



Grid-tie Transformerless Solar Inverter

M60U_260
Operation and Installation Manual

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1 Safety

1.1 Information of the Inverter

1.1.1 Legal Provisions

Copyright – Delta Electronic, INC. All rights reserved.

This manual accompanies our product and is intended for use by qualified installers and customers. This manual's technical instructions and illustrations are to be treated as confidential. No part may be reproduced without the prior written consent of Delta Electronics Inc. End users may not divulge the information contained herein or use this manual for purposes other than those strictly connected with the correct use of this purpose.

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 how it is operated.
- Trained in the installation and commissioning of electrical devices and installations.
- Trained 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 to ensure the long-term operation of the solar inverter, it is essential to carefully read this section and fully understand all safety instructions before using the inverter.

This user manual provides important instructions for the Delta inverter, which has been designed, tested, verified, and certified according to international safety requirements, certifications, and standards; however, precautions must be taken 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 on the grid side which is following to isolate 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. To function properly, any PV array connected must have its PV circuits isolated from the ground, i.e., do not bond either side of the array to the 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, and L3 terminals to the ground; to do so will damage the inverter and void the product warranty.

1.2.1 Condition of Use

- M60U_260 is a transformerless solar inverter with 6 MPP tracking inputs, 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 10 μ F.
- 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 when unheeded can lead to death or serious injury.

CAUTION : HOT SURFACES, DO NOT TOUCH!

- This warning indicates a potential burn hazard.
- Do not touch the product surface when operating.
- 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.



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

2 Introduction

M60U_260 transformerless 3Ø PV inverters are designed to enable the highest levels of efficiency and provide longer operating life by use of state-of-the-art high frequency and low EMI switchmode technology.



- 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 type:

- M60U_260

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

The components are shown as **Figure 2-1**.

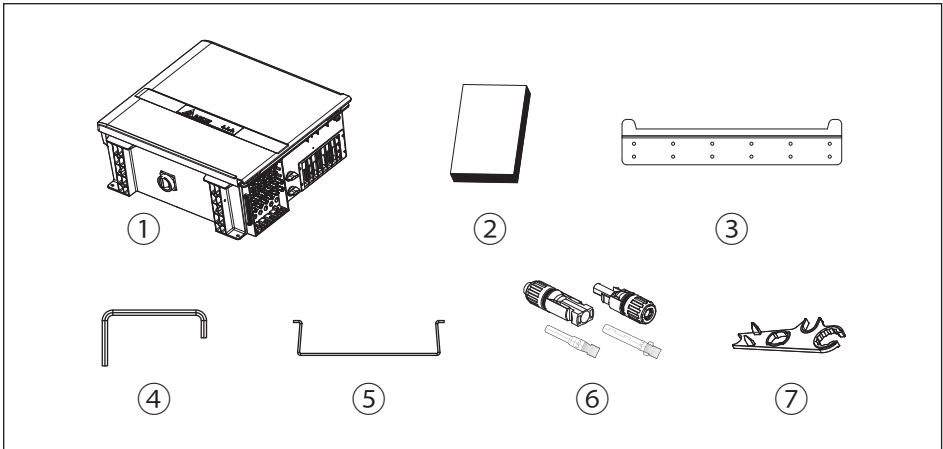


Figure 2-1: Components

Table 2-1: Packing list

M60U_260			
	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: 1/8 inch)
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 Connectors	12 pairs	DC input connectors and ferrules
7	H4 Wrench	2 pcs	To disconnect H4 connector

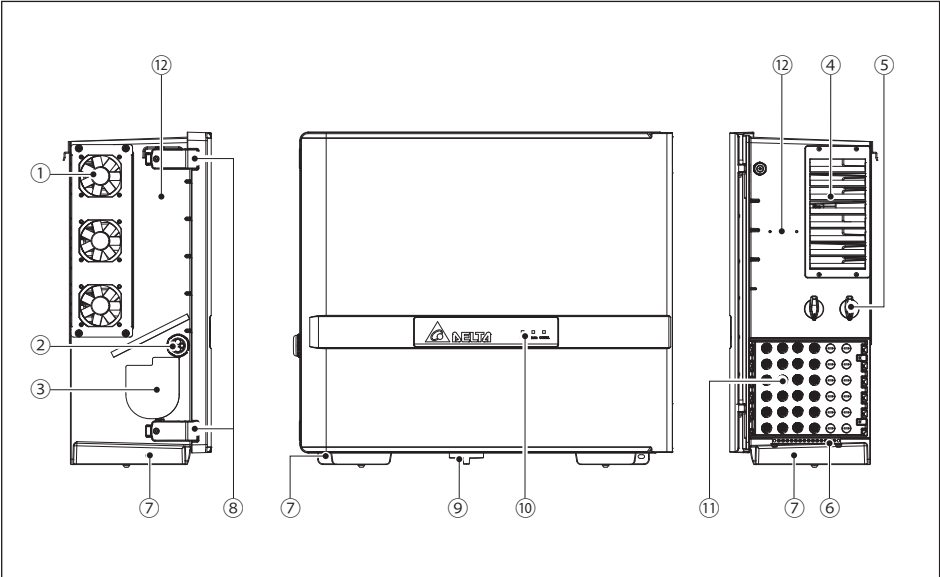


Figure 2-2: Overview

Table 2-2: Overview description

NO.	Component	NO.	Component	NO.	Component
1	External fans	5	DC Switches	9	AC Switch
2	Communication port	6	Grounding bar	10	LED Indicator
3	2" opening for AC output	7	External grounding (M6 threaded stud)	11	DC Input (H4)x 12 strings
4	Air cooling outlet	8	Toggle Latches	12	Reserved*

*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.

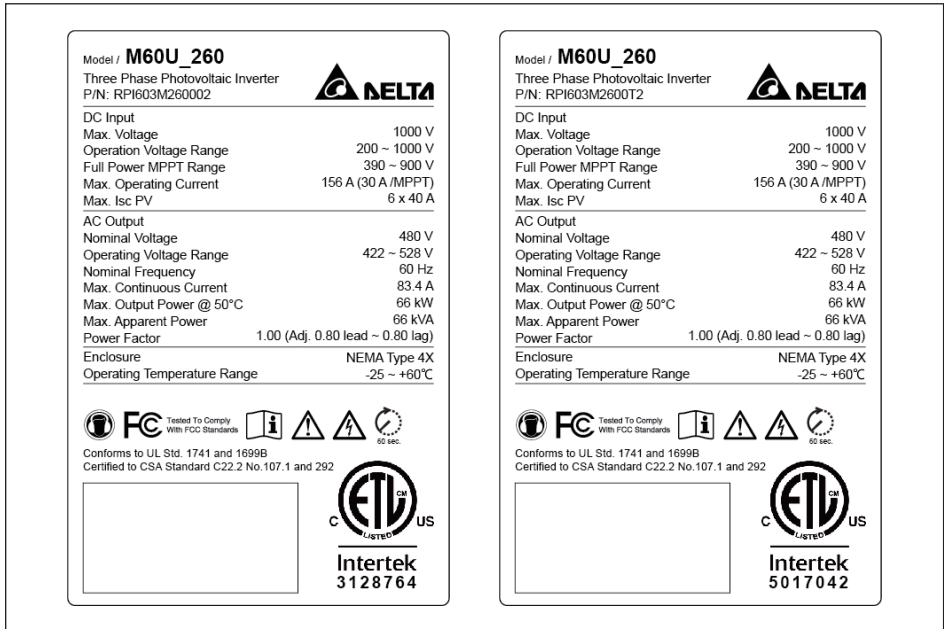






Figure 2-3: Rating label

Table 2-3: Rating label explanation

Symbol	Definition
	Danger to life through electric shock Potentially fatal voltage is applied to the inverter during operation. Never open inverter before 60 seconds after disconnecting all the power source. Please ask a trained operator for maintaining or repairing to avoid the electric shock or affecting the warranty.
	The housing of the inverter must be grounded if this is required by local regulations.
	Please be aware of noise level.
	Before working with the inverter, you must read the supplied manual and follow the instructions contained therein.

In the following pages, **Figures 2-4** illustrate the general layout of the chassis and wiring area. **Figure 2-5** and **Table 2-4**, provide detailed description of the internal layout of the inverter.

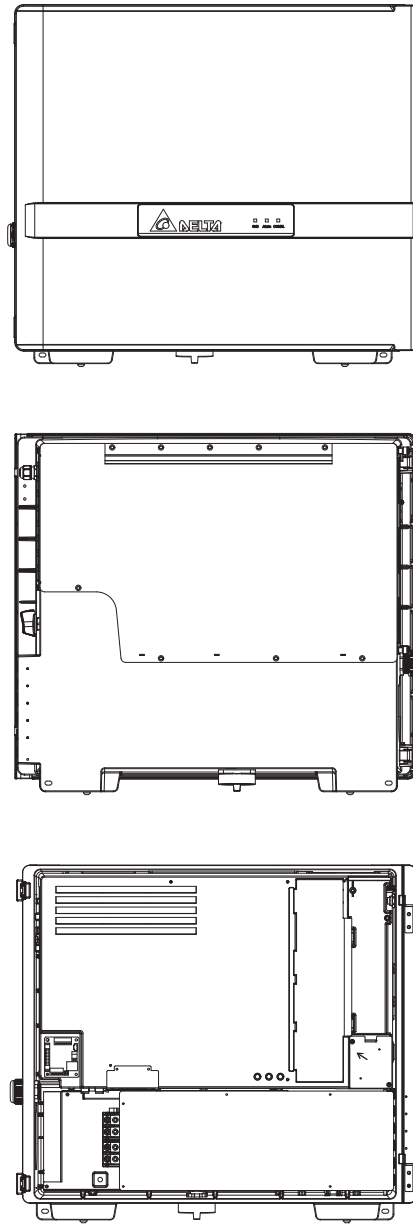


Figure 2-4: External/ internal view

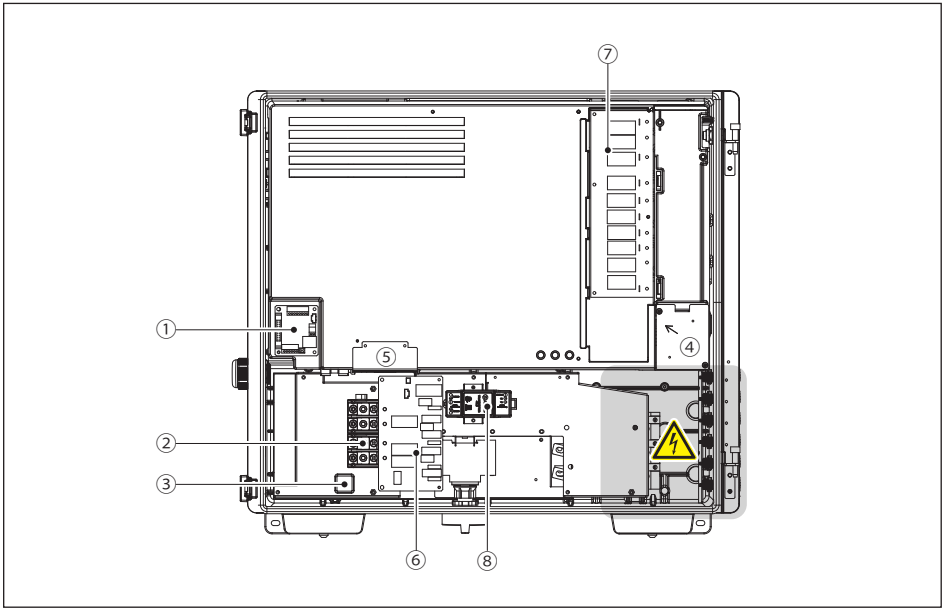


Figure 2-5: layout

Table 2-4: layout description

NO.	Component	NO.	Component	NO.	Component
1	Communication module	4	Internal fan 1	7	Type II DC SPD
2	AC terminal	5	Internal fan 2	8	Rapid Shutdown Transmitter
3	Internal grounding	6	Type II AC SPD		

DANGER : ELECTRICAL HAZARD!!



- Please avoid touching the live area with the hazard sign when the DC insulated cover is removed, even if the DC switches are OFF.

3 Installation

WARNING !



- Do not install the unit near or on flammable surfaces.
- Inverter must be mounted securely to a solid / smooth surface.
- Ensure the installation complies with local code and electrical regulations.

CAUTION !



- In some locations, mounting the inverter in direct sunlight may cause the inverter operate over nominal thermal rating range, and the unit need to derated. To eliminate this concern, a shade structure over the inverter chassis may be necessary.
- When installing the unit in an extreme temperature climate, please refer to its nominal operating range. For self-protection, the unit will operate in the derating stage when the internal temperature is outside the nominal operating range.

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.

3.1 Unboxing & Review

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

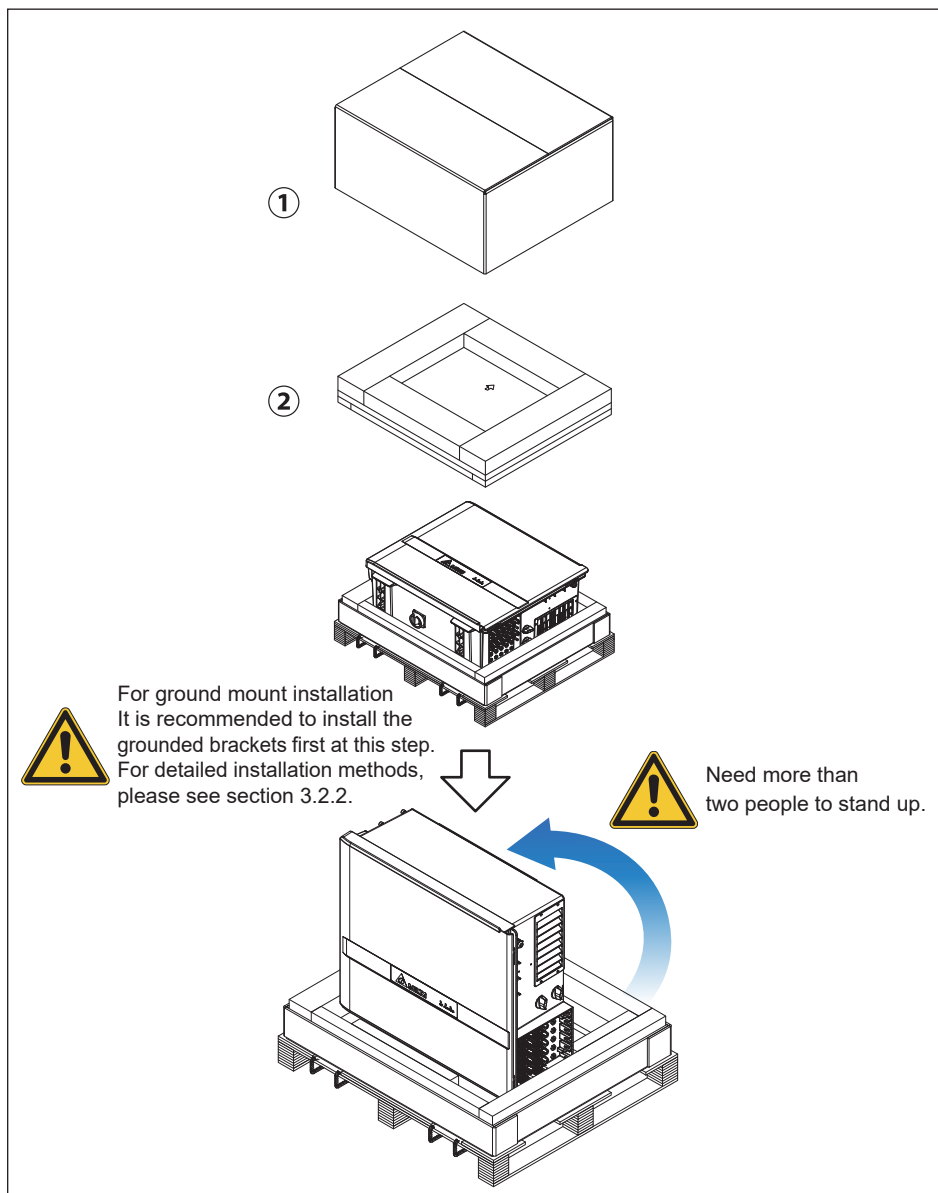
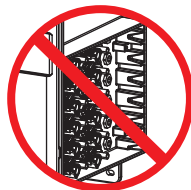
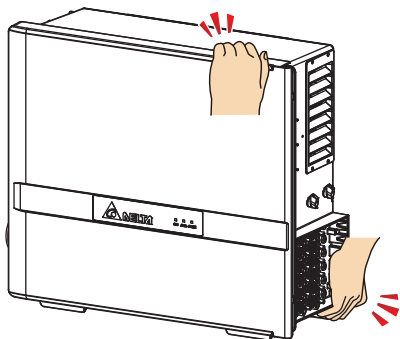


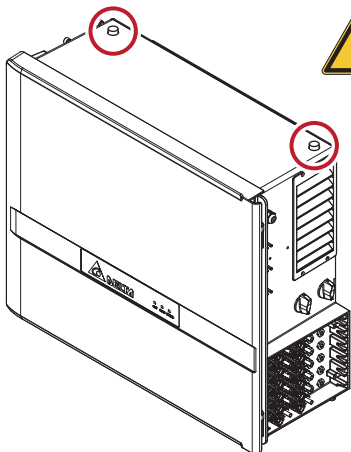
Figure 3-1: The step to unpacking the inverter

Manual handling

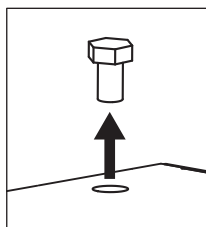


Applying force on fan, fan shutters, DC connectors, or AC/DC switches are prohibited.

