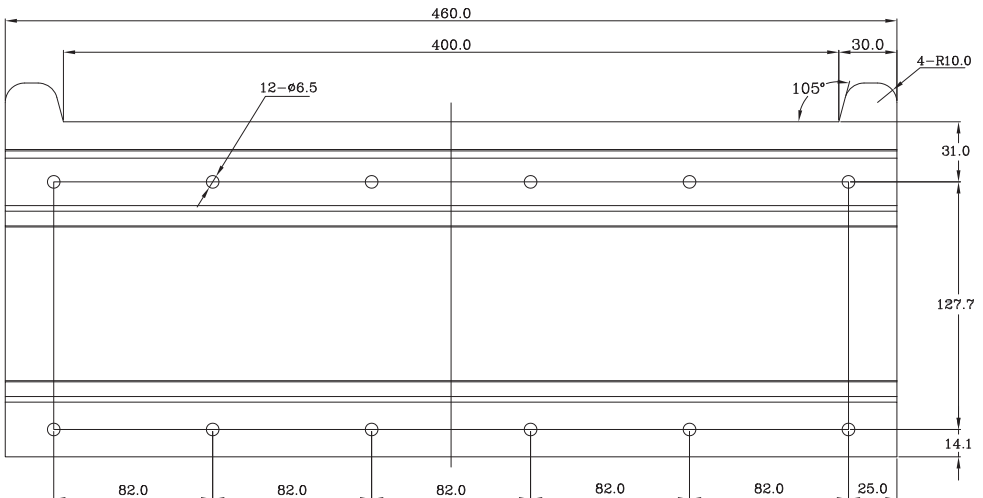


Figure 3-1 Mount Dimention

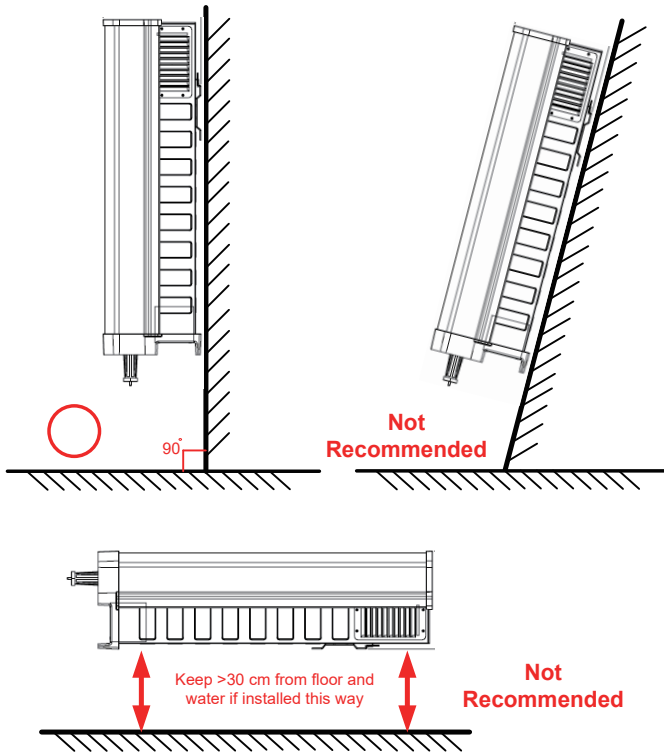
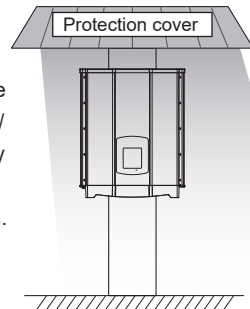


Figure 3-2 Recommended installation

CAUTION !



To avoid malfunction of inverter caused by extreme weather (ex: snow, hail...etc) or non-proper installation/maintenance, an additional protection cover is strongly recommended to be installed by Delta. For more details, please contact local service team.



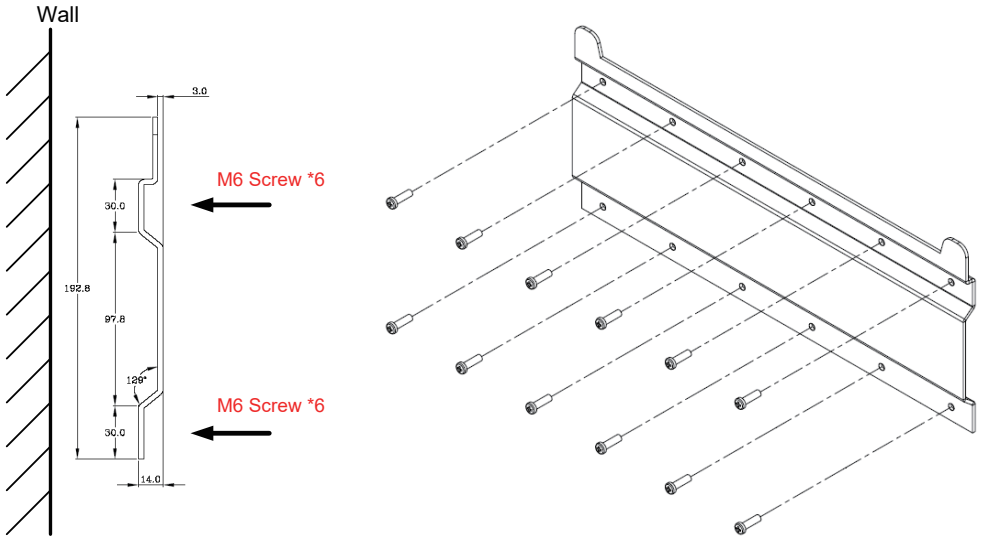


Figure 3-3 Screw the mounting bracket

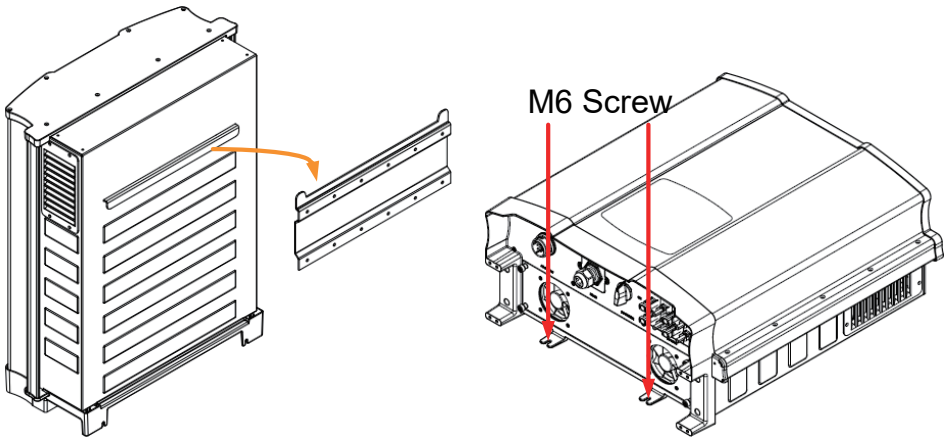


Figure 3-4 Attach to the bracket and fasten with screws

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 non-obscured and safe access, in turn ensuring easy access for service and maintenance.
- Please leave an appropriate gap in between units when installing several solar inverter systems as shown in **Figure 3-5**.
- Please install solar inverter at an eye level to allow easy observation for operation and parameter setting.
- Ambient temperature -25°C ~ 60°C . (power de-rating above 40°C)

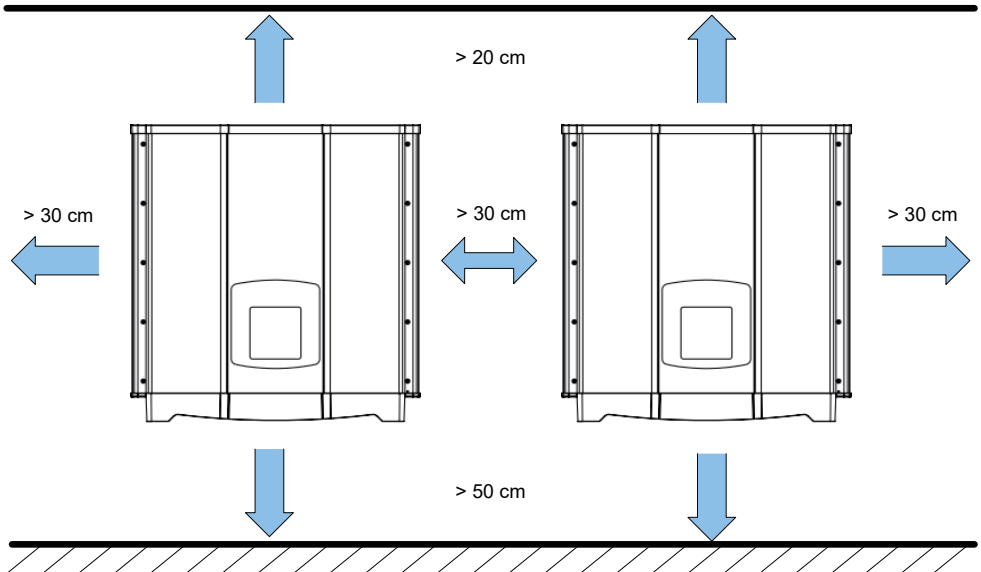


Figure 3-5 Proper installation gap

4. Wiring

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.

4.1. Preparation Before Wiring

- For floating PV array, inverter can accept DC input in parallel connection or separate connection.
- When grounding the solar array, an isolation transformer at AC side is required and DC inputs must be parallel connection due to the RPI-series not having galvanic isolation between the DC-input and AC-output.
- Different DC connection type needs different settings of insulation detection. About setting, please refer to 5.2.7.3 Install Settings.

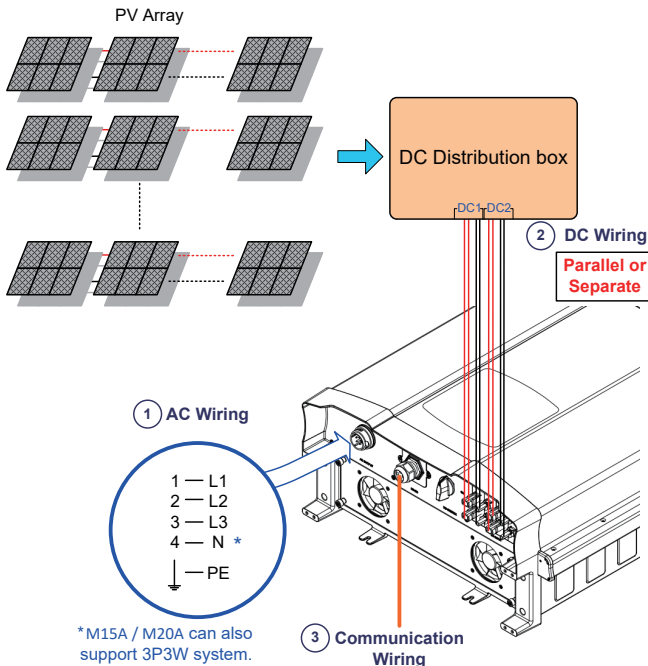


Figure 4-1 Connection of a system for floating DC inputs

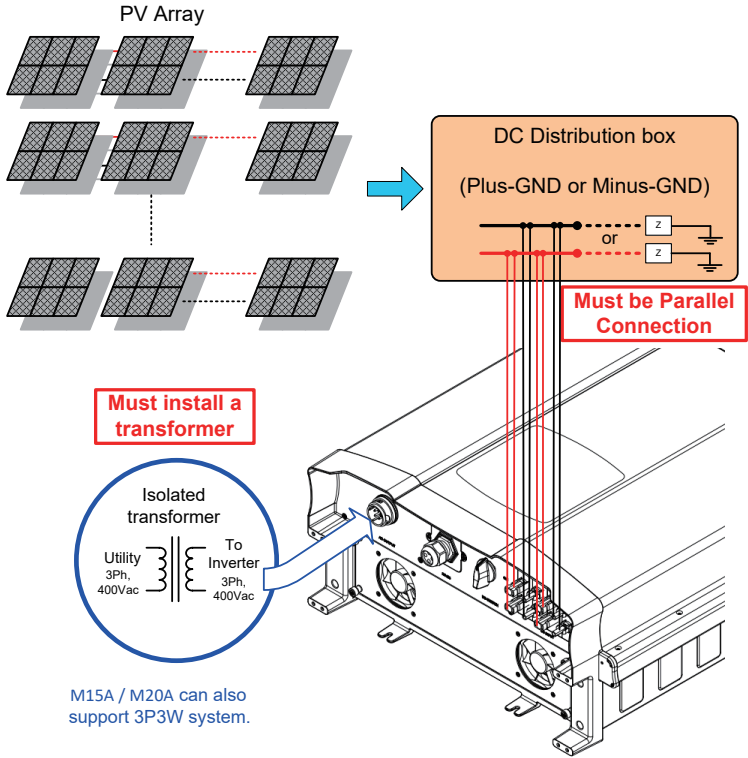


Figure 4-2 Connection of system with positive/negative ground

4.2. AC Grid Connection: 3-Phase+PE or 3-Phase+N+PE

WARNING !



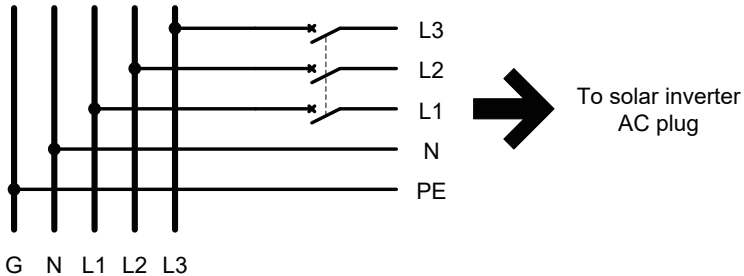
Before commencing AC wiring, please ensure AC breaker is switched off.

4.2.1. Required Protective Devices and Cable Cross-sections

It is recommended to install an upstream circuit breaker between AC side and inverter side for over current protection.

Model	Upstream circuit breaker
RPI-M15A	30A
RPI-M20A	40A

Table 4-1 Recommended upstream protection



The AC cable must be jacketed and meet the specifications in table 4-2.

Model	Current Rating	Cable size	Recommended Torque
RPI-M15A	40 A	6 mm ² or 10 AWG / 8 AWG	0.7 N.m
RPI-M20A	40 A	6 mm ² or 10 AWG / 8 AWG	0.7 N.m

Table 4-2 AC input cable requirement

RPI-M15A and M20A support both 3P3W (3phase and PE) and 3P4W (3phase, N and PE) connections.

CAUTION ! Machine and equipment damage may occur.



Make sure to choose proper size for AC cable.

- Failed to follow these instructions may cause AC plug damage.
- AC plug's installation must meets the local electrical code.
- If there is any conflict between installation instruction and electrical code, please follow the electrical code.

Follow the steps below to strip the wires before assembling the AC plug:

- Remove 68.5 mm (MAX) of AC cable outer jacket.
- Trim the L1, L2, L3, and N wire to 70 mm (MAX).
- Strip 20 mm of insulation from all wires ends.

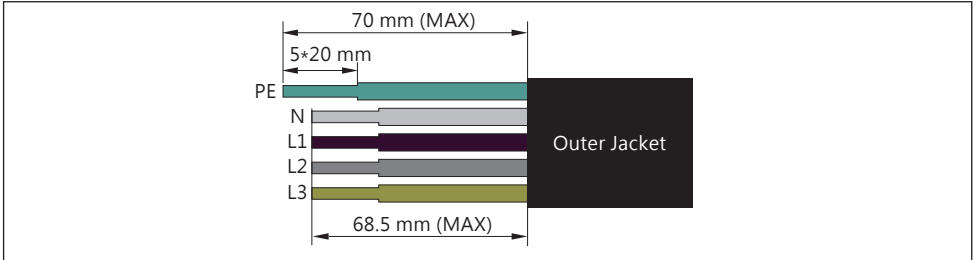


Figure 4-3 Stripping the wires

Assemble the AC plug and wires as the procedures shown in **Figure 4-4**. The sequence of L1~ L3 can be connected randomly. However, N and PE must be connected correctly.

1. The packing has the parts of AC Plug, please follow the step to assemble the ac plug first. The fastening torque is 55kgf-cm~75kgf-cm.
2. Rotate the plug to release part A & B.
3. Users should select the appropriate diameter rubber gasket for part A to ensure good water resistance. Cable range (mm) / Part F fastening torque (Nm) / Fastening distance P (mm)

	Outer jacket diameter (mm)	Tightening torque (N · m)	Gap P (mm)
D1	32.6 ~ 41.3	13 ~ 20	1 ~ 7
D2	20.5 ~ 32.6	13 ~ 20	0 ~ 7
D3	15.3 ~ 20.5	13 ~ 20	1 ~ 5.5
D4	10.8 ~ 16	9 ~ 13	1 ~ 6.5

Figure 4-4 AC plug illustration for M15A/ M20A.

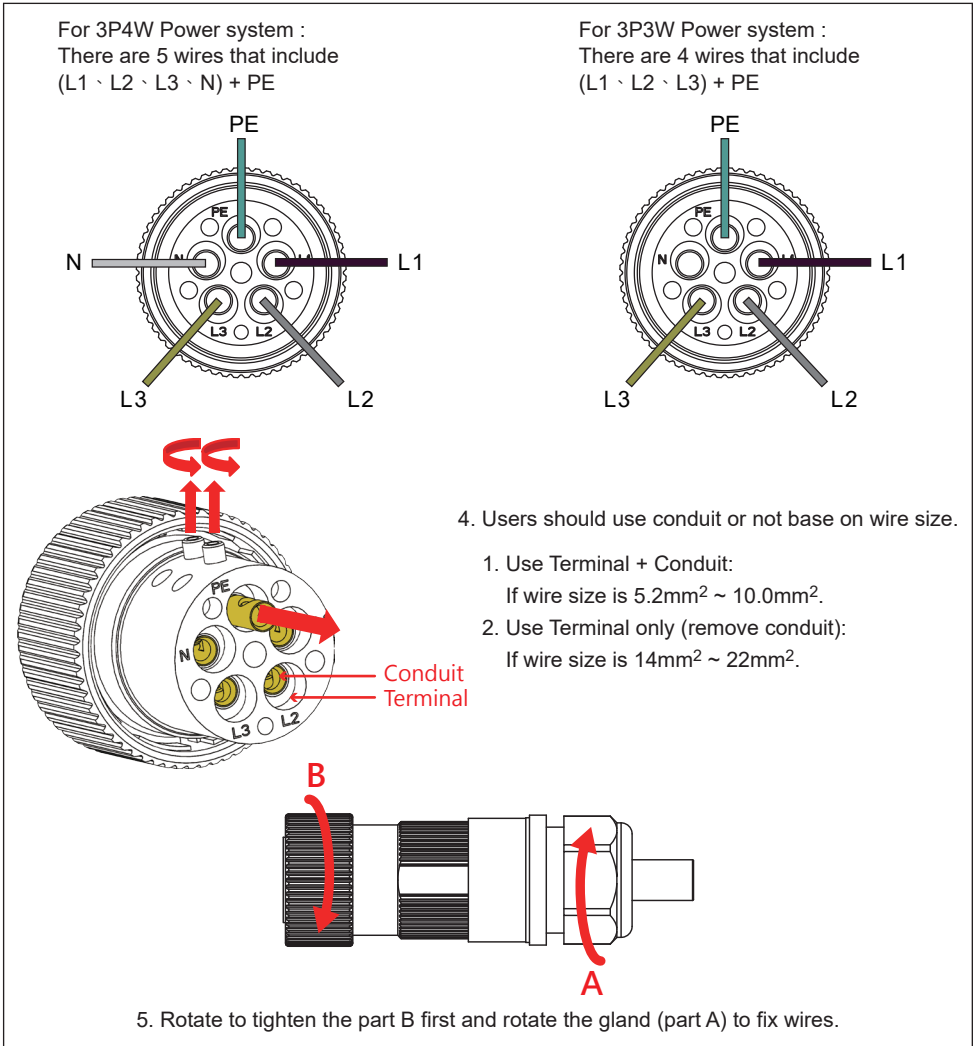


Figure 4-4 AC plug illustration for M15A/ M20A. (continued)

User should set AC connection (3P3W or 3P4W) by display to make sure voltage reading is correct. Please refer to 5.2.7.3 Install Setting.

The AC voltage should be as followings:

<p>3P3W</p> <p>L1-L2: 400 Vac ± 10%</p> <p>L1-L3: 400 Vac ± 10%</p> <p>L2-L3: 400 Vac ± 10%</p>	<p>3P4W</p> <p>L1-N: 230 Vac ± 10%</p> <p>L2-N: 230 Vac ± 10%</p> <p>L3-N: 230 Vac ± 10%</p>
-------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------

4.3. 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 power switch on the PV array is OFF.

CAUTION !



- The connection number of PV Array, open circuit voltage and power of all strings in DC1 must be coherent.
- The maximum open circuit voltage of PV Array cannot exceed 1000V.
- Any device installed between PV Array and inverter must meet the following specifications:
Rated voltage > open-circuit voltage of PV Array.
Rated current > short-circuit current of PV Array.
- The input power to the inverter should not higher than the rated power shown in table 4-3.

Type of limit	RPI-M15A	RPI-M20A
Total input power	16.5 kW	22 kW
DC1 or DC2	11.1 kW	14.8 kW

Table 4-3 Maximum rating of input power

Model	Current Rating	Wire size
M15A / M20A	DC 22A	4 - 6mm ² / 12 - 10 AWG

Table 4-4 Cable size

DC wiring polarities are divided into positive and negative, which is shown in **Figure 4-5**. The connection shall be coherent with the indication marked on inverter.



Figure 4-5 DC Wiring illustration

4.4. Communication Module Connections

Please refer to **Figure 4-6** for the Communication Module illustration. The module provides VCC, RS-485, dry contact, and EPO for different use.

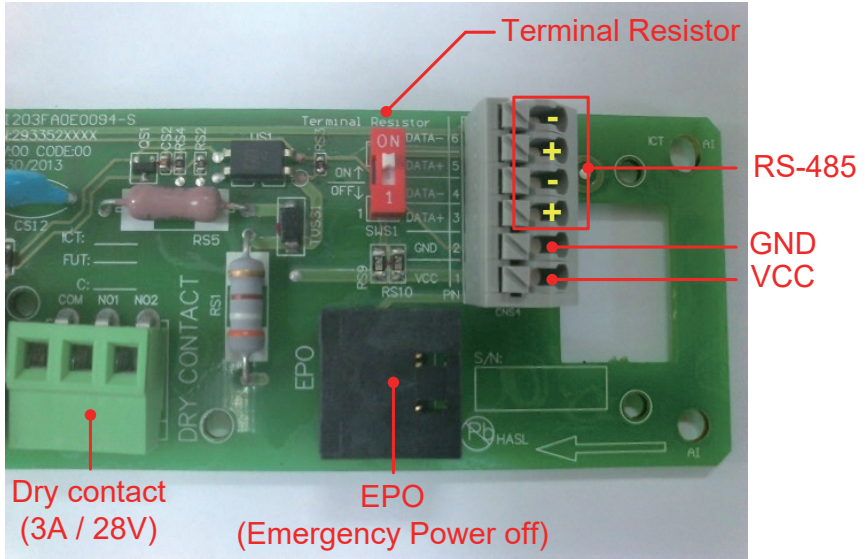


Figure 4-6 Communication module

4.4.1. RS-485 Connection

The pin definition of RS-485 is shown in table 4-5. Different RS-485 connection needs different set up of the terminal resistor.

- When single inverter is installed, the terminal resistor on its communication module should be switched ON.
- When multi-inverters in chain as shown in **Figure 4-7**, only the first and last inverter's terminal resistor must be switched ON.

Please refer to table 4-6 for the terminal resistor setting.

Pin	Function
1	VCC (+12V)
2	GND
3	DATA+
4	DATA-
5	DATA+
6	DATA-

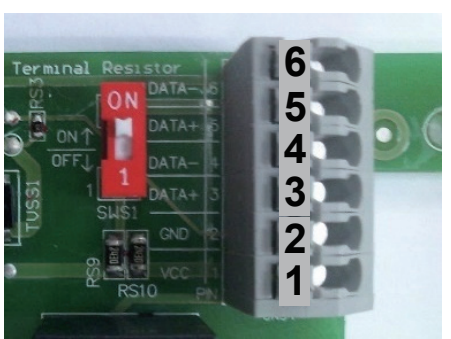


Table 4-5 Definition of RS 485 pin

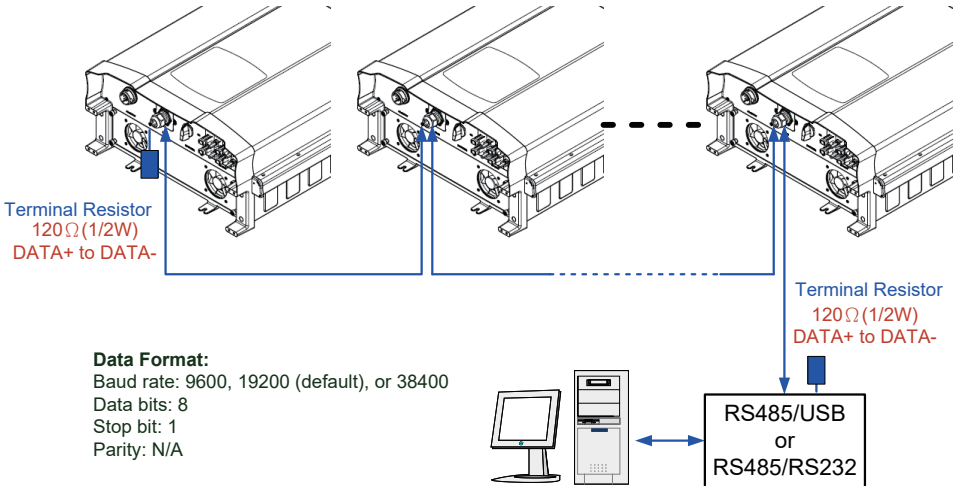


Figure 4-7 Multi-inverter connection illustration

	Switch
ON	Terminal Resistor ON
OFF	Terminal Resistor OFF

Tabel 4-6 Terminal resistor setting

4.4.2. EPO Functions & Digital Input

Communication Module has 1 set of emergency power off function (EPO). Inverter will shutdown immediately when the outer external switch is short-circuited.

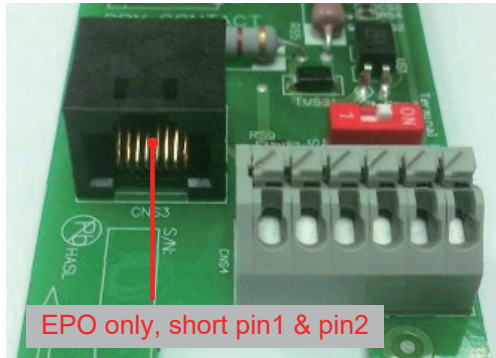


Figure 4-8 EPO functions

4.4.3. Dry Contact Connection

RPI-M15A / M20A models provide 1 set of Dry Contact function. When Fan Fail is detected by inverter, the Dry Contact two ports will be short-circuited.

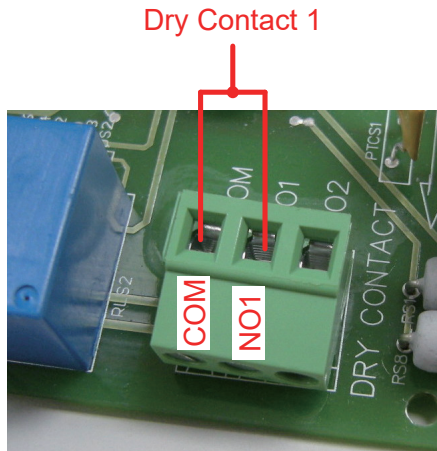


Figure 4-9 Dry contact port & Assignments

5. Turn On PV Inverter

WARNING ! BURN HAZARD



The enclosure temperature may exceed 70°C while inverter is operation. A dangerous burn hazard is present in this situation.

5.1. LCD Flow Chart

RPI-M15A / M20A models have a 320x240 pixel LCD display and two LED lights to indicate inverter's status.

Please refer to **table 5-1** for more information about inverter's statuses and LED indicator.

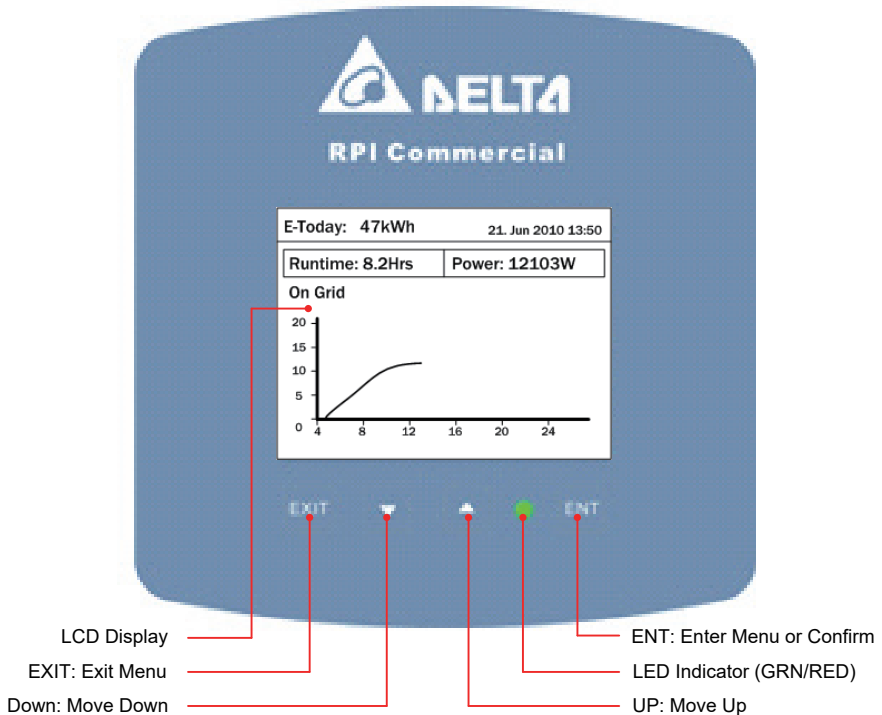


Figure 5-1 panel indicator

Condition	Green LED	Red LED
Standby or Countdown	FLASH *	OFF
Power ON	ON	OFF
Error or Fault	OFF	ON
Night time (No DC)	OFF	OFF
Bootloader mode	FLASH *	

* ON 1s / OFF 1s

Table 5-1 LED indicator

5.2. First startup

At first startup, please supply AC power to the inverter. After the LCD display panel comes live, please set Language and Country according to your region and make sure that there is no any error, fault or warning showing on home page. Now you can feed in DC power and switch ON the DC switch. If there is enough power generated from PV array, inverter will start to feed in power to grid.

First Startup

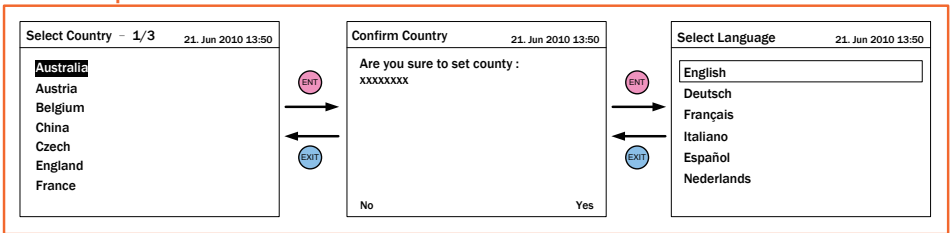


Figure 5-2 Country and language settings for first startup

5.2.1. Home Page

When inverter is operating normally, the LCD will display the homepage as shown in **Figure 5-3**, user can get the information of output power, inverter status, E-today, date and time.

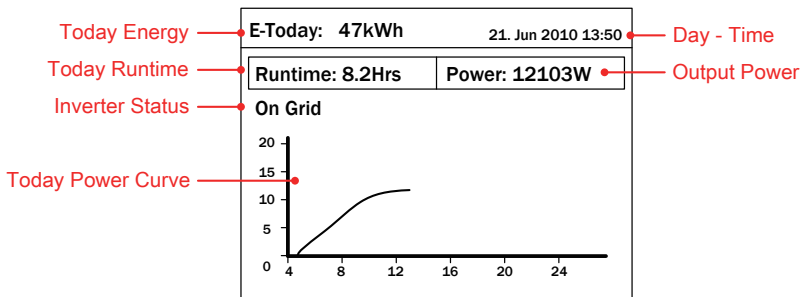


Figure 5-3 Home page

5.2.2. Power Meter

This page displays voltage, current and power from both AC and DC side.

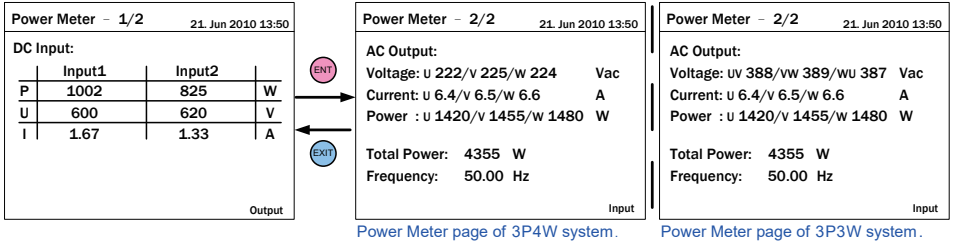


Figure 5-4 Power meter page

5.2.3. Energy Log

In this page, users can view the historical data on the power generated from a yearly, monthly and daily basis.

