

Grid-tie Transformerless Solar Inverter

M70A_260 / M50A_260 / M50A_261 / M50A_240
Operation and Installation Manual

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1 Safety

1.1 Information of the Inverter

1.1.1 Legal Provisions

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This manual accompanies our product for use by the end users. The technical instructions and illustrations contained in this manual are to be treated as confidential and no part may be reproduced without the prior written permission of DELTA ELECTRONICS, INC. Service engineers and end users may not divulge the information contained herein or use this manual for purpose other than those strictly connected with correct use of the product. All information and specifications are subject to change without notice.
DELTA ELECTRONICS, INC. shall have no obligation to either personal injury and property damage claims hereinafter with respect to any actions -- (a) the product has been installed and/or repaired improperly; (b) the product has been misused without following the instructions on this user manual; (c) the product has failed due to incorrect unpacking.

1.1.2 Target Group

This - manual – is prepared for use by a well-trained technician for installing, commissioning, operation, and maintenance. The technician must have the following basic and advanced skills:

- Knowledge of the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.
- Knowledge of how a solar inverter works and is operated.
- Training in the installation and commissioning of electrical devices and installations.
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations.
- Compliance with this manual and all safety information.

1.2 General Safety

IMPORTANT SAFETY INSTRUCTIONS : SAVE THESE INSTRUCTIONS !



- Please read these instructions carefully and save them for later use.

To prevent personal injury and/or property damage, and also to ensure long term operation of the solar inverter, it is imperative this section be read carefully and all the safety instructions understood before using this inverter.
This user manual provides important instructions for Delta grid-tie transformerless solar inverter. The product is designed, tested, verified, and certified according to international safety requirements, certifications, and standards but precautions must be observed when installing and operating the product.
This product is suitable for both indoor and outdoor use.

ATTENTION : NO GALVANIC ISOLATION



- External insulation transformer shall be installed at grid side which is following to isolating between AC and PV array.
- The design of this inverter is transformerless. There is no isolation transformer between the AC and DC sides, i.e., the product does not require galvanic isolation. In order to function properly, any PV array connected must have its PV circuits isolated from ground, i.e., do not bond either side of the array to ground!
  If a grounded PV array is connected to the inverter, the error message INSULATION (E34) will appear on the display.
- It is prohibited to reference the L1, L2, L3 or N terminal to ground; to do so will damage the inverter and void the producr warranty.

1.2.1 Condition of Use

- M70A$_{260}$ / M50A$_{260}$ / M50A$_{261}$ / M50A$_{240}$ is a transformerless solar inverter with multiple MPP tracking input, which converts the variable direct current generated by the solar array into a utility frequency grid-compliant balanced three-phase AC current and feeds it into the utility grid.
- The Photovoltaic modules used must be compatible with the inverter. PV modules with a high parasitic capacitance to ground may only be utilized if the capacitive coupling does not exceed 10μF.
- The inverter must only be operated in countries for which it is approved by Delta and the grid operator.

1.2.2 Symbols

This section describes the definition of the symbols in this manual.
In order to prevent both personal injury and property damage, and to ensure long-term operation of the product, please read this section carefully and follow all the safety instructions while you use the product.

DANGER!



- This warning indicates an immediate hazard which will lead to death or serious injury.

WARNING !



- This warning indicates a hazardous condition which may lead to death or serious injury.

CAUTION !



- This warning indicates a hazardous condition which may lead to minor injury.

ATTENTION



- This warning indicates a condition of potential damage to property and/or the environment.

INFORMATION



- An exclamation mark enclosed in a double circle indicates additional important information is contained in the following section and the user should follow the instructions to prevent any hazards.

DANGER : ELECTRICAL HAZARD!!



- This warning indicates an immediate electrical hazard that unheeded can lead to death or serious injury.

CAUTION : HOT SURFACES, DO NOT TOUCH!



- This warning indicates a potential burn hazard.
- Use care when touching surfaces when operating the product.
- Do not perform any task until the product cools down sufficiently.



- This icon indicates that a prescribed time delay must elapse before engaging in an indicated action.
- Patientez le délai requis avant d'entreprendre l'action indiquée.



- This symbol indicates the location of an equipment grounding conductor (EGC) terminal.

2 Introduction

The transformerless 3Ø PV inverter is designed to enable the highest levels of efficiency and provide longest operating life by use of state-of-the-art high frequency and low EMI switchmode technology. It is suitable for outdoor use.

ATTENTION : NO GALVANIC ISOLATION



- This product utilizes a transformerless design, and is not provisioned with an isolation transformer, and therefore has no galvanic isolation between the DC and AC sides.
  PV array circuits connected must be floating with respect to ground, i.e., must not be referenced (bonded) to ground.
  If grounded PV arrays are connected to the inverter, the inverter will not connect to the grid and the error message INSULATION (E34) will appear.
- It is prohibited to connect terminals L1, L2, L3 or N to ground.

2.1 Valid Model

The user manual is valid for the following device types:

- M70A_260
- M50A_260
- M50A_261
- M50A_240

This user manual must be followed during installation, operation, and maintenance.

Delta reserves the right to make modifications to the content and technical data in this user manual without prior notice.

2.2 Product Overview

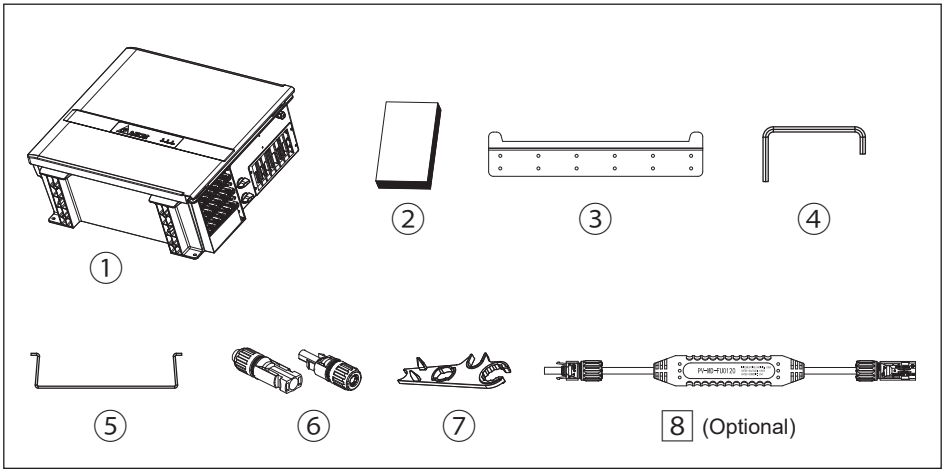


Figure 2-1: Components

Table 2-1: Packing list

M70A_260 / M50A_260/261/240			
	Object	Qty	Description
1	Delta Solar Inverter	1 pc	Solar inverter
2	User Manual	1 pc	Important instructions for solar inverter. Safety instructions should be followed during installation and maintenance.
3	Mounting Bracket	1 pc	Wall mounting bracket (Material: Aluminum/Thickness: 3mm)
4	Hexagon Driver (Installed on latch lock cover)	1 pc	Keep the door being open. Can unscrew the latch lock cover screw.
5	Protective Frame	6 pcs	Protect DC connectors
6	H4 Connector	18/12/8 pairs*	DC String inputs
7	H4 Wrench	2 pcs	To disconnect H4 connector
8	External Fuse	x pcs	Optional fuse for DC inputs

* M70A_260: 18 pairs / M50A_260: 12 pairs / M50A_261: 12 pairs / M50A_240: 8 pairs

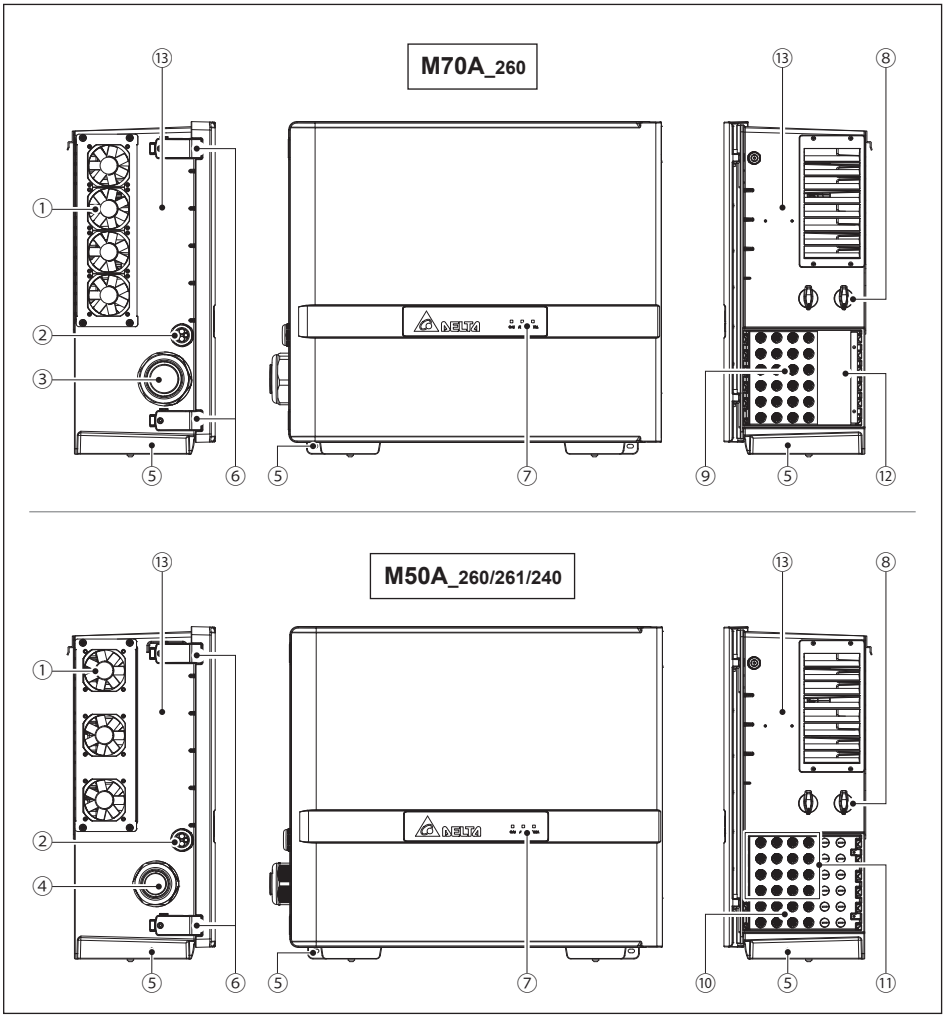


Figure 2-2: Overview

Table 2-2: Overview description

NO.	Component	NO.	Component	NO.	Component
1	External fans	6	Toggle Latches	11	DC Input (H4)x 8 strings
2	RS-485	7	LED Indicator	12	Protective Cover *1
3	2.8” AC Output	8	DC Switch	13	Reserved *2
4	2.5” AC Output	9	DC Input (H4)x 18 strings		
5	External grounding (M6 threaded stud)	10	DC Input (H4)x 12 strings		

*1 If MPPT 3 is need to be connected, please remove the protective cover to expand DC inputs.
*2 Always keep nut and screws properly tightened on the case. Water leakage may cause serious damage.

Figure 2-3 below, shows the certification and rating label.
Table 2-3 defines the symbol markings on this label.

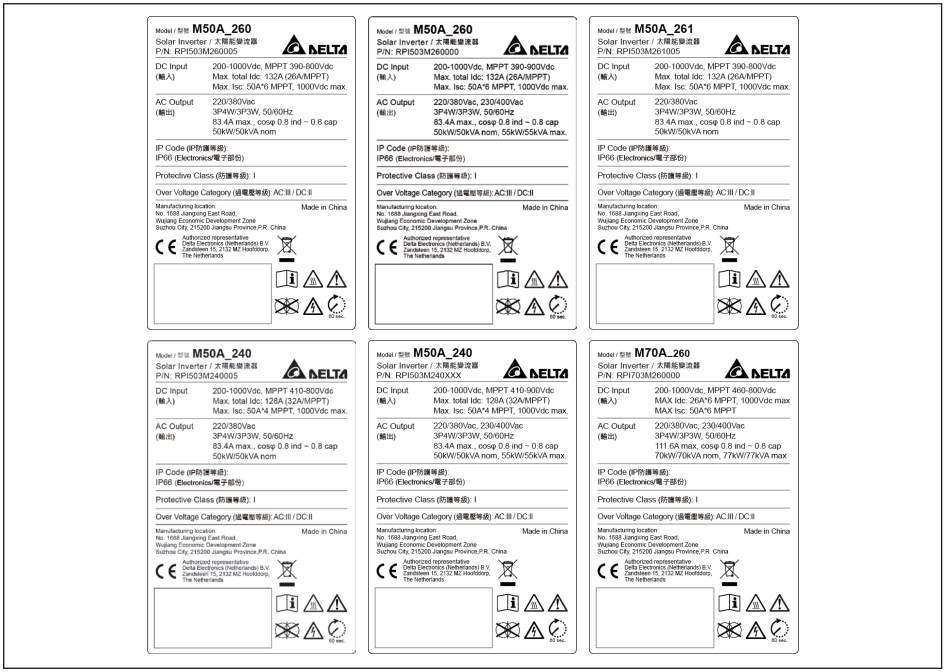


Figure 2-3: Rating label

Table 2-3: Rating label explanation

Symbol	Definition		
60 seconds	**Danger to life through electric shock** Potentially fatal voltage is applied to the inverter during operation. This voltage persists even 60 seconds after disconnection of the power supply. Never open the inverter. The inverter contains no components that must be maintained or repaired by the operatoror installer. Opening the housing will void the warranty.		
	Beware of hot surface. This inverter can get hot during operation.		Before working with the inverter, you must read the supplied manual and follow the instructions contained therein.
	This inverter is not separated from the grid with a transformer.		**WEEE marking** The inverter must not be disposed of as standard household waste, but in accordance with the applicable electronic waste disposal regulations of your country or region.
	The housing of the inverter must be grounded if this is required by local regulations.		

In the following pages, ***Figures 2-4*** illustrate the general layout of the chassis and wiring area. ***Figure 2-5*** and ***Table 2-4***, provides a detailed description of each wiring area option.

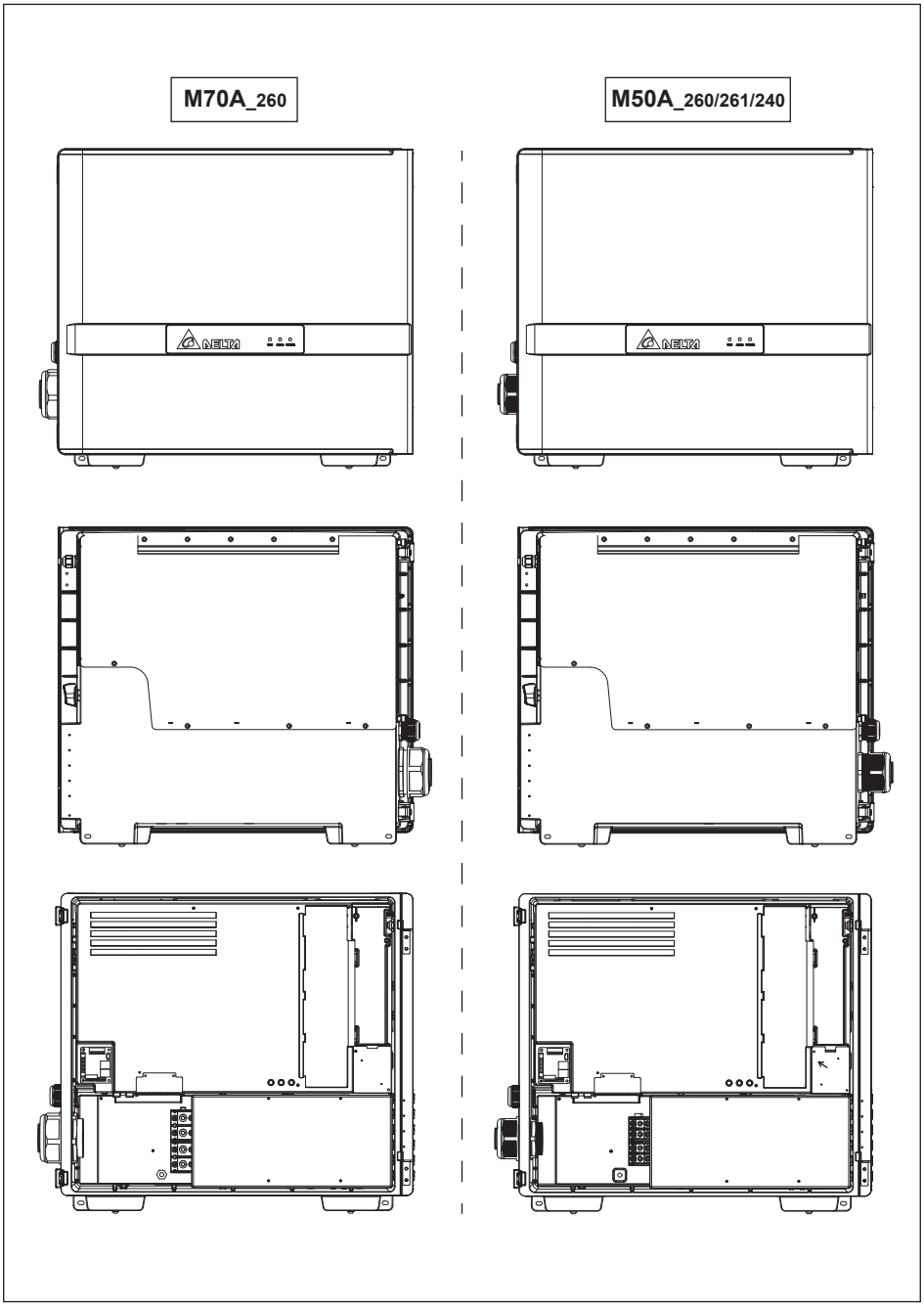


Figure 2-4: External/ internal view

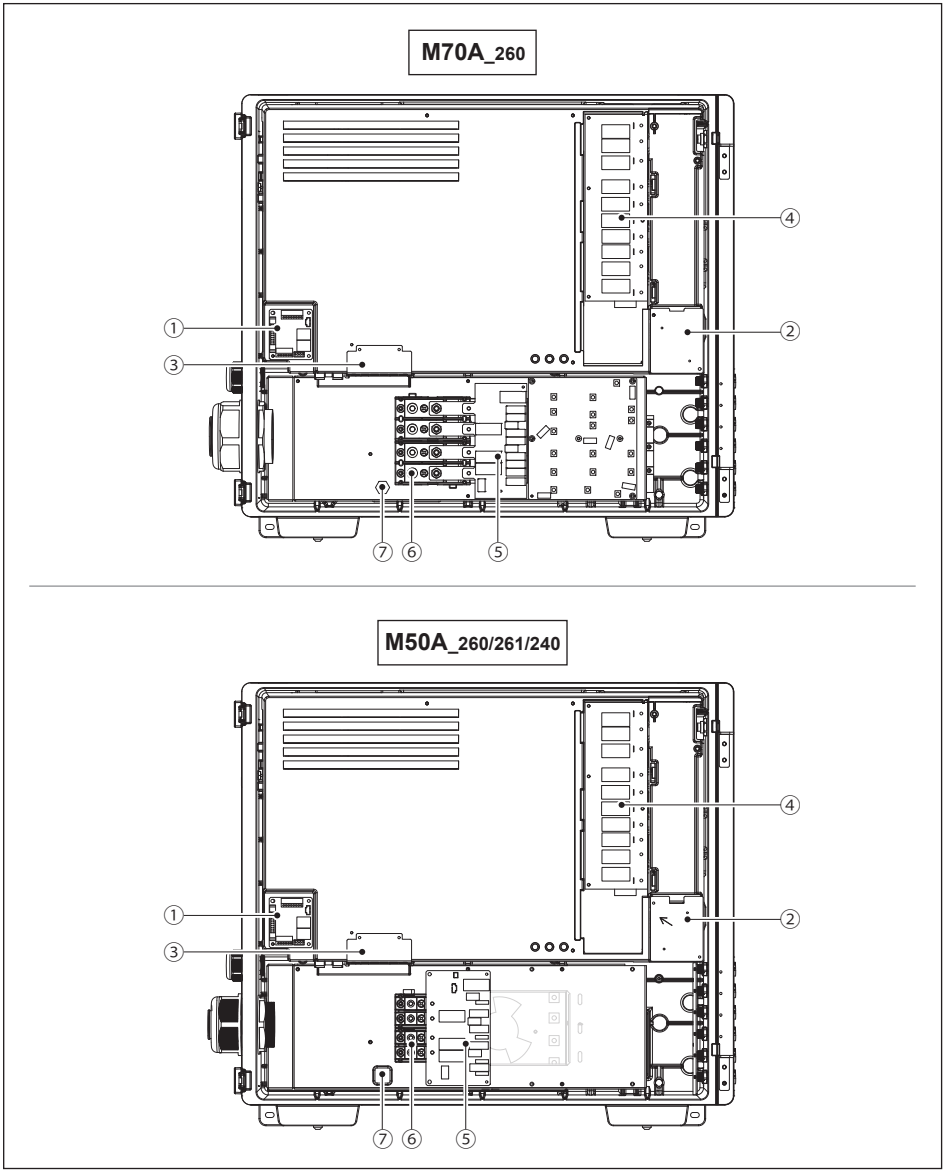


Figure 2-5: layout

Table 2-4: layout description

NO.	Component	NO.	Component	NO.	Component
1	Communication module	4	Type II DC SPD	7	Internal grounding
2	Internal fan 1	5	Type II AC SPD		
3	Internal fan 2	6	AC terminal		

3 Installation

WARNING !



- Do not install the unit near or on flammable surfaces.
- Inverter must be mounted securely to a solid / smooth surface.

CAUTION !



- In some locations, mounting the inverter in direct sunlight may cause the inverter to enter a thermal derating mode. To eliminate this concern, a shade structure over the inverter chassis may be necessary.

CAUTION !



The product supports wireless communication.

- Install the product as far away as possible from devices that emit strong radio waves, such as civil band radio equipment.
- Do not install the product in metal box and make sure there is no metal barrier between the product and connecting devices to prevent the communication signal attenuation.
- When using Bluetooth to connect the inverter, make sure the device is operated in front of the inverter within 1.5 m for the best communication quality.

