Smartgen®

HGM610C/620C

AUTO START MODULE

OPERATING MANUAL

HGM610C

HGM620C

Smartgen Electronic

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Software Version

Version	Date	Note
2.1	2009-02-18	Upgrade Release.

CONTENT

1 SUMMARY

HGM610/620 series generator controller integrating digital, intelligent and network techniques is used for automatic control system of diesel generator. It can carry out functions including automatic start/stop, data measure and alarming. The controller uses LCD display, optional Chinese and English display interface with operation easy and reliable.

HGM600 series generator controller uses micro-processing technique which can carry out precision measure, constant value adjustment, timing and threshold setting and etc. of multi-parameters. It can be widely used in all types of generator automatic control system for compact structure, advanced circuits, simple connections and high reliability.

2 PERFORMANCE AND CHARACTERISTICS

HGM600 controller has two types:

1. HGM610: Automatic engine start;
2. HGM620: AMF (automatic mains failure).

- Using microprocessor as a core, graphics LCD with big screen and backlight, display between Chinese and English, key touch for operation；
- Precision measure and display of

  Mains voltage (RMS)
  Mains current (RMS)
  Mains frequency
  Mains active power
  Mains power factor

  Generator voltage (RMS)
  Generator current (RMS)
  Generator frequency
  Generator active power
  Generator power factor
  Generator temperature
  Generator pressure
  Generator fuel level
  Start battery voltage
- Configurable single phase or three phase voltage input;
- Control protection: Automatic start/stop, load transferring and alarming of generator;
- Parameters setting: Allow user to modify setting and store them inside internal FLASH memory, the parameters can not be lost even with power down;
- Automatic control of shutter which is mounted onto the generator room wall;
- Five channel analogs inputs, may joint with Voltage-type or Resistive-type

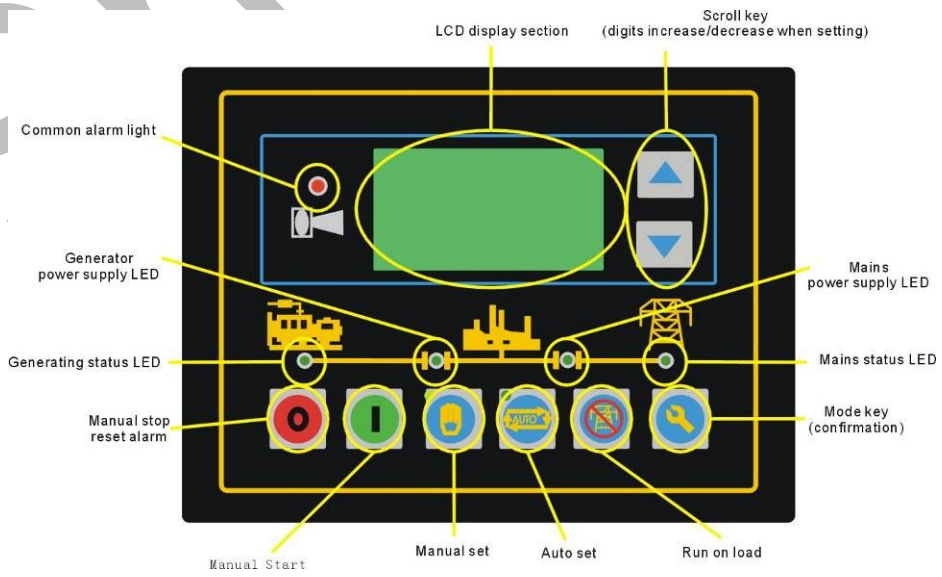
temperature/pressure/fuel level sensors, several temperature and pressure sensors can be used directly (i.e. VDO, DATCON, CUMMINS, and PT100). also may select “user defined” sensor via entering 8 point curves;

- Functions including RTC(real time clock) and hours count;
- Display of generator cumulated electric energy;
- Security password-protected programming levels;
- Several crank success conditions are optional;
- Built-in speed/frequency detecting units can accurately judge the states such as crank success and over speed;
- 99 historical records can be stored circularly and inquiring of the records can be made on site;
- Power supply range is wide (DC8 to 35V), accommodating to different starting battery voltage environments;
- All parameters use digital modulation, abandoning analog modulation using conventional electronic potentiometer, reliability and stability are increased;
- Built-in watch dog can never be dead halt, ensuring smooth program execution;
- Modular configuration design, inserted type connection terminals, flush type installation, compact structure, easy installation.

3 OPERATION

3.1 OPERATION PANEL

HGM620 front panel



LCD display screen can display multi -parameters of generator such as voltage, current,

battery voltage, various parameters of engine such as engine rotating speed, engine oil pressure, cooling water temperature, also can display multi-states and alarming amount.

 push-button. The  function is used to change a programming value while in the programming mode. When this push-button is held down, the displayed value will be decremented to a lower value as desired.

 push-button. The  function is used to change a programming value while in the programming mode or to select a desired programming menu loop. When this push-button is held down, the displayed value will be incremented to a higher value as desired.

 push-button. The  function is used to entering in setting menu, shifting cursor in setting and confirming the set information.

 push-button. The  function is used to initiate a manual start signal to the engine-generator set.

 push-button. The  function is used to initiate a stop signal to the engine generator set.

 push-button and LED light viewing window. The  function is used to initiate automatic operation of the engine-generator set.

 push-button and LED light viewing window. The  function is used to initiate automatic operation of the engine-generator set.

 push-button. The  function is used to initiate load test of the engine generator set when connected to an associated transfer switch.

 Light viewing window. The  illuminates (flashes) when any pre-programmed warning or shutdown fault has been activated.

3.2 AUTOMATIC OPERATION

This mode is activated by pressing the  push-button. The LED indicator beside the push-button confirms this action.

When mains are abnormal, the following sequence is initiated:

First the Mains abnormal timer is initiated. After this delay, the **start timer** is initiated.

