FASVG STATIC VAR GENERATOR

FaSVG (V2.1)

Operation manual

Lafaelt

LAFAELT ELECTRIC

Safety Instructions

These safety instructions apply to all static var generators of our company.

Ignoring these instructions could result in personal injury and death.

Live Operation Forbidden!

■ Specific Purpose

Static var generator (SVG for short, the same below) is a new generation of power quality control device, which is mainly used for reactive power compensation.

Please pay attention to whether there is reactive power compensation device composed of passive components such as capacitors and reactors in the same system. If the settings are improper, SVG may conflict with these passive compensation device, or the compensation ability cannot be fully exerted.

■ Operator Qualification

Only qualified personnel engaged in electrical work are allowed to operate this device.

The installation, operation monitoring and fault repair of SVG can only be operated by professionals, and the personnel who operate

the device must be familiar with this manual.

■ Exemption from Liability

The content of the user manual describes the characteristics of the product, but is usually not a guarantee.

If you encounter any questions and problems, please contact us in time to avoid irreparable accidents!

Catalogue

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About This Manual

Before installing and operating the SVG, this manual should be read carefully. This manual contains the necessary information for the perfect performance of the device and to avoid incorrect operation.

The following symbols, terms and names are used in this manual.

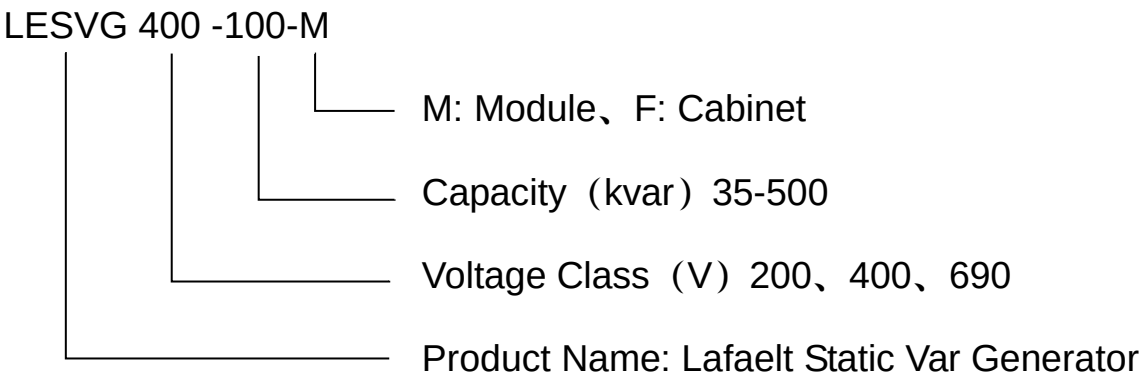
Table1 Use of symbols, terms and names

	Note
Attention！	Follow the instructions in the manual to prevent device damage
	Follow the instructions in the manual to prevent device damage and personal injury
 Warning	Follow the instructions in the manual to prevent serious accidents
 Danger	Follow the instructions in the manual to prevent serious accidents and fatal injury
 Danger	Follow the instructions in the manual to prevent serious accidents and fatal injury caused by dangerous voltage
【Note】	Please pay attention to the content in [Note] for explanation

SVG Instruction

Our company wholeheartedly solves power quality problems for users. SVG has unprecedented comprehensive power quality management capabilities. SVG response time less than 100 μs, can compensate positive sequence (capacitive and inductive), negative sequence, and zero sequence reactive power, and corresponding harmonic and three-phase unbalance compensation can be formulated according to actual needs. Multiple SVGs can run in parallel at the same time, and the efficiency of the whole machine is greater than 97.5%. It is completely suitable for various situations in the industrial and civil fields, and is the best solution for nonlinear load harmonic control and reactive power compensation.

■ Model Description



■ FaSVG Series Features

1. Modular design, the failure of any module will not affect the normal operation of other modules, which greatly improve the reliability of the whole machine.
2. Reactive power compensation can make the power factor reach 1.

It can simultaneously compensate the harmonic, or selected compensation, and can correct unbalanced three-phase current to complete balance.

3. Reactive power compensation, three-phase unbalance compensation and filter can be single or multiple selected, and the priority can be set.
4. Using sliding window iterative DFT detection algorithm, the calculation speed is fast, the instantaneous response time is less than 0.1ms, and the device compensation response time is less than 10ms.
5. Onsite CT wiring location can choose load side or grid side for sampling.
6. It can be paralleled with any LC passive device onsite without resonance.
7. A reliable current limiting control link is adopted, when the current to be compensated is larger than the SVG rated capacity, it can limit the current at 100% of the output automatically, maintain normal operation, and will not happen faults such as overload or burned.
8. The main circuit adopts tri-level three leg, with high output waveform quality and low switching loss.
9. It adopts a 7-inch high definition touch screen, which is easy to operate. The screen displays operating parameters of the system and device in real time, with faults alarm and recall functions. Using FPGA as the control chip and DSP chip for algorithmic processing, parallel operation, the operation rate is much higher than that of a single DSP control mode, the communication delay

is small, and the response speed is faster. After the sintering program, the FPGA is equivalent to the hardware circuit, and the anti-interference ability is extremely strong. There will be no failure of the program to run away.

10. The SVG input terminal is designed according to the second level lightning protection, and is equipped with reliable surge protectors, which play a protective role in lightning strikes to avoid device damaging.
11. With layered design, dust will not adhere to the circuit board, which is suitable for use under harsh working conditions.

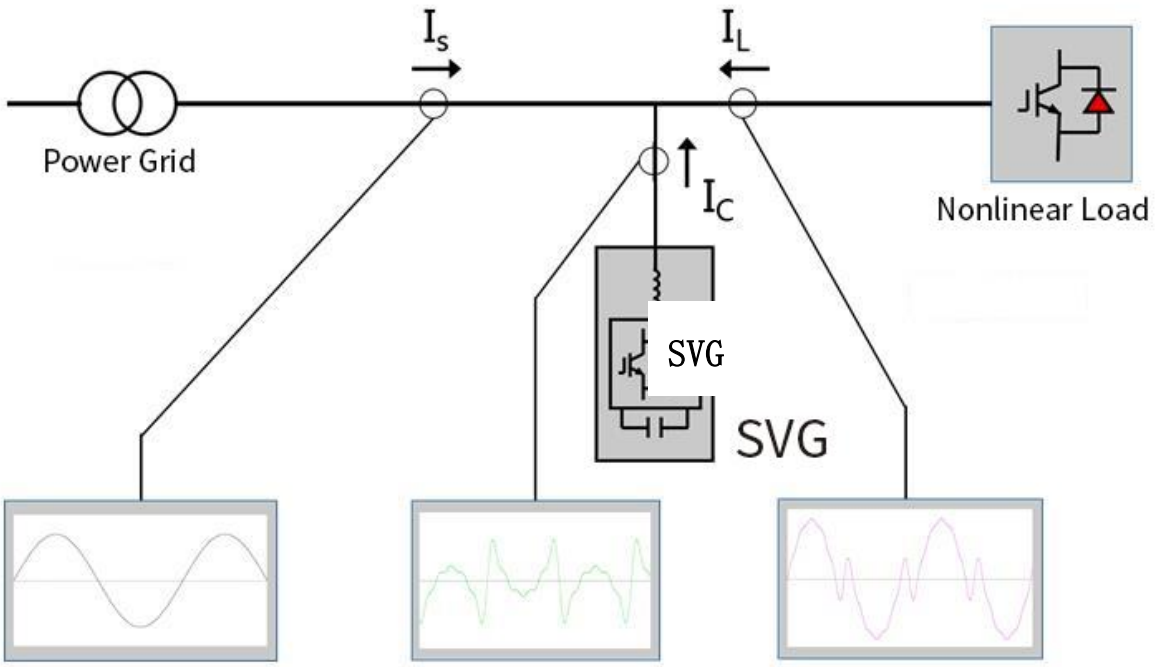
■ Technical Specifications

Table 2 Technical Specifications

		SVG			
Specifications	Rated Capacity	35kvar	50kvar	75kvar	100kvar
Input	Working Voltage	200V/400V/690V（±15%）			
	Working Frequency	50Hz（-10% ~ +10%）			
	Current Transformer	100:5 ~ 10000:5			
	Overall Efficiency	>97%			
	Target Power Factor	Adjustable from -1 to +1			
Protocol	Communication Ports	RS232, 485, Modbus Protocol, TCP/IP Optional			
	Communication Interface	RS485, Net Port			
	PC Software	Yes, all the parameters can be set through PC computer			
	Fault Alarm	See the list of common faults at the end of the page			
	Monitoring	Support independent monitoring of each model/centralized monitoring of the whole machine			
Technical Indicators	Response Time	<10ms			
	Active Loss	<2.5%			
	Cooling Method	Smart Air Cooling			
	Noise Level	<65dB			
	Sample/Control Frequency	15~20kHz			
	Equivalent Switching Frequency	15~20kHz			
	Protection Functions	More than 20 kinds of protection such as overvoltage, under-voltage, over temperature, overcurrent, short-circuit			
	CT Install Location	Load side/Grid side Optional			
Mechanical Properties	Single Machine Size	See SVG Dimension drawing for details（P13-14）			
	Weight	30kg~55kg			
Environment Requirements	Ambient Temperature	-10℃~+45℃			

	Altitude	<5000m (Above 1500m, derating 1% every additional 100m)
	Relative Humidity	<90%(25℃)
	Protection Class	IP20 (Higher protection grade can be customized)

■ SVG Working Principle



Picture1 SVG Working Principle Chart

1. SVG Working Principle

   User can set parameters so that the device can simultaneously have the function of filtering harmonics, dynamic reactive power compensation, and three-phase unbalance compensation.

   The principle of reactive power compensation is that the SVG collects the load current signal in real time through the external current transformer, through the IGBT power converter to generate capacitive or inductive reactive current, though controller to detect the load current in real time, and the real-time two-way reactive power (100% inductive-100% capacitive) and unbalance compensation is realized through the current decomposition algorithm and control algorithm.

