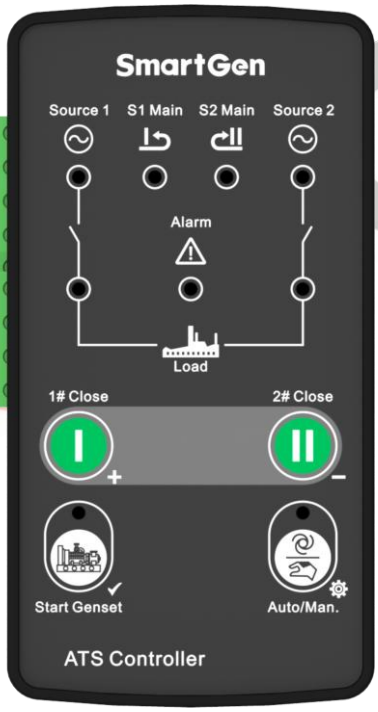
HAT162

ATS CONTROLLER

USER MANUAL



SMARTGEN (ZHENGZHOU) TECHNOLOGY CO.,LTD.

Chinese trademark

English trademark

SmartGen — make your generator ***smart***
SmartGen Technology Co., Ltd.
No. 28 Jinsuo Road
Zhengzhou
Henan Province
P. R. China
Tel: 0086-371-67988888/67981888
0086-371-67991553/67992951
0086-371-67981000(overseas)
Fax: 0086-371-67992952
Web: www.smartgen.com.cn
www.smartgen.cn
Email: sales@smartgen.cn

Table 1 - Software Version

Date	Version	Content
2018-05-10	1.0	Original release

CONTENTS

1. OVERVIEW

HAT162 ATS Controller is suitable for no breaking two stage ATS. It can accurately detect 2-way-3-phase voltage and judge voltage abnormal (such as over voltage, under voltage, over frequency, under frequency, lack of phase and phase rotation), and then control ATS to switch. When ATS switches abnormally, the controller can detect close/open failure and alarm on the front panel to ensure the correct action of ATS. In auto mode, if source 1 failure, controller will send signal to start the genset. Moreover, it can also realize remote communication, remote control and parameter configuration functions via LINK port communication.

2. PERFORMANCE AND CHARACTERISTICS

HAT162 controller can detect 2-way voltage (2-way mains, 1-way mains and 1-way gen) and control ATS.

Mains characters are as below,

- It is suitable for AC system with 3-phase 4-wire, 2-phase 3-wire, single phase, 3-phase 3-wire(special order required);
- “Source 1 Main (auto transfer and restore)”, “Source 2 Main (auto transfer and restore)”, and “No Main Use (auto transfer and non-auto restore)” power supply methods;
- Measuring and displaying 2-way voltage and frequency:

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

- With over/under voltage, over/under frequency, loss of phase, and phase rotation detection functions;
- Breaker close fail alarm indication;
- LEDs on the panel can clearly display ATS working status;
- Auto/Manual mode can be switched. In manual mode, ATS can be switched by pressing front panel button;
- With manual commissioning function;
- Applicable for 2 isolated neutral line.
- Close output can be configured as pulse and continuous output;
- Parameter setting: parts of parameters can be adjust from front panel; all can be adjust via LINK port(with SG72 adaptor) by using computer software;
- Digitization adjustment of parameters (abandon simulation adjustment of regular potentiometer, and enhanced reliability and stability);
- Modular design, self extinguishing ABS+PC plastic shell, pluggable terminal, and compact structure;
- Three installation ways: panel built-in, internal 35mm slideway installation and internal screw mounting.

3. SPECIFICATION

Table 2 – Specification Parameters

Items	Contents
Operating Voltage	AC power A1N1/A2N2 supply. Rated AC240V (range: AC170V~277V)
Power Consumption	Under rated voltage, power consumption is not more than 3VA
AC Voltage Input: 3-phase 4-wire 2-phase 3-wire Single phase 2-wire 3-phase 3-wire	 AC170V – AC277V (ph-N) AC170V – AC277V (ph-N) AC170V – AC277V (ph-N) AC170V – AC277V (ph-ph) (special order required)
AC Frequency	50/60Hz
1# Close Relay	16A AC250V Volt free output (Normally open)
2# Close Relay	16A AC250V Volt free output (Normally open)
Oil Engine Start Relay	7A AC250V Volt free output (Normally close)
Programmable Output Relay	7A AC250V Volt free output (Normally open)
Communication	LINK interface, MODBUS-RTU Protocol
Case Dimensions	86.9mmx158mmx119.5mm
Panel Cutout	73.5mmx144mm
Working Conditions	Temperature: (-25~+70)°C; Relative Humidity: (20~93)%RH
Storage Condition	Temperature: (-25~+70)°C
Protection Level	IP65: when water-proof gasket installed between control panel and enclosure.
Insulation Strength	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.
Weight	0.6kg