After the above delays the **Fuel Solenoid** is energized, and the **Starter Motor** is engaged.

The engine is cranked for a pre-set time period. If the engine fails to fire during this cranking then the starter motor is disengaged for the pre-set rest period. Should this sequence continue beyond the set number of attempts, the start sequence will be terminated and **Fail to Start** fault will be displayed on LCD.

When the engine fires, the starter motor is disengaged and locked out at a pre-set frequency from the Alternator output. Alternatively a Magnetic Pickup mounted on the flywheel housing can be used for speed detection.

After the starter motor has disengaged, the **Wait for oil pressure** timer is activated.

Once the engine is running, the **Warm Up** timer is initiated, allowing the engine to stabilize before accepting the load. After this delay, send out a closing gens signal.

When mains is normal, the mains normal delay timer is initiated, once it has timed out, the **closing gens** signal is de-energized, then the closing mains signal is active.

When the mains normal delay has time out, the Stop delay timer is initiated. After this delay, the **Cooling** timer is then initiated, allowing the engine a cooling down period off load before shutting down. Once the **Cooling** timer expires the **Fuel Solenoid** is de-energized, bringing the generator to a stop.

3.3 MANUAL OPERATION

To initiate a start sequence in **MANUAL**, press the  pushbutton. When the controller is in the manual mode (indicated by an LED indicator beside the button), pressing the  button will initiate the start sequence.

If the **pre-heat** output is selected the preheat delay is initiated, and the digit output selected is energized.

After the above delay the **Fuel Solenoid** is energized, and then the **Starter Motor** is engaged.

The engine is cranked for a pre-set time period. If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the pre-set rest period. Should this sequence continue beyond the set number of attempts, the start sequence will be terminated and **Fail to Start** fault will be displayed on LCD.

When the engine fires, the starter motor is disengaged and locked out at a pre-set frequency from the Alternator output. Alternatively a Magnetic Pickup mounted on the flywheel housing can be used for speed detection.

After the starter motor has disengaged, the **oil bypass** timer is activated.

Once the engine is running, the **Warm Up** timer is initiated, allowing the engine to stabilize before accepting the load.

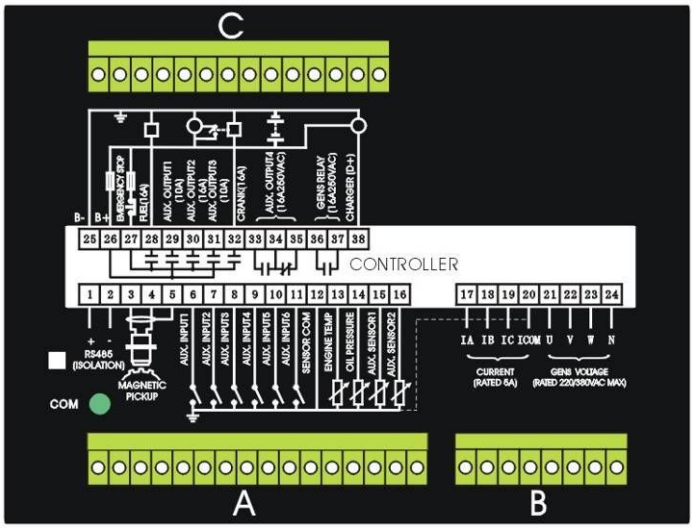
Selecting  de-energizes the **FUEL SOLENOID**, bringing the generator to a stop.

3.4 RUN ON LOAD

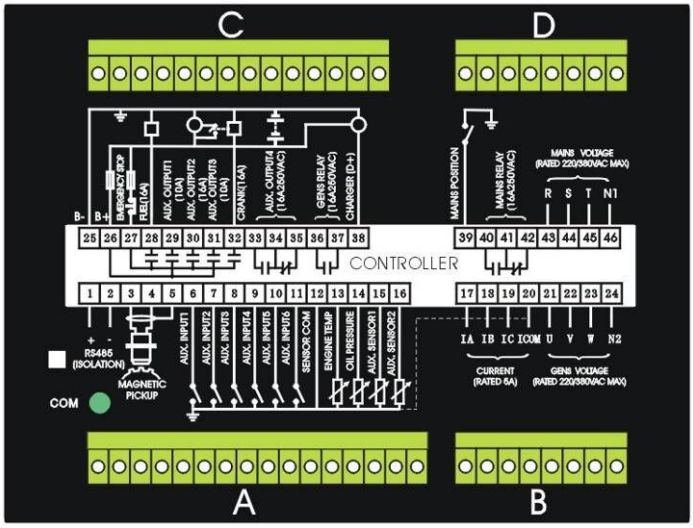
When mains voltage is normal, press the key  , then press the key  , after generator is normal, press the  , it will pop up the LOAD TEST menu, pressing the key  will switch mains off-load, then switch generator on-load.

4 BACK BOARD

The back board of HGM610 Controller is shown as follows:



The back board of HGM620 Controller is shown as follows:



5 CONNECTING TERMINAL

Connecting Terminal “A” with 16 Pins

No.	Function	Diameter of Wire	Description	
1	RS485 Port A(+)	0.5mm	Interconnecting wiring to/from the HGM600 engine/generator controller communication port shall utilize #22 AWG (min.) 2 conductors, twisted, shielded cable. The drain (shield) wire must be connected at the HGM600 controller end.	
2	RS485 port B(-)			
3	Magnetic Pickup Input	0.5mm	Connecting with Magnetic Pickup	
4	Magnetic Pickup Input	0.5mm		
5	Magnetic Pickup Input common	0.5mm		
6	Configurable Input Port 1	1.0mm	Active connected with Grounding(- Ve)	Setting Item Is Given in Table 3.
7	Configurable Input Port 2	1.0mm		
8	Configurable Input Port 3	1.0mm		
9	Configurable Input Port 4	1.0mm		
10	Configurable Input Port 5	1.0mm		
11	Configurable Input Port 6	1.0mm		
12	Sensors Common	1.5mm	Connecting to engine body near the sensor	
13	Temperature Sensor Input	1.0mm	Connecting with Coolant Temperature Sensor, Voltage-type or Resistive-type.	
14	Oil Pressure Sensor Input	1.0mm	Connecting with Oil Pressure Sensor, Voltage-type or Resistive-type.	
15	Aux. Sensor1	1.0mm	Configurable sensor, Voltage-type or Resistive-type.	Setting Item Is Given in Table 4.
16	Aux. Sensor2	1.0mm		

