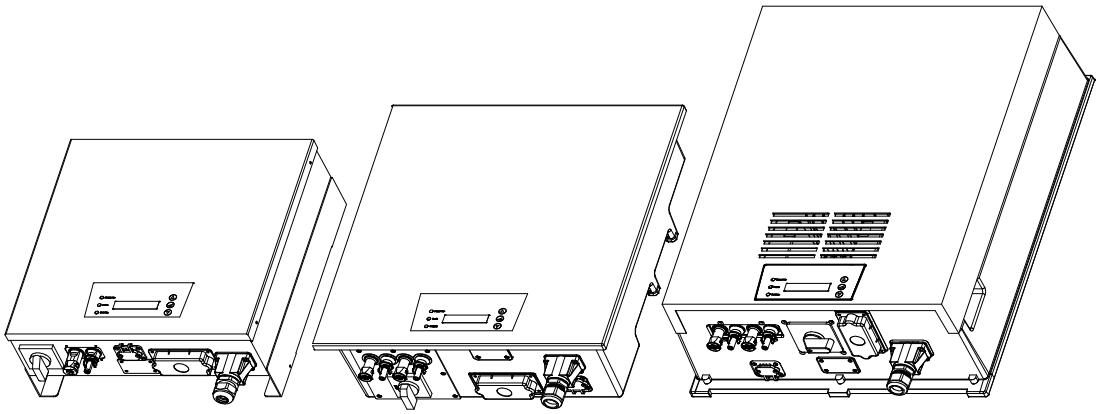
Grid-Tied PV-Inverter

SV 1500s
SV 2000s
SV 3000s
SV 4000s
SV 4600s
SV 6000s

Installation and Operation Manual

Version 2.0E 2014.04



Contents

Before Getting Started …

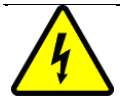
This manual contains important information regarding installation and safe operation. Be sure to read this manual carefully before using the product.

Thanks for choosing this Grid-tied PV inverter (referred to in this manual as “PV inverter”, or simply “Inverter”). This Grid PV inverter is a highly reliable product due to its innovative design and perfect quality control. Such an Inverter is used in high demand, grid-tied PV systems.

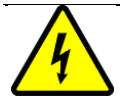
If you encounter any problems during installation or operation of the product, please check this manual first before contacting local dealer or supplier. Instructions inside this manual will help you solve most installation and operation difficulties. This manual shall be stored together with other system documentation and be accessible easily.

Safety Instructions

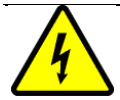
Risk of Electric Shock
Alternating Current (AC) and Direct Current (DC) sources are connected to this device. To prevent risk of electric shock during maintenance or installation please ensure that all AC and DC connections are disconnected.



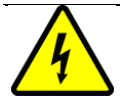
Risk of Electric Shock
When PV module or panel is exposed to light, it starts to supply high DC voltage, be sure to turn off DC switch before commencing the maintenance, and make sure the cables from PV panel are properly sealed after disconnection.



Risk of Electric Shock
To avoid electric shock resulted from leakage current, make sure the earth cable at AC terminal is well connected before connecting to the utility.



Risk of Electric Shock
In case there is more than one source of DC power supply, please disconnect all sources before commencing maintenance.

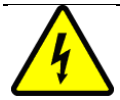


Risk of Electric Shock
After disconnecting the PV inverter from PV modules, the inverter will continue the discharge at DC terminal for a short period. Before commencing maintenance, please wait for at least 2 minute after the power is disconnected.

Risk of Electric Shock
The PV inverter is designed to feed AC power directly in the public grid. Do not use the inverter as an AC power supply for equipment, appliances or devices.

Danger of Burn
Although designed to meet international safety standards, the PV inverter can become hot during operation. Do not touch the heat sink or housing during or shortly after operation.

Authorized Personnel Only
Only authorized personnel are allowed to install, commission and repair the inverter.



Risk of Electric Shock
Risk of electric shock from energy stored in capacitor, do not remove cover until 2 minutes after disconnecting all sources of power supply.

Warning
Some models of the PV inverter may be too heavy to be lifted by manpower. To avoid injury be sure to use proper lifting equipment while unpacking and installing the Inverter.

Warning
If the PV inverter is used in a manner which is not covered by the scope of warranty, the protection provided by the PV inverter may be impaired.

Scope of Warranty

The Inverter comes with a standard 5-year warranty. This warranty includes all defects of design, components and manufacturing. The Warranty is void and does not cover any defects or damages caused by in any of the following circumstances:

- Seal on the product is broken
- The Inverter has been misused, neglected, or abused
- Improper transportation and delivery
- The Inverter has been used or stored in conditions outside its electrical or environmental specifications
- The Inverter has been used for purposes other than for which it was designed
- The Inverter has been used outside its stated specifications, operating parameters and application
- Acts of third parties, atmospheric discharges, excess voltage, chemical influences, natural wear and tear and for loss and damage in transit
- Improper testing, operation, maintenance, adjustment, repair, or any modification of any kind not authorized in writing by the Inverter supplier
- The Inverter has been connected to other equipment with which it is not compatible
- Use and application beyond the definition in this manual
- Application beyond the scope of applicable safety standards or grid codes (VDE, UL etc.)
- Acts of nature such as lighting, fire, storm, flood, vandalism and etc.

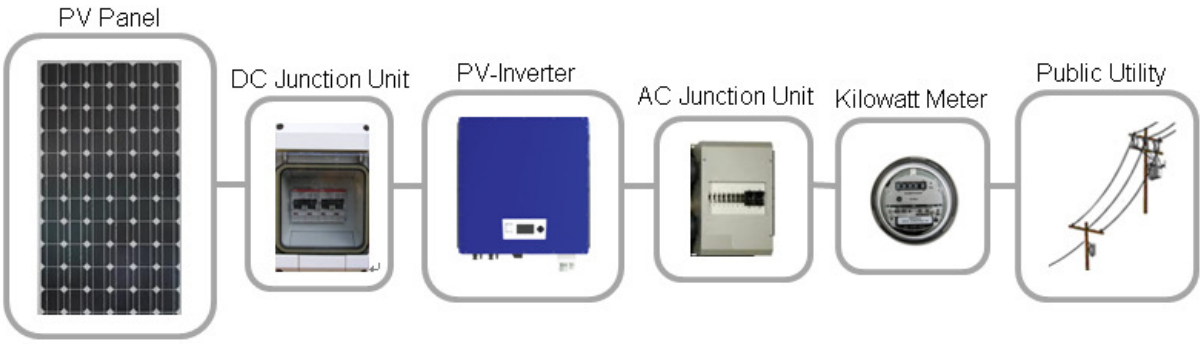
The right to repair and/or replace the defective product is at the supplier's sole discretion. Any warranty claim shall be asserted in writing to the supplier within 5 working days after notice of product failure. The supplier is not responsible for damages beyond the scope of this warranty.

1. Product Overview

1.1. PV System

A Grid-tied PV System is mainly composed of 5 parts: **PV Array (or PV Panel)**, **DC Junction Unit**, the **PV inverter**, **AC Junction Unit** (connection Interface) and a connection to the **Public Utility.**

The typical PV system is shown in the following figure.



▲Figure 1.1-1 Grid-tied PV System

Unit	Description
PV Array	A device which convers light energy from the sun into electricity and provide DC power to the Inverter
DC Disconnect Unit (or DC Junction Unit)	The “interface” between PV array and PV inverter which consist of DC breaker, and connecting terminals.
PV Inverter	A device which converts DC (Direct Current) power from PV panel(s) to AC (Alternating Current) power.
AC Disconnect Unit (or AC Junction Unit)	The interface between Utility and PV-Inverter for the installation of protection equipment devices required by safety standards, such as AC switch, AC breaker, fuse and connecting terminals. To comply with local safety standards and codes, the power system configuration should be designed and implemented by a qualified technician.
Public Utility or Gird	The infrastructure allowing electric power company to supply AC power to end users (also referred to as “grid” in this manual). Please note that the PV-Inverter can only connect to low-voltage systems

▲Table 1.1-1 Description of each part

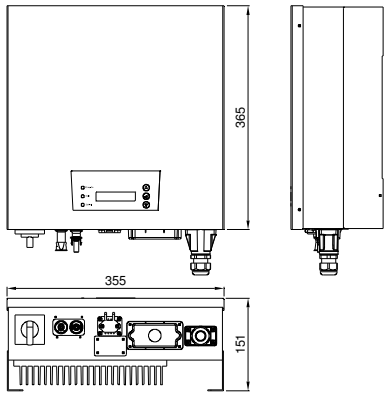
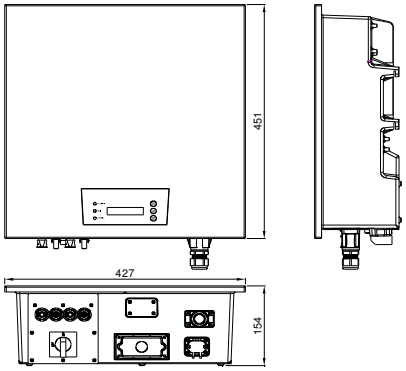
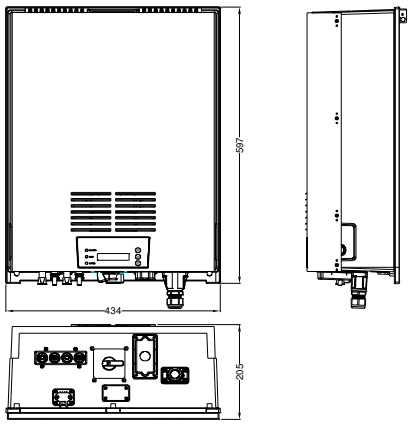
DC Disconnection Device
According to DIN VDE 0100-712:2006-06, a device for disconnecting Inverter from DC po must be installed between PV-module and the Inverter in Germany.

PV Modules Only
Do not connect any DC power sources other than PV modules to PV inverter.

WARNING!
External AC and DC disconnect device shall comply with local safety standards and codes, the connection system should be designed and implemented by a qualified technician.

1.2. Product Introduction

The grid-tied PV Inverter converts direct current (DC) power generated by PV array into alternating current (AC), which is compatible with the local electricity distribution network (also known as public utility or grid system).

Model	Appearance	Dimension
SV 1500s **SV 2000s**		355*365*151
SV 3000s **SV 4000s**		427*451*154
SV 4600s **SV 6000s**		434*597*205

▲ Table 1.2-1 Appearance and Dimensions of each model

1.3. Identification of Product Model

It is essential for installer or user to keep a record of Inverter information (such as model, serial number and associated pole number) installed for the purpose of management or maintenance and service in the future.

■ Model Number and Serial Number

A **Rating Label** can be found on the left side of the PV inverter (Fig 1.3-1) which states the Type, Brand Name, Model Name, Specifications, and the Serial Number of the Inverter. In the event a problem is found during installation or operation, please record the Serial Number (SN) before contacting your local dealer or service representative.

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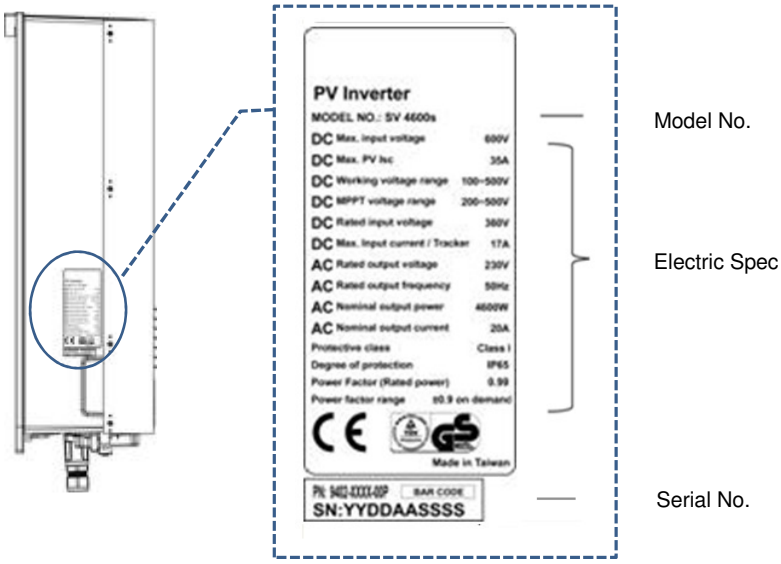


▲ Figure 1.3-1 Rating label

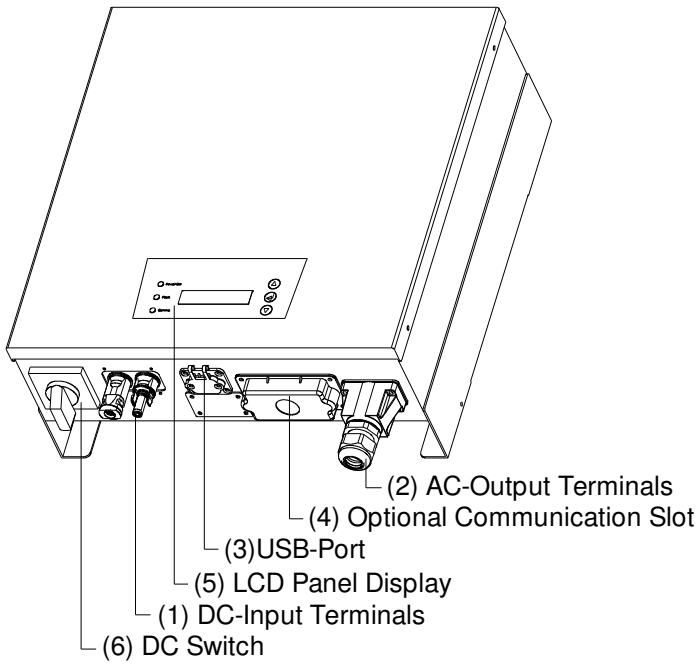
■ Exterior Parts

The major exterior parts of Inverter are described as below: (Table 1.3-1 and Figure 1.3-2):

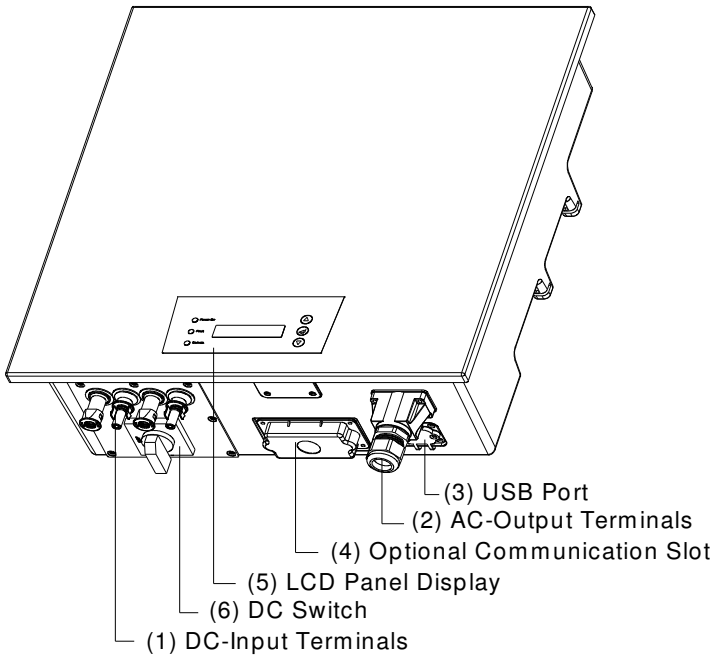
Part Name	Description
(1) DC-Input Terminals	The terminals for the connection with PV array. Each input pair consists of positive and negative terminal
(2) AC-Output Terminals	The terminals for the connection with AC grid
(3) USB Port	The port for the connection with PC. User may connect the Inverter with PC via an USB cable; Specific software program shall be installed on PC in order to enable this communication feature
(4) Optional Communication Slot	Slot for optional RS485 card., Users can link the inverter via communication network and monitor its real-time operation and status remotely
(5) LCD Panel Display	Display for operation status and parameter setting
(6) DC Switch	The switch for disconnecting the inverter from PV array
(7) Fan	External cooling fan for the inverter

▲ Table 1.3-1 Description of major exterior parts

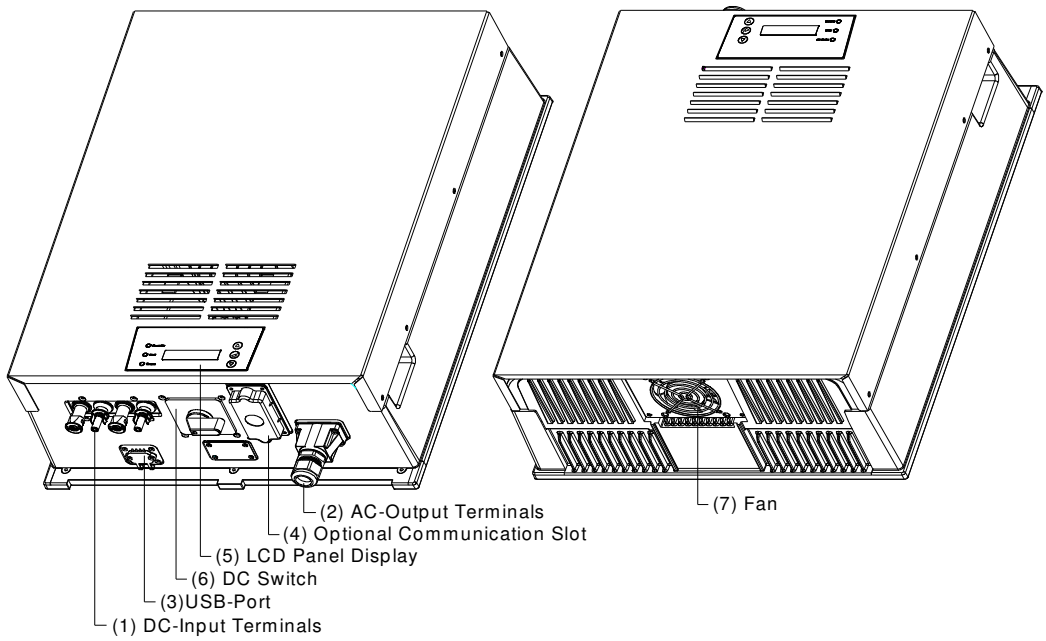
SV 1500s
SV 2000s



SV 3000s
SV 4000s



SV 4600s SV 6000s

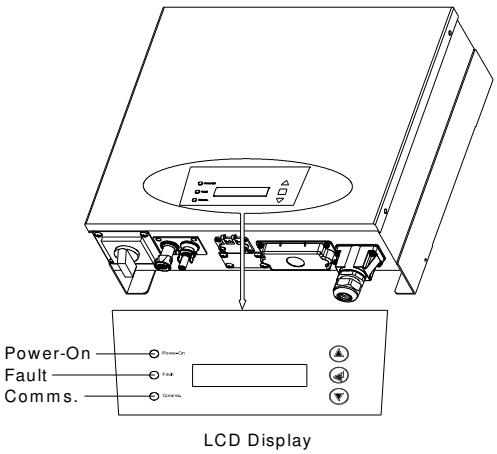


▲ Figure 1.3-2 Position of exterior parts on the inverter

1.4. Identification of Product Model

■ Front Control Panel

The front control panel consists of a LCD display, three status indication LEDs, and three keys.



