SVG

User manual

20Kvar~150Kvar

Modular

SVG

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User manual

Data Version A00
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The company is committed to the continuous improvement of SVG equipment, so the information provided is subject to change without notice.

Contents

Preface

Our SVG uses the most advanced digital signal processor as the controller, IGBT semiconductor as the switching device, and the advanced three-level topology in the industry to get the best harmonic control effect.

Notes for unpacking inspection

When unpacking, please confirm carefully:

Whether the product is damaged;

Whether the rating of the nameplate of the machine is consistent with your ordered requirements;

The company has strictly inspected the manufacture and packaging of the product. If there is any omission, please contact the company or the supplier to resolve it.

Chapter 1 Safety Information

1.1 Security definition

	Failure to follow the instructions may result in death or serious injury.
	It may cause moderate or minor injuries or material damage due to failure to operate as required.

1.2 Installation precautions

-It is strictly prohibited to place combustible materials near the SVG, otherwise it may cause a fire;
-It is strictly forbidden to install the SVG in an environment containing explosive gas, otherwise it may cause explosion;
-Wiring must be performed by a qualified person, otherwise there is a danger of electric shock;
-Make sure that the input power is completely disconnected before performing wiring work, otherwise there is a danger of electric shock; after power on, it is prohibited to touch other parts of the SVG device except the operation panel;
-The ground terminal of the SVG device must be reliably grounded. Poor grounding can easily lead to abnormal operation and risk of electric shock;
-Maintenance operations should be performed 15 minutes after disconnecting the power, otherwise there is a danger of electric shock;
-The exposed part of the cable terminals for the main circuit wiring must be insulated to avoid potential safety hazards.

-When carrying, do not pull the SVG device through the front panel to avoid personal injury or damage the objects;
-Do not drop screws, gaskets and metal objects into the SVG device, otherwise there is a danger of fire and damage to the device;
-If the SVG equipment is damaged or the parts are incomplete, please do not install and run it, otherwise there is a danger of fire and personal injury;
-The main circuit terminal and the wire nose must be firmly connected.

1.3 Precautions for use

Wrong installation

When the SVG is incorrectly installed and applied (such as the output current transformer is reversed), it will increase the harmonic current on the power system, which may endanger the power system or other equipment.

Input voltage exceeded

Please use SVG equipment within the rated voltage range. In special occasions, please use step-up or step-down devices.

Lightning protection

The SVG device is equipped with a lightning overcurrent protection device. After wiring correctly according to the instructions, it has a certain self-protection ability for inductive lightning.

Altitude and derating use

In areas where the altitude exceeds 1000 meters, considering the decrease in dielectric strength and the weakening of the air cooling effect, it must be derated. Figure 1-1 shows the relationship between the rated current of SVG and altitude.

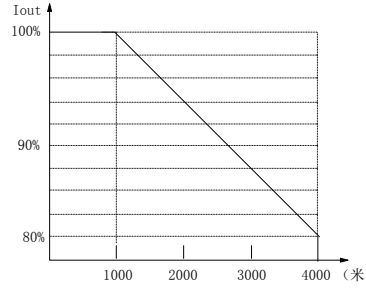

Figure 1-1 Altitude and Derating Use Form

1.4 Disposal considerations

When scrapping SVG equipment, please note:

Please dispose of it as industrial waste

Chapter 2 Product Specifications

2.1 SVG technical specifications

Table 2-1 Product technical specifications

project		project description
Electrical Specifications	Input line voltage	380V±20%
	Phase	3 phase 4 wire
	frequency	50/60 ± 5Hz (can be set)
	Compensation current (per phase)	30a ~ 150a (depending on the model)
	Compensated harmonic order	2 ~ 50 times
	Power factor correction	-1~+1
	Parallel operation	Up to 8 modules can be connected in parallel
	Module power consumption	<2.5kW
	effectiveness	Up to 97.5%
	CT ratio range	150:5~6000:5
Communication Interface	Dry contact	1 EPO
	Communication	RS485
Environmental specifications	Use place	Indoor, free from direct sunlight, dust-free, corrosive and flammable gases, oil mist, water vapor, dripping water or salt, etc.
	Working altitude	Below 1000 meters, derating for use above 1000 meters
	storage temperature	-20ºC ~ +70ºC
	Operating temperature	-10ºC ~ +40ºC
	humidity	Less than 95%RH, no condensation
	vibration	Less than 5.9 m / s ^{2} (0.6g)
Structure	Protection class	IP20
	colour	Black / 7035 grey (customizable)
	size	See next section (depending on model)
	net weight	22kg/38kg/46kg
	cooling method	Intelligent air cooling

