

## Photovoltaic Inverter

**H103A**



<b>1. Contents</b>	<b>1</b>
<b>2. Reference</b>	<b>2</b>
<b>3. Safety Precautions</b>	<b>3</b>
<b>4. Precaution for Use</b>	<b>6</b>
<b>5. Inverter System</b>	<b>7</b>
<b>6. Composition of Inverter</b>	<b>8</b>
<b>7. Installation of Inverter</b>	<b>11</b>
<b>8. Grid (AC) Connection</b>	<b>15</b>
<b>9. PV (DC) Connection</b>	<b>17</b>
<b>10. AC and DC Disconnection</b>	<b>20</b>
<b>11. Message</b>	<b>22</b>
<b>12. Test Operation</b>	<b>25</b>
<b>13. Technical Data</b>	<b>26</b>
<b>14. Warranty</b>	<b>27</b>

## 2. Reference

### 2.1 Overview

- ◆ Thoroughly read this manual to safely and properly use the photovoltaic inverter.
- ◆ Keep this manual in a place that is easily visible.
- ◆ The purpose of this manual is to help you understand the maintenance and operation procedures of the photovoltaic generation system and operate the Hex Power System's grid-connected inverter.
- ◆ When applying this manual to system operation, avoid uniform applications and operate the facilities considering their importance, surrounding environment, and conditions.
- ◆ You are recommended to consult with the manufacturers when performing regular inspections and services of major facilities and dangerous equipment.

### 2.2 Scope

- ◆ This manual is applied to the H103A inverter of Hex Power System.

## 3. Safety Precautions








### 3.1 Overview

You must comply with these safety precautions to prevent accidents and dangers, operate the photovoltaic generation system stably, and use the inverter safely.

**The inverter uses high voltage that can be fatal to people. Every repair and service must be performed by certified service personnel. No part inside the product may be serviced by the user.**

### 3.2 Warning Symbols

This manual uses the following warning symbols. **Always refer to them during maintenance work.**

	<b>Danger of Electric Shock !</b> This Danger of Electric Shock symbol applies to parts or tasks that involve high voltage and high currents. Ignoring this warning may result in death from electric shock.
	<b>Warning for Electric Shock !</b> This Warning for Electric Shock symbol applies to parts or tasks that are exposed to the danger of fatal electric shock. Ignoring this warning may result in serious injury or death from electric shock.
	<b>Danger of Burn !</b> This Danger of Burn symbol applies to inverters that operate at high temperatures. Ignoring this warning may result in serious injury or death from burning.
	<b>Warning for Burn !</b> This Warning for Burn symbol applies to tasks that are exposed to fatal burns from the inverter. Ignoring this warning may result in serious injury or death from burning.
	<b>Warning !</b> This part or task is exposed to fatal danger from the inverter. Ignoring this warning may result in serious injury or death.
	<b>Caution !</b> This symbol applies to the operation or inspection of the inverter. Ignoring this caution may result in mild injury or damage of the inverter
	<b>Check !</b> This symbol refers to the checkpoints that must be checked for the safe and normal operation of the inverter.

### 3.3 Precautions



#### **Danger of Electric Shock!**

This Danger of Electric Shock symbol applies to parts or tasks that involve high voltage and high currents. Ignoring this warning may result in death from electric shock.

- Do not touch any part of the inverter through which high voltage and high currents flow.
- Comply with all the safety regulations on the handling of high-voltage and high-current systems.



#### **Warning for Electric Shock!**

This Warning for Electric Shock symbol applies to parts or tasks that are exposed to the danger of fatal electric shock. Ignoring this warning may result in serious injury or death from electric shock.

- The inverter is always charged with high voltage even if it is stopped.  
Internal inspection of the inverter is only permitted to people who have been trained for inverter inspection.
- Do not operate while the inverter door is open. The exposed high-voltage terminals and live parts may cause electric shock.
- Do not operate the switches with wet hands. It may cause electric shock.
- Damaged cables of the inverter may cause fatal dangers such as electric shock or fire.



#### **Danger of Burn!**

This Danger of Burn symbol applies to inverters that operate at high temperatures. Ignoring this warning may result in serious injury or death from burning.

- The inverter generates high heat during operation. Do not touch the inverter.



#### **Warning for Burn!**

This Warning for Burn symbol applies to tasks that are exposed to fatal burns from the inverter. Ignoring this warning may result in serious injury or death from burning.

- Even if the inverter has stopped, the inverter housing is hot. Only people who have been trained for inspection may inspect the inverter.
- Even if the inverter has stopped, the parts inside the inverter are hot. Touching them may result in burn.

**Warning !**

This part or task is exposed to fatal danger from the inverter. Ignoring this warning may result in serious injury or death.

- Some inverter parts are sharp or pointed. Touching them may result in serious injury or death.

**Caution !**

This symbol applies to the operation or inspection of the inverter. Ignoring this caution may result in mild injury or damage of the inverter.

- Only operate the inverter in a technically safe condition.
- Operate the inverter only when no damage is detected by visual inspection.
- The LCD of the operation panel may be damaged by static electricity. Please take caution.
- Take special care when operating the input power and output power switches of the inverter.

**Check !**

This symbol refers to the checkpoints that must be checked for the safe and normal operation of the inverter.

- Every repair and service except daily checkups of the inverter must be always performed by certified service personnel.
- Turn off the input and output power supplies when there is any problem in inverter operation. Otherwise, it may lead to a secondary accident.
- Regularly perform visual inspection of the inverter for any damages.
- Regularly check the operation status of the inverter.
- Always use the inverter at an altitude below 1,000m.
- For smooth operation of the inverter, the air inflow and discharge must be clear. Avoid contaminated environment in which water, dusts or metallic foreign matters may flow in.
- Install the inverter in a place that is easily accessible for service.

## 4. Precautions for Use

### 4.1 Precautions for Transportation and Installation

- Always transport in accordance with the transportation method stated on the product box.
- Pile up product boxes in accordance with the allowed number of piled boxes on the box.
- Do not put heavy objects on the product box.
- Do not drop or give shock to the inverter.
- Always follow the installation procedure detailed in this manual when installing the inverter.
- Always follow the wiring procedure detailed in this manual when wiring the inverter.

### 4.2 Installation Conditions

- Installation Site : Outdoors
- Storage and Operation Temperature : -20°C ~ 50°C
- Altitude : 1,500m or lower

### 4.3 Consideration for Installation

- Abnormal vibrations, shocks or noise are accepted to a limit.
- Using in a place where there are high iron contents.
- Using in an environment with salt, high humidity, water accumulation, ice and snow, mercury steam, chlorine gas, sulfuric acid gas, or other harmful gases.
- Using in water or oil steams, or in explosive gases.
- Exposure to a level of radiation that is higher than normal.
- Rapid changes in temperature or humidity and exposure to strong electronic field.



## 5. Inverter System

### 5.1 Photovoltaic Generation System

- The H103A Photovoltaic Generation System converts the DC power of solar cells to commercial AC power and supplies the AC power to loads and AC systems. The power generation information can be watched from the monitoring system.

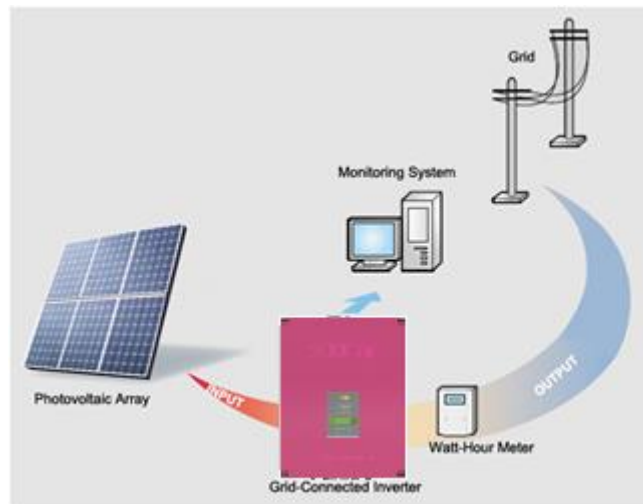


Figure 5.1 Conceptual Diagram of Photovoltaic Generation System

### 5.2 Inverter System

- The H103A system consists of Boost Converter for the boosting of the photovoltaic DC voltage and MPPT, Inverter for converting from DC to AC, Filter for removing output noises, Controller for controlling the inverter, and HMI for displaying the status.

