
User Manual

SG30KTL/SG30KTL-M PV Grid-Connected Inverter



About This Manual

This manual is for the inverters SG30KTL and SG30KTL-M. These inverter are grid-connected, transformer-less, robust and of high conversion efficiency. The device will bring you profit from PV power system.

Aim

The manual contains information about the inverter, which will provide you guidelines to connect the inverter into the PV power system and operate the inverter.

Related Documents

The manual cannot include complete information about the PV system. You will get the additional information about other devices at www.sungrowpower.com or via webpage of device manufacturer.

Target Group

The manual is targeted to technical personnel who is responsible for inverter installation and commissioning in the PV power system and inverter owner who will perform daily LCD operation.

How to Use This Manual

Read the manual and other related documents before any work with the inverter. Documents must be stored carefully and available at all times.

The contents of the manual will be periodically updated or revised due to the product development. It is probably that there are changes of manual in subsequent inverter edition. The latest manual can be acquired via visiting the web page www.sungrowpower.com.

Symbols Explanation

Important instructions contained in this manual should be followed during installation, operation and maintenance of the inverter. And they will be highlighted by the following symbols.

DANGER

DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE indicates a situation which, if not avoided, could result in equipment or property damage.



NOTE indicates additional information, emphasized contents or tips to help you solve problems or save time.

Symbols on the Inverter Body



This symbol indicates that you should wait at least 10 minutes after disconnecting the inverter from the utility grid and from the PV input before touching any inner live parts.



Hot surface! In order to reduce the risk of burns, do not touch the hot surface when the device is running.



Look over the user manual before any operation on the inverter!



The installation and service of the inverter unit can only be performed by qualified personnel.



Do not disconnect DC connectors from the unit under load!

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1 Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS

The SG30KTL and the SG30KTL-M have been designed and tested strictly according to the international safety regulations. As electrical and electronic equipment, safety instructions related to them must be complied with during installation, commissioning, operation and maintenance. Incorrect operation or work may result in damage to:

- The life and well-being of the operator or a third party
- The inverter and other properties that belong to the operator or a third party

Therefore, the following safety instructions must be read and always kept in mind prior to any work. All detailed work-related safety warnings and notes will be specified at the critical points in corresponding chapter.

WARNING

All installation and electrical work must only be performed by qualified personnel. They have

- **been trained specially;**
- **already completely read through and understood the manual and other related documents;**
- **been familiar with safety requirements for electrical system.**

Technical personnel mentioned above may perform the following work:

- Install the inverter onto the wall
- Connect the inverter into the PV power system
- Connect other devices into the PV power system
- Commission the inverter
- Maintain and service the inverter

Before Installation

CAUTION

There is a risk of injury due to improperly handling the device!

- Always follow the instructions contained in the manual when moving and positioning the inverter.
- The weight of the equipment can cause injuries, serious wounds, or bruise if improperly handled.

During Installation

Prior to installing the inverter onto the wall, it is crucial to make certain that the inverter is not electrically connected.

CAUTION

System performance loss due to bad ventilation!

The equipment requires good quality ventilation during operation. It is essential to keep the unit upright and nothing covering the heat sink in order to ensure that the equipment interior is well cooled down.

During Electrical Connection

DANGER

Lethal voltage exists!

PV arrays will produce electrical energy when exposed to sunlight and thus can create an electrical shock hazard.

- Wiring of the PV arrays should only be performed by qualified personnel.
- PV modules should be covered by opaque materials during wiring.

WARNING

All cables must be firmly attached, undamaged, properly insulated and adequately dimensioned.

During Inverter Operation

Do not open the enclosure when the inverter is under voltage. There is an unlikely but possible risk of explosion in very specific cases of malfunction. The housing will protect persons and property from such an explosion, only if it is correctly sealed.

DANGER

There is a risk of inverter damage or personal injury!

Do not disconnect DC connectors while the inverter is under AC load! First de-energize the equipment from dual power sources and then verify that there is no voltage present.

CAUTION

There is a risk of burn!

Prevent from touching device hot parts (such as heat sink) during operation. Only LCD display panel and DC switch can be touched during inverter operation.

Maintenance and Service

DANGER

There is a risk of inverter damage or personnel injury due to incorrect service work!

Always keep in mind that the inverter is power supplied by dual power source: PV arrays and utility grid.

Before any service work, you should obey the following procedures.

- **Disconnect inverter from the utility grid side first and then PV arrays;**
- **Wait at least ten minutes until the inner capacitors discharge completely;**
- **Verify that no voltage or current present with appropriate testing device.**

CAUTION

Keep unrelated person away!

A temporary warning sign and barrier must be posted to keep non-related person away for any period while performing electrical connection and service work.

NOTICE

- **Any malfunction that may impair the inverter safety functions must be repaired immediately before the inverter is restarted again.**
- **Inverter contains no owner serviceable parts inside. Please contact local authorized personnel if any service work is required.**



Servicing of the device in accordance with the manual should never be undertaken in the absence of proper tools, test equipment or more recent revision of the manual which is clearly and thoroughly understood.

NOTICE

There is a risk of inverter damage if it is improperly serviced.

Use only accessories and spare parts approved by the inverter manufacturer. Never modify the inverter or other components of the inverter. Otherwise it will cause loss of any or all warranty rights.

NOTICE

There is a risk of inverter damage due to electrostatic discharge!

The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Avoid unnecessary touch with the boards during replacement.

Others**NOTICE**

The selected country settings can be changed by qualified personnel only!

Unauthorized modification to country settings should be prohibited. Alternation of the country settings may cause a breach of the type-certificate marking.

**WARNING**

All safety instructions, warning labels and nameplate on the inverter body:

- **Must be clearly visible;**
- **Must not be removed, covered and pasted.**



WARNING

These regulations should also be followed:

- **The regulations related to the electricity fed into grid;**
- **The safety instructions related to PV arrays;**
- **The safety instructions related to other electrical device.**

2 Product Introduction

2.1 Intended Usage

SG30KTL and SG30KTL-M (They will be referred to as inverter hereinafter unless otherwise specified) which are a 3-phase string inverter without transformer, are crucial unit between the PV strings and utility grid in the PV power system.

Inverter is dedicated to converting direct current power generated by the PV modules into alternating current, which conforms to parameters of local utility grid, and feeds it into the utility grid. The intended usage of the inverter is illustrated in Fig. 2-1.

WARNING

Inverter CANNOT be connected to the PV modules, the positive or negative terminal of which needs to be grounded.

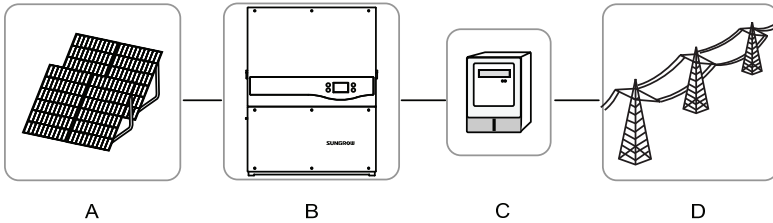


Fig. 2-1 Application of the inverter of the PV Power System

Item	Description	Note
A	PV strings	Monocrystalline silicon; polycrystalline silicon and thin-film without grounding of protection class II
B	Inverter	SG30KTL, SG30KTL-M
C	Metering device	meter cupboard with power distribution system
D	Utility grid	TT, TN-C, TN-S, TN-C-S.

If the PV system exceeds the capacity of one inverter, it is possible to make a multiple connection of several inverters into the PV system, with each one connected to an appropriate section of PV inputs and on the AC side they connected in parallel to the grid.

NOTICE

Any other or additional usage is not permitted except the intended usage.

Inverter may only accept PV modules with Protection Class II as its input.

Inverter may only be connected to utility grid via distribution board. Local loads (home appliance, lights, motor loads, etc.) cannot be connected between inverter and AC circuit breaker on the distribution board.

Additionally, the unit is intended for fixed installation. Located on a part that is not removable without impairing the operation of the unit.

2.2 Product Description

2.2.1 Product Appearance

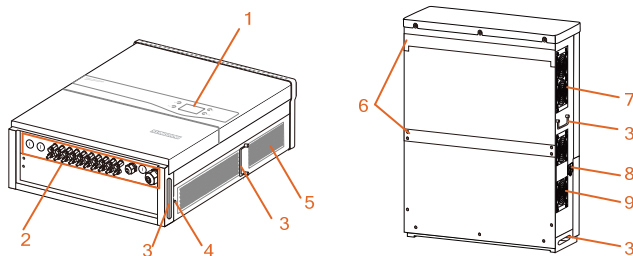


Fig. 2-2 Product Components Description

Item	Name	Description
1	LCD display panel	Inverter operation data viewing and parameters configuration can be performed via the LCD display panel.
2	Connection terminals	They are DC input terminals, AC output terminal and RS485 communication terminal.
3	Handles	The handles are designed for holding the unit when transporting, installing or servicing.
4	Second PE Terminals	Second protective earth terminals as specified in EN 50178.
5	Air outlet	Exit of hot air during the inverter operation.
6	Mounting ear	It is used for hanging inverter onto the backplate.
7	Fans	There are four fans to perform controlled forced-air cooling.
8	DC switch	During normal operation it is in "ON" state. It can shut down the inverter immediately in "OFF" position.
9	Air inlet	Entrance of cool air.

2.2.2 Dimensions of Inverter

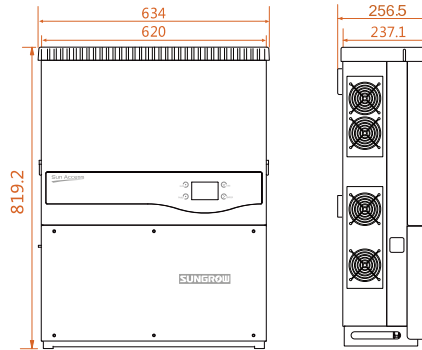


Fig. 2-3 Outline Dimensions of Inverter (unit: mm)

2.2.3 LCD Display Panel

As a human-computer interaction interface, LCD display panel comprises LED indicators, buttons and LCD display screen on the front panel of the inverter.

- LEDs indicate the working status of the inverter
- The current running information shown on the LCD display
- Malfunction records shown on the LCD display
- Inverter configuration by pressing the buttons

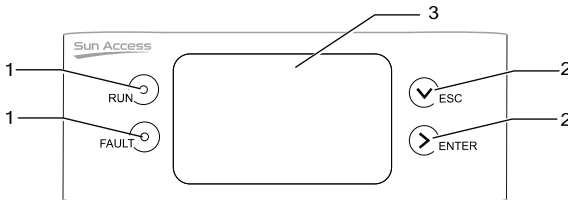


Fig. 2-4 LCD Display Panel

Tab. 2-1 LCD Display Panel Description

No.	Name	Description
1	LED indicators	“RUN” and “FAULT”. Inverter current state can be known from the two indicators. Detailed definition is shown in Tab. 2-2.
2	Buttons	Navigate in the LCD menu, set values and so on. Detailed function is shown in Tab. 10-1.
3	LCD screen	LCD screen can display current state of inverter, current running information, history information and parameters to be set.

Tab. 2-2 Description of LED Indicator Status

LED Status	Description
"RUN": on; "FAULT": off	Inverter is feeding AC power to the utility grid.
"RUN": off; "FAULT": on	A malfunction happens; or protection function triggers.
"RUN": off; "FAULT": off	Inverter is not energized; or there is a communication error between DSP and LCD.

2.2.4 DC Switch

DC switch is designed for safely disconnecting the DC input current if required.

The inverter works automatically when input and output meet the requirements. Rotating DC switch to the "OFF" position will immediately cut off the flow of DC current.



Rotate the DC switch to the "ON" position, before restarting the inverter.

2.3 Technical Description

2.3.1 Principle Description

The principle design of transformer-less and grid-connected inverters-SG30KTL and SG30KTL-M are illustrated in Fig. 2-5 and Fig. 2-6.

PV strings input voltage is transmitted to DC BUS via Boost circuit.

- The SG30KTL is equipped with one MPPT for DC inputs to ensure that the maximum power can be utilized.
- The SG30KTL-M is equipped with MPPTs for two DC inputs to ensure that the maximum power can be utilized even in different PV modules installation conditions.

Inversion circuit converts DC power into AC power, which will be fed into the utility grid via five core terminals. Protective circuits are designed to guarantee inverter safe operation and human safety.

A DC switch is integrated for safe disconnection of DC current. The inverter provides standard interface RS485 for communication. Inverters are also provided running records display and parameters configuration via human-computer interface – LCD display panel.

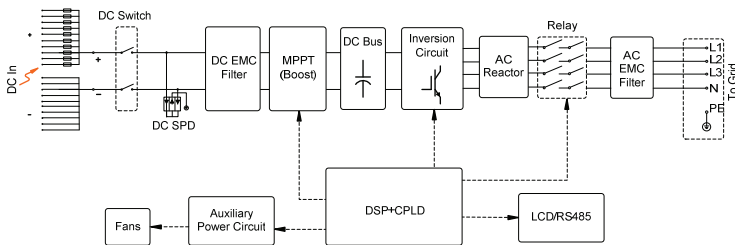


Fig. 2-5 Main Circuit Diagram of SG30KTL

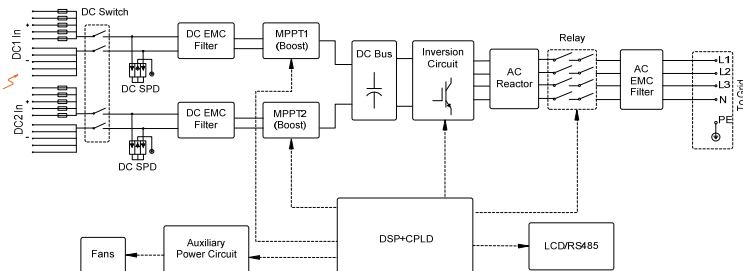


Fig. 2-6 Main Circuit Diagram of SG30KTL-M

2.3.2 Functions Description

Inverter functions can be grouped as the following:

- **Conversion function**
Inverter converts the direct current power into alternating current power, which conforms to the grid requirement of its installation country.
- **Data storage and display**
Inverter stores essential data including running information and fault records, and displays them on integrated LCD display.
- **Parameters configuration**
Inverter provides various parameters configuration for optimal operation.
- **Communication interface**
Standard RS485 interface for connecting other monitoring devices into the PV system is included.
- **Protection functions**
 - Reverse polarity protection
 - Short circuit protection
 - Insulation resistance to ground surveillance
 - Inverter output voltage surveillance
 - Inverter output frequency surveillance
 - Residual current protection
 - DC component of AC output current surveillance
 - Anti-islanding phenomena protection
 - Ambient temperature surveillance
 - DC over-voltage protection
 - Over current protection
 - Power module over-temperature protection

2.3.3 Derating

Derating the output power is a way to protect the inverter from overload and potential malfunctions. Inverter's derating function can be activated in the following scenarios:

- PV input overload
- Grid voltage too low
- Temperature too high (Inner temperature and power modules temperature)
- Power limit setting on the inverter LCD display or remote dispatch
- Grid frequency too high (when the Country selection is "DE" or "IT")

PV Overload Derating

When the PV input power exceeds the defined Max DC Input Power (32 kW), the inverter will reduce the power evenly to the maximum limit and keep the output power at nominal value.

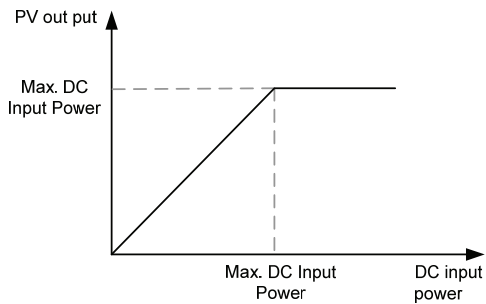


Fig. 2-7 PV Overload Derating

Power Limit Setting

User may allocate output power value of the inverter via LCD control panel or the remote dispatch from the grid company. Under this kind of power derating, the operating states will display on the LCD screen.

Over-temperature Derating

Power modules over-temperature may result from high ambient temperature, poor ventilation or fault of fans. Over-temperature derating may protect the inverter as well as the power modules against damage.