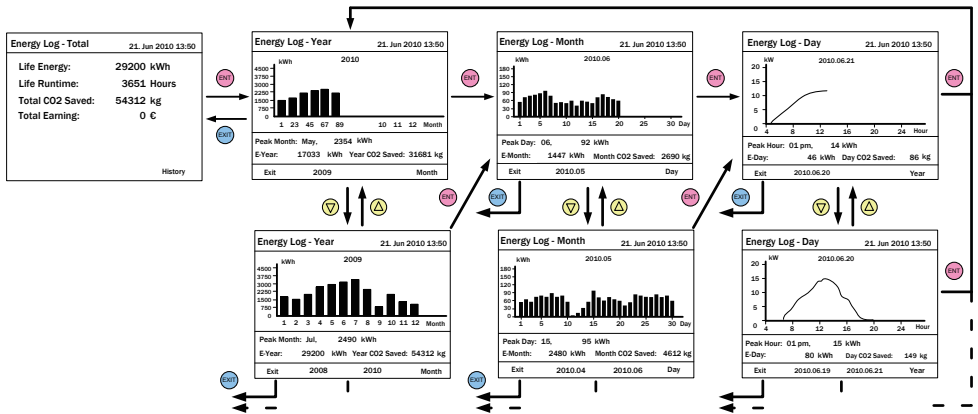


Figure 5-5 Energy log flow chart

5.2.4. Event Log

This page can record 30 events (error or fault) that had occurred before. Press ENT in this page can view the statistical data.

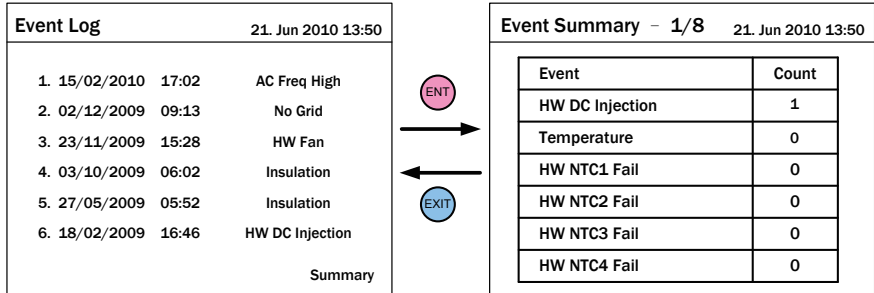


Figure 5-6 Event log flow chart

5.2.5. Operation Data

The operation data is divided into 4 pages. They record the maximum and minimum values of history; including voltage, current, power and temperature.

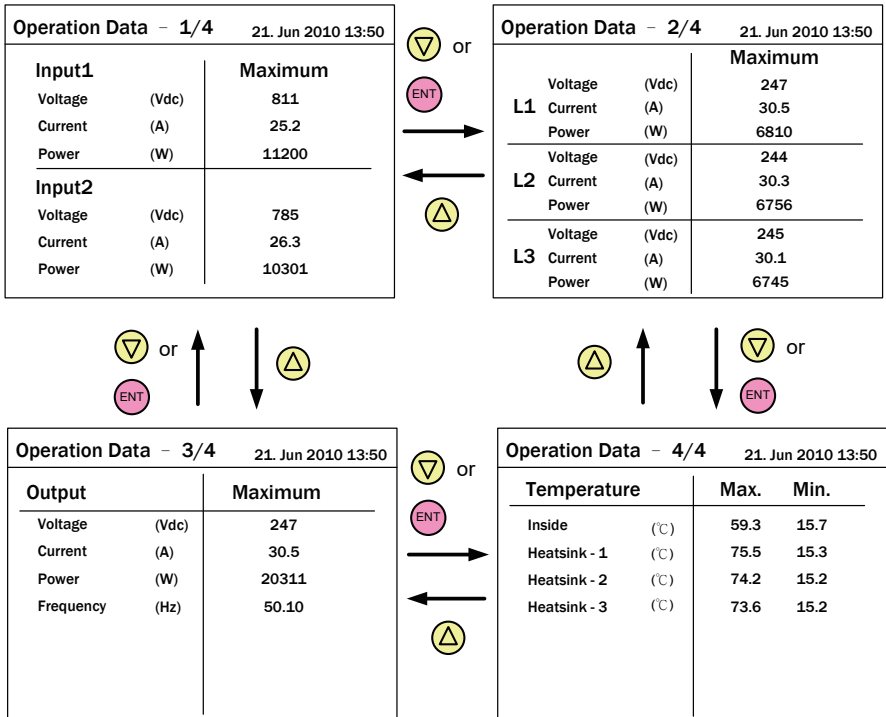


Figure 5-7 Operation data page

5.2.6. Inverter Information

This page can help user to recognize the inverter. It has the following information: serial number, firmware version, inverter ID, country setting, insulation setting.

Inverter Information	21. Jun 2010 13:50
Serial Number	AE46000006
DSP-Version	1.80
Red.-Version	1.17
Comm.-Version	1.99
Installation Date	05.Jan.2009
Inverter ID	001
Country	Custom

Figure 5-8 Inverter information page

5.2.7. Settings

All the adjustable functions and settings are collected in this page. We recommend that you are accompanied by technician when adjusting these settings.

Settings	21. Jun 2010 13:50
Personal Settings	
Coefficients Settings	
Install Settings	
Active/Reactive Power Control	
FRT	

Figure 5-9 Install settings page

5.2.7.1. Personal Settings

In this page, users can set display language, date & time, screen saver, backlight brightness and display contrast.

Personal Settings		21. Jun 2010 13:50
Language	[English]	
Date	21 / 06 / 2010	
	(DD/MM/YYYY)	
Time	13:50	
Screen Saver	[5 min]	
Brightness	[3]	
Contrast	[2]	

Figure 5-10 Personal settings page

5.2.7.2. Coefficient Settings

Users can set the CO2 saving coefficient, earning value coefficient, and baud rate in this page.

Coefficient Settings		21. Jun 2010 13:50
CO2 Saved kg/kWh	[1.86]	
Earning Value/kWh	[2.50]	
Currency (\$,€)	[€]	
Baud Rate	[19200]	

Figure 5-11 Coefficient setting page

5.2.7.3. Install Settings

CAUTION !



The settings in Install Settings page can only be adjusted by qualified installers or engineers. Changing these settings may result in damage to the inverter and other equipment.

To enter Install Settings page, users have to enter correct password. There are 2 sets of password with different permissions: user level and installer level.

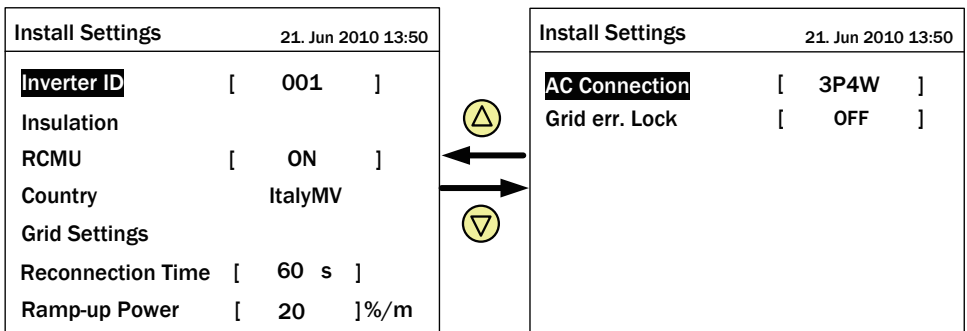


Figure 5-12 Install setting page –User mode

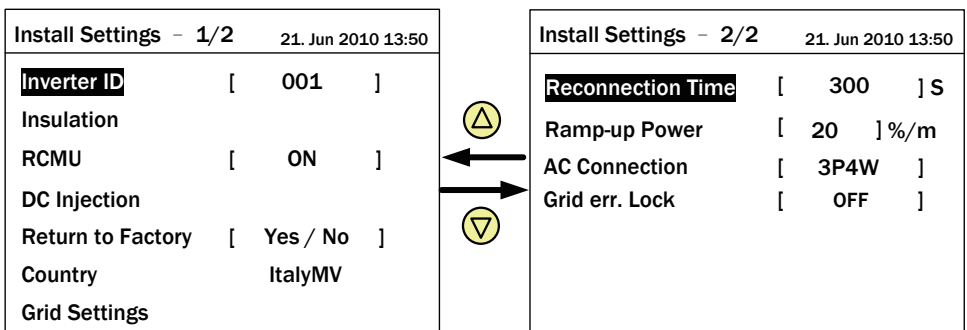


Figure 5-13 Install setting page –Installer mode

The following parts will introduce the setting items of user level.

- Inverter ID:
Inverter ID is used in RS-485 communication, for PC recognizing the inverter. If users connect several inverters together via RS-485, each inverter must have different ID.
- Insulation:
Before connecting to grid, inverter will measure the impedance between the PV array and PE first. There are 6 impedance measurement methods: ON, DC1 Only, DC2 Only, Positive Ground, Negative Ground, and OFF. Installer must select the appropriate method based on PV array's wiring.
- Country:
Each country has its own electricity regulations. Installer must select the country correctly.
- RCMU:
RCMU is a detection function that detecting the leakage current between input and output. If the leakage current exceeds the internal limit, inverter will shutdown immediately.
- Reconnection Time:
When error or fault occurred, inverter will disconnect from grid. After error or fault is cleared, the inverter will reconnect to grid in this reconnection time.
- Ramp-up Power:
When there is enough power generated from PV array, inverter will start to feed in power to grid with a ramp up rate. Users can adjust this ramp up rate through this item.
- AC connection:
RPI-M15A / M20A models can support 3P3W and 3P4W system. Please select the correct AC wiring type.
- Grid err. Lock:
This function is for Japan electricity regulation only. If there is any fault occurred in grid side, inverter will lock itself and not trying to reconnect anymore until users unlock it with special instruction.

5.2.7.4. Active/Reactive Power Control

A password is required to enter Active/Reactive Power Control page. This page includes two kinds of function: active power control and reactive power control. In active power control function, there are 3 control modes: Power Limit, Power vs. Frequency, and P(V). In reactive power control function, there are 4 control modes: Constant cosphi, cosphi(P), Constant Q, and Q(V).

Only some of countries (electricity regulations) have the requirement of these functions.

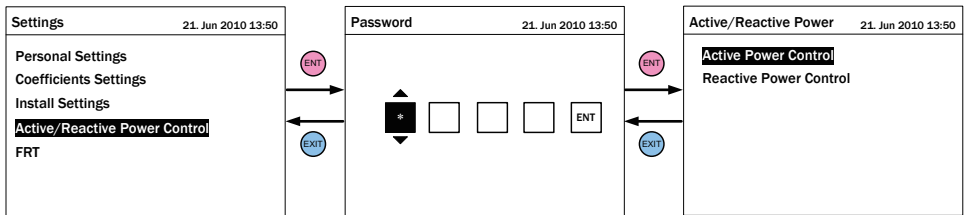


Figure 5-14 Active/Reactive power setting page

5.2.7.4.1. Active Power Control – Power Limit

This control mode can reduce the output power to a percentage of inverter's rated power. Users can limit the output power by set the Set Point in Power Limit page.

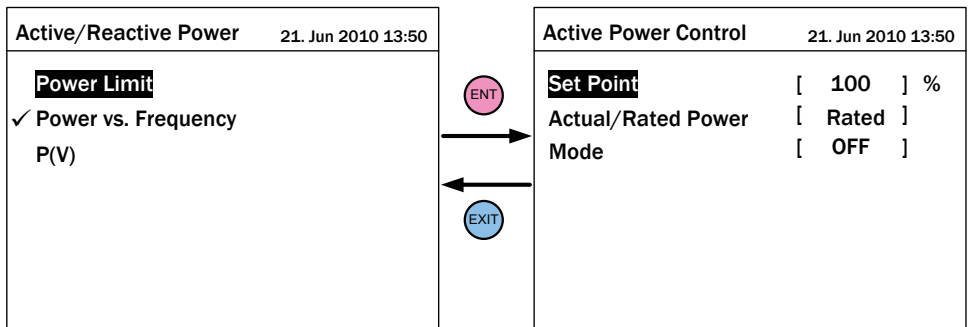


Figure 5-15 Power limit setting page

5.2.7.4.2. Active Power Control – Power vs. Frequency

Inverter will reduce output power when grid frequency rises up if this mode enabled. Users can tune the parameters in Power vs. Frequency page to change the inverter’s behavior.

Active Power Control		21. Jun 2010 13:50
	Actual/Rated Power	[Actual]
(a)	Start Frequency	[50.20] Hz
	Stop Frequency	[--] Hz
(b)	Recovery Frequency	[50.00] Hz
(c)	Statism	[40] %
	Recovery Time	[300] s
	Mode	[ON]

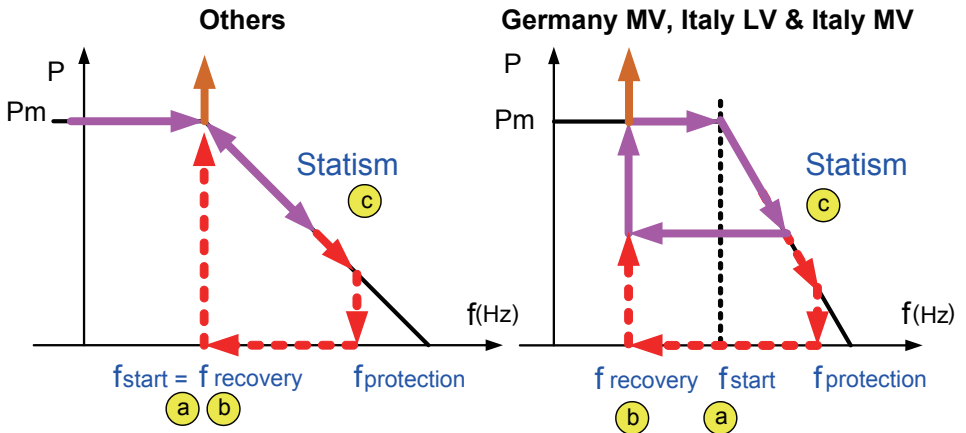


Figure 5-16 Power vs. frequency setting page.

5.2.7.4.3. Active Power Control – P(V)

When grid voltage rises up to a lock-in voltage(V lock-in) and inverter's present output power is greater than lock-in power(P lock-in), inverter will reduce the output power and keep it at a certain value(P lock-out) until grid voltage drop back to lock-out voltage(V lock-out) and passing a certain time(T recovery).

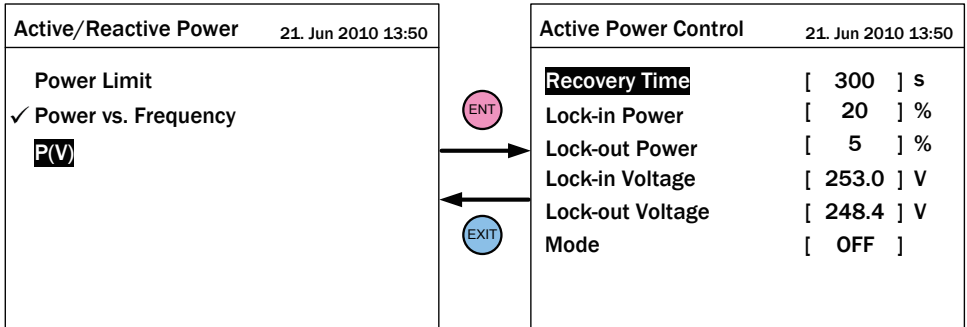


Figure 5-17 P(V) setting page.

5.2.7.4.4. Reactive Power Control – Constant $\cos\phi$

Inverter can feed in a fixed reactive power to grid. Users can set the power factor($\cos\phi$) in Constant $\cos\phi$ page.

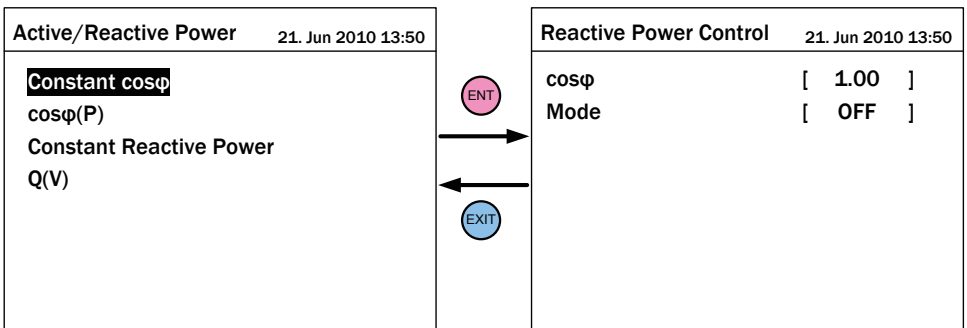


Figure 5-18 Constant $\cos\phi$ setting page.

5.2.7.4.5. Reactive Power Control – $\cos\phi$ (P)

Cosphi (P) is a function that inverter will feed in reactive power when its output active power reach the setting values. For country Italy MV and Italy LV, users can set lock-in voltage and lock-out voltage to assign the operation interval. When grid voltage reach the lock-in voltage(V lock-in), inverter will enable cosphi (P) function automatically and disabled it when grid voltage reach lock-out voltage(V lock-out).

Reactive Power Control		21. Jun 2010 13:50
a	Upper limit - $\cos\phi$	[Cap 0.90]
b	Lower Power	[0] %

c	Lower limit - $\cos\phi$	[Ind 0.90]
d	Upper Power	[100] %

	Lock-in Voltage	[241.5] V

Reactive Power Control		21. Jun 2010 13:50
	Lock-out Voltage	[230.0] V
	Mode	[OFF]

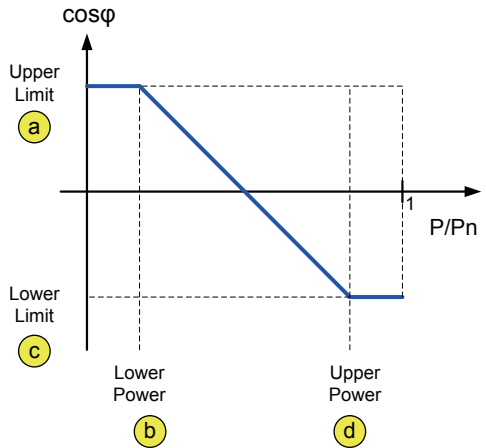


Figure 5-19 $\cos\phi(P)$ setting page.

5.2.7.4.6. Reactive Power Control – Constant Reactive Power

Like Constant cosphi function, users can assign a percentage of reactive power in Constant Reactive Power page.

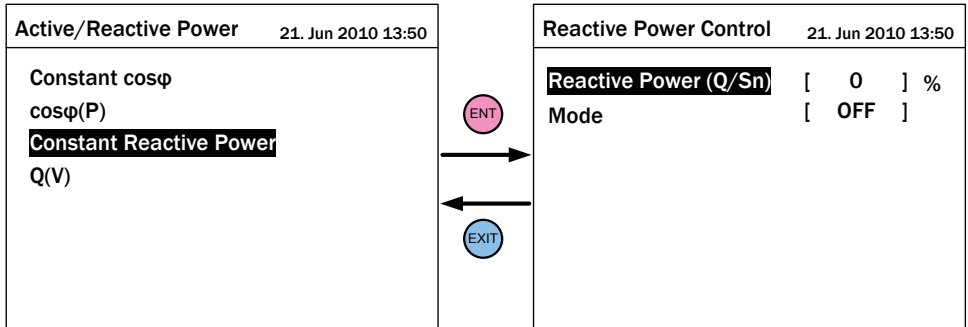


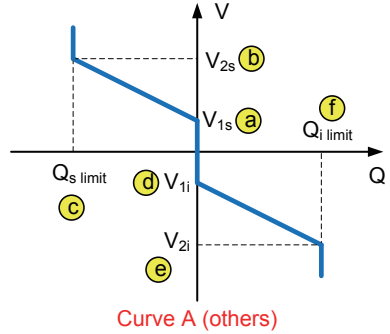
Figure 5-20 Constant Reactive Power setting page.

5.2.7.4.7. Reactive Power Control – Q(V)

Q(V) is a control mode that inverter will provide reactive power according to grid voltage. For country Italy MV and Italy LV, users can set lock-in power and lock-out power to assign Q(V) function operation interval.

Reactive Power Control		21. Jun 2010 13:50
(a)	V1s	[248.4] V
(b)	V2s	[253.0] V
(c)	Qs limit	[Ind 44] %

(d)	V1i	[211.6] V
(e)	V2i	[207.0] V
(f)	Qi limit	[Cap 44] %



Reactive Power Control		21. Jun 2010 13:50
Delay Time	[10]	s
Lock-in Power	[20]	%
Lock-out Power	[5]	%
Mode	[OFF]	

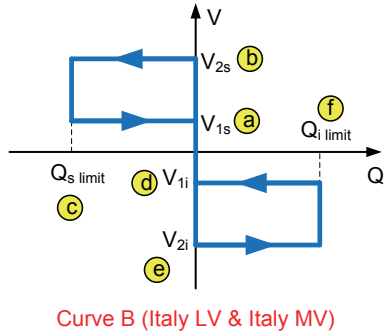


Figure 5-21 Q(U) setting page.

5.2.7.5. FRT (Fault ride through)

Some electricity regulations requests that inverter should keep connected to grid when grid voltage drops suddenly in few seconds. In these areas, users can enable FRT function and adjust the parameters to meet the requirement.

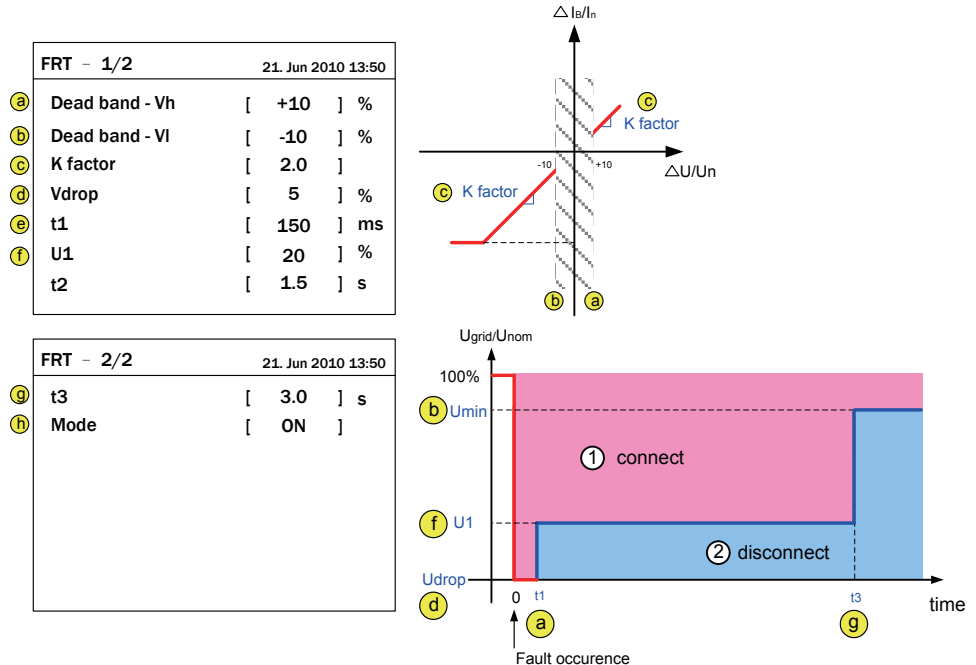


Figure 5-22 FRT setting page.

6.Maintenance

Please check the unit regularly. 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.

WARNING !



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

6.1. Clean Fan

Loosen the 4 screws shown in Figure 6-1. Once the screws are loose, pulling the fan bracket out will expose the connectors. Each fan has one wire connected.

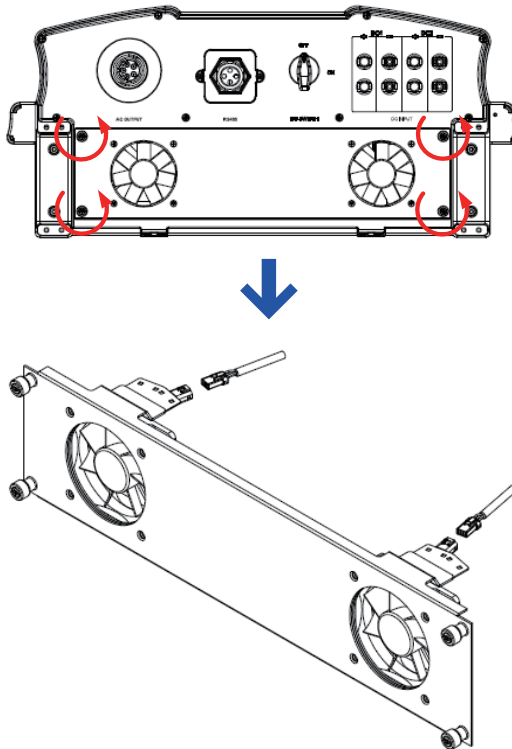


Figure 6-1 Disassembling fan panel

6.2. Replace Fan

In the event that a fan needs to be replaced, user should disassemble the 4 pcs screws around the fans and disconnect the connector right behind the fan bracket. Then replace new fan and reassemble the 4pcs screws.

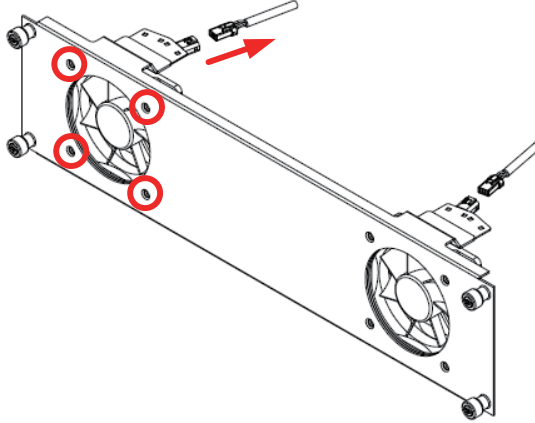


Figure 6-2 Removal of a fan

6.3. Clean Air Outlets

Unscrew the 4 screws of air outlets and clean them should be done regularly.

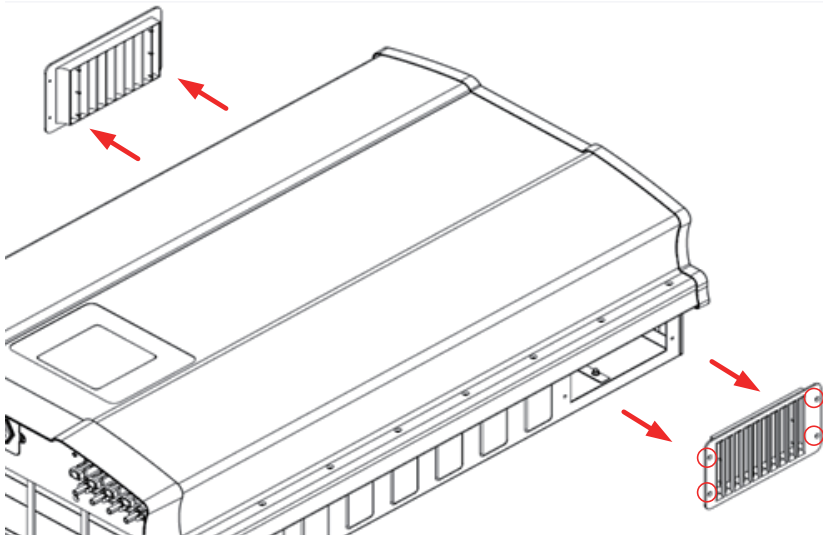


Figure 6-3 Removal of air outlets

7. Error message and Trouble Shooting

ERROR		
Message	Possible cause	Action
AC Freq High	<ol style="list-style-type: none"> 1. Actual utility frequency is over the OFR setting 2. Incorrect country setting 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the utility frequency on the inverter terminal 2. Check country setting 3. Check the detection circuit inside the inverter
AC Freq Low	<ol style="list-style-type: none"> 1. Actual utility frequency is under the UFR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the utility frequency on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
Grid Quality	Non-linear load in Grid and near to inverter	Grid connection of inverter need to be far away from non-linear load if necessary
HW Con. Fail	<ol style="list-style-type: none"> 1. Wrong connection in AC plug 2. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the AC connection, must accords to manual 2. Check the detection circuit inside the inverter
No Grid	<ol style="list-style-type: none"> 1. AC breaker is OFF 2. Disconnect in AC plug 	<ol style="list-style-type: none"> 1. Switch on AC breaker 2. Check the connection in AC plug and make sure it connects to inverter
AC Volt Low	<ol style="list-style-type: none"> 1. Actual utility voltage is under the UVR setting 2. Incorrect country or Grid setting 3. Wrong connections in AC plug 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the utility voltage connection to the inverter terminal 2. Check country & Grid setting 3. Check the connection in AC plug 4. Check the detection circuit inside the inverter
AC Volt High	<ol style="list-style-type: none"> 1. Actual utility voltage is over the OVR setting 2. Utility voltage is over the Slow OVR setting during operation 3. Incorrect country or Grid setting 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the utility voltage on the inverter terminal 2. Check the utility voltage on the inverter terminal 3. Check country & Grid setting 4. Check the detection circuit inside the inverter
Solar1 High	<ol style="list-style-type: none"> 1. Actual Solar1 voltage is over 1000Vdc 2. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Modify the solar array setting, and make the Voc less than 1000Vdc 2. Check the detection circuit inside the inverter

ERROR		
Message	Possible cause	Action
Solar2 High	<ol style="list-style-type: none"> 1. Actual Solar2 voltage is over 1000Vdc 2. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Modify the solar array setting, and make the Voc less than 1000Vdc 2. Check the detection circuit inside the inverter
Insulation	<ol style="list-style-type: none"> 1. PV array insulation fault 2. Large PV array capacitance between Plus to Ground or Minus to Ground or both. 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the insulation of Solar inputs 2. Check the capacitance, dry PV panel if necessary 3. Check the detection circuit inside the inverter

Table 7-1 Error Message

Warning		
Message	Possible cause	Action
Solar1 Low	<ol style="list-style-type: none"> 1. Actual Solar1 voltage is under the limit 2. Some devices were damaged inside the inverter if the actual Solar1 voltage is close to "0" 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the Solar1 voltage connection to the inverter terminal 2. Check all switching devices in boost1 3. Check the detection circuit inside the inverter
Solar2 Low	<ol style="list-style-type: none"> 1. Actual Solar2 voltage is under the limit 2. Some devices were damaged inside the inverter if the actual Solar2 voltage is close to "0" 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the Solar2 voltage connection to the inverter terminal 2. Check all switching devices in boost2 3. Check the detection circuit inside the inverter
HW FAN	<ol style="list-style-type: none"> 1. One or more fans are locked 2. One or more fans are defective 3. One ore more fans are disconnected 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Remove the object that stuck in the fan(s) 2. Replace the defective fan(s) 3. Check the connections of all fans 4. Check the detection circuit inside the inverter
SPD Fail	<ol style="list-style-type: none"> 1. Inverter was struck by lighting. 2. One or more SPD are defective 3. One or more SPD are disconnected 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check inverter's status 2. Replace the defective SPD 3. Check the connections of SPDs 4. Check the detection circuit inside the inverter

Table 7-2 Warning Message

FAULT		
Message	Possible cause	Action
HW DC Injection	<ol style="list-style-type: none"> Utility waveform is abnormal Detection circuit malfunction 	<ol style="list-style-type: none"> Check the utility waveform. Grid connection of inverter need to be far away from non-linear load if necessary Check the detection circuit inside the inverter
Temperature High	<ol style="list-style-type: none"> The ambient is over 60°C (The installation is abnormal) Detection circuit malfunction 	<ol style="list-style-type: none"> Check the installation ambient and environment Check the detection circuit inside the inverter
Temperature Low	<ol style="list-style-type: none"> Ambient temperature is <-30°C Detection circuit malfunction 	<ol style="list-style-type: none"> Check the installation ambient and environment Check the detection circuit inside the inverter (RTM1, RTB1, RTG1 and RTH1)
HW NTC1 Fail	<ol style="list-style-type: none"> Ambient temperature >90°C or <-30°C Detection circuit malfunction 	<ol style="list-style-type: none"> Check the installation ambient and environment Check the detection circuit inside the inverter (RTM1)
HW NTC2 Fail	<ol style="list-style-type: none"> Ambient temperature >90°C or <-30°C Detection circuit malfunction 	<ol style="list-style-type: none"> Check the installation ambient and environment Check the detection circuit inside the inverter (RTB1)
HW NTC3 Fail	<ol style="list-style-type: none"> Ambient temperature >90°C or <-30°C Detection circuit malfunction 	<ol style="list-style-type: none"> Check the installation ambient and environment Check the detection circuit inside the inverter (RTG1)
HW NTC4 Fail	<ol style="list-style-type: none"> Ambient temperature >90°C or <-30°C Detection circuit malfunction 	<ol style="list-style-type: none"> Check the installation ambient and environment Check the detection circuit inside the inverter (RTH1)
HW DSP ADC1	<ol style="list-style-type: none"> Insufficient input power Auxiliary power circuitry malfunction Detection circuit malfunction 	<ol style="list-style-type: none"> Check the input voltage, must >150Vdc Check the auxiliary circuitry inside the inverter Check the detection circuit inside the inverter
HW DSP ADC2	<ol style="list-style-type: none"> Insufficient input power Auxiliary power circuitry malfunction Detection circuit malfunction 	<ol style="list-style-type: none"> Check the input voltage, must >150Vdc Check the auxiliary circuitry inside the inverter Check the detection circuit inside the inverter

