



SmartGen
ideas for power

HGM4000N

(HGM4010N/4020N/ 4010NC/4020NC/4010CAN/ 4020CAN)

GENSET CONTROLLER

USER MANUAL



SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

3 SPECIFICATION OPERATION









Table 2 - Technical Parameters

Items	Contents
Operating Voltage	DC8.0V to DC35.0V, Continuous Power Supply.
Power Consumption	<3W (standby \leq 2W)
Alternator Volt Input Range 3Phase 4Wire 3Phase 3Wire Single Phase 2Wire 2Phase 3Wire	AC15V-AC 360V (ph-N) AC30V - AC620V (ph-ph) AC15V - AC360V (ph-N) AC15V - AC360V (ph-N)
Alternator Frequency	50 Hz /60Hz
Speed sensor voltage	1.0V to 24.0V (RMS)
Speed sensor Frequency	10,000 Hz (max.)
Start Relay Output	5 A DC28V at supply output
Fuel Relay Output	5 A DC28V at supply output
Programmable Relay Output (1)	1 A DC28V at supply output
Programmable Relay Output (2)	1 A DC28V at supply output
Programmable Relay Output (3)	1A DC28V at supply output
Programmable Relay Output (4)	1A DC28V at supply output
Case Dimension	135mm x 110mm x 44mm
Panel Cutout	116mm x 90mm
CT Secondary Current	5A rated
Working Conditions	Temperature: (-25~+70) $^{\circ}$ C; Relative Humidity: (20~93)%RH
Storage Condition	Temperature: (-25~+70) $^{\circ}$ C
Protection Level	IP65: rubber seal installed between the controller enclosure and panel fascia.
Insulating Intensity	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.
Net Weight	0.32kg

4 OPERATION

4.1 KEY FUNCTION

Table 3 - Key Function Descriptions

Icon	Function	Description
	Stop/ Reset	Stop running generator in Auto/Manual mode; In case of alarm condition, pressing the button will reset alarm; In stop mode, 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; press this button during genset start up, genset will jump to next status and genset can fast-boot.
	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 causes the controller to toggle the display C/O and the main page. Press Up or Down key to control switch close or open in C/O interface under manual mode.
	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. In C/O interface under manual mode: press this button can control mains close or open(HGM4020 series); Press this button can control gen close (HGM4010 series).
	Down/Decrease	Scrolls the screen down; Shift the cursor down or decrease the set value in parameter setting menu. In C/O interface under manual mode: press this button can control gen close or open(HGM4020 series); Press this button can control gen open (HGM4010 series).

4.2 CONTROLLER PANEL



Fig.1 - HGM4010N/HGM4010NC/HGM4010CAN Front Panel Indication



Fig.2 - HGM4020N/HGM4020NC/HGM4020CAN Front Panel Indication

NOTE: Part of indicator lights illustration:

Alarm Indicators: slowly flash when warn alarms; fast flash when shutdown alarms; light is off when no alarms.

Status Indicators: Light is off when genset is standby; flash once per second during start up or shut down; always on when normal operation.

6 WIRINGS CONNECTION

Compared with HGM4020, HGM4010 missing one mains voltage three-phase input terminal. HGM4020 controller back panel is as follows:

