ONESTO®

STATIC VAR GENERATOR

10kVar/15kVar/20kVar

User Manual

Contents

Preface

Modular SVG products use state-of-the-art digital signal processors as controllers, IGBT semiconductors as switching devices, and industry-advanced three-level topology to obtain the best compensation effect.

Matters needing attention in unpacking inspection

When unpacking, please carefully confirm:
Whether the product is damaged;
Whether the rating of the nameplate of this machine is consistent with your ordering requirements;
Our company has strictly inspected the manufacturing and packaging of products. If you find some omissions, please contact our company or suppliers to solve them as soon as possible.

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

1 Security Information

1.1 Security Definition

Failure to operate as required may cause death or serious injury.

Where moderate or minor injury or material damage may be caused due to failure to operate as required.

1.2 Installation Considerations

It is strictly forbidden to place combustibles near SVG equipment, otherwise there is a danger of fire;
It is strictly forbidden to install SVG equipment in an environment containing explosive gas, otherwise there is a danger of explosion;
Wiring must be carried out by a professionally qualified person, otherwise there is a risk of electric shock;
Confirm that the input power supply is completely disconnected before wiring operation, otherwise there is a danger of electric shock; After power-on, it is forbidden to touch other parts of SVG equipment except the operation panel; The grounding terminal of SVG equipment must be grounded reliably. Poor grounding will easily lead to abnormal operation and the danger of electric shock;
Maintenance operation should be carried out after disconnecting the power supply for 15 minutes, otherwise there is a danger of electric shock;
The exposed parts of cable terminals for main circuit wiring must be insulated to avoid potential safety hazards.

When handling, do not pull SVG equipment by hand through the front panel to avoid personal injury or damage to objects;
Do not drop screws, gaskets and metal foreign bodies into SVG equipment, otherwise there is a risk of fire and damage to the device;
If SVG equipment is damaged or parts are incomplete, please do not install and operate, otherwise there is a risk of fire and personal injury;
The main circuit terminal must be firmly connected to the lead nose.

1.3 Precautions for Use

Error installation
When SVG is installed incorrectly (for example, the output transformer is connected in reverse), it will increase the reactive power content in the power system and reduce the power factor.

The input voltage value exceeds the standard
Please use SVG equipment within the rated voltage range of SVG equipment. Under special circumstances, please use booster or step-down devices.

Lightning impact protection
SVG equipment is equipped with lightning strike overcurrent protection device. After correct wiring according to the instruction manual, it has certain self-protection ability for induced lightning.

Altitude and derating use
In areas over 1500 meters above sea level, considering the reduction of dielectric strength and the weakening of air cooling effect, it is necessary to use derating.

1.4 Scrap Precautions

When scrapping SVG equipment, please note:
The electrolytic capacitor of the main circuit and the electrolytic capacitor on the printed circuit board may explode during incineration;
Toxic gases will be produced when plastic parts are burned.
Please treat it as industrial waste.

2 Brief Introduction of Product Specifications

2.1 Technical Specifications

Tab.2-1 Technical Specifications of Products

Project		Project description
Electrical specification	Input line voltage	380V ± 15%
	Phase number	3P3W/3P4W
	Capacity	10kVar/15kVar/20kVar
	Frequency	50/60 ± 5Hz (settable)
	Response time	< 10ms
	Power factor correction	-1 to 1 adjustable
	Parallel operation	Up to 8 modules can be connected inparallel
	Module power consumption	< 2.5kW
	Efficiency	Up to 97.5%
	CT ratio range	50:5~10000:5
Communication interface	Dry contact	EPO/DI/DO
	Communication	RS485
Environmental specification	Place of use	Indoor, free from direct sunlight, dust, corrosive, combustible gas, oilmist, water vapor, dripping water orsalt,etc.
	Working altitude	When it is less than1500 meters and higher than 1500 meters, it is used for derating
	Storage temperature	-45 ° C ~ + 70 ° C
	Operating temperature	-35 ° C ~ + 55 ° C (Derating above 45°C)
	Humidity	Less than 95%RH, no condensation of water droplets
	Vibration	Less than 5.9m/se² (0.6g)
Enclosure	Protection level	IP20
	Color	PANTONE 2035C
	Dimensions	See the following section (according to model)
	Net weight	7.3 kg
	Cooling mode	Intelligent air cooling

2.2 Module Outline Dimensions

The overall dimensions of 10kVar/15kVar/20kVar SVG module are shown in the following figure, which is a wall-mounted installation mode.