FAULT		
Message	Possible cause	Action
HW DSP ADC3	<ol style="list-style-type: none"> 1. Insufficient input power 2. Auxiliary power circuitry malfunction 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the input voltage, must >150Vdc 2. Check the auxiliary circuitry inside the inverter 3. Check the detection circuit inside the inverter
HW Red ADC1	<ol style="list-style-type: none"> 1. Insufficient input power 2. Auxiliary power circuitry malfunction 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the input voltage, must >150Vdc 2. Check the auxiliary circuitry inside the inverter 3. Check the detection circuit inside the inverter
HW Red ADC2	<ol style="list-style-type: none"> 1. Insufficient input power 2. Auxiliary power circuitry malfunction 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the input voltage, must >150Vdc 2. Check the auxiliary circuitry inside the inverter 3. Check the detection circuit inside the inverter
HW Efficiency	<ol style="list-style-type: none"> 1. The calibration is incorrect 2. Current feedback circuit is defective 	<ol style="list-style-type: none"> 1. Check the accuracy of current and power 2. Check the current feedback circuit inside the inverter
HW COMM1	<ol style="list-style-type: none"> 1. DSP is idling 2. The communication connection is disconnected 3. The communication circuit malfunction 	<ol style="list-style-type: none"> 1. Check reset and crystal in DSP 2. Check the connection between DSP and COMM 3. Check the communication circuit
HW COMM2	<ol style="list-style-type: none"> 1. Red. CPU is idling 2. The communication connection is disconnected 	<ol style="list-style-type: none"> 1. Check reset and crystal in Red. CPU 2. Check the connection between Red. CPU and DSP
Ground Current	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Check the insulation of Solar inputs 2. Check the capacitance (+ <-> GND & - <-> GND), must < 2.5uF. Install a external transformer if necessary 3. Check boost driver & boost choke 4. Check the detection circuit inside the inverter
HW Connect Fail	<ol style="list-style-type: none"> 1. Power line is disconnected inside the inverter 2. Current feedback circuit is defective 	<ol style="list-style-type: none"> 1. Check the power lines inside the inverter 2. Check the current feedback circuit inside the inverter

FAULT		
Message	Possible cause	Action
RCMU Fail	<ol style="list-style-type: none"> 1. RCMU is disconnected 2. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the RCMU connection inside the inverter 2. Check the detection circuit inside the inverter
Relay Test Short	<ol style="list-style-type: none"> 1. One or more relays are sticking 2. The driver circuit for the relay malfunction 	<ol style="list-style-type: none"> 1. Replace the defective relay(s) 2. Check the driver circuit inside the inverter
Relay Test Open	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Replace the defective relay(s) 2. Check the driver circuit inside the inverter 3. Check the Vgrid and Vout voltage detection accuracy
Bus Unbalance	<ol style="list-style-type: none"> 1. Not totally independent or parallel between inputs 2. PV Array short to Ground 3. Driver for boost is defective or disconnected 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the inputs connections 2. Check the PV Array insulation 3. Check the driver circuit for boost inside the inverter 4. Check the detection circuit inside the inverter
HW Bus OVR	<ol style="list-style-type: none"> 1. Driver for boost is defective 2. Voc of PV array is over 1000Vdc 3. Surge occurs during operation 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the driver circuit for boost inside the inverter 2. Modify the solar array setting, and make the Voc less than 1000Vdc 3. N/A 4. Check the detection circuit inside the inverter
AC Current High	<ol style="list-style-type: none"> 1. Surge occurs during operation 2. Driver for inverter stage is defective 3. Switching device is defective 4. Detection circuit malfunction 	<ol style="list-style-type: none"> 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
HW CT A Fail	<ol style="list-style-type: none"> 1. Test current loop is broken 2. CSC1 is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the connection of WC3 to CNC16 2. Replay CSC1 with new one 3. Check the detection circuit inside the inverter
HW CT B Fail	<ol style="list-style-type: none"> 1. Test current loop is broken 2. CSC2 is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the connection of WC3 to CNC16 2. Replace CSC2 with new one 3. Check the detection circuit inside the inverter

FAULT		
Message	Possible cause	Action
HW CT C Fail	<ol style="list-style-type: none"> 1. Test current loop is broken 2. CSC3 is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the connection of WC3 to CNC16 2. Replace CSC3 with new one 3. Check the detection circuit inside the inverter
HW AC OCR	<ol style="list-style-type: none"> 1. Large Grid harmonics 2. Switching device is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the utility waveform. Grid connection of inverter need to be far away from non-linear load if necessary 2. Check all switching devices in inverter stage 3. Check the detection circuit inside the inverter
HW ZC Fail	The detection circuit for synchronal signal malfunction	Check the detection circuit for synchronal signal inside the inverter
DC Current High	<ol style="list-style-type: none"> 1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit

Table 7-3 Fault Message

8.De-Commissioning

If it is 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 with electricity grid.
- Switch off DC switch to disconnect with DC source.
- Switch off the PV array switch to disconnect from the PV array.
- Use proper voltmeter 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.

9. Technical Data

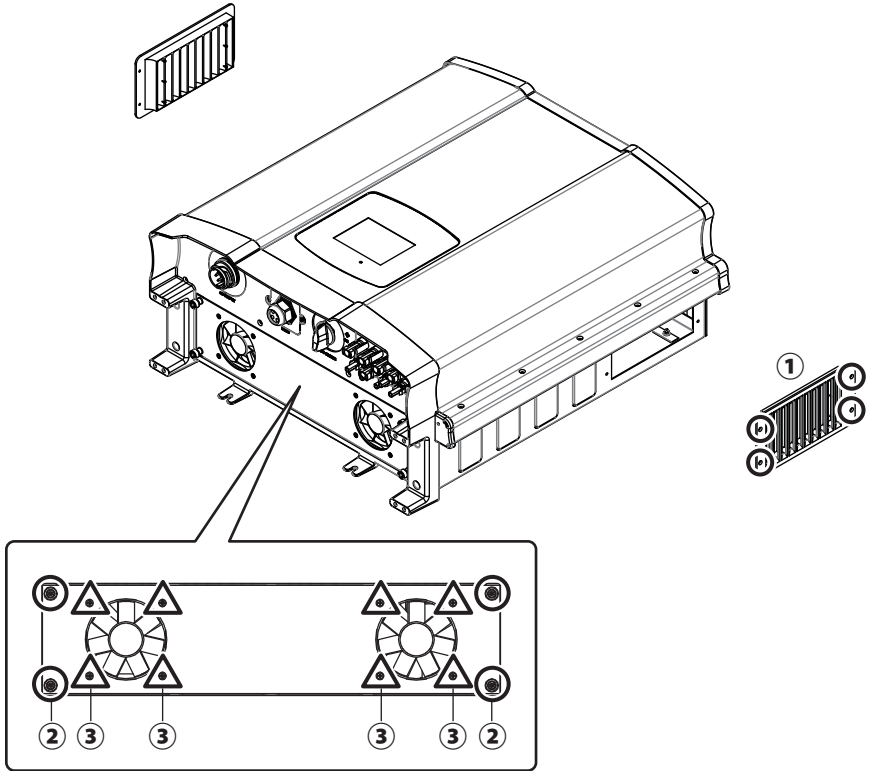
	RPI-M15A	RPI-M20A
GENERAL		
Enclosure	Powder coated aluminum	
Operating temperature	-25~60°C, full power up to 40°C	
Operating Altitude	2000m	
Relative humidity	0 – 100% non condensing.	
Environmental category	Outdoor, wet locations	
Protection degree	IP65 (Electronics)	
Pollution degree	3	
Overvoltage category	AC output :III, DC Input :II	
Maximum backfeed current to the array	0	
Galvanic isolation	NO	
Safety class	Class I metal enclosure with protective earth	
Weight	43kg	
Dimensions(W*H*D)	612 × 625 × 278mm	
Connectors	Weather resistant connectors	
DC INPUT (Solar side)		
Maximum input power	16.5kW	22kW
Recommended PV power range	14kW – 19kW	18kW – 25kW
Nominal voltage	635Vdc	
Operating voltage	200Vdc – 1000 Vdc	
Startup voltage	> 250 Vdc	
Start up power	40W	
MPP tracker	Parallel inputs: 1 MPP tracker Separate inputs: 2 MPP trackers	
Absolute maximum voltage	1000V	

	RPI-M15A	RPI-M20A
Maximum power MPPT range		
Balanced inputs (50/50)	355-820Vdc	470-820Vdc
Unbalanced inputs (67)	475-820Vdc	635-820Vdc
Unbalanced inputs (33)	235-820Vdc	310-820Vdc
DC INPUT (Solar side)		
Number of inputs	4 pairs MC4	
Rated current	22A * 2	
Maximum short circuit current per MPPT (Isc)	24A	
AC OUTPUT (GRID SIDE)		
Nominal power	15kVA	20kVA
Maximum power	15.75kVA	21kVA
Voltage	3Ph, 220/380Vac, 230/400Vac	
Nominal current	22A	29A
Maximum current	24A	32A
Inrush current	150A/100µs	
Maximum output fault current (rms)	33.6A	51.2A
Maximum output over current protection	28.8A	38.4A
Frequency	Rated 50/60Hz (Programmable 45Hz - 65Hz)	
Total harmonic distortion	< 3 %	
Power factor	> 0.99 @ full power Adjustable: 0.80 leading – 0.80 lagging	
DC current injection	<0.5% rated current	
Tare loss	< 2W	
Maximum efficiency	98.3 %	98.4 %
EU efficiency	97.9 %	98.1 %
AC connector	3 Ph + N + PE; 3-phase AC plug that meets IP67 and specifications in table 4-2.	

		RPI-M15A	RPI-M20A
SYSTEM INFORMATION / COMMUNICATION			
User interface		Black-on-white character type LCD display	
		365 days data logger and real time clock	
		30 events record	
External communication		2 RS-485 connections	
REGULATIONS & DIRECTIVES			
CE conformity		Yes	
Grid interface		VDE0126-1-1, VDE-AR-N 4105, RD1699, CEI 0-21	
Emission		EN 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	
Electrical safety		IEC 62109-1/ -2	
MISCELLANEOUS			
Cooling		Fan, 2pcs	
Enclosure		Mounting bracket	
		Aluminum with powder coating	

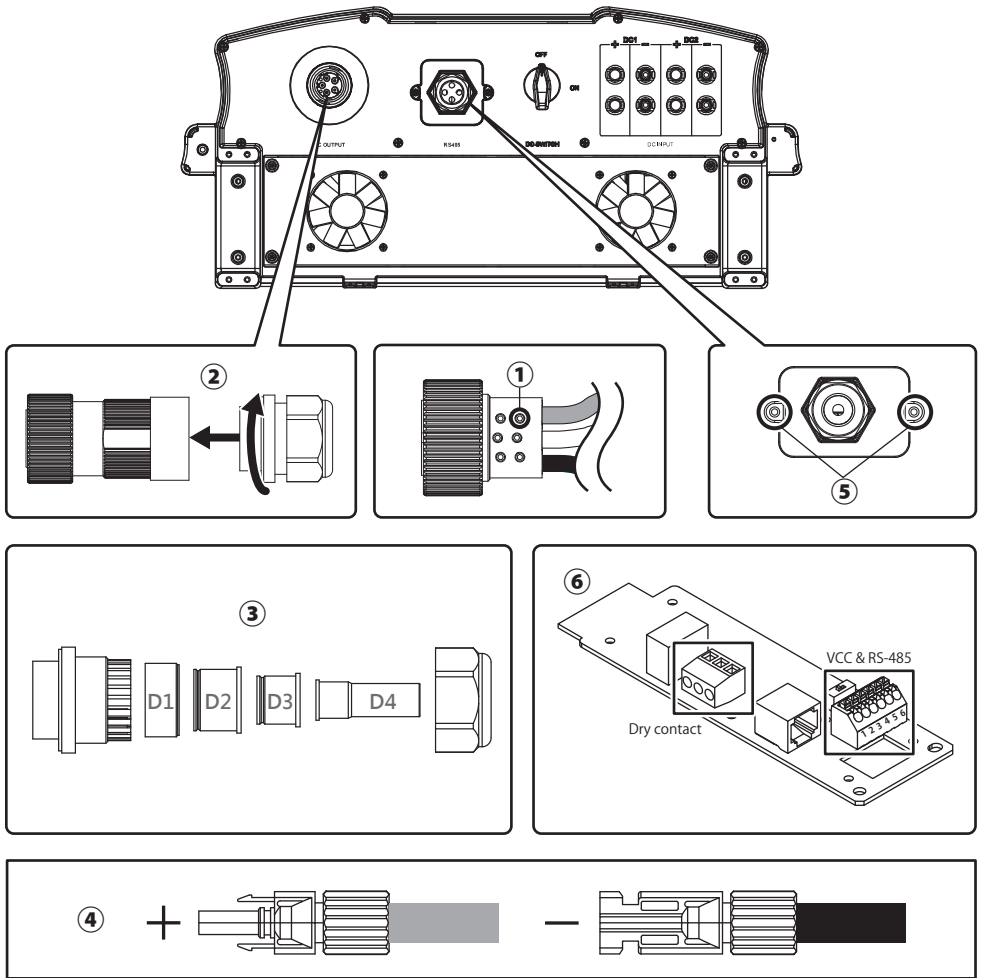
Table 9-1 Specifications for RPI-M15A / M20A

10.Assembly Note



NO	Location	Screw torque
1	Air inlet	8 Kgf-cm (0.8N-m)
2	Fan panel	8 Kgf-cm (0.8N-m)
3	Fans	8 Kgf-cm (0.8N-m)

Table 10-1 Assembly Note-1



NO	Location	Screw torque	Conductor cross-section
1	AC wire	7 Kgf-cm (0.7N-m)	10~8AWG (6mm ²)
2	AC plug	55 ~ 75 kgf-cm (5.4 ~ 7.4N-m)	--
3	Rubber rings	D1 / D2 / D3: 133 ~ 204 Kgf-cm (13 ~ 20N-m) D4: 92 ~ 133 Kgf-cm (9 ~ 13N-m)	--
4	MC4 wire	--	12~10AWG (4~6mm ²)
5	Communication cover	8 Kgf-cm (0.8N-m)	--
6	Communication module	--	20 AWG (0.5mm ²)

Table 10-2 Assembly Note-2



The power behind competitiveness

三相并网型逆变器

RPI-M15A/M20A
操作手册

English 1

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安全规范

本手册提供使用者以下几种常见安全规范:

注意!



如若不遵守此规范则可能导致机器设备的损毁。

警告!



如若不遵守此规范则可能会导致人员的伤亡。
本机任何维修动作只能由制造商进行。

危险!



如若不遵守此规范则将会导致人员的伤亡。
为了避免触电, 请勿私自打开本逆变器外壳。

高温危险!



机器正常操作时表面温度可能会有烫伤的危险请勿碰触。

1. 信息

1.1. 关于此手册

本手册将提供产品之电器规格、安装步骤以及相关设定等信息，本手册适用机型为RPI-M15A/ RPI-M20A。

1.2. 产品说明

本产品为三相非隔离、市电并联型之太阳能逆变器(solar inverter)。太阳光能量经由太阳能板(PV array)转换成可运用之直流电后，再由逆变器转换成三相电流输出与市电并联，不支持独立运转(stand alone)。

太阳能逆变器工作方式如图1-1，将太阳能板的直流电源转换成三相交流电源输出至市电，达到节能省电的目的。

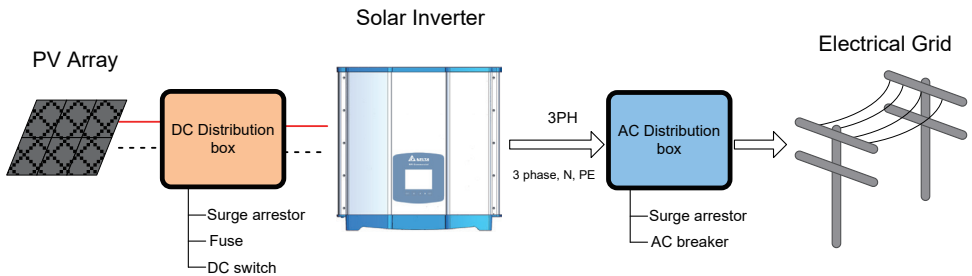


图 1-1 太阳能逆变器使用说明

1.3. 其他信息

如果想获得RPI-M15A/ RPI-M20A更详细之信息或其它相关产品信息，可链接至以下网站：<http://www.deltaww.com>

2. 产品概观

2.1. 逆变器开箱

RPI-M15A / M20A之开箱步骤请参考图2-1。

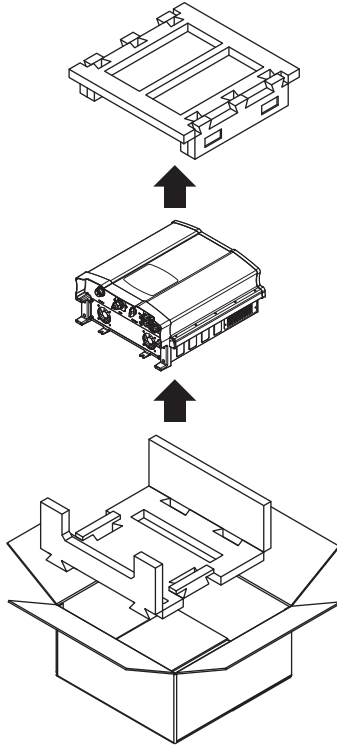


图2-1 开箱

2.2. 检查内容物

由于逆变器于运送过程中, 有可能遭遇任何无法预估的状况, 因此建议您按照以下项目逐项检查:

- 检外包装箱是否有损坏或破损的现象。
- 检查各项配件是否齐全。详细的配件信息请参考表2-1与图 2-2。
- 检查外箱之机子型号、序号与包装内机子之型号、序号是否相符。

当您发现包装内、外部有任何损毁的情况或是附件有短缺、损毁, 请立即联系您的逆变器供货商。

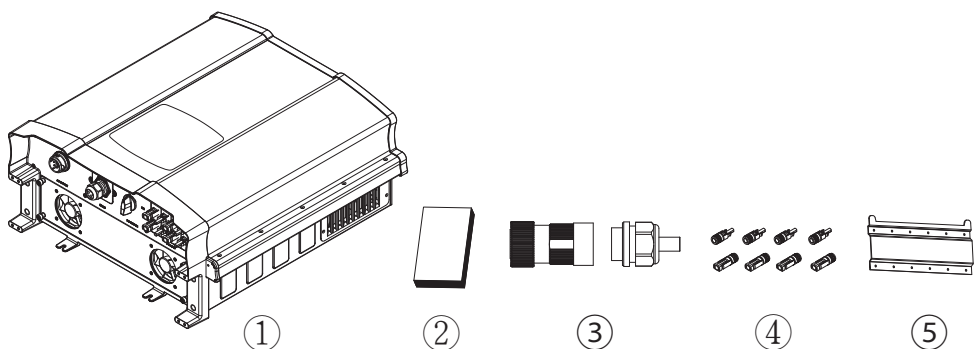


图2-2 内容物清单

RPI-M15A/ RPI-M20A			
	物品	数量	说明
1	太阳能逆变器	1 pcs	RPI系列太阳能逆变器
2	使用说明书	1 pcs	安全规范、安装步骤、产品规格...等
3	AC 接头	1 pcs	AC 连接接头
4	DC 接头	4 sets	DC 连接接头
5	壁挂板	1 pcs	将太阳能逆变器挂于墙上之壁挂板。

表2-1 内容物清单

2.3. 产品卷标

用户可透过产品卷标上的信息得知逆变器之型号、规格以及序号。卷标的位置请参考图2-3。

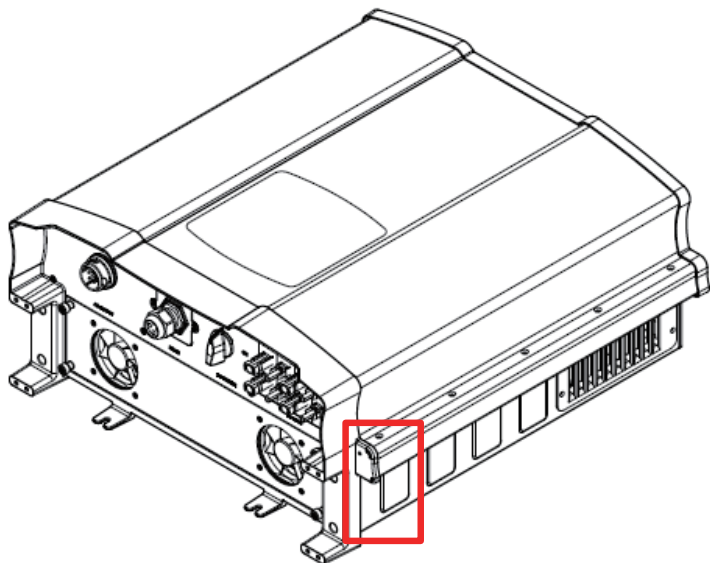


图 2-3 产品卷标

2.4. 外观介绍

逆变器外部组件如图2-4所示。详细的输出与输入接口请参考图 2-5。

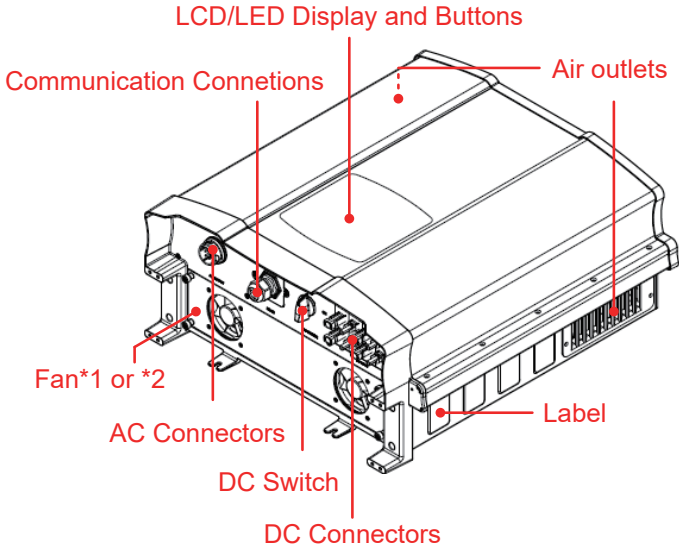


图 2-4 外观介绍

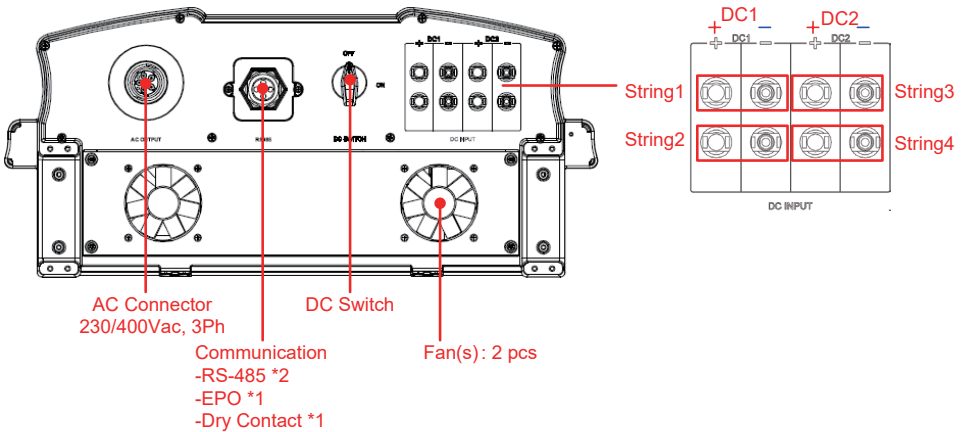


图 2-5 输出输入接口介绍

3. 安装

注意!



逆变器不可安装在阳光可直射的地方。

警告!



- 请勿将逆变器安装于易燃性物质附近。
- 请将逆变器安装于稳固之墙上。
- 太阳能板(PV array)绝缘等级须具有IEC 61730 Class A，或者在市电侧额外安装隔离变压器。

本逆变器属于壁挂式机种，安装时请以机身垂直地面，AC/DC接头位于机子正下方之方式壁挂于墙上。勿将机子安装于倾斜之处。

请依照以下步骤将逆变器安装于墙上：

1. 使用12颗M6螺丝将壁挂板锁附于墙上。请参考图3-3。
2. 将逆变器附挂于壁挂板上。
3. 使用2颗M6螺丝将逆变器固定于墙上。请参考图3-4。

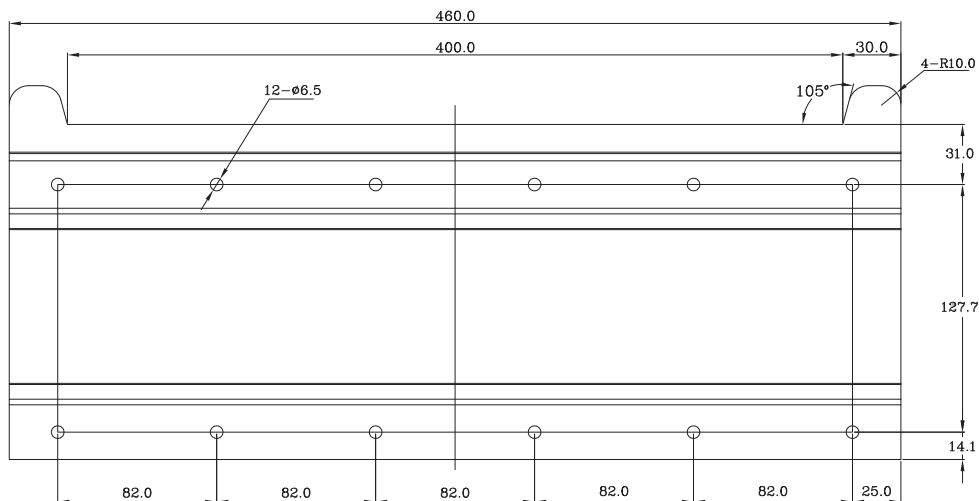


图 3-1 壁挂板尺寸

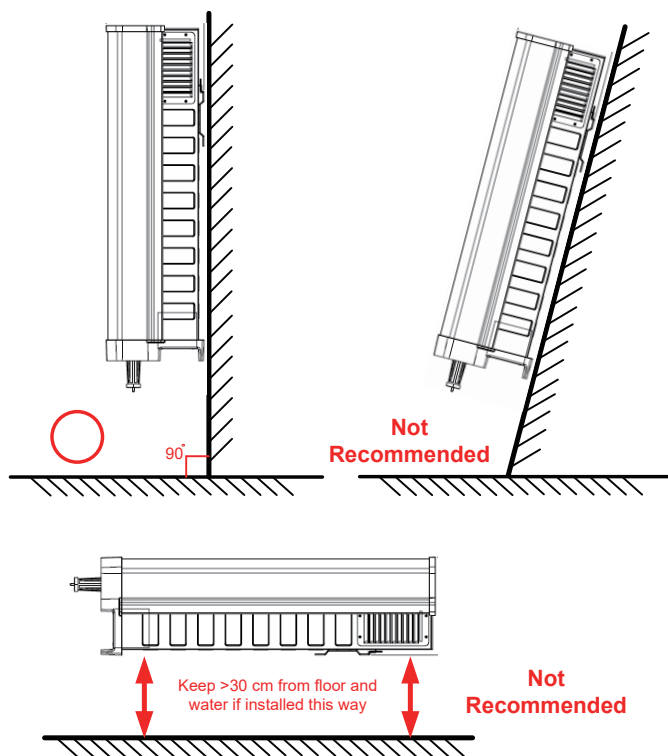
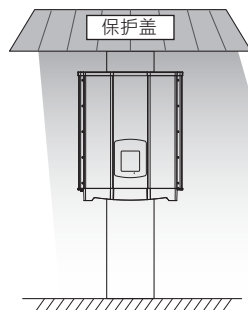


图 3-2 建议和不建议的安装方式

注意！



为避免由于极端气候(大雪, 冰雹...等)或不恰当的安装/维运所导致的逆变器故障, 台达强烈建议安装额外的保护盖, 详细细节请洽当地服务团队。



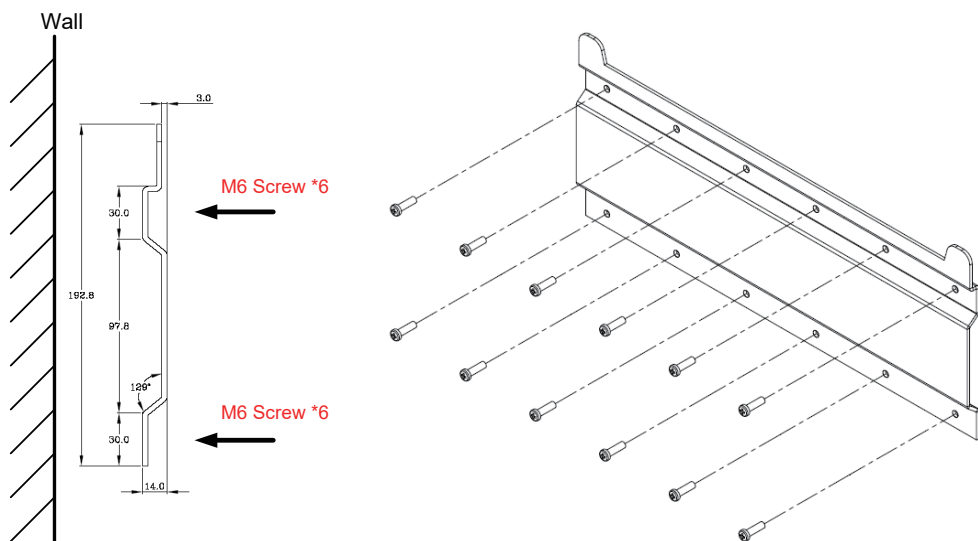


图 3-3 以螺丝固定壁挂板

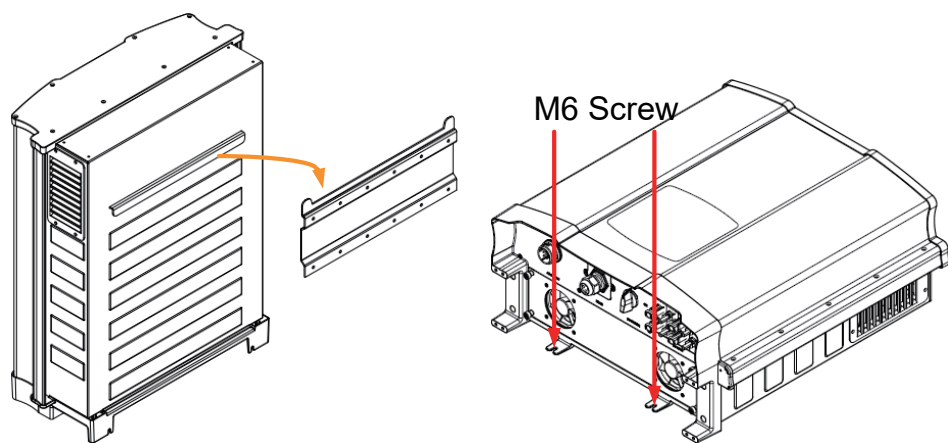


图 3-4 附挂和固定逆变器

注意!



