



SmartGen
ideas for power

HGM400N SERIES
(HGM410N/HGM420N)
GENSET CONTROLLER
USER MANUAL



SMARTGEN (ZHENGZHOU) TECHNOLOGY CO.,LTD.



Chinese trademark

SmartGen English trademark

SmartGen — make your generator *smart*

SMARTGEN(ZHENGZHOU) TECHNOLOGY CO., LTD.

No. 28 Jinsuo Road

Zhengzhou City

P. R. China

Tel: +86-371-67988888

+86-371-67981888

+86-371-67991553

+86-371-67992951

+86-371-67981000 (overseas)

Fax: 0086-371-67992952

Web: <http://www.smartgen.com.cn>

<http://www.smartgen.cn>

Email: sales@smartgen.cn

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Version

Date	Version	Note
2016-08-01	1.0	Original release.
2017-03-29	1.1	Modify some details.
2017-04-21	1.2	Modify Storage Temperature and Operation Humidity.



CONTENTS

1	OVERVIEW	4
2	PERFORMANCE AND CHARACTERISTICS	4
3	SPECIFICATION	6
4	OPERATION	7
4.1	PUSHBUTTONS	7
4.2	INDICATOR LIGHT	8
4.3	AUTOMATIC START/STOP OPERATION	9
4.4	MANUAL START/STOP OPERATION	10
4.5	EMERGENCY START	10
5	PROTECTION	11
5.1	WARNINGS	11
5.2	SHUTDOWN ALARM	14
6	CONNECTIONS	16
7	DEFINITION AND RANGE OF PARAMETERS	18
7.1	PARAMETER CONTENTS AND RANGE	18
7.2	PROGRAMMABLE OUTPUT 1-5	25
7.3	PROGRAMMABLE INPUT 1-4 (ACTIVE WHEN CONNECT GND (B-))	26
7.4	SENSOR SELECT	27
7.5	CONDITIONS OF CRANK DISCONNECT	28
8	PARAMETERS SETTING	29
9	SENSOR SETTING	30
10	COMMISSIONING	31
11	TYPICAL APPLICATION	32
12	INSTALLATION	34
12.1	FIXING CLIPS	34
12.2	OVERALL DIMENSION AND PANEL CUTOUT	34
13	FAULT FINDING	36

1 OVERVIEW

HGM400N series genset controllers integrate digitization, intelligentization and network technology which are used for genset automation and monitor control system of single unit to achieve automatic start/stop, data measurement, alarm protection and “three remote” (remote control, remote measuring and remote communication; SG485 module must be fitted). It fit with LCD display, optional languages interface (Chinese, English, Spanish, Turkish, Russian and French), and it is reliable and easy to use.

HGM400N series genset controllers adopt micro-processor technology with precision parameters measuring, fixed value adjustment, time setting and set value adjusting and etc. All parameters can be configured from front panel or through USB interface by using PC. It can be widely used in all types of automatic genset control system with compact structure, advanced circuits, simple connections and high reliability.

2 PERFORMANCE AND CHARACTERISTICS

HGM400N series controller has two types:

HGM410N: ASM (Automatic Start Module), it controls generator to start/stop by remote signal;

HGM420N: AMF (Auto Mains Failure), updates based on HGM410N, moreover, has mains electric quantity monitoring and mains/generator automatic transfer control function, especially for automatic system composed by generator and mains.

- 132x64 LCD with backlight, selectable language interface (Chinese, English, Spanish, Turkish, Russian and French), push-button operation;
- Improved LCD wear-resistance and scratch resistance due to hard screen acrylic;
- Silicon panel and pushbuttons for better operation in high/low temperature environment;
- Suitable for 3-phase 4-wire, 3-phase 3-wire, single phase 2-wire, and 2-phase 3-wire systems with voltage 120/240V and frequency 50/60Hz;
- Collects and shows 3-phase voltage, current, power parameter and frequency of generator or mains.

Mains

Line Voltage (Uab, Ubc, Uca)

Phase Voltage (Ua, Ub, Uc)

Frequency (HZ)

Phase Sequence

Generator

Line Voltage (Uab, Ubc, Uca)

Phase Voltage (Ua, Ub, Uc)

Frequency (HZ)

Phase Sequence

Load

Current (IA, IB, IC)

Split-phase and Total Active Power (kW)

Reactive Power (kvar)

Apparent Power (kVA)

Power Factor (PF)

Accumulated Energy (kWh)

Output Percentage with Load (%)

- For Mains, controller has over voltage, under voltage and loss of phase detection functions; For generator, controller has over voltage, under voltage, over frequency, under frequency, over current

and over power detection functions;

- Precision collect and display parameters about Engine,

Temp. (WT)	°C/°F
Oil pressure (OP)	kPa/psi/bar
Fuel Level (FL)	% remain fuel level L
Engine Speed (RP)	r/min
Battery Voltage (VB)	V
Charger Voltage (VD)	V
Hours Counter (HC)	
Start times	

- Control & Protection: automatic start/stop of the genset, ATS(Auto Transfer Switch) control with perfect fault indication and protection function;
- With ETS(Energize To Stop), idle control, pre-heat control, speed raise control and speed drop control function, All output ports are relay-out;
- Parameter setting: parameters stored in internal FLASH can be modified and cannot be lost even in case of power outage; all the controller parameters can be adjusted using front panel of the controller or via USB or RS485 interface by using PC.
- Multiplex input port 3 and 4 can be used in various fields: input 3 can be used as auxiliary input port or fuel level sensor while input 4 can be used as auxiliary input port or configurable sensor.
- More kinds of curves of temperature, oil pressure, fuel level can be used directly and users can define the sensor curves by themselves;
- Configurable sensor: can be set as temperature sensor, oil pressure sensor or fuel level sensor, enable the detection of double temperature, double oil-pressure and double fuel level.
- Multiple crank disconnect conditions (magnetic pickup, oil pressure, generator frequency) are optional;
- With emergency start function;
- With fly teeth auto-recognize function;
- Widely Power supply range: DC(8~35)V, suitable to different start battery voltage environment.
- All parameters used digital adjustment, instead of conventional analog modulation with normal potentiometer, more reliability and stability;
- With maintenance function. Types (date or running time) can be set. Actions (warning, alarm shutdown) can be set when maintenance time out;
- With event log function (max. 99 pieces of record), real-time clock, and schedule to start/stop generator function (start once monthly/weekly/daily on/off load can be set).
- IP55 waterproofness with rubber-ring gasket;
- With metal fixing clips;
- Modular design, self-extinguished ABS plastic enclosure, pluggable connection terminals and embedded installation way; compact structure with easy mounting.



3 SPECIFICATION

Items	Contents
Working Voltage	DC8. 0V to 35. 0V, Continuous Power Supply.
Overall Consumption	<3W(Standby mode: ≤2W)
AC voltage Input: 3 Phase 4 Wire 3 Phase 3 Wire Single phase 2 Wire 2 Phase 3 Wire	AC15V - AC360V (ph-N) AC30V - AC620V (ph-ph) AC15V - AC360V (ph-N) AC15V - AC360V (ph-N)
Alternator Frequency	50Hz/60 Hz
Speed Sensor Voltage	1.0V to 24V (RMS)
Speed Sensor Frequency	10,000 Hz (max)
Start Relay Output	5A DC28V power supply
Auxiliary Relay Output 1	5A DC28V power supply
Auxiliary Relay Output 2	5A DC28V power supply
Auxiliary Relay Output 3	5A DC28V power supply
Auxiliary Relay Output 4	5A AC250V voltage-free output
Auxiliary Relay Output 5	5A AC250V voltage-free output
Overall Dimensions	126mm x 109mm x 44mm
Panel Cutout	110mm x 90mm
CT Secondary Current	5A (rated)
Working Condition	Temperature: (-25~70)°C; Humidity: (20~93)%RH
Storage Condition	Temperature: (-25~+70)°C
Protection Level	IP55 Gasket
Insulation Intensity	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.
Weight	0.26kg