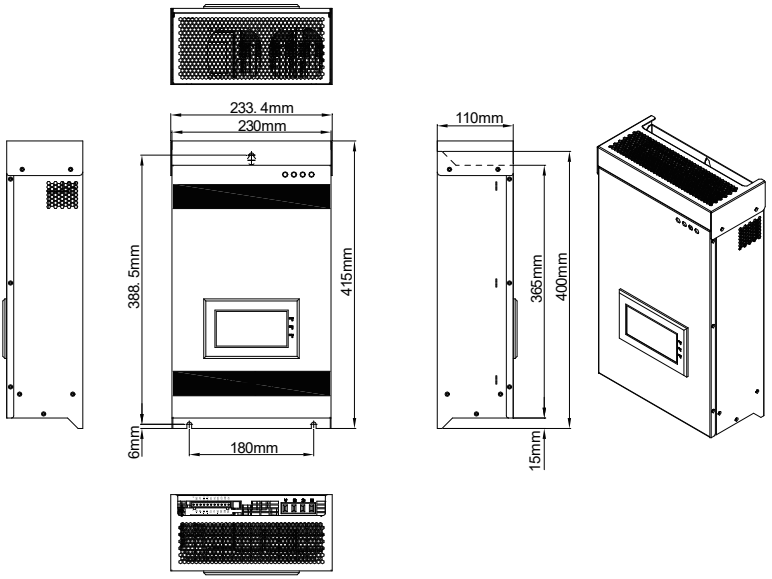


Fig.2-1 Outline Dimension Drawing of 10kVar/15kVar/20kVar SVG Module

2.3 Module Port Type and Configuration

The distribution port of 10kVar/15kVar/20kVar SVG module is divided into power port and signal port, as shown in Fig.2-2.

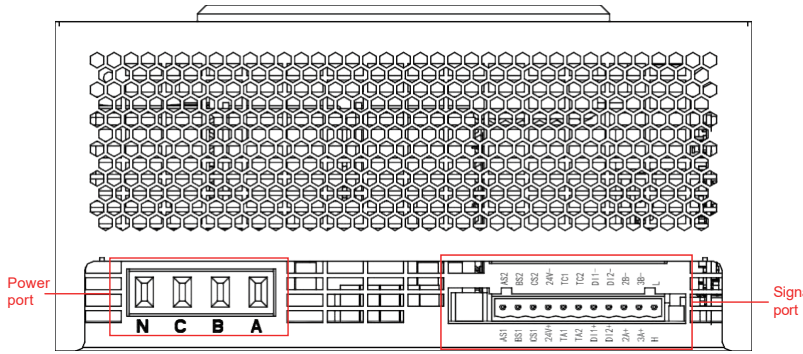


Fig.2-2 Port Configuration Diagram

Tab.2-2 Power Port Description

Terminal symbol	Terminal function description
A	Phase
B	Phase
C	Phase
N	Three-phase four-wire neutral input terminal

The signal ports are shown in Fig.2-3, and the signal description of each port is shown in Tab.2-3.

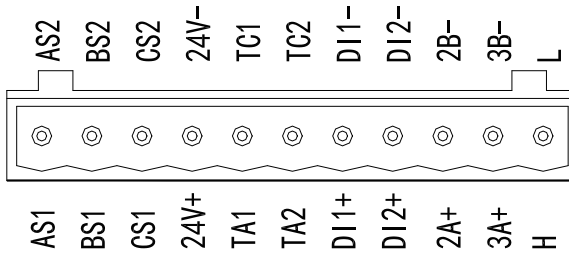


Fig.2-3 Signal Port Configuration Diagram

Tab.2-3 Description of CT and Control Terminal

AS1	AS2	Transformer signal access terminal Phase A: AS1/AS2; Phase B: BS1/BS2 Phase C: CS1/CS2
BS1	BS2	
CS1	CS2	
24V +	24V-	DC24V output
TA1	TC1	Two digital output TA1/TC1; TA2/TC2
TA2	TC2	
DI1 +	DI1-	Two-way digital input DI1+/DI1-; DI2+/DI2-
DI2 +	DI2-	
2A +	2B-	Two-way 485 communication interface 2A+/2B-; External screen 3A +/3B–
3A +	3B-	
H	L	CAN parallel machine

3 Installation and Distribution

3.1 Mechanical Installation

The module is a wall-mounted model, which needs to be fixed in a hard wall or cabinet through upper and lower edges.

3.2 Electrical Installation

When SVG module is distributed on a single machine, the connection mode of three-phase power line, N line, PE line and external CT line is shown in Fig.3-1.

NOTE:

The P1 end of CT faces the power supply side and the P2 end faces the load side.