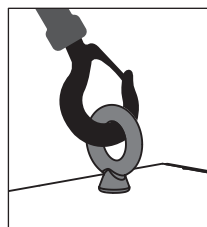
Hoisting



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



Screw plug
(35 lbf-in)



Hoisting ring
(M12 x P1.75, L ≤ 0.8 inch)
(372 lbf-in)

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 **Figure 3-4** to **Figure 3-9**.

1. The surface for hanging the inverter must be sufficiently sturdy to support its weight.
2. Orient the mounting bracket (item 3, **Figure 2-1**) horizontally (perpendicular to the floor) as **Figure 3-4**.
3. Secure the bracket to the wall with 12 pieces of M6 screws. (**Figure 3-5**)
4. Hang the inverter on the bracket.
5. Secure the inverter by two 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 !

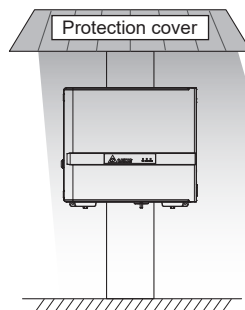


- The mounting components are specially designed and are the only certified device for mounting the inverter.
- Failure to comply with following mounting instructions including permitted orientations and designated clearances will result in derated power output and void the warranty.

CAUTION !



It is recommended to install an additional protection cover to prevent the risk of inverter malfunction caused by severe weather conditions (such as snow, hail, etc.) or improper installation/maintenance. For more information, please contact our local service team.



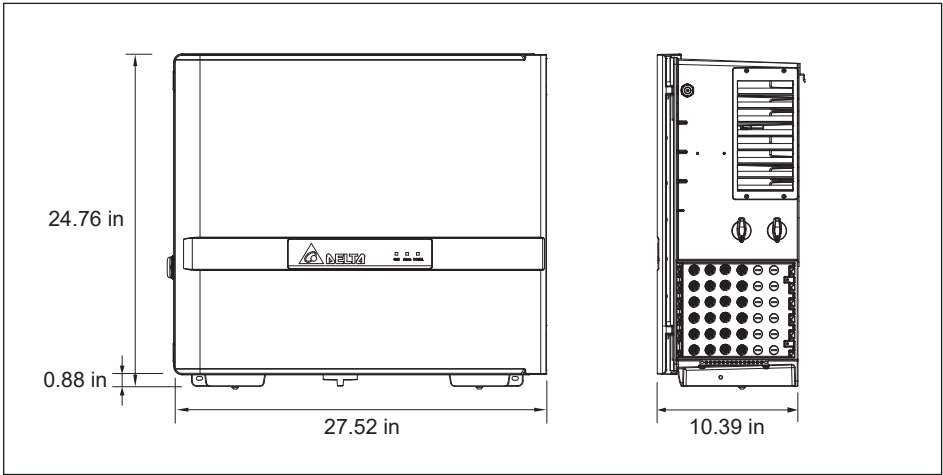


Figure 3-3: Inverter dimensions

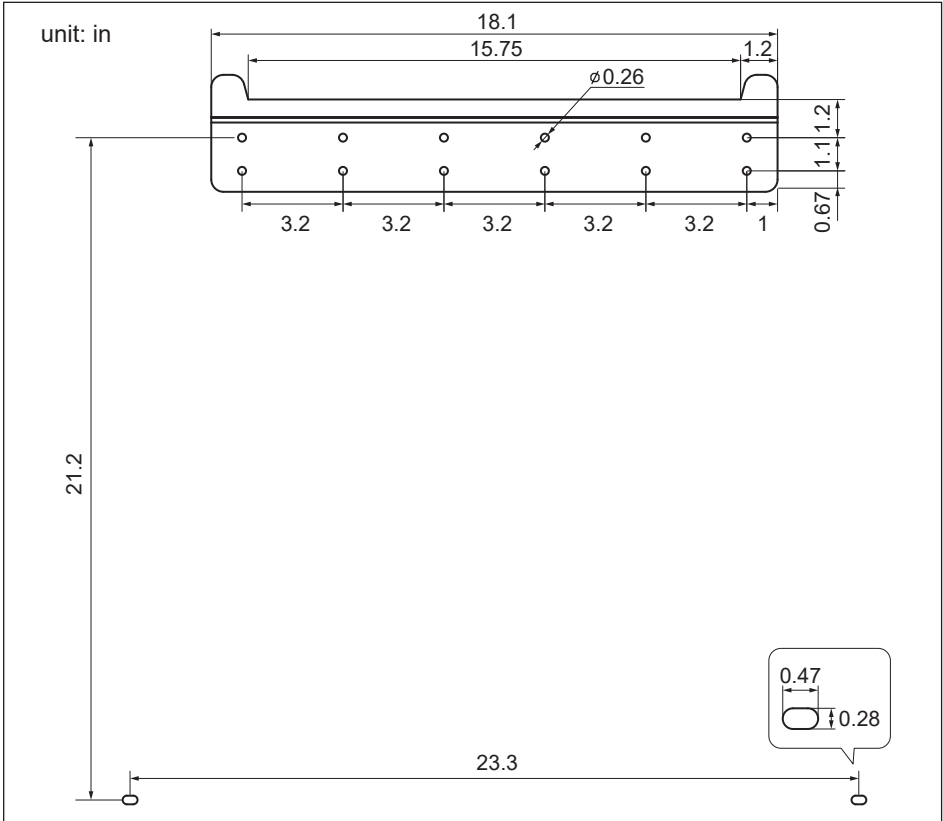
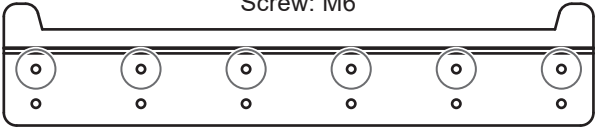


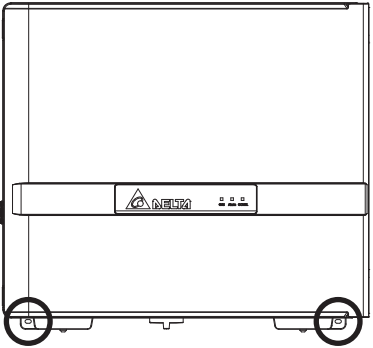
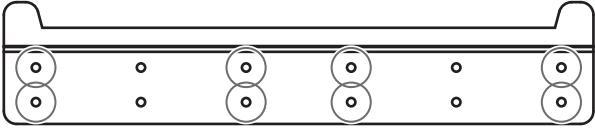
Figure 3-4: Mounting bracket dimensions

Positions for least amount of mounting bracket screws

Screw: M6



or



Screw: M6

0.47 in
0.28 in

Figure 3-5 : Positions of mounting screws

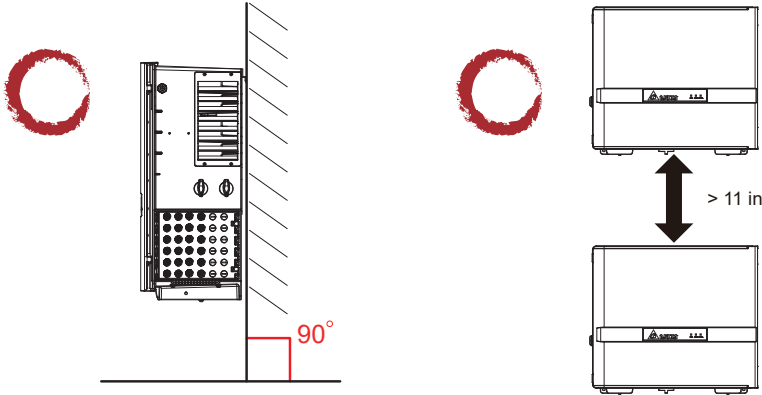


Figure 3-6: Permitted mounting positions

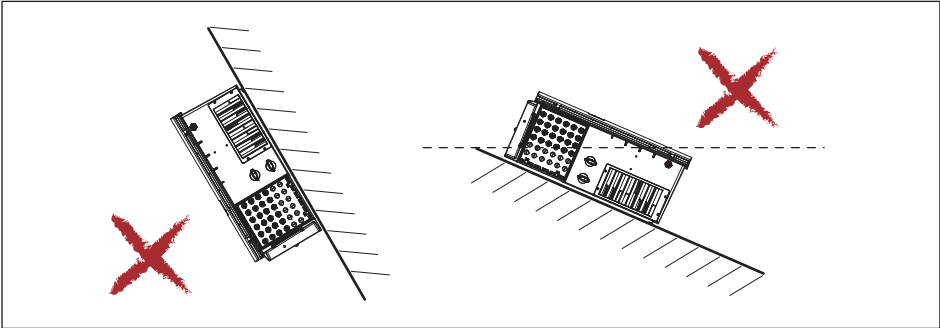


Figure 3-7: Prohibited mounting positions

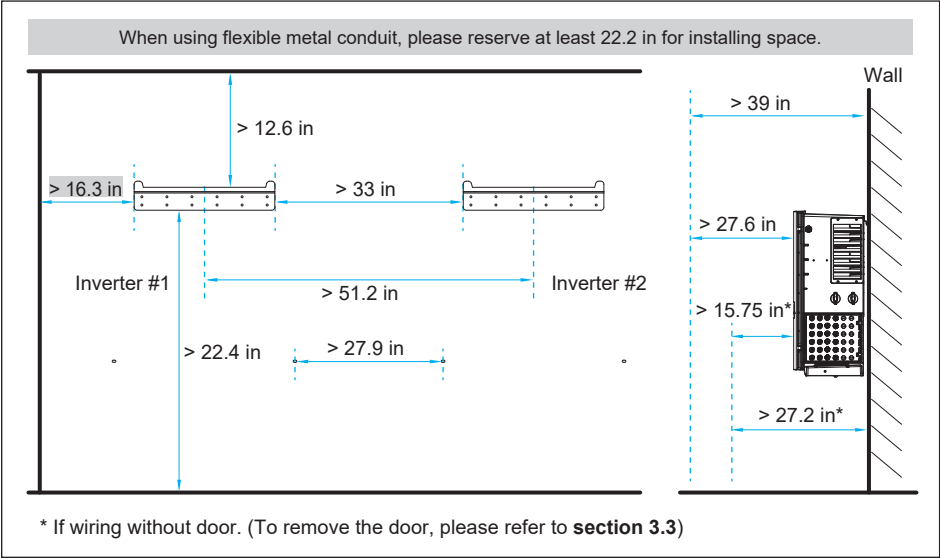


Figure 3-8: Required mounting clearances

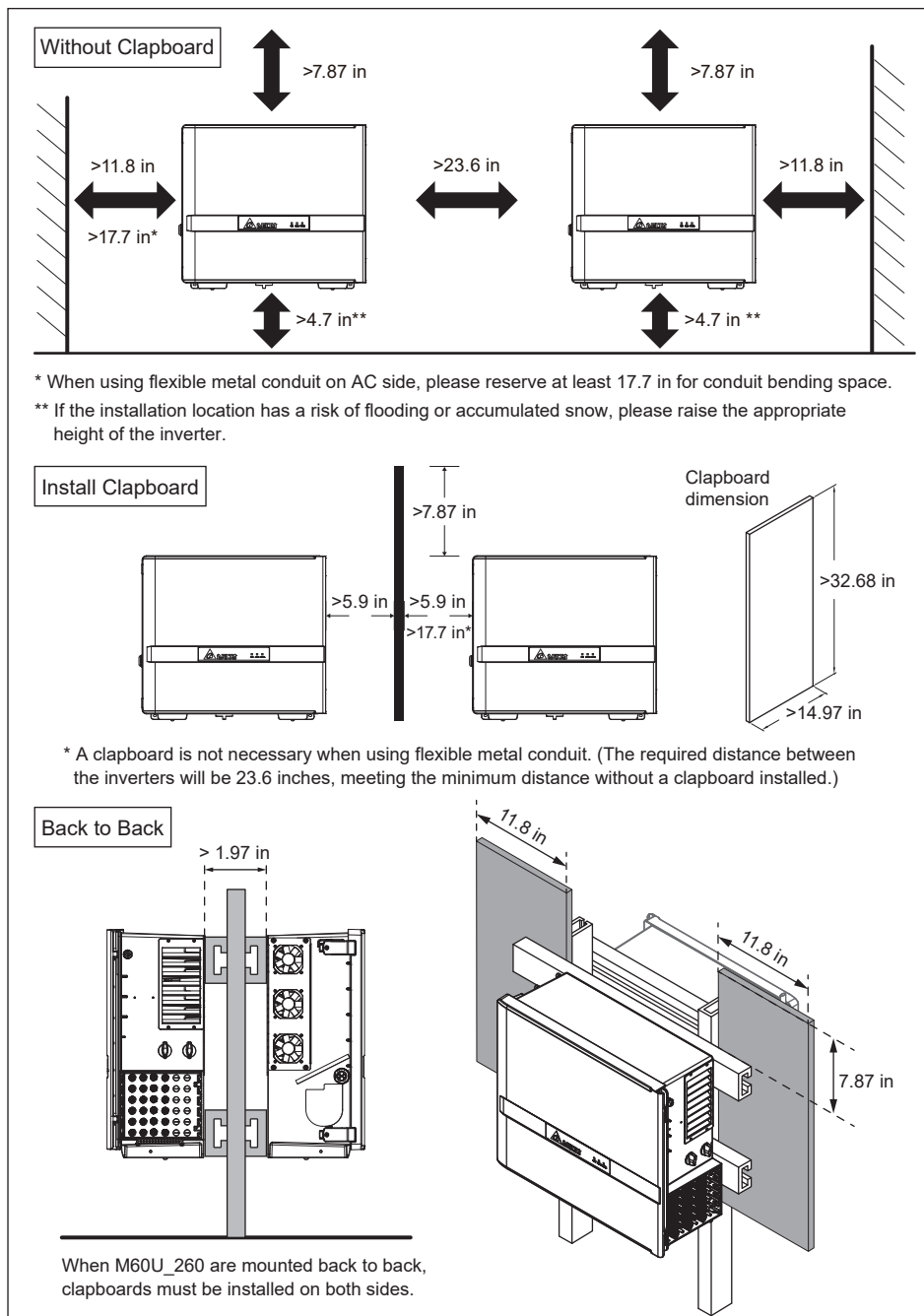


Figure 3-9: Separation distance of multiple inverters

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**.

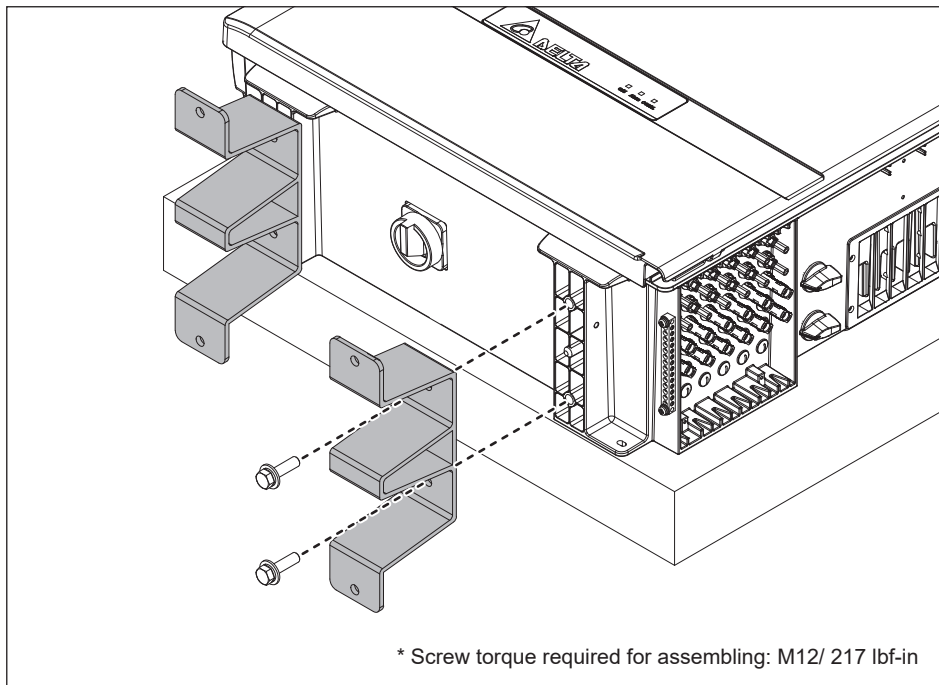
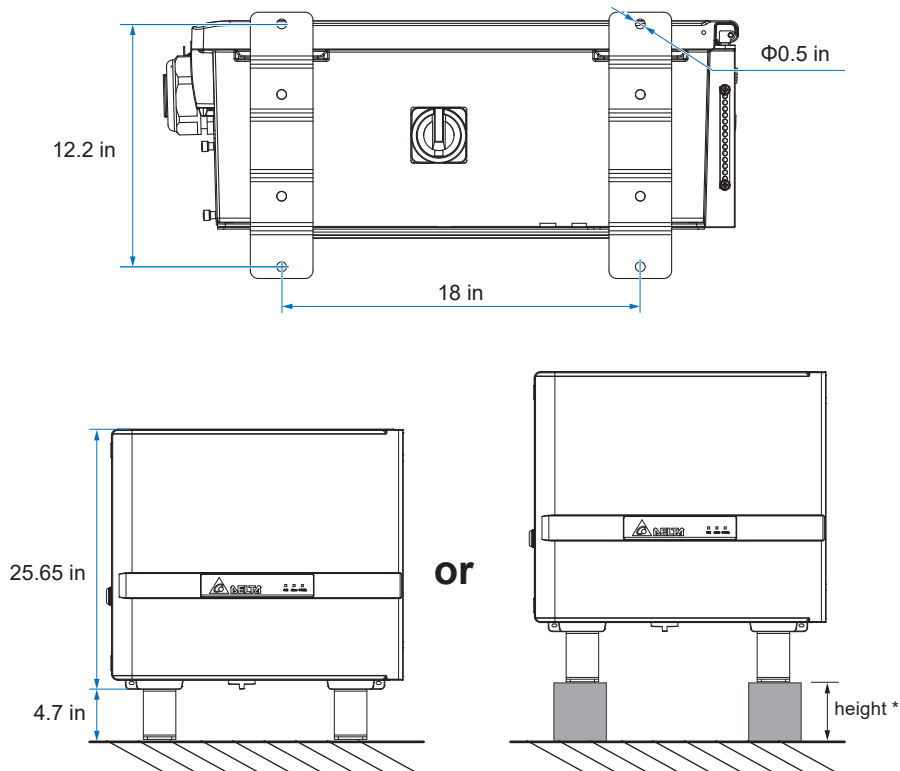


Figure 3-10 : Lock the grounded brackets to feet



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

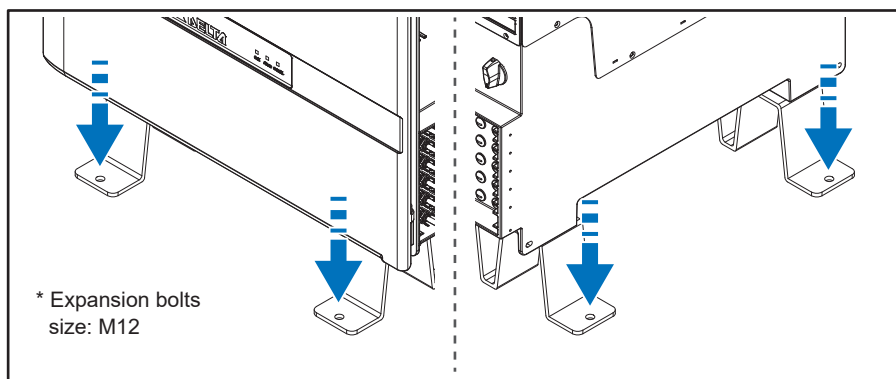


Figure 3-11: To secure inverter grounded brackets to ground-mounting base

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.