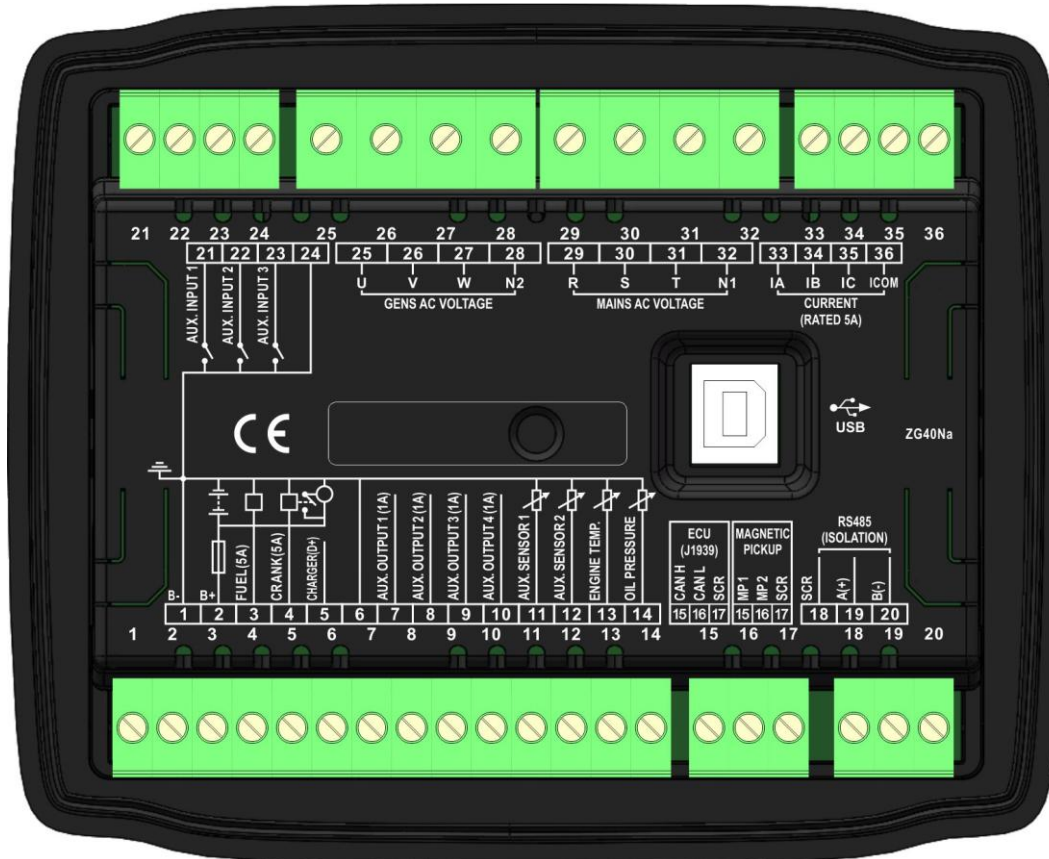


Fig.3 - HGM4020 Back Panel

Table 6 - 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	Fuel relay output	1.5mm ²	B+ is supplied by 2 terminal, rated 5A Parameter set as "programmable relay output 5".
4	Start relay output	1.5mm ²	B+ is supplied by 2 terminal, rated 5A
5	Charger(D+)	1.0mm ²	Connected with charger starter's D+ (WL) terminals. Being hang up If there is no this terminal.
6	Common earth ground	1.5 mm ²	Inside connect to B-.
7	Aux. Output 1	1.0mm ²	B+ is supplied by 2 terminal, rated 1A
8	Aux. Output 2	1.0mm ²	B+ is supplied by 2 terminal, rated 1A
			Details see Table 8



No.	Function		Cable Size	Remarks	
9	Aux. Output 3		1.0mm ²	B+ is supplied by 2 terminal, rated 1A	
10	Aux. Output 4		1.0 mm ²	B+ is supplied by 2 terminal, rated 1A	
11	Aux. Input 1		1.0mm ²	Used as liquid level sensor or digital input port 4	
12	Aux. Input 2		1.0mm ²	Used as programmable sensor or digital input port 5	
13	Temperature sensor		1.0mm ²	Connected with water temperature or cylinder temperature resistor type sensor.	Details see Table 10
14	Oil pressure sensor		1.0mm ²	Connected with oil pressure resistor type sensor.	
15	CAN H	Speed sensor input	0.5mm ²	Controller connected with CAN BUS(if with CAN BUS function); Controller connected with speed sensor(if with no CAN BUS function); Shielding line is recommended.	
16	CAN L	Speed sensor input. Controller inside connected with battery cathode	0.5mm ²		
17	CAN Common ground		0.5mm ²		
18	RS485 Common ground		/	Impedance-120Ω shielding wire is recommended, its single-end earthed	
19	RS485A(+)		0.5mm ²		
20	RS485B(-)		0.5mm ²		
21	Aux. input 1		1.0mm ²	Ground connected is active (B-)	Details see Table 9
22	Aux. input 2		1.0mm ²	Ground connected is active (B-)	
23	Aux. input 3		1.0mm ²	Ground connected is active (B-)	
24	Input COM		1.0mm ²	Inside connected to B-	
25	Genset U-phase voltage monitoring input		1.0mm ²	Connected to U-phase output of genset (2A fuse recommended).	
26	Genset V-phase voltage monitoring input		1.0mm ²	Connected to V-phase output of genset (2A fuse recommended).	
27	Genset W-phase voltage monitoring input		1.0mm ²	Connected to W-phase output of genset (2A fuse recommended).	
28	Genset line N2 input		1.0mm ²	Connected to N-line output of genset.	
29	Mains R-phase voltage monitoring input		1.0mm ²	Connected to R-phase of mains (2A fuse recommended). (HGM4010 without)	
30	Mains S-phase voltage monitoring input		1.0mm ²	Connected to S-phase of mains (2A fuse recommended). (HGM4010 without)	