The chapter contains instructions for
(1) Mechanical installation
(2) Electrical Installation
(3) Communication setup
Figure 3-3 provides the mechanical dimensions of the inverter.

3.1 Unboxing & Review

Unpacking the case, please follow the order of ***Figure 3-1***.
It could be transported by 2 people (***Figure 3-2***) .

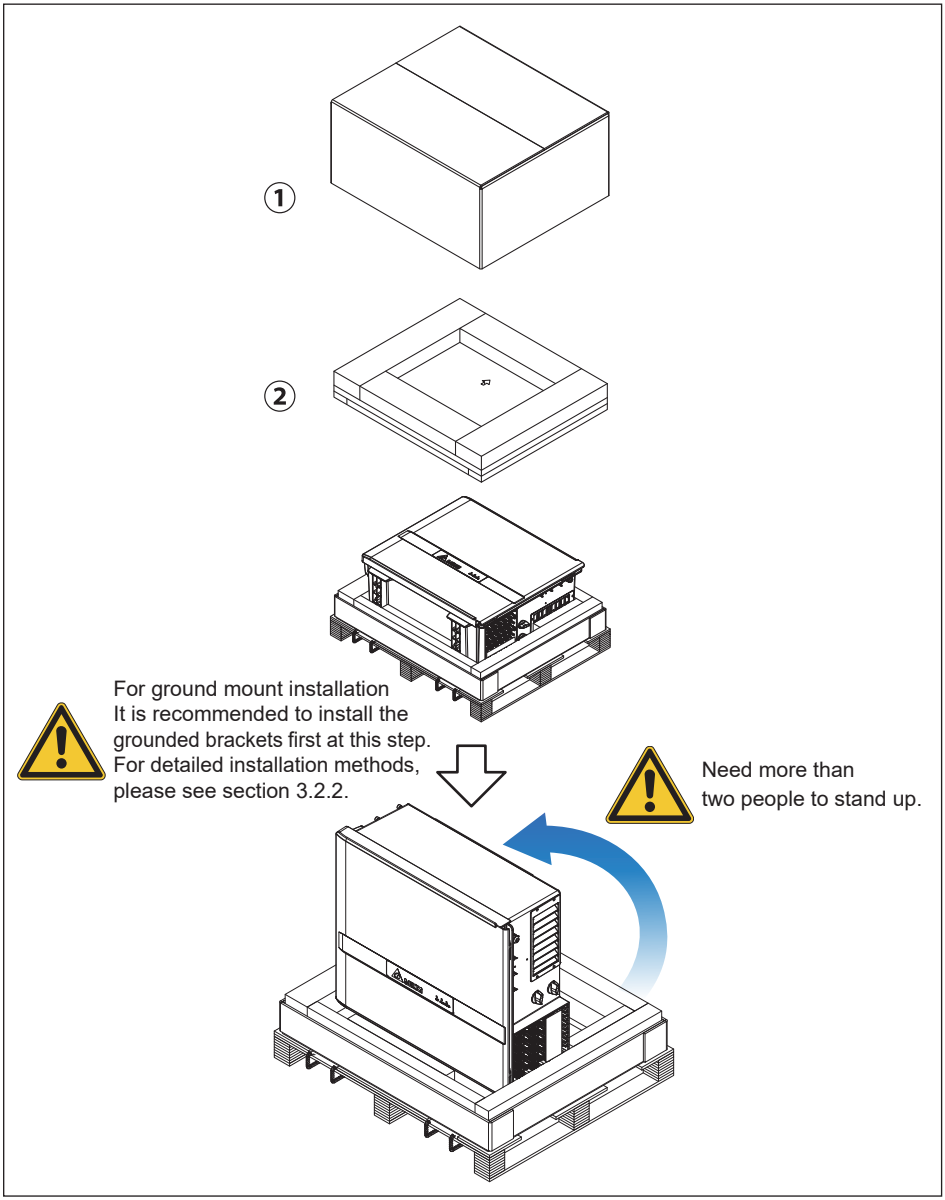
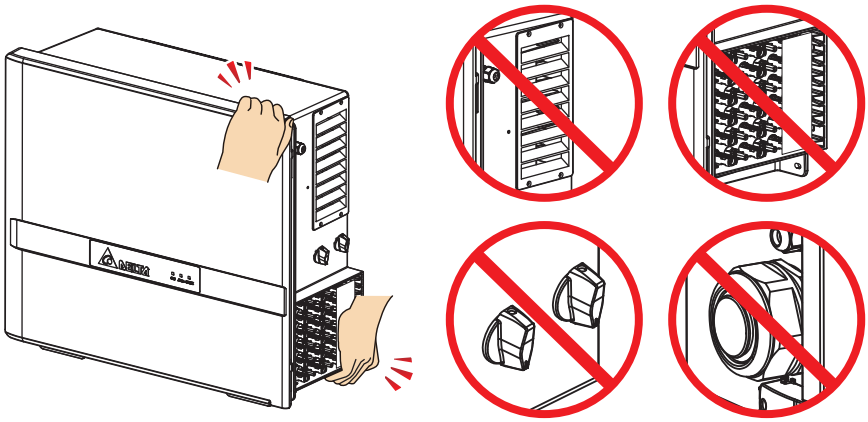


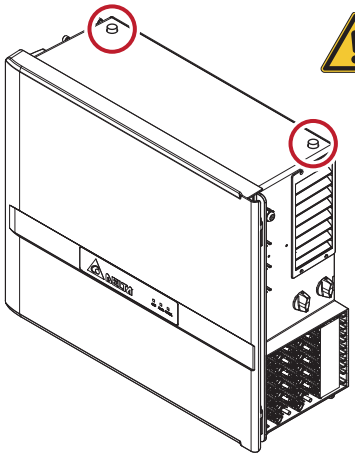
Figure 3-1: The step to unpacking the inverter

Manual handling

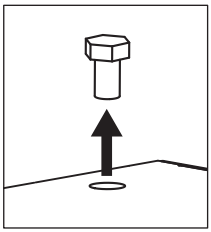


Do not hold fan, fan shutters, DC connectors, DC switches, or AC gland, it may cause damage to certain components.

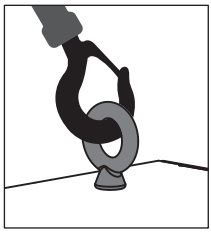
Hoisting



After hoisting, please keep the screw plugs on the casing to prevent water from entering.



Screw plug
(4 N-m)



Hoisting ring
(M12 x P1.75, L ≤ 20 mm)
(42 N-m)

Figure 3-2: Lift the inverter

3.2 Mechanical Installation

This unit is designed to be wall-mounted per **Section 3.2.1** or ground mounted **Section 3.2.2.**

3.2.1 Vertical Wall Mount

Refer to ***Figures 3-4*** through ***Figures 3-9.***

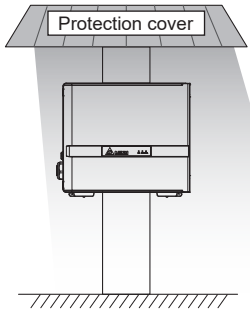
1. Ensure the surface to which the unit is to be mounted is sufficiently strong enough to carry the weight.
2. Orient the wall bracket (***Figure 3-4***) horizontally (perpendicular to the floor).
3. Secure the mounting bracket on the wall with 12 M6 screws.(***Figure 3-5***)
4. Hang the inverter on the wall mounting bracket.
5. Secure the inverter by 2 M6 screws on the position* shown as ***Figure 3-5***.
   * These are also grounding points for equipment grounding. (To ground the inverter, please refer to ***Section 3.5.2***)

CAUTION !

- The mounting bracket shipped with the unit is specially designed and is the only certified mounting device for mounting the inverter.
- Secure the mounting bracket on the wall with at least 6 M6 screws.
- Failure to comply with following mounting instructions including permitted orientations and designated clearances may result in derated power output and may void the warranty.

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.



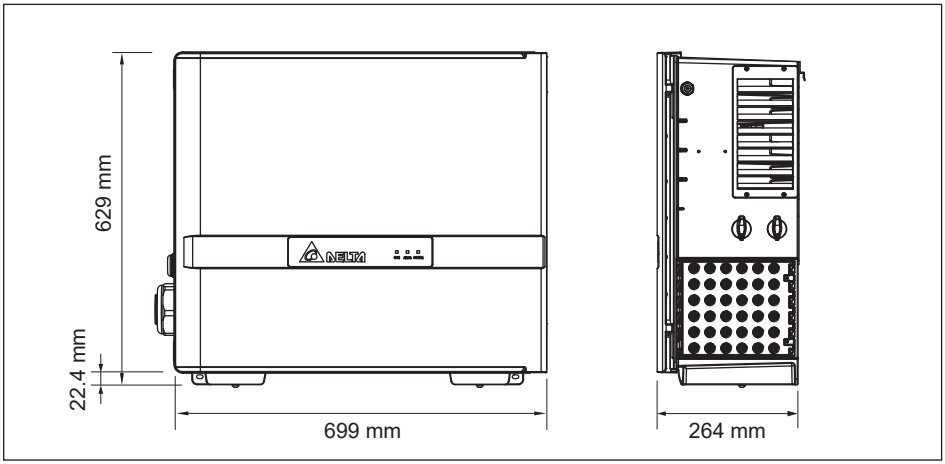


Figure 3-3: Inverter dimensions

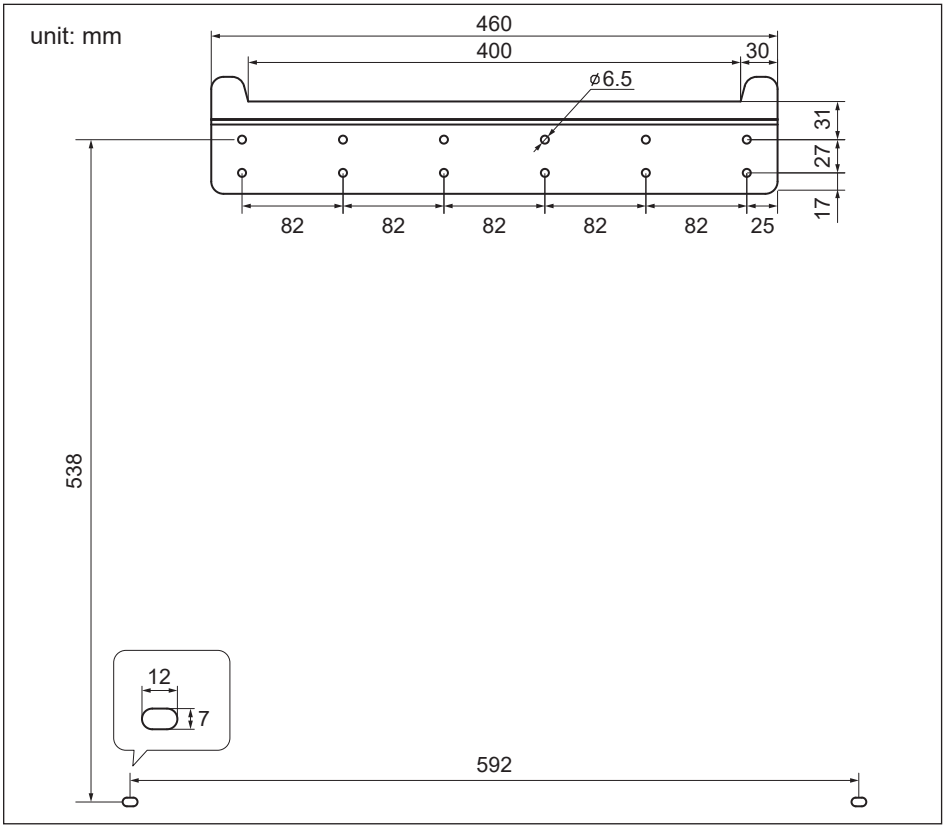


Figure 3-4: Mounting bracket dimensions

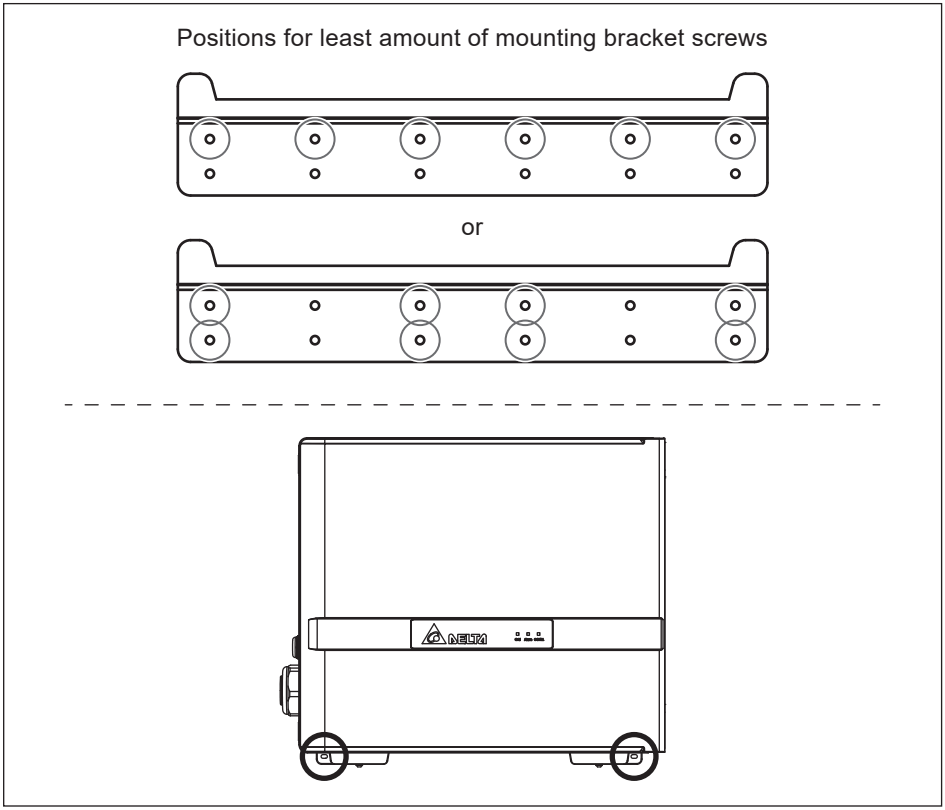


Figure 3-5 : Positions of mounting screws

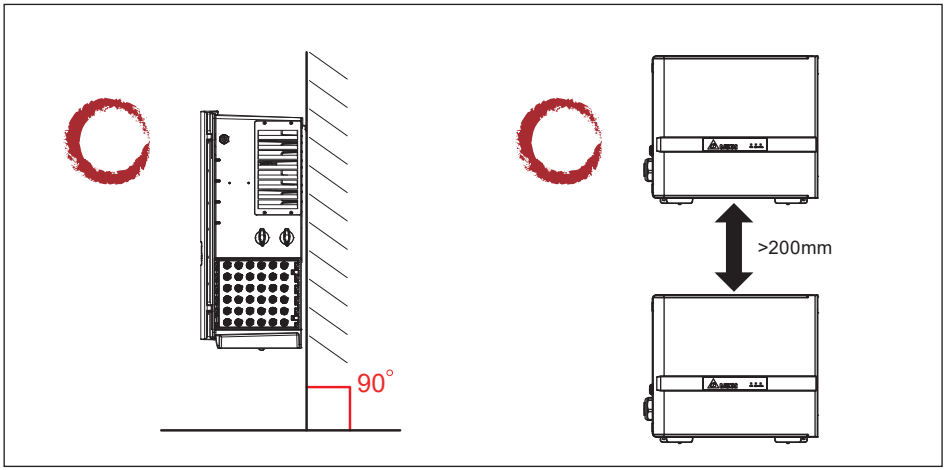


Figure 3-6: Permitted mounting positions

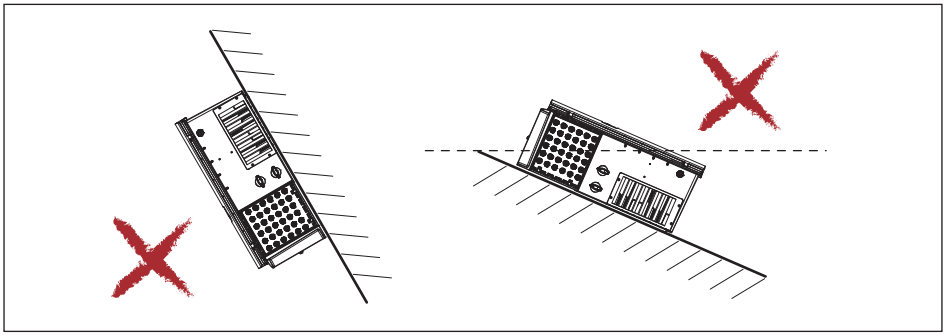


Figure 3-7: Prohibited mounting positions

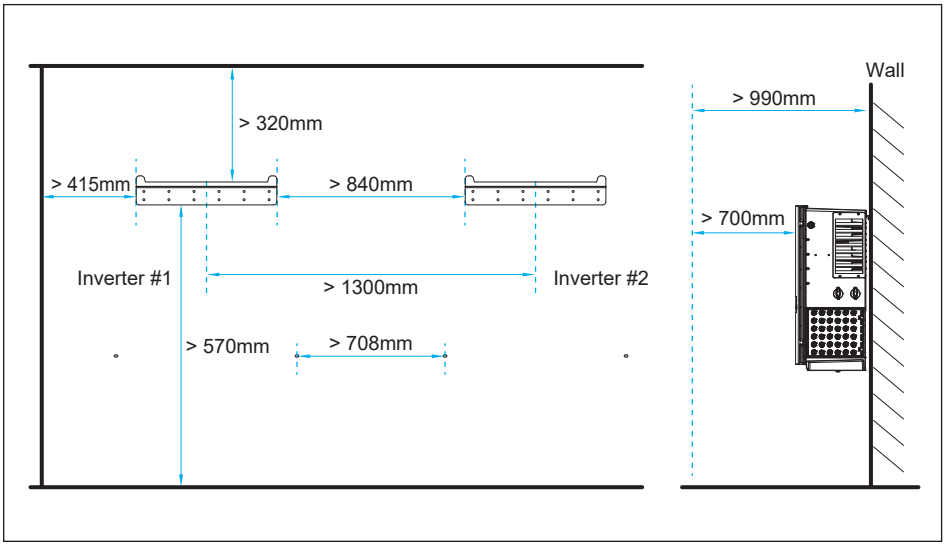
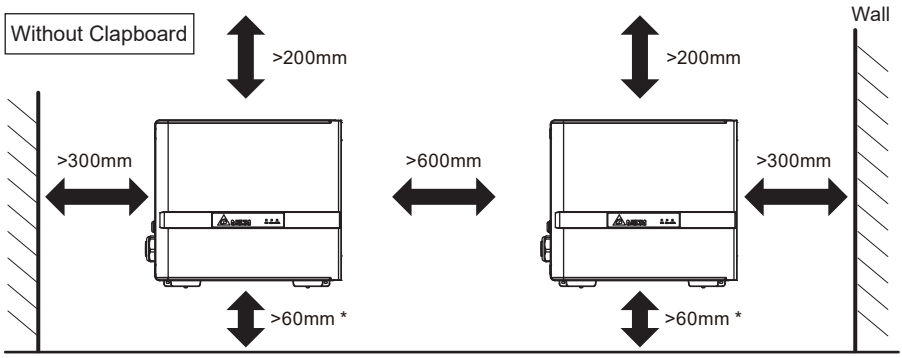
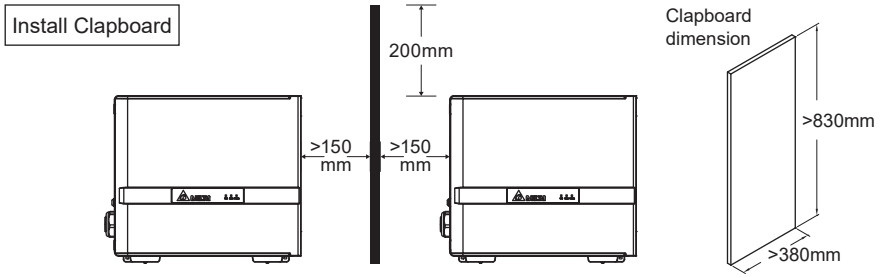


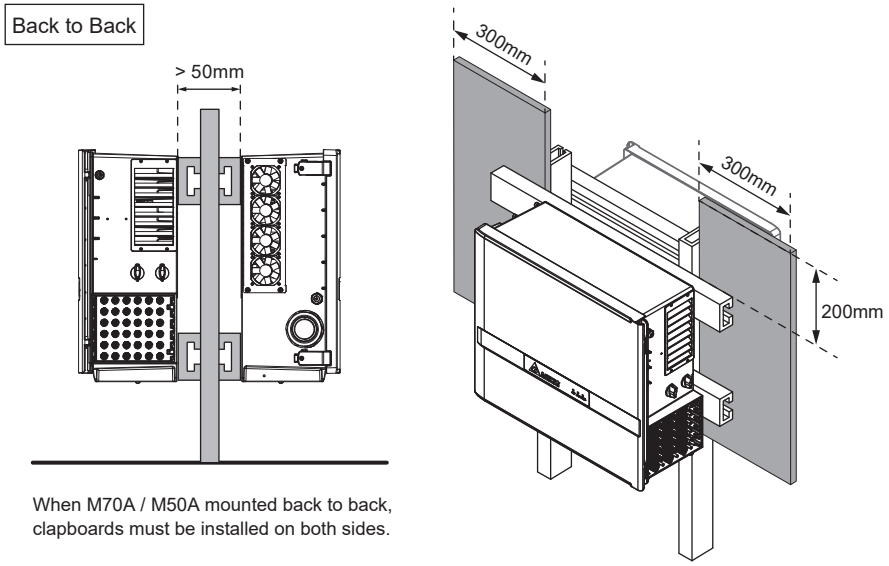
Figure 3-8: Required mounting clearances



* If the installation location has a risk of flooding or accumulated snow, please raise the appropriate height of the inverter.



* In order to avoid interference, please do not insatll metal clapboard when using SUB_1G antenna.



When M70A / M50A mounted back to back, clapboards must be installed on both sides.

