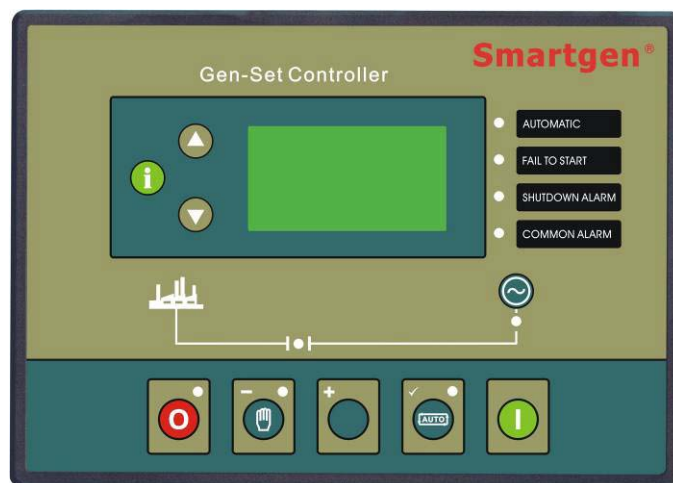


Smartgen®

HGM6400 Automatic Genset Controller

(With J1939 Interface)

USER MANUAL



Smartgen Technology



众智电子 Chinese trademark

Smartgen® English trademark

Smartgen — make your generator *smart*

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Software Version

Date	Version	Note
2008-09-26	1.0	Original release
2008-11-24	1.1	1. Add expansion relay of start, fuel and stop outputs in Typical Application . 2. Add NOTE (inhibit removing starter battery) in terminals description.
2010-07-27	1.2	Optimize some details in the manual.
2011-11-08	1.3	Modify the contents of parameter setting.

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1 SUMMARY

HGM6400 series automatic genset controller (with J1939) which assembles digitization, intelligent and networked techniques is used in automatic and monitor control system of genset to achieve automatic start/stop, data measure, alarm protection and “three remote” functions (remote control, remote measure, remote communication). The controller adopts large liquid crystal display (LCD) and optional Chinese and English interface with easy and reliable operation.

HGM6400 genset controller adopts microprocessor technique with precision measurement of multi parameters, time setting and threshold adjusting and etc.. It can be widely used in all types of automatic genset control system with compact structure, advanced circuits, simple connections and high reliability.

With SAE J1939, it can communicate with engine with J1939 interface. Rotate speed, water temperature, oil temperature and oil pressure can be read directly from the interface and displayed in the LCD screen, users need not to install sensors, which can reduce complex wirings and enhance parameter precision.

2 PERFORMANCE AND CHARACTERISTICS

- **HGM6400** controller has two variants:
 - HGM6410**: Automatic Start Module, it controls generator to start/stop by remote start signal;
 - HGM6420**: Based on **HGM6410**, it adds mains AC monitoring and mains/gens automatic switching control (AMF), especially suitable for the automation system composed by mains and genset.
- Microprocessor control, big screen LCD with back-lit display, optional Chinese and English interface with push-button operation;
- Accurate measuring and display: Real-time monitoring on genset, mains parameter, water temperature, oil pressure and fuel level;
- Can communicate with kinds of engines with J1939 interface, digital isolation technique ensures reliable communication with engine ECU;
- With RS232/RS485 interface, can achieve “three remote” functions via MODBUS protocol;
- Control protection: Automatic start/stop genset, load transfer and alarm protection
- Parameters setting: Allow user to modify setting and store them in internal FLASH memory, the parameters won't be lost even when loss of power.
- Multi temperature, pressure and fuel level sensors can be directly used, parameters can be defined.
- With real-time calendar and clock, hours count function;
- Accumulated electrical energy display of genset;
- Conditions of crank disconnect can be selected;
- Built-in speed/frequency detection can accurately judge crank disconnect, rated running and over speed status;
- 99 sets of event logs can be circularly stored and inquired on the spot;
- Part of parameters can be programmed on site, all parameters can be programmed by

testing software via PC


- (8~35)VDC power supply, adapting to different starter battery voltage environments;
- All parameters use digital modulation, abandoning analog modulation using conventional potentiometer, reliability and stability are enhanced;
- Built-in watch dog can never be dead halt which ensures to execute program smoothly;
- Modular design, flame-retardant ABS shell, embedded mounting, compact structure and easy installation.

