SUNGROW

User Manual

SG2K-S / SG2K5-S / SG3K-S /

SG3K-D / SG3K6-D / SG4K-D /

SG4K6-D / SG5K-D / SG6K-D

PV Grid-Connected Inverter

SG2-6K-UEN-Ver11-201903 Version：1.1

About This Manual

The manual mainly describes the product information, guidelines for installation, operation and maintenance. The manual cannot include complete information about the photovoltaic (PV) system. You can get additional information about other devices at en.sungrowpower.com or on the webpage of the respective component manufacturer.

Applicability

This manual is applicable to the following inverter types:

- SG2K-S
- SG2K5-S
- SG3K-S
- SG3K-D
- SG3K6-D
- SG4K-D
- SG4K6-D
- SG5K-D
- SG6K-D

They will be referred to as "inverter" hereinafter unless otherwise specified.

Target Group

This manual is intended for:

- qualified personnel who are responsible for the installation and commissioning of the inverter; and
- inverter owners who will have the ability to interact with the inverter.

How to Use This Manual

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

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Contents may be periodically updated or revised due to product development. The information in this manual is subject to change without notice. The latest manual can be acquired at en.sungrowpower.com.

Symbols

Safety instructions will be highlighted with the following symbols.

Symbol	Explanation
	Indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk that, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a situation that, if not avoided, could result in equipment or property damage.
	Indicates additional information, emphasized contents or tips that may be helpful, e.g. to help you solve problems or save time.

Contents

1 Safety

The inverter has been designed and tested strictly according to international safety regulations. Read all safety instructions carefully prior to any work and observe them at all times when working on or with the inverter.

Incorrect operation or work may cause:

- injury or death to the operator or a third party; or
- damage to the inverter and property safety of the operator or a third party.

All detailed work-related safety warnings and notes will be specified at critical points in this manual.

1.1 General Safety

PV Panels

Please follow the safety instructions related to the PV strings.

⚠ DANGER

Lethal voltage!

PV strings will produce electrical power when exposed to sunlight and can cause a lethal voltage and an electric shock.

Only qualified personnel can perform the wiring of the PV panels.

Utility Grid

Please follow the regulations related to the utility grid.

NOTICE

All electrical connections must be in accordance with local and national standards.

Only with the permission of the utility grid, the inverter can be connected to the utility grid.

1.2 Inverter

There is a warning label on the inverter body.

	Disconnect the inverter from all the external power sources before service!
	Do not touch live parts until 10 minutes after disconnection from the power sources.
	There is a danger from a hot surface that may exceed 60 °C.
	Danger to life due to high voltages! Only qualified personnel can open and service the inverter.
	Check the user manual before service!

* The warning label in English has been pasted before delivery. The labels in other languages are included in the delivery contents and users may paste the corresponding label according to specified need.

DANGER

Danger to life from electric shocks due to live voltage

- Do not open the enclosure at any time. Unauthorized opening will void guarantee and warranty claims and in most cases terminate the operating license.
- When the enclosure lid is removed, live components can be touched which can result in death or serious injury due to electric shock.

Danger to life from electric shock due to damaged inverter

- Only operate the inverter when it is technically faultless and in a safe state.
- Operating a damaged inverter can lead to hazardous situations that can result in death or serious injuries due to electric shock.

⚠ WARNING

Risk of inverter damage or personal injury

Do not pull out the PV connectors and AC connector when the inverter is running. Disconnect the AC circuit breaker and set the DC load-break switch of the inverter to OFF. Wait 10 minutes for the internal capacitors to discharge. Verify that there is no voltage or current before pulling any connector.

⚠ WARNING

All the warning labels and nameplate on the inverter body:

- must be clearly visible; and
- must not be removed, covered or pasted.

⚠ CAUTION

Risk of burns due to hot components!

Do not touch any hot parts (such as heat sinks) during operation. Only the LCD panel and the DC switch can safely be touched at any time.

NOTICE

Only qualified personnel can change the country setting.

Unauthorized alteration of the country setting may cause a breach of the type-certificate marking.

Risk of inverter damage due to electrostatic discharge (ESD).

By touching the electronic components, you may damage the inverter. For inverter handling, be sure to:

- **avoid any unnecessary touching; and**
- **wear a grounding wristband before touching any connectors.**

1.3 Skills of Qualified Personnel

Qualified personnel must have the following skills:

- training in the installation and commissioning of the electrical system, as well as the dealing with hazards;
- knowledge of the manual and other related documents; and
- knowledge of the local regulations and directives.

2 Product Introduction

2.1 Intended Use

The inverters, which are single-phase string inverters without transformer, are the crucial units between the PV strings and the utility grid in a PV power system.

The inverter converts DC power from the PV array into grid-compliant AC power and feeds it into the utility grid.

WARNING

Any use other than the intended use is not permitted.

The inverter must only be operated with PV strings of protection class II in accordance with IEC 61730, application class A. It is not permitted for the positive pole or the negative pole of the PV strings to be grounded. This can cause the inverter to be destroyed.

Damages to the product due to a faulty or damaged PV installation are not covered by warranty.

The intended use example is shown in **Fig. 2-1**.

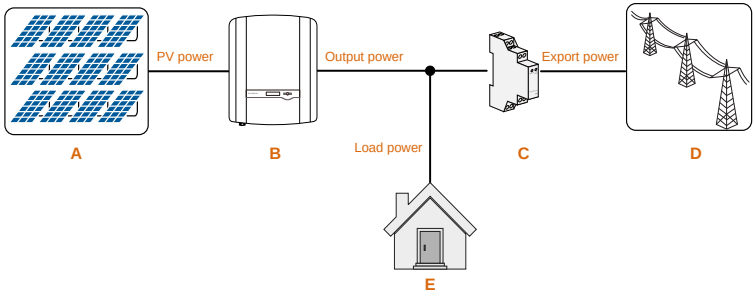


Fig. 2-1 Application in a PV Power System

Item	Description	Remarks
A	PV strings	Monocrystalline silicon, polycrystalline silicon and thin-film without grounding.
B	Inverter	SG2K-S, SG2K5-S, SG3K-S, SG3K-D, SG3K6-D, SG4K-D, SG4K6-D, SG5K-D and SG6K-D.

Item	Description	Remarks
C	Sungrow single-phase or three-phase meter (optional)	Measures the export power and communicates with the inverter via an RS485 connection.
D	Utility grid	Grid grounding system types: TT, TN.
E	Household load	Devices that consume energy.

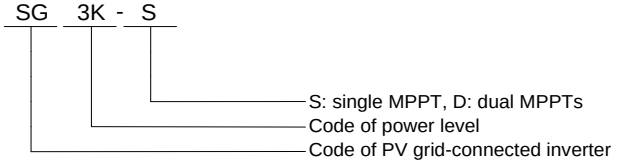
NOTICE

For the TT utility grid, the N line voltage to ground must be 30 V or less.

2.2 Inverter

Type Description

The type description is as follows (take SG3K-S as an example):



Tab. 2-1 Power Level Description

Type	Nominal Output Power	Nominal Grid Voltage
SG2K-S	2000 W	230 Vac (single phase)
SG2K5-S	2500 W	
SG3K-S	3000 W	
SG3K-D	3000 W	
SG3K6-D	3680 W	
SG4K-D	4000 W	
SG4K6-D	4600 W	
SG5K-D	4990 W	
SG6K-D	6000 W	

Appearance

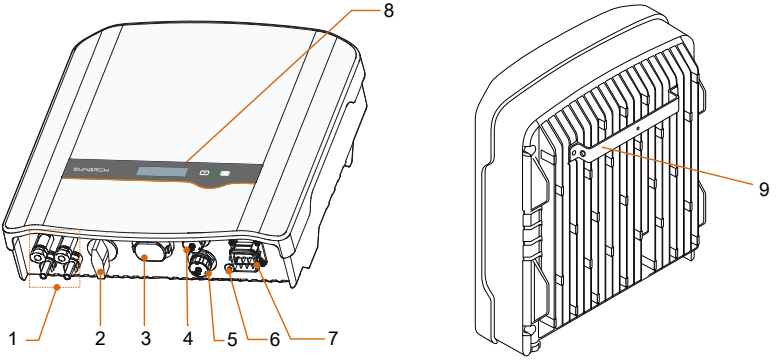


Fig. 2-2 Inverter Appearance (-D series for reference)

* The image shown here is for reference only. The actual product you receive may differ.

Item	Name	Description
1	PV terminals	Positive and negative DC input connectors. One or two pairs, depending on inverter type.
2	DC switch	To disconnect the DC current safely.
3	RS485 terminal	Can be connected to Wi-Fi or E-Net communication module.
4	DRM terminal	Reserved.
5	Meter terminal	For Smart Energy Meter.
6	Second PE terminal	For reliable grounding.
7	AC terminal	To feed power into the utility grid.
8	LCD panel	The display and two buttons can be used to access current operating data or change inverter settings.
9	Mounting rack	For mounting the inverter to the wall mounting bracket.

Dimensions and Weight

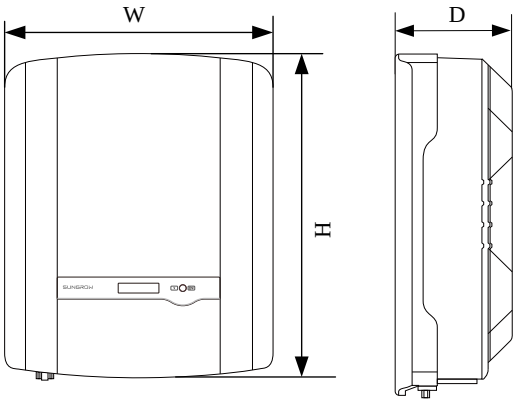


Fig. 2-3 Dimensions of the Inverter

Tab. 2-2 Dimensions and Weight

Type	W (mm)	H (mm)	D (mm)	Weight (kg)
SG2K-S / SG2K5-S / SG3K-S	300	370	125	8.5
SG3K-D / SG3K6-D / SG4K-D / SG4K6-D / SG5K-D / SG6K-D	360	390	133	11.5

LCD Panel

The LCD panel with a screen, an indicator and two buttons is on the front of the inverter.

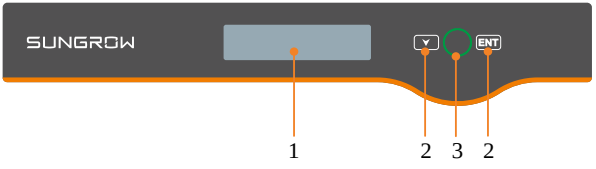


Fig. 2-4 LCD Panel

No.	Name	Description
1	LCD screen	Display and access current operating data or change inverter settings.
2	Buttons	▼ / ENT. View or set parameters via the buttons. For detailed functions, see **Tab. 6-1**.

No.	Name	Description
3	Indicator	Green / red. User can observe the color and blinking frequency to get the current state of the inverter. For detailed definition, see **Tab. 6-2**.

2.3 Smart Energy Meter (optional)

The Sungrow Smart Energy Meter is installed next to the main switch to detect the electrical measured values at the grid-connected point. It communicates with the inverter via an RS485 connection. The dimensions are shown below.

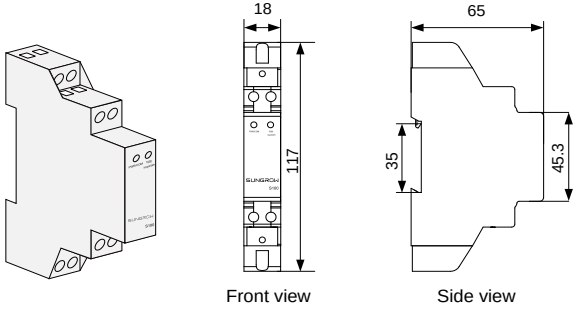


Fig. 2-5 single-phase Smart Energy Meter Dimensions (unit: mm)

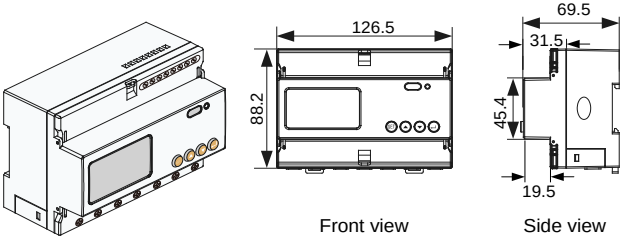


Fig. 2-6 Three-phase Smart Energy Meter Dimensions (unit: mm)

- The single-phase Smart Energy Meter and the three-phase Smart Energy Meter are optional and delivered separately. The meter figures in this document have been created for the single-phase Smart Energy Meter unless otherwise specified.
- More detailed information on the Smart Energy Meter can be found in the respective Quick Installation Guide.

2.4 Function Description

2.4.1 Basic Function

- Conversion function

  The inverter converts DC power from the PV array into grid-compliant AC power and feeds it into the utility grid.

- Data storage

  Inverter logs essential data including running information and error records.

- Parameter configuration

  Inverter provides various parameter configurations for optimal operation. You can view the parameters via iSolarHome App and set the parameters via iSolarCloud App or iSolarCloud server (qualified personnel only). In case you require further settings, please contact SUNGROW.

- RS485 communication

  The RS485 communication terminal is provided to which communication module can be connected, thereby achieving the communication function and connecting the monitoring device to the whole PV system.

  - It is recommended to use the communication module from Sungrow. Using a device from other companies may lead to communication failure or other unexpected damage.
  - Further information on the communication module can be found in the respective Quick Installation Guide.

- Earth fault alarm

  If an earth fault occurs, the error code will be displayed on the LCD screen. The buzzer inside the inverter will beep to signal an external alarm.

- Protective function

  The protective functions are integrated in the inverter, including short circuit protection, grounding insulation resistance surveillance, residual current protection, anti-islanding protection, DC overvoltage / over-current protection, etc.

2.4.2 Regular Operational Voltage Range

The inverters can operate within the allowable voltage range for at least the specified observation time. The setting of the conditions depends on whether the connection is due to a normal operational start-up or an automatic reconnection after tripping of the interface protection.

When the voltage level is out of the operational levels, the inverter will disconnect from the grid in the protection time. If a disturbance lasts less than the required protection time, the inverter can reconnect to the grid if the voltage level goes back to normal levels after the disturbance.

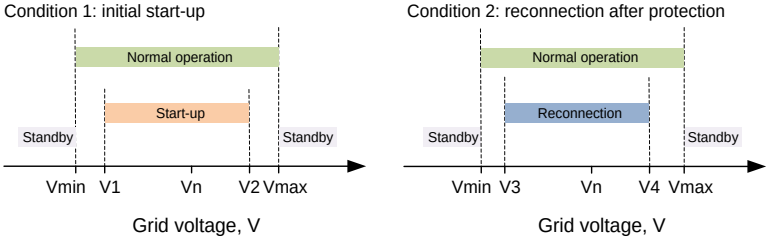


Fig. 2-7 Inverter Action related to Grid Voltage ("DE" for example)

Tab. 2-3 Operational Voltage Parameter Description

Parameter	Explanation
Grid-connection	
V1	The lower voltage limit for initial start-up.
V2	The upper voltage limit for initial start-up.
V3	The lower voltage limit for reconnection.
V4	The upper voltage limit for reconnection.
t_v	Minimum observation time.
k_v	Connection or recovery gradient.
Protection	
V_{min}	Under-voltage protection value.
V_{max}	Over-voltage protection value.
T_{min}	Under-voltage protection time.
T_{max}	Over-voltage protection time.

