HES9510

HYBRID ENERGY CONTROLLER

USER MANUAL

郑州众智科技股份有限公司
SMARTGEN(ZHENGZHOU)TECHNOLOGY CO.,LTD.

SmartGen众智 Chinese trademark

SmartGen English trademark

SmartGen — make your generator *smart*

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Table 1 Software Version

Date	Version	Note
2020-08-31	1.0	Original release.
2022-08-09	1.1	1. Optimize some descriptions; 2. Add the application scene diagrams.

This manual is only suits for HES9510 hybrid energy controller.

Table 2 Symbol Instruction

Symbol	Instruction
▲NOTE	Highlights an essential element of a procedure to ensure correctness.
⚠CAUTION	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
☠WARNING	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

CONTENTS

1   OVERVIEW

HES9510 Hybrid Energy Controller is used for diesel gensets with solar energy, wind energy, energy storage battery in inverter as output energy systems, which can control the start and stop of inverter power supply, output mode, output size as well output closing/opening of breaker, etc. It can also control the start and stop of gensets in system according to the loads, provide spinning reverse for the inverter power supply. In addition, it can also control the inverter for energy storage battery charging and discharging management to realize the data measurement, alarm protection as well as "three-remote" functions. It fits with large LCD display, optional Chinese, English and other languages interface, and it is reliable and easy to use.

HES9510 Hybrid Energy Controller applies 32-bit microprocessor technology, realizing the functions of precise measurement, fixed value adjustment, timing and setting value of various parameters. Most parameters can be adjusted from the front panel of the controller, and all parameters can be adjusted by PC via USB or RS485, Ethernet interface. Its compact structure, simple connection and high reliability can be widely used in hybrid energy control system.

2 PERFORMANCE AND CHARACTERISTICS

Main characteristics are as bellow:

— With ARM-based 32-bit SCM, high integration of hardware and more reliable;

— 240x128 LCD with backlight, multilingual interface (including English, Chinese or other languages) which can be chosen on site, making commissioning convenient for factory personnel;

— Improved LCD wear-resistance and scratch resistance due to hard screen acrylic;

— Silicon panel and pushbuttons for better operation in high/low temperature environment;

— Two RS485 communication ports enable remote control, remote measuring, remote communication via MODBUS protocol;

— A variety of built-in protocols enable communication with inverters such as HUAWEI;

— Suitable for 3-phase 4-wire, 3-phase 3-wire, single phase 2-wire, and 2-phase 3-wire systems with voltage 120/240V and frequency 50/60Hz;

— Collects and displays 3-phase voltage, frequency, 3-phase current, power and voltage harmonic parameters;

— For Busbar, controller has loss of phase and reverse phase sequence detection functions; For new energy, controller has over voltage, under voltage, over frequency, under frequency, high unbalanced voltage, high total harmonic distortion, over current, earth fault, high unbalanced current, low power factor, over power, reverse power, loss of excitation, loss of phase, reverse phase sequence detection functions;

— 5 analog sensor inputs can be set to temperature, pressure, level, power inverters or irradiance sensors;

— Partial sensor inputs can connect with resistor type, voltage type or current type sensors;

— Voltage, current and power display of up to 4-way solar panel channels can be set;

— The maximum capacity of PV calculated by collecting up to 3-way solar panel temperature and 3-way solar irradiance;

— Various of temperature, pressure and oil level sensor curves can be used directly or customized;

— Busbar normal automatic closing and starting with load, automatic soft loading and soft unloading;

— Two active power control modes (fixed power, inverter control);

— Three reactive power control modes (fixed power, power factor, inverter control);

— Each energy can be set or calculated as rated active power, rated reactive power and rated apparent power. The rated active power of PV power station can be calculated in real time according to the sensor data and weather data, the rated power of gensets can be calculated in real time according to the information of online units, the rated power of energy storage power station and mains supply can be set for direct use;

— The controller is able to control the priority of energy use (mains supply, gensets, PV power station (including wind power station), energy storage power station). Each energy can be prioritized

separately, and the smaller the priority value, the higher the priority. Default: PV power station >energy storage station >mains supply>gensets. It supports dynamic prioritization；

— The input port can be set to make them unavailable for mains supply, PV power station, gensets and energy storage power station. When the energy is unavailable, the energy will no longer provide energy and spinning reserve.

— Parameter setting function: parameters can be modified by users and stored in internal EEPROM memory, and cannot be lost even in case of power outage; most of them can be adjusted from the front panel of the controller and all of them can be modified on PC by USB ports and RS485 ports;

— Wide power supply range DC(8~35)V, suitable for different starting battery voltage environment;

— Event log, real-time clock;

— Black box function, which allows to record the genset data of 5 alarms;

— All parameters apply digital adjustment, getting rid of conventional analogue modulation with normal potentiometer, and improving genset reliability and stability;

— IP65 protection level is achieved with the help of rubber-ring gasket between shell and control panel;

— Metal fixing clips employed to fix the controller and make it perform better under high temperature environment;

— Modular structure design, self-extinguishing ABS plastic shell, pluggable terminal, built-in mounting，compact structure with easy installation;

3 SPECIFICATION

Table 3 Technical Specification

Parameter	Details
Working Voltage	Range: DC8V ~ DC35V continuous, DC reverse connection protection
	Resolution: 0.1V
	Accuracy: 1%
Overall Consumption	<7W (Standby mode: ≤2.5W)
AC Voltage	Phase voltage
	Range: AC15V ~ AC360V (ph-N)
	Resolution: 0.1V
	Accuracy: 0.5%
	Wire voltage
	Range: AC30V - AC620V (ph- ph)
	Resolution: 0.1V
	Accuracy: 0.5%
AC Frequency	Range: 5Hz -75Hz
	Resolution: 0.01Hz
	Accuracy: 0.1Hz
AC Current	Rated: 5A
	Range: 0A – 10A
	Resolution: 0.1A
	Accuracy: 1%
Analog Sensor	Resistor Input
	Range: 0Ω- 6000Ω
	Resolution: 0.1
	Accuracy: 1Ω(below 300Ω)
	Voltage Input
	Range: 0 V~5V
	Resolution: 0.001V
	Accuracy: 1%
	Current Input
	Range: 0 mA ~20mA
	Resolution: 0.01mA
	Accuracy: 1%
Digital Output 1	16A DC24V DC power supply output (relay output)
Digital Output 2	16A DC24V DC power supply output (relay output)
Digital Output 3	5A DC30V DC power supply output (relay output)
Digital Output 4	5A DC30V DC power supply output (relay output)
Digital Output 5	5A DC30V DC power supply output (relay output)
Digital Output 6	8A DC250V volt-free output (relay output)
Digital Output 7	8A DC250V volt-free output (relay output)

Parameter	Details
Digital Output 8	8A DC250V volt-free output (relay output)
Digital Output 9	1A DC30V DC power supply output (transistor output)
Digital Output 10	1A DC30V DC power supply output (transistor output)
Digital Input 1-10	Low limit voltage is 1.2V; high limit input voltage is 60V;
RS485	Isolated, half-duplex, 9600 baud rate, maximum communication length 1000m
Ethernet	Self-adapting 10/100Mbit
MSC CAN	Isolated, maximum communication length 250m; for further distances, CAN bus relay module SGCAN300 is recommended.
EMC/CE Certification	EN 61326-1:2013
Vibration Test	5 - 8 Hz: ±7.5 mm 8 - 500 Hz: 2 g IEC 60068-2-6
Shock Test	50g, 11ms, half-sine, complete shock test from three directions, and 18 times shock for each test IEC 60068-2-27
Bump Test	25g, 16ms, self-sine IEC 60255-21-2
Production Compliance	According to EN 61010-1 installation category (over voltage category) Ⅲ, 300V, pollution class 2, altitude 3000m
Case Dimensions	242 mm x 186 mm x 49 mm
Panel Cutout	214mm x 160mm
Working Temperature	(-25~+70)°C
Working Humidity	(20~93)%RH
Storage Temperature	(-30~+80)°C
Protection Level	Front Enclosure: IP65 when rubber-ring gasket is installed between the enclosure and the control panel Rear Enclosure: IP20
Insulation Intensity	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.
Weight	1.1kg

4 OPERATION

4.1 INDICATOR LAMP

Fig.1 HES9510 Indication

⚠**NOTE**: Description for parts of indicators:

Table 4 Alarm indicator Description

Alarm Type	Alarm Indicator
Warning	Slow flashing (1 time per second)
Block	Slow flashing (1 time per second)
Safety Trip	Fast flashing (5 times per second)
Safety Trip and Stop	Fast flashing (5 times per second)
Trip	Fast flashing (5 times per second)
Trip and Stop	Fast flashing (5 times per second)
Shutdown	Fast flashing (5 times per second)
No Alarm	Extinguished
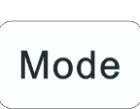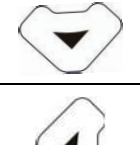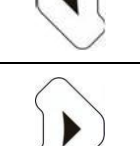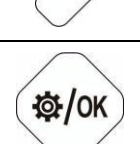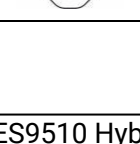
Running indicator: is normally illuminated after crank disconnection and before ETS stop and extinguished for other periods.

New energy normal indicator：is normally illuminated when the new energy is normal; flashing when new energy state is abnormal; extinguished when there is no new energy.

Busbar normal indicator: is normally illuminated when the busbar is normal; flashing when busbar is abnormal; extinguished when there is no busbar.

4.2 PUSHBUTTONS

Table 5 Button Function Description

Icons	Buttons	Description
Stop (red)	Stop	Stop the running inverter in Auto/Manual mode; Reset alarm in stop mode; Lamp test (press at least 3 seconds);
Start (green)	Start	Start the inverter in Manual mode.
Manual hand icon	Manual Mode	Press this button and the controller goes in Manual mode.
Auto icon	Auto Mode	Press this button and controller goes in Auto mode.
Mute icon	Mute/Reset Alarm	Remove the alarm sound; Remove the alarm by pressing for over 3s.
Mode	Mode	In manual mode, the mode conversion of various power stations, PQ mode (constant power) and VF mode (constant frequency and constant voltage), can be controlled to charge and discharge conversion of energy storage power stations.
Close (green)	Close	In manual mode to control the new energy breaker closing. In manual mode, PV power station and energy storage power station have separate circuit breakers, and the corresponding circuit breaker closing can be controlled at the state interface of PV power station or energy storage switch.
Open (red)	Open	In manual mode to control the new energy breaker opening. In manual mode, PV power station and energy storage power station have separate circuit breakers, and the corresponding circuit breaker opening can be controlled at the state interface of PV power station or energy storage switch.
Up arrow	Up/Increase	1) Screen scroll; 2) Move up the cursor and increase value in setting menu.
Down arrow	Down/Decrease	1) Screen scroll; 2) Move down the cursor and decrease value in setting menu.
Left arrow	Left	1) Page scroll; 2) Left move the cursor in setting menu.
Right arrow	Right	1) Page scroll; 2) Right move the cursor in setting menu.
☼/OK	Set/Confirm	1) Enter setting screen; 2) Enter in next menu or confirm configuration in setting menu.

Icons	Buttons	Description
ESC	Exit	1) Return to main menu; 2) Return to previous menu in setting menu.

⚠️**CAUTION:** Factory default password is "00318", and users can change it in case others change the advanced parameter settings. Please clearly remember the password after changing. If you forget it, please contact SmartGen services and send the PD information in the controller page of "**ABOUT**" to the service personnel.

4.3 LCD DISPLAY

4.3.1 MAIN DISPLAY

Paging is applied for the main screen; ◀ ▶ is used for page scroll and ▲ ▼ for screen scroll.

Main Screen includes the following contents:

PV: voltage, frequency, current, active power, reactive power;

Busbar: voltage, frequency, active power, reactive power;

New energy: voltage, frequency, current;

Converter(enabled): active power, reactive power;

Battery voltage;

Part of status displays;

Status page includes the following contents:

Busbar status, priority of new energy, controller mode, PV working status, breaker status, PV breaker status, storage energy status.

Sensor page includes the following contents:

Digital analog1-5 data, power voltage.

PV page includes the following contents:

PV input DC voltage, PV input DC current, PV input DC power, output active power, output reactive power, total energy, total generating time, PV current active power percentage, PV target active power percentage, PV current reactive power percentage, PV current reactive power percentage, PV breaker status, total starting up time, times.

Storage energy power station parameters includes the following contents:

Output voltage, frequency, current, battery pack voltage and current.

New energy page includes the following contents:

Phase voltage, line voltage, frequency, phase, current, each phase active power, total active power and percentage, each phase reactive power, total reactive power and percentage, each phase apparent power, total apparent power, each phase power factor, average power factor, total energy, earth current and percentage, unbalanced current and percentage, unbalanced voltage percentage.

⚠️**NOTE:**

NOTE:

P stands for active power;

Q stands for reactive power.
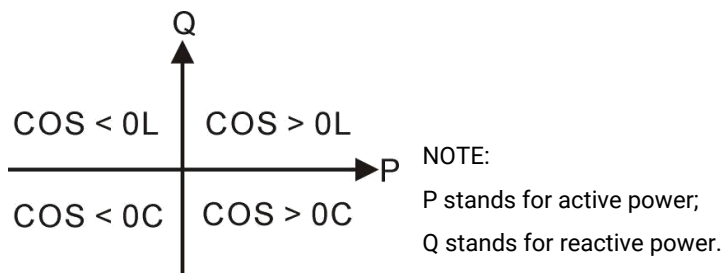
Fig. 2 Power Factor Display Description

Table 6 Power Factor Display Description

Power Factor	Conditions	Active Power	Reactive Power	Remark
COS>0L	P>0,Q>0	Input	Input	Load is resistive induction.
COS>0C	P>0,Q<0	Input	Output	Load is resistive capacitance.
COS<0L	P<0,Q>0	Output	Input	Load equals an under excitation generator.
COS<0C	P<0,Q<0	Output	Output	Load equals an over excitation generator.

⚠NOTES:

1. Input active power, and new energy will send active power to load.
2. Output active power, and load will supply electricity to new energy.
3. Input reactive power, and new energy will send reactive power to load.
4. Output reactive power, and load will send reactive power to new energy.

Busbar page includes the following contents:

Phase voltage, line voltage, frequency, phase sequence; available power.

Alarm page

Event log page:

Make records about all start/stop events (alarm events except warnings, manual start/stop events) and the real time when events occur;

Extension Page

AIN8 analog input module sensor 1-8.

Module and other information include the following contents:

Module time and Date, input/output port status, communication indication and Ethernet configuration (if configured), extended input port status, extended output port status.

About page includes the following contents:

Release software version, hardware version, and product PD number.

4.3.2 USER MENU AND PARAMETER SETTING

Press ⬡/OK button for more than 1s and it enters user menu.

● Parameter Setting

After inputting the correct password (factory default password is 00318) you can enter the parameter setting screen.

● Language

Optional Simplified Chinese, English and others.

4.4 AUTO START/STOP OPERATION

Press the [↻] button and the indicator beside is illuminated, which means the genset is at Auto Start Mode.

Automatic Start of PV Power Station:

Application mode: when mains supply is available, the system priority is: PV>Storage Energy>Mains Supply>Gen

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When mains supply is normal, and the mains supply module sends out start order or remote start input is active, the PV power station will start and output power to the load, and VF (constant frequency and constant voltage) is provided by the mains power.

When mains supply is abnormal, and the mains supply module sends out start order or remote start input is active, if the energy storage power station is allowed to start, the energy storage power station will start in VF mode (constant frequency and constant voltage), the PV power station will start and output power to the load.

Application mode: island mode, the system priority is: PV>Storage Energy >Gen

Remote start input is active, if busbar is normal, PV power station will start and output power to the load; otherwise if storage energy is allowed to start, the energy storage power station will start in VF mode (constant frequency and constant voltage), the PV power station will start and output power to the load.

Remote start input is active, if busbar is normal, PV power station will start and output power to the load; otherwise if storage energy is not allowed to start, the gensets will start in VF mode (constant frequency and constant voltage), the PV power station will start and output load to the load.

Automatic Stop of PV Power Station:

Application mode: when mains supply is available, the system priority is: PV>Storage Energy>Mains Supply>Gen

When mains supply is normal, and the mains supply module sends out stop order or remote start input is inactive, the PV power station will stop with soft unloading.

