



# Grid-tie Transformerless Solar Inverter

M125HV\_111

Operation and Installation Manual





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# 1 Safety

## 1.1 Information of the Inverter

### 1.1.1 Legal Provisions

Copyright – DELTA ELECTRONICS, INC. - All rights reserved.

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, and L3 terminal to ground; to do so will damage the inverter and void the product warranty.

### 1.2.1 Condition of Use

- M125HV\_111 is a transformerless solar inverter with single 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 20 $\mu$ 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 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

M125HV\_111 transformerless 3Ø PV inverters are 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



- 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, and L3 to ground.

### 2.1 Valid Model

The user manual is valid for the following device types:

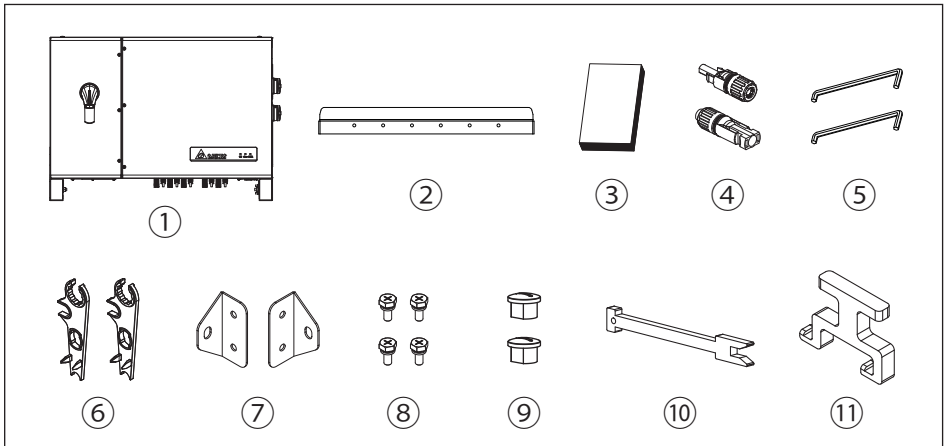
- M125HV\_111

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 of M125HV\_111 is shown as **Figure 2-1**.



**Figure 2-1: Components**

**Table 2-1: Packing list**

M125HV_111			
	Object	Qty	Description
1	Delta Solar Inverter	1 pc	Solar inverter
2	Mounting Bracket	1 pc	Wall mounting bracket (Material: Aluminum/Thickness: 3mm)
3	User Manual	1 pc	Important instructions for solar inverter. Safety instructions should be followed during installation and maintenance.
4	H4 Plus Connector	20 pairs	DC String inputs
5	Hexagon Driver	2 pcs	Fixture for both front doors Prevent it from closing
6	H4 Wrench	2 pcs	For disconnecting H4 connector
7	Reinforce Bracket	2 pcs	Wall mount brackets for stands on each side
8	Screw M8x16L	4 pcs	To lock reinforce bracket with foot
9	Screw Plug	2 pcs	Spare M12 screw plug
10	Calibration Tool	1 pc	To reinforce the base mount fuse holder
11	Fuse Puller	1 pc	Tool to remove the fuse holder

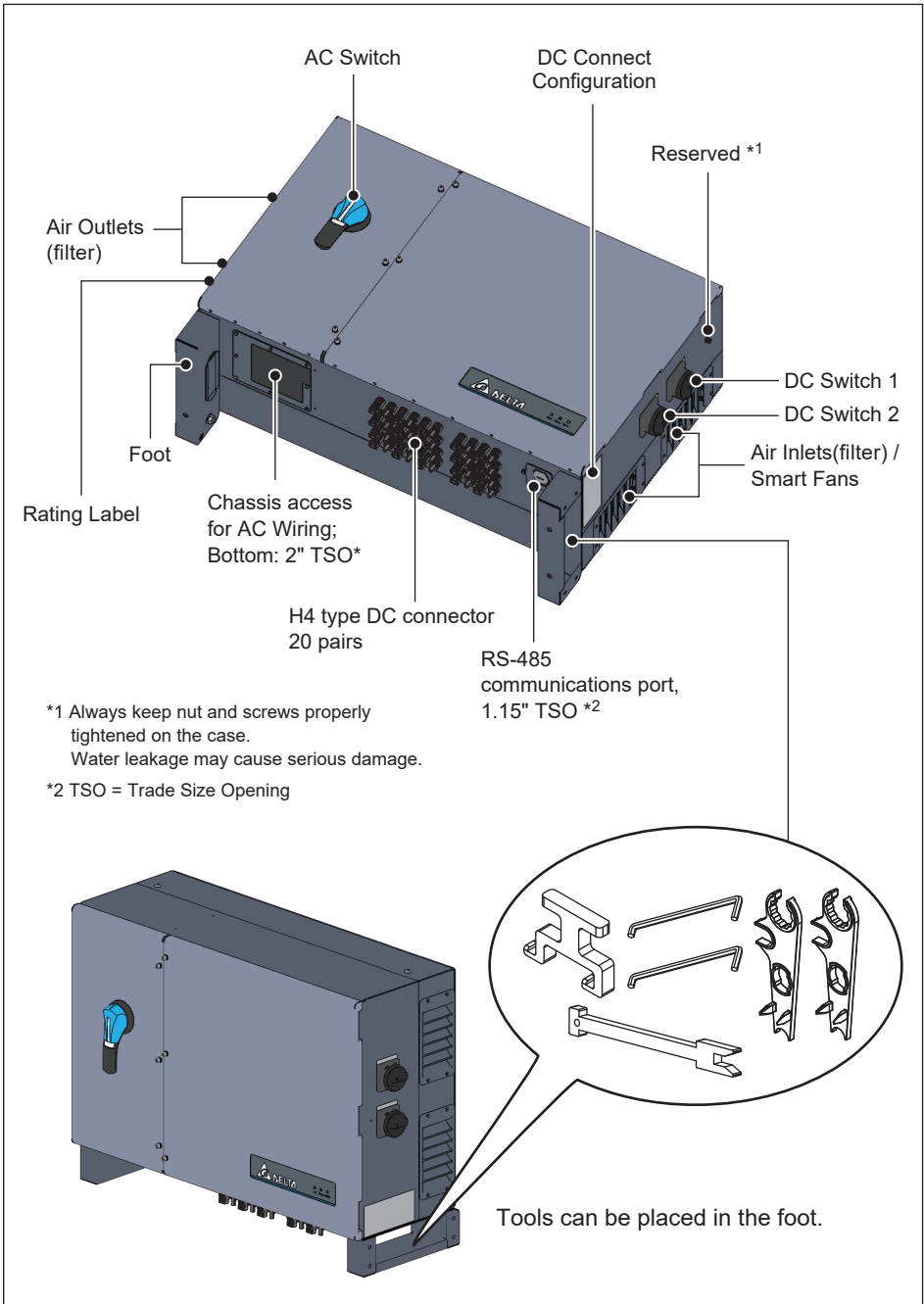
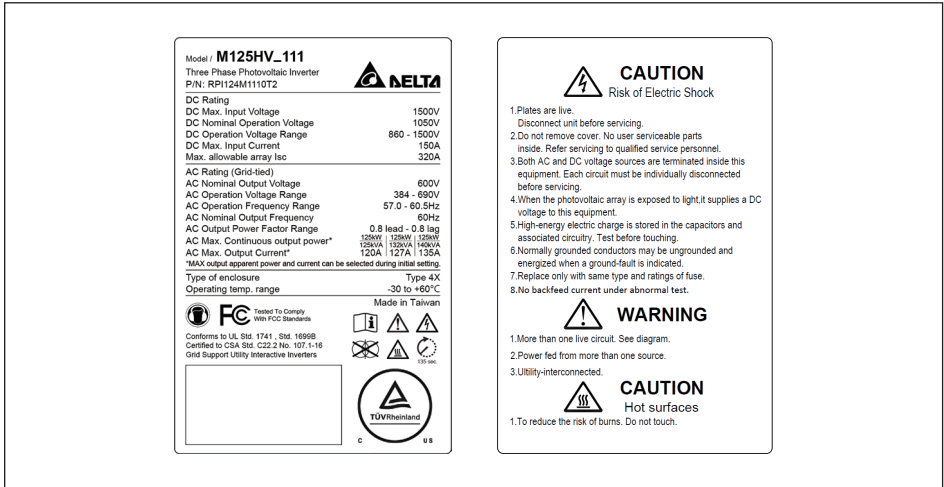







Figure 2-2: Overview

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

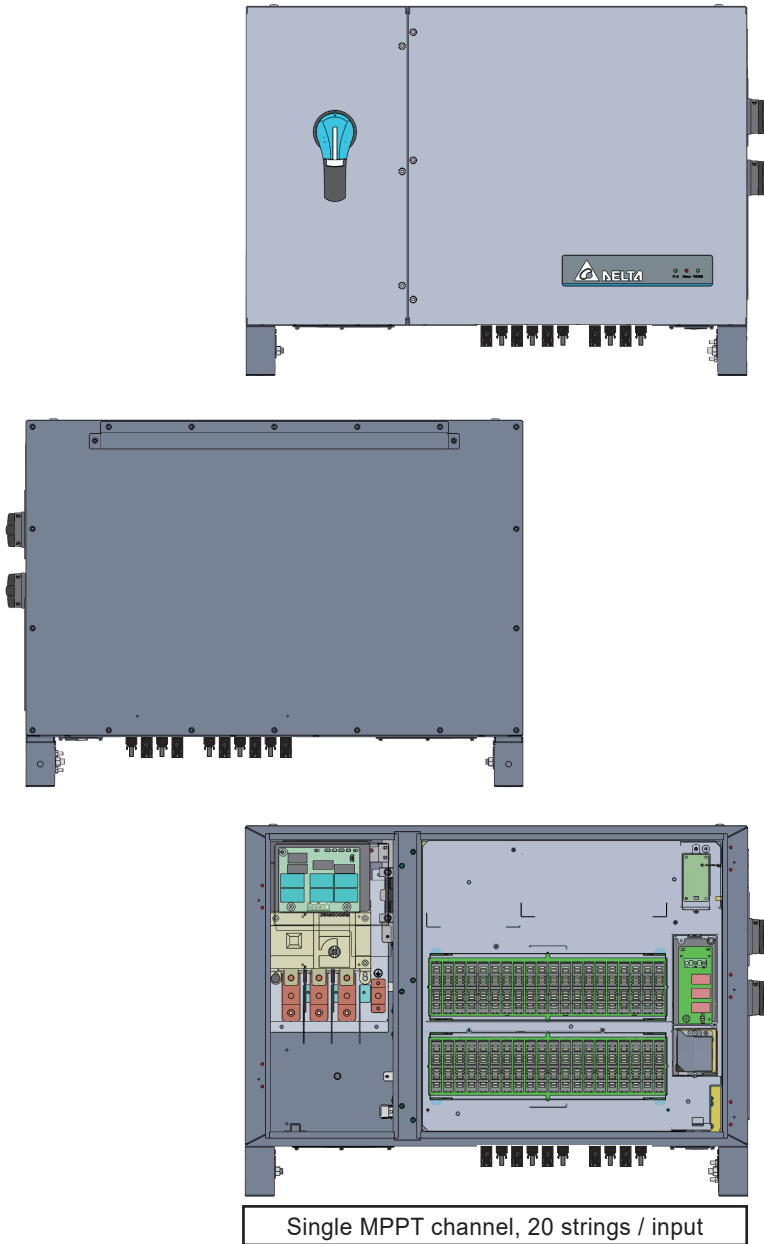


**Figure 2-3: Rating label**

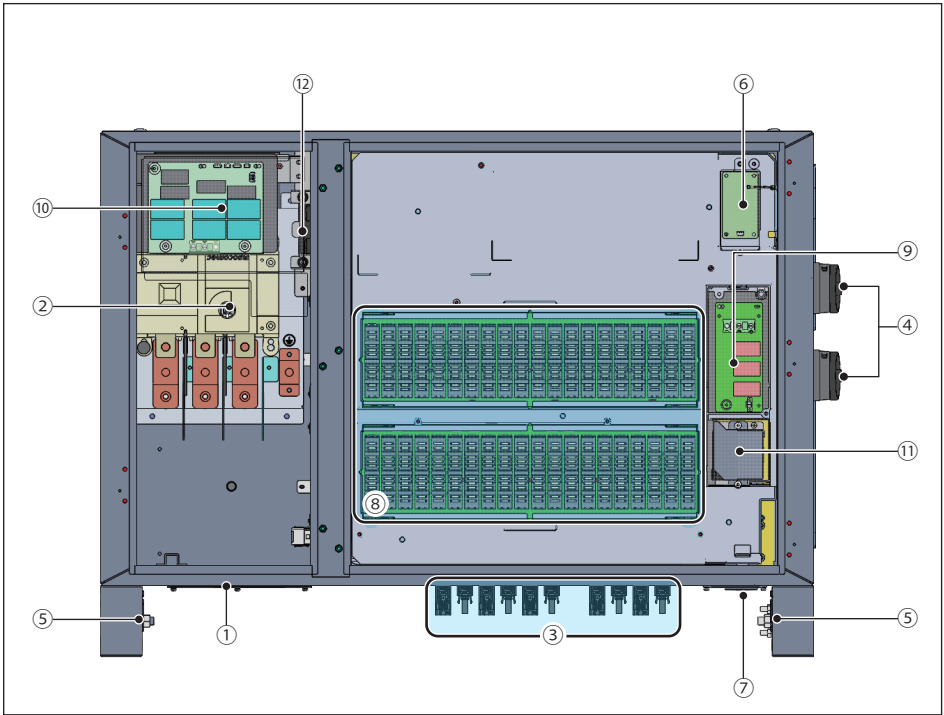
**Table 2-2: Rating label explanation**

Symbol	Definition	
 135 seconds	<b>Danger to life through electric shock</b> Potentially fatal voltage is applied to the inverter during operation. This voltage persists even 135 seconds after disconnection of the power supply. Never open the inverter. The inverter contains no components that must be maintained or repaired by the operator or installer. Opening the housing will void the warranty.	
	Before working with the inverter, you must read the supplied manual and follow the instructions contained therein.	 Please be aware of noise protection.
	This inverter is not separated from the grid with a transformer.	 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 and wiring area. **Figure 2-5** and **Table 2-3**, provides a detailed description of each wiring area option. The wiring area includes terminals for connection of the output (AC) wiring and surge protection devices (SPD).



**Figure 2-4: External/ internal view**



**Figure 2-5: Layout**

**Table 2-3: Layout description**

NO.	Component	NO.	Component	NO.	Component
1	2" cable opening for AC	5	Grounding (M6/10 threaded stud)	9	Type II DC SPD
2	AC switch	6	N3U_SB1	10	Type II AC SPD
3	H4 connectors (20 pairs)	7	Communication port	11	Internal fan 1
4	DC switches	8	Fuse holder	12	Internal fan 2

### 3 Installation

#### 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.

#### WARNING !



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

The chapter contains instructions for

- (1) Mechanical installation
- (2) Electrical Installation
- (3) Communication setup

**Figure 3-4** provides the mechanical dimensions of the inverter.

#### CAUTION !

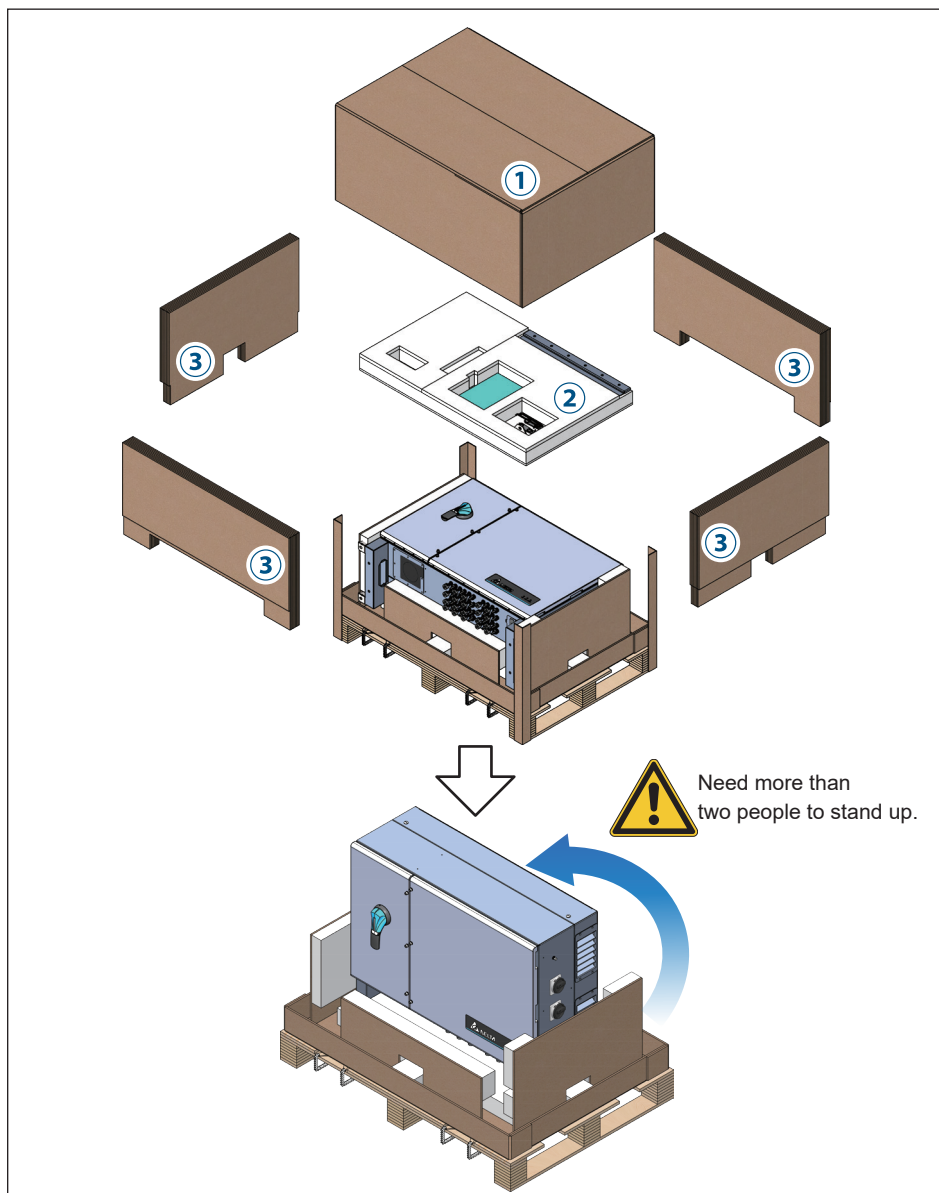


- Failure to comply with following mounting instructions including permitted orientations and designated clearances may result in derated power output and may void the warranty. To avoid these issues follow the instructions above!

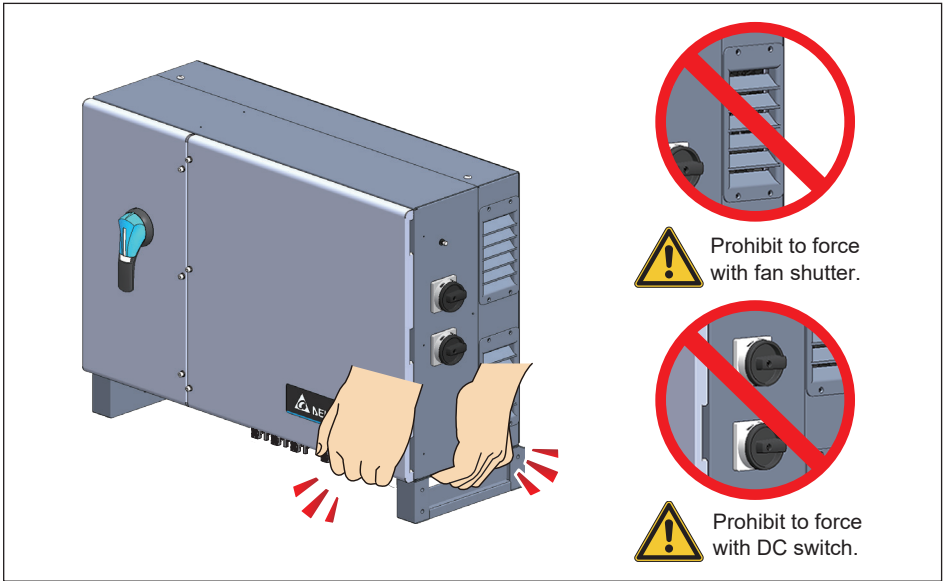


## 3.1 Unboxing & Review

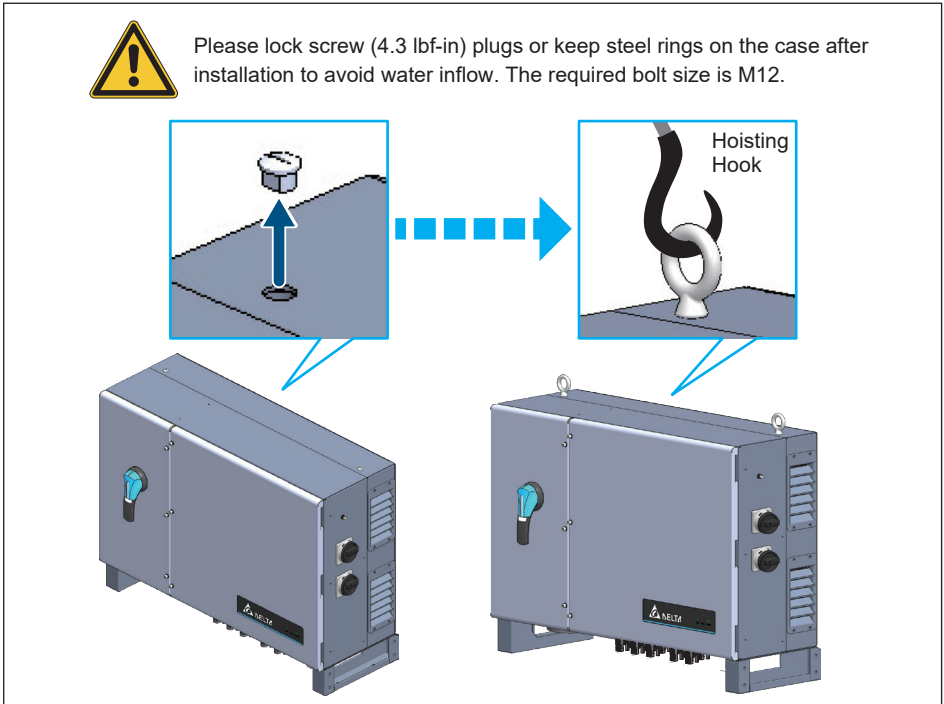
Unpacking the M125HV\_111, please follow the order of **Figure 3-1**. It could be transported by 2 people (**Figure 3-2**) or crane (**Figure 3-3**).



**Figure 3-1: The step to unpacking the inverter**



**Figure 3-2: Handle position for handling**



**Figure 3-3: Attaching the Hoisting hooks**

## 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 3-5** through **Figures 3-9**.

1. Ensure the surface to which the unit is to be mounted is sufficiently strong enough to carry the inverter.
2. Orient the wall bracket (item 2, **Figure 2-1**) horizontally (perpendicular to the ground), and mark required mounting hole locations as **Figure 3-5**.
3. Secure the mounting bracket onto the wall with 6x M10 screws.
4. Assemble reinforce bracket (item 7, **Figure 2-1**) on both sides of the foots with 4x M8 screws (item 8, **Figure 2-1**) by 133 lbf-in torque as **Figure 3-8**.
5. Hang the inverter on the wall mounting bracket.
6. Secure the inverter by tightening 2x M10 screws to the reinforce bracket and the wall as shown in **Figure 3-9**.