Tab. 2-4 Default Values of Operational Voltage Parameter

Parameter	DE	BE	LUX	NL	IT
V1 (V)	195.5	195.5	195.5	195.5	195.5
V2 (V)	253.0	253.0	253.0	253.0	253.0
V3 (V)	195.5	195.5	195.5	195.5	195.5
V4 (V)	253.0	253.0	253.0	253.0	253.0
t_v (s)	60	60	60	60	30 or 300 (3)

Parameter	DE	BE	LUX	NL	IT
k_v	25% Pn/min or 10% Pn/min (1)	Not applicable or 10% Pn/min (2)			20% Pn/min
V_{min} (V)	184.0 for stage I 103.5 for stage II	184.0	184.0	184.0	195.5
V_{max} (V)	287.5	264.5	264.5	253.0	264.5
T_{min} (s)	3.0 for stage I 0.3 for stage II	0.2	1.35	2.0	0.4
T_{max} (s)	0.1	0.2	0.15	2.0	0.2

(1) 25% Pn/min for initial connection and 10% Pn/min for reconnection.

(2) Not applicable for initial connection and 10% Pn/min for reconnection.

(3) 30 s for initial connection and 300 s for reconnection.

Parameter	FR1	FR2	FR3
V1 (V)	195.5	195.5	195.5
V2 (V)	253.0	253.0	253.0
V3 (V)	195.5	195.5	195.5
V4 (V)	253.0	253.0	253.0
t_v (s)	60	60	60
k_v	Not applicable for initial connection and 10% Pn/min for reconnection.		
V_{min} (V)	184.0	184.0	195.5
V_{max} (V)	264.5	255.3	264.5
T_{min} (s)	0.2	0.2	0.2
T_{max} (s)	0.2	0.2	0.2

Hereinafter, FR1, FR2 and FR3 stand for grids of France homeland 50 Hz, France overseas 50 Hz and France overseas 60 Hz respectively. FR stands for all France region.

2.4.3 Regular Operational Frequency Range

The inverter can operate within the frequency allowable range for at least the specified observation time. The setting of conditions depends on whether the connection is due to a normal operational start-up or an automatic reconnection after tripping of the interface protection.

When the frequency level is out of the operational levels, the inverter will disconnect from the grid. If a disturbance lasts less than the required protection time, the inverter can reconnect to the grid if the frequency level goes back to normal levels after the disturbance.

For Countries except "IT"

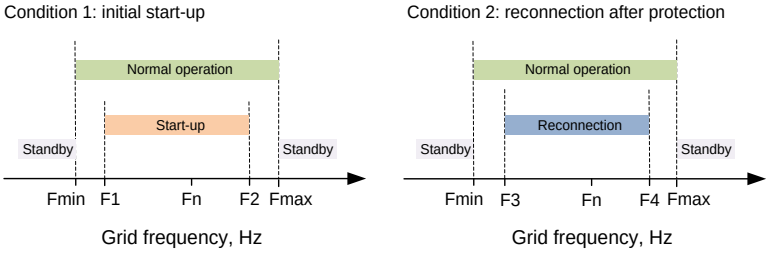


Fig. 2-8 Inverter Action related to Grid Frequency ("DE" for example)

Tab. 2-5 Operational Frequency Parameter Description

Parameter	Description
Grid-connection	
F1	The lower frequency limit for initial start-up.
F2	The upper frequency limit for initial start-up.
F3	The lower frequency limit for reconnection.
F4	The upper frequency limit for reconnection.
t_f	Minimum observation time.
k_f	Connection gradient.
Protection	
F_{min}	Under-frequency protection value.
F_{max}	Over-frequency protection value.
T_{min}	Under-frequency protection time.
T_{max}	Over-frequency protection time.

Tab. 2-6 Default Values of Operational Frequency Parameter

Parameter	DE	FR1	FR2	FR3	BE	LUX	NL
F1 (Hz)	47.50	47.50	47.50	59.90	47.50	47.50	48.00
F2 (Hz)	50.10	50.10	50.10	60.10	50.10	50.10	50.10
F3 (Hz)	47.50	47.50	47.50	59.90	47.50	47.50	48.00
F4 (Hz)	50.10	50.05	50.05	60.10	50.05	50.05	50.05
t_f (s)	60	60	60	60	60	60	60
k_f	25% Pn/min or 10% Pn/min *	Not applicable for initial connection and 10% Pn/min for reconnection					
F_{min} (Hz)	47.50	47.50	46.00	55.00	47.50	47.50	48.00
F_{max} (Hz)	51.50	50.60	52.00	62.50	51.50	52.00	51.00
T_{min} (s)	0.1	0.2	0.2	0.2	0.4	0.3	2.0
T_{max} (s)	0.1	0.2	0.2	0.2	0.4	0.3	2.0

* 25% Pn/min for initial connection and 10% Pn/min for reconnection.

For Country "IT"

The inverter can be connected to grid and start to generate electrical power when the grid frequency is between 49.90 Hz and 50.10 Hz.

- For a normal operational start-up, the observation time is 30 s and the gradient is 20% Pn/min.
- For an automatic reconnection after tripping of the interface protection, the observation time is 300 s and the gradient is 20% Pn/min.

For Italy, the over- / under- frequency protection value and time can be controlled by the SPI function, through LCD setting or remote command via RS485 communication. Please refer to "**2.4.6 SPI and Auto Test (Italy only)**" for details.

2.4.4 Active Power Regulation

Over-voltage Response

When the grid voltage is higher than (110 % V_{max} - 5) V, the inverter will reduce the active power export to grid according to the following equation:

$$\Delta P = P_{nom} \times R$$

Where:

- ΔP is the variation of active power export to grid (in %) related to the nominal power.
- P_{nom} is the nominal grid power.
- R is the desired reduction in active export power (expressed in % of Volt), adjusted in -20 % per Volt.

Over-Frequency Response

When there is an increase in grid frequency which exceeds the Start value, the inverter will reduce the power output linearly with an increase of frequency until the End value is reached.

Tab. 2-7 Definition of Over-frequency Response Parameters

Parameter	Description
OverFrq Start	The Start frequency value for over-frequency response.
OverFrq End	The Stop frequency value for over-frequency response.
Pm	The actual AC output power at the instance when the frequency reaches the Start frequency.
Gradient	The active power reduction rate relative to the actual power Pm per Hz.

Tab. 2-8 Default Values and Range of Over-frequency Response Parameters

Parameter	DE, FR1, FR2, BE, LUX, NL	FR3	IT
OverFrq Start	50.20 Hz	60.20 Hz	50.30 Hz
OverFrq End	51.50 Hz	62.00 Hz	51.50 Hz
Gradient	40% Pm/Hz	40% Pm/Hz	83.4% Pm/Hz

The following figure shows the over-frequency response.

Between the Start value and the End value, all adjustable power generation systems shall reduce (for frequency increase) or increase (for frequency decrease) the active power Pm generated instantaneously, as shown on the curve a.

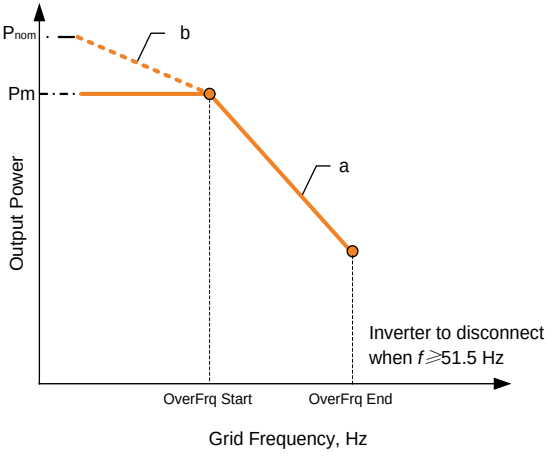


Fig. 2-9 Active Power Response at Over-frequency

For countries except Italy, if the grid frequency drops again to a value below the value of OverFrq Start and if the possible generation power at that instant is greater than the active power Pm, the increase of the active power supplied to the grid will not exceed a gradient of 10 % of the maximum active power per minute, as shown on the curve b.

For Italy, when the grid frequency returns back to 50 ± 0.1 Hz (default setting) for a minimum continuous time of 300 s, the system will end the frequency response and return to its ordinary operation linearly with a transitional time not less than 300 s, as shown in the figure below.

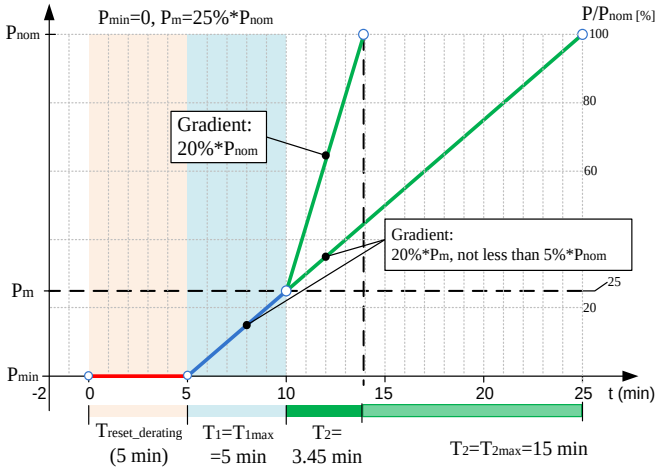


Fig. 2-10 Power Restoration in Condition of Transient Over-frequency (IT)

Where the P_{min} is the minimum power obtained during the transient over-frequency.

Under-Frequency Response (only for "DE")

When there is a decrease in grid frequency which exceeds the Start value, the inverter will increase the power output linearly with a decrease of frequency until the End value is reached.

Tab. 2-9 Definition of Under-frequency Response Parameters

Parameter	Description	Default Value
UnderFrq Start	The Start frequency value for under-frequency response.	49.80 Hz
UnderFrq End	The Stop frequency value for under-frequency response.	47.50 Hz
Pm	The actual AC output power at the instance when the frequency reaches the Start frequency.	-
Gradient	The active power increase rate relative to the actual power Pm per Hz.	40% Pm/Hz

The following figure shows the under-frequency response.

Between the Start value and the End value, all adjustable power generation systems shall reduce (for frequency increase) or increase (for frequency decrease) the active power Pm generated instantaneously, as shown on the curve.

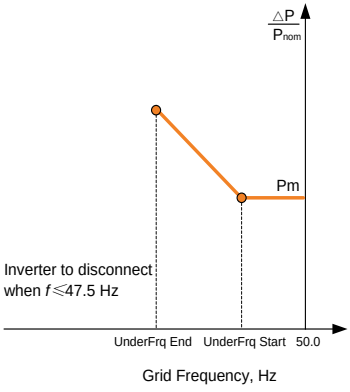


Fig. 2-11 Active Power Response at Under-frequency

If the grid frequency increases and is between 49.80 Hz and 50.20 Hz, the active power supplied to the grid will recover with a gradient that not exceeds 10 % of the maximum active power per minute.

2.4.5 Reactive Power Regulation

The inverter is capable of operating in the following reactive power control modes for the purpose of providing support to the grid. The reactive power regulation modes for the country "DE" can be set via the LCD in commissioning. For the other countries, they can only be set via iSolarCloud App or iSolarCloud server.

Fixed Power Factor Mode (PF)

The PF mode controls the active power factor of the inverter's output according to a set-point set via the LCD. The PF ranges from 0.8 leading (+) to 0.8 lagging (-), with the default value of +1.0.

Voltage Related Control Mode Q(U)

The voltage related control mode Q(U) controls the reactive power output as a function of the grid voltage.

- Q(U) curve for countries except Italy ("IT")

Tab. 2-10 "Q(u)" Mode Parameter Explanations

Parameter	Explanation
V1 Ref.	Grid voltage limit (in %) of point P1 in the Q(U) mode curve
V2 Ref.	Grid voltage limit (in %) of point P2 in the Q(U) mode curve

Parameter	Explanation
V3 Ref.	Grid voltage limit (in %) of point P3 in the Q(U) mode curve
V4 Ref.	Grid voltage limit (in %) of point P4 in the Q(U) mode curve
Leading Q/Sn	Leading Q/Sn value of point P1 in the Q(U) mode curve
Lagging Q/Sn	Lagging Q/Sn value of point P1 in the Q(U) mode curve
Hysteresis*	Hysteresis voltage width (in %)

*V2 Ref. + Hysteresis < V3 Ref. - Hysteresis

Tab. 2-11 "Q(u)" Mode Parameter Values

Parameter	DE, FR			BE, LUX, NL	
	Default (DE)	Default (FR)	Range	Default	Range
V1 Ref.	93 %	80 %	80 %–100 %	90 %	90 %–92 %
V2 Ref.	97 %	95 %	80 %–100 %	92 %	92 %–100 %
V3 Ref.	103 %	105 %	100 %–120 %	108 %	100 %–108 %
V4 Ref.	107 %	115 %	100 %–120 %	110 %	108 %–110 %
Leading Q/Sn	60 %	30 %	0–60 %	60 %	0–60 %
Lagging Q/Sn	60 %	30 %	0–60 %	60 %	0–60 %
Hysteresis	0 %	30 %	0–50 %	0 %	0–50 %

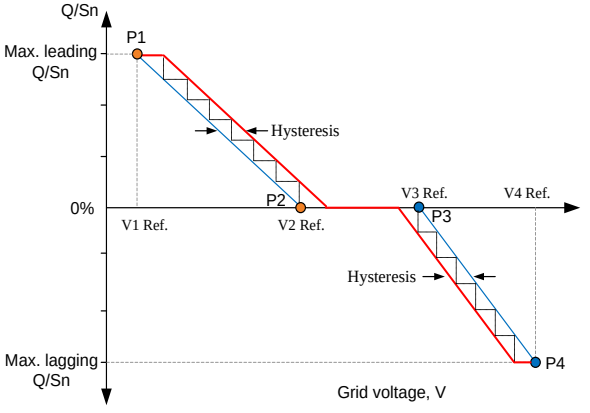


Fig. 2-12 Reactive Power Control Curve in Q(U) Curve

- Q(U) curve for the country Italy ("IT")

Tab. 2-12 Italy"*Q*(U)" Mode Parameters Explanation

Parameter	Explanation	Default	Range
V2i*	Grid voltage at point A (in %)	90 %	90 %–110 %
V1i*	Grid voltage at point B (in %)	92 %	90 %–110 %
V1s*	Grid voltage at point C (in %)	108 %	90 %–110 %
V2s*	Grid voltage at point D (in %)	110 %	90 %–110 %
k	The ratio of the base reactive power (in %)	10 %	0–100 %
Pin**	Enter into the Q(U) regulation mode when the power is above Pin	20 %	20%–100%
Pout**	Exit from the Q(U) regulation mode when the power is below Pout	5 %	1 %–20 %
Qmax	The max. ratio of reactive power (in %)	32.8 %	0–60 %

*V2i < V1i < V1s < V2s **Pin > Pout

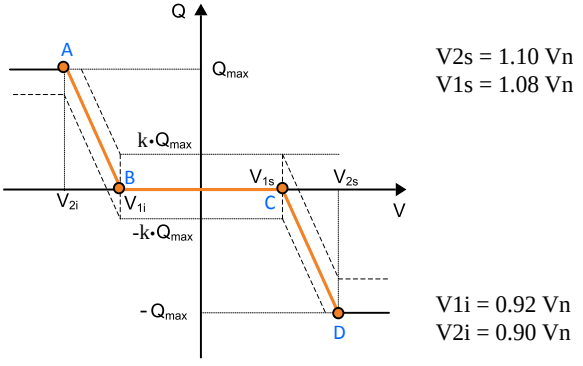


Fig. 2-13 Reactive Power Control Curve in "IT" Q(U) Mode

Power Related Control Mode Q(P)

The power related control mode controls the active power factor (PF) of the inverter output as a function of its active power output.