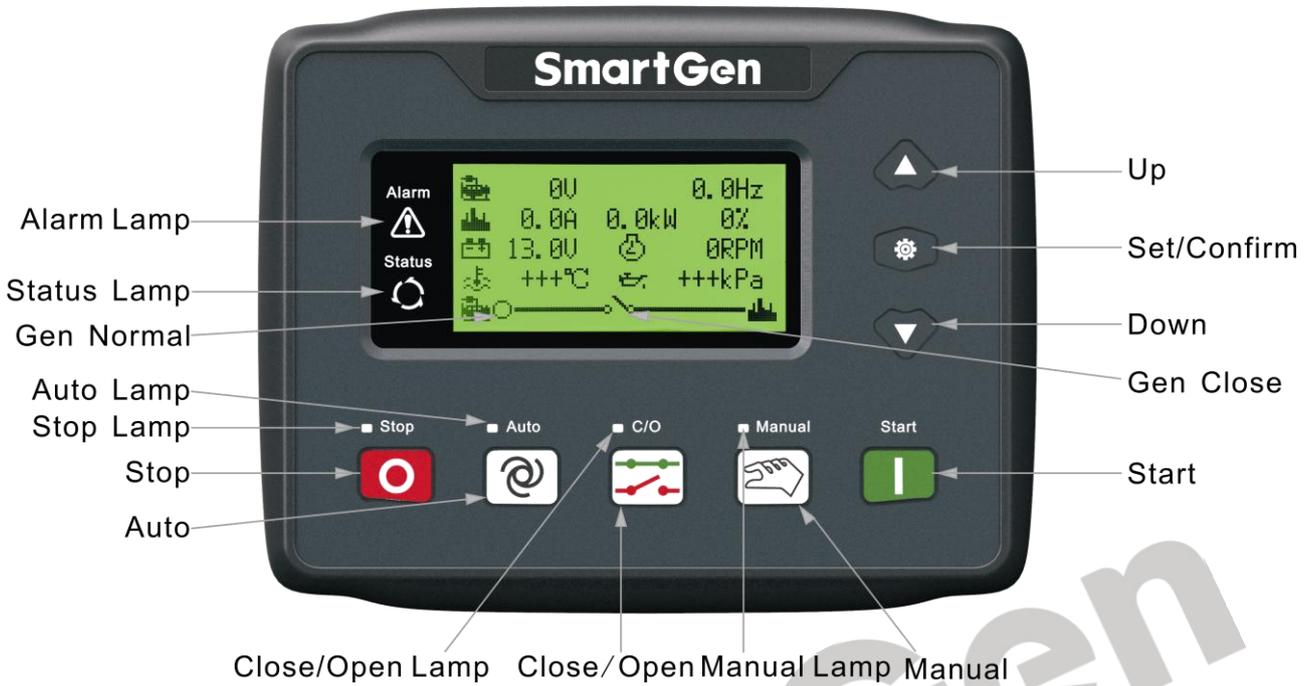
4 OPERATION

4.1 PUSHBUTTONS

Icon	Key	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	Start genset in Manual/Test mode. When press this key in starting process, genset will skip to next status.
	Manual	Pressing this key will set the module into manual mode.
	Auto	Pressing this key will set the module into auto mode.
	Close/Open	For close/open switch. Pressing this key can switch between close/open interface and homepage. At close/open interface in manual mode, pressing up/down keys can control open or close.
	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. When at close/open interface in manual mode: Pressing this key can control mains close/open (HGM420N) and gen close (HGM410N).
	Down/Decrease	Scrolls the screen down; shift the cursor down or decrease the set value in parameter setting menu. When in close/open interface in manual mode: Pressing this key can control mains close/open (HGM420N) and gen close (HGM410N).

4.2 INDICATOR LIGHT

HGM410N Panel Indicators



HGM420N Panel Indicators



▲Note: Partial indicator states

Alarm Lamp: slowly blink when warning alarms; fast blink when shutdown alarms; won't illuminate when there is no alarm.

Status Lamp: won't illuminate when genset stand by; blink 1 time in start or stop process and always illuminate when runs normally.

4.3 AUTOMATIC START/STOP OPERATION

Auto mode is selected by pressing the  button; a LED besides the button will illuminate to confirm the operation.

Auto Start Sequence,

- 1) **HGM420N:** when mains is abnormal (over/under voltage, loss of phase), enter into “Mains Abnormal Delay” and LCD displays count down time. “Start Delay” timer is initiated after the delay has expired.
- 2) **HGM410N:** When “Remote Start” is active, “Start Delay” timer is initiated;
- 3) “Start Delay” countdown will be displayed on LCD;
- 4) When start delay is over, preheat relay energizes (if configured), “preheat delay XXs” information will be displayed on LCD;
- 5) After the above delay, the Fuel Relay is energized, and then one second later, the Start Relay is engaged. The engine is cranked for a pre-set time. If the engine fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; “crank rest time” begins and wait for the next crank attempt.
- 6) This start sequence should continue beyond the set number of attempts, the start sequence will be terminated, the fifth line of LCD display will be highlighted with black and Fail to Start fault will be displayed.
- 7) In case of successful crank attempt, the “Safety On” timer is activated, allowing Low Oil Pressure, High Temperature, Under speed, Charge Alternator Failure and Auxiliary inputs (configured) to stabilise without triggering the fault. As soon as this delay is over, “start idle” delay is initiated (if configured).
- 8) During “start idle” delay, under speed, under frequency, under voltage alarms are inhibited. When this delay is over, “warming up” delay is initiated (if configured).
- 9) After the “warming up” delay, if generator status is normal, its indicator will be illuminated. If generator voltage and frequency have reached on-load requirements, then the generator close relay will be energized; genset will take load; generator power indicator will illuminate and generator will enter into Normal Running status. If voltage or frequency is abnormal, the controller will initiate shutdown alarm (alarm information will be displayed on LCD).

Auto Stop Sequence,

- 1) **HGM420N:** During normal running process, if mains normal, enters into “Mains Normal Delay”. When mains indicator illuminates, “Stop Delay” is initiated.
- 2) **HGM410N:** When the “Remote Start” signal is removed, the Stop Delay is initiated.
- 3) Once this “stop delay” has expired, the Generator Breaker will open and the “Cooling Delay” is then initiated. After “Transfer Delay”, the mains close relay will be energized; mains will take load; generator power indicator will extinguish while mains power indicator will illuminate.
- 4) During “Stop Idle” Delay (if configured), idle relay is energized.
- 5) “ETS Solenoid Hold” begins, ETS relay is energized while fuel relay is de-energized.
- 6) “Fail to Stop Delay” begins, complete stop is detected automatically.
- 7) Generator is placed into its standby mode after its complete stop. Otherwise, fail to stop alarm is initiated and the corresponding alarm information is displayed on LCD.

4.4 MANUAL START/STOP OPERATION

- 1) **HGM420N:** Manual mode is selected by pressing the  button; a LED besides the button will illuminate to confirm the operation. In this mode, press  button to start the genset, it can automatically judge crank success and accelerate to high speed running. If high temperature, low oil pressure, over speed and abnormal voltage occur during genset running, controller can effectively protect genset to stop (detail procedures please refer to No.4~9 of Auto start sequence). In **Manual Mode**, load switch won't auto-switch. It needs to press  to enter close/open interface, it controls mains switch to close/open by pressing  and controls gen switch to close/open by pressing .
- 2) **HGM410N:** Manual mode is selected by pressing the  button; the LED besides the button will illuminate to confirm the operation and the genset start. It can automatically judge crank success and accelerate to high speed running. If high temperature, low oil pressure, over speed and abnormal voltage occur during genset running, controller can effectively protect genset to stop (detail procedures please refer to No.4~9 of Auto start sequence). After genset high speed normal running, It needs to press  to enter close/open interface, it controls mains switch to close by pressing  and controls gen switch to open by pressing  (gen is on load).
- 3) Manual stop: pressing  key can stop the running genset. (detail procedures please refer to No.3~7 of Auto stop sequence)

4.5 EMERGENCY START

In manual mode, pressing  and  can compel genset to start. The controller won't judge whether the controller has started successfully according to disconnect conditions and the disconnection of starter needs to control by operators. When operators observed the genset has started successfully, loose the keys and the controller enter safety delay with start stops to output.

5 PROTECTION

5.1 WARNINGS

Warnings are not shutdown alarms and do not affect the operation of the gen-set. Warning alarms does not lead to shutdown. The alarm information will be displayed on LCD.

Warning alarms types are as follows:

No.	Items	Description
1	High Temp.	When the controller detects that engine temperature has exceeded the pre-set value while shutdown is prohibited, or detects that the Aux. input high temperature while shutdown is prohibited, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
2	Low OP	When the controller detects that the oil pressure has fallen below the pre-set value while shutdown is prohibited, or detects that the Aux. input low oil pressure while shutdown is prohibited, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
3	Gen Over Current	When the controller detects that the genset current has exceeded the pre-set value and the over current delay has expired, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
4	Fail To Stop	After "fail to stop" delay/ ETS delay has expired, if gen-set does not stop completely, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
5	Low Fuel Level	When the controller detects that the fuel level has fallen below the pre-set value while shutdown is prohibited, or detects that the Aux. input low fuel level while shutdown is prohibited, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
6	Charge Alt Failure	When the controller detects that charger voltage has fallen below the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
7	Battery Under Volt	When the controller detects that battery voltage has fallen below the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
8	Battery Over Volt	When the controller detects that battery voltage has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
9	Aux. Input	When the controller detects that the auxiliary input warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
10	Loss Of Speed Signal	When the controller detects that the engine speed is 0 and the delay is 0, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.