Figure 3-9: Separation distance of plural inverters

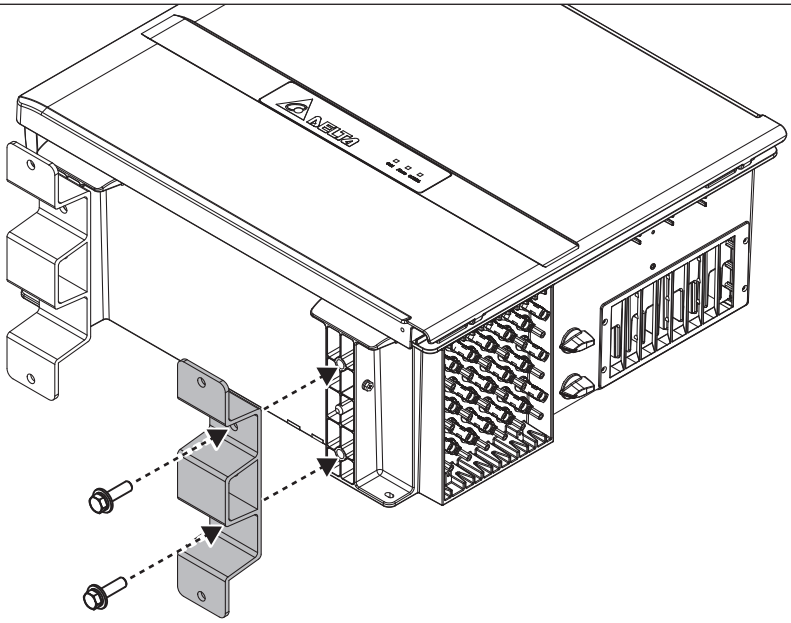
3.2.2 Ground Mount (optional)

ATTENTION

- Ensure the grounded base is strong enough to hold the weight of the inverter.

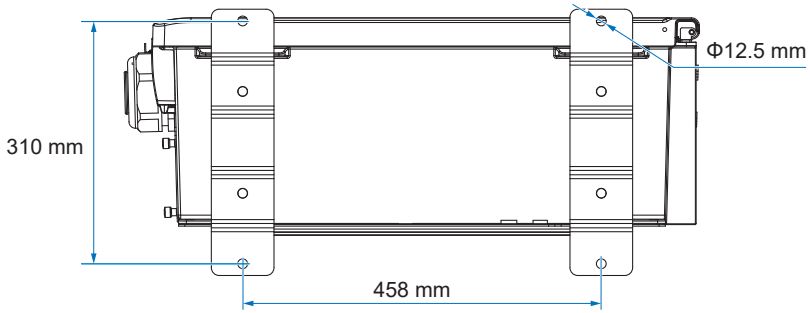
Grounded Bracket kit is an optional part, please contact the customer service center for the detail.

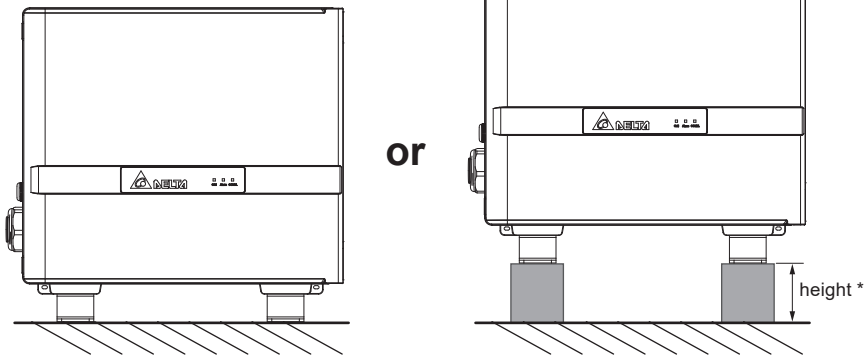
1. Fix the grounded brackets to the bottom of the inverter as ***Figure 3-10***.
2. Mount the inverter with grounded brackets to the ground-mounting base by 4 expansion bolts as ***Figure 3-11***.



* Screw torque required for assembling: 24.5 N · m

Figure 3-10 : Lock the grounded brackets to foots





* If the installation location has a risk of flooding or accumulated snow, please raise the appropriate height of the inverter.

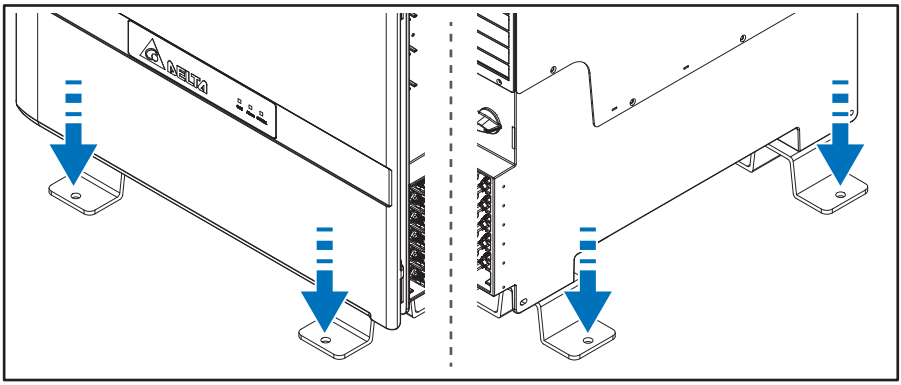


Figure 3-11: To secure inverter grounded brackets to ground-mounting base

3.3 Door

In order to ensure the normal long-term operation of the inverter, please follow the procedures in **Section 5.1** to open and close the door.
After opening the door, please make sure the door is fixed by hexagon driver as shown below.

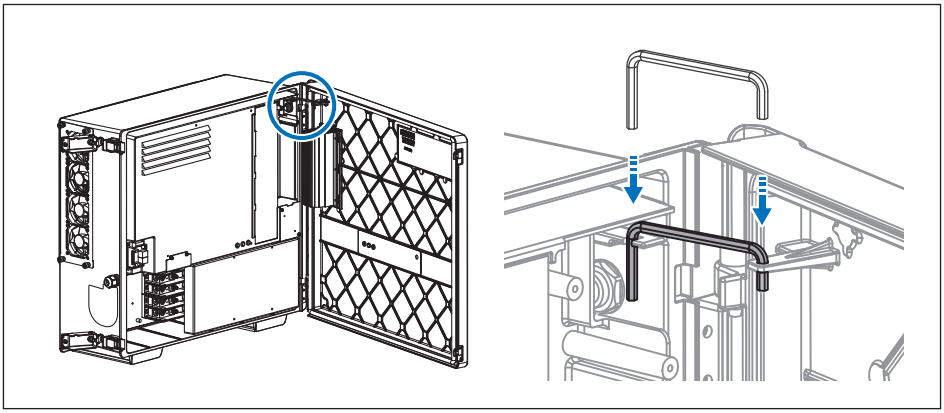


Figure 3-12: To secure the door by hexagon driver

3.4 Electrical Installation for AC Wiring

DANGER : ELECTRICAL HAZARD!!

- Insure any live grid connections are removed from the inverter during cabling.
- Do not perform wiring operations under rainy conditions.

WARNING !

- Code compliance is the installer's responsibility.
- Inverter warranty void if the DC input voltage exceeds 1000 Vdc.
- After the wiring operations, please close the door immediately and fully tighten both toggle latches.

CAUTION : INVERTER AND EQUIPMENT DAMAGE MAY OCCUR !

- Installation for AC terminal must meet the local electrical code.
- Failed to follow the instructions may damage AC cable.

CAUTION: WRONG AC WIRING !

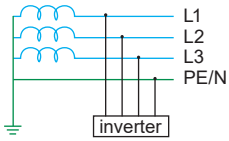
- In order not to damage the components in the inverter, ensure the correct conductor is connected to the appropriate AC terminal on the inverter.

3.4.1 AC Grid Types and Connections

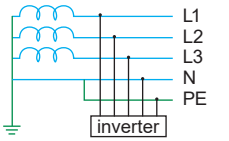
ATTENTION

The default AC Grid connection is 3Ø-4W. It can also connect 3Ø-3W without Neutral (N). The inverter will operate from the following grid connections without need of an external transformer:

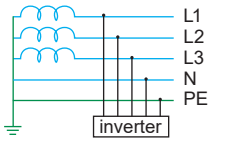
TNC system
230/400V



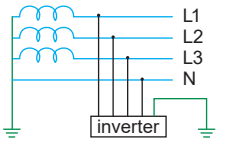
TNC-S system
230/400V



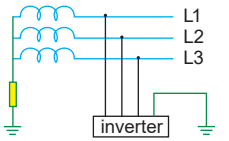
TNS system
230/400V



TT system
230/400V



IT system
230/400V



3.4.2 Required Protective Devices

It is recommended to install an upstream AC line disconnection and over current protection device. Please refer to your local rules for the required product.

3.4.3 AC Wiring Preparation

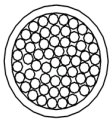
- The cross-sectional area for each AC conductor is shown below.
- The information and notice of cable using is shown on next page.

Conductor cross-section:
M70A_260 -
Cu: 35 mm² (1 AWG) ~ 120 mm² (250 kcmil)
Al: 60 mm² (2/0 AWG) ~ 120 mm² (250 kcmil)
M50A_260/261/240 -
Cu: 25 mm² (2 AWG) ~ 60 mm² (2/0 AWG)
Al: 35 mm² (1 AWG) ~ 60 mm² (2/0 AWG)
Stripping length: 20mm

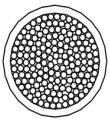


Figure 3-13: Size of AC conductors

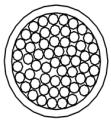
M70A / M50A support Cu stranded, Cu flexible conducor, Al stranded wire, aluminum solid (include sector wire)



Cu stranded



Cu flexible wire
(need press with terminal)

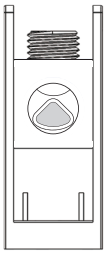


Al stranded



Aluminum solid
(sector) *

- Cu:
  The Cu flexible wire need stamp with terminal, for the other model wiring with bear wire is available.
- Al:
  The oxide layer at the end of the terminal must be removed when connecting the aluminum wire. After removing the oxide layer, we recommended cost the neutral fat or acid-free, alkali-free vaseline on the end of the conductor and connect the conductor immediately. It's necessary to treat the oxide layer when reconnect the wire.



* The sector wiring direction is shown as right figure.

WARNING !

- If not following the above pretreatment, the contact resistance will increase significantly which will lead to the excessive temperature rise, even catch fire.

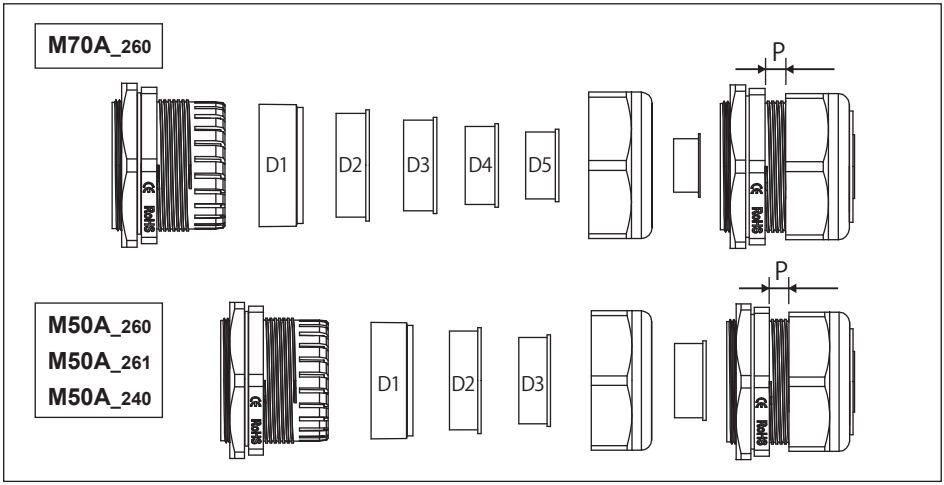


Figure 3-14: AC Gland with multiple inlet

Table 3-1: Cable size comparison table

M70A	Sizes of Cables (mm)		Torque (N·m)	Dimension of P (mm)
D1	51-57	2550 mm^2	8.5	7
D2	43-50	1962 mm^2	8.5	5
D3	36-43	1450 mm^2	8	5
D4	30-36	1017 mm^2	8.5	5
D5	26-30	706 mm^2	8.5	5

M50A	Sizes of Cables (mm)		Torque (N·m)	Dimension of P (mm)
D1	30.8-44.7	1570 mm^2	13	2
D2	26.8-35.4	984 mm^2	15	2
D3	21.9-27.6	598 mm^2	13	2

3.4.4 AC Side –Prewire Set-Up

Prior to installing conductors on terminal complete the following procedure to make terminals ready for connections.
For each of the AC terminals (L1, L2, L3, N):
Tighten or Lose nuts with 8 mm (M70A) / 5mm (M50A) hex wrench.
If an electric tool is used, insure the torque setting is low enough to NOT over-torque the screw.

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:
- ► Please select the Al wire size according to rules due to lower conductivity of Al.
- ► Keep the installation location as free as possible from moisture or corrosive atmospheres.
- ► Connect the aluminum cables quickly.
- ► Tighten the clamping screw in the clamping body with the maximum permissible tightening torque.

3.4.5 AC Wiring

Refer to ***Figure 3-13*** in **Section 3.4** for the procedure to prepare AC conductors for connection to the AC terminals. Ensure the AC conductors used are sized to the correct ampacity per NEC or other local code.

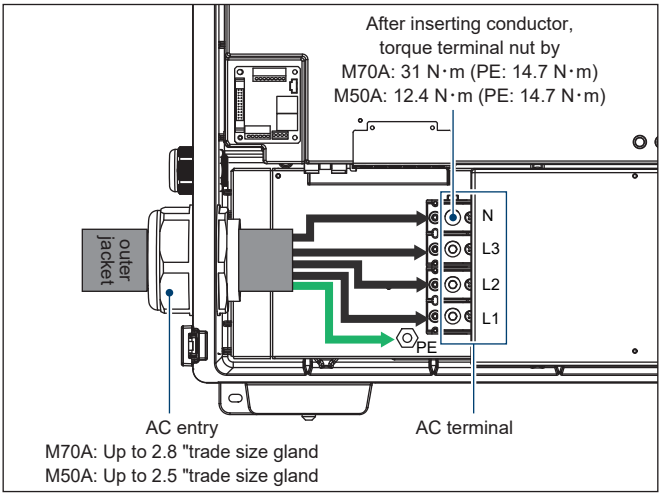


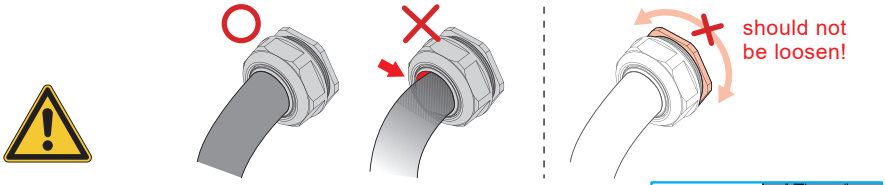
Figure 3-15: Location for AC terminal

Figure 3-15 illustrates the location of the AC conduit entry and connections to the AC terminal block:

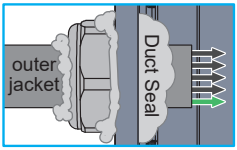
- Unscrew all AC terminal nits as noted in **Section 3.4.4.**
- Ensure the correct conductor is connected to the appropriate terminal.
- After conductor is inserted, use 8 mm (M70A) / 5mm (M50A) hex wrench to tighten L1, L2, L3, N terminal with the torque shown as ***Figure 3-15.***

CAUTION !

- Please make sure there is no gap between gland and cable.
- Please make sure the gland is tight after setup as shown below.



- Please sealed every entries by duct seal (firemud or slicon sealant etc.) to avoid water intrution and live creature entering the inverter.



3.5 Electrical Installation for DC Wiring

DANGER : ELECTRICAL HAZARD!!

- PV array converts sunlight into electric power with high DC voltage and high DC current which can cause dangerous electrical shock hazard!
- Use an opaque material to cover the PV array before wiring or cabling.
- Ensure the correct polarities are connected when DC cabling is applied.
- The amount of PV module of each string within one MPPT should be the same to avoid the circulating current between the strings.
- Do not perform wiring operations under rainy conditions.

WARNING !

- The risk of electric shock and fire exists because of high DC and AC voltages.
- Only PV modules that are listed with system voltage under 1100V are permitted for use.
- Ensure the two DC switches are placed in the "OFF" position, and the PV array is disconnected when DC conductors are connected.
- After the wiring operations, please close the door immediately and fully tighten both toggle latches.

CAUTION: DC SWICH ON/OFF !

- In order not to damage the components in the inverter, don't repeat to change the status of DC Switch quickly, the correct operation is waiting for the LED display show "green off and yellow flash" (No DC) or turn on the switch after 5 minute later.

ATTENTION

- The PV Array current carrying conductors (positive or negative) must not be referenced to ground.

DANGER : ELECTRICAL HAZARD!!

- Before plug in the DC connectors, pay attention to the polar is correct. Reverse positive and negitive voltage, inverter will probably damage.



ATTENTION

- Do not remove the waterproof plug for unused DC strings.
- Do not remove the protective cover for unused MPPT 3 DC strings.

3.5.1 DC Wiring Installation

Please read the following instructions for connecting DC connector :

- Ensure the DC conductors used are Cu and sized to the correct ampacity per NEC or other local code
- Strip off all wires for 6.5~7.5 mm.
- The cross-sectional area for each DC conductor is 12/10 AWG (4/6mm^2).
- Choose the DC string wire size based on NEC requirements or other local code.

M70A and M50A use bulkhead mounted H4 type connectors for interconnecting string wiring to the inverter. Mating connectors (See ***Figure 3-16***) are provided within the accessory kit.

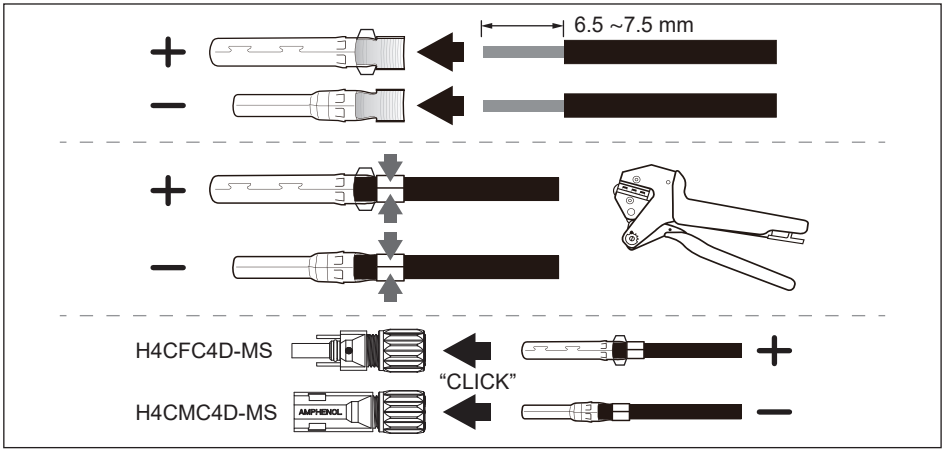


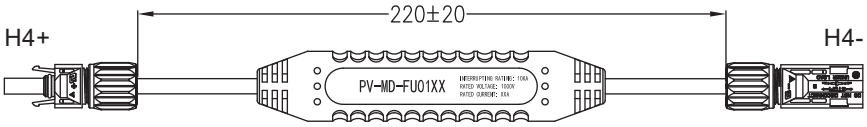
Figure 3-16: DC Wiring

DC wiring polarities are divided into positive and negative, and the layout of the connectors is shown in ***Figure 3-17.***

- After DC Wiring installing, insert the protective frame for DC connector and the method is shown in ***Figure 3-18.***

ATTENTION

- According to different local regulations, if the external string fuse is required, please contact Delta dealers.



XX: Fuse rating 20A / 25A / 30A

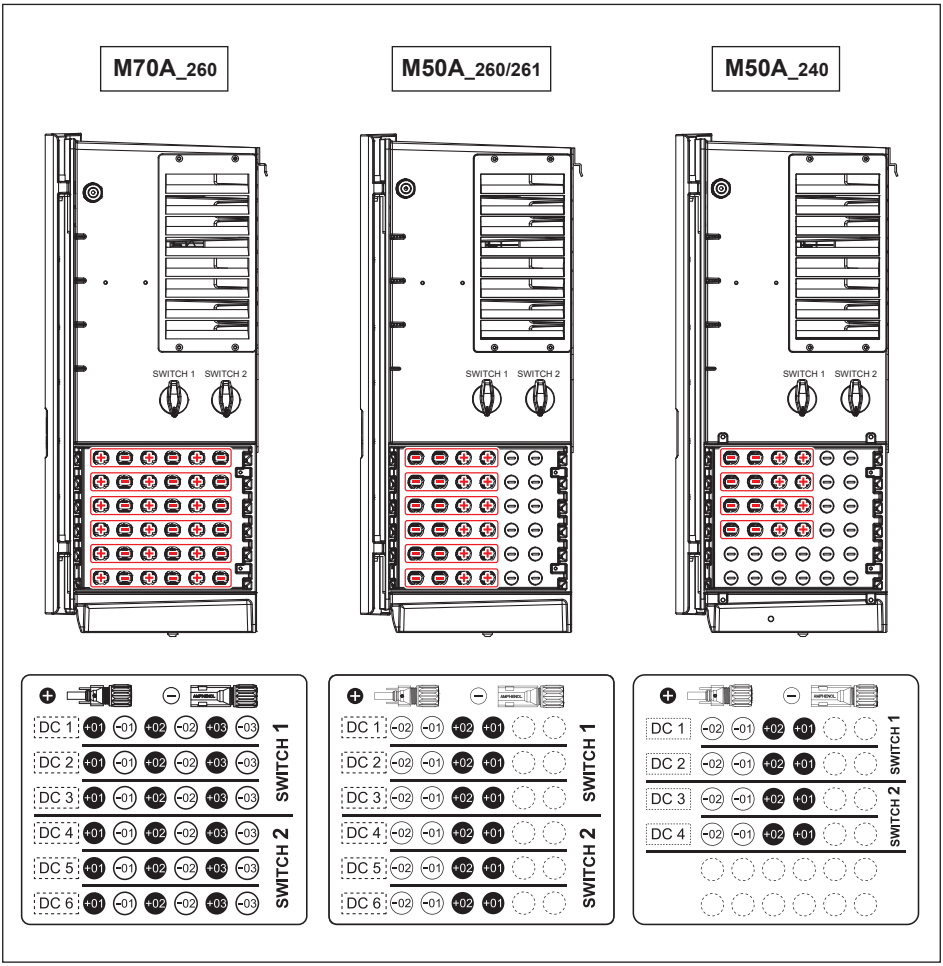
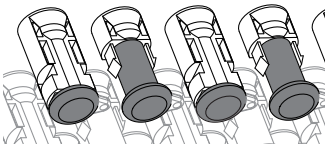


Figure 3-17: location of H4 connectors to connect array wiring (DC)

ATTENTION

- For unused DC connectors, please keep the cap on to prevent water or dirt intrusion.



