HGM7220N/HGM7220S SERIES

GENSET CONTROLLER

USER MANUAL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

4 OPERATION

4.1 KEY FUNCTION

Table 3 - Key Function Descriptions

Icon	Function	Description
	Stop/ Reset	Stop the running genset both in Auto/Manual mode; Remove the alarm in stop mode; Press for 3 seconds or over and panel indicators can be tested (lamp test); Press again in stop process and genset shall stop immediately.
	Start	Start genset in manual mode.
	Manual	Set the module to manual mode.
	Auto	Set the module to auto mode.
	C/O	Control breaker close and open in manual mode.
	Set/Confirm	Enter menu list page; Move cursor in parameter setting and confirm the set information.
	Up/Increase	Scrolls the screen up; Shift cursor up or increase the set value in parameter setting.
	Down/Decrease	Scrolls the screen down; Shift cursor down or decrease the set value in parameter setting.
	Home/Return	Return to home page in main interface; Return to last interface in parameter setting; Press for 3 seconds or over, trip alarm can be reset.

NOTE: press any key to mute alarms in main screen.

4.2 CONTROLLER PANEL

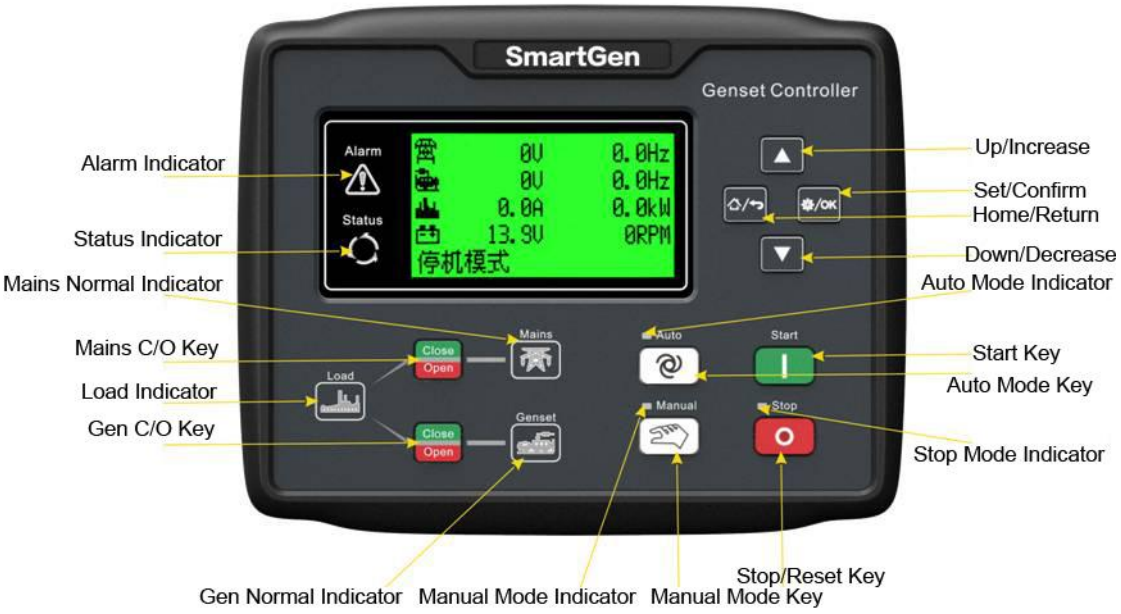

Figure 1 - HGM7220N/7220S Front Panel Indication

NOTE: Illustration for part indicators.

Table 4 - Alarm Indicator Description

Alarm Type	Alarm Indicators
Warning alarm	slowly flashing (once per second)
Trip alarm	slowly flashing (once per second)
Shutdown alarm	fast flashing (5 times per second)
Trip and stop alarm	fast flashing (5 times per second)

NOTES:

a) Status Indicators: illuminate always after crank disconnection and before ETS; extinguished during other periods.

b) Gen Normal Indicator: illuminates always when generator is normal; flashes when generator is abnormal; extinguished when generator is standby.

c) Mains Normal Indicator: illuminates always when mains is normal; flashes when mains is in fault; extinguished when gen is standby.

d) When mains is disabled, mains normal indicator is extinguished, and meanwhile mains C/O key does not work.

4.3 AUTO START/STOP OPERATION

4.3.1. ILLUSTRATION

Press and the indicator beside is illuminated, meaning genset is in Auto Start mode.

4.3.2. AUTO START SEQUENCE

a) HGM7220N/HGM7220S Start Conditions:

Mains Enable: When mains is abnormal (over and under voltage, over and under frequency, loss of phase and inverse phase), genset enters “mains abnormal delay” and LCD displays countdown time. When mains abnormal delay is over, it enters “start delay”. Or when remote start (load on) input is active, it enters “start delay”.

Mains Disable: When remote start (load on) input is active, genset enters “start delay”.

b) “start delay” countdown is shown on LCD.

c) When start delay is over, preheating relay outputs (if configured), “Pre-heat Delay XX s” is shown on LCD.

d) When preheating delay is over, fuel relay outputs for 1s. Then start relay outputs; if engine cranking fails during “cranking time”, the fuel relay and start relay are deactivated and enter “crank rest time” waiting for next crank.

e) If engine crank fails within setting times, controller will initiate “failed to start” shutdown signal and “failed to start” message appears on LCD display at the same time.

f) In case of successful cranking, “safety on time” starts. During this period, low oil pressure, high water temperature, under speed, and charge failure alarms are disabled. As soon as “safety on delay” is over, “start idle delay” is initiated (if configured).

g) During “start idle delay” period, under speed, under frequency, under voltage alarms are inhibited. When this delay is over, “warming up delay” starts (if configured).

h) In case mains is abnormal and HGM7220N remote start (on-load) input is active, when “warming up delay” is over, if generator status is normal, the indicator will be illuminated; if voltage and frequency has reached to on-load requirements, the closing relay will be energized, generator will accept load, generator power indicator will be lit on, and generator will enter Normal Running status; if voltage and frequency are abnormal, the controller will initiate shutdown alarm (shutdown alarm will be displayed on LCD alarm page).

i) In case HGM7220S remote start (on-load) input is active, when “warming up delay” is over, if generator status is normal then the generator status indicator shall be illuminated. Until genset and mains satisfy the synchronization conditions, the controller shall issue close signal and when the controller detects the close feedback signal, it shall issue immediately the open signal, and genset is on-load.

