Smartgen®

HGM96XX Series

(HGM9610/HGM9620)

Automatic Genset Controller

USER MANUAL

Smartgen Technology

2MODULES COMPARISON

Item		HGM 9210	HGM 9220	HGM 9310	HGM 9320	HGM 9410	HGM 9420	**HGM 9610**	**HGM 9620**	HGM 9510	HGM 9520
LCD	Dimen-sion	3.7”						4.3”			
	Pixel	132 x 64						480 x 272			
AMF			●		●		●		●		●
BUS Monitoring										●	
Parallel connection										●	●
Expansion module								●	●		
Input Port Number		7	7	7	7	7	7	8	8	7	8
Output port Number		8	8	8	8	8	8	8	8	8	8
Sensor number		5	5	5	5	5	5	5	5	5	5
Neutral (earth) current								●	●		
Schedule function		●	●	●	●	●	●	●	●	●	●
ETHERNET								●	●		
RS485				●	●	●	●	●	●	●	●
GSM				●	●	●	●	●	●		
J1939						●	●	●	●	●	●
USB		●	●	●	●	●	●	●	●	●	●
LINK		●	●								
Real-time clock		●	●	●	●	●	●	●	●	●	●
Event log		●	●	●	●	●	●	●	●	●	●
Micro SD card								●	●		

NOTE:

(1) Two of the outputs are fixed: start output and fuel output.

(2)HGM96XX’s analog sensors are composed by 3 fixed sensors (temperature, pressure, liquid level) and 2 configurable sensors.

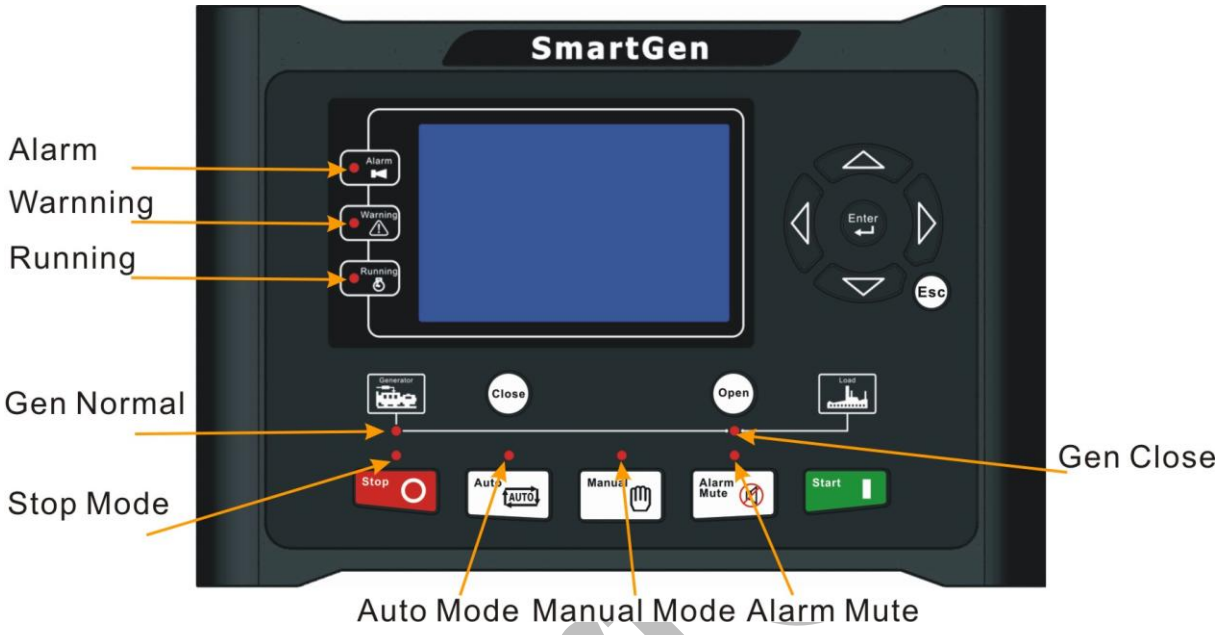
4SPECIFICATION

Items	Contents
Operating Voltage	**DC8.0V** to **DC35.0V**, Continuous Power Supply.
Power Consumption	**<4W** (standby ≤**2W**)
Alternator Input Range 3-Phase 4-Wire 3-Phase 3-Wire Single-Phase 2-Wire 2-Phase 3-Wire	 **AC15V-AC 360V (ph-N)** **AC30V - AC620V (ph-ph)** **AC15V - AC360V (ph-N)** **AC15V - AC360V (ph-N)**
Alternator Frequency	**50 Hz /60Hz**
Speed sensor voltage	**1.0V to 24.0V (RMS)**
Speed sensor Frequency	**10,000 Hz** (max.)
Start Relay Output	**16 A DC28V** at supply output
Fuel Relay Output	**16 A DC28V** at supply output
Programmable Relay Output (1)	**7 A DC28V** at supply output
Programmable Relay Output (2)	**7 A DC28V** at supply output
Programmable Relay Output (3)	**7A DC28V** at supply output
Programmable Relay Output (4)	**7A AC250V** voltage free output
Programmable Relay Output (5)	**7 A AC250V** voltage free output
Programmable Relay Output (6)	**7 A AC250V** voltage free output
Case Dimension	**266mm x182mm x45mm**
Panel Cutout	**214mm x160mm**
C.T. Secondary	**5A** rated
Working Conditions	Temperature: **(-25~+70)°C**; Humidity: **(20~93)%RH**
Storage Condition	Temperature: **(-25~+70)°C**
Protection Level	IP55 Gasket
Insulating Intensity	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.
Net Weight	0.95kg

