SmartGen

MAKING CONTROL SMARTER

HATC60

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

SmartGen English trademark

SmartGen — make your generator *smart*

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Table 1 Software Version

Date	Version	Note
2019-01-19	1.0	Original release.
2019-06-13	1.1	Fixed overview contents and describe this device as dedication for Socomec ATS.
2019-09-03	1.2	Fixed a parameter in Switch Settings.
2020-06-01	1.3	Fixed DC power supply range to (12-48)V.
2021-05-06	1.4	Fixed the front panel picture of controller; Upgraded the translation, font, header and footer of the manual.
2022-08-29	1.5	Updated company logo and manual format.

CONTENT

1 OVERVIEW

HATC60 dual power ATS controller is the 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.

HATC60 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 switch signal. This device is dedicated for Socomec ATS switch. 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   PERFORMANCE AND CHARACTERISTICS

—— System type can be set as Mains-Gen, Mains-Mains, Gen-Gen, etc.;

—— Suitable for multiple AC system types (3-phase 4-wire, 3-phase 3-wire, 1-phase 2-wire, 2-phase 3-wire methods);

—— Equipped with single color LCD screen with 132x64 pixel and bilingual display (Simplified Chinese, English), and touch-button operation;

—— Able to collect and display 2-way 3-phase voltage, frequency and phase sequence;

—— Equipped with overvoltage, undervoltage, overfrequency, underfrequency, phase loss, reverse phase sequence functions;

—— Equipped with display function of accumulated S1/S2 breaker-close times;

—— Equipped with display function of current lasting power supply time and accumulated S1/S2 power supply time;

—— Equipped with Auto/Manual status switchover function. Under manual status switch breaker close and open can be controlled artificially;

—— All parameters can be configured on the spot. Password verification is employed in case of wrong operation by non-professionals;

—— Manual commissioning is available on the spot for genset Start/Stop operation;

—— Equipped with switch breaker re-close function;

—— Breaker close output can be set as pulse or continuous output;

—— Equipped with separated 2-way N-wire design;

—— Equipped with real-time clock display function, and event log function which can record 200 items circularly;

—— Equipped with timing inspection Start/timing No-start function for genset, which can be set for once running, monthly running, or weekly running and running with loading or not can be set for all of them;

—— Able to control two generators, which realizes cycle running, master running, and balanced time running;

—— Wide DC power supply range, which allows the controller bear instantaneous 80V DC input at most;

—— Large space between AC input terminals which allows the controller to bear maximum 625V input;

—— One RS485 isolated communication interface is designed. It applys ModBus-RTU communication protocol and has remote control, remote communication, remote measuring, remote regulating functions. It can remotely control genset Start, Stop, switch breaker close and open functions;

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

3 SPECIFICATION

Table 2 Performance Parameters

Items	Description	
Operating Voltage	1. DC12.0V~48.0V continuous power supply; 2. AC power supply A1N1/A2N2, voltage range(90~305)V.	
Power Consumption	<3.5W (Standby mode:≤2W)	
AC Voltage Input	AC system	
	3P4W (L-L)	(80~530)V
	3P3W (L-L)	(80~530)V (DC supply is needed.)
	1P2W (L-N)	(50~305)V
	2P3W (A-B)	(80~530)V
Rated Frequency	50/60Hz	
Breaker-close Relay Output	8A AC250V, AC output	
Breaker-open Relay Output	8A AC250V, AC output	
Programmble Output 1 Relay	16A AC250V, Voltage free output	
Programmble Output 2 Relay	16A AC250V, Voltage free output	
Programmble Output 3 Relay	16A AC250V, Voltage free output	
Programmble Output 4 Relay	8A AC250V, Voltage free output	
Digital Input Port	Active when it is connected with input common terminal	
Communication Method	Isolated RS485 interface, MODBUS Protocol	
Case Dimensions	163mmx133mmx51mm	
Panel Cutout	152mmx122mm	
Working Temperature	(-25~+70)°C	
Working Humidity	(20~93)%RH	
Storage Temperature	(-30~+70)°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	0.54kg	

4 MEASURE AND DISPLAY DATA

Table 3 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	S1/S2 Present Power Status
6	Continuous Power Supply Time (Current)
7	Continuous Power Supply Time (Last Time)
8	S1 Accumulated Power Supply Time
9	S2 Accumulated Power Supply Time
10	QS1 Total Close Times
11	QS2 Total Close Times
12	S1/S2 Loading Status
13	Generator Start Status
14	Real Time Clock
15	Alarm Information
16	Event Log

5 OPERATION

5.1 INDICATORS

Fig.1 Panel Indication Drawing

Table 4 Indicators Description

Indicator Name	Color	Description
S1 Power	Green	S1 power is normal, it is always illuminated; When abnormal, it flashes; When S1 power is shutdown, it is extinguished.
S2 Power	Green	S2 power is normal, it is always illuminated; When abnormal, it flashes; When S2 power is shutdown, it is extinguished.
Auto Mode	Green	When current mode is Auto, it is illuminated.
S1 Close	Green	It is illuminated when S1 is loading.
Breaker Open	Green	It is illuminated when the loading is disconnected.
S2 Close	Green	It is illuminated when S2 is loading.
Alarm Indicator	Red	Slow flashing when warning alarms occur (once every 1s); fast flashing when fault alarms occur (five times every 1s).

5.2 KEY FUNCTION DESCRIPTION
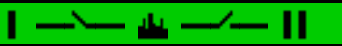
Table 5 Button Function Description

Key Name	Function Description
Set/Confirm/Alarm Reset	Press it in main interface, menu page appears; Entering menu page, confirm key can move the cursor and confirm the setting information; press it for longer time, current operation exits and returns back to the main interface; Press it for 3s, it can remove the breakdown alarms when fault alarms occur.
Up	Press it in main interface, scroll up display appears; Entering the menu page, it can move up the cursor and add the number of position where the cursor is.
Down	Press it in main interface, scroll down display appears; Entering the menu page, it can move down the cursor and reduce the number of position where the cursor is; Press for 3s, and LCD backlight flashes once and enters light always mode; press it for 3 second again, and LCD backlight goes dark, and recovers normal display mode.
Manual/Auto	Switchover between manual mode and auto mode.
S1 Close	Active under manual mode; Press this key and Power S1 is connected to load.
Breaker Open	Active under manual mode; Press this key and Power S1 is disconnected.
S2 Close	Active under manual mode; Press this key and Power S2 is connected to load.

In the main interface, press Set/Confirm and Down Key simultaneously and lamp test shall be conducted. At this time LCD backlight is illuminated, LCD displays full dark and all indicators on the panel are illuminated.