NOTE: when remote start (off-load) signal input is active, the auto start sequence is the same as above except item h), generator closing relay will not output, and genset is off-load.

4.3.3. AUTO STOP SEQUENCE

a) In case HGM7220N/7220S genset is at normal running, if mains recovers normal, genset shall enter mains voltage “normal delay”. As soon as mains normal status is confirmed, mains status indicator shall be illuminated and “stop delay” starts; Or if remote start input is not active, “stop delay” starts.

b) As soon as “stop delay” is over,

① **HGM7220N:** starts “cooling delay”, meanwhile generating close relay is disconnected. After “transfer reset delay”, mains close relay outputs, mains is on-load, gens power supply indicator is light off,m and mains supply indicator is light on.

② **HGM7220S:** and mains meet the synchronization conditions, the controller shall issue mains close signal. When the controller detects mains close feedback signal, it shall give out immediately the gens open signal, gens supply indicator is extinguished, mains is on-load, mains supply indicator is illuminated, and genset starts “cooling delay”.

c) When genset enters “stop idle delay” (if configured), idle relay is energized and outputs.

d) When genset enters “ETS hold delay”, ETS relay is energized. Fuel relay is deactivated and detects whether it stops or not automatically.

e) Then it enters “wait stop time”, and controller shall detects whether genset stops or not is automatically.

f) After genset is stopped completely, it enters “after stop delay”, otherwise it enters “failed to stop” and the controller issue “failed to stop” warning (after stop failure warning, if gen-set stops after the alarm, it will enter “after stop delay” and “failed to stop” alarm will be eliminated automatically).

g) When “after stop delay” is over, genset shall enter standby status.

4.4 MANUAL START/STOP OPERATION

a) **HGM7220N/7220S:** Press  button and controller enters “Manual Mode”, Manual Mode indicator is illuminated. In this mode, Press  button and genset is started. Start success is detected automatically and genset goes up to high speed running automatically. In case high water temperature, low oil pressure, over speed and abnormal voltage occur during diesel genset running, controller can effectively protect genset to stop (for detailed procedures please refer to 4.3.2 Auto Start Sequence c~i.). In manual mode, load breaker won’t transfer automatically. It needs to press 

C/O key to open/close.

b) **Manual Stop**: press  key and the running genset shall be stopped. (for detailed procedures please refer to 4.3.3 Auto Stop Sequence b-g.)

4.5 EMERGENCY START

Simultaneously press  and  in manual mode and the generator shall be forced to crank. Successful start will not be judged according to crank disconnect conditions, but controlled by operator. When operator observes that the genset has started, he/she should release the button and start output will be deactivated. “Safety on delay” will be initiated.

5 BREAKER CONTROL PROCESS OF GENSET CONTROLLER

5.1 HGM7220N BREAKER CONTROL PROCESS

5.1.1. MANUAL SWITCHING PROCESS

Breaker is switched by manual control if controller in manual mode.

Operator controls load transfer of ATS via pressing 

button.

Mains Enable: When breaker open detection is disabled, (1) press generator 

button, open breaker will output if generator is on-load; generator will be closed if load is disconnected; mains will be opened if mains is on-load, and generator is closed after open delay is over; (2) press mains 

button, if mains is on-load, open breaker output; if load is disconnected, mains will be closed; if generator is on-load, generator will be opened, and mains will be closed after open delay is over.

If breaker open detection is enabled, mains on-load is changed to gens on-load. It is needed to press mains 

and press generator 

after open delay, then generator is closed (directly press gens close button, and none action occurs.). Gens on-load is changed to mains on-load, which is the same as above.

Mains Disable: Press generator 

button, and if generator is not on-load, then generator close outputs. Press generator 

and if generator is on-load, then generator open outputs.

5.1.2. AUTO SWITCHING PROCESS

Breaker is switched by automatic control if controller is in auto mode or stop mode.

a) In case input port is configured as close status auxiliary input,

Mains Enable:

When breaker open detection is enabled, mains on-load changes to generator on-load. After open delay and transfer rest delay, in the process of open output, transfer failure is detected. When the detection time is due, if open fails, then generator close does not occur, otherwise generator close occurs. In the process of generator close, transfer failure is detected. When the detection time is due, if close fails, then generator close is waited for. If transfer failure warning is enabled, then open/close failures shall issue warning signals. For generator on-load transfers to mains on-load, it is the same process as above.

When breaker open detection is disabled, mains on-load changes to generator on-load. After open delay and transfer rest delay, generator close occurs. In the process of generator close, transfer failure is detected. When the detection time is due, if close fails, then generator close is waited for. If transfer failure warning is enabled, then warning signal is issued. For generator on-load transfers to mains on-load, it is the same process as above.

Mains Disable:

When breaker open detection is enabled, mains on-load changes to generator on-load. After open delay in the process of open output, transfer failure is detected. When the detection time is due, if open fails, then open is waited for, otherwise open is completed. For generator off-load changing to generator on-load, after close delay, in the process of close output, transfer failure is detected. When the detection time is due, if close fails, then close is waited for, otherwise close is completed.

If transfer failure warning is enabled, then open/close failures shall issue warning signals.