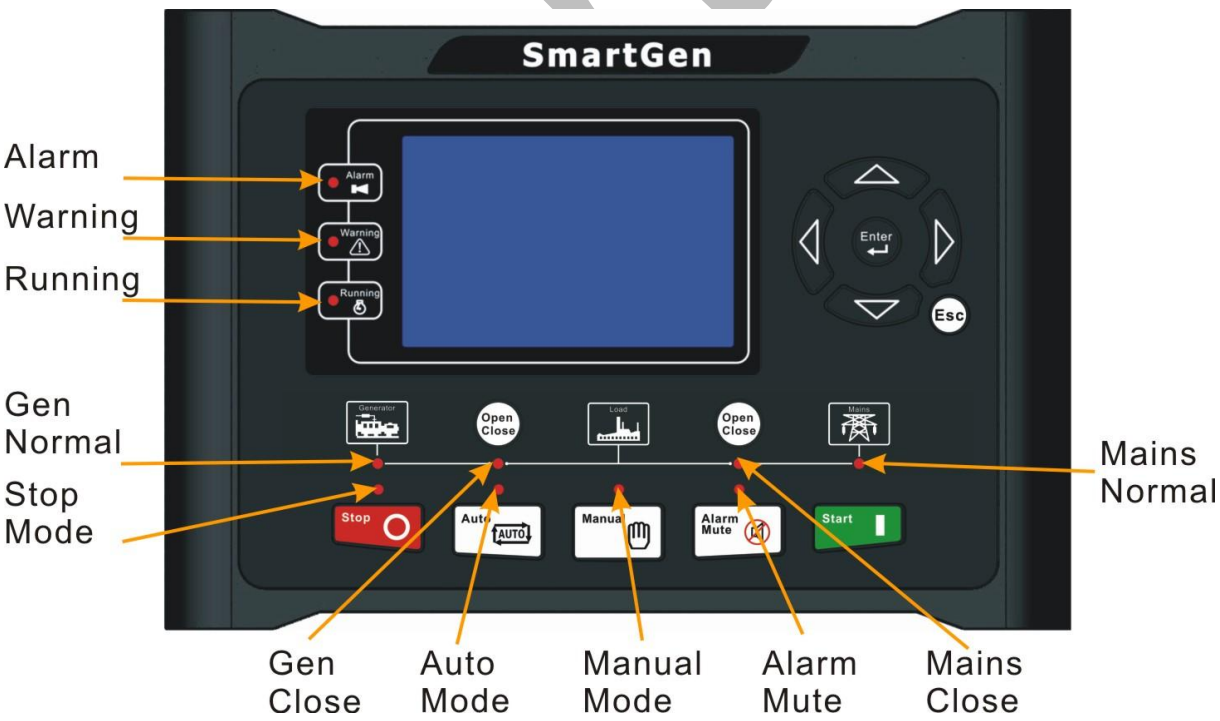
5 OPERATION

5.1INDICATOR LIGHT

HGM9610



HGM9620



Note: Selected light indicators description:

Warning indicator and Alarm indicator:

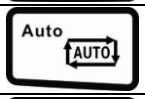
Alarm Type	Warning Indicator	Alarm Indicator
Warning	Slow flashing	Slow flashing
Trip Alarm	Slow flashing	Slow flashing
Shutdown Alarm	Off	Fast flashing
Trip and Stop Alarm	Off	Fast flashing

Running indicator: illuminated from crank disconnect to ETS while off during other periods.

Genenerator normal light：It is light on when generator is normal; flashing when generator state is abnormal; off when there is no generator power.

Mains normal light：It is light on when mains is normal; flashing when mains state is abnormal; off when there is no mains power.

5.2KEY FUNCTIONS

	Stop	Stop running generator in Auto/Manual mode; Lamp test (press at least 3 seconds); Reset alarm in stop mode; During stopping process, press this button again to stop generator immediately.
	Start	Start genset in Manual mode.
	Manual Mode	Press this key and controller enters in **Manual** mode.
	Auto Mode	Press this key and controller enters in **Auto** mode.
	Mute/Reset Alarm	Alarming sound off; If there is trip alarm, pressing the button at least 3 seconds can reset this alarm.
	Gen Close/Open	Can control generator to switch on or off in manual mode. (HGM9610 without)
	Mains Close/Open	Can control generator to switch on or off in manual mode. (HGM9610 without).
	Close	Can close breaker in manual mode (HGM9620 without)
	Open	Can open breaker in manual mode (HGM9620 without)
	Up/Increase	1) Screen scroll; 2) Up cursor and increase value in setting menu.
	Down/Decrease	1) Screen scroll; 2) Down cursor and decrease value in setting menu.
	Left	1) Screen scroll; 2) Left move cursor in setting menu.
	Right	1) Screen scroll; 2) Right move cursor in setting menu.
	Set/Confirm	1. Select viewing area; 2. Pressing and holding for more than 3 seconds enters parameter configuration menu; 3. In settings menu confirms the set value.
	Exit	1. Returns to the previous screen; 2. In settings menu returns to the upper level menu.

