

30kvar SVG Static Var Generator

User Manual

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Our company provides customers with comprehensive technical support. Users can contact the nearest company office or customer service center, or directly contact the company headquarters.

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Special Declaration

Personal Safety

1. The installation of this product must be carried out by the manufacturer or a professional engineer authorized by the manufacturer's agent. The machine debugging must be carried out by the engineer designated by the manufacturer, otherwise it may cause product failure or endanger personal safety.
2. Before installing and debugging the product, it is essential to carefully read this product manual and safety precautions, otherwise it may cause product failure or endanger personal safety.
3. This product cannot be used as a power supply for any life support module.

Module Safety

1. This product must be placed in a dry, clean, and specified temperature range environment if stored or not used for a long time.
2. This product should be used in an appropriate working environment (see the Environmental Requirements section of this product manual for details).
3. It is prohibited to use this product in the following working environments:
 - High temperature, low temperature, or humid places that beyond the technical specifications of this product
 - Places with vibration and susceptibility to collisions
 - Places close to heat sources or with strong electromagnetic interference

Statement of Responsibility

Our company is not responsible for defects or malfunctions caused by the following reasons:

1. Beyond the specified usage range and working environment of the product, such as allowing the module to work in an environment with conductive dust or condensation;

2. Unauthorized modification or repair, incorrect installation, improper operation, such as not following the instructions in Chapter 3 of this manual for CT wiring;
3. Encountering force majeure
4. Other violations of the provisions of this product manual

This manual may be updated periodically due to product upgrades and other reasons without prior notice.

- **This manual covers the following products**

Product Series	Product Name	Product Model	
SVG(Rack)	SVG 30kvar	MDG03034RL00	400VAC three-phase four-wire 30kvar SVG-Module SVG(Rack)
		MDG03034RC00	400VAC three-phase four-wire 30kvar SVG-Module SVG(Rack,No Display)
SVG(Wall-Mounted)	SVG 30kvar	MDG03034WL00	400VAC three-phase four-wire 30kvar SVG module (Wall-Mounted)
		MDG03034WC00	400VAC three-phase four-wire 30kvar SVG module (Wall-Mounted,No Display)

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Chapter 1 Safety Information

1.1 Safety Precaution

Improper use of the following operations can cause dangerous situations and potentially result in personal injury or death !



1. It is strictly prohibited to place combustible materials near the SVG module, otherwise there is a risk of fire;
2. It is strictly prohibited to install SVG modules in environments containing explosive gases, otherwise there is a risk of explosion;
3. Wiring operations must be carried out by qualified personnel wearing insulation protective equipment, otherwise there is a risk of electric shock;
4. Universal SVG wiring operations can only be carried out when the input power is completely power off, otherwise there is a risk of electric shock;
5. After power on, do not touch any other parts of the SVG module except for the HMI operation panel;
6. The grounding terminal of the SVG module must be reliably grounded, as poor grounding can easily lead to abnormal operation and the risk of electric shock;
7. If maintenance operations are required, they should be carried out after disconnecting the power for 15 minutes, otherwise there is a risk of electric shock;
8. The exposed part of the cable nose in the main circuit wiring must be wrapped with insulation



1. When handling, do not use the front panel handle to pull the SVG module to avoid personal injury or damage to objects;
2. If screws, gaskets, and metal foreign objects accidentally fall into the interior of the SVG module, it must be prohibited from being power on or immediately power off, otherwise there is a risk of fire and damage to the components;
3. If the SVG module is damaged or has incomplete components, please do not install or operate it, otherwise there is a risk of fire and personal injury;
4. The main circuit terminal must be firmly connected to the wire nose.

1.2 Precautions for Use

Incorrect Installation

When the SVG module is incorrectly installed and applied, if the output transformer is reversed, it will increase the harmonic current and reactive current on the power system, which may endanger the power system and other connected modules.

Input Voltage Value Beyond the Limit

Please use the SVG module within its rated voltage range. In special occasions, please use a boosting or lowering device.

Lightning Impulse Protection

The SVG module is equipped with a lightning overcurrent protection device, which has a certain self-protection ability for induced lightning. Please ensure that the PE line of the SVG module is connected to the ground.

Chapter 2 Product Specification

Introduction

2.1 Environmental Characteristics

SVG module is a power electronics module with complex control system. **The installation environment may affect its reliability and service life.** The SVG module is equipped with a cooling fan to remove the heat generated during operation. Therefore, do not block the ventilation openings during the installation process. Do not install the SVG module in environments with excessive dust, heat, humidity, corrosion, or vibration.

Project	Unit	Data information
Rated power	kvar	30
Altitude	m	≤1500 , 1500m~3000m , Reduce rating by 1% every 100m in this range.
Relative Humidity	%RH	0~95, No condensation
Working Temperature	℃	- 10~45℃ The ambient temperature is - 10~40℃ ,and the module has no output power reduction; The ambient temperature is 40~45℃ ,and the module output power is reduced to 90%; The ambient temperature is 45~50℃ , and the module output power is reduced to 80%.
SVG module Storage and Transportation Temperature	℃	- 20~ + 70
Overvoltage Level		Overvoltage level II

Table 2.1 Environmental Characteristics of 30kvar SVG Module

2.2 Mechanical Characteristics

Project	Unit	Data information
Mechanical Dimensions (W×D×H)	mm	380×424×88 (Rack, without packaging materials) ; 515×545×150 (Rack, with packaging materials) ;
Chassis Thickness		2U
Weight (Max)	kg	11.5
Color		RAL 7035
Protection level , IEC (60529)		IP20(Front door open or closed,Back door closed)

Table 2.2 Mechanical Characteristics of 30kvar SVG Module

2.3 Electrical Characteristics

Project	Unit	Data information
Rated AC Voltage	Vac	380/400/415 , three-phase five-wire (compatible with three-phase four-wire and three-phase three-wire)
Rated A, B, C, N Currents	A	45
Working Frequency	Hz	50/60
Voltage Range (Rated 380Vac)	%Vac	upper limit: + 15 lower limit: - 20
Frequency Range	Hz	±3
Loss	%	<2.5
CT Ratio Range		150:5~10000:5

Table 2.3 Electrical Characteristics of 30kvar SVG Module

2.4 Module Appearance and Installation Dimensions

Our company offers rack mounted models for the 30kvar SVG modules produced. Figure 2.1 illustrates the key mechanical characteristics of this model.