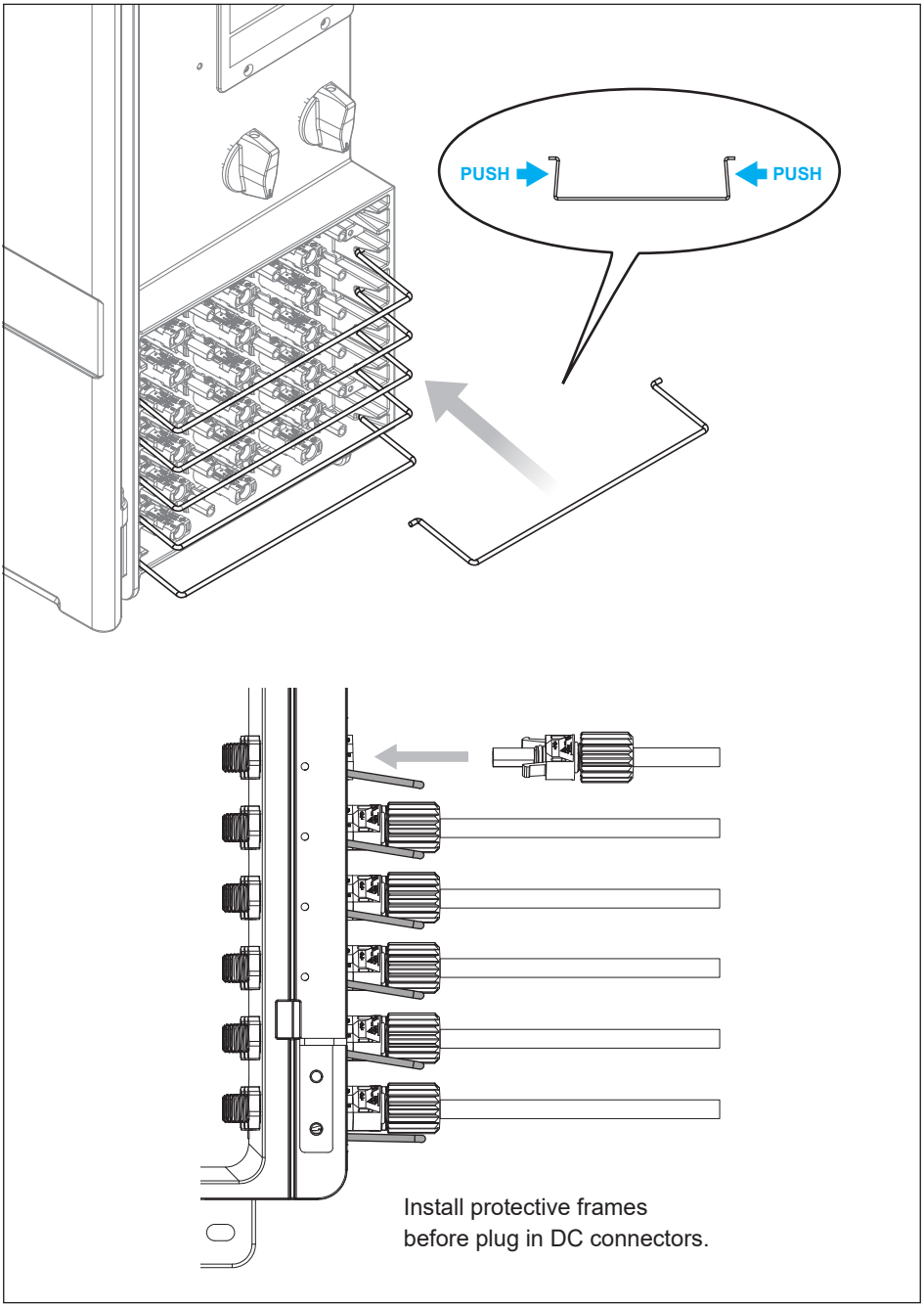


Figure 3-18: Installation methods for protective frame

3.5.2 Equipment Grounding

To ground the inverter, please crimp the grounding wire to ring terminal lug and fix it on the grounding point shown as ***figure 3-19***.

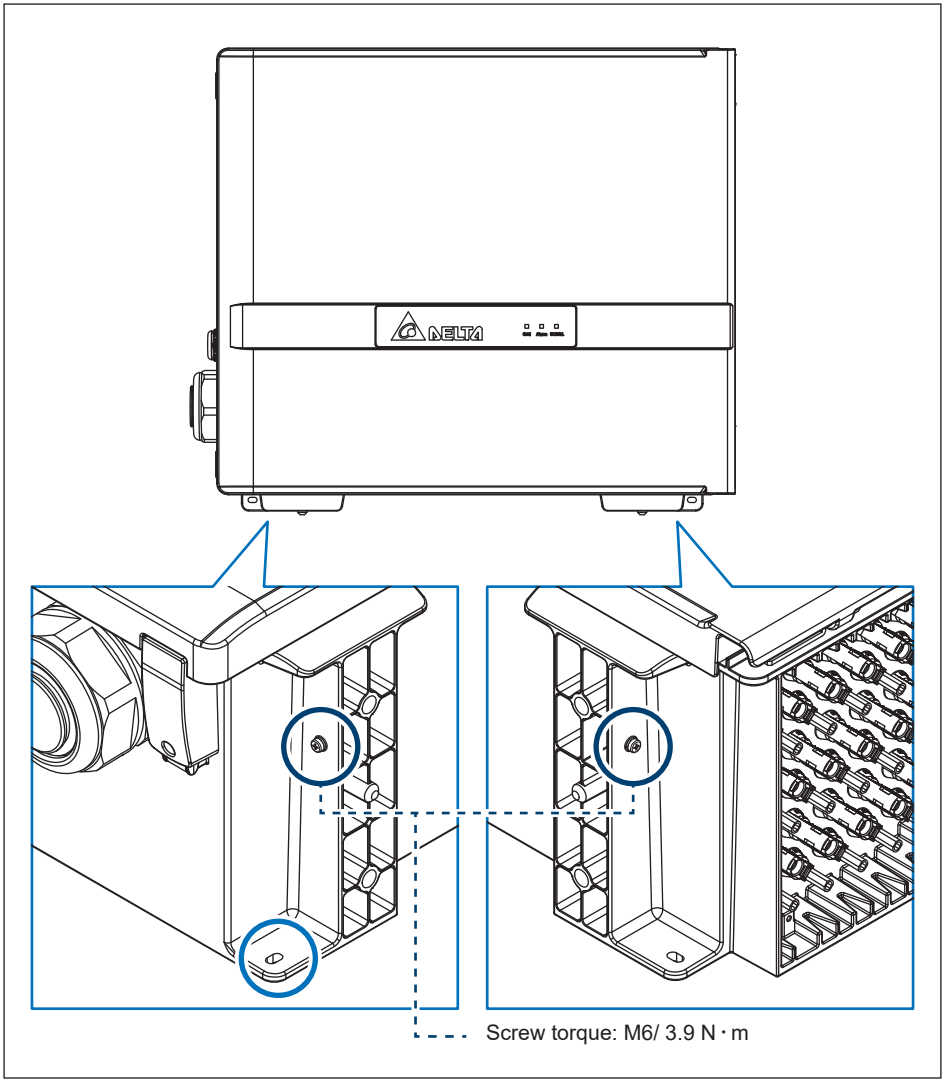


Figure 3-19: Mount the equipment grounding

3.6 Communication Module Connections

The communication module is shown in ***Figure 3-20***. It provides VCC, RS-485, dry contact, EPO, and Digital Input terminals for use in various applications. Details for each are presented below.
There's a 12 VDC source between VCC & GND for use with external device.

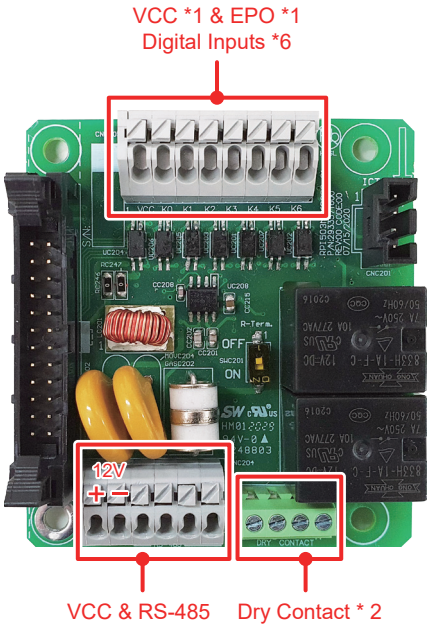


Figure 3-20: Communication Module Layout

Please refer to ***Chapter 5.1*** to open the door, the circle in the following figure is showing the location of the communication module.

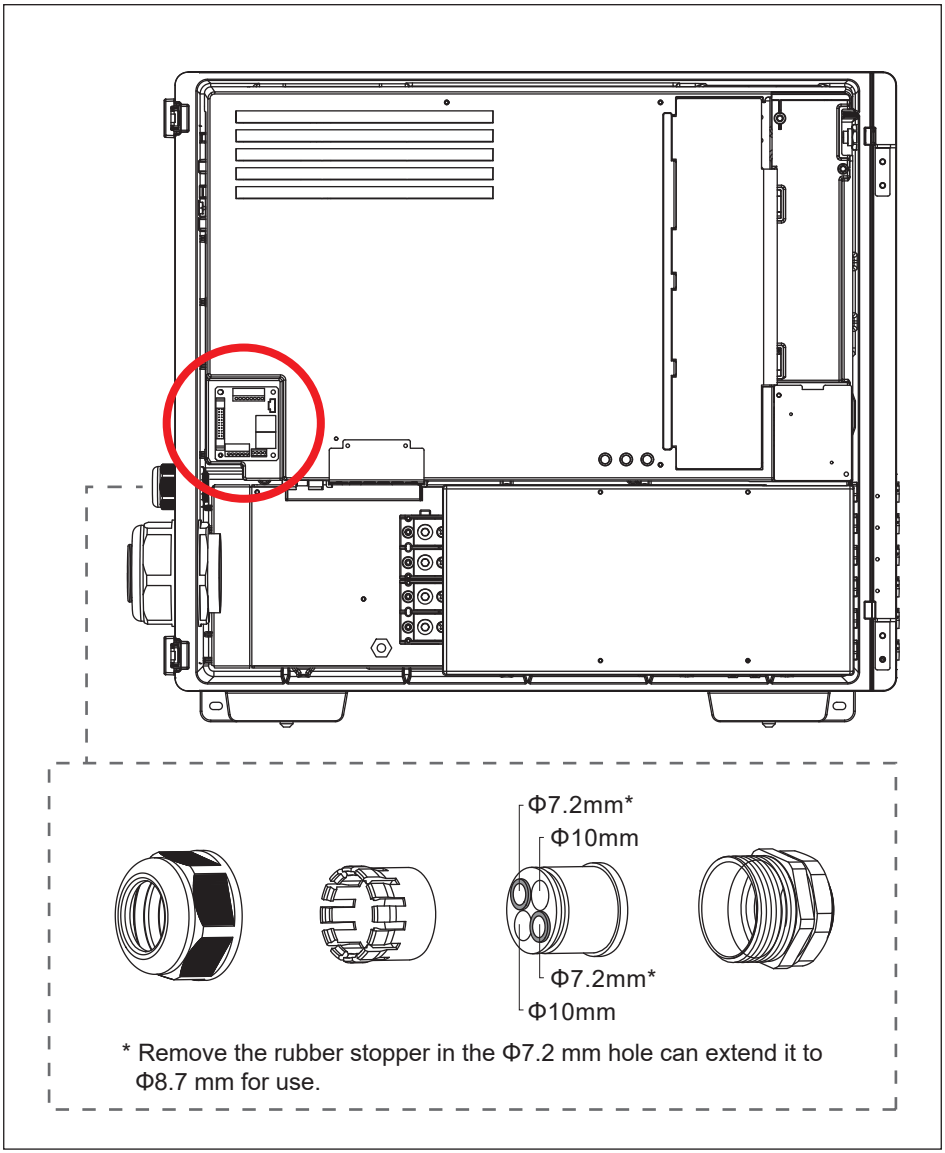


Figure 3-21: Location and access to Communication Module

3.6.1 RS-485 Connection

The pin definition for the RS-485 terminal block is shown in ***Table 3-2.***

- Pins 1 and 2 provide a 12VDC / 0.5A bus for use with accessories.
- Pins 3 and 5 are both connected to the DATA+ input.
- Pins 4 and 6 are both connected to the DATA- input.

These connections allow easy daisy-chaining of multiple inverters.

A 120ohm bus termination resistor and associated control switch are located on the communication board (***Figure 3-22***). ***Table 3-3*** shows the switch function. Different RS-485 connection scenarios require different set up for the 120ohm bus termination resistor.

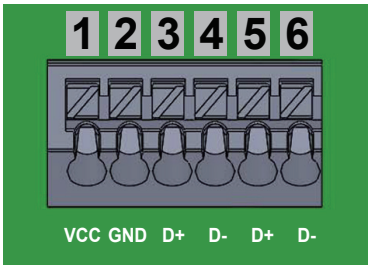
- When several inverters are cascaded (i.e., "daisy-chained") only the last inverter in the chain must have its bus termination resistor switched ON (***Figure 3-22***).
- If the length of any RS-485 bus is greater than 610m, the use of Belden 3105A cable (or eq.) is recommended to insure communication quality.

ATTENTION

- In order to have good transfer quality, twisted-pair wire is recommended to be used as communication cable.

Table 3-2: RS-485 Terminal block wiring

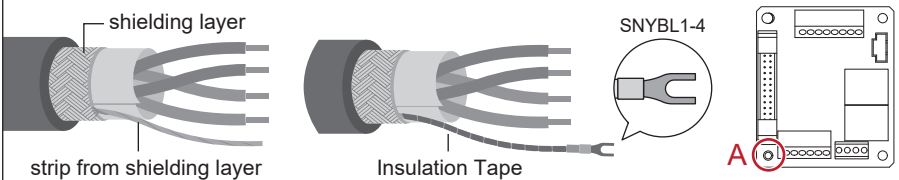
Pin	Function
1	VCC (+12V)
2	GND (It is NOT the PE)
3	DATA+
4	DATA-
5	DATA+
6	DATA-



INFORMATION

When the RS-485 cable needs to be grounded, please follow the steps below.

1. strip a wire from the shielding layer and properly insulate it
2. crimp the insulated wire to the Y-type lug and fix it in position A



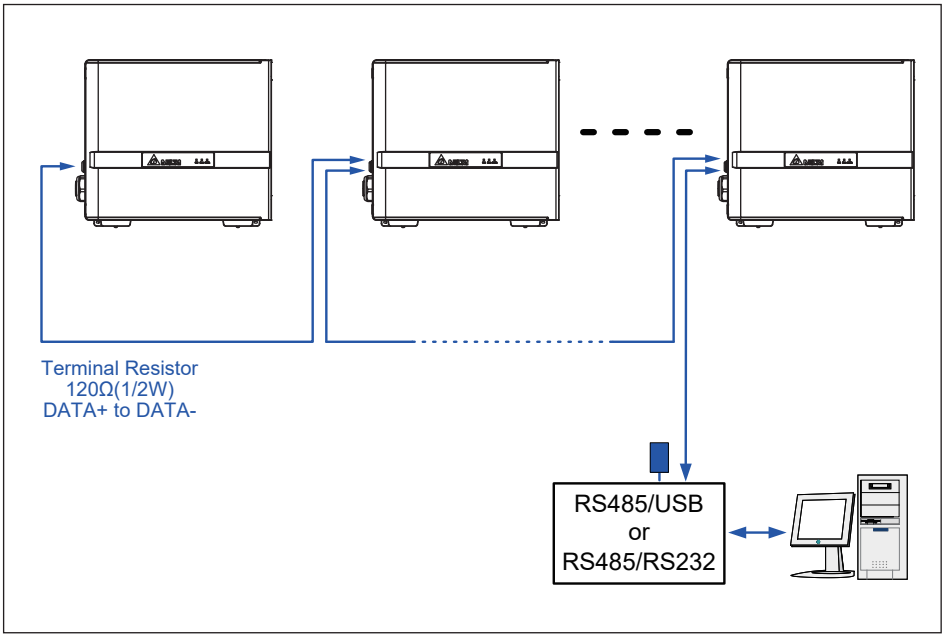


Figure 3-22: Multiinverter connection illustration

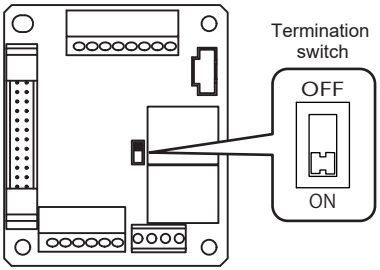


Table 3-3: Bus Termination switch settings

	Switch 1
ON	Terminal Resistor ON
OFF	Terminal Resistor OFF

3.6.2 EPO Function & Digital Input

The communication module has an Emergency Power Off function (EPO). Users can customize EPO function in APP or Delta Solar System (DSS).

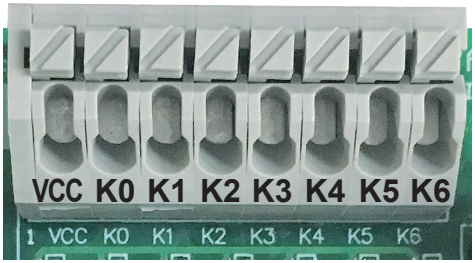


Figure 3-23: EPO function terminal block

Once enabled, the EPO function can be used to turn off the inverter via a NO relay contact connected across terminal [VCC & K0].

Additionally, a digital power reduction control is available that can be set to limit the inverter's available active output power. The control settings for this function are made by placing a hardware short (jumper or relay) between two terminals of the terminal block shown in ***Table 3-4***, below.

Table 3-4: Definition of digital input & EPO function

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

3.6.3 Dry Contact Connection

The inverter provide a dry control contact pair that may be used to control external devices based on the status of operation of the inverter.

The terminal block for this function is shown in ***Figure 3-24***. The terminals marked in the figure identify the dry contact connection. The operation of the dry contact is normally open. The functionality of this contact can be customized by users via settings available in APP or DSS.

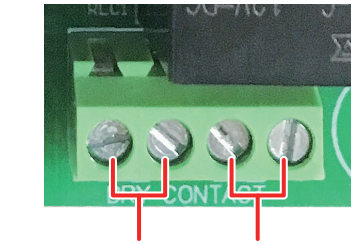


Figure 3-24: Dry Contact connection

4 Commissioning

CAUTION : HOT SURFACES, DO NOT TOUCH!

- Use care to avoid hot surfaces when operating the product!
- Do not perform any task until the unit cools down or appropriate personal protection gear is worn.

4.1 Display Operation Introduction

With 3 LEDs allow visual display of the inverter's data and status as shown in ***Figure 4-1***.
Please refer to ***Table 4-1*** for information as to the information provided by the LED indicators.

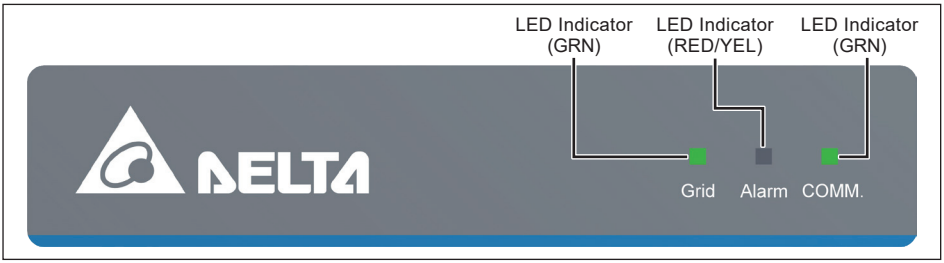


Figure 4-1: Front Panel Display

Table 4-1: Inverter status

Condition	Grid (Green)	Alarm (Red/Yellow)
Countdown	FLASH	OFF / OFF
On Grid	ON	OFF / OFF
Inverter Fault / Remote off	OFF	ON / OFF
Inverter Warning	ON (or OFF)	FLASH / OFF
Field Fault	OFF	OFF / ON
Field Warning	ON	OFF / FLASH
NO DC	OFF	OFF / FLASH SLOW
FW Upgrade	FLASH	FLASH / OFF
Standby	FLASH	OFF / FLASH
Check PV Power	FLASH FAST	OFF / FLASH FAST
System Lock	OFF	FLASH / FLASH

*FLASH: ON 1s / OFF 1s
FLASH FAST: ON 0.25s / OFF 0.25s
FLASH SLOW: ON 5s / OFF 10s

4.2 Commission an Inverter Individually – Bluetooth

The inverter with built-in Bluetooth function can be commissioned individually via the “DeltaSolar” App.

DeltaSolar App can be downloaded and installed by scanning the QR code or searching in App Store (iOS user) / Google Play (Android user).

DeltaSolar
DELTA ELECTRONICS, INC.

QR Code

Download on the App Store
iOS

GET IT ON Google Play
Android

About OS version
iOS: 8.0 and above
Android OS: Android 8.0 and above

Start Commissioning the Inverter

① Enable the Bluetooth function of your mobile device.

② Click the Bluetooth icon on the bottom right corner.

③ Select the S/N of the corresponding inverter.