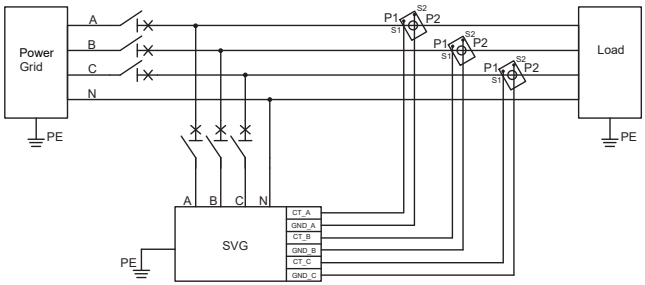


Fig.3-1 Module Distribution Wiring Diagram

3.3 Operation of HMI Panel

SVG module contains a 4.3 inch LCD panel as user interface, from which user can set parameters or read grid, load and output information etc.
Main page of LCD is shown in Fig.3-2.
It can be divided into 3 areas. The module model, time, and operating status are displayed in area 1. Main parameters of grid and SVG itself are displayed in area 2. Buttons in area 3 are for switching to other pages.

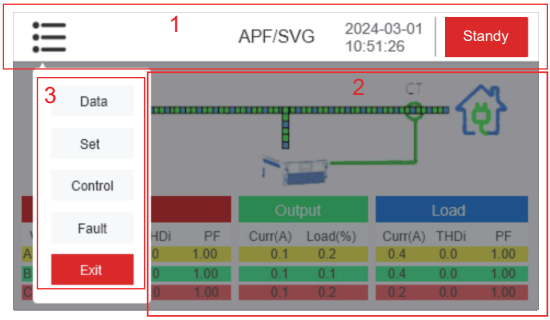


Fig.3-2 Main page of LCD

NOTE:

1. For simple use of one-set SVG, the only parameter needed to be set is CT ratio in Setting page.
2. If Auto mode is on, SVG would start automatically when power on.
3. When press Start button, number beside it will increase every second, and SVG will run after 30 seconds, RUN LED will be light up meanwhile.
4. Use Cure Para button to save parameter i.e. CT ratio.

3.3.1 Parameters Displayed in LCD

All parameters displayed in LCD are listed in Tab.3-1.

Tab.3-1 Parameters and definition

Page	Parameter	Definition	Type
Main	Status	Ready, Run, Fault	R
	Login	If password is needed, input 1111	B
Data	Rate Voltage	Rate voltage of SVG	R
	Capacity	Nominal output current of SVG	R
	Phase A/B/C Volt	AC voltage of phase A B C	R
	DC bus Volt	Internal DC bus voltage of SVG	R
	IGBT Temp	Max. temperature of IGBT in SVG	R
Settings	Start	Manually run the SVG	B
	Stop	Manually stop the SVG	B
	MODBUS Addr	Set MODBUS address in multi-set mode	W
	CT Ratio	Set the CT Ratio uses in load side	W
	Sys Capacity	Set the whole SVG capacity in multi-set mode	W
	Cure Para	Save changed parameter	B
Fault	Fault ID	All fault information are readable, if SVG is tripped please contact the supplier.	R
About	Model	SVG Model	R
	DSP/FPGA Ver.	Internal DSP/FPGA software version of SVG	R

NOTE:

R: Read; W: Write; B: Butt

4 Test run of a single machine

4.1 Check again

Please check the following again before the first power on:

1. Whether the SVG equipment is firmly installed on the cabinet (wall) installation column;
2. A / B / C / N wiring is correct, whether there is leakage or mixed connection phenomenon;
3. A / B / C / N / PE wiring is firm, with hand shaking without displacement or loosening, and PE wiring should be firmly grounded;
4. The distance should be maintained, phase spacing not less than 15mm;
5. Use the multimeter to detect whether there is A short circuit between the equipment A, B, C and N;
6. Check whether the CT wiring is correct and whether the wiring at the terminal row corresponds one to one;
7. Check the installation position and installation situation of the current transformer;
8. Whether the disconnecting switch is installed correctly and is disconnected;
9. The SVG installation environment meets the contents described.
10. Check whether the SVG phase order is consistent with that of the power grid, and the input voltage should be the positive phase order (ABCN).

4.2 Power on the SVG

After the above recheck, close the disconnecting switch between the power supply / grid and SVG, the module 4.3-inch LCD screen is lit and enter the home page, the power / POWER indicator of the module is lit and always on. At this time, the module is in the "standby" state. Click "Login" to directly enter the data page and view the power grid voltage parameter data,as shown in Fig.4-1.

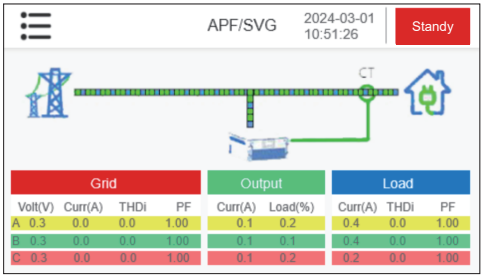


Fig.4-1 First-page interface

Go to the Module page to see whether the CT change ratio and CT installation position is correct,as shown in Fig.4-2.