Connecting Terminal “B” with 8 Pins

No.	Function	Diameter of Wire	Remarks
17	Generator L1 current transformer connection.	2.5mm	Externally Connecting with Secondary Coil of Current Transformer (Rated 5A).
18	Generator L2 current transformer connection.	2.5mm	Externally Connecting with secondary Coil of Current Transformer (Rated 5A).
19	Generator L3 current transformer connection.	2.5mm	Externally Connecting with secondary Coil of Current Transformer (Rated 5A).
20	Current Transformer Common	2.5mm	Refer to the installation instructions for detailed information.
21	Generator L1 voltage input.	1.0mm	Connect to alternator L1 output. (Fuse of 2A is Recommended)
22	Generator L2 voltage input.	1.0mm	Connect to alternator L2 output. (Fuse of 2A is Recommended)
23	Generator L3 voltage input.	1.0mm	Connect to alternator L3 output. (Fuse of 2A is Recommended)
24	Generator N sensing input.	1.0mm	Connect to alternator N output.

Connecting Terminal “C” with 14 Pins

No.	Function	Diameter of Wire	Remarks
25	DC Supply -ve.	2.5mm	System DC negative input.
26	DC Supply +ve.	2.5mm	System DC positive input. Fuse of Max. 20A Is Recommended.
27	Emergency Stop Input	2.5mm	Connecting with +Ve through Emergency Stop Button.
28	Fuel Relay Output	2.5mm	Supplied with +Ve from Port 27, Rated at 16A.
29	Configurable Output Port 1	2.5mm	Supplied with +Ve from Port 26, Rated at 10A.
30	Configurable Output Port 2		Supplied with +Ve from Port 27, Rated at 16A.
31	Configurable Output Port 3		Supplied with +Ve from Port 26, Rated at 10A.
32	Crank Relay Output	2.5mm	Supplied with +Ve from Port 27, Rated at 16A.
33	Configurable Output Port 4	2.5mm	Normal Opening Output, Rated at 16A.
34			Common Port for Relay.

No.	Function	Diameter of Wire	Remarks
35			Normal Closing Output, Rated at 16A, 250VAC.
36	Close Generator Relay Output	1.5mm	Normal opening Port for Relay, Rated at 16A, 250VAC.
37			
38	Charging alternator D+(or WL) Port Input or Analog 3 input	1.0mm	Connecting with charge alternator terminal WL or D+. If the terminal mounted on the Charger alternator isn't exist, don't connect. If THE input is Anolag3 (voltage-type sensor), please order from factory, setting item Is Given in Table 4.

Connecting Terminal "D" with 8 Pins

No.	Function	Diameter of Wire	Remarks
39	Mains position	1.0mm	Active connected with Grounding (- Ve).
40	Close Mains Relay Output	1.5mm	Normal Opening and Normal Closing Port for Relay, Rated at 16A, 250V.
41			
42			
43	Mains L1 voltage input	1.0mm	Connect to Mains L1 output. (Fuse of 2A is Recommended)
44	Mains L2 voltage input	1.0mm	Connect to Mains L2 output. (Fuse of 2A is Recommended)
45	Mains L3 voltage input	1.0mm	Connect to Mains L3 output. (Fuse of 2A is Recommended)
46	Mains N sensing input	1.0mm	Connect to Mains N output.

6 PARAMETERS SETTING

The performance parameter of the controller of HGM600 is given as follows:

6.1 Table 1 list of content and range for parameter setting

No	Item	Setting range	Default	Description
1	Mains normal delay	(0-9999)s	10	Mains transient delay, suited for ATS (automatic transfer switch).
2	Mains abnormal delay	(0-9999)s	5	
3	Mains over voltage	(30-360)V	276	When mains voltage is over than the point, mains over voltage are active. When the point is 360V, mains over voltage are disabled.
4	Mains under voltage	(30-360)V	184	When mains voltage is under

No	Item	Setting range	Default	Description
				than the point, mains under voltage are active. When the point is zero, mains under voltage are disabled.
5	Mains over frequency	(0-75.0)Hz	55.0	When mains frequency is over than the point, mains over frequency are active. When the point is 75.0Hz, mains over frequency are disabled.
6	Mains low frequency	(0-75.0)Hz	45.0	When mains frequency is low than the point, mains low frequency is active. When the point is zero, mains low frequency is disabled.
7	Transfer rest time	(0-999.9)s	1.0	It's the delay from mains is opened to generator closing or from generator is opened to mains closing.
8	Start delay	(0-9999)s	1	It's the delay from remote start signal is active or mains is failure, to start generator.
9	Stop delay	(0-9999)s	1	It's the delay from remote start signal is inactive or mains is normal, to stop generator.
10	Close time	(0-10.0)s	3.0	Mains or Gens switch closing pulse width, when it is zero, output is continuing.
11	Gens over voltage	(30-360)V	264	When generator voltage is over than the point, generator over voltage is active. When the point is 360V, generator over voltage is disabled.
12	Gens under voltage	(30-360)V	196	When generator voltage is under than the point, generator under voltage is active. When the point is 30V, generator under voltage is disabled.
13	Gens over frequency	(0-75.0)Hz	57.0	When generator frequency is over than the point and hold great than 3 seconds, generator over frequency is active. When the point is 75.0Hz, generator over frequency is disabled.
14	Gens low frequency	(0-75.0)Hz	40.0	When generator frequency is low than the point, generator low frequency is active. When the point is 0Hz, generator low frequency is disabled.
15	CT rate	(5-6000)/5	500	Current transformer rate
16	Full load current	(5-6000)A	500	Mains or generator set