- When the modules temperature exceeds an upper limit, the inverter start to gradually derating until the temperature decreases to normal range.
- When the inner temperature exceeds an upper limit, the inverter start to gradually derating until the temperature decreases to normal range.



The deration lower limitation is about 33%.

If the modules temperature and the inner temperature are both exceed the limit, the actual derating power value will be the less one.

Grid Under-voltage Derating

Once the grid voltage is in the defined range of V_{grid} ($V_{min} \dots 215V$), the inverter will decrease the power output.

$$P_{[V_{min} \dots 215V]} = P_n \times (V_{grid} / 230V)$$

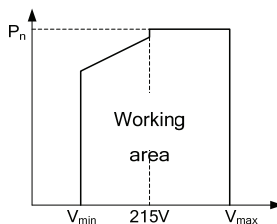


Fig. 2-8 Grid Under-voltage Derating

3 Installation Flow

Fig. 3-1 shows the installation flow of inverter for installer. Please follow these procedures.

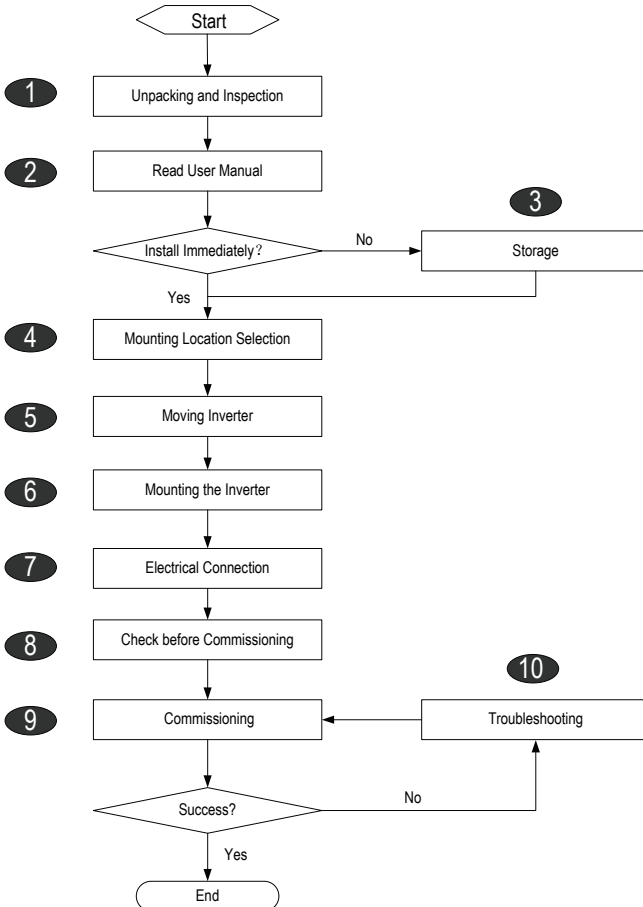


Fig. 3-1 Installation Flow Chart

Tab. 3-1 Description of Installation Flow

Order	Description	Reference Chapter
1	Unpacking and inspection	Section 4.1
2	Read this manual, especially the section on "safety instruction"	Chapter 1
3	Store the inverter unit if not install immediately	Section 4.4
4	Choose the best installation site	Section 5.1
5	Moving the inverter to installation site	Section 5.2
6	Install the inverter against the chosen wall	Section 5.3
7	Electrical connections include DC, AC, ground and communication(optional)connection	Section 6.3...6.7
8	Examine before commissioning	Section 7.1
9	Start up inverter and configure corresponding parameters	Section 7.2
10	Troubleshooting	Section 9.1

4 Unpacking and Storage

4.1 Unpacking and Inspection

The unit is thoroughly tested and strictly inspected before delivery. Damage may still occur during shipping.

- Check the packing for any visible damage upon receiving.
- Check the inner contents for damage after unpacking.
- Check the completeness of delivery contents according to the inner packing list.

If there is visible damage to the packaging or the inner contents, or if there is something missing, contact the unit dealer.

Do not dispose of the original packaging. It will be the best choice to store the inverter by re-using the original packaging.

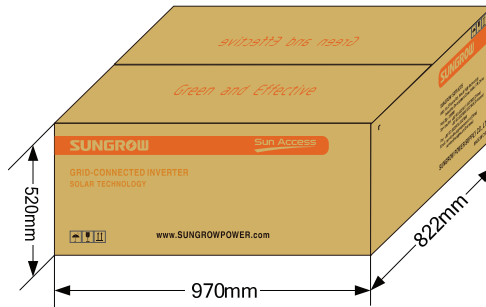


Fig. 4-1 Paper Packaging of Inverter

4.2 Identifying Inverter

A nameplate is attached to one side of the inverter and the carton respectively. It provides information on type of inverter, along with the most important specifications, marks of certification institutions, website and serial number which is available and identified by Sungrow.

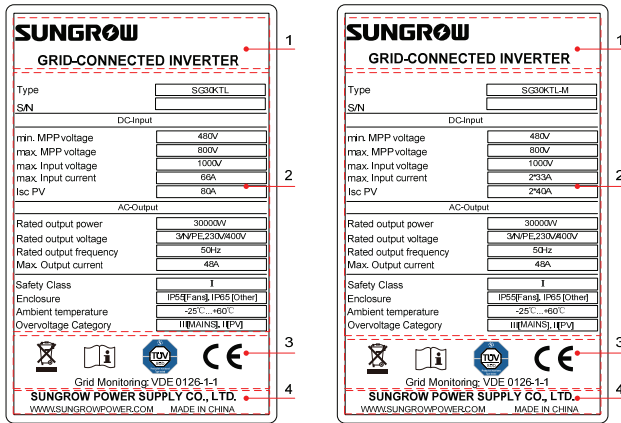


Fig. 4-2 Nameplate of Inverters (without serial number)

*Image shown here is indicative only. Actual product you receive may differ.

Item	Description
1	SUNGROW logo and product type
2	Technical data of inverter
3	Marks of certification institutions of inverter
4	Company name, website and origin

Tab. 4-1 Description of Icons on the Nameplate

Icon	Description
	Don't dispose of the inverter with the household waste.
	Refer to the corresponding instructions.
	TUV mark of conformity. The inverter is in compliance with directives of TUV.
	CE mark of conformity. The inverter is in compliance with directives of CE.

4.3 Delivery Contents

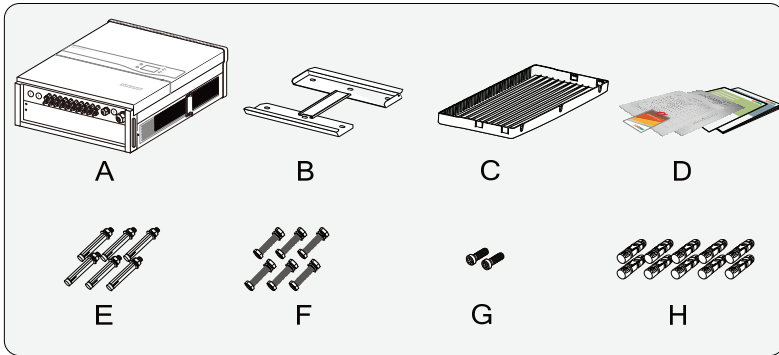


Fig. 4-3 Delivery Contents

Item	Name	Description
A	Inverter unit	---
B	Backplate	It is used for mounting inverter onto the wall.
C	Inverter cap	It is for inverter's better weather-proof function.
D	Documents	Documents include quality certificate, packing list, product test report, quick installation guide and inverter user manual.
E	Expansion bolts	Six units. It is used for fastening backplate onto concrete wall.
F	Fastener set	Six units. It is used for fastening backplate onto metal frame.
G	Fix screws	2 M4×16 screws for fix the inverter to the backplate.
H	DC connectors	Ten pairs. PV input cables must be equipped with the connector.

4.4 Storage of Inverter

Where the inverter may not be installed immediately or inverter needs to be stored under certain condition, store the unit as the following indications:

- The unit must be packed into original carton and desiccant must be put inside. If the original packaging is not available, an equivalent carton which is able to support the unit weight and size can be used.
- The packing should be sealed by adhesive tape.
- The unit must be stored in a clean and dry place to protect against dust and moisture.
- The storage temperature should be always between -25°C and 60°C . And the storage relative humidity should be always 0 and 95%.
- The recommended number of stack layers is not more than 4.
- It is very important to keep the packing away from chemicals. Otherwise it will lead to corrosion.
- During the storage time, periodically check any visible damage by rats and other rodents. Replace the packaging if necessary.
- The packaging should be kept upright.
- After long term storage, local installer or service dept. of Sungrow should perform a comprehensive test before connecting the inverter into PV power system.

5 Installing Inverter onto Wall

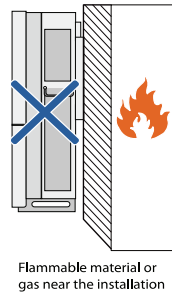
5.1 Selecting Installation Location

Selecting an optimal installation location for the inverter is decisive for its operating safety as well as its expected efficiency and service life.

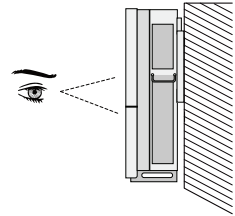
- Take the load capacity of the wall into account. The wall (such as concrete wall and metal structure) should be strong enough to hold the weight of the inverter over a long period of time.
- Install the unit where is accessible to install, electrical connect or service.
- Do not install the unit on the wall of flammable materials.



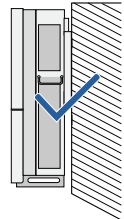
- Do not install the inverter where contains flammable materials or flammable gas in the vicinity of the unit installation.



- Install the unit at eye level for easily buttons operation and display read.

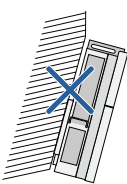


- It is suggested that the inverter be installed vertically with upside up for good heat dissipation.

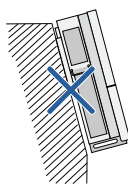


- Never install the inverter horizontally, nor with a forward tilt, nor with a backward tilt nor even with upside down.

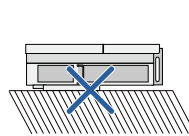
Forward tilt



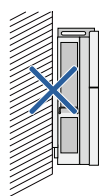
Backward tilt



Horizontally



Upside down



- The inverter unit with IP65 can be installed indoors or outdoors also.



Max. ambient temperature:
+60°C

- The ambient temperature should range from -25°C to 60°C.



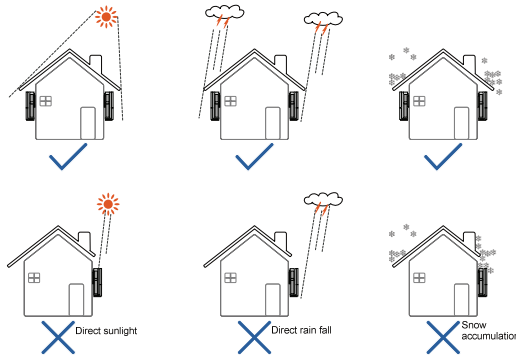
Min. ambient temperature:
-25°C

- The relative humidity at the installation must not exceed 95%. Moisture may result in corrosion and damage to the internal device components.

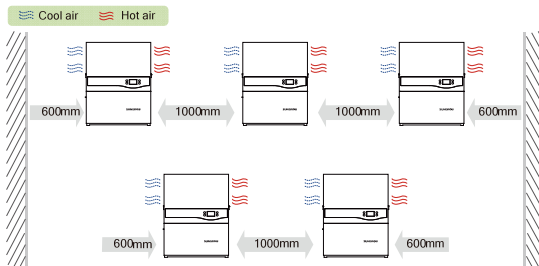


Max. relative humidity:
+95% No condensing

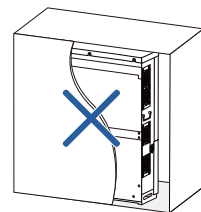
- Avoid exposing inverter to direct sunlight or rain or snow to extend its service life despite the IP65 protection degree. Exposure to the sun may cause additional internal heating which will cause power reducing. Shaded site of the building is preferred.



- Take enough space for convection into consideration during installing multiple inverters. It is suggested that position the multiple inverters in a staggered way if necessary.



- Do not install the inverter in a closed cabinet. Otherwise, the inverter will not operate normally. It is necessary to make sure that hot air will be discharged by forced ventilation.
- Do not install the inverter where children can reach.
- Do not install the inverter in living area. Noise can be produced during running of inverter, which may affect your daily life.



5.2 Moving Inverter to Installation Site

If the inverter is to be installed, remove the unit from the packaging and move it to the chosen installation site. During the moving process, the following instructions should be obeyed.

- Always remember the weight of the inverters.
- Grasp the equipment handles by both hands by means of handles.
- Move the unit with the help of others or the lifting device.
- Do not release the equipment unless it has been secured to the wall firmly.

5.3 Installing the Inverter

Inverter is installed onto the wall by means of backplate enclosed in the packaging. If you don't use the supplied backplate, you may drill holes refer to its dimension below.

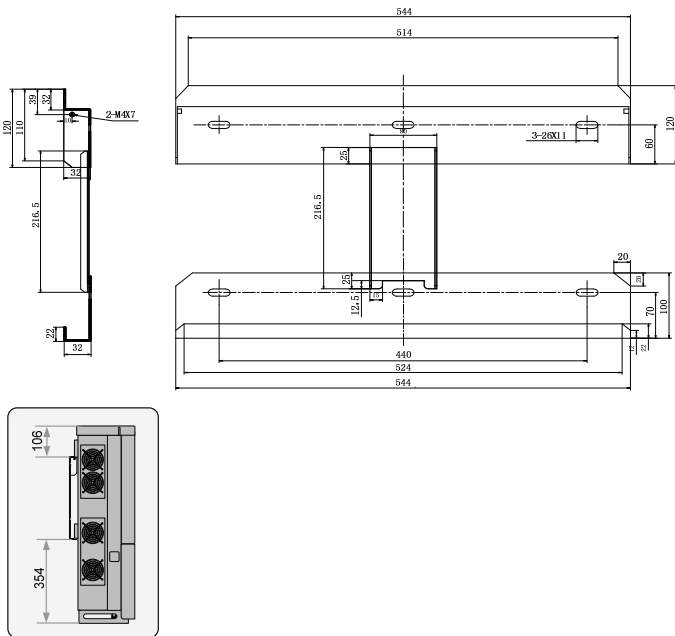


Fig. 5-1 Dimensions of Backplate(unit: mm)

There are two sets of stainless fasteners supplied for attaching the backplate to concrete wall and metal frame.

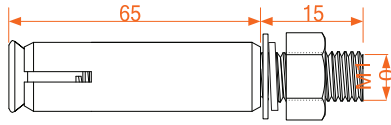


Fig. 5-2 Dimensions of Expansion Bolt Set for Concrete Wall (unit: mm)

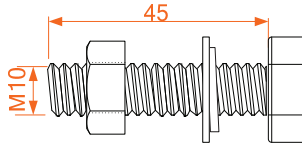


Fig. 5-3 Dimensions of Fastener Set for Metal Frame (unit: mm)

5.3.2 Installing on Concrete Wall

Step 1 Remove backplate and fasteners from the packaging.

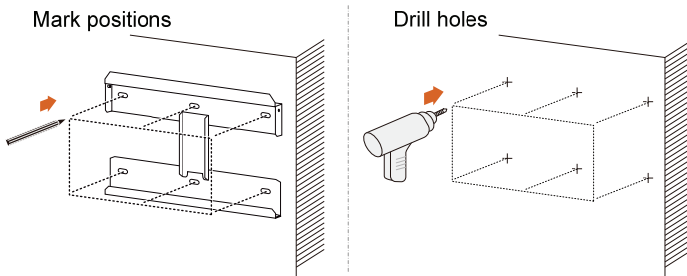
Step 2 Place the backplate onto the chosen concrete wall and adjust it until it is in a horizontal position.

Step 3 Mark the positions to drill holes using the backplate as the template.

Step 4 Drill holes according to the marks made before.

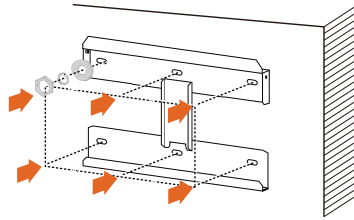
⚠ DANGER

In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.