No.	Function	Cable Size	Remarks
31	Mains T-phase voltage monitoring input	1.0mm ²	Connected to T-phase of mains (2A fuse recommended). (HGM4010 without)
32	Mains line N1 Input	1.0mm ²	Connected to line N of mains (HGM4010 without)
33	CT A-phase monitoring input	1.5mm ²	Outside connected to secondary coil of CT (5A rated).
34	CT B-phase monitoring input	1.5mm ²	Outside connected to secondary coil of CT (5A rated).
35	CT C-phase monitoring input	1.5mm ²	Outside connected to secondary coil of CT (5A rated).
36	CT COM	1.5mm ²	Reference to <i>Installation Instruction</i>

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



No.		Description	Remark
		11 Digital Closed 12 Digital Open	
2	Pressure Sensor	0 Not used 1 User Configured (Resistor type Curve) 2 VDO 10Bar 3 SGH 4 SGD 5 CURTIS 6 DATCON 10Bar 7 VOLVO-EC 8 SGX 9 Reserved 10 Reserved 11 Digital Closed 12 Digital Open	Defined resistance's range is 0Ω-999.9Ω, default is SGX sensor.
3	Oil Level Sensor	0 Not used 1 User Configured (Resistor type Curve) 2 SGH 3 SGD 4 reserved 5 reserved 6 Digital Closed 7 Digital Open	Defined resistance's range is 0Ω-999.9Ω, default is SGD sensor.

7.5 CONDITIONS OF CRANK DISCONNECT SELECTION

Table 11 Crank Disconnect Conditions Selection

No.	Setting description
0	Speed
1	Gen frequency
2	Speed + Gen frequency
3	Speed +Oil pressure
4	Gen frequency + Oil pressure
5	Speed + Gen frequency + Oil pressure
6	Oil pressure


▲NOTE:

- 1) There are 3 conditions to make starter separate with engine; speed, generator frequency and oil pressure can be used separately while oil pressure suggest be used together with speed and generator frequency. The aim is to disconnect the starter motor as soon as possible.
- 2) Speed stands for the real rotation speed detected by the speed sensor. Speed sensor is the magnetic equipment which be installed in starter for detecting flywheel teeth.
- 3) When set as speed, must ensure that the number of flywheel teeth is as same as setting, otherwise, "over speed shutdown" or "under speed shutdown" may be caused.
- 4) If genset without speed sensor please don't select corresponding items, otherwise, "start fail" or "loss speed signal" maybe caused.

- 5) If genset without oil pressure sensor, please don't select corresponding items.
- 6) If not select generator frequency in crank disconnect setting, controller will not collect and display the relative power quantity (can be used in water pump set); if not select speed in crank disconnect setting, the engine speed displayed in controller is calculated by generator signal.

8 PARAMETERS SETTING

8.1 CONTROLLER PARAMETER SETTING

Start the controller, then press  to enter into the parameters setting menu, menu items as follows:

- 1 Set Parameters
- 2 Information
- 3 Language
- 4 Eventlog
- 5 Maintenance

When entered password interface, inputting "0318" can set all parameter items in [Table 7](#). If the password is changed, only input the password same as controllers', can the parameter be set via PC software. If there is need to set more parameters (e.g. voltage calibration; current calibration), please contact the factory.