NOTE: In manual mode, pressing 

and 

simultaneously will force generator to crank. Successful start will not be judged according to crank disconnect conditions, operator will have to crank the starter motor manually; when operator decides that the engine has fired, he/she should release the button and start output will be deactivated, safety on delay will start.

WARNING: Default password is 00318, user can change it in case of others change the advanced parameters setting. Please clearly remember the password after changing.

If you forget it, please contact Smartgen services and send all information in the controller page of "**ABOUT**" to us.

5.3 LCD DISPLAY

5.3.1 MAIN DISPLAY

Main screen show pages; use  to scroll the pages and  to scroll the screen.

★**Main Screen**, including as below,

Gen: voltage, frequency, current, active power, reactive power

Bus: voltage, frequency

Engine: speed

Some status

★**Status**, including as below,

Status of genset, mains, and ATS

NOTE: HGM9610 has no mains status screen.

★**Engine**, including as below,

Speed, temperature of engine, engine oil pressure, liquid (fuel) level, Configure Sensor 1, Configure Sensor 2, battery voltage, charger voltage, accumulated run time, accumulated start times.

NOTE: If connected with J1939 engine via CANBUS port, this page also includes: coolant pressure, coolant level, fuel temperature, fuel pressure, inlet temperature, exhaust temperature, turbo pressure, total fuel consumption and so on. (Different engine with different parameters)

★**Gen**, including as below,

Phase voltage, Line voltage, frequency, phase sequence

★**Mains**, including as below

Phase voltage, Line voltage, frequency, phase sequence

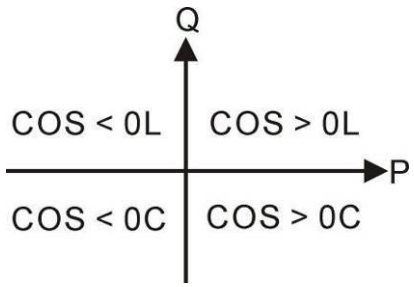
NOTE: HGM9610 has no this page.

★**Load**, including as below,

Current, each phase and total active power (positive and negative), each phase and total reactive power (positive and negative), each phase and total apparent power, each phase and average power factor (positive and negative), accumulated energy (**kWh, kVarh, kVAh**) and earth current.

Note: When only mains switch on indicator lights, count active and inactive power, apparent power, power factor, but accumulate electric energy. Counting the generator active and reactive power, apparent power, power factor, and accumulate electric energy under other conditions.

NOTE: Power factor shows as following,



Remark:
P stands for active power
Q stands for inactive power

Power factor	Conditions	Active power	Inactive power	Remark
COS>0L	P>0,Q>0	Input	Input	Load is inductive resistance.
COS>0C	P>0,Q<0	Input	Output	Load is capacitance resistance.
COS<0L	P<0,Q>0	Output	Input	Load equal to one under excitation generator
COS<0C	P<0,Q<0	Output	Output	Load equal to one over excitation generator.

Note:

1. Input active power, generator or mains supply electricity to load.
2. Output active power, load supply electricity to generator or mains.
3. Input reactive power, generator or mains send reactive power to load.
4. Output reactive power, load send reactive power to generator or mains.

★Alarm:

NOTE: For ECU alarms and shutdown alarms, if the alarm information is displayed, check engine according to it, otherwise, please check the manual of generator according to SPN alarm code.

◙ **Event log**

Records all start/stop events (shutdown alarm, trip and shutdown alarm, manual /auto start or stop) and the real time when alarm occurs.

Others, including,

Time and Date, count down time for maintenance (if it is enable), input/output ports status, NET status and SD status.

◙ **About,** including,

Issue time of software and hardware version

Example,

Return Mains **Timers >** Engine Generator Load Switch Temp. Sensor OP Sensor Level Sensor Config Sensor 1 Config Sensor 2	>Start Delay >Return Delay >Preheat Delay >Cranking Time >Crank Rest Time >Safty On Time >Start Idle Time >Warming Up Time >Cooling Time >Stop Idle Time >ETS Hold Time >Wait Stop Time	Form1: Use to scroll settings, Enter to enter settings (form2), Esc to exit settings menu.

Return Mains **Timers >** Engine Generator Load Switch Temp. Sensor OP Sensor Level Sensor Config Sensor 1 Config Sensor 2	> Start Delay > Return Delay > Preheat Delay > Cranking Time > Crank Rest Time > Safety On Time > Start Idle Time > Warming Up Time > Cooling Time > Stop Idle Time > ETS Hold Time >Wait Stop Time	Form 2: Use to scroll settings, Enter to enter settings (form3), Esc to return to previous menu. (form 1).

Return Mains **Timers >** Engine Generator Load Switch Temp. Sensor OP Sensor Level Sensor Config Sensor 1 Config Sensor 2	>Start Delay > Return Delay > Preheat Delay > Cranking Time > Crank Rest Time > Safety On Time > Start Idle Time > Warming Up Time > Cooling Time > Stop Idle Time > ETS Hold Time >Wait Stop Time	Form 3: Use to scroll settings, Enter to enter settings (form4), Esc to return to previous menu. (form 1).

> Start Delay > Return Delay > Preheat Delay > Cranking Time >Crank Rest Time > Safty On Time > Start Idle Time > Warming Up Time > Cooling Time > Stop Idle Time > ETS Hold Time >Wait Stop Time	00008	Form 4： Press Enter to enter settings (form 5), Esc to return to previous menu. (form 6).