Step 5 Attach the backplate to the wall firmly with the supplied expansion bolt set. The torque for fastening the nut is 35 Nm.

Install backplate

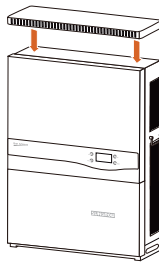


Step 6 Assemble the cap onto the inverter for better weatherproof function.

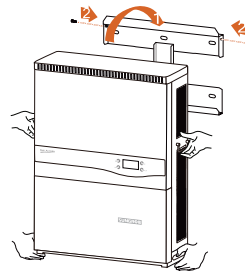
Step 7 Lift up inverter above the backplate and then slide down to make sure that the recesses on the back of the inverter fit perfectly together with the backplate.

Step 8 After fit the inverter to the backplate, fasten the inverter to the backplate with two M4×16 screws.

Assemble cap



Hang inverter

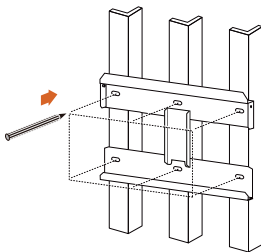


5.3.3 Installing on Metal Frame

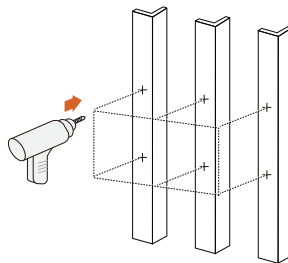
- Step 1** Remove backplate and fasteners from the packaging.
- Step 2** Choose the best installation site according to above requirements. Place the backplate onto the chosen metal frame and adjust it until it is in a horizontal position.
- Step 3** Mark the positions to drill holes by using the backplate as the template.
- Step 4** Drill 6 holes at the marks you have made. If the shape of the metal frame doesn't fit the holes on the backplate, re-drill holes on the backplate of appropriate position according to the chosen frame.

⚠ DANGER
In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

Mark positions

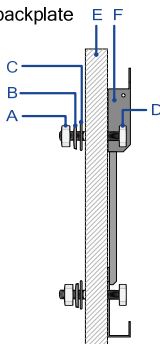


Drill holes



- Step 5** Fasten the backplate against the metal frame with bolts and nuts. The dimensions of fasteners used in the following diagram are recommended. The torque for fastening the nut is 35 Nm.

Install backplate



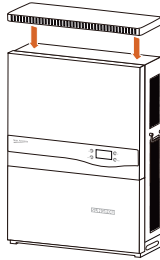
Item	Description	Remark
A	Hexagonal socket nut	M10
B	Spring washer	-
C	Washer	-
D	Hexagonal bolt	M10*45
E	Metallic wall	-
F	Backplate	-

Step 6 Assemble the cap onto the inverter for better weatherproof function.

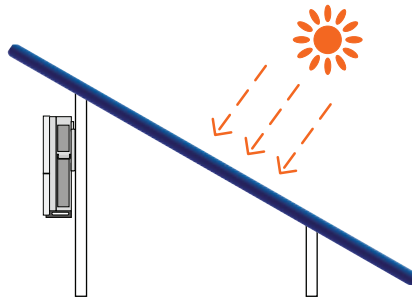
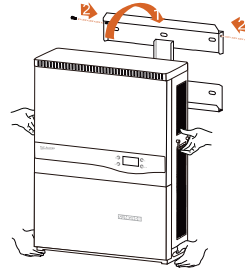
Step 7 Lift up the inverter above the backplate and then slide down to make sure that the recesses on the back of the inverter fit perfectly together with the backplate.

Step 8 After fit the inverter to the backplate, fasten the inverter to the backplate with two M4×16 screws.

Assemble cap



Hang inverter



6 Electrical Connection

Once the inverter is firmly attached to the appropriate location, it can be connected to the PV power system.

Installation shall comply with local regulations and technical rules. Installation shall comply with the relevant instructions of AS 4777.1.

WARNING

Improper operation during the wiring process can cause fatal injury to the operator or unrecoverable damage to the inverter.

Only qualified personnel can perform the wiring work.

Prior to any electrical connection, keep in mind that inverter has dual power supplies. It is mandatory for technical personnel to wear personal protective equipment: helmet, footwear and gloves during the electrical work.

6.1 Simplified Electrical Connection Diagram

Connecting inverter to the existing PV system includes connecting inverter to local grid and connecting inverter to PV arrays. There may be communication connection for monitoring inverter operation if necessary.

All electrical connection should follow the National Wiring Rules of Standard AS/NZS 3000.

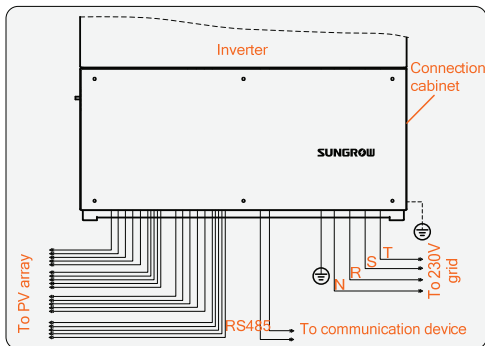


Fig. 6-1 Simplified Electrical Connection Diagram

6.2 Terminals Description

All electrical terminals and cable openings of the inverter are located at the connection cabinet as Fig. 6-2.

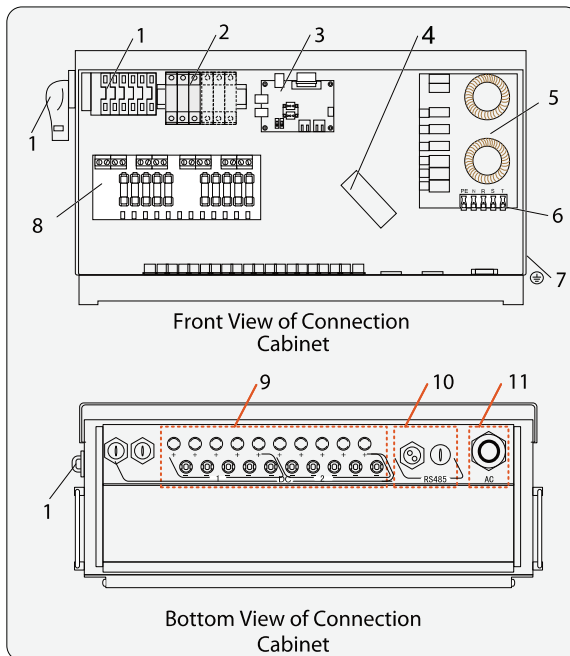


Fig. 6-2 Connection Cabinet Description

No.	Description	No.	Description
1	DC switch	7	Second PE terminal
2	Plinth of DC SPDs (Surge Protection Devices)	8	DC connection circuit board
3	Configuration circuit board	9	PV input terminals
4	Cooling Fan	10	Communication cable glands
5	AC connection circuit board	11	AC cable gland
6	AC connection terminal block and PE terminal	-	

6.3 Connecting Inverter to AC Grid

6.3.1 AC Side Requirements



Only after receiving prior approval from the local grid company as required, should you connect the inverter to the grid.

Prior to connecting to the utility grid, verify whether the grid voltage and frequency are within the range of inverter output parameters, referred to "Appendix". Otherwise consult local grid company for solution.

AC Side Circuit Breaker

An independent three or four-pole circuit breaker (minimum size value 50A) for each inverter must be installed at the output side to ensure that the inverter can be securely disconnected.

NOTICE

There are some points that are not allowed for the inverter:

- **It is not allowed for several inverters to use the same circuit breaker.**
- **It is not allowed to connect loads between inverter and circuit breaker.**

Residual Current Device

With an integrated universal current-sensitive residual current monitoring unit inside, the inverter is able to distinguish the fault currents from normal capacitive leakage currents. The inverter will disconnect from mains as soon as a fault current of more than limit value has been detected.

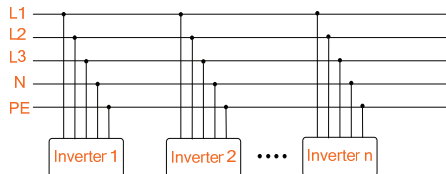
However if an external RCD or residual current breaker is mandatory, the switch must trigger at a failure current of 300mA or higher.

Requirements of Multiple Inverters in Parallel Grid Connection

If several inverters are operated in parallel connection to grid, different requirements should be obeyed.

Scenario 1:

Several inverters are operated in parallel connection to the three-phase Low Voltage grid.



Requirements:

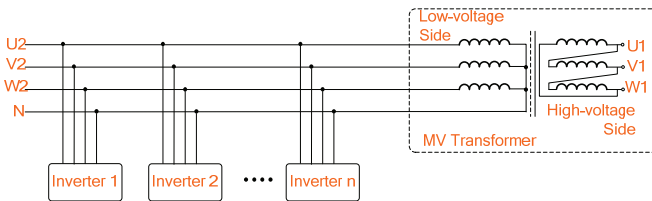
The sum of all inverters in parallel connection is limited to 34.

Scenario 2:

Several inverters are operated in parallel connection to low-voltage side of MV transformer. The high-voltage side of MV transformer is connected to the Middle Voltage Grid.

Requirements:

- The sum of all inverters in parallel grid connection is limited to 34.
- The rate voltage on the low-voltage side of transformer must meet the inverter output electrical specification. A neutral point is necessary and must lead outwards as neutral conductor.

**NOTICE**

The low-voltage side of the transformer must be Y-type.

1MW transformer with a short-circuit impedance less than 6% is recommended.

WARNING

As mentioned in the scenarios above, the total number of inverters is always less than or equal to 34. If there are inverters more than the limited value, inverters may not operate normally.



See technical information **“Technical notes for multiple-paralleled grid-connected inverters”** in the download area www.sungrowpower.com for more detailed information

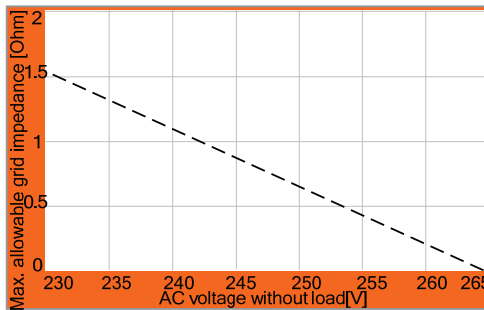
6.3.2 Grid Connection

An AC terminal block inside the connection cabinet is used for the five-wire grid connection (L1, L2, L3, N, PE) of the inverter. And feed-in power is always three-phase via the AC terminal.

AC Cable Requirements

Consider the following facts when select AC cables specifications and types:

- The grid impedance of the AC cable must correspond to the specification to avoid unintended disconnection from the grid or derating of the output power.



- Voltage drop and other consideration may use the larger size cables. Avoid power loss in cables of more than 1% of nominal inverter rating.
- Withstand ambient temperature;
- Layout type (inside wall, underground, free air etc.);
- UV resistance and so on.

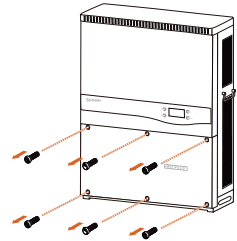
Connecting Inverter to AC Grid

⚠ DANGER

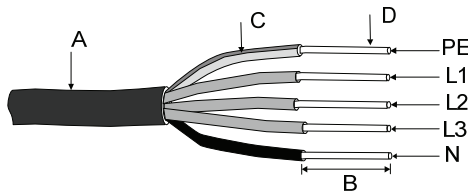
Danger to human life due to high voltage existing inside the inverter!
Make sure that all the DC and AC cables to the inverter are not live before you start the electrical work.
Do not turn on the AC side circuit breaker until all inverter electrical connections have completed.

Connect the inverter exclusively to TN or TT mains as the following procedures:

- Step 1** Disconnect AC circuit breaker and prevent it from reconnection inadvertently.
- Step 2** Loose the six screws on the lower connection cabinet.
- Step 3** Strip off AC cables as the following indication.



For flexible cables (stranded wires), use cold pressing terminal lugs(plastic sleeves).



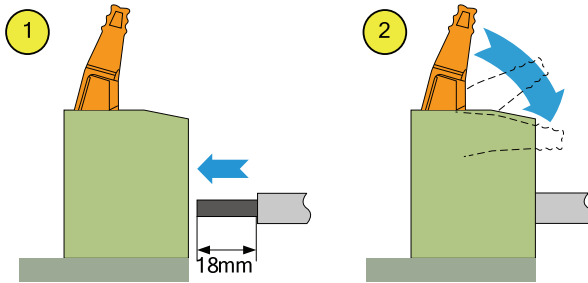
No.	Description	Remark
A	Protective layer	Accepted cable external diameter ranges from 22mm to 27mm.
B	Length of insulation to be stripped off	18 mm
C	Insulation layer	-
D	Cross section of AC cables	Recommendation value: 10mm ² (7 AWG) Max. value: 16mm ²



The maximum accepted cable external diameter ranges from 22 to 27 mm, whereas each individual terminal of the terminal board accepts a cable with cross-section of up to 16 mm².

Step 4 Insert AC cables through cable gland from outside.

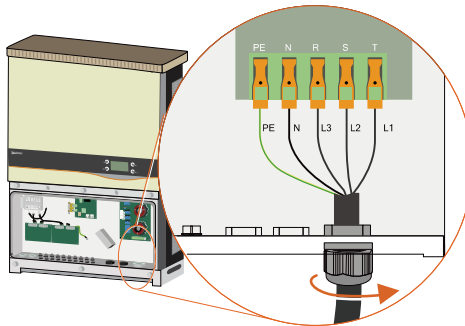
Step 5 Pull the cables through and fix L1/L2/L3/N/PE cables ends to the corresponding terminals according to markings.



NOTICE

- Observe the pin assignment of AC terminal block. If a phase wire is connected to the "PE" terminal, it may permanently destroy the inverter.
- Please avoid squeezing the cable insulation layer into the AC terminal. Improper connection may damage the inverter.

Step 6 Screw cap nut tightly onto the cable.



6.4 Connecting Inverter to PV Arrays

DANGER

Lethal voltage exists!

PV arrays produce electrical energy when exposed to light and thus can create an electrical shock hazard. Cover the PV arrays with opaque materials and then perform the wiring. Wiring should only be performed by qualified personnel.

NOTICE

Make sure that the maximum input-ground capacity of the inverter is less than $(0,12\mu\text{f}/\text{kW}) * 30\text{kW}$, otherwise the inverter will not function properly.

WARNING

Before connecting the PV arrays to the inverter, make sure that the impedances between the positive terminal of the PV string and Earth and the impedances between the negative terminal of the PV string and Earth are larger than 1Mohm.

6.4.1 PV Inputs Configuration of SG30KTL

All PV strings connected to the SG30KTL should have a homogenous structure, including the same type, the same number, identical tilt and identical orientation.

The following electrical specifications must be met simultaneously:

Total DC Power Limit for the SG30KTL	Open-circuit Voltage Limit for Each Input	Short-circuit Current Limit for Total Input
32kW	1000V	66A

You should also take the negative open-circuit voltage temperature coefficient into consideration when designing the PV string.

NOTICE

There is a risk of inverter damage! The following requirements should be met; otherwise they will lead to loss of any and all warranty rights.

- **Make sure that the maximum short circuit current of each DC input is less than inverter allowable limit.**
- **Make sure that the maximum open voltage of each string is less than 1000V. Voltage over 1000V can damage the inverter.**

6.4.2 PV Inputs Configuration of SG30KTL-M

The SG30KTL-M inverter has two PV input areas DC1 input and DC2 input, each owning its MPP tracker.

The two PV inputs can be configured in independent mode or parallel mode.

NOTICE

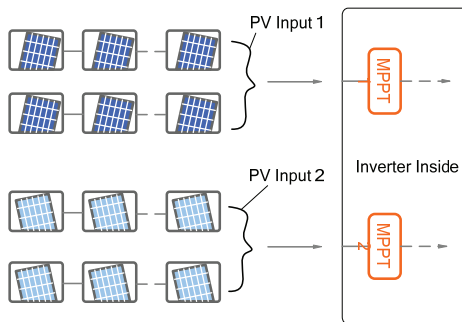
There is a risk of inverter damage! The following requirements should be met; otherwise they will lead to loss of any and all warranty rights.

