SmartGen

MAKING CONTROL SMARTER

HAT820

(HAT820/HAT820S)

DUAL POWER ATS 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

SmartGenEnglish trademark

SmartGen — make your generator *smart*

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Table 1 Software Version

Date	Version	Note
2019-05-25	1.0	Original release.
2020-05-20	1.1	1.Added level-by-level switching function of output ports; 2.Added PT secondary circuit wire breaking alarm function description; 3.Made detailed description for AC supply, RS485 function, Auto Trans/Restore, Load end live check contents.
2021-04-06	1.2	1. Modified the front panel pictures in the manual; 2. Modified the parameters of "Digital Input Setting"; 3. Upgraded translation.
2022-07-27	1.3	1. Updated the format of the manual; updated the Logo of SmartGen; updated the figure of overall & cutout dimensions and clips installation. 2. Added the function illustration of parallel mode setting; 3. Added the function illustration of "Auto Restore Waiting Time" and "Auto Restore Duration Permission"; 4. Added the function illustration of "Local Mode", "Non-parallel", "Manual Auto Mode", "Manual Parallel", "Auto Parallel" for input port; 5. Added the function illustration of "Electrical Interlock Remove", "Load-off Output", "Local Mode", " QS1 QS2 Parallel Alarm".

CONTENT

1 OVERVIEW

HAT820 series dual power ATS controller is an intelligent dual-power switchover module with configurable function, automatic measurement, LCD display, and digital communication. It combines digitization, intelligence and networking together. Measurement and control process can be conducted automatically, which reduces artificial operating mistakes, so that it is the ideal option for dual-power switchover products.

HAT820 series dual power ATS controller is composed by the powerful microprocessor in the core, which can precisely measure the voltages (2-way 3-phase) and make accurate decision for abnormal voltages (overvoltage, undervoltage, overfrequency, underfrequency, phase loss, reverse phase sequence), and putout power-off control digital signal. It has compact structure, advanced circuits, simple wiring and high reliability, and can be widely used in electrical automatic control system of electric power, telecommunications, petroleum, coal, metallurgy, railways, municipal administration, intelligent building and etc.

2 NAMING CONVENTION AND MODEL COMPARISON

2.1 NAMING CONVENTION
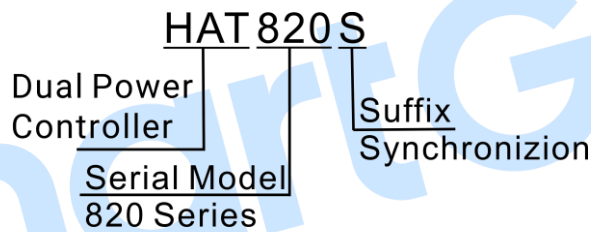
Fig. 1 Naming Convention Diagram

2.2 MODEL COMPARISON

Table 2 Model Number

Function							
Model No.	DC Supply	AC Supply	AC Current & Power	Synchronizing Close	Input No. (Fixed+Aux.)	Output No. (Aux.)	RS485
HAT820	●	● (90~576)V	●		11	12	●
HAT820S	●	● (90~576)V	●	●	11	12	●

3　PERFORMANCE AND CHARACTERISTICS

——System type can be set as Mains-Power Generation, Power Generation-Mains, Mains-Mains, Power Generation-Power Generation;

——4.3-inch large LCD Display of single color, 240x128 pixel with white backlight, multiple language display (Simplified Chinese, English, and Other), default language for Other is Traditional Chinese, and touch-button operation;

——Collect and display 2-way 3-phase voltages, frequency and phase sequence;

——Collect and display loading active power, reactive power, apparent power, power factor and current;

——Independent over current warning and trip alarm functions for S1 and S2;

——NEL trip function;

——Display of accumulated active power, accumulated reactive power, accumulated close times, accumulated automatic transfer times, and mains outage transfer times for S1 and S2;

——Display of continuous power supply time, accumulated power supply time for S1 and S2, accumulated automatic transfer running time;

——For energy-accumulated switch, it has function of breaker close when switch PF (close is well prepared) signal is active;

——Functions of over voltage, under voltage, over frequency, under frequency, over current, loss of phase, and inverse phase sequence;

——Auto/Manual status switchover is set, and breaker close/open can be controlled manually in manual mode;

——With local mode, when it is active, the controller only displays data parameters and the switch needs to be transferred by external operation;

——With electrical interlock remove function, it is used to remove the electrical interlock when switch parallel transferring (only for HAT820S);

——All parameters can be configured on site, and it applies password verification, which can prevent non-professional mistake operation;

——Commissioning can be done on site manually to do start/stop operation of genset;

——Function of breaker re-close function;

——Close output can be pulse or continuous output;

——2-way N wire isolated design;

——Real time clock display, event log function with recording cyclical 200 data;

——Scheduled detecting start/scheduled not start function for genset; it can be set to run for once, each month, or each week, and running with loading or not can also be set;

——It can control two gensets, realizing cyclical running, master running, and balanced time running;

——Wide range of DC power supply, which can bear max. 80V DC input transiently;

——AC power supply can be phase voltage (L, N), or wire voltage (L, L) with supply range: (90~576)V;

——Large space between AC input wire terminals, which can bear 625V voltage input;

——Loading end is live or not can be detected;

——2 ways of RS485 isolated communication ports are set, which has remote control, remote communication, remote measurement, and remote regulation functions by ModBus-RTU communication protocol; it can also remote control genset start, stop, breaker close and open functions;

——Suitable for multiple AC system types (3-phase 4-line, 3-phase 3-line, 1-phase 2-line, 2-phase

3-line methods);

——Modular structure design, flame retarding ABS shell, pluggable connecting terminal, and embedded installation method, with compact structure and convenient installation.

4 SPECIFICATION

Table 3 Performance Parameters

Items	Description	
Operating Voltage	1. DC8.0V~35.0V continuous power supply; 2. AC power supply, voltage range: AC(90~576)V;	
Power Consumption	<6W(Standby mode:≤2W)	
AC Voltage Input	AC system	
	3P4W (L-L)	(80~625)V
	3P3W (L-L)	(80~625)V
	1P2W (L-N)	(50~360)V
	2P3W (A-B)	(80~625)V
Rated Frequency	50/60Hz	
Programmable Output 1~6 Relay Capacity	16A 250V AC, volts free output;	
Programmable Output 7~12 Relay Capacity	8A AC250V AC, volts free output;	
Digital Input of S1/S2 Close	Ground connected is active (B-);	
Programmable Input Port 1~8	Ground connected is active (B-);	
Programmable Input Port 9	DC (9~36)V, voltage input;	
Communication Method	1. 2 ways of isolated RS485 interface, MODBUS Protocol; 2. D-type USB port;	
Case Dimensions	260mmx180mmx54mm	
Panel Cutout	242mmx161mm	
Working Temperature	(-25~+70)°C	
Working Humidity	(20~93)%RH	
Storage Temperature	(-30~+80)°C	
Protection Level	IP65: when waterproof gasket is inserted between the controller and the panel;	
Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal, and the leakage current shall be not more than 3mA within 1min;	
Weight	1.2kg	

5   MEASURE AND DISPLAY DATA

Table 4 Display Parameters

| No.	Measuring & Display Data Items
1	S1/S2 Power Phase Voltage
2	S1/S2 Power Line Voltage
3	S1/S2 Power Voltage Phase
4	S1/S2 Power Frequency
5	Load 3-phase Current
6	Load 3-phase Active Power kW
7	Load Total Active Power kW
8	Load 3-phase Reactive Power kvar
9	Load Total Reactive Power kvar
10	Load 3-phase Apparent Power kVA
11	Load Total Apparent Power kVA
12	Load 3-phase Power Factor PF
13	Load Average Power Factor PF
14	Continuous Power Supply Time (Current)
15	Continuous Power Supply Time (Last Time)
16	S1 Accumulated Power Supply Time
17	S2 Accumulated Power Supply Time
18	Accumulated Automatic Transfer Running Time
19	S1 Accumulated Active Power kWh
20	S2 Accumulated Active Power kWh
21	S1 Accumulated Reactive Power kvarh
22	S2 Accumulated Reactive Power kvarh
23	QS1 Total Close Times
24	QS2 Total Close Times
25	Accumulated Automatic Transfer Times
26	Mains Outage Transfer Times
27	Switch Input/Output Terminal Status
28	Real Time Clock
29	Event Log
30	Black Box Log
31	Alarm Information
32	Communication Status
33	Synchronization Information (HAT820S)

6 OPERATION
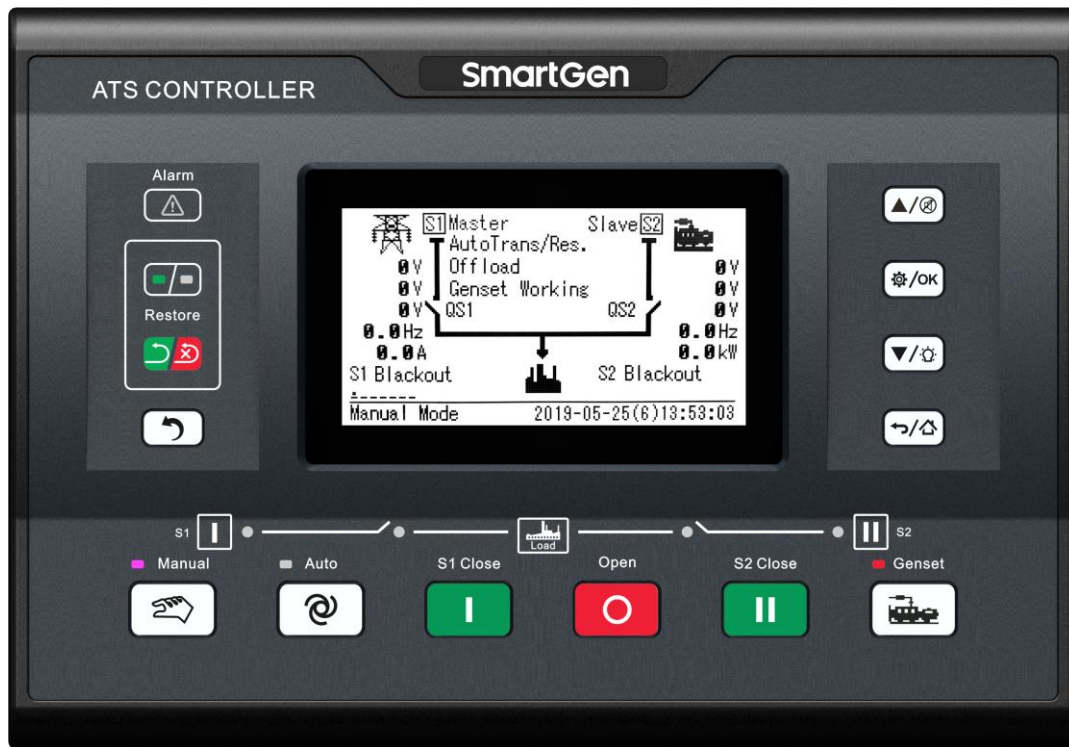
Fig. 2 Panel Indication Drawing

6.1 INDICATORS

Table 5 Indicators Description

Indicator Name	Description
Alarm Indicator	Slow flash (once per second) for warnings, fast flash (5 times per second) for faults;
Auto Trans./ Auto. Restore	Light on when it is Auto Trans./Auto Restore;
Auto Trans./ Non Restore	Light off when it is Auto Trans./Non Restore;
S1 Power Indicator	S1 power is normal, it is always bright; When abnormal, it flashes; When S1 power is shutdown, it is dark;
S1 Close Status Indicator	Light on when QS1 aux. contactor is active; light off when inactive; flashes when it is transferring to current status;
S2 Close Status Indicator	Light on when QS2 aux. contactor is active; light off when inactive; flashes when it is transferring to current status;
S2 Power Indicator	S2 power is normal, it is always bright; When abnormal, it flashes; When S2 power is shutdown, it is dark;
Manual Mode Indicator	When current mode is Manual, it is illuminated;
Auto Mode Indicator	When current mode is Auto, it is illuminated;
Genset Indicator	Light on when controller has issued engine start signal;

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6.2 KEY FUNCTION DESCRIPTION

Table 6 Button Function Description

Icon	Key Name	Function Description
✍	Manual	Switch to manual mode;
⊚	Auto	Switch to auto mode;
I	S1 Close	It is active in manual mode; Press it and QS1 closes, and S1 supplies loading;
O	Open	It is active in manual mode; Press it and loading is disconnected;
II	S2 Close	It is active in manual mode; Press it and QS2 closes, and S2 supplies loading;
🚂	Commissioning	Press and enter manual genset start/stop operation interface directly;
↩❌	Restore	Switchover between Auto Trans./Auto Res. and Auto Trans./Non Res.
↰	Alarm Reset	Clear up fault alarms by pressing it;
↩/⌂	Return/Home	It is return key and can return to upper menu when parameters are set; Return to first page of main menu when it is in main menu; Return to first page of main menu in other screens;
⚙/OK	Set/Confirm	Enter menu screen when it is in main screen by pressing it; After entering menu screen, move cursor and confirm set information;
▲/⊘	Up/Alarm Mute	Scroll up the screen by pressing it in main screen; After entering menu screen, move cursor and increase values for it by pressing it; It is alarm mute by pressing it longer, which can close alarm sound.
▼/☼	Down/Lamp Test	Scroll down the screen by pressing it in main screen; After entering menu screen, move cursor and decrease values for it by pressing it; It is lamp test by pressing it longer in main screen; LCD backlight is illuminated, LCD displays dark, and all indicators are illuminated when lamp test is done;

7 LCD DISPLAY

7.1 MAIN SCREEN

Table 7 Screen Display

Items	Display Contents
Home	S1 power status; S2 power status, genset start status, switch status; Power supply system map, QS1 is side switch of S1 power; QS2 is side switch of S2 power; S1/S2 voltage/frequency; S1/S2 master settings; Auto Trans./Auto Res. status; Load related parameters;
S1 Power S2 Power	S1 wire voltage, phase voltage, phase angle, frequency; S2 wire voltage, phase voltage, phase angle, frequency;
Load	Load 3-phase current A(I1, I2, I3); Load 3-phase active power kW (P1, P2, P3); Load 3-phase reactive power kvar (Q1, Q2, Q3); Load 3-phase apparent power kVA (S1, S2, S3); Load total active power kW (sum of P1, P2, P3); Load total reactive power kvar (sum of Q1, Q2, Q3); Load total apparent power kVA (sum of S1, S2, S3); Load 3-phase power factor PF (PF1, PF2, PF3); Load average power factor PF (average of PF1, PF2, PF3); S1 accumulated active power; S2 accumulated active power; S1 accumulated reactive power; S2 accumulated reactive power; S1 accumulated running time; S2 accumulated running time;
Time	Continuous power supply time (current); Continuous power supply time (last); Accumulated automatic transfer running time;
QF Switch	QS1 accumulated close times; QS2 accumulated close times; Accumulated automatic transfer times; Mains outage transfer times;
I/O Digital Switch	Programmable digital input status and switch auxiliary status; Programmable digital output status;
Communication	RS485-1 communication status and baud rate; RS485-2 communication status and baud rate; USB communication status;
Alarms	Present alarm information (including warning and fault alarms);

Items	Display Contents
⚠	
Synchronization 〔↻〕	Voltage difference; Frequency difference; Phase difference; Only displayed on HAT820S;
Status Row	Alarm status/working status; Real time clock; Status row is displayed in the last row of every page in main screen.