4. OPERATION

4.1 FRONT PANEL DESCRIPTION

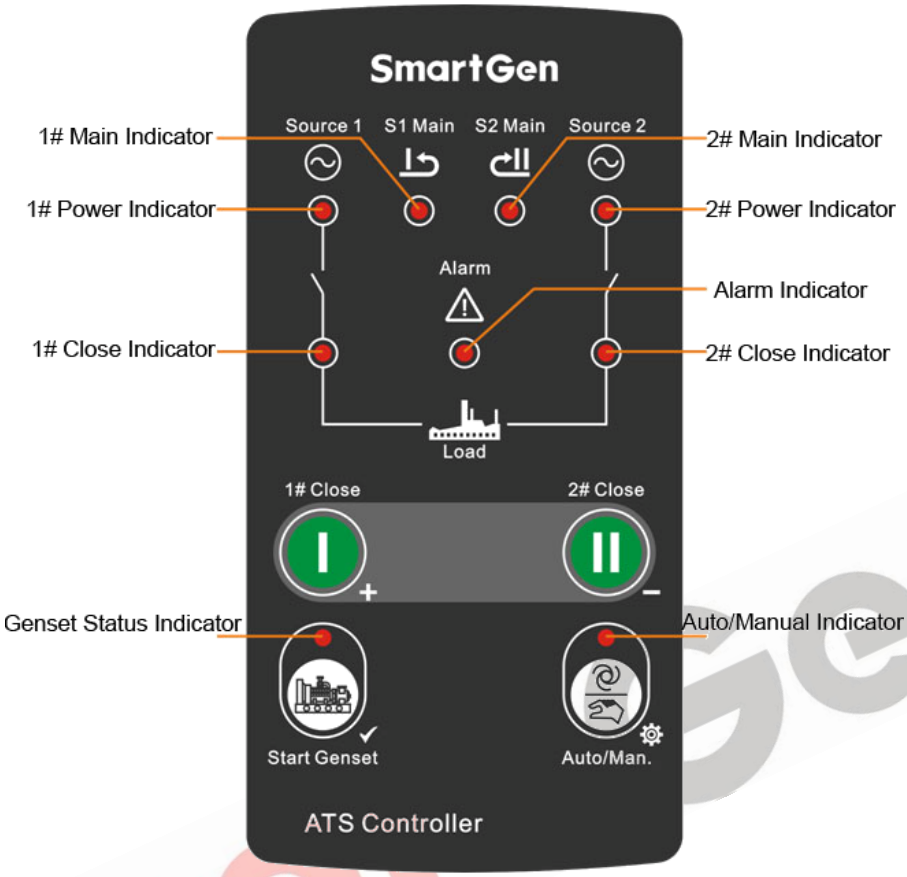


Fig.1 – Front Panel Description

4.2 KEY FUNCTION DESCRIPTION

Table 3 – Keys Description

Icon	Function	Description
	Auto (Set)	Auto/Manual mode switch; Enter into lamp test status by pressing for 3s; Enter into parameter configuration mode by pressing for 8s.
	1# Close (Numerical increase)	1# close in manual mode; Adjust parameters in parameter configuration mode.
	2# Close (Numerical decrease)	2# close in manual mode; Adjust parameters in parameter configuration mode.
	Test (Confirm)	It is active in manual mode; While genset start signal is energizing, press this button can deactivate the start genset signal; While genset start signal is inactive, press this button can active the genset start signal; Confirm user defined parameters in parameter setting screen.

4.3 INDICATOR DESCRIPTION

Table 4 – Indicator Description

Indicators	Description	
1# Power●	Lamp illuminates: 1# power normal Lamp flashes: 1# power abnormal (over/under voltage, over/under frequency, loss of phase, and phase rotation) Lamp off: 1# loss of power	
2# Power●	Lamp illuminates: 2# power normal Lamp flashes: 2# power abnormal (over/under voltage, over/under frequency, loss of phase, and phase rotation) Lamp off: 2# loss of power	
1# Main●	Lamp illuminates: 1# Priority (auto transfer and restore)	Both illuminates: “mutual backup” (auto transfer and non-auto restore)”
2# Main●	Lamp illuminates: 2# Priority (auto transfer and restore)	
1# Close●	Lamp illuminates: 1# Supply	
2# Close●	Lamp illuminates: 2# Supply	
Alarm●	Lamp illuminates: 1# or 2# Close fault	
Auto/Manual Mode●	Lamp illuminates: controller in Auto mode Lamp off: controller in Manual mode	
Genset Status●	Lamp illuminates: genset start signal outputs Lamp flashes: genset start signal de-energized	

4.4 OPERATION

4.4.1 AUTO/MANUAL MODE SWITCH

When the controller is normally working, if auto/manual mode indicator is off, it means controller is in manual mode; it can switch into auto mode by pressing, the indicator will be normally light; then press again to switch back to manual mode.

Note: after repower-on, controller mode depends on the mode in which the controller was last powered down. When the controller is powered off in manual mode, the controller is still in manual mode after repower-on.

4.4.2 MANUAL OPERATION

When controller is in manual mode, if press , 1# close relay outputs, and 1# close status indicator illuminated when 1# close status input detecting is active, and then 1# supply ramps on load; if press , 2# close relay outputs, and 2# close status indicator illuminated when 2# close status input detecting is active, and then 2# supply ramps on load.

4.4.3 AUTO OPERATION

In auto mode, controller can switch between 1# supply and 2# supply automatically.

4.4.4 MANUAL TEST

In manual mode, when genset start signal is active, press  can deactivate the genset start signal.

When genset start signal is inactive, press  can active the genset start signal.

5. CLOSE FAULT ALARM

Braker close fault devided into 1# supply breaker close fault and 2# supply breaker close fault. After the controller send a breaker close fault alarm, alarm indicator flashes.

