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Grid-tie Transformerless Solar Inverter

RPI M30A_120 / M30A_121

Operation and Installation Manual

English 1

简体中文 81

繁體中文 161

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Table of Contents

- 1 General Information 09**
 - 1.1 About this Manual 09
 - 1.2 Product Description 09
 - 1.3 Additional Information 09
- 2 Product Overview 10**
 - 2.1 Unpack the Inverter 10
 - 2.2 Checking Unit and Accessories 10
 - 2.3 Product Label 13
 - 2.4 Exterior Objects 14
- 3 Installation 16**
- 4 Wiring 20**
 - 4.1 Preparation Before Wiring (M30A_120) 20
 - 4.2 Preparation Before Wiring (M30A_121) 24
 - 4.3 AC Grid Connection: 3-Phase+PE or 3-Phase+N+PE 30
 - 4.3.1 Required Protective Devices and Cable Cross-sections 30
 - 4.3.2 Permitted earthing systems 34
 - 4.4 DC Connection from PV Array 35
 - 4.5 Multiple Inverter Combinations 36
 - 4.5.1 Three-Phase Parallel Combination System 36
 - 4.5.2 Communication Module Connections 36
 - 4.5.3 RS-485 Connection 37
 - 4.5.4 EPO Function & Digital Input & DRMs 38
 - 4.5.5 Dry Contact Connection 40
- 5 Turn On PV Inverter 41**
 - 5.1 LCD Flow Chart 41
 - 5.2 First startup 42
 - 5.2.1 Home Page 43
 - 5.2.2 Power Meter 43
 - 5.2.3 Energy Log 44
 - 5.2.4 Event Log 44
 - 5.2.5 Inverter Information 45
 - 5.2.6 General Settings 46
 - 5.2.7 Install Settings 47
 - 5.2.7.1 Inverter ID 47
 - 5.2.7.2 Insulation 48
 - 5.2.7.3 Country 48
 - 5.2.7.4 Grid Settings 49
 - 5.2.7.5 Dry Contact 50

5.2.7.6	PID	51
5.2.7.7	EPO	51
5.2.7.8	AC connection	51
5.2.7.9	Max. Power	51
5.2.8	Active / Reactive power	52
5.2.8.1	Power Limit	52
5.2.8.2	Power vs. Frequency	52
5.2.8.3	P(V)	53
5.2.8.4	Constant cosphi	54
5.2.8.5	Cosphi (P)	54
5.2.8.6	Constant Q	55
5.2.8.7	Q(V)	55
5.2.9	FRT (Fault ride through)	56
6	Maintenance	57
6.1	Replace Surge Protection Device (SPD)	57
6.2	Replace Internal String Fuse	60
6.3	Clean Fan	61
6.4	Replace Fan	62
6.5	Clean Air Inlets	62
7	Error message and Trouble Shooting	63
8	De-Commissioning	69
9	Technical Data	70
APPENDIX		78
	Appendix A: I-V curve limitation	78
	Appendix B: Assembly Note	79

Figure

- Figure 1-1 : Solar system operation illustration 09
- Figure 2-1 : Unpack the inverter 10
- Figure 2-2 : Packing list of M30A_120 11
- Figure 2-3 : Packing list of M30A_121 12
- Figure 2-4 : Product label 13
- Figure 2-5 : Inverter's exterior objects 14
- Figure 2-6 : Input / output interface 15
- Figure 3-1 : Mounting bracket dimension 16
- Figure 3-2 : Recommended installation 17
- Figure 3-3 : Screw the mounting bracket 18
- Figure 3-4 : Attach to the bracket and fasten with screws 18
- Figure 3-5 : Proper installation gap 19
- Figure 3-6 : M30A Air flow 19
- Figure 4-1 : Floating string with separate connection 21
- Figure 4-2 : Force M30A_120 operate in parallel mode 21
- Figure 4-3 : Minus grounding of M30A_120 with fuse 22
- Figure 4-4 : Plus grounding of M30A_120 with fuse 23
- Figure 4-5 : Floating string of M30A_121 24
- Figure 4-6 : Plus or minus grounding wiring of M30A_121 25
- Figure 4-7 : Wrong connection – 1 26
- Figure 4-8 : Wrong connection – 2 27
- Figure 4-9 : Wrong connection – 3 28
- Figure 4-10 : Wrong connection – 4 29
- Figure 4-11 : Striping the wires 31
- Figure 4-12 : Cord end terminal 31
- Figure 4-13 : Bi-metal sleeves 32
- Figure 4-14 : AC plug illustration for M30A 33
- Figure 4-15 : The rubber rings of AC plug 33
- Figure 4-16 : DC Wiring illustration 35
- Figure 4-17 : Three-phase parallel combinations 36
- Figure 4-18 : Communication module 36
- Figure 4-19 : Multi-inverter connection illustration 37
- Figure 4-20 : EPO functions 38
- Figure 4-21 : EPO & Digital input & DRMs parallel connection 39
- Figure 4-22 : Dry contact port & Assignments 40
- Figure 5-1 : Panel indicator 41
- Figure 5-2 : Country and language settings for first startup 42
- Figure 5-3 : Home page 43
- Figure 5-4 : Power meter page 43

Figure 5-5 : Energy log Page	44
Figure 5-6 : Event log Page	44
Figure 5-7 : Inverter information page	45
Figure 5-8 : General settings page	46
Figure 5-9 : Install settings page	47
Figure 5-10 : Inverter ID page	47
Figure 5-11 : Insulation page	48
Figure 5-12 : Country page	48
Figure 5-13 : Grid Settings page	49
Figure 5-14 : Dry Contact page	50
Figure 5-15 : PID function settings	51
Figure 5-16 : EPO page	51
Figure 5-17 : AC connection	51
Figure 5-18 : Max. Power page	51
Figure 5-19 : Active / Reactive power page	52
Figure 5-20 : Power Limit page	52
Figure 5-21 : Power vs Frequency page	52
Figure 5-22 : Power vs Frequency parameters	53
Figure 5-23 : P(V) page	53
Figure 5-24 : Constant cosphi page	54
Figure 5-25 : Cosphi (P) page	54
Figure 5-26 : Cosphi (P) page	54
Figure 5-27 : Constant Q parameters	55
Figure 5-28 : Q(V) page	55
Figure 5-29 : Q(V) parameters	56
Figure 5-30 : FRT page	56
Figure 5-31 : FRT Parameters	56
Figure 6-1 : Remove / Reassemble front cover	58
Figure 6-2 : Recognize the connectors	58
Figure 6-3 : Loosen the 6 screws	59
Figure 6-4 : Pull out the SPD unit	59
Figure 6-5 : Pull out the fuse	60
Figure 6-6 : Replace the fuse	61
Figure 6-7 : Disassembling fan panel	61
Figure 6-8 : Removal of a fan	62
Figure 6-9 : Removal of air outlets	62
Figure 9-1 : M30A Efficiency Curve	73
Figure 9-2 : M30A Thermal Derating Curve ($\cos\phi=1.0$)	74
Figure 9-3 : M30A Thermal Derating Curve ($\cos\phi=0.95$)	75
Figure 9-4 : M30A Thermal Derating Curve ($\cos\phi=0.9$)	76
Figure 9-5 : M30A Input Voltage Derating Curve	77
Appendix A : I-V curve limitation for fuse	78

Table

- Table 2-1 : Packing list of M30A_120 11
- Table 2-2 : Packing list of M30A_121 12
- Table 2-3 : Model name 13
- Table 4-1 : Maximum current rating of each DC connector 26
- Table 4-2 : Recommended upstream protection 30
- Table 4-3 : AC input cable requirement 30
- Table 4-4 : Maximum rating of input power 35
- Table 4-5 : Cable size 35
- Table 4-6 : Definition of RS-485 pin 37
- Table 4-7 : Terminal resistor setting 38
- Table 4-8 : Definition of digital input & EPO functions 38
- Table 4-9 : Definition of DRMs for Australia (AU 2015) and New Zealand (NZ 2016) 38
- Table 5-1 : LED indicator 42
- Table 5-2 : Dry Contact Trigger Setting 50
- Table 7-1 : Error Message 63
- Table 7-2 : Warning Message 64
- Table 7-3 : Fault Message 65
- Table 9-1 : Specifications for RPI M30A 70
- Appendix B-1 : Assembly Note-1 79
- Appendix B-2 : Assembly Note-2 80

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 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 of RPI M30A_120 / M30A_121 solar inverters.

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.

PID (Potential Induced Degradation) suppression function can provide longer life of PV panel.

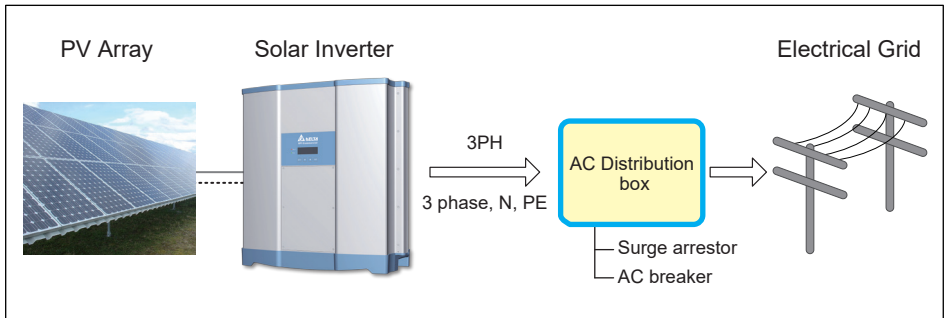


Figure 1-1 : Solar system operation illustration

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 M30A_120 / M30A_121 is shown as **Figure 2-1**.

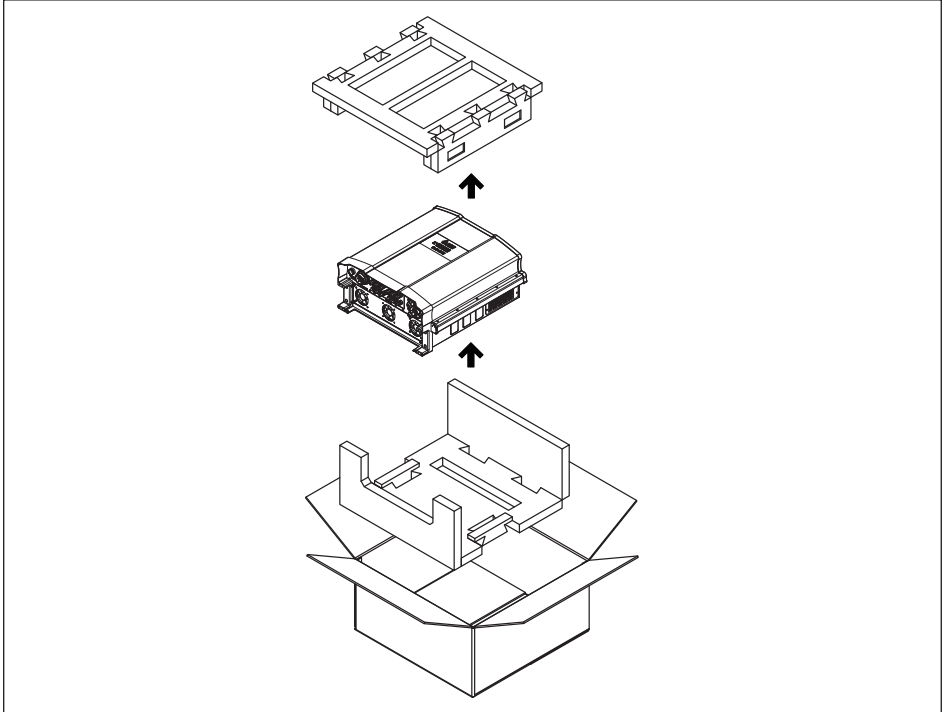


Figure 2-1 : Unpack the inverter

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 shown in following tables and figures:

For RPI M30A_120, Please refer to **Figure 2-2** and **Table 2-1**.

For RPI M30A_121, Please refer to **Figure 2-3** and **Table 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/accessories or any damage to the packaging, please contact your inverter supplier.

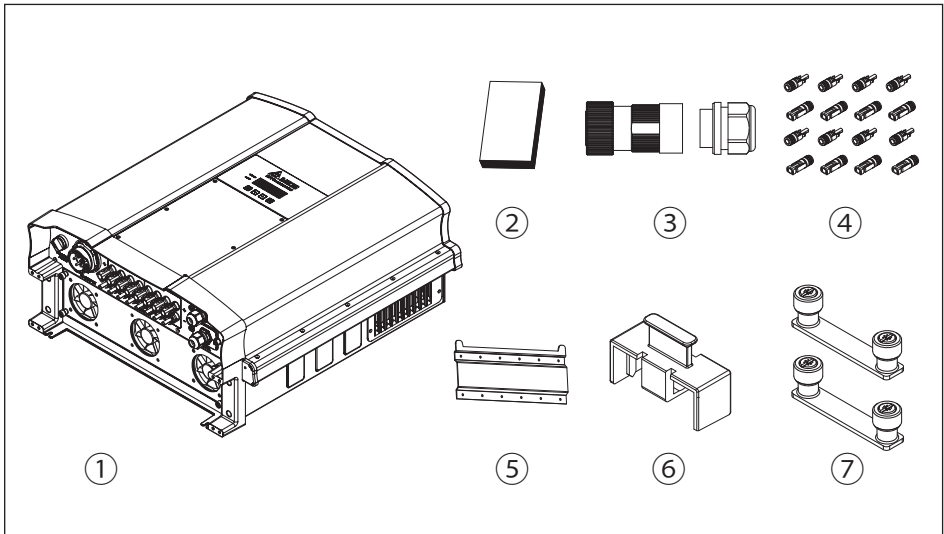


Figure 2-2 : Packing list of M30A_120

RPI M30A_120			
	Object	Qty	Description
1	PV Inverter	1 pc	RPI series solar inverter
2	User Manual	1 pc	The Instruction to provide the information of safety, Installation, specification, etc.
3	AC Plug	1 pc	Connector for AC connection
4	DC Plug	8 sets	Connector for DC connection
5	Mounting Bracket	1 pc	Wall mounting bracket to mount the solar inverter on the wall.
6	Holder	1 pc	Holder for Grounding Fuse
7	Bus-bar	2 pcs	Bus-bar for DC+ or DC- Parallel Connection.

Table 2-1 : Packing list of M30A_120

※These products does not provide grounding fuse. Users can choose 1000V / 1A Midget size grounding fuse if needed.

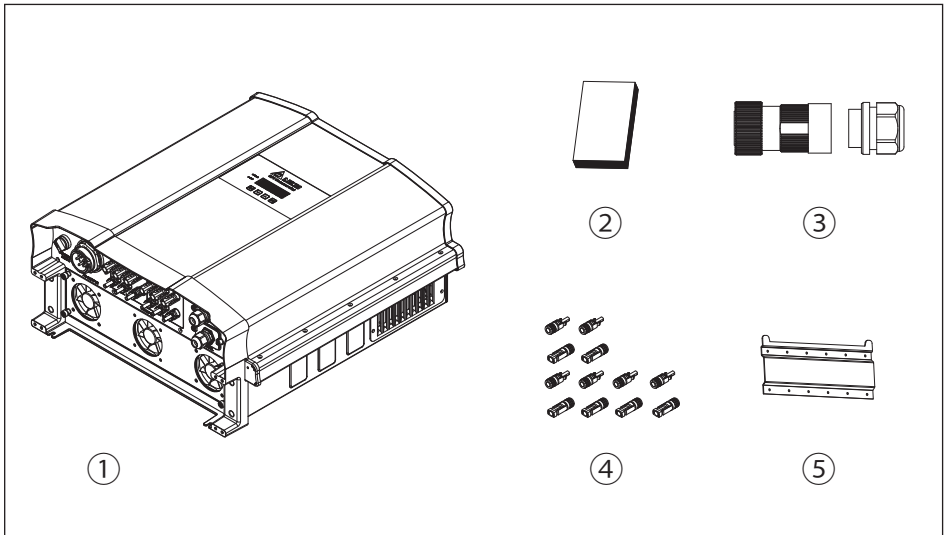


Figure 2-3 : Packing list of M30A_121

RPI M30A_121			
	Object	Qty	Description
1	PV Inverter	1 pc	RPI series solar inverter
2	User Manual	1 pc	The Instruction to provide the information of safety, Installation, specification, etc.
3	AC Plug	1 pc	Connector for AC connection
4	DC Plug	6 sets	Connector for DC connection
5	Mounting Bracket	1 pc	Wall mounting bracket to mount the solar inverter on the wall.

Table 2-2 : Packing list of M30A_121

2.3 Product Label

Please refer to **Figure 2-4** for the location of product label. You can identify the model number and the specifications by the information on the label.

RPI M30A_120 / M30A_121 series have 2 models. The differences between them are having surge protection devices (SPD) and internal strings fuse or not.

For more detail information, please see the **Table 2-3**.

Model Name	Part Number	SPD	Internal Fuse
RPI M30A_120	RPI303FA0E1000	✓	✓
RPI M30A_121	RPI303FA0E1100	X	X

Table 2-3 : Model name

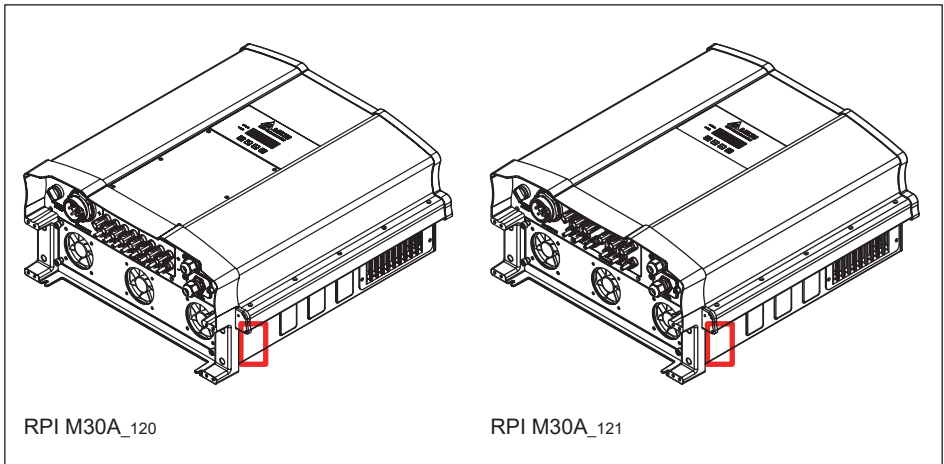


Figure 2-4 : Product label

2.4 Exterior Objects

The Inverter's exterior objects are shown in **Figure 2-5**. The detailed input / output interfaces illustration is shown in **Figure 2-6**. Different models have different number of DC input strings.

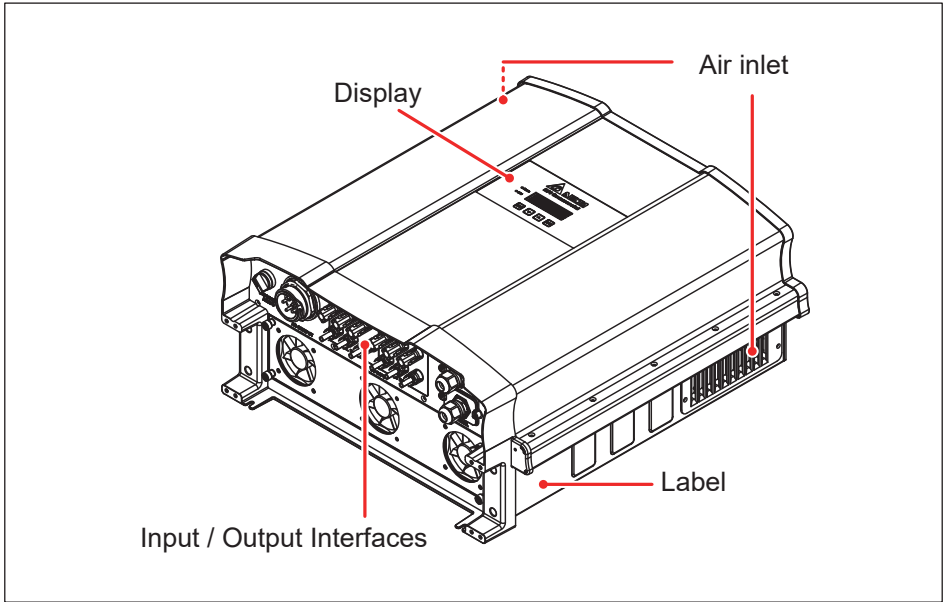


Figure 2-5 : Inverter's exterior objects

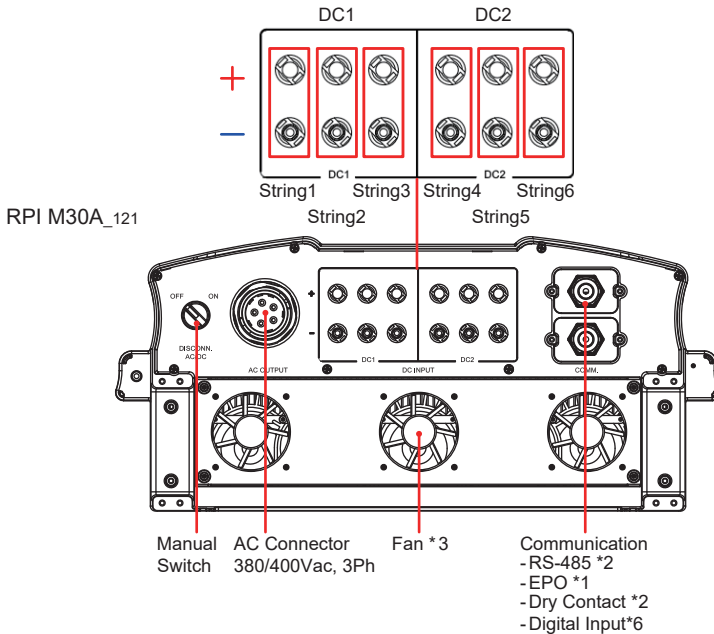
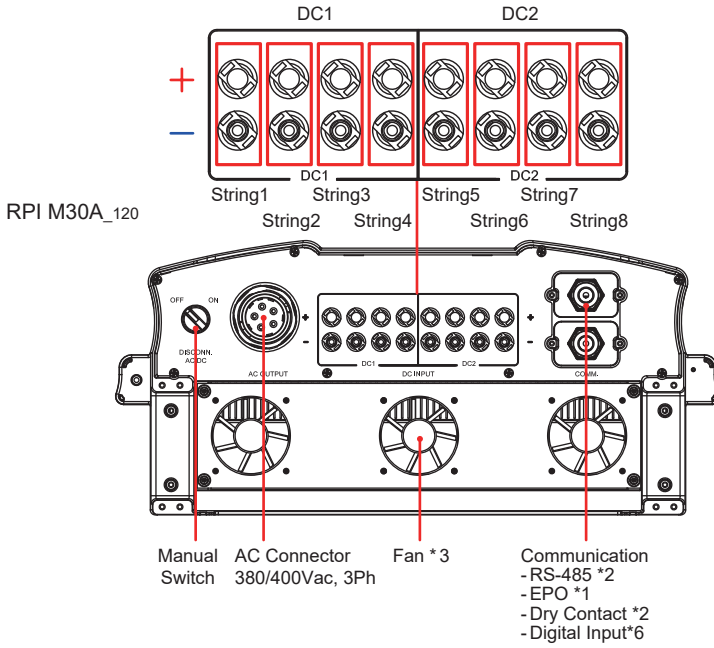


Figure 2-6 : Input / output interface

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.

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**.
 * Upper 6 screws must be locked at least.
2. Attach the inverter to the mounting bracket.
3. Fix the inverter with 2 M6 Phillips head screws.
 Please refer to **Figure 3-4**.

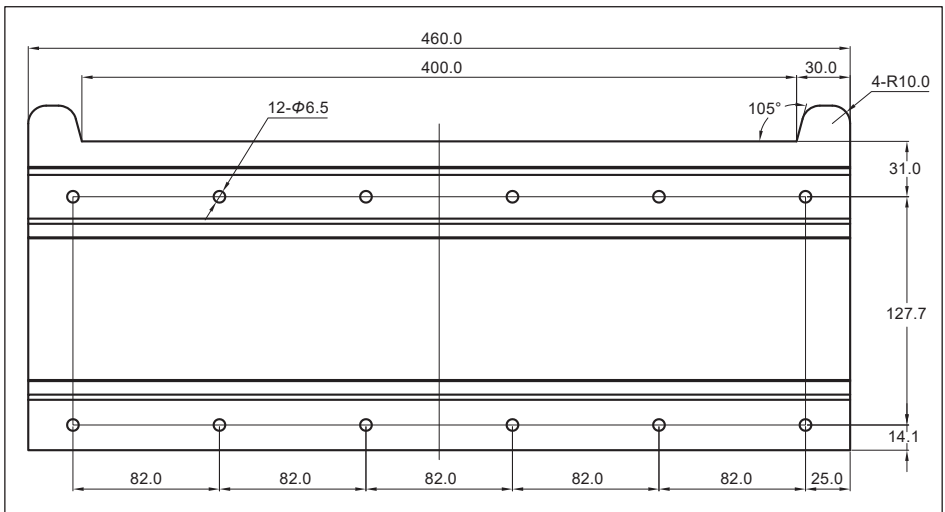


Figure 3-1 : Mounting bracket dimension

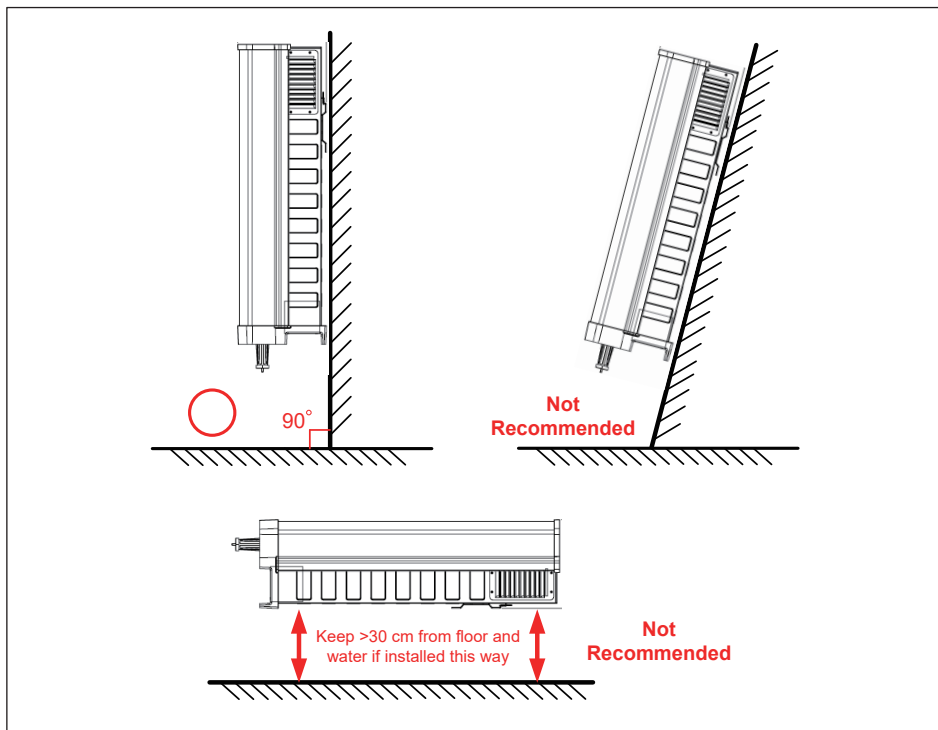


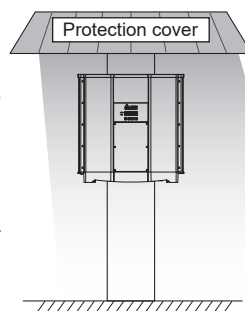
Figure 3-2 : Recommended installation

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.



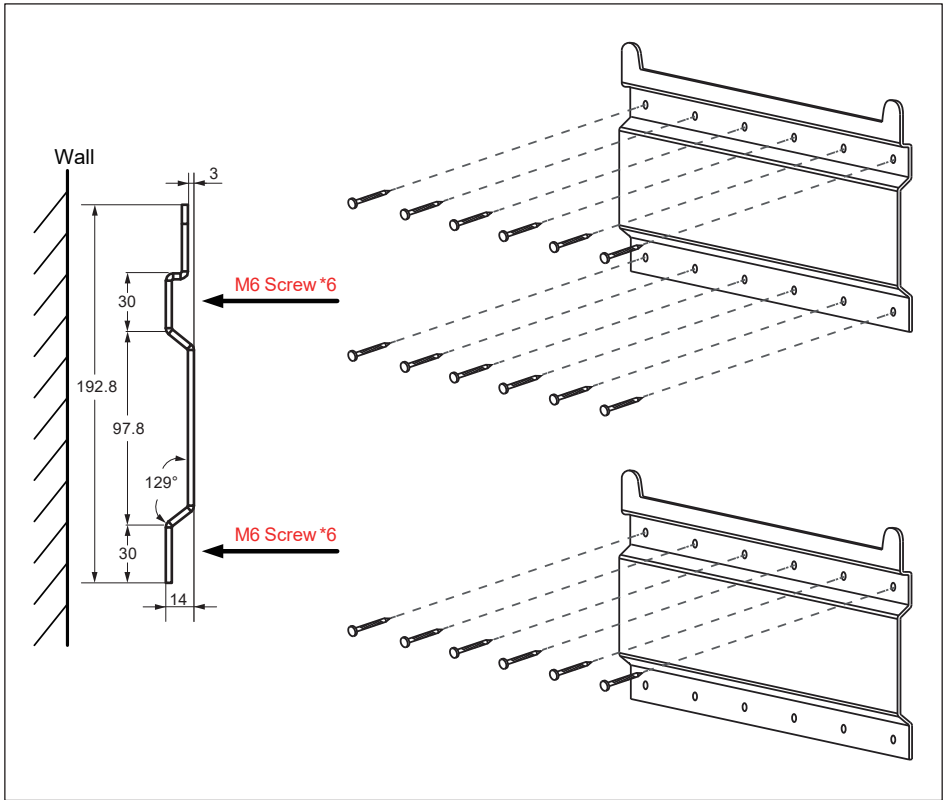


Figure 3-3 : Screw the mounting bracket

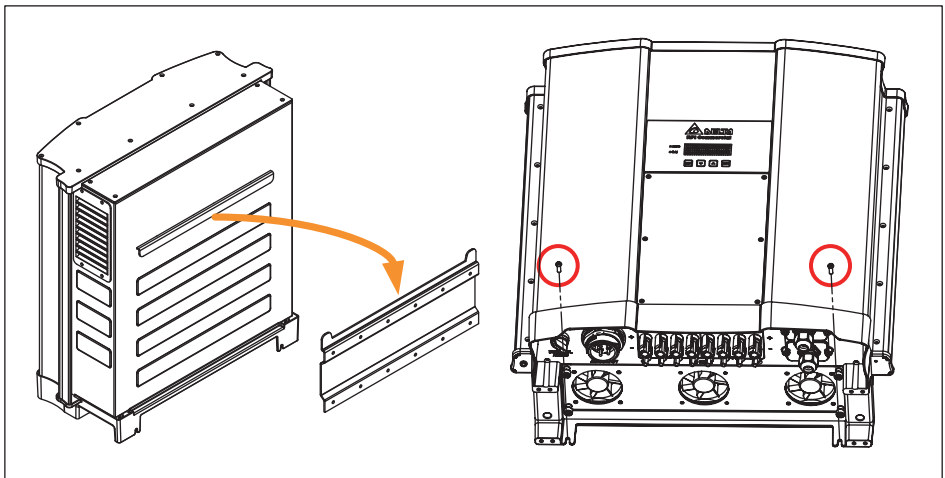


Figure 3-4 : Attach to the bracket and fasten with screws

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)

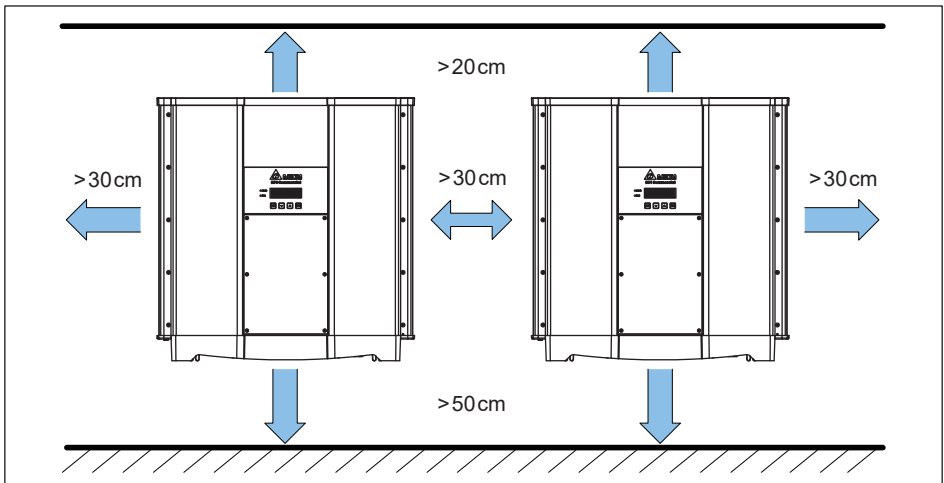


Figure 3-5 : Proper installation gap

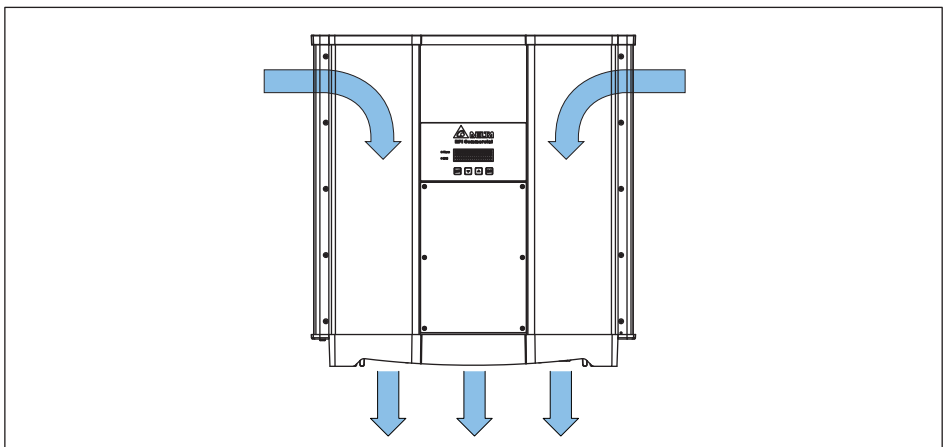


Figure 3-6 : M30A Air flow

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 (M30A_120)

- M30A_120 has 15A DC fuse in each Plus and Minus DC connector, the maximum current of each string should not exceed 10A.
- For model with fuses, PV arrays can connect to the inverter directly, but parallel connection at external DC distribution box is not recommended due to the limits of DC fuse. Please refer to **Figure 4-1** for the detail wiring illustrations.
- If you want inverter working at parallel input mode (only 1 MPPT), please install 2 bus bar kits in the inverter as shown in **Figure 4-2**. The outer wiring at DC side is same as **Figure 4-1**.
- When grounding the solar array, an isolation transformer is required because the RPI series does not have galvanic isolation between the DC-input and AC-output. In addition, Users must install a 1000V/1A midsize grounding fuse and 1 or 2 bus bar kits in the inverter. Wiring illustrations please refer to **Figure 4-3**, **Figure 4-4**.
- When solar array is grounded, the PID function can not be enabled, and the insulation has to be set to "Plus Grounded" or "Minus Grounded".
- It must keep DC and AC power off when disconnected the DC connector even if turn off the manual switch that in the button cover.
- Different DC connections type need different settings of insulation detection. Please refer to 5.2.7 Install Settings for further information.

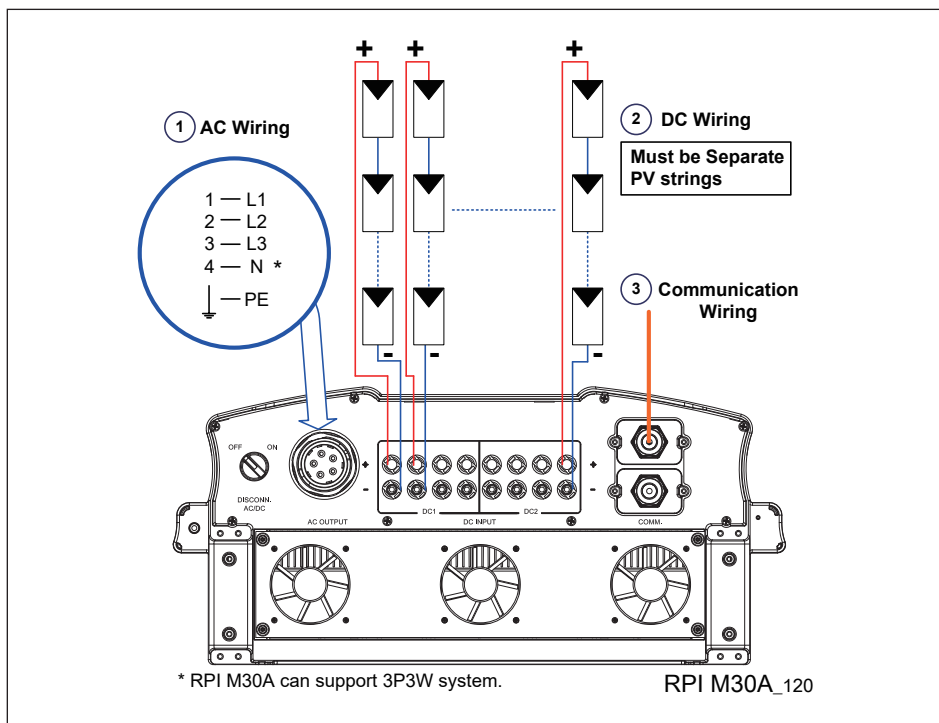


Figure 4-1 : Floating string with separate connection

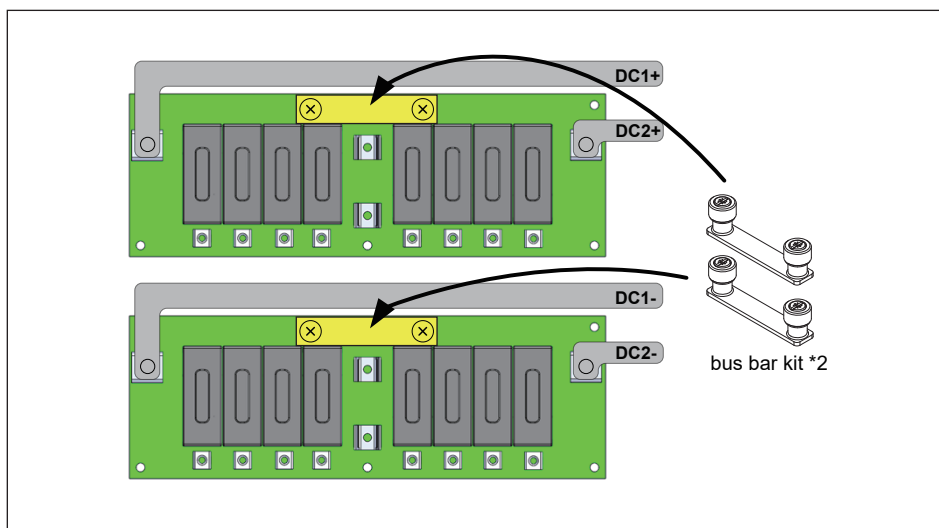


Figure 4-2 : Force M30A_120 operate in parallel mode

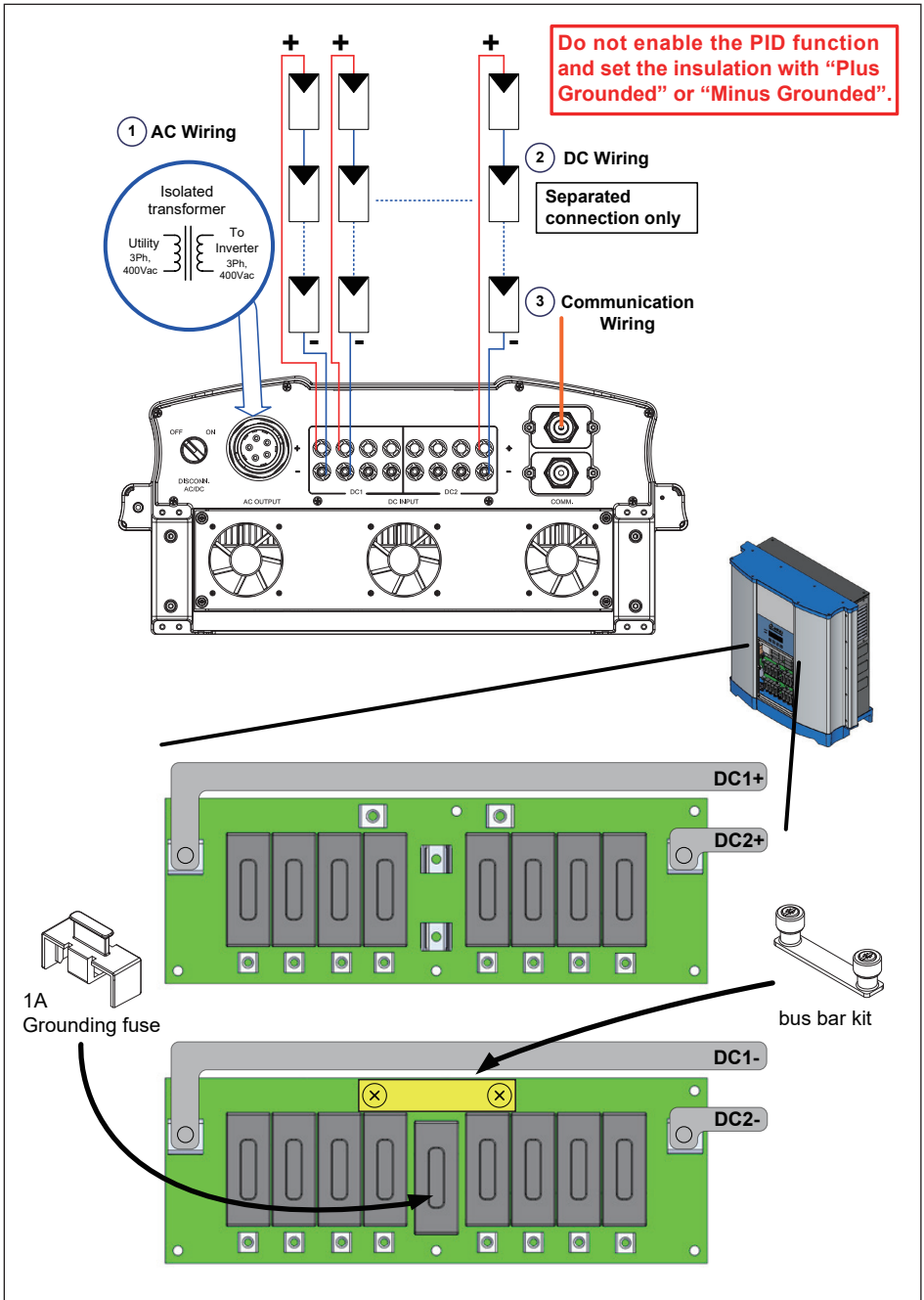


Figure 4-3 : Minus grounding of M30A_120 with fuse

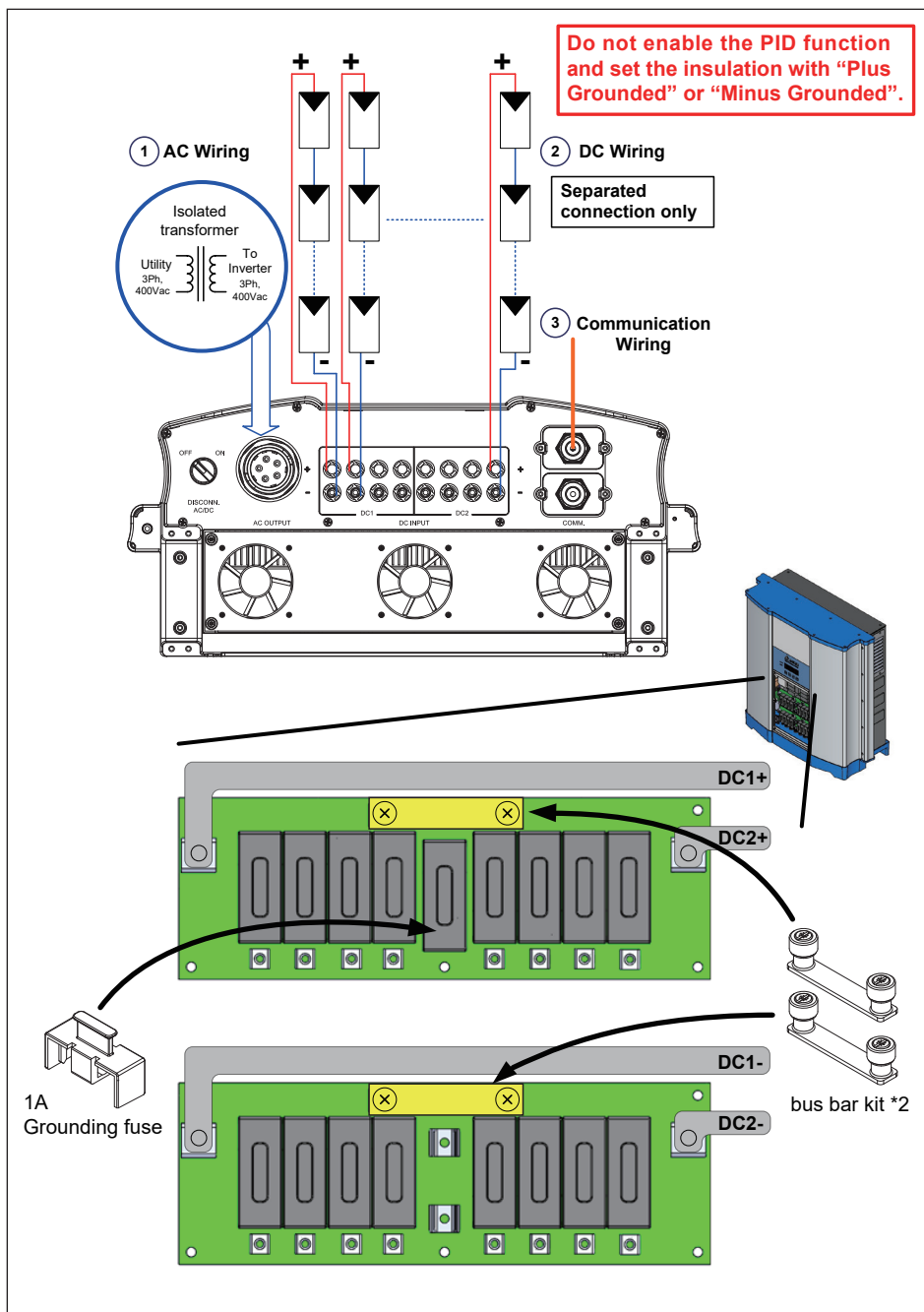


Figure 4-4 : Plus grounding of M30A_120 with fuse

4.2 Preparation Before Wiring (M30A_121)

- RPI M30A_121 does not have internal strings fuse. Each string can accept maximum current 30A. It can use one pair of DC connector for each string. (string1~6)
- 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.
- When solar array is grounded, the PID function can not be enable, and the insulation have to be setting “Plus Grounded” or “Minus Grounded”.
- Different DC connection type needs different settings of insulation detection. About setting, please refer to 5.2.7 Install Settings.

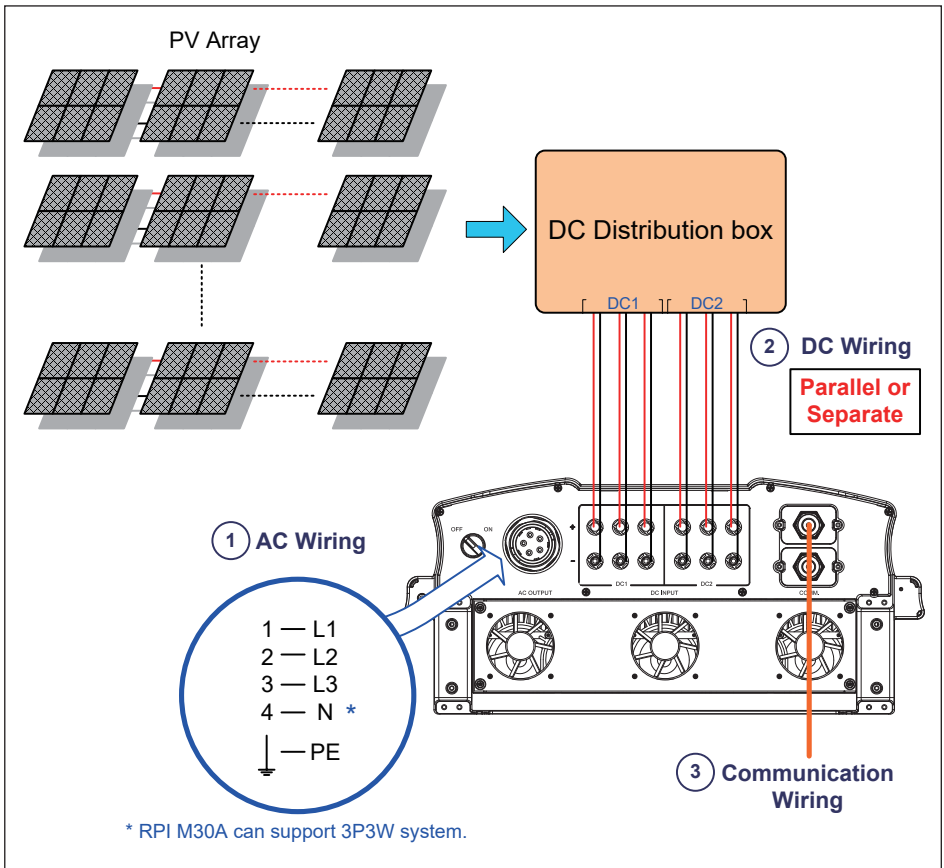


Figure 4-5 : Floating string of M30A_121

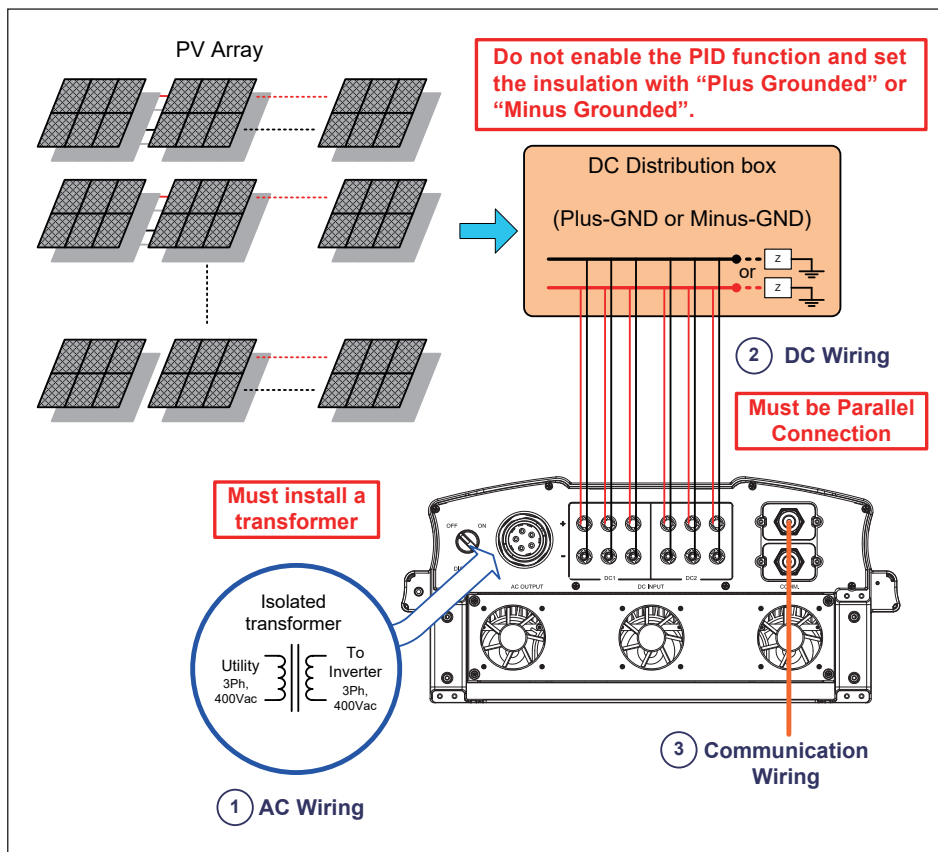


Figure 4-6 : Plus or minus grounding wiring of M30A_121

Note for Field Wiring

Due to the limitation of physical wire also the DC connector used in the inverter, the absolute maximum current of each DC connector should be always observed as following table to keep fire risk away.

Note that, the following value is provided to identified and checked the justification for field wiring instead of the DC current rating of inverter.

RPI M30A_120	16A
RPI M30A_121	39A

Table 4-1 : Maximum current rating of each DC connector

Connection with PV Combiner Box

M30A_120:

- Normally, the output current of combiner box is larger than 16A. Thus it can't be used as the following diagram (Shown as **Figure 4-7**). The max input current of each string is 7.5A.

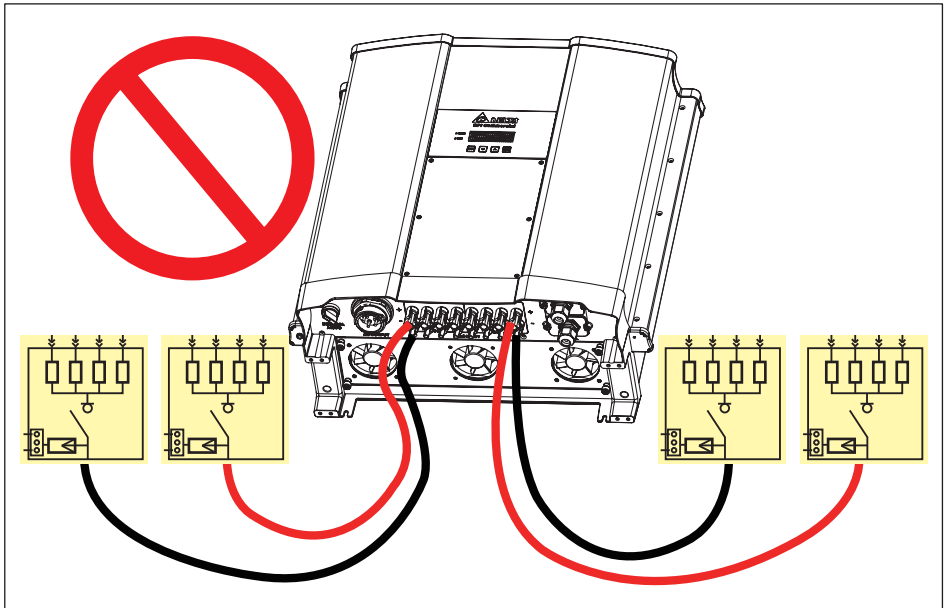


Figure 4-7 : Wrong connection – 1

M30A_120:

- Also, you can't use two or more branch to share the current from combiner box to each DC connector of inverter (Shown as **Figure 4-8**).

Because the current might not be symmetric among the branch, the current of one branch might be larger than the limitation still.

The max input current of each string is 7.5A.

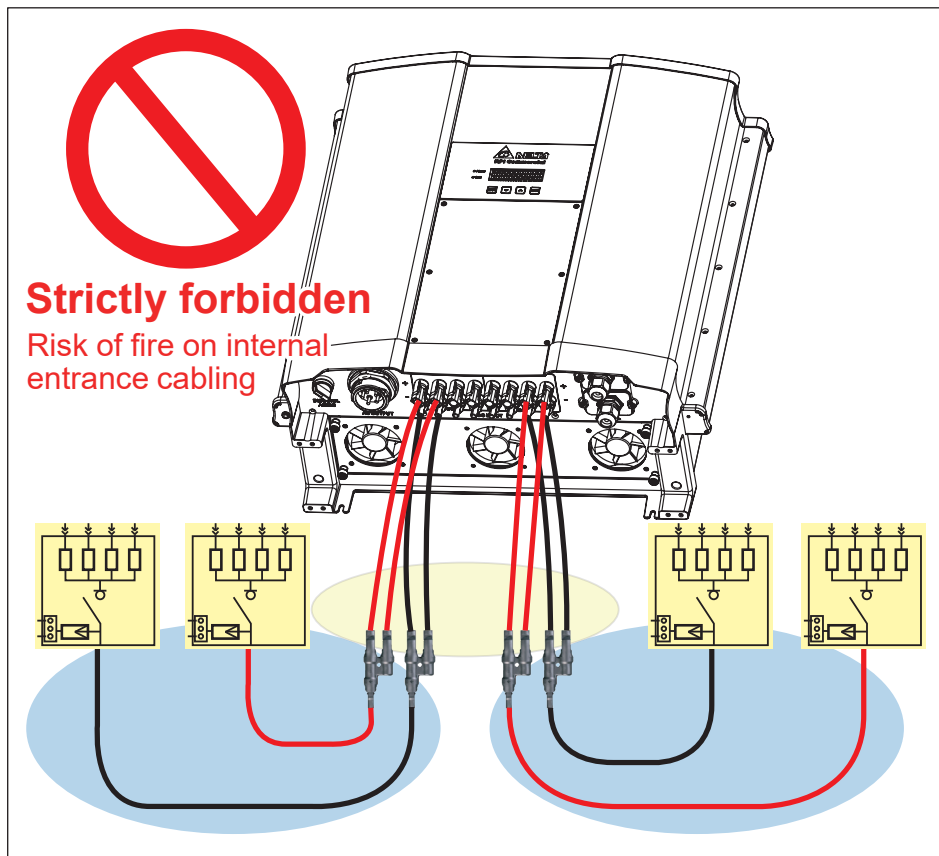


Figure 4-8 : Wrong connection – 2

M30A_120:

As **Figure 4-9** shown , the branch plug might suffer the DC current lager than its limitation. Thus it is not suitable for use.

The max input current of each string is 7.5A.

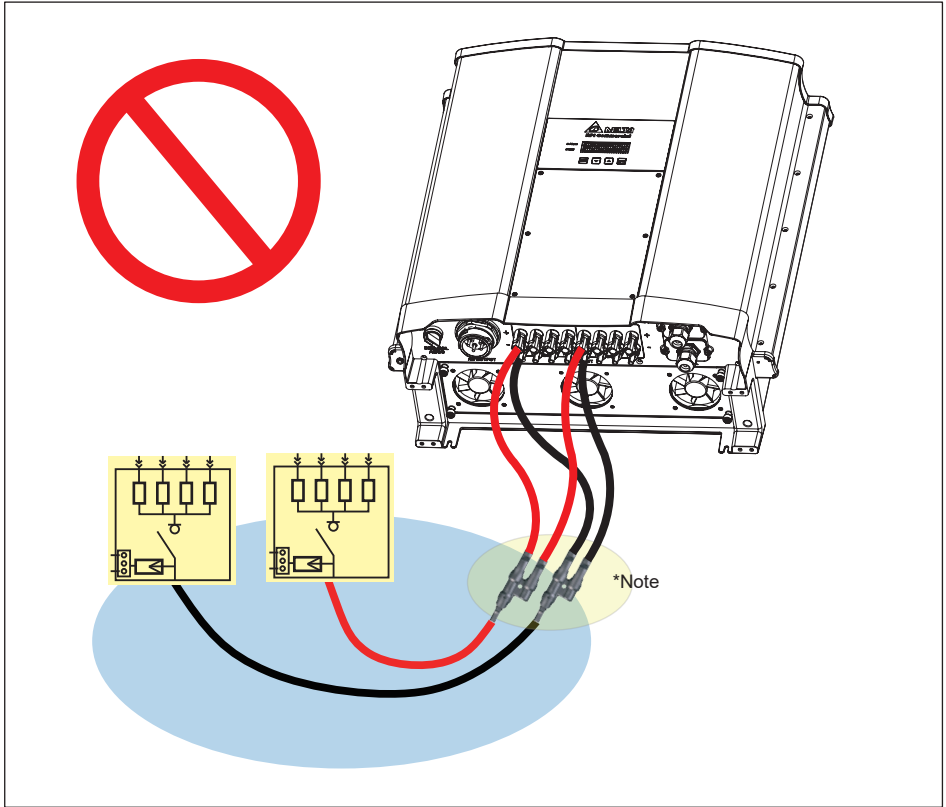


Figure 4-9 : Wrong connection – 3

M30A_120 and M30A_121:

The following diagram shown risky connection with M30A and PV combiner box. As **Figure 4-10** shown , the left pair of DC connector will suffer DC input current more than the limitation of connector or fuse. Thus it is not suitable for use.

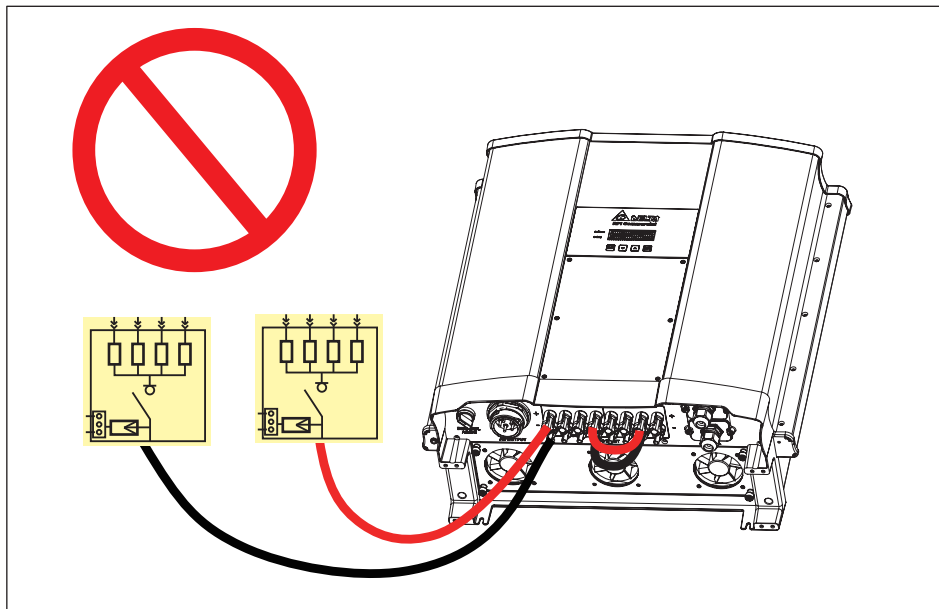


Figure 4-10 : Wrong connection – 4

4.3 AC Grid Connection: 3-Phase+PE or 3-Phase+N+PE

WARNING !



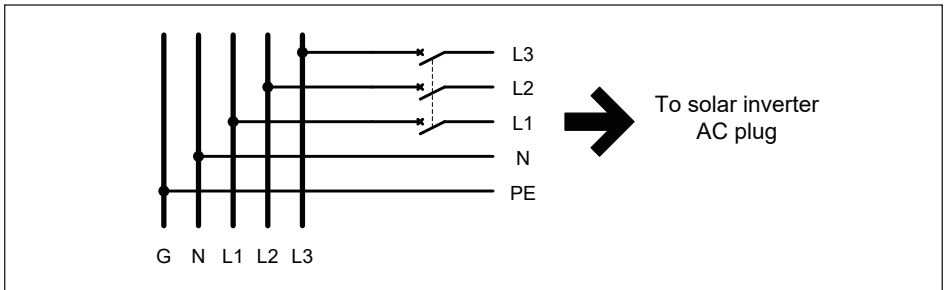
- Before commencing AC wiring, please ensure AC breaker is switched off.

4.3.1 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 M30A	60A

Table 4-2 : Recommended upstream protection



The AC cable must be jacketed and meet the specifications in **Table 4-3**. If there is any conflict between **Table 4-3**'s specification and local electrical code, please follow the electrical code.

Model	Current Rating	Wire Size	Cable size	Recommended Torque
RPI M30A	65 A	13.3-25mm ² 6-4AWG	23-31mm	2.5 N.m

Table 4-3 : AC input cable requirement

End sleeve is not able to be installed if 25mm² or 4AWG is applied.

RPI M30A support both 3P3W (3 phase and PE) and 3P4W (3 phase, 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 meet 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 wire ends for RPI M30A.

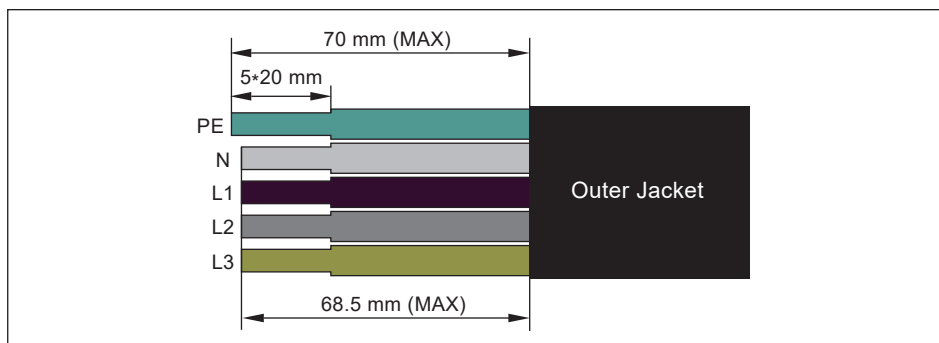


Figure 4-11 : Stripping the wires

End sleeve is not able to be installed if 25mm²(4AWG) is applied.
16mm²(6AWG) Dimensions of the recommended sleeve are indicated in Fig.