- Q(P) curve for countries except Italy ("IT")

Tab. 2-13 "*Q*(P)" Mode Parameter Explanations

Parameter	Explanation
Leading PF	Power factor of the lower power point
Lagging PF	Power factor of the upper power point
Lower Power*	Lower limit of the output power (in %)
Upper Power*	Upper limit of the output power (in %)

*Lower Power <Upper Power

Tab. 2-14 "Q(P)" Mode Parameter Values

Parameter	Default		Range
	DE, FR	BE, LUX, NL	
Leading PF	1.000	1.000	0.900–1.000
Lagging PF	0.95	0.90	0.900–1.000
Lower Power*	50 %	50 %	0–50 %
Upper Power*	100 %	100 %	50 %–100 %

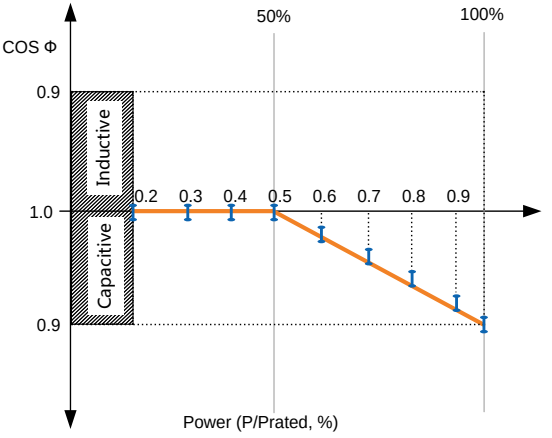


Fig. 2-14 Reactive Power Regulation Curve in Q(P) Mode

- Q(P) curve for the country Italy ("IT")

Tab. 2-15 Italy "Q(P)" Mode Parameters Explanation

Parameter	Explanation	Default	Range
Power A	Active power at point A *(in %)*	20 %	20 %–100 %
Power B	Active power at point B *(in %)*	50 %	20 %–100 %
Power C	Active power at point C *(in %)*	100 %	20 %–100 %
Max. PF	Power factor at point C	0.95	0.90–1.00
Uin	Enter into the Q(P) regulation mode when the grid voltage is above Uin	105 %	100 %–110 %
Uout	Exit from the Q(P) regulation mode when the grid voltage is below Uout	100 %	90 %–100 %

* Power A < Power B ≤ Power C, Uin > Uout

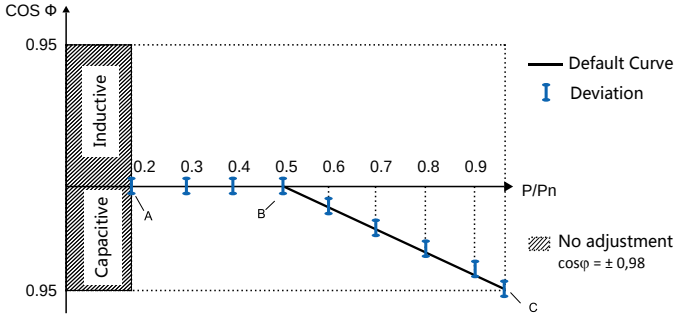


Fig. 2-15 Reactive Power Regulation Curve in"IT" Q(P) Mode

2.4.6 SPI and Auto Test (Italy only)

The auto test system will check the maximum/minimum frequency and voltage provided in the interface protection system (SPI). For each frequency and voltage protection function, the tripping threshold varies linearly upward or downward with a slope of ≤ 0.05 Hz/s or ≤ 0.05 V/s respectively for the frequency and voltage protection. For details, see"**7.11 Italian Functions**

Auto Test".

The SPI local control via the LCD setting is capable to change the frequency protection thresholds. For details, see"**7.11.2 SPI Local Control**".

The frequency protection thresholds can also be set via RS485 by an external device. Through the external signal/command:

- Low (state value 0) in case of really operating communication
- High (state value 1) in case of external commands sent by the external device

Note: The local control will be automatically set to "**ON**" when a remote control command is reported to the inverter.

Tab. 2-16 Frequency Protection Parameters in Conditions of SPI ("IT")

Explanation	LCD Setting		Remote Control	
	0 (OFF)	1 (ON)	0	1
Min. frequency 1 (F<) (Hz)	47.50	49.50	47.50	49.50
Min. frequency 1 (F<) tripping time (s)	0.1	0.1	4.0	0.1
Min. frequency 2 (F<<) (Hz)	47.50	47.50	47.50	47.50
Min. frequency 2 (F<<) tripping time (s)	0.1	0.1	4.0	4.0

Explanation	LCD Setting		Remote Control	
	0 (OFF)	1 (ON)	0	1
Max. frequency 1 (F>) (Hz)	51.50	50.50	51.50	50.50
Max. frequency 1 (F>) tripping time (s)	0.1	0.1	1.0	0.1
Max. frequency 2 (F>>) (Hz)	51.50	51.50	51.50	51.50
Max. frequency 2 (F>>) tripping time (s)	0.1	0.1	1.0	1.0

When the local control and remote control modes exist at the same time, the remote control mode takes priority over the local control mode.

3 Unpacking and Storage

3.1 Unpacking and Inspection

The inverter is thoroughly tested and strictly inspected before delivery. Damage may still occur during shipping. Conduct a thorough inspection after receiving the device.

1. Check the packaging for any visible damage.
2. Check the inner contents for damage after unpacking.
3. Check the delivery contents for completeness according to the packaging list.

Contact SUNGROW or the distributor in case of any damaged or missing components.

It is the best choice to store the inverter in the original packaging. So, do not dispose of it.

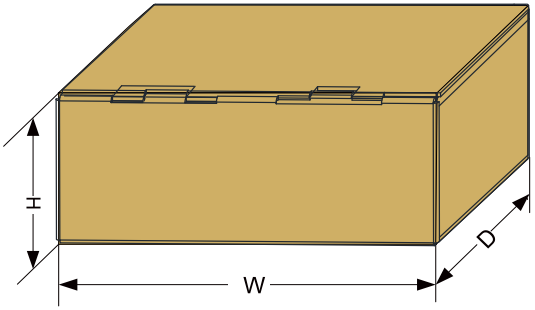


Fig. 3-1 Single Inverter Packaging

Inverter Type	W (mm)	H (mm)	D (mm)
SG2K-S / SG2K5-S / SG3K-S	500	235	375
SG3K-D / SG3K6-D / SG4K-D / SG4K6-D / SG5K-D / SG6K-D	530	235	435

3.2 Identifying the Inverter

The nameplate clearly identifies the product. It is attached to the side of the inverter.

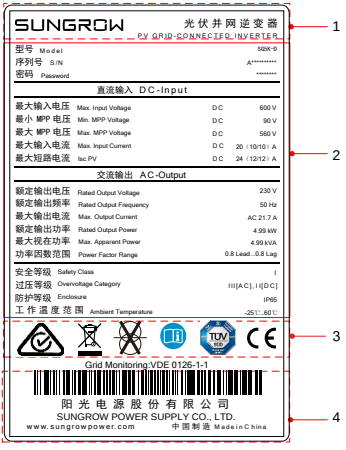


Fig. 3-2 Nameplate of Inverter

* The image shown here is for reference only. The actual product you receive may differ.

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

Tab. 3-1 Description of Icons on the Nameplate

Icon	Description
	Regulatory compliance mark.
	Do not dispose of the inverter together with household waste.
	The inverter does not have a transformer.
	Refer to the corresponding instructions in the manual.

Icon	Description
	TÜV mark of conformity.
	CE mark of conformity.

3.3 Delivery Contents

Standard Delivery

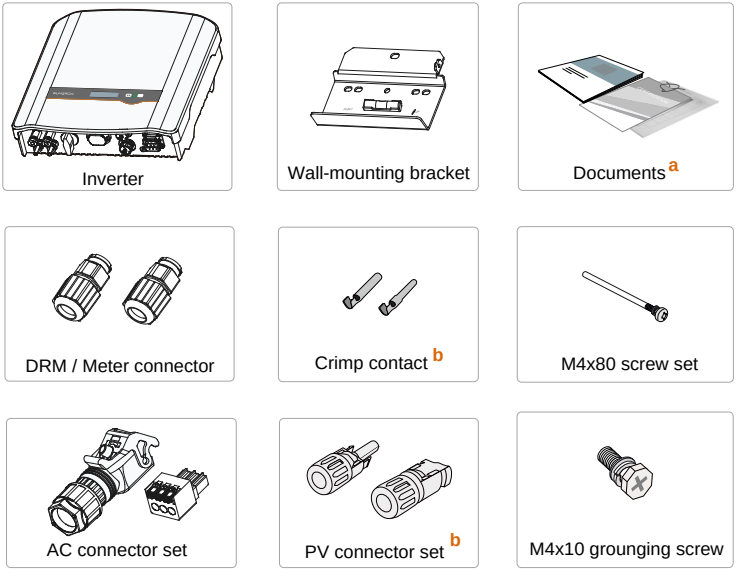
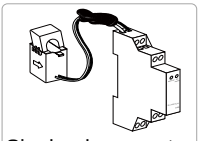


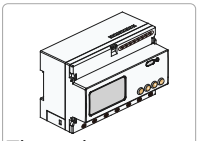
Fig. 3-3 Delivery Contents

a) The documents include the Quick User Manual, quality certificates, packaging list, warning labels and product test reports.

b) One pair for the –S series and two pairs for the –D series.

Optional Accessory


Single-phase meter


Three-phase meter


E-Net module


Wi-Fi module

- The meter figures in this document have been created for the single-phase Smart Energy Meter unless otherwise specified.
- The optional accessory is not included in the inverter packaging but, if ordered, delivered separately.

3.4 Storage of Inverter

If you do not install the inverter immediately, choose an appropriate location to store it.

- Store the inverter in the original packaging with the desiccant inside.
- The storage temperature must be always between -30°C and +70°C, and the storage relative humidity must be always between 0 and 100 %, non-condensing.
- When storing inverters, do not stack more than 8 inverter packages on top of each other.
- The packaging must be upright.

4 Mechanical Mounting

4.1 Safety during Mounting

DANGER

Make sure there is no electrical connection before installation.

In order to avoid electric shock or other injury, be sure there is no electricity or plumbing installations before drilling holes.

CAUTION

Risk of injury due to improper handling

- **The weight can cause injuries, serious wounds, or bruise.**
- **Always follow the instructions when moving and positioning the inverter.**

System performance loss due to bad ventilation!

- **The inverter requires good ventilation during operation. Keep it upright and nothing covering the heat sinks.**

NOTICE

Wear gloves to avoid scratches when mounting the inverter.

4.2 Location Requirements

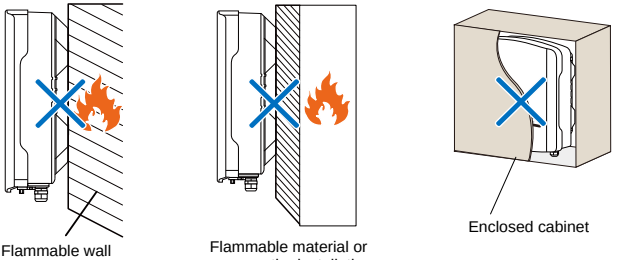
The inverter with IP65 can be installed indoors or outdoors.

Selecting an optimal location for the inverter is critical for its operating safety as well as the expected efficiency and service life. Considerations for the location include:

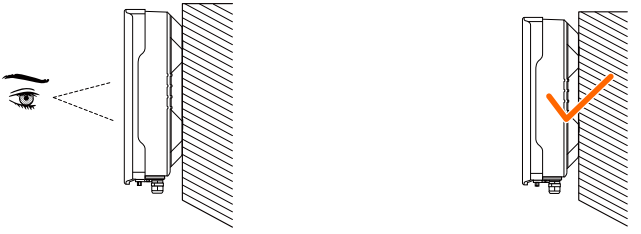
1. The structure should be capable of withstanding a force of four times the weight of the inverter.
2. Install the inverter where it is convenient for installation, cable connection and service.

3. Do not install the inverter in the living area or bedrooms. The noise during its operation may affect daily life.
4. The location should be not accessible to children.
5. The ambient temperature and relative humidity must meet the following requirements.

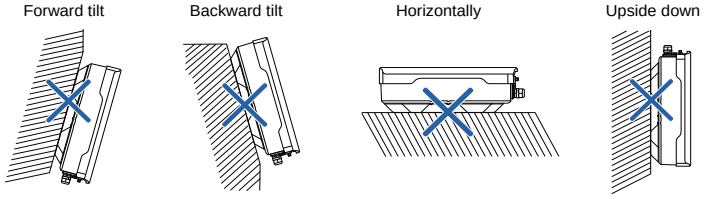
6. Only mount the inverter on a non-flammable surface or a wooden structure. Keep away from flammable materials or gas. Do not enclose the inverter into a tight confinement.



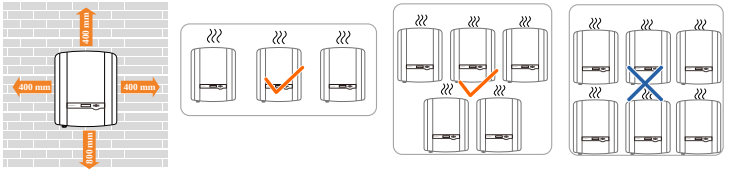
7. Prevent the inverter from direct exposure to sun, rain and snow.
8. Install at eye level for easy inspection.
9. Install vertically for good heat dissipation.



10. Never install the inverter horizontally, or with a forward tilt or with a backward tilt or even with upside down. The horizontal installation can result in damage to the inverter.

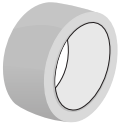
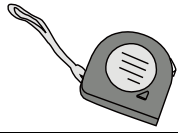
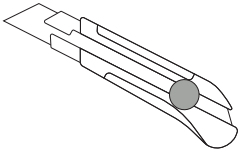
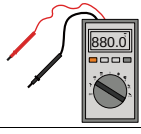


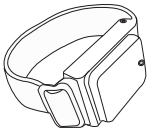
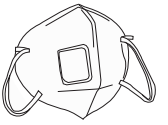
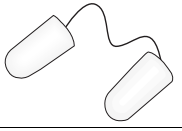
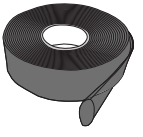
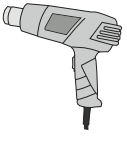
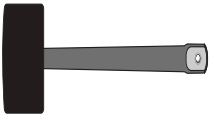
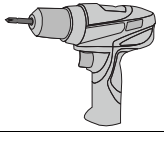
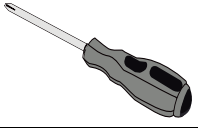
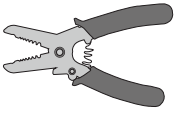
11. Clearance requirement and multiple installation:

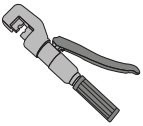
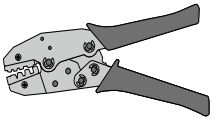
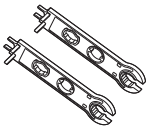
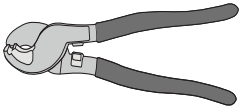
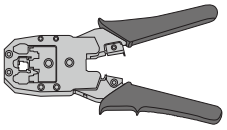
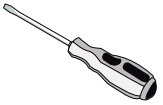
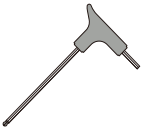
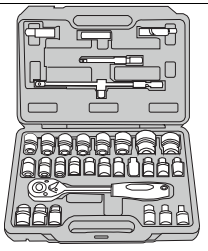


For multi-row installation, the distance between two adjacent rows must be at least 400 mm.

4.3 Tools

General tools (recommended)		
Packaging tape 	Marker 	Measuring tape 
Utility knife 	Multimeter Measurement range: ≥ 1100Vdc 	Protective clothing 

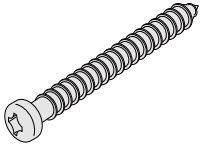
Wrist strap 	Protective gloves 	Dust mask 
Earplugs 	Goggles 	Insulated shoes 
Vacuum cleaner 	Heat shrink tubing 	-
Installation tools (recommended)		
Heat gun 	Hammer drill Drill bit: Φ10 	Rubber mallet 
Electric screwdriver Tool bit: M4 	Phillips screwdriver Specification: M4 	Wire stripper 

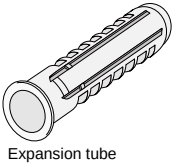
Hydraulic plier 	Wire crimper Crimping range: 2.5-6mm² 	Wrench for MC4 terminal 
Wire clipper 	RJ45 crimping tool 	Flat-blade screwdriver M2 
Torx screwdriver TX30 	Socket wrench Open end: 10mm (for M6 bolts) 13mm (for M8 bolts) 16mm (for M10 bolts)	

4.4 Installing the Inverter

Inverter is installed on the wall by means of wall-mounting bracket and the expansion plug sets.