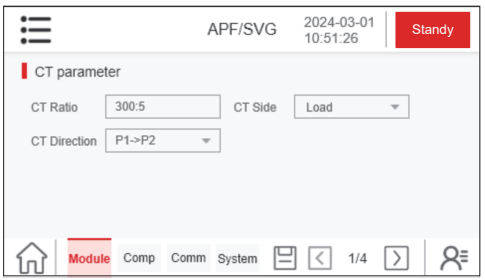


Fig.4-2 Setting up the operation interface

After ensuring the above error, click "standby" (startup time is 30s), and the module starts running. The RUN indicator is on and constantly illuminated with the POWER indicator.

Fig.4-3 Operation interface of the switch machine

4.3 SVG shutdown

SVG shutdown generally has two steps: Shutdown and power off.

1. Shutdown

That is, through the module 4.3 "LCD LCD screen (optional) or external 7" large screen, click "shutdown" to enter the standby state, the running / RUN indicator is off, but the power supply / POWER indicator is always on. This method only makes the module into the low power standby state, and the system bus, auxiliary power supply and main circuit terminal are still charged.

2. Power failure

After the equipment is shut down and enters the standby state, then disconnect the isolation switch between the SVG equipment and the power supply / grid, so that the SVG equipment can stop running and completely power off. When the module needs to be wired or maintained, it should be under power off and shutdown.

* Do not directly power off the equipment in operation, which will cause some damage to the equipment!

4.4 Manual / automatic operation

SVG devices are started in default manual mode. The manual mode should manually log in the user interface and click on. The automatic mode can automatically turn up and run after the module is powered on. Users can switch to automatic mode in standby state according to actual requirements.

5 A 4.3-inch screen menu

The front panel of the module will have a 4.3-inch LCD that provides a user-friendly user interface.

1. Users can view the status and information of the power grid, load and SVG module through the 4.3-inch screen;
2. Users can conduct all operation commands in the menu of the module through the menu button provided on the page;
3. It is beneficial to monitor, view and eliminate the SVG module faults;
4. The SVG system version and the monitoring software system version can be displayed;
5. Click the "Login" key to enter the user interface, without entering the password, convenient and fast.

5.1 LCD open-home page

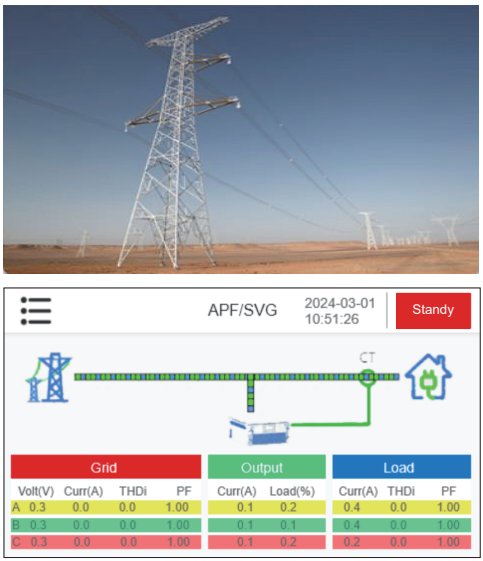
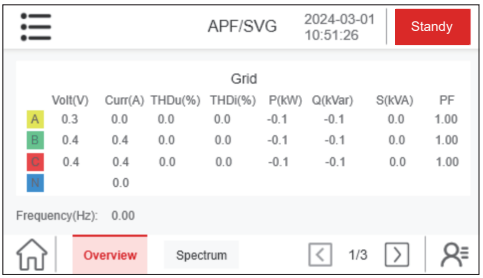


Fig.5-1 Home page

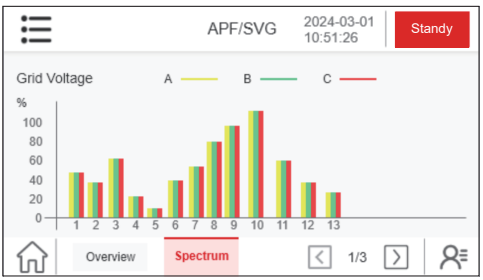
- After the screen is powered on, the screen will automatically light up, and the home page will automatically enter the home after the boot page, without secondary operation;
- The data of power grid, load and SVG current can be viewed on the home page;
- The model and status of the SVG device (standby / running) can be viewed at any interface on the screen.