- **Make sure that the maximum short circuit current of each DC input is less than inverter allowable limit.**
- **Make sure that the maximum open voltage of each string is less than 1000V. Voltage over 1000V can damage the inverter.**

PV Configuration Mode- Independent Mode

For independent mode, the two PV inputs work independently, each with its own MPPT. Therefore the two PV inputs can be different with each other, including different PV module types, different numbers of connected in PV string, different tilt angles or orientation angle of PV modules.

As shown in the following diagram, SG30KTL-M should choose independent mode due to different orientation angle between the two PV inputs.



To make sure maximum DC power can be utilized, PV strings connected to individual input area should have a homogenous structure, including the same type, the same number, identical tilt and identical orientation.

Prior to connecting the SG30KTL-M to PV inputs, the following electrical specifications must be met simultaneously:

Total DC Power Limit	DC Power Limit for Each Input	Open-circuit Voltage Limit for Each Input	Short-circuit Current Limit for Each Input
32000W	16000W	1000V	33A

Considering the negative voltage temperature coefficient of PV module, more attention should be paid to the open-circuit voltage of PV strings when designing at the lowest ambient temperature.

Take an example for explanation. The parameters of PV module STP230S-24/Vb are listed below.

Item	Value
PV module type	STP230S-24/Vb
Power	230W
Open-circuit voltage(STC)	42.4V
Short-circuit current(STC)	7.60A
Open-circuit voltage temperature coefficient(β)	-0.3656%/°C
Number of PV module in a PV string	21

Under the STC condition, where ambient temperature is 25°C, the open-circuit voltage of PV string=42.4V×21=890.4V<1000V.

Supposed that the lowest temperature is -25°C, the open-circuit voltage of PV string=21×42.4V×[1+ β ×(min. ambient temperature- STC temperature)] = 21×42.4V × [1+(-0.3656%/°C) × (-25°C-25°C)]=1053V>1000V.

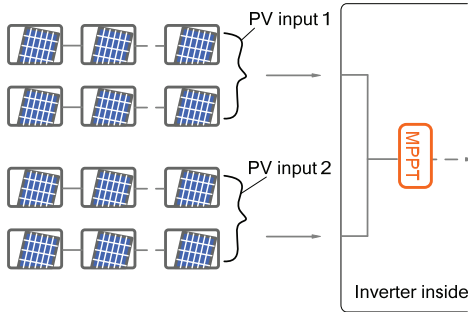
Therefore, PV string should be designed again to meet the open-circuit voltage requirement even under the lowest ambient temperature.

PV Configuration Mode-Parallel Mode

For parallel mode, the PV inputs can be configured in parallel inside the connection cabinet.

All PV strings connected to the SG30KTL-M have a homogenous structure, including the same type, the same number, identical tilt and identical orientation.

As shown in the following diagram, the SG30KTL-M may choose parallel mode due to no difference between the two PV inputs.



Prior to connecting the SG30KTL-M to PV inputs, the following electrical specifications must be met simultaneously:

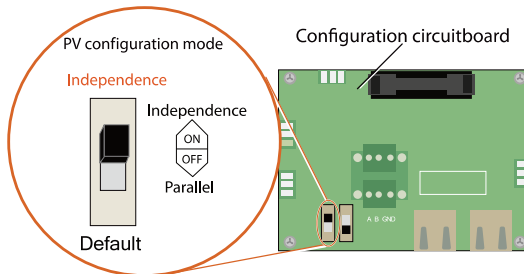
Total DC Power Limit for the SG30KTL-M	Open-circuit Voltage Limit for Each Input	Short-circuit Current Limit for Total Input
32000W	1000V	66A

You should also take the negative open-circuit voltage temperature coefficient into consideration when designing the PV string.

Configuration of PV Connection Mode

PV configuration mode of the SG30KTL-M can be performed by a switch on the configuration circuit board.

- Independence mode: turn the switch ON.
- Parallel mode: turn the switch OFF.



NOTICE
For SG30KTL, the switch must be set in parallel mode.

6.4.3 PV Connection Procedures

DC cables from PV strings should be equipped with DC connectors. Sungrow provides corresponding plug connectors in the scope of delivery for quick connection of PV inputs. Pairs of MC4 DC connectors are supplied in the scope of delivery.



To maintain IP65 weatherproof function of inverter, only the supplied DC connectors or the connectors of the same protection class can be used.

DC Cable Requirements

Cross-section Area Range	Outer cable diameters	Max. Withstand Voltage	Max. input current for each PV string
4...6mm ² 12AWG...10AWG	6...9mm	1000V	10A

NOTICE

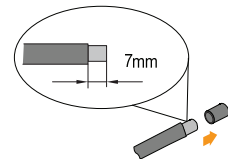
The input current of each input channel should be less than 10A, otherwise the fuse may blow out.

DC Cable Connection Procedures

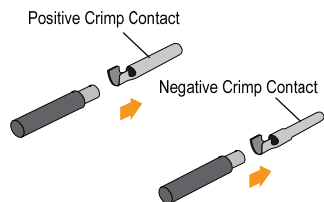
DANGER

Make sure that all the DC and AC cables to the inverter are not live before you start the electrical work.

Step 1 Strip off 7mm insulation layer from all DC cables.



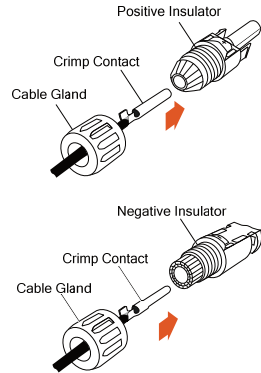
Step 2 Assemble cable ends with crimp contacts by crimping pliers.



Step 3 Lead cable through cable gland.

Step 4 Insert the crimp contact into the insulator until it snaps into place. Then pull gently to check if it is correctly engaged.

Step 5 Screw the cable gland to front insulator with tightening torque 2.5...3 N·m.



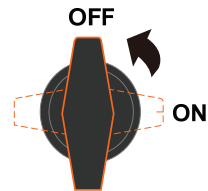
For further assembly and connection instruction, please visit the webpage of the device manufacturer.

Step 6 Make sure the connection cable of PV string for the correct polarity.

NOTICE

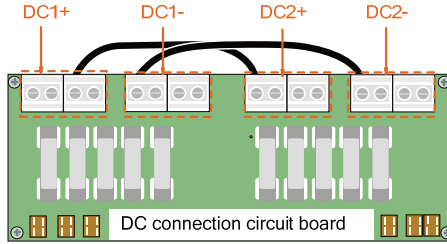
The inverter will not function properly if the DC polarities are reversed.

Step 7 Disconnect the DC switch.

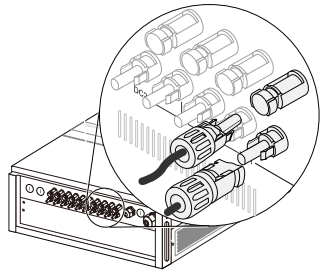


Step 8 For **SG30KTL-M**, configure PV configuration mode via a jumper according to actual PV conditions. Please refer to "**6.4.2 PV Inputs Configuration of SG30KTL-M**".

If inverter selects parallel PV configuration mode, connect DC1+ terminal to DC2+ with a cable of cross-section not less than 6mm² (10 AWG) and connect DC1- to DC2- on the DC connection circuit board as the following diagram shown. The existing cable connections are not displayed in the below diagram.



- Step 9** Plug the positive and negative DC connectors into PV terminals underneath the connection cabinet until there is an audible sound.
- Step 10** Connect other PV strings following the above-mentioned procedures.
- Step 11** Seal the unused DC terminals with the terminal caps.



6.5 Grounding the Inverter

WARNING

Because of the transformer-less design of the inverter, neither the DC positive pole nor the DC negative pole of the PV string is permitted to be grounded.

6.5.1 Grounding System Overview

All non-current carrying exposed metal parts of the equipment and other enclosures in the PV power system should be grounded (e.g., PV arrays frame and inverter enclosure).

Where there is only one inverter in the PV power system, connect “PE” cable to the installation ground.

Where there are multiple inverters in the PV power system, connect “PE” cables of all inverters and mounting frame of PV arrays to the same copper bus bar. In this way, it will establish equipotential connection.

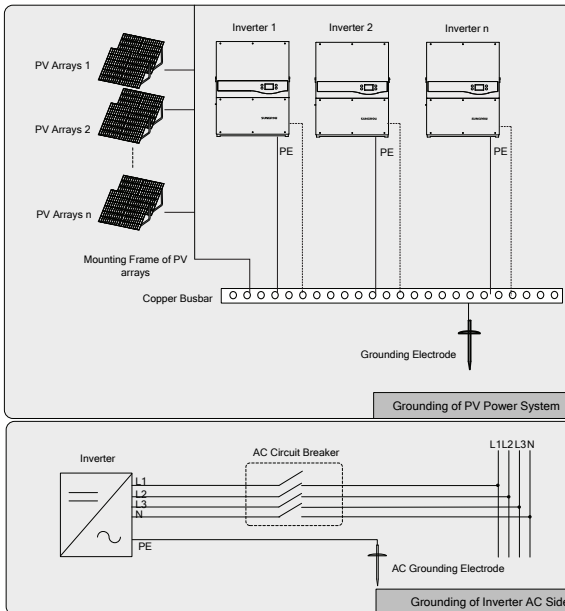


Fig. 6-3 Grounding for Inverter

6.5.2 Second Protective Earth Terminal

The inverter is equipped with second protective earth terminal as specified in EN 50178.

Second PE Terminals

There is a second PE terminal on one side of the inverter. Users may choose to connect PE connection.

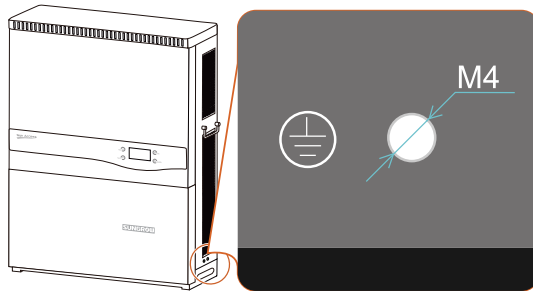
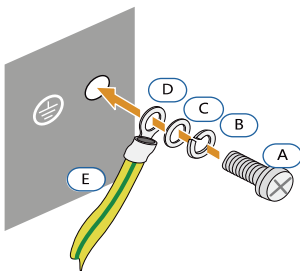


Fig. 6-4 Second PE Terminals

Second PE Connection



Item	Description	Remark
A	Screw	M4×12mm
B	Lock washer	-
C	Washer	-
D	Cable socket	-
E	Yellow-green cable	6mm ² (9AWG)

Fig. 6-5 Connection of the Second PE Connection

*The connection parts are not included in the delivery scope.

6.6 Communication Connection

6.6.1 Communication Overview

The inverter operation information can be transferred via its integrated RS485 interface to a PC with monitoring software (such as SolarInfo Insight), or to data logging device (such as SolarInfo Logger).

RS485 is the standard communication choice for inverter.

There are communication terminals (RS485) at the bottom of the inverter. And there apply two optional connection terminals on the configuration circuit board: RS485 A/B terminal blocks and RJ45 plug in terminals.

In the case of a need of terminating resistor, switch on the 120Ω terminating resistor switch, a terminating resistor will be connected between the communication cables of the inverter.

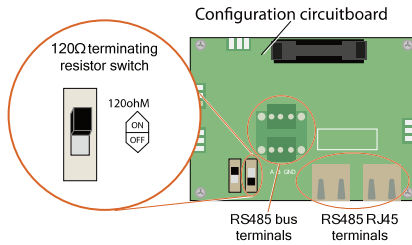


Fig. 6-6 Communication related devices on the Configuration Circuit Board

Before communication connection, prepare communication cable and RJ45 plug.

NOTICE

RS485 cable's requirements to ensure quality of communication:

- **Twist-pair type cable**
- **Twist-pair type shielding Ethernet cable**

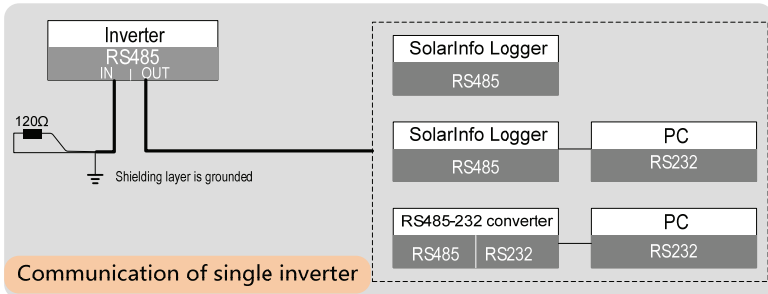


A converter such as RS485-232 converter or SolarInfo Logger, which converts 485 to 232 signal, is needed between inverter and PC.

6.6.2 Communication System

For Single Inverter

Where there is only one inverter, a RS485 cable enables connection between inverter and data logging device.

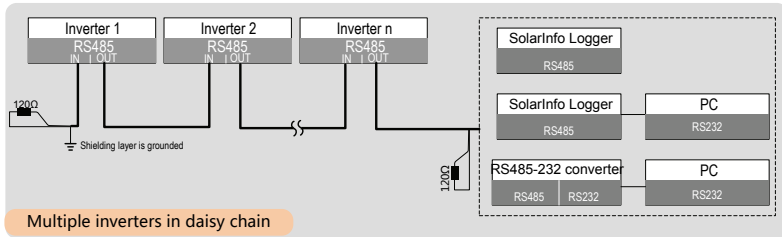


Inverter	Communication Connection (RS 485 A/B bus or RJ 45)		Terminating Resistor
	RS 485 A/B bus	RJ 45	
Single one	Only out. 	Only out. 	Yes

For Multiple Inverters

Where there is more than one inverter, all inverters can be connected to data logging device in daisy chain. The first and last inverters in the chain must be terminated with a resistor of 120Ω. The shielding layer of RS485 cable should be single-point grounded.

The maximum number that inverters are connected in the daisy chain depends on converter, data logging device and other factors. Please refer to converter's or data logging device's manual to obtain the limit.



Inverter	Communication Connection (RS 485 A/B bus or RJ 45)		Terminating Resistor
	RS 485 A/B bus	RJ 45	
Inverter 1	Only out 	Only out 	Yes
Inverter 2...n-1	In and Out 	In and Out 	No
Inverter n	In and Out 	In and Out 	Yes

6.6.3 RS485 Communication Connection

RS485A/B Bus Connection

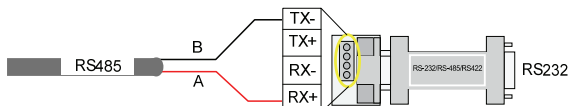
- Step 1** Lead shielding RS485 twist-pair type cable through communication cable gland to the configuration circuit board.
- Step 2** Trip off the insulating layer of the communication cables. Connect the cables to the RS 485 bus terminal blocks.
- Step 3** According to the position of the inverter (refer to the prior section), repeat step 1...2 to connect the other RS 485 cables.
- Step 4** Pull cables outwards to confirm whether they are fastened firmly.
- Step 5** According to the position of the inverter (refer to the prior section) switch ON or OFF the terminating resistor.
- Step 6** Tighten the tread-lock sealing lock. Block off the vacant terminals to protect the inverter's internal from dust and moisture.
- Step 7** If there is no other connection procedure, recover and fix the front cover of the connection cabinet.
- Step 8** Now perform RS485 communication connection as the diagram shown above. Connect the other end of cable to other devices. Communication terminal definition is referred to device manual.
- Step 9** Verify the communication connection and configure the communication parameters.



If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure the communication parameters of each inverter. See "10.12 Communication Parameters Setting".