▲ Figure 1.4-1 Front panel

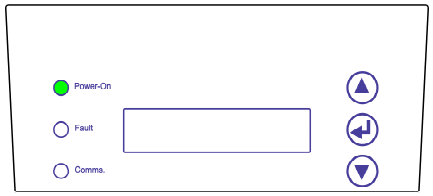
Parts	Name	Description
LED	Power-On	This LED lights when the Inverter is powered on
	Fault	This LED lights on if a fault is detected
	Comms	This LED lights on when the communication port is activated
Button	△	Scroll up the menu or move the cursor upward
	▽	Scroll down the menu or move the cursor downward
	□	Set or confirm the setting
LCD Display	16 Characters x 2 lines; Monochrome	For displaying the operational status and parameter settings

▲ Table 1.4-1 Description of parts on front panel

■ LED

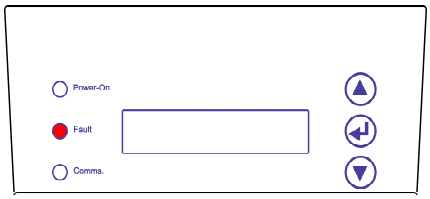
There are 3 LEDs on the front panel and they are designed to indicate the following statuses:

(1) Power on LED (Green): The inverter is feeding AC power to grid.



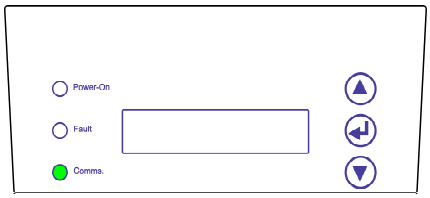
▲ Figure 1.4-2 Power On LED

(2) Fault LED (Red): A fault has been detected and the inverter has tripped off from the grid. More details of possible faults and their remedial actions can be found in the chapter “Troubleshooting”.



▲ Figure 1.4-3 Fault LED

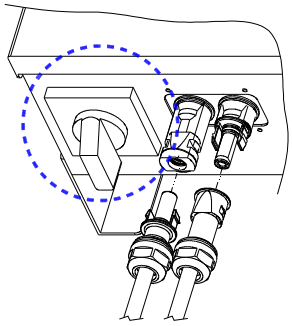
(3) Communication LED (Green): Communication via USB port or RS-485 card is in progress.



▲ Figure 1.4-4 Communication LED

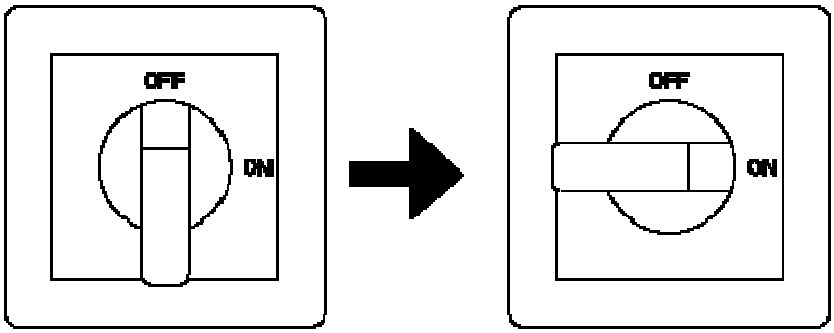
1.5. DC Switch (optional)

A built-in DC switch is available for SV 1500s to SV 6000s models and can be found at the bottom of the Inverter.



▲ Figure 1.5-1 Location of DC switch

To feed DC power to the Inverter, the DC switch shall be switched to “ON” position (Figure 1.5-2).



▲ Figure 1.5-2 Switch on the DC switch

Note: This integrated DC switch is merely a switch for disconnecting DC power from the Inverter. Additional DC breaker must be comprised in DC junction unit in order to comply with safety standard.

2. Installation

2.1. Scope of Delivery

After opening the package, please check the content of the carton which should contain the following items (Table 2.1-1):

Item	Q'ty	Note
(1) PV-Inverter	1	Grid-tied PV Inverter
(2) Mounting Bracket	1	Bracket for mounting the PV inverter on the wall
(3) Accessory Box	1	Box Containing all necessary accessories (Table 3.1-2)
Note: Please keep the packing materials (carton, cushions and etc.) in case of need to send the product for repair.		

▲ Table 2.1-1 Scope of Delivery

Accessory Box contains accessories as listed in the table below,

Items	Q'ty	Items Description	Figure
User's Manual	1	Installation and Operation Manual	
DC Connector Extractor	1	Tool for dismantling the DC input connector	
Rubber Bushing (10.7mm)	1	For AC wires connection.	
Rubber Bushing (16.4mm)	1		
Nylon Drive Anchor	4 (or 6)	Accessories for mounting the wall bracket	
Screw (M4 x 30L)	4 (or 6)		
Security Screw	2	For securing the inverter on the wall mounting bracket	
Screw (M3 x15L)	4	For AC Cover installation	
AC Cover	1	Cover for AC terminal block	
Rubber Bushing	1	Accessories for communication slot	
Screws (M3 x 15L)	4		
Communication Slot Cover (Optional)	1		
MC4 connector (male-female pair)	1 (or 2)	1 pair for SV1500s & SV2000s 2 pairs for SV3000s,SV4000s,SV4600s & SV6000s	
Warning label	1		

▲ Table 2.1-2 Content of Accessory Box

2.2. Installation Cautions

Before starting installation, please consider and check the followings

- ✓ Make sure the ambient temperature of installation is within the specified range -20 ~ +60°C
- ✓ The grid voltage and frequency at installed site must fall within the specific range set out in the product specification.
- ✓ Prior approval for grid connection has been granted by electric utility company. The installation will be performed by qualified personnel
- ✓ Adequate space is available for ventilation
- ✓ No flammable object is near the Inverter
- ✓ No mounting on wooden or flammable surface

WARNING!
SV 1500s, SV 2000s, are designed for indoor use (IP43). Do not expose the Inverter to humid or moist conditions.

WARNING!
SV 3000s, SV 4000s, SV 4600s, SV 6000s are designed for outdoor application (IP65), however, it is recommended not to expose the PV-Inverter directly to severe moist or humid environment.

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

Installation location :
The Inverter can be installed and operated at locations where the ambient temperature is up to 60°C. However, for optimal operation, it is recommended that Inverter is installed where the ambient temperature is between 0~40°C.

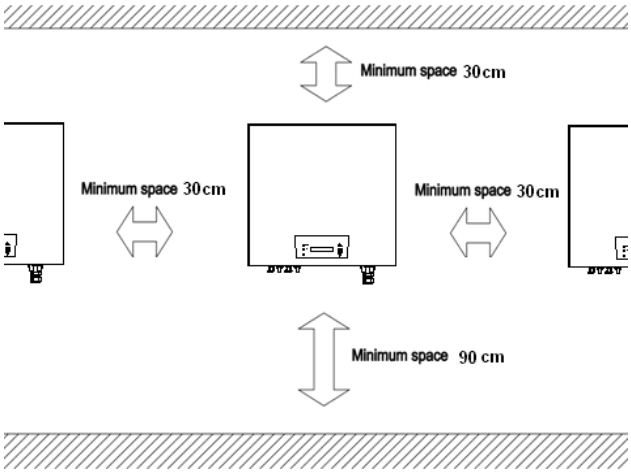
RCMU protection:
Inverter is equipped with a RCMU (Residual Current Monitoring Unit) device which is used to protect user from electric shock caused by leakage current.

WARNING!
Some models of the PV inverter may be too heavy to be lifted by manpower. To avoid injury be sure to use proper lifting equipment while unpacking and installing the Inverter.

2.3. Mounting PV Inverter

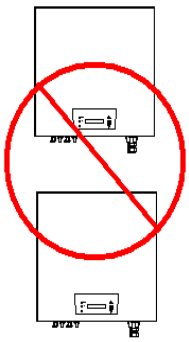
Please be sure the installation guidelines listed below are followed,

1. Select a wall or solid vertical surface that can support the PV-Inverter for the long term.
2. PV-Inverter requires adequate space for ventilation and heat dissipation. Allow at least 30cm space above and 90cm space below the Inverter. (Figure 2.3-1).
3. For maintenance purpose, please keep Inverters at least 30cm distance between inverters.



▲ Figure 2.3-1 Minimum space requirement

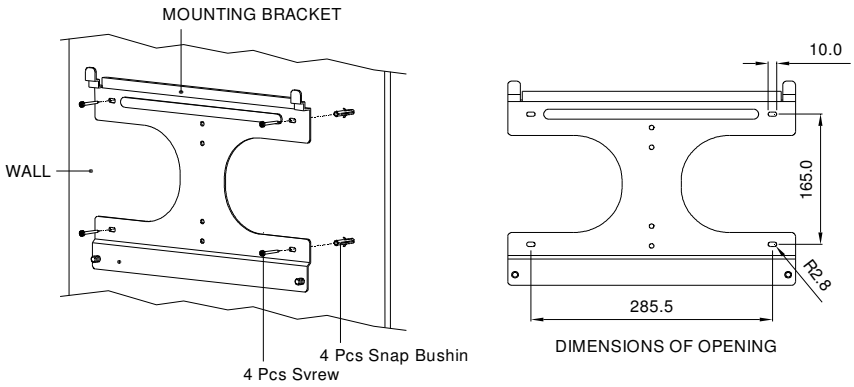
Note: Don't mount PV-Inverter on top of another one or other heat radiating source unless it is inevitable, in that case, 90cm distance at minimum from each other is required to provide proper ventilation.

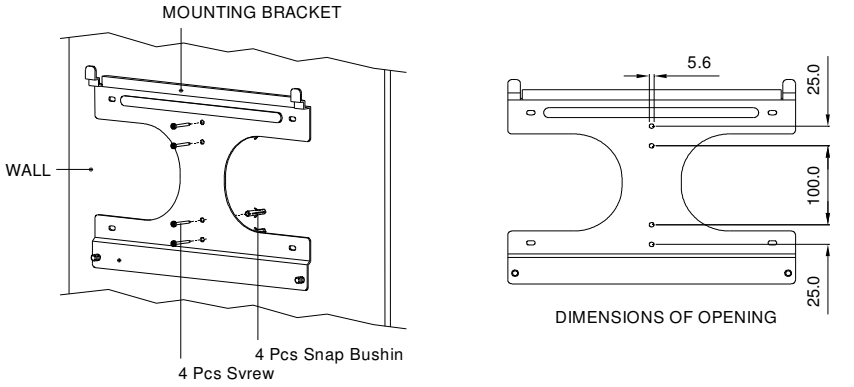


▲ Figure 2.3-2 Vertical installation is not suggested

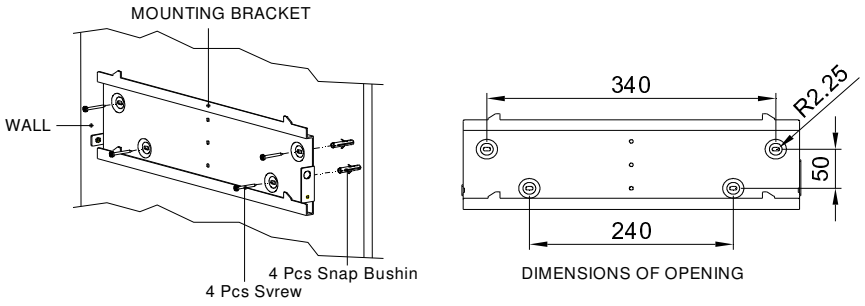
4. Fix the bracket with screws on all mounting holes with M4*30mm screws and 16kgf-cm (or 1.57 N-m) torque as illustrated below (Figure 2.3-3):