WIRE SIZE	DIMENSIONS(mm)				
	L	F	ΦC	ΦD	ΦW
16mm ² 6AWG	28	18	5.8	6.2	8.7

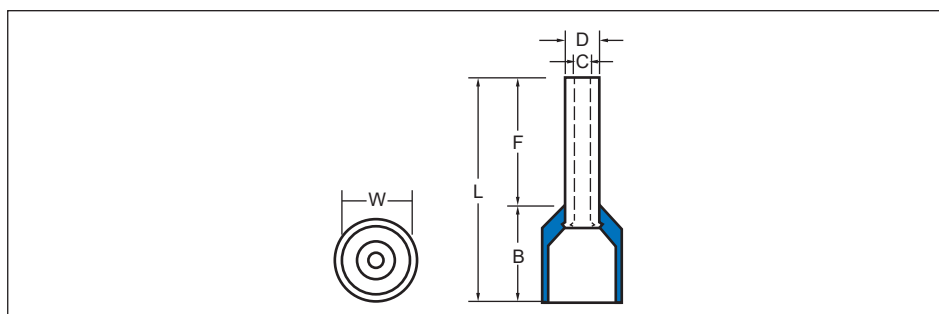


Figure 4-12 : Cord end terminal

For Cu AC wires:

Delta recommends the AC cables used should be flexible unarmored multi-strand and with suitable ampacity.

For Al AC wires:

To make sure good conductivity, bi-metal sleeves must be used in conjunction with aluminum wires. (Shown as **Figure 4-13**)

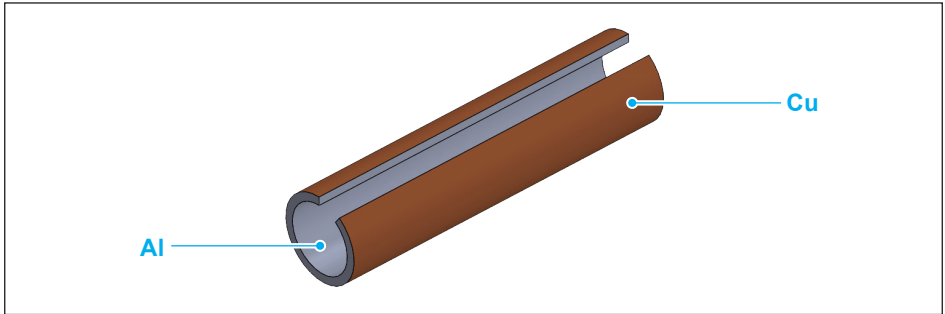


Figure 4-13 : Bi-metal sleeves

NOTICE

Extreme temperature rise at the clamping point

If the contact resistance between the aluminum conductor and clamping point is too high, the clamping point can become very hot and even catch fire in extreme cases.

To ensure a safe and reliable contact, **always** perform the following work steps:

- ▶ Use a conductor cross-section at least one number larger due to the lower current-carrying capacity.
- ▶ Keep the installation location as free as possible from moisture or corrosive atmospheres.
- ▶ Connect the aluminum cables quickly.
- ▶ Mechanically clean the stripped end of the aluminum conductor (using for instance a knife blade to scrape off the oxide layer). Then immediately dip the aluminum conductor into acid-free and alkaline-free (=neutral) Vaseline and straight away insert it into the terminal block.
- ▶ Tighten the clamping screw in the clamping body with the maximum permissible tightening torque.



Assemble the AC plug and wires as the procedures shown in **Figure 4-14** (RPI M30A). The sequence of L1~ L3 can be connected randomly. However, N and PE must be connected correctly.

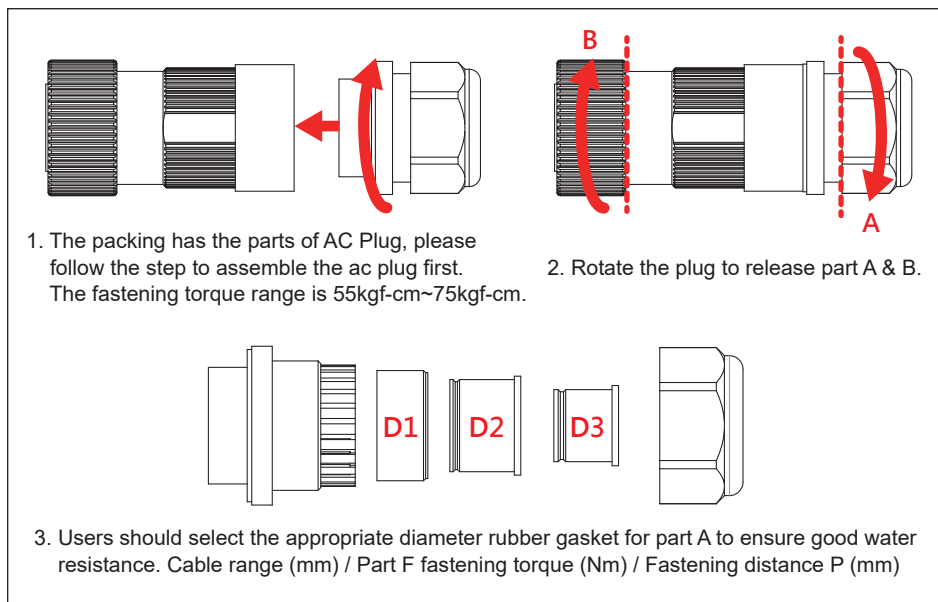


Figure 4-14 : AC plug illustration for M30A

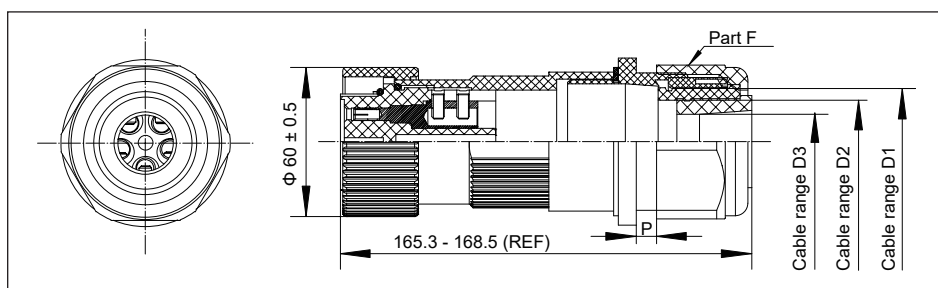


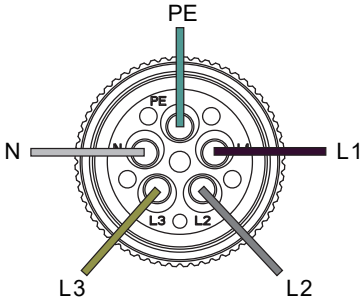
Figure 4-15 : The rubber rings of AC plug

**The connector is not designed for solid wire but only for stranded wires with end steeves.

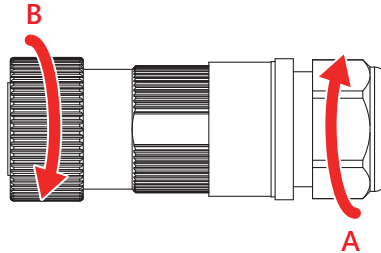
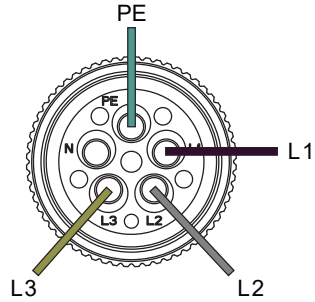
**That terminal gets a silver surface treatment.

	Cable range (mm)	Part F fastening torque (Nm)	Fastening distance 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

For 3P4W Power system :
There are 5 wires that include
(L1、L2、L3、N) + PE



For 3P3W Power system :
There are 4 wires that include
(L1、L2、L3) + PE



5. Rotate to tighten the part B first and rotate the gland (part A) to fix wires.

The AC voltage should be as followings:

3P3W

L1-L2: 400 Vac \pm 20%

L1-L3: 400 Vac \pm 20%

L2-L3: 400 Vac \pm 20%

3P4W

L1-N: 230 Vac \pm 20%

L2-N: 230 Vac \pm 20%

L3-N: 230 Vac \pm 20%

4.3.2 Permitted earthing systems

Earthing system	TN-S	TN-C	TN-C-S	TT	IT
Permitted	Yes	Yes	Yes	Yes	No



TT is not recommended. The voltage of N has to be very close to PE.
(difference <20 V_{rms})

4.4 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 connection number of PV Array, open circuit voltage and power of all strings in DC2 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:
Absolute maximum 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 4-4**.

Type of limit	RPI M30A
Maximum input power	35 kW
DC1 or DC2	23.5 kW

Table 4-4 : Maximum rating of input power

Model	Current Rating	Wire size
RPI M30A_120	DC 15A	4 - 6 mm ² / 12 - 10 AWG
RPI M30A_121	DC 30A	6 mm ² / 10 AWG

Table 4-5 : Cable size

DC wiring polarities are divided into positive and negative, which is shown in **Figure 4-16**. The connection shall be coherent with the indication marked on inverter.



Figure 4-16 : DC Wiring illustration

4.5 Multiple Inverter Combinations

4.5.1 Three-Phase Parallel Combination System

RPI M30A can be used in three-phase parallel combination system. In this application, inverter may be parallel connected to a same AC grid. Please refer to **Figure 4-17**.

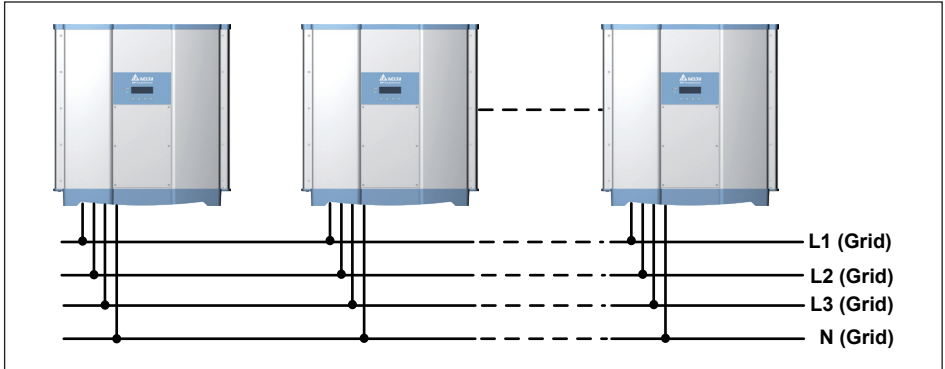


Figure 4-17 : Three-phase parallel combinations

4.5.2 Communication Module Connections

Please refer to **Figure 4-18** for the Communication Module illustration. The module provides VCC, RS-485, dry contact, EPO, Digital Input and Demand Response Modes (DRMs) terminals for different use.

** Please use cable with outer diameter lie between 20 AWG (0.5mm²) to secure the space IP65. **

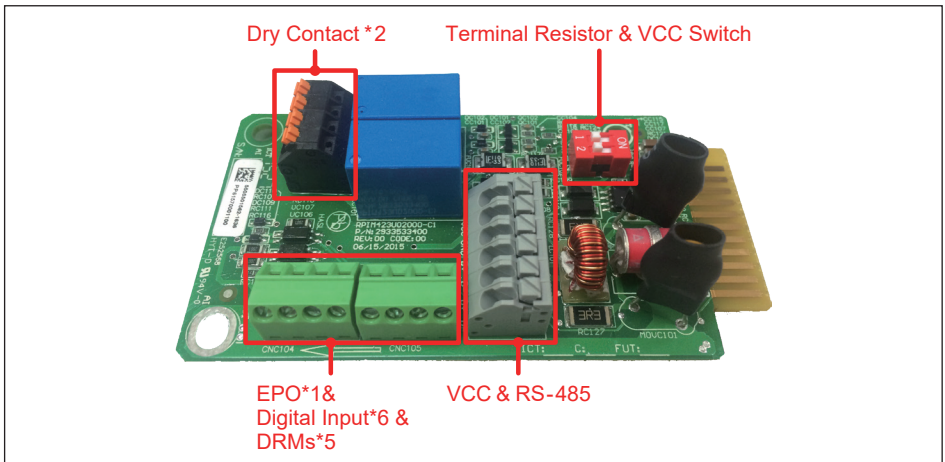


Figure 4-18 : Communication module

4.5.3 RS-485 Connection

The pin definition of RS-485 is shown in **Table 4-6**. 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 4-19**, only the last inverter's terminal resistor must be switched ON.

Please refer to **Table 4-7** for the terminal resistor setting.

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

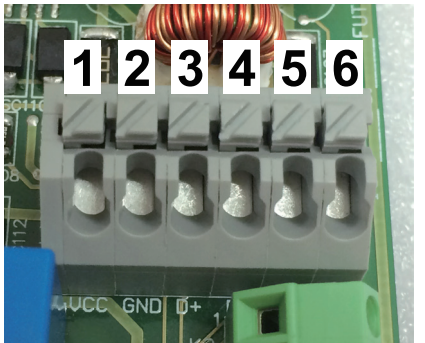


Table 4-6 : Definition of RS-485 pin

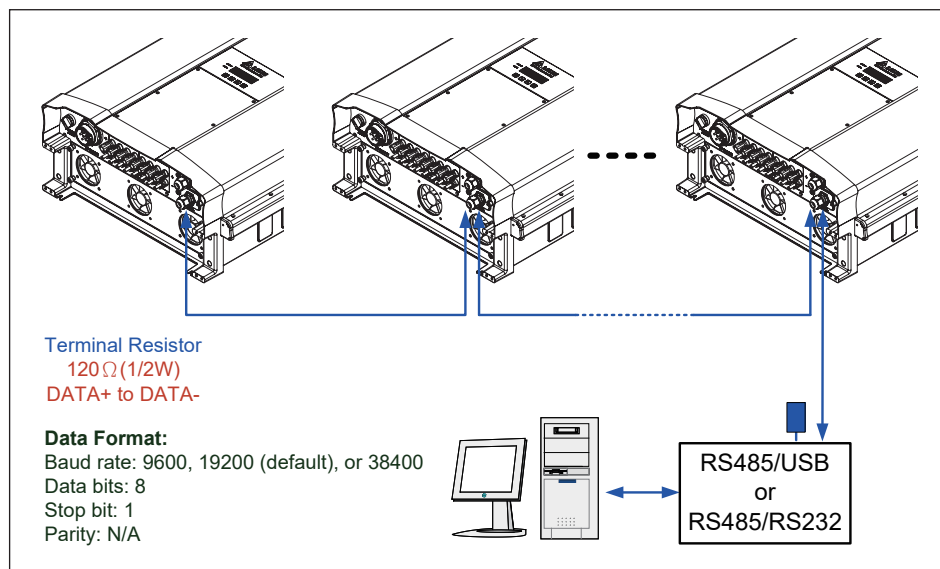


Figure 4-19 : Multi-inverter connection illustration

	Switch 1	Switch 2
ON	VCC ON	Terminal Resistor ON
OFF	VCC OFF	Terminal Resistor OFF

Table 4-7 : Terminal resistor setting

4.5.4 EPO Function & Digital Input & DRMs

Communication Module has 1 set of emergency power off function (EPO). Users can customize EPO function in Install Settings page. Please refer to section 5.2.7.7 EPO. RPI M30A also provides 6 sets of digital input function (K1~K6). Please refer to **Table 4-8** for the digital input setting. In Australia (AU 2015) and New Zealand (NZ 2015), the DRMs are also use digital input function to assert. The definition is different from normal digital input function; please refer to **Table 4-9** for the DRMs pin definitions. The suitable electric wire is 20 AWG (0.5mm²).

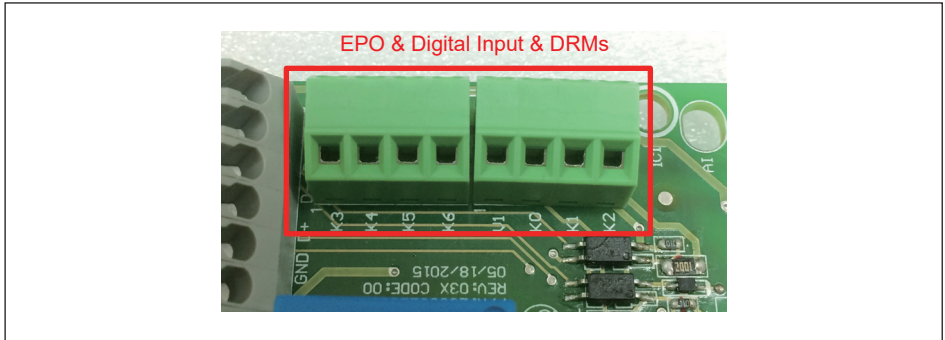


Figure 4-20 : EPO functions

Short	Inverter's action
V1 & K0	Emergency power off (EPO)
V1 & K1	0% active power
V1 & K2	Maximum 30% active power
V1 & K3	Maximum 60% active power
V1 & K4	Maximum 100% active power
V1 & K5	Reserved
V1 & K6	Reserved

Table 4-8 : Definition of digital input & EPO functions

Short	Inverter's action
V1 & K0	DRM0 (Emergency power off)
V1 & K1	DRM5 (0% active power)
V1 & K2	DRM6 (Maximum 50% active power)
V1 & K3	DRM7 (Maximum 75% active power and sink reactive power)
V1 & K4	DRM8 (Maximum 100% active power and sink reactive power)

Table 4-9 : Definition of DRMs for Australia (AU 2015) and New Zealand (NZ 2015)

EPO, digital input function and DRMs can be parallel connection in multi-inverter operation, refer to **Figure 4-21** for the connection.

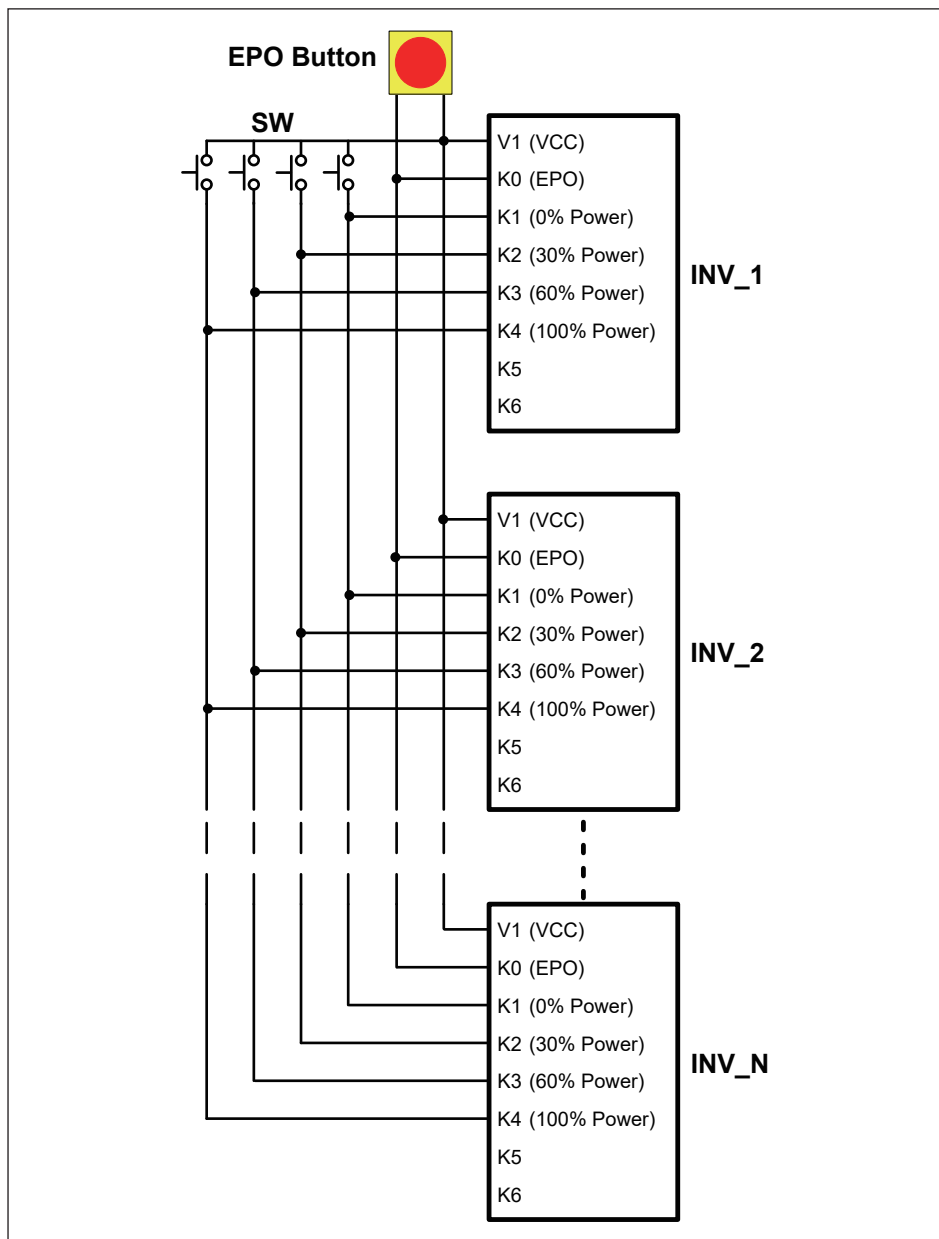


Figure 4-21 : EPO & Digital input & DRMs parallel connection

4.5.5 Dry Contact Connection

RPI M30A provide 2 sets of Dry Contact. The function can be customized by users, please refer to section **5.2.7.5 Dry Contact**.

The dry contact port can withstand with 250Vac/28Vdc/9A, and suitable electric wire is 20 AWG (0.5mm²).

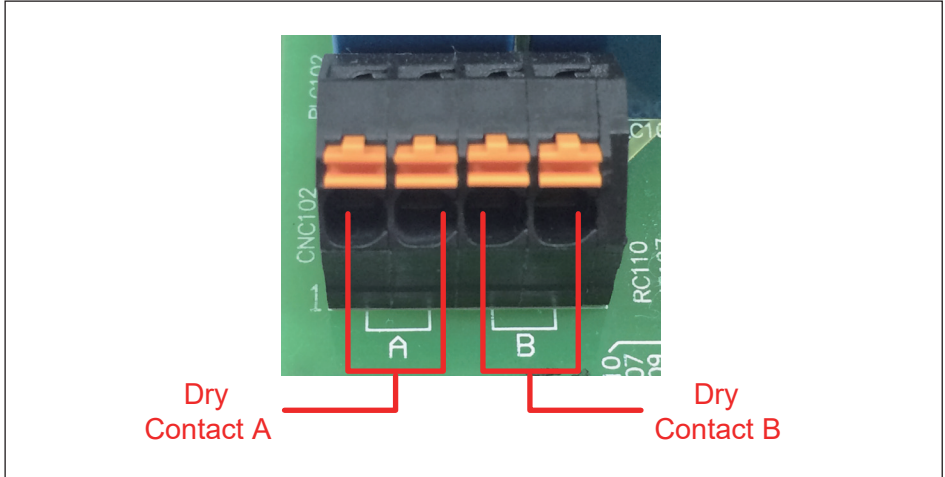


Figure 4-22 : Dry contact port & Assignments

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 M30A include a 4x20 character type LCD display and 2 LED lights to indicate inverter's status. For physical characteristics.

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

The following section will introduce the functions that can be adjusted by users through the LCD panel. When you are adjusting settings, LCD panel will change the display cursor from "▶" to "➔".

Power Meter	5.2.2
Energy Log	5.2.3
Event Log	5.2.4
Inverter Information	5.2.5
General Settings	5.2.6
Install Settings	5.2.7
Active/Reactive Power	5.2.8
FRT	5.2.9

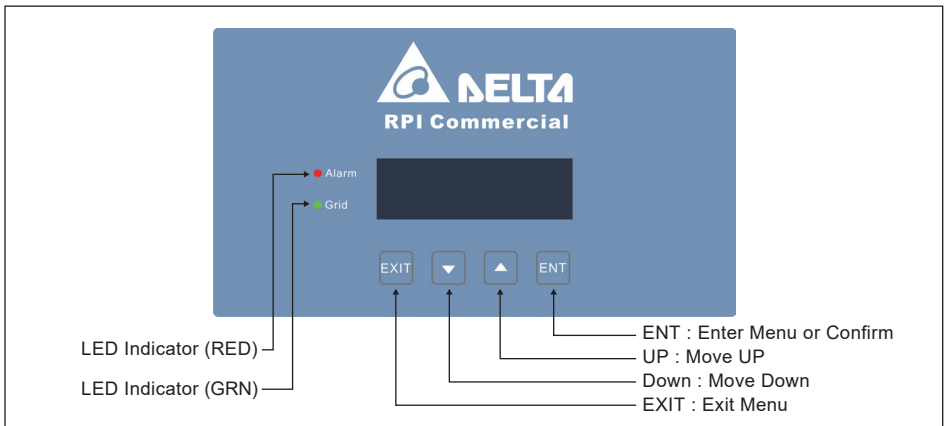


Figure 5-1 : Panel indicator

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, users have to feed in AC power and switch on the Manual Switch. Inverter will start up on AC power and LCD display panel will come 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 wait for inverter initially self-test about 2 minutes. If there is enough power generated from PV array, inverter will start to feed in power to grid.

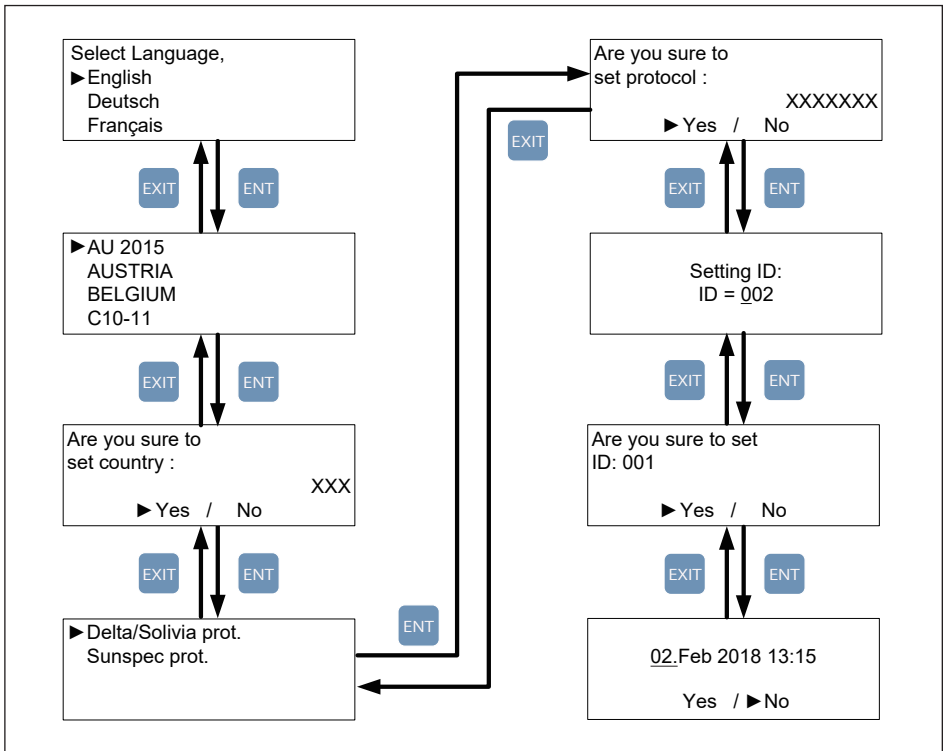


Figure 5-2 : Country and language settings for first startup

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 about output power, inverter status, E-today, date and time.

Pressing any key in home page can users enter the main menu. Press EXIT at main menu or wait 5 minutes without any operation, the display will return to homepage.

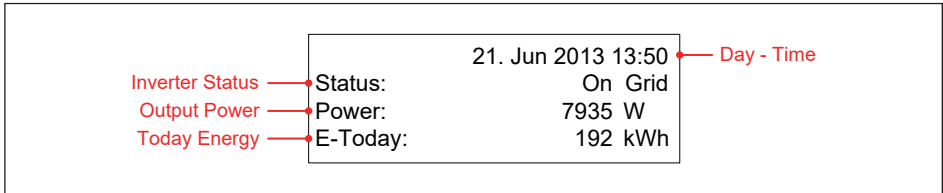


Figure 5-3 : Home page

5.2.2 Power Meter

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

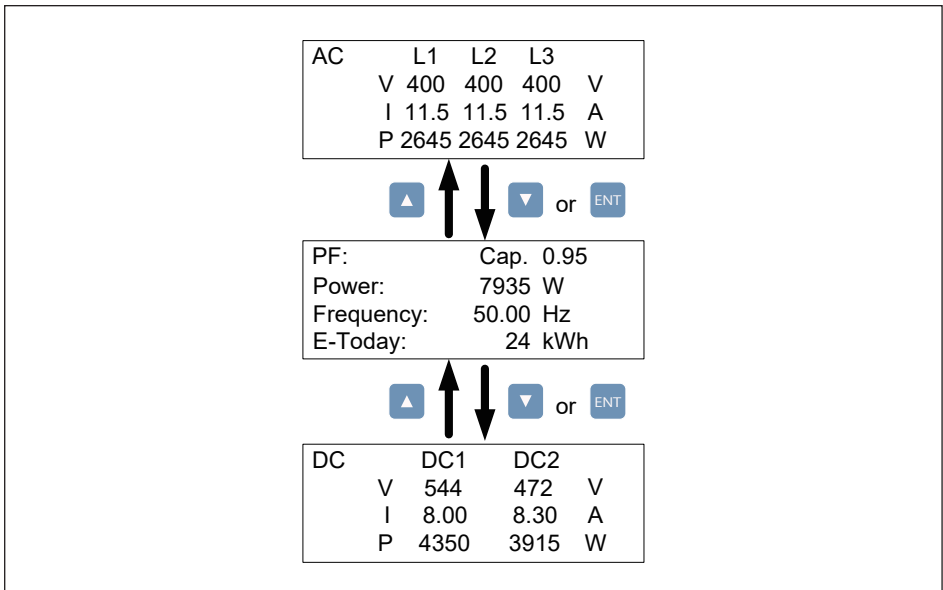


Figure 5-4 : Power meter page

5.2.3 Energy Log

User can view the inverter's life energy and life runtime via Energy Log page.

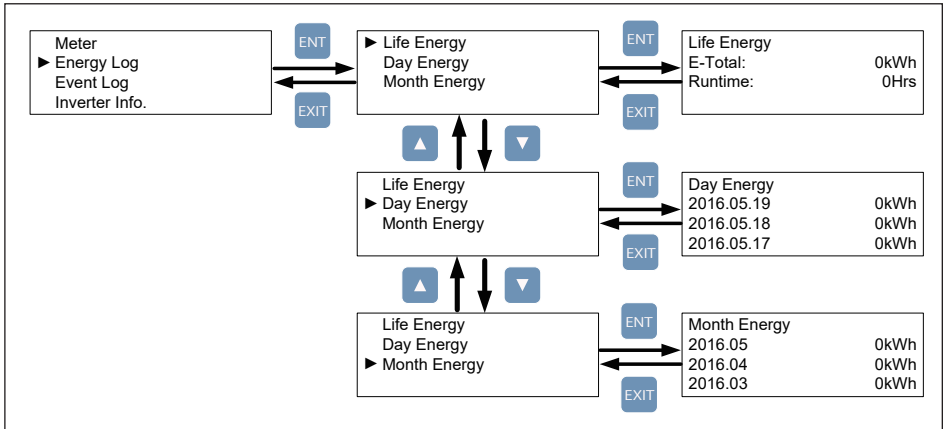


Figure 5-5 : Energy log Page

5.2.4 Event Log

Event Log has two sub-pages : Error Events page and Grid Report page. Error Events page displays all the events (Error and Fault) and it can show 30 records at a time. Grid Report page only displays the error that occurred at grid side, and it can show 5 records at a time.

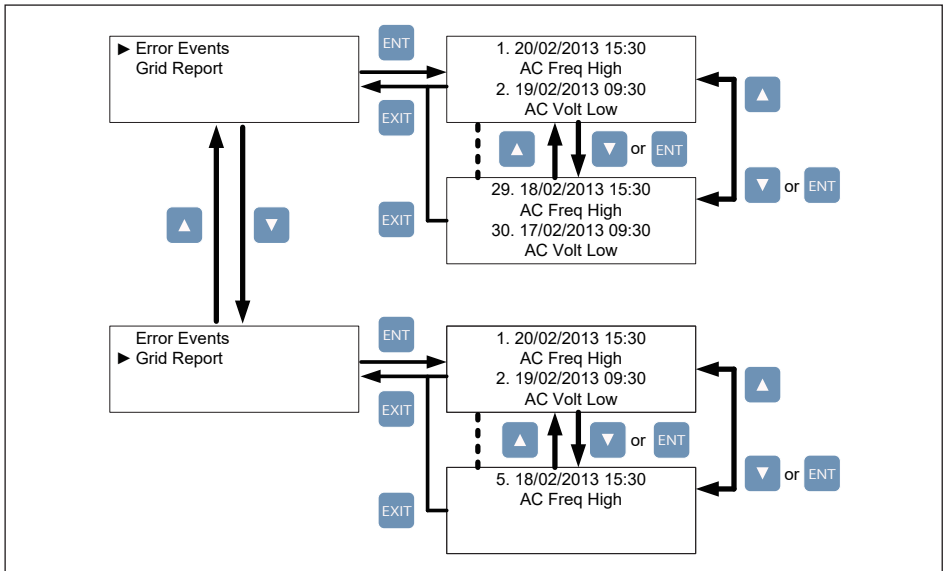


Figure 5-6 : Event log Page

5.2.5 Inverter Information

This page can help user to recognize the inverter. First section displays serial number, installation date, ID, and firmware version. Another 3 sections displays the settings of inverter functions. For more information about these settings, please refer to **5.2.7 Install Settings**, **5.2.8 Active/Reactive power**, and **5.2.9 FRT (Fault ride through)**.

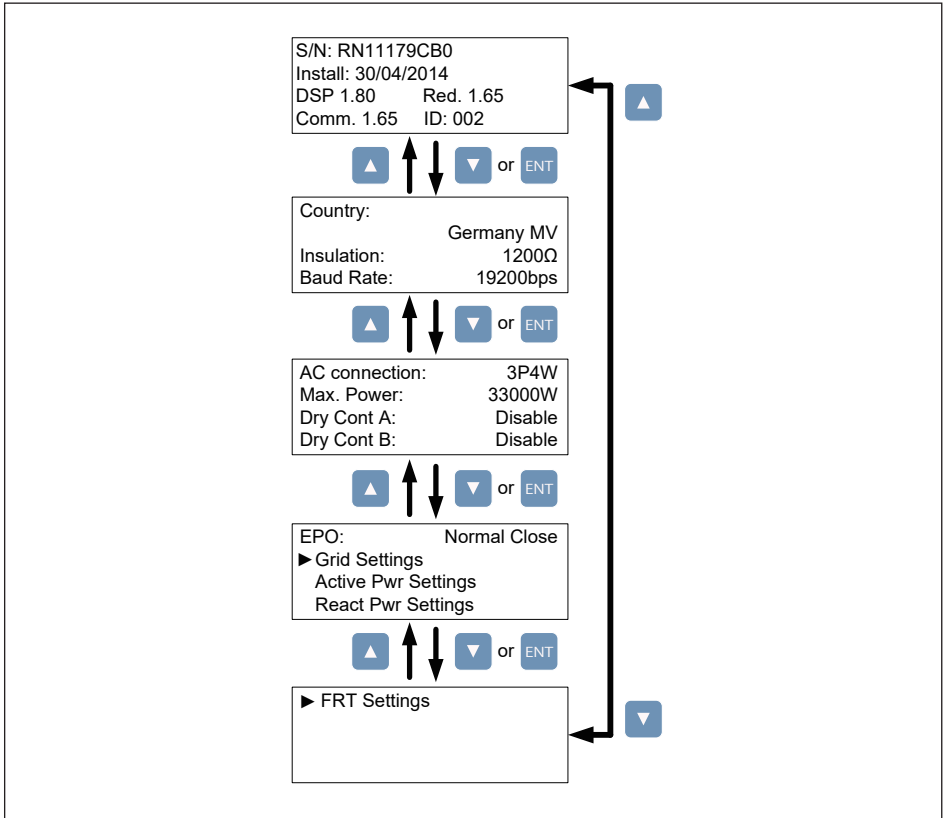


Figure 5-7 : Inverter information page

5.2.6 General Settings

Users can set Language, Date and Time, and RS-485 communication baud rate in this page.

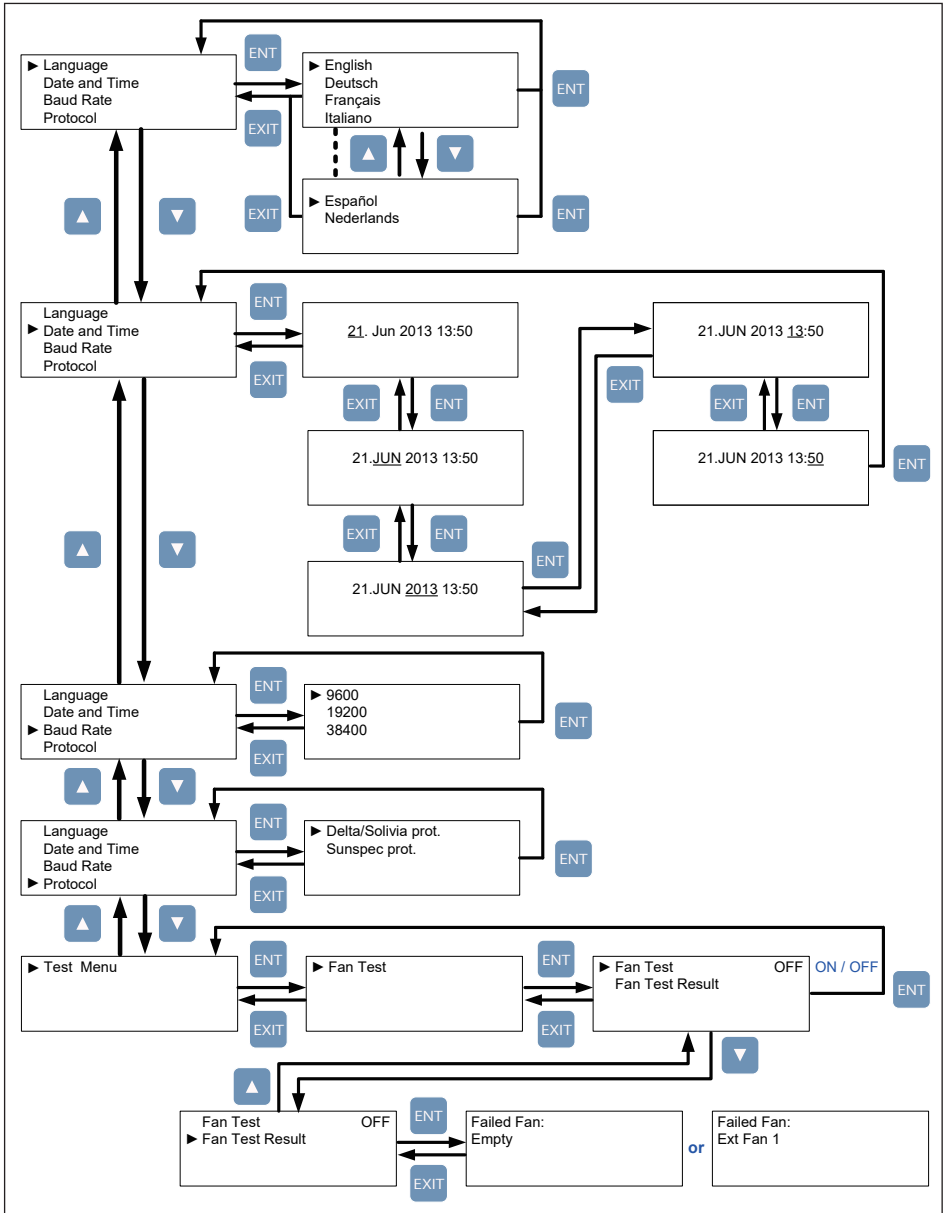


Figure 5-8 : General settings page

5.2.7 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 3 sets of password with different permissions: user level, installer level, and manufacturer level. The following sub-sections will introduce the setting items in Install Settings page of user level and installer level.

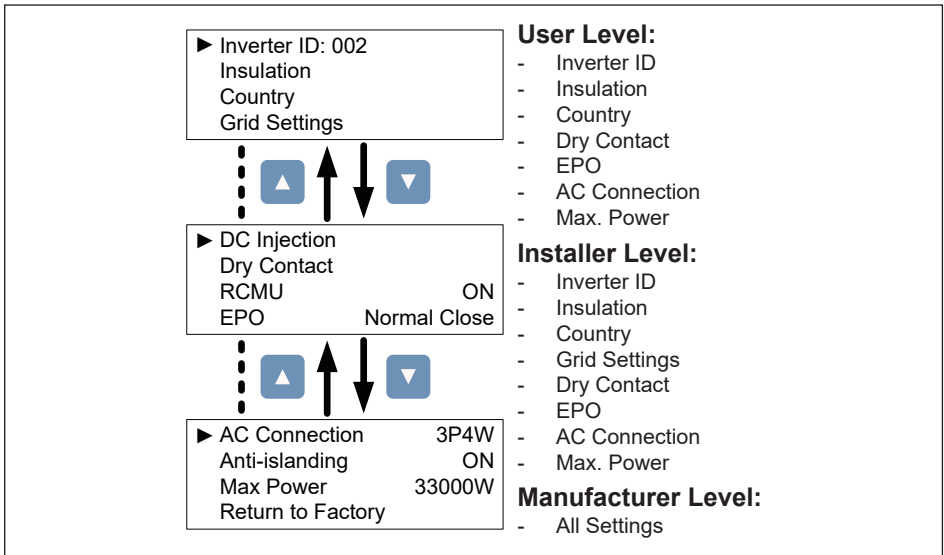


Figure 5-9 : Install settings page

5.2.7.1 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.

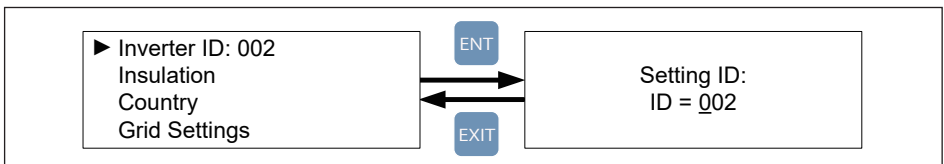


Figure 5-10 : Inverter ID page

5.2.7.2 Insulation

Before connecting to grid, inverter will measure the impedance between the PV array and PE first. M30A models provide 4 types of impedance measurement methods (ON, Plus Grounded, Minus Grounded, and OFF) and 2 impedance limits. Installer must select the appropriate method based on PV array's wiring.

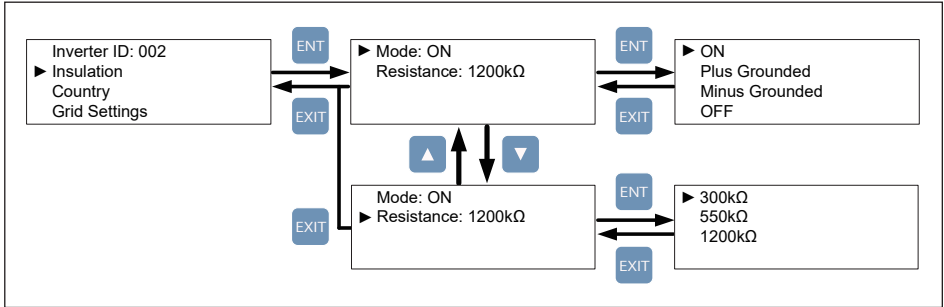


Figure 5-11 : Insulation page

5.2.7.3 Country

Each country has its own electricity regulations. Installer must select the country correctly.

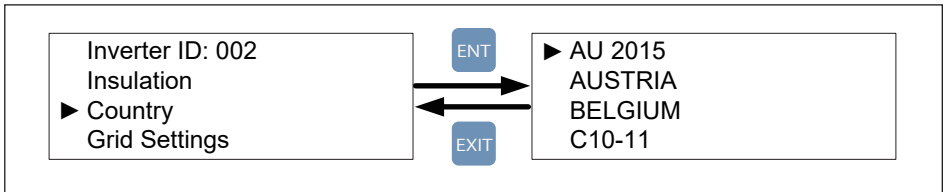


Figure 5-12 : Country page

5.2.7.4 Grid Settings

Grid settings page includes the voltage and frequency protection points. These protection points are linked to electricity regulations.

If there is no any special requirement, please do not change any grid settings.

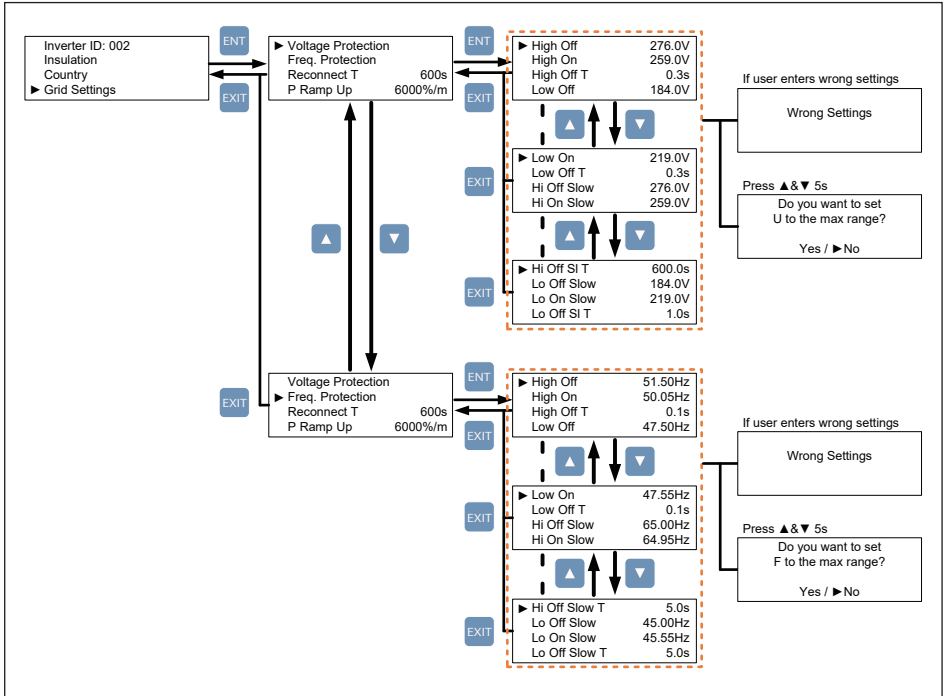


Figure 5-13 : Grid Settings page

5.2.7.5 Dry Contact

Users can choose the trigger condition of dry contact. There are 8 options in the setting page: Disable, On Grid, Fan Fail, Insulation, Alarm, Error, Fault, and Warning. Please refer to **Table 5-2** for more details about these options.

Setting	Dry Contact Trigger Timing
Disable	No action.
On Grid	Inverter is connecting to grid.
Fan Fail	Fan Fail occurs.
Insulation	Insulation test fail.
Alarm	Any error, fault, or warning occurs.
Error	Any Error occurs.
Fault	Any Fault occurs.
Warning	Any Warning occurs.

Table 5-2 : Dry Contact Trigger Setting

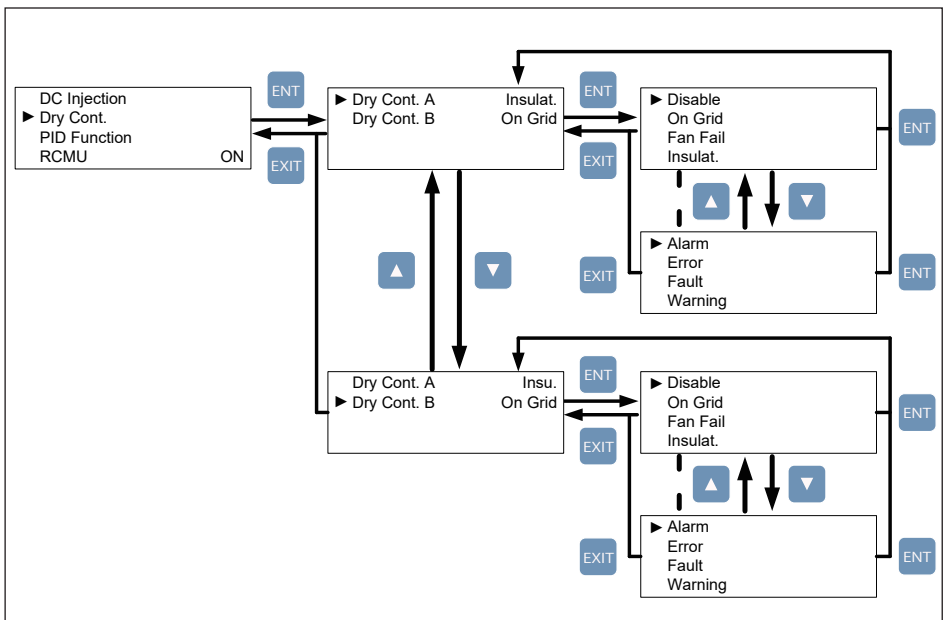


Figure 5-14 : Dry Contact page

5.2.7.6 PID

The PID function default action time is set with 0, user can set the time from 0-10 hours or Auto. It will be started the function at 30 minutes after No DC, and will be stop the function when DC voltage is input.

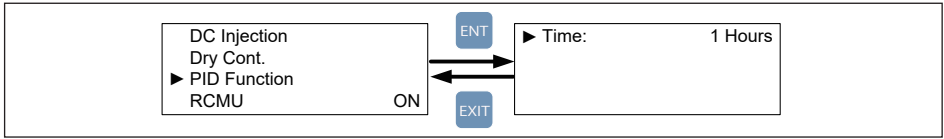


Figure 5-15 : PID function settings

5.2.7.7 EPO

EPO function has 2 detection methods: Normal Open and Normal Close. Normal Open means EPO pins are usually open-circuited. When these two pins are short-circuited, inverter will shut down immediately. Normal Close is contrary to Normal Open. Please choose an appropriate detection method according to your needs.

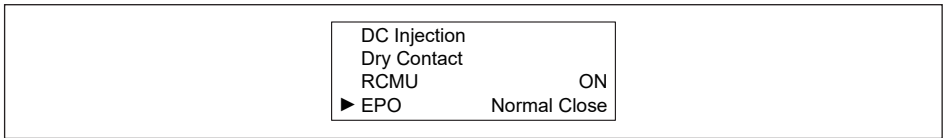


Figure 5-16 : EPO page

5.2.7.8 AC connection

RPI M30A models can support 3P3W and 3P4W system. Please select the correct AC wiring type.

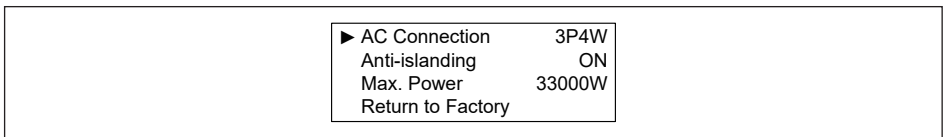


Figure 5-17 : AC connection

5.2.7.9 Max. Power

Electricity regulation in some area requests that inverter must have power limit function. In these areas, users can adjust Max. Power to limit the maximum output power of the inverter.

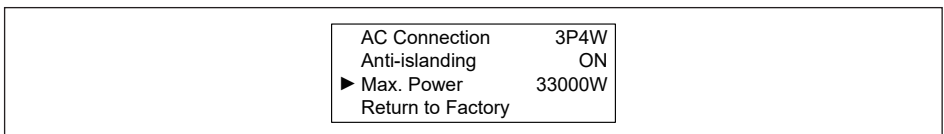


Figure 5-18 : Max. Power page

5.2.8 Active / Reactive power

A password is required to enter Active / Reactive Power 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). These modes will be introduced in next section.

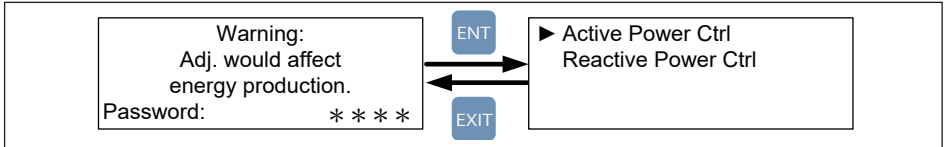


Figure 5-19 : Active / Reactive power page

5.2.8.1 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.

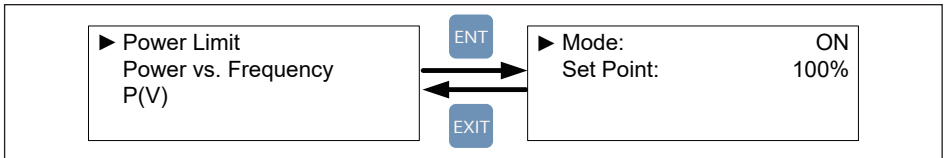


Figure 5-20 : Power Limit page

5.2.8.2 Power vs. Frequency

Inverter will reduce output power when grid frequency rises up if this mode enabled.

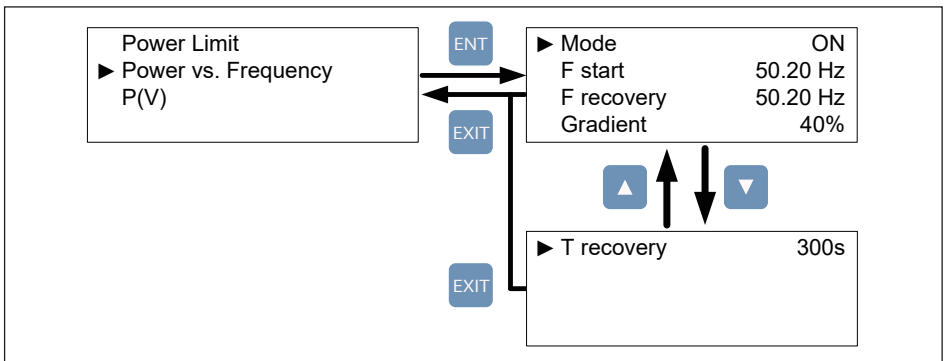


Figure 5-21 : Power vs Frequency page

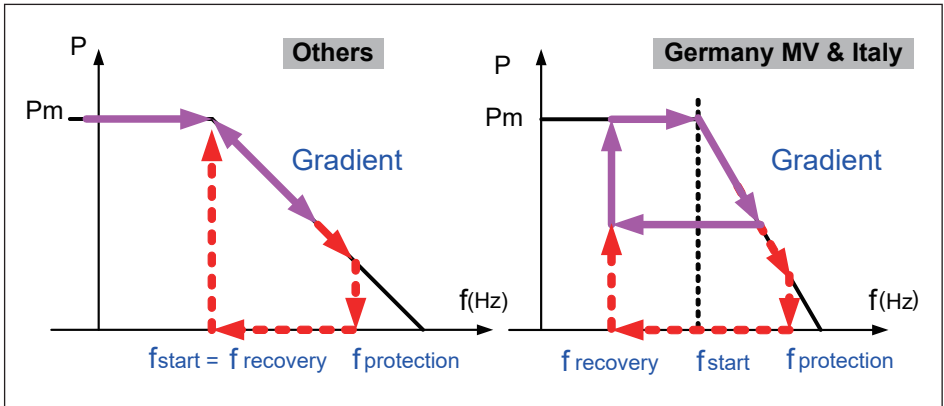


Figure 5-22 : Power vs Frequency parameters

5.2.8.3 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).

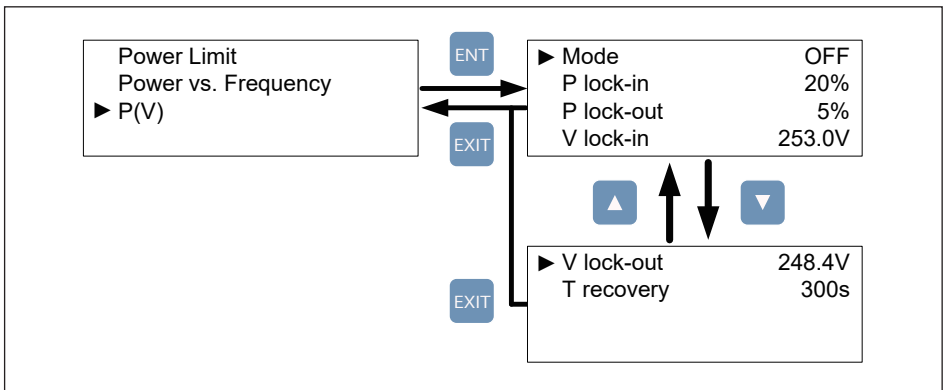


Figure 5-23 : P(V) page

5.2.8.4 Constant cosphi

Inverter can feed in a fixed reactive power to grid. Users can set the power factor(cosphi) in Constant cosphi page.

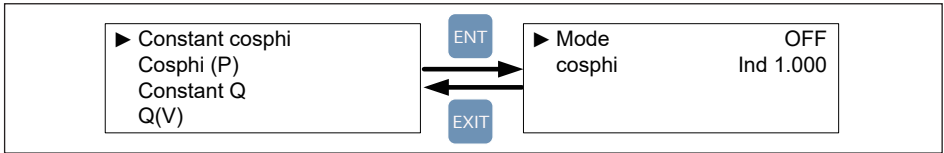


Figure 5-24 : Constant cosphi page

5.2.8.5 Cosphi (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).

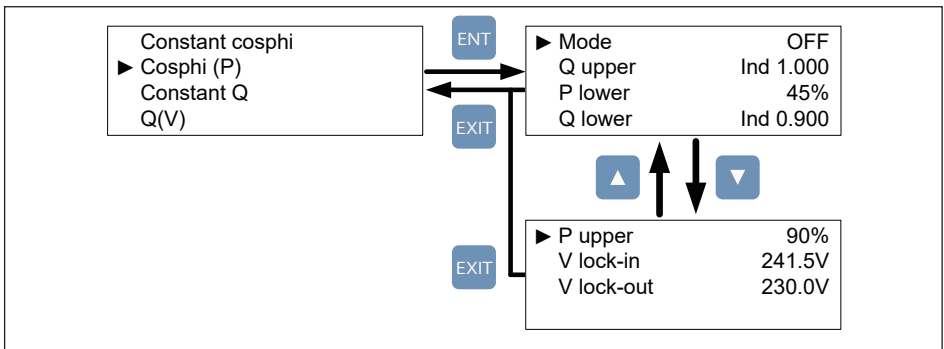


Figure 5-25 : Cosphi (P) page

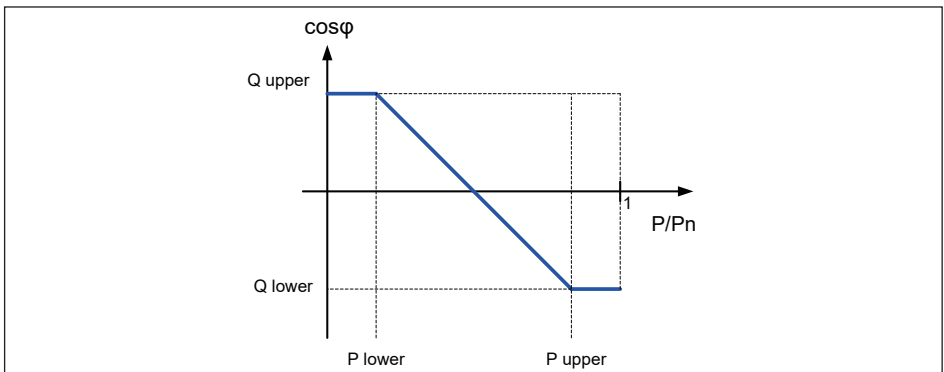


Figure 5-26 : Cosphi (P) page

5.2.8.6 Constant Q

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

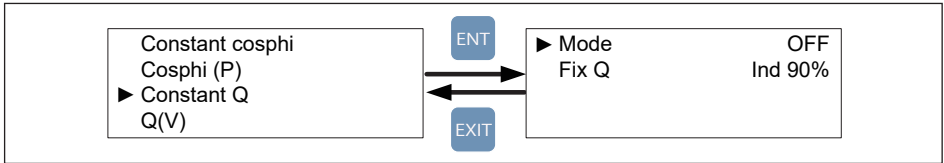


Figure 5-27 : Constant Q parameters

5.2.8.7 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.

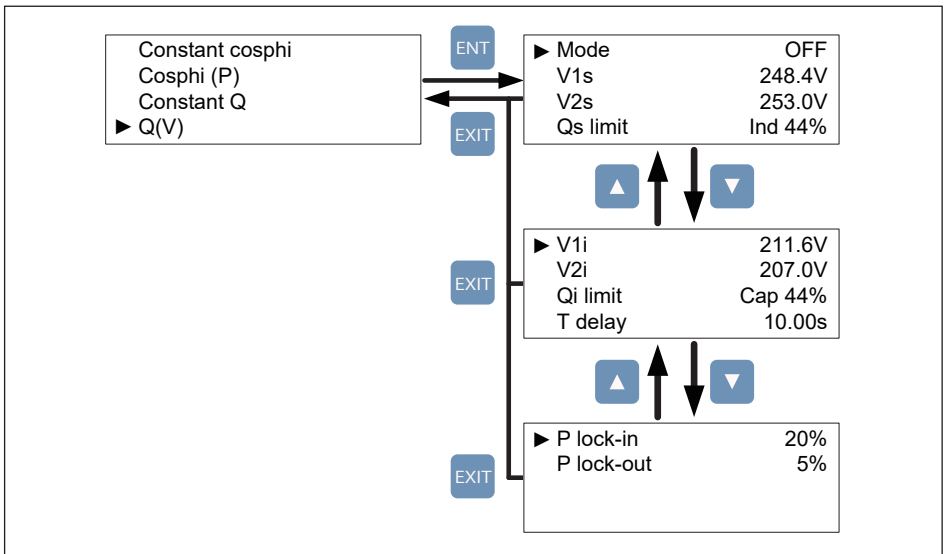


Figure 5-28 : Q(V) page

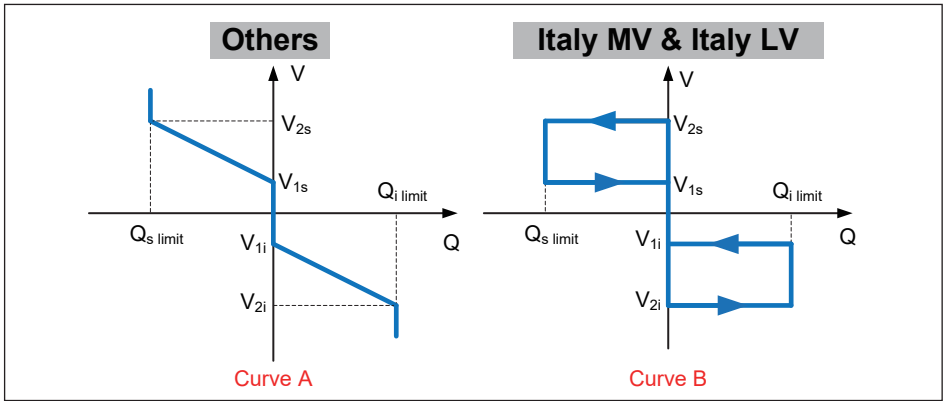


Figure 5-29 : Q(V) parameters

5.2.9 FRT (Fault ride through)

Some area 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.

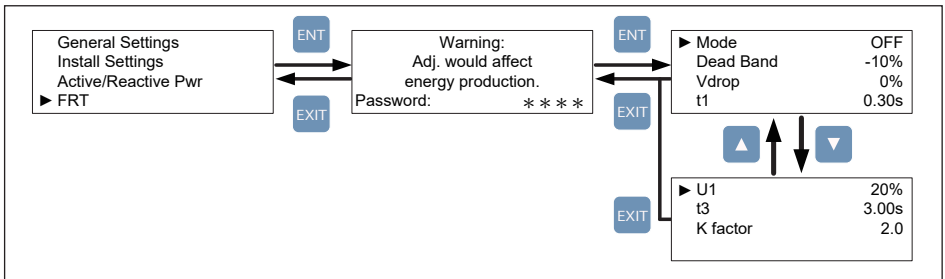


Figure 5-30 : FRT page

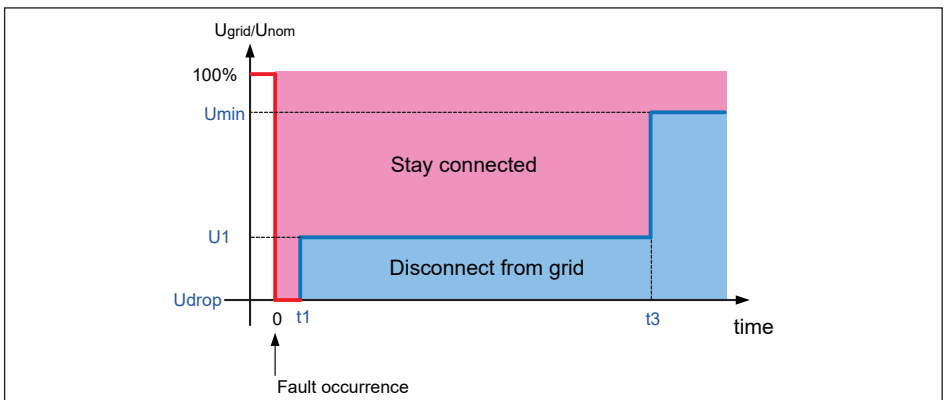


Figure 5-31 : FRT Parameters

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 even if manual switching turn off.

6.1 Replace Surge Protection Device (SPD)

RPI M30A_120 model have surge protection device (SPD) at both DC and AC side.

Once the inverter encounters voltage spikes (e.g. struck by lighting), SPD will protect the inverter and got damaged. If you find a warning message “SPD Fail” shown on display panel, please follow the steps below to replace the SPD.