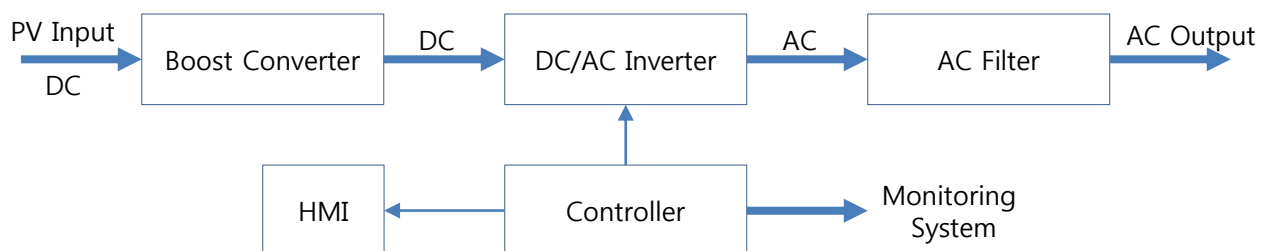
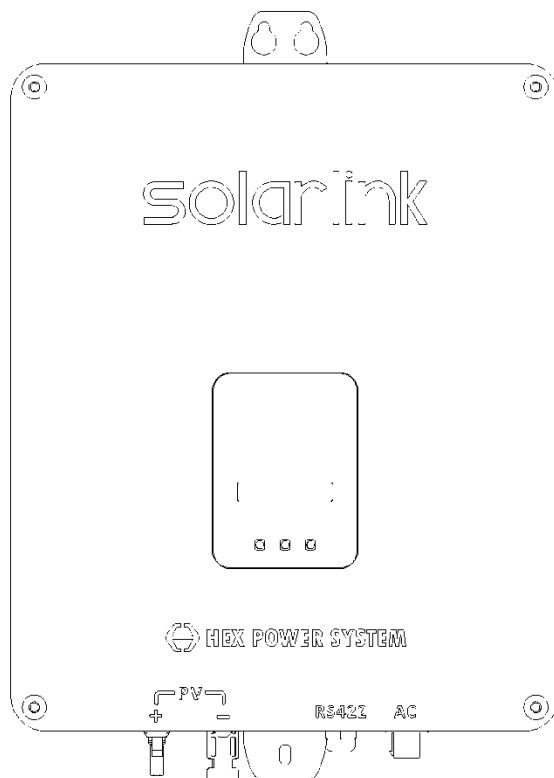


Figure 5.2 Composition of Inverter System

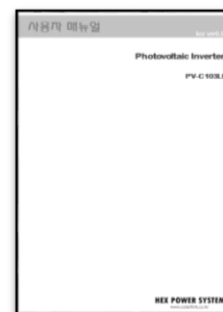
## 6. Composition of Inverter

### 6.1 Components of H103A Product

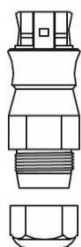
- One H103A inverter, one copy of user manual, PV connector set + and -, one connector for AC connection.