7.2 STATUS DESCRIPTION

Table 8 S1 Voltage Status

No.	Status Name	Description
1	S1 Available	S1 Normal Delay;
2	S1 Unavailable	S1 Abnormal Delay;
3	S1 Available	Power supply voltage is within the setting range;
4	S1 Blackout	Voltage is 0;
5	S1 Over Volt	Voltage is higher than the set upper limit value;
6	S1 Under Volt	Voltage has fallen below the set low limit value;
7	S1 Over Freq	Frequency is higher than the set upper limit value;
8	S1 Under Freq	Frequency has fallen below the set low limit value;
9	S1 Loss of Phase	Loss of one or two phases of A, B and C;
10	S1 Phase Sequence Wrong	A-B-C phase sequence is wrong.

Table 9 S2 Voltage Status

No.	Status Name	Description
1	S2 Available	S2 Normal Delay;
2	S2 Unavailable	S2 Abnormal Delay;
3	S2 Available	Power supply voltage is within the setting range;
4	S2 Blackout	Voltage is 0;
5	S2 Over Volt	Voltage is higher than the set upper limit value;
6	S2 Under Volt	Voltage has fallen below the set low limit value;
7	S2 Over Freq	Frequency is higher than the set upper limit value;
8	S2 Under Freq	Frequency has fallen below the set low limit value;
9	S2 Loss of Phase	Loss of one or two phases of A, B and C;
10	S2 Phase Seq Wrong	A-B-C phase sequence is wrong.

Table 10 Genset Status

No.	Status Name	Description
1	Genset Start Delay	The delay time before genset starts;
2	Genset Stop Delay	The delay time before genset stops;
3	Schedule Not Work	When it is active, the lasting time of scheduled not-working displays;
4	Schedule Work	When it is active, the lasting time of scheduled working displays;
5	Gen1 Cycle Run	When it is active, countdown of S1 circular start running begins;
6	Gen2 Cycle Run	When it is active, countdown of S2 circular start running begins;
7	S1 Genset Working	It is active if there are only two generators in the system and S1 is generating;
8	S2 Genset Working	It is active if there are only two generators in the system and S1 is generating;
9	Genset Working	Genset start signal outputs;
10	Genset Standby	There is not genset start signal outputting.

Table 11 Switch Status

No.	Status Name	Description
1	Ready to Transfer	Switch transfer begins;
2	QS1 Closing	QS1 closing delay is in progress;
3	QS1 Opening	QS1 opening delay is in progress;
4	QS2 Closing	QS2 closing delay is in progress;
5	QS2 Opening	QS2 opening delay is in progress;
6	Transfer Rest	Interval time between switch transfers;
7	Closing QS1 Again	It is the second closing time when the first QS1 opening is not successful, with the condition that the second closing delay setting is not 0;
8	Opening QS1 Again	It is the second opening time when the first QS1 closing is not successful, with the condition that the second opening delay setting is not 0;
9	Closing QS2 Again	It is the second closing time when the first QS2 opening is not successful, with the condition that the second closing delay setting is not 0;
10	Closing QS2 Again	It is the second opening time when the first QS2 closing is not successful, with the condition that the second opening delay setting is not 0;
11	Waiting QS1 PF	QS1 is waiting for input setting and gets ready for PF is active before QS1 closes;
12	Waiting QS2 PF	QS1 is waiting for input setting and gets ready for PF is active before QS1 closes;
13	Elevator Delay	Delay time before switch transfer, elevator control outputs;
14	S1 On Load	QS1 was already closed and S1 is taking load1;
15	S2 On Load	QS2 was already closed and S2 is taking load2;
16	Offload	Switch was already opened and load is disconnected.

When controller detects warning alarm, warning alarm is active; alarm indicator shall flash slowly (once per second); When warning is removed, alarm indicator shall be extinguished, that is, warning alarm is unlatched.

Table 12 Warning Alarms

No.	Status Name	Description
1	S1 Over Current Warn	Action is set to warning; current is over pre-set limit when S1 is taking load;
2	S2 Over Current Warn	Action is set to warning; current is over pre-set limit when S2 is taking load;
3	Forced Open Warn	It alarms when the forced open (Non-firefighting cutoff input) action is warning, and the forced open input is active;
4	Battery Under Volt	Battery voltage is lower than the set limit value and it alarms for delaying 60s;
5	Battery Over Volt	Battery voltage is higher than the set limit value and it alarms for delaying 60s;
6	Temp. Sensor Open	It alarms when temp. sensor is open circuit.
7	S1 PT wire broken	It alarms when PT secondary circuit is broken;
8	S2 PT wire broken	It alarms when PT secondary circuit is broken;

Fault alarms are active when controller detects the alarm signals. Alarm indicator will flash rapidly (5 times per second) and the alarm will last until it is removed manually. Fault alarms are latched.

Table 13 Fault Alarms

No.	Status Name	Description
1	QS1 Failed to Close	QS1 fails to close when it closes;
2	QS1 Failed to Open	QS1 fails to open when it opens;
3	QS2 Failed to Close	QS2 fails to close when it closes;
4	QS2 Failed to Open	QS2 fails to open when it opens;
5	S1 Over Current Trip	Action is set to trip; current is over preset limit when S1 is taking load;
6	S2 Over Current Trip	Action is set to trip; current is over preset limit when S2 is taking load;
7	Forced Open Fault	It alarms when the forced open (Non-firefighting cutoff input) action is fault, and the forced open input is active;
8	S1 Genset Fault	It is active if there are only two generators in the system, S1 is generating and S1 cannot start normally;
9	S2 Genset Fault	It is active if there are only two generators in the system, S2 is generating and S2 cannot start normally;
10	S1 Breaker Trip Alarm	S1 breaker trip alarm input is active;
11	S2 Breaker Trip Alarm	S2 breaker trip alarm input is active;
12	Sync Fail Fault	Sync. failure action is set to fault, when it is over delay time, fault alarms;
13	S1 Load End Dead	Fault alarms when S1 closes but load end is dead;
14	S2 Load End Dead	Fault alarms when S1 closes but load end is dead;

The indication information will continuously display for 2s after it is active.

Table 14 Indication Information

No.	Status Name	Description
1	Please reset the alarm	Reminder information for switching to auto mode manually before alarm is removed when fault alarm occurs;
2	QS1 was already closed	The indication information for pressing QS1 close key when QS1 has been closed;
3	QS2 was already closed	The indication information for pressing QS2 close key when and QS2 has been closed;
4	It was already opened	The indication information for pressing open key when the breaker has been opened.
5	Panel Locked	Indication information for pressing panel buttons (Man, Auto, S1 Close, S2 Close, Open, Commissioning) when Panel Locked is active;

Table 15 Other Status Information

No.	Status Name	Description
1	Start Inhibit	It displays when the genset start inhibition input is active;
2	S1 Close Inhibit	It displays when S1 close inhibition input is active;
3	S2 Close Inhibit	It displays when S2 close inhibition input is active;
4	NEL 1 Trip	It displays when NEL 1 unload outputs;
5	NEL 2 Trip	It displays when NEL 2 unload outputs;
6	NEL 3 Trip	It displays when NEL 3 unload outputs;
7	Remote Gen On Load	It displays when the remote start with load input is active;
8	Remote Gen Off Load	It displays when the remote start without load input is active;
9	Gen Start Mains NG	It displays when genset is starting and Mains is abnormal;
10	Cycle Gen Start Mode	It is active when S1 is generating and S2 is generating;
11	Balance Gen Hours Mode	It is active when S1 is generating and S2 is generating;
12	Gen Start Master	It is active when S1 is generating and S2 is generating;
13	Auto Mode	It displays when current mode is Auto mode;
14	Manual Mode	It displays when current mode is Manual mode.

7.3 MAIN MENU

In main screen, press **Set/Confirm** key and enter main menu interface.

1. Configuration **2. Data Calibration** **3. Historical Records** **4. Black Box Records** **5. Auto Trans./Restore** **6. Language** **7. About**	Press **Up/Down** key to choose different parameter line (current line is highlighted with black) and then press **Confirm** key to enter the corresponding display screen.

⚠**NOTE1**：Password is needed to enter the parameter setting menu and the default password is 01234. Users can change the password in case that others change the controller configurations randomly. After changing please remember it carefully. If you forget it, please contact our company service personnel.

⚠**NOTE2**: Data calibration is used by factory to calibrate controllers; It can be entered by inputting factory password and users cannot access to it.

8 GENSET START/STOP OPERATION

8.1 MANUAL MODE START/STOP

8.1.1 START/STOP ON THE PANEL

In the main interface, press [icon] and it shall enter manual start operation screen directly when system type is "S1 Mains S2 Gen, S1 Gen S2 Mains, S1 Mains S2 Mains".

Manual Test Genset	
Return Genset Stop Genset Start	Press **Up/Down** key to choose different parameter line (current line is highlighted with black) and then press **Confirm** key to confirm.

Genset Stop: disconnect the outputted genset start signal and it can control the genset stop.

Genset Start: Control genset start signal output, that is, it can control the genset start.

When system type is "S1 Gen S2 Gen", manual Start/Stop menu screen is as follows:

Manual Test Genset	
Return S1 Genset Stop S1 Genset Start S2 Genset Stop S2 Genset Start	Press **Up/Down** key to choose different parameter line (current line is highlighted with black) and then press **Confirm** key to confirm.

S1 Genset Stop: disconnect the outputted S1 genset start signal, that is, control S1 genset stop.

S1 Genset Start: Control S1 genset start signal output, that is, it can control S1 genset start.

S2 Genset Stop: disconnect the outputted S2 genset start signal, that is, control S2 genset stop.

S2 Genset Start: Control S2 genset start signal output, that is, it can control S2 genset start.

8.1.2 REMOTE COMMUNICATION START/STOP CONTROL

Remote control Start/Stop orders can be sent by using MODBUS protocol and through RS485 interface.

Remote Communication Stop Control: disconnect the outputted genset start signal, that is, control the genset stop.

Remote Communication Start Control: Control genset start signal, that is , control the genset start.

8.2 AUTO MODE START/STOP

8.2.1 START CONDITIONS

8.2.1.1 INPUT PORT START

Set "Remote Gen On Load" and "Remote Gen Off Load" in the programmable input port setting, and it shall not be set at the same time.

Remote Gen On Load: genset start outputs, and when the generating is normal, close the generating breaker; when the output is inactive, disconnect the genset start output signal.

Remote Gen Off Load: genset start outputs, and when the mains is normal, close the mains breaker; when the mains is abnormal and the generating is normal, close the generating breaker; when the output is inactive, disconnect the genset start output signal.

8.2.1.2 GENSET START WITH MAINS ABNORMAL

When Mains is abnormal, genset start outputs; when the generating is normal, the generating breaker closes.

8.2.2 START/STOP OF TWO GENSETS

When system type is "S1 Gen S2 Gen", input port settings is as below:

Set "Remote Gen On Load" and "Remote Gen Off Load" in the programmable input port setting, and it shall not be set at the same time.

Remote Gen On Load: estimate S1 or S2 start output according to start ways, and when the generating is normal, generating breaker closes.

Remote Gen Off Load: estimate S1 or S2 start output according to starting ways, and after the genset starts, both S1 and S2 breakers shall not be closed.

Start ways for two gensets: Cycle Gens, master and slave Gens, balance Gens Hours, Not Used.

Cycle Gens

If remote start is active, S1 and S2 shall start the engine based on circular running time. For the first time users shall choose S1 or S2 according to the switchover priority, for example: if S1 is prior to S2, then S1 shall first start; then countdown works according to the set S1 circular running time, and meanwhile countdown for genset fault check starts; afterwards before the fault check countdown ends S1 generating is normal; after that make S1 work with loading; When S1 circular running countdown is over, S2 starts and countdown for S2 circular running starts; at the same time countdown for genset fault check begins and before the fault check countdown ends S2 generation is normal; afterwards make S2 works with loading; then S1 stops; In this way make it circularly working

until remote start is inactive.

If during the start process genset fault (fault check is overtime or input of genset fault is active), breaker-close failure, loading prohibition occurs, immediately stop the current working genset and start another genset.

During the circular running process, if it is switched over to Manual Mode it shall remain current status, and suspend the circular running timing.

Master and Slave Gens

When remote start is active, master genset starts. During the start process present genset fault (genset power supply delay is overtime or input of genset fault is active), breaker-close failure, loading inhibition occurs, immediately stop the current working genset and start another genset, otherwise current genset keeps on starting until remote start is inactive.

Balance Gens Hours

When remote start is active, the genset with shortest accumulated running time starts. During the starting process present genset fault (genset power supply delay is overtime or input of genset fault is active), breaker-close failure, loading inhibition occurs, immediately stop the current working genset and start another genset, otherwise current genset keeps on starting until remote start is inactive.

If it is demanded to do Start/Stop operation on two gensets, the following conditions are to be satisfied.

1) It shall be active under Auto Mode;
2) Set system type "S1 Gen S2 Gen";
3) It is needed to set "S1 Genset Start" and "S2 Genset Start" in the output port;
4) It is needed to set "S1 Genset Fault Input", "S2 Genset Fault Input" and "Remote Start On Load" or "Remote Start Off Load" in the input port;
5) It is needed to set "Gen-Gen Start Mode";
6) "Genset Available Time" shall be configured; if start mode is circular starting, it is also needed to set "S1 Cycle Work Time" and "S2 Cycle Work Time";

"S1 Genset Fault Input" and "S2 Genset Fault Input" in the input ports are optional settings. Genset fault can also be checked from "Genset Available Time", and it is needless to input genset fault status by input port.