When mains supply is abnormal, and the mains supply module sends out stop order or remote start input is inactive, if storage energy is not allowed to discharge, PV power station will stop with soft unloading.

Application mode: island mode, the system priority is: PV>Storage Energy >Gen

When energy storage station is not allowed to discharge and gensets are not allowed to start, PV power station will stop with soft unloading.

When remote start input is inactive, PV power station will stop with soft unloading.

Automatic Start of Storage Energy Power Station:

Application mode: when mains supply is available, the system priority is: PV>Storage Energy>Mains Supply>Gen

When mains supply is normal, PV power station will output power to the load, when the target power of new energy from mains supply module is greater than the power of PV power station, and the energy storage power station is allowed to discharge, the storage energy breaker will close and output, the energy storage station starts and outputs power to the load.

When mains supply is abnormal, the energy storage power station will start in VF mode (constant frequency and constant voltage), the PV power station starts and outputs power to the load.

Application mode: island mode, the system priority is: PV>Storage Energy >Gen

If remote start input is active, energy storage power station will start.

When gensets haven't been started, the energy storage power station will start in VF mode (constant frequency and constant voltage), and the energy storage switch closes and outputs

When genset have been started, the energy storage power station will start in PQ mode (constant power), and the genset operates in VF mode (constant frequency and constant voltage).

Automatic Stop of Storage Energy Power Station:

Application mode: when mains supply is available, the system priority is: PV>Storage Energy>Mains Supply>Gen

Mains supply is normal, when the target power of new energy from mains supply module is lower than the power of PV power station, the PV power station will charge for energy storage power station, and the unit will stop when energy storage power station is fully charged.

Application mode: island mode, the system priority is: PV>Storage Energy >Gen

When energy storage station is not allowed to discharge, gensets will start and energy storage power station will stop with soft unloading.

When remote start input is inactive, energy storage power station will stop.

Automatic Start of Gensets:

Application mode: when mains supply is available, the system priority is: PV>Storage Energy>Mains Supply>Gen

The mains supply module controls the start of gensets.

Application mode: island mode, the system priority is: PV>Storage Energy >Gen

Remote start input is active, when energy storage power station is not allowed to discharge, the gensets will start in VF mode (constant frequency and constant voltage).

Automatic Stop of Gensets:

Application mode: when mains supply is island, the system priority is: PV>Storage Energy>Mains Supply>Gen

The mains supply module controls the stop of gensets.

Application mode: island mode, the system priority is: PV>Storage Energy >Gen

Energy storage power station is allowed to discharge and meets the load requirements, the gensets will stop.

Remote start input is inactive, the gensets will stop.

4.5 AUTO START/STOP FLOW CHART

Application Mode: mains supply is available.
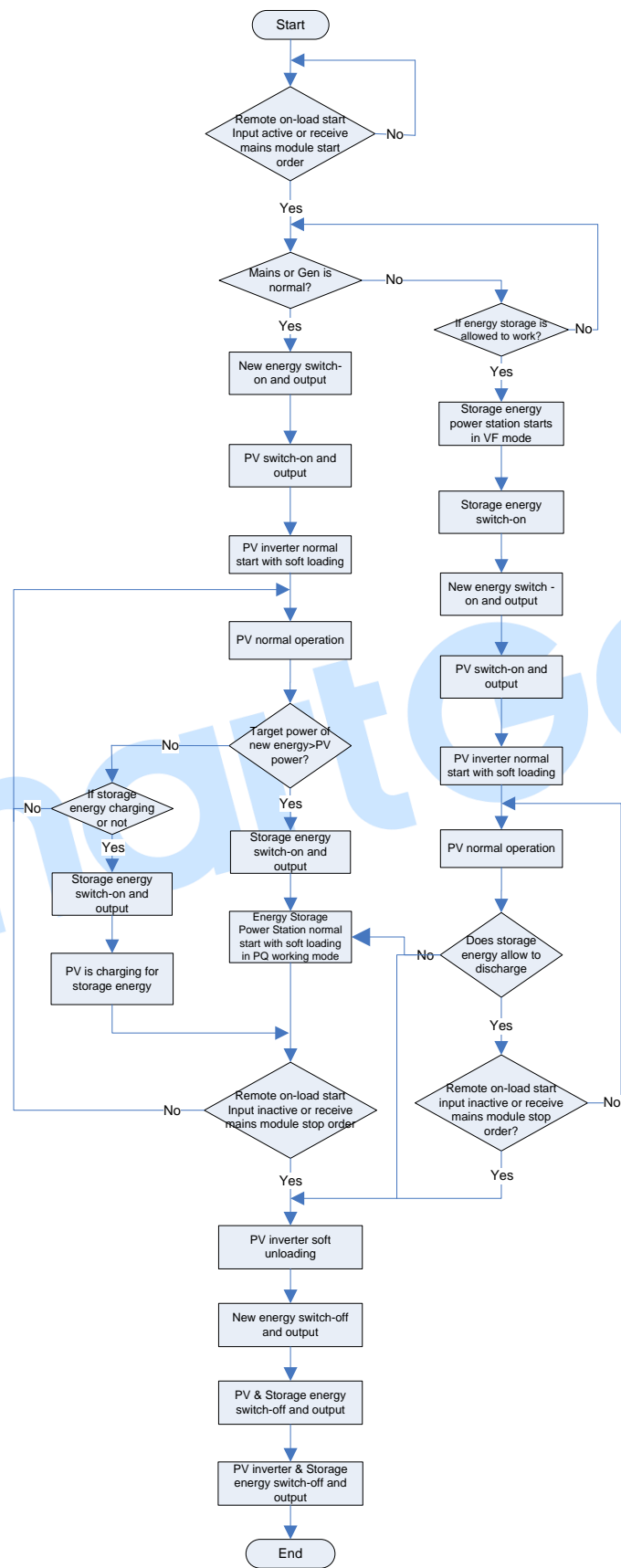
Fig.3 Mains Auto Start/Stop Flow Chart

Application Mode: Island Mode (mains supply is unavailable).
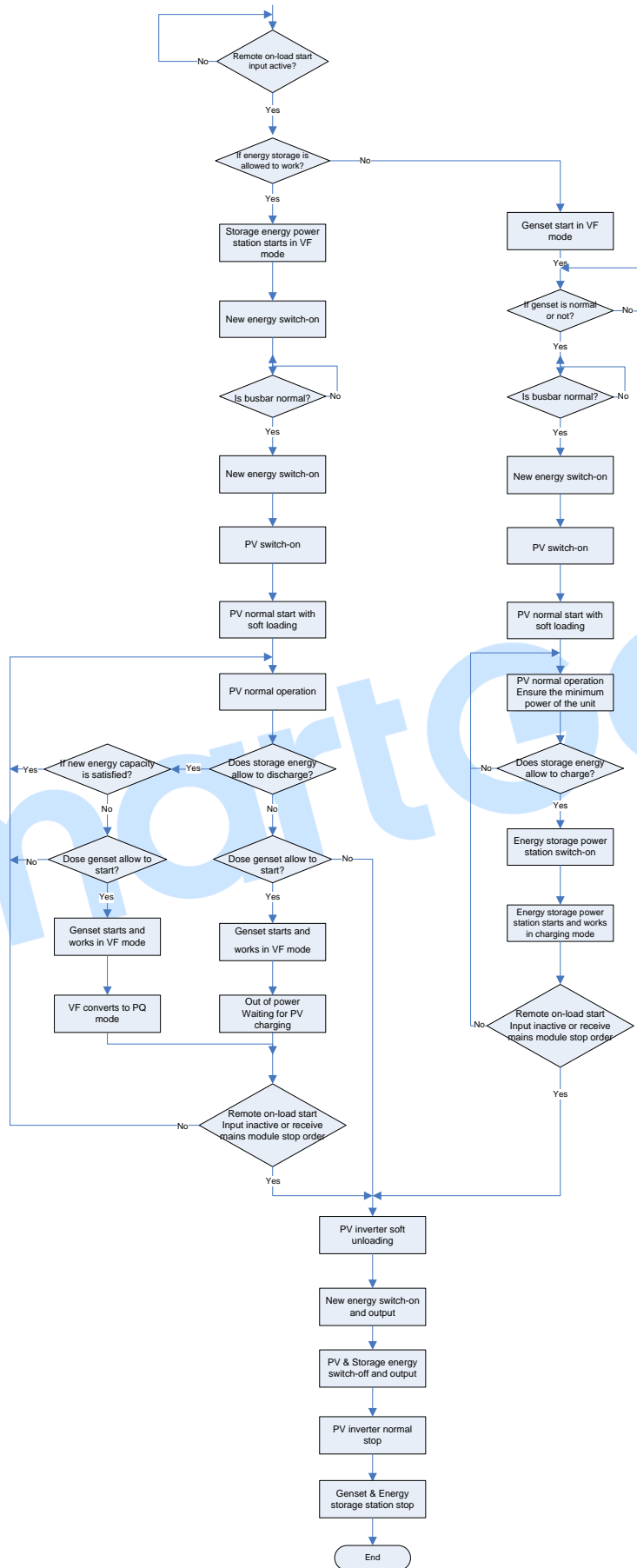
Fig.4 Island Mode Auto Start/Stop Flow Chart

4.6 MANUAL START/STOP OPERATION

1. MANUAL START: press [button] button to enter "Manual Mode" and the indicator light is illuminated. In this mode, firstly press [button] button to close the new energy, press [button] button to start inverter, it can detect crank disconnect condition automatically and the inverter enters normal running. In the status-storage energy interface, press the start button and then the storage energy will start normally, the PQ mode and VF mode switches by Mode button.

2. MANUAL STOP: Press [button] and it can shut down the running inverters. The storage energy power station and gensets in running can also be shut down.

⚠NOTE: In "manual mode", please refer to the manual for the Switch Control Procedure.

4.7 SWITCH CONTROL PROCEDURES

4.7.1 MANUAL TRANSFER PROCEDURES

When controller is in **Manual** mode, the switch control procedures will start through manual transfer procedures. Users can control it to switch on or off via pressing the button.

New Energy Close Operation： When the voltage of busbar is normal, press [button] button to switch on.

PV1-4 Breaker Close Operation: When the new energy closes, the controller interface will switch to the corresponding PV breaker status page, and press [button] button, the corresponding PV breaker will close and the relay will output.

New Energy Open Operation： Press the open button [button] and it will issue a closing signal of new energy.

PV1-4 Breaker Open Operation: When controller interface switches to the corresponding PV breaker status page, press [button] button, the corresponding PV breaker will open and the relay will output.

4.7.2 AUTOMATIC CONTROL PROCEDURE

When controller is in Auto mode, the switch control procedure is automatic control procedure.

⚠NOTE: The auxiliary close input should be configured necessarily and make sure the connection is correct.

5 PROTECTIONS

5.1 CONTROLLER ALARM TYPES

Table 7 Controller Alarm Types

Alarm Type/Action	Open CB Directly	Open CB After Unloading	Stop Directly	Stop After Cooling	Reset Alarm
Warning	-	-	-	-	Auto
Block	-	-	-	-	Manual
Safety Trip	-	●	-	-	Manual
Safety Stop	-	●	-	●	Manual
Trip	●	-	-	-	Manual
Trip and Stop	●	-	-	●	Manual
Alarm Shutdown	●	-	●	-	Manual

5.2 WARNING ALARMS

When controller detects the warning alarm, it only issues warning, and the genset does not open and shutdown. When the warning signal disappears, it is removed automatically.

Table 8 Warning Alarms

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the frequency is above the preset limit, it shall issue a warning. It is always detected.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue a warning. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the voltage is above the preset limit, it shall issue a warning. It is always detected.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue a warning. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over Current	When this is enabled, and the controller detects the current is above the preset limit, it shall issue a warning. It is always detected.
6	Negative Sequence Current	When this is enabled, and the controller detects the value is above the preset limit, it shall issue a warning. It is always detected.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue a warning. It is always detected.
8	New Energy Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue a warning. It is always detected.
9	New Energy Over Power	When this is enabled, and the controller detects the new energy power (positive) is above the preset limit, it shall issue a warning. It is always detected.
10	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue a warning. It is always detected.
11	Flex. Sensor 1-5 High	When over high warning is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue a warning. It is always detected.
12	Flex. Sensor 1-5 Low	When over low warning is enabled, and the controller detects the sensor value is below the preset low limit, it shall issue a warning.

No	Type	Description
		It is always detected when the sensor is selected as fuel level sensor.
13	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue a warning, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is detected always.
14	Fail to Stop	When controller detects 'fail to stop', it shall issue a warning.
15	Power Supply Over Volt	When this is enabled, and the controller detects the power supply voltage is above the preset limit, it shall issue a warning signal. It is always detected.
16	Power Supply Under Volt	When this is enabled, and the controller detects the Power Supply voltage is below the preset limit, it shall issue a warning signal. It is always detected.
17	New Energy Breaker Alarm	When the controller input port does not set the new energy closing state input, it shall issue a warning signal. It is always detected.
18	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller.
19	Inverter 1 Alarm	When the controller and the inverter communicate normally, the controller shall issue a warning signal when the inverter alarm is received.
20	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller.
21	Inverter 2 Alarm	When the controller and the inverter communicate normally, the controller shall issue a warning signal when the inverter alarm is received.
22	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller.
23	Inverter 3 Alarm	When the controller and the inverter communicate normally, the controller shall issue a warning signal when the inverter alarm is received.
24	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller.
25	Inverter 4 Alarm	When the controller and the inverter communicate normally, the controller shall issue a warning signal when the inverter alarm is

No	Type	Description
		received.
26	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate a warning for the input port. It is detected in the detection range set for the input port.
27	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate a warning. It is detected in the detection range set by the PLC function.
28	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate a warning. It is always detected.
29	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate a warning. It is detected in the detection range set in the input.
30	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate a warning. It is always detected.
31	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate a warning. It is always detected.
32	AIN8 Sensor Open	When the controller detects the sensor circuit is open, it shall issue a warning. It is always detected.
33	AIN8 Sensor High	When over high warning is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue a warning. It is always detected.
34	AIN8 Sensor Low	When over low warning is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue a warning. It is always detected.
35	Power Factor Low	When this is enabled and the controller detects that the generator power factor has fallen below the pre-set value, it will initiate a warning alarm. It is always detected.
36	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set value, it will initiate a warning alarm. It is always detected.
37	New Energy Volt Unbalance	When this is enabled and the controller detects that the voltage unbalanced value has exceeded the pre-set value, it will initiate a warning alarm. It is always detected.

5.3 BLOCK ALARMS

When the controller detects block signals, it only issues warning and the genset does not shutdown and not open. Users need to reset alarms manually.

Table 9 Block Alarms

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the new energy frequency is above preset limit, it shall issue a block alarm. It is detected always.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue a block alarm. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the new energy voltage is above preset limit, it shall issue a block alarm. It is detected always.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue a block alarm. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over Current	When this is enabled, and the controller detects the new energy current is above preset limit, it shall issue a block alarm. It is detected always.
6	Negative Sequence Current	When this is enabled, and the controller detects the unbalanced current is above preset limit, it shall issue a block alarm. It is detected always.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue a block alarm. It is always detected.
8	Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue a block alarm. It is always detected.
9	Over Power	When this is enabled, and the controller detects the new energy power (positive) is above the preset limit, it shall issue a block alarm. It is always detected.
10	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue a block alarm. It is always detected.
11	Flex. Sensor 1-5 High	When over high block alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue a block alarm. It is always detected.
12	Flex. Sensor 1-5 Low	When over low block alarm is enabled, and the controller detects the

No	Type	Description
		sensor value is below the preset low limit, it shall issue a block alarm. It is always detected.
13	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue a block alarm, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is detected always.
14	Fail to Stop	When controller detects 'fail to stop', it shall issue a warning.
15	Power Supply Over Volt	When this is enabled, and the controller detects the power supply voltage is above the preset limit, it shall issue a block signal. It is always detected.
16	Power Supply Under Volt	When this is enabled, and the controller detects the power supply voltage is below the preset limit, it shall issue a block signal. It is always detected.
17	Digital Input Alarm	When the closing status input is not set in the put port, the controller will initiate a block signal for the input port. It is always detected.
18	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue a block signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
19	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue a block signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
20	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue a block signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
21	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue a block signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
22	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate a block signal for the input port. It is detected in the detection range set for the input port.
23	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate a block signal. It is detected in the detection range set by the PLC function.