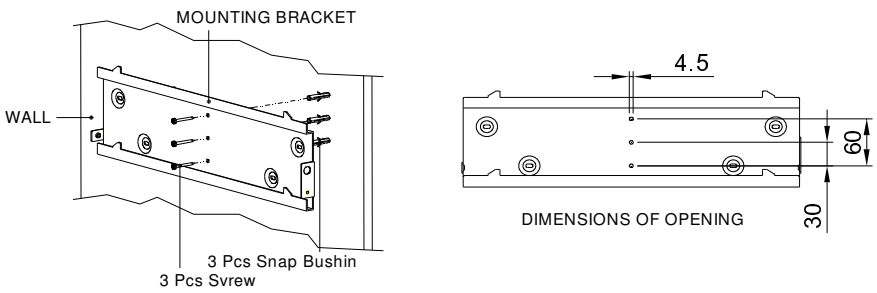
SV 1500s
SV 2000s

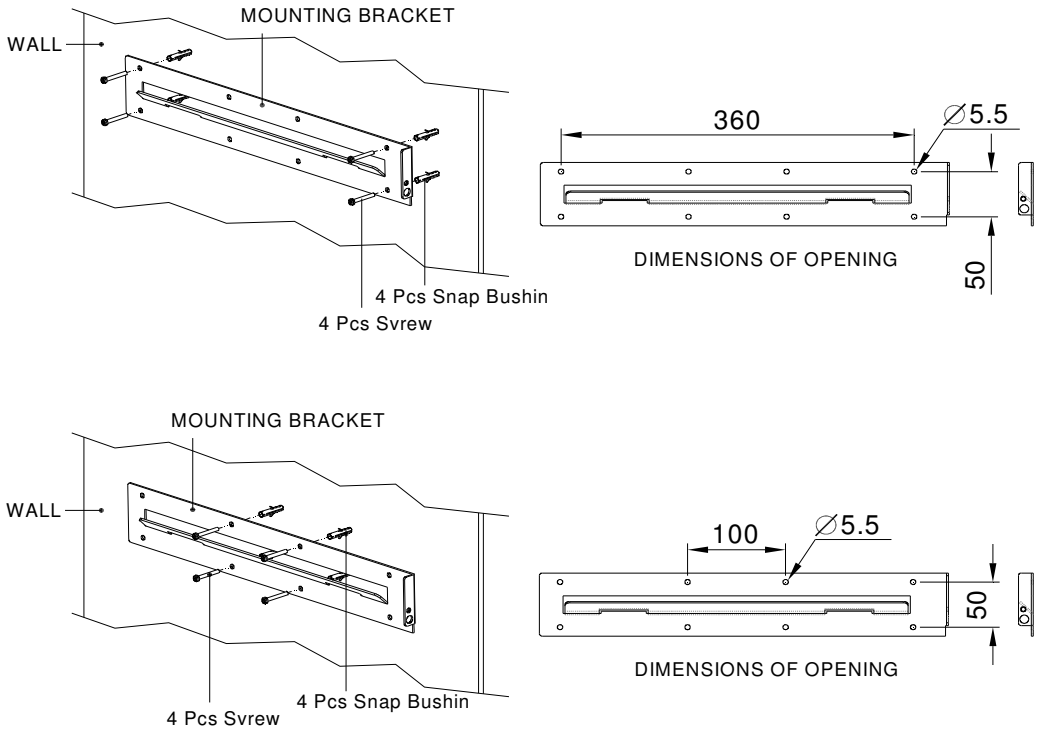




SV 3000s
SV 4000s





SV 4600s SV 6000s


▲ Figure 2.3-3 Dimensions and openings of mounting bracket

5. Mount the PV-Inverter onto the bracket as illustrated below (Figure 2.3-4):

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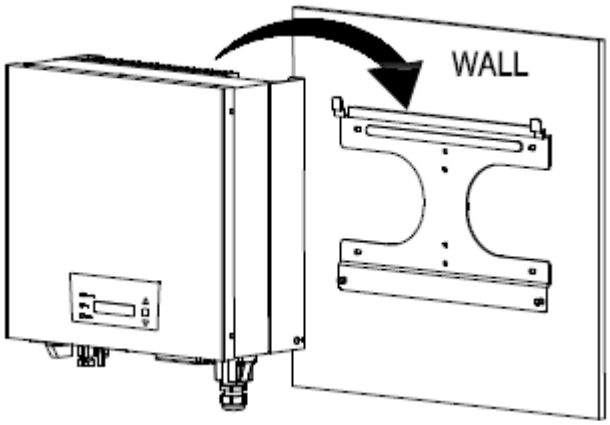
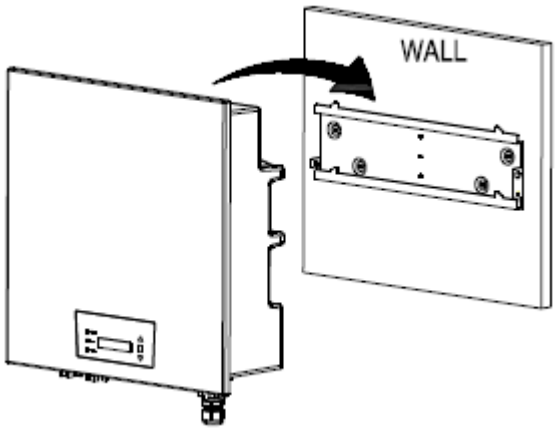
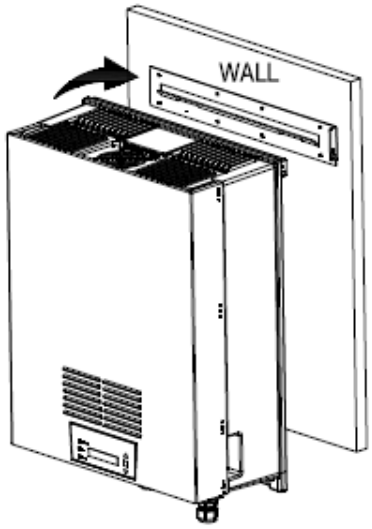
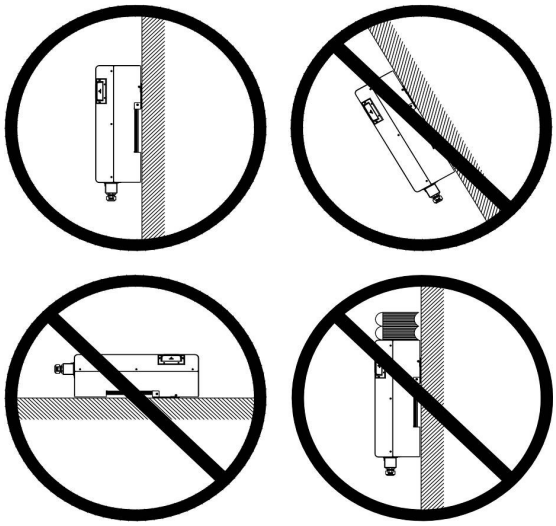


SV 3000s SV 4000s

SV 4600s SV 6000s


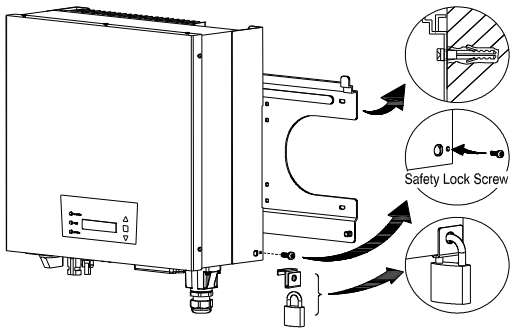
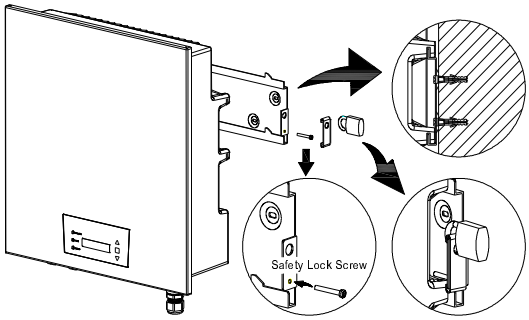
▲ Figure 2.3-4 Mounting the Inverter on wall bracket

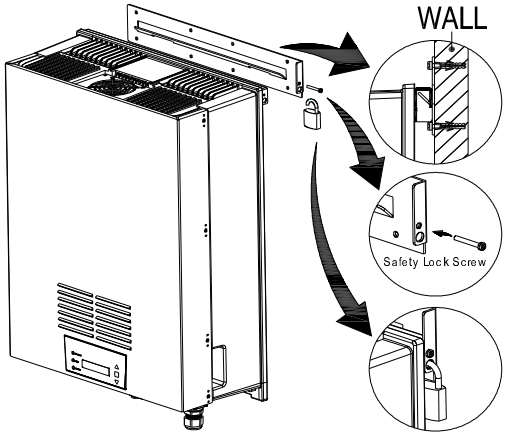
6. The device shall be properly fixed to the bracket in the correct direction as specified below (Figure 2.3-5),



▲ Figure 2.3-5 Installation Guidance (upper left diagram)

7. The user may install safety lock to secure the Inverter on the wall mounting bracket. (Figure 2.3-6).

SV 1500s SV 2000s	SV 3000s SV 4000s
	

SV 4600s SV 6000s


▲ Figure 2.3-6 Safety lock installation

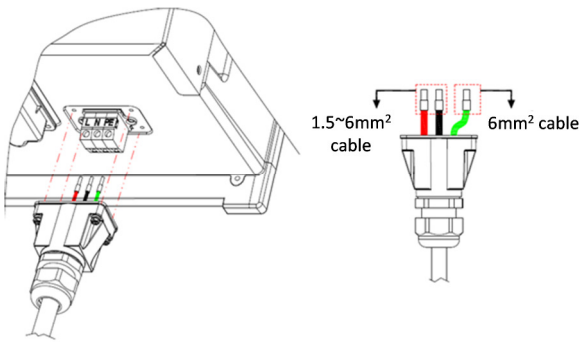
2.4. AC Cable Selection

AC cable size shall be properly selected basing on maximum wiring length.

(1) To meet safety requirement, use AC output wires with section area of no less than the minimum required size as indicated in the table below (Table 2.4-1):

L (Phase); N (Neutral); PE (Protective Earth): 1.5-6mm^2 Minimum

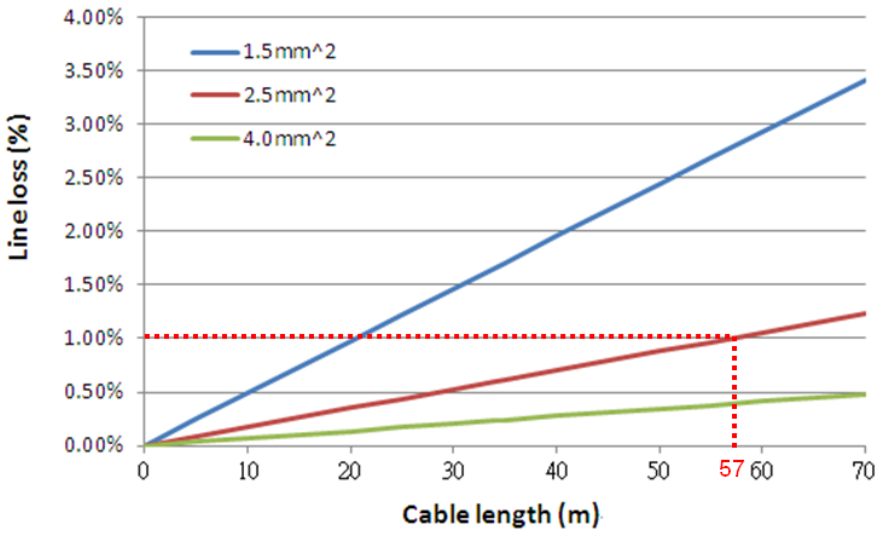
Model	Rating	Section Area	
	W	mm^2	AWG
SV 1500s	1500	1.5	14
SV 2000s	2000	1.5	14
SV 3000s	3000	2.5	12
SV 4000s	4000	2.5	12
SV 4600s	4600	4.0	10
SV 6000s	6000	4.0	10



▲ Table 2.4-1 Requirement of AC output wires

Note: **Do not use cables which may cause power loss over 1% of nominal power.**

(2) The Line loss-Cable length characteristic is illustrated in **Appendix I: Line Loss vs. Cable Length.** Take SV 2000s for instance, to reduce the line loss below 1% the maximum wiring length is 57m for copper wires with 2.5mm^2 cross section area as shown in Figure 2.4-1 below:

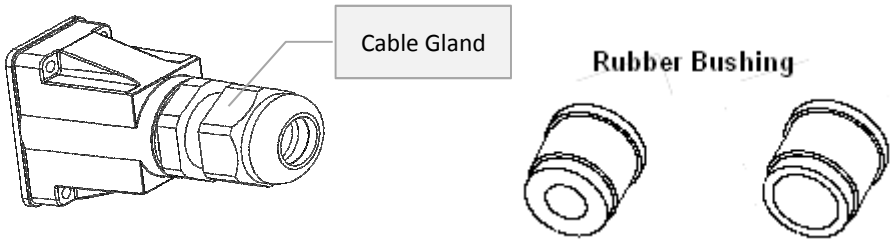


▲ Figure 2.4-1 Line Loss vs. Cable Length

2.5. Connecting to Public Grid (AC)

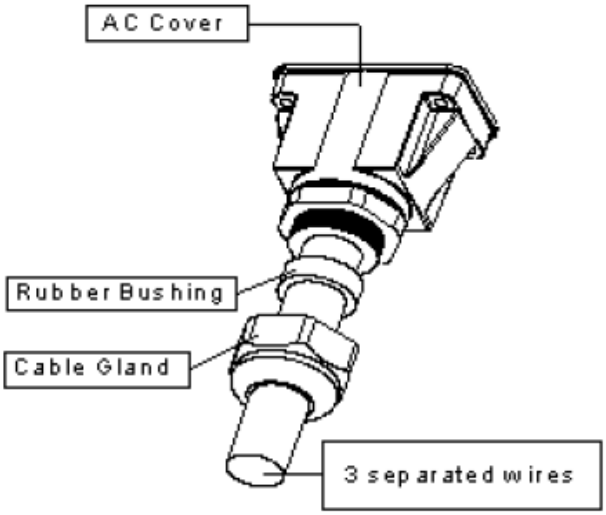
Connect PV Inverter to the AC Junction Unit with AC output wires and ground wire by following the steps below,

(1) Measure AC grid voltage and frequency which shall fall within the permitted range (see "Specification" chapter), and the voltage between N (Neutral) and PE (Protective Earth) shall be close to 0V.
(2) Switch off the AC circuit breaker and make sure no AC voltage is applied on the AC cables from the AC junction unit.
(3) Select AC wires with the recommended gauge as indicated section 3.4.
(4) Take the AC cover from accessory box and remove the cable glands as shown below. There are two size of rubber bushing available for selection according to the AC cables used.



▲ Figure 2.5-1 AC cover kit

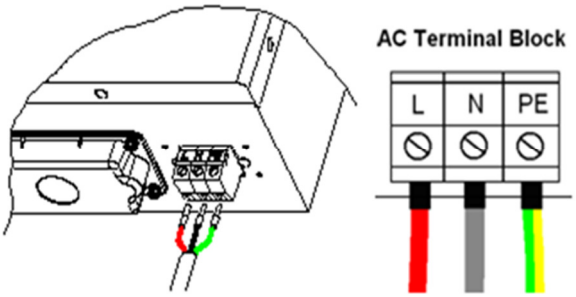
(5) Thread all AC cables through AC cover in the following order before cramping the cable ends with insulated cord end terminal: cable gland → rubber bushing → AC cover → cord end terminal (Figure 2.5-2)



▲ Figure 2.5-2 AC output connection

(6) An insulated cord end terminal shall be cramped at the end of each AC cable before connecting to the AC terminal block. The stripped length of AC cable shall be about 9mm to 10mm.

(7) Connect the AC cables to the AC terminal block in accordance with the label (Figure 2.5-3).

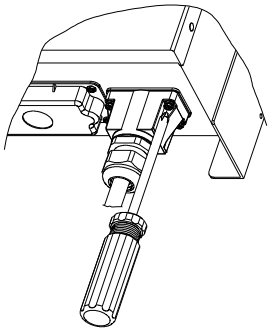


▲ Figure 2.5-3 AC terminal block connection

Note: All wires should be firmly fixed with torque 6Kgf-cm or 0.6N-m. The maximum AC wire area for the AC Terminal Block to accommodate is 6mm^2 (10AWG).

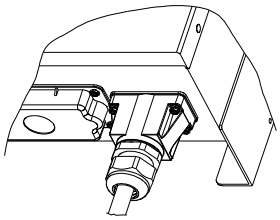
After fixing the AC cables to the AC terminal block, slightly pull the cables one by one and make sure they cannot be easily pulled off.

(8) Fix the AC output cover back with four M3x15L screws (6Kgf-cm torque at least).



▲ Figure 2.5-4 AC cover installation

(9) Turn and tighten the two cable glands to fix the cables on AC cover.



▲ Figure 2.5-5 Completion of AC wires connection

2.6. External AC Circuit Breaker

Individual AC Circuit Breaker (or Load Disconnection Unit) shall be installed for each PV inverter in order for the inverter to safely disconnect with grid under load.

The rating of AC circuit breaker shall be selected according to the maximum AC output current of the inverter which is different for each model. Please find below the maximum AC output current for each model as well as the recommended rating of AC circuit breaker:

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
Max. AC output current	6.5A	8.7A	13A	17.4A	20A	26A
Recommended rating of AC circuit breaker	10A	10A	16A	20A	25A	35A

▲Table 2.6-1 Recommended rating for external AC circuit breaker

WARNING!
Please do not connect more than one PV inverter to one AC circuit breaker.

WARNING!
A circuit breaker shall be installed between the PV inverter and public grid. In the event an individual circuit breaker is used for N wire, please do not disconnect N wire before disconnecting L wire, otherwise the PV inverter might be damaged.

2.7. Connection of PV Array (DC)

■ Applicable Type of PV Array

The PV modules connected to one PV inverter must consist of PV array of the same type. The table below lists the applicability of different type of PV array,

PV Array Type	Applicability
Mono-crystalline	Yes
Multi-crystalline	Yes
Thin-Film(Without earthed positive or negative pole)	Yes
Specific type with earthed positive pole	No
Specific type with earthed negative pole	No

▲Table 2.7-1 Applicability of PV arrays

WARNING!
Please consult your PV array supplier and confirm the type of PV array and applicability according the table above.

WARNING!
The PV modules connected to one PV inverter must be of the same type. Do not connect one string to more than on PV inverter.

WARNING!
The PV array shall comply with IEC 61730 Class A rating

■ Electrical Limitations

- ✓ The maximum open-circuited voltage (V_{oc}) of each PV string shall not exceed the Maximum Working Voltage Range as specified in the table below.
- ✓ The short-circuited current (I_{sc}) of the PV string should not exceed the Inverter's permitted maximum DC current as specified below.

Model	V_{oc} (per string)	Max. I_{sc} (per string)
SV 1500s	≦550V	9.1 A
SV 2000s	≦550V	11 A
SV 3000s	≦500V	17.5 A
SV 4000s	≦500V	20 A
SV 4600s	≦500V	17 A
SV 6000s	≦500V	20 A

▲Table 2.7-2 Maximum Open Circuit Voltage

WARNING!
The Voc of PV array might increase as the environmental temperature decreases (e.g. in winter). Please consider the possible temperature range of the installation location and make sure the maximum Voc does not exceed the permitted range of inverter.

WARNING!
Connecting PV string whose Voc or Isc exceeds the upper limit as specified in the table above might result in the damage of PV inverter, and in such case the warranty of PV inverter is void.

2.8. Connection Procedure

■ DC Connector

The cables for PV arrays shall be fitted with DC connectors so that they can be connected to the PV inverter. The DC connectors on the inverter are either **Wieland PST40i1** or **Multicontact MC4** DC connectors. The DC connector used for the cables from PV arrays shall be of the same brand in order to ensure reliable connection. The two types of DC connector may be distinguished by the appearance as shown in the table below:

	MultiContact MC4	Wieland PST40i1
Male	 PV-ADSP4	 PST40i1 (Part No: 96.112.1053.1) (Part No: 05.545.2202.8)
Female	 PV-ADBP4	 PST40i1 (Part No: 96.111.1053.1) (Part No: 02.125.8202.8)

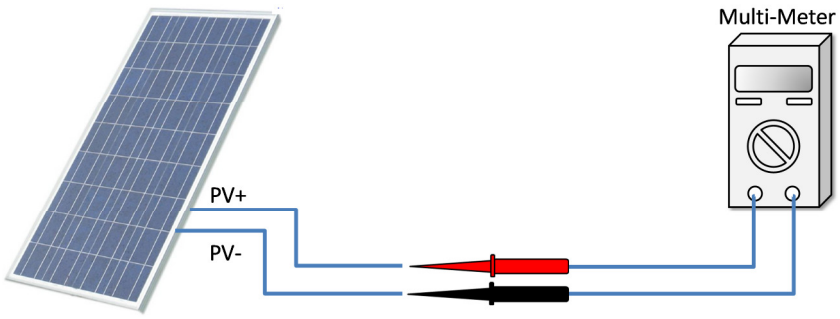
▲ Table 2.8-1 Types of DC Connector

WARNING!
Using DC connector of different brand as one pair might result in poor conductivity, poor insulation or even the damage of DC connectors. The DC cable may also fall off easily and result in the risk of electric shock.