No	Item	Setting range	Default	Description
				maximum rated current.
17	Over current percent	(50-130)%	120	When the load current is over than the point, the over current delay is initiated.
18	Over current delay	(0-9999)s	1296	When load current is over than the point and hold great than the timer, send out over current signal. When the delay is zero, over current is disabled.
19	Number of start	(1-9)	3	Numbers of crank cycles.
20	Cranking time	(3-60)s	5	
21	Crank rest time	(3-60)s	10	
22	Oil bypass delay	(1-60)s	10	
23	Start idle time	(0-9999)s	0	
24	Warming up time	(3-9999)s	10	
25	Cooling time	(3-9999)s	10	
26	Stop idle time	(0-9999)s	0	
27	ETS solenoid hold	(0-120)s	30	It's the delay for energizing to stop.
28	Fail to stop delay	(0-120)s	0	
29	Shutter open time	(0-300)s	0	
30	Preheat time	(0-300)s	0	
31	Crank disconnect	(1-7)	5	Setting Item Is Given in Table 5.
32	Flywheel teeth numbers	(10-300)	118	
33	Over speed	(0-6000)RPM	1710	When the engine speed is over than the point and hold great than 2 seconds, generator over speed is active.
34	Under speed	(0-6000)RPM	1200	When the engine speed is under than the point and hold great than 10 seconds, generator under speed is active.
35	Gens pole numbers	(2-16p)	4	Generator pole numbers
36	Freq disconnect	(14-30)Hz	14	When generator frequency is large than this point, starter will disconnect.
37	WL volts disconnect	(0-30)V	8.0	When charge alternator WL/D+ voltage is large than this point, starter will disconnect.
38	Speed disconnect	(0-3000)RPM	360	When engine speed is large than this point, starter will disconnect.
39	Run out fail-safe	(1-2)	1	When disabled, this feature will inhibit the run output and allow the ETS solenoid energize until the controller receives a speed sensing signal, thus preventing possible damage from starting

No	Item	Setting range	Default	Description
				the engine with no speed sensing for crank disconnect and over speed.
40	Low oil pressure	(0-400)kPa	103	When engine oil pressure sensor value is less than this point, the low oil pressure delay start. When the value is zero, low oil pressure signal is disabled. (it's suited for oil pressure sensor only)
41	Low oil press delay	(0-20.0)s	2.0	When the value is zero, it's a warning alarm, not a shutdown alarm. (it's suited for oil pressure sensor only)
42	High temperature	(80-140) Celsius degree	95	When engine temperature sensor value is large than this point, the high temperature delay start. When the value is 140, high temperature signal is disabled. (It's suited for engine temperature sensor only).
43	High temperature delay	(0-20.0)s	2.0	When the value is zero, it's a warning alarm, not a shutdown alarm. (It's suited for engine temperature sensor only).
44	Low fuel level	(0-100)%	10	When fuel level sensor value is less than this point and remain for 10 seconds, send out warning alarm.
45	Battery over volts	(12.0-40.0)V	33.0	When generator battery voltage is over than the point and remains for 20 seconds, battery over voltage signal is active. It's a warning alarm.
46	Battery under volts	(4.0-30.0)V	8.0	When generator battery voltage is less than the point and remains for 20 seconds, battery under voltage signal is active. It's a warning alarm.
47	Charge failure volt	(0.0-30.0)V	6.0	During generator is running, when charge alternator WL/D+ voltage is low than this point and remain for 5 seconds, generator will shutdown and alarm.
48	Gens transient	(1-25)s	5	Generator voltage transient delay from normal to abnormal
49	Digit input1	(1-23)	13	Auxiliary digital input See below table 3
50	Digit input2		14	
51	Digit input3		15	

No	Item	Setting range	Default	Description
52	Digit input4		02	
53	Digit input5		05	
54	Digit input6		10	
55	Digit input1 delay	(0.0-20.0)s	2.0	Transient delay
56	Digit input2 delay		2.0	
57	Digit input3 delay		0.0	
58	Digit input4 delay		1.0	
59	Digit input5 delay		2.0	
60	Digit input6 delay		0.0	
61	Digit output1	(1-60)	08	Auxiliary digital output See behind table 2
62	Digit output2		10	
63	Digit output3		11	
64	Digit output4		2	
65	Communication address	(1-254)	1	Communication address
66	Temperature sensor	(1-11)	6	Select engine temperature sensor. see behind table 4
67	Oil pressure sensor	(1-11)	6	Select engine oil pressure sensor. see behind table 4
68	Select analog1	(1-5)	1	Configurable analog sensor 1#. see behind table 4
69	Select analog2	(1-5)	1	Configurable analog sensor 2#. see behind table 4
70	Select analog3	(1-3)	2	Configurable analog sensor 3#. see behind table 4
71	Temperature unit	(1-2)	1	Select display temperature unit on LCD.
72	Pressure unit	(1-3)	1	Select display oil pressure unit on LCD.
73	Sensor curve	Refer to the setting information behind.		
74	Select line	(1-2)	1	Select mains or generator sensing line.

6.2Table 2 list of definable content for configurable output ports 1 to 4

No.	Definition	Description
1	Not used	
2	Common alarm	The designated programmable output relay will energize when any warning or shutdown fault circuit has been activated.
3	Open shutter	In automation mode, the shutter which is a window that mounted on generator room wall will open before the generator start. In manual mode, shutter will open at sometime as fuel relay outputting. This output will hold, until generator stop.
4	Not alarm in crank	Shielding generator high engine temperature, low oil pressure, over speed alarm during starter is starting. Its energizing will cranking, it will de-energies after oil pressure is normal. It's suited for some special engines.