Process of trigger 1# supply close fault alarm is as below:

When 1# supply voltage is normal, controller will initiate an command of close 1# supply; if 1# close input signal cannot be detected, 1# supply will be open and close again. If controller still cannot detect the 1# close signal, it will be regarded as 1# close failure and the alarm indicator illuminates at the same time. Meanwhile, if 2# supply voltage is normal and doesn't occur close fault, then 2# power will be closed.

Process of trigger 2# supply close fault alarm is as below:

When 2# supply voltage is normal, controller will initiate an command of close 2# supply; if 2# close input signal cannot be detected, 1# supply will be open and close again. If controller still cannot detect the 2# close signal, it will be regarded as 2# close failure and the alarm indicator illuminates at the same time. Meanwhile, if 1# supply voltage is normal and doesn't occur close fault, then 1# power will be closed.

Reset close fault alarm: after alarm occurs, switch controller to manual mode to reset alarm. This moment, troubleshooting and ATS transfer test can be carried out.

NOTE: after reset alarms, the fault must be checked and cleared.

6. WIRE CONNECTION

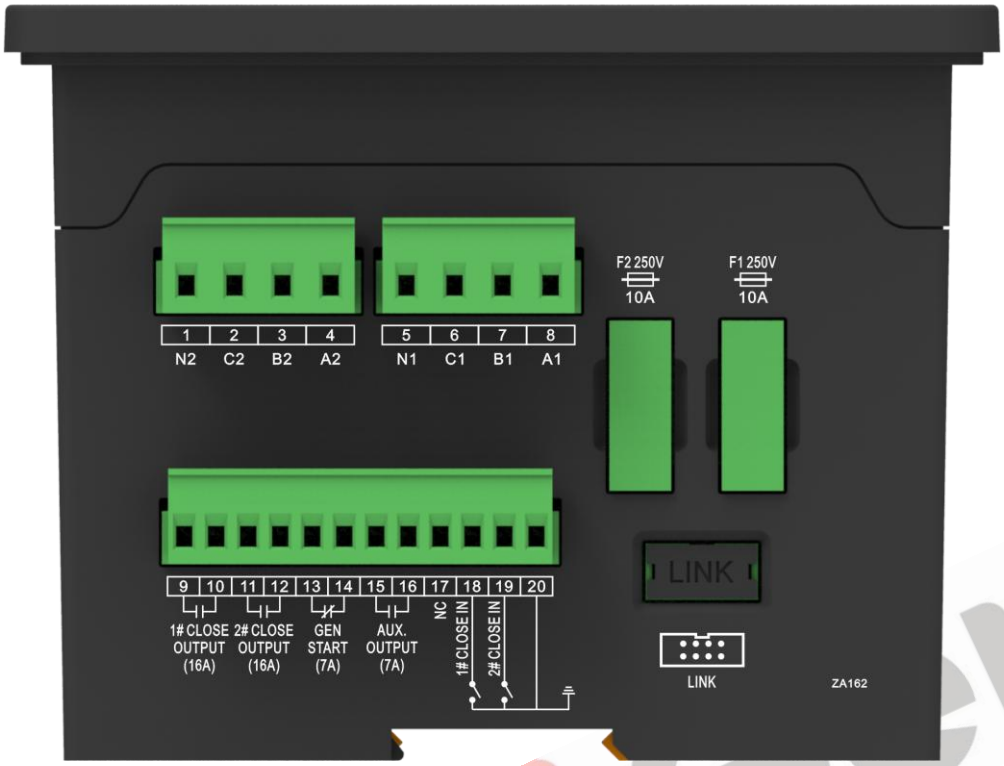


Fig.2 – Controller Rear Panel Drawing

Table 5 – Terminals Description

No.	Items	Function Description	Remark
1	N2	2# AC 3-phase 4-wire input	Single phase 2-wire: connect with A2 and N2, B2 and C2 are not connected; 2-phase 3-wire: connect with A2, B2, and N2, C2 is not connected; 3-phase 3-wire: connect with A2, B2, and C2, N2 is not connected (special order required).
2	C2		
3	B2		
4	A2		
5	N1	1# AC 3-phase 4-wire input	Single phase 2-wire: connect with A1 and N1, B1 and C1 are not connected; 2-phase 3-wire: connect with A1, B1, and N1, C1 is not connected; 3-phase 3-wire: connect with A1, B1, and C1, N1 is not connected (special order required).
6	C1		
7	B1		
8	A1		
9	1# Close Relay	Volt free normally open contact output	Rated capacity: 16A/250VAC
10			
11	2# Close Relay	Volt free normally open contact output	Rated capacity: 16A/250VAC
12			
13	Gen Start Signal output	Volt free normally close contact output	Rated capacity: 7A/250VAC
14			
15	Aux. output	Volt free normally open contact output	Rated capacity: 7A/250VAC
16			
17	NC		Not connect

No.	Items	Function Description	Remark
18	1# Close Input	Detect 1# breaker close status, auxiliary contact input.	Ground is active
19	2# Close Input	Detect 2# breaker close status, auxiliary contact input.	Ground is active
20	Common Port	GND	
LINK	Communication Port	Communicate with PC and used for program update	Used with SG72 adaptor
F1	Fuse		Rated 10A 250V
F2	Fuse		Rated 10A 250V

7. DEFINITION AND RANGE OF PARAMETERS

Table 6 – Parameters Definition and Range Table (1)