1. Switch AC and DC power off and wait until LCD display turn off.
2. Loosen the 6 screws on the front cover. (**Figure 6-1**)
3. Recognize the connectors. (**Figure 6-2**)
4. Loosen the 6 screws. (**Figure 6-3**)
5. Pull out the SPD unit. (**Figure 6-4**)
6. Replace the SPD unit.
7. Reassemble the inverter. Please be careful the waterproof tape for ensure the protection degree.
8. Reassemble the inverter. Please follow the sequence in **Figure 6-1**.

WARNING !



- Reassemble the inverter. Note torque should be 10Kgf-cm.

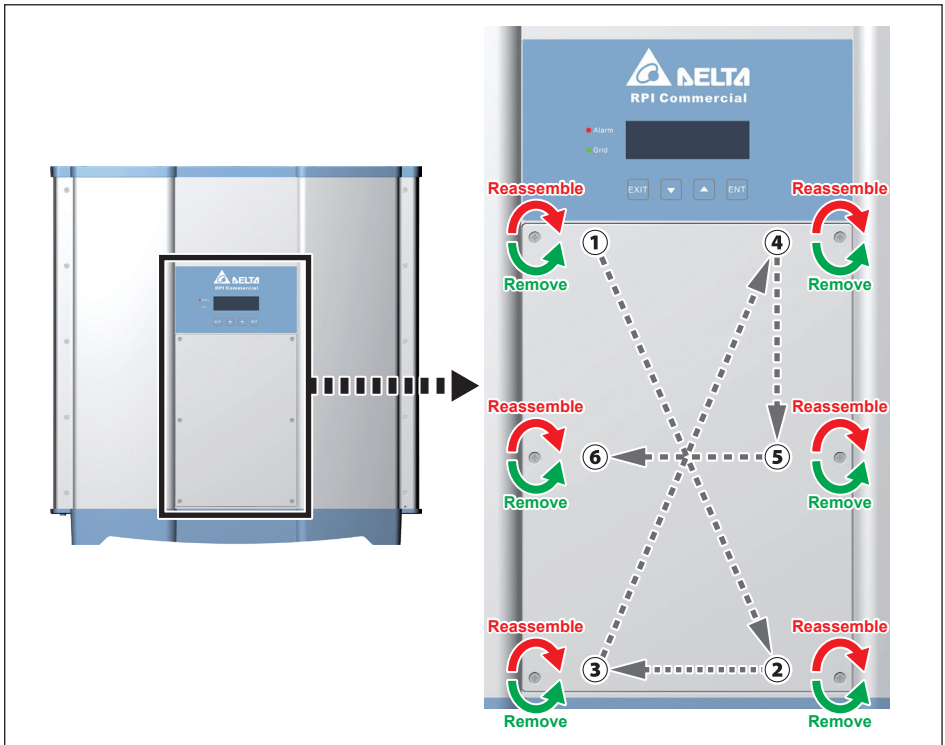


Figure 6-1 : Remove / Reassemble front cover

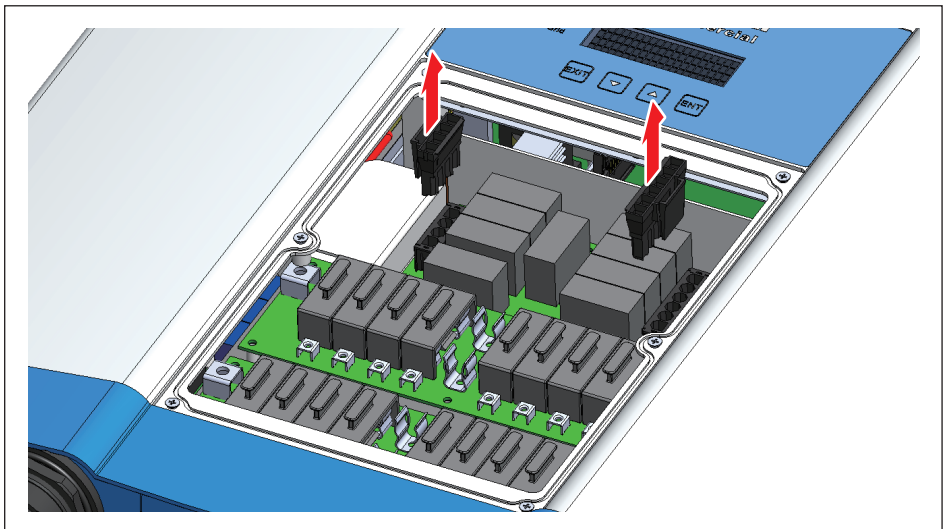


Figure 6-2 : Recognize the connectors

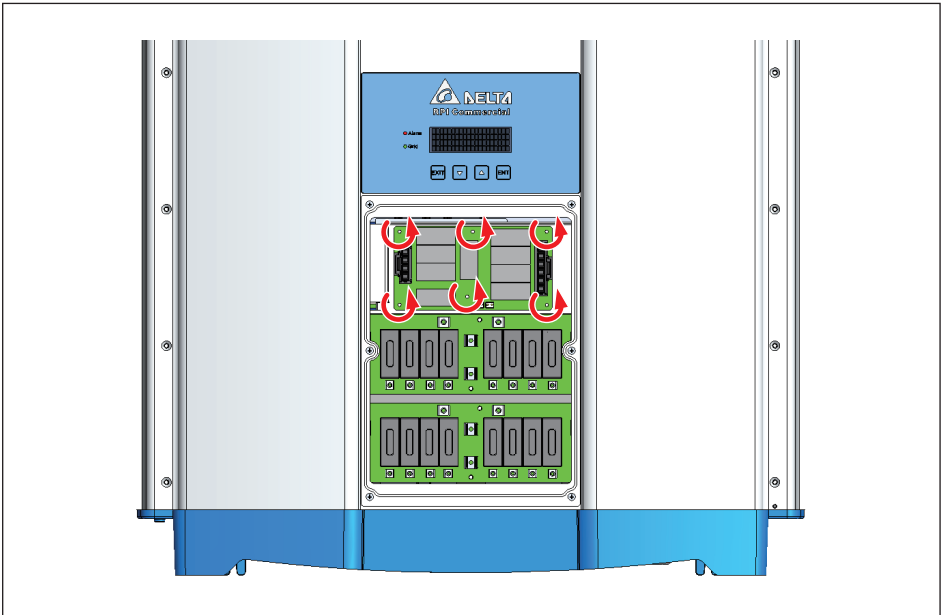


Figure 6-3 : Loosen the 6 screws

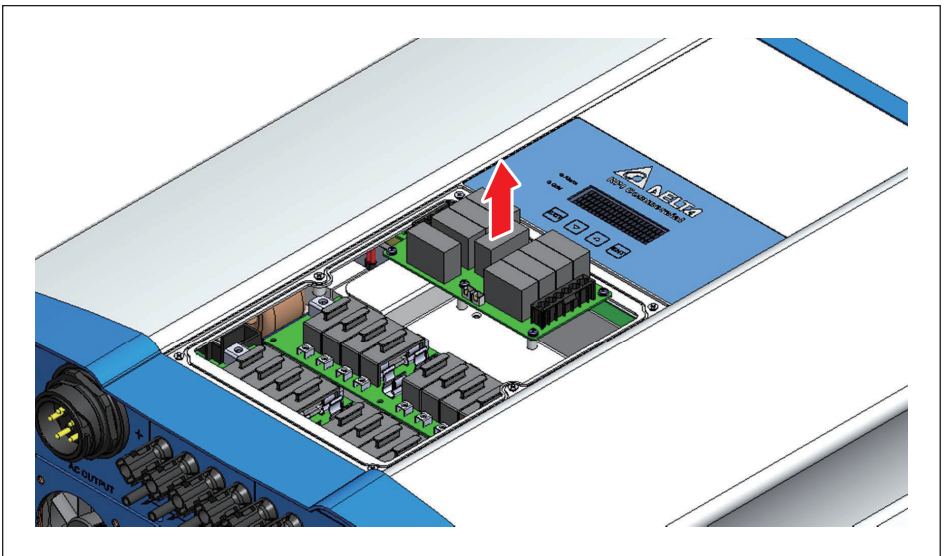


Figure 6-4 : Pull out the SPD unit

6.2 Replace Internal String Fuse

RPI M30A_120 model have internal string fuse in each Plus and Minus DC connector. The specifications of these fuses are revealed as below.

Fuse selection please according to the following elements of the proposal.

- | | |
|---------------------------------|---------------------------------|
| - Item : String Fuse (source 1) | - Item : String Fuse (source 2) |
| - Part number : 10GPV15U0 | - Part number : 0SPF015.T |
| - Rate amp : 15 A | - Rate amp : 15 A |
| - Rate voltage : 1000 V | - Rate voltage : 1000 V |
| - Manufacturers : Hollyland | - Manufacturers : Littelfuse |

Please check the fuses if the power generation of inverter is abnormal.

1. Switch AC and DC power off and wait until LCD display turn off.
2. Loosen the 6 screws on the front cover. (**Figure 6-1**)
3. Pull out the fuse holder and check the fuse. (**Figure 6-5**)
4. Replace the fuse if necessary. (**Figure 6-6**)
5. Reassemble the inverter. Please be careful the waterproof tape for ensure the protection degree.

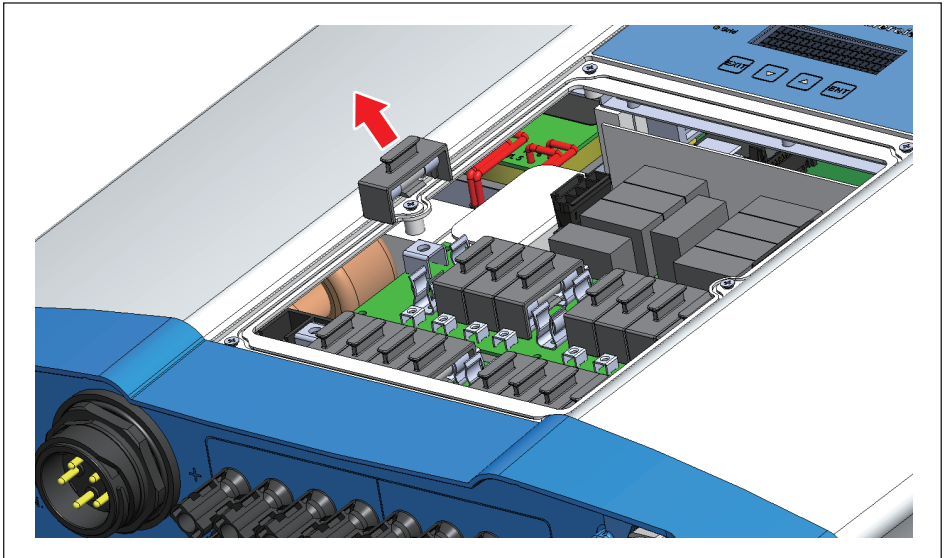


Figure 6-5 : Pull out the fuse



Figure 6-6 : Replace the fuse

6.3 Clean Fan

Loosen the 4 screws shown in **Figure 6-7**. Once the screws are loose, pulling the fan bracket out will expose the connectors. Each fan has one wire connected.

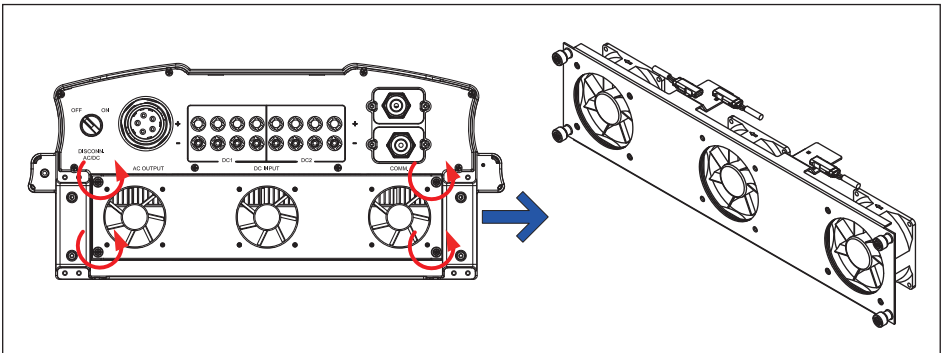


Figure 6-7 : Disassembling fan panel

6.4 Replace Fans

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.

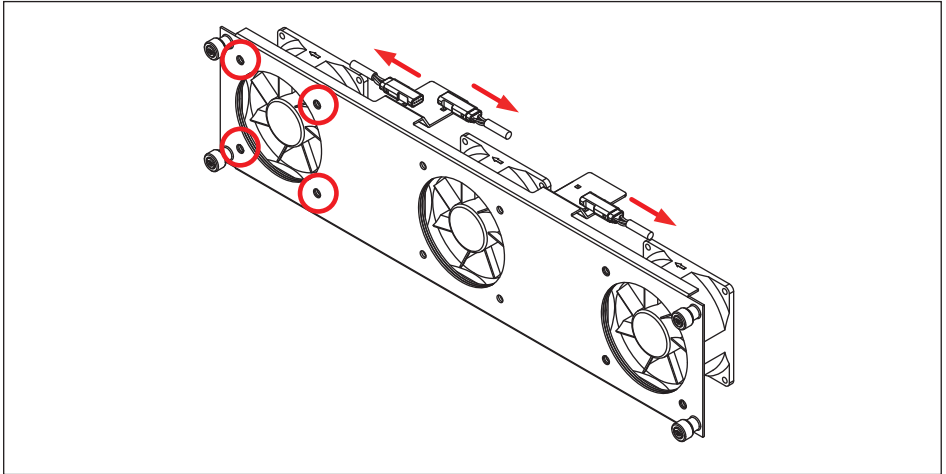


Figure 6-8 : Removal of a fan

6.5 Clean Air Inlets

Unscrew the 4 screws of air inlets and clean them regularly.

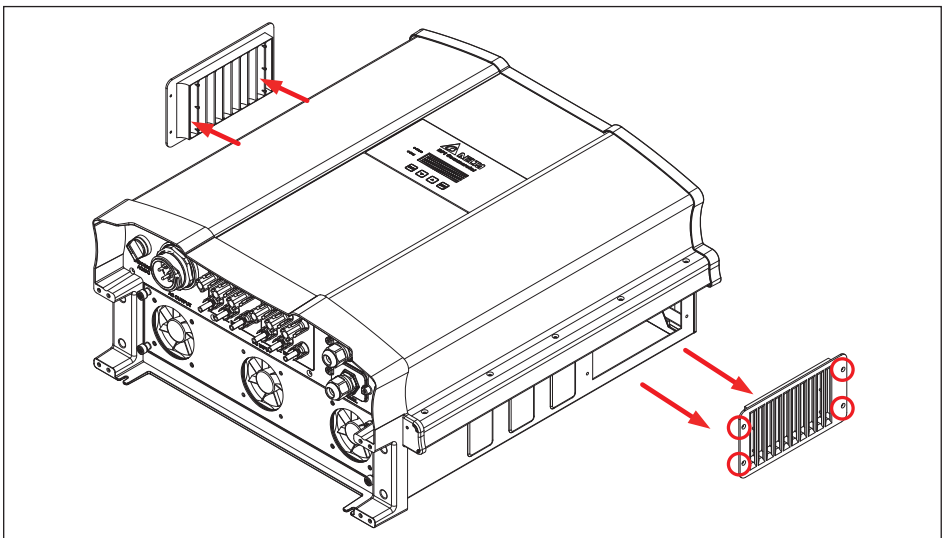


Figure 6-9 : Removal of air outlets

7 Error message and Trouble Shooting

ERROR		
Message	Possible cause	Action
AC Freq High (E01)	<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 (E02)	<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 (E07)	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 (E08)	<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 (E09)	<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 (E10, E15, E20)	<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 (E11, E13, E16, E18, E21, E23)	<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 (E30)	<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
Solar2 High (E31)	<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

ERROR		
Message	Possible cause	Action
Insulation (E34)	<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 (W01)	<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 (W02)	<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 (W11)	<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
De-rating (W07)	<ol style="list-style-type: none"> 1. Over temperature 2. Fan fail 3. Power Limit function 4. Power vs. Frequency function 5. P(V) function 6. Grid Voltage low 7. Solar Voltage low 8. Solar Voltage High 	<ol style="list-style-type: none"> 1. Check the installation ambient and environment 2. Check the fan(s) 3. Check country & Grid setting 4. Check the utility frequency on the inverter terminal 5. Check the utility voltage on the inverter terminal 6-1. Check the utility voltage on the inverter terminal 6-2. Check reactive power setting 7. Check the Solar voltage on the inverter terminal 8. Check the Solar voltage on the inverter terminal
SPD Fail (W15)	<ol style="list-style-type: none"> 1. Inverter was struck by lightning. 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
DC Injection (F01, F02, F03)	<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 (F05)	<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 (F07)	<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
HW NTC1 Fail (F06)	<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
HW NTC2 Fail (F08)	<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
HW NTC3 Fail (F09)	<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
HW NTC4 Fail (F10)	<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
HW RLY (F13)	<ol style="list-style-type: none"> Driver circuit for relay is defective Relay(s) is defective Detection circuit malfunction (Inverter voltage) 	<ol style="list-style-type: none"> Check the input voltage, must >150Vdc Replace the defective relay Check the detection circuit inside the inverter
HW DSP ADC1 (F15)	<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 ADC2 (F16)	<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 DSP ADC3 (F17)	<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 (F18)	<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 (F19)	<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 Eff. (F20)	<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 (F23)	<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 (F22)	<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 Cur. (F24)	<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

FAULT		
Message	Possible cause	Action
HW Con. Fail (F26)	<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
RCMU Fail (F27)	<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
RLY Short (F28)	<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
RLY Open (F13, F29)	<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 detect on accuracy
Bus Unbal. (F30)	<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 (F31, F33, F35)	<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 Cur. High (F36, F37, F38, F39, F40, F41)	<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 (F42)	<ol style="list-style-type: none"> 1. Test current loop is broken 2. CTP3 is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the connection of CNP4 to CNM4 2. Replay CTP3 with new one 3. Check the detection circuit inside the inverter

FAULT		
Message	Possible cause	Action
HW CT B Fail (F43)	<ol style="list-style-type: none"> 1. Test current loop is broken 2. CTP4 is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the connection of CNP4 to CNM4 2. Replace CTP4 with new one 3. Check the detection circuit inside the inverter
HW CT C Fail (F44)	<ol style="list-style-type: none"> 1. Test current loop is broken 2. CTP5 is defective 3. Detection circuit malfunction 	<ol style="list-style-type: none"> 1. Check the connection of CNP4 to CNM4 2. Replace CTP5 with new one 3. Check the detection circuit inside the inverter
HW AC OCR (F45)	<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 (F50)	The detection circuit for synchronal signal malfunction	Check the detection circuit for synchronal signal inside the inverter
DC Cur. High (F60, F61, F70, F71)	<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 Manual Switch to shut down the inverter.
- Switch off AC circuit breaker to disconnect with electricity grid.
- 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

Model	RPI M30A_120	RPI M30A_121
GENERAL		
Enclosure	Powder coated aluminum	
Operating temperature	-25~60°C, full power up to 40°C Full power up to 50°C @VDC 600V, COSØ=1 (Please refer to Figure 9-1 to 9-3 .)	
Operating Altitude	2000m	
Relative humidity	0% – 100% non-condensing.	
Environmental category	Outdoor, wet locations	
Protection degree	IP65 (Electronics)	
Pollution degree	II	
Overvoltage category	AC output :III, DC Input :II	
Maximum back-feed current to the array	0	
Galvanic isolation	NO	
Safety class	Class I metal enclosure with protective earth	
Weight	49.5kg	48kg
Dimensions(W*H*D)	612 × 625 × 278mm	
Connectors	Weather resistant connectors	
DC INPUT (Solar side)		
Maximum input power	35kW	
Rated power	31.5kW	
Recommended PV power	≤38kW	
Nominal voltage	600Vdc	
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	
Occasionally maximum voltage	1100V *	

* The max withstand voltage is 1100Vdc. (inverter stop output when input is over 1000Vdc)
About 1000Vdc above application, please refer to appendix.

Model		RPI M30A_120	RPI M30A_121
MPP range (rated power)			
Balanced inputs (50/50)		520-800Vdc	
Maximum unbalanced inputs	67%	700-800Vdc	
	33%	350-800Vdc	
Number of inputs		8 pairs MC4	6 pairs MC4
Rated current		30A * 2 with max current per input of 7.5A	30A * 2 with max current per input of 10A
Maximum short circuit current per MPPT (Isc)		47A for each MPPT(Total 2 MPPT) 16A for each string(Total 8 string)	47A for each MPPT(Total 2 MPPT) 39A for each string(Total 6 string)
String fuse protection		15A	No
Surge protection device		Type II, Replaceable EN 50539-11, IEC 61643-11	Type III, not replaceable
AC OUTPUT (Grid side)			
Nominal power		30kW / 30kVA	
Maximum power		33kW / 33kVA (Refer to Figure 9-1 to 9-3)	
Voltage		3Ph, 230 / 400Vac	
Nominal current		43.5A(230Vac) / 45.5A (220Vac)	
Maximum current		50A	
Inrush current		150A / 100µs	
Maximum output fault current (rms)		88.6A	
Maximum output over current protection		57A	
Frequency		Rated 50/60Hz (Programmable 45Hz - 65Hz)	
Active anti-islanding method		Reactive power injection	
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		< 3W	
Maximum efficiency		98.5 %	
EU efficiency		98.2 %	
AC connector		3 Ph + N + PE; 3-phase AC plug that meets IP67 and specifications in table 4-2.	
Surge protection device		Type II, Replaceable EN 50539-11, IEC 61643-11	Type III, not replaceable

Model		RPI M30A_120	RPI M30A_121
SYSTEM INFORMATION / COMMUNICATION			
User interface	Black-on-white character type LCD display		
	Real time clock		
	30 events record		
External communication	2 RS-485 connections		
REGULATIONS & DIRECTIVES			
CE conformity	Yes		
Grid interface	VDE-AR-N 4105 BDEW,UK G59/3 VDE0126-1-1 NB/T 32004		
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, 3pcs		
Enclosure	Mounting bracket		
	Aluminum with powder coating		

Table 9-1 : Specifications for RPI M30A

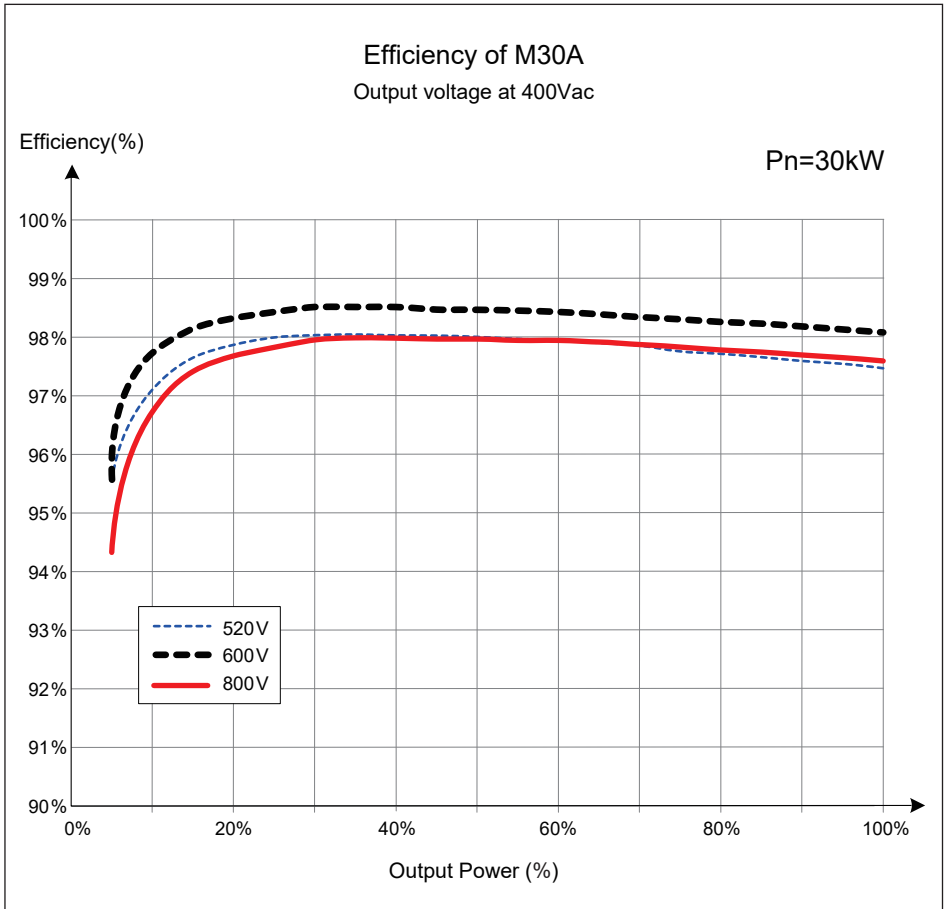


Figure 9-1 : M30A Efficiency Curve

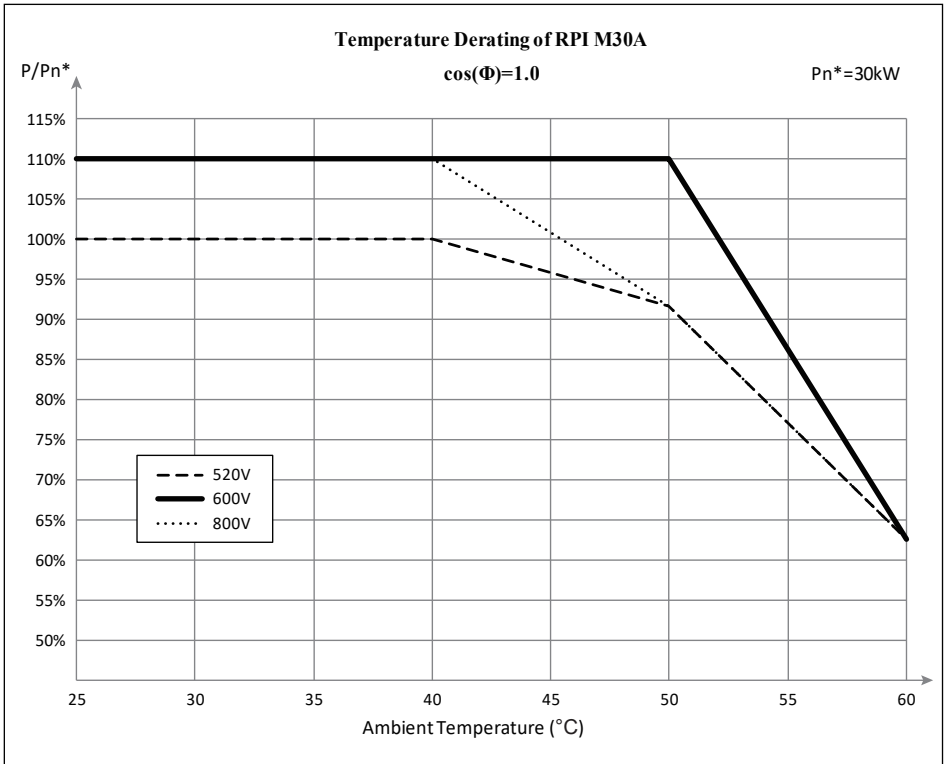


Figure 9-2 : M30A Thermal Derating Curve ($\cos\phi=1.0$)

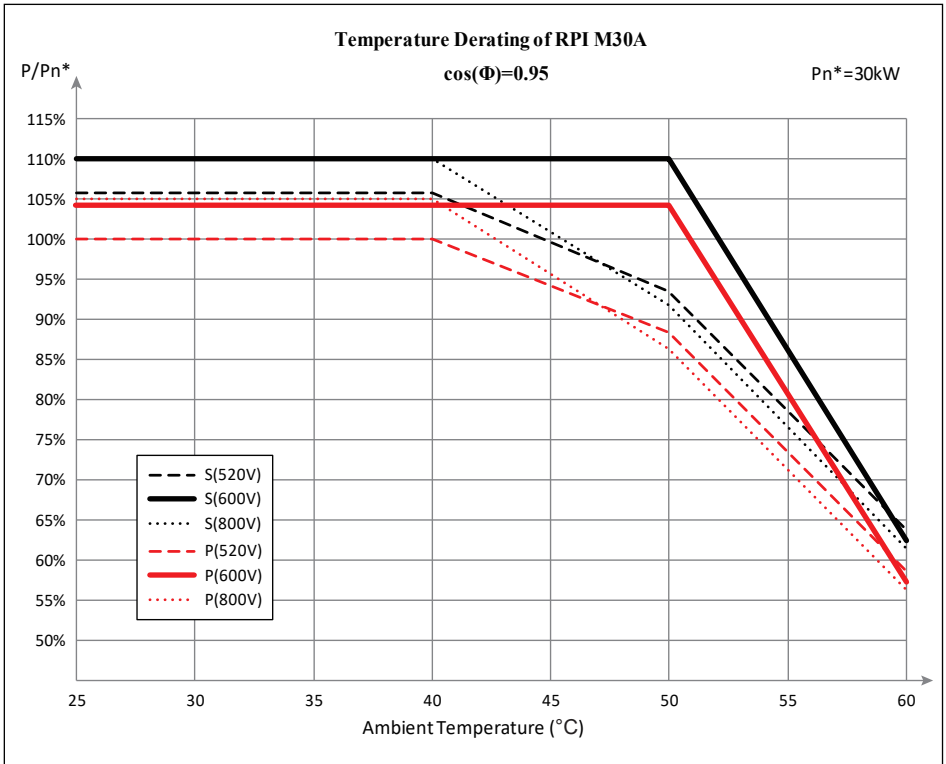


Figure 9-3 : M30A Thermal Derating Curve ($\cos\phi=0.95$)

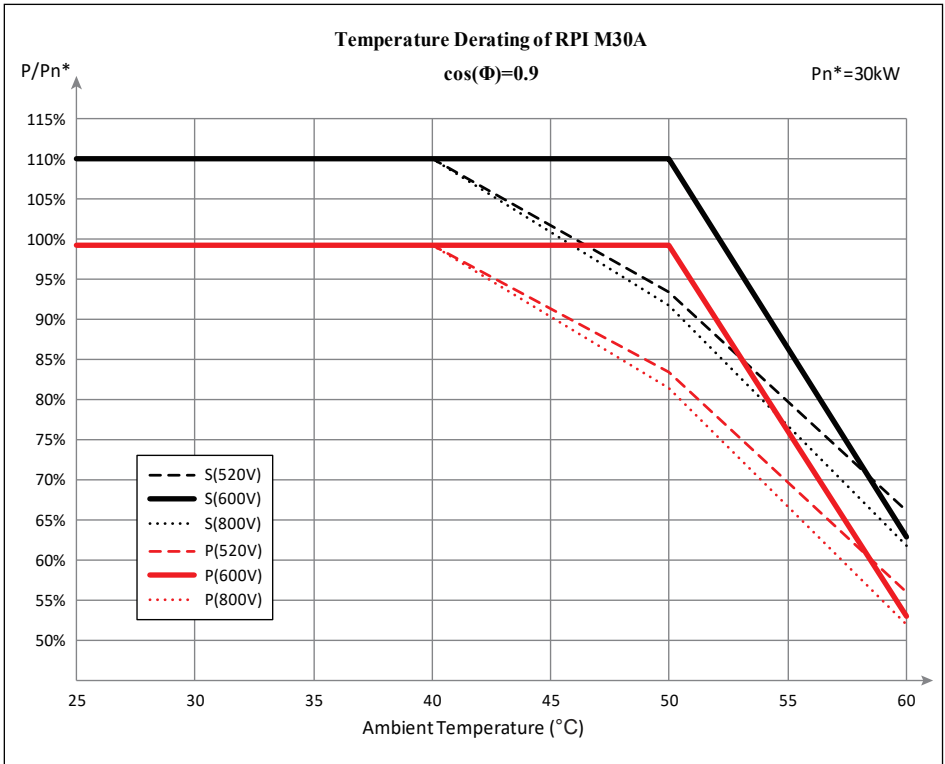


Figure 9-4 : M30A Thermal Derating Curve ($\cos\phi=0.9$)

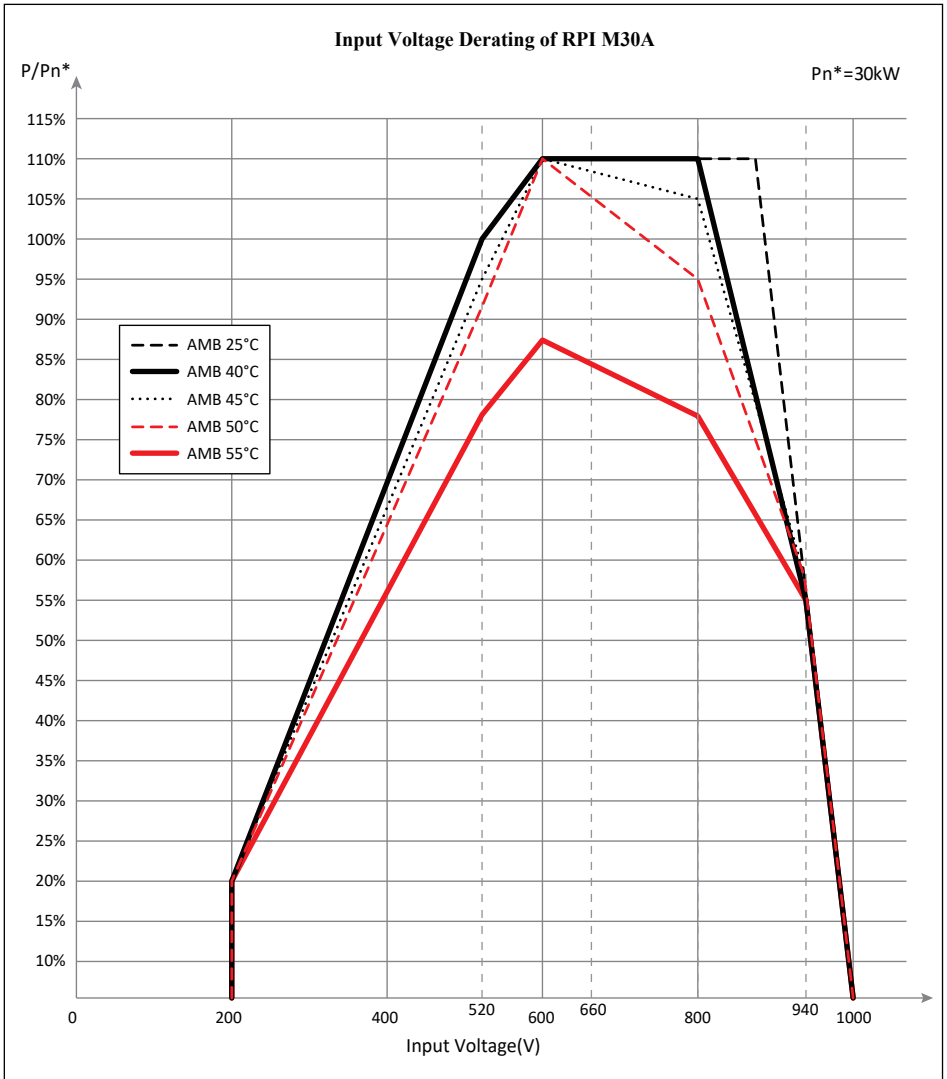


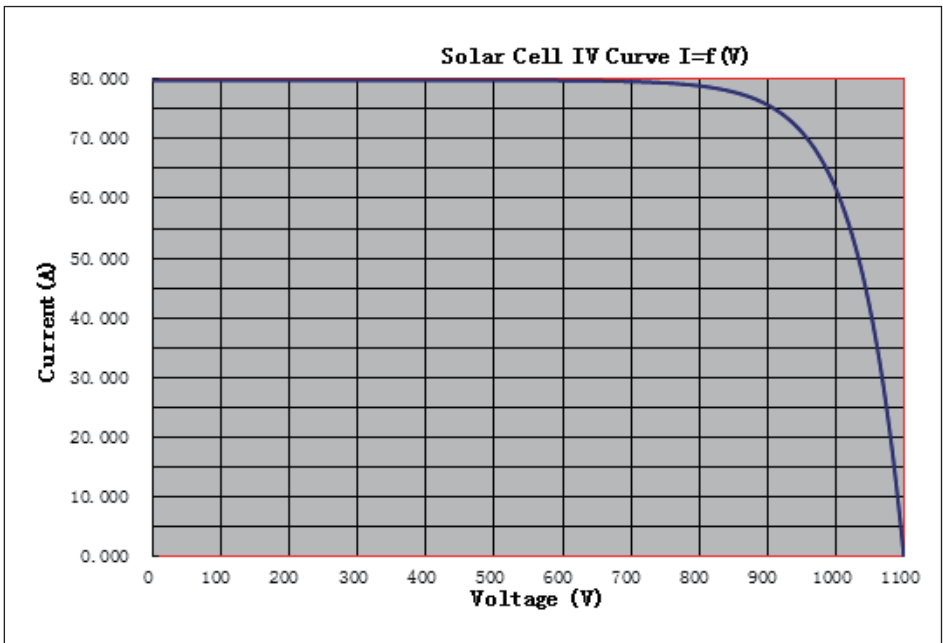
Figure 9-5 : M30A Input Voltage Derating Curve

Appendix

Appendix A: I-V curve limitation

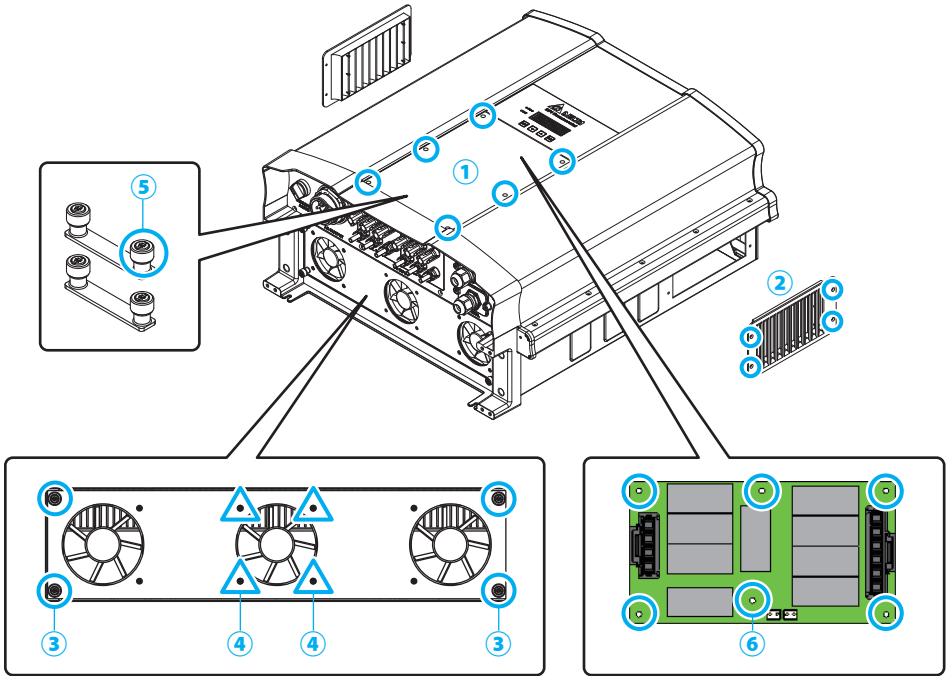
Based on operational safety of the fuse, the configuration of the solar panels maximum power can not exceed this I-V curve.

If the user uses an external fuse, the user shall ensure that the fuse at 1000Vdc above fusing characteristics.



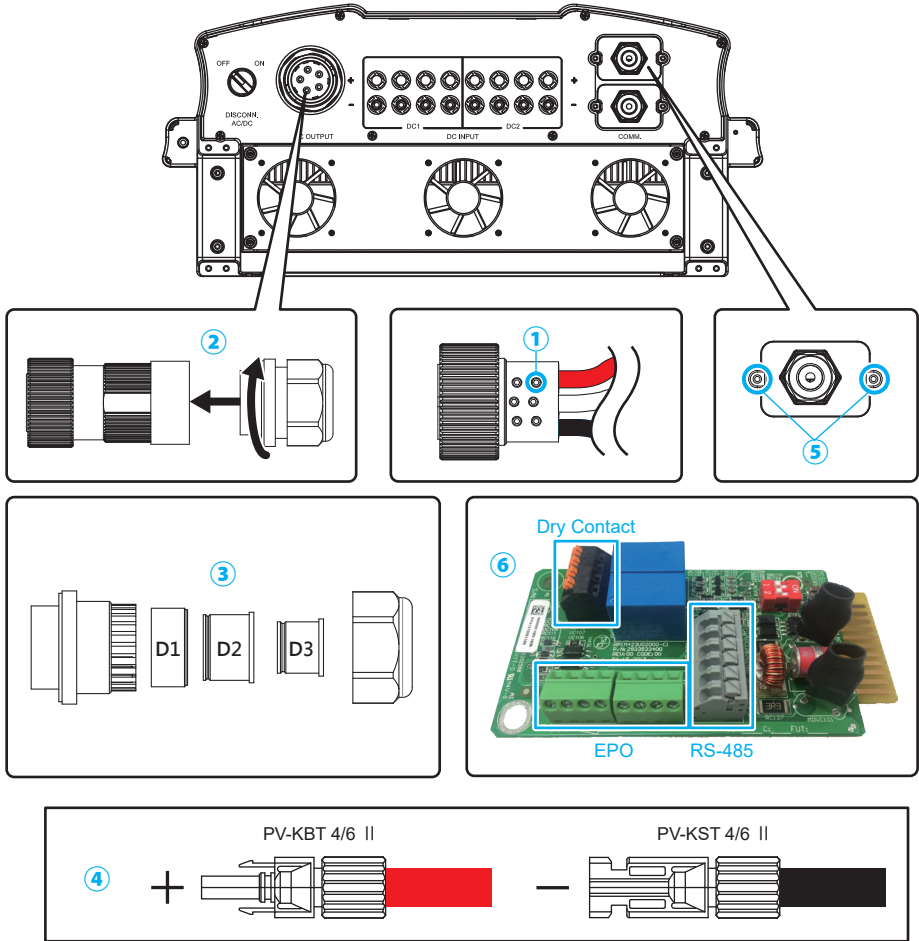
Appendix A : I-V curve limitation for fuse

Appendix B: Assembly Note



NO	Location	Screw torque
1	Front cover	10 Kgf-cm (1N-m)
2	Air inlet	8 Kgf-cm (0.8N-m)
3	Fan panel	8 Kgf-cm (0.8N-m)
4	Fans	8 Kgf-cm (0.8N-m)
5	Bus bar	10 Kgf-cm (1N-m)
6	SPD board	8 Kgf-cm (0.8N-m)

Appendix B-1 : Assembly Note-1



NO	Location	Screw torque	Conductor cross-section
1	AC wire	25 Kgf-cm (2.5N-m)	6~4AWG (13.3~25mm 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)	--
4	MC4 wire	--	RPI M30A_120: 12~10AWG (4~6mm ²) RPI M30A_121: 10AWG (6mm ²)
5	Communication cover	8 Kgf-cm (0.8N-m)	--
6	Communication module	--	20 AWG (0.5mm ²)

Appendix B-2 : Assembly Note-2



The power behind competitiveness

三相并网型逆变器

RPI M30A_120 / M30A_121

操作手冊

English 1

简体中文 81

繁體中文 161

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Table of Contents

1	信息	88
1.1	关于此手册	88
1.2	产品说明	88
1.3	其他信息	88
2	产品概观	89
2.1	逆变器开箱	89
2.2	检查内容物	89
2.3	产品卷标	92
2.4	外观介绍	93
3	安装	95
4	配线	99
4.1	配线前准备事项 (M30A_120)	99
4.2	配线前准备事项 (M30A_121)	103
4.3	AC(市电端)之连接: 三相三线(3P+PE)或三相四线(3P+N+PE)	109
4.3.1	保护装置与AC配线图	109
4.3.2	允许接地系统	113
4.4	直流输入端(太阳能板电源端)之连接	114
4.5	多台逆变器组合	115
4.5.1	多台逆变器在三相系统并联配置方式	115
4.5.2	通讯接口之连接	115
4.5.3	RS-485之连接	116
4.5.4	紧急关机装置与数字输入之连接	117
4.5.5	干接点之连接	119
5	逆变器开机	120
5.1	LCD 操作流程	120
5.2	首次开机	121
5.2.1	主画面	122
5.2.2	Power Meter	122
5.2.3	Energy Log	123
5.2.4	Event Log	123
5.2.5	Inverter Information	124
5.2.6	General Settings	125
5.2.7	Install Settings	126
5.2.7.1	Inverter ID	126
5.2.7.2	Insulation	127
5.2.7.3	Country	127
5.2.7.4	Grid Settings	128
5.2.7.5	Dry Contact	129

5.2.7.6	PID	130
5.2.7.7	EPO	130
5.2.7.8	AC connection	130
5.2.7.9	Max. Power	130
5.2.8	Active / Reactive power	131
5.2.8.1	Power Limit	131
5.2.8.2	Power vs. Frequency	131
5.2.8.3	P(V)	132
5.2.8.4	Constant cosphi	133
5.2.8.5	Cosphi (P)	133
5.2.8.6	Constant Q	134
5.2.8.7	Q(V)	134
5.2.9	FRT (Fault ride through)	135
6	设备维护	136
6.1	更换突波保护器 (SPD)	136
6.2	更换DC保险丝	139
6.3	清理风扇	140
6.4	更换风扇	141
6.5	清理进风口滤网	141
7	错误讯息与简易故障排除	142
8	卸除	148
9	技术数据	149
	附录	157
	附录 A: I-V curve limitation	157
	附录 B: 组装说明	158

Figure

图1-1: 太阳能逆变器使用说明	88
图2-1: 开箱	89
图2-2: M30A_120内容物清单	90
图2-3: M30A_121内容物清单	91
图2-4: 产品卷标	92
图2-5: 外观介绍	93
图2-6: 输出接口介绍	94
图3-1: 壁挂板尺寸	95
图3-2: 建议和不建议的安装方式	96
图3-3: 以螺丝固定壁挂板	97
图3-4: 附挂和固定逆变器	97
图3-5: 适当安装间距	98
图3-6: 进气方向	98
图4-1: DC端不接地配线图	100
图4-2: 强制逆变器操作于并联模式	100
图4-3: M30A_120 DC端负接地配线图	101
图4-4: M30A_120 DC端正接地配线图	102
图4-5: M30A_121 系统配线图(DC端不接地)	103
图4-6: M30A_121 系统配线图(DC正接地或负接地)	104
图4-7: 错误的连接方式-1	105
图4-8: 错误的连接方式-2	106
图4-9: 错误的连接方式-3	107
图4-10: 错误的连接方式-4	108
图4-11: AC线材拔线	110
图4-12: 欧式端子	110
图4-13: 铜铝端子	111
图4-14: RPI M30A之AC接头配线图	112
图4-15: AC端子防水塞	112
图4-16: DC配线端子	114
图4-17: 多台逆变器在三相系统并联配置方式	115
图4-18: 通讯模块示意图	115
图4-19: 多台逆变器串接通讯	116
图4-20: EPO使用说明	117
图4-21: 紧急停止开关与数位输入功能的多台并联	118
图4-22: 干接点连接	119
图5-1: 控制面板	120
图5-2: 首次开机出现语言和国别设定	121
图5-3: 主画面	122
图5-4: Power meter页面	122

图5-5: Energy log页面	123
图5-6: Event log流程	123
图5-7: Inverter information页面	124
图5-8: General settings页面	125
图5-9: Install settings页面	126
图5-10: Inverter ID页面	126
图5-11: Insulation页面	127
图5-12: Country 页面	127
图5-13: Grid Settings 页面	128
图5-14: Dry Contact 页面	129
图5-15: PID功能設定	130
图5-16: EPO页面	130
图5-17: AC配线方式	130
图5-18: Max. Power页面	130
图5-19: Active/Reactive power页面	131
图5-20: Power Limit page页面	131
图5-21: Power vs Frequency页面	131
图5-22: Power vs Frequency参数对照	132
图5-23: P(V)页面	132
图5-24: Constant cosphi页面	133
图5-25: Cosphi (P)页面	133
图5-26: Cosphi (P)参数对照	133
图5-27: Constant Q页面	134
图5-28: Q(V)页面	134
图5-29: Q(V)参数对照	135
图5-30: FRT页面	135
图5-31: FRT参数对照	135
图6-1: 卸下/重新装上前盖	137
图6-2: 移除端子	137
图6-3: 解开螺丝	138
图6-4: 取下损坏之SPD	138
图6-5: 取下保险丝座	139
图6-6: 更换保险丝	140
图6-7: 拆解风扇模块	140
图6-8: 拆解单一风扇	141
图6-9: 拆卸出风口滤网模块示意图	141
图9-1: M30A效率曲线	152
图9-2: M30A温度降载曲线 (cosφ=1.0)	153
图9-3: M30A温度降载曲线 (cosφ=0.95)	154
图9-4: M30A温度降载曲线 (cosφ=0.9)	155
图9-5: M30A输入电压降载曲线	156
附录 A: 保险丝使用限制之I-V曲线	157

Table

表2-1: M30A_120内容物清单	90
表2-2: M30A_121内容物清单	91
表2-3: 产品型号	92
表4-1: 每一直流端子的最大电流耐受值	105
表4-2: 断路器建议规格	109
表4-3: AC接头线径尺寸	109
表4-4: 最大容许输入功率限制	114
表4-5: 线径大小	114
表4-6: RS-485端子定义	116
表4-7: 终端电阻设定	117
表4-8: 数字输入功能与EPO设定	117
表4-9: Demand Response Modes (DRMs)	117
表5-1: LED指示灯状态	121
表5-2: 干接点触发条件设定	129
表7-1: 错误信息	142
表7-2: 警告信息	143
表7-3: 故障信息	144
表9-1: RPI M30A规格	149
附录 B-1: 组装说明-1	158
附录 B-2: 组装说明-2	159

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 M30A_120 / M30A_121。

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。

PID(电位诱导衰减)抑制功能可以为太阳能面板提供较长的使用寿命。

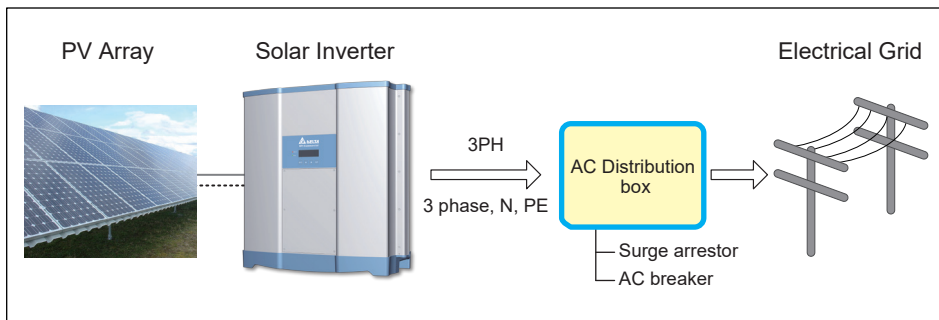


图1-1 : 太阳能逆变器使用说明

1.3 其他信息

如果想获得RPI M30A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 M30A_120 / M30A_121 之开箱步骤请参考图2-1。

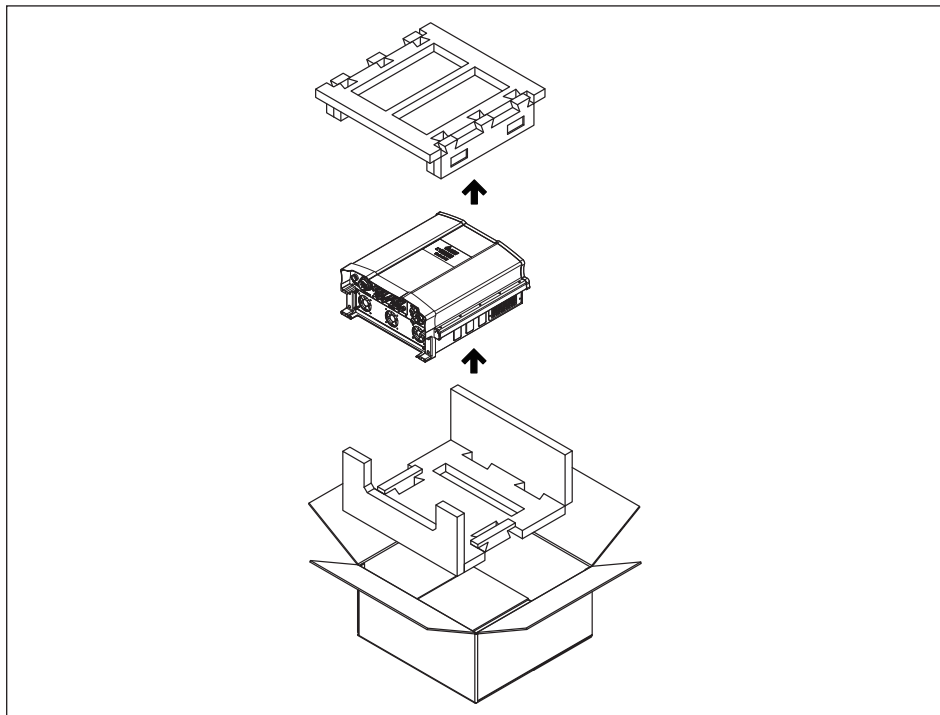


图2-1：开箱

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：

- 检查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以下的表与图：
RPI M30A_120机种请参考图 2-2 与表 2-1。
RPI M30A_121机种请参考图 2-3 与表 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。

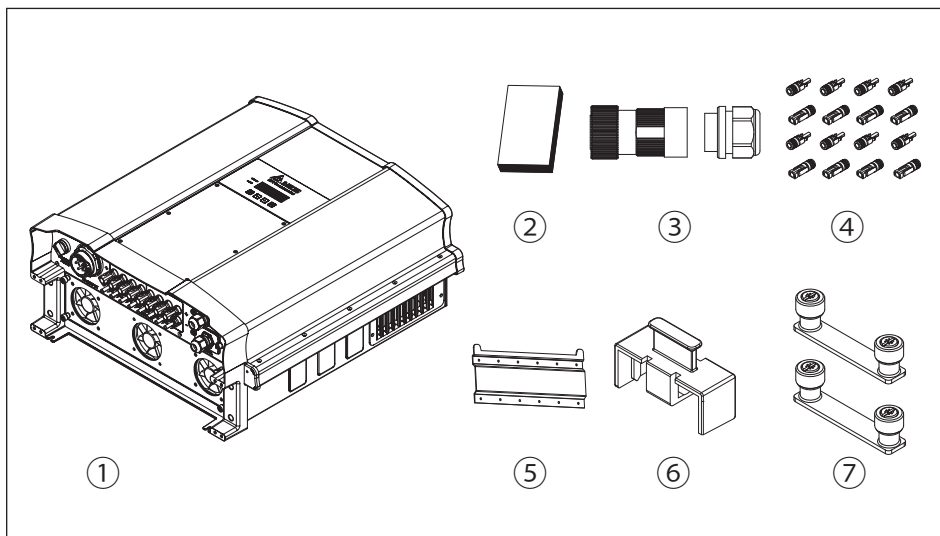


图2-2 : M30A_120内容物清单

RPI M30A_120			
	物品	数量	说明
1	太阳能逆变器	1 pc	RPI系列太阳能逆变器
2	使用说明书	1 pc	安全规范、安装步骤、产品规格...等
3	AC 接头	1 pc	AC 连接接头
4	DC 接头	8 组	DC 连接接头
5	壁挂板	1 pc	将太阳能逆变器挂于墙上之壁挂板
6	保险丝座	1 pc	接地保险丝座
7	导电片	2 pcs	将DC+端或DC-端并联之导电片

表2-1 : M30A_120内容物清单

※本产品不提供接地保险丝，如有需求请自行选用1000V/1A之Midget型保险丝。

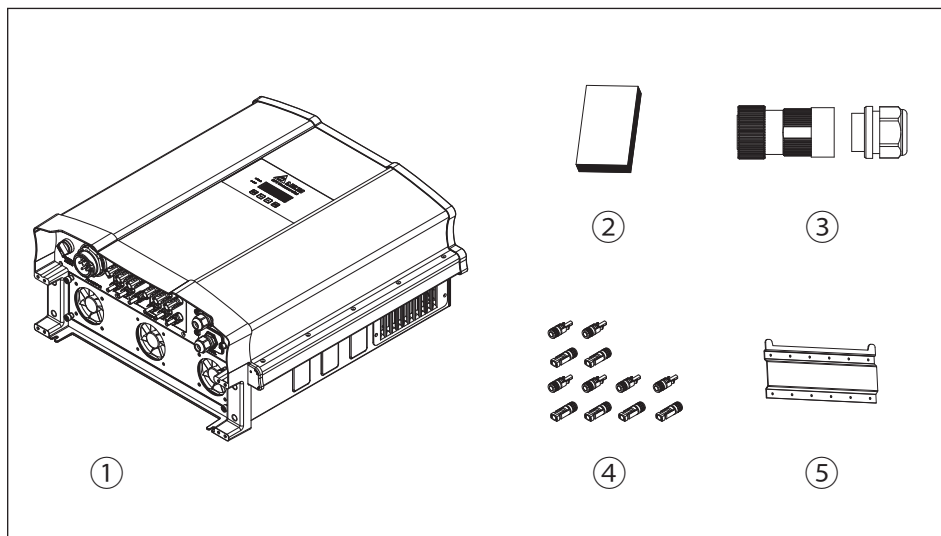


图2-3 : M30A_121内容物清单

RPI M30A_121			
	物品	数量	说明
1	太阳能逆变器	1 pc	RPI系列太阳能逆变器
2	使用说明书	1 pc	安全规范、安装步骤、产品规格...等
3	AC 接头	1 pc	AC 连接接头
4	DC 接头	6 组	DC 连接接头
5	壁挂板	1 pc	将太阳能逆变器挂于墙上之壁挂板

表2-2 : M30A_121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，逆变器之型号、规格及序号皆标示于产品卷标上，关于卷标的位置请参考图 2-4。

RPI M30A_120 / M30A_121 系列依照DC保险丝与突波保护器的有无可分为两种类型，请参考表2-3。

型号名称	产品型号	突波保护器	DC保险丝
RPI M30A_120	RPI303FA0E1000	✓	✓
RPI M30A_121	RPI303FA0E1100	X	X

表2-3：产品型号

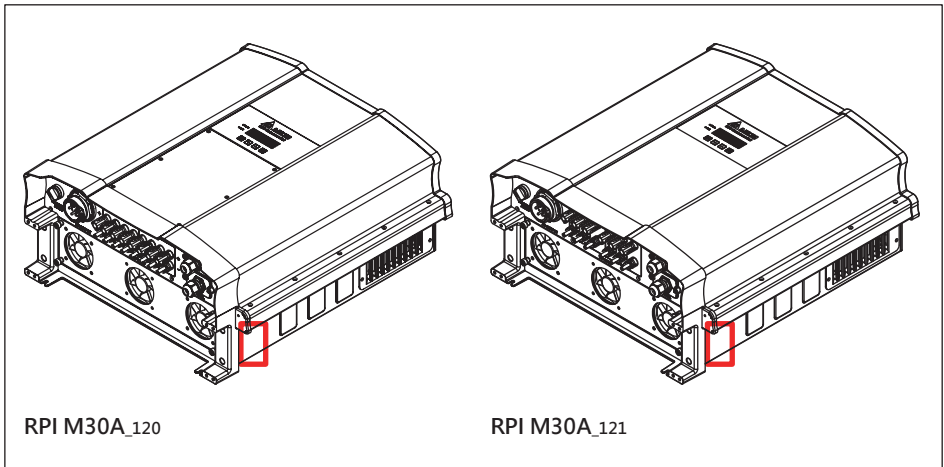


图2-4：产品卷标

2.4 外观介绍

逆变器外部组件如图2-5所示。详细的输出与输入接口请参考图 2-6。
DC输入组数会因机种不同而有所差异。

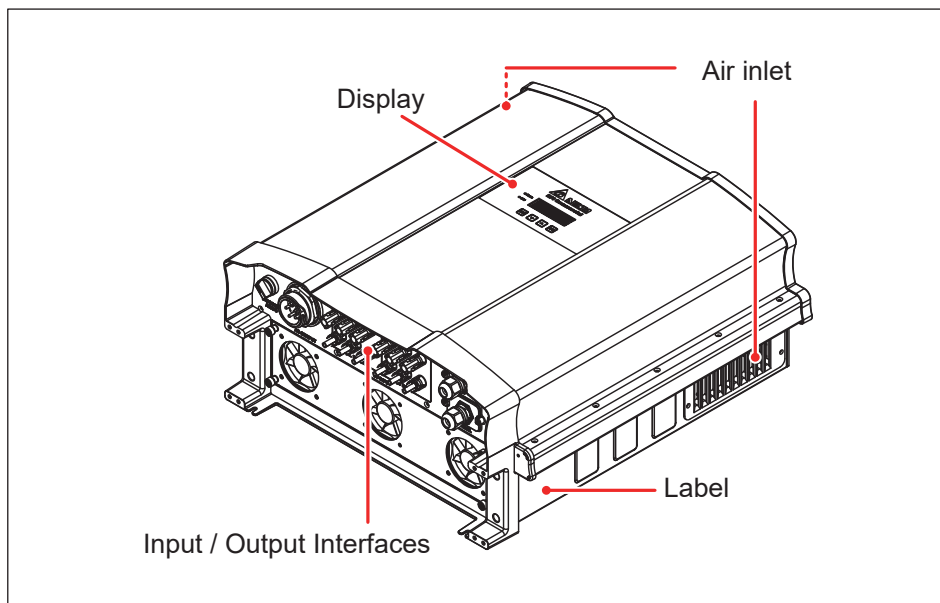


图2-5：外观介绍

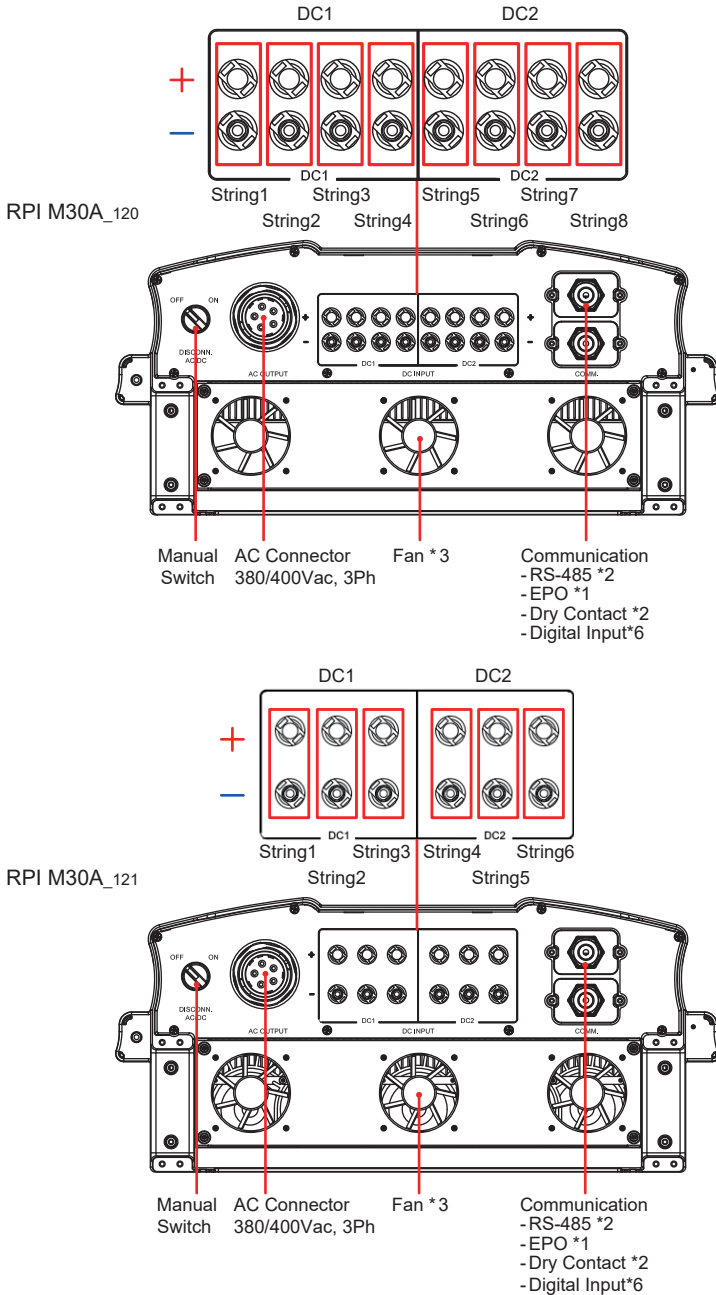


图2-6：输出接口介绍

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。

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。
* 至少需锁附上面的6颗螺丝。
- 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。