If the starting mode of the two groups of gensets is set "Not Used", then genset starting signal shall not be outputted.

For example:

Table 16 Start Example Description

System Type	Starting Conditions	First Starting Result
S1 Gen S2 Gen	Input port is active (remote gens on load/remote gens off load)	S1 Genset Start is outputted.
	Priority level: S1 master	

8.2.3 SCHEDULE WORK

When schedule work function is enabled, users can set scheduled start time. When the scheduled time is up, the controller shall send out starting signal. When the lasting time for scheduled starting time is over then the starting signal is disconnected. Scheduled Genset Start can be with loading or without loading.

Schedule Work On Load: genset start outputs, and when the generating is normal, the generating breaker is closed;

Schedule Work Off load: genset start outputs, and when the mains is normal, the mains breaker is closed.

The circular time for scheduled start can be set by month, week and day.

Start by month: it can be set to start in any month and the start date and time can also be set.

Start by week: it can be set to start at the same time for several days in one week; for example: set start at 08:00 from Monday to Friday for lasting 10 hours every day.

Start by day: it can be set to start at the same time every day.

8.2.4 SCHEDULE NOT WORK

When scheduled non-start function is enabled, users can set scheduled non-start time. When the scheduled time is up, controller starting signal is disconnected. Before the scheduled non-start lasting time is over starting signal is prohibited.

Scheduled Non-start circular time can be set by month, week and day.

Scheduled Non-start by month: which month to not start and the non-start date and time can be set.

Scheduled Non-start by week: it can be set to not start at the same time for several days in one week; for example: set non-start at 19:00 from Monday to Friday for lasting 12 hours every day.

Scheduled Non-start by day: it can be set to not start at the same time everyday;

⚠**NOTE3**: Scheduled non-start operation is prior to scheduled start operation.

9   PARAMETER CONFIGURATION

9.1   ILLUSTRATION

In the first page of main screen, press ⚙/OK and enter menu screen, choose **Configuration** and press ⚙/OK again to confirm, then it enters password confirmation interface. Input the correct password, and it enters main screen of parameter setting. Input wrong password and it shall exit to main interface directly. **Factory default password is *01234*.** In parameter configuration interface, press ↩/⌂ and it shall exit and return to the upper interface.

9.2   PARAMETER CONFIGURATION TABLE

Table 17 Parameter Configuration Item Form

No.	Item	Range	Default	Description
AC Settings				
1	S1 Available Delay	(0-3600)s	10	The check time for S1 from abnormal to normal;
2	S1 Unavailable Delay	(0-3600)s	5	The check time for S1 from normal to abnormal;
3	S2 Available Delay	(0-3600)s	10	The check time for S2 from abnormal to normal;
4	S2 Unavailable Delay	(0-3600)s	5	The check time for S2 from normal to abnormal;
5	Master-Slave Set	(0~1)	0	0: S1 Master 1: S2 Master
6	System Type Set	(0~3)	0	0: S1 Mains S2 Gen 1: S1 Gen S2 Mains 2: S1 Mains S2 Mains 3: S1 Gen S2 Gen
7	AC System	(0-3)	0	0: 3-Phase 4-Wire 1: 3-Phase 3-Wire 2: 2-Phase 3-Wire 3: Single Phase 2-Wire
8	PT Fitted	(0~1)	0	0: Disable 1: Enable
9	PT Primary Voltage	(30~30000)V	100	Primary voltage of AC PT ratio;
10	PT Secondary Voltage	(30~1000)V	100	Secondary voltage of AC PT ratio;
11	Rated Voltage	(0-30000)V	220	Rated voltage of AC system;
12	Over Volt Set	(0~1)	1	0: Disable 1: Enable
13	Set Value	(0-200)%	120	Upper limit value of voltage; it is abnormal if the value has exceeded the set value.

No.	Item	Range	Default	Description
14	Return Value	(0-200)%	115	Upper limit return value of voltage; it is normal only when the value has fallen below the set value.
15	Under Volt Set	(0~1)	1	0: Disable 1: Enable
16	Set Value	(0-200)%	80	Lower limit value of voltage; it is abnormal if the value has fallen below the set value.
17	Return Value	(0-200)%	85	Lower limit return value of voltage; it is normal only when the value has exceeded the set value.
18	Rated Frequency	(10.0-75.0)Hz	50.0	Rated frequency of AC system
19	Over Frequency Set	(0-1)	1	0: Disable 1: Enable
20	Set Value	(0-200)%	110	Upper limit value of frequency; it is abnormal if the value has exceeded the set value.
21	Return Value	(0- 200)%	104	Upper limit return value of frequency; it is normal only when the value has fallen below the set value.
22	Under Frequency Set	(0-1)	1	0: Disable 1: Enable
23	Set Value	(0- 200)%	90	Lower limit value of frequency; it is abnormal if the value has fallen below the set value.
24	Return Value	(0- 200)%	96	Lower limit return value of frequency; it is normal only when the value has exceeded the set value.
25	Phase Sequence Wrong	(0-1)	1	0: Disable 1: Enable
26	Load Volt Enable	(0-1)	0	0: Disable 1: Enable
Switch Settings				
1	Definite C/O Time	(0~1)	0	0: Disable 1: Enable Disable: Detect output time according to close status when close/open pulse outputs; longest time is the set time; Enable: close/open pulse output time is the set close/open time;
2	Close Delay	(0.1~20.0)s	5.0	Outputted pulse time of close relay;
3	Open Delay	(0.1~20.0)s	5.0	Outputted pulse time of open relay;
4	Transfer Time	(0~9999)s	1	Delay time from S1 open to S2 close; or from S2 open to S1 close;

No.	Item	Range	Default	Description
5	Auto Trans/Restore	(0-1)	1	0: Auto Trans./Non Res. 1: Auto Trans./Res.
6	Auto Restore Waiting Time	(0~30000)min	0	
7	Auto Restore Start Time Permission (h)	(0~23)	0	
8	Auto Restore Start Time Permission (min)	(0~59)	0	
9	Auto Restore Stop Time Permission (h)	(0~23)	0	
10	Auto Restore Stop Time Permission (min)	(0~59)	0	
11	Again Close Time	(0-20.0)s	1.0	If the first switch open is not successful, then the second close starts and again close delay starts; when the delay is over, then the second open starts; if the open cannot be conducted, then open failure alarm signal shall be sent out;
12	Again Open Time	(0-20.0)s	1.0	If the first switch close is not successful, then the second open starts and again open delay starts; when the delay is over, then the second close starts; if the close cannot be conducted, then close failure alarm signal shall be sent out;
13	Switch Type	(0~2)	0	0: Two Breakings 1: One Breaking 2: None Breaking
14	Forced Open Action	(0-1)	0	0: Warn Alarm 1: Fault Alarm
15	Continually Close	(0~1)	0	0: Disable 1: Enable It needs to be enabled when close control is continuous signal and close/open time is inactive at this time;
16	Sync Enabled	(0~1)	0	0: Disable 1: Enable
17	Load SW Transfer Time	(0-9999) s	1	Delay waiting time for each load continuing to close;
18	Load SW Close Time	(0-20.0) s	5.0	Pulse time of close relay output for each load continuing to close; continuous output when it is 0;
19	Parallel Mode Setting	(0~3)	0	0: Non-parallel 1: Manual auto parallel

No.	Item	Range	Default	Description
				2: Auto parallel 3: Manual parallel
20	Volt Diff. Enabled	(0~1)	0	0: Disable 1: Enable
21	Volt Diff.	(0~50)V	5	Max. voltage difference when sync. is completed;
22	Freq Diff.	(0~0.50)Hz	0.20	Max. frequency difference when sync. is completed;
23	Phase Diff.	(0~20) °	5	Max. phase difference when sync. is completed;
24	Fail to Sync Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm It continues to wait for sync when sync fails until it closes after sync; For warning alarm, it is removed when sync is completed or exit from sync. For fault alarm, it needs to press alarm reset to remove alarm.
25	Transfer in Sync Fail	(0~1)	0	0: Disable 1: Enable After sync fails, close without sync shall be conducted and fail to sync alarm also isn't issued;
26	Fail to Sync Delay	(0~9999)s	120	Time for waiting for sync success; if it is over time, then sync fails;
27	Breaker Feedback Time	(0.1~1.0)s	0.6	At the time of sync transfer, sync close/open output delay starts; during this period if correct close status is detected, then stop close/open pulse output; if delay is over and close status is not detected, then close/open failure alarm shall be initiated;
28	ATS Power Type	(0~1)	1	0: DC Power Supply 1: AC Power Supply
29	ATS Power Low Point	(0~100)%	70	Min. AC power for switch; if it is lower than this value, then switch cannot be transferred;
30	ATS Power High Point	(0~200)%	200	Max. AC power for switch; if it is higher than this value, then switch cannot be transferred;
Genset Settings				
1	Genset Start Delay	(0~9999)s	1	When genset prepares to start, delay starts, and when the delay is over, genset starting signal is sent out;
2	Genset Stop Delay	(0~9999)s	5	When genset prepares to stop, delay

No.	Item	Range	Default	Description
				starts, and when the delay is over, genset starting signal is disconnected;
3	Gen-Gen Start Mode	(0~3)	0	0: Cycle Gens 1: Master-Slave Gens 2: Balance Gens Hours 3: Not Used
4	S1 Cycle Work Time	(0~9999)min	720	The running time of S1 at the mode of Cycle Gens;
5	S2 Cycle Work Time	(0~9999)min	720	The running time of S2 at the mode of Cycle Gens;
6	Genset Available Time	(0~9999)s	120	Time from issuing genset start signal to gen voltage is normal; if delay is over and gen voltage is still abnormal, then genset fault alarm is initiated;
7	Battery Volt Enable	(0~1)	0	0: Disable 1: Enable
8	Battery Low Volt Warn Enable	(0~1)	0	0: Disable 1: Enable
9	Battery Low Volt Warn	(0~100.0)V	10.0	It occurs when battery voltage is lower than the set value;
10	Battery Low Volt Return	(0~100.0)V	10.5	When battery voltage is higher than the set return value, warning is removed;
11	Battery Over Volt Warn Enable	(0~1)	0	0: Disable 1: Enable
12	Battery Over Volt Warn	(0~100.0)V	30.0	It occurs when the battery voltage is higher than the set value;
13	Battery Over Volt Return	(0~100.0)V	29.5	It shall be removed if the battery voltage is lower than the set value;
Scheduled Start/Stop Settings				
1	Schedule Gen Enable	(0~1)	0	0: Disable 1: Enable
2	Schedule Load	(0~1)	0	0: Off Load 1: Load
3	Schedule Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily
4	Schedule Monthly	(1~4095)	4095	Bit0: January Bit1: February Bit2: March Bit3: April Bit4: May Bit5: June Bit6: July Bit7: August

No.	Item	Range	Default	Description
				Bit8: September
				Bit9: October
				Bit10: November
				Bit11: December
5	Schedule Date	(1~31)	1	Date of genset start in every month;
6	Schedule Weekly	(1~127)	1	Bit0: Sunday Bit1: Monday Bit2: Tuesday Bit3: Wednesday Bit4: Thursday Bit5: Friday Bit6: Saturday
7	Schedule Hours	(0~23)h	0	Scheduled start time;
8	Schedule Minutes	(0~59)min	0	
9	Schedule Work Time	(0~30000)min	30	The lasting time for scheduled start running;
10	Gen Inhibit Work	(0~1)	0	0: Disable 1: Enable
11	Inhibit Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily
12	Inhibit Monthly	(1~4095)	4095	Bit0: January Bit1: February Bit2: March Bit3: April Bit4: May Bit5: June Bit6: July Bit7: August Bit8: September Bit9: October Bit10: November Bit11: December
13	Inhibit Date	(1~31)	1	Date of not start in every month;
14	Inhibit Weekly	(1~127)	1	Bit0: Sunday Bit1: Monday Bit2: Tuesday Bit3: Wednesday Bit4: Thursday Bit5: Friday Bit6: Saturday
15	Inhibit Hours	(0~23)	0	Time for scheduled non-start;
16	Inhibit Minutes	(0~59)	0	
17	Inhibit Rest Time	(0~30000)	30	The lasting time for scheduled non-start;
Load Settings				

No.	Item	Range	Default	Description
1	Current CT Enable	(0~1)	1	0: Disable 1: Enable
2	CT Primary/5	(5~6000)A	500	Primary Current of CT;
3	S1 Full Load Rating	(5~6000)A	500	Current of S1 full load;
4	S2 Full Load Rating	(5~6000)A	500	Current of S2 full load;
5	S1 Max kW Rating	(1~20000)kW	200	Max. active power of S1 full load;
6	S2 Max kW Rating	(1~20000)kW	200	Max. active power of S2 full load;
7	Over Current Enable	(0~1)	1	0: Disable 1: Enable
8	Over Current	(0~200)%	120	Limits for over current;
9	Over Current Protection	(0~1)	0	0: Warn 1: Trip
10	Over Current Type	(0~1)	0	0: Definite 1: Inverse Definite
11	Definite Delay Set (Value)	(0~3600)s	10	Over current delay value for definite time;
12	Inverse Delay Set (Multiplier)	(1~36)	36	Over current delay multiplier for inverse definite;
13	Elevator Enable	(0~1)	0	0: Disable 1: Enable
14	Elevator Delay	(0~300)s	300	Delay time for load power off or before switch transfer; used to control the running elevator stop at the nearest level until switch transfer is finished;
15	NEL Enable	(0~1)	0	0: Disable 1: Enable
16	NEL Over Power Val 1	(0~200)%	90	When load power is over the set value, unload control outputs after delay;
17	NEL Over Power Delay 1	(0~3600)s	5	
18	NEL Over Power Val 2	(0~200)%	100	When load power is over the set value, unload control outputs after delay;
19	NEL Over Power Delay 2	(0~3600)s	1	
20	NEL Return Enable	(0~1)	0	0: Disable 1: Enable
21	NEL Return Value	(0~200)%	50	When load power is lower than the set value, unload control is disconnected after delay;
22	NEL Return Delay	(0~3600)s	5	
23	NEL Nums	(1~3)	3	NEL numbers;
24	Mains Load NEL Enable	(0~1)	0	0: Disable 1: Enable
Digital Input Settings				
1	Digital Input 1	(0~35)	1	Forced Open