No	Type	Description
24	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate a block signal. It is always detected.
25	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate a block signal. It is detected in the detection range set in the input.
26	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate a block signal. It is always detected.
27	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate a block signal. It is always detected.
28	AIN8 Sensor Open	When the controller detects the sensor circuit is open, it shall issue a block alarm. It is always detected.
29	AIN8 Sensor High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue a block alarm. It is always detected.
30	AIN8 Sensor Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue a block alarm. It is always detected.
31	Power Factor Low	When this is enabled and the controller detects that the new energy power factor has fallen below the pre-set limit, it will initiate a block alarm. It is always detected.
32	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set limit, it will initiate a block alarm. It is always detected.
33	New Energy Volt Unbalance	When this is enabled and the controller detects that the voltage unbalanced value has exceeded the pre-set limit, it will initiate a block alarm. It is always detected.

5.4 SAFETY TRIP

When controller detects safety trip signals, it will open breaker after soft unloading but not stop the genset. Users need to reset alarms manually.

Table 10 Safety Trip

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the new energy frequency is above preset limit, it shall issue an alarm signal. It is always detected.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the new energy voltage is above preset limit, it shall issue an alarm signal. It is always detected.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over Current	When this is enabled, and the controller detects the new energy current is above preset limit, it shall issue an alarm signal. It is always detected.
6	Negative Sequence Current	When this is enabled, and the controller detects the unbalanced current is above preset limit, it shall issue an alarm signal. It is always detected.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue an alarm signal. It is always detected.
8	Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue an alarm signal. It is always detected.
9	Over Power	When this is enabled, and the controller detects the new energy power (positive) is above the preset limit, it shall issue an alarm signal. It is always detected.
10	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
11	Flex. Sensor 1-5 High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected when the sensor is selected as fuel level sensor.
12	Flex. Sensor 1-5 Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset low limit, it shall issue an alarm signal.

No	Type	Description
		It is always detected when the sensor is selected as fuel level sensor.
13	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue an alarm signal, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is detected always.
14	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
15	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
16	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
17	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
18	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate an alarm signal for the input port. It is detected in the detection range set for the input port.
19	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set by the PLC function.
20	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal l. It is always detected.
21	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set in the input.
22	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
23	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal.

No	Type	Description
		It is always detected.
24	AIN8 Sensor Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
25	AIN8 Sensor High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
26	AIN8 Sensor Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue an alarm signal. It is always detected.
27	Power Factor Low	When this is enabled and the controller detects that the new energy power factor has fallen below the pre-set limit, it will initiate an alarm signal. It is always detected.
28	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.
29	New Energy Volt Unbalance	When this is enabled and the controller detects that the voltage unbalanced value has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.

5.5 SAFETY TRIP AND STOP ALARMS

When controller detects safety stop signals, it will open breaker after soft unloading and genset stops after cooling. Users need to reset alarms manually.

Table 11 Safety Trip and Stop Alarms

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the new energy frequency is above preset limit, it shall issue an alarm signal. It is always detected.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the new energy voltage is above preset limit, it shall issue an alarm signal. It is detected always.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over	When this is enabled, and the controller detects the new energy

No	Type	Description
	Current	current is above preset limit, it shall issue an alarm signal. It is detected always.
6	Negative Sequence Current	When this is enabled, and the controller detects the unbalanced current is above preset limit, it shall issue an alarm signal. It is detected always.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue an alarm signal. It is always detected.
8	Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue an alarm signal. It is always detected.
9	Over Power	When this is enabled, and the controller detects the genset power (positive) is above the preset limit, it shall issue an alarm signal. It is always detected.
10	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
11	Flex. Sensor 1-5 High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
12	Flex. Sensor 1-5 Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset low limit, it shall issue an alarm signal. It is always detected.
13	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue an alarm signal, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is detected always.
14	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
15	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
16	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.

No	Type	Description
17	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
18	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate an alarm signal for the input port. It is detected in the detection range set for the input port.
19	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set by the PLC function.
20	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
21	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set in the input.
22	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
23	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
24	AIN8 Sensor Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
25	AIN8 Sensor High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
26	AIN8 Sensor Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue an alarm signal. It is always detected.
27	Power Factor Low	When this is enabled and the controller detects that the new energy power factor has fallen below the pre-set limit, it will initiate an alarm signal. It is always detected.
28	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.
29	New Energy Volt Unbalance	When this is enabled and the controller detects that the voltage unbalanced value has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.

5.6 TRIP ALARMS

When controller detects trip alarms, it will open breaker directly but not stop the genset. Users need to reset alarms manually.

Table 12 Trip Alarms

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the new energy frequency is above preset limit, it shall issue an alarm signal. It is detected always.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the new energy voltage is above preset limit, it shall issue an alarm signal. It is detected always.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over Current	When this is enabled, and the controller detects the new energy current is above preset limit, it shall issue an alarm signal. It is detected always.
6	Negative Sequence Current	When this is enabled, and the controller detects the unbalanced current is above preset limit, it shall issue an alarm signal. It is detected always.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue an alarm signal. It is always detected.
8	Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue an alarm signal. It is always detected.
9	Over Power	When this is enabled, and the controller detects the genset power (positive) is above the preset limit, it shall issue an alarm signal. It is always detected.
10	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
11	Flex. Sensor 1-5 High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
12	Flex. Sensor 1-5 Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset low limit, it shall issue an alarm signal.

No	Type	Description
		It is always detected.
13	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue an alarm signal, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is always detected.
14	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
15	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
16	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
17	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
18	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate an alarm signal for the input port. It is detected in the detection range set for the input port.
19	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set by the PLC function.
20	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
21	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set in the input.
22	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
23	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal.

No	Type	Description
		It is always detected.
24	AIN8 Sensor Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
25	AIN8 Sensor High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
26	AIN8 Sensor Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue an alarm signal. It is always detected.
27	Power Factor Low	When this is enabled and the controller detects that the new energy power factor has fallen below the pre-set limit, it will initiate an alarm signal. It is always detected.
28	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.
29	New Energy Volt Unbalance	When this is enabled and the controller detects that the voltage unbalanced value has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.

5.7 TRIP AND STOP ALARM

When the controller detects trip and stop signals, it will open breaker directly and stop the genset after cooling. Users need to reset alarms manually.

Table 13 Trip and Stop Alarms

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the new energy frequency is above preset limit, it shall issue an alarm signal. It is always detected.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the new energy voltage is above preset limit, it shall issue an alarm signal. It is detected always.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over Current	When this is enabled, and the controller detects the new energy current is above preset limit, it shall issue an alarm signal. It is always detected.
6	Negative Sequence Current	When this is enabled, and the controller detects the unbalanced current is above preset limit, it shall issue an alarm signal. It is always detected.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue an alarm signal. It is always detected.
8	Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue an alarm signal. It is always detected.
9	Over Power	When this is enabled, and the controller detects the genset power (positive) is above the preset limit, it shall issue an alarm signal. It is always detected.
10	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
11	Flex. Sensor 1-5 High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
12	Flex. Sensor 1-5 Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset low limit, it shall issue an alarm signal.

No	Type	Description
		It is detected after 'safety on time' before 'ETS solenoid hold' when the sensor is selected as temperature sensor and pressure sensor; It is always detected.
13	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue an alarm signal, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is detected always.
14	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
15	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
16	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
17	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is detected always.
18	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate an alarm signal for the input port. It is detected in the detection range set for the input port.
19	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set by the PLC function.
20	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
21	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set in the input.
22	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.

No	Type	Description
23	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
24	AIN24 Sensor Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
25	AIN8 Sensor High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
26	AIN8 Sensor Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue an alarm signal. It is always detected.
27	Power Factor Low	When this is enabled and the controller detects that the new energy power factor has fallen below the pre-set limit, it will initiate an alarm signal. It is always detected.
28	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.
29	New Energy Volt Unbalance	When this is enabled and the controller detects that the voltage unbalanced value has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.

5.8 SHUTDOWN ALARMS

When controller detects shutdown alarms, it will send signal to open breaker and shut down the generator. Users need to reset alarms manually.

Table 14 Shutdown Alarms

No	Type	Description
1	New Energy Over Frequency	When this is enabled, and the controller detects the new energy frequency is above preset limit, it shall issue an alarm signal. It is always detected.
2	New Energy Under Frequency	When this is enabled, and the controller detects the frequency is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
3	New Energy Over Voltage	When this is enabled, and the controller detects the new energy voltage is above preset limit, it shall issue an alarm signal. It is always detected.
4	New Energy Under Voltage	When this is enabled, and the controller detects the voltage is below the preset limit, it shall issue an alarm signal. It is detected when inverter in normal running and 'stop after cooling' shutdown.
5	New Energy Over Current	When this is enabled, and the controller detects the new energy current is above preset limit, it shall issue an alarm signal. It is always detected.
6	Negative Sequence Current	When this is enabled, and the controller detects the unbalanced current is above preset limit, it shall issue an alarm signal. It is always detected.
7	Earth Fault	When this is enabled, and the controller detects the earth current is above the preset limit, it shall issue an alarm signal. It is always detected.
8	Reverse Power	When this is enabled, and the controller detects the reverse power (negative) is above the preset limit, it shall issue an alarm signal. It is always detected.
9	Over Power	When this is enabled, and the controller detects the genset power (positive) is above the preset limit, it shall issue an alarm signal. It is always detected.
10	Power Supply Over Volt	When this is enabled, and the controller detects the power supply voltage is above the preset limit, it shall issue a warning signal. It is always detected.
11	Power Supply Under Volt	When this is enabled, and the controller detects the Power Supply voltage is below the preset limit, it shall issue a warning signal. It is always detected.
12	Fail to Start	When controller detects 'fail to start', it shall issue a warning. It is always detected.

No	Type	Description
13	Flex. Sensor 1-5 Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
14	Flex. Sensor 1-5 High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
15	Flex. Sensor 1-5 Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset low limit, it shall issue an alarm signal. It is always detected.
16	Flex. Sensor 1-5 Wrong	When voltage or current input is selected for the curve type of the controller, and the controller detects input signal is abnormal, it shall issue an alarm signal, and meanwhile the curve is transferred to resistor type to prevent damaging the controller. It is always detected.
17	Inverter 1 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 1, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
18	Inverter 1 Alarm	When the controller and the inverter communicate normally, the controller shall issue a shutdown signal when the inverter alarm is received. It is always detected.
19	Inverter 2 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 2, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
20	Inverter 2 Alarm	When the controller and the inverter communicate normally, the controller shall issue a shutdown signal when the inverter alarm is received.
21	Inverter 3 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 3, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller. It is always detected.
22	Inverter 3 Alarm	When the controller and the inverter communicate normally, the controller shall issue a shutdown signal when the inverter alarm is received.
23	Inverter 4 Com. Fail	When the inverter communication port is enabled and the number of inverters is greater than or equal to 4, it shall issue an alarm signal when the inverter communication data cannot be detected and received by the controller.

| No	Type	Description
		It is always detected.
24	Inverter 4 Alarm	When the controller and the inverter communicate normally, the controller shall issue a shutdown signal when the inverter alarm is received.
25	MSD ID Wrong	When the controller detects the same ID on the MSC bus, the controller will initiate a shutdown alarm signal. It is always detected. It is always detected.
26	Digital Input Alarm	When the digital input port is set users-defined and if it is active, the controller will initiate an alarm signal for the input port. It is detected in the detection range set for the input port.
27	PLC Functions Alarm	When PLC function is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set by the PLC function.
28	DIN16 Com. Fail	When DIN16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
29	DIN16 Input Alarm	When DIN16 input is set users-defined and if it is active, the controller will initiate an alarm signal. It is detected in the detection range set in the input.
30	DOUT16 Com. Fail	When DOUT16 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
31	AIN8 Com. Fail	When AIN8 communication is enabled and the controller cannot receive the communication data, it will initiate an alarm signal. It is always detected.
32	AIN8 Sensor Open	When the controller detects the sensor circuit is open, it shall issue an alarm signal. It is always detected.
33	AIN8 Sensor High	When over high alarm is enabled, and the controller detects the sensor value is above the preset upper limit, it shall issue an alarm signal. It is always detected.
34	AIN8 Sensor Low	When over low alarm is enabled, and the controller detects the sensor value is below the preset lower limit, it shall issue an alarm signal. It is always detected.
35	Power Factor Low	When this is enabled and the controller detects that the new energy power factor has fallen below the pre-set limit, it will initiate an alarm signal. It is always detected.
36	THD High	When this is enabled and the controller detects that the THD has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.
37	New Energy Volt	When this is enabled and the controller detects that the voltage

No	Type	Description
	Unbalance	unbalanced value has exceeded the pre-set limit, it will initiate an alarm signal. It is always detected.

6 WIRING CONNECTION
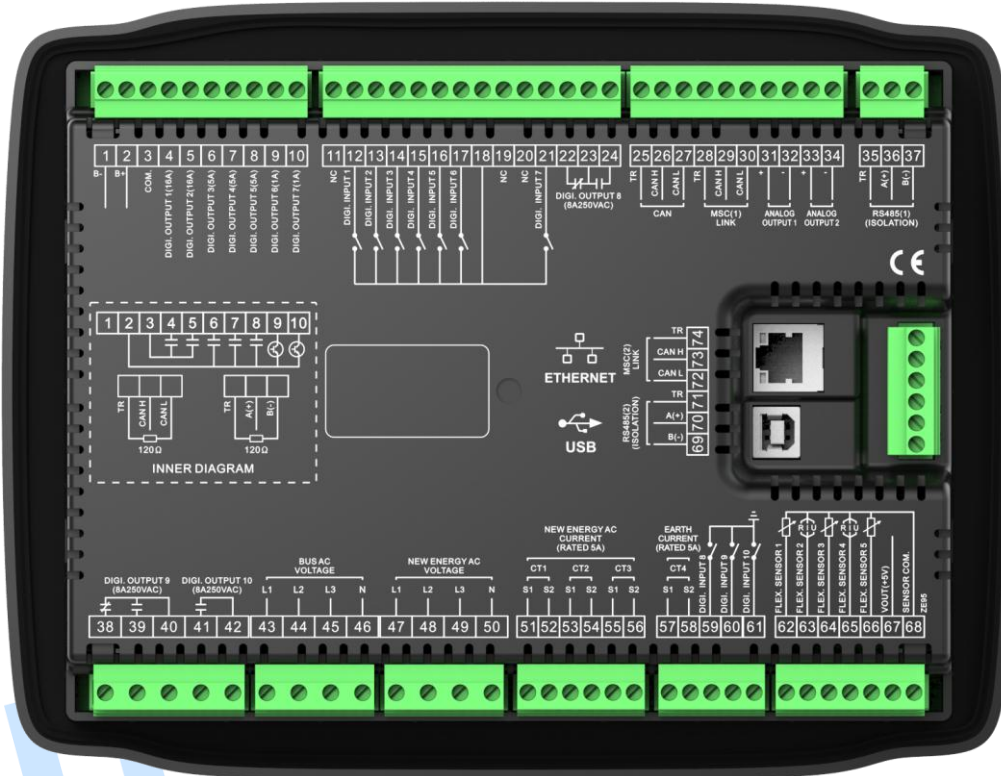
Fig. 5 HES9510 Controller Rear Panel

Table 15 Terminal Connection Description

No.	Functions	Cable Size	Remark
1	B-	1.5mm^2	Connect with battery negative.
2	B+	1.5mm^2	Connect with battery positive. If wire length is over 30m, it's better to double wires in parallel. Max. 20A fuse is recommended.
3	Output Com	1.5mm^2	AUX.1 COM and AUX.2 COM
4	Digi. output 1	1.5mm^2	B+ is supplied by 3 points, rated 16A.
5	Digi. output 2	1.5mm^2	B+ is supplied by 3 points, rated 16A.
6	Digi. output 3	1.0mm^2	B+ is supplied by 2 points, rated 5A.
7	Digi. output 4	1.0mm^2	B+ is supplied by 2 points, rated 5A.
8	Digi. output 5	1.0mm^2	B+ is supplied by 2 points, rated 5A.
9	Digi. output 6	1.0mm^2	B+ is supplied by 2 points, rated 1A.
10	Digi. output 7	1.0mm^2	B+ is supplied by 2 points, rated 1A.
11	NC	/	Reserved
12	Digi. input 1	1.0mm^2	Ground connected is active (B-).