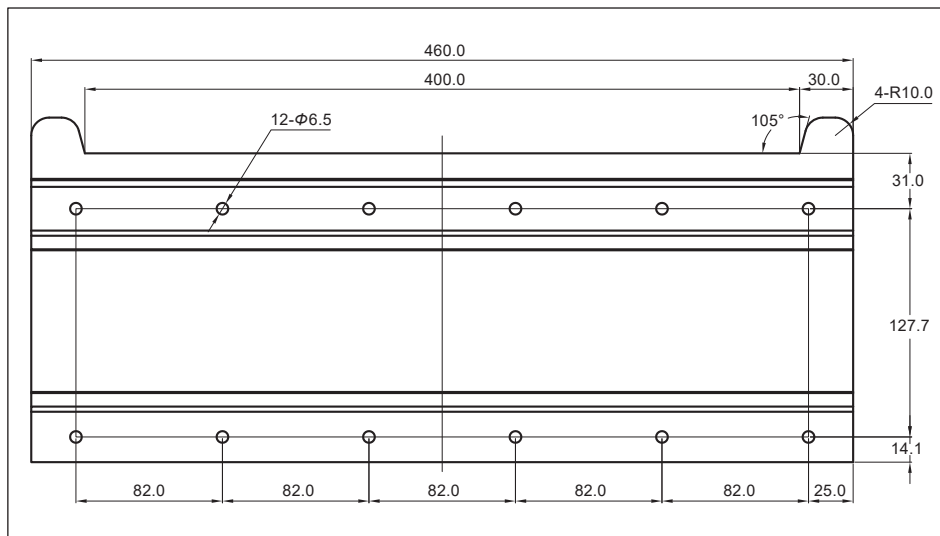


图3-1：壁挂板尺寸

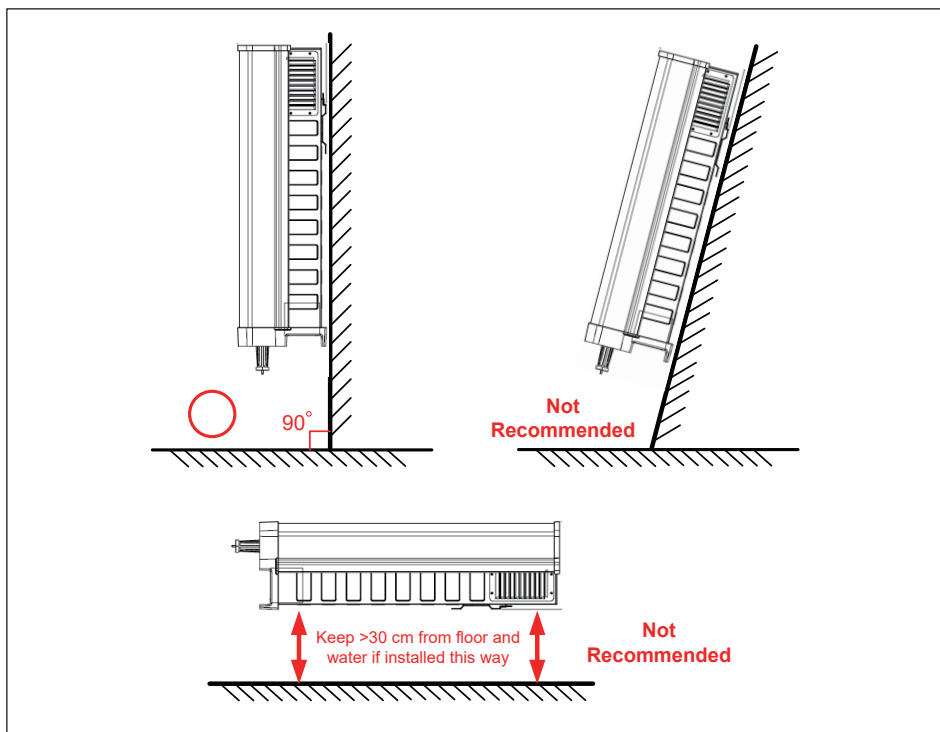
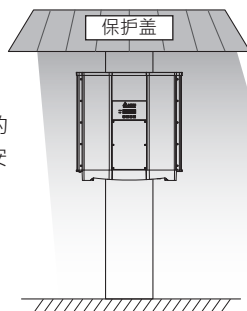


图3-2: 建议和不建议的安装方式

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。



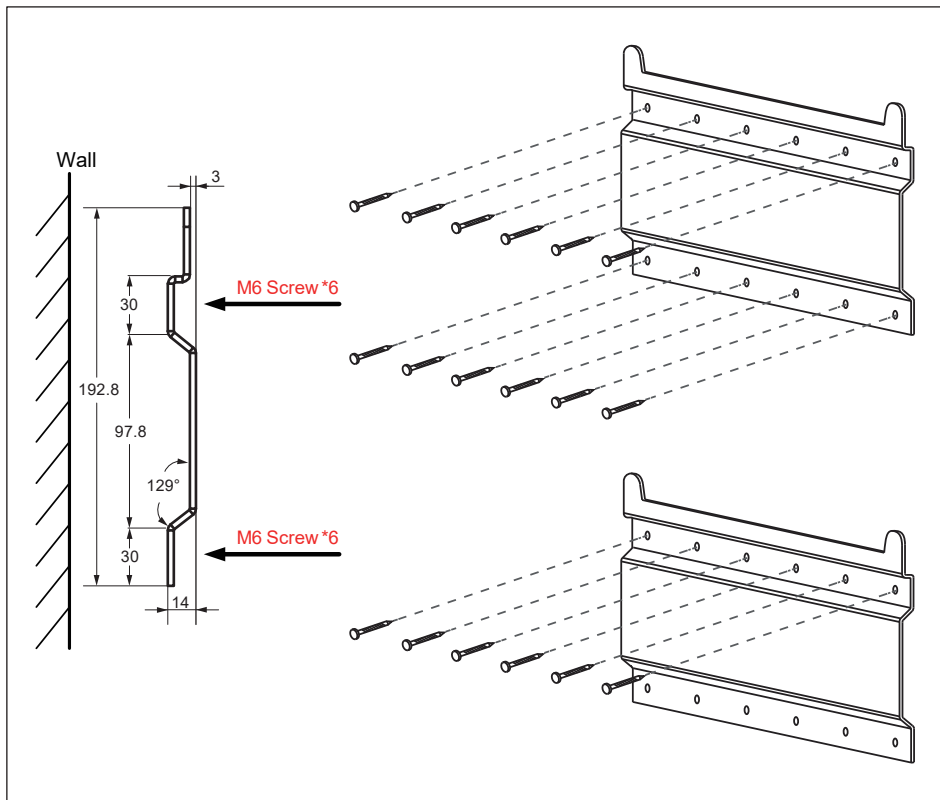


图3-3：以螺丝固定壁挂板

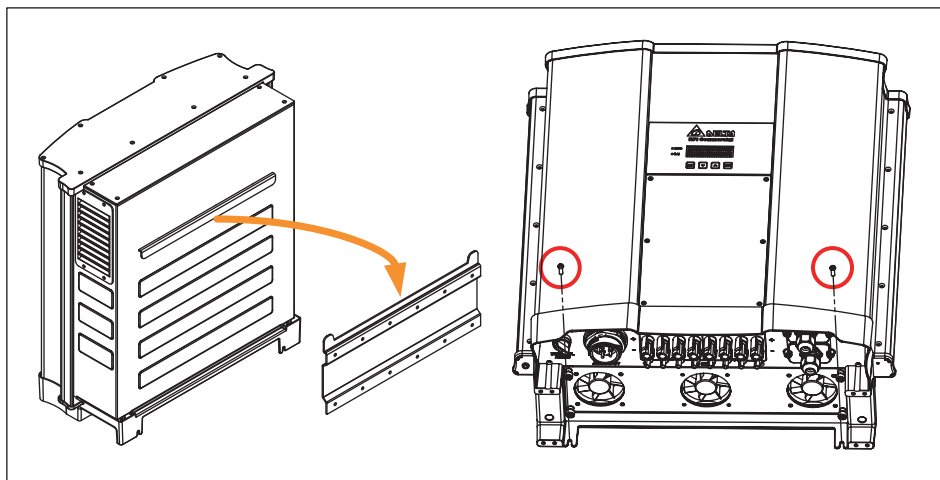


图3-4：附挂和固定逆变器

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。

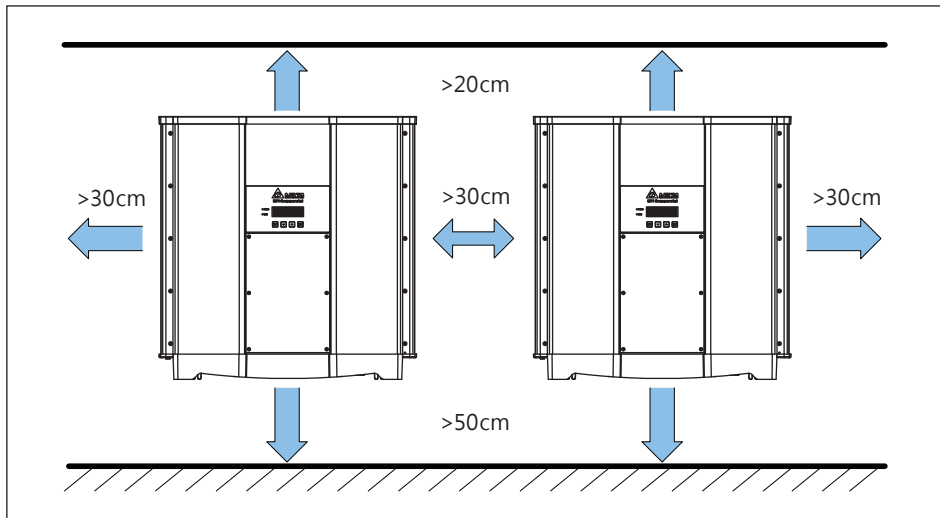


图3-5 : 适当安装间距

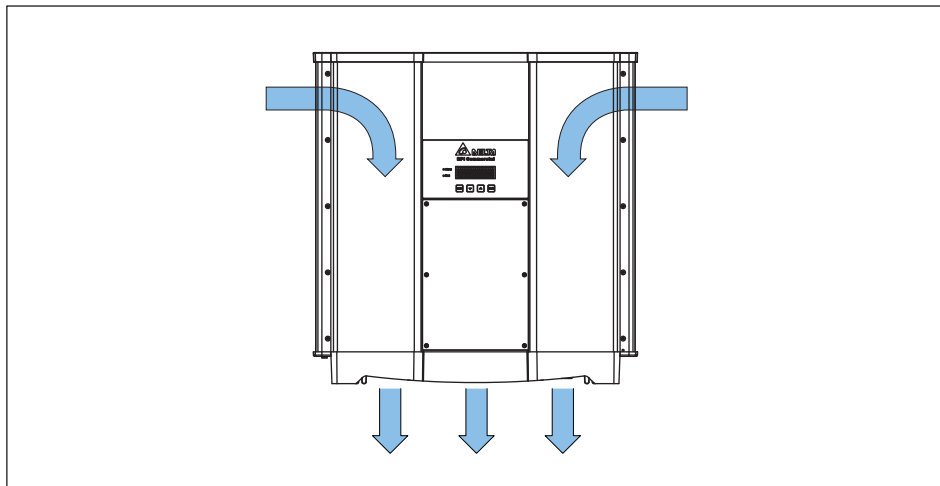


图3-6 : 进气方向

4 配线

警告！电击危险



- 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 (M30A_120)

- M30A_120 机种于DC输入端皆有配接15A的DC保险丝。每个输入串之最大输入电流不可超过10A。
- 太阳能板可以直接与各个DC输入端独立连接。但并不建议用户使用配电箱将太阳能板并联后再分接入机子，此接线方式若阻抗不均容易造成电流超出保险丝负荷。接线方式请参考图 4-1。
- 若您想强制逆变器操作于并联输入模式(仅启动一组MPPT)，请于逆变器内加装2组短路导电片，如图4-2。外部DC端则维持如图4-1之接线方式。
- RPI系列机种内部并未附带隔离变压器。若太阳能板为正端接地或负端接地时，使用者须于AC端加装外部隔离变压器，并于逆变器内安装1000V/1A之midget型接地保险丝与短路导电片。详细的接线方式请参考图 4-3、图 4-4。
- 当太阳能正端或负端接地时，不可以启动PID功能，同时对地阻抗须设定为“Plus Grounded”或是“Minus Grounded”。
- 即使切断机壳底部的手动开关，在移除MC4 DC端子前仍需将AC与DC电源确实脱离，避免触电。
- 不同的DC配线方式需于逆变器控制面板上设定不同的对地阻抗(insulation)侦测方式，请参考5.2.7 Install Settings。

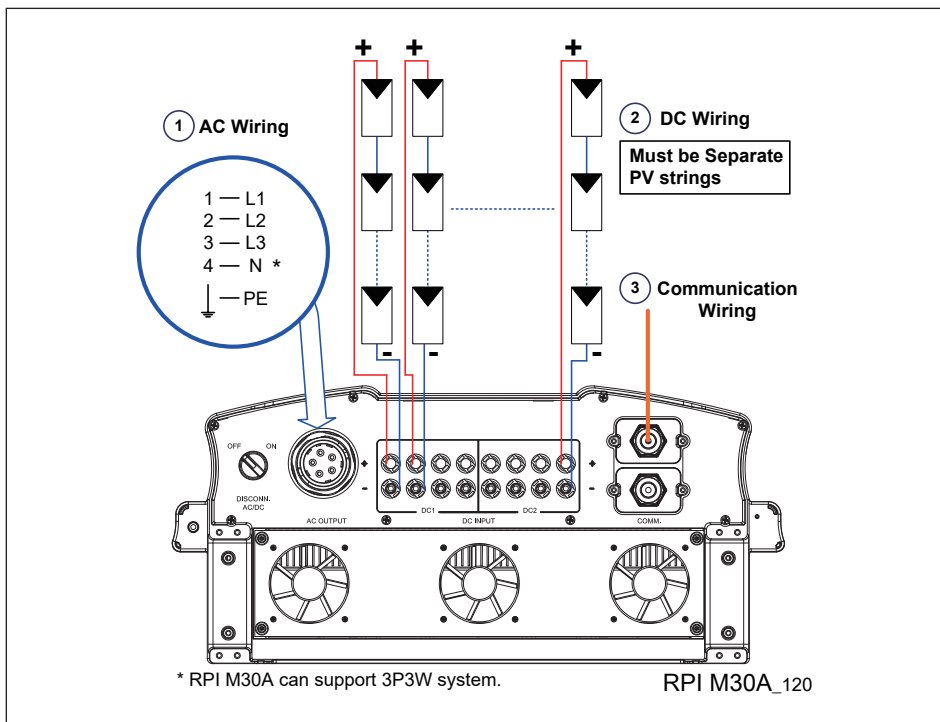


图4-1：DC端不接地配线图

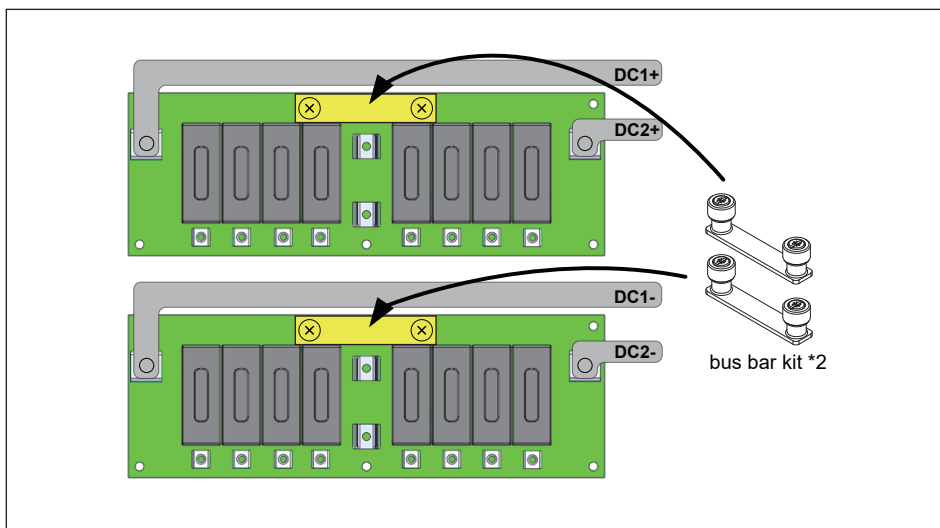


图4-2：强制逆变器操作于并联模式

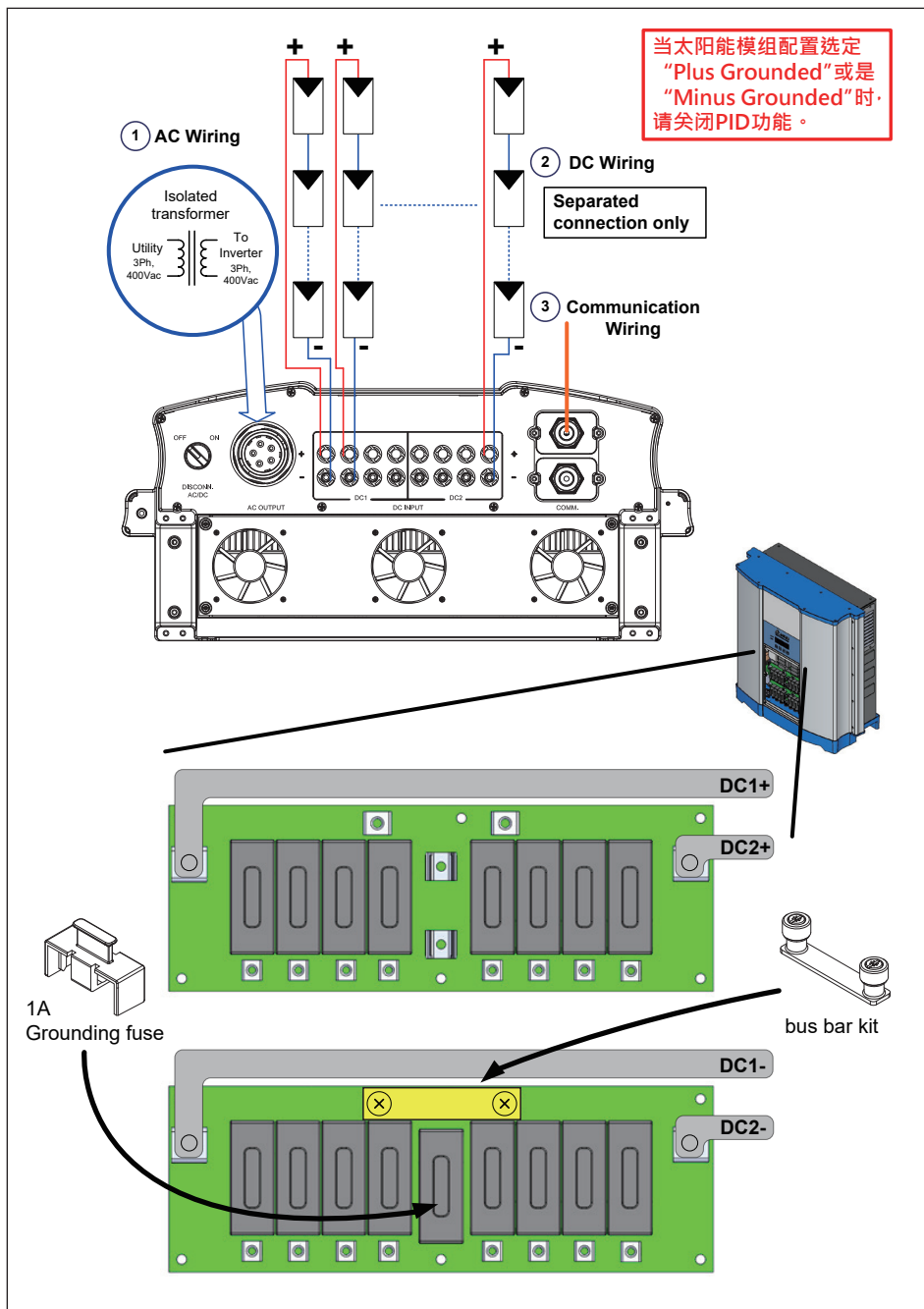


图4-3 : M30A_120 DC端负接地配线图

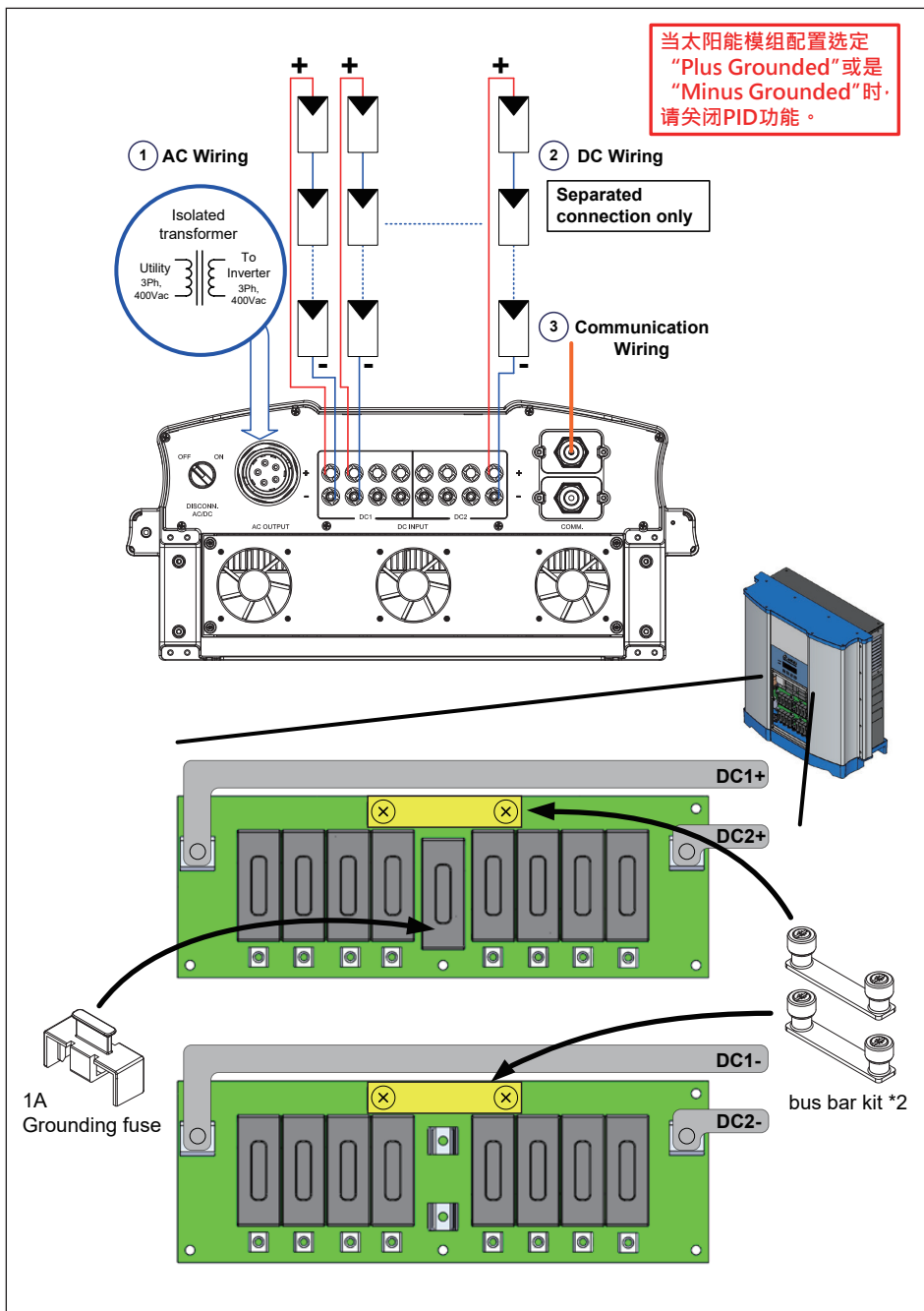


图4-4：M30A_120 DC端正接地配线图

4.2 配线前准备事项 (M30A_121)

- RPI M30A_121内部并未配备DC保险丝，每组DC输入皆可承受最大30A之输入电流。每串输入端只可以使用一对DC端子。
- 当太阳能板不接地时，机子DC端可接受并联 或是独立连接。
- RPI系列机种内部并未附带隔离变压器，若太阳能板为正端接地或负端接地时，DC端仅允许并联配线并需于AC 端加装外部隔离变压器。
- 当太阳能正端或负端接地时，不可以启动PID功能，同时对地阻抗须设定为“Plus Grounded”或是“Minus Grounded”。
- 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 Install Settings。

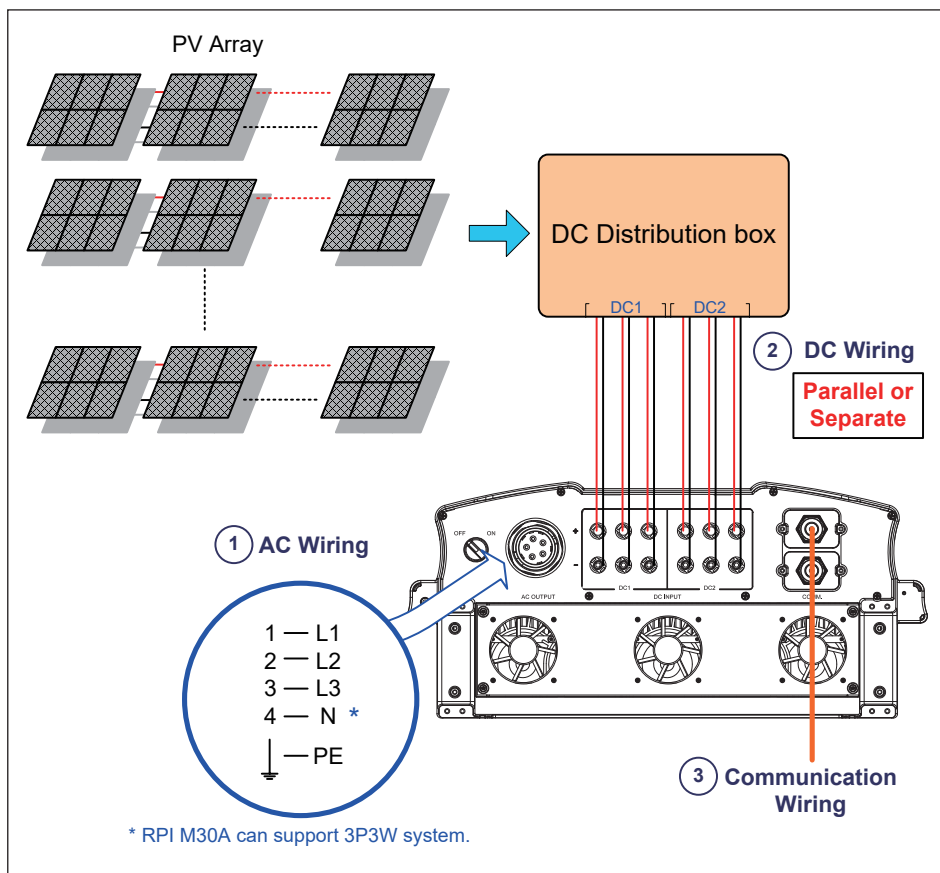


图4-5 : M30A_121 系统配线图(DC端不接地)

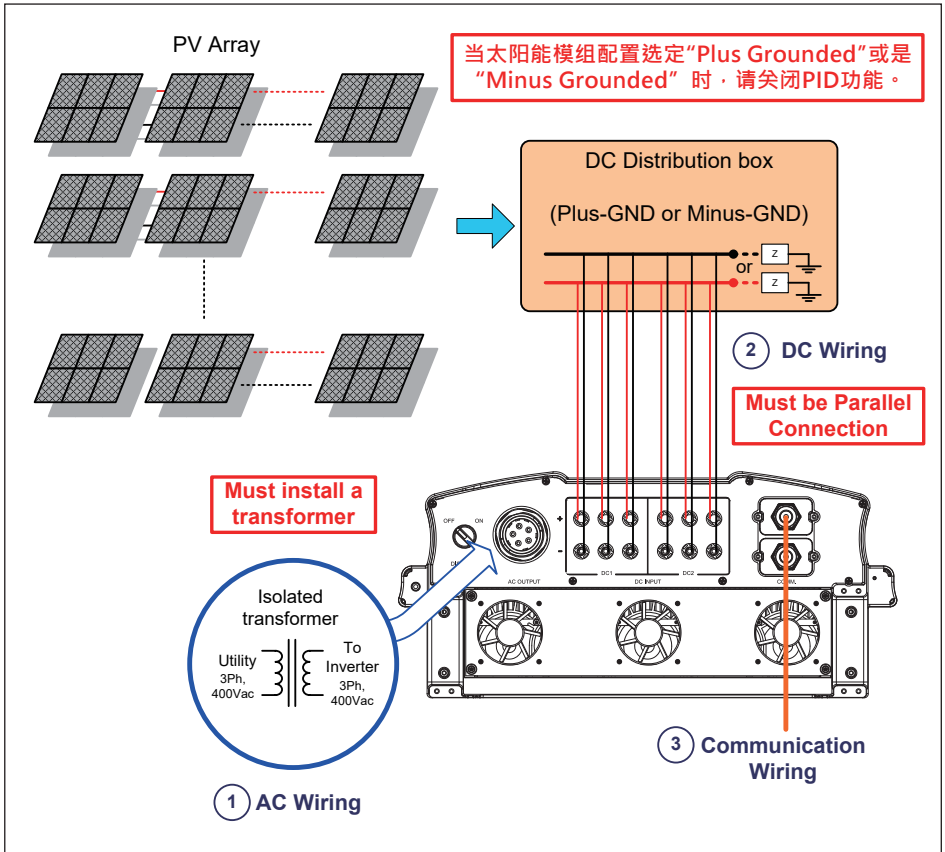


图4-6 : M30A_121 系统配线图(DC正接地或负接地)

Note for Field Wiring

由于逆变器内部接线与直流配接端子的耐流限制，使用逆变器时，需能确保每一直流端子的电流不会超出下表限制值，以避免火灾等情事。

下表的电流限制值仅供做为案场配接时的参考依据，不表示逆变器的额定应用值。

RPI M30A_120	16A
RPI M30A_121	39A

表4-1：每一直流端子的最大电流耐受值

光伏汇流箱的使用

M30A_120:

- 主要是因为光伏汇流箱的输出电流大于每一直流端子的最大电流限制值，16A。所以如下图的应用是不恰当的。(图4-7)
- 每一组最大输入电流为7.5A。

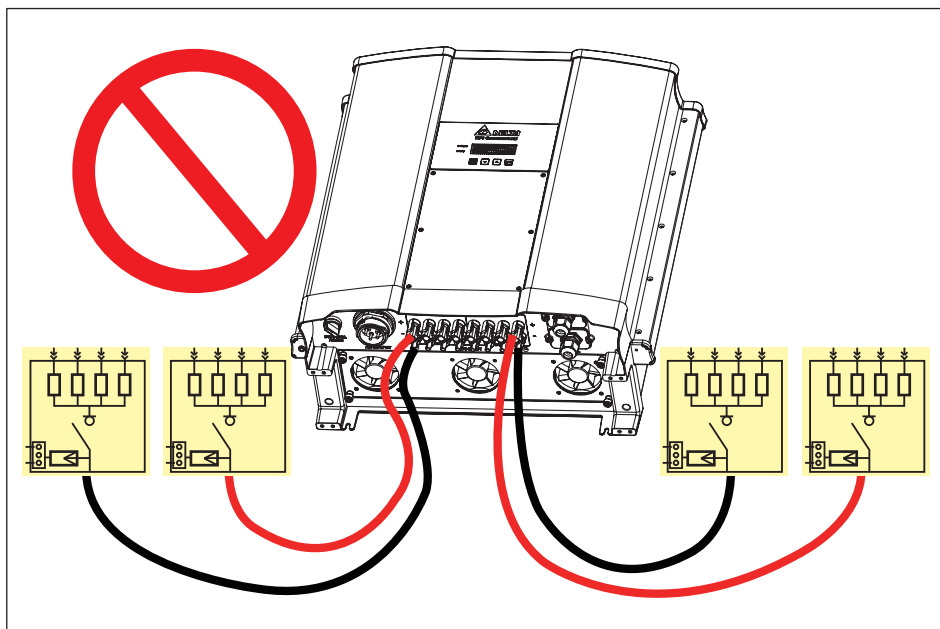


图4-7：错误的连接方式 - 1

M30A_120:

- 不建议一个或多个分流接头的使用。(图4-8)

因分流端子后的电流不能保证是平均分配的。

不平衡分流下，局部的直流输入端子仍有可能会超出16A。

每一组最大输入电流为7.5A。

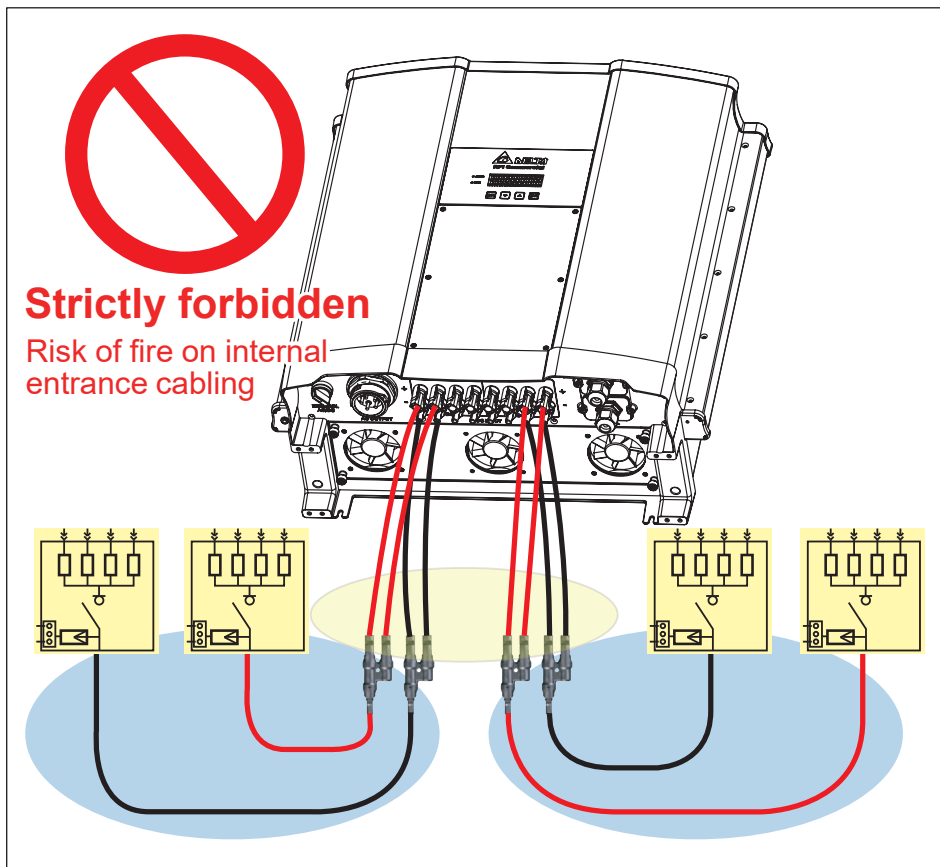


图4-8：错误的连接方式 - 2

M30A_120:

不建议如下图(图4-9)所示的分流接头应用。
因通过分流接头的电流将超过分流接头的限制值。
每一组最大输入电流为7.5A。

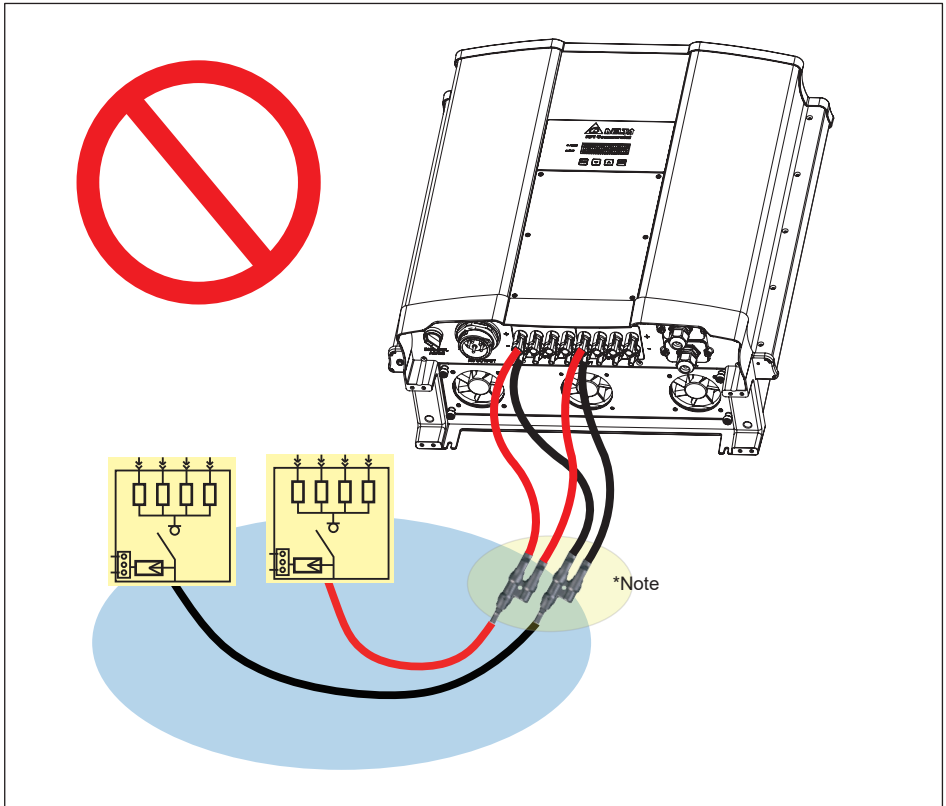


图4-9：错误的连接方式 - 3

M30A_120 and M30A_121:

禁止将直流输入端子当做分流接头使用。(图4-10)

因由光伏汇流箱流进逆变器的第一组直流端子电流将远高于端子跟保险丝的限制值。

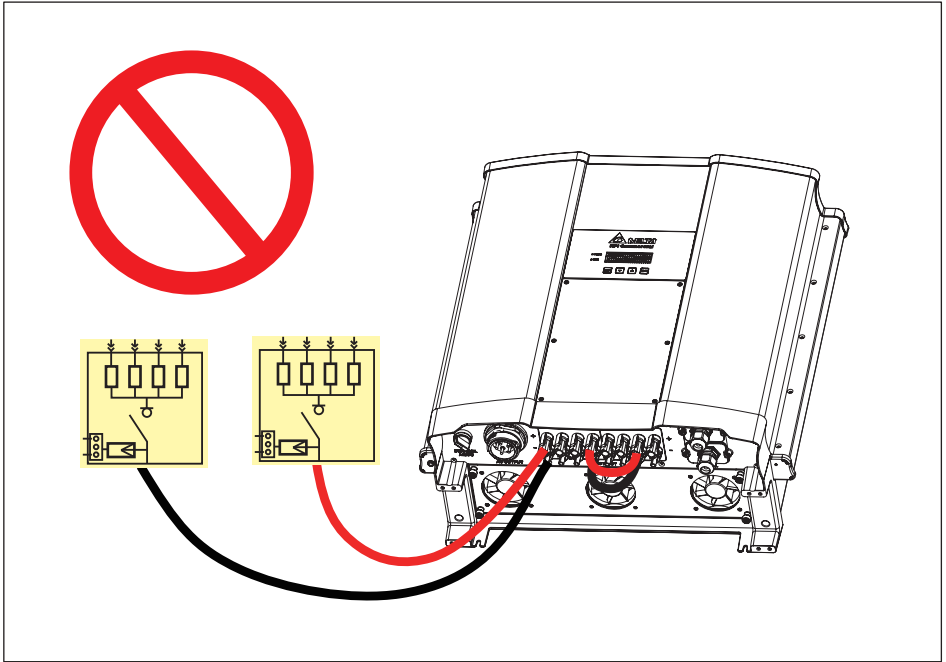


图4-10：错误的连接方式 - 4

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

警告!



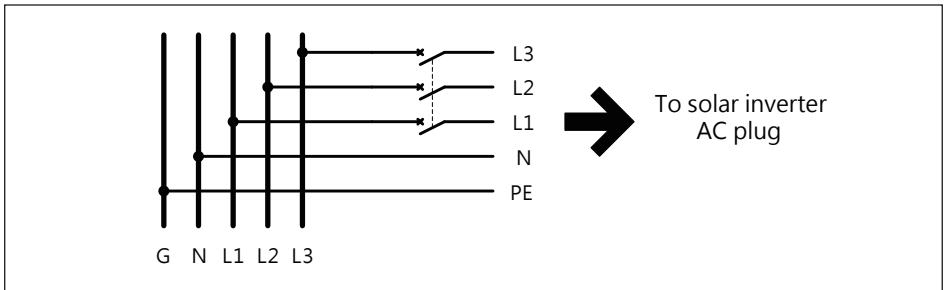
- 执行配线作业时, 必须确认市电电源开关已经关闭。

4.3.1 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。

Model	Upstream circuit breaker
RPI M30A	60A

表4-2: 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4-3中之规格。
若表4-3之规范与当地法规有所抵触, 请以当地法规之规范为主。

机种名称	额定电流	单一线径	电缆外径	建议扭力值
RPI M30A	65 A	13.3-25mm ² 6-4AWG	23-31mm	2.5 N.m

表4-3: AC接头线径尺寸

M30A机种若使用线径25mm² 或4AWG之电线, 线末将无法加装压接端子。

RPI M30A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。
- RPI M30A机种剥除内部所有线材之胶皮20mm。

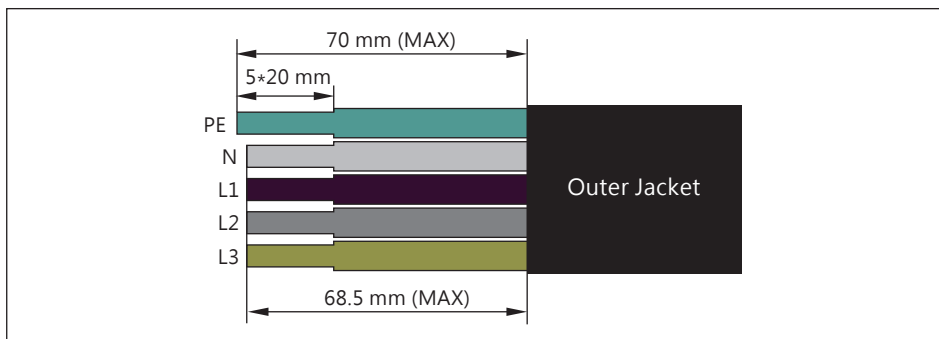


图4-11：AC线材拨线

其中25mm²(4AWG)不要压接冷压端子。

16mm²(6AWG)建议管型端子尺寸如下图所示。

WIRE SIZE	DIMENSIONS(mm)				
	L	F	ΦC	ΦD	ΦW
16mm ² 6AWG	28	18	5.8	6.2	8.7

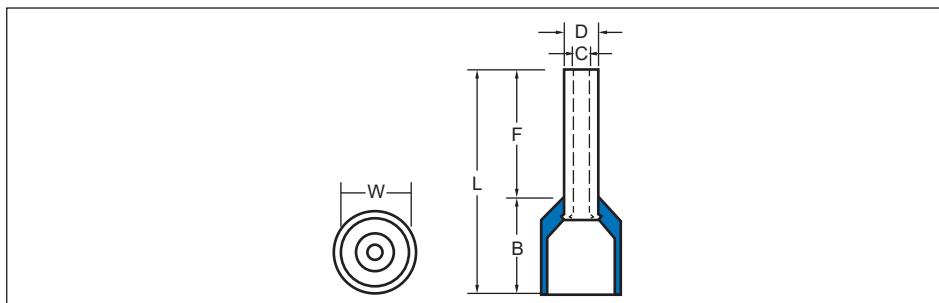


图4-12：欧式端子

对于铜线:

台达建议AC线材使用适当耐流能力之多股软芯线。

对于铝线:

为确保良好的导电性及安全性, 必须使用如图4-13所示的铜铝端子。(与AC Plug 的接触面须为铜)

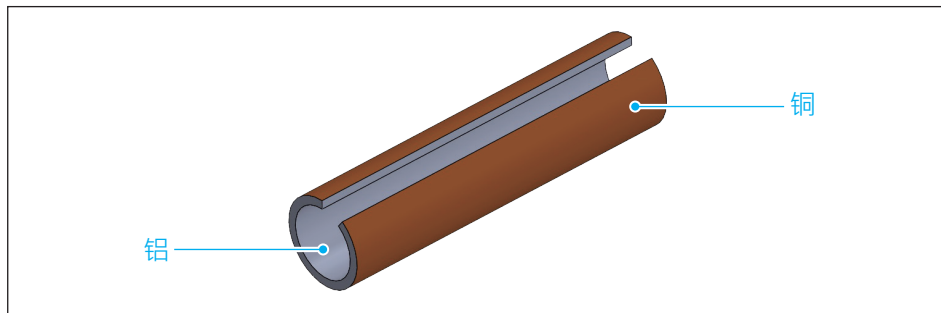


图4-13 : 铜铝端子

注意:**有可能产生高温:**

若压接点的阻抗过高, 该点则有可能产生高温导致火灾。

为确保安全性及可靠的接触点, 请确实遵守以下步骤

1. 铝线的导电性较铜线差, 铝线线径请至少选用比铜线线径大一个等级。
2. 安装铝线时请尽量在低湿度且低腐蚀性的环境下进行。
3. 安装过程需快速。
4. 确实使用硬体工具(如刀子)将剥线后的裸露表面氧化层刮除, 并立即将裸露线材浸泡至凡士林内(须为中性、不含酸、碱成分), 然后放入铜铝端子内。
5. 使用最大允许的压接扭力进行压接。



线材压接完成后请按照图 4-14 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。

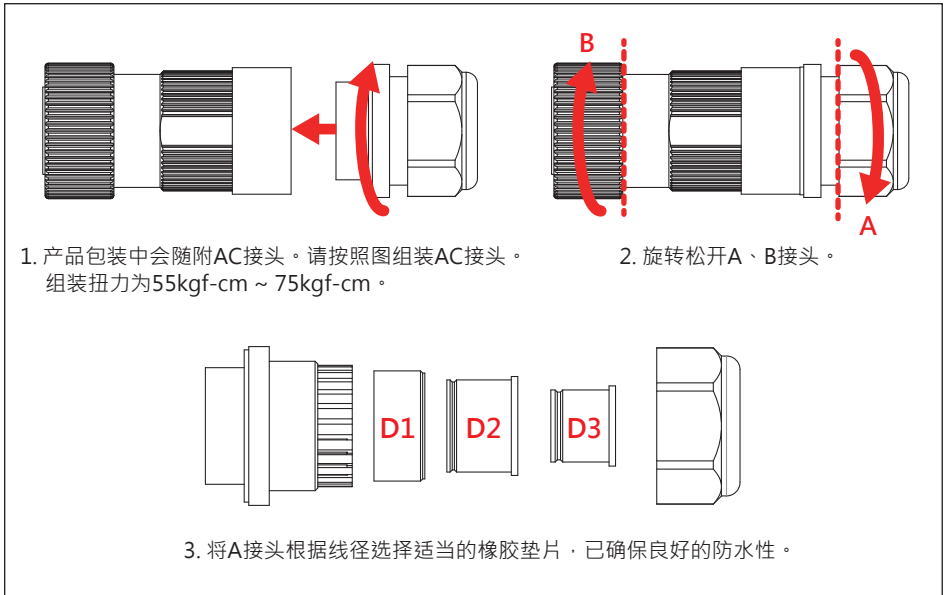


图4-14：RPI M30A之AC接头配线图

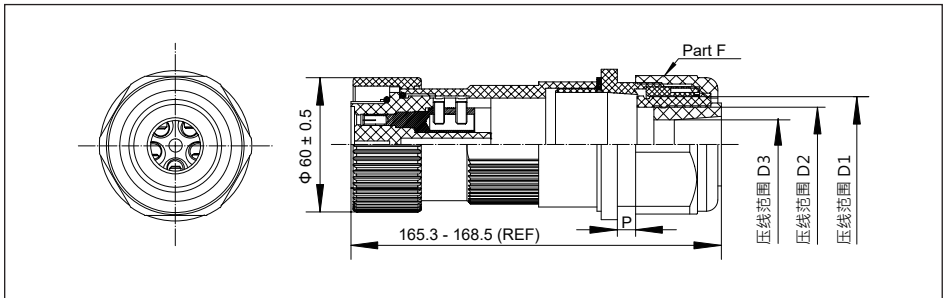
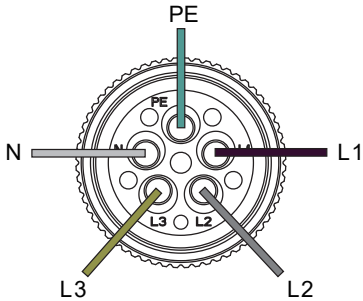


图4-15：AC端子防水塞

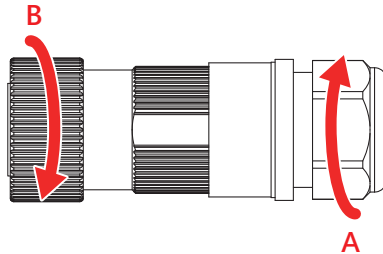
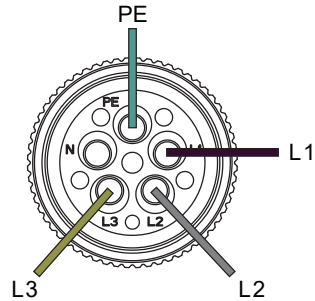
**接线端子并不适用于单芯电缆线，请使用多芯电缆线并配合欧式端子使用。
 **该接线端子经过镀银处理。

	适用线径(mm)	Part F 扭力(Nm)	扭紧间距P(mm)
D1	32.6 ~ 41.3	13 ~ 20	1 ~ 7
D2	20.5 ~ 32.6	13 ~ 15	0 ~ 7
D3	15.3 ~ 20.5	13 ~ 20	1 ~ 5.5

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. 先拧紧B接头后，再拧紧A接头固定电线

连接至AC之电压必须符合下列规范：

三相三线：

L1-L2: 400 Vac \pm 20%

L1-L3: 400 Vac \pm 20%

L2-L3: 400 Vac \pm 20%

三相四线：

L1-N: 230 Vac \pm 20%

L2-N: 230 Vac \pm 20%

L3-N: 230 Vac \pm 20%

4.3.2 允许接地系统

接地系统	TN-S	TN-C	TN-C-S	TT	IT
是否允许	Yes	Yes	Yes	Yes	No



不建议N与PE压差 $>20V_{rms}$ 的TT接地系统。

4.4 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。
- TDC2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, 绝对最大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4-4之规范。

限制条件	RPI M30A
最大输入功率	35 kW
DC1、DC2个别输入功率	23.5 kW

表4-4: 最大容许输入功率限制

型号	额定电流	线径
RPI M30A_120	DC 15A	4 - 6 mm ² / 12 - 10 AWG
RPI M30A_121	DC 30A	6 mm ² / 10 AWG

表4-5: 线径大小

DC 配线端子可分为正极和负极两种, 如图4-16所示。配接时请务必确认极性与逆变器上的标示一致。

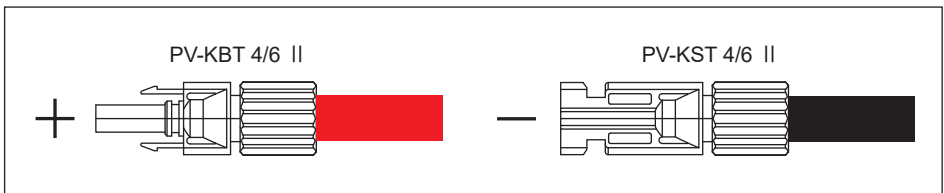


图4-16: DC配线端子

4.5 多台逆变器组合

4.5.1 多台逆变器在三相系统并联配置方式

RPI M30A 可配置在三相电压的系统，也可将多台RPI M30A的AC侧并联在相同的市电网。请参考图4-17。

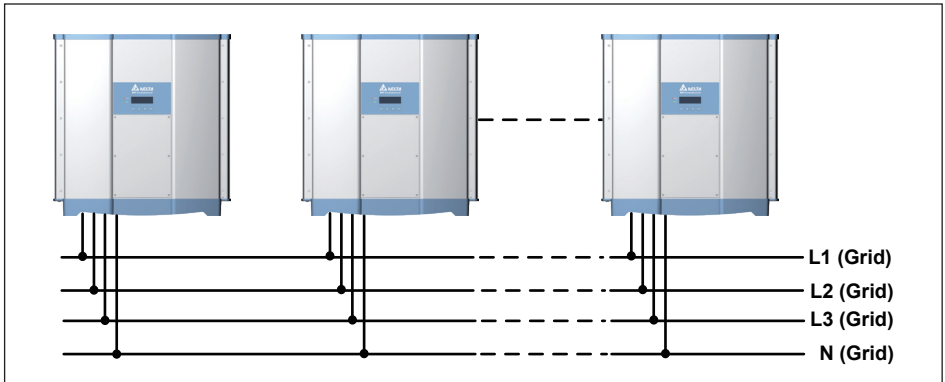


图4-17：多台逆变器在三相系统并联配置方式

4.5.2 通讯接口之连接

RPI M30A机种之通讯模块请参考图4-18。此模块提供VCC、RS-485、干接点、紧急关机、以及数字输入等不同功能之连接端子。

** 请使用外径20 AWG (0.5mm²)的电缆线。 **

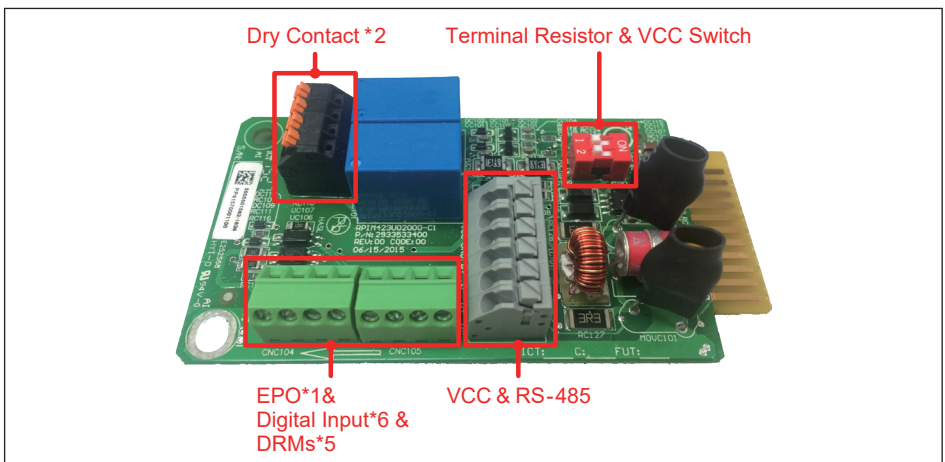


图4-18：通讯模块示意图

4.5.3 RS-485之连接

RS-485端子的定义如表4-6。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4-19。

终端电阻的设定方式请参考表4-7。

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

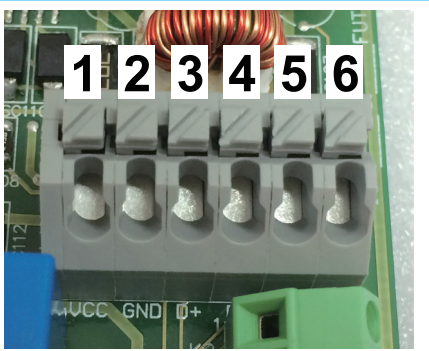


表4-6：RS-485端子定义

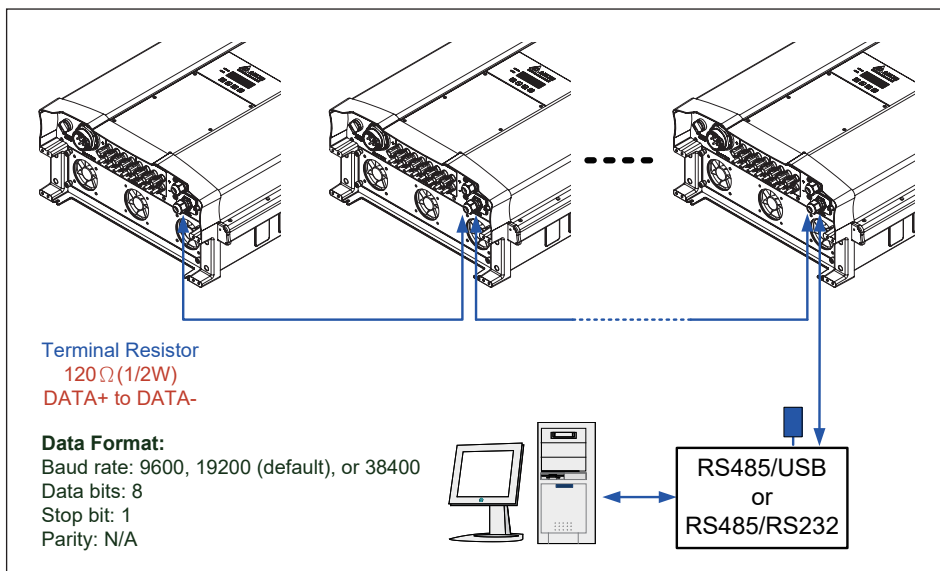


图4-19：多台逆变器串接通讯

	指拨开关1	指拨开关2
ON	VCC ON	Terminal Resistor ON
OFF	VCC OFF	Terminal Resistor OFF

表4-7：终端电阻设定

4.5.4 紧急关机装置与数字输入之连接

RPI M30A机种提供一组紧急关机装置(EPO)·用户可于Install Settings页面自行定义其触发条件·设定方式请参考章节5.2.7.7 EPO。

此外·机子内部尚配备6组数字输入功能(K1~K6)·各组功能请参考表4-8·合适的电线是20 AWG (0.5mm²)。

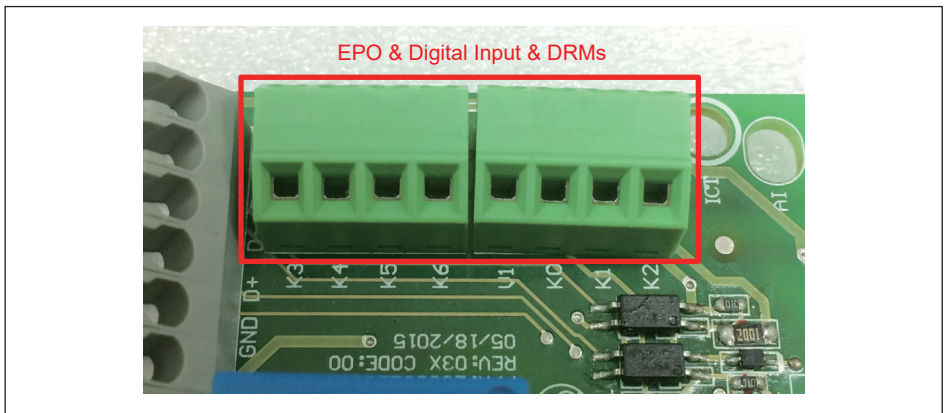


图4-20：EPO使用说明

短路以下脚位	逆变器执行动作
V1 & K0	紧急关机
V1 & K1	停止输出任何功率
V1 & K2	降低功率输出至30%额定功率
V1 & K3	降低功率输出至60%额定功率
V1 & K4	恢复功率输出至100%额定功率
V1 & K5	保留
V1 & K6	保留

表4-8：数字输入功能与EPO设定

短路以下脚位	逆变器执行动作
V1 & K0	DRM0 (Emergency power off)
V1 & K1	DRM5 (0% active power)
V1 & K2	DRM6 (Maximum 50% active power)
V1 & K3	DRM7 (Maximum 75% active power and sink reactive power)
V1 & K4	DRM8 (Maximum 100% active power and sink reactive power)

表4-9：Demand Response Modes (DRMs)

※ 此功能仅支援澳洲和纽西兰地区

紧急停止开关与数位输入功能可以在inverter多台并联下使用，接线方式请参考图4-21。

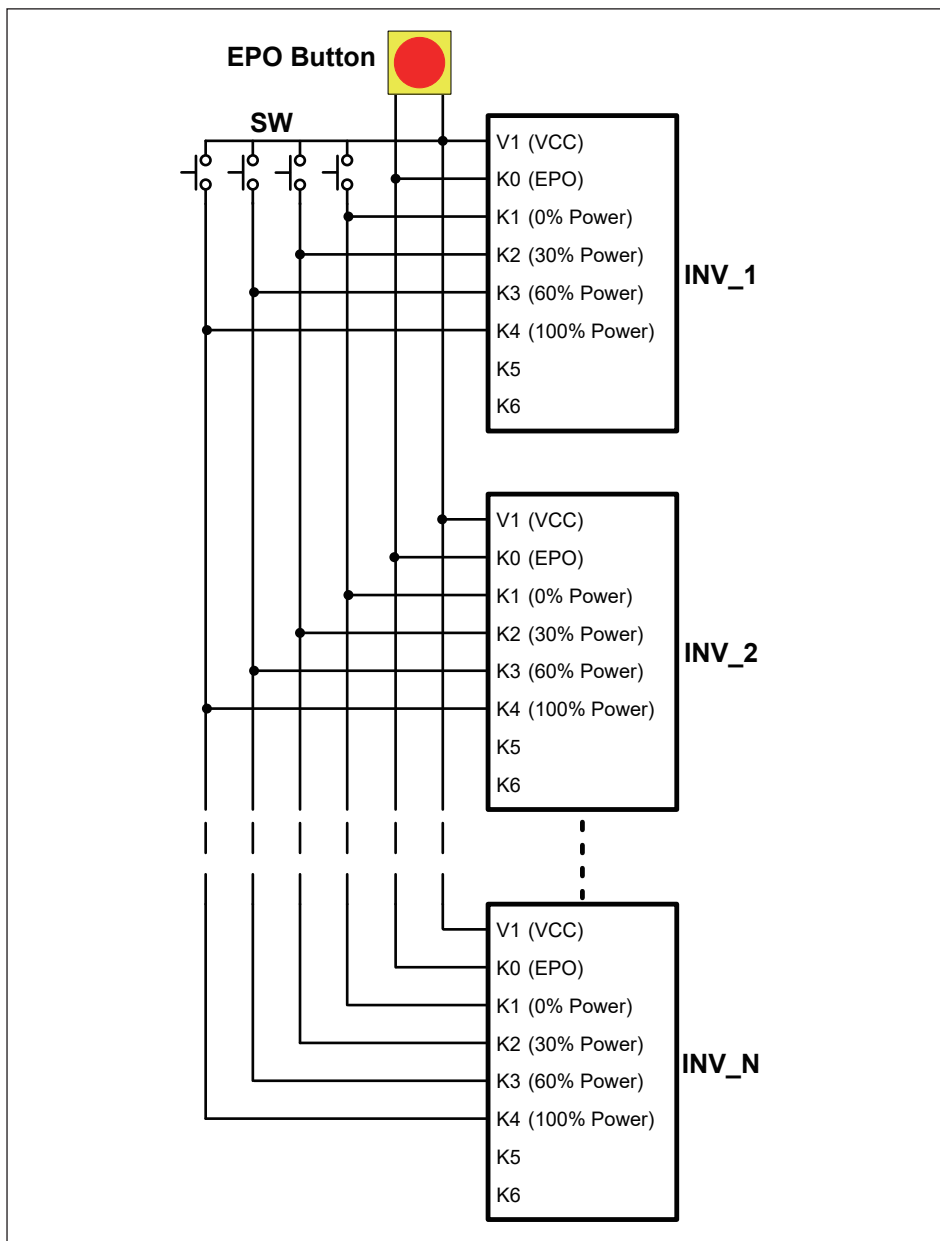


图4-21：紧急停止开关与数位输入功能的多台并联

4.5.5 干接点之连接

RPI M30A 机种提供2组连动的干接点，其触发条件可由使用者自定义，设定方式请参考章节5.2.7.5 Dry Contact。

干接点可承受250Vac/28Vdc/9A，其适合线径范围为20 AWG (0.5mm²)。

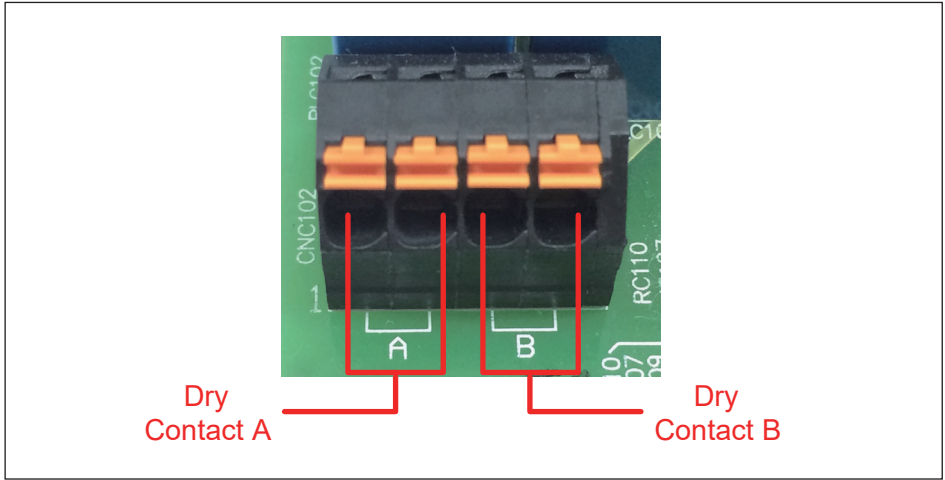


图4-22：干接点连接

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 M30A机种的控制面板含有一个4x20格的文字型显示器与两颗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。接下来的章节将会逐步介绍使用者可于控制面板设定或调整之功能。当您在调整设定值时，面板上的光标会由「▶」变为「➔」。

Power Meter	5.2.2
Energy Log	5.2.3
Event Log	5.2.4
Inverter Information	5.2.5
General Settings	5.2.6
Install Settings	5.2.7
Active/Reactive Power	5.2.8
FRT	5.2.9