11	Low Coolant Level	When the controller detects the low coolant level input is active, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
12	Temp. Sensor Open	When the controller detects that the temperature sensor is open circuit and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
13	OP Sensor Open	When the controller detects that the oil pressure sensor is open circuit and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
14	Level Sensor Open	When the controller detects that the level sensor is open circuit and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
15	Temp. Sensor 2 Open	If the config. sensor set as temperature sensor, When the controller detects that the temperature sensor is open circuit and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
16	OP Sensor 2 Open	If the config. sensor set as oil pressure sensor, When the controller detects that the oil pressure sensor is open circuit and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
17	Level Sensor Open	If the config. sensor set as level sensor, When the controller detects that the level sensor is open circuit and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
18	High Temp. 2	When the controller detects that config. sensor temperature (sensor type: temperature sensor) has exceeded the pre-set value while shutdown is prohibited, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
19	Low OP 2	When the controller detects that config. sensor oil pressure (sensor type: oil pressure sensor) has fallen below the pre-set value while shutdown is prohibited, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
20	Low Level	When the controller detects that config. sensor low level (sensor type: level sensor) has fallen below the pre-set value while shutdown is prohibited, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
21	Maintenance Due	When genset running time has exceeded the user setting maintenance time and the action select "Warn", it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD. The maintenance alarm will reset if the action select "Inactive".
22	Gen Over Volt	When the controller detects that the generator voltage has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.



23	Gen Under Volt	When the controller detects that the genset voltage has fallen below the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
24	Gen Over Freq	When the controller detects that the genset frequency has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
25	Gen Under Freq	When the controller detects that the genset frequency has fallen below the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
26	Fail to Charge	When the controller detects that the fail to charge warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
27	Over Power	If over power detection is enabled, when the controller detects that the over power value (power is positive) has exceeded the pre-set value and the action select "Warn", it will initiate a warning alarm.

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5.2 SHUTDOWN ALARM

When controller detects shutdown alarm, it will send signal to open breaker and shuts down generator. The alarm information will be displayed on LCD.

Shutdown alarms as following:

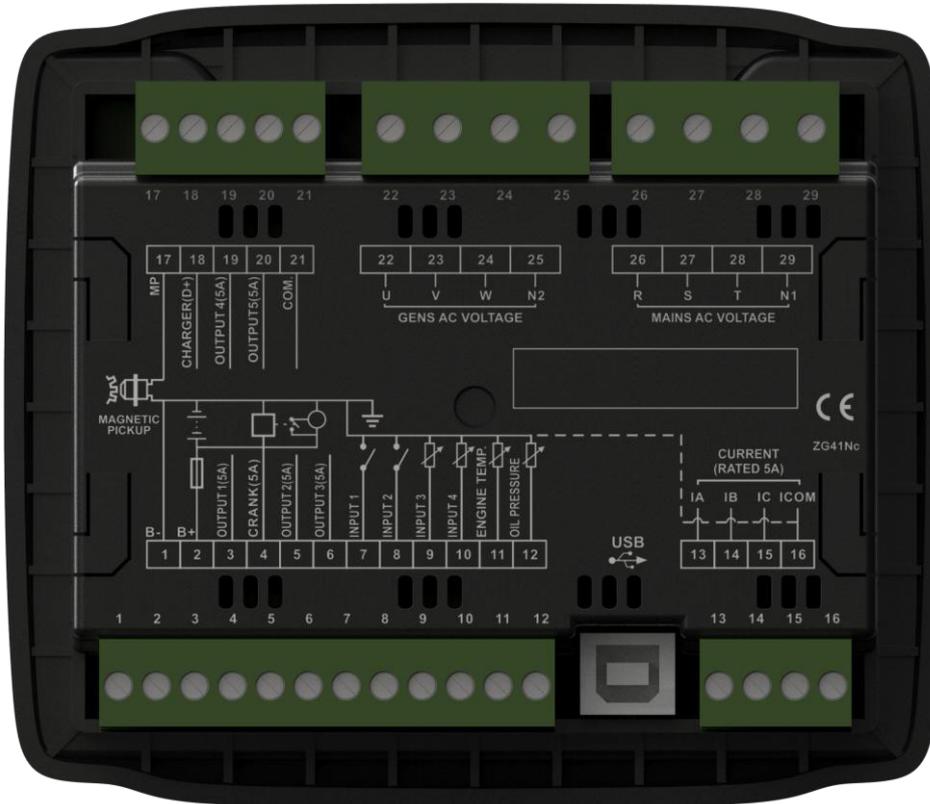
No	Items	Description
1	Emergency Shutdown	When the controller detects that the emergency shutdown signal, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
2	Over Speed	When the controller detects that the generator speed has exceeded the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
3	Under Speed	When the controller detects that the generator speed has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
4	Loss Of Speed Signal	When the controller detects that the engine speed is 0 and the delay is <i>NOT</i> 0, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
5	Gen Over Freq	When the controller detects that the genset frequency has exceeded the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
6	Gen Under Freq	When the controller detects that the genset frequency has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
7	Gen Over Voltage	When the controller detects that the genset voltage has exceeded the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
8	Gen Under Voltage	When the controller detects that the genset voltage has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
9	Gen Over Current	When the controller detects that the genset current has exceeded the pre-set value and delay is not 0, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
10	Fail To Start	If the engine does not fire after the pre-set number of attempts, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
11	High Temp.	When controller detects that the water/cylinder temperature has exceeded the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
12	Low OP	When the controller detects that the oil pressure has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
13	No Gens Freq	When the controller detects that the genset frequency is 0, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
14	Low Fuel Level	When the controller detects that the fuel level has fallen below the pre-set value or detects that the low fuel level input is active, it will initiate a shutdown



No	Items	Description
		alarm and the corresponding alarm information will be displayed on LCD.
15	Low Coolant Level	When the controller detects the low coolant level input is active, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
16	Temp. Sensor Open	When the controller detects that the temperature sensor is open circuit and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
17	OP Sensor Open	When the controller detects that the oil pressure sensor is open circuit and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
18	Fuel Level Sensor Open	When the controller detects that the level sensor is open circuit and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
19	Temp. Sensor 2 Open	If the config. sensor set as temperature sensor, When the controller detects that the temperature sensor is open circuit and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
20	OP Sensor 2 Open	If the config. sensor set as oil pressure sensor, When the controller detects that the oil pressure sensor is open circuit and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
21	Level Sensor Open	If the config. sensor set as level sensor, When the controller detects that the level sensor is open circuit and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
22	High Temp. 2	When the controller detects that config. sensor temperature (sensor type: temperature sensor) has exceeded the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
23	Low OP 2	When the controller detects that config. sensor oil pressure (sensor type: oil pressure sensor) has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
24	Low Level	When the controller detects that config. sensor fuel level (sensor type: level sensor) has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
25	Maintenance Due	When genset running time has exceeded the user setting maintenance time and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD. The maintenance alarm will reset if the action select "Inactive".
26	Over Power	If over power detection is enabled, when the controller detects that the over power value (power is positive) has exceeded the pre-set value and the action select "Shutdown", it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.

6 CONNECTIONS

Compared with **HGM420N**, **HGM410N** has no Mains AC Voltage input terminals. The rear panel of **HGM420N** is as below.



Description of terminal connections:

Pin	Function	Cable Size	Description
1	B-	2.5mm ²	Connected with negative of starter battery.
2	B+	2.5mm ²	DC power supply. Connected with positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.
3	Aux. Output 1	1.5mm ²	B+ is supplied by 2 point, rated 5A.
4	Crank	1.5mm ²	Crank Relay Output; B+ is supplied by 2 point, rated 5A. Connect to starter coil.
5	Aux. Output 2	1.5mm ²	B+ is supplied by 2 point, rated 5A.
6	Aux. Output 3	1.5mm ²	B+ is supplied by 2 point, rated 5A.
7	Digital Input 1	1.0mm ²	Ground connected is active (B-)
8	Digital Input 2	1.0mm ²	Ground connected is active (B-)
9	Digital Input 3	1.0mm ²	Ground connected is active (B-); Can be used as Level Sensor.
10	Digital Input 4	1.0mm ²	Ground connected is active (B-); Can be used as Config. Sensor.