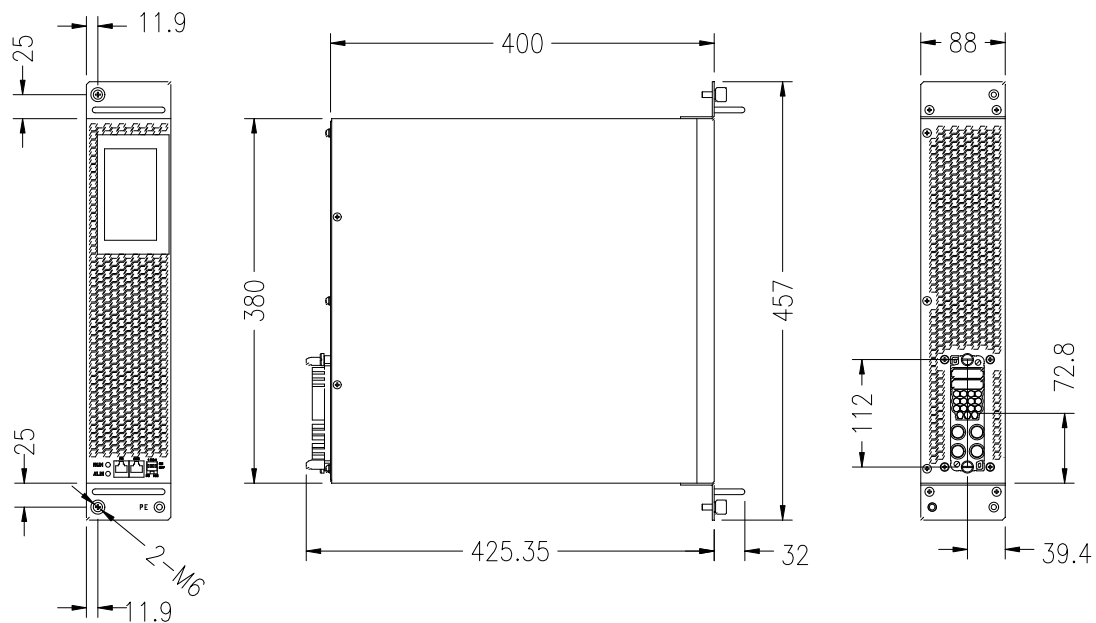


Figure 2.1 Installation dimension diagram of rack mounted 30kvar SVG module (unit: mm)

Figure 2.2 illustrates the key mechanical characteristics of wall mounted model.

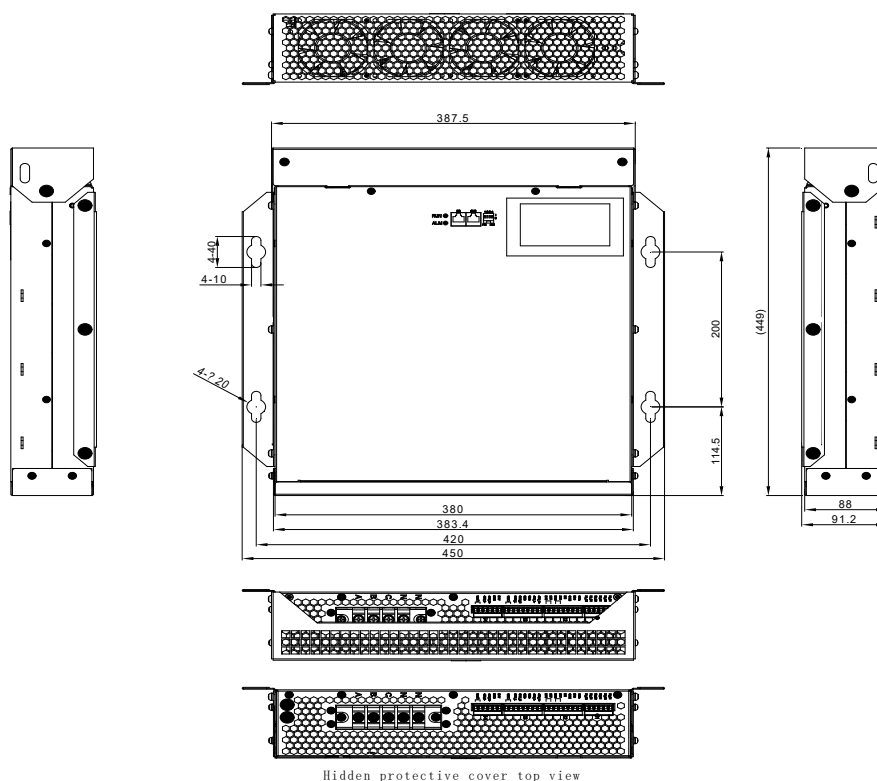


Figure 2.2 Installation dimension diagram of wall mounted 30kvar SVG module (unit: mm)

2.5 Mechanical Installation

When the SVG module is installed on the rack, it is fixed to the cabinet mounting column by hanging ears on both sides, as shown in Figure 2.3. The chassis width of the 30kvar SVG module is 2U. In addition, our company can provide full cabinet models. Please contact our engineers for details.

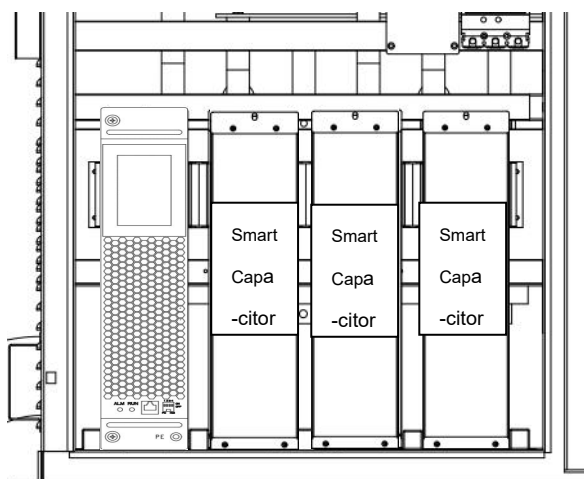


Figure 2.3 Installation diagram of 30kvar SVG module rack

Chapter 3 Electrical Installation

3.1 Power Cable

Terminal Symbol	Terminal Function Description	Current/A	Recommended cross-sectional Area of cable/mm ²	Suggested tightening torque(N•m)
A	A-phase input terminal	45	16	6
B	B-phase input terminal	45	16	6
C	C-phase input terminal	45	16	6
N	Neutral input terminal for three-phase four-wire/three-phase five-wire systems	45	16	6
PE	Safety grounding terminal (chassis)		16	6

Table 3.1 SVG Module Power Terminal Current and Cable Recommendation



Explanation:

1. Connect the input ground wire to the input ground terminal. (Note: Ground wire connections must comply with local and national regulations.)
2. Connect the AC input cable to the input terminals (A-B-C-N) of the SVG module. Pay attention to ensuring the correct phase sequence.
3. When routing the communication input cable, try to avoid the module's air outlet as much as possible to ensure that there are no obstructions within 20cm of the module's air outlet.
4. The connection of the ground wire must use the shortest wiring path.
5. When tightening the power cable terminals of the rack mounted SVG module, M6 bolts should be used (recommended tightening torque is 6N • m).

3.2 Port Information

3.2.1 Front Panel Port

Figure 3.1 shows the front panel signal ports. Among them, there are two rows of dialing codes located on the upper and lower sides of the dialing hole on the right. The dial code in the upper row is used to set a dedicated ID number for each SVG module during parallel power on. **Multiple SVG modules are not allowed to use the same ID number**, otherwise communication will not be possible. If the user needs to control the SVC capacitor, they can connect the RJ-45 network port marked with "SVC" to the RJ-45 network port of the SVC capacitor.

