User Manual

SVGD

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Chapter I Safety Instructions

1. This manual covers the installation and use of SVGD. Please read this manual before installation.
2. The SVGD must be commissioned and maintained by engineers designated by the manufacturer or its agent. Failure to do so may endanger personal safety and cause equipment malfunction. The resulting SVGD damage and other malfunctions are not covered by the warranty and our responsibility.
3. The installation of this unit must comply with all relevant safety procedures. The correct wiring and wire size must be used to ensure operational safety and operational reliability as well as measurement accuracy.
4. The power input side will generate high voltage that is harmful to personal safety. Care should be taken during operation and strict safety procedures should be followed.
5. When collecting data while in a charged state, do not touch the live part under any circumstances.

Chapter II Use Environment

Air temperature: air temperature is not higher than +40℃, not lower than -10℃, humidity: ≤95%, no condensation

Altitude: no more than 2500 meters

Environmental conditions: The surrounding environment is free of flammable and explosive media, no corrosive gas, no conductive dust, rain and snow erosion, and the installation site cannot be shaken vigorously.

Storage temperature: no higher than 70℃, not lower than -40℃

Chapter III Basic Function

3.1 Real-time data monitoring

SVGD provides real-time information of the system, power grid, SVG/APF, and CT on the monitor interface through connection with monitor, as shown in Figure 3.1, 3.2, 3.3, 3.4, and 3.5.

System: A, B, C phases' voltage, current, active power, reactive power, COSφ

Grid side: A, B, C phases' voltage, current, power factor, THDu, THDi, system frequency, active power, reactive power, COSφ

SVG (need to change setting on monitor): A, B, C phases' compensation current, load rate, IGBT temperature, machine capacity

