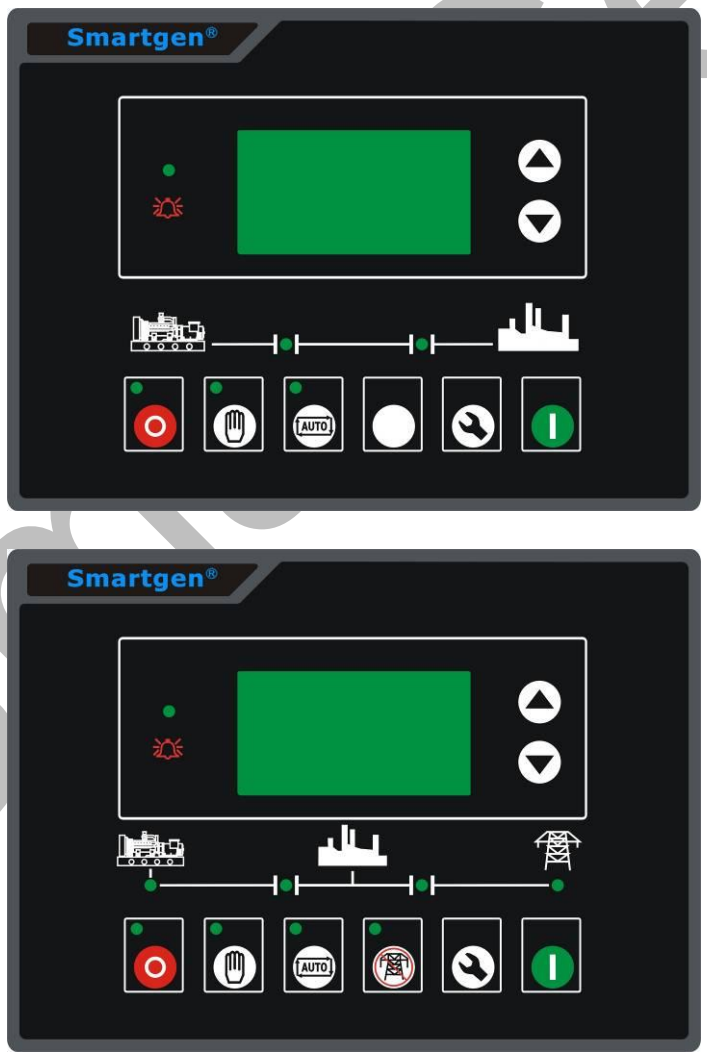
Smartgen®

HGM6200K Series

Automatic Control Module

(HGM6210K/6210KC/6220K/6220KC)

USER MANUAL



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Software Version

Date	Version	Contents
2009-7-17	1.0	Original release.
2009-12-31	1.1	Modify Typical Application.
2010-04-21	1.2	Add functions: event log, real-time clock, scheduled start/stop, Spanish. Add output: (15) over current. Add input: (25) low water level warning; (26) low water level shutdown.
2010-06-21	1.3	Modify Panel Cutout: length and width are both increased 2mm. Change working temperature of the controller.
2010-07-07	1.4	Optimize some details in this manual.
2011-06-20	1.5	Modify single/3-phase input range.
2011-12-26	1.6	Add Fuel Moisture Content Warn. Modify parts of parameter items.

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1 SUMMARY

HGM6200K series automatic controller, integrating digital, intelligent and network techniques, is used for automatic control and monitoring system of genset. It can carry out functions of automatic start/stop, data measurement, alarm protection and three “remote” (remote control, remote measure and remote communication). The controller uses LCD display, optional display interface including Chinese, English, Spanish and Russian with easy and reliable operation.

HGM6200K series automatic controller uses micro-processing technique which can achieve precision measurement, value adjustment, timing and threshold setting and etc.. All the parameters can be configured from front panel or use programmable interface (or PS485 interface) to adjust via PC. It can be widely used in all types of automatic control system for its compact structure, simple connections and high reliability.

2 PERFORMANCE AND CHARACTERISTICS

HGM6200K controller has four variants:

HGM6210K/6210KC: Automatic Start Module, it controls generator to start/stop by remote start signal;

HGM6220K/6220KC: Based on HGM6210K/6210KC, it adds mains AC monitoring and mains/gens automatic switching control (AMF), especially suitable for the automation system composed by mains and genset.

Note1: HGM6210KC/6220KC has RS485 interface, **HGM6210K/6220K** without.

Note2: HGM6210KC/6220KC is taken as an example to describe in this manual.

- 128x64 LCD display with backlight, optional language interface (Chinese, English, Spanish), push-button operation;
- With RS485 communication interface, can achieve “three remote” functions via MODBUS protocol;
- Adapt to 3P4W, 1P2W and 2P3W (120V/240V), 50Hz/60Hz AC power system;
- Can measure and display 3 phase voltage, 3 phase current, frequency, power parameter of mains and gens;

Mains	**Gens**
Line voltage (Uab, Ubc, and Uca)	Line voltage (Uab, Ubc, and Uca)
Phase voltage (Ua, Ub, and Uc)	Phase voltage (Ua, Ub, and Uc)
Frequency HZ	Frequency HZ

Load

Current IA, IB, IC

Active power KW

Reactive power KVar

Apparent power KVA

Power factor Cos

Gens accumulated energy kWh

- Mains have functions of over/under voltage and lack of phase; Gens have functions of over/under voltage, over/under frequency and over current;
- Stop mode, manual mode and auto mode can be selected;
- Dual temperature sensor and oil pressure sensor input;
- Precision measure and display of parameters about engine,

  Temp. (WT), °C/ °F both are displayed

  Oil pressure (OP), kPa/Psi/Bar all are displayed

  Fuel level (FL), %

  Speed (SPD), RPM

  Battery Voltage (VB), V

  Charger Voltage (VD), V

  Hours count (HC) can accumulate Max. 999999 hours.

  Start times can accumulate Max.999999 times.
- Control protection: Automatic start/stop of genset, load transfer(ATS control) and complete failure display and protection;
- With ETS, idle speed control, pre-heat control, speed droop control, all of them are relay output;
- Event log, real-time clock and scheduled start/stop;
- Parameter setting: Allow user to modify setting and store them in internal FLASH memory. The parameters cannot be lost even when loss of power. All of

parameters can be set not only from the front panel, but use programmable interface (or PS485 interface) to adjust via PC;

- Multi sensors of temperature, pressure and fuel level can be used directly, sensor curve can be defined by user;
- Multi conditions of crank disconnect (speed sensor, oil pressure, gens) can be selected;
- Power supply range: (8~35)VDC, accommodating to different starting battery volts;
- All parameters use digital modulation, instead of analog modulation using conventional potentiometer, having improved reliability and stability;
- Modular design, flame-retardant ABS shell, embedded mounting, compact structure and easy installation;