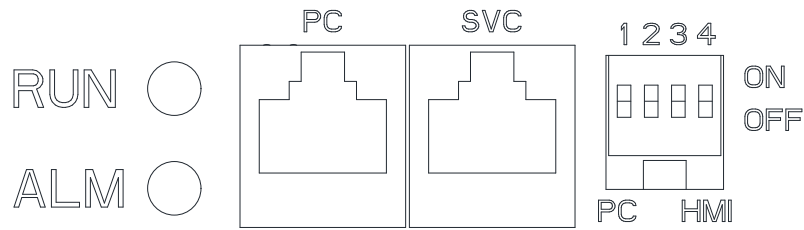


Figure 3.1 Front panel Signal Port

The maximum number of parallel connections allowed by the SVG module is 8. Here, the first three dials follow the rule of binary 421 to assign ID numbers to each SVG module. Among them, the first dial is the lowest bit, and the third dial is the highest bit.

Module ID	Dialing Combination	Instance
1	000	
2	001	
3	010	
4	011	
5	100	
6	101	
7	110	
8	111	

Table 3.2 Corresponding relationship between module ID number and dialing combination

There is a "PC/HMI" selection dial below the dial hole on the right side. At the factory, this dial code is set to "HMI" by default for communication between the SVG module and the small screen on the module. "PC" is developed and maintained by our company's personnel and is not open to users.

3.2.2 Rack Mounted SVG Port

The definition of signal ports is shown in Figure 3.2, and the explanations of each signal are shown in the table 3.2.

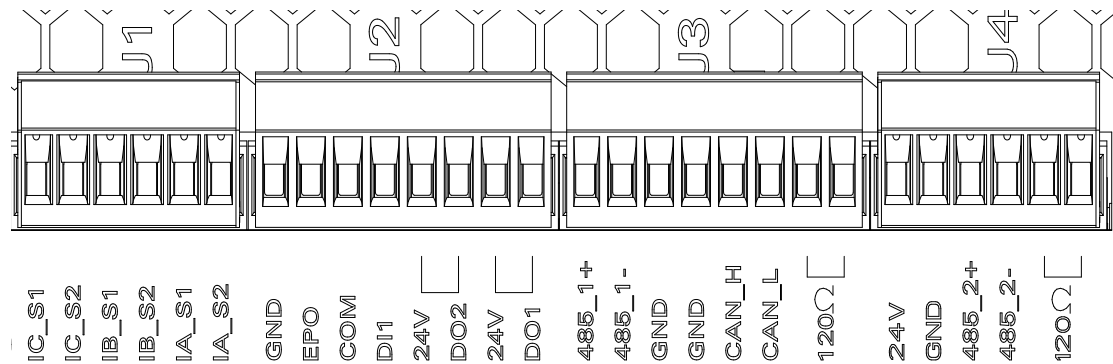


Figure 3.2 Rack mounted 30kvar SVG module signal port

Port Number	Pin Number	Channel Name	Functional annotations
J1	1	IC_S1	Connect S1 end of C-phase CT
	2	IC_S2	Connect S2 end of C-phase CT
	3	IB_S1	Connect S1 end of B-phase CT
	4	IB_S2	Connect S2 end of B-phase CT
	5	IA_S1	Connect S1 end of A-phase CT
	6	IA_S2	Connect S2 end of A-phase CT
J2	1	GND	Isolation site, electrically isolated from the mains
	2	EPO	emergency stop buttons
	3	COM	Isolation site, electrically isolated from the mains
	4	DI1	Power on signal input dry contact
	5	24V	Isolated 24V output terminal, electrically isolated from the mains, used to power the large screen and indicator lights
	6	DO2	Fault information
	7	24V	Isolated 24V output terminal, electrically isolated from the mains, used to power the large screen and indicator lights
	8	DO1	Operation information
J3	1	485_1+	485_1 communication channel, used for communication between SVG module and SVC capacitor
	2	485_1-	
	3	GND	Isolation site, electrically isolated from the mains
	4	GND	Isolation site, electrically isolated from the mains

	5	CAN_H	CAN communication channel, used for SVG module source side parallel communication
	6	CAN_L	
	7	120Ω	CAN communication matching resistor, please short circuit 7 and 8 when needed
	8		
J4	1	24V	Isolated 24V output terminal, electrically isolated from the mains, used to power the large screen and indicator lights
	2	GND	Isolation site, electrically isolated from the mains
	3	485_2+	485_2 communication channel, used for centralized monitoring of modules during parallel power distribution
	4	485_2-	
	5	120Ω	485_2 communication matching resistor, please short circuit 5 and 6 when needed
	6		

Table 3.3 Rack mounted 30kvar SVG module signal ports and their functions

3.3 The wiring method for CT lines

This section provides a detailed explanation of the potential issues users may encounter when wiring CT lines in practical application scenarios.

3.3.1 Phase sequence self-adaptation

In certain application scenarios, users may be unable to confirm the correct phase sequence of the three-phase power lines. In such cases, the "Phase sequence self-adaptation" feature of the SVG module needs to be used. The principle diagram is shown in Figure 3.4. If users need to enable the "Phase sequence self-adaptation" feature of the module, they need to check "Enable" in the parameter setting interface of the monitoring screen as shown in Figures 4.2 and 4.5. After clicking "Confirm Settings," the feature will take effect.

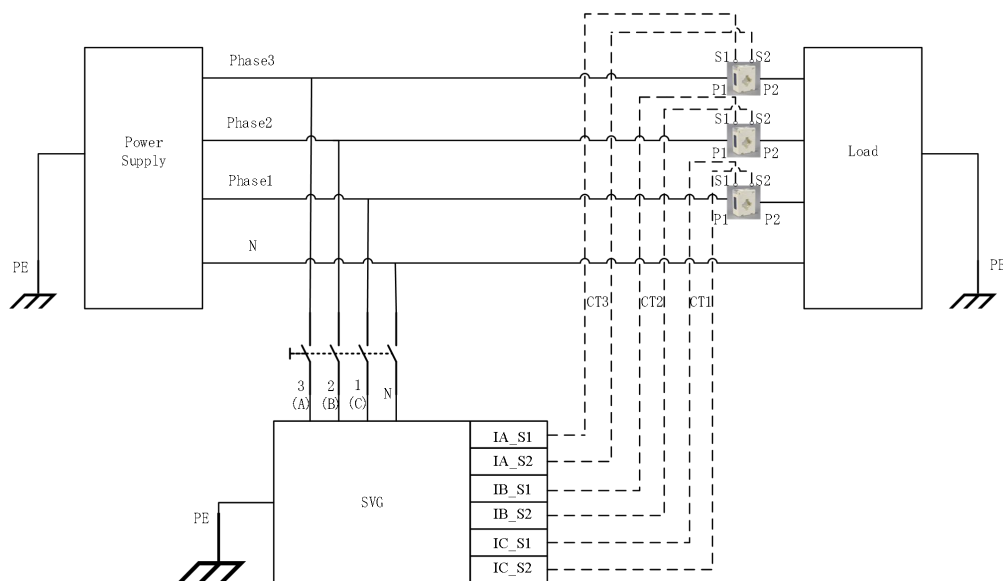


Figure 3.4: Schematic Diagram of Phase Sequence Self-adaptation Wiring Method

After enabling the "Phase sequence self-adaptation" feature, even if the specific phase of each line is unknown, as long as the power lines and CT lines are connected to the same phase on the SVG module respectively, the SVG module will function correctly.