No.	Item	Range	Default	Description
2	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
3	Digital Input 2	(0~35)	0	S1 switch trip input
4	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
5	Digital Input 3	(0~35)	8	S2 switch trip input
6	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
7	Digital Input 4	(0~35)	9	Not Used
8	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
9	Digital Input 5	(0~35)	0	Not Used
10	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
11	Digital Input 6	(0~35)	0	Not Used
12	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
13	Digital Input 7	(0~35)	0	Not Used
14	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
15	Digital Input 8	(0~35)	0	Not Used
16	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
17	Digital Input 9	(0~35)	0	Not Used
18	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
Digital Output Settings				
1	Digital Output 1 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
2	Digital Output 1	(0~92)	34	QS1 switch close control
3	Digital Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
4	Digital Output 2	(0~92)	35	QS1 switch open control
5	Digital Output 3 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
6	Digital Output 3	(0~92)	36	QS2 switch close control
7	Digital Output 4 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
8	Digital Output 4	(0~92)	37	QS2 switch open control
9	Digital Output 5 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
10	Digital Output 5	(0~92)	49	ATS Power L1
11	Digital Output 6 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate

No.	Item	Range	Default	Description
12	Digital Output 6	(0~92)	52	ATS Power N
13	Digital Output 7 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
14	Digital Output 7	(0~92)	0	Not Used
15	Digital Output 8 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
16	Digital Output 8	(0~92)	0	Not Used
17	Digital Output 9 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
18	Digital Output 9	(0~92)	0	Not Used
19	Digital Output 10 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
20	Digital Output 10	(0~92)	0	Not Used
21	Digital Output 11 Active Type	(0~1)	1	0: Close to activate; 1: Open to activate
22	Digital Output 11	(0~92)	32	Genset Start
23	Digital Output 12 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
24	Digital Output 12	(0~92)	0	Not Used
25	Combined 1 Or Output 1Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
26	Combined 1 Or Output 1 Contents	(0~92)	23	S1 voltage is normal;
27	Combined 1 Or Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
28	Combined 1 Or Output 2 Contents	(0~92)	25	S2 voltage is normal;
29	Combined 1 Or Output Active Type	(0~1)	1	0: Close to activate; 1: Open to activate
30	Combined 1 Or Output Contents	(0~92)	0	Not Used
31	Combined 2 or Output 1 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
32	Combined 2 or Output 1 Contents	(0~92)	0	Not Used
33	Combined 2 or Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
34	Combined 2 or Output 2 Contents	(0~92)	0	Not Used
35	Combined 2 or Output Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
36	Combined 2 or Output Contents	(0~92)	0	Not Used
37	Combined 3 or	(0~1)	0	0: Close to activate;

No.	Item	Range	Default	Description
	Output 1 Active Type			1: Open to activate
38	Combined 3 or Output 1 Contents	(0~92)	0	Not Used
39	Combined 3 or Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
40	Combined 3 or Output 2 Contents	(0~92)	0	Not Used
41	Combined 3 or Output Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
42	Combined 3 or Output Contents	(0~92)	0	Not Used
43	Combined 4 or Output 1 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
44	Combined 4 or Output 1 Contents	(0~92)	0	Not Used
45	Combined 4 or Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
46	Combined 4 or Output 2 Contents	(0~92)	0	Not Used
47	Combined 4 or Output Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
48	Combined 4 or Output Contents	(0~92)	0	Not Used
49	Combined 5 or Output 1 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
50	Combined 5 or Output 1 Contents	(0~92)	0	Not Used
51	Combined 5 or Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
52	Combined 5 or Output 2 Contents	(0~92)	0	Not Used
53	Combined 5 or Output Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
54	Combined 5 or Output Contents	(0~92)	0	Not Used
55	Combined 6 or Output 1 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
56	Combined 6 or Output 1 Contents	(0~92)	0	Not Used
57	Combined 6 or Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
58	Combined 6 or Output 2 Contents	(0~92)	0	Not Used
59	Combined 6 or	(0~1)	0	0: Close to activate;

No.	Item	Range	Default	Description
	Output Active Type			1: Open to activate
60	Combined 6 or Output Contents	(0~92)	0	Not Used
Module Settings				
1	Power On Mode	(0~2)	0	0: Last Mode (reserved the mode before power off) 1: Manual 2: Auto
2	Language	(0~1	0	0: Simplified Chinese 1: English
3	Password	(00000~65534)	01234	For entering parameter setting
4	Module Address	(1~254)	1	RS485 communication address
5	RS485-1 Baud Rate	(0~3)	2	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps
6	RS485-1 Stop Bit	(1~2)	2	1/2 bit can be set;
7	RS485-1 Parity	(0~2)	0	0: None 1: Odd Parity 2: Even Parity
8	RS485-2 Baud Rate	(0~3)	2	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps
9	RS485-2 Stop Bit	(1~2)	2	1/2 bit can be set;
10	RS485-2 Parity	(0~2)	0	0: None 1: Odd Parity 2: Even Parity
11	RS485-1 COM Set	(0~3)	0	0: Enable COM Adj/Ctrl 1: Disable COM Control 2: Disable COM Adjust 3: DisableCOM Adj/Ctrl
12	RS485-2 COM Set	(0~3)	0	0: Enable COM Adj/Ctrl 1: Disable COM Control 2: Disable COM Adjust 3: DisableCOM Adj/Ctrl
13	Date/Time Setting			
14	Controller Information 1	(0-20) characters		Information displayed in ABOUT page; Users can input any character (letter is 1 character; while Chinese character is 2 characters), and it needs to set on PC by software;
15	Controller Information 2	(0-20) characters		
Sensor Settings				
1	Fan Control Enable	(0~1)	0	0: Disable

No.	Item	Range	Default	Description
				1: Enable
2	Fan Control Value	(0~300)℃	50	
3	Fan Control Return	(0~300)℃	40	
4	Fan Control Delay	(0~3600) s	60	
5	Sensor Curve Type	(0~2)	1	Fixed range 0: Not Used 1: Default Curve 2: User defined (default curve: Temp. is PT100);

9.3 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

9.3.1 INPUT PORT FUNCTION

Table 18 Input Port Function Description

No.	Item	Description
0	Not Used	Invalid
1	Forced Open	It (Non-firefighting cutoff input) is only suitable for switches with breaker control; when it is active, switches shall changeover to 0 no matter in manual mode or in auto mode.
2	Remote Start on Load	Genset start outputs, and when the mains is normal, close the generating breaker.
3	Remote Start off Load	Genset start outputs, and when the mains is normal, close the mains breaker.
4	Lamp Test	LED indicators are all light; LED backlight is light; LED is all dark.
5	S1 Genset Fault Input	Prohibit S1 genset start when S1 genset has fault (used in circular starting).
6	S2 Genset Fault Input	Prohibit S2 genset start when S2 genset has fault (used in circular starting).
7	Start Inhibit Input	Prohibit genset start signal output; In auto mode, disconnect start signal output when stop delay is over; In manual mode, start is inactive after genset stop when it is stopped manually if it has started;
8	S1 Trip Input	Breaker trip fault input.
9	S2 Trip Input	Breaker trip fault input.
10	S1 Close Inhibit	S1 close and takes load are prohibited; In manual mode, manual close is prohibited; if it is closed, then it needs to open manually; In auto mode, if it is closed then load is disconnected and S2 takes load;
11	S2 Close Inhibit	S2 close and takes load are prohibited; In manual mode, manual close is prohibited; if it is closed, then it needs to open manually; In auto mode, if it is closed then load is disconnected and S1 takes load;
12	QS1 Breaker PF IN	S1 close ready signal input; waiting for S1 PF input is active before S1 close;
13	QS2 Breaker PF IN	S2 close ready signal input; waiting for S2 PF input is active before S2 close;
14	Key S1 Close	Same as S1 close key on the panel, and it is needed to select auto reset button.
15	Key S2 Close	Same as S2 close key on the panel, and it is needed to select auto reset button.
16	Key Open	Same as breaker open key on the panel, and it is needed to select auto reset button.
17	Alarm Reset	Remove current alarm;
18	Alarm Mute	Stop audible alarm output;

No.	Item	Description
19	NEL Trip Key	Control NEL unload manually; it is needed to select auto reset button;
20	NEL Return Key	Control NEL to load again manually; it is needed to select auto reset button;
21	S1 Master Input	Forcibly set S1 switch priority the highest;
22	S2 Master Input	Forcibly set S2 switch priority the highest;
23	Man Mode Input	Forcibly set controller mode as manual mode.
24	Auto Mode Input	Forcibly set controller mode as manual mode.
25	Panel Lock	Panel button operation is prohibited; Up/Down/Confirm/Return/Alarm Reset/Alarm Mute can be used;
26	Sync Inhibit	Sync transfer function is inactive;
27	Scheduler Inhibit	Scheduled start and scheduled not start functions are inactive;
28	Simulate S1 OK	Simulate S1 power is normal; S1 voltage detection is inactive;
29	Simulate S2 OK	Simulate S2 power is normal; S2 voltage detection is inactive;
30	AutoTrans/Restore	Auto Trans/Restore for active; Auto Trans/Non-restore for inactive;
31	S1 Open IN	QS1 close feedback input;
32	S2 Open IN	QS2 close feedback input;
33	Remote Ctrl Inhibit	Remote operation is inactive when it is active.
34	S1 PT wire broken	PT secondary circuit wire broken input
35	S2 PT wire broken	PT secondary circuit wire broken input
36	Local Mode	In this mode, the controller only display "not control"
37	Non-parallel	In this mode, the parallel transfer is inhibited.
38	Manual Auto Parallel	Both manual mode and auto mode (auto restore) are available for parallel transfer. (Only for HAT820S)
39	Auto Parallel	In auto mode, when main power is in auto restore, the auto parallel will transfer. (Only for HAT820S)
40	Manual Parallel	In manual mode, parallel transfer can be manually operated. (Only for HAT820S)

9.3.2 OUTPUT PORT FUNCTION

Table 19 Output Port Function Description

No.	Items	Description
0	Not Used	Output port is inactive.
1	Custom Combined 1	
2	Custom Combined 2	
3	Custom Combined 3	
4	Custom Combined 4	
5	Custom Combined 5	
6	Custom Combined 6	
7	Electrical Interlock Remove	Output when parallel mode is active. (Only for HAT820S)
8	Load-off Output	Output when load off.
9	Local Mode	Output in local mode.
10	Reserved	

| No.	Items	Description
11	Common Alarm	It includes fault alarm and warning alarm.
12	Common Fault Alarm	It includes "Transition Fault" alarm, and "Over Current" alarm.
13	Common Warn Alarm	It includes reverse phase sequence of S1, reverse phase sequence of S2, over current loading and forced open.
14	Transition Fault	It includes "QS1 Fail to Close" alarm, "QS1 Fail to Open" alarm, "QS2 Fail to Close" alarm, "QS2 Fail to Open" alarm.
15	Audible Alarm	It can be connected with annunciator externally when common alarm is active. When "alarm mute" input is active or 60s delay has expired, it can remove the alarm.
16	Reserved	
17	Genset Start Delay	Output when genset start delay is initiated;
18	Genset Stop Delay	Output when genset stop delay is initiated;
19	Elevator Control	Output before load is power off or switch transfer; used to control running elevator to stop at the nearest level until transfer is finished;
20	Reserved	
21	Reserved	
22	Reserved	
23	S1 Available	Output when S1 voltage is normal.
24	S1 Unavailable	Output when S1 voltage is abnormal.
25	S2 Available	Output when S2 voltage is normal.
26	S2 Unavailable	Output when S2 voltage is abnormal.
27	S1 Over Current	Output when S1 is over current with load;
28	S2 Over Current	Output when S2 is over current with load;
29	Load End Dead Out	Output when load end is dead after switch close;
30	Auto Mode	Output when the genset is in Auto mode.
31	Manual Mode	Output when the genset is in Manual mode.
32	Genset Start Output	Control the genset starting.
33	Reserved	
34	QS1 Close Control	Control the QS1 switch to close.
35	QS1 Open Control	Control the QS1 switch to open.
36	QS2 Close Control	Control the QS2 switch to close.
37	QS2 Open Control	Control the QS2 switch to open.
38	S1 PT wire broken	It outputs when PT secondary circuit wire broken occurs;
39	S2 PT wire broken	It outputs when PT secondary circuit wire broken occurs;
40	NEL1 Trip Control	Control NEL unload when output is active; used to control NEL unload and return (on load) when output is inactive;
41	NEL2 Trip Control	
42	NEL3 Trip Control	
43	Reserved	
44	Reserved	
45	QS1 Closed Input	The close status of S1;
46	QS2 Closed Input	The close status of S2;
47	S1 Genset Start	Control S1 genset start; used for system S1-Gen S2-Gen;
48	S2 Genset Start	Control S2 genset start; used for system S1-Gen S2-Gen;

No.	Items	Description
49	ATS Power L1	Power supply for ATS.
50	ATS Power L2	
51	ATS Power L3	
52	ATS Power N	
53	Remote Control Output	It is controlled by RS485 communication command.
54	Input 1 Status	Programmable input status;
55	Input 2 Status	
56	Input 3 Status	
57	Input 4 Status	
58	Input 5 Status	
59	Input 6 Status	
60	Input 7 Status	
61	Input 8 Status	
62	Input 9 Status	
63	Reserved	
64	S1 Blackout	S1 power status;
65	S1 Over Volt	
66	S1 Under Volt	
67	S1 Over Freq	
68	S1 Under Freq	
69	S1 Loss Of Phase	
70	S1 Phase Seq Wrong	
71	Reserved	
72	Reserved	
73	S2 Blackout	S2 power status;
74	S2 Over Volt	
75	S2 Under Volt	
76	S2 Over Freq	
77	S2 Under Freq	
78	S2 Loss Of Phase	
79	S2 Phase Seq Wrong	
80	Reserved	
81	Reserved	
82	Sync Fail	HAT820S
83	Sync Waiting	HAT820S
84	Switching	Output in the process of switch transfer.
85	Battery Under Volt	Output at battery under voltage alarm.
86	Battery Over Volt	Output at battery over voltage alarm.
87	Gen Inhibit Work	Output in continuous time for scheduled not start.
88	Scheduler Gen Start	Output in continuous time for scheduled start.
89	QS1 QS2 Parallel Alarm	Output when QS1 & QS2 parallel alarms.
90	Fan Control	Output when temp. is over pre-set value.
91	Load 1 Close Out	It outputs when Load 1 closes.
92	Load 2 Close Out	It outputs when Load 2 closes.

