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Grid PV-Inverter

10Kw

Installation and Operation Manual
Version 3.0E

Content

Read this User Manual before you start

Congratulations on purchasing 10KW Grid PV-Inverter (referred to in this manual as "PV-Inverter", or simply "Inverter"). This PV-Inverter is a highly reliable product due to its innovative design and excellent quality control. The device is dedicated to high demand, 3 phase grid-linked PV systems. Additionally this product is IP65 rated for dusty or humid environments and is suitable for outdoor use.

This manual contains important information regarding installation and safety operation of this unit. Be sure to read this manual carefully before using PV-Inverter.

If you encounter any difficulties during installation or operation, please refer to this manual before contacting your local dealer or representative. Thank you for choosing our product. Please keep this manual on hand for quick reference.

1. Safety Instructions

Risk of Electric Shock:
Alternating Current (AC) and Direct Current (DC) sources are terminated in this device. To prevent risk of electric shock during maintenance or installation please ensure that all AC and DC terminals are disconnected. Be sure to secure the Ground line to the Grid's Ground, and double check the Line and Neutral are not confused with Ground.

Risk of Electric Shock:
When PV module or panel is exposed to light, it starts to supply DC voltage, be sure to turn off DC switch before servicing, or make sure no live part will be touched.

Risk of Electric Shock:
Warning - High leakage current, earth connection is essential before connecting to the utility.

Risk of Danger:
More than one source of supply. Disconnect all sources before servicing.

Handling PV-Inverter:
Only qualified service personnel should handle PV-Inverter. When the

PV-panel is exposed to sufficient radiation and connected to the device, it generates a DC voltage to charge the DC link capacitors.

After disconnecting the PV-Inverter from the power supply and PV-panel, electrical charge can still reside in the DC link capacitors. Before handling the device, please allow at least 8 minutes after the power is disconnected.

Public Utility only:
The PV-Inverter is designed to feed AC power directly to the public utility power grid. Do not connect the AC-output of this device to any private AC equipment.

Hot Surfaces:
Although designed to meet international safety standards, the PV-Inverter can become hot during operation. Do not touch the heat sink or peripheral surfaces during or shortly after operation.

Maintaining and Servicing PV-Inverter:
Only authorized personnel are allowed to open the inverter for service purpose.

CAUTION – Risk of electric shock from energy stored in capacitor, do not remove cover until 8 minutes after disconnecting all sources of supply.

Unpacking and Installation:
The 10KW Grid PV-Inverter weighs 33.9 kg (74.7 lb). To avoid injury and for safety purpose, be sure to use proper lifting techniques and secure the help of someone to assist in the unpacking and installation of the inverter.

2. Limited Warranty

10kw Grid PV-Inverter comes with a 5-year warranty. An optional extended warranty may be available by special request before delivery. This warranty covers all defects due to design, manufacturing and components. This warranty does not cover damages resulting from:

- Seal on the product is broken
- Improper transportation and delivery
- Unqualified persons opening the unit
- Improper installation
- Unauthorized modification, test or repairing
- Use and application beyond the definition in this manual
- Application beyond the scope of safety standards (e.g. VDE)
- Acts of nature such as lightning, fire, storm etc.

Repairs and/or replacement of parts or the device are made at the manufacturer's discretion. Defective parts or malfunction discovered during installation should be presented in a written report for confirmation before applying for replacement or repair. The damage report must be issued within seven working days after receiving the PV Inverter. Manufacturer is not responsible for damages beyond the scope of this warranty.

3. Overview

3.1 Introducing the Grid PV System

The Grid PV System is mainly composed of 5 parts: PV-panels, the PV-Inverter, DC-Connection Unit, AC-Connection Unit (connection Interface) and a connection to the Public Utility. When PV-panel is exposed to sufficient irradiation and connected to an inverter, it generates DC power. The PV-Inverter converts DC to AC and feeds in to the Public Utility via the AC-Connection unit.

The following figure shows the PV-Inverter in the Grid PV System.
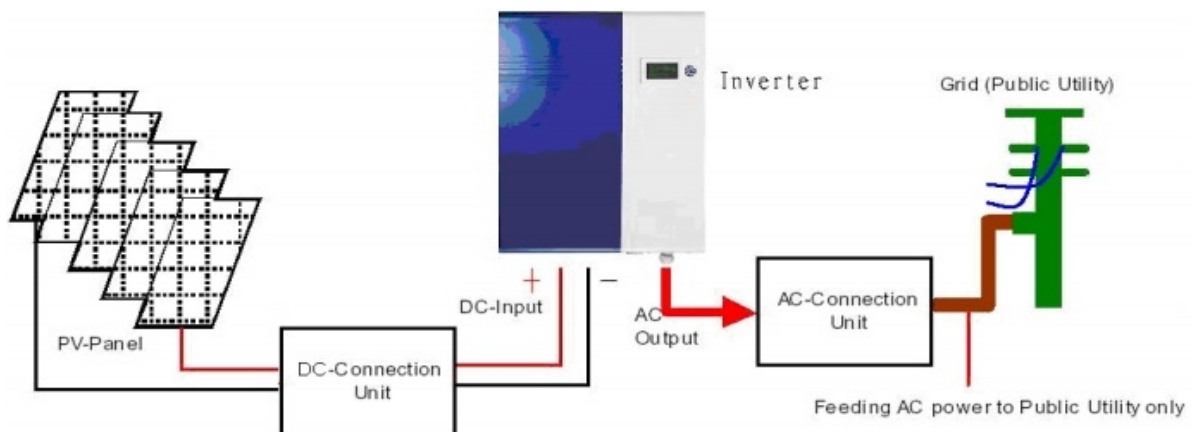
3.2 Introducing 10KW PV Inverter

The 10KW grid-connected PV inverter converts direct current (DC) power generated by PV panel into alternating current (AC), which is compatible with the local electricity distribution network; also called the public utility, or grid system.

3.2.1 Dimensions of 10KW PV Inverter

The dimension is in millimeters.
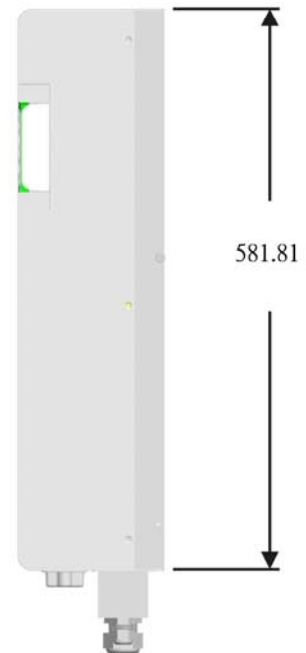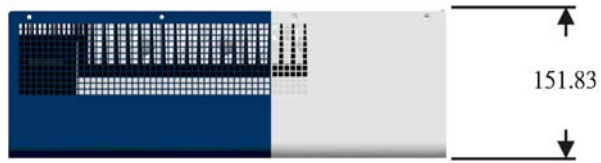
3.2.2 Identification

On the left side of 10KW PV shows the type plate of the inverter. The type plate shows the Type, Specifications, and the Serial Number of the inverter. When encounter any difficulties during installation or operation, please record the Serial Number (SN) before contacting your local dealer or representative.

PV Netz-Wechselrichter
PV Grid Inverter

Sunville 10000X   IP65   Made In Taiwan

Model No.: PS3100DE65

DC	Nenn-Betriebsspannung Nominal operating voltage	640V
DC	Betriebsspannungsbereich Operating voltage range	200~800V
DC	MPPT Bereich MPPT voltage range	300~800V
DC	Max. Eingangsstrom/Tracker Max. input current/Tracker	13A
AC	Nenn-Betriebsspannung Nominal operating voltage	400V 3PH/N/PE
AC	Nenn-Betriebsfrequenz Nominal operating frequency	50Hz
AC	Nenn-Ausgangsleistung Nominal output power	10000W
AC	Max. Ausgangsleistung Max. output power	11000W
AC	Max. Ausgangsstrom Max. output current	17.5A 3PH/N/PE
	Betriebstemperaturbereich Operating temperature range	-20~55°C
	Geräte-Schutzart Enclosure	IP65

CE   VDE   GS

3.2.3 Specific Parts of 10KW PV Inverter

The descriptions of the major parts of 10KW PV Inverter are indicated below:
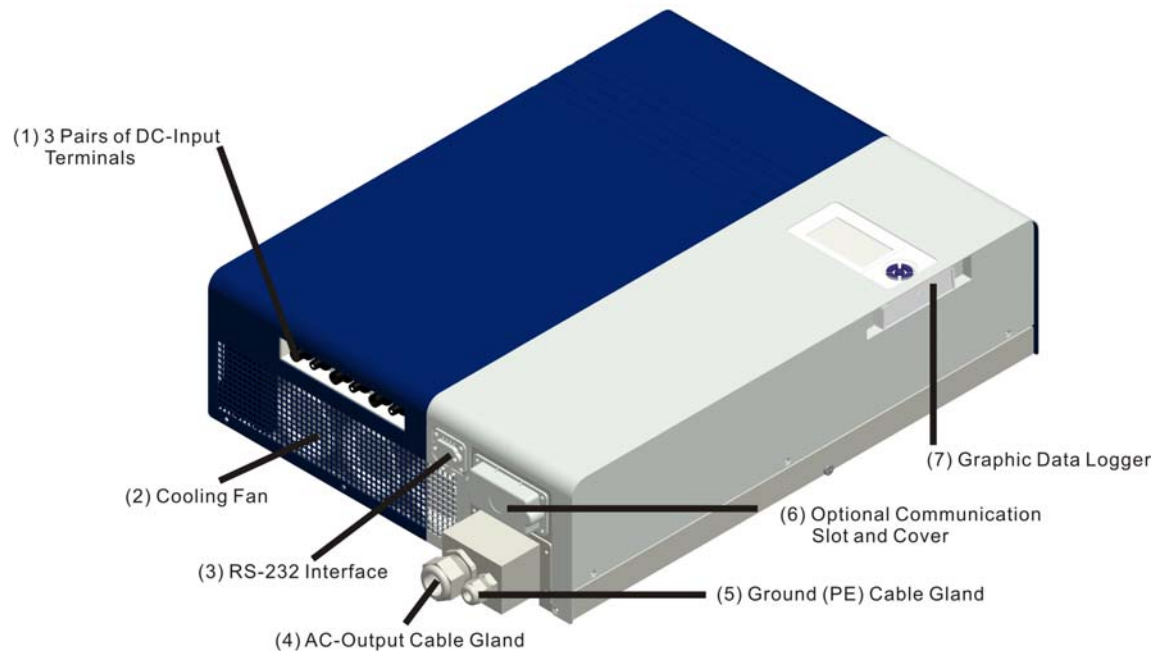
(1) 3 Pairs of DC-Input Terminals: Each input pair consists of positive and negative terminals. Refer to *Installation Section* for set-up information.

(2) Cooling Fan: The inverter is equipped with 3 air cooling fans to eject heat dissipated by the heat sink. When the temperature of heat sink reaches 50ºC, the fans automatically turn on.

(3) RS232 Interface: Connect this port directly to your PC via an RS232 serial cable.

(4) AC-Output Cable Gland: The cable gland is for securing the AC power wires L1 (phase R), L2 (phase S), L3 (phase T), N (Neutral), Gnd (PE): 4/6mm^2

(5) Ground (PE) Cable Gland: The cable gland is for securing the Ground (PE) wire for safety purpose. Refer to *Installation Section* for set-up information. G (Ground, PE): 10mm^2 wires.

(6) Optional Communication Slot and Cover: The cover behind is a slot to accommodate the optional communication interface, such as RS485 card.

(7) Graphic Data Logger: This device displays and records useful information about the inverter operating status.

3.3 Introducing Graphic Data Logger

To show the information of inverter, there is a graphic Data Logger in the unit. This Data Logger can show various information of the inverter such as operational status and warning message. In addition, it can be removed from its slot to a place user prefers. A standard 1.8-meter cord is attached with the Data Logger. If the user wishes to extend the length, a standard RS232 (DB9) cable of maximum 15 meters in length can be used for communication purpose.