3.3.2 Multi-module Parallel CT Cascading

When users operate multiple SVG modules in parallel, they should note that the CT lines between the modules are cascaded in series. The principle diagram is shown in Figure 3.5. The wiring ports are detailed in Table 3.3.

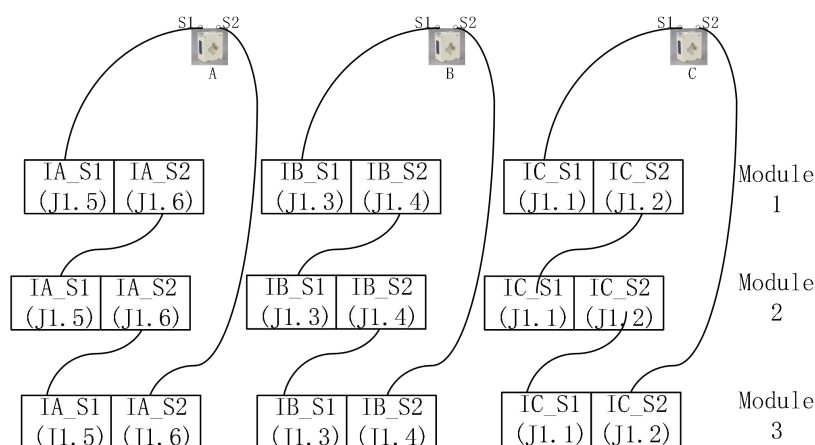


Figure 3.5: Principle Diagram of CT Cascading When Multiple SVG Modules are Operated in Parallel

The maximum current that the CT lines can carry is 5 amperes. Please use appropriate wiring material for your CT lines accordingly.

3.4 Signal Line Wiring Method

3.4.1 Wiring Method for SVG Module and Monitoring Screen

The monitoring screen is powered by the $\pm 24V$ port of the SVG module. When multiple modules are operated in parallel, only the $\pm 24V$ port of one module should be used to power the monitoring screen.

Warning: Please do not connect the 24V outputs of multiple modules in parallel!

The SVG modules communicate with the monitoring screen via channel 485_2. When multiple modules are paralleled, the cascade configuration of the 485_2 ports of the SVG module is parallel, as shown in figure 3.6. Refer to table 3.3 for the wiring ports

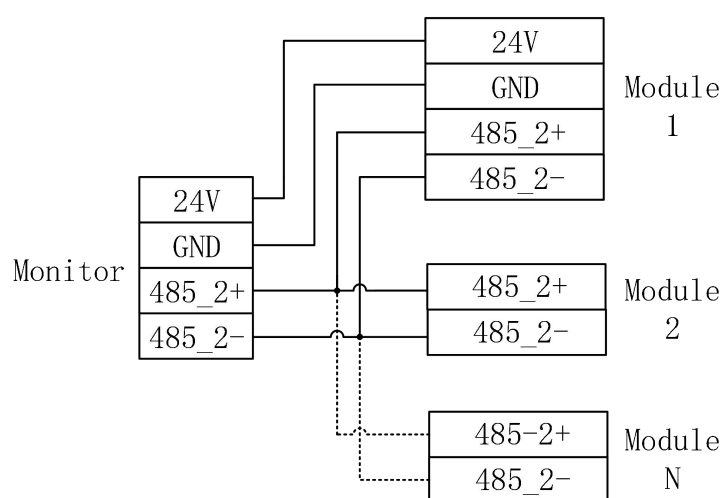


Figure 3.6 Schematic diagram of the wiring between modules and the monitoring screen.

Figure 3.6 is for illustration purposes only. When wiring in parallel, any $\pm 24V$ output port of a module can be used to power the monitoring screen. For the 485_2 communication channel, please use twisted pair wiring.

3.4.2 The wiring method for connecting the SVG module with indicator lights and emergency stop buttons.

Each SVG module provides a set of wiring ports for operation indicator lights and fault indicator lights. **When multiple modules are in parallel, do not cascade the indicator lights of multiple SVG modules.** If conditions allow, a separate set of operation and fault indicator lights should be provided for each module. **The voltage level of the indicator lights should be selected as 24VDC, and attention should be paid to distinguishing between the anode and cathode of the indicator lights during wiring.** The schematic diagram of the wiring principle is shown in Figures 3.7 and 3.8. Refer to Table 3.3 for wiring ports.

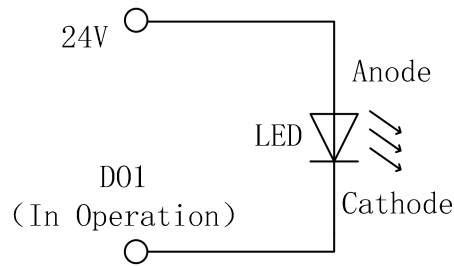


Figure 3.7 Schematic diagram of the wiring method for operation indicator lights.

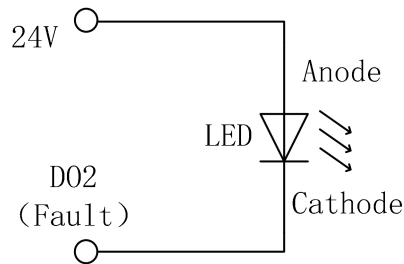


Figure 3.8 Schematic diagram of the wiring method for fault indicator lights.

Each SVG module provides a set of wiring ports for emergency stop buttons (EPO). When multiple modules are in parallel, the EPO normally open terminals of each SVG module can be cascaded. The cascading method is parallel connection, as illustrated in Figure 3.9.

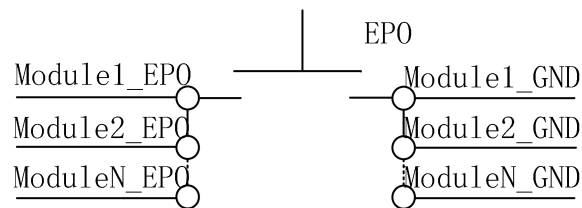


Figure 3.9 Schematic diagram of the wiring method for emergency stop buttons in multi-module parallel operation.

3.4.3 Wiring method for CAN bus.

When the SVG modules are wired in source-side parallel operation, communication between each module requires the use of the CAN bus. The cascading method for the CAN communication channel ports is parallel connection, as illustrated in Figure 3.10.

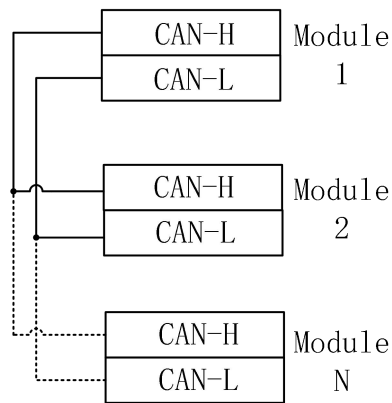


Figure 3.10 Schematic diagram of the wiring method for source-side multi-module parallel operation CAN communication channels.

