HAT160

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 City

P. R. China

Tel: +86-371-67988888

+86-371-67981888

+86-371-67991553

+86-371-67992951

+86-371-67981000 (overseas)

Fax: 0086-371-67992952

Web: http://www.smartgen.com.cn

http://www.smartgen.cn

Email: sales@smartgen.cn

Software Version

Date	Version	Content
2015-12-09	1.0	Original release

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

CONTENTS

1. OVERVIEW

HAT160 ATS Controller is suitable for CB ATS of single motor. It can accurately detect 2-way-3-phase 4-wire/single-phase 2-wire voltage and judge voltage abnormal (such as, over voltage, under voltage, over frequency, under frequency and lack of phase), then control ATS after delay. When ATS switch abnormally, the controller can detect close/open failure and alarm on the front panel to ensure the correct action of ATS. After abnormal of I# power, the controller will send signal to start the genset. The controller has remote communication, remote control and parameter configuration functions via LINK port communication.

2. PERFORMANCE AND CHARACTERISTICS

HAT160 controller can detect 2-way (2-way mains and 2-way gens or 1-way mains and 1-way gens) 3-phase/single phase voltage and control ATS.

1) 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

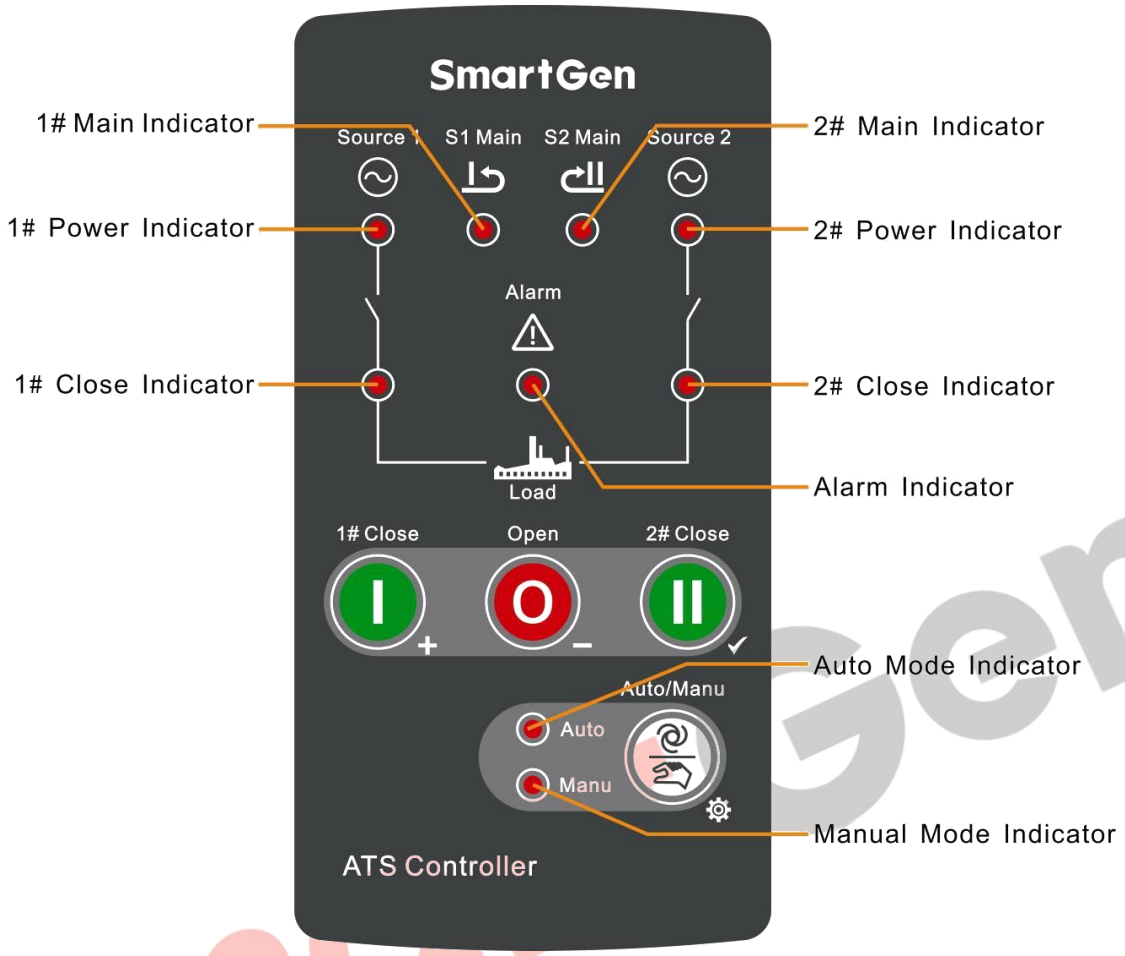
2) Over/under voltage, over/under frequency and loss of phase protection (active or deactive can be configured);
3) Close/Open failure alarm;
4) LED display work status;
5) Auto/Manual mode. In manual mode, ATS can be switched by pressing front panel button;
6) Applicable for 2 isolated neutral line.
7) “1# Priority, 2# Priority (auto change, auto recovery), No Priority (auto change, manually recovery)” and “1#/2# power normal/abnormal delay” can be set via panel buttons;
8) Automatic Re-closing;
9) Close delay, delay is 0.5s;
10) Any one way of A phase voltage is normal, the controller and ATS can normally work. When 2-way power and volts are abnormal at the same time, if any way of A phase voltage is normal, ATS will automatically transfer to Breaking (Middle) Position;
11) Fire reset interface. When the input port is enabled, ATS will automatically transfer to Breaking (OFF) Position;
12) Parameter setting: parts of parameters can be adjust from front panel; all can be adjust via LINK port(with SG72A adaptor) by using computer software;
13) Digitization adjustment of parameters (abandon simulation adjustment, enhanced reliability and stability);
14) Strong anti-electromagnetic interference ability, can be used under complex electromagnetic interference environment;
15) Modular design, self extinguishing ABS plastic shell, pluggable terminal, compact structure;
16) Three installation ways: panel built-in, internal 35mm slideway and internal screw mounting.