See Performance and Characteristics

See [7.3](#)



Pin	Function	Cable Size	Description
11	Engine Temp. Sensor	1.0mm ²	Connect to temperature/cylinder resistance sensor.
12	Oil Press Sensor	1.0mm ²	Connect to oil pressure resistance sensor.
13	Current IA	1.5mm ²	Outside connected to secondary coil of current transformer(rated 5A)
14	Current IB	1.5mm ²	Outside connected to secondary coil of current transformer(rated 5A)
15	Current IC	1.5mm ²	Outside connected to secondary coil of current transformer(rated 5A)
16	Current COM	1.5mm ²	See INSTALLATION in this manual.
17	Magnetic Pickup	0.5mm ²	Connect to speed sensor; Shielded wire is recommended. The other end of speed sensor connects to B-.
18	Charger D+	1.0mm ²	Connect to charging starter's D+ terminal. If there is no this terminal, then be hang up.
19	Aux. Output 4	1.0mm ²	The combination of terminal 19 and 21 is relay normally open contact; rated 5A; Voltage free.
20	Aux. Output 5	1.0mm ²	The combination of terminal 20 and 21 is relay normally open contact; rated 5A; Voltage free.
21	Aux. Output COM	1.5mm ²	Common terminal of auxiliary output 4 and 5.
22	Gen AC Voltage U	1.0mm ²	Connected to U-phase of generator (2A fuse is recommended)
23	Gen AC Voltage V	1.0mm ²	Connected to V-phase of generator (2A fuse is recommended)
24	Gen AC Voltage W	1.0mm ²	Connected to W-phase of generator (2A fuse is recommended)
25	Gen AC Voltage N2	1.0mm ²	Connected to N-wire of generator.
26	Mains AC Voltage R	1.0mm ²	Connected to R-phase of mains (2A fuse is recommended) (HGM410N without)
27	Mains AC Voltage S	1.0mm ²	Connected to S-phase of mains (2A fuse is recommended) (HGM410N without)
28	Mains AC Voltage T	1.0mm ²	Connected to T-phase of mains (2A fuse is recommended) (HGM410N without)
29	Mains AC Voltage N1	1.0mm ²	Connected to N-wire of mains (HGM410N without)

Note: USB interface is parameters programmable interface that can be programmed via PC.



7 DEFINITION AND RANGE OF PARAMETERS

7.1 PARAMETER CONTENTS AND RANGE

No	Items	Range	Default	Description
1	Mains Normal Delay	(0-3600)s	10	The time from mains abnormal to normal or from normal to abnormal; suitable for ATS (automatic transfer switch).
2	Mains Abnormal Delay	(0-3600)s	5	
3	Mains Under Volt	(30-620)V	184	When mains voltage has fallen below the set value, Mains Under Voltage is active. When set the value as 30V, the controller does not detect under voltage signal. Back lash: 10V
4	Mains Over Volt	(30-620)V	276	When mains voltage has exceeded the set value, Mains Over Voltage is active. When set the value as 620V, the controller does not detect over voltage signal. Back lash: 10V
5	Transfer Rest Delay	(0-99.9)s	1.0	Interval time from mains switch off to generator switch on; or from generator switch off to mains switch on.
6	Start Delay	(0-3600)s	1	Time from mains abnormal or remote start signal is active to start genset.
7	Stop Delay	(0-3600)s	1	Time from mains normal or remote start signal is deactivated to genset stop.
8	Start Attempts	(1-10)times	3	Maximum crank times of crank attempts. When reach this number, controller will send start failure signal.
9	Preheat Time	(0-300)s	0	Power-on time of heater plug before starter is powered up.
10	Cranking Time	(3-60)s	8	Power-on time of starter
11	Crank Rest Time	(3-60)s	10	The waiting time before second power up when engine start fail.
12	Safety On Delay	(1-60)s	10	Alarms for low oil pressure, high temperature, under speed, under frequency/voltage, charge alt failure are inactive.
13	Start Idle Time	(0-3600)s	0	Idle running time of genset when starting.
14	Warming Up Time	(0-3600)s	10	Warming time between genset switch on and high speed running.
15	Cooling Time	(3-3600)s	10	Radiating time before genset stop, after it unloads.
16	Stop Idle	(0-3600)s	0	Idle running time when genset stop.
17	ETS Solenoid Hold	(0-120)s	20	Stop electromagnet's power on time when genset is stopping.
18	Fail to Stop Delay	(0-120)s	0	Time between ending of genset idle delay and stopped when "ETS time" is set as 0; Time between ending of ETS hold delay and



No	Items	Range	Default	Description
				stopped when "ETS time" is not 0.
19	Breaker Close Time	(0-10)s	5.0	Pulse width of mains/generator switch on. When it is 0, means output constantly.
20	Flywheel Teeth	(10.0-300.0)	118.0	Tooth number of the engine, for judging of starter crank disconnect conditions and inspecting of engine speed. See the installation instructions.
21	Gen Abnormal Delay	(0-20.0)s	10.0	The alarm delay of generator over voltage and under voltage.
22	Gen Over Volt	(30-620)V	276	When generator voltage has exceeded the set value and the "Gen abnormal delay" has expired, Gen Over Voltage is active. When set the value as 620V, the controller does not detect over voltage signal.
23	Gen Under Volt	(30-620)V	184	When generator voltage has fallen below the set value and the "Gen abnormal delay" has expired, Gen Under Voltage is active. When set the value as 30V, the controller does not detect under voltage signal.
24	Under Speed	(0-6000)r/min	1200	When engine speed has fallen below the set value for 10s, Under Speed is active. It will initiate a shutdown alarm signal.
25	Over Speed	(0-6000)r/min	1710	When engine speed has exceeded the set value for 2s, Over Speed is active. It will initiate a shutdown alarm signal.
26	Under Freq	(0-75.0)Hz	40.0	When generator frequency has fallen below the set value but Not equal to 0 for 10s, Under Frequency is active. It will initiate a shutdown alarm signal.
27	Over Freq	(0-75.0)Hz	57.0	When generator frequency has exceeded the set value for 2s, Over Frequency is active. It will initiate a shutdown alarm signal.
28	High Temp.	(80-140)°C	98	When the temperature value of the external temperature sensor exceeds the set value, "High Temperature" timer is initiated. Detecting only after safety on delay has expired. If the set value is 140, high temperature signal will not be sent (this only concerns external temperature sensor, not high temperature signal via config. input port).
29	Low OP	(0-400)kPa	103	When the external pressure sensor value falls below this set value, "Low Oil Pressure" timer is initiated. Detecting only after safety on delay



No	Items	Range	Default	Description
				has expired. If the set value is 0, low oil pressure signal will not be sent (this only concerns pressure sensor and does not concern low oil pressure warning signal via configurable input port)
30	Low Fuel Level	(0-100)%	10	When the liquid level of the external sensor falls below the set value, "Low Fuel Level" timer is initiated. (this only concerns fuel level sensor and does not concern low fuel level warning signal via configurable input port)
31	Aux. Sensor	(80-140)°C (0-400)kPa (0-100)%	98	Each value correspond to above 28 (Temperature sensor), 29 (Oil pressure sensor) and 30 (Level sensor), respectively.
32	Loss of Speed Signal	(0-20.0)s	5.0	If the set value is 0, only warning and not to shutdown the generator.
33	Charge Alt Failure	(0-30)V	6.0	During generator is normal running, when alternator D+(WL) voltage has fallen below the set value and remains for 5s, It will initiate a shutdown alarm signal.
34	Battery Over Volt	(12-40)V	33.0	When battery voltage has exceeds the set value and remains for 20s, It will initiate a warning alarm signal. Only warning and not to shutdown the generator.
35	Battery Under Volt	(4-30)V	8.0	When battery voltage has fallen below the set value and remains for 20s, It will initiate a warning alarm signal. Only warning and not to shutdown the generator.
36	Current Trans.	(5-6000)/5	500	The ratio of external CT
37	Full Load Current Rating	(5-6000)A	500	Generator's rated current, used for load over current calculating.
38	Over Current Percentage	(50-130)%	120	When the load current has exceeded the set value, "over current" delay is initiated.
39	Over Current Delay	(0-3600)s	30	When load current has exceeded the set value and the "over current" delay has expired, over current alarm is initiated. When the set value is 0, only warning and not to shutdown the generator.
40	Fuel Pump On	(0-100)%	25	When fuel level has fallen below the set value for 10s, "Fuel Pump On" alarm is initiated.
41	Fuel Pump Off	(0-100)%	80	When fuel level has exceeded the set value for 10s, "Fuel Pump Off" alarm is initiated.
42	Aux. Output 1	(0-17)	14	Factory default: Fuel Relay Output
43	Aux. Output 2	(0-17)	2	Factory default: Energized To Stop