When breaker open detection is disabled, generator on-load changes to generator off-load. After open delay, open is completed. For generator off-load changing to generator on-load, after close delay, in the process of close output, transfer failure is detected. When the detection time is due, if close fails, then close is waited for, otherwise close is completed. If transfer failure warning is enabled, then close

failure shall issue warning signal.

b) In case input port is not configured as close status auxiliary input,

Mains Enable:

For mains on-load changing to generator on-load, after open delay and transfer rest delay, generator close occurs. For generator on-load changing to mains on-load, it is the same as above.

Mains Disable:

For generator off-load changing to generator on-load, generator close outputs. For generator on-load changing to generator off-load, generator open outputs.

NOTE: In case of applying ATS without neutral breaking, open detection shall be disabled.

NOTE: In case of applying ATS with neutral breaking, open detection can be enabled and disabled. If it is enabled, please configure open output.

NOTE: In case of applying AC contactor, open detection is recommended to be enabled.

5.2 HGM7220S BREAKER CONTROL PROCESS

5.2.1. MANUAL SWITCHING PROCESS

Breaker is switched by manual control if controller in manual mode.

Operator controls ATS load transfer via C/O button.

Mains Enable:

Press generator Close Open button,

1. In case of generator on-load, then generator open outputs;
2. In case of generator&mains off-load, then generator close occurs;
3. In case of mains on-load, when generator synchronization close is over, mains open occurs and generator is on-load.

NOTE: In the process of waiting for synchronization or if synchronization fails, press generator C/O button to cancel synchronization, and generator breaker is open. Then press mains C/O button to force mains on-load.

Mains Disable:

Press generator C/O button, and if generator is off-load, then generator close outputs; if generator is on-load, then generator open outputs.

5.2.2. AUTO SWITCHING PROCESS

Breaker is switched by automatic control if controller in auto mode.

Mains Enable:

1. For mains on-load changing to generator on-load,

Controller shall output generator close when genset and mains meet synchronization conditions. When it detects generator close feedback signal, mains open outputs and generator is on-load. If generator close is outputted, generator close feedback signal is not detected during the C/O synchronization period, generator open is outputted and mains is on-load. Mains open status is detected at the time of mains open output. When the C/O synchronization time is due, if mains open fails, generator open outputs. If synchronization signal is not detected during the set synchronization failure time, then synchronization failure alarm is issued. If synchronization failure alarm is warning and transfer is forced to be enabled after synchronization failure ten mains open outputs. After open delay, mains open status is detected at the time of mains open output. When detection time is due, if mains open fails, then generator shall not close, otherwise, after transfer delay generator close outputs. Generator close status is detected at the time of generator close output. When the detection time is

6.4 TRIP ALARM

When controller detects trip alarms, it will immediately disconnect the generator close signals but genset does not stop.

Table 8 - Trip Alarms

No.	Type	Description
1	Over Current	When controller detects the genset current value is higher than the set value and action is selected “Trip”, it will send trip signals.
2	Reverse Power	When controller detects that the genset reverse power value (power is negative) exceeds the pre-set value, and action is selected “Trip”, it will send trip signals.
3	Over Power	When controller detects that the genset power value (power is positive) exceeds the pre-set value, and action is selected “Trip”, it will send trip signals.
4	Input Trip	When input port is configured as “Trip”, and if it is active, controller will send trip signals.
5	Mains Breaker Fail	HGM7220S controller: when controller detects mains C/O fails, it shall issue the alarm signal.
6	Gen Breaker Fail	HGM7220S controller: when controller detects generator C/O fails, it shall issue the alarm signal.
7	Fail to Sync	HGM7220S controller: When controller is in auto mode, if synchronization signal is not detected during the synchronization time for mains/generator synchronization close, it shall issue a warning signal.

7 WIRINGS CONNECTION

HGM7220N/7220S controller back panel is as below.