> Start Delay > Return Delay >Preheat Delay > Cranking Time > Crank Rest Time > Safty On Time > Start Idle Time > Warming Up Time > Cooling Time > Stop Idle Time > ETS Hold Time >Wait Stop Time	00008	Form5: Press ◀ ▶ to change cursor position, ▲ ▼ are used for changing cursor value, Enter Confirm setting (form 4), Esc exit setting (form 4).

> Start Delay > Return Delay > Preheat Delay > Cranking Time > Crank Rest Time > Safty On Time > Start Idle Time > Warming Up Time > Cooling Time > Stop Idle Time > ETS Hold Time >Wait For Stop	00008	Form 6: ▲ ▼ are used for changing the setting contents. Enter Confirm setting (form 4), Esc to return to previous menu. (form 1).

NOTE: Pressing Stop can exit setting directly during setting.

5.5MANUAL START/STOP OPERATION

1. MANUAL START: Press 

, controller enters into Manual mode and its indicator lights. Press 

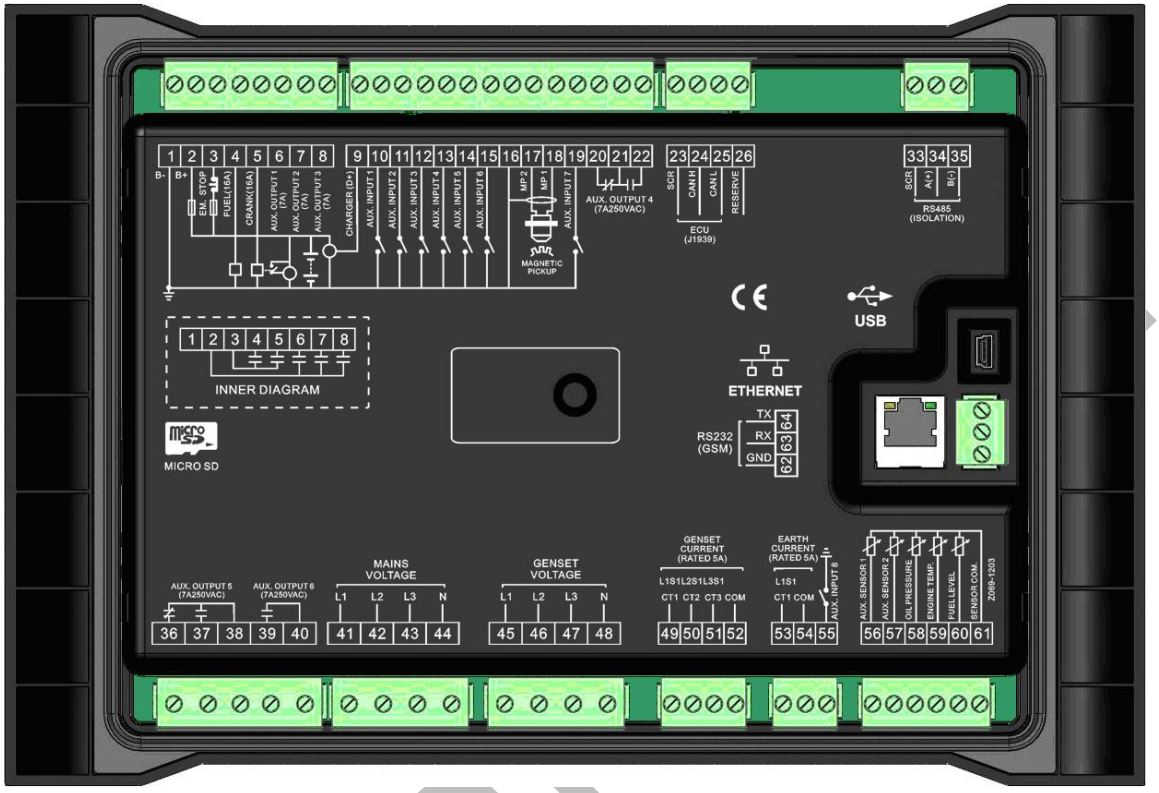
to start generator, can automatically detect crank disconnected, and generator accelerates to high-speed running automatically. With high temperature, low oil pressure and abnormal voltage during generator running, controller can protect genset to stop quickly (please refer to No.4~9 of Auto start operation for detail procedures).
2. MANUAL STOP: Press 

can stop the running generators. (please refer to No.3~8 of Auto stop operation for detail procedures).

NOTE: In “manual mode”, the procedures of ATS please refer to ATS procedure of generator in this manual.

