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Grid-tie Transformerless Solar Inverter

H2.5 / H3 / H3A / H4A / H5A

Operation and Installation Manual

English 1

繁體中文 45

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Contents

1	General Information	05
1.1	Scope of delivery	05
1.2	General Warnings / Notes on Safety	05
1.3	Validity	06
1.4	Product Description	06
1.5	How it Works	06
1.6	Additional Information	06
2	Installation and Wiring	07
2.1	Instruction before Installation	07
2.2	Unpacking	07
2.3	Package Inspection	08
2.4	Identification Label	10
3	Product Overview	11
3.1	Dimensions	11
3.2	Function Introduction	11
3.2.1	LED and Button	12
3.3	Inverter Comparison	13
4	Installation	14
4.1	Installation Location	14
4.2	Mounting	14
5	Wiring	17
5.1	Preparation before Wiring	17
5.2	AC Grid Connection : L + N + PE	18
5.2.1	Required protective devices and cable cross-sections	18
5.2.1.1	AC plug of H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221	18
5.2.1.2	AC plug of H5A_222	19
5.3	DC Connection (from PV Array)	21
5.3.1	Asymmetrical Loading	22
5.3.1.1	DC connector of H3A / H4A / H5A_220 / H5A_221	22
5.3.1.2	DC connector of H5A_222	23
6	Active/Reactive Power Control and LVRT (Optional)	24
6.1	Active Power Control	24
6.1.1	Power Limit	24
6.1.2	Power vs. Frequency	24
6.2	Reactive Power Control	25
6.2.1	Fixed Power Factor $\cos\phi$ (VDE-AR-N 4105,CEI 0-21)	26
6.2.2	$\cos\phi(P)$ (VDE-AR-N 4105,CEI 0-21)	26
6.2.3	Fixed Reactive Power InVAR(CEI 0-21)	26
6.2.4	Reactive Power/ Voltage Characteristic Q(U)(CEI 0-21)	26
6.3	Low Voltage Ride Through (LVRT)	28
6.4	Digital Input	29
6.5	Function Port of H5A_222	30
6.5.1	Installation of the Rubber Washer	30
6.5.2	Digital Input	30
6.5.3	Dry Contact connection	31
6.5.4	Power meter	32
7	Turning the PV inverter on/off	33
7.1	Start-up Procedures	33
7.1.1	PV Array DC Voltage Checking	33
7.1.2	AC Utility Voltage Checking	33
7.1.3	Starting up the Inverter	34

8 Maintenance	35
9 Error Message and Trouble Shooting	36
9.1 Error Message & Trouble Shooting	36
10 De-Commissioning	40
11 Technical Data	41
11.1 Specifications	41

Figure

Figure 1-1 : Solar system operation illustration	06
Figure 2-1 : Unpacking process	07
Figure 2-2 : Components of H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221	08
Figure 2-3 : Components of H5A_222	09
Figure 2-4 : The identification label	10
Figure 3-1 : Dimensions of H2.5 / H3 / H3A / H4A / H5A	11
Figure 3-2 : Inverter exterior objects	11
Figure 3-3 : LED and Button	12
Figure 3-4 : Inverter comparison	13
Figure 4-1 : Attaching the mounting bracket for H2.5 / H3 / H3A / H4A / H5A	15
Figure 4-2 : Correct and incorrect installation illustration	15
Figure 4-3 : Adequate installation gap	16
Figure 5-1 : Connection of a system for floating solar array	17
Figure 5-2 : AC plug illustration (96.031.4154.3 01K, Wieland Electric GmbH)	19
Figure 5-3 : AC plug illustration (PRC 3-FC-FS6)	20
Figure 5-4 : DC Wiring illustration of H3A / H4A / H5A_220 / H5A_221	22
Figure 5-5 : DC Wiring illustration of H5A_222	23
Figure 6-1 : Power vs. frequency characteristic	25
Figure 6-2 : $\cos\phi(P)$ characteristic	26
Figure 6-3 : Q(U) characteristic	27
Figure 6-4 : LVRT characteristic	28
Figure 6-5 : Digital input via DC1_100	29
Figure 6-6 : Digital input on DC1_100	29
Figure 6-7 : Digital input, Dry contact & Power meter	31

Table

Table 2-1 : Packing list of H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221	08
Table 2-2 : Packing list of H5A_222	09
Table 2-3 : Option part of H5A_222	09
Table 3-1 : LED and Reset button function	12
Table 5-1 : Recommended upstream protection	18
Table 5-2 : Recommended upstream protection	19
Table 5-3 : MC4 connectors	22
Table 5-4 : H4 connectors	23
Table 9-1 : Error Message	36
Table 9-2 : Fault Message	37
Table 11-1 : Specifications	41

1 General Information

1.1 Scope of delivery

Congratulations on the purchase of your Delta H2.5 / H3 / H3A / H4A / H5A grid-tied solar inverter. This manual will assist you in becoming familiar with this product. Please observe all safety regulations and take into account the connection requirements by your local grid utility.

1.2 General Warnings / Notes on Safety

Careful handling of the product will contribute to its service life durability and reliability. Both are essential to ensure maximum yield from your product. As some of the solar inverter models are heavy, two people may be required for lifting purposes.

CAUTION !



During operation of electrical devices, certain parts are under dangerous voltage. Inappropriate handling can lead to physical injury and material damage. Always adhere to the installation regulations. Installation may only be conducted by certified electricians.

WARNING !



Repair work on the device should **ONLY** be carried out by the manufacturer. The inverter contains no user serviceable parts inside. Please observe all points in the operation and installation manual. Isolate the device from the grid and the PV modules before undertaking work on the device.

DANGER!



60 seconds

To avoid risk of electrical shock, do not open the solar inverter. The inverter contains no user-serviceable parts. Opening the inverter will void the warranty. Dangerous voltage is present for 1 minute after disconnecting all sources of power, recommend 5 minutes for discharging. Remember that the unit has a high leakage current. The PE conductor **MUST** be connected prior to commencing operation.

WARNING !



The internal temperature may exceed over 70°C while operating. To avoid injury, do not touch the surface of the inverter whilst the unit is in operation.

ATTENTION



For operation and installation of inverter refer to the user manual. Failure to comply with the instructions in this manual may void the warranty.

1.3 Validity

This user manual describes the installation process, maintenance, technical data and safety instructions of the following solar inverter models under the DELTA brand.

- H2.5
- H3
- H3A
- H4A
- H5A

1.4 Product Description

This device is a single-phase grid-tie solar inverter. It converts direct current (DC) electricity from the PV array into single phase alternating current (AC) to supply power to the load and feed the excess generated power back to the local grid. This inverter allows for a wide voltage input range and has a high performance efficiency and user friendly operation. In addition, the special DSP (Digital Signal Processor) design reduces the complexity of the circuit and electronic components. Please note that this device does not support off-grid function. The features for H2.5 / H3 / H3A / H4A / H5A are shown below.

Features

- Power Rating: 2.5kVA (H2.5), 3kVA (H3/ H3A), 4kVA (H4A), 5kVA (H5A)
- Single-phase (L + N + PE), Grid-tie, transformerless solar inverter
- Maximum efficiency : >97.4% (>98.3% @ H5A)
- Europe efficiency : 96.8% (98.0% @ H5A)
- Reactive power capability (Cap 0.8 – Ind 0.8)
- Total harmonic distortion (THD < 3%) @ full load

1.5 How it Works

The operation of a solar inverter is shown in **Figure 1-1**.

In order to save energy and electricity, the solar inverter converts the DC input power supplied from the PV Array into single-phase AC output power to Grid.

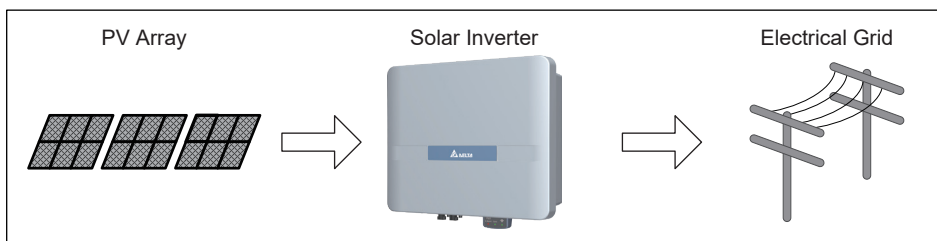


Figure 1-1 : Solar system operation illustration

1.6 Additional Information

For more detailed information for H2.5 / H3 / H3A / H4A / H5A or other related product information, please visit : www.deltaww.com

2 Installation and Wiring

2.1 Instruction before Installation

Due to the variety of users and installation environments, you must read this manual thoroughly before installation. Installation of the unit and start-up procedures must be carried out by an accredited technician.

2.2 Unpacking

Unpacking process is shown as **Figure 2-1**.

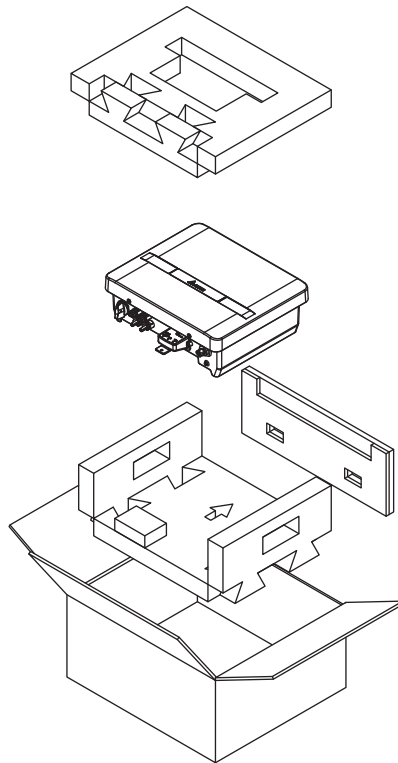


Figure 2-1 : Unpacking process

Upon receiving your brand new RPI inverter, you will be required to remove it's protective packaging. This packaging consists of various materials that will need to be disposed of according to the specific recycling marking printed on them.