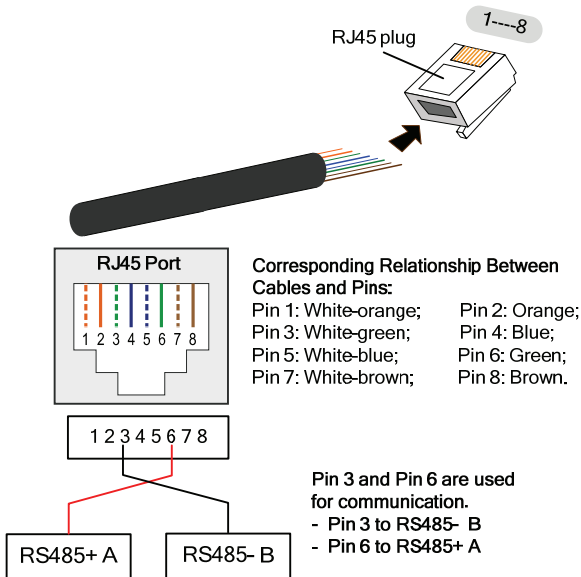
SolarInfo logger and RS485-232 converter are optional parts and can be ordered from Sungrow.



RJ45 Connection

Step 1 Lead shielding Ethernet cable through communication cable gland to the configuration circuit board.

Step 2 Use the Ethernet crimper to crimp the cables and connect cables to RJ45 plug according to TIA/EIA 568B.



Step 3 Connect the RJ45 plug into the RS485 in/RS485 out terminal on the configuration circuit board.

Step 4 According to the position of the inverter (refer to the prior section), repeat step 1...3 to connect the other RS 485 Ethernet cables to the RS485 out/RS485 in terminal on the configuration circuit board.

Step 5 Pull cables outwards to confirm whether they are fastened firmly.

Step 6 Tighten the tread-lock sealing lock. Block off the vacant terminals to protect the inverter's internal from dust and moisture.

Step 7 According to the position of the inverter (refer to the prior section) switch ON or OFF the terminating resistor.

Step 8 If there is no other connection procedure, recover and fix the front cover of the connection cabinet.

Step 9 As for the wires which connect to the logging devices, use the Ethernet wire stripper to strip the insulation layer and connect the RS485 A and B cables (3 and 6) to data logging device or RS 485-232 converter. Communication

terminal definition is referred to the device manual.

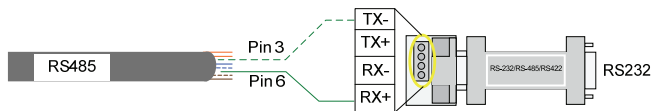
Step 10 Verify the communication connection and configure the communication parameters.



If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure the communication parameters of each inverter. See “10.12 Communication Parameters Setting”.



SolarInfo logger and RS485-232 converter are optional parts and can be ordered from Sungrow.



7 Commissioning

Commissioning is a critical part for a well-installed PV system, which can protect against fires, injury and electrical shock.

7.1 Inspection before Commissioning

Before starting the inverter, you should check the following items should be checked for requirements.

1. Inverter unit is accessible for operation, maintenance and service.
2. Re-check that the inverter is firmly installed onto the wall.
3. Space for ventilation well is provided for one inverter or more than one inverter.
4. Nothing is left on the top of the inverter unit.
5. Inverter and accessories are correctly connected.
6. Cables are routed in safe place or protected against mechanical damage.
7. Specification of AC circuit breaker is reasonable.
8. Terminals not used underneath the inverter are sealed.
9. Warning signs & labels are suitably affixed and durable.

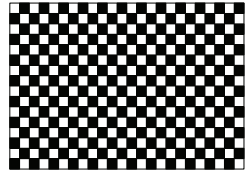
7.2 Commissioning Procedure

If all checking items mentioned above meet the requirements, precede the following procedures to start up the inverter for the first time.

Step 1 Close external AC circuit breaker.

Step 2 Rotate DC switch to "ON" position.

Suppose there are sufficient sunlight and enough DC power. PV arrays initialize and supply DC power to inverter. The LCD display is activated to check the validity first. If there is a defect on the display, contact Sungrow.



Step 3 Language selection screen will prompt. Perform language settings with the right two buttons. Detailed button functions can be referred to "10.1 Description of Button Function". **Press** ▼ to choose language as you prefer. Confirm the settings by **Pressing ENTER**.

Languages	
<input checked="" type="radio"/>	English
<input type="radio"/>	Deutsch
<input type="radio"/>	Française
<input type="radio"/>	Italia
<input type="radio"/>	中文

Step 4 Configure time according to the local time. Time setting is very important, which directly affects data logging. **Press** ► to move cursor and **Press** ▼ to scroll up time value. Confirm the settings by **Pressing ENTER**.

Time	
Format:	YY/MM/DD
Date:	12/01/31
Time:	10:30:55

Step 5 Select the country code according to the inverter's installation country. Each country code represents corresponding local protective parameters that have been preset before delivery. Before country setting, there is warning screen.

Warning!
Only qualified personnel are allowed to adjust following parameters.
Improper settings may cause damage to the inverter!

Step 6 **Press** ▼ to choose country code. Confirm the settings by **Pressing ENTER**.

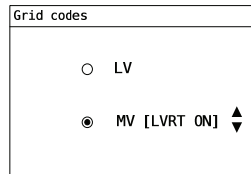
Countries							
<input type="radio"/>	GB	<input type="radio"/>	DE	<input type="radio"/>	FR	<input type="radio"/>	IT
<input type="radio"/>	ES	<input type="radio"/>	AT	<input type="radio"/>	AU	<input type="radio"/>	CZ
<input type="radio"/>	BE	<input type="radio"/>	DK	<input type="radio"/>	GR_LO	<input type="radio"/>	GR_IS
<input type="radio"/>	NL	<input type="radio"/>	PT	<input type="radio"/>	CHN	<input type="radio"/>	SE
<input checked="" type="radio"/>	Other						

Refer to “10.11 Protective Parameters Setting” for country code explanation. If the inverter is installed where the country code is not included, please choose item “Other” and manually set the protective parameters.

⚠ CAUTION

If the country code is not set correctly during commissioning, reset the protective parameters as dictated in “10.11 Protective Parameters Setting”. There may be faults if otherwise.

Step 7 **Configure** grid code on the display. **Press** ▼ to select grid code. Confirm the selection by **Pressing ENTER**. Where, LV indicates Low Voltage Grid Code; MV indicates Middle Voltage Grid Code.



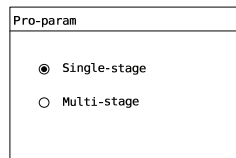
Step 8 When choose MV, **Press** ► to enter the LVRT function selection, **Press** ▼ to switch on or off the LVRT function and **Press ENTER** to confirm the selection.



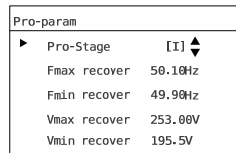
If the Country selected does not have the “Grid codes” directives, this configuration will not affect the following procedures.

However, you may select the MV to enable/disable the LVRT function regardless of the country selected.

Step 9 After configuring the Grid Code, there will be a “Pro-param” type selection screen and then corresponding sub-menu will come up. For detailed information, please refer to “10.11 Protective Parameters Setting”.



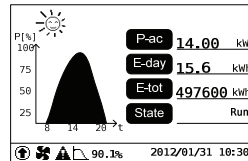
IT(italy)



Step 10 After configuring all parameters, there will be a “setting confirmation” screen. Check whether all above-mentioned parameters are correct. Confirm by **Pressing ENTER**. Cancel by **Pressing ESC** and reset.

Setting confirmation	
Country	Other
Grid code	LV
LVRT	OFF
Date	2012/01/31
Confirm above settings?	

Step 11 Inverter will enter into startup process. Observe status of LED indicators and the LCD main screen. If inverter’s commissioning succeeds, the “RUN” indicator will be lit and “RUN” will be displayed on the “State” area.



If inverter’s commissioning fails, the “FAULT” indicator will be lit and “fault” will occur on the display. Press ▼ to view “current fault” information. Remove the existing malfunction and then repeat starting up inverter as the above procedures.

8 Disconnecting, Dismantling and Disposing the Inverter

8.1 Disconnecting the Inverter

For maintenance work or any service work, inverter must be switched off. In normal operation, switching off is not necessary.

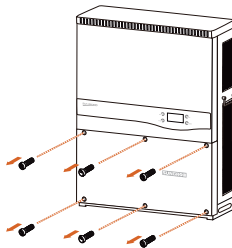
In order to disconnect the inverter from the AC and DC power sources, you should proceed with the following procedures. Otherwise you will be exposed to lethal voltages or the inverter will be damaged.

1. Disconnect the external AC circuit breaker and prevent it from connecting again.
2. Turn off the upstream DC circuit break or cover the PV arrays with opaque materials. Rotate DC switch at the side of inverter to the "OFF" position.

NOTICE

Please strictly follow the sequence of the above procedures. Otherwise it will lead to unrecoverable inverter damage.

3. Wait about ten minutes until the capacitors inside the inverter have discharged.
4. Loose the six screws on the lower connection cabinet and then remove the lid.



5. Measure AC voltage to ground at the AC terminal to confirm AC output of inverter at the AC circuit breaker is voltage free.
6. Loose screws to remove AC cables.
7. Disconnect DC cables from the inverters.

8.2 Dismantling the Inverter

Refer to Chapter 5 and Chapter 6 to dismantle the inverter in reverse steps.

NOTICE

If the inverter will be reinstalled in the future, please refer to 4.4 Storage of Inverter for a proper conservation.

8.3 Disposing the Inverter

Users should take the responsibility for the disposal of the inverter.

NOTICE

Some parts and devices in the inverter, such as LCD display, batteries, capacitors, may cause environment pollution. Users must comply with the related local regulations to avoid causing pollution.

9 Troubleshooting and Maintenance

9.1 Troubleshooting

9.1.1 Troubleshooting of LED Indicator

See “Tab. 2-2 Description of LED Indicator Status” for definition of LED’s states.

Type of fault	Troubleshooting
LED indicators and LCD screen cannot be lit	<ol style="list-style-type: none"> 1. Disconnect AC side circuit breaker. 2. Rotate DC switch to the “OFF” position. 3. Check the polarity of DC input.
“RUN” indicator goes out	<ol style="list-style-type: none"> 1. Disconnect AC side circuit breaker. 2. Rotate DC switch to the “OFF” position. 3. Check the correctness of electrical connection of inverter. See “6 Electrical Connection”. 4. Check whether DC input voltage exceeds the inverter start voltage of inverter. 5. If all above conditions are OK, please contact with Sungrow.
“Fault” indicator is lit	<ol style="list-style-type: none"> 1. A fault is not removed yet. 2. Perform troubleshooting in according to fault type in LCD screen. See “9.1.2 Troubleshooting of Faults in LCD Screen”. 3. If it cannot be solved, please contact Sungrow.

9.1.2 Troubleshooting of Faults in LCD Screen

When faults occur, “Fault” state will be shown on the main screen. Press ▼ to view multiple “current fault” information pages.

Fault Code	Description	Troubleshooting
0002	The grid voltage has exceeded inverter allowable upper limit.	<ol style="list-style-type: none"> 1. Check the voltage of the grid. 2. If the grid voltage exceeds the permissible range of inverter protective parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact Sungrow Service Dept..

Fault Code	Description	Troubleshooting
0003	Inverter has checked that the instantaneous sample value of the grid voltage exceeds the allowable limit for some time.	<ol style="list-style-type: none"> 1. This is a short-term fault due to grid condition. Wait a moment for inverter recovery. 2. If the fault still exists, please contact Sungrow Service Dept..
0004	The grid voltage has fallen below inverter's allowable lower limit.	<ol style="list-style-type: none"> 1. Check the voltage of the grid. 2. If the grid voltage exceeds the permissible range of inverter protective parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact Sungrow Service Dept..
0005	The grid voltage is too low.	<ol style="list-style-type: none"> 1. This is a short-term fault due to grid condition. Wait a moment for inverter recovery. 2. If the fault still exists, please contact Sungrow Service Dept..
0006	The AC output current exceeds inverter protective limit.	<ol style="list-style-type: none"> 1. The inverter will resume if the output current falls below the protective value. 2. If the fault still exists, please contact Sungrow Service Dept..
0007	Inverter has checked AC overcurrent temporarily.	The inverter will self-recover after several seconds.
0008	The grid frequency has exceeded inverter allowable upper limit.	<ol style="list-style-type: none"> 1. Check the frequency of the grid. 2. If the grid frequency exceeds the permissible range of inverter protective parameters, ask utility grid company for solution.
0009	The grid frequency has fallen below inverter allowable lower limit.	<ol style="list-style-type: none"> 3. If the grid frequency is within the permissible range, contact Sungrow Service Dept..
0010	Islanding	<ol style="list-style-type: none"> 1. Check whether AC circuit breaker is triggered. 2. Check whether AC cables are all firmly connected. 3. Check whether grid is not on service. 4. If all conditions are OK and this malfunction still occurs in the LCD screen, contact Sungrow Service Dept..
0011	The DC component of AC current has exceeded inverter limit.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0012	Inverter has detected that there is a failure current.	<ol style="list-style-type: none"> 1. Check the PV strings for ground fault. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..

Fault Code	Description	Troubleshooting
0013	Inverter has checked that the grid is abnormal	<ol style="list-style-type: none"> 1. Wait a moment for grid recovery. 2. If the grid parameters exceed the permissible range of inverter protective parameters, ask utility grid company for solution. 3. If the grid frequency is within the permissible range, contact Sungrow Service Dept..
0014	The average grid voltage over 10 minutes is not within the permissible range.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0015	Grid impedance has exceeded inverter's limit	<ol style="list-style-type: none"> 1. Check AC cables for appropriate size. 2. Wait a moment for inverter recovery. 3. If the fault occurs repeatedly, contact Sungrow Service Dept..
0016	The AC output overloads.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0017	The inverter has checked that there is unbalance between the three phase voltages.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0019	The bus voltage is temporarily high.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0020	The bus voltage is high.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0021	Inverter has checked that there is overcurrent of PV1 input.	Check the layout and the wiring of PV1 input.
0022	Inverter has checked that there is overcurrent of PV2 input.	Check the layout and the wiring of PV2 input.
0023	PV configuration mode has changed during inverter running.	Check the PV input configuration mode and restart the inverter when necessary.
0024	Inverter has checked the deviation of neutral point voltage.	<ol style="list-style-type: none"> 1. Inverter will recover if the deviation value falls below the protective limit. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0025	Inverter has checked out the unbalance of neutral point voltage temporarily.	<ol style="list-style-type: none"> 1. Inverter will recover if the deviation value falls below the protective limit. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..

Fault Code	Description	Troubleshooting
0026	There is high Bus fluctuation voltage.	<ol style="list-style-type: none"> 1. This is a short-term fault. Wait a moment for inverter recovery. 2. If the fault still exists, please contact Sungrow Service Dept..
0027	The DC current is not balanced between the two PV inputs for parallel PV configuration mode.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0028	Inverter has checked the reverse polarity of PV connection.	<ol style="list-style-type: none"> 1. Disconnect inverter. 2. Reconnect PV strings.
0036	The temperature of module is too high	<ol style="list-style-type: none"> 1. Check whether AC output power exceeds nominal power too much. 2. Check whether fans work normally and whether there are some abnormal fans. Please replace broken fan, in necessary.
0037	The ambient temperature is too high	<ol style="list-style-type: none"> 3. Clean air grills of outlet. 4. If the fault still exists, please contact with Sungrow.
0038	The inverter has checked that there is a fault of relay.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0039	The insulation resistance is low. (ISO-ft)	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0040	IGBT saturation	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0041	There is a fault with sampling channel.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0042	Current imbalance.	If the fault occurs repeatedly, contact Sungrow Service Dept..
0043	The ambient temperature falls below -25°C	Disconnect inverter to stop. Wait for ambient temperature to rise above -25 °C and then start inverter again.
0044	There is a fault with DC/AC inversion circuit	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0045	There is a fault with PV1 boost circuit.	<ol style="list-style-type: none"> 1. Wait a moment for inverter recovery.
0046	There is a fault with PV2 boost circuit.	<ol style="list-style-type: none"> 2. If the fault occurs repeatedly, contact Sungrow Service Dept..

