

Static Var Generator User Manual



50kvar/100kvar Wall-mounted



50kvar/100kvar Rack-mounted



200kvar Wall/Rack-mounted

50~100 kVar

Built-in 8/16-way relay
Static Var Generator

TRINITY ENERGY SYSTEMS PVT LTD

Static var generator (built-in relay)

User Manual

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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.

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Introduction

Modular SVG products use the most advanced digital signal processor as the controller, using IGBT semiconductor as the switching device, and using the industry's advanced three-level topology, to obtain the best compensation effect.

Points for attention in open box inspection



When unpacking, make sure:

- Whether the product is damaged or not;
- Whether the rated value of this machine nameplate is consistent with your order;


The company in the manufacture of products and packaging factory has been strictly inspected, if there is a certain omission, please contact the company or suppliers to solve.

1. Security information

1.1 Security definitions

	Failure to perform as required may result in death or serious injury.
	Failure to perform as required may cause moderate or minor injury or cause material damage.

1.2 Installation considerations

	
<ul style="list-style-type: none"> ● It is strictly prohibited to place combustibles near SVG equipment, otherwise there is a risk of fire; ● It is strictly prohibited to install SVG equipment in an environment containing explosive gas, otherwise there is a risk of explosion; ● Wiring must be carried out by a person with professional qualifications or risk of electric shock; ● Make sure that the input power supply is completely disconnected before wiring operation, otherwise there is a risk of electric shock; after electrification, do not touch other parts of the SVG device except the Operation Panel; ● The grounding terminal of SVG equipment must be grounded reliably, the bad grounding is easy to lead to abnormal operation and the risk of electric shock; ● Maintenance should be carried out 15 minutes after the power is disconnected, or risk of electric shock; ● The exposed part of the cable terminal for the main circuit connection must be well insulated to avoid potential safety hazard. 	



- When Handling, SVG equipment shall not be pulled by a handle on the front panel to avoid personal injury or damage to objects;
- Do not drop screws, gaskets and metallic foreign bodies into the SVG equipment, or risk of fire and damage to the equipment;
- Do not install or operate SVG if the SVG equipment is damaged or the parts are incomplete, otherwise there is the risk of fire and personal injury;
- The terminal of the main circuit must be firmly connected to the nose of the conductor.

1.3 Warning

Incorrect installation

When SVG is installed in the wrong application (such as the reverse connection of the output transformer), it will increase the reactive power content on the power system and reduce the power factor.

Input voltage exceeding the standard

Please use SVG equipment within the rated voltage range of SVG equipment. For special occasions, please use a step-up or step-down device.

Lightning impulse protection

SVG equipment is equipped with a lightning over-current protection device. After wiring correctly according to the manual, it has a certain self-protection ability for induction lightning.

Altitude and use of declining quota

In areas where the altitude exceeds 1000 m, the reduction of dielectric strength and the reduction of air cooling effect must be taken into account. Figure 1-1 shows the relationship between the SVG output current and altitude.

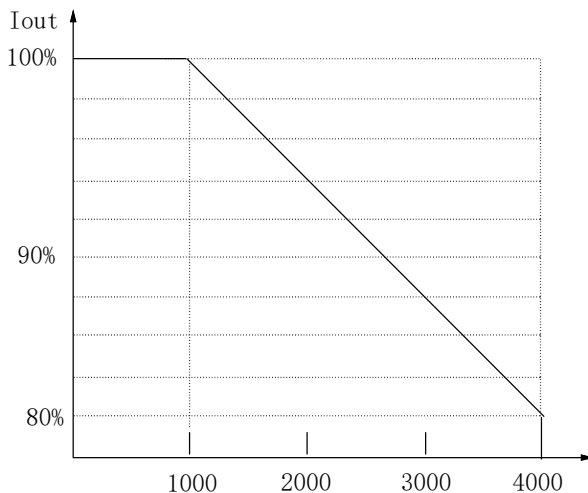


Figure 1-1 table for use of altitude and fall

1.4 Notice for obsolescence

When scrapping SVG equipment, please note:

- The electrolytic capacitor of the main circuit and the electrolytic capacitor on the printed circuit board may explode when burned;
- Toxic gases are produced when plastic parts are burned.