- 壁挂板是专为逆变器设计, 而且是逆变器唯一的安装方式。
- 请安装于安全且空旷之场所, 方便保养与检修。
- 此产品运转时其周围需有适当空间, 如图3-5所示。
- 请安装于视线可及之高度, 以便观察其运转状态与参数设定。
- 请安装于温度介于 $-25^{\circ}\text{C} \sim 60^{\circ}\text{C}$ 的场所。
(超过 40°C 机子将会主动降低输出功率)

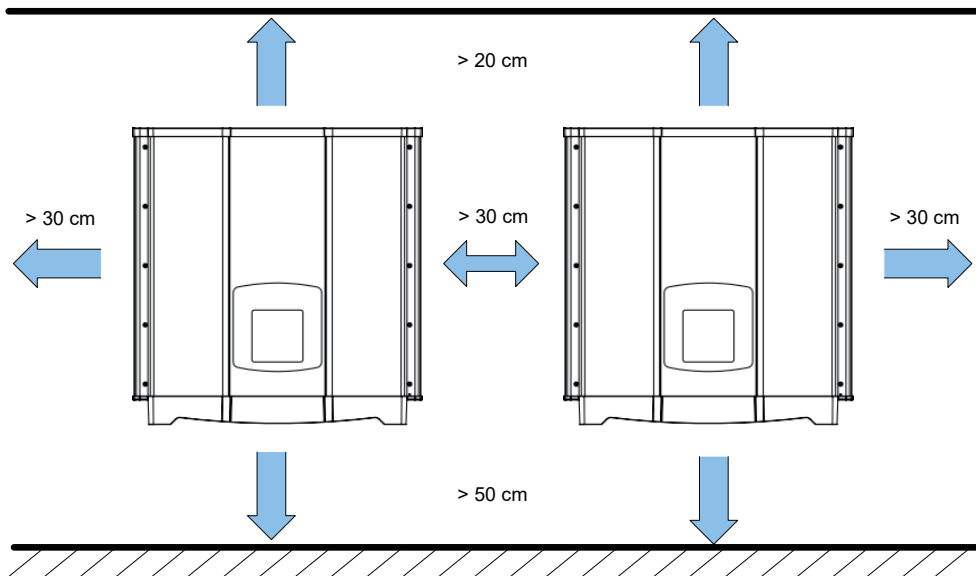


图 3-5 适当安装间距

4. 配线

WARNING ! SHOCK HAZARD



太阳能板曝晒于阳光下即会产生电力，为避免触电危险，配线前请使用不透明材料覆盖于太阳能板上，并将太阳能板之电源供应开关转至 OFF。

4.1. 配线前准备事项

- 当太阳能板不接地(浮接)时，机子DC端可接受并联或是独立连接。
- 若太阳能板为正端接地或负端接地时，因RPI系列机种内部并未附带隔离变压器，DC端仅允许并联配线并需于AC端加装外部隔离变压器。
- 不同的DC配线方式需于逆变器控制面板上设定不同的Insulation侦测方式，请参考5.2.7.3 Install Settings。

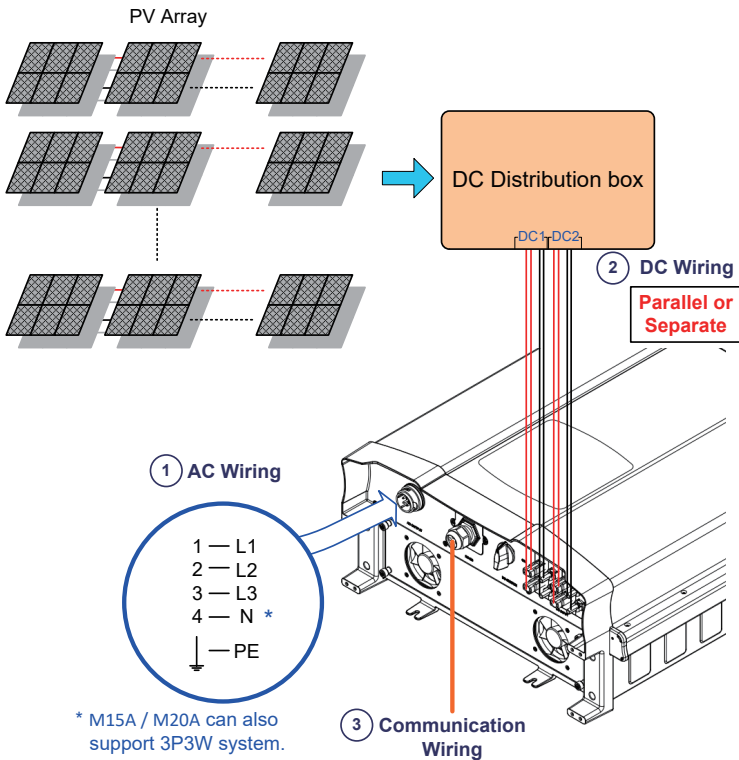


图4-1 系统配线图(DC端不接地)

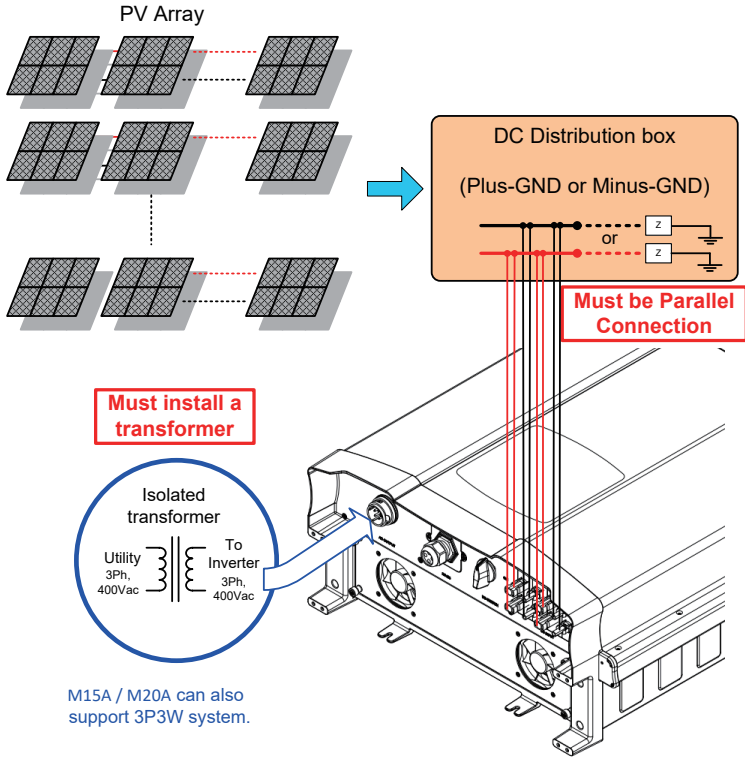


图4-2 系统配线图(DC正接地或负接地)

4.2. AC(市电端)之连接: 三相三线(3P+PE)或三相四线(3P+N+PE)

警告!



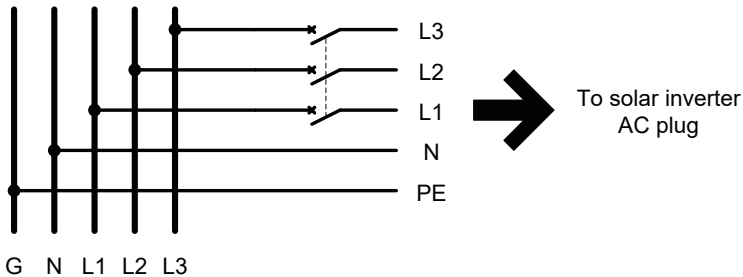
执行配线作业时, 必须确认市电电源开关已经关闭。

4.2.1. 保护装置与AC配线图

建议在市电与逆变器之间加装断路器以达到过电流保护的效果。
请参考下表的规格选择适当的断路器。

机种	断路器规格
RPI-M15A	30A
RPI-M20A	40A

表 4-1 断路器建议规格



AC端之配线必须妥善包覆以确保安全并符合表4-2中之规格。

机种名称	额定电流	线径	建议扭力值
RPI-M15A	40 A	6 mm ² or 10 AWG / 8 AWG	0.7 N.m
RPI-M20A	40 A	6 mm ² or 10 AWG / 8 AWG	0.7 N.m

表 4-2 AC接头线径尺寸

RPI-M15A以及M20A机型皆支持三相三线(3-phase and PE)与三相四线(3-phase, N and PE)两种配线方式。

注意！可能造成机器设备损毁



- 未使用正确线材线径可能会有线材锁附不牢固状况，导致AC接头损毁状况发生。
- AC接头之装配须符合当地之电气法规，若此安装说明与法规有所抵触，请以法规为准。

在组装AC plug前请先按照以下步骤剥除线皮：

- 剥除电缆外部胶皮68.5mm。
- 将内部L1、L2、L3、N线材修剪至70mm。
- 剥除内部所有线材之胶皮20mm。

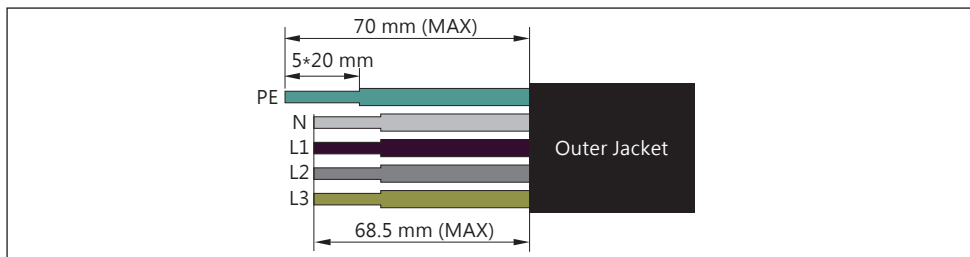


图4-3 AC线材剥线

线材压接完成后请按照图4-4组装AC接头。

逆变器可接受正相序或负相序连接，意即 L1~L3 连接顺序可调整，但N与PE则必须正确的连接。

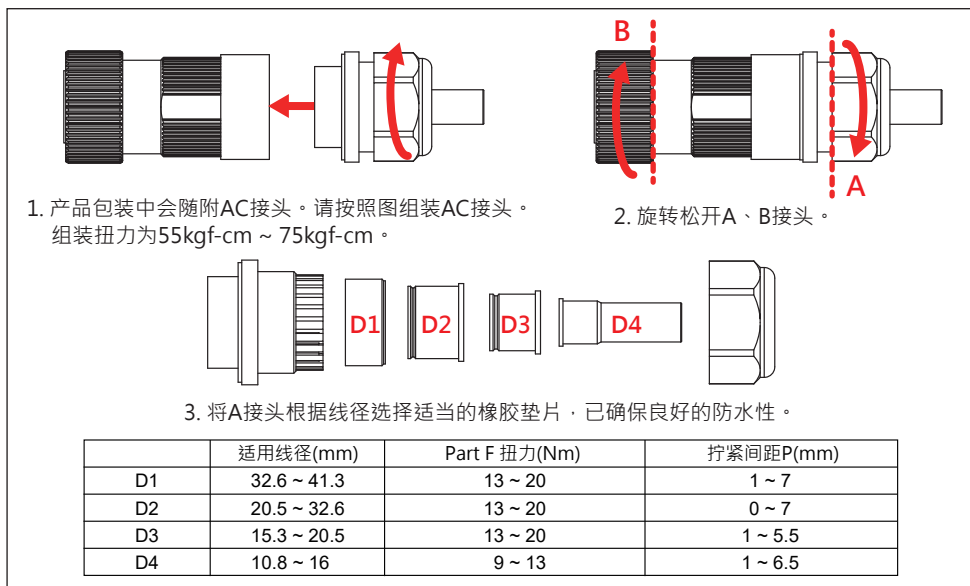
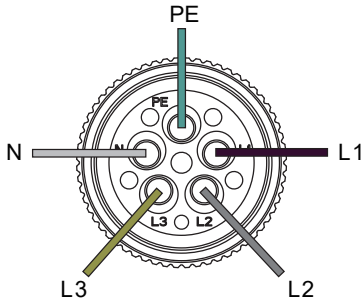
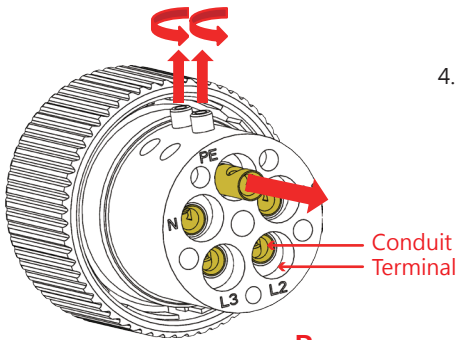
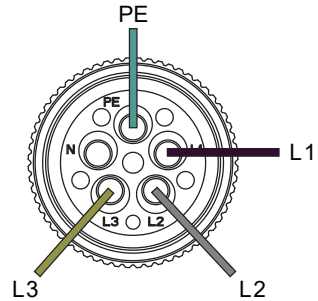


图4-4 AC接头配线图

3P4W 电网系统的配线：
3 相配备 5 线路 (L1、L2、L3、N) + PE



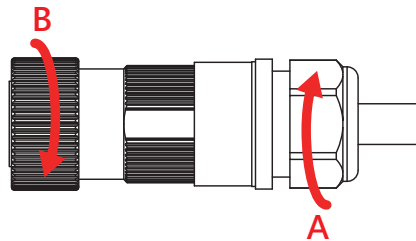
3P3W 电网系统的配线：
3 相配备 4 线路 (L1、L2、L3) + PE



4. 将B接头配线后依据线径选择适当的铜套。

Terminal + Conduit：电缆范围 $5.2\text{mm}^2 \sim 10.0\text{mm}^2$

如果线材的尺寸是 $14\text{mm}^2 \sim 22\text{mm}^2$ ，
请松开端子上的螺丝并将套管移除。



5. 先拧紧B接头后，再拧紧A接头固定电线。

图4-4 AC接头配线图(续)

AC配线完成后使用者须于控制面板上选择相对应的AC接线方式，以确保机子能正确判读电压。设定方式请参考5.2.7.3 Install Settings。

连接至AC之电压必须符合下列规范：

三相三线：

L1-L2: $400\text{ Vac} \pm 10\%$

L1-L3: $400\text{ Vac} \pm 10\%$

L2-L3: $400\text{ Vac} \pm 10\%$

三相四线：

L1-N: $230\text{ Vac} \pm 10\%$

L2-N: $230\text{ Vac} \pm 10\%$

L3-N: $230\text{ Vac} \pm 10\%$

4.3. 直流输入端(太阳能板电源端)之连接

警告！



- 配线时, 请选用适当之线径, 并依正确极性连接。
- 配线时, 确认太阳能板(PV Array)电源之开关已关闭。

注意！



- DC1所有的string串接后之太阳能板数量、开路电压与功率大小须为一致。
- DC2所有的string串接后之太阳能板数量、开路电压与功率大小须为一致。
- 太阳能板串接后的最大开路电压(Voc)不可超过1000Vdc。
- 安装至太阳能板端之装置, 额定电压须大于太阳能板之开路电压, 额定电流须大于太阳能板之短路电流。
- 输入至逆变器之最大功率不可超过表4-3之规范。

限制条件	RPI-M15A	RPI-M20A
最大输入功率	16.5 kW	22 kW
DC1、DC2个别输入功率	11.1 kW	14.8 kW

表 4-3最大容许输入功率限制

型号	额定电流	线径
M15A/ M20A	DC 22A	4 - 6mm ² / 12 - 10 AWG

表 4-4线径大小

DC 配线端子可分为正极和负极两种, 如图4-5所示。
配接时请务必确认极性与逆变器上的标示一致。



图 4-5 DC配线端子

4.4. 通讯接口之连接

RPI-M15A/ M20A机种之通讯模块请参考图4-6。

此模块提供VCC、RS-485、dry contact、以及EPO等不同功能之连接端子。

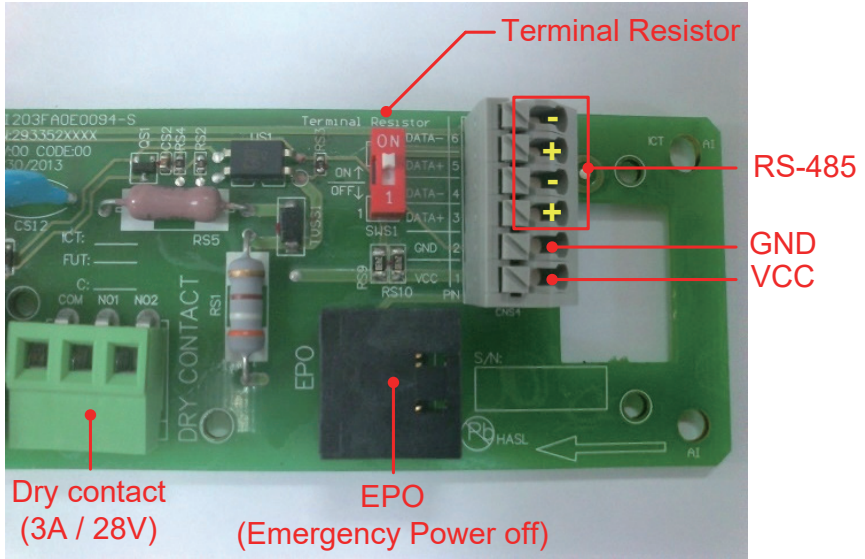


图4-6 通讯模块示意图

4.4.1. RS-485之连接

RS-485端子的定义如表4-5。不同的RS-485连接方式，其终端电阻设定方式亦有所不同。

- 当逆变器为单台安装时，安装者需将该台之终端电阻设置为ON。
- 当逆变器为多台串联时，安装者需将第一台与最后一台逆变器之终端电阻设置为ON，其余机子则为OFF。请参考图4-7。

终端电阻的设定方式请参考表4-6。

Pin	Function
1	VCC (+12V)
2	GND
3	DATA+
4	DATA-
5	DATA+
6	DATA-

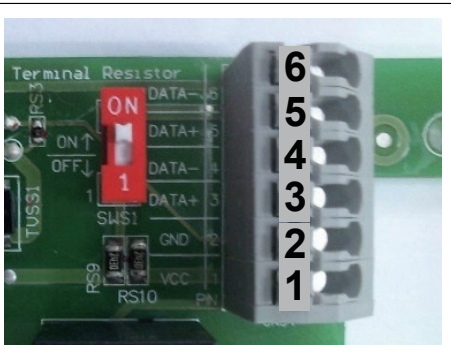


表 4-5 RS-485端子定义

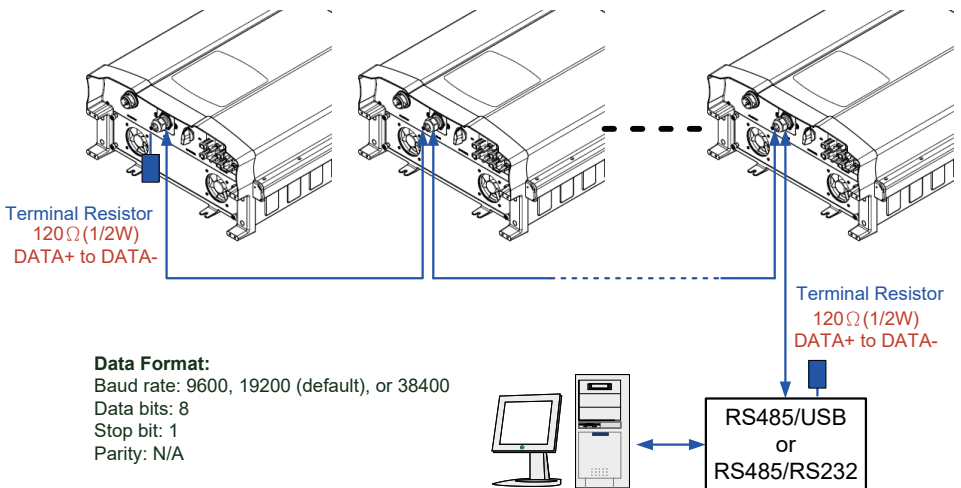


图4-7 多台逆变器串联通讯

	指拨开关1
ON	终端电阻ON
OFF	终端电阻OFF

表 4-6 终端电阻设定

4.4.2. 紧急关机装置

RPI- M15A/ M20A机种提供一组紧急关机装置(EPO)。
当使用者从外部将其短路时，逆变器会立刻关机。

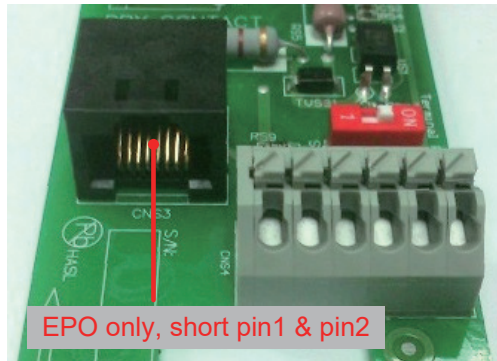


图4-8 EPO使用说明

4.4.3. 干接点之连接

RPI-M15A/ M20A 机种提供1组干接点。
当逆变器侦测到 Fan Fail时COM与NO1将会短路。

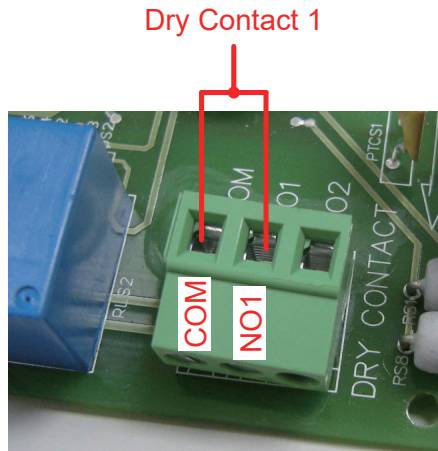


图4-9 干接点连接

5. 逆变器开机

警告！烫伤危险



在逆变器运转期间，外壳温度可能超过70°C，请勿触摸以免烫伤。

5.1. LCD 操作流程

RPI-M15A/ M20A 机种的控制面板含有一个320x240 像素之显示器与两颗LED指示灯。不同的指示灯号代表逆变器不同的工作状态，各种灯号的说明请参考表 5-1。

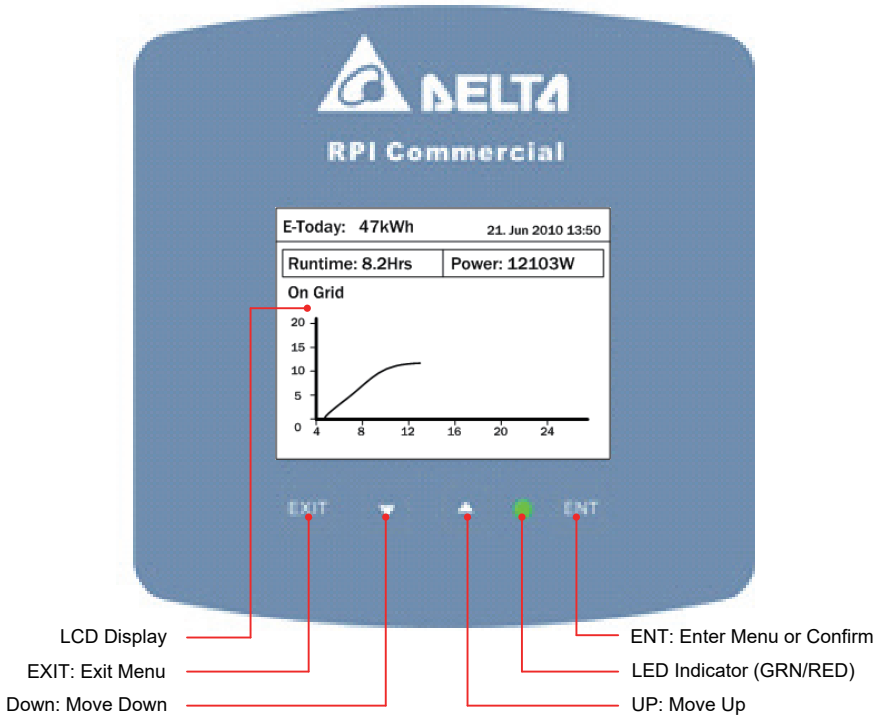


图5-1 控制面板

状态	绿色LED	红色LED
待机、并网前倒数	闪烁*	OFF
成功并网	ON	OFF
发生Error或Fault	OFF	ON
夜间模式(无DC时)	OFF	OFF
刻录模式	闪烁*	

* ON 1s / OFF 1s

表5-1 LED指示灯状态

5.2. 首次开机

首次开机时请先将AC电源送入逆变器，此时显示面板会被点亮并要求用户选择显示语言与所在的国家(电力法规)。语言与国家设定完毕后，请观察主画面中是否有显示任何错误讯息，若无则可送入DC电源并将DC切换开关转至ON。当太阳能板提供的能量足够且市电供应正常时，逆变器将会进行自我测试后自动与市电连接并开始运转。

First Startup



图5-2 首次开机出现语言和国别设定

5.2.1. 主画面

当逆变器正常工作画面会显示如图5-3。使用者可从画面上得知今日累计发电量、今日发电时数、今日发电曲线、瞬时发电功率、逆变器工作状态、以及日期时间等信息。

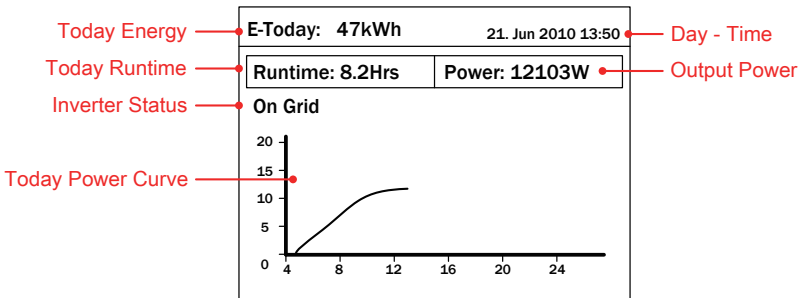


图5-3 主画面

5.2.2. Power Meter

此页面显示AC与DC端之电压、电流、功率等信息。

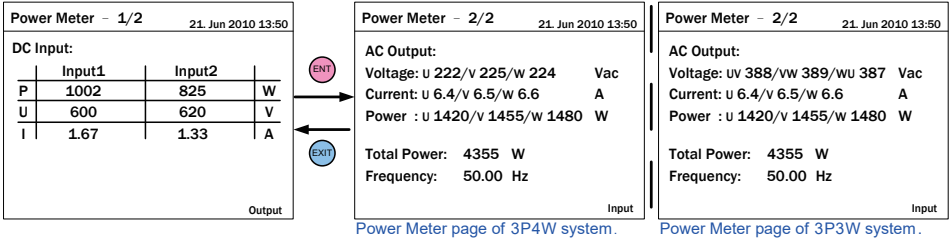


图5-4 Power meter页面

5.2.3. Energy Log

此页面按可观看逆变器的历史发电资料。使用者可查看各年、月及日的发电量，年与月以直方图表示，日则以曲线表示。

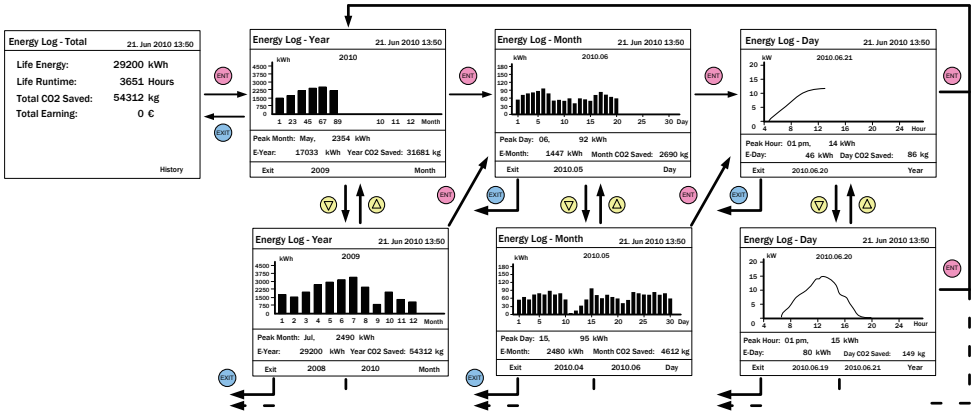


图5-5 Energy log页面

5.2.4. Event Log

此页面可纪录至多30笔过去曾发生的Error与fault。
于页面中按下 ENT 键后可检视所有事件发生次数的统计表。

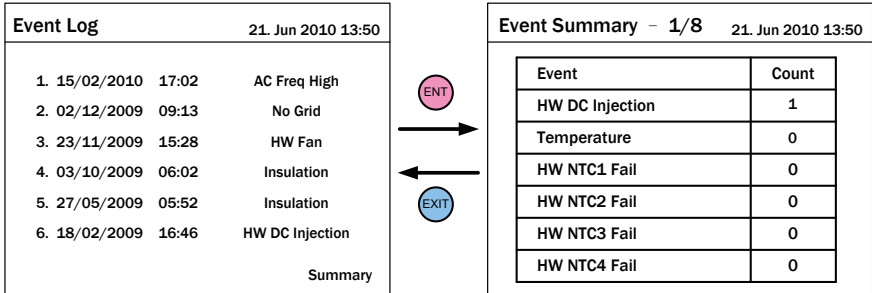


Figure 5-6 Event log flow chart

5.2.5. Operation Data

此页面分为四个部分，分别记录逆变器运作期间的各种历史最大数据，包括输入与输出的最大电压、最大电流、最大功率；功率散热片与逆变器内部的最高温度。

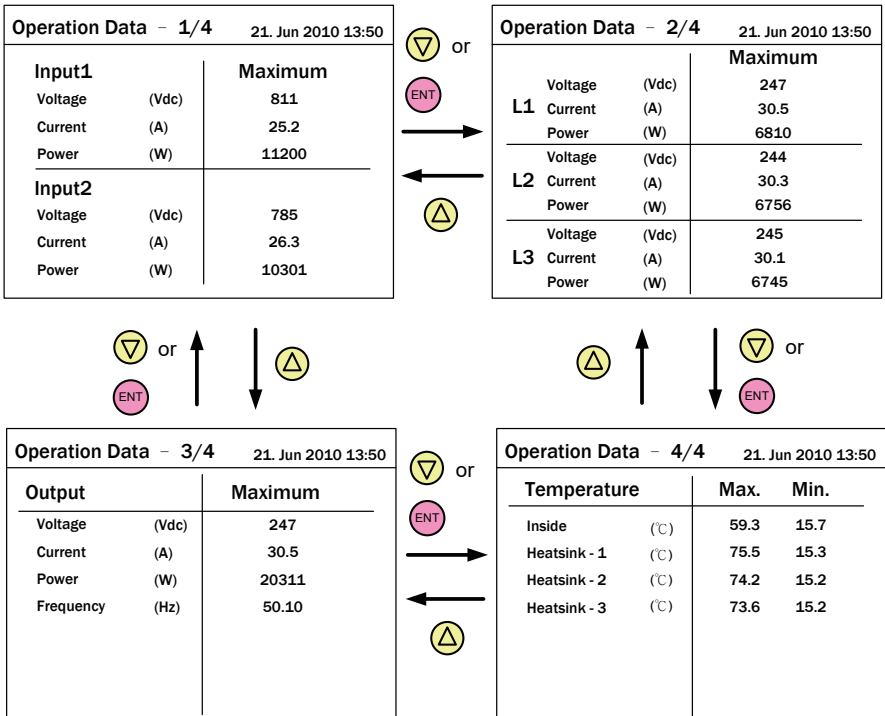


图5-7 Operation data页面

5.2.6. Inverter Information

此页面提供产品序号、本体版本、安装日期、逆变器ID、设定之国家(电力法规)以及逆变器最大发电量等信息。

Inverter Information	21. Jun 2010 13:50
Serial Number	AE46000006
DSP-Version	1.80
Red.-Version	1.17
Comm.-Version	1.99
Installation Date	05.Jan.2009
Inverter ID	001
Country	Custom

图5-8 Inverter information页面

5.2.7. Settings

所有可供用户调整的功能与设定值皆集中于此页面。建议您在有专业人员指导或陪同的情况下再启动这些功能或修改其设定值。

Settings	21. Jun 2010 13:50
Personal Settings	
Coefficients Settings	
Install Settings	
Active/Reactive Power Control	
FRT	

图5-9 Install settings页面

5.2.7.1. Personal Settings

此页面可设定 Language、Date、Time、Screen Saver、LCD brightness 与 Contrast。Screen Saver 可调整范围为 5min - 60min，一旦使用者超过设定的时间没有使用按键，系统会自动关闭 LCD 背光并回到主画面。Brightness 与 Contrast 可调整范围为 1-5。

Personal Settings		21. Jun 2010 13:50
Language	[English]	
Date	21 / 06 / 2010	
	(DD/MM/YYYY)	
Time	13:50	
Screen Saver	[5 min]	
Brightness	[3]	
Contrast	[2]	

图5-10 Personal settings 页面

5.2.7.2. Coefficient Settings

使用者可依照需求于此页面设定 CO2 节约功能、节电收入功能与RS-485 通讯baud rate。

Coefficient Settings		21. Jun 2010 13:50
CO2 Saved kg/kWh	[1.86]	
Earning Value/kWh	[2.50]	
Currency (\$,€)	[€]	
Baud Rate	[19200]	

图 5-11 Coefficient setting 页面

5.2.7.3. Install Settings

注意！



此页面仅允许专业安装人员或有专业人员在旁指导时方可调整，任意更改这些设定有可能造成逆变器损坏。

进入Install Settings页面前需要输入密码，密码分为两种权限：用户权力与安装者权限。

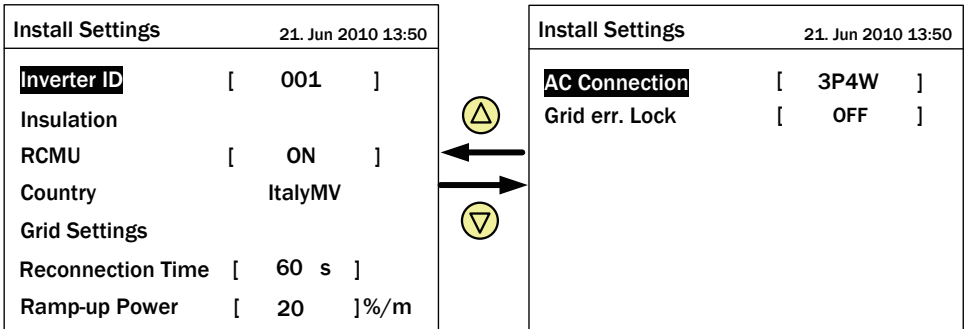


图5-12 Install setting 页面 – 用户权力

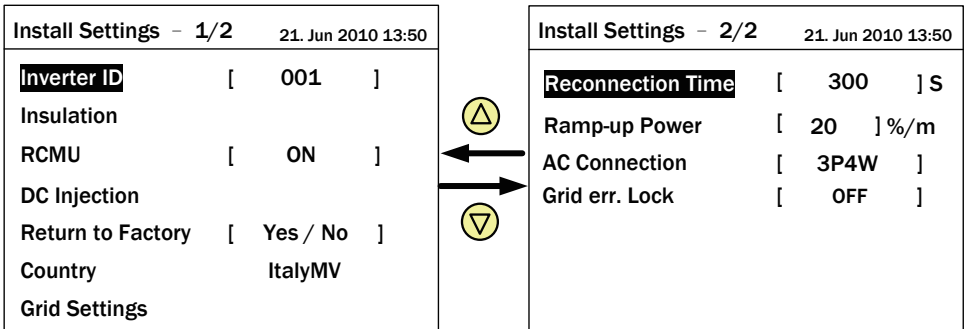


图5-13 Install setting 页面 – 安装者权限

以下将会介绍用户权力可调整之各选项与设定值。

- **Inverter ID:**

逆变器的ID使用于RS-485通讯时，使Master(主)端能顺利辨认各个Slave(仆)端之逆变器。当使用者将多台逆变器透过RS-485串联时，各逆变器必须要有不同的ID。