CT: A, B, C phases' current, THDi, active power, reactive power, COSφ

Capacitor Bank: Capacitor bank switching setting parameters

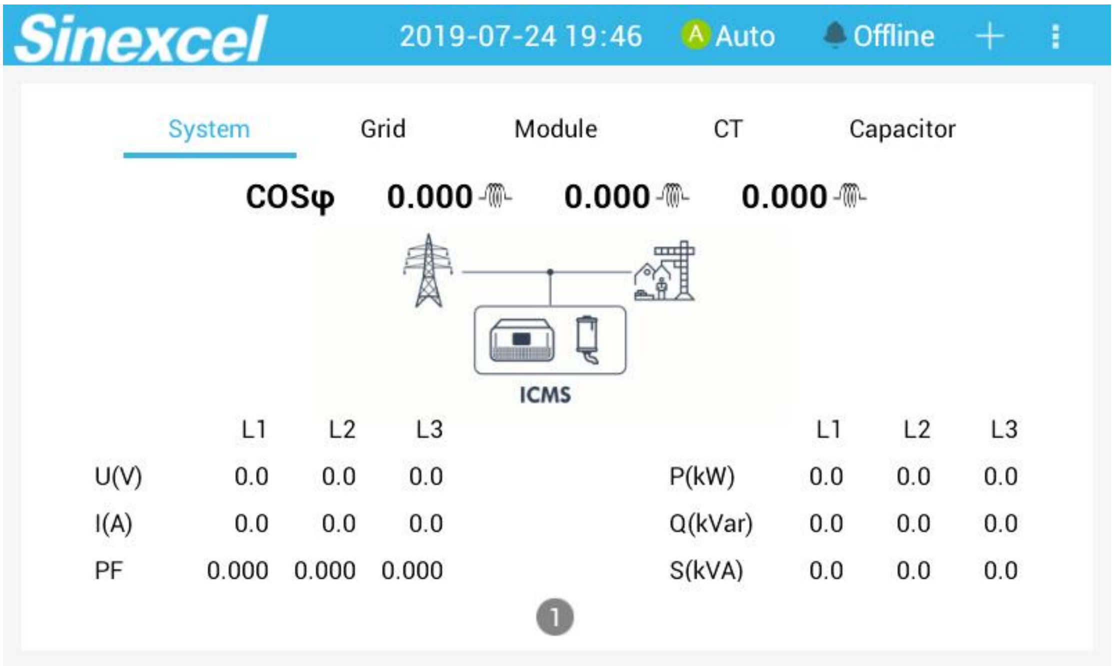


Figure3.1System

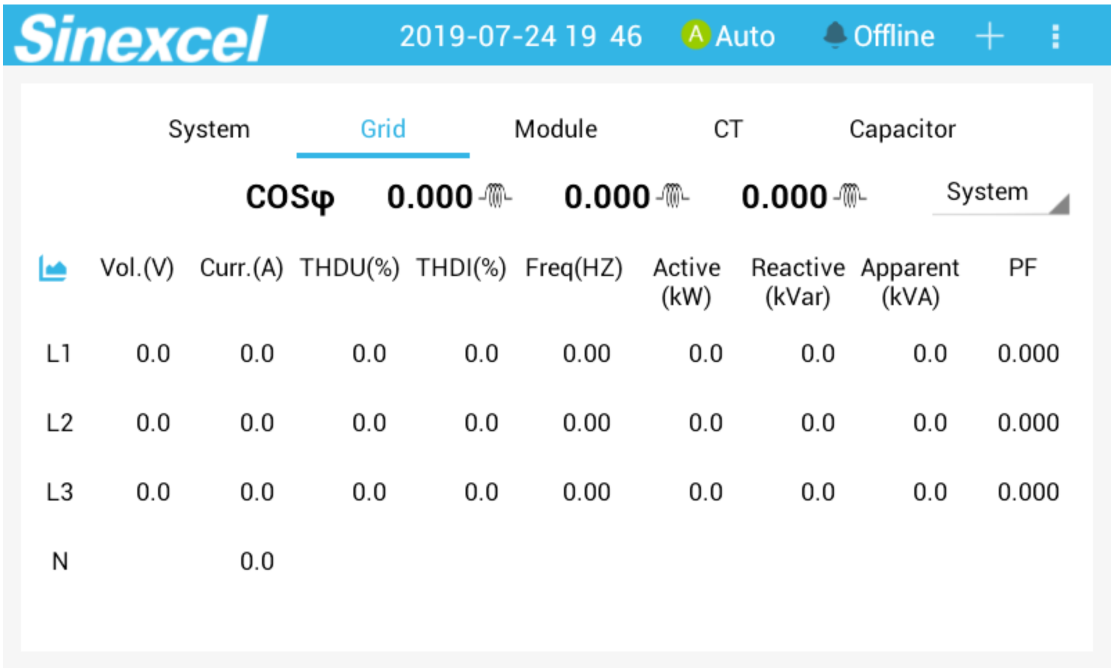


Figure3.2 Power Grid

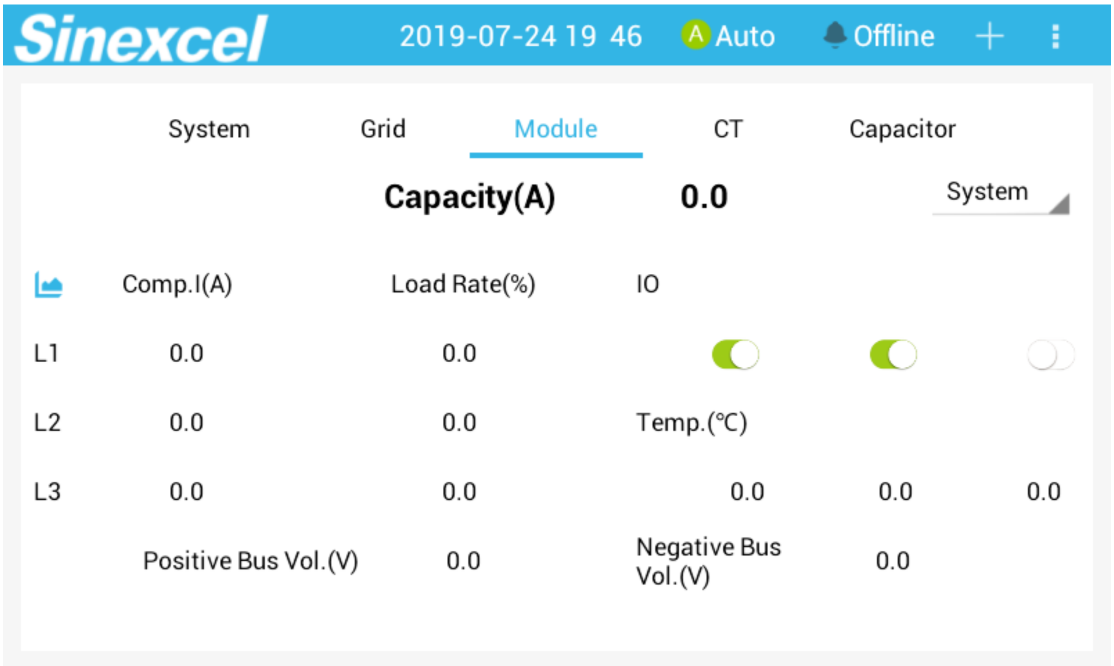


Figure 3.3 SVG

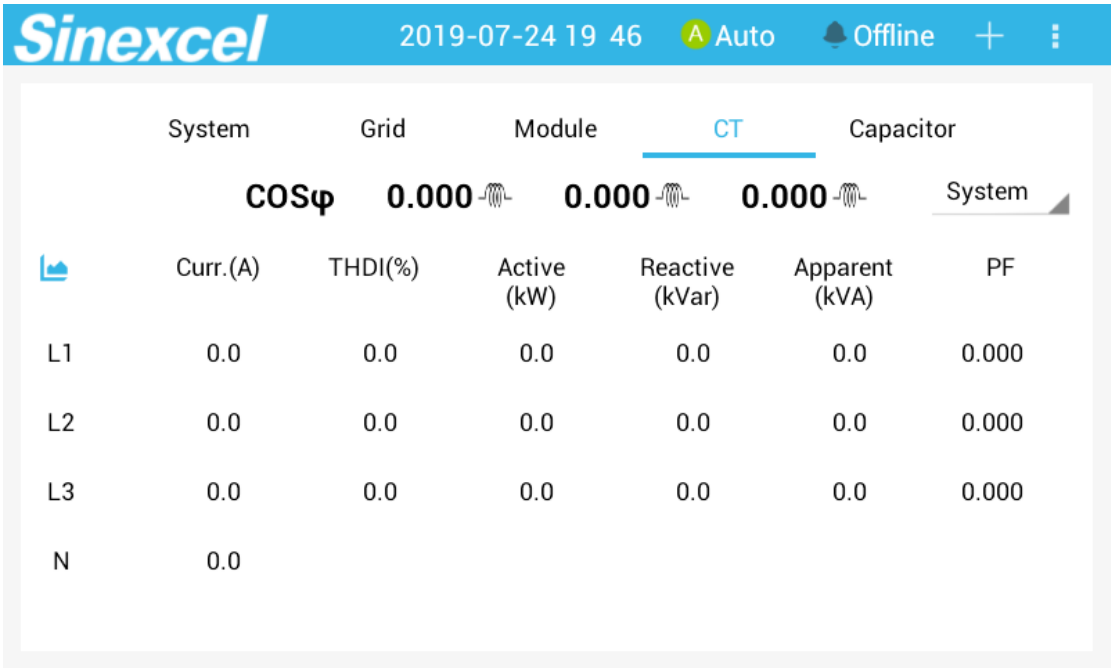


Figure 3.4 CT

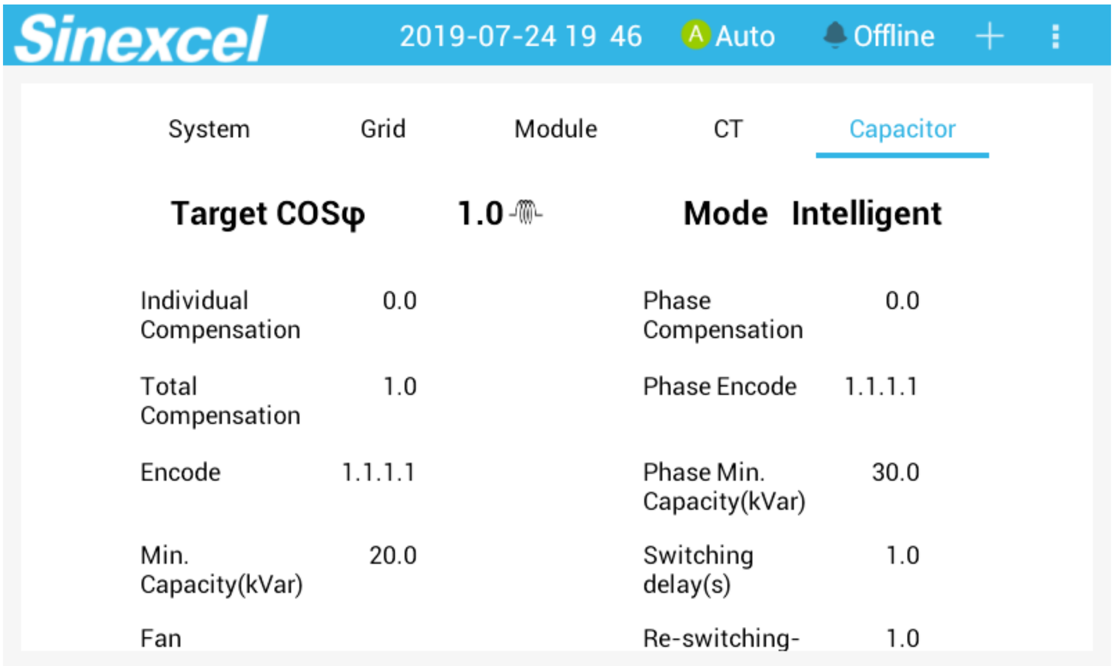


Figure 3.5 Capacitor Bank

3.2 Historical data records

The historical data can be stored on the monitor module, and the power-down data saving function is enabled. The user can click the top bar and click to view the current alarm, historical alarm, operation records of SVGD, as well as the switching numbers and running time of each group of capacitor banks, as shown from Figures 3.6 to 3.9.

Users can check and solve certain problems based on current alarm information.