Please use twisted pair wiring for the CAN communication channels.

3.5 SVG Wiring Method

Figures 3.4 to 3.7 show the wiring diagram of the SVG module. The connection method of the power line and CT line in the following figure is taken as an example for phase A. The solid line represents the power line, the wide dashed line represents the CT line, and the thin dashed line represents the signal line.

The signal ports of the rack mounted SVG are used in the following figure to demonstrate the connection relationship.

3.5.1 SVG Single Machine Distribution

There are two wiring methods for SVG's single machine power distribution. Figure 3.11 shows the wiring diagram of CT connected to the load side during SVG single machine distribution. Our company suggests that users try to connect the CT to the load side when wiring. If it is inconvenient to wire on the load side, the CT can also be connected to the power side.

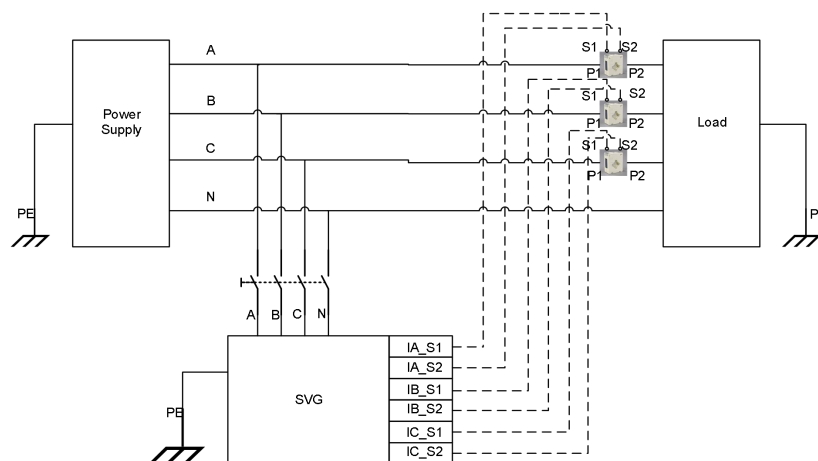


Figure 3.11 SVG Single Machine Power Distribution Diagram (CT Connected to Load Side)

Figure 3.12 shows the wiring diagram of CT connected to the power supply side during SVG single machine power distribution.

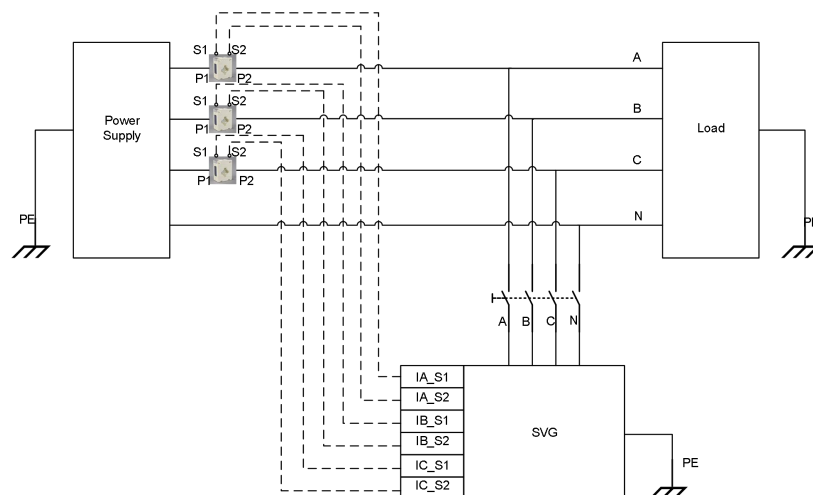


Figure 3.12 SVG Single Machine Power Distribution Diagram (CT Connected to Power Supply Side)

3.5.2 SVG Parallel Distribution

There are two wiring methods for SVG's parallel power distribution. During parallel power distribution, the SVG module communicates with the monitoring screen using the 485_2 channel, and the maximum number of SVG modules integrated into the monitoring screen is 8. Users can short-circuit the 485_2 matching resistor of the first and last SVG modules to improve communication quality, as detailed in section 3.2.2.

Figure 3.13 shows the wiring diagram of CT connected to the load side during SVG parallel power distribution. Our company suggests that users try to connect the CT to the load side when wiring. If it is inconvenient to wire on the load side, the CT can also be connected to the power side.

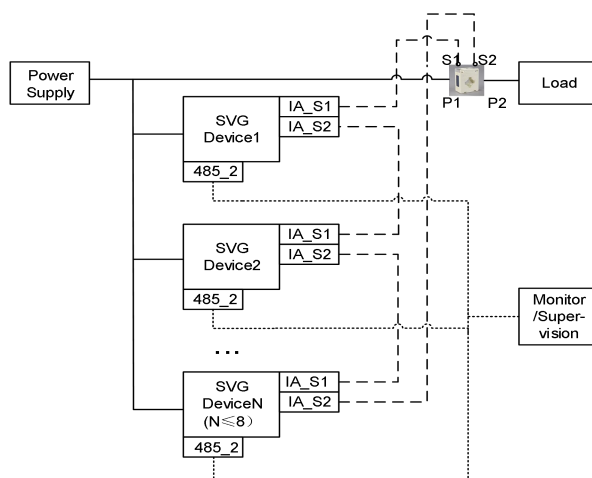


Figure 3.13 SVG Parallel Power Distribution Diagram (CT Connected to Load Side)

Figure 3.14 shows the wiring diagram of CT connected to the power supply side during SVG parallel power distribution. It should be noted that this wiring method requires a CAN line connection between modules. Users can short-circuit the CAN matching resistors of the first and last SVG modules to improve communication quality, as detailed in section 3.2.2.

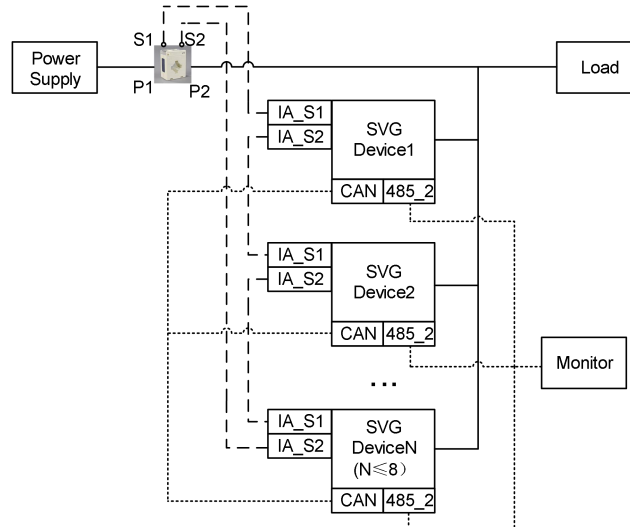


Figure 3.14 Schematic diagram of SVG parallel power distribution (CT connected to power supply side).