- **Insulation:**

逆变器于并网前将会进行太阳能板之对地组抗侦测，使用者可自定义侦测方式与对地阻抗限制值。RPI-M15A/ M20A机种提供六种对地组抗侦测方式(ON、DC1 Only、DC2 Only、Positive Ground、Negative Ground、OFF)与三种对地阻抗限制值可设定。

- **Country:**

选单中的每一个国家选项即代表一种电力法规，安装者于安装逆变器后必须选择正确的国家选项，以符合当地电力法规的要求。

- **RCMU:**

RCMU为侦测输入端与输出端是否存在漏电流之功能。若漏电流大于逆变器内部的限制值，逆变器将会立刻断开市电并停止运作。

- **Reconnection Time:**

逆变器自Error或Fault中回复，欲重新连接市电时会无条件等待一段时间，此段时间即为Reconnection Time。使用者可自行调整此段等待时间的长短。

- **Ramp-up Power:**

当逆变器成功连接市电后，其输出功率的爬升速率可由用户自定义。速率愈高则愈快达到太阳能板端能提供之最大功率。

- **AC connection:**

RPI-M15A/ M20A支持3P3W与3P4W配线方式，请依照实际配线方式选择对应的设定，确保机子能正常运作。

- **Grid err. Lock:**

此功能仅供日本电力法规使用。当逆变器侦测到任何市电端之故障时会断开市电并主动锁机，直到使用者至机子前透过手动指令解锁后才会继续运转。

5.2.7.4. Active/Reactive Power Control

进入实功/虚功控制页面前必须输入密码。
此页面包含实功率控制与虚功率控制两个主要功能。

实功功率控制有三种模式：
Power Limit, Power vs. Frequency, and P(V)；
虚功功率控制有四种模式：
Constant cosphi, cosphi(P), Constant Q, and Q(V)。

仅有部分国家(电力法规)有此类功能的需求。

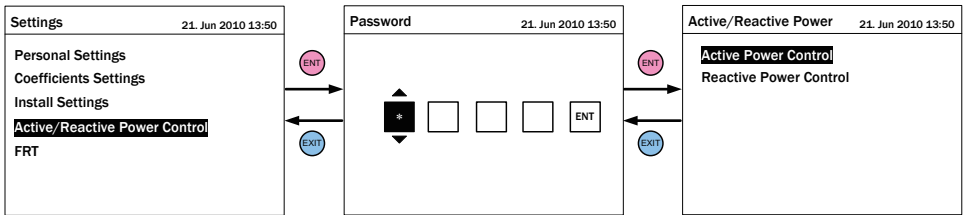


图5-14 Active/Reactive power setting 页面

5.2.7.4.1. Active Power Control – Power Limit

此控制模式可限制逆变器之输出功率。
使用者可透过设定Set Point来指定逆变器所能输出的最大功率。

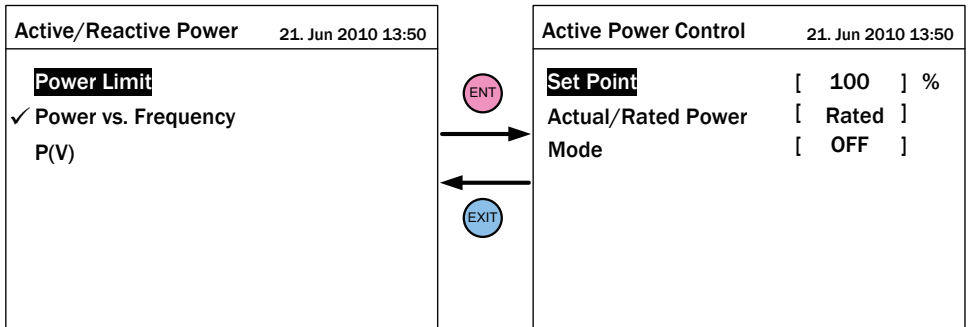


图5-15 Power limit设定页面

5.2.7.4.2. Active Power Control – Power vs. Frequency

此模式开启后，逆变器可随着市电频率升高而自动降低其输出功率。各参数值所代表的意义可对照图5-16。

Active Power Control		21. Jun 2010 13:50
Actual/Rated Power	[Actual]	
(a) Start Frequency	[50.20] Hz	
Stop Frequency	[--] Hz	
(b) Recovery Frequency	[50.00] Hz	
(c) Statism	[40] %	
Recovery Time	[300] s	
Mode	[ON]	

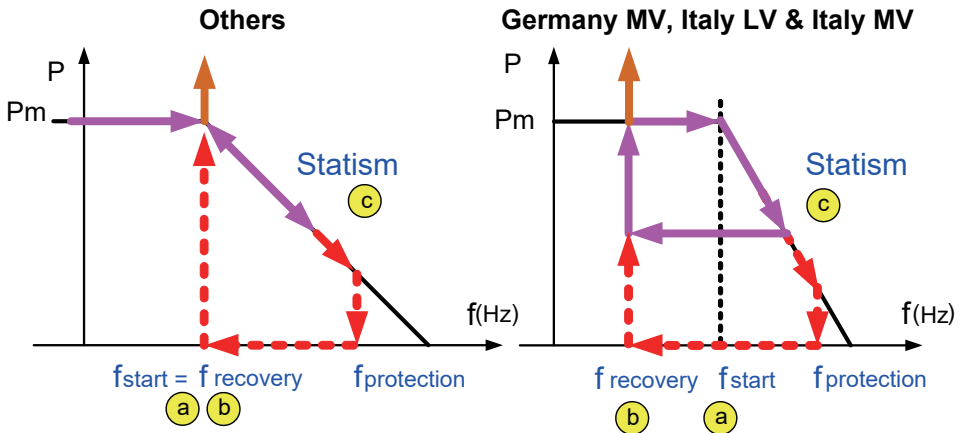


图5-16 Power vs. frequency 设定页面

5.2.7.4.3. Active Power Control – P(V)

此模式启动后，当市电电压大于V lock-in且此时逆变器之输出功率大于P lock-in时，逆变器将会自动将输出功率降低至P lock-out，直到市电电压低于V lock-out且经过T recovery秒后方回复正常功率输出。

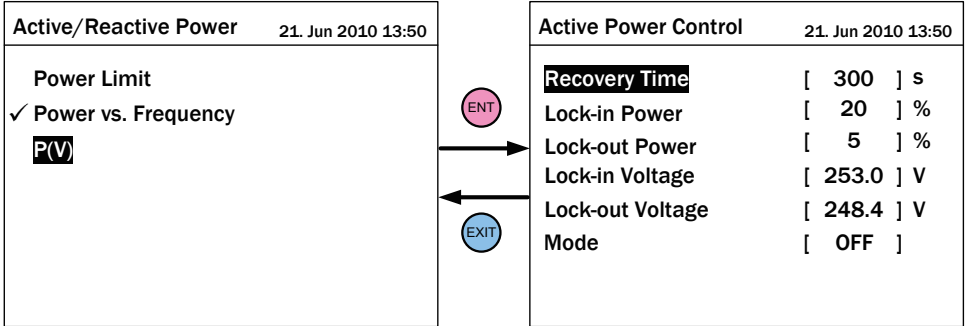


图5-17 P(V) 设定页面

5.2.7.4.4. Reactie Power Control – Constant cosφ

此模式启动后，逆变器可馈入固定功率因子(cosphi)之虚功率至市电，使用者可透过设定页面指定欲馈入之功率因子。

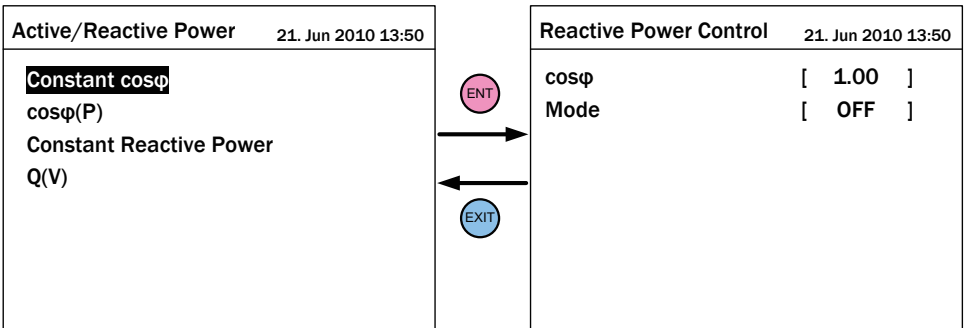


图5-18 Constant cosφ 设定页面

5.2.7.4.5. Reactive Power Control – $\cos\phi$ (P)

此功能启动后，逆变器可随着输出之实功率高低而馈入一定比例之虚功率。当国家设定为Italy LV或Italy MV时，使用者可进一步指定当市电电压高于V lock-in时方馈入虚功，电压低于V lock-out后，无论此时输出实功率为何，皆不馈入虚功。

Reactive Power Control		21. Jun 2010 13:50
a	Upper limit - $\cos\phi$	[Cap 0.90]
b	Lower Power	[0] %
c	Lower limit - $\cos\phi$	[Ind 0.90]
d	Upper Power	[100] %
Lock-in Voltage		[241.5] V

Reactive Power Control		21. Jun 2010 13:50
Lock-out Voltage	[230.0] V	
Mode	[OFF]	

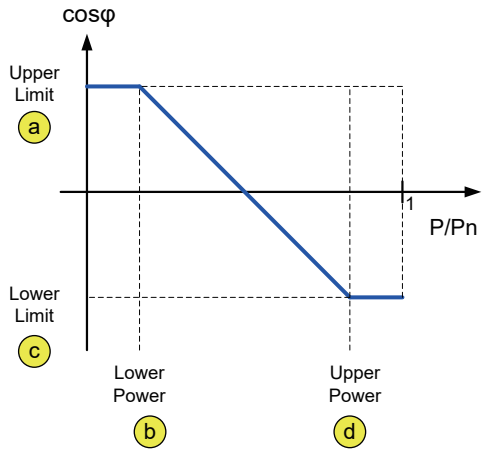


图5-19 $\cos\phi$ (P) 设定页面

5.2.7.4.6. Reactive Power Control – Constant Reactive Power

此模式启动后，逆变器可馈入固定比例之虚功率至市电，使用者可透过设定页面指定欲馈入之虚功率量。

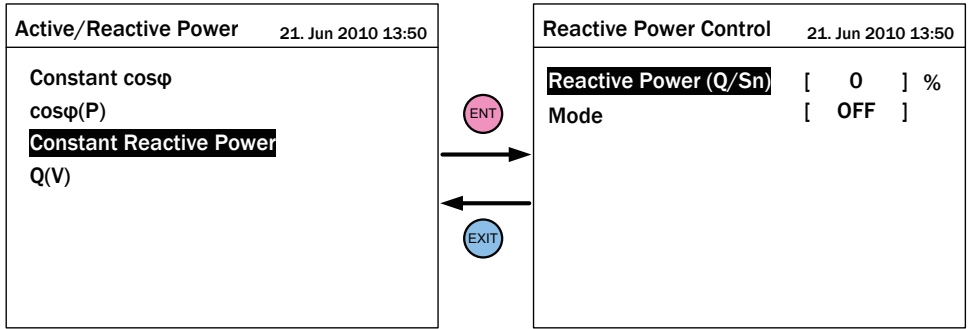


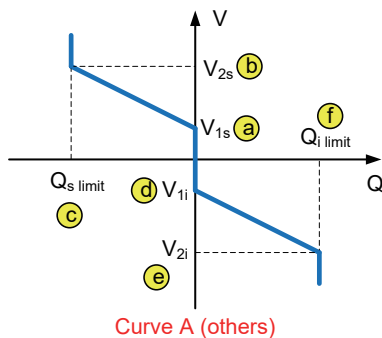
图5-20 Constant Reactive Power 设定页面

5.2.7.4.7. Reactive Power Control – Q(V)

此模式启动后，逆变器会随着市电电压变化而馈入不同性质的虚功功率。当国家设定为Italy LV或Italy MV时，使用者可进一步指定输出功率达到P lock-in时方馈入虚功，输入功率小于P lock-out时则无论市电电压为何，皆不馈入任何虚功。

Reactive Power Control		21. Jun 2010 13:50
a	V1s	[248.4] V
b	V2s	[253.0] V
c	Qs limit	[Ind 44] %

d	V1i	[211.6] V
e	V2i	[207.0] V
f	Qi limit	[Cap 44] %



Reactive Power Control		21. Jun 2010 13:50
Delay Time	[10]	s
Lock-in Power	[20]	%
Lock-out Power	[5]	%
Mode	[OFF]	

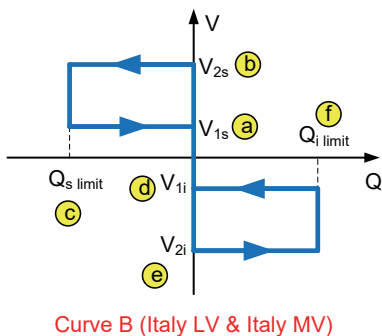


图5-21 Q(V) 设定页面

5.2.7.5. FRT (Fault ride through)

根据某些特定地区之电力法规规范，当市电电压发生骤降时，在一定的时间内逆变器必须维持并网状态。用户可透过启动FRT功能并设定所需的参数来达到这项要求。

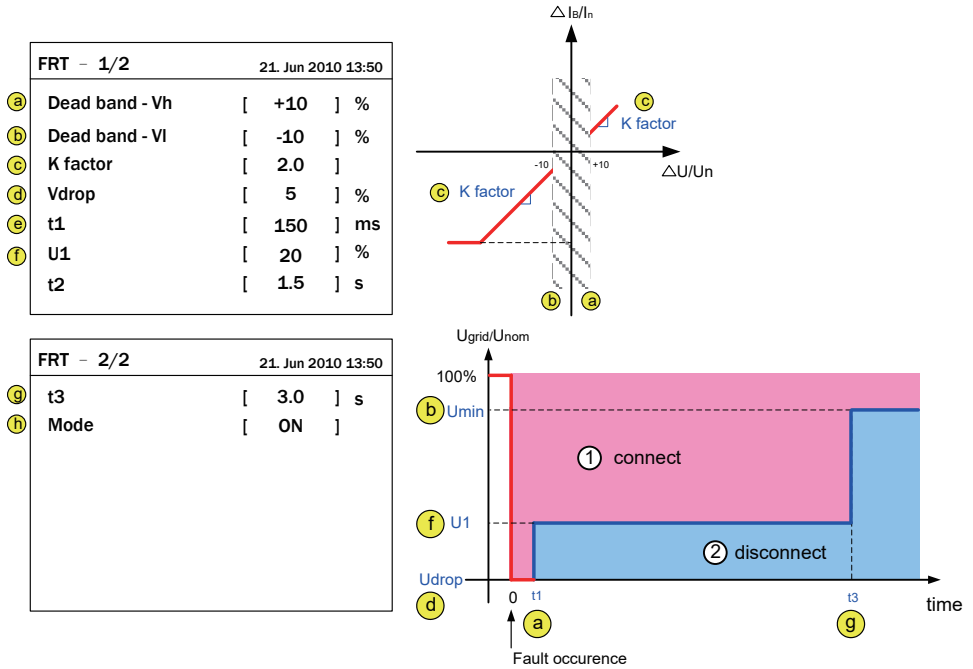


图5-22 FRT 设定页面

6. 设备维护

为确保PV Inverter正常运转，请至少每半年确认一次逆变器所有端子与螺丝是否松脱、电缆线是否毁损、散热出口有无异物阻塞。如有上述情形，请联络合格之技术人员进行维修、清理或更换。

触电危险！



进行维护工作之前请务必将AC与DC电源断电，避免触电危险。

6.1. 清理风扇

将风扇架四个角落的螺丝松开后，稍微拉出风扇架即可看到风扇接头，依序解开后可将整个风扇模块拆离逆变器，以便进行清除积尘工作，请参考图6-1。

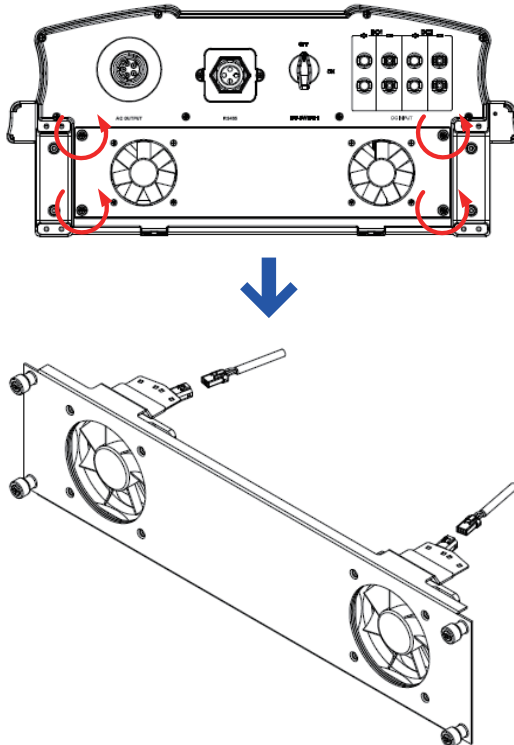


图6-1 拆解风扇模块

6.2. 更换风扇

若风扇故障需要更换，请将该风扇四颗螺丝与固定于风扇架的连接端子拆除，即可换上新风扇。

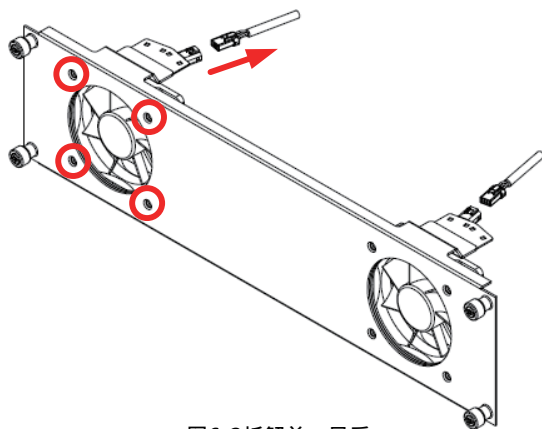


图6-2 拆解单一风扇

6.3. 清理出风口滤网

进风口滤网模块拆解方式如图6-3，拆除4支固定螺丝即可卸下模块并进行清除积尘的工作，逆变器左右两侧的进风口滤网均需定期清理。

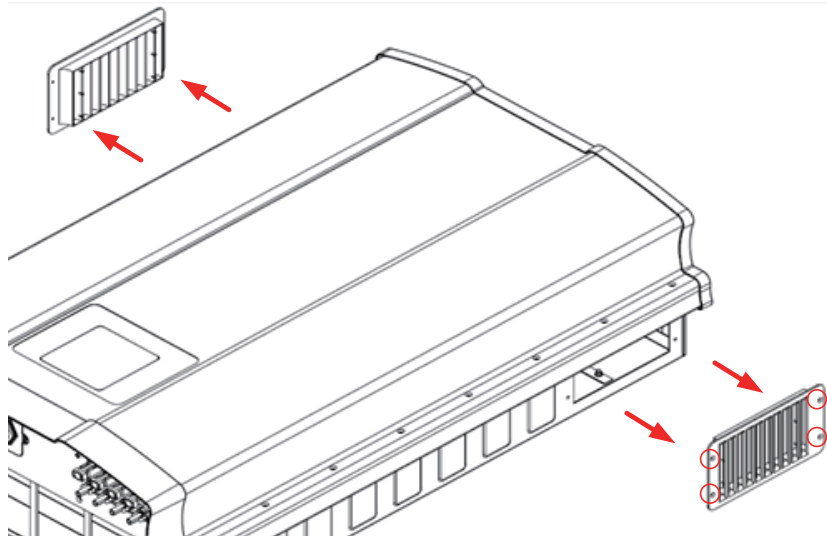


图6-3 拆卸出风口滤网模块示意图

7. 错误讯息与简易故障排除

错误信息		
信息显示	可能原因	故障排除
AC Freq High	<ol style="list-style-type: none"> 实际的市电频率高过过频率保护设定 国家设定不正确 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查逆变器端的市电频率 检查国家设定 检查逆变器端的侦测电路
AC Freq Low	<ol style="list-style-type: none"> 实际的市电频率低于欠频率保护设定 国家或电网设定不正确 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查逆变器端的市电频率 检查国家与电网设定 检查逆变器端的侦测电路
Grid Quality	在电网或靠近逆变器附近非线性的负载	必要时逆变器与电网连接处必须远离非线性的负载
HW Con. Fail	<ol style="list-style-type: none"> 在AC接口连接错误 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查AC连接，必须和使用手册一致 检查逆变器内部的侦测电路
No Grid	<ol style="list-style-type: none"> AC 断路器跳开 中断AC界面 	<ol style="list-style-type: none"> 断开AC 断路器 检查连接AC接口并确认其连接至逆变器
AC Volt Low	<ol style="list-style-type: none"> 实际市电的电压低于低电压保护设定 国家或电网设定不正确 AC接口连接错误 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查市电与逆变器端的连接 检查国家或电网设定 检查AC接口连接 检查逆变器内部的侦测电路
AC Volt High	<ol style="list-style-type: none"> 实际市电的电压高于过电压保护设定 操作期间，市电的电压高于慢速电压保护设定 国家或电网设定不正确 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查逆变器端的市电电压 检查逆变器端的市电电压 检查国家或电网设定 检查逆变器内部的侦测电路
Solar1 High	<ol style="list-style-type: none"> 实际Solar1电压超过1000Vdc 侦测到电路功能异常 	<ol style="list-style-type: none"> 修正 solar array 设定并使得 Voc 小于 1000Vdc 检查逆变器内部的侦测电路

錯誤資訊		
訊息顯示	可能原因	故障排除
Solar2 High	<ol style="list-style-type: none"> 1. 实际Solar2电压超过1000Vdc 2. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 修正 solar array 设定并使得 Voc 小于 1000Vdc 2. 检查逆变器内部的侦测电路
Insulation	<ol style="list-style-type: none"> 1. 太阳能板绝缘测试未通过 2. 太阳能板电容值介于正到接地端或负到接地端太大或者两者皆有之 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查输入端绝缘 2. 检查电容值, 必要时擦干太阳能板 3. 检查逆变器内部的侦测电路

表 7-1 错误信息

警告		
讯息显示	可能原因	故障排除
Solar1 Low	<ol style="list-style-type: none"> 1. 实际Solar1电压低于下限值 2. 若实际Solar1电压接近0，逆变器内部可能有装置损坏 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查Solar1电压至逆变器端的连接 2. 检查boost1的所有开关装置 3. 检查逆变器内部的侦测电路
Solar2 Low	<ol style="list-style-type: none"> 1. 实际Solar2电压低于下限值 2. 若实际Solar1电压接近0，逆变器内部可能有装置损坏 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查Solar2 voltage至逆变器端的连接 2. 检查boost2的所有开关装置 3. 检查逆变器内部的侦测电路
HW FAN	<ol style="list-style-type: none"> 1. 一个或多个风扇死锁 2. 一个或多个风扇无效 3. 一个或多个风扇未连接 4. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 移除卡在风扇内的对象 2. 替换无效的风扇 3. 检查风扇的连接 4. 检查逆变器内部的侦测电路

表7-2 警告信息

故障		
讯息显示	可能原因	故障排除
HW DC Injection	<ol style="list-style-type: none"> 市电波形异常 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查市电波形. 必要时逆变器与电网连接处必须远离非线性的负载 检查逆变器内部的侦测电路
Temperature High	<ol style="list-style-type: none"> 环境温度超过60°C (装置异常) 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查设备的周遭和环境 检查逆变器内部的侦测电路
Temperature Low	<ol style="list-style-type: none"> 环境温度 < -30°C 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查设备的周遭和环境 检查逆变器内部的侦测电路 (RTM1, RTB1, RTG1 and RTH1)
HW NTC1 Fail	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查设备的周遭和环境 检查逆变器内部的侦测电路 (RTM1)
HW NTC2 Fail	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查设备的周遭和环境 检查逆变器内部的侦测电路 (RTB1)
HW NTC3 Fail	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查设备的周遭和环境 检查逆变器内部的侦测电路 (RTG1)
HW NTC4 Fail	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查设备的周遭和环境 检查逆变器内部的侦测电路 (RTH1)
HW DSP ADC1	<ol style="list-style-type: none"> 输入功率不足 辅助电源电路功能异常 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查输入电压必须 > 150Vdc 检查逆变器内部的辅助电源电路 检查逆变器内部的侦测电路
HW DSP ADC2	<ol style="list-style-type: none"> 输入功率不足 辅助电源电路功能异常 侦测到电路功能异常 	<ol style="list-style-type: none"> 检查输入电压必须 > 150Vdc 检查逆变器内部的辅助电源电路 检查逆变器内部的侦测电路

故障		
讯息显示	可能原因	故障排除
HW DSP ADC3	<ol style="list-style-type: none"> 1. 输入功率不足 2. 辅助电源电路功能异常 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查输入电压必须 > 150Vdc 2. 检查逆变器内部的辅助电源电路 3. 检查逆变器内部的侦测电路
HW Red ADC1	<ol style="list-style-type: none"> 1. 输入功率不足 2. 辅助电源电路功能异常 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查输入电压必须 > 150Vdc 2. 检查逆变器内部的辅助电源电路 3. 检查逆变器内部的侦测电路
HW Red ADC2	<ol style="list-style-type: none"> 1. 输入功率不足 2. 辅助电源电路功能异常 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查输入电压必须 > 150Vdc 2. 检查逆变器内部的辅助电源电路 3. 检查逆变器内部的侦测电路
HW Efficiency	<ol style="list-style-type: none"> 1. 校正不正确 2. 电流回授电路无效 	<ol style="list-style-type: none"> 1. 检查电流和功率的精度 2. 检查逆变器内部电流回授电路
HW COMM1	<ol style="list-style-type: none"> 1. DSP 闲置中 2. 通讯连接中断 3. 通讯电路功能异常 	<ol style="list-style-type: none"> 1. 检查DSP中reset和crystal 2. 检查DSP和COMM通讯连接 3. 检查通讯电路
HW COMM2	<ol style="list-style-type: none"> 1. Red. CPU闲置中 2. 通讯连接中断 	<ol style="list-style-type: none"> 1. 检查Red. CPU中reset和crystal 2. 检查Red. CPU和DSP通讯连接
Ground Current	<ol style="list-style-type: none"> 1. 太阳能板绝缘测试未通过 2. 太阳能板电容值介于正到接地端或负到接地端太大 3. Boost 驱动电路或Boost 电感其中之一功能异常 4. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查输入端的绝缘 2. 检查电容值 (+ <-> GND & - <-> GND), 必须 < 2.5uF. 必要时安装外部的变压器 3. 检查boost驱动电路和boost电感 4. 检查逆变器内部的侦测电路
HW Connect Fail	<ol style="list-style-type: none"> 1. 逆变器内部的电源线未连接 2. 电流回授电路无效 	<ol style="list-style-type: none"> 1. 检查逆变器内部电源线 2. 检查逆变器内部电流回授电路

故障		
訊息顯示	可能原因	故障排除
RCMU Fail	<ol style="list-style-type: none"> 1. RCMU连接中断 2. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查逆变器内部RCMU连接 2. 检查逆变器内部的侦测电路
Relay Test Short	<ol style="list-style-type: none"> 1. 一个或多个继电器是闭合的 2. 继电器driver电路功能异常 	<ol style="list-style-type: none"> 1. 替换无效的继电器 2. 检查逆变器内部的驱动电路
Relay Test Open	<ol style="list-style-type: none"> 1. 一个或多个继电器异常 2. 继电器驱动电路功能异常 3. Vgrid与Vout侦测精度不正确 	<ol style="list-style-type: none"> 1. 替换无效的继电器 2. 检查逆变器内部的驱动电路 3. 检查Vgrid与Vout电压侦测精度
Bus Unbalance	<ol style="list-style-type: none"> 1. 输入端并未完全独立或并联 2. 太阳能板短路到地 3. Boost驱动电路无效或连接中断 4. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查输入连接 2. 检查太阳能板绝缘设定 3. 检查逆变器内部boost的驱动电路 4. 检查逆变器内部的侦测电路
HW Bus OVR	<ol style="list-style-type: none"> 1. Boost驱动电路无效或连接中断 2. 太阳能板Voc超过1000Vdc 3. 操作期间突波发生 4. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查逆变器内部boost的驱动电路 2. 修正太阳能板设定, 并使得Voc小于1000Vdc 3. N/A 4. 检查逆变器内部的侦测电路
AC Current High	<ol style="list-style-type: none"> 1. 操作期间突波发生 2. Inverter stage驱动电路无效 3. 开关装置无效 4. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. N/A 2. 检查inverter stage驱动电路 3. 检查inverter stage全部开关装置 4. 检查逆变器内部的侦测电路
HW CT A Fail	<ol style="list-style-type: none"> 1. 测试电流回路损坏 2. CSC1无效 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查WC3至CNC16的连接 2. 替换新的CSC1 3. 检查逆变器内部的侦测电路
HW CT B Fail	<ol style="list-style-type: none"> 1. 测试电流回路损坏 2. CSC2无效 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查WC3至CNC16的连接 2. 替换新的CSC2 3. 检查逆变器内部的侦测电路

故障		
讯息显示	可能原因	故障排除
HW CT C Fail	<ol style="list-style-type: none"> 1. 测试电流回路损坏 2. CSC3无效 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查WC3至CNC16的连接 2. 替换新的CSC3 3. 检查逆变器内部的侦测电路
HW AC OCR	<ol style="list-style-type: none"> 1. 市电谐波成分大 2. 开关装置无效 3. 侦测到电路功能异常 	<ol style="list-style-type: none"> 1. 检查市电波形. 必要时逆变器与电网连接处必须远离非线性的负载 2. 检查inverter stage开关装置 3. 检查逆变器内部的侦测电路
HW ZC Fail	同步讯号侦测电路功能异常	检查逆变器内部同步讯号的侦测电路
DC Current High	<ol style="list-style-type: none"> 1. Boost开关装置无效 2. Boost驱动电路无效 3. 输入电流侦测电路功能异常 	<ol style="list-style-type: none"> 1. 检查boost全部开关装置 2. 检查逆变器内部的boost驱动电路 3. 检查输入电流侦测电路

表 7-3 故障信息

8. 卸除

如需要将逆变器卸除，请务必遵守以下规范与程序。

警告！



为了避免人员受伤，请遵守以下程序：

- 切断AC断路器，解除与市电端之连接。
- 将DC切换开关转至OFF。
- 切断太阳能板断路器，解除逆变器和太阳能板之连接。
- 使用适合之电压量测仪表(voltmeter)，确认AC电源与DC电源已完全断除。
- 拔除与市电连接之AC端缆线。
- 拔除与太阳能板连接之DC端缆线。
- 拔除所有通讯连接RS-485模块。

完成后上述步骤可将逆变器卸下。

9. 技术数据

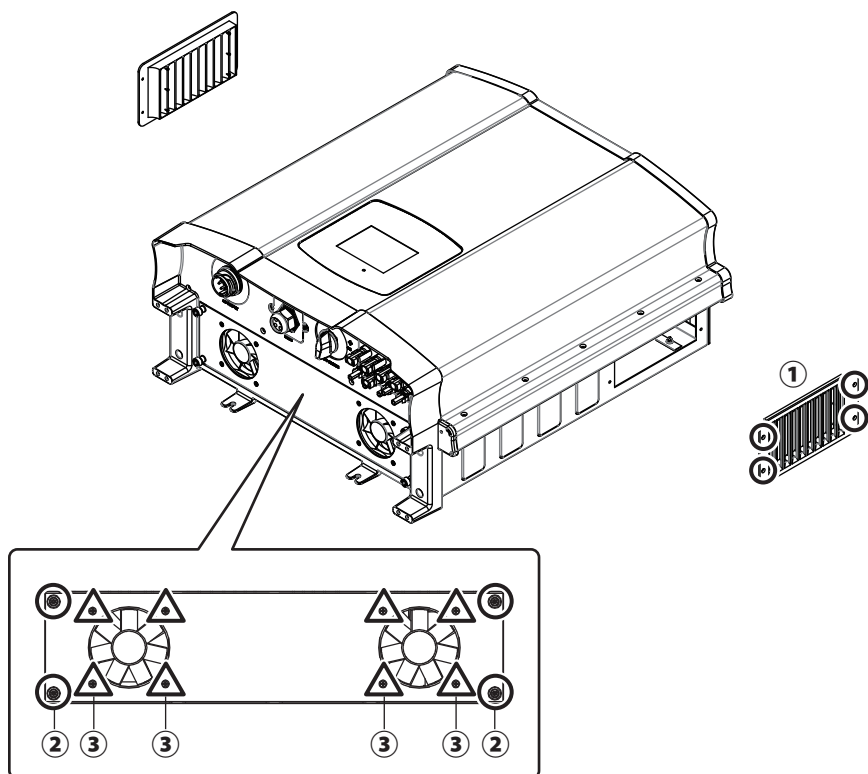
	RPI-M15A	RPI-M20A
一般规格		
外壳	Powder coated aluminum	
操作温度	-25~60°C, full power up to 40°C	
操作高度	2000m	
相对湿度	0 – 100% non condensing.	
环境类别	Outdoor, wet locations	
防护等级	IP65 (Electronics)	
污染等级	3	
过电压类别	AC output :III, DC Input :II	
回馈至array电流最大值	0	
电气隔离	NO	
安全性等级	Class I metal enclosure with protective earth	
重量	43kg	
尺寸(W*H*D)	612 × 625 × 278mm	
连接器	Weather resistant connectors	
直流侧(Solar side)		
最大输入功率	16.5kW	22kW
太阳能板功率建议范围	14kW – 19kW	18kW – 25kW
标称电压	635Vdc	
操作电压	200Vdc – 1000 Vdc	
初始电压	> 250 Vdc	
初始功率	40W	
MPP 追踪	Parallel inputs: 1 MPP tracker Separate inputs: 2 MPP trackers	
绝对最大电压	1000V	

	RPI-M15A	RPI-M20A
MPP电压追踪范围		
平衡输入(50/50)	355-820Vdc	470-820Vdc
非平衡输入(67)	475-820Vdc	635-820Vdc
非平衡输入(33)	235-820Vdc	310-820Vdc
直流侧(Solar side)		
输入数目	4 pairs MC4	
额定电流	22A * 2	
各MPPT最大短路电流 (Isc)	24A	
市电侧(GRID SIDE)		
标称功率	15kVA	20kVA
最大功率	15.75kVA	21kVA
电压	3Ph, 220/380Vac, 230/400Vac	
标称电流	22A	29A
最大电流	24A	32A
浪涌电流	150A/100 μ s	
最大输出故障电流 (rms)	33.6A	51.2A
最大输出过流保护	28.8A	38.4A
频率	Rated 50/60Hz (Programmable 45Hz - 65Hz)	
总谐波失真	< 3 %	
功率因子	> 0.99 @ full power Adjustable: 0.80 leading – 0.80 lagging	
DC 电流注入	<0.5% rated current	
夜间功率损耗	< 2W	
最大效率	98.3 %	98.4 %
欧洲效率	97.9 %	98.1 %
AC 界面	3 Ph + N + PE; 3-phase AC plug that meets IP67 and specifications in table 4-2.	