Graphic Data Logger

LCD Display

Pac:0W
Vdc:307/0/0V
Vac:220.7/220.9/222.4V
Eac:266.7KWh
Status:Waiting
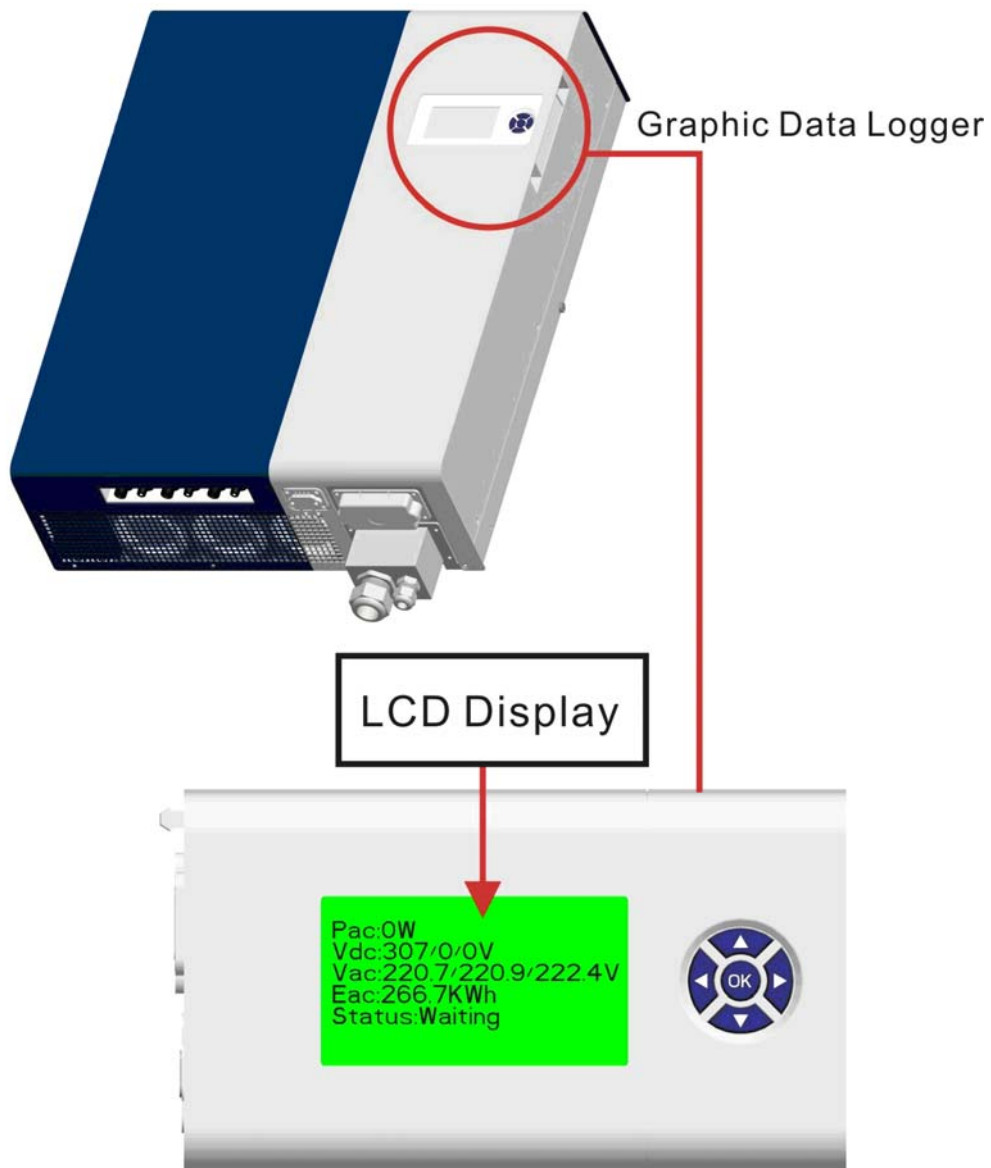
3.3.1 Configuration

The following table indicates the main specification of the Data Logger:

LCD	Monochrome
Displayed Information	Each I/P power, O/P power, Operation mode and warning message
Storage Period	3 years
Storage Media	SD card
Data Download	Via mini USB

3.3.2 Features

Removable Data Logger

The Data Logger is removable from its inverter. The display is a module designed so that users can remove and remount the module easily. Between the display module and inverter, there is a standard DB9 RS232 cable at length of 1.8m in-between. The display can be mounted on wall after taking out from its slot at inverter.

Multicolored back light

The backlight of the LCD changes according to its status. There are 3 colors and their indications are:

● **Green:** Start-up and normal status

● **Red:** Fault Status. In this status, inverter disconnected from grid due to system fault or inverter failure. These faults and failures are defined in "error message table" later on.

● **Yellow:** Warning Status. Inverter disconnected from grid due to system fault within the past 48 hours, but inverter reconnected.

Data download

You can download and access logger data with a PC via mini USB cable and manage internal data. For detail information, please refer to *8. Downloading data inside Data Logger.*

3.3.3 Connection

The Data Logger can be either located on the inverter or remotely mounted on a wall. A 1.8-meter cord connects the Data Logger and the main inverter unit (Mechanical will provide the information)

3.3.4 Appearance

- LCD: 128 x 64 graphic, monochrome

- Navigation Pad: " ↑ ", " ↓ ", "→" , "←" and "OK" in the center.

- Back light: 3 colors

4. Features

- Lead-free, RoHS compliant

- High conversion efficiency

- 3 MPP (Maximum Power Point) trackers

- IP65 enclosure

- 128x64 graphic display

- 3-phase 4 wire, 400V

- Compact design

- High reliability

- Easy operation

- Maintenance free

- Powerful Communications Interface

- Embedded ENS, complying with VDE 0126-1-1

- Internal GFCI (Ground Fault Current Interrupter)

- Supports active power reduction in 10% steps via Solar-Log 1000PM.

5. Installation

5.1. Inside the Package

The following items are included in the Package:
(1) PV-Inverter x 1
(2) Installation and Operation Manual x 1
(3) Mounting Screws(M4) x 4 and Snap Bushings x 4
(4) Safety-lock screws x 2
(5) Mounting Bracket for the inverter x 1
(6) Service Card x 1
(7) Mounting plate of the data logger x 1
(8) Screws for mounting the data logger x 2
(9) AC Output Cover x 1
(10) Rubber Bushing for AC connection (2 types)

5.2. Mounting 10KW PV Inverter

Suggestions before mounting
To obtain optimal results from PV-Inverter, please consider the following guidelines before installing the device:

Do not expose the PV-Inverter to direct sunlight. Direct sunlight increases the internal temperature that may reduce conversion efficiency.

✓ Check the ambient temperature of installation is within specified range -20 ~ +55°C.
✓ The AC grid voltage is 400Vx3, -15% +10%, 50Hz.
✓ Electric utility company has approved the grid connection.
✓ Qualified personnel are performing the installation.
✓ Adequate convection space surrounds the inverter.
✓ Inverter is being installed away from explosive vapors.
✓ No flammable items are to be near the inverter.
✓ No mounting on wooden flammable surface.

The inverter can be installed and operated at locations where the ambient temperature is up to 55 degree Celsius. However for optimal performance, it is recommended to install the inverter at an ambient temperature from 0 to 40 degree Celsius.

The inverter can cause current with a DC component, where a GFCI (ground fault current interrupter) device is used for protection of direct or indirect contact with this product.

To mount the inverter to a wall, please follow the steps:

（1）It is recommended to choose a dry place, out of direct sunlight with ambient temperature between 0 and 40°C

（2）Select a wall or solid vertical surface which is strong enough to support the inverter.

（3）The PV-Inverter requires adequate cooling space for heat dissipation. Reserve at least **20cm** above and **50cm** (measured start from the bottom of the AC cover) below the inverter. Each inverter should have minimum of **30cm** space to each other for multiple inverters installation.
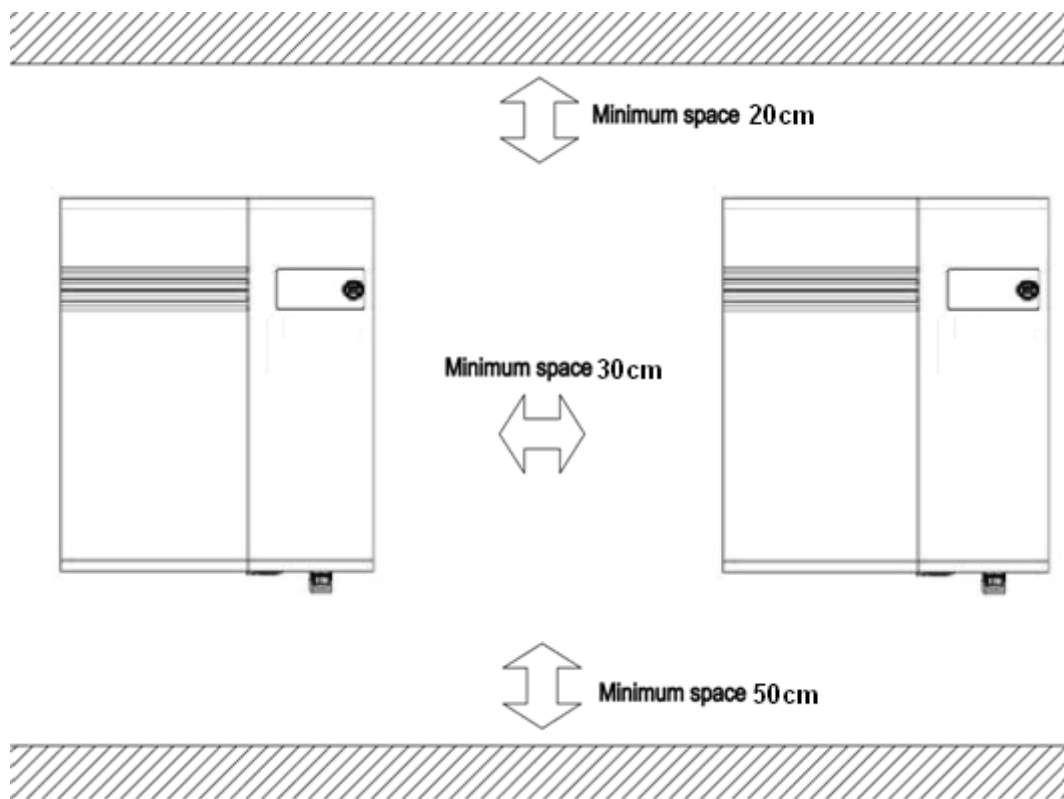
Note: Don't mount PV-Inverter on top of another one or other heat radiating sources unless you have to, in that case, 70cm spacing at minimum from each other is required to provide proper ventilation effect.

（4） Fix the Bracket by using Outer Mounting Holes:

（a） To install the device to a wall, mark 4 outer holes with φ6.35mm at the back of the bracket as illustrated below.

Using the outer Mounting Holes
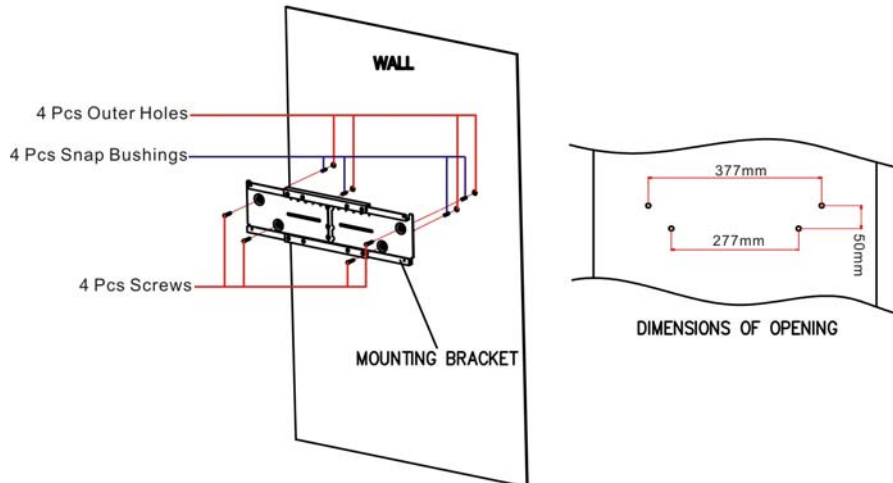
（b） Drill the 4 marked holes in the wall, and then drive in the 4 Snap Bushings(φ 6mm x L 30mm). Now insert the screws, and tighten.
Note: Screw (M4) size is φ 4mm x L 33.2mm.

（c） Mount the PV-Inverter onto the base plate as illustrated below.
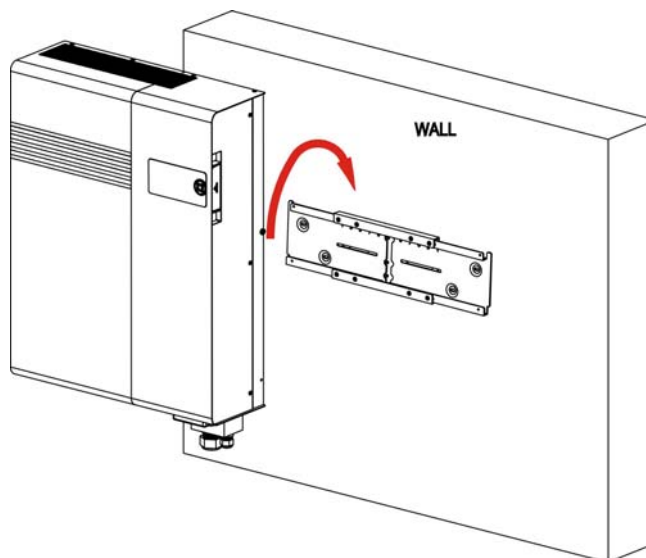
（5） Fix the Bracket by Using Central Mounting Holes:

（a） To install the device to a narrow upright, mark 3 central holes at the back of the bracket as illustrated below.
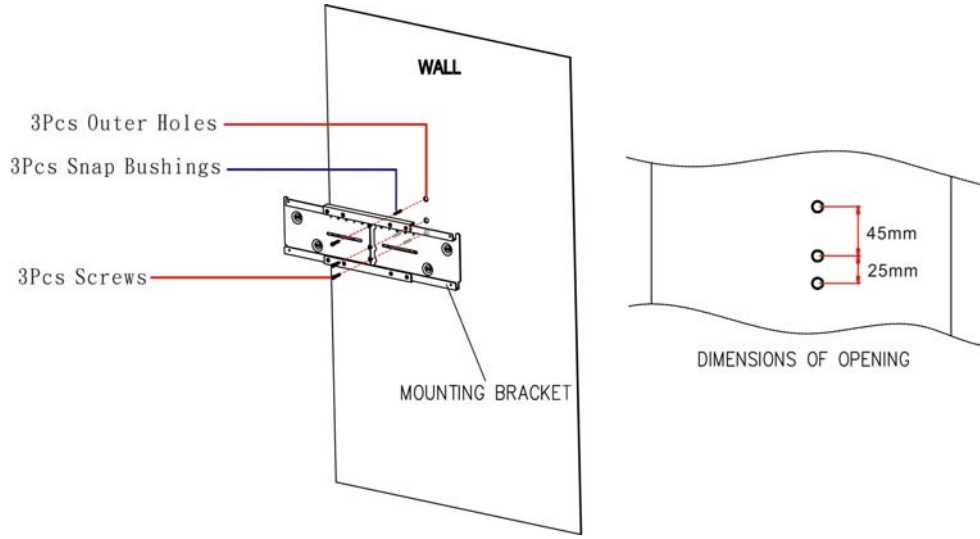
（b） Drill the 3 marked holes in the wall, and then drive in the 3 Snap Bushings. Now insert the screws, and tighten.