NOTES:





- a) For HGM4010, there are no items from 1 to 5 in [Table 7](#); there are no mains items in auxiliary output 1-5.
- b) Please change the controller parameters when generator is in standby mode only (e. g. Crank disconnect conditions selection, auxiliary input, auxiliary output, various delay), otherwise, shutdown and other abnormal conditions may occurs.
- c) Over voltage set value must be higher than under voltage set value, otherwise over voltage and under voltage condition may occur simultaneously.
- d) Over speed set value must be higher than under speed set value, otherwise over speed and under speed condition may occur simultaneously.
- e) Please set the generator frequency value as low as possible when cranking, in order to make the starter be separated quickly as soon as possible.
- f) Auxiliary input 1~5 could not be set as same items; otherwise, there are abnormal functions. However, the auxiliary output 1~5 can be set as same items.
- g) Programmable sensor 1 input port can be set as fuel level sensor or digital input port 4; programmable sensor 2 input port can be set as temperature sensor, pressure sensor, coolant level sensor or digital input port 5. Choose either sensor or digital input port, if digital input port be selected, corresponding set parameters be functional and sensor parameters are inactive and reserved; otherwise, if sensor be selected, corresponding sensor parameters be functional and digital input port parameters are deactive and reserved.
- h) If need to shut down after cooling, please set any auxiliary input as "High Temperature Stop Input", then connect this input port to GND or set "High Temperature Stop Input" action as "Cooling Stop"

8.2 CONTROLLER INFORMATION

- a) LCD will display software version, issue date of the controller.

▲Note: In this interface, press  will display the auxiliary inputs and outputs status.

- b) LCD contrast control

Press  and  or  and  simultaneously to adjust LCD contrast ratio and make LCD character display more clearly. Contrast ratio adjustment range: 0-7.

8.3 LANGUAGE SELECTION

Chinese, English, Spanish, Russian, Turkish, French, Portuguese and Polish can be optional.

8.4 EVENT LOG

View event log from this interface, including start/stop information and shutdown alarm information log. It can record and display up to 99 pieces.

8.5 MAINTENANCE

Password need to be input when enter into the maintenance interface, default as 0(if change this password, please contact with SmartGen service personnel or sales personnel). Setting maintenance parameters will refresh maintenance time.

▲Note: Refresh maintenance time and enter into the next maintenance period in maintenance interface when Maintenance Due Alarm.

9 SENSOR SETTING

- When reselect sensors, the sensor curve will be transferred into the standard value. For example, if temperature sensor is SGH (120°C resistor type), its sensor curve is SGH (120°C resistor type); if select the SGD (120°C resistor type), the temperature sensor curve is SGD curve.
- When there is difference between standard sensor curves and using sensor, user can adjust it in “curve type”.
- When input the sensor curve, X value (resistor) must be input from small to large, otherwise, mistake occurs.
- If there is no oil pressure sensor, but there is low oil pressure alarm switch, user must set the oil pressure sensor as “None”, otherwise, maybe low oil pressure shutdown occurs.
- The headmost or backmost values in the vertical coordinates can be set as same as below,