No	Items	Range	Default	Description
44	Aux. Output 3	(0-17)	3	Factory default: Idle Control
45	Aux. Output 4	(0-17)	5	Factory default: Close Generator
46	Aux. Output 5	(0-17)	6	Factory default: Mains Closed
47	Digital Input 1	(0-15)	1	Factory default: High Temperature Input
48	Digital Input 1 Active	(0-1)	0	Factory default: Close to active
49	Digital Input 1 Delay	(0-20.0)s	2.0	
50	Digital Input 2	(0-15)	2	Factory default: Low Oil Pressure Warning Input
51	Digital Input 2 Active	(0-1)	0	Factory default: Close to active
52	Digital Input 2 Delay	(0-20.0)s	2.0	
53	Digital Input 3	(0-15)	10	Factory default: Remote Start
54	Digital Input 3 Active	(0-1)	0	Factory default: Close to active
55	Digital Input 3 Delay	(0-20.0)s	2.0	
56	Digital Input 4	(0-15)	11	Factory default: Fuel Level Warn
57	Digital Input 4 Active	(0-1)	0	Factory default: Close to active
58	Digital Input 4 Delay	(0-20.0)s	2.0	
59	Power On Mode	(0-2)	0	0: Stop Mode 1: Manual Mode 2: Auto Mode
60	Module Address	(1-254)	1	Communication address of controller.
61	Passwords	(0-9999)	0318	
62	Crank Disconnect	(0-6)	2	There are 3 conditions of disconnecting starter with engine: Generator Frequency, Magnetic Pickup, Oil Pressure. Each condition can be used alone and simultaneously to separating the start motor and genset as soon as possible. See 7.5
63	Disconnect Magnetic Pickup	(0-3000)r/min	360	When engine speed higher than the set value, starter will be disconnected.
64	Disconnect Gen Freq	(10.0-30.0)Hz	14.0	When generator frequency higher than the set value, starter will be disconnected.
65	Disconnect OP	(0-400)kPa	200	When generator oil pressure higher than the set value, starter will be disconnected.
66	High Temp. Inhibit Enabled	(0-1)	0	Factory default: when high temperature occurs, shutdown alarm is initiated. Note 2
67	Low OP Inhibit Enabled	(0-1)	0	Factory default: when low oil pressure occurs, shutdown alarm is initiated. Note 3
68	Low Fuel Level Inhibit	(0-1)	1	Factory default: when low fuel level occurs, shutdown alarm is initiated. Note 4
69	Config. Sensor Inhibit	(0-1)	1	Factory default: when config. sensor value higher/lower than the set value (particular case depends on the sensor type), shutdown alarm is initiated.



No	Items	Range	Default	Description
70	AC System	(0-3)	0	0: 3P4W; 1: 2P3W 2: 1P2W; 3: 3P3W
71	Temp. Sensor Curve	(0-12)	8	SGX See 7.4
72	Pressure Sensor Curve	(0-12)	8	SGX See 7.4
73	Multiplex Input 1	(0-1)	0	0: Digital Input 3 1: Level Sensor
74	Level Sensor Curve	(0-7)	3	SGD See 7.4
75	Multiplex Input 2	(0-3)	0	0: Digital Input 4 1: Temperature Sensor 2: Oil Pressure Sensor 3: Level Sensor Note 5
76	Config. Sensor Curve	(0-9)	8	SGX
		(0-9)	8	SGX
		(0-5)	3	SGD
77	Poles	(2-64)	4	
78	Temp. Sensor Open	(0-2)	1	0:Indication; 1:Warn; 2:Shutdown (temperature sensor will show “+++”);
79	OP Sensor Open	(0-2)	1	0: Indication (oil pressure sensor will show “+++”); 1:Warn; 2:Shutdown
80	Fuel Level Sensor Open	(0-2)	1	0: Indication (fuel level sensor will show “+++”); 1:Warn; 2:Shutdown
81	Config. Sensor Open	(0-2)	1	0: Indication (LCD display will show “+++”); 1:Warn; 2:Shutdown
82	Cooling Blower On	(0-140)°C	60	It controls the cooling blower to open or close if the output port is configured as Cooling Blower.
83	Cooling Blower Off	(0-140)°C	40	
84	Low Fuel Level Warn	(0-100)%	20	When the liquid level of the external sensor falls below the set value, “Low Fuel Level” timer is initiated. (this only concerns fuel level sensor and does not concern low fuel level warning signal via configurable input port)
85	Gen Over Volt Warn	(30-620)V	253	When genset voltage is over the point, generator over voltage is active. When the point is 620V, generator over voltage is disabled.
86	Gen Under Volt	(30-620)V	193	When generator voltage is under the point, generator under voltage is active. When the point is 30V, generator under voltage is disabled.
87	Gen Over Freq Warn	(0-75.0)Hz	55.0	When generator’s frequency is over the point, generator over frequency is active.
88	Gen Under Freq Warn	(0-75.0)Hz	42.0	When generator frequency is lower than the point, warn alarm signal will be sent.
89	Gen Over Current Warn	(50-130)%	110	When load current is over the point, over



No	Items	Range	Default	Description
	Percentage			current is active. When this value is 0, warn alarm signal won't be sent.
90	High Temp. Warn	(80-140)°C	95	When the temperature value of the external temperature sensor exceeds the set value, "High Temperature" timer is initiated. Detecting only after safety on delay has expired. If the set value is 140, high temperature signal will not be sent (this only concerns external temperature sensor, not high temperature signal via config. input port).
91	Low OP Warn	(0-400)kPa	124	When the external pressure sensor value falls below this set value, "Low Oil Pressure" timer is initiated. Detecting only after safety on delay has expired. If the set value is 0, low oil pressure signal will not be sent (this only concerns pressure sensor and does not concern low oil pressure warning signal via configurable input port)
92	Aux. Sensor Warn	(80-140)°C (0-400)kPa (0-100)%	95	Respective corresponding with 90 temp. sensor, 91 pressure sensor and 84 level sensor in this table.
93	Gen Over Volt Delay	(0-20.0)s	10.0	When generate voltage exceeds shutdown value and last for a while, gen over volt shutdown is active.
94	Gen Over Freq Delay	(0-20.0)s	2.0	When generate frequency exceeds shutdown value and last for a while, gen over freq shutdown is active.
95	Disconnect OP Delay	(0-20.0)s	0.0s	When disconnect conditions include oil pressure and engine oil pressure is higher than disconnect oil pressure delay, the genset is regarded as start successfully and starter will disconnect.
96	Timing Start	(0-1) (0-1)	0 0	0: Disabled; 1:Enabled 0:No-load; 1:On-load
97	Timing Start Circulate	(0-2) (1-31) (0-7) (1-23)h (1-59)min (0-30000)min	0 1 0 0 0 30	0: monthly; 1: weekly; 2:daily Day(0:monthly is active) Week(0:weekly is active) Prohibit start time (h) Prohibit start time (min) Duration
98	Auto Start Inhibited	(0-1)	0	0: Disabled; 1:Enabled
99	Auto Start Circulate Inhibited	(0-2) (1-31)	0 1	0: monthly; 1: weekly; 2:daily Day(0:monthly is active)



No	Items	Range	Default	Description
		(0-7)	0	Week(0:weekly is active)
		(1-23)h	0	Prohibit start time (h)
		(1-59)min	0	Prohibit start time (min)
		(0-30000)min	30	Duration
100	Over Power	(0-2) (0-6000)kW (0-6000)kW (0-3600)s	0 304 290 5	0 Inactive; 1 Warn; 2 Alarm Shutdown Over power setting value Over power warn return Over power delay When power is higher than preset value and duration exceeds than delay, over power warning is active. Return and delay value can be set.
101	Date	Set the date of controller.		
102	Custom Sensor Curve	(0-3)	0	0 Custom temperature sensor 1 Custom pressure sensor 2 Custom level sensor 3 Custom auxiliary sensor Choose sensor which need to be set, input every point(8 points need to be input) resistance and corresponding value(or current, voltage) of curve.

▲Note1: The default value in “No.” column is for HGM420N and the number value needs to minus 5 for HGM410N.

▲Note2: if “high temperature inhibit” is configured, or set auxiliary input as “inhibit high temperature stop” and this input is active, when temperature is higher than the preset value, or high temperature alarm input is active, controller will send warning signal only and not stop the unit.

▲Note3: if “low oil pressure inhibit” is configured, or set auxiliary input as “inhibit low oil pressure stop” and this input is active, when oil pressure is lower than the preset value, or low oil pressure alarm input is active, controller will send warning signal only and not stop the unit.

▲Note4: if “low fuel level inhibit” is configured, or set auxiliary input as “inhibit low fuel level stop” and this input is active, when fuel level is lower than the preset value, or low fuel level alarm input is active, controller will send warning signal only and not stop the unit.