The expansion plug set shown below is recommended for the installation. They are not included in the delivery scope.


Self-tapping screw M6


Expansion tube


Fender washer

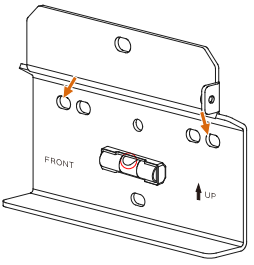

Spring washer

1. Align the wall mounting bracket horizontally on the wall with the arrow upwards. Mark the position of the drill holes. Use at least one hole on the right- and left-hand side of the wall mounting bracket.

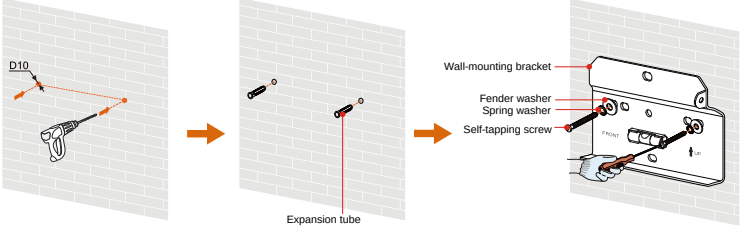
   Tip:

   The air bubble in the bracket must be between the two lines in the red circles to ensure the horizontal level.

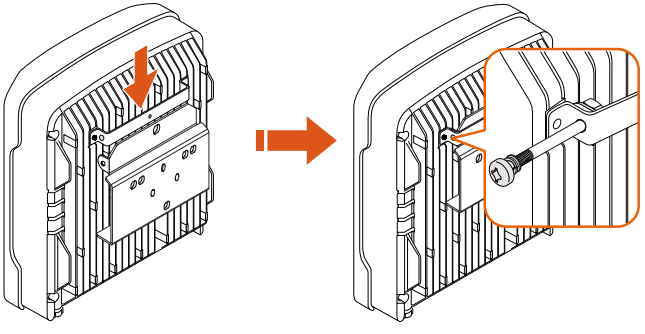
   When mounting on a post, use the upper and lower central holes of the wall mounting bracket.



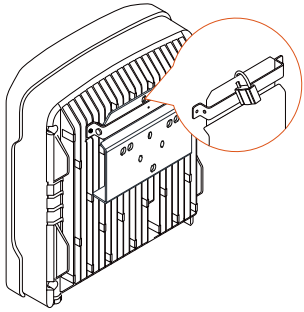
2. Drill holes and install the wall-mounting bracket. The depth of the holes should be about 70 mm.



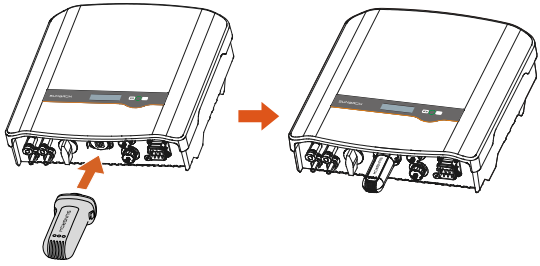
3. Mount the inverter to the bracket, and secure it with an M4x80 screw (torque: 1.5 N·m).



4. To protect the inverter from theft, you can lock it with a padlock. The padlock is purchased by the user if necessary. The hole diameter is about 8 mm.



5. Remove the waterproof cap from RS485 terminal and install the communication module to the inverter. The following figure takes the Wi-Fi module as an example. For the details, please refer to the respective manual.



4.5 Installing the Smart Energy Meter

The Sungrow Smart Energy Meter must be installed between the grid and the load. It supports a 35 mm DIN-rail installation, as shown in the following figure.

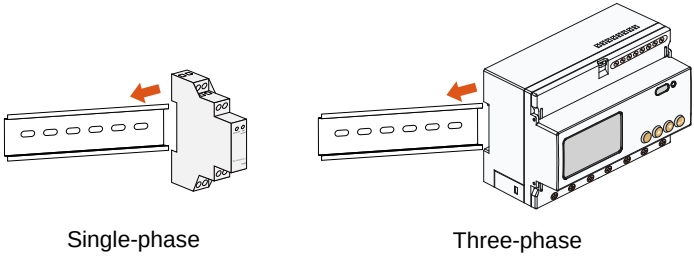


Fig. 4-1 Installing the Smart Energy Meter to the Rail

5 Electrical Connection

Prior to any electrical connections, keep in mind that the inverter has dual power supplies. It is mandatory for the qualified personnel to wear personal protective equipments (PPE) during the electrical work.

⚠ DANGER

Danger to life due to a high voltage inside the inverter

- **Make sure that the cables are not live before electrical connection.**
- **Do not turn on the AC circuit breaker until all the electrical connections are completed.**

⚠ WARNING

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

Only qualified personnel can perform the wiring work.

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

NOTICE

Comply with the safety instructions related to the PV strings and the regulations related to the utility grid.

All electrical connections must be in accordance with local and national standards.

Only with the permission of the utility grid, the inverter can be connected to the utility grid.

Electrical connections of the inverter include grounding, PV connection, AC connection and communication connection.

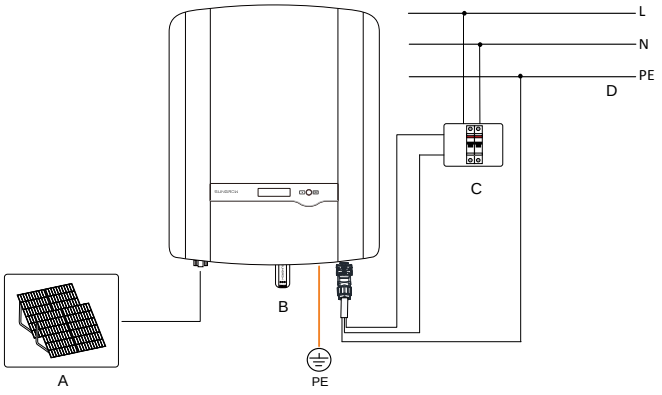


Fig. 5-1 Electrical Connection Diagram

Item	Name	Remarks
A	PV strings	**-S series:** one pair of PV terminals.
		-D series: two pairs of PV terminals.
B	Communication module	RS485 communication.
C	AC circuit breaker	Used as a protective device during electrical connection. User equips this device according to the maximum output voltage and current. The PE wire of the AC terminal must be directly connected to the grounding bar. Do not connect it to protection devices such as the circuit breaker.
D	Utility grid	Nominal line-to-neutral voltage of the utility grid is 230 Vac.

5.1 Terminal Description

All electrical terminals are located at the bottom of the inverter.

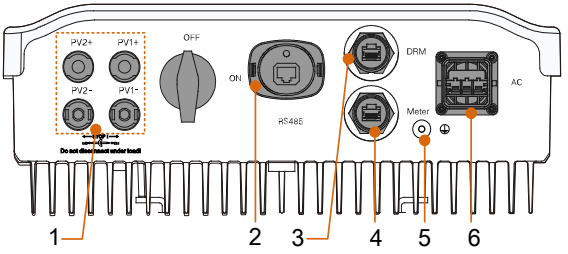


Fig. 5-2 Terminal Description

* Image shown here is for reference only. The actual product you receive may differ.

Tab. 5-1 Terminal Descriptions

Item	Terminal	Description
1	PV terminals	MC4 terminals for PV inputs. **-S series:** one pair of PV terminals. **-D series:** two pairs of PV terminals.
2	RS485 terminal	Can be connected to Wi-Fi or E-Net communication module.
3	DRM terminal	Reserved.
4	Meter terminal	For Smart Energy Meter
5	Second PE terminal	For reliable grounding.
6	AC terminal	For connection to the utility grid.

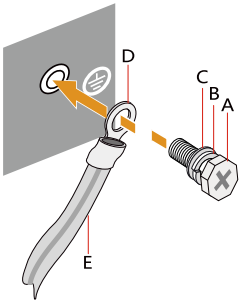
5.2 Grounding the Inverter

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

A second Protective Earth (PE) terminal is equipped at the bottom of the inverter. Be sure to connect this PE terminal for reliable grounding and ensure that the grounding resistance is less than 10 Ohm.

WARNING

Correct connection of both PE terminals is mandatory. Not properly connecting both PE will void any or all product warranty.



Item	Description
A	Screw (M4×10 mm)
B	Spring washer
C	Washer
D	Cable socket
E	Grounding cable

* The second PE conductor should be of the same cross-sectional area as the original PE conductor in the AC connector. The cable and cable socket are not included in the delivery scope.

5.3 Grid Connection

The inverter is connected to the grid via 3 wires (L, N and PE).

Inverter is equipped with the waterproof direct plug-in connector which matches the AC terminal at the bottom of the inverter.

5.3.1 AC Side Requirements

AC Circuit Breaker

An independent two-pole AC circuit breaker for the inverter must be installed at the output side for safe disconnection. The recommended specifications are as follows:

Inverter Type	Specification
SG2K-S / SG2K5-S / SG3K-S / SG3K-D	25 A
SG3K6-D / SG4K-D / SG4K6-D / SG5K-D	32 A
SG6K-D	40 A

NOTICE

In PV systems with multiple inverters, protect each inverter with a separate circuit breaker. This will prevent any residual voltage from being present at the corresponding cable after disconnection.

Residual Current Device

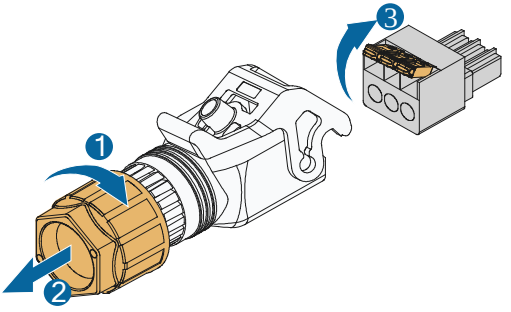
With an integrated universal current-sensitive residual current monitoring unit

inside, the inverter will disconnect immediately from the mains power as soon as a fault current with a value exceeding the limit has been detected.

However if an external residual current device (RCD) is mandatory, the switch must be triggered at a residual current of 300 mA or higher.

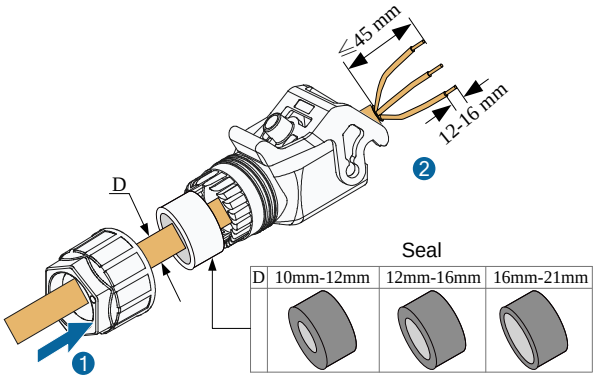
5.3.2 Assembling the AC Connector

1. Unscrew the cable gland from AC connector and open the clamp on the terminal block.

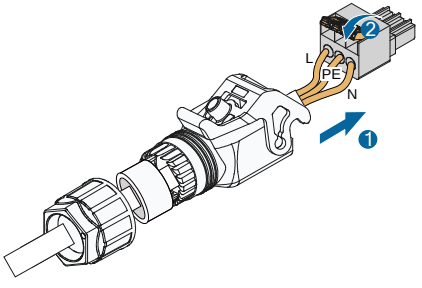


2. Lead the AC cable through the cable gland and the housing. Remove the cable jacket by less than 45 mm, and strip the wire insulation by 12 mm–16 mm. The cross-section are shown in the following table

Type	Cross-section Range / Recommended	Seal
SG2K-S / SG2K5-S / SG3K-S / SG3K-D	4 mm^2–6 mm^2 / 4 mm^2	10 mm–12 mm
SG3K6-D / SG4K-D / SG4K6-D / SG5K-D / SG6K-D	4 mm^2–6 mm^2 / 6 mm^2	12 mm–16 mm



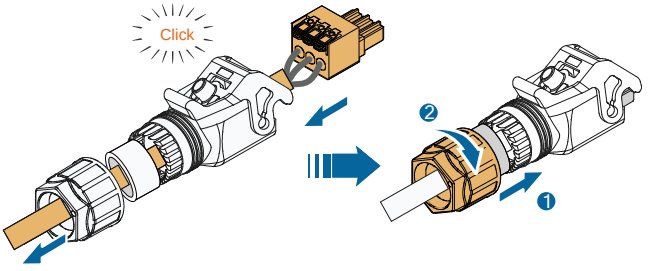
3. Fully insert the conductors into the corresponding cable holes and close the clamp.



NOTICE

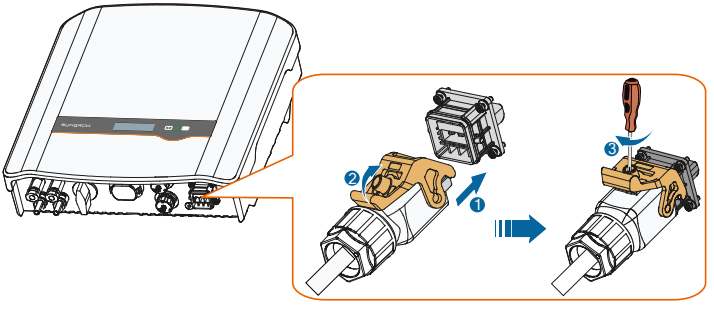
Observe the terminal layout on the block. Do not connect the phase lines to "PE" terminal, otherwise the inverter will not function properly and the loss of any or all the warranty rights may follow.

4. Assemble the terminal block to the housing and mate them together until a "Click" is heard or felt. Tighten the cable gland with a torque of 6.5 N·m.



5.3.3 Installing the AC Connector

1. Disconnect the AC circuit breaker and secure it against reconnection.
2. Measure the voltage and frequency of the grid-connected point to ensure that they are within the specified range listed in "**10.1 Technical Data**".
3. Align the AC connector and the AC terminal and mate them together. Secure the screw on the connector with a torque of 1.2 N•m.



4. Connect the other ends. Connect "PE" conductor to the grounding electrode. Connect "L" and "N" conductors to the AC circuit breaker.
5. Pull all the lines outward to check whether they are firmly installed.

5.4 PV Connection

NOTICE

There is a risk of inverter damage! The following requirements must be met. Failure to do so will void guarantee and warranty claims.

- **Make sure that the maximum short circuit current of each DC input is less**

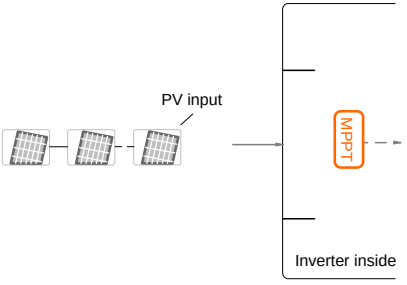
than inverter allowable limit.

- **Make sure that the maximum open voltage of each string is less than 600 V. Voltage over 600 V can damage 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 200 kΩ in any case.**

5.4.1 PV Input Configuration

-S Series

There is one input area with one MPP tracker. Only one input can be connected, as shown in the following figure.