3. SPECIFICATION

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 2VA
AC Voltage Input: 3-phase 4-wire Single-phase 2-wire 3-phase 3-wire	 AC170V – AC277V (ph-N) AC170V – AC277V (ph-N) AC170V – AC277V (ph-ph)
AC Frequency	50/60Hz
Start Relay	7A AC250V Volts free output (Normally close)
1# Close Relay	7A AC250V Volts free output (Normally open)
2# Close Relay	7A AC250V Volts free output (Normally open)
LO/NO Relay Output	7A AC250V
Communication	LINK interface, MODBUS Protocol
Case Dimensions	86.9mmx158mmx119.5mm
Panel Cutout	73.5mmx144mm
Working Conditions	Temperature: (-25~+70)°C; Humidity: (20~93)%RH
Storage Condition	Temperature: (-25~+70)°C
Protection Level	IP55 Gasket
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. PANEL DESCRIPTION

4.1 FRONT PANEL



4.2 KEY FUNCTION DESCRIPTION

Icon	Function	Description
	Auto/Manual (Setting)	Auto/Manual mode switch; Enter into lamp test status by pressing for 3s; Enter into parameter configuration mode by pressing for 5s.
	1# Close	1# Close in Manual mode; Adjust parameters in parameter configuration mode.
	Open	Open in Manual mode; Adjust parameters in parameter configuration mode; Clear alarm (Close/Open Fault alarm, auxiliary input alarm) in Auto/Manual mode.
	2# Close (Confirm)	2# Close in Manual mode; Confirm parameter value in parameter configuration mode.