2.3 Package Inspection

Unforeseeable events causing damage or movement may occur during shipment. Please check for damage on the packaging upon receiving your inverter. Please check the model number and the serial number on the packaging is identical with the model number and serial number on the unit itself. Check if all the accessories are in the package, the standard accessories are listed as **Table 2-1**, and H5A_222 standard accessories are listed as **Table 2-3**:

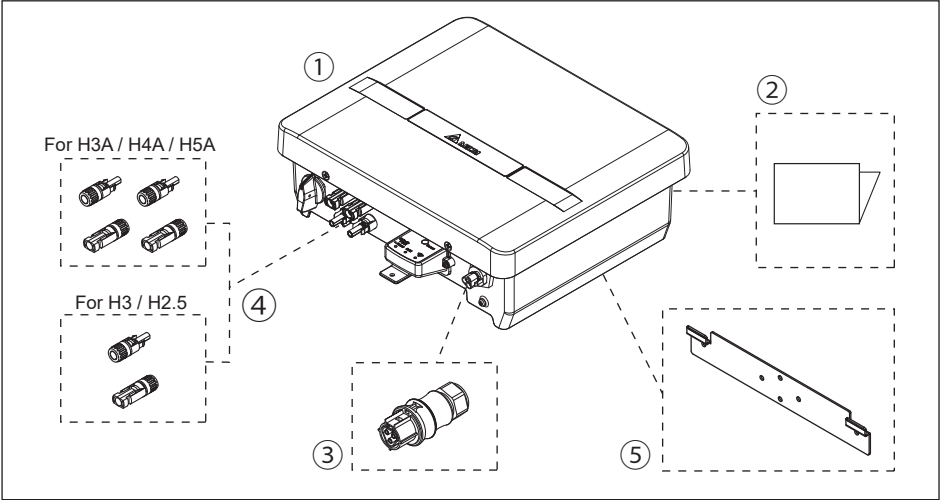


Figure 2-2 : Components of H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221

H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221			
	Object	Qty	Description
①	PV Inverter	1	Solar inverter
②	Quick installation guide	1	Important safety instructions and technical specifications should be followed during installation.
③	AC Plug	1	Connector for AC connection
④	DC Plug	2 pairs	MC4 connector for DC connection for H3A / H4A / H5A models
		1 pairs	MC4 connector for DC connection for H3 / H2.5 models
⑤	Wall-Mount Bracket	1	To mount the solar inverter securely on the wall.

Table 2-1 : Packing list of H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221

CAUTION !



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

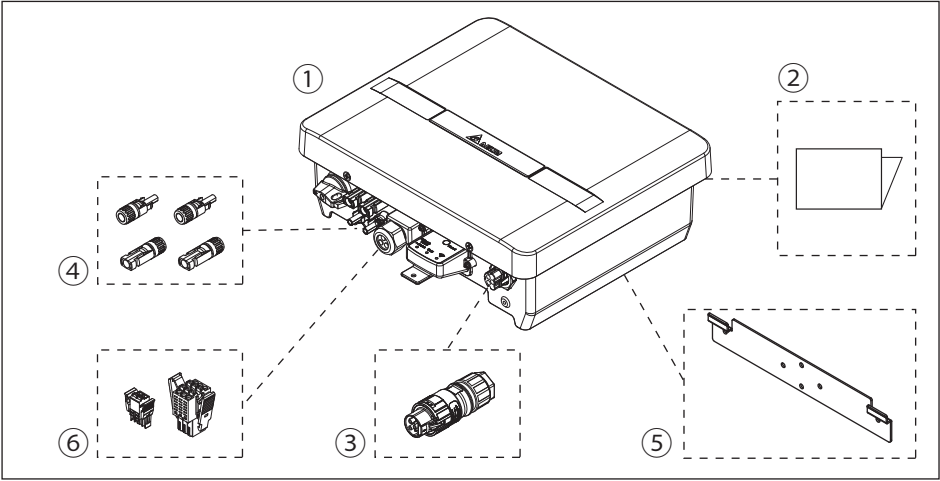


Figure 2-3 : Components of H5A_222

H5A_222			
	Object	Qty	Description
①	PV Inverter	1	Solar inverter
②	Quick installation guide	1	Important safety instructions and technical specifications should be followed during installation.
③	AC Plug	1	Connector for AC connection
④	DC Plug	2 pairs	H4 connector for DC connection
⑤	Wall-Mount Bracket	1	To mount the solar inverter securely on the wall.
⑥	Digital input connector Dry contact connector	2	Digital input connector and dry contact connector for function port.

Table 2-2 : Packing list of H5A_222

Option part			
Model	Object	Exterior	Description
PPM CT16_101	Current sensor		Current sensor for power meter function.
PPM W2_210	10m current sensor cable		Current sensor cable for current sensor
PPM W2_230	30m current sensor cable		

Table 2-3 : Option part of H5A_222



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

2.4 Identification Label

Users can identify the model name by the information on the product label. The model name, serial number and other specifications can be located on the product label. For label location, please refer to **Figure 2-3**.

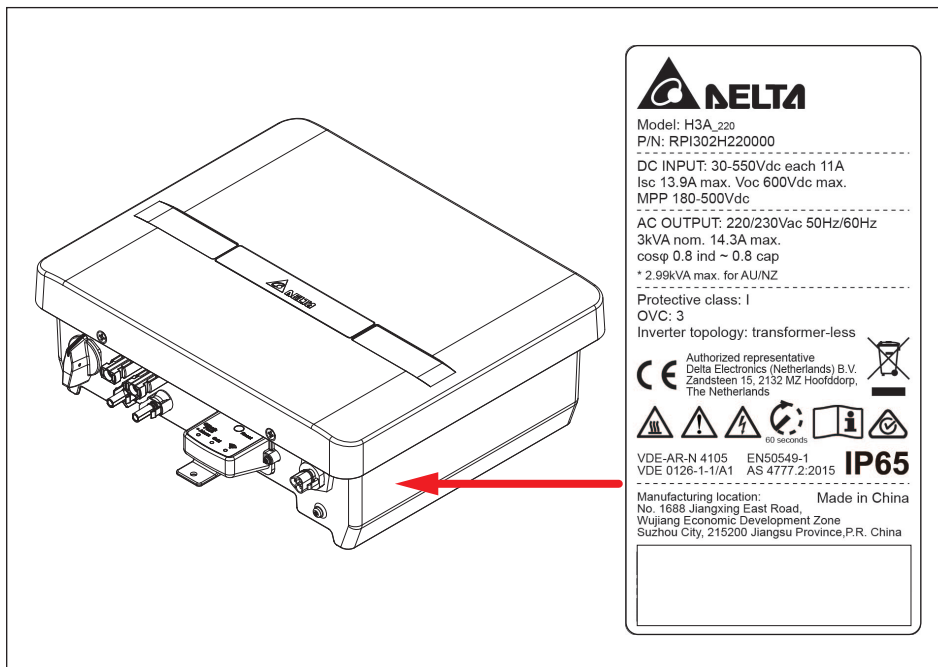


Figure 2-4 : The identification label

3 Product Overview

3.1 Dimensions

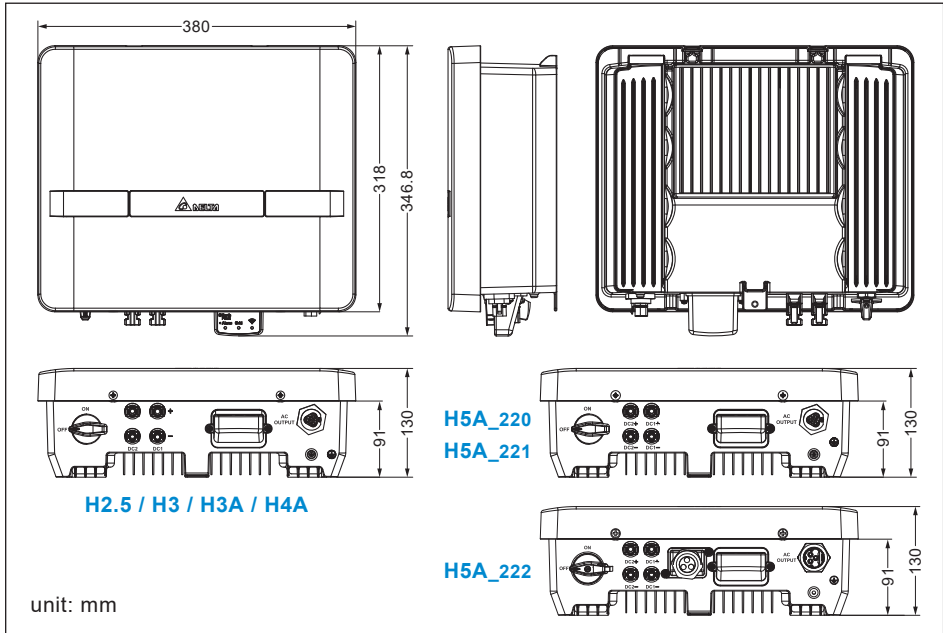


Figure 3-1 : Dimensions of H2.5 / H3 / H3A / H4A / H5A

3.2 Function Introduction

The Inverter's exterior is shown in **Figure 3-2**. The description for individual objects can be found in sections 3.2.1.

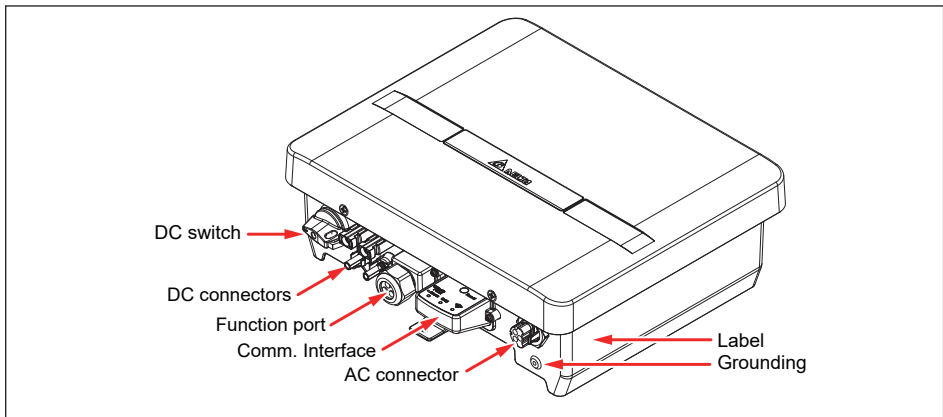


Figure 3-2 : Inverter exterior objects

3.2.1 LED and Button



Figure 3-3 : LED and Button

Table 3-1 : LED and Reset button function

LED	Action	Status
Alarm	Flash:100ms On, 100ms Off	Insulation
	Steady on	Error or Fault. (see Chapter 9.1)
Grid	Flash:100ms On, 100ms Off	Default Country Setting
	Flash:1s On, 1s Off	Countdown
	Steady on	On grid
Wi-Fi	Flash:3s On, 3s Off	Connected to Wi-Fi router/DC1
	Flash:3s Flash(100ms), 3s Off	Connected to both WiFi router/DC1 and mobile device
	Off	Not connected
	Steady on	Connected to mobile device
	Flash:100ms On, 100ms Off	Connected to mobile device and transferring data
	Flash:500ms On, 500ms Off	Reboot Wi-Fi (Press Button 3~10s)
	Flash:1s On, 1s Off	Reset password & Wi-Fi settings (Press Button 20~30s)
Reset Button	Wi-Fi LED Status	Description
Push 3s~10s	Wi-Fi LED flashing once every half a second	Reset Wi-Fi module
Push 10s~20s	No flash	No function
Push 20s~	Wi-Fi LED flashing once every one seconds	Reset Wi-Fi module, and Wi-Fi password returns to the default: DELTASOL

3.3 Inverter Comparison

The DC switch is only presented in the 210/220/222 models.
Model series 211/221 does not have the DC switch.