No.	Functions	Cable Size	Remark
13	Digi. input 2	1.0mm^2	Ground connected is active (B-).
14	Digi. input 3	1.0mm^2	Ground connected is active (B-).
15	Digi. input 4	1.0mm^2	Ground connected is active (B-).
16	Digi. input 5	1.0mm^2	Ground connected is active (B-).
17	Digi. input 6	1.0mm^2	Ground connected is active (B-).
18	Digi. Com	1.5mm^2	Internal connected (B-).
19	NC	/	Reserved
20	NC		
21	Digi. input 7	1.0mm^2	Ground connected is active (B-).
22	AUX. Output 8	1.5mm^2	Normally close output, rated 8A.
23			Public points of relay.
24			Normally open output, rated 8A.
25	TR	/	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. Short connect TR with H and then connect to 120Ω terminal resistor.
26	CAN H	0.5mm^2	
27	CAN L	0.5mm^2	
28	MSC(1) TR	/	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. Short connect TR with H and then connect to 120Ω terminal resistor.
29	MSC(1) CAN H	0.5mm^2	
30	MSC(1) CAN L	0.5mm^2	
31	Analog Output 1(+)	0.5mm^2	(-10~10)V output.
32	Analog Output 1(-)	0.5mm^2	
33	Analog Output 2(+)	0.5mm^2	(-10~10)V output.
34	Analog Output 2(-)	0.5mm^2	
35	RS485(1) TR	/	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. Short connect TR with A and then connect to 120Ω terminal resistor.
36	RS485(1) A(+)	0.5mm^2	
37	RS485(1) B(-)	0.5mm^2	
38	Digi. output 9	1.5mm^2	Normally close output, rated 8A.
39		1.5mm^2	Normally open output, rated 8A.
40		1.5mm^2	Public points of relay.
41	Digi. output 10	1.5mm^2	Normally open output, rated 8A.
42		1.5mm^2	Public points of relay.
43	Bus A-phase voltage input	1.0mm^2	Connect to A-phase of bus (2A fuse is recommended).
44	Bus B-phase voltage input	1.0mm^2	Connect to B-phase of bus (2A fuse is recommended).
45	Bus C-phase voltage input	1.0mm^2	Connect to C-phase of bus (2A fuse is recommended).
46	Bus N-wire input	1.0mm^2	Connect to N-wire of bus.
47	New Energy A-phase voltage input	1.0mm^2	Connect to A-phase of new energy (2A fuse is recommended).
48	New Energy B-phase voltage input	1.0mm^2	Connect to B-phase of new energy (2A fuse is recommended).

No.	Functions	Cable Size	Remark
49	New Energy C-phase voltage input	1.0mm²	Connect to C-phase of new energy (2A fuse is recommended).
50	New Energy N-wire input	1.0mm²	Connect to N-wire of new energy.
51	CT A-phase input	1.5mm²	Outside connect to secondary coil of current transformer (rated 5A).
52		1.5mm²	
53	CT B-phase input	1.5mm²	Outside connect to secondary coil of current transformer (rated 5A).
54		1.5mm²	
55	CT C-phase input	1.5mm²	Outside connect to secondary coil of current transformer (rated 5A).
56		1.5mm²	
57	Earth CT input	1.5mm²	Outside connect to secondary coil of current transformer (rated 5A).
58		1.5mm²	
59	Digi. input 8	1.0mm²	Ground connected is active (B-).
60	Digi. input 9	1.0mm²	Ground connected is active (B-).
61	Digi. input 10	1.0mm²	Ground connected is active (B-).
62	Flex. sensor 1	1.0mm²	Connect to temp. /pressure/fuel level/power transmitter/optical radiation sensor.
63	Flex. sensor 2	1.0mm²	Connect to temp. /pressure/fuel level/power transmitter/optical radiation sensor. Voltage type (0V-5V), current type (4-20mA) and resistance sensor can be chosen.
64	Flex. sensor 3	1.0mm²	Connect to temp. /pressure/fuel level/power transmitter/optical radiation sensor.
65	Flex. sensor 4	1.0mm²	Connect to temp. /pressure/fuel level/power transmitter/optical radiation sensor. Voltage type (0V-5V), current type (4-20mA) and resistance sensor can be chosen.
66	Flex. sensor 5	1.0mm²	Connect to temp. /pressure/fuel level/power transmitter/optical radiation sensor.
67	VOUT(+5V)	1.0mm²	Provide +5V voltage for voltage type sensor, and current is below 50mA.
68	Sensor COM.	/	Public sensor terminal, and B- is already connected in the controller.
69	RS485(2) B(-)	0.5mm²	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. Short connect TR with H and then connect to 120Ω terminal resistor.
70	RS485(2) A(+)	0.5mm²	
71	RS485(2) TR	/	
72	MSC(2) CAN L	/	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. Short connect TR with H and then connect to 120Ω terminal resistor.
73	MSC(2) CAN H	0.5mm²	
74	MSC(2) TR	0.5mm²	

⚠ **NOTE**: USB ports on the controller rear panel are configurable parameter ports, and users can directly program the controller on PC.

⚠️**NOTE**: ETHERNET port on the controller rear panel is parameter programming and monitoring port, and it can be programmed and monitored on PC.

7   SCOPES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

7.1 CONTENTS AND SCOPES OF PARAMETERS

Table 16 Parameter Configuration

No.	Items	Parameters	Defaults	Description
Module Setting				
1.	Power On Mode	(0-2)	0	0: Stop Mode 1: Manual Mode 2: Auto Mode
2.	Module Address	(1-254)	1	Controller address for remote monitoring
3.	Language	(0-2)	0	0: Simplified Chinese 1: English 2: Other
4.	Password	(0-65535)	00318	It is used to enter advanced parameter setting.
5.	Daylight Saving Time	(0-1)	0	0: Disable 1: Enable Start and end time for this can be set.
6.	Date and Time			It is used for date and time settings.
7.	Temperature Unit	(0-1)	0	0: ℃; 1: ℉
8.	Pressure Unit	(0-2)	0	0: kPa 1: Psi 2: Bar
9.	Backlight Time	(0-3600)s	300	
10.	Network	(0-1)	1	0: Disable 1: Enable
11.	Alarm Data Interval	(0-60.0)s	0.1	The interval of black box data record.
12.	RS485(1) Baud Rate	(0-2)	1	0: 4800bit/s; 1: 9600bit/s; 2: 19200bit/s
13.	RS485(1) Stop Bit	(0-1)	0	0:2bit; 1:1bit.
14.	RS485(2) Baud Rate	(0-2)	0	0:4800bit/s; 1:9600bit/s; 2:19200bit/s.
15.	RS485(2) Stop Bit	(0-1)	0	0:2bit; 1:1bit.
16.	Rated Volt	(0-60.0)V	24.0	Provide standard for judging over voltage

No.	Items	Parameters	Defaults	Description
				and under voltage of power supply.
17.	Over Volt Alarm 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 120.0 115.0 60 1	0: Disable 1: Enable The setting value is the percentage of rated voltage. The return value is the percentage of rated voltage. Delay value. Action.
18.	Over Volt Alarm 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	0 120.0 115.0 60 0	0: Disable 1: Enable The setting value is the percentage of rated voltage. The return value is the percentage of rated voltage. Delay value. Action.
19.	Under Volt Alarm 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 85.0 90.0 60 0	0: Disable 1: Enable The setting value is the percentage of rated voltage. The return value is the percentage of rated voltage. Delay value. Action.
20.	Under Volt Alarm 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	0 85.0 90.0 60 0	0: Disable 1: Enable The setting value is the percentage of rated voltage. The return value is the percentage of rated voltage. Delay value. Action.
Busbar Setting				
1.	Power Supply System	(0-3)	0	0: 3P4W; 1: 3P3W; 2: 2P3W; 3: 1P2W
2.	Normal Delay	(0-3600)s	10	The confirm time from abnormal to normal of the busbar.
3.	Abnormal Delay	(0-3600)s	5	The confirm time from normal to abnormal of the busbar.
4.	Rated Volt	(30-30000)V	230	Provide standard for judging over voltage and under voltage of the busbar. If the voltage transformer is used, this value is the primary voltage of the transformer. When the AC power supply system is 3P3W, this setting value is line voltage; when it is other power supply systems,

No.	Items	Parameters	Defaults	Description
				this setting value is phase voltage.
5.	Volt Transformer	(0-1)	0	0: Disable 1: Enable
6.	Over Volt Setting	(0-1) (0-200.0)% (0-200.0)% (0-3600)s	1 120.0 116.0 5	The setting value is the percentage of busbar rated voltage.
7.	Under Volt Setting	(0-1) (0-200.0)% (0-200.0)% (0-3600)s	1 80.0 84.0 5	
8.	Rated Freq.	(10.0-75.0)Hz	50	Provide standard for judging over frequency and under frequency of busbar.
9.	Over Freq. Setting	(0-1) (0-200.0)% (0-200.0)% (0-3600)s	0 114.0 110.0 5	The setting value is the percentage of busbar rated frequency.
10.	Under Freq. Setting	(0-1) (0-200.0)% (0-200.0)% (0-3600)s	0 90.0 94.0 5	
Timer Setting				
1.	Start Delay	(0~3600)s	5	Time from remote start signal is active to inverter is starting.
2.	Stop Delay	(0~3600)s	30	Time from remote start signal is inactive to inverter is stopping.
3.	Warming Up Time	(0~3600)s	0	Warming up time before starting.
4.	Start Time	(0~3600)s	10	Time for initiating start order to inverter.
5.	Wait for Start	(0~3600)s	10	Time for waiting for inverter normal running.
6.	Cooling Time	(0~3600)s	60	The cooling time before shutdown after the inverter unloading.
7.	Stop Time	(0-3600)s	20	Time for initiating stop order to inverter.
8.	Wait for Stop	(0~3600)s	0	Time for waiting for inverter stop running.
New Energy Setting				
1.	New Energy Rated Voltage	(30~30000)V	230	Provide standards for detecting of new energy's over/under voltage and loading voltage. (It is primary voltage when using voltage transformer; It is line voltage when AC system is 3P3W while it is phase voltage when using other AC system).
2.	New Energy Rated Frequency	(10.0~75.0)Hz	50.0	Provide standards for detecting over/under/load frequency.

No.	Items	Parameters	Defaults	Description
3.	New Energy Volt. Trans.(PT)	(0~1)	0	0: Disable; 1:Enable
4.	Harmonic Display	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	0 120.0 118.0 3 7	0: Disable 1: Enable Set value is gen rated volt percentage. Return value is gen rated volt percentage. Delay value. Action.
5.	New Energy Over Volt Alarm 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 120.0 118.0 3 7	0: Disable 1: Enable The setting value is percentage of the new energy rated voltage. The return value is percentage of the new energy rated voltage. Delay value. Action.
6.	New Energy Over Volt Alarm 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 110.0 108.0 5 1	0: Disable 1: Enable The setting value is percentage of the new energy rated voltage. The return value is percentage of the new energy rated voltage. Delay value. Action.
7.	New Energy Under Volt Alarm 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 80.0 82.0 3 7	0: Disable 1: Enable The setting value is percentage of the new energy rated voltage. The return value is percentage of the new energy rated voltage. Delay value. Action.
8.	New Energy Under Volt Alarm 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 84.0 86.0 5 1	0: Disable 1: Enable The setting value is percentage of the new energy rated voltage. The return value is percentage of the new energy rated voltage. Delay value. Action.
9.	Volt Unbalance 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)(0-1)	1 10.0 5.0 5 1	0: Disable 1: Enable The setting value is the degree of unbalance. The return value is the degree of unbalance. Delay value. Action.
10.	Volt Unbalance 2	(0-1)	0	0: Disable 1: Enable

No.	Items	Parameters	Defaults	Description
		(0-200.0)%	10.0	The setting value is the degree of unbalance.
		(0-200.0)%	5.0	The return value is the degree of unbalance.
		(0-3600)s	5	Delay value.
		(0-7)	0	Action
11.	THD Alarm 1	(0-1)	0	0: Disable 1: Enable
		(0-200.0)%	10.0	The setting value is the degree of distortion.
		(0-200.0)%	5.0	The return value is the degree of distortion.
		(0-3600)s	5	Delay value.
		(0-7)	0	Action.
12.	THD Alarm 2	(0-1)	0	0: Disable 1: Enable
		(0-200.0)%	10.0	The setting value is the degree of distortion.
		(0-200.0)%	5.0	The return value is the degree of distortion.
		(0-3600)s	5	Delay value.
		(0-7)	0	Action.
13.	New Energy Over Freq. Alarm 1	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	114.0	The setting value is the percentage of new energy rated frequency.
		(0-200.0)%	112.0	The return value is the percentage of new energy rated frequency.
		(0-3600)s	2	Delay value
		(0-7)	7	Action.
14.	New Energy Over Freq. Alarm 2	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	110.0	The setting value is the percentage of new energy rated frequency.
		(0-200.0)%	108.0	The return value is the percentage of new energy rated frequency.
		(0-3600)s	5	Delay value
		(0-7)	1	Action.
15.	New Energy Under Freq. Alarm 1	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	80.0	The setting value is the percentage of new energy rated frequency.
		(0-200.0)%	82.0	The return value is the percentage of new energy rated frequency.
		(0-3600)s	3	Delay value
		(0-7)	7	Action.
16.	New Energy Under Freq. Alarm 2	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	84.0	The setting value is the percentage of new

No.	Items	Parameters	Defaults	Description
		(0-200.0)%	86.0	energy rated frequency.
		(0-3600)s	5	The return value is the percentage of new
		(0-7)	1	energy rated frequency.
				Delay value
				Action.
17.	CT Change	(5-6000)/5	500	Ratio of external connected current transformer.
18.	Rated Current	(5-6000)A	500	It is rated current of new energy and used for loading current standard.
19.	Over Current Alarm 1	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	120.0	The setting value is percentage of rated current.
		(0-200.0)%	118.0	The return value is percentage of rated current.
		(0-3600)s	3	Delay value.
		(0-7)	6	Action.
20.	Over Current Alarm 2	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	110.0	The setting value is percentage of rated current.
		(0-200.0)%	108.0	The return value is percentage of rated current.
		(0-3600)s	5	Delay value.
		(0-7)	1	Action.
21.	NegSeq Current Alarm 1	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	20.0	The setting value is percentage of rated current.
		(0-200.0)%	18.0	The return value is percentage of rated current.
		(0-3600)s	5	Delay value.
		(0-7)	1	Action.
22.	NegSeq Current Alarm 2	(0-1)	0	0: Disable 1: Enable
		(0-200.0)%	20.0	The setting value is percentage of rated current.
		(0-200.0)%	18.0	The return value is percentage of rated current.
		(0-3600)s	5	Delay value.
		(0-7)	0	Action.
23.	Earth Fault 1	(0-1)	1	0: Disable 1: Enable
		(0-200.0)%	20.0	The setting value is percentage of rated current.
		(0-200.0)%	18.0	The return value is percentage of rated current.
		(0-3600)s	5	Delay value.
		(0-7)	1	

No.	Items	Parameters	Defaults	Description
				Action.
24.	Earth Fault 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	0 20.0 18.0 5 0	0: Disable 1: Enable The setting value is percentage of rated current. The return value is percentage of rated current. Delay value. Action.
25.	Rated Active Power	(0-6000)kW	276	New energy rated active power, which is standard of loading active power.
26.	Rated Reactive Power	(0-6000)kvar	210	New energy rated reactive power, which is standard of loading reactive power.
27.	Reverse Power Alarm 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 10.0 8.0 3 7	0: Disable 1: Enable The setting value is percentage of new energy rated active power. The return value is percentage of new energy rated active power. Delay value. Action.
28.	Reverse Power Alarm 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 5.0 3.0 5 1	0: Disable 1: Enable The setting value is percentage of new energy rated active power. The return value is percentage of new energy rated active power. Delay value. Action.
29.	Over Power Alarm 1	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 120.0 118.0 3 6	0: Disable 1: Enable The setting value is percentage of new energy rated active power. The return value is percentage of new energy rated active power. Delay value. Action.
30.	Over Power Alarm 2	(0-1) (0-200.0)% (0-200.0)% (0-3600)s (0-7)	1 110.0 108.0 5 1	0: Disable 1: Enable The setting value is percentage of new energy rated active power. The return value is percentage of new energy rated active power. Delay value. Action.
31.	Power Factor Low Alarm 1	(0-1) (0-1.00) (0-1.00)	1 0.70 0.75	0: Disable 1: Enable The setting value is new energy power factor.

