SmartGen HAT520NC ATS Controller User Manual

Contents

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SmartGen HAT520NC ATS Controller

SmartGen — make your generator smart

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Date	Version	Note
2020-03-02	1.0	Original release.
2020-03-13	1.1	Changed application diagram.
2020-04-16	1.2	Add auto transfer auto restore/auto transfer non-restore function description.
2020-06-05	1.3	Add auto transfer auto restore/auto transfer non-restore parameters instruction for panel setting steps.
2022-08-04	1.4	Update the manual format; update the logo of SmartGen.

OVERVIEW

HAT520NC ATS Controller is composed of the core microprocessor, which can precisely measure 3 phase/single phase voltage of 2 ways, make accurate judgment on abnormal voltages (power lost, over/under voltage, over/under frequency, loss of phase, phase sequence wrong), and control ATS to transfer after the delay has expired. It is suitable for No breaking ATS. When 1# power is abnormal, controller can send signal to start genset after the “1# abnormal delay” has expired. “Three remotes” (remote control, remote measurement, and remote communication) function can be implemented via RS485 communication port.

PERFORMANCE AND CHARACTERISTICS

Controller performance and characteristics are shown as below:

- 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) Fre quency Hz Frequency Hz
- Over/under voltage, loss of phase, phase sequence wrong, over/under frequency detection function. As default, phase sequence wrong and over/under frequency detection are disable;however, users can set the function as they need.
- RS485 communication port (SmartGen SG72 adapt o r is needed). It can realize controller parameter

configuration function and it also can realize firmware update of controller.

- The norm al delay of 1# or 2# power can be set (Range: 0~60 s and the Genset start delay can be set (Range: 0~3600 s
- The abnormal delay of 1# or 2# power can be set Range: 0~60 s and the Genset stop delay can be set Range: 0~3600 s s.
- “1# Master ”, Each Backup ” and “ Master ” can be set via controller front panel , to realize 1# master power supply, 2# master power supply, or backup supply methods for each other to supply power.
- Clos e output signal can be set as on intervals or as continuous output.
- 2 way N line isolated design.
- Auto/Manual mode transfer. In manual mode, ATS transfer 1# switch or 2# switch can be implemented via the panel pushbutton.
- LEDs mounted on front panel can clearly show the ATS running status.
- The output contactor capacity of 1# and 2# power supply transfer relay (1# CLOSE, 2# CLOSE) is 16A AC250V, volts free contact, can be directly used in driving the switch to transfer etc
- The output contactor capacity of the Genset start relay (GENS START) is 7A AC250V/7A DC28V, volts free Normally Close contact.
- Suitable for various AC systems (3 phase 4 wire, 2 phase 3 wire and single phase 2 wire).
- Mo modular design, flame retardant ABS plastic shell, pluggable terminal, built-in mounting , compact structure with easy installation.

SPECIFICATION

Items	Contents
Operating Voltage	AC170V~277V during AC power L1N1/L2N2 supply.
Power Consumption	<2W (Standby mode: <1W)
AC Voltage Input 3P4W (ph-N) 1P2W (ph-N) 2P3W (ph-N)	AC170V~AC277V(ph-N) AC170V~AC277V (ph-N) AC170V~AC277V(ph-N)
Rated Frequency	50/60Hz

1# Close Relay Output	16A AC250V Volts free output
2# Close Relay Output	16A AC250V Volts free output
Gen Start Relay	7A AC250V Volts free output
1# Close Input	COM connected is active.
2# Close Input	COM connected is active.
Communication	RS485 Port, MODBUS Protocol
Case Dimensions	139mmx120mmx50mm
Panel Cutout	130mmx111mm
Working Temperature	(-25~+70)°C;
Working Humidity	(20~93)%RH
Storage Temperature	(-30~+80)°C
Protection Level	IP65: when waterproof gasket installed between controller and the control window;

Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.
Weight	0.49kg

PANEL DESCRIPTION

PANEL OPERATION

INDICATOR LIGHT FUNCTION DESCRIPTION

Indicator Light	Function Description
1# Power Indicator	It is illuminated when 1# power is normal; flashing when 1# power state is abnormal; off when there is no 1# power.
2#Power Indicator	It is illuminated when 2# power is normal; flashing when 2# power state is abnormal; off when there is no 2# power.
1# Close Indicator	It is illuminated when 1# power auxiliary contactor is active while off when it is deactivated.
2# Close Indicator	It is illuminated when 2# power auxiliary contactor is active while off when it is deactivated.
Auto Mode Indicator	It is illuminated when the controller is in auto mode while off when the controller is in manual mode.
Manual Mode Indicator	It is illuminated when the controller is in manual mode while off when the controller is in auto mode.