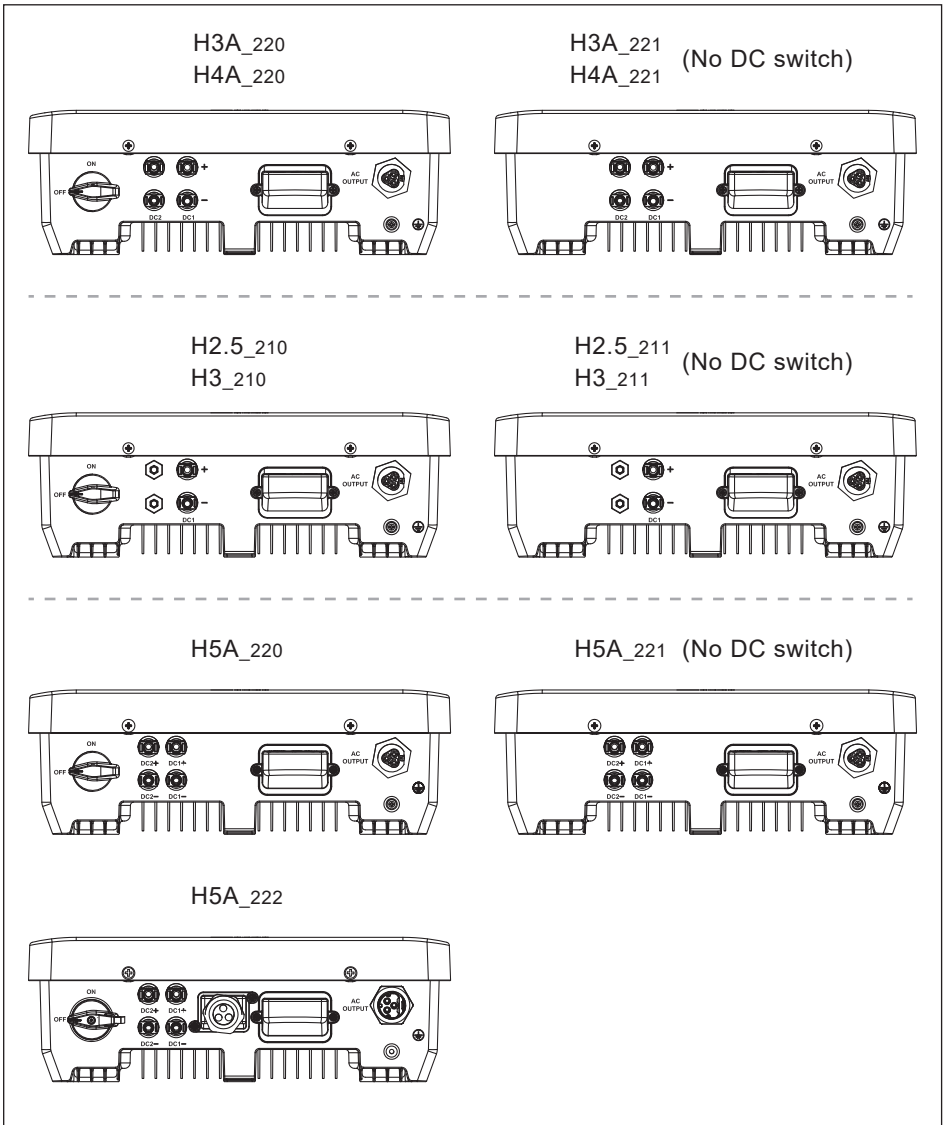


Figure 3-4 : Inverter comparison

4 Installation

4.1 Installation Location

The inverter can be installed in indoors / outdoors.

WARNING !



Do not install the unit near or on flammable surfaces.
Mount the unit tightly on a solid/smooth surface.

CAUTION !



The unit should not be installed in direct sunlight.

4.2 Mounting

This unit is designed to be wall-mounted. Please ensure the installation is perpendicular to the floor and the AC plug located at the base of the unit. Do not install the device on a slanting wall. The dimensions of the mounting bracket are shown in the figure below.

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

- 1.Screw the mounting bracket on the wall with 6 * $\Phi 5.5$ mm Phillips head screws.
- 2.Attach the inverter to the mounting bracket.
- 3.Use Hex Wrench fixing the inverter with 1 * $\Phi 5.0$ mm Hexagon Socket screw.

Please refer to **Figure 4-1**.

CAUTION !



- The bracket supplied with the unit is specially designed and should be the only mounting device used for the unit.
- It is recommended to install the inverter in a suitable location which offers easy and safe access for service and maintenance.
- Please leave an appropriate gap in between units when installing multiple solar inverter systems (refer to **Figure 4-3**).
- Please install solar inverter at eye level to allow easy observation for operation and parameter setting.
- Ambient temperature for operation: $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$ (power derating above 40°C).

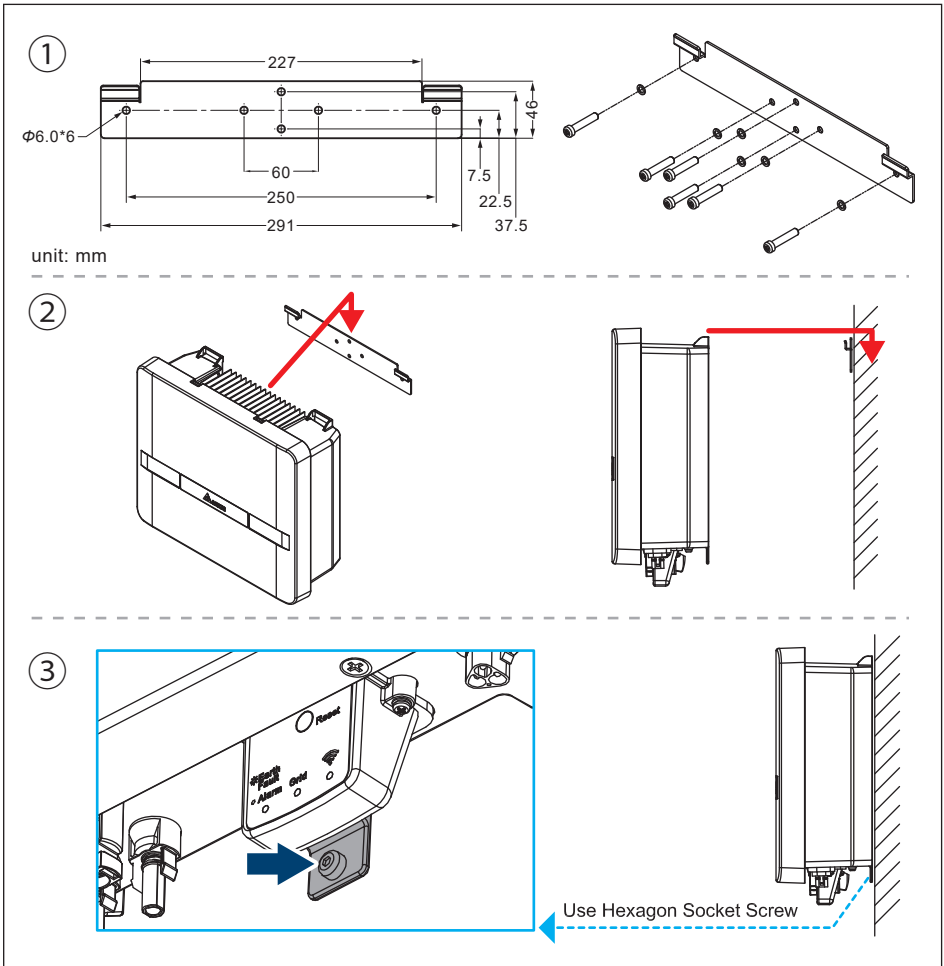


Figure 4-1 : Attaching the mounting bracket for H2.5 / H3 / H3A / H4A / H5A

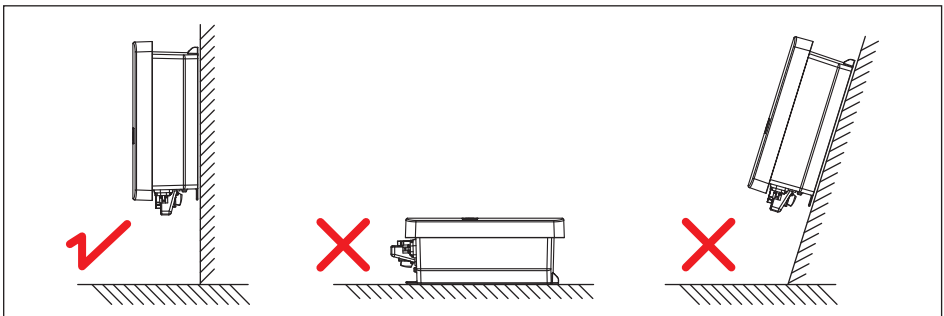


Figure 4-2 : Correct and incorrect installation illustration

Please ensure the spacing requirement to allow for sufficient convective cooling.
It is essential to ensure sufficient space for product operation as shown in **Figure 4-3**.