3 SPECIFICATION

Operating Voltage	DC8.0V to 35.0V, continuous power supply
Power Consumption	<3W(Standby mode: ≤2W)
AC Voltage Input Range 3P4W 1P2W 2P3W	 15V AC - 360V AC (ph-N) 15V AC - 360V AC (ph-ph) 15V AC - 360V AC (ph-N)
AC Alternator Frequency	50Hz/60 Hz
Magnetic AC Voltage	1.0V to 24V (RMS)
Magnetic AC Frequency	10,000 Hz (max.)
Start Relay Output	16 Amp DC28V at supply voltage
Fuel Relay Output	16 Amp DC28V at supply voltage
Aux. Relay Output 1	7 Amp DC28V at supply voltage
Aux. Relay Output 2	7A 250VAC passive output
Aux. Relay Output 3	16A 250VAC passive output
Aux. Relay Output 4	16A 250VAC passive output
Aux. Relay Output 5	16 Amp 250VAC passive output
Aux. Relay Output 6	16 Amp 250VAC passive output
Case Dimensions	209mm x 153mm x 55mm

Panel Cutout	186mm x 141mm
C.T. Secondary	5A (rated)
Working Condition	Temperature: (-25~70)ºC; Humidity: (20~90)%
Storage Condition	Temperature: (-30~+80)ºC
Protection Level	IP55: when waterproof rubber gasket added between controller and its panel. IP42: when waterproof rubber gasket not added between controller and its panel.
Insulation Intensity	Object: among in input/output/power Quote standard: IEC688-1992 Test way: AC1.5 kV / 1min 3mA leakage current
Weight	0.73kg

4 OPERATION

4.1 KEY FUNCTION

	Stop/ Reset	Can stop generator under Manual/Auto mode; Can reset alarms when a shutdown alarm occurs; Pressing this key at least 3 seconds can test panel indicators (lamp test); During stopping process, pressing this again can stop genset immediately.
	Start	To start genset under Manual or Manual Test mode.
	Manual	Press this key to set the module as Manual mode.
	Auto	Press this key to set the module as Auto mode.
	Run with load	Press to set controller into Manual Test mode. Under this mode, if gens normal genset will run with load automatically. (HGM6210KC without)
	Set/ Confirm	In parameter setting, can shift cursor and confirm setting.
	Up/Increase	Scroll screen; In parameter setting, can shift cursor or increase value.
	Down/Decrease	Scroll screen; In parameter setting, can shift cursor or decrease value.

4.2 AUTOMATIC OPERATION

Auto mode is activated by pressing the 

. LED indicator beside the button is illuminating which confirms this action.

Starting Sequence,

1) **HGM6220KC**: When mains is abnormal (over/voltage, lack of phase), enter into "Mains Abnormal Delay" and LCD displays count-down time. When delay is over, "Start Delay" begins.
2) **HGM6210KC**: when "remote start" input is enabled, enter into "Start Delay".
3) "Count- down" of start delay is displayed in LCD.
4) When start delay is over, preheat relay is outputting (if configured), "Preheat Delay XX s" is displayed in LCD.
5) When preheat delay is over, fuel relay is outputting 1s and then start relay outputs; if genset failed to start during "Crank Time", the fuel and start relay stop outputting and enter into "Crank Rest Time" and wait for next cranking.
6) If genset failed to start within set start times, the fourth line of LED will turn black and Fail to Start alarm will be displayed.
7) Any time to start genset successfully, it will enter into "Safety on Run". During this period, alarms of low oil pressure, hi-temperature, under speed, charge failure and Aux. input (be configured) are disabled. As soon as this delay is over, genset will enter into "Start Idle Delay" (if configured).
8) During start idle delay, alarms of under speed, under frequency, under voltage are disabled. As soon as this delay is over, genset will enter into "Warming up Delay" (if configured).
9) When "Warming up Delay" is over, the indicator is illuminating if gens normal. If voltage and frequency of engine meets to the load requirement, close relay outputs, genset is taking load and indicator illuminates; if voltage or frequency of engine is abnormal, controller will alarm to shutdown (LCD displays the alarm).

Stopping Sequence,

1) **HGM6220KC**: during normal running, if mains normal, genset will enter into "Mains Normal Delay" of voltage, mains indicator illuminates, "Start Delay" begins.
2) **HGM6210KC**: genset enters into "Stop Delay" as soon as "Remote Start" is enabled.
3) When "Stop Delay" is over, genset enters into "Cooling Delay". Close relay is disconnected. After switch "Transfer Rest Delay", close relay is outputting, mains

is taking load, power supply indicator of gens eliminates while indicator of gens illuminates.

4) When entering “Stop Idle Delay”, idle relay is energized to output. (If configured).
5) When entering “ETS Delay”, ETS relay is energized to output, fuel relay output is disconnected.
6) When entering “Genset at Rest”, genset will automatically judge if it has stopped.
7) When genset has stopped, enter into standby mode; if genset failed to stop, controller will alarm (“Failed to Stop” alarm will be displayed in LCD).

4.3 MANUAL OPERATION

1) **HGM6220KC**: Auto Mode is enabled when press and its indicator illuminates. Press , then controller enters into “Manual Test Mode” and its indicator is illuminating. Under both of the modes, press to start genset, it can automatically detect crank disconnect and accelerate to hi-speed running. If there is hi-temperature, low oil pressure, over speed and abnormal voltage during genset running, controller can protect genset to stop (detail procedures please refer to No.4~9 of Auto start operation). Under Manual Mode , switch won’t transfer automatically. Under “Manual Test Mode” , after genset runs well in high speed, no matter mains is normal or not, loading switch will be transferred to gens.

2) **HGM6210KC**: Auto Mode is enabled when pressing , and its indicator is illuminating. Then press to start genset, it can automatically detect crank disconnect and accelerate to hi-speed running. If there is hi-temperature, low oil pressure, over speed and abnormal voltage during running, controller can protect genset to stop quickly (detail procedures please refer to No.4~9 of Auto start operation). After genset runs well in high speed, if remote start signal is active, controller will close gens, if remote start signal is inactive, controller will not close gens.

3) Manual stop, pressing can shut down the running genset (detail procedures please refer to No.3~7 of Auto stop operation).

5 PROTECTION

5.1 WARNINGS

When controller detects the warning signal, only alarm and not stop genset. The alarms are displayed in LCD.

Warnings as following,

No.	Type	Description
1	Loss Of Speed Signal	When the speed of genset is 0 and set the delay as 0, controller will send warning alarm signal and t will be displayed in LCD.
2	Gens Over Current	When the current of genset is higher than threshold and set over current delay as 0, controller will send warning alarm signal and t will be displayed in LCD.
3	Fail To Stop	When genset cannot stop after the “stop delay” is over, controller will send warning alarm signal and it will be displayed in LCD.
4	Low Fuel Level	When the fuel level of genset is lower than threshold or low fuel level warning is enabled, controller will send warning alarm signal and it will be displayed in LCD.
5	Charge Failure	When the voltage of genset charger is lower than threshold, controller will send warning alarm signal and it will be displayed in LCD.
6	Battery Under Voltage	When the battery voltage of genset is lower than threshold, controller will send warning alarm signal and it will be displayed in LCD.
7	Battery Over Voltage	When the battery voltage of genset is higher than threshold, controller will send warning alarm signal and it will be displayed in LCD.
8	Over Speed	When genset speed is higher than set threshold, controller will send warning alarm signal and it will be displayed in LCD.
9	Under Speed	When genset speed is lower than set threshold, controller will send warning alarm signal and it will be displayed in LCD.
10	Gens Over Voltage	When genset voltage is higher than threshold, controller will send warning alarm signal and it will be displayed in LCD.
11	Gens Under Voltage	When genset voltage is under set threshold, controller will send a warning alarm signal and it will be displayed

No.	Type	Description
		in LCD.
12	Over Frequency	When genset frequency is higher than set threshold, controller will send warning alarm signal and it will be displayed in LCD.
13	Under Frequency	When genset frequency is lower than set threshold, controller will send warning alarm signal and it will be displayed in LCD.
14	High Temp 1	When the temperature 1 of water/cylinder is higher than set threshold, controller will send warning alarm signal and it will be displayed in LCD.
15	Low OP 1	When oil pressure 1 is lower than threshold, controller will send warning alarm signal and it will be displayed in LCD.
16	High Temp 1	When the temperature 2 of water/cylinder is higher than set threshold, controller will send warning alarm signal and it will be displayed in LCD.
17	Low OP 2	When oil pressure 2 is lower than threshold, controller will send warning alarm signal and it will be displayed in LCD.