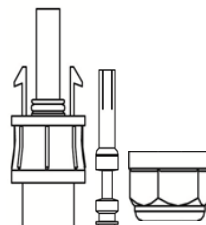
H103A Photovoltaic Inverter



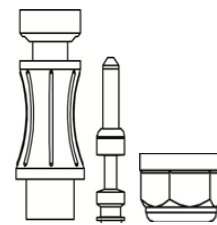
User Manual



Connector for AC Connection

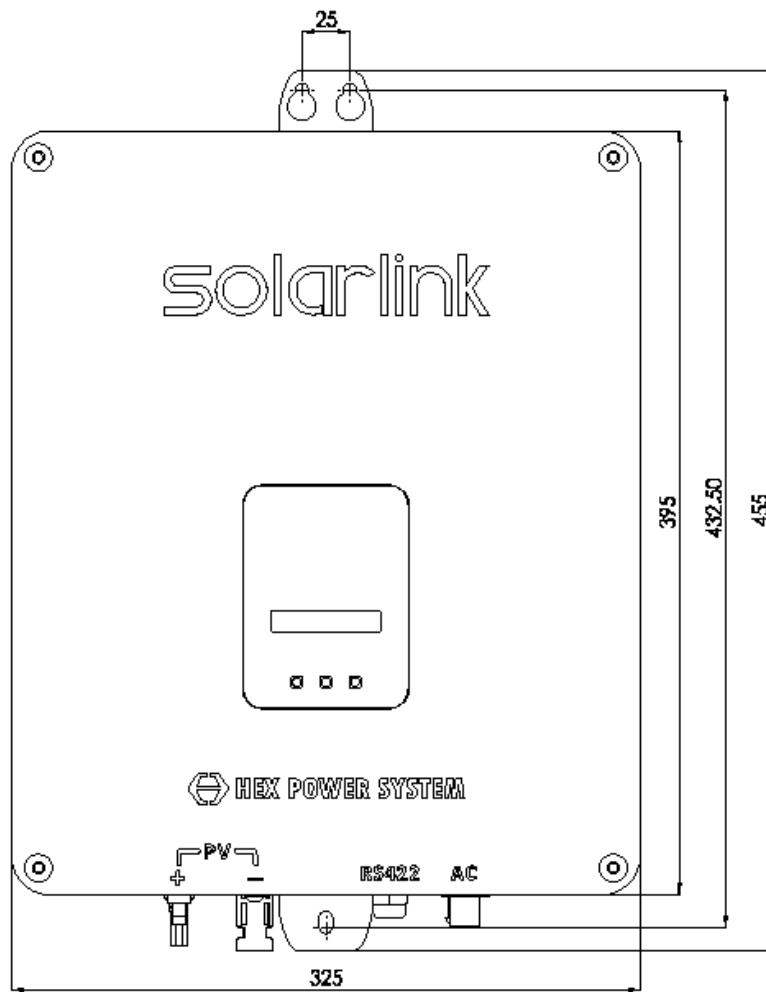


PV + Connector Set

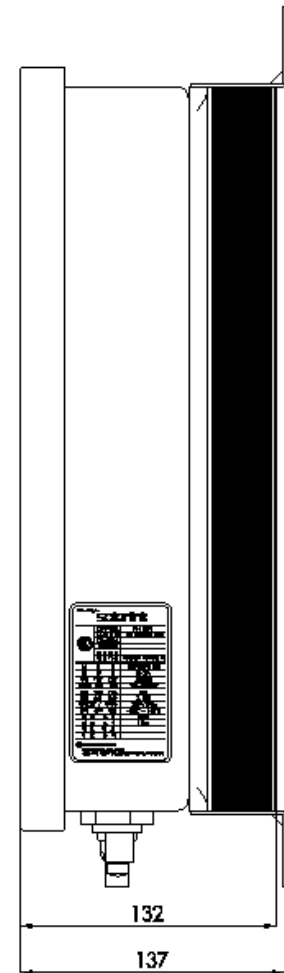


PV - Connector Set

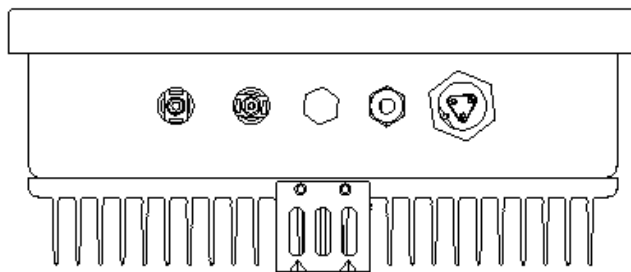
## 6.2 Inverter Size



<Front View>



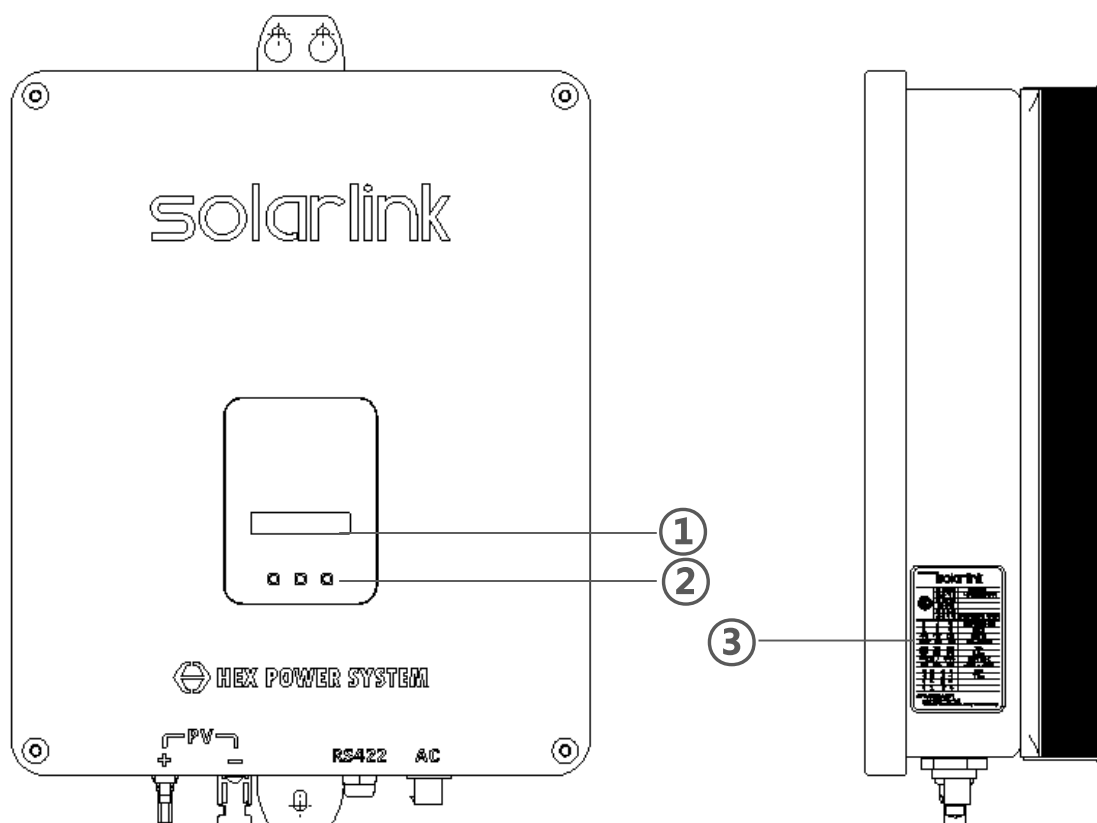
<Side View>



<Bottom View>

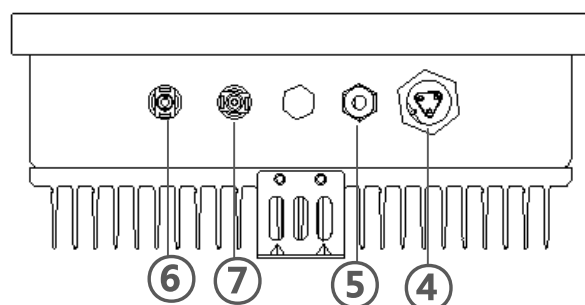
(mm)

### 6.3 Exterior of Inverter



<Front View>

<Side View>



<Bottom View>

- ① LCD Display
- ② LED Display
- ③ Nameplate
- ④ System Connector Terminal
- ⑤ Communication Connector Terminal
- ⑥ PV + Connector Terminal
- ⑦ PV – Connector Terminal

## 7. Installation of Inverter

### 7.1 Safety



#### Warning !

This part or task is exposed to fatal danger from the inverter. Ignoring this warning may result in serious injury or death.

- The inverter may catch fire even if it has been manufactured in a safe manner.
- Do not install the inverter on a combustible structure.
- Do not install the inverter in a place where combustible materials are stored.
- Do not install the inverter in a place that has the danger of explosion.



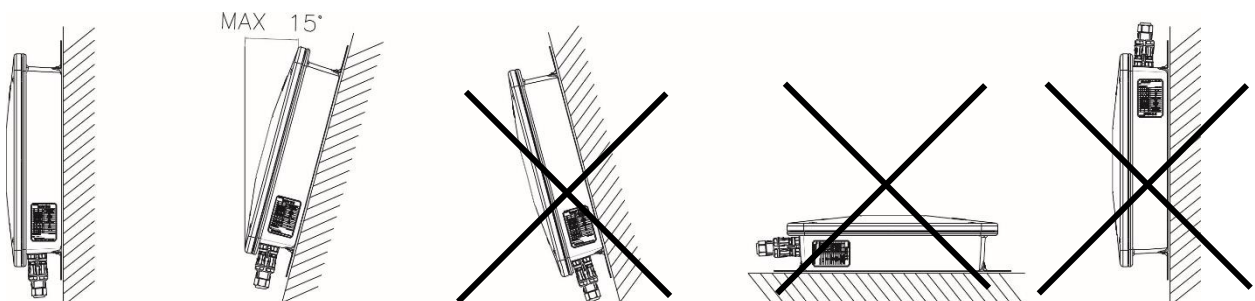
#### Danger of Burn !

This Danger of Burn symbol applies to inverters that operate at high temperatures. Ignoring this warning may result in serious injury or death from burning.

### 7.2 Installation Site

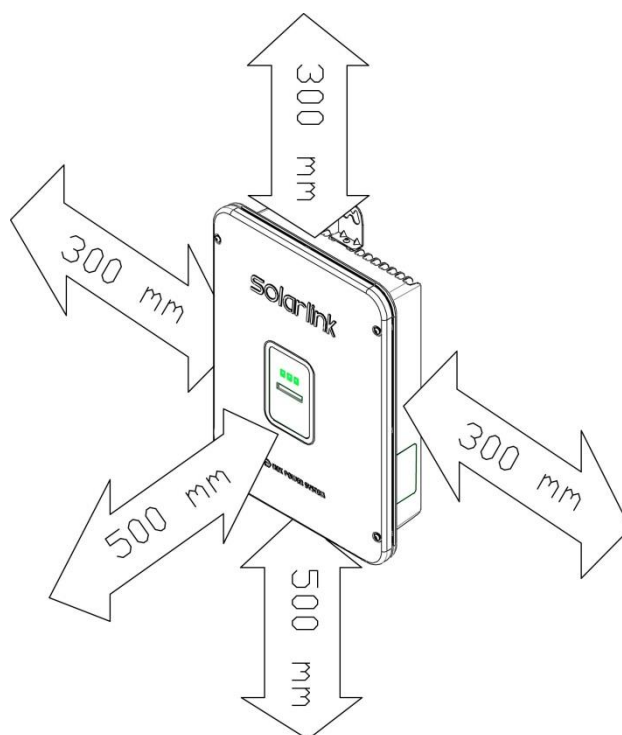
Before deciding on an installation site, please check the following ;

- Install the inverter on a solid surface such as concrete or metal wall.
- The installation site must be always clean and the inverter must be accessible safely without any aid. Otherwise, after-sales service may be limited.
- Install the inverter at eye-level to facilitate the checking of operation status.



- Install the inverter vertically on a wall or at an angle of up to 15°.