#### CAUTION !



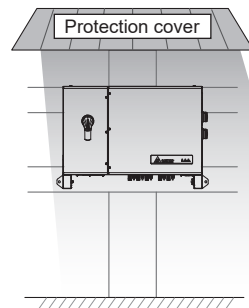
- The mounting bracket shipped with the unit is specially designed and is the only certified mounting device for mounting the inverter.
- Secure the mounting bracket on the wall with 6x M10 screws. (5 screws at least)

#### 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.



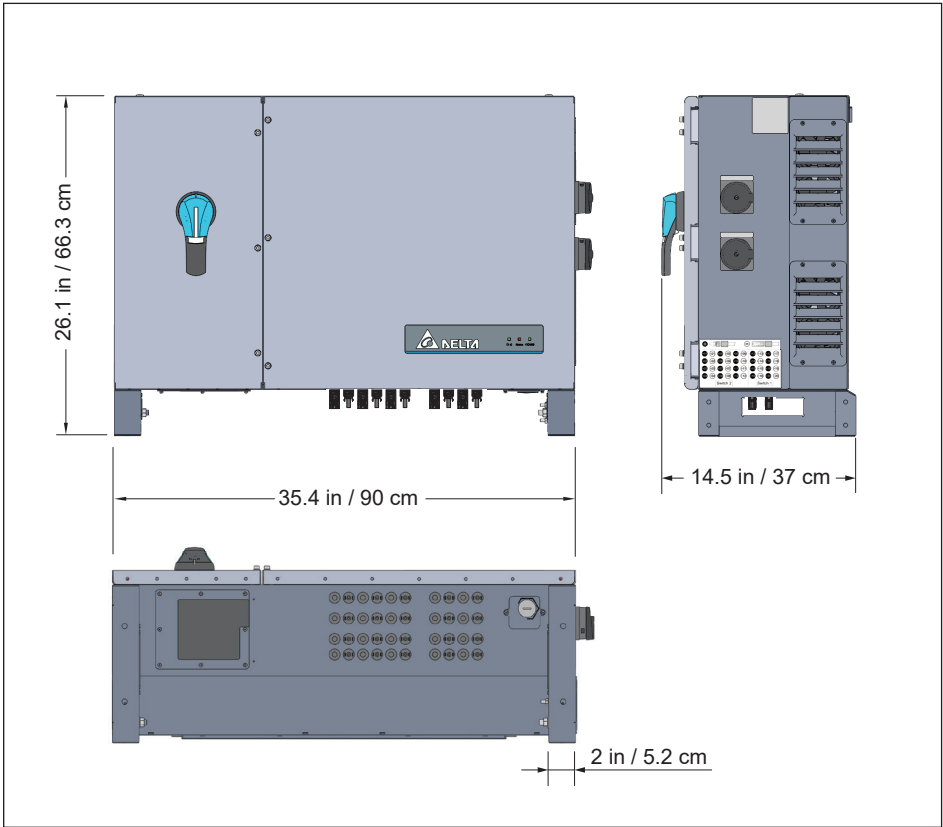
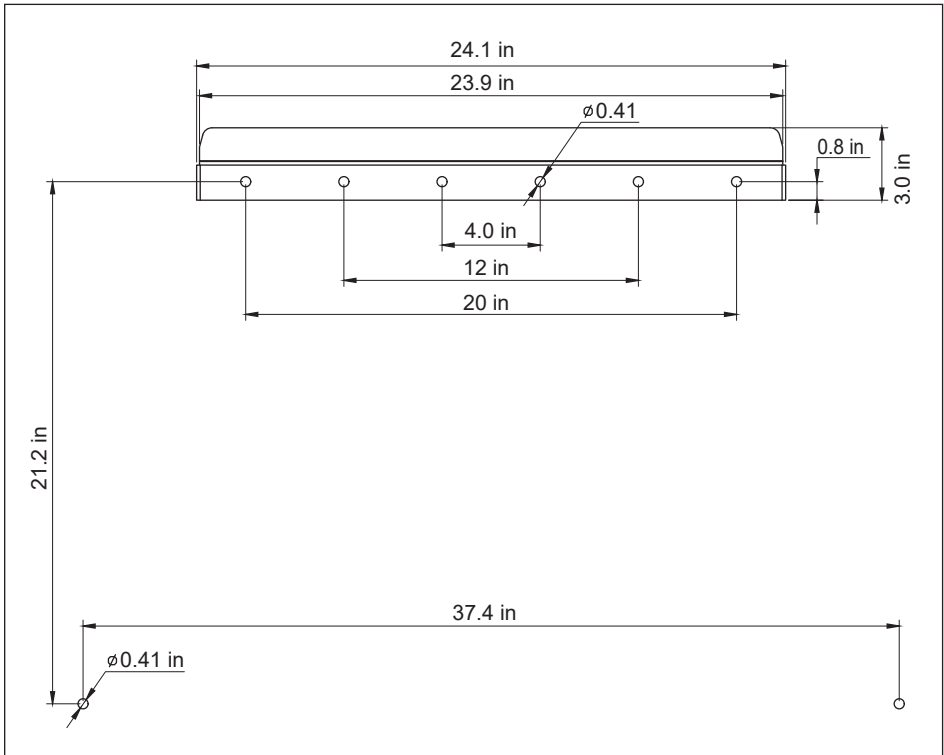
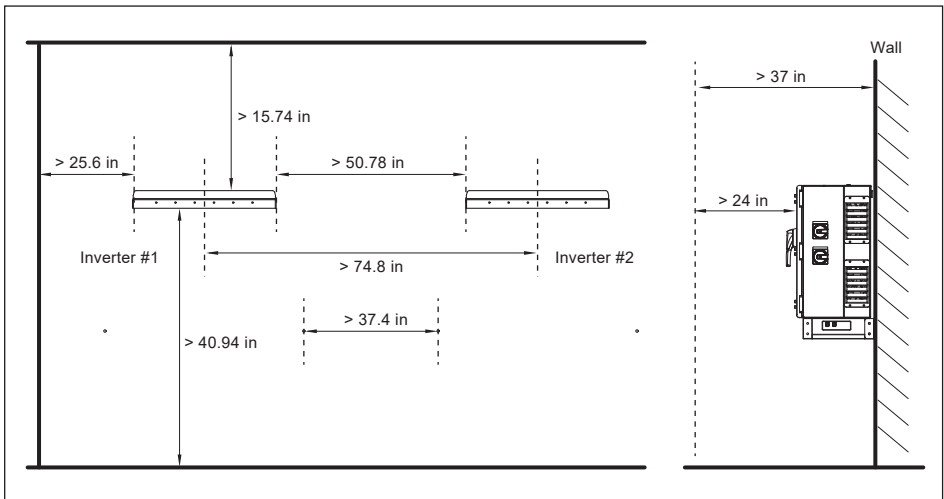


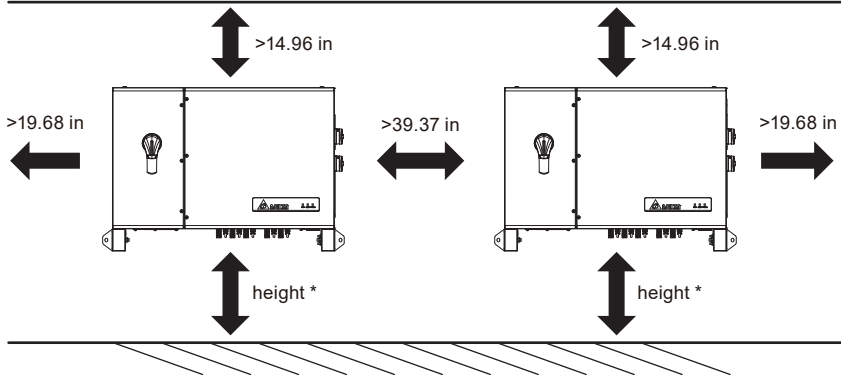
Figure 3-4: Inverter dimensions



**Figure 3-5: Mounting bracket dimensions**



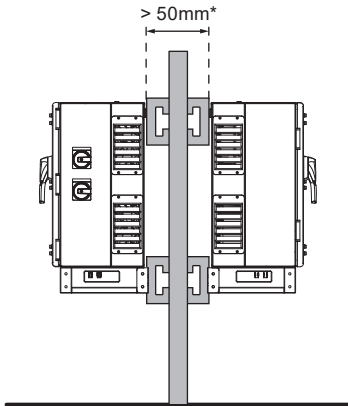
**Figure 3-6: Required mounting clearances**



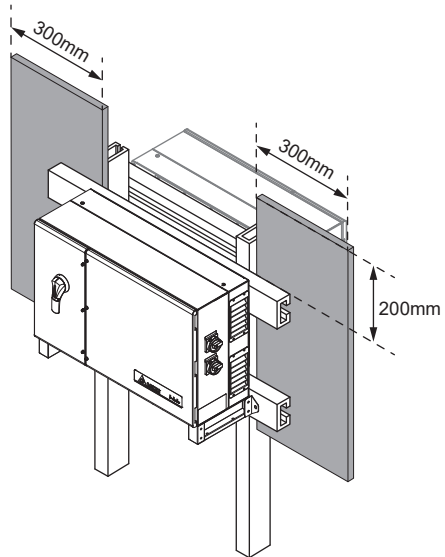
\* For wall mount installation, make sure it is high enough to have sufficient space for wiring.

### Back to Back

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

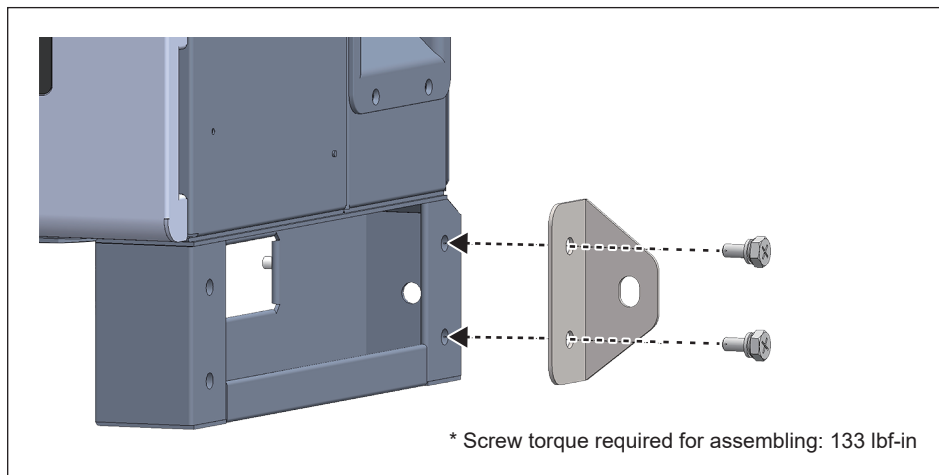


\* Clapboard is unnecessary when back to back distance > 500mm.

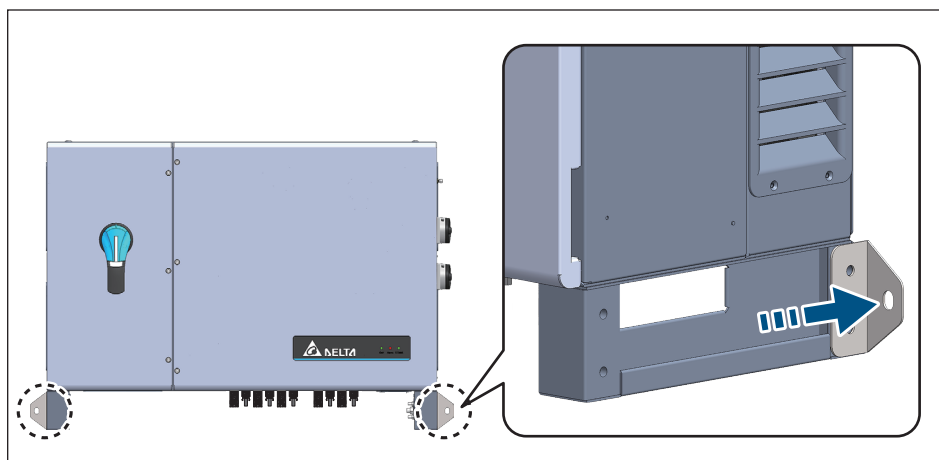


**Figure 3-7: Separation distance of plural inverters**

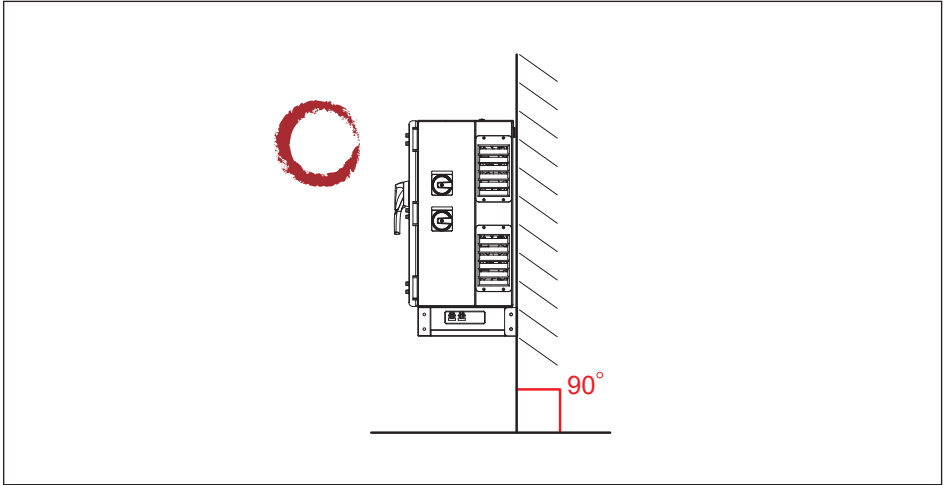
After installing the reinforce brackets on the foots (**Figure 3-8**), secure the reinforce brackets to the wall with two screws per **Figure 3-9**.



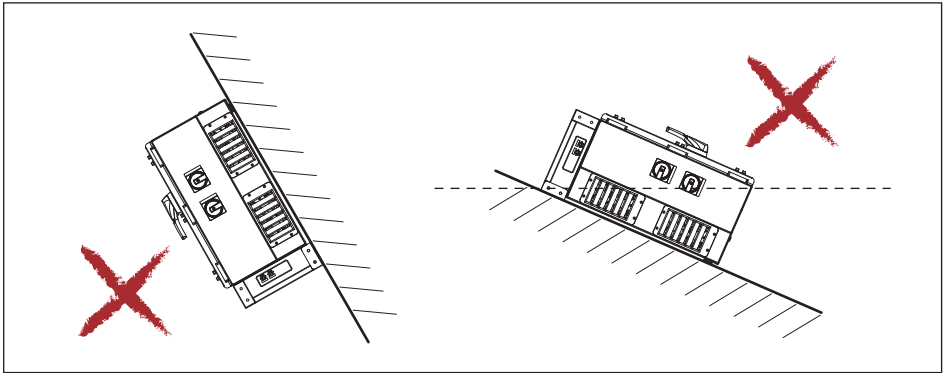
**Figure 3-8: Install the unit on the foots**



**Figure 3-9: To secure inverter reinforce brackets to wall-mounting bracket**



**Figure 3-10: Permitted mounting positions**



**Figure 3-11: Prohibited mounting positions**

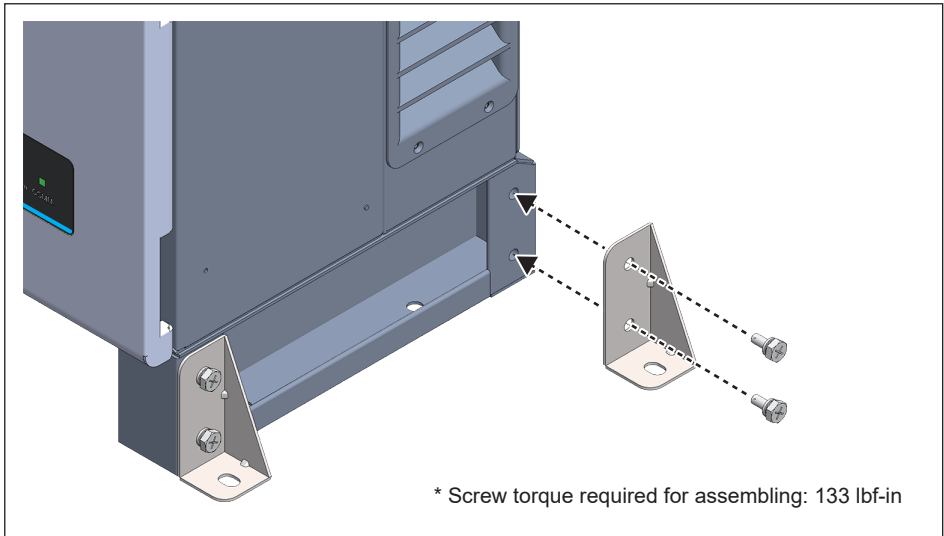
O : Permitted / X : Prohibited



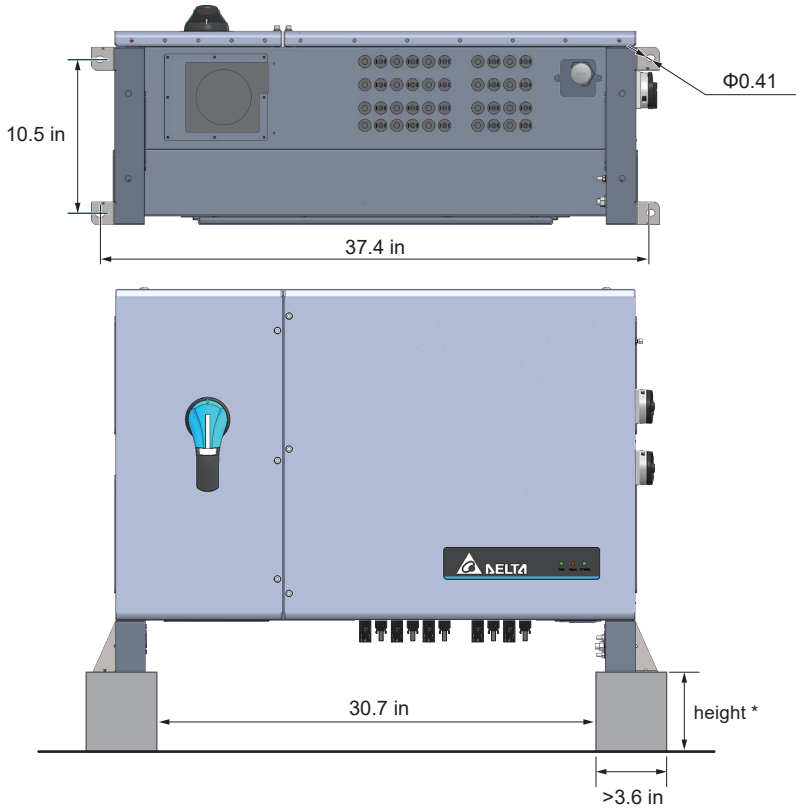
## 3.2.2 Ground Mount (optional)

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

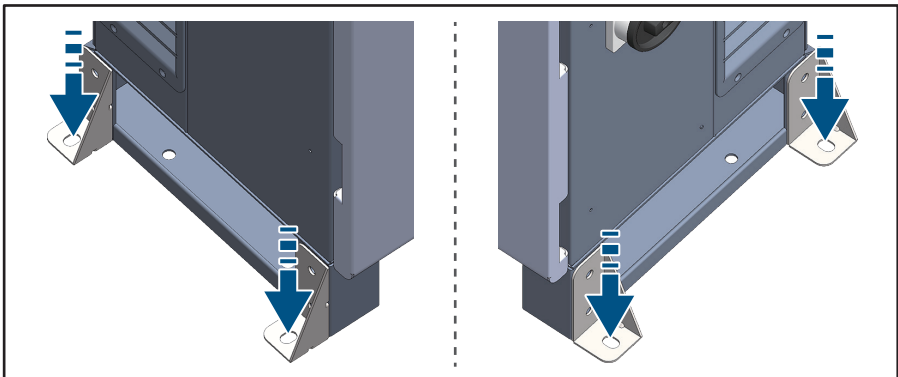
1. Ensure the grounded base to which the unit is to be mounted is sufficiently strong enough to carry the weight.
2. The grounded base horizontally (perpendicular to the floor), and mark required mounting hole locations per **Figure 3-13**.
3. Lock the grounded brackets to foots with 8 screws. (**Figure 3-12**)
5. Set the inverter on the ground mounting base.
4. Secure the grounded brackets on the grounded base with 4 M10 screws per **Figure 3-13**.



**Figure 3-12 : Lock the grounded brackets to foots**



\* For ground mount installation, make sure the cement base is high enough to have sufficient space for wiring.

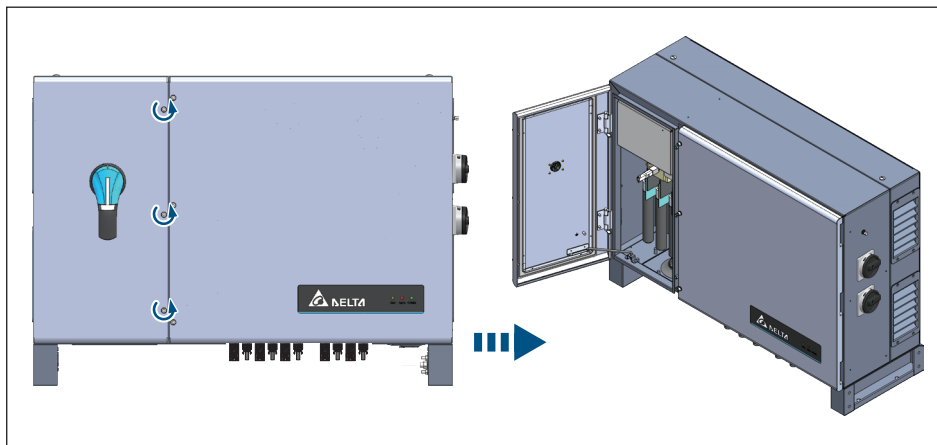


**Figure 3-13: To secure inverter grounded brackets to ground-mounting base**

### 3.3 Door

In order to guarantee proper long-term operation of the inverter, procedures in **Section 5.1** must be followed.

For the first time installation, only need to open the AC side (left) door for wiring.



*Figure 3-14: AC side (left) door*

#### INFORMATION



- Use Hexagon Driver (Table2-1, Item5) or other proper tool to untighten door screws.
- Door screws are captive screw type. Do not disassemble door screws.
- Please follow the recommended torque to lock-on door screw with torque wrench.

#### DANGER!



- **It is forbidden to open both doors at the same time.**

## 3.4 Electrical Installation for AC Wiring

### **DANGER : ELECTRICAL HAZARD!!**



- To avoid shock hazard during cabling, insure any live grid connections are removed from the inverter.

### **DANGER!**



- **It is forbidden to open both doors at the same time.**

### **WARNING !**



- Code compliance is the installer's responsibility.
- After the wiring installation, please close the door immediately and fasten the screws with the torque wrench according to the recommended torque.