（6） Mount the PV-Inverter onto the bracket as illustrated:
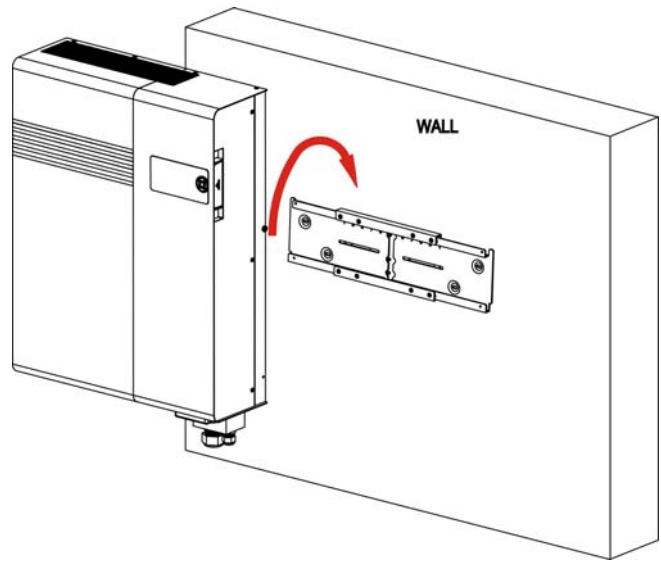
（7） Insert the Safety Lock screws to fix the PV-Inverter in place.

Safty Lock Screw

Safty Lock Screw
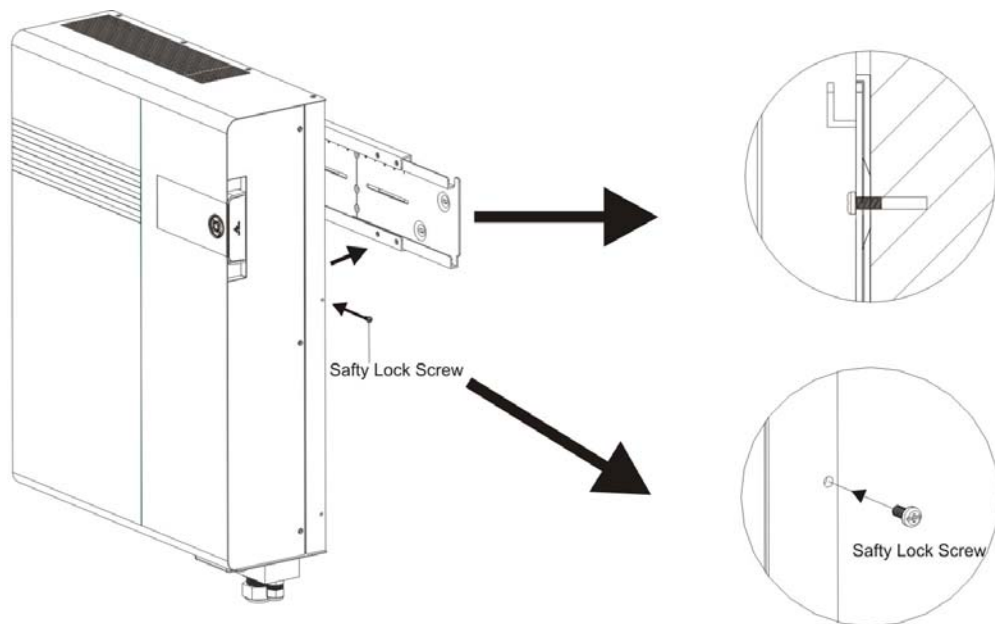
（8） Ensure the device is properly fixed to the bracket.
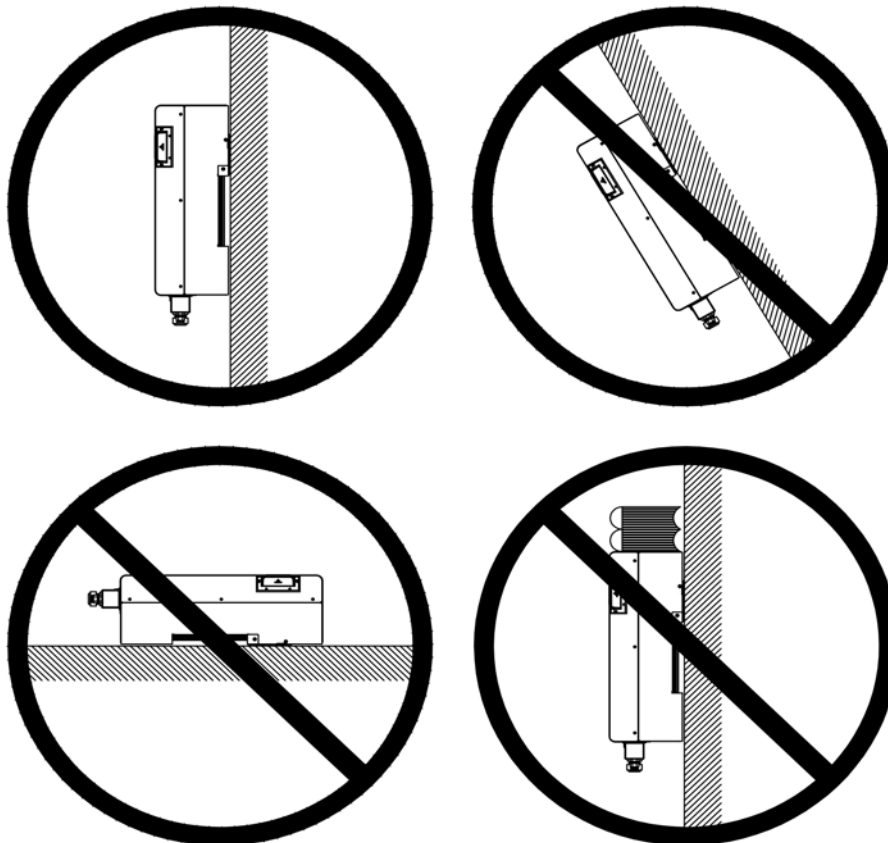
（9） Users can install Data Logger separately from the main unit. The mounting plate of the data logger and 2 screws are included in the accessories package[*]:

(a) Fix the mounting plate of the data logger by 2 screws.
Note: Screw (M4) size is φ 4mm x L 33.2mm.
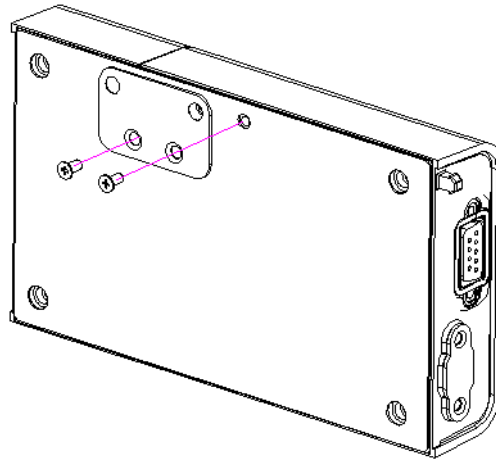
(b) Drill 2 holes in the wall, insert the screws, and tighten to fix the Data Logger in place.

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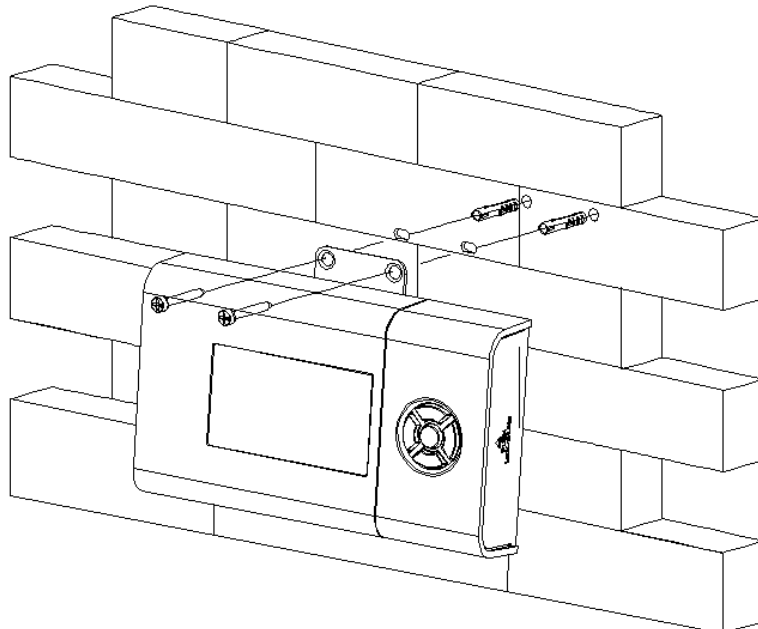
[*] This section applies only to inverter with removable data logger.

5.3. Connecting the AC-Output Cable

Connect PV-Inverter to the AC-Junction box via the AC-output cable and Ground cable as shown in the following steps:

(1)   Find the recommended AC-output cable size:
       Do not use cables where losses will exceed 1%, see Appendix 1
       L1 (phase R), L2 (phase S), L3 (phase T), N (Neutral), Gnd (PE):
       4/6mm^2

       Gnd (PE): 10mm^2 wire

(2)   Remove the rubber plug from inside the AC and Ground connector socket.

(3)   Insert AC cables to the left side of the connection lock, rubber bushing in the accessory package, and AC-output cover. Then, insert Ground cable to the right side of the connection lock, rubber bushing, and AC-output cover.

(4)   The choice of cable together with the way it is routed, the ambient temperatures the inverter operates at, and other underlying conditions determines the maximum AC fuse protection used for the inverter. See Appendix 2
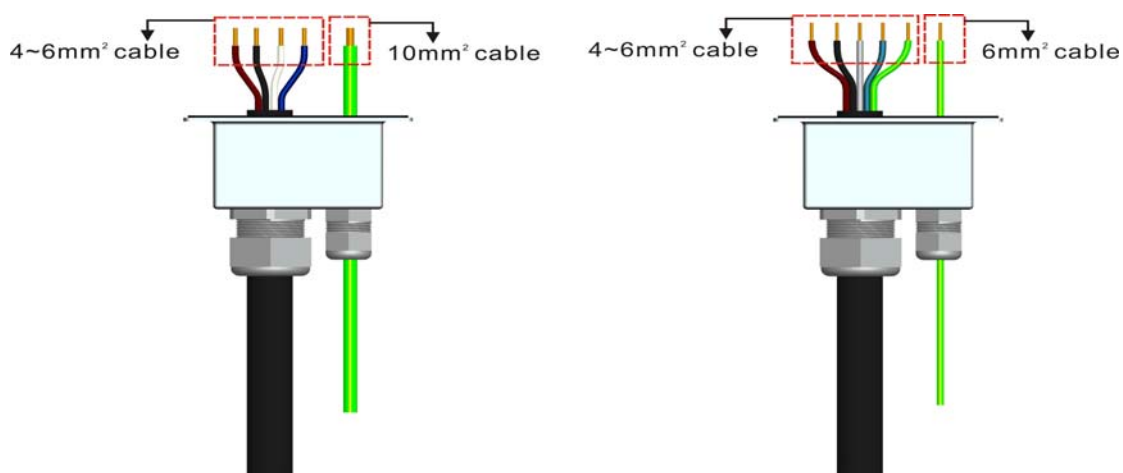
Suggestion before connecting
To obtain solid connection to terminal block, we strongly suggest that appropriate **insulated cord end terminals** are used for each wire, and the stripping length is **10-12mm**.