4.3 INDICATOR DESCRIPTION

Indicators	Description	
1# Power	Lamp illuminates: 1# power normal; Lamp flashes: 1# power abnormal (over/under voltage, over/under frequency and lack of phase); Lamp off: 1# loss of power	
2# Power	Lamp illuminates: 2# power normal; Lamp flashes: 2# power abnormal (over/under voltage, over/under frequency and lack of phase); Lamp off: 2# loss of power	
1# Main	Lamp illuminates: 1# Priority	Both illuminates:"spare to each other (auto change, manual recovery)"
2# Main	Lamp illuminates: 2# Priority	
1# Close	Lamp illuminates: 1# Supply	
2# Close	Lamp illuminates: 2# Supply	
Alarm	Lamp illuminates: 1# or 2# Close/Open fault; Lamp flashes: Auxiliary input alarm (Fire Reset enabled)	
Auto Mode	Lamp illuminates: controller in Auto mode	
Manual Mode	Lamp illuminates: controller in Manual mode Lamp flashes: enter into parameter configuration mode	
Note: Lamp flash frequency: 1Hz		

4.4 OPERATION

When the controller is normally working in manual mode, it can switch into auto mode by pressing, the indicator will be normally light.

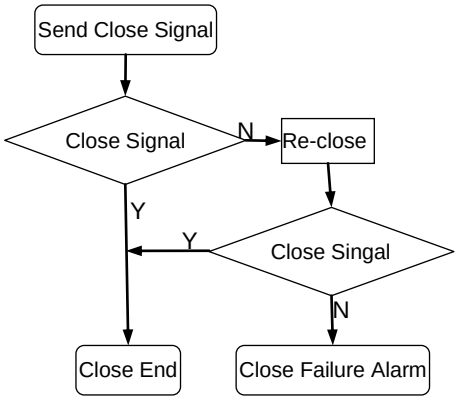
When the controller is in auto mode, it can switch into manual mode by pressing. In manual mode, the load will transfer to 1# supply by pressing I; the load will transfer to 2# supply by pressing II; ATS transfer to Breaking (Middle) Position by pressing O.

Power On Mode is decided by the last power down mode of the controller. If the controller is in manual mode when power down, it will still in manual mode when power on again.

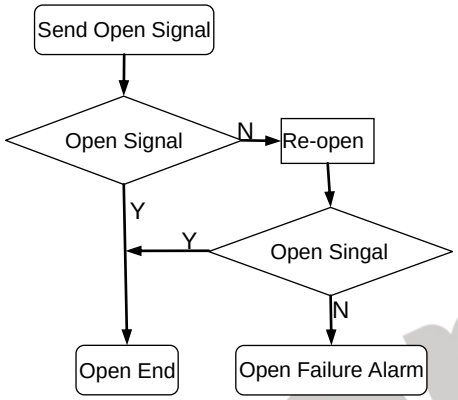
5. ALARM

5.1 CLOSE/OPEN FAULT ALARM

In Auto mode, after the controller send a open signal, if the controller can also detect open signal when open delay ends, it will be regarded as open failure and the alarm indicator illuminates at the same time. In Auto mode, after the controller send a close signal, if the controller cannot detect close signal when close delay ends, it will be regarded as close failure and the alarm indicator illuminates at the same time.



a)Close Flow Chart



b) Open Flow Chart

5.2 EXTERNAL INPUT ALARM

When auxiliary alarm input signal active is detected, the front panel alarm indicator will flash (1Hz) meanwhile the ATS transfer to Breaking (Middle) Position and alarm will be locked.