2.2 SVG dimensions

The appearance of the rack-mounted SVG is shown in Figure 2-1, and the specific appearance and installation dimensions are shown in Table 2-2.

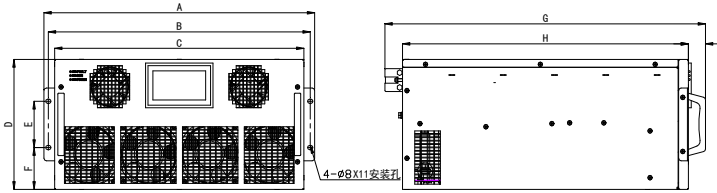

Figure 2-1 SVG rack size dimensions

Wall-mounted SVG dimensions are shown in Figure 2-2.

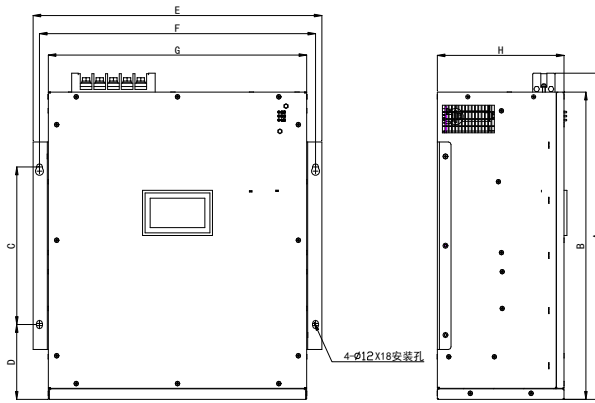

Figure 2-2 SVG wall-mounted dimensions

Size (mm)	Rack-mounted				Wall-mounted			
	20Kvar/ 35Kvar	50Kvar	75Kvar	100Kvar	20Kvar/ 35Kvar	50Kvar	75Kvar	100Kvar
A	359	409	484	554	521.5	575	611	621
B	341	391	466	536	500	550	575	585
C	315	365	440	510	300	300	300	300

D	200	232	232	250	120.5	125	137.5	142.5
E	89	89	89	89	375	425	500	570
F	55.5	71.5	71.5	80.5	350	400	475	545
G	556.5	610	646	656	315	365	440	510
H	500	550	575	585	200	232	232	250
K	35	35	35	35				

Table 2-2 SVG dimensions

2.3 SVG port type and configuration

The SVG power distribution port is divided into a power port and a control port, as shown in Figure 2-3. The control port can be divided into an external CT current current transformer input port, a parallel communication port, a monitoring port, and a debugging port according to function.

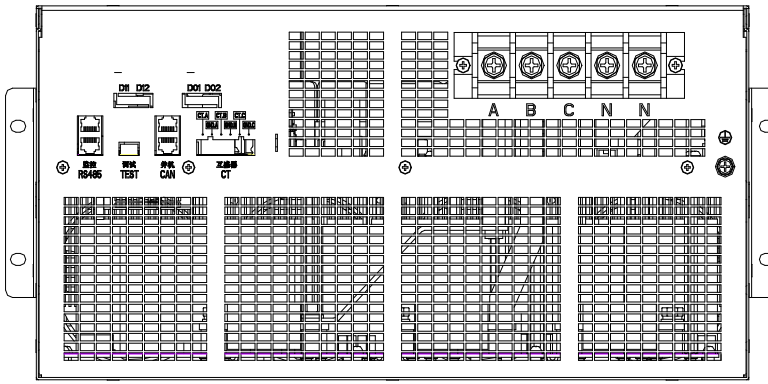

Figure 2-3 Port configuration diagram

Table 2-3 Power port description

Terminal symbol	Terminal function description
A	A phase input
B	B phase input
C	C phase input
N	Three-phase four-wire neutral input
PE	Safety ground terminal (enclosure)