No.	Definition	Description
5	Excitant Gens	Excite alternator by supplying 12V or 24VDC for generator rotor, its energizing will cranking, de-energizing after alternator voltage is normal.
6	Fuel relay on	The designated programmable output relay will energize when the engine “RUN” (i.e. FUEL) energizes prior to the engine starting. The output will remain on until the engine has reached a “stop” or “shutdown” command.
7	Crank relay on	The designated programmable output relay will energize when the engine starter energizes. The output will remain on until the engine has reached crank disconnect speed.
8	Energized to stop (ETS)	The designated programmable output relay will energize when a stop signal has been activated. The output will remain energized for pre-set timer once the engine has come to a complete stop, then de-energizes.
9	Idle control	The designated programmable output relay will energize when the idle delay is not zero. The output contact would typically be connected to the “idle/run” input control of an electronic governor.
10	Raise speed	It’s active from entering warming to switching load on.
11	Drop speed	It’s active from idling in stopping to engine has been stopped.
12	Preheat output	The designated programmable output relay will energize during the preheat delay timer period until the engine start to crank. The preheat output is typically used for an engine starting aid such as glow plugs.
13	Gens being running	The designated programmable output relay will energize when the engine has started and has reached crank disconnect speed.
14	Stop mode	It’s active when generator enters standby state.
15	Gens running	It’s active from entering warming to cooling down.
16	AUTO mode	It’s active in automation mode.
17	Manual mode	It’s active in manual mode.
18	Auto running	Generator is running in automation mode.
19	Manual running	Generator is running in manual mode.
20	Not used	
21	Running on load	Generator is running on load.
22	Not used	
23	Close mains	Switch mains breaker on.
24	Close gens	Switch generator breaker on.
25	Open mains & gens	Switch breaker off. The output delay is 5 seconds.
26	Low oil pressure	Low oil pressure shutdown alarm.
27	High temperature	High engine temperature shutdown alarm.
28	Over speed	Over speed shutdown alarm.
29	Under speed	Under speed shutdown alarm.
30	Failed to start	If the engine does not fire after the pre-set number of attempts has been made a shutdown will be initiated.
31	Failed to stop	If the module detects the engine is still running when the ‘Fail to stop timer’ expires, it’s active.
32	Emergency stop	Removal of the **+VE DC** Supply from the Emergency Stop

No.	Definition	Description
		input initiates the following sequence, firstly it will initiate a controlled shutdown of the Generator and prevent any attempt to restart the Generator until the Emergency Stop push-button has been reset. Secondly it removes the **+VE DC** supply from both the Fuel Solenoid and Starter Solenoid.
33	PC emergency stop	The emergency stop is come from PC (personal Computer) or the monitor room.
34	Loss of speed	Loss of speed shutdown alarm
35	Failed to Charge	If the module does not detect a voltage from the warning light terminal on the auxiliary charge alternator, it's active.
36	Battery over volts	If the module detects that the plant DC supply has risen above the high volts setting level, it's active.
37	Battery low volts	If the module detects that the plant DC supply has fallen below the low volts setting level, it's active.
38	Mains volt normal	When mains voltage is normal, the output is active.
39	Gens volt normal	When generator voltage is normal, the output is active.
40	Mains volt abnormal	When mains voltage is abnormal, the output is active.
41	Gens volt abnormal	When generator voltage is abnormal, the output is active.
42	Over current	If the module detects a generator output current in excess of the pre-set trip the warning is initiated.
43	Digit input1 state	When the input terminals are connected to –VE DC, these are active.
44	Digit input2 state	
45	Digit input3 state	
46	Digit input4 state	
47	Digit input5 state	
48	Digit input6 state	
49	Alarm(delay 60s)	Shutdown alarm output. After 60 seconds it is inactive.
50	Mains closed port	The import state of mains closed.
51	Remote start port	The import state of remote start.
52	Not used	
53	Shutdown alarm out	The designated programmable output relay will energize when any shutdown fault circuit has been activated.
54	Warning alarm out	The designated programmable output relay will energize when any warning fault circuit has been activated.
55	Low fuel level out	If the fuel level detected by the fuel level sender falls below the low fuel level setting, this warning will occur.
56	Not used	
57	Not used	
58	Not used	
59	Not used	
60	Not used	

Note: The 38, 40, 50 item of HGM610 is "Not used".

6.3Table 3 list of definable content for configurable input ports

No.	Definition	description
1	Not used	
2	Over speed input	Auxiliary Over speed digital input

No.	Definition	description
3	Low fuel level	Auxiliary Low fuel level digital input
4	Shutter status	Shutter status digital input. It's active when shutter is opened.
5	Auxiliary warn	Auxiliary warn alarm digital input.
6	Auxiliary shutdown	Auxiliary shutdown alarm digital input.
7	Not used	
8	Stop after cooled	During engine running, if the engine occur high temperature shutdown, when the input is active, the engine will first initiate cooling delay and then stop, else will stop immediately.
9	Inhibit start	This will inhibit generator to start when it is active.
10	Gen closed input	The imports state of generator closed.
11	Aux. charger fail	Auxiliary charger charge failure digit input..
12	Low water level	Low water level digit input.
13	High Temp input	High engine temperature digital input
14	Low OP input	Low oil pressure digit input
15	Remote start input	Auxiliary Remote start input
16	Inhibit Load input	Engine runs but mains and generator will not take load.
17	Low engine temp	Auxiliary Low engine temperature input.
18	Breaker tripped	Auxiliary Breaker tripped input.
19	Remote emerg.stop	Auxiliary Remote emergency stop input.
20	High oil level	Auxiliary High oil level input.
21	Low fuel pressure	Auxiliary Low fuel pressure input.
22	Gens breaker open	Auxiliary Generator breaker open input.
23	Failed to sync	Auxiliary Failed to sync input.