### **CAUTION : INVERTER AND EQUIPMENT DAMAGE MAY OCCUR !**



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

### **CAUTION: WRONG AC WIRING !**



- Please make sure the AC cable is longer than 3m.
- 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 Medium Voltage Transformer

The MV transformer installed along with the inverter should meet the following requirements:

1. The MV transformer can be oil-type or dry-type.
2. It is suggested to have tap changer on the high voltage side to align the voltage level to medium voltage.
3. MV transformer should be capable of withstanding max 5% of total harmonic current at nominal power.
4. Transformer with a short-circuit impedance 6% (permissible tolerance:  $\pm 10\%$ ) is recommended.
5. For the thermal rating, the load curve of the transformer and environment conditions should be taken into account.
6. The transformer must be protected against overloading and short circuit.
7. The winding configuration of the transformer on the low voltage side must be wye for the inverter to detect an open phase on utility side.
8. The following list shows the compatibility of different transformer winding configuration:

Primary Winding (Utility side)	Secondary Winding (Inverter side)	Compatibility
Delta	Yn	Compatible
Delta	Y	Compatible
Y	Yn	Compatible
Y	Y	Compatible
Yn	Yn	Conditionally Compatible*1
Yn	Y	
Any type	Delta	Not Recommended*2

\*1 When the neutral of the utility side is grounded, additional device (e.g., a recloser) needs to be installed to detect an open phase on the utility side."

\*2 The winding configuration of the transformer on the inverter side must be wye for all Delta 3-phase string inverters to detect an open phase on utility side.

### 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.

**Table 3-1: Recommended AC circuit breaker rating**

Rated voltage	min. 600 V
Rated current	min. 175 A
Breaking Capacity	min. 10 kA

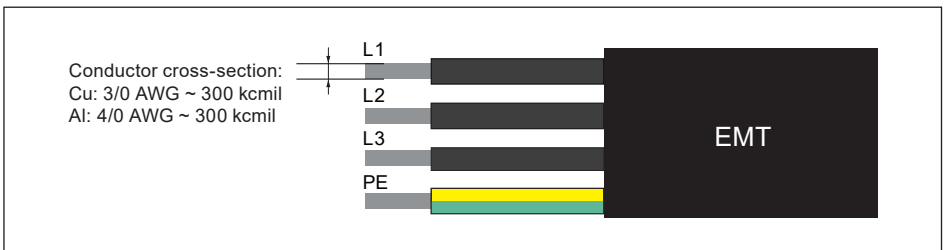
### 3.4.3 Requirement for Multiple Inverters in Parallel Connection

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 20.

### 3.4.4 AC Wiring Preparation

Below is the procedure for preparing the AC conductors for connection to the AC terminals:

- It is important to choose the proper size for AC cable. Refer to **Figure 3-15**.
- The cross-sectional area for each AC conductor is 3/0 AWG ~ 300 kcmil for Cu. (4/0 AWG ~ 300 kcmil for Al)
- The maximum width of each terminal lugs should be within 1.57 in, the diameter of screw hole should be within  $\Phi 0.41$  in, as shown in **Figure 3-16**.
- Terminal can use for Cu lug or Al lug based on the wires material.
- When multiple inverter connected to the grid in parallel, the AC cable between the inverter and AC Panel should be longer than 10 m.



**Figure 3-15: Size of AC conductors**

**AC Terminal (tin-plated)**

Conductor	Compatible Lug
Cu	Cu(Tin-Plated)
	Cu(Nickel-Plated)
	Pure Cu
	Stainless steel
Al	Aluminum (Tin-Plated)*
	Bi-metal*

**PE Connection (Nickel-plated)**

Conductor	Compatible Lug
Cu	Cu(Tin-Plated)
	Pure Cu
Al	Aluminum (Tin-Plated)*
	Bi-metal*

\* It is recommended to apply electrical grease before fitting wire conductor into terminal lug for best protection.



The working temperature of power cable should be at least 90°C.

**Figure 3-16: Dimension of lug**

### 3.4.5 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, PE):

Tighten/Lose nuts with 17mm socket. If an electric socket is utilized insure the torque setting is low enough to NOT OVER-TORQUE the screw. Once nut bottoms out, do not turn it any further.

#### 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.



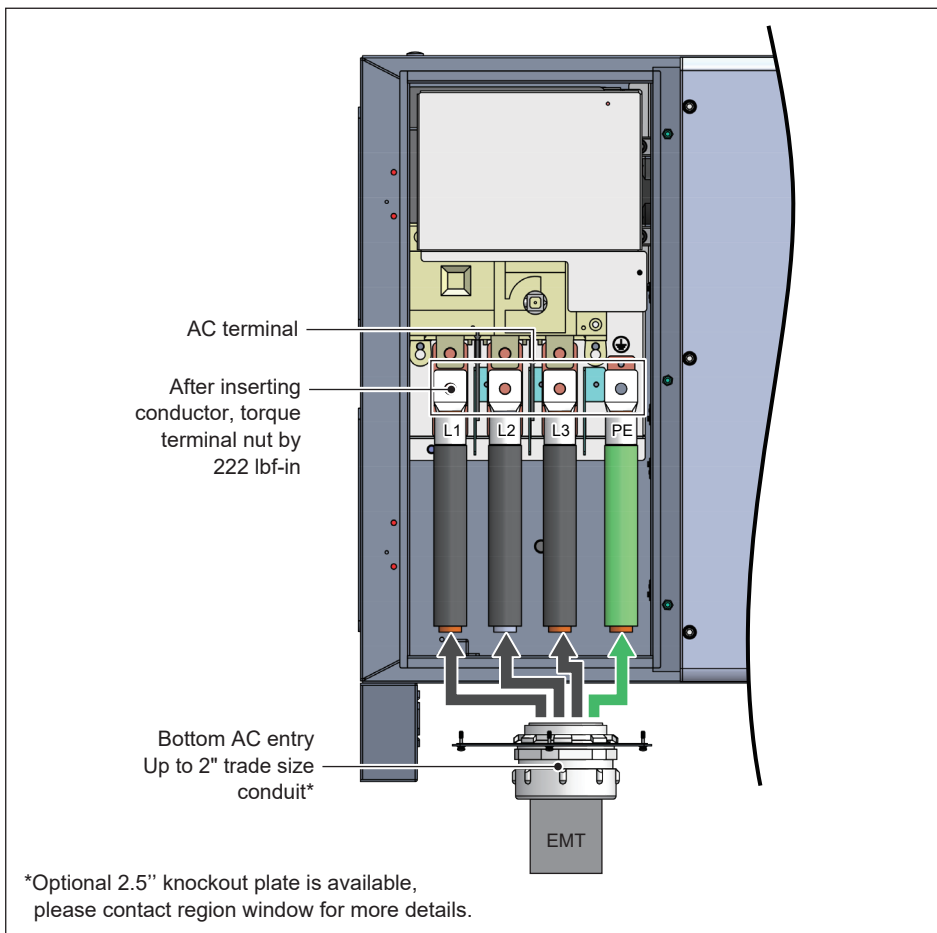
To ensure a safe and reliable contact, **always** perform the following work steps:

- ▶ 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.

### 3.4.6 AC Wiring

Refer to **Figure 3-15** 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. Refer to **Figure 3-15**.

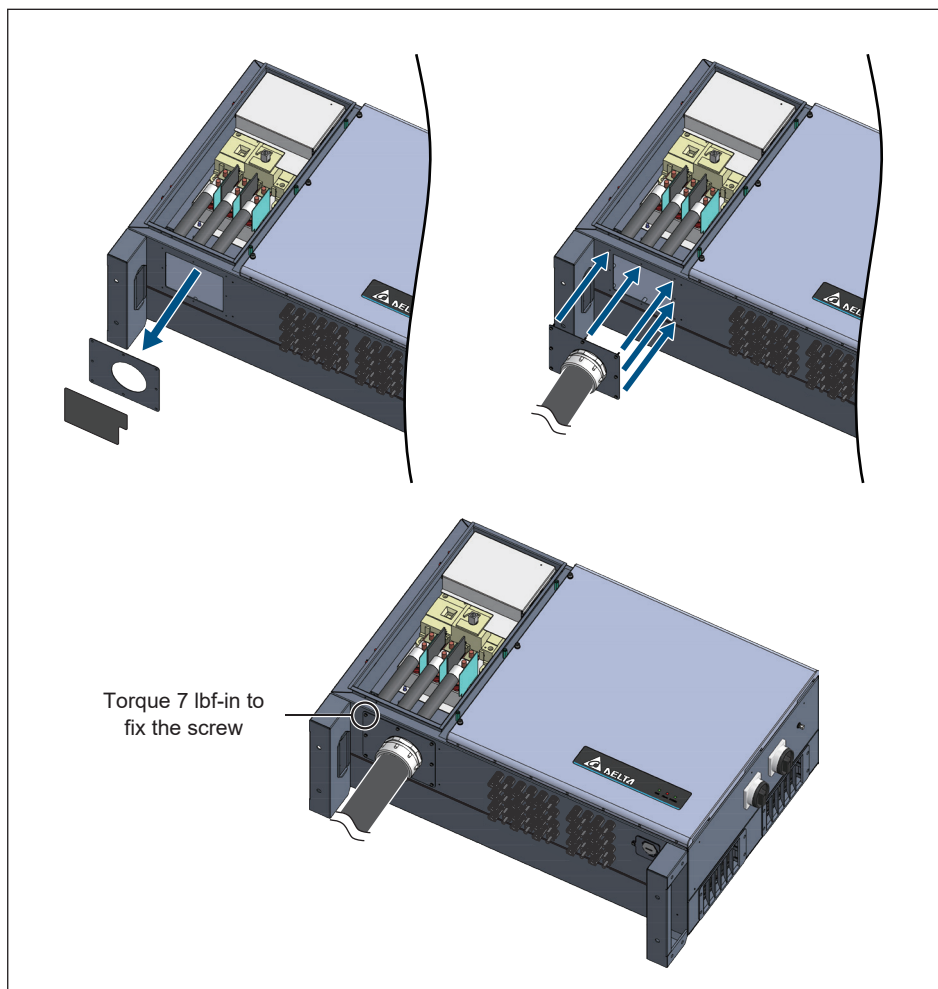


**Figure 3-17: Location for AC terminal**

**Figure 3-17** illustrates the location of the AC conduit entry and connections to the AC terminal block:

- Unscrew all AC terminal nuts as noted in **Section 3.4.5**.
- Ensure the correct conductor is connected to the appropriate terminal.
- After conductor is inserted, use M10 nuts to tight L1~L3, PE terminal with a torque of 222 lbf-in



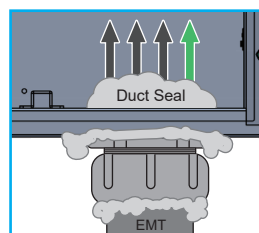


**Figure 3-18 : AC chassis access assembling**

## 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 enter the wiring box.



## 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.

### DANGER!



- **It is forbidden to open both doors at the same time.**

### 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 1600V 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.
- Without rain cover or protection, never perform any wiring or maintenance operations under rainy conditions.
- Please wipe the inverter case if it is wet to avoid water seepage.

### CAUTION: DC SWITCH 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 minutes later.

### ATTENTION

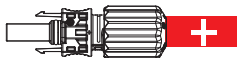


- The PV Array current carrying conductors (positive or negative) must not be referenced to ground.

### DANGER : ELECTRICAL HAZARD!!



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



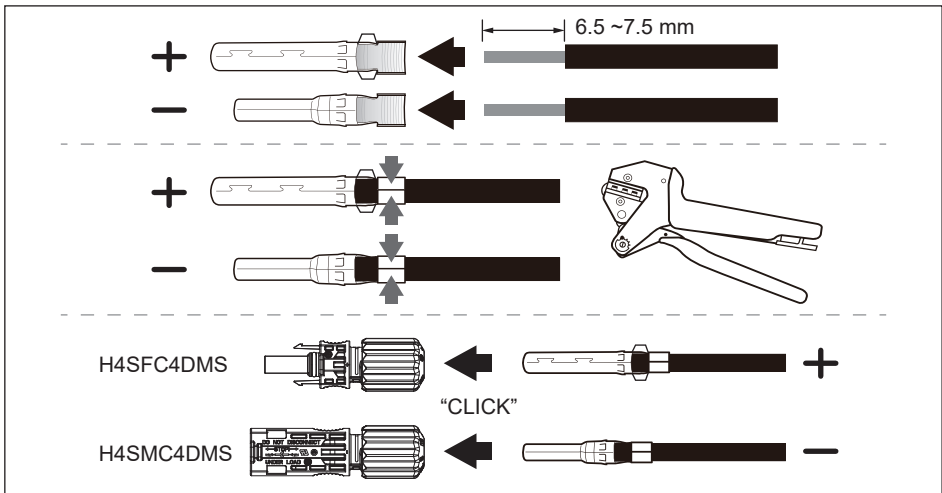
To ensure a better operating performance of the inverter, recommended configuration for the PV array are shown below:

1. To ensure the inverter operates with the highest performance, the DC input voltage should be greater than the AC Line-Line Voltage x 1.5 ( or AC phase Voltage x 2.6 )  
If the DC input voltage is lower than above value, inverter will not operate normally.  
Ex: Nominal  $V_{ac} = 600V_{ac}$ ,  $V_{mp}$  should be  $> 600V_{ac} \times 1.5 = 900V_{dc}$
2. PV array configuration should be designed considering the lowest environment temperature and make sure the  $V_{oc}$  of the PV array is within  $1500V_{dc}$ .
3. Inverter will be damaged if the DC input voltage is higher than  $1600V_{dc}$ , and the product warranty will be voided.

### 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 0.25~0.29 in.
  - The cross-sectional area for each DC conductor is 12/10 AWG ( $4/6mm^2$ ) .
- The Standard H4 Plus connector in accessories (**Figure 3-19**) support cable O.D. from 5.0~7.8mm, if PV cable O.D. over 7.8mm, please refer to **Table 3-2** and contact service to select H4SxC8DM series connector as optional accessory.

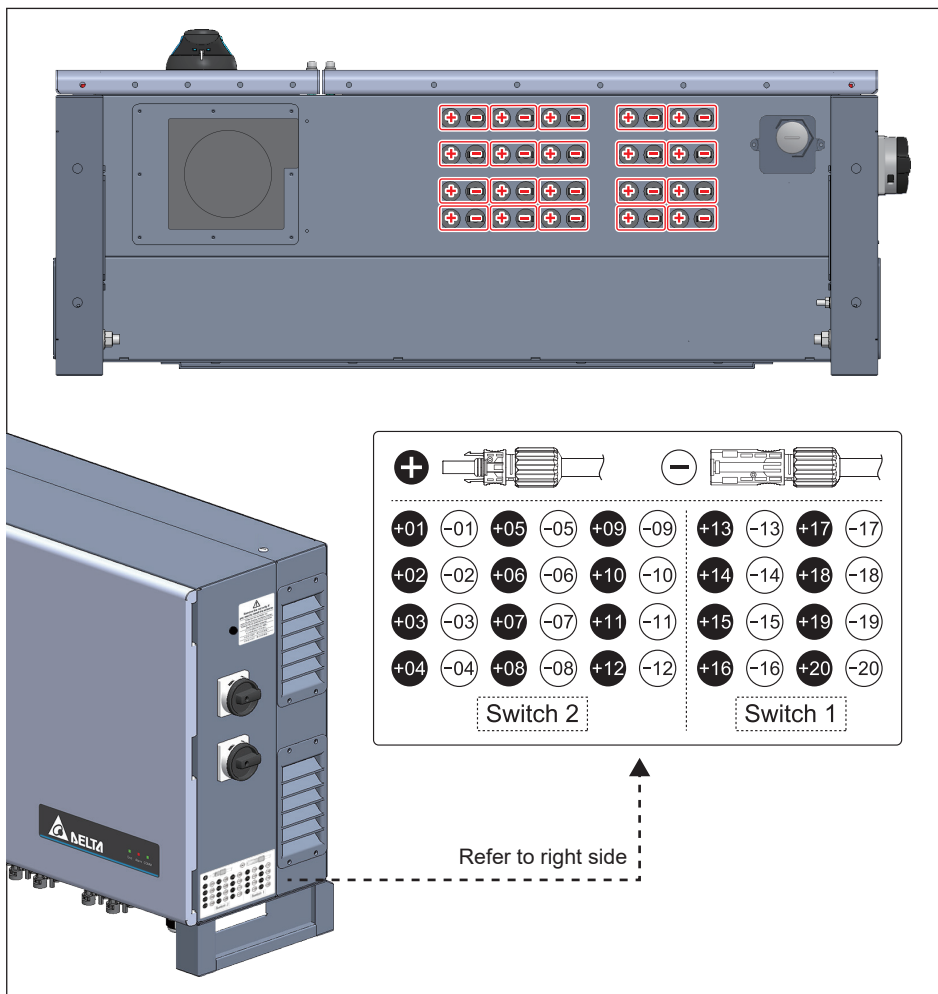


**Figure 3-19: DC Wiring illustration**

**Table 3-2: H4 series connector**

Ref. Cable diameter	H4SxC4DM plus connector (standard) Support cable O.D.: 5.0~7.8mm	H4SxC8DM plus connector (optional) Support cable O.D.: 7.5~8.8mm
12 AWG ( $4 mm^2$ )	O	X
10 AWG ( $6 mm^2$ )	O	X
8 AWG ( $10 mm^2$ )	X	O

DC wiring polarities are divided into positive and negative, and the layout of the connectors is shown in **Figure 3-20**.

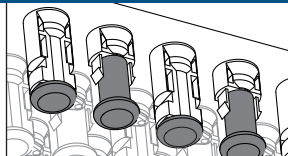


**Figure 3-20: Location of DC connectors to connect array wiring (DC)**

## ATTENTION



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



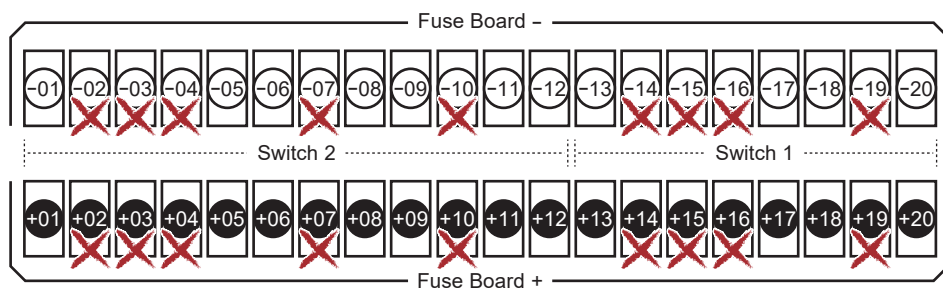
### ■ DC Side Y connection

M125HV\_111 is compatible with 1500V/30A UL listed fuse, however, the designer must be aware of the following requirements:

- The max  $I_{sc-stc}$  of a connected array (sum of all paralleled strings) cannot exceed the rated  $I_{sc}$  limit of the inverter, that is no more than 320A total.
- Because of internal current limitations and higher string currents allowable with 30A fuses, inputs 2、3、4、7、10、14、15、16 and 19 must **NOT** be used.

#### Recommend fuse models

1. Vendor: Mersen Vendor P/N: HP15M30
2. Vendor: EATON(Bussmann Series) Vendor P/N: PV-30A10F85L
3. Vendor: Littelfuse Vendor P/N: SPXV 30



### CAUTION !



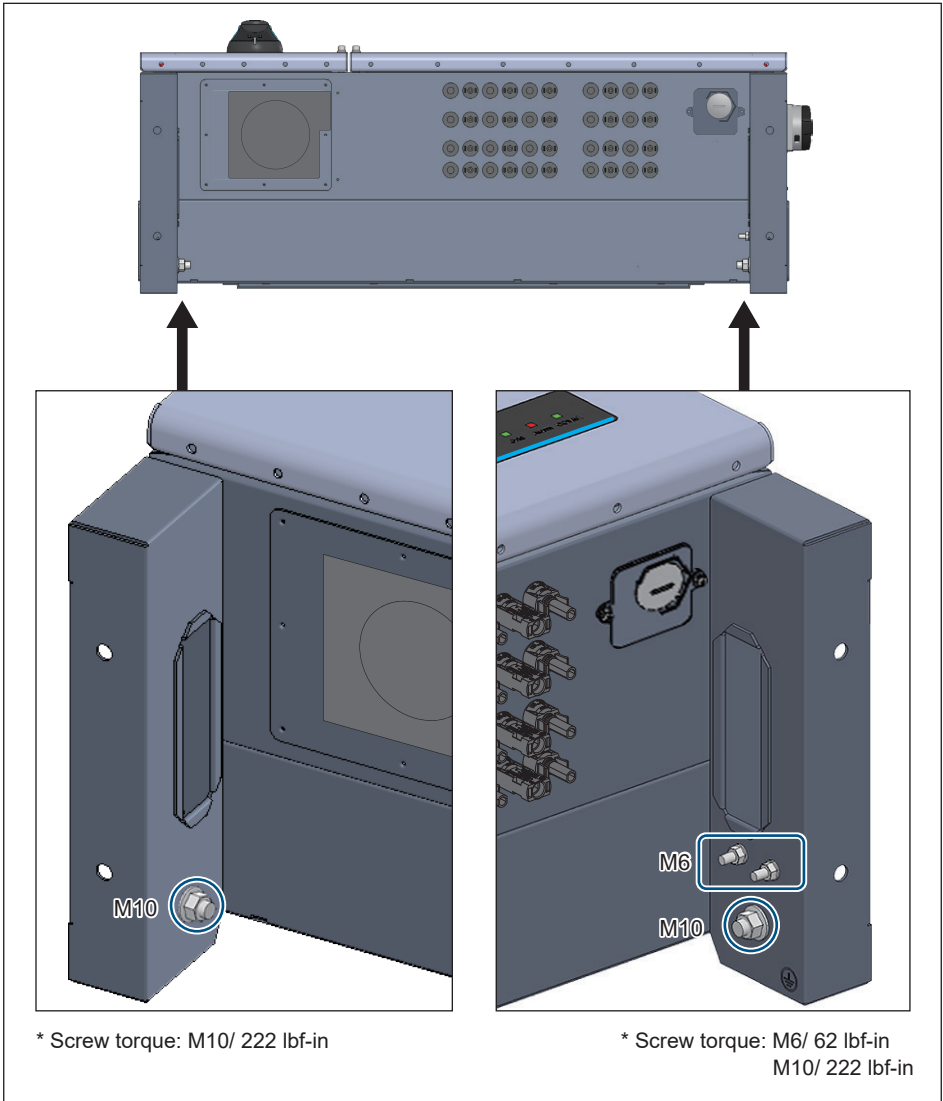
- When 30A string fuses are utilized do **NOT** use input 2、3、4、7、10、14、15、16 and 19 on either MPPT channel.