(5)   Insert the AC-output cables correspondingly.
The **Brown wire (phase R) to L1**, the **Black wire (phase S) to L2**, the **Grey wire (phase T) to L3**, the **Blue wire to N** (**Neutral**), and the **Yellow-Green wire to Gnd (PE)** of the terminal block.
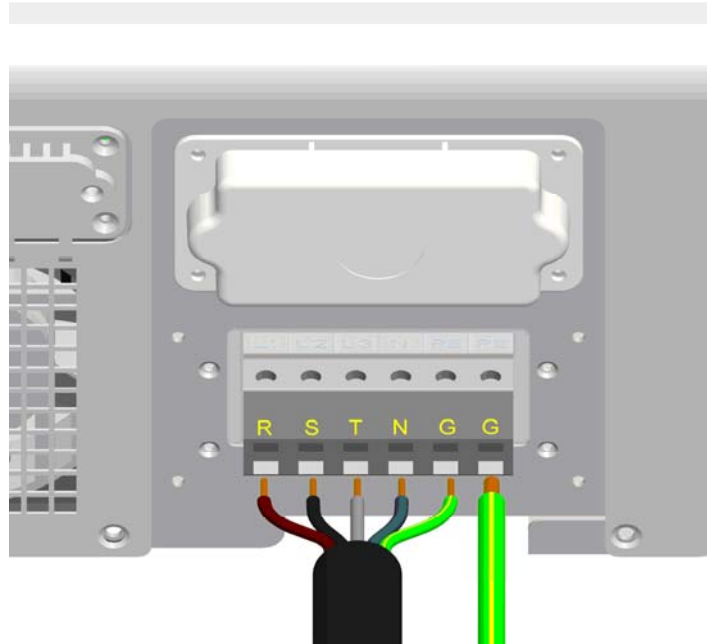
(6)   Fix the L1 (R), L2 (S), L3 (T), N (Neutral), and Gnd (PE) .
Please note that all wires should be firmly connected with torque value 1.5Nm to 1.8Nm.

(7)   Fix the other 10mm^2 Gnd (PE) wire firmly.
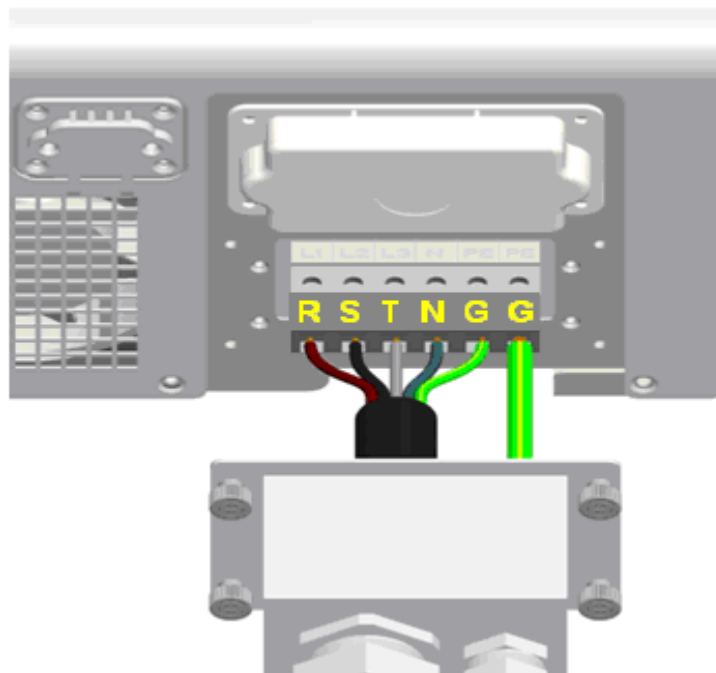
(8)   Fix the AC output cover back with a screwdriver.
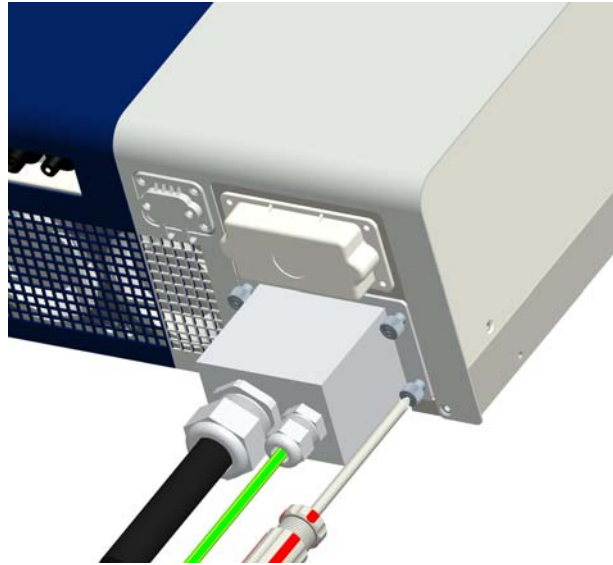
(9)   Twist on the connector cable gland to lock the bushing and cable.
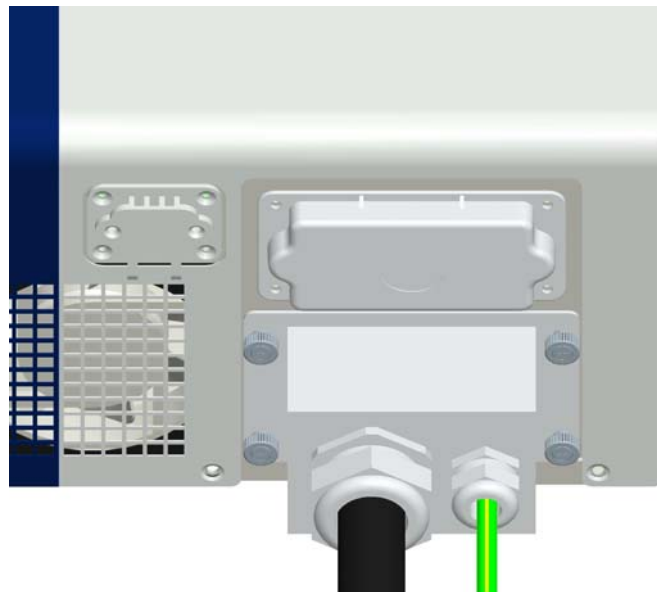
5.4. Connecting PV-Panel

For connecting DC input, connected strings must consist of modules of the same type. The number, orientation, and tilt of panels may differ for different application usage. The following are the specification of the plug connectors.

Connector Type	Cable connection dimension	Max. Rated Current
Male cable coupler	**Ø 3mm connecting system** Recommended: **Multi-Contact PV-KST3**	20A
Female cable coupler	**Ø 3mm connecting system** Recommended: **Multi-Contact PV-KBT3**	20A

Suggestions before connecting the PV Panel

To obtain optimal results from PV-Inverter, please consider the following guidelines before connecting the PV Panel to the device:

（1） First make sure the maximum open circuit voltage (Voc) of each PV string is below $800V_{DC}$ under any condition.

（2）Always connect PV-Panel **positive (+) terminal** to PV-Inverter DC positive (+) terminal; PV-Panel **negative (-) terminal** to PV-Inverter DC negative (-) terminal.
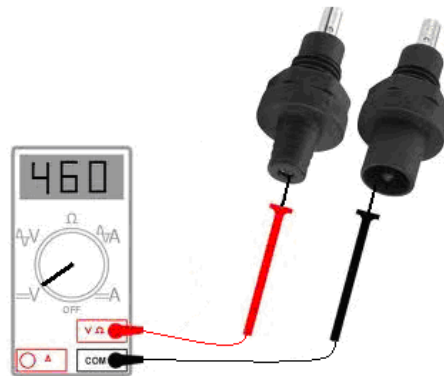
（3）Each set of PV-Inverter DC terminal converts maximum DC input current of 13A. As a result, 3 pairs of PV-Inverter DC terminals can take a combined input current of up to 39A.

The following diagrams show the PV system with/without DC Switch.

● **Illustration of the PV System with DC Switch:**
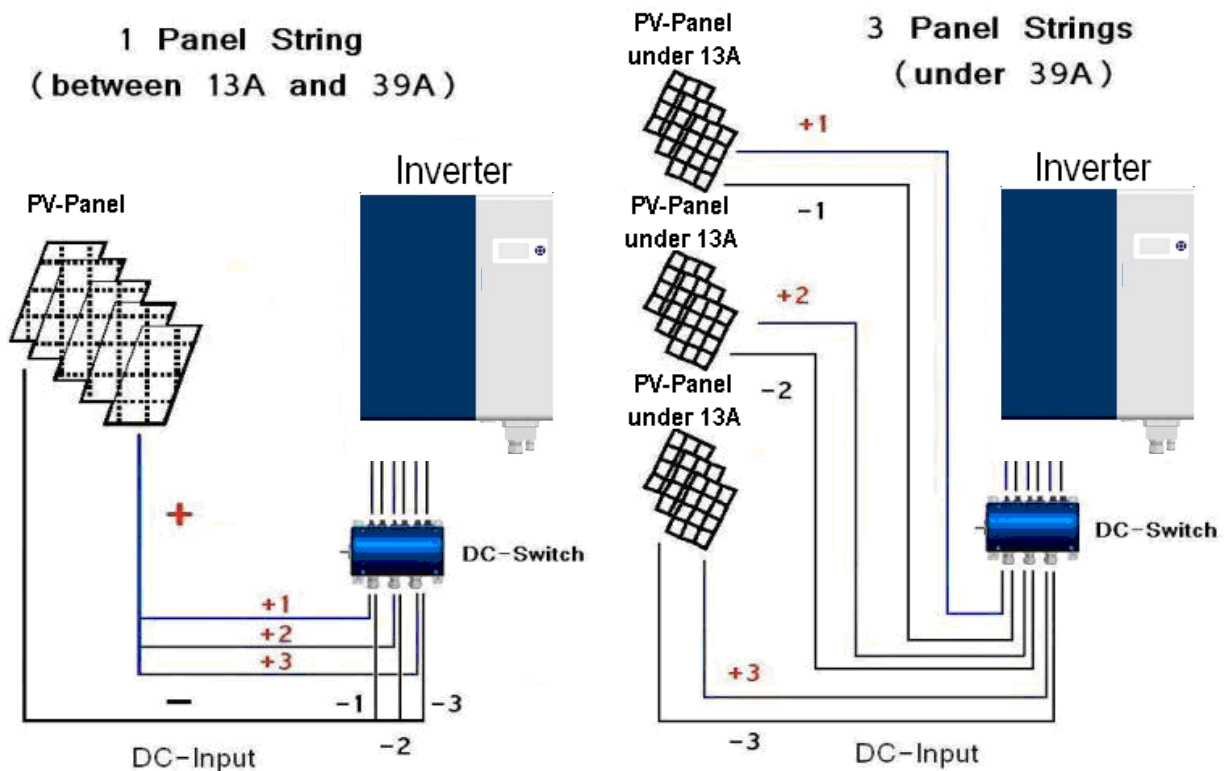
5.5. Connecting to the Junction box

The AC Junction box is an interface between PV-Inverter and the Public Utility. It may consist of an electrical breaker, fuse, surge protector and terminals for connection to both the PV-Inverter and the Public Utility. This AC Junction box must be designed by a qualified technician to comply with local safety standards requirement.
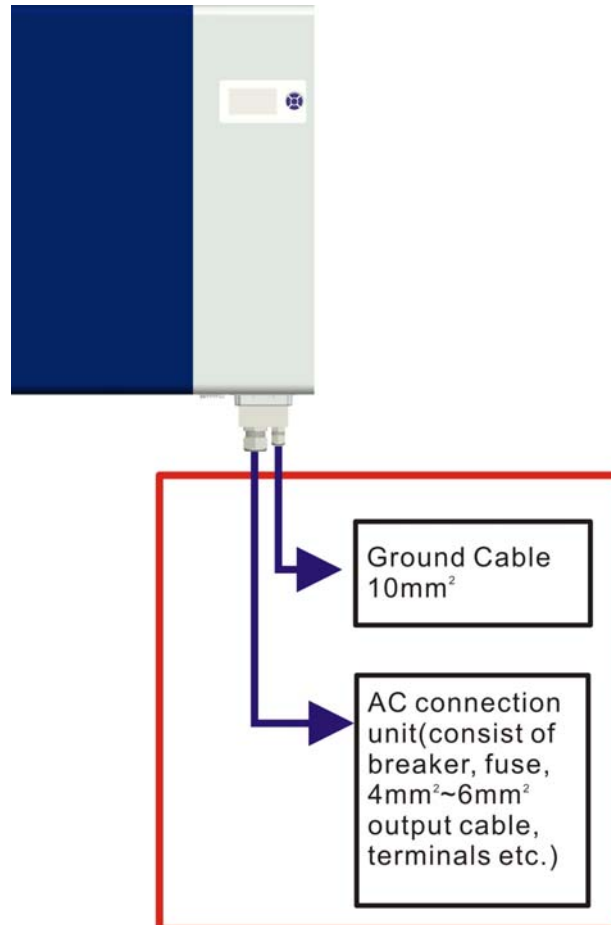
5.6 Post Installation Checklist

(1) High voltages exist when PV-Panel is exposed to sufficient irradiation. Exposed terminals of PV-Panel are under tension, and can cause electric shock. Avoid making physical contact with those parts of the device.