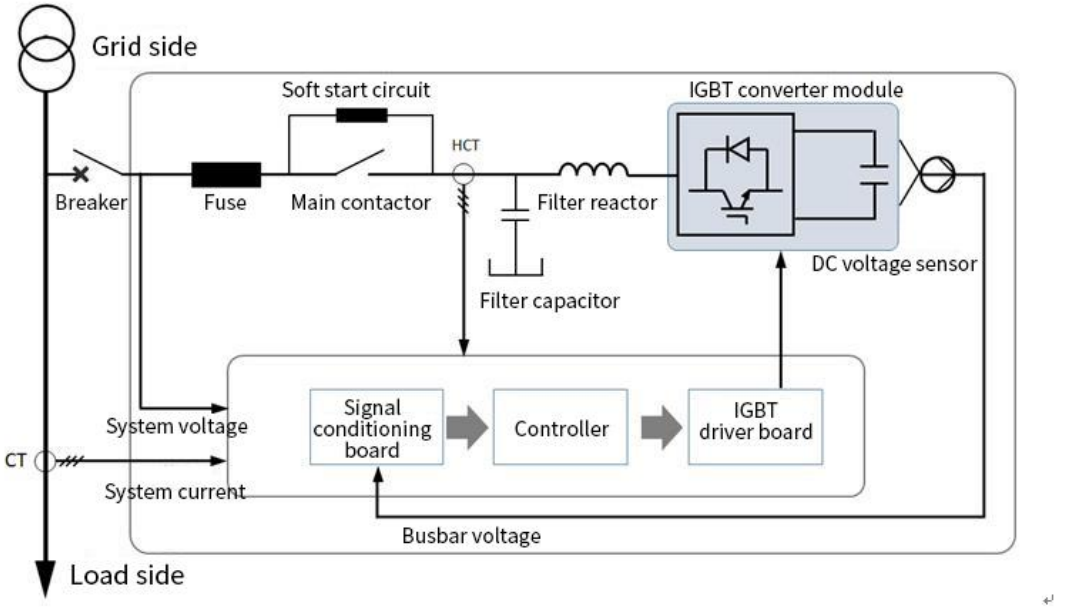
   The SVG output compensation current changes dynamically and accurately according to the harmonic content of the system, so there will be no over-compensation problem. In addition, there is an

overload protection function inside the SVG. When the harmonic amount of the system is greater than the SVG capacity, the device can automatically limit the output at 100% of the rated capacity, so no overload will occur.

The principle of three-phase unbalance compensation is that SVG collects system current signals in real time through external current transformers and sends them to DSP for real-time calculation to judge where the system current is in an unbalanced state, and at the same time calculates the current difference of each phase when it reaches a balanced state. According to the current difference, closed loop and dynamically output PWM signal to control and drive IGBT to invert current of each phase, and control its natural transfer between the three phase, to make the current of system to reach a balanced state.

The principle of filtering harmonic is that SVG collects the current signal in real time through current transformer, separates the harmonic part through the internal detection circuit, and generates equal to but opposite phase compensation current through IGBT power converter, to realize the function of filtering harmonics.

2. Principle of SVG Internal Control



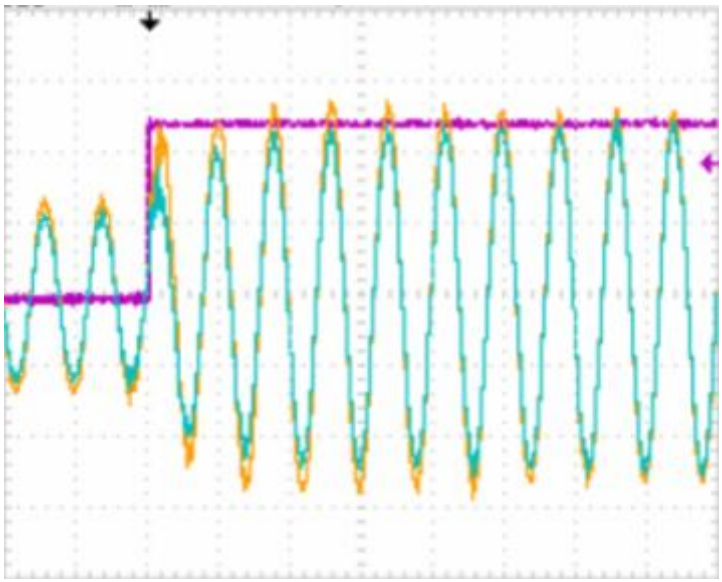
Picture2 SVG Internal Control Schematic

As shown in Picture2, after the circuit breaker is closed, in order to prevent instantaneous impact from grid to DC bus capacitor when the power is turned on, SVG first charges to DC busbar capacitor through the soft start circuit, and the process lasts for more than ten seconds. When the bus voltage Udc reaches a predetermined value, the main contactor closes. DC capacitor acts as an energy storage device, and supplies energy by outputting compensation current through IGBT and internal reactor. SVG collects current signal in real time through external CT and sends it to signal conditioning circuit, then sends it to controller. The controller separates the fundamental wave components, extracts all harmonic current, reactive power current, and three-phase unbalance current, and compares the collected current components with the compensated current send by SVG to obtain the difference, and output to the drive circuit as a real-time compensation signal, which triggering the converter module to inject the compensated current to grid to realize closed-loop

control and complete the compensation function.

- **Responding Speed of SVG**

Compare with normal reactive power compensation devices, SVG has extremely fast response speed, the internal response speed of SVG is less than 100us, it can give fast compensation to the grid reactive power. The response speed waveform is shown in Picture3.



Picture3 Response Speed

Initial Inspection and Installation

This chapter introduces the relevant requirements that must be considered when selecting the location and wiring of the SVG and its related device.

Due to the particularity of each site, this chapter does not introduce detailed installation steps, but only provides guidance for installers in general installation steps and methods, and the installer will handle it according to the specific conditions of the site.

Attention!	● Requires three-phase four-wire or three-phase three-wire to input power ● The standard SVG system can be

	connected with three-phase four-wire (grounding) TN, TT and IT AC power distribution system (IEC60364-3) and three-phase three-wire AC power system. If used in an IT AC distribution system, a 4-pole circuit breaker should be configured for the input, and reference can be made to relevant IT system standards.
 Warning	● The SVG can only be powered on with the approval of the commissioning engineer. ● Installation of the SVG should be performed by a qualified engineer with the instruction of this manual. The SVG involved in this manual is shipped with detailed mechanical and electrical installation information.
 Danger	Mainly refer to the fatal danger caused by short circuit, electric shock caused by ungrounded or contact with liquid. ● Make sure the SVG is grounded. ● Start the SVG where liquid around is not allowed ● Put SVG in a high humility environment is not allowed. ● Make sure to remove or open the cover/door with the SVG powered off. In particular, please note that after the circuit breaker in the cabinet is powered off, the upper part of the circuit breaker is still charged, so the upper switch should be disconnected to ensure absolute safety.

	Poor Ventilation Poor ventilation or heat dissipation can cause overheating and damage the machine. ● Vent openings are not allowed to cover. ● If installed in a switch cabinet, ensure that the heat source has been removed, and the device is in the air duct of the cabinet.
  Danger	● Parts behinds protective cover that require tools to open are not user-operable parts. ● Tearing the anti-tear label without permission is regarded as giving up the manufacturer's maintenance service. ● **Strong recommendation:** Although the rack-mounted SVG has its own circuit breaker, this manual still recommends users install a circuit breaker between SVG and the mains for isolation, and disconnect the breaker during maintenance to ensure absolute safety.

■ Initial Inspection

Following checks should be done before the SVG installation:

1. Visually inspect the exterior and interior of the SVG for shipping damage. In case of damage, notify the carrier immediately.
2. Check the product label to confirm the correctness of the device. A nameplate is attached to the device shell to indicate the SVG model, capacity and main parameters.

■ Position Selection

1. SVG Installation Selection

   The SVG is designed for indoor installation and should be installed in a clean environment with good ventilation to ensure

that the ambient temperature meets product specifications.

The SVG is cooled by internal fans, the cool air enters the SVG through the air grille in front of the SVG cabinet, and the hot air is exhausted through the air grille at the rear of the SVG cabinet. Do not block the vents.

Due to the air duct isolation, there is no need to install a dust filter in general environment, but for hash environment, such as high temperature, high humility, and a lot of conductive dust environment, please contact our product engineers when making on-site application solutions, and confirm the specific heat dissipation scheme.

There is a main touch screen on the front panel of the SVG cabinet, which is used for centralized operation and display of running status. Each module can independently set its own parameters and query status.

The SVG is installed in a cabinet, there are power terminals and CT input terminals at the cable inlet end of the SVG chassis. In order to facilitate the maintenance of the SVG during daily operation, in addition to meeting the local regulations, sufficient space should be reserved for facilitate maintenance personal to access cables.

Attention	● The installation method is the cabinet mode, at least 600mm of ventilation space and rear maintenance space must be reserved at the front and rear outlets of the cabinet. ● If necessary, indoor exhaust fans or air conditions should be installed to avoid room temperature increasing.

2. Storage

If there is no need to install the SVG immediately, please store the SVG indoor to avoid excessive humility or high temperature.

■ Device Handling

Attention!	● Since the weight of a single SVG module is 30kg-55kg, it is recommended to be transported by two people within a short distance, if transported over a long distance, it needs to be completed with the help of transportation device.

■ Installation Environment

In order to prolong the service life, the choice of SVG position should ensure:

1. Easy wiring
2. Have enough operation space
3. Good ventilation to meet heat dissipation requirements
4. No corrosive gas around
5. No source of excessive humility and high temperature
6. Non-dusty environment
7. Comply with the fire protection requirements

Please observe the environment and conditions in the table below:

Table 3 Installation Environment

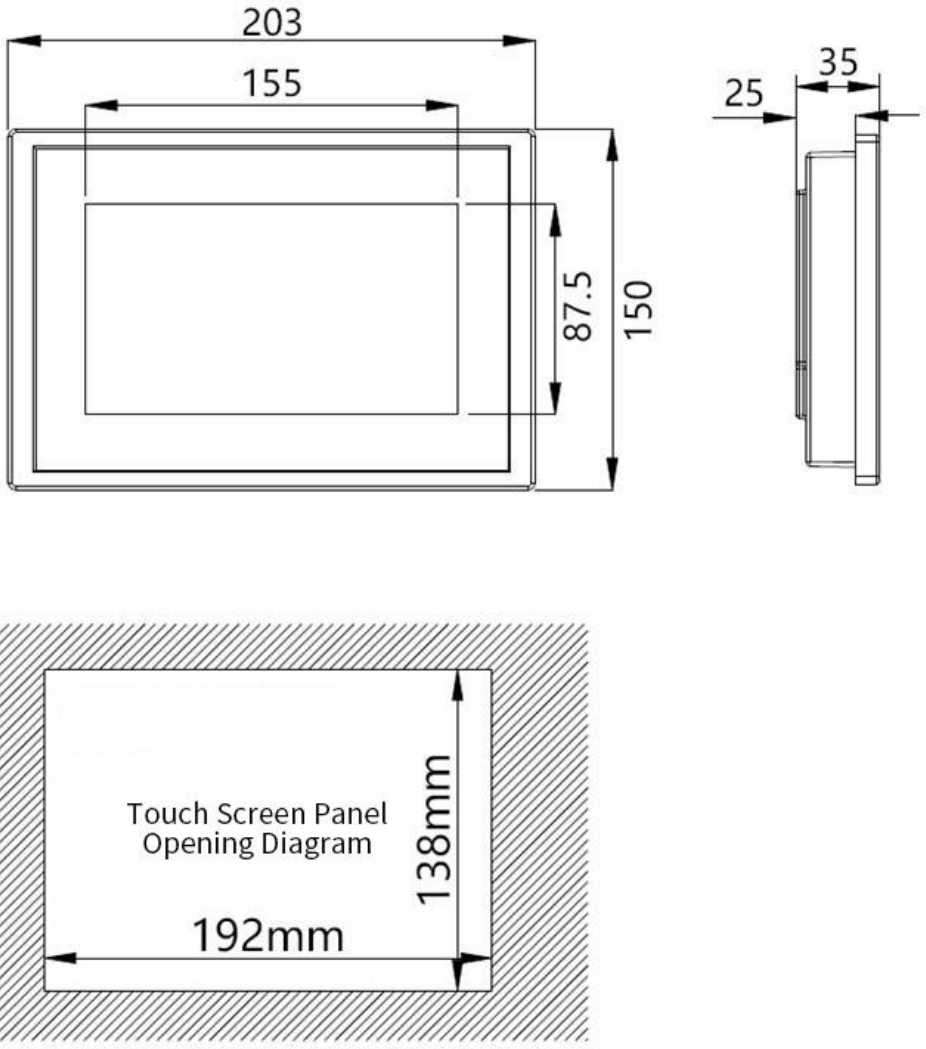
Content	Condition	Attention
Altitude	<1500m	Device overvoltage is designed according to Class III standard
	From 1500m to 5000m	The device is derating by 1% for every 100m rise
Temperature	-10~40℃	Below -10℃, heating device should be installed in the cabinet

		Exceeds 40℃, ventilation or cooling facilities should be installed indoors
Humility	<90%	For higher requirements, please contact the manufacture
Installation	Modular	At least 60mm of ventilation space should be reserved at the front and rear outlets of the cabinet

Table 4 Conditions of Module Installation

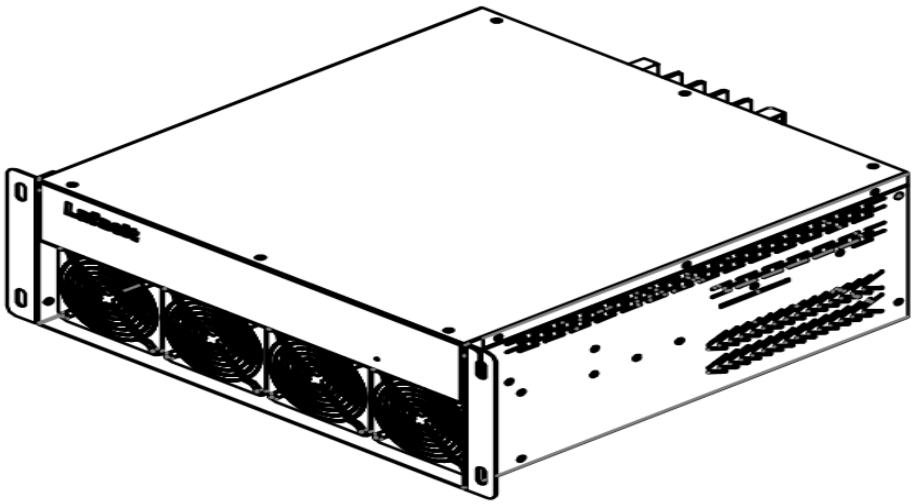
Position	**Minimum required installation space**
Top	No need
Front side to front door panel (air inlet)	150mm
Back side to rear door panel (air outlet)	250mm
Left/Right side	No need

■ Touch Screen Size Chart

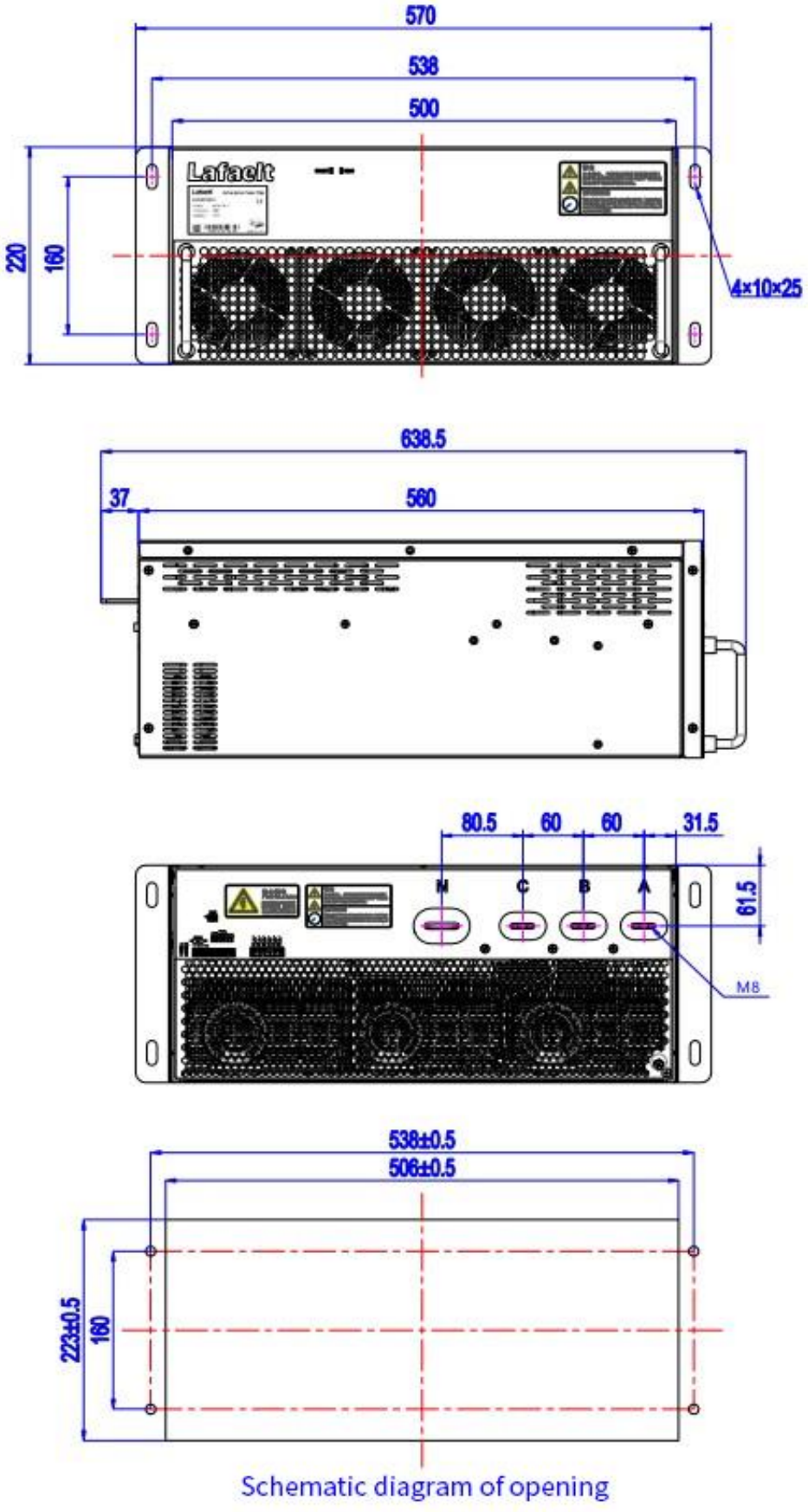


Picture4 Touch Screen Size

■ SVG Dimension



Picture5 Schematic Diagram of Module Appearance

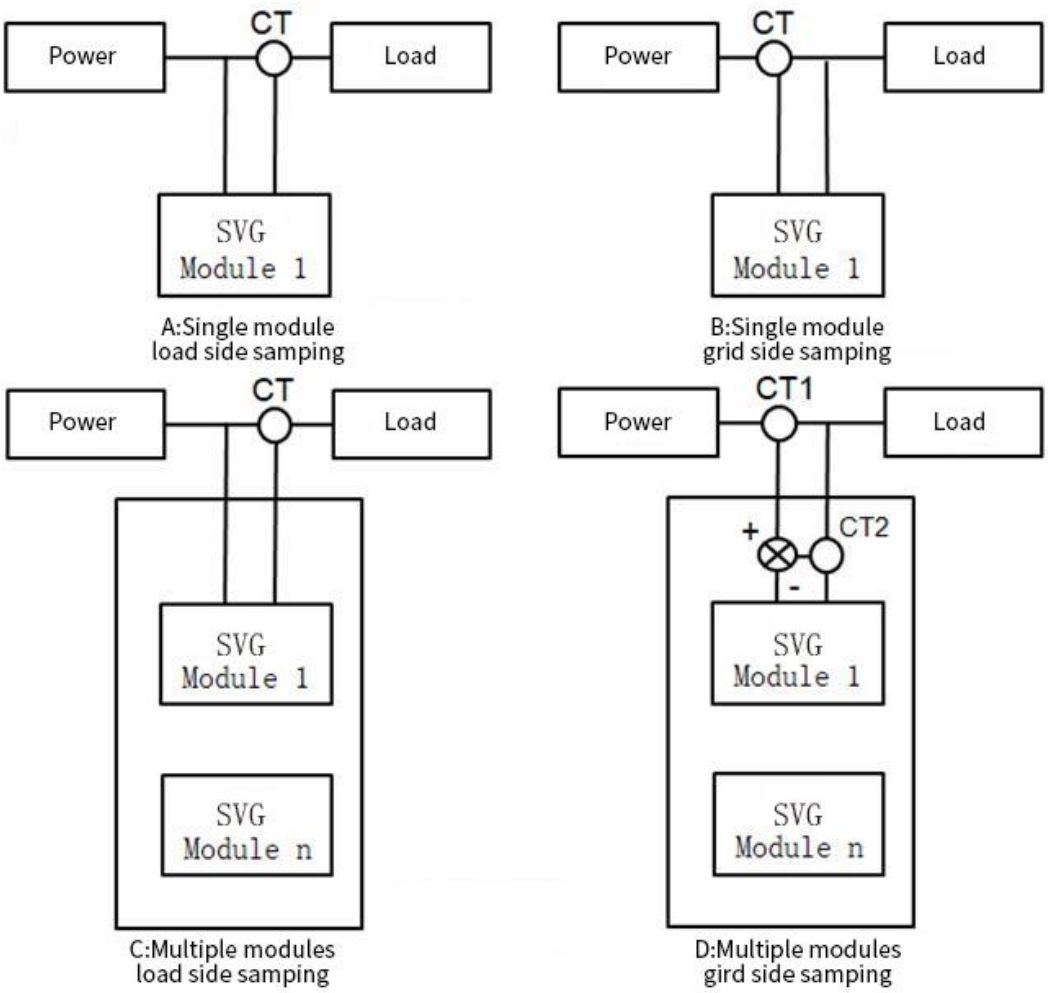


Picture6 Module Dimensions

■ Optional accessories installation

1. 外部采样 CT

SVG 并联安装在系统中，电流互感器 CT 可在触摸屏上任选接于电网侧或负载侧，默认是选择负载侧安装，如果现场为采样电网侧的话，多模块并联的机柜内需要将电网 CT 信号与装置输出总电流 CT 信号相减得到负载侧电流，作为最终采样信号输入到模块内。共有如下接线方式：