5.2 SHUTDOWN ALARM

When controller detects shutdown alarm, it will send signal to open switch and to stop genset. The alarms are displayed in LCD.

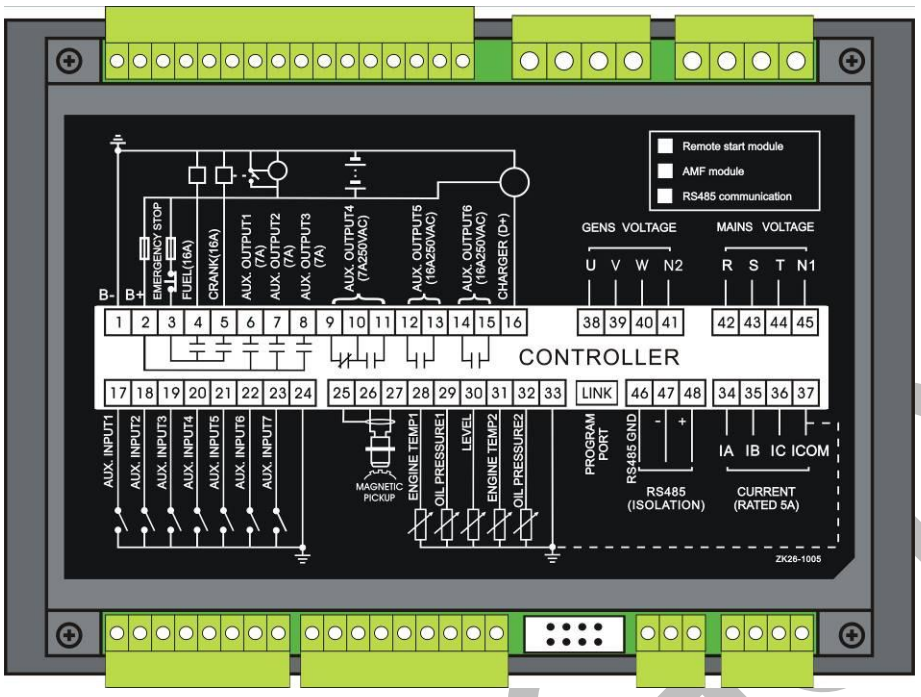
Shutdown alarms as following,

No.	Type	Description
1	Emergency Stop	When controller detects emergency stop signal, it will send a stop alarm signal and it will be displayed in LCD.
2	High Temperature 1	When the temperature 1 of water/cylinder is higher than set threshold, controller will send a stop alarm signal and it will be displayed in LCD.
3	Low OP 1	When oil pressure 1 is lower than threshold, controller will send a stop alarm signal and it will be displayed in LCD.
4	High Temperature 2	When the temperature 2 of water/cylinder is higher than set threshold, controller will send a stop alarm signal and it will be displayed in LCD.
5	Low OP 2	When oil pressure 2 is lower than threshold, controller will send a stop alarm signal and it will be displayed in LCD.
6	Over Speed	When genset speed is higher than set threshold, controller will send a stop alarm signal and it will be displayed in

No.	Type	Description
		LCD.
7	Under Speed	When genset speed is lower than set threshold, controller will send a stop alarm signal and it will be displayed in LCD.
8	Loss Of Speed Signal	When rotate speed is 0 and delay is not 0, controller will send a stop alarm signal and it will be displayed in LCD.
9	Gens Over Voltage	When genset voltage is higher than threshold, controller will send a stop alarm signal and it will be displayed in LCD.
10	Gens Under Voltage	When genset voltage is under set threshold, controller will send a stop alarm signal and it will be displayed in LCD.
11	Gens Over Current	When genset current is higher than set threshold and delay is not 0, it will send a stop alarm signal and it will be displayed in LCD.
12	Fail To Start	Within set start times, if failed to start, controller will send a stop alarm signal and it will be displayed in LCD.
13	Over Frequency	When genset frequency is higher than set threshold, controller will send a stop alarm signal and it will be displayed in LCD.
14	Under Frequency	When genset frequency is lower than set threshold, controller will send a stop alarm signal and it will be displayed in LCD.
15	Gens Failed	When genset frequency is 0, controller will send a stop alarm signal and it will be displayed in LCD.
16	Temp. Sensor 1 Open Circuit	When controller detects temperature sensor 1 open circuit, controller will send a stop alarm signal and it will be displayed in LCD.
17	OP Sensor 1 Open Circuit	When controller detects oil pressure sensor 1 open circuit, controller will send a stop alarm signal and it will be displayed in LCD.
18	Temp. Sensor 2 Open Circuit	When controller detects temperature sensor 2 open circuit, controller will send a stop alarm signal and it will be displayed in LCD.
19	OP Sensor 2 Open Circuit	When controller detects oil pressure sensor 2 open circuit, controller will send a stop alarm signal and it will be displayed in LCD.

6 CONNECTIONS

Compared with HGM6220KC, HGM6210KC doesn't have 3-phase input terminal of mains voltage. The back panel of HGM6210KC and HGM6220KC is as below.



Descriptions of terminal connection as following,

No.	Function	Cable Size	Description	
1	DC Plant Supply B-	2.5mm^2	Connect to starting battery negative	
2	DC Plant Supply B+	2.5mm^2	Connect to starting battery positive. If more than 30m, use 2 cables to parallel ; Recommended 20A fuse	
3	Emergency Stop	2.5mm^2	Plant Supply B+	
4	Fuel Relay Output	1.5mm^2	Plant Supply B+ from pin 3. 16 Amp rated.	
5	Start Relay Output	1.5mm^2	Plant supply B+ from pin 3. 16 Amp rated. Connect to start coil. Connect to starting coil	
6	Aux. Relay Output 1	1.5mm^2	Plant Supply B+ from pin 2. 7 Amp rated.	Reference table 2
7	Aux. Relay Output 2	1.5mm^2	Normally close output, 7 Amp rated.	
8	Aux. Relay Output 3	1.5mm^2	Relay common port	
9	Aux. Relay Output 4	1.5mm^2	Normally open output, 7 Amp rated.	
10			Normally open contact of relay,16 Amp rated, Passive contact output.	
11				