No.	Items	Parameters	Defaults	Description
		(0-3600)s	5	The setting value is new energy power factor.
		(0-7)	1	Delay value
				Action
32.	Power Factor Low Alarm 2	(0-1)	0	0: Disable 1: Enable
		(0-1.00)	0.70	The setting value is new energy power factor.
		(0-1.00)	0.75	The setting value is new energy power factor.
		(0-3600)s	5	Delay value
		(0-7)	0	Action

Switch Setting

No.	Items	Parameters	Defaults	Description
1.	Close Time	(0~20.0)s	5.0	Pulse width of switch on. When it is 0, it means output constantly.
2.	Open Time	(0~20.0)s	3.0	Pulse width of switch off. When it is 0, it means output constantly.
3.	Check Time	(0-20.0)s	5.0	Feedback and check time of breaker close status input.

Analog Sensor Setting

Flexible Sensor 1-5

No.	Items	Parameters	Defaults	Description
1.	Sensor Selection	(0~5)	0	0: Not used; 1: Temp. sensor; 2: Pressure sensor; 3: Level sensor 4: Power transducer 5: Irradiance sensor;
2.	Curve Type	(0-15)	0	Refer to Table 19.
3.	Open Circuit Action	(0-7)	0	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety trip and stop; 5: Trip; 6: Trip and stop; 7: Shutdown.
4.	High Alarm 1	(0-1)	0	0: Disable 1: Enable
		((-100)-1000)	100	The setting value is sensor value.
		((-100)-1000)	90	The setting value is sensor value.
		(0-3600)s	5	Delay Value.
		(0-7)	7	Action.
5.	High Alarm 2	(0-1)	0	0: Disable 1: Enable
		((-100)-1000)	90	The setting value is sensor value.
		((-100)-1000)	80	The setting value is sensor value.
		(0-3600)s	5	Delay Value.
		(0-7)	1	Action.
6.	Low Alarm 1	(0-1)	0	0: Disable 1: Enable
		((-100)-1000)	10	The setting value is sensor value.
		((-100)-1000)	20	The setting value is sensor value.

No.	Items	Parameters	Defaults	Description
		(0-3600)s	5	Delay Value.
		(0-7)	7	Action.
7.	Low Alarm 2	(0-1)	0	0: Disable 1: Enable
		((-100)-1000)	20	The setting value is sensor value.
		((-100)-1000)	30	The setting value is sensor value.
		(0-3600)s	5	Delay Value.
		(0-7)	1	Action.
8.	User-defined Curve Setting			

Analog Output 1-2

No.	Items	Parameters	Defaults	Description
9.	Parameter Selection	(0-82)	0	0: Busbar UAB
10.	User-defined Curve Setting			

Digital Input Ports Setting

Digital Input Port 1

No.	Items	Parameters	Defaults	Description
1.	Contents Setting	(0~70)	28	Remote start (on-load).
2.	Active Type	(0~1)	0	0: Close 1: Open

Digital Input Port 2

No.	Items	Parameters	Defaults	Description
1.	Contents Setting	(0~70)	0	User-defined.
2.	Active Type	(0~1)	0	0: Closed to active 1: Open to active
3.	Arming	(0-3)	0	0: Normal running 1: From starting 2: Always 3: Never
4.	Active Actions	(0-7)	0	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.7: Shutdown.
5.	Active Delay	(0-20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active..

Digital Input Port 3

No.	Items	Parameters	Defaults	Description
1.	Contents Setting	(0~70)	0	User-defined.
2.	Active Type	(0~1)	0	0: Closed to active 1: Open to active
3.	Arming	(0-3)	0	0: Normal running 1: From starting 2: Always 3: Never
4.	Active Actions	(0-7)	0	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.7: Shutdown.
5.	Active Delay	(0-20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active..

No.	Items	Parameters	Defaults	Description
Digital Input Port 4				
1.	Contents Setting	(0~70)	13	New energy close status input
2.	Active Type	(0~1)	0	0: Close 1: Open
Digital Input Port 5				
1.	Contents Setting	(0~70)	0	Users-defined
2.	Active Type	(0~1)	0	0: Closed to active 1: Open to active
3.	Arming	(0~3)	3	0: From safety on 1: From starting 2: Always 3: Never
4.	Active Actions	(0~7)	4	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
5.	Active Delay	(0~20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active.
Digital Input Port 6				
1.	Contents Setting	(0~70)	44	Gensets are unavailable.
2.	Active Type	(0~1)	0	0: Close 1: Open
Digital Input Port 7				
1.	Contents Setting	(0~70)	0	Users-defined.
2.	Active Type	(0~1)	0	0: Close 1: Open
3.	Arming	(0~3)	3	0: From safety on 1: From starting 2: Always 3: Never
4.	Active Actions	(0~7)	4	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
5.	Active Delay	(0~20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active.
Digital Input Port 8				
1.	Contents Setting	(0-70)	0	User defined.
2.	Active Type	(0-1)	0	0: Closed 1: Open
3.	Arming	(0-3)	3	0: From safety on 1: From starting 2: Always 3: Never
4.	Active Actions	(0-7)	4	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
5.	Active Delay	(0-20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active.
Digital Input Port 9				
1.	Contents Setting	(0-70)	0	Users-defined

No.	Items	Parameters	Defaults	Description
2.	Active Type	(0-1)	0	0: Close 1: Open
3.	Arming	(0-3)	3	0: From safety on 1: From starting 2: Always 3: Never
4.	Active Actions	(0-7)	4	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
5.	Active Delay	(0-20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active.
Digital Input Port 10				
1.	Contents Setting	(0-70)	0	Users-defined
2.	Active Type	(0-1)	0	0: Close 1: Open
3.	Arming	(0-3)	3	0: From safety on 1: From starting 2: Always 3: Never
4.	Active Actions	(0-7)	4	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
5.	Active Delay	(0-20.0)s	2.0	Time from detecting active to confirm
6.	Description			LCD displays detailed contents when the input is active.
Digital Output Ports				
Digital Output Port 1				
1	Contents Setting	(0~299)	48	Common alarm.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 2				
1	Contents Setting	(0~299)	0	Not used.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 3				
1	Contents Setting	(0~299)	0	Not used.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 4				
1	Contents Setting	(0~299)	0	Not used.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 5				
1	Contents Setting	(0~299)	0	Not used.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 6				
1	Contents Setting	(0~299)	0	Not used.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 7				
1	Contents Setting	(0~299)	0	Not Used
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close

No.	Items	Parameters	Defaults	Description
Digital Output Port 8				
1	Contents Setting	(0~299)	0	Not Used
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 9				
1	Contents Setting	(0~299)	30	New energy opens and outputs.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Digital Output Port 10				
1	Contents Setting	(0~299)	29	New energy closes and outputs.
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
System Application Setting				
System Setting				
Priority				
1	PV	(0-31)	0	
2	Storage Energy Power Station	(0-31)	1	
3	Mains	(0-31)	2	
4	Gen	(0-31)	3	
Current Transformer Setting				
1	Com Port	(0-2)	0	0: Not used; 1:RS485(1)；2:RS485(2)
2	Com ID	(1-254)	5	Current transformer communication ID.
3	Com Failure	(0-7)	1	Communication failure actions. 0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
BMS Setting				
1	BMS Com Terminal	(0-2)	0	0: Not used; 1:RS485(1)；2:RS485(2)
2	BMS Com ID	(1-254)	6	Current transformer communication ID.
3	BMS Com Failure	(0-7)	1	Communication failure actions. 0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
PV Power				
1	PV-1 Rated (kW)	(0-6000)kW	500	PV-1rated active power.
2	PV-1 (kvar)	(0-6000)kvar	500	PV-1rated reactive power.
3	PV-2 (kW)	(0-6000)kW	500	PV-2rated active power.
4	PV-2 (kvar)	(0-6000)kvar	500	PV-2rated reactive power.
5	PV-3 (kW)	(0-6000)kW	500	PV-3rated active power.
6	PV-3 (kvar)	(0-6000)kvar	500	PV-3rated reactive power.
7	PV-4 (kW)	(0-6000)kW	500	PV-4rated active power.
8	PV-4 (kvar)	(0-6000)kvar	500	PV-4rated reactive power.
Power of Energy Storage Power Station				
1	Storage Energy	(0-6000)kW	500	Rated active power of energy storage

No.	Items	Parameters	Defaults	Description
	Rated (kW)			power station.
2	Storage Energy Rated (kvar)	(0-6000)kvar	500	Rated reactive power of energy storage power station.
Mains Power				
1	Mains Rated (kW)	(0-6000)kW	500	Mains rated active power.
2	Mains Rated(kvar)	(0-6000)kvar	500	Mains rated reactive power.
Spinning Reverse Power				
1	Spinning Reverse Power	(0-200.0%)	50	The percentage of PV spinning reverse power.
Energy Storage Power Station Setting				
1.	Permissible Discharge Capacity	(0-60000)kwh	1000	When the energy storage battery capacity is lower than the setting permissible discharge capacity, the energy storage power station will no longer provide energy and spinning reserve.
2.	PV Charging Enable	(0-1)	0	0: Disable 1: Enable
3.	PV Charging Time 1	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
4.	PV Charging Time 2	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
5.	PV Charging Time 3	(0-1)	0	The start time and charging time can be set.
6.	PV Charging Time 4	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
7.	PV Charging Time 5	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
8.	Mains Charging Enable	(0-1)	0	0: Disable 1: Enable
9.	Mains Charging Time 1	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
10.	Mains Charging Time 2	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
11.	Mains Charging Time 3	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
12.	Mains Charging Time 4	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.

No.	Items	Parameters	Defaults	Description
				set.
13.	Gen Charging Enable	(0-1)	0	0: Disable 1: Enable
14.	Gen Charging Time 1	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
15.	Gen Charging Time 2	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
16.	Gen Charging Time 3	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
17.	Gen Charging Time 4	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
18.	Gen Charging Time 5	(0-1)	0	0: Disable 1: Enable The start time and charging time can be set.
19.	Permissible Charging Load Power	(0-6000)kW	500	
Inverter Setting				
1.	Model	(0-49)	0	00 Sofarsolar
2.	Com Failure Delay	(0-3600)s	5	
3.	Com Failure Action	(0-7)	1	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
4.	Numbers of Inverter	(1-4)	1	
5.	Inverter Com Terminal	(0-2)	1	0: Not used. 1:RS485(1)；2:RS485(2)
6.	Inverter 1 ID	(1-254)	1	
7.	Inverter 1 DC Channel	(1-4)	2	
8.	Inverter 2 ID	(1-254)	2	
9.	Inverter 2 DC Channel	(1-4)	2	
10.	Inverter 3 ID	(1-254)	3	
11.	Inverter 3 DC Channel	(1-4)	2	
12.	Inverter 4 ID	(1-254)	4	
13.	Inverter 4 DC Channel	(1-4)	2	

No.	Items	Parameters	Defaults	Description
PV Power Setting 1				
1.	Load Ramp Rate	(0-100.0) %	3.0	The target power percentage increases according to the load ramp rate, and when reaches to on-load ramp rate delay point, the on-load ramp rate delay stops while the target power percentage increases.
2.	On-load Ramp Rate Delay Point	(0.1-40.0)%	10.0	
3.	On-load Ramp Rate Delay	(0-30）	0	
4.	Unloading Ramp Rate	(0-100.0) %	3.0	The target power percentage decreases according to the unload ramp rate.
5.	Unloading Open Setting	(0-1)	1	0: Disable 1: Enable
		(0-100.0)%	10.0	The active power percentage of unloading open.
		(0-3600)s	60	The delay value of unloading failure alarm. The unloading failure alarm is always active.
PV Power Setting 2				
1.	Temp.1 Input Selection	(0-5)	0	0: Not used; 1: Flex. sensor 1; 2: Flex. Sensor 2; 3: Flex sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5.
2.	Temp.1 Power Curve	X-Temp.; Y-Power Percentage.		
3.	Temp.2 Input Selection	(0-5)	0	0: Not used; 1: Flex. sensor 1; 2: Flex. Sensor 2; 3: Flex sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5.
4.	Temp.2 Power Curve	X-Temp.; Y-Power Percentage.		
5.	Temp.3 Input Selection	(0-5)	0	0: Not used; 1: Flex. sensor 1; 2: Flex. Sensor 2; 3: Flex sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5.
6.	Temp.3 Power Curve	X-Temp.; Y-Power Percentage.		
7.	Temp.1 Power Percentage	(0-100.0)%	20.0	The sum of (power percentage from temperature and optical illuminance sensors * power percentage from each sensor) is the maximum capacity percentage of the inverter.
8.	Temp.2 Power Percentage	(0-100.0)%	15.0	
9.	Temp.3 Power Percentage	(0-100.0)%	15.0	
10.	Irradiance 1 Input Selection	(0-5)	0	0: Not used; 1: Flex. sensor 1; 2: Flex. Sensor 2; 3: Flex sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5.
11.	Irradiance 1 Power Curve	X-Irradiance; Y-Power Percentage.		
12.	Irradiance 2 Input	(0-5)	0	0: Not used; 1: Flex. sensor 1; 2: Flex.

No.	Items	Parameters	Defaults	Description
	Selection			Sensor 2; 3: Flex sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5.
13.	Irradiance 2 Power Curve	X-Irradiance; Y-Power Percentage.		
14.	Irradiance 3 Input Selection	(0-5)	0	0: Not used; 1: Flex. sensor 1; 2: Flex. Sensor 2; 3: Flex sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5.
15.	Irradiance 3 Power Curve	X-Irradiance; Y-Power Percentage.		
16.	Irradiance 1 Power Percentage	(0-100.0)%	20.0	The sum of (power percentage from temperature and optical illuminance sensors * power percentage from each sensor) is the maximum capacity percentage of the inverter.
17.	Irradiance 2 Power Percentage	(0-100.0)%	15.0	
18.	Irradiance 3 Power Percentage	(0-100.0)%	15.0	
Load Size Control				
1.	Application Mode	(0-1)	0	0: Island Mode; 1: Mains available.
2.	Active Power Control Mode	(0-1)	0	0: Fixed Power; 1: Inverter control.
3.	Reactive Power Control Mode	(0-2)	0	0: 0: Fixed Power; 1: Power factor control; 2: Inverter control.
4.	Fixed Active Power	(0-100.0)%	60	
5.	Fixed Reactive Power	(0-100.0)%	60	
6.	Fixed Power Factor	(0-1.00)	0.80	
7.	Minimum Load (%)	(0-100.0)%	10	
8.	Active Regulation Limit (%)	(0-100.0)%	10	
9.	Reactive Regulation Limit (%)	(0-100.0)%	10	
MSC				
1.	Numbers of MSC	(1-32)	1	
2.	Few Com Alarm Action	(0-7)	1	0: None; 1: Warning; 2: Block; 3: Safety Trip; 4: Safety Stop; 5: Trip; 6: Trip and Stop; 7: Shutdown.
3.	Module MSC ID	(0-31)	1	The ID in the MSC communication network. The MSC ID in the entire communication network should be unique.
4.	Module Priority	(0-31)	0	The smaller the value, the higher the priority.
Expansion Module				
1.	Expand DIN16	(0-1)	0	0: Disable ; 1: Enable

No.	Items	Parameters	Defaults	Description
2.	Expand DOUT16	(0-1)	0	0: Disable ; 1: Enable
3.	Expand AIN8	(0-1)	0	0: Disable ; 1: Enable

7.2 ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS

Table 17 Definition of Digital Output Ports

No.	Type	Description
0	Not Used	
1	Reserved	Please refer to 7.2.1 for detailed function descriptions.
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Custom Combined Output 1	
8	Custom Combined Output 2	
9	Custom Combined Output 3	
10	Custom Combined Output 4	
11	Custom Combined Output 5	
12	Custom Combined Output 6	
13-17	Reserved	
18	Audible Alarm	Act on warning, shutdown, and trips. An annunciator can be connected externally. If 'alarm mute' configurable input port is active, this is prohibited.
19-25	Reserved	
26	Remote Control Output	This port is controlled by communication (PC).
27	Reserved	
28	Reserved	
29	Close New Energy Output	It can control new energy switch to take load.
30	Open New Energy Output	It can control new energy switch to take off load.
31	Reserved	
32	Reserved	
33	Crank Success	Close when a successful start signal is detected.
34	New Energy Normal Output	Act when new energy voltage is normal.
35	PV Gen Active	Act during inverter normal running.
36	Busbar Normal Output	Act when busbar is normal.
37	Close PV1 Output	It can control PV1 switch to take load.
38	Open PV1 Output	It can control PV1 switch to take off load.
39	Close PV2 Output	It can control PV2 switch to take load.
40	Open PV2 Output	It can control PV2 switch to take off load.
41	Close PV3 Output	It can control PV3 switch to take load.
42	Open PV3 Output	It can control PV3 switch to take off load.
43	Close PV4 Output	It can control PV4 switch to take load.
44	Open PV4 Output	It can control PV4 switch to take off load.
45	Close CT Output	It can control current transformer switch to take load.