No.	Items	Description
93	Load 3 Close Out	It outputs when Load 3 closes.
94	Load 4 Close Out	It outputs when Load 4 closes.
95	Load 5 Close Out	It outputs when Load 5 closes.
96	Load 6 Close Out	It outputs when Load 6 closes.
97	Load 7 Close Out	It outputs when Load 7 closes.
98	Load 8 Close Out	It outputs when Load 8 closes.
99	Reserved	

9.3.3 Defined Combination Output

Defined combination output is composed by 3 parts: condition output SW1 or SW2 and condition output SW3.
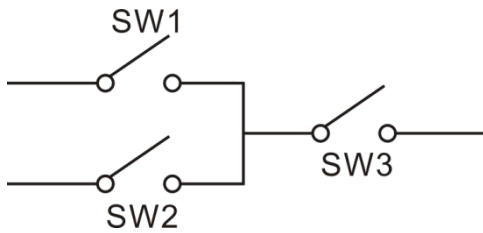
SW1 or SW2 is **TRUE**, and SW3 is **TRUE**, defined combination output is outputting;

SW1 and SW2 are **FALSE**, or SW3 is **FALSE**, defined combination output is not outputting.

⚠**NOTE:** SW1, SW2, SW3 can be set as any contents except for "defined combination output" in the output settings.

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

For example:

Contents of OR condition output SW1: Input port 1 is active;

Close when OR condition output SW1 is active /inactive: close when active (disconnect when inactive);

Contents of OR condition output SW2, input port 2 is active;

Close when OR condition output SW2 is active /inactive: close when active (disconnect when inactive);

Contents of AND condition output SW3: Input port 3 is active;

Close when AND condition output SW3 is active /inactive: close when active (disconnect when inactive);

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

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

9.4 Over Current Definite Time and Inverse Definite Time Settings

Definite Time: Over current delay is fixed delay; different over current values correspond to the same delay, which is the pre-set delay time;

Inverse Definite Time: Over current delay decreases as over current increases; different over current values correspond to different delays;

Inverse over current delay formula is as below:

$T = t / ((IA/IT)-1)^2$

T: Over current delay value (s)

t: Timing multiplier

IA: Current maximum current (L1/L2/L3)

IT: Pre-set value of over current

T= 36

IA= 550A

IT= 500A

Then T= 3600s(1h)

10 HISTORICAL RECORDS

In main screen, press ⚙/OK key and enter menu page. Select **Historical Records**, and then press

⚙/OK key again to enter historical records interface.

Each record includes:
> Record date and time
> Record type
> Event log
> S1 power supply status
> S2 power supply status
> S1 3-phase voltage
> S2 3-phase voltage
> S1 frequency
> S2 frequency
> Current IA, IB, IC
> Power factor

Maximum pieces of historical record are 200. The first record is the latest, and users could check every record by Up/Down keys. When the record items are over 200, the latest record will cover the oldest one.

Event log type includes: Action Event, Warn Event and Fault Event. All fault event actions are fault alarms and all warn event actions are warning alarms.

Table 20 Action Event List

No.	Action Events	Description
1.	Closing QS1	Record when the QS1 close outputs.
2.	Closing QS2	Record when the QS2 close outputs.
3.	Opening QS1	Record when the QS1 open outputs.
4.	Opening QS2	Record when the QS2 open outputs.
5.	Sync Closing QS1	Record when QS1 sync closes;
6.	Sync Closing QS2	Record when QS2 sync closes;
7.	NEL 1 Trip	Record when NEL 1 unload control outputs;
8.	NEL 2 Trip	Record when NEL 2 unload control outputs;
9.	NEL 3 Trip	Record when NEL 3 unload control outputs;
10.	Genset Start	Record when the genset start signal outputs.
11.	S1 Genset Start	Record when the S1 genset start signal outputs.
12.	S2 Genset Start	Record when the S2 genset start signal outputs.
13.	Genset Stop	Record when the genset start signal is disconnected and this is outputted.
14.	S1 Genset Stop	Record when the S1 genset start signal is disconnected and this is outputted.
15.	S2 Genset Stop	Record when the S2 genset start signal is disconnected and this is outputted.
16.	Auto Mode	Record when Auto Mode is shifted.
17.	Manual Mode	Record when Manual Mode is shifted.
18.	Local Mode	Record when transferring to local mode.
19.	Manual Key Open	
20.	Manual Key S1 Close	
21.	Manual Key S2 Close	
22.	Remote Key Open	
23.	Remote Key S1 Close	
24.	Remote Key S2 Close	

11 BLACK BOX RECORDS

In main screen, press 🔅/OK key and enter menu page. Select **Black Box Records**, and then press

🔅/OK key again to enter black box records interface.

Each record includes:

Record date and time

Record type

Event log

S1 power supply status

S2 power supply status

S1 3-phase voltage

S2 3-phase voltage

S1 frequency

S2 frequency

Current IA, IB, IC

Active power

Power factor

Maximum pieces of black box record are 5. Each record contains status information of this record for 60s in total before and after the record time. It records once per second. When it is over 5, the latest record will cover the oldest one. The first one is the newest. Users can check every record by Confirm key, and check detailed data status of 60 items in each record by Up/Down key.

Event log type includes: action events in the process of close/open transfer in auto mode.

Table 21 Action Event List

No.	Action Events	Description
1	Auto Action Open	Breaker open in auto mode;
2	Auto Action S1 Close	QS1 close in auto mode;
3	Auto Action S2 Close	QS2 close in auto mode;

12 SWITCH OPERATION

12.1 MANUAL OPERATION

Press ✍ key, and manual status indicator is illuminated. Controller is in manual mode.

After switch transfer key is pressed, switch transfers immediately. In the transferring process, the corresponding indicator flashes and it is always light when transfer is done.

Table 22 Manual Transfer Key

Icon	Function	Description
I	S1 Close Key	Press and if load is disconnected, then QS1 closes and load is supplied by S1.
II	S2 Close Key	Press and if load is disconnected, then QS2 closes and load is supplied by S2.
O	Open Key	Press and load is disconnected.

12.2 AUTOMATIC OPERATION

Press ◎ key, and auto mode indicator becomes light and the controller is in the auto mode.

Under auto mode, the controller will switch automatically to ensure power supply for loading according to S1&S2 status, switch priority and Auto Trans./Res. status.

Table 23 Auto Breaker Transfer Logic

Power Status	Breaker and Load Status	S1 Master	S2 Master
S1 Normal S2 Normal Auto Trans./Res.	Breaker Status	QS1 Close QS2 Open	QS1 Open QS2 Close
	Load Status	S1 Supply for load	S2 Supply for load
S1 Normal S2 Abnormal Auto Trans./Res.	Breaker Status	QS1 Close QS2 Open	QS1 Close QS2 Open
	Load Status	S1 Supply for load	S1 Supply for load
S1 Abnormal S2 Normal Auto Trans./Res.	Breaker Status	QS1 Open QS2 Close	QS2 Close QS1 Open
	Load Status	S2 Supply for load	S2 Supply for load
S1 Abnormal S2 Abnormal (Normal power supply for ATS)	Breaker Status	QS1 Open QS2 Open	
	Load Status	Load is power off.	

During the switching process, when breaker close failure or close inhibition occurs, the corresponding switch shall not conduct close action any more, and other switches that can execute close action shall supply power for load. If breaker open failure occurs, then switch shall do not any actions.

12.2.1 AUTO TRANS./RESTORE

When Auto Trans./Restore is set, S1 power is master; if S1 power is normal, then S1 power closes; if S1 power is abnormal, S2 power is normal, then S1 power opens, S2 power closes; if S1 power recovers normal, then S2 power opens, S1 power closes.
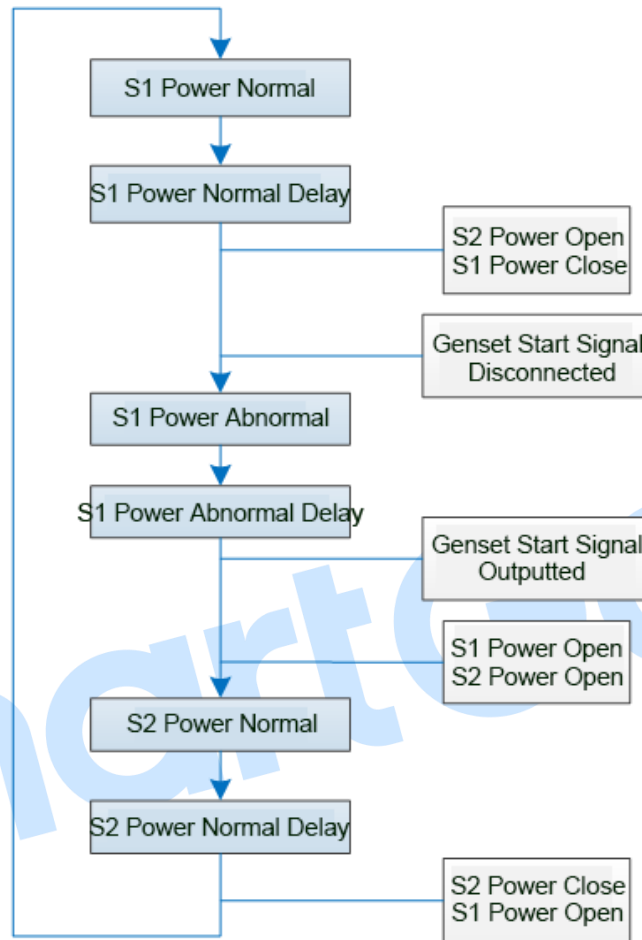

Fig. 3 Auto Trans./Restore Diagram

12.2.2 AUTO TRANS./NON RESTORE

When Auto Trans./Non Restore is set, S1 power is master. If S1 power is normal, then S1 power closes; if S1 power is abnormal, S2 power is normal, then S1 power opens, and S2 power closes; If S1 power recovers normal, S2 power is normal, then switch keeps at S2 power close status.
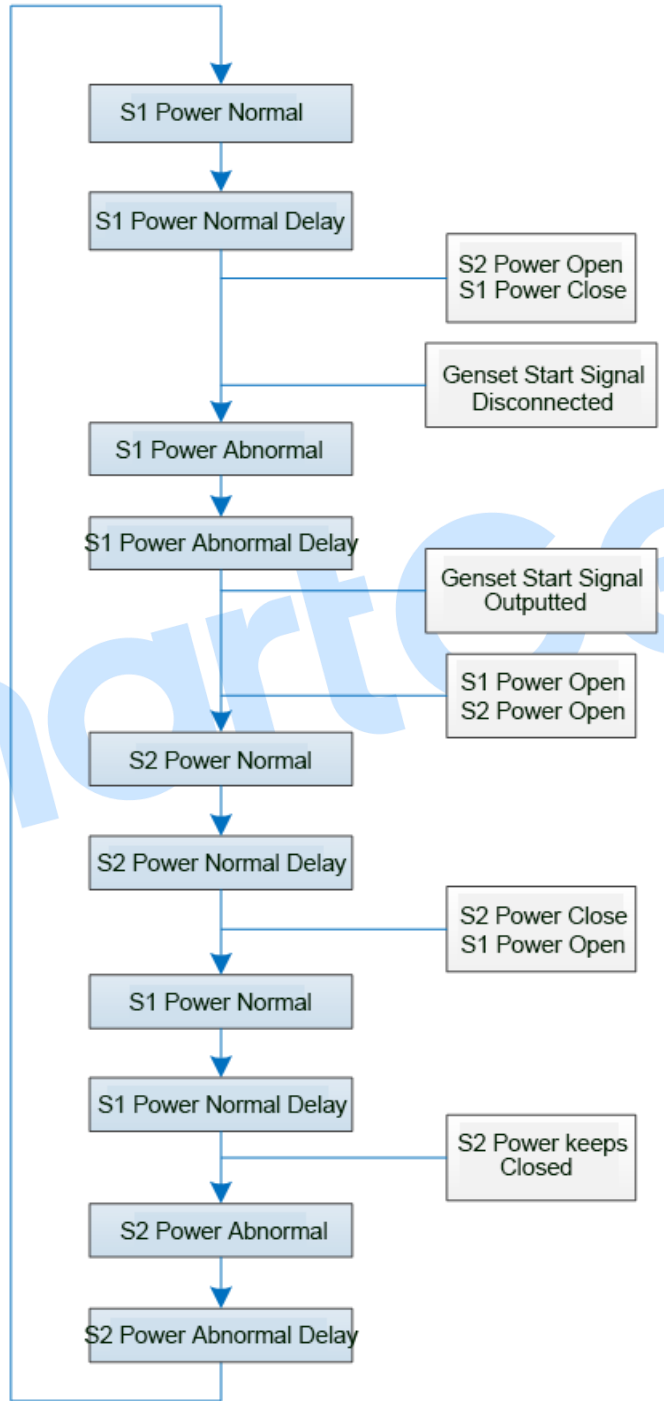
Fig. 4 Auto Trans./Non-Restore Diagram

Switch power supply can be set to DC supply or AC supply. If switch is DC supply, then it is considered that switch can be transferred at any time, including S1 and S2 both are outage. If switch is AC supply, then that switch power supply is normal or abnormal is judged by AN voltage status of S1 and S2 and switch power voltage range.

If ATS power is supplied by S1 and S2, controller controls power supply intellectually; Only one of S1 and S2 is normal can the ATS power supply be normal to ensure normal switch transfer.