## 3.5.2 Equipment Grounding

To ground the inverter, please crimp the grounding wire to the ring terminal lug and fix it on the grounding point shown as **figure 3-21**.

mounting torque: M6/ 62 lbf-in

M10/ 222 lbf-in



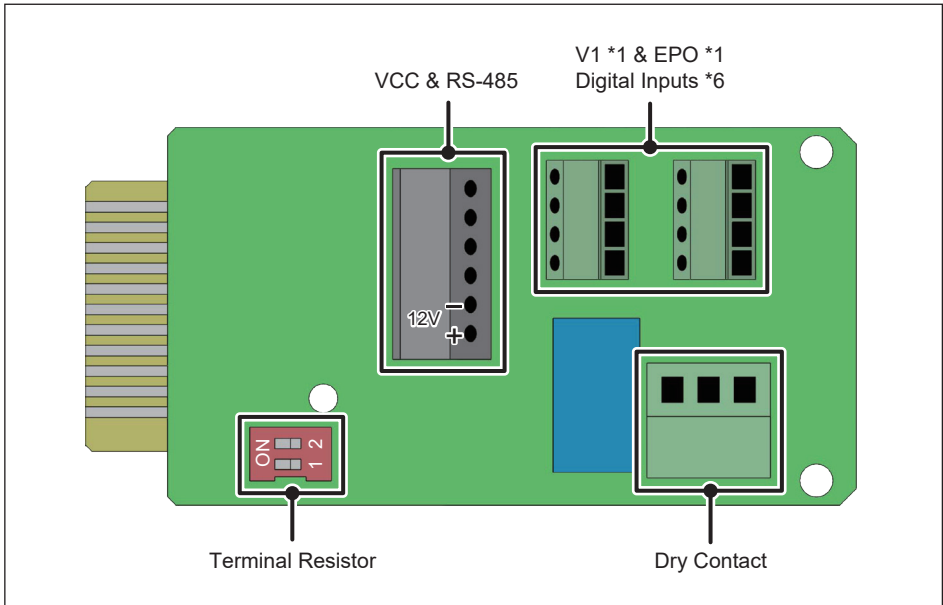
**Figure 3-21: Mount the equipment grounding**

### 3.6 Communication Module Connections

The communication module of M125HV\_111 is shown in **Figure 3-22**.

It provides VCC, RS-485, dry contact, EPO, and digital input terminals for use in various applications.

There's a 12VDC source between VCC & GND for use with external device.



**Figure 3-22: Communication Module Layout**

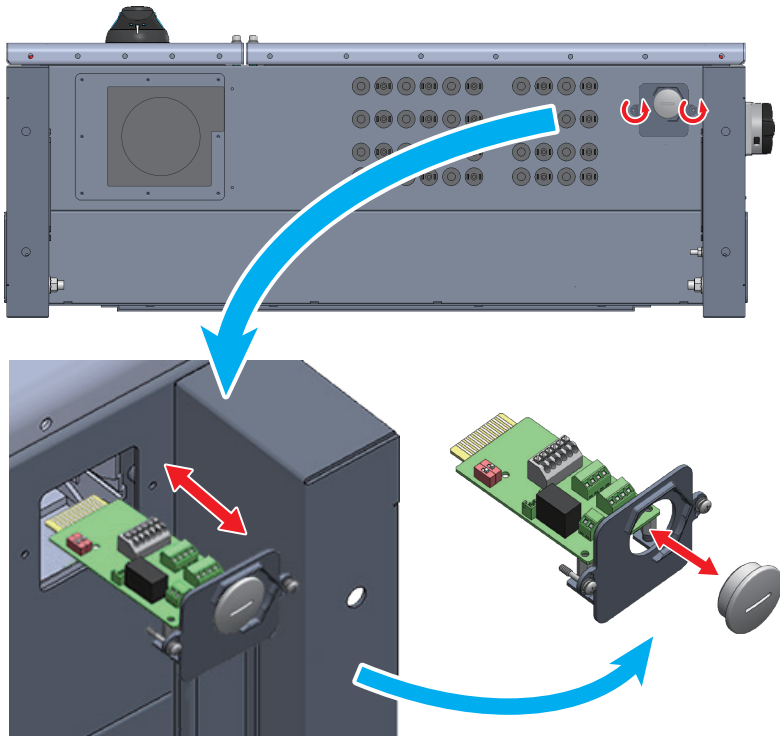
### 3.6.1 Accessing the Communication Module

The communication module consists of an assembly with a PCB and a plastic carrier. It is located in a slot through the bottom of the chassis.

It is accessed from the bottom exterior of the chassis. The carrier is secured to the chassis by two self-retaining screws. See **Figure 3-23**.

To access the communication module, loosen the two self-retaining screws to loosen the carrier from the chassis. Once loosened completely, the card/carrier module can be withdrawn from the chassis by gently pulling the carrier straight out from the chassis.

After pulling the desired signal cable(s) through the wiring chassis access provided or a connected conduit, and connected electrically as shown in the following sections, the module can be reinstalled by reversing the above directions. Ensure the assembly is oriented into the chassis so as to allow the edge connector to engage properly.



\* Screw torque required for assembling:  
7 lbf-in

**Figure 3-23: Location and access to Communication Module**



### 3.6.2 RS-485 Connection

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

- Pins 1 and 2 provide a 12VDC 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 (See **Table3-4**).

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 3-24**)
- If the length of any RS-485 bus is greater than 2001ft, 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 3-3: RS-485 Terminal block wiring**

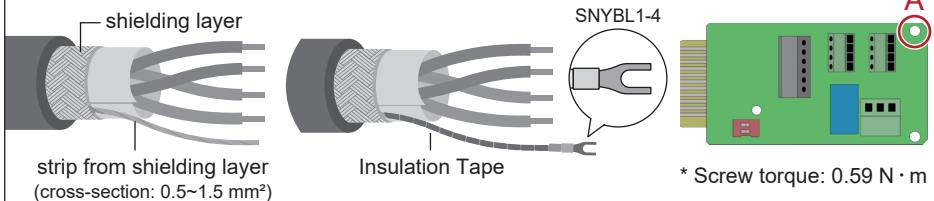
Pin	Function	
1	VCC (+12V)	
2	GND (It is NOT the PE)	
3	DATA+	
4	DATA-	
5	DATA+	
6	DATA-	

#### 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



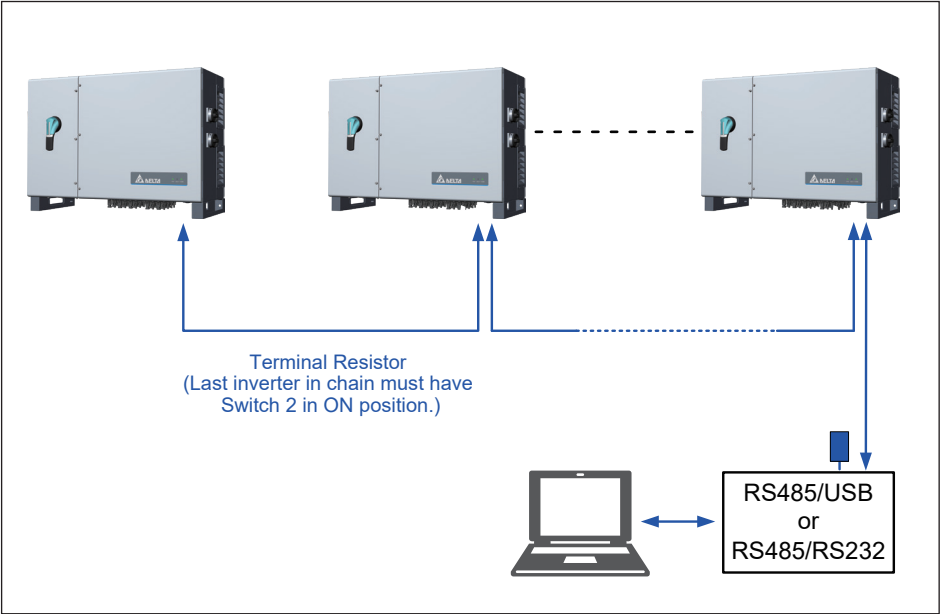


Figure 3-24: Multiinverter connection illustration

Table 3-4: Vcc and Bus Termination switch settings

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

### 3.6.3 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 3-25: 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 [V1 & 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 3-5**, below.

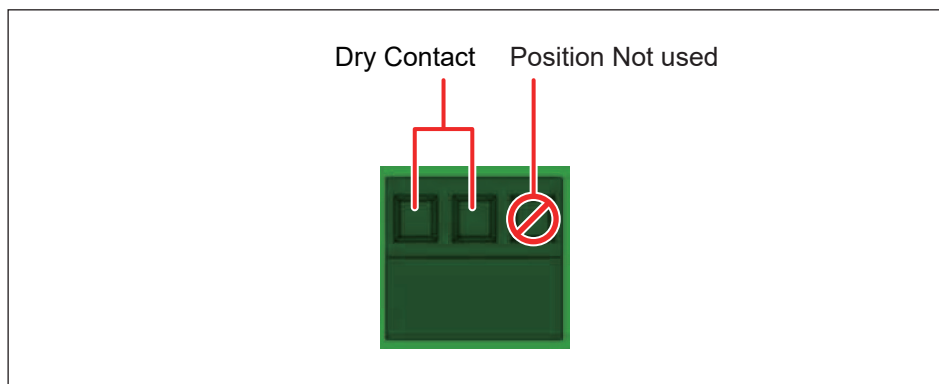
**Table 3-5: Definition of digital input & EPO function**

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

### 3.6.4 Dry Contact Connection

M125HV\_111 provides 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 3-26**. 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 the APP or DSS..



**Figure 3-26: Dry Contact connection**

## 4 Commissioning

### CAUTION : HOT SURFACES, DO NOT TOUCH!

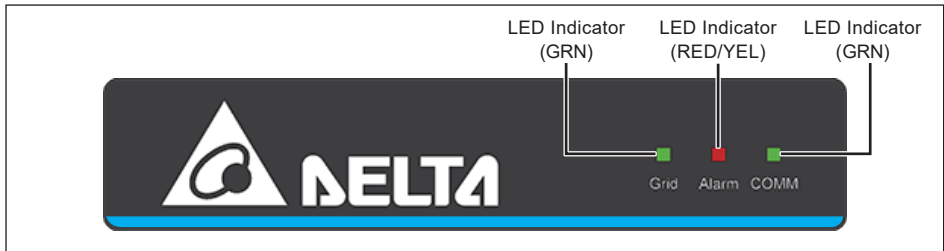


- Use care to avoid hot surfaces when operating the product!
- Do not perform any task until the unit cools down or appropriate personal protection gear is worn.

### 4.1 Display Operation Introduction

M125HV\_111 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

**Table 4-2: LED COMM indicator**

SUB_1G Condition	COMM (Green)
Work	FLASH
Fault	OFF

\* FLASH: ON 3s / OFF 2s

## 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



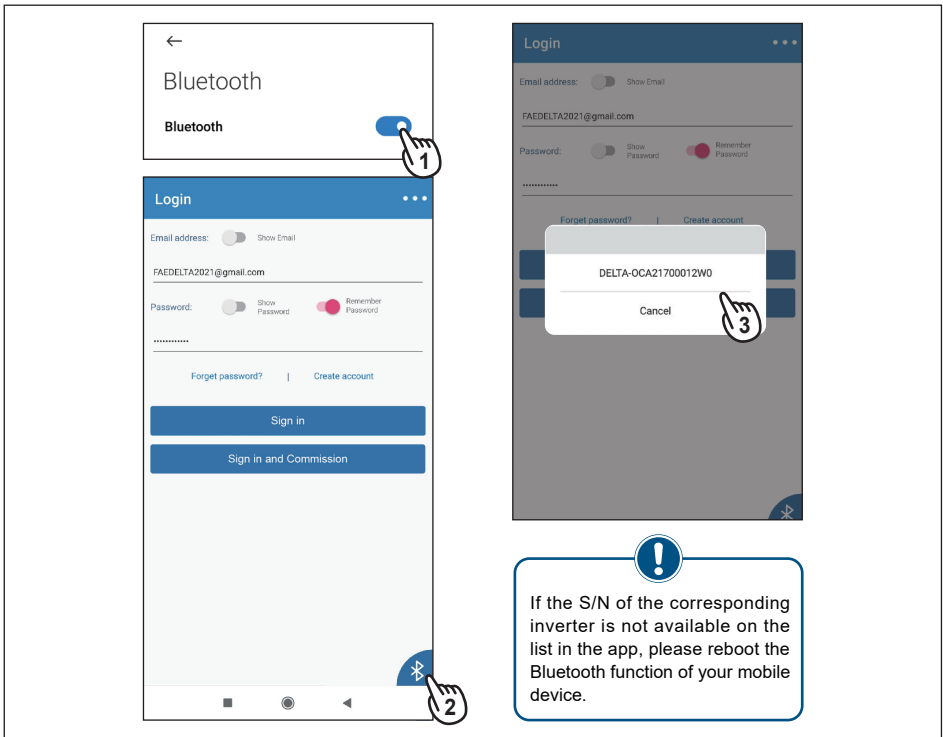
Android



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

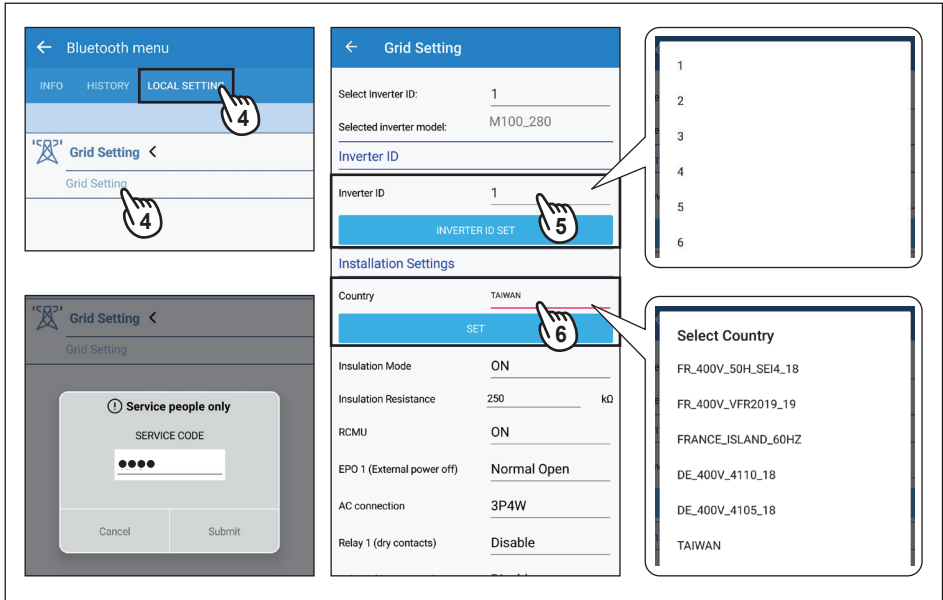
### Start Commissioning the Inverter

- 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 20 cm 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 20 cm 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 20 cm 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 20 cm 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 20 cm 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 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 

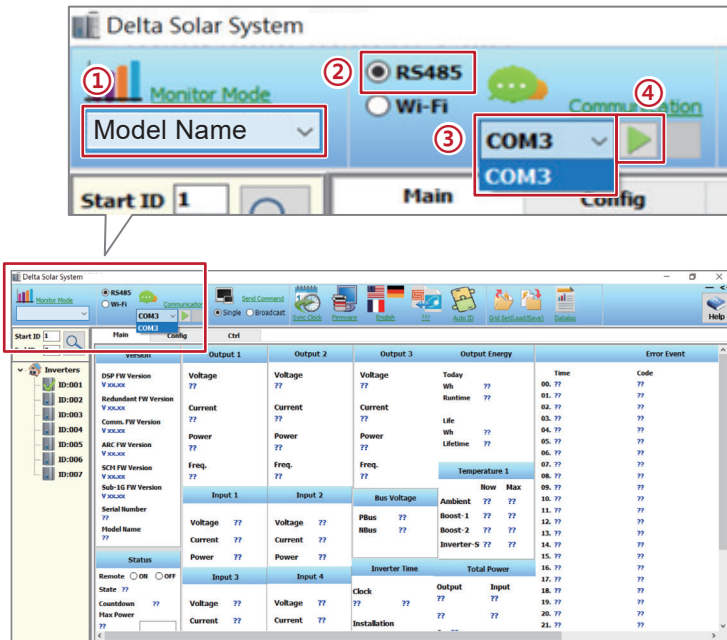



Figure 4-4: DSS Commission setting



## 4.3.2 Scan inverter

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

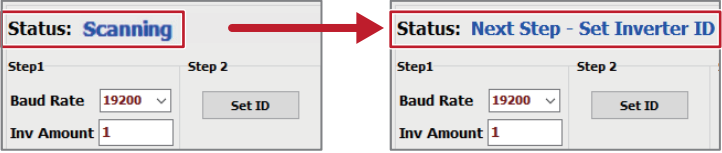
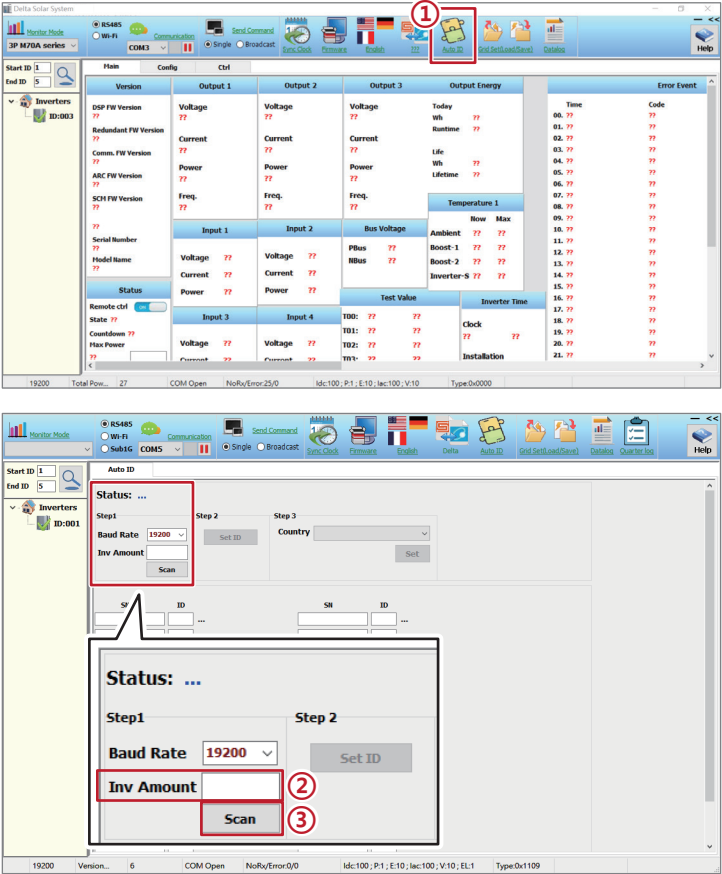


Figure 4-5: Steps of scanning inverters

### 4.3.3 Set ID

- ① The serial number of the successfully scanned device will be displayed, the default ID can be changed.
- ② After ID setting is completed, click "Set ID".

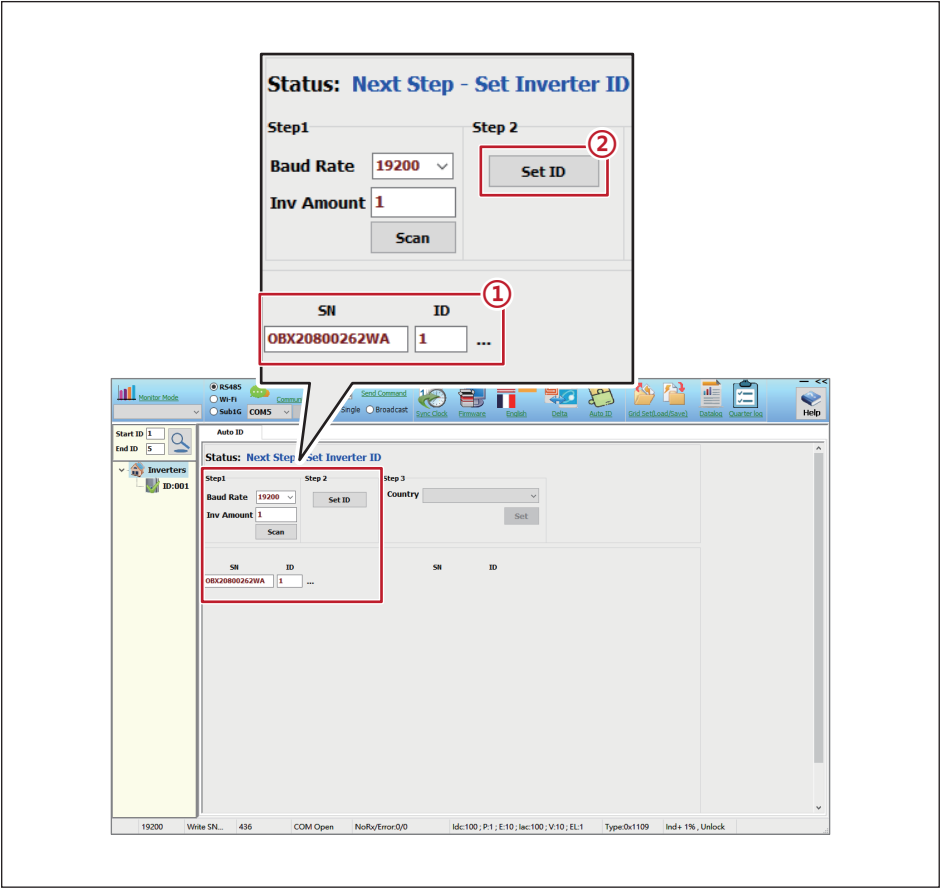


Figure 4-6: Steps of ID setting

### 4.3.4 Set Country

- ① Click to select the country of inverter.
- ② Click “Set”.

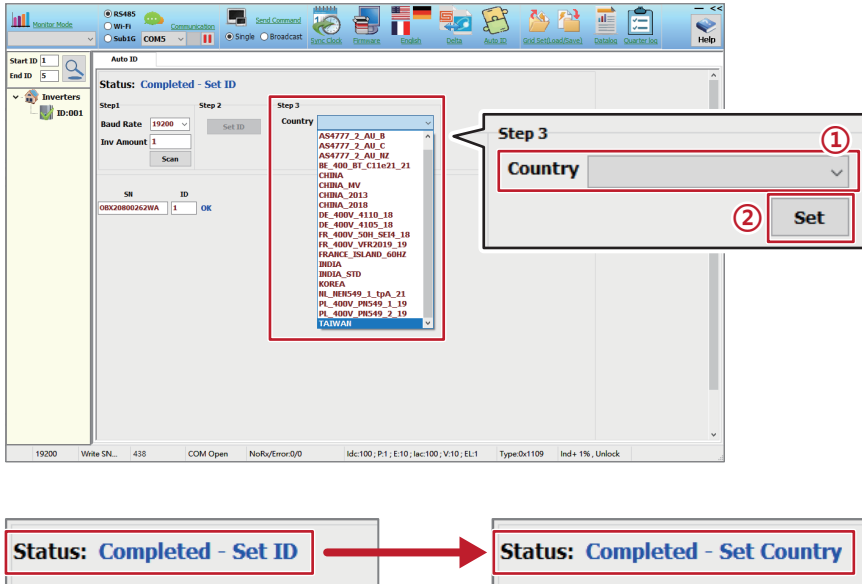
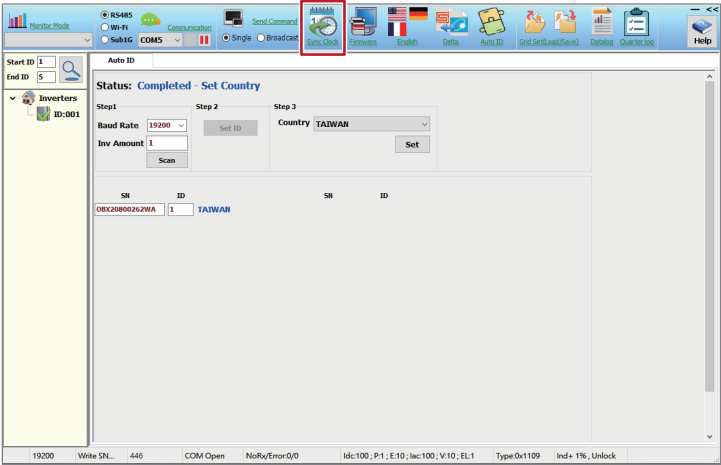


Figure 4-7: Steps of country setting

### 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-frequency 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	

Please refer to the following link for operation manual.