3 SPECIFICATION

Item	CONTENT
Operating Voltage	DC8. 0V to 35. 0V, continuous power supply
Power Consumption	<3W(Standby mode: ≤2W)
Alternator Voltage Input:	
3 phase 4 wire	15V AC - 360 V AC (ph-N)
3 phase 3 wire	30V AC - 600 V AC (ph-ph)
1 phase 2 wire	15V AC - 360 V AC (ph-N)
2 phase 3 wire	15V AC - 360 V AC (ph-N)
Alternator Frequency	50 Hz/60Hz
Magnetic AC Voltage	1.0V to 24.0V (RMS)
Magnetic AC Frequency	10,000 Hz (Max.)
Start Relay Output	16 Amp DC28V power supply output.
Fuel Relay Output	16 Amp DC28V power supply output.
Auxiliary Relay Output (1-3)	16 Amp DC28V power supply output.
Auxiliary Relay Output (4-6)	16Amp 250VAC volt-free output
Overall Dimensions	240mm x 172mm x 57mm
Panel Cutout	214mm x 160mm
C. T. Secondary Current	5A (rated)
Working Condition	Temperature: (-25~+70)°C Humidity: (20~90)%
Storage Condition	Temperature: (-30~+80)°C
Protection Level	IP55: when waterproof rubber gasket added between controller and its panel. IP42: when waterproof rubber gasket not added between controller and its panel.
Insulation Intensity	Object: among input/output/power Quote standard: IEC688-1992 Test way: AC1.5 kV/1min 3mA leakage current
Weight	0.90kg

4 OPERATION

4.1 LCD DISPLAY

LCD screen consists of four pages, which can be scrolled by pressing .

Page order:

- Status display
- Measurement data display
- Alarms display
- Event log

● STATUS PAGE

This LCD will show: Generator state, Mains state, Switch closed/ open state.

Mains on load:

<div style="background-color: #00FF00; padding: 5px;"> System in Stop Mode Mains normal Genset at Rest Mains on Load </div>	It indicates that system in stop mode, Mains normal and mains on load.
--	--

Generator on load:

<div style="background-color: #00FF00; padding: 5px;"> System in Manual Mode L-N 220V 300A 50.0Hz L-L 381V 48.7KW Gens on Load </div>	<p>It indicates that system in manual mode; Gens on load.</p> <p>This screen also indicates average line voltage and phase voltage of gens, maximum current, gens frequency and total power.</p>
--	--

● MEASUREMENT DATA PAGE

This page includes:

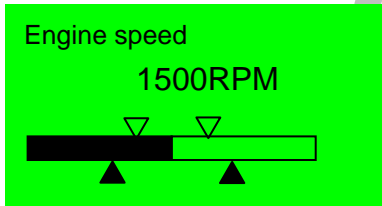
- Engine speed
- Oil Pressure
- Fuel Pressure
- Coolant Temperature
- Engine Oil Temperature
- Accumulated run time/start times/electric energy
- Date/Time
- Battery Voltage
- Charger Voltage
- Gens Phase Voltage
- Gens Line Voltage
- Gens Frequency (Hz)

- Gens Current (fitted mutual inductance)
- Generator Output (active power, reactive power, apparent power, power factor, gens frequency)
- Fuel Level (%)
- Mains Phase Voltage
- Mains Line Voltage
- Mains Frequency (Hz)

NOTE: If enhanced data measurement is selected (supported by the engine manufacturer); the following data will be displayed.

- Engine Fuel Temperature (ECU)
- Inlet Manifold Temperature (ECU)
- Exhaust Temperature (ECU)
- Coolant Pressure (ECU)
- Fuel Pressure (ECU)
- Fuel Consumption (ECU)
- Total Fuel Consumption (ECU)
- Turbocharger Pressure (ECU)

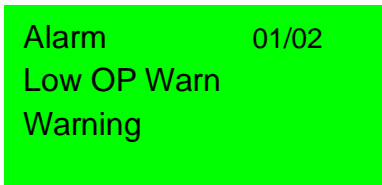
Example: Engine Rotating Speed

 <p>The image shows a green rectangular display area. At the top, it says 'Engine speed' and '1500RPM'. Below this is a horizontal progress bar. The bar is divided into two sections: a solid black section on the left and a white section on the right. Above the bar, there are two hollow triangles pointing downwards, one at the end of the black section and one at the end of the white section. Below the bar, there are two solid black triangles pointing upwards, one at the end of the black section and one at the end of the white section.</p>	<p>Engine speed is 1500RPM. Rectangle indicates current rotating speed; Hollow triangle indicates upper and lower limits of warn value; Solid triangle indicates upper and lower limits of shutdown value or trip value;</p>
--	---

Note: Press  and  to scroll the screen.