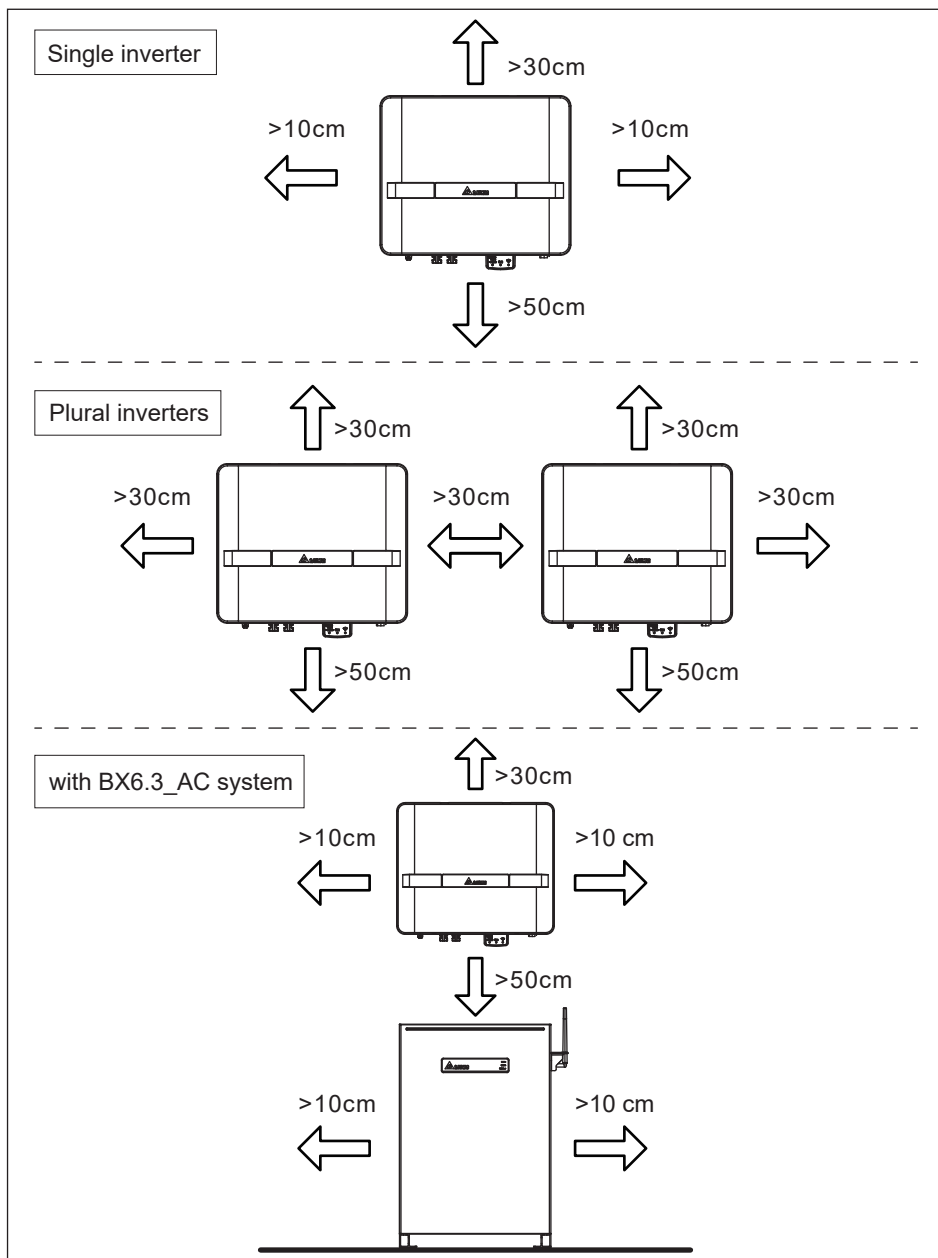


Figure 4-3 : Adequate installation gap

5 Wiring

5.1 Preparation before Wiring

1. Ensure voltage values and polarities are correct.
2. When grounding the solar array positive or negative terminal, an isolation transformer is required due to the H2.5 / H3 / H3A / H4A / H5A not having galvanic isolation between the DC-input and AC-output.
3. The ground fault detection is a fixed internal setting. It cannot be modified.
4. Please refer to **Figure 5-1** for connections. Inverter can accept DC inputs in parallel.
5. According to IEC 62109-2, the PV modules need to have an IEC 61730 Class A rating.

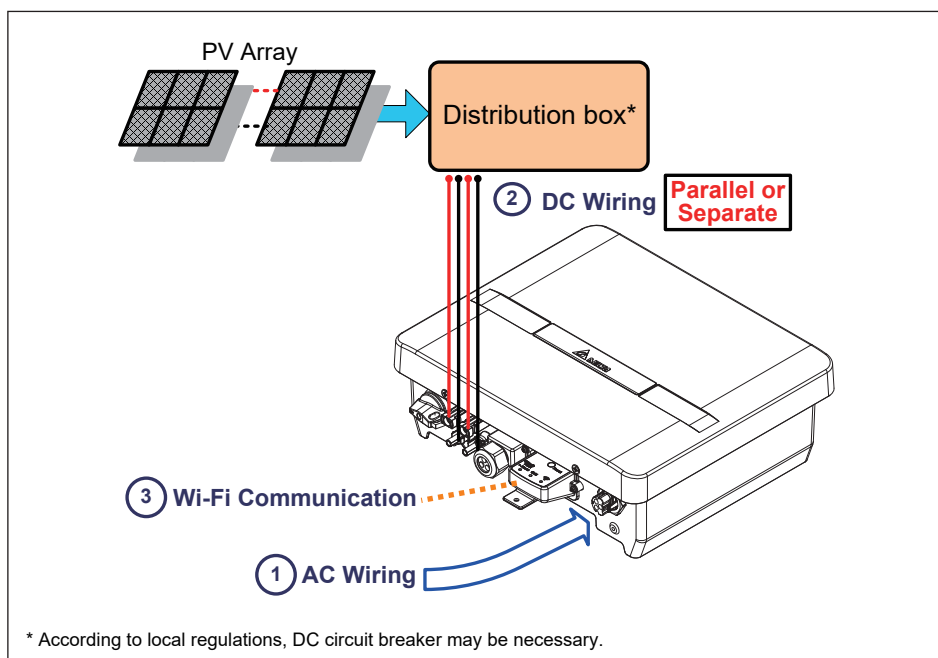


Figure 5-1 : Connection of a system for floating solar array

WARNING! SHOCK HAZARD



When the photovoltaic array is exposed to light, it supplies a DC voltage to the Inverter, a shock hazard may exist due to output wires or exposed terminals. To reduce the risk of shock during installation, cover the array with an opaque (dark) material and ensure that the Disconnect Device in the inverter is set to OFF before commencing any wiring.

5.2 AC Grid Connection : L + N + PE

WARNING !



Before commencing AC wiring, please ensure all AC circuit breakers are switched off.

5.2.1 Required protective devices and cable cross-sections

5.2.1.1 AC plug of H2.5 / H3 / H3A / H4A / H5A_220 / H5A_221

	Power rating	Upstream AC circuit breaker
H2.5	3.125 kVA	16A
H3 / H3A	3.75 kVA	20A
H4A / H5A	5 kVA	25A

Table 5-1: Recommended upstream protection

The AC plug provided with the inverter has the following technical characteristics:

AC connector	96.031.4154.3 01K, Wieland Electric GmbH
Current rating	≤ 25 A
Min. / Max. cable diameter	10 ... 14 mm
Min. / Max. wire diameter	1.25 ... 4 mm ²
Recommended torque for terminal screws	0.8~1 N.m

Read and follow the instructions delivered with the AC plug.

The AC plug delivered with the inverter can be used with flexible or rigid copper cable.

When calculating the cross section of the cable, consider:

- material used
- thermal conditions
- cable length
- type of installation
- AC voltage drop
- power losses in cable

Always follow the system installation requirements defined for your country!

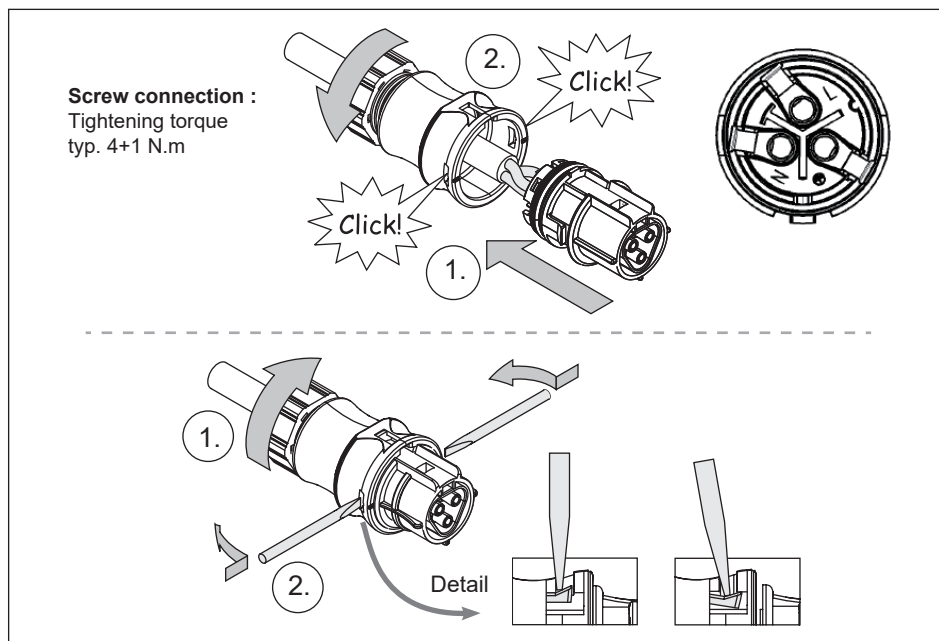


Figure 5-2 : AC plug illustration (96.031.4154.3 01K, Wieland Electric GmbH)

5.2.1.2 AC plug of H5A_222

	Power rating	Upstream AC circuit breaker
H5A_222	5 kVA	25A

Table 5-2: Recommended upstream protection

The AC plug provided with the inverter has the following technical characteristics:

Technical data		IP66** / IP68 (2 m, 24 h)** / IP69K***			
Degree of protection		IEC 61984 IEC 61535 2 PfG 1915 @ 85 °C			
Nominal current (observe derating*)		35 A	32 A	21,4 A	
- conductor cross section:	6 mm ²	32 A	25 A	17.3 A	
	4 mm ²	24 A	20 A	14,1 A	
	2.5 mm ²	17,5 A	17,5 A	12,2 A	
2.5 mm ² with 1.5 mm ² field plug		IEC 61984 IEC 61535 2 PfG 1915	UL 2238		
Nominal voltage		690 V	500 V	500 V	600 V
Rated surge voltage		6 kV			
Pollution degree		3			
Operating temperature		-40 °C ... +110 °C	-40 °C ... +110 °C	-40 °C ... +110 °C	-40 °C ... +105 °C
Material		PPE			

* Operating current [A] depending on ambient temperature [°C], according to conductor cross-section.

** TÜV Rheinland approved / *** Phoenix Contact approved

Read and follow the instructions delivered with the AC plug.

The AC plug delivered with the inverter can be used with flexible or rigid copper cable.