The definition of the signal port is shown in Figure 2-4, where the debugging port is used for maintenance personnel debugging; the monitoring interface is used to connect to external centralized monitoring when multiple units are parallel; the parallel port is used to communicate between machines when multiple units are parallel This port may not be connected in parallel application; the current current transformer port is used to connect the external current transformer input signal. For the description of each port signal, see Table 2-4.

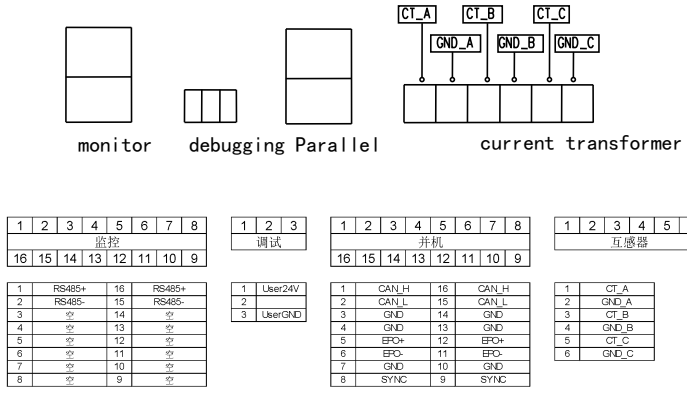

Figure 2-4 Signal port configuration diagram

Table 2-4 ct and control terminal description

	Terminal symbol	Terminal function description
current transformer	CT_A	Connect the s1 end of phase A CT
	GND_A	Connect to the s2 end of phase A CT
	CT_B	Connect to s1 end of phase B ct

	GND_B	Connect to s2 end of phase B ct
	CT_C	Connect to s1 end of phase C
	GND_C	Connect to s2 end of phase C CT
monitor	RS485+	Module and monitoring connection 485 signal (Pin1)
	RS485-	Module and monitoring connection 485 signal (Pin2)
	RS485+	Module and monitoring connection 485 signal (Pin16)
	RS485-	Module and monitoring connection 485 signal (Pin15)

Chapter III Installation and Power Distribution

3.1 Mechanical installation

When installing a general-purpose rack-mounted SVG, it is fixed to the cabinet mounting post through the front two mounting ears, as shown in Figure 3-1.

Wall-mounted models need to be fixed with upper and lower edges in hard walls or cabinets.

In addition, we can provide rail-mounted models, please contact our engineers for details.

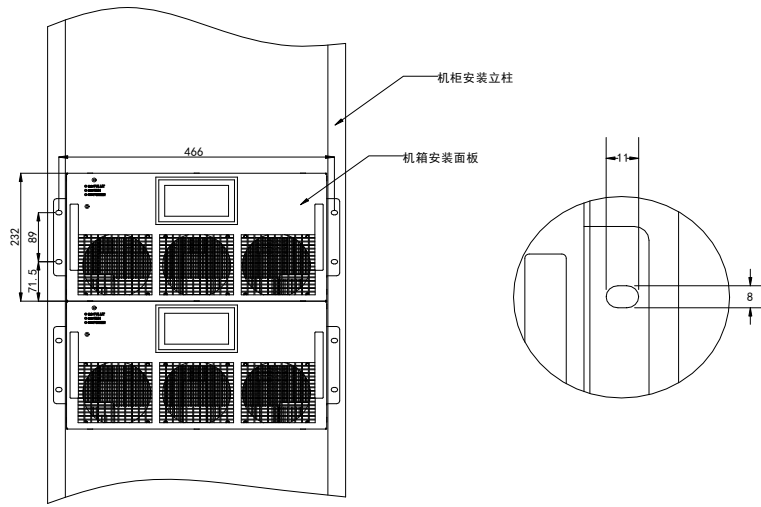

Figure 3-1 Rack mounting method

3.2 Electrical installation

The SVG can be used in a single machine or in parallel, with a maximum of 8 units. When a single machine is installed, the three-phase power line and

external CT cable must be wired. When the machine is parallel, the parallel line and CT cable must be configured. The wiring method is also different from when it is stand-alone.