● **ALARMS PAGE**

Example: Warning Alarm

 <p>The image shows a green rectangular display area. It contains the text 'Alarm' followed by '01/02' on the same line. Below this, it says 'Low OP Warn' and 'Warning' on two separate lines.</p>	<p>The module is warning that the engine oil pressure has fallen below a preset level. The generator not shutdown.</p>
--	--

Example: ECU Alarm

<div>Alarm 01/01</div> <div>ECU Shutdown</div> <div>Coolant High Temp</div> <div>110, 3, High</div>	The screen displays one of the two alarms: ECU Shutdown; SPN=110; FMI=3: Coolant High Temp
---	---

Note: Press  and  to scroll the screen.










● EVENT LOG


Example: Event Log

<div>Abnormal Shutdown Records</div> <div>Record 01/12</div> <div>Failed to Start</div> <div>2006-01-02 06:03:05</div>	The screen displays one of the 16 shutdown records. The third line indicates alarm type; The fourth line indicates date and time;
--	---


Note: Press  and  to scroll the screen.

4.2 KEY FUNCTION

	Stop/ Reset	When engine is running, press to stop the engine. When an alarm occurs, press to reset alarm. In Stop mode, pressing this key over 3 seconds can test panel indicators. (Lamp Test)
	Start	In Manual or Manual Test mode, pressing this key can start genset.
	Manual / “-”	Set the module into Manual mode. In parameter setting, press this key to decrease parameter value.
	Test/ “+”	Set the module into Manual Test mode. In parameter setting, press this key to increase parameter value.
	Auto/ “√”	Set the module into Auto mode. In parameter setting, pressing this key will shift cursor right or confirm setting (in the forth bit).
	Gens Close/Open	In Manual mode, push this button to make gens on/off load (no matter gens normal or not).
	Mains Close/open	In Manual mode, press the key to make mains on/off load (no matter mains normal or not). HGM6420 ONLY
	Scroll Up	In data measurement page, alarm page and event log page, pressing this key can scroll screen.
	Scroll Down	

	Page Turning	Pressing this key can circularly display status page, data measurement page, alarm page and event page.
---	--------------	---

4.3 AUTOMATIC START/STOP OPERATION

This mode is activated by pressing . LED indicator beside the button is illuminating which confirms this action.

Starting Sequence,














- 1) **HGM6420:** When mains is abnormal (over/under voltage, over/under frequency), enter into "Mains Abnormal Delay" and LCD displays count-down time. When delay is over, "Start Delay" begins.
- 2) **HGM6410:** When "Remote Start" input is active, enter into "Start Delay".
- 3) "Count- down" of start delay is displayed in LCD.
- 4) When start delay is over, preheat relay is outputting (if configured), "Preheat Start Delay XX s" is displayed in LCD.
- 5) When preheat delay is over, fuel relay is outputting 1s and then start relay outputs; if genset failed to start during "Crank Time", the fuel and start relays stop outputting and enter into "Crank Rest Time" and wait for next cranking.
- 6) If genset failed to start within start times, the fourth line of LED will turn black and "Fail to Start" alarm will be displayed.
- 7) Whatever times to start genset successfully, it will enter into "Safety on Time". During this period, alarms of low oil pressure, hi-temperature, under speed, charge failure and Aux. input (be configured) are inactive. As soon as this delay is over, genset will enter into "Start Idle Delay" (if configured).
- 8) During start idle delay, alarms of under speed, under frequency, under voltage are inactive. As soon as this delay is over, genset will enter into "Warming up Delay" (if configured).
- 9) When "Warming up Delay" is over, the indicator is illuminating if gens normal. If voltage and frequency of engine reach the load requirement, close relay is outputting, genset takes load and indicator illuminates; if voltage and frequency of genset abnormal, controller will alarm to shutdown (alarm is displayed in LCD).

