HGM7100N SERIES

(HGM7110N/7120N)

GENSET CONTROLLER

USER MANUAL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

CONTENTS

4 OPERATION

4.1 KEY FUNCTION

Table 3 - Key Function Descriptions

Icon	Function	Description
	Stop/ Reset	Stop running generator in Auto/Manual mode; In stop mode, in case of alarm condition, pressing the button will reset alarm; Pressing and holding the button for 3 seconds will test indicator lights (lamp test); During stopping process, press this button again to stop generator immediately.
	Start	Under manual mode, press this button will start genset;
	Manual	Pressing this key will set the module into manual mode.
	Auto	Pressing this key will set the module into auto mode.
	C/O	Pressing this key to control breaker close or open in C/O interface under manual mode. (only suit for HGM7120N)
	Close	Pressing this key to control breaker close under user manual mode. (only suit for HGM7110N)
	Open	Pressing this key to control breaker open under user manual mode. (only suit for HGM7110N)
	Set/Confirm	Pressing this key will enter into Main Menu; In setting parameter status, press this key will shift cursor or confirm setting value.
	Up/Increase	Scrolls the screen up; Shift the cursor up or increase the set value in parameter setting menu.
	Down/Decrease	Scrolls the screen down; Shift the cursor down or decrease the set value in parameter setting menu.
	Homepage/Return	Controller returns to homepage if pressed this key in main screen; controller returns to the previous page if pressed this key in parameter setting page; hold and press this key for 3 seconds, trip alarm can be reset.

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

4.2 CONTROLLER PANEL

Figure 1 - HGM7110N Front Panel Indication

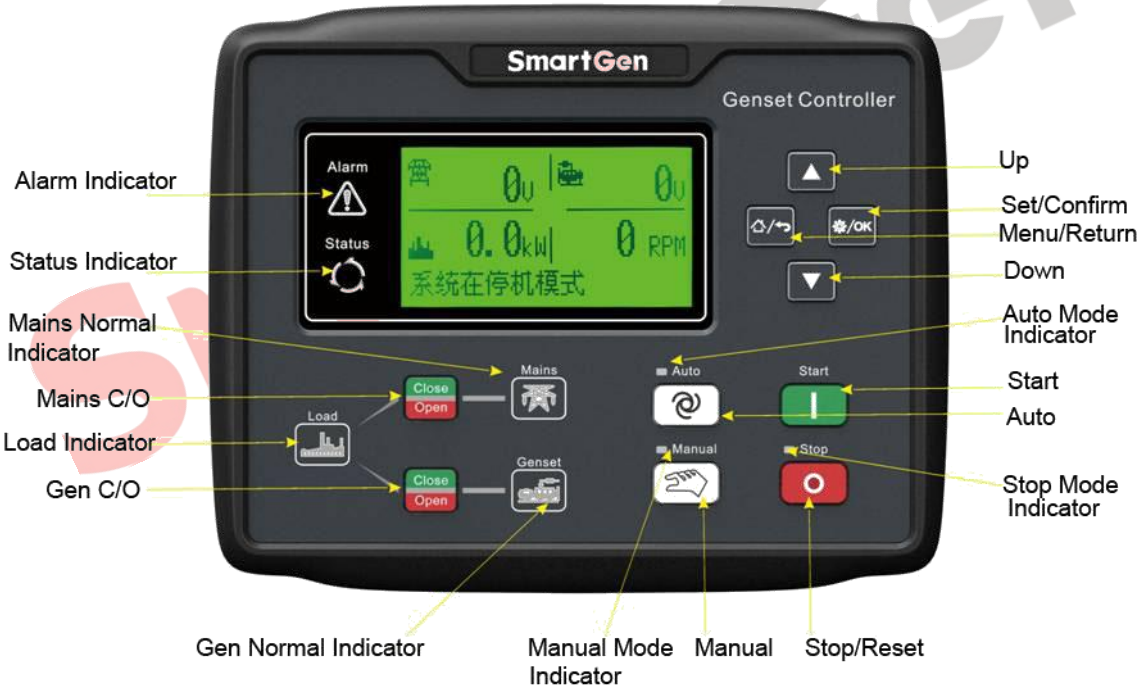

Figure 2 - HGM7120N Front Panel Indication

NOTE: Part of indicator lights illustration:

Table 4 - Alarm Indicator Description

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

7 WIRINGS CONNECTION

Compared with HGM7120N, HGM7110N is missing one mains voltage three-phase input terminal. HGM7120N controller back panel is as follows:

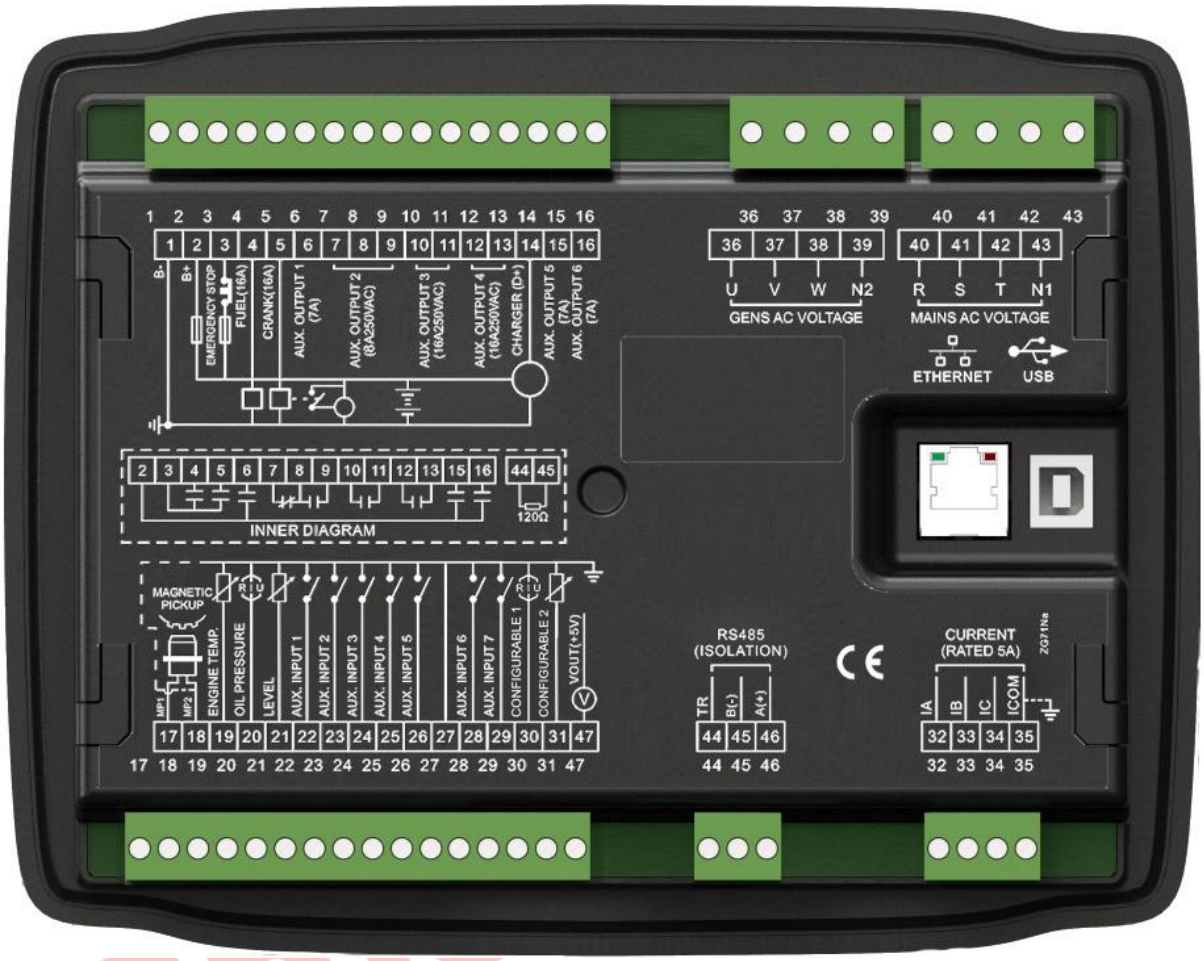

Figure 3 - HGM7120N Back Panel

Table 9 - Terminal Wiring Connection

No.	Function	Cable Size	Remarks	
1	B-	2.5mm^2	Connected with negative of starter battery	
2	B+	2.5mm^2	Connected with positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.	
3	Emergency Stop	2.5mm^2	Connect emergency stop button with B+.	
4	Fuel (16A)	1.5mm^2	B+ is supplied by No.3 terminal, rated 16A.	
5	Crank (16A)	1.5mm^2	B+ is supplied by No.3 terminal, rated 16A. Connect with starting coil of starter.	
6	Aux. Output 1(7A)	1.5mm^2	B+ is supplied by No.2 terminal, rated 7A.	
7	Aux. Output 2(8A 250VAC)	1.5 mm^2	Normally close output, rated 8A.	Details see Table 11
8			Relay common port	