### DSS Operation Manual:



[https://mydeltasolar.deltaww.com/manual/eng/SUB\\_1G/DSS.pdf](https://mydeltasolar.deltaww.com/manual/eng/SUB_1G/DSS.pdf)

### DeltaSolar (APP) Operation and Installation Manual:

- Mobile App > DeltaSolar APP Operation 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.

### WARNING !



- Prior to beginning any maintenance procedures outside AC breaker and DC switch off to avoid risk of electrical shock!
- Confirm the replacement position, only the AC side (left) door can be opened, either the DC side (right) door can only be opened on the right side.
- **It is forbidden to open both doors at the same time.**

### 5.1 Open and Close the Door

In order to guarantee proper long-term operation of the inverter, please follow procedures as **Figure 5-1 ~ Figure 5-3** to open and close the door.

To fix door by hexagon driver per **Figure 5-2**.

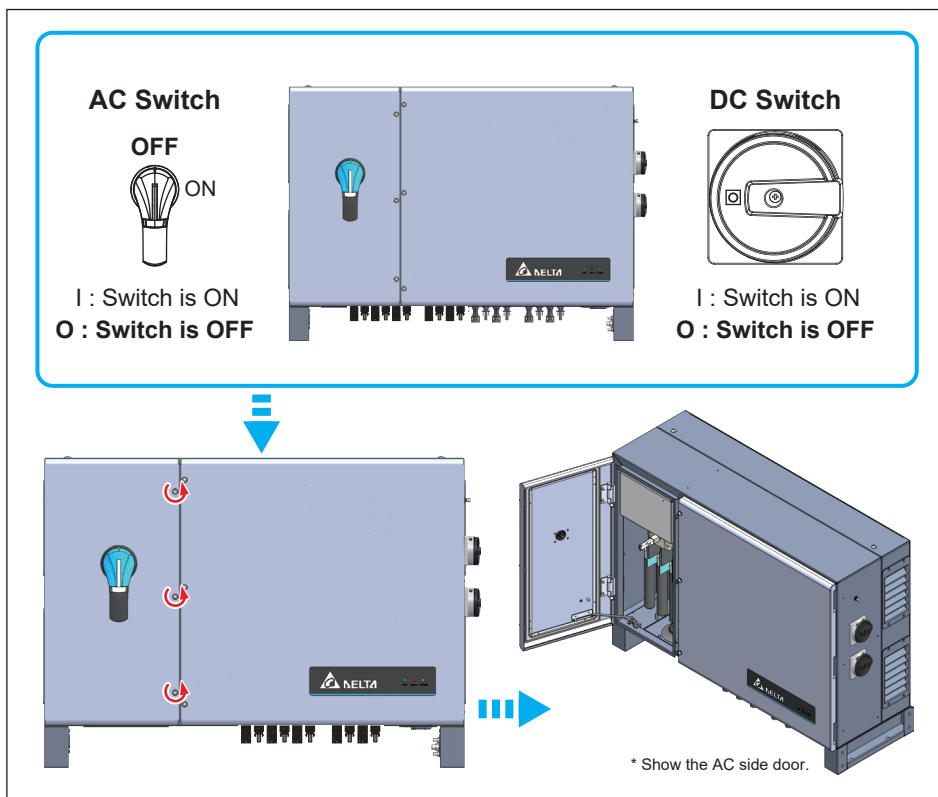
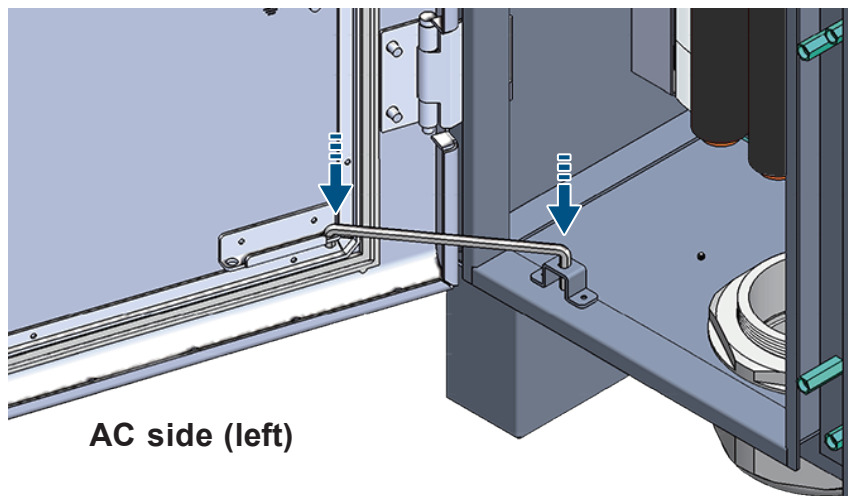
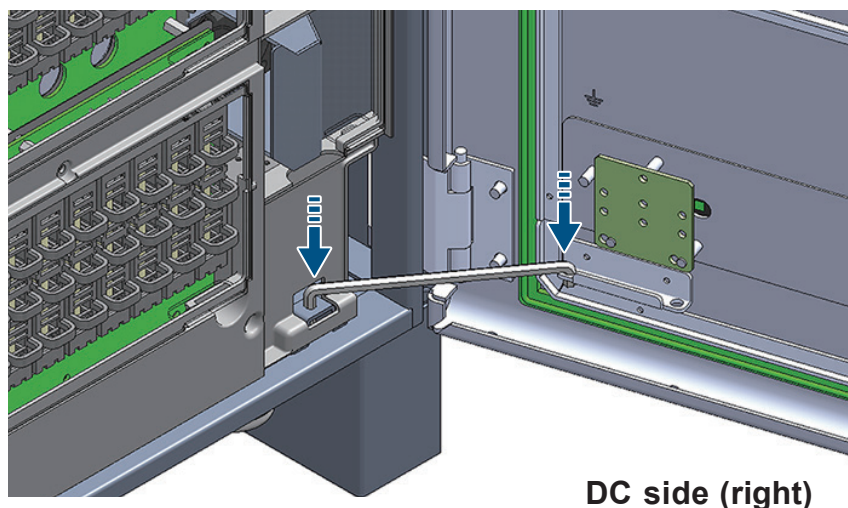


Figure 5-1: Open and close the door



or



### 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*

## INFORMATION



- Use Hexagon Driver (Table2-1, Item5) or other proper tool to untighten door screws.
- Door screws are captive screw type. Do not disassemble door screws.
- Please follow the recommended torque to lock-on door screw with torque wrench.

### 5.1.1 Open the 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.
- AC / DC power off and wait until LED display turns off.
- Loosen the 3 screws on the door and open its.
- Use care not to contaminate the door's gasket and mating surfaces.

***Do not open the door for long periods of time.***

### 5.1.2 Close the Door

**Before closing the door:**

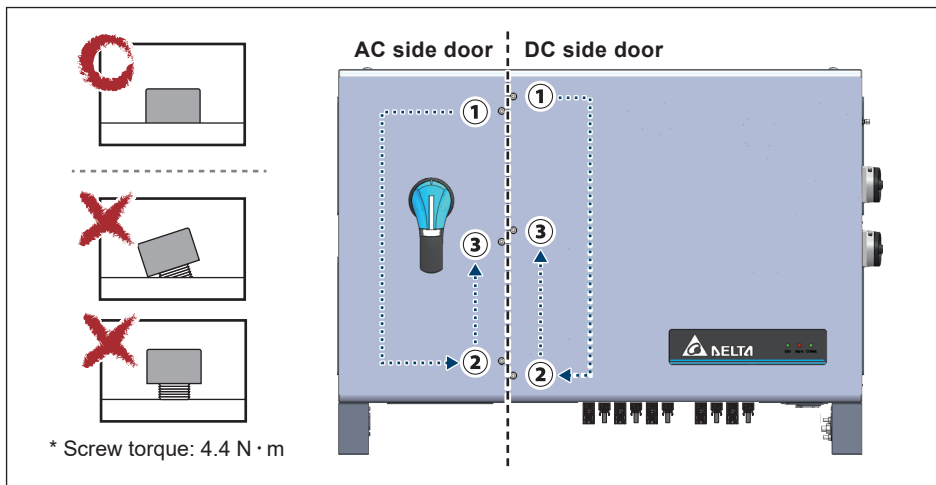
1. Ensure rubber sealant and mating surface are clean and in good condition.
2. The rubber sealant has to be properly mounted on the enclosure.

**When closing the door:**

Tighten the door screws to 39 lbf-in of torque with torque wrench.

**After closing the door:**

Make sure the screws are locked securely. See **Figure 5-3**.



**Figure 5-3: Closing process for the door**



## 5.2 Replacement of Surge Protection Devices (SPD)

M125HV\_111 have the surge protection device (SPD) at both AC and DC side as shown in **Figure 5-4**. **Table 5-1** summarizes the specifications of AC and DC SPD.

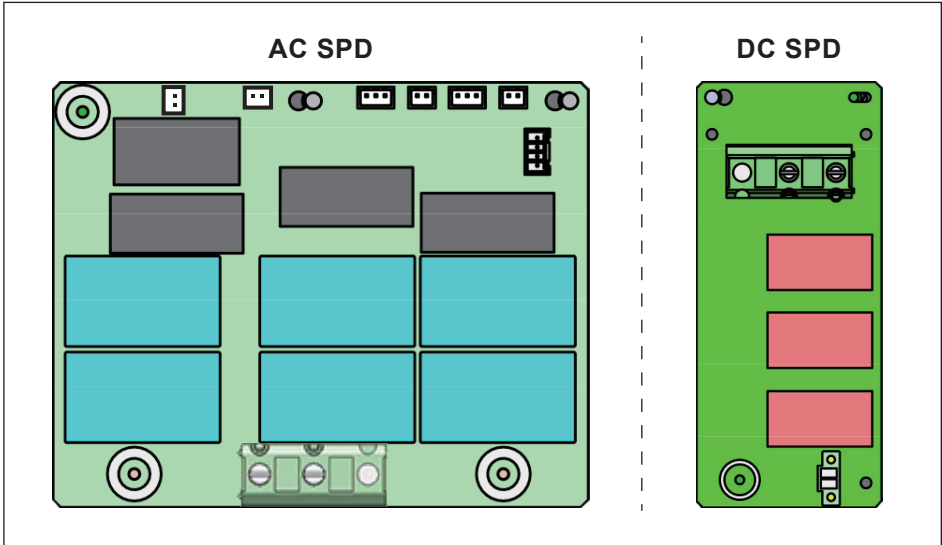


Figure 5-4: AC and DC SPD modules

Table 5-1: SPD Specifications

Description		Value
Working voltage:	AC Module	1190VRMS
	DC Module	1800VDC
Working Current (8/20us)		10kA
Rated Current (IMAX – 8/20us)		20kA
Operating Ambient Temperature Range		-40°C to 85°C
Manufacturer:	Sichuan Zhongguang Lightning Protection Technologies Co., Ltd	

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 5-5**.

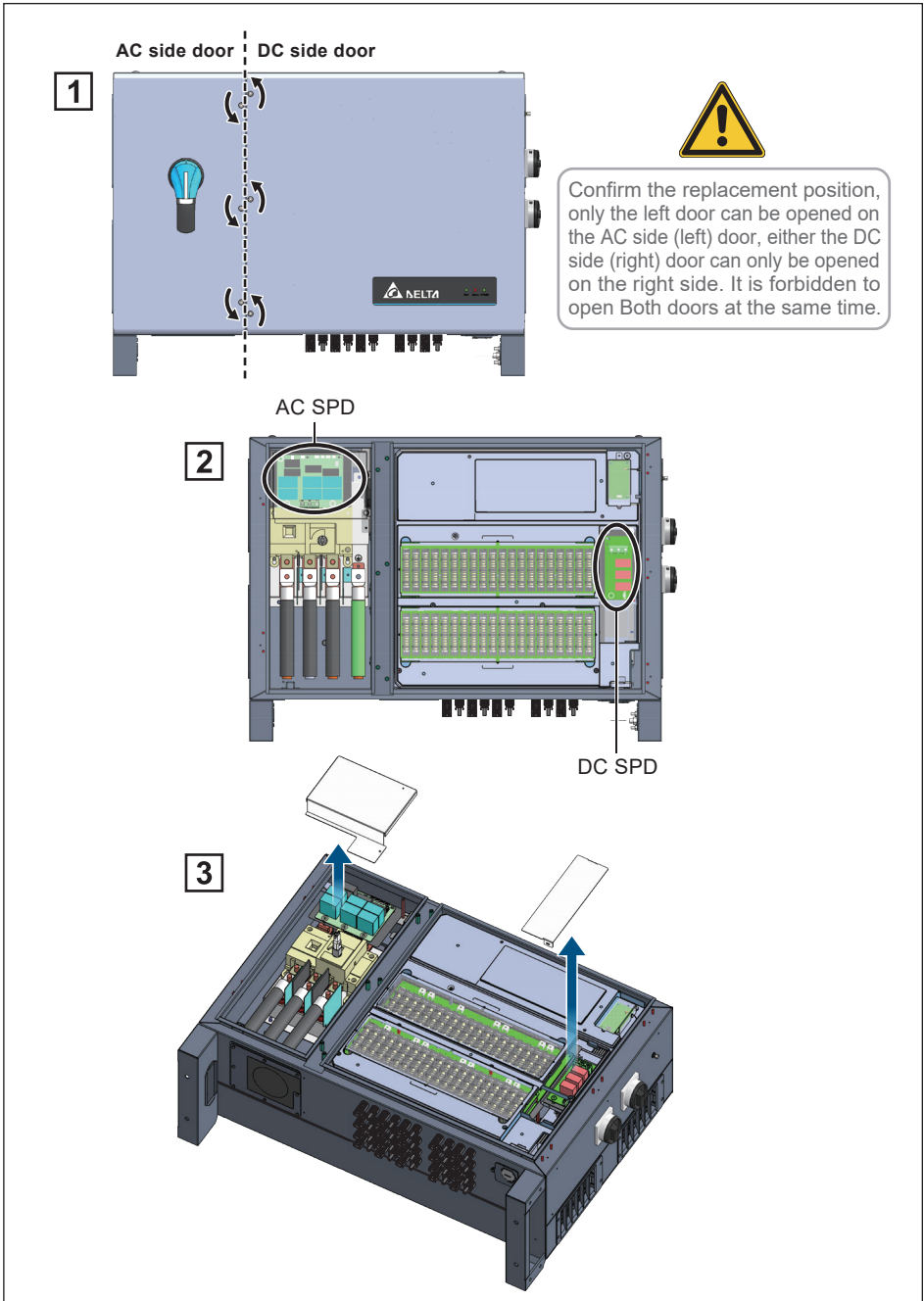


**Figure 5-5: Display Indicating AC and DC SPD failure**

- Accessing the door
  1. Switch DC 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 5-6**.
  
- **To remove the defective AC SPD (Figure 5-6)**
  1. Disengage the 5 signal wiring connectors from the AC SPD PCB.  
(4-pin x 1, 3-pin x 2, 2-pin x 2)
  2. Disengage the 3 power wirings from the AC SPD PCB.
  3. Remove three self-retaining screws located on the left (AC) side of the AC SPD PCB.
  4. Lift and remove the entire AC SPD PCB and unplug the A cable and plug it into the new SPD.
  5. Install the new AC SPD using the above procedure in reverse order.  
Tighten the five screws to a torque value shown in **Figure 5-7**.
  
- **To remove the defective DC SPD (Figure 5-7)**
  1. Disengage 1 signal wiring connector from the DC SPD PCB.
  2. Disengage the 2 power wirings from the DC SPD PCB.
  3. Remove two self-retaining screws located on the right (DC) side of 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 five screws to a torque value shown in **Figure 5-8**.
  
- Closing the door

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



\* L1/L2/G: Screw torque 7 lbf-in

\* A/G: Screw torque 7 lbf-in

## 5.3 Replace Internal String Fuse

M125HV\_111 have independent MPPT inputs.

The combiners utilize standard 10mm x 85mm PV combiner fuses and associated fuse holders. Because of the TL design, all strings are floating with respect to ground, and two fuses are required per string input connected in series with the positive and negative string leads.

Any 10mm x 85mm listed PV fuse (15A / 20A) can be used for replacement purposes. The standard built in M125HV\_111 is 20A Fuse.

The specifications for the required fuse and fuse brands used in the factory are listed below.

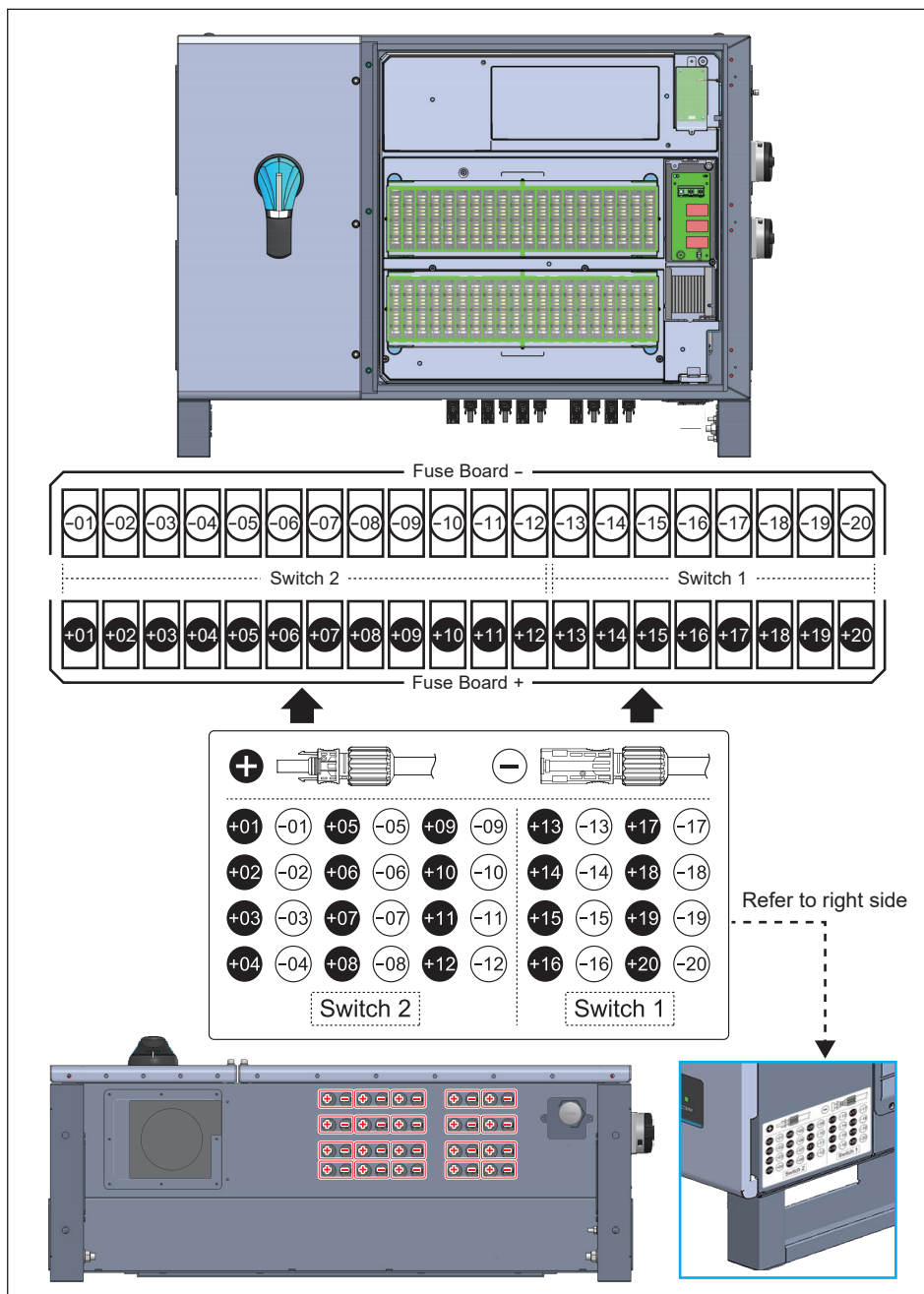
**Table 5-2: Combiner Fuse Specification**

Rated current	20 A	UL listed	UL 248-19, UL 4248-19
Rated voltage	1500 V	Typical Mfr	Littelfuse, Bussmann
Operating Class	Solar PV	Mfr P/N	SPXV 20, PV-20A10F85L
Fuse Type	10x85 ferrule		

### **DANGER : ELECTRICAL HAZARD!!**



- Ensure DC and AC cables are always de-energized during the maintenance to avoid the shock hazard risk!
- Before removing the fuses, please turn off DC switch and make sure the inverter has stopped working, then remove the corresponding H4 Plus connector.



**Figure 5-9: Layout of fuse board and location of DC connectors**

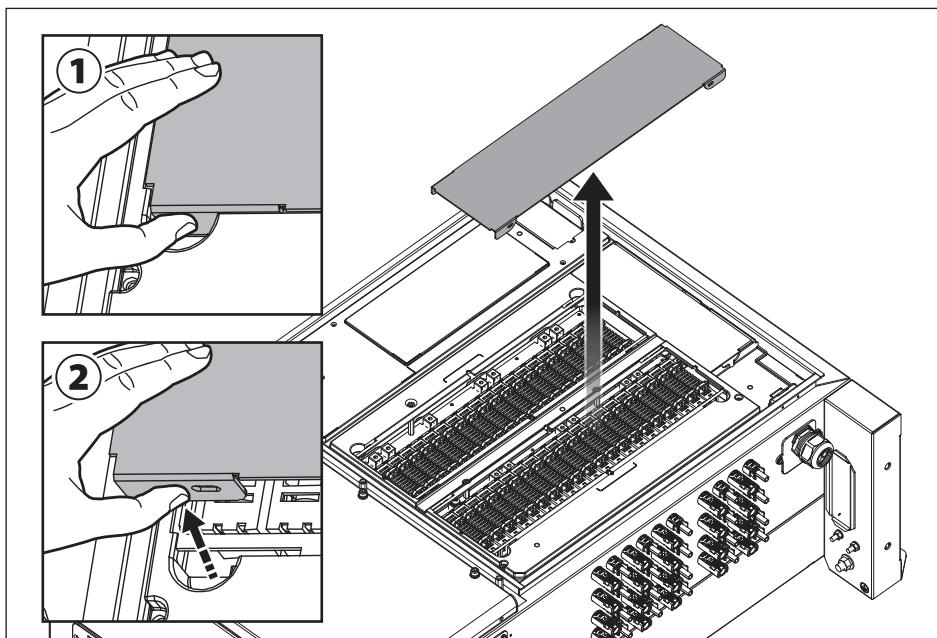
M125HV\_111 is equipped with 40 combiner fuses in “pull-out fuse holders, which support connection of up to 20 strings. The fuse holders are mounted on two PWBs. The pull-out fuse holders allow safe removal of fuses which are inserted into a carrier.

**Figure 5-10** shows the location of the combiner fuse holders and shield cover, and **Figure 5-11** provides details to remove a fuse; refer to **Figure 2-5** for additional information.