Stopping Sequence,

- 1) **HGM6420:** during genset running, if mains normal, enters into "Mains Normal Delay", mains indicator illuminates, "stop delay" begins.
- 2) **HGM6410:** genset enters into "Stop Delay" when "Remote Start" is active.

- 3) When "Stop Delay" is over, genset enters into "Cooling Delay". Gens closing relay is open. After switch "Transfer Rest Delay", mains close relay outputs, mains is taking load, power supply indicator of gens eliminates while indicator of gens illuminates.
- 4) When entering "Stop Idle Delay" (if configured), Idle relay is energized to output.
- 5) When entering "ETS delay", ETS relay is energized to output, fuel relay is open.
- 6) When entering "Genset at Rest", genset will judge whether genset is stopped or not.
- 7) When genset has stopped, enters into standby mode; if genset failed to stop, controller will alarm ("Fail to Stop" alarm will be displayed in LCD).

4.4 MANUAL START/STOP OPERATION

- 1) **HGM6420, Manual Mode** is activated when press  and its indicator illuminates. Press  key, controller enters "**Manual Test Mode**" and indicator illuminates. Under the two modes, press  key to start genset, it can automatically judge crank disconnect and accelerate to hi-speed running. If hi-temperature, low oil pressure, over speed and abnormal voltage occur during genset running, controller can protect genset to stop (detail procedures please refer to No.4~9 of Auto start operation). Under **Manual Mode** , press  or  at any time can control gens/mains to take load or unload. Under **Manual Test Mode** , after genset normally runs in high speed, no matter mains normal or not, load will be transferred to gens.
- 2) **HGM6410: Manual Mode** is active when press  key and its indicator illuminates. Then press  key to start generator, if hi-temperature, low oil pressure, over speed and abnormal voltage occur during genset running, controller can protect genset to stop (detail procedures please refer to No.4~9 of Auto start operation). In **Manual mode** , pressing  key at any time can control gens to take load on or unload.
- 3) **Manual stop:** pressing  key can shutdown the running genset (detail procedures please refer to No.3~7 of Auto stop operation). Press this  key again during stopping, genset will enter into immediate stop process.

5 PROTECTION

5.1 WARNINGS

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

displayed in LCD.

Warnings as following,

No.	Type	Range	Description
1	High Coolant Temperature	From start idle to stop idle	When controller detects water temperature over pre-set value, a warning alarm initiates and displayed in LCD.
2	Low Oil Pressure	From start idle to stop idle	When controller detects fuel level in excess of the pre-set value a warning alarm initiates. Warning is displayed in LCD.
3	Gens Over Speed	Always active	When controller detects engine speed above pre-set, warning alarm signal will be sent and displayed in LCD.
4	Gens Under Speed	From wait for loading to cooling timer	When engine speed is less than pre-set, warning alarm signal will be sent and displayed in LCD.
5	Loss Of Speed Signal	From Start idle delay to stop idle	When speed of genset is 0, warning alarm signal will be sent and displayed in LCD.
6	Gens Over Frequency	Always active	When engine voltage frequency above pre-set, warning alarm signal will be sent, and warning is displayed in LCD.
7	Gens Under Frequency	From wait for loading to cooling timer	When engine voltage frequency is less than pre-set, warning alarm signal will be sent, and warning is displayed in LCD.
8	Gens Over Voltage	From wait for loading to cooling timer	When controller detects engine voltage over pre-set, warning alarm signal will be sent, and warning is displayed in LCD.
9	Gens Under Voltage	From wait for loading to cooling timer	When engine voltage is less than pre-set, warning alarm signal will be sent, and warning is displayed in LCD.
10	Gens Over Current	Always active	When controller detects gens current above the pre-set value, a warning alarm initiates and displayed in LCD.
11	Fail To Stop	ETS delay/after genset at rest	When ETS delay is over, if genset output with power, a warning alarm signal will be sent and displayed in LCD.
12	Low Fuel Level	Always active	When controller detects fuel level below pre-set value, a warning alarm initiates and displayed in LCD.