3.2.1 Selection of power distribution interface and wire diameter

The user only needs to select the appropriate cable for the fixed terminal of the device according to the power requirements for wiring at the site. The wiring of each terminal is shown in Figure 3-2. The diameter of the power cable is selected according to SVG A / B / C / N / PE. Selection table requested by our company 3-1.

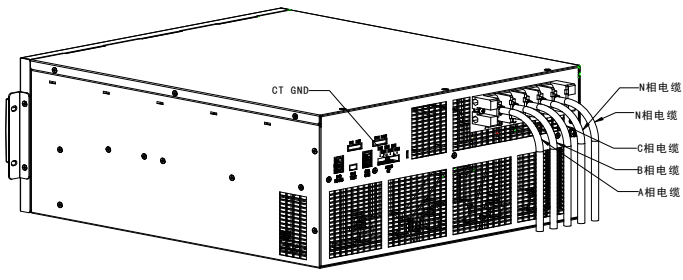

Figure 3-2 SVG single power module wiring diagram

Table 3-1 Selection table

Rated current	SVG
Power cable	A / B / C / N requires 100Kvar：50mm² PE：25mm²；75Kvar：35mm² ；50Kvar：25mm² ；20Kvar/35Kvar：16mm² ；20Kvar～75Kvar PE:16mm²
CT cable	Below 15m: RVVSP 2 × 2.5mm²; 15m-30m: RVVSP 2 × 4mm²; Above 30m: please contact us
CT ratio range	150/5～6000/5

Open circuit rated current	Choose according to different models
Note	If the temperature of the cable is required, you need to increase the size of the cable

The main SVG external terminals are:

- Input A-400V phase A input terminal corresponds to the yellow cable;
- Input B-400V Phase B input terminal corresponds to green cable;
- Input C-400V phase C input terminal corresponds to the red cable;
- N - neutral wire access point;
- PE - The system ground terminal.Because the system enclosure is a metal shell, in order to prevent personal safety accidents, it must be connected to the earth through this terminal before the system is turned on;
- CT - Terminal block, the maximum allowable current from external connection is 5A.

3.2.2 Selection of current current transformer

3.2.2.1 Accuracy requirements for current current transformers

The current transformer is one of the important external parts of the SVG. It plays a key role in the system's compensation accuracy in normal work. The accuracy of the external current transformer must be above Class 0.2 (closed) or Class 0.5 (open). With lower accuracy, the system compensation accuracy will be affected to some extent.

3.2.2.2 Selection of current transformer ratio

The minimum allowable transformation ratio of external CT is 150: 5 and the maximum allowed is 6000:5. Among this range, the corresponding transformation ratio can be set according to the actual CT applied, and the adaptability is relatively wide. When selecting the CT current transformation ratio, it is best to make the corresponding selection based on the actual load current. Generally, 1.5 times the maximum value of the current during the operation is selected, and an appropriate margin is left. This allows the SVG to perform reactive power compensation with higher accuracy after configuration, so that the client achieve a more ideal compensation effect, for example: the

maximum load current of the client is 1000A, in order to ensure the accuracy of the measurement, the best range is 1500: 5 ~ 2000: 5.

Note: As an optional accessory, the current transformer can be selected as an open or closed type. The installation of the open CT is more convenient. The closed CT installation must be installed when the client is powered off. When selecting the CT, you must pay attention to the change of the CT. The ratio is the ratio allowed by the SVG. Before starting the machine, you must check whether the external CT ratio is set to be consistent with the actual CT ratio.