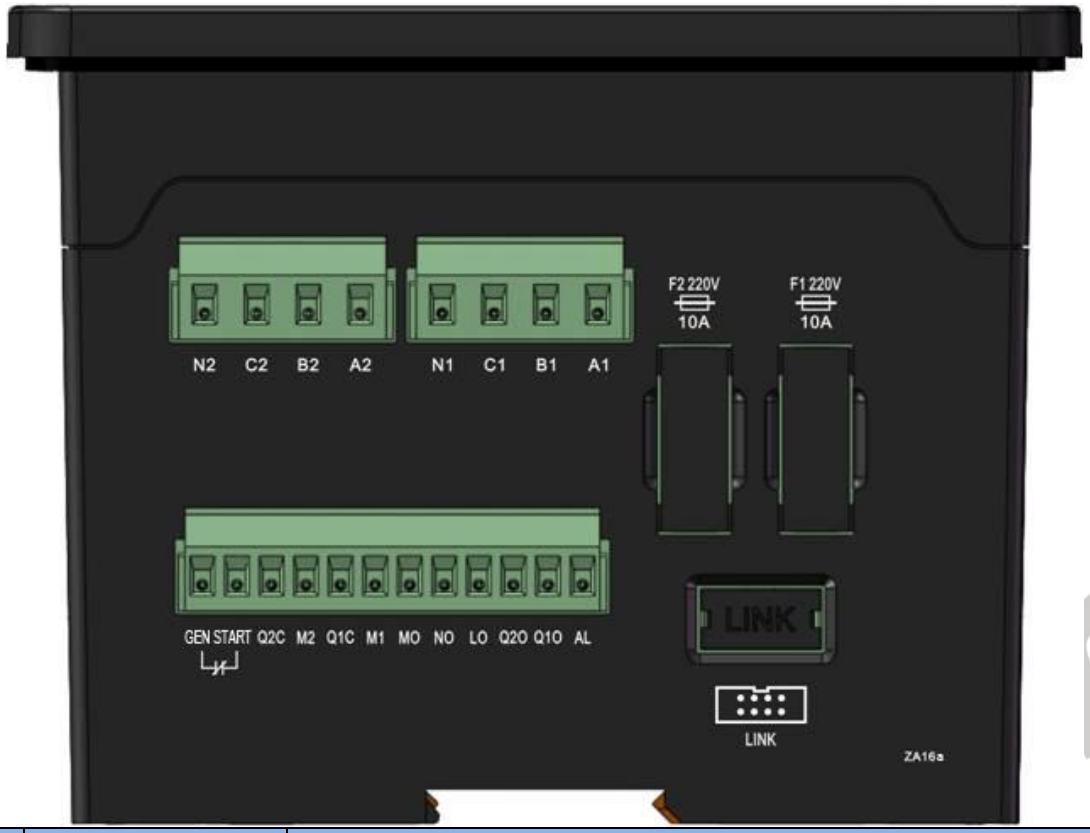
5.3 ALARM RESET

If Close/Open alarms in auto mode, clear alarm by pressing (the indicator will be extinguished at the same time, the controller will Close/Open again after 3s delay), or switch to manual mode for clearing alarm by pressing .

If auxiliary input alarms, clear alarm by pressing after the alarm ends and the indicator will be extinguished at the same time.

Note: trouble already clearing must be confirmed when rest alarm.

6. CONNECTION

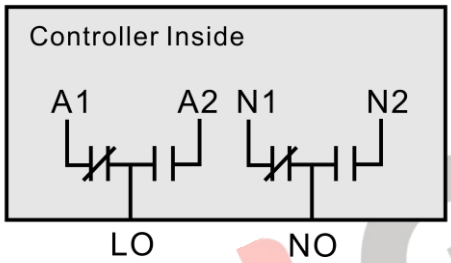


Terminal	Function	Note
A1	1# A phase	1# AC 3-phase 4-wire voltage input; If it is single-phase, connect A1 and N1 only, B1 and C1 hang up.
B1	1# B phase	
C1	1# C phase	
N1	1#N phase	
A2	2# A phase	2# AC 3-phase 4-wire voltage input; If it is single-phase, connect A2 and N2 only, B2 and C2 hang up.
B2	2# B phase	
C2	2# C phase	
N2	2#N phase	
Q1C	1# Close Relay	Volts free output (Normally open)
M1		
Q2C	2# Close Relay	Volts free output (Normally open)
M2		
M0		M0 short connect with NO internally.
Q1O	1# Close Input	Connect to auxiliary normally open contact of 1# power, AC voltage input When close voltage reaches 70% of rated voltage, close signal is active, when close voltage falls below 65% of rated voltage, close signal is deactive.
Q2O	2# Close Input	Connect to auxiliary normally open contact of 2# power, AC voltage input When close voltage reaches 70% of rated voltage, close signal is active, when close voltage falls below 65% of rated voltage, close signal is deactive.
LO	ATS Supply Output	The output voltage from phase A and phase N switching, which can act