6.4Table 4 selection for sensors

No		Defined	Description
1	Temperature Sensor	1 not used 2 defined voltage type 3 defined resistive type 4 VDO 120 degree 5 DATCON 120 degree 6 SG 120 degree 7 DATCON high 8 DATCON high 9 MURPHY 10 CUMMINS 11 PT100	1. Configurable voltage type input voltage range is 0-30VDC. 2. Configurable resistive type input resistance range is 0-9999 ohm.
2	Oil pressure Sensor	1 not used 2 defined volt_type 3 defined res_type 4 VDO 10 bar 5 DATCON 10 bar 6 SG 10 bar 7 VDO 5 bar 8 DATCON 7 bar 9 DATCON 5 bar 10 MURPHY 7 bar	1. Configurable voltage type input voltage range is 0-30VDC 2. Configurable resistive type input resistance range is 0-9999 ohm

No		Defined	Description
		11 CMB812	
3	Auxiliary Sensor1	1 Not used 2 defined voltage type(Temperature) 3 defined voltage type (Fuel level) 4 defined resistive type(temperature) 5 defined resistive type(Fuel level)	1. Configurable voltage type input voltage range is 0-5.0VDC. 2. Configurable resistive type input resistance range is 0-9999 ohm.
4	Auxiliary Sensor2	1 Not used 2 defined voltage type(Pressure) 3 defined voltage type(Temperature) 4 defined resistive type(Pressure) 5 defined resistive type (Temperature)	
5	Auxiliary Sensor3	1 Not used 2 Charger W/L 3 defined voltage type(oil Pressure)	Configurable voltage type input voltage range is 0-30VDC.

Note: please specify on ordering when Auxiliary Sensor3 is selected for “defined voltage type (Pressure)”.

6.5Table 5 Conditions for Crank Success

No.	Setting Content
1	Magnetic Pickup
2	Charge Alternator D+(or WL)
3	Magnetic Pickup and Charge Alternator D+(or WL)
4	Generating Frequency
5	Magnetic Pickup and Generating Frequency
6	Generating Frequency and Charge Alternator D+(or WL)
7	Magnetic Pickup, Charge Alternator and Generating Frequency

7 SETTING PARAMETER

After the controller is powered up, press the key to enter into the setting interface:

1 History record
2 Set Date and time
3 Set Parameters
4 Information
5 Set Languages

1. History record

When looking for history record, press button to lookup nest record, press UP or DOWN to lookup previous or next item of current record. The controller may store 99 records circularly. The record will be stored when these below events have happen:

Emergency stop shutdown
High temperature shutdown
Low oil pressure shutdown
Over speed shutdown
Auxiliary shutdown alarm
Failed to start
Failed to stop
Loss of speed shutdown
Failed to charge shutdown
Generator under frequency shutdown
Low water level warning
Low fuel level warning
Generator voltage abnormal shutdown
Under speed shutdown
Generator Over frequency shutdown
Start generator

2. Set date and time

The max number is 2099-12-31 and 23:59:59。

3. Set parameters

The default password is “1234” when it leaves factory. The senior setting password is fixed as “0318”. When setting each item, after selecting this item, press the key to enter the setting interface, then press the key or to adjust the numerical value, press the key to move the cursor, finally press the key to confirm the set parameter.

NOTE:

a. Please set parameters in stop mode, else shutdown or other event may occur.
b. The over value point must be great than the under value.
c. The configurable input 1 to 6 can’t set as same item. The configurable output 1 to 4 allow to set as same item.
d. When the “crank disconnect” has been selected for “charge WL”, “Run output fail safe” must set as “Enabled” .
e. Configurable output2 can’t been seated as “Energies to stop”, “Common

alarm", "Droop speed , "Idle control", "Open generator" etc, because the output supply come from #27 terminal(Emergency stop).

4. Information

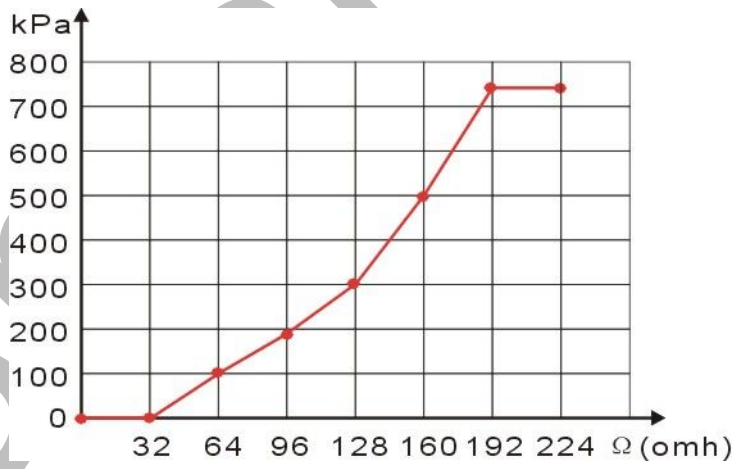
LCD will display the controller software version, issue date. Note: press the key DOWN will display the states of configurable input 1 to 6.

5. Set language

User may set display interface language as Chinese or English.
Hint: Press the key OFF will exit at any time.

8 SENSOR CONFIG

1. If the used sensor curve is not same as the standard curve, please adjust in "Sensor curve".
2. When entering the sensor curve, X value (voltage or resistance) must be from small value to big value.
3. If the oil pressure sensor is not exist and the oil pressure alarm switch is exist, please set "Oil pressure sensor" as "not used", else low oil pressure shutdown will occur.
4. If the sensor curve slope is positive, please according to the below curve Diagram.



Common unit's conversion table

	N/m^2 (pa)	kgf/cm^2	bar	(1b/in^2) psi
1Pa	1	1.01972×10^{-5}	1×10^{-5}	1.45038×10^{-4}
1kgf/cm^2	9.80665×10^{4}	1	0.980665	14.2233
1bar	1×10^{5}	1.01972	1	14.5038
1psi	6.89476×10^{3}	7.0307×10^{-2}	6.89476×10^{-2}	1

9 COMMUNICATION

Serial port: RS485

Protocol: MODBUS

Baud rate: 9600bps

Data bit: 8bits

Parity bit: none

Stop bit: 1bit or 2 bit

Address: 1-254

The detail information refers to “HGM600 communication protocol manual”.