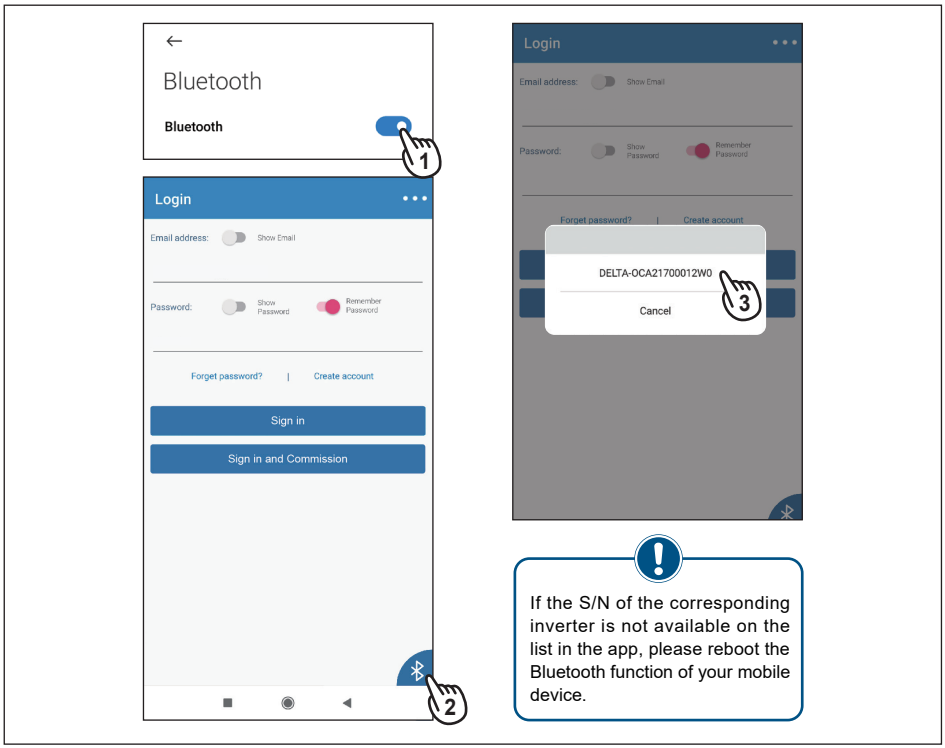


Figure 4-2: Steps to commission via bluetooth (1-3)

④ Select “Local Setting” sheet and click “Grid Setting”.

⑤ Click “Inverter ID” to select the required ID and then click “Inverter ID Set”.

⑥ Click “Country” to select the required grid code and then click “Set”.

⑦ Done.

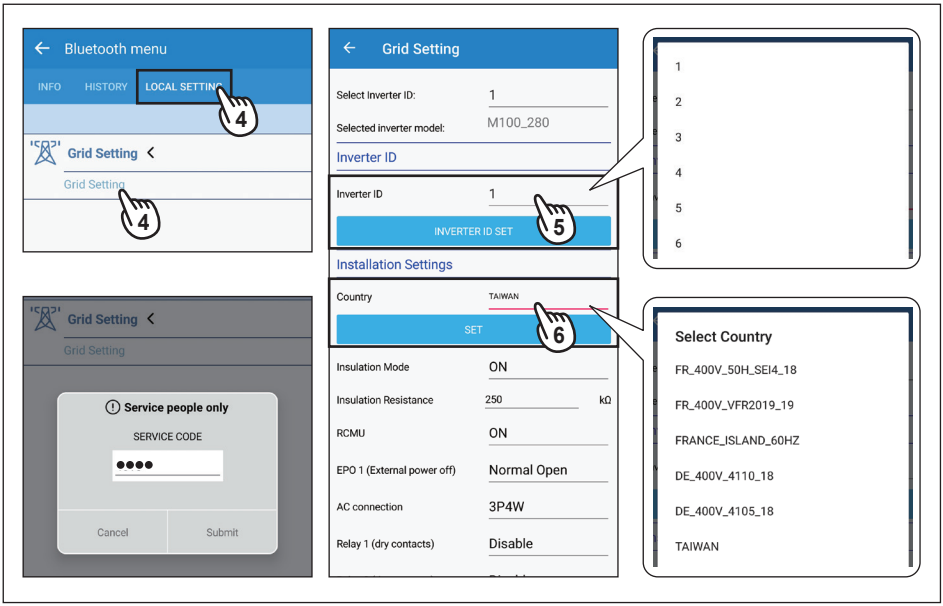


Figure 4-3: Steps to commission via bluetooth (4-7)

4.3 Commission multiple inverters – Auto ID Function

The Auto ID function can set all inverter IDs at once by DSS (Delta Solar System) or DeltaSolar APP.

- DSS

Connect the inverter through RS-485 with computer.

- APP

Connect the inverter through DC1 with mobile device.

(please refer to ***chapter 4.4*** for operation manual.)

4.3.1 Commission Setting (DSS)

① Select the corresponding model

② Click “RS485“

③ Select communication port (automatic detection by the system).

④ Click ▶

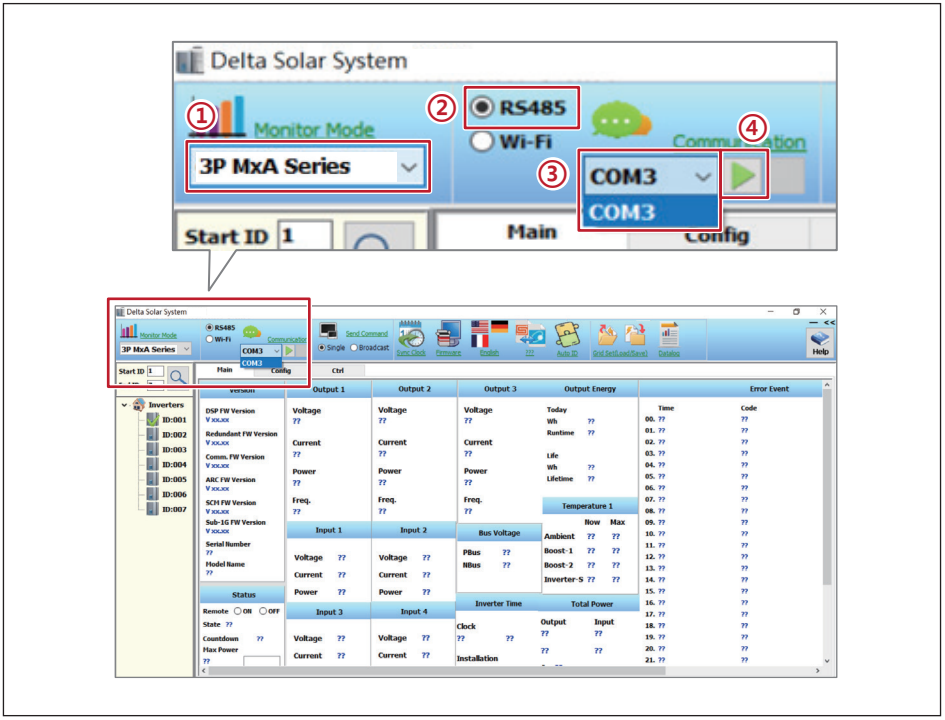


Figure 4-4: DSS Commission setting

4.3.2 Scan inverter

① Click “Auto ID  ”
② Enter numbers of inverters.
③ Click “Scan”.

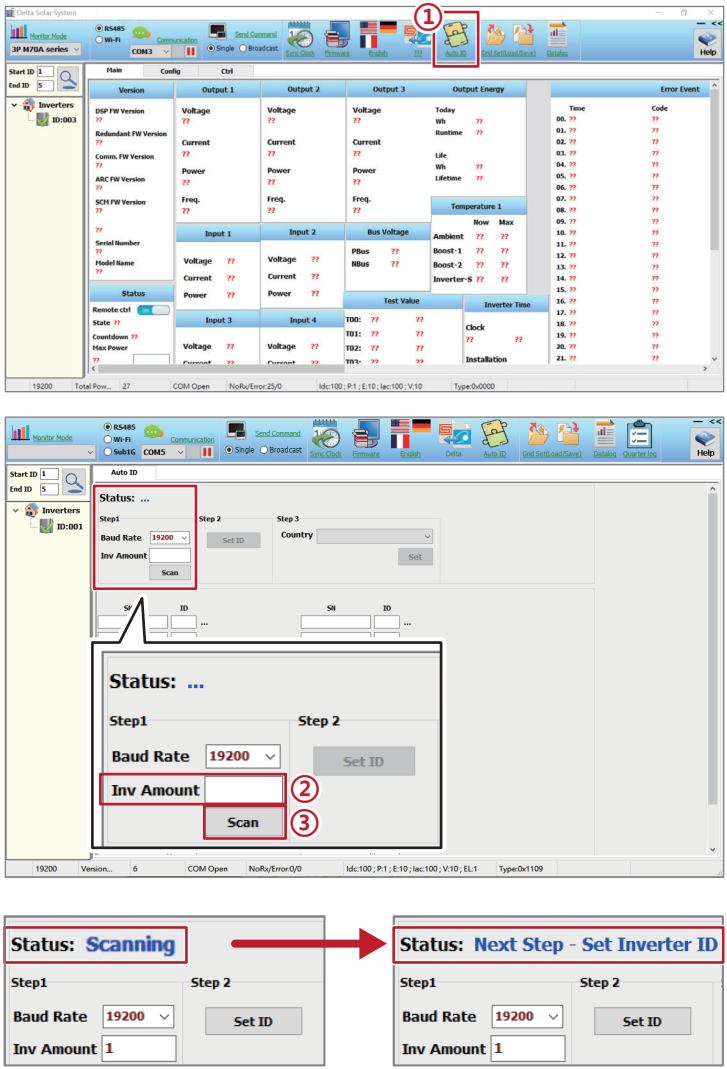


Figure 4-5: Steps of scanning inverters

4.3.3 Set ID

① The serial number of the successfully scanned device will be displayed below, the default ID can be changed.

② After ID setting is completed, click “Set ID”.

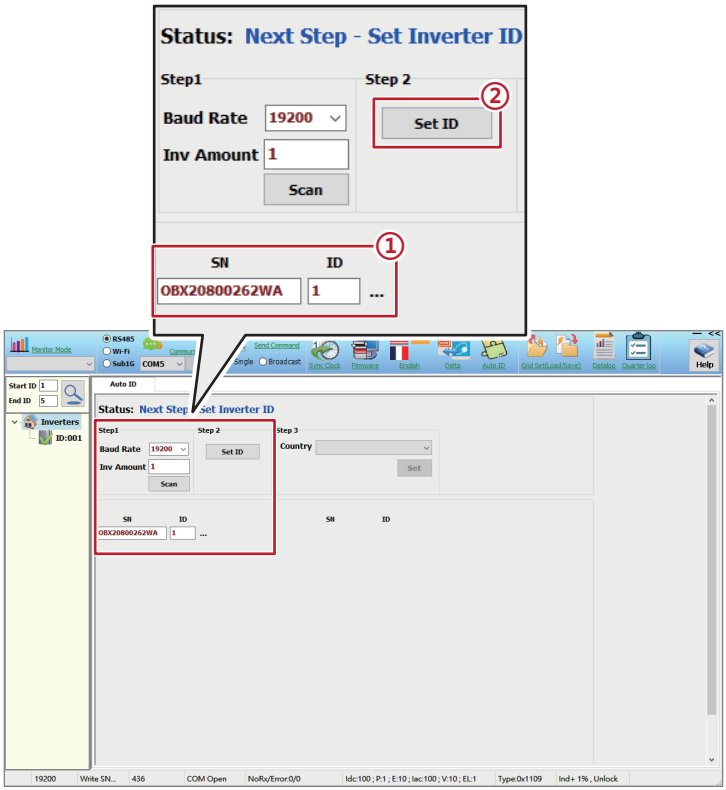


Figure 4-6: Steps of ID setting

4.3.4 Set Country

① Click to select the country of inverter.

② Click “Set”.

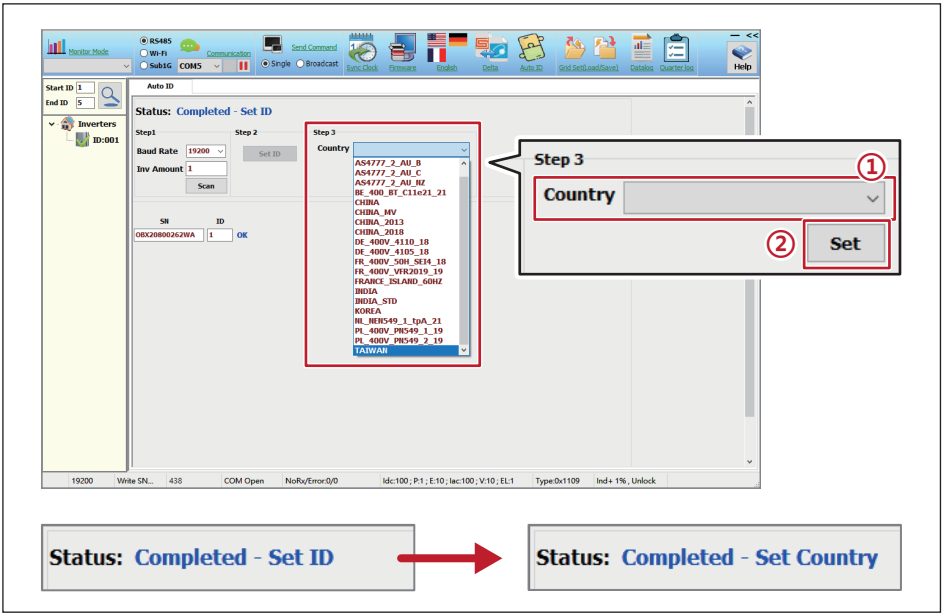


Figure 4-7: Steps of country setting

4.3.5 Synchronize time

Click “Sync Clock  ” to Synchronize time.

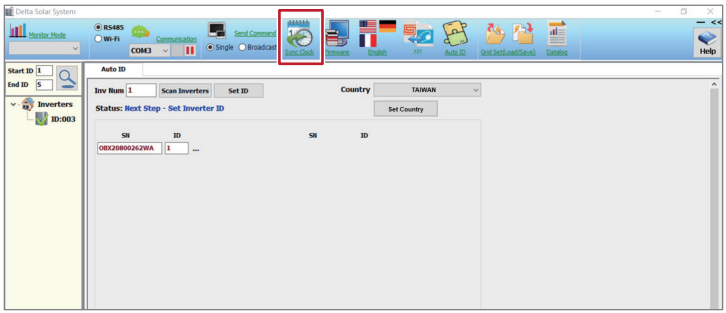


Figure 4-8: Steps of time synchronization

4.4 Delta Function Setting

Delta offers two setting tools:

DSS (Delta Solar System Software) and APP (DeltaSolar)

Function	
Active power control	Q(U) control (volt-var control)
P-F control (watt-frequecy control)	Q by night(Q setting 24/7)
P(U) control (volt-watt control)	Anti-PID
Fixed cosφ	Dry contact
Fixed Q(%)	ARC fault detection
Auto ID	Bluetooth

Please refer to the following link for operation manual.

DSS Operation Manual:

https://mydeltasolar.deltaww.com/manual/eng/SUB_1G/DSS.pdf

DeltaSolar (APP) Operation and Installation Manual:

https://mydeltasolar.deltaww.com/index.php?p=manual

5 Maintenance

Please check the unit regularly. If there are any impaired or loose parts, please contact your solar installer. Ensure that there are no fallen objects in the path of the heat outlet.

DANGER !



- Prior to beginning any maintenance procedures outside AC breaker and DC switch off to avoid risk of electrical shock!
- Do not perform maintenance operations under rainy conditions.

5.1 Open and Close the Door

In order to guarantee proper long-term operation of the inverter, the following procedures must be followed to open and close the door, refer to ***Figure 5-1.*** To fix door by hexagon driver per ***Figure 5-2.***

5.1.1 Open Door

- Do not attempt to open the door under raining condition.
- Before opening the front door, please wipe the inverter case if it is wet to avoid water seepage.
- Switch DC and AC power off and wait until LED display turns off.
- Take out the hexagonal wrench on the latch lock cover.
- Loosen 1 screw on the latch lock cover and open its.
- Use care not to contaminate the door's gasket and mating surfaces.

After opening the door, do not leave the door opened for long periods of time.

5.1.2 Close Door

Before closing the door:

1. Ensure mating surfaces and gasket are clean.
2. The gasket is properly located and aligned in its mounting slot.

When closing the door:

1. Install in reverse order according to **5.1.1** and lock on the latch locks.
2. Fully tighten the latch lock screws to 2.45 N · m of torque.

ATTENTION



- After cabling or maintenance for the inverter, please lock both toggle latch to make sure the inverter will remain IP66 protection.

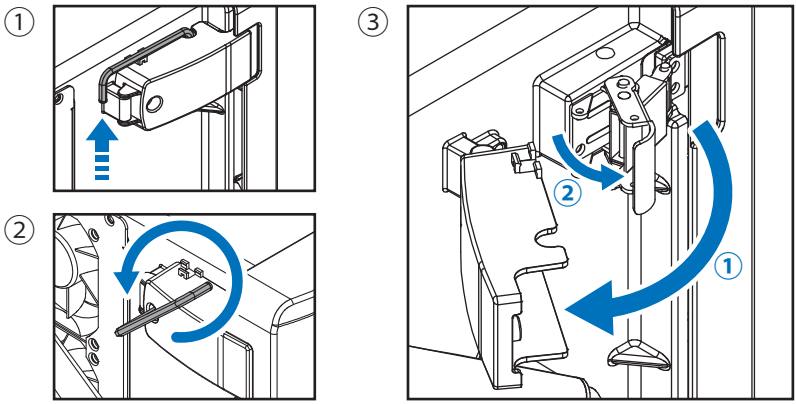
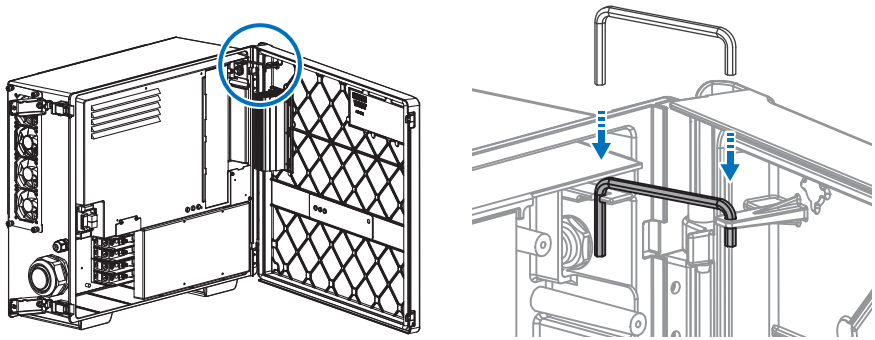


Figure 5-1: Open the door



ATTENTION

- After opening the door, please make sure the door is fixed by hexagon driver to avoid strong wind breaking it.

Figure 5-2: To secure door by hexagon driver

5.2 Replacement of Surge Protection Devices (SPD)

There has the surge protection device (SPD) at both AC and DC side as shown in ***Figure 5-3***.

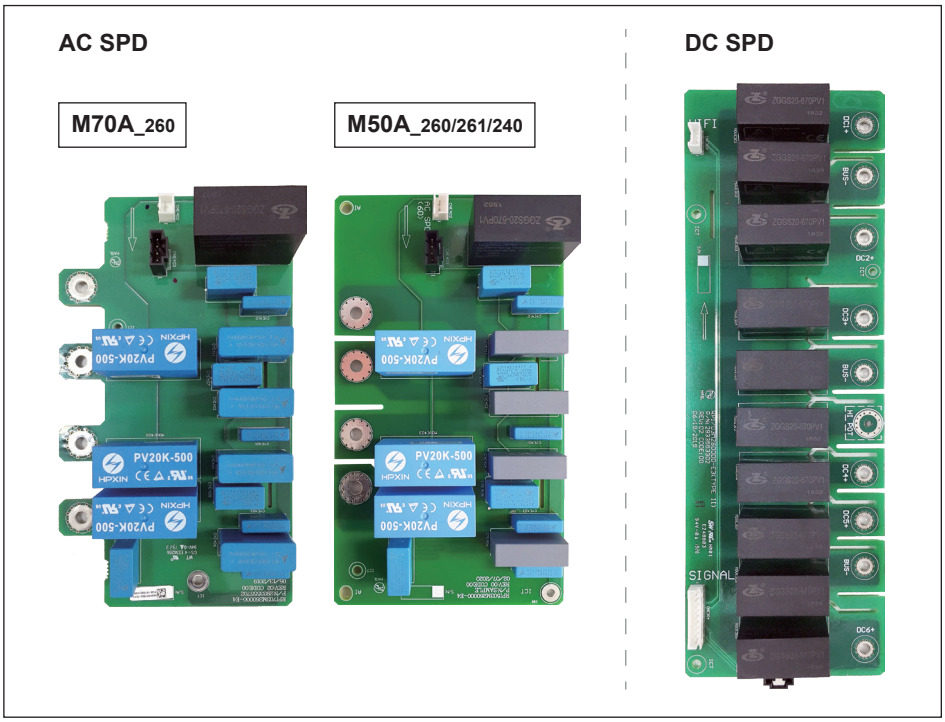


Figure 5-3: AC and DC SPD modules

Surge protection devices (SPD) are designed to protect sensitive circuit elements of the inverter from damage caused by lightning and other electrical transients/surges, as such they are sacrificial components and periodically, may need replacement.

The SPDs are located in the inverter.
If a warning message “AC Surge” or “DC Surge” appears on APP and DSS, follow the procedure below to replace the SPD.

• Determine which SPD unit is damaged. See ***Figure 5-4.***
  AC SPD/DC SPD: Show on the corner of the LED panel.



Figure 5-4: Display Indicating AC and DC SPD failure

• Accessing the door

1. Switch DC and AC power off and wait until LED display turns off.
2. ***To access the door, use procedure found in Section 5.1.1***
   Do not leave the door opened for long periods of time.