When calculating the cross section of the cable, consider:

- material used
- thermal conditions
- cable length
- type of installation
- AC voltage drop
- power losses in cable

Always follow the system installation requirements defined for your country!

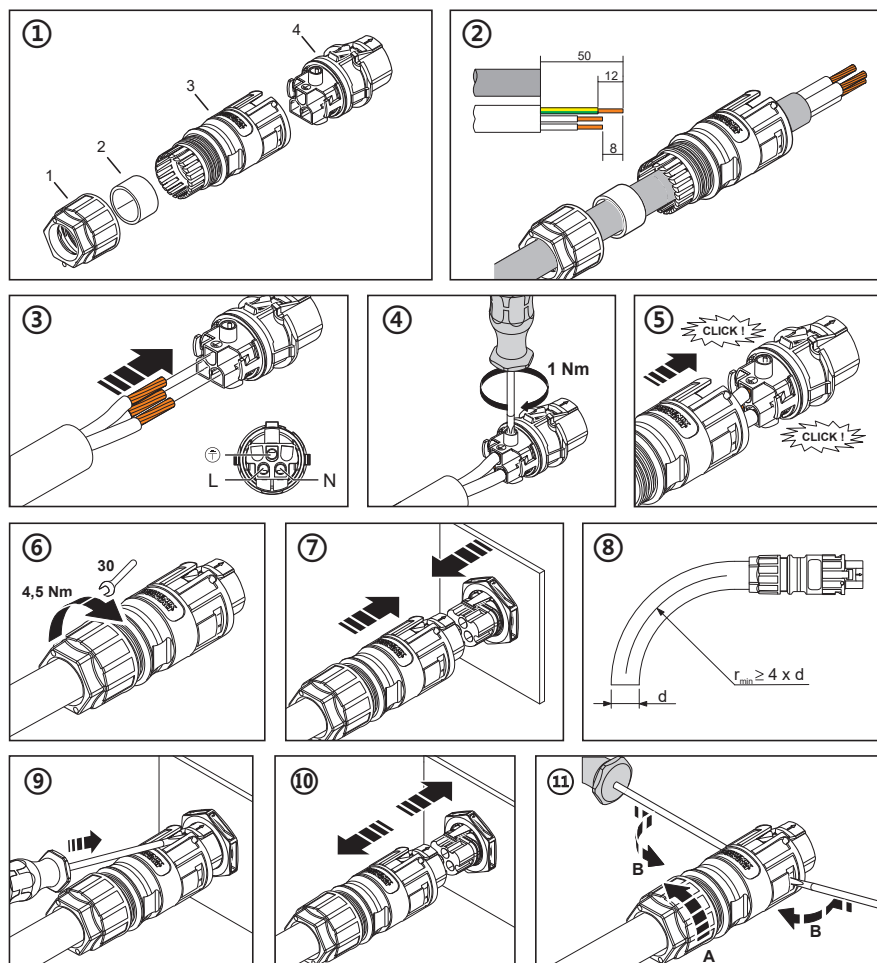


Figure 5-3 : AC plug illustration (PRC 3-FC-FS6)

5.3 DC Connection (from PV Array)

WARNING !



- When undertaking DC wiring, please ensure the correct polarities are connected.
- When undertaking DC wiring, please ensure that the DC isolator switch on the PV array is OFF.

CAUTION !



The maximum open circuit voltage of the PV Array must not exceed 500Vdc(H2.5) / 600Vdc (H3 / H3A / H4A / H5A).

NOTE



The isolator installed between the PV Array and inverter must meet the rating of voltage higher than this device's maximum input voltage.

5.3.1 Asymmetrical Loading

5.3.1.1 DC connector of H3A / H4A / H5A_220 / H5A_221

The inverters (H3A / H4A / H5A) operate using two separate MPP trackers that can handle both symmetrical and asymmetrical loads to allow for optimum adjustment. This allows for the requirements of complex PV system designs to be fulfilled.

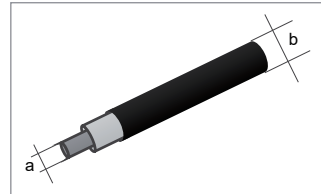
MPP range with Max. power	H3A	H4A	H5A
Symmetrical load	180~500V	240~500V	240~500V
Asymmetrical load	290~500V	380~500V	430~500V
Max. ratio for asymmetrical load	100/0% ; 0/100%	100/0% ; 0/100%	94/6% ; 6/94%

The RPI range of PV inverters uses genuine Multi-Contact® MC4 connectors.

DC plugs and DC cables

The DC plugs for all DC connections are provided along with the inverter.

If you want to order more or need a different size, see the information in the following table.



DC connectors on the inverter	DC plugs for DC cable		
	a mm ²	b mm	Multi-Contact
DC- 	1,5/2,5	3-6	32.0010P0001-UR
		5,5-9	32.0012P0001-UR
	4/6	3-6	32.0014P0001-UR
		5,5-9	32.0016P0001-UR
DC+ 	1,5/2,5	3-6	32.0011P0001-UR
		5,5-9	32.0013P0001-UR
	4/6	3-6	32.0015P0001-UR
		5,5-9	32.0017P0001-UR

Table 5-3 : MC4 connectors

DC wiring polarities have two components, Plus and Minus, which are shown in **Figure 5-3**. The connection shall conform to the indication marked on inverter.

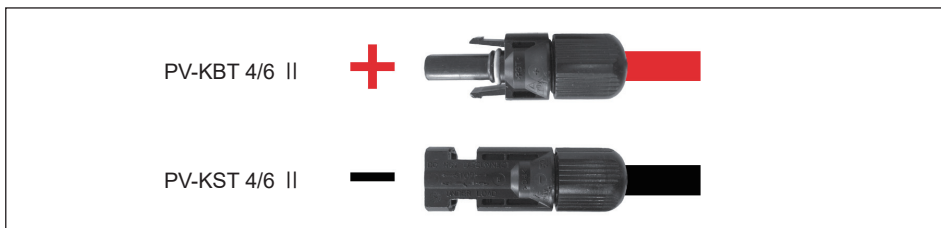


Figure 5-4 : DC Wiring illustration of H3A / H4A / H5A_220 / H5A_221

5.3.1.2 DC connector of H5A_222

The inverter (H5A_222) operate using two separate MPP trackers that can handle both symmetrical and asymmetrical loads to allow for optimum adjustment. This allows for the requirements of complex PV system designs to be fulfilled.

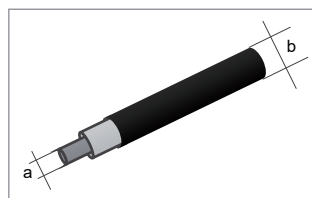
MPP range with Max. power	H5A_222
Symmetrical load	240~500V
Asymmetrical load	430~500V
Max. ratio for asymmetrical load	94/6% ; 6/94%

The RPI range of PV inverters uses genuine Amphenol H4 connectors.

DC plugs and DC cables

The DC plugs for all DC connections are provided along with the inverter.

If you want to order more or need a different size, see the information in the following table.



Description	Specifications		
contact size	2.5mm ² / 14AWG	4mm ² / 12AWG	6mm ² / 10AWG
rated current (TUV)	25A @85°C	35A @85°C	45A @85°C

Table 5-4 : H4 connectors

DC wiring polarities have two components, Plus and Minus, which are shown in **Figure 5-5**. The connection shall conform to the indication marked on inverter.

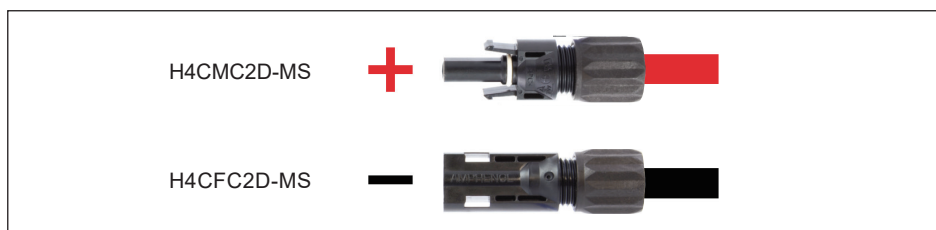


Figure 5-5 : DC Wiring illustration of H5A_222

6 Active/Reactive Power Control and LVRT (Optional)

There are 2 settings for active power and 4 settings for reactive power control that can be configured based on the requirement of the local network operator.

ATTENTION



The parameters are set according to the requirements of the selected country. A change to the parameter settings may result in the approval being lost.

6.1 Active Power Control

6.1.1 Power Limit

Users can reduce inverter output power by a set percentage of actual or rated power.

6.1.2 Power vs. Frequency

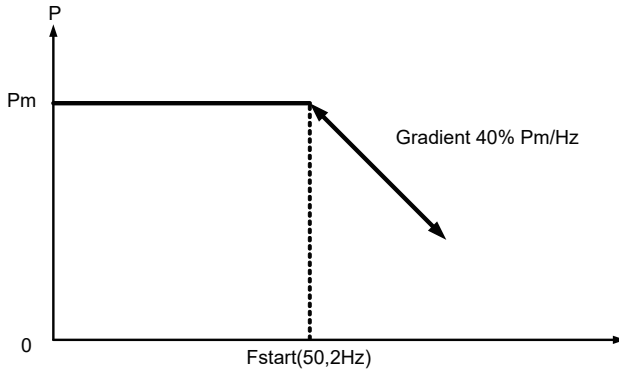
According to VDE-AR-N 4105 (5.7.3.3):

At frequencies between 50.2Hz and 51.5Hz, all adjustable power generation systems shall reduce (for frequency increase) or increase (for frequency decrease) the active power P_m generated instantaneously (at the time of exceeding the mains frequency 50.2Hz; freezing the value on the current level) with a gradient of 40% of P_m per Hertz).

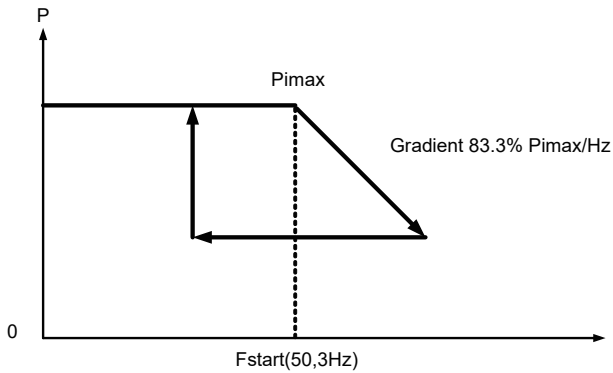
According to CEI 0-21 (8.5.3.2):

Within a frequency range from 50.3Hz to 51.5Hz, all adjustable production plants equipped with static converters have to be able to reduce the currently generated active power in case of an increase of the frequency with a variable drop of 2% to 5% with a default value of 2.4% (with corresponds to a power gradient of 83.3%/Hz).