No.	Function	Cable Size	Description	
12 13	Aux. Relay Output 5	2.5mm^2		
14 15	Aux. Relay Output 6	2.5mm^2		
16	Charge Alternator D+ Input	1.0mm^2	Connect to D+ (WL) terminal. If without, the terminal vacant.	
17	Aux. Input 1	1.0mm^2	Connect to GND (B-)	
18	Aux. Input 2	1.0mm^2	Connect to GND (B-)	
19	Aux. Input 3	1.0mm^2	Connect to GND (B-)	
20	Aux. Input 4	1.0mm^2	Connect to GND (B-)	
21	Aux. Input 5	1.0mm^2	Connect to GND (B-)	
22	Aux. Input 6	1.0mm^2	Connect to GND (B-)	
23	Aux. Input 7	1.0mm^2	Connect to GND (B-)	
24	Aux. Input Common	GND (B-)		
25	Magnetic Pickup Shield	Connect to Magnetic Pickup device. Recommend using screen.		
26	Magnetic Pickup B+			
27	Magnetic Pickup B-			
28	Temp. Sensor 1Input	Connect to temperature resistor sensor.		Reference table 4
29	OP Sensor 1Input	Connect to oil pressure resistor sensor.		
30	Liquid Level Sensor Input	Connect to liquid level resistor sensor.		
31	Temp. Sensor 2 Input	Connect to temperature resistor sensor.		
32	OP Sensor 2 Input	Connect to oil pressure resistor sensor.		
33	Resistor Sensor Input	Connect to resistor-type sensor.		
34	CT A Phase Sensing	1.5mm^2	Connect to secondary coil, rated 5A	
35	CT B Phase Sensing	1.5mm^2	Connect to secondary coil, rated 5A	
36	CT C Phase Sensing	1.5mm^2	Connect to secondary coil, rated 5A	
37	CT Common Port	1.5mm^2	Refer to INSTALLATION description.	
38	Generator A Voltage Sensing	1.0mm^2	Connect to A phase (Recommend 2A fuse)	
39	Generator B Voltage Sensing	1.0mm^2	Connect to B phase (Recommend 2A fuse)	
40	Generator C Voltage	1.0mm^2	Connect to C phase	

No.	Function	Cable Size	Description
	Sensing		(Recommend 2A fuse)
41	Generator N Input	1.0mm^2	Connect to generator neutral
42	Mains A Voltage Sensing	1.0mm^2	Connect to mains A phase (Recommend 2A fuse); HGM6210KC without
43	Mains B Voltage Sensing	1.0mm^2	Connect to mains B phase, (Recommend 2A fuse) HGM6210KC without.
44	Mains C Voltage Sensing	1.0mm^2	Connect to mains C phase, (Recommend 2A fuse) HGM6210KC without.
45	Mains N Input	1.0mm^2	Connect to mains neutral, HGM6210KC without
46	RS485 Common GND	0.5mm^2	Use 120Ω RS485 screen and screen must be grounded at one end.
47	RS485 -	0.5mm^2	
48	RS485+	0.5mm^2	

Note: LINK interface in back is programmable interface. Controller can be programmable by PC via an SG72 adapter.

7 PARAMETER RANGE AND DEFINITION

7.1 PARAMETER CONTENT AND RANGE TABLE (TABLE 1)

No.	Item	Range	Default	Description
1	Mains Normal Delay	(0-3600)s	10	It's the delay for confirming whether mains normal or not, used for ATS control.
2	Mains Abnormal Delay	(0-3600)s	5	
3	Mains Under Voltage	(30-360)V	184	When mains voltage is under the point, mains under voltage enabled. When the value is 30, mains under voltage disabled.
4	Mains Over Voltage	(30-360)V	276	When mains voltage is over the point, mains over voltage enabled. When the point is 360V, mains over voltage disabled.
5	Transfer Rest Time	(0-99.9)s	1.0	It's the delay from mains open to generator closed or from generator open to mains closed.

No.	Item	Range	Default	Description
6	Start Delay	(0-3600)s	1	It's the delay from mains failure or remote start signal enabled, to start generator.
7	Stop Delay	(0-3600)s	1	It's the delay from mains normal, or remote start signal disabled to stop genset.
8	Start Times	(1-10)times	3	When engine start not success, maximum cranking times. When setting crank times up, controller send out fail to start signal.
9	Preheat Time	(0-300)s	0	Power the preheat plug before engine starts with power.
10	Crank Time	(3-60)s	8	The time used to pre-power the starter.
11	Crank Rest Time	(3-60)s	10	Time for waiting the second powering if failed to start at the first time.
12	Safety Run Time	(1-60)s	10	Alarms of Low OP, high temp, under speed/freq/volt, charge failure, are disabled
13	Start Idle Time	(0-3600)s	0	Idle running time when started
14	Warming Up Time	(3-3600)s	10	Time for warming up before close breaker
15	Cooling Time	(3-3600)s	10	Time for cooling before stopping.
16	Stop Idle Time	(0-3600)s	0	Genset idle running time during stopping.
17	ETS Solenoid Hold	(0-120)s	20	It's the delay for energizing to stop.
18	Over Stop Delay	(0-120)s	0	If "ETS solenoid hold" set as 0, it is the time from end of idle delay to gen-set at rest; if not 0, it is from end of ETS solenoid delay to gen-set at rest
19	ATS Close Delay	(0-10)s	5.0	Mains or generator switch closing pulse width, when it is 0, output is continuous.
20	Flywheel Teeth	(10-300)	118	Number of flywheel teeth, can detect disconnection conditions and engine speed.
21	Gens Abnormal Delay	(0-20.0)s	10.0	Over or under volt alarm delay

No.	Item	Range	Default	Description
22	Gens Over Volt Shutdown	(30-360)V	264	When gens voltage is over the point, generator over voltage is enabled. When the point is 360V, generator over voltage is disabled.
23	Gens Under Volt Shutdown	(30-360)V	196	When generator voltage is under the point, generator under voltage is enabled. When the point is 30V, generator under voltage is disabled.
24	Under Speed Shutdown	(0-6000)RPM	1200	When the engine speed is under the point for 10s, shutdown alarm signal is sent out.
25	Over Speed Shutdown	(0-6000)RPM	1710	When the engine speed is over the point for 2s, shutdown alarm signal is sent.
26	Under Freq Shutdown	(0-75.0)Hz	45.0	When generator frequency is lower than the point for 10s, shutdown alarm signal is sent.
27	Over Freq Shutdown	(0-75.0)Hz	57.0	When generator frequency is over the point and holds for 2s, generator over frequency is enabled.
28	High Temp 1 Shutdown	(80-300)ºC	98	When engine temperature sensor 1 is over this point, send out shutdown alarm. Active from safety run timer over (only suited for temperature sensor)
29	Low OP 1 Shutdown	(0-400)kPa	103	When engine oil pressure sensor 1 is under this point, send out shutdown alarm. Active from safety run timer over
30	High Temp 2 Shutdown	(80-300)ºC	98	When engine temperature sensor 2 is over this point, send out shutdown alarm. Active from safety run timer over (only suited for temperature sensor)
31	Low OP 2 Shutdown	(0-400)kPa	103	When engine oil pressure sensor 2 is under this point, send out shutdown alarm. Active from safety run timer over