3.2.2.3 Connection method of current transformer

The CT cable is in the SVG and is shipped as an optional accessory mode. The CT cable should be selected. Yellow + black, green + black, red + black 3 shielded twisted pair cables; each group of cables consists of 2 cables, two pairs of two twisted together to form a CT cable. When connecting and installing an external CT, we specify that the yellow twisted wire is connected to phase A, the green twisted wire is connected to phase B, and the red twisted wire is connected to phase C. Three-phase power cables, neutral wires, the connection method of the PE wire and the external CT wire is shown in Figure 3-3. In the CT wiring, the output terminals S1 and S2 of the CT are connected to the positive and negative ends of the corresponding phase of the external CT terminal of the SVG, for example, for phase A when wiring, the CT output terminals S1 and S2 are connected to the CT_A and GND_A of the external CT terminal of the SVG respectively; and the P1 end of the CT faces the load side and the P2 end faces the power side.

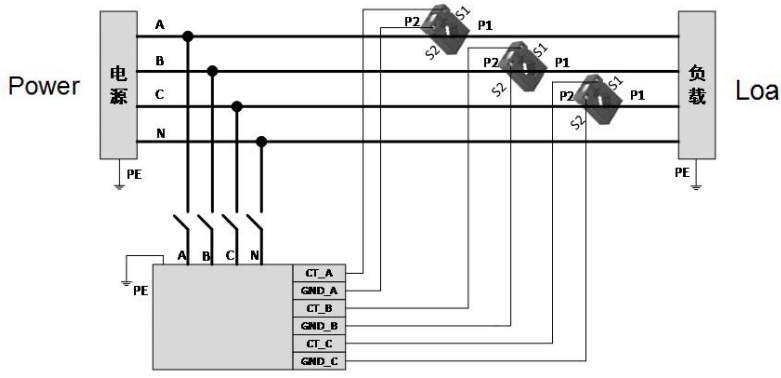

Figure 3-2 Single-machine power distribution wiring diagram

3.2.2 Parallel Power Distribution

The maximum number of parallel units allowed by SVG is 8. When parallel wiring, the power line connection is the same as that of a single unit; CT secondary side cables are recommended to connect in parallel; when there is a centralized monitoring screen outside the cabinet, the two RS485 ports on the back are connected separately, as shown in Figure 3-3.

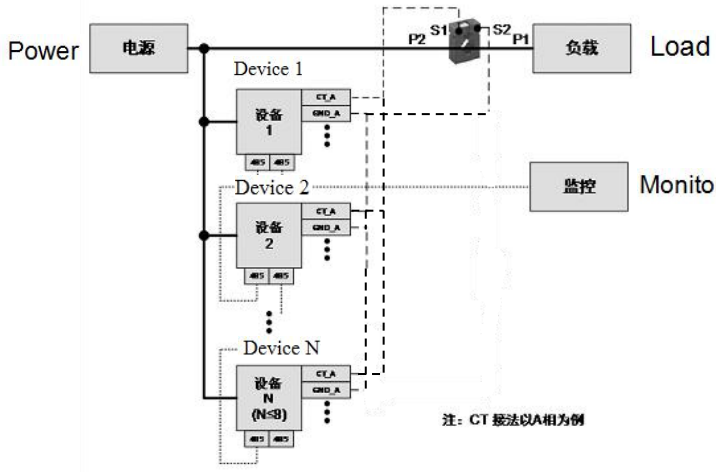

Figure 3-3 Schematic diagram of power distribution and monitoring wiring during parallel operation

3.2.2.1 Connection of ct when paralleling

It is recommended to use the parallel connection method for CT secondary cables when paralleling.

Taking phase A as an example, Figure 3-4 is a schematic diagram of the CT parallel connection method in parallel.

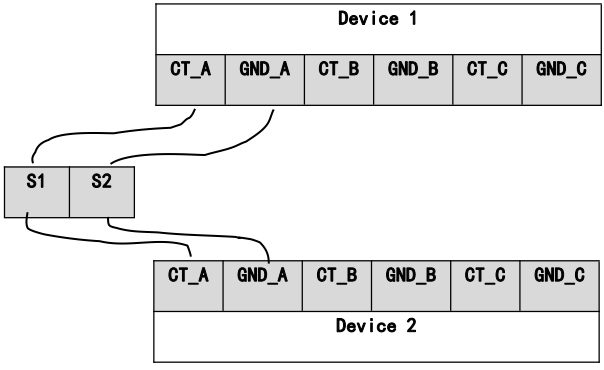

Figure 3-4 CT parallel connection method in parallel

3.2.2.2 Monitoring and connection method in parallel

When connected in parallel, if there is a centralized monitoring screen on the outside of the cabinet, the two RS485 ports of each machine case and the rear monitoring interface need to be connected separately, and the network ports between two adjacent machines correspond to each other, as shown in Figure 3-3 Shown.