No.	Type	Range	Description
13	Charge Failure	From start idle to stop idle	When controller detects charger voltage under the pre-set, a warning alarm initiates and displayed in LCD.
14	Battery Under Voltage	Always active	When start battery voltage under the pre-set value a warning alarm initiates. Warning is displayed in LCD.
15	Battery Over Voltage	Always active	When controller detects start battery voltage above the pre-set value a warning alarm initiates and displayed in LCD.
16	Aux. Input 1-6	User defined	When controller detects auxiliary input 1-6 warning input, warning alarm signal will be sent and displayed in LCD.
17	ECU Warning	Always active	If the module receives an "error" message from ECU, a warning alarm initiates, and "Can ECU Error" is displayed in LCD.
NOTE: warning of auxiliary input is active after configured by users			

5.2 SHUTDOWN ALARMS

Shutdowns are latching and stop the Generator. The alarm must be cleared, and the fault removed to reset the module.

Shutdown alarms are shown as below,

No.	Type	Range	Description
1	Emergency Stop	Always active	When controller detects an emergency stop signal, a warning alarm is sent and displayed in LCD.
2	High Coolant Temp	From start idle to stop idle	When controller detects water temperature over pre-set value, a warning alarm initiates and displayed in LCD.
3	Low Oil Pressure	From start idle to stop idle	When controller detects fuel level in excess of the pre-set value a warning alarm initiates. Warning is displayed in LCD.
4	Gens Over Speed	Always active	When controller detects engine's speed is above pre-set, warning alarm signal will be sent and displayed in LCD.
5	Gens Under Speed	From wait for loading to cooling timer	When engine's speed is less than pre-set, warning alarm signal will be sent and displayed in LCD.
6	Loss Of Speed Signal	From start idle to stop idle	When the speed of genset is 0, warning alarm signal will be sent and displayed in LCD.

No.	Type	Range	Description
7	Gens Over Frequency	Always active	When engine voltage frequency is above pre-set, warning alarm signal will be send, and warning is displayed in LCD.
8	Gens Under Frequency	From wait for loading to cooling timer	When engine voltage frequency is less than pre-set, warning alarm signal will be send, and warning is displayed in LCD.
9	Gens Over Voltage	From wait for loading to cooling timer	When engine voltage is over pre-set, warning alarm signal will be sent, and warning is displayed in LCD.
10	Gens Under Voltage	From wait for loading to cooling timer	When engine voltage is less than pre-set, warning alarm signal will be sent, and warning is displayed in LCD.
11	Gens Over Current	Always active	When controller detects gens current above the pre-set value, a warning alarm initiates and displayed in LCD.
12	Failed To Start	Within set start times	If genset failed to disconnect crank within set start attempts, a warning alarm signal will be sent and displayed in LCD.
13	Oil Pressure Sensor Open	Always active	When controller detects oil sensor open circuit, a warning alarm initiates and displayed in LCD.
14	Aux. Input 1-6	User defined	When controller detects auxiliary input 1-6 warning input, warning alarm signal will be sent and displayed in LCD.
15	ECU Warning	Always active	If the module receives an "error" message from ECU, a warning alarm is generated, and "Can ECU Error" is shown in LCD.
16	ECU COM Failure	Disabled in Stop or standby mode	If the module cannot detect CAN, a warning alarm is generated and displayed in LCD.

NOTE: Shutdown Alarm Of Auxiliary Input Is Enabled After Configured By Users

5.3 ELECTRICAL TRIPS



Electrical trips are latching and stop the Generator but in a controlled manner. On initiation of the electrical trip condition the module will de-energies the '**Close Generator**' Output to remove the load from the generator.

No.	Type	Range	Description
1	Gens Over Current	Always active	When controller detects genset current over the pre-set, a warning alarm initiates and displayed in LCD.
2	Aux. Input 1-6	User defined	When controller detects auxiliary input 1-6 trip alarm, a shutdown alarm initiates and displayed in LCD.

Note: Trip alarm of Auxiliary Input is enabled after configured by users.

6 PANEL CONFIGURATION

6.1 PARAMETER SETTING


Pressing  and  key can enter into password interface. (See Fig1)

Press “-” or “+” to input password. (Range of 0-9); press “√” to shift bit right. In the forth bit, press “√” again to confirm. If the password is correct, enter the parameter setting interface (See Fig 2). If password is incorrect, exit directly.