Fault Code	Description	Troubleshooting
0047	The PV configuration mode set on the display is not in accordance with the configuration in the connection cabinet.	1. Disconnect inverter. 2. Re-select PV configuration mode and re-connect PV strings. For more detailed information please refer to "6.4 Connecting Inverter to PV Arrays".
0048	Phase-R current sampling channel fault.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0049	Phase-S current sampling channel fault.	
0050	Phase-T current sampling channel fault.	
0051	Hardware Overvoltage/ Overcurrent protection	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact Sungrow Service Dept..
0070	Fans are defective.	Disconnect inverter and remove the broken fan.
0072	Fault with DC SPD	It is necessary to replace the DC SPD. Contact Sungrow Service Dept..
0073	Fuse has blown out	Disconnect inverter and replace the fuses. Contact Sungrow Service Dept..
0074	Communication fault of LCD	A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid. Contact Sungrow Service Dept..
0075	Solar irradiation is not sufficient for inverter operation.	Wait for higher irradiation. If this recurs at medium irradiation, check the PV system design and correct the connection of PV inputs.
0076	PV1 overload	Check the PV system design and correct the connection of PV1 inputs.
0077	PV2 overload	Check the PV system design and correct the connection of PV2 inputs.

9.2 Maintenance

9.2.1 Routine Maintenance

Items	Methods	Period
Save data	Save the running data, parameters and log to a disk or a file. Refer to the manuals of the data logging devices.	Once a month
General state of system	Visual check any damage or deformation of the inverter. Check any abnormal noise during the running of the inverter. Check each parameter of inverter operation. Check if the temperature of the housing is normal. Monitor the system using the thermal imager.	Every 6 months
System clean	Check the temperature and dust of the inverter. Clean the inverter enclosure. Check the humidity and dust of the environment. Meanwhile check whether the filter function of the air inlet is ok. Clean the air inlet and outlet, when necessary.	Six months to a year (it depends on the dust contents in air.)
Electrical connection	Check whether cable connections are loose. Tighten the loose connections. Check whether there is injury in the cables, especially the surface in contact with metal. Check whether the wrap belt of the connection terminals is strip-off.	Six months after commissioning and then once or twice a year.
Fans	Check whether there is crack of the fan blade Check whether there is any abnormal noise of the fan turning. Clean or replace the fans.	Once a year
Devices check	Check the fuses and the DC SPD. Replace the fuse. Contact Sungrow to order new DC SPDs.	Every 6 months
Safety function	Check the LCD stop and emergency stop circuit of the system. Simulate shutdown and check stop signal communication. Check the warning labels, and replace them if necessary.	Once or twice a year
Software	Software optimization. Check the setting of every parameter.	Once or twice a year

9.2.2 Maintenance Instruction

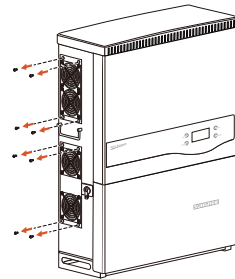
Fans' Maintenance

There are four fans at the side of the inverter for active cooling during running operation. If the fans are dirty or out of work, the inverter may not be cooled down well and its efficiency may accordingly decrease. Therefore it is necessary to clean the dirty fans or replace the broken fans as the following indications.

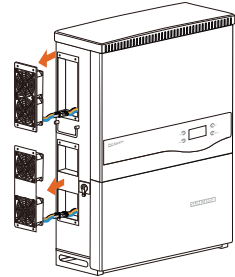
⚠ DANGER

- **Disconnect the inverter from the grid first and then PV arrays before any maintenance work.**
- **Lethal voltage still exists in the inverter. Please wait for at least ten minutes and then perform maintenance work.**
- **Fans' maintenance work may only be performed by qualified electricians.**

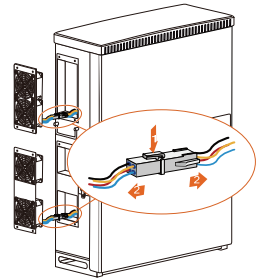
1. Disconnect the AC circuit breaker.
2. Turn off the upstream DC circuit break or cover the PV arrays with opaque materials. Rotate DC switch at the side of inverter to the "OFF" position.
3. Wait for at least ten minutes.
4. Disconnect all electrical connection in the reverse procedures in the "6 Electrical Connection".
5. Lift up the inverter over the backplate with the help of others and then remove it from the wall.
6. Place the inverter onto the platform.
7. Loosen the screws as the right diagram shown.



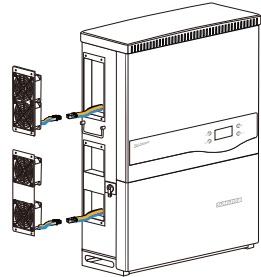
8. Disassemble the metal plate slightly.



9. Release the locking part of four connectors by pressing on the ribbing of the locking hooks and pull outwards.



10. Remove fans from the inverter.



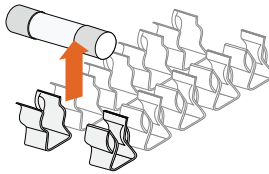
11. You can clean the dirty fans with soft brush or vacuum cleaner. Or replace the broken fans.
12. Re-assemble the fans onto the inverter.
13. Connect the four connectors and fasten them with cable ties.
14. Assemble the plate by fastening the four screws.
15. The inverter can be put into the application again.

Replacing the String Fuses

For optional version inverter, it is necessary to replace the blown string fuses due to overcurrent.

To do so, proceed as follows:

1. Disconnect AC circuit breaker.
2. Turn off the upstream DC circuit break or cover the PV arrays with opaque materials. Rotate DC switch at the side of inverter to the "OFF" position.
3. Wait for at least ten minutes.
4. Open the inverter as described in section "8 Disconnecting, Dismantling and Disposing the Inverter".
5. Observe the string fuse assignment and check the fuse conductivity using the multimeter. A non-conductive fuse indicates a fault in the affected string.
6. Have the installer of the PV generator check the affected string and order the fuse for the defective string fuse of the same specification from Sungrow.
7. Remove the blown string fuse.



8. Insert the new fuse into the fuse holder.
9. Close the inverter and startup the inverter again.

Clean Air Inlet and Outlet

A huge amount of heat is generated in the process of running the inverter. The inverter adopts a controlled forced-air cooling method.

In order to maintain good ventilation, please check whether there is anything blocking the air inlet and outlet.

Clean the air inlet and outlet with soft brush or vacuum cleaner if necessary.

9.3 Contact Sungrow Service

Should you have any problems in operating on the inverter, please contact us:

Service hotline: +86 551 65327817

Email: service@sungrow.cn

We need the following information to provide you the best assistance:



- Type of the inverter
- Serial number of the inverter
- Fault code/name
- Brief description of the problem

10 Operation of LCD Display

10.1 Description of Button Function

Inverter offers two buttons for the user to look up the running information and configure parameters settings. The two buttons have multiple functions. Please refer to Tab. 10-1 before any operation onto inverter.

Tab. 10-1 Button Function

Button	Operation	Description
	Press less than two seconds	Move upwards or downwards, or increase setting value. Hereafter, it is referred to as "Press ▼".
	Press more than two seconds	Return to the previous menu or cancel the command. Hereafter, it is referred to as "Press ESC ".
	Press less than two seconds	Move left or right, or turn pages. Hereafter, it is referred to as "Press ▶".
	Press more than two seconds	Enter into the sub-screen or confirm the command. Hereafter, it is referred to as "Press ENTER ".



The background illumination of the LCD screen will go out to save power if there is no button operation after one minute. You can activate it by pressing any button.

10.2 Inverter Menu Structure

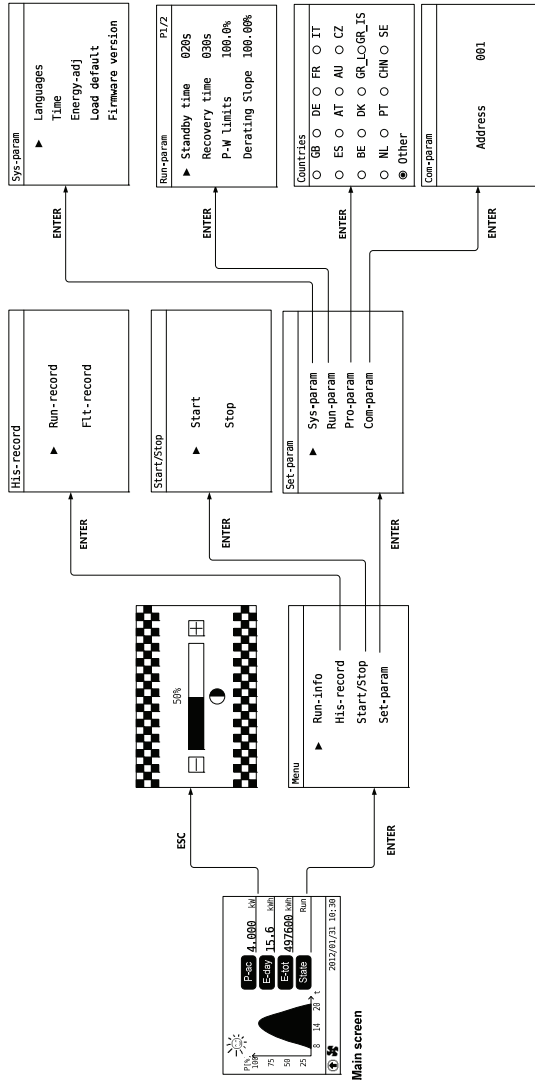


Fig. 10-1 Menu Tree-English

10.3 Main Screen

If the inverter succeeds in commissioning, LCD display will enter into the main screen, as shown in Fig. 10-2.

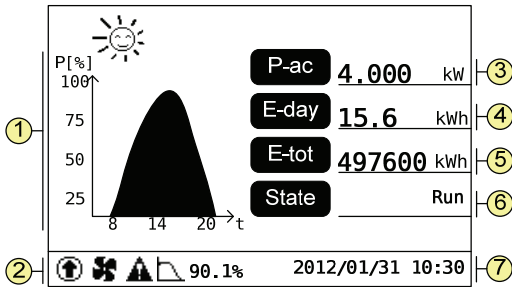


Fig. 10-2 Main Screen Description

No.	Description
1	Power curve. x-axis: time in hours; y-axis: output power yield P in %.
2	Icons (refer to the Tab. 10-3) and the Inverter active power limits (P-W limits).
3	Current output power.
4	Energy generation during this day until now.
5	Total energy generation since initial commissioning.
6	Inverter state.
7	Date (year/month/date) and time.





Tab. 10-2 Inverter State Description

Inverter State	Description
Run	After being energized, the inverter tracks the PV arrays' maximum power point (MPP) and feeds AC power to grid. This mode is the normal mode.
Standby	Inverter will enter into Standby mode for insufficient input power. In this mode the inverter will wait until the DC voltage recovers.
Stop	The inverter is shut down.
Key-stop	The inverter will stop operation by manual "Stop" through LCD menu.
Start...	The inverter is initializing and synchronizing with the grid.
Upd fail	IAP (In Application Programming) update fails
Fault	If a fault occurs, the inverter will automatically stop operation, trigger the AC relay and show "Fault" on the LCD with the "FAULT" indicator lit.
	Once the fault is removed in recovery time (set by user, see "10.10 Running Parameters Setting"), the inverter will automatically resume running.
Warning	Inverter has checked out some warning information.

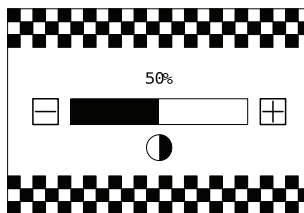
If inverter is in “Fault” state, Press $\blacktriangleright/\blacktriangledown$ to view multiple “Current fault” information pages. To know the meaning of the fault code, please refer to “9.1.2 Troubleshooting of Faults in LCD Screen”

Current fault	P[1/2]	Fault pages
1 Fault	0008	Fault code
2 Fault	0008	
3 Fault	0008	
4 Fault	0008	
5 Warning	0045	

Tab. 10-3 Icon Description

Icon	Description
	Inverter is in IAP update process.
	Inverter is in power reduction state.
	Fans inside are working.
	Inverter is warning the running state.

10.4 Adjust Contrast



1. Press ESC to enter into the contrast adjustment screen.
2. Press \blacktriangledown to increase the setting value and press \blacktriangleright to decrease the value.
3. Press ENTER to confirm the contrast setting.



The contrast value ranges from 0 to 100. The recommended value is 50 or 60.

10.5 Detailed Running Information

On the main screen, there is some basic information about the inverter. For more detailed running information, please operate as follows.

Main Screen (**Press ENTER**) →Menu→Run-info (**Press ENTER**)

LCD screen will show four detailed running information pages. Scroll pages by pressing **>/<**.

“DC power input” represents the total input power of PV1 and PV2.

“Vdc” indicates the DC voltage of each input.

“Idc” indicates the DC current of each input.

“Pdc” indicates the DC power of each input.

“Indep / Paral mode” is the PV configuration mode of the two PV inputs.

indicates the corresponding input is at work.

DC power input	00000W	
	PV1	PV2
Vdc[V]	0000.0	0000.0
Idc[A]	000.0	000.0
Pdc[W]	00000	00000
Indep mode	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

“P-W” is inverter output active power.

“S-Va” is inverter output apparent power.

“Country” is inverter selected country code.

“Grid code” is inverter selected grid code.

P-W	00000W
S-Va	00000VA
Country	GB
Grid code	LV

“Vac” is phase voltage.

“Iac” is phase current.

“Pac” is AC output of each phase.

“F” is frequency of each phase.

	L1	L2	L3
Vac[V]	000.0	000.0	000.0
Iac[A]	000.0	000.0	000.0
Pac[W]	0000	0000	0000
F[Hz]	00.00	00.00	00.00

“CO2-reduce” indicates total CO2 emission reduction due to the inverter..

“E-month” is the energy generation in this month.

“h-Total” is the total running hours of the inverter.

“T-today” is today running time of the inverter.

“Temp” is the internal temperature of the inverter.

CO2-reduce	00000kg
E-month	00000kwh
h-Total	0000h
T-today	0000min
Temp	000.0°C

10.6 History Records

10.6.1 Running Information Records

Main Screen (Press **ENTER**) →Menu (Press **▼**) →His-record (Press **ENTER**)
 →Run-record (Press **ENTER**)

On the “Run-record” display, press **▼** to select the date you want to view. Confirm by pressing **ENTER**.

P 1/2	Run-record	T[2]
▶	2012/01/21(30)	
	2012/01/22(30)	
	2012/01/23(30)	
	2012/01/24(30)	
	2012/01/25(30)	
	2012/01/26(30)	

Inverter shows historical running information pages. Scroll pages by pressing **▼**. Change to the next record by pressing **▶**.

P 3/10	2012/01/21 10:16	
	PV1	PV2
Vdc[V]	0000.0	0000.0
Idc[A]	000.0	000.0
Pdc[W]	00000	00000
Paral mode	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

P 3/30	2012/01/31 10:16
P-W	00000W
S-Va	00000VA
Country	GB
Grid code	LV

P 3/30	2012/01/31 10:16		
	L1	L2	L3
Vac[V]	000.0	000.0	000.0
Iac[A]	000.0	000.0	000.0
Pac[W]	0000	0000	0000
F[Hz]	00.00	00.00	00.00

P 3/10	2012/01/21 10:16
Temp	000.0°C
State	Run

10.6.2 Fault Records

Main Screen (Press **ENTER**) →Menu (Press **▼**) →His-record (Press **ENTER**, Press **▼**) →Flt-record (Press **ENTER**)

Inverter shows fault record pages. Scroll pages by pressing **▼**.

Flt-record	P 1/2
1>	12/01/31 10:16:10 [0000]
2>	12/01/31 10:16:10 [0000]
3>	12/01/31 10:16:10 [0000]
4>	12/01/31 10:16:10 [0000]
5>	12/01/31 10:16:10 [0040]

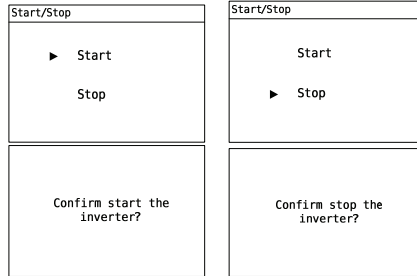


The inverter can only store at most 10 latest fault records.

10.7 Start and Stop Inverter

Main Screen (**Press ENTER**) →Menu (**Press ▼** ×2) →Start/Stop (**Press ENTER**)

Press ▼ to choose “Start”/“Stop” and **press ENTER** to confirm the choice.