No.	Type	Description
46	Open CT Output	It can control current transformer switch to take off load.
47	Reserved	
48	Common Alarm	Act when genset common warning, common shutdown, common trip alarms occur.
49	Common Trip and Stop	Act when common trip and stop alarm occurs.
50	Common Shutdown	Act when common shutdown alarm occurs.
51	Common Trip	Act when common trip alarm occurs.
52	Common Warn	Act when common warning alarm occurs.
53	Common Block	
54	Battery Over Voltage	Act when battery's over voltage warning alarm occurs.
55	Battery Under Voltage	Act when battery's low voltage warning alarm occurs.
56	Reserved	
57	Common Safety Stop	Act when common safety stop alarm occurs.
58	Common Safety Trip	Act when common safety trip alarm occurs.
59	Reserved	
60	Reserved	
61	Start Failure Alarm	Act when start failure alarm occurs.
62	Stop Failure Alarm	Act when stop failure alarm occurs.
63	New Energy Unbalanced Volt Alarm	Act when new energy unbalanced voltage warning occurs.
64	New Energy Unbalanced Volt Alarm	Act when new energy unbalanced voltage alarm (except warning) occurs.
65-68	Reserved	
69	Digital Input 1 Active	Act when input port 1 is active.
70	Digital Input 2 Active	Act when input port 2 is active.
71	Digital Input 3 Active	Act when input port 3 is active.
72	Digital Input 4 Active	Act when input port 4 is active.
73	Digital Input 5 Active	Act when input port 5 is active.
74	Digital Input 6 Active	Act when input port 6 is active.
75	Digital Input 7 Active	Act when input port 7 is active.
76	Digital Input 8 Active	Act when input port 8 is active.
77	Digital Input 9 Active	Act when input port 9 is active.
78	Digital Input 10 Active	Act when input port 10 is active.
79	Reserved	
80	Reserved	
81	Ext DI Input 1 Active	Act when extension digital input 1 is active.
82	Ext DI Input 2 Active	Act when extension digital input 2 is active.
83	Ext DI Input 3 Active	Act when extension digital input 3 is active.
84	Ext DI Input 4 Active	Act when extension digital input 4 is active.
85	Ext DI Input 5 Active	Act when extension digital input 5 is active.
86	Ext DI Input 6 Active	Act when extension digital input 6 is active.
87	Ext DI Input 7 Active	Act when extension digital input 7 is active.

| No.	Type	Description
88	Ext DI Input 8 Active	Act when extension digital input 8is active.
89	Ext DI Input 9 Active	Act when extension digital input 9 is active.
90	Ext DI Input 10 Active	Act when extension digital input 10 is active.
91	Ext DI Input 11 Active	Act when extension digital input 11 is active.
92	Ext DI Input 12 Active	Act when extension digital input 12 is active.
93	Ext DI Input 13 Active	Act when extension digital input 13 is active.
94	Ext DI Input 14 Active	Act when extension digital input 14 is active.
95	Ext DI Input 15 Active	Act when extension digital input 15 is active.
96	Ext DI Input 16 Active	Act when extension digital input 16 is active.
97-106	Reserved	
107	New Energy Over Freq. Warning	Act when new energy over frequency warning occurs.
108	New Energy Over Freq. Alarm	Act when new energy over frequency alarm (except warning) occurs.
109	New Energy Over Volt. Warning	Act when new energy over voltage warning occurs.
110	New Energy Over Volt. Alarm	Act when generator over voltage alarm (except warning) occurs.
111	New Energy Under Freq. Warning	Act when new energy under frequency warning occurs.
112	New Energy Under Freq. Alarm	Act when new energy under frequency alarm (except warning) occurs.
113	New Energy Under Volt. Warning	Act when new energy under voltage warning occurs.
114	New Energy Under Volt. Alarm	Act when new energy under voltage alarm (except warning) occurs.
115	New Energy Loss of Phase	Act when new energy loss of phase occurs.
116	New Energy Reverse Phase	Act when new energy reverse phase occurs.
117	New Energy Over Power Warning	Act when new energy over power warning occurs.
118	New Energy Over Power Alarm	Act when new energy over power alarm (expect warning) occurs.
119	New Energy Reverse Power Warning	Act when new energy reverse power warning occurs.
120	New Energy Reverse Power Alarm	Act when new energy reverse power alarm (expect warning) occurs.
121	New Energy Over Current Warning	Act when new energy over current warning occurs.
122	New Energy Over Current Alarm	Act when new energy over current alarm (except warning) occurs.
123-137	Reserved	

No.	Type	Description
138	Flex. Sensor 1 High Warning	Act when flexible sensor 1 high warning occurs.
139	Flex. Sensor 1 Low Warning	Act when flexible sensor 1 low warning occurs.
140	Flex. Sensor 1 High Alarm	Act when flexible sensor 1 high alarm occurs.
141	Flex. Sensor 1 Low Alarm	Act when flexible sensor 1 low alarm (except warning) occurs.
142	Flex. Sensor 2 High Warning	Act when flexible sensor 2 high warning occurs.
143	Flex. Sensor 2 Low Warning	Act when flexible sensor 2 low warning occurs.
144	Flex. Sensor 2 High Alarm	Act when flexible sensor 2 high alarm occurs.
145	Flex. Sensor 2 Low Alarm	Act when flexible sensor 2 low alarm (except warning) occurs.
146	Flex. Sensor 3 High Warning	Act when flexible sensor 3 high warning occurs.
147	Flex. Sensor 3 Low Warning	Act when flexible sensor 3 low warning occurs.
148	Flex. Sensor 3 High Alarm	Act when flexible sensor 3 high alarm occurs.
149	Flex. Sensor 3 Low Alarm	Act when flexible sensor 3 low alarm (except warning) occurs.
150	Flex. Sensor 4 High Warning	Act when flexible sensor 4 high warning occurs.
151	Flex. Sensor 4 Low Warning	Act when flexible sensor 4 low warning occurs.
152	Flex. Sensor 4 High Alarm	Act when flexible sensor 4 high alarm occurs.
153	Flex. Sensor 4 Low Alarm	Act when flexible sensor 4 low alarm (except warning) occurs.
154	Flex. Sensor 5 High Warning	Act when flexible sensor 5 high warning occurs.
155	Flex. Sensor 5 Low Warning	Act when flexible sensor 5 low warning occurs.
156	Flex. Sensor 5 High Alarm	Act when flexible sensor 5 high alarm occurs.
157	Flex. Sensor 5 Low Alarm	Act when flexible sensor 5 low alarm (except warning) occurs.
158-201	Reserved	
202	AIN8 Sensor 1 High Alarm	Act when expansion AIN8 sensor 1 high alarm (except warning) occurs.
203	AIN8 Sensor 1 High Warning	Act when expansion AIN8 sensor 1 high warning occurs.
204	AIN8 Sensor 1 Low Alarm	Act when expansion AIN8 sensor 1 low alarm (except warning) occurs.
205	AIN8 Sensor 1 Low Warning	Act when expansion AIN8 sensor 1 low warning occurs.
206	AIN8 Sensor 2 High Alarm	Act when expansion AIN8 sensor 2 high alarm (except warning) occurs.
207	AIN8 Sensor 2 High Warning	Act when expansion AIN8 sensor 2 high warning occurs.
208	AIN8 Sensor 2 Low Alarm	Act when expansion AIN8 sensor 2 low alarm (except warning) occurs.
209	AIN8 Sensor 2 Low Warning	Act when expansion AIN8 sensor 2 low warning occurs.
210	AIN8 Sensor 3 High Alarm	Act when expansion AIN8 sensor 3 high alarm (except warning) occurs.
211	AIN8 Sensor 3 High Warning	Act when expansion AIN8 sensor 3 high warning occurs.

No.	Type	Description
212	AIN8 Sensor 3 Low Alarm	Act when expansion AIN8 sensor 3 low alarm (except warning) occurs.
213	AIN8 Sensor 3 Low Warning	Act when expansion AIN8 sensor 3 low warning occurs.
214	AIN8 Sensor 4 High Alarm	Act when expansion AIN8 sensor 4 high alarm (except warning) occurs.
215	AIN8 Sensor 4 High Warning	Act when expansion AIN8 sensor 4 high warning occurs.
216	AIN8 Sensor 4 Low Alarm	Act when expansion AIN8 sensor 4 low alarm (except warning) occurs.
217	AIN8 Sensor 4 Low Warning	Act when expansion AIN8 sensor 4 low warning occurs.
218-229	Reserved	
230	Stop Mode	Act when the system is in stop mode.
231	Manual Mode	Act when the system is in Manual mode.
232	Reserved	Reserved
233	Auto Mode	Act when the system is in Auto mode.
234	New Energy On-load Indication	
235-239	Reserved	
240-279	PLC Flag1~40	PLC flag output.
280-299	Reserved	

7.2.1 DEFINED COMBINATION OUTPUT

Defined combination output is composed by 3 parts, **or condition output S1, or condition output S2** and **condition output S3**.
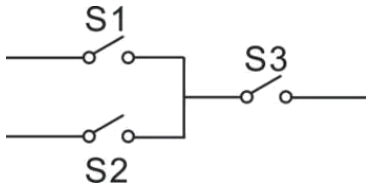
S1 or S2 is **TRUE**, while S3 is **TRUE**, defined combination output is outputting;

S1 and S2 are **FALSE**, or S3 is **FALSE**, defined combination output is not outputting.

⚠**NOTE:** S1, S2, S3 can be set as any contents except for "defined combination output" in the output setting.

⚠**NOTE:** 3 parts of defined combination output (S1, S2, S3) couldn't include or recursively include themselves.

For example:

Contents of or condition output S1: output port 1 is active;

Close when or condition output S1 is active /inactive: close when active (disconnect when inactive);

Contents of or condition output S2, output port 2 is active;

Close when or condition output S2 is active /inactive: close when active (disconnect when inactive);

Contents of or condition output S3: output port 3 is active;

Close when or condition output S3 is active /inactive: close when active (disconnect when inactive);

When input port 1 active or input port 2 active, if input port 3 is active, defined combination output is outputting; If input port 3 inactive, defined combination output is not outputting;

When input port 1 inactive and input port 2 inactive, whatever input port 3 is active or not, defined combination output is not outputting.

7.3 DEFINED CONTENTS OF PROGRAMMABLE INPUT PORTS

Table 18 Definition of Digital Input Ports

No.	Type	Description
0	Users Configured	Users-defined alarm. Active range: Never: input inactive. Always: input is active all the time. From crank: detecting as soon as start. From safety on: detecting after safety on run delay.
1	Reserved	
2	Alarm Mute	Can prohibit 'Audible Alarm' output when input is active.
3	Reset Alarm	Can reset shutdown alarm and trip alarm when input is active.
4	Reserved	
5	Lamp Test	All LED indicators are illuminated when input is active.
6	Panel Lock	All buttons in panel is inactive except navigation buttons and there is 🔒 in the left top corner in LCD when input is active.
7	Reserved	
8	Reserved	
9	Inhibit Auto Stop	In **Auto** mode, after PV normal running, when input is active, prohibit generator shutdown automatically.
10	Inhibit Auto Start	In **Auto** mode, prohibit generator start automatically when input is active.
11	Reserved	
12	Reserved	
13	New Energy Closed Input	Connect new energy loading switch's auxiliary point.
14	New Energy On Load Prohibit	Prohibit new energy switch on or unload when input is active.
15	Reserved	
16	Reserved	
17	Auto Mode Input	When input is active, controller enters into Auto mode.
18	Auto Mode Invalid	When input is active, controller won't work under Auto mode. Auto button and simulate auto button input do not work.
19	Reserved	
20	Reserved	
21	Inhibit Alarm Stop	All shutdown alarms are prohibited except emergence stop.(Means battle mode)
22	Instrument Mode	All outputs are prohibited in this mode.
23	Reserved	
24	Reserved	
25	Reserved	
26	Reserved	

No.	Type	Description	
27	Reserved		
28	Remote Start (On Load)	In **Auto** mode, when input is active, the new energy switch can be automatically closed, then the inverter can be controlled to start and load after normal running. When the input is invalid, the new energy can be automatically unloaded and the inverter can be shut down.	
29	Remote Start (Off Load)	In **Auto** mode, when input is active, the new energy switch can be automatically closed, then the inverter can be controlled to start and unload after normal running. When the input is invalid, the inverter can be shut down automatically.	
30	Aux. Manual Start	In **Auto** mode, when input active, the inverter will be started automatically; when input inactive, it will be stopped automatically	
31	Remote Start (On Demand)	In **Auto** mode, when input active, all controllers that need to be parallel will start according to the priority and calling other generator according to the load.	
32	Reserved		
33	Simulate Stop Button	An external button (Not Self-locking) can be connected and pressed as simulate panel.	
34	Simulate Manual Button		
35	Reserved		
36	Simulate Auto Button	An external button (Not Self-locking) can be connected and pressed as simulate panel.	
37	Simulate Start Button		
38	Simulate Close New Energy Button	This is simulate close button of new energy.	
39	Simulate Open New Energy Button	This is simulate open button of new energy.	
40	Simulate Busbar Normal	In auto mode, when input is active, it means busbar is normal.	
41	Simulate Busbar Abnormal	In auto mode, when input is active, it means busbar is abnormal.	
42	Mains Unavailable	When input is active, it means mains is unavailable.	When energy is unavailable, it will not provide energy and spinning reserve.
43	PV Power Station Unavailable	When input is active, it means PV power station is unavailable.	
44	Genset Unavailable	When input is active, it means genset is unavailable.	
45	Energy Storage Power Station Unavailable	When input is active, it means energy storage power is unavailable.	
46	Mains No Priority	When input is active, it means mains is not preferred.	The non-priority energy priority still uses the setting energy priority. If set the mains takes precedence over generator, when the
47	PV Power Station No Priority	When input is active, it means PV power station is not preferred.	
48	Genset No Priority	When input is active, it means genset is not preferred.	

No.	Type	Description	
49	Energy Storage Power Station No Priority	When input is active, it means energy storage is not preferred.	non-priority of mains and generator is active, the mains will take precedence over the generator.
50	PV1 Close Input		
51	PV2 Close Input		
52	PV3 Close Input		
53	PV4 Close Input		
54-70	Reserved		

7.4 SELECTION OF SENSORS

Table 19 Sensor Selection

No.		Description	Remark
1	Temperature Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA curve 3 Custom (0-5)V curve 4 VDO 5 CURTIS 6 DATCON 7 SGX 8 SGD 9 SGH 10 PT100 11 SUZUKI 12 PRO 13-15 Reserved	Defined resistance's range is $(0\sim6)k\Omega$.
2	Pressure Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA curve 3 Custom (0-5)V curve 4 VDO 10Bar 5 CURTIS 6 DATCON 10Bar 7 SGX 8 SGD 9 SGH 10 VDO 5Bar 11 DATCON 5Bar 12 DATCON 7Bar	Defined resistance's range is $(0\sim6)k\Omega$.