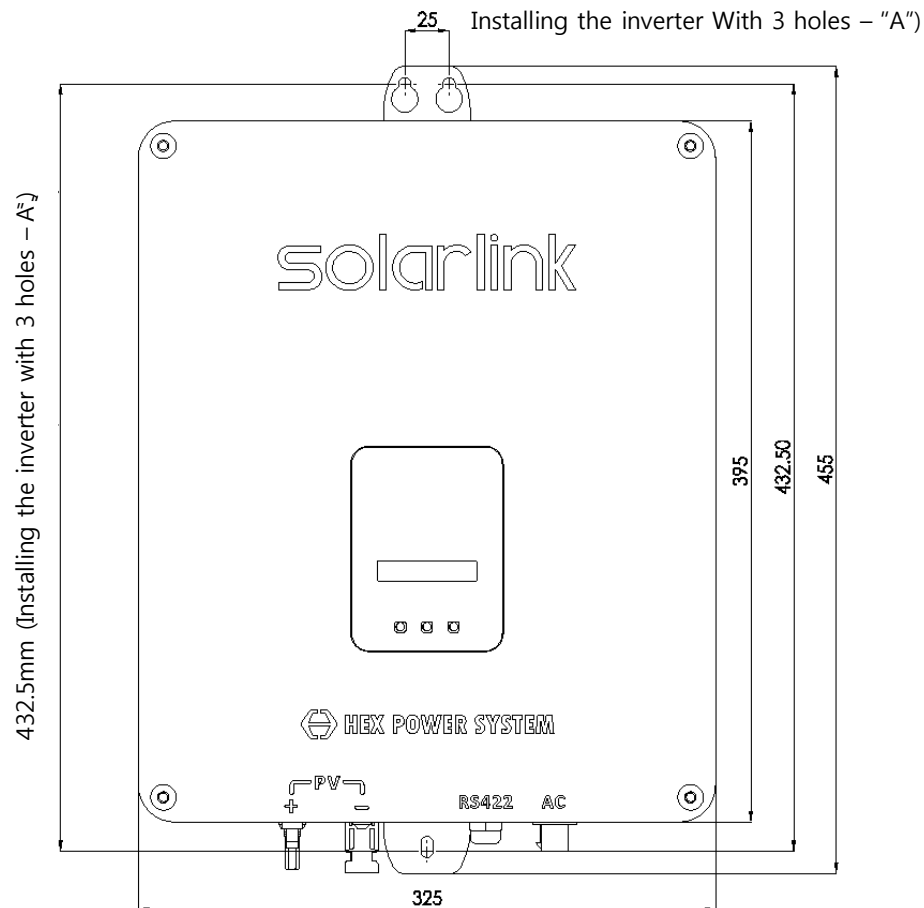
- The AC and DC connectors must face downward. They must never face upward.
- The inverter must not be inclined forward.
- The inverter must not be inclined sideways.
- The inverter must not be installed horizontally.
- The ambient air temperature must not exceed 50° and the inverter must not be exposed to direct sunlight.
- To prevent noise, do not install the inverter on a plaster board or similar walls that may generate noise.
- For sufficient heat discharge and after-sales service in the future, keep the minimum clearance between inverters or between the inverter and other objects.
- Minimum clearance of inverter



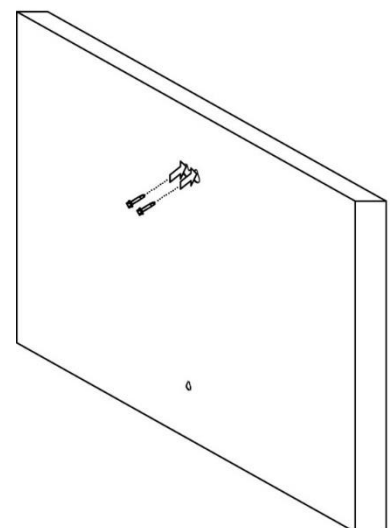
### 7.3 Installation of Inverter on Wall

1. Before installing the inverter, mark drill holes or connecting screw holes on the wall.

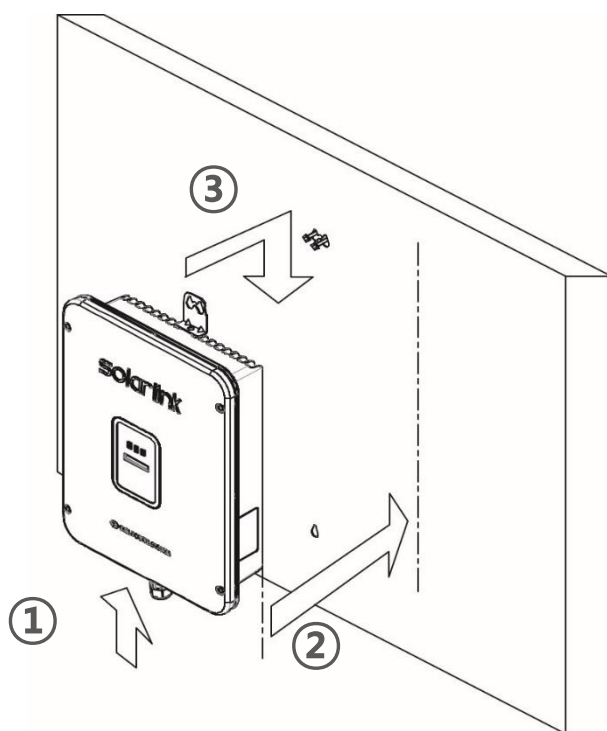
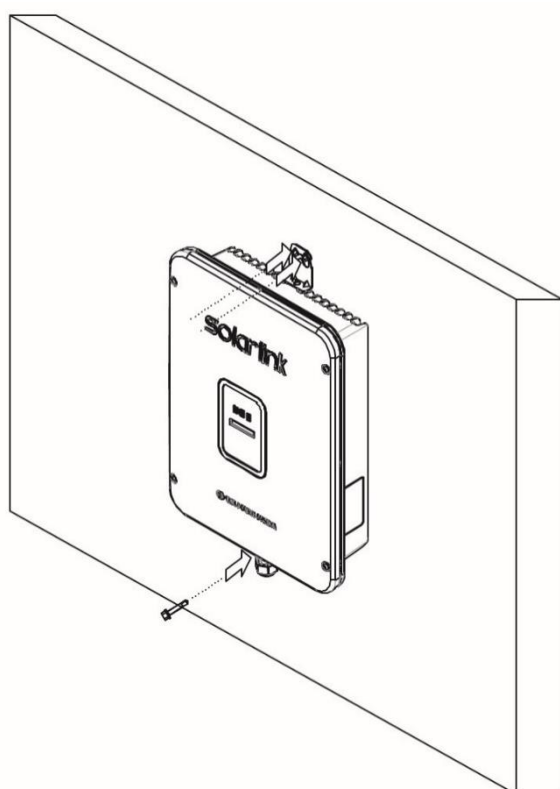
- When installing the inverter with three holes, make two connecting screws or drill holes at the top and one hole at the bottom as shown in A.
- When installing the inverter with two holes, make one connecting screw or drill hole at the top and hole at the bottom as shown in A.



2. Fix screw about two thirds of the screw length.  
(for concrete wall, mount anchor bolts (M6) and fix with nuts. For metal wall, use connecting screws)

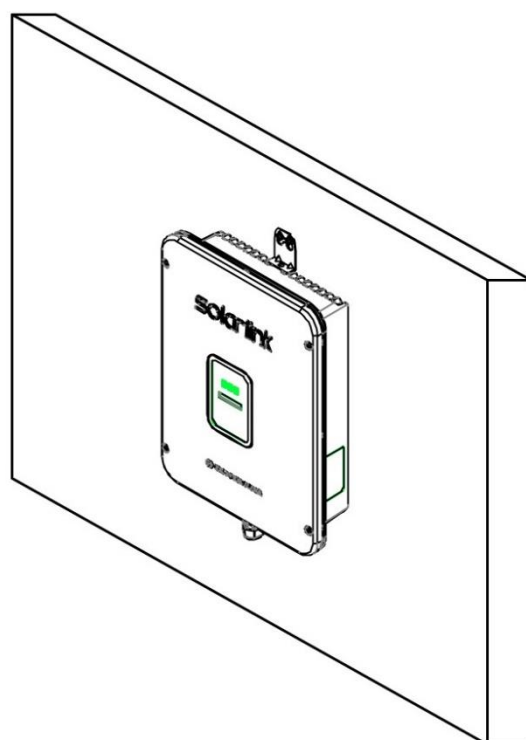


3. Lift the inverter slightly and insert bolt into the top fixing pin to fix the inverter.



4. Tighten bolt in the top fixing pins and a bolt between the bottom pins

5. Finish the inverter installation as shown in the figure.





## 8. Grid (AC) Connection

### 8.1 Safety

- Each inverter must have an individual circuit breaker to safely separate the inverter in the event of overloads.