No.	Item	Range	Default	Description
32	Low Fuel Level	(0-100)%	10	When fuel level sensor value under this point and remains for 10s, send out warning alarm.
33	Loss Of Speed Signal Delay	(0-20.0)s	5.0	When the delay is 0, send out warning alarm.
34	Gens Over Volt Warn	(30-360)V	256	When gens voltage is over the point, generator over voltage is enabled. When the point is 360V, generator over voltage is disabled.
35	Gens Under Volt Warn	(30-360)V	205	When generator voltage is under the point, generator under voltage is enabled. When the point is 30V, generator under voltage is disabled.
36	Under Speed Warn	(0-6000)RPM	1350	When the engine speed is under the point, a warning alarm signal is sent.
37	Over Speed Warn	(0-6000)RPM	1650	When the engine speed is over the point, a warning alarm signal is sent.
38	Under Freq Warn	(0-75.0)Hz	47.0	When generator frequency is lower than the point, a warning alarm signal is sent.
39	Over Freq Warn	(0-75.0)Hz	55.0	When generator frequency is over the point, a warning alarm signal is sent.
40	Charge Failure	(0-30)V	6.0	During generator is running, when charge alternator WL/D+ voltage is under this point and remain for 5s, generator will warning alarm.
41	Battery Over Volt Warn	(12-40)V	33.0	When generator battery voltage is over the point and holds for 20s, battery over voltage signal is enabled. It's a warning alarm.
42	Battery Under Volt Warn	(0-30)V	8.0	When generator battery voltage is under the point and holds for 20s, battery under voltage signal is enabled. It's a warning alarm.

No.	Item	Range	Default	Description
43	High Temp 1 Warn	(80-300)ºC	95	When engine temperature sensor 1 is over this point, send warning alarm. Active from safety run timer over.
44	Low OP 1 Warn	(0-400)kPa	124	When engine oil pressure sensor 1 is under this point, send out warning alarm. Active from safety run timer over.
45	High Temp 2 Warn	(80-300)ºC	95	When engine temperature sensor 2 is over this point, send warning alarm. Active from safety run timer over.
46	Low OP 2 Warn	(0-400)kPa	124	When engine oil pressure sensor 2 is under this point, send out warning alarm. Active from safety run timer over.
47	CT Rate	(5-6000)/5	500	Current transformer rate
48	Full Load Current	(5-6000)A	500	Rated current of generator
49	Over Current Shutdown	(50-130)%	120	When load current is over the point, the over current delay is initiated.
50	Over Current Delay	(0-3600)s	1296	When load current is over the point, over current signal is sent. When the delay is 0, warn only not shutdown.
51	Over Current Warn	(50-130)%	110	When load current is over the point, a warning signal is sent.
52	Aux. Output 1	(0-35)	16	Default: From preheat to crank
53	Aux. Output 2	(0-35)	1	Default: Common alarm
54	Aux. Output 3	(0-35)	10	Default: Energized to stop
55	Aux. Output 4	(0-35)	7	Default: Idle control
56	Aux. Output 5	(0-35)	21	Default: Gens closed
57	Aux. Output 6	(0-35)	22	Default: Mains closed
58	Aux. Input 1	(0-26)	8	Default: Remote start (only for 6210KC)
59	Aux. Input 1 Delay	(0-20.0)s	2.0	
60	Aux. Input 2	(0-26)	1	Default: High temperature alarm
61	Aux. Input 2 Delay	(0-20.0)s	2.0	
62	Aux. Input 3	(0-26)	2	Default: Low oil pressure alarm

No.	Item	Range	Default	Description
63	Aux. Input 3 Delay	(0-20.0)s	2.0	
64	Aux. Input 4	(0-26)	3	Default: External alarm input
65	Aux. Input 4 Delay	(0-20.0)s	2.0	
66	Aux. Input 5	(0-26)	4	Default: External shutdown alarm input
67	Aux. Input 5 Delay	(0-20.0)s	2.0	
68	Aux. Input 6	(0-26)	19	Default: Low fuel level warn
69	Aux. Input 6 Delay	(0-20.0)s	2.0	
70	Aux. Input 7	(0-26)	21	Default: Default: Lamp test
71	Aux. Input 7 Delay	(0-20.0)s	2.0	
72	Power Mode Select	(0-2)	0	Default: Stop Mode;
73	Module Address	(1-254)	1	The address of controller.
74	Password	(0-9999)	1234	
75	Crank Disconnect Condition	(0-5)	2	Conditions of disconnecting starter (gens, magnetic pickup sensor, oil pressure)
76	Engine Speed	(0-6000)RPM	360	When engine speed is over this point, starter will disconnect.
77	Engine Frequency	(0-30)Hz	14	When generator frequency is over this point, starter will disconnect.
78	Engine Oil Pressure	(0-400)kPa	200	When engine oil pressure is over this point, starter will disconnect.
79	Single/3-phase Input	(0-2)	0	0: 3P4W; 1: 2P3W; 2: 1P2W
80	Temp. Sensor 1	(0-10)	08	SGX (120ºC resistor)
81	OP Sensor 1	(0-10)	08	SGX (10Bar resistor)
82	Liquid Level Sensor	(0-5)	03	SGD
83	Temp. Sensor 2	(0-10)	00	Not Used
84	OP Sensor 2	(0-10)	00	Not Used
85	Poles Number	(2-32)	04	Number of magnetic poles, used for calculating rotating speed of generator without speed sensor.

7.2 PROGRAMMABLE OUTPUT 1-6 TABLE (TABLE 2)

No.	Items	Description
0	Not Used	Output is disabled when this item is selected.
1	Common Alarm	Including all shutdown alarm and warning alarm. When a warning alarm occurs, the alarm won't self-lock; When a shutdown alarm occurs, the alarm will self-lock until alarm is reset.
2	Common Shutdown Alarm	Action when a common shutdown alarm occurs.
3	Common Warn Alarm	Action when a common warning alarm occurs.
4	Reserved	
5	Start Relay Output	This output will disconnect when unit has started.
6	Fuel Relay Output	This output will disconnect when unit at rest.
7	Idle Control	Used for the genset with idle speed. Pick-up when crank while disconnect when enter into warming up. Pick-up during stop idle while disconnect when genset at rest.
8	Speed Raise Control	Pick-up when enter into warming up time. Disconnect if raise speed auxiliary input enabled.
9	Speed Droop Control	Pick-up when enter into stop idle or ETS solenoid stop (shutdown alarm). Disconnect if droop speed auxiliary input enabled.
10	ETS Control	Used for the genset with stop solenoid. Pick-up when idle speed is over while disconnect when ETS delay is over.
11	Magnetizing Control	12V or 24V DC supply. Pick-up when engine cranks and disconnect when voltage is normal.
12	Fuel Pump Control	Pick-up when the fuel level lower than the threshold and disconnect when the fuel level higher than 85% of the threshold.
13	Air Flap Control	The output controls the closing of the air-flaps in an Emergency Stop or Over Speed situation.
14	Louver Control	The output controls the opening of the louvers on engine starting and closure when engine has stopped.