No.		Description	Remark
		13 SUZUKI	
		14 PRO	
		15 Reserved	
3	Oil Level Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA curve 3 Custom (0-5)V curve 4 SGD 5 SGH 6~15 Reserved	Defined resistance's range is (0~6)kΩ.
4	Power Transmitter	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA curve 3 Custom (0-5)V curve 4~15 Reserved	Defined resistance's range is (0~6)kΩ.

NOTE: User should make special declare when order controller if your flexible sensor 1, 3 and 5 use non-resistance sensor.

8   PARAMETERS SETTING

⚠**CAUTION:** Please change the controller parameters when generator is in standby mode only (e. g. configurable input, configurable output, various delay etc.), otherwise, alarming to stop and other abnormal conditions may happen.

⚠**NOTE:** Maximum set value must over minimum set value in case that the condition of too high as well as too low will happen.

⚠**NOTE:** When the warning alarm is set, please set the correct return value; otherwise, maybe there is abnormal alarm. When the maximum value is set, the return value must be less than the set value; when the minimum value is set, the return value must be over the set value.

⚠**NOTE:** Digital input could not be set as the same items; otherwise, there are abnormal functions. However, the digital output can be set as the same items.

9   SENSOR SETTING

1)   When sensors are reselected, the sensor curves will be transferred into the standard value. For example, if temperature sensor is SGX (120℃ resistor type), its sensor curve is SGD (120℃ resistor type); if select the SGH (120℃ resistor type), the temperature sensor curve is SGH curve.

2)   When there is difference between standard sensor curves and used sensor curves, users can adjust it in the "sensor curve type".

3)   When the sensor curve is inputted, x value (resistor) must be inputted from small to large, otherwise, mistake occurs.

4)   If sensor type is selected as "none", sensor curve is not working.

5)   If the corresponding sensor has alarm switch only, users must set this sensor as "none", otherwise, shutdown or warning may occur.

6)   The headmost or backmost values in the vertical coordinates can be set as the same as below.
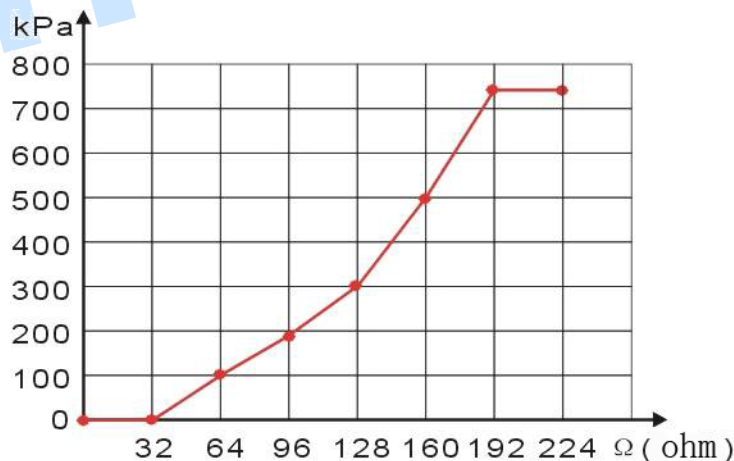
Fig. 6 Sensor Curve Diagram

Table 20 Normal Pressure Unit Conversion Form

	pa	kgf/cm^2	bar	psi
1Pa	1	1.02×10^{-5}	1×10^{-5}	1.45×10^{-4}
1kgf/cm^2	9.8×10^4	1	0.98	14.2
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1

10 COMMISSIONING

1) Check the parameter configurations of the controller;

2) Check the if all wiring connections are correct and the wire diameter is suitable. MSC CAN wiring connection between the controllers.

3) Press "Close" button when busbar is normal, connect busbar to the inverter, then press the "Start" button, the inverter is going to start up. After the setting "Wait for start delay" is over, the PV inverter enters into normal running successfully. If not successfully, the controller will issue a signal of start failure.

4) Select auto mode on front panel, and then switch on the busbar signal. After the normal delay of the busbar, the controller closes the circuit breaker (if has) to the inverter, and the controller starts automatically with load;

5) After the busbar is abnormal again, the controller will issue shutdown instruction, and then issue open new energy generation instruction. If not, refer to this manual to check the wiring of the switch control section

6) If there is any question, please contact our service personnel in time.

11 LOAD CONTROL MODE

11.1 APPLICATION MODE

Mains Available (Large Power Grid)

The power is adjusted by HGM9560, and according to the energy priority to output constant active power and reactive power to the mains supply.

VF is provided by bus and PQ is provided by other energy.

Island Mode (Microgrid)

Mains is unavailable, and according to the setting energy priority (exclude the mains supply) to take load.

The genset provides VF prior to energy storage power station.

PV power station can't take load separately.

11.2 ACTIVE POWER CONTROL MODE

Fixed Power Mode

The active power set by constant output.

Inverter Control Mode

The controller doesn't control the power output, but the inverter controls the active power output.

11.3 REACTIVE POWER CONTROL MODE

Fixed Power Mode

The reactive power set by constant output.

Power Factor Control Mode

The reactive power outputs according to the power factor, or the controller automatically controls the inverter according to the power factor (if the inverter supports).

Inverter Control Mode

The controller doesn't control the power output, but the inverter controls the reactive power output.

12 APPLICATION SCENARIOS

1. The mains is available but expensive from 08:00 to 12:00. If the PV is insufficient, it is recommended to use the energy storage power station during this time period. If the energy storage power station is insufficient, use the mains and power generation according to the priority. Charging for storage energy is allowed for the mains during 00:00~06:00 and the PV is allowed to charge all the time. It is not allowed to send power back to the mains, and ensure the minimum load of the unit when using power generation.

Application Mode: Mains available

Active Power Control Mode: Fixed Power Mode

Mains Module: Available, the mains can provide unlimited spinning reserve, the mains power is determined by setting value, the genset is controlled by the mains module.

Setting Priority: 08:00~12:00 PV>Storage Energy>Mains Supply>Gen

or PV>Storage Energy>Gen>Mains Supply

Other time period PV>Mains Supply>Storage Energy>Gen

Setting mains supply running charging time: 00:00~06:00

Set mains module to peak clipping mode, mains with load 10%.

Time period: 08:00~12:00

When the mains supply is normal and PV is closed, the PV output is controlled according to the new energy target power (Tp) sent by the mains module.

When PV power is insufficient (Tp>PV max. power), the energy storage power station starts (PQ), and the output power of the PV and energy storage power station are controlled is Tp.

When PV power is sufficient (Tp<PV max. power), if the storage energy needs to be charged, the storage energy charging is controlled so that the output power of the PV and the energy storage power station is Tp; otherwise the energy storage power station exits.

Other Time Periods:

When the mains supply is normal and PV is closed, the PV output is controlled according to the new energy target power (Tp) sent by the mains module. The storage energy can't be used.

When PV power is insufficient (Tp>PV max. power), the controller will issue an alarm of insufficient PV power.

When PV power is sufficient (Tp<PV max. power), if the storage energy needs to be charged, the storage energy charging is controlled so that the output power of the PV and the energy storage power station is Tp; otherwise the energy storage power station exits.

2.The mains is available but expensive from 08:00 to 12:00. If the PV is insufficient, it is recommended to use the energy storage power station during this time period. If the energy storage power station is insufficient, use the mains and power generation according to the priority. Charging for storage energy is allowed for the mains during 00:00~06:00 and the PV is allowed to charge all the time. It is allowed to send power back to the mains, and ensure the minimum load of the unit when using power generation.

Application Mode: **Mains available**

Active Power Control Mode: **Fixed Power Mode**

Mains Module: **Unavailable, the mains can provide unlimited power spinning reserve**

Setting Priority: 08:00~12:00 **PV>Storage Energy>Mains Supply>Gen or**

PV>Storage Energy>Gen>Mains Supply

Other time period **PV>Mains Supply>Storage Energy>Gen**

Setting charging time of mains supply running: 00:00~06:00

Time period: 08:00~12:00

When busbar is normal and PV is closed, the PV fixed power (Tp) (new energy fixed power percentage) output is controlled.

When PV power is insufficient (Tp>PV max. power), the energy storage power station starts (PQ), the fixed power output of PV and energy storage power station are controlled.

When PV power is sufficient (Tp<PV max. power), if the storage energy needs to be charged, the storage energy charging is controlled so that the output power of the PV and the energy storage power station is Tp; otherwise the energy storage power station exits.

If power generation takes precedence over mains supply, when PV power and energy storage power station are insufficient, the genset starts (PQ) to control the fixed power output of PV, energy storage power station and genset, at the same time, the minimum load of the unit should be ensured, otherwise, the genset will not start.

When power is sufficient, the power generation and energy storage power station will exit in turns.

Other Time Periods:

When the mains supply is normal and PV is closed, the PV fixed power output is controlled.

When PV power is insufficient (Tp>PV max. power), the controller will issue an alarm.

When PV power is sufficient (Tp<PV max. power), if the storage energy needs to be charged, the storage energy charging is controlled so that the output power of the PV and the energy storage power station is Tp; otherwise the energy storage power station exits.

3. When the mains supply is unavailable and the PV power is insufficient, the energy storage power station is used, if the energy storage power station is insufficient, then use the power generation, if the PV power is sufficient, the storage energy is charged. The minimum load of the unit should be ensured when using power generation.

Setting Mode   Island Mode

Setting Priority: PV>Storage Energy>Gen

Energy storage power station starts (VF) and PV is closed, PV power is controlled to ensure that there is no reverse power of the energy storage power station.

When the power of energy storage power station and spinning reserve are insufficient, the genset starts (VF) and the energy storage power station turns to PQ mode.

When the capacity of energy storage power station is insufficient, the genset starts (VF) and the energy storage power station stops to exit power supply sequence.

When the energy storage power station exits the power supply sequence, if PV power is sufficient and charging for energy storage power station until meet the capacity requirements of charging, then enters power supply sequence and the energy storage power station starts (PQ).

When the power of energy storage power station and spinning reserve are sufficient, the genset stops and the energy storage power station turns to VF mode.

4. When the mains supply is unavailable and the PV power is insufficient, then uses the power generation, if the power generation is insufficient, then uses the energy storage power station. The minimum load of the unit should be ensured when using power generation.

Setting Mode   Island Mode

Setting Priority   PV> Gen > Storage Energy

The genset starts (VF) and PV is closed to control the PV power, the minimum load of the unit should be ensured.
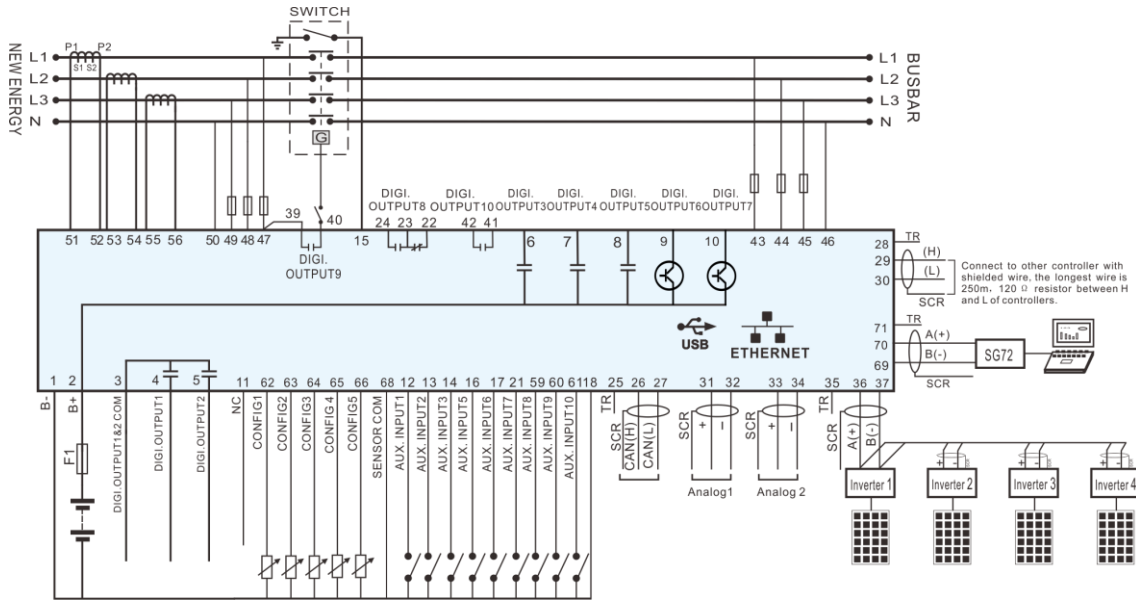
When the power of genset or spinning reserve are insufficient, the energy storage power station starts (PQ).

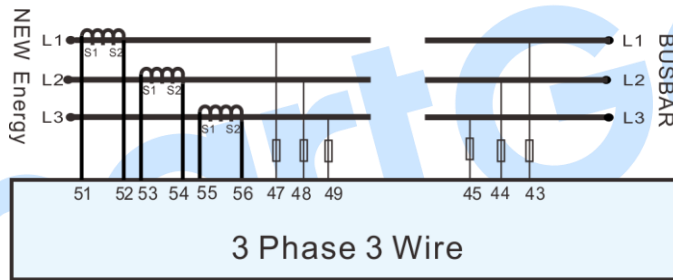If load power is small, the energy storage power station is charged.
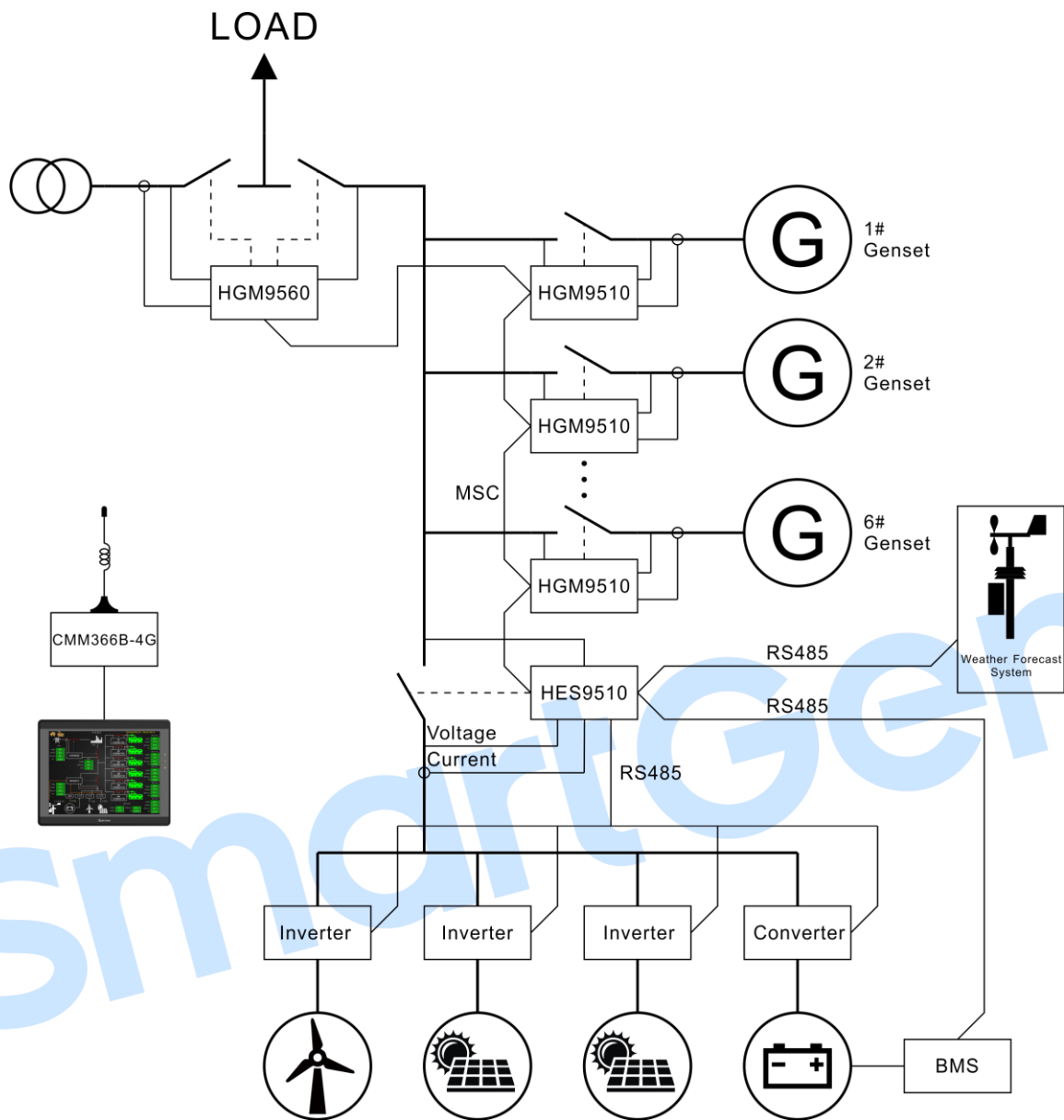
Fig. 7 HES9510, HGM9510 and HGM9560 Typical Application Diagram
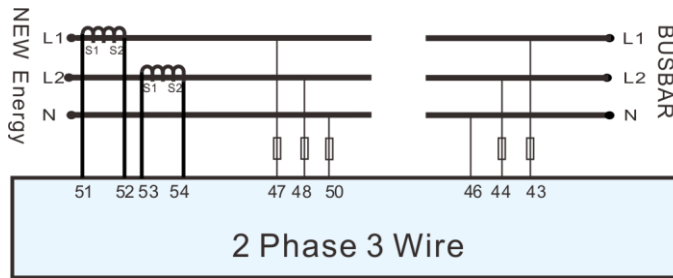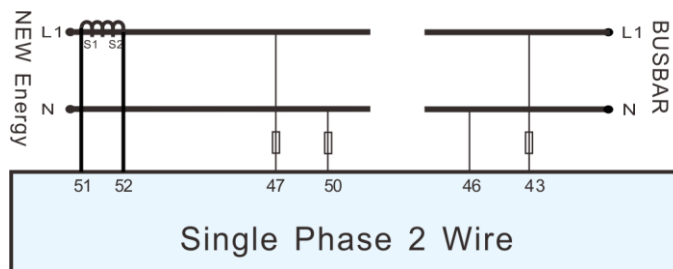
Fig.8 HES9510 Typical Application Diagram