6 LCD DISPLAY

6.1 MAIN SCREEN

Table 6 Screen Display

Items			Display Contents
	S1 Uab: 380V F: 50.0 Hz Power Normal	S2 Uab: 380V F: 50.0 Hz Power Normal	This page displays: loading status of I and II, wire voltage (Uab), frequency, and power status.
	U1 L-L 380 380 380 V U2 L-L 380 380 380 V Auto Trans./Rev. S1 Master		This page displays: loading status of I and II, wire voltage (Uab, Ubc, Uca), transforming status, master setting informations etc.
	U1L-N 220 220 220 V U2L-N 220 220 220 V S1 0° 120° 240° S2 0° 120° 240°		This page displays: loading status of I and II, wire voltage (Ua, Ub, Uc), phase.
	2019-01-19(6) 15:52:58 QS1 Closing 4s Genset Standby Manual Mode Bat 27.6V		This page displays: date and time, start signal status, current working status, other status information, battery voltage.
	Alarm 2/2 Fault Alarm QS1 Failed to Close Warn Alarm Battery Over Volt		This page displays: alarm information.

6.2   STATUS DESCRIPTION

Table 7 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 Reverse Phase Seq.	A-B-C phase sequence is wrong.

Table 8 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 Reverse Phase Seq.	A-B-C phase sequence is wrong.

Table 9 Genset Status

No.	Status Name	Description
1	Genset Start Delay	The delay time before genset starts.
2	Genset Return 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 starting running.
6	Gen2 Cycle Run	When it is active, countdown of S2 circular starting running.
7	S1 Genset Working	It is active if there are only two generators in the system types and S1 is generating.
8	S2 Genset Working	It is active if there are only two generators in the system types and S1 is generating.
9	Genset Working	Genset starting signal outputs.
10	Genset Standby	Non-genset starting signal outputs.

Table 10 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 transfer.
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	S1 On Load	QS1 was already closed and S1 is taking load1.
12	S2 On Load	QS2 was already closed and S2 is taking load2.
13	Offload	Switch was already opened and load is disconnected.

Warning alarms are active when controller detects the alarm signals, and alarm indicator will flash slowly (1 time per sec). When alarm is reset, indicator is extinguished, which means warn alarms are not latched.

Table 11 Warning Alarms

No.	Status Name	Description
1	Forced Open Warn	It alarms when the forced open (Non-firefighting cutoff input) action is Warning, and the forced open input is active.
2	Battery Under Volt	Battery voltage is lower than the set limit value.
3	Battery Over Volt	Battery voltage is higher than the set limit value.

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

Table 12 Fault Aalrms

No.	Status Name	Description
1	QS1 Failed to Close	QS1 fails to close.
2	QS1 Failed to Open	QS1 fails to open.
3	QS2 Failed to Close	QS2 fails to close.
4	QS2 Failed to Open	QS2 fails to open.
5	Forced Open Fault	It alarms when the forced open (Non-firefighting cutoff input) action is Fault, and the forced open input is active.
6	S1 Genset Fault	It is active if there are only two generators in the system types, S1 is generating and S1 cannot start normally.
7	S2 Genset Fault	It is active if there are only two generators in the system types, S2 is generating and S2 cannot start normally.
8	Switch Trip Alarm	It will initiate a fault alarm, when the input is active.

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

Table 13 Indication Information

No.	Status Name	Description
1	Exist Alarm!	The indication information for switching to Auto mode manually before alarm is removed when there is fault alarm.
2	QS1 Already Close	The indication information for pressing QS2 close key when switch type has breaking separations and QS1 has been closed.
3	QS2 Already Close	The indication information for pressing QS1 close key when switch type has breaking separations and QS2 has been closed.
4	Already Open	The indication information for pressing open key when the breaker has been opened.

Table 14 Other Status Information

No.	Status Name	Description
1	Start Inhibit	It displays when the genset starting inhibition input is active.
2	Remote Gen On Load	It displays when the remote starting with load input is active.
3	Remote Gen Off Load	It displays when the remote starting without load input is active.
4	Gen Start Mains NG	It displays when genset is starting and the Mains is abnormal.
5	Auto Mode	Current mode is Auto mode.
6	Manual Mode	Current mode is Manual mode.

6.3 MAIN MENU

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

1. Exit **2. Parameters Set** **3. History Record** **4. Auto Trans./Restore** **5. Manual Commossioning** **6. Date & Time Set** **7. Language** **8. Total Information** **9. Information**	Press **Up/Down** key to choose parameters (the current line was highlighted with black) and then press **Confirm** key to enter into the corresponding display screen.

⚠**NOTE:** 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 configuration randomly. After changing please remember it carefully. If you forget it, please contact with our company service personel.

7 GENSET START/STOP OPERATION

7.1 MANUAL COMMISSIONING

7.1.1 PANEL START/STOP

In the main interface, press **Set/Confirm** key and it shall enter the main menu screen. Choose "5. Manual Commissioning", and it shall enter manually starting operation screen.

Manual Commissioning	
Return Genset Stop Genset Start	Press **Up/Down** key to choose parameters (the current line was highlighted with black) and then press **Confirm** key to confirm.

Genset Stop: disconnect the outputted genset starting signal and it can control the genset stop.
Genset Start: Output genset starting signal and it can control the genset start.
When the system type is "S1 Gen S2 Gen", manual Start/Stop menu interface is as follows:

Manual Commissioning	
Return S1 Genset Stop S1 Genset Start S2 Genset Stop S2 Genset Start	Press **Up/Down** key to choose parameters (the current line was highlighted with black) and then press **Confirm** key to confirm.

S1 Genset Stop: disconnect the outputted S1 genset starting signal and it can control the genset stop.

S1 Genset Start: Output S1 genset starting signal and it can control the genset start.

S2 Genset Stop: disconnect the outputted S2 genset starting signal and it can control the genset stop.

S2 Genset Start: Output S2 genset starting signal and it can control the genset start.

7.1.2 REMOTE COMMUNICATION START/STOP

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

Remote Communication Stop Control: disconnect the outputted genset starting signal and it can control the genset stop.

Remote Communication Start Control: Output genset starting signal and it can control the genset start.

7.2   AUTO MODE START/STOP

7.2.1   START CONDITIONS

7.2.1.1   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 Start On Load: genset starting outputs, and when the generating is normal, close the generating breaker; when the output is inactive, disconnect the genset starting output signal.

Remote Start Off Load: genset starting 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 starting output signal.

7.2.1.2   GEN START MAINS NG

When the mains is abnormal, genset starting outputs; when the generating is normal, closing the generating breaker.

7.2.2   TWO GENSETS START/STOP

When the system type is "S1 Gen S2 Gen", the start condition is that the input port is active: set "Remote Gen On Load" and "Remote Gen Off Load" in the programmable input port setting.

Remote Start On Load: estimate S1 or S2 starting output according to starting ways, and when the generating is normal, close the generating breaker.

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

Starting ways for two groups of gensets: cycle starting, master and spare starting, balanced running time starting, none.

Cycle Starting

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 starting process genset fault (fault check is overtime or input port 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 time.

