

HAT560NC SERIES (HAT560NC/HAT560NBC) ATS CONTROLLER USER MANUAL



SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.



SmartGen – make your generator *smart*

SmartGen Technology Co., Ltd.

No.28 Jinsuo Road, Zhengzhou, Henan Province, China

Tel: +86-371-679888888/67981888/67992951

+86-371-67981000(overseas)

Fax: +86-371-67992952

Email: sales@smartgen.cn

Web: <u>www.smartgen.com.cn</u> www.smartgen.cn

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Date	Version	Note
2016-06-27	1.0	Original release.
2019-10-16	1.1	Add breaker application diagram.
2021-04-06	1.2	Modify the translation of "Aux. Input 2 Description" in Table 8.

Table 1 Software Version



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1 OVERVIEW

HAT560NC series ATS controller is an intelligent dual power transfer module with configurable function, automatic measurement, LCD display and digital communication. It integrates digitalization, intelligence and networking together, automating measurement and control process, reducing artificial operation mistakes and it an ideal product for dual power transfer.

HAT560NC series ATS controller is made by the microprocessor in the core, which can precisely measure 2-channel 3 phase/single phase voltage, make accurate judgment for any abnormal voltage (over volt, under volt, loss of phase, over frequency, under frequency) and output volt free discrete control signal. After full consideration of its applications on various ATS (load automatic transfer system), it can be directly used for specialized ATS, contactor ATS, air break ATS etc. It has compact structure, advanced circuits, simple wiring and high reliability, which can be widely used in electrical devices, automatic control and testing system of electric power, telecommunications, petroleum, coal, metallurgy, railways, municipal administration, intelligent building, etc.

SC



2 PERFORMANCE AND CHARACTERISTICS

- 1) System type can set as: Mains (1#) & Generator (2#), Generator (1#) & Mains (2#), Mains (1#) & Mains (2#), Generator (1#) & Generator (2#).
- 2) 132x64 LCD with backlight, optional Chinese and English display, push-button operation.
- 3) Measure and display 2-way 3 phase Voltage and Frequency:

1#	2#
Line voltage (Uab, Ubc, Uca)	Line voltage (Uab, Ubc, Uca)
Phase voltage (Ua, Ub, Uc)	Phase voltage (Ua, Ub, Uc)
Frequency Hz	Frequency Hz

- 4) Over/under voltage, loss of phase, reverse phase sequence, over/under frequency protection.
- 5) Automatic/manual mode transfer: in manual mode, it can force the switch to close or open;
- 6) All parameters can be configured on site; with two level passwords and non-professional operations can be prevented.
- 7) Load/non load mode can be configured on site to do genset commissioning operations;
- 8) Switch re-closing function and power-off re-closing function are fitted;
- 9) Close output can be configured to pulse or steady pulse output;
- 10) Applicable for ATS of one neutral position and non-position.
- 11) 2-channel N wire isolation design;
- 12) Real-time clock (RTC).
- 13) Event log function, which can record 50 items circularly.
- 14) Scheduled genset start/stop function: running for once monthly/weekly and running with load or without load can also be configured;
- 15) Can control two generators to work cyclically, and genset running time and crank rest time can be set.
- 16) Optional AC system or DC system supply.
- 17) LINK communication interface has "remote control, remote measuring, remote communication" function by the ModBus communication protocol and can remote start/stop the genset and remote control the ATS to close or open.
- 18) RS485 isolated communication interface has "remote control, remote measuring, remote communication" function by the ModBus communication protocol; by the front-end intelligent device (YD/T 1363.3-2005) protocol users can remotely measure the status of incoming line cabinet and remotely control ATS close and open;
- 19) Can check the current status of controller (digital input port, digital output port, over voltage, under voltage, over frequency, under frequency etc. abnormal circuit phenomenon);
- 20) Suitable for various wiring types (3 phase 4-wire, 3-phase 3-wires single-phase 2-wire, and 2-phase 3-wire);
- 21) Modular design, self extinguishing ABS plastic shell, pluggable terminal, built-in mounting, compact structure with easy installation;

Function			
Туре	DC Power Supply	AC Power Supply	AC Current/Power
HAT560NC	\checkmark	×	×
HAT560NBC	\checkmark	√ (LN220V)	×

Table 2 HAT560NC Series Controller Model and Function Distinguish



3 SPECIFICATION

Table 3 Technical Parameters

Items	Items Contents			
Operating Voltage	1. DC 8.0V~35.0V continuous; 2. AC170V~277V, AC power L1N1/L2N2 supply			
Devue Oeneratien			бріу	
Power Consumption	≤3W (Standby mode:	,		
	AC system	HAT560NC	HAT560NBC	
	3P4W (ph-N)	AC30V~AC360V	AC170V~AC277V	
AC Voltage Input	3P3W (ph-ph)	AC60V~AC620V	N/A	
, to tonago input	1P2W (ph-N)	AC30V~AC360V	AC170V~AC277V	
	2P3W (ph-N)	AC30V~AC360V	AC170V~AC277V	
Rated Frequency	50/60Hz			
Close Relay Output	16A AC250V Volts free output			
Auxiliary Relay Output 2	7A AC250V Volts free output			
Auxiliary Relay Output 3	16A AC250V Volts free output			
Auxiliary Relay Output 4	16A AC250V Volts free output			
Digital Input	GND connected is active.			
Communication	RS485 isolated communication interface; ModBus protocol/front-end intelligent device (YD/T 1363.3-2005) protocol.			
Case Dimensions	139mmx120mmx50mm			
Panel Cutout	130mmx111mm			
Working Conditions	Temperature: (-25~+70)°C; Humidity: (20~93)%RH			
Storage Condition	Temperature: (-25~+70)°C			
Protection Level	IP55: When waterproof gasket is installed between controller and the control panel;			
Insulation Strength	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.			
Weight	0.62kg			



4 OPERATING

4.1 OPERATION PANEL



Fig. 1 Operation Panel

4.2 KEY FUNCTION DESCRIPTION

Table 4 Key Function Description

Keys	Function	Description
	I# Manual Close	In manual mode, press and I# connects to load;
0	Open	In manual mode, press and disconnect I#/II# load;
	II# Manual Close	In manual mode, press and II# connects to load;
E E	Manual/Auto Set	Press and it can set controller to Manual/Auto mode;
	Menu/Confirm	Press and enter menu interface; press for longer and exit from current operation and return to main screen; For controller fault alarms, press for 3s, and alarms can be cleared.
\odot	Scroll Screen /Decrease	Transfer display interface; Value decrease key for adjusting parameters in parameter setting page; Press for 3s, LCD backlight shall flash for once and enter backlight always on mode; and press again for 3s, LCD backlight is off and recovers to normal display mode.