3.6 SVGC Wiring Method

Figures 3.15 to 3.18 show the wiring diagram of the SVGC module composed of the SVG module and the SVC capacitor. It should be noted that regardless of which wiring method is used, the number of SVC capacitors integrated into the grid cannot more than 16. The connection method of the power line and CT line in the following figure is taken as an example for phase A. The solid line represents the power line, the wide dashed line represents the CT line, and the thin dashed line represents the signal line.

The signal ports of the rack mounted SVG are used in the following figure to demonstrate the connection relationship.

3.6.1 SVGC Single Machine Distribution

Figure 3.15 shows the wiring diagram of CT connected to the load side during SVGC single machine power distribution. In this wiring method, please connect the CT between SVG and SVC, and do not connect the CT between SVC capacitor and load. If wiring is inconvenient, the CT can also be connected to the power supply side.

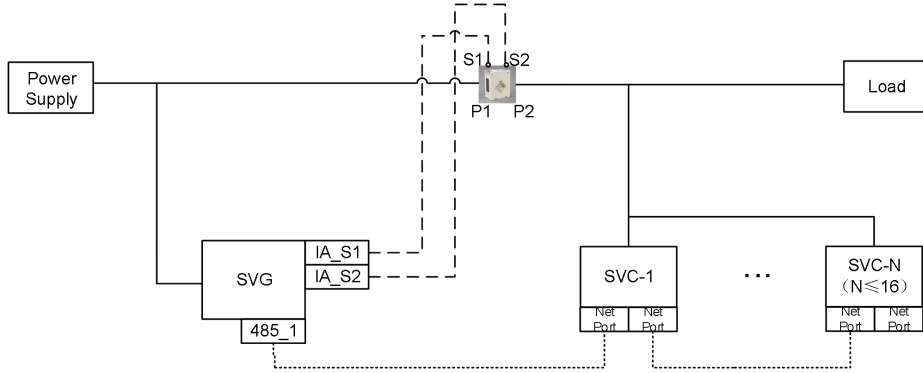


Figure 3.15 Schematic diagram of SVGC single machine power distribution (CT connected between SVG and SVC)

Figure 3.16 shows the wiring diagram of the CT connected to the power supply side during SVGC single machine power distribution.

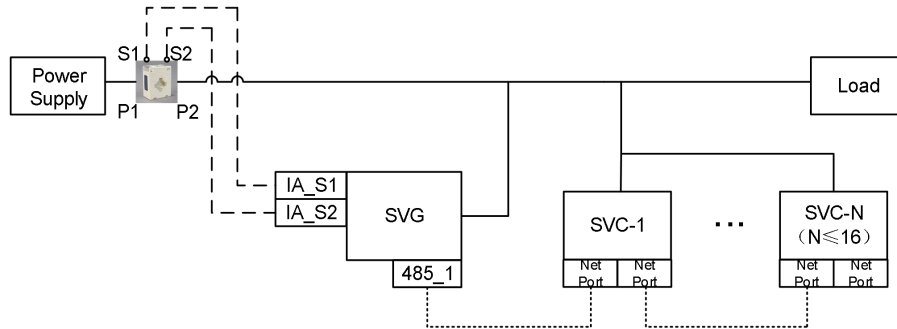


Figure 3.16 Schematic diagram of SVGC single machine power distribution (CT connected to power supply side)

3.6.2 SVGC Parallel Distribution

In the case of SVGC parallel power distribution, it is necessary to note that the compensation capacitor only communicates with the SVG module with ID number 1 on the 485_1 channel. Figure 3.17 shows the wiring diagram of CT connected to the load side during SVGC parallel power distribution. In this wiring method, please connect the CT between SVG and SVC, and do not connect the CT between SVC capacitor and load. If wiring is inconvenient, the CT can also be connected to the power supply side. Users can short-circuit the 485_2 matching resistor of the first and last SVG modules to improve communication quality, as detailed in section 3.2.2.

Chapter 4 Power on Operation

Instructions

4.1 SVG Module Power on/off

4.1.1 Startup Steps

This startup step is applicable to turning on the SVG module when it is in a fully power-off state. The operation steps are as follows:

1. Tighten the outer chassis of the SVG module and connect the power and signal cables, as described in Chapter 2.

Warning: When performing the startup steps of the SVG module, the output terminals of the SVG module may already be live. If there is a load connected to the output terminal of the SVG module, please confirm with the user whether the power supply to the load is safe. If the load is not ready to receive power, be sure to safely isolate the load from the output terminals of the SVG module.

2. Close the isolation switch between the mains electricity and SVG module

The front panel displays fault (red) and running (green) indicator lights. If the SVG module starts up normally, the green indicator light will light up; If there is a fault in the SVG module, the fault indicator light will display red, and the SVG module cannot start up normally.

4.1.2 Shutdown Steps

There are two ways to shut down the system. One is to directly disconnect the isolation switch between the SVG module and the mains . This is a complete shutdown mode, which means that after shutdown, the system is not live and can be repaired.

Another way is to use the settings on the HMI control panel to shut down. This shutdown mode only shuts down the operation of power components in the system, and the machine is in standby mode.

4.1.3 Manual/Automatic Startup

After SVG is power-on, it is necessary to click the power button on the screen to achieve power on compensation. After turning on, the running indicator light will light up.

4.2 Front Panel of Small Screen Display and Settings

Turn "PC/HMI" to "HMI", and after power-on, the small screen will light up and enter the "initial interface". To enter the "Parameter Settings" interface, you need to enter a password. The initial password is "123456", as shown in Figure 4.1.

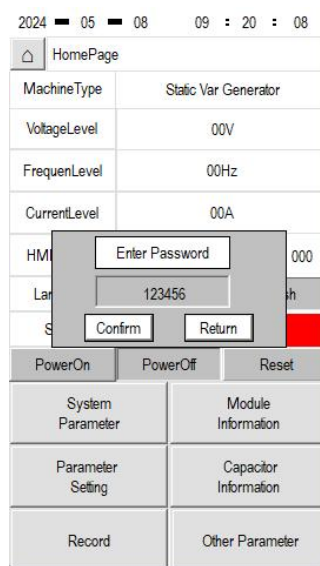


Figure 4.1 Small screen entering parameter setting interface, entering password

The parameter setting interface is shown in Figure 4.2. After setting the parameters, you need to click "Confirm Settings" at the bottom of the page to take effect.

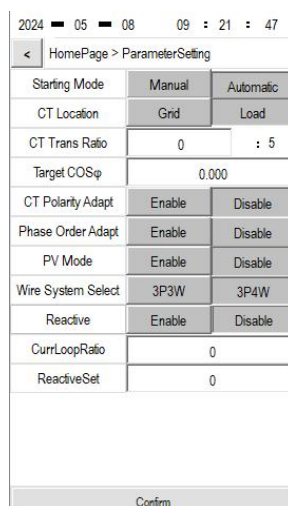


Figure 4.2 Small screen parameter setting interface

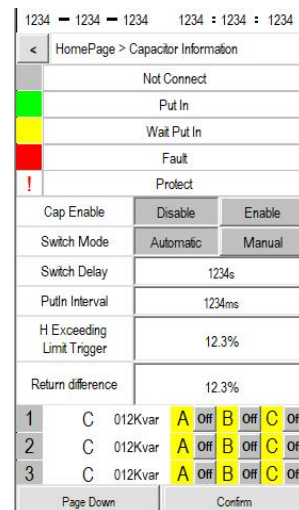


Figure 4.3 SVC capacitance information interface

If the user purchases a product for SVGC modules, the small screen will also display additional capacitance information, as shown in Figure 4.3. After setting the capacitor switching method, users need to click "Confirm Settings" at the bottom of the page to take effect. In order to protect the SVC capacitor, the settings made by the user will not take effect during the capacitor switching delay time.