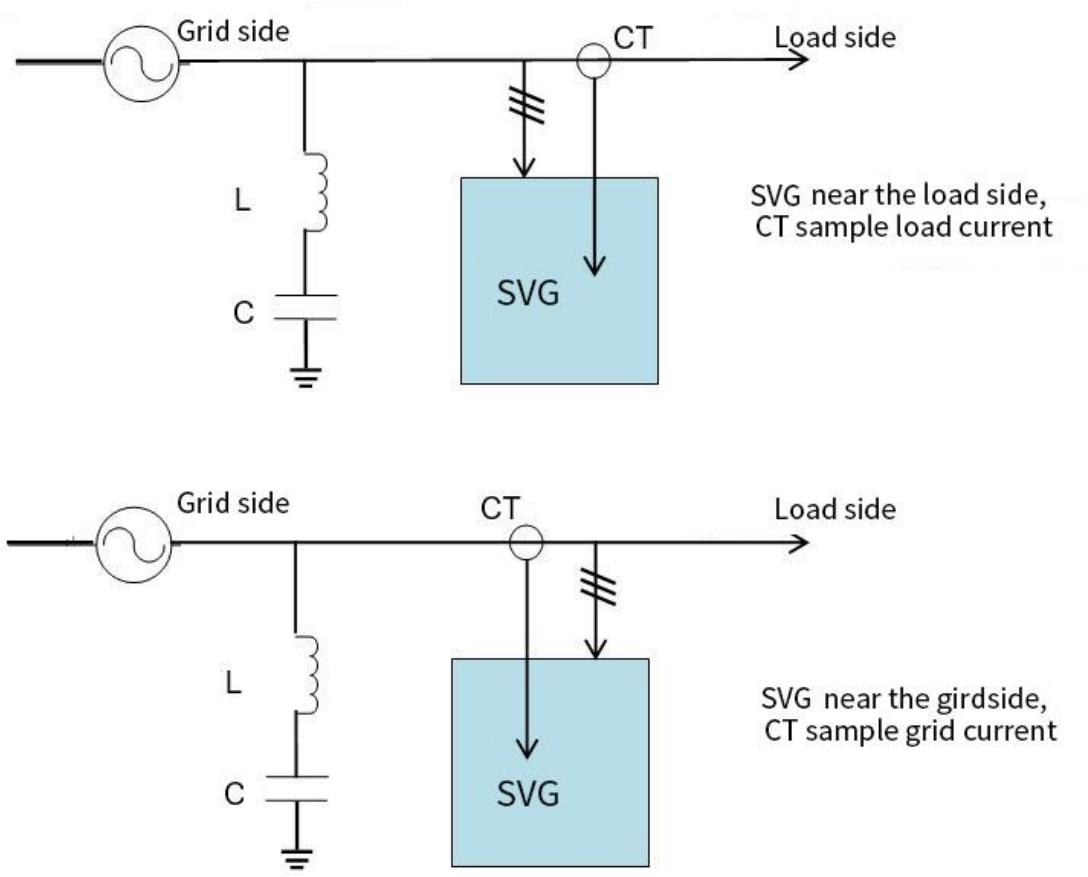


Picture7 Installation Diagram

In Picture7, if there are several modules in a cabinet, the total output current sampling CT2 is required in the cabinet to realize the sampling on the grid side.

For the wiring when SVG and capacitor are used together, the

principle is that the main incoming line point of SVG is closer to the load than the capacitor. The reason is that SVG compensates harmonics, the current flowing through is the fundamental wave when the SVG access point faces the grid side, which is good for capacitor life.



Picture8 The position relationship between SVG and capacitor compensation

 Danger	**If the current transformer is connected incorrectly, it may cause fatal by short circuit or electric shock.** ● The power should be turned off before installing current transformer. ● Make sure that the current transformer is in a short circuit status until the CT connect terminals of the SVG are connected. ● Short-circuit the current transformer with the

	separable short-circuit terminal before separating the current transformer and SVG.

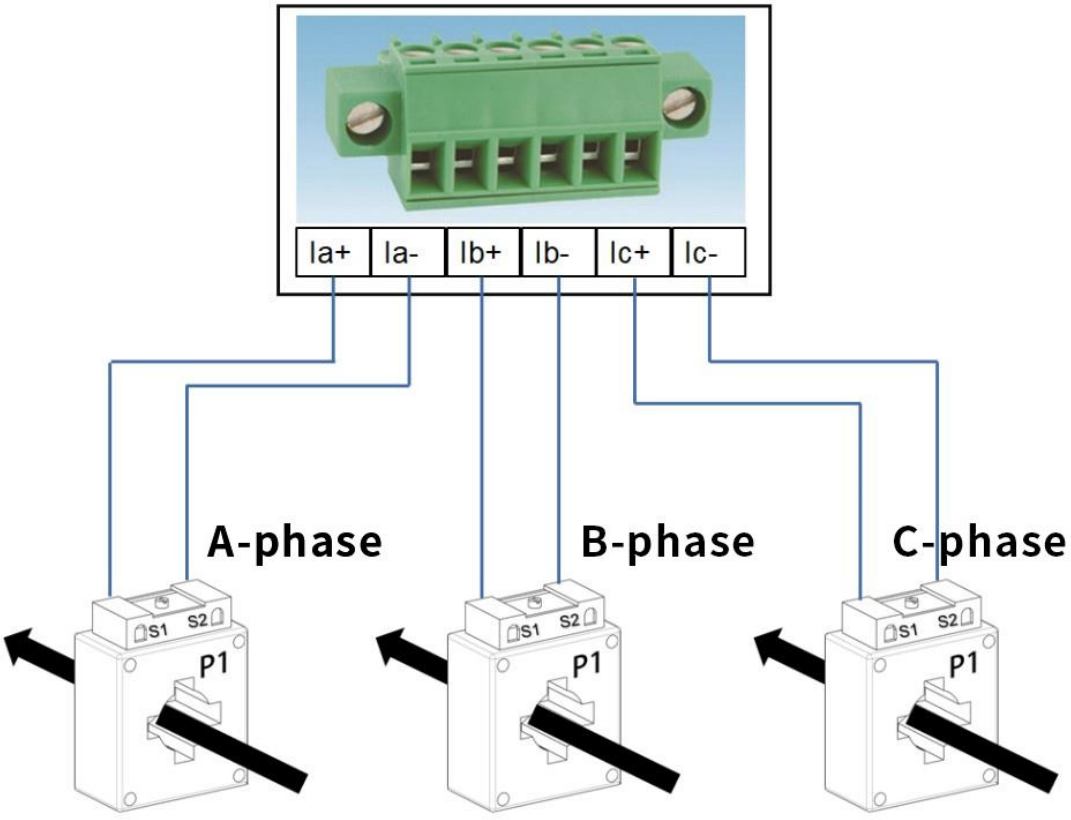
External CT Specification

Option	Model	Note
External CT Components	Chosen by Customer	The current transformation ratio can be freely selected from 100/5-10000/5. In view of AD sampling accuracy, too large CT transformation ratio will reduce the compensation accuracy.

Current Transformer Specification

Parameters	Specifications
Rated Secondary Current	5A
Rated Primary Current	The primary current must be selected based on the maximum effective value of the current (Example: starting current 800A→use current transformer 1000A:5A)
Accuracy Class	Level 0.2 or 0.5
Rated Load（VA）	10 and above

① Wiring of current transformer when a single SVG module is running. In order to ensure that the current can be detected correctly, pay attention to the current direction and phase sequence of the current transformer

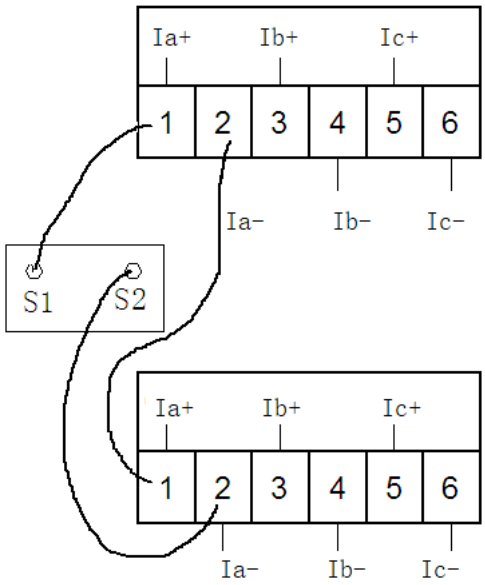


Picture Wiring of current transformer when a single SVG module running

② Wiring of current transformer when multiple SVG modules running in parallel.

The parallel operation of SVG modules can increase the compensation current value.

When multiple SVGs are connected in parallel, they share a set of current transformers, and the CT secondary side cables are connected in series.



Picture10 CT Cables Connection Diagram

【Note】：The installation of the electric part of SVG device must be carried out by trained and qualified engineers in accordance with the "Electrical Code", and other personnel are strictly prohibited from installing. This manual only introduces basic content of the installation, for specific installation details, please refer to the Electrical Code.

CT cables choose 2.5mm2 shielded twisted pair RVSP2×2.5（length L<15m），or choose 4mm2 shielded twisted pair RVSP2×4（length 15m<L<30m）.

■ External Incoming Cable Specification

Three-phase four-wire SVG requires that the specifications of the two neutral cables must be the same as the phase cable, because the three and thrice times harmonics all flow through the neutral line, if the neutral line specification is reduced, it will cause danger.

The SVG incoming cables under each current level are as follows:

Table 6 Cable Specification

Device Rated Current	35 kvar	50 kvar	75 kvar	100 kvar
BVR Cable（mm2）	16	25	50	70

User Operation Guideline

SVG can be operated through touch screen.