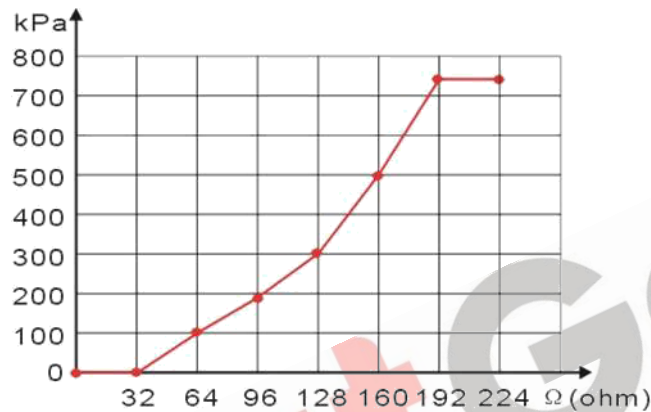


Table 12 Common unit conversion table

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

11 TYPICAL APPLICATION

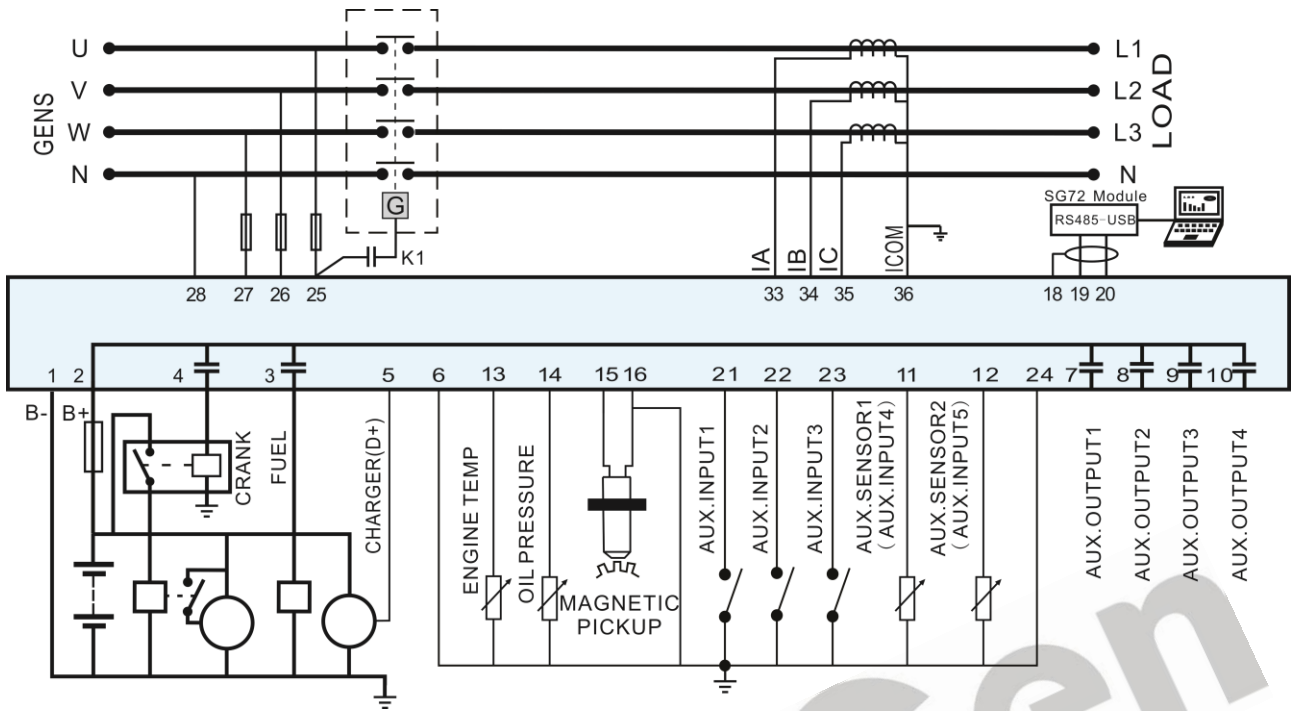


Fig.4 - HGM4010NC Typical Application

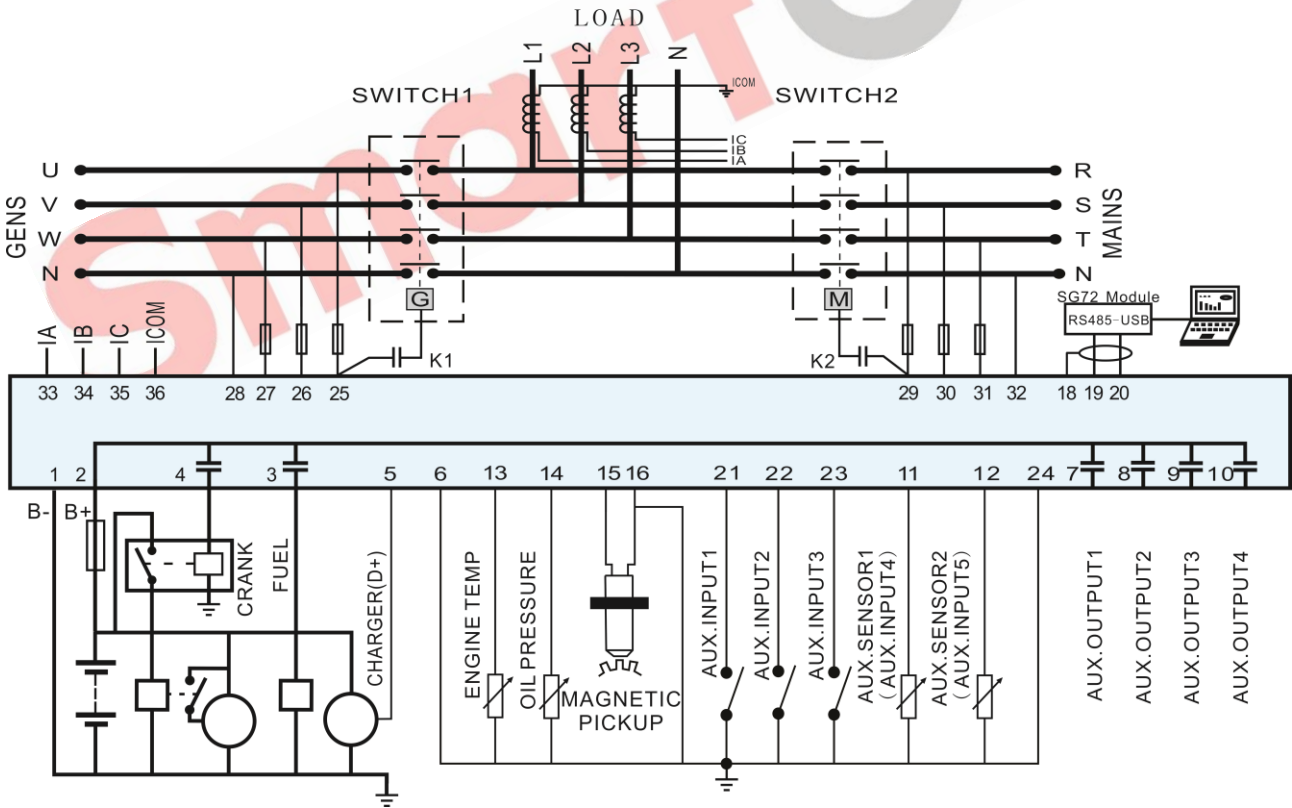


Fig.5 - HGM4020NC Typical Application

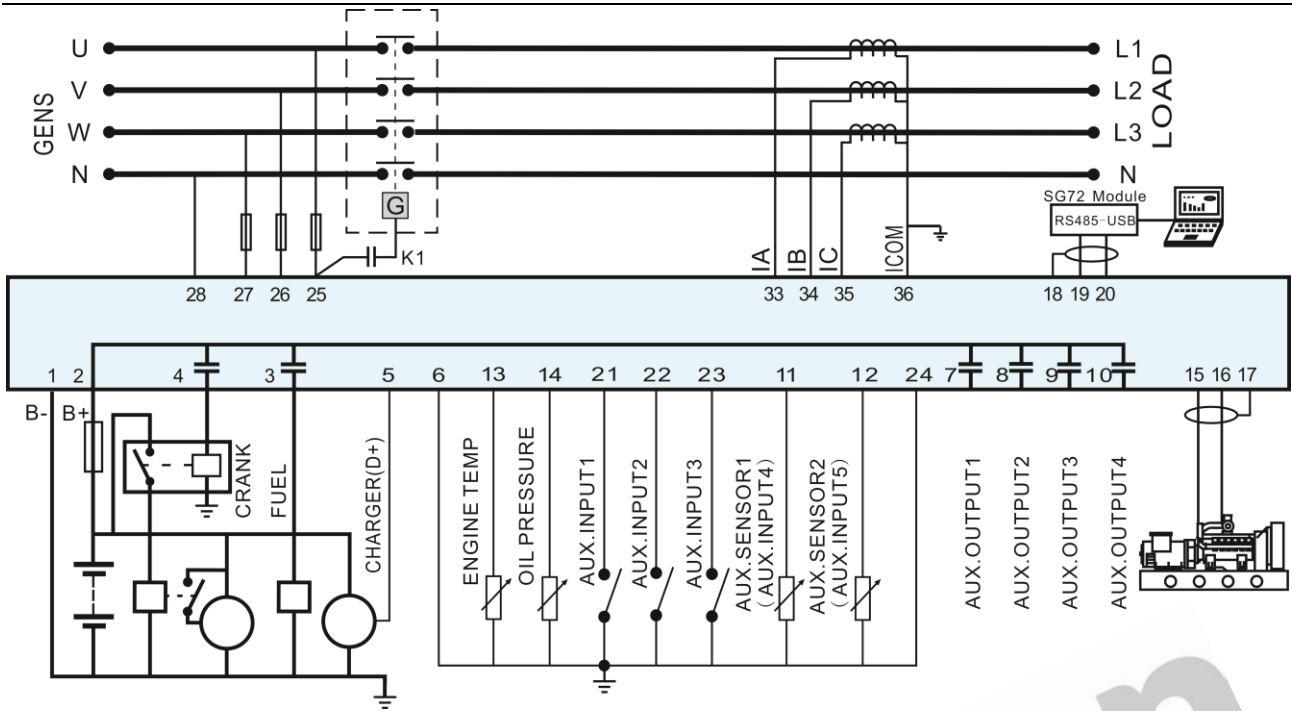


Fig.6 - HGM4010CAN Typical Application

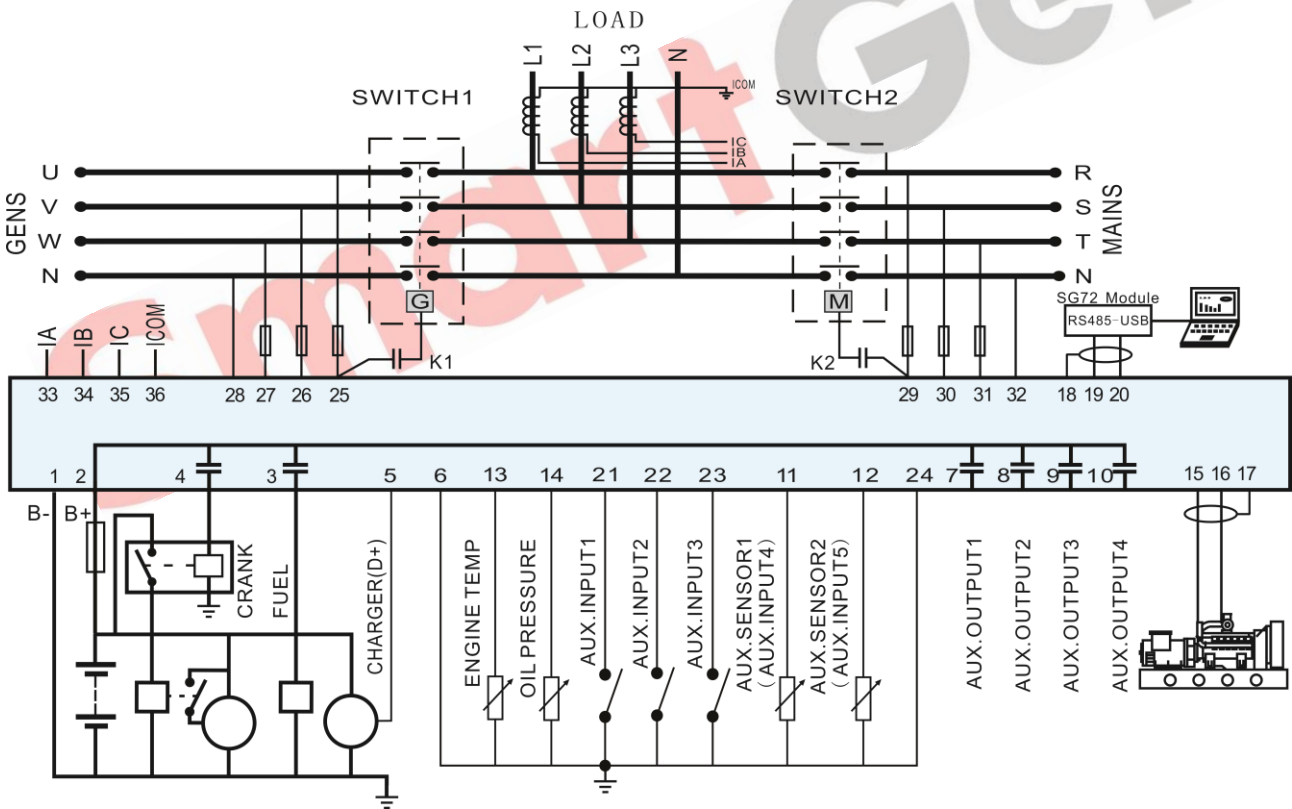


Fig.7 - HGM4020CAN Typical Application

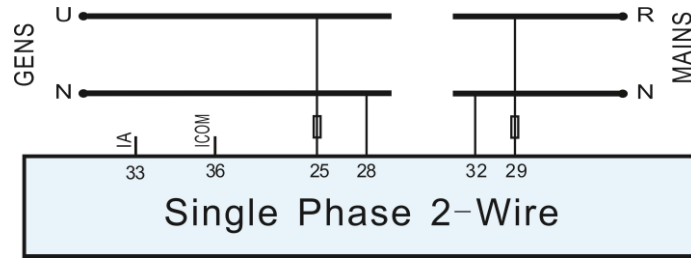