5 LCD DISPLAY

5.1 MAIN SCREEN

U1(L-L) 380 380 380V U2(L-L) 380 380 380V F1 50.0Hz F2 50.0Hz Present Status: MANUAL	This screen shows: 1#/2# line voltage (L1-L2, L2-L3, and L3-L1), frequency, controller working status, close and load information.
U1(L-N) 220 220 220V U2(L-N) 220 220 220V 2016-06-27 (1) 09:43:36 Present Status: MANUAL	This screen shows: 1#/2# 3 phase Voltage (L-N), real-time clock, controller working status, close load information.
1# Under Volt 2# Volt normal Gens Start signal Out Present Status: AUTO	First line: 1# working status Second line: 2# working status Third line: other working status Fourth line: alarm type and information. Fifth line: close and load information

Table 5 1# Status (Upper to Lower)

No.	Item	Туре	Description
1	1# Gens Alarm	Alarm	When 1# genset failure occurs, this will display.
2	1# Fail to Close	Alarm	When 1# close failure occurs, this will display.
3	1# Fail to Open	Alarm	When 1# open failure occurs, this will display.
4	1# Over Voltage	Indication	When 1# power supply voltage has exceeded the set value, this will display.
5	1# Loss of Phase	Indication	Loss of any phase of A, B and C.
6	1# Over Freq	Indication	When 1# power supply frequency is higher than the set value, this will display.
7	1# Under Freq	Indication	When 1# power supply frequency has fallen below the set value, this will display.
8	1# Under Volt	Indication	When 1# power supply voltage has fallen below the set value, this will display.
9	1# Phase Sequence Wrong	Warning	Phase sequence is not A-B-C.
10	1# Volt Normal Indication		1# power supply voltage is within the setting range.



Table 6 2# Status (Upper to Lower)

No.	Item	Туре	Description		
1	2# Gens Alarm	Alarm	When 2# genset failure occurs, this will display.		
2	2# Fail to Close	Alarm	When 2# close failure occurs, this will display.		
3	2# Fail to Open	Alarm	When 2# open failure occurs, this will display.		
4	2# Over Voltage	Indication	When 2# power supply voltage has exceeded the setting value, this will display.		
5	2# Loss of Phase	Indication	Loss of any phase of A, B and C.		
6	2# Over Freq	Indication	When 2# power supply frequency is higher than the set value, this will display.		
7	2# Under Freq	Indication	When 2# power supply frequency has fallen below the set value, this will display.		
8	2# Under Volt	Indication	When 2# power supply voltage has fallen below the set value, this will display.		
9	2# Phase Sequence Wrong	Warning	Phase sequence is not A-B-C.		
10	2# Volt Normal	Indication	2# power supply voltage is within the setting range.		

Table 7 Other Status (Upper to Lower)

No.	Item	Туре	Description
1	Trip Alarm	Alarm	Trip alarm input is active.
2	Breaking Compulsorily	Warning	Breaking compulsorily input is active.
3	Gens Start Out	Indication 📹	Start input is active.
4	Remote Start Input	Indication	This input is active when start the genset circularly.

ANOTES:

Alarm: When alarm occurs, indicators will flash and this alarm signal won't be removed until ⁽²⁾ is pressed for 3s; Warning: When warning alarm occurs, alarm indicator will flash while it will extinguish when warning alarm is inactive. That is to say, warning alarm is not latched.

5.2 MAIN MENU INTERFACE

In the main screen, press 🔅 key and enter into the main menu interface.

1. Exit2. Parameters Set3. Event Log4. Scheduled Start5. Commissionning	Press 💽 key to choose parameters (the current line was highlighted with black) and then press 🙆 key to
 4. Scheduled Start 5. Commissioning 6. Date/Time 7. Language 6. Information 	confirm, then enter into the corresponding display screen.



6 PARAMETERS CONFIGURATION

6.1 PARAMETERS CONFIGURATION INTERFACE

In the main interface, press 🔅 key, choose **2.Parameters setting** and press 🔅 again to enter parameter password confirmation interface.

Press \bigcirc and input the corresponding password 0~9; press 20 key to right move the bit, at fifth bit

press (*) key to check password. If password is correct, it enters parameter setting interface, otherwise, it exits directly. Factory default password is **00318**.

NOTE: In parameter setting page, press interface.

>Exit >Module Setting >System Setting >Timer Setting >Input Port Setting	Press $oldsymbol{\overline{O}}$ key to choose parameters (the current line was
 > System Setting > Timer Setting > Input Port Setting > Output Port Setting > Function Setting 	highlighted with black) and then press ⁽²⁾ key to confirm, and it can enter into the corresponding display screen. Select >Exit and it will return to main display.

System Setting Exit System Type Neutral Setting AC System	
System Setting >Priority >Rated Voltage >Over Voltage >Under Voltage	Press key to choose parameters (the current line was highlighted with black) and then press key to confirm, and it can enter into the corresponding display screen. Select >Exit
System Setting > Over Voltage >Under Voltage >Over Frequency >Under Frequency	and it will return to previous menu.



Under Voltage Set Value: 00080%	Press 🗩 button and it can scroll screen in parameter setting;
Return Value: 00085%	In current parameter setting screen, press 🏾 and it will enter
	into configuration status; the first digit of the current
Under Voltage Set Value: 00080% Return Value: 00085%	parameter was highlighted with black. Press $oldsymbol{\overline{S}}$ to adjust the
Return value: 0000378	set value; and press 🕸 key to right move the bit, at last bit
	press 🐵 key to confirm the set value. If the set value is in the
	range, the setting is successful; if it is out of the range, then
	the setting is invalid.