5.2 Data page

5.2.1 Power grid data



- On this page, you can view the data of the grid: grid voltage value, grid voltage histogram and voltage distortion rate THDu, grid current, grid current histogram and current distortion rate THDi and you can also view the power factors, active power, reactive power, apparent power and other values of the power grid.



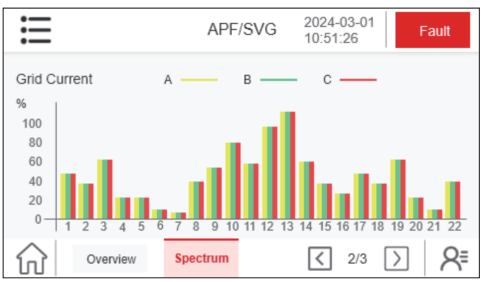
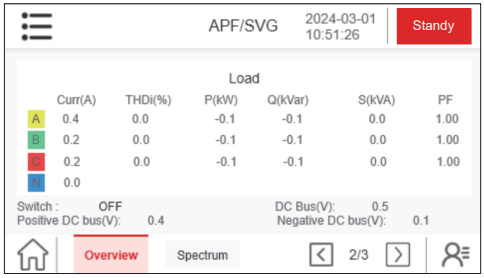


Fig.5-2 Power Grid-Data page

5.2.2 Load data



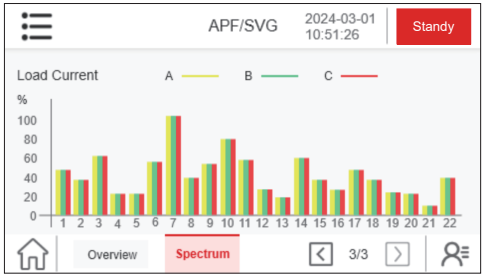
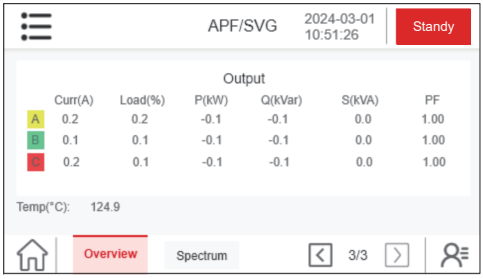


Fig.5-3 Load Data page

The load data page contains two pages:

- On this page, the load three-phase current, the current distortion rate THDi and the load current can be checked in the bar chart and you can also view the power factors, active power, reactive power, and apparent power of the load in three phases.

5.2.3 SVG data



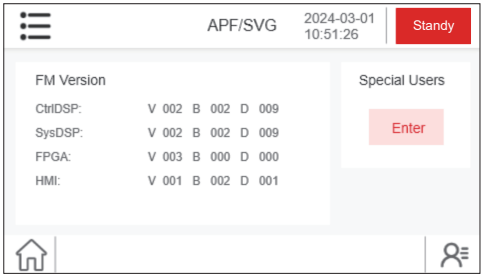
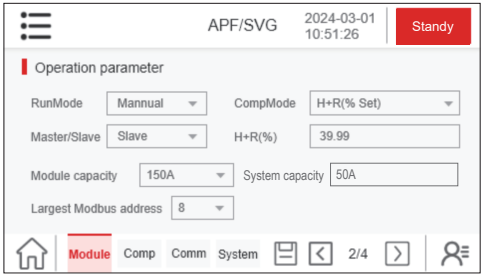


Fig.5-4 SVG-Data Page

The SVG data page contains two pages:

- On the first page, you can view the data of the SVG equipment: output current, PF and system temperature;
- On the second page, you can view the model, main DSP version, secondary DSP version, FPG A version, and HMI version of the SVG device.

5.2.4 Operation and grid parameter



- **Startup Mode:** Available as "Manual"/" Automatic".

  Comp Mode: Different modes can be selected according to the requirements.

  Master/Slave: If multiple devices are connected in parallel, configure one host and multiple slave servers.

  Module capacity: Rated capacity of a single module.

  Largest Modbus address: Sets the number of screen control modules.Set to 5, the screen can switch control of 5 modules.

  H+R(%): This setting is displayed when you switch working modes. Proportion of harmonic and reactive power compensation.

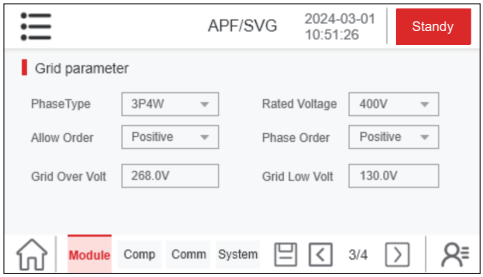


Fig.5-5 Generator control screen

- Phase Type: Set to "3P3W" or "3P4W" according to the system situation.