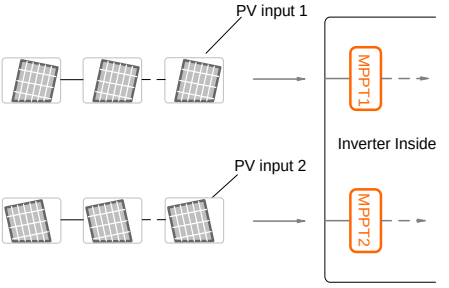
Type	Total PV Input Power Limit	Open-circuit Voltage Limit	Short-circuit Current Limit
SG2K-S	3000 W	600 V	12 A
SG2K5-S	3200 W	600 V	12 A
SG3K-S	4000 W	600 V	12 A

-D Series

There are two PV input areas, each with its MPP tracker. The two PV inputs can be configured in independent mode or parallel mode.

- Independent Mode

The two PV inputs work independently, each with its own MPPT. The two PV inputs can be different from each other in PV module types, numbers of PV panels in PV string, tilt angles and orientation angle of PV modules.



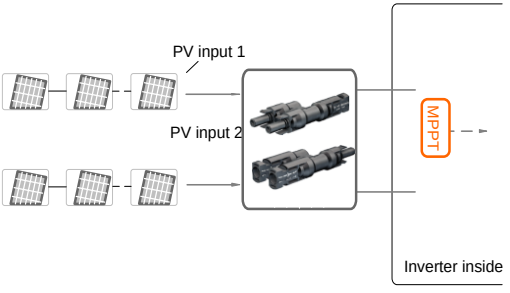
Prior to connecting the inverter to PV inputs, the specifications in the following table must be met:

Type	Total PV Input Power Limit	Open-circuit Voltage Limit (PV1 / PV2)	Short-circuit Current Limit (PV1 / PV2)
SG3K-D	4000 W	600 V/600 V	12 A/12 A
SG3K6-D	4800 W	600 V/600 V	12 A/12 A
SG4K-D	5200 W	600 V/600 V	12 A/12 A
SG4K6-D	6000 W	600 V/600 V	12 A/12 A
SG5K-D	6500 W	600 V/600 V	12 A/12 A
SG6K-D	7800 W	600 V/600 V	12 A/12 A

Only the current is limited for a single input and the power is not limited.

- Parallel Mode

All PV strings should have the same PV module type, the same string length, identical tilt and identical orientation for optimum results.



Prior to connecting the inverter to PV inputs, the specifications in the following table must be met:

Type	Total PV Input Power Limit	Open-circuit Voltage Limit	Short-circuit Current Limit
SG3K-D	4000 W	600 V	24 A
SG3K6-D	4800 W	600 V	24 A
SG4K-D	5200 W	600 V	24 A
SG4K6-D	6000 W	600 V	24 A
SG5K-D	6500 W	600 V	24 A
SG6K-D	7800 W	600 V	24 A

To avoid the input power unbalance of the two inputs or input load-restriction, ensure the two PV input cables are of the same type.

5.4.2 Assembling the PV Connector

All PV cables are equipped with the water-proof direct plug-in connectors which match the PV terminals at the bottom of the inverter.

NOTICE

The PV cables must be multi-core cables.

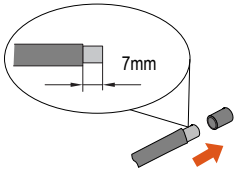
To ensure the protection degree IP65, only use the connectors delivered.

The requirements of PV cables are as follows.

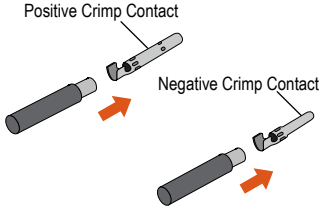
Cross-section	Cable Diameter	Max. Withstand Voltage	Max. Withstand Current
4 mm^2–6 mm^2	6 mm–9 mm	600 V	Same with short-circuit current

Procedure:

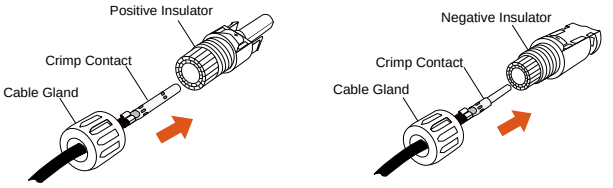
1. Strip the insulation from the cables by 7 mm.



2. Assemble the cable ends by crimping pliers.



3. Lead the cable through cable gland, and insert into the insulator until it snaps into place. Then tighten the cable gland (torque 2.5 N·m to 3 N·m).



4. Make sure that the cable polarity of each PV string is correct before connecting it to the inverter.

NOTICE

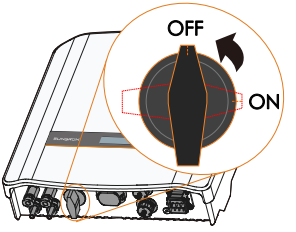
The inverter will not function properly if any PV polarity is reversed.

If the PV connectors are not assembled into place, it may cause an arc or overheat. The loss caused by this issue will void the warranty.

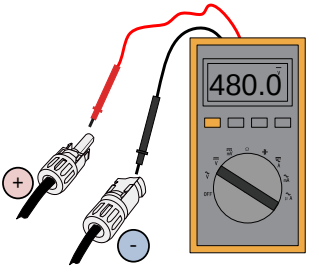
5.4.3 Installing the PV Connector

Connect the inverter to PV strings according to the following procedure.

1. Rotate the DC switch to "OFF".



2. Check the connection cable of the PV string for the correct polarity and that the open-circuit voltage does not exceed the inverter input limit of 600 V, even under the lowest operating temperature. Refer to the module specification supplied by the module manufacturer for detailed information.

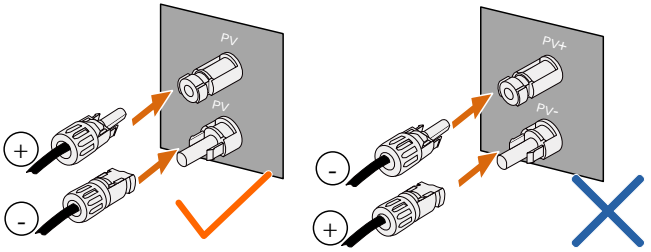


NOTICE

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

Check the positive and negative polarity of the PV strings before installation.

3. Plug the positive and the negative PV connectors into corresponding terminal until there is an audible click.



* The image shown here is for reference only. The actual product you receive may differ.

4. (**-D series**) Seal the unused PV terminals with the terminal caps.

5.5 RS485 Connection

More detailed information for the RS485 communication module can be found in the respective manual.

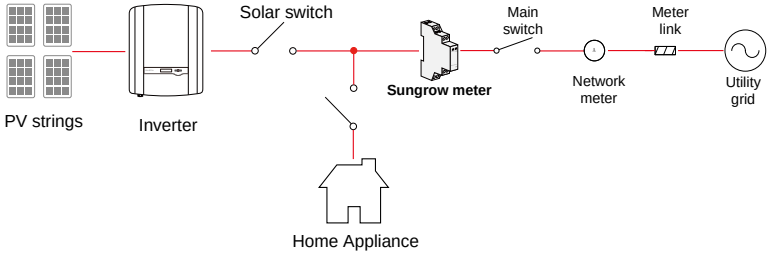
NOTICE

The RS485 terminal can also be used to connect an external RS485 device. For the pin definition and waterproof procedure, please contact SUNGROW.

Failure to comply with the requirements of wiring or waterproofing will void the warranty.

5.6 Meter Connection

The Sungrow Smart Energy Meter should be installed next to the main switch.

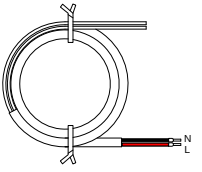


5.6.1 On the Meter Side

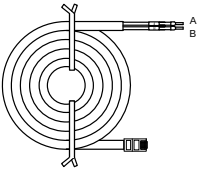
If the RS485 cable is prepared by the customer, we recommend the shield twisted pair cable or shield Ethernet cable.

For Single-phase Smart Energy Meter

1. Take out the meter (with 1-phase sensor) and cables from the meter's packaging.

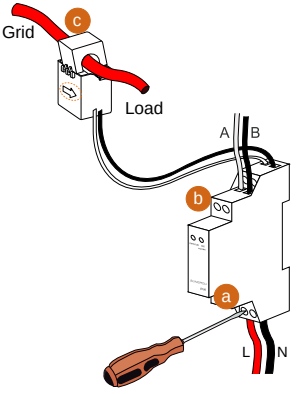


Power supply cable



Meter RS485 cable

2. Connect the cables to the meter.
   - (a) Tighten the power supply wires to terminal **3 (L)** and terminal **6 (N)**.
   - (b) Tighten the RS485 wires to terminal **2** and terminal **5**.
   - (c) Place the 1-phase sensor around the phase wire (**L**) from the main switch.
   - The CT clamp of 1-phase sensor can be placed before or after the main switch.

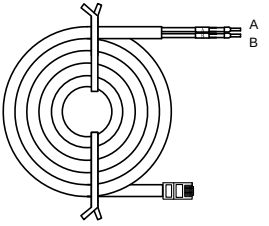


NOTICE

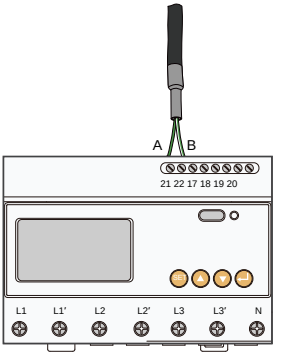
Make sure that the CT clamp of 1-phase sensor is installed in the right direction: the arrow on the sensor must point away from the grid towards the load.

For Three-phase Smart Energy Meter

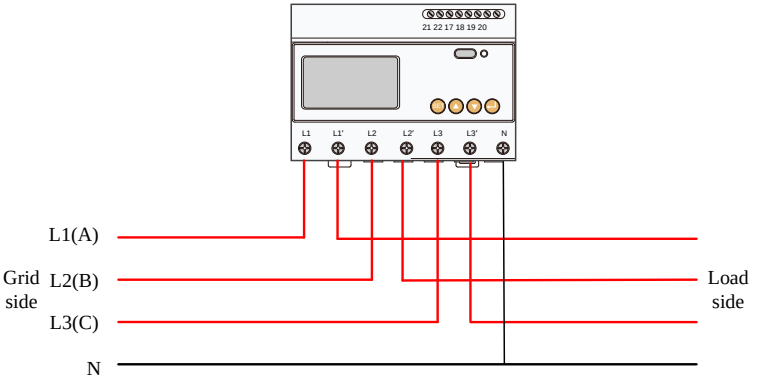
1. Take out the meter and RS485 cable from the meter's packaging.



2. Connect the plugs A and B to terminals 21 and 22 on the Energy Meter.



3. Strip the insulation from the power wires by 10 mm. Then connect the wires to the terminals on the Smart Energy Meter, as shown below. (Cross-section: 10 mm^2 to 25 mm^2)

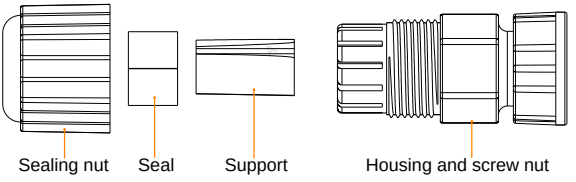


- The line conductor L1 supplies power to the Energy Meter. At least the line conductor L1 and the neutral conductor must be connected to the Energy Meter.
- Just connect the line conductor L1, L1' and the neutral conductor, then the three-phase Energy Meter can be used as a single-phase Energy Meter.

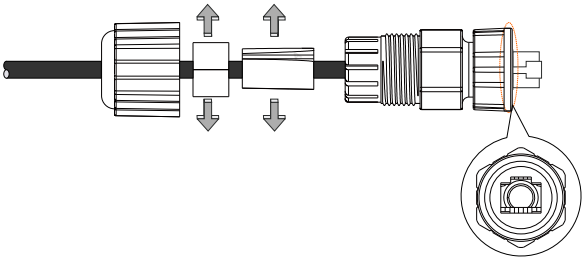
5.6.2 On the Inverter Side

Proceed as follows to connect the RS485 wires to the inverter.

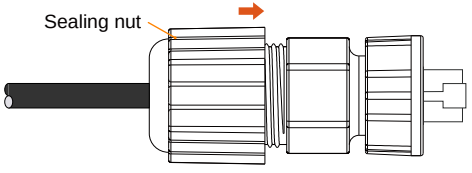
1. Take out the meter communication connector from inverter's packaging. The components are shown as follows.



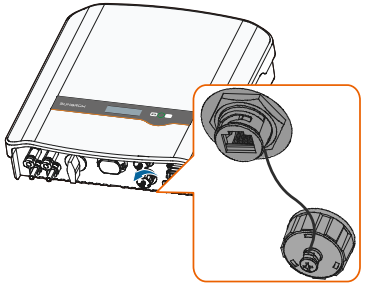
2. Lead the communication cable through the components according to the following sequence. Align the RJ45 plug and the slot on the housing. The cable should be fully inserted until the RJ45 plug is positioned to the place.



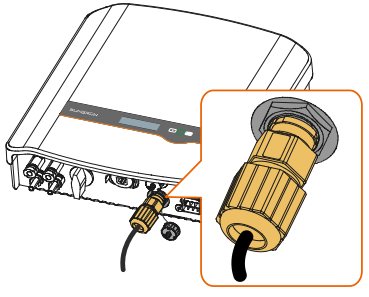
3. Push the support and the seal into the housing. Then tighten the sealing nut to the housing.



4. Unscrew the waterproof cap from the **Meter** terminal.



5. Align the communication connector and the **Meter** terminal. Plug the connector and make them engage perfectly until a "Click" is heard or felt. Secure the screw nut to the inverter bottom.



6 Commissioning

Proper commissioning is essential for the system to protect it against fires, injury and electric shock.

6.1 Inspection before Commissioning

Check the following items before starting the inverter:

1. All the installation sites are convenient for operation, maintenance and service.
2. Check and confirm that the inverter is firmly installed.
3. Space for ventilation is sufficient for one inverter or multiple inverters.
4. Nothing is left on the top of the inverter.
5. The inverter and accessories are correctly connected.
6. Cables are routed in a safe place or protected against mechanical damage.
7. The selection of the AC circuit breaker is in accordance to this manual and all applicable local standards.
8. All unused terminals at the bottom of the inverter are properly sealed.
9. Warning signs and labels are suitably affixed and durable.

6.2 Button Function

Inverter offers two buttons. Please refer to the following table before any operation of the inverter.

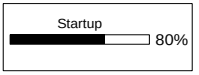
Tab. 6-1 Button Function

Button	Description
▼	Navigate down or increase the setting value.
ENT	Confirm the selection or settings.

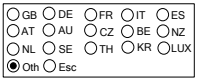
6.3 Commissioning Procedure

Make sure all the above mentioned items meet the requirements.

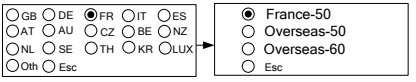
1. Connect the external AC circuit breaker.
2. Rotate the DC switch to "**ON**".
3. The LCD screen will be activated 5 seconds later.



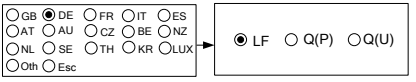
4. **Touch** ▼ to choose the country and **touch ENT** to confirm.



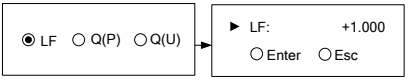
If the country is set to "FR" (France), select the grid standard on the next screen.



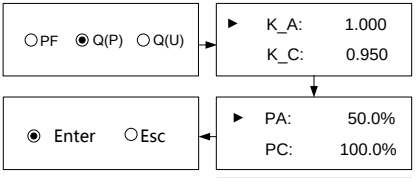
If the country is set to "DE" (Germany), set the reactive response mode and parameters.