6.2 PARAMETERS TABLE

Table 8 Parameter Configuration Table

011# Volts Normal Delay(0-9999)s10The delay from #1 power abnormal to normal.021# Volts Abnormal Delay(0-9999)s5The delay from #1 power normal to abnormal.032# Volts Normal Delay(0-9999)s10The delay from #2 power abnormal to normal.042# Volts Abnormal Delay(0-9999)s5The delay from #2 power normal to abnormal.042# Volts Abnormal Delay(0-9999)s5The delay from #2 power normal to abnormal.05Close Time(0-20)s5Pulse time of close relay. When it is 0, means output constantly.06Open Time(1-20)s5Pulse time of open relay.07Transfer Interval Palay Expired(0-9999)s1Interval time from 1# switch off to 2# switch on.08Transfer Delay Expired Again Close Delay(0-20.0)s0.0The prolongation output time of the close relay after the module receives a closing signal.09Again Close Delay(0-20.0)s1.0When the breaker fail to open for the first time, then the module will close for the second time and the Again Close Delay begins, after the delay has expired, if still failed to open the second time, the module will open for the second time and the Again Open Delay begins, after the delay has expired, if still failed to close the second time, the module will open for the second time then the module will open for the second time and the Again Open Delay begins, after the delay has expired, if still failed to close the second time, the module will open for the second time then the module will open for the second time then the module wil	No.	Item	Range	Default	Description
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04 Delay (0-9999)s 5 The delay from #2 power normal to abnormal. 05 Close Time (0-20)s 5 Pulse time of close relay. When it is 0, means output constantly. 06 Open Time (1-20)s 5 Pulse time of open relay. 07 Transfer Interval (0-9999)s 1 Interval time from 1# switch off to 2# switch on. 08 Transfer Delay Expired (0-20.0)s 0.0 The prolongation output time of the close relay after the module receives a closing signal. 09 Again Close Delay (0-20.0)s 1.0 When the breaker fail to open for the first time, then the module will close for the second time and the Again Close Delay begins, after the delay has expired, if still failed to open the second time, then the module will send out fail to open alarm. 10 Again Open Delay (0-20.0)s 1.0 When the breaker fail to close for the first time, then the module will open for the second time and the Again Open Delay begins, after the delay has expired, if still failed to close the second time and the Again Open Delay begins, after the delay has expired, if still failed to close the second time, then the module will open for the second time and the Again Open Delay begins, after the delay has expired, if still failed to close the second time, then the module will send out fail to close alarm. 11 Gen Start Delay (0-9999)s 1 When voltage is abnorm	03	2# Volts Normal Delay	(0-9999)s	10 🔰	The delay from #2 power abnormal to normal.
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12Gen Stop Delay(0-9999)s5After the genset is start, when voltage is	11	Gen Start Delay	(0-9999)s		after the start delay has expired, start signal will
	12	Gen Stop Delay	(0-9999)s	5	After the genset is start, when voltage is