(2) After PV-Panels are connected to the PV-Inverter, the output voltage is greater than $300V_{DC}$ and when the AC grid is not connected to the inverter, the Data Logger LCD displays the following:

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:0.0/0.0/0.0V
STATUS:Fault
         No Utility
```

(3) Check the connection between PV-Inverter and the AC Connection System, and then check the connection between the Public Utility and the AC junction box. Close the AC breaker or fuse in the unit.

(4) Under normal operation, the Data Logger LCD shows the following as an example:

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:219.4/219.3/219.3V
STATUS:Normal

         02/12/09 15:59
```

(5) When the display is green, the inverter is feeding power to the grid. Under such condition, you have installed the inverter successfully.

Before connecting PV-Panels to DC terminals, make sure the polarity of each connection is correct. An incorrect connection could permanently damage the device.

Please ensure that AC voltage should not exceed product spec under any circumstances.

6. Operation of 10KW PV Inverter

6.1 Auto Power-up
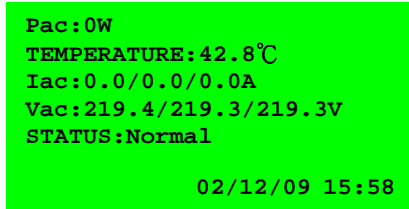
The PV-Inverter starts up automatically once the DC-power from PV Panel is sufficient and fuse is closed.

6.2 Operating Modes

There are 4 modes of operation. For each mode, there is a corresponding color and text to indicate the status.

（1）Normal
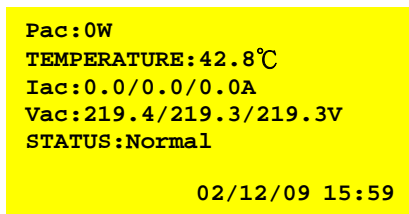
In this mode, inverter continuously converts energy from solar generator to grid (utility). The corresponding color of LCD is green in this case.

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:219.4/219.3/219.3V
STATUS:Normal

            02/12/09 15:58
```

（2）Recovery from Fault

In some situations such as abnormal voltage and frequency, the inverter has to disconnect from grid. After the situations are cleared, inverter recovers to normal condition. For the coming 48 hours, the LCD backlight will be yellow as following picture. If there is no further abnormal event after 48 hours of operation, the color switches back to green again.

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:219.4/219.3/219.3V
STATUS:Normal

            02/12/09 15:59
```

（3）During Fault

During grid fault or system failure (refer to "error message table" for further information) the inverter disconnects from the grid, the backlight turns red, and alarm is ON to notify user. User can press "OK" button on navigation pad to clear fault notification. In this condition, please check the message. If the fault notification can not be cleared, please contact with your local service.

```
⚠
No Utility

Press OK to Clear
```

（4）Shutdown

During night or heavily cloudy day, the inverter automatically shuts down. In this condition, Data Logger and the navigation pad are inactive.

（5）Three Operating States:

- **Standby**: During normal operation, the PV-Inverter is in "standby" state and the open circuit voltage is between 200V to 300V.

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:219.4/219.3/219.3V
STATUS:STANDBY

          02/12/09 15:59
```
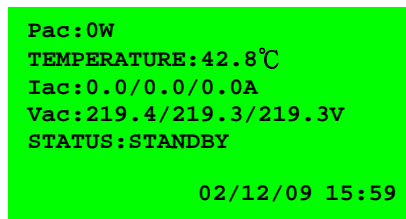
- **Waiting**: Between 300V and 350V in DC side, the device is in "waiting" state, in the meanwhile, the inverter is checking both DC and AC conditions and waiting for connection.

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:219.4/219.3/219.3V
STATUS:Waiting

          02/12/09 15:59
```
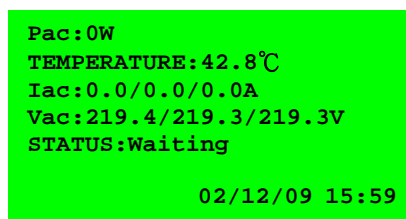
- **Normal**: To be in "normal" state, voltage on DC side must be above 350V. To check the DC wire connection, this inverter tries to disturb its input power for every starting-up. During the process, user can see the DC power reading drift.

```
Pac:0W
TEMPERATURE:42.8℃
Iac:0.0/0.0/0.0A
Vac:219.4/219.3/219.3V
STATUS:Normal

          02/12/09 15:59
```
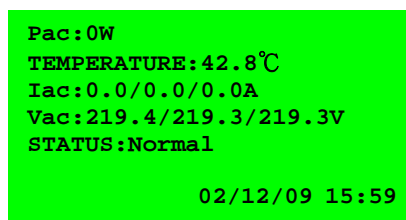
6.3 Using the LCD Display and Data Logger

6.3.1 Operation

（1）**Keys on the data logger:**

On the data logger, there are 5 keys used to change and operate. Generally, the functions of keys are defined as followings.
- "→": View the lower layer (1st to 2nd) or move the cursor right
- "←" : View upper layer (2nd to 1st) or move the cursor left
- "↑" : View the previous screen or move the cursor up
- "↓" : View the next screen or move the cursor down
- "OK": Set or confirm

（2）**Back light of LCD**

As described in previous section, the color of backlight changes according to operation status. To save power, the light remains illuminated only for 3 minutes after last operation. However, in case a failure or error occurs, other than the backlight goes red, the backlight flashes every second until user presses the key according to instruction on the LCD.

（3）**Audio Alarm**

To inform the user, data logger will emit audio alarm in cases of following:
  （a）Inverter failure
  （b）Memory capacity of data logger is less than 5%
  （c）Convection fan is not able to rotate for any reason

This alarm also can be turned "off" by setting in the "System Display". To do this, please refer to "System Display" section afterwards.

（4）**Behavior in case memory is full**

Once the capacity of memory is less than 5%, data logger will emit audible alarm. At that moment, user should manage the data inside and try to clear the memory by using a PC. *In case user ignores the warning and does not clear the memory, after memory is 100% full, the latest data will overwrite the earlier ones.*

6.3.2 Display on LCD

（**1**）**Startup**
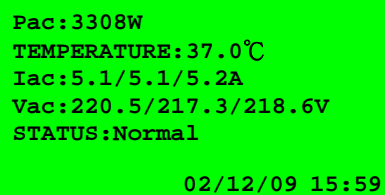
After the inverter starts up, the LCD shows logo and firmware version.
The frame lasts for 3 seconds and changes to text information.

（**2**）**Text display**

The display shows four measurements and one status. The bottom-right part of the display shows the time and date. **On occurrence of a "warning" or "error" message, the bottom line "Status" is automatically replaced by the error message.**

The user can change the four monitoring parameters.
（a）Press "→" to high-light the monitoring parameter at the first line. By using "↑" and "↓", the user can shift to the next line.
（b）Press "OK" to begin setting the monitoring parameter.
（c）Press "↑" or "↓" to select the monitoring parameter of the line.
（d）Press "OK" to confirm.

```
Pac:3308W
TEMPERATURE:37.0℃
Iac:5.1/5.1/5.2A
Vac:220.5/217.3/218.6V
STATUS:Normal

        02/12/09 15:59
```

（**3**）**Daily graph**

By pressing the "↓" key in the text display, screen on LCD is transformed to daily graph as below. The graph indicates the AC power trend of a specified date. Further explanations are stated below:

- **Time-axis (x-axis):** On the frame, the longest period is 12 hours. The number represents the hour. The first recorded data of a day is plotted on the left most point. In case the recorded data of a day is longer than 12 hours, press "OK" first and then press "→" and "←" to move the graph to time interested. Press "OK" again to terminate the moving.
- **Power-axis (y-axis):** From 0 to 13KW. Each point is the averaged power during 6-minute interval.
- **Date:** On the upper right corner, the date of present display is shown. To see daily graph of expected day, press "→" and "←" to select
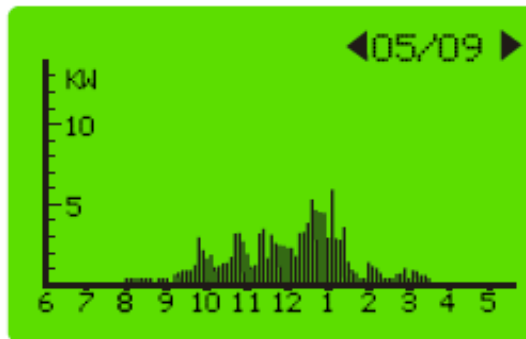
（**4**）**Weekly graph**

Press the "↓" of daily display, LCD changes to the "Weekly Display" as below. For further explanations, see below:

- **Time-axis (x-axis):** 7 days from Sunday of a week. The left most point is the data for Sunday.
- **Generated KWh (Y-axis):** The amount in kWh generated of that day. Ranged from 0 to 130kWh.
- **Week change:** Press "←" and "→" to switch to the week interested. The corresponding dates on the upper-right corner can also be changed.
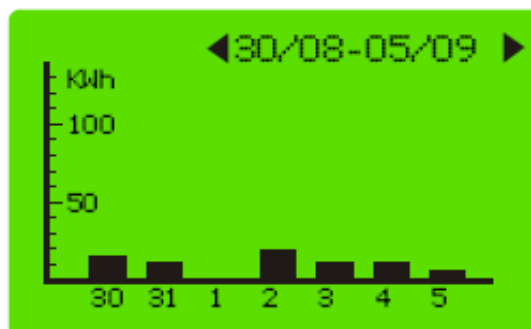
（5）Error history

By pressing "↓" again on the "Weekly Display", the LCD changes to "Error Message" as shown below. The LCD displays the last two recorded error events. To see more error events, press "OK" first to toggle the display and then press "→" and "←".

```
ERROR HISTORY
E073:Grid fault
@ 02/12/09  2:44
VALUE=0,0,0
E074:Grid fault
@01/12/09  10:21
VALUE=51.5Hz
```

（6）System Information

By pressing "↓" again on "Error History", the LCD changes to the information of the inverter including serial number of the inverter, firmware version, etc… as shown below.

```
        SYSTEM INFORMATION
S/N: ST20090623
Version: O0.11-00.07
MEMORY: 0.1%
DATE: 02/12/09  WED
TIME: 02:52:32  GMT+01
AUDIO ALARM: ON
LANGUAGE: ENG
```

The following are the monitoring parameters shown in "System Display":
● SN: The serial number of the inverter
● Version: The firmware version of the inverter
● Memory: The memory status of the Data Logger
● Date: The date setting of the inverter
● Time: The time setting of the inverter
● Audio Alarm: "On" or "Off", the status of the setting
● Language: The language setting of display

To change the Date, Time, Audio and Language settings:
（a）Press "→" and then press "↑" or "↓" to change the parameter to the desired setting.
（b）Press "OK" to confirm. Use "↑" and "↓" to alter the value
（c）Press "OK" to confirm.
（d）Press "←" to cancel a selection and complete the setting.

6.3.3 Data Logger Function Tree:

The following is the summary of the operation:

Function tree		
Initial screen	1st layer	2nd layer

Welcome — After 5 second → **Text display**

Text display ← Left-Right arrow → **Channel selection**
1. Select channel by up-down arrow
2. Press enter to change
3. Select parameter by using up, down, left and right arrows
4. Enter to confirm and back

Up-Down arrow

Daily graph
1. The display is shown from first data of a day
2. Up to 12 hours can be displayed
3. Select date by using right and left arrows
4. Press enter to "scroll" if the display is not enough to show the data of a day

Up-Down arrow

Weekly graph
1. The display is shown from first data of a week, Sunday namely
2. 7 days on one display
3. Select week by using right and left arrows

Up-Down arrow

Error history — Show the lastest 2 records of error

Up-Down arrow

System ← Left-Right arrow →
1. Date
2. Time
3. Audible Alarm
4. Language

1. Use up & down key to select item
2. Use enter key to set
3. Use up and down to change number
4. Use right and left to move cursor
5. Press enter again to confirm