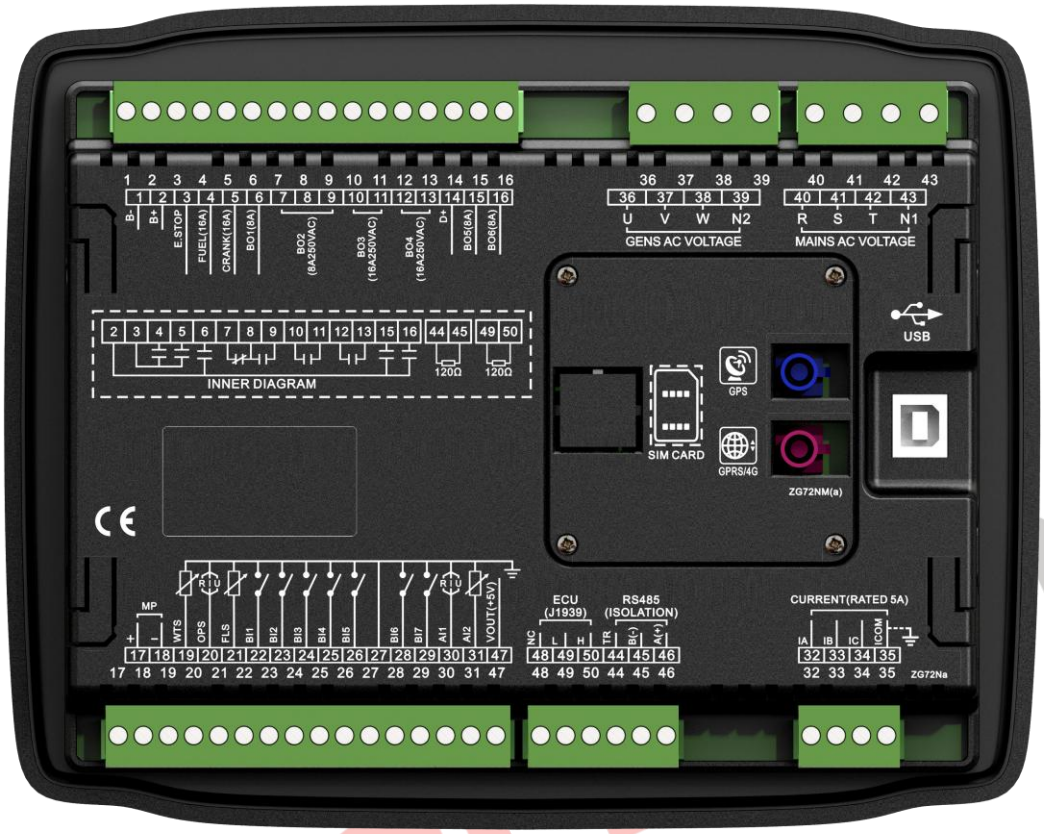

Figure 2 - Back Panel

Table 9 - Terminal Wiring Connection

No.	Function	Cable Size	Remarks
1	B-	2.5mm^2	Connected with negative of starter battery.
2	B+	2.5mm^2	Connected with positive of starter battery. If wire length is over 30m, it's better to double wires in parallel. Max. 20A fuse is recommended.
3	Emergency Stop	2.5mm^2	Connect with B+ via emergency stop button.
4	Fuel (16A)	1.5mm^2	B+ is supplied by Terminal 3, rated 16A.
5	Crank (16A)	1.5mm^2	B+ is supplied by Terminal 3, rated 16A. Connect with starting coil of starter.
6	Aux. Output 1(8A)	1.5mm^2	B+ is supplied by Terminal 2, rated 8A.
7	Aux. Output 2(8A 250VAC)	1.5 mm^2	NC output, rated 8A.
8			Relay common port.
9			NO output, rated 8A.
10	Aux. Output 3(16A 250VAC)	2.5 mm^2	Relay NO volt free contact, rated 16A, volt free contact output.
11			
12	Aux. Output 4(16A 250VAC)	2.5 mm^2	
13			
14	Charger(D+)	1.0mm^2	Connected with charger starter's D+ (WL) terminal. Please hang it up if there is not this terminal.
15	Aux. Output 5(8A)	1.5 mm^2	B+ is supplied by Terminal 2, rated 8A
16	Aux. Output 6(8A)	1.5 mm^2	
17	Speed Sensor Input	Connect with speed sensor, and shielded wire is recommended.	
18	Speed sensor input, battery negative electrode has been connected inside controller.		
19	Engine Temp.	Connect with temperature sensor	
20	Oil Pressure	Connect with pressure sensor	
21	Fuel Level	Connect with fuel level sensor	
22	Aux. Input 1	1.0mm^2	Ground connected is active (B-)
23	Aux. Input 2	1.0mm^2	Ground connected is active (B-)
24	Aux. Input 3	1.0mm^2	Ground connected is active (B-)
25	Aux. Input 4	1.0mm^2	Ground connected is active (B-)
26	Aux. Input 5	1.0mm^2	Ground connected is active (B-)
27	Sensor Common Port	Sensor common port, battery negative electrode has been connected inside controller.	
28	Aux. Input 6	1.0mm^2	Ground connected is active (B-)
29	Aux. Input 7	1.0mm^2	Ground connected is active (B-)

No.	Function	Cable Size	Remarks
30	Configurable Sensor 1	Connected with temp/pressure/fuel level sensor.	For items please see Table 13.
31	Configurable Sensor 2		
32	CT A-phase Monitoring Input	1.5mm^2	Outside connected to secondary coil of CT (5A rated).
33	CT B-phase Monitoring Input	1.5mm^2	Outside connected to secondary coil of CT (5A rated).
34	CTC-phase Monitoring Input	1.5mm^2	Outside connected to secondary coil of CT (5A rated).
35	CT Common Port	1.5mm^2	Details to see the following installation description.
36	Gen U-phase Voltage Monitoring Input	1.0mm^2	Connected to U-phase output of genset (2A fuse recommended).
37	Gen V-phase Voltage Monitoring Input	1.0mm^2	Connected to V-phase output of genset (2A fuse recommended).
38	Gen W-phase Voltage Monitoring Input	1.0mm^2	Connected to W-phase output of genset (2A fuse recommended).
39	Gen N2-line Input	1.0mm^2	Connected to N-line output of genset.
40	Mains R-phase Voltage Monitoring Input	1.0mm^2	Connected to R-phase of mains (2A fuse recommended).
41	Mains S-phase voltage monitoring input	1.0mm^2	Connected to S-phase of mains (2A fuse recommended).
42	Mains T-phase voltage monitoring input	1.0mm^2	Connected to T-phase of mains (2A fuse recommended).
43	Mains line N1 Input	1.0mm^2	Connected to N-line of mains.
44	Terminal Resistor (120Ω)	0.5mm^2	If 120Ω resistor is needed, short connect 44 and 46.
45	RS485-	0.5mm^2	120Ω shielding wire is recommended with single end ground connected.
46	RS485+	0.5mm^2	
47	VOUT(+5V)	0.5mm^2	Output DC +5V.
48	NC		
49	ECU CAN L	0.5mm^2	120Ω shielding wire is recommended with single end ground connected. Between CAN L and CAN H there is already 120Ω resistor inside the controller.
50	ECU CAN H	0.5mm^2	

NOTE: USB ports in controller rear panel are programmable parameter ports, and users can directly configure the controller on PC.

NOTE: Modem expansion module can be connected from the rear panel.