4.3 Centralized Monitoring of Large Screen Display and Settings

The monitoring screen will light up after power on and enter the initial interface. The information in the upper left corner will display the total capacity of the SVG modules integrated into the grid. The monitoring screen supports up to 8 SVG modules in parallel. In the "Module Information" interface, you can view the specific information of each SVG module.

To enter the parameter setting interface, you need to enter a password, as shown in Figure 4.4. The initial password is "123456".

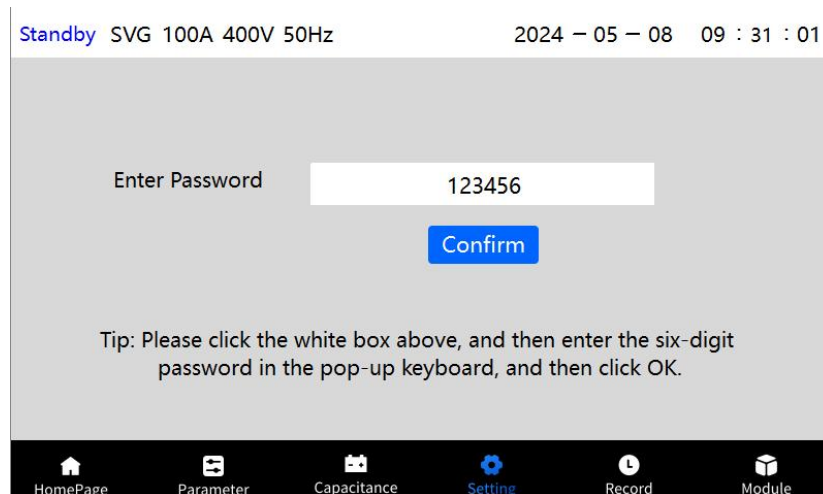


Figure 4.4 Parameter Setting Input Password

The parameter setting interface consists of two pages, as shown in Figures 4.5 to 4.6. Click the left and right arrows in the upper right corner to select and view the parameter settings of one of the SVG modules. It is not allowed for two SVG modules to share the same ID number. For details on setting the SVG module ID number, please refer to section 3.2.1.

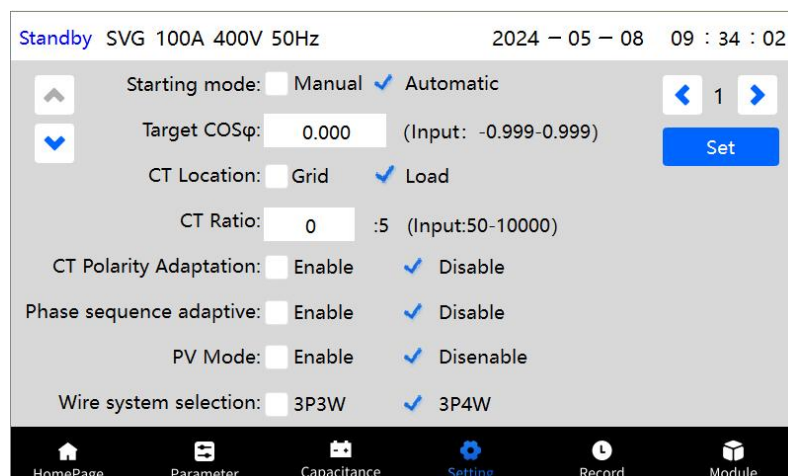


Figure 4.5 First page of parameter setting interface

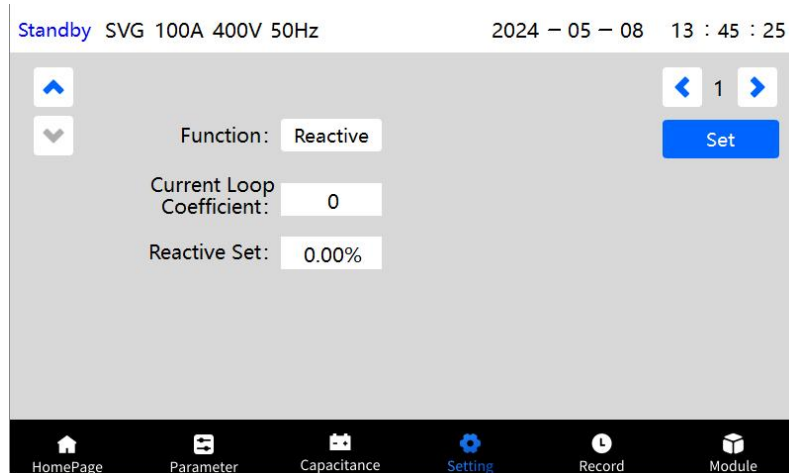


Figure 4.6 Parameter Setting Interface Page 2

After completing the settings, you need to click "Confirm Settings" on the right side to take effect.

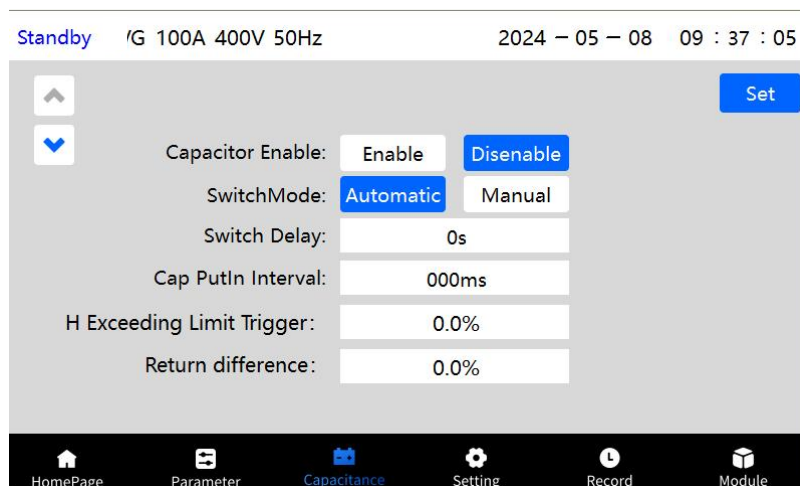


Figure 4.7 Capacitance Information Interface

If the user purchases the product for SVGC modules, the small screen will also display additional capacitance information, as shown in Figure 4.7. After setting the capacitor switching method, users need to click "Confirm Settings" on the right side of the page to take effect. In order to protect the SVC capacitor, the settings made by the user will not take effect during the capacitor switching delay time.