■ Polarity Check

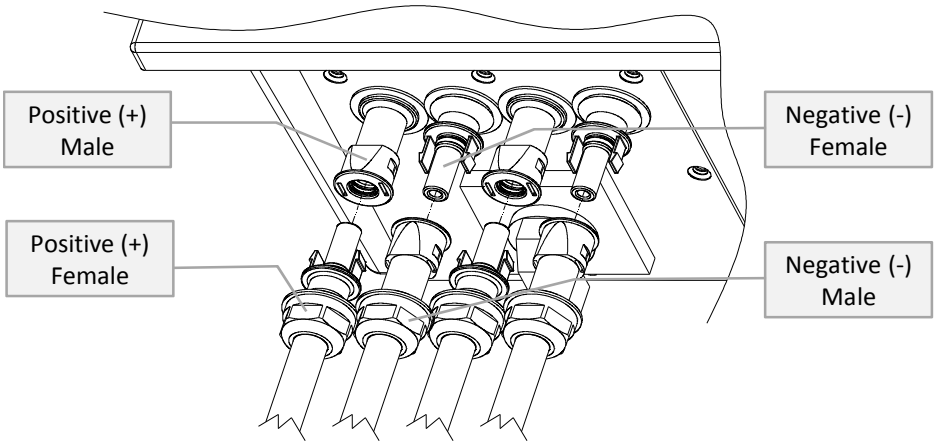
Before fitting the DC connectors on the cables of PV string, it's important to conduct polarity check by following the steps below,

- Using multi-meter to measure the PV string's cable ends and check the parity
- The positive (+) end of cable shall be fitted with **Female Connector**
- The negative end (-) of cable shall be fitted with **Male Connector**



▲ Figure 2.8-1 Polarity confirmation via multi-meter

The polarity of DC connectors on the PV inverter is shown below,



▲ Figure 2.8-2 Polarity of DC connectors

WARNING!
Before connecting DC power to the Inverter, make sure the polarity of each DC input pair is correct. Incorrect polarity connection will permanently damage the device.

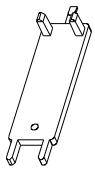
Risk of Electric Shock
There might be high voltage at the cable ends of PV array if it's exposed to sunlight. Please wear protective glove while performing the polarity check as well as fitting the DC connectors to the cable ends.

WARNING!
A protective device with adequate rating to disconnect short-circuited current from PV array shall be installed.

■ How to Dismantle the DC Connectors

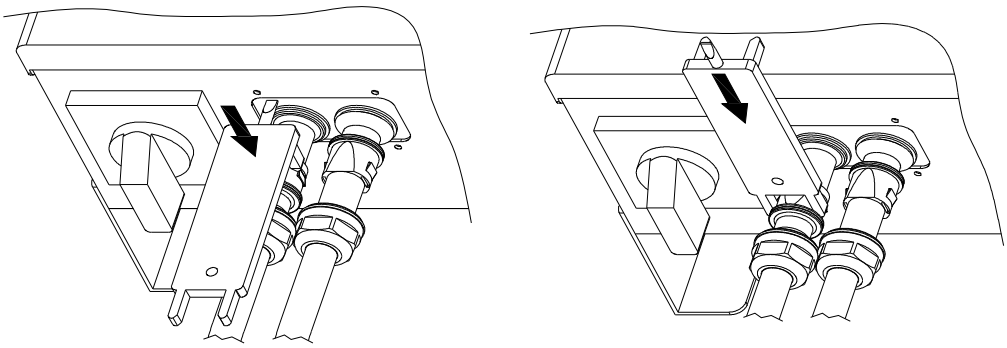
To avoid electric shock, the DC connectors are designed not to be dismantled easily. To disconnect the DC cables, please follow the instruction below:

(1) Find the connector remover as shown below in the accessory box.



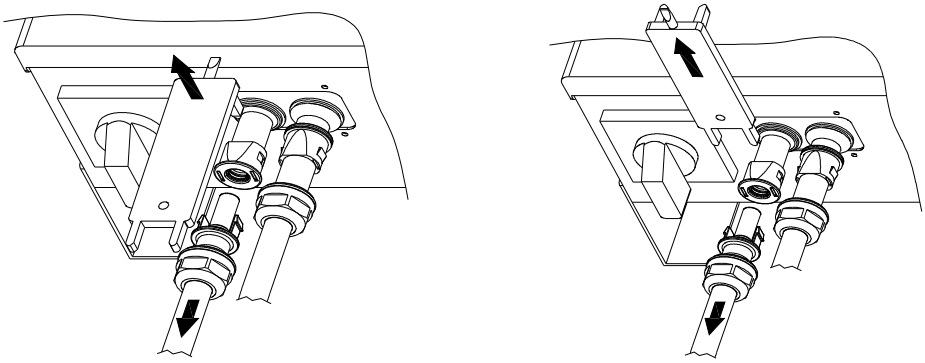
▲ Figure 2.8-3 DC Connector Remover

(2) Insert the remover into the connector using either ends of the remover to cramp the connector's clips.



▲ Figure 2.8-4 Insert the remover to cramp the connector's clip

(3) After cramping the clips, pull the connector slightly to dismantle the connector, and then remove the remover.



▲ Figure 2.8-5 Pull off the connector and then remove the remover

WARNING!
Do not dismantle the DC connectors while the Inverter is still under load. Be sure to switch off both AC and DC power first before dismantling the DC connectors.

WARNING!
Do not rotate the DC connectors on the inverter otherwise the DC connector might become loose.

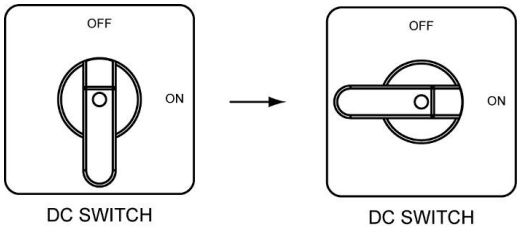
2.9. Commissioning

Please check the following requirements before commission:

- The PV inverter is securely mounted on the wall
- DC cables are connected with correct polarity and securely fixed on DC connectors
- Correct connection of the AC cables
- AC cover is well-fitted on the housing and the cable glands are tightened

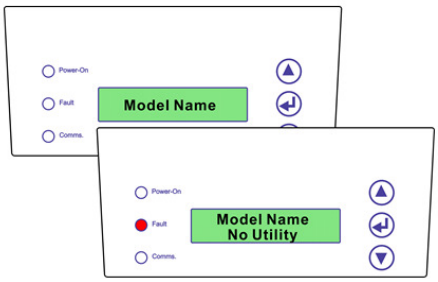
Follow the steps below for commissioning:

1. If the PV inverter equips with DC switch, turn the DC switch to “ON” position to feed in the DC power.



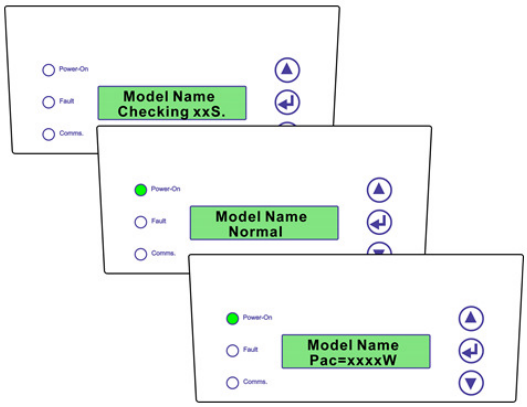
▲ Figure 2.9-1 DC Switch

2. If the PV inverter does not equip with DC switch, switch on the external DC switch to feed in the DC power.
3. As long as the DC voltage from PV string is greater than 150V_{DC}, the LCD will be turned on.
4. In the case that the AC grid is still not connected, the LCD will show "No Utility" after displaying the “Model Name”.
5. When the "No Utility" message shows and the red Fault LED will be on as well (Figure 2.9-3).



▲ Figure 2.9-2 Message of “No Utility” on LCD

6. Close the AC breaker between the PV Inverter and the grid and the Inverter will enter into “Checking” status with a countdown shown on LCD. During the countdown period (which is subject to selected grid standard) the Inverter will check the condition of DC power and AC power, and if the condition falls within the operational criteria, the Inverter will connect to AC grid and “Normal” status will be shown on LCD (Figure 2.9-3).



▲ Figure 2.9-3 Normal status on LCD

7. Under the circumstance, the commissioning is successfully completed.

3. Operation

3.1. Operation Mode

There are 3 different modes of operation,

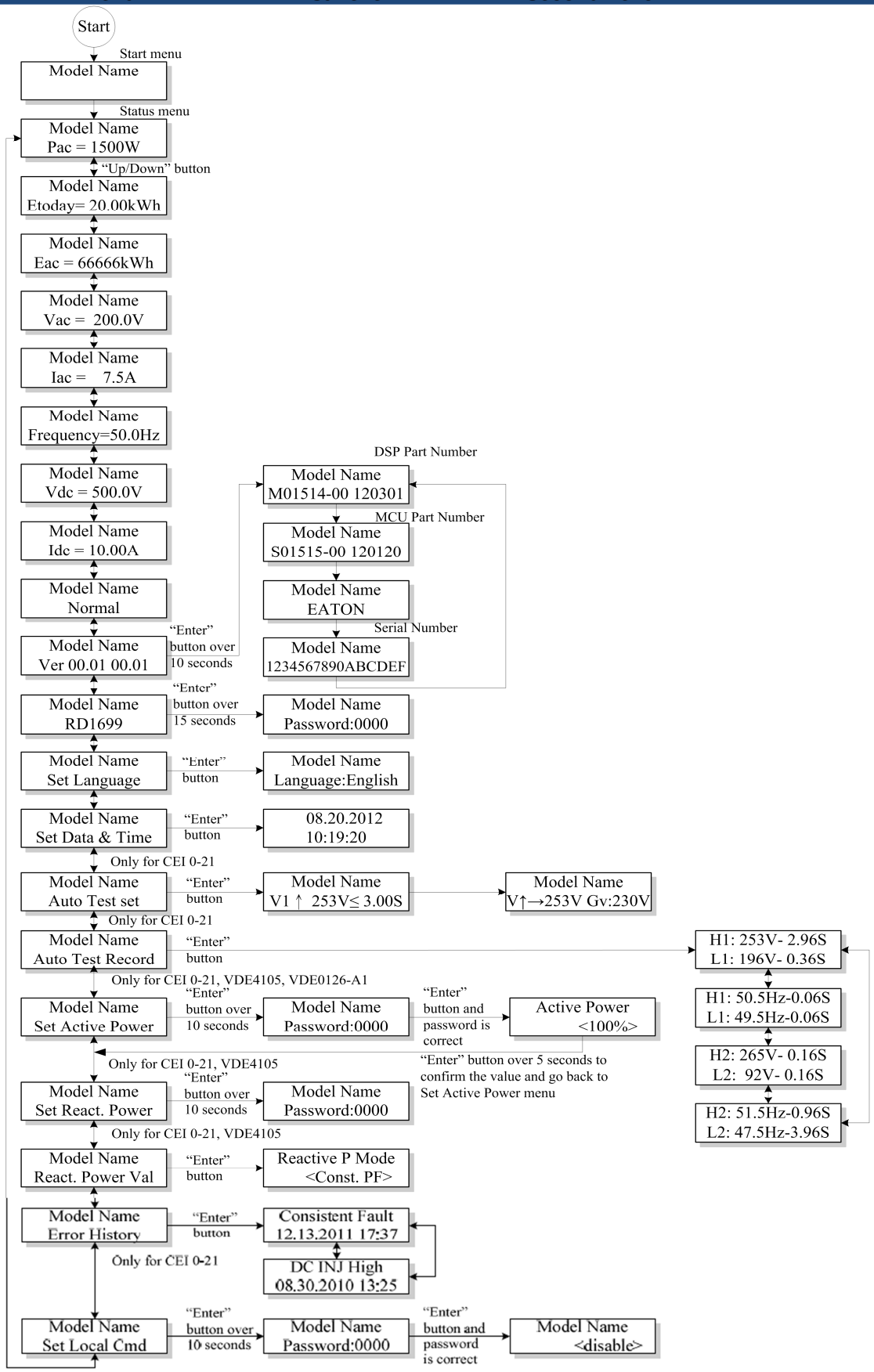
- **Normal mode**
  When the DC input power from PV arrays is sufficient (V_{DC} >150V), Inverter converts power generated by the PV arrays to the grid. In normal mode the green LED will be on.

- **Fault mode**
  If a fault is detected by the inverter, corresponding error message will be displayed on the LCD and the inverter will be tripped off from the grid. In Fault Mode the red “Fault” LED will be on.

- **Shutdown mode**
  During the night time or cloudy day when the illumination is low, the inverter will automatically shut down. In Shutdown mode, the LCD and LED are all off.

3.2. LCD Display Sequence

In normal mode, the user can check the inverter’s real-time operating status on LCD, the operating message displayed on LCD will be shown in following sequence by operating the buttons,



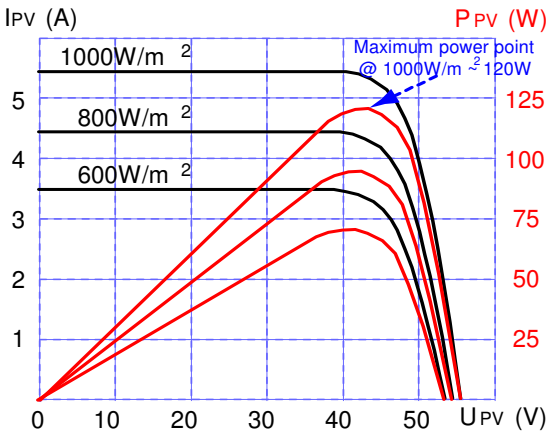
▲ Figure 3.2-1 Display Sequence

Accuracy of LCD reading

The Inverter is not designed for precise measurement of voltage, current and power, The readings on the LCD is solely for user's reference and should not be taken as the index for official performance evaluation or feed-in tariff calculation. It's not recommend using the data for checking or testing of the system. The reading tolerance may vary from 2% to 5% depending on the operating condition. If precise measurement of the system status is needed, adequate equipment such as power meter shall be installed.

■ Maximum Power Point Tracking (MPPT)

PV-Inverter is designed to convert as much power from PV array as possible in order to optimize the system efficiency. Under different illumination conditions, the Inverter will actively track the power generated from PV array all the time and try to track the maximum power point of the PV array.



4. Definition of Display Messages

The PV inverter is designed to be user-friendly by showing the operational information of the PV inverter on LCD automatically. The message showed on LCD aims to let user easily understand the status of the inverter by reading the LCD. Detailed definition of the messages can be found in this chapter.