No.	Items	Range	Default	Description
1	AC System	(1-4)	1	1: 3 Phase, 4 Wire (3P4W) 2: Single Phase, 2 Wire (1P2W) 3: 3 Phase, 3 Wire (3P3W) (special order required) 4: 2 Phase, 3 Wire (2P3W)
2	S1 Normal Delay	(1-7)	2	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
3	S2 Normal Delay	(1-7)	2	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
4	S1 Abnormal Delay	(1-7)	2	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
5	S2 Abnormal Delay	(1-7)	2	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
6	Close Delay	(1-7)	4	1: Continuous Close Enabled 2: 1s

No.	Items	Range	Default	Description
				3: 3s 4: 5s 5: 8s 6: 10s 7: User defined(Default: 5s)
7	Again Open Delay	(1-7)	2	1: 1s 2: 3s 3: 5s 4: 8s 5: 10s 6: 15s 7: User defined(Default: 3s)
8	Transfer Delay Expired	(1-7)	1	1: 0.5s 2: 1s 3: 2s 4: 3s 5: 4s 6: 5s 7: User defined(Default: 0.5s)
9	Gen Start Delay	(1-7)	4	1: 3s 2: 8s 3: 15s 4: 30s 5: 50s 6: 70s 7: User defined(Default: 30s)
10	Gen Stop Delay	(1-7)	6	1: 3s 2: 8s 3: 15s 4: 30s 5: 50s 6: 70s 7: User defined(Default: 90s)
11	Set Priority	(1-3)	1	1: S1 Priority 2: S2 Priority 3: No priority

NOTE:

a) The parameters in this form can be set via computers and slave;

b) When delay is "7: User defined", parameter delay must be set via computer. If parameter is not set via computer, the delay is Default; if parameter has been set via computer, then the delay is the set value.

Table 7 - Parameters Definition and Range Table (2)

No.	Item	Range	Default	Description
1	Rated Voltage	(170-270)V	230	Provide base for over/under volt judge.
2	Rated Frequency	(50.0-60.0)Hz	50.0	Provide base for over/under frequency judge.
3	Over Voltage Warn	(0-1)	1	0: Disabled 1: Enabled
4	Over Volt Set Value	(100-120)%	115	Threshold value
5	Over Volt Return Value	(100-120)%	113	Return value

No.	Item	Range	Default	Description
6	Under Voltage Warn	(0-1)	1	0: Disabled 1: Enabled
7	Under Volt Set Value	(70-100)%	75	Threshold value
8	Under Volt Return Value	(70-100)%	77	Return value
9	Over Frequency Warn	(0-1)	1	0: Disabled 1: Enabled
10	Over Frequency Set Value	(100-120)%	110	Threshold value
11	Over Frequency Return Value	(100-120)%	104	Return value
12	Under Frequency Warn	(0-1)	1	0: Disabled 1: Enabled
13	Under Frequency Set Value	(80-100)%	90	Threshold value
14	Under Frequency Return Value	(80-100)%	96	Return value
15	Loss of Phase	(0-1)	1	0: Disabled 1: Enabled (fixed delay as 3s)
16	Phase Sequence Wrong	(0-1)	0	0: Disabled 1: Enabled (fixed delay as 3s)
17	Output Ports	(0-16)	0	0: Not Used 1: S1 Volts Normal 2: S1 Volts Abnormal 3: S2 Volts Normal 4: S2 Volts Abnormal 5: Manual Status Output 6: Auto Status Output 7: Gens Start Output(NO) 8: Gens Start Output(NC) 9: S1 Close Output 10: S2 Close Output 11: S1 Close Status Output 12: S2 Close Status Output 13: Reserved 14: Reserved 15: Reserved 16: Reserved
18	Module Address	(1-254)	1	Address that communicates with PC software

NOTE: The parameters in this form can be set via computers.

8. PARAMETERS SETTING

8.1 PARAMETERS SETTING MODE

In manual mode, enter into parameters setting mode by pressing for 8s and manual/auto indicator● and gen status indicator● flash; ①, ②, ③, ④ indicators illuminate. LED numbers please to see the following picture.

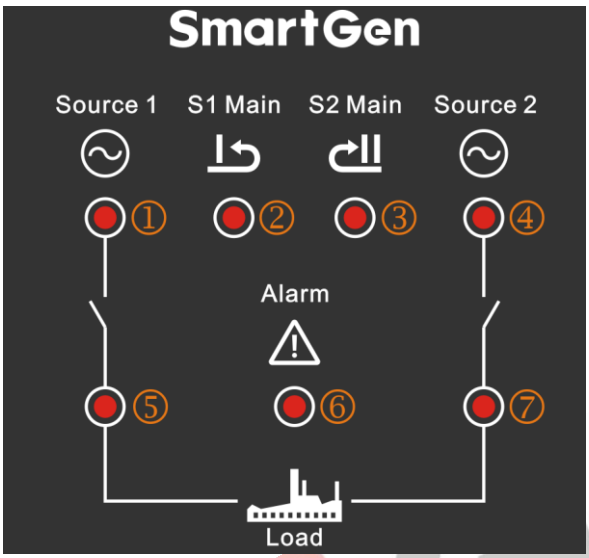


Fig.3 – Parameter Configuration

NOTE: At this moment, press will be back to normal mode after LED flash.

8.2 PARAMETERS SETTING

When it entered into parameter setting mode, users can adjusting parameters by pressing. And ④ and ⑦ LEDs are illuminated. ①, ②, ③, ④ indicators mean setting items numbers (currently item number is 1); ⑤, ⑥, ⑦ indicators mean these parameter values (currently parameter value is 1). Configurable parameter list please check “Table 6 – Parameters Definition and Range Table (1)” of item 7.