If the installation space is too narrow for the wiring operation, please remove the door according to **Figure 3-12**. After the wiring operation, please install the door onto the inverter and follow the procedures in **Section 5.1.2** to close the door.

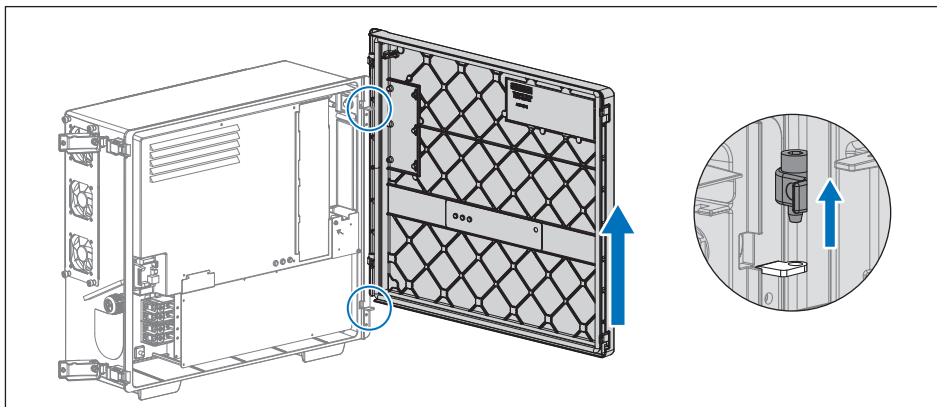


Figure 3-12: Removing the door

3.4 Electrical Installation for AC Wiring

DANGER : ELECTRICAL HAZARD!!



- Ensure any live grid connections are removed from the inverter.
- Without rain cover or protection, never perform any wiring or maintenance operations under rainy conditions.

WARNING !



- Code compliance is the installer's responsibility.
- After the wiring operations, please close the door immediately and fully tighten both toggle latches.

CAUTION : INVERTER AND EQUIPMENT DAMAGE MAY OCCUR !



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

CAUTION: WRONG AC WIRING !



- In order not to damage 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

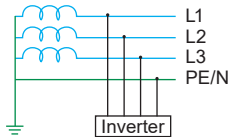
ATTENTION



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:

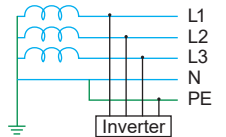
TNC system

277/480V



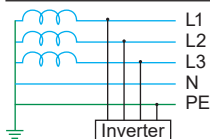
TNC-S system

277/480V



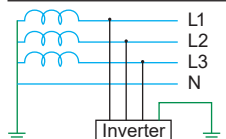
TNS system

277/480V



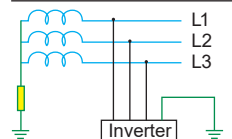
TT system

277/480V



IT system

277/480V



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 Multiple Inverters in Parallel Connection

When multiple inverters are connected to the grid in parallel, the maximum number of inverters can be connected to a single winding of the transformer is 25.

3.4.4 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.

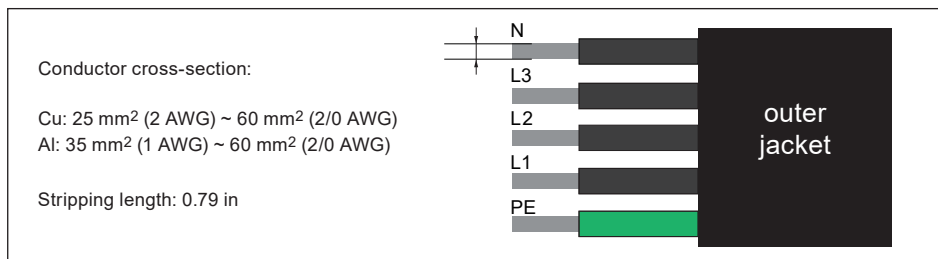
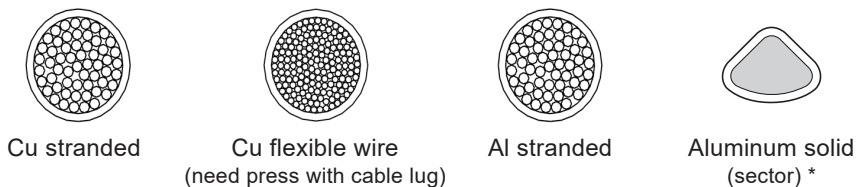


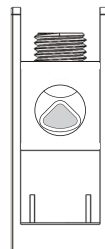
Figure 3-13: Size of AC Conductors

M60U_260 support Cu stranded wire, Cu flexible conductor, Al stranded wire and aluminum solid (include sector wire).



- Cu:
The Cu flexible wire need stamp with terminal, for the other model wiring with bare wire is available.
- Al:
The oxide layer at the end of the wire must be removed when connecting the aluminum wire. After removing the oxide layer, we recommend applying no-ox grease on the bare conductor and connecting the conductor immediately. It's necessary to treat the oxide layer when reconnecting the wire.

* The sector wiring direction is shown as right figure.



WARNING !



- If the above preparations are not followed, the contact resistance will increase significantly which will lead to excessive temperature rises, and potential thermal events.

3.4.5 AC Side –Prewire Set-Up

Prior to installing cables to the unit, please treat all exposed wires with a conductive grease such as Noalox to prevent corrosion. Each connection should be installed with the specified torque (L1~L3: 110 lbf-in, PE:130 lbf-in) by the 3/16" (5mm) hex socket. Improper torque can lead to damage of the unit.

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.



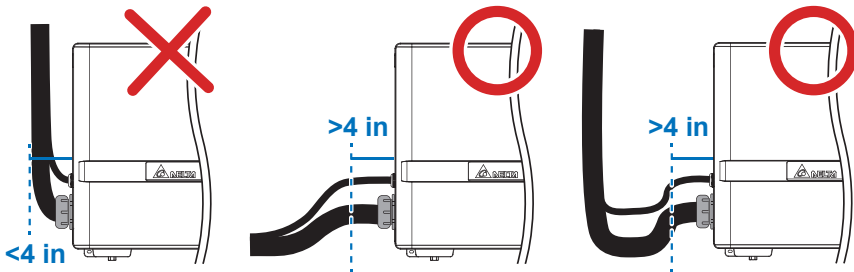
To ensure a safe and reliable contact, **always** perform the following work steps:

- ▶ Please select the Al wire size according to local electrical 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.

ATTENTION



- A "hump" pipe routing is recommended which can prevent water flow to the connector.



1. Keep at least 4 inches length of straight cables from the edge of cable glands.
2. Anchor or support the straight cables to strain relief.
3. Must be routed to create a "hump" to prevent flowing water on the cable gland.

3.4.6 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.

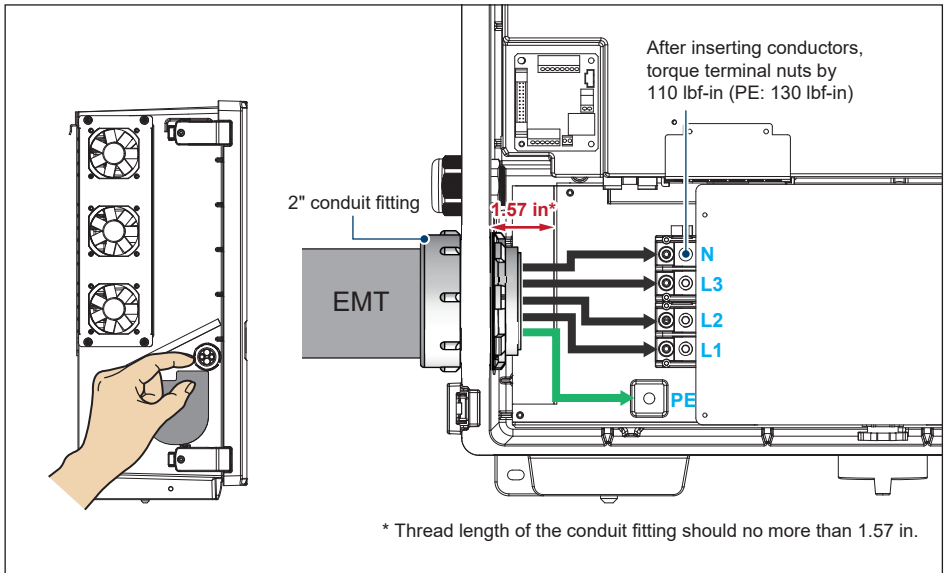


Figure 3-14: Location for AC Terminal

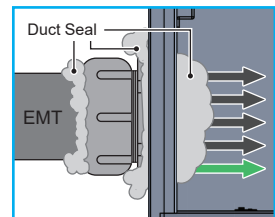
1. Remove the insulators both inside and outside of the case on AC entry.
2. Unscrew all AC terminal nuts as noted in **Section 3.4.4**.
3. Ensure the correct conductor is connected to the appropriate terminal.
4. After conductors are inserted, use 3/16" (5mm) hex wrench to tighten L1, L2, L3 and N terminals with the torque shown as **Figure 3-14**.

ATTENTION



Please seal the EMT from both inside and outside the wiring box and the gap between connector and EMT by using duct seal to prevent living creature or moisture from entering the wiring box.

It will avoid warranty if the installation was not properly sealed.



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 cabling.
- The amount of PV module of each string within one MPPT should be the same to avoid circulating current between the strings.
- Without rain cover or protection, never perform any wiring or maintenance operations under rainy conditions.
- Before plugging in the DC connectors, pay attention that the polarity is correct. Reversing the polarity when connecting the positive and negative conductors to the inverters will damage the inverters.



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 connecting.

CAUTION: DC SWITCH ON/OFF !



- In order not to damage components in the inverter, do not turn ON/OFF DC switches in quick succession. Please turn the switches on 5 minutes later after turning DC switches OFF.

ATTENTION



- The PV Array current carrying conductors (positive or negative) must not be referenced to ground.
- Do not remove the waterproof plug for unused DC strings.

3.5.1 DC Wiring Installation

Please read the following instructions for preparing/connecting connectors:

- Ensure the DC conductors used are Cu and sized to the correct ampacity per NEC or other local code
- Strip off 1/4~0.3 in. from all DC wires
- The cross-sectional area for each DC conductor is 12 to 10 AWG.
- Choose the DC string wire size based on NEC requirements or other local code.

M60U_260 uses H4 bulkhead connectors for interconnecting string wirings to the inverter.

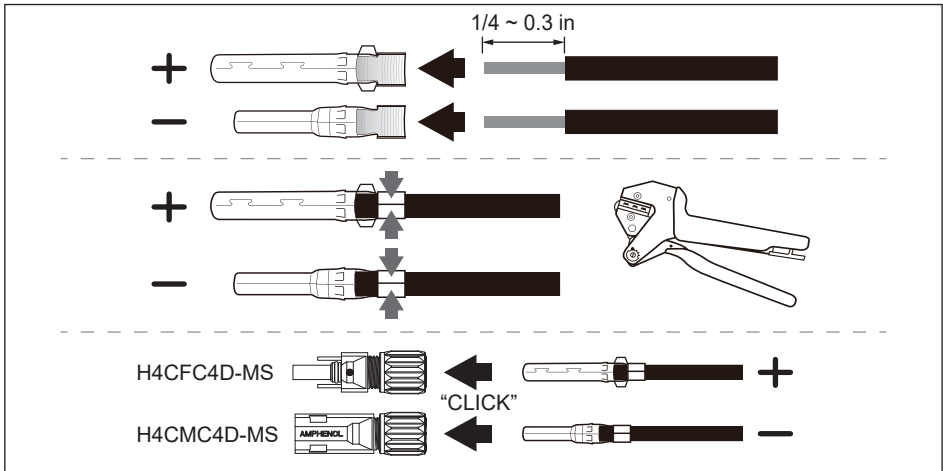


Figure 3-15: DC Wiring illustration

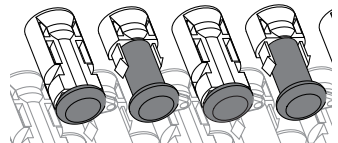
DC wiring polarities are divided into positive and negative, and the layout of the connectors is shown in **Figure 3-16**.

- Before plugging in DC connectors, insert the protective frame (item 5, **Figure 2-1**) for DC connector as **Figure 3-17**.

ATTENTION



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



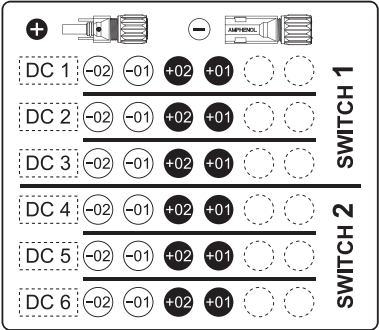
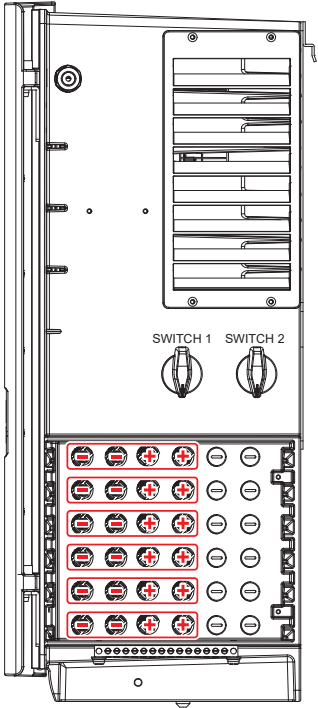


Figure 3-16: Location of H4 connectors to connect array wiring (DC)

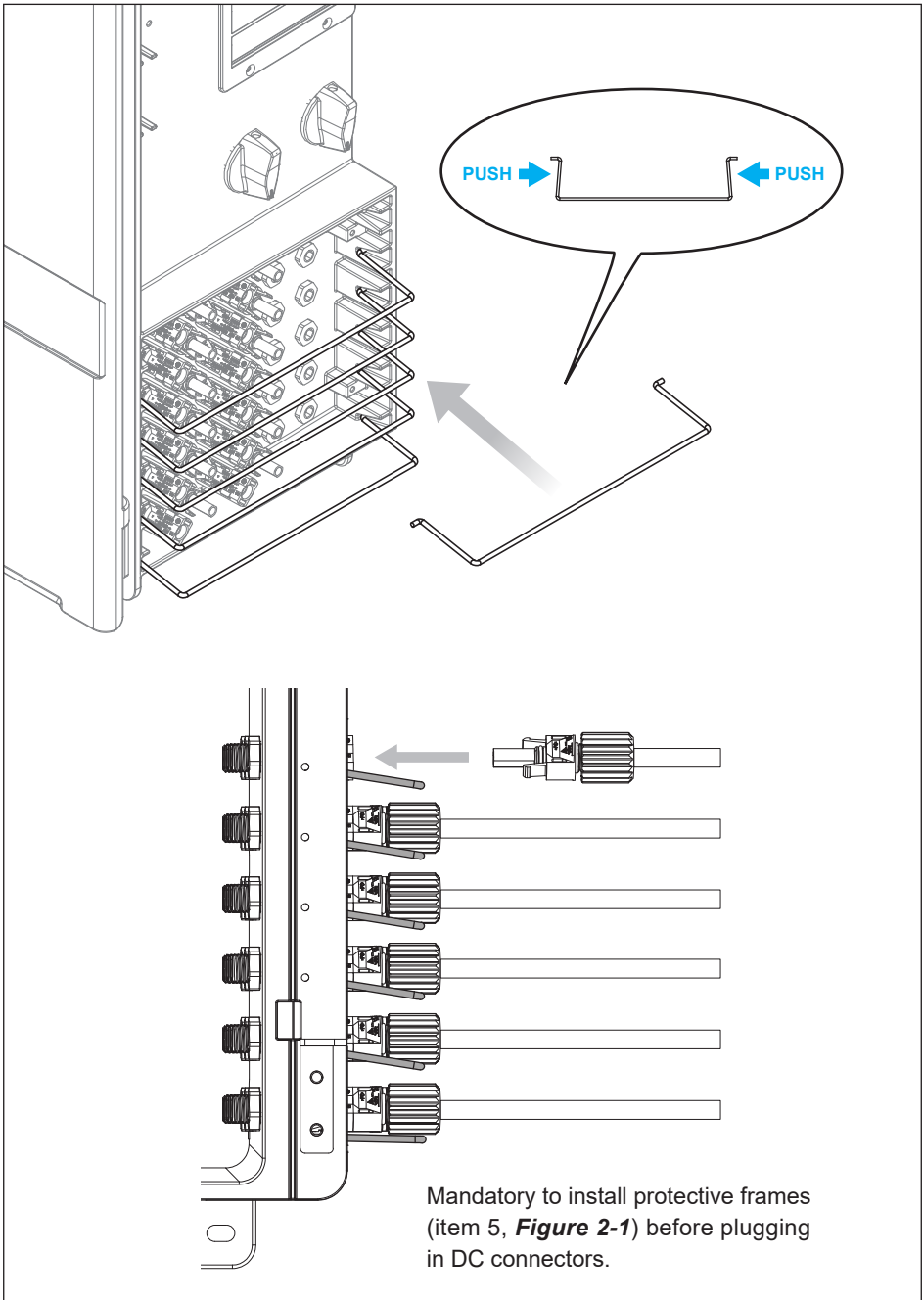


Figure 3-17: Installation methods for protective frame

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 in the figure below.