If ATS power is supplied by controller, only when controller detects ATS normal power, can the switch conducts close/open actions. Users shall select supply voltage (phase voltage or wire voltage) according to ATS type. If it is phase voltage supply, it is needed to connect the phase voltages of S1&S2 separately with the normally close contact (Terminal 21) and the normally open contact (Terminal 22) of digital port 5. The N phase of S1&S2 shall be connected separately with the normally close contact (Terminal 24) and the normally open contact (Terminal 25) of digital port 6. Afterwards connect the common port of port 5 and port 6 with ATS power supply. At last enter parameter setting interface and set port 5 as the corresponding phase voltage "ATS power L1", and set port 6 as "ATS power N". It is the same when ATS is supplied by wire voltage. It is only needed to change N phase as phase voltage input and port 6 is also needed to change according to the settings. Wire connection is as below:
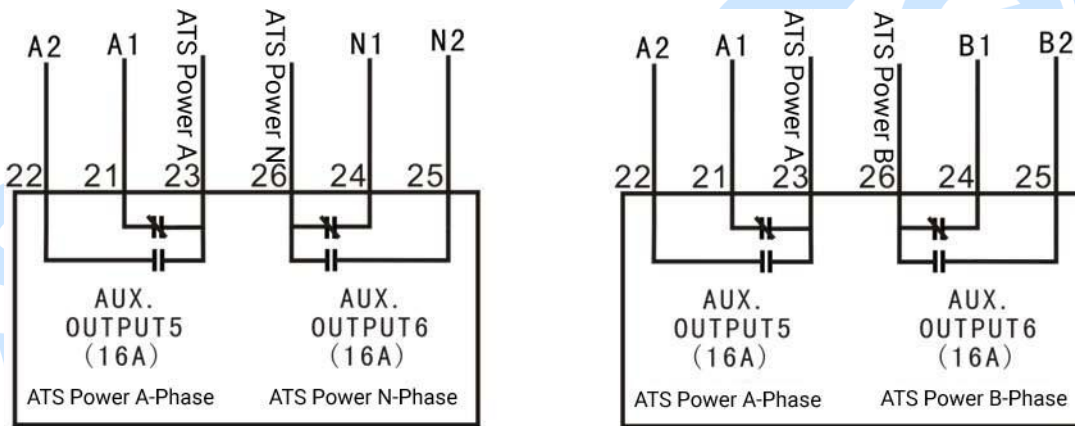

Fig. 5 ATS Power Supply Wiring Drawing

14   NEL CONTROL

14.1   ILLUSTRATION

Non-essential Load is NEL for short, which refers to the load that can be unloaded first when genset power is not enough.

Controller can control 3 ways of NEL trip and the essentiality is: NEL 3>NEL 2>NEL 1.

14.2   AUTOMATIC OPERATION

When NEL auto trip is enabled: If genset power has exceeded NEL trip value, after trip delay NEL1 will trip for the earliest, and next is NEL2, NEL3;

When NEL auto reconnection is enabled: If genset power has fallen below the auto reconnection set value, after the auto reconnection delay NEL3 will be reconnected for the earliest, and next is NEL2, NEL1;

t1: NEL Trip Delay
t2: Reconnection Delay
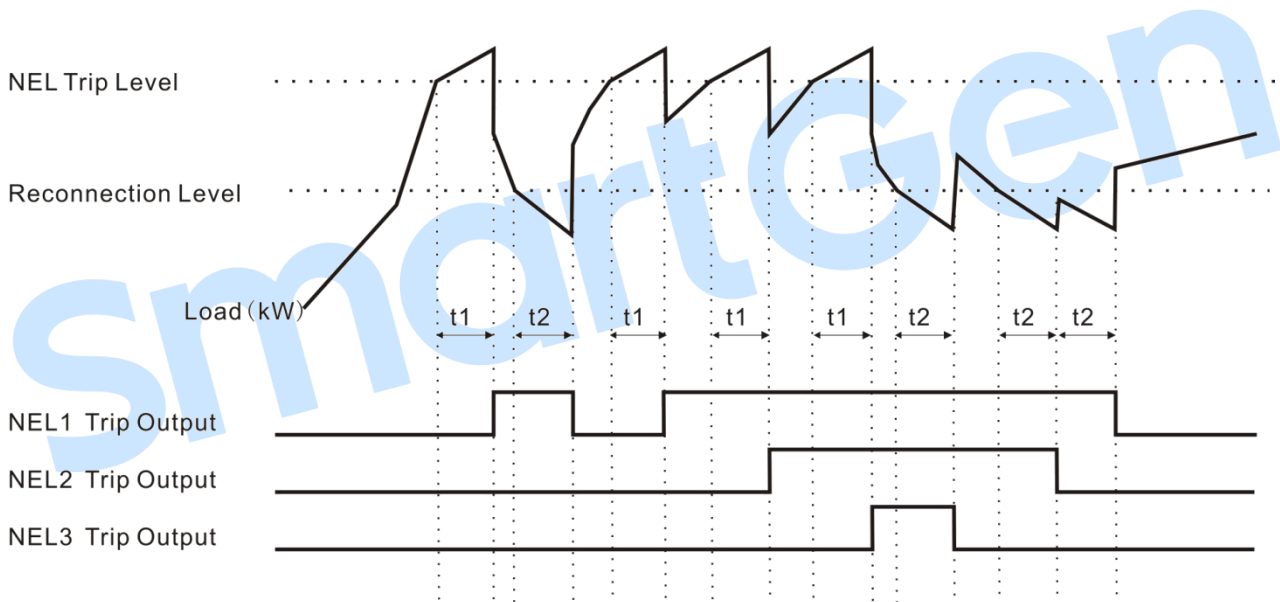
14.3   MANUAL TRIP

If NEL manual trip input is active (failing edge is active), NEL1 will trip without delay; If NEL manual trip input is active again, NEL2 will trip; If NEL manual trip input is active for the third time, NEL3 will trip. During this process, the controller does not detect if the genset power has exceeded the NEL trip value or not.

If NEL manual reconnection input is active (failing edge is active), NEL3 will be reconnected without delay; If NEL manual reconnection input is active again, NEL2 will reconnect; If NEL manual reconnection input is active for the third time, NEL1 will reconnect. During this process, the controller detects the genset power: if the genset power has fallen below the NEL reconnection value, then the input is active; if it doesn't, the input is deactivated.

⚠**NOTE:** When auto trip and auto reconnection are enabled, manual trip is still active.

15 COMMUNICATION CONFIGURATION AND CONNECTION

15.1 ILLUSTRATION

HAT820 Dual Power ATS controller is equipped with RS485 and USB communication ports. RS485 allows it to connect with LAN (Local Area Network) with open structure. It applies MODBUS communication protocol and via software on PC or on data collection system it can provide a simple and practical dual power switching management project for factories, telecom, industry and civil buildings to achieve "remote control, remote measuring, and remote communication" functions.

More information about Communication Protocol, please refer to *HAT820 Communication Protocol.*

15.2 RS485 COMMUNICATION DESCRIPTION

HAT820 series controller has 2 isolated RS485 communication ports. One can conduct RD485 LAN monitoring, and the other can connect CMM366 series communication module to do cloud monitoring.

Communication Rules: Modbus-RTU

Communication parameters:

Module address	1 (range: 1-254)
Baud rate	9600 bps (2400/4800/9600/19200bps)
Data bit	8-bit
Parity bit	None (None/Odd/Even)
Stop bit	2 bits (1 bit or 2 bits)

15.3 USB COMMUNICATION DESCRIPTION

Controller has a D-type USB communication port, which can be used to connect PC test software to do configuration parameters and at the same time used for module software upgrade.
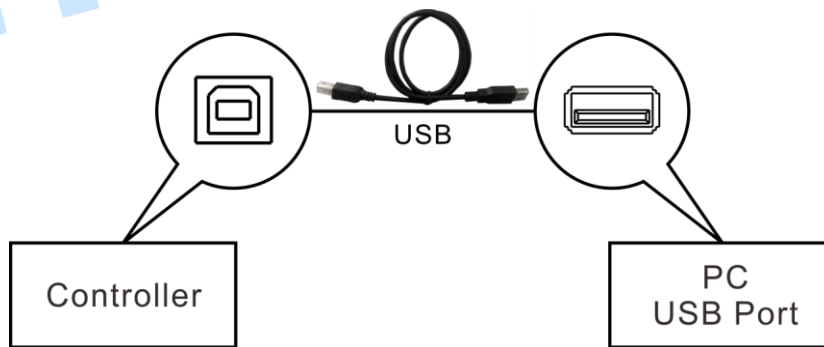

Fig. 6 USB Connection

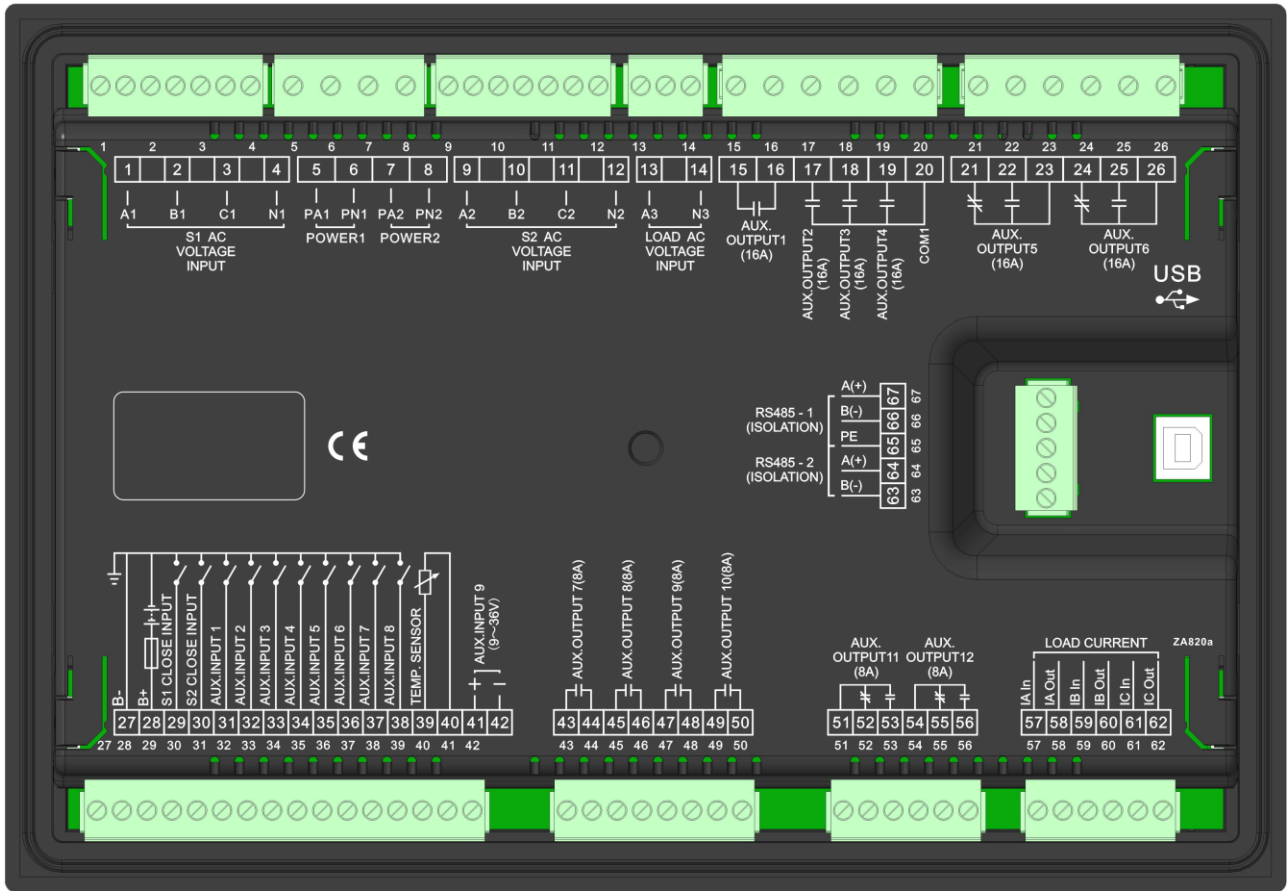## 16 TERMINAL DEFINITION

16.1 TERMINAL DESCRIPTION

Fig. 7 Controller Rear Panel Drawing

Table 24 Input/Output Function Description

No.	Items	Description		Remark
1	A1	S1 AC System 3P4W voltage input		For single phase, only connect A1, N1.
2	B1			
3	C1			
4	N1			
5	PA1	Power 1 AC supply input		Phase voltage or wire voltage; Supply range AC(90~576)V
6	PN1			
7	PA2	Power 2 AC supply input		Phase voltage or wire voltage; Supply range AC(90~576)V
8	PN2			
9	A2	S2 AC System 3P4W voltage input		For single phase, only connect A2, N2.
10	B2			
11	C2			
12	N2			
13	A3	Voltage input for load;		When load end is connected, "Load Volt Enable" is enabled; Default is Disable;
14	N3			
15	AUX. OUTPUT 1	Programmable output 1		Default: QS1 close control; Volts free relay; Normally Open output. Capacity: 16A 250VAC
16				
17	AUX. OUTPUT 2	Programmable output 2		Default: QS1 open control; Volts free relay; Normally Open output. Capacity: 16A 250VAC
18	AUX. OUTPUT 3	Programmable output 3		Default: QS2 close control; Volts free relay; Normally Open output. Capacity: 16A 250VAC
19	AUX. OUTPUT 4	Programmable output 4		Default: QS2 open control; Volts free relay; Normally Open output. Capacity: 16A 250VAC
20	COM	Public point		Public point of Aux. outputs 2,3,4;
21	AUX. OUTPUT 5	N/C	Programmable output 5	Default: ATS power L1; Volts free relay; N/C(N/O) output; Capacity: 16A 250VAC
22		N/O		
23		COM		
24	AUX. OUTPUT 6	N/C	Programmable output 6	Default: ATS power N; Volts free relay; N/C(N/O) output; Capacity: 16A 250VAC
25		N/O		
26		COM		
27	B-	Negative of DC power		Ground connected terminal for module;
28	B+	Positive of DC power		DC positive input (8-35)V; controller power supply;
29	QS1 CLOSE INPUT	QS1 close status input		Check QS1 close status; volts free contact input; Ground connected is active;
30	QS2 CLOSE INPUT	QS2 close status input		Check QS2 close status; volts free contact input; Ground connected is active;
31	AUX. INPUT 1	Programmable input 1		Defaults: Forced open Active if it is connected with ground;

No.	Items	Description		Remark
32	AUX. INPUT 2	Programmable input 2		Defaults: S1 trip input; Active if it is connected with ground.
33	AUX. INPUT 3	Programmable input 3		Default: S2 trip input; Active if it is connected with ground.
34	AUX. INPUT 4	Programmable input 4		Default: Not Used; Active if it is connected with ground.
35	AUX. INPUT 5	Programmable input 5		Default: Not Used; Active if it is connected with ground.
36	AUX. INPUT 6	Programmable input 6		Default: Not Used; Active if it is connected with ground.
37	AUX. INPUT 7	Programmable input 7		Default: Not Used; Active if it is connected with ground.
38	AUX. INPUT 8	Programmable input 8		Default: Not Used; Active if it is connected with ground.
39	TEMP. SENSOR	Temp. sensor input		Connect resistor sensor externally;
40	COM	COM for ground connected		Connected with B- internally;
41	AUX. INPUT 9	+	(9~36)V	Default: Not Used;
42		-		
43	AUX. OUTPUT 7	Programmable output 7		Default: Not Used; volts free relay; N/O output; Capacity: 250V 8A
44				
45	AUX. OUTPUT 8	Programmable output 8		Default: Not Used; volts free relay; N/O output; Capacity: 250V 8A
46				
47	AUX. OUTPUT 9	Programmable output 9		Default: Not Used; volts free relay; N/O output; Capacity: 250V 8A
48				
49	AUX. OUTPUT 10	Programmable output 10		Default: Not Used; volts free relay; N/O output; Capacity: 250V 8A
50				
51	AUX. OUTPUT 11	COM	Programmable output 11	Default: Genset start; N/C output. volts free relay; N/C (N/O) output; Capacity: 250V 8A
52		N/C		
53		N/O		
54	AUX. OUTPUT 12	COM	Programmable output 12	Default: Not Used; volts free relay; N/C (N/O) output; Capacity: 250V 8A
55		N/C		
56		N/O		
57	IA Input	Secondary A-Phase Current Input of CT		
58	IA Output			
59	IB Input	Secondary B-Phase Current Input of CT		
60	IB Output			
61	IC Input	Secondary C-Phase Current Input of CT		
62	IC Output			
63	RS485-2 B(-)	RS485-2 communication port		120Ω resistor shall be connected according to local network organization.
64	RS485-2 A(+)			
65	PE	GND terminal for communication port		
66	RS485-1 B(-)	RS485-1 communication port		120Ω resistor shall be connected according to local network organization.
67	RS485-1 A(+)			

No.	Items	Description	Remark
USB	USB	D-type USB communication port	Used for parameter configurations and software upgrade by connecting with PC.