		RPI-M15A	RPI-M20A
接口与通讯			
用户接口		Black-on-white character type LCD display	
		365 days data logger and real time clock	
		30 events record	
外部通讯		2 RS-485 connections	
认证			
CE conformity		Yes	
Grid interface		VDE0126-1-1, VDE-AR-N 4105, RD1699, CEI 0-21	
Emission		EN 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	
Electrical safety		IEC 62109-1/ -2	
杂项			
Cooling		Fan, 2pcs	
Enclosure		Mounting bracket	
		Aluminum with powder coating	

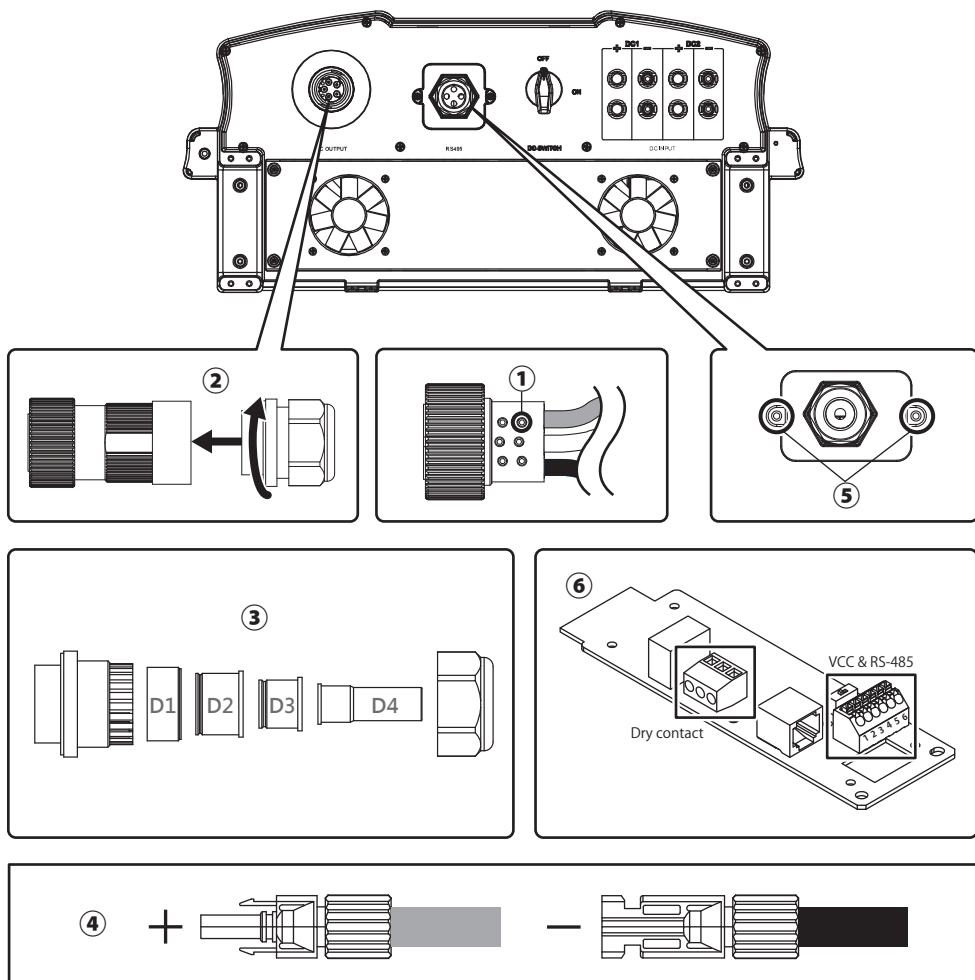
表9-1 RPI-M15A/ M20A规格

10. 组装说明



NO	位置	螺丝扭力
1	Air inlet	8 Kgf-cm (0.8N-m)
2	Fan panel	8 Kgf-cm (0.8N-m)
3	Fans	8 Kgf-cm (0.8N-m)

表10-1 组装说明-1



NO	位置	螺丝扭力	导体横截面
1	AC wire	7 Kgf-cm (0.7N-m)	10~8AWG (6mm ²)
2	AC plug	55 ~ 75 kgf-cm (5.4 ~ 7.4N-m)	--
3	Rubber rings	D1 / D2 / D3: 133 ~ 204 Kgf-cm (13 ~ 20N-m) D4: 92 ~ 133 Kgf-cm (9 ~ 13N-m)	--
4	MC4 wire	--	12~10AWG (4~6mm ²)
5	Communication cover	8 Kgf-cm (0.8N-m)	--
6	Communication module	--	20 AWG (0.5mm ²)

表10-2 组装说明-2



The power behind competitiveness

三相併網型變流器

RPI-M15A/M20A

操作手冊

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安全規範

本手冊提供使用者以下幾種常見安全規範:

注意！



如若不遵守此規範則可能導致機器設備的損毀。

警告！



如若不遵守此規範則可能會導致人員的傷亡。
本機任何維修動作只能由製造商進行。

危險！



如若不遵守此規範則將會導致人員的傷亡。
為了避免觸電,請勿私自打開本變流器外殼。

高溫危險！



機器正常操作時表面溫度可能會有燙傷的危險請勿碰觸。

1. 信息

1.1. 關於此手冊

本手冊將提供產品之電器規格、安裝步驟以及相關設定等資訊，本手冊適用機型為RPI-M15A/ RPI-M20A。

1.2. 產品說明

本產品為三相非隔離、市電並聯型之太陽能變流器(solar inverter)。太陽光能量經由太陽能板(PV array)轉換成可運用之直流電後，再由變流器轉換成三相電流輸出與市電並聯，不支持獨立運轉(stand alone)。

太陽能變流器工作方式如圖1-1，將太陽能板的直流電源轉換成三相交流電源輸出至市電，達到節能省電的目的。

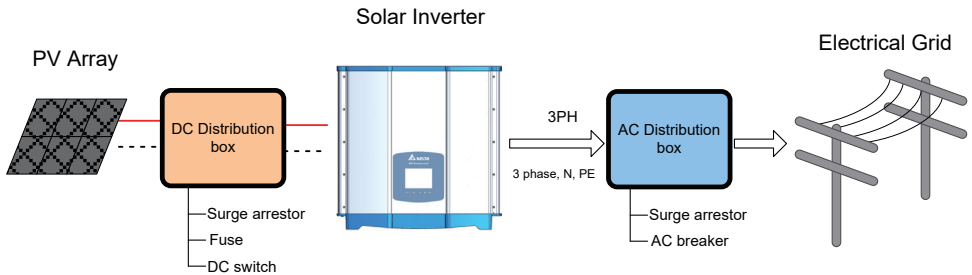


圖 1-1 太陽能變流器使用說明

1.3. 其他資訊

如果想獲得RPI-M15A/ RPI-M20A更詳細之資訊或其它相關產品資訊，可連結至以下網站：<http://www.deltaww.com>

2. 產品概觀

2.1. 變流器開箱

RPI-M15A / M20A之開箱步驟請參考圖2-1。

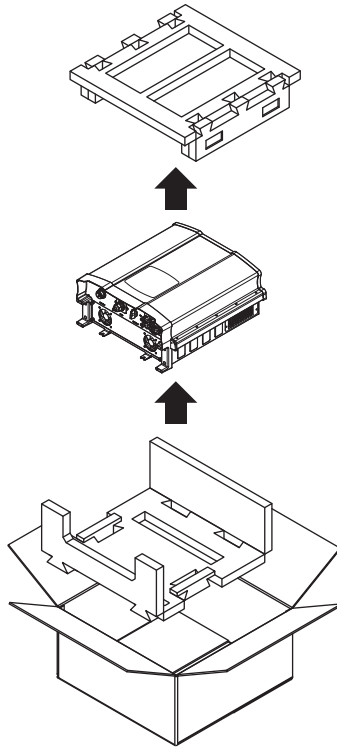


圖2-1 開箱

2.2. 檢查內容物

由於變流器於運送過程中, 有可能遭遇任何無法預估的狀況, 因此建議您按照以下項目逐項檢查：

- 檢外包裝箱是否有損壞或破損的現象。
- 檢查各項配件是否齊全。詳細的配件資訊請參考表2-1與圖 2-2。
- 檢查外箱之機子型號、序號與包裝內機子之型號、序號是否相符。

當您發現包裝內、外部有任何損毀的情況或是附件有短缺、損毀，請立即聯繫您的變流器供應商。

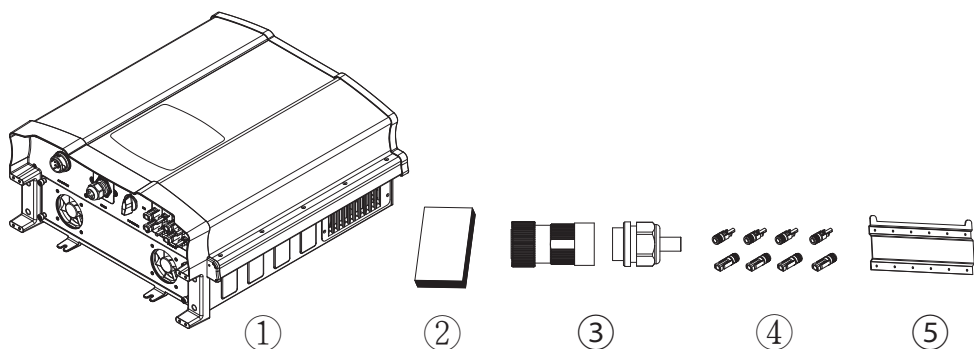


圖2-2 內容物清單

RPI-M15A/ RPI-M20A			
	物品	數量	說明
1	太陽能變流器	1 pcs	RPI系列太陽能變流器
2	使用說明書	1 pcs	安全規範、安裝步驟、產品規格...等
3	AC 接頭	1 pcs	AC 連接接頭
4	DC 接頭	4 sets	DC 連接接頭
5	壁掛板	1 pcs	將太陽能變流器掛於牆上之壁掛板。

表2-1 內容物清單

2.3. 產品標籤

使用者可透過產品標籤上的資訊得知變流器之型號、規格以及序號。標籤的位置請參考圖2-3。

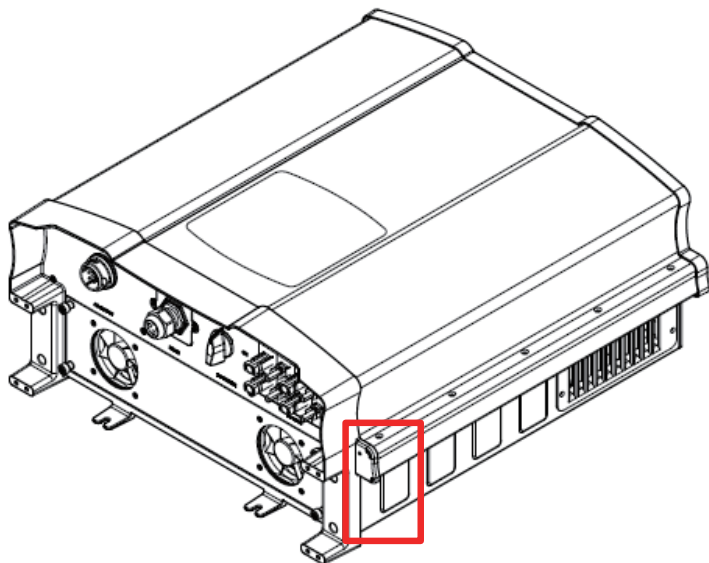


圖 2-3 產品標籤

2.4. 外觀介紹

變流器外部元件如圖2-4所示。詳細的輸出與輸入介面請參考圖 2-5。

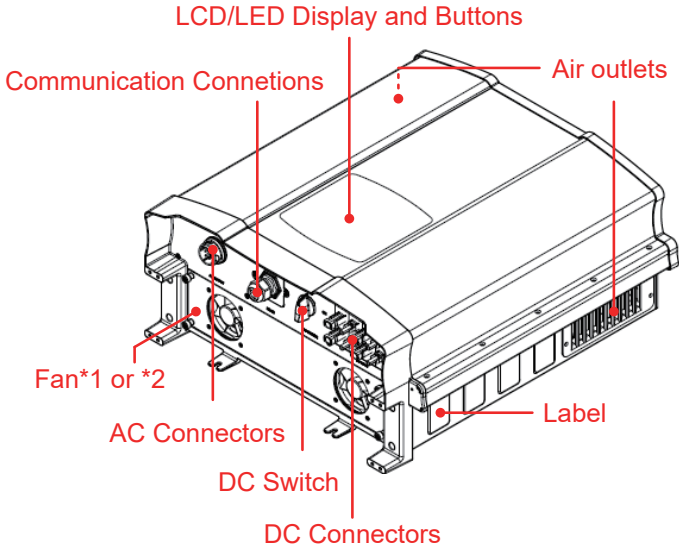


圖 2-4 外觀介紹

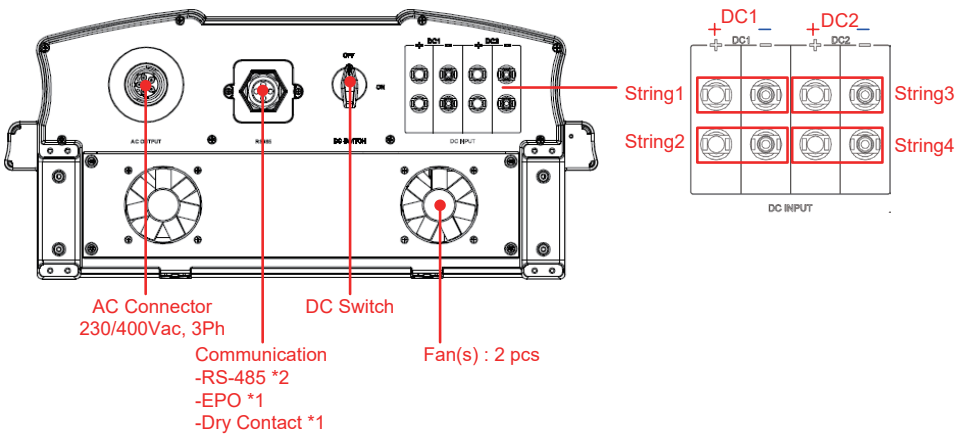


圖 2-5 輸出入介面介紹

3. 安裝

注意！



變流器不可安裝在陽光可直射的地方。

警告！



- 請勿將變流器安裝於易燃性物質附近。
- 請將變流器安裝於穩固之牆上。
- 太陽能板(PV array)絕緣等級須具有IEC 61730 Class A，或者在市電側額外安裝隔離變壓器。

本變流器屬於壁掛式機種，安裝時請以機身垂直地面，AC/DC接頭位於機子正下方之方式壁掛於牆上。勿將機子安裝於傾斜之處。

請依照以下步驟將變流器安裝於牆上：

1. 使用12顆M6螺絲將壁掛板鎖附於牆上。請參考圖3-3。
2. 將變流器附掛於壁掛板上。
3. 使用2顆M6螺絲將變流器固定於牆上。請參考圖3-4。

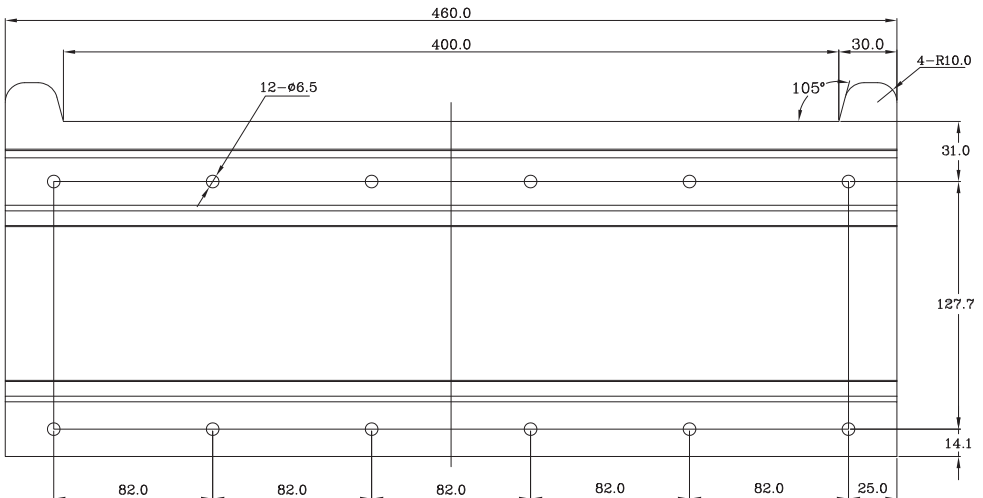


圖 3-1 壁掛板尺寸

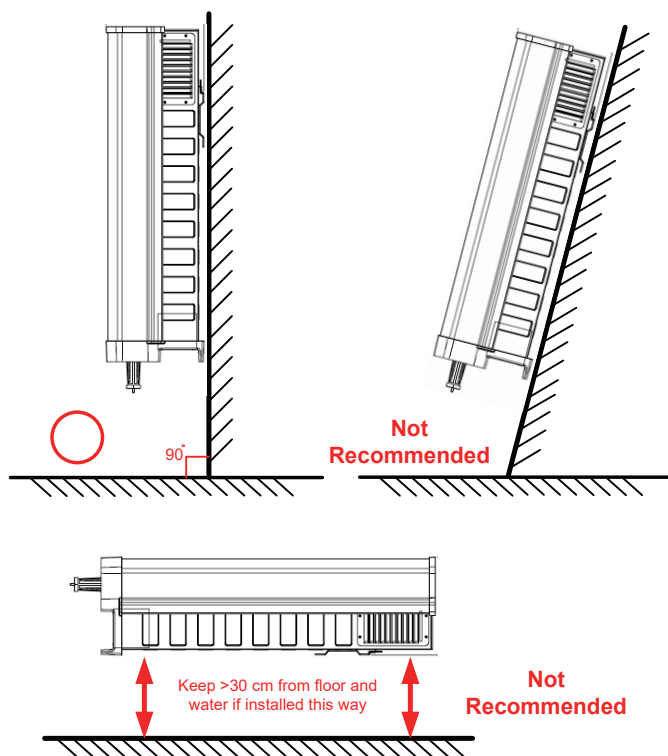
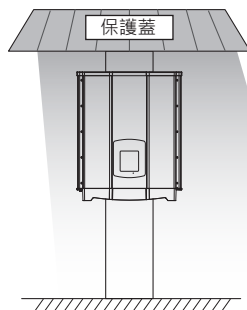


圖 3-2 建議和不建議的安裝方式

注意！



為避免由於極端氣候(大雪, 冰雹...等)或不恰當的安裝/維運所導致的變流器故障, 台達強烈建議安裝額外的保護蓋, 詳細細節請洽當地服務團隊。



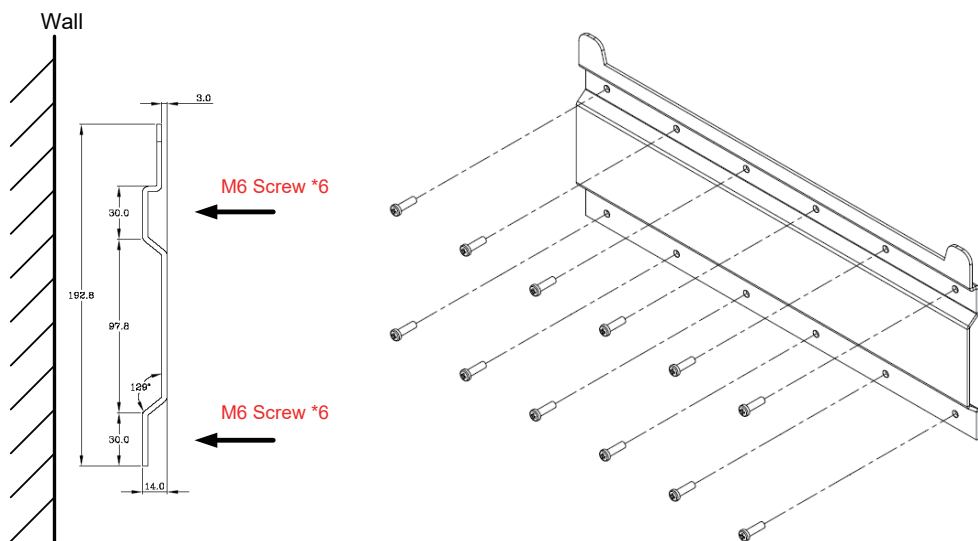


圖 3-3 以螺絲固定壁掛板

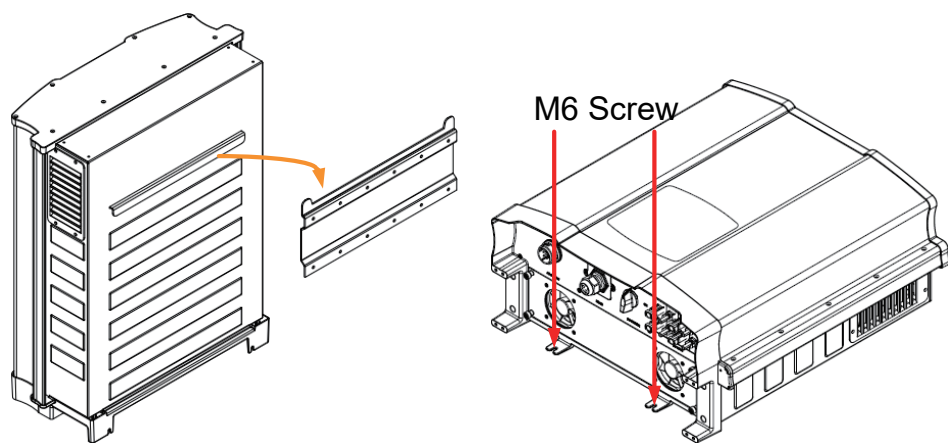


圖 3-4 附掛和固定變流器

注意!



- 壁掛板是專為變流器設計，而且是變流器唯一的安裝方式。
- 請安裝于安全且空曠之場所，方便保養與檢修。
- 此產品運轉時其周圍需有適當空間，如圖3-5所示。
- 請安裝於視線可及之高度，以便觀察其運轉狀態與參數設定。
- 請安裝於溫度介於 $-25^{\circ}\text{C} \sim 60^{\circ}\text{C}$ 的場所。
(超過 40°C 機子將會主動降低輸出功率)

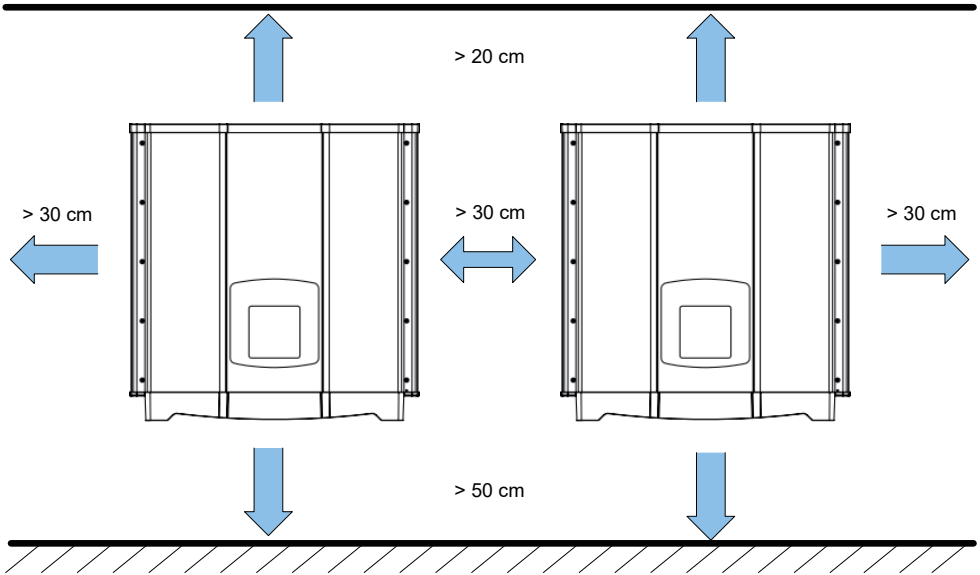


圖 3-5 適當安裝間距

4. 配線

WARNING ! SHOCK HAZARD



太陽能板曝曬於陽光下即會產生電力，為避免觸電危險，配線前請使用不透明材料覆蓋於太陽能板上，並將太陽能板之電源供應開關轉至 OFF。

4.1. 配線前準備事項

- 當太陽能板不接地(浮接)時，機子DC端可接受並聯或是獨立連接。
- 若太陽能板為正端接地或負端接地時，因RPI系列機種內部並未附帶隔離變壓器，DC端僅允許並聯配線並需於AC端加裝外部隔離變壓器。
- 不同的DC配線方式需於變流器控制面板上設定不同的Insulation偵測方式，請參考5.2.7.3 Install Settings。

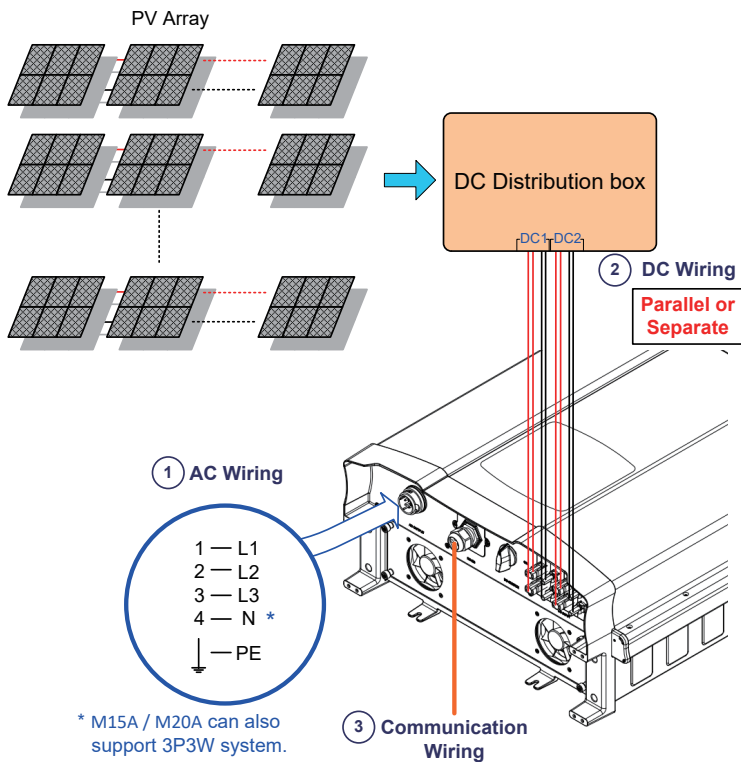


圖4-1 系統配線圖(DC端不接地)

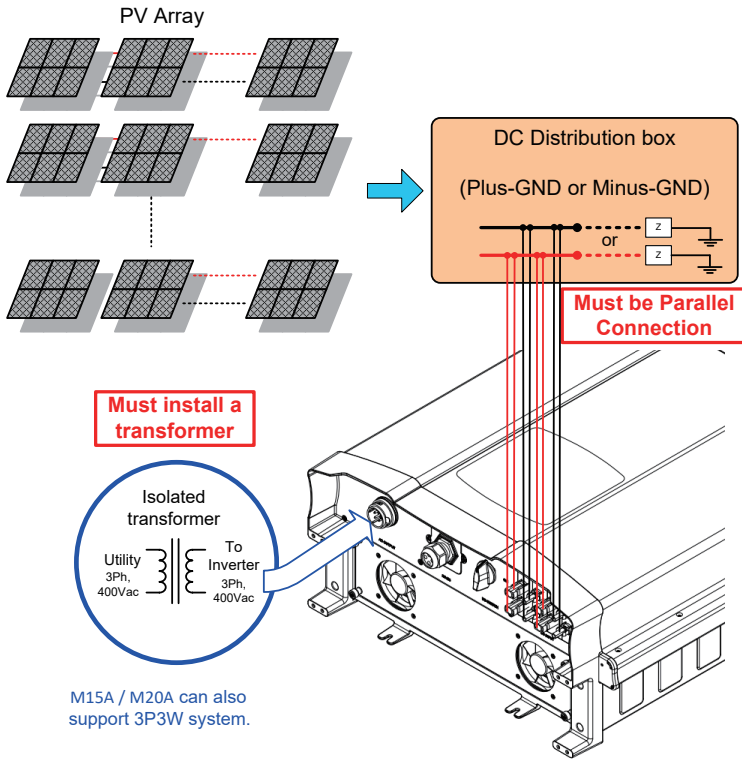


圖4-2 系統配線圖(DC正接地或負接地)

4.2. AC(市電端)之連接: 三相三線(3P+PE)或三相四線(3P+N+PE)

警告!