Please treat it as industrial waste.

2. Specification introduction

2.1 Specifications

Table 2-1 product specifications

Projects	Project description	
Electrical specification	Input line voltage	400 V \pm 20%
	Phase number	Three-phase four-wire
	Capacity	20 ~ 140kVar (depending on the model)
	Frequency	50/60 \pm 5Hz (settable)
	Response time	< 10ms
	Power Factor Correction	- one to one, adjustable
	Parallel operation	Maximum 8 modules can be connected in parallel
	Module power consumption	< 2.5 kw
	Efficiency	97.5%
	Range of CT ratio	150:5 ~ 6,000:5
Communication interface	Dry contact	1 EPO
	Communication	RS485
Environmental specification	Place of use	Indoor, from direct sunlight, dust-free, corrosive, flammable gases, oil mist, water vapor, water or salt, and so on
	Working altitude	Lower than 1500m and lower than 1500m
	Storage temperature	- 20 °C ~ + 70 °C
	Operating temperature	- 25 °C ~ + 50 °C
	Humidity	Less than 95% Rh, no condensation
Vibration	Less than 5.9 m/s 2(0.6 g)	
Structure	Protection level	IP20
	Color	7035 gray and white/black (customizable)
	Dimensions	See next section (depending on the model)
	NET weight	20kg/36kg/50kg/70kg (according to model)
	Cooling mode	Intelligent air cooling

2.2 Dimensions

SVG series products can be divided into rack type, wall-mounted type and vertical type according to the installation method, and the outline dimensions of the two can be marked as figure 2-2-1, 2-2-2, 2-2-3. The product covers 35kVar ~ 140kVar, according

to the size of the power grade there are four different sizes of chassis, detailed configuration installation size table 2-2.