HAT560NC Series ATS Controller User Manual



Image: has expired, stop signal will be initiated.13Cycle Running Time(1-1440)min720Gens cycle start running time.14Cycle Stop Time(1-1440)min720Gens cycle stop time, that is to say it is to cycle start running time of the other genset.15Genset Supply Delay(0-9999)s60Failure identification time during genset cystart running.16Rated Voltage(100-600)V230AC system rated voltage.17Over Voltage(100-150)%120Upper limit value of voltage; it is abnormal if to value has exceeded the set value.	No.	Item	Range	Default	Description
13 Cycle Running Time (1-1440)min 720 Gens cycle start running time. 14 Cycle Stop Time (1-1440)min 720 Gens cycle start running time of the other genset. 15 Genset Supply Delay (0-9999)s 60 Failure identification time during genset cy start running. 16 Rated Voltage (100-600)V 230 AC system rated voltage. 17 Over Voltage (100-150)% 120 Upper limit value of voltage; it is abnormal if 1 value has exceeded the set value. 18 Over Voltage Return (100-150)% 115 Upper limit return value of voltage; it is norm only when the value has fallen below the set value. 20 Under voltage Return (50-100)% 80 Lower limit return value of voltage; it is abnormal if 1 value has fallen below the set value. 21 Over Frequency (0.0-75.0)Hz 55.0 Upper limit return value of voltage; it is abnorma the value has exceeded the set value. 22 Over Frequency Return (0.0-75.0)Hz 55.0 Upper limit return value of frequency; it is abnorma the value has fallen below the set value. 23 Under Frequency (0.0-75.0)Hz 45.0 Lower limit return value of frequency; it is abnorma only when the value has fallen below tis set value. </td <td></td> <td></td> <td></td> <td></td> <td>normal, stop delay begins, after the stop delay</td>					normal, stop delay begins, after the stop delay
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21Over Frequency(0.0-75.0)Hz55.0the value has exceeded the set value.22Over Frequency Return(0.0-75.0)Hz52.0Upper limit return value of frequency; it normal only when the value has fallen below the set value.23Under Frequency(0.0-75.0)Hz45.0Lower limit value of frequency; it is abnormative value has fallen below the set value.24Under Frequency(0.0-75.0)Hz48.0Lower limit return value of frequency; it normal only when the value has fallen below the set value.25Module Address(1-254)1Communication address26Password00318For entering advanced parameters setting.27System Type(0-3)01.1# Gens 2# Mains 3.1# Gens 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)11) One Breaking;					
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22Over Frequency Return(0.0-75.0)Hz52.0normal only when the value has fallen below to set value.23Under Frequency(0.0-75.0)Hz45.0Lower limit value of frequency; it is abnormative value has fallen below the set value.24Under Frequency Return(0.0-75.0)Hz48.0Lower limit return value of frequency; it normal only when the value has fallen below the set value.25Module Address(1-254)1Communication address26Password00318For entering advanced parameters setting.27System Type(0-3)01.1# Gens 2# Mains 3.1# Gens 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)11) One Breaking;					
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23Under Frequency(0.0-75.0)Hz45.0the value has fallen below the set value.24Under Frequency Return(0.0-75.0)Hz48.0Lower limit return value of frequency; it normal only when the value has fallen below the set value.25Module Address(1-254)1Communication address26Password00318For entering advanced parameters setting.27System Type(0-3)01.1# Gens 2# Mains 3.1# Gens 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)11) One Breaking; 1) One Breaking;					
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24Under ReturnFrequency (0.0-75.0)Hz(0.0-75.0)Hz48.0normal only when the value has fallen below to set value.25Module Address(1-254)1Communication address26Password00318For entering advanced parameters setting.26Password00318For entering advanced parameters setting.27System Type(0-3)01.1# Gens 2# Mains 3.1# Gens 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)11) One Breaking; 1) One Breaking;					
Returnset value.25Module Address(1-254)1Communication address26Password00318For entering advanced parameters setting.27System Type(0-3)0 $\begin{array}{c} 0.1\#$ Mains 2# Gens 1.1# Gens 2# Mains 2.1# Mains 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)11) One Breaking; 1) One Breaking;	24	Under Frequency	(0,0-75,0),	10 0	
25Module Address(1-254)1Communication address26Password00318For entering advanced parameters setting.27System Type(0-3)01.1# Gens 2# Gens 1.1# Gens 2# Mains 3.1# Gens 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)10) Two Breaking; 1) One Breaking;	24	Return	(0.0-7 3.0)112	40.0	-
26Password00318For entering advanced parameters setting.27System Type(0-3)00.1# Mains 2# Gens 1.1# Gens 2# Mains 2.1# Mains 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)10) Two Breaking; 1) One Breaking;	25	Module Address	(1-254)	1	
27 System Type (0-3) 0 0.1# Mains 2# Gens 1.1# Gens 2# Mains 2.1# Mains 2# Mains 3.1# Gens 2# Gens 28 Neutral Setting (0-2) 1 0) Two Breaking; 1) One Breaking;			(1204)	-	
27System Type(0-3)01.1# Gens 2# Mains 2.1# Mains 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)10) Two Breaking; 1) One Breaking;	20			00010	· · · ·
27System Type(0-3)02.1# Mains 2# Mains 3.1# Gens 2# Gens28Neutral Setting(0-2)10) Two Breaking; 1) One Breaking;					
28Neutral Setting(0-2)13.1# Gens 2# Gens0) Two Breaking; 1) One Breaking;	27	System Type	(0-3)	0	
28Neutral Setting(0-2)11) One Breaking;					
28Neutral Setting(0-2)11) One Breaking;					
	28	Neutral Setting	(0-2)	1	,
		-	```	•	
0: 3P4W; 1: 3P3W;		Connection Setting	(0-3)		
29Connection Setting(0-3)002: Single Phase; 3: 2P3W.	29			0	
0. 1# Priority;		Priority Select			
	30		(0-2)	0	
2. NO Priority	30				
31 Aux. Output 2 (0-31) 12 Not used	30				2. NO Priority
		Aux. Output 2	(0-31)	12	
		Aux. Output 2	(0-31)	12	



No.	Item	Range	Default	Description
				Fail of Transfer
				Warning output
				Alarm output(delay)
				1# Normal volt
				1# Abnormal volt
				2# Normal volt
				2# Abnormal volt
				Reserved
				Auto status output
				Manual status output
				Gens Start Output(N/O)
				Gens Start Output(N/C)
				1# Close output
				1# Open output
				2# Close output
33	Aux. Output 4	(0-31)	27	2# Open output
				Common Alarm output
				Timing Commissioning
				1# Close Status Output
				2# Close Status Output
				1# Gen Start Output(N/O)
				2# Gen Start Output(N/O)
				ATS Power A Phase
				ATS Power B Phase
				ATS Power C Phase
				ATS Power N Phase
				1# 2# Abnormal Volt
				Reserved
				Reserved
				Reserved
34	Aux. Input 1	(0-13)	1	00.Not used
				01.Breaking compulsorily
				02.Test off-load
				03.Test on-load