Master and Spare Starting

When remote start is active, switch over to the genset with high starting priority to start. During the starting process current genset fault (genset power supply delay is overtime or input port of genset fault is active), breaker-close failure occurs, immediately stop the current working genset and start another genset, otherwise genset with high switchover priority keeps on starting until remote start is inactive.

Balanced Running Time Starting

When remote start is active, the genset with shortest accumulated running time starts. During the starting process current genset fault (genset power supply delay is overtime or input port of genset fault is active), breaker-close failure 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 groups of 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 cycle 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 "None", then genset starting signal shall not be putoutted.

For example:

Table 15 Start Example Description

Starting Mode	Starting Conditions	First Starting Result
Circular Starting	Input port is active (remote start with loading/remote start without loading).	S1 Genset Starting is outputted.
	Priority level: S1 switchover first.	

7.2.3 SCHEDULED START

When scheduled genset start function is enabled, users can set scheduled starting 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.

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

Scheduled Start 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 everyday.

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

7.2.4 SCHEDULED NON-START

When scheduled genset 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 everyday.

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

NOTE2: Scheduled non-start operation is prior to scheduled start operation.

8 PARAMETER CONFIGURATION

8.1 ILLUSTRATION

In the main interface, press **Set/Confirm** key and enter menu page, choose **Parameters Set** and press **Set/Confirm** again to enter password confirmation interface. Input the correct password, and enter parameter setting interface. Otherwise it shall exit to main interface directly. **Factory default password is** *01234*. In parameter configuration interface, press **Set/Confirm** key longer it shall exit and return to the main interface.

8.2 PARAMETER CONFIGURATION TABLE

Table 16 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	Set Master	(0~1)	0	0: S1 Master S2 Spare 1: S2 Master S1 Spare
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 Sysem	(0-3)	0	0: 3-phase 4-wire 1: 3-phase 3-wire 2: 2-phase 3-wire 3: 1-phase 2-wire
8	Rated Voltage	(0-30000)V	220	Rated voltage of AC system
9	Over Volt Enable	(0~1)	1	0: Disable 1: Enable
10	Over Volt Threshold	(0-200)%	120	Upper limit value of voltage; it is abnormal if the value has exceeded the set value.
11	Over Volt Return Threshold	(0-200)%	115	Upper limit return value of voltage; it is normal only when the value has fallen below the set value.
12	Under Volt Enable	(0~1)	1	0: Disable; 1: Enable
13	Under Volt Threshold	(0-200)%	80	Lower limit value of voltage; it is abnormal if the value has fallen below the set value.

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

No.	Item	Range	Default	Description
6	Switch Type	(0~2)	1	0: Two Breakings 1: One Breaking 2: None Breaking
7	Forced Open Action	(0-1)	0	0: Warn Alarm 1: Fault Alarm
8	Auto Trans//Restore	(0-1)	1	0: Auto Trans/Non Res 1: Auto Trans/Res.
9	Open Input Enable	(0-1)	0	0: Disable; 1: Enable If open breaker position input is not connected, please disable the setting;
10	No Open Transfer Enable	(0-1)	1	0: Disable; 1: Enable When it is enabled, the controller shall switch from circuit 1 to circuit 2 and there is not breaker open control ouput in the process.
Genset Settings				
1	Genset Start Delay	(0~9999)s	1	When the genset prepares to start, the delay starts, and when the delay is over, genset starting signal is sent out;
2	Genset Stop Delay	(0~9999)s	5	When the genset prepares to stop, the delay starts, and when the delay is over, genset starting signal is disconnected;
3	Gen-Gen Start Mode	(0~3)	0	0: Cycle starting 1: Master and spare starting 2: Balanced running time starting 3: None
4	S1 Cycle Work Time	(0~9999)min	720	The running time of S1 in the mode of circular starting;
5	S2 Cycle Work Time	(0~9999)min	720	The running time of S2 in the mode of circular starting;
6	Genset Available Time	(0~9999)s	120	The time from sending out genset starting signal to normal generation voltage; if the delay is over and the generation voltage is still not normal, then the genset fault alarm occurs;
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	Battery Overvoltage Warning shall be removed if battery voltage is higher than the set return value;
11	Battery Over Volt Warn Enable	(0~1)	0	0: Disable; 1: Enable

No.	Item	Range	Default	Description
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 Selection	(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 Bit8: September Bit9: October Bit10: November Bit11: December
5	Schedule Date	(1~31)	1	Date of monthly starting
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 Starting Time
8	Schedule Minutes	(0~59)min	0	
9	Schdule Work Time	(0~30000)min	30	The lasting time for scheduled starting running
10	Gen Inhibit Work Set	(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

No.	Item	Range	Default	Description
				Bit9: October
				Bit10: November
				Bit11: December
13	Inhibit Date	(1~31)	1	Date of monthly non-start
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
Digital Input Settings				
1	Digital Input 1	(0~20)	1	Forced Open
2	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
3	Digital Input 2	(0~20)	0	Not used
4	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	(0~36)	30	ATS Power L1
3	Digital Output 2 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
4	Digital Output 2	(0~36)	33	ATS Power N
5	Digital Output 3 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
6	Digital Output 3	(0~36)	1	Common Alarm Output
7	Digital Output 4 Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
8	Digital Output 4	(0~36)	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	(00000~65535)	01234	For entering parameter setting
4	Module Address	(1~254)	1	RS485 communication address

No.	Item	Range	Default	Description
5	COM Baud Rate	(0~3)	2	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps
6	COM USART_Parity	(0-2)	0	0: None 1: USART_Parity_Odd 2: USART_Parity_Even
7	COM Stop Bit	(0~3)	2	2 stop bits or 1 stop bit can be set;
8	Date/Time Setting			
9	Communication Set	(0-3)	0	0: Remote adjustment/control enabled 1: Remote control disabled 2: Remote adjustment disabled 3: Remote adjustment/control disabled

8.3   DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

8.3.1   INPUT PORT FUNCTION

Table 17 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 starting outputs, and when the mains is normal, close the generating breaker.
3	Remote Start Off Load	Genset starting 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 faults (used in cyclestarting).
6	S2 Genset Fault Input	Prohibit S2 genset start when S2 genset has faults (used in cycle starting).
7	Start Inhibit Input	Prohibit genset starting signal output; In auto mode, when stopping delay is over, disconnect genset starting signal output; In manual mode, if the genset has started, manual stop is needed and manual start ia inactive after the stop.
8	Breaker Trip Input	Breaker trip fault input.
9	S1 Master Input	Forcibly set S1 primary used.
10	S2 Master Input	Forcibly set S2 primary used.
11	QS1 Close Key Input	Same as QS1 breaker close key on the panel, and it is needed to select auto reset button.
12	QS2 Close Key Input	Same as QS2 breaker close key on the panel, and it is needed to select auto reset button.