No.	Items	Description
15	Over Current Output	Action when load current is over the threshold.
16	Pre-Heat (During Preheat Timer)	Pre-heat output is available from preheat delay to cranking begins.
17	Pre-Heat (Until End Of Cranking)	Pre-heat output is available from preheat delay to cranking ends.
18	Pre-Heat (Until End Of Warming Up)	Pre-heat output is available from preheat delay to warming up ends.
19	Pre-Heat (Until Safety On)	Pre-heat output is available from preheat delay to safety run ends.
20	Reserved	
21	Close Gens	When set close time as 0, it is continuous closing.
22	Close Mains	6210KC without
23	Open Breaker	When set close time as 0, Open Breaker is disabled.
24	Reserved	
25	Crank Disconnect	Action when the engine has fired successfully.
26	Genset Normal Run	Pick-up during warming up and disconnect during cooling time.
27	Gens Normal	This output indicates that the voltage is normal.
28	Reserved	
29	System In Manual Test Mode	This output indicates that the module is in the Manual Test mode.
30	System In Auto Mode	The output indicates that the module is in the Auto mode.
31	System In Manual Mode	This output indicates that the module is in the Manual mode.
32	System In Stop Mode	The output indicates that the module is in the Stop mode.
33	Reserved	
34	Mains Abnormal	Over/under voltage and lack of phase of mains. 6210KC without.
35	Reserved	

7.3 PROGRAMMABLE INPUT 1-7 TABLE (ALL IS ACTIVE WHEN CONNECT TO GRAND (B-) (TABLE 3)

No.	Item	Description
0	Not Used	

No.	Item	Description
1	High Temp. Alarm	After safety run on, if the signal is enabled, genset will immediately alarm to shutdown.
2	Low OP Alarm	
3	Auxiliary Alarm	Only warn, not shutdown.
4	Aux. Shutdown Alarm	If the signal is enabled, genset will immediately alarm to shutdown.
5	Coolant To Stop	During engine running and the input is enabled, if high temperature shutdown occurs, controller will stop after high speed cooling; when the input is disabled, controller will stop immediately.
6	Gens Closed Input	
7	Mains Closed Input	
8	Remote Start Input	Access to remote start signal.
9	High Temp. Inhibit	When it is enabled, high oil temperature stop is inhibited.
10	Low OP Inhibit	When it is enabled, low oil pressure stop is inhibited.
11	Analogy Manual Key	
12	Analogy Auto Key	
13	Analogy Start Key	
14	Analogy Stop Key	
15	Analogy Manual Test Key	
16	Panel Lock	When the input is activated, all the panel keys are inactive. The right corner of the forth line will show  .
17	Auto Stop Inhibit	In auto mode, when the input is active, auto stop is not allowed.
18	Auto Start Inhibit	In Auto Mode, when the input is enabled, no matter mains normal or not, genset won't start. If genset is in normal running, stop process won't be executed. When input is disabled, genset will automatically start or stop.
19	Low Fuel Level Warn	Only warn, not shutdown.
20	Alarm Reset	When the input is activated, shutdown alarm, trip alarm can be removed.
21	Lamp Test	When the input is activated, all LED indicators

No.	Item	Description
		will illuminate.
22	Fuel Moisture Content Warn	When the input is activated, controller will send and display a warning alarm.
23	Speed Raise Input	When the input is activated, speed raise output is inhibited.
24	Speed Droop Input	When the input is activated, speed droop output is inhibited.
25	Low Water Level Warn	When the input is activated, controller will send and display a warning alarm.
26	Low Water Level Shutdown	When the input is activated, controller will send and display a shutdown alarm.

7.4 SENSOR SELECTION (TABLE 4)

No.	Items	Content	Description
1	Temperature Sensor	0 Not used 1 Defined Res. Type 2 VDO 3 SGH(Huanghe sensor) 4SGD(DongKang sensor) 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Reserved 10 Reserved	Defined input resistance range is 0~999.9Ω, factory default is SGX sensor.
2	Pressure Sensor	0 Not used 1 Defined Res. Type 2 VDO 10Bar 3 SGH(Huanghe sensor) 4 SGD(DongKang sensor) 5 CURTIS 6 DATCON 10Bar 7 VOLVO-EC 8 SGX 9 Reserved 10 Reserved	Defined input resistance range is 0~999.9Ω, factory default is SGX sensor.
3	Fuel Level Sensor	0 Not used 1 Defined Res. Type 2 SGH 3 SGD 4 Reserved 5 Reserved	Defined curve input resistance range is 0-999.9Ω, factory default is SGD sensor.

7.5 CONDITIONS OF CRANK DISCONNECT (TABLE 5)

No.	Content
0	Magnetic pickup sensor
1	Gens
2	Magnetic pickup sensor + Gens
3	Magnetic pickup sensor + Oil pressure
4	Gens + Oil pressure
5	Gens + Magnetic pickup sensor + Oil pressure

1) There are 3 kinds of crank disconnect conditions. Magnetic pickup sensor and gens can be used alone. Oil pressure must be used with magnetic pickup sensor and the gens, in order to make the starter and the engine disconnect as soon as possible.
2) Magnetic pickup sensor is installed in the engine for testing flywheel teeth.
3) When choosing magnetic pickup sensor, ensure the number of flywheel teeth is same as the pre-set, otherwise over or under speed shutdown may appear.
4) If generator has no magnetic pickup sensor, don't choose corresponding item; otherwise Fail to Start or Loss of Speed Signal shutdown will occur.
5) If the generator has no oil pressure sensor, don't choose corresponding item.
6) If gens has not been selected, controller will not measure and display the relative parameters (can be applied to the pump set); if magnetic pickup sensor has not been selected, the rotating speed will calculated by the generating AC signal.

8 PARAMETER SETTING

After controller powered on, press to enter into the parameters setting menu:

1. Parameters Setting
2. Information
3. Language

◆ **Parameters Editing**

When inputting password, "1234" can set the items of 1-47; "0318" can set all items. If more parameter items are needed to set, such as voltage and current calibration, please contact the factory.

NOTE:

HGM6210KC, there are not items 1-5 in table1; programmable output 1-6 have no digital outputs about mains.

1. Please modify the parameters in standby mode (crank conditions, auxiliary input and output configuration, multi delays, etc.) otherwise shutdown alarm or other abnormal conditions may appear.
2. The over-voltage threshold must be greater than the under-voltage threshold; otherwise over-voltage and under-voltage will occur at the same time.
3. The over-speed threshold must be greater than under-speed threshold, otherwise over speed and under speed will occur at the same time.
4. Set frequency value (after crank disconnect) as low as possible, in order to disconnect starter quickly.
5. Programmable input 1-5 cannot be set as the same items, otherwise cannot realize correct function; programmable output 1-4 can be set as the same item.
6. If need to shut down after cooling, please set any input as " stop after cooling ", then connect this input to GND.

◆ **Information**

LCD will display some information of controller, such as software version, issue date.

Note: Pressing will display the status of digital inputs and outputs.

◆ **Language**

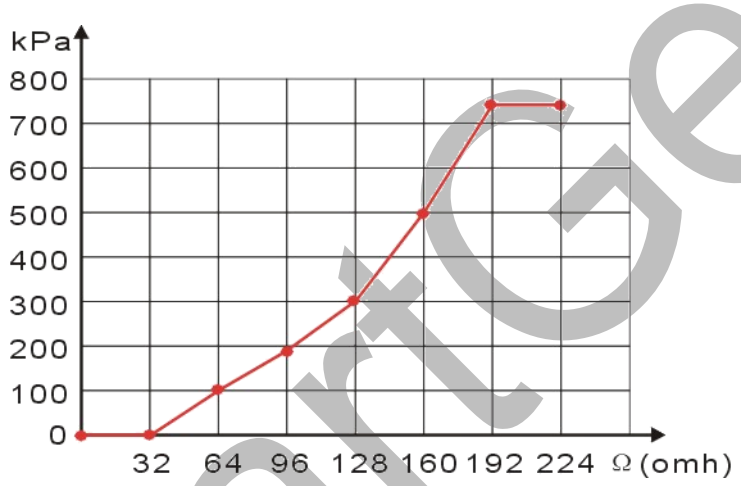
User may select display language as Chinese, English and Spanish.