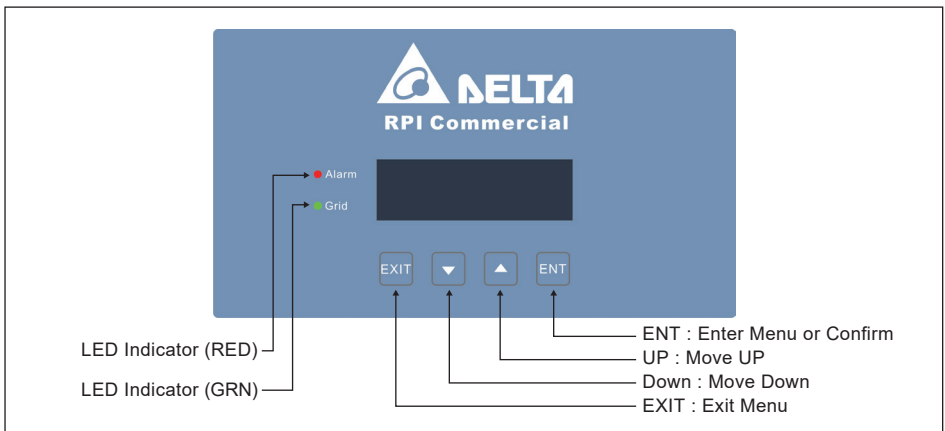


图5-1：控制面板

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，并将手动开关(Manual Switch)转至ON，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，请观察主画面中的Status是否有显示任何错误讯息，若无则可送入DC电源并等待逆变器自我测试，约莫2分钟后机子将会进行并网前倒数而后并网。

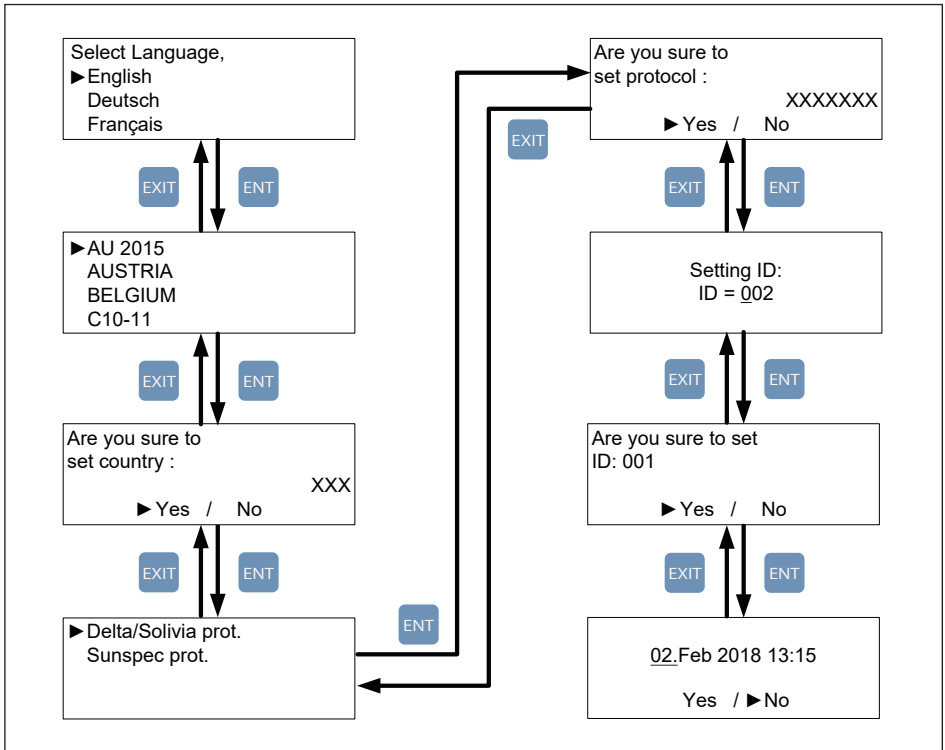


图5-2 : 首次开机出现语言和国别设定

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的累计发电量、目前Power、逆变器工作状态、以及日期时间等信息。

用户于主画面按压任何按键即可进入主选单，于主选单按压EXIT键或待机5分钟以上则会回到主画面。

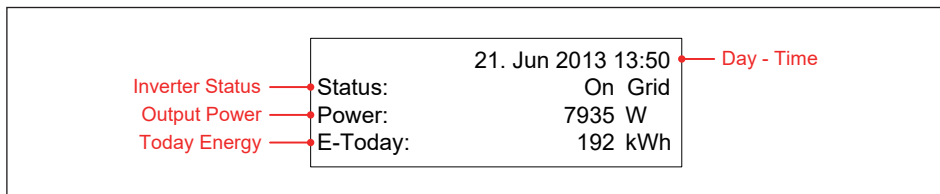


图5-3：主画面

5.2.2 Power Meter

此页面显示AC与DC端之电压、电流、功率等信息。

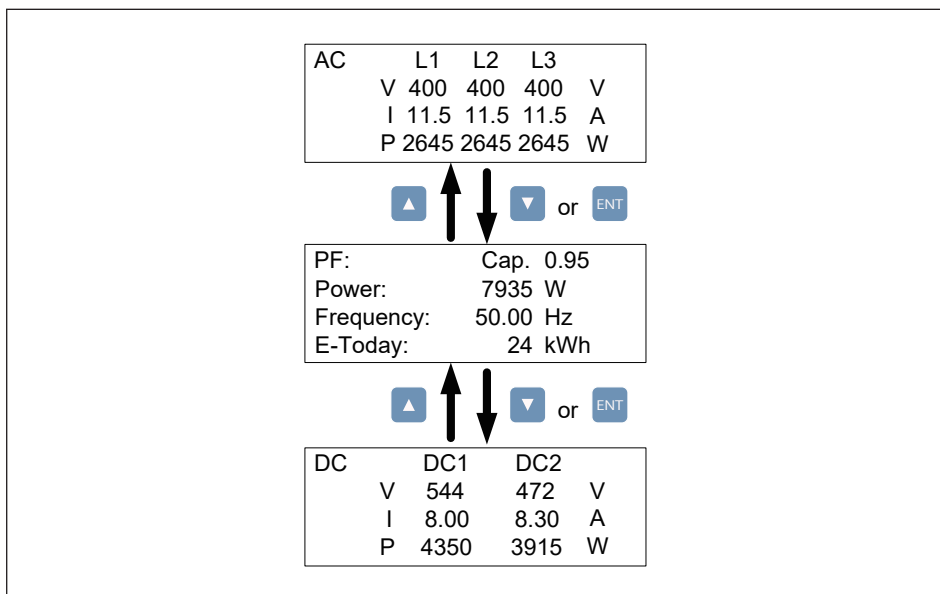


图5-4：Power meter页面

5.2.3 Energy Log

此页面可观看逆变器安装至今的总发电瓦时与总运作时间。

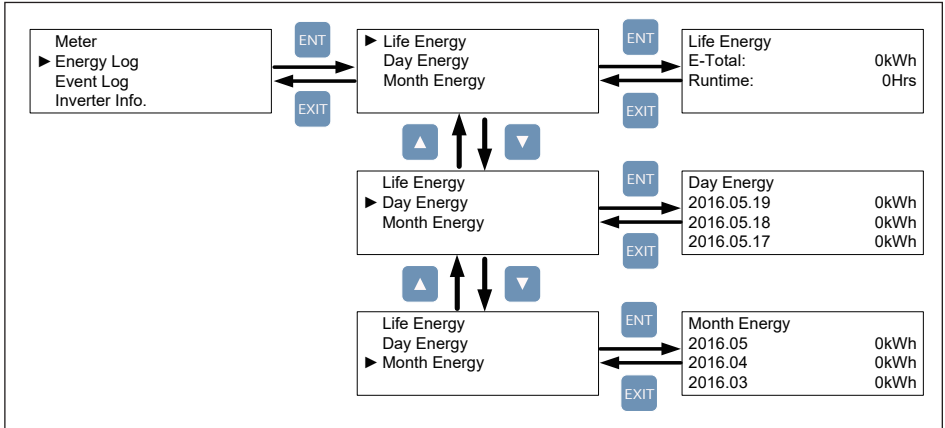


图5-5 : Energy log页面

5.2.4 Event Log

Event Log可分为Error Events与Grid Report两个分页。Error Events分页可记录30笔逆变器所侦测到的错误讯息，包含Internal Error与Grid Fault；而Grid Report分页则可单独记录五笔与市电端有关之错误讯息(Grid Fault)。

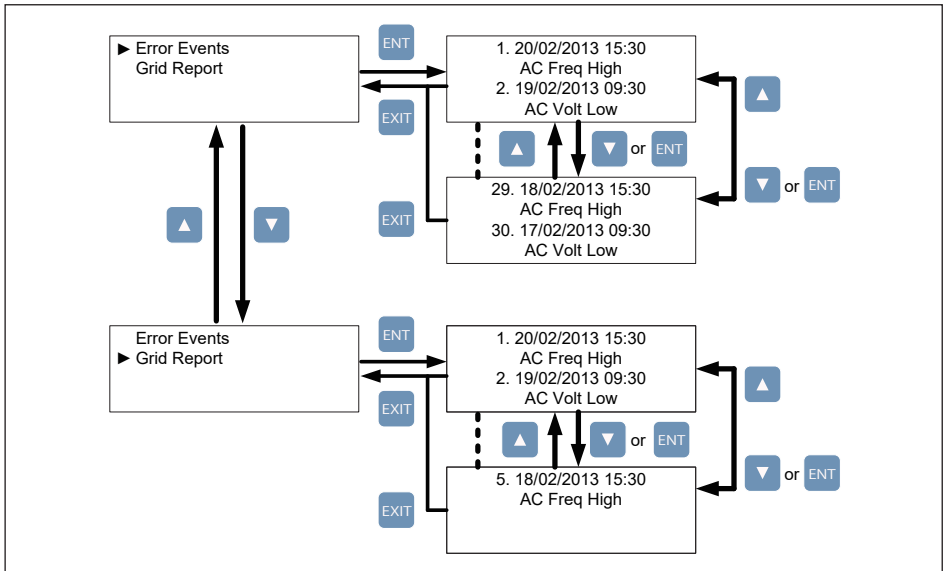


图5-6 : Event log流程

5.2.5 Inverter Information

此页面可显示产品序号、安装日期、固件版本与逆变器内部各项设定值之信息。若有修改这些设定值的需求，请参考章节5.2.7 Install Settings、章节5.2.8 Active/Reactive power以及章节5.2.9 FRT (Fault ride through)。

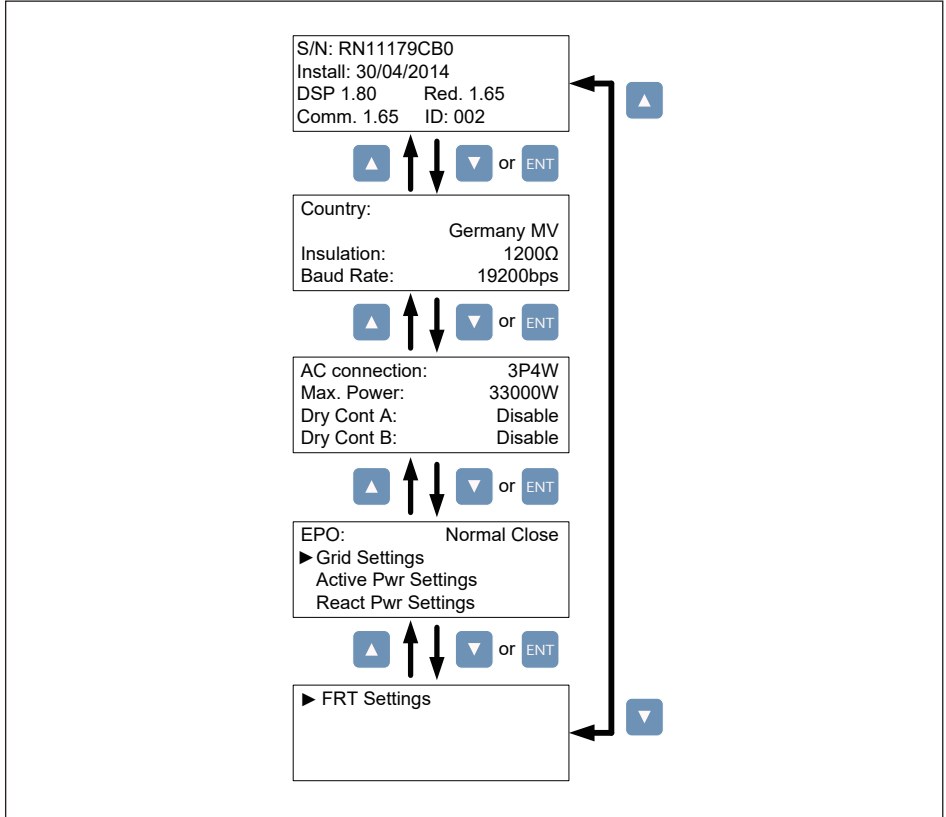


图5-7 : Inverter information页面

5.2.6 General Settings

此页面可设定语言、日期和时间以及RS-485通讯baud rate。

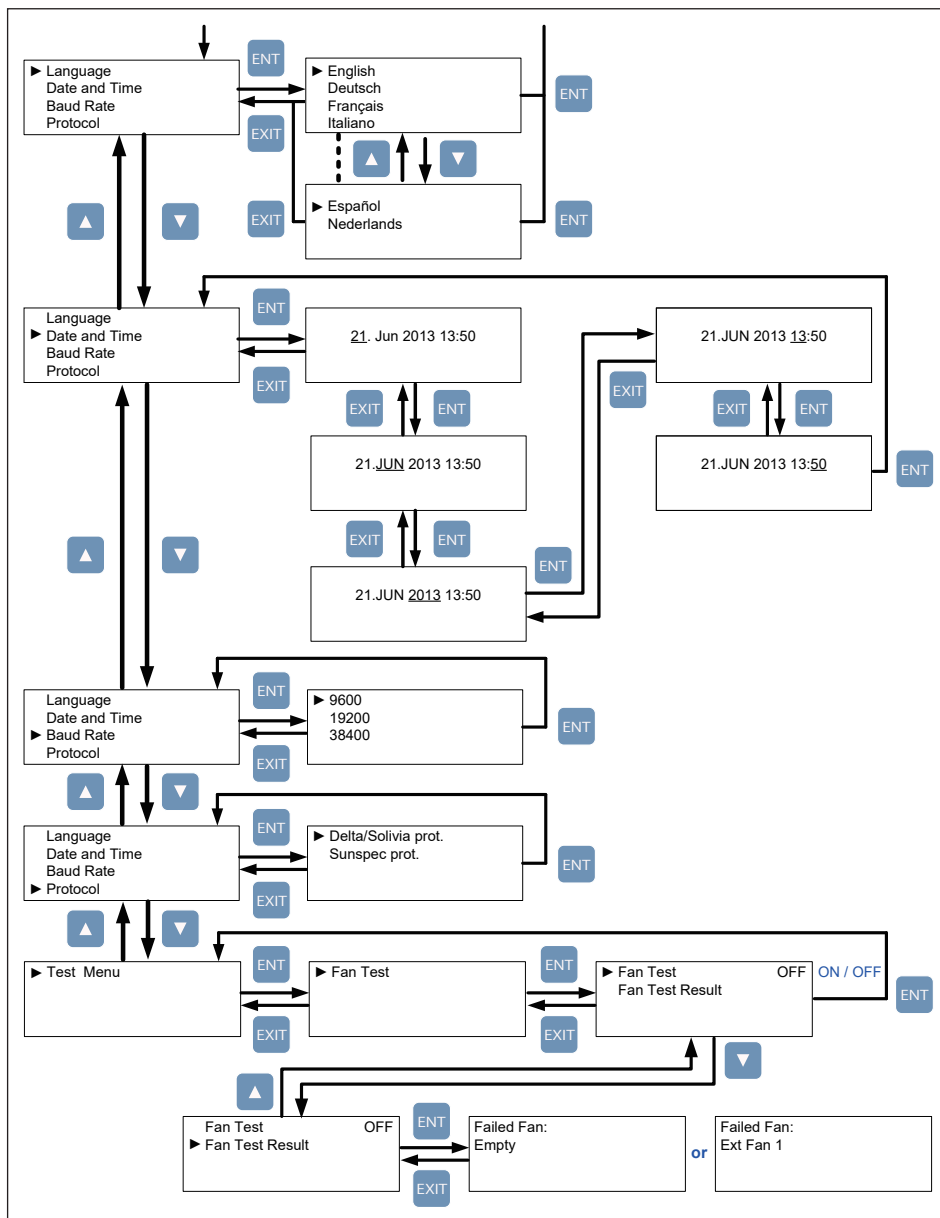


图5-8 : General settings页面

5.2.7 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，密码分为三种权限：用户权力、安装者权限以及制造商权限。以下章节仅会介绍用户权力与安装者权限所需之各项设定值。

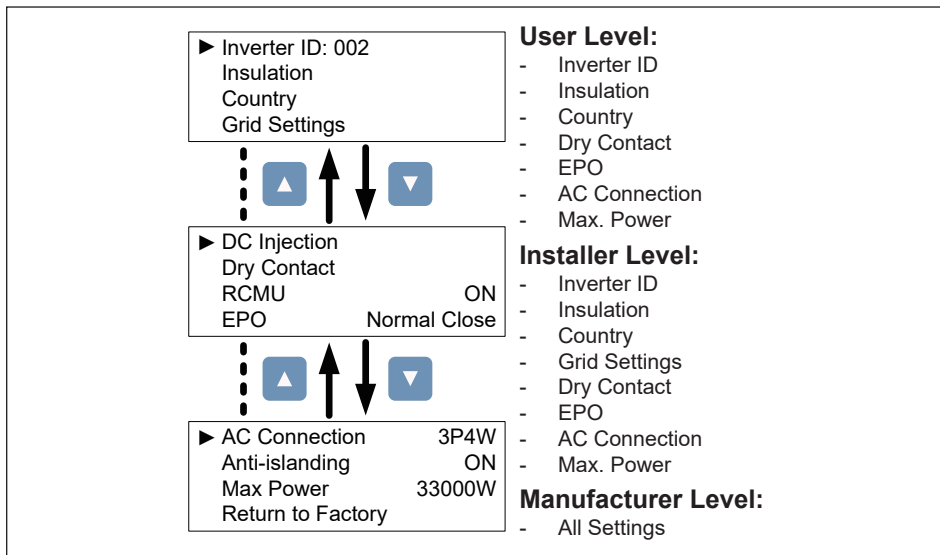


图5-9：Install settings页面

5.2.7.1 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。

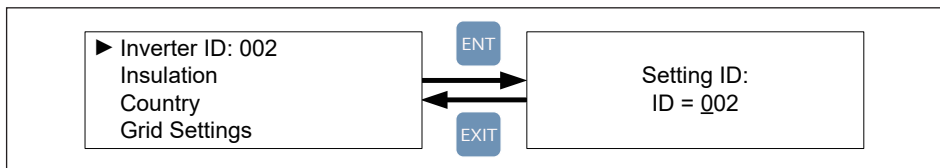


图5-10：Inverter ID页面

5.2.7.2 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 M30A机种提供四种对地组抗侦测方式(ON、Plus Grounded、Minus Grounded、OFF)与两种对地阻抗限制值可设定。

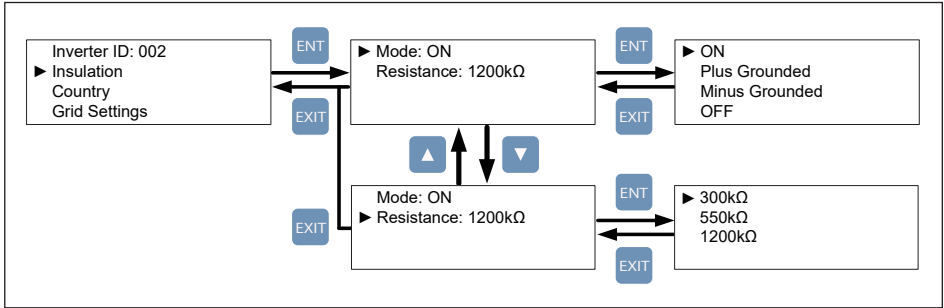


图5-11 : Insulation页面

5.2.7.3 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。

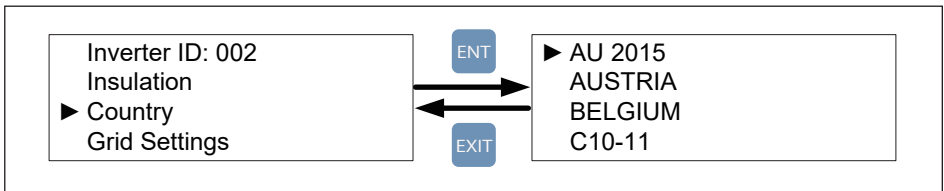


图5-12 : Country 页面

5.2.7.4 Grid Settings

Grid Settings页面包含各种电压与频率保护值，这些保护值乃依据各电力法规所建立，若无特殊需求请勿修改任何保护值。

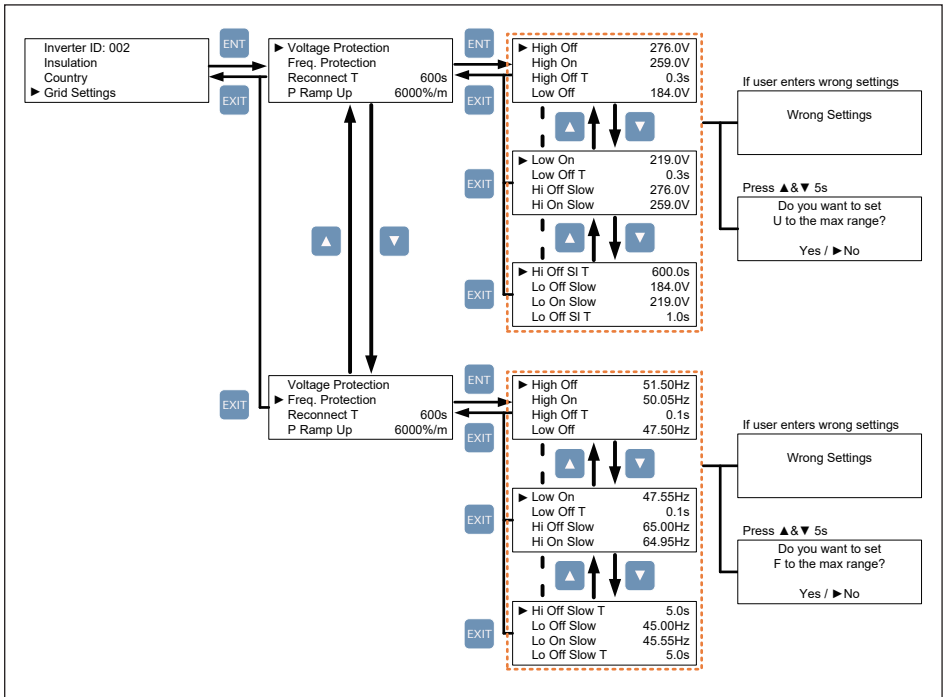


图5-13 : Grid Settings 页面

5.2.7.5 Dry Contact

使用者可透过此页面自定义干接点1之触发条件。M30A机种提供8种触发条件可选择，当被选择的条件触发时，干接点1之两个针脚将会短路，以触动用户所连接的外部装置。各选项与触发条件的详细信息请参考表5-2。

设定值	干接点触发时机
Disable	不动作。
On Grid	当逆变器成功并网时。
Fan Fail	当Fan Fail发生时。
Insulation	当对地阻抗测试失败时。
Alarm	任何 Error、Fault、Warning发生时。
Error	任何 Error发生时。
Fault	任何 Fault发生时。
Warning	任何 Warning发生时。

表5-2：干接点触发条件设定

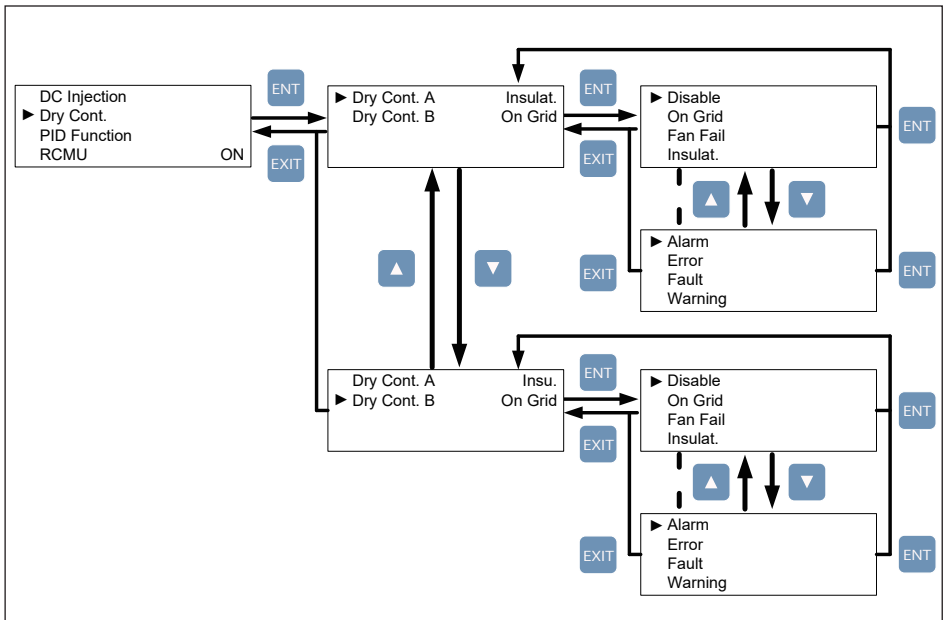


图5-14：Dry Contact 页面

5.2.7.6 PID

PID功能预设时间为0小时，使用者可自行设定时间，时间区间0-10小时或是Auto。PID功能在没有直流电压后30分钟启动，当直流电压输入时则停止该功能。

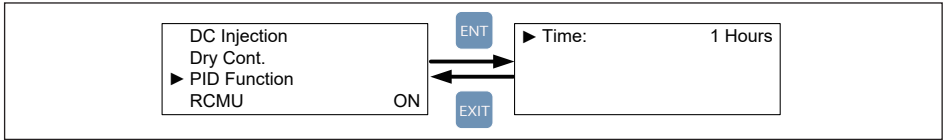


图5-15 : PID功能設定

5.2.7.7 EPO

EPO有两种侦测模式：Normal Open与Normal Close。Normal Open代表EPO常态为开路，短路时则触发紧急关机功能。Normal Close则代表常态为短路，开路时则触发紧急关机功能。请依据您的需求选择适合的侦测模式。

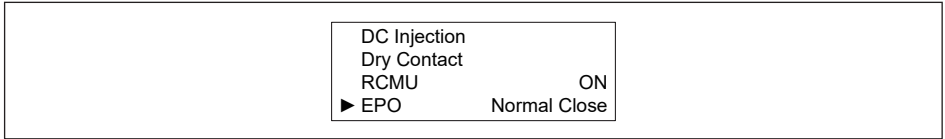


图5-16 : EPO页面

5.2.7.8 AC connection

RPI M30A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。

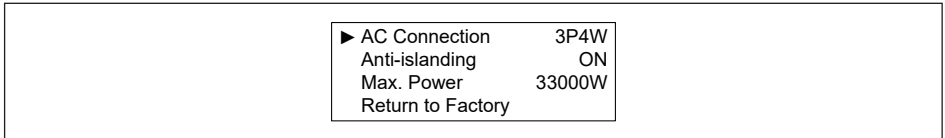


图5-17 : AC配线方式

5.2.7.9 Max. Power

某些电力法规有调整最大功率输出之要求，参照此类电力法规之用户可透过此功能更改逆变器的最大功率输出额度。

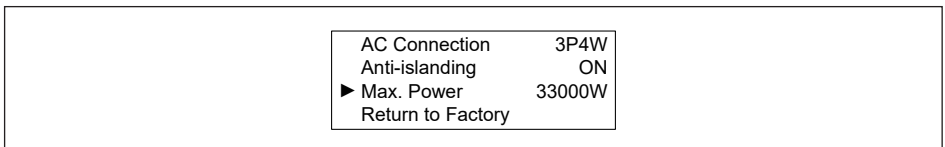


图5-18 : Max. Power页面

5.2.8 Active / Reactive power

进入实功/虚功控制页面前必须输入密码。此页面包含实功功率控制与虚功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)。

这些模式将会在下方的章节中详细的介绍。

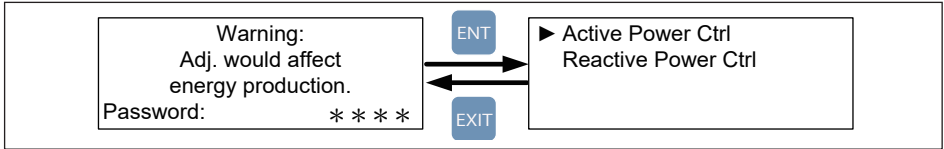


图5-19 : Active/Reactive power页面

5.2.8.1 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。

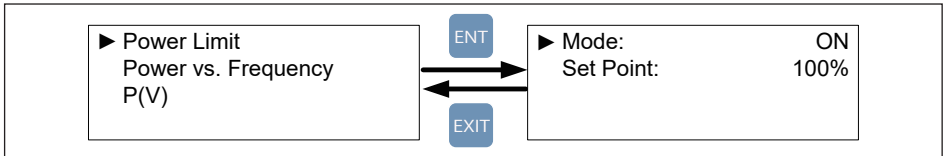


图5-20 : Power Limit page页面

5.2.8.2 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。

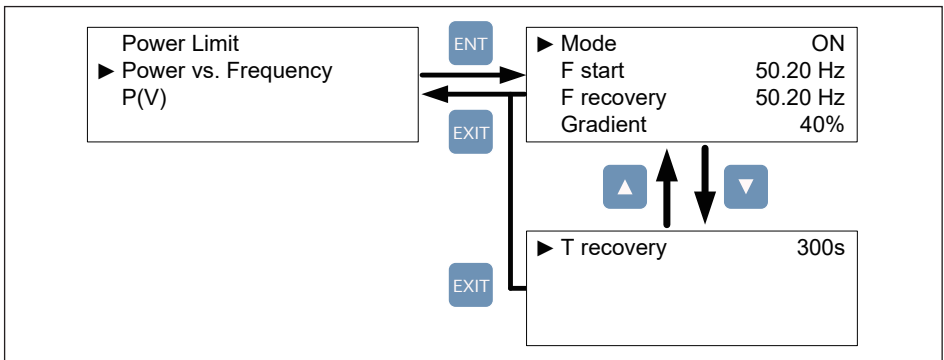


图5-21 : Power vs Frequency页面

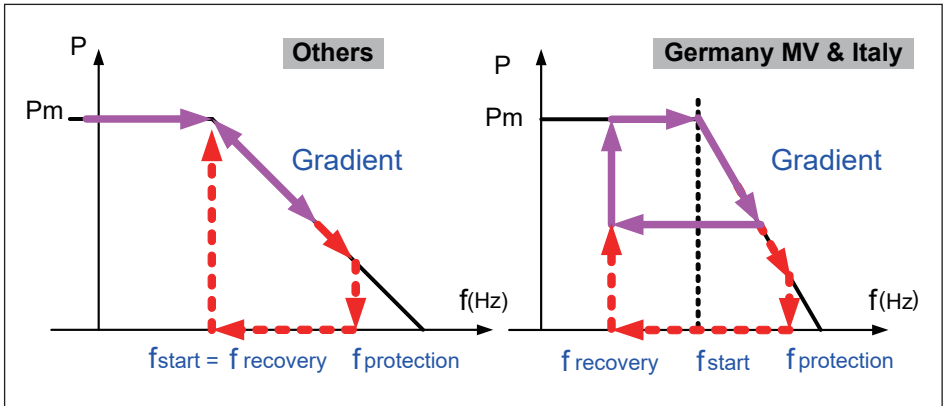


图5-22 : Power vs Frequency参数对照

5.2.8.3 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。

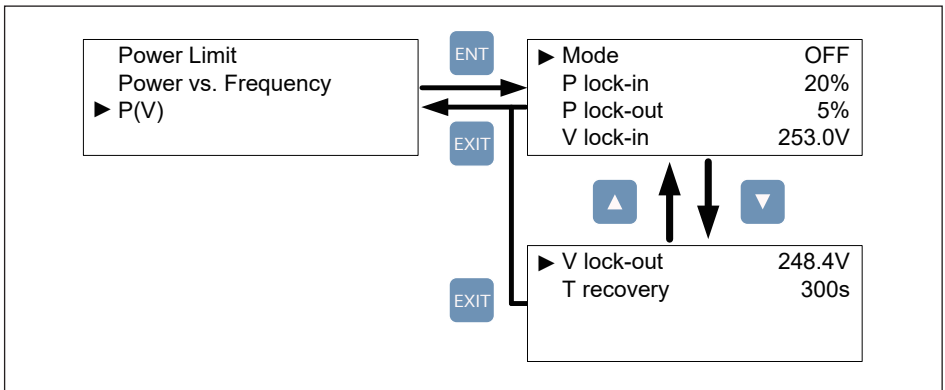


图5-23 : P(V)页面

5.2.8.4 Constant cosphi

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。

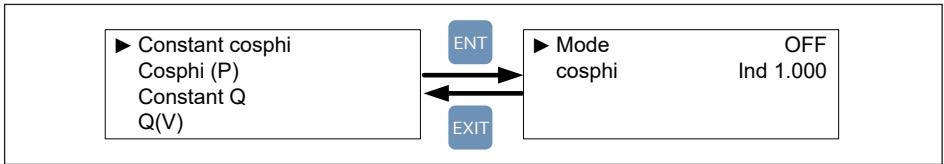


图5-24 : Constant cosphi页面

5.2.8.5 Cosphi (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。

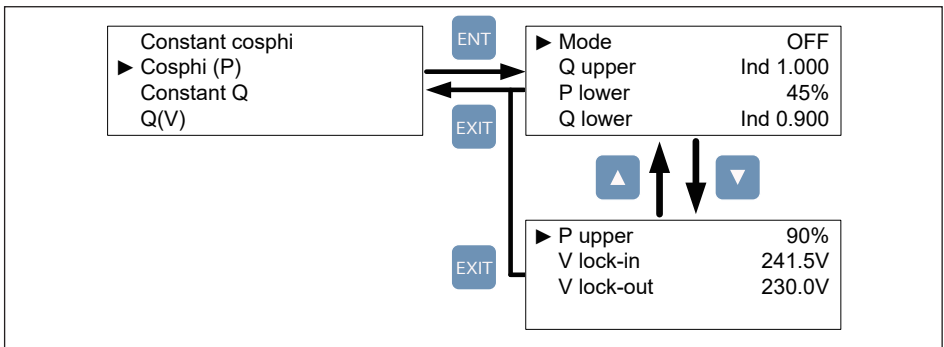


图5-25 : Cosphi (P)页面

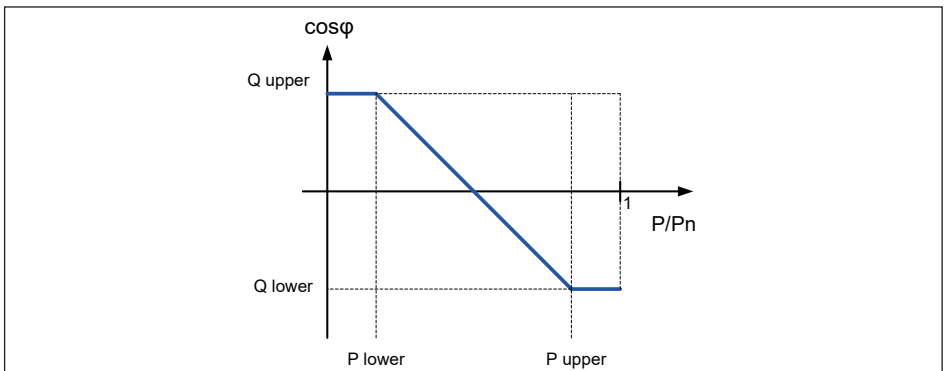


图5-26 : Cosphi (P)参数对照

5.2.8.6 Constant Q

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。

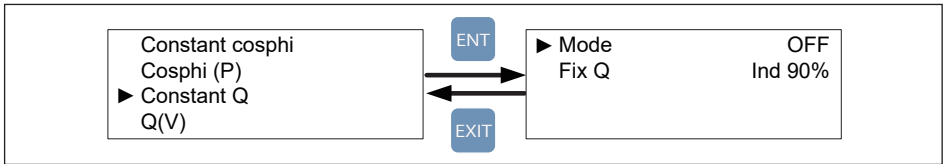


图5-27 : Constant Q页面

5.2.8.7 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。

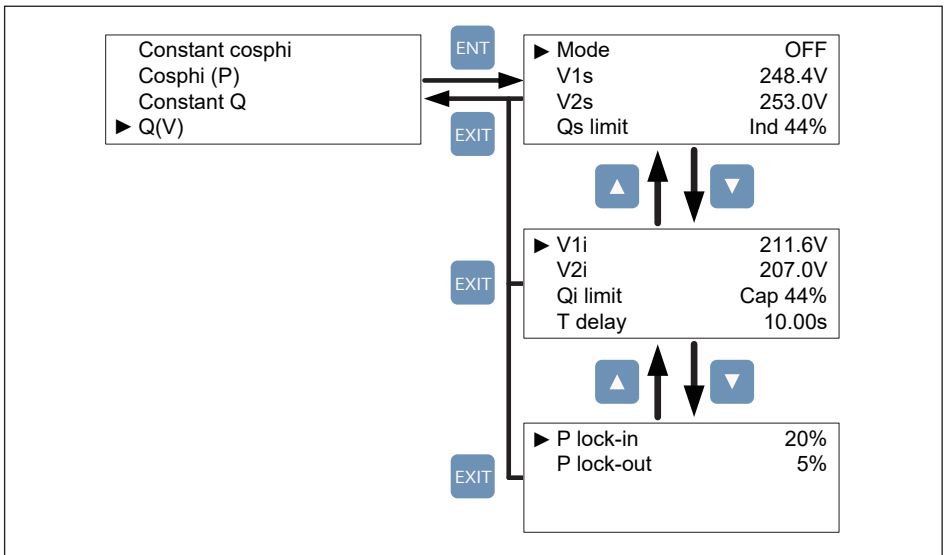


图5-28 : Q(V)页面

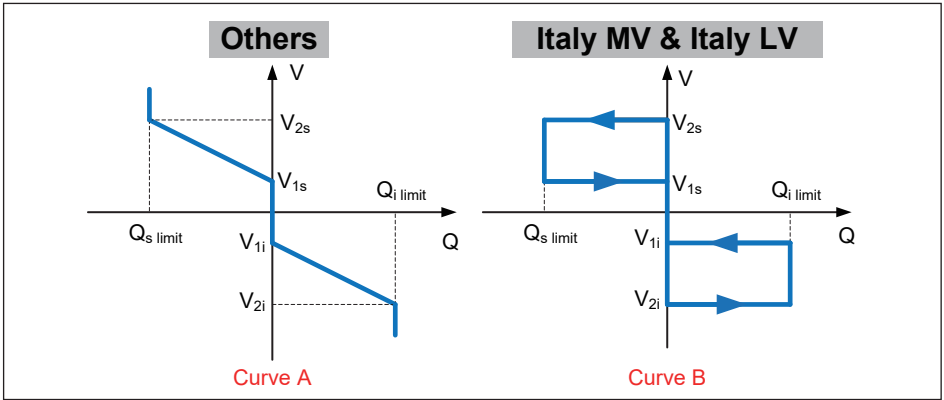


图5-29：Q(V)参数对照

5.2.9 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。使用者可透过启动FRT功能并设定所需的参数来达到这项要求。

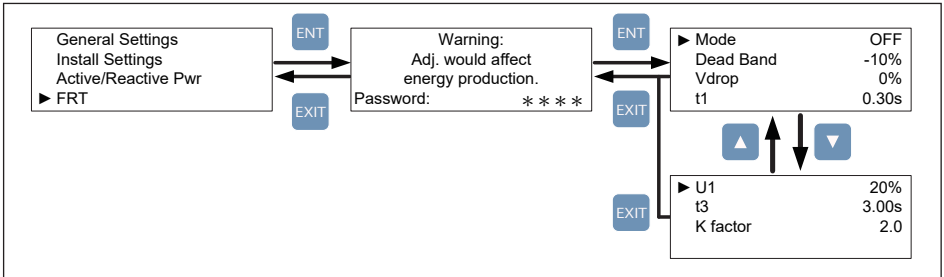


图5-30：FRT页面

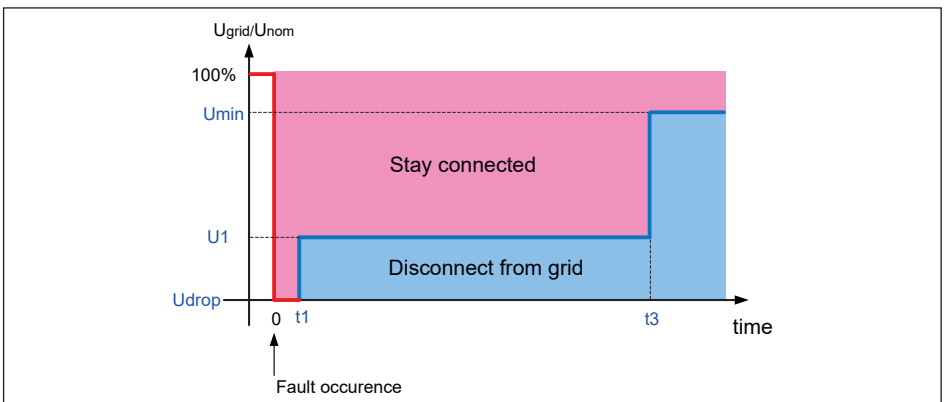


图5-31：FRT参数对照

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、电缆线是否破损、散热出风口有无异物阻塞。如有上述情形，请联系合格之技术人员进行维修、清理或更换。

触电危险！



- 在进行维护工作前, 即使切断机壳底部的手动开关, 仍需将AC 与 DC 电源确实切离, 避免触电。

6.1 更换突波保护器 (SPD)

RPI M30A_120 机种于AC与DC端皆有安装突波保护器。

当逆变器遭受突波时(例如：遭受雷击)，突波保护器将会保护逆变器而后损坏。当您发现显示面板上出现「SPD Fail」的错误讯息时，代表至少有一个突波保护器已损坏，此时请参考以下步骤更换突波保护器。

1. 将逆变器之AC与DC电源断电并等待至显示面板完全熄灭。
2. 将前盖显示面板下方的六个螺丝旋开。(参考图6-1)
3. 移除端子。(参考图6-2)
4. 解开螺丝。(参考图6-3)
5. 取下损坏之SPD。(参考图6-4)
6. 更换突波保护器模组。
7. 将前板重新盖上并锁上螺丝。组装时请注意防水胶条的完整性，避免保护等级下降。
8. 将前板锁上螺丝时请依照图6-1顺序。

警告！



- 当前板重新锁上螺丝时，注意扭力为10Kgf-cm。

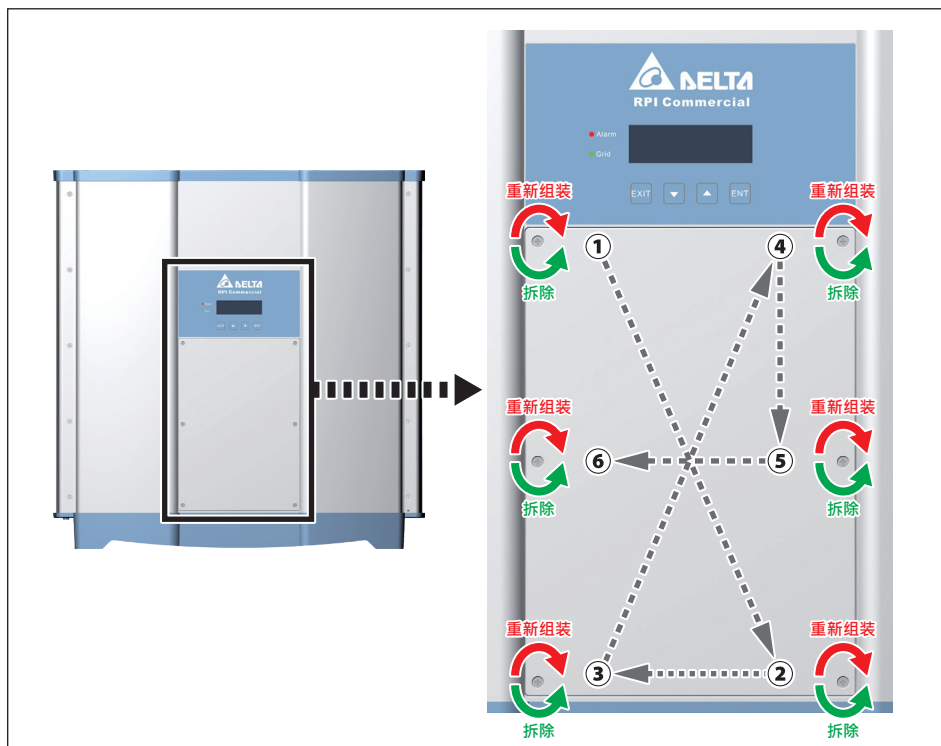


图6-1：卸下/重新装上前盖

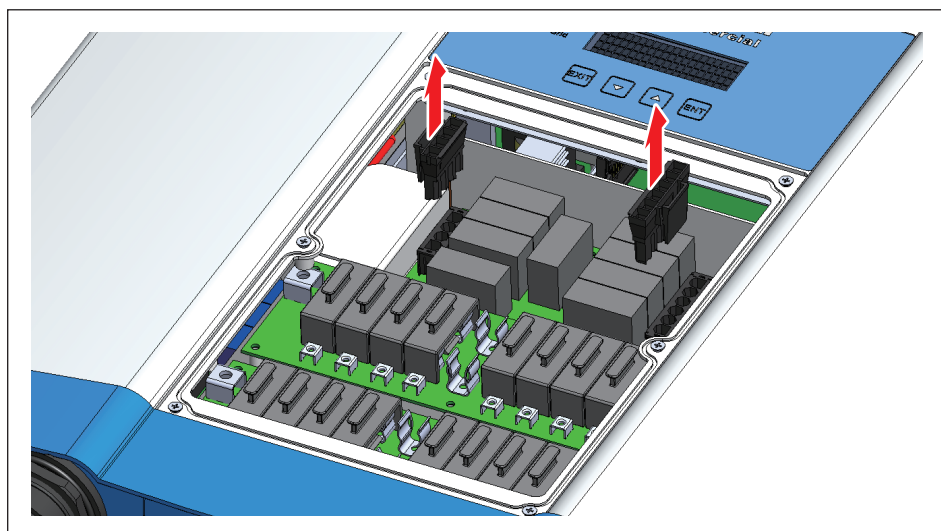


图6-2：移除端子

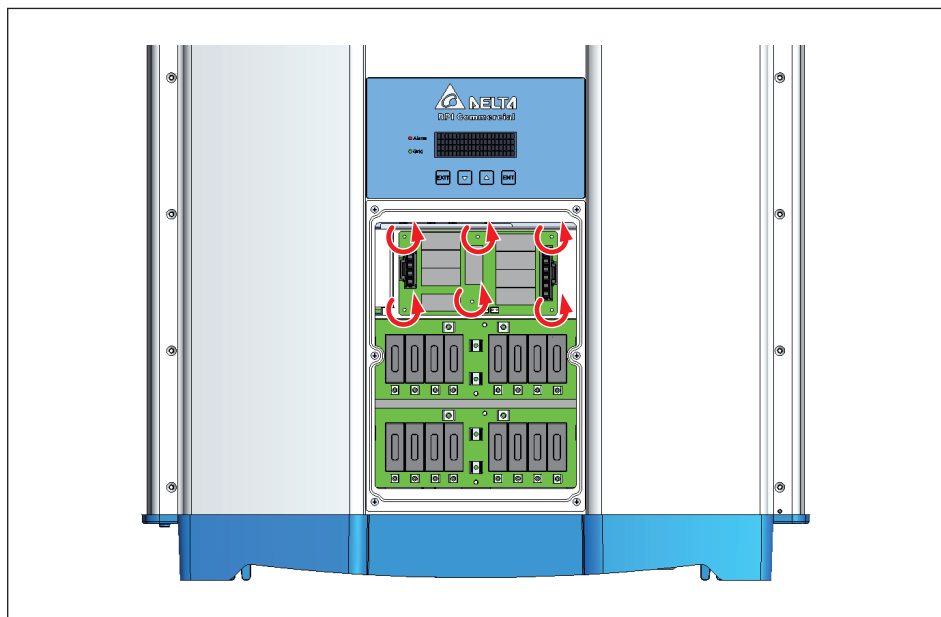


图6-3：解开螺丝

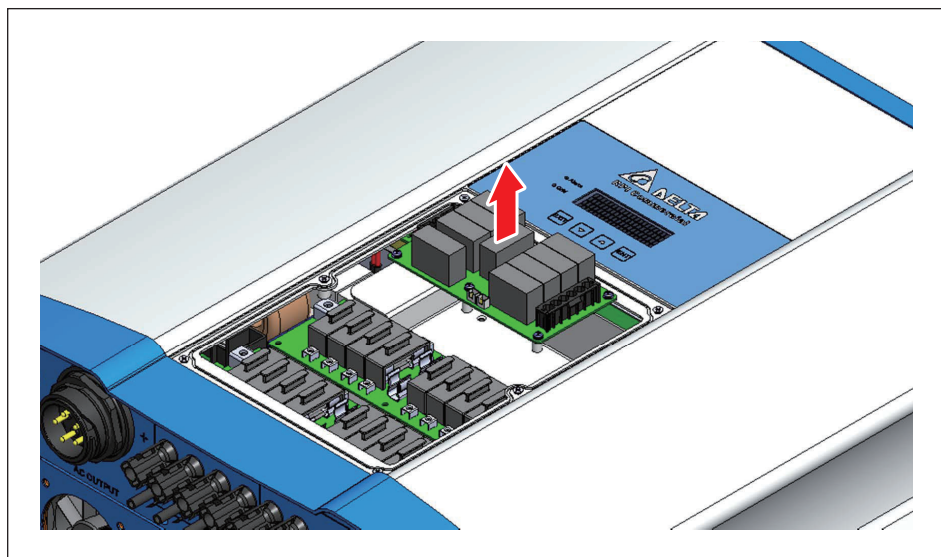


图6-4：取下损坏之SPD

6.2 更换DC保险丝

RPI M30A_120 机种于DC输入端皆有配接15A的DC保险丝。此保险丝之详细规格如下：保险丝的选用请参照下方所建议之元件。

- | | |
|---------------------------------|---------------------------------|
| - Item : String Fuse (source 1) | - Item : String Fuse (source 2) |
| - Part number : 10GPV15U0 | - Part number : 0SPF015.T |
| - Rate amp : 15 A | - Rate amp : 15 A |
| - Rate voltage : 1000 V | - Rate voltage : 1000 V |
| - Manufacturers : Hollyland | - Manufacturers : Littelfuse |

如果您发现逆变器的发电量异常，请依照以下步骤检查或更换保险丝。

1. 将逆变器之AC与DC电源断电并等待至显示面板完全熄灭。
2. 将前盖显示面板下方的六个螺丝旋开。(参考图6-1)
3. 取下保险丝座并使用电表检查保险丝。(参考图6-5)
4. 如有必要请更换保险丝。(参考图6-6)
5. 将前板重新盖上并锁上螺丝。组装时请注意防水胶条的完整性，避免保护等级下降。

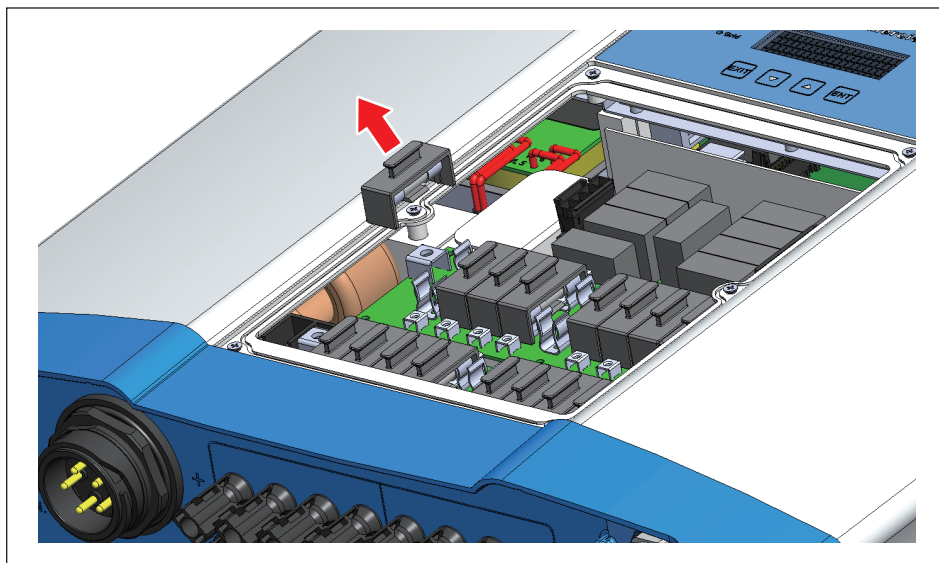


图6-5：取下保险丝座



图6-6：更换保险丝

6.3 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6-7。

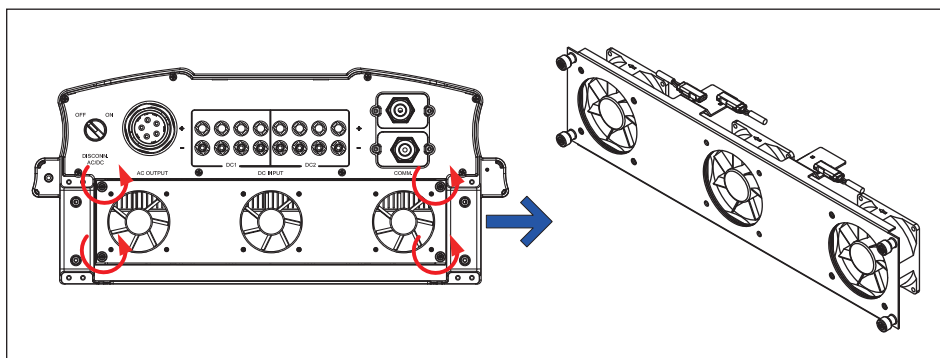


图6-7：拆解风扇模块

6.4 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。

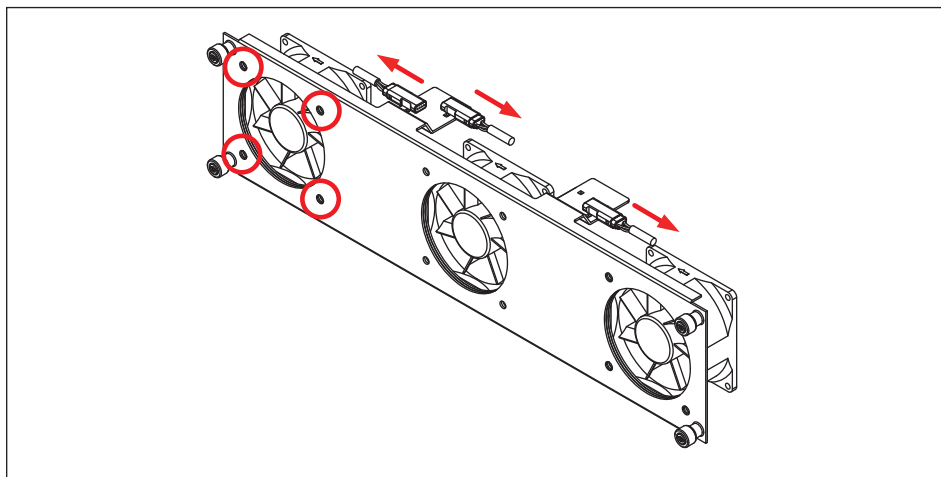


图6-8：拆解单一风扇

6.5 清理进风口滤网

进风口滤网模块拆解方式如图6-9，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。

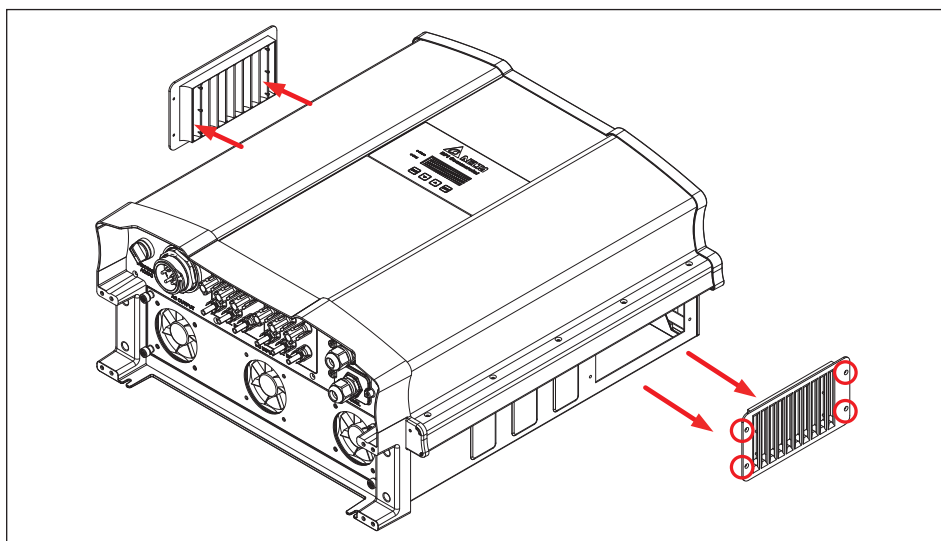


图6-9：拆卸出风口滤网模块示意图

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 (E01)	<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 (E02)	<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 (E07)	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 (E08)	<ol style="list-style-type: none"> 在AC接口连接错误 侦测电路功能异常 	<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 (E09)	<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 (E10, E15, E20)	<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 (E11, E13, E16, E18, E21, E23)	<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 (E30)	<ol style="list-style-type: none"> 实际Solar1电压超过1000Vdc 侦测电路功能异常 	<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
Solar2 High (E31)	<ol style="list-style-type: none"> 实际Solar2电压超过1000Vdc 侦测电路功能异常 	<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

错误信息		
信息显示	可能原因	故障排除
Insulation (E34)	<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		
信息显示	可能原因	故障排除
Solar1 Low (W01)	<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 (W02)	<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 (W11)	<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
De-rating (W07)	<ol style="list-style-type: none"> 1. 本体及环境温度过高 2. 风扇故障 3. 实功率限制功能作动 4. P-F功能作动 5. P(V) 功能作动 6. 市电电压过低 7. 输入电压过低 8. 输入电压过高 	<ol style="list-style-type: none"> 1. 确认安装机器本体及环境温度 2. 确认风扇能否正常运转 3. 确认国别及最大功率限制参数设定 4. 确认市电频率是否异常 5. 确认市电电压是否异常 6-1. 确认市电电压是否异常 6-2. 确认虚功控制功能设定 7. 确认PV panel输入电压是否过低 8. 确认PV panel输入电压是否过高
SPD Fail (W15)	<ol style="list-style-type: none"> 1. 逆变器遭受到雷击 2. 一个或多个SPD有缺陷 3. 一个或多个SPD未连接 4. 侦测电路功能异常 	<ol style="list-style-type: none"> 1. 检查逆变器是否遭受雷击 2. 更换有缺陷之SPD 3. 检查SPD的连接 4. 检查逆变器内部之侦测线路

表7-2 : 警告信息

故障		
信息显示	可能原因	故障排除
DC Injection (F01, F02, F03)	<ol style="list-style-type: none"> 市电波形异常 侦测电路功能异常 	<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 (F05)	<ol style="list-style-type: none"> 环境温度超过60°C (装置异常) 侦测电路功能异常 	<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 (F07)	<ol style="list-style-type: none"> 环境温度 < -30°C 侦测电路功能异常 	<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 (F06)	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测电路功能异常 	<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 (F08)	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测电路功能异常 	<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 (F09)	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测电路功能异常 	<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 (F10)	<ol style="list-style-type: none"> 环境温度 > 90°C 或 < -30°C 侦测电路功能异常 	<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 RLY (F13)	<ol style="list-style-type: none"> 继电器的驱动电路故障 一个或多个继电器本体故障 侦测电路功能异常 	<ol style="list-style-type: none"> 检查输入电压需大于150Vdc 更换故障之继电器 检查逆变器内部之侦测电路
HW DSP ADC1 (F15)	<ol style="list-style-type: none"> 输入功率不足 辅助电源电路功能异常 侦测电路功能异常 	<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		
信息显示	可能原因	故障排除
HW DSP ADC2 (F16)	<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 DSP ADC3 (F17)	<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 (F18)	<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 (F19)	<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 Eff. (F20)	<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 (F23)	<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 (F22)	<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 Cur. (F24)	<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

故障		
信息显示	可能原因	故障排除
HW Con. Fail (F26)	<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
RCMU Fail (F27)	<ol style="list-style-type: none"> 1. RCMU连接中断 2. 侦测电路功能异常 	<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
RLY Short (F28)	<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
RLY Open (F13, F29)	<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 Unbal. (F30)	<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 (F31, F33, F35)	<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 Cur. High (F36, F37, F38, F39, F40, F41)	<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 (F42)	<ol style="list-style-type: none"> 1. 测试电流回路损坏 2. CSC1无效 3. 侦测电路功能异常 	<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

故障		
信息显示	可能原因	故障排除
HW CT B Fail (F43)	<ol style="list-style-type: none"> 1. 测试电流回路损坏 2. CSC2无效 3. 侦测电路功能异常 	<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
HW CT C Fail (F44)	<ol style="list-style-type: none"> 1. 测试电流回路损坏 2. CSC3无效 3. 侦测电路功能异常 	<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 (F45)	<ol style="list-style-type: none"> 1. 市电谐波成分大 2. 开关装置无效 3. 侦测电路功能异常 	<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 (F50)	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 Cur. High (F60, F61, F70, F71)	<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：

- 将手动开关(Manual Switch)转至OFF。
- 切断AC断路器, 解除与市电端之连接。
- 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。

9 技术数据

Model	RPI M30A_120	RPI M30A_121
一般规格		
外壳	Powder coated aluminum	
操作温度	-25~60°C, full power up to 40°C Full power up to 50°C @VDC 600V, COSØ=1 (请参考图9-1至图9-3)	
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	II	
过电压类别	AC output :III, DC Input :II	
反馈至太阳能板电流最大值	0	
电气隔离	NO	
安全性等级	Class I metal enclosure with protective earth	
重量	49.5kg	48kg
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	35kW	
额定功率	31.5kW	
建议PV 功率	≤38kW	
标称电压	600Vdc	
操作电压	200Vdc – 1000 Vdc	
启动电压	> 250 Vdc	
启动功率	40W	
MPP追踪	Parallel inputs: 1 MPP tracker Separate inputs: 2 MPP trackers	
绝对最大电压	1100V *	

* 最大承受电压为1100V(当输入大于1000Vdc, inverter将不会输出功率)
关于1000Vdc以上的应用请参阅附录说明。

Model	RPI M30A_120		RPI M30A_121
最大功率追踪电压范围 (额定功率)			
平衡输入(50/50)	520-800Vdc		
最大非平衡输入	67%	700-800Vdc	
	33%	350-800Vdc	
输入数目	8 pairs MC4		6 pairs MC4
额定电流	30A * 2 with max current per input of 7.5A		30A * 2 with max current per input of 10A
各MPPT最大短路电流(Isc)	47A for each MPPT(Total 2 MPPT) 16A for each string(Total 8 string)		47A for each MPPT(Total 2 MPPT) 39A for each string(Total 6 string)
保险丝	15A		No
Surge protection device	Type II, 可替换 EN 50539-11, IEC 61643-11		Type III, 不可替换
市电侧(Grid side)			
标称功率	30kW / 30kVA		
最大功率	33kW / 33kVA (参考图9-1至图9-3)		
电压	3Ph, 230 / 400Vac		
标称电流	43.5A(230Vac) / 45.5A(220Vac)		
最大电流	50A		
浪涌电流	150A / 100μs		
最大输出故障电流 (rms)	88.6A		
最大输出过流保护	57A		
频率	Rated 50/60Hz (Programmable 45Hz - 65Hz)		
主动式孤岛效应侦测	无效功率注入		
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	< 3W		
最大效率	98.5 %		
欧洲效率	98.2 %		
AC 界面	3 Ph + N + PE; 3-phase AC plug that meets IP67 and specifications in table 4-2.		
Surge protection device	Type II, 可替换 EN 50539-11, IEC 61643-11		Type III, 不可替换

Model		RPI M30A_120	RPI M30A_121
接口与通讯			
用户接口		Black-on-white character type LCD display	
		Real time clock	
		30 events record	
外部通讯		2 RS-485 connections	
认证			
CE conformity		Yes	
Grid interface		VDE-AR-N 4105 BDEW,UK G59/3 VDE0126-1-1 NB/T 32004	
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			
冷却系统		Fan, 3pcs	
附件		Mounting bracket	
		Aluminum with powder coating	