Up-Down arrow

6.4 Display Messages

Operating conditions	In English	In German	Description
Normal Working Status			
Power off	No display	Keine Anzeige	In case of input voltage < 200V, PV inverter is totally shutdown
Standby	Status:Standby	Status:Standby	Input voltage range: 200V~ 260V
Initialization & waiting	Status:Waiting	Status:Warten	Input voltage range: 260~350V
Check grid	Status:Checking xxxs	Status:Netz-Prüf xxxs	In case of PV voltage> 350V, inverter is checking feeding conditions
Feeding grid, MPPT	Status:Normal	Status: Normalbetrieb	Inverter is feeding power. After 10 seconds of this display, LCD will show wattage.
Waiting for reconnect to grid	Status:Reconnect xxxs	Status:Kontakt xxxs	The time for reconnect to grid
FLASH	Status:FLASH	Status:FLASH	FLASH firmware
SLAVE FLASH	Status:SLAVE FLASH	Status:SLAVE FLASH	SLAVE FLASH firmware
FAULT	Status:Fault	Status:Fehler	See "System Fault", "Inverter Fault" to know the fault detail
Monitoring Parameters			
Instantaneous Input power	Pdc:xxxx/xxxx/xxxxW	Pdc:xxxx/xxxx/xxxxW	The individual DC input power
Instantaneous Output power	Pac:xxxxxW	Pac:xxxxxW	The real time output power in xxxx W
Accumulated energy information	Etot:xxxxxxxxx.xkWh	E-tot:xxxxxxxxx.xkWh	Total energy to has been fed to grid since inverter was installed
3-phase Grid voltage	Vac:xxx.x/xxx.x/xxx.xV	Uac:xxx.x/xxx.x/xxx.xV	Grid voltage in xxx.x VAC for 3 phases
Grid frequency	Frequency:xx.xHz	Frequency:xx.x Hz	Grid frequency in xx.x Hz
Feeding current	Iac:xx.x/xx.x/xx.xA	Iac:xx.x/xx.x/xx.xA	Feeding current amount in xx.x A
PV array voltage	Vdc:xxx/xxx/xxxV	Udc:xxx/xxx/xxxV	Input voltage of PV array, xxx VDC
PV array current	Idc:xx.x/xx.x/xx.xA	Idc:xx.x/xx.x/xx.xA	Input DC current of tracker n
Daily Energy	Etoday:xxx.xkWh	E-Heute:xxx.xkWh	The accumulated kWh of that day
Working Hour	H-total:xxxxxxhr	h-Gesamt:xxxxxxhr	Total working hours of inverter

Operating conditions	In English	In German	Description
Internal Temperature	Temperature:xx.x°C	Temperatur:xx.x°C	Temperature is indicated in Celsius

System Fault

Isolation failure	Isolation Fault	Isolationsfehler	Earth fault of PV-panels or failure of surge voltage protection
GFCI active	Ground I Fault	Fehlerstrom	Leakage current on ground conductor is too high
Grid failure	Grid Fault	Netzfehler	Grid measured data is beyond the specification (voltage & frequency)
Relay failure	Relay Failure	Relais Fehler	The output relay is out of order
No utility	No Utility	Kein Netz	Utility is not available
Input voltage too high	PV over voltage	DC-Überspg	Input voltage higher than 800V

Inverter Fault

Consistent failure	Consistent fault	Konsistenzfehler	The readings of 2 microprocessors are not consistent. It could be caused by CPU and/or other circuit do not function well.
Temperature too high	Over temperature	Übertemperatur	The internal temperature is higher than normal value
Output DC injection too high	DC INJ High	DC-INJ zu hoch	Output DC injection is too high
EEPROM problem	EEPROM failure	EEPROM Fehler	Reading/writing of EEPROM failed
Communication failure between microprocessors	Sci Failure	CPU Fehlfunktion	The communication between MCU inside is abnormal
DC bus voltage is too high	High DC Bus	U/dc Bus zu hoch	The DC BUS inside is higher than expected
DC bus voltage is too low	Low DC Bus	U/dc Bus zu klein	The DC BUS inside is lower than expected
Output DC sensor abnormal	DC Sensor Fault	DC Sensor Fehler	The output DC sensor is abnormal
GFCI detection problem	GFCI Failure	FI-Fehler	The GFCI circuit is abnormal
Master and Slave firmware dismatch1	M-S Ver. Fault	M-S Ver. Fault	firmware mismatch between Master and Slave
Memory card full	Memory Full	Memory Full	There is not enough space to store data

System Information

Serial Number	SN: xxxxxxxxxxxxxxxx	SN: xxxxxxxxxxxxxxxx	16 characters, unique serial number

Operating conditions	In English	In German	Description
Firmware version	Version:xx.xx-xx.xx	Version:xx.xx-xx.xx	The Master and Slave CPU F/W version information
SD card memory	Memory:xx.x%	Speicher:xx.x%	Memory utilization percentage on SD card
Date display	Date:DD/MM/YY Sun	Datum:DD/MM/YY Son.	Date display
Date display	Date:DD/MM/YY Mon	Datum:DD/MM/YY Mon.	Date display
Date display	Date:DD/MM/YY Tue	Datum:DD/MM/YY Die.	Date display
Date display	Date:DD/MM/YY Wed	Datum:DD/MM/YY Mit.	Date display
Date display	Date:DD/MM/YY Thu	Datum:DD/MM/YY Don.	Date display
Date display	Date:DD/MM/YY Fri	Datum:DD/MM/YY Frei.	Date display
Date display	Date:DD/MM/YY Sat	Datum:DD/MM/YY Sam.	Date display
Time display	Time:HH/MM/SS GMT+xx	Zeit:HH/MM/SS GMT+xx	Time display
Audible alarm setting on	Audible Alarm:On	Alarm:An	Set up audible alarm
Audible alarm setting off	Audible Alarm:Off	Alarm:Aus	Set up audible alarm
Setting Language	Language:English	Sprache: Englisch	Set up of the display language
Setting Language	Language:ESP	Sprache:ESP	Set up of the display language
Setting Language	Language:German	Sprache: Deutsch	Set up of the display language
Setting Language	Language:ITA	Sprache: ITA	Set up of the display language
Memory is to be full	Memory left xx.x%	memory left xx.x%	When the memory space of card is less than 5%, this warning should be displayed in the status.
Fan Lock	Fan Lock	FanLock	The fan for heat dissipation is stopped abnormally
Other Message			
Initial screen	Ver xx.xx	Ver xx.xx	LCD Firmware version
USB connection	USB CONNECT	USB angeschlossen	Connect to PC with USB
Daily graph	No Daily Records	Keine Tagesaufz.	No data for daily graph display
Daily graph	Please Wait	Bitte warten	data processing

Operating conditions	In English	In German	Description
Weekly graph	No Weekly Records	Keine Wochenaufz.	No data for weekly graph display
Error history	Error History	Fehler	banner
Error history	No Error History	Keine Fehler	No data for error history display
Error history	Value=N/A	Value= N/A	fault value is not available
Error history	Value=xxxx xxxx xxxx	Value= xxxx xxxx xxxx	display fault value
System display	SYSTEM INFORMATION	Systemanzeige	banner
Display after error	Press OK to Clear	Presse OK zum Löschen	Press OK to clear fault message box

7. Communication Interface

7.1. RS-232 (on inverter)

The PV-Inverter is equipped with a versatile communications interface. Use the inverter "Pro Control" to monitor the status of multiple inverters. Firmware upgrades are also available via this interface. The inverter is integrated with a DB9 socket for the RS-232 interface. Open the DB9 socket cover before use. Pin assignment of this DB9 socket is stated as below:
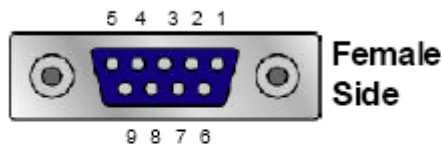
Pin	Signal Assignment
1	N.C.
2	TxD
3	RxD
4	N.C.
5	Common
6	N.C.
7	N.C.
8	N.C.
9	N.C.

7.2. Optional Communications slot for RS-485

PV-Inverter has an extended slot for an optional communication interface. Hardware such as RS-485 card or compliant card to extend the communication functions of the inverter. To use this slot, please use a screwdriver to open the cover, insert the card into the slot and wire through the rubber bushing. For further information, refer to manual of related interface card.
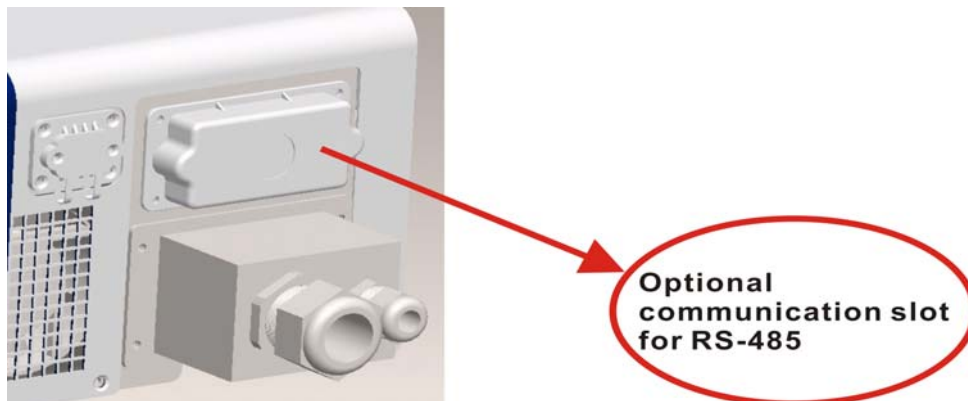
7.3. USB (on Data Logger)

The Data Logger is fit with a mini USB connector for your PC USB host interface. Open the mini type USB socket cover before use.

8. Downloading Data inside Data Logger

To manage the data inside the Data Logger, please take out the Data Logger from inverter and access its internal data via USB cable. The Data Logger is powered directly by the PC's USB port.

8.1. How to eject / inject the Data Logger[*]

（1）Push the area which marked "PUSH LOCK/UNLOCK", the Data Logger will be ejected. Take it out carefully.

（2）After taking out, you can see a cable between Data Logger and inverter, unbind the cable if necessary. The cable can be extended to 1.8m at most. To get further extension, you can use a standard RS-232 cable to do that. To separate the Data Logger from inverter, disconnect RS-232 connector on it.

（3）When you want to place back the Data Logger, please use the tie provided to bind the cable as shown above. Then, cram the cable and slide the Data Logger into the inverter, slightly push the Data Logger on the side, the Data Logger will be locked.

---

[*] This section applies only to inverter with removable data logger.

8.2. How to Access and Manage Log Data

（1）Remove the Data Logger from the inverter and disconnect the RS-232 cable. Unscrew and take off the cover of mini-B USB port. For PC with **Windows ME, 2000,** and **XP**, **Vista**, **Windows 7**, it is not necessary to install driver to access the data logger. For PC with **Windows 98**, to access the data logger, driver for the data logger is needed. ****Do not remove the data Logger while the inverter unit is working.****

（2）Connect the mini-B USB to Data Logger and Type A USB to PC. LED will show "USB CONNECT" when Data Logger is connected to PC properly.
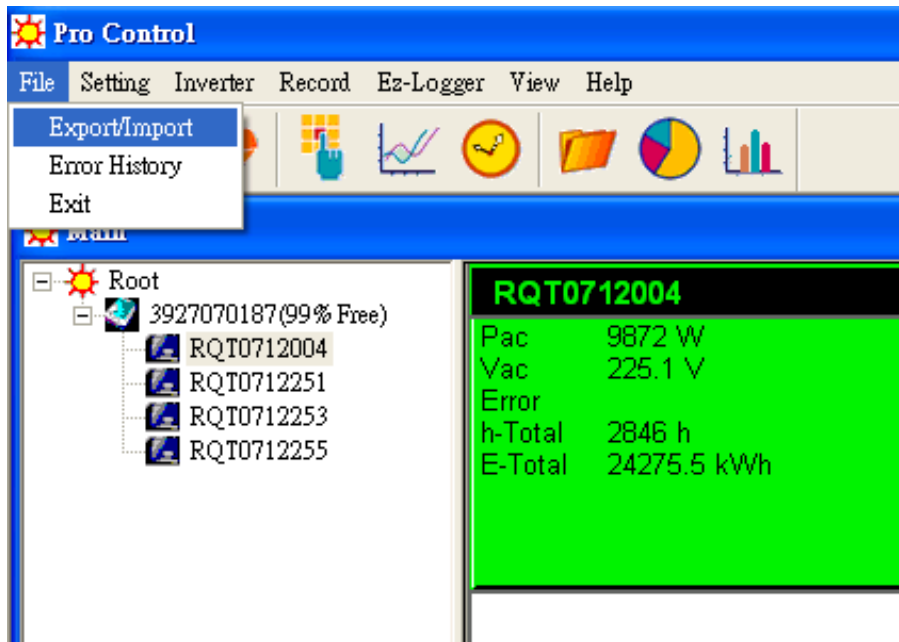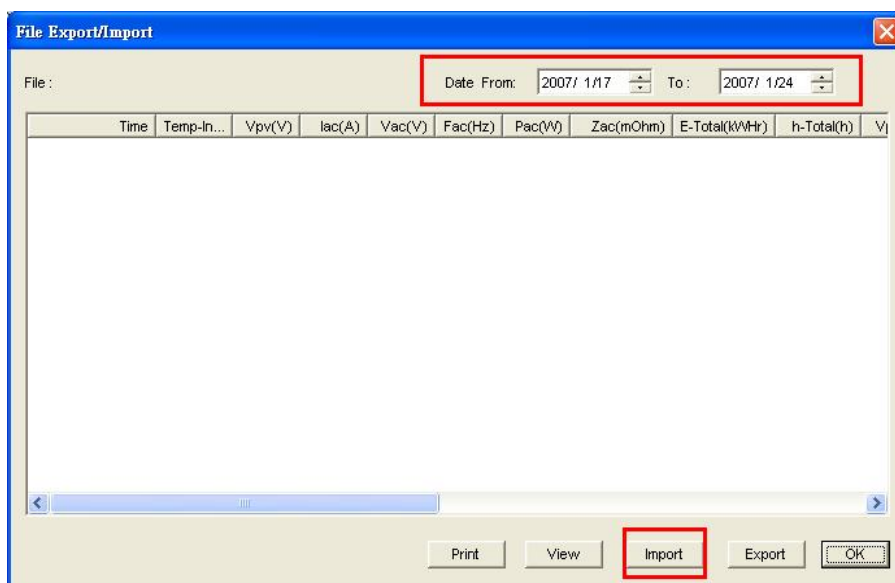

（3）Click "My Computer" – "Removable Disk" in your PC.