No.	Function	Cable Size	Remarks
9			Normally open output, rated 8A.
10	Aux. Output 3(16A 250VAC)	2.5 mm^2	Relay normally open volt free contact, rated 16A, volt free contact output.
11			
12	Aux. Output 4(16A 250VAC)	2.5 mm^2	
13			
14	Charger(D+)	1.0mm^2	Connected with charger starter's D+ (WL) terminals. Being hang up If there is no this terminal.
15	Aux. Output 5(7A)	1.5 mm^2	B+ is supplied by No.2 terminal, rated 7A; Details see Table 11
16	Aux. Output 6(7A)	1.5 mm^2	
17	Speed Sensor Input	Connect with speed sensor, shielded wire is recommended.	
18	Speed sensor input, battery negative electrode has been connected to the inside of controller.		
19	Engine Temp.	Connected with temperature sensor	Details to see table 13
20	Oil Pressure	Connected with pressure sensor	
21	Fuel Level	Connected with fuel level sensor	
22	Aux. Input 1	1.0mm^2	Ground connected is active (B-); Details to see table 12
23	Aux. Input 2	1.0mm^2	Ground connected is active (B-)
24	Aux. Input 3	1.0mm^2	Ground connected is active (B-)
25	Aux. Input 4	1.0mm^2	Ground connected is active (B-)
26	Aux. Input 5	1.0mm^2	Ground connected is active (B-)
27	Sensor Common Port	Sensor common port, battery negative electrode has been connected to the inside of controller.	
28	Aux. Input 6	1.0mm^2	Ground connected is active (B-); Details to see table 12
29	Aux. Input 7	1.0mm^2	Ground connected is active (B-)
30	Configurable Sensor 1	Connected with temp/pressure/fuel leve sensor.	Details to see table 13
31	Configurable Sensor 2		
32	CT A-phase Monitoring Input	1.5mm^2	Outside connected to secondary coil of CT (5A rated).
33	CT B-phase Monitoring Input	1.5mm^2	Outside connected to secondary coil of CT (5A rated).
34	CT C-phase Monitoring Input	1.5mm^2	Outside connected to secondary coil of CT (5A rated).
35	CT Common Port	1.5mm^2	Details to see the following installation description.
36	Gen U-phase Voltage Monitoring Input	1.5mm^2	Connected to U-phase output of genset (2A fuse recommended).
37	Gen V-phase Voltage Monitoring Input	1.0mm^2	Connected to V-phase output of genset (2A fuse recommended).

No.	Function	Cable Size	Remarks
38	Gen W-phase Voltage Monitoring Input	1.0mm^2	Connected to W-phase output of genset (2A fuse recommended).
39	Gen N2-line Input	1.0mm^2	Connected to N-line output of genset.
40	Mains R-phase Voltage Monitoring Input	1.0mm^2	Connected to R-phase of mains (2A fuse recommended) (HGM7110N without)
41	Mains S-phase voltage monitoring input	1.0mm^2	Connected to S-phase of mains (2A fuse recommended). (HGM7110N without)
42	Mains T-phase voltage monitoring input	1.0mm^2	Connected to T-phase of mains (2A fuse recommended). (HGM7110N without)
43	Mains line N1 Input	1.0mm^2	Connected to N-line of mains. (HGM7110N without)
44	RS485 Common Ground	0.5mm^2	120Ω shielded wire is recommended with single end ground.
45	RS485-	0.5mm^2	
46	RS485+	0.5mm^2	
47	VOUT(+5V)	0.5mm^2	Output DC +5V.

⚠ NOTE: USB ports in controller rear panel are programmable parameter ports, user can directly configure the controller via PC.

⚠ NOTE: ETHERNET port in controller rear panel is network monitoring port, user can directly monitor the controller via PC.

8 SCOPES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

8.1 CONTENTS AND SCOPES OF PARAMETERS

Table 10 - Parameters Settings and Scope

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

No.	Items	Range	Default	Description
8	Warming Up Time	(0-3600)s	10	Warming time between gen-set switch on and high speed running.
9	Cooling Time	(0-3600)s	10	Radiating time before gen-set stop, after it unloads.
10	Stop Idle Time	(0-3600)s	0	Idle running time while gen-set closing down.
11	ETS Solenoid Hold	(0-3600)s	20	Stop electromagnet's power on time when gen-set is closing down.
12	Wait For Stop Time	(0-3600)s	0	When "ETS Solenoid Hold" is set as 0, it is the time between gen-set idle delay expired and stopped completely; When "ETS Solenoid Hold" is not 0, it is time between ETS hold delay expired and stopped.
13	After Stop Time	(0-3600)s	0	Time from gen-set stopped to standby.
Engine				
1	Engine Type	(0-39)	0	Default: conventional engine.
2	Flywheel Teeth	(1.0-300.0)	118	It is tooth number of the engine, which is used for judging starter crank disconnect conditions and inspecting engine speed. Details to see the following installation description.
3	Engine Rated Speed	(0-6000)RPM	1500	Provide standard for judging over/under speed and on-load speed.
4	Speed On-load	(0-100)%	90	The setting value is rated speed percentage. The controller detects it while gen-set preparing to take the load, if the speed is less than the on-load speed, gen-set will not enter the normal operation period.
5	Speed Signal Loss Delay	(0-3600)s	5	Time from the speed is detected as 0 to the action confirmed.
6	Speed Signal Loss Action	(0-1)	0	0: Warning; 1: Shutdown
7	Over Speed Shutdown	(0-200)%	114	The setting value is the percentage of rated speed, and delay value can be set.
8	Under Speed Shutdown	(0-200)%	80	
9	Over Speed Warning	(0-200)%	110	The setting value is the percentage of rated speed, return value and delay value can be set.
10	Under Speed Warning	(0-200)%	86	
11	Battery Rated Voltage	(0-60.0)V	24.0	Provide standard for judging battery over/under voltage.
12	Battery High Voltage Warning	(0-200)%	120	The setting value is the percentage of rated voltage, return value and delay value can be set.
13	Battery Low Voltage Warning	(0-200)%	85	