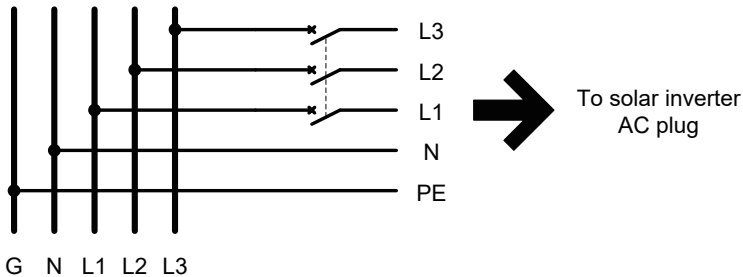
執行配線作業時, 必須確認市電電源開關已經關閉。

4.2.1. 保護裝置與AC配線圖

建議在市電與變流器之間加裝斷路器以達到過電流保護的效果。
請參考下表的規格選擇適當的斷路器。

機種	斷路器規格
RPI-M15A	30A
RPI-M20A	40A

表 4-1 斷路器建議規格



AC端之配線必須妥善包覆以確保安全並符合表4-2中之規格。

機種名稱	額定電流	線徑	建議扭力值
RPI-M15A	40 A	6 mm ² or 10 AWG / 8 AWG	0.7 N.m
RPI-M20A	40 A	6 mm ² or 10 AWG / 8 AWG	0.7 N.m

表 4-2 AC接頭線徑尺寸

RPI-M15A以及M20A機型皆支持三相三線(3-phase and PE)與三相四線(3-phase,N and PE)兩種配線方式。

注意！可能造成機器設備損毀



- 未使用正確線材線徑可能會有線材鎖附不牢固狀況，導致AC接頭損毀狀況發生。
- AC接頭之裝配須符合當地之電氣法規，若此安裝說明與法規有所抵觸，請以法規為準。

在組裝AC plug前請先按照以下步驟剝除線皮：

- 剝除電纜外部膠皮68.5mm。
- 將內部L1、L2、L3、N線材修剪至70mm。
- 剝除內部所有線材之膠皮20mm。

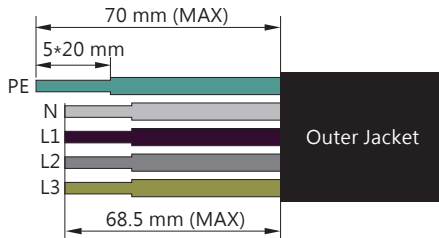
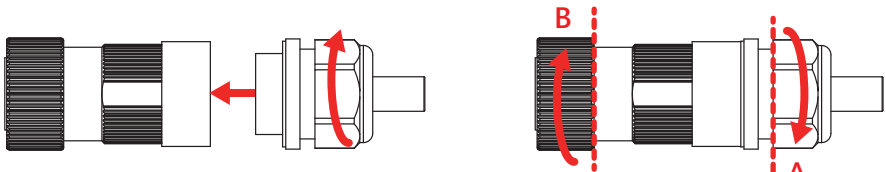


圖4-3 AC線材撥線

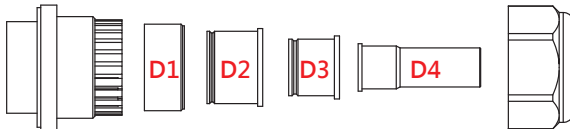
線材壓接完成後請按照圖4-4組裝AC接頭。

變流器可接受正相序或負相序連接，意即 L1~L3 連接順序可調整，但N與PE則必須正確的連接。



1. 產品包裝中會隨附AC接頭。請按照圖組裝AC接頭。組裝扭力為55kgf-cm ~ 75kgf-cm。

2. 旋轉鬆開A、B接頭。

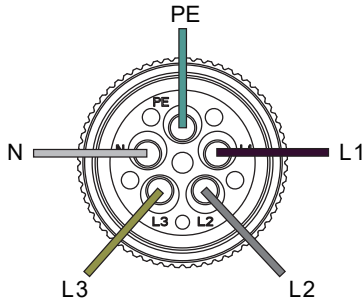


3. 將A接頭根據線徑選擇適當的橡膠墊片，已確保良好的防水性。

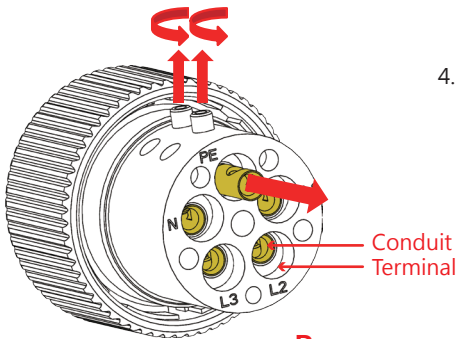
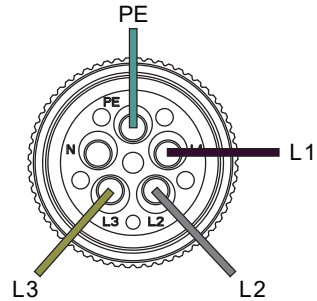
	適用線徑(mm)	Part F 扭力(Nm)	擰緊間距P(mm)
D1	32.6 ~ 41.3	13 ~ 20	1 ~ 7
D2	20.5 ~ 32.6	13 ~ 20	0 ~ 7
D3	15.3 ~ 20.5	13 ~ 20	1 ~ 5.5
D4	10.8 ~ 16	9 ~ 13	1 ~ 6.5

圖4-4 AC接頭配線圖

3P4W 電網系統的配線：
3 相配備 5 線路 (L1、L2、L3、N) + PE



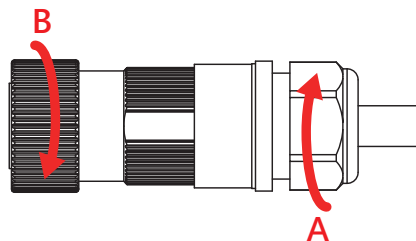
3P3W 電網系統的配線：
3 相配備 4 線路 (L1、L2、L3) + PE



4. 將B接頭配線後依據線徑選擇適當的銅套。

Terminal + Conduit：電纜範圍 $5.2\text{mm}^2 \sim 10.0\text{mm}^2$

如果線材的尺寸是 $14\text{mm}^2 \sim 22\text{mm}^2$ ，
請鬆開端子上的螺絲並將套管移除。



5. 先擰緊B接頭後，再擰緊A接頭固定電線。

圖4-4 AC接頭配線圖(續)

AC配線完成後使用者須於控制面板上選擇相對應的AC接線方式，以確保機子能正確判讀電壓。設定方式請參考5.2.7.3 Install Settings。

連接至AC之電壓必須符合下列規範：

三相三線：
L1-L2: $400\text{ Vac} \pm 10\%$
L1-L3: $400\text{ Vac} \pm 10\%$
L2-L3: $400\text{ Vac} \pm 10\%$

三相四線：
L1-N: $230\text{ Vac} \pm 10\%$
L2-N: $230\text{ Vac} \pm 10\%$
L3-N: $230\text{ Vac} \pm 10\%$

4.3. 直流輸入端(太陽能板電源端) 之連接

警告！



- 配線時，請選用適當之線徑，並依正確極性連接。
- 配線時，確認太陽能板(PV Array)電源之開關已關閉。

注意！



- DC1所有的string串接後之太陽能板數量、開路電壓與功率大小須為一致。
- DC2所有的string串接後之太陽能板數量、開路電壓與功率大小須為一致。
- 太陽能板串接後的最大開路電壓(Voc)不可超過1000Vdc。
- 安裝至太陽能板端之裝置，額定電壓須大於太陽能板之開路電壓，額定電流須大於太陽能板之短路電流。
- 輸入至變流器之最大功率不可超過表4-3之規範。

限制條件	RPI-M15A	RPI-M20A
最大輸入功率	16.5 kW	22 kW
DC1、DC2個別輸入功率	11.1 kW	14.8 kW

表 4-3最大容許輸入功率限制

型號	額定電流	線徑
M15A/ M20A	DC 22A	4 - 6mm ² / 12 - 10 AWG

表 4-4線徑大小

DC 配線端子可分為正極和負極兩種，如圖4-5所示。
配接時請務必確認極性與變流器上的標示一致。



圖 4-5 DC配線端子

4.4. 通訊介面之連接

RPI-M15A/ M20A機種之通訊模組請參考圖4-6。

此模組提供VCC、RS-485、dry contact、以及EPO等不同功能之連接端子。

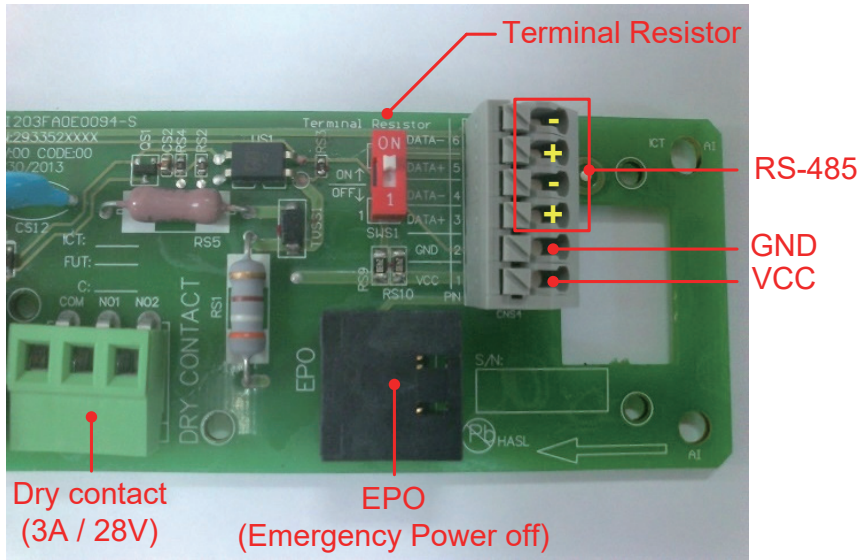


圖4-6 通訊模組示意圖

4.4.1. RS-485之連接

RS-485端子的定義如表4-5。

不同的RS-485連接方式，其終端電阻設定方式亦有所不同。

- 當變流器為單台安裝時，安裝者需將該台之終端電阻設置為ON。
- 當變流器為多台串聯時，安裝者需將第一台與最後一台變流器之終端電阻設置為ON，其餘機子則為OFF。請參考圖4-7。

終端電阻的設定方式請參考表4-6。

Pin	Function
1	VCC (+12V)
2	GND
3	DATA+
4	DATA-
5	DATA+
6	DATA-

表 4-5 RS-485端子定義

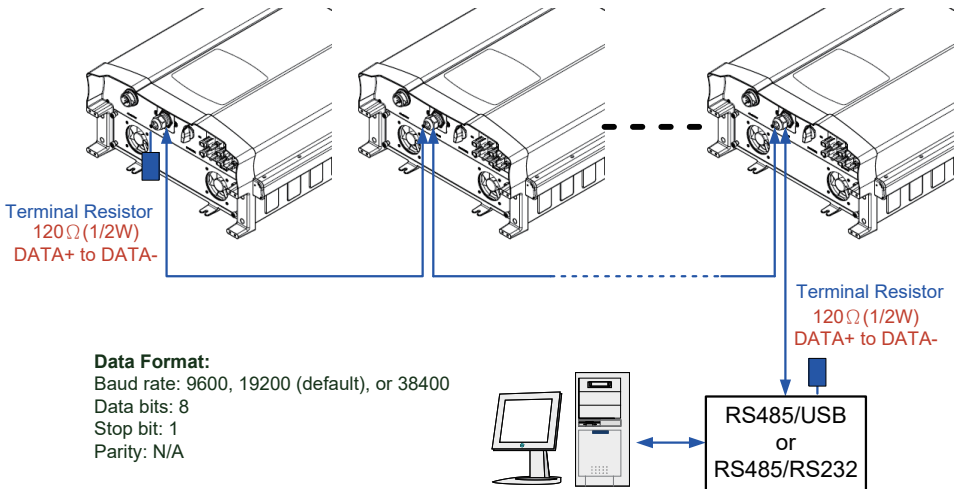


圖4-7多台變流器串接通訊

	指撥開關1
ON	終端電阻ON
OFF	終端電阻OFF

表 4-6 終端電阻設定

4.4.2. 緊急關機裝置

RPI-M15A/ M20A機種提供一組緊急關機裝置(EPO)。
當使用者從外部將其短路時，變流器會立刻關機。

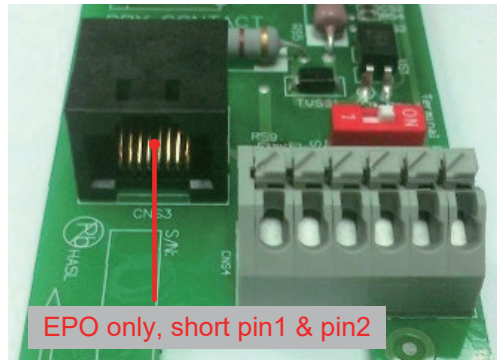


圖4-8 EPO使用說明

4.4.3. 乾接點之連接

RPI-M15A/ M20A 機種提供1組乾接點。
當變流器偵測到 Fan Fail時COM與NO1將會短路。

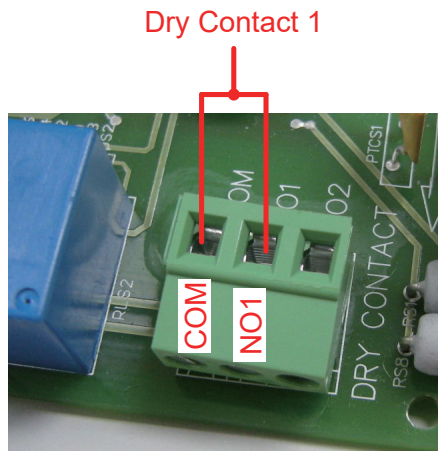


圖4-9乾接點連接

5. 變流器開機

警告！燙傷危險



在變流器運轉期間，外殼溫度可能超過70°C，請勿觸摸以免燙傷。

5.1. LCD 操作流程

RPI-M15A/ M20A 機種的控制面板含有一個320x240 像素之顯示器與兩顆LED指示燈。

不同的指示燈號代表變流器不同的工作狀態，各種燈號的說明請參考表 5-1。

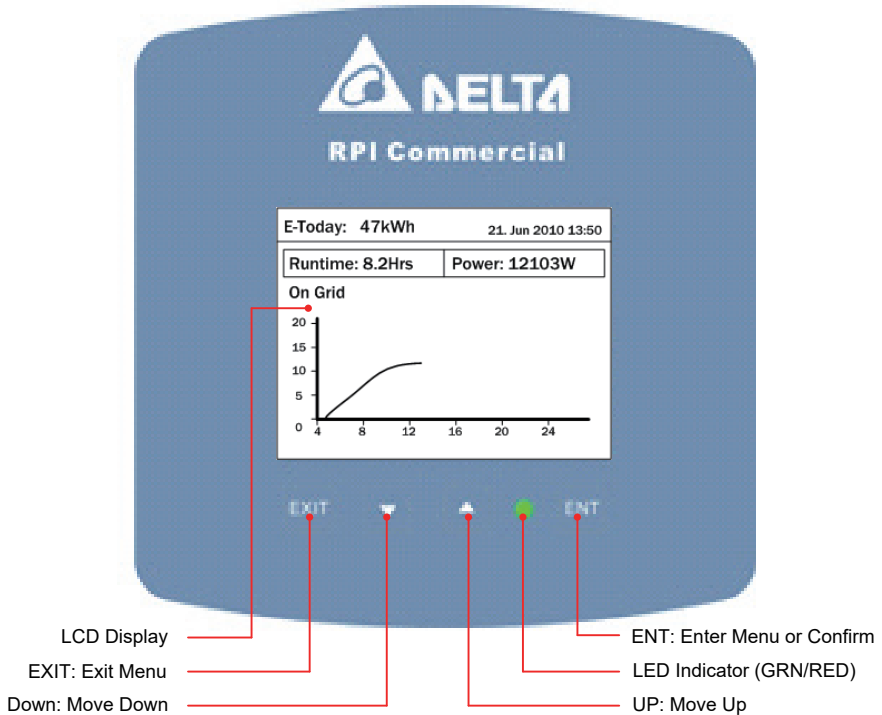


圖5-1 控制面板

狀態	綠色LED	紅色LED
待機、併網前倒數	閃爍*	OFF
成功併網	ON	OFF
發生Error或Fault	OFF	ON
夜間模式(無DC時)	OFF	OFF
燒錄模式	閃爍*	

* ON 1s / OFF 1s

表5-1 LED指示燈狀態

5.2. 首次開機

首次開機時請先將AC電源送入變流器，此時顯示面板會被點亮並要求使用者選擇顯示語言與所在的國家(電力法規)。語言與國家設定完畢後，請觀察主畫面中是否有顯示任何錯誤訊息，若無則可送入DC電源並將DC切換開關轉至ON。當太陽能板提供的能量足夠且市電供應正常時，變流器將會進行自我測試後自動與市電連接並開始運轉。

First Startup

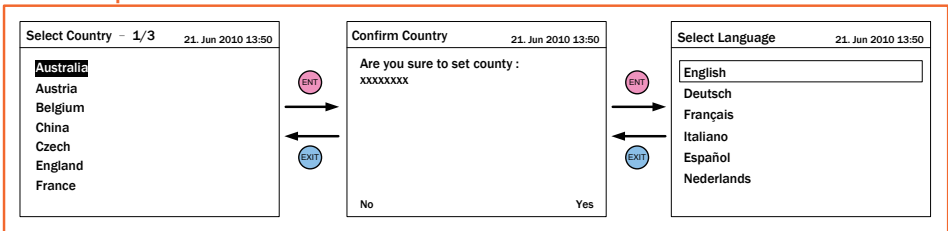


圖5-2 首次開機出現語言和國別設定

5.2.1. 主畫面

當變流器正常工作畫面會顯示如圖5-3。使用者可從畫面上得知今日累計發電量、今日發電時數、今日發電曲線、瞬時發電功率、變流器工作狀態、以及日期時間等資訊。

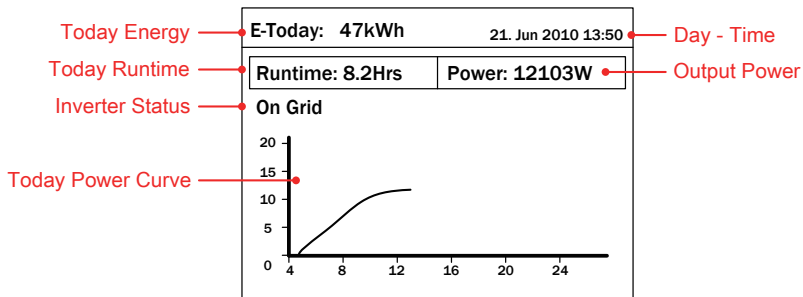


圖5-3 主畫面

5.2.2. Power Meter

此頁面顯示AC與DC端之電壓、電流、功率等資訊。

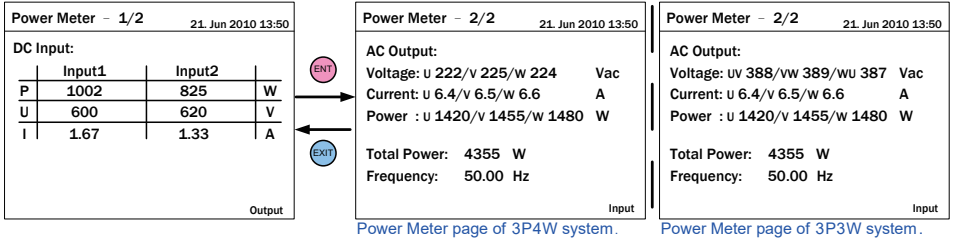


圖5-4 Power meter頁面

5.2.3. Energy Log

此頁面按可觀看變流器的歷史發電資料。使用者可查看各年、月及日的發電量，年與月以長條圖表示，日則以曲線表示。

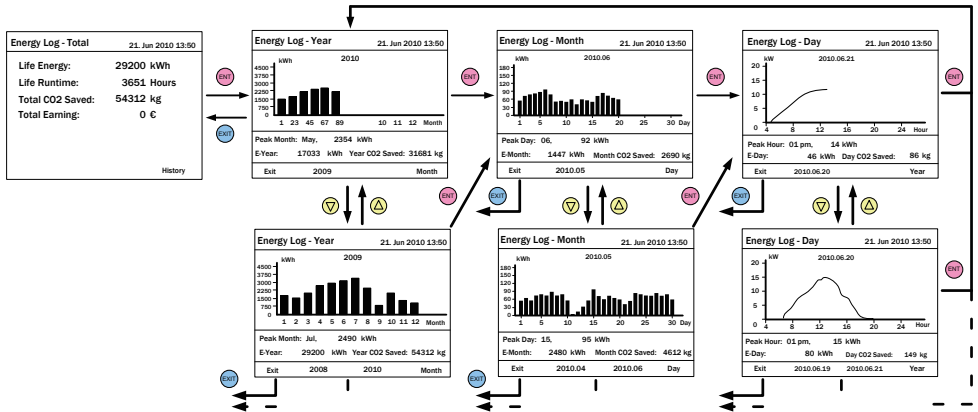


圖5-5 Energy log頁面

5.2.4. Event Log

此頁面可紀錄至多30筆過去曾發生的Error與fault。
於頁面中按下 ENT 鍵後可檢視所有事件發生次數的統計表。

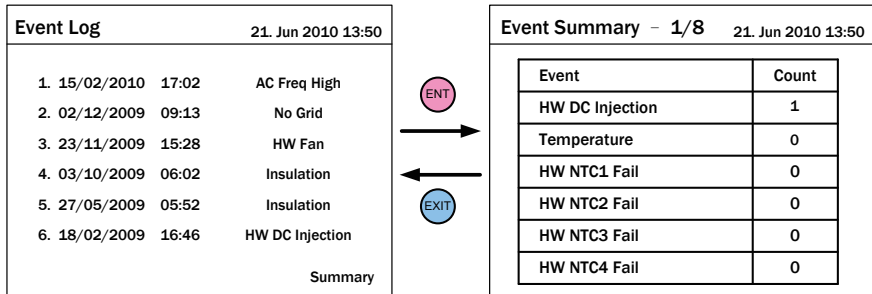


Figure 5-6 Event log flow chart

5.2.5. Operation Data

此頁面分為四個部分，分別記錄變流器運作期間的各種歷史最大資料，包括輸入與輸出的最大電壓、最大電流、最大功率；功率散熱片與變流器內部的最高溫度。

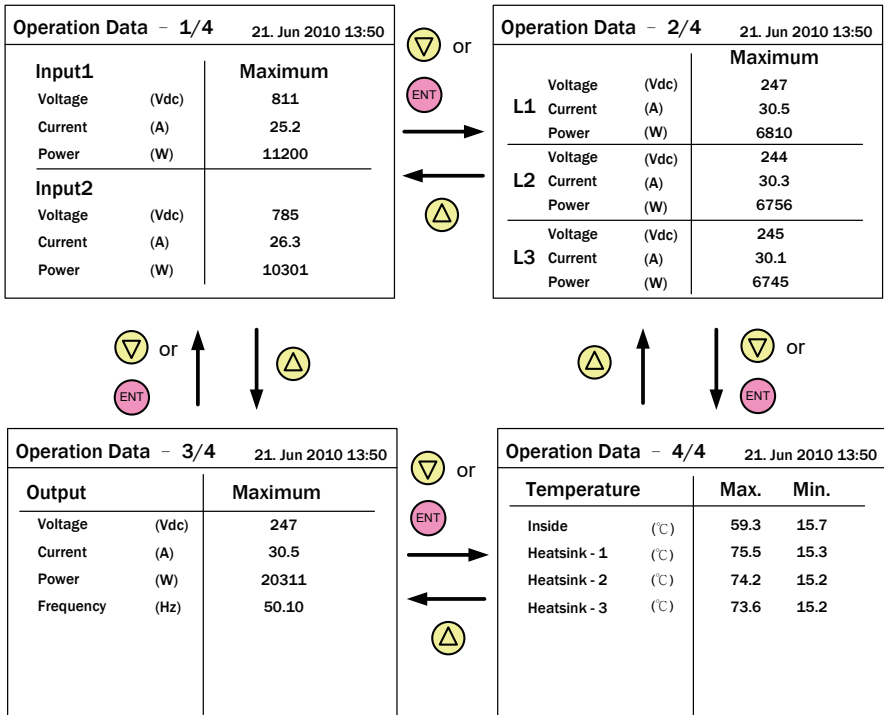


圖5-7 Operation data頁面

5.2.6. Inverter Information

此頁面提供產品序號、韌體版本、安裝日期、變流器ID、設定之國家(電力法規)以及變流器最大發電量等資訊。

Inverter Information	21. Jun 2010 13:50
Serial Number	AE46000006
DSP-Version	1.80
Red.-Version	1.17
Comm.-Version	1.99
Installation Date	05.Jan.2009
Inverter ID	001
Country	Custom

圖5-8 Inverter information頁面

5.2.7. Settings

所有可供使用者調整的功能與設定值皆集中於此頁面。建議您在有專業人員指導或陪同的情況下再啟動這些功能或修改其設定值。

Settings	21. Jun 2010 13:50
Personal Settings	
Coefficients Settings	
Install Settings	
Active/Reactive Power Control	
FRT	

圖5-9 Install settings頁面

5.2.7.1. Personal Settings

此頁面可設定 Language、Date、Time、Screen Saver、LCD brightness 與 Contrast。Screen Saver 可調整範圍為 5min - 60min，一旦使用者超過設定的時間沒有使用按鍵，系統會自動關閉 LCD 背光並回到主畫面。Brightness 與 Contrast 可調整範圍為 1-5。

Personal Settings		21. Jun 2010 13:50
Language	[English]	
Date	21 / 06 / 2010	
	(DD/MM/YYYY)	
Time	13:50	
Screen Saver	[5 min]	
Brightness	[3]	
Contrast	[2]	

圖5-10 Personal settings 頁面

5.2.7.2. Coefficient Settings

使用者可依照需求於此頁面設定 CO2 節約功能、節電收入功能與RS-485 通訊baud rate。

Coefficient Settings		21. Jun 2010 13:50
CO2 Saved kg/kWh	[1.86]	
Earning Value/kWh	[2.50]	
Currency (\$,€)	[€]	
Baud Rate	[19200]	

圖 5-11 Coefficient setting 頁面

5.2.7.3. Install Settings

注意！



此頁面僅允許專業安裝人員或有專業人員在旁指導時方可調整，任意更改這些設定有可能造成變流器損壞。

進入Install Settings頁面前需要輸入密碼，密碼分為兩種權限：
使用者權限與安裝者權限。

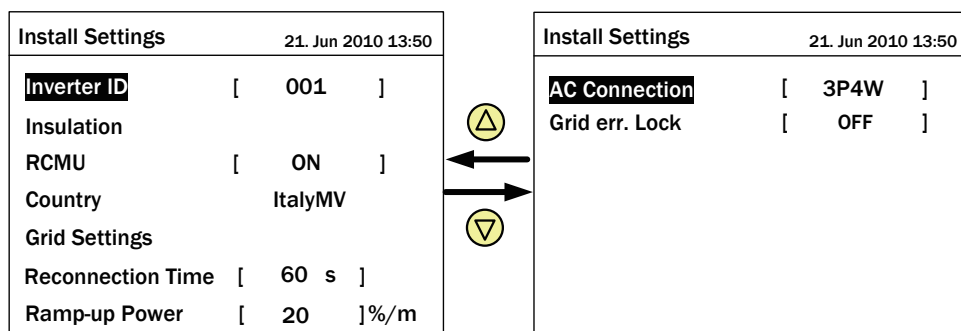


圖5-12 Install setting 頁面 – 使用者權限

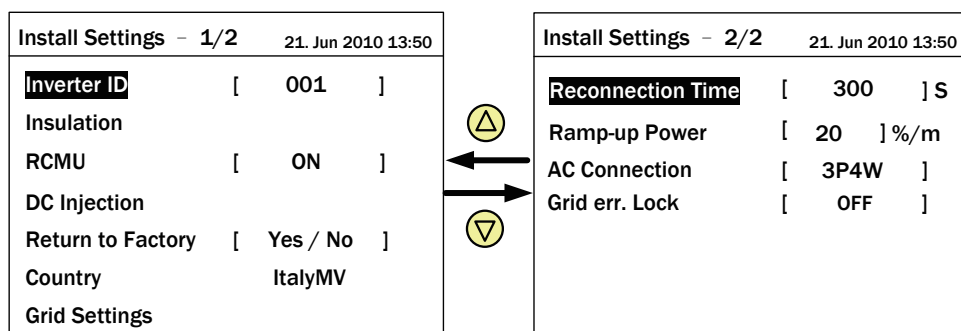


圖5-13 Install setting 頁面 – 安裝者權限

以下將會介紹使用者權限可調值整之各選項與設定值。

- **Inverter ID:**

變流器的ID使用於RS-485通訊時，使Master(主)端能順利辨認各個Slave(僕)端之變流器。當使用者將多台變流器透過RS-485串聯時，各變流器必須要有不同的ID。

- **Insulation:**

變流器於併網前將會進行太陽能板之對地組抗偵測，使用者可自訂偵測方式與對地阻抗限制值。RPI-M15A/ M20A機種提供六種對地組抗偵測方式(ON、DC1 Only、DC2 Only、Positive Ground、Negative Ground、OFF)與三種對地阻抗限制值可設定。

- **Country:**

選單中的每一個國家選項即代表一種電力法規，安裝者於安裝變流器後必須選擇正確的國家選項，以符合當地電力法規的要求。

- **RCMU:**

RCMU為偵測輸入端與輸出端是否存在漏電流之功能。若漏電流大於變流器內部的限制值，變流器將會立刻斷開市電並停止運作。

- **Reconnection Time:**

變流器自Error或Fault中回復，欲重新連接市電時會無條件等待一段時間，此段時間即為Reconnection Time。使用者可自行調整此段等待時間的長短。

- **Ramp-up Power:**

當變流器成功連接市電後，其輸出功率的爬升速率可由使用者自訂。速率愈高則愈快達到太陽能板端能提供之最大功率。

- **AC connection:**

RPI-M15A/ M20A支援3P3W與3P4W配線方式，請依照實際配線方式選擇對應的設定，確保機子能正常運作。

- **Grid err. Lock:**

此功能僅供日本電力法規使用。當變流器偵測到任何市電端之故障時會斷開市電並主動鎖機，直到使用者至機子前透過手動指令解鎖後才會繼續運轉。

5.2.7.4. Active/Reactive Power Control

進入實功/虛功控制頁面前必須輸入密碼。
此頁面包含實功率控制與虛功率控制兩個主要功能。

實功率控制有三種模式：
Power Limit, Power vs. Frequency, and P(V)；
虛功率控制有四種模式：
Constant cosphi, cosphi(P), Constant Q, and Q(V)。

僅有部分國家(電力法規)有此類功能的需求。

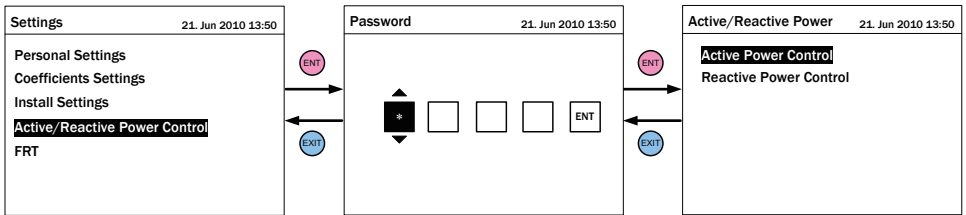


圖5-14 Active/Reactive power setting 頁面

5.2.7.4.1. Active Power Control – Power Limit

此控制模式可限制變流器之輸出功率。
使用者可透過設定Set Point來指定變流器所能輸出的最大功率。

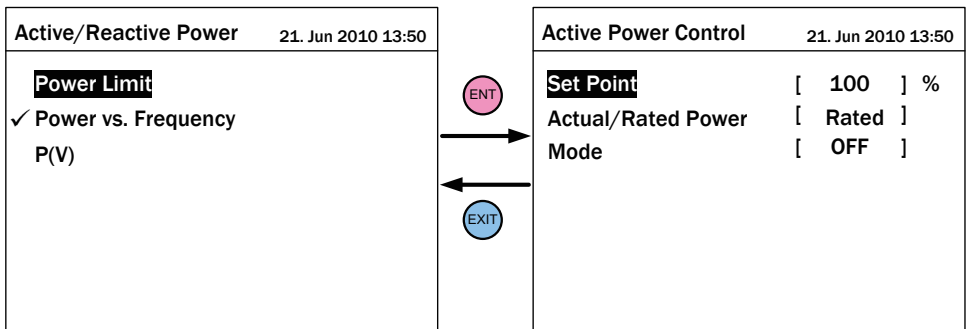


圖5-15 Power limit設定頁面

5.2.7.4.2. Active Power Control – Power vs. Frequency

此模式開啟後，變流器可隨著市電頻率升高而自動降低其輸出功率。各參數值所代表的意義可對照圖5-16。

Active Power Control		21. Jun 2010 13:50
	Actual/Rated Power	[Actual]
(a)	Start Frequency	[50.20] Hz
	Stop Frequency	[--] Hz
(b)	Recovery Frequency	[50.00] Hz
(c)	Statism	[40] %
	Recovery Time	[300] s
	Mode	[ON]

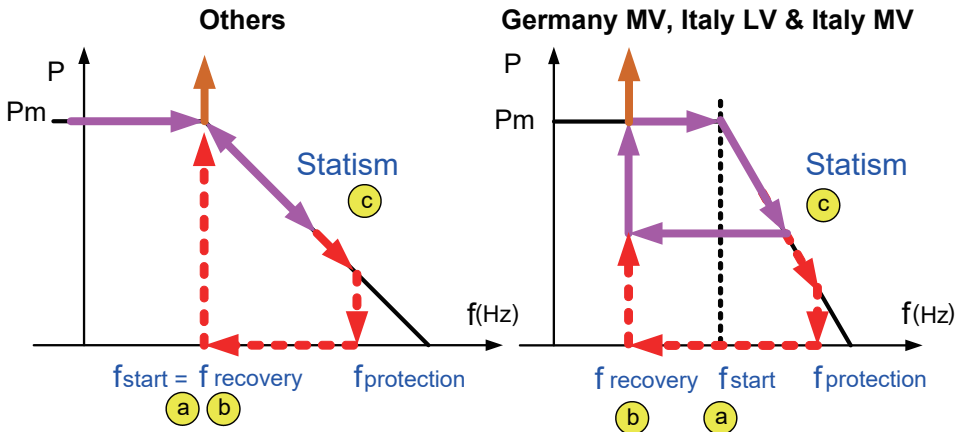


圖5-16 Power vs. frequency 設定頁面

5.2.7.4.3. Active Power Control – P(V)

此模式啟動後，當市電電壓大於V lock-in且此時變流器之輸出功率大於P lock-in時，變流器將會自動將輸出功率降低至P lock-out，直到市電電壓低於V lock-out且經過T recovery秒後方回復正常功率輸出。