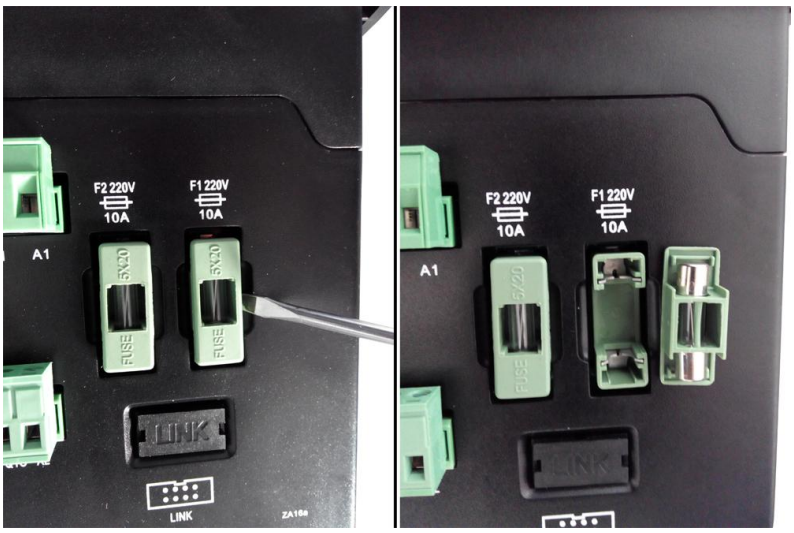
Terminal	Function	Note
NO		as power supply for ATS switching.
AL	Auxiliary Alarm	If has trip function, the trip input must be connected to aux. alarm terminal. Can control ATS to switch to Breaking (OFF) position, AC voltage input. When input voltage reaches 70% of rated voltage, aux. alarm signal is active, when input voltage falls below 65% of rated voltage, aux. alarm is deactive.
Gen Start	Start Signal Output	Volts free output (Normally close)
F1 and F2	Fuse	AC 250V/10A

Note: See Typical Application for more details.

LO、NO Switch Diagram



Terminals changing



Fuse changing

Programme via LINK

7. DEFINITION AND RANGE OF PARAMETERS

Form1

No.	Items	Range	Default	Description
1	Priority	(1-3)	1	1: 1# priority 2: 2# priority 3: Spare to each other
2	1# Volt Abnormal Delay	(1-7)	2 (5s)	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
3	2# Volt Abnormal Delay	(1-7)	2 (5s)	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
4	Start Delay	(1-7)	4 (30s)	1: 3s 2: 8s 3: 15s 4: 30s 5: 50s 6: 70s 7: User defined(Default: 1s)
5	Stop Delay	(1-7)	6 (70s)	1: 3s 2: 8s 3: 15s 4: 30s 5: 50s 6: 70s 7: User defined(Default: 90s)
6	Open Delay	(1-7)	3 (5s)	1: 1s 2: 3s 3: 5s 4: 8s 5: 10s 6: 15s 7: User defined(Default: 5s)
7	Close Delay	(1-7)	3 (5s)	1: 1s 2: 3s 3: 5s 4: 8s 5: 10s 6: 15s 7: User defined(Default: 5s)
8	Switch Transfer Rest	(1-7)	1 (1s)	1: 1s 2: 3s 3: 5s

No.	Items	Range	Default	Description
				4: 8s 5: 10s 6: 15s 7: User defined(Default: 1s)
9	1# Volt Normal Delay	(1-7)	2 (5s)	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)
10	2# Volt Normal Delay	(1-7)	2 (5s)	1: 1s 2: 5s 3: 10s 4: 20s 5: 30s 6: 45s 7: User defined(Default: 5s)

Note: The parameters in this form can be set via computers and slave.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.