No.	Items	Range	Default	Description
14	Charge Alt Fail	(0-60.0)V	8.0	If the voltage of charger D+(WL) is lower than the setting value during gen-set normal running, controller will initiate fail to charge warning alarms.
15	Start Attempts	(1-10)times	3	Maximum crank times when engine starts fail. If reach this number, controller will send start failure signals.
16	Crank Disconnect Condition	(0-6)	2	Details please to see table 14 There are 3 cranking disconnect conditions, which can be used separately or together, aiming to disconnect starter motor with engine as soon as possible.
17	Frequency of Crank Disconnect	(0-200)%	24	The setting value is the percentage of rated frequency, when generator frequency is higher than the set value, starter will be disconnected. Details to see the following installation description.
18	Speed of Crank Disconnect	(0-200)%	24	The setting value is the percentage of the rated speed, when speed is higher than the setting value, starter will disconnect. Details to see the following installation description.
19	Oil Pressure of Crank Disconnect	(0-1000)kPa	200	When engine oil pressure is higher than the setting value, starter will disconnect. Details to see the following installation description.
20	Battery Low Voltage Start Enabled	(0-1)	0	0: Disabled; 1:Enabled
21	Battery Low Voltage Start Value	(1.0-60.0)V	10.0	It is the low-battery-start value. Active when in auto mode.
22	Battery Low Voltage Stop Value	(1.0-60.0)V	24.0	The shutdown value after low-battery-start and charged. Active when in auto mode.
23	Battery Low Voltage Start/Stop Delay	(0-3600)s	60	When battery voltage reached to engine start threshold, engine will start up after delay expired; when battery voltage reached to engine stop threshold, engine will stop after delay expired.
Generator				
1	Power Supply System	(0-3)	0	0: 3P4W; 1: 3P3W 2: 2P3W 3: 1P2W
2	Engine Poles	(2-64)	4	It is the number of engine poles, which can help engine without installing speed sensor to calculate engine speed.
3	Rated Voltage	(30-30000)V	230	Provide standard for judging gen over/under voltage, and on-load voltage. If voltage transformer is used, this value is transformer primary voltage.

No.	Items	Range	Default	Description
4	Voltage On-load	(0-200)%	85	The setting value is rated voltage percentage. The controller detects it while gen-set preparing to take the load, if voltage is less than the on-load voltage, gen-set will not enter normal operation period.
5	Rated Frequency	(10.0-600.0) Hz	50.0	Provide standard for judging over/under frequency and on-load frequency.
6	Frequency On-load	(0-200)%	85	The setting value is rated frequency percentage. The controller detects it while gen-set preparing to take the load, if frequency is less than the on-load frequency, gen-set will not enter normal operation period.
7	Voltage Transformer (PT)	(0-1)	0	0: Disabled; 1: Enabled
8	Gen. Over Voltage Shutdown	(0-200)%	120	The setting values are rated voltage percentage of generator, and delay value can be set.
9	Gen. Under Voltage Shutdown	(0-200)%	80	
10	Gen. Over Frequency Shutdown	(0-200)%	114	The setting values are rated frequency percentage of generator, and delay value can be set.
11	Gen. Under Frequency Shutdown	(0-200)%	80	
12	Gen. Over Voltage Warning	(0-200)%	110	The setting values are rated voltage percentage of generator, and return value and delay value can be set.
13	Gen. Under Voltage Warning	(0-200)%	84	
14	Gen. Over Frequency Warning	(0-200)%	110	The setting values are rated frequency percentage of generator, and return value and delay value can be set.
15	Gen. Under Frequency Warning	(0-200)%	84	
16	Gen. Loss of Phase Check	(0-1)	1	0: Disabled; 1:Enabled
17	Gen. Reverse Phase Check	(0-1)	1	
Load				
1	Current Transformer Ratio	(5-6000)/5	500	It is the ratio of external connected current transformer.
2	Rated Current	(5-6000)A	500	It is the rated current of generator, which is used as the standard for load current.
3	Rated Power	(0-6000)kW	276	It is the rated power of generator, which is used as the standard for load current.
4	Over Current Enable	(0-200)%	120	The setting value is the percentage of rated full-load current, and delay value can be set as DMT or IDMT.