8 SCOPES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

8.1 CONTENTS AND SCOPES OF PARAMETERS

Table 10 - Parameter Settings and Scope

No.	Items	Range	Default	Description
Mains Setting				
1	Mains Enable	(0-1)	1	0: Disable; 1: Enable
2	AC System	(0-3)	0	0: 3P4W; 1: 3P3W 2: 2P3W 3: 1P2W
3	Rated Voltage	(30-30000)V	230	Provide standard for judging mains over/under voltage or not; if voltage transformer is applied, this value is the primary voltage of transformer.
4	Rated Frequency	(10.0-75.0)Hz	50.0	Provide standard for judging mains over/under frequency or not.
5	Normal Time	(0-3600)s	10	The time from mains abnormal to normal.
6	Abnormal Time	(0-3600)s	5	The time from mains normal to abnormal.
7	Voltage Transformer (PT)	(0-1)	0	0: Disabled; 1: Enabled
8	Over Voltage	(0-200)%	120	The setting value is mains rated voltage percentage; return value and delay value also can be set.
9	Under Voltage	(0-200)%	80	
10	Over Frequency	(0-200)%	Disabled	The setting value is mains rated frequency percentage; return value and delay value also can be set.
11	Under Frequency	(0-200)%	Disabled	
12	Loss of Phase Check	(0-1)	1	0: Disabled; 1: Enabled
13	Reverse Phase	(0-1)	1	
Timer Setting				
1	Start Delay	(0-3600)s	1	Time between mains abnormal or remote start signal is active and genset start.
2	Return Delay	(0-3600)s	1	Time between mains normal or remote start signal is deactivated and genset stop.
3	Preheat Delay	(0-3600)s	0	Power-on time of heater plug before starter is powered up.
4	Cranking Time	(3-60)s	8	Each starter power-on time
5	Crank Rest Time	(3-60)s	10	The waiting time before second power up when engine start fails.
6	Safety On Time	(0-3600)s	10	Alarms for low oil pressure, high temp, under speed, under frequency/voltage, charge alt failure are deactivated.
7	Start Idle Time	(0-3600)s	0	Running time for idling speed when genset starts up.
8	Warming Up Time	(0-3600)s	10	Warming up time for genset after entering high speed running before breaker close.

No.	Items	Range	Default	Description
SGE02-4G Setting				
1	SGE02-4G Enable	(0-1)	1	0: Disabled; 1: Enabled
2	SMS Enable	(0-1)	0	0: Disabled; 1: Enabled
3	Mobile Number	Max. 20 bits	All numbers are needed to add district or country number, e.g. China 13666666666.	
4	GPRS Enable	(0-1)	1	0: Disabled; 1: Enabled
5	GPS Enable	(0-1)	1	0: Disabled; 1: Enabled
6	Longitude	(-180-180)°	113.33	When GPS is disabled, monitor module GPS position and altitude information can be inputted.
7	Latitude	(-90-90)°	34.48	
8	Altitude	(-9999.9-9999.9)m	100	
Cloud Server Setting				
1	Site Name	20 characters/40 letters/40 numbers		
2	URL Server	www.monitoryun.com		
3	Server Port	(0-65535)	91	
4	Module Password	123456		16 characters

8.2 DEFINITION CONTENT OF PROGRAMMABLE OUTPUT PORTS 1~6

Table 11 - Programmable Output Ports 1~6

No.	Type	Description
0	Not Used	
1	Custom Period 1	For details about function description please see the following content.
2	Custom Period 2	
3	Custom Period 3	
4	Custom Period 4	
5	Custom Period 5	
6	Custom Period 6	
7	Custom Combined 1	
8	Custom Combined 2	
9	Custom Combined 3	
10	Custom Combined 4	
11	Custom Combined 5	
12	Custom Combined 6	
13	Reserved	
14	Reserved	
15	Reserved	
16	Reserved	
17	Air Flap Control	It is activated when over speed shutdown and emergency shutdown alarms occur, which can turn off the engine intake.
18	Audible Alarm	It is activated when warning, shutdown and electrical trip alarms appear. Announciator can be connected externally; if aux. input port is configured as “Mute Alarms” and if it is

Table 15 - Common Unit Conversion Table

Items	N/m^2 (pa)	kgf/cm^2	bar	$(p/in^2.psi)$
1Pa	1	$1.02x10^{-5}$	$1x10^{-5}$	$1.45x10^{-4}$
$1kgf/cm^2$	$9.8x10^4$	1	0.98	14.2
1bar	$1x10^5$	1.02	1	14.5
1psi	$6.89x10^3$	$7.03x10^{-2}$	$6.89x10^{-2}$	1

12 COMMISSIONING

Please make sure the following checks are made before commissioning,

- Ensure all the wiring connections are correct and wire diameter is suitable.
- Ensure that the controller DC power has fuse, and controller's positive and negative and start battery are correctly connected.
- Emergency stop input is connected to the positive pole of starter battery via emergency stop button's normally closed point and fuse.
- Take proper actions to prevent engine from cranking successfully (e. g. Remove the connection wire of fuel valve). If checking is OK, make the start battery power on; choose manual mode and controller will executive routine.
- Set controller under manual mode, press "start" button, and genset will start. After the cranking times set before, controller will send signal of Start Failure; then press "stop" to reset controller.
- Recover the action to prevent engine from cranking successfully (e. g. Connect wire of fuel valve), press start button again, and genset will start. If everything goes well, genset will be normally running after idle running (if idle run is set). During this time, please watch engine's running situation and AC generator's voltage and frequency. If there is something abnormal, stop genset and check all wiring connections according to this manual.
- Select the **AUTO** mode from controller's panel, and connect mains signal. After the mains normal delay, controller will transfer ATS (if set) into mains load. After cooling time, controller will stop genset and make it into "at rest" mode until there is mains abnormal situation.
- When mains is abnormal again, genset will be started automatically and enter into normal running, then controller send signal to make generator switch on, and control the ATS transfer into generator load. If it is not like this, please check ATS' wiring connection according to this manual.
- If there is any other question, please contact SmartGen's service.