Form2

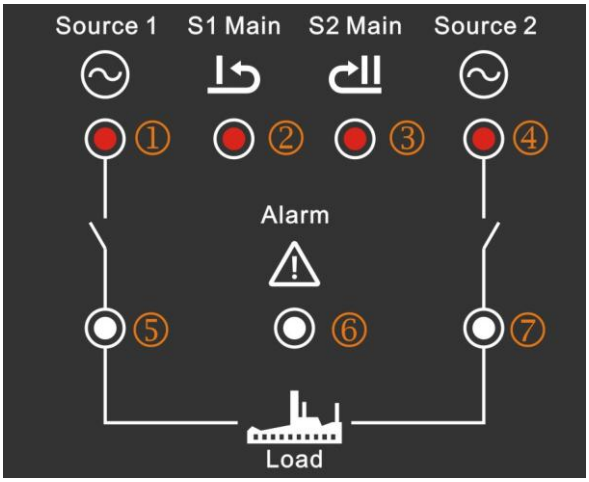
No.	Item	Range	Default	Description
1	Power Supply	(0-1)	0	0: 3Phase 4Wire 1: 1Phase 2Wire
2	Rated Volt	(170-270)V	230	Provide base for over/under volt judge. Provide base for close volt and aux. alarm judge.
3	Rated Freq	(50.0-60.0)Hz	50.0	Provide base for over/under frequency judge.
4	Over Volt Monitor Enabled	(0-1)	1	0: Disabled 1: Enabled
5	Over Volt Threshold	(100-120)%	115	Threshold
6	Over Volt Return	(100-120)%	113	Return
7	Under Volt Monitor Enabled	(0-1)	1	0: Disabled 1: Enabled
8	Under Volt Threshold	(70-100)%	75	Threshold
9	Under Volt Return	(70-100)%	77	Return
10	Over Freq Monitor Enabled	(0-1)	1	0: Disabled 1: Enabled
11	Over Freq Threshold	(100-120)%	110	Threshold
12	Over Freq Return	(100-120)%	104	Return
13	Under Freq Monitor Enabled	(0-1)	1	0: Disabled 1: Enabled
14	Under Freq Threshold	(80-100)%	90	Threshold
15	Under Freq Return	(80-100)%	96	Return
16	Loss of Phase Monitor Enabled	(0-1)	1	0: Disabled 1: Enabled (Settled delay: 3s)

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 5s and manual indicator flashes; ①, ②, ③, ④ indicators illuminate.



8.2 PARAMETERS SETTING

When it entered into parameter setting mode, enter into modify mode by pressing O. ①, ②, ③, ④ indicators mean setting items numbers; ⑤, ⑥, ⑦ indicators mean these parameter value.

Specific setting as below:

Select setting number which needs to adjust by pressing I and O;

Enter into setting status by pressing II and ⑤, ⑥, ⑦ indicator flashes;

After set this parameter by pressing I and O, save the value by pressing II.

Note: See 7 Form1 for settable parameters (the No. is setting item numbers).

Note: In setting process, discontinue present setting by pressing any time, exit with the present value not saving.