No.	Items	Range	Default	Description
5	Over Power Setting	(0-1)	0	0: Disabled; 1: Enabled
6	Reverse Power Setting	(0-1)	0	0: Disabled; 1: Enabled
Switch				
1	Switching Time	(0-7200)s	5	Time from open mains to close generator or from open generator to close mains.
2	Close Delay	(0-20.0)s	5.0	Pulse width of mains closed and generator closed; 0s stands for constant output.
3	Open Delay	(0-20.0)s	3.0	Pulse width of open mains and open generator.
4	Switching Detection Time	(0-20.0)s	5.0	It is the time to detect auxiliary contactor after ATS switching.
5	Switch Failure Warning Enabled	(0-1)	0	0: Disabled; 1: Enabled
6	Open Detection Enabled	(0-1)	0	
7	Immediately Trip when Mains Dropout	(0-1)	1	0: Disabled; 1: Enabled
Module				
1	Power On Mode	(0-2)	0	0: Stop Mode; 1: Manual Mode; 2: Auto Mode
2	Communication Address	(1-254)	1	Controller address while in remote monitoring status.
3	Communication Stop-bit Setting	(0-1)	1	0: 2-bit stop bit; 1: 1-bit stop bit
4	Language Selection	(0-2)	0	0: Simplified Chinese; 1: English; 2: Other
5	Password Setting	(0-65535)	00318	This password used to enter into advanced parameter setting.
6	Backlight Time	(0-3600) s	300	When it is 0s, LCD always light.
Schedule & Maintenance				
1	Scheduled Start Setting	(0-1)	0	0: Disabled; 1: Enabled
2	Scheduled Not Run Setting	(0-1)	0	0: Disabled; 1: Enabled
3	Maintenance Setting	(0-1)	0	0: Disabled; 1: Enabled
Analog Sensors				
Temperature Sensor				
1	Curve Type	(0-15)	7	SGX. Detail to see Table 13
2	Open Circuit Action	(0-2)	0	0: Warning; 1: Shutdown; 2: None
3	High Temp Shutdown Setting	(0-300)ºC	98	When temperature value of external connected temperature sensor is higher than the setting point, controller will initiate high temperature shutdown alarm (judgment only starts after safety on delay expired). Delay value can be set.

No.	Items	Range	Default	Description
4	High Temp Warning Setting	(0-300)ºC	95	When temperature value of external connected temperature sensor is higher than the setting point, controller will initiate high temperature warning alarm (judgment only starts after safety on delay expired). Return value and delay value can be set.
5	Low Temp Warning Setting	(0-1)	0	0: Disabled; 1: Enabled
Oil Pressure Sensor				
1	Curve Type	(0-15)	7	SGX. Details to see table 13.
2	Open Circuit Action	(0-2)	0	0: Warning; 1: Shutdown; 2: None
3	Low Oil Pressure Shutdown Setting	(0-1000)kPa	103	When pressure value of external connected oil pressure sensor is lower than the setting point, controller will initiate low oil pressure shutdown alarm (judgment only starts after safety on delay expired). Delay value can be set.
4	Low Oil Pressure Warning Setting	(0-1000)kPa	124	When pressure value of external connected oil pressure sensor is lower than the setting point, controller will initiate low oil pressure warning alarm (judgment only starts after safety on delay expired). Return value and delay value can be set.
5	Sensor Type	(0-2)	0	0: Resistor type; 1: Current type; 2: Voltage type.
Level Sensor				
1	Curve Type	(0-15)	4	SGH. Details to see table 13.
2	Open Circuit Action	(0-2)	0	0: Warning; 1: Shutdown; 2: None
3	Low Level Warning	(0-300)%	10	When the value of external connected fuel level sensor is lower than the setting point, controller will initiate low liquid level warning alarm (always judge). Return value and delay value can be set.
4	Low Level Shutdown	(0-300)%	8	When the value of external connected level sensor is lower than the setting point, controller will initiate low liquid level shutdown alarm (always judge). Delay value can be set.
Flexible Sensor 1				
1	Flexible Sensor 1 Setting	(0-3)	0	0: Not Used; 1:Temperature Sensor; 2:Pressure Sensor; 3:Fuel Level Sensor
2	Sensor Type	(0-2)	0	0: Resistor type; 1: Current type; 2: Voltage type.
Flexible Sensor 2				
1	Flexible Sensor 2 Setting	(0-3)	0	0: Not Used; 1:Temperature Sensor; 2:Pressure Sensor; 3:Fuel Level Sensor
Digital Inputs				
Digital Input 1				