16.2 CONTROLLER AC SUPPLY DESCRIPTION

Controller can be AC power supply. Supply power can be phase voltage (L, N) or line voltage (L, L), with supply input range (90-576)V.
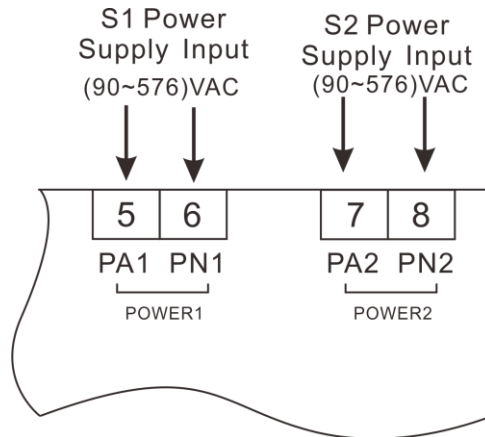

Fig. 8 AC Supply Diagram

16.3 LOAD LIVE CHECK DESCRIPTION

Controller can check whether load is live after it is used. Load end connected into controller can be phase voltage (L, N) or line voltage (L, L). When load end is in use, and it is checked that load end is dead, controller will alarm and indicate load end is dead. When this function is not used, there is no need to connect wiring in the input port and Load Volt Enable in parameter setting can be set to disabled.
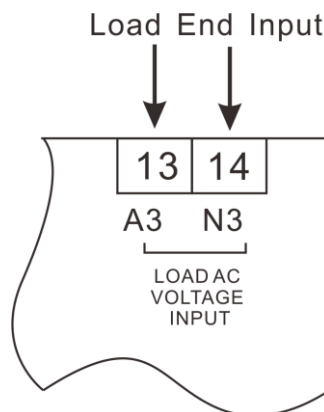
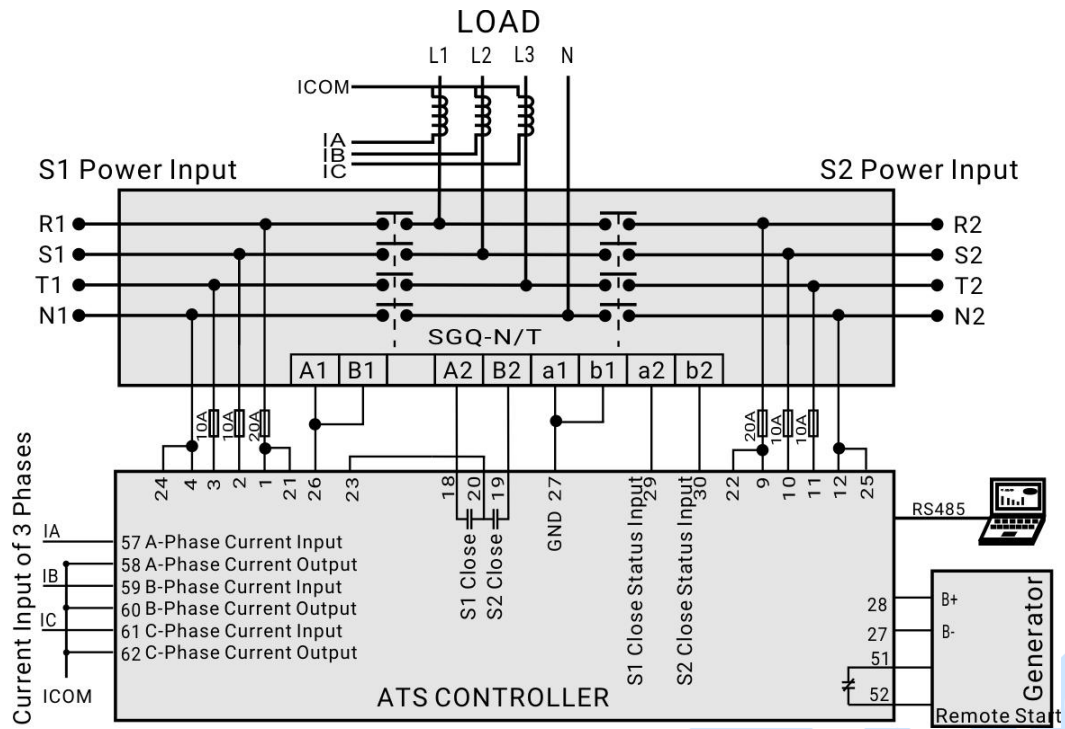**Fig. 9 Load End Live Check Diagram**

17 TYPICAL APPLICATION DIAGRAM

Fig. 10 SGQ-N/T Application Diagram

Table 25 Corresponding Settings

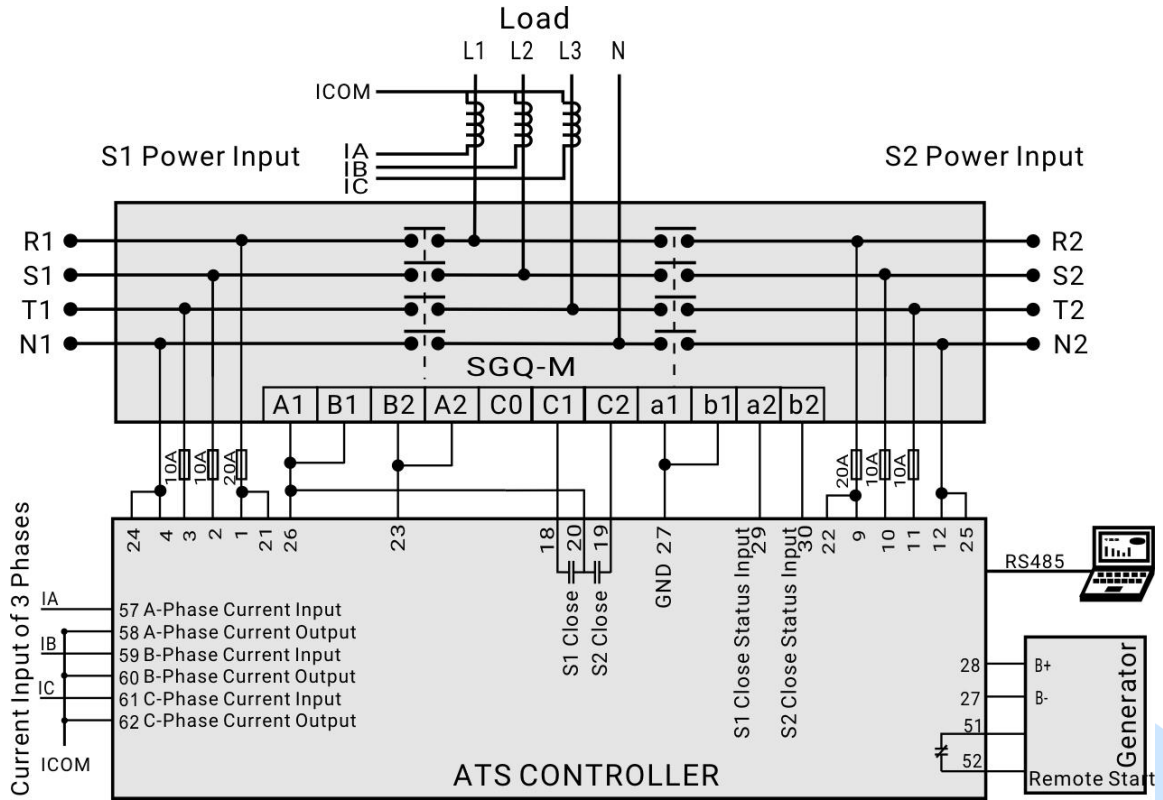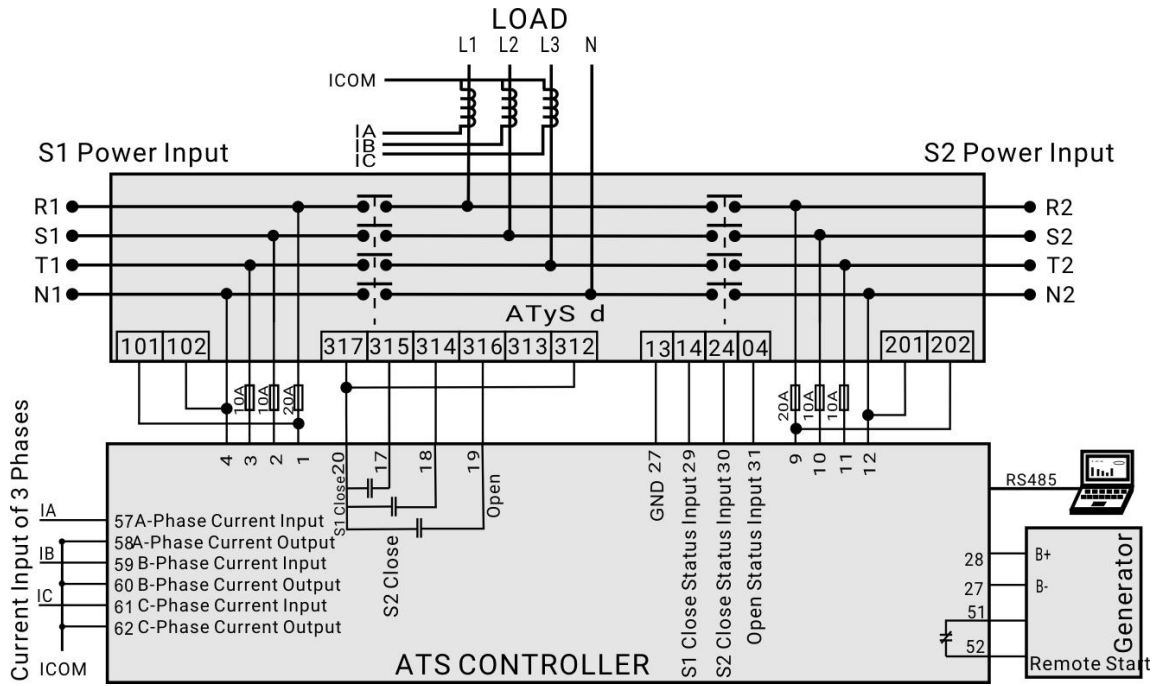| Parts of Parameter Settings	
Switch Type	No Breaking
Programmable output 2	Not Used
Programmable output 3	QS1 Close Output
Programmable output 4	QS2 Close Output
Programmable output 5	ATS Power L1
Programmable output 6	ATS Power N
Programmable output 11	Genset Start Output

Fig. 11 SGQ-M Application Diagram

Table 26 Corresponding Settings

Parts of Parameter Settings	
Switch Type	No Breaking
Programmable output 2	Not Used
Programmable output 3	QS1 Close Output
Programmable output 4	QS2 Close Output
Programmable output 5	ATS Power L1
Programmable output 6	ATS Power N
Programmable output 11	Genset Start Output

Fig. 12 ATyS d Application Diagram

Table 27 Corresponding Settings

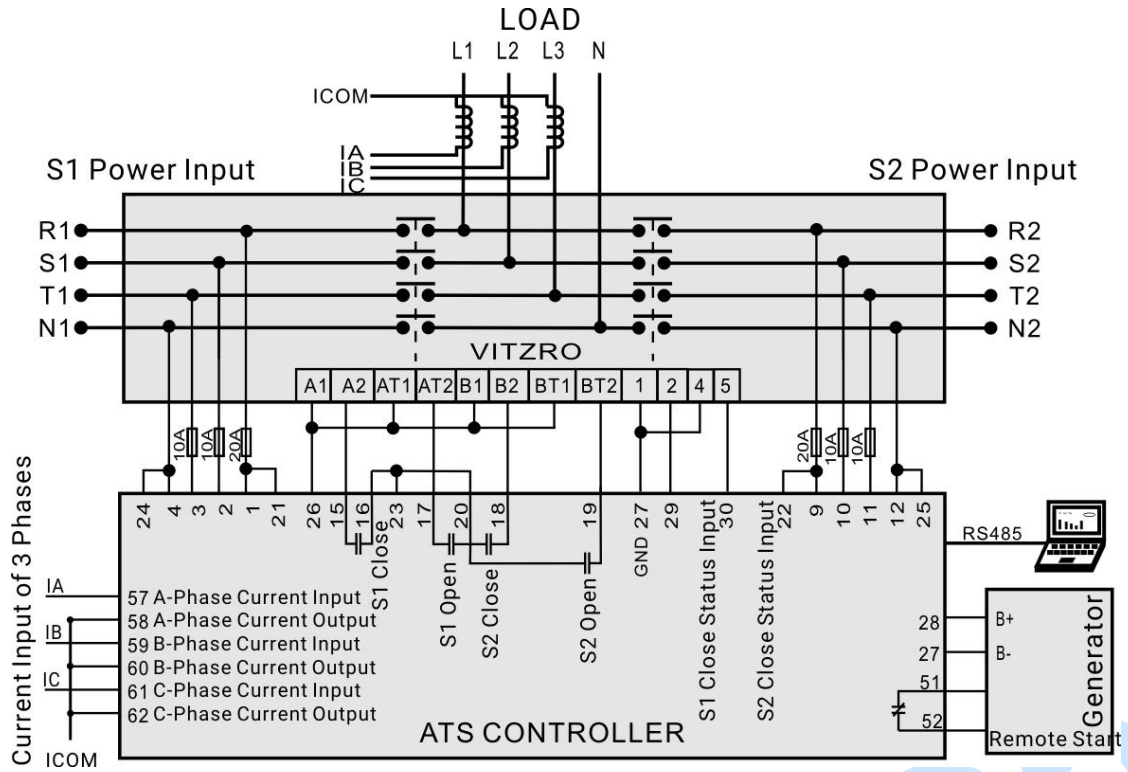| Parts of Parameter Settings	
Switch Type	One Breaking
Programmable output 2	QS1 Close
Programmable output 3	QS2 Close
Programmable output 4	QS1 Open
Programmable output 11	Genset Start
Programmable input 1	QS1 Open Input