13 TYPICAL APPLICATION

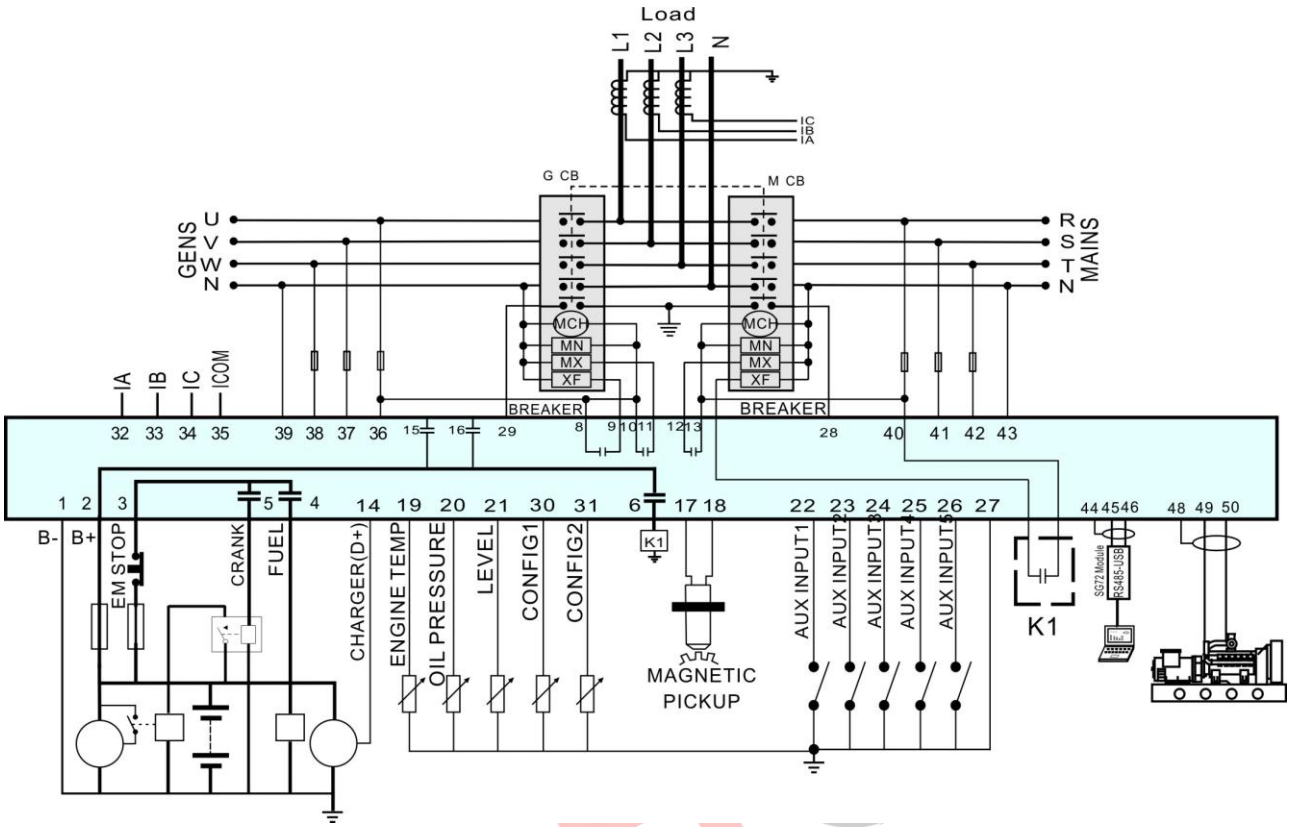

Figure 4 - HGM7220S Typical Application

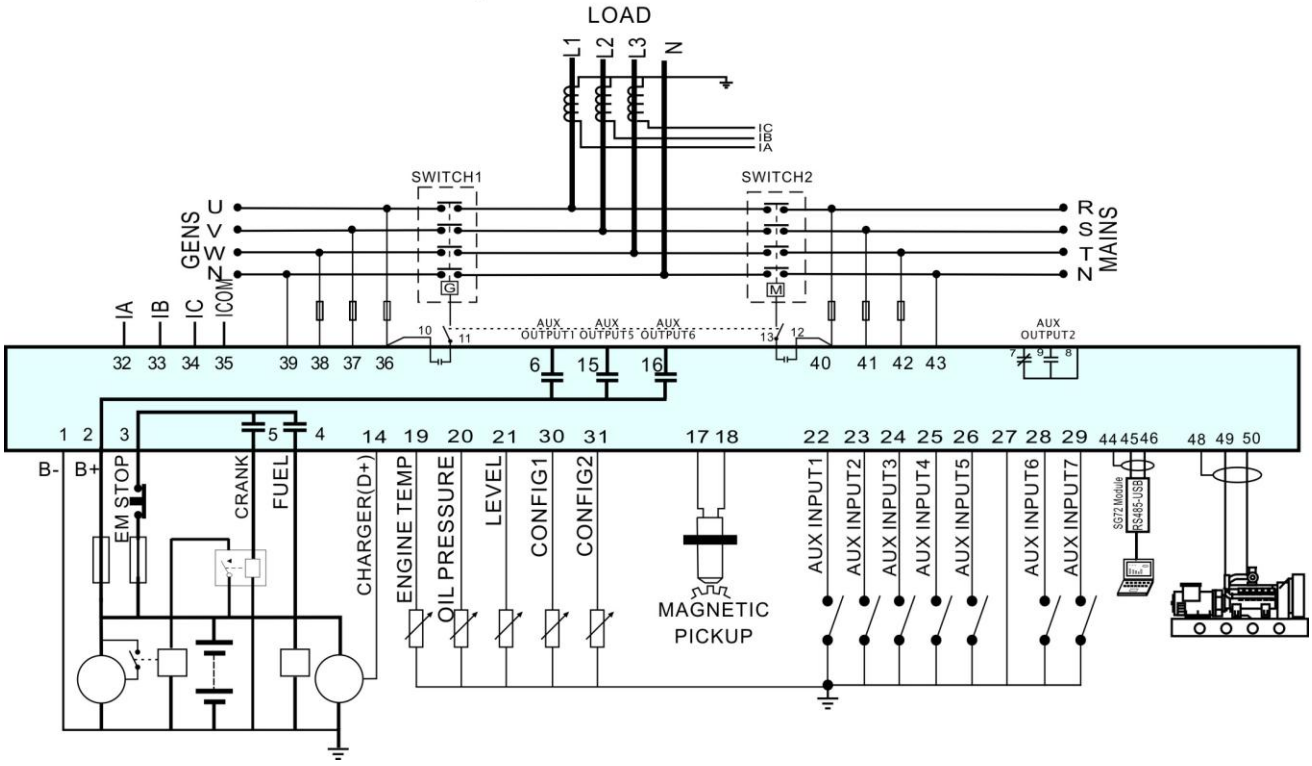

Figure 5 - HGM7220N Typical Application

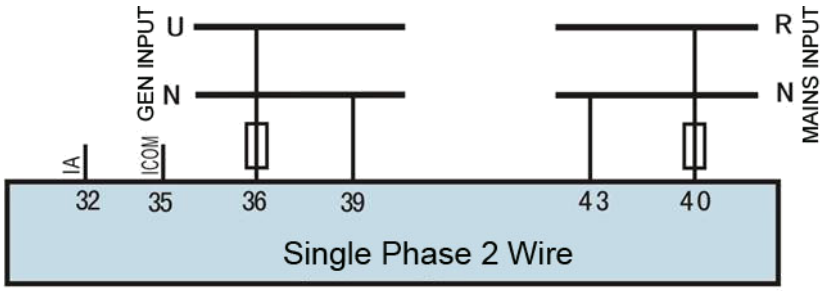

Figure 6 - Single Phase 2-Wire Connection Diagram

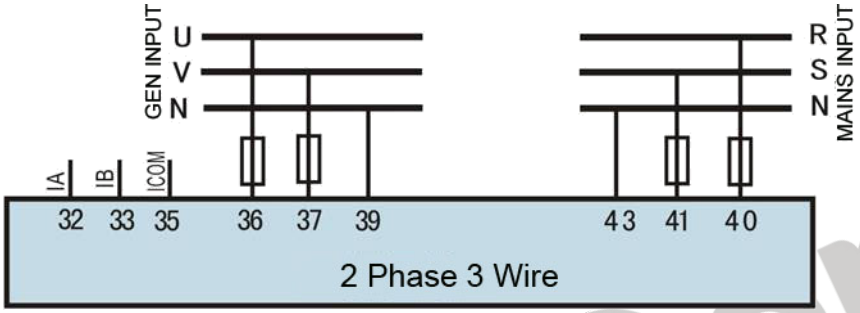

Figure 7 – 2-Phase 3-Wire Connection Diagram

NOTE: Expand relay with high capacity in start and fuel output is recommend.

14 INSTALLATION

14.1 SGE02 EXPANSION MODULE

14.1.1 4G ANTENNA PORT