Specific settings are as below:

1) Select setting number which needs to adjust by pressing and ;
2) Enter into setting status by pressing and ⑦ indicator flashes;
3) After set this parameter by pressing and , and press the key to save the value.
4) Hold and press after all parameters are configured, and release when all LEDs flash, which means parameters are all saved and then will return to normal mode.

NOTE: See “Table 8 Parameter Value Comparison” for the values corresponding of LED indicators.

NOTE: after parameters configured completely, users need to press to back to the normal mode to save the parameters. Otherwise, the setting parameters will be lost after controller power outage.

Table 8 – Parameter Value Comparison

Parameter Serial No. LED Indicate				Value	Parameter Value LED Indicate			Value
①	②	③	④		⑤	⑥	⑦	
○	○	○	●	1	○	○	●	1
○	○	●	○	2	○	●	○	2
○	○	●	●	3	○	●	●	3
○	●	○	○	4	●	○	○	4
○	●	○	●	5	●	○	●	5
○	●	●	○	6	●	●	○	6
○	●	●	●	7	●	●	●	7
●	○	○	○	8				
●	○	○	●	9				
●	○	●	○	10				
●	○	●	●	11				

8.3 RESET TO DEFAULT

In parameter setting mode, press  , ①, ② and ③ LEDs illuminated, and ⑦ LED flashes.

After pressing  , ⑦ LED illuminates for 2s, indicating that the factory value has been restored. Meanwhile, all LEDs flash for 3 times and return back to the normal mode.

NOTE: if needn't to restore to factory value, press  to return to the normal mode after LED flashes.