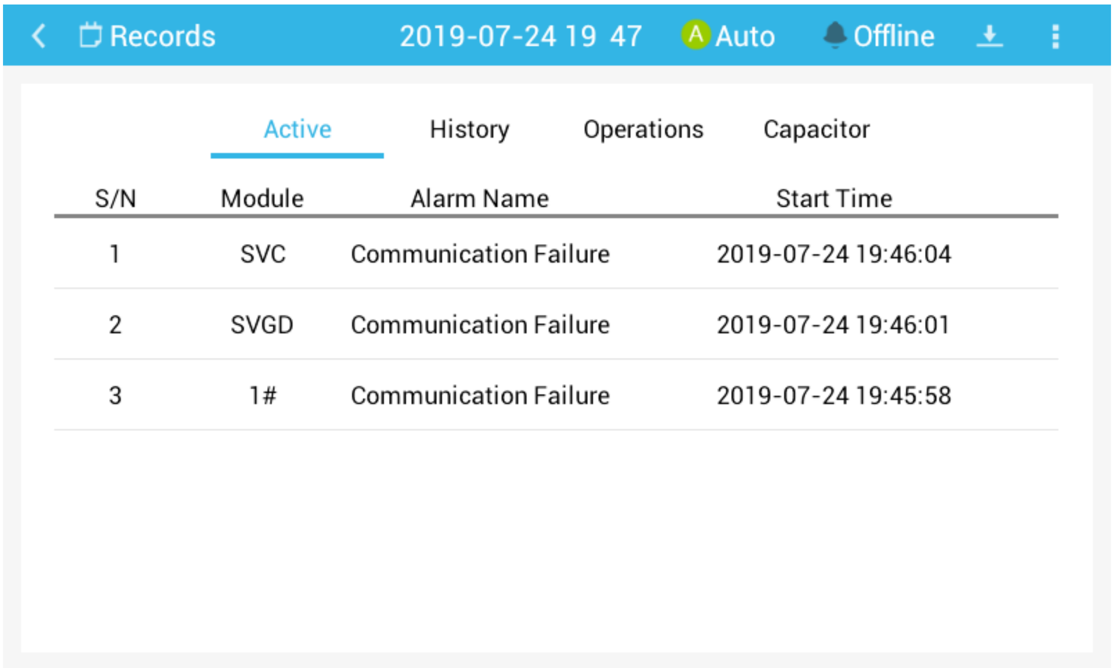
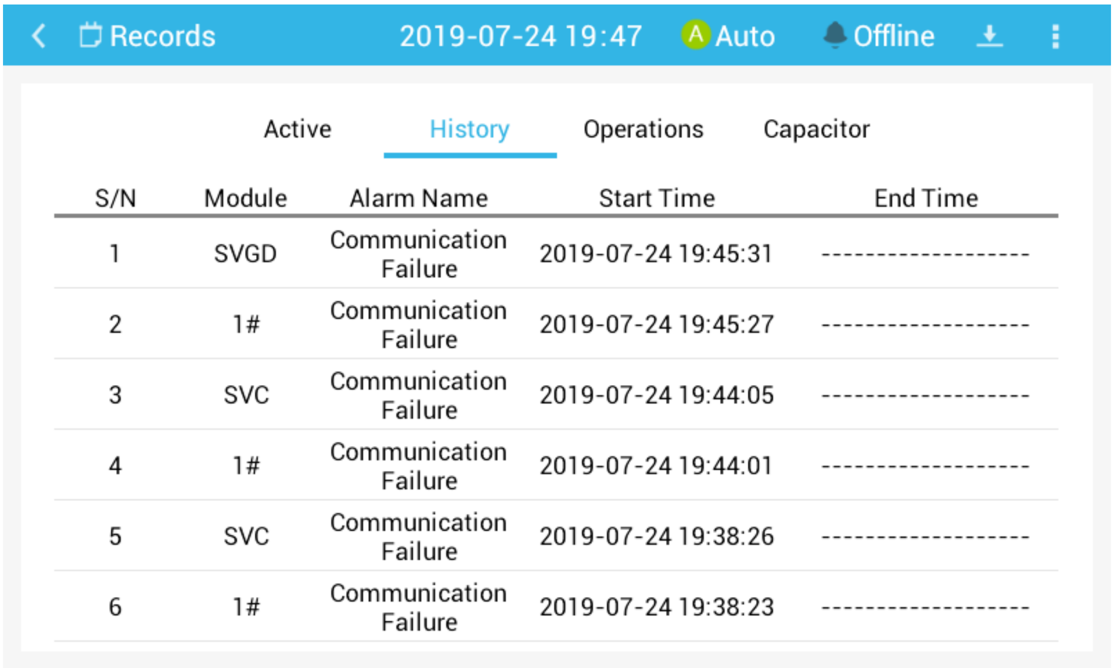
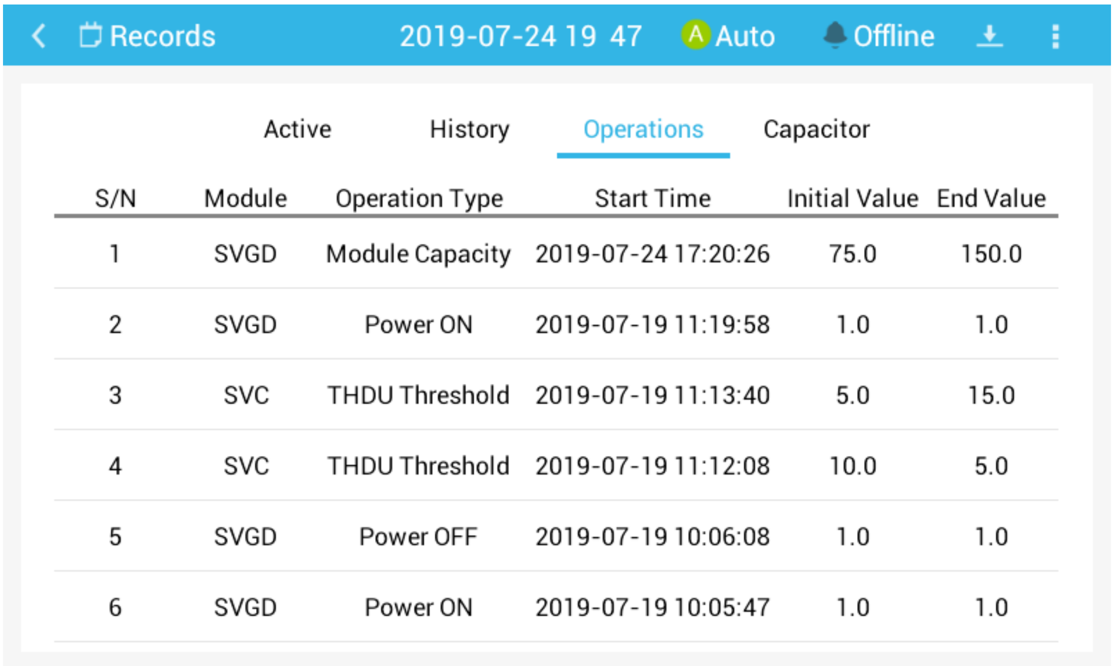


Figure 3.6 Current Alarm



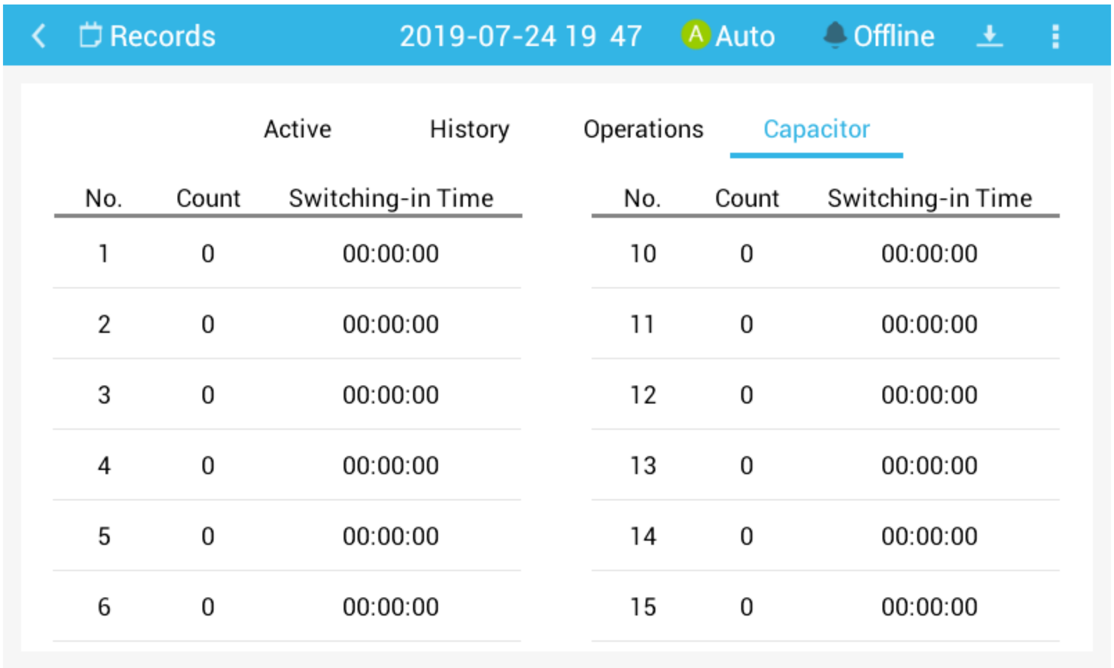
S/N	Module	Alarm Name	Start Time	End Time
1	SVGD	Communication Failure	2019-07-24 19:45:31	------------------
2	1#	Communication Failure	2019-07-24 19:45:27	------------------
3	SVC	Communication Failure	2019-07-24 19:44:05	------------------
4	1#	Communication Failure	2019-07-24 19:44:01	------------------
5	SVC	Communication Failure	2019-07-24 19:38:26	------------------
6	1#	Communication Failure	2019-07-24 19:38:23	------------------

Figure 3.7 Historical Alarm



S/N	Module	Operation Type	Start Time	Initial Value	End Value
1	SVGD	Module Capacity	2019-07-24 17:20:26	75.0	150.0
2	SVGD	Power ON	2019-07-19 11:19:58	1.0	1.0
3	SVC	THDU Threshold	2019-07-19 11:13:40	5.0	15.0
4	SVC	THDU Threshold	2019-07-19 11:12:08	10.0	5.0
5	SVGD	Power OFF	2019-07-19 10:06:08	1.0	1.0
6	SVGD	Power ON	2019-07-19 10:05:47	1.0	1.0

Figure 3.8 Operation Record



No.	Count	Switching-in Time	No.	Count	Switching-in Time
1	0	00:00:00	10	0	00:00:00
2	0	00:00:00	11	0	00:00:00
3	0	00:00:00	12	0	00:00:00
4	0	00:00:00	13	0	00:00:00
5	0	00:00:00	14	0	00:00:00
6	0	00:00:00	15	0	00:00:00

Figure 3.9 Capacitor Bank Switching

Table 3.2 Common faults and troubleshooting

Fault and alarm	Possible Cause
Communication faults	Communication between the monitor module and AHF module or SVG module is faulty
Over temperature	1. The ambient temperature is too high; 2. The air duct is blocked; 3. The fan is faulty
Abnormal input voltage	1. The power cable system is not set correctly (3-phase 3-wire or 3-phase 4-wire); 2. The input voltage is overvoltage or undervoltage, and the inverter does not turn on or turn off.
Frequency abnormal	If the input frequency exceeds the limit, the inverter is turned off or does not turn on.
DC bus overvoltage	The converter is turned off or does not turn on due to DC bus overvoltage
Auxiliary power failure	Auxiliary power supply itself is faulty
No compensation current	1.AHF is not turned on. 2. There is a problem with the CT installation wiring. 3.the compensation rate is set too small.
CT ratio setting failure	External CT ratio setting failure

Chapter IV System installation and wiring diagram

4.1 Installation and testing

Before opening the package of this unit for installation, you should carefully check for signs of damage, check the accessories and instructions are complete, if you find any problems, please contact with the supplier in time. Connect to the power supply, check whether the operation function and display are normal under power-on status.