User can set all necessary settings to meet the requirements from the network operator. Please refer to actual Power vs. Frequency shown in **Figure 6-1** for the settings procedure.



Power vs. frequency curve for VDE-AR-N 4105



Power vs. frequency curve for CEI-021

Figure 6-1 : Power vs. frequency characteristic

6.2 Reactive Power Control

The setting value is either :

- fixed power factor $\cos\phi$ (VDE-AR-N 4105 ,CEI 0-21)
- displacement factor/active power characteristic curve $\cos\phi(p)$ (VDE-AR-N 4105 ,CEI 0-21)
- fixed reactive power in Var.(CEI 0-21)
- reactive power/voltage characteristic $Q(U)$. (CEI 0-21)

6.2.1 Fixed Power Factor $\cos\phi$ (VDE-AR-N 4105,CEI 0-21)

Users can set the power factor from Cap 0.8 to Ind 0.8 (inverter would stop reactive power control if output power is below 20% rated power).

6.2.2 $\cos\phi(P)$ (VDE-AR-N 4105,CEI 0-21)

Once user enables this method, the inverter will deliver reactive power according to output active power at that moment. **Figure 6-2** is an example.

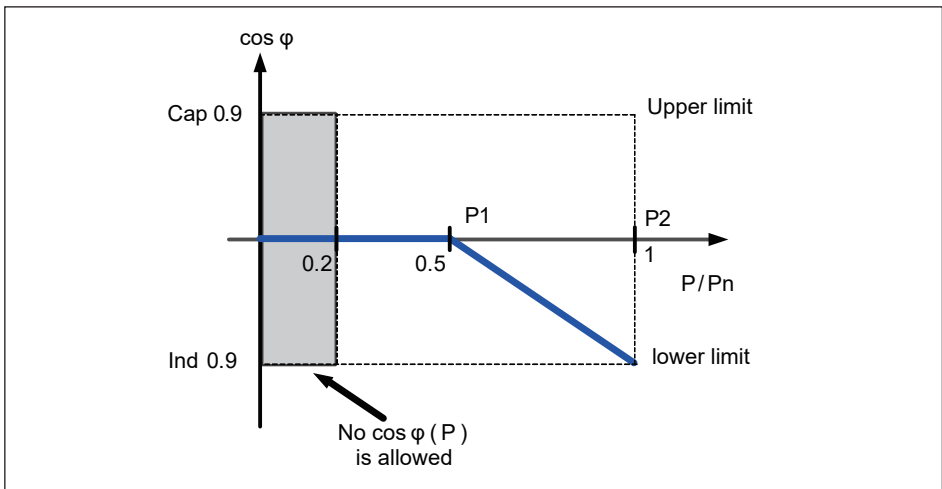


Figure 6-2 : $\cos\phi(P)$ characteristic

6.2.3 Fixed Reactive Power InVAR(CEI 0-21)

Once user enables this method, the inverter will deliver reactive power (i.e. Q) consistent with that of the fixed reactive power setting.

The setting range is from Cap 53% to Ind 53%.

6.2.4 Reactive Power/ Voltage Characteristic Q(U)(CEI 0-21)

Once the user enables this method, the user can set Q vs. Grid voltage operation curve as in **Figure 6-3** below.

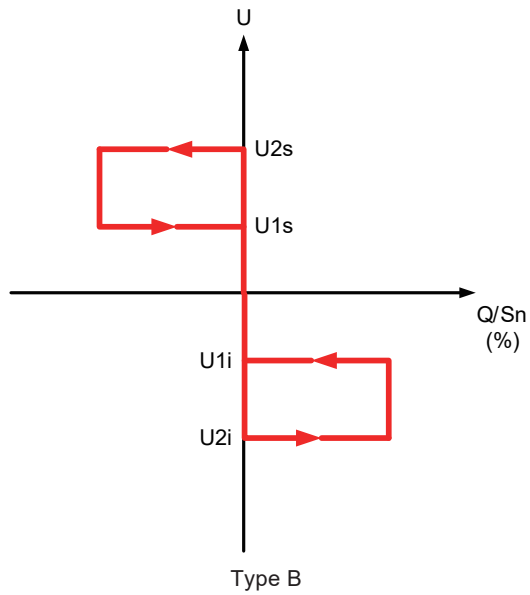
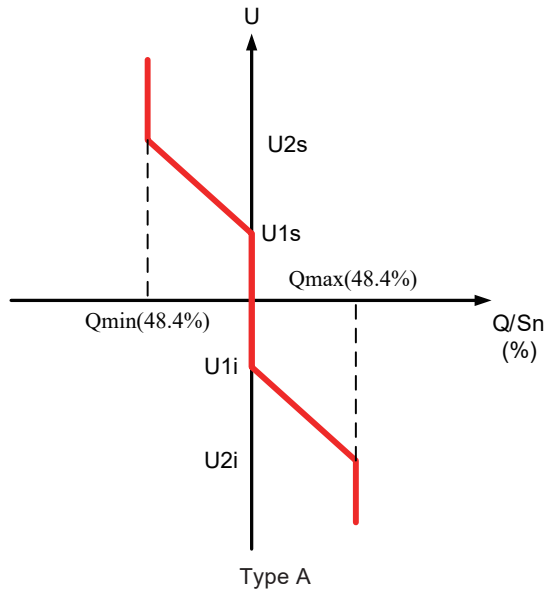


Figure 6-3 : $Q(U)$ characteristic

6.3 Low Voltage Ride Through (LVRT)

According to CEI 0-21, 8.5.1

To avoid undue separation from the network if voltage dips occur, a generation system with over 6 kW total power must be able to comply with certain functional requirements, which are known as LVRT (Low Voltage Ride Through) in international literature.

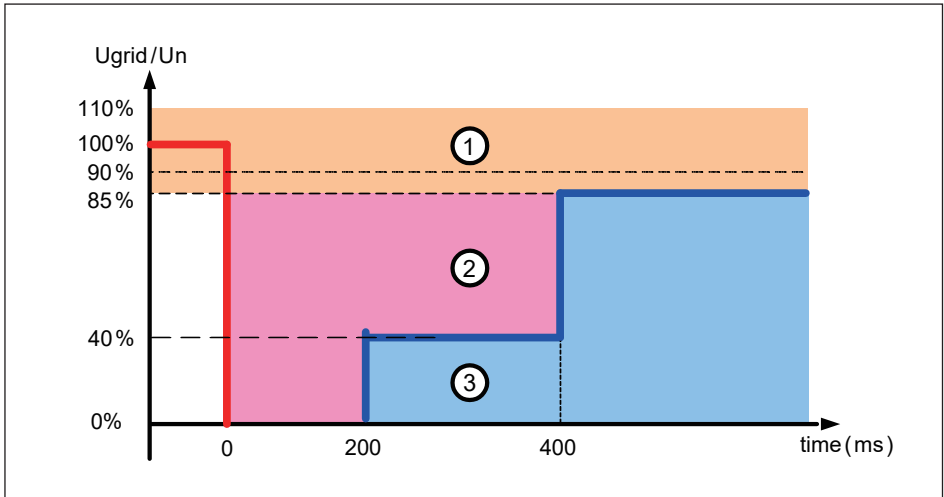


Figure 6-4 : LVRT characteristic

Zone 1 : The Inverter doesn't disconnect from the grid.

Zone 2 : The Inverter may temporarily interrupt the supply of active and reactive power supplied before the breakdown.

Zone 3 : The inverter disconnect from the grid.

6.4 Digital Input

To implementation of power management, the digital input interface receives the specifications of the network operator via a ripple control receiver or a DRED. H2.5/H3/H3A/H4A/H5A can access these command via DC1_100.

- **Germany** : The active power limitation in the stages 0%, 30%, 60% and 100%
- **Italy** : Power output of Max 6KW for PV plant installation.
Remote shutdown
Narrow Frequency limits between 49.5 Hz to 50.5Hz.
- **Australia and New Zealand:**
The inverter support the demand response mode (DRMs).
DRM 0 - Operate the disconnection device.
DRM 5 - Do not generate power.
DRM 6 - Do not generate at more than 50% of rated power.
DRM 7 - Do not generate at more than 75% of rated power.
And sink reactive power.
DRM 8 - Increase power generation.
(subject to constraints from other active DRMs)
- **Customer** : User defined.