Note: Pressing key at any time will exit the editor and back to main interface.

9 SENSOR SETTING

1. When choosing sensor, standard of sensor curve will be needed. If set temperature sensor as SGD (120ºC resistor type), sensor curve should be SGD (120^{o}C resistor type); If set as SGH (120ºC resistor type), sensor curve should be SGH curve.
2. If there is difference between standard sensor curve and chosen sensor, select "defined sensor", and then input defined sensor curve.

3. When inputting sensor curve, X value (resistance) must be in accordance with the order of higher to lower, otherwise errors will occur.
4. When select sensor "Not used", sensor curve does not work, LCD screen will display " - - -".
5. If there is no pressure sensor, but only has low pressure alarm switch, then you must set pressure sensor as "Not used", otherwise oil pressure low alarm shutdown may appear.
6. Can set several points of forehand or backmost as the same ordinate, like the following picture:



Conventional pressure unit conversion table

	1N/m^2 (pa)	1kgf/cm^2	1bar	(1b/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

10 COMMISSIONING

Before operation, the following checking should be carried out:

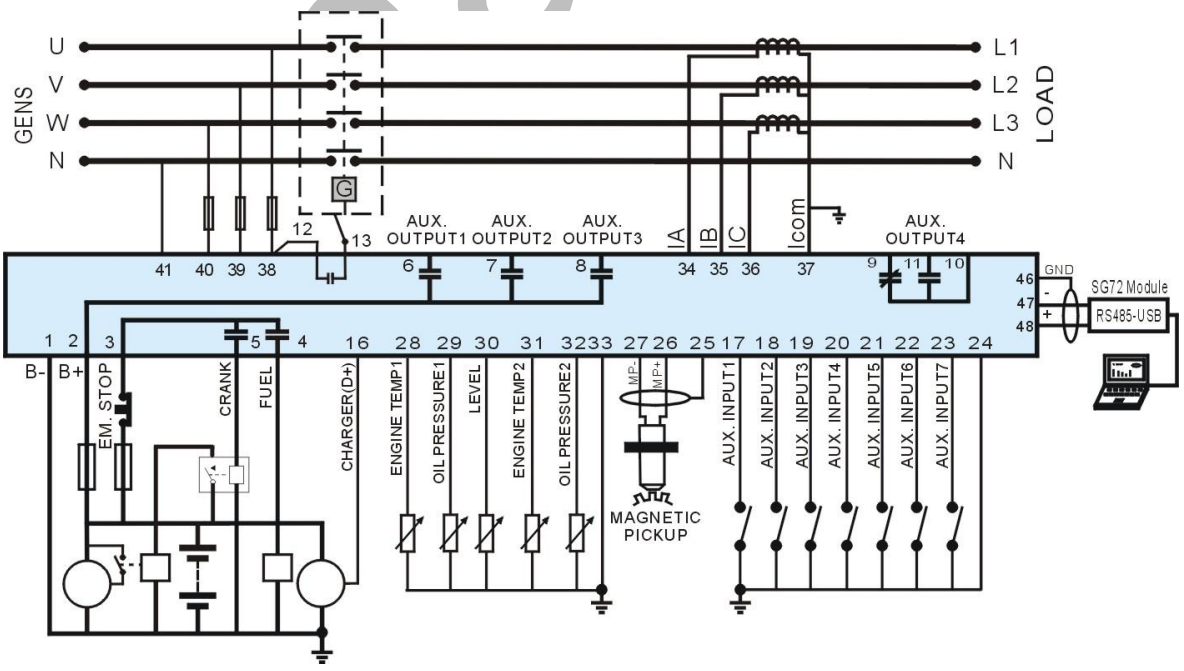
1. Check and ensure all the connections are correct and wires diameter is suitable.
2. Ensure that the controller DC power has insurance; battery positive and negative have correctly connected.
3. Emergence stop input must be connected to positive of starting battery via normally close contact of emergency stop.
4. Take proper actions to prevent engine to disconnect crank (e. g. Remove the connections of fuel value). If checking is OK, connect start battery, select Manual

Mode, controller will execute the program.

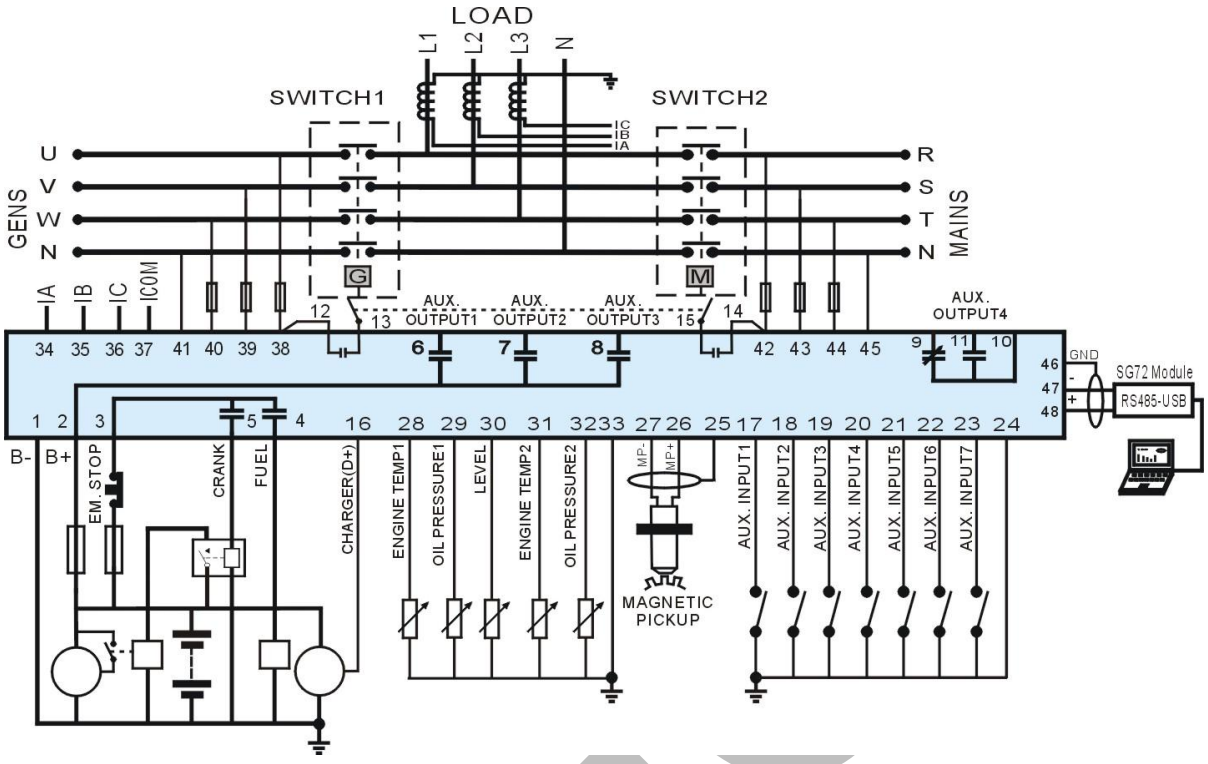
5. Set controller as Manual Mode, press “start” button to start genset. If failed within the setting crank times, controller will send “Failed to Start” signal; then press “Reset” to reset controller.
6. Recover actions of preventing engine to disconnect crank (e. g. Connect wire of fuel value), press “start” button again, genset will start. If everything goes well, genset will normal run after idle running (if configured). During this period, watch for engine’s running situations and voltage and frequency of alternator. If abnormal, stop genset and check all connections according to this manual.
7. Select the Auto Mode from front panel, connect to mains signal. After the mains normal delay, controller will transfer ATS (if configured) and into mains load. After cooling, controller will stop genset and into standby state until mains abnormal again.
8. When mains abnormal again, genset will start automatically and into normal running, send signal to make gens close, transfer ATS and make genset take load. If not like this, please check connections of ATS according to this manual.
9. If there are any other questions, please contact Smartgen’s technical personnel.