9. TYPICAL APPLICATION

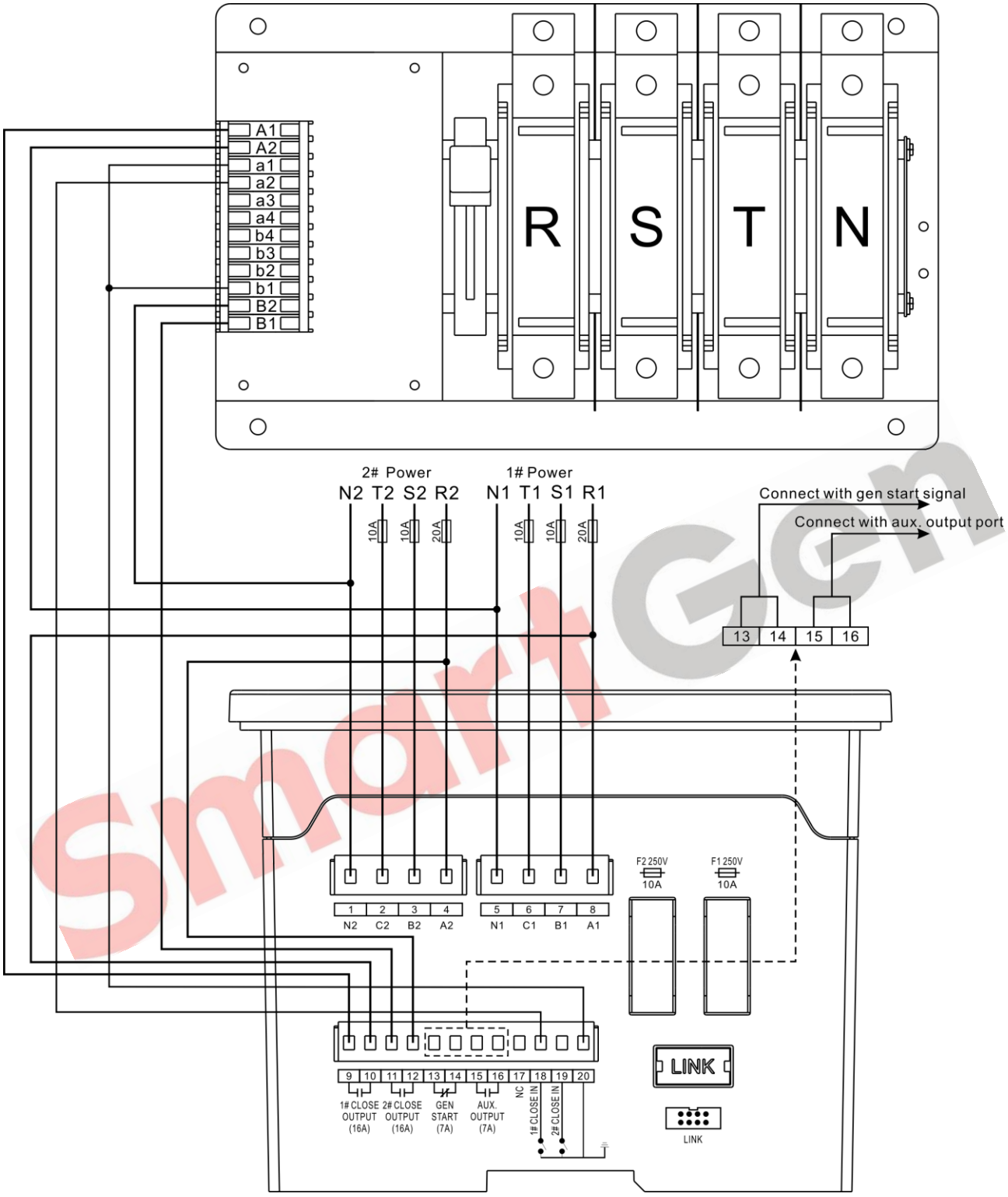


Fig.4 – SGQ-N Wire Connection

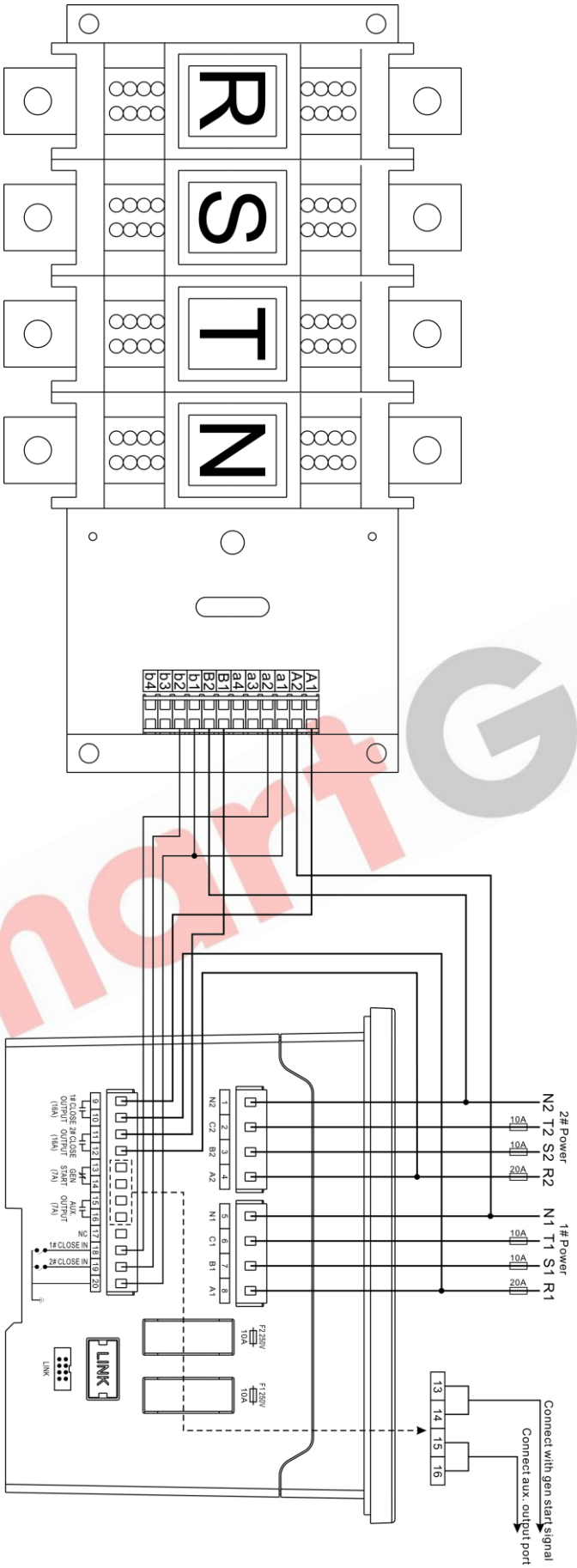


Fig.5 – SGQ-T Wire Connection

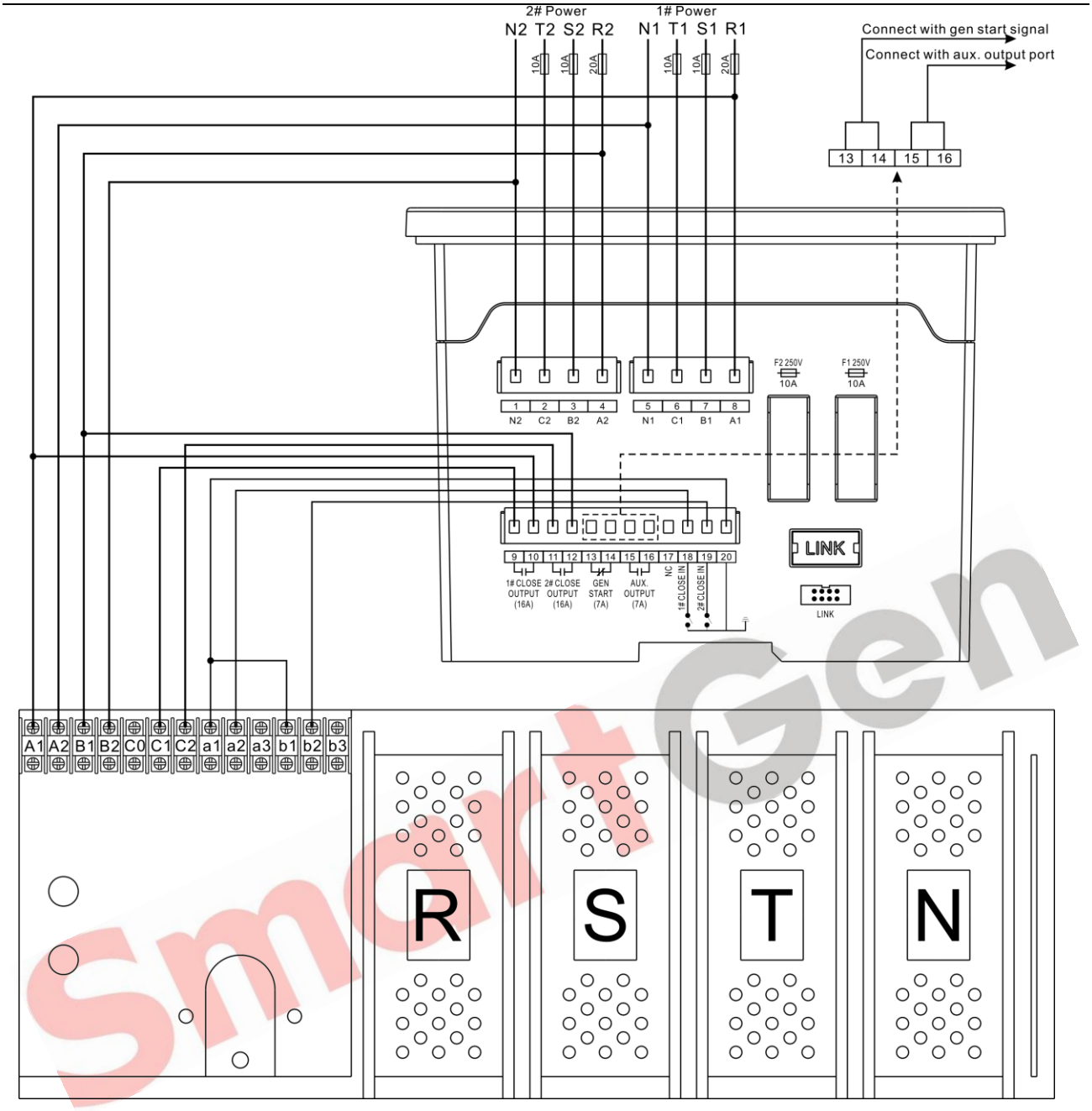


Fig.6 – SGQ-M Wire Connection

NOTE: Please conference the above drawings for wiring. The actual wiring on site is subject to the ATS switch wiring instructions. And the capacity of the fuse should be selected according to the actual power consumption at the site, which cannot be based on the fuse capacity in the drawing.

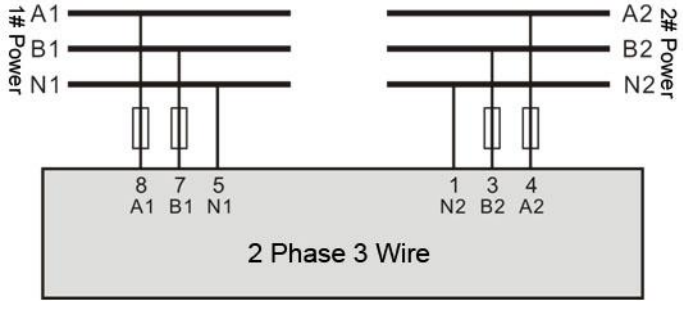


Fig.7 – 2 Phase 3 Wire Connection