The parallel interface behind the cabinet has two functions, one is to provide communication data between various machines when paralleling, and the other is to provide an emergency stop signal (EPO) for external use. If users want to use the EPO function, they can use EPO + and EPO- connected via an emergency stop switch outside the cabinet.

Chapter IV Power-on Operation Instructions

The content of this chapter includes the steps of turning on and off the SVG, the display and operation of the LCD panel. The design principle of the product is to allow the end user to achieve the function of the SVG with minimal operations.

4.1 Power on / off of SVG device

4.1.1 Startup steps

The steps are as follows:

1. Fasten the housing of the SVG and connect the power and signal cables.

Warning: When the SVG power-on step is performed, the SVG output terminal may be charged. If the load is connected to the SVG output terminal, please confirm with the user whether it is safe to supply power to the load. If the load is not ready to receive power, be sure to connect the load to the SVG output terminal Safe isolation.

2. Close the main power switch.

At this point, the LCD displays the splash screen.

The top left corner of the front panel is fault (red), running (green), and power (green) indicators from top to bottom. If the SVG is powered on normally, the power indicator is on; if the SVG is faulty, the fault indicator will be red , SVG cannot boot normally.

4.1.2 Shutdown steps

There are two ways to shut down.One is to directly disconnect the main power switch.This method is a complete shutdown mode, that is, after the power is turned off, the system is de-energized and related system maintenance work can be performed.

Another way is to use the settings of the LCD control panel to shut down. This shutdown mode just shuts down the operation of the power devices in the system, the machine is in the standby state, and the output terminals are live.

4.1.3 Manual / Automatic Start

After the SVG is powered on, you need to click the power-on button on the screen to achieve power-on compensation. After power-on, the running indicator lights up.

4.2 Display and operation of HMI

The front panel of the SVG device contains a 4.3-inch LCD touch screen (HMI). This screen can display the current grid voltage and current information, the status of the SVG device, and can set parameters through the screen and manually control the power on and off.

The typical display interface is shown in Figure 4-1, which is mainly divided into 3 areas:

Area 1 is the current date and time;

Area 2 is the page switching button.Click the button to switch between pages.

Area 3 is the main display and operation area where you can operate and change parameters.

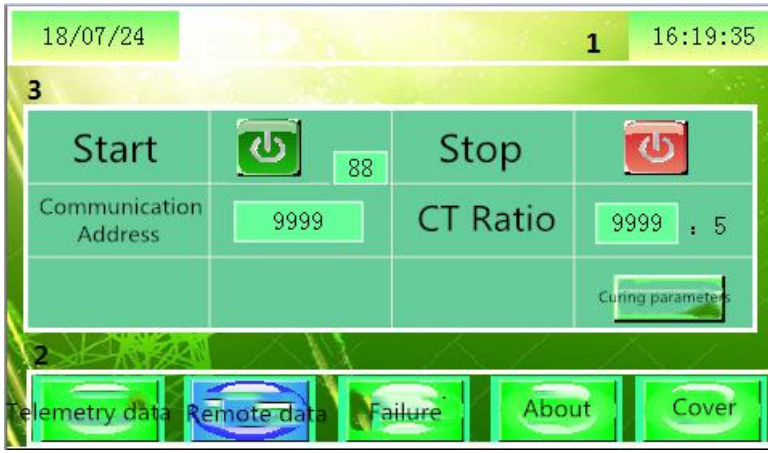

Figure 4-1 Login page

4.2.1 HMI display parameters and operations

The following table details the parameters and their meanings displayed on each page.