No.	Item	Description
13	Open Key Input	Same as breaker open key on the panel, and it is needed to select auto reset button.
14	Man Mode Input	Forcibly set controller mode as manual mode.
15	Auto Mode Input	Forcibly set controller mode as manual mode.
16	Alarm Reset Input	Reset the current alarm.
17	Remote Ctrl Inhibit	Remote operation is inactive when it is active.
18	Reserved	
19	Reserved	
20	Reserved	

8.3.2 OUTPUT PORT FUNCTION

Table 18 Output Port Function Description

No.	Items	Description
0	Not Used	Output port is inactive.
1	Common Alarm	It includes fault alarm and warning alarm.
2	Common Fault Alarm	It includes "Transition Fault" alarm, and "Over Current" alarm.
3	Common Warn Alarm	It includes reverse phase sequence of S1, reverse phase sequence of S2, reverse phase sequence of S3, overcurrent loading and forcible open.
4	Transfer Fault	It includes "QS1 Fail to Close" alarm, "QS1 Fail to Open" alarm, "QS2 Fail to Close" alarm, "QS2 Fail to Open" alarm, "QS3 Fail to Close" alarm, "QS3 Fail to Open" alarm.
5	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.
6	Reserved	
7	Reserved	
8	Transfer Output	It outputs when the breaker close and open are shifting; when the transition is over the output stops; the shortest output time is 1s.
9	S1&S2 Abnormal Output	It outputs when S1 and S2 are both abnormal.
10	S1 Available	Output when S1 power is normal.
11	S1 Unavailable	Output when S1 power is abnormal.
12	S2 Available	Output when S2 power is normal.
13	S2 Unavailable	Output when S2 power is abnormal.
14	Auto Mode	Output when the genset is in Auto mode.
15	Manual Mode	Output when the genset is in Manual mode.
16	Genset Start Output	Control the genset starting.
17	Forced Open	Output when forcible open is active.
18	QS1 Close Control	Control the QS1 switch to close.
19	QS1 Open Control	Control the QS1 switch to open.
20	QS2 Close Control	Control the QS2 switch to close.
21	QS2 Open Control	Control the QS2 switch to open.
22	Open Control	Control QS1&QS2 breakers to open.
23	Reserved	
24	Reserved	
25	QS1 Closed Input	The close status of S1; output when the breaker is at the position of I.
26	QS2 Closed Input	The close status of S2; output when the breaker is at the position of II.
27	Opened Input	Open status; output when the breaker is at the position of 0.
28	S1 Genset Start	Control S1 genset starting, and it is used in the system type in which there are two groups of gensets and power S1 is

No.	Items	Description
		generation type.
29	S2 Genset Start	Control S2 genset starting, and it is used in the system type in which there are two groups of gensets and power S2 is generation type.
30	ATS Power L1	Power supply for ATS.
31	ATS Power L2	
32	ATS Power L3	
33	ATS Power N	
34	Remote Control Output	It is controlled by RS485 communication command.
35	Reserved	
36	Reserved	

9   HISTORICAL RECORDS

In the main screen press **Set/Confirm** key and enter menu page. Select **Historical Records**, and then press **Set/Confirm** key again, the screen will show the 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

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 while all warn event actions are warning alarms.

Table 19 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	Record when the breaker open outputs.
4.	Genset Start	Record when the genset starting signal outputs.
5.	S1 Genset Start	Record when the S1 genset starting signal outputs.
6.	S2 Genset Start	Record when the S2 genset starting signal outputs.
7.	Genset Stop	Record when the genset starting signal is disconnected and this is outputted.
8.	S1 Genset Stop	Record when the S1 genset starting signal is disconnected and this is outputted.
9.	S2 Genset Stop	Record when the S2 genset starting signal is disconnected and this is outputted.
10.	Auto Mode	Record when Auto Mode is shifted to.
11.	Manual Mode	Record when Manual Mode is shifted to.

10 SWITCH OPERATION

10.1 MANUAL OPERATION

Press **Manual/Auto** key, the auto status indicator vanishes and the controller is in the manual status.

— Press S1 Close key, S1 power close relay outputs; if the detection for S1 power close status input is active, then S1 is connected with loading;

— Press S2 Close key, S2 power close relay outputs; if the detection for S2 power close status input is active, then S2 is connected with loading;

— Press Breaker Open key, S1&S2 power open relay outputs; if the detection for S1&S2 power status input is inactive, then loading is disconnected with S1&S2 power.

NOTE3: For ATS without breaker disconnection positions, it is inactive to press breaker open key.

10.2 AUTOMATIC OPERATION

Press Manual/Auto key, and the 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 loadings according to S1&S2 status, switch priority and Auto Trans./Res. status.

Table 20 Auto Breaker Transfer Logic

Power Status	Breaker and Loading Status	S1 Master	S2 Master
S1 Normal S2 Normal Auto Trans./Res.	Breaker Status	QS1 Close QS2 Open	QS1 Open QS2 Close
	Loading Status	S1 Supply for loadings	S2 Supply for loadings
S1 Normal S2 Abnormal Auto Trans./Res.	Breaker Status	QS1 Close QS2 Open	QS1 Close QS2 Open
	Loading Status	S1 Supply for loadings	S1 Supply for loadings
S1 Abnormal S2 Normal Auto Trans./Res.	Breaker Status	QS1 Open QS2 Close	QS2 Close QS1 Open
	Loading Status	S2 Supply for loadings	S2 Supply for loadings
S1 Abnormal S2 Abnormal (Normal power suppy for ATS)	Breaker Status	QS1 Open QS2 Open	
	Loading Status	Loadings are power off.	

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

11 ATS POWER SUPPLY

The power supply for ATS is controlled by the controller smartly. Only one of S1&S2 voltages is normal can the power supply for ATS be normal and make it switch actions normally.

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 wire voltages of S1&S2 separately with the normally closed contact (Terminal 11) and the normally opened contact (Terminal 10) of the digital input port 1. The N phase of S1&S2 shall be connected separately with the normally closed contact (Terminal 14) and the normally opened contact (Terminal 13) of digital input port 2. Afterwards connect the common port of port 1 and port 2 with ATS power supply. At last power on the controller and enter parameter setting interface. Set port 1 as the corresponding wire voltage "ATS power L1", and set port 2 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 2 is also needed to change according to the settings.
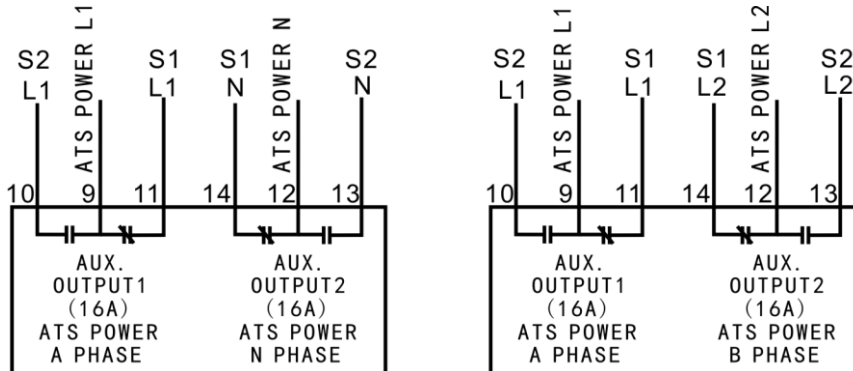