7 WIRINGS CONNECTION

HGM96XX series controller's rear as following:

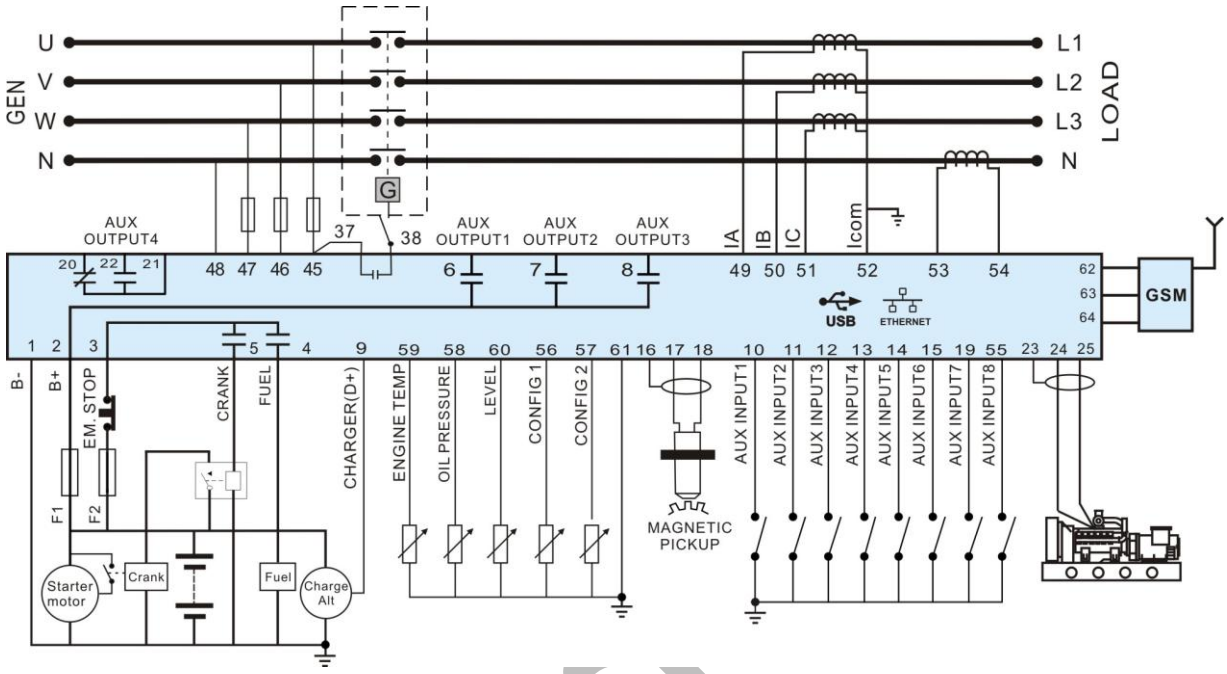


Description of terminal connection:

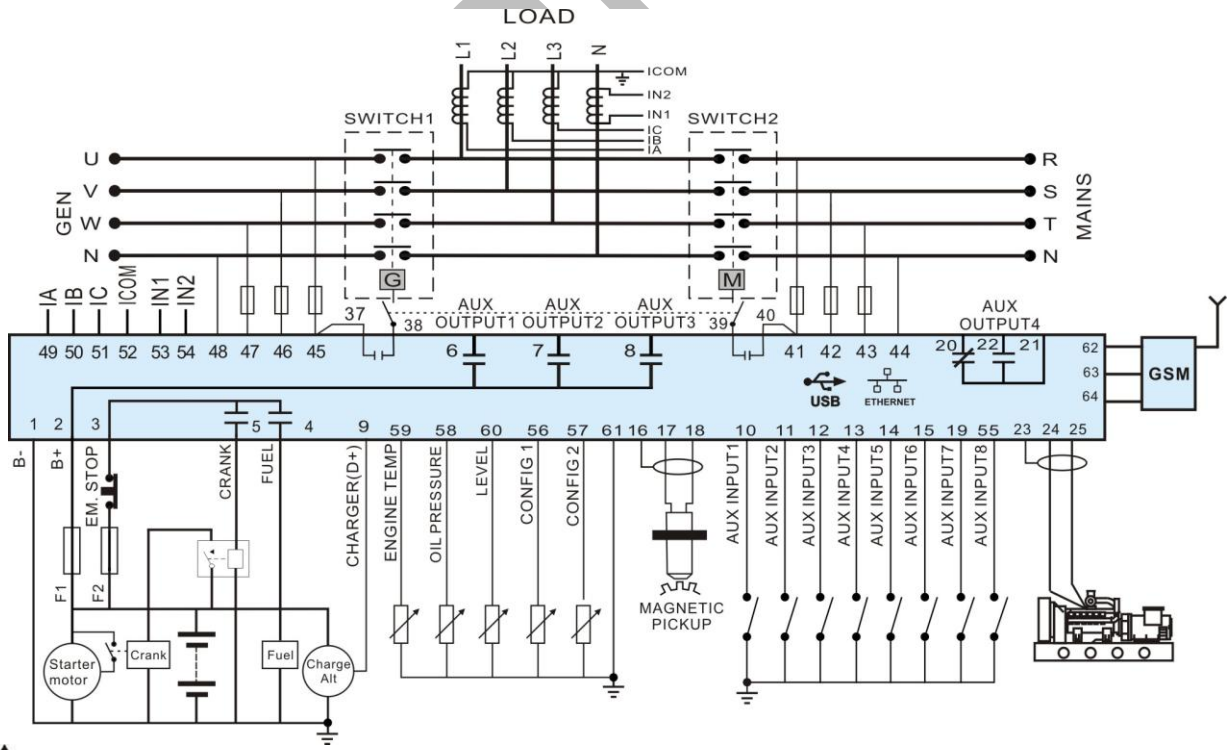
No.	Function	Cable Size	Remarks	
1	B-	2.5mm^2	Connected with negative of starter battery	
2	B+	2.5mm^2	Connected with positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.	
3	Emergency stop	2.5mm^2	Connected with B+ via emergency stop button	
4	Fuel relay output	1.5mm^2	B+ is supplied by 3 terminal, rated 16A	
5	Start relay output	1.5mm^2	B+ is supplied by 3 terminal, rated 16A	Connected to starter coil
6	Aux. Output 1	1.5mm^2	B+ is supplied by 2 terminal, rated 7A	Details see form 2
7	Aux. Output 2	1.5mm^2	B+ is supplied by 2 terminal, rated 7A	
8	Aux. Output 3	1.5mm^2	B+ is supplied by 2 terminal, rated 7A	