A: rack type

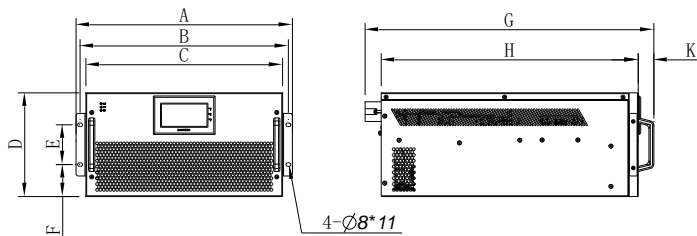


Fig. 2-2-1 Rack-mounted SVG dimensions

B: wall-mounted

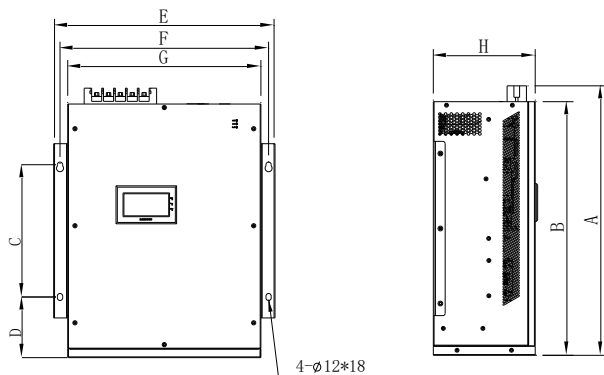


Figure 2-2-2 Wall-mounted SVG dimensions

C: Vertical

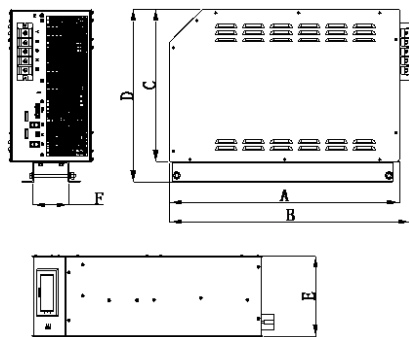


Figure 2-2-3 Vertical -mounted SVG dimensions

Dimensions (mm)	Rack-type					Wall-mounted type					Vertical type			
	20kV ar/35kVar	50 kVar	75 kVar	100 kVar	150kVar	20kV ar/35kVar	50 kVar	75 kVar	100 kVar	150 kVar	20kV ar/35kVar	50 kVar	75 kVar	100 kVar
A	359	399	484	554	674	521.5	545	611	621	676	553	616	666	656
B	341	381	466	536	656	500	520	575	585	640	571.5	638	699	689
C	315	355	440	510	630	300	360	300	300	420	317.4	358	443	513
D	200	200	232	250	250	120.5	80	137.5	142.5	110	377.4	418	503	573
E	89	89	89	89	89	378	419	504	574	694	202.2	202.5	234.5	251.5
F	55.5	55.5	71.5	80.5		350	390	475	545	666	140	140	140	140
G	534.5	615	646	656	676	315	355	440	510	630				
H	500	555	575	585	640	200	200	232	250	250				
K	13	13	35	35	30									

Table 2-2 product dimensions schedule

Note: non-standard products can be made according to the requirements of users.

		CT.	
	Ib	Connect the S2 terminal to the B-phase CT.	
	IC	Connect to the S1 terminal of the c-phase CT.	
	IC	Connect the S2 terminal to the c-phase CT.	
Digital output	Do1	Relay output 1 constant start	TA-TC: normally open contacts; Contact capacity: 250VAC/2a (cos φ = 1), 30VDC/1a
	Do1	Relay output 1 neutral terminal	
	Do2	Relay output 2 constant start	
	Do2	Relay output 2 neutral terminal	
Digital input	Di	Digital input port	Optocoupler isolated input Input Voltage: 9 ~ 24VDC INPUT IMPEDANCE: 5K ω
	Com	Digital input common terminal	
RS485	485	Terminal A of group 1485 communication terminal	Through a custom cable to the central control panel
	485	B terminal of group 1485 communication terminal	Through a custom cable to the central control panel
	485	Terminal A of group 2485 communication terminal	Backup 485
	485	B terminal of group 2485 communication terminal	Backup 485
	485	Terminal A of group 3485 communication terminal	Backup 485
	485	B terminal of group 3485 communication terminal	Backup 485
Can Port	Can	CAN communication interface L terminal	
	Can	CAN communication interface N terminal	
Direct current supply	24 +	DC24V + output	
	24 -	DC24 v-output	
	12 +	DC12V + output	
	12.-yeah	DC12V-OUTPUT	
Relay Output Terminal	Ta1	Relay output neutral terminal, Route 1	Contact capacity: 250VAC 10A,
	Tc1	No. 1 relay output constant opening	
	Ta2	Relay output neutral terminal, 2nd circuit	
	TC2	No. 2 relay output constant open	
	Ta3	Relay output neutral terminal, 3rd circuit	

TC3	3-way relay output normally open	30VDC 10A
Ta4	Relay output neutral terminal, Route 4	
Tc4	4-way relay output normal start	
Ta5	Relay output neutral terminal, Route 5	
Tc5	5-way relay output normal start	
Ta6	Relay output neutral terminal, Route 6	
Tc6	Route 6 relay output normal start	
Ta7	Relay output neutral terminal, Route 7	
Tc7	No. 7 relay output normally open	
Ta8	Relay output neutral terminal, Route 8	
TC8	8-way relay output normally open	
Ta9	Relay output neutral terminal, Route 9	
TC9	No. 9 relay output normal start	
TA10	Relay output neutral terminal, Route 10	
TC10	10-way relay output normally open	
TA11	Relay output neutral terminal, Route 11	
TC11	Route 11 relay output normally open	
TA12	Relay output neutral terminal, Route 12	
TC12	12-way relay output normally open	
TA13	Relay output neutral terminal, Route 13	
TC13	Route 13 relay output normally open	
TA14	Relay output neutral terminal, Route 14	
TC14	Route 14 relay output normally open	
TA15	Relay output neutral terminal, Route 15	
TC15	Route 15 relay output normally open	
TA16	Relay output neutral terminal, Route 16	
TC16	Relay 16 output normally open	

The SVG module can control the thyristor switch (TSC) or the contactor through the relay output terminal to realize the switching of reactive power compensation capacitor. When the thyristor switch scheme is used, the electrical schematic diagram and terminal wiring diagram are shown in fig. 2-5 and Fig. 2-6 respectively.