NOTE: Indicators Description after set ting the parameters: More detail s please refer to the following description of “Panel Button

PANEL BUTTON OPERATION

PANEL BUTTON OPERATION

Pressing and holding the  button for more than 3s, all LEDs are illuminated to enter into lamp test mode;

Keep pressing  and don’t release, after 7s all LEDs are flashing (once per 500ms) to enter parameter setting

status, and release the button; At this time if users don’t plan to set paramters, press  button, and all LEDs flash rapidly for 5 times (once per 200ms) to return back to normal testing mode. At the status of lamp test, release  button and controller goes back to normal testing mode. After entering parameter setting status, if parameters are not set, controller will automatically go back to normal testing mode after about 1 minute and 30 seconds.

MASTER SETTING
First of all make controller enter parameter setting status, and then conduct the settings. Procedures of setting “1# Master ”, “ Master ” and Each Backup

- Press ,  and  at the sam  e time, when 1# 1#/#2 power indicator and auto indicator are illuminated; release the three buttons, then the auto indicator and 2# power indicators extinguish, 1# power indicator illuminates, which means the controller master setting s tatus is entered
- Pressing can circularly set 3 conditions of power supply.
  - **1# Master :** 1# power indicator illuminates and 2# power indicator extinguishes
  - **2# Master :** 2# power indicator illuminates and 1# power indicator extinguishes
  - **Each Backup :** 1# po wer and 2# power indicators are illuminating at the same time;
- After adjusting, press , when 1# power indicator, auto indicator and 2# power indicator are illuminating, the adjusted master power value has been saved. The controller will go back to normal s tatus automatically after all LEDs are flashing 5 times rapidly and the controller will work according to the set master status

NOTE

Once the controller is powered on, master status can be judged by the following three conditions.

- If the 1# power supply indicator flashes rapidly three times, it indicates es 1# power supply is master
- If the 2# power supply indicator flashes rapidly three times, it indicates es 2# power supply is master
- If 1# and 2# power supply indicators flash simultaneously three times, it i indicate es it is each backup

AC SYSTEM SETTING
First of all make the controller enter the parameter setting status, and then conduct the settings. Procedures of setting “ single phase 2 wire”wir “3 phase 4 wire” and “2 phase 3 wire”

- Press  ,  and  at the same time when 1#/2# power indicator and auto indicator are illuminated; release the three buttons, then the auto indicator and 2# power indicators extinguish, 1# power indicator illuminates.
- Press  , when 1#/2# power indicator and auto indicator are illuminated; release the button, then the auto indicator and 1#/2# power indicators are extinguished simultaneously, which means controller AC system setting status is entered
- Pressing  can circularly set three AC systems.
  - Single phase 2 wire: 1# close indicator illuminates

    - 3 phase 4 wire: 1# close indicator, 2# close indicator, and manual mode indicator illuminates simultaneously
    - 2 phase 3 wire: 1# close indicator and manual mode indicator illuminates simultaneously;
- After adjusting, press  , when 1# power indicator, auto indicator, and 2#power indicator are illuminating, and the adjusted AC system has been saved. The controller will go back to normal status automatically after all LEDs are flashing 5 times rapidly and the controller will work according to the set AC system.

NOTE
Once the controller is powered on, its AC system can be judged by the following three conditions.

- If 1# close indicator illuminates, it means a Single phase 2 wire system is selected.
- If 1# close indicator, manual mode indicator and 2# close indicator illuminate ate simultaneously, it means 3 phase 4 wire system is selected.
- If 1# close indicator and manual mode indicator illuminate simultaneously, it means 2 phase 3 wire system is selected.

AUTO TRANS. AUTO RESTORE SETTING

First of all, make the controller enter the parameter setting status and then conduct the setting Set Auto Trans. Auto Restore/Auto Trans. Non-Restore" Steps:

- Press and at the same time, when 1#/2# power indicator s and auto indicator are illuminated release the two buttons, then the auto indicator and 2# power indicator are extinguished 1 power indicator and 1 close indicator are illuminated, which means the auto trans. auto restore of the controller can be set.
- Press can circularly set two states: Auto trans. non-restore when 1# power indicator and 1# close indicator are illuminated, 2# power indicator and 2# close indicator are extinguished. Auto t rans. auto restore when 2# power indicator and 2# close indicator are illuminated, 1# power indicator and 1# close indicator are extinguished.
- After adjustment, press . When the 1#/2# power indicator s and auto indicator are illuminated at the same time, it indicates that the set parameter value has been saved successfully; all indicators on the panel flash 5 times quickly to return to normal test mode. The controller works according to the set state of auto-trans. auto restore/auto trans. nonrestore.