	UK ENGLISH	DEUTSCH	ESPAÑOL
Status	Standby	Standby	En espera
	Normal	In Betrieb	Normal
	Checking 20S	Netzprüfung 20s	Verificando 20s
	Reconnect 120S	Verbindung 120s	Reconexión 120s
	Waiting	Warten	En proceso
	Lock	Eingestellt	Bloqueo
	FLASH	Firmware update	Actualizando
	ITALY	**Français**	**Nederlands**
	Standby	Standby	Standby
	Stato Normale	Normal	In bedrijf
	Verifica… 20S	Vérif.Rés. 20s	Controle 20S
	Connessione 120S	Reconnexion 120s	Verbinden 120S
	Attendere…	En attente	Wachten
	Display bloccato	Verrouillé	LCD geblokkeerd
	Aggiornamento	Flash Mémoire	Firmware update
	UK ENGLISH	**DEUTSCH**	**ESPAÑOL**
Reading	Pac = 1500W	Pac = 1500W	Pac = 1500W
	Etoday=101.86kWh	Eheute=101,86kWh	Ehoy =101,86kWh
	Eac = 253kWh	Eac = 253kWh	Etot = 253kWh
	Vac = 220.0V	Uac = 220,0V	Vac = 220,0V
	Iac = 10.0A	Iac = 10,0A	Iac = 10,0A
	Frequency=50.0Hz[1]	Frequenz =50,0Hz[1]	Frecuenc.=50,0Hz[1]
	Vdc = 400.0V	Udc = 400,0V	Vdc = 400,0V
	Idc = 10.00A	Idc = 10,00A	Idc = 10,00A
	Vdc=400.0/400.0V[2]	Udc=400,0/400,0V[2]	Vdc=400,0/400,0V[2]
	Idc=10.00/10.00A[2]	Idc=10,00/10,00A[2]	Idc=10,00/10,00A[2]
	ITALY	**Français**	**Nederlands**
	Pac = 1500W	Pac = 1500W	Pac = 1500W
	Eoggi =101,86kWh	Ejour =101,86kWh	Etoday=101,86kWh
	Etot = 253kWh	Etotal= 253kWh	Eac = 253kWh
	Vac = 220,0V	VAC = 220,0V	Uac = 220,0V
	Iac = 10,0A	IAC = 10,0A	Iac = 10,0A
	Freq = 50,0Hz[1]	Fréquence=50,0Hz[1]	Freq. = 50,0Hz[1]
	Vdc = 400,0V	VDC = 400,0V	Udc = 400,0V
	Idc = 10,00A	IDC = 10,00A	Idc = 10,00A
	Vdc=400,0/400,0V[2]	VDC=400,0/400,0V[2]	Udc=400,0/400,0V[2]
	Idc=10,00/10,00A[2]	IDC=10,00/10,00A[2]	Idc=10,00/10,00A[2]

1. AC grid frequency
2. For SV4600s and SV6000s which have 2 trackers. The first reading is for Tracker 1 and the second reading for Tracker 2

	UK ENGLISH	DEUTSCH	ESPAÑOL
Setting Menu	Set Language Language:English Set Date & Time Set 60HzFunction 60Hz Disable[3] 60Hz Enable[3] Error History	Sprache Sprache:Deutsch Datum & Uhrzeit Set 60HzFunction 60Hz Disable[3] 60Hz Enable[3] Fehlergeschichte	Elección idioma Idioma:Español Fecha & Hora Func. ajuste60Hz Deshabilitar60Hz[3] Habilitar 60Hz[3] HistoricoErrores
	ITALY	**Français**	**ESPAÑOL**
	Imposta lingua Lingua:Italiano Date & ora Set Funz. 60Hz 60Hz Disabilit[3] 60Hz Abilitata[3] Storico errori	Changer langue Langue:Français Date & heure Fonction 60Hz 60Hz Off[3] 60Hz On[3] Err. Historique	Taalinstelling Taal:Nederlands Set Date & Time Set 60HzFunction 60Hz Disable[3] 60Hz Enable[3] Foutenhistorie
	UK ENGLISH	**DEUTSCH**	**ESPAÑOL**
Error Message	Grid Volt. Fault Grid Freq. Fault Consistent Fault PV Over Voltage Over Temperature Isolation Fault RCMU Fault Fan Lock External FanLock Relay Failure DC INJ High EEPROM Failure SCI Failure High DC Bus Low DC Bus Ref 2.5V Fault RCMU Failure No Utility	Fehler Netzspg. Fehler Netzfrq. Konsistenzfehler Udc zu hoch Übertemperatur Isolationsfehler Fehlerstrom Lüfter blockiert Lüfter blockiert Relais Fehler DC INJ zu hoch EEPROM Fehler CPU Fehlfunktion Udc Bus zu hoch Udc Bus zu tief Uref Fehlfunkt. FI-Fehler Kein Netz	Def. tension red Def. frec. red Defec.Coherencia Sobretensión DC Sobretemperatura Def. aislamiento Defecto a Tierra Bloqueo ventil. Bloq.vent.extern Fallo relé Inyec. DC alta Fallo EEPROM Fallo en 1 CPU Bus DC alto Bus DC bajo Defecto ref.2.5V FalloDiferencial Red ausente
	ITALY	**Français**	**Nederlands**
	Err. Tens. rete Err. Freq. rete Err. processore Vdc alta Sovratemperatura Err.Isolamento I dispers.Alta Ventilaz.blocc. Ventil.est.blocc Errore Relè DC iniett. alta Errore EEPROM Err.Comunicaz. VBus alta VBus bassa Errore rif.2,5V Err. Sens.Terra Rete non dispon.	Déf. U(v) réseau Déf. Freq réseau Erreur CPU Surtension PV Temp. anormale Défaut isol. Défaut terre Verrou. Ventil. Verr. Ventil Ext Défaut relais Inj DC haute Défaut EEPROM Défaut SCI Bus DC haut Bus DC bas Défaut Ref 2.5V Défaut RCMU Pas de Réseau	Netspanningsfout Netfreq. fout CPU fout DC-overspanning Temp. te hoog Isolatiefout Aardfout Vent.geblokkeerd Ext.vent.geblokk Relaisfout DC INJ hoog EEPROM fout SCI fout Udc Bus hoog Udc Bus laag Ref 2.5V fout RCMU fout Net niet aanw.

▲ Table 4-1 Display message matrix

3. These messages shows only when 60Hz function is enabled.

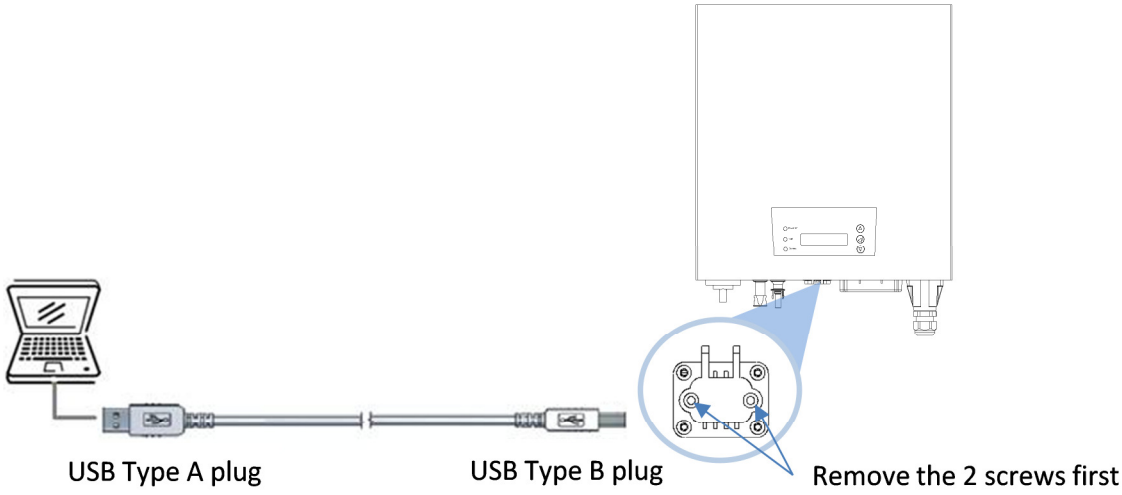
5. Communication

This inverter has powerful communication interfaces through which the Inverter can be monitored directly with a PC or an external data logger. The inverter's firmware can also be updated by qualified personnel via the USB interface if needed.

5.1. USB Port (on Inverter)

The PV inverter is equipped with an USB port at the bottom which enables the user to monitor the real-time status of inverter using specified software on PC. Firmware upgrade for the inverter can also conducted via this interface.

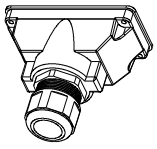
To use the USB port, please firstly unscrew the cover and use USB type-A to type-B USB cable for the connection between PC (laptop) and the inverter.



▲ Figure 5.1-1 Connecting PC to Inverter via USB

5.2. RS-485 Communication Card Slot

PV inverter has a slot for optional communication card. By installing a RS-485 card the communication function of the Inverter, such as remote monitoring, can be extended. To use this slot, please unscrew the cover, and insert the RS-485 card into the slot. An optional communication card cover (as shown below) can be used to prevent the cables and RS-485 card from water leakage.



▲ Figure 5.2-1 Optional communication card cover

For further information about the RS-485 card, please contact your dealer.

6. Troubleshooting

The following table (Table 6.1-1) provides a preliminary guideline for troubleshooting whenever a fault message is shown on the LCD or the Inverter does not work normally.

Troubleshooting Guideline		
	Fault Message	**Diagnosis and Action**
System Fault	**Isolation Fault**	The insulation to ground for DC input is poor and might result in leakage current. Please contact the installer and check if the impedance between PV(+) & PV(-) and ground is larger than the DC insulation impedance as set out in **Section 9.2**. If not, please improve the system installation.
	RCMU Fault	Leakage current at AC output is too high. Please make sure the AC cables are well-fixed on the terminal and no foreign object is found between the cables and ground. If the fault cannot be cleared by re-fixing the AC cables, please contact the supplier for service.
	Grid Volt Fault **Grid Freq. Fault**	AC grid has one of the following conditions: over/under voltage, over/under frequency. Please contact the installer and make sure the AC grid is under normal condition.
	PV Over Voltage	The DC voltage fed from PV arrays is too high. Please make sure the PV arrays used meets the specification set out in **Section 9.2**
	No Utility	AC grid is not available. Please check if the AC cables are well-fixed to the terminals. If the AC grid exists and the fault persists, please contact the service representative.
	Fan Lock	Internal fan has malfunctioned, if the error persists after restarting the Inverter, please contact the service representative.
	External Fanlock	External fan might be blocked by foreign object. If no foreign object is found and the fault persists, please contact the service representative. (Refer to **Section 8.2** Cleaning And Replacing External Fans)

▲ Table 6.1-1 Troubleshooting guideline (System Failure)

Troubleshooting Guideline		
	Fault Message	**Diagnosis and Action**
Inverter Failure	**Consistent Fault**	Communication problem is defected within the Inverter. If the fault cannot be cleared after restarting the Inverter, please contact the service representative.
	SCI Failure	
	Over Temperature	The ambient temperature of the inverter is too high. If necessary improve the ventilation of the inverter. If the error messages shows when the ambient temperature is below 50°C, please contact the service representative.
	Relay Fault	The relay inside the Inverter is malfunctioned. If the fault cannot be cleared after restarting the Inverter, please contact the service representative.
	DC INJ High	The Inverter detects high DC component in the AC output current. Disconnect the AC grid and wait for one minute. If the fault persists after restarting the Inverter, please contact the service representative.
	EEPROM Failure	Memory error is detected. If the fault persists after restarting the Inverter, please contact the service representative.

	High DC Bus **Low DC Bus**	The internal bus voltage is abnormal. If the fault persists after restarting the Inverter, please contact the service representative.
	Ref 2.5V Fault	The reference voltage of microprocessor is found abnormal. If the fault persists after restarting the Inverter, please contact the service representative.
	RCMU Failure	Internal module is found abnormal. If the fault persists after restarting the Inverter, please contact the service representative.

▲ Table 6.1-2 Troubleshooting Guideline (Inverter Failure)

Note: If there is no display on the panel and the DC input voltage is higher than 150V, please check if both DC and AC wires are well-fixed to the terminals. If no problem is found on the wiring, please contact the service representative.

Note: Repeated power on and off may be observed on Inverter during morning or dusk when the illumination is low. In this case, such phenomenon is normal.

Risk of Electric Shock

When both DC and AC wires are connected, touching the connection joints might result in electric shock. For the end-user who is not specialized in electrical engineering, please do not touch the wires or connection joints when DC or AC power is on.

7. Preventative Maintenance

The following regular maintenances may help to ensure the PV Inverter's operation with optimal performance.

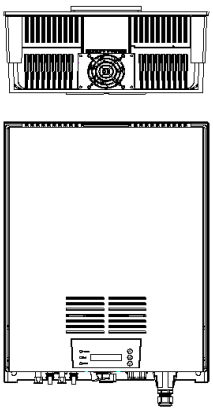
7.1. Step of Checking and Maintenance

- ✓ Check if the fan grill cover is covered with debris or dust and clean the fan if necessary
- ✓ Check if the heat sink is covered by dust or blocked by objects which might affect the heat dissipation
- ✓ Check if there's corrosion, especially at connecting points
- ✓ Check if the wire connections are well-fixed

	**Hot Surface:** The Inverter and peripherals can be hot after operation. Maintenance shall be performed 10 minutes after the DC and AC power are both switched off.
	**Caution:** Before cleaning PV array or Inverter, be sure to switch off AC power and make sure that "No Utility" message is shown on LCD. Cleaning shall be limited to the exterior surface only.
	**Caution:** To avoid risk of electric shock, both AC and DC power shall be switched off whenever personnel needs to contact PV array under any circumstances.
	**Warning:** Whenever there is a need to disconnect DC and AC power. Do NOT disconnect DC cables while the Inverter is still feeding power to the grid. And please switch off AC circuit breaker before disconnecting DC cables.

7.2. Cleaning and Replacement of External Fan

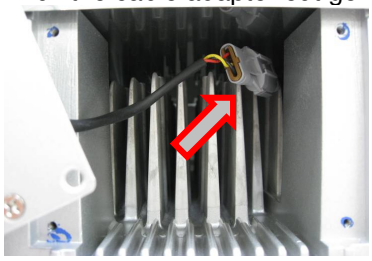
(Note: This section is only applicable for models with external fan)



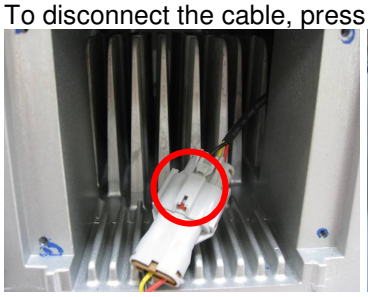
The following steps shall be followed in order to remove the external fan when there is a need for cleaning or replacement:

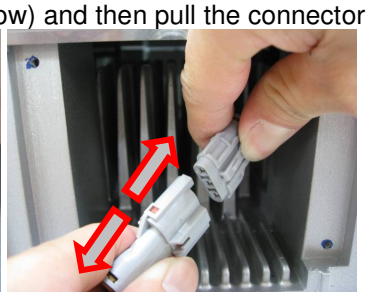
(1) Disconnect both AC and DC power.
(2) Unscrew the four screws as marked below.

(3) Pull the cable adapter out gently.



(4) To disconnect the cable, press the lock arm (as marked below) and then pull the connector off.



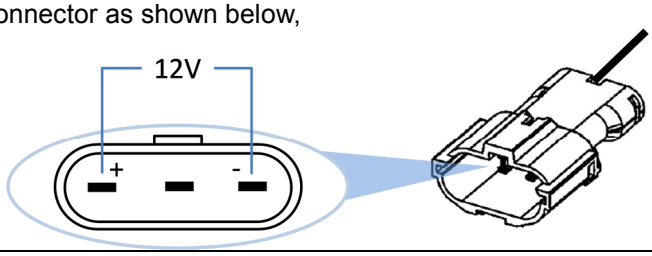


(5) The fan module can be removed now for cleaning or replacement. Use soft brush and vacuum cleaner to clean the dust on the fan if needed.

(6) If the fan is malfunctioned, please contact the supplier to order spare fans if needed.

How to test the fan?

After disconnecting the fan, the user may test the function of fan by applying +12V DC power on the connector as shown below,



8. Specification

8.1. Target Markets and Grid Standards

Model	SV 1500s SV 2000s SV 3000s SV 4000s SV 4600s SV 6000s				
Market	Germany	Spain	Italy	UK	Taiwan
Grid standard	VDE-AR-N 4105* / VDE0126-1-1/A1	RD1699	CEI 0-21	G83/1-1 / G59 Issue 2	IEEE1547

▲ Table 8.1-1 Marketing vs. Regulatory

Note: VDE-AR-N 4105 is applicable for all models except SV 6000s

8.2. Input (DC)

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
Max. PV open voltage	550V	550V	500V	500V	500V	500V
Nominal DC voltage	360V					
Max. DC power	1700W	2300W	3450W	4600W	5250W	6300W
System start-up voltage	150 V					
Initial feeding voltage	150 V					
Shutdown voltage	Typical 80V					
Working voltage range	100 ~ 550 V		100 ~ 500[1] V			
MPPT voltage range (full rating range)	175 ~ 500 V	200 ~ 500 V	200 ~ 500 V	225 ~ 500 V	200 ~ 500 V	200 ~ 500 V
MPPT efficiency	> 99%					
Max. DC current	9.1A	11A	17.5A	20A	2 x 17A	2 x 20A
Max PV Isc current	15A	15A	20A	25A	35A	45A
Number of MPP tracker(s)	1	1	1	1	2[2]	2[3]
DC voltage ripple	< 10% of the input voltage					
DC insulation resistance[4]	1.5K ~ 4K : VDE0126 & VDE0126-1-1/A1 : Riso >1MΩ, Others : Riso > 200KΩ 4.6K ~ 6K : VDE0126 & VDE0126-1-1/A1 : Riso >1.5MΩ, Others : Riso > 200KΩ					

Definition:
Start-up voltage: minimum voltage that allows the Inverter to turn on the LCD for user's operation.
Initial feed-in voltage: minimum voltage that allows the Inverter to connect to grid.
Shut-down voltage: inverter in operation will shut down when the DC input voltage is below this level.
MPPT Voltage range: the voltage range allowing the Inverter to activate maximum power point tracking.

1. It is recommended that the open circuit voltage (Voc) of each PV string should not exceed 500V.
2. The max operation voltage for two trackers to independent usage is 500V, and the maximum power for one tracker is 3400W.
3. The max operation voltage for two trackers to independent usage is 500V, and the maximum power for one tracker is 4000W.
4. DC insulation resistance is the impedance of PV+ or PV- of DC input to the ground.

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
Max. Inverter backfeed current to the PV array	163.4mA	288.4mA	620mA	901mA	383.2mA	579.3mA
External DC circuit breaker	10A	15A	20A	25A	2*20A	2*25A

▲ Table 8.2-1 Specification for DC Input

8.3. Output (AC)

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
Nominal AC power	1500W	2000W	3000W	4000W	4600W	6000W
Max. AC power [5] [6] (in 10 minutes)	1650VA	2200VA	3300VA	4400VA	5060VA	6000VA
Max apparent power	1500VA	2000VA	3000VA	4000VA	4600VA	6000VA
Nominal voltage	Default: 220/380V Option: 230/400V 3-phase, 4-wire					
Nominal frequency	50/60Hz (auto detection)					
AC grid system	Single phase					
Nominal AC current	6.8 A	9 A	13.6 A	18.2 A	20.9 A	27.3 A
Max. AC current	7.2 A	9.6 A	14.4 A	19.2 A	22.1 A	28.8 A
Current (Inrush)	59 A	59 A	127 A	127 A	127 A	127 A
Max. output fault current	17.99A	17.99A	20.89A	26.3A	39.09A	48.61A
O/P current distortion (THDi)	< 3%					
Power factor	0.99 Max.					