（4）Copy the "DAILY" folder in the "Removable Disk" and paste it on the "Desktop."

（5）Execute the Pro-Control program. Then, click "File", select "Export/Import".
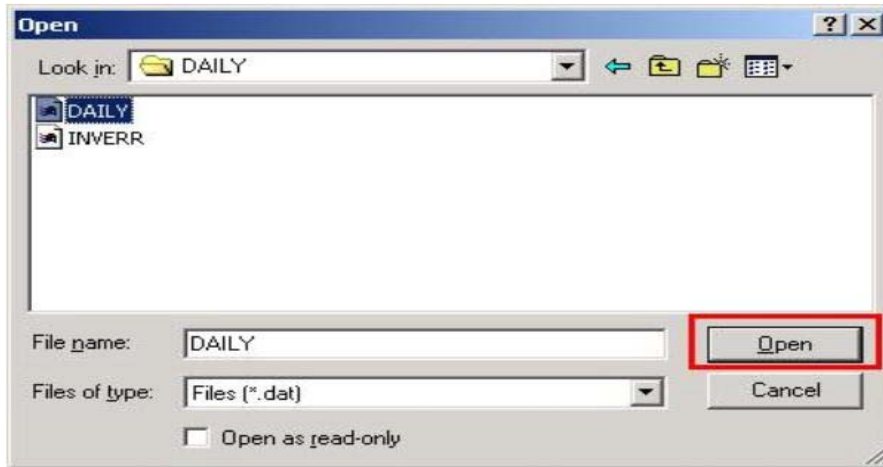
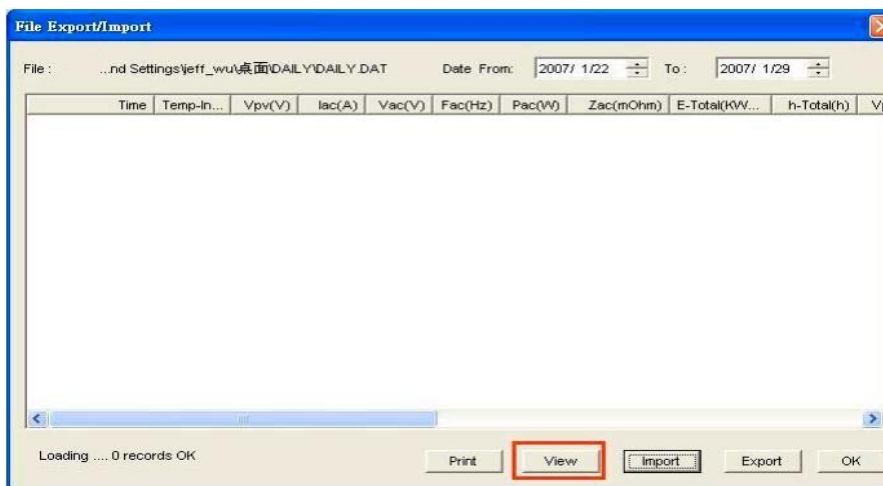Please contact your local dealer or representative for the installation for this program.

（6）Select "Date from" and "Date to" the period which you prefer. Then, click "Import" button.

（7）Select "DAILY.dat" file under your previous saved DAILY folder. Then, click "Open" button.

（8）Click "View" button and the log data will be processed by Pro-Control software in few seconds.

（9）Click "Export" button
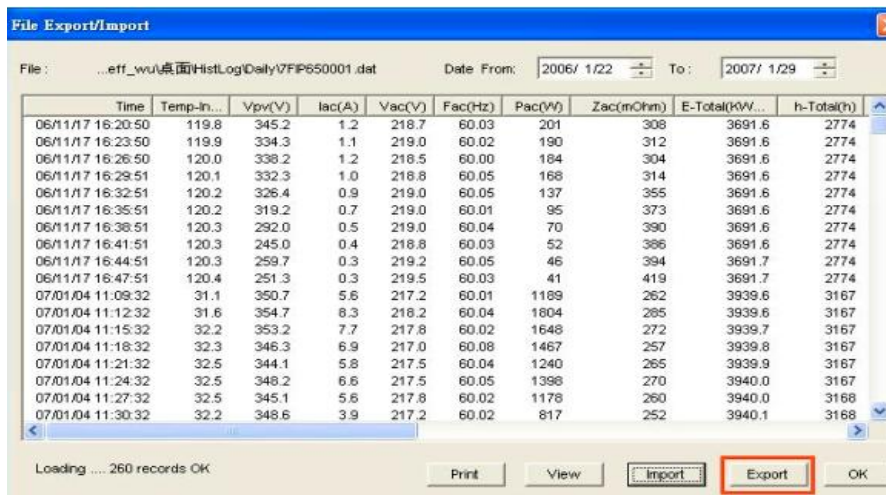
（10）Click "Save" button. Then, log data will be saved in .CSV format in your preferred directory in your PC

（11） Click "OK" button.

（12）Double click "DAILY.CSV" file in your preferred directory in your PC. After that, you can manipulate the log data with Microsoft Excel.

9. Troubleshooting

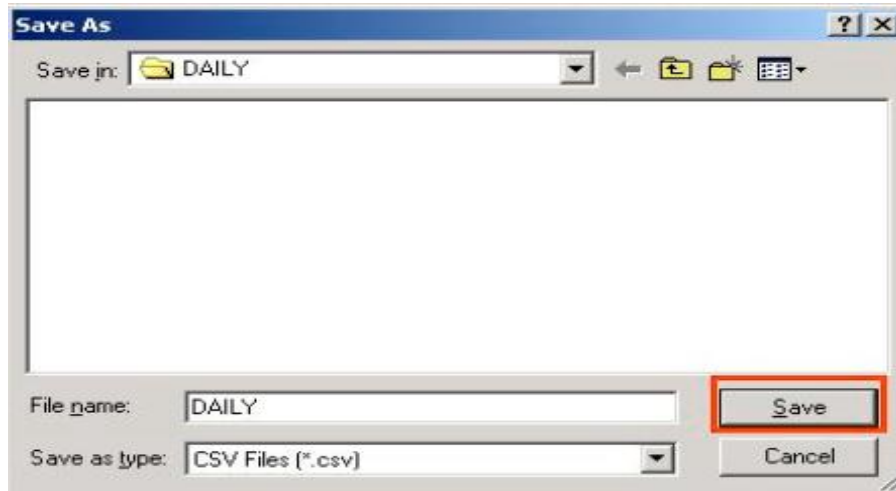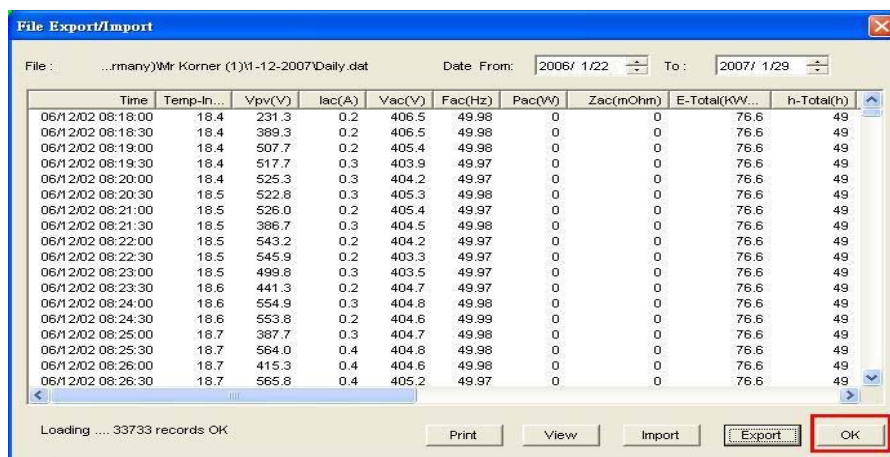PV-Inverter requires very little maintenance. When unexpected situation occurs, please refer to the following table for quick troubleshooting before contacting your local service. The following table lists common fault messages and ways to cope with the fault or error.

Fault Analysis and Actions

	Fault Message	Fault definition	Possible Causes	Proposed Actions for End-user	Proposed Actions for Professionals
System Fault	Ground I Fault	The ground current detected by inverter is higher than threshold	1. Obstacle, humidity or water exits between AC LINE and/or NEUTRAL to earth ground 2. Obstacle, humidity or water exits between AC LINE and/or NEUTRAL to earth ground in the junction box 3. The Insulation of AC wires is broken that could be bit by rat or any animals 4. Inverter is abnormal	1. Disconnect AC connection of inverter by opening AC switch. 2. Check the AC junction box and wiring of system. Clear obstacle ONLY IN SAFE CONDITIONS 3. Reconnect AC connection, check the status of inverter 4. If the problem persists, call local service	1. Disconnect AC side of inverter by opening AC switch 2. Disconnect the DC side from the inverter 3. Check both the AC and DC wiring and insulation 4. Reconnect AC connection, check the status of inverter 5. If the problem persists, please ➢ Update the firmware according to instructions, or ➢ Replace the inverter
	Grid Fault	Grid measured data is beyond the specification (voltage & frequency)	1. The detected AC voltage is beyond/under the setting of inverter 2. The detected AC frequency is beyond/under the setting of inverter 3. AC connection is not correct 4. Grid condition is weak or unstable 5. Other high-power consumption device is affecting the grid system 6. The setting of inverter is deviated from its default values 7. Inverter is abnormal	1. If this problem occurs seldom (such as 1 time a day), no action is necessary 2. If the problem occurs frequently, do the actions below 3. Find the device with high power consumption near your AC system 4. Use inverter software to check the setting of inverter. The setting should be in the range listed in specification 5. If the settings are not correct, call your service for changing 6. Use inverter software or monitoring device to collect data. Send the data to professionals for further investigation 7. Consult your utility power supplier, understand the grid conditions 8. Ask help of your installer	1. Check the system connection including polarities and security first 2. Find the devices with high power consumption near the AC system 3. Consult the utility power supplier, understand the grid conditions 4. Use inverter software to monitor the frequency and voltage 5. If the measured data beyond the setting, under the permission of utility supplier, use the software to change parameters 6. If the situation is not improved after changing parameters, please ➢ Update the firmware according to instructions, or ➢ Replace the inverter
	No Utility	Inverter is not able to detect AC voltage	1. Grid is not available 2. AC connection is incorrect 3. AC switch between inverter and utility is not ON 4. AC fuse and/or breaker is open 5. Inverter is abnormal	1. Make sure the breaker and switch on AC side are close 2. Check the AC wiring 3. If the problem continues, call your local service	1. Make sure the breaker and switch on AC side are close 2. Check the AC wiring 3. If the problem continues, replace the inverter

	Fault Message	Fault definition	Possible Causes	Proposed Actions for End-user	Proposed Actions for Professionals
	PV over Voltage	The detected PV voltage is higher than specification	1. The PV array voltage is too high 2. Inverter is abnormal	1. Open DC connection of inverter and reconnect 2. If the fault continues, call your local service	1. Check the open PV voltage, and see if it is more than or too close to specification 2. If PV voltage is much less than specification and the problem still occurs, please replace the inverter

	Consistent Fault	The readings of 2 microprocessors are inconsistent	1. Software problem
			2. Circuits inside inverter are abnormal
			3. Inverter is abnormal
				1. Open all DC connections of inverter
				2. Wait for 3 minutes
				3. Reconnect DC connection and check
				4. If the fault continues, call your local service
					1. Open all DC connections of inverter
					2. Wait for 3 minutes
					3. Reconnect DC connection and check
					4. If the fault continues
					  ➤ Update the firmware according to instructions, or
					  ➤ Replace the inverter

Inverter Failure	**Over Temperature**	The detected temperature is high	1. Ambient temperature is too high 2. Heat dissipation problem 3. Inverter is abnormal	1. Make sure the ambient temperature of installation is less than 55°C 2. Check the space near the heat sink 3. Remove any obstacle that block the heat dissipation near heat sink 4. Call local service if the problems persists	1. Make sure the ambient temperature of installation is less than 55°C 2. Check the space near the heat sink 3. Remove any obstacle that block the heat dissipation near heat sink 4. If the problem persists, replace it

	Relay Failure	The checking of AC relay is abnormal	Inverter is abnormal	1. Disconnect ALL PV (+) and PV (-)
				2. Wait for 1 minutes
				3. After no display on LCD, reconnect again and check
				4. If the message appears again, call your local service
					1. Make sure installation is under specification of each model for "High DC Bus"
					2. Do the same actions as left column again
					3. If the problem persists, please try to
					  ➤ Upgrade the latest firmware according to instruction or firmware release note, or
					  ➤ Replace the unit