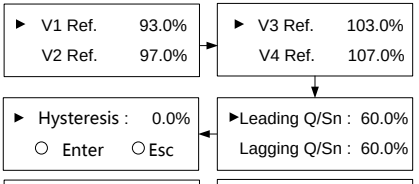
"DE" PF parameter setting:



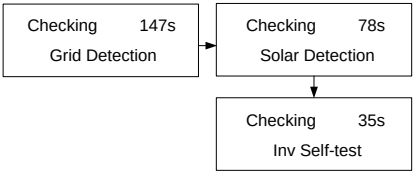
"DE" Q(P) parameter setting:



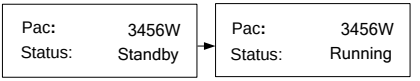
"DE" Q(U) parameter setting:



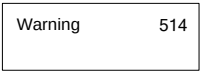
5. The inverter will enter checking mode and automatically perform the grid, solar and inverter detections.



6. If all detections pass and there is sufficient sunlight, the inverter will enter the running status.



If any detection fails, the error/warning code will be displayed. Touch any button to quit this interface and enter the main screen.



7. Observe the status of the indicator.

Tab. 6-2 Indicator Status Description

Status		Description
Green	Steady on.	The inverter is running normally, or with a warning, or with power limitation. Inverter status: Running.
	Flash once every 1s.	The inverter is in the status of standby, startup or Turn off (via LCD menu).
Red	Steady on.	Inverter faults.
	Flash quickly every 0.2s.	Grid faults.
	Flash slowly every 1s.	PV faults.

Indicator lights of the communication module are described in the respective manual.

8. Visit www.isolarcloud.eu or iSolarCloud App to view inverter information. Further information on the communication module can be found in the respective Quick Installation Guide.

7 LCD Operation

7.1 Button Function

The inverter offers two buttons. Please refer to the following table before any operation of the inverter.

Tab. 7-1 Button Function

Button	Description
▼	Navigate down or increase the setting value.
ENT	Confirm the selection or settings.

⚠ CAUTION

Risk of burns due to hot components!

Do not touch any hot parts (such as heat sinks) during operation. Only the LCD panel and the DC switch can be safely be touched at any time.

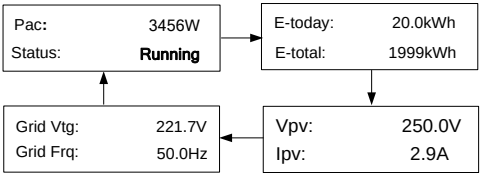
7.2 Main Screen

After successful commissioning, the LCD screen will enter the main screen.

If there is no button operation for:

- 1 minute, LCD backlight will be automatically deactivated;
- 2 minutes, system will return to the default menu (main screen).

When there is no button operation for more than 8 seconds on the main screen, the displayed information will automatically cycle through to provide additional data: Main screen, energy, PV data, utility grid data. The screen will cycle every 2 seconds. Press any button to quit this mode.



* The images shown here are for your reference only. For –D series, both PV1 and PV2 will be displayed.

Tab. 7-2 Status Description

State	Description
Standby	The inverter waits for sufficient sunlight, then the DC voltage recovers.
Startup	The inverter is initializing and synchronizing with the grid.
Running	After being energized, the inverter tracks the PV strings' maximum power point (MPP) and feeds the AC power to grid. This mode is the normal mode.
Turn off	The inverter will stop running by manual "OFF" via the LCD menu. Set to "ON" if you want to restart the inverter.
Upgrading	The DSP or LCD firmware is upgrading.
Error xxx	If an error occurs, the inverter will automatically stop operation, trigger the AC relay and show "Error xxx" on the LCD with the indicator red (xxx is the error code). Once the error is cleared in recovery time, the inverter will automatically try to resume normal operation. The recovery time can be set via the App.

NOTICE

If the device is in standby mode for more than 10 minutes, please check:

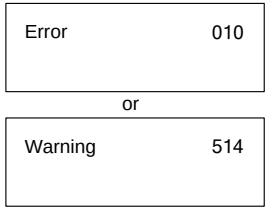
- **Whether the insolation is sufficient and the PV connection is correct.**
- **If no anomaly is found, disconnect and reconnect the DC switch and the main switch to restart.**
- **If it still does not work, contact SUNGROW.**

Viewing the Active Error/Warning

If the status on the main screen is "Error xxx", **Touch** ▼ to view the active error code.

If the inverter is running with a warning, **Touch** ▼ to view the active warning code.

Only one error or warning can be displayed on this screen. Refer to "**8.1 Troubleshooting**" for a solution.



7.3 Menu Structure

For the running information, the power value indicated represents the average value during the time interval.

The energy yields displayed are indicative only. For the actual yields, please refer to the energy meter of electric utility company.

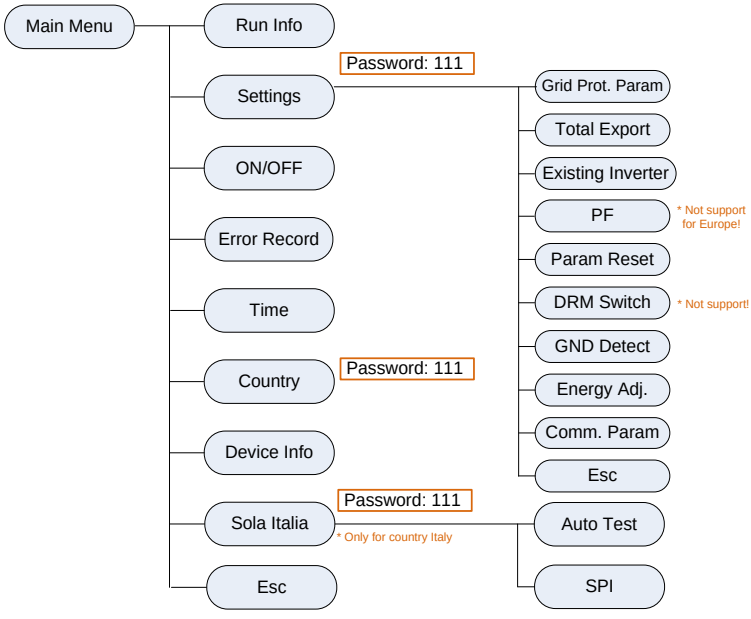


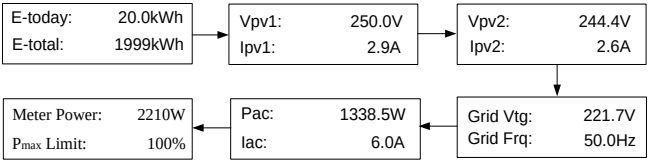
Fig. 7-1 LCD Menu Tree

7.4 Viewing Running Info

Proceed as follows to look through the detailed running information.

Main Screen (Touch ENT) → Menu → Run Info (Touch ENT)

Scroll pages by touching ▼. **Touch ENT** to exit.



Meter power:

+ (omitted): The inverter is sinking power from the grid.

-: The inverter is sourcing power to the grid.

P_{max} limit: only indicated for the derating in the event of over-temperature, overvoltage or over-frequency.

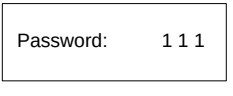
7.5 Advanced Settings

7.5.1 Inputting the Password

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

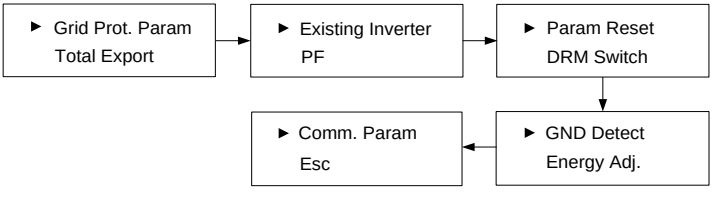
Main Screen (Touch ENT) → Menu (Touch ▼) → Settings (Touch ENT)

Touch ▼ to change the value and **Touch ENT** to move the cursor. Input the password **111**.



Touch ENT to confirm the password and enter the submenu.

Touch ▼ to navigate down **and touch ENT** to confirm the selection.

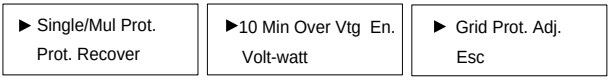


7.5.2 Setting Protective Parameters

Protective parameters are designed for the thresholds that can trigger the protective function of the inverter. The thresholds are compliant with the requirements of local safety standards and the utility grid.

If the protection function is triggered, the inverter will automatically disconnect from the grid with the "Error xxx" state displayed on the LCD main screen. After the grid voltage or frequency recovers to the specified range, the inverter will start running normally and can reconnect to the grid.

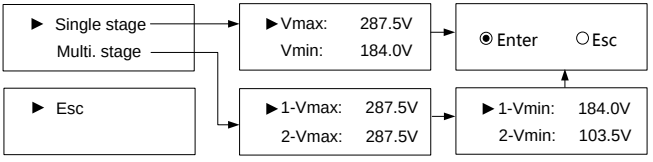
Touch ▼ to select the item and **touch ENT** to enter the setting interface.



* The Volt-watt item is not supported for Europe.

Single/Multiple Protection

Touch ▼ to select the item and **touch ENT** for modification.
When modifying, **touch** ▼ to change the value and **touch ENT** to move the cursor.
Scroll pages by **touching** ▼.
Touch ▼ to select "Enter" and **touch ENT** to confirm settings.



Tab. 7-3 Protective Parameters and the Range

Parameter	Explanation	Range
V_{max}	Grid over-voltage	230.0 V–277.0 V
V_{min}	Grid under-voltage	46.0 V–230.0 V
1-V_{max}	Grid over-voltage 1 (V>)	230.0 V–299.0 V
2-V_{max}	Grid over-voltage 2 (V>>)	230.0 V–311.0 V
1-V_{min}	Grid under-voltage 1 (V<)	46.0 V–230.0 V
2-V_{min}	Grid under–voltage 2 (V<<)	46.0 V–230.0 V

The values listed in the following table are for your reference only. Please follow the requirements of local grid standard. Refer to **Tab. 7-6** for the descriptions of the country codes.

Tab. 7-4 Default Protective Parameters for Countries in Europe

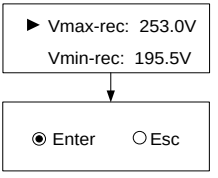
Parameter	DE	BE, LUX, FR1	FR2	FR3	NL	IT
V_{max} (V)	287.5	264.5	255.3	264.5	253.0	264.5
V_{min} (V)	184.0	184.0	184.0	195.5	184.0	195.5
1-V_{max} (V)	287.5	264.5	255.3	264.5	253.0	264.5
2-V_{max} (V)	287.5	264.5	255.3	264.5	253.0	264.5
1-V_{min} (V)	184.0	184.0	184.0	195.5	184.0	195.5
2-V_{min} (V)	103.5	184.0	184.0	195.5	184.0	195.5

NOTICE

Too high grid voltage may affect the normal usage and the life of household loads. The loss of any or all the warranty rights may follow if the protection set-point is beyond the specified range.

Protection Recover

Vmax-rec (230.0 V–277.0 V):
Recovery value for an over-voltage error. Inverter will start operating when the grid voltage falls below this value.
Vmin-rec (46.0 V–230.0 V):
Recovery value for an under-voltage error. Inverter will start operating when the grid voltage is above this value.



Tab. 7-5 Default Voltage Recover Parameters for Countries in Europe

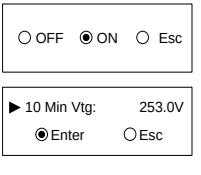
Parameter	DE	FR	BE	LUX	NL	IT
$V_{max\text{-}rec}$ (V)	253.0	253.0	253.0	253.0	253.0	253.0
$V_{min\text{-}rec}$ (V)	195.5	195.5	195.5	195.5	195.5	195.5

10-Minute Over-voltage Protection

ON (default setting except Netherlands ("NL"))**:** enables the protection function. The inverter will automatically disconnect from the grid within 3 s when the average voltage for a 10 min period exceeds the set-point of *10 Min Over Vtg*.

***OFF*:** disables the function.

Range: 244.0 V–258.0 V, 253.0 V by default.



Grid Protection Voltage Adjusting

All SUNGROW inverters are compliant with the local standard related to grid protection requirements. In order to work with unstable utility grid, inverters are equipped with automatic protection voltage adjusting function (disabled by default). This mode can be enabled via the LCD.

OFF (default setting)**:** the function is disabled. The grid protection voltage cannot automatically adjust.

***ON*:** enables the protection function. The inverter will automatically adjust the protection threshold to a higher value so as to be normally connected to the grid in the event of grid over-voltage. The $V_{max\text{-}rec}$ will be adjusted the same with the V_{max}, with an upper limit value not higher than V_{max}.

If the setting is changed from ***ON*** to ***OFF***, you must set the protection voltage as specified in **Tab. 7-3** according to local protection requirements.

NOTICE

If the automatic protection voltage adjusting function is set to *ON*, the 10-minute over-voltage protection function will be automatically disabled.

If the line voltage or frequency goes outside pre-determined parameters, the inverter must shut down for safety purposes, which means it is not a faulty inverter in these instances. High line voltages may damage home appliances and SUNGROW is not held responsible or liable for these issues.

7.5.3 Total Export Setting

Touch ▼ to select and **touch ENT** to confirm.

Touch ▼ to change the value and **touch ENT** to move the cursor.

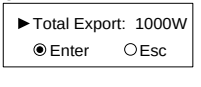
Touch ▼ to select "Enter" and **touch ENT** to confirm settings.

OFF (default setting)**:** all power will be fed into the utility grid.

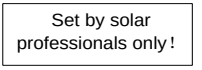
***ON*:** no power will be fed into the utility grid.

***Total Export*:** maximum feed-in power limit for the PV system.

ON:



A prompt will appear when you set it for the second time.



NOTICE

With the password 111, the zero-export setting can only be done at the first time. The later modification can be performed by professionals only, please contact SUNGROW.

The range of export power will automatically change:

When the existing inverter is disabled: 0 to (rated power of the inverter)

When the existing inverter is enabled:

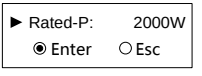
- The lower limit is the rated power of existing inverter.
- The upper limit is ([rated power of the existing inverter] + rated power of the inverter).

For example, retrofit an existing PV system (rated power: 2000 W) with SG5K-D (rated power: 5000 W). The total export range will be 2000 W – 7000 W. According to the local regulations in Germany, please set the export power to 70 % of the installation capacity.

7.5.4 Adding Already Installed Inverter Power

Rated-P: rated power of the existing inverter.

Touch ▼ to select "Enter" and **touch ENT** to confirm settings.



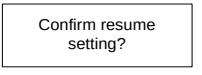
7.5.5 Parameter Reset

NOTICE

All settable parameters will return to the default values once the "Param Reset" operation is performed.

Touch ENT to confirm the operation.

Touch ▼ to discard the operation.



7.5.6 GND Detection

Touch ▼ to select and **touch ENT** to confirm.
Select **ON** to enable the GND Detection. If the enclosure of the inverter is not grounded, the error code 106 will be shown on the main screen. The buzzer inside will sound at the same time.

7.5.7 Energy Adjustment

If the accumulative value "E-total" displayed on inverter screen is different from the value indicated on the metering device, you should adjust the energy deviation.

(Energy Adj. value) = (Real measured value) - (E-total reading value)

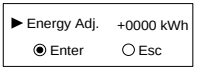
Touch ENT for modification.

Touch ▼ to change the value and **touch ENT** to move the cursor.

Touch ▼ to select "Enter" and **touch ENT** to confirm settings.

The "+" can be changed to "-" by **touching** ▼.

The adjustment ranges from -9999 kWh to +9999 kWh.



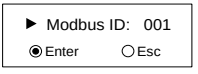
7.5.8 Setting Communication Parameter

Touch ENT for modification.

Touch ▼ to set the appropriate value and **touch ENT** to move the cursor.

Touch ▼ to select "Enter" and **touch ENT** to confirm settings.

Device address range: 1-246.

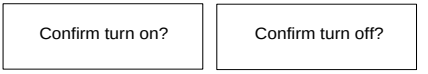


7.6 Starting/Stopping the Inverter

Main Screen (Touch ENT) → Menu (Touch ▼) → ON/OFF (Touch ENT)

Touch ▼ to select and **touch ENT** to confirm.