4.2 size and interface

SVGD casing, the dimension is 212.5×120.4×45mm（W×D×H）;

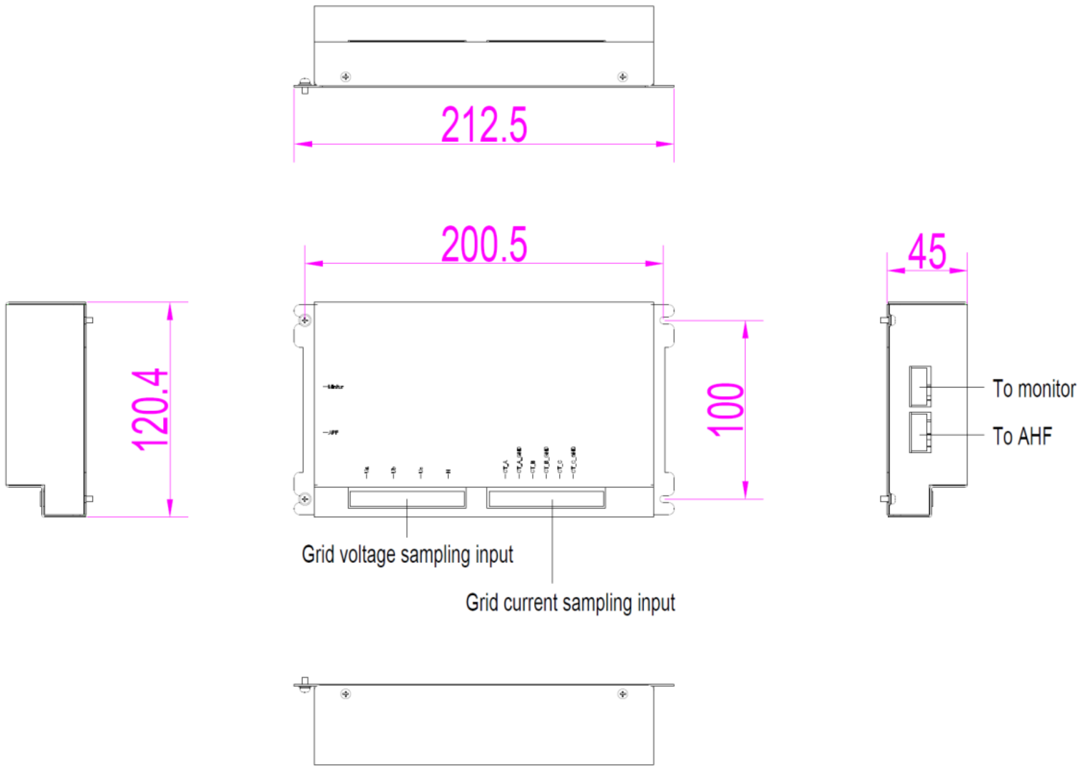


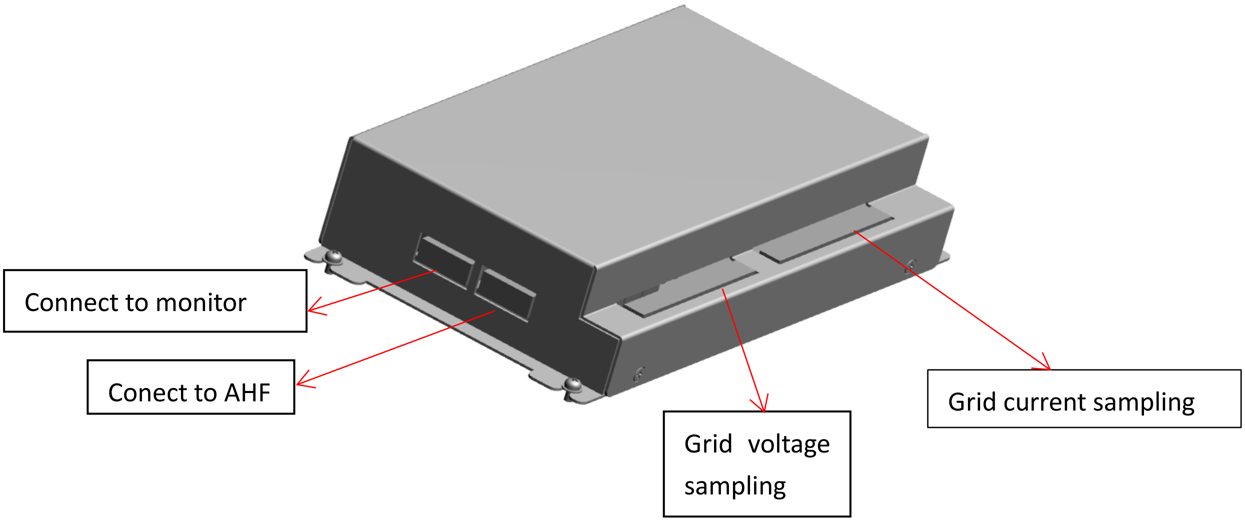
Figure 4.2 Size and interface

The terminals outside of SVGD are:

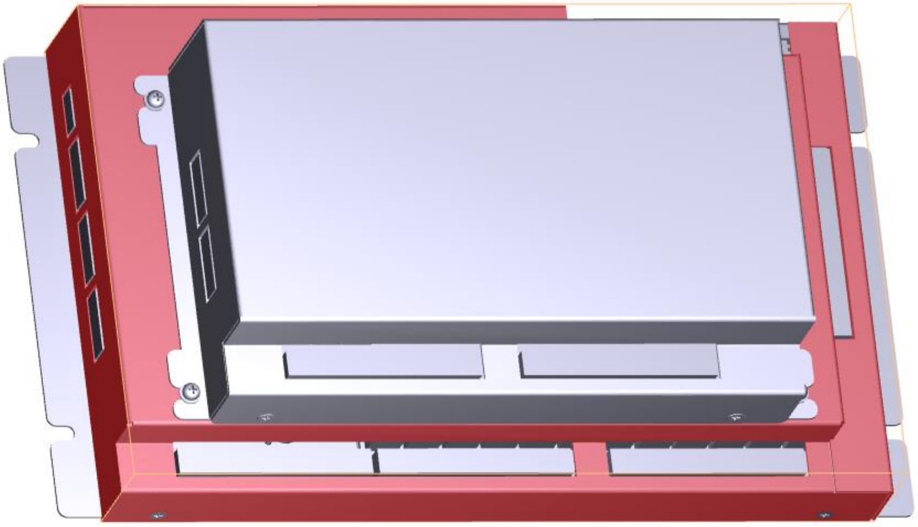
- Grid voltage sampling input – A, B, C, N of three-phase four-wire (for three-phase three-wire system, N line can not be connected);
- Grid current sampling input – CT input;
  Connect to AHF – connect to AHF, SVG;
- Connect to monitor – connect to 7-inch monitor screen;

4.3 Appearance

SVGD appearance is as follows:

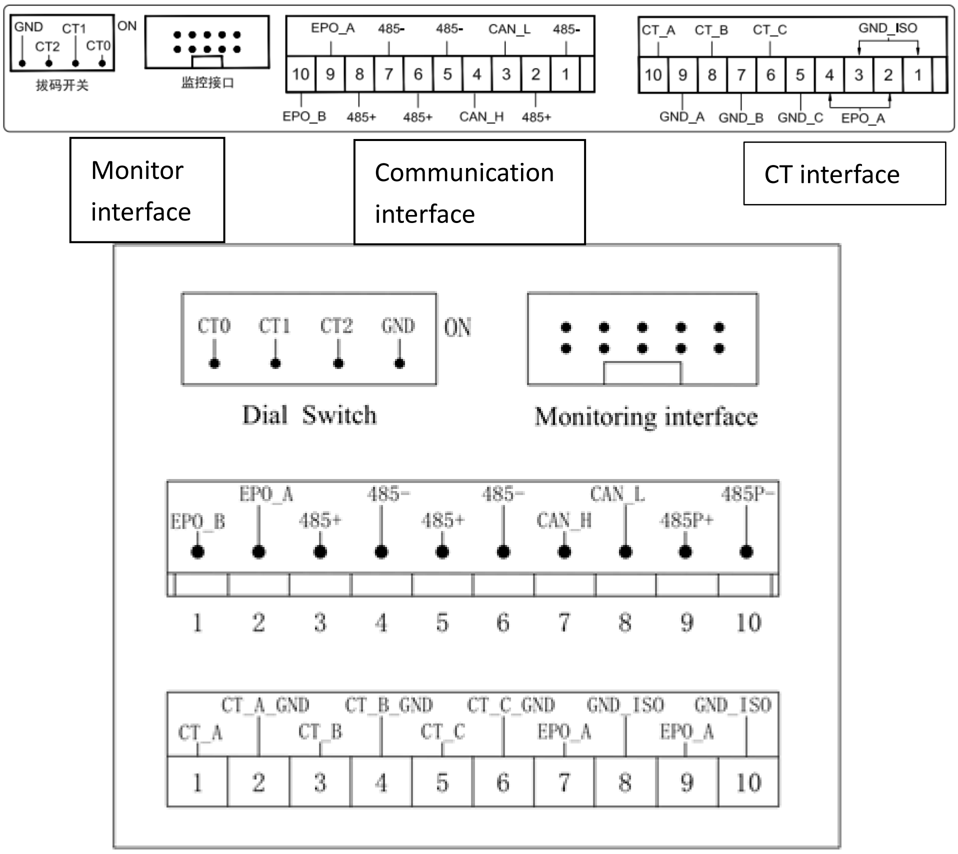


In addition, SVGD can also be installed with the ICMS as shown below; the SVGD is attached to the back of the ICMS with M3 x 6 screws.

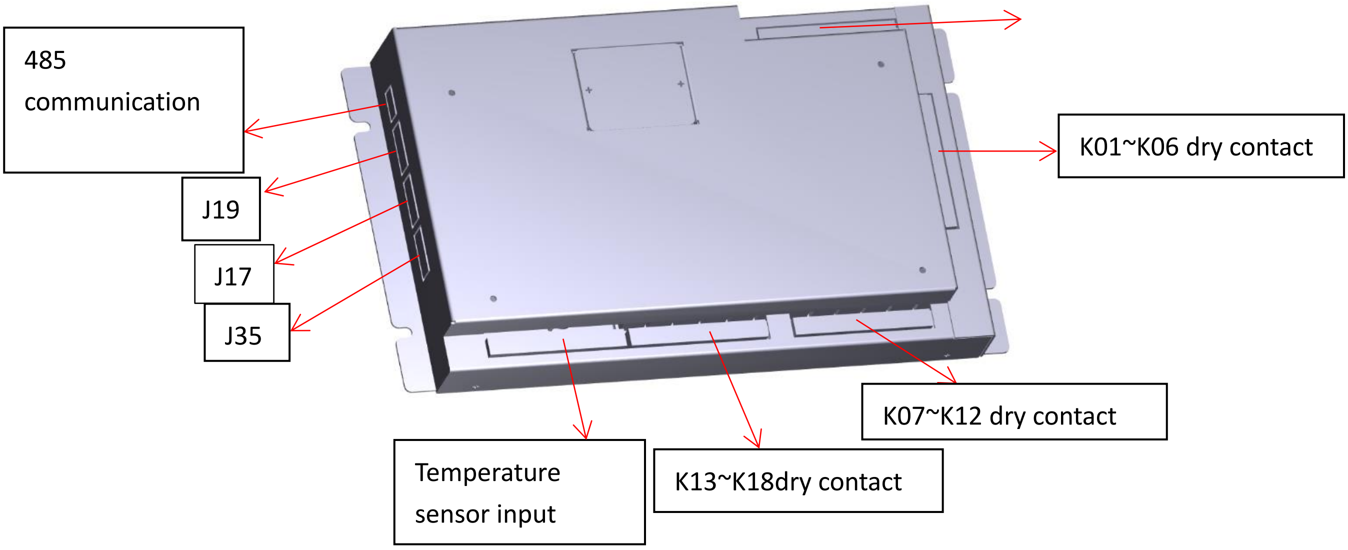


Chapter V SVGD scheme principle

The following figure shows the backplane interface of AHF or SVG.



Interface diagram of ICMS 18:



5.1 SVGD+AHF+ICMC(SVC) Scheme

The SVGD+AHF+ICMS(SVC) scheme and wiring diagram are shown in Figure 5.1 below. The working principle is as follows: AHF performs source side harmonic compensation by CT2 sampling load current, SVGD control board samples grid voltage and samples grid current through CT1, analyze and calculate the reactive current component in the power grid, communicate with the ICMS control board through 485/CAN communication mode, and connect the dry contact of the ICMS control board to the passive compensator SVC switch control coil to realize the compensation of reactive current of the load. (For example, when the grid has large capacitive reactive power, the ICMS control board controls the inductive switch to close for the compensation); At the same time, 7-inch centralized monitor and ICMS control board, AHF, SVGD control board adopt 485/CAN to realize real-time display of parameters and status of each module such as load harmonic current, reactive current, compensation current, etc..

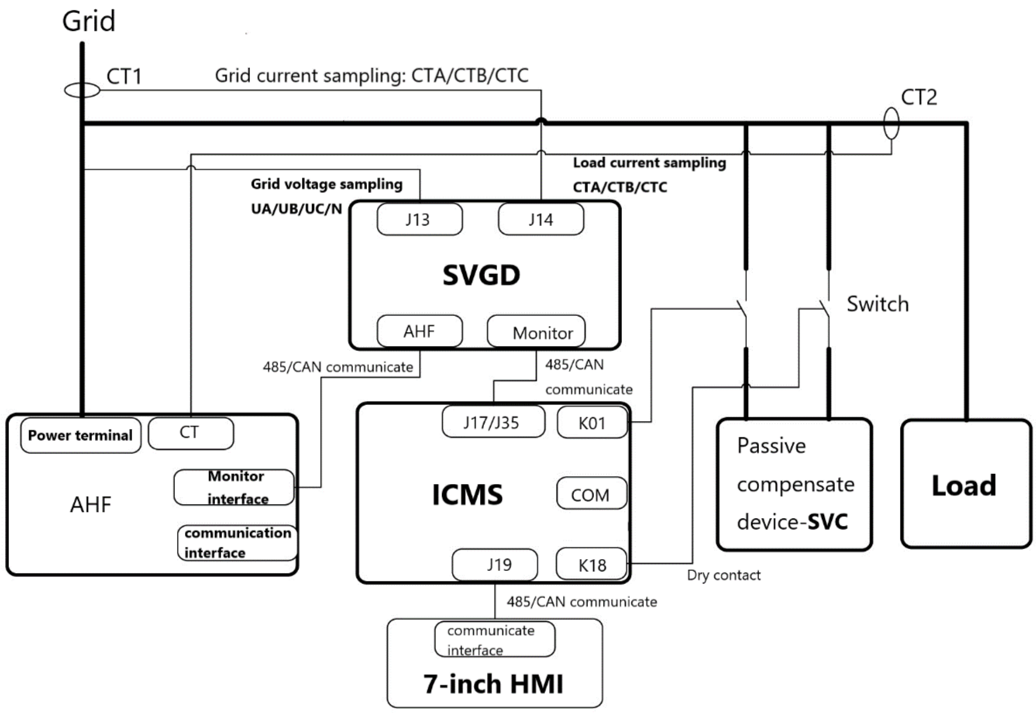
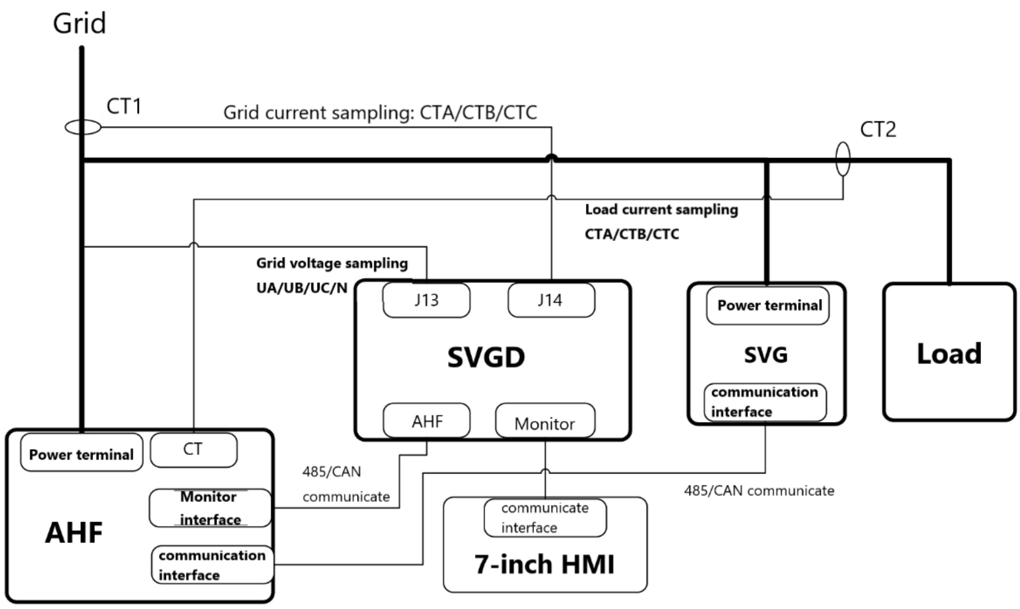