▲ Table 8.3-1 Specification for AC Output

5. This definition is just for active power control and it needs to meet the grid definition of limitation of single phase.
6. For the VDE-AR-N 4105 :
(1) The maximum power is 4600W. This means the SV 4600s doesn't have 110% over load ability. (2) The maximum Q is equal to its normal AC power. (3) VDE-AR-N 4105 is not applicable for SV 6000s.

8.4. General Specification

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
Max. conversion efficiency	96.5%	96.8%	97.2%	97.5%	97.5%	97.5%
European efficiency	95.2%	95.8%	96.5%	97%	97%	97%
Topology	Transformerless					
Power consumption: Standby / Night	<7W / <0.1W				< 10W / < 0.2W	
Protection degree	IP43	IP43	IP65	IP65	IP65	Chassis: IP65 Fan: IP55
Heat dissipation	Convection				Forced air cooling	
					(internal Fan, can't replace)	(external Fan, can replace)
Acoustic (dBA)	< 35dB				< 45dB	
Communication (standard)	USB B port / RS485					
Protocol	Standard protocol, Eaton Phoenixtec MMPL proprietary protocol					
Protection device DC Switch	Optional					
Hazard substance restriction	Lead free, complied with RoHS GP2					
Operating temperature range	-20 ~ +60℃					
Max AC output power under 60℃ with nominal voltage (linear de-rating)	898W	912W	2337W	2850W	3103W	3306W
Max. operating temperature without de-rating (nominal voltage)	40℃					
Humidity	0 to 95%, Non-condensing		0 to 100%, condensing			
Altitude	Up to 2000m without power de-rating					

▲ Table 8.4-1 General specification

8.5. Dimension & Weight

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
Dimensions W×H×D (mm)	355*365*151	355*365*151	427*451*154	427*451*154	434*597*205	434*597*205
Net Weight (Kg)	12.1	12.9	15	16.5	30.9	33.6
Gross Weight (Kg)	15	15.8	18.7	20.1	36.8	39.4

▲Table 8.5-1 Dimensions and weight

8.6. Requirement of DC/AC Wires

Model	SV 1500s	SV 2000s	SV 3000s	SV 4000s	SV 4600s	SV 6000s
DC connectors (pairs)	1	1	2	2	1x2	1x2
DC connection	Multi Contact MC4 (or Wieland/PST40i1)					
Min. DC wire cross section area	1.5mm^2	1.5mm^2	2.5mm^2	2.5mm^2	4.0mm^2	4.0mm^2
AC Terminal Block	Dinkle connector (or Phoenix Connector)					
Min. AC wire cross section area	1.5mm^2	1.5mm^2	2.5mm^2	2.5mm^2	4.0mm^2	4.0mm^2
Max. AC short-circuited current (A)	20	20	29.9	39.8	45	79

▲ Table 8.6-1 Specification of connection

8.7. Compliance of Standards

Model	SV 1500s SV 2000s SV 3000s SV 4000s SV 4600s SV 6000s				
Market	Germany	Spain	UK	Italy	Taiwan
Grid standard	VDE-AR-N 4105 / VDE0126-1-1/A1	RD1699	G83/1-1 / G59 Issue 2	CEI 0-21	IEEE1547
EMC	EN 61000-6-2: 2005 EN 61000-6-3: 2007+A1: 2011				
Safety	EN 62109-1: 2010 EN 62109-2: 2011 (IEC 62109-1; IEC 62109-2)				
CE	LVD: 2006/95/EC EMC: 2004/108/EC				

Model		SV 1500s SV 2000s	SV 3000s SV 4000s	SV 4600s SV 6000s
Environment Category		Pollution Degree II	Pollution Degree III	
Overvoltage Category	DC Input	Overvoltage Category II		
	AC Output	Overvoltage Category III		
Protective Class		Class I		

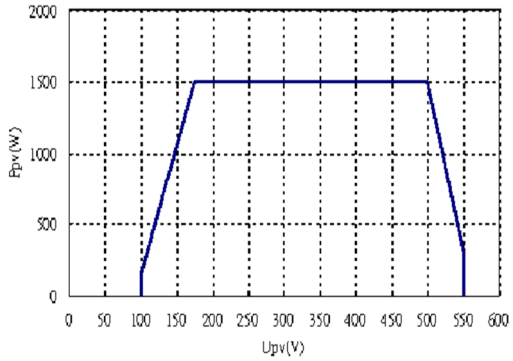
▲ Table 8.7-1 Compliance of Standards

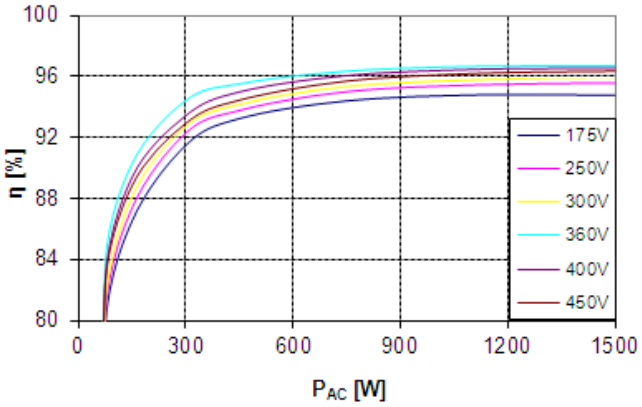
Note: The product's specifications are subject to change without notice.

9. Load and Efficiency Chart

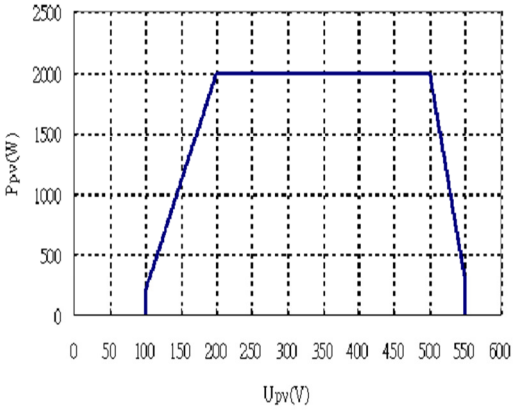
The load chart (DC Power vs. String Voltage) and typical efficiency chart (V_{DC} and P_{AC}) are shown below.

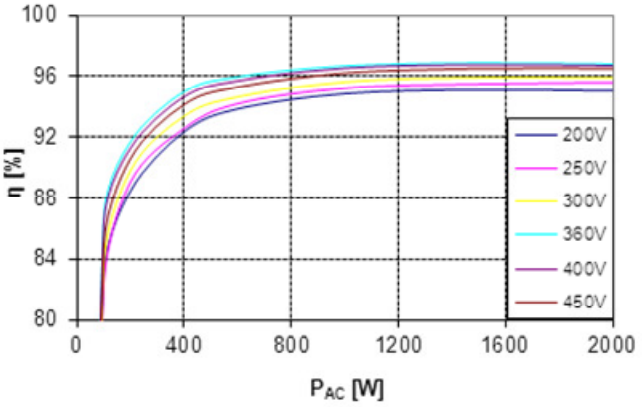
SV 1500s





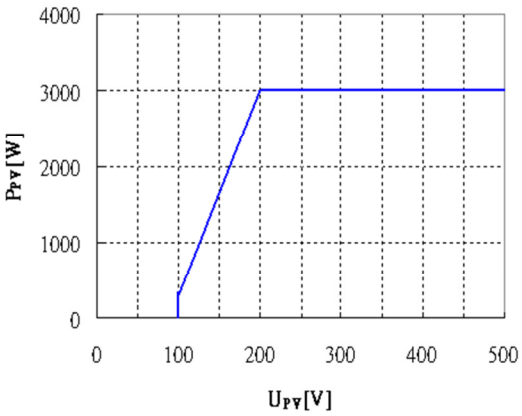
SV 2000s

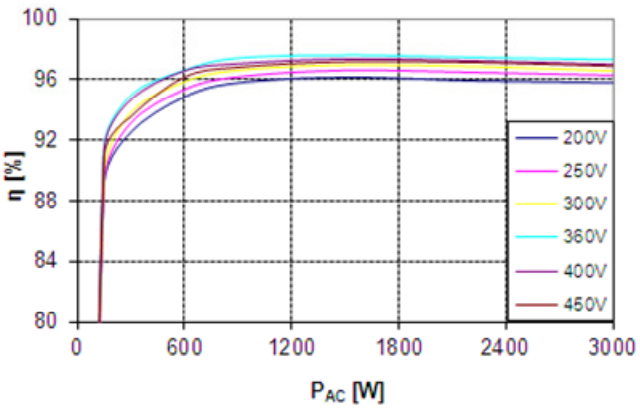




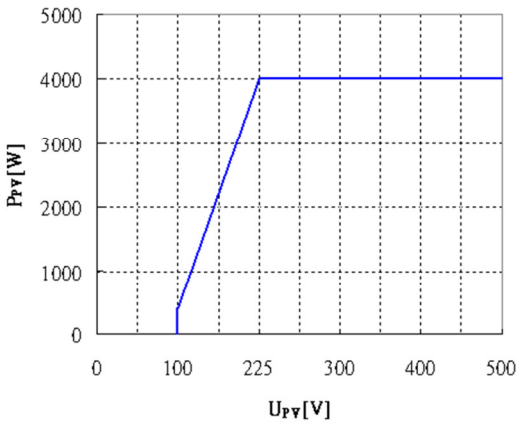
▲ Table 9-1 Load and efficiency chart of SV 1500s/ SV 2000s

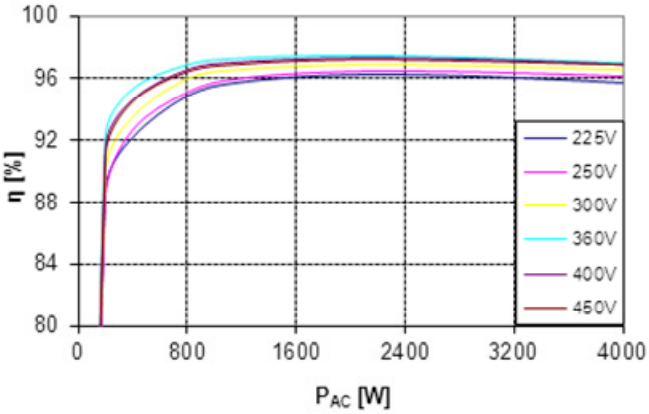
SV 3000s



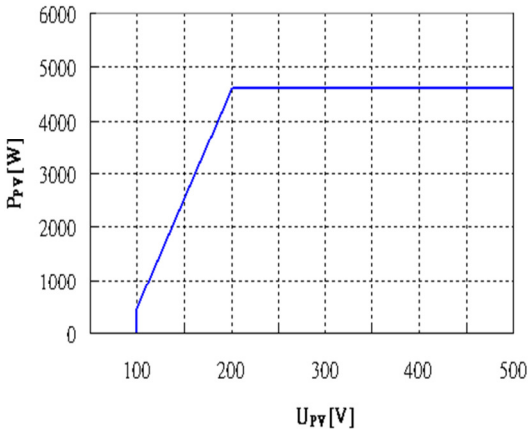
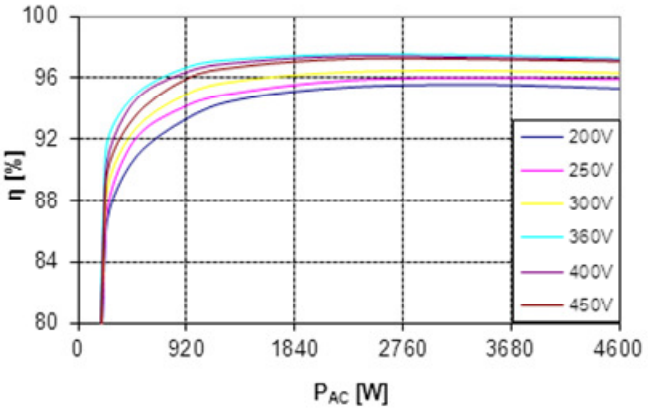
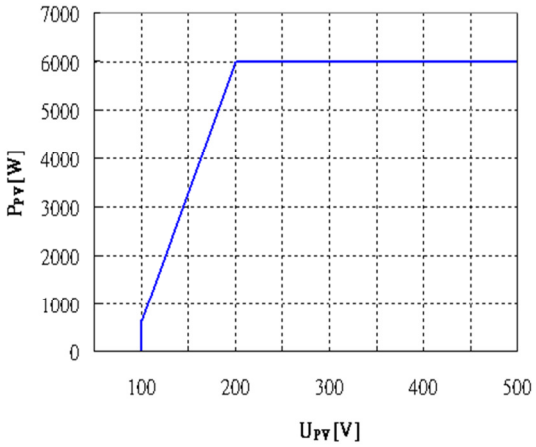
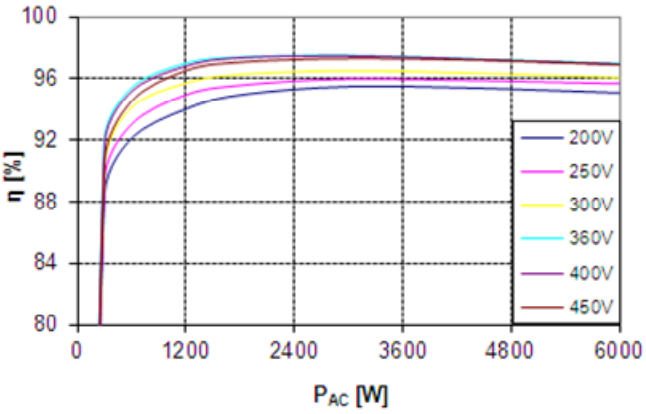


SV 4000s





▲ Table 9-2 Load and efficiency chart of SV 3000s/ SV4000s

SV 4600s	
	
SV 6000s	
	

▲ Table 9-3 Load and efficiency chart of SV 4600s/ SV 6000s

10. Disposal

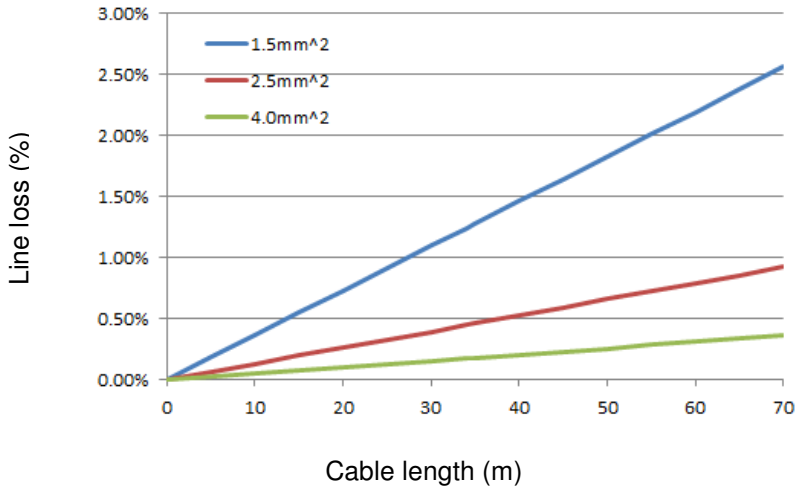
In the event the PV inverter reaches the end of its service life, please contact the your dealer for disposal instructions

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

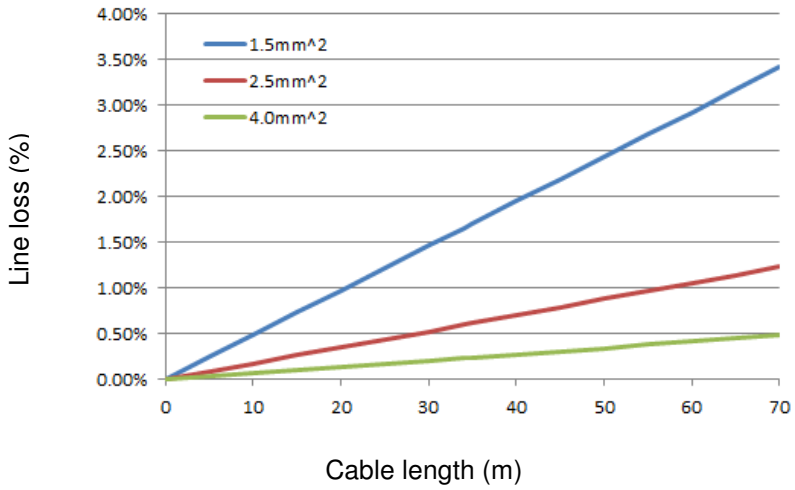
Disposal of the PV Inverter at the end of its service life shall be done in accordance with applicable disposal regulations for electronic waste