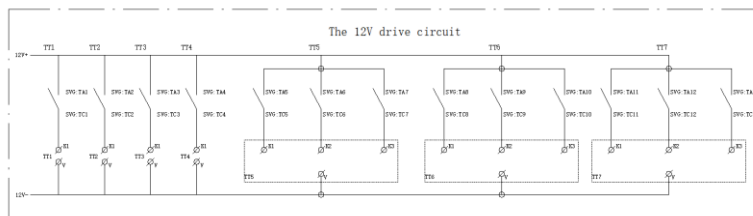


Fig. 2-5 electrical schematic diagram of thyristor switching scheme

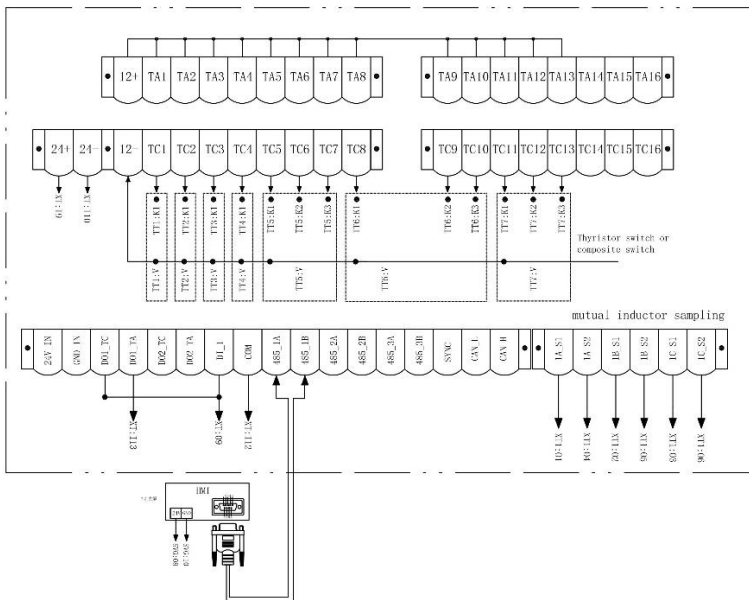


Fig. 2-6 Terminal wiring diagram of thyristor switch scheme

Terminal wiring diagram description:

- The module has its own output DC12V, DC24V, thyristor or compound switch to supply power when it is switched on or off;
- When the contactor is switched on and off, 220V power supply should be connected from outside;
- Total delta and wye road number, when placing orders, please note clearly;
- Compared with 16-way relay board, 8-way relay board is short of 8 terminals: TA9 ~ TA16, other no difference.

3. Installation and distribution

3.1 Mechanical installation

When Universal rack-type SVG is installed, it is fixed on the installation column of the cabinet through the front two hanging ears, as shown in figure 3-1. The wall-mounted type should be fixed in the hard wall or cabinet through the upper and lower edge.

In addition, we can provide guide rail type installation machine, please contact our engineers.

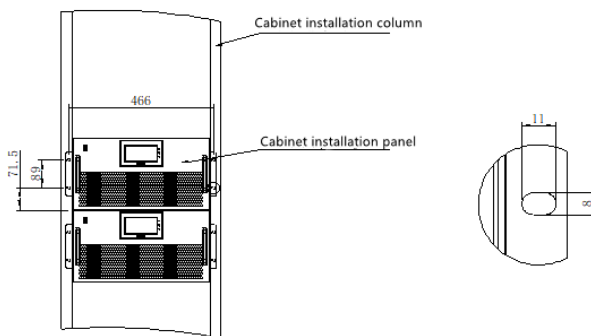


Fig. 3-1 schematic diagram of rack type installation mode

3.2 Electrical installation

The SVG module can be used by single machine or parallel machine.