The default password is “1234” which can be user defined.

During setting parameters, pressing “-” or “+” can scroll screen, press “√” to enter the chosen item. The first digital of the current value turns black. (See Fig 3) Press “-” or “+” to adjust the value, press “√” to shift bit and confirm in the forth bit. (See Fig 4)

If the setting value is out of range, it cannot be saved. If correct, the value can be permanently stored in internal FLASH of the controller.

Pressing  at any time can exit and back to main interface. If no key operation in 3 seconds, automatically back to main menu.

Configurable parameters are shown as below:

Items	Range	Default	Notes
01 Low OP 1 (Warn)	(1-399)kPa	124kPa/18.0PSI	Return: 138kPa/20.0PSI
02 Low OP 1 (Shutdown) *3	(0-398)kPa	103kPa/14.9PSI	

Fig1

Parameter Setting
Input Password

0000

Fig2

Parameter Setting
01 Low OP Warn
Range: (0-400) kPa
0124 Return: 0138

Fig3

Parameter Setting
01 Low OP Warn
Range: (0-400) kPa
0124 Return: 0138

Fig4

Parameter Setting
01 Low OP Warn
Range: (0-400) kPa
0124 Return: 0130

Items	Range	Default	Notes
03 High Temp.1 (Warn)	(81-139)°C	90°C/194°F	Return: 88°C/190°F
04 High Temp.1 (Shutdown)*4	(82-140)°C	95°C/203°F	
05 Fuel Level (Warn)	(0-100)%	10%	Analog quantity
06 Start Delay	(0-9999)s	5s	Timer
07 Pre-Heat Delay	(0-300)s	0s	Timer
08 Crank Time	(3-60)s	8s	Timer
09 Crank Rest Time	(3-60)s	10s	Timer
10 Safety Run Time	(1-60)s	10s	Timer
11 Over Speed/Shoot Delay	(0-10)s	2s	Timer
12 Start Idle Time	(0-3600)s	10s	Timer
13 Warming Up Time	(0-3600)s	30s	Timer
14 Transfer Rest Time	(0-600)s	2s	Timer
15 Stop Delay	(0-9999)s	30s	Timer
16 Cooling Time	(0-3600)s	60s	Timer
17 Stop Idle Time	(0-3600)s	10s	Timer
18 ETS Time	(0-120)s	20s	Timer
19 Over Stop Time	(10-120)s	30s	Timer
20 Gens Transient Delay	(0-30)s	5s	Timer
21 Mains Transient Delay *1	(0-30)s	2s	Timer
22 Mains Under Volt (Trip) *1	(50-360V/624) *2	184V	Return: 207V
23 Mains Over Volt (Trip) *1	(50-360V/624) *2	276V	Return: 253V
24 Mains Low Freq. (Trip) *1	(0-75)Hz	45.0Hz	Return: 48.0Hz
25 Mains High Freq. (Trip) *1	(0-75)Hz	55.0Hz	Return: 52.0Hz
26 Gens Under Volt (Shutdown)	(50-360V/624) *2	184V	
27 Gens Under Volt (Warn)	(50-360V/624) *2	196V	Load: 207V

Items	Range	Default	Notes
28 Gens Over Volt (Warn)	(50-360V/624) *2	265V	Return: 253V
29 Gens Over Volt (Shutdown)	(50-360V/624) *2	273V	
30 Gens Low Freq. (Shutdown)	(0-74.8)Hz	40.0Hz	
31 Gens Low Freq. (Warn)	(0.1-74.9Hz)	42.0Hz	Load: 45.0Hz
32 Gens High Freq. (Warn)	(0.1-74.9)Hz	55.0Hz	Return: 52.0Hz
33 Gens High Freq. (Shutdown)	(0.2-75)Hz	57.0Hz	
34 Over Current Percentage	(50-120%)	100%	Analog quantity
35 Flywheel Teeth	(10-500)	118	
36 Under Speed (Shutdown)	(0-5998)RPM	1270RPM	
37 Under Speed (Warn)		Disable	
38 Over Speed (Warn)		Disable	
39 Over Speed (Shutdown)	(2-6000)RPM	1710RPM	
40 Over Shoot Percentage	(0-10%)	0	Analog quantity
41 Battery Under Volt (Warn)	(0-39.9)V	8.0V	Analog quantity
42 Battery Over Volt (Warn)	(0.1-40)V	33.0V	Analog quantity
43 Charge Failure (Warn)	(0-39)V	6.0V	Analog quantity
44 Language Select	(0-1)	0	0: Chinese; 1:English
45 Password	(0-9999)	1234	Digital numbers
46 Low OP 2 (Warn)	(1-399)kPa	124	Return: 138kPa/20.0PSI
47 Low OP 2 (Shutdown)	(0-398)kPa	103	
48 High Temp. 2 (Warn)	(81-139)°C	81°C/194°F	Return: 88°C/190°F
49 High Temp. 2 (Shutdown)	(82-140)°C	82°C/194°F	