NOTE: Turn on the power supply of the controller, auto trans. auto restore/auto trans. nonrestore set by the controller can be judged by the following two situations:

- If 1# power indicator and 1# close indicator flash quickly three times at the same time, it is auto trans. nonrestore.
- If 2# power indicator and 2# close indicator flash quickly three times at the same time, it is auto-trans. auto restore

PROGRAMMED PARAMETER AND RANGE

No.	Item	Range	Default	Description
01	1# Normal Delay	(0-60)s	Can be set via a controller potentiometer	It is the delay of 1# power from voltage abnormal to voltage normal. Generally, it is 10s.
02	1# Abnormal Delay	(0-60)s	5	It is the delay of 1# power from voltage normal to voltage abnormal.
03	2# Normal Delay	(0-60)s	Can be set via a controller potentiometer	It is the delay of 2# power from voltage abnormal to voltage normal. Generally, it is 10s.
04	2# Abnormal Delay	(0-60)s	5	It is the delay of 1# power from voltage normal to voltage abnormal.
05	Close Delay	(0-20)s	5	Pulse time for close relay; If set it to 0, it is continuous output.
06	Exceed Transfer	(0-20.0)s	0.0	It is the extra output delay of the close relay after the close signal has been received.

07	Start Delay	(0-3600)s	1	When voltage is abnormal, start delay begins; start signal is initiated after the delay has expire d.
08	Stop Delay	(0-3600)s	90	At genset starting, if Mains voltage is normal,

No.	Item	Range	Default	Description
				stop delay begins; after the delay, close genset start signal;
09	AC System	(0-2)	0	0. 3-phase 4-wire 1. 2-phase 3-wire 2. Single phase 2-wire
10	Rated Volt	(100-240)V	230	AC system rated voltage.
11	Rated Frequency	(50.0-60.0)Hz	50.0	To offer standards for detecting over/under frequency.

12	Over Volt Enable	(0-1)	1	0: Disable 1: Enable
13	Over Voltage	(100-120%)	115	Voltage upper limit; it is abnormal when the voltage has exceed the set value.
14	Over Voltage Return	(100-120%)	113	Voltage upper limit return value; it is normal only when the voltage falls below the set value.
15	Under voltage	(70-100%)	75	Voltage lower limit; it is abnormal when the voltage has fallen below the set value.
16	Under Voltage Return	(70-100%)	77	Voltage lower limit return value; it is normal only when the voltage has exceeded the set value.
17	Over Freq Enable	(0-1)	0	0: Disable 1: Enable
18	Over Frequency	(100-120%)	110	Frequency upper limit; it is abnormal when the frequency has exceed the set value.

19	Over Frequency Return	(100-120%)	104	Frequency upper limit return value; it is normal only when the frequency falls below the set value.
20	Under Freq Enable	(0-1)	0	0: Disable 1: Enable
21	Under Frequency	(80-100%)	90	Frequency lower limit; it is abnormal when the frequency has fallen below the set value.
22	Under Frequency Return	(80-100%)	96	Frequency lower limit return value; it is normal only when the frequency has exceeded the set value.
23	Loss of Phase	(0-1)	1	0: Disable 1: Enable
24	Phase Sequence Wrong	(0-1)	0	0: Disable 1: Enable

25	Master-Slave Set	(0-2)	0	0. 1# Master; 1. 2# Master; 2. Each Backup
26	Auto Trans./Auto Restore	(0-1)	1	0: Auto Trans. Non-Restore 1: Auto Trans. Auto Restore