#### **Warning !**

This part or task is exposed to fatal danger from the inverter. Ignoring this warning may result in serious injury or death.

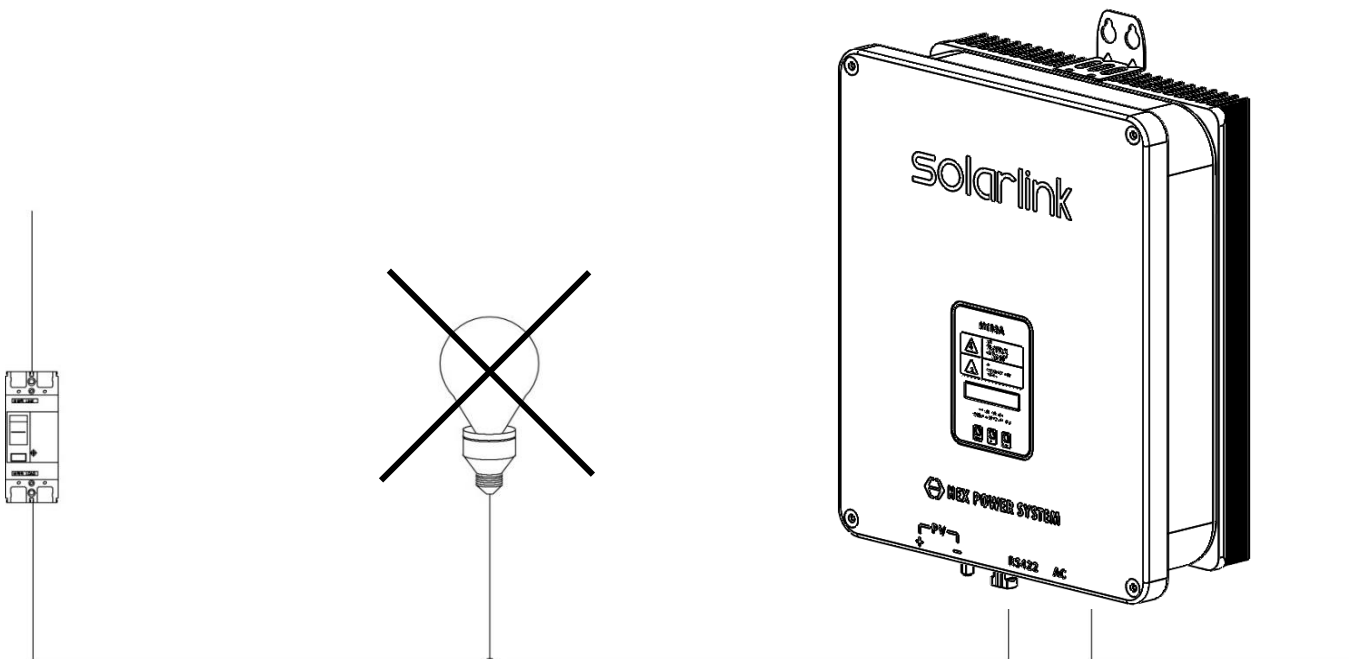
- There is a danger of death from fire. Connecting two or more inverters to the same circuit breaker can not guarantee the protection function of the circuit breaker and the cable may catch fire or the inverter may be damaged as a result.
- Never connect multiple inverters to the same circuit breaker.



#### **Warning !**

This part or task is exposed to fatal danger from the inverter. Ignoring this warning may result in serious injury or death.

- Connecting an inverter and a consumer electronic device(such as lamp) to the same circuit breaker can not guarantee the protection function of the circuit breaker and a fire may break out as a result.
- No consumer electronic devices may be connected between a circuit breaker and inverter.



## 8.2 AC Connection Method

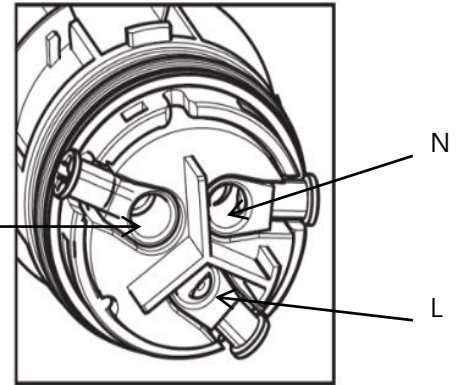
To connect to an inverter, the supplied AC plug connector must be attached to an AC cable.

You can assemble the AC plug connector in the following sequence. There are L, N, Ground Marks on the AC connector. Connect L to the L-phase, N to N-phase and Ground to the Ground to the ground wire(Take special care about the L and N connections)



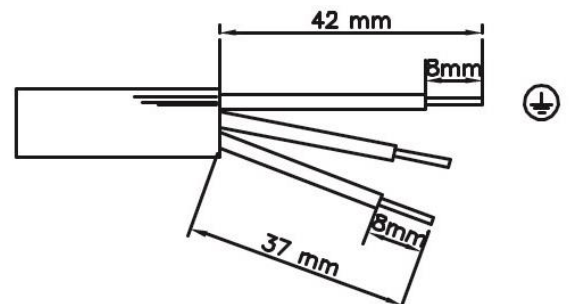
**Warning !**  
**The Ground must be connected to a ground wire.**

Ground



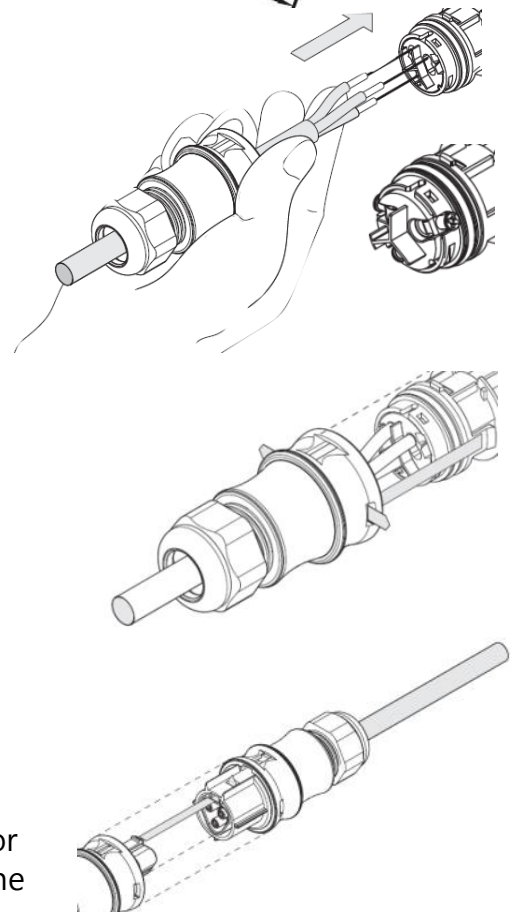
### Cable Condition

Use 4SQ or higher HIV cables.