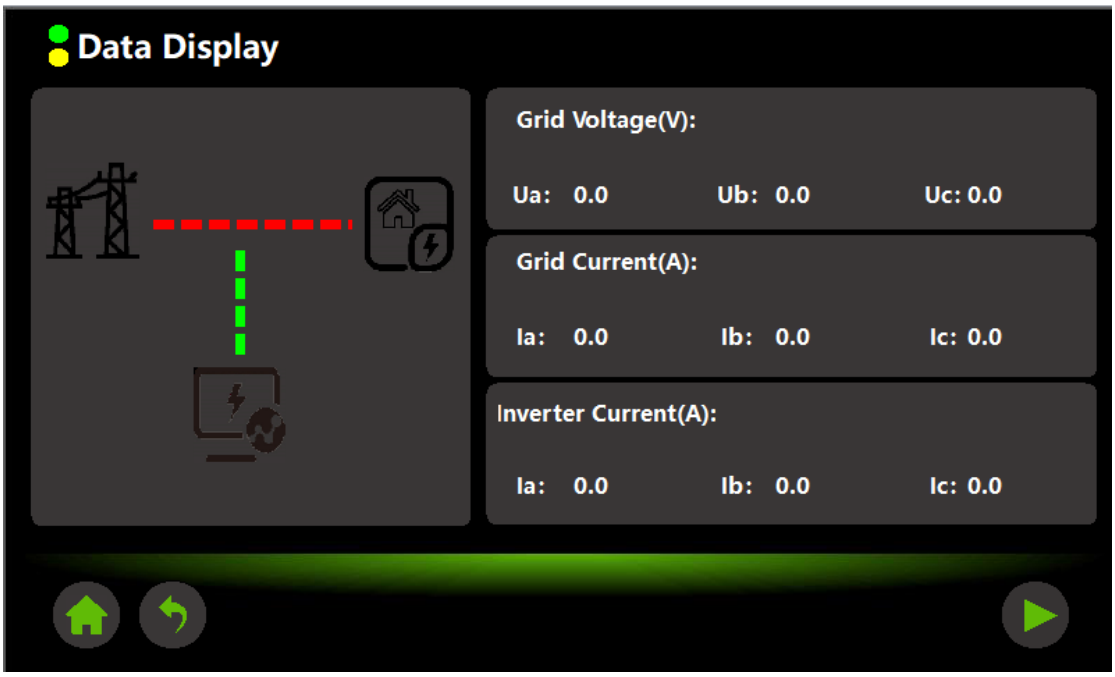
- **Main Menu**

  After the device is powered on, the screen is in the startup state, and the startup process lasts for about 10 seconds. After the startup is successful, if the system is normal, the following page will be displayed, and you can see the main status of the device.

Picture11 Main Menu

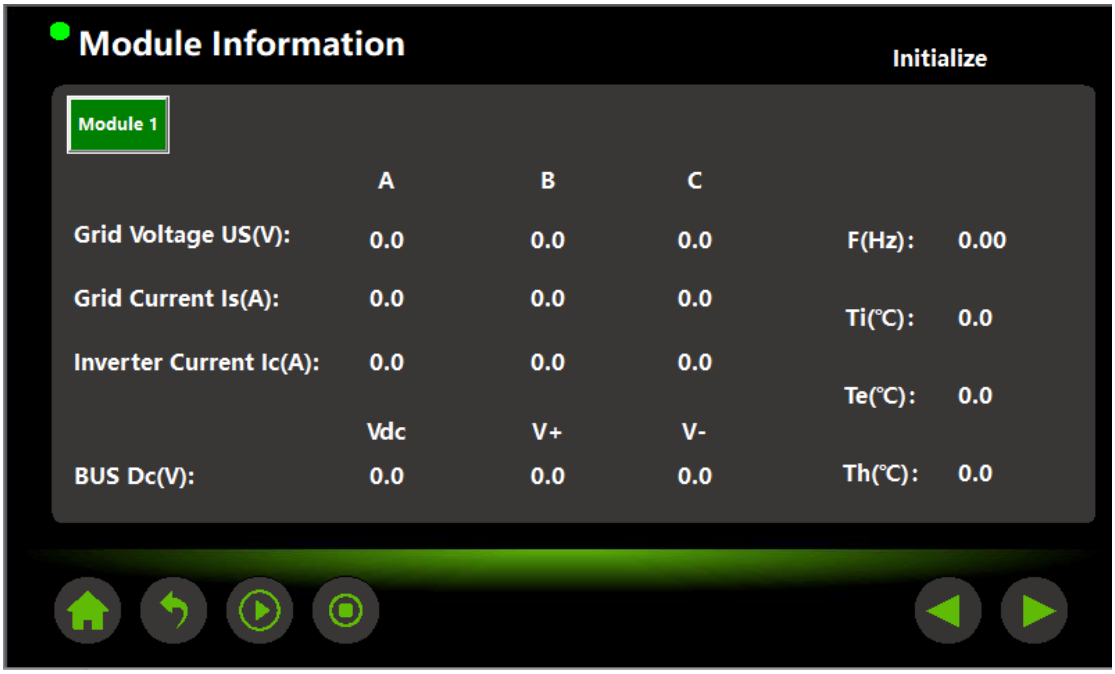
There are eight parts in the main menu: real-time data, module information, user setting, real-time curve, operation control, current records, history records, manufacture information.