An extra grounding bar shown in the figure below accommodates grounding conductors in the range of 4AWG ~ 14AWG, conductors torque: 26 lbf-in

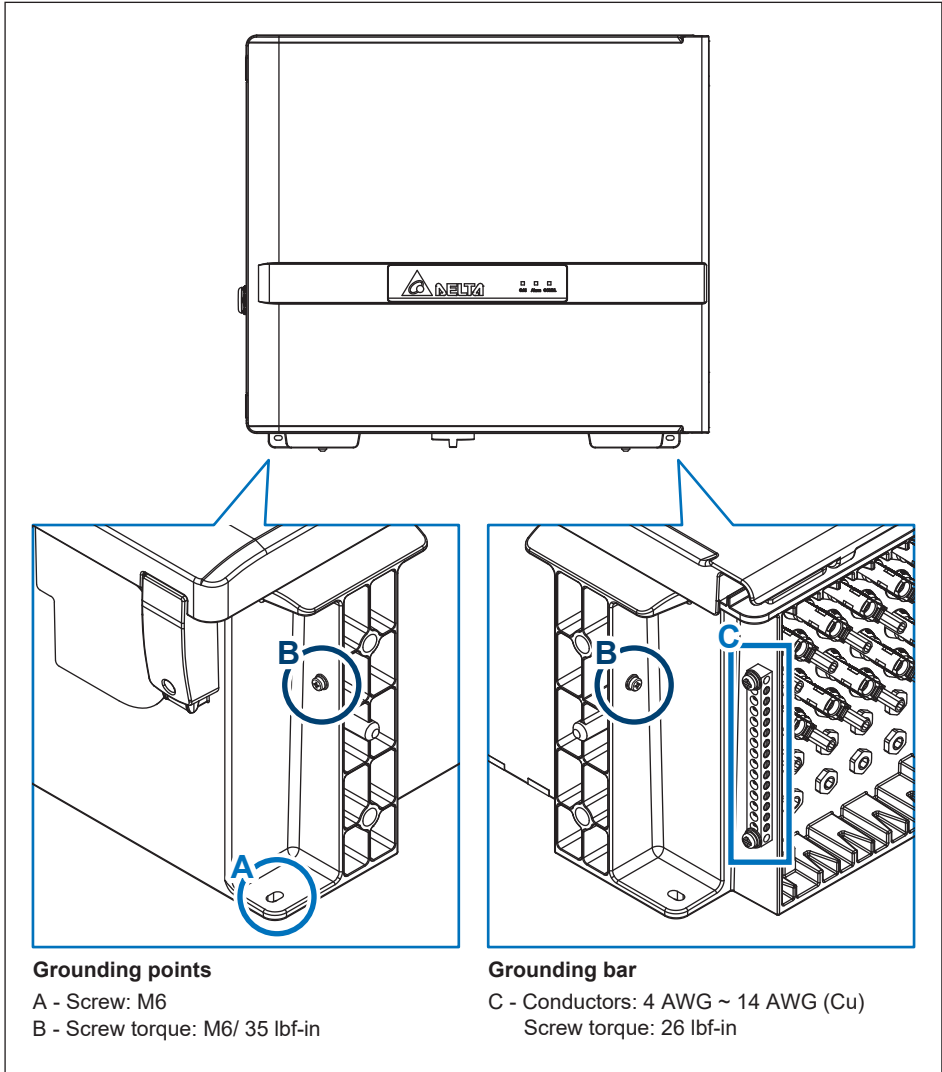


Figure 3-18: Mount the equipment grounding

3.6 Communication Module Connections

The communication module of M60U_260 is shown in **Figure 3-19**. 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 (not the PE) for use with external device.

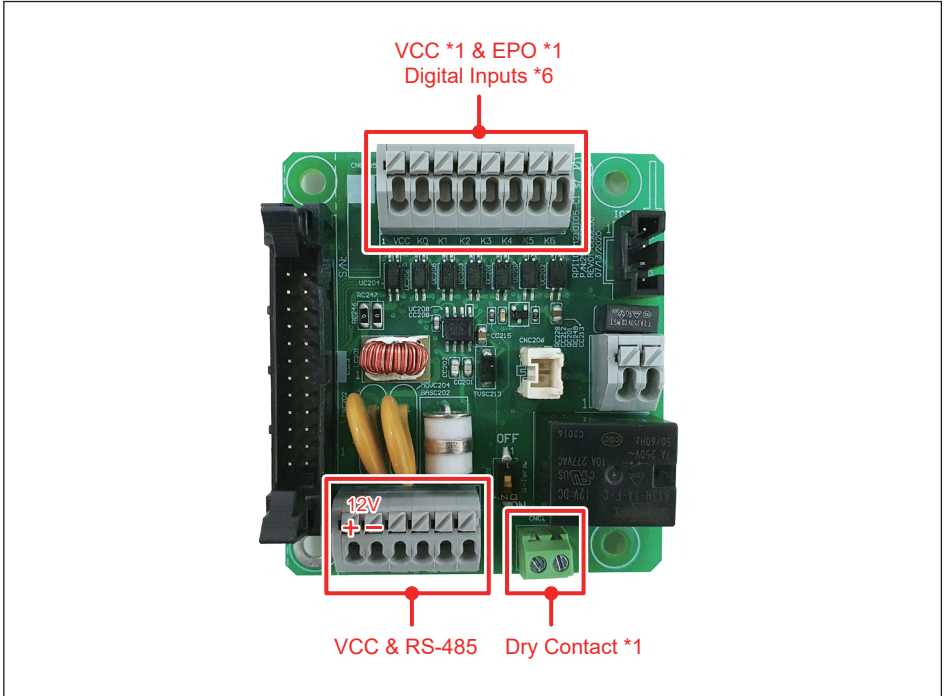


Figure 3-19: Communication module layout

Please refer to Section 5.1.1 on how to open the door.

The location of the communication module is in the red circle shown below.

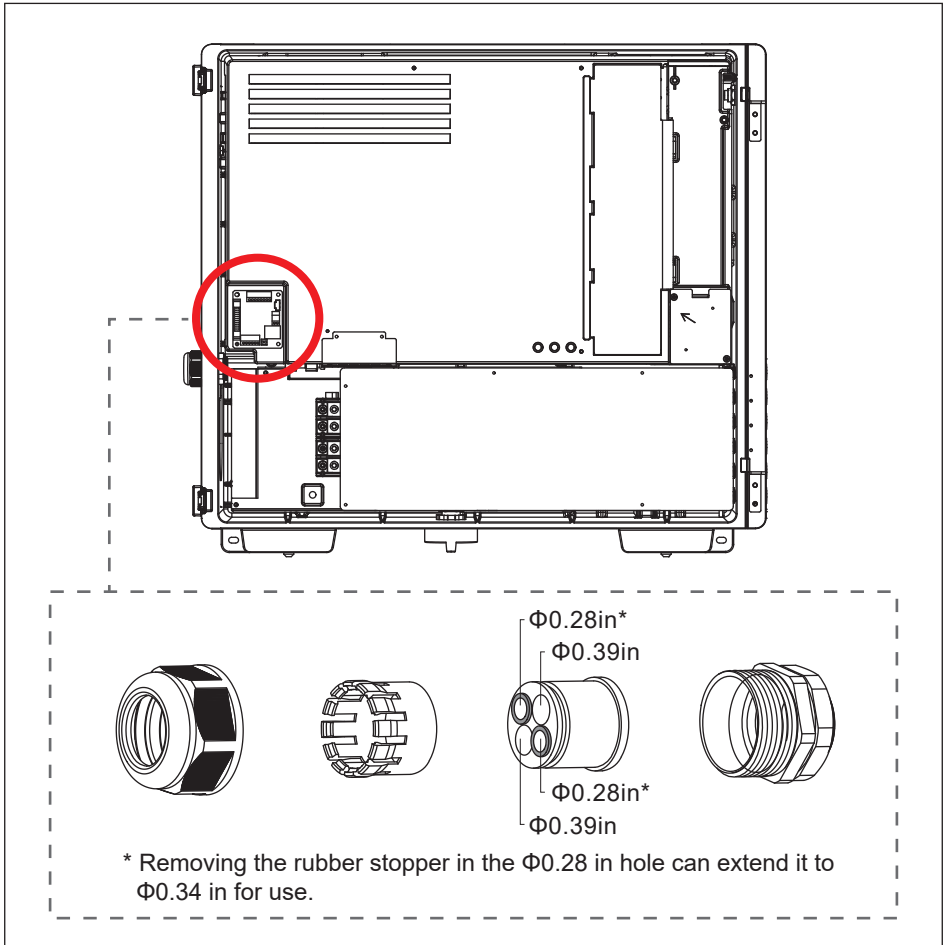
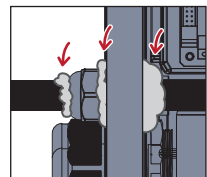


Figure 3-20: Location and access to communication module

CAUTION !



- Please seal the COMM. gland from both inside and outside the wiring box and the gap between outer jacket and gland by using duct seal to prevent living creature or moisture from entering the wiring box.
- It will avoid warranty if the installation is not properly sealed.



3.6.1 RS-485 Connection

The pin definition for the RS-485 terminal block is shown in **Table 3-1**.

- 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 3-21**). **Table 3-2** shows the switch function.

- Only allowed one daisy chain wire per RS-485 and data terminal.
- When several inverters are cascaded (i.e., "daisy-chained") only the last inverter in the chain must have its bus termination resistor switched ON (**Table 3-2**).
- If the length of any RS-485 bus is greater than 2000ft, the use of Belden 3105A cable (or eq.) is recommended to ensure stable communication quality.

ATTENTION



- To reduce excessive noise interference, shielded twisted-pair wires should used as communication cables.

Table 3-1: RS-485 Terminal block wiring

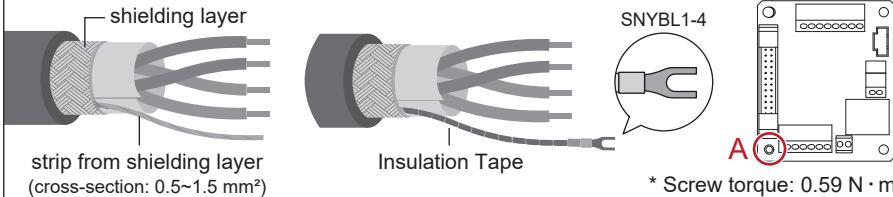
Pin	Function	
1	VCC (+12V)	
2	GND (It is NOT the PE)	
3	DATA+	
4	DATA-	
5	DATA+	
6	DATA-	

INFORMATION



Shield should be grounded properly per site configuration. If the RS-485 cable needs to be grounded at the communication board, 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



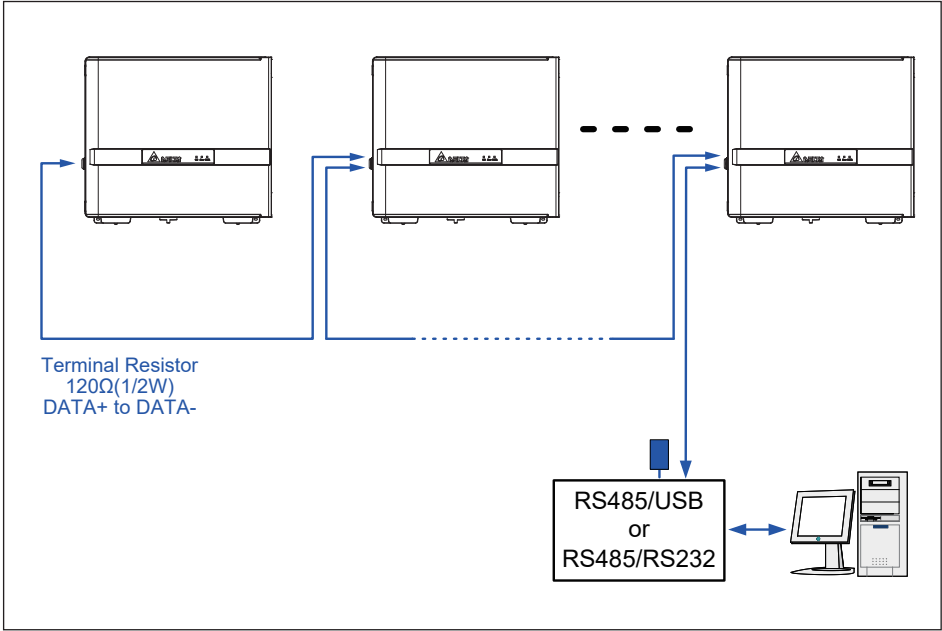


Figure 3-21: Multiinverter connection illustration

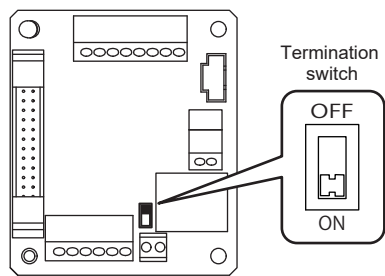


Table 3-2: Bus Termination switch settings

	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 the EPO function in APP or Delta Solar System (DSS).

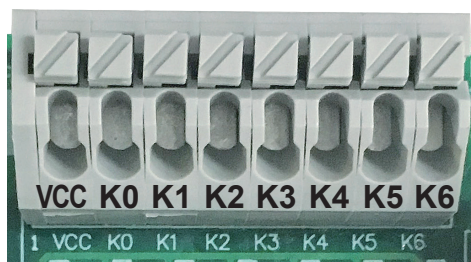


Figure 3-22: EPO function terminal block

Once enabled, the EPO function can be used to turn off the inverter via a NO relay switching contactor for operating short/open between 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 3-3**, below.

Table 3-3: 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

M60U_260 provides dry control contact pairs that may be used to control external devices such as warning indicator based on the status of operation of the inverter. The terminal block for this function is shown in **Figure 3-23**. 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.

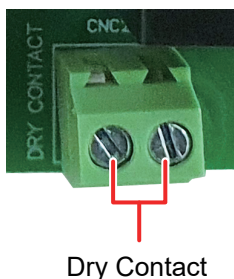


Figure 3-23: Dry contact connection

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 to touchable temperature or appropriate personal protection equipment is worn.

4.1 Display Operation Introduction

M60U_260 has 3 LEDs which allows 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.

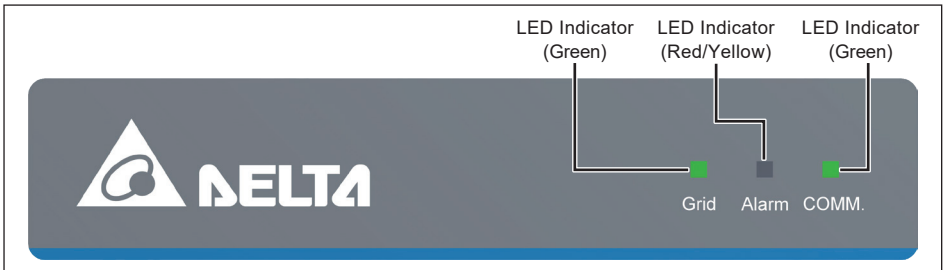


Figure 4-1: Front panel display

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



iOS



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.