### Procedure

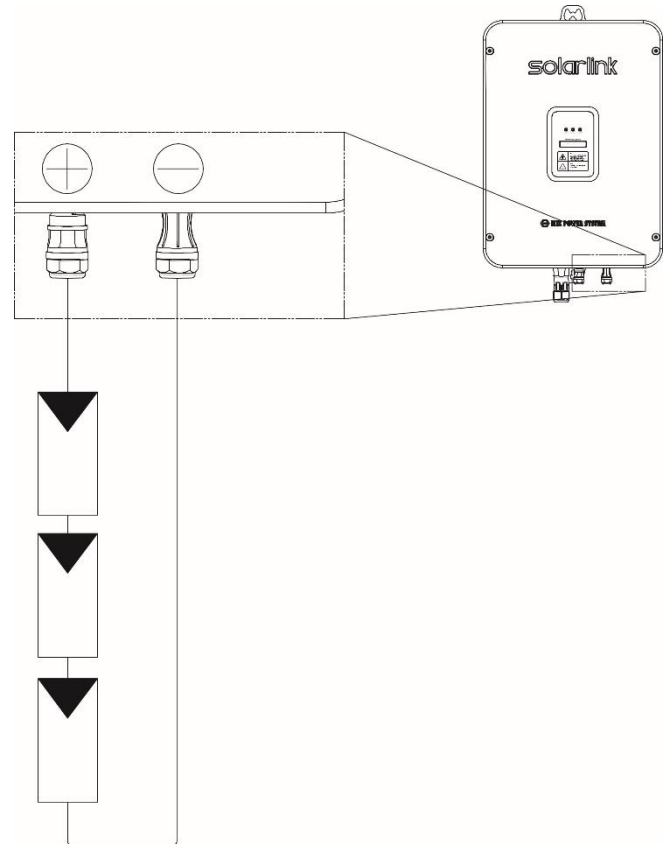
1. Uncover the cable, insert the plug, and fasten with a screwdriver.
2. Push the connector and plug until it clicks into place and fasten the screw joint at the bottom.
3. When the assembly of the AC cable and AC plug cable connector is completed, insert the AC connector of the inverter until it clicks into place as shown in the figure



## 9. PV (DC) Connection

### 9.1 Inverter Connection

- Connect the module to the inverter as shown in the figure, taking care not to change the + and – poles. Connect the other string in the same way.



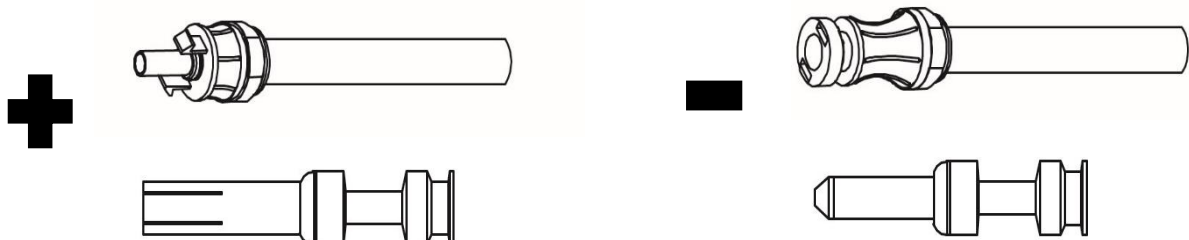
#### Conditions of PV Module Strings

- Use the same type of modules.
- Use the modules of the same manufacturer.
- Use the same module arrangement.
- Set the same module slope.

### 9.2. Connection of DC Connector

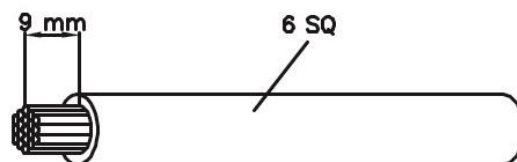
To connect the inverter, the DC plug connector must be attached to the connection Cable of the PV module.

Assemble the DC plug connector in the following sequence. Make sure that the + connector is connected with the + wire and the – connector with the – wire.



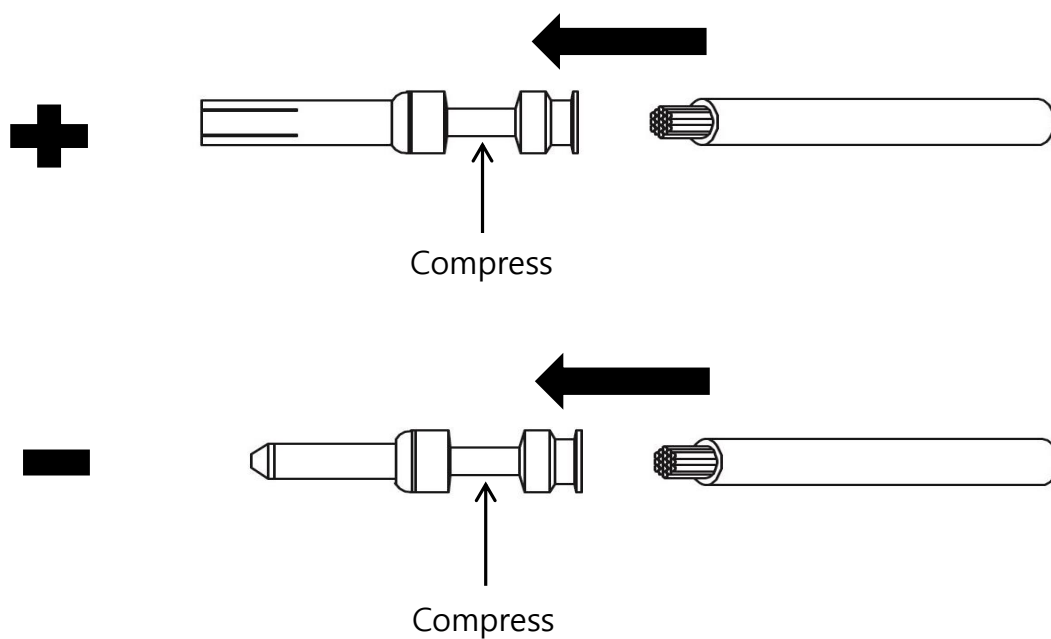
## Cable Connections

Use 6SQ or higher HIV cables.

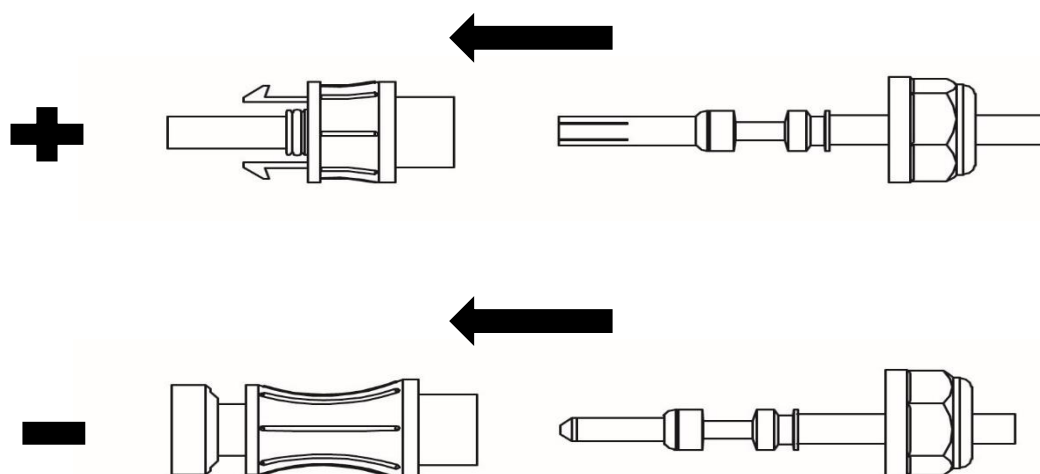


## Procedure

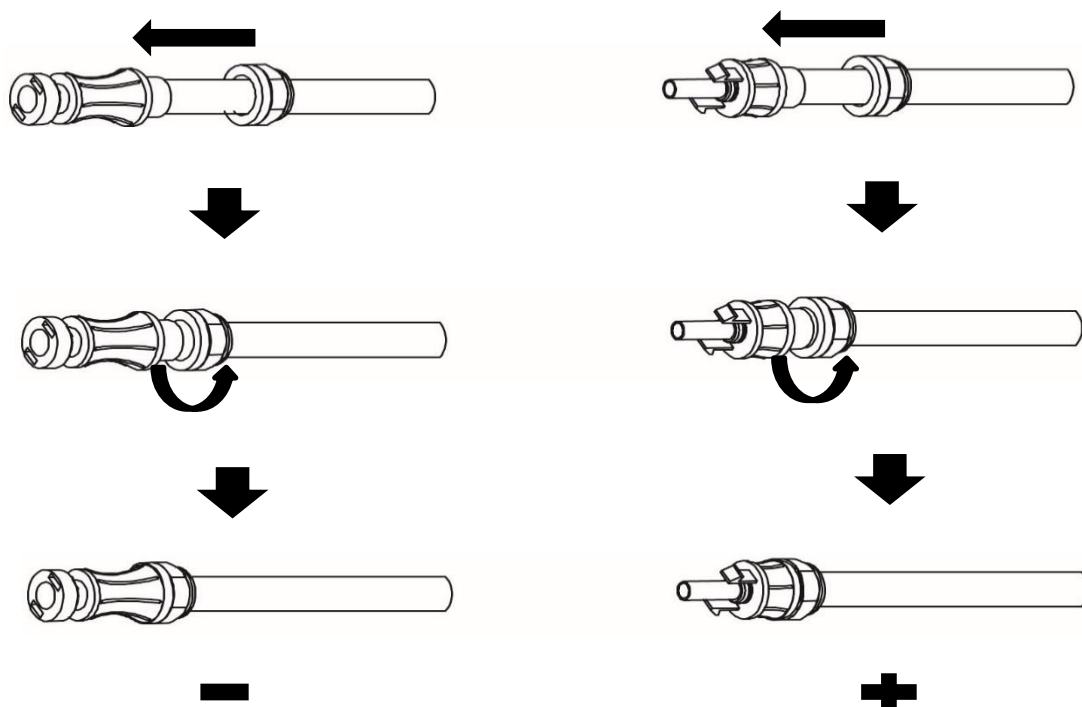
1. Insert the uncovered cable into the pin connector and compress it. Make sure that the + cable is connected to the + pin and the – cable to the – pin.