• Changing the SPD modules - use the following procedure:
The AC and DC SPD units are located as shown in ***Figure 5-5.***

• To remove the defective **AC SPD** (*Figure 5-6*)

1. Remove 4 self-retaining screws on the A cover. (screw torque: 0.8 N·m)
2. Disengage the 2 signal wiring connectors from the AC SPD PCB.
   (4-pin x 1, 2-pin x 1)
3. Remove 4 self-retaining screws which connect to AC terminal from AC SPD PCB.
4. Remove 2 self-retaining screws on the right side and left side of PCB.
5. Lift and remove the entire AC SPD PCB and replace with new unit.
6. Install the new AC SPD using the above procedure in reverse order.
   Tighten the 6 screws to a torque value shown in ***Figure 5-6.***

• To remove the defective **DC SPD** (*Figure 5-7*)

1. Remove B cover.
2. Disengage Signal, fan and Wi-Fi (option) wiring connectors from the DC SPD PCB.
3. Disengage A &G self-retaining screws from the DC SPD PCB.
4. Lift and remove the entire DC SPD PCB and replace with new unit.
5. Install the new DC SPD using the above procedure in reverse order.
   Tighten the 12 screws to a torque value shown in ***Figure 5-7.***

ATTENTION

- Please make sure the copper pillar is firmly tightened before reassembling the SPD board.

• Closing the door

To close the door, use the procedure found in Section 5.1.2

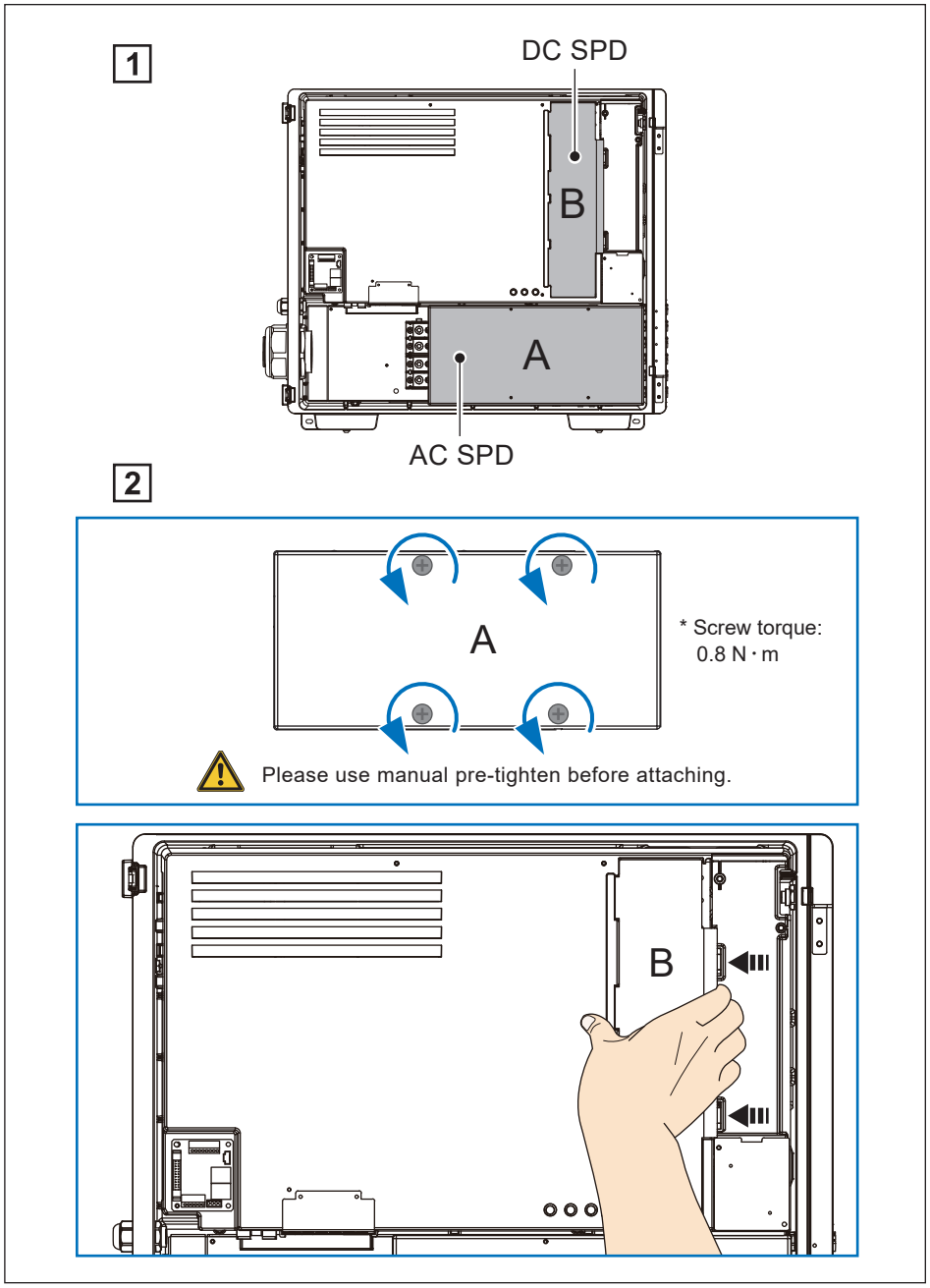


Figure 5-5: Steps of changing SPDs

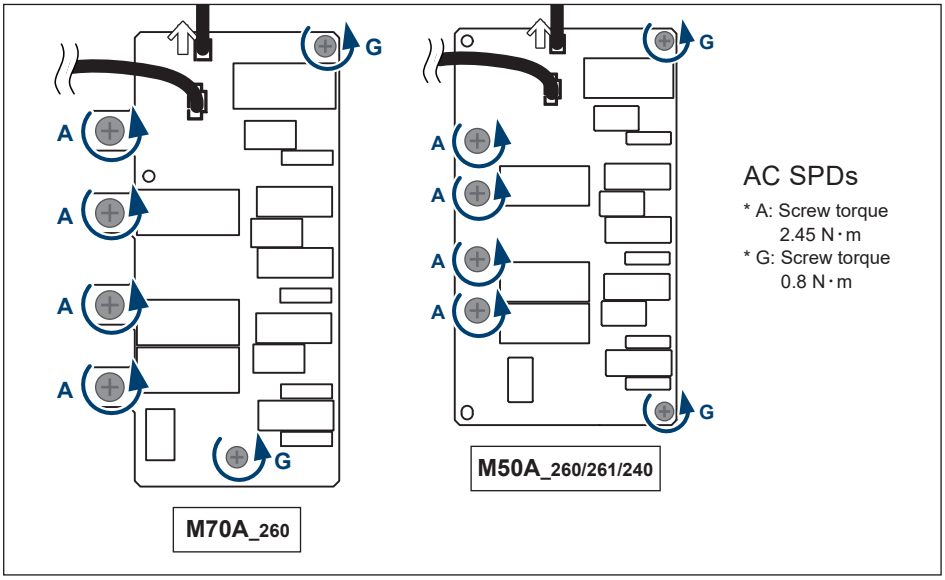


Figure 5-6: Remove wirings as connectors of AC SPD

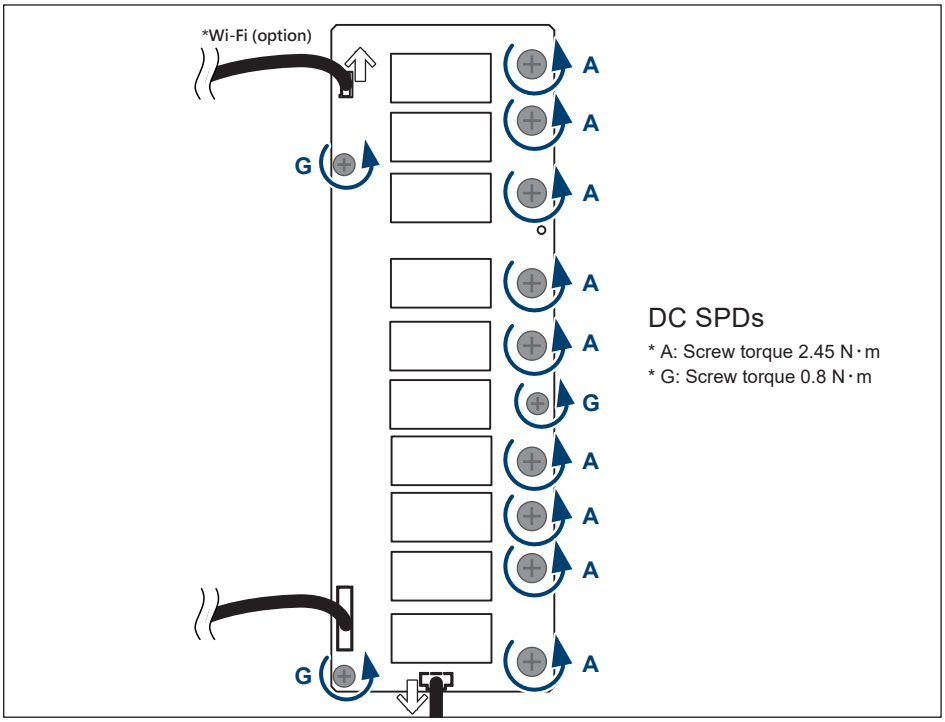


Figure 5-7: Remove wirings as connectors of DC SPD

5.3 External String Fuse

According to different local regulations, if the external string fuse is required, please contact Delta dealers.

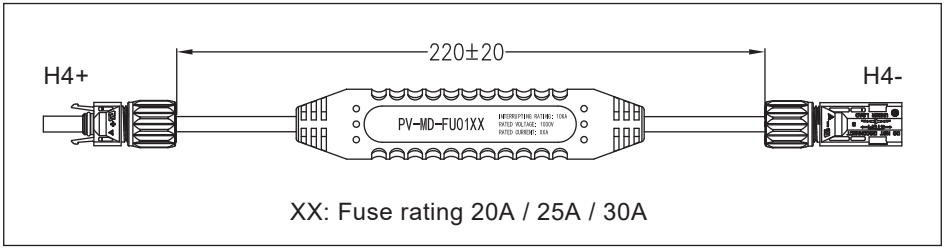


Figure 5-8: External String Fuse

5.4 Smart Fans Replacement and Filter Cleaning

M70A and M50A is provisioned with processor-controlled "smart fans" for cooling of the electronics. This section provides procedures for cleaning filters associated with these fans, and instructions for field replacement of the fans.
The system features detection of a failed fan, and generates a **"FAN-FAIL"** signal that is interfaced to the inverter control to trigger a FAN-FAIL alarm and places the inverter in a power de-rate mode as required for safe operation.

M70A and M50A has one fan tray for power module cooling and two internal fans for inside air circulation.
Figures 5-10 illustrates the PM fan locations.
Figures 5-11, 5-12, 5-13 illustrates the internal fan 1.
Figures 5-14, 5-15, 5-16 illustrates the internal fan 2.

ATTENTION

Periodic fan and filter cleaning is required to insure long life and reliability.
- The time period between cleanings depends on the quality of the environment.
- Under normal duty use, Delta recommends smart fans and filters be cleaned every 4 months
- For very dusty locations, it may be necessary to clean the fans and filters quarterly or monthly.

5.4.1 Location of failure fan for M50A_260/261/240

If the Error-code comes **"Fan Fail"**, please refer to the corresponding code shown on DSS and procedure in following chapters to remove the fan.

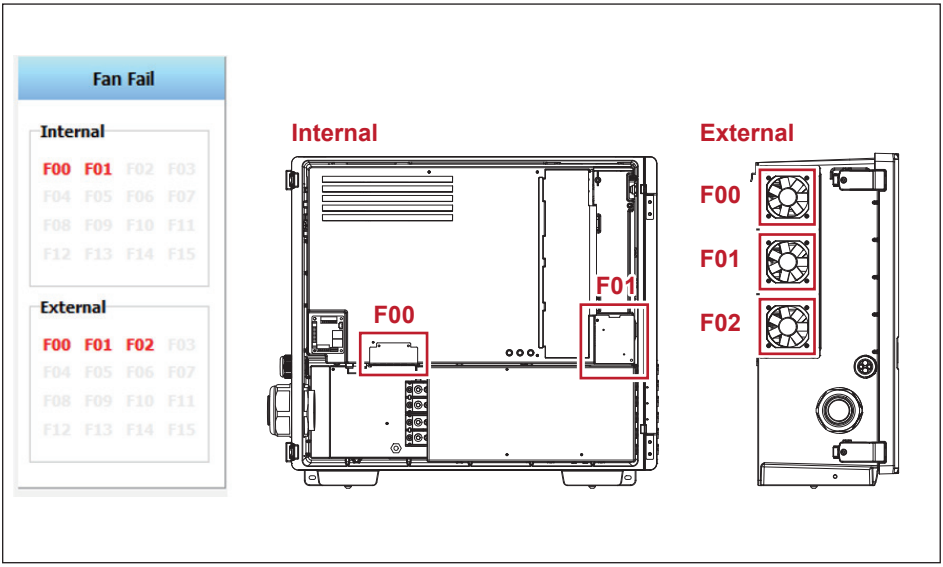


Figure 5-9: The corresponding fan location to the fan fail code on DSS

DANGER : ELECTRICAL HAZARD!!

- Prior to beginning any maintenance procedures outside AC breaker and DC switch off to avoid risk of electrical shock!

5.4.2 Power Module (PM) Fan Tray

The inverter electronics are convection cooled. The primary equipment used for this function consists of a fan tray located in a plenum within the inverter. The PM electronics are isolated, and heat is transferred to the plenum airflow via a large heatsink.

The PM fan tray is modular and holds four smart fans that operate together and also provide redundancy; the inverter will operate to full power with four fans operating and will enter a power derating mode under failure of any fan.

These fans are protected by air filters at the plenum air inlet and outlet.

Refer to ***Figure 5-10*** and follow the steps outlined below:

1.Remove four screws that secure inlet filter cover to case.
  Check filter condition on this step and clean it if necessary.
  For fan maintenance, continue to do following steps.
2.Unplug fan power connectors for each fan.
  (To release snap-fit, press location A and location B from both side .)
3.Pull fan tray out from PM chassis.
  To disassemble fan , remove four screws that secure it to fan tray.

To reassemble reverse the order of the above procedure and tighten screws to torque values indicated in ***Figure 5-10.***

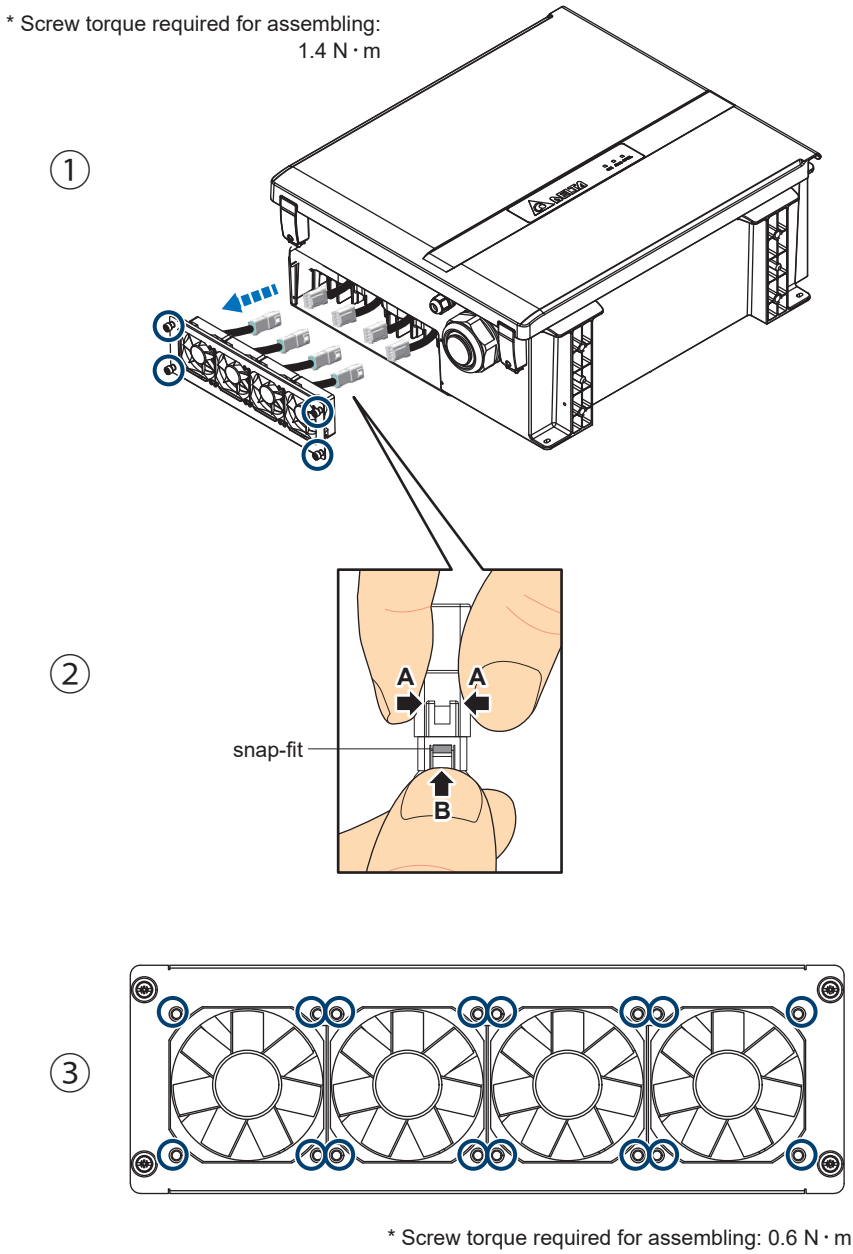


Figure 5-10: Disassembling fan tray from PM chassis

5.4.3 Internal Fan 1

If the warrning **"Fan Fail- Internal F01"** show on the DSS / APP, please follow the procedure below to remove Internal Fan 1.

(1) Remove the B cover.

(2) Loosen two self-retaining screws shown in ***Figure 5-11*** and remove the fan cabinet.

(3) Disconnect the power connector on the DC SPD board.

(4) Lift the entire fan assembly. (shown in ***Figure 5-12***)

(5) Clean assembly or replace with a new fan. (shown in ***Figure 5-13***)

(6) Reassemble using a tightening torque of 0.8 N · m.

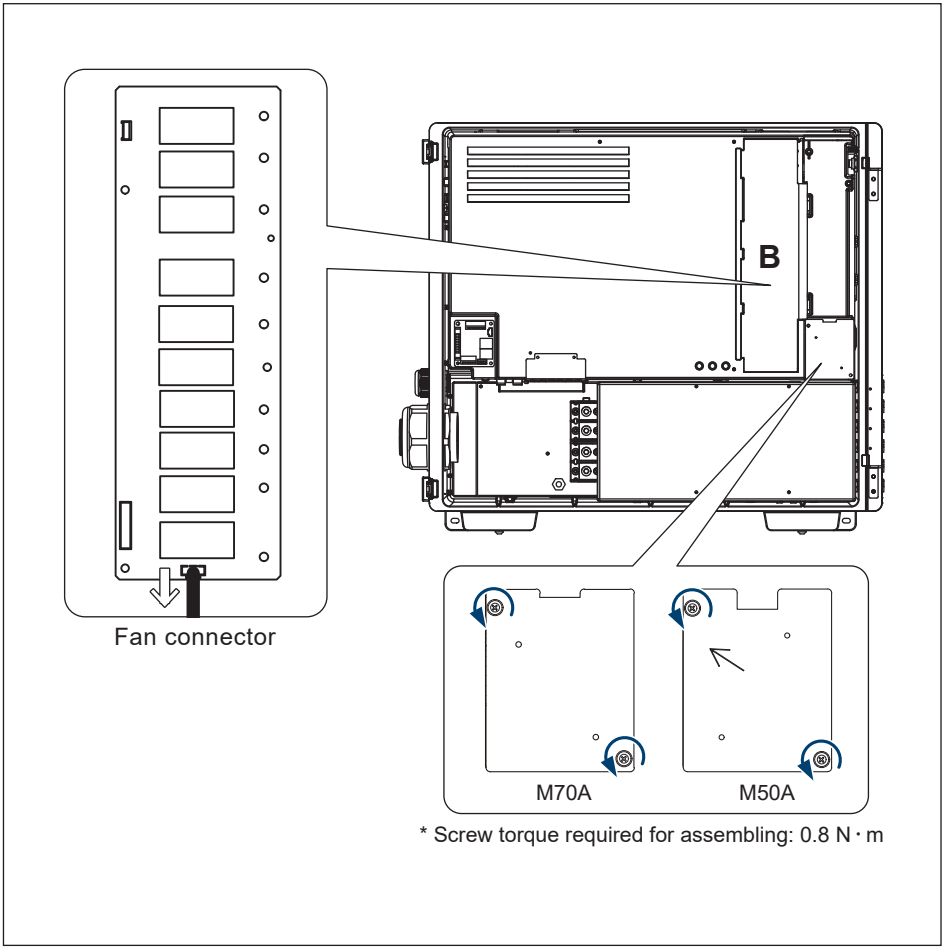


Figure 5-11: Internal fan 1 location & remove the shield cover

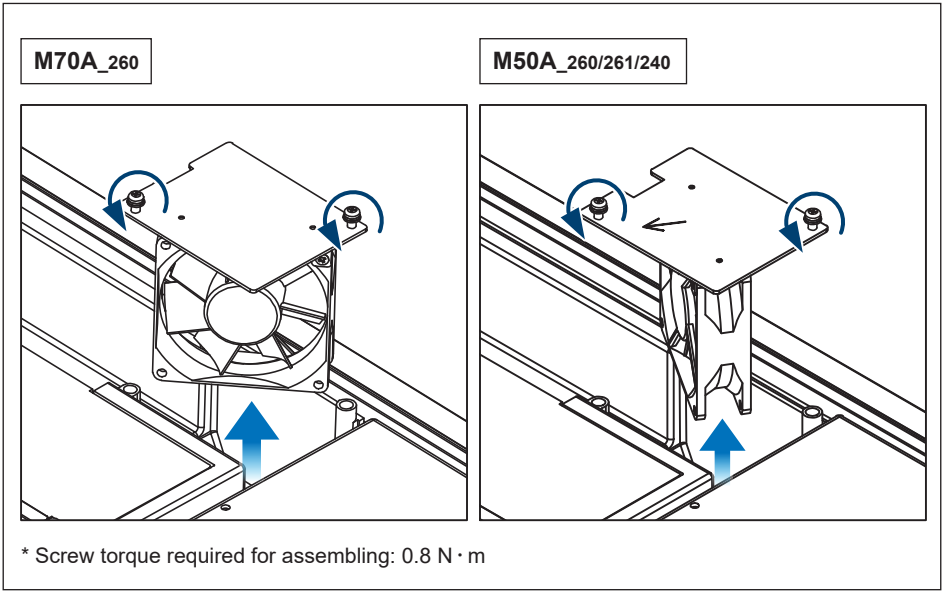


Figure 5-12: Take off the internal fan 1

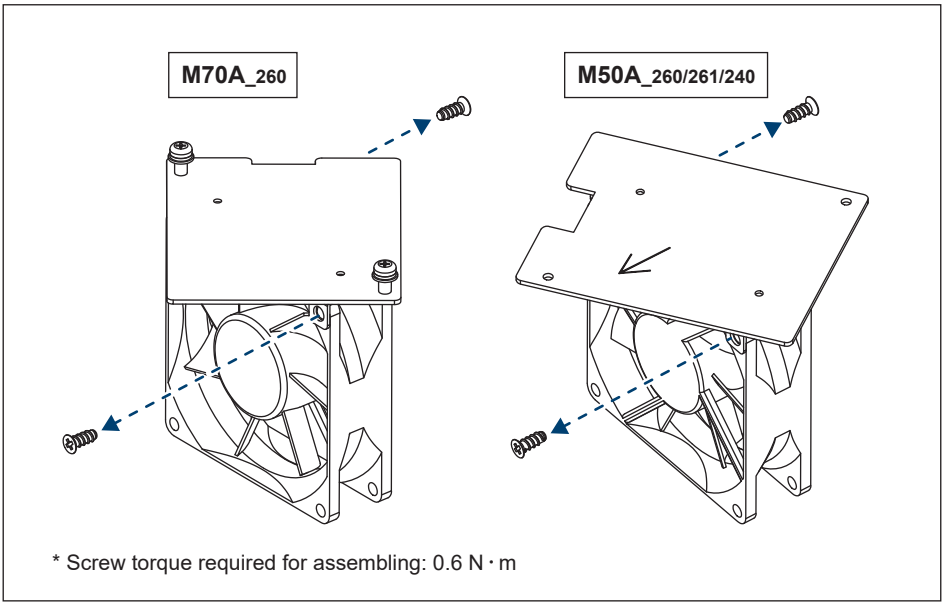


Figure 5-13: Replace with a new fan

5.4.4 Internal Fan 2

If the warrning **"Fan Fail- Internal F00"** show on the DSS / APP, please follow the procedure below to remove Internal Fan 2.