Fig.2 ATS Power Supply Wiring Drawing

12   COMMUNICATION CONFIGURATION AND CONNECTION

HATC60 Dual Power ATS controller is equipped with RS485 communication port, which allows to connect with LAN (Local Area Network) with open structure. It applies MODBUS communication protocol via softwares on PC or data colletion 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 *HATC60 Communication Protocol.*

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)

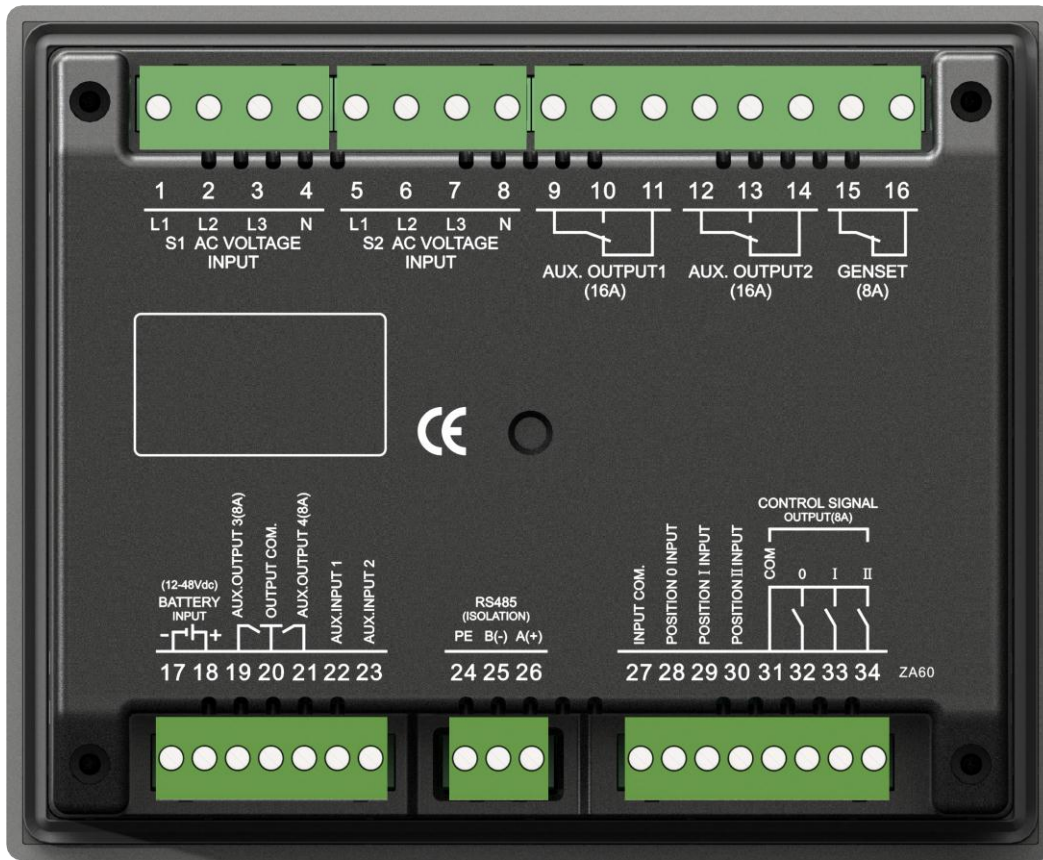Stop bit   2 bits (1 bit or 2 bits)

13 TERMINAL DEFINITION

Fig.3 Controller Rear Panel Drawing

Table 21 Input/Output Function Description

No.	Items	Description		Remark
1	L1	S1 AC System 3P4W voltage input		For single phase, only connect L1, N.
2	L2			
3	L3			
4	N			
5	L1	S2 AC System 3P4W voltage input		For single phase, only connect L1, N.
6	L2			
7	L3			
8	N			
9	AUX. OUTPUT 1	Common port	Programmable Output 1	Default: ATS power L1 Volts free; Normally Open/close output. Capacity: 250V16A
10		Normally opened		
11		Normally closed		
12	AUX. OUTPUT 2	Common port	Programmable Output 2	Default: ATS power N Volts free; Normally Open/close

No.	Items	Description		Remark	
13		Normally opened		output. Capacity: 250V16A	
14		Normally closed			
15	GENSET	Genset starting output port		Volts free; Normally Close output; Capacity: 250V8A	
16					
17	B-	Negative of DC supply		Ground-connected terminal of module	
18	B+	Positive of DC supply		DC positive input	
19	AUX. OUTPUT 3	Programmable output 3		Volts free; Normally open output; Capacity: 250V8A	
20	OUTPUT COM	19&20 COM		Common port of output port 3&4	
21	AUX. OUTPUT 4	Programmable output 4		Volts free; Normally open output; Capacity: 250V8A	
22	AUX. INPUT 1	Programmable input 1		Defaults: Forced open Active if it is connected with COM.	
23	AUX. INPUT 2	Programmable input 2		Defaults: Not used Active if it is connected with COM.	
24	PE	Ground-connected terminal of communication port			
25	RS485 B(-)	RS485 communication port		120Ω impedance matched resistance should be connected externally according to local networking.	
26	RS485 A(+)				
27	INPUTCOM.	Input common port			
28	POSITION 0 INPUT	Breaker close detection at 0 position		Active when it is connected with common port.	
29	POSITIOⅠINPUT	Breaker close detection at I position			
30	POSITIOⅡINPUT	Breaker close detection at II position			
31	COM	Common port of 32, 33, &34		Breaker close/open common port	
32	POSITION 0	Breaker close output at 0 position		Breaker open relay output	Volt free; normally open output; capacity: 250V8V
33	POSITIOⅠ	Breaker close output at I position		S1 close relay output	
34	POSITIOⅡ	Breaker close output at II position		S1 close relay output	