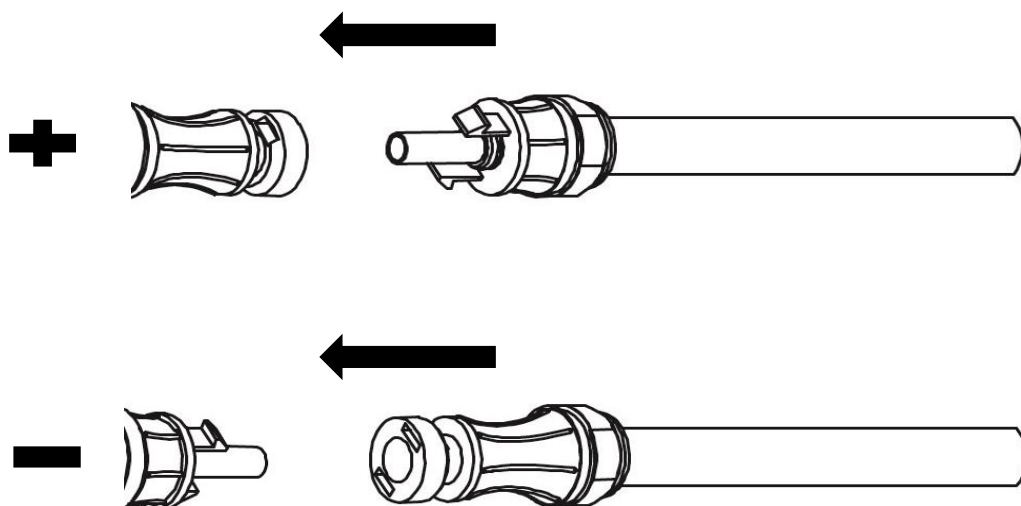
2. Push the cable connected to the pin into the plug until it clicks into place.



3. Push the screw joint in and fasten tightly.



4. After connecting the DC plug connector with the cable, push it into the connector of the inverter until it clicks into place as shown in the figure.



## 10. AC and DC Disconnection



### Warning !

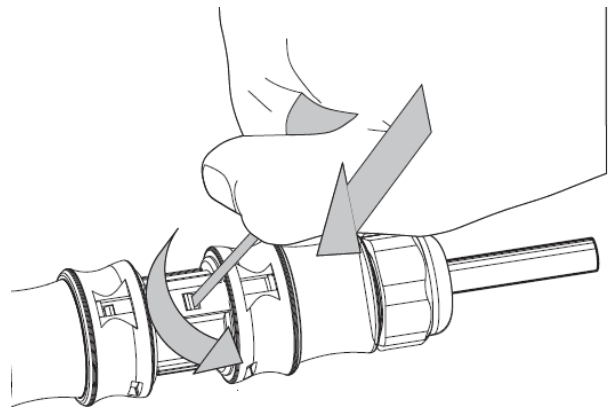
This part or task is exposed to fatal danger from the inverter. Ignoring this warning may result in serious injury or death.

- Before disconnecting the AC and DC connectors, you must shut off the AC and DC lines to prevent them from being re-inputted.
- There is residual voltage in the inverter even after the AC and DC lines are disconnected. Therefore, you must wait at least 10 minutes before doing this task.

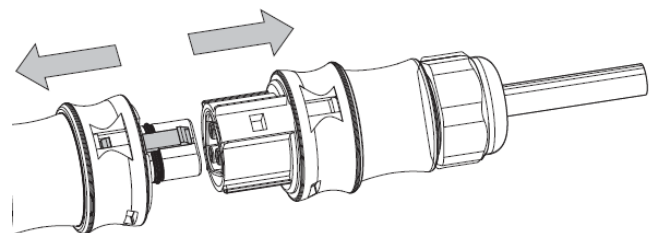
### 10.1 AC Disconnection

- You can disconnect the AC connector in the following procedure.

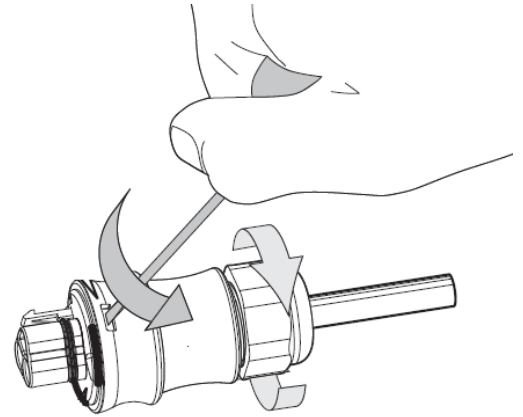
1. Press the connections at both sides with a flat-head screwdriver and screw.



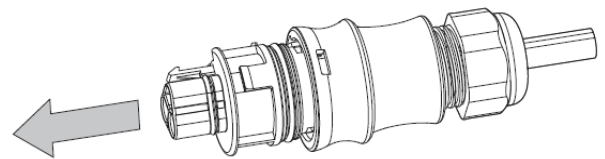
2. Pull out the connection to remove it from the inverter.



3. Release the screw joint, press the joints on both sides and turn them.



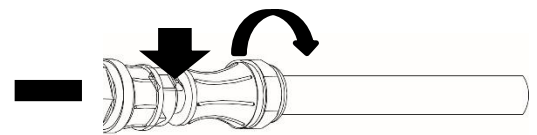
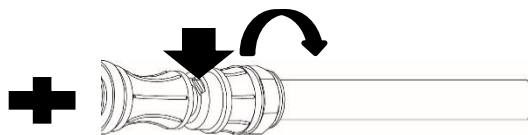
4. Remove the front part of the plug connector.



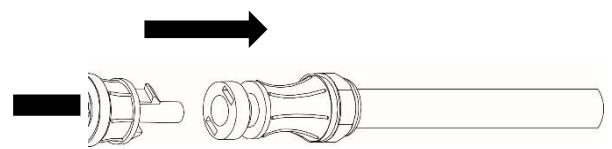
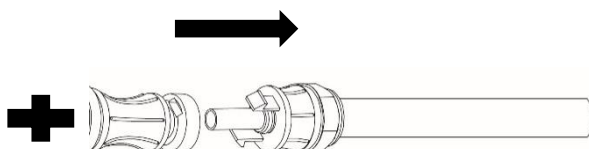
## 10.2 DC Disconnection

- Disconnect the DC connection in the following procedure.