3.2.1 Single unit distribution

Single distribution, three-phase power line, N Line, PE line and external CT line connection as shown in figure 3-2. When CT is Wired, the terminal S1 and S2 of CT are connected to the corresponding positive and negative terminals of SVG external CT respectively. For example, when a phase CT is Wired, CT outlet terminals S1 and S2 are connected to CT and GND of SVG external CT terminals respectively, and the P1 end of CT faces the power side and the P2 end faces the load side.

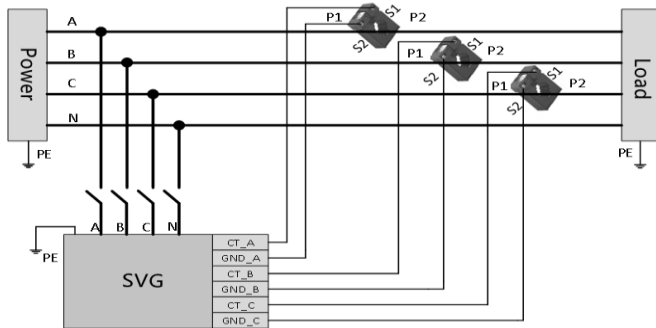


Fig. 3-2 schematic diagram of single-unit distribution wiring

3.2.2 Parallel power distribution

The maximum number of parallel machines allowed for SVG modules is 8. The power line connection is the same as the single machine connection when the parallel machine is wiring; the serial connection is recommended for the CT sub-side cable; when there is a centralized monitoring screen outside the machine cabinet, each machine 485+ and 485- should be connected in parallel separately, the wiring pattern is shown in figure 3-3.

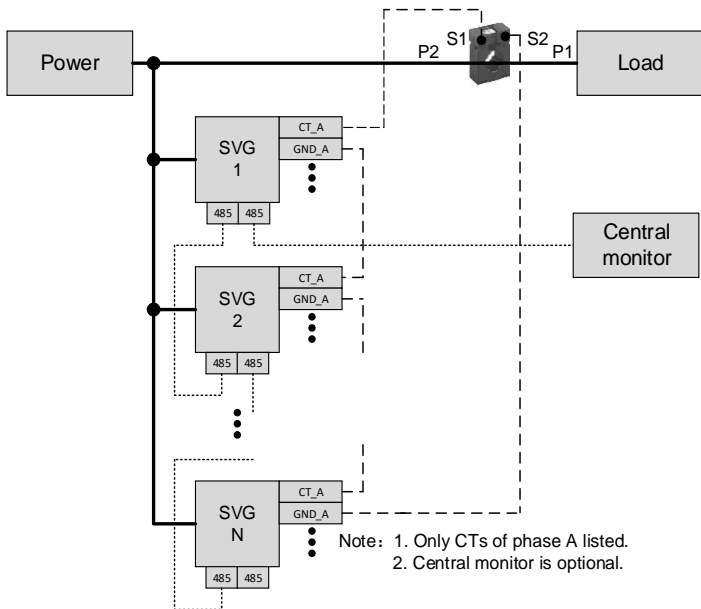


Fig. 3-3 schematic diagram of power distribution and monitoring wiring during parallel operation

4. Electricity Operation Instruction

The contents of this chapter, including SVG switch steps, LCD panel display and operation. The product is designed to allow the end user to implement SVG functionality with minimal manipulation.

4.1 Switchgear for SVG devices

4.1.1 Boot step

The steps are as follows:

Tighten the SVG housing and connect the power and signal cables.

Warning: SVG output terminals may be live when performing SVG boot steps. If a load is connected to the SVG output terminal, please confirm to the user whether it is safe to supply power to the load. If the load is not ready to receive power, be sure to securely insulate the load from the SVG output terminal.

Switch between closed mains and SVG.

At this point, the LCD display startup screen.

The front panel has three status indicator lights, which are failure (red) , operation (green) and power (Green) . If SVG is powered on normally, the power indicator lights up; if SVG has a fault, the fault indicator lights up red, and SVG cannot be turned on normally.

4.1.2 Shutdown steps

There are two ways of shutdown, one is to directly disconnect the switch between SVG and the utility, this way is the complete shutdown mode, that is, after shutdown, the system is not charged, can carry out the relevant maintenance of the system.