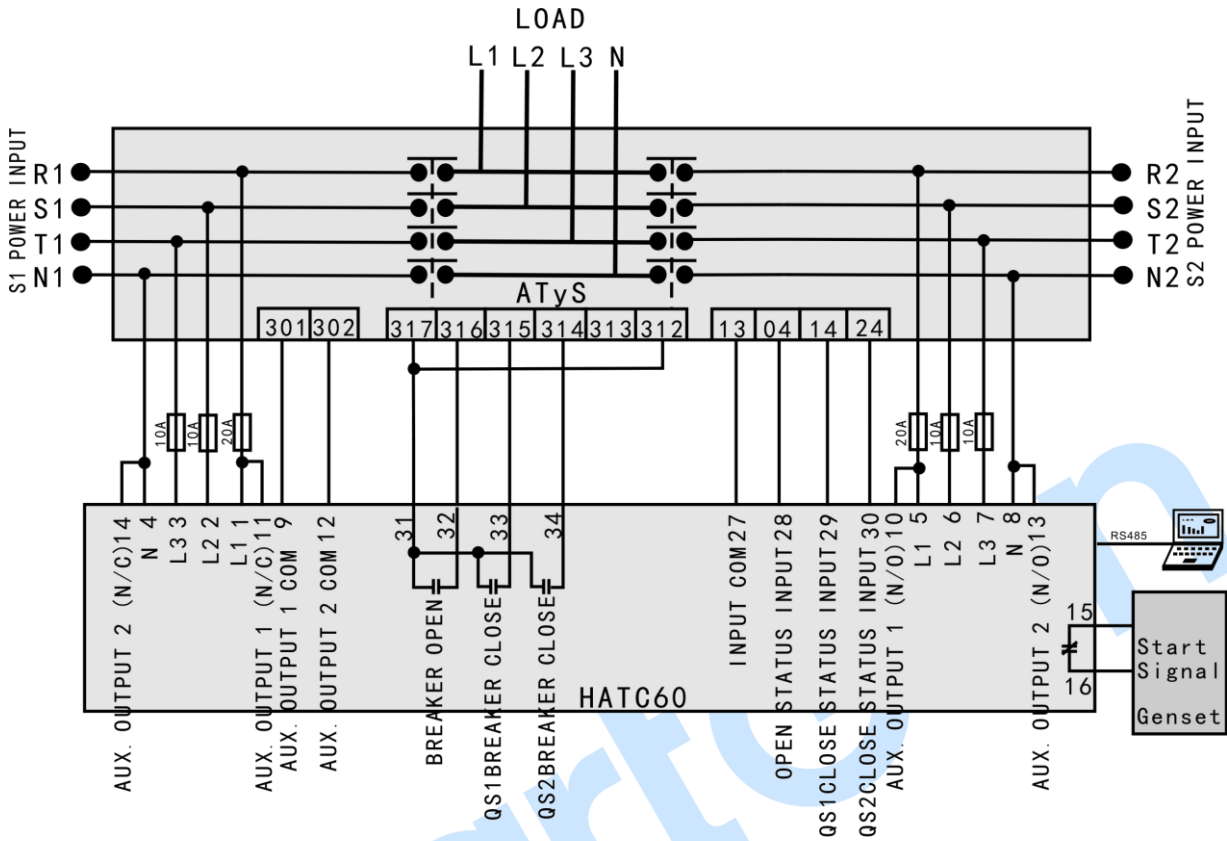## 14   TYPICAL APPLICATION DIAGRAM
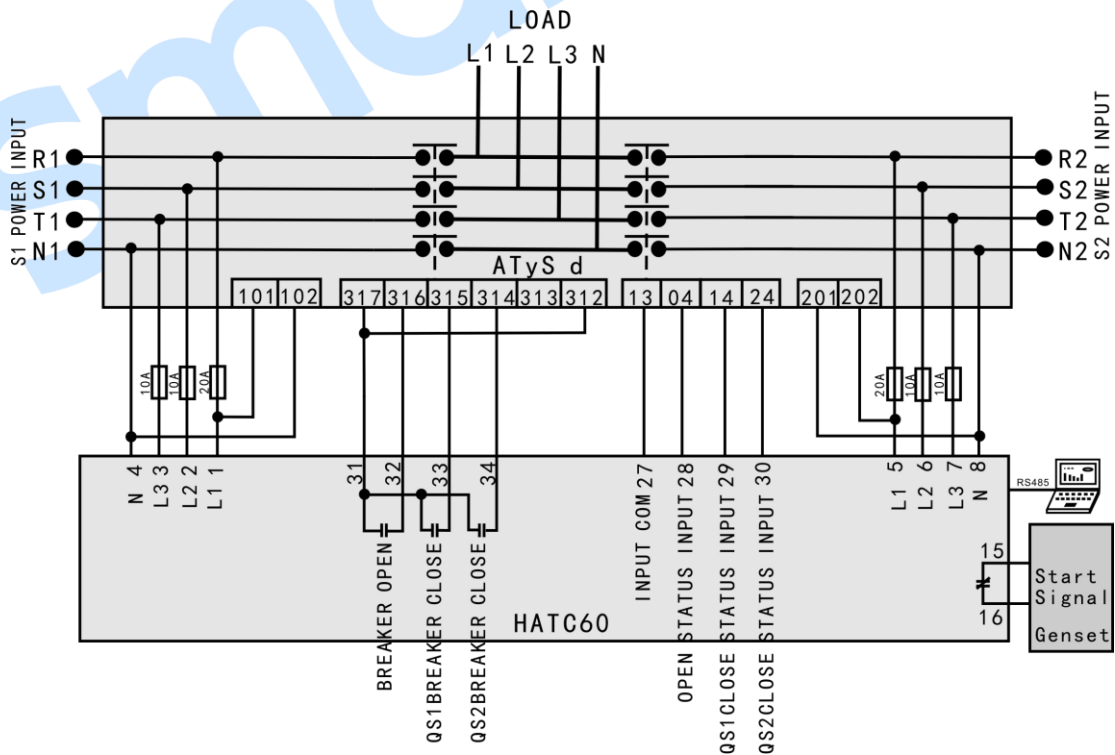