				04. Test Lamp
				05. 1# Gens Alarm
				06. 2# Gens Alarm
35	Aux. Input 2	(0-13)	0	07. Remote start
				08. Trip alarm
				09. 1# Priority
				10. 2# Priority
				11. Reserved
				12. Reserved
				13. Reserved



6.3 INPUT/OUTPUT FUNCTION DESCRIPTION

Table 9 Input Port Function Description

ltem	Description
0 Not used	Invalid
1 Breaking compulsorily	Applicable only for ATS with breakings; when it is active, ATS will
T Breaking compulsionly	transfer to 0 no matter in manual or auto mode;
2 Test off-load	Genset start is outputted and when Mains is normal, Gen doesn't close;
3 Test On-Load	Genset start is outputted and When Mains is normal, Gen closes;
4 Test Jamp	LED indicators on the panel are all on; LCD backlight is on; LCD screen
4 Test lamp	is dark;
5 1# Gens Alarm	1# genset fault occurs and it prohibits to start 1# genset (used for
5 T# Gens Alann	cyclical start);
6 2# Gens Alarm	2# genset fault occurs and it prohibits to start 2# genset (used for
	cyclical start);
7 Remote start	It is a must for genset start cyclically;
8 Trip alarm	
9 1#Priority	
10 2#Priority	
11 Reserved	
12 Reserved	
13 Reserved	

nO



Table 10 Output Port Function Description				
Item	Description			
0 Not Used	Invalid			
1 Critical Failure	It includes switch transfer failure;			
2 Fail of Transfer	It includes 1# close failure, 1# open failure, 2# close failure, 2# open failure;			
3 Warning Alarm Output	rm Output General warnings include 1# phase sequence wrong, 2# phase sequence wrong, and force to open;			
4 Alarm Output (delay)	It outputs for 60s continuously for critical fault alarms;			
5 1# Volts Normal	It will output when #1 voltage is normal.			
6 1# Volts Abnormal	It will output when #1 voltage is abnormal.			
7 2# Volts Normal	It will output when #2 voltages is normal.			
8 2# Volts Abnormal	It will output when #2 voltages is abnormal.			
9 Reserved				
10 Auto Status Output	It will output in auto mode.			
11 Manual Status Output	It will output in manual mode.			
12Gens Start Output (N/O)	It outputs when genset starts (Relay closed).			
13Gens Start Output(N/C)	It outputs when genset starts (Relay opened).			
14 1# Close Output	1# switch close signal output.			
151# Open Output	1# switch open signal output as one breaking			
16 2# Close Output	2# switch close sig <mark>nal out</mark> put.			
17 2# Open Output	2# switch open signal output.			
18 Common Alarm Output	It includes critical failure alarm and warning alarm.			
19 Timing Commissioning	Timing test function starts;			
20 1# Close Status Output	#1 switch close status output.			
21 2# Close Status Output	#2 switch close status output.			
22 1#Gen Start Output (N/O)	It issues 1# oil engine start signal;			
23 2#Gen Start Output (N/O)	It issues 2# oil engine start signal;			
24 ATS Power A Phase				
25 ATS Power B Phase				
26 ATS Power C Phase	ATS power supply.			
27 ATS Power N Phase				
28 1#2# Volts Abnormal	It outputs when 1# voltage and 2# voltage are abnormal.			
29 Reserved	-			
30 Reserved				
31 Reserved				



7 EVENT LOG

In the main screen, press (a) key and select **3 Event log**, and then press (b) key again to confirm, the screen will show the event log information below:

1# Close	01/50
1# Volt normal	
2# Under Volt	
2016-06-27 08:43:14	
Long pressing 🕸 to ex	cit

Press \bigcirc key to select the corresponding record, and press 1 key to enter into detailed information interface.

In the detailed information interface, p	nress 🔍	key and it can	display the record	d information circularly
in the detailed information interface, p		Rey and it can	uspidy the recon	a information circularly,

which includes 1#/2# volt status, specific voltage, frequency and time and date. Press 🤷 and it can

exit the current interface, while press $^{\textcircled{3}}$ for a long time and it can return to main screen.

Event log information includes: event log type, 1# power supply, 2# power supply, 1# 3-phase voltage, 2# 3-phase voltage, 1# frequency, 2# frequency and the record date and time.

# 1 Close 01/50	#1 Close 01/50	#1 Close 0 ⁴
1# Volt normal	U1 L-N 220 220 220V	F1 50.0Hz F2 50
2# Under Volt	U2 L-N 0 100 220V	2016-06-27 08:43
2016-06-27 08:43:14	2016-06-27 08:43:14	Long pressing 🧶 to
Long pressing 🤷 to exit	Long pressing 🍥 to exit	

Table 11 Event Log Types

No.	Туре	Description
1	1# Close	1# close signal output
2	2# Close	2# close signal output
3	1# Fail to Close	1# power supply cannot connect to load.
4	2# Fail to Close	2# power supply cannot connect to load.
5	1# Fail to Open	1# power supply cannot disconnect to load.
6	2# Fail to Open	2# power supply cannot disconnect to load.
7	Trip alarm	The input is active.
8	Breaking compulsorily	Breaking compulsorily input is active.



8 TIMING START

In the main screen, press (*) key and select **4 Time start**, and then pressing (*) key to confirm, the screen will show the timing start interface below:



Time start cycle: includes inhibit start; start the genset single time, weekly or monthly.

Load set: start the generator with load or without load.

Start time: the date and time of the genset starting.

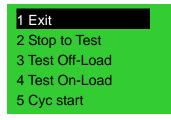
Duration time: generator continuous run time can be set to the duration of maximum time for 99 hours and 59 minutes.

SC



9 COMMISSIONING

In the main screen, press () key and select **5 Commissioning**, and then press () key to confirm, the screen will show the commissioning interface as below:



Press 🗩 key to select corresponding function, and press 🌞 key to confirm.

TEST OFF-LOAD: It will send out a start signal immediately. After gen voltage is normal, if mains voltage is normal, the ATS will not act. If mains voltage is abnormal, ATS will transfer the load to generator. When mains volt recovers to normal, the ATS will transfer the load to mains. At this time the start generator signal still continuously outputs.

TEST ON-LOAD: It will send out a start generator signal immediately. After gen voltage is normal, the ATS will transfer the load to mains immediately regardless the mains is normal or not.

STOP TO TEST: When Commissioning has been chosen, and if this item is selected, genset start signal will disconnect immediately and it will stop TEST OFF-LOAD or TEST ON-LOAD operation.

CYCLE START: When this is chosen, oil engine start signal will output circularly according to master status. Circular output time can be set by the users. If oil engine fault occurs, it won't send start signal to the oil engine. If it transfers to manual mode, it will keep current status and stop circular start time counting.

Requirements needed:

1. In automatic mode.

2. Set output to 1# Oil Engine start output (N/O Output) and 2 # Oil Engine start output (N/O Output).

- 3. Set input to remote start input.
- 4. <Cycle running time> and <Cycle stop time> should be programmed.