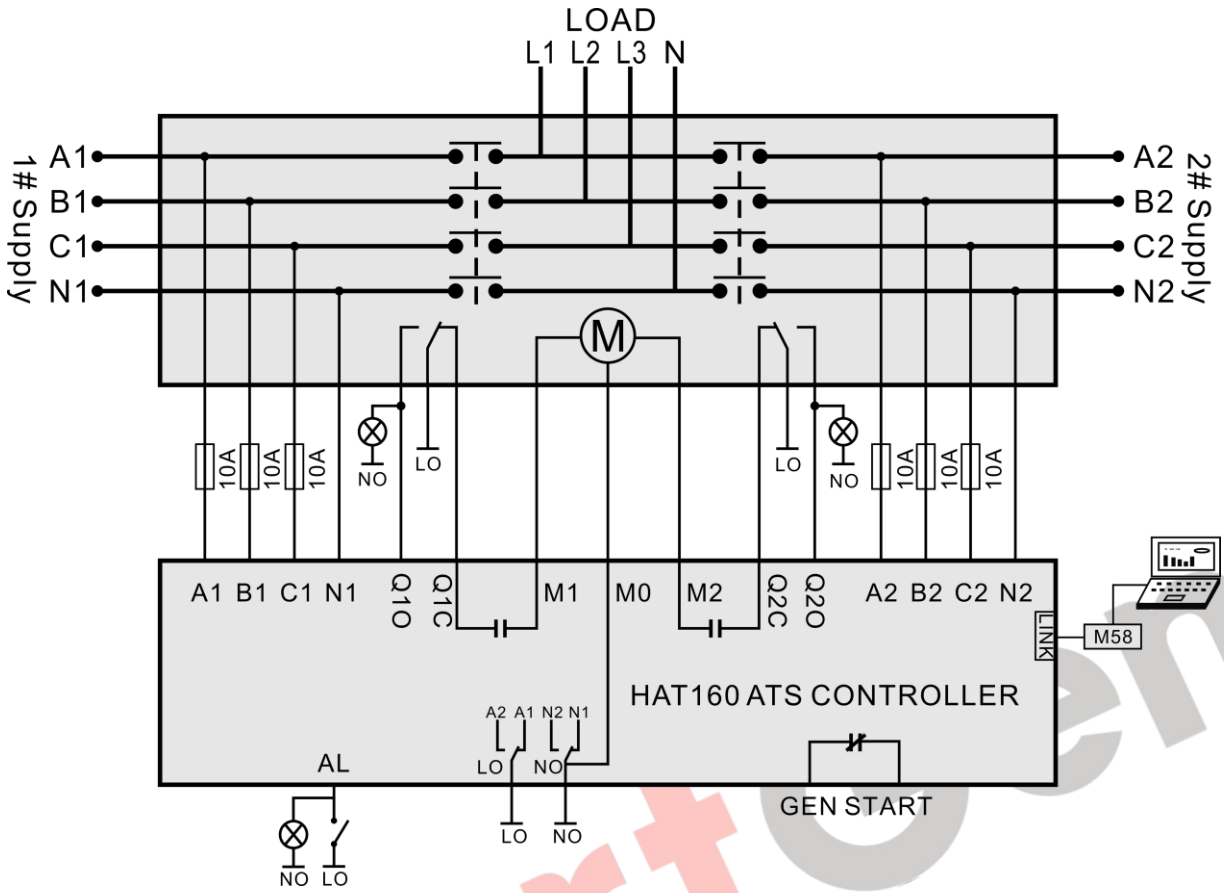
Note: See 8.3 for the values corresponding of LED indicators.

8.3 RESET TO DEFAULT

In parameter setting mode, press I, Normal, S1 Main, S2 Main and Emergency indicators illuminate and 2# On indicator flashes; press II, 2# On indicator illuminating means reset to default successfully; exit this mode by pressing any time in this process.

Indicators				Value	Indicators			Value
Normal	S1 Main	S2 Main	Emergency		1# On	Alarm	2# On	
○	○	○	●	1	○	○	●	1
○	○	●	○	2	○	●	○	2
○	○	●	●	3	○	●	●	3
○	●	○	○	4	●	○	○	4
○	●	○	●	5	●	○	●	5
○	●	●	○	6	●	●	○	6
○	●	●	●	7	●	●	●	7
●	○	○	○	8				
●	○	○	●	9				
●	○	●	○	10				