▲Note5: Multiplex Input can be set as “auxiliary input” or “level sensor”; if one of them is set successfully, then the corresponding items are active. For instance, if set “Multiplex Input 3” as “Auxiliary Input”, the related configuration items of auxiliary input 3 are active; if set “Multiplex Input 3” as “Level Sensor”, the related configuration items of level sensor are active;

▲Note6: If default password (0318) isn’t changed, it doesn’t need to input when configuring parameters via PC software; if the password is changed for the first time via PC software, it need to input password in password window.

▲Note7: Between input correct password and LCD back light haven’t got dark, input parameter numbers can enter parameter setting interface when enters “Password Input” again.

▲Note8: In teeth configuration interface, configure teeth status and power large than 20Hz, press start key for auto calculating teeth numbers and press confirm key for changing teeth numbers.



7.2 PROGRAMMABLE OUTPUT 1-5

No	Items	Description
0	Not Used	Output port is deactivated when “Not Used” is selected.
1	Common Alarm	Include all shutdown alarms and warning alarms. When there is warning alarm only, it is not self-lock; when a shutdown alarm occurs, it is self-lock until the alarm is reset.
2	Energized to Stop	Suitable for genset with electromagnet and will active after “stop idle delay”. It is deactivated when the “ETS Solenoid delay” expires.
3	Idle Control	Used for engine which has idles. Close before starting and open in warming up delay; Close during stop idle delay and open when stop is completed.
4	Preheat Control	Close before starting and open before power up;
5	Close Generator	When close time is 0, it’s continuous output.
6	Mains Closed	HGM410N without
7	Open ATS	When close time is 0, it’s disabled.
8	Raise Speed	Close when the generator enters into Warming Up delay (close time: warming up delay) while open when Aux.
9	Drop Speed	Close when the generator enters into Stop Idle delay/ Energized to Stop delay (close time: Stop Idle delay) while open when Aux.
10	Gen Run	Action when genset is starting and disconnect when stop is completed.
11	Fuel Pump Control	Close when fuel level is lower than the “Fuel Pump On” value or when low fuel level warning input is active; Open when fuel level is higher than the “Fuel Pump Off” and low fuel level warning input is deactivated;
12	High Speed Control	Close when the generator enters into Warming Up delay while open after cooling delay.
13	In Auto Mode	The controller is in automatic mode.
14	Fuel Relay Output	Close when the generator enters into Warming Up delay while open after cooling delay.
15	Generator Excite	Output in start period. If there is no generator frequency during safety running, output for 2 seconds.
16	Air Cooler Output	Control air cooler to start/stop according to cooler temperature.
17	Louver Control	Action when genset starting and disconnect when genset stopped completely.
18	Shutdown Alarm	Alarm when genset shutdown.
19	Audible Alarm	When shutdown alarm and warn alarm, audible alarm is set as 300s. In audible alarm output duration, when panel any key or “alarm mute” input is active, it can remove the alarm.
20	Cooler Control	It is controlled by cooler of temperature sensor’s limited threshold.
21~31	Reserved	



7.3 PROGRAMMABLE INPUT 1-4 (ACTIVE WHEN CONNECT GND (B-))

No	Items	Description
0	Not Used	
1	High Temp. Input	If these signals are active after safety on delay, shutdown alarm will be immediately initiated.
2	Low OP Warning Input	
3	Auxiliary Warning	Only warning and not stops if this input is active.
4	Emergency Stop Input	Shutdown alarm will be immediately initiated if this input is active.
5	High Temp. Stop Input	When the gen-set is running normally and this signal is activated, if there is a high temperature situation, the controller will first cool down the generator and then stop it; if the signal is deactivated and a high temperature situation occurs, the controller will shut down the gen-set without cooling down.
6	Generator Closed Input	Connect to auxiliary port of gen load breaker.
7	Mains Closed Input	Connect to auxiliary port of mains load breaker.
8	Inhibit High Temp. Stop	When it is active, prohibit stopping when high temperature occurs. Note 2
9	Inhibit Low OP Stop	When it is active, prohibit stopping when low oil pressure occurs. Note 3
10	Remote Start Input	In Auto mode, when input active, genset can be started and with load after genset is OK; when input inactive, genset will stop automatically.
11	Low Fuel Level Warn	Connected to sensor digital input. The controller sends an warning alarm signal when active.
12	Low Water Level Warn	
13	Low Fuel Level Shutdown	Connected to sensor digital input. The controller sends an shutdown alarm signal when active.
14	Low Water Level Shutdown	
15	Auto Start Inhibit	In Auto mode, if this input is active, whether mains is normal or not, the controller will not give a start command to the generator. If generator is normal running, stop command won't be executed. When this input is deactivated, genset will automatically start or stop according to the mains status (normal or abnormal).
16	Remote Control Input	All buttons in panel is inactive except    and Remote Mode is displayed on LCD. Remote module can switch module mode and start/stop operation via panel buttons.
17	Failed To Charge	Connect to failed to charge output.
18	Panel Lock	All buttons in panel is inactive except    and there is  in the left of fifth row in LCD when input is active.
19	Manual/Auto Switch	When input is active, enter into auto mode automatically, panel buttons and local operation are inactive; When input is inactive, enter into manual mode automatically, remote operation is inhibited.
20	Alarm Mute	Can prohibit "Audible Alarm" output when input is active.
21~31	Reversed	



7.4 SENSOR SELECT

No	Item	Content	Description
1	Temp. Sensor	0 Not used 1 User Defined Resistive Type 2 VDO 3 SGH 4 SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Reserved 10 Reserved 11 Low Digit Input Active 12 High Digit Input Active	Defined resistive range is (0~6000) Ω , default is SGX sensor.
2	Pressure Sensor	0 Not used 1 User Defined Resistive Type 2 VDO 10bar 3 SGH 4 SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Reserved 10 Reserved 11 Low Digit Input Active 12 High Digit Input Active	Defined resistive range is (0~6000) Ω , default is SGX sensor.
3	Fuel Level Sensor	0 Not used 1 User Defined Resistive Type 2 SGH 3 SGD 4 Reserved 5 Reserved 6 Low Digit Input Active 7 High Digit Input Active	Defined resistive range is (0~6000) Ω , default is SGD sensor.



7.5 CONDITIONS OF CRANK DISCONNECT

No	Content
0	Magnetic pickup
1	Generator Frequency
2	Magnetic pickup + Generator Frequency
3	Magnetic pickup + Oil pressure
4	Generator Frequency + Oil pressure
5	Generator Frequency + Magnetic pickup + Oil pressure
6	Oil pressure

- 1) There are 3 conditions to make starter separate with engine; magnetic pickup, generator frequency can be used separately while oil pressure must be used together with magnetic pickup and generator frequency. The aim is to disconnect the starter motor as soon as possible.
- 2) Magnetic pickup is the magnetic equipment which be installed in starter for detecting flywheel teeth.
- 3) When set as magnetic pickup, 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 magnetic pickup, 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 magnetic pickup in crank disconnect setting, the engine speed displayed in controller is calculated by generator signal.

8 PARAMETERS SETTING

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

1. Set Parameters
2. Information
3. Language
4. Event Log
5. Maintenance Setting

a) Parameters Setting

“0318” can set all items in 7.1 during inputting password. When default password has been changed, it needs to input the same password with controller for parameter setting via PC software. If more parameter items need to be set or password is forgotten, such as voltage and current calibration, please contact with the factory.

▲Note:

- 1) **HGM410N**, there are not items 1-5 in 7.1; programmable output 1-4 have no digital outputs about mains.
- 2) 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.
- 3) The over-voltage threshold must be greater than the under-voltage threshold; otherwise over-voltage and under-voltage will occur at the same time.
- 4) The over-speed threshold must be greater than under-speed threshold, otherwise over speed and under speed will occur at the same time.
- 5) Set frequency value (after crank disconnect) as low as possible, in order to disconnect starter quickly.
- 6) Programmable input 1-4 cannot be set as the same items, otherwise it cannot realize correct function; programmable output 1-5 can be set as the same item.
- 7) Digital input 3 can be configured as Fuel Level Sensor. Digital input 4 can be configured as Temperature Sensor, Oil Pressure Sensor and Water Level Sensor. Digital input and sensor need to be picked one: if input is chosen, the corresponding digital input parameter is active and the sensor parameter inactive but saved; otherwise if sensor is chosen, the corresponding sensor parameter is active and the digital input parameter is inactive but saved.
- 8) If need to shut down after cooling, please set any input as “ stop after cooling “, then connect this input to ground; or set high temperature stop action as “cooling stop”

b) Information

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

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

c) LCD contract

Press  and  (or  and ) can adjust LCD contract. Adjustment range is 0-7.

d) Language

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

e) Event Log

Users can check event log (max. 99) on this interface including start/stop info and shutdown alarms.