表9-1 : RPI M30A规格

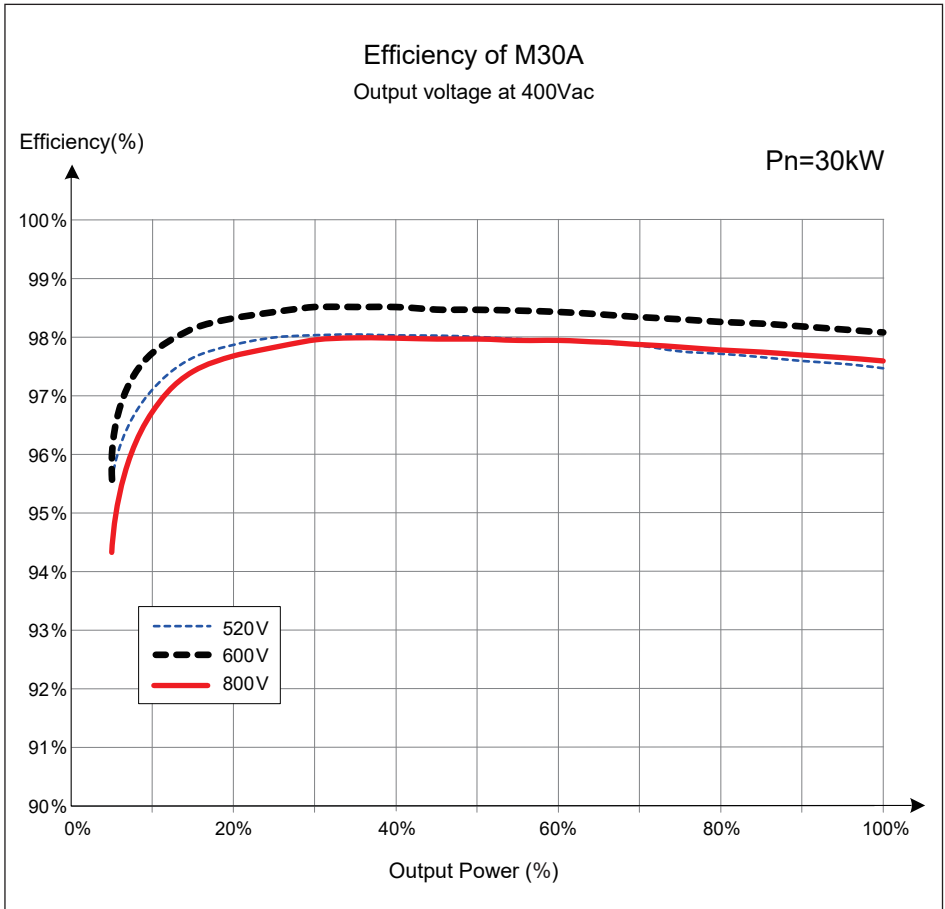


图9-1 : M30A效率曲线

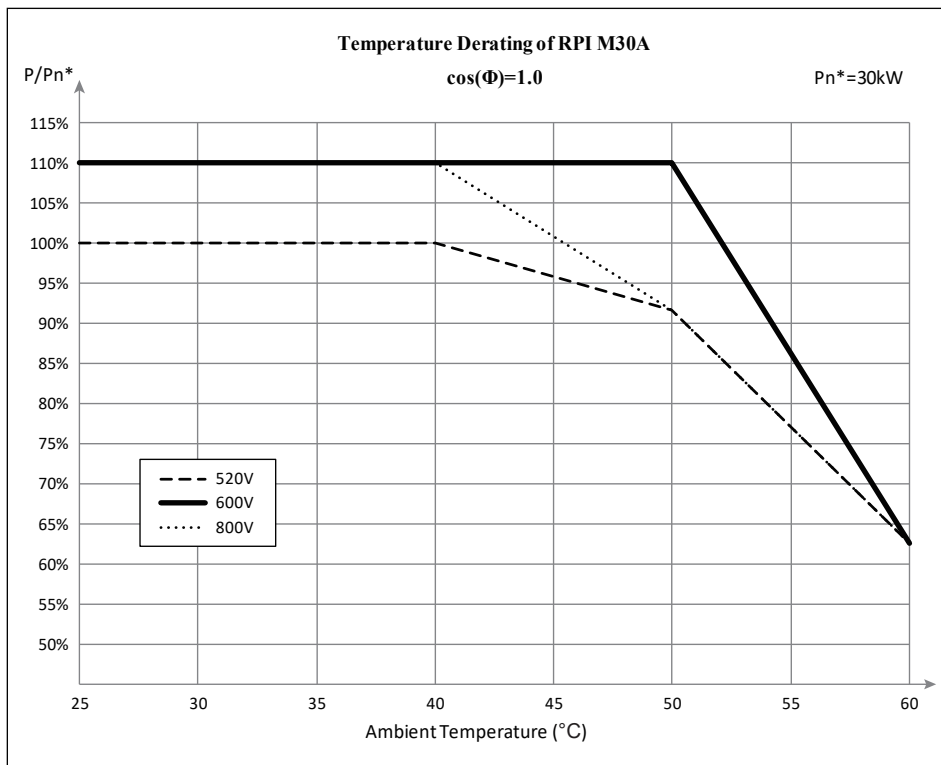


图9-2 : M30A温度降载曲线 ($\cos\varphi=1.0$)

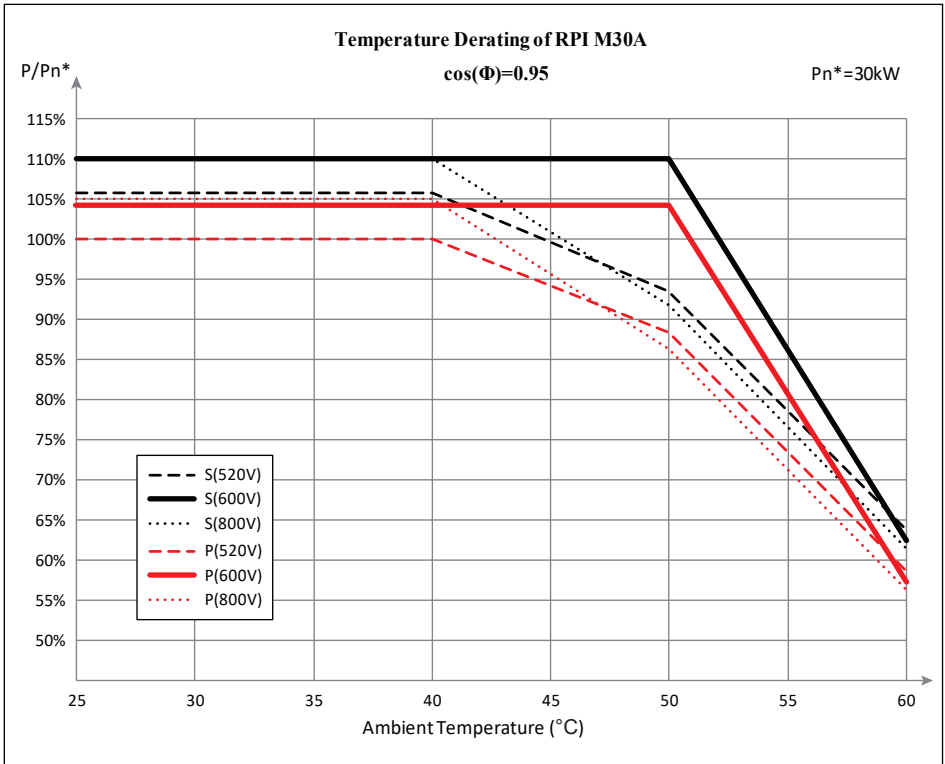


图9-3 : M30A温度降载曲线 ($\cos\varphi=0.95$)

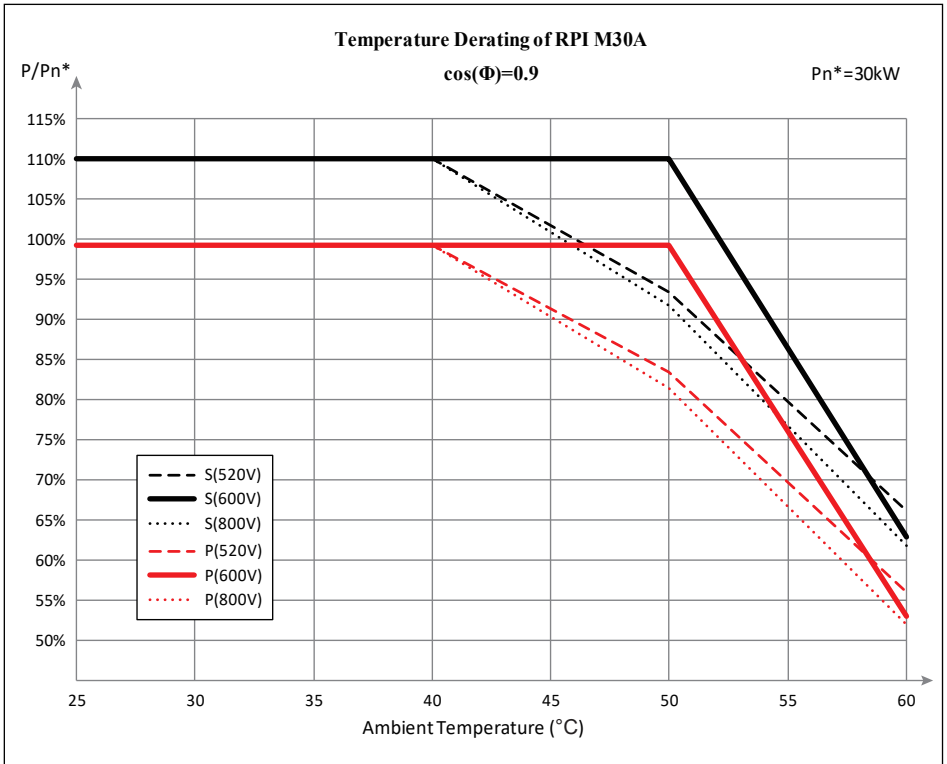


图9-4 : M30A温度降载曲线 ($\cos\varphi=0.9$)

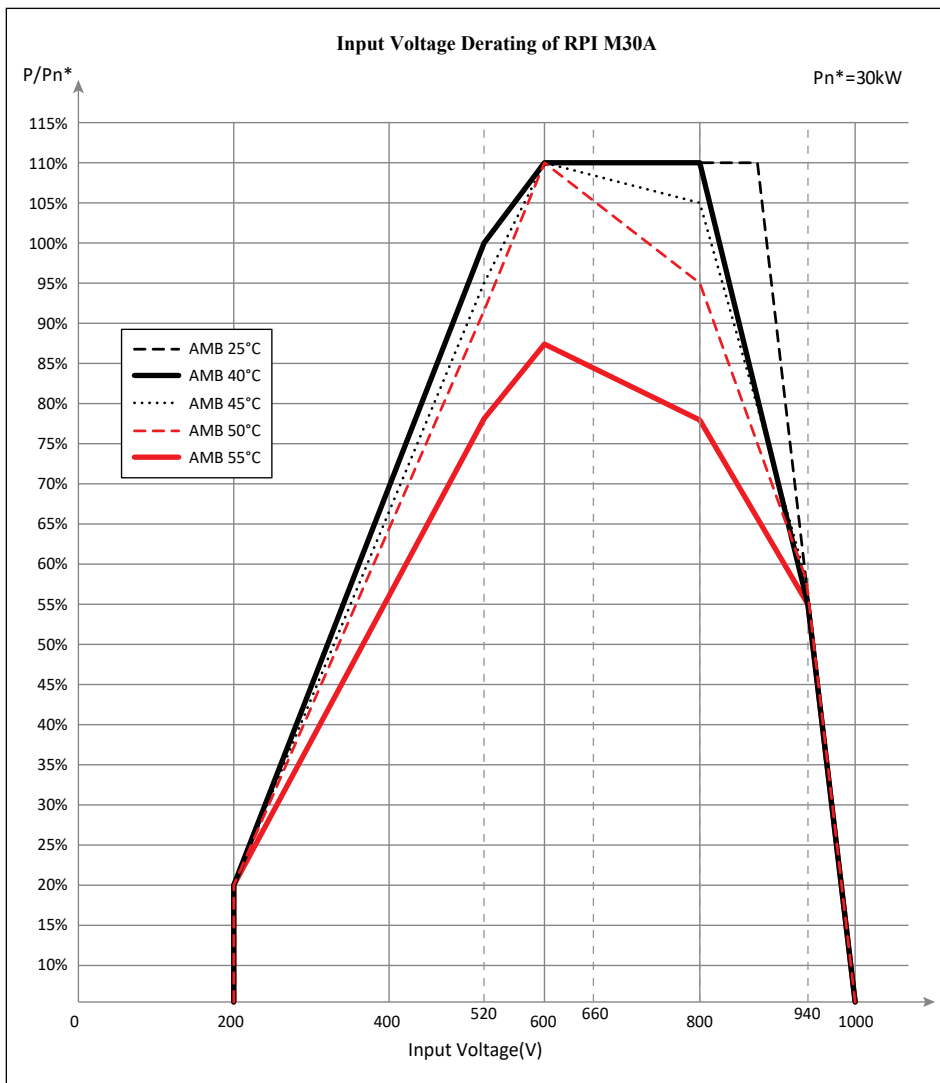


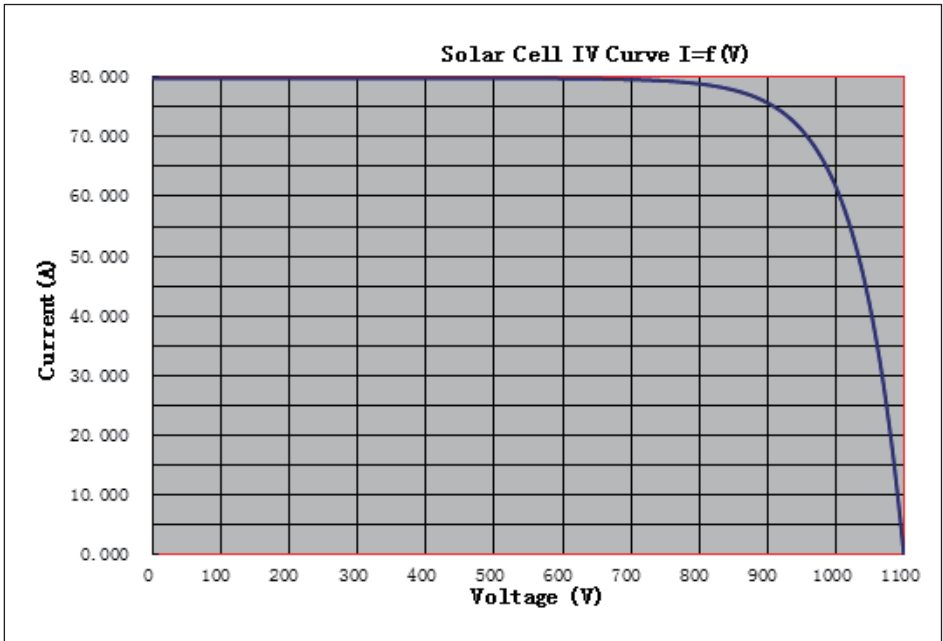
图9-5 : M30A输入电压降载曲线

附录

附录 A: I-V curve limitation

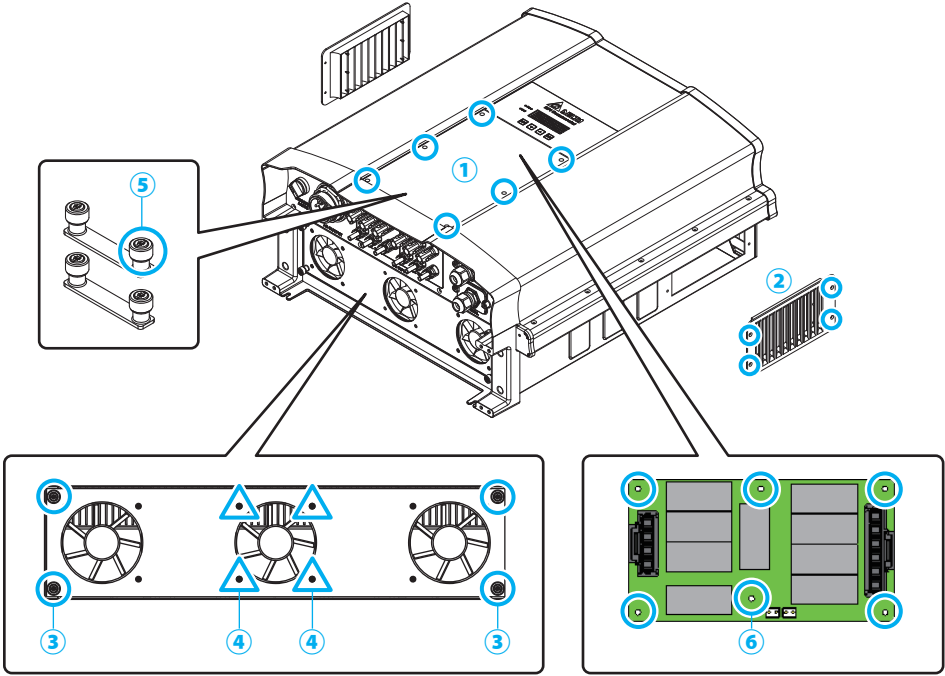
基于保险丝的安全性，太阳能电池板最大功率的配置不能超过此IV曲线。

若是使用者使用外接保险丝，使用者须确保该保险丝在1000Vdc以上的熔断特性。



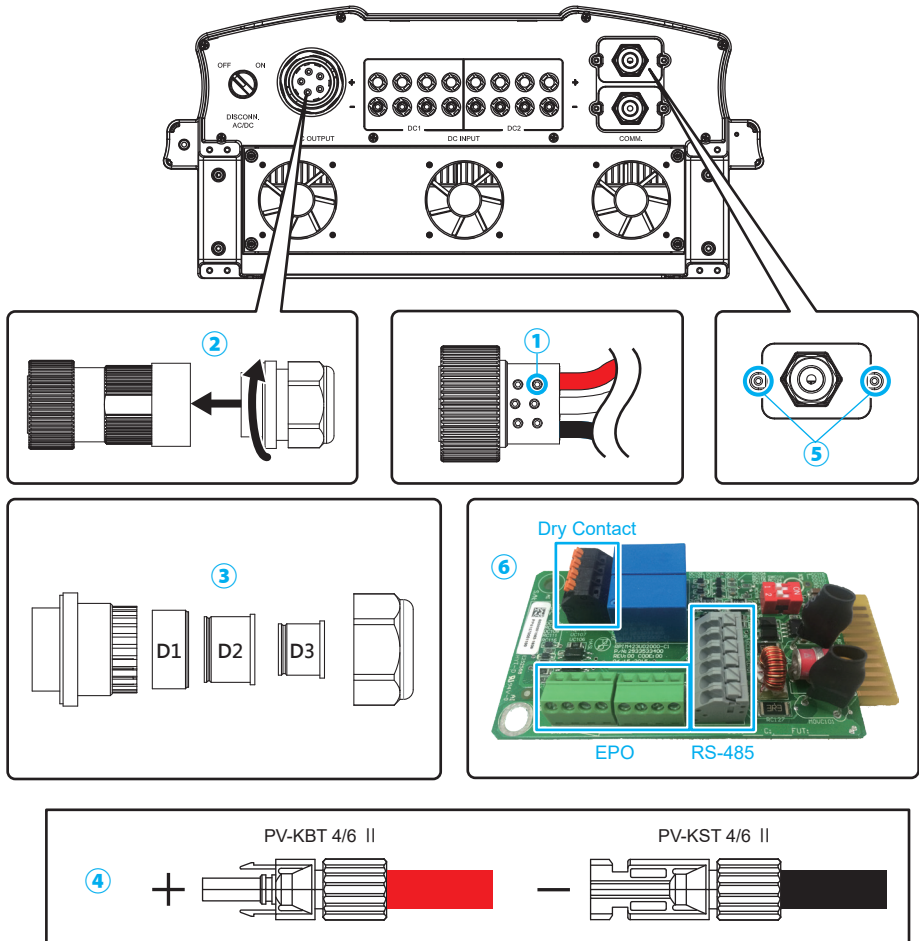
附录 A : 保险丝使用限制之I-V曲线

附录 B: 组装说明



NO	位置	螺丝扭力
1	Front cover	10 Kgf-cm (1N-m)
2	Air inlet	8 Kgf-cm (0.8N-m)
3	Fan panel	8 Kgf-cm (0.8N-m)
4	Fans	8 Kgf-cm (0.8N-m)
5	Bus bar	10 Kgf-cm (1N-m)
6	SPD board	8 Kgf-cm (0.8N-m)

附录 B-1 : 组装说明-1



NO	位置	螺丝扭力	导体横截面
1	AC wire	25 Kgf-cm (2.5N-m)	6~4AWG (13.3~25mm 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)	--
4	MC4 wire	--	RPI M30A_120: 12~10AWG (4~6mm ²) RPI M30A_121: 10AWG (6mm ²)
5	Communication cover	8 Kgf-cm (0.8N-m)	--
6	Communication module	--	20 AWG (0.5mm ²)

附录 B-2 : 组装说明-2



The power behind competitiveness

三相併網型變流器

RPI M30A_120 / M30A_121

操作手冊

English 1

简体中文 81

繁體中文 161

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Table of Contents

1	信息	168
1.1	關於此手冊	168
1.2	產品說明	168
1.3	其他資訊	168
2	產品概觀	169
2.1	變流器開箱	169
2.2	檢查內容物	169
2.3	產品標籤	172
2.4	外觀介紹	173
3	安裝	175
4	配線	179
4.1	配線前準備事項(M30A_120)	179
4.2	配線前準備事項(M30A_121)	183
4.3	AC(市電端)之連接: 三相三線(3P+PE)或三相四線(3P+N+PE)	189
4.3.1	保護裝置與AC配線圖	189
4.3.2	允許接地系統	193
4.4	直流輸入端(太陽能板電源端)之連接	194
4.5	多台變流器組合	195
4.5.1	多台變流器在三相系統並聯配置方式	195
4.5.2	通訊介面之連接	195
4.5.3	RS-485之連接	196
4.5.4	緊急關機裝置與數位輸入之連接	197
4.5.5	乾接點之連接	199
5	變流器開機	200
5.1	LCD 操作流程	200
5.2	首次開機	201
5.2.1	主畫面	202
5.2.2	Power Meter	202
5.2.3	Energy Log	203
5.2.4	Event Log	203
5.2.5	Inverter Information	204
5.2.6	General Settings	205
5.2.7	Install Settings	206
5.2.7.1	Inverter ID	206
5.2.7.2	Insulation	207
5.2.7.3	Country	207
5.2.7.4	Grid Settings	208
5.2.7.5	Dry Contact	209

5.2.7.6	PID	210
5.2.7.7	EPO	210
5.2.7.8	AC connection	210
5.2.7.9	Max. Power	210
5.2.8	Active / Reactive power	211
5.2.8.1	Power Limit	211
5.2.8.2	Power vs. Frequency	211
5.2.8.3	P(V)	212
5.2.8.4	Constant cosphi	213
5.2.8.5	Cosphi (P)	213
5.2.8.6	Constant Q	214
5.2.8.7	Q(V)	214
5.2.9	FRT (Fault ride through)	215
6	設備維護	216
6.1	更換突波保護器 (SPD)	216
6.2	更換DC保險絲	219
6.3	清理風扇	220
6.4	更換風扇	221
6.5	清理進風口濾網	221
7	錯誤訊息與簡易故障排除	222
8	卸載	228
9	技術資料	229
	附錄	237
	附錄 A: I-V curve limitation	237
	附錄 B: 組裝說明	238

Figure

圖1-1: 太陽能變流器使用說明	168
圖2-1: 開箱	169
圖2-2: M30A_120內容物清單	170
圖2-3: M30A_121內容物清單	171
圖2-4: 產品標籤	172
圖2-5: 外觀介紹	173
圖2-6: 輸出入介面介紹	174
圖3-1: 壁掛板尺寸	175
圖3-2: 建議和不建議的安裝方式	176
圖3-3: 以螺絲固定壁掛板	177
圖3-4: 附掛和固定變流器	177
圖3-5: 適當安裝間距	178
圖3-6: 進氣方向	178
圖4-1: DC端不接地配線圖	180
圖4-2: 強制變流器操作於並聯模式	180
圖4-3: M30A_120 DC端負接地配線圖	181
圖4-4: M30A_120 DC端正接地配線圖	182
圖4-5: M30A_121 系統配線圖(DC端不接地)	183
圖4-6: M30A_121 系統配線圖(DC正接地或負接地)	184
圖4-7: 錯誤的連接方式 – 1	185
圖4-8: 錯誤的連接方式 – 2	186
圖4-9: 錯誤的連接方式 – 3	187
圖4-10: 錯誤的連接方式 – 4	188
圖4-11: AC線材撥線	190
圖4-12: 歐式端子	190
圖4-13: 銅鋁端子	191
圖4-14: RPI M30A之AC接頭配線圖	192
圖4-15: AC端子防水塞	192
圖4-16: DC配線端子	194
圖4-17: 多台變流器在三相系統並聯配置方式	195
圖4-18: 通訊模組示意圖	195
圖4-19: 多台變流器串接通訊	196
圖4-20: EPO使用說明	197
圖4-21: 緊急停止開關與數位輸入功能的多台並聯	198
圖4-22: 乾接點連接	199
圖5-1: 控制面板	200
圖5-2: 首次開機出現語言和國別設定	201
圖5-3: 主畫面	202
圖5-4: Power meter頁面	202

圖5-5: Energy log頁面	203
圖5-6: Event log流程	203
圖5-7: Inverter information頁面	204
圖5-8: General settings頁面	205
圖5-9: Install settings頁面	206
圖5-10: Inverter ID頁面	206
圖5-11: Insulation頁面	207
圖5-12: Country 頁面	207
圖5-13: Grid Settings 頁面	208
圖5-14: Dry Contact 頁面	209
圖5-15: PID功能設定	210
圖5-16: EPO頁面	210
圖5-17: AC配線方式	210
圖5-18: Max. Power頁面	210
圖5-19: Active/Reactive power頁面	211
圖5-20: Power Limit page頁面	211
圖5-21: Power vs Frequency頁面	211
圖5-22: Power vs Frequency參數對照	212
圖5-23: P(V)頁面	212
圖5-24: Constant cosphi頁面	213
圖5-25: Cosphi (P)頁面	213
圖5-26: Cosphi (P)參數對照	213
圖5-27: Constant Q頁面	214
圖5-28: Q(V)頁面	214
圖5-29: Q(V)參數對照	215
圖5-30: FRT頁面	215
圖5-31: FRT參數對照	215
圖6-1: 卸下/重新裝上前蓋	217
圖6-2: 移除端子	217
圖6-3: 解開螺絲	218
圖6-4: 取下損壞之SPD	218
圖6-5: 取下保險絲座	219
圖6-6: 更換保險絲	220
圖6-7: 拆解風扇模組	220
圖6-8: 拆解單一風扇	221
圖6-9: 拆卸出風口濾網模組示意圖	221
圖9-1: M30A效率曲線	232
圖9-2: M30A溫度降載曲線 (cosφ=1.0)	233
圖9-3: M30A溫度降載曲線 (cosφ=0.95)	234
圖9-4: M30A溫度降載曲線 (cosφ=0.9)	235
圖9-5: M30A輸入電壓降載曲線	236
附錄 A: 保險絲使用限制之I-V曲線	237

Table

表2-1: M30A_120內容物清單	170
表2-2: M30A_121內容物清單	171
表2-3: 產品型號	172
表4-1: 每一直流端子的最大電流耐受值	185
表4-2: 斷路器建議規格	189
表4-3: AC接頭線徑尺寸	189
表4-4: 最大容許輸入功率限制	194
表4-5: 線徑大小	194
表4-6: RS-485端子定義	196
表4-7: 終端電阻設定	197
表4-8: 數位輸入功能與EPO設定	197
表4-9: Demand Response Modes (DRMs)	197
表5-1: LED指示燈狀態	201
表5-2: 乾接點觸發條件設定	206
表7-1: 錯誤信息	222
表7-2: 警告信息	223
表7-3: 故障信息	224
表9-1: RPI M30A規格	229
附錄 B-1: 組裝說明-1	238
附錄 B-2: 組裝說明-2	239

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 M30A_120 / M30A_121

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。

PID(電位誘導衰減)抑制功能可以為太陽能面板提供較長的使用壽命。

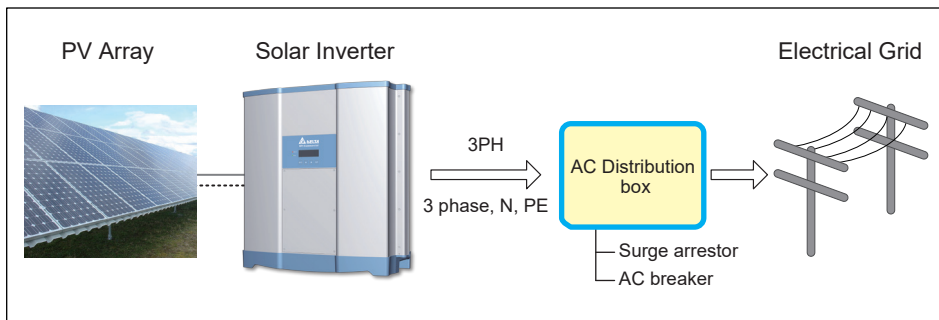


圖 1-1 : 太陽能變流器使用說明

1.3 其他資訊

如果想獲得RPI M30A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 M30A_120 / M30A_121 之開箱步驟請參考圖2-1。

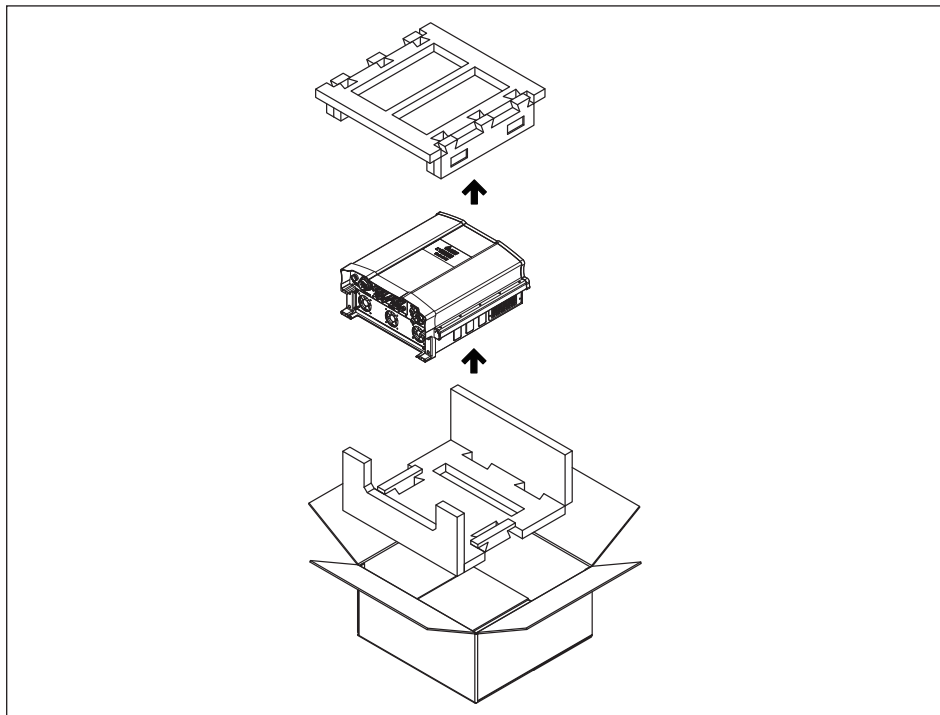


圖2-1：開箱

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以下的表與圖：
 - RPI M30A_120機種請參考圖 2-2 與表 2-1。
 - RPI M30A_121機種請參考圖 2-3 與表 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。

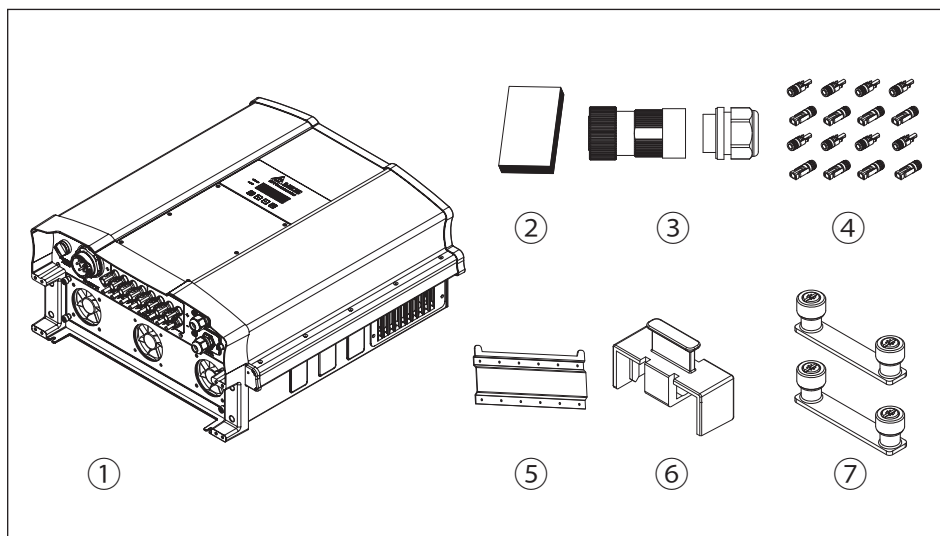


圖2-2：M30A_120內容物清單

RPI M30A_120			
	物品	數量	說明
1	太陽能變流器	1 pc	RPI系列太陽能變流器
2	使用說明書	1 pc	安全規範、安裝步驟、產品規格...等
3	AC 接頭	1 pc	AC 連接接頭
4	DC 接頭	8 組	DC 連接接頭
5	壁掛板	1 pc	將太陽能變流器掛於牆上之壁掛板
6	保險絲座	1 pc	接地保險絲座
7	導電片	2 pcs	將DC+端或DC-端並聯之導電片

表2-1：M30A_120內容物清單

※本產品不提供接地保險絲，如有需求請自行選用1000V/1A之Midget型保險絲。

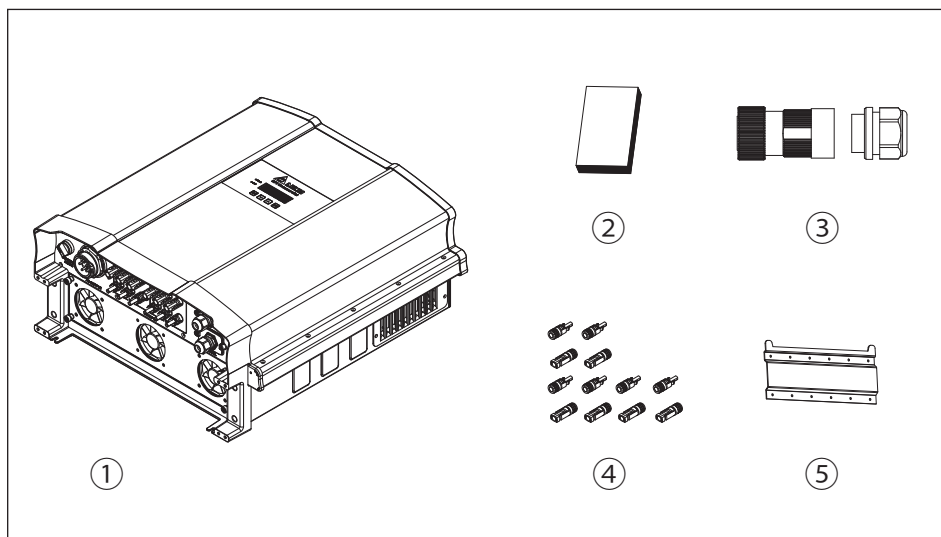


圖2-3：M30A_121內容物清單

RPI M30A_121			
	物品	數量	說明
1	太陽能變流器	1 pc	RPI系列太陽能變流器
2	使用說明書	1 pc	安全規範、安裝步驟、產品規格...等
3	AC 接頭	1 pc	AC 連接接頭
4	DC 接頭	6 組	DC 連接接頭
5	壁掛板	1 pc	將太陽能變流器掛於牆上之壁掛板

表2-2：M30A_121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，變流器之型號、規格及序號皆標示於產品標籤上，關於標籤的位置請參考圖 2-4。

RPI M30A_120 / M30A_121 系列依照DC保險絲與突波保護器的有無可分為兩種類型，請參考表2-3。

型號名稱	產品型號	突波保護器	DC保險絲
RPI M30A_120	RPI303FA0E1000	✓	✓
RPI M30A_121	RPI303FA0E1100	X	X

表2-3：產品型號

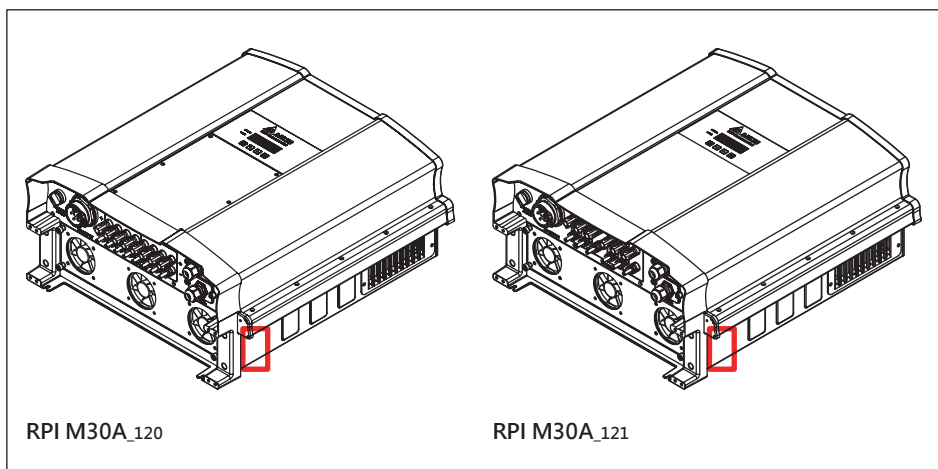


圖2-4：產品標籤

2.4 外觀介紹

變流器外部元件如圖2-5所示。詳細的輸出與輸入介面請參考圖 2-6。
DC輸入組數會因機種不同而有所差異。

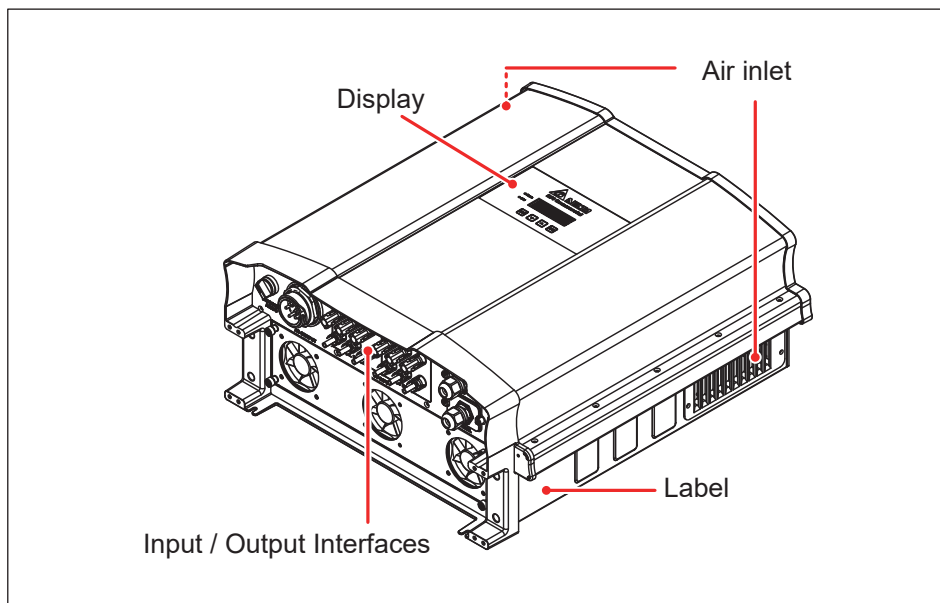


圖2-5：外觀介紹

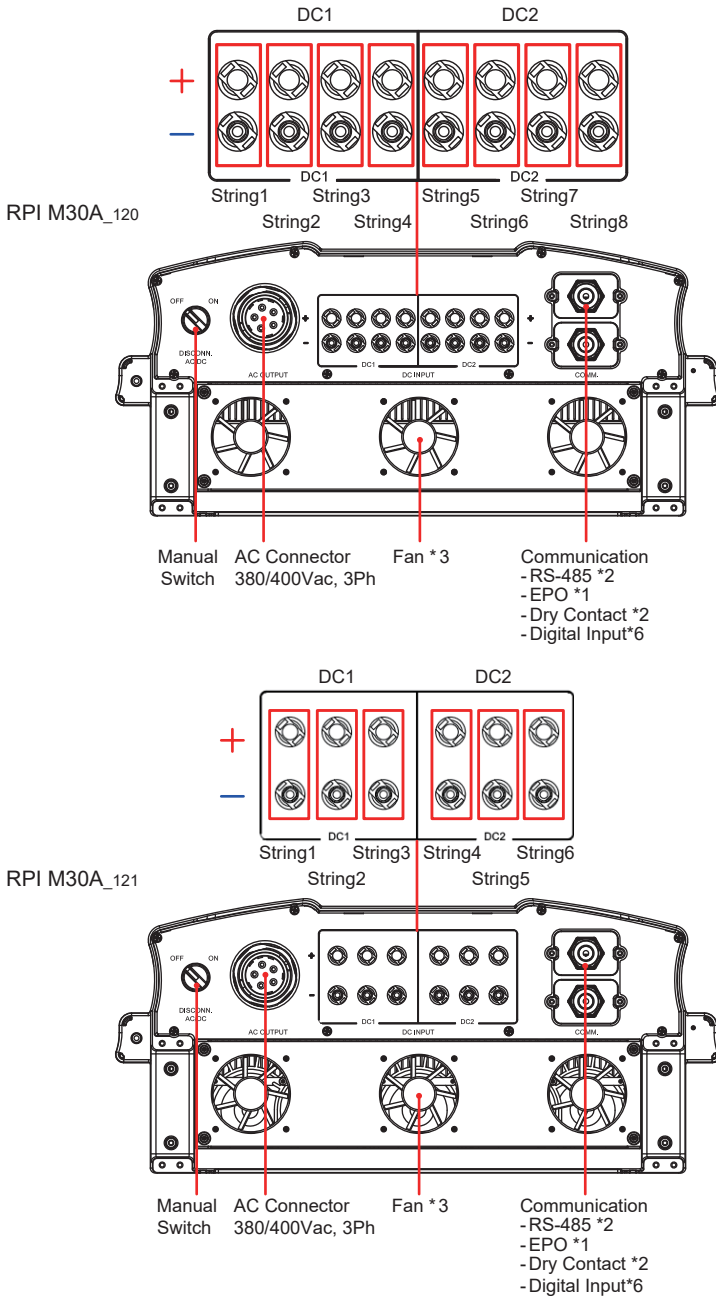


圖2-6：輸出入介面介紹

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。

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。
* 至少須鎖附上面的6顆螺絲。
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。

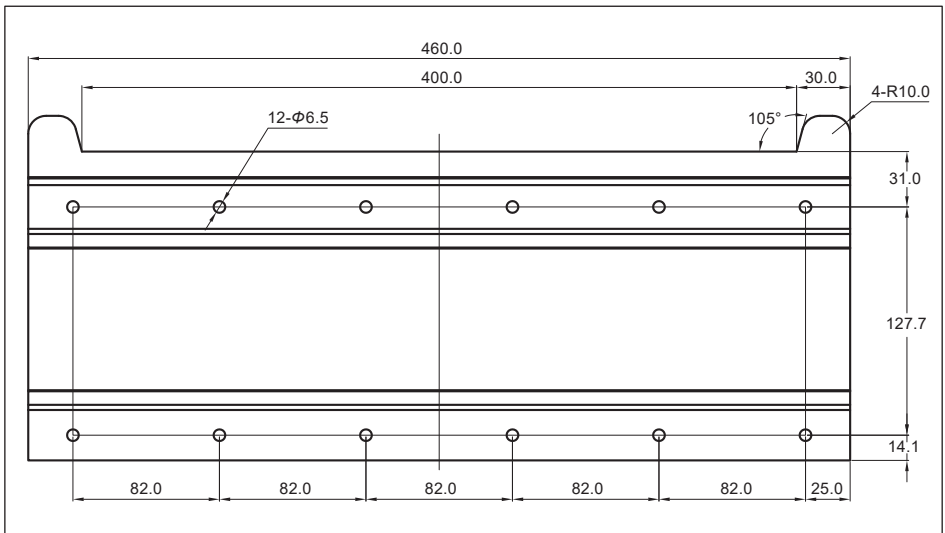


圖3-1: 壁掛板尺寸

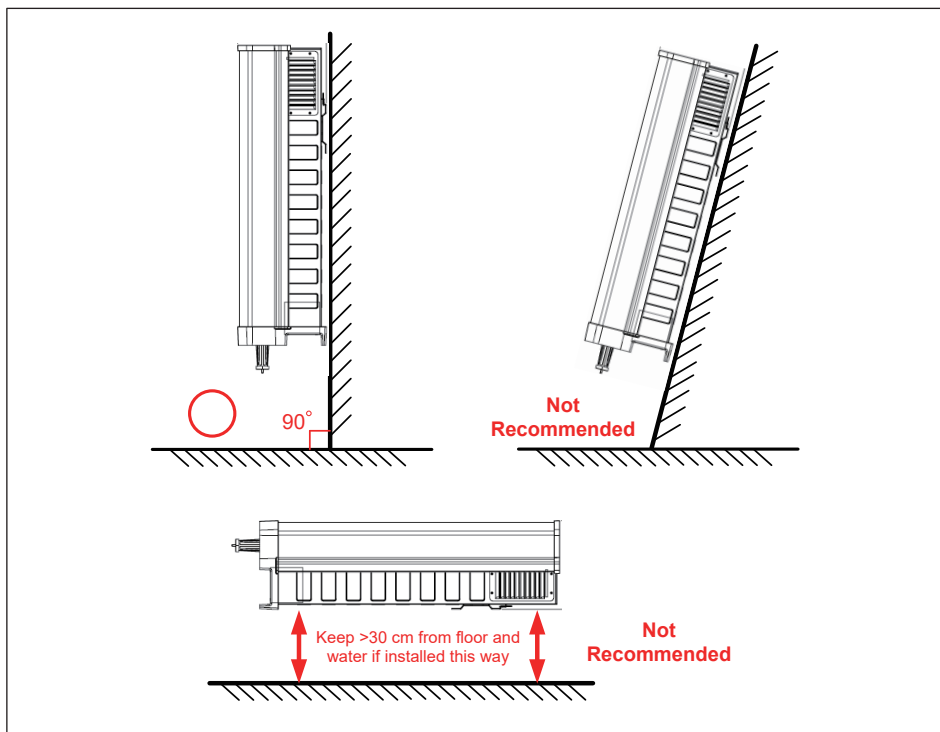
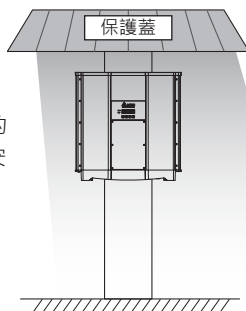


圖3-2：建議和不建議的安裝方式

注意！



為避免由於極端氣候(大雪, 冰雹...等)或不恰當的安裝/維護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。



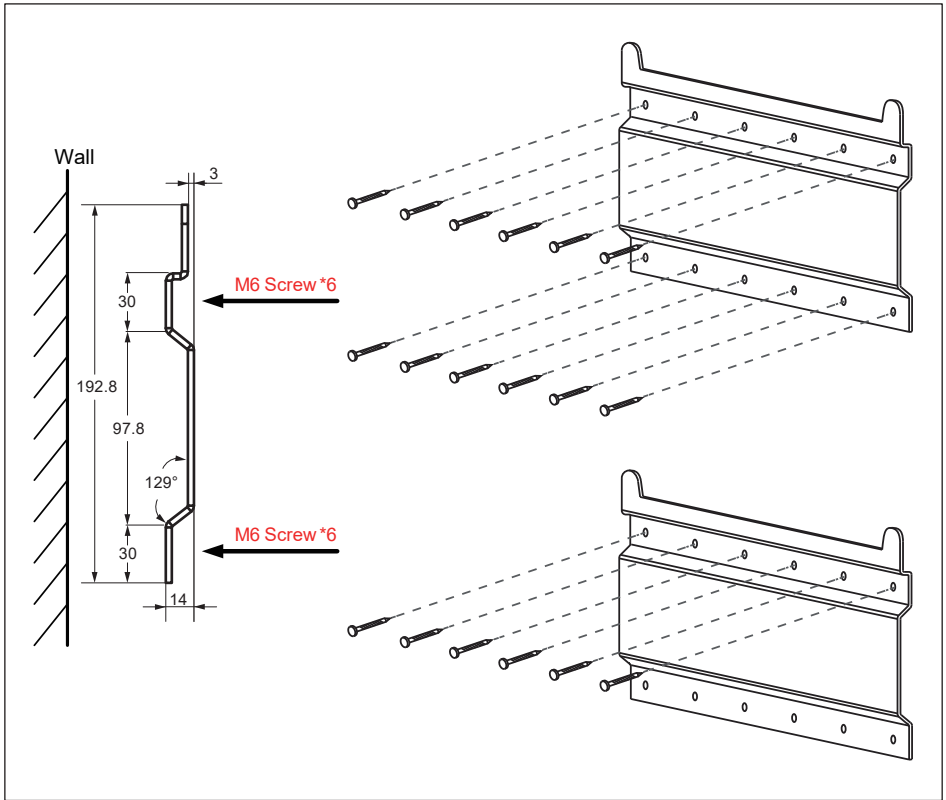
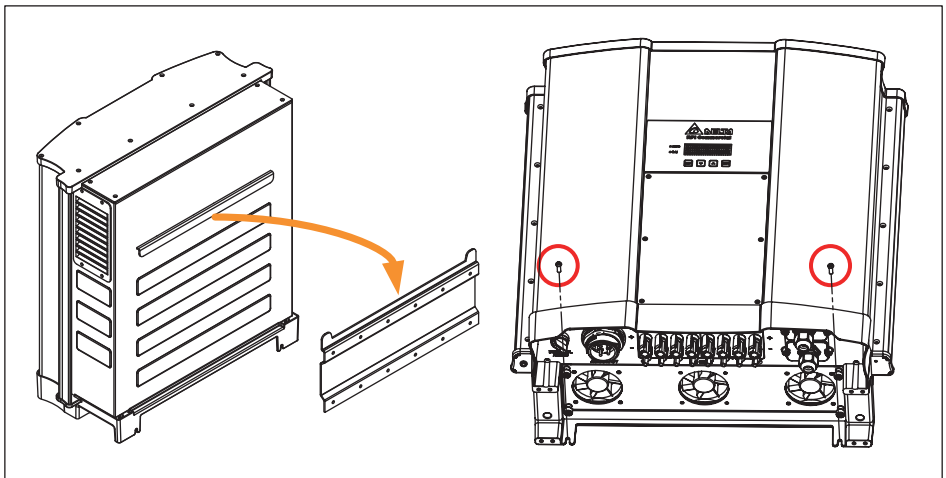


圖3-3：以螺絲固定壁掛板



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。
- 請安裝於安全且空曠之場所，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。

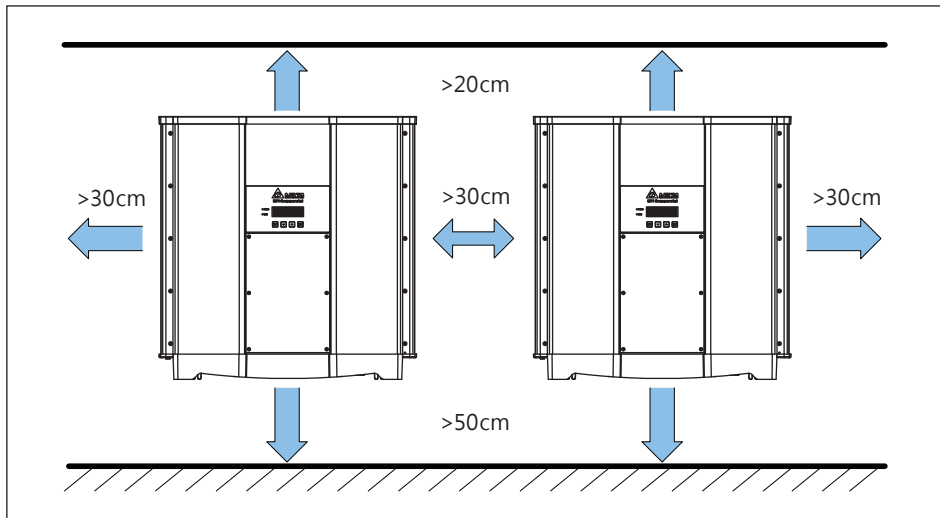


圖3-5：適當安裝間距

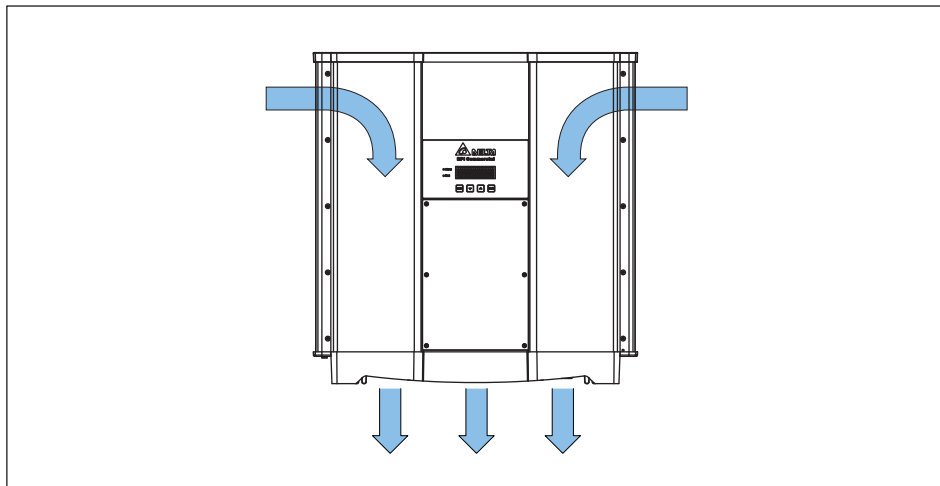


圖3-6：進氣方向

4 配線

警告！電擊危險



- 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 (M30A_120)

- M30A_120 機種於DC輸入端皆有配接15A的DC保險絲。每個輸入串之最大輸入電流不可超過10A。
- 太陽能板可以直接與各個DC輸入端獨立連接。但並不建議用戶使用配電箱將太陽能板並聯後再分接入機子，此接線方式若阻抗不均容易造成電流超出保險絲負荷。接線方式請參考圖 4-1。
- 若您想強制變流器操作於並聯輸入模式(僅啟動一組MPPT)，請於變流器內加裝2組短路導電片，如圖4-2。外部DC端則維持如圖4-1之接線方式。
- RPI系列機種內部並未附帶隔離變壓器。若太陽能板為正端接地或負端接地時，使用者須於AC端加裝外部隔離變壓器，並於變流器內安裝1000V/1A之midget型接地保險絲與短路導電片。詳細的接線方式請參考圖 4-3、圖 4-4。
- 當太陽能正端或負端接地時，不可以啟動PID功能，同時對地阻抗須設定為“Plus Grounded”或是“Minus Grounded”。
- 即使切斷機殼底部的手動開關，在移除MC4 DC端子前仍需將AC與DC電源確實切離，避免觸電。
- 不同的DC配線方式需於變流器控制面板上設定不同的對地阻抗(insulation)偵測方式，請參考5.2.7 Install Settings。

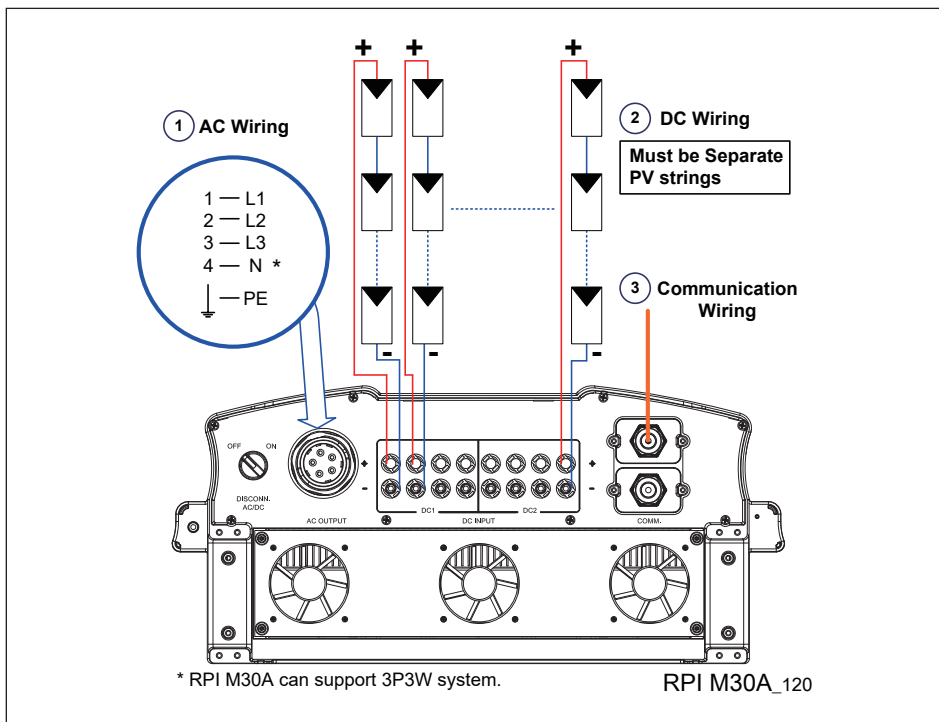


圖4-1：DC端不接地配線圖

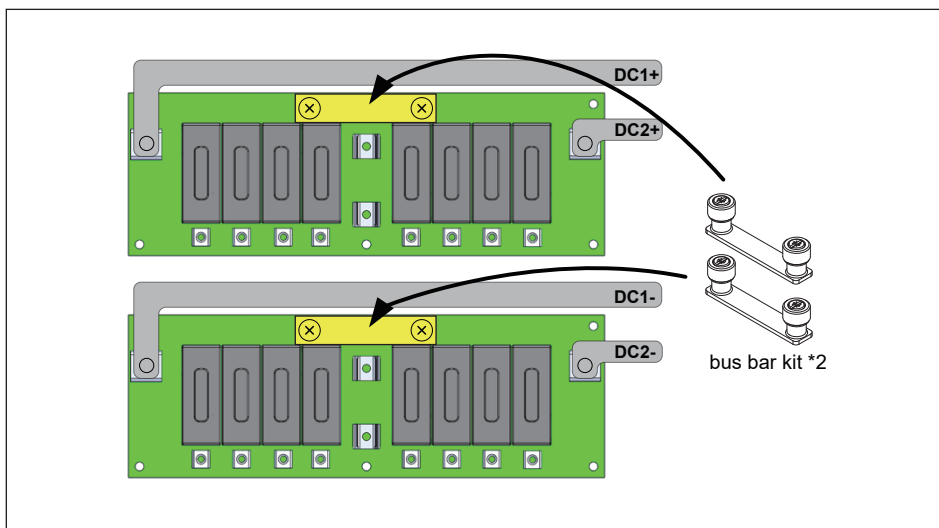


圖4-2：強制變流器操作於並聯模式

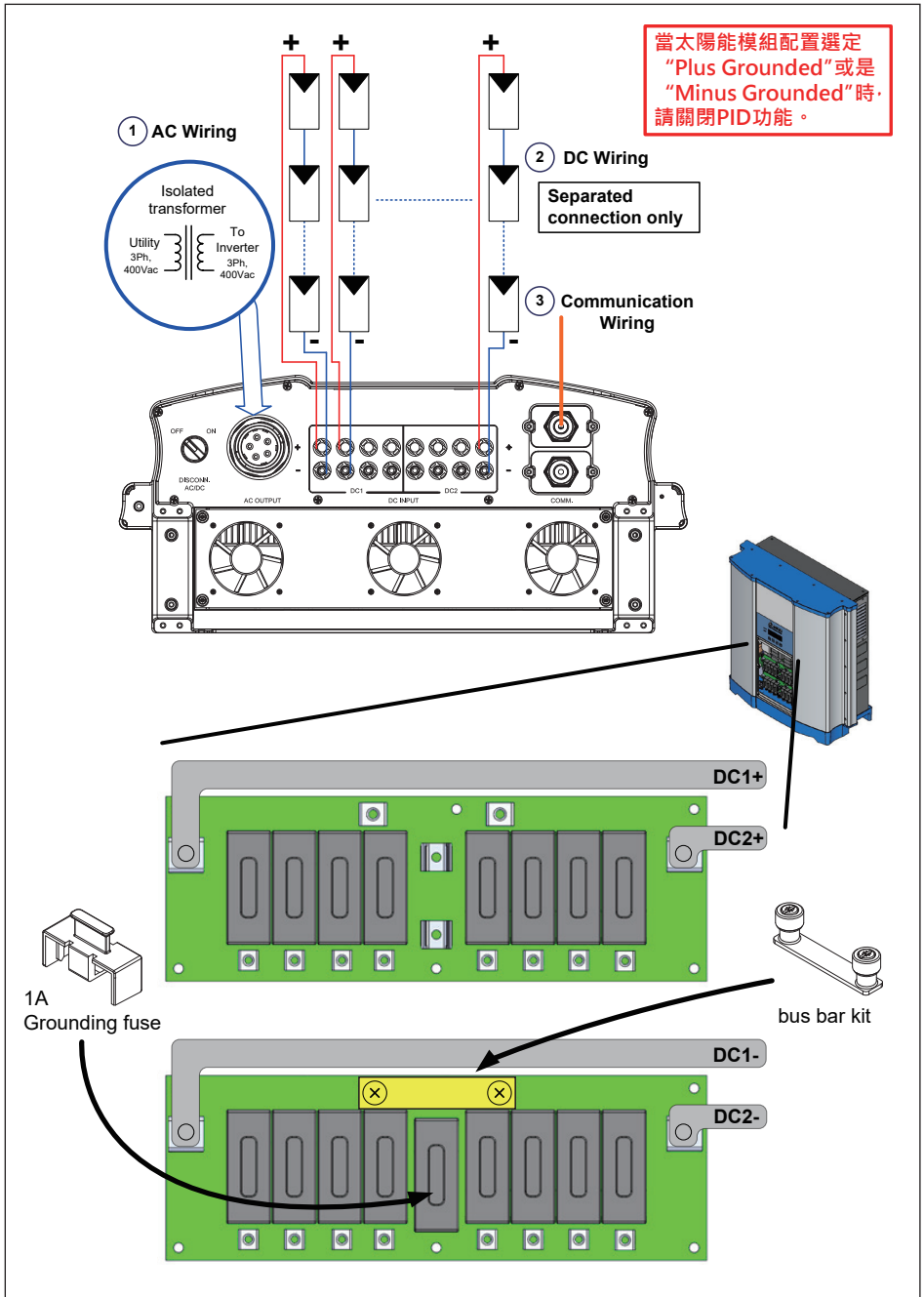


圖4-3 : M30A_120 DC端負接地配線圖

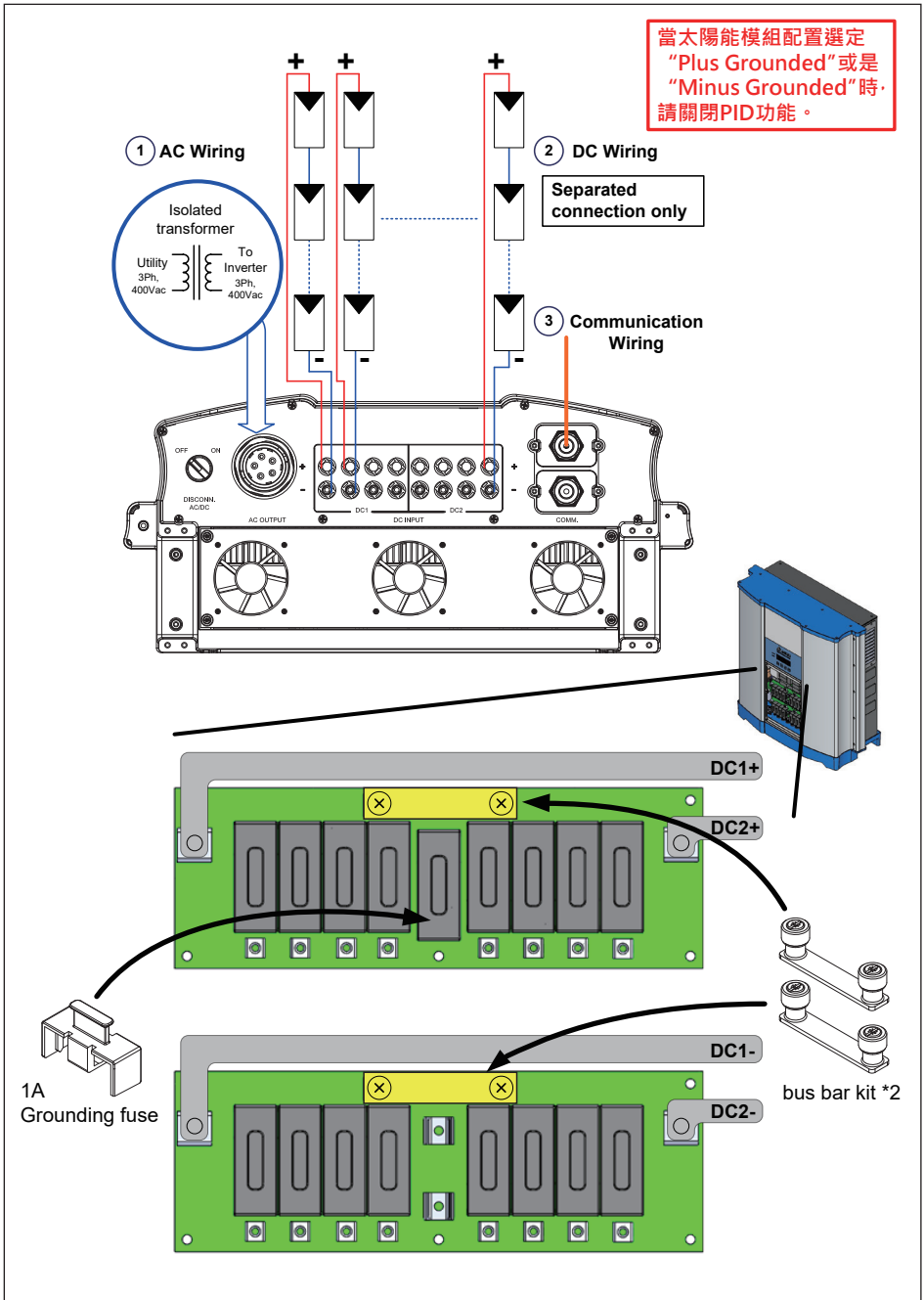


圖4-4 : M30A_120 DC端正接地配線圖

4.2 配線前準備事項 (M30A_121)