12TYPICAL APPLICATION

HGM9610 typical application diagram

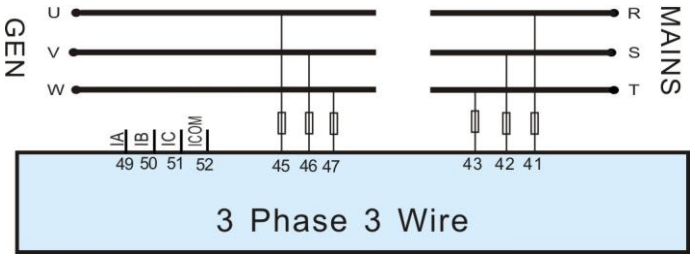


HGM9620 typical application diagram

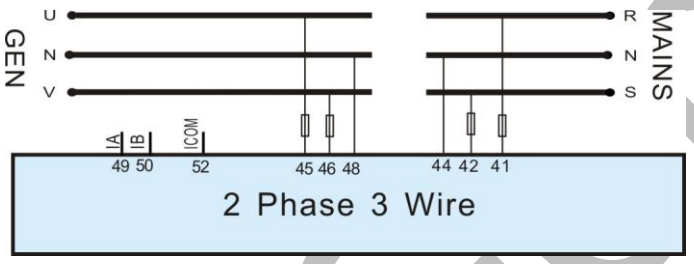


Note: Fuse F1：min. 2A; max. 20A. Fuse F2：max. 32A. Users should select suitable fuse depend on practical application.

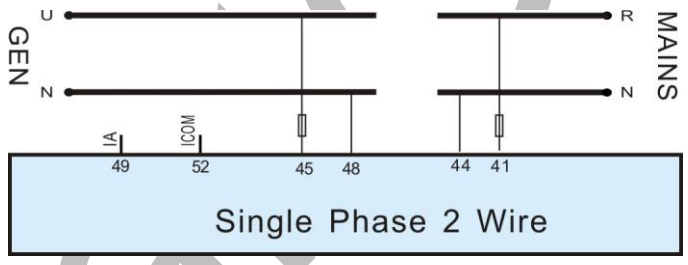
3 Phase 3 Wire



2 Phase 3 Wire

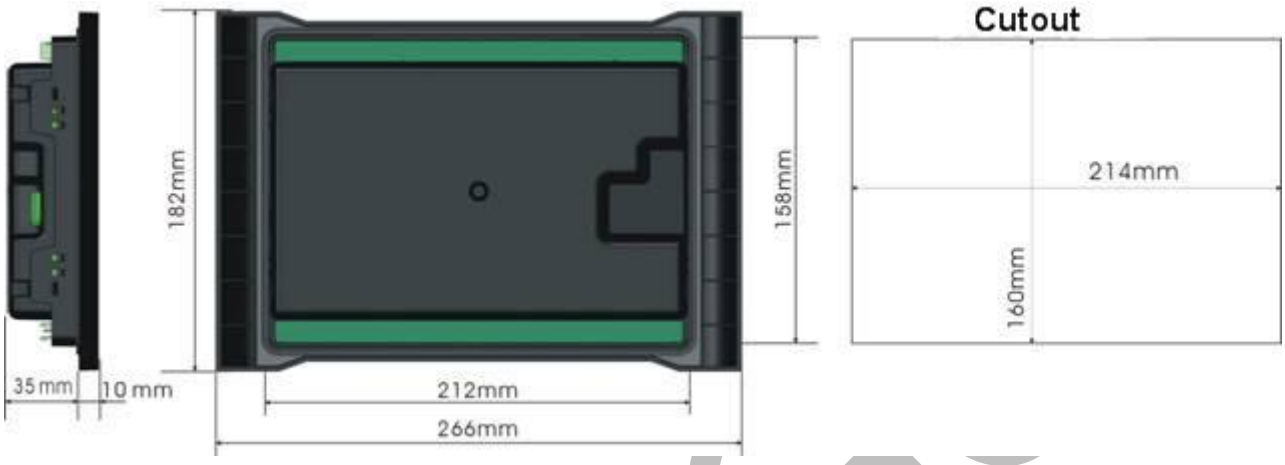


Single Phase 2 Wire



13INSTALLATION

Controller is panel built-in design; it is fixed by clips when installed. The controller's overall dimensions and cutout dimensions for panel, please refers to as following,



1) Battery Voltage Input

NOTE: HGM96XX series controller can suit for widely range of battery voltage DC(8~35)V. Negative of battery must be connected with the engine shell. The diameter of wire which from power supply to battery must be over 2.5mm^2. If floating charge 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 charge disturbing the controller's normal working.

2) Speed Sensor Input

NOTE: Speed sensor is the magnetic equipment which be installed in starter and for detecting flywheel teeth. Its connection wires to controller should apply for 2 cores shielding line. The shielding layer should connect to No. 16 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 AC(1~24)V (effective value) during the full speed. AC12V is recommended (in rated speed). When install the speed sensor, let the sensor is spun to contacting flywheel first, then, port out 1/3 lap, and lock the nuts of sensor at last.