Appendix I: Line Loss vs. Cable Length

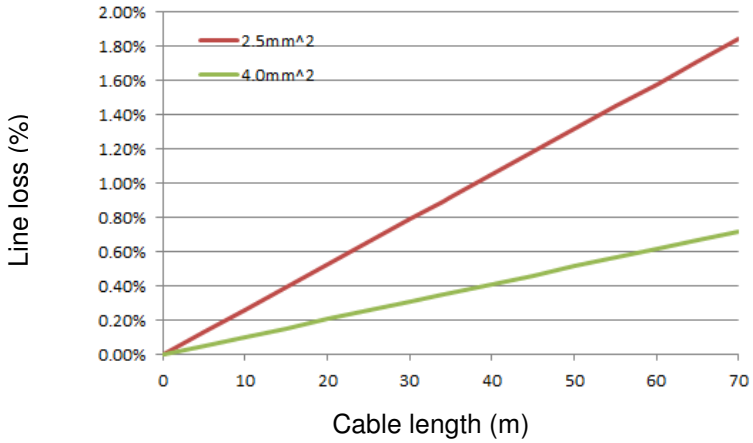
SV 1500s



SV 2000s

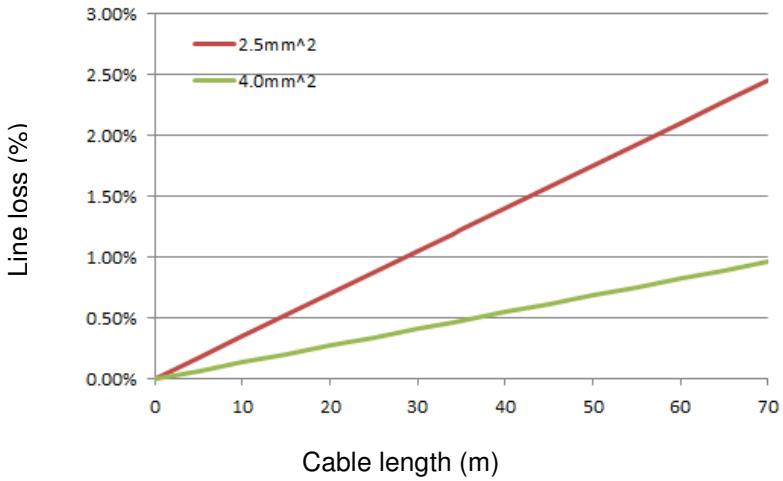


SV 3000s

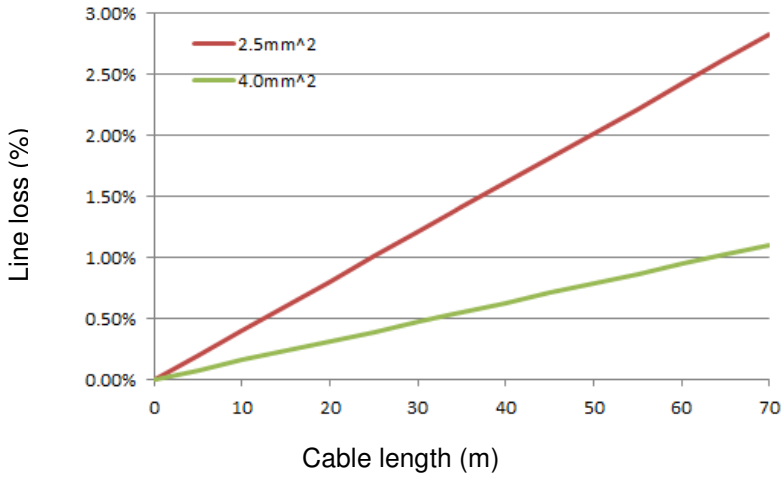


▲ Table A1-1 Line loss vs. Cable length of SV 1500s/ SV 2000s/ SV 3000s

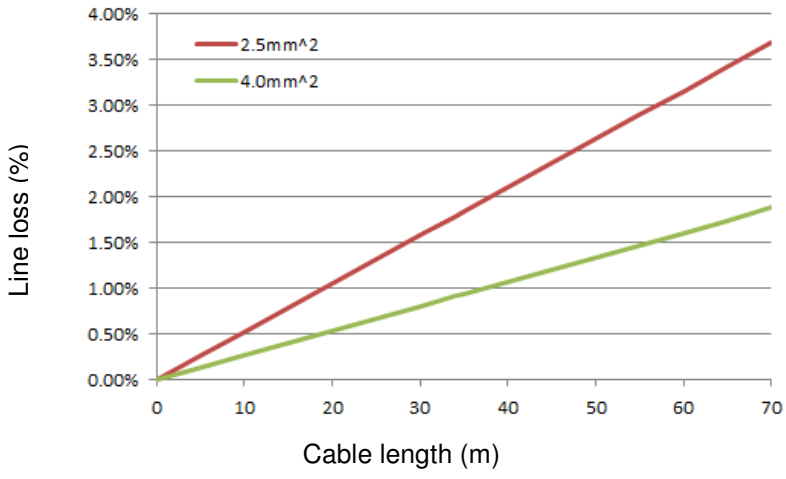
SV 4000s



SV 4600s



SV 6000s

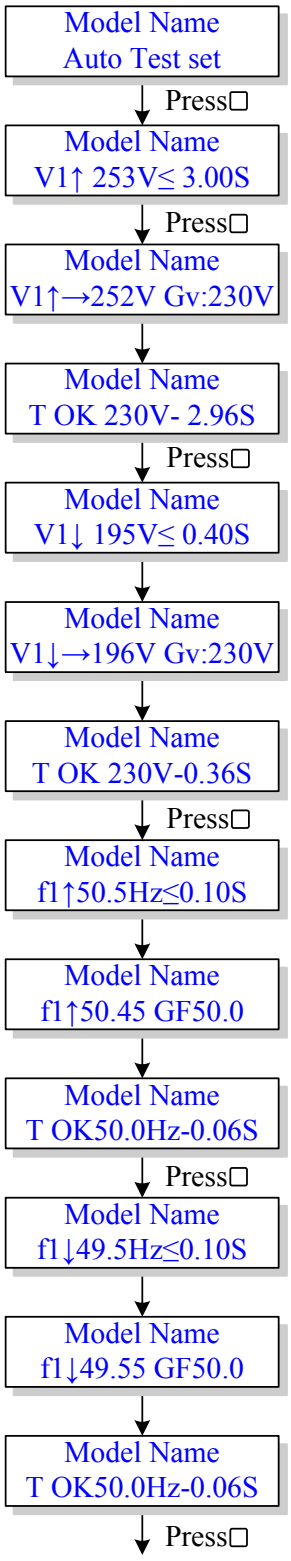


▲ Table A1-2 Line loss vs. Cable length of SV 4000s/ SV 4600s/ SV 6000s

Appendix II: Auto Test Menu (Only for CEI 0-21)

The Auto Test Menu is only available when the regulatory setting is set as CEI 0-21.

1. Press △ or ▽ to scroll the menu till the “Auto Test Set” menu is shown on the LCD.
2. Press □ to start the auto test procedure. The test flow is as shown in the diagram below.



Test condition (Upper voltage level 1 threshold test)

Test proceeding menu (Upper voltage level 1 threshold test)

Test result menu (Upper voltage level 1 threshold test)

Test condition (Lower voltage level 1 threshold test)

Test proceeding menu (Lower voltage level 1 threshold test)

Test result menu (Lower voltage level 1 threshold test)

Test condition (Upper frequency level 1 threshold test)

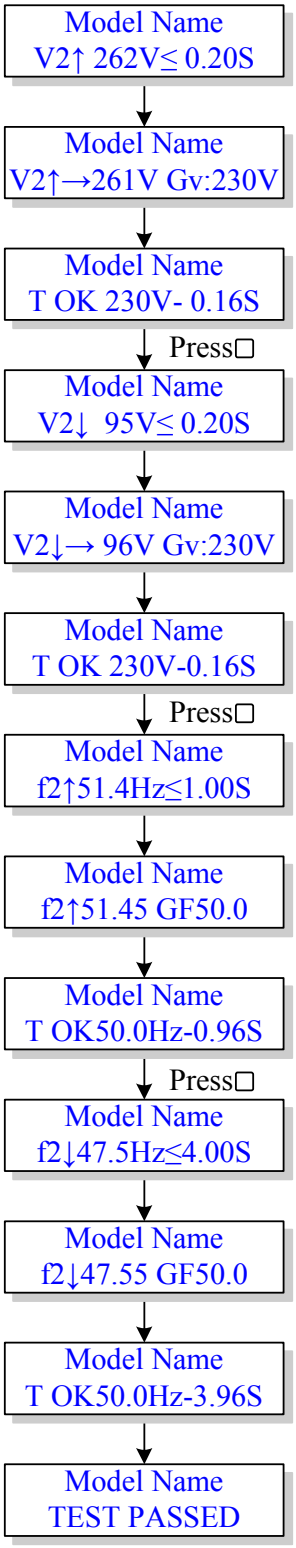
Test proceeding menu (Upper frequency level 1 threshold test)

Test result menu (Upper frequency level 1 threshold test)

Test condition (Lower frequency level 1 threshold test)

Test proceeding menu (Lower frequency level 1 threshold test)

Test result menu (Lower frequency level 1 threshold test)



Test condition (Upper voltage level 2 threshold test)

Test proceeding menu (Upper voltage level 2 threshold test)

Test result menu (Upper voltage level 2 threshold test)

Test condition (Lower voltage level 2 threshold test)

Test proceeding menu (Lower voltage level 2 threshold test)

Test result menu (Lower voltage level 2 threshold test)

Test condition (Upper frequency level 2 threshold test)

Test proceeding menu (Upper frequency level 2 threshold test)

Test result menu (Upper frequency level 2 threshold test)

Test condition (Lower frequency level 2 threshold test)

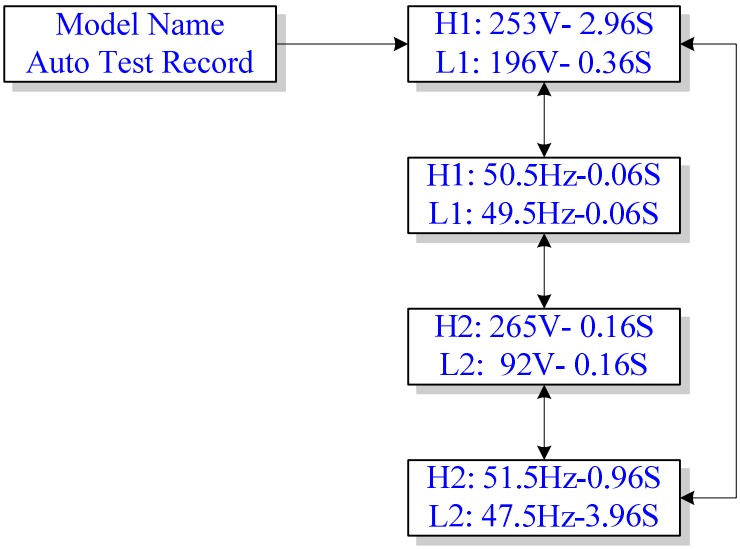
Test proceeding menu (Lower frequency level 2 threshold test)

Test result menu (Lower frequency level 2 threshold test)

Auto Test Record Menu (Only for CEI 0-21)

Auto Test Record Menu allows the user to check the test result of auto test.

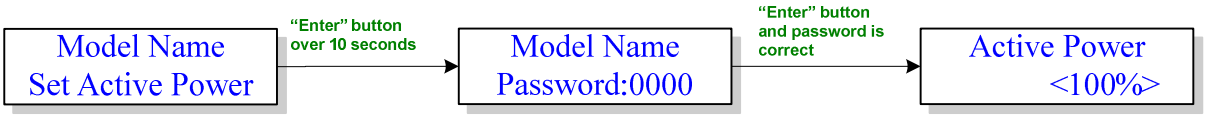
1. Press △ or ▽ to scroll the menu till the “Auto Test Record” menu is shown on the LCD.
2. Press □ to display the test record (if available). If the auto test has never been performed, “No Test Record” will be shown on the LCD.
3. Press △ or ▽ to scroll through the test results.
4. Press □ to exit from the menu.



Appendix III: Active Power Setting Menu (Only for CEI-021, VDE-AR-N 4105, VDE0126-1-1/A1)

In the event the user needs to set the output active power, please follow the steps below,

1. Press △ or ▽ to scroll the menu till the “Set Active Power” menu is shown on the LCD.
2. Press □ for over 10 seconds to enter into the password screen.
3. Press △ or ▽ to change the number of the toggled digit. Press □ to confirm the setting and move the cursor to the next digit. Continue the process until all 4 digits are set.
4. If the password is correctly set, active power setting menu will be entered and the current percentage of active power can be seen (default value: 100%)



5. Press △ or ▽ to change the percentage of desired active power.
6. Press □ for over 5 seconds to save the setting.

This menu is for Active Power limit setting.

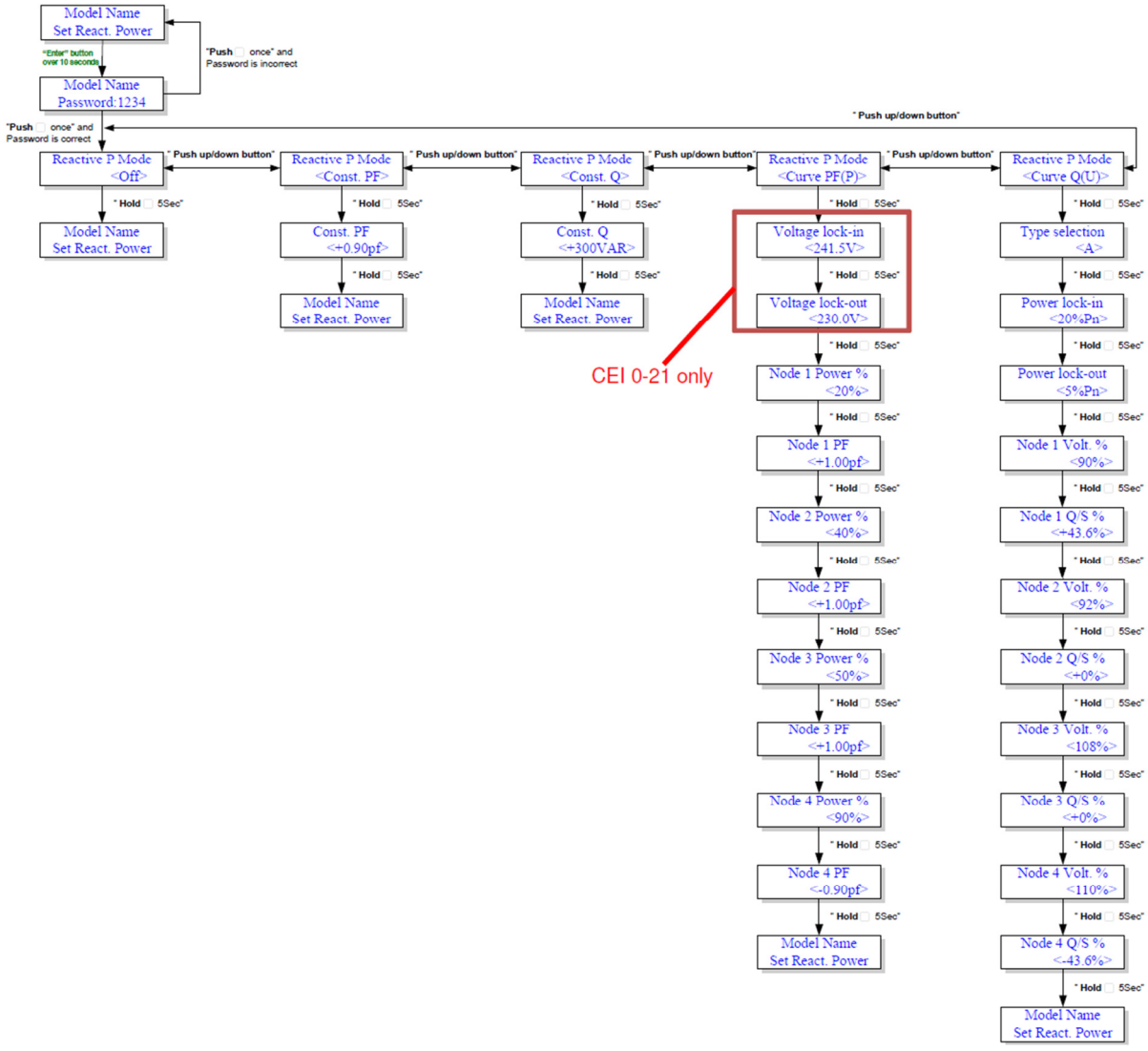
WARNING:
The active power setting shall be performed only by qualified technician. Please contact your dealer to obtain the password if needed.

Appendix IV: Reactive Power Setting Menu (Only for CEI 0-21, VDE-AR-N 4105)

In the event the user needs to set the output reactive power, please follow the steps below,

1. Press △ or ▽ to scroll the menu till the “Set React. Power” menu is shown on the LCD.
2. Press □ for over 10 seconds to enter into the password screen.
3. Press △ or ▽ to change the number of the toggled digit. Press □ to confirm the setting and move the cursor to the next digit. Continue the process until all 4 digits are set.

4. If the password is correctly set, “Reactive P Mode” menu will be entered.
5. Press △ or ▽ to scroll the 5 modes: “Off”, “Const. PF”, “Const. Q”, “Curve PF(P)”, and Curve Q(U). The settings for the 5 modes are described respectively below.