Confirm your selection by **touching ENT**.



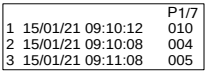
7.7 Viewing the Error Record

Main Screen (Touch ENT)→Menu (Touch ▼)→Error Record (Touch ENT)

Scroll pages by **touching ▼**.

Touch ENT to exit.

3 records can be displayed on each page and 20 records at most for all.

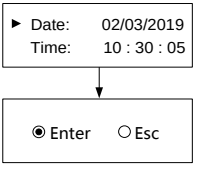


7.8 Setting the Time

The correct system time is very important. Wrong system time will directly affect the data logging and power generation value. The clock is in 24-hour format.

Main Screen (Touch ENT)→Menu (Touch ▼)→Time (Touch ENT)

Scroll pages by **touching ▼**.

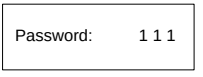


7.9 Setting the Country

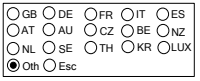
To make the protection parameters setting convenient, inverter provides built-in protection parameters for certain countries. The country setting is protected with a password.

Main Screen (Touch ENT) → Menu (Touch ▼) → Country (Touch ENT)

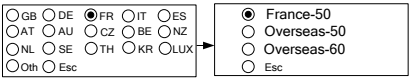
Touch ▼ to add the value and **Touch ENT** to move the cursor. Input the password **111**.



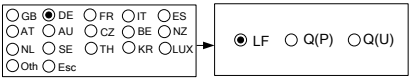
Touch ▼ to choose the country and **touch ENT** to confirm. If the country selected is not in the list, please choose Other and then set the protection parameters manually.



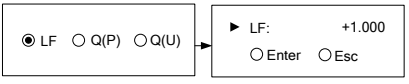
If the country is set to "FR" (France), select the grid standard on the next screen.



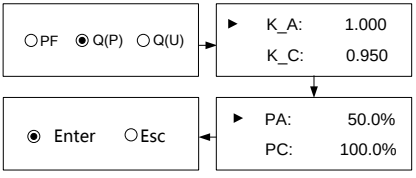
If the country is set to "DE" (Germany), set the reactive response mode and parameters.



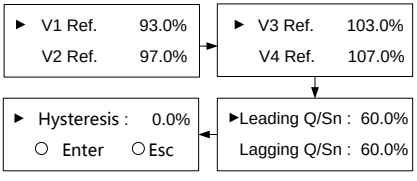
"DE" PF parameter setting:



"DE" Q(P) parameter setting:



"DE" Q(U) parameter setting:



Tab. 7-6 Country Code Description

Code	Full Name	Language	Code	Full Name	Language
GB	Great Britain	English	BRA	Brazil	Portuguese
DE	Germany	German	CN	China	Chinese
FR	France	French	SE	Sweden	English
IT	Italy	Italian	TH	Thailand	English
ES	Spain	English	KR	Korea	English
AT	Austria	German	LUX	Luxemburg	Dutch
AU	Australia	English	NZ	New Zealand	English
CZ	Czech	English	NL	Netherlands	Dutch
BE	Belgium	Dutch	Other	Country not included above	English

* The country code "Other" represents 50 Hz grid and 60 Hz grid. The inverter will automatically choose 50 Hz or 60 Hz according to the local grid frequency.

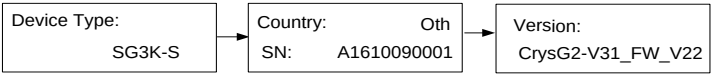
7.10 Viewing Device Info

Main Screen (Touch ENT)→Menu (Touch ▼)→Device Info (Touch ENT)

These interfaces show the read-only information.

Scroll pages by **touching** ▼.

Touch ENT to exit.

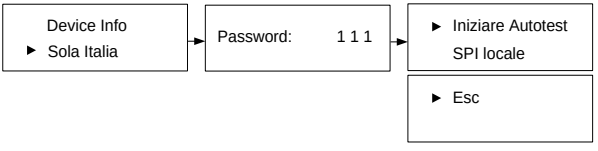


7.11 Italian Functions

7.11.1 Auto Test

The inverter is integrated with interface protection functions and provides an auto test system to verify the maximum / minimum frequency and maximum / minimum voltage functions. The "Auto Test" item can only display when the country code is set to "IT" (Italy), so the screenshots introduced in this section will be in Italian.

Touch ENT to confirm "Auto Test" and start the auto test.



Touch ENT to start the auto test. If the inverter is in the status of "Error" or "Turn off", it cannot start the test and a prompt interface will appear.

During normal auto testing, the LCD will automatically cycle through the grid protection testing items.

You can **touch** ▼ to quit this interface with the test normally going.

(1) 81>.S1: over-frequency test (stage I)

(2) 81<.S1: under-frequency test (stage I)

(3) 59.S1: over-voltage test (stage I)

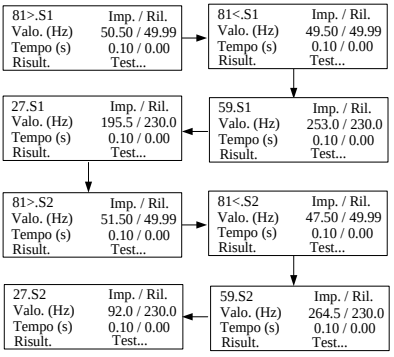
(4) 27.S1: under-voltage test (stage I)

(5) 81>.S2: over-frequency test (stage II)

(6) 81<.S2: under-frequency test (stage II)

(7) 59.S2: over-voltage test (stage II)

(8) 27.S2: under-voltage test (stage II)



Imp.: the default protection threshold

Ril.: the actual sample value

- For over- frequency / voltage protection testing, the default protection threshold (***Imp.***) is linearly decreased with a ramp <= 0.05 Hz/s or <= 0.05 Vn/s. The protection function will be triggered if the threshold is lower than the actual sample value (***Ril.***).
- For under- frequency / voltage protection testing, the default protection threshold (***Imp.***) is linearly increased with a ramp <= 0.05 Hz/s or <= 0.05 Vn/s. The protection function will be triggered if the threshold is higher than the actual sample value (***Ril.***).

If the protection function is triggered, the LCD will automatically return to the main screen with the corresponding error code displayed and the LED indicator will be lit red.

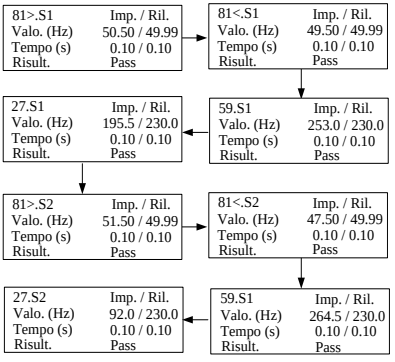
If the test is successfully completed, for each test, the values of frequency / voltage and the trip times will be visualized as well as the current values of the frequency and voltage measured by the inverter.

Touch ▼ to scroll pages and **touch ENT** to exit.

The thresholds (***Imp.***) are compliant with standard CEI 0-21 and the actual values (***Ril.***) are for your reference only.

Pass.: The inverter will restore the normally used settings and automatically reconnect to the grid.

Fail: The inverter will report the error **105**. The inverter cannot reconnect to the network until the test is successfully done.



NOTICE

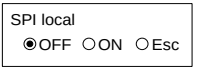
If the auto test fails or an error is triggered, the inverter cannot be connected to the grid. Re-do the test until the result is "Pass".

During the testing process, if an external command aimed at changing the frequency protection thresholds is sent to the inverter, the command will fail to act.

7.11.2 SPI Local Control

Through the local LCD setting, the over- / under-frequency protection thresholds can be changed.

OFF (default setting): The over- / under-frequency protection will be at wide permissive thresholds;



ON: The over- / under-frequency protection will be at restrictive thresholds;

The following table shows the protection thresholds for different settings.

Protection Parameter Explanation	OFF	ON
Minimum frequency 1 (F<) (Hz)	47.50	49.50
Minimum frequency 1 (F<) tripping time (s)	0.1	0.1
Minimum frequency 2 (F<<) (Hz)	47.50	47.50
Minimum frequency 2 (F<<) tripping time (s)	0.1	0.1
Maximum frequency 1 (F>) (Hz)	51.50	50.50
Maximum frequency 1 (F>) tripping time (s)	0.10	0.1
Maximum frequency 2 (F>>) (Hz)	51.50	51.50
Maximum frequency 2 (F>>) tripping time (s)	0.10	0.1

The SPI remote control via RS485 connection to an external device can also change the thresholds. When the local control and remote control modes exist at the same time, the remote control takes priority over the local control.

8 Troubleshooting and Maintenance

8.1 Troubleshooting

8.1.1 LED Indicator

See "**Tab. 6-2 Indicator Status Description**" for the definition.

Fault Type	Troubleshooting
LED indicator cannot be lit.	1. Disconnect the AC circuit breaker. 2. Rotate the DC switch to "OFF". 3. Check the polarity of DC input.
Green indicator goes out.	1. Disconnect the AC circuit breaker. 2. Rotate the DC switch to "OFF". 3. Check the inverter electrical connection. Refer to "**5 Electrical Connection**". 4. Check whether the voltage of PV input exceeds the inverter start-up voltage. 5. If all the above conditions are OK, please contact SUNGROW.

8.1.2 Errors on the App or LCD Screen

If the communication module is equipped, an error icon will be shown in the App once a fault occurs. For details, see the respective manual. At the same time, the "Error" state will be shown on the main screen of the inverter.

Code	Description	Troubleshooting
002	Grid over-voltage. The grid voltage exceeds the protective value. (stage I)	1. Check the voltage of the grid. 2. If the grid voltage exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact SUNGROW.
003	Transient over-voltage. The grid transient voltage exceeds inverter allowable upper limit.	1. This is a short-term fault due to grid condition. Wait a moment for inverter recovery. 2. If the fault persists, please contact SUNGROW.

Code	Description	Troubleshooting
004	Grid under-voltage. The grid voltage is below the protective value. (stage I)	1. Check the grid voltage. 2. If the grid voltage exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact SUNGROW.
005	Grid under-voltage. The grid voltage is below the protective value, which is lower than the protective value of error 004. (stage II)	1. This is a short-term fault due to grid condition. Wait a moment for inverter recovery. 2. If the fault persists, please contact SUNGROW.
006	AC over-current. The AC output current exceeds inverter allowable upper limit.	1. The inverter will resume if the output current falls below the protection value. 2. If the fault persists, please contact SUNGROW.
007	Transient AC overcurrent.	1. The inverter will self-recover after several seconds. 2. If the fault persists, please contact SUNGROW.
008	Grid over-frequency. The grid frequency exceeds the protective value. (stage I)	1. Check the grid frequency. 2. If the grid frequency exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid frequency is within the permissible range, contact SUNGROW.
009	Grid under-frequency. The grid frequency is below the protective value. (stage I)	
010	Grid failure (Islanding)	1. Check whether AC circuit breaker is triggered. 2. Check whether AC cables are all firmly connected. 3. Check whether grid is not in service. 4. If all conditions are OK and this fault still occurs in the LCD screen, contact SUNGROW.
011	DC injection over-current. The DC current injection of AC current exceeds the upper limit.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
012	Leakage current over-current. The leakage current exceeds inverter allowable upper limit.	1. Check the PV strings for ground fault. 2. If the fault occurs repeatedly, contact SUNGROW.

Code	Description	Troubleshooting
014	10-minute grid over-voltage. The average grid voltage in 10 minutes exceeds the permissible range.	1. Check whether the selected country code is correct. 2. Wait a moment for inverter recovery. 3. Check the voltage of the grid. If the grid voltage exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 4. If the fault occurs repeatedly, contact SUNGROW.
015	Grid over-voltage The grid voltage exceeds the protective value, which is higher than the protective value of error 002. (stage II)	1. Check the model of the AC cables. 2. Wait a moment for inverter recovery. 3. If the grid voltage exceeds the permissible range, ask utility grid company for solution. 4. If the fault occurs repeatedly, contact SUNGROW.
016	The bus voltage or power is high.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
019	Bus transient over-voltage. The transient bus voltage exceeds inverter allowable upper limit.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
020	Bus over-voltage. The bus voltage exceeds inverter allowable upper limit.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
021	PV1 input over-current.	Check the layout and the wiring of PV1 input.
022	PV2 input over-current.	Check the layout and the wiring of PV2 input.
028	PV1 reverse connection.	Check the cable connections of PV1.
029	PV2 reverse connection.	Check the cable connections of PV2.
036	The temperature of radiator is too high.	1. Check whether the ambient temperature shown on the screen is too high. Wait a moment for inverter recovery. 2. Check whether there is enough space for convection. 3. Check whether the inverter is in direct sunlight. 4. Check whether the fan is functioning. Replace it if necessary (-D series only). 5. Clean the air inlets. 6. If the fault persists, please contact SUNGROW.
037	The internal temperature of inverter is too high.	

Code	Description	Troubleshooting
038	Relay fault on the grid side.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
039	The insulation resistance of PV to earth is low. (ISO-flt)	1. Check whether there is a reliable inverter grounding line. 2. Check whether one of the PV strings is short-circuited with ground. 3. Wait a moment for inverter recovery. 4. If the fault occurs repeatedly, contact SUNGROW.
041	Leakage current sampling fault.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
043	Inner under-temperature fault. The ambient temperature inside the inverter is too low.	The inverter will recover once the ambient temperature rises above -25℃.
044	Inverter self-test fault.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
045	PV1 boost circuit fault.	
046	PV2 boost circuit fault.	
048	Phase current sampling fault.	
053	The slave DSP detects that the grid voltage exceeds inverter allowable upper limit.	1. Check the grid voltage. 2. If the grid voltage exceeds the allowable range of inverter protection parameters, ask utility grid company for solution. 3. If the grid voltage is within the permissible range, contact SUNGROW.
054	The slave DSP detects that the grid frequency exceeds inverter allowable upper limit.	1. Check the grid frequency. 2. If the grid frequency exceeds the allowable range of inverter protection parameters, ask utility grid company for solution. 3. If the grid frequency is within the allowable range, contact SUNGROW.
056	The slave DSP detects that the leakage current exceeds inverter allowable upper limit.	1. Check whether there is a ground fault of the PV string. 2. If the fault occurs repeatedly, contact SUNGROW.
059	Communication alarm between master DSP and slave DSP.	1. Wait 1 minute for inverter recovery. 2. If the fault persists, contact SUNGROW.
061	Alarm for no inverter type setting.	Contact SUNGROW.

Code	Description	Troubleshooting
070	Fans are defective (-D series only).	Stop the inverter and disconnect the AC & DC cables. Check whether the fan duct has been blocked. If not, replace fans.
084	Warning for reverse cable connection of the Sungrow Smart Energy Meter.	1. Check whether the power cable connections are correct. 2. If "Existing Inverter" is set to "ON" via LCD menu, check and ensure that its rated power is correctly set. 3. For Sungrow single-phase Smart Energy Meter, check whether the CT clamp of the 1-phase sensor is correctly placed. Refer to "**5.6.1 On the Meter Side**".
085	Mismatched software version.	Please contact SUNGROW.
100	The AC output current exceeds the upper limit.	1. The inverter will resume if the output current falls below the protection value. 2. If the fault persists, please contact SUNGROW.
101	Grid over-frequency. The grid frequency exceeds the protective value, which is higher than the protective value of error 008. (stage II)	1. Check the grid frequency. 2. If the grid frequency exceeds the permissible range of inverter protection parameters, ask utility grid company for solution. 3. If the grid frequency is within the permissible range, contact SUNGROW.
102	Grid under-frequency. The grid frequency is below the protective value, which is lower than the protective value of error 009. (stage II)	
105	SPI auto test fault (for Italy only)	1. Restart the system and re-do the auto test if necessary. 2. If the fault persists, please contact SUNGROW for a solution.
106	Abnormal grounding. Neither the PE terminal on the AC connection block nor the second PE terminal on the enclosure is reliably connected.	Check whether there is a reliable inverter grounding line, if there is access to the ground, and the fault persists, please contact SUNGROW.