Check the combiner fuses if the power generation of inverter is abnormal using the following procedure:

1. Check to determine if any string current measurement is zero, which will most probably indicate a blown fuse.
2. AC and DC power off and wait until LED display turns off.
3. **To access the DC side (right) door, use procedure found in Section 5.1.1**
4. Based on step 1, check the corresponding fuse locations by pulling out the fuse holder (**Figure 5-11**) and checking continuity of the fuse.
5. Replace the fuse if necessary.
6. **Closing the DC side (right) door, using the procedure found in Section 5.1.2**

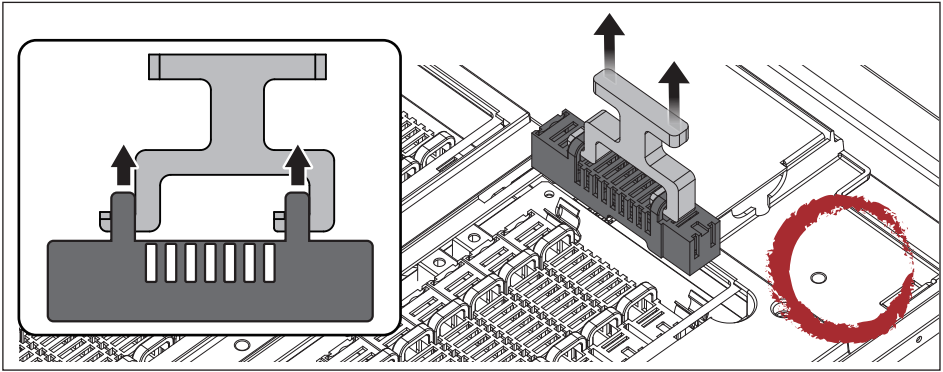
- 
1. Remove the shield cover.



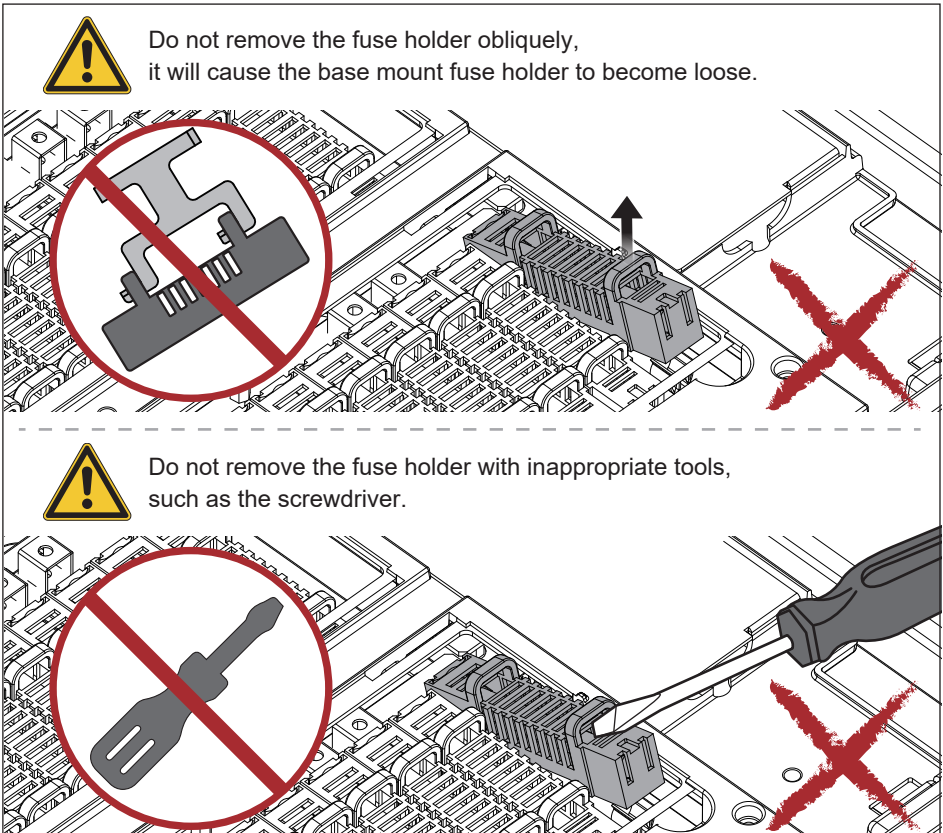
**Figure 5-10: Fuse holder locations**



2. Pull the fuse puller vertically to remove the fuse holder.  
(The fuse holders should be removed or installed vertically.)

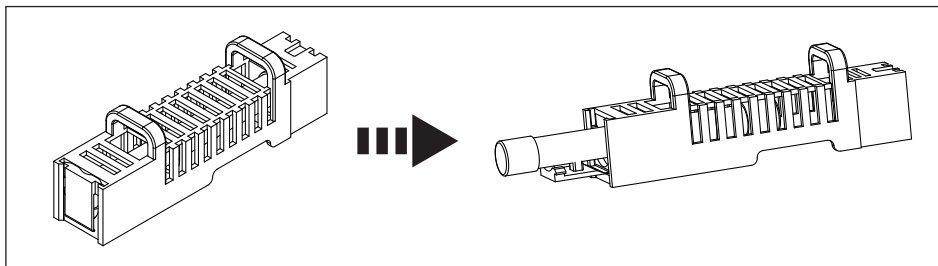


**Figure 5-11: Accessing the individual fuses**



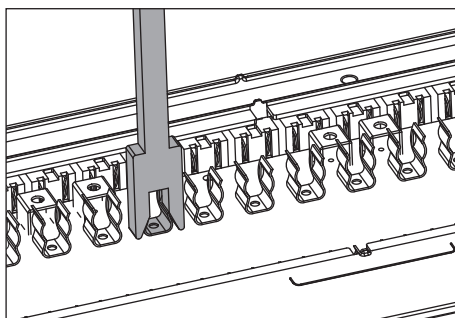
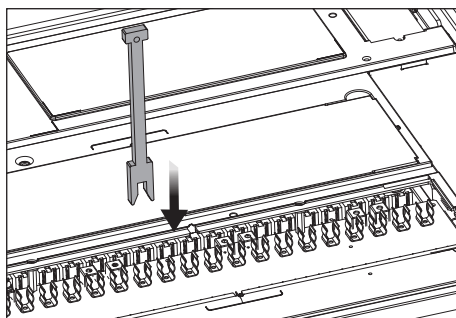
**Figure 5-12: Incorrect remove method**

3. Open the lid of the fuse holder.
  4. Tilt the fuse holder slightly to take out the fuse.
- \* Please be careful not to drop the fuse at this time.



**Figure 5-13: Replace the fuse**

5. Insert the calibration tool vertically downward to the clamp of the fuse holder, and then pull it out.



6. Vertically install the fuse holder.
7. Re-attach the shield cover.

## ATTENTION



Please keep the fuse puller and the calibration tool clean before using it.

## 5.4 Smart Fans Replacement and Filter Cleaning

M125HV\_111 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 fans utilized have high reliability ratings and coupled with use of processor controls provide a "smart" cooling system design with a long life. The system features tachometer 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.

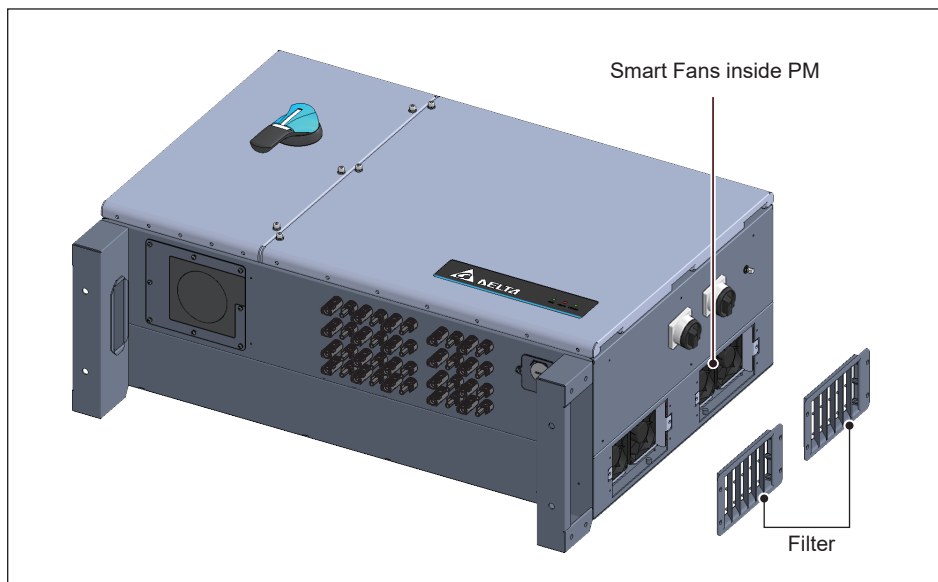
Depending upon the model, fans are installed at two locations within inverter:

- Power Module (PM) compartment
- Inside the inverter compartment

**Figures 5-16** illustrates the PM fan locations.

**Figures 5-17, 5-18, 5-19, 5-20** illustrates the internal fan 1 locations.

**Figures 5-21, 5-22, 5-23, 5-24** illustrates the internal fan 2 locations.



**Figure 5-14: Smart Fans location on Power Module chassis**

## 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.

The cooling fans feature modular designs that make their removal for cleaning or replacement a simple task. As a result, the replacement of fans is also smart.

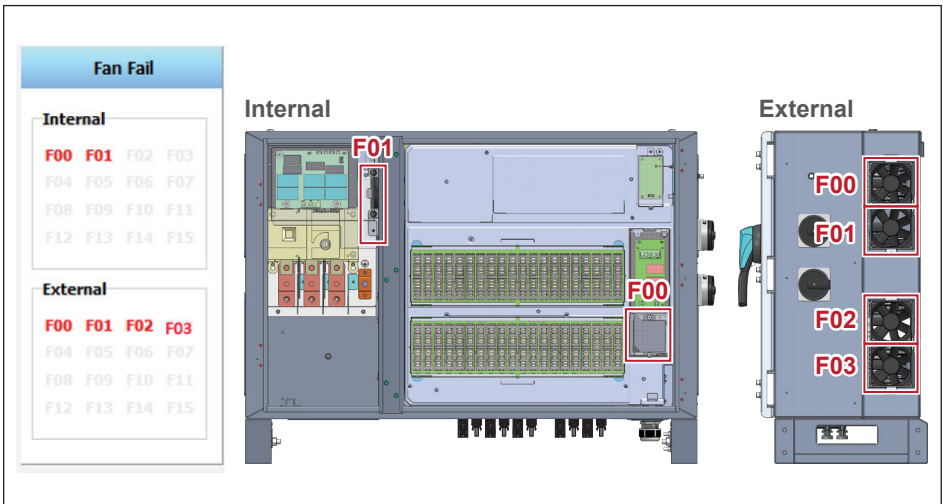
## DANGER : ELECTRICAL HAZARD!!



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

### 5.4.1 Location of failure fan

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 5-15: The corresponding fan location to the fan fail code on DSS**

## 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.

The order of fan is shown in **Figure 5-15**.

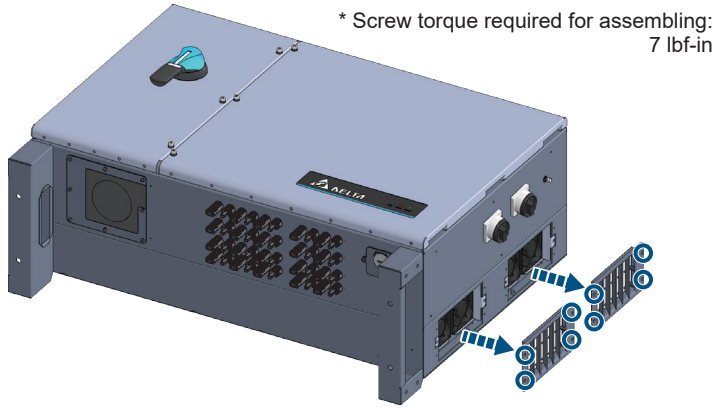
Follow the warning "FXX" to replace the fan which was broken.

Refer to **Figure 5-16** and follow the steps outlined below:

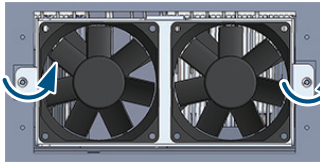
1. Remove four screws that secure inlet filter cover to case.  
Check filter condition on this step and clean it if necessary.  
For fan maintenance, continue to do following steps.
2. On the right side, remove two screws for each fan tray.
3. On the right side, unplug fan power connectors for each fan.  
(To release snap-fit, press location A and location B from both side .)
4. 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 5-16**.

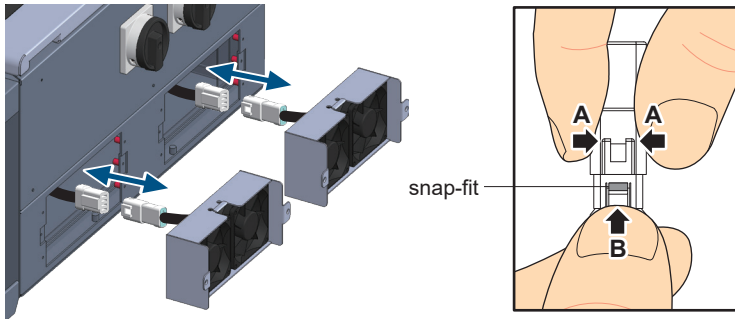
①



②



③



④

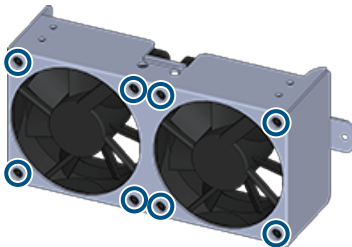


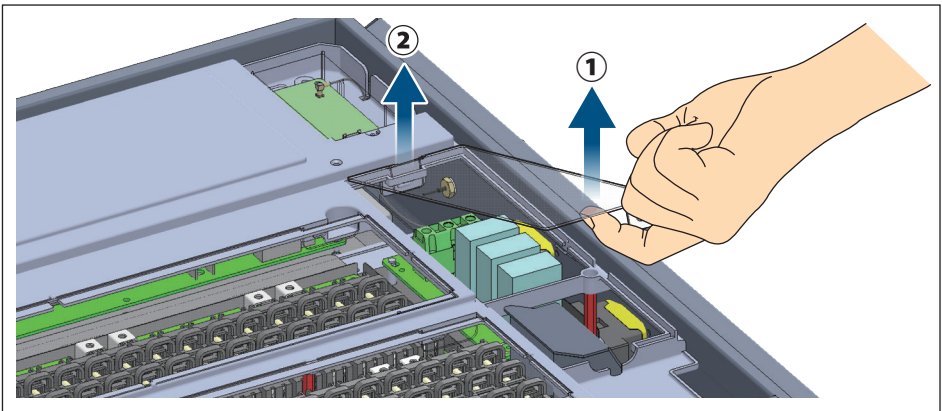
Figure 5-16: Disassembling fan tray from PM chassis

### 5.4.3 Internal Fan 1

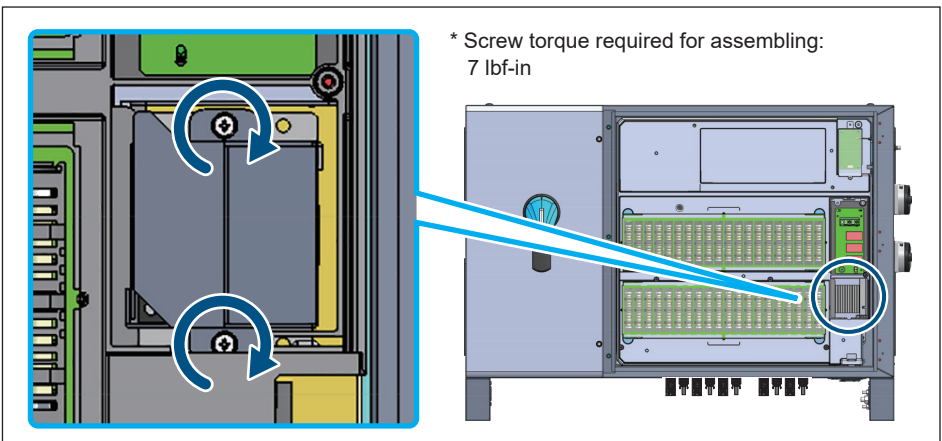
When used, the DC side (right) compartment is provisioned with a single fan module. (See **Figure 5-17, 5-18, 5-19, 5-20**)

If the warning **"Fan Fail- Internal F00"** show on the DSS / APP, please follow the procedure below to remove Internal Fan 1.

- (1) Remove the shield cover.
- (2) Loosen two screws shown in **Figure 5-18** and remove the fan cabinet.
- (3) Disconnect the power connector.
- (4) Lift the entire fan assembly from the DC side (right) compartment. (shown in **Figure 5-19**)
- (5) Clean assembly or replace with a new fan. (shown in **Figure 5-20**)
- (6) Reassemble using a tightening torque of 7 lbf-in.

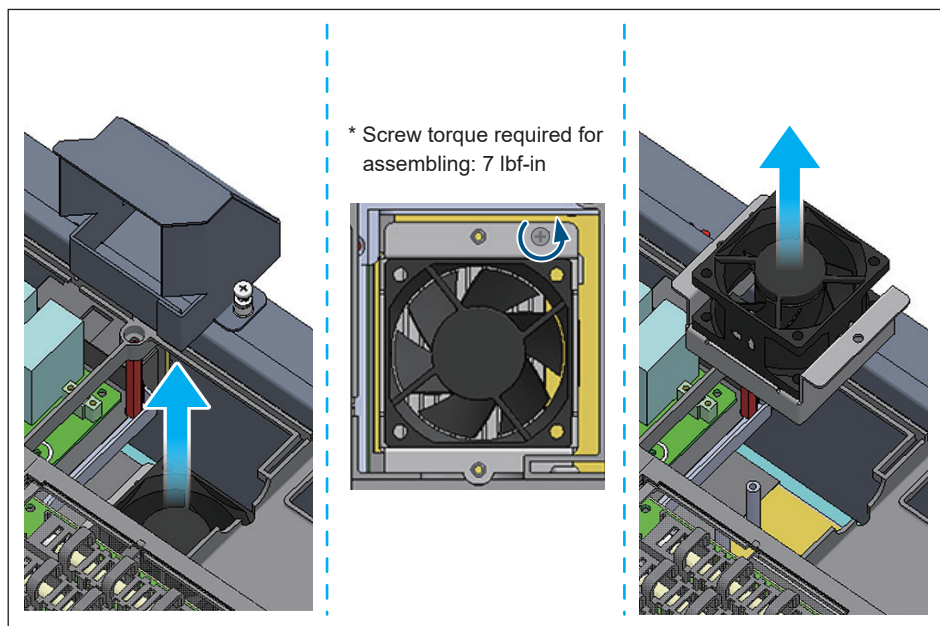


**Figure 5-17: Remove the internal fan 1 shield cover**

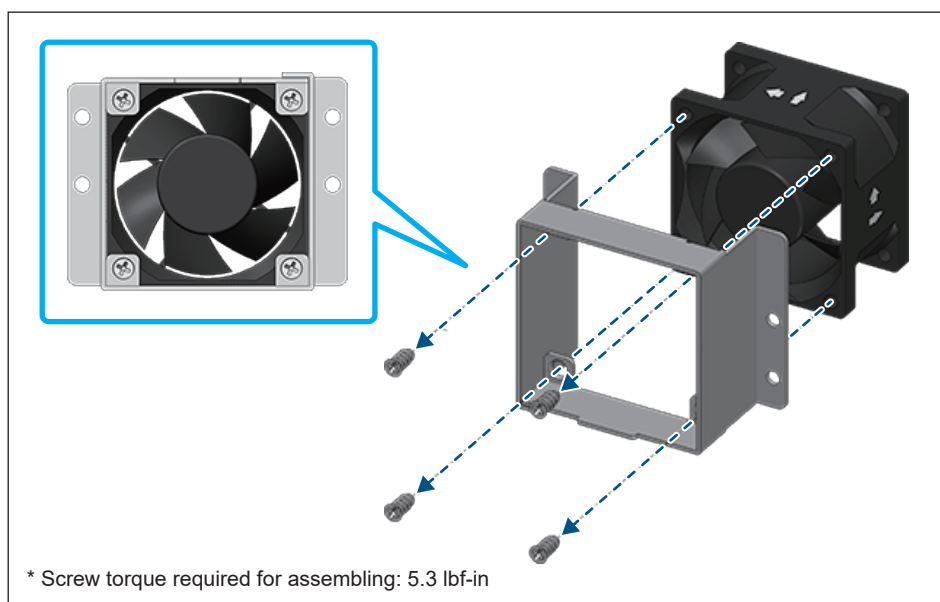


\* Screw torque required for assembling:  
7 lbf-in

**Figure 5-18: Internal fan 1 location**



**Figure 5-19: Take off the internal fan 1**



**Figure 5-20: Replace with a new fan**

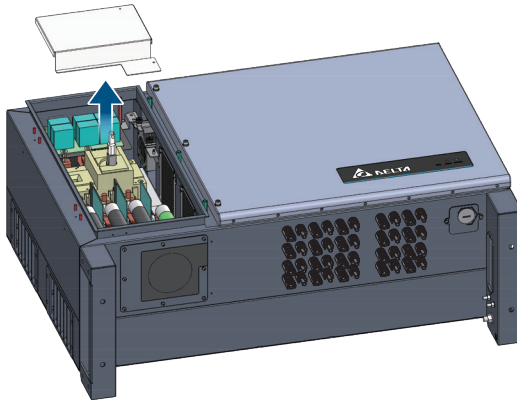


## 5.4.4 Internal Fan 2

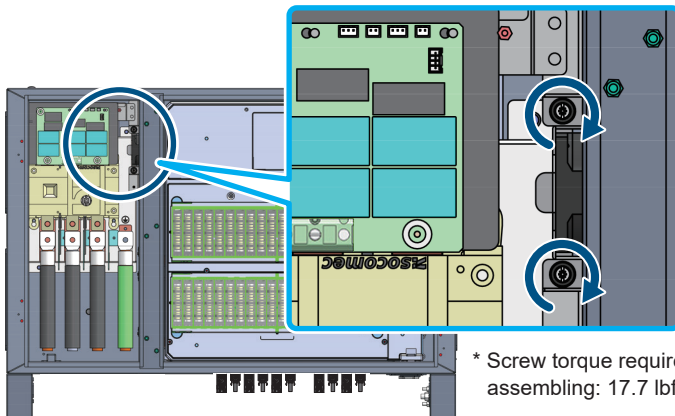
When used, the AC side compartment is provisioned with a single fan module.  
(See **Figure 5-21, 5-22, 5-23, 5-24**)

If the warning **"Fan Fail- Internal F01"** show on the DSS / APP, please follow the procedure below to remove Internal Fan 2.

- (1) Remove the shield cover. (shown in **Figure 5-21**)
- (2) Remove the two screws shown in **Figure 5-22**.
- (3) Disconnect the fan power connector.
- (4) Lift the entire fan assembly from the left compartment. (shown in **Figure 5-23**)
- (5) Clean assembly or replace with a new fan. (shown in **Figure 5-24**)
- (6) Reassemble using a tightening torque of 17.7 lbf-in.