9. TYPICAL APPLICATION



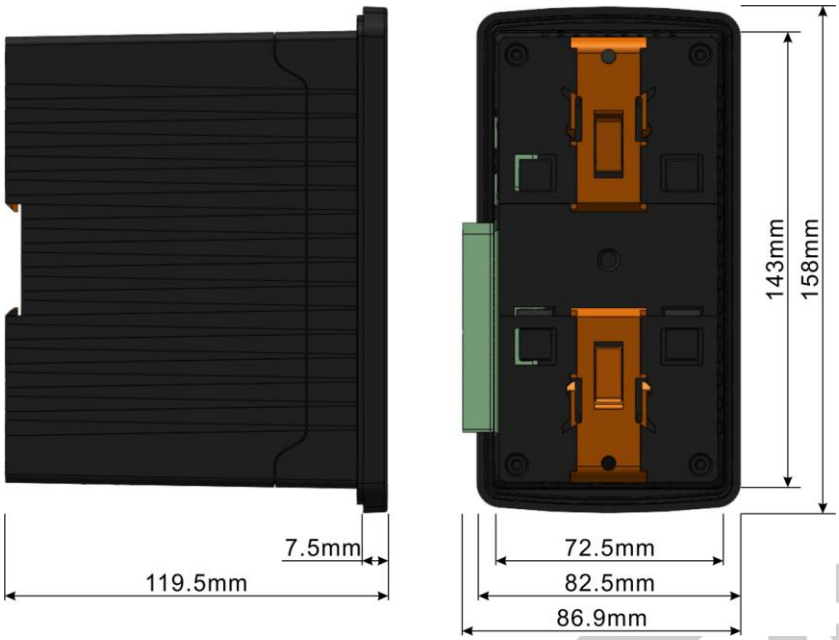
⚠CAUTION: If ATS has trip function, then it must be connected to AL port (AC Volt input).

Ensure 1# and 2# A phase won't be abnormal at the same time, otherwise the controller won't send Close/Open signal.

10. VERALL DIMENSION AND PANEL CUTOUT

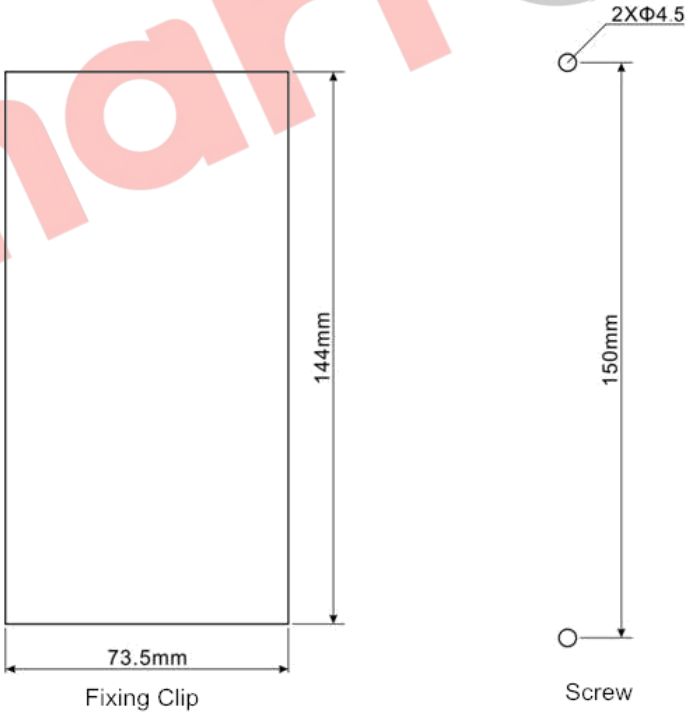
10.1 CASE DIMENSION

Unit: mm



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:



10.3 INSTALLATION

A)Fixing Clips

B) 35mm Slideway

C) Screw Mounting

11. TROBLESHOOTING

Symptom	Possible Remedy
Controller inoperative	Check connections of 1# and 2# power; Check F1 or F2 fuse
Switch not activate	Check ATS; Check the connections between controller and ATS.
1# or 2# power Lamp flashes	Check whether AC voltage is normal or not.
Alarm lamp flashes	Remove trip status of the switch and reset alarm.
Alarm lamp illuminates	Check the connections between controller and ATS. Check if auxiliary contact is reliably connected; Check Close/Open delay value, appropriately length the value.
Genset failed to stop when switch has transferred	Disconnect controller; check if auxiliary contact is reliably connected.