	DC INJ High	DC current component in AC output is higher than permission	1. The AC sensor at output is abnormal
			2. Grid DC current is higher than the permissible value.
			3. Inverter is abnormal
				1. Observe the faulty condition for 1 minute.
				2. If it does not restore to normal operation, please call service.
					1. Reconnect DC connection and check
					2. If the fault continues
					  ➤ Update the firmware according to instructions, or
					  ➤ Replace the inverter

	EEPROM Failure	EEPROM inside inverter is abnormal	1. Software problem
			2. Circuits inside inverter are abnormal
			3. Inverter is abnormal
				1. Disconnect PV (+) and PV (-) from the input, start the unit again.
				2. If it does not work, please call service.
					1. Do the same actions as left column again
					2. If the fault continues
					  ➤ Update the firmware according to instructions, or
					  ➤ Replace the inverter

	SCI Failure	Communication between the two CPUs is abnormal	1. Software problem
			2. Circuits inside inverter are abnormal
			3. Inverter is abnormal
				1 Disconnect PV (+) and PV (-) from the input, start the unit again.
				2 If it does not work, please call service.
					1. Do the same actions as left column again
					2. If the fault continues
					  ➤ Update the firmware according to instructions, or
					  ➤ Replace the inverter

	High DC Bus	DC BUS voltage inside inverter is higher than expectation	Inverter is abnormal	1. Disconnect PV (+) and PV (-) from the input, start the unit again.
				2. If so, please call service.
					1. Do the same actions as left column again
					2. If the fault continues
					  ➤ Update the firmware according to instructions, or
					  ➤ Replace the inverter

47

Fault Message	Fault definition	Possible Causes	Proposed Actions for End-user	Proposed Actions for Professionals

Low DC Bus	DC BUS voltage inside inverter is lower than expectation	Inverter is abnormal	1. Disconnect PV (+) and PV (-) from the input, start the unit again.
			2. If it does not work, please call service.
				1. Do the same actions as left column again
				2. If the fault continues
				  ➢ Update the firmware according to instructions, or
				  ➢ Replace the inverter

DC Sensor Fault	The DC sensor at output is abnormal			
GFCI Failure	The GFCI detection circuit is abnormal			

Warning: Dangerous high voltage exists on both DC and AC wires and connections. For the end-user: Please do NOT touch any live parts.

10. Preventative maintenance

Although PV-Inverter requires very little maintenance, the following inspections at regularly would help to ensure PV Inverter operation with optimal performance.

10.1 Visual Inspection
Check the inverter and cables for any signs of external damage. Contact your installer immediately if you find any defects. **Do not carry out any repairs on your own**.

10.2 Checking and Maintenance
Asking your installer to check for proper inverter operation at regularly is the measure we suggested for preventative maintenance.

The following check is the key:
   (1) Check If the fan guard is covered with debris or dust, get rid of it if find any.

   (2) Check heatsink to ensure no barrier blocking its air flow.

   (3) Inspect for corrosion, especially at connecting point.

   (4) Verify all connections are firmly tightened periodically.

   (5) Clean the exterior of the unit periodically with a damp cloth to prevent accumulation of dust and dirt, Keep warranty label intact anyhow.

   (6) To get optimal performance, PV-panel cleaning periodically would also be essential due to it is prone to dust and dirt accumulation.

Before cleaning PV-panel or Inverter, be sure to switch off AC power and double check LCD of Inverter displaying "No Utility", cleaning shall be restricted to the exterior surface.

To avoid any risk of electric shock, AC and DC power shall be switched off whenever personnel need to contact PV-panel under any circumstances.

11. Specifications

Model	10KW
Market	Germany
Nominal AC output power	10000 W
Max. AC output power in 10 minutes	11000 W
Input	
Nominal DC voltage	640 V_{DC}
Maximum PV power / Tracker	5500 W
Maximum PV open voltage	800 V_{DC}
Full load rated voltage range	400 ~ 720V_{DC}
MPPT voltage range	245 ~ 720V_{DC}
Maximum DC input current / Tracker	13 A_{DC}
Output	
Operational voltage	400Vx3,-15% +10%
Operational frequency range	47.55~50.15 Hz
Maximum AC-current	17.5A_{RMS}
Nominal AC-current	14.5A_{RMS}
AC wiring system	3-phase, 4 wire
O/P Current distortion	< 3%
Power factor	> 0.99
Conversion efficiency(max)	96.5%
European efficiency	95% @ nominal input
System	
Protection degree	Chassis: IP65; Fan: IP55
Operational temperature range	-20 to 55°C
Operating Altitude	Under 2000m
Continuous full power temperature range	-20 to 40°C
Humidity (no condense)	0 to 95%
Heat Dissipation	Air force cooling, variable fan speed control according to temperature on heat sink
Acoustic Noise Level	Under 50dB
Display	128X64 Graphic LCD
Hazard substance restriction	Lead free, complied with RoHS GP2
Communication	RS-232 Standard, RS-485 optional
RS485 Protocol	Standard protocol
Mechanical	
HxWxD (mm)	581.81 x 453.2 x 151.83
Weight (kg)	33.9kg

*The product's specifications are subject to change without notice.

12. Disposal

The dealer or installers should remove the PV Inverter from the array and contact the supplier for disposal instructions

The inverter must not be disposed of with the household waste.

Dispose of the PV Inverter at the end of its service life should be done in accordance with the disposal regulations for electronic waste which apply at the installation site at that time.

Please contact supplier for disposal instruction, the contact information could be found in **Chapter 13. Contact Information.**

14. Compliance of Standards

EMC:
DIN EN 61000-6-3 (class B)
DIN EN 61000-6-2

Grid Interface Regulation:
VDE0126-1-1 (2006)

Safety:
DIN EN 50178

CE:
LVD: 2006/95/EC
EMC: 2004/108/EC

Environment Category:
Pollution Degree II
Overvoltage Category III

*Note: Both DC input and AC output of the inverter have equipped with surge protection component which is VDE IEC61051-1 recognized. Therefore, the inverter shall be protected from overvoltage in Type 2 application.

15. Load Graph and Efficiency Graph

The relationship between PV input voltage (String voltage, V_{PV}) and input power (P_{MPP}) is shown in the following example. Once the PV input voltage is less than 423V, the relation of V_{PV} and power is:

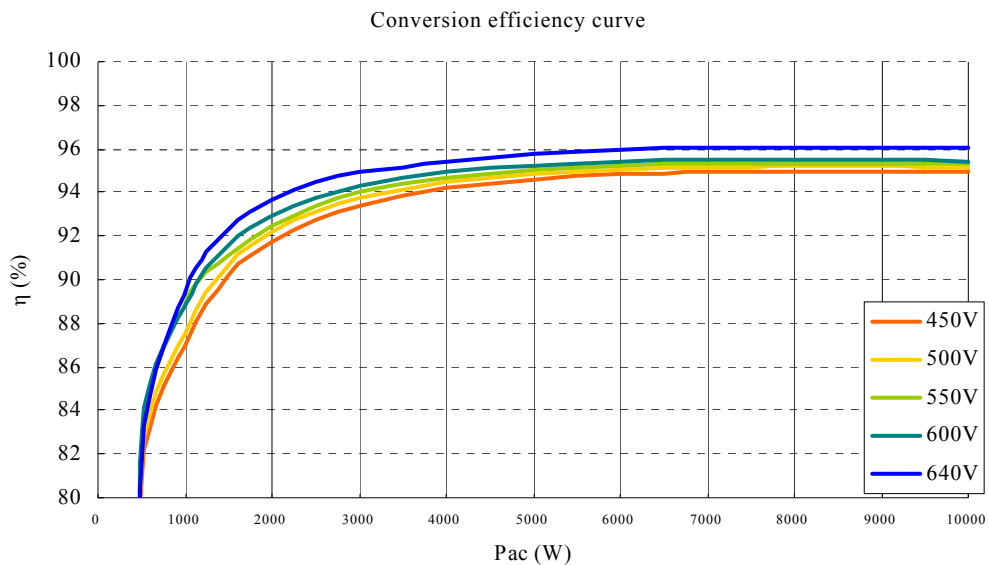$P_{PV}(W) = 0.0205 \times V^2_{PV} + 4.8 \times V_{PV}$
(under condition: 423V > String voltage, V_{PV} > 200V)

For example: V_{PV} is $400V_{DC}$, the maximum power converted by the inverter in one string is 5200W.
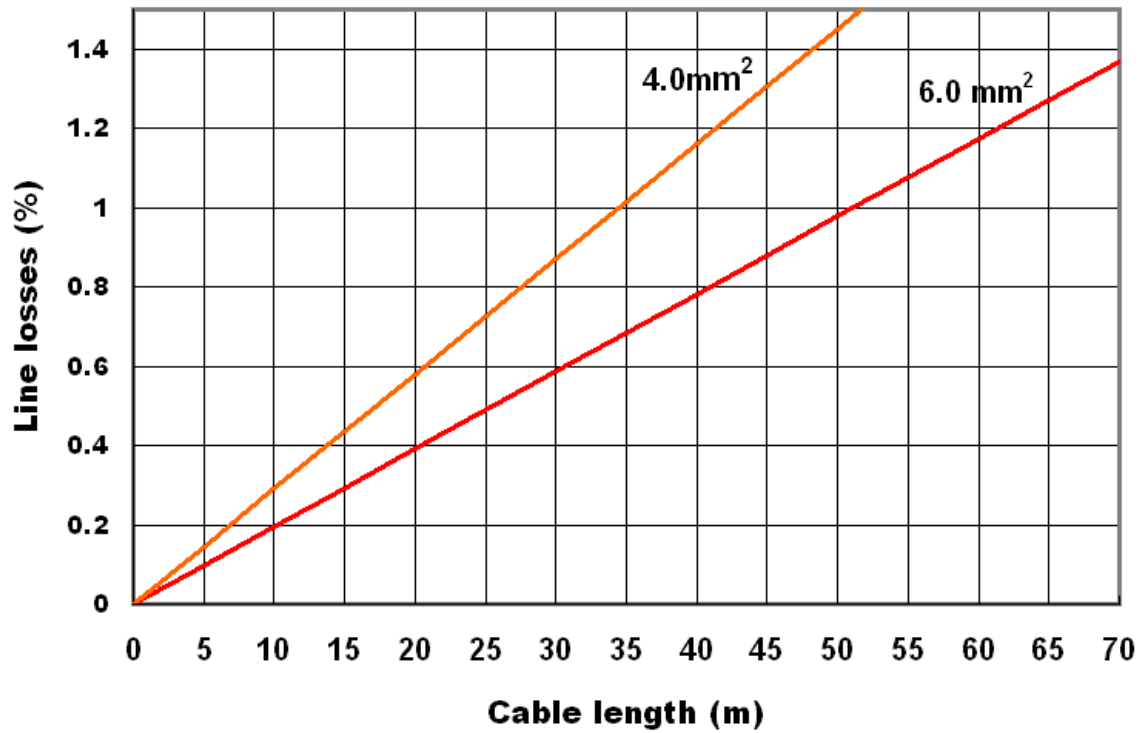
Allowable String DC Power vs. String Voltage
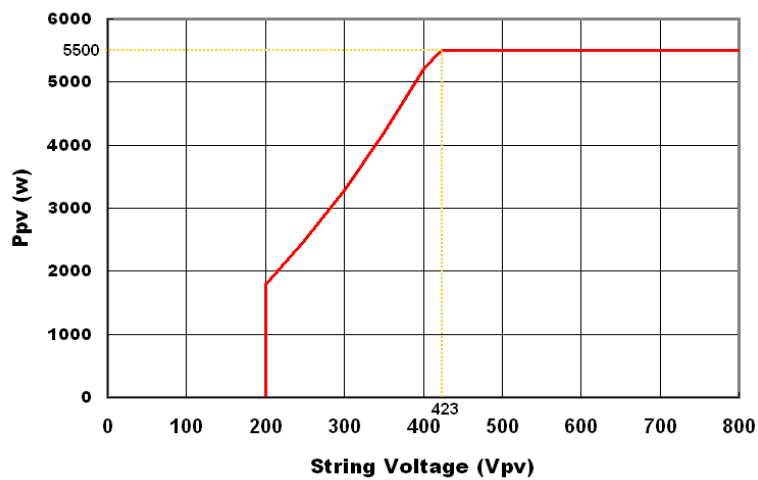
The typical efficiency chart related to V_{DC} and P_{AC} is as shown below.

Conversion efficiency curve

Results may vary due to test equipment tolerances and product differences.

Appendix I: Line losses of the Inverter

The following maximum cable lengths are possible for the different cable cross-sections:

Cable cross-section	4.0 mm2	6.0 mm2
Max. cable length	34 m	51 m

Appendix II: SELECTING THE LINE CIRCUIT BREAKERS

- the maximum possible nominal current for the cable used and the maximum possible fuse protection for the inverter limit the maximum possible nominal current for the line circuit breaker

- additionally, check the thermal suitability of the line circuit breakers

When selecting line circuit breakers, a number of load factors needs to be taken into account. These can be found in the respective datasheets. For example, one manufacturer's circuit breaker may be designed for an ambient temperature of $50°C$.