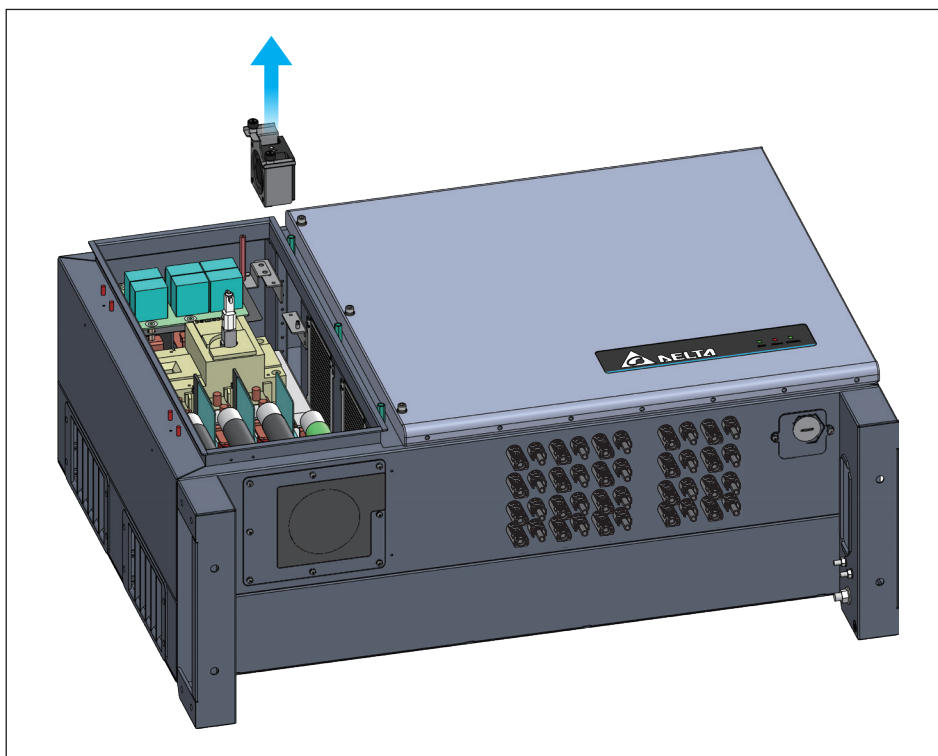


**Figure 5-21: Remove the internal fan 2 shield cover**

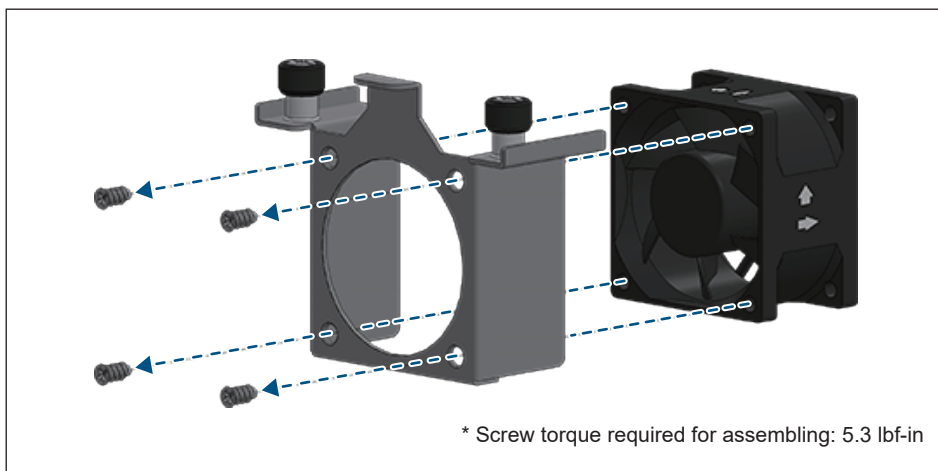


\* Screw torque required for assembling: 17.7 lbf-in

**Figure 5-22: Internal Fan 2 location**



**Figure 5-23: Take off the internal Fan 2**



\* Screw torque required for assembling: 5.3 lbf-in

**Figure 5-24: 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, use follow the procedures.

- 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 !



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

### CAUTION : POSSIBLE INJURY !



***The inverter weighs 176 lbs.***

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



Use carefully when handling mounting hardware.  
Do not leave loose screws and nuts inside the AC side (left) compartment.

## 6 Error Message and Trouble Shooting

While Delta Electronics endeavors to build electronic products to very high standards of reliability, there will arise instances where the inverter may not operate properly. When such a condition is encountered, please follow the instructions in the Troubleshooting Guide (**Tables 6-1, 6-2, and 6-3**) to attempt to clear the fault. If it can't solve the problem, 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	<b><i>If repeated occurrence, contact customer service for technical support</i></b>
AC phase abnormal (E08)	Wrong connection in AC terminal	Check the AC connection in accordance with the user manual
No Grid (E09)	1. AC breaker is OFF 2. Disconnect in AC terminal	1. Check switch or AC breaker turn on 2. Check the connection in AC terminal and make sure it connects to inverter
AC Volt Low (E10)	Grid voltage low	1. Check the utility voltage within the suitable range 2. Check Grid code & Grid setting 3. Check the connection in AC terminal
AC Volt High (E11)	Grid voltage high	
EPO (E25)	EPO is operated by user	Release the EPO button
DC Voltage High (E30)	Input voltage is over 1500Vdc	Modify the solar array setting, and make the Voc less than 1500Vdc
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 extern 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	<b>Contact customer service for technical support</b>
Temperature High (F05)	One of inner ambient NTC and inverter module NTCs is over high temperature limit	Check the installation ambient and environment
Amb Temp Fault (F06)	The ambient NTC temperature >105 °C or <-40 °C	<b>Contact customer service for technical support</b>
Temperature Low (F07)	One of inner ambient NTC and inverter module NTCs is under low temperature limit.	Check the installation ambient and environment
Inverter Temp Fault (F10)	The inverter NTC temperature >125 °C or <-40 °C	<b>Contact customer service for technical support</b>
AC RLY Fault (F13)	Grid relay open	<b>Contact customer service for technical support</b>
FW Unmatch (F14)	Firmware Incompatibility	<b>Contact customer service for technical support</b>
AC Sensor Fault (F15)	DSP Iac or Vac sensor circuit defective	1. Check the polarity of PV connection (if the error code comes along with <b>W08</b> ) 2. <b>Contact customer service for technical support</b>
AC Sensor Fault (F18)	Red Vac sensor circuit defective	<b>Contact customer service for technical support</b>
Red COMM Fault (F22)	The internal communication connection is disconnected	<b>Contact customer service for technical support</b>
DSP COMM Fault (F23)	The 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. Check the capacitance (+ <-> GND & - <-> GND), must < 10uF. Install external transformer if necessary
Iac Unbalance (F26)	1. Power line is disconnected inside the inverter 2. Current feedback circuit is defective	Check the connection in AC terminal
RCMU Fault (F27)	RCMU circuit is disconnected	<b>Contact customer service for technical support</b>
AC RLY Short (F28)	Grid relay short	Check the connection and Grid voltage in AC terminal

**Table 6-2B: Fault Codes (inverter fault) & Messages**

<b>Message</b>	<b>Description</b>	<b>Action</b>
AC RLY Open (F29)	Grid relay open	<b>Contact customer service for technical support</b>
Bus Unbalance (F30)	Inverter Vbus voltage unbalance	Restart inverter by DC switches
Bus Voltage High (F31, F33, F35)	Voc of PV array is over 1500Vdc	Restart inverter by DC switches
Bus Voltage Low (F32, F34)	Inverter Vbus voltage significant unbalance	<b>Contact customer service for technical support</b>
AC Current High (F36,F37,F38 F39,F40,F41)	Surge occurs during operation	<b>Contact customer service for technical support</b>
AC CT Fault (F42)	Phase R CT is defective	<b>Contact customer service for technical support</b>
AC CT Fault (F43)	Phase S CT is defective	<b>Contact customer service for technical support</b>
AC CT Fault (F44)	Phase T CT is defective	<b>Contact customer service for technical support</b>
AC Current High (F45)	AC current over range	Restart the inverter by DC switches
ZC Circuit Fault (F50)	The zero crossing circuit defective	<b>Contact customer service for technical support</b>
Inv Circuit Fault (F51)	The inverter circuit defective	<b>Contact customer service for technical support</b>
Thermal Fuse Fault (F55)	Thermal fuse detected abnormal temperature	<b>Contact customer service for technical support</b>
Arc circuit fail (F58)	Arc circuit fail	<b>Contact customer service for technical support</b>
Arc fault (F59)	Arc fault	<ol style="list-style-type: none"> <li>1. Check If any damage of DC connector and DC wire</li> <li>2. <b>Contact customer service for technical support</b></li> </ol>
DC Current High (F60, F70)	DC current over range	Restart inverter by DC switches
Ext COMM. Fault (F74)	The external communication connection is disconnected	<ol style="list-style-type: none"> <li>1. Check the connection between external unit and COMM</li> <li>2. <b>Contact customer service for technical support</b></li> </ol>

## 6.3 Warning Codes (Field Warning)

**Table 6-3A: Warning Codes (Field warning) & Messages**

Message	Description	Action
De-rating (W07)	<ol style="list-style-type: none"> <li>Over temperature</li> <li>Power Limit function</li> <li>Power vs. Frequency function</li> <li>P(V) function</li> <li>Grid Voltage low</li> <li>Solar Voltage low</li> <li>Solar Voltage High</li> <li>Ramp up function</li> </ol>	<ol style="list-style-type: none"> <li>Check the installation ambient and environment</li> <li>Check Grid Code &amp; Grid setting</li> <li>Check the utility frequency on the inverter terminal</li> <li>Check the utility voltage on the inverter terminal</li> <li>5-1. Check the utility voltage on the inverter terminal</li> <li>5-2. Check reactive power setting</li> <li>Check the Solar voltage on the inverter terminal</li> <li>Check the Solar voltage on the inverter terminal</li> <li>Check Ramp up setting</li> </ol>
String fault (W08)	<ol style="list-style-type: none"> <li>DC Connectors polar is incorrect</li> <li>String current monitoring function is failure</li> </ol>	<ol style="list-style-type: none"> <li>Check the polarity of PV connection</li> <li>Restart DC switch and AC breaker</li> <li><b>Contact customer service for technical support</b></li> </ol>

## 6.4 Warning Codes (Inverter Warning)

**Table 6-4A: Warning Codes (inverter warning) & Messages**

Message	Description	Action
Fan Fail (W11)	<ol style="list-style-type: none"> <li>One or more fans are locked</li> <li>One or more fans are defective</li> <li>One ore more fans are disconnected</li> </ol>	<p><b>Ext Fan Fail</b></p> <ol style="list-style-type: none"> <li>Remove the object that stuck in the fan(s)</li> <li>Check the connections of all fans</li> <li>Replace the defective fan(s)</li> </ol> <hr/> <p><b>Int Fan Fail</b></p> <p><b>Contact customer service for technical support</b></p>
DC SPD Fault (W17) AC SPD Fault (W18)	<ol style="list-style-type: none"> <li>One or more SPD are defective</li> <li>One or more SPD are disconnected</li> </ol>	<ol style="list-style-type: none"> <li>Replace the defective SPD</li> <li>Check the connections of SPDs</li> </ol>
Aux Power Fault (W19)	The Aux-Power defective	<b>Contact customer service for technical support</b>
String COMM Fault (W23)	String monitor communication fail	<b>Contact customer service for technical support</b>
String Current Low (W23)	Disconnect in DC connectors	<ol style="list-style-type: none"> <li>Check String Connector and Fuse</li> <li><b>Contact customer service for technical support</b></li> </ol>



## 7 Technical Information

### 7.1 Technical of M125HV\_111

Table 7-1A: Specifications	
Model	M125HV_111
DC Input	
Occasionally Max. voltage	1500V
Operating voltage range	860 – 1500V
MPP voltage range	860 – 1350V * <sup>1</sup>
Start voltage	910V
Rated voltage	1050V
MPP tracker	1
Max. operating current	150A
Max. allowable array Isc	320A
String fuse provisioned	20A/1500V PV fuses
Connection	20 pairs of H4 series connectors * <sup>2</sup>
Surge protection	Type II SPD
DC switch	Built-in
AC Output	
Rated output power	125kW / 125kVA
Max. output power	125kVA / 132kVA / 140kVA * <sup>3</sup>
Max. output current	120A@125kVA / 127.5A@132kVA / 135A@140kVA * <sup>4</sup>
Max. inrush current	300A, 100μs
Max. output fault current (rms)	160A
Max. output overcurrent protection	175A
Rated voltage	3P/PE, 600Vac
Operating voltage range	384V~690V
Operating frequency range	50/60Hz ±5Hz
Power factor	0.8 ind ~ 0.8 cap adjustable (1~0.9 at maximum power)
Surge protection	Type II SPD
T.H.D	<3%
Connection	Ring terminal lug with Terminal busbar (Max. 150mm <sup>2</sup> Cu or Al wire)
Night time consumption * <sup>3</sup>	< 3.5W

\*<sup>1</sup> Ambient < 77°F : 860~1350V ; Ambient < 104°F : 860~1250V

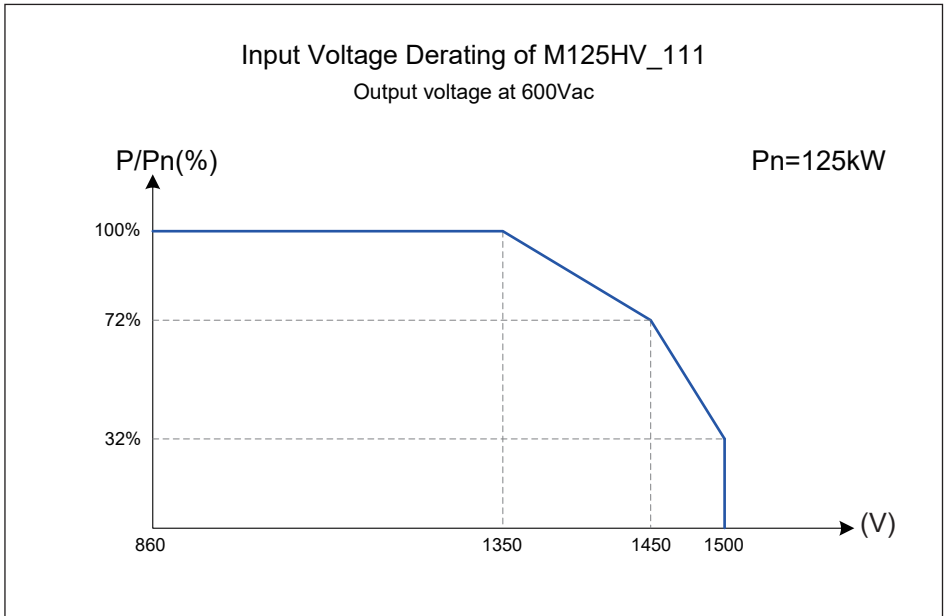
\*<sup>2</sup> Accessories H4 Plus for field wiring, suitable size : 4 / 6 / 10(optional) mm<sup>2</sup> copper conductor

\*<sup>3</sup> Max. Apparent Power can be set during commissioning.

\*<sup>4</sup> Night time consumption with standby communication.

Table 7-1B: Specifications	
Model	M125HV_111
Efficiency	
Peak efficiency	>99 %
CEC efficiency	99.0 %
Information	
Communication	RS-485 (Delta / Sunspec) , Bluetooth
Indicator	LED (Grid, Alarm, COMM.)
Regulation	
	UL 1741 SA, UL1741, UL1998, UL 1699B IEEE1547, IEEE1547.1, CSA C22.2
General Data	
Smart inverter functionality	Voltage/Frequency Ride through, Volt/Var, Volt/Watt, Power curtailment, Frequency/Watt
Max. inverter backfeed current to the array	0A
Pollution degree	3
Overvoltage category	AC output :III, DC Input :II
Protective class	I
AC connection type	Ring terminal lug with Terminal busbar (Max. 150mm <sup>2</sup> Cu or Al wire)
Operating temp. range	-22°~140°F, >122°F de-rating
Protection level	NEMA 4X
Relative humidity	0% – 100% non-condensing.
Operating elevation	<9800 ft, Outdoor, wet locations
Cooling	Forced air cooling with Smart Fan control
Noise	71.5 dBA @1m, Amb25°C
Dimension (W x H x D, in)	35.4 x 26.1 x 14.5
Weight (lb)	176

If the input voltage is higher than 1350V, the inverter may derate the output power. The relationship between the input voltage and the output power derating is shown in **Figure 7-1**.

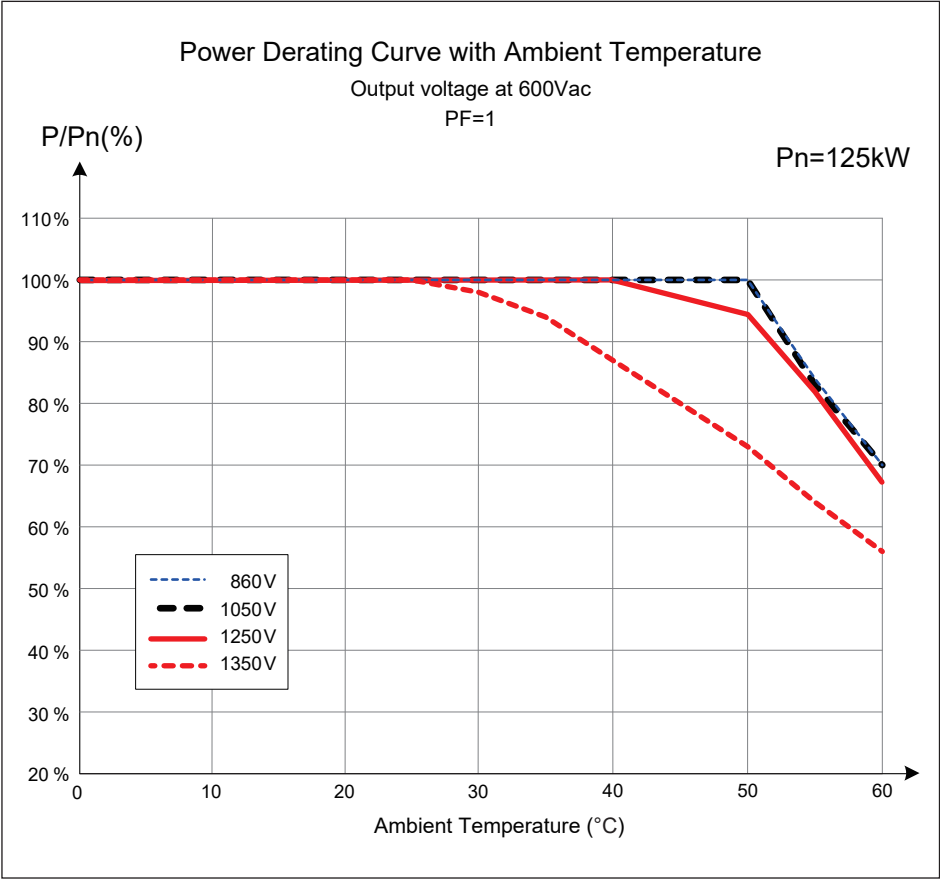


**Figure 7-1: Input Voltage Derating Curve**

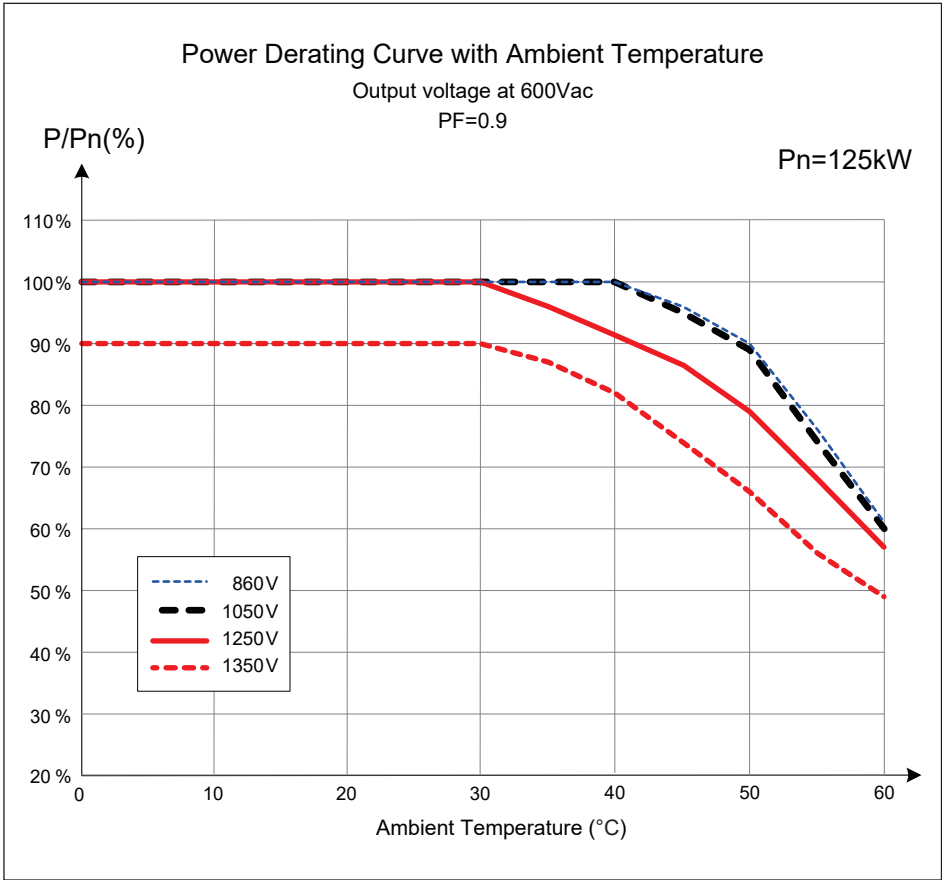
Either power module temperature or inverter internal temperature exceeds the upper limit, the inverter will derate power until the temperature drops within the permissible range.

- Power will derate when ambient temperature is over 50°C. Derating curve is shown in **Figure 7-4**.
- Apparent power could be 110% with ambient temperature is under 40°C. Derating curve with PF=0.9 is shown in **Figure 7-5**.

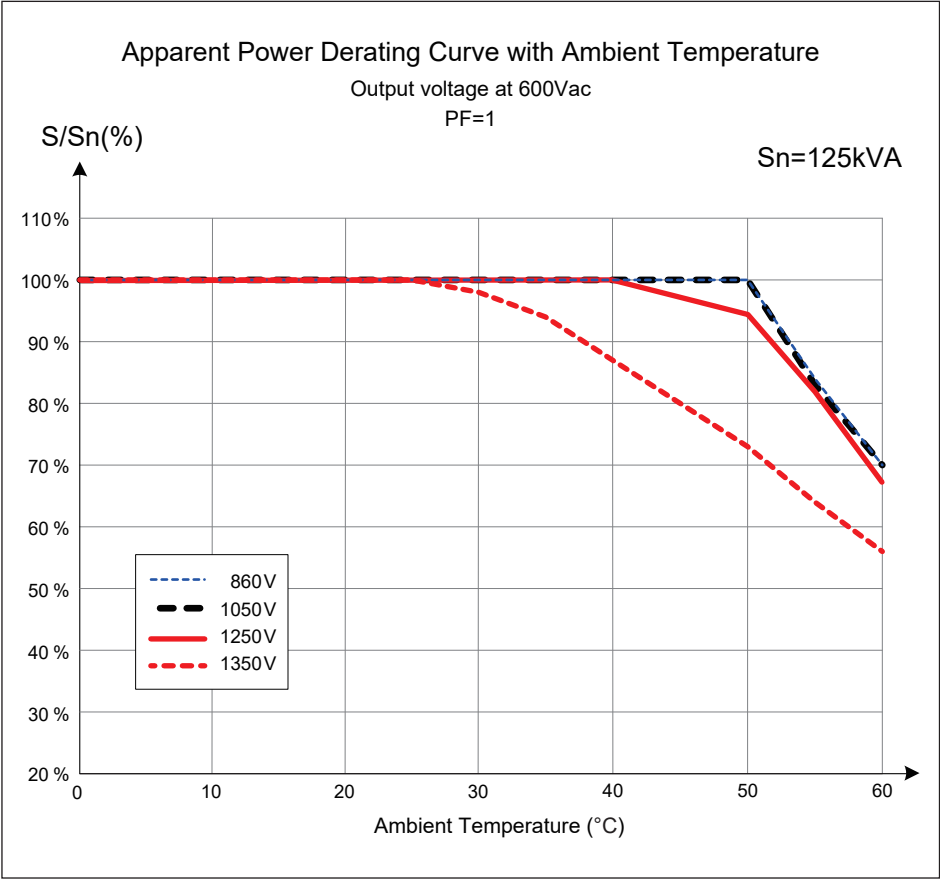
The width operation input voltage with full power can fulfill high latitudes application with up to 2 times dc/ac ratio. When doing panel configuration design of the solar field, please refer to the input voltage derating curve. Input voltage derating curve with PF=1 and PF=0.9 is shown in **Figure 7-6** and **Figure 7-7**.