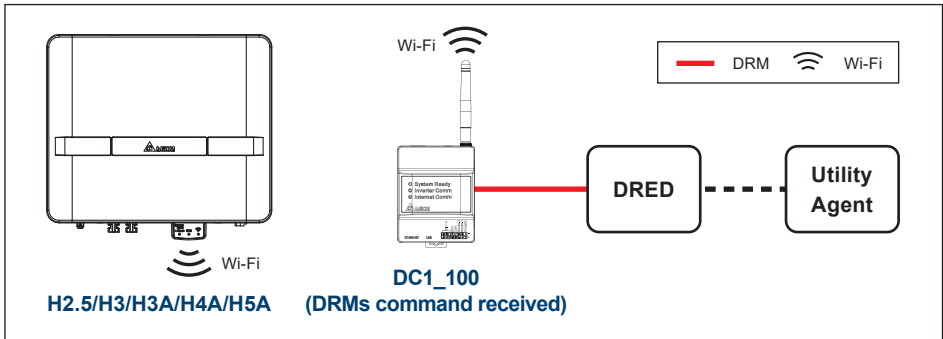


Figure 6-5 : Digital input via DC1_100

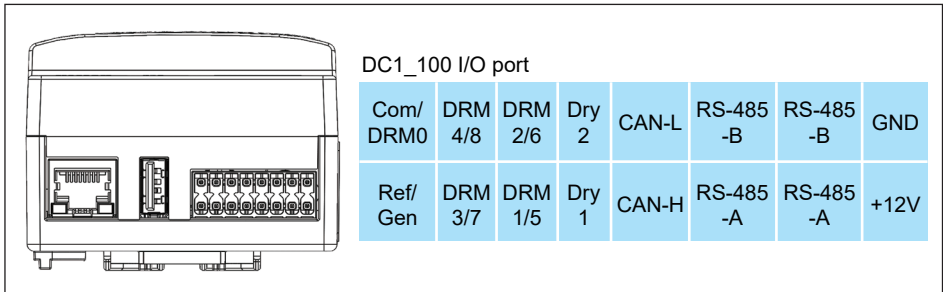
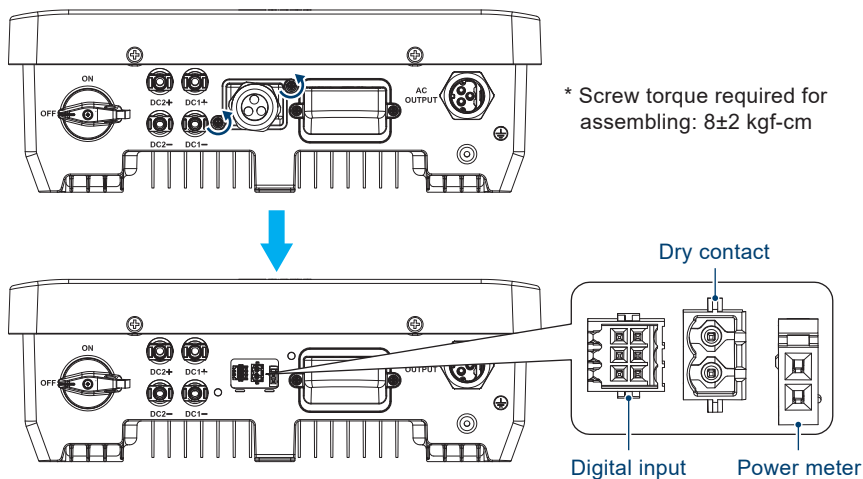
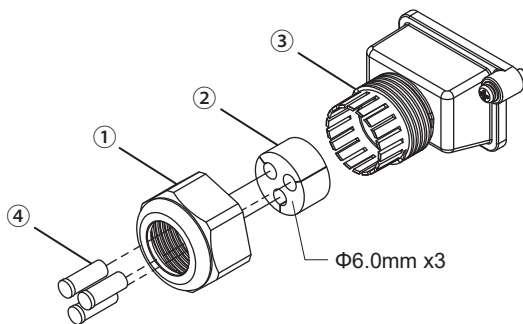


Figure 6-6 : Digital input on DC1_100

6.5 Function Port of H5A_222



6.5.1 Installation of the Rubber Washer



- (1) Loosen the front cover ① counterclockwise.
- (2) Remove the rubber washer ② from the fastening ring ③.
- (3) Remove the washer plugs ④ and insert the cable from the cut out of rubber washer ②.
- (4) Connect the cable with the terminal.
- (5) Install the rubber washer ② to the fastening ring ③.
- (6) Surely tighten the front cover ①.

* To ensure contactment, please make sure cables are not twisted.

6.5.2 Digital Input

To implementation of power management, the digital input interface receives the specifications of the network operator via a ripple control receiver.

- **Australia and New Zealand:**

The inverter support the demand response mode (DRMs).

DRM 0 - Operate the disconnection device.

DRM 5 - Do not generate power.

DRM 6 - Do not generate at more than 50% of rated power.

DRM 7 - Do not generate at more than 75% of rated power.

And sink reactive power.

DRM 8 - Increase power generation.

(subject to constraints from other active DRMs)

- **Customer :** User defined.

The inverter can detect the state of the relay of the ripple control receiver.

The information which relay shall be controlled parameter by the network operator.

Short pins	Inverter behavior (AU)
D6 & D1	DRM 0 - Disconnect from grid
D6 & D2	DRM 8 - Power de-rating to 100%
D6 & D3	DRM 7 - Power de-rating to 75%
D6 & D4	DRM 6 - Power de-rating to 50%
D6 & D5	DRM 5 - Power de-rating to 0%

- Conductor cross-section: 0.205 mm² (AWG24) ~ 0.081 mm². (AWG28)
- Outside diameter of cable: 3.8mm ~ 5.2mm
- Please refer to UL 2464 computer cable guideline

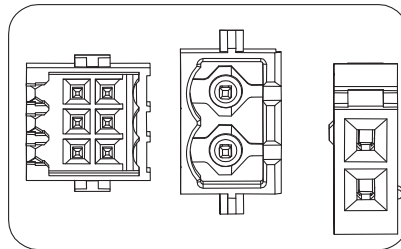


Figure 6-7 : Digital input, Dry contact & Power meter

D6	D3	Dry contact	Power meter
D5	D2	Dry contact	Power meter
D4	D1		

6.5.3 Dry Contact connection

Provide single set of Dry Contact.

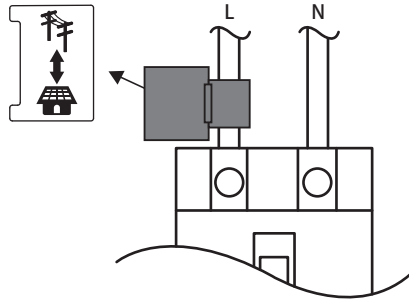
The function can be customized by users.

The dry contact port can withstand with 250Vac/28Vdc/9A, and suitable electric wire is 0.2-1.5 mm².

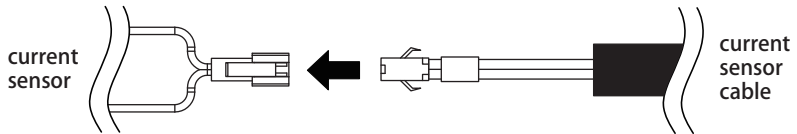
6.5.4 Power meter

Connecting the current sensor in the following steps

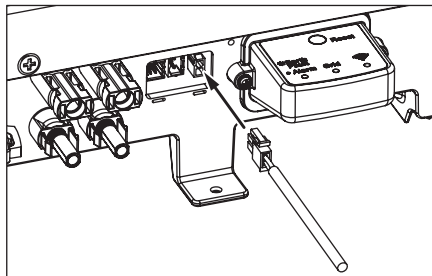
- (1) Attach a current sensor to the L cables of the main earth leakage circuit breaker.
- (2) Clamp current sensor on power line and make sure that the direction is correct



- (3) Connect the current sensor cable to the current sensor connection terminal of the measurement unit.



- (4) Connect the current sensor cable to the CT sensor connection terminal on the function port.



7 Turning the PV inverter on/off

WARNING !

The internal temperature may exceed over 70°C while operating. To avoid injury, do not touch the surface of the inverter whilst the unit is in operation.



After installation, please ensure the AC, the DC and communication connection are correct. When enough power is generated from the PV array, the device will operate automatically and will initial 'self-test'. This self-test takes approximately 2 minutes and will occur at first start-up of the day.

7.1 Start-up Procedures

7.1.1 PV Array DC Voltage Checking

Firstly, uncover the PV arrays and expose them to full sunlight. Please note, the sunlight must be intense enough to produce the required output voltage for the inverter to start up.

Measure the PV array open circuit DC voltage across the DC positive (+) and negative (-) terminals.

7.1.2 AC Utility Voltage Checking

Using an AC voltmeter, measure the AC open circuit utility voltage between L1 (L) and L2 (N) Ensure the voltage is at approximately the nominal value. The inverter operates with a line-to-line voltage range around the nominal value.

Refer to page 33 "11. Technical data" output section for the utility voltage operating range for your inverter model.

7.1.3 Starting up the Inverter

1. Switch on the PV Array switch and DC switch (with DC switch model) to connect PV Array.

2. Switch on AC circuit breaker to connect electricity grid.

3. Communication Module

The Communication Module supports the communication with the device with Wi-Fi function. (e.g., smart phone, tablet ect.)

Wi-Fi communication

1. Turn on the device's Wi-Fi function.
2. Select the inverters' Wi-Fi SSID: Delta-[serial number]
(e.g. Delta-O4L16A00001W0 ; See Inverter " The identification label")
3. Enter the Wi-Fi password: DELTASOL
(The Default password is also printed on the identification label)
4. Use the "MyDeltaSolar" APP (You can download the APP via google play or App Store)

Please note :

- (1) The product only support one device communicating at the same time.
- (2) If the Wi-Fi password is forgotten, press and hold the Reset Button more than 20s to return the Default password to ("DELTASOL").

4. Upon first start-up of the inverter, country selection is required, please contact your system installer to process the setting.
More information please refer to "Get Started Register" guide.

Initial Setting

INSTALL SETTING

*Inverter ID : 1

*Country : Australia

*Grid Code : AUST-Energex

Set

INVERTER TIME SYNC

Device Time : 2017/10/23 07:14:40

Inverter Time : 2017/10/23 07:08:58

CAUTION !



Due to the variety of installation environments, installation of the unit and start-up procedures must be carried out by an accredited technician.
Incorrect settings may cause the inverter to malfunction.

8 Maintenance

In order to ensure normal operation of the inverter, please check the unit regularly. Check that all terminals, screws and cables are connected and appear as they did upon installation. If there are any impaired or loose parts, please contact your solar installer immediately. Ensure that there are no foreign objects in the path of the heat outlet and keep the unit and its surroundings clean and tidy at all times.

WARNING !



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

9 Error Message and Trouble Shooting

9.1 Error Message & Trouble Shooting

Table 9-1 : Error Message

Error		
Message	Possible cause	Action
E01: OFR	1. Actual utility frequency is higher than the OFR setting 2. Incorrect country setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country setting 3. Check the detection circuit inside the inverter
E02: UFR	1. Actual utility frequency is lower than the UFR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E09: No Grid	1. AC breaker is OFF 2. AC plug disconnected 3. Internal fuses are broken	1. Switch on AC breaker 2. Check the connection in AC plug and make sure it connects to inverter 3. Replace fuses and check all switching devices in boost & inverter stages
E10: UVR	1. Actual utility voltage is higher the UVR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Measure the utility AC voltage to the inverter terminal. 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E11: OVR	1. Actual utility voltage is higher than the OVR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Measure the utility AC voltage to the inverter terminal. 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E13: OVR-Slow	1. Actual utility voltage is over than the OVR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility voltage on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E26: OFR-Slow	1. Actual utility frequency is over the OFR setting 2. Incorrect country or grid setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country setting 3. Check the detection circuit inside the inverter
E27: UFR-Slow	1. Actual utility frequency is under the UFR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility frequency on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter

Error		
Message	Possible cause	Action
E28: UVR-Slow	1. Actual utility voltage is under the UVR setting 2. Incorrect country or Grid setting 3. Detection circuit malfunction	1. Check the utility voltage on the inverter terminal 2. Check country & Grid setting 3. Check the detection circuit inside the inverter
E30: OVR(PV)	1. Actual Solar voltage is over 510Vdc (H2.5) or 560Vdc (H3/ H3A/ H4A/ H5A) 2. Detection circuit malfunction	1. Modify the solar array configuration and make the Voc less than 500Vdc (H2.5) or 550Vdc (H3/ H3A/ H4A/ H5A) 2. Check the detection circuit inside the inverter
E34: Insulation	1. PV array insulation fault 2. Large PV array capacitance between Plus to Ground or Minus to Ground or both. 3. Detection circuit malfunction	1. Check the insulation of Solar inputs 2. Check the capacitance, dry PV panel if necessary 3. Check the detection circuit inside the inverter