Figure 5.1 SVGD+APF+SVC scheme principal and wiring diagram

5.2 SVGD+AHF+SVG Scheme

The SVGD+AHF+SVG scheme and wiring diagram are shown in Figure 5.2 as below. The working principle is as follows: AHF performs source side harmonic compensation by CT2 sampling load current, SVGD control board samples grid voltage and samples grid current through CT1, analyze and calculate the reactive current component in the power grid, communicate with SVG through 485/CAN communication mode, and transmit the reactive power compensation capacity command (for example, when the power grid has large capacitive reactive power, the SVG performs capacitive compensation and emits sensible reactive power). At the same time, 7-inch centralized monitor and SVG, AHF, SVGD control board adopt 485/CAN to realize real-time display of parameters and status of each module such as load harmonic current, reactive current, compensation current, etc..



Fugure 5.2 SVGD+APF+SVG Scheme principal and wiring diagram

5.3 ASVG+SVGD+ICMS(SVC) Scheme

Figure 5.3 shows the SVGD+ASVG+SVC scheme and wiring diagram. The working principle is as follows: ASVG performs source side harmonic and reactive power compensation by CT2 sampling load current, SVGD control board samples grid voltage and samples grid current through CT1, analyze and calculate the reactive current component in the power grid, communicate with ICMS control board through 485/CAN communication mode, and connect the dry contact of the ICMS control board to the passive compensator SVC switch control coil to realize the compensation of reactive current of the load. (For example, when the grid has large capacitive reactive power, the ICMS control board controls the inductive switch to close for the compensation); At the same time, 7-inch centralized monitor and ICMS control board, AHF, SVGD control board adopt 485/CAN to realize real-time display of parameters and status of each module such as load harmonic current, reactive current, compensation current, etc..

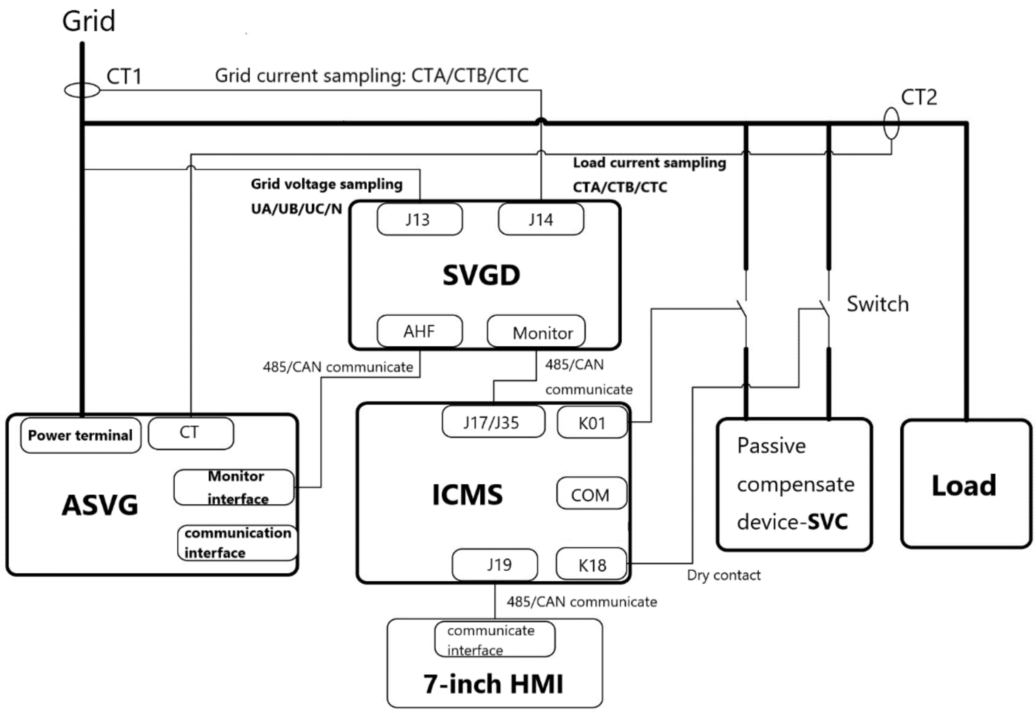


Figure 5.3 SVGD+ASVG+SVC scheme principal and wiring diagram

5.4 AHF+SVGD+SVC+SVG scheme

Figure 5.4 shows the AHF+SVGD+SVC+SVG scheme and wiring diagram. The working principle is as follows: AHF performs source side harmonic compensation by CT2 sampling load current, SVGD control board samples grid voltage and samples grid current through CT1, analyze and calculate the reactive current component in the power grid, communicate with SVG, ICMS control boards through 485/CAN communication mode, and transmit the reactive power compensation capacity command (for example, when the power grid has large capacitive reactive power, the ICMS control board controls the inductive switch to close for the compensation, and the SVG performs capacitive compensation and emits sensible reactive power). At the same time, 7-inch centralized monitor and ICMS control board, SVG, AHF, SVGD control board adopt 485/CAN to realize real-time display of parameters and status of each module such as load harmonic current, reactive current, compensation current, etc..

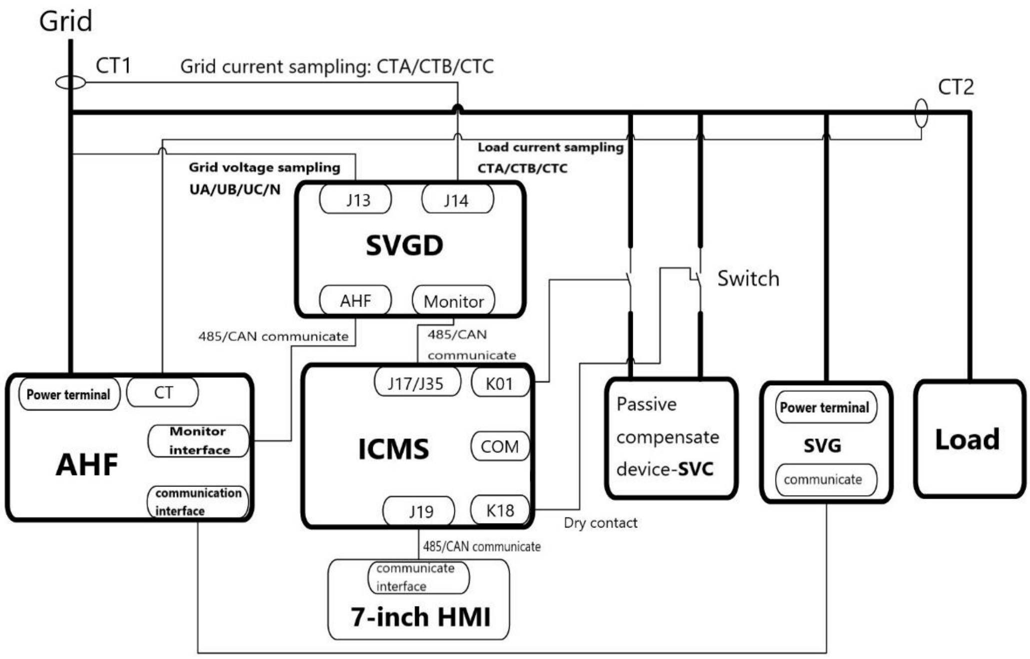


Figure 5.4 APF+SVGD+SVC+SVG scheme principal and wiring diagram

When parallel APF is required, connect the power terminals, connect the CTs in series, and connect the communication interfaces. Parallel SVG does not require a CT connection.