Fig.8 - Single Phase 2-Wire Connection Diagram

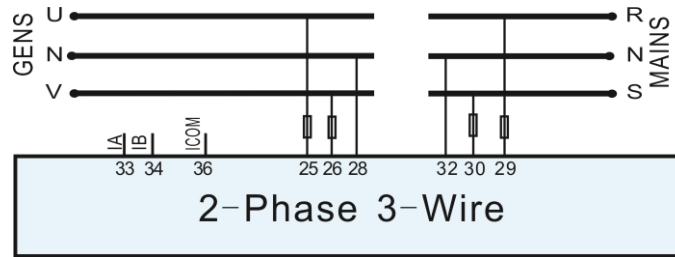


Fig.9 - 2-Phase 3-Wire Connection Diagram

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

SmartGen

12 INSTALLATION

12.1 FIXING CLIPS

- 1) Controller is panel built-in design; it is fixed by clips when installed.
- 2) Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.
- 3) Pull the fixing clip backwards (towards the back of the module) ensuring two clips are inside their allotted slots.
- 4) 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.

12.2 OVERALL DIMENSION

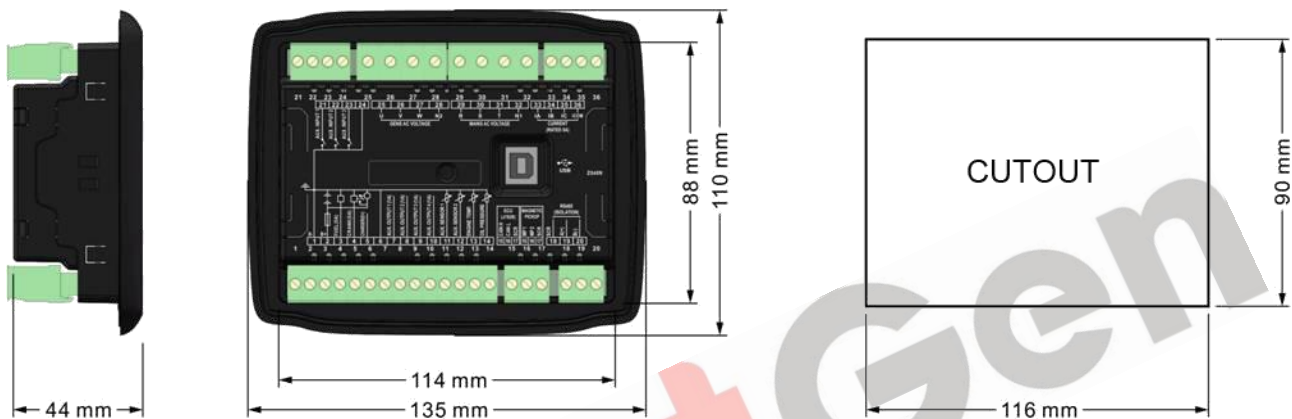


Fig.10 - Overall Dimensions

HGM4000N 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.

— 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. 17 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.1 and No.17 terminals in controller. The output voltage of speed sensor should be within AC(1~24)V (effective value) during the full speed. AC12V is recommended (in rated speed). When install the speed sensor, let the sensor is spun to contacting flywheel first, then, port out 1/3 lap, and lock the nuts of sensor at last.

— 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.

— AC INPUT

Current input of controller must be connected to outside current transformer. And the current transformer's secondary side current must be 5A. At the same time, the phases of current transformer and input voltage must correct. Otherwise, the current of collecting and active power maybe not correct.