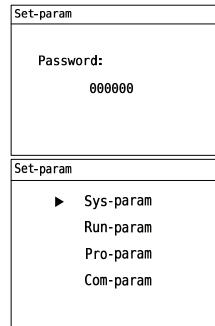


Press ENTER to confirm.

10.8 Input Parameter Settings Password

The parameter settings are protected by the password. If you want to set the inverter's parameters, you have to input the correct password.

1. **Press ENTER** to enter into “Menu” screen.
2. **Press ▼** to move the cursor to “Set-param” menu item and confirm by **pressing ENTER**.
3. A password confirmation screen will occur. **Press ▶** to move cursor right and **Press ▼** to input the password 111111.
4. **Press ENTER** to confirm the password and .enter the “Set-param” sub menu.



10.9 System Parameters Setting

10.9.1 Language Setting

The inverter supports five languages: English, German, French, Italian and Chinese. Language can be configured as the following indication.

Main Screen(**Press ENTER**) → Menu screen(**Press ▼×3**) → Set-param(**Press ENTER**) → Enter password(**Press ENTER**) → Sys-param(**Press ENTER**) → Language(**Press ENTER**)

Press ▼ to select language as you prefer and confirm it by pressing **ENTER**.

Languages	
<input checked="" type="radio"/>	English
<input type="radio"/>	Deutsch
<input type="radio"/>	Française
<input type="radio"/>	Italia
<input type="radio"/>	中文

10.9.2 Time Setting

If there is deviation between the time on inverter main screen and your local time, you should perform the operation time setting. Otherwise the inverter data logging will fail. Clock is 24-hour format.

Main Screen(**Press ENTER**) → Menu screen(**Press ▼×3**) → Set-param(**Press ENTER**) → Enter password(**Press ENTER**) → Sys-param(**Press ENTER, Press ▼**) → Time(**Press ENTER**)

On the "Time" screen, **Press ▶** to move the cursor right and **Press ▼** to set the correct date and time. Confirm settings by **pressing ENTER**.

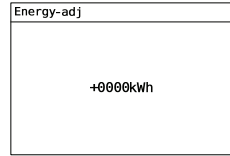
Time	
Format:	YY/MM/DD
Date:	12/01/31
Time:	10:30:55

10.9.3 Energy Deviation Adjustment

If the accumulative value of "E-total" in the inverter is different from the value in the external metering device, you should adjust the "Energy-adj" setting.

Main Screen(**Press ENTER**) → Menu screen(**Press ▼×3**) → Set-param(**Press ENTER**) → Enter password(**Press ENTER**) → Sys-param(**Press ENTER, Press ▼×2**) → Energy-adj(**Press ENTER**)

On the “Energy-adj” screen, Press **▶** to move cursor right and **Press ▼** to set the correct offset value. Confirm settings by pressing **ENTER**. The positive symbol “+” can be changed to the negative symbol “-”. The adjustment range is from -9999 to +9999 kWh. (Energy-adj value)= (Real measured value)-(E-tot reading value).



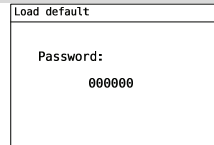
10.9.4 Load Default

NOTICE

All history accumulated information will be unrecoverable cleared and all parameters will return to the default value except the protective parameters and time, once the “load default” operation is performed.

Main Screen(**Press ENTER**)→Menu screen(**Press ▼ ×3**)→Set-param(**Press ENTER**)→Enter password(**Press ENTER**) → Sys-param(**Press ENTER, Press ▼×3**) → Load default(**Press ENTER**)

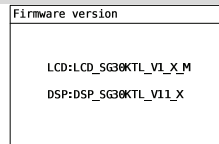
A password confirmation screen will occur. Press **▶** to move cursor right and **Press ▼** to input the password 111111. Press **ENTER** to confirm “load default”.



10.9.5 Firmware Version

Main Screen(**Press ENTER**)→Menu screen(**Press ▼ ×3**)→Set-param(**Press ENTER**)→Enter password(**Press ENTER**)→Sys-param (**Press ENTER, Press ▼×4**) →Firmware version (**Press ENTER**)

Inverter shows detailed firmware information, including LCD version and DSP version. The firmware version information is read only.



10.10 Running Parameters Setting

10.10.1 Main Menu of Run-param

Main Screen(Press **ENTER**)→Menu screen(Press **▼** × 3)→Set-param(Press **ENTER**)→Enter password(Press **ENTER**, Press **▼**)→Run-param(Press **ENTER**)

On the “Run-param” screen, Press **▼** to move arrow to one item and Press **ENTER** to start this item setting.

For each item setting, Press **▶** to move cursor right and Press **▼** to set the appropriate value.

Confirm by Pressing **ENTER**.

Run-param		P1/2
▶ Standby time	020s	
Recovery time	030s	
P-W limits	100.0%	
Derating Slope	100.00%	
↓		
Run-param		P2/2
▶ Q-Var switch	[OFF] ▲▼	
PF	+1.000	
Q-Var limits	+100.0%	

Tab. 10-4 Specification of Running Parameters

Parameter	Explanation	Default	Range
Standby time	The time from inverter initialization to inverter feeding power to grid.	20s	20...255s
Recover time	The time from the fault is cleared to inverter feeding power to grid.	30s [IT: 300s]	0...900s
P-W limits	Inverter active power limits.	100.0%	0...100%
Q-Var switch	Whether to start inverter reactive power adjustment function.	[Pf]	[Pf] / [Qt] / [Off] / [Q(P)] / [Q(U)]
PF	Power factor	+1.000	-1.000...-0.900 / +0.900...+1.000
Q-Var limits	Inverter reactive power limits	0.0%	0...+100% / 0...-100%
Derating Slope*	Over-frequency power derating slope (Pm/Hz) Only available when the “Countries” is selected to “IT”.	83.33%	40%...100%

10.10.2 Reactive Power Regulation

The inverter provides reactive power regulation function. Use the “Q-Var switch” parameter to activate this function and select proper regulation mode.

Mode	Explanation
Pf	The reactive power can be regulated by the parameter <i>PF (Power Factor)</i> .
Qt	The reactive power can be regulated by the parameter <i>Q-Var limits (in %)</i> .
Off	The <i>PF</i> is limited to +1.000, and the <i>Q-Var limits</i> is limited to 0.0%.
Q(P)	The <i>PF</i> changes with the output power of the inverter.
Q(U)	The reactive power changes with the grid voltage.

“Pf” Mode

The reactive power can be regulated by the parameter PF on the Run-param screen.

“Qt” Mode

The reactive power can be regulated by the parameter Q-Var limits (in %) on the Run-param screen.

“Off” Mode

The PF is limited to +1.000, and the Q-Var limit is limited to 0.0%.

“Q(P)” Mode(when the country selection is not “IT”)

The PF changes with the inverter output power.

If the country selection is not “IT” (Italy), after selecting Q(P) Mode, **Press** ▼ to enter the Run-param-Q(P) sub-menu.

For each item setting, **Press** ▶ to move cursor right and **Press** ▼ to set the appropriate value. Confirm settings by Press **ENTER**.

Run-param-Q(P)	
▶ Upper PF Cap	1.000
Lower Power	050.0%
Lower PF Ind	0.900
Upper Power	100.0%

Parameter	Explanation	Default	Range
Upper PF Cap	Power factor of point P1 in the Q(P) mode curve	1	0.9...1
Lower Power*	Output power of point P1 in the Q(P) mode curve (in %)	50%	0%...50%
Lower PF Ind	Power factor of point P2 in the Q(P) mode curve	0.9	0.9...1
Upper Power*	Output power of point P2 in the Q(P) mode curve (in %)	100%	50%...100%

*Lower Power <Upper Power

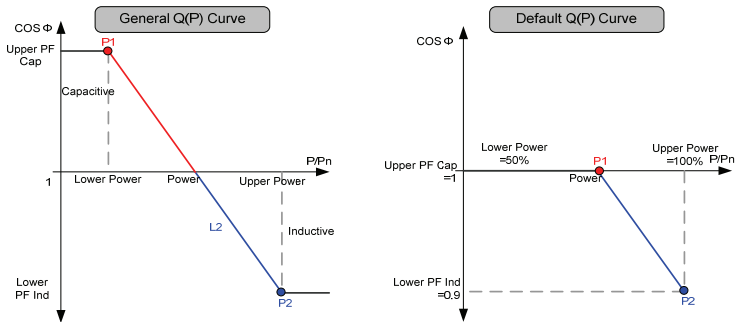


Fig. 10-3 Reactive Power Regulation Curve in Q(P) Mode

“Q(U)” Mode(when the country selection is not “IT”)

The reactive power ratio changes with the grid voltage. If the country selection is not “IT” (Italy), after selecting Q(U) mode, **Press** ▼ to enter the Run-param-Q(U) sub-menu. For each item setting, **Press** ▶ to move cursor right and **Press** ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.

```

Run-param-Q(U)
▶ Lower Q/Sn Ind 050.0%
  Upper Q/Sn Cap 050.0%
  Lower U Limit  095.0%
  Upper U Limit  115.0%
  ▼
Run-param-Q(U)
▶ U1 Limit      095.0%
  U2 Limit      105.0%
  Hysteresis    3.0%
    
```

Parameter	Explanation	Default	Range
Lower Q/Sn Ind	Inductive Q/Sn value of point P4 in the Q(U) mode curve	25%	0%...50%
Upper Q/Sn Cap	Capacitive Q/Sn value of point P1 in the Q(U) mode curve	25%	0%...50%
Lower U Limit	Grid voltage limit (in %) of point P1 in the Q(U) mode curve	80%	80%...90%
Upper U Limit	Grid voltage limit (in %) of point P4 in the Q(U) mode curve	115%	110%...115%
U1 Limit*	Grid voltage limit (in %) of point P2 in the Q(U) mode curve	95%	95%...100%
U2 Limit*	Grid voltage limit (in %) of point P3 in the Q(U) mode curve	105%	100%...105%
Hysteresis*	Hysteresis voltage width (in %)	3%	0%...5%

*U1 Limit + Hysteresis < U2 Limit - Hysteresis

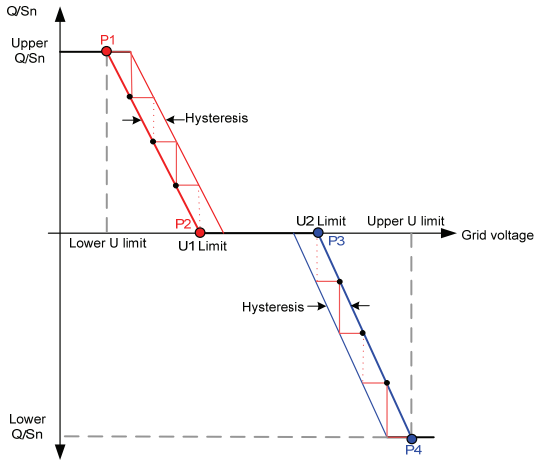


Fig. 10-4 Reactive Power Regulation Curve in Q(U) Mode

10.10.3 Save P/Q-set

On the “Save P/Q-set” screen, **Press** to move arrow to one item, **Press** to move cursor right and **Press** to set.

Confirm by Pressing **ENTER**.

Select “Y” to save up the values set when power down.
 Select “N” to restore default values when power down.

Save P/Q-set	
▶ Save P-W limits	[Y/N]
Save Q-Var set	[Y/N]

10.11 Protective Parameters Setting

Protective parameters are designed for the limit value that can trigger the protective functions of the inverter.

Main Screen(Press **ENTER**)→Menu screen(Press **▼** ×3)→Set-param(Press **ENTER**)→

Enter password(Press **ENTER**, Press **▼** ×2)→Pro-param(Press **ENTER**)

A password confirmation screen will occur. Press **▶** to move cursor right and Press **▼** to input the password. Please enquire Sungrow or your dealer for this password.

Pro-param
Password: 000000

To make protective parameters setting convenient, Inverter provides country code selection. The protective parameters have been configured before delivery according to different countries utility grid requirements. Choose the correct country code by Press **▼** and Press **ENTER** to confirm.

Countries
<input type="radio"/> GB <input type="radio"/> DE <input type="radio"/> FR <input type="radio"/> IT <input type="radio"/> ES <input type="radio"/> AT <input type="radio"/> AU <input type="radio"/> CZ <input type="radio"/> BE <input type="radio"/> DK <input type="radio"/> GR_L <input type="radio"/> GR_IS <input type="radio"/> NL <input type="radio"/> PT <input type="radio"/> CHN <input type="radio"/> SE <input checked="" type="radio"/> Other

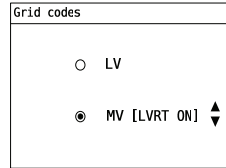
The description of country code is illustrated below:

Country Code	Full Name	Country Code	Full Name
GB	Great Britain	DE	Germany
FR	France	IT	Italy
ES	Spain	AT	Austria
AU	Australia	CZ	Czech
BE	Belgium	DK	Denmark
GR_L	Greece Land	GR_IS	Greece Island
NL	Netherlands	PT	Portugal
CHN	China	SE	Sweden
Other	Country not included above	-	-

Confirm by pressing **ENTER** after country code selection. Choose grid code according to actual grid condition.

Note: "LV" represents Low Voltage Grid Code, and "MV" represents Middle Voltage Grid Code.

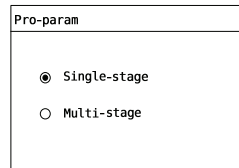
When choose MV, **Press** **➤** to enter the LVRT function selection, **Press** **▼** to switch on or off the LVRT function and **Press** **ENTER** to confirm the selection.



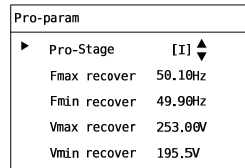
Note: If the Country selected does not have the "Grid codes" directives, this configuration will not affect the following procedures.

However, you may select the MV to enable/disable the LVRT function regardless of the country selected.

Press **▼** to select protective parameter type. Press **ENTER** to confirm the selection.



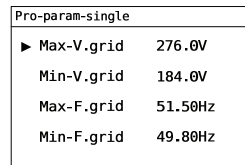
If the country selection is "IT" (Italy), the Pro-param menu right will show, refer to the 10.13.3 Protective Parameters Setting for Italy for detailed settings.



Single-stage Protective Parameter (when the country selection is not "IT")

If the selected protective parameter type is "Single-stage", the following sub-menu will come up.

Press **▼** to select parameter, **Press** **➤** to move cursor right and **Press** **▼** to set the appropriate value. Confirm settings by Pressing **ENTER**.



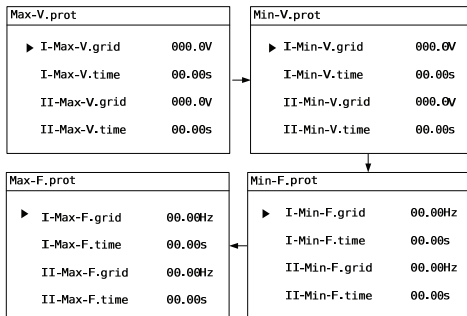
Tab. 10-5 Single-stage Protective Parameter Explanation

Parameter	Explanation
Max-V.grid	Grid over-voltage value
Min-V.grid	Grid under-voltage value
Max-F.grid	Grid over frequency value
Min-F.grid	Grid under frequency value

Multi-stage Protective Parameter (when the country selection is not “IT”)

If the selected protective parameter type is “Multi-stage”, the following sub-menus will come up.

Press ▼ to select parameter, **Press** ▶ to move cursor right and **Press** ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.



Tab. 10-6 Multi-stage Protective Parameter Explanation

Parameter	Explanation
Max-V. prot	Over-voltage protection
I -Max-V. grid	Stage I Grid over-voltage
I -Max-V. time	Stage I Grid over-voltage tripping time
II -Max-V. grid	Stage II Grid over-voltage
II -Max-V. time	Stage II Grid over-voltage tripping time
Min-V. prot	Under-voltage protection
I -Min-V. grid	Stage I Grid under-voltage
I -Min -V. time	Stage I Grid under-voltage tripping time
II -Min -V. grid	Stage II Grid under-voltage
II -Min -V. time	Stage II Grid under-voltage tripping time
Max-F. prot	Over-frequency protection
I -Max-F. grid	Stage I Grid over-frequency
I -Max-F. time	Stage I Grid over-frequency tripping time
II -Max-F. grid	Stage II Grid over-frequency
II -Max-F. time	Stage II Grid over-frequency tripping time
Min-F. prot	Under-frequency protection
I -Min-F. grid	Stage I Grid under-frequency
I -Min -F. time	Stage I Grid under-frequency tripping time
II -Min -F. grid	Stage II Grid under-frequency
II -Min -F. time	Stage II Grid under-frequency tripping time

Confirm settings by pressing **ENTER** and enter the "Setting confirmation" screen. Check all above-mentioned parameter settings. Confirm them by pressing **ENTER**. Cancel by pressing **ESC** and reset.