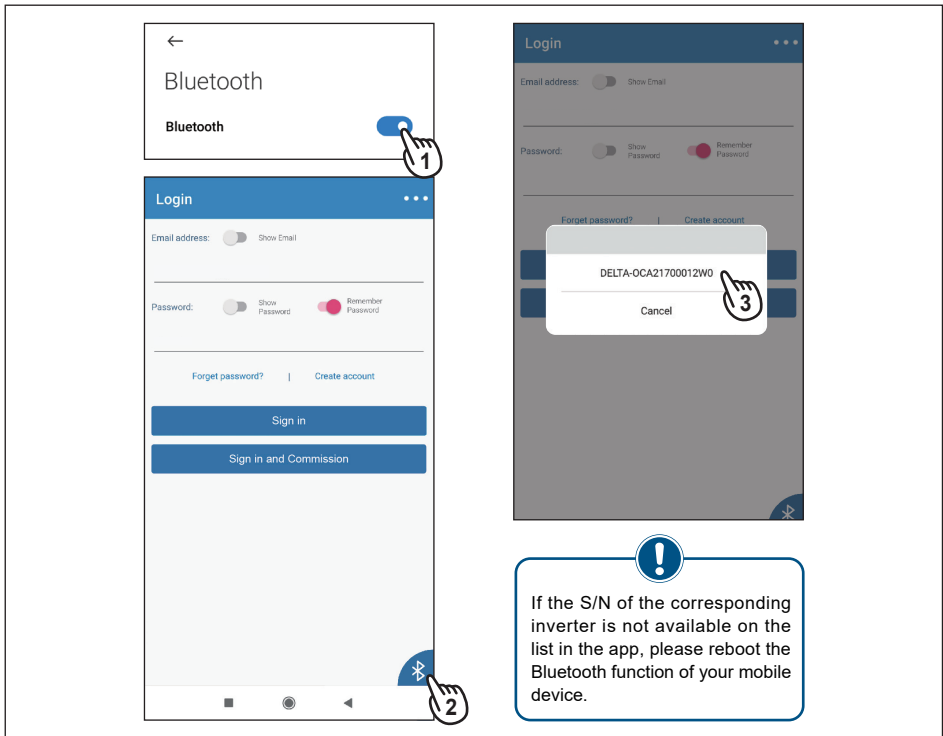


Figure 4-2: Steps to commission via bluetooth (1-3)

- 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.

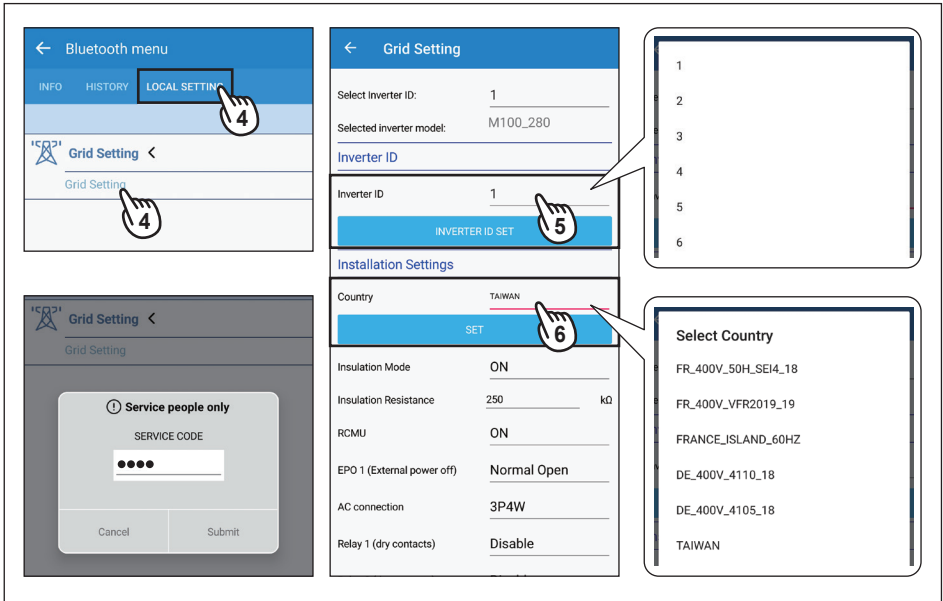


Figure 4-3: Steps to commission via bluetooth (4-7)

FCC

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user authority to operate the equipment.

1. To comply with FCC RF exposure compliance requirements, a separation distance of at least 7.87 in must be maintained between the antenna of this device and all persons.
2. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 7.87 in is maintained between the antenna and users. For laptop installations, the antenna must be installed to ensure that the proper spacing is maintained in the event the users places the device in their lap during use (i.e. positioning of antennas must be placed in the upper portion of the LCD panel only to ensure 7.87 in will be maintained if the user places the device in their lap for use) and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as the 2 conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in devices where the antenna may be installed such that 7.87 in may be maintained between the antenna and users (for example access points, routers, wireless ASDL modems, certain laptop configurations, and similar equipment). The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: 2ARTO-RP1703M26000C".

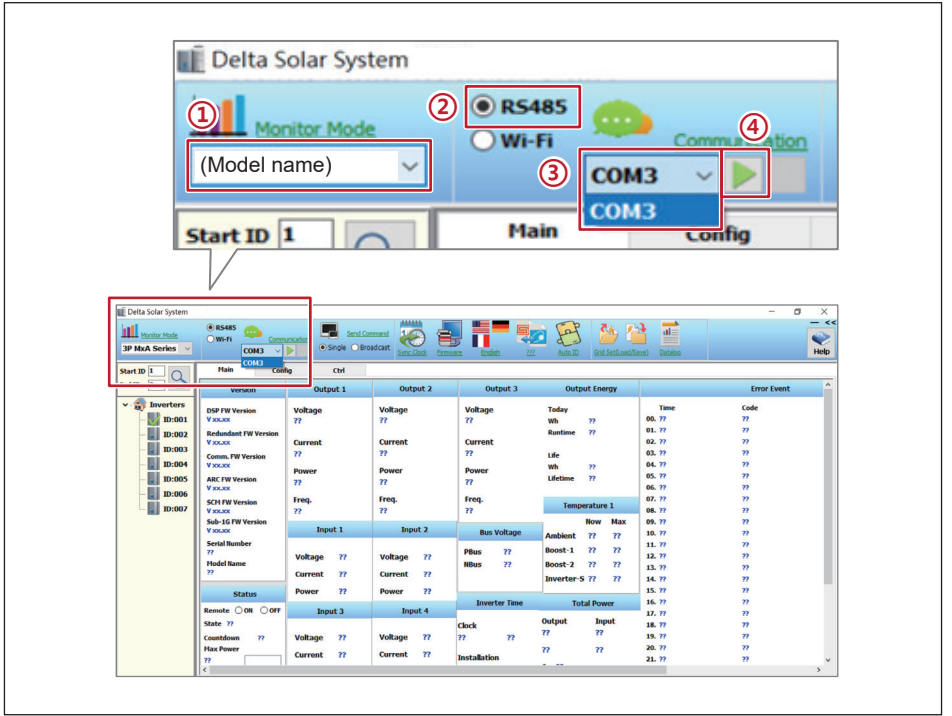
RF Exposure Manual Information That Must be Included

The users manual for end users must include the following information in a prominent location


"IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 7.87 in from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

Additional Information That Must be Provided to OEM Integrators

The end user should NOT be provided any instructions on how to remove or install the device.



4.3.2 Scan inverter

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

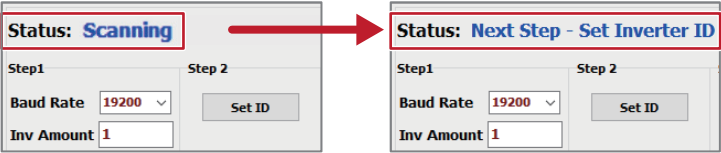
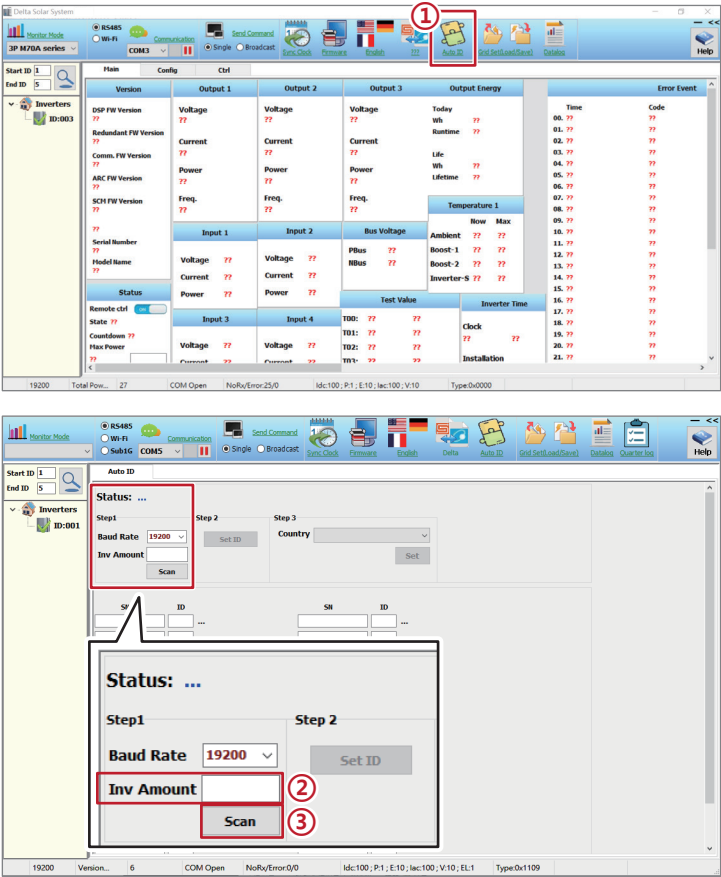


Figure 4-5: Steps of scanning inverters

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".

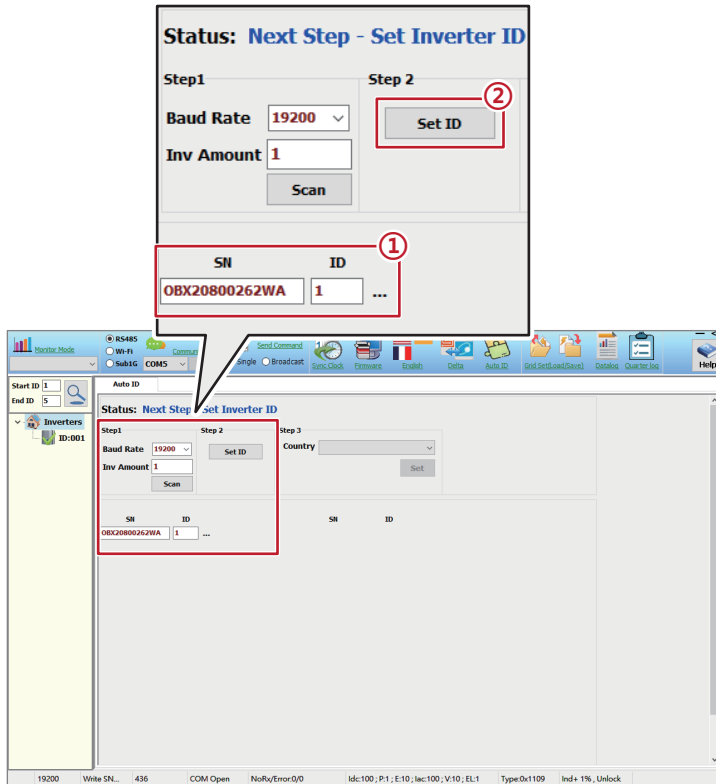


Figure 4-6: Steps of ID setting

4.3.4 Set Country

- ① Click to select the Country (grid code) of inverter.
- ② Click “Set”.

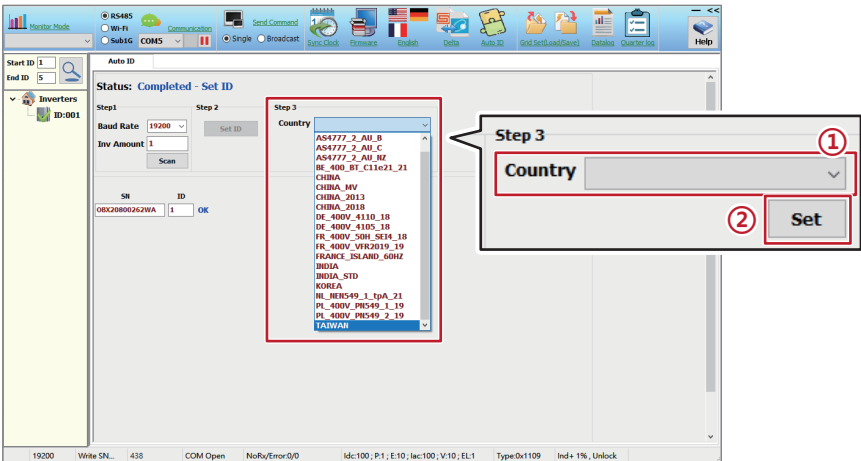


Figure 4-7: Steps of country setting

4.3.5 Synchronize time

Click “Sync Clock ” to Synchronize time.

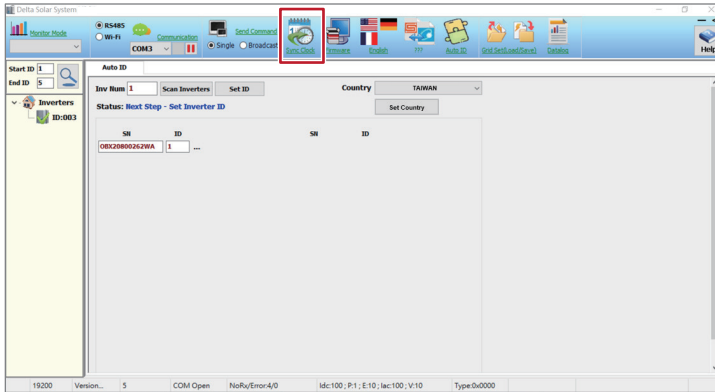


Figure 4-8: Steps of time synchronization

4.4 Delta Function Setting

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 $\cos\phi$	Dry contact
Fixed Q(%)	ARC fault detection
Auto ID	Bluetooth

Please refer to the following link for operation manual and function details.

DSS Operation Manual:



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

5 Maintenance

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

DANGER : ELECTRICAL HAZARD!!



- Before beginning any maintenance procedures, turn off the AC switch of the inverter first and then the DC switches to avoid the risk of electrical shock!
- Without rain cover or protection, never perform any wiring or 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**.

Door stopper by hexagon driver per **Figure 5-2**.

5.1.1 Open Door

- Without rain cover or protection, never perform any wiring or maintenance operations under rainy conditions.
- Before opening the front door, please wipe the inverter case if it is wet to avoid water seepage.
- Switch off the AC power, then DC, and wait until the LED display turns off.

Figure 5-1 ① Take out the hexagonal wrench on the latch lock cover.

Figure 5-1 ② Loosen the screw on each of the latch lock cover.

Figure 5-1 ③ Open the cover and loosen the latch lock.

- Use care not to contaminate the door's gasket.

Be caution not to leave door opened for long period of time, preventing moisture and abnormal objects such as insects from entering the inverter.

5.1.2 Close Door

Before closing the door:

1. Ensure matting 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 22 lbf-in of torque.

ATTENTION



- After cabling or maintenance for the inverter, please lock both toggle latch to make sure the inverter will remain under NEMA 4X protection.

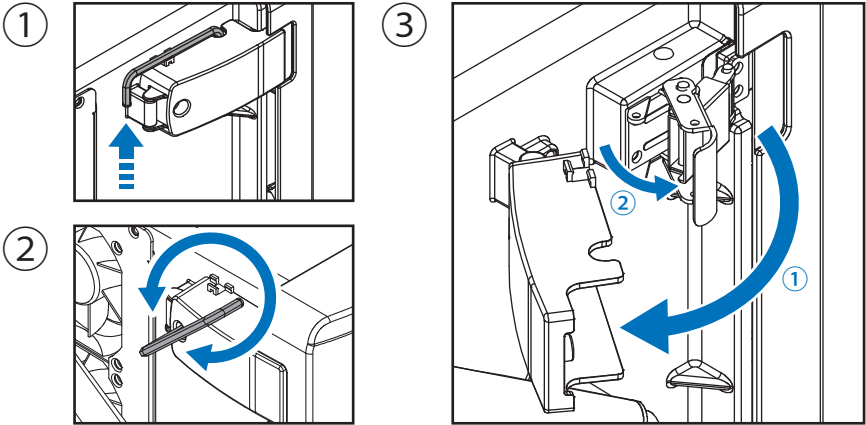
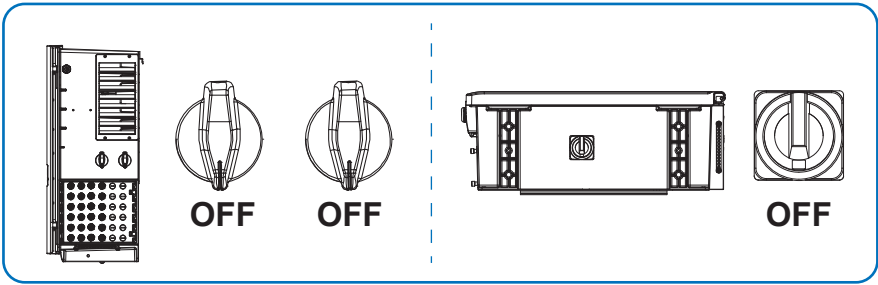
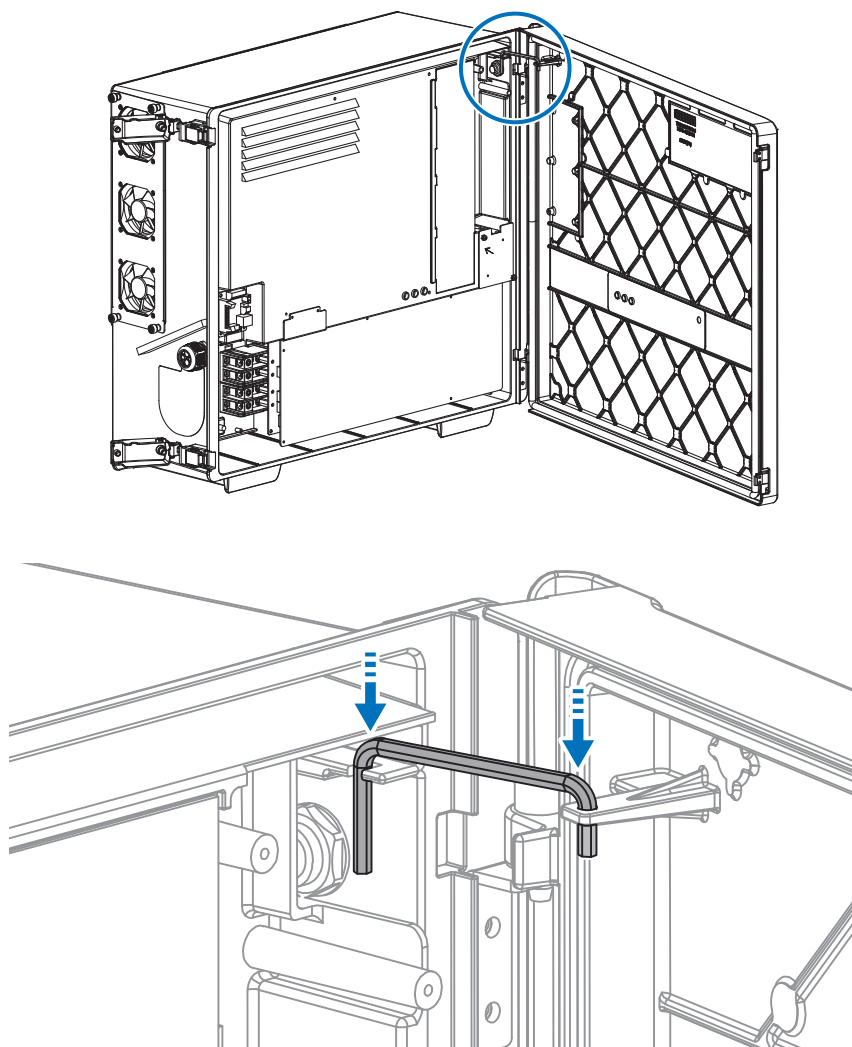


Figure 5-1: Opening and closing the door

**ATTENTION**

- After opening the door, please make sure the door is fixed by the 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)

M60U_260 have surge protection devices (SPD) at both AC and DC side as shown in **Figure 5-3**.