- 5. Set the system type as 1# Gens & 2# Gens.
- 6. Set proper < Wait Running > time, and set default delay to 60s.

ATS will not transfer automatically except for operation manually by pressing key on the front panel.



10 DATE AND TIME SETTING

In the main screen, press () key and select **6 Date & Time**, and then press () key again to confirm, the screen will show the Date & Time Set interface as below:

Date & Time

2016.06.07(4) 15:38:41

Press \bigcirc to input the corresponding number 0~9; press $\textcircled{1}{2}$ key to right move the bit, at the last bit press $\textcircled{1}{2}$ key to update the date and time.

11 LANGUAGE SETTING

In the main screen, press (2) key and select **7 Language**, press (2) again to enter into language setting interface as below:

Language 0. Simplified Chinese

Press 💽 to select the language and press 🎕 to confirm the setting. Language option: Simplified Chinese/ English.

12 CONTROLLER INFORMATION

In the main screen, press () key and select **8 Controller information**, and then press () key again to enter controller information interface as below:

Information One NEUTRAL Position 1# Priority Ver1.5 2016-01-05

Display contents include current breaking positions setting, transfer priority choice and controller version and date. Press and enter users customizable information page. Longer press key and it will exit and return to main screen.



13 ATS OPERATION

13.1 MANUAL OPERATION

Press and manual mode indicator is on, which means controller is in manual mode.

1) Press \mathbf{U} , 1# close relay outputs immediately, if 1# close input is active, the 1# power supply connects to load.

2) Press \mathbf{U} , 2# close relay outputs immediately, if 2# close input is active, the 2# power supply connects to load.

3) Press \bigcirc , 1#/2# open relay outputs immediately, if 1#/2# close input is inactive, the 1#/2# power supply disconnects with load.

ANOTE: For the ATS without neutral position, it is invalid to press **O** key.

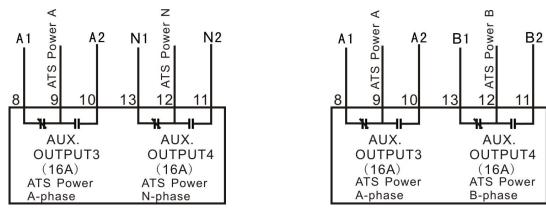
13.2 AUTOMATIC OPERATION

Auto mode indicator is on, which means controller is in auto mode. Controller can transfer to 1# load or 2# load automatically.

13.3 ATS POWER SUPPLY

ATS power supply is provided by the controller smartly. Only if there is one channel normal voltage can it ensure normal ATS power, and make it work normally.

Users shall choose power supply voltage (phase or line) based on ATS type. If it is phase voltage power, connect the phase voltage (A phase) of 1# and 2# with N/C Terminal 8 and N/O Terminal 10 of programmable port 3, connect N phase of 1# and 2# with N/C Terminal 13 and N/O Terminal 11 of programmable port 4, then connect the COM of programmable port 3 and programmable 4 with ATS power supply. At last power on the controller, and enter parameter configuration page; set port 3 to corresponding phase voltage "ATS power A phase", and set port 4 to "ATS power N phase". If ATS is supplied by line voltage, the set method is as above. You only need to change N phase to phase voltage connection and for port 4 you also need to change according to settings.







ANOTE: Normally Close (N/C) input voltage must come from 1# voltage.



14 FAULT ALARM

No.	Items	Туре	Description		
1	1# Gens Alarm	Alarm	1# genset failure occurs.		
2	1# Fail to Close	Alarm	1# close failure occurs.		
3	1# Fail to Open	Alarm	When 1# open failure occurs.		
4	2# Gens Alarm	Alarm	2# genset failure occurs.		
5	2# Fail to Close	Alarm	2# close failure occurs.		
6	2# Fail to Open	Alarm	When 2# open failure occurs.		
7	Trip alarm	Alarm	Trip alarm input is active.		

Table 12 Critical Failure

Table 13 Warning Types

No.	Items	Туре	Description
1	1# Phase Sequence Wrong	Warning	1# phase sequence is not A-B-C.
2	2# Phase Sequence Wrong	Warning	2# phase sequence is not A-B-C.
3	Breaking compulsorily	Warning	Breaking compulsorily input is active.

15 COMMUNICATION CONFIGURATION

HAT560NC series controller has RS485 interface, which can provide a simple and practical dual power transfer management method for factories, telecom, industrial and civil buildings by using ModBus protocol/front-end intelligent device (YD/T 1363.3 - 2005) protocol via PC or software running on data collecting system, and can realize "remote control, remote measuring, remote communication" functions.

Communication Parameters

Module address 1 (range: 1-254, User-set) Baud rate 9600 bps Data bit 8bit

Parity bit None 2-bit

Stop bit

ANOTE: Select DC power supply please in order to keep the continuity of communication.



16 CONNECTION

5

1 2 3 4 5 6 B- B+ €	JT2 OUTPUT3 OUTPUT4	3 14 15 16 17 1# CLOSE OUTPUT (16A) 4 CLOSE 0 UTPUT (16A) 4 CLOSE 0 UTPUT (16A)
		Base
1#AC VOLTAGE INPUT A1 B1 C1 N1 1 1 18 19 20 21	Com LINE TERMENT FECLOSE INPUT FECLOSE INFUT FECLOSE INFUT F	2#AC VOLTAGE INPUT A2 B2 C2 N2 A2 B2 C2 N2 A2 AC N2 A2 B2 C2 N2 A2 AC N2 A2 AC N2 A2 AC N2 A2 AC N2 A2 AC N2 A

Fig. 2 HAT560NC/HAT560NBC Back Panel



No.FunctionsDescriptionRemark1B-Connected with negative of starter battery.DC input B-2B+Connected with positive of starter battery for genset start;DC (8-35)V, Power supply for controller; battery for genset start;3RS485 A+RS485 Communication PortDC (8-35)V, Power supply for controller; battery for genset start;4RS485 B-N/CDefault: 0115Aux. output 2N/CDefault: 0116Aux. output 3COMDefault: ATS Power ARelay contact output; volts free; rated 16A10N/CDefault: ATS Power ARelay contact output; volts free; rated 16A11Aux. output 4N/ODefault: ATS Power ARelay contact output; volts free; rated 16A12Aux. output 4N/CDefault: ATS Power NRelay contact output; volts free; rated 16A131# Close COMRelay contact output; volts free; rated 16AIf A141# Close PouputRelay contact output; volts free; rated 16AIf A15Output1# AC System 3P4W voltage input.For single phase, only connect A1, N121N1Detect the 1# ATS close status. Auxiliary contact input.Ground connected is active.232# Close InputDetect the 2# ATS close status. Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMOutput <th></th> <th colspan="9">Table 14 Terminal Description</th>		Table 14 Terminal Description								
1B-starter battery.DC input B-2B+Connected with positive of starter battery for genset start;DC (8-35)V, Power supply for controller; battery for controller;3RS485 A+ 4RS485 B-N/CDefault: Oli Engine StartRelay contact output; volts free; rated 7A5N/CDefault: Oli COMEngine StartRelay contact output; volts free; rated 7A7N/CDefault: ATS Power ARelay contact output; volts free; rated 16A10N/CDefault: ATS Power NRelay contact output; volts free; rated 16A11N/CDefault: ATS Power NRelay contact output; volts free; rated 16A11N/CPower NRelay contact output; volts free; rated 16A12Aux. output 4Relay contact output; volts free; rated 16A131#Close OutputRelay contact output; volts free; rated 16A141#Close OutputRelay contact output; volts free; rated 16A15OutputRelay contact output; volts free; rated 16A162#Close Relay contact output; volts free; rated 16A17OutputDetect the 1# ATS close status. Auxiliary contact input.18A1A119B1Detect the 2# ATS close status. Auxiliary contact input.21I# Close InputDetect the 2# ATS close status. Auxiliary contact input.221# Close InputDetect the 2# ATS close status. Auxiliary contact input.232# Close InputDetect the 2#	No.	Functions	Description	า	Remark					