11 TYPICAL APPLICATION

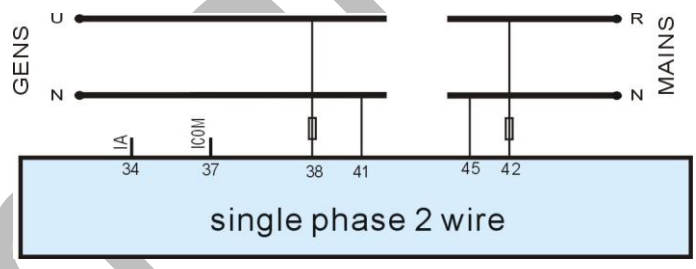
HGM6210KC Typical Wiring Diagram



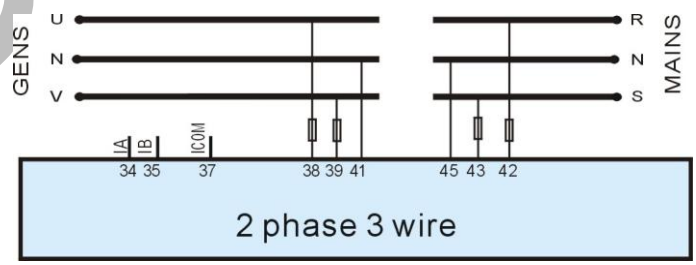
HGM6220KC Typical wiring diagram



Single Phase 2 Wire (HGM6220KC)



2 Phase 3 Wire (HGM6220KC)

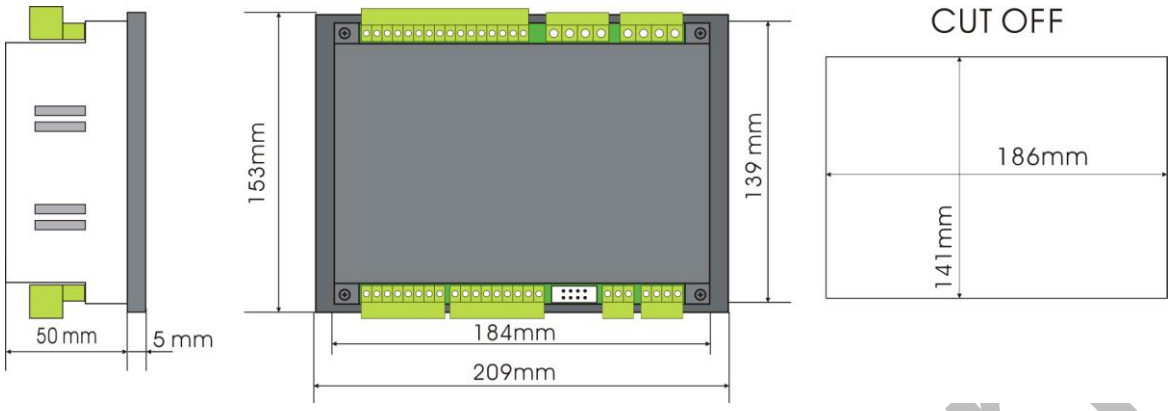


Note: Recommend that the output of crank and Fuel expand high capacity relay.

12 INSTALLATION

The module is held into the panel fascia using the supplied fixing clips. Case

dimensions and panel cutout are shown as below.



1) Battery Voltage Input

HGM6200K series controller can be applicable to (8-35) VDC battery voltage. Battery negative must be reliably connected to engine shell. The connection between controller power and battery should not be less than 2.5mm^2, if a float charger is fitted, please connect output line of the charger with battery positive directly, then from battery positive separately connect to power input terminal of controller, in case that charger will interfere with the normal running of controller.

2) Speed Sensor Input

Speed sensor is installed in the engine for testing flywheel teeth. The connection with controller uses 2-core screen, shield layer should be connected to terminal25 of controller with the other end vacant. The other two signal lines are respectively connected to terminal26 and terminal27. At full speed, output voltage range is 1-24VAC (RMS), recommended 12VAC (rated speed). During installing, make the speed sensor contact the flywheel firstly, then pour out 1/3 laps, finally lock nut on the sensor.

3) Output And Expansion Relay

All the outputs of controller are relay output. If need to expand relay, please add freewheeling diode in both ends of relay coil (when expansion relay coil links DC), or add RC loop (when expansion relay coil links AC), in case controller or other equipments are interfered.

4) AC Input

HGM6200K series controller must externally connect current transformer, CT current must be 5A. Besides, the phase position of CT and input voltage must be correct, otherwise the sampling current and active power may be incorrect.

Note: A. ICOM must connect battery anode power controllers.

B. When the load current, open circuit is inhibited in the transformer

secondary.

5) Withdraw Voltage Test

When the controller has been installed in the control panel, during the test please disconnect all the terminals, lest high voltage damages the controller.

13 FAULT FINDING

Fault	Possible Remedy
Generator Inoperative	Check starting battery; Check connections of controller. Check the DC fuse.
Genset Stops	Check if water/cylinder temperature too high. Check alternator voltage. Check the DC fuse.
Emergency Stop	Check if an emergency stop button is fitted; Ensure battery positive is connected to the emergency stop input. Check if connection is open circuit.
Low Oil Pressure Alarm (After Crank Disconnect)	Check oil pressure sensor and connections.
High Temp. Alarm (After Crank Disconnect)	Check temperature sensor and connections.
Shutdown Alarm During Running	Check switch and connections according to information on LCD. Check configuration inputs.
Crank Not Disconnect	Check connections of fuel solenoid. Check starting battery. Check speed sensor and its connections. Refer to engine manual.
Starter Inoperative	Check connections of starter; Check starting battery.
Genset Running While ATS Not Transfer	Check ATS; Check connections between ATS and controller.
RS485 COM Failure	Check connections; Check if COM port is correct; Check if A and B of RS485 is connected reversely; Check if PC COM port is damaged; Recommended using 120ohm resistance between PR485 and AB.