10 SPECIFICATION

Operating Voltage	DC8.0V to 35.0V, Continuous Power Supply.
Power Consumption	<3W
AC Generator Voltage Input	(0 to 300)V (Single-Phase) or (0 to 520)V (Three-Phase)
AC Generator Frequency	50 to 60Hz
Magnetic Pickup Voltage	1.0 to 70V
Magnetic Pickup Frequency	Max. 10000Hz
Crank Relay Output	16Amp DC24V
Fuel Relay Output	16Amp DC24V
Configurable Output Port 1	10Amp DC24V
Configurable Output Port 2	16Amp DC24V
Configurable Output Port 3	10Amp DC24V
Configurable Output Port 4	16Amp DC24V
Close Generator Relay	16Amp DC24V
Close Mains Relay	16Amp DC24V
Overall Dimension	192mm x144mm x87.5mm
Cut out Dimension	186mm x139mm
Rated Current of Current Transformer	5A
Operating Condition	Temperature: (0-50)Celsius degree Humidity: (20-90)%
Storage Condition	Temperature: (-20 - 60)Celsius degree

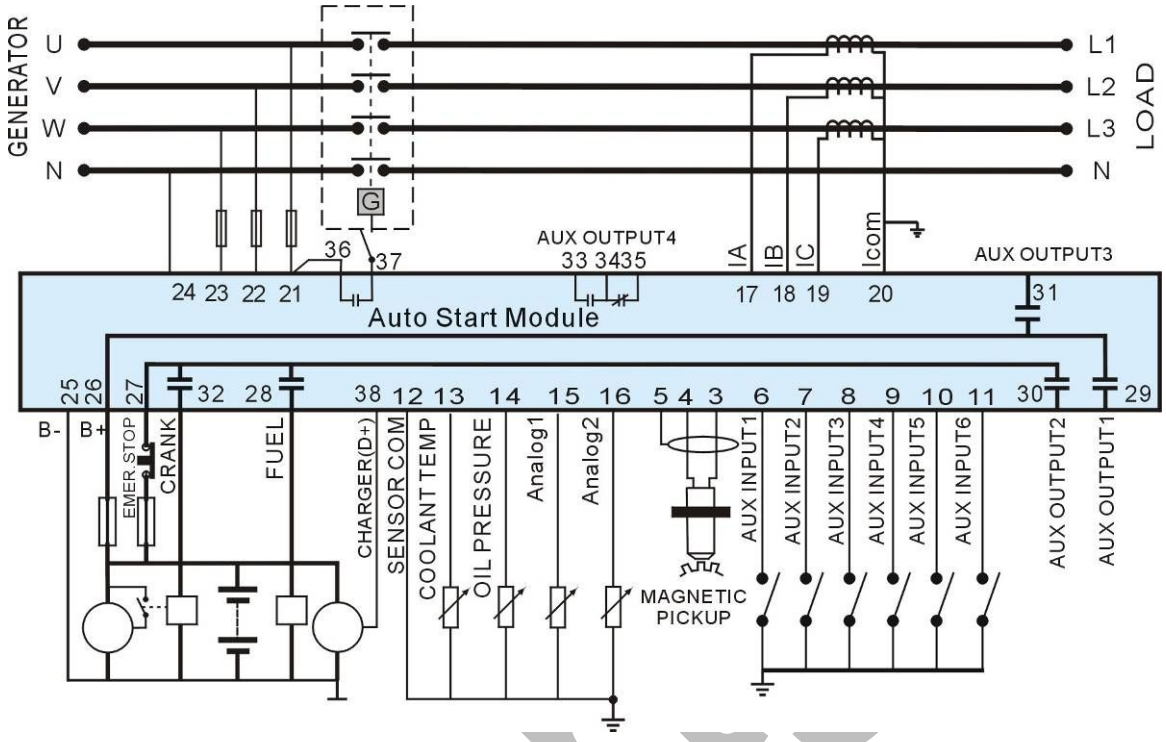
11 OPERATION

Before operation, inspections that are recommended as follows should be carried out:

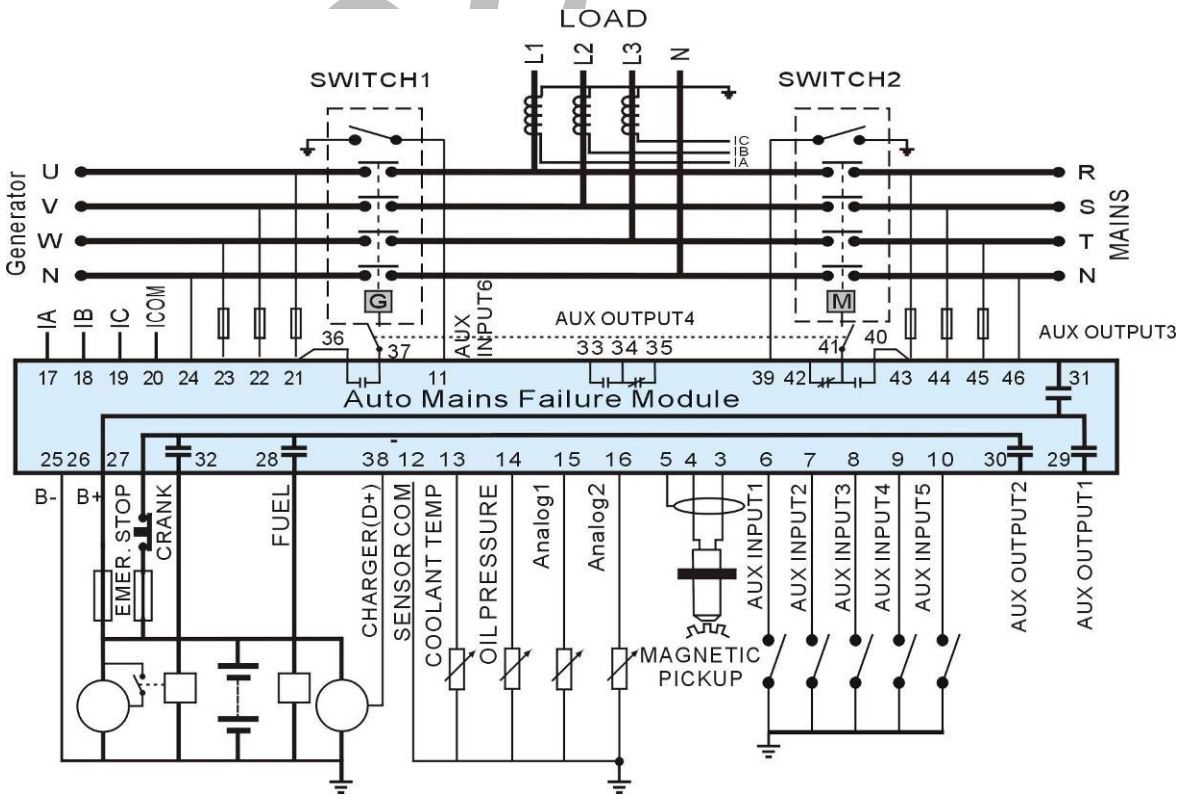
a. Check and assure that all connections are correct, and that diameter of wire is suitable;
b. The DC power supply of controller is equipped with fuse, and the positive supply (+Ve) and negative supply (-Ve) connected with battery are connected correctly;
c. The emergency stop input is connected with the positive supply (+Ve) of the battery through the NC terminal and fuse of emergency stop button;
d. The suitable operation should be taken to prevent the engine from crank success (such as dismantling the connection of fuel), check and assure that it is correct, then connect with battery, select manual mode, the controller will execute program;
e. Press down the starting button on the panel of controller , the engine will crank, after starts have been carried out according to setting crank numbers, the controller sends the signal that indicates crank failure; Press the Stop/Reset key to make the controller resetting;
f. Restore the measure that prevents the engine from crank success (such as restoring the connection of fuel), press down the starting button again, the engine will crank, if crank is normal, the generator will operate from idle operation (if idle has been set) to normal operation. In the meantime, observe the operation situation of engine and the voltage and frequency of the AC generator. If there is abnormal, stop the generator, then check connections of each part according to this handbook;
g. Select automatic state through front panel, then switch on the mains voltage, the controller switches over ATS (if it exist) to mains on load after pass through the mains normal delay, after cooling time, and then shut down to go into standby state until the mains is abnormal again;
h. After the mains is abnormal again, the Generator will automatically crank into normal operation state, and then close generator relay, control the ATS to switch transfer to generator on load. If the situation is not same as described above, check the connection of control part of the ATS according to this handbook;
i. If there are other questions, please contact the technical personnel of our company in time.

12 TYPICAL APPLICATION

Typical Application Diagram for HGM610 Generator Automatic Controller

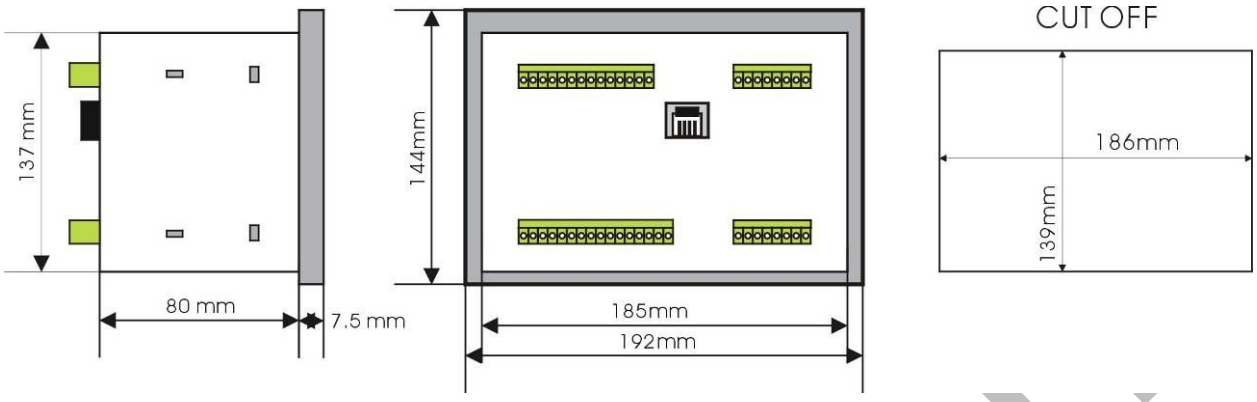


Typical Application Diagram for HGM620 Generator Automatic Controller



13 INSTALLATION

The controller is designed to panel installation mode, and it is fixed by clamps when it is installed. The overall dimension and panel tapping dimension are given as follows:



14 TROUBLESHOOTING

Fault Symptom	Measures May Be Taken
The controller is not work	Check the battery voltage. Check connections of the controller. Check DC fuse.
Generator stop	Check if engine temperature is over high. Check voltage of AC generator. Check DC fuse.
Controller emergency stop	Check if the function of emergency stop button is correct. Check if the positive supply (+VE) of battery is correctly connected with emergency stop input.
Low oil pressure alarm after crank success	Check oil pressure input and its connection.
High water temperature alarm after crank success	Check temperature input and its connection.
Shutdown during operation	Check related switches and connections according to information displayed by LCD. Check configurable input ports.
Fail to crank	Check actuator and its connections. Check fuel. Check battery voltage. Check Magnetic Pickup and its connections. Refer to handbook of engine.
Fail to Start	Check connections of starter. Check battery.