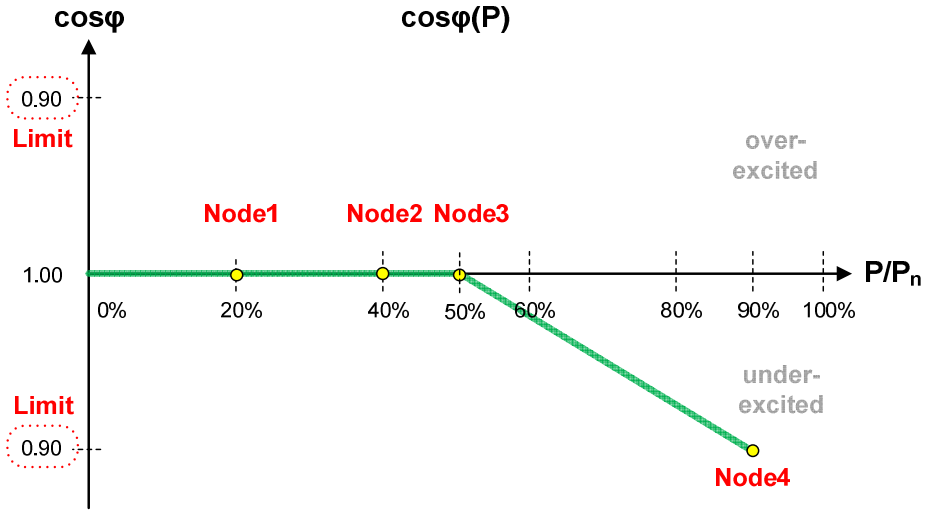
Off Mode
In Off mode, the reactive power control will be disabled.
1. Scroll to <Off> mode.
2. Press ☐ for over 5 seconds to disable the reactive power control.
3. “Set React. Power” message will be shown on the screen to indicate that the setting is saved.

Const. PF
In Const. PF mode, the user may specify a power factor (“PF”) so as to let the inverter output active power and reactive power according to the fixed PF.
1. Scroll to <Const. PF> mode.
2. Press ☐ for over 5 seconds to set the PF.
3. Press △ or ▽ to change the PF to desired value.
4. Press ☐ for over 5 seconds to save the setting.
5. “Set React. Power” message will be shown on the screen to indicate that the setting is saved.

Const. Q
In Const. Q mode, the user may specify the upper limit of reactive power.
1. Scroll to <Const. Q> mode.
2. Press ☐ for over 5 seconds to set the upper limit of reactive power.
3. Press △ or ▽ to change the upper limit to desired value.
4. Press ☐ for over 5 seconds to save the setting.
5. “Set React. Power” message will be shown on the screen to indicate that the setting is saved.

The upper limit of reactive power is only applicable when input power is sufficient. Under this mode, in no case the power factor will exceed the range -0.9~+0.9. If the input power is too low, the output reactive power will be subject to input power so as to make sure the power factor falls in the above range.

Curve PF(P)
In Curve PF(P) mode, the user may let the PF (“cosϕ”) change as a function of active power, under a given AC output voltage range. The relationship between cosϕ and PF may be specified by setting Node 1~4 as shown in the example below.

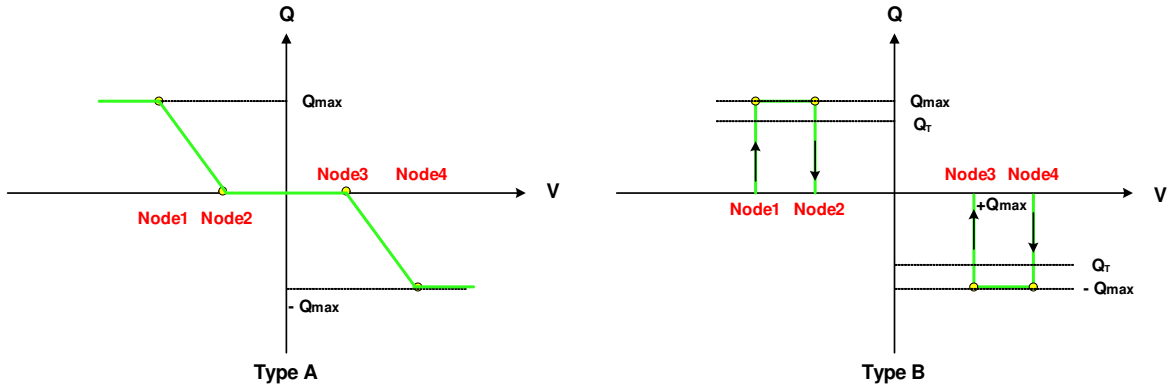


1. Scroll to <Curve PF(P)> mode.
2. Press ☐ for over 5 seconds to enter the setting menu.
3. In “Voltage lock-in” menu, press△ or ▽ to change the AC voltage where reactive power control will be enabled. Press ☐ for over 5 seconds to confirm the setting.
4. In “Voltage lock-out” menu, press△ or ▽ to change the AC voltage where reactive power control will be disabled. Press ☐ for over 5 seconds to confirm the setting.

5. In “Node 1 Power %” screen, press△ or ▽ to change the output active power (percentage of nominal output power) for Node 1. Press □ for over 5 seconds to confirm the setting.
6. In “Node 1 PF” screen, press △ or ▽ to change the desired PF for Node 1. Press □ for over 5 seconds to confirm the setting.
7. Repeat step 5 and step 6 to complete the setting for Node 2~4.
8. “Set React. Power” message will be shown on the screen to indicate that the setting is saved.

Curve Q(U)

In “Curve Q(U)” mode, user may let the reactive power (“Q”) change as the function of AC output voltage, under given range of output active power. The relationship between Q and U may be specified by setting Node 1~4 as shown in the example below.

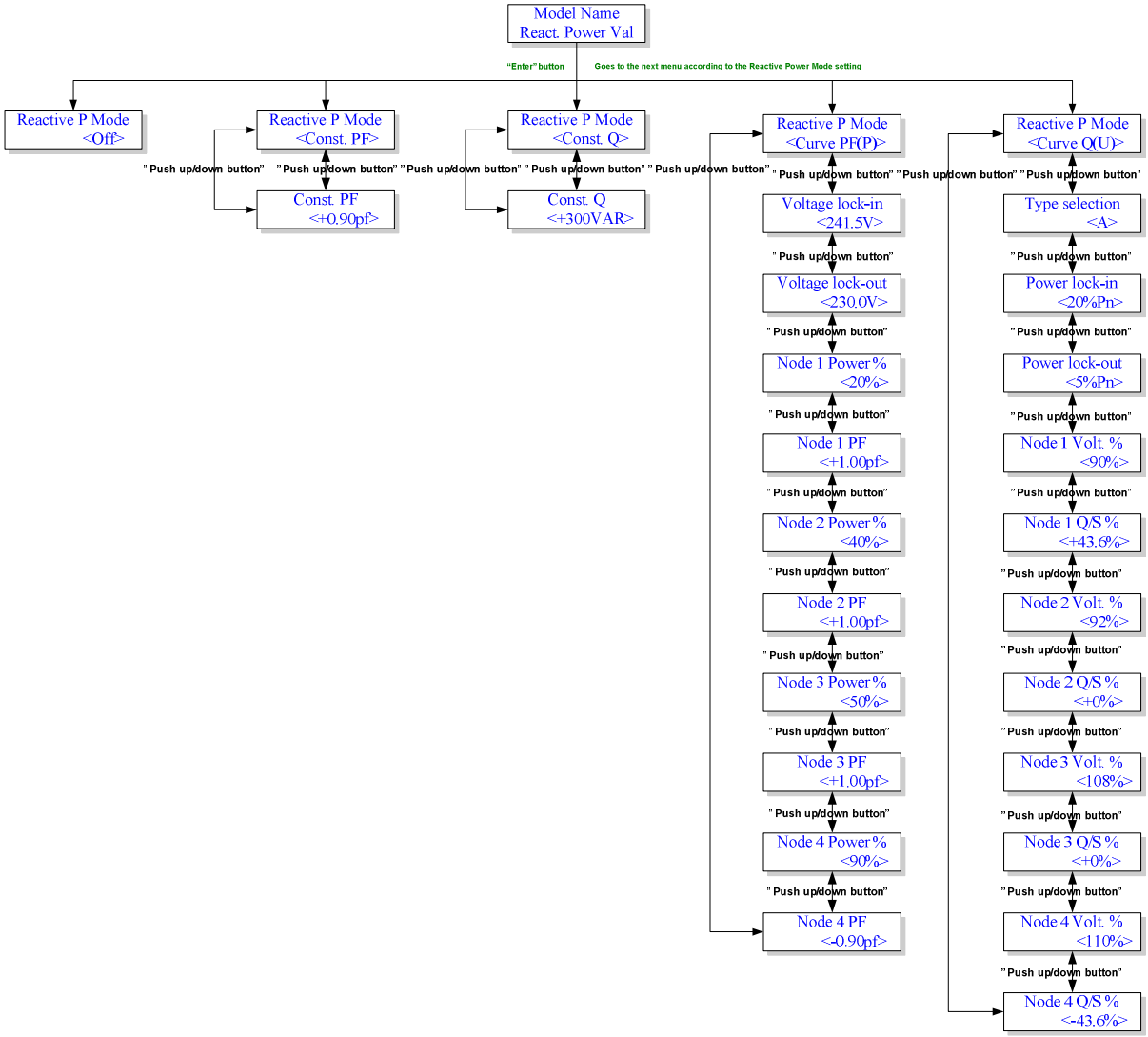


1. Scroll to <Curve Q(U)> mode.
2. Press □ for over 5 seconds to set the type of Curve Q(U).
3. In “Type selection” screen, press△ or ▽ to change to the desired type. Press □ for over 5 seconds to confirm the setting and go the next menu to set the output active power range in which the Curve Q(U) mode will be activated.
4. In “Power lock-in” menu, press△ or ▽ to change the output active power (percentage of nominal output power) where the reactive power control will be enabled. Press □ for over 5 seconds to confirm the setting.
5. In “Power lock-out” menu, press△ or ▽ to change the output active power (percentage of nominal output power) where the reactive power control will be disabled. Press □ for over 5 seconds to confirm the setting.
6. In “Node 1 Volt. %” screen, press△ or ▽ to change the AC voltage (percentage of nominal AC voltage) for Node 1. Press □ for over 5 seconds to confirm the setting.
7. In “Node 1 Q/S %” screen, press △ or ▽ to change the desired output reactive power (percentage of output apparent power) for Node 1. Press □ for over 5 seconds to confirm the setting.
8. Repeat step 6 and step 7 to complete the setting for Node 2~4.
9. “Set React. Power” message will be shown on the screen to indicate that the setting is saved.

Warning:
The setting of reactive power control will affect the output power of inverter and therefore shall only be set by qualified technician. Please contact your dealer to obtain the password if needed.

Appendix V: Reactive Power Value Menu (Only for CEI 0-21, VDE-AR-N 4105)

The Reactive Power Value Menu is designed to let the user check the current setting of reactive power control (For the setting of reactive power control, please refer to Appendix IV).

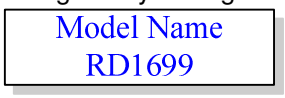


1. Press △ or ▽ to scroll the menu till the “React. Power Val” menu is shown on the LCD.
2. Press □ to enter into the next menu level which is subject to current setting of the mode for reactive power control.
3. Press △ or ▽ to scroll the current setting of parameters available for the mode.
4. Press □ to exit from the menu.

Appendix VI: How to Change Regulatory Setting

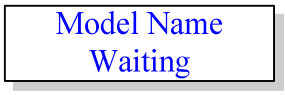
In the event the user needs to change the regulatory setting, please follow the steps below,

1. Press △ or ▽ to scroll the menu till the regulatory setting is shown on the LCD as the example below,



2. Hold □ for 2 seconds to lock the screen first.
3. Hold □ for 15 seconds to enter the password menu, as the example below,

4. Press △ or ▽ to change the number of the toggled digit. Press □ to confirm the setting and move the cursor to the next digit. Continue the process until all 4 digits are set.
5. If the password is set correctly, “Waiting” will be shown on the LCD and then the initialization menu.

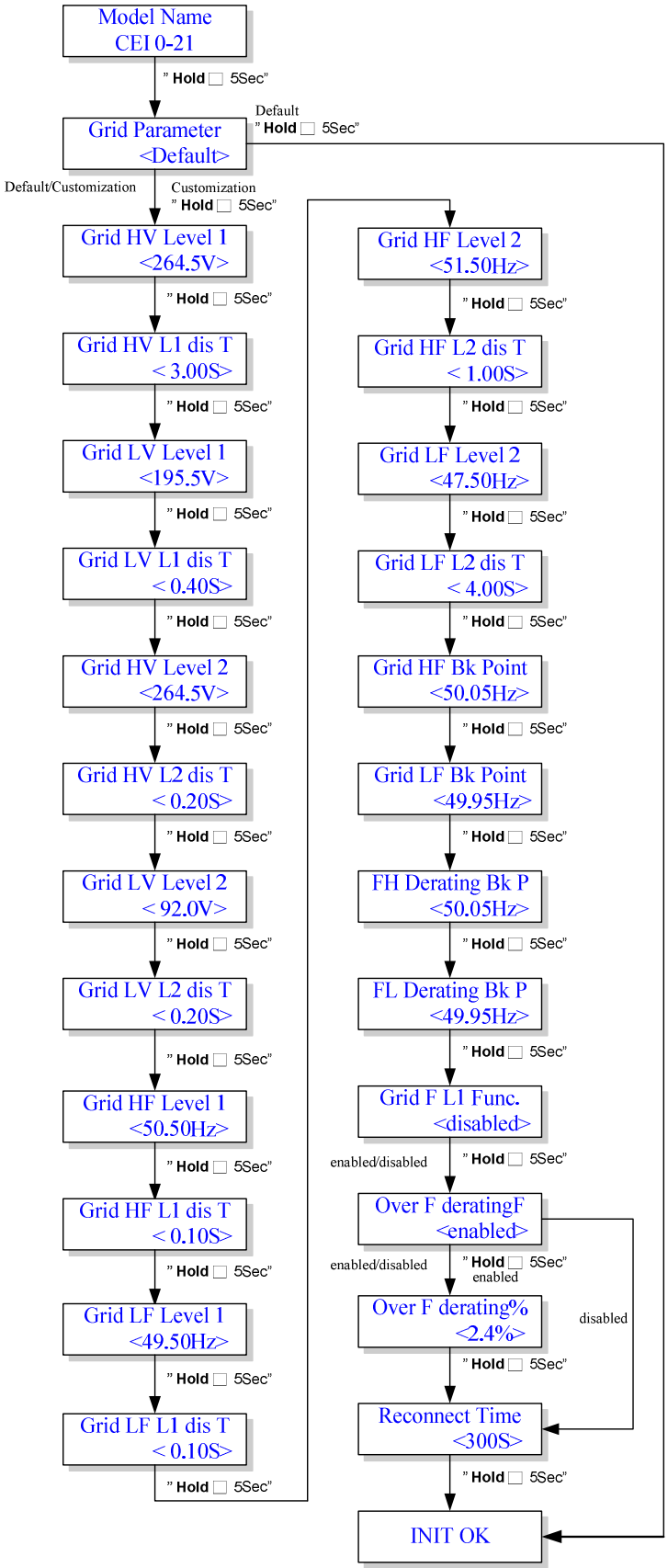


6. Please refer to Section 2.9 for initialization process.

Appendix VII: Customized Setting for CEI 0-21

In the event the user needs to customize the parameter setting for CEI 0-21, please following the steps below,

1. Press △ or ▽ to scroll the menu till the CEI 0-21 setting is shown on the LCD.
2. Press □ for 5 seconds to enter “Grid Parameter” menu.
3. Press △ or ▽ to select between “Default” or “Customization”. Select “Customization” to start the customized setting procedure. (If “Default” is selected, “INIT OK” will be shown on the LCD.)
4. In “Grid HV Level 1” menu, press △ or ▽ to change the value, and then press □ for 5 seconds to confirm the setting and move the next parameter.
5. Repeat the procedure in step 4 till all parameters are set. Please refer to the flow chart below.
6. “INIT OK” will be shown on the LCD and the setting is completed.


Model Name
CEI 0-21
" Hold 5Sec"
Grid Parameter
<Default>
Default
" Hold 5Sec"
Default/Customization
Customization
" Hold 5Sec"
Grid HV Level 1
<264.5V>
Grid HV L1 dis T
< 3.00S>
Grid LV Level 1
<195.5V>
Grid LV L1 dis T
< 0.40S>
Grid HV Level 2
<264.5V>
Grid HV L2 dis T
< 0.20S>
Grid LV Level 2
< 92.0V>
Grid LV L2 dis T
< 0.20S>
Grid HF Level 1
<50.50Hz>
Grid HF L1 dis T
< 0.10S>
Grid LF Level 1
<49.50Hz>
Grid LF L1 dis T
< 0.10S>
Grid HF Level 2
<51.50Hz>
Grid HF L2 dis T
< 1.00S>
Grid LF Level 2
<47.50Hz>
Grid LF L2 dis T
< 4.00S>
Grid HF Bk Point
<50.05Hz>
Grid LF Bk Point
<49.95Hz>
FH Derating Bk P
<50.05Hz>
FL Derating Bk P
<49.95Hz>
Grid F L1 Func.
<disabled>
enabled/disabled
Over F deratingF
<enabled>
enabled/disabled
enabled
Over F derating%
<2.4%>
disabled
Reconnect Time
<300S>
INIT OK