⚠️**NOTE:** Fuse F1：min. 2A; max. 20A; Fuse F2：max. 32A; Users should select the suitable fuse depending on practical application.

Fig. 9 3-Phase 3-Wire Typical Application Diagram

Fig. 10 2-Phase 3-Wire Typical Application Diagram

Fig. 11 Single Phase 2-Wire Typical Application Diagram

14   APPLICATION SCENE DIAGRAMS

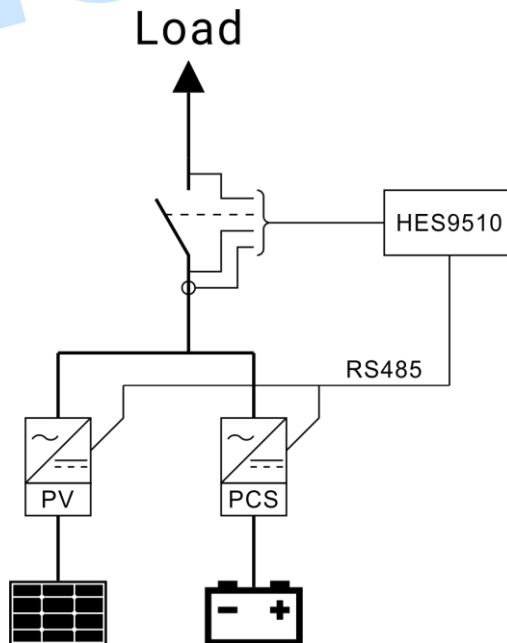**Grid-tied application (without genset)**: parallel application of mains, PV and stored energy.
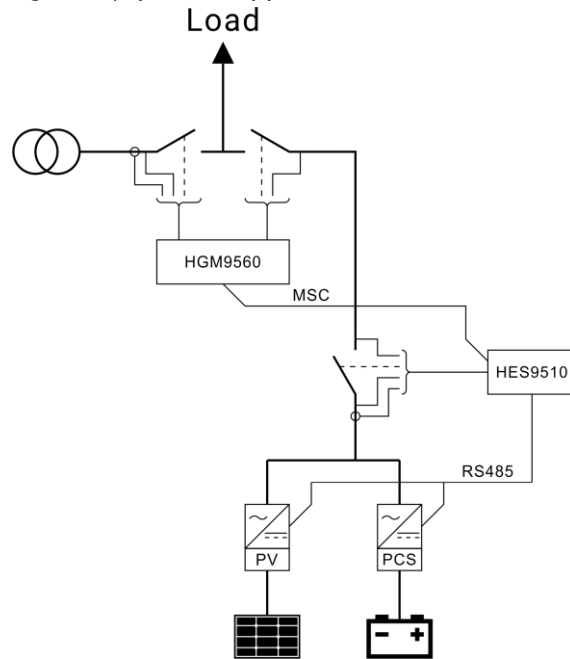
Fig.12 Grid-tied Application (without genset) Diagram

Grid-tied application (single unit): parallel application of mains, PV, stored energy.
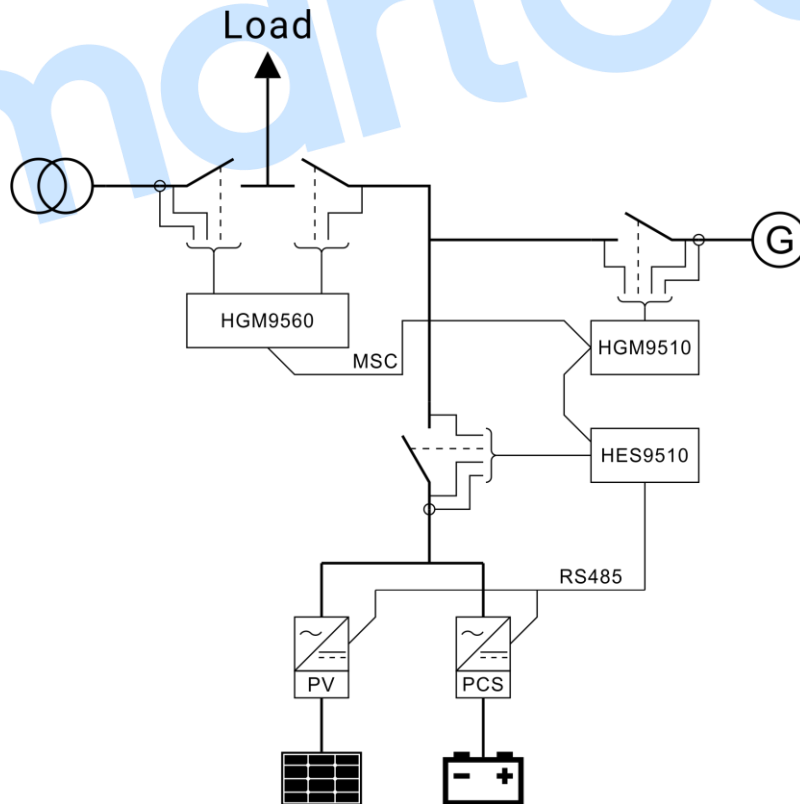
Fig.13 Grid-tied Application (single unit) Application

Grid-tied Application (multiple units): parallel application of mains, PV, stored energy and multiple units.
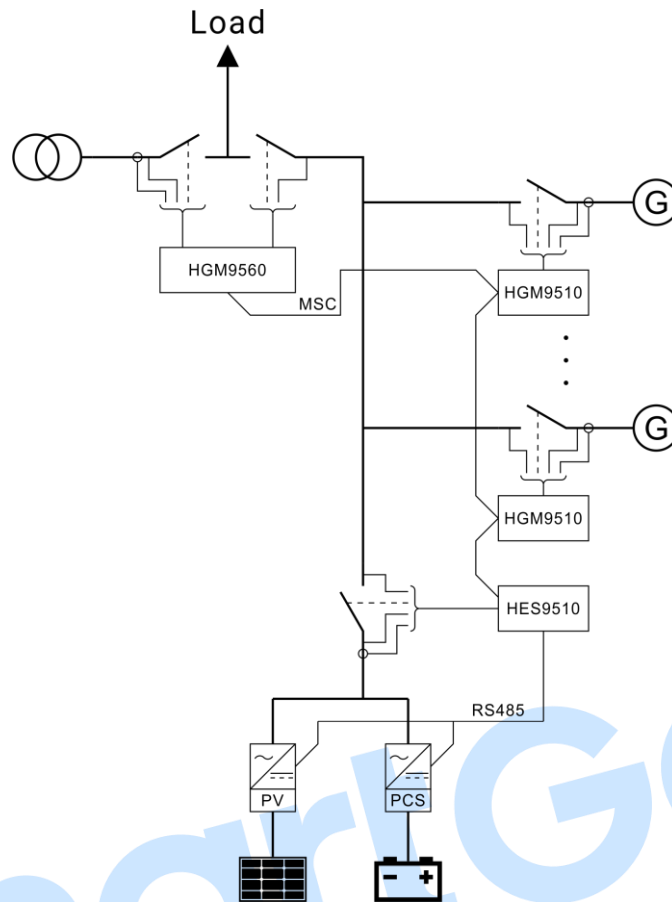
Fig.14 Grid-tied Application (multiple units) Diagram

Off-grid application (without genset): parallel application of PV and stored energy.

Fig.15 Off-grid Application (without genset) Diagram

Off-grid application (single unit): parallel application of single unit, PV and stored energy.
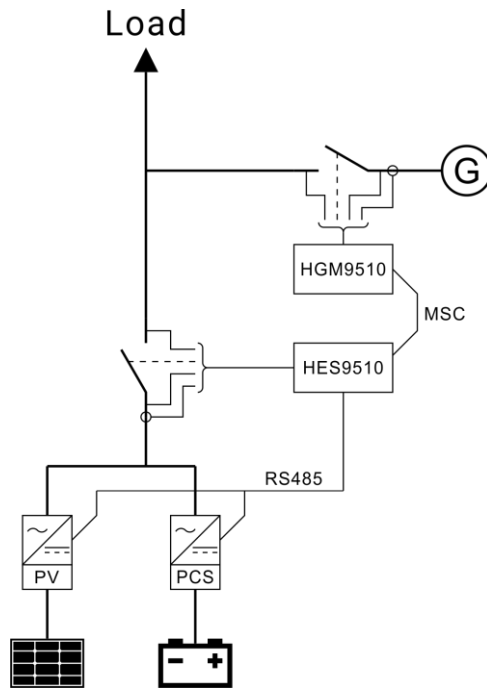

Fig.16 Off-grid application (single unit) Diagram

Off-grid application (multiple units): parallel application of multiple units, PV and stored energy.
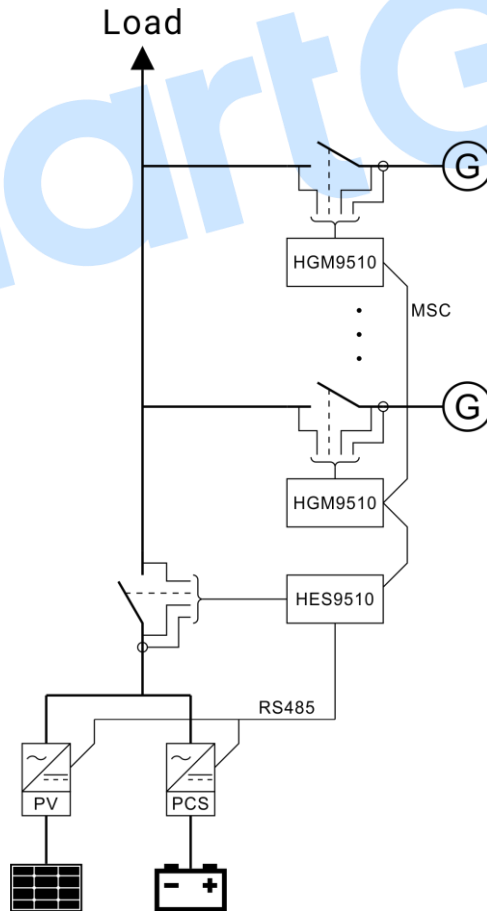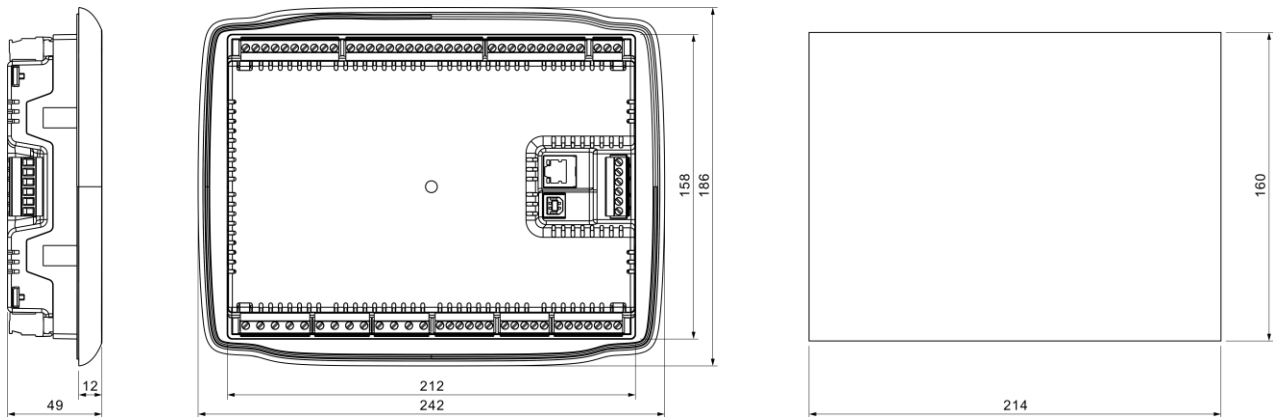

Fig.17 Off-grid Application (multiple units) Diagram

15 INSTALLATION

The controller is panel built-in design; it is fixed by clips when installed.

Fig. 12 Dimension and Cutout Size (Unit: mm)

1) Battery Voltage Input

⚠**NOTE:** HES9510 controller can suit for wide range of battery voltage (8~35) VDC. The wire area connecting controller power B+/B- with negative and positive electrodes must be over 2.5mm². If floating charge is configured, please firstly connect output wires of charger to battery's positive and negative directly, and then connect wires from battery's positive and negative to controller's positive and neg202ative input ports separately in order to prevent the charge from disturbing the controller's normal working.

2) Output And Expand Relays

⚠**CAUTION:** If the expansion relay is needed, freewheel diode (relay coils is DC) and resistor and capacitor circuit (AC) shall be added to the two ends of the relay coils in order to prevent disturbing the controller or others equipments.

3) Alternate Current Input

Controller current input must be connected to outside current transformer. The secondary side current of the current transformer must be 5A and at the same time current transformer phase and input voltage phase must be correct, otherwise the collected current and active power are maybe not correct.

⚠**NOTE**: ICOM port must be connected to negative pole of battery.

☠ **WARNING!** When there is load current, transformer's secondary side is prohibited open circuit.

4) Withstand Voltage Test

⚠**CAUTION!** When controller had been installed in control panel, if need the high voltage test, please disconnect controller's all terminal connections, in order to prevent high voltage into controller and damage it.

16 FAULT FINDING

Table 21 Fault Finding

Symptoms	Possible Solutions
Power on but no response for the controller	Check starting batteries; Check controller connection wirings; Check DC fuse.
Start Failure	Check whether the "wait for start time" is enough; Check if the inverter has alarm; Check if alternate current is connected to inverter;
Switch Fault	Check close feedback wiring is correct or not; Check whether the switch closing/opening signals are continuous; Check whether switch acts or not;
Shutdown alarm in running	Check related switch and its connections according to the information on LCD; Check digital inputs.
RS485 communication is abnormal	Check connections; Check settings of COM port is correct or not; Check RS485's A and B connections is reversely connected or not; Check RS485 transfer model is damaged or not; Check communication port of PC is damaged or not.

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