(1) Loosen two self-retaining screws shown in ***Figure 5-14*** and remove the fan cabinet.

(2) Disconnect the power connector on the comm. board.

(3) Lift the entire fan assembly. (shown in ***Figure 5-15***)

(4) Clean assembly or replace with a new fan. (shown in ***Figure 5-16***)

(5) Reassemble using a tightening torque of 0.8 N · m.

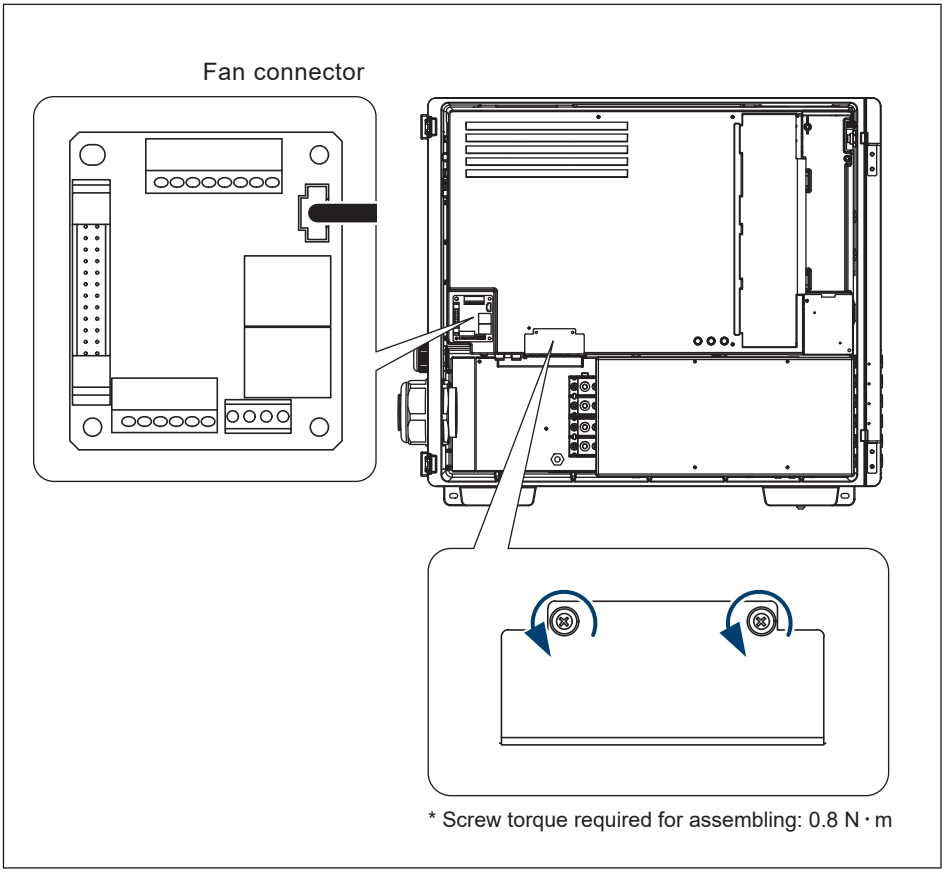


Figure 5-14: Internal fan 2 location & remove the shield cover

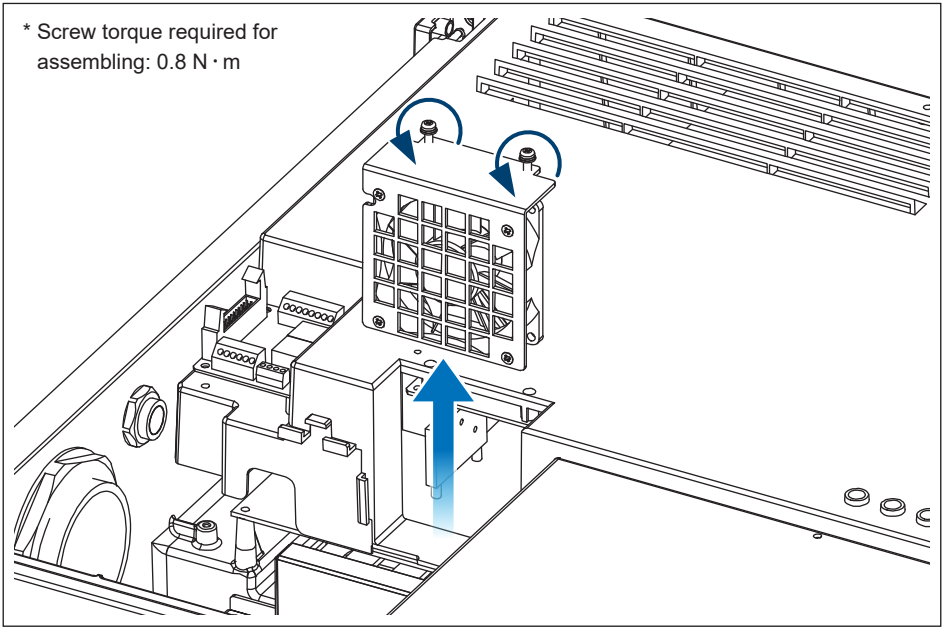


Figure 5-15: Take off the internal fan 2

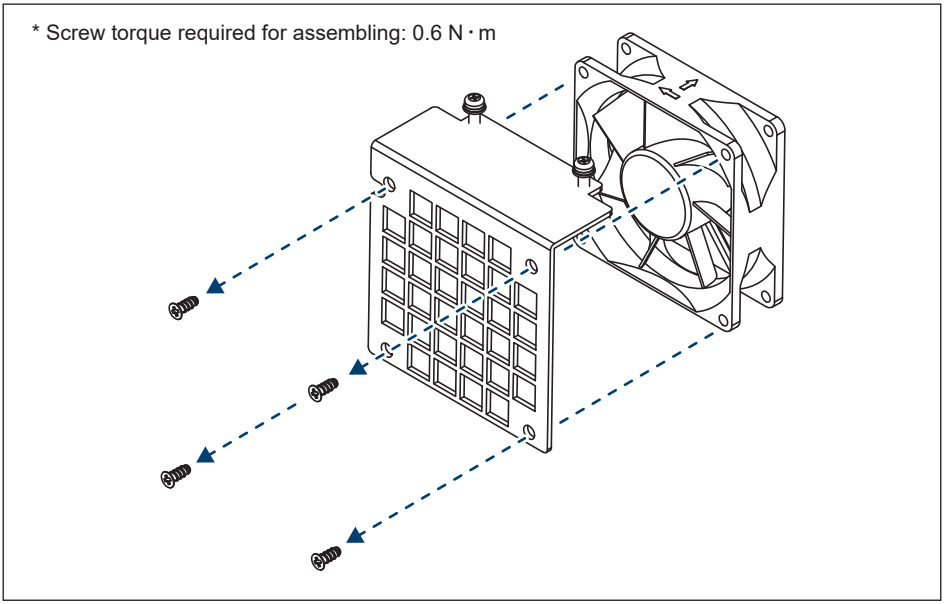


Figure 5-16: Replace with a new fan

5.5 De-Commissioning

When necessary to remove the inverter from active operation for maintenance or replacement, follow the instructions below.

DANGER : ELECTRICAL HAZARD!!



To avoid serious injury, please follow the procedure below.

- Switch off external AC circuit breaker or switch to disconnect the electrical grid from the inverter chassis.
- Switch off both DC switches to cease inverter operation.
- Use H4 wrench tool to disconnect each string from the chassis mounted H4 terminals. Remove array DC from chassis requires opening string level H4 connectors in order to break string continuity at the inverter H4 connectors are not intended for use as a load break switch, therefore:
  Ensure inverter DC switches are open and there is no DC current flow.

■ RS-485 Communication module

1. Disconnect all communications wiring from the module terminals.
2. Remove wiring from communications board assembly.

CAUTION : HOT SURFACES, DO NOT TOUCH !



- Use care not to touch hot surfaces if the inverter is just shutting down.
- Do not perform any task until the product cool down sufficiently.

CAUTION : POSSIBILE INJURY !



M70A weighs 69 kg / M50A weighs 64 kg.
There is risk of injury if the inverter is carried incorrectly or dropped during transport or when attaching or removing it from the wall mounting bracket. Personnel should wear suitable gloves to protect against injury and maintain firm control of the inverter chassis

ATTENTION



Do not leave loosen screws and nuts inside the case.

6 Error Message and Trouble Shooting

While Delta Electronics endeavors to build electronic products with high reliability standards, there may still be situations where the inverter may not operate properly. In this case, please follow the instructions in the following table to attempt to clear the fault. If the problem can't be solved, please contact customer service for technical support.

6.1 Error Codes (Field Fault)

Table 6-1A: Error Codes (Field Fault) & Messages

Message	Description	Action
AC Freq High (E01)	Grid frequency high	1. Check the utility frequency 2. Check Grid code & Grid setting
AC Freq Low (E02)	Grid frequency low	
Island (E03,E04,E05)	Islanding is detected	Check Grid breaker
AC phase jump (E06)	Phase jump of Grid voltage	If repeated occurrence, contact customer service for technical support
Grid Quality (E07)	Non-linear load in Grid and near to inverter	***If repeated occurrence, contact customer service for technical support***
AC phase abnormal (E08)	Wrong connection in AC plug	Check the AC connection in accordance with the user manual
No Grid (E09)	1. AC breaker is OFF 2. Disconnect in AC plug	1. Switch on AC breaker 2. Check the connection in AC plug and make sure it connects to inverter
AC Volt Low (E10)	1. Actual utility voltage is under the UVR setting 2. Incorrect Grid Code or Grid setting 3. Wrong connections in AC plug	1. Check the utility voltage within the suitable range 2. Check Grid code & Grid setting 3. Check the connection in AC plug
AC Volt High (E11)	1. Actual utility voltage is over the OVR setting 2. Incorrect Grid Code or Grid setting	
EPO (E25)	EPO is operated by user	Release the EPO button
DC Voltage High (E30)	Input voltage is over 1000Vdc	Modify the solar array setting, and make the Voc less than 1000Vdc
Insulation Fault (E34)	Insulation problem of PV array to ground	1. Check if panel enclosure ground conpletely 2. Check if inverter ground conpletely 3. Check if the DC breakers get wet
Remote OFF (E36)	Remote OFF by external communication	Check if remote OFF function is active

6.2 Fault Codes (Inverter Fault)

Table 6-2A: Fault Codes (inverter fault) & Messages		
Message	**Description**	**Action**
DC Injection (F01,F02,F03,F04)	Utility waveform is abnormal	***Contact customer service for technical support***
Temperature High (F05)	The internal ambient temperature is over limit	Check the installation ambient and environment
Amb Temp Fault (F06)	Ambient temperature detection failure	***Contact customer service for technical support***
Temperature Low (F07)	The internal ambient temperature is under limit	Check the installation ambient and environment
Boost Temp Fault (F08)	Boost module temperature detection failure	***Contact customer service for technical support***
Bidir. Temp Fault (F09)	The boost/bidir. NTC temperature	***Contact customer service for technical support***
Inveter Temp Fault (F10)	Inverter module temperature detection failure	***Contact customer service for technical support***
AC RLY Fault (F13)	1. Defective relay driver circuit 2. Relay(s) failure	***Contact customer service for technical support***
FW Unmatch (F14)	Firmware Incompatibility	***Contact customer service for technical support***
AC Sensor Fault (F15)	Auxiliary power circuit failure	1. Check the polarity of PV connection (if the error code comes along with **W08**) ***2. Contact customer service for technical support***
Vdc Sensor Fault (F16)	DSP Vdc sensor circuit defective	***Contact customer service for technical support***
Idc Sensor Fault (F17)	Auxiliary power circuit failure	1. Check the polarity of PV connection (if the error code comes along with **W08**) ***2. Contact customer service for technical support***
AC Sensor Fault (F18)	Auxiliary power circuit failure	***Contact customer service for technical support***
Idc Sensor Fault (F19)	Auxiliary power circuit failure	***Contact customer service for technical support***
Red COMM Fault (F22)	The internal communication connection is disconnected	***Contact customer service for technical support***

Table 6-2B: Fault Codes (inverter fault) & Messages		
Message	**Description**	**Action**
DSP COMM Fault (F23)	The internal communication connection is disconnected	Check the connection interface RS-485
Ground Cur. High (F24)	Insulation problem of PV array to ground	1. Check the insulation of Solar inputs 2. ***Contact customer service for technical support***
Iac Unbalance (F26)	1. Power line is disconnected 2. Current feedback circuit is defective	Check the connection in AC plug
RCMU Fault (F27)	RCMU circuit is disconnected	***Contact customer service for technical support***
AC RLY Short (F28)	Grid relay short	***Contact customer service for technical support***
AC RLY Open (F29)	Grid relay open	***Contact customer service for technical support***
Bus Unbalance (F30)	Voltage unbalance of DC link	Restart inverter by DC switch
Bus Voltage High (F31, F32, F33 F34, F35)	High bus capacitor voltage	1.Restart inverter by DC switch 2.Check the solar array setting, and make sure the Voc less than Max. Vdc of Inverter (if the error code comes along with E30)
AC Current High (F36,F37,F38 F39,F40,F41)	Surge occurs during operation	***Contact customer service for technical support***
AC CT Fault (F42,43,44)	Phase R / S / T CT is defective	***Contact customer service for technical support***
AC Current High (F45)	AC current over range	Restart the inverter by DC switches
ZC Circuit Fault (F50)	The zero crossing circuit is defective	***Contact customer service for technical support***
Inv Circuit Fault (F51)	The inverter circuit is defective	***Contact customer service for technical support***
Boost Circuit Fault (F52)	The boost circuit is defective	***Contact customer service for technical support***
Arc circuit fail (F58)	1. AFCI is not installed 2. AFCI self-test is fail	Check the AFCI detection circuit board for making sure it is connected correctly
Arc fault (F59)	The inverter detects arcing occurs	1. Check if there are any cable damaged at DC side. 2. Replace DC cable and unlock the Arc fault from DSS 3. ***Contact customer service for technical support***

Table 6-2C: Fault Codes (inverter fault) & Messages		
Message	**Description**	**Action**
DC Current High (F60,F61,F70,F71)	DC current over range	Restart inverter by DC switches
Ext COMM. Fault (F74)	The external communication connection is disconnected	1. Check the connection between external unit and COMM 2. ***Contact customer service for technical support***

6.3 Warning Codes (Field Warning)

Table 6-3A: Warning Codes (Field warning) & Messages		
Message	**Description**	**Action**
De-rating (W07)	1. Over temperature 2. Power Limit function 3. Power vs. Frequency function 4. P(V) function 5. Grid Voltage low 6. Solar Voltage low 7. Solar Voltage High 8. Ramp up function	1. Check the installation ambient and environment 2. Check Grid Code & Grid setting 3. Check the utility frequency on the inverter terminal 4. Check the utility voltage on the inverter terminal 5-1. Check the utility voltage on the inverter terminal 5-2. Check reactive power setting 6. Check the Solar voltage on the inverter terminal 7. Check the Solar voltage on the inverter terminal 8. Check Ramp up setting
String fault (W08)	1. Polarity of DC connectors is incorrect 2. String current monitoring function is fail	1. Check the polarity of PV connection 2. Restart DC switch and AC breaker ***3. Contact customer service for technical support***
String Current Low (W23)	Disconnection in DC connectors	1. Check String Connector and Fuse 2. ***Contact customer service for technical support***

6.4 Warning Codes (Inverter Warning)

Table 6-4A: Warning Codes (inverter warning) & Messages		
Message	**Description**	**Action**
Fan Fail (W11)	1. One or more fans are locked 2. One or more fans are defective 3. One or more fans are disconnected	***Contact customer service for technical support***
DC SPD Fault AC SPD Fault (W17) (W18)	1. One or more SPD are defective 2. One or more SPD are disconnected	1. Replace the defective SPD 2. Check the connections of SPDs
Aux Power Fault (W19)	The AC Aux power is fail	***Contact customer service for technical support***
Boost Circuit Fault (W30)	The boost circuit defective	***Contact customer service for technical support***

7 Technical Information

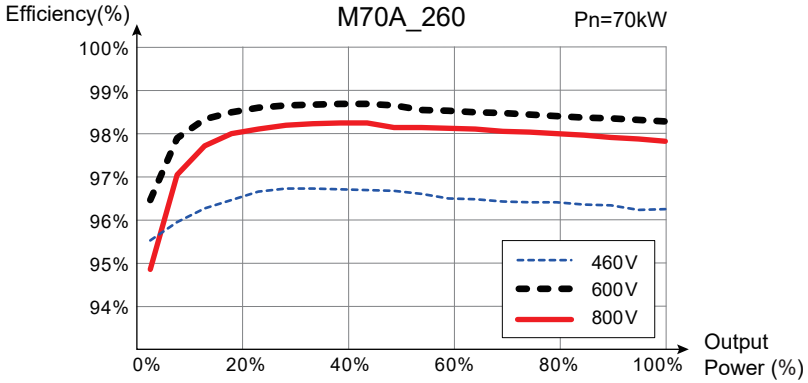
Model	M70A_260	M50A_260	M50A_260 (Korea) M50A_261	M50A_240
DC Input				
Occasionally max. voltage	1100 V *1		1000 V	
Operating Voltage Range	200 - 1000 V			
MPP Voltage Range (Full Power)	460 - 900 V *2	390 - 900 V *3	390 - 800 V *3	410 - 800 V *4
Start Voltage	> 250 V			
Rated Voltage	600 V			
Max. Input Current	156A(26A/MPPT)	132 A (26A*5 /MPPT)		128A(32A*5/MPPT)
Max. Input Power	15.7kW /MPPT	11.7kW /MPPT		15.2kW /MPPT
Max. allowable array Isc	50A			
MPP Tracker	6			4
Connection Type	2 strings /MPPT 3 strings /MPPT H4 DC Connector	2 strings /MPPT H4 DC Connector		
DC Switch	Built-in			
String Monitoring	Built-in			
Arc Fault Detection	Built-in			
Surge Protection	Type II SPD(built-in) ; Type I+II SPD(optional)			
AC Output				
Rated Output Power	70kW	50kW		
Max. Output Power	77kVA *6 (77kW when PF=1)	55kVA *6 (55kW when PF=1)	55kVA *6 (50kW when PF=1)	
Max. Output Current	111.6A	83A		
Rated Voltage	3 Ph 220 / 380V, 230 / 400V Y or Δ			
Operating Voltage Range	80% to 130% of Nominal AC Voltage			
Operating Frequency Range	50 / 60Hz ± 5Hz			
Power Factor	0.8 ind - 0.8 cap (Adjustable)			
Surge Protection	Type II SPD(built-in) ; Type I+II SPD(optional)			
T.H.D	< 3%			
Night Time Consumption *7	< 3.5 W			

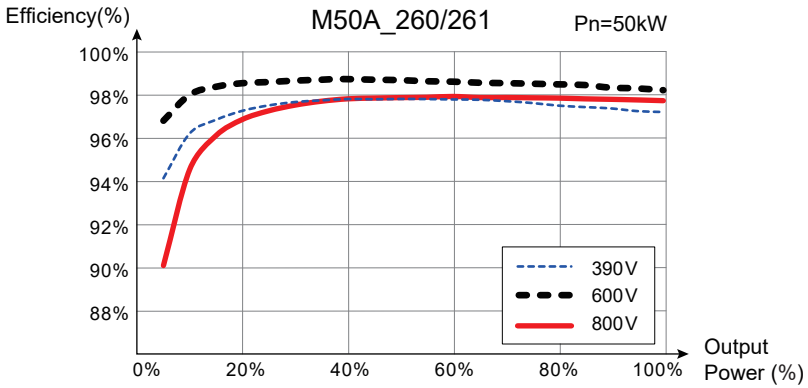
*1 The max withstand voltage is 1100Vdc. (inverter stop output when input is over 1000Vdc)
*2 AC 400V - Ambient < 35°C: 460 - 900V ; Ambient < 40°C: 460 - 800V ; Ambient < 50°C: 520 - 720V
AC 380V - Ambient < 35°C: 490 - 820V ; Ambient < 40°C: 490 - 800V ; Ambient < 50°C: 520 - 720V
*3 Ambient < 40°C: 390 - 900V ; Ambient < 50°C: 390 - 850V
*4 Ambient < 40°C: 410 - 900V ; Ambient < 50°C: 470 - 850V
*5 M50A_260(korea): Idc max. /string =13A ; M50A_261: Idc max. /string =20A ; M50A_240: Idc max. /string =20A
*6 Ambient < 40°C
*7 Night time consumption with standby communication.