Items	Range	Default	Notes
50 Current Transformer	(5-6000:5A)	500A	Load: 500A
51 OP Sensor 1 Select	(1-14)	9	SGX 10Bar
52 Temp. Sensor 1 Select	(1-13)	7	SGX 120°C
53 Fuel Level Sensor Select	(1-11)	4	VDO Range: (10-180)Ω
54 OP Sensor 2 Select	(1-14)	Not used	
55 Temp. Sensor 2 Select	(1-13)	Not used	
56 Module Address	(1-254)	1	
Note: *1: HGM6410 controller doesn't have the item. *2: 360V for phase voltage, 624V for line voltage (3 phase 3 wires). *3: When set low oil pressure (shutdown) value as 0, not shutdown. *4: When high temperature (shutdown) value as 140, not shutdown.			

Other parameters configuration, (only adjust via PC software)

Parameter	Default
J1939 Enable	Disable
J1939 Enhanced Data Enabled	Disable
Alternator AC Voltage Sensing	Yes
Generator Pole Number	4
Magnetic Pickup Select	Yes
AC System	3P4W
Fast On Load Mode	No
Crank Times	3
Switch Breaker Select When Mains Abnormal	No action (only HGM6420)
Voltage Transformer	No
Fuel Pump Control	No
Digital Input 1	Remote start on load, close to activate.
Digital Input 2	High temperature input, shutdown, close to activate (from safety on over).
Digital Input 3	Low oil pressure input, shutdown, close to activate (from safety on over).
Digital Input 4	Low oil level input, warning, close to activate, (always activate).

Parameter	Default
Digital Input 5	High oil temperature input, shutdown, close to activate (from safety on over).
Digital Input 6	External alarm input, shutdown, close to activate (always activate).
Digital Output 1	From pre-heat output to start
Digital Output 2	Common alarm
Digital Output 3	ETS solenoid output
Digital Output 4	Idle /high speed control
Digital Output 5	Gens close output
Digital Output 6	Close mains (HGM6420); Not used (HGM6410)
LED1	System in Auto mode
LED2	Fail to start
LED3	Common shutdown alarm
LED4	Common alarm
Full Load Current (Rated)	500A
Over Load Current	100%(500A)
Over Current Delay Multiplier	36
Action (Over Current)	Electrical trip shutdown
Generator Frequency (Crank Disconnect)	15Hz
Engine Speed (Crank Disconnect)	450RPM
Oil Pressure (Crank Disconnect)	Not used
Detect Oil Pressure During Cranking	No
Scheduled Start Genset	No

6.2 DATE/TIME SETTING

Pressing  and  can enter the Data/Time Setting interface. The first digital of the forth line turns black display. Press “-” or “+” to input values (Rang of 0-9); Press “√” to shift bit right, and press “√” again in the forth bit to confirm setting and exit. Press  key directly can exit the editor without saving the setting.





Setting sequence: year-month-day (week) hour-minute-second

Date /Time Setting
 Current Time:
 05-06-16 (4) 23:32:00
 05-06-16 (4) 23:32:00

Note: Parameter and date/time must be set in Stop Mode.