Another way is to use the LCD control panel settings for shutdown, this shutdown mode is only to close the system power device operation, the machine is in standby state, the output terminal live.

4.1.3 Manual/Auto Start

When SVG is powered on, it needs to click on the on-screen boot key to realize boot compensation. After turning on the machine, the running indicator light is lighted.

By setting the self-enable button of the interface, the automatic running of SVG on electricity can be realized.

It is suggested that the module should be run manually when it is debugged for the first time. After debugging, it can run automatically.

4.2 SVG HMI display and operation

The SVG can be equipped with HMI, which can be 4.3-inch LCD touch screen or 1.8-inch keypad screen.

4.2.1 HMI display and operation

The HMI can display the voltage, current, power and SVG status of the current power grid side and load side, and can set parameters by touch screen.

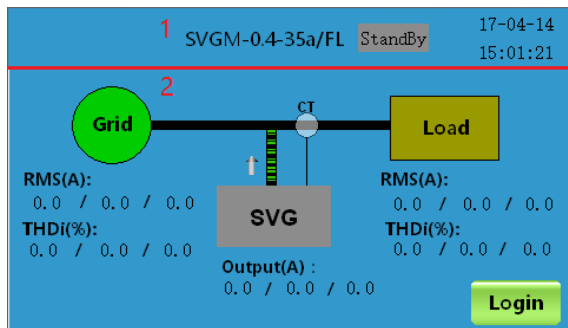


Figure 4-2-1 HMI touch screen display home page

The general display interface is shown below, showing the grid/load/SVG side of the power parameters, click on each page name button to switch between the pages.

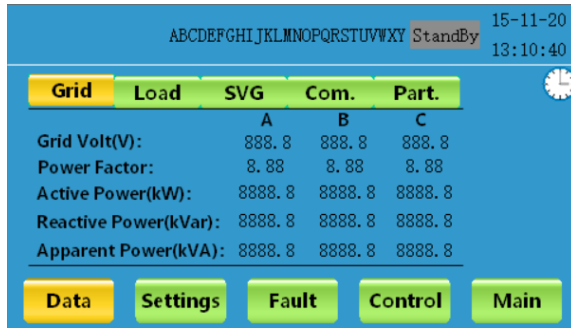


Figure 4-2-1 HMI interface

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

Table 4.1 HMI parameters and significance

HMI page	Parameter name		Parameter meaning	Attribute
Home	Power grid	Grid current	A/b/C grid current	Read only
	Electric current	Power factor	Power factor of each phase of A/b/C network	Read only
	Load Electric current	Load current	A/b/C phase load current	Read only
		Power factor	A/b/c load power factor of each phase	Read only
	SVG output current		Effective value of SVG output current	Read only
	Login button		Enter the password can be logged in to view other parameters	Push the button
Data	Grid data	Voltage	NET voltage RMS	Read only
		Power factor	Power factor of electric network	Read only
		apparent power	Active power in each phase of the grid	Push the button
		Reactive power	Reactive power of each phase of power grid	Read only
		Apparent power	Line-of-sight power	Read only
	Load data	Voltage	RMS of load voltage	Read only
		Power factor	Load power factor	Read only
		apparent power	Active power of each phase of load	Push the button
		Reactive power	Load phase reactive power	Read only
		Apparent power	Apparent power of each phase of load	Read only
	SVG Data	Output Current	Effective value of each phase output current of SVG module	Read only
		Bus Voltage	SVG module internal bus voltage	Read only
		Contact Condition	Contact State Inside SVG module	Read only
		System temperature	Maximum temperature of IGBT inside SVG module	Read only
		Version information	Firmware version of SVG module	Read only