■ Real-time Data

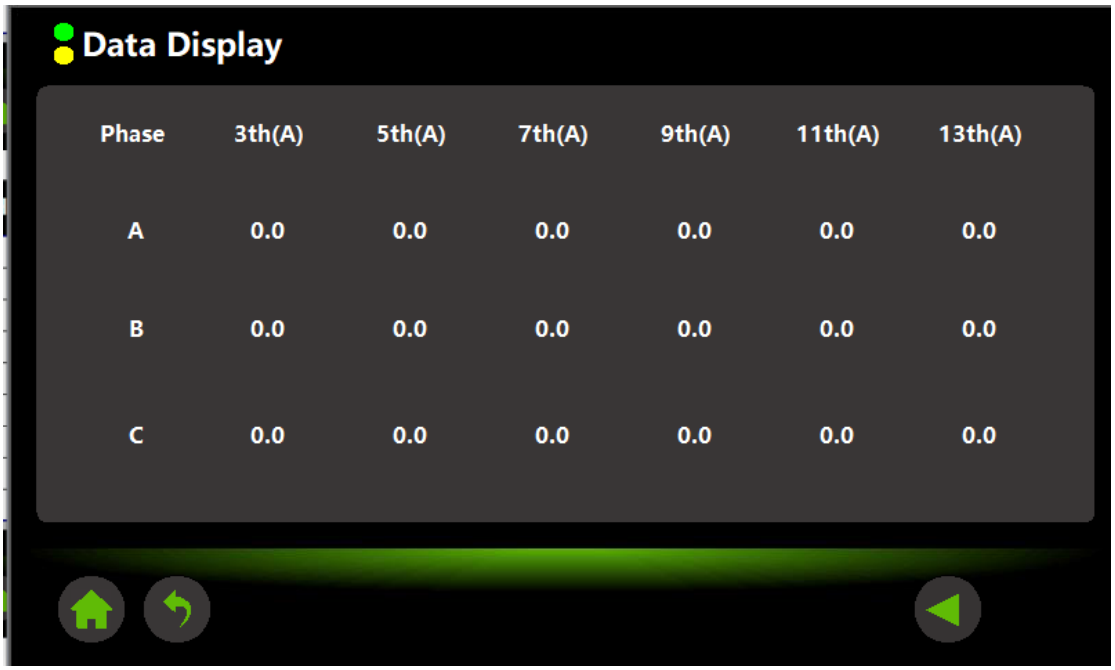


Picture12 Real-time data

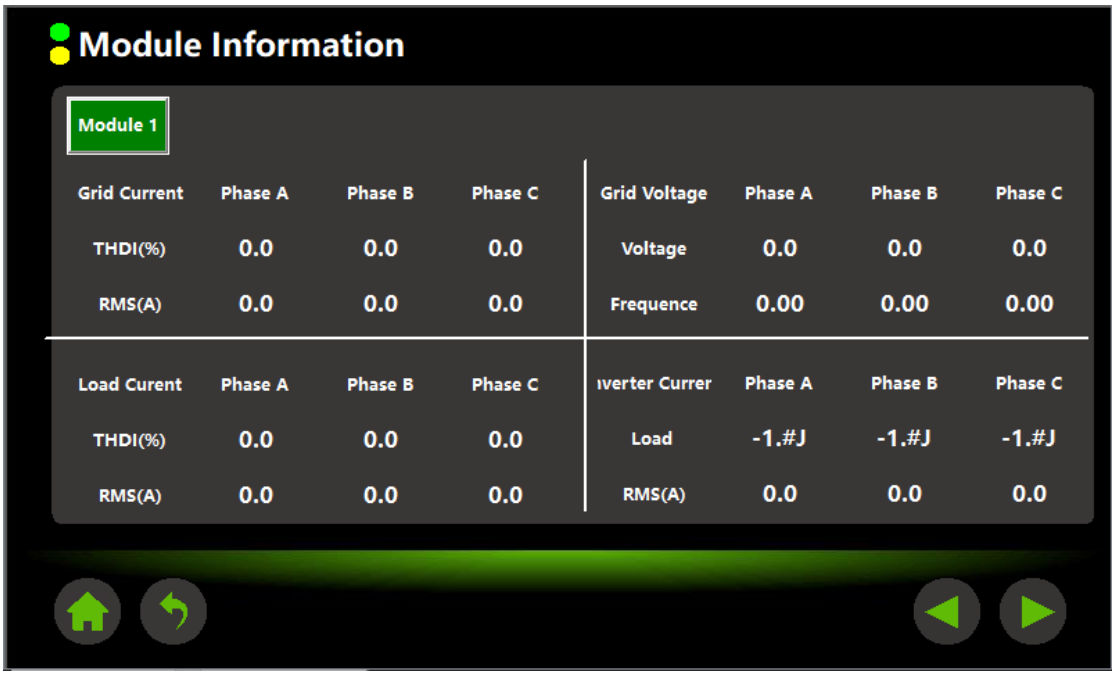
■ Module Information



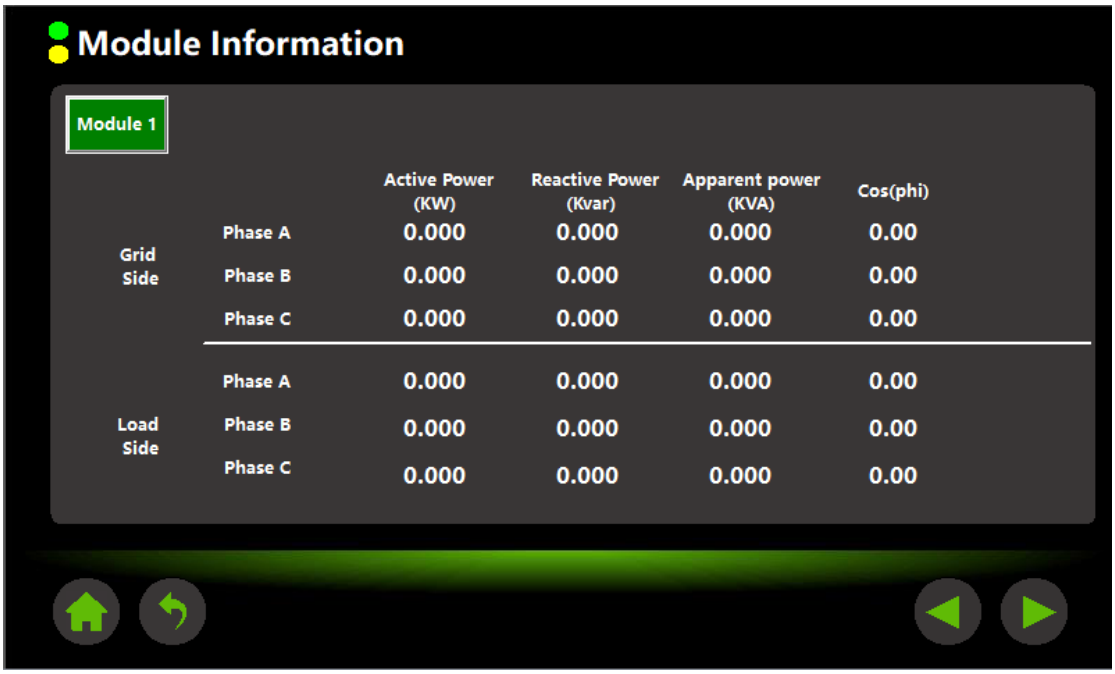
Picture13 Module Information1



Picture14 Module Informaiton2(Detect the size of each harmonic current)



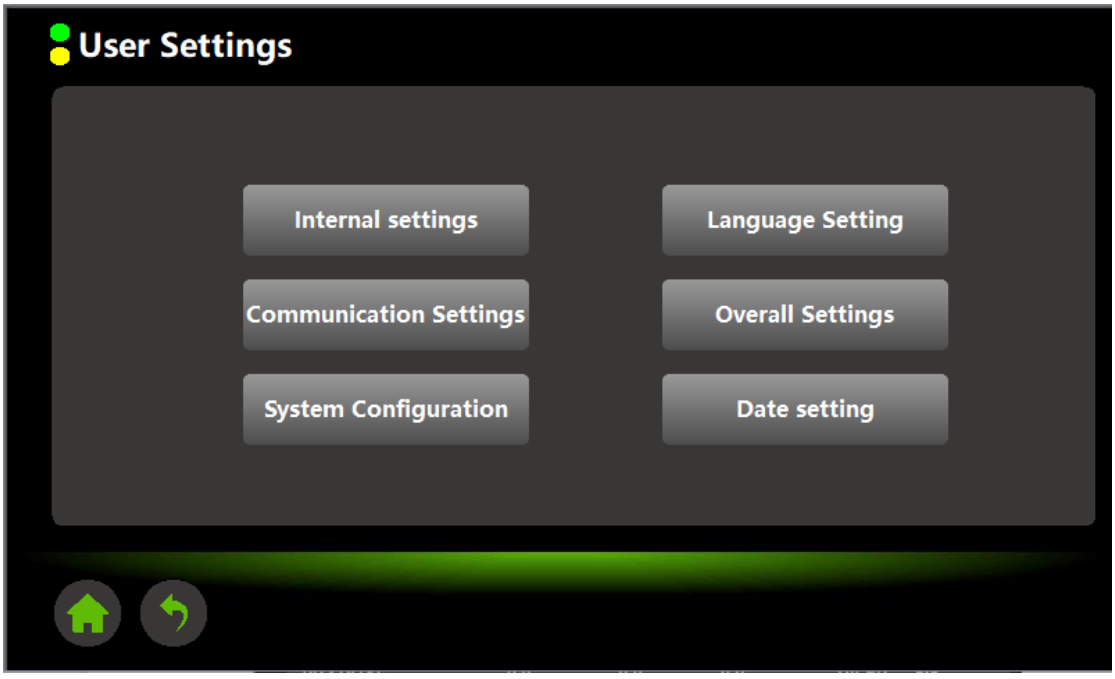
Picture15 Module Information3



Picture16 Module Information4

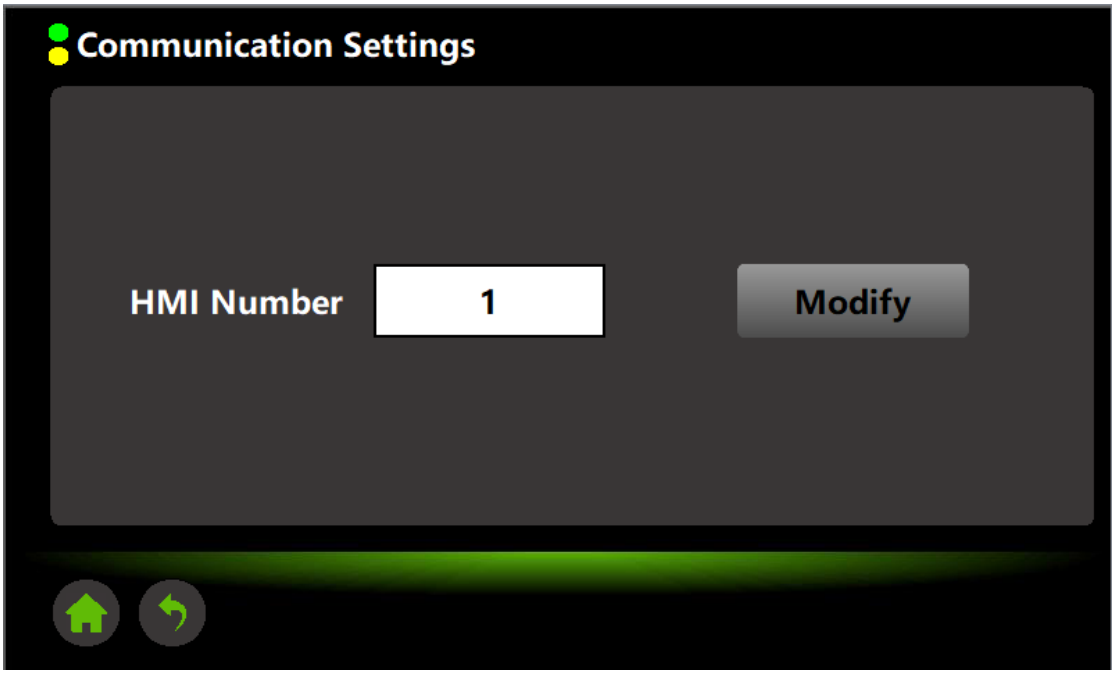
■ User Setting

Click User Setting, enter technician user password:8888 to enter the user settings page



Picture17 User Setting

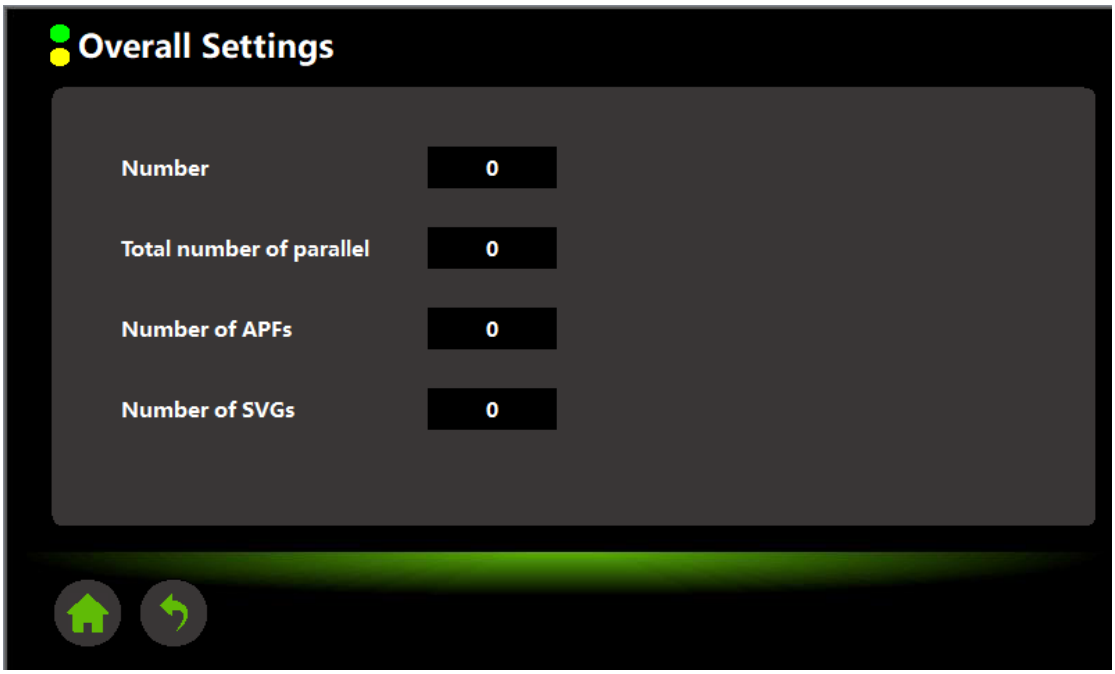
■ Communication Setting



Picture18 Communication Setting

The screen station number has been set to 1 by default before leaving the factory.

■ 整柜设置



Picture19 Overall Setting

Number of units in the cabinet: corresponding to the number of modules

in the cabinet.

The number of all parallel units: for the number of all modules of the master and slave machines.

SVG units: The number of corresponding models of mixed cabinet (o for non-mixed cabinets).