1. Release the screw joint, press the connections at both sides with a flat-head screwdriver and slightly turn it.



2. Disconnect the connector from inverter.

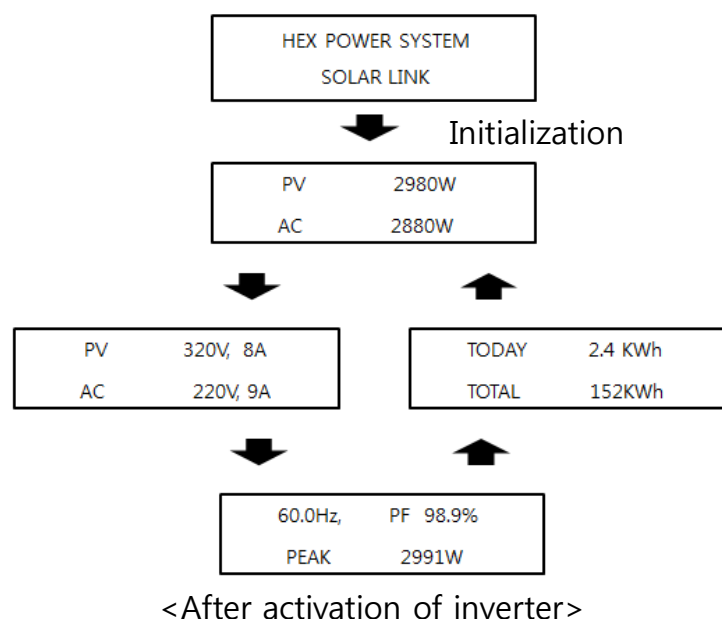


## 11. Messages

HMI is not displayed if the DC voltage is insufficient.  
HMI and messages are displayed if the DC voltage is sufficient.

### 11.1 Display of Measurements

If the DC voltage is sufficient, the HMI displays measurements and operation status.



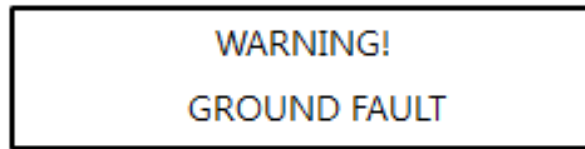
The key measurements of the inverter are as shown below.

No	HMI LCD Display	Content
1	<b>PV 2980W</b> <b>AC 2880W</b>	PV – Solar cell power(W) AC – Inverter output power(W)
2	<b>PV 320V, 8A</b> <b>AC 220V, 9A</b>	PV – Solar cell voltage (V), current (A) AC – Inverter output voltage (V), current(A).
3	<b>50.0Hz, PF 98.9%</b> <b>PEAK 2991W</b>	50.0Hz – Output frequency PF – Inverter output power factor (%). PEAK – Transient peak generation of inverter (W)
4	<b>TODAY 2.4KWh</b> <b>TOTAL 152KWh</b>	TODAY – Today's power generation TOTAL – Total power generation



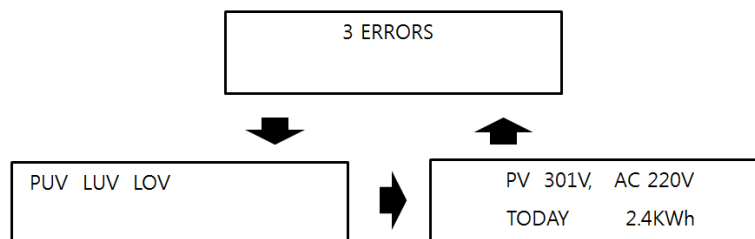
## 11.2 Error Message

The following message appears in the event of ground fault.



<In the event of ground fault>

When there is an error other than ground fault, the number and types of errors are displayed on the LCD display as shown below.



### 11.3 Error Message Status and Remedies

No	Error Message	Inverter Status	Remedy
1	POV	The solar cell voltage is higher than the specified voltage.	Check the solar cell voltage and restart. Contact for service if restart fails.
2	PUV	The solar cell voltage is lower than the specified voltage.	Check the solar cell voltage and restart. This can occur when the sun sets or it is cloudy. Check for restart on the next day.
3	ULF	Utility Line Fault.	The inverter automatically restarts when utility grid is normalized.
4	IOC	The inverter current is higher than the specified value.	The inverter automatically restarts within one minute after the over current factor such as short circuit is removed. Contact for service if restart fails.
5	ASY	The phases of the inverter and the phases of utility grid are not synchronized.	The inverter automatically restarts when utility grid is synchronized.
6	LUV	The system voltage is lower than the specified value.	The inverter automatically restarts when utility grid is normalized.
7	LOV	The system voltage is higher than the specified value.	The inverter automatically restarts when utility grid is normalized.
8	COC	Over current in the converter inside the inverter.	Check the inverter and restart the system.
9	LOF	Over frequency of the system.	The inverter automatically restarts when utility grid is normalized.
10	LUF	Under frequency of the system.	The inverter automatically restarts when utility grid is normalized.
11	Ground Fault!	Utility grid ground fault.	Check the system. The inverter automatically restarts when the ground fault is removed.

## 12. Test Operation

### 12.1 Test Operation of Inverter

1. Check the following before test operation.
  - Make sure that the inverter is installed properly (see 6.2).
  - Make sure that the grid (AC) is connected properly (see 7).
  - Make sure that the PV (DC) is connected properly (see 8).
  - Make sure that the ground connection is correct.
  - Make sure that the inverter housing screws are fixed properly.
  - Make sure that the circuit breaker is installed properly.
2. Input the AC.
3. Input the PV(DC).
4. Check the HMI screen of the inverter to check if the inverter is working normally.

## 13. Technical Data

Category	Item	Content
DC Input Data	DC Power	3150 W
	Maximum DC Power	3150 W
	DC Maximum Input Voltage	500 VDC
	MPPT Voltage Range	185~400 VDC
	Operating Voltage Range	120~500 VDC
	Minimum Input Voltage	120 VDC
	Initial Input Voltage	180 VDC
	Maximum Input Current	18 A
AC Output Data	Rated Output Power	3100 W
	Maximum Output current	14 A
	AC Output Voltage	220 V
	AC Output Frequency	50 Hz
	Rated Output Current Wave Distortion Factor ( THD )	Total 5 % less ( 3 % or less for each order )
	Rated Output Power Factor	0.95 or higher
	Phase	Single Phase
	Insulation Type	No Transformer Type
Efficiency	Maximum Efficiency	97.35 %
	Euro Efficiency ( $\eta_{EU}$ )	96.44 %
Instruments	Size ( W x H x D )	325 X 395 X 130
	Noise	25dB or lower ( 1m or higher )
	Cooling Method	Natural Air Cooling
	Protection Class	IP 65
	Weight	11 kg
Others	Operating Temperature	-20 °C ~ 50 °C
	Relative Humidity	0 % ~ 95 %
	Operation and Status Display	Automatic Operation
		HMI ( text LCD )
	Protection Features	Input & Output Under Voltage / Over Voltage
		Grid Under Frequency / Over Frequency, Output Over Current
		System Over Heating Protection
		Anti-Islanding Operation
	External Communication Feature	RS-422 Serial Interface ( Option)

## 14. Warranty

Product name	Photovoltaic inverter	Purchase date	
Model name	H103A	Warranty term	3 years (variable by terms and conditions)
Customer	Name		
	Address		
	Phone		
Manufacturer	Name	Hex Power System Co Ltd..	
	Address	08636 Unit 206~7, GeumcheonSolareasyum, 179, Siheung-daero, Geumcheon-gu, Seoul, Republic of Korea	
	Phone	0502-760-7608	

This product has been manufactured through the strict quality control and inspection process of HEX POWER SYSTEM.

The warranty term is 36 months from the purchase date. If the purchase date is not written here, the warranty term will be applied from the date of manufacture. However, this is subject to change depending on the terms and conditions.

### Free Service

If your product has trouble while being used in normal conditions within the warranty term, the product will be repaired free of charge at our distributor or service center.

### Charged Service

You can receive charged services in any of the following events:

- ◆ Consumables are replaced.
- ◆ The trouble was caused intentionally or due to carelessness of the user.
- ◆ The trouble was caused by abnormal power supply or a faulty device connected to the product.
- ◆ The trouble was caused by natural disaster (fire, flood, gas disaster, earthquake, etc.).
- ◆ The product was remodeled or repaired in other places than our distributor or service center.
- ◆ The warranty term has expired.





**HEX POWER SYSTEM**

[www.HEX.co.kr](http://www.HEX.co.kr)

Customer Support: +82-502-760-7608