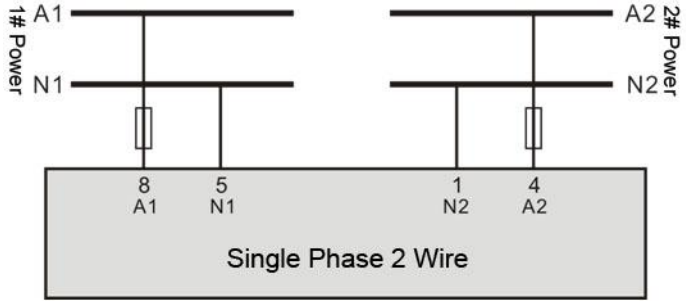


Fig.8 – Single Phase 2 Wire Connection

NOTE: The above drawing shows the wiring method is the AC phase voltage of 220V. If the AC phase voltage is 110V in actual use, please contact our technical personnel to confirm the specific wiring method.

10. OVERALL DIMENSION AND PANEL CUTOUT

10.1 CASE DIMENSION

Unit: mm

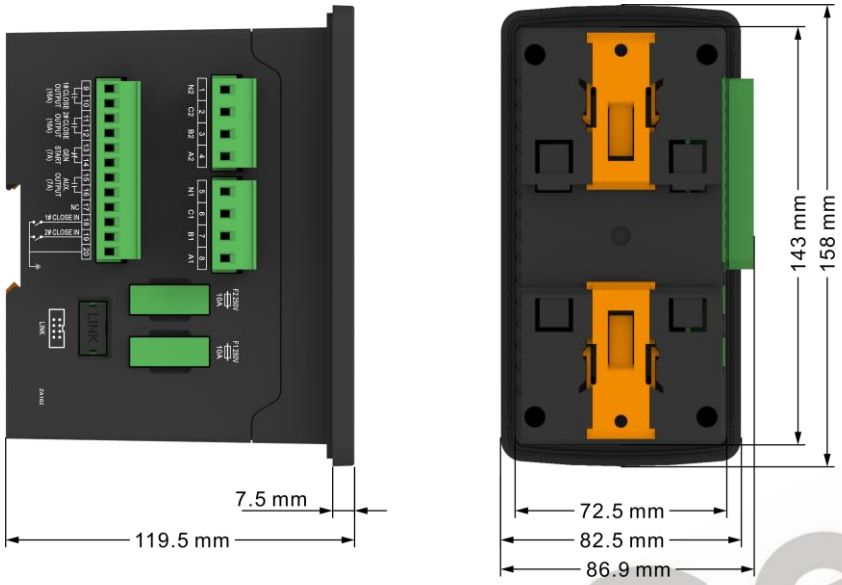


Fig.9 – Overall Dimensions

10.2 CUTOUT

The controller has three installation ways: panel built-in, internal 35mm slideway and internal screw mounting. Panel built-in and internal screw mounting are as below:

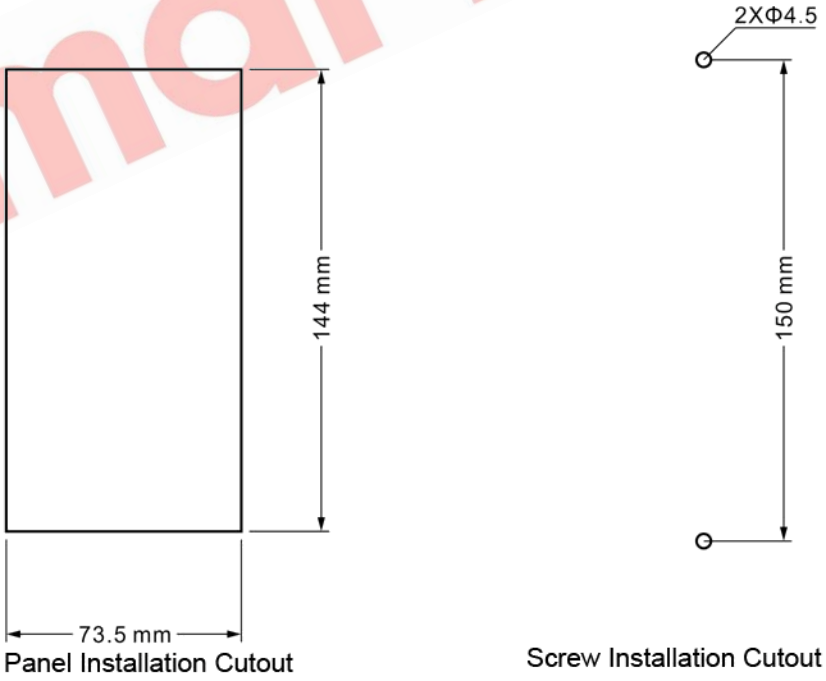


Fig.10 – Cutout Dimensions

10.3 INSTALLATION

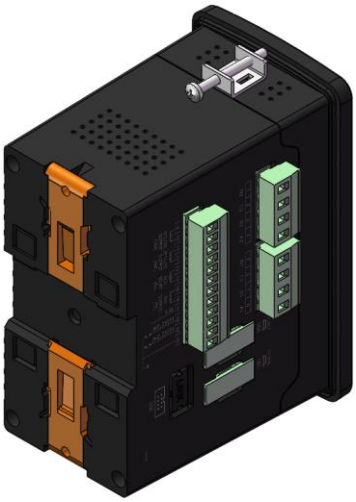


Fig. 11 – Panel Built-in Installation

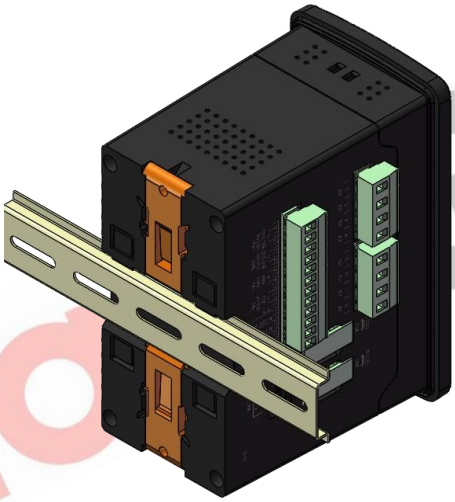


Fig.12 – 35mm Sideway Installation

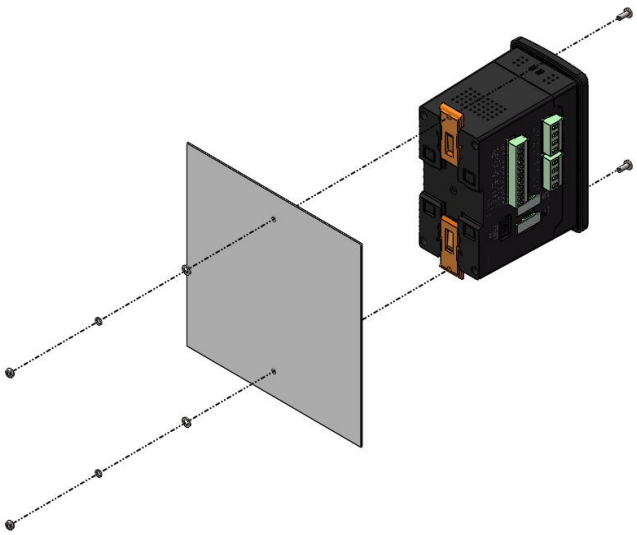


Fig.13 – Internal Screw Installation

11. TROBLESHOOTING

Tale 9 - Troubleshooting

Symptom	Possible Solutions
Controller inoperative	Check connections and voltages of 1# and 2# power; Check F1 or F2 fuse
Controller displays normal but switch not activate	Check ATS; Check the connections between controller and ATS.
1# or 2# power LED flashes	Check whether AC voltage is normal or not.
Alarm LED flashes	If switch close failure alarms, please check switch auxiliary contact wiring.