HMI page	Parameter name		Parameter meaning	Attribute
Data	Cocompensation capacitance	Total quantity	Capacitance quantity	Read only
		Id	Address	Read only
		Capacity	Capacitance capacity	Read only
		Group	Capacitance group	Read only
		Status	Switch and input status display	Read only
		Command	Cut-and-drop button	Push the button
		Automaticity	Automatic mode and manual mode toggle button	Push the button
	Offset capacitance	Total quantity	Capacitance quantity	Read only
		Id	Address	Read only
		Capacity	Capacitance capacity	Read only
		Group	Capacitance group	Read only
		Status	Switch and input status display	Read only
		Command	Cut-and-drop button	Push the button
		Automaticity	Automatic mode and manual mode toggle button	Push the button
Set up	Page 1	CT ratio	Set external transformer ratio	Read and write
		Parallel capacity	When parallel, the capacity of the filter cabinet	Read and write
		Modbus address	When merging, the module address	Read and write
		Operation Mode	Set whether to power up and run automatically	Push the button
	Page 2	Grid overvoltage point	Setting SVG grid overvoltage point	Read and write
		Undervoltage Point	Setting up SVG undervoltage point	Read and write
		Grid over-frequency point	Setting SVG grid over-frequency point	Read and write
		Underfrequency point of power grid	Setting up SVG underfrequency point	Read and write
	Page 3	Frequency setting of harmonic	Select the number of harmonics to be compensated (odd)	Push the button

HMI page	Parameter name		Parameter meaning	Attribute
		compensation		
	Page 4	Frequency setting of harmonic compensation	Select the number of harmonics to be compensated (even)	Push the button
		Curing parameter	After setting up, save the parameters Note: it can only be cured in standby mode	Push the button
Malfunctions	A sign of EPO failure		EPO switch off	Read only
	Bus hardware overvoltage		Bus voltage greater than the hardware overvoltage point	Read only
	Busbar overvoltage		Busbar voltage greater than set overvoltage point	Read only
	Busbar undervoltage		The busbar voltage is less than the set undervoltage point	Read only
	Power module overheating		The temperature inside the SVG IGBT is too high	Read only
	Fan failure		The Fan won't turn	Read only
	AC line voltage AB/BC/CA overvoltage		The grid voltage is higher than the maximum input voltage of SVG	Read only
	AC line voltage AB/BC/CA undervoltage		The grid voltage is lower than the minimum input voltage of SVG	Read only
	Grid over frequency		The grid voltage frequency is higher than the maximum frequency of SVG	Read only
	Grid underfrequency		The grid voltage frequency is lower than the minimum frequency of SVG	Read only
	Grid phase sequence inversion		Three-phase A/b/C phase sequence error in power grid	Read only
	A/b/C phase overcurrent in power grid		Grid current greater than set value	Read only
	Pre-filled busbar overvoltage		The bus voltage is higher than the maximum setting value when power on	Read only
	Undervoltage of pre-filled busbar		The bus voltage is lower than the minimum setting value when power on	Read only
	Auxiliary power failure		SVG internal 24V power failure	Read only
Single Board connection failure		The internal terminals of SVG are not in good contact	Read only	

HMI page	Parameter name	Parameter meaning	Attribute
Switch gear	Roll camera	manual Start button, after the key, counting 30 seconds, after the number of 30 boot	Push the button
	Turn it off	Manual shutdown key, press the key immediately after shutdown	Push the button
	Reset	Failure reset key	Push the button

5. Routine maintenance

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

5.1 Safety precautions

SVG equipment running with strong electricity, security, equipment running time maintenance personnel cannot touch any live equipment terminal, and ensure that the equipment grounding terminal reliable grounding.

Due to the large capacitance of the SVG equipment busbar, the maintenance work must be carried out after 15 minutes of power failure.

5.2 Routine checks

Do not open the device while it is running or when it is powered on. Visually inspect the device from outside to see if there is anything abnormal:

- Whether the display screen data meets the requirements;
- Whether the display screen shows the failure;
- Abnormal sound, abnormal vibration, abnormal smell;
- Any signs of overheating, discoloration, anything unusual.

5.3 Regular check ups

In compliance with the safety precautions, the equipment from the power grid off for periodic inspection, periodic testing items as shown in the table below.

Table 5-1 periodic review of items

Categories	Check items	Notes
Environment	Temperature, humidity, presence of metal dust, corrosive gases	
Electrical connection	Cable, terminal is damaged	
	Whether the main circuit wiring, grounding wire, CT wiring, communication wiring and so on are reliably connected	
Equipment cooling	If there's a blockage in the air duct	