Chapter VI Parameter setting

The product control and protection parameters are preset at the factory, and the user can modify it according to the needs of the site. The set parameters are automatically saved and will not be lost under the circumstance of power-down.

The following takes the first scheme as an example. According to the wiring diagram of Figure 1, the various monitoring settings are set after the modules, control boards and centralized monitor are correctly connected.

6.1 Personalized settings

As shown in Figure 6.1, select "APF+SVGD" in the advanced password setting item "Personalization-Monitoring Model" and wait for centralized monitor restart.

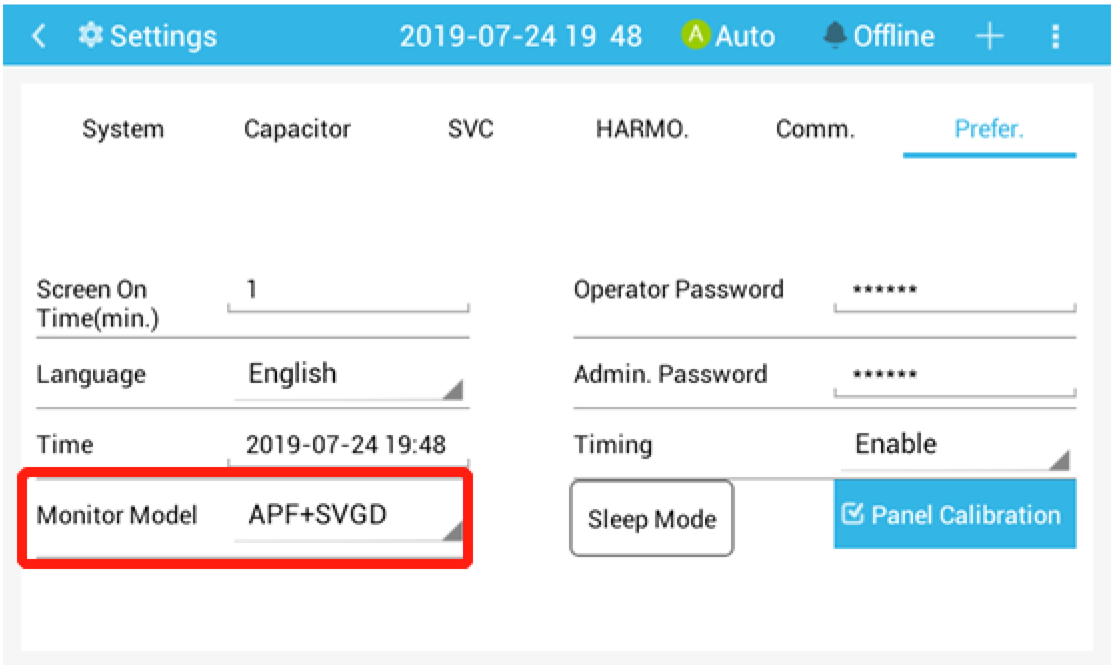


Figure 6.1

6.2 Common parameter settings

As shown in Figure 6.2 and Figure 6.3, in the advanced password setting item "System", set each setting item according to the actual situation (note the setting items in each red box in the picture, set the number of parallel units, single unit capacity, paralleled units capacity, CT ratio adopted);

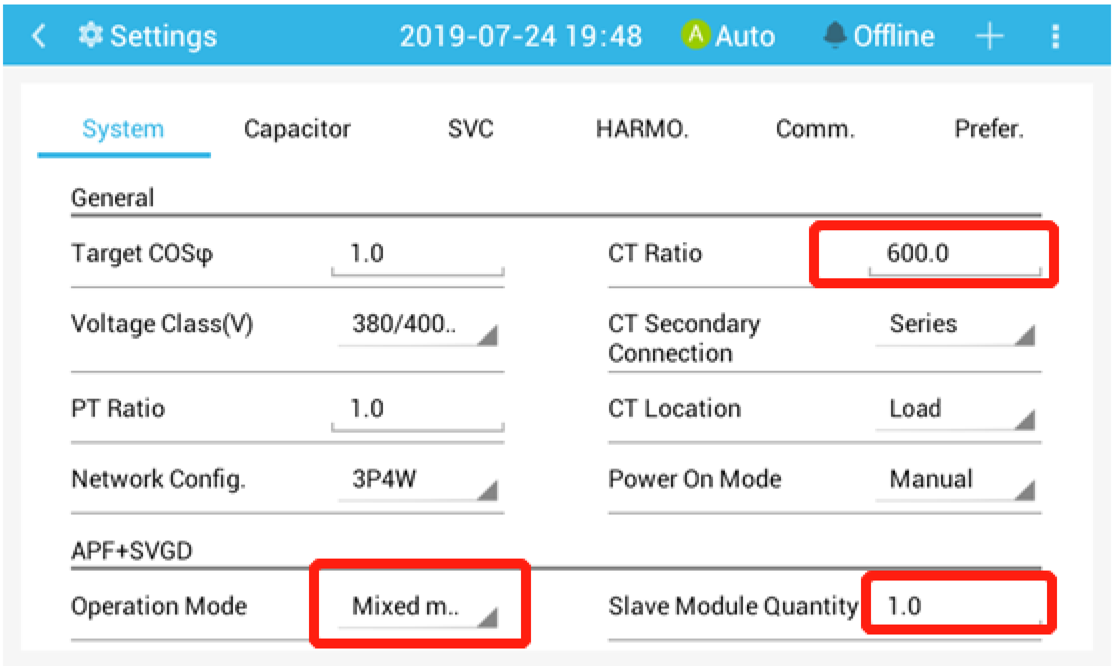


Figure 6.2

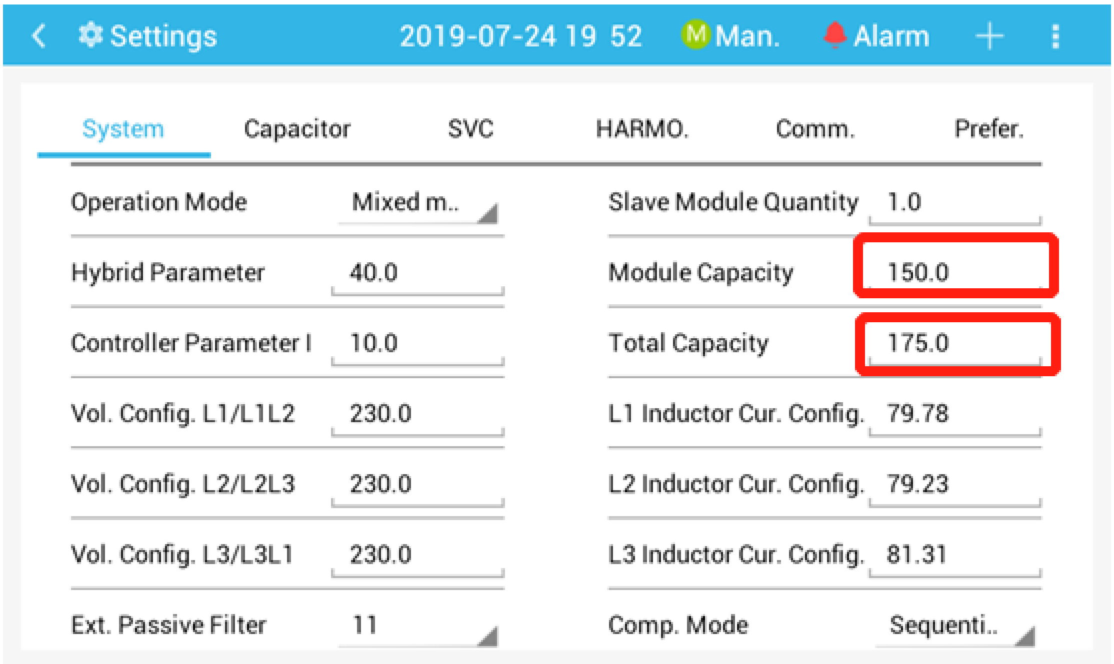


Figure 6.3

Table 6.2 Common parameter settings

Target COSφ	Target power factor setting value, setting range -1 to 1
CT Ratio	Set the external CT ratio
CT Position	Select the source side or load side according to the actual CT wiring position
CT Wiring method	CT secondary side wiring mode selection, series or parallel
External transformer	Set the external transformer ratio, if not, set to 1
Boot mode	Set the SVG boot mode. In the automatic mode, the SVG automatically compensates for reactive power after power-on. In manual mode, you need to manually click the boot, SVG will compensate for reactive power.