Table 4-1 Screen display parameters and meaning

HMI page	parameter name	Parameter meaning	Attributes
Home	Working condition	Standby and running states	Read-only
	Login button	After entering the password, you can log in to view other parameters	button
Telemetry data	A / B / C phase current effective value	A / B / C effective current value of each phase	Read-only
	A / B / C phase voltage effective value	A / B / C effective value of each phase voltage	Read-only
	bus voltage	SVG device internal bus voltage	Read-only
	Internal temperature	SVG device internal module temperature	Read-only
Remote data	Start	Click the button to start it manually	button
	Stop	Click the button to shut down manually	button
	Communication address	Address when setting up parallel	Read and write
	CT ratio	Set according to the transformation ratio of the external current transformer	Read and write
	Curing parameters	Click the button, curing parameters	button
accident details	EPO fault sign	EPO switch is off	Read-only
	Bus hardware overvoltage	The bus voltage is greater than the hardware overvoltage point	Read-only
	Bus overvoltage	The bus voltage is greater than the set overvoltage point	Read-only
	Bus under-voltage	The bus voltage is less than the set undervoltage point	Read-only
	Power module over temperature	SVG internal IGBT temperature is too high	Read-only
	igbt hardware overcurrent flag	IGBT hardware overcurrent	Read-only
	Power module 1 hardware	Power module overcurrent	Read-only

HMI page	parameter name	Parameter meaning	Attributes
	overcurrent		
	Fan failure	Fan does not turn	Read-only
	AC line voltage AB / BC/ CA overvoltage	Grid voltage is higher than the SVG maximum input voltage	Read-only
	AC line voltage AB / BC / CA undervoltage	Grid voltage is lower than the minimum input voltage of SVG	Read-only
	Grid over frequency	Grid voltage frequency is higher than the maximum frequency of SVG	Read-only
	Grid underfrequency	Grid voltage frequency is lower than the minimum SVG frequency	Read-only
	Power grid phase sequence inversion	Three-phase a / b / c phase sequence error of power grid	Read-only
	Power grid A/ B /C phase overcurrent	Grid current is greater than the set value	Read-only
	Precharge bus overvoltage	The bus voltage is higher than the maximum set value when power on	Read-only
	Precharge bus undervoltage	The bus voltage is lower than the minimum set value when power on	Read-only
	Uncontrolled rectifier bus undervoltage	Uncontrolled rectifier bus undervoltage	Read-only
	Auxiliary power failure	SVG internal 24v power failure	Read-only
	Board connection failure	poor contact of SVG internal terminal	Read-only
Version Information	Equipment model	SVG model	Read-only
	DSP version	SVG internal DSP software version	Read-only

4.3 Cabinet large monitoring HMI

The monitoring HMI used by the user cabinet is an optional accessory.Our company can customize it according to customer needs. Contact our engineers for details.

Chapter V Daily Maintenance

In order to maintain the long-term and reliable operation of SVG equipment, daily or regular inspection and maintenance should be performed.

5.1 Safety precautions

The SVG device runs with strong electricity. For safety reasons, maintenance personnel should not touch any live terminals of the device while the device is running, and ensure that the ground terminal of the device is reliably grounded.

Due to the large number of capacitors in the SVG device bus, maintenance work must be performed after 15 minutes of power failure.

5.2 Daily inspection

Do not open the device during operation and power-on. Visually check whether there is any abnormality in the operation status. Generally, the following items are checked:

- Whether the display data meets the requirements;
- Whether the display shows a fault;
- Are there any abnormal sounds, vibrations, or odors?
- Are there any signs of overheating and discoloration?

5.3 Periodic inspection

Following the safety precautions, the equipment is periodically inspected after it is disconnected from the grid, and the periodic inspection items are shown in the table below.

Table 5-1 Periodic inspection items

category	Check item	Note
surrounding	Temperature, humidity, presence of metal dust, corrosive gases	
Electrical	Whether the cables and terminals are damaged	

connections	Whether the main circuit wiring, ground wire, ct wiring, communication wiring, etc. are connected reliably	
Equipment cooling	Whether there is a blockage at the air duct	

5.4 Maintenance records

Periodic Inspection Record Form

date	condition	Check item	Note