Fig. 13 VITZRO Application Diagram

Table 28 Corresponding Settings

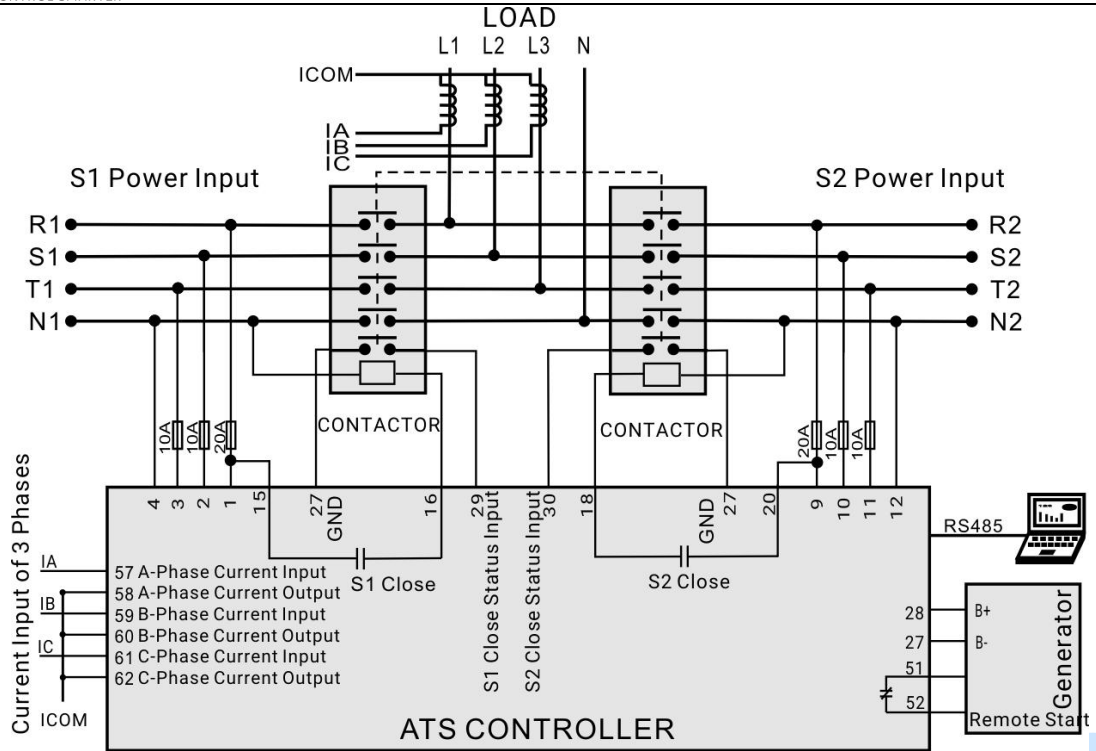| Parts of Parameter Settings	
Switch Type	Two Breakings
Programmable output 1	QS1 Close
Programmable output 2	QS1 Open
Programmable output 3	QS2 Close
Programmable output 4	QS2 Open
Programmable output 5	ATS Power L1
Programmable output 6	ATS Power N
Programmable output 11	Genset Start

Fig. 14 Contactor Application Diagram

Table 29 Corresponding Settings

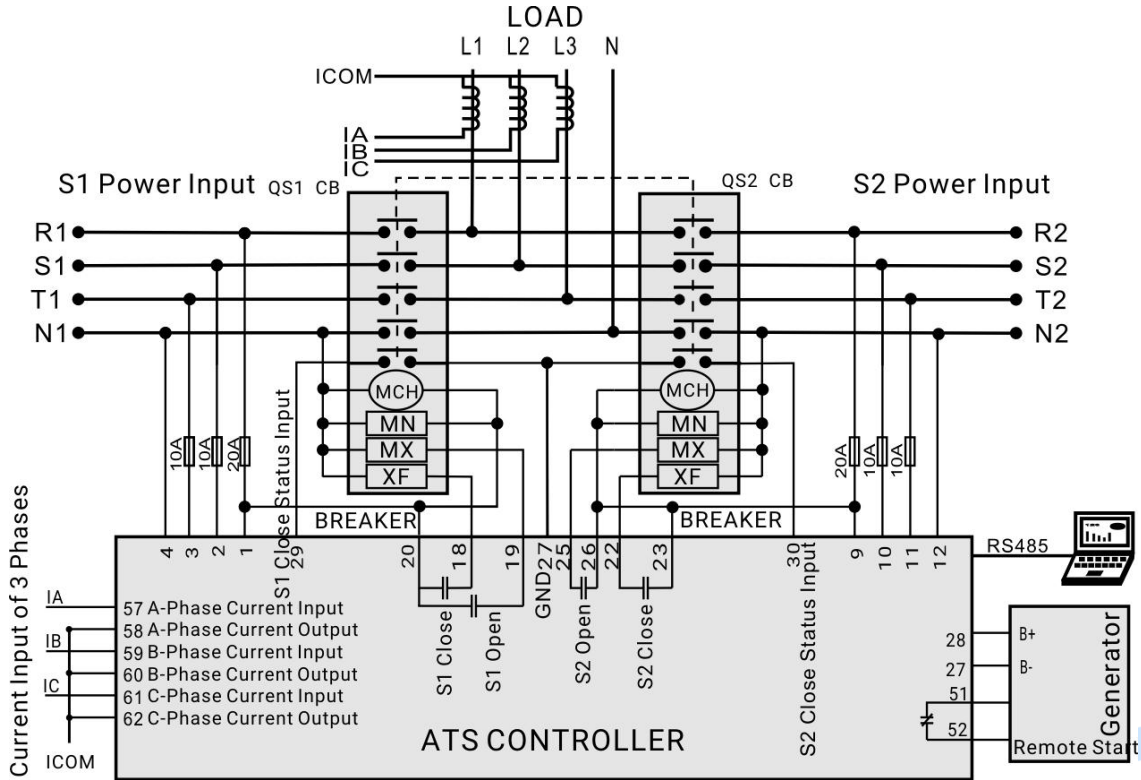| Parts of Parameter Settings	
Switch Type	Two Breakings
Continually Close	Enable
Transfer Time	10s (set based on actual situation)
Programmable output 1	QS1 Close
Programmable output 3	QS2 Close
Programmable output 11	Genset Start

Fig. 15 Breaker Application Diagram

Table 30 Corresponding Settings

MCH: Energy Storage Motor;   MN: Undervoltage Tripping;

MX: Opening Coil;   XF: Closing Coil

Parts of Parameter Settings	
Switch Type	Two Breakings
Programmable output 3	QS1 Close
Programmable output 4	QS1 Open
Programmable output 5	QS2 Close
Programmable output 6	QS2 Open
Programmable output 11	Genset Start

⚠**NOTE**: Above application diagrams are only examples. Users shall do wiring connection according to actual situation.

18 INSTALLATION

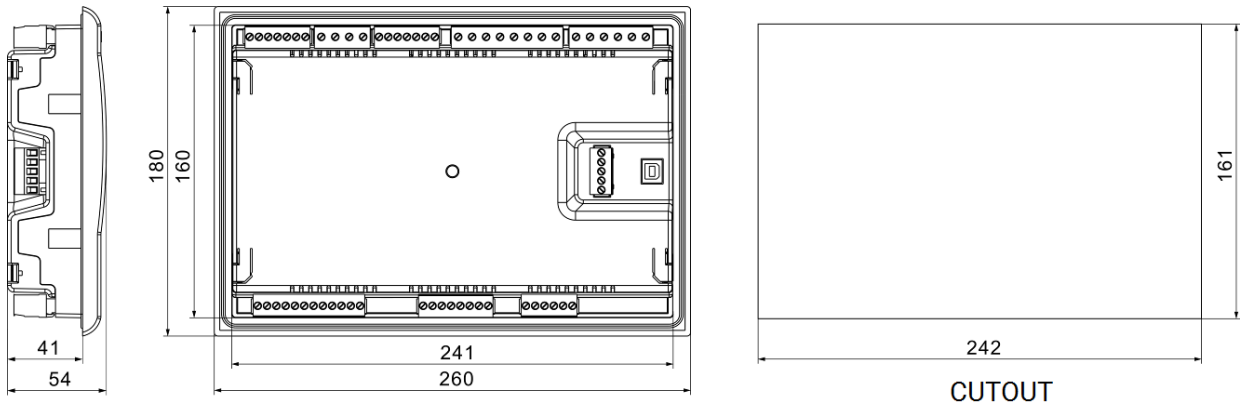The controller is panel-embedded design and they are fixed by clips in installation.
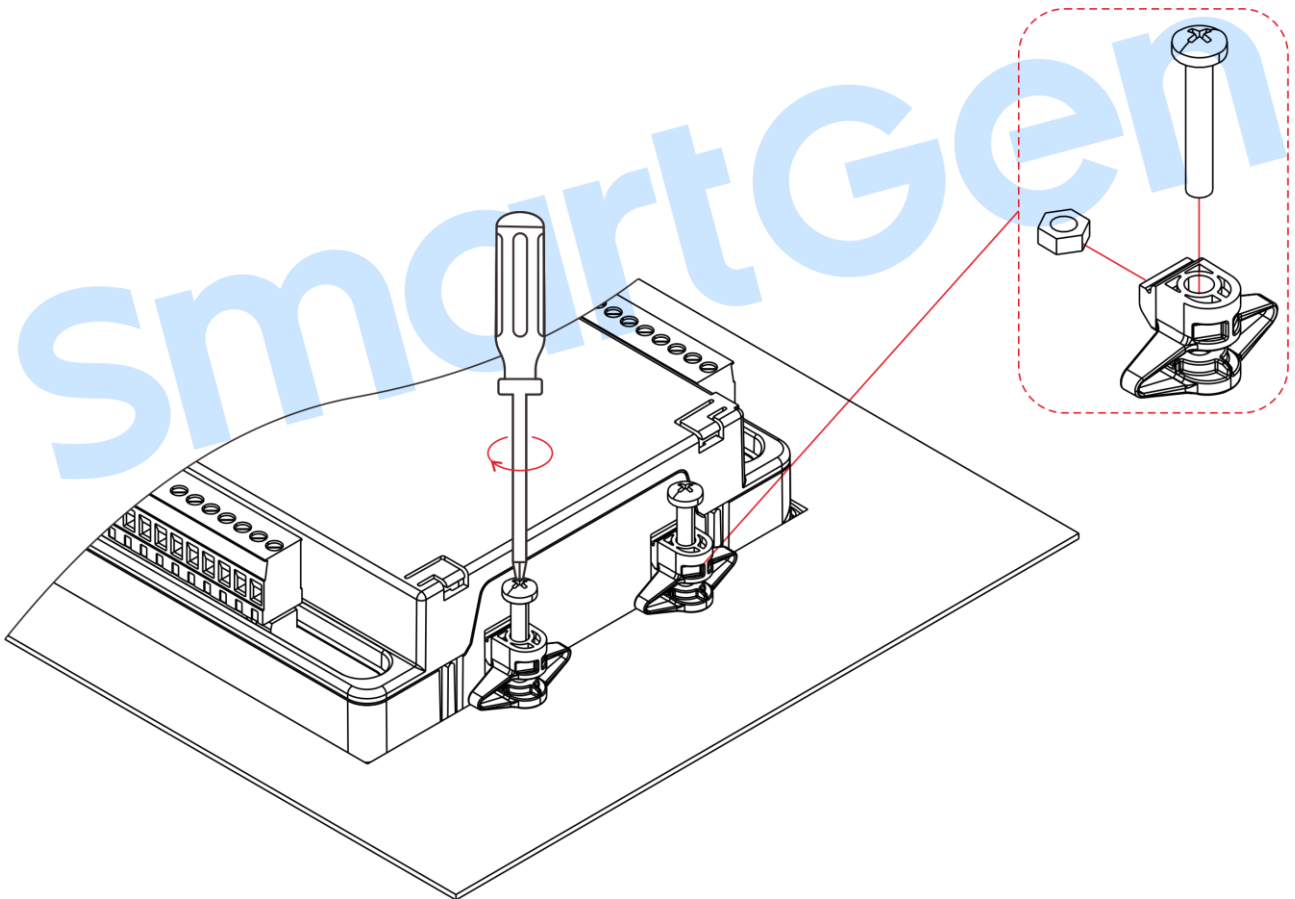
Unit: mm

Fig. 16 Overall & Cutout Dimensions

Fig. 17 Clip Installation Illustration

19 TROUBLE SHOOTING

Table 31 Troubleshooting

Symptoms	Possible Solutions
Controller no response with power.	Check DC voltage; Check DC fuse; Check AC Power supply.
RS485 communication is abnormal	Check RS485 positive and negative poles are connected correctly or not; Check RS485 transfer is normal or not; Check the module address in the parameter settings is correct or not; If above methods can't solve the problem, try to parallelly connect 120Ω resistor between RS485 A terminal and B terminal.
Auxiliary Output Error	Check auxiliary output connections, pay attention to normally open contact and normally close contact; Check the output setting function and output type in parameter settings.
Auxiliary Input Abnormal	Check that the auxiliary input is soundly connected to GND when it's active, it shall be hung up when it is inactive; (**NOTE**: The input port will be possibly destroyed when it is connected with overvoltage.) Check the output setting function and output type in parameter settings.
Breaker Shift Abnormal	Check the breakers; Check the wirings between the controller and the breakers; Check related parameter settings about breakers.
Genset Start Control Abnormal	Check system type settings; Check function setting and output type of the output ports; Check all Start/Stop function settings.

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