Model	M70A_260	M50A_260	M50A_260 (Korea) M50A_261	M50A_240
Efficiency				
Peak efficiency	98.8 %	98.7 %		
Euro efficiency	98.4 %	98.3 %		
Information				
Communication Port (built-in)	RS-485 / Bluetooth			
Regulation				
	IEC 62109-1/-2 EN 61000-6-2 EN 61000-6-3 VDE-AR-N 4105 VDE 0124-100	VDE-AR-N 4110 NB/T 32004: 2018 GB/T 19964: LVRT CNS 15382	KN 62920 KS C 8567 KS C 8565	
General Data				
Operating Temp. Range	-25 to +60°C			
Protection Level	IP66			
Operating Elevation	< 4000 m			
Cooling	Smart fan air cooling			
Noise	67.3 dBA @1m,Amb25°C	65 dBA @1m, Amb25°C		
Dimension (W x H x D)	699 x 629 x 264 mm			
Weight	69 kg	64 kg		

Efficiency

Output voltage at 400Vac





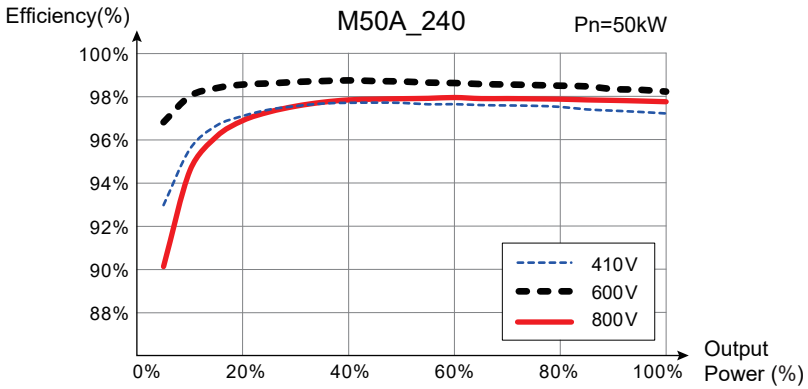


Figure 7-1: Efficiency Curve

Power Derating Curve with Ambient Temprature

Output voltage at 230Vac / 400Vac | PF=1

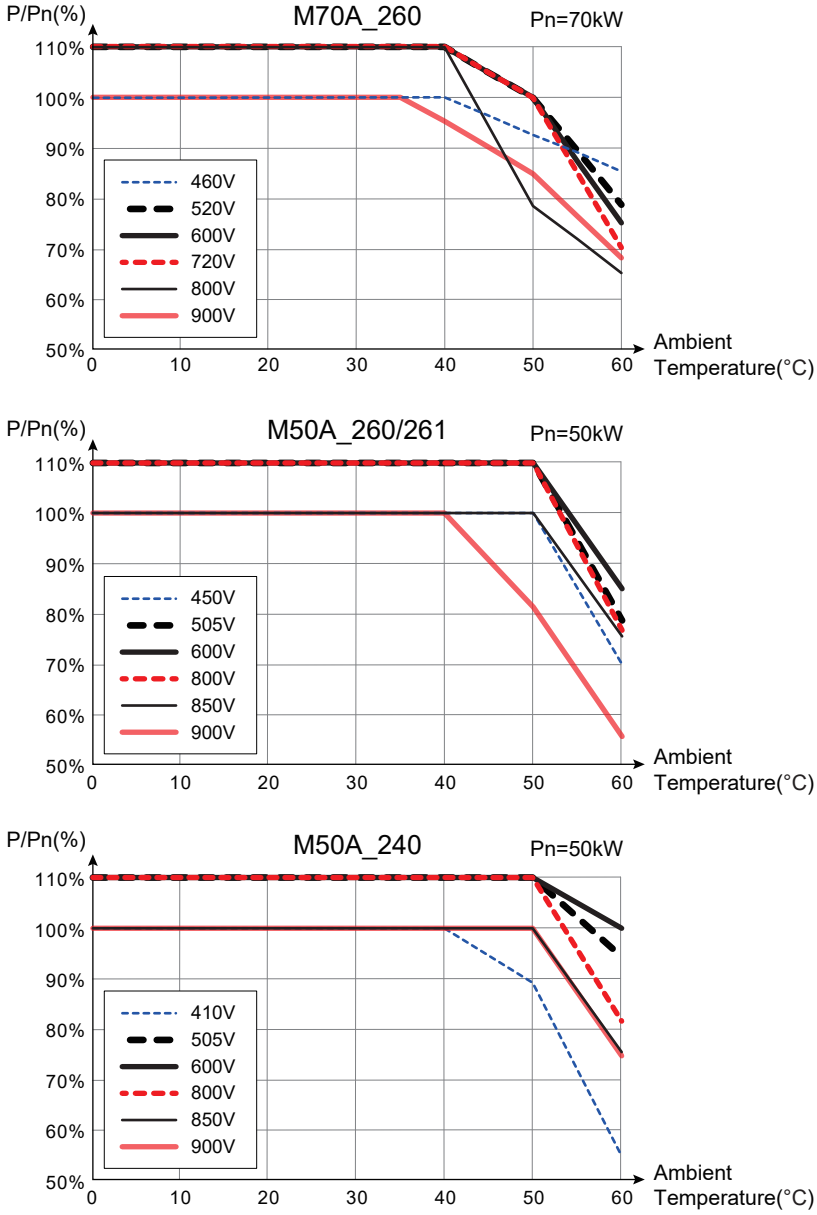


Figure 7-2: Power Derating Curve with Ambient Temprature (PF=1)

Power Derating Curve with Ambient Temprature

Output voltage at 230Vac / 400Vac | PF=0.9

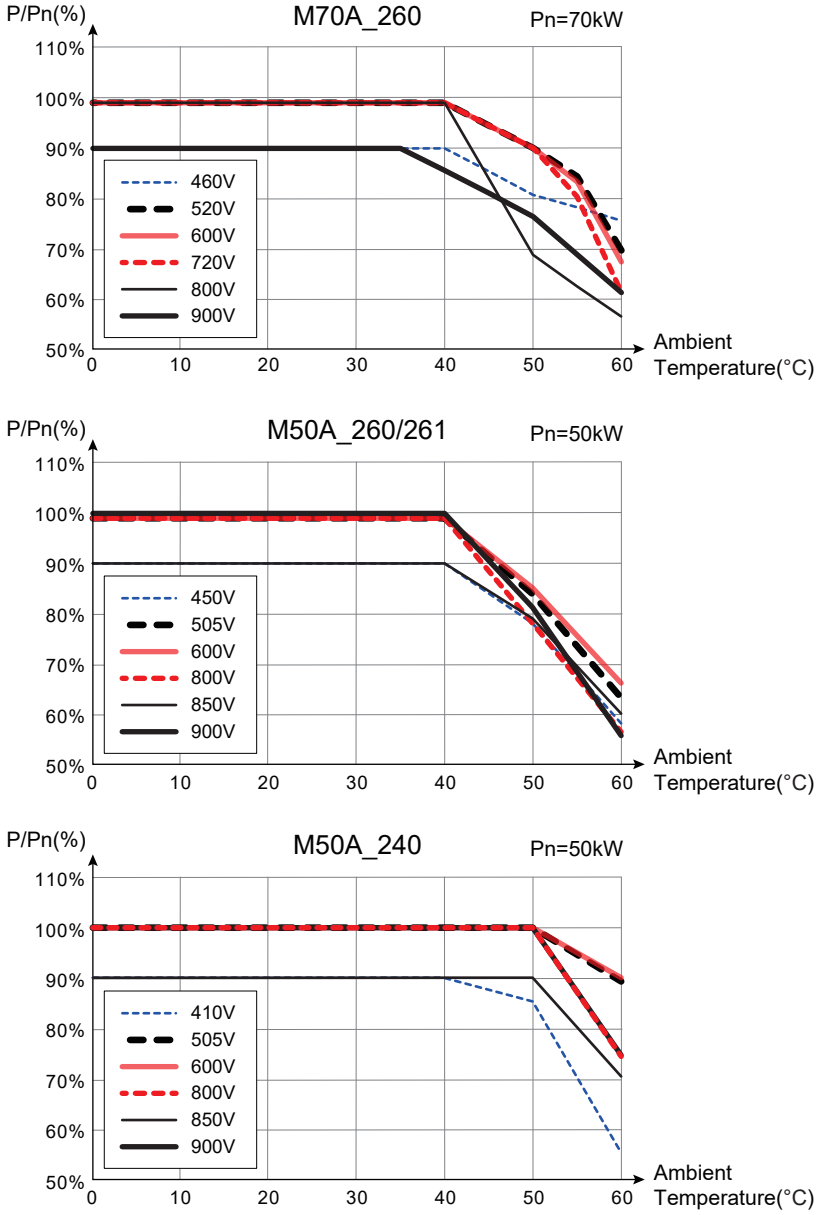


Figure 7-3: Power Derating Curve with Ambient Temprature (PF=0.9)

Apparent Power Derating Curve with Ambient Temprature

Output voltage at 230Vac / 400Vac | PF=0.9

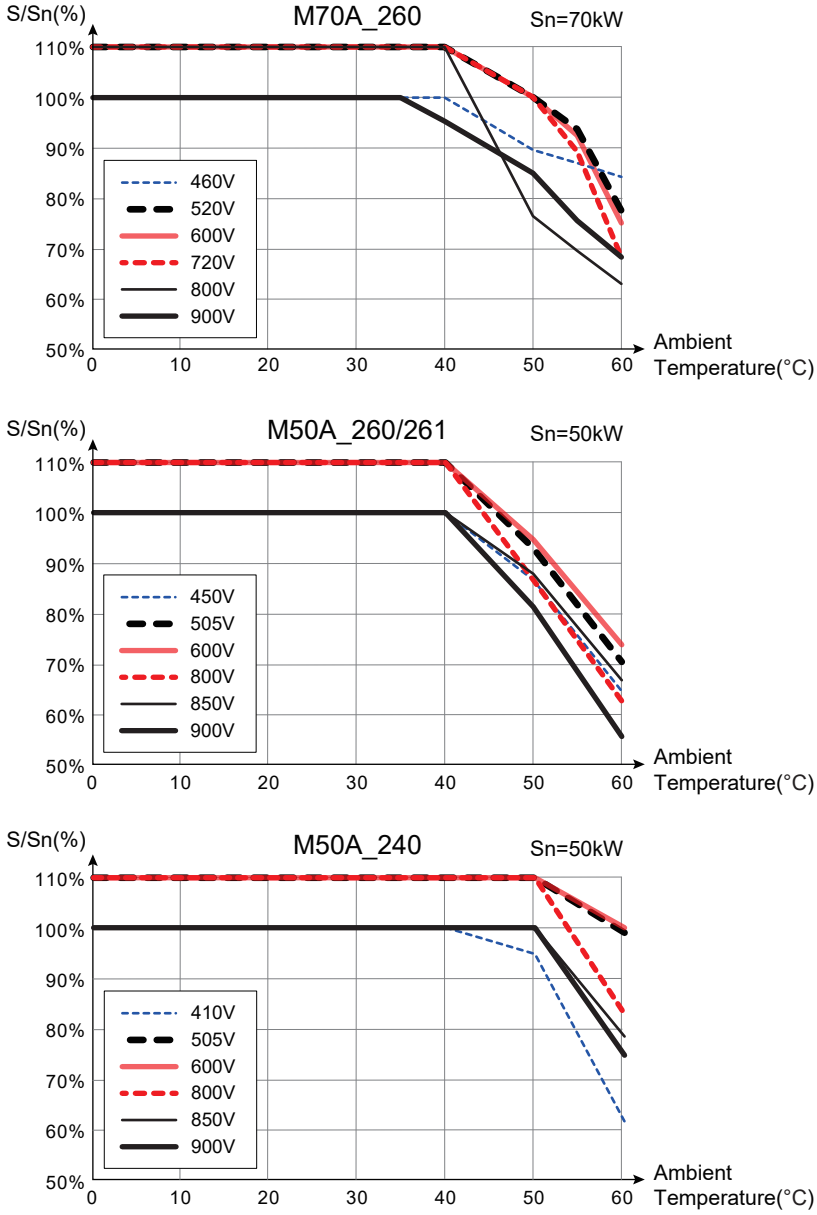
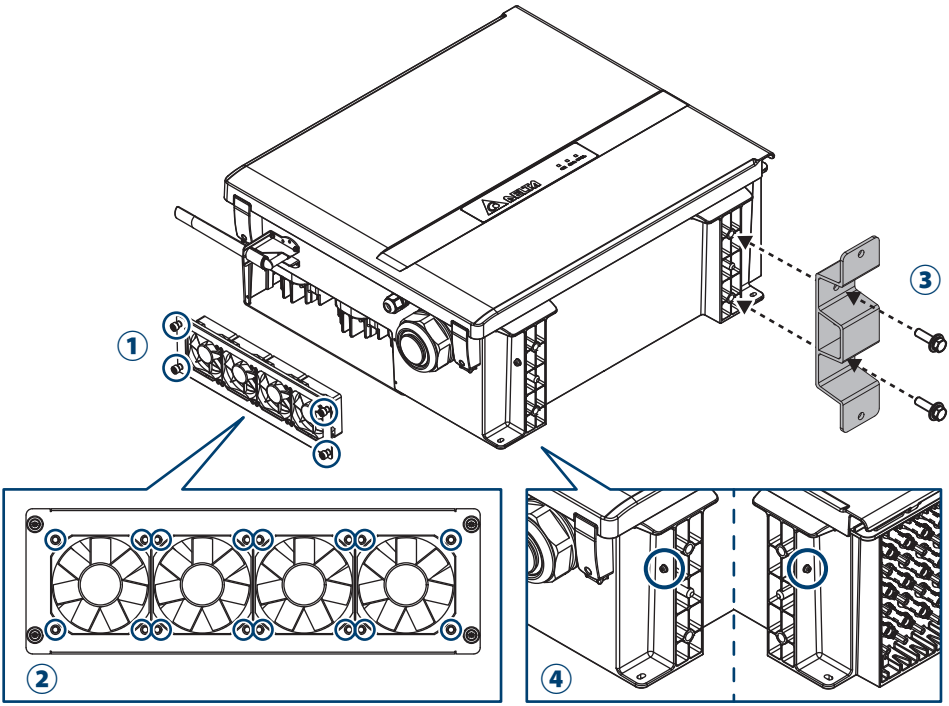


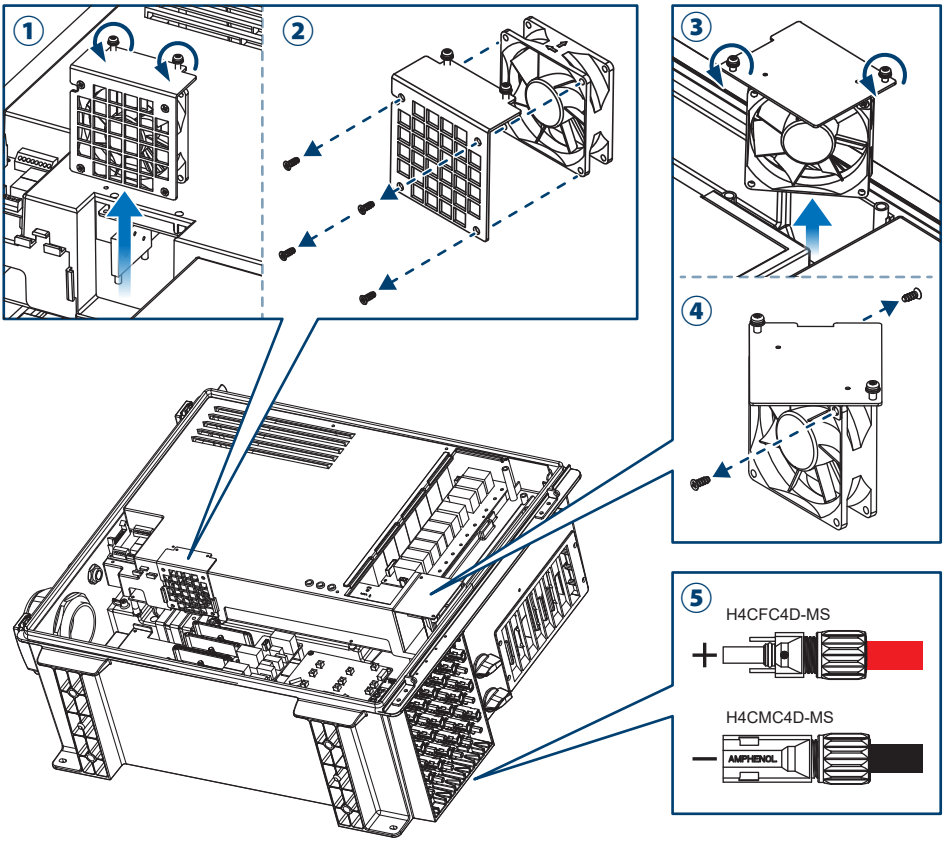
Figure 7-4: Apparent Power Derating Curve with Ambient Temprature (PF=0.9)

Appendix: Assembly Note



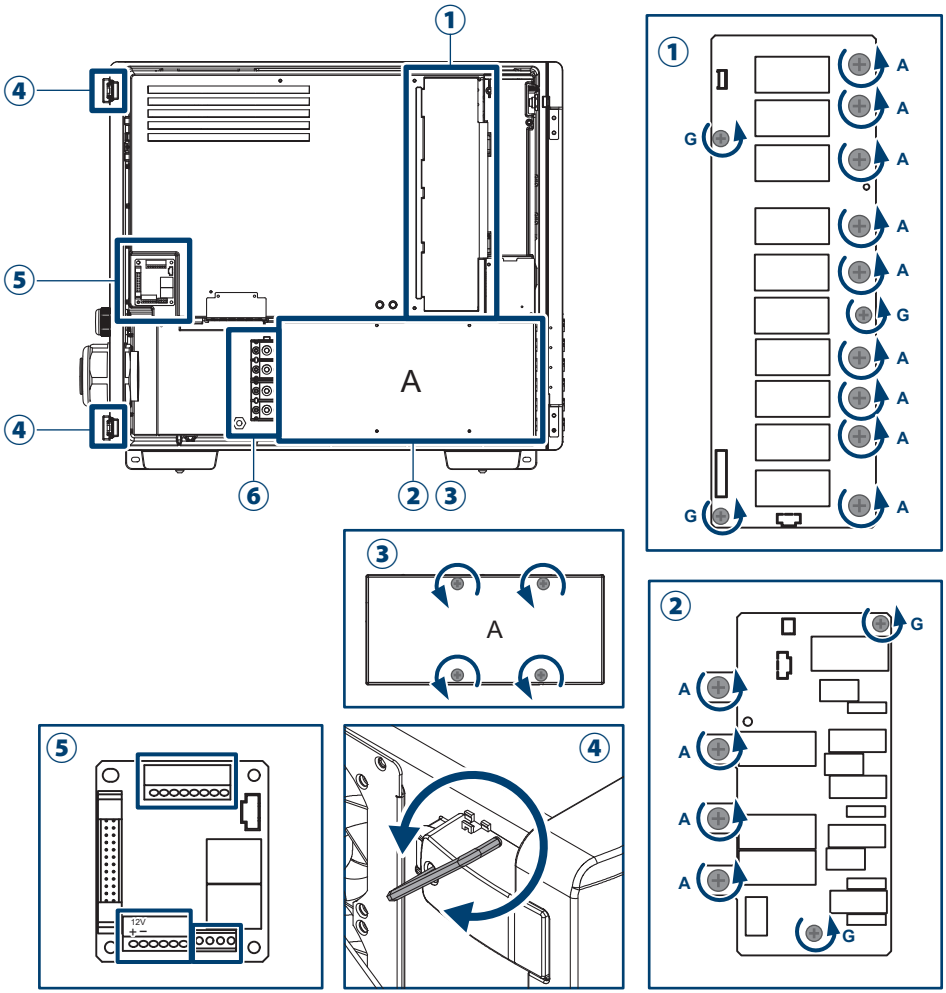
Appendix-1: Assembly Note-1

NO	Location	Screw torque
1	Filter	14 kgf-cm (1.4N·m)
2	Fan Tray	6 kgf-cm (0.6N·m)
3	Grounded Bracket	250 kgf-cm (24.5N·m)
4	Grounding (M6)	40 kgf-cm (3.9N·m)



Appendix-2: Assembly Note-2

NO	Location	Screw torque	Conductor cross-section
1	Internal Fan 2 Cover	8.0 kgf-cm (0.8N · m)	-
2	Internal Fan 2 Tray	6 kgf-cm (0.6N·m)	-
3	Internal Fan 1 Cover	8.0 kgf-cm (0.8N · m)	-
4	Internal Fan 1 Tray	6 kgf-cm (0.6N·m)	-
5	H4 wire	-	12/10 AWG (4/6mm²)



Appendix-3: Assembly Note-3

NO	Location		Screw torque	Conductor cross-section
1	DC SPD board		A: 25 kgf-cm (2.45N·m) G: 8.0 kgf-cm (0.8N·m)	-
2	AC SPD board			
3	AC Cover		8.0 kgf-cm (0.8N·m)	-
4	Toggle Latch		25 kgf-cm (2.45N·m)	-
5	Communication port		-	20 AWG (0.5mm²)
6	AC terminal	L1, L2, L3, N	M70A: 317 kgf-cm (31N·m)	M70A Cu: 35 mm² (1 AWG) ~ 120 mm² (250 kcmil) Al: 60 mm² (2/0 AWG) ~ 120 mm² (250 kcmil)
			M50A: 126 kgf-cm (12.4N·m)	M50A Cu: 25 mm² (2 AWG) ~ 60 mm² (2/0 AWG) Al: 35 mm² (1 AWG) ~ 60 mm² (2/0 AWG)
		PE	150 kgf-cm (14.7N·m)	



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