Code	Description	Troubleshooting
200	Bus hardware over-voltage fault. The bus voltage exceeds the protective value.	1. Wait for inverter recovery after bus voltage lower. 2. If the fault occurs repeatedly, contact SUNGROW.
201	The bus voltage is too low.	1. Wait a moment for inverter recovery. 2. If the fault occurs repeatedly, contact SUNGROW.
202	PV hardware over-current fault. The PV1 or PV2 current exceeds the protective value.	If the fault occurs repeatedly, contact SUNGROW.
203	The PV input voltage exceeds the bus voltage.	Check the functionality of the PV connection terminals.
306	Input and output power mismatching fault.	If the fault occurs repeatedly, contact SUNGROW.
315	PV1 current sampling fault.	Channel sampling anomaly. Contact SUNGROW.
316	PV2 current sampling fault.	
320	Leakage current sensor fault.	Contact SUNGROW.
409	All temperature sensors fail.	If the fault occurs repeatedly, contact SUNGROW.
503	Ambient temperature sensor open circuit warning.	
504	Ambient temperature sensor short circuit warning.	If the fault occurs repeatedly, contact SUNGROW.
505	Radiator temperature sensor open circuit warning.	
506	Radiator temperature sensor short circuit warning.	
501	External memory reading/writing warning.	1. Inverter can normally be connected to the grid. 2. Power on the inverter again. If the fault persists, contact SUNGROW.

Code	Description	Troubleshooting
514	Abnormal communication warning of the Sungrow Smart Energy Meter. (Inverter can be normally connected to the grid.)	1. Check whether the power cable connections of the meter are correct. 2. Check whether the RS485 connection is correct.

8.2 Routine Maintenance

DANGER

Risk of inverter damage or personal injury due to incorrect service!

Always keep in mind that the inverter is powered by dual sources: PV strings and utility grid.

Before any service work, observe the following procedure.

- **Disconnect the AC circuit breaker and then set the DC load-break switch of the inverter to OFF;**
- **Wait at least 10 minutes for inner capacitors to discharge completely;**
- **Verify that there is no voltage or current before pulling any connector.**

CAUTION

Keep non-related persons away!

A temporary warning sign or barrier must be posted to keep non-related persons away while performing electrical connection and service work.

NOTICE

Risk of inverter damage if it is improperly serviced.

Use accessories and spare parts approved by the inverter manufacturer only. Never modify the inverter or other components of the inverter.

Unauthorized alterations will void guarantee and warranty claims and in most cases terminate the operating license. SUNGROW shall not be held liable for any damage caused by such changes.

NOTICE

Any malfunction that may impair the inverter safety operation must be repaired immediately before the inverter is restarted.

The inverter contains no customer 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 the latest revision of the manual which has been clearly and thoroughly understood.

Items	Methods	Period
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.	Six months to a year (it depends on the dust contents in air.)

9 System Decommissioning

9.1 Disconnecting the Inverter

For maintenance or other service work, the inverter must be switched off.

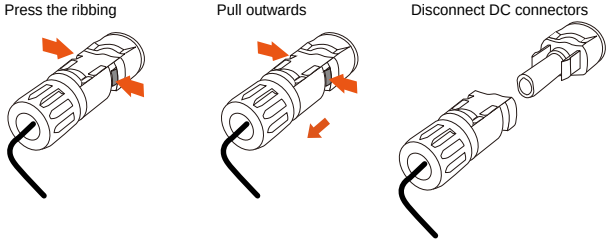
Proceed as follows to disconnect the inverter from the AC and DC power sources. Lethal voltages or damage to the inverter will follow if otherwise.

1. Stop the inverter via the LCD menu. For details, see "**7.6 Starting/Stopping the Inverter**".
2. Disconnect the AC circuit breaker and secure it against reconnection.
3. Rotate DC switch to "OFF". Disconnect the external DC circuit breaker.

NOTICE

Please strictly follow the sequence of the above procedures. Inverter will not work normally if otherwise.

4. Wait about **10** minutes until the capacitors inside the inverter completely discharge.
5. Measure to confirm that the AC output at the AC circuit breaker is voltage free.
6. Remove the AC connector. Lay the tool in the location of snap and press the tool down. Then snap can be pushed from the AC terminal.
7. Release the locking part of PV connectors by pressing on the ribbing of the locking hooks with nipper pliers and pull it outwards.



For further disconnection and conductor reconnection instruction, please visit the webpage of respective component manufacturer.

9.2 Dismantling the Inverter

CAUTION

Risk of burn injuries and electric shock!

Do not touch any inner live parts until at least 10 minutes after disconnecting the inverter from the utility grid and the PV input.

1. Refer to "**5 Electrical Connection**" for the inverter disconnection of all cables in reverse steps.
2. Dismantle the inverter referring to "**4 Mechanical Mounting**" in reverse steps.
3. If necessary, remove the wall-mounting bracket from the wall.
4. If the inverter will be reinstalled in the future, please refer to "**3 Unpacking and Storage**" for a proper conservation.

9.3 Disposing of the Inverter

Users take the responsibility for the disposal of the inverter.

NOTICE

Some parts and devices of the inverter, such as the capacitors, may cause environment pollution.

Do not dispose of the product together with household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.

10 Appendix

10.1 Technical Data

10.1.1 –S Series

Parameters	SG2K-S	SG2K5-S	SG3K-S
Input Data			
Max. PV input power	3000 W	3200 W	4000 W
Max. PV input voltage	600 V		
Startup voltage	120 V		
Nominal input voltage	360 V		
MPP voltage range	90 V...560 V		
MPP voltage range for nominal power	210 V...480 V	260 V...480 V	310 V...480 V
No. of MPPTs	1		
Max. number of PV strings per MPPT	1		
Max. PV input current	10 A		
Max. current for input connector	12 A		
Short-circuit current of PV input	12 A		
Max. inverter backfeed current to PV string	0 A		
Output Data			
Nominal AC power	2000 W	2500 W	3000 W
Max. AC apparent power	2000 VA	2500 VA	3000 VA
Max. AC current	9.1 A	11.3 A	13.7 A
Max. inrush current (peak value / duration)	8 A / 12 ms		
Max. output fault current (peak value / duration)	80 A / 3.2 ms		
Max. output over-current protection	25 A		
Nominal AC voltage	230 Vac (single phase)		
AC voltage range	180 Vac...276 Vac		
Nominal grid frequency	50 Hz / 60 Hz		
Grid frequency range	45 Hz...55 Hz / 55 Hz...65 Hz		
Total harmonic distortion (THD)	<3% (of nominal power)		

Parameters	SG2K-S	SG2K5-S	SG3K-S
DC current injection	<0.5% (of nominal current)		
Power factor	>0.99 at default value at nominal power (adj. 0.8 leading to 0.8 lagging)		
Protection			
PV reverse connection protection	Yes		
AC short circuit protection	Yes		
Leakage current protection	Yes		
Anti-islanding protection	Yes (frequency shift)		
Low voltage fault ride through (LVRT)	Yes (only for "DE")		
DC switch	Yes		
Overvoltage category	III [AC], II [DC]		
Safety protection class	I		
System Data			
Max. efficiency	98.2 %	98.2 %	98.2 %
Max. European efficiency	97.2 %	97.5 %	97.7 %
Isolation method	Transformerless		
Ingress protection rating	IP65		
Pollution degree outside the enclosure	3		
Pollution degree inside the enclosure	2		
Power loss in night mode	< 1 W		
Operating ambient temperature	-25℃ ... +60℃ (derating when > 45℃)		
Max. allowable value for relative humidity (non-condensing)	100 %		
Cooling method	Natural cooling		
Max. operating altitude	4000 m (derating when > 2000 m)		
Display	Graphic LCD		
Communication	Wi-Fi, Ethernet (optional)		
PV connection type	MC4		
AC connection type	Plug and play connector		
Certification	IEC 61000-6-2, IEC 61000-6-3, IEC 62109-1, IEC 62109-2, VDE-AR-N-4105, VDE0126-1-1 , G83/2, C10/11, EN50438, CEI 0-21:2016-06		
Mechanical Data			
Dimensions (W x H x D)	300 mm x 370 mm x 125 mm		
Mounting method	Wall-mounting bracket		
Weight	8.5 kg		

10.1.2 –D Series

Parameters	SG3K-D	SG3K6-D	SG4K-D
Input Data			
Max. PV input power	4000 W	4800 W	5200 W
Max. PV input voltage	600 V		
Startup voltage	120 V		
Nominal input voltage	360 V		
MPP voltage range	90 V...560 V		
MPP voltage range for nominal power	160 V...480 V	190 V...480 V	210 V...480 V
No. of MPPTs	2		
Max. number of PV strings per MPPT (PV1/PV2)	1/1		
Max. PV input current	20 A (10 A / 10 A)		
Max. current for input connector	24 A (12 A / 12 A)		
Short-circuit current of PV input	24 A (12 A / 12 A)		
Max. inverter backfeed current to PV string	0 A		
Output Data			
Nominal AC power	3000 W	3680 W	4000 W
Max. AC apparent power	3000 VA	3680 VA	4000 VA
Max. AC current	13.7 A	16.0 A	18.2 A
Max. inrush current (peak value / duration)	10 A / 12 ms		
Max. output fault current (peak value / duration)	100 A / 3.2 ms		
Max. output over-current protection	25 A	32 A	32 A
Nominal AC voltage	230 Vac (single phase)		
AC voltage range	180 Vac...276 Vac		
Nominal grid frequency	50 Hz / 60 Hz		
Grid frequency range	45 Hz...55 Hz / 55 Hz...65 Hz		
Total harmonic distortion (THD)	< 3 % (of nominal power)		
DC current injection	< 0.5 % (of nominal current)		
Power factor	> 0.99 at default value at nominal power (adj. 0.8 leading to 0.8 lagging)		
Protection			
PV reverse connection protection	Yes		
AC short circuit protection	Yes		
Leakage current protection	Yes		

Parameters	SG3K-D	SG3K6-D	SG4K-D
Anti-islanding protection	Yes (frequency shift)		
Low voltage fault ride through (LVRT)	Yes (only for "DE")		
DC switch	Yes		
Overvoltage Category	III [AC], II [DC]		
Safety protection class	I		
System Data			
Max. efficiency	98.4 %	98.4 %	98.4 %
Max. European efficiency	97.7 %	97.7 %	98.0 %
Isolation method	Transformerless		
Ingress protection rating	IP65		
Pollution degree outside/inside the enclosure	3 / 2		
Power loss in night mode	< 1 W		
Operating ambient temperature	-25℃ ... +60℃ (derating when > 45℃)		
Max. allowable value for relative humidity (non-condensing)	100 %		
Cooling method	Natural cooling		
Max. operating Altitude	4000 m (derating when > 2000 m)		
Display	Graphic LCD		
Communication	Wi-Fi, Ethernet (optional)		
PV connection type	MC4		
AC connection type	Plug and play connector		
Certification	IEC 61000-6-2, IEC 61000-6-3, IEC 62109-1, IEC 62109-2, VDE-AR-N-4105, VDE0126-1-1 , G83/2, C10/11, EN50438, CEI 0-21:2016-06		
Mechanical Data			
Dimensions (W x H x D)	360 mm x 390 mm x 133 mm		
Mounting method	Wall-mounting bracket		
Weight	11.5 kg		

Parameters	SG4K6-D	SG5K-D	SG6K-D
Input Data			
Max. PV input power	6000 W	6500 W	7800 W
Max. PV input voltage	600 V		
Startup voltage	120 V		
Nominal input voltage	360 V		
MPP voltage range	90 V...560 V		
MPP voltage range for nominal power	240 V...480 V	260 V...480 V	315 V...480 V

Parameters	SG4K6-D	SG5K-D	SG6K-D
No. of MPPTs	2		
Max. number of PV strings per MPPT (PV1/PV2)	1/1		
Max. PV input current	20 A (10 A / 10 A)		
Max. current for input connector	24 A (12 A / 12 A)		
Short-circuit current of PV input	24 A (12 A / 12 A)		
Max. inverter backfeed current to PV string	0 A		
Output Data			
Nominal AC power	4600 W	4990 W	6000 W
Max. AC apparent power	4600 VA	4990 VA	6000 VA
Max. AC output current	21.0 A	21.7 A	27.3 A
Max. inrush current (peak value / duration)	10 A / 12 ms		
Max. output fault current (peak value / duration)	100 A / 3.2 ms		
Max. output over-current protection	32 A	32 A	40 A
Nominal AC voltage	230 Vac (single phase)		
AC voltage range	180 Vac...276 Vac		
Nominal grid frequency	50 Hz / 60 Hz		
Grid frequency range	45 Hz...55 Hz / 55 Hz...65 Hz		
Total harmonic distortion (THD)	< 3 % (of nominal power)		
DC current injection	< 0.5 % (of nominal current)		
Power factor	> 0.99 at default value at nominal power (adj. 0.8 leading to 0.8 lagging)		
Protection			
PV reverse connection protection	Yes		
AC short circuit protection	Yes		
Leakage current protection	Yes		
Anti-islanding protection	Yes (frequency shift)		
Low voltage fault ride through (LVRT)	Yes (only for "DE")		
DC switch	Yes		
Overvoltage Category	III [AC], II [DC]		
Safety protection class	I		
System Data			
Max. efficiency	98.4 %	98.4 %	98.4 %
Max. European efficiency	98.0 %	98.0 %	98.0 %

Parameters	SG4K6-D	SG5K-D	SG6K-D
Isolation method	Transformerless		
Ingress protection rating	IP65		
Pollution degree outside/inside the enclosure	3 / 2		
Power loss in night mode	< 1 W		
Operating ambient temperature	-25℃ ... +60℃ (derating when > 45℃)		
Max. allowable value for relative humidity (non-condensing)	100 %		
Cooling method	Natural cooling		
Max. operating Altitude	4000 m (derating when > 2000 m)		
Display	Graphic LCD		
Communication	Wi-Fi, Ethernet (optional)		
PV connection type	MC4		
AC connection type	Plug and play connector		
Certification	IEC 61000-6-2, IEC 61000-6-3, IEC 62109-1, IEC 62109-2, VDE-AR-N-4105, VDE0126-1-1 , G83/2, C10/11, EN50438, CEI 0-21:2016-06		
Mechanical Data			
Dimensions (W x H x D)	360 mm x 390 mm x 133 mm		
Mounting method	Wall-mounting bracket		
Weight	11.5 kg		

10.2 Quality Assurance

When product faults occur during the warranty period, SUNGROW will provide free service or replace the product with a new one.

Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, SUNGROW has the right to refuse to honor the quality guarantee.

Conditions

- After replacement, unqualified products shall be processed by SUNGROW.
- The customer shall give SUNGROW a reasonable period to repair the faulty device.

Exclusion of Liability

In the following circumstances, SUNGROW has the right to refuse to honor the quality guarantee:

- If the free warranty period for the whole machine/components have expired.
- If the device is damaged during transport.
- If the device was incorrectly installed, refitted, or used.
- If the device is operated in a very improper environment, as described in this manual.
- If the fault or damage was caused by installation, repairs, modification, or disassembly performed by a service provider or personnel other than this company.
- If the fault or damage was caused by the use of non-standard or non-SUNGROW components or software.
- If the installation and use range are beyond stipulations of relevant international standards.
- If the damage was caused by an abnormal natural environment.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of SUNGROW.

Software Licenses

- It is prohibited to use data contained in firmware or software developed by SUNGROW, in part or in full, for commercial purposes by any means.
- It is prohibited to reverse engineer, crack, or perform any other operations that compromise the original program design of the software developed by SUNGROW.

10.3 Contact Information

Should you have any question about this product, please contact us.

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

- Type of the inverter
- Serial number of the inverter
- Error code/name

- Brief description of the problem

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