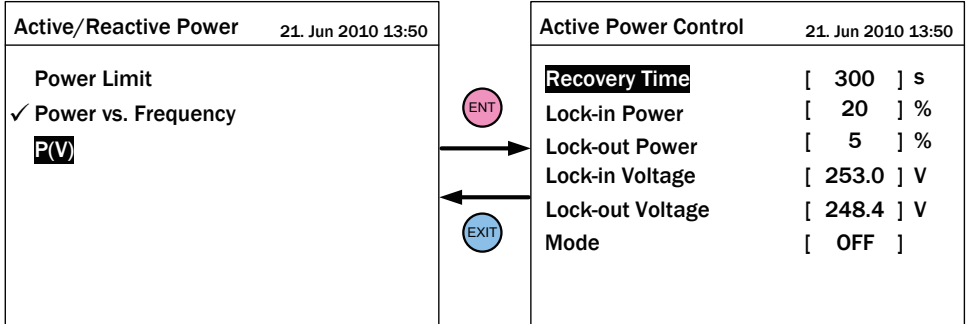


圖5-17 P(V) 設定頁面

5.2.7.4.4. Reactiv Power Control – Constant cosφ

此模式啟動後，變流器可饋入固定功率因子(cosphi)之虛功率至市電，使用者可透過設定頁面指定欲饋入之功率因子。

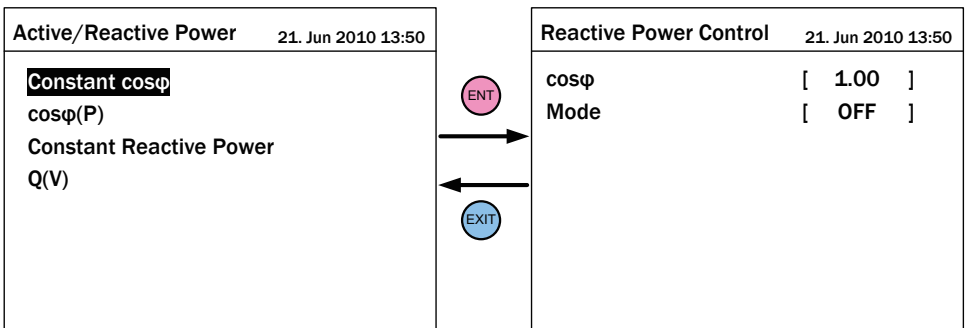


圖5-18 Constant cosφ 設定頁面

5.2.7.4.5. Reactive Power Control – $\cos\phi$ (P)

此功能啟動後，變流器可隨著輸出之實功率高低而饋入一定比例之虛功率。當國家設定為Italy LV或Italy MV時，使用者可進一步指定當市電電壓高於V lock-in時方饋入虛功，電壓低於V lock-out後，無論此時輸出實功率為何，皆不饋入虛功。

Reactive Power Control		21. Jun 2010 13:50
a	Upper limit - $\cos\phi$	[Cap 0.90]
b	Lower Power	[0] %
c	Lower limit - $\cos\phi$	[Ind 0.90]
d	Upper Power	[100] %
Lock-in Voltage		[241.5] V

Reactive Power Control		21. Jun 2010 13:50
Lock-out Voltage	[230.0] V	
Mode	[OFF]	

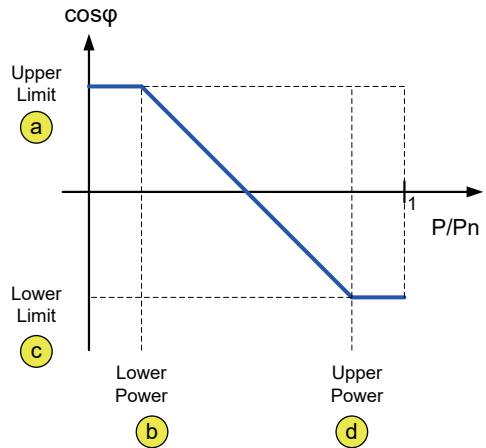


圖5-19 $\cos\phi$ (P) 設定頁面

5.2.7.4.6. Reactive Power Control – Constant Reactive Power

此模式啟動後，變流器可饋入固定比例之虛功功率至市電，使用者可透過設定頁面指定欲饋入之虛功功率量。

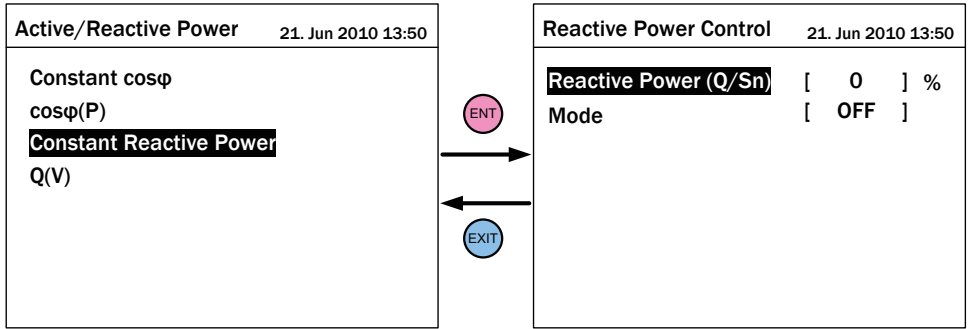


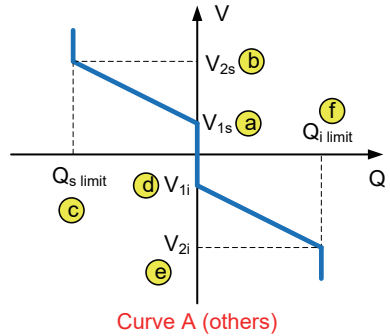
圖5-20 Constant Reactive Power 設定頁面

5.2.7.4.7. Reactive Power Control – Q(V)

此模式啟動後，變流器會隨著市電電壓變化而饋入不同性質的虛功功率。當國家設定為Italy LV或Italy MV時，使用者可進一步指定輸出功率達到P lock-in時方饋入虛功，輸入功率小於P lock-out時則無論市電電壓為何，皆不饋入任何虛功。

Reactive Power Control		21. Jun 2010 13:50
a	V1s	[248.4] V
b	V2s	[253.0] V
c	Qs limit	[Ind 44] %

d	V1i	[211.6] V
e	V2i	[207.0] V
f	Qi limit	[Cap 44] %



Reactive Power Control		21. Jun 2010 13:50
Delay Time	[10]	s
Lock-in Power	[20]	%
Lock-out Power	[5]	%
Mode	[OFF]	

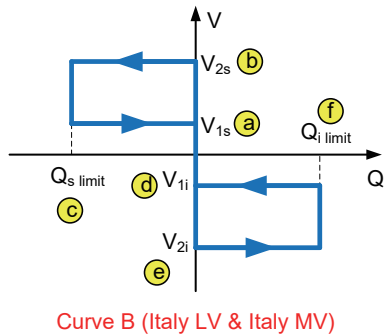


圖5-21 Q(V) 設定頁面

5.2.7.5. FRT (Fault ride through)

根據某些特定地區之電力法規規範，當市電電壓發生驟降時，在一定的時間內變流器必須維持併網狀態。使用者可透過啟動FRT功能並設定所需的參數來達到這項要求。

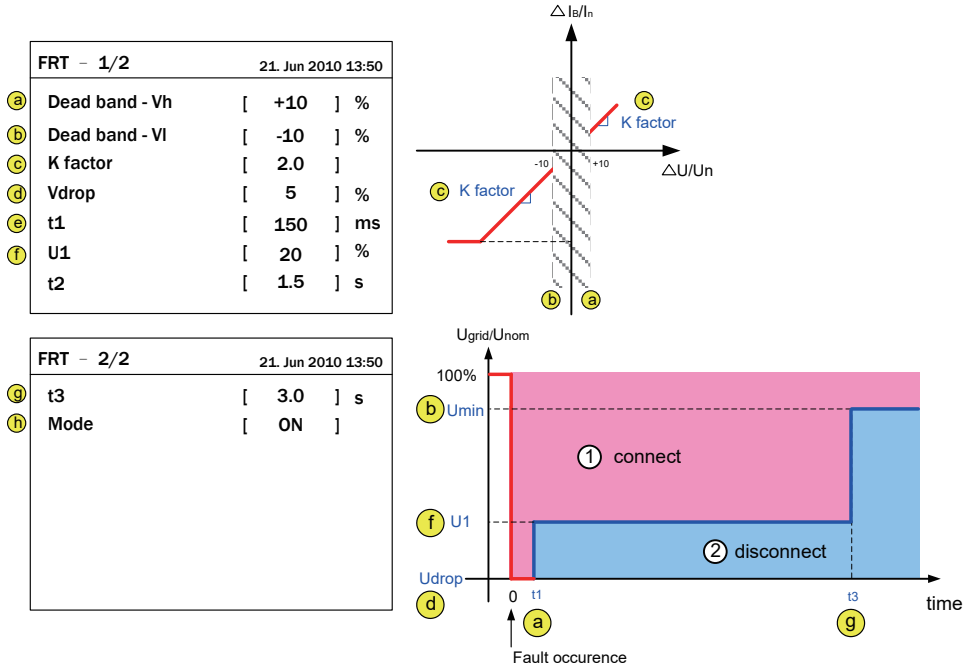


圖5-22 FRT 設定頁面

6. 設備維護

為確保PV Inverter正常運轉，請至少每半年確認一次變流器所有端子與螺絲是否鬆脫、電纜線是否毀損、散熱出風口有無異物阻塞。如有上述情形，請聯絡合格之技術人員進行維修、清理或更換。

觸電危險！



進行維護工作之前請務必將AC 與DC電源斷電，避免觸電危險。

6.1. 清理風扇

將風扇架四個角落的螺絲鬆開後，稍微拉出風扇架即可看到風扇接頭，依序解開後可將整個風扇模組拆離變流器，以便進行清除積塵工作，請參考圖6-1。

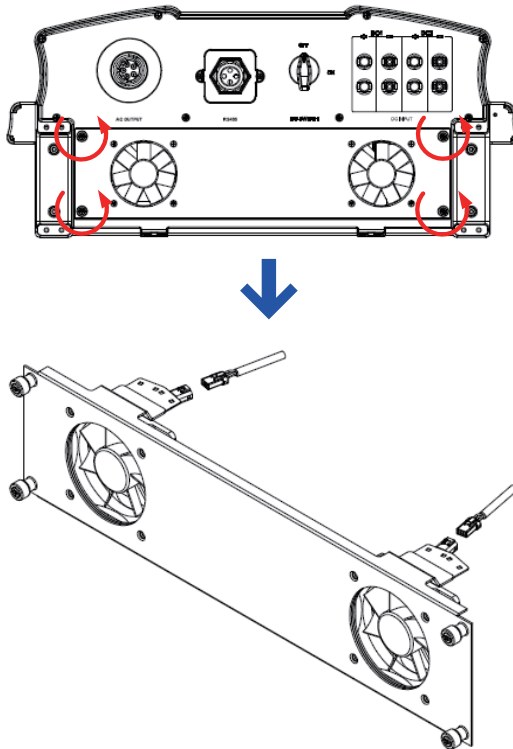


圖6-1 拆解風扇模組

6.2. 更換風扇

若風扇故障需要更換，請將該風扇四顆螺絲與固定於風扇架的連接端子拆除，即可換上新風扇。

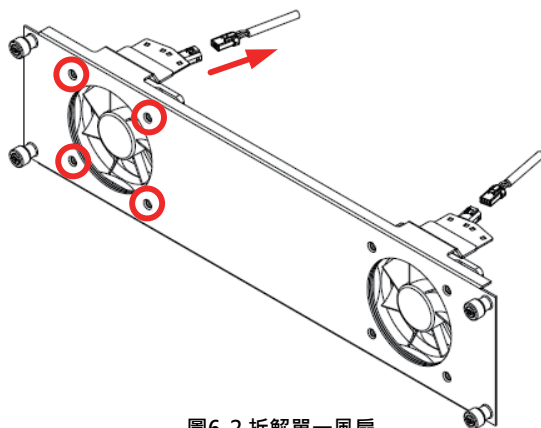


圖6-2 拆解單一風扇

6.3. 清理出風口濾網

進風口濾網模組拆解方式如圖6-3，拆除4支固定螺絲即可卸下模組並進行清除積塵的工作，變流器左右兩側的進風口濾網均需定期清理。

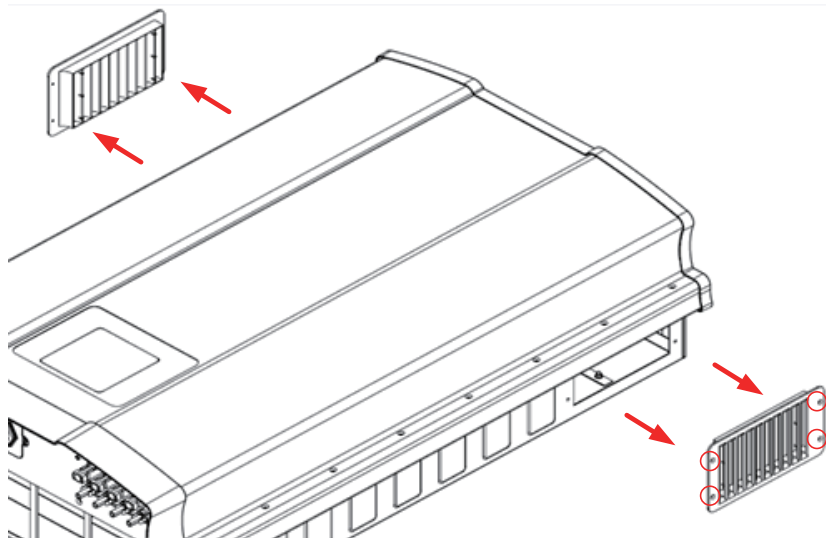


圖6-3 拆卸出風口濾網模組示意圖

7. 錯誤訊息與簡易故障排除

錯誤資訊		
訊息顯示	可能原因	故障排除
AC Freq High	<ol style="list-style-type: none"> 1. 實際的市電頻率高過過頻率保護設定 2. 國家設定不正確 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查變流器端的市電頻率 2. 檢查國家設定 3. 檢查變流器端的偵測電路
AC Freq Low	<ol style="list-style-type: none"> 1. 實際的市電頻率低於欠頻率保護設定 2. 國家或電網設定不正確 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查變流器端的市電頻率 2. 檢查國家與電網設定 3. 檢查變流器端的偵測電路
Grid Quality	在電網或靠近變流器附近非線性的負載	必要時變流器與電網連接處必須遠離非線性的負載
HW Con. Fail	<ol style="list-style-type: none"> 1. 在AC介面連接錯誤 2. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查AC連接，必須和使用手冊一致 2. 檢查變流器內部的偵測電路
No Grid	<ol style="list-style-type: none"> 1. AC 斷路器跳開 2. 中斷AC介面 	<ol style="list-style-type: none"> 1. 斷開AC 斷路器 2. 檢查連接AC介面並確認其連接至變流器
AC Volt Low	<ol style="list-style-type: none"> 1. 實際市電的電壓低於低電壓保護設定 2. 國家或電網設定不正確 3. AC介面連接錯誤 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查市電與變流器端的連接 2. 檢查國家或電網設定 3. 檢查AC介面連接 4. 檢查變流器內部的偵測電路
AC Volt High	<ol style="list-style-type: none"> 1. 實際市電的電壓高於過電壓保護設定 2. 操作期間，市電的電壓高於慢速電壓保護設定 3. 國家或電網設定不正確 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查變流器端的市電電壓 2. 檢查變流器端的市電電壓 3. 檢查國家或電網設定 4. 檢查變流器內部的偵測電路
Solar1 High	<ol style="list-style-type: none"> 1. 實際Solar1電壓超過1000Vdc 2. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 修正 solar array 設定並使得 Voc 小於 1000Vdc 2. 檢查變流器內部的偵測電路

錯誤資訊		
訊息顯示	可能原因	故障排除
Solar2 High	<ol style="list-style-type: none"> 1. 實際Solar2電壓超過1000Vdc 2. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 修正 solar array 設定並使得 Voc 小於 1000Vdc 2. 檢查變流器內部的偵測電路
Insulation	<ol style="list-style-type: none"> 1. 太陽能板絕緣測試未通過 2. 太陽能板電容值介於正到接地端或負到接地端太大或者兩者皆有之 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查輸入端絕緣 2. 檢查電容值, 必要時擦乾太陽能板 3. 檢查變流器內部的偵測電路

表 7-1 錯誤資訊

警告		
訊息顯示	可能原因	故障排除
Solar1 Low	<ol style="list-style-type: none"> 1. 實際Solar1電壓低於下限值 2. 若實際Solar1電壓接近0，變流器內部可能有裝置損壞 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查Solar1電壓至變流器端的連接 2. 檢查boost1的所有開關裝置 3. 檢查變流器內部的偵測電路
Solar2 Low	<ol style="list-style-type: none"> 1. 實際Solar2電壓低於下限值 2. 若實際Solar1電壓接近0，變流器內部可能有裝置損壞 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查Solar2 voltage至變流器端的連接 2. 檢查boost2的所有開關裝置 3. 檢查變流器內部的偵測電路
HW FAN	<ol style="list-style-type: none"> 1. 一個或多個風扇鎖死 2. 一個或多個風扇無效 3. 一個或多個風扇未連接 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 移除卡在風扇內的對象 2. 替換無效的風扇 3. 檢查風扇的連接 4. 檢查變流器內部的偵測電路

表7-2 警告資訊

故障		
訊息顯示	可能原因	故障排除
HW DC Injection	<ol style="list-style-type: none"> 市電波形異常 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查市電波形. 必要時變流器與電網連接處必須遠離非線性的負載 檢查變流器內部的偵測電路
Temperature High	<ol style="list-style-type: none"> 環境溫度超過60°C (裝置異常) 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查設備的周遭和環境 檢查變流器內部的偵測電路
Temperature Low	<ol style="list-style-type: none"> 環境溫度 < -30°C 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查設備的周遭和環境 檢查變流器內部的偵測電路 (RTM1, RTB1, RTG1 and RTH1)
HW NTC1 Fail	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查設備的周遭和環境 檢查變流器內部的偵測電路 (RTM1)
HW NTC2 Fail	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查設備的周遭和環境 檢查變流器內部的偵測電路 (RTB1)
HW NTC3 Fail	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查設備的周遭和環境 檢查變流器內部的偵測電路 (RTG1)
HW NTC4 Fail	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查設備的周遭和環境 檢查變流器內部的偵測電路 (RTH1)
HW DSP ADC1	<ol style="list-style-type: none"> 輸入功率不足 輔助電源電路功能異常 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查輸入電壓必須 > 150Vdc 檢查變流器內部的輔助電源電路 檢查變流器內部的偵測電路
HW DSP ADC2	<ol style="list-style-type: none"> 輸入功率不足 輔助電源電路功能異常 偵測到電路功能異常 	<ol style="list-style-type: none"> 檢查輸入電壓必須 > 150Vdc 檢查變流器內部的輔助電源電路 檢查變流器內部的偵測電路

故障		
訊息顯示	可能原因	故障排除
HW DSP ADC3	<ol style="list-style-type: none"> 1. 輸入功率不足 2. 輔助電源電路功能異常 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查輸入電壓必須 > 150Vdc 2. 檢查變流器內部的輔助電源電路 3. 檢查變流器內部的偵測電路
HW Red ADC1	<ol style="list-style-type: none"> 1. 輸入功率不足 2. 輔助電源電路功能異常 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查輸入電壓必須 > 150Vdc 2. 檢查變流器內部的輔助電源電路 3. 檢查變流器內部的偵測電路
HW Red ADC2	<ol style="list-style-type: none"> 1. 輸入功率不足 2. 輔助電源電路功能異常 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查輸入電壓必須 > 150Vdc 2. 檢查變流器內部的輔助電源電路 3. 檢查變流器內部的偵測電路
HW Efficiency	<ol style="list-style-type: none"> 1. 校正不正確 2. 電流回授電路無效 	<ol style="list-style-type: none"> 1. 檢查電流和功率的精度 2. 檢查變流器內部電流回授電路
HW COMM1	<ol style="list-style-type: none"> 1. DSP 閒置中 2. 通訊連接中斷 3. 通訊電路功能異常 	<ol style="list-style-type: none"> 1. 檢查DSP中reset和crystal 2. 檢查DSP和COMM通訊連接 3. 檢查通訊電路
HW COMM2	<ol style="list-style-type: none"> 1. Red. CPU閒置中 2. 通訊連接中斷 	<ol style="list-style-type: none"> 1. 檢查Red. CPU中reset和crystal 2. 檢查Red. CPU和DSP通訊連接
Ground Current	<ol style="list-style-type: none"> 1. 太陽能板絕緣測試未通過 2. 太陽能板電容值介於正到接地端或負到接地端太大 3. Boost 驅動電路或Boost 電感其中之一功能異常 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查輸入端的絕緣 2. 檢查電容值 (+ <-> GND & - <-> GND), 必須 < 2.5uF. 必要時安裝外部的變壓器 3. 檢查boost驅動電路和boost電感 4. 檢查變流器內部的偵測電路
HW Connect Fail	<ol style="list-style-type: none"> 1. 變流器內部的電源線未連接 2. 電流回授電路無效 	<ol style="list-style-type: none"> 1. 檢查變流器內部電源線 2. 檢查變流器內部電流回授電路

故障		
訊息顯示	可能原因	故障排除
RCMU Fail	<ol style="list-style-type: none"> 1. RCMU連接中斷 2. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查變流器內部RCMU連接 2. 檢查變流器內部的偵測電路
Relay Test Short	<ol style="list-style-type: none"> 1. 一個或多個繼電器是閉合的 2. 繼電器driver電路功能異常 	<ol style="list-style-type: none"> 1. 替換無效的繼電器 2. 檢查變流器內部的驅動電路
Relay Test Open	<ol style="list-style-type: none"> 1. 一個或多個繼電器異常 2. 繼電器驅動電路功能異常 3. Vgrid與Vout偵測精度不正確 	<ol style="list-style-type: none"> 1. 替換無效的繼電器 2. 檢查變流器內部的驅動電路 3. 檢查Vgrid與 Vout電壓偵測精度
Bus Unbalance	<ol style="list-style-type: none"> 1. 輸入端並未完全獨立或並聯 2. 太陽能板短路到地 3. Boost驅動電路無效或連接中斷 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查輸入連接 2. 檢查太陽能板絕緣設定 3. 檢查變流器內部boost的驅動電路 4. 檢查變流器內部的偵測電路
HW Bus OVR	<ol style="list-style-type: none"> 1. Boost驅動電路無效或連接中斷 2. 太陽能板Voc超過1000Vdc 3. 操作期間突波發生 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查變流器內部boost的驅動電路 2. 修正太陽能板設定, 並使得Voc 小於1000Vdc 3. N/A 4. 檢查變流器內部的偵測電路
AC Current High	<ol style="list-style-type: none"> 1. 操作期間突波發生 2. Inverter stage驅動電路無效 3. 開關裝置無效 4. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. N/A 2. 檢查inverter stage驅動電路 3. 檢查inverter stage全部開關裝置 4. 檢查變流器內部的偵測電路
HW CT A Fail	<ol style="list-style-type: none"> 1. 測試電流回路損壞 2. CSC1無效 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查WC3至CNC16的連接 2. 替換新的CSC1 3. 檢查變流器內部的偵測電路
HW CT B Fail	<ol style="list-style-type: none"> 1. 測試電流回路損壞 2. CSC2無效 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查WC3至CNC16的連接 2. 替換新的CSC2 3. 檢查變流器內部的偵測電路

故障		
訊息顯示	可能原因	故障排除
HW CT C Fail	<ol style="list-style-type: none"> 1. 測試電流回路損壞 2. CSC3無效 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查WC3至CNC16的連接 2. 替換新的CSC3 3. 檢查變流器內部的偵測電路
HW AC OCR	<ol style="list-style-type: none"> 1. 市電諧波成分大 2. 開關裝置無效 3. 偵測到電路功能異常 	<ol style="list-style-type: none"> 1. 檢查市電波形. 必要時變流器與電網連接處必須遠離非線性的負載 2. 檢查inverter stage開關裝置 3. 檢查變流器內部的偵測電路
HW ZC Fail	同步訊號偵測電路功能異常	檢查變流器內部同步訊號的偵測電路
DC Current High	<ol style="list-style-type: none"> 1. Boost開關裝置無效 2. Boost驅動電路無效 3. 輸入電流偵測電路功能異常 	<ol style="list-style-type: none"> 1. 檢查boost全部開關裝置 2. 檢查變流器內部的boost驅動電路 3. 檢查輸入電流偵測電路

表 7-3 故障資訊

8. 卸載

如需要將變流器卸載，請務必遵守以下規範與程序。

警告！



為了避免人員受傷，請遵守以下程序：

- 切斷AC斷路器，解除與市電端之連接。
- 將DC切換開關轉至OFF。
- 切斷太陽能板斷路器，解除變流器和太陽能板之連接。
- 使用適合之電壓量測儀錶(voltmeter)，確認AC電源與DC電源已完全斷除。
- 拔除與市電連接之AC端纜線。
- 拔除與太陽能板連接之DC端纜線。
- 拔除所有通訊連接RS-485模組。

完成後上述步驟可將變流器卸下。

9. 技術資料

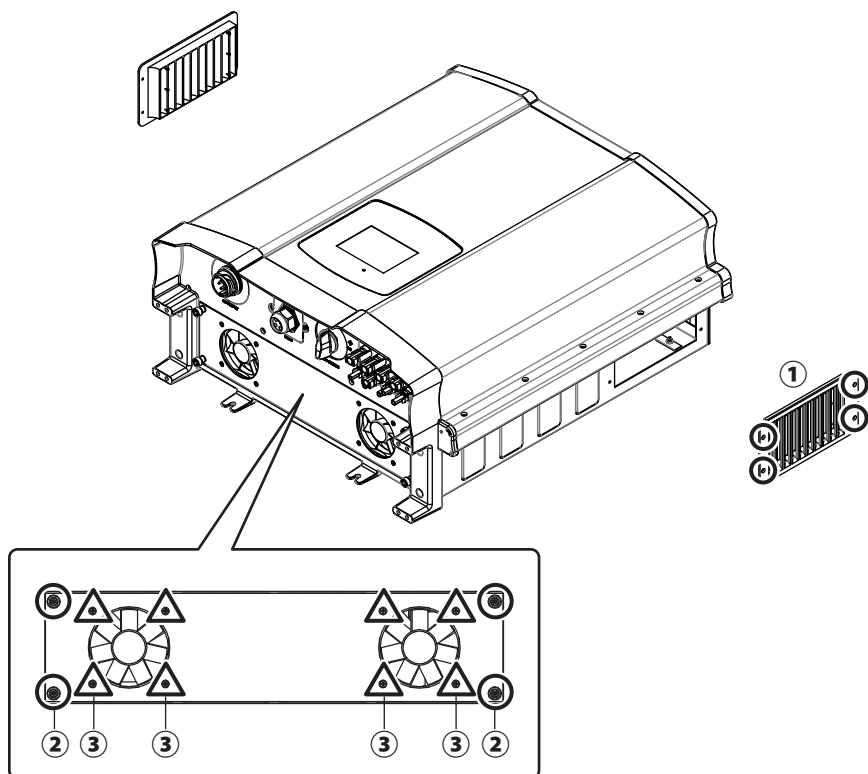
	RPI-M15A	RPI-M20A
一般規格		
外殼	Powder coated aluminum	
操作溫度	-25~60°C, full power up to 40°C	
操作高度	2000m	
相對濕度	0 – 100% non condensing.	
環境類別	Outdoor, wet locations	
防護等級	IP65 (Electronics)	
污染等級	3	
過電壓類別	AC output :III, DC Input :II	
回饋至array電流最大值	0	
電氣隔離	NO	
安全性等級	Class I metal enclosure with protective earth	
重量	43kg	
尺寸(W*H*D)	612 × 625 × 278mm	
連接器	Weather resistant connectors	
直流側(Solar side)		
最大輸入功率	16.5kW	22kW
太陽能板功率建議範圍	14kW – 19kW	18kW – 25kW
標稱電壓	635Vdc	
操作電壓	200Vdc – 1000 Vdc	
初始電壓	> 250 Vdc	
初始功率	40W	
MPP 追蹤	Parallel inputs: 1 MPP tracker Separate inputs: 2 MPP trackers	
絕對最大電壓	1000V	

	RPI-M15A	RPI-M20A
MPP電壓追蹤範圍		
平衡輸入(50/50)	355-820Vdc	470-820Vdc
非平衡輸入(67)	475-820Vdc	635-820Vdc
非平衡輸入(33)	235-820Vdc	310-820Vdc
直流側(Solar side)		
輸入數目	4 pairs MC4	
額定電流	22A * 2	
各MPPT最大短路電流 (Isc)	24A	
市電側(GRID SIDE)		
標稱功率	15kVA	20kVA
最大功率	15.75kVA	21kVA
電壓	3Ph, 220/380Vac, 230/400Vac	
標稱電流	22A	29A
最大電流	24A	32A
浪湧電流	150A/100 μ s	
最大輸出故障電流 (rms)	33.6A	51.2A
最大輸出過流保護	28.8A	38.4A
頻率	Rated 50/60Hz (Programmable 45Hz - 65Hz)	
總諧波失真	< 3 %	
功率因數	> 0.99 @ full power Adjustable: 0.80 leading – 0.80 lagging	
DC 電流注入	<0.5% rated current	
夜間功率損耗	< 2W	
最大效率	98.3 %	98.4 %
歐洲效率	97.9 %	98.1 %
AC 介面	3 Ph + N + PE; 3-phase AC plug that meets IP67 and specifications in table 4-2.	

		RPI-M15A	RPI-M20A
介面與通訊			
使用者介面		Black-on-white character type LCD display	
		365 days data logger and real time clock	
		30 events record	
外部通訊		2 RS-485 connections	
認證			
CE conformity		Yes	
Grid interface		VDE0126-1-1, VDE-AR-N 4105, RD1699, CEI 0-21	
Emission		EN 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	
Electrical safety		IEC 62109-1/ -2	
雜項			
Cooling		Fan, 2pcs	
Enclosure		Mounting bracket	
		Aluminum with powder coating	

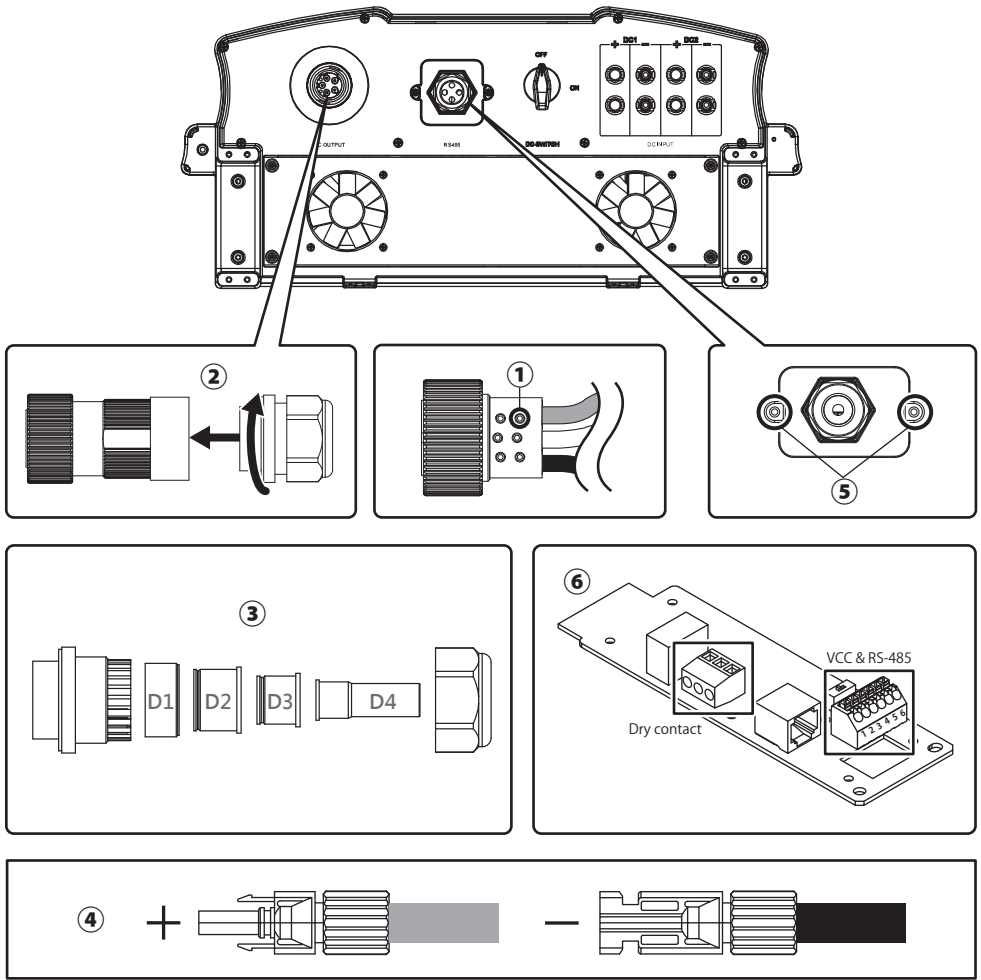
表9-1 RPI-M15A / M20A規格

10.組裝說明



NO	位置	螺絲扭力
1	Air inlet	8 Kgf-cm (0.8N-m)
2	Fan panel	8 Kgf-cm (0.8N-m)
3	Fans	8 Kgf-cm (0.8N-m)

表10-1 組裝說明-1



NO	位置	螺絲扭力	導體橫截面
1	AC wire	7 Kgf-cm (0.7N-m)	10~8AWG (6mm ²)
2	AC plug	55 ~ 75 kgf-cm (5.4 ~ 7.4N-m)	--
3	Rubber rings	D1 / D2 / D3: 133 ~ 204 Kgf-cm (13 ~ 20N-m) D4: 92 ~ 133 Kgf-cm (9 ~ 13N-m)	--
4	MC4 wire	--	12~10AWG (4~6mm ²)
5	Communication cover	8 Kgf-cm (0.8N-m)	--
6	Communication module	--	20 AWG (0.5mm ²)

表10-2 組裝說明-2



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