Connect 4G antenna and 4G port of SGE02.

Antenna port: 50Ω/SMA USB.

14.1.2 GPS ANTENNA PORT

Make GPS function enable, and connect GPS antenna and GPS port of SGE02.

NOTE: GPS antenna needs to be placed at open outdoor, otherwise location information shall be incorrect, or cannot be obtained.

Antenna port: 50Ω/SMA USB. Active antenna.

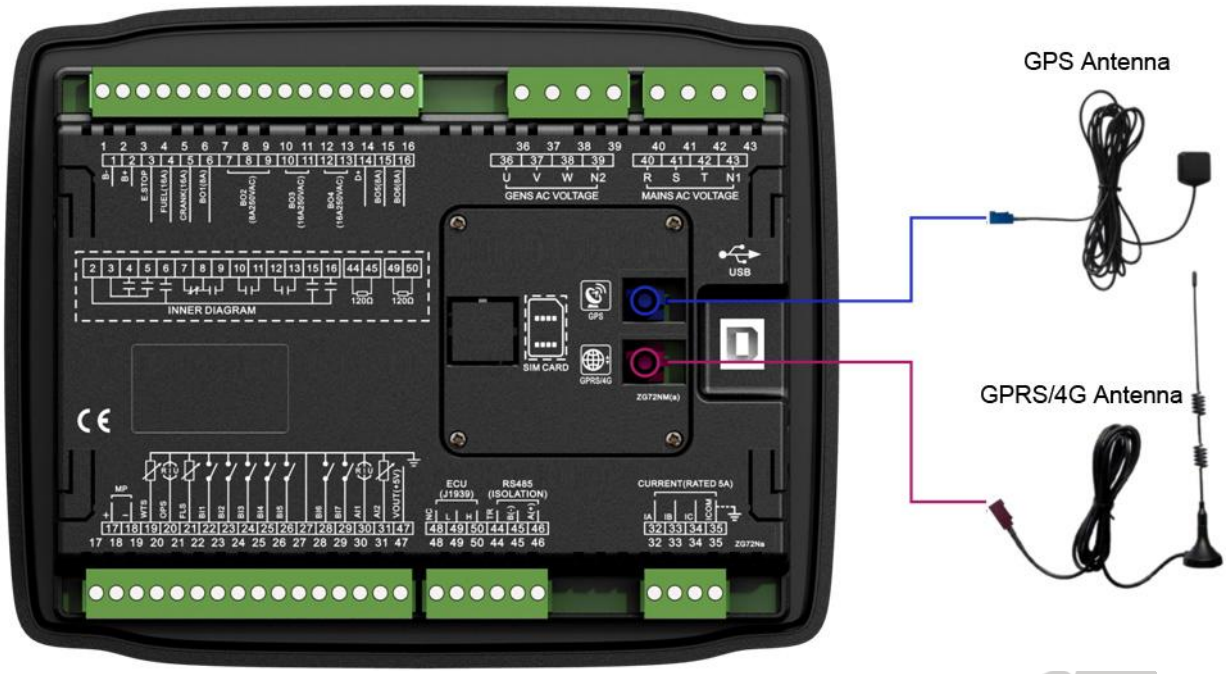

Figure 8 - HGM7220N/7220S Antenna Connection

14.1.3 SIM CARD INSTALLATION

Insert 4G, 3G or 2G SIM card, and connect it with servicer via wireless network.