8.3 DEFINED CONTENTS OF CONFIGURABLE INPUT PORTS 1~7

Table 12 - Enable Programmable Inputs 1~7 (Ground connected is active (B-))

No	Items	Description
0	User Configured	Users can define content as bellows: Indication: only display without warning and shutdown. Warning: only warning without shutdown. Shutdown: alarm and shutdown immediately. Trip and stop: alarm, generator ramp-off load and stop after high-speed cooling. Trip: alarm, generator ramp-off load but not stop. Inactive: input doesn't work. Always active: input detects all the time. From crank: start detecting at the beginning of startup. From safety on: start detecting after safety on delay is expired.
1	Reserved	
2	Alarm Mute	When input is active, "Audible Alarm" output is inhibited.
3	Reset Alarm	When input is active, shutdown alarms and trip alarms can be reset.
4	Reserved	
5	Lamp Test	When input is active, all LED indicators are light.
6	Panel Lock	When input is active, all buttons on the panel are inactive except for ▲ ▼ ✱/OK ⌂/⮌, and 🔒 displays on the right side of the first line of LCD status page.
7	Reserved	
8	Idle Control Mode	Under speed, under frequency and under voltage are not protected in this mode.
9	Inhibit Auto Stop	After generator is normal running in auto mode, when input is active, generator-set auto stop function is inhibited.
10	Inhibit Auto Start	After input is active in auto mode, generator-set auto start is inhibited.
11	Inhibit Scheduled Start	After input is active in auto mode, generator-set auto timing start gen-set is inhibited.
12	Master Select	Duty unit selection in cycle running.
13	Aux. Gen. Closed	Connecting the auxiliary contact of generator loading switch.
14	Inhibit Gen. Load	When input is active, gen-set will inhibit to close.
15	Aux Mains Closed	Connecting the auxiliary contact of mains loading switch.
16	Inhibit Mains Load	When input is active, mains will inhibit to close.
17	Auto Mode Input	When input is active, controller will enter into auto mode, and all buttons on the panel are inactive except for ▲ ▼ ✱/OK ⌂/⮌, and 🔒 displays on the right side of the first line of LCD status page.
18	Auto Mode Invalid	When input is active, controller will not works in auto mode, key and "Simulate Auto Mode" key are unavailable.