Fig.4 Breaker ATyS Application Diagram

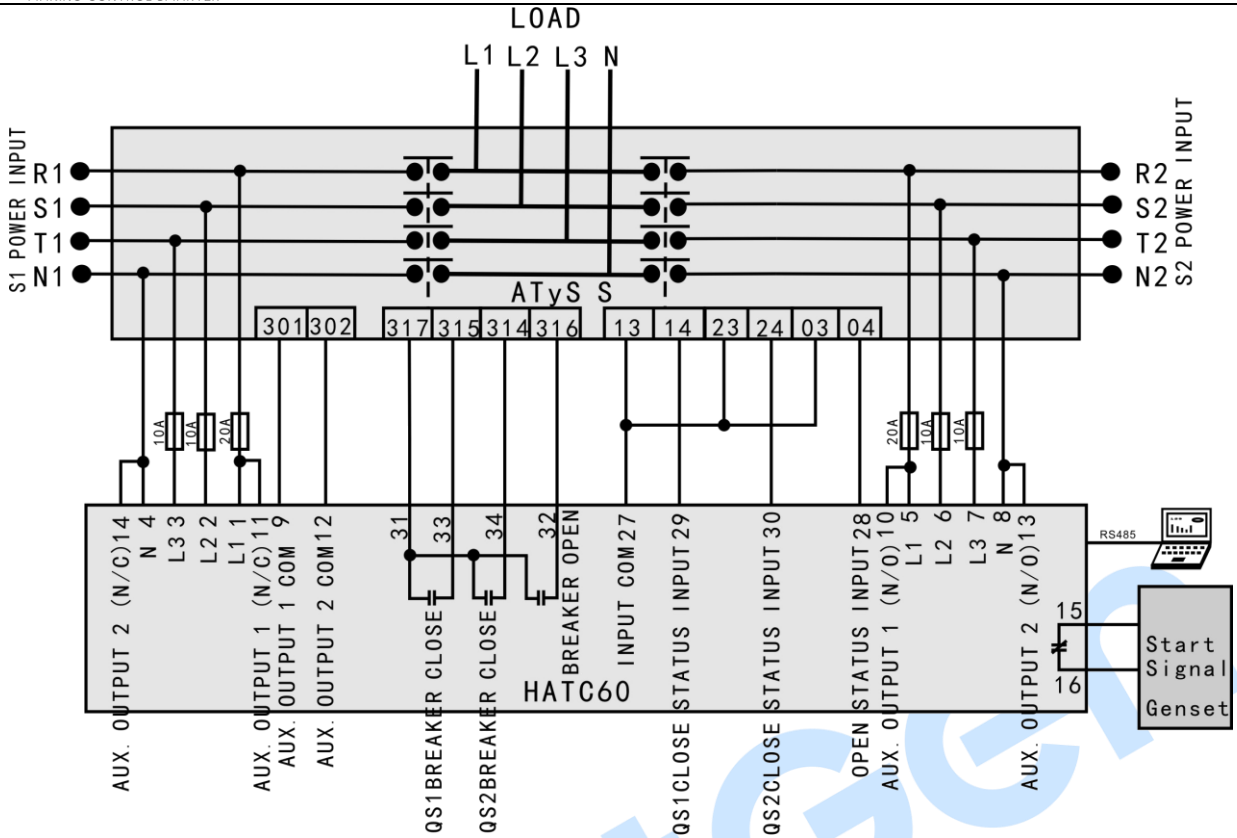**Fig.5 Breaker ATyS d Application Diagram**

Fig.6 Breaker ATyS S Application Diagram
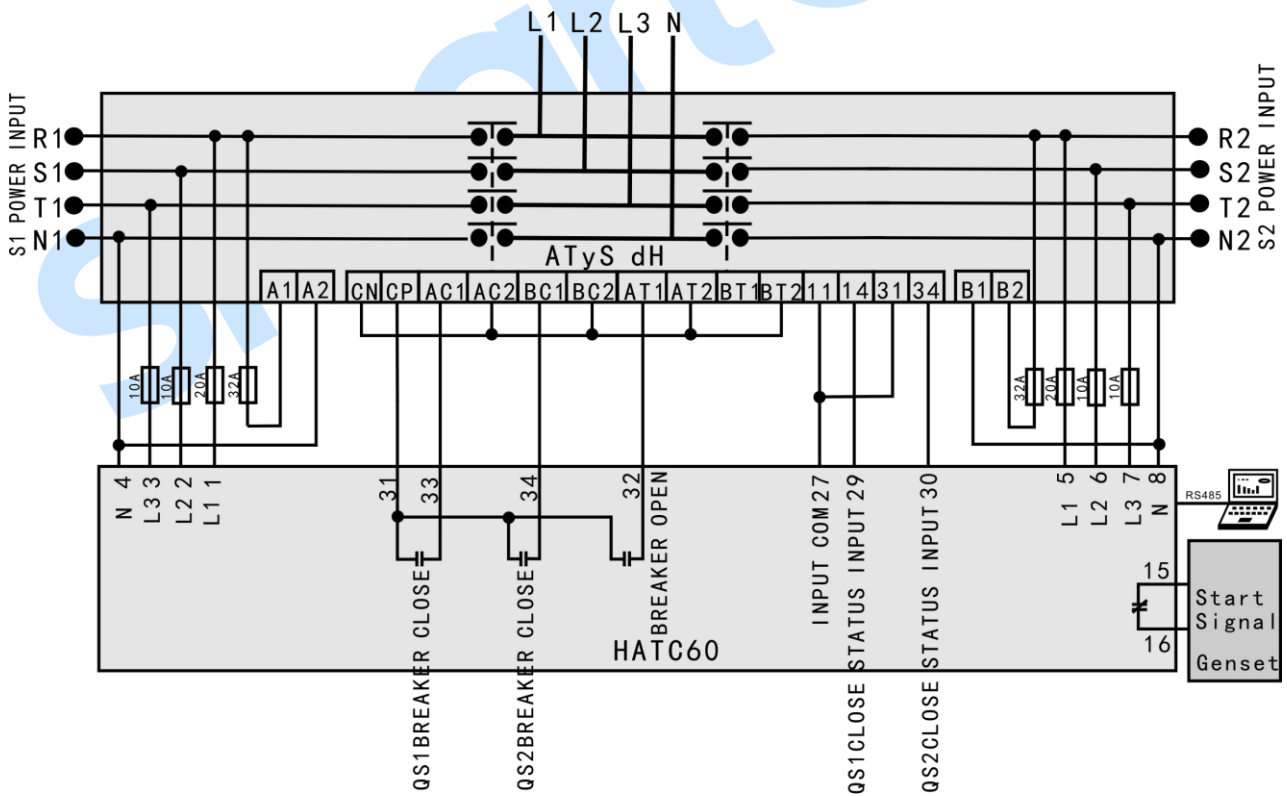

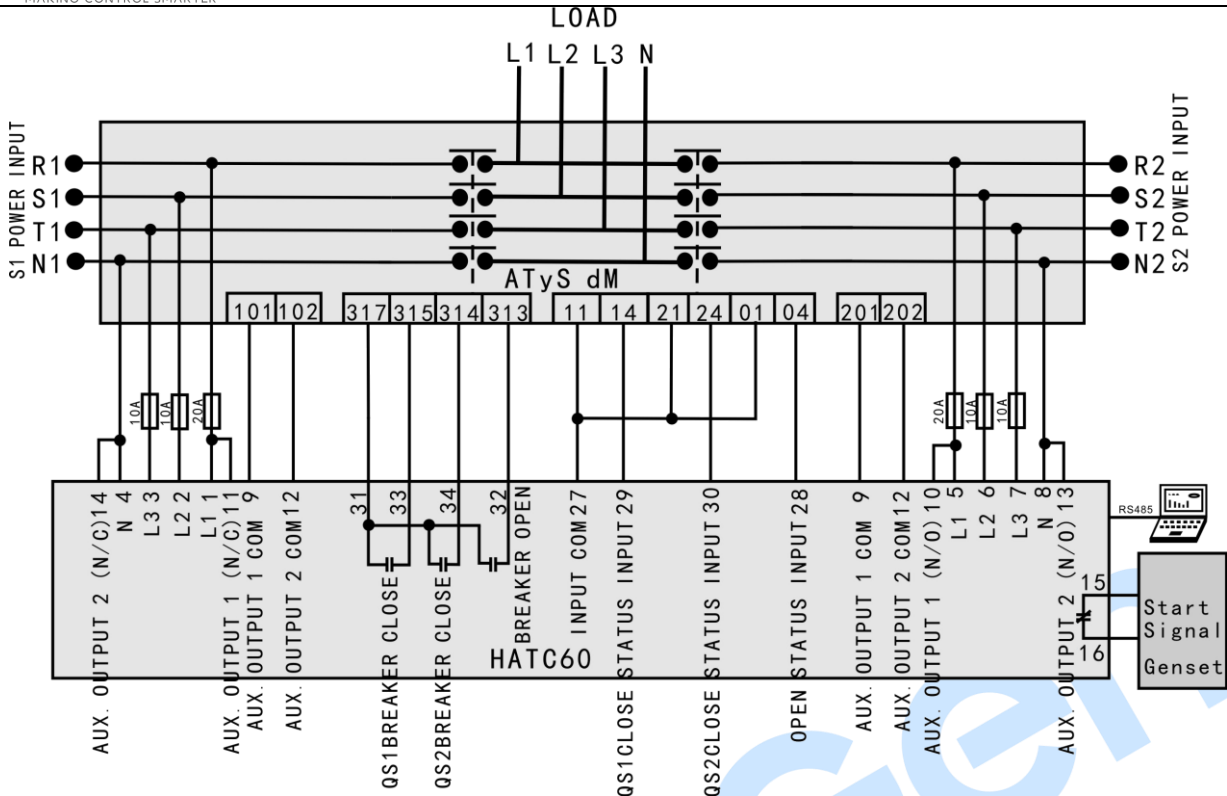**Fig.7 Breaker STyS dH Application Diagram**