1Starter battery.Connected with positive of starter battery for genset start;DC (8-35)V, Power supply for controller; DC (8-35)V, Power supply for controller;3RS485 A+ RS485 B- Aux. output 2RS485 Communication PortDC (8-35)V, Power supply for controller; DC (8-35)V, Power supply for controller;5Aux. output 2N/C COM N/ODefault: 0il Output (N/O)Relay contact output; volts free; rated 7A7N/C VODefault: ATS Power ARelay contact output; volts free; rated 16A10N/O COM N/ODefault: ATS Power ARelay contact output; volts free; rated 16A11 12 13Aux. output 4N/O COM N/ODefault: ATS Power ARelay contact output; volts free; rated 16A11 14 15 Output1# Close Relay contact output; volts free; rated 16ARelay contact output; volts free; rated 16A16 17 10 101# AC System 3P4W volts free; Aux. Input 1Relay contact output; volts free; rated 16A18 19 19 19 10Detect the 1# ATS close status. Aux. Input 2Detect the 1# ATS close status. Aux. Input 2Ground connected is active.21 22 241# Close InputDetect the 2# ATS close status. Aux. Input 2Ground connected is active.23 24 24 24Que offined.Ground connected is active.24 24 24 24Ground connected is active.Ground connected is active.25 24 25 24Que offined.Ground connected is active.25 24 24Que offined.Ground connected is active.<	1	B-	Connected with negative of		DC input B-					
2B+ battery for genset start;DC (8-35)V, Power supply for controller;3RS485 A+ RS485 B-Rs485 Communication PortDefault: OII Engine StartRelay contact output; volts free; rated 7A Relay contact output; volts free; rated 7A5 $Aux. output 2$ N/C Default: OII ROMDefault: OII Engine StartRelay contact output; volts free; rated 7A Relay contact output; volts free; rated 7A 16A9 $Aux. output 3$ N/C Default: ATS Power ARelay contact output; volts free; rated 16A10 N/C N/CDefault: ATS Power NRelay contact output; volts free; rated 16A11 12 13 N/C N/CDefault: ATS Power NRelay contact output; volts free; rated 16A14 14 14 0utput1# Close OutputRelay contact output; volts free; rated 16A16 24 0utputRelay contact output; volts free; Power NRelay contact output; volts free; rated 16A18 19 19 19 19 19 19 20C1Defact the 1# ATS close status: Auxilary contact input.Ground connected is active.24 24 24 24 24 24 24Defact the 2# ATS close status: Auxilary contact input.Ground connected is active.25 24 24 24User-defined.Ground connected is active.26 24 24 25COM 24 24 24 24Que for PC communication/For single phase, only connect A2, N2 For single phase, only connect A2, N2 For single phase, only connect A2, N2 For single phase, only connect A2, N227 24 25Aux Aux	Ľ	5	starter battery.							
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4RS485 B-RS485 Communication Port5Aux. output 2N/CDefault: Oil Engine Start N/ORelay contact output; volts free; rated 7A7N/CDefault: ATS Power ARelay contact output; volts free; rated 16A10N/CDefault: ATS Power ARelay contact output; volts free; rated 16A11N/CDefault: ATS Power ARelay contact output; volts free; rated 16A12Aux. output 4N/CDefault: ATS Power ARelay contact output; volts free; rated 16A1314Close OutputRelay contact output; volts free; rated 16ARelay contact output; volts free; rated 16A1414Close OutputRelay contact output; volts free; rated 16ARelay contact output; volts free; rated 16A162#Close AtaRelay contact output; volts free; rated 16ARelay contact output; volts free; rated 16A17Output1# AC System 3P4W voltage inputRelay contact output; volts free; rated 16A18A1A1A119B1Auxiliary contact input.Ground connected is active.211# Close InputDetect the 1# ATS close status. Auxiliary contact input.Ground connected is active.232# Close InputDetect the 2# ATS close status. Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMGIDFree rate 10A27 </td <td>2</td> <td>10</td> <td>DC (6-35) v, Power supply for controller,</td>	2	10			DC (6-35) v, Power supply for controller,					
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9 Aux. output 3 COM Power A 16A 10 N/O Power A 16A 11 Aux. output 4 N/O Default: ATS Power N Relay contact output; volts free; rated 16A 13 1# COM Power N 16A 14 1# Close Output Relay contact output; volts free; Relay contact output; volts free; rated 16A 16 2# Close Relay contact output; volts free; Relay contact output; volts free; rated 16A 17 Output Relay contact output; volts free; Relay contact output; volts free; rated 16A 18 A1 A1 Aux.iliary contact output; volts free; Relay contact output; volts free; rated 16A 19 B1 1# AC System 3P4W voltage input Relay contact output; volts free; rated 16A 20 C1 1# AC System 3P4W voltage input Ground connected is active. 21 N1 Detect the 1# ATS close status. Auxiliary contact input. Ground connected is active. 23 2# Close Input Detect the 2# ATS close status. Auxiliary contact input. Ground connected is active. 24 Aux. Input 1 User-defined. Ground connected is	8		N/C							
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12 Aux. output 4 COM Default: ATS Relay contact output; volts free; rated 13 14 1# Close Power N 16A 14 1# Close Relay contact output; volts free; Relay contact output; volts free; rated 16 2# Close Relay contact output; volts free; Relay contact output; volts free; rated 16 2# Close Relay contact output; volts free; Relay contact output; volts free; rated 17 Output Power N Power N Relay contact output; volts free; rated 16 2# Close Relay contact output; volts free; rated 16A 18 A1 Relay contact output; volts free; rated 16A 19 B1 I# AC System 3P4W voltage input For single phase, only connect A1, N1 20 C1 Detect the 1# ATS close status. Ground connected is active. 21 N1 Detect the 2# ATS close status. Ground connected is active. 23 2# Close Input Detect the 2# ATS close status. Ground connected is active. 24 Aux. Input 1 User-defined. Ground connected is active. 25 Aux. Input 2 User-defined. Ground connected is active. 27 A2 Pa	10		N/O Powe	er A	16A					