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 the DSS, follow the procedure below to replace the SPD.

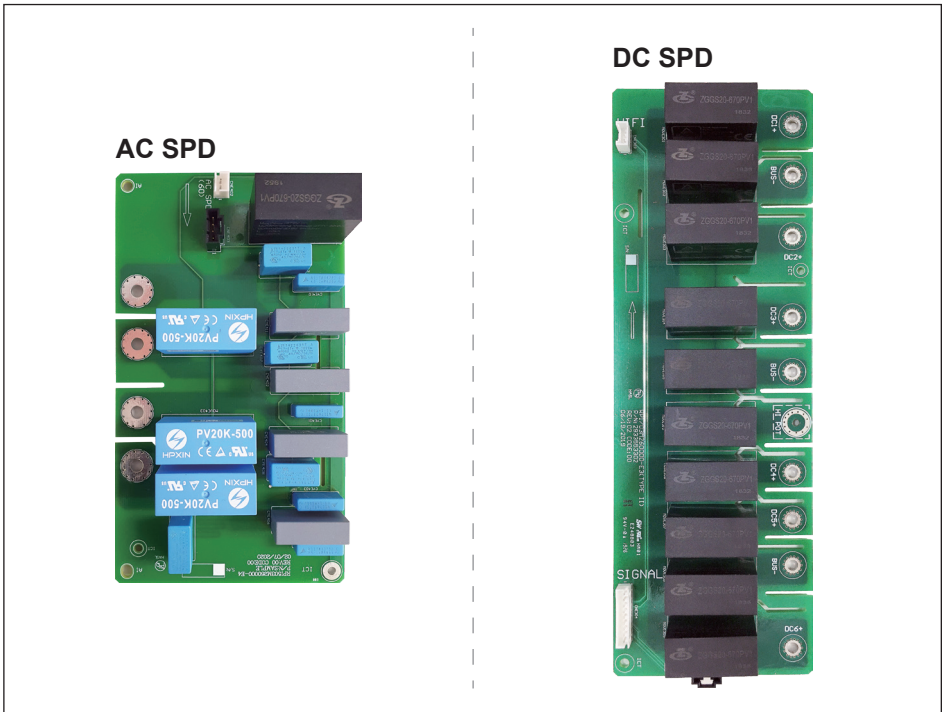


Figure 5-3: AC and DC SPD modules

- 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**
 1. Remove 5 self-retaining screws on the A cover. (**Figure 5-5**)
 2. Remove the 2 signal wiring connectors from the AC SPD. (**Figure 5-6**)
 3. Loosen 4 self-retaining screws (**Figure 5-6 screw A**).
 4. Loosen 2 self-retaining screws (**Figure 5-6 screw G**).
 5. Lift and remove the entire AC SPD 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 the value shown in **Figure 5-6**.
- **To remove the defective DC SPD (Figure 5-5 & 5-7)**
 1. Remove B cover. (**Figure 5-5**)
 2. Remove signal and fan wiring connectors from the DC SPD. (**Figure 5-7**)
 3. Loosen 9 self-retaining screws (**Figure 5-7 screw A**).
 4. Loosen 3 self-retaining screws (**Figure 5-7 screw G**).
 5. Lift and remove the entire DC SPD and replace with new unit.
 6. 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

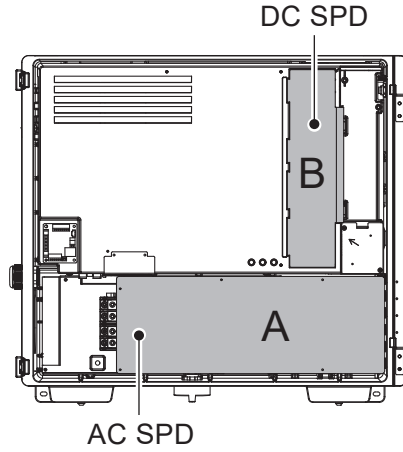


- Please make sure the copper pillar is firmly tightened before reassembling the SPD board.

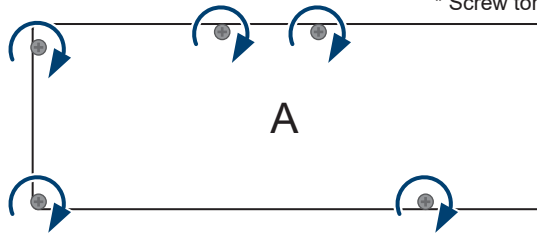
- Closing the door

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

1



2



* Screw torque: 7 lbf-in



Please pre-lock manually before using an electric screwdriver to lock to the recommended torque.

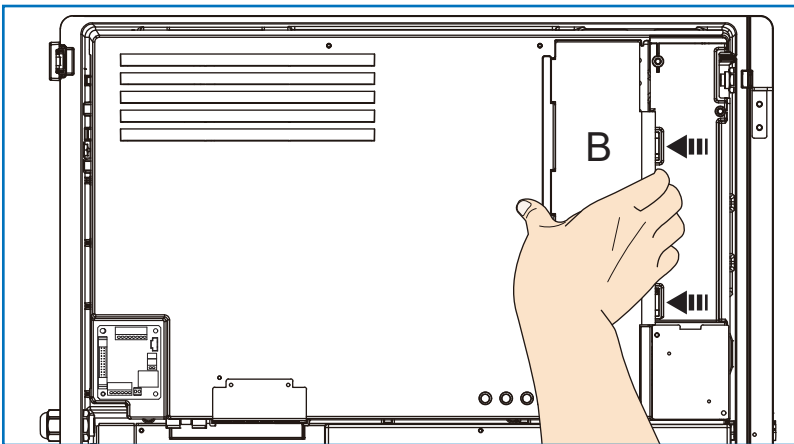


Figure 5-5: Steps of changing SPDs

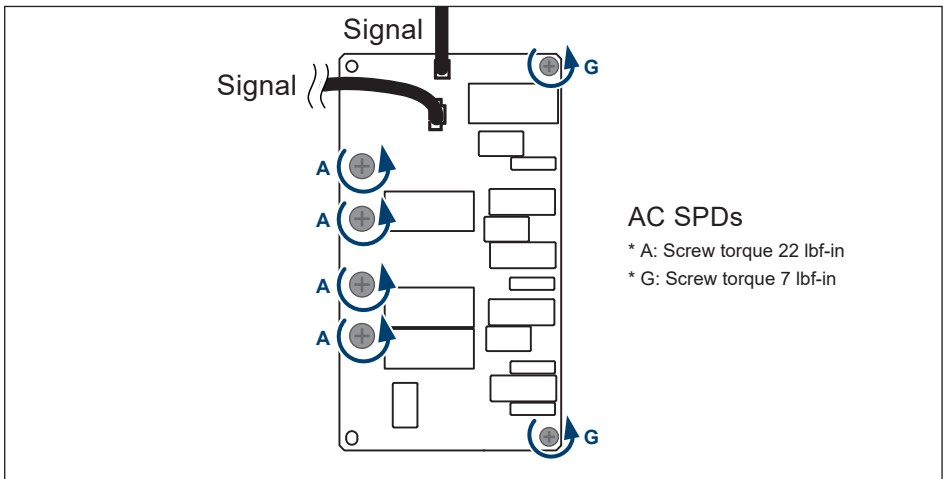


Figure 5-6: Remove wirings as connectors of AC SPD

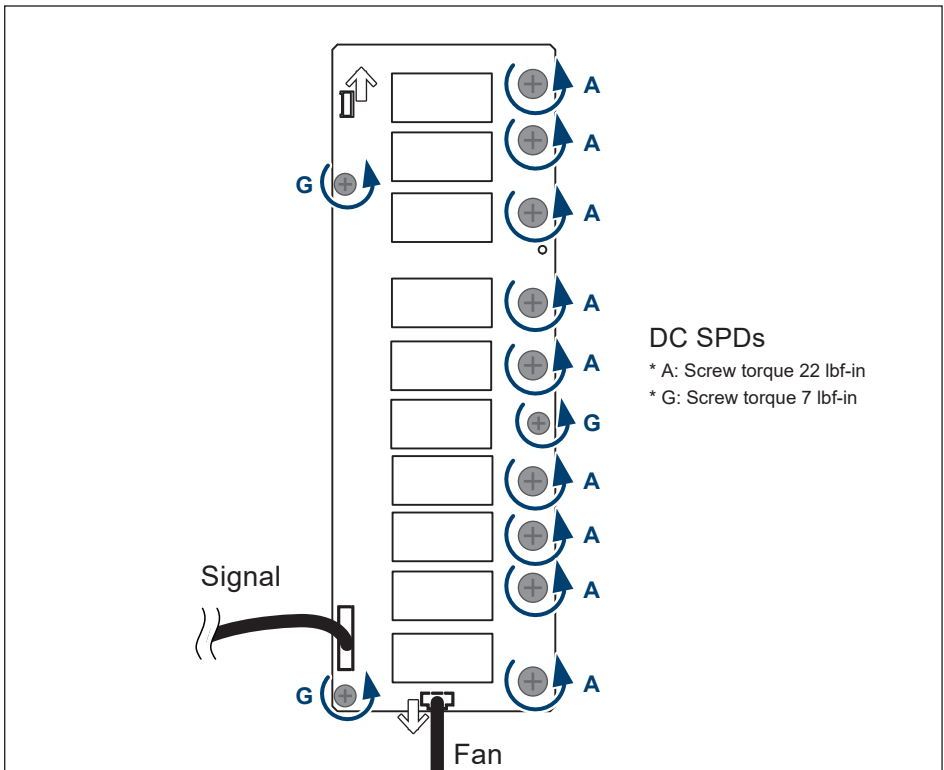


Figure 5-7: Remove wirings as connectors of DC SPD

5.3 Smart Fans Replacement and Filter Cleaning

DANGER : ELECTRICAL HAZARD!!



- Before beginning any maintenance procedures, turn off the AC switch of the inverter first and then the DC switches to avoid the risk of electrical shock!

The inverter has one fan tray for power module cooling and two internal fans for inside air circulation as shown in **Figure 5-8**

The system features a fan fail detection and generates a "FAN-FAIL" signal to control the inverter into power de-rate mode for safe operation.

ATTENTION



- Periodic fan and filter cleaning is required to ensure 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.

5.3.1 Location of failure fan

If the error event list shows **"Fan Fail"**, please refer to the corresponding code shown on DSS and procedure in following chapters to remove the fan.

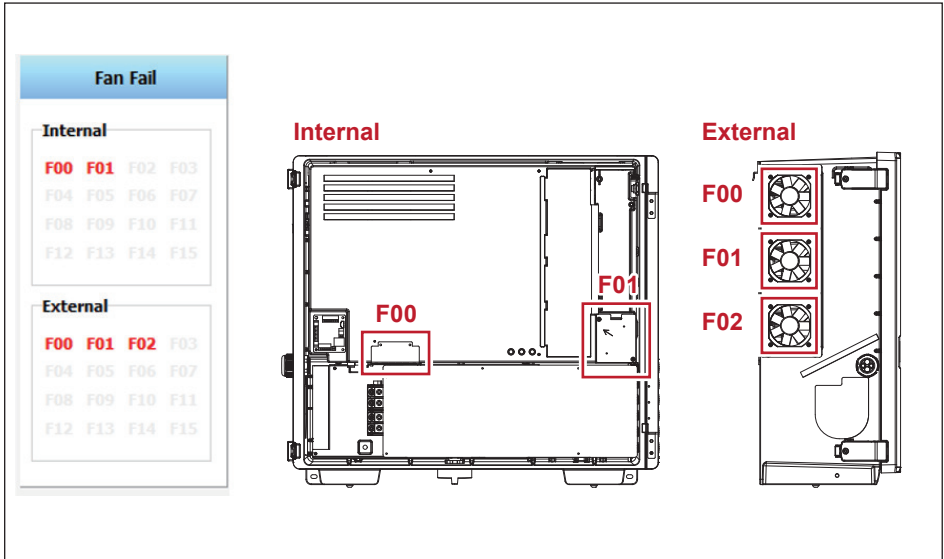


Figure 5-8: The corresponding fan location to the fan fail code on DSS

5.3.2 Power Module (PM) Fan Tray

DANGER : ELECTRICAL HAZARD!!



- Before beginning any maintenance procedures, turn off the AC switch of the inverter first and then the DC switches to avoid the risk of electrical shock!

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 three smart fans that operate together and also provide redundancy; the inverter will operate to full power with three 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 5-9** and the following steps for removal and replacement of fans:

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.

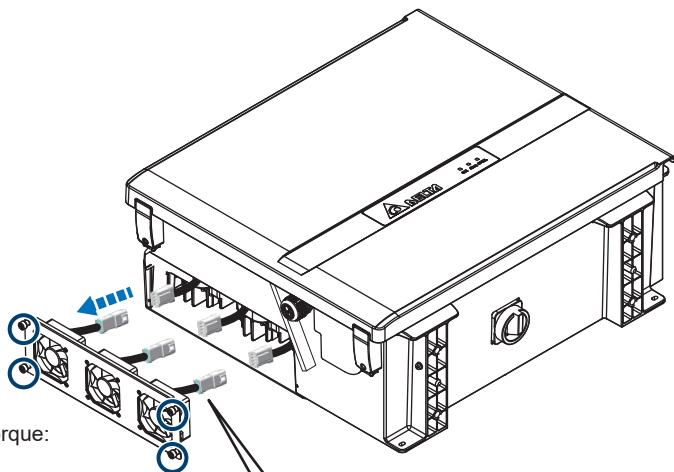
(To release snap-fit, press location A and location B from both side .)

3.Pull fan tray out from PM chassis.

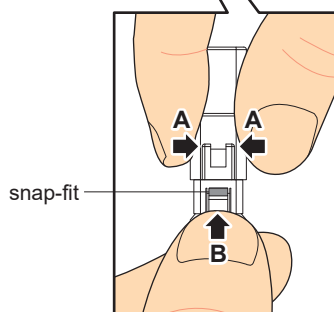
To disassemble each fan, remove four screws that secure it to the fan tray.

To reassemble reverse the order of the above procedure and tighten screws to torque values indicated in **Figure 5-9**.

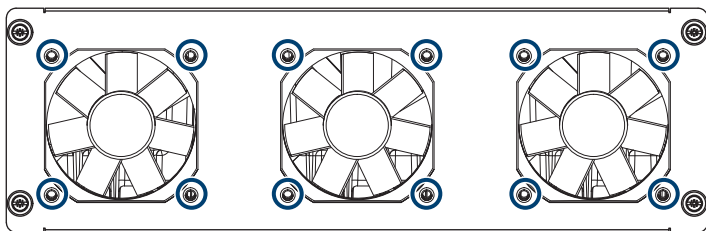
①



②



③



* Screw torque required for assembling: 5 lbf-in

Figure 5-9: Disassembling fan tray from PM chassis

5.3.3 Internal Fan 1

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

- (1) Open the front door as instructed in **Section 5.1.1**.
- (2) Remove the DC SPD cover. (shown in **Figure 5-10**)
- (3) Disconnect the fan connector on the DC SPD board.
- (4) Loosen two self-retaining screws and remove the fan cabinet.
- (5) Lift the entire fan assembly. (shown in **Figure 5-11**)
- (6) Clean assembly or replace with a new fan. (shown in **Figure 5-12**)
- (7) Reassemble using a tightening torque of recommended.