f) Maintenance Setting

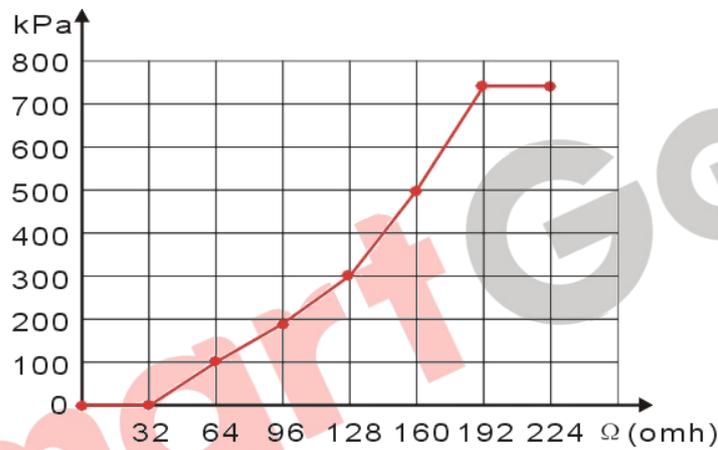
The default password (when enter maintenance setting) is 0 (it needs to contact sales or after sale personnel to change the password). It'll refresh maintenance time after entered maintenance setting.

Remark: It will enter into the next maintenance period after refreshing the time in the maintenance

setting interface.

9 SENSOR SETTING

- 1) 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.
- 2) If there is difference between standard sensor curve and chosen sensor curve, select “defined sensor”, and then input defined sensor curve.
- 3) When input the sensor curve, X value (resistor) must be input from small to large, otherwise, mistake occurs.
- 4) 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.
- 5) The headmost or backmost values in the vertical coordinates can be set as same as below,



Common unit conversion table

	N/m² Pa	kgf/cm²	bar	psi
1Pa	1	1.02×10^{-5}	1×10^{-5}	1.45×10^{-4}
1kgf/cm ²	9.8×10^4	1	0.98	14.2
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1

10 COMMISSIONING

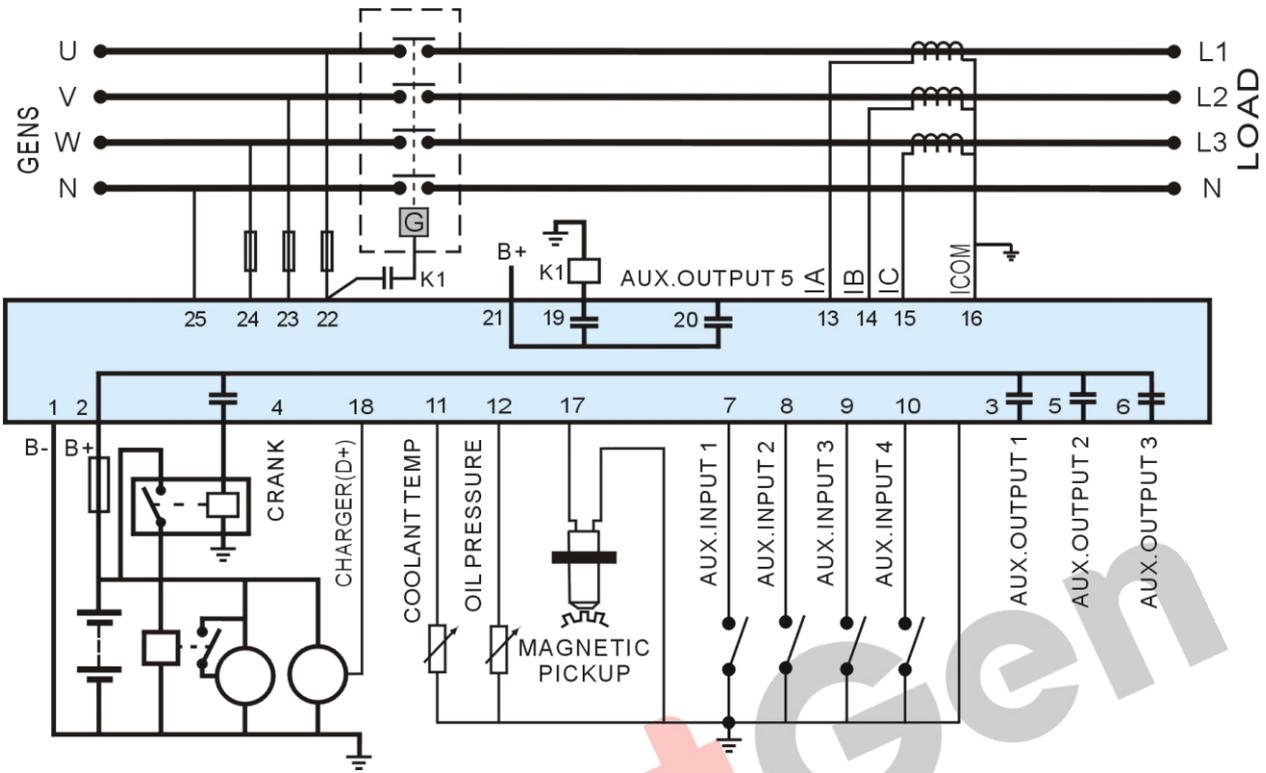
Before operation, the following checking should be carried out:

- 1) Check and ensure all the connections are correct and wires diameter is suitable.
- 2) Ensure that the controller DC power has fuse; 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 “stop” 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 there is 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) 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 it not likes this, please check connections of ATS according to this manual.
- 9) If there are any other questions, please contact SmartGen’s service.