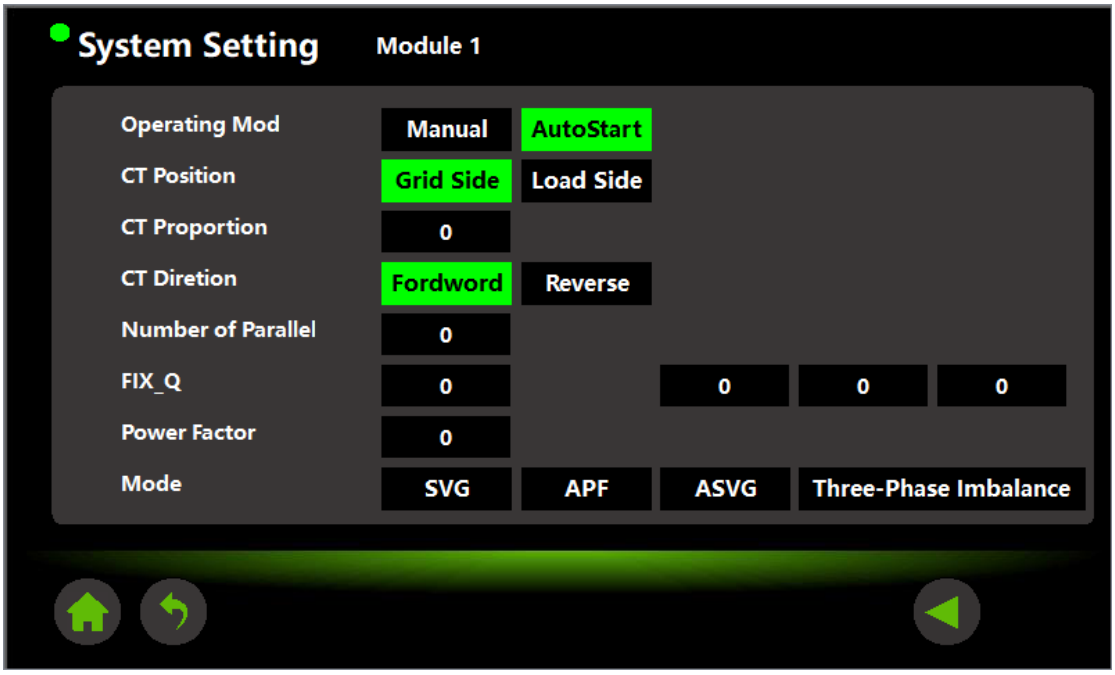
Machine NO.	Code dial setting
1#	0 0 0
2#	1 0 0
3#	0 1 0
4#	1 1 0
5#	0 0 1
6#	1 0 1
7#	0 1 1
8#	1 1 1

Picture20 DIP Setting

When there are multiple modules in the whole cabinet, the numbers need to be set, and the dial code is set according to the device number. The picture above shows the code setting of the 1# device corresponding to the address 1, and order and so on. The dialing position is located in the upper left corner of the device back, and the table above shows the address dialing settings of 1#-8# devices.

Remarks: In Picture20, when the code is pulled to the top, it is ON, represented by the number 0; when it is pulled to the bottom, it is OFF, represented by the number 1.

■ System Setting



Picture21 System Setting

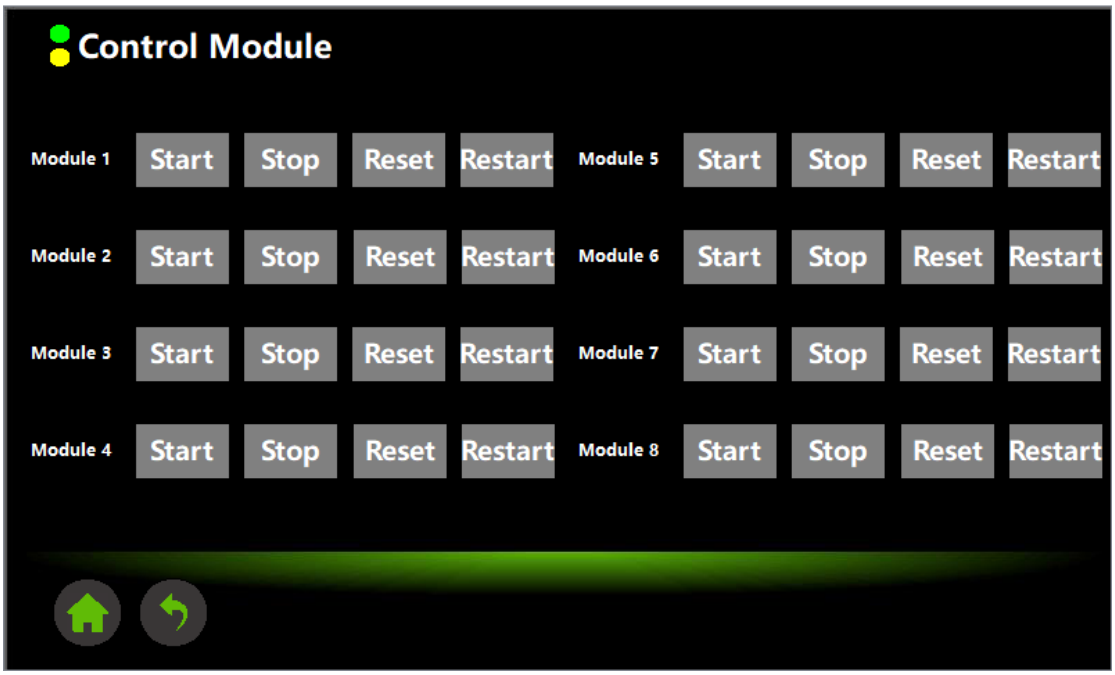
Click the parameter you want to set, and a corresponding dialog box will pop up to enter the parameter. More detailed internal control parameter settings have been set before leaving the factory. If it is necessary to change internal control parameters during operation, you should be authorized by manufacturer to enter internal advanced menu to change for device security.

1. Operation Mode: This device is manual operation by default before leaving the factory.
2. Transformer Position: The sampling position of the external transformer has two types, “power side” and “load side”, and the external transformer position can be changed by clicking the corresponding option.
3. Transformation Ratio of Transformers： The transformation ratio range of the external transformer is [100—10000]:5. For example, the transformation ratio of external transformers is 200:5, and the actual filling result should be 40. After clicking the input box, an

input dialog box will pop up. According to the transformation ratio settings, the larger the transformation ratio, the lager the sampling scape and the larger sampling error.

4. Parallel number of Units: Set according to the actual number of units running in parallel.
5. Given Reactive Power: When the compensation mode is set to “reactive power”, “Given reactive” “Given Qa” “Given Qb” “Given Qc” can be used as expert modes for manufactures and special customers, and users are prohibited from selection.
6. Power Factor: It can be set to 0~99 in corresponding to power factor 0~0.99 when the compensation mode is set to “reactive power”, the operation method is the same as above, click the gray box to enter changed data. The State Grid stipulates that if the power factor is lower than 0.9, a penalty will be charged, if factor is larger than 0.9, rewards will be given. If the fixed power factor is required to run between 0.90 to 0.99, the power factor needs to be set.
7. Compensation Mode: If “Harmonic” is selected for harmonic compensation, the given reactive and power factor are displayed as 0, and it is the harmonic priority mode. If “reactive power” is selected for reactive power compensation, the given reactive and power factor are displayed as 0, and it is reactive power priority at this time.

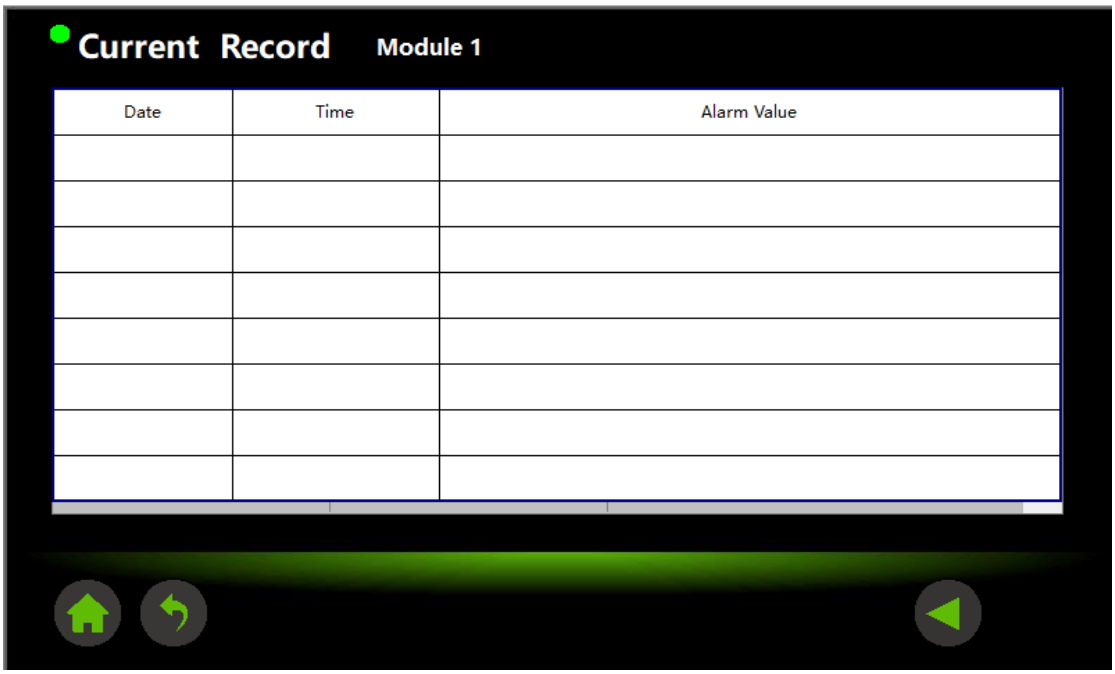
■ Operation Interface



Picture22 Operation Interface

■ Current Record

If there is any abnormality in the device, the fault code will be displayed in the lower right corner of “Module Information”. Query specific exception information through “Current Record” menu. This page displays various internal and external faults and alarm information records during this power-on process.



Picture23 Current Records

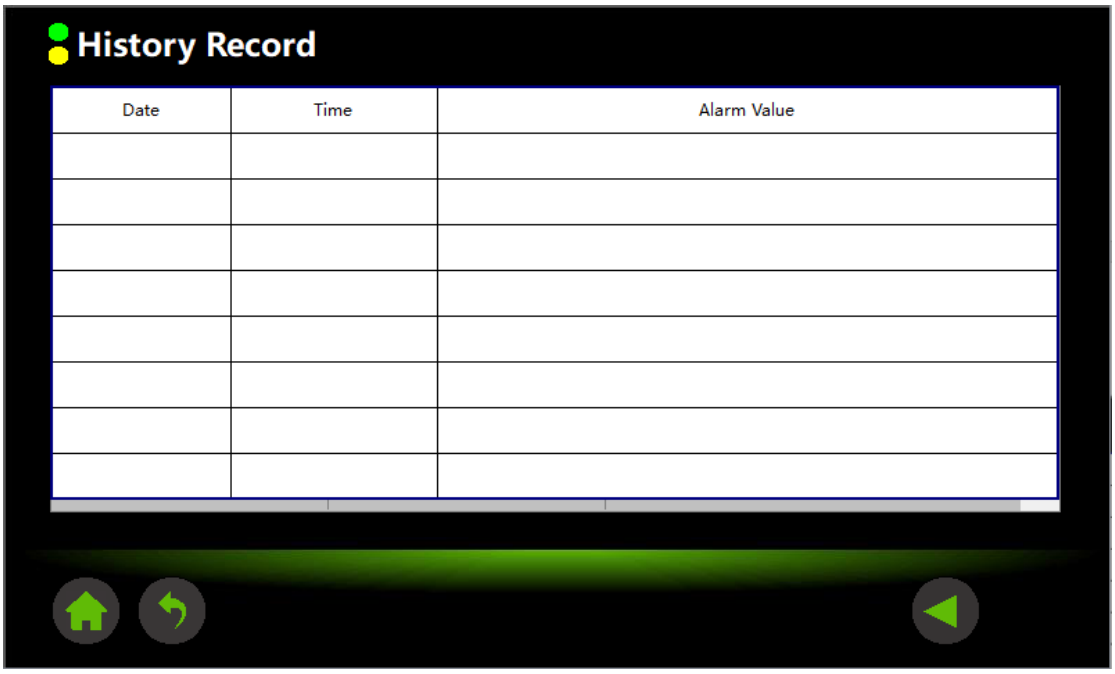
[Note]:

1. If the user has not clicked to start the device after it is powered on, the device will automatically start and run after 10 minutes.
2. If a fault occurs during operation and the device will automatically shut down, then the device can automatically reboot after the fault disappearing.
3. If the device is directly powered off after being powered on, the current state will be recorded, it will automatically read the parameter settings before powered off when it automatically starts running after it is powered on.