Table 6.3 AHF&ASVG&SVG parameter settings

Operating mode	Select operating mode (harmonic compensation, reactive power compensation, etc.)
Mixed mode parameter	For internal debugging, use the default value (40)
Controller parameter	For internal debugging, use the default value (10)
Single module capacity	Set single module capacity

Paralleled modules capacity	Set paralleled modules capacity
Phase A input voltage calibration	Used to calibrate phase A input voltage
Phase B input voltage calibration	Used to calibrate phase B input voltage
Phase C input voltage calibration	Used to calibrate phase C input voltage
Phase A inductor current calibration	Used to calibrate phase A inductor current
Phase B inductor current calibration	Used to calibrate phase B inductor current
Phase C inductor current calibration	Used to calibrate phase C inductor current
Compensation mode	Generally select sequential compensation
Derating factor	Set derating capacity

6.3 Capacitor Bank Parameter Settings

As shown in Figure 6.4, set the setting items on the page “Capacitor Bank” of monitor advanced password setting according to the capacitance information of actual SVC connection. For example, the test condition of this screenshot is that SVC connects with 2 sets of 30K total compensation(3 phases) capacitors without connection of individual (single phase) capacitor, so the "total compensation" in the setting item is set to 2, the number of "individual compensation" is set to 0, and the "minimum capacity" is set to 30;

Table 6.3 Capacitor Bank Parameter Setting Description

Number of individual compensation	Set number of individual compensation for 3 phases, setting range 0-6
Number of total compensation	Set number of total compensation for 3 phases, setting range 0-18
Coding method	Set coding method of capacitor bank
Minimum capacity	Set minimum capacity of capacitor bank
Switching Mode	Set switching mode, recommending use smart mode
Switching delay	Set the switching delay, recommending 40ms (20ms-500ms) for thyristor type, 10s (5s-300s) for contactor type.
Re-switch delay	Set the capacitor bank re-switch delay time, recommending setting 10s

In the automatic switching mode, the capacitor bank has 4 different switching modes: stack mode, normal mode, cycle mode, and smart mode. It is recommended that the user select the smart mode.

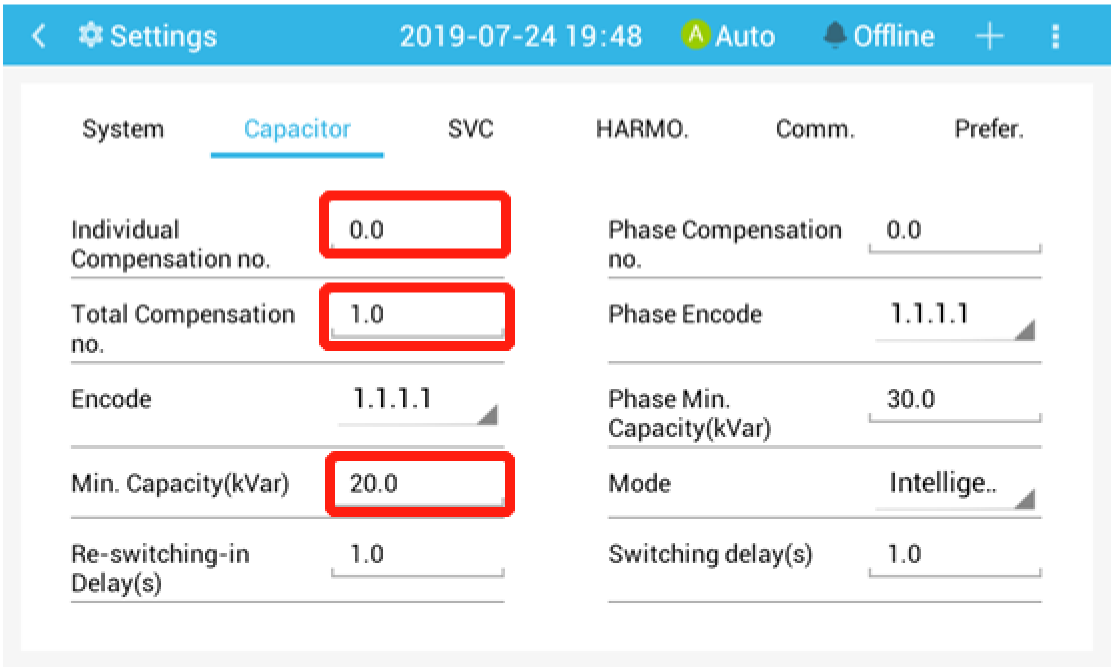


Figure 6.4

6.4 SVC protection settings

Table 6.4 Description of SVC protection settings

Overvoltage protection	Set the input voltage protection value
Undervoltage protection	Set the input undervoltage protection value
THDu over limit	Set the THDu overlimit value
Frequency protection upper limit	Set the input frequency upper limit protection value
Frequency protection	Set the input frequency lower limit protection value

lower limit	
Control mode	Set the fan control mode
Control cycle	Set the period value of the fan control
Control duty ratio	Set the fan control duty ratio
Operating temperature	When the fan is in temperature control mode, set the temperature value when fan is on.

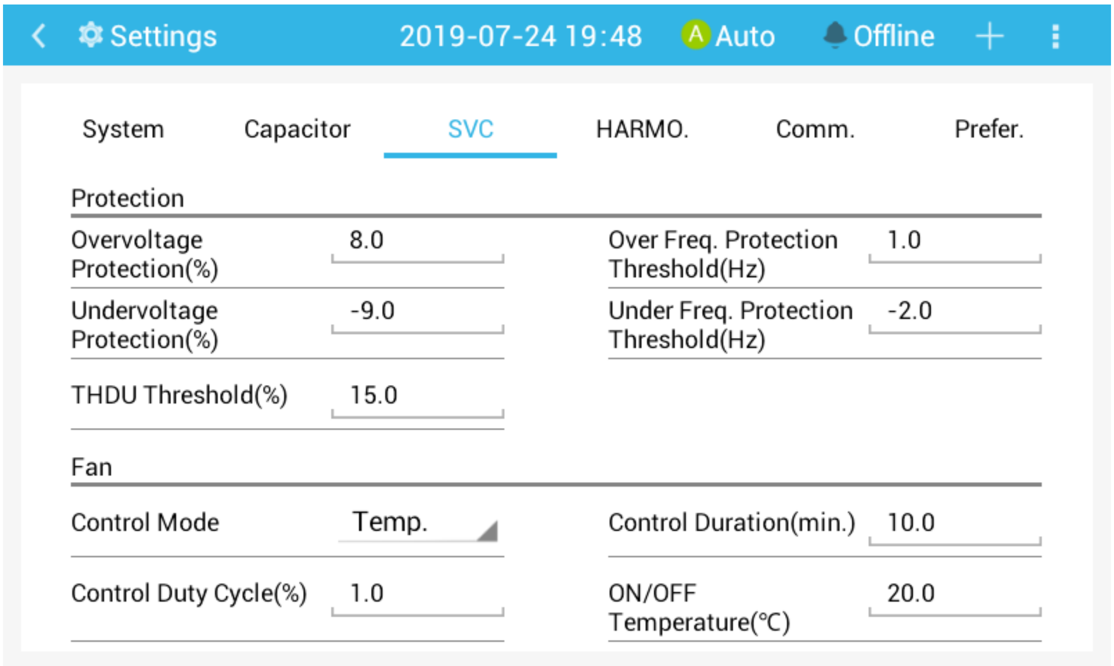


Figure 6.5