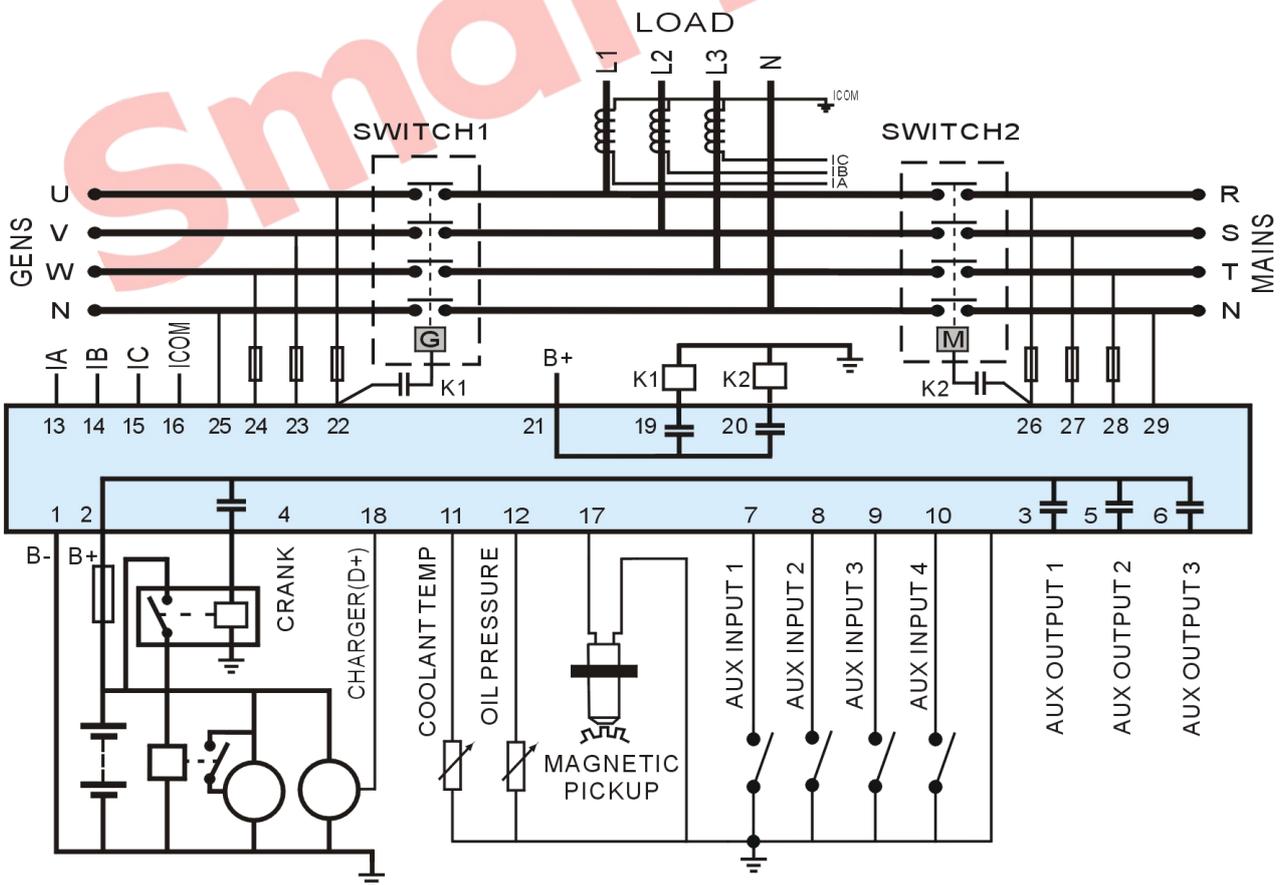


11 TYPICAL APPLICATION

HGM410N Typical wiring diagram

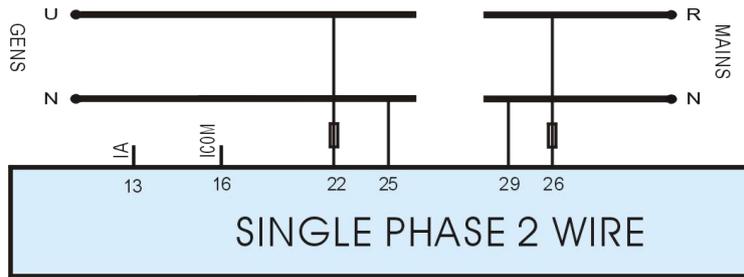


HGM420N Typical wiring diagram

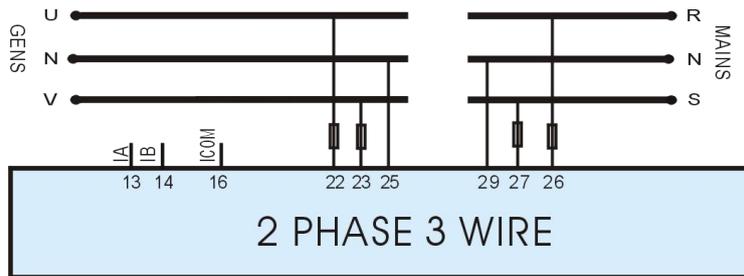




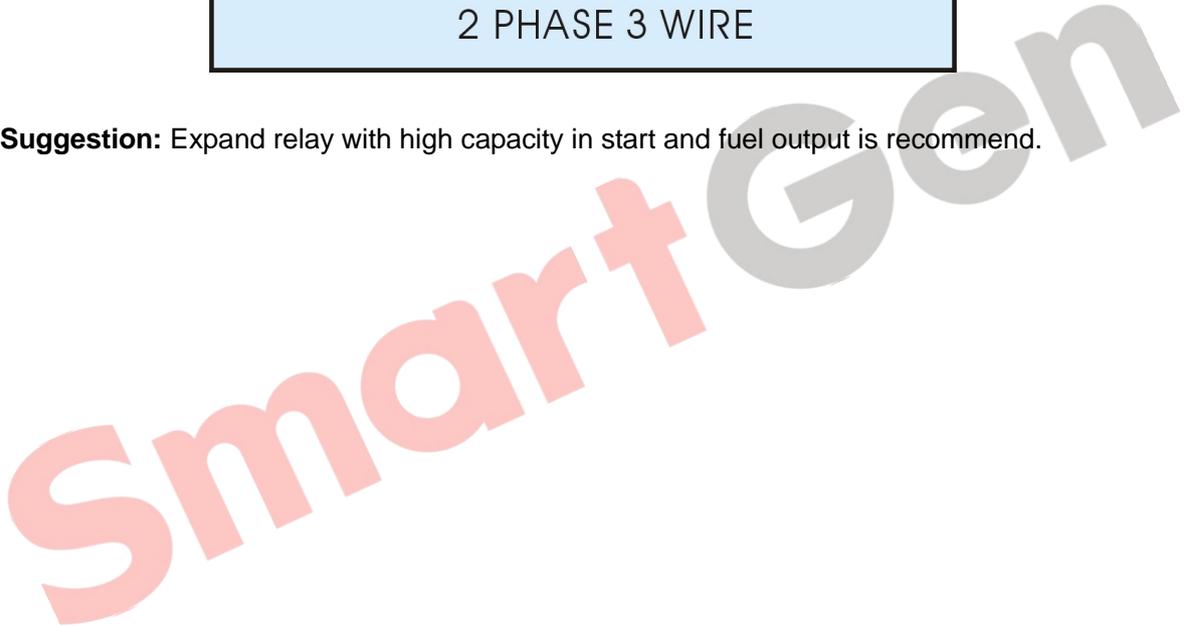
Single Phase 2 Wire (HGM420N)



2 Phase 3 Wire (HGM420N)



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



12 INSTALLATION

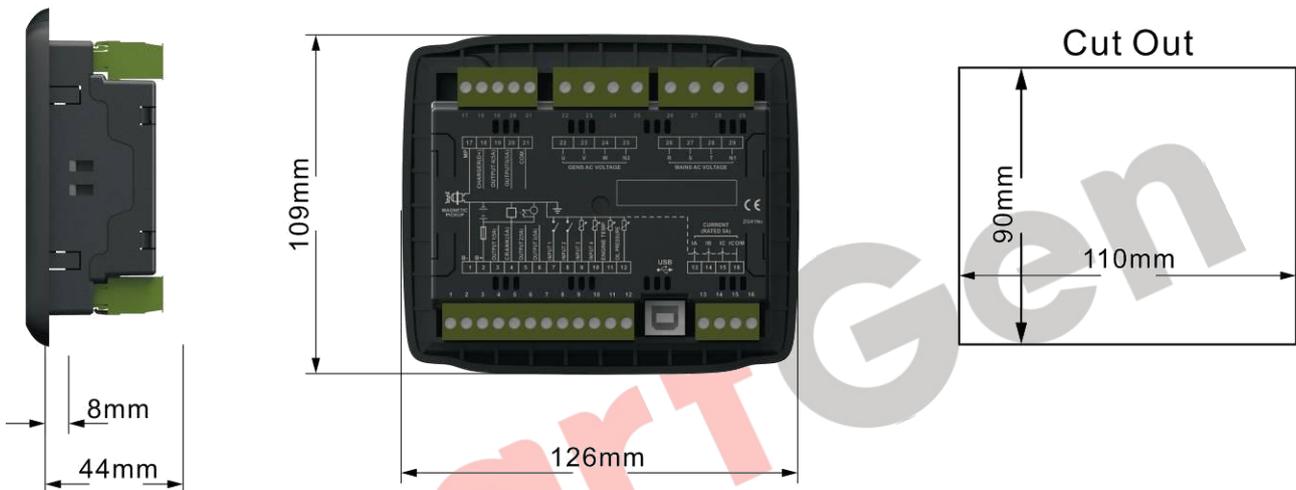
12.1 FIXING CLIPS

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

- 1) Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.
- 2) Pull the fixing clip backwards (towards the back of the module) ensuring four clips are inside their allotted slots.
- 3) Turn the fixing clip screws clockwise until they make contact with the panel.

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

12.2 OVERALL DIMENSION AND Panel CUTOUT



1) **Battery Voltage Input**

HGM400N series controller can suit for widely range of battery voltage DC(8~35)V. Negative of battery must be connected with the engine shell. The diameter of wire from power supply to battery must be over 2.5mm^2 . If floating charge configured, please firstly connect output wires of charger to battery's positive and negative directly, then, connect wires from battery's positive and negative to controller's positive and negative input ports in order to prevent charge disturbing the controller's normal working.

2) **Speed Sensor Input**

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. 1 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.

3) **Output And Expansion Relay**

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, add

resistance-capacitance return circuit (when coils of relay has AC current), in order to prevent disturbance to controller or others equipment.

4) **AC Input**

HGM400N series 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 collected current and active power maybe not correct.

Note: 1. ICOM port must be connected to negative pole of battery.

2. When there is load current, transformer's secondary side prohibit open circuit.

5) **Withdraw Voltage Test**

When controller had been installed in control panel, if need the high voltage test, please disconnect controller's all terminal connections, in order to prevent high voltage into controller and damage it.

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13 FAULT FINDING

Symptom	Possible Remedy
Controller no response with power.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check the water/cylinder temperature is too high or not; Check the genset AC voltage; Check DC fuse.
Low oil pressure alarm after crank disconnect	Check the oil pressure sensor and its connections.
High water temp. alarm after crank disconnect	Check the temperature sensor and its connections.
Shutdown Alarm During Running	Check related switch and its connections according to the information on LCD; Check auxiliary inputs.
Fail to Start	Check fuel circuit and its connections; Check starting batteries; Check speed sensor and its connections; Refer to engine manual.
Starter no response	Check starter connections; Check starting batteries.
Genset running while ATS not transfer	Check ATS; Check the connections between ATS and controllers.