3) Output And Expand Relays

CAUTION: All outputs of controller are relay contact output type. If need to expand the relays, please add freewheel diode to both ends of expand relay's coils (when coils of relay has DC current) or, increase resistance-capacitance return circuit (when coils of relay has AC

14.2 GSM SHORT MESSAGE REMOTE CONTROL

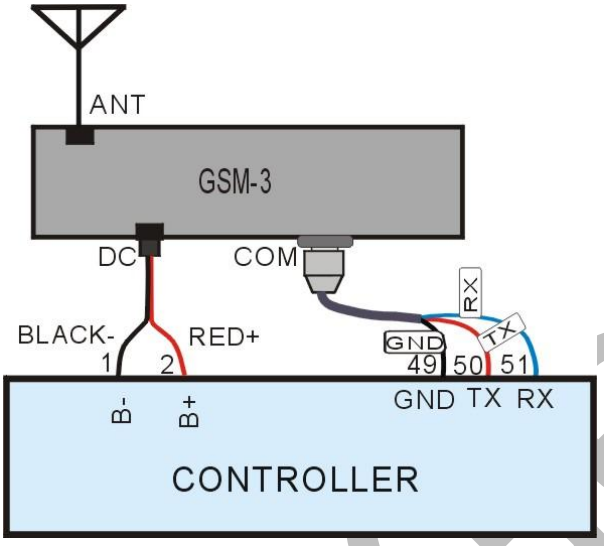
Users send order message to GSM module, then controller will make actions according to this SMS order and pass back corresponding operations information. Controllers only execute the orders by pre-set. Detail orders as following:

No.	SMS Orders	Pass back Information	Description	
1	SMS GENSET	GENSET ALARM	When genset is stopping alarm	status of genset
		SYSTEM IN STOP MODE GENSET AT REST	At rest status in stop mode	
		SYSTEM IN MANUAL MODE GENSET AT REST	At rest status in manual mode	
		SYSTEM IN AUTO MODE GENSET AT REST	At rest status in Auto mode	
		SYSTEM IN STOP MODE GENSET IS RUNNING	Running status in stop mode	
		SYSTEM IN MANUAL MODE GENSET IS RUNNING	Running status in manual mode	
		SYSTEM IN AUTO MODE GENSET AT RUNNING	Running status in stop mode	
2	SMS START	GENSET ALARM	Generator is shutdown alarm or trip alarm	Start genset
		STOP MODE NOT START	Cannot start in stop mode	
		SMS START OK	Start in manual mode	
		AUTO MODE NOT START	Cannot start in auto mode	
3	SMS STOP MODE	SMS STOP OK	Set as stop mode	
4	SMS MANUAL MODE	SMS MANUAL MODE OK	Set as manual mode	
5	SMS AUTO MODE	SMS AUTO MODE OK	Set as auto mode	
6	SMS DETAIL	Pass back information can be set via controller software.	Gets details information of genset.	

NOTE: When sending orders, users need to follow SMS orders in above form and all the

14.3 CONTROLLER CONNECT TO GSM MODULE

The diagram below illustrates the application of Smartgen GSM-3 module (international version).



15CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

15.1CUMMINS ISB/ISBE

Terminals of controller	Connector B	Remark
Fuel relay output	39	
Start relay output	-	Connect with starter coil directly.
Auxiliary output 1	Expand 30A relay, battery voltage of 01,07,12,13 is supplied by relay.	ECU power Set Auxiliary output 1 as “ECU power”.

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield	CAN communication shielding line(connect with ECU terminal only).
CAN(H)	SAE J1939 signal	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return	Impedance 120Ω connecting line is recommended.

Engine type: Cummins ISB

15.2 CUMMINS QSL9

Suitable for CM850 engine control mode

Terminals of controller	50 pins connector	Remark
Fuel relay output	39	
Start relay output	-	Connect to starter coil directly.

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield-E	CAN communication shielding line(connect with ECU terminal only).
CAN(H)	SAE J1939 signal-C	Using impedance 120Ω connecting line.
CAN(L)	SAE J1939 return-D	Using impedance 120Ω connecting line.

Engine type: Cummins-CM850

15.3 CUMMINS QSM11(IMPORT)

It is suitable for CM570 engine control module. Engine type is QSM11 G1, QSM11 G2.

Terminals of controller	C1 connector	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 5 and port 8 of C1 be connected.
Start relay output	-	Connect to starter coil directly.

Terminals of controller	3 pins data link connector	Remark
CAN GND	C	CAN communication shielding line(connect with ECU terminal only).
CAN(H)	A	Using impedance 120Ω connecting line.
CAN(L)	B	Using impedance 120Ω connecting line.

Engine type: Cummins ISB

15.4 CUMMINS QSX15-CM570

It is suitable for CM570 engine control module. Engine type is QSX15.

Terminals of controller	50 pins connector	Remark
Fuel relay output	38	Oil spout switch
Start relay output	-	Connect to starter coil directly.

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield-E	CAN communication shielding line(connect with ECU terminal only).
CAN(H)	SAE J1939 signal-C	Using impedance 120Ω connecting line.
CAN(L)	SAE J1939 return-D	Using impedance 120Ω connecting line.