  Rated Voltage: Set the system output voltage.

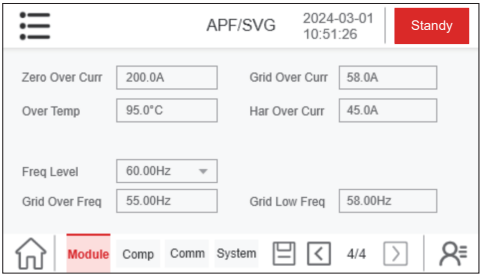
  Allow Order: The default setting is "positive". When the grid is in negative sequence, it needs to be set to "sequence".

  Phase Order: Set the corresponding phase sequence according to the power grid.

  Grid Over Volt: When the power grid voltage exceeds this value, the system enters the protection state.

  Grid Low Volt: When the power grid voltage is lower than this value, the system enters the protection state.

5.2.5 Controlling Smart Capacitor Data



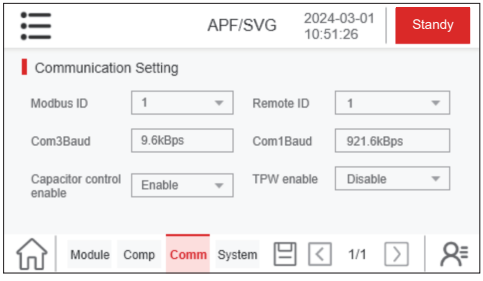
- **Zero Over Current:** Default zero line crossing point. Generally, select the default value.
  Grid Over Current: Default module overflow point. Generally, select the default value.
  Over Temp: The over temperature protection point of the module is the default value.
  Har Over Current: Resonant overflow point, generally select the default value can be.
  Freq Level: Set according to the grid frequency.
  Grid Over Freq: If the frequency of the grid exceeds this value, it will alarm Grid.
  Low Freq: Grid frequency below this value will alarm.

- **Target Mode:** Power factor and kVar can be selected.
  Target PF: Power factor, default is 1.
  Additional reactive power: Positive value is inductive reactive power, negative value is capacitive reactive power, and the Target Mode needs to be set to "kVar" (if it is necessary to send capacitive reactive power 10kVar to the grid, set it to "-10kVar").

Fig.5-6 Smart capacitor control screen

5.3 Communication setting

The Settings page can be entered through the "Settings" button on the screen.



- **Modbus ID:** Modbus communication address. The host is 1.
  Remote ID: IP address for remote control. The default value is 1.
  Com3 Baud: Interface baud rate.
  Com1 Baud: Interface baud rate.
  Capacitor control enable: This function is disabled by default. You need to enable this function when the device controls the capacitor.
  TPW enable: If the screen is a TPW screen, TPW can be enabled, but other screens cannot be enabled.

Fig.5-7 Communication parameter setting

- Click [>] (next page) to enter the compensation data interface, select the corresponding harmonic compensation times, where set the gain and phase Angle, [×] is not enabled, click [✓] to enable. The right column monitors the network THDi and load THDi in real time.
  Click [>] (next page), you can select the harmonic compensation times, generally select the default value, no need to change.

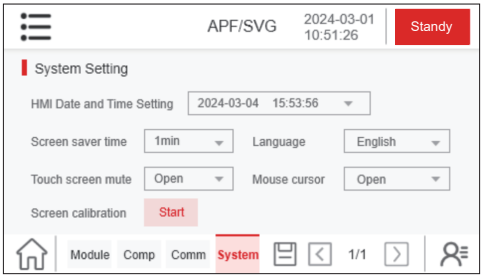


Fig.5-8 Settings page

- **HMI Date and Time Setting:** Set the screen display time.

  Screen saver time: If you do not touch the screen during this time period, the screen will turn off.

  Language: Select the desired language.

  Touch screen mute: When closed, clicking will make a sound.

  Mouse cursor: When opened, you will see the on-screen cursor point.

  Screen calibration: When the cursor point is offset, click Start to calibrate the screen.