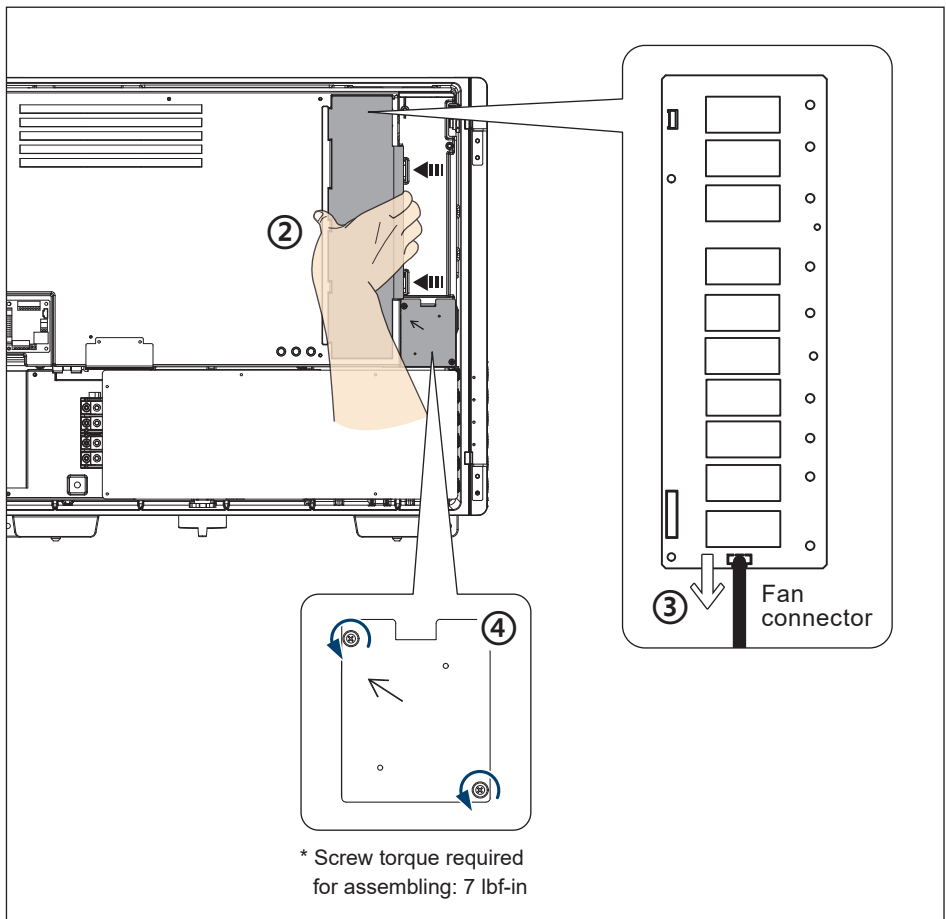
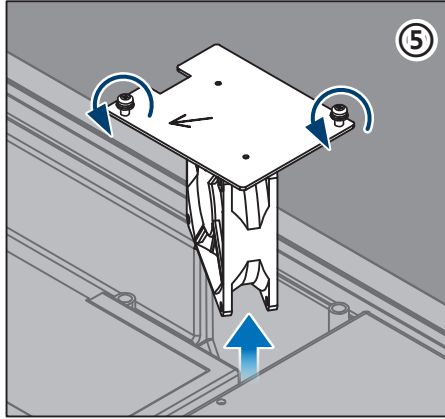
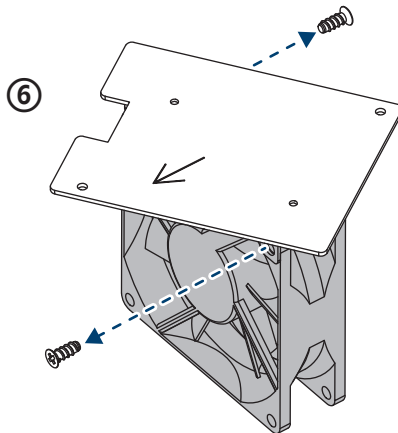


Figure 5-10: Internal fan 1 location & remove the shield cover



* Screw torque required for assembling: 7 lbf-in

Figure 5-11: Take off the internal fan 1



* Screw torque required for assembling: 5 lbf-in

Figure 5-12: Replace with a new fan

5.3.4 Internal Fan 2

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

- (1) Open the front door as instructed in **Chapter 5**.
- (2) Disconnect the fan connector on the comm. board as figure below.
- (3) Loosen two self-retaining screws and remove the fan cabinet.
- (4) Lift the entire fan assembly. (shown in **Figure 5-14**)
- (5) Clean assembly or replace with a new fan. (shown in **Figure 5-15**)
- (6) Reassemble using a tightening torque of recommended.

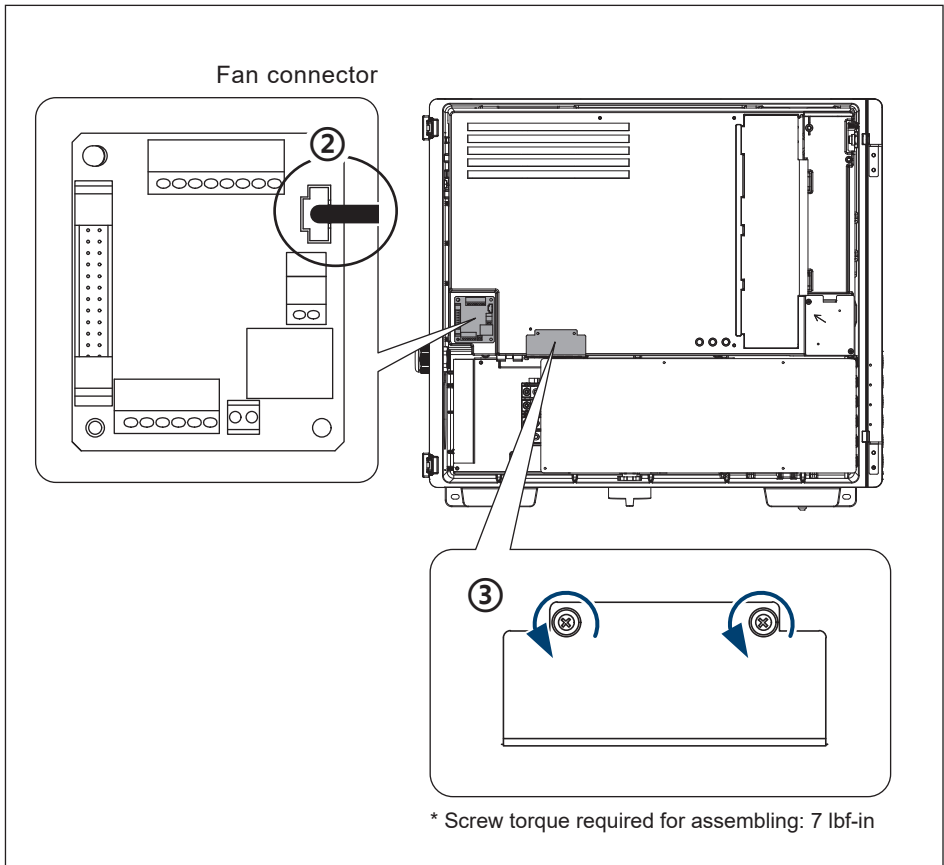


Figure 5-13: Internal fan 2 location & remove the shield cover

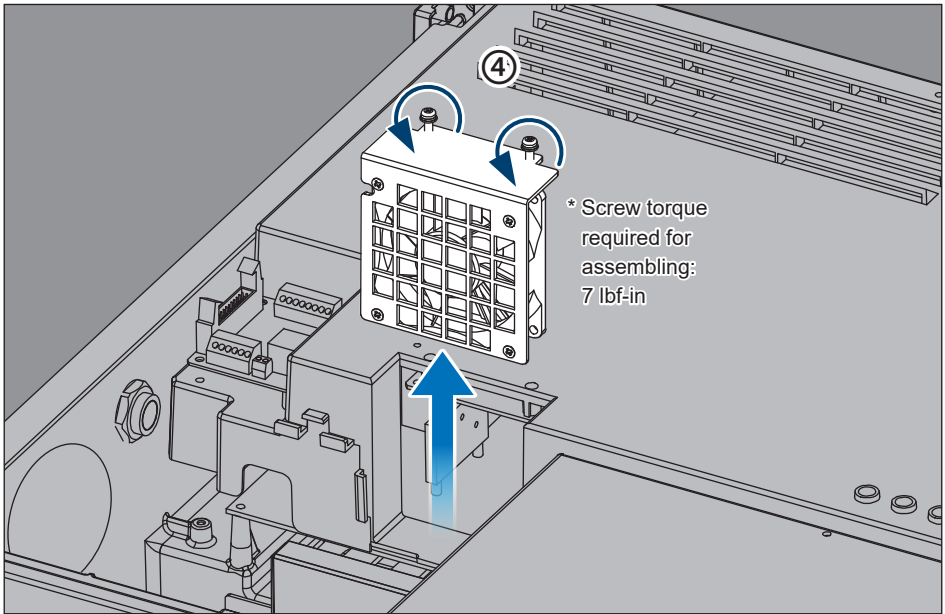


Figure 5-14: Take off the internal fan 2

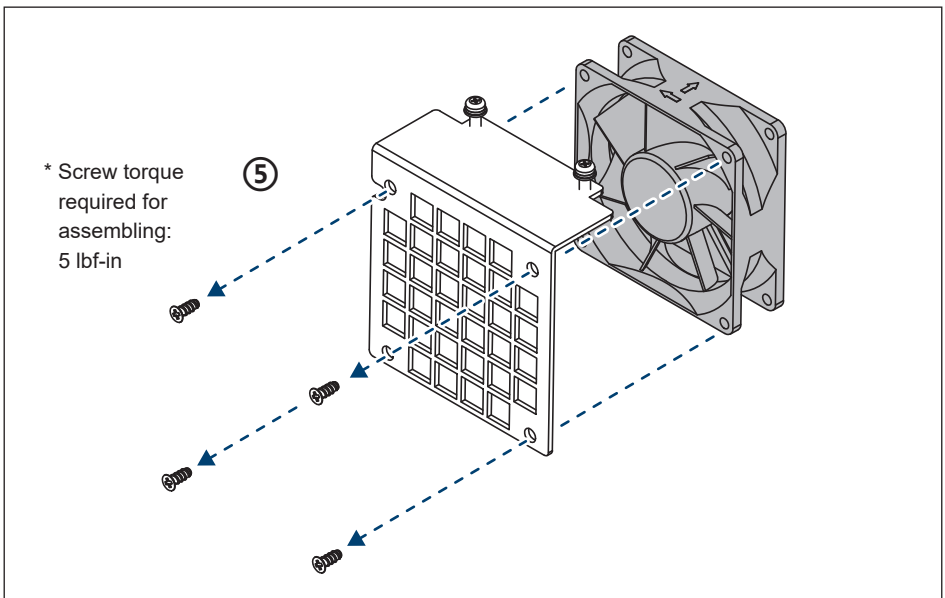


Figure 5-15: Replace with a new fan

5.4 De-Commissioning

When it's necessary to remove the inverter from operation for replacement or for maintenance purposes, follow the instruction below.

DANGER : ELECTRICAL HAZARD!!



To avoid serious injury, please follow the local safety protocol and the procedure below.

1. Switch off the AC switch and the external AC circuit breaker to disconnect the electrical grid from the inverter chassis.
2. Turn both of the DC switches to OFF position, then secure to against reconnection.
3. Wait 150 seconds and make sure LED indicators of the inverter have gone out.
4. To ensure there is no current in the cables, please use a current clamp to measure DC/AC cables.
5. Use H4 wrench tool to disconnect each string from the chassis mounted H4 terminals.

■ 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 cools down sufficiently.

CAUTION : POSSIBLE INJURY !



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 inverter.

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 “Troubleshooting Guide” (**Tables 6-1 ~ 6-4**) 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 6-1: 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	<i>If repeated occurrence, contact customer service for technical support</i>
Grid Quality (E07)	Non-linear load in Grid and near to inverter	<i>If repeated occurrence, contact customer service for technical support</i>
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 completely 2. Check if inverter ground completely 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
Inverter 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 6-3: 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 6-4: 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	Ext Fan Fail 1. Remove the object that stuck in the fan(s) 2. Check the connections of all fans 3. Replace the defective fan(s) ----- Int Fan Fail Contact customer service for technical support
DC SPD Fault AC SPD Fault (W17) (W18)	One or more SPD are defective or disconnected	1. Replace the defective SPD 2. Check the connections of SPDs
Aux Power Fault (W19)	DC Aux-Power fail	Contact customer service for technical support
Boost Circuit Fault (W30)	The boost circuit defective	Contact customer service for technical support

7 Technical Information

Table 7-1A: Specifications	
Model	M60U_260
DC Input	
Occasionally Max. voltage	1000 V
Operating Voltage Range	200 - 1000 V
MPP Voltage Range (Full Power)	390 - 900 V *1
Start Voltage	> 250 V
Rated Voltage	710 V
Max. Input Current	Each MPPT: 30 A, Total: 156 A
Max. Input Power	Each MPPT: 15.2 kW
Max. allowable array Isc	40 A
MPP Tracker	6
Connection Type	2 strings / MPPT (fuse not required) Amphenol H4 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	60 kW
Max. Output Power	66 kVA *3 (66 kW when PF=1)
Max. Output Current	83.4 A
Rated Voltage	3 Ph 277 / 480V Y or Δ
Operating Voltage Range	88% to 110% of Nominal AC Voltage
Operating Frequency Range	58.5 - 60.5 Hz
Power Factor	0.8 ind - 0.8 cap (adjustable)
Surge Protection	Type II SPD (built-in) ; Type I+II SPD (optional)
T.H.D	< 5%
Night Time Consumption *2	< 3.5 W

*1 Ambient < 40°C: 390 - 900V ; Ambient < 50°C: 470 - 900V

*2 Night time consumption with standby communication.

Table 7-1B: Specifications	
Model	M60U_260
Efficiency	
Peak efficiency	98.5 %
CEC efficiency	98 % *3
Euro efficiency	98.2 %
Information	
Communication Port	RS-485 / Bluetooth
Regulation	
	CSA C22.2 No.107.1-01 UL 1741 SOP/ SA UL1699B IEEE1547_2020 CEC UL 1741 Supplement SB
General Data	
Operating Temp. Range	-13 to 140°F (-25 to 60 °C)
Protection Level	NEMA 4X
Operating Elevation	< 13100 ft (< 4000 m)
Cooling	Smart fan air cooling
Noise	65.2 dBA @ 1m, Amb 25°C
Dimension (W x H x D)	27.5 x 24.8 x 10.4 in
Weight	141 lb

*3 MPP voltage range: Vmin 390V, Vnom 710V, Vmax 850V - 98%

MPP voltage range: Vmin 390V, Vnom 710V, Vmax 900V - 97.8%

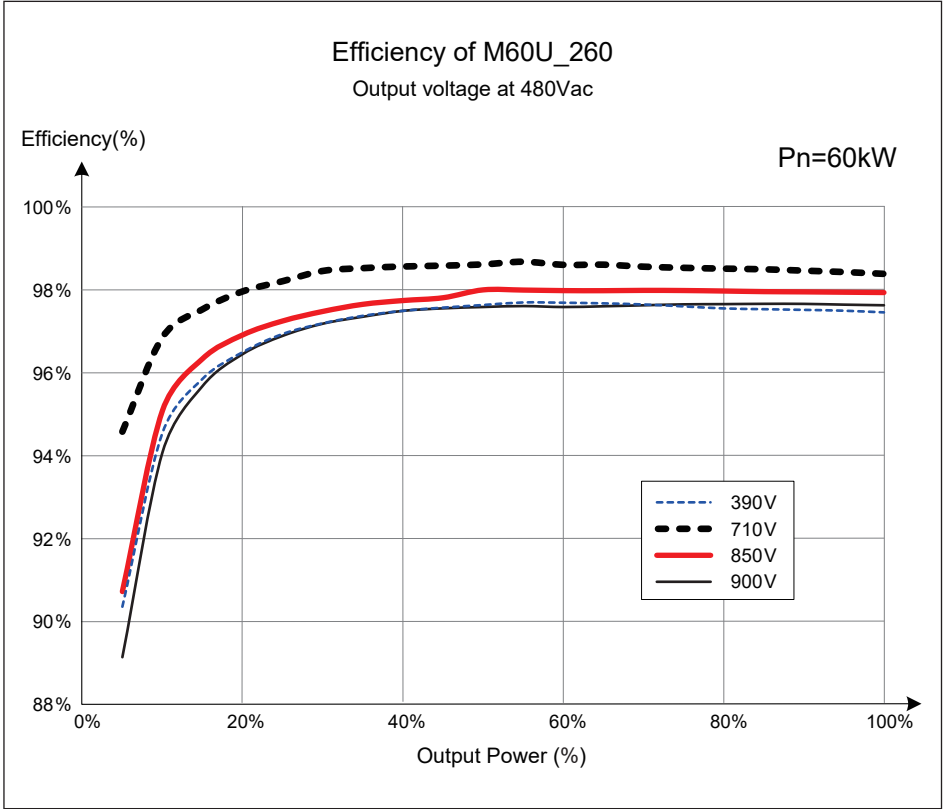


Figure 7-1: Efficiency curve

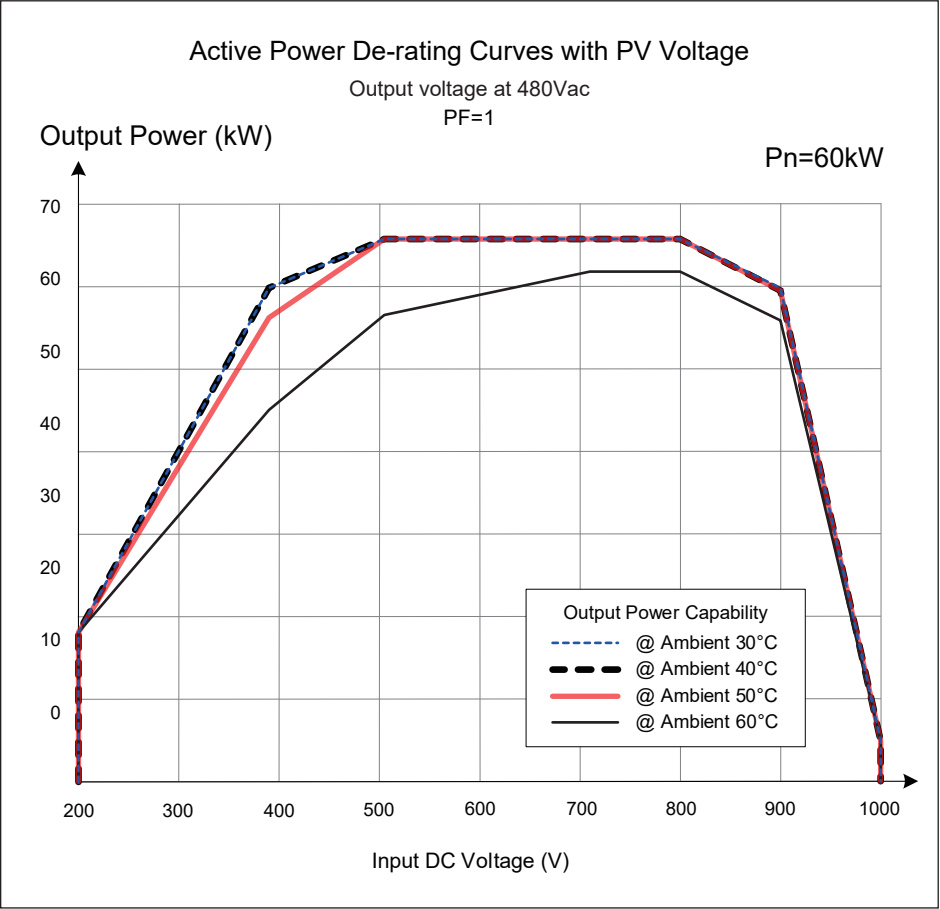


Figure 7-2: Active power de-rating curves with PV voltage (PF=1)