- **NOTE** 1 Parameters above are configured by SmartGen PC software. PC program ming connection: connect RS485 interface of SG72 and controller RS485
- **NOTE** 2 “1# Normal Delay” and “2# Normal Delay” can be set only via the potentiometer which locate s nearby the back panel terminal. “1# Abnormal Delay” and “2# Abnormal Delay” can be set via the PC software or potentiometer which locate s nearby the back panel terminal. AC sy stem and priority selection can be set via panel button or PC software while other parameters can be set via PC software only.
- **NOTE 3** 1# Normal Delay set value must n’t be less than 1# Abnormal Delay, otherwise, 1# Normal Delay set value will be forced to be set as 1# Abnormal Delay set value. 2# Normal Delay set value shall be over or equal to 2# Abnormal Delay set value, otherwise 2# Normal Delay set value will be forced to be set as 2# Abnormal Delay set value. If motor driving type ATS (e.g. SOCOMEC VS) is applied, the Close delay and Open delay must n’t be less than 5s; If magnet driving type ATS (e.g. SGQ N) is applied, the Exceed Transfer delay must be set as
- **NOTE 4:** “Priority Select” in last version is changed to “Master Slave Set “; Set contents “0: 1# Priority; 1: 2# Priority; 2: NO Priority” are changed to “0: 1 # Master; 1: 2# Master; 2: Backup”.

OPERATION CONTROL

When the controller is running, pressing 

key can set the controller to Auto mode and auto status indicator is illuminated. The pressing  key can set the controller to Manual mode and the manual status indicator is illuminated. In auto mode, the controller can automatically transfer the load to 1# power supply or 2# power supply. When it is set to Auto Transfer Auto Restore, master power is normal, and the controller will transfer to master power in priority. When it is set to Auto Transfer Non-Restore, the controller only transfers to backup power, and master power transfer can only be controlled manually. Each Backup is mutually backed up for dual power sources. When 1# power is abnormal, and 2# is normal, the switch will transfer to 2# power supply, and

vice versa. When it is set to Each Backup, the controller will not detect Auto Transfer Auto Restore settings.

In Manual mode, press I key and load will be transferred to 1# power supply; press II key and load will be transferred to 2# power supply.