NOTE: This module supports 4G wireless network fitting all networks. Standard SIM card (size: 25mmx15mm) is applied. It displays on the controller, and this means SIM is not inserted or SIM contact is not good.

Please refer to the following installation steps.

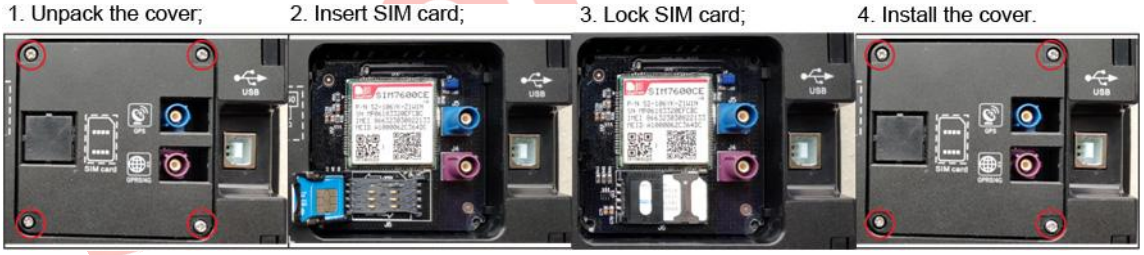

Figure 9 – SIM Installation Steps

14.2 FIXING CLIPS

- Controller is panel built-in design; it is fixed by clips when installed.
- Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.
- Pull the fixing clip backwards (towards the back of the module) and ensure two clips are inside their allotted slots.
- Turn the fixing clip screws clockwise until they are fixed on the panel.
- Care should be taken not to over tighten the screws of fixing clips.

14.3 OVERALL DIMENSION

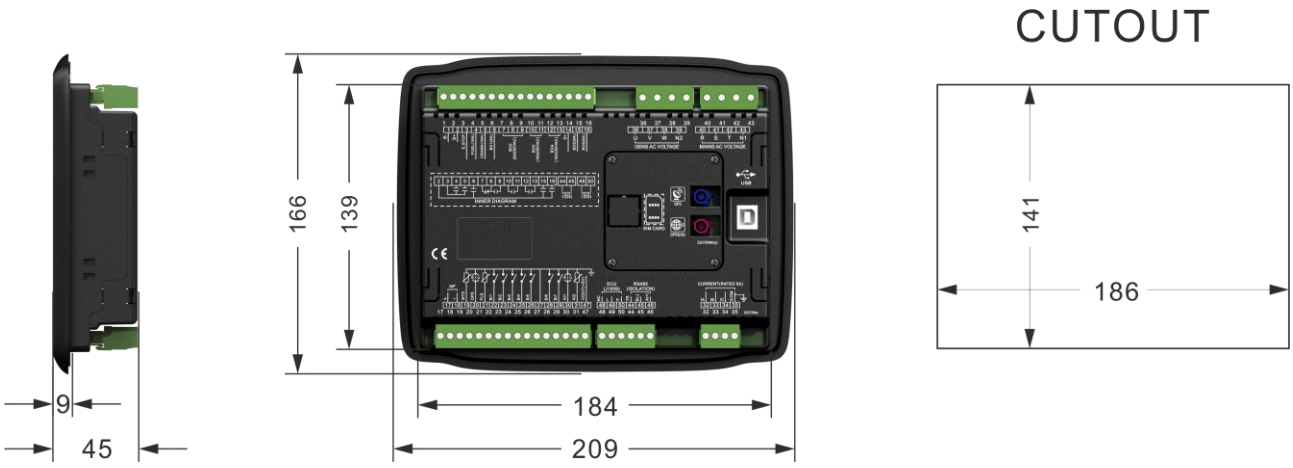

Figure 10 - Overall Dimensions

HGM7220N7220S series controller can suit for wide range of battery voltage DC (8~35) V. Negative of battery must be connected with the engine shell. Diameter of wire that connects power supply with battery must be over 2.5mm^2. If floating charger is configured, please firstly connect output wires of charger to battery's positive and negative directly, then, connect wires from battery's positive and negative to controller's positive and negative input ports in order to prevent charger disturbing the controller's normal working.

— SPEED SENSOR INPUT: Speed sensor is the magnetic equipment installed in starter and for detecting flywheel teeth. Its connection wires with the controller should apply 2-core shielding line. The shielding layer should connect to No. 18 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.17 and No.18 terminals in controller. The output voltage of speed sensor should be within (1~24) VAC (effective value) during the full speed. 12VAC is recommended (in rated speed). When the speed sensor is installed, let the sensor spun to contacting flywheel first, then, make it back 1/3 lap, and lock the nuts of sensor at last.

— OUTPUT AND EXPAND RELAYS: All outputs of controller are relay contact output type. If expansion relays are needed, please add freewheel diode to both ends of expansion relay's coils (when coils of relay has DC current) or, increase resistance-capacitance return circuit (when coils of relay has AC current), in order to prevent disturbance to controller or other equipments.

— AC INPUT: Current input of HGM7220N/7220S series controller must be connected to outside current transformer. And the current transformer's secondary side current must be 5A. At the same time, the phases of current transformer and input voltage must be correct. Otherwise, the current collected and active power maybe not be correct.

— WITHSTAND VOLTAGE TEST: When controller had been installed on display window, if the high voltage test is needed, please disconnect controller's all terminal connections, in order to prevent high voltage getting into controller and damaging it.

NOTES:

a) ICOM port must be connected to negative pole of battery.

b) When there is load current, open circuit is prohibited on transformer's secondary side.