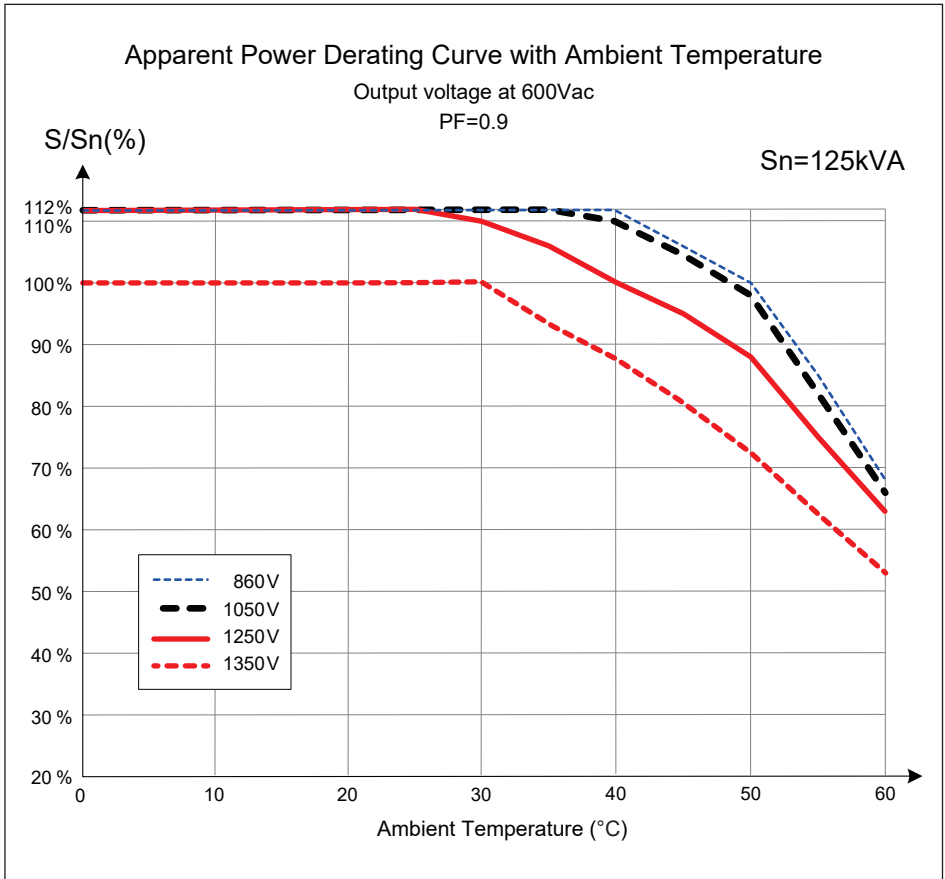
**Figure 7-2: Power Derating Curve with Ambient Temperature (PF=1)**



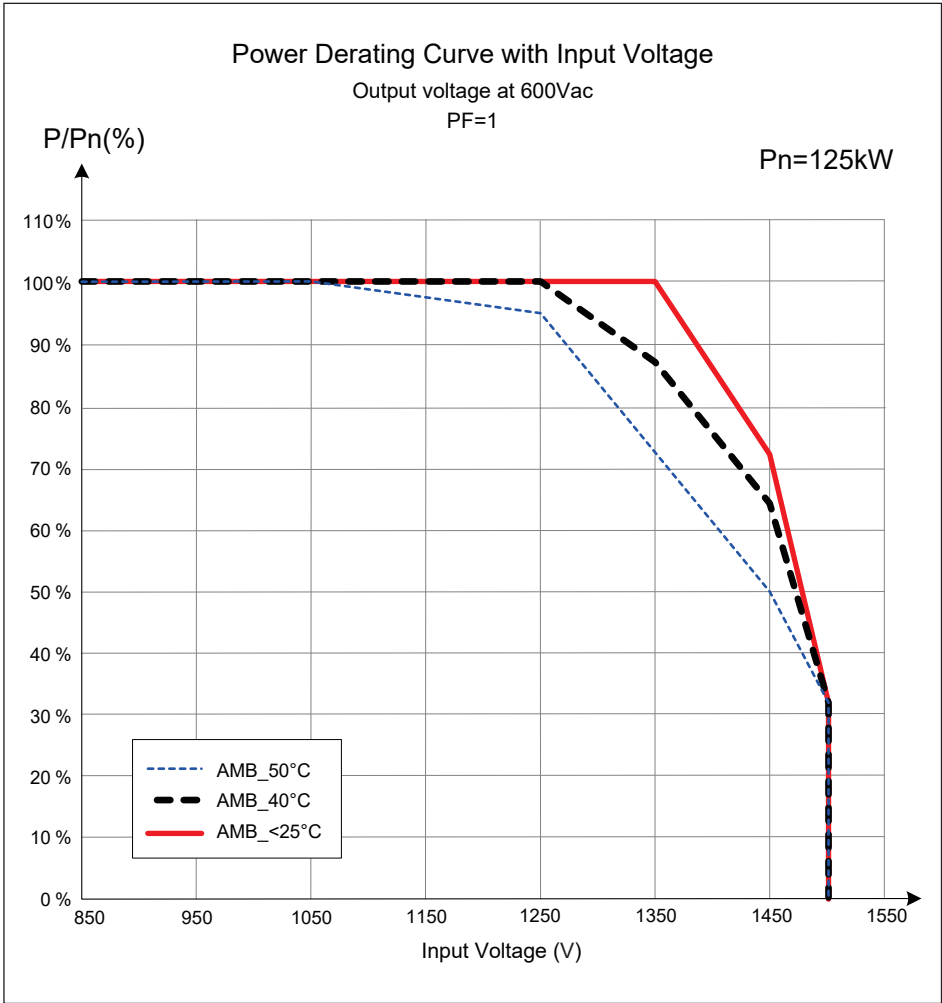
**Figure 7-3: Power Derating Curve with Ambient Temperature (PF=0.9)**



**Figure 7-4: Apparent Power Derating Curve with Ambient Temperature (PF=1)**

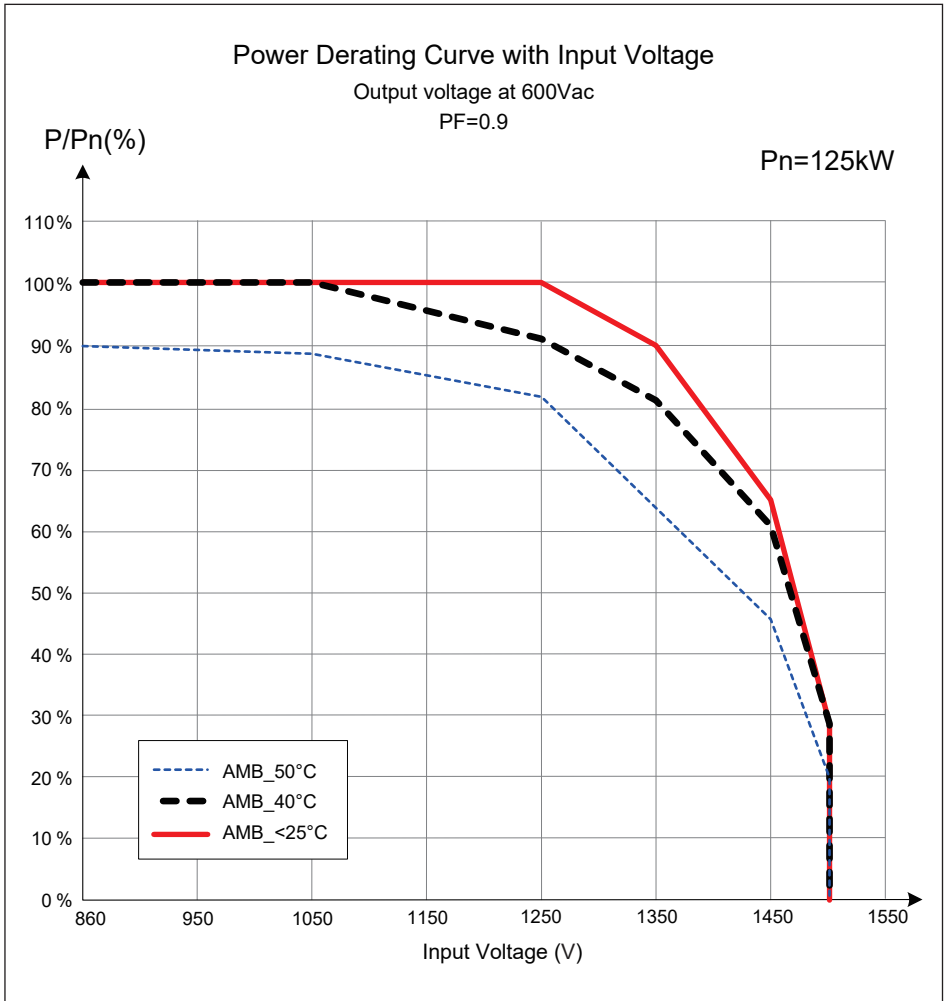


**Figure 7-5: Apparent Power Derating Curve with Ambient Temperature (PF=0.9)**



**Figure 7-6: Power Derating Curve with Input Voltage (PF=1)**





**Figure 7-7: Power Derating Curve with Input Voltage (PF=0.9)**

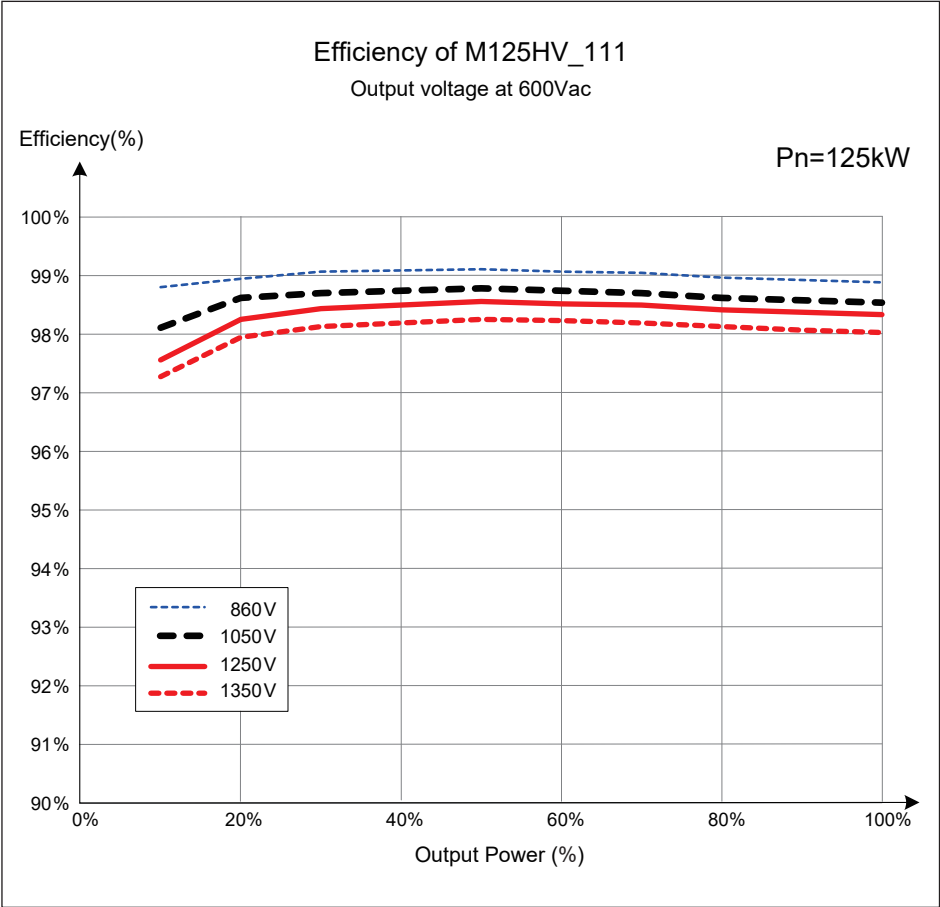
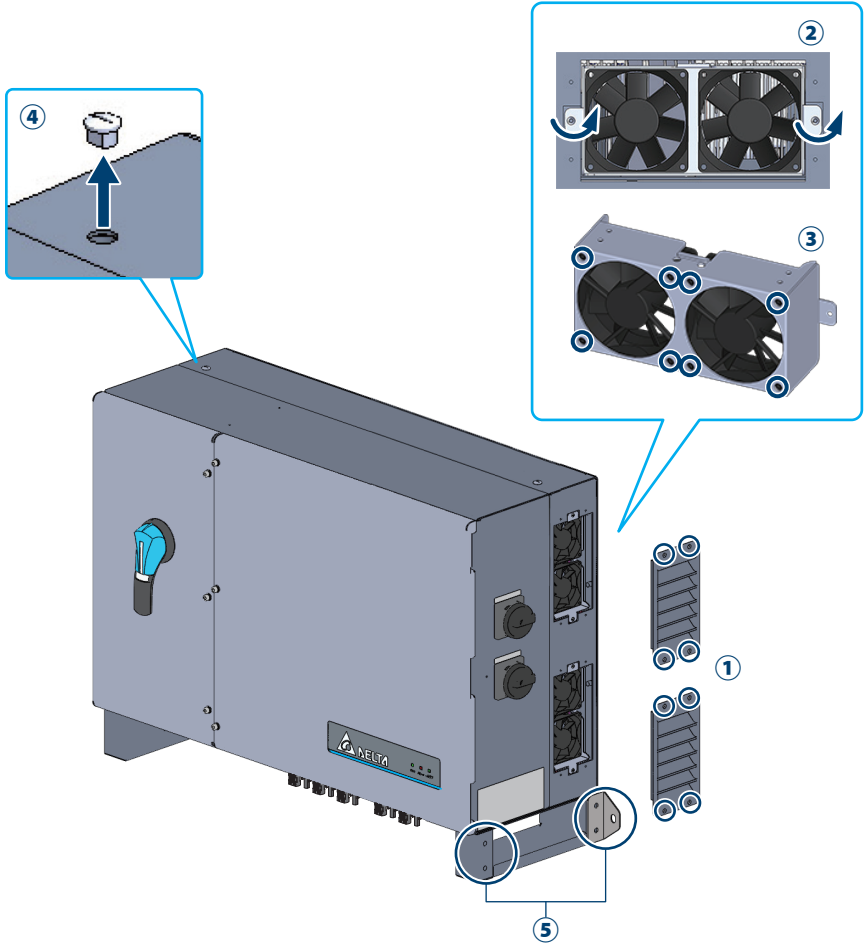


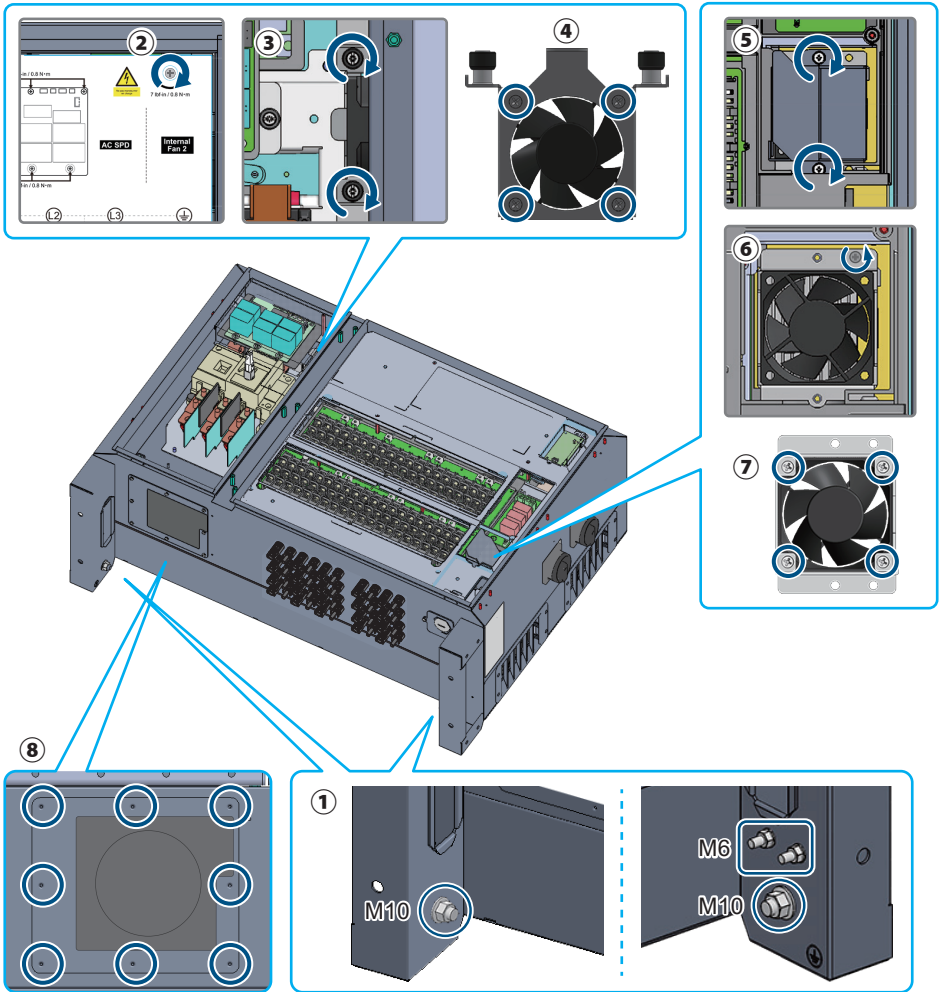
Figure 7-8: Efficiency Curve

# Appendix: Assembly Note



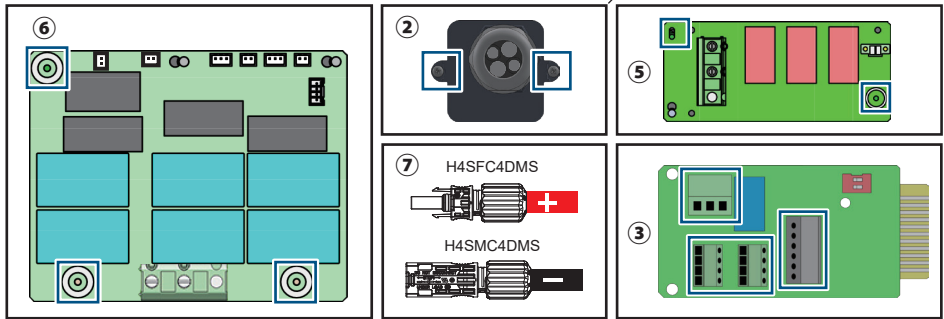
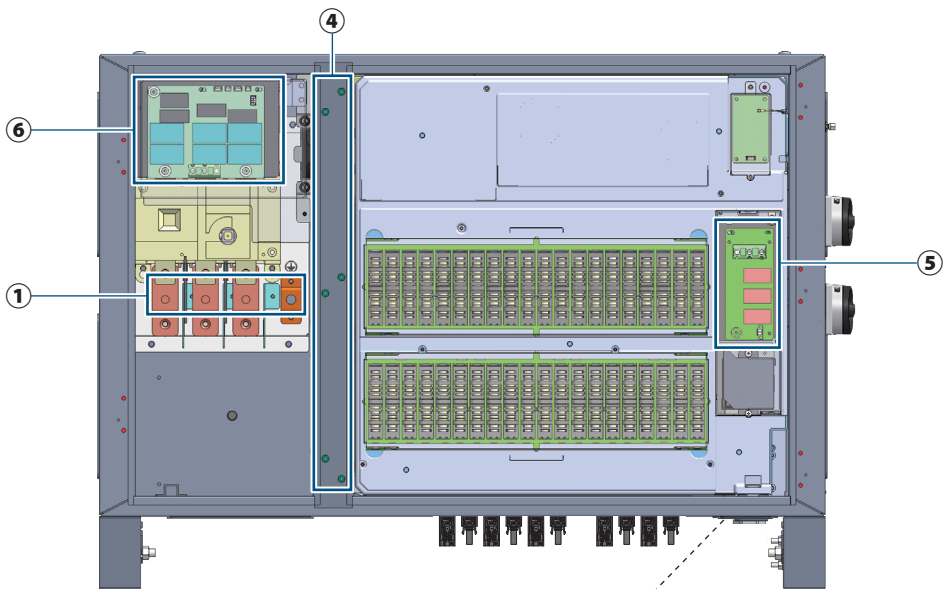
Appendix-1: Assembly Note-1

NO	Location	Screw torque
1	Filter	7 lbf-in (0.8N · m)
2	Fan Tray	7 lbf-in (0.8N · m)
3	Fan	5.3 lbf-in (0.6N · m)
4	Screw Plug	4.3 lbf-in (0.5N · m)
5	Reinforce Bracket / Grounded Bracket	133 lbf-in (15N · m)



Appendix-2: Assembly Note-2

NO	Location	Screw torque	
1	Grounding	M6	62 lbf-in (7.0N · m)
		M10	222 lbf-in (25N · m)
2	AC Cover		7 lbf-in (0.8N · m)
3	Internal Fan 2 Cover		17.7 lbf-in (2.0N · m)
4	Internal Fan 2 Tray		5.3 lbf-in (0.6N · m)
5	Internal Fan 1 Cover		7 lbf-in (0.8N · m)
6	Internal Fan 1 Tray		7 lbf-in (0.8N · m)
7	Internal Fan 1 Tray		5.3 lbf-in (0.6N · m)
8	AC Chassis Access		7 lbf-in (0.8N · m)



Appendix-3: Assembly Note-3

NO	Location	Screw torque	Conductor cross-section
1	AC terminal	222 lbf-in (25N · m)	Cu: 3/0 AWG ~ 300 kcmil Al: 4/0 AWG ~ 300 kcmil
2	Communication cover	7 lbf-in (0.8N · m)	-
3	Communication port	-	20 AWG (0.5mm <sup>2</sup> )
4	Crossbeam	39 lbf-in (4.4N · m)	-
5	DC SPD board	7 lbf-in (0.8N · m)	-
6	AC SPD board	7 lbf-in (0.8N · m)	-
7	H4 Plus wire	-	12~10 AWG (4~6mm <sup>2</sup> )