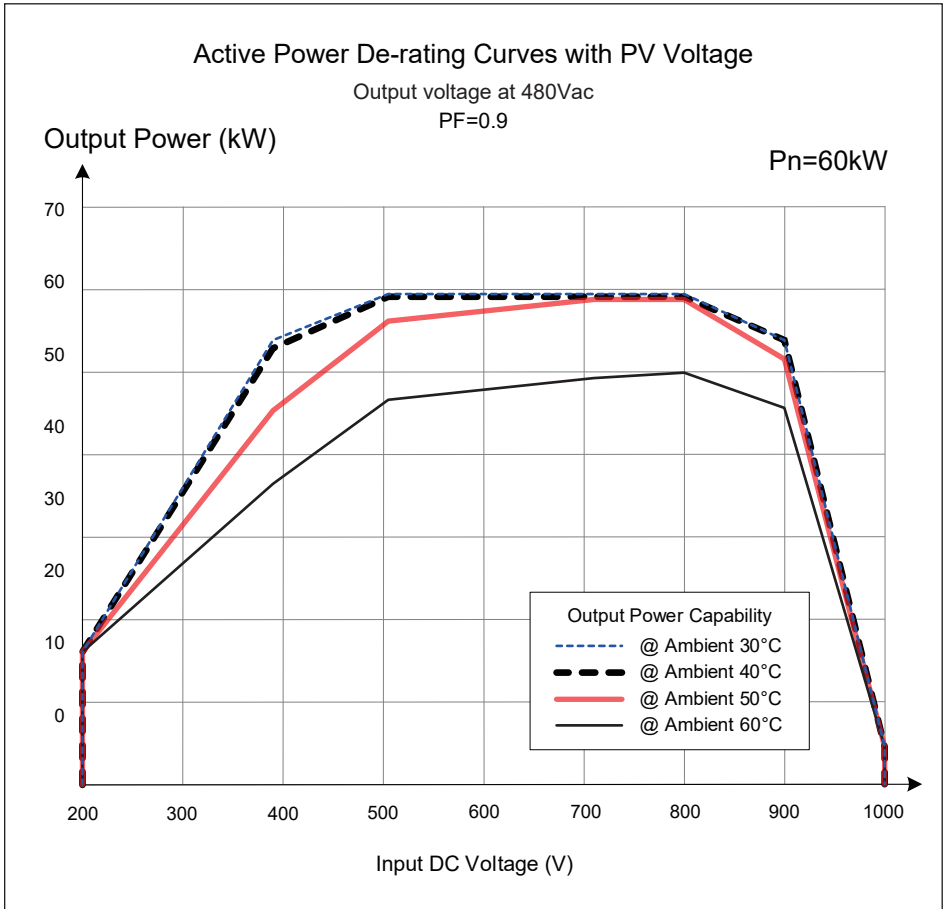


Figure 7-3: Active power de-rating curves with PV voltage (PF=0.9)

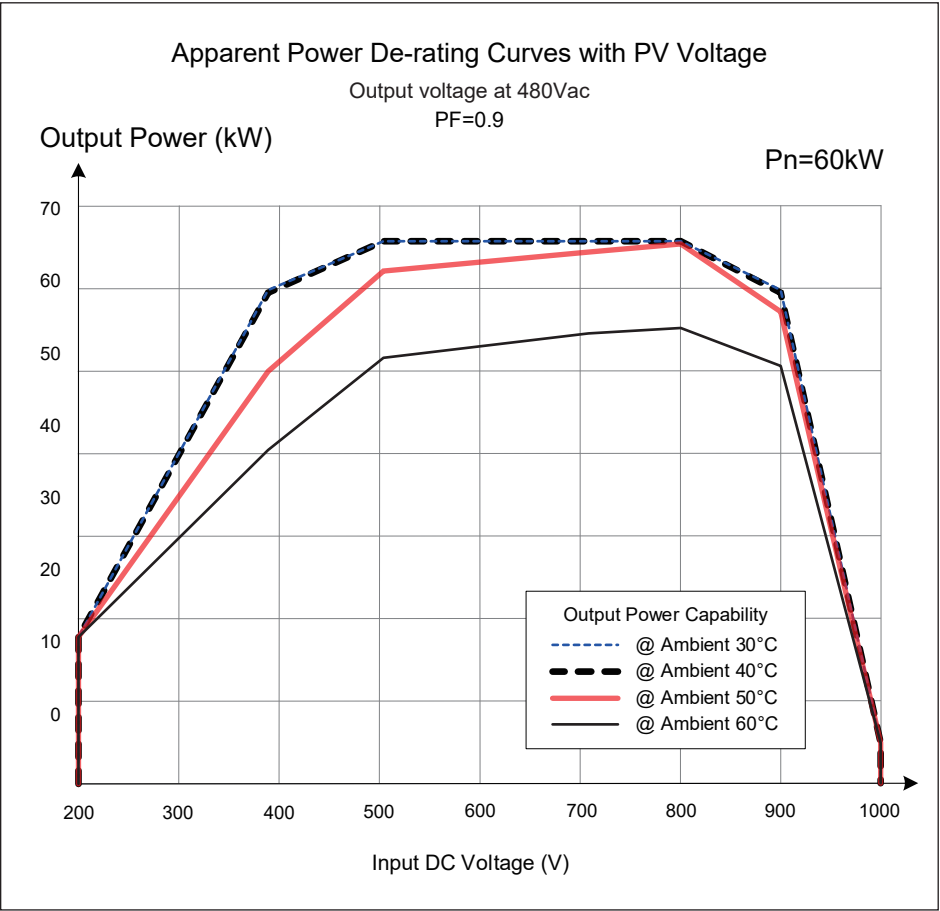
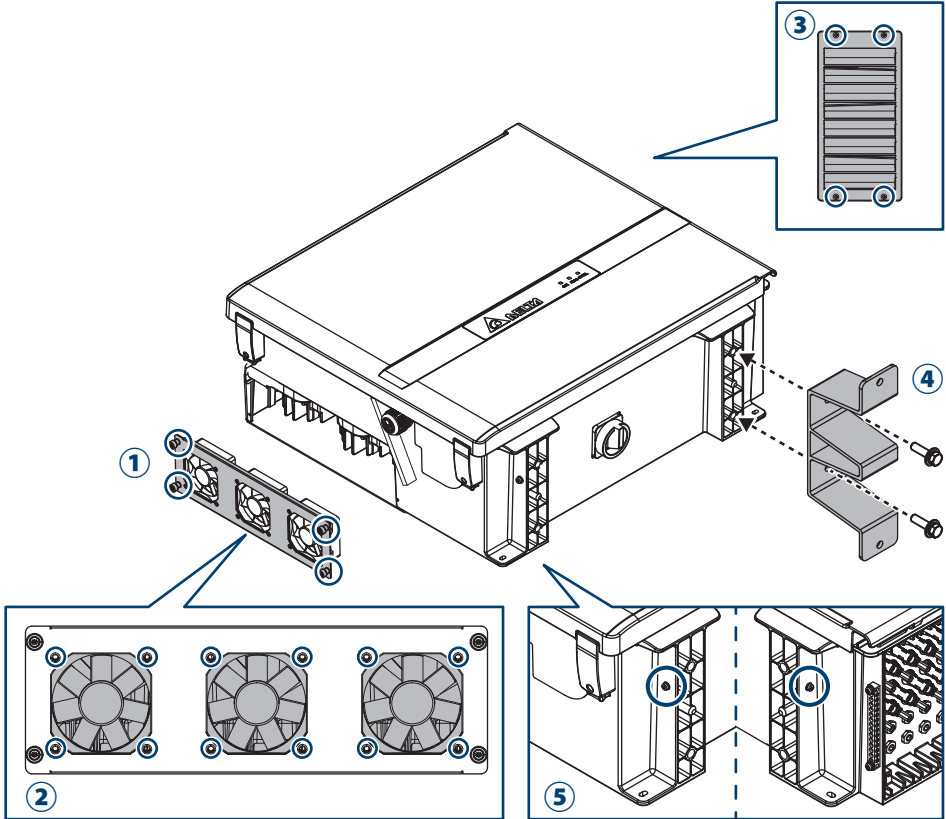


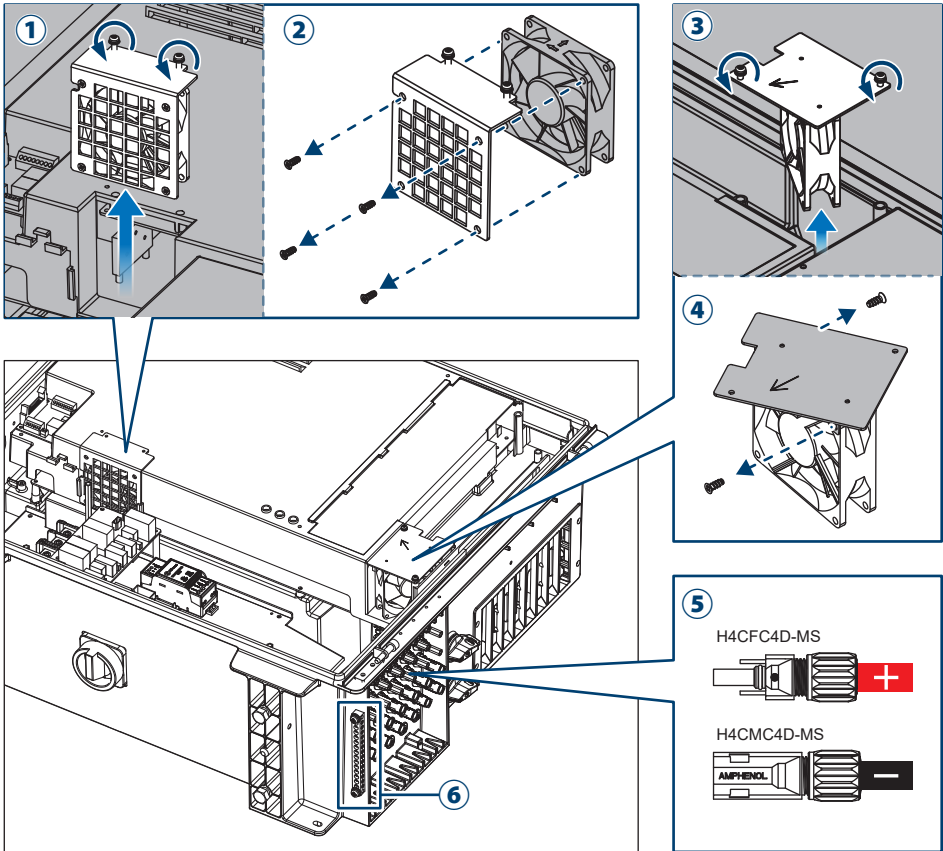
Figure 7-4: Apparent power de-rating curves with PV voltage (PF=0.9)

Appendix: Assembly Note



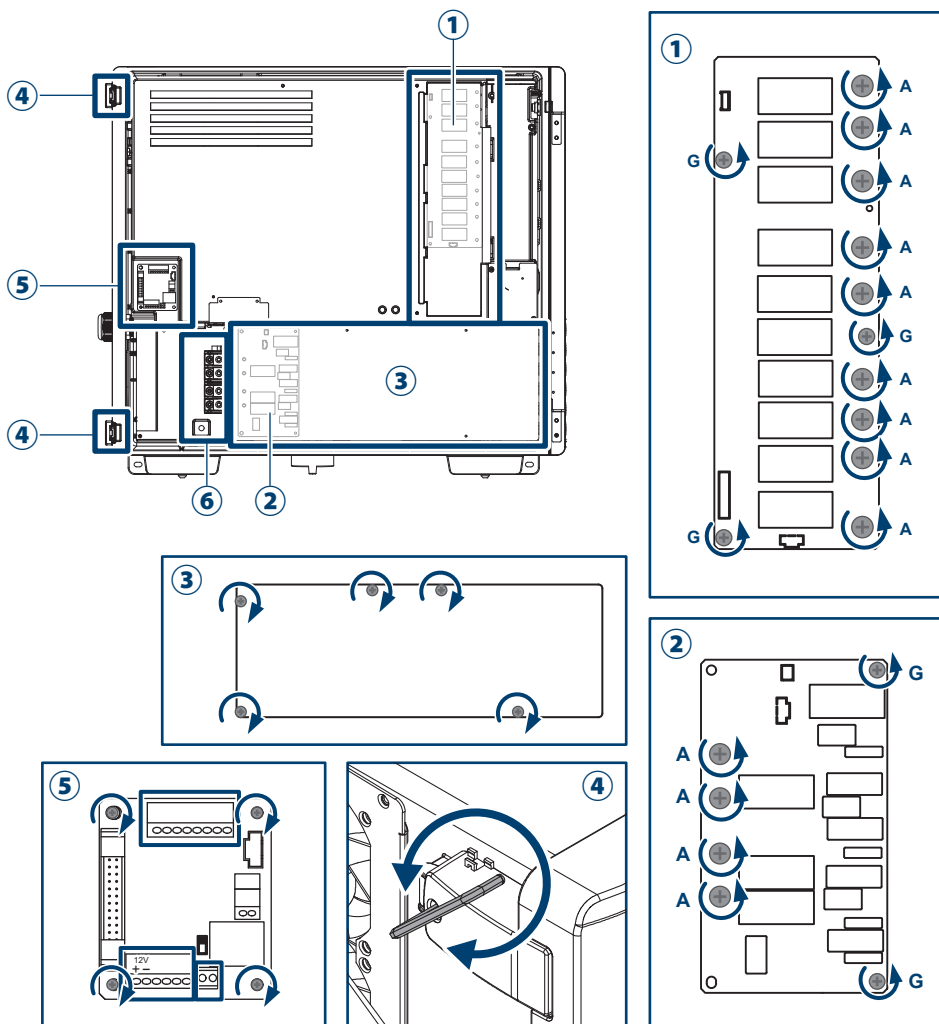
Appendix-1: Assembly Note-1

NO	Location	Screw torque
1	Fan Tray	12 lbf-in (1.4N·m)
2	Fan	5 lbf-in (0.6N·m)
3	Fan Filter	12 lbf-in (1.4N·m)
4	Grounded Bracket	217 lbf-in (24.5N·m)
5	Grounding (M6)	35 lbf-in (3.9N·m)



Appendix-2: Assembly Note-2

NO	Location	Screw torque	Conductor cross-section
1	Internal Fan 2 Cover	7 lbf-in (0.8N · m)	-
2	Internal Fan 2 Tray	5 lbf-in (0.6N · m)	-
3	Internal Fan 1 Cover	7 lbf-in (0.8N · m)	-
4	Internal Fan 1 Tray	5 lbf-in (0.6N · m)	-
5	H4 wire	-	12~10 AWG (4~6 mm ²)
6	Grounding bar	26 lbf-in (3N · m)	14~4 AWG (2.5~25 mm ²)



Appendix-3: Assembly Note-3

NO	Location		Screw torque	Conductor cross-section
1	DC SPD board		A: 22 lbf-in (2.45 N·m)	-
2	AC SPD board		G: 7 lbf-in (0.8 N·m)	
3	AC Cover		7 lbf-in (0.8 N·m)	-
4	Toggle Latch		22 lbf-in (2.45 N·m)	-
5	Communication card		7 lbf-in (0.8 N·m)	20 AWG (0.5 mm ²)
6	AC terminal	L1, L2, L3, N	110 lbf-in (12.4 N·m)	Cu: 25 mm ² (2AWG) ~ 60 mm ² (2/0AWG) Al: 35 mm ² (1AWG) ~ 60 mm ² (2/0AWG)
		PE	130 lbf-in (14.7 N·m)	



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