5.4 Fault page

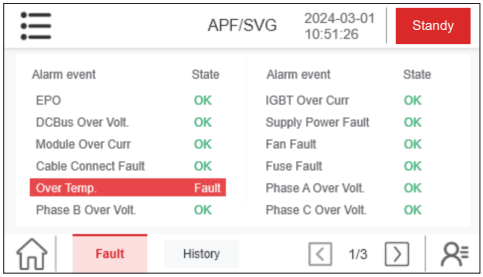


Fig.5-9 Fault page

- **EPO:** Check whether the emergency stop switch button is pressed, reset the button switch, and then click the reset switch on the screen to remove the fault.
  IGBT Over Current: Please check whether the current value set on the screen is reasonable. You can use the tool to measure whether there is deviation between the real current value and the set value .
  DC Bus Over Volt: Click the data interface on the screen to check the voltage of the device data bus. The standby bus voltage of the normal module is about 650.
  Supply Power Fault: Please contact after-sales personnel to solve this problem!
  Module Over Current: Check whether the CT installation direction is consistent with the configuration, and whether the secondary CT cable is reversed.
  Fan fault: Check whether the fan is running normally. If the fan is not running, replace it. If the fan is running normally, click reset and start again.
  Cable Connect Fault: Please contact after-sales personnel to solve this problem!
  Fuse fault: Please contact after-sales personnel to solve this problem!
  Over Temp: Check whether the ambient temperature is too high, and whether the air intake and air outlet of the system are smooth. If everything is normal, reset and start the system again.
  Phase A Over Volt: Use a multimeter to check whether the input voltage is normal and the device over voltage point is properly set on the screen.

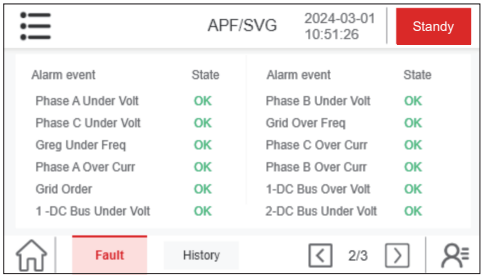


Fig.5-10 Fault page

- **Phase A Under Volt:** Use the voltmeter to confirm whether the input voltage is normal and whether the under voltage point of the device on the screen is set reasonably.
  Grid Over Freq: Check whether the value of the power grid over frequency set on the screen is greater than the real input voltage frequency.
  Grid Under Freq: Check whether the value of the power grid over frequency set on the screen is less than the real input voltage frequency.
  Phase C Over Current: Check whether the device over current point on the screen is set too low and whether the device over current is normal.
  Grid Order: Check whether the phase sequence of the power grid is consistent with that set on the screen.
  1-DC Bus Over Volt: Click reset to shut down, disconnect the circuit and adjust the bus to take power.
  1-DC Bus Under Volt: Click reset to shut down, disconnect the circuit and adjust the bus to take power.
  2-DC Bus Under Volt: Click reset to shut down, disconnect the circuit and adjust the bus to take power.

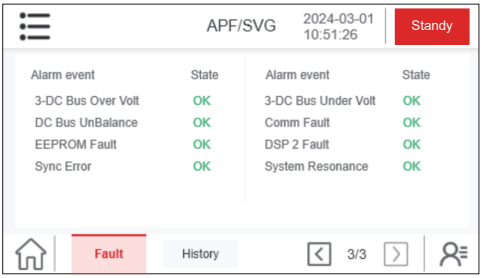


Fig.5-11 Fault page

- **3-DC Bus Over Volt:** Click reset to shut down, disconnect the circuit and adjust the bus to take power.

  3-DC Bus Under Volt: Click reset to shut down, disconnect the circuit and adjust the bus to take power.

  DC Bus Unbalance: Check whether the N cable is connected, whether the cable connection mode is correct, and whether the external cable connection is consistent with the cable connection mode set on the device on the screen.

  Comm Fault: Check whether the connection between the module and the screen is normal, and whether the COM indicator is green. If the communication is normal, please upgrade the program.

  EEPROM Fault: If it still exists after you click Reset to restart the machine, please contact after-sales personnel to solve it!

  DSP 2 Fault: If it still exists after you click Reset to restart the machine, please contact after-sales personnel to solve it!

  Sync Error: If it still exists after you click Reset to restart the machine, please contact after-sales personnel to solve it!

  System Resonance: If it still exists after you click Reset to restart the machine, please contact after-sales personnel to solve it!

5.5 Switch the machine page

Fig.5-12 Switch machine page

- Click on the upper left corner of the pop-up function selection, and then click control to enter the startup, shutdown, reset interface, generally in case of sudden failure can choose to reset.

6 WiFi Setting

Users can also connect to the WiFi of the device through the mobile device (cell phone, PAD), and log in to the browser for remote monitoring.
The following is an example of how to monitor the device remotely through WiFi.