WIRE CONNECTION

DESCRIPTION OF CONNECTING TERMINALS

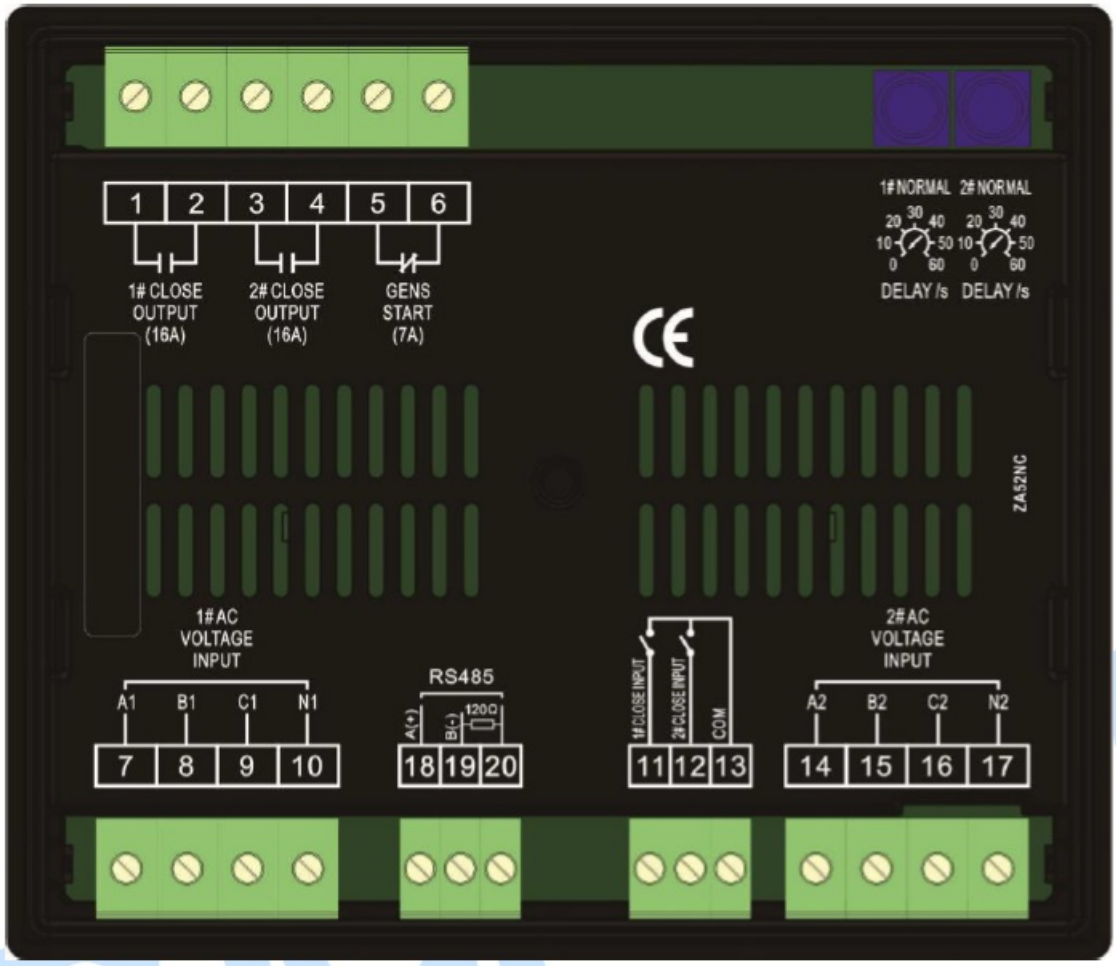

Fig. 2 HAT520NC Back Panel

Table 5 Terminal Function Description

No.	Items	Description	Remark
1	1# Close Output	Volt-free relay contact output	N/O contact output; rated 16A.
2			
3	2# Close Output	Volt-free relay contact output	N/O contact output; rated 16A.

4			
5	Gens Start	Volt-free relay contact output	N/C contact output; rated 7A.
6			
7	A1	1# AC 3-phase 4 wire voltage input	For single phase, only connect A1, N 1.
8	B1		
9	C1		
10	N1		
11	1# Close Input	Detection of 1# ATS closing status; auxiliary contact input	Connect COM is active.
12	2# Close Input	Detection of 2# ATS closing status; auxiliary contact input	Connect COM is active.
13	COM	COM	
14	A2	2# AC 3-phase 4 wire voltage input	For single phase, only connect A2, N 2.
15	B2		
16	C2		

17	N2		
18	A(+)	RS485 communication port	Inside already connected 120 Ω impedance matched resistor
19	B(-)		
20	120Ω Resistor	RS485 impedance matched resistor	Users need to make this connected with terminal No. 18 based on field n etwork, used for connecting inside 120Ω resistor;

RS485 CONNECTION DES CRIPTION

Connection between RS485 and adaptor is as below:

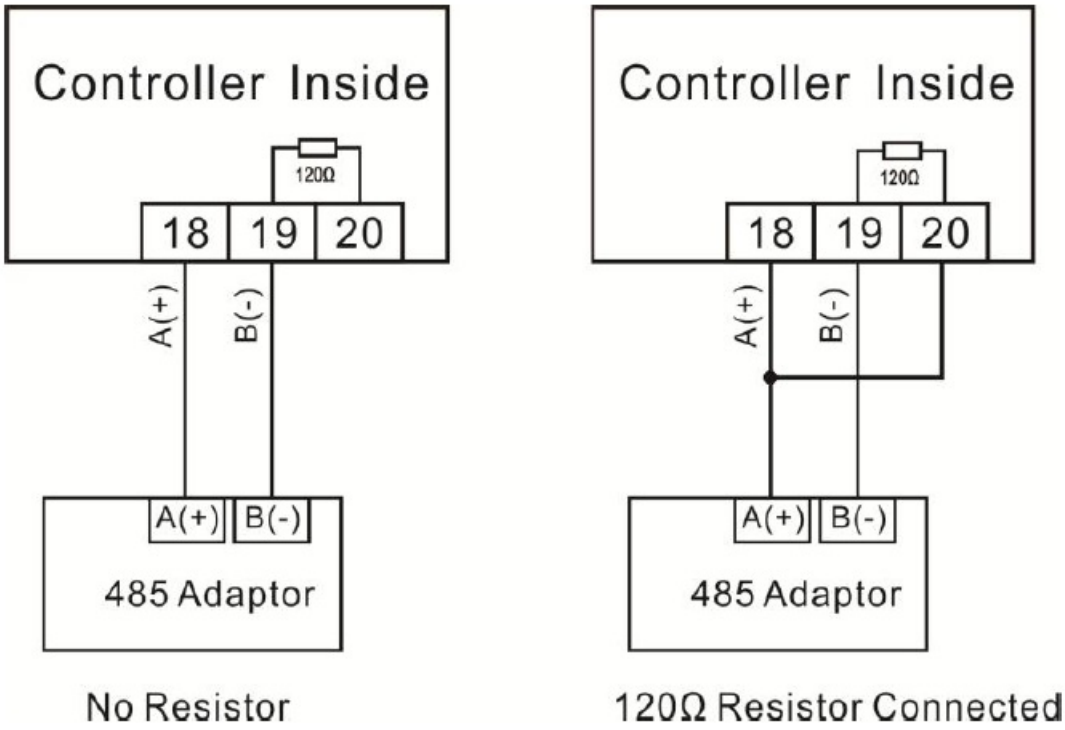

Fig. 3 RS485 Connection

TYPICAL WIRING DIAGRAM

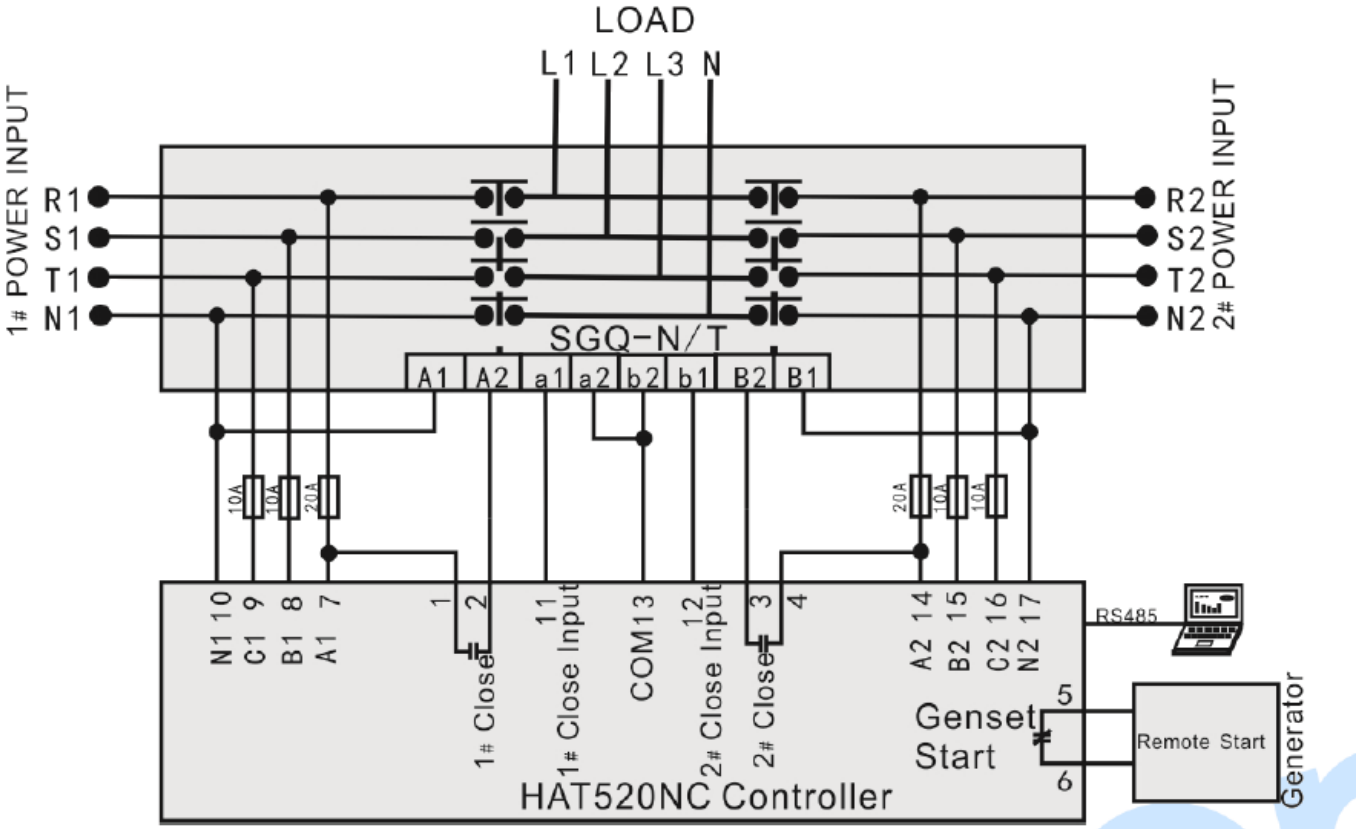

Fig. 4 SGQ-N/T Wiring Diagram

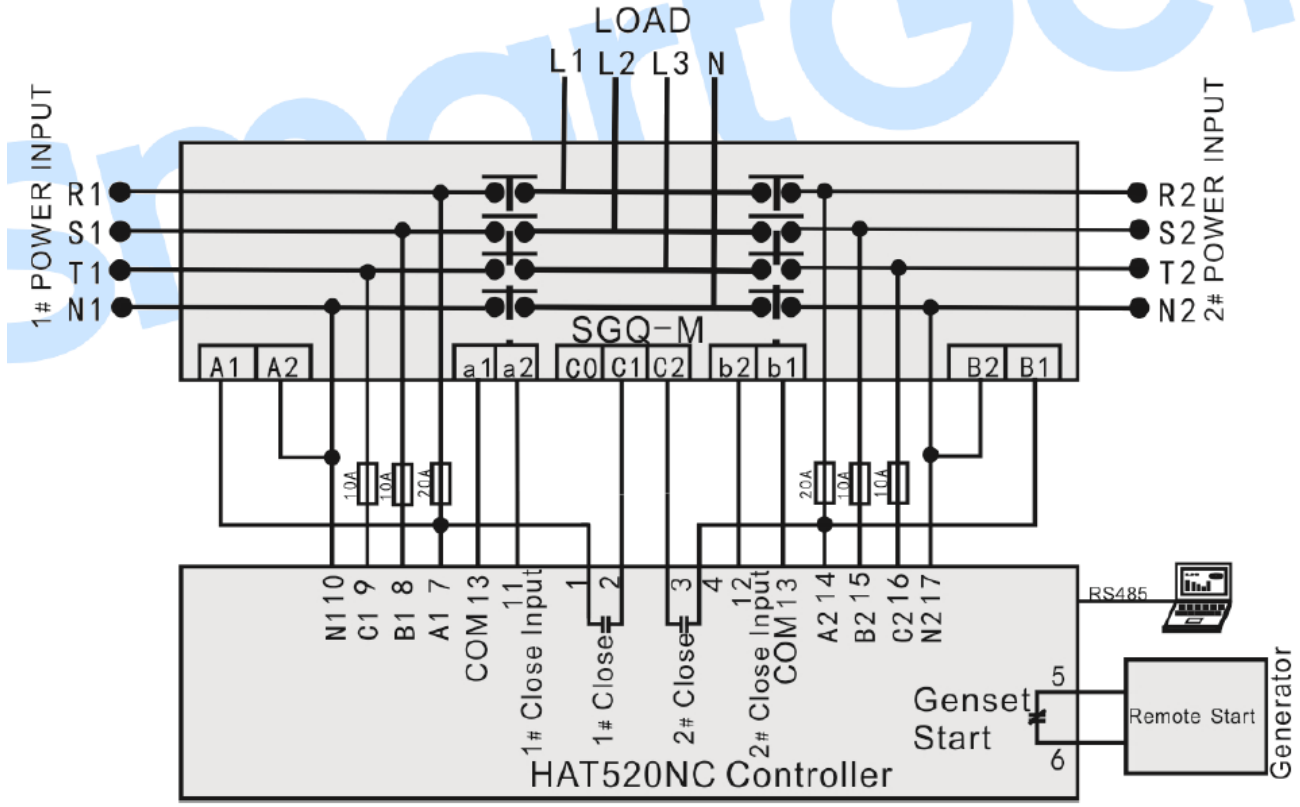

Fig. 5 SGQ-M Wiring Diagram

NOTE The diagram is for reference only. The actual wiring shall follow the ATS instruction. Users should choose prop er fuse capacity according to the actual power consumption. Please don't take the fuse in the diagram above as standard.