13 TYPICAL APPLICATION

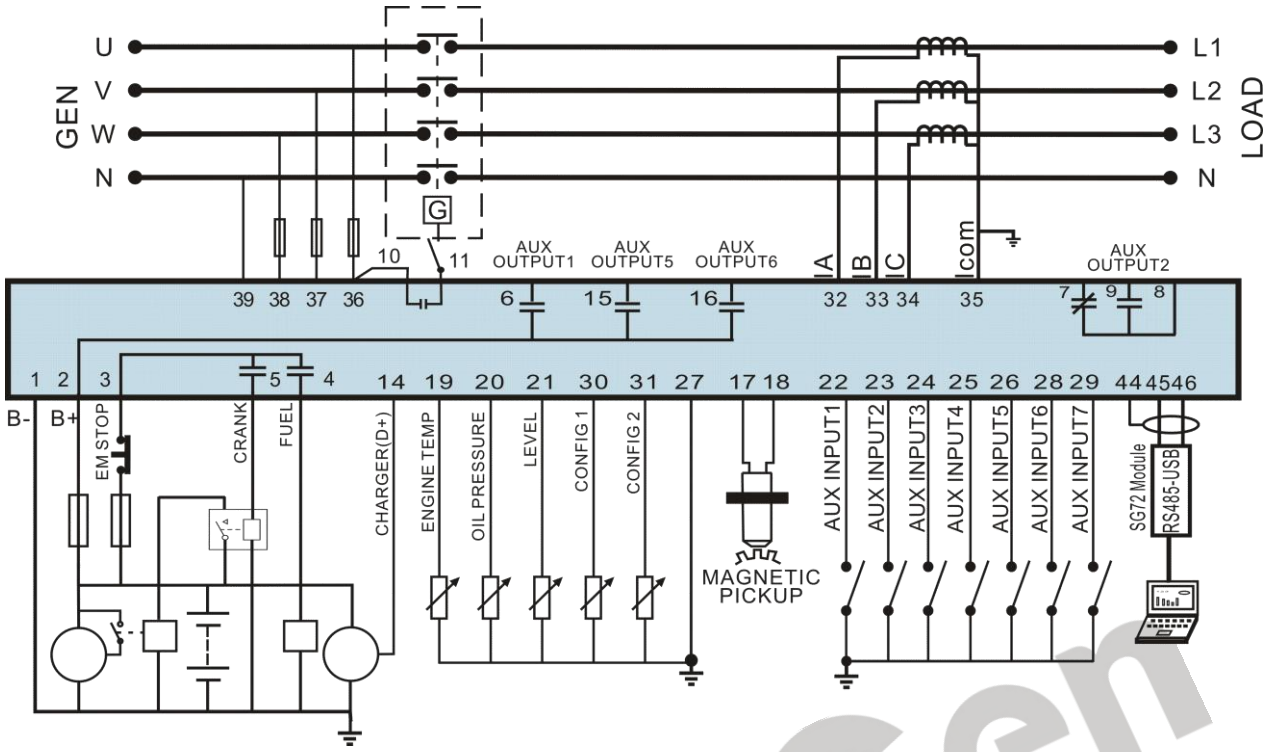

Figure 5 - HGM7100N Typical Application

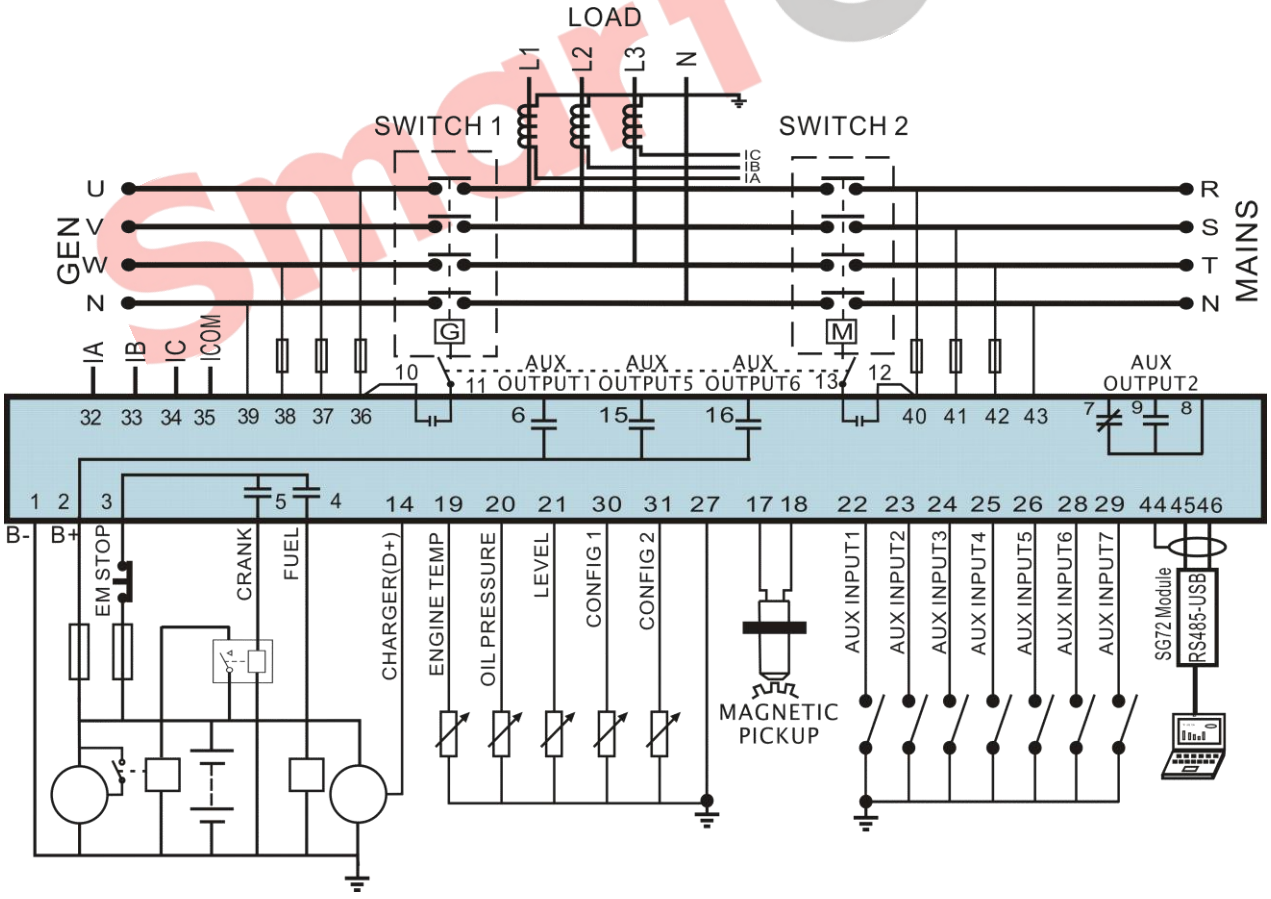

Figure 6 - HGM7120N Typical Application

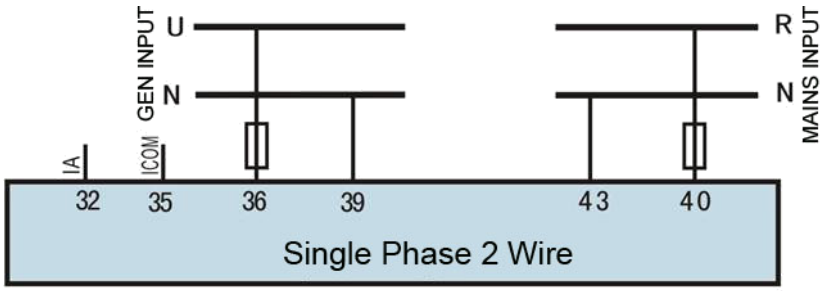

Figure 7 - Single Phase 2-Wire Connection Diagram

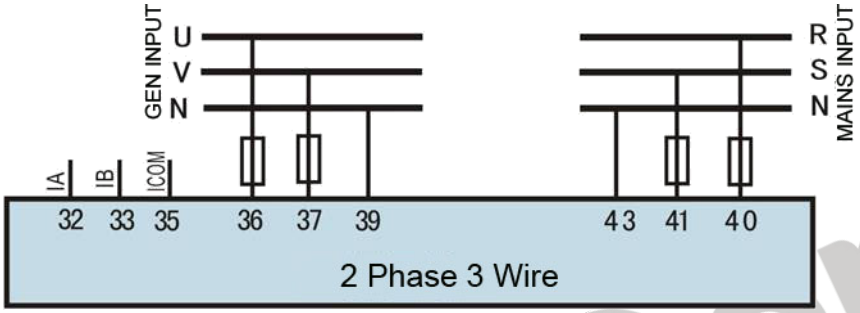

Figure 8 - 2Phase 3Wire Connection Diagram

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

14 INSTALLATION

14.1 FIXING CLIPS

- Controller is panel built-in design; it is fixed by clips when installed.
- Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.
- Pull the fixing clip backwards (towards the back of the module) ensuring two clips are inside their allotted slots.
- Turn the fixing clip screws clockwise until they are fixed on the panel.

Note: Care should be taken not to over tighten the screws of fixing clips.

14.2 OVERALL DIMENSION

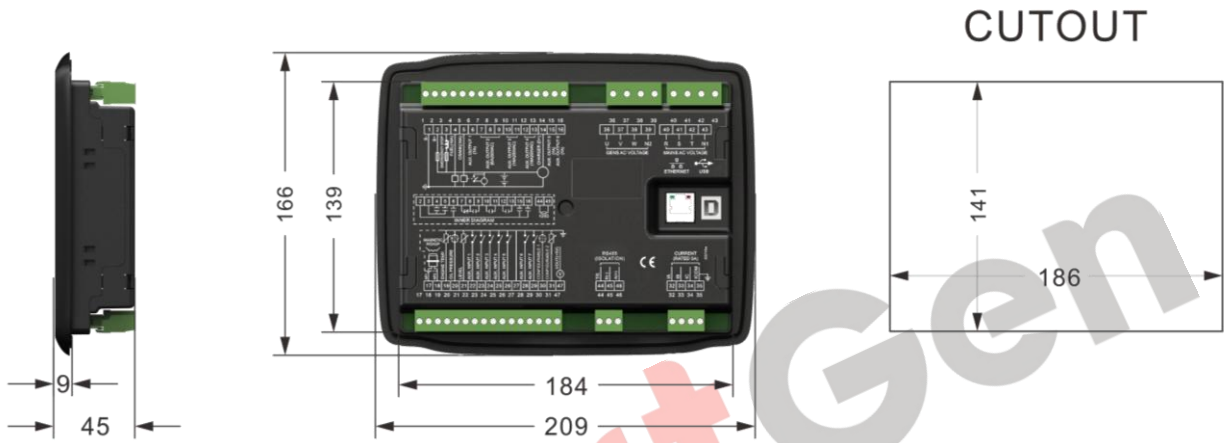

Figure 9 - Overall Dimensions

HGM7100N series controller can suit for widely range of battery voltage DC (8~35) V. Negative of battery must be connected with the engine shell. Diameter of wire that connects 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.

a) SPEED SENSOR INPUT

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. 18 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.17 and No.18 terminals in controller. The output voltage of speed sensor should be within (1~24) VAC (effective value) during the full speed. 12VAC is recommended (in rated speed). When 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.

b) OUTPUT AND EXPAND RELAYS

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 current), in order to prevent disturbance to controller or others equipment.

c) AC INPUT

Current input of HGM7100N series controller must be connected to outside current transformer. And