Figure 4.8 Capacitor Switching Control Interface 1

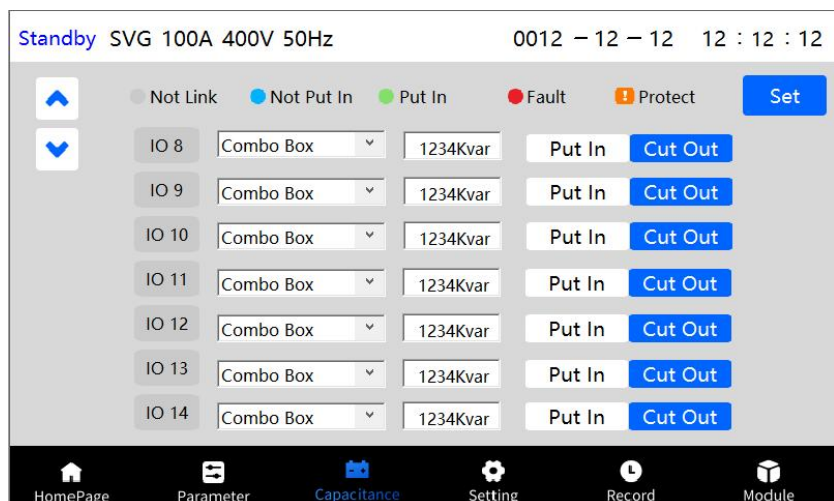


Figure 4.9 Capacitor Switching Control Interface 2

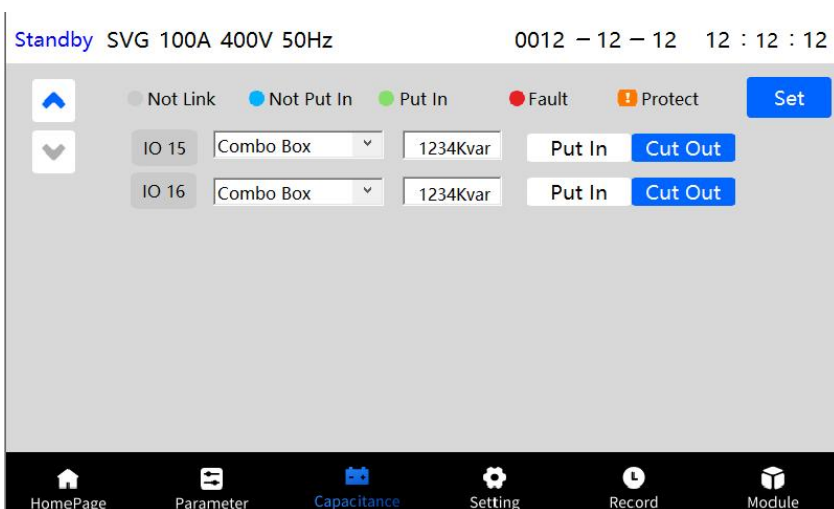


Figure 4.10 Capacitor Switching Control Interface 3

Chapter 5 Daily Maintenance and Upkeep

5.1 Safety Precautions

1. The SVG module operates with strong electricity. For safety, maintenance personnel should not touch any live terminals of the module during operation, and ensure that the grounding terminal of the module is reliably grounded.
2. Due to the large amount of capacitors in the SVG module busbar, maintenance and repair work must be carried out after 15 minutes of power off, and only after the discharge of the capacitors is completed.

5.2 Daily Inspection

Please do not open the SVG module while it is running or power on. Users should visually inspect the SVG module for any abnormalities from the outside, and usually perform the following checks: ① Whether the display screen data meets the requirements;

- ② Is the display screen showing a malfunction;
- ③ Is there any abnormal sound, vibration, or odor;
- ④ There are no signs of overheating or abnormal phenomena such as discoloration.

Following safety precautions, the module undergoes regular inspections after being disconnected from the power grid. The periodic inspection items are shown in Table 5.1

Category	Check Item	Remarks
Environment	Temperature, humidity, presence of metal dust or corrosive gases	
Electrical connections	Damage:Is there any damage to the cables and terminals	
	Reliably Connected check :Is the main circuit wiring, grounding wire, CT wiring, communication wiring, etc reliably connected.	
Module heat dissipation	Blockage:Is there any blockage at the air duct	

Table 5.1 Regular Inspection Items Table

5.3 Fault Information

Users can see the fault information of the SVG module in the "Current Record" and "History" columns. **The meaning of "fault information" is** that the current problems faced by the SVG module will affect the normal function of the SVG module. The SVG module will automatically

shut down or cannot be power on. Until the content of the fault information is resolved, the user cannot manually turn on the SVG.

Display information content	Specific situation	Recovery conditions
Fan abnormality	At least one fan has malfunctioned	After the fault is resolved, it will automatically recover
Bus voltage undervoltage	After successful soft start, the voltage of the power bus is lower than 80% of the rated voltage of the bus	After the fault is resolved over 1 minutes, it will automatically recover
Overload timeout	Current overload	After the fault is resolved over 5 minutes, it will automatically recover (This fault needs to be manually cleared if reported three times within 30 minutes)
Abnormal grid voltage	Including one or more of the following situations: ① The grid voltage over $220V \pm 15\%$; ② Input voltage power failure; ③ Phase lock failure	After the fault is resolved, it will automatically recover
Soft start failed	During the soft start process, the positive and negative bus voltages cannot reach 1.1 times the effective value of the C-phase grid voltage	After the fault is resolved, it will automatically recover (This fault needs to be manually cleared if reported three times within 30 minutes)
Abnormal input voltage frequency	For 50Hz machines, the grid frequency beyond the range of $50Hz \pm 3Hz$; For 60Hz machines, the grid frequency beyond the range of $60Hz \pm 3Hz$	After the fault is resolved, it will automatically recover
Input voltage phase sequence reverse	Input voltage phase sequence reversed	After the fault is resolved, it will automatically recover
Bus voltage overvoltage	If the DC bus voltage is too high, the relay will be disconnected and the IGBT will be blocked	After the fault is resolved over 5 minutes, it will automatically recover
Auxiliary power supply failure	Internal auxiliary power board of SVG module loses power	After the fault is resolved, it will automatically recover
Input missing zero line	N-line open circuit	After the fault is resolved, it will automatically recover
Relay open circuit fault or fuse broken	Relay or fuse open circuit; Or the relay cannot be properly engaged	After the fault is resolved, it will automatically recover

Relay short circuit fault	The relay cannot be disconnected normally	After the fault is resolved, it will automatically recover (This fault needs to be manually cleared if reported three times within 30 minutes)
IGBT over temperature	IGBT temperature reaches 90 °C	After the temperature drops to 80 °C, it will automatically recover. But if the fan is abnormal at this time, it cannot be recovered
Emergency shutdown	Forcefully shut down the SVG module through an external relay	Manual Clearing
Abnormal output current	The actual output current differs from the bridge arm output current by 20% of the rated current	After the fault is resolved, it will automatically recover
ambient temperature too high	The ambient temperature over 55 °C	Automatically recover when the ambient temperature drops to 50 °C or below

Table 5.2 Fault Information Table