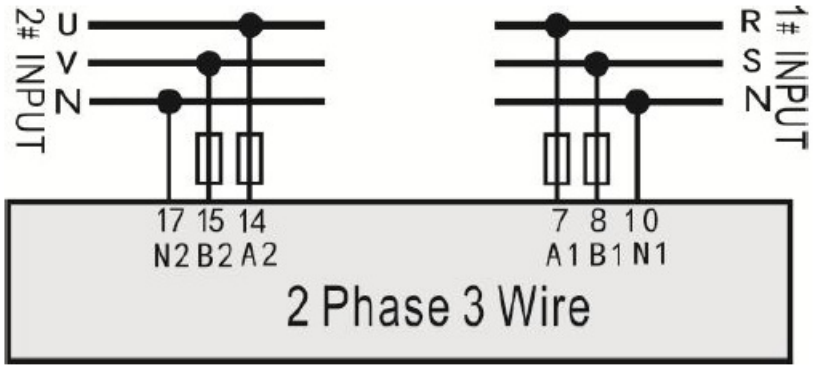

Fig. 6 2-phase 3-wire Wiring Diagram

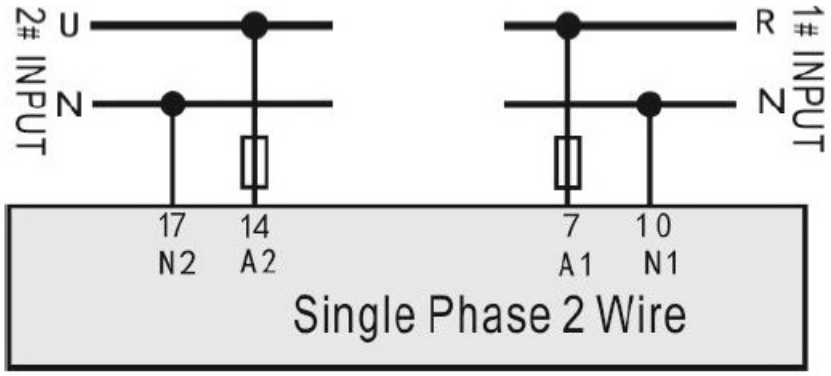

Fig. 7 Single phase 2-wire Wiring Diagram

NOTE Above pictures take the AC 220V voltage as ex ample. If AC 110V voltage is applied in actual use, please contact with SmartG en technical staff to get the specific wiring methods.

INSTALLATION

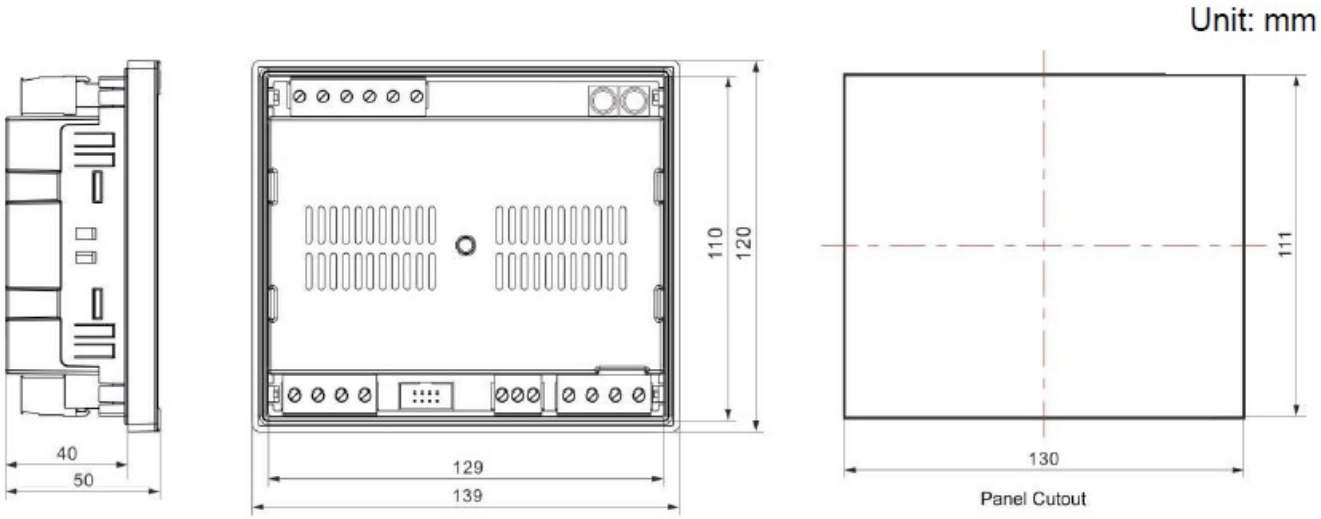

Fig. 8 Installation Dimension

FAULT FINDING

Table 6 Common Faults

Symptom	Possible Solutions
Controller no response with power.	Check controller wiring connections;
Genset running while ATS not transfer	Check ATS; Check the connection wirings between the controller and the ATS.
Electrical parameters detection error	Check controller wring; Modify electrical parameters detection value;
PC software communication failure	Check communication port setting and connections.

Documents / Resources

	SmartGen HAT520NC ATS Controller [pdf] User Manual HAT520NC ATS Controller, HAT520NC, HAT520NC Controller, ATS Controller, Controller

References

- 众智
- 众智