Attention: In order to ensure the device safety and prevent misuse, more control parameter settings have been set before leaving the factory, and will not be disclosed in this manual.

■ History Record

Fault information will be recorded in “History Record” eventually.



Picture24 History Record

List of Common Faults

This device has the function of maintenance-free. When a fault occurs, the device will automatically reboot after a maximum of 5 minutes.

If the fault still occurs frequently after rebooting, please contact us and we will try our best to troubleshoot for you. For your personal safety, regardless any faults, do not disassemble the device without our permission, and products with damaged warranty label are not covered by the warranty.

Diagram7 Common Faults

NO.	Status Description	Remark
5	Phase A sustained overvoltage	Overvoltage 1 minute and above
6	Phase B sustained overvoltage	Overvoltage 1 minute and above
7	Phase C sustained overvoltage	Overvoltage 1 minute and above
8	Phase A overvoltage	Exceed the maximum working range
9	Phase B overvoltage	Exceed the maximum working range
10	Phase C overvoltage	Exceed the maximum working range
11	Phase locked loop error	
12	Relay closing failure	
13	Voltage phase sequence error	
14	DC overvoltage software protection	Exceed the maximum permission range
15	DC low voltage software protection	Lower than the minimum permission range
16	Grid side A phase overcurrent	Effective value 1.6 times
17	Grid side B phase overcurrent	Effective value 1.6 times
18	Grid side C phase overcurrent	Effective value 1.6 times
19	Grid side N phase overcurrent	Effective value 1.6 times
20	Grid side A phase overcurrent	Peak 2 times overcurrent
21	Grid side B phase overcurrent	Peak 2 times overcurrent
22	Grid side C phase overcurrent	Peak 2 times overcurrent

23	Grid side A phase overcurrent	Effective value 1.2 times
24	Grid side Bphase overcurrent	Effective value 1.2 times
25	Grid side C phase overcurrent	Effective value 1.2 times
26	Grid side N phase overcurrent	Effective value 1.2 times
27	Grid side A phase overcurrent	Effective value 1.4 times
28	Grid side B phase overcurrent	Effective value 1.4 times
29	Grid side C phase overcurrent	Effective value 1.4 times
30	Grid side N phase overcurrent	Effective value 1.4 times
31	Grid side A phase overcurrent	Peak 5 times overcurrent
32	Grid side B phase overcurrent	Peak 5 times overcurrent
33	Grid side C phase overcurrent	Peak 5 times overcurrent
34	IGBT over temperature	The temperature of IGBT is too high
35	Watchdog failure	
36	Driver failure	The driver protection action is triggered for a short time
37	Internal environment over temperature	Module Internal over temperature
38	Multiple failures	Faults 35-37 exist more than two
39	Phase detection uncompleted	
40	Driver continuous failure	The driver protection action is continuous triggered
41	Phase A sustained low voltage	Low voltage for 1 minute and above
42	Phase B sustained low voltage	Low voltage for 1 minute and above
43	Phase C sustained low voltage	Low voltage for 1 minute and above
44	Phase A low voltage	Lower than the minimum working range
45	Phase B low voltage	Lower than the minimum working range
46	Phase B low voltage	Lower than the minimum working range
47	Phase A low voltage	Instantaneous voltage out of range
48	Phase B low voltage	Instantaneous voltage out of range
49	Phase C low voltage	Instantaneous voltage out of range
50	Inverter hardware overcurrent	Inverter current instantaneous overcurrent
51	Bus hardware overvoltage	DC bus instantaneous overvoltage
52	Over temperature derating	IGBT temperature exceeds the

		derating point
53	Overload derating	Compensation current exceeds the derating point (100% rated)

SVG Communication Data Point Table

1. Protocol RS485 MODBUS RTU, Communication Band Rate 9600BPS, Date Bit 8 bits, no check digit, stop bit 1. Support protocol read function code 03.

2. The address and data table of each module in the access screen are as follows:

NO	Content Description	Unit	Range	Remark	1# Module		2# Module		3# Module		4# Module		5# Module		6# Module		7# Module		8# Module	
					10HEX	16HEX	10HEX	16HEX	10HEX	16HEX	10HEX	16HEX				10HEX	16HEX	10HEX	16HEX	10HEX
1	Run Code			See “Fault Code Table”	48	30	148	94	248	F8	348	15C	448	1C0	548	224	648	288	748	2EC
2	Substrate T1	℃	-2000~+2000	Actual Value = Communication Value	49	31	149	95	249	F9	349	15D	449	1C1	549	225	649	289	749	2ED
3	IGBT Model Temperature T2	℃	-2000~+2000	Actual Value = Communication Value	50	32	150	96	250	FA	350	15E	450	1C2	550	226	650	28A	750	2EE
4	System Voltage A Phase	V	0~65535	Actual Value = Communication Value /10	51	33	151	97	251	FB	351	15F	451	1C3	551	227	651	28B	751	2EF
5	System Voltage B Phase	V	0~65535	Actual Value = Communication Value /10	52	34	152	98	252	FC	352	160	452	1C4	552	228	652	28C	752	2F0
6	System Voltage C Phase	V	0~65535	Actual Value = Communication Value /10	53	35	153	99	253	FD	353	161	453	1C5	553	229	653	28D	753	2F1
7	System Current A Phase	A	0~65535	Actual Value = Communication Value /10	54	36	154	9A	254	FE	354	162	454	1C6	554	22A	654	28E	754	2F2
8	System Current B Phase	A	0~65535	Actual Value = Communication Value /10	55	37	155	9B	255	FF	355	163	455	1C7	555	22B	655	28F	755	2F3
9	System Current C Phase	A	0~65535	Actual Value = Communication Value /10	56	38	156	9C	256	100	356	164	456	1C8	556	22C	656	290	756	2F4
10	Device Current A Phase	A	0~65535	Actual Value = Communication Value /10	57	39	157	9D	257	101	357	165	457	1C9	557	22D	657	291	757	2F5
11	Device Current B Phase	A	0~65535	Actual Value = Communication	58	3A	158	9E	258	102	358	166	458	1CA	558	22E	658	292	758	2F6

				Value /10															
12	Device Current C Phase	A	0~65535	Actual Value = Communication Value /10	59	3B	159	9F	259	103	359	167	459	1CB	559	22F	659	293	759	2F7
13	System Power Factor A Phase	%	-100~100		60	3C	160	A0	260	104	360	168	460	1CC	560	230	660	294	760	2F8
14	System Power Factor B Phase	%	-100~100		61	3D	161	A1	261	105	361	169	461	1CD	561	231	661	295	761	2F9
15	System Power Factor C Phase	%	-100~100		62	3E	162	A2	262	106	362	16A	462	1CE	562	232	662	296	762	2FA
16	System Current Aberration Rate A Phase	%			63	3F	163	A3	263	107	363	16B	463	1CF	563	233	663	297	763	2FB
17	System Current Aberration Rate B Phase	%			64	40	164	A4	264	108	364	16C	464	1D0	564	234	664	298	764	2FC
18	System Current Aberration Rate C Phase	%			65	41	165	A5	265	109	365	16D	465	1D1	565	235	665	299	765	2FD
19	Imbalance A Phase	%	0~65535	Actual Value = Communication Value	66	42	166	A6	266	10A	366	16E	466	1D2	566	236	666	29A	766	2FE
20	Imbalance B Phase	%	0~65535	Actual Value = Communication Value	67	43	167	A7	267	10B	367	16F	467	1D3	567	237	667	29B	767	2FF
21	Imbalance C Phase	%	0~65535	Actual Value = Communication Value	68	44	168	A8	268	10C	368	170	468	1D4	568	238	668	29C	768	300
22	Total DC Voltage	V	0~65535	Actual Value = Communication Value	69	45	169	A9	269	10D	369	171	469	1D5	569	239	669	29D	769	301
23	DC Voltage+	V	0~65535	Actual Value = Communication Value	70	46	170	AA	270	10E	370	172	470	1D6	570	23A	670	29E	770	302
24	DC Voltage-	V	0~65535	Actual Value = Communication Value	71	47	171	AB	271	10F	371	173	471	1D7	571	23B	671	29F	771	303
25	Phase A CT		-30000~+3000	Actual Value =	72	48	172	AC	272	110	372	174	472	1D8	572	23C	672	2A0	772	304

	Transformation Ratio		0	Communication Value															
26	Heat Sink Temperature	℃	-2000~+2000	Actual Value = Communication Value	73	49	173	AD	273	111	373	175	473	1D9	573	23D	673	2A1	773	305
27	Phase B CT Transformation Ratio		-30000~+30000	Actual Value = Communication Value	74	4A	174	AE	274	112	374	176	474	1DA	574	23E	674	2A2	774	306
28	Parallel Number		0~65535	Actual Value = Communication Value	75	4B	175	AF	275	113	375	177	475	1DB	575	23F	675	2A3	775	307
29	Reactive Value Settings	kvar	-100~100	Actual Value = Communication Value	76	4C	176	B0	276	114	376	178	476	1DC	576	240	676	2A4	776	308

After-sale Service

The products of our company are guaranteed for 1 year, and the warranty period starts from the date of product sale. If the product faults or the parts are damaged during the warranty period, our company will provide free maintenance after it is identified by our technicians as occurring under normal use.

In the following cases, material costs and maintenance man-hours will be charged:

- Damage caused by not following the instructions in the manual
- Damage caused by unauthorized desoldering of parts or modification

The operation exceeds the “Three Guarantees” period.

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