12 Aux. output 4 COM Power N 16A 13 1# Close Relay contact output; volts free; Relay contact output; volts free; rated 16A 14 1# Close Relay contact output; volts free; Relay contact output; volts free; rated 16A 16 2# Close Relay contact output; volts free; Relay contact output; volts free; rated 16A 17 Output Relay contact output; volts free; Relay contact output; volts free; rated 16A 18 A1 I# AC System 3P4W voltage input For single phase, only connect A1, N1 20 C1 I# AC System 3P4W voltage input For single phase, only connect A1, N1 21 N1 Detect the 1# ATS close status. Auxiliary contact input. Ground connected is active. 23 2# Close Input Detect the 2# ATS close status. Auxiliary contact input. Ground connected is active. 24 Aux. Input 1 User-defined. Ground connected is active. 25 Aux. Input 2 User-defined. Ground connected is active. 26 COM GND For single phase, only connect A2, N2 28 B2 2# AC System; 3P4W voltage input For si	11		N/O Defe							
13 N/C Relay contact output; volts free; Relay contact free;	12	Aux. output 4	COM							
15OutputRelay contact output; volts free; output16A162#Close Pelay contact output; volts free; outputRelay contact output; volts free; 16A17OutputRelay contact output; volts free; 16ARelay contact output; volts free; 16A18A1A1A119B1A1A120C1Petect the 1# ATS close status. Auxiliary contact input.For single phase, only connect A1, N121N1Detect the 1# ATS close status. Auxiliary contact input.Ground connected is active.232# Close InputDetect the 2# ATS close status. Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMGNDEt AC System; 3P4W voltage inputFor single phase, only connect A2, N229C2inputInputFor single phase, only connect A2, N230N2VaValueFor single phase, only connect A2, N21 INKCommunicationUsed for PC communication/For single phase, only connect A2, N2	13		N/C Powe	erin	ТОА					
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17OutputImage: Constraint of the second secon	16	2# Close			Relay contact output; volts free; rated					
19B120C11# AC System 3P4W voltage inputFor single phase, only connect A1, N121N1Connected is active.221# Close InputDetect the 1# ATS close status. Auxiliary contact input.Ground connected is active.232# Close InputDetect the 2# ATS close status. Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMGNDConnected is active.27A2A2Aux AC System; 3P4W voltage inputFor single phase, only connect A2, N229C2inputUsed for PC communication/For single phase, only connect A2, N2	17	Output	Relay contact output,	voits free;	16A					
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20C1And the second secon	19	B1	1# AC System 3P/W/v	oltage input	For single phase only connect A1 N1					
221# Close InputDetect the 1# ATS close status. Auxiliary contact input.Ground connected is active.232# Close InputDetect the 2# ATS close status. Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMGNDImage: Connected is active.27A2A2A229C2Image: Connected inputConnected is active.30N2Image: N2Image: Connected input11NKCommunicationUsed for PC communication/Image: Connected input	20	C1	T# AC System SI 4W V	oltage input	For single phase, only connect AT, NT					
221# Close Input Auxiliary contact input.Ground connected is active.232# Close InputDetect the 2# ATS close status. Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMGNDImput27A2ImputImput28B2ImputImput29C2inputImput30N2Used for PC communication/For single phase, only connect A2, N2	21	N1								
232# Close Input Auxiliary contact input.Ground connected is active.24Aux. Input 1User-defined.Ground connected is active.25Aux. Input 2User-defined.Ground connected is active.26COMGND2727A2Aux Arrow and a stream of the stream	22	1# Close Input			Ground connected is active.					
25Aux. Input 2User-defined.Ground connected is active.26COMGND27A2A2A4A428B2AC System; 3P4W voltage inputFor single phase, only connect A2, N230N2Vsed for PC communication/	23	2# Close Input			Ground connected is active.					
26COMGNDGND27A2A228B22# AC System; 3P4W voltage inputFor single phase, only connect A2, N229C2input30N2Vent1 INKCommunicationUsed for PC communication/	24	Aux. Input 1			Ground connected is active.					
27A228B22# AC System; 3P4W voltage inputFor single phase, only connect A2, N229C2inputImput30N2Vertical for PC communication/	25	Aux. Input 2	User-defined.		Ground connected is active.					
28 B2 2# AC System; 3P4W voltage input For single phase, only connect A2, N2 29 C2 input For single phase, only connect A2, N2 30 N2 Value Value I INK Communication Used for PC communication/	26	СОМ	GND							
29 C2 input For single phase, only connect A2, N2 30 N2 LINK Communication	27	A2								
29 C2 input 30 N2 LINK Communication Used for PC communication/	28	B2	2# AC System; 3P	4W voltage	For single phase, only connect A2, N2					
LINK Communication Used for PC communication/	29	C2	input							
	30	N2								
port software updating.		Communication								
		port								

Table 14 Terminal Description



17 TYPICAL WIRING DIAGRAM

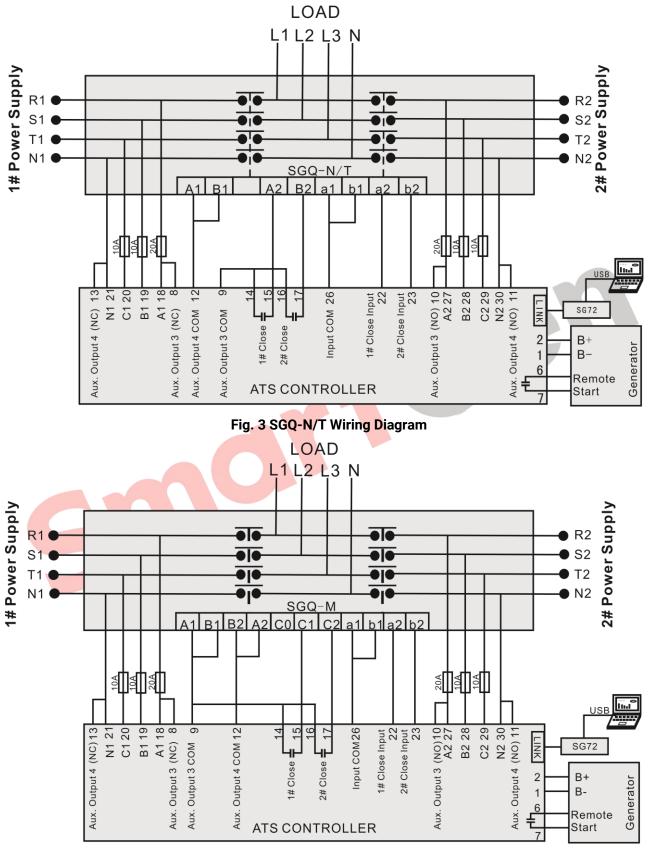
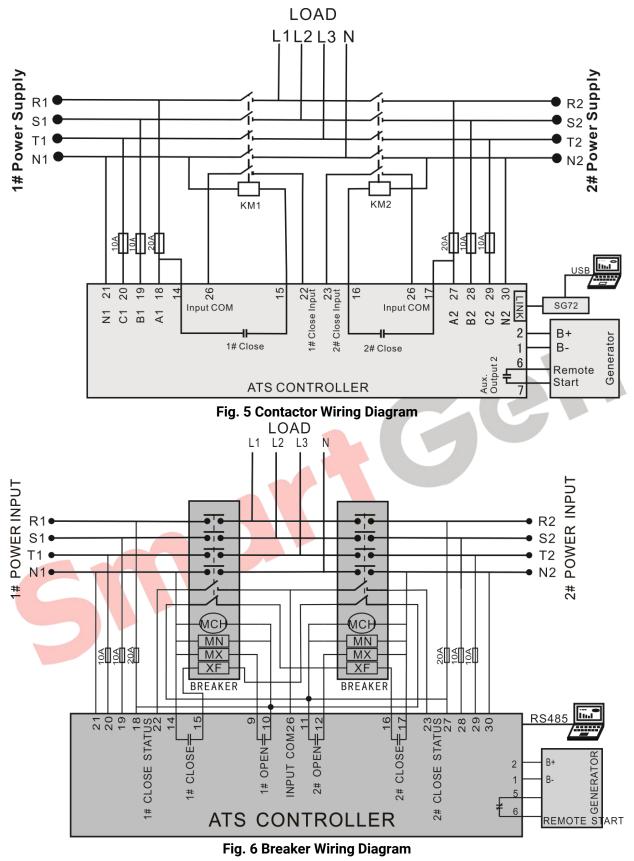


Fig. 4 SGQ-M Wiring Diagram





MCH: Energy Storage Motor; MN: Under Volt Trip; MX: Open Coil; XF: Close Coil

NOTE 1: Aux. output 3 is configured to 15: 1# breaker open output;

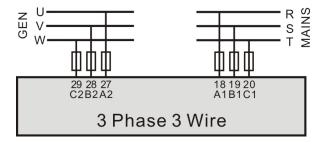
NOTE 2: Aux. output 4 is configured to 17: 2# breaker open output;

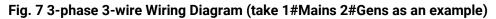
NOTE 3: Aux. output 2 is configured to 12: Oil Engine Start N/C output;

NOTE: Select fuse capacity according to actual power consumption on-site, and users cannot take that in the diagram as



standard. If there is not DC power supply, please select relay N/C output for genset start control. For ACB application, please refer to breaker wiring diagram, and switch trip must be connected to controller input terminal during the usage.





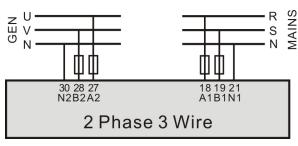


Fig. 8 2-phase 3-wire Wiring Diagram (take 1#Mains 2#Gens as an example)

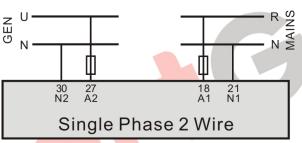
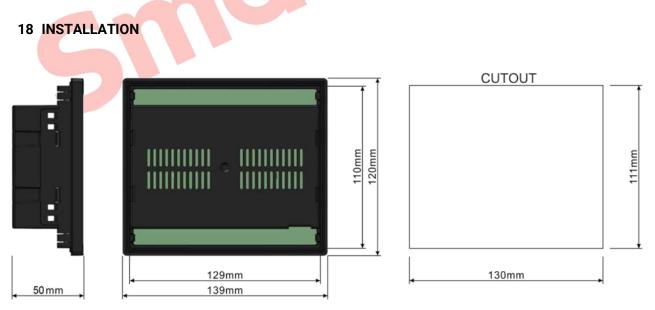


Fig. 9 Single phase 2-wire Wiring Diagram (take 1#Mains 2#Gens as an example)







19 FAULT FINDING

Symptom	Possible Solutions	
Controller no response with power.	Check battery voltage;	
RS485 communication failure	Check RS485 positive and negative connections. Check RS485 converter. Check module address in parameter settings. Recommend to add 120Ω resistor between RS485 A and B.	
LINK communication failure	If SG72 module is fitted, check its connections. Check module address in parameter settings.	
Auxiliary Output Error	Check auxiliary output connections, paying attention to normally open contact and normally close contact. Check the output settings in parameter settings.	
Auxiliary Input Abnormal	Ensure that the auxiliary input is soundly connected to GND when it's active, while hung it up when it is inactive. (ANOTE: The input port will be possibly destroyed when connected with voltage.)	
Genset running but ATS not transfer	Check ATS. Check the connection wirings between controller and ATS. Check whether ATS breakings are in accordance with the set breakings.	

Table 15 Fault Finding