Table 9-2 : Fault Message

Fault		
Message	Possible cause	Action
F01: DC Injection	1. Utility waveform is abnormal 2. Detection circuit malfunction	1. Check the utility waveform. Grid connection of inverter need to be far away from non-linear load if necessary 2. Check the detection circuit inside the inverter
F05: NTC OTP	1. The ambient temp. is over 60°C 2. Detection circuit malfunction	1. Check the installation ambient temperature and environment 2. Check the detection circuit inside the inverter
F06: NTC0 Circuit Fail	1. Ambient temp. >100°C or <-40°C 2. Detection circuit malfunction	1. Check the installation ambient temperature and environment 2. Check the detection circuit inside the inverter
F07: NTC LTP	1. Ambient temp. <-30°C 2. Detection circuit malfunction	1. Check the installation ambient temperature and environment 2. Check the detection circuit inside the inverter
F09: Ntc2 Circuit Fail	1. Ambient temp. >100°C or <-40°C 2. Detection circuit malfunction	1. Check the installation ambient temperature and environment 2. Check the detection circuit inside the inverter

Fault		
Message	Possible cause	Action
F15: HW ADC1	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F16: HW ADC2	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F17: HW ADC3	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F19: HW ADC5	1. Auxiliary power circuitry malfunction 2. Detection circuit malfunction	1. Check the auxiliary circuitry inside the inverter 2. Check the detection circuit inside the inverter
F20: Efficiency Abnormal	1. The calibration is incorrect 2. Current feedback circuit is defective	1. Check the accuracy of current and power 2. Check the current feedback circuit inside the inverter
F23: Comm. Fault (Dis.)	1. DSP is idling 2. The communication connection is disconnected 3. The communication circuit malfunction	1. Check reset and crystal in DSP 2. Check the connection between DSP and COMM 3. Check the communication circuit
F24: RCMU Over Rating	1. PV array insulation fault 2. Large PV array capacitance between Plus to Ground or Minus to Ground 3. Either side of boost driver or boost choke malfunction 4. Detection circuit malfunction	1. Check the insulation of Solar inputs 2. Check the capacitance (+ <-> GND & - <-> GND), must < 2.5uF. Install an external transformer if necessary 3. Check boost driver & boost choke 4. Check the detection circuit inside the inverter
F27: RCMU Circuit Fail	1. RCMU is disconnected 2. Detection circuit malfunction	1. Check the RCMU connection inside the inverter 2. Check the detection circuit inside the inverter
F28: Relay Test Short	1. One or more relays are sticking 2. The driver circuit for the relay malfunction	1. Replace the defective relay(s) 2. Check the driver circuit inside the inverter
F29: Relay Test Open	1. One or more relays are abnormal 2. The driver circuit for the relay malfunction 3. The detection accuracy is not correct for Vgrid and Vout	1. Replace the defective relay(s) 2. Check the driver circuit inside the inverter 3. Check the Vgrid and Vout voltage detection accuracy

Fault		
Message	Possible cause	Action
F35: HW Bus OVR	1. Driver for boost is defective 2. Voc of PV array is over 510Vdc (H2.5) or 560Vdc (H3/ H3A/ H4A/ H5A) 3. Surge occurs during operation 4. Detection circuit malfunction	1. Check the driver circuit for boost inside the inverter 2. Modify the solar array setting, and make the Voc less than 500Vdc (H2.5) or 550Vdc (H3/ H3A/ H4A/ H5A) 3. N/A 4. Check the detection circuit inside the inverter
F37: OSCP	Detection circuit malfunction	Check the detection circuit inside the inverter
F42: CT sensor Fail (A)	1. Inverter choke Fail 2. Output Filter Fail 3. Detection circuit malfunction	1. Check Inverter choke inductance. 2. Check output filter capacitance. 3. Check the detection circuit inside the inverter
F56: HW incompat.	HW power rating incorrect	Check comm. HW power rating info.
F60: IOCP(PV1)	1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction	1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit
F61: IOCP(PV2)	1. Switching device in boost is defective 2. Driver for boost is defective 3. Input current detection circuit malfunction	1. Check all switching device in boost 2. Check the driver circuit for boost inside the inverter 3. Check input current detection circuit

10 De-Commissioning

De-Commissioning Procedure:

If necessary to put the device out of operation for maintenance and/or storage, please follow the instructions below.

WARNING !



To avoid injuries, please follow this procedures

1. Switch off AC circuit breaker to disconnect from electricity grid.
2. Switch off the PV Array switch to disconnect from PV Array.
3. Use proper voltage meter to confirm that the AC and DC power are disconnected from the unit.
4. Remove the AC wiring immediately to completely disconnect from electricity grid.
5. Remove the DC wiring to disconnect from PV Array.
6. After completing all of the above steps, the inverter can be removed.

11 Technical Data

Table 11-1 : Specifications

Model 1	H2.5_210 H2.5_211	H3_210 H3_211	H3A_220 H3A_221	H4A_220 H4A_221	H5A_220 H5A_221	H5A_222
GENERAL						
Enclosure	Powder-coated aluminium					
Operating temperature	-25~60°C, full power up to 40°C					
Operating Altitude	2000m					
Relative humidity	0% – 95% non-condensing.					
Environmental category	Outdoor, wet locations					
Galvanic isolation	Non-isolated (TL Topology)					
Safety class	Class I metal enclosure with protective earth					
Pollution degree	Internal: II, External: III					
Overvoltage category	AC output: III, DC input: II					
Flicker impedance	Z = 0.4 + j 0.25 Ω (total impedance)					
Three-phase combinations	No					
DC INPUT (Solar side)						
Max. input voltage	500 Vdc	600 Vdc				
Operating voltage range	30-500 Vdc	30-550Vdc				
MPP range (rated power)	240-470 Vdc	290-500Vdc	180-500Vdc	240-500Vdc		
Normal voltage	350 Vdc					
MPP tracker	1		2			
Maximum input current	11 A		11Adc for each / 18Adc for total		11Adc for each / 22Adc for total	
Max. short circuit current per MPPT	15 A					
Max. inverter backfeed current to the array	0A					
Startup voltage	35 Vdc					
Input connection	MC4, 1 pairs		MC4, 2 pairs			H4, 2 pairs

Model ¹	H2.5_210 H2.5_211	H3_210 H3_211	H3A_220 H3A_221	H4A_220 H4A_221	H5A_220 H5A_221	H5A_222
DC Switch parameters (Solar side)						
Insulation voltage (Ui)	850 V					1200 V
Rated impulse withstand voltage(Uimp)	8 kV					
Suitability for isolation	Isolating device					
Rated operational current	650 V / 30 A					600 V / 30 A
PV utilization category	DC-21B					DC-PV2
Rated thermal current uninterrupted duty (Iu)	45 A					50 A
Rated short-time withstand current (1s) (Icw)	700 A					
Rated short-circuit making capacity (Icm)	1.4 kA					1 kA
Rated conditional short-circuit current (Isc)	5 kA					
AC OUTPUT (Grid side)						
Nominal output power ²	2500 VA	3000 VA		4000 VA	5000 VA	
Maximum power	2500 VA	3000 VA		4000 VA	5000 VA	
Voltage	220/230 Vac -20%~+22%					
Nominal output current	10.9 A	13 A		17.4 A	22 A ³	
Max. output current	13.9 A	14.3 A		18.6 A	24 A	23 A
Maximum output fault current	16 A			20 A	25 A	
Maximum output over current protection	16 A			20 A	25 A	
Current (inrush) (A, peak and duration)	30A peak, 1ms					
Frequency	50/60 Hz					
Total harmonic distortion ⁴	<3% @Rated power					
Power factor ⁴	>0.99 @Rated power					
Peak efficiency	97.5%				98.3%	97.5%
EU efficiency	96.8%				98.0%	96.8%
Output connection	IP 67 single-phase					
Active anti-islanding method	AC Current frequency					
MECHANISM						
Housing	Die casting					
Cooling	Convection cooling					
IP rating	IP65					
External communication	Wi-Fi					
Weight	10 kg			11 kg	12 kg	
Dimensions	380 × 318 × 130 mm					

Model ¹		H2.5_210 H2.5_211	H3_210 H3_211	H3A_220 H3A_221	H4A_220 H4A_221	H5A_220 H5A_221	H5A_222
REGULATIONS & DIRECTIVES							
Safety		IEC 62109-1 / -2 CE compliance					
Grid interface		VDE AR-N 4105 / VDE 0126-1-1 / AS4777.2:2015 ⁵⁻¹ / G83-2 / G59-3 / EN50438 / VFR2014 / C10 / C11 / UTE C15-712-1 / IEC61683 / IEC61727 / IEC62116 / EN50549-1:2019 / ABNT NBR 16149 ⁵⁻² / ABNT NBR 16150 ⁵⁻²					AS4777.2:2015 IEC61683 IEC62116 IEC61727
Emission		IEC 61000-6-4, IEC 61000-6-3					
Harmonics		EN 61000-3-12					
Variations and flicker		EN 61000-3-11					
Immunity		EN 61000-6-2					
Immunity	ESD	IEC 61000-4-2					
	RS	IEC 61000-4-3					
	EFT	IEC 61000-4-4					
	Surge	IEC 61000-4-5					
	CS	IEC 61000-4-6					
	PFMF	IEC 61000-4-8					

1: H2.5_210/ H3_210/ H3A_220/ H4A_220/ H5A_220/ H5A_222 : The product is with DC switch
H2.5_211/ H3_211/ H3A_221/ H4A_221/ H5A_221 : The product is without DC switch

- 2: (a) H2.5 : 2.49kVA max. for Australia, New Zealand (AU / NZ)
(b) H3 / H3A : 2.99kVA max. for Australia, New Zealand (AU / NZ)
(c) H5A : 4.99kVA max. for Australia, New Zealand (AU / NZ)
(d) H5A : 4.6kVA max. for Germany (DE)
(e) H4A/ H5A : 3.68kVA max. for Denmark (DK1 / DK2)

3: 21.7A nom. for Australia, New Zealand (AU / NZ)

4: reactive power control disabled

5-1: not support AS4777.2:2015 Single-phase inverters used in three-phase combinations

5-2: only H3_210/ H4A_220/ H5A_220 support