Setting confirmation	
Country	Other
Grid code	LV
LVRT	OFF
Confirm above settings?	



When the Country or the Grid code or LVRT switch mode is changed, the protective settings will be unavailable unless the inverter is re-energized.

10.12 Communication Parameters Setting

Main Screen(**Press ENTER**)→Menu screen(**Press ▼** ×3)→Set-param(**Press ENTER**)→Enter password(**Press ENTER**, **Press ▼** ×3)→Com-param(**Press ENTER**)

Press ▶ to move cursor right and **Press ▼** to set the appropriate value. Confirm settings by Pressing **ENTER**.

The range of communication address is 1...247.

Com-param	
Address	001

10.13 Special Settings for Italy

If the "Countries" selection is "IT" (Italy), several LCD menus and operation methods are different from other countries.

The differences focus on "Run-param" and "Pro-param" as shown below.

10.13.1 Over-frequency Derating Setting for Italy

If the "Countries" selection is "IT" (Italy), the "Derating Slope"* will display in the "Run-param" screen.

When the grid frequency is between 50.3Hz and 51.5Hz, inverter will decrease power according to the "Derating Slope".

Default derating slope (Pm/Hz, Pm is the power before derating): 83.33%. Range: 40% ...100%.

Note: "Derating Slope"* is the power derating slope. Power derating slope = $100 / (\text{Grid frequency} \times \text{Frequency derating slope})$. Frequency derating slope range: 2% ...5%.

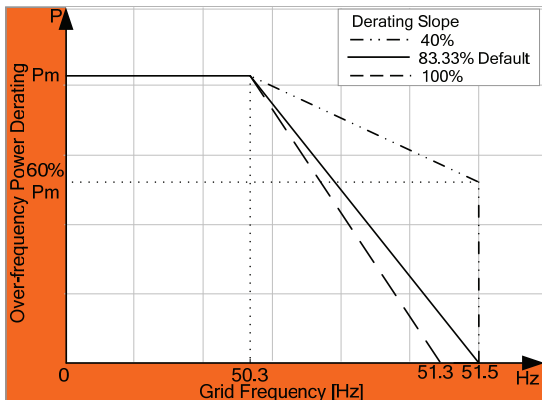


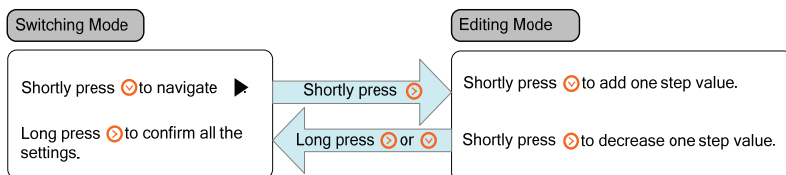
Fig. 10-5 "IT" Over-frequency Derating Curve

10.13.2 Reactive Power Regulation for Italy

Button Operation

The button functions for Italy parameter setting sub-menus may differ from that in other menus.

Proceed as follows to perform the parameter settings.



Italy “Q(P)” Mode

The power factor changes with the output power of the inverter.

Select Q(P) mode and **Press** \blacktriangledown to enter into the “Run-para-Q(P)” sub-menu.

Press \blacktriangledown to navigate the cursor; **Press** \blacktriangleright to enter into the editing mode, then the selected parameter will be shaded.

Press \blacktriangledown to increase one-step value; **Press** \blacktriangleright to decrease one-step value.

Press **ENTER** to confirm the setting and exit from the editing mode.

Run-param-Q(P)	P3/3
\blacktriangleright PA	020.0%
PB	050.0%
PC	100.0%
Pf max	0.900
Uin	105.0%
Uout	100.0%

Tab. 10-7 Italy “Q(P)” Mode Parameters Explanation

Parameter	Explanation	Default	Range	Step
PA*	Active power at point A (in %)	20%	20%...100%	1%
PB*	Active power at point B (in %)	50%	20%...100%	1%
PC*	Active power at point C (in %)	100%	20%...100%	1%
Pf max	Power factor at point C	0.9	0.9...1	0.01
Uin**	Enter into the Q(P) regulation mode when the grid voltage is above Uin	105%	100%...110%	1%
Uout**	Exit from the Q(P) regulation mode when the grid voltage is below Uout	100%	90%...100%	1%

*PA < PB ≤ PC

** Uin > Uout

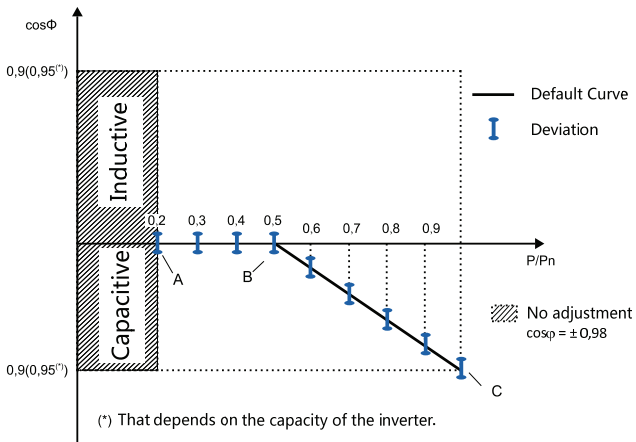


Fig. 10-6 Reactive Power Regulation Curve in "IT" Q(P) Mode

Italy "Q(U)" Mode

The reactive power ratio changes with the grid voltage. Select Q(U) mode and **Press** ▼ to enter into the "Run-para-Q(U)" sub-menu.

Press ▼ to navigate the cursor; **Press** ▶ to enter into the editing mode, then the selected parameter will be shaded.

Press ▼ to increase one-step value; **Press** ▶ to decrease one-step value.

Press ENTER to confirm the setting and exit from the editing mode.

Run-param-Q(U)		P3/4
V2i	090.0%	
V1i	092.0%	
V1s	108.0%	
V2s	110.0%	
Qmax	100.0%	
Pin	020.0%	

↓

Run-param-Q(U)		P4/4
Pout	009.0%	
Curve	[A]	▲▼

Tab. 10-8 Italy "Q(U)" Mode Parameters Explanation

Param.	Explanation	Default	Range	Step
V2i*	Grid voltage at point D (in %)	90%	90%...110%	1%
V1i*	Grid voltage at point C (in %)	92%	90%...110%	1%
V2s*	Grid voltage at point A (in %)	108%	90%...110%	1%
V1s*	Grid voltage at point B (in %)	110%	90%...110%	1%
Qmax	The max. ratio of reactive power (in %)	90%	50%...100%	1%
Pin**	Enter into the Q(U) regulation mode when the power is above Pin	20%	20%...100%	1%
Pout**	Exit from the Q(U) regulation mode when the power is below Pout	9%	1%...20%	1%
Curve	Curve type	A	A/B	-

* $V_{2i} < V_{1i} < V_{1s} < V_{2s}$

** $P_{in} > P_{out}$

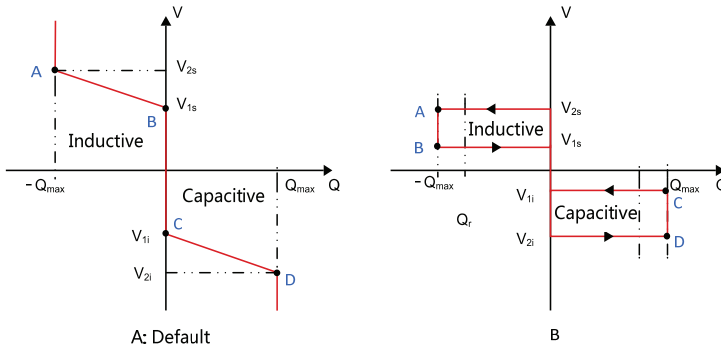


Fig. 10-7 Reactive Power Regulation Curve in “IT” Q(U) Mode

10.13.3 Protective Parameters Setting for Italy

If the “Countries” selection is “IT” (Italy), the protective parameters settings procedures are shown below.

After “Grid codes” selection, you may enter into the “Pro-param” sub-menu.

Press ▼ to select parameter, **Press** ► to move cursor right and **Press** ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.

IT(Italy)	
Pro-param	
► Pro-Stage	[I] ▲▼
Fmax recover	50.10Hz
Fmin recover	49.90Hz
Vmax recover	253.00V
Vmin recover	195.5V

Tab. 10-9 Italy Grid protection Recovery Value

Parameter	Explanation
Fmax recover	Inverter can start operating only when the grid frequency is below Fmax recovery. The fault recovery value when the grid over-frequency occurs.
Fmin recover	Inverter can start operating only when the grid frequency is above Fmin recovery. The fault recovery value when the grid under-frequency occurs.
Vmax recover	Inverter can start operating only when the grid voltage is below Vmax recover. The fault recovery value when the grid over-voltage occurs.
Vmin recover	Inverter can start operating only when the grid voltage is above Vmin recover. The fault recovery value when the grid under-voltage occurs.

“IT” Stage I Protective Parameter

If the selected protective parameter is “Pro-stage I”, the following sub-menu will come up.

Press ▼ to select parameter, **Press** ▶ to move cursor right and **Press** ▼ to set the appropriate value. Confirm settings by Pressing **ENTER**.

Pro-param-single	
▶ Max-V.grid	253.0V
Min-V.grid	195.5V
Max-F.grid	51.50Hz
Min-F.grid	47.50Hz

Tab. 10-10 Stage I Protective Parameter Explanation

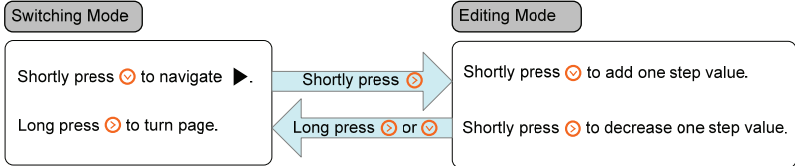
Parameter	Explanation	Parameter	Explanation
Max-V.grid	Grid over-voltage value	Max-F.grid	Grid over frequency value
Min-V.grid	Grid under-voltage value	Min-F.grid	Grid under frequency value

“IT” Stage II Protective Parameter



The button functions for Italy Stage II parameter setting sub-menus may differ from that in other menus.

Proceed as follows to perform the parameter settings.

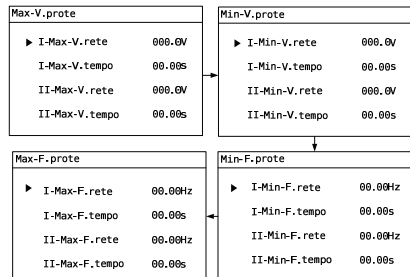


Select “Pro-stage II” and **Press** ▼ to enter into the sub-menus.

Press ▼ to navigate the cursor; **Press** ▶ to enter into the editing mode, then the selected parameter will be shaded.

Press ▼ to increase one-step value; **Press** ▶ to decrease one-step value.

Press **ENTER** to confirm the setting and exit from the editing mode.



Tab. 10-11 "IT" Stage II Protective Parameters Explanation

Parameter	Explanation
Max-V. prote	Over-voltage protection
I -Max-V. rete	Stage I Grid over-voltage
I -Max-V. tempo	Stage I Grid over-voltage tripping time
II -Max-V. rete	Stage II Grid over-voltage
II -Max-V. tempo	Stage II Grid over-voltage tripping time
Min-V. prote	Under-voltage protection
I -Min-V. rete	Stage I Grid under-voltage
I -Min -V. tempo	Stage I Grid under -voltage tripping time
II -Min -V. rete	Stage II Grid under -voltage
II -Min -V. tempo	Stage II Grid under -voltage tripping time
Max-F. prote	Over-frequency protection
I -Max-F. rete	Stage I Grid over-frequency
I -Max-F. tempo	Stage I Grid over-frequency tripping time
II -Max-F. rete	Stage II Grid over-frequency
II -Max-F. tempo	Stage II Grid over-frequency tripping time
Min-F. prote	Under-frequency protection
I -Min-F. rete	Stage I Grid under-frequency
I -Min -F. tempo	Stage I Grid under-frequency tripping time
II -Min -F. rete	Stage II Grid under-frequency
II -Min -F. tempo	Stage II Grid under-frequency tripping time

11 Appendix

11.1 Technical Data

Parameters	SG30KTL	SG30KTL-M
Input Side Data		
Max. PV input power	32000W	
Max. PV input voltage	1000V	
Startup voltage	300V	
Nominal input voltage	650V	
MPP voltage range	280...950V	
MPP voltage range for nominal power	480...800V	
No. of MPPT(s)	1	2
Max. number of PV strings per MPPT	10	5
Max. PV input current(DC1/DC2)	66A	66A(33A/33A)
Max. input current for input connector	10A	
Short-circuit current of PV input (DC1/DC2)	80A	80A(40A/40A)
Output Side Data		
Nominal AC output power	30000W	
Max. AC output apparent power	33120VA	
Max. AC output current	48A	
Nominal AC voltage	3/N/PE, 230/400Vac	
AC voltage range	310...480Vac (May vary as per corresponding country's grid standard.)	
Nominal grid frequency	50Hz	
Grid frequency range	45...55Hz (May vary as per corresponding country's grid standard.)	
THD	< 3 % (at nominal power)	
DC current injection	<0.5%In	
Power factor	>0.99 default value at nominal power (adj. 0.9 overexcited...0.9 underexcited)	
Protection		
Anti-islanding protection	Yes	
LVRT	Yes	
DC reverse connection protection	Yes	

Parameters	SG30KTL	SG30KTL-M
AC short circuit protection	Yes	
Leakage current protection	Yes	
DC switch	Integrated	
DC fuse	Integrated	
Overvoltage protection	Type II DIN rail surge arrester	
System data		
Max. efficiency	98.3%	
Max. European efficiency	98.0%	
Isolation method	Transformerless	
Ingress protection rating	IP65 (Fans: IP55)	
Night power consumption	<1W	
Operating ambient temperature range	-25... + 60°C (>45°C derating)	
Allowable relative humidity range	0...95%, no condensing	
Cooling method	Smart forced air cooling	
Max. operating altitude	4000m (>2000m derating)	
Display	Graphic LCD	
Communication	RS485 (RJ45 connector)	
Certification	VDE0126-1-1, EN62109-1, EN62109-2, G59/2, CEI-021, AS/NZS 3100, AS4777.2, AS4777.3, VDE-AR-N-4105, BDEW, CGC-SOLAR.	
Mechanical Data		
Dimensions (W×H×D)	634×820×257mm	
Mounting method	Wall bracket	
Weight	65kg	

11.2 Terminals and Cables

Terminal	Type	Conductor size	Recommended conductor size
AC terminals	PGA29L-27 Phoenix Spring terminal block PLH 16/ 5-15	8AWG...5AWG 8... 16mm ²	7AWG 10 mm ²
DC terminals	MC4 PV-KST4/6II-UR PV-KBT4/6II-UR	12AWG... 10AWG 4...6mm ²	11AWG 4mm ²
RS485Comm. terminals	MG25A-H2-06-ST	Twist-pair type cable Twist-pair type shielding Ethernet cable	
Second PE terminal	-	10AWG...8AWG 6mm ²	9AWG 6mm ²

11.3 Exclusion of Liability

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11.4 About Us

Sungrow power supply is a China-leading manufacturer of various power electronics products for renewable energy generation systems. Our products include converters, inverters, battery chargers and other power supplies for distributable generation system in both grid-connected and stand-alone applications. The power rating of Sungrow products covers from hundred watt to mega-watt systems.

The vision of Sungrow is to help our customers acquire stable and clean power with minimum cost, maximum reliability and enhanced safety.

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