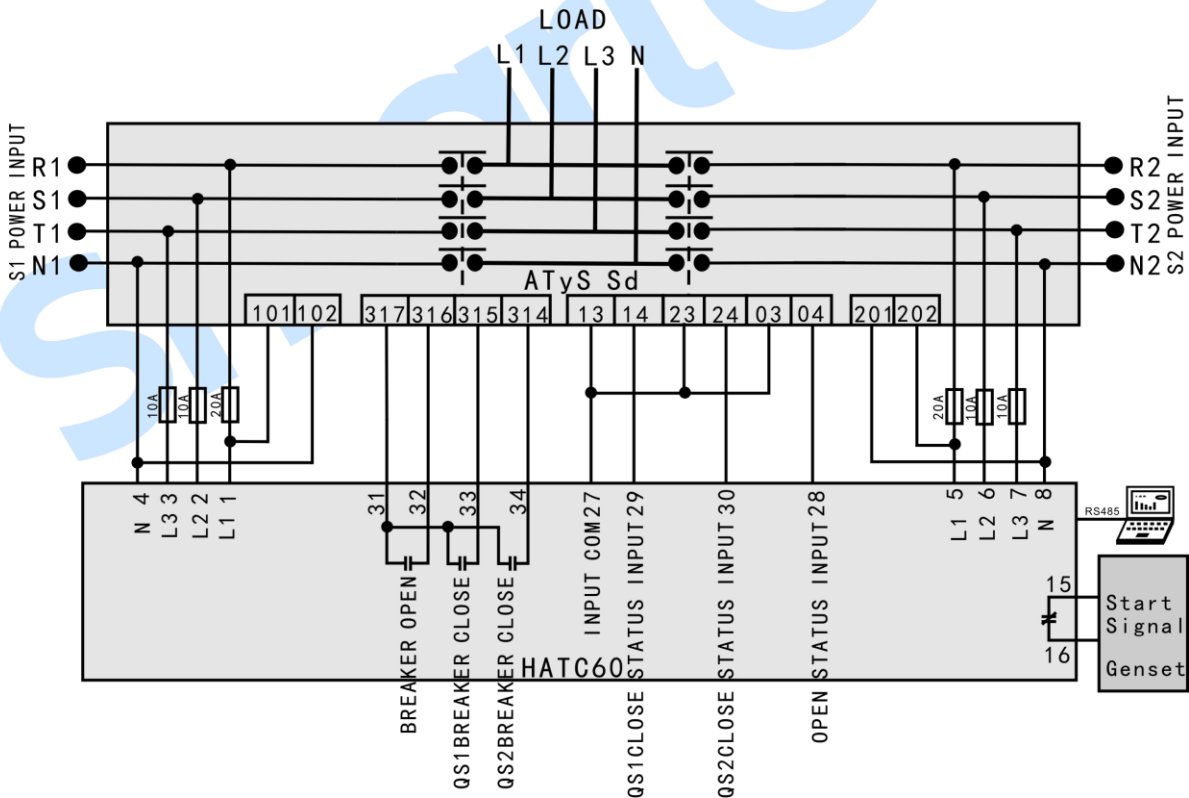**Fig.8 Breaker ATyS dM Application Diagram**

Fig.9 Breaker ATyS Sd Application Diagram

NOTE4: Above application diagrams are only examples and users shall connect the wirings according to real situations.

If Breaker Open auxiliary input is not connected with wires, the controller shall set "Breaker Open Input Disabled".

15 INSTALLATION

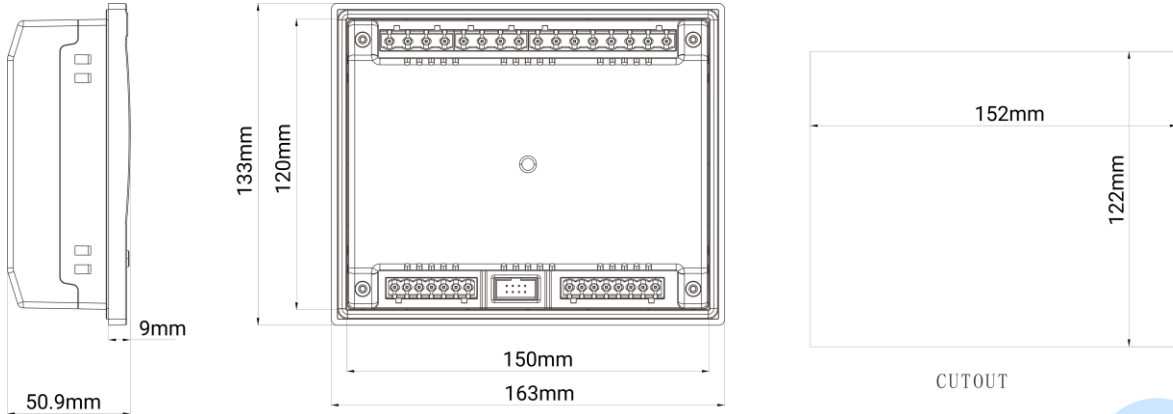The controller is panel-embedded design and they are fixed by clips in installation.

Fig.10 Overall & Cutout Dimensions

16 TROUBLE SHOOTING

Table 22 Troubleshooting

Symptoms	Possible Solutions
Controller no response with power.	Check DC voltage; Check DC fuse; Check AC Power supply.
RS485 communication 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 setting; Check function setting and output type of the output ports; Check all Start/Stop function settings.

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