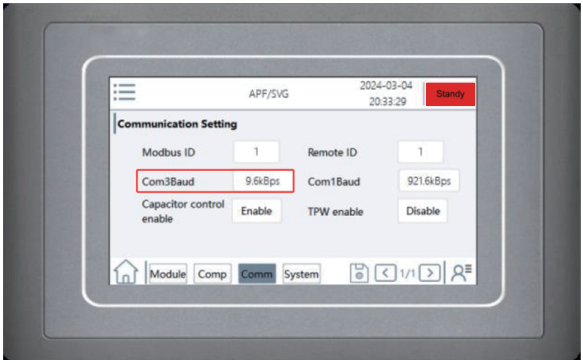


Fig.6-1 The com3 baud rate should be set to 9600

6.1 Find the wireless network with the network name “BS-XXXXXX” in the “Settings-WiFi” of your cell phone, click to connect, enter the password “66668888” and wait for the wireless connection. Wait for the wireless connection to be successful, as shown in Fig.6-2.

Fig.6-2 WiFi Hotspot Connection Interface

6.2 After the hotspot is successfully connected, open the browser and enter the URL “192.168.3.1” as shown in Fig.6-3.

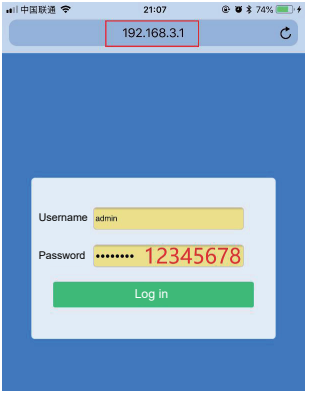


Fig.5-3 User Login Interface

6.3 In Fig.6-3, enter “admin” and “12345678” in the User name and password column respectively, and click Log in to enter the home page as in Fig.6-4.

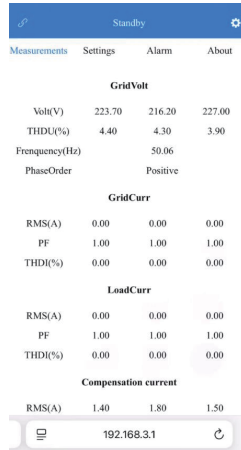


Fig.6-4 Home Page Display

6.4 WiFi display interface is divided into 4 areas: “Basic”, “Settings”, “Alarm” and “About”.

6.5 Users can change the hotspot name, password, login name and password as required, see Fig.6-5.

NOTE: Users are advised not to change it, so as not to forget the password.

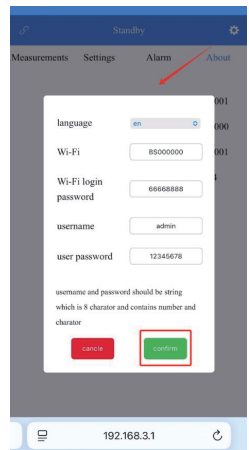


Fig.6-5 WiFi Hotspot Customization Settings Interface

The “Basic” display interface is shown in Fig.6-4, which displays the information of grid voltage, frequency, grid current, load current, compensation current, grid-side power, load-side power, and so on.

The “Setting” display interface is shown in Fig.6-6, in which you can set the CT ratio and remote control operation.

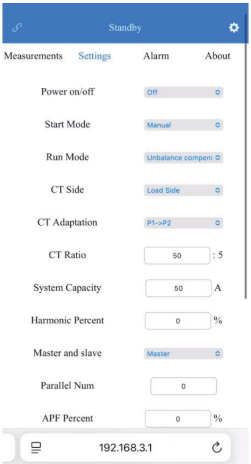


Fig.6-6 “Setting” Display Interface

The “Alarm” interface displays the alarm information of the device, if the device has alarm information, the corresponding circle will be red, and you can click the red circle to display the English description of the fault information. The “About” interface displays the software version of the device.

7 Daily Maintenance

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

7.1 Safety Considerations

SVG equipment is operated with strong electricity. For safety reasons, maintenance personnel should not touch any live terminals of the equipment during operation, and ensure that the grounding terminals of the equipment are reliably grounded.
Because there are a lot of capacitors in the bus of SVG equipment, the maintenance work must be carried out after 15 minutes of power failure.

7.2 Daily Inspection

Do not turn on the equipment during operation and power-on, and visually check whether the operation status is abnormal from the outside. Usually, check the following items:

- Whether the display data meets the requirements;
- Whether the display screen shows fault;
- Whether there is abnormal sound, abnormal vibration and abnormal smell;
- There are no signs of overheating and abnormal phenomena such as discoloration.

7.3 Regular Inspection

Under the safety precautions, the equipment shall be inspected periodically after being disconnected from the power grid, and the periodic inspection items are shown in the following table.

Tab.7-1 Periodic Inspection Items

Category	Check items	Remarks
Environment	Temperature, humidity, whether there is metal dust and corrosive gas	
Electrical	Are cables and terminals damaged	
Connection	Whether the main circuit wiring, grounding wire, CT wiring and communication wiring are connected reliably	
Heat dissipation of equipment	Is there any blockage at the air duct	