- RPI M30A_121內部並未配備DC保險絲，每組DC輸入皆可承受最大30A之輸入電流。每串輸入端只可以使用一對DC端子。
- 當太陽能板不接地時，機子DC端可接受並聯或是獨立連接。
- RPI系列機種內部並未附帶隔離變壓器，若太陽能板為正端接地或負端接地時，DC端僅允許並聯配線並需於AC端加裝外部隔離變壓器。
- 當太陽能正端或負端接地時，不可以啟動PID功能，同時對地阻抗須設定為“Plus Grounded”或是“Minus Grounded”。
- 不同的DC配線方式需於變流器控制板上設定不同的Insulation偵測方式，請參考5.2.7 Install Settings。

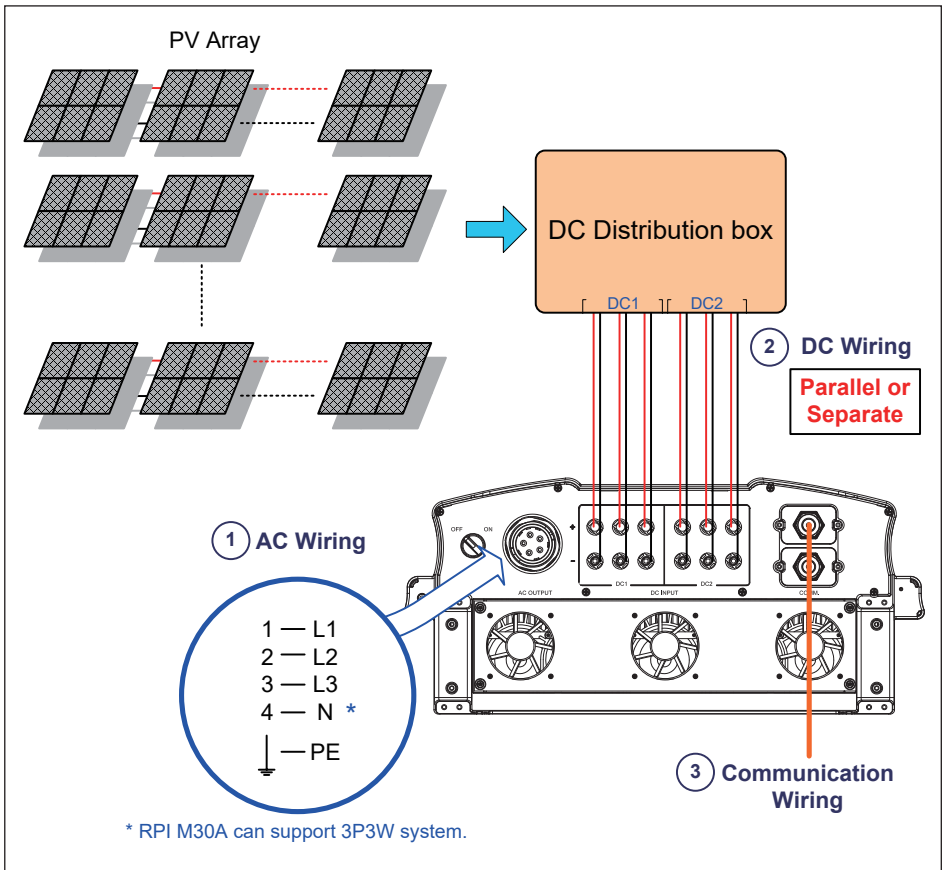


圖4-5 : M30A_121 系統配線圖(DC端不接地)

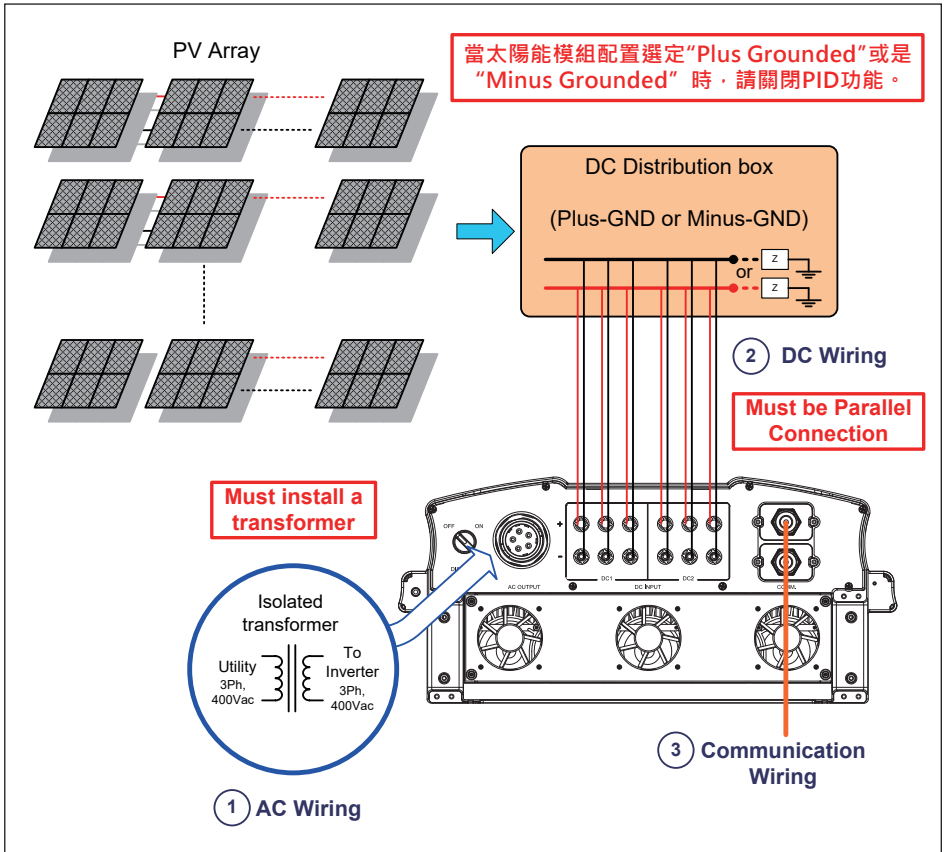


圖4-6 : M30A_121 系統配線圖(DC正接地或負接地)

Note for Field Wiring

由於變流器內部接線與直流配接端子的耐流限制，使用變流器時，需能確保每一直流端子的電流不會超出下表限制值，以避免火災等情事。

下表的電流限制值僅供做為案場配接時的參考依據，不表示變流器的額定應用值。

RPI M30A_120	16A
RPI M30A_121	39A

表4-1：每一直流端子的最大電流耐受值

光伏匯流箱的使用

M30A_120:

- 主要是因為光伏匯流箱的輸出電流大於每一直流端子的最大電流限制值，16A。

所以如下圖的應用是不恰當的。(圖4-7)

每一組最大輸入電流為7.5A。

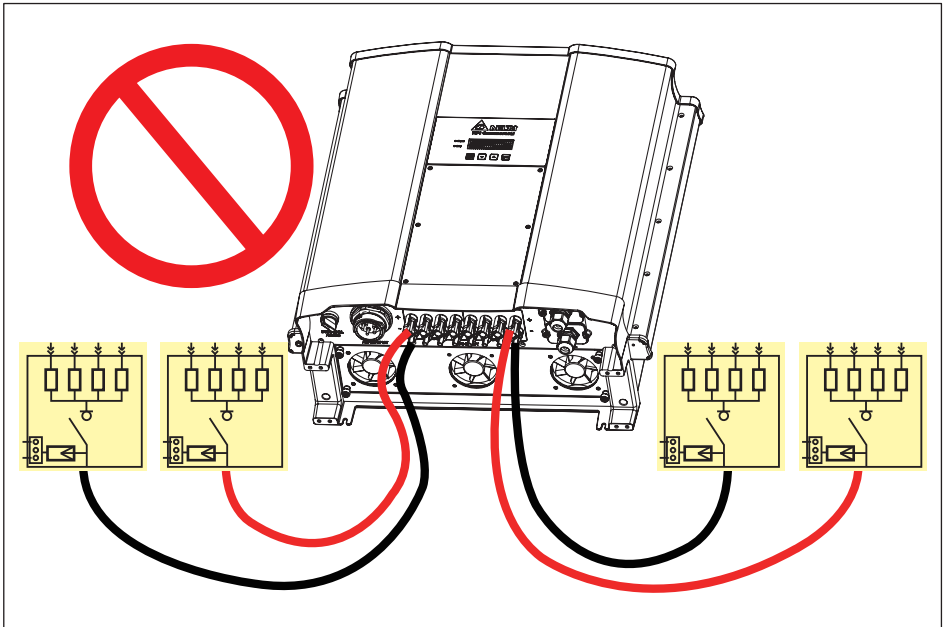


圖4-7：錯誤的連接方式 - 1

M30A_120:

- 不建議一個或多個分流接頭的使用。(圖 4-8)

因分流端子後的電流不能保證是平均分配的。

不平衡分流下，局部的直流輸入端子仍有可能會超出16A。

每一組最大輸入電流為7.5A。

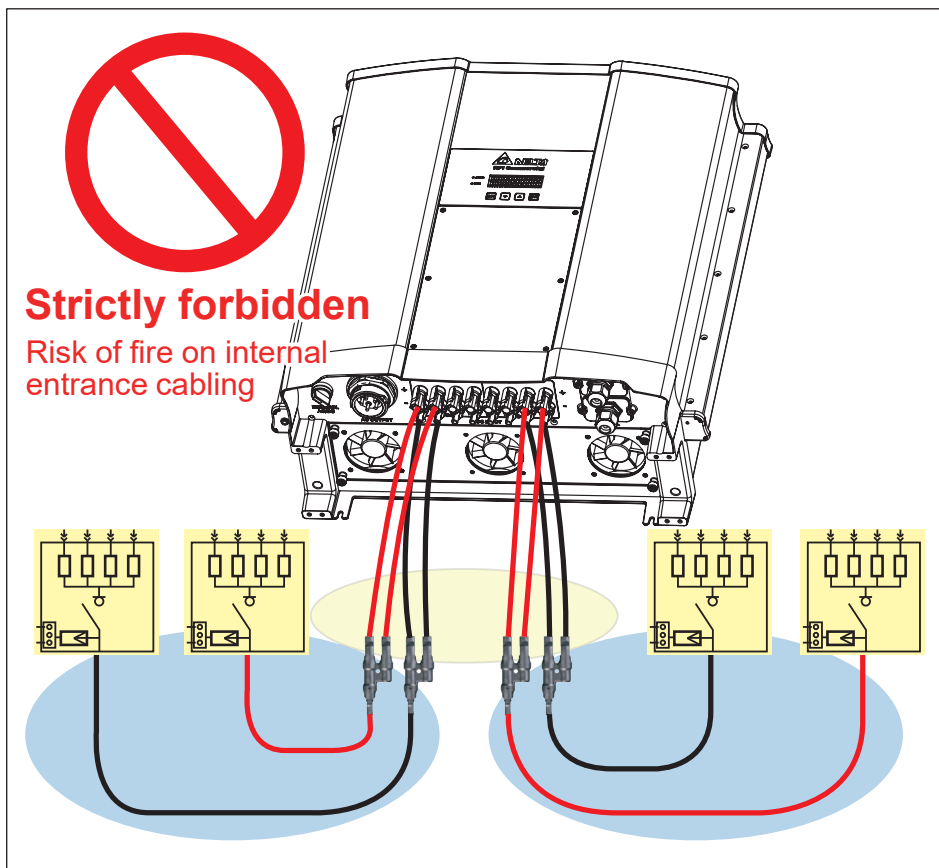


圖4-8：錯誤的連接方式 - 2

M30A_120:

不建議如下圖(圖4-9)所示的分流接頭應用。
因通過分流接頭的電流將超過分流接頭的限制值。
每一組最大輸入電流為7.5A。

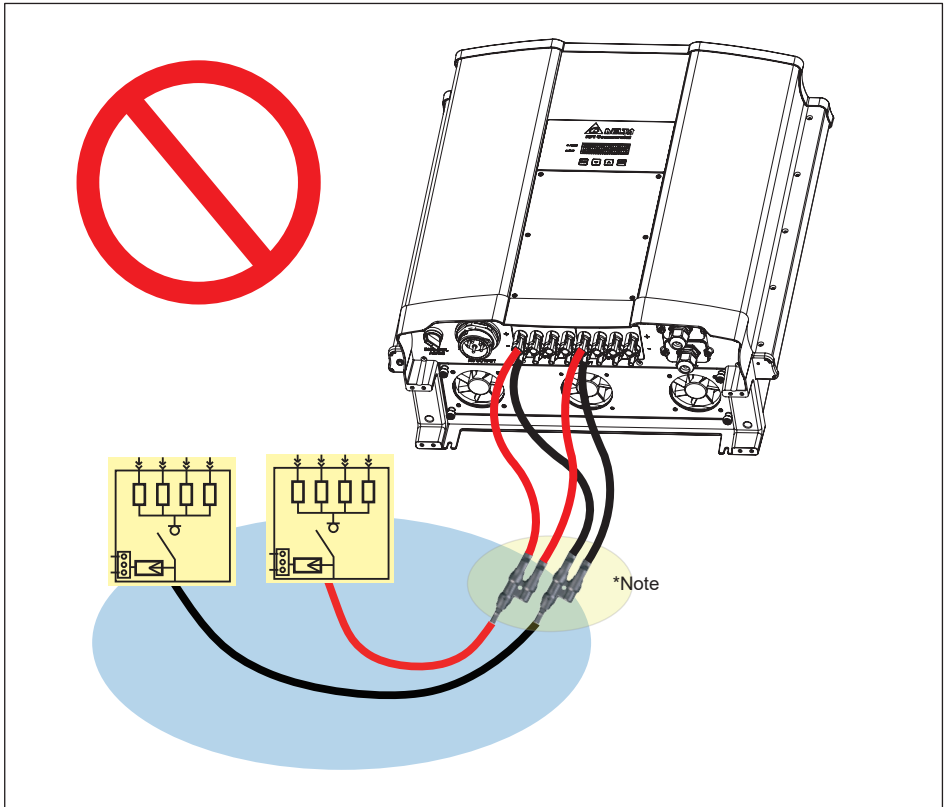


圖4-9：錯誤的連接方式 - 3

M30A_120 and M30A_121:

禁止將直流輸入端子當做分流接頭使用。(圖4-10)

因由光伏匯流箱流進變流器的第一組直流端子電流將遠高於端子跟保險絲的限制值。

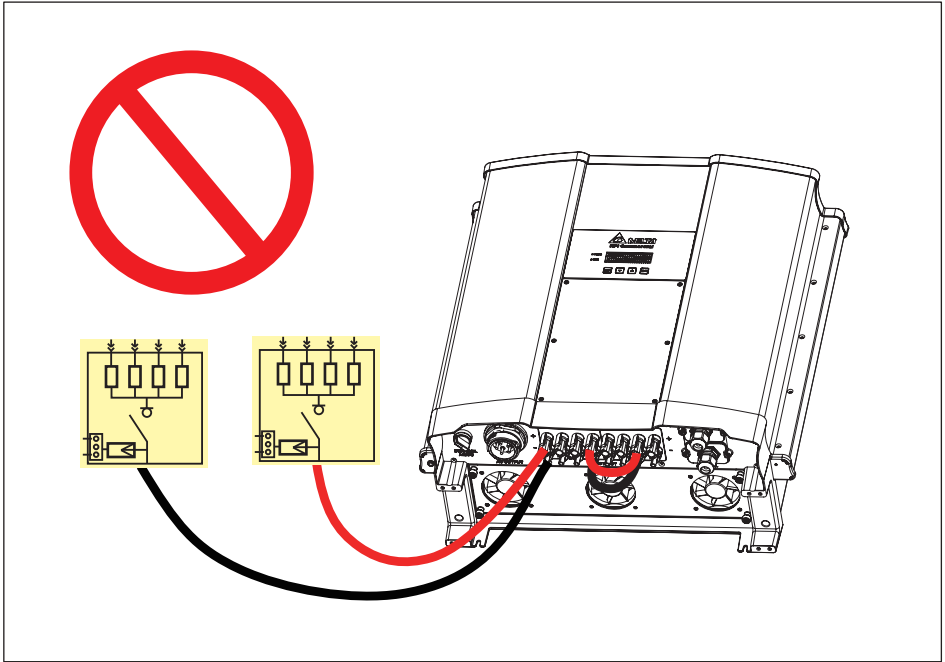


圖4-10：錯誤的连接方式 - 4

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

警告!



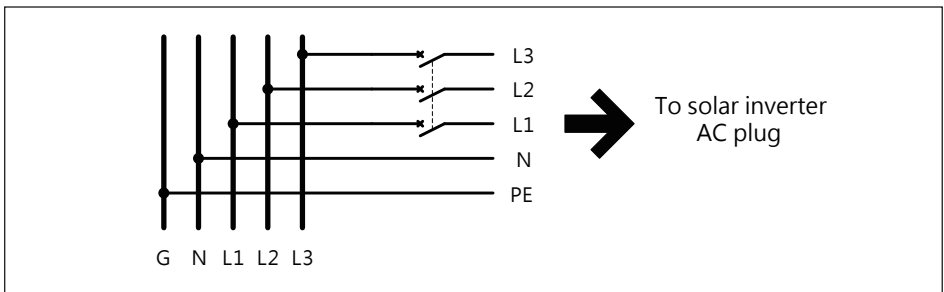
- 執行配線作業時, 必須確認市電電源開關已經關閉。

4.3.1 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。

Model	Upstream circuit breaker
RPI M30A	60A

表4-2: 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4-3中之規格。
若表4-3之規範與當地法規有所抵觸，請以當地法規之規範為主。

機種名稱	額定電流	單一線徑	電纜外徑	建議扭力值
RPI M30A	65 A	13.3-25mm ² 6-4AWG	23-31mm	2.5 N.m

表4-3: AC接頭線徑尺寸

M30A機種若使用線徑25mm² 或4AWG之電線，線末將無法加裝壓接端子。

RPI M30A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。
- RPI M30A機種剝除內部所有線材之膠皮20mm。

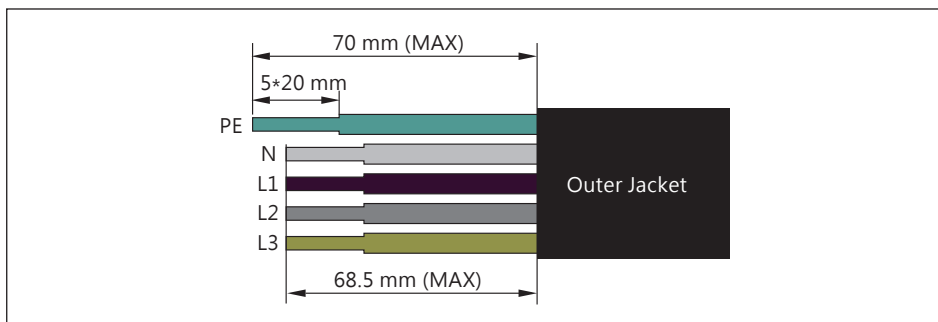


圖4-11：AC線材撥線

其中25mm²(4AWG)不要壓接冷壓端子。

16mm²(6AWG)建議管型端子尺寸如下圖所示。

WIRE SIZE	DIMENSIONS(mm)				
	L	F	ΦC	ΦD	ΦW
16mm ² 6AWG	28	18	5.8	6.2	8.7

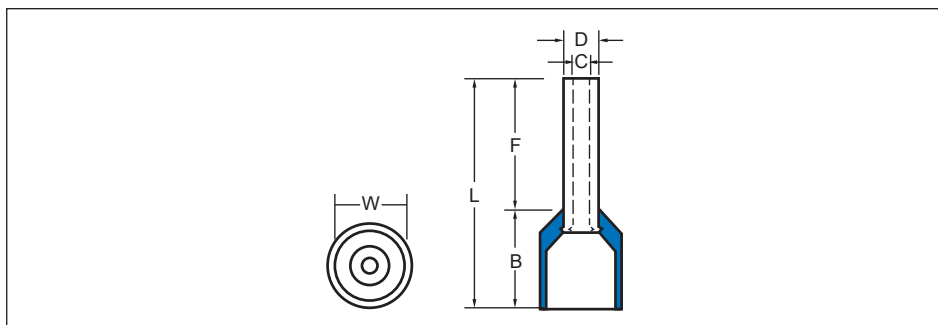


圖4-12：歐式端子

對於銅線：

台達建議AC線材使用適當耐流能力之多股軟芯線。

對於鋁線：

為確保良好的導電性及安全性，必須使用如圖4-13所示的銅鋁端子。
(與AC Plug 的接觸面須為銅)

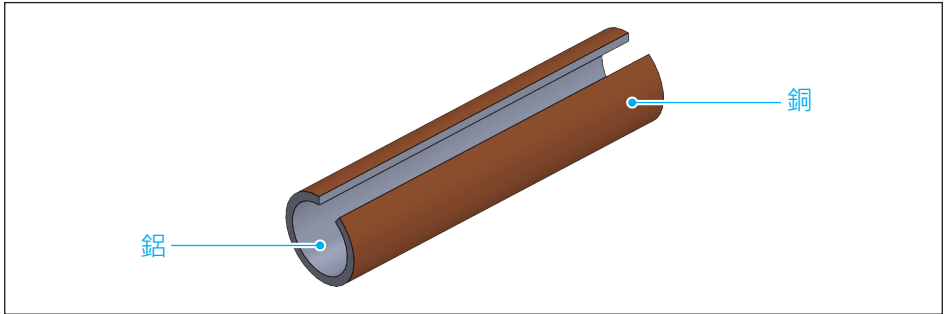


圖4-13：銅鋁端子

注意：**有可能產生高溫：**

若壓接點的阻抗過高，該點則有可能產生高溫導致火災。

為確保安全性及可靠的接觸點，請確實遵守以下步驟



1. 鋁線的導電性較銅線差，鋁線線徑請至少選用比銅線線徑大一個等級。
2. 安裝鋁線時請盡量在低濕度且低腐蝕性的環境下進行。
3. 安裝過程需快速。
4. 確實使用硬體工具(如刀子)將剝線後的裸露表面氧化層刮除，並立即將裸露線材浸泡至凡士林內(須為中性、不含酸、鹼成分)，然後放入銅鋁端子內。
5. 使用最大允許的壓接扭力進行壓接。

線材壓接完成後請按照圖 4-14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。

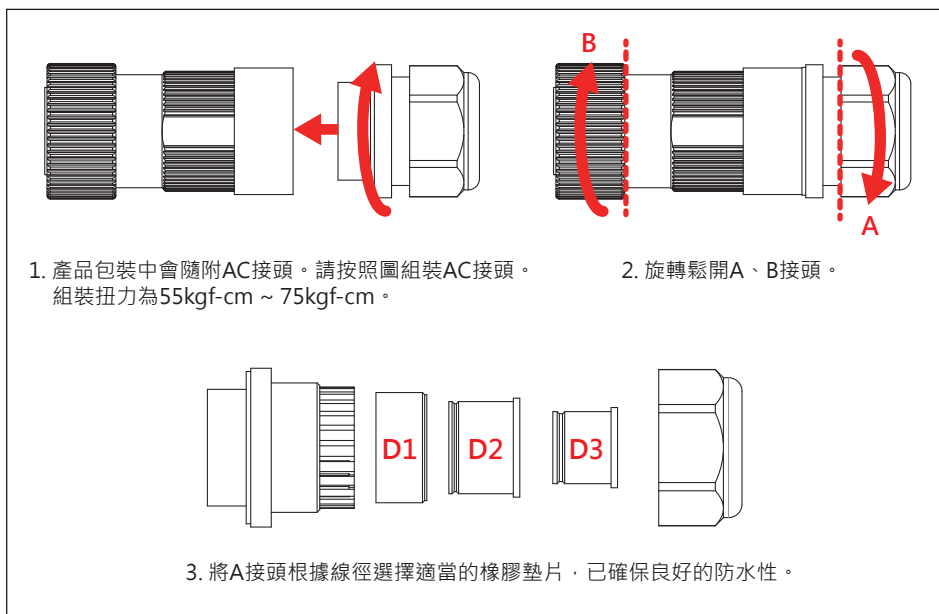


圖4-14：RPI M30A之AC接頭配線圖

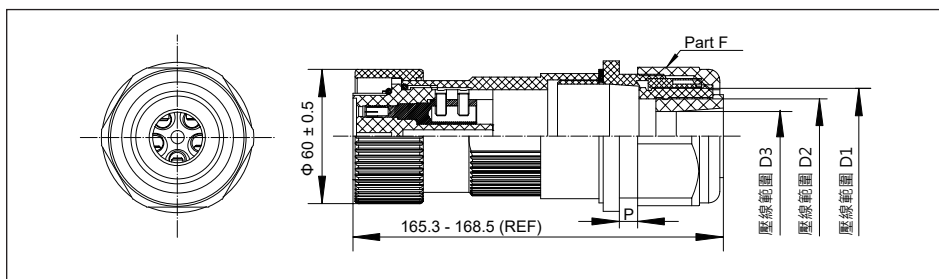


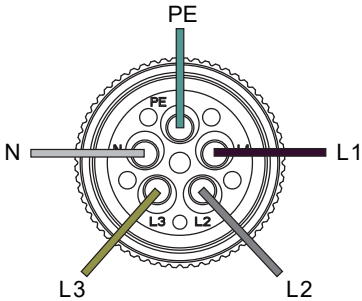
圖4-15：AC端子防水塞

**接線端子並不適用於單芯電纜線，請使用多芯電纜線並配合歐式端子使用。

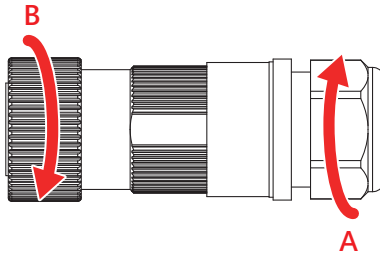
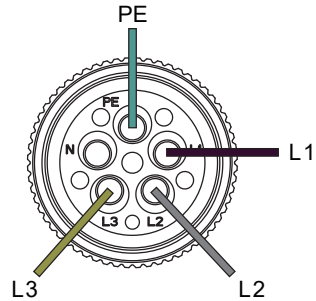
**該接線端子經過鍍銀處理。

	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 ~ 15	0 ~ 7
D3	15.3 ~ 20.5	13 ~ 20	1 ~ 5.5

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. 先擰緊B接頭後，再擰緊A接頭固定電線

連接至AC之電壓必須符合下列規範：

三相三線：

L1-L2: 400 Vac \pm 20%

L1-L3: 400 Vac \pm 20%

L2-L3: 400 Vac \pm 20%

三相四線：

L1-N: 230 Vac \pm 20%

L2-N: 230 Vac \pm 20%

L3-N: 230 Vac \pm 20%

4.3.2 允許接地系統

接地系統	TN-S	TN-C	TN-C-S	TT	IT
是否允許	Yes	Yes	Yes	Yes	No



不建議N與PE壓差 $>20V_{rms}$ 的TT接地系統。

4.4 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。
- TDC2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，絕對最大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4-4之規範。

限制條件	RPI M30A
最大輸入功率	35 kW
DC1、DC2個別輸入功率	23.5 kW

表4-4：最大容許輸入功率限制

型號	額定電流	線徑
RPI M30A_120	DC 15A	4 - 6 mm ² / 12 - 10 AWG
RPI M30A_121	DC 30A	6 mm ² / 10 AWG

表4-5：線徑大小

DC 配線端子可分為正極和負極兩種，如圖4-16所示。配接時請務必確認極性與變流器上的標示一致。

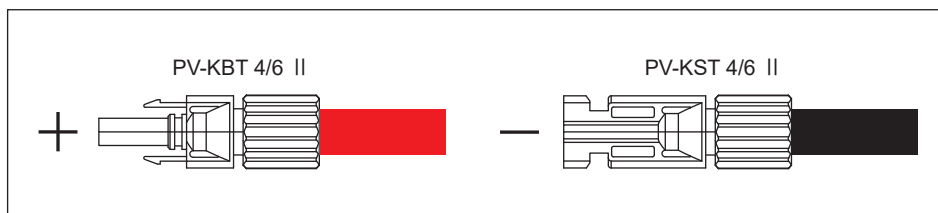


圖4-16：DC配線端子

4.5 多台變流器組合

4.5.1 多台變流器在三相系統並聯配置方式

RPI M30A 可配置在三相電壓的系統，也可將多台RPI M30A的AC側並聯在相同的市電電網。請參考圖4-17。

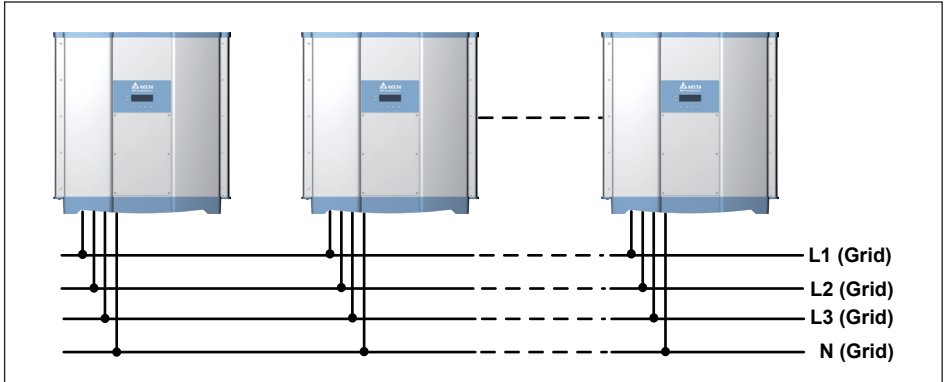


圖4-17：多台變流器在三相系統並聯配置方式

4.5.2 通訊介面之連接

RPI M30A機種之通訊模組請參考圖4-18。此模組提供VCC、RS-485、乾接點、緊急關機、以及數位輸入等不同功能之連接端子。

** 請使用外徑20 AWG (0.5mm²)的電纜線。 **

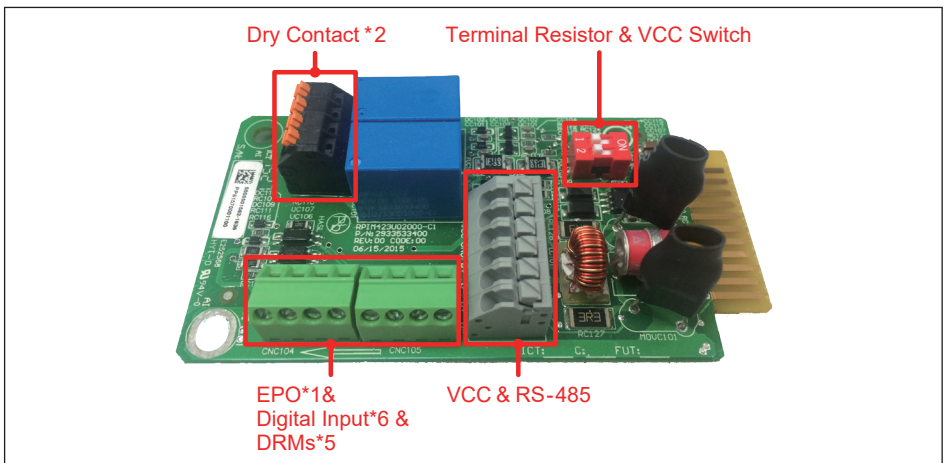


圖4-18：通訊模組示意圖

4.5.3 RS-485之連接

RS-485端子的定義如表4-6。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4-19。

終端電阻的設定方式請參考表4-7。

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

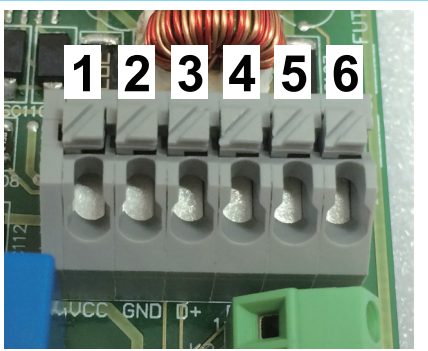


表4-6：RS-485端子定義

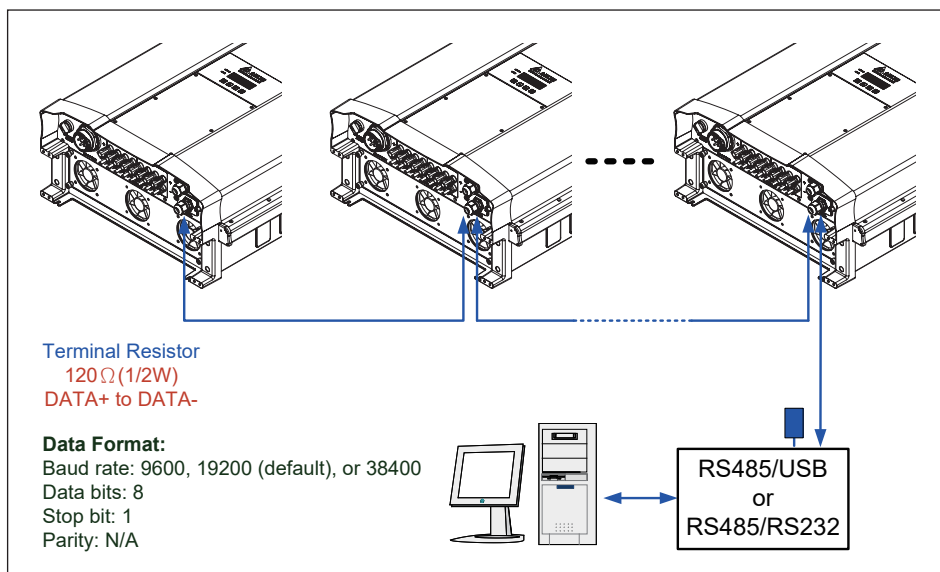


圖4-19：多台變流器串接通訊

	指撥開關1	指撥開關2
ON	VCC ON	終端電阻ON
OFF	VCC OFF	終端電阻OFF

表4-7：終端電阻設定

4.5.4 緊急關機裝置與數位輸入之連接

RPI M30A機種提供一組緊急關機裝置(EPO)·使用者可於Install Settings頁面自行定義其觸發條件·設定方式請參考章節5.2.7.7 EPO。

此外·機子內部尚配備6組數位輸入功能(K1~K6)·各組功能請參考表4-8·合適的電線是20 AWG (0.5mm²)。

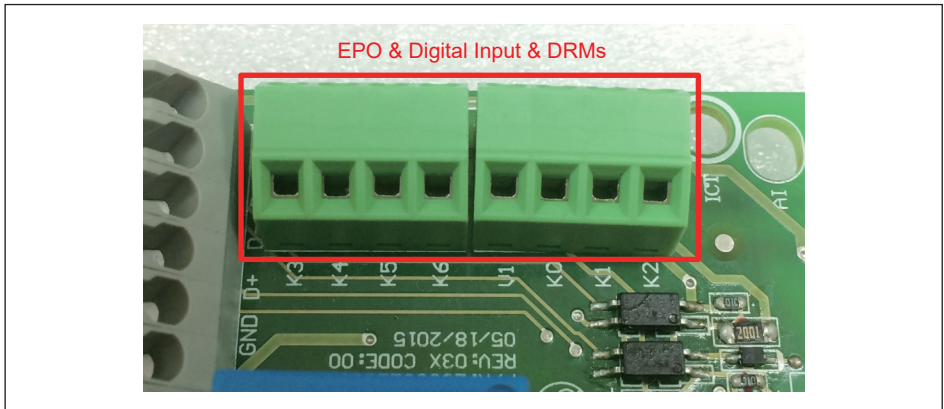


圖4-20：EPO使用說明

短路以下腳位	變流器執行動作
V1 & K0	緊急關機
V1 & K1	停止輸出任何功率
V1 & K2	降低功率輸出至30%額定功率
V1 & K3	降低功率輸出至60%額定功率
V1 & K4	恢復功率輸出至100%額定功率
V1 & K5	保留
V1 & K6	保留

表4-8：數位輸入功能與EPO設定

短路以下腳位	變流器執行動作
V1 & K0	DRM0 (Emergency power off)
V1 & K1	DRM5 (0% active power)
V1 & K2	DRM6 (Maximum 50% active power)
V1 & K3	DRM7 (Maximum 75% active power and sink reactive power)
V1 & K4	DRM8 (Maximum 100% active power and sink reactive power)

表4-9：Demand Response Modes (DRMs)

※ 此功能僅支援澳洲和紐西蘭地區

緊急停止開關與數位輸入功能可以在inverter多台並聯下使用，接線方式請參考圖4-21。

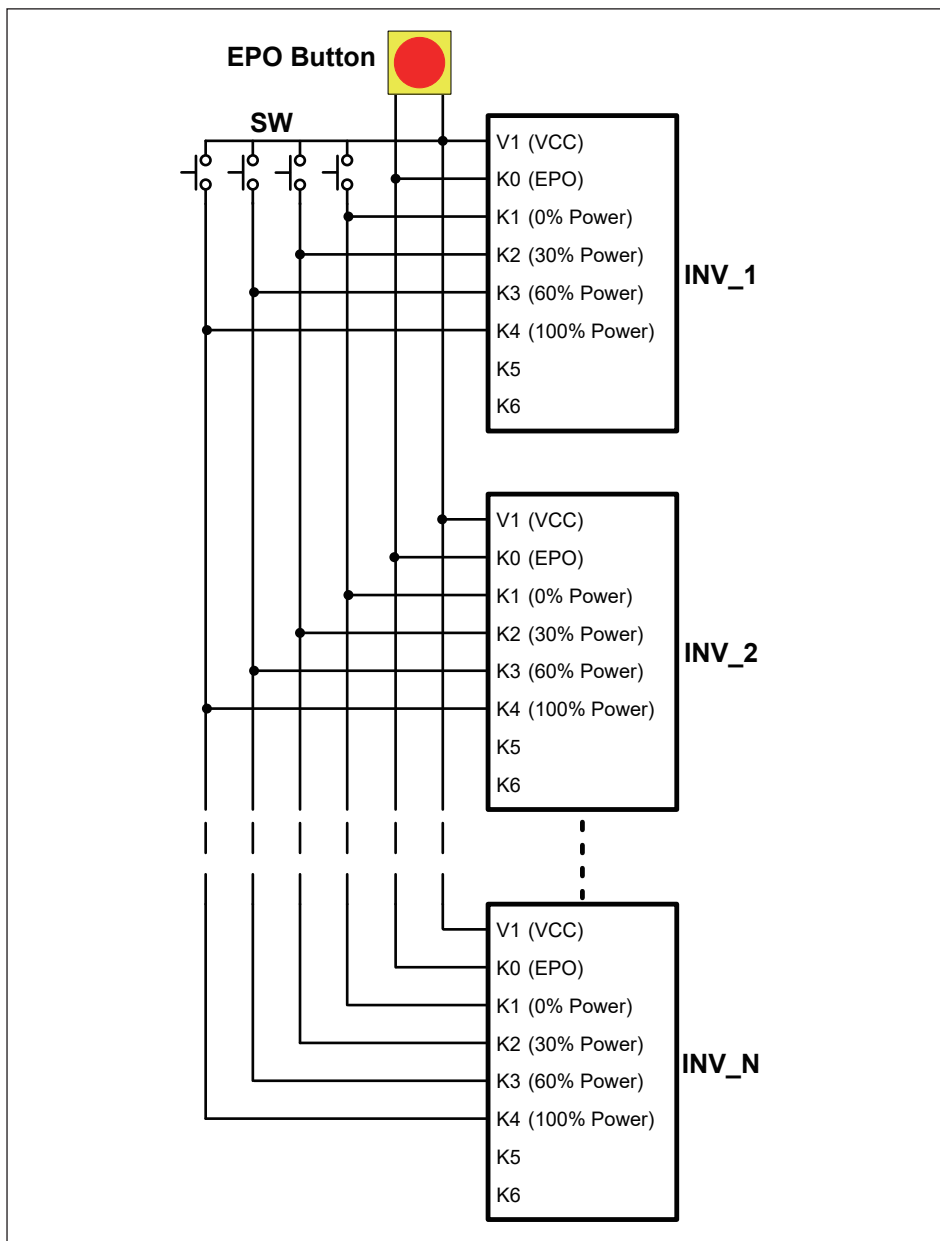


圖4-21：緊急停止開關與數位輸入功能的多台並聯

4.5.5 乾接點之連接

RPI M30A 機種提供2組連動的乾接點，其觸發條件可由使用者自訂，設定方式請參考章節5.2.7.5 Dry Contact。

干接點可承受250Vac/28Vdc/9A，其適合線徑範圍為20 AWG (0.5mm²)。

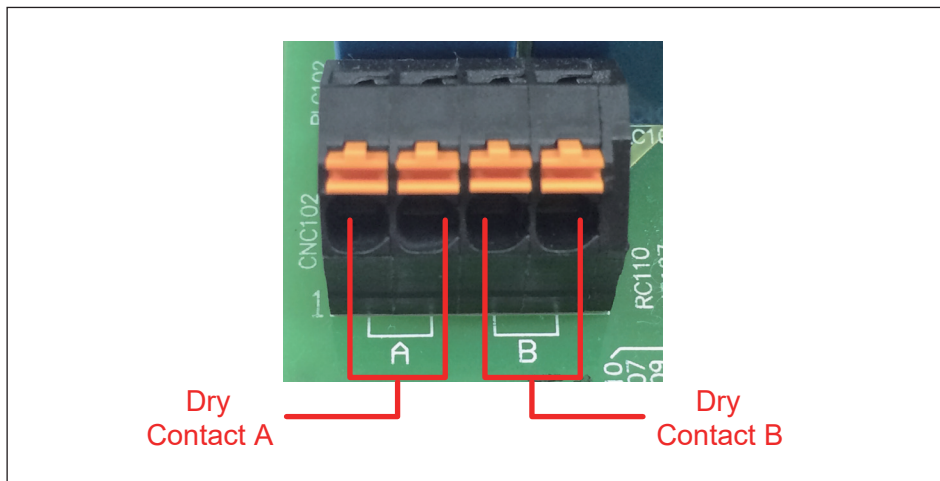


圖4-22：乾接點連接

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 M30A機種的控制面板含有一個4x20格的文字型顯示器與兩顆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。接下來的章節將會逐步介紹使用者可於控制面板設定或調整之功能。當您在調整設定值時，面板上的游標會由「▶」變為「➔」。

Power Meter	5.2.2
Energy Log	5.2.3
Event Log	5.2.4
Inverter Information	5.2.5
General Settings	5.2.6
Install Settings	5.2.7
Active/Reactive Power	5.2.8
FRT	5.2.9

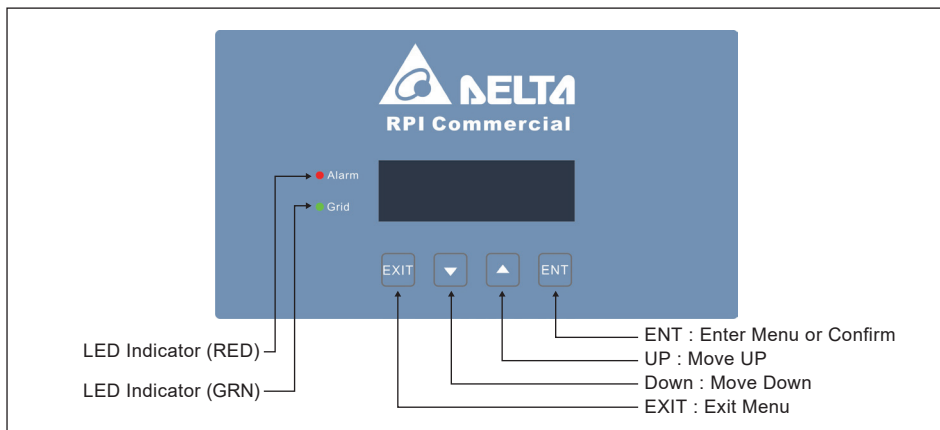


圖5-1：控制面板

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，並將手動開關(Manual Switch)轉至 ON，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，請觀察主畫面中的Status是否有顯示任何錯誤訊息，若無則可送入DC電源並等待變流器自我測試，約莫2分鐘後機子將會進行併網前倒數而後併網。

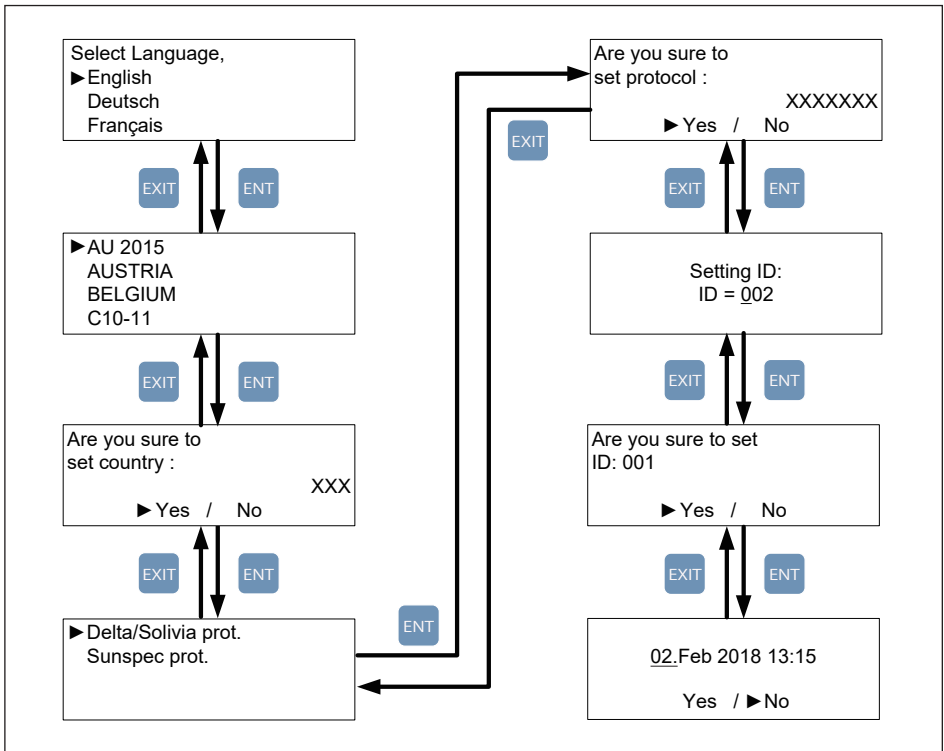


圖5-2 : 首次開機出現語言和國別設定

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的累計發電量、目前Power、變流器工作狀態、以及日期時間等資訊。

使用者於主畫面按壓任何按鍵即可進入主選單，於主選單按壓EXIT鍵或待機5分鐘以上則會回到主畫面。

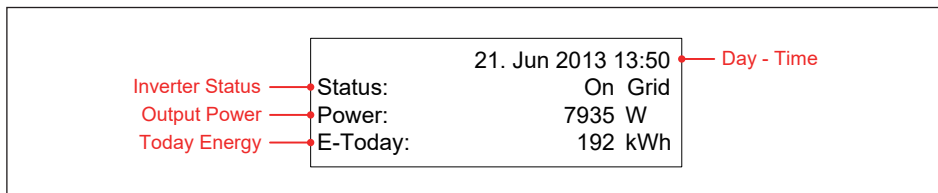


圖5-3 : 主畫面

5.2.2 Power Meter

此頁面顯示AC與DC端之電壓、電流、功率等資訊。

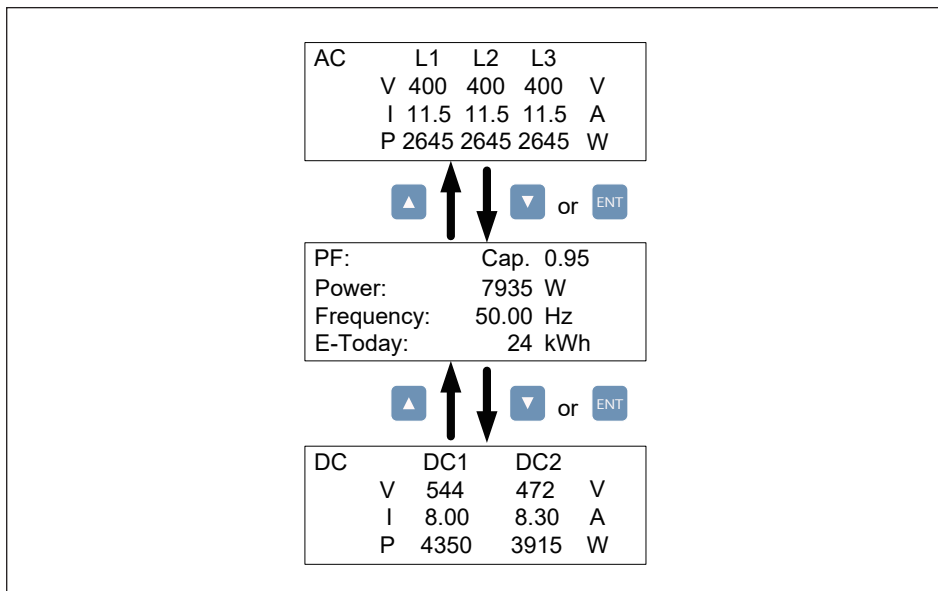


圖5-4 : Power meter頁面

5.2.3 Energy Log

此頁面可觀看變流器安裝至今的總發電瓦時與總運作時間。

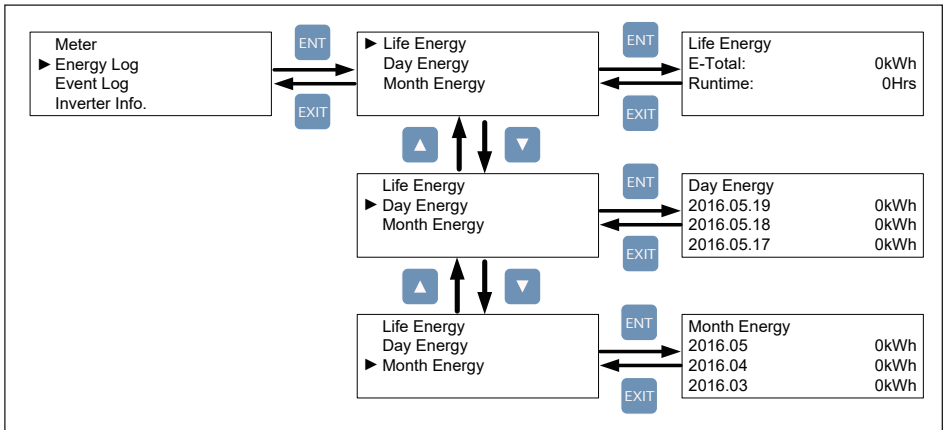


圖5-5 : Energy log頁面

5.2.4 Event Log

Event Log可分為Error Events與Grid Report兩個分頁。Error Events分頁可記錄30筆變流器所偵測到的錯誤訊息，包含Internal Error與Grid Fault；而Grid Report分頁則可單獨記錄五筆與市電端有關之錯誤訊息(Grid Fault)。

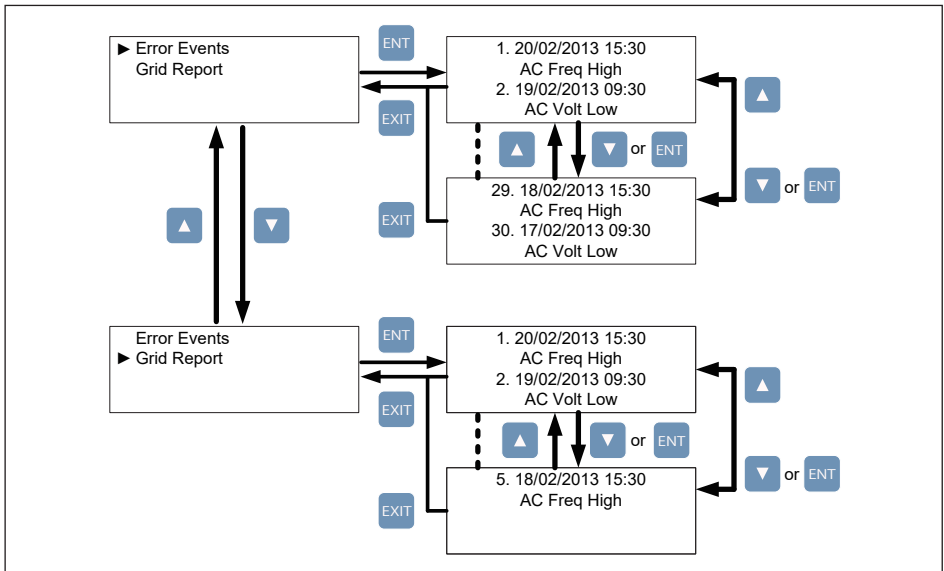


圖5-6 : Event log流程

5.2.5 Inverter Information

此頁面可顯示產品序號、安裝日期、韌體版本與變流器內部各項設定值之資訊。若有修改這些設定值的需求，請參考章節5.2.7 Install Settings、章節5.2.8 Active/Reactive power以及章節5.2.9 FRT (Fault ride through)。

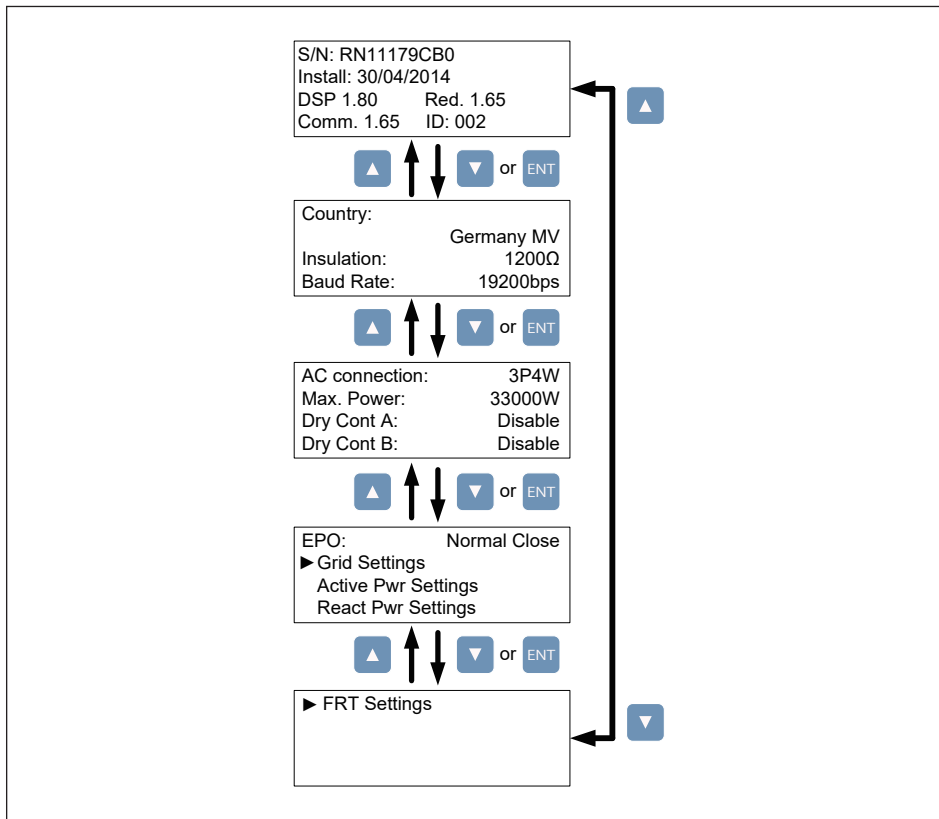


圖5-7 : Inverter information頁面

5.2.6 General Settings

此頁面可設定語言、日期和時間以及RS-485通訊baud rate。

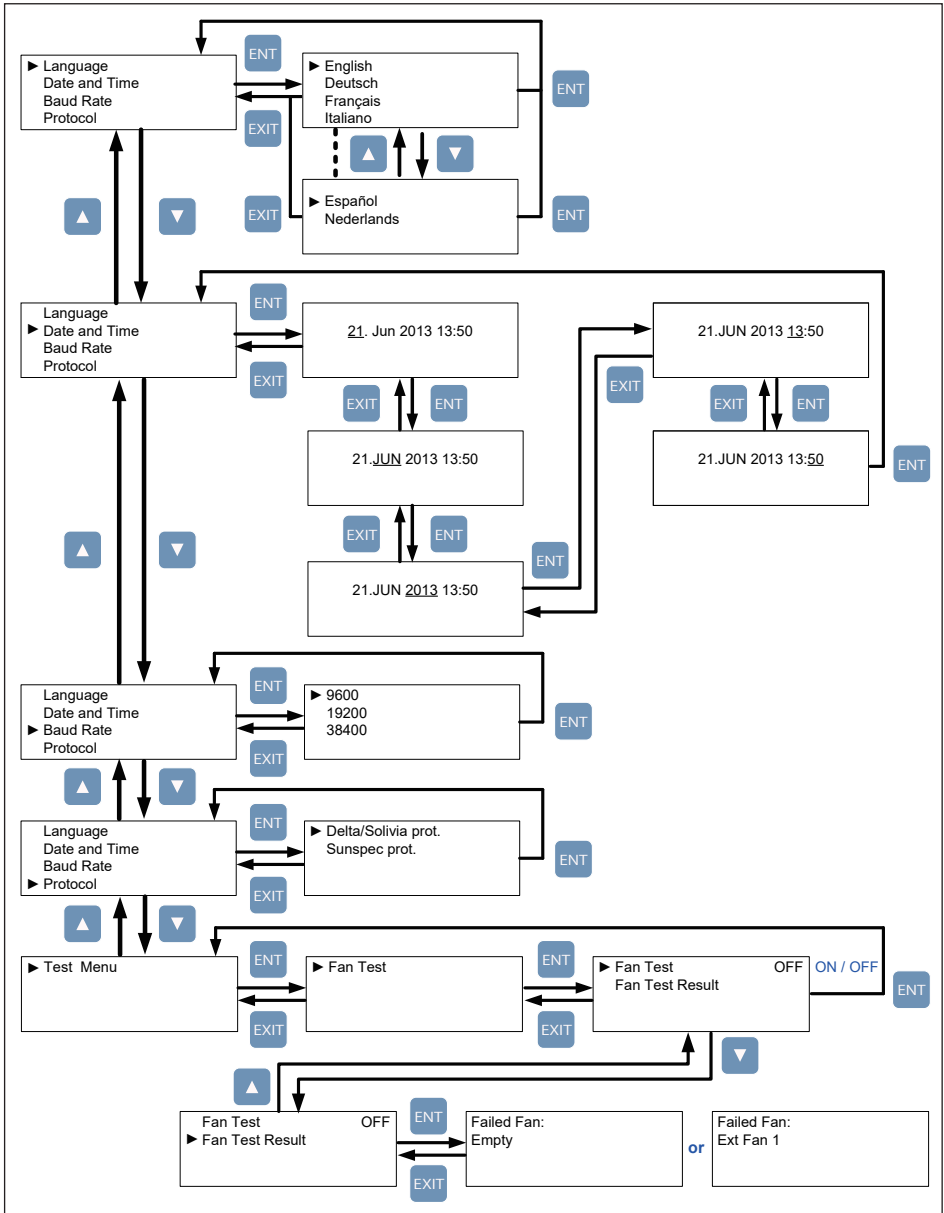


圖5-8 : General settings頁面

5.2.7 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，密碼分為三種權限：使用者權限、安裝者權限以及製造商權限。以下章節僅會介紹使用者權限與安裝者權限所需之各項設定值。

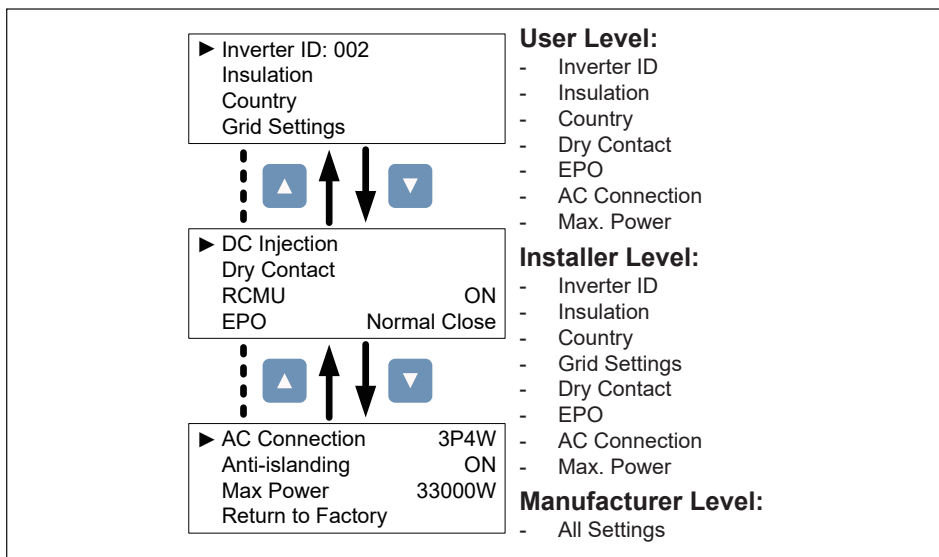


圖5-9：Install settings頁面

5.2.7.1 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。

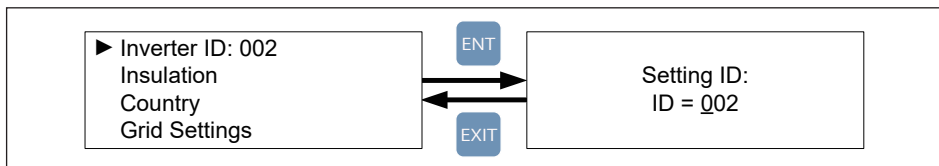


圖5-10：Inverter ID頁面

5.2.7.2 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 M30A機種提供四種對地組抗偵測方式(ON、Plus Grounded、Minus Grounded、OFF)與兩種對地阻抗限制值可設定。

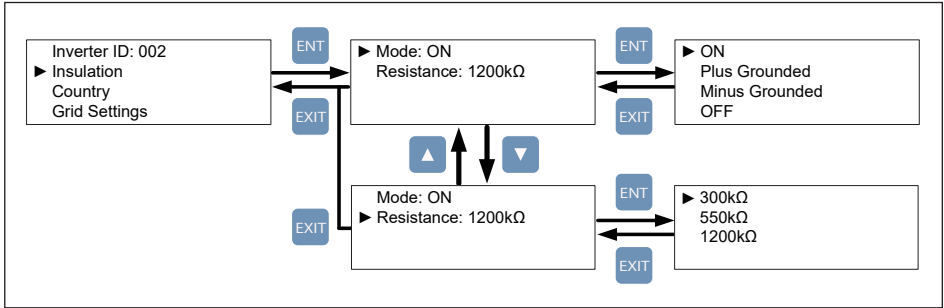


圖5-11 : Insulation頁面

5.2.7.3 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。

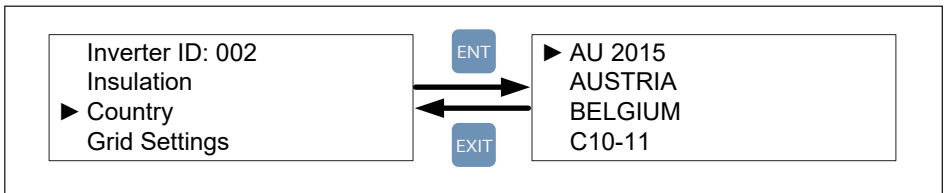


圖5-12 : Country 頁面

5.2.7.4 Grid Settings

Grid Settings頁面包含各種電壓與頻率保護值，這些保護值乃依據各電力法規所建立，若無特殊需求請勿修改任何保護值。

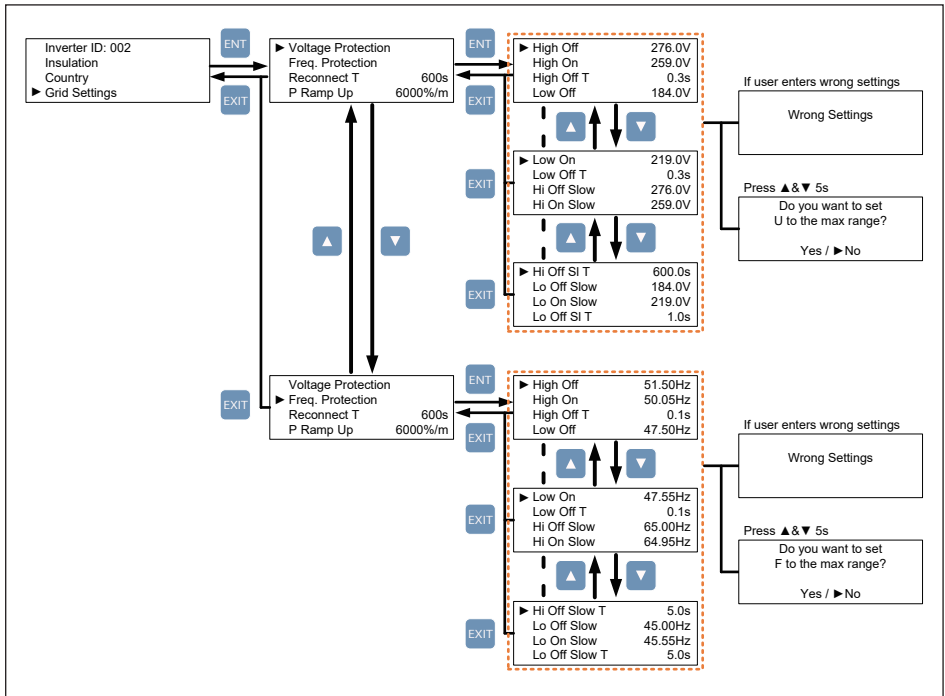


圖5-13 : Grid Settings 頁面

5.2.7.5 Dry Contact

使用者可透過此頁面自訂乾接點1之觸發條件。M30A機種提供8種觸發條件可選擇，當被選擇的條件觸發時，乾接點1之兩個針腳將會短路，以觸動使用者所連接的外部裝置。各選項與觸發條件的詳細資訊請參考表5-2。