Engine type: Cummins QSX15-CM570

15.5 CUMMINS GCS-MODBUS

It is suitable for GCS engine control module. Use RS485-MODBUS to read information of engine. Engine types are QSX15, QST30, QSK23 / 45/60/78 and so on.

Terminals of controller	D-SUB connector 06	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 05 and 08 of the connector 06 be connected.
Start relay output	-	Connect to starter coil directly.

Terminals of controller	D-SUB connector 06	Remark
RS485 GND	20	CAN communication shielding line(connect with ECU terminal only).
RS485+	21	Using impedance 120Ω connecting line.
RS485-	18	Using impedance 120Ω connecting line.

Engine type: Cummins QSK-MODBUS, Cummins QST-MODBUS, Cummins QSX-MODBUS

15.6 CUMMINS QSM11

Terminals of controller	OEM connector of engine	Remark
Fuel relay output	38	
Start relay output	-	Connect with starter coil directly
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only).
CAN(H)	46	Using impedance 120Ω connecting line.
CAN(L)	37	Using impedance 120Ω connecting line.

Engine type: common J1939

15.7 CUMMINS QSZ13

Terminals of controller	OEM connector of engine	Remark
Fuel relay output	45	
Start relay output	-	Connect to starter coil directly
Auxiliary output 1	16&41	Setting to idle speed control, normally open output. Making 16 connect to 41 during high-speed running of controller via external expansion relay.
Auxiliary output 2	19&41	Setting to pulse raise speed control, normally open output. Making 19 connect with 41 for 0.1s during high-speed warming of controller via external expansion relay.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only).
CAN(H)	1	Using impedance 120Ω connecting line.
CAN(L)	21	Using impedance 120Ω connecting line.

Engine type: Common J1939

16.2WEB SERVER MODE

If the controller acts as a web server, it can be controlled via web browser using PC.

The procedure is the following:

1. Set IP adress and sub network of the controller. The IP address must in the same network segment as the IP address of monitoring equipment (such as PC), e.g.: if monitoring equipment IP address is 192.168.0.16, controller IP can be 192.168.0.18, sub network mask 255.255.255.0
2. Connect the controller. It can be connected to the monitoring equipment directly using network cable or via switchboard.
3. In order to monitor the controller, input its IP address in web browser address bar. E.g.: http://192.168.0.18

NOTE: in this connection mode, controller parameters cannot be altered.

Browser screen capture:

16.3 CONTROLLER AND NETWORK CABLE CONNECTION

1. Controller network port description

No.	Name	Description
1	TX+	Tranceive Data+
2	TX-	Tranceive Data-
3	RX+	Receive Data+
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data-
7	NC	Not connected
8	NC	Not connected

2. Controller and PC are connected directly using a network cable:

For this connection crossover cable must be used.

Crossover cable: EIA/TIA 568A standard on one end and EIA/TIA 568B on the other end.

NOTE: If PC network port has Auto MDI/MDIX function, parallel cable can also be used.

3. Controller and PC connection via switchboard (or router).

Parallel lines must be used.

Parallel cable: EIA/TIA 568A standard on both ends or EIA/TIA 568B standard on both ends.

NOTE: If switchboard (or router) network port has Auto MDI/MDIX function function, crossover cable can also be used.

17 MICRO SD

HGM96XX series controller has Micro SD card support, the controller can regularly save gen-set operational data (engine speed, temperature, oil pressure, generator voltage, generator frequency, load current, load power, alarm information etc.) to Micro SD card.

For user convenience, every day the controller creates a date named file (e.g. 20120605.dat), where it records operating data of that day; every month it creates a year and month named folder (e.g. 201206) where all files of the month are saved. Data can be then alalysed with the help of SD Tool software provided by Smartgen.

NOTE: At present the controllers support ≤8GB Micro SD card.

Micro SD card installation direction:

18 USB

Users can set the controller's parameters and monitor the controller's status via the test software which provided by Smatgen company. The connection way between PC and controller as following:

19FAULT FINDING

Symptoms	Possible Solutions
Controller no response with power.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check the water/cylinder temperature is too high or not; Check the genset AC voltage; Check DC fuse.
Controller emergency stop	Check emergence stop button is correct or not; Check whether the starting battery positive be connected with the emergency stop input; Check whether the circuit is open.
Low oil pressure alarm after crank disconnect	Check the oil pressure sensor and its connections.
High water temp. alarm after crank disconnect	Check the temperature sensor and its connections.
Shutdown Alarm in running	Check related switch and its connections according to the information on LCD; Check programmable inputs.
Crank not disconnect	Check fuel oil circuit and its connections; Check starting batteries; Check speed sensor and its connections; Refer to engine manual.
Starter no response	Check starter connections; Check starting batteries.
Genset running while ATS not transfer	Check ATS; Check the connections between ATS and controllers.
RS485 communication is abnormal	Check connections; Check setting of COM port is correct or not; Check RS485's connections of A and B is reverse connect or not; Check RS485 transfer model whether damage or not; Check communication port of PC whether damage.
ECU communication failed	Check connections of CAN high and low polarity; Check if correctly connected of 120Ω resister; Check if type of engine correct; Check if connections from controller to engine and setting of outputs correct.
ECU warning or stop	Get information from LCD of alarm page; If there is detailed alarm, check engine according to description. If not, please refer to engine manual according to SPN alarm code.