設定值	乾接點觸發時機
Disable	不動作。
On Grid	當變流器成功併網時。
Fan Fail	當Fan Fail發生時。
Insulation	當對地阻抗測試失敗時。
Alarm	任何 Error、Fault、Warning發生時。
Error	任何 Error發生時。
Fault	任何 Fault發生時。
Warning	任何 Warning發生時。

表5-2：乾接點觸發條件設定

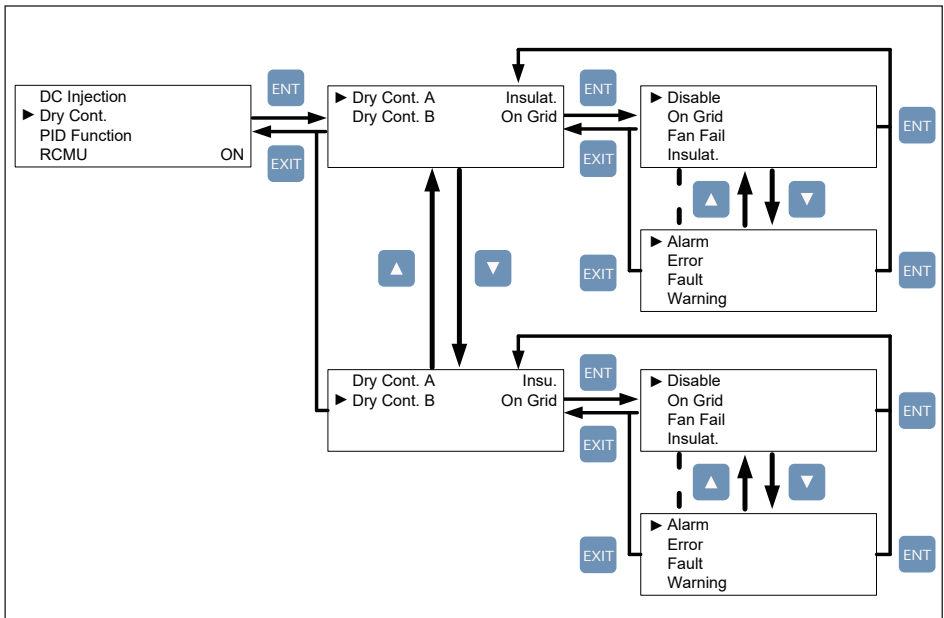


圖5-14：Dry Contact 頁面

5.2.7.6 PID

PID功能預設時間為0小時，使用者可自行設定時間，時間區間0-10小時或是Auto。PID功能在沒有直流電壓後30分鐘啟動，當直流電壓輸入時則停止該功能。

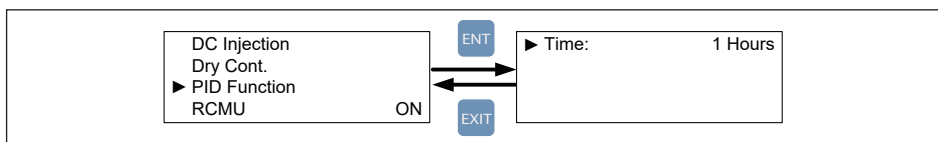


圖5-15 : PID功能設定

5.2.7.7 EPO

EPO有兩種偵測模式：Normal Open與Normal Close。Normal Open代表EPO常態為開路，短路時則觸發緊急關機功能。Normal Close則代表常態為短路，開路時則觸發緊急關機功能。請依據您的需求選擇適合的偵測模式。

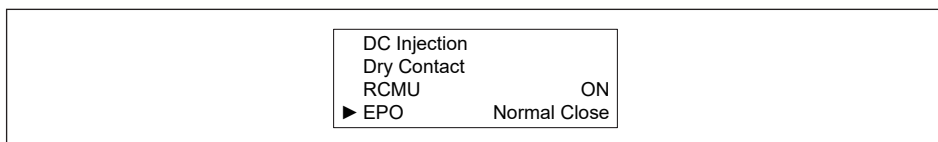


圖5-16 : EPO頁面

5.2.7.8 AC connection

RPI M30A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，確保機器能正常運作。

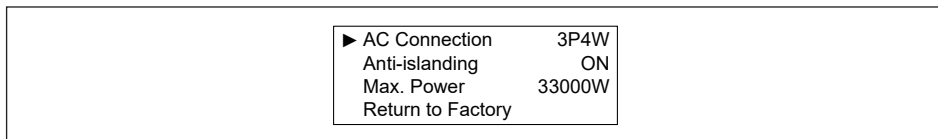


圖5-17 : AC配線方式

5.2.7.9 Max. Power

某些電力法規有調整最大功率輸出之要求，參照此類電力法規之使用者可透過此功能更改變流器的最大功率輸出額度。

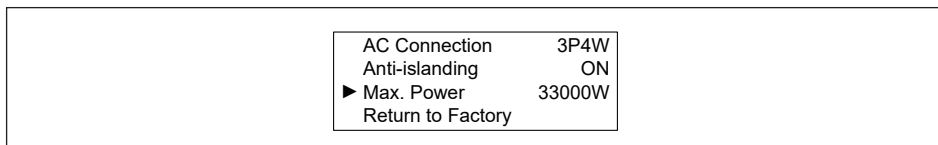


圖5-18 : Max. Power頁面

5.2.8 Active / Reactive power

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

實功功率控制有三種模式：

Power Limit, Power vs. Frequency, and P(V)；

虛功功率控制有四種模式：

Constant cosphi, cosphi(P), Constant Q, and Q(V)。

這些模式將會在下面的章節中詳細的介紹。

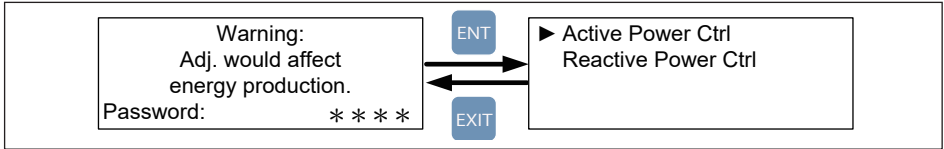


圖5-19 : Active/Reactive power頁面

5.2.8.1 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。

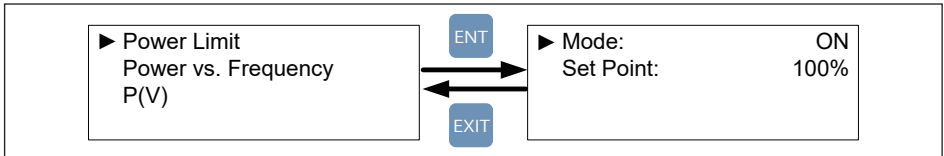


圖5-20 : Power Limit page頁面

5.2.8.2 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。

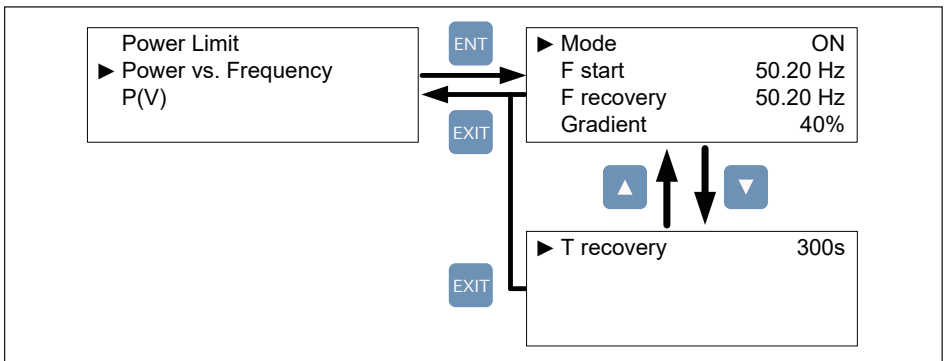


圖5-21 : Power vs Frequency頁面

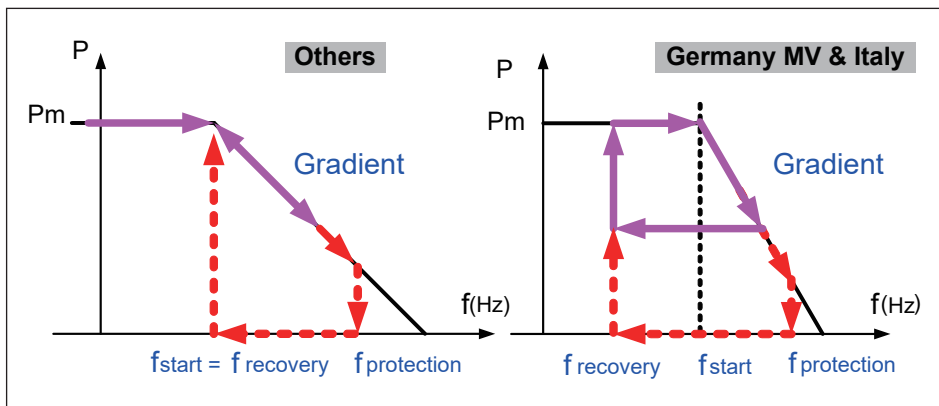


圖5-22 : Power vs Frequency參數對照

5.2.8.3 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。

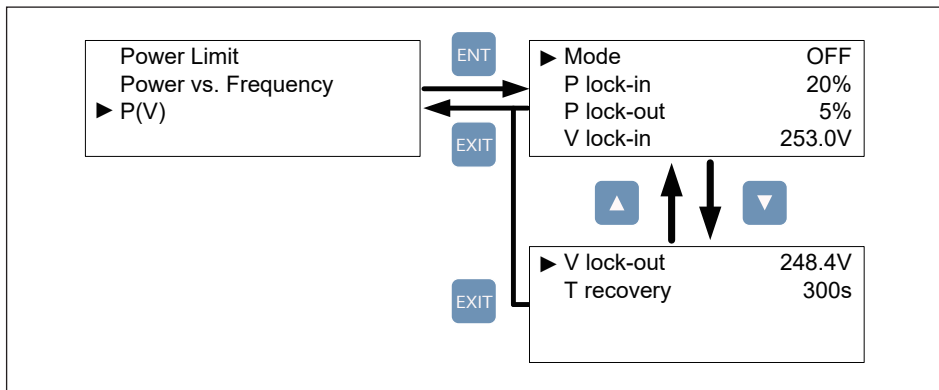


圖5-23 : P(V)頁面

5.2.8.4 Constant cosphi

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

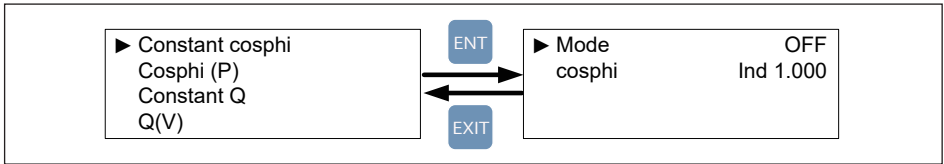


圖5-24 : Constant cosphi頁面

5.2.8.5 Cosphi (P)

此功能啟動後，變流器可隨著輸出之實功功率高低而饋入一定比例之虛功功率。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，無論此時輸出實功功率為何，皆不饋入虛功。

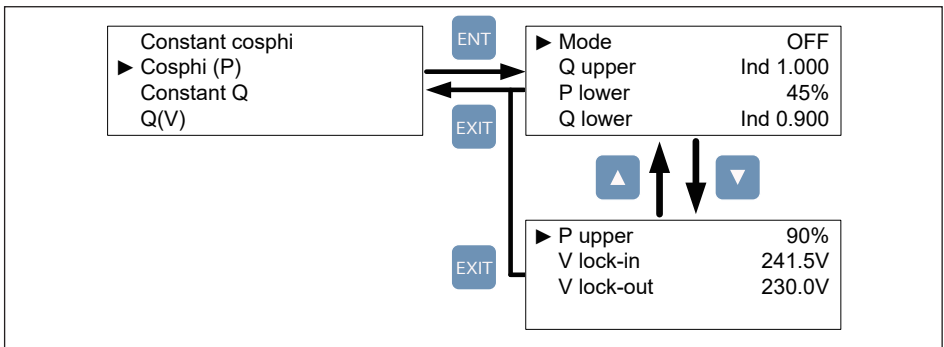


圖5-25 : Cosphi (P)頁面

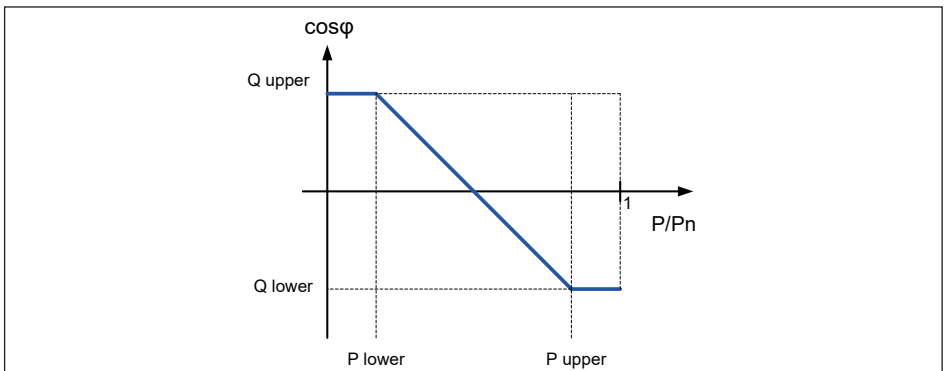


圖5-26 : Cosphi (P)參數對照

5.2.8.6 Constant Q

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

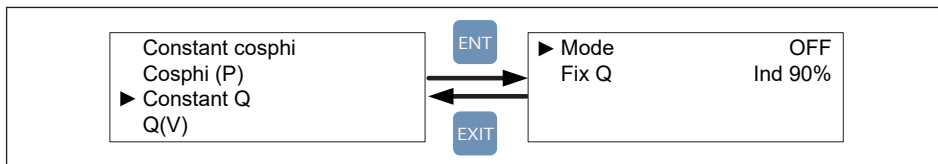


圖5-27 : Constant Q頁面

5.2.8.7 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。

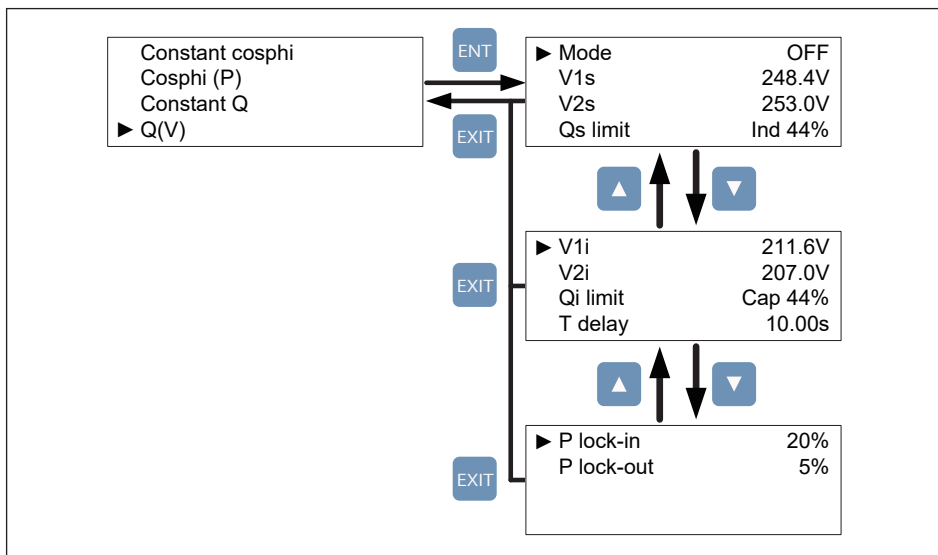


圖5-28 : Q(V)頁面

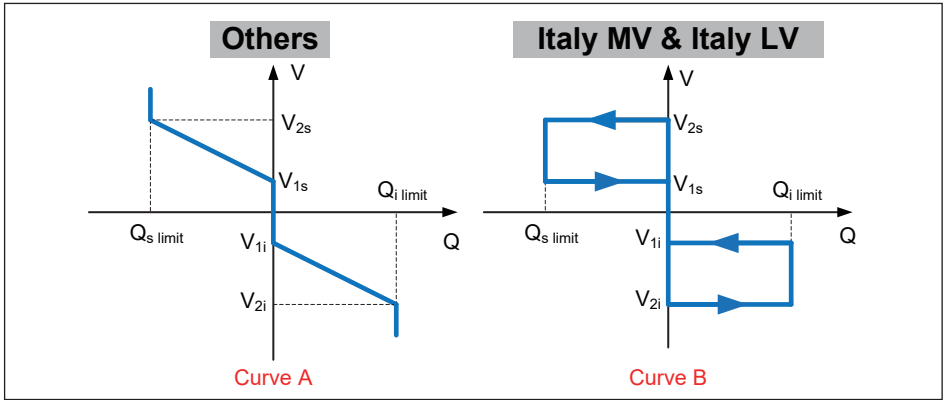


圖5-29：Q(V)參數對照

5.2.9 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，在一定的時間內逆變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。

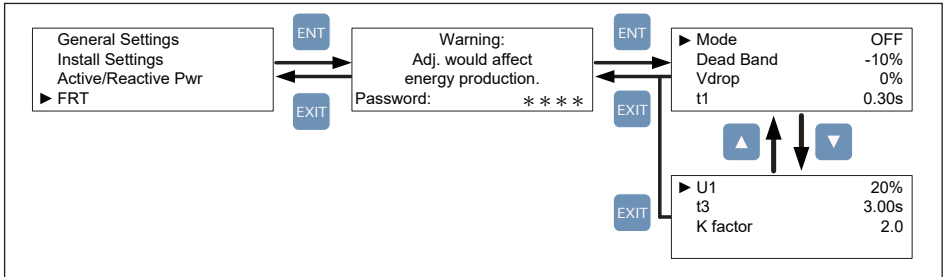


圖5-30：FRT頁面

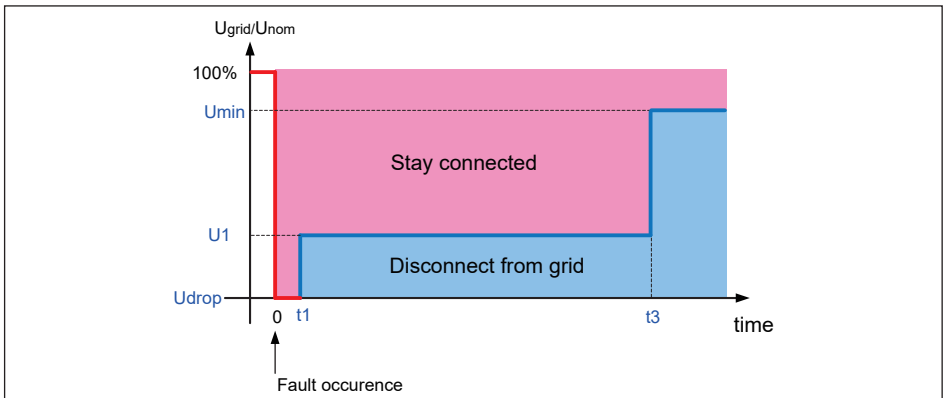


圖5-31：FRT參數對照

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！



- 在進行維護工作前，即使切斷機殼底部的手動開關，仍需將AC與DC電源確實切離，避免觸電。

6.1 更換突波保護器 (SPD)

RPI M30A_120 機種於AC與DC端皆有安裝突波保護器。

當變流器遭受突波時(例如：遭受雷擊)，突波保護器將會保護變流器而後損壞。當您發現顯示面板上出現「SPD Fail」的錯誤訊息時，代表至少有一個突波保護器已損壞，此時請參考以下步驟更換突波保護器。

1. 將變流器之AC與DC電源斷電並等待至顯示面板完全熄滅。
2. 將前蓋顯示面板下方的六個螺絲旋開。(參考圖6-1)
3. 移除端子。(參考圖6-2)
4. 解開螺絲。(參考圖6-3)
5. 取下損壞之SPD。(參考圖6-4)
6. 更換突波保護器模組。
7. 將前板重新蓋上並鎖上螺絲。組裝時請注意防水膠條的完整性，避免保護等級下降。
8. 將前板鎖上螺絲時請依照圖6-1順序。

警告！



- 當前板重新鎖上螺絲時，注意扭力為10Kgf-cm。

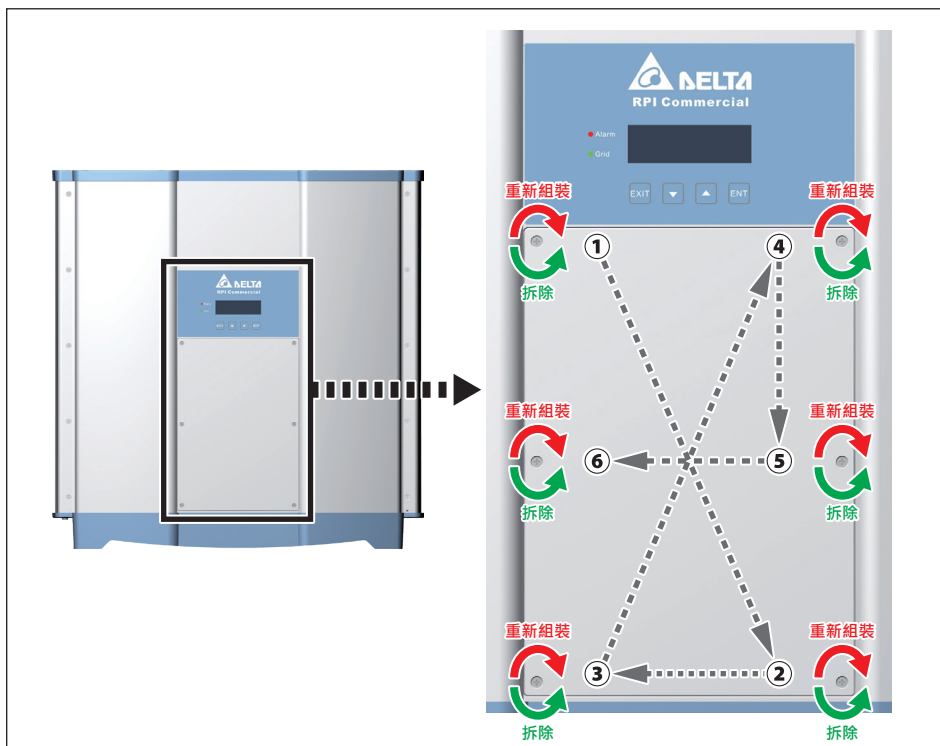


圖6-1：卸下/重新裝上前蓋

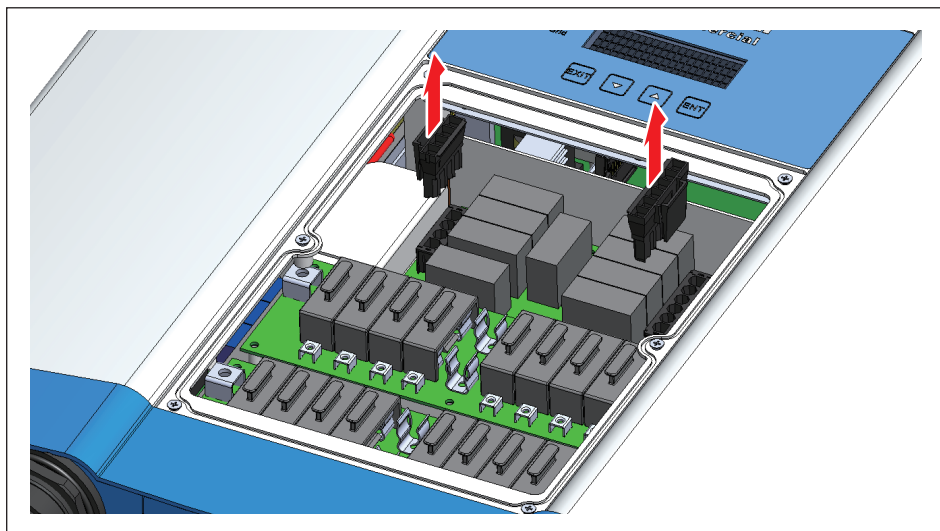


圖6-2：移除端子

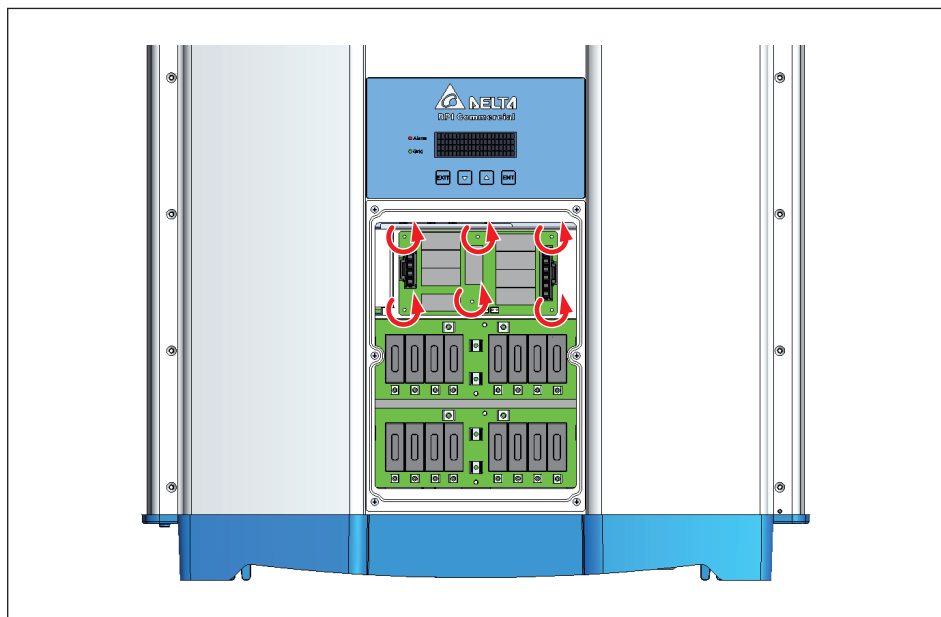


圖6-3：解開螺絲

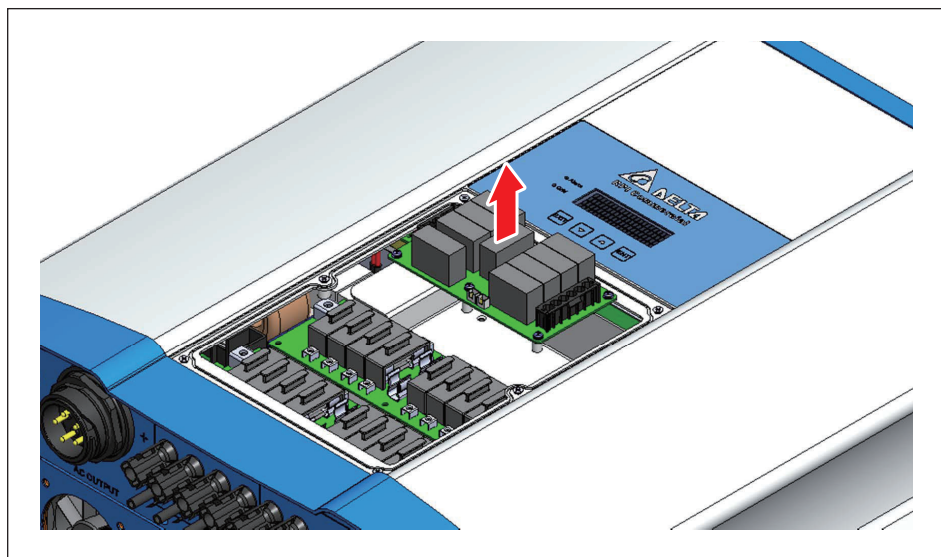


圖6-4：取下損壞之SPD

6.2 更換DC保險絲

RPI M30A_120 機種於DC輸入端皆有配接15A的DC保險絲。此保險絲之詳細規格如下：保險絲的選用請參照下方所建議之元件。

- | | |
|---------------------------------|---------------------------------|
| - Item : String Fuse (source 1) | - Item : String Fuse (source 2) |
| - Part number : 10GPV15U0 | - Part number : 0SPF015.T |
| - Rate amp : 15 A | - Rate amp : 15 A |
| - Rate voltage : 1000 V | - Rate voltage : 1000 V |
| - Manufacturers : Hollyland | - Manufacturers : Littelfuse |

如果您發現變流器的發電量異常，請依照以下步驟檢查或更換保險絲。

1. 將變流器之AC與DC電源斷電並等待至顯示面板完全熄滅。
2. 將前蓋顯示面板下方的六個螺絲旋開。(參考圖6-1)
3. 取下保險絲座並使用電表檢查保險絲。(參考圖6-5)
4. 如有必要請更換保險絲。(參考圖6-6)
5. 將前板重新蓋上並鎖上螺絲。組裝時請注意防水膠條的完整性，避免保護等級下降。

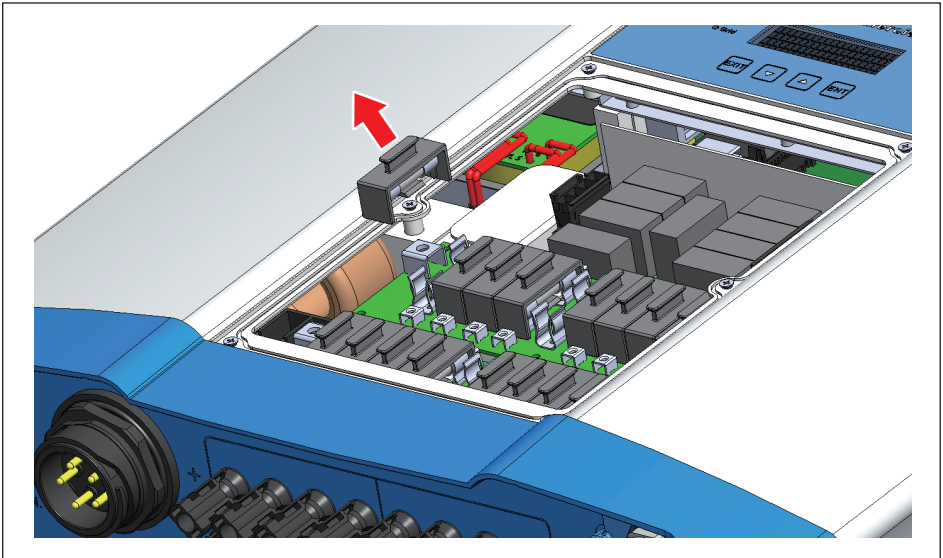


圖6-5：取下保險絲座



圖6-6：更換保險絲

6.3 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6-7。

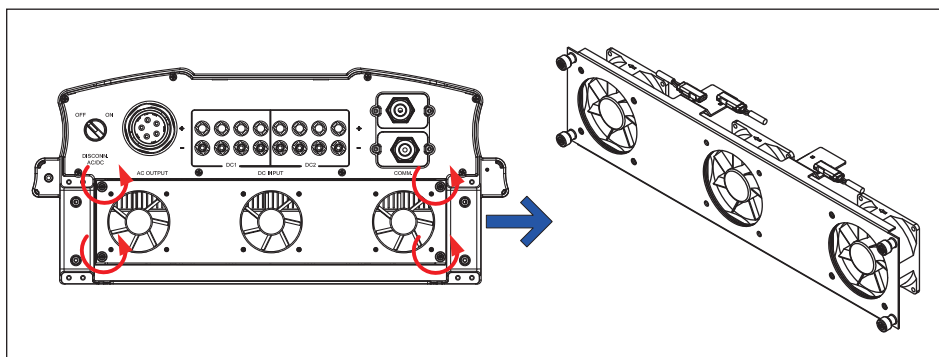


圖6-7：拆解風扇模組

6.4 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连接端子拆除，即可換上新風扇。

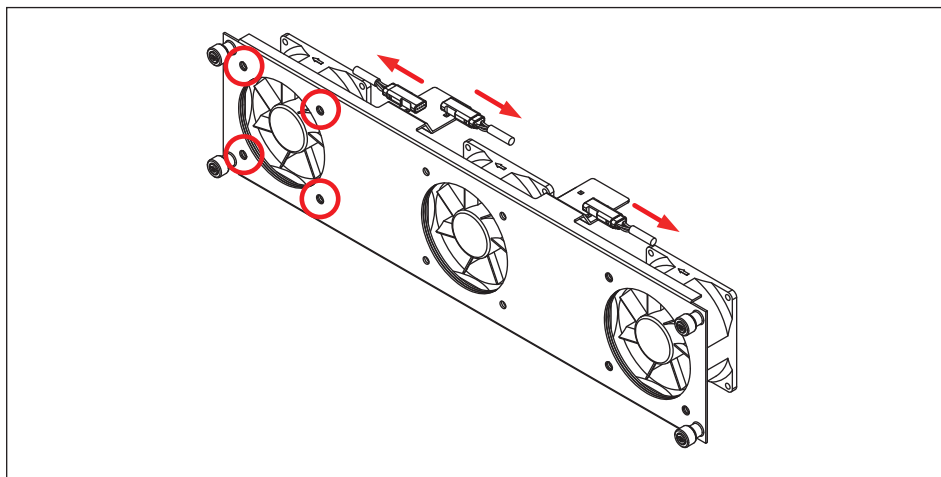


圖6-8：拆解單一風扇

6.5 清理進風口濾網

進風口濾網模組拆解方式如圖6-9，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。

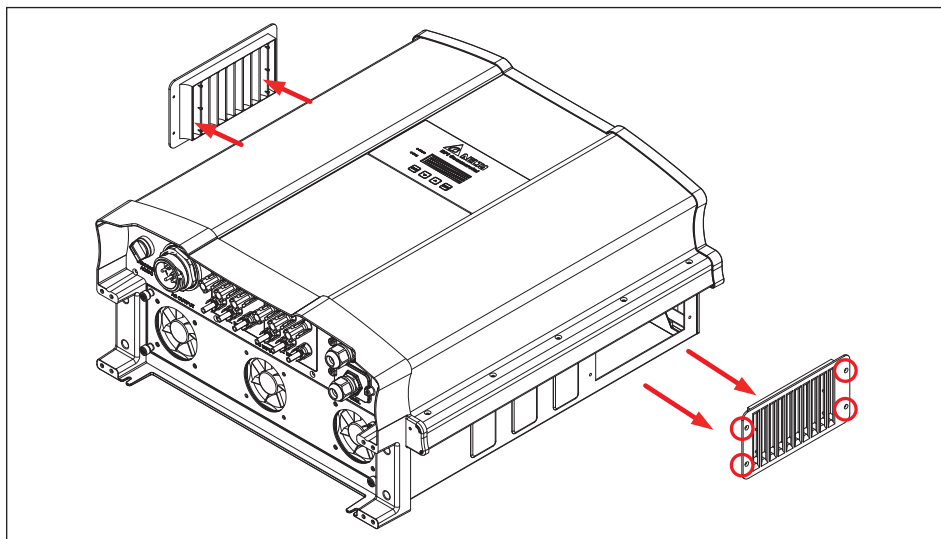


圖6-9：拆卸出風口濾網模組示意圖

7 錯誤訊息與簡易故障排除

錯誤資訊		
資訊顯示	可能原因	故障排除
AC Freq High (E01)	<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 (E02)	<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 (E07)	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 (E08)	<ol style="list-style-type: none"> 1. 在AC介面連接錯誤 2. 偵測電路功能異常 	<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 (E09)	<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 (E10, E15, E20)	<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 (E11, E13, E16, E18, E21, E23)	<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 (E30)	<ol style="list-style-type: none"> 1. 實際Solar1電壓超過1000Vdc 2. 偵測電路功能異常 	<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
Solar2 High (E31)	<ol style="list-style-type: none"> 1. 實際Solar2電壓超過1000Vdc 2. 偵測電路功能異常 	<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		
資訊顯示	可能原因	故障排除
Insulation (E34)	<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		
資訊顯示	可能原因	故障排除
Solar1 Low (W01)	<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 (W02)	<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 (W11)	<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
De-rating (W07)	<ol style="list-style-type: none"> 1. 本體及環境溫度過高 2. 風扇故障 3. 實功率限制功能作動 4. P-F功能作動 5. P(V) 功能作動 6. 市電電壓過低 7. 輸入電壓過低 8. 輸入電壓過高 	<ol style="list-style-type: none"> 1. 確認安裝機器本體及環境溫度 2. 確認風扇能否正常運轉 3. 確認國別及最大功率限制參數設定 4. 確認市電頻率是否異常 5. 確認市電電壓是否異常 6-1. 確認市電電壓是否異常 6-2. 確認虛功控制功能設定 7. 確認PV panel輸入電壓是否過低 8. 確認PV panel輸入電壓是否過高
SPD Fail (W15)	<ol style="list-style-type: none"> 1. 變流器遭受到雷擊 2. 一個或多個SPD有缺陷 3. 一個或多個SPD未連接 4. 偵測電路功能異常 	<ol style="list-style-type: none"> 1. 檢查變流器是否遭受雷擊 2. 更換有缺陷之SPD 3. 檢查SPD的連接 4. 檢查變流器內部之偵測線路

表7-2：警告資訊

故障		
資訊顯示	可能原因	故障排除
DC Injection (F01, F02, F03)	<ol style="list-style-type: none"> 市電波形異常 偵測電路功能異常 	<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 (F05)	<ol style="list-style-type: none"> 環境溫度超過60°C (裝置異常) 偵測電路功能異常 	<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 (F07)	<ol style="list-style-type: none"> 環境溫度 < -30°C 偵測電路功能異常 	<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 (F06)	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測電路功能異常 	<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 (F08)	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測電路功能異常 	<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 (F09)	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測電路功能異常 	<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 (F10)	<ol style="list-style-type: none"> 環境溫度 > 90°C 或 < -30°C 偵測電路功能異常 	<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 RLY (F13)	<ol style="list-style-type: none"> 繼電器的驅動電路故障 一個或多個繼電器本體故障 偵測電路功能異常 	<ol style="list-style-type: none"> 檢查輸入電壓需大於150Vdc 更換故障之繼電器 檢查變流器內部之偵測電路
HW DSP ADC1 (F15)	<ol style="list-style-type: none"> 輸入功率不足 輔助電源電路功能異常 偵測電路功能異常 	<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		
資訊顯示	可能原因	故障排除
HW DSP ADC2 (F16)	<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 DSP ADC3 (F17)	<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 (F18)	<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 (F19)	<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 Eff. (F20)	<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 (F23)	<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 (F22)	<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 Cur. (F24)	<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

故障		
資訊顯示	可能原因	故障排除
HW Con. Fail (F26)	<ol style="list-style-type: none"> 變流器內部的電源線未連接 電流回授電路無效 	<ol style="list-style-type: none"> 檢查變流器內部電源線 檢查變流器內部電流回授電路
RCMU Fail (F27)	<ol style="list-style-type: none"> RCMU連接中斷 偵測電路功能異常 	<ol style="list-style-type: none"> 檢查變流器內部RCMU連接 檢查變流器內部的偵測電路
RLY Short (F28)	<ol style="list-style-type: none"> 一個或多個繼電器是閉合的 繼電器driver電路功能異常 	<ol style="list-style-type: none"> 替換無效的繼電器 檢查變流器內部的驅動電路
RLY Open (F13, F29)	<ol style="list-style-type: none"> 一個或多個繼電器異常 繼電器驅動電路功能異常 Vgrid與Vout偵測精度不正確 	<ol style="list-style-type: none"> 替換無效的繼電器 檢查變流器內部的驅動電路 檢查Vgrid與 Vout電壓偵測精度
Bus Unbal. (F30)	<ol style="list-style-type: none"> 輸入端並未完全獨立或並聯 太陽能板短路到地 Boost驅動電路無效或連接中斷 偵測電路功能異常 	<ol style="list-style-type: none"> 檢查輸入連接 檢查太陽能板絕緣設定 檢查變流器內部boost的驅動電路 檢查變流器內部的偵測電路
HW Bus OVR (F31, F33, F35)	<ol style="list-style-type: none"> Boost驅動電路無效或連接中斷 太陽能板Voc超過1000Vdc 操作期間突波發生 偵測電路功能異常 	<ol style="list-style-type: none"> 檢查變流器內部boost的驅動電路 修正太陽能板設定, 並使得Voc 小於 1000Vdc N/A 檢查變流器內部的偵測電路
AC Cur. High (F36, F37, F38, F39, F40, F41)	<ol style="list-style-type: none"> 操作期間突波發生 Inverter stage驅動電路無效 開關裝置無效 偵測電路功能異常 	<ol style="list-style-type: none"> N/A 檢查inverter stage驅動電路 檢查inverter stage全部開關裝置 檢查變流器內部的偵測電路
HW CT A Fail (F42)	<ol style="list-style-type: none"> 測試電流回路損壞 CSC1無效 偵測電路功能異常 	<ol style="list-style-type: none"> 檢查WC3至CNC16的連接 替換新的CSC1 檢查變流器內部的偵測電路

故障		
資訊顯示	可能原因	故障排除
HW CT B Fail (F43)	<ol style="list-style-type: none"> 1. 測試電流回路損壞 2. CSC2無效 3. 偵測電路功能異常 	<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
HW CT C Fail (F44)	<ol style="list-style-type: none"> 1. 測試電流回路損壞 2. CSC3無效 3. 偵測電路功能異常 	<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 (F45)	<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 	<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 (F50)	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 Cur. High (F60, F61, F70, F71)	<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：

- 將手動開關(Manual Switch)轉至OFF。
- 切斷AC斷路器，解除與市電端之連接。
- 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模塊。

9 技術資料

Model	RPI M30A_120	RPI M30A_121
一般規格		
外殼	Powder coated aluminum	
操作溫度	-25~60°C, full power up to 40°C Full power up to 50°C @VDC 600V, COSØ=1 (請參考圖9-1至圖9-3)	
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	II	
過電壓類別	AC output :III, DC Input :II	
反饋至太陽能板電流最大值	0	
電氣隔離	NO	
安全性等級	Class I metal enclosure with protective earth	
重量	49.5kg	48kg
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	35kW	
額定功率	31.5kW	
建議PV功率	≤38kW	
標稱電壓	600Vdc	
操作電壓	200Vdc – 1000 Vdc	
啟動電壓	> 250 Vdc	
啟動功率	40W	
MPP追蹤	Parallel inputs: 1 MPP tracker Separate inputs: 2 MPP trackers	
絕對最大電壓	1100V *	

* 最大承受電壓為1100V(當輸入大於1000Vdc, inverter將不會輸出功率)
關於1000Vdc以上的應用請參閱附錄說明。

Model	RPI M30A_120		RPI M30A_121
最大功率追蹤電壓範圍 (額定功率)			
平衡輸入(50/50)	520-800Vdc		
最大非平衡輸入	67%	700-800Vdc	
	33%	350-800Vdc	
輸入數目	8 pairs MC4	6 pairs MC4	
額定電流	30A * 2 with max current per input of 7.5A	30A * 2 with max current per input of 10A	
各MPPT最大短路電流(Isc)	47A for each MPPT(Total 2 MPPT) 16A for each string(Total 8 string)	47A for each MPPT(Total 2 MPPT) 39A for each string(Total 6 string)	
保險絲	15A	No	
Surge protection device	Type II, 可替換 EN 50539-11, IEC 61643-11	Type III, 不可替換	
市電側(Grid side)			
標稱功率	30kW / 30kVA		
最大功率	33kW / 33kVA (參考圖9-1至圖9-3)		
電壓	3Ph, 230 / 400Vac		
標稱電流	43.5A(230Vac) / 45.5A(220Vac)		
最大電流	50A		
浪湧電流	150A / 100µs		
最大輸出故障電流 (rms)	88.6A		
最大輸出過流保護	57A		
頻率	Rated 50/60Hz (Programmable 45Hz - 65Hz)		
主動式孤島效應偵測	無效功率注入		
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	< 3W		
最大效率	98.5 %		
歐洲效率	98.2 %		
AC 介面	3 Ph + N + PE; 3-phase AC plug that meets IP67 and specifications in table 4-2.		
Surge protection device	Type II, 可替換 EN 50539-11, IEC 61643-11	Type III, 不可替換	

Model		RPI M30A_120	RPI M30A_121
介面與通訊			
使用者介面		Black-on-white character type LCD display	
		Real time clock	
		30 events record	
外部通訊		2 RS-485 connections	
認證			
CE conformity		Yes	
Grid interface		VDE-AR-N 4105 BDEW,UK G59/3 VDE0126-1-1 NB/T 32004	
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			
冷卻系統		Fan, 3pcs	
附件		Mounting bracket	
		Aluminum with powder coating	

表9-1 : RPI M30A規格

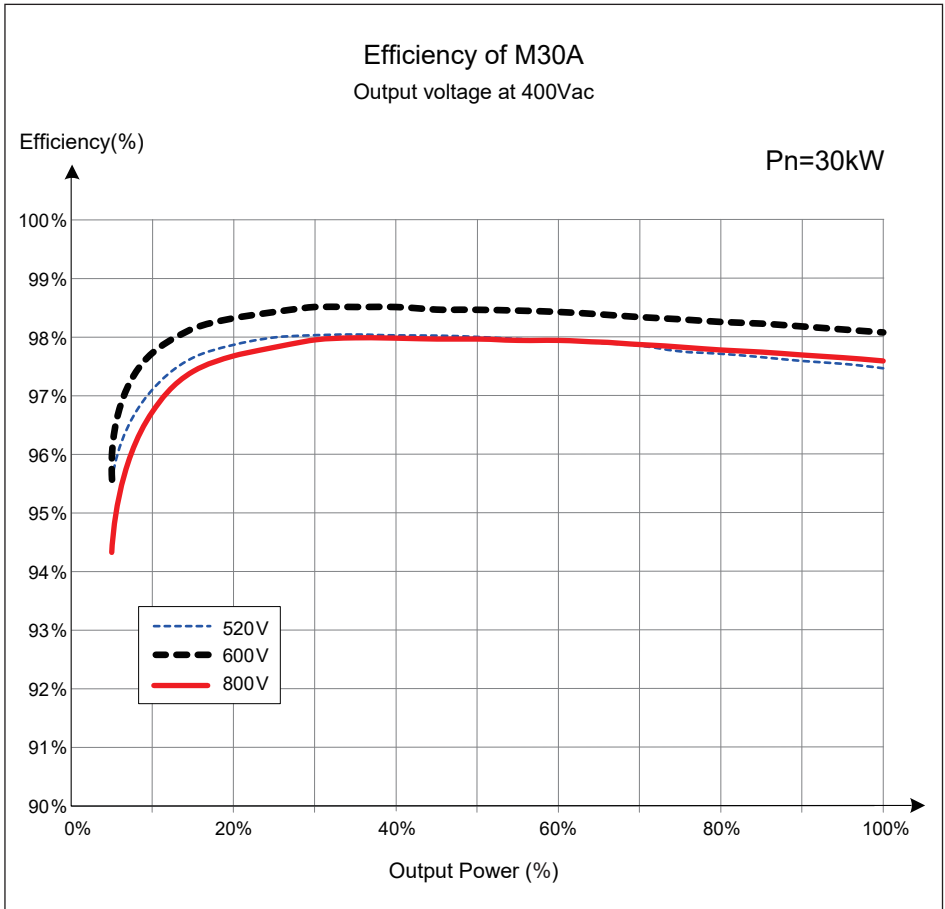


圖9-1 : M30A效率曲線

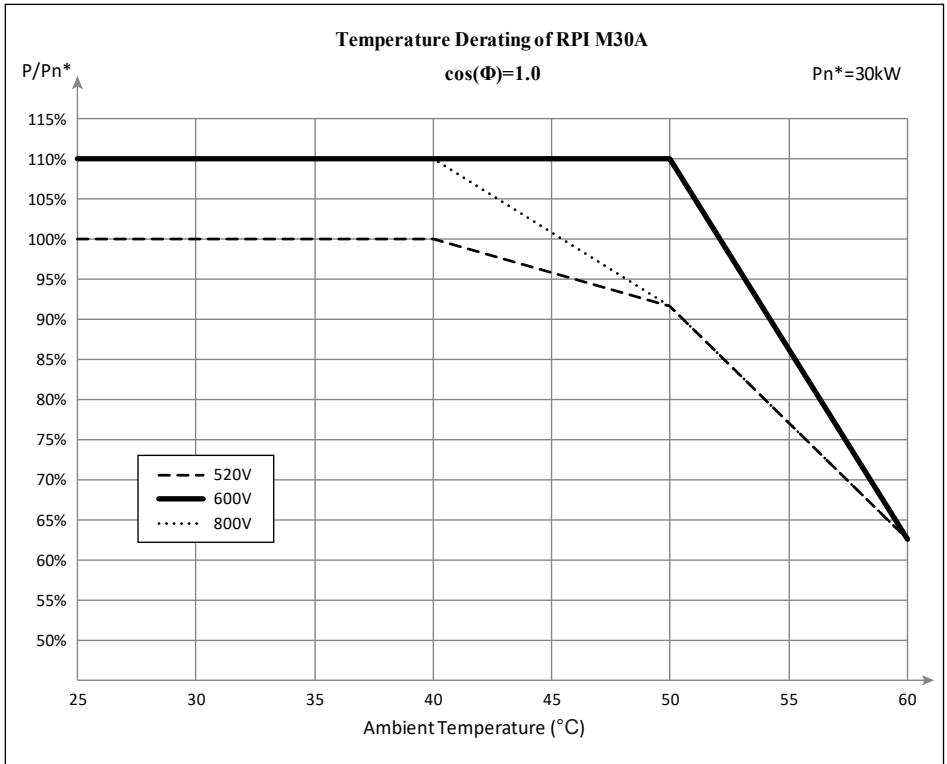


圖9-2 : M30A溫度降載曲線 ($\cos\phi=1.0$)

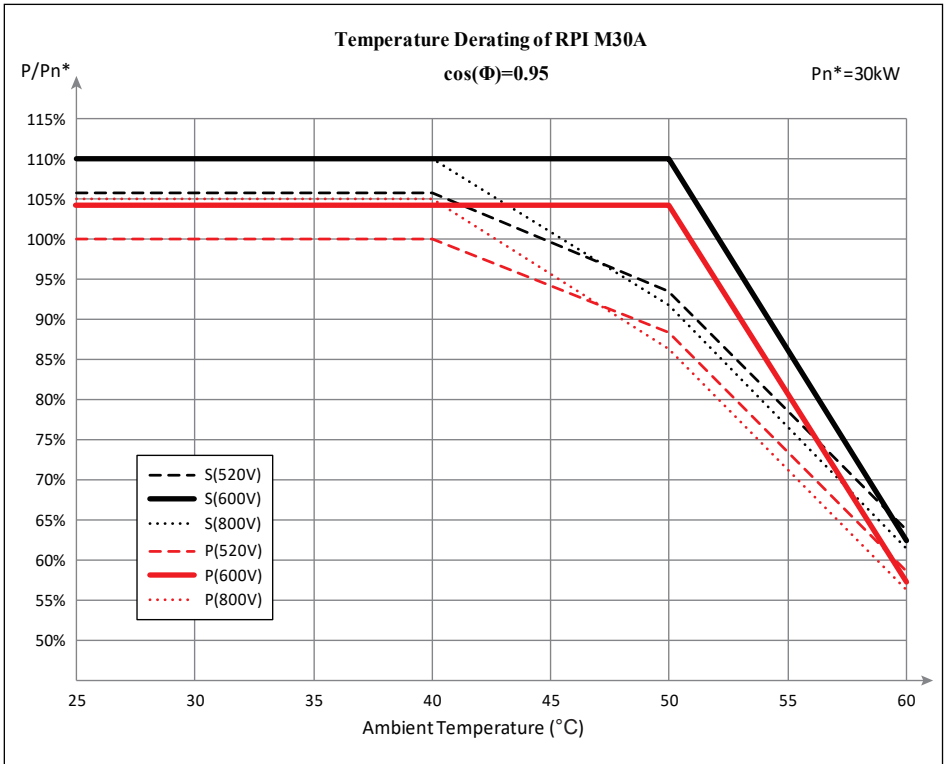


圖9-3 : M30A溫度降載曲線 ($\cos\varphi=0.95$)

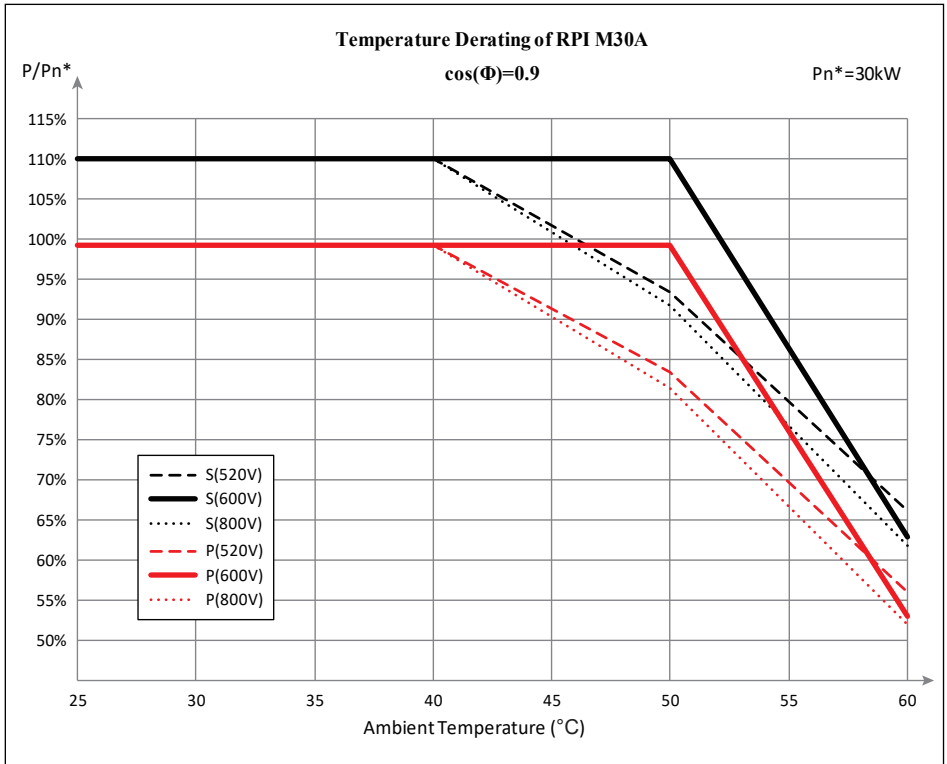


圖9-4 : M30A溫度降載曲線 ($\cos\phi=0.9$)

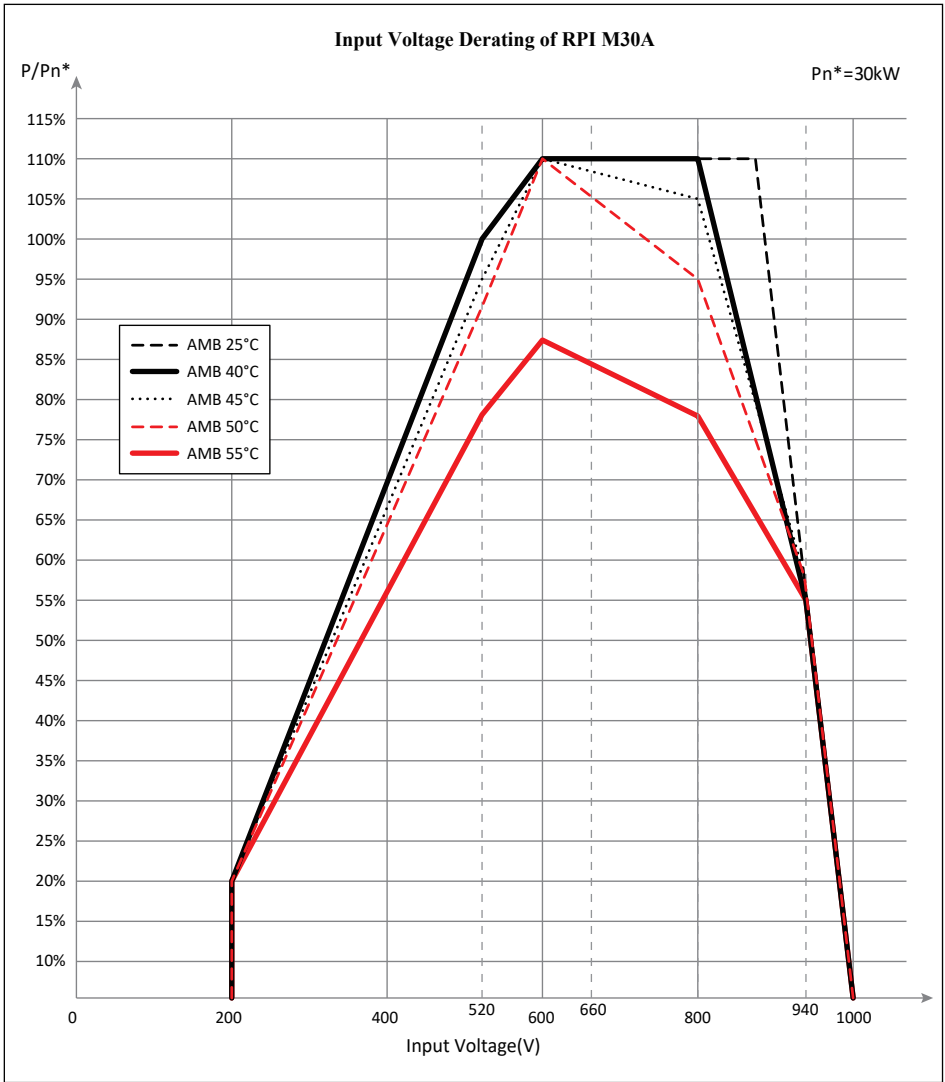


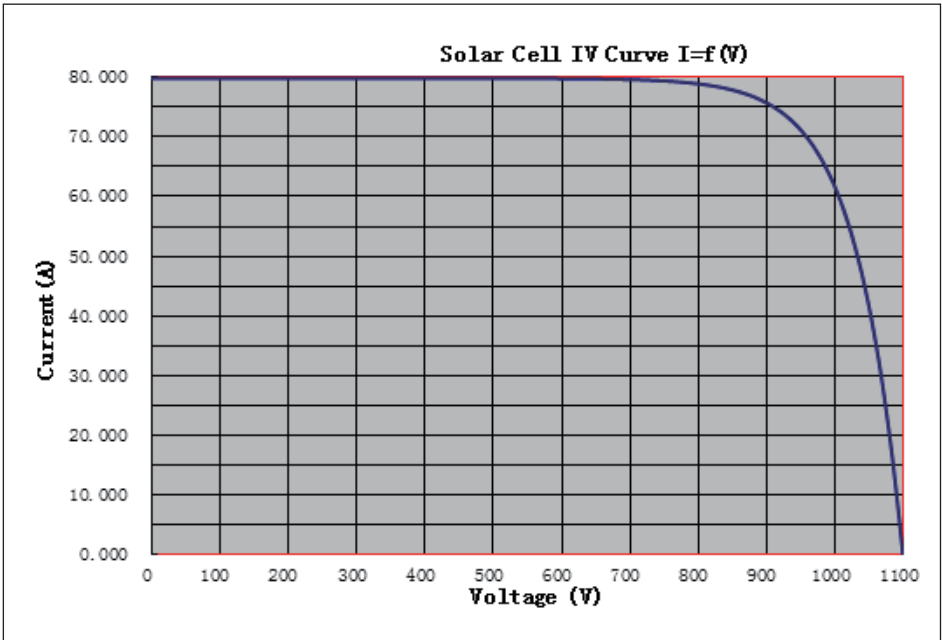
圖9-5 : M30A輸入電壓降載曲線

附錄

附錄 A: I-V curve limitation

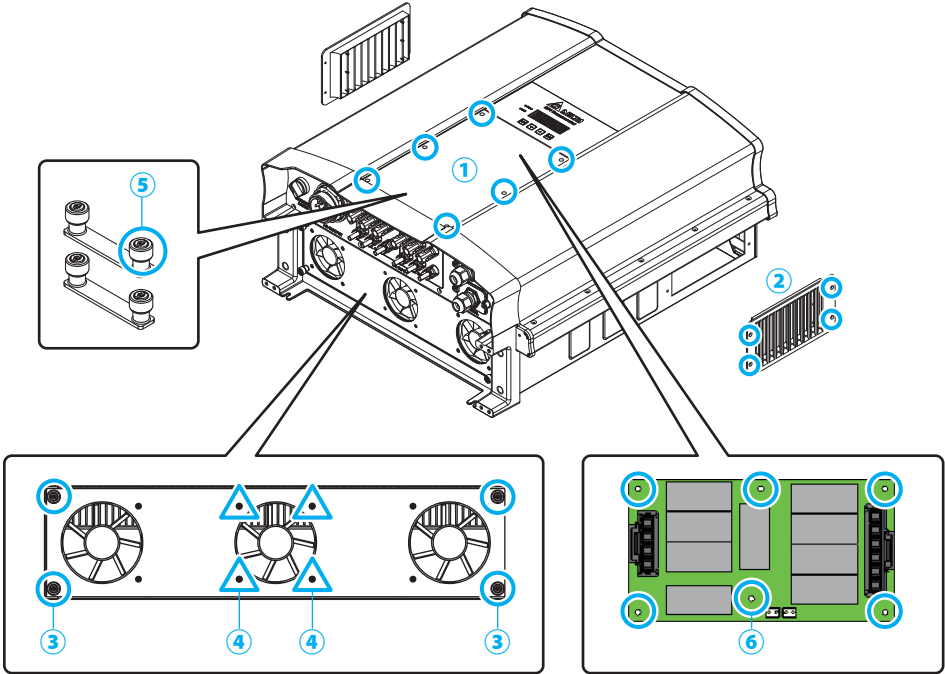
基於保險絲的安全性，太陽能電池板最大功率的配置不能超過此IV曲線。

若是使用者使用外接保險絲，使用者須確保該保險絲在1000Vdc以上的熔斷特性。



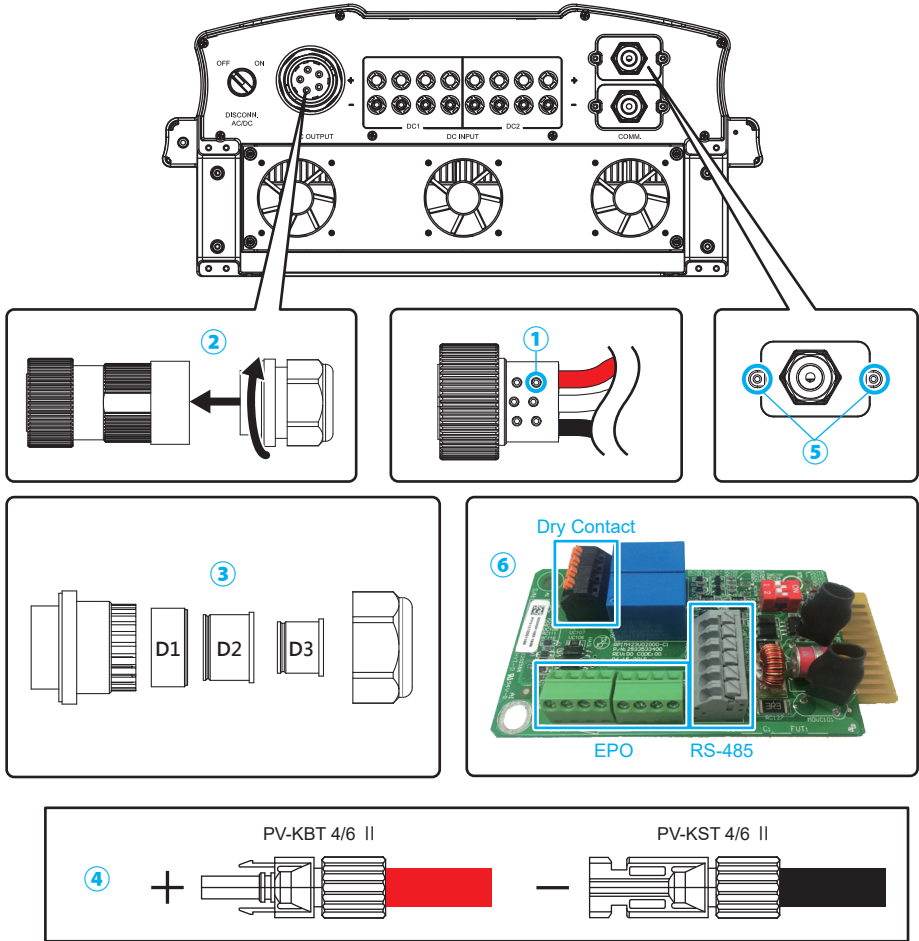
附錄 A : 保險絲使用限制之I-V曲線

附錄 B: 組裝說明



NO	位置	螺絲扭力
1	Front cover	10 Kgf-cm (1N-m)
2	Air inlet	8 Kgf-cm (0.8N-m)
3	Fan panel	8 Kgf-cm (0.8N-m)
4	Fans	8 Kgf-cm (0.8N-m)
5	Bus bar	10 Kgf-cm (1N-m)
6	SPD board	8 Kgf-cm (0.8N-m)

附錄 B-1 : 組裝說明-1



NO	位置	螺絲扭力	導體橫截面
1	AC wire	25 Kgf-cm (2.5N-m)	6~4AWG (13.3~25mm 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)	--
4	MC4 wire	--	RPI M30A_120: 12~10AWG (4~6mm ²) RPI M30A_121: 10AWG (6mm ²)
5	Communication cover	8 Kgf-cm (0.8N-m)	--
6	Communication module	--	20 AWG (0.5mm ²)

附錄 B-2 : 組裝說明-2