7 DEFINITION OF INPUTS AND OUTPUTS

7.1 DIGIT INPUTS 1-6

Types	Description
User Defined	User can define the following functions: Indication: annunciation only, no alarm or shutdown; Warning: alarm only, no shutdown; Shutdown: alarm and shutdown; Electrical Trip: alarm/off-load generator, shutdown after cooling; Never active: The input is inactive; Always active: The input is always active; Active from start: The input is only active once generator is started; Active from safety on: Auxiliary inputs are only active once the safety on timer has timed out.
Alarm Mute	When active, this will disable an output configured as “Audible Alarm”.
Alarm Reset	It can reset shutdown alarm and electrical trip alarm.
Auto Stop Inhibit	In Auto mode, when the input is active, automatic stop is inhibited. (Only HGM6420)
Auto Start Inhibit	In Auto mode, when the input is active, automatic start is inhibited.
Mains Abnormal I	When the input is active, mains abnormal. (Only HGM6420)
Gens Close	It should be connected to auxiliary contact of load switching device.
Gens On-Load Inhibit	If generator has taken load, this input is inactive; if not, activating this input will inhibit generator to take load.
Lamp Test	When the input is activated, all LED indicators will illuminate.
Main Closed	It should be connected to auxiliary contact of load switching device.
Mains On-Load Inhibit	When the input is active, inhibit mains to take load; If already on load, activating this input will unload the mains supply. (Only HGM6420)
Panel Lock	When the input is active, not all keys are on its function except for  ,  and  ; the first screen of LCD displays  .
Remote Start (On Load)	In Auto mode, when this input is active, genset starts automatically, genset runs normally to take load. When input is inactive, genset stops automatically.

Types	Description
Remote Start (Un-Load)	In Auto mode, when this input is active, genset starts automatically, genset runs normally without taking load. When input is inactive, genset stops automatically.
Timing Start Inhibit	In Auto mode, when the input is active, to scheduled start genset is inhibited.
Analog Mains Normal	In Auto mode, when the input is active, mains normal; unless this input is inactive and mains detection inactive, genset will start automatically. (Only HGM6420)

Note: Digital input 1-6 only can be configured via PC software.

7.2 DIGIT OUTPUTS 1-6

Content	Description
Not Used	
Air Flap Control	The output controls the closing of the air-flaps in an Emergency Stop or Over Speed situation.
Audible Alarm	This output can connect an external alarm indicator when the module triggering a warning, shutdown or electrical trip
Battery High Voltage	This output indicates that a Battery High Voltage alarm has occurred.
Battery Low Voltage	This output indicates that a Battery Low Voltage alarm has occurred.
ECU Power	Used for ECU connection
ECU Stop	Used for ECU connection
Reversed	
Start Relay Output	The output is active when generator cranks and inactive after crank has disconnected.
Fuel Relay Output	The output is active when generator starts and inactive when genset at rest.
Timing Start Active	This output indicates that a scheduled run is in progress.
Charge Failure	This output indicates that a failure of the auxiliary charging alternator on the generator has occurred.
Gens Close	This output source is intended to be used to control the load switching device.
Gens Pulse Close	This control source will be active for the duration of the 'Breaker Close Pulse Timer'. Once this timer has expired, the output source will once again become inactive.

Content	Description
Mains Close	This output source is intended to be used to control the load switching device.
Mains Pulse Close	This control source will be active for the duration of the 'Breaker Close Pulse Timer'. Once this timer has expired, the output source will once again become inactive.
Under/Over Freq Shutdown	The output indicates that either an under frequency or over frequency shutdown has been activated.
Under/Over Freq Warning	The output indicates that either an under frequency or over frequency warning has been activated.
Under/Over Volt Shutdown	The output indicates that either an under voltage or over voltage shutdown has been activated.
Under/Over Volt Warning	The output indicates that either an under voltage or over voltage warning has been activated.
Common Alarm	The output indicates that a warning, shutdown alarm or electrical trip has been activated.
Common Electrical Trip	The output indicates that an electrical trip alarm has been activated.
Common Shutdown Alarm	The output indicates that a shutdown alarm has been activated.
Common Warning Alarm	The output indicates that a warning alarm has been activated.
High Temp. 1 Warning	This output indicates that a high engine temperature ¹ warning has occurred.
High Temp. 1 Shutdown	This output indicates that a high engine temperature ¹ shutdown has occurred.
Cooling Timer In Progress	This output source will be active when the cooling off-load timer is running.
Reserved	
Digital Input 1-6 Active	Action when digital input 1-6 is active.
Emergency Stop	An Emergency stop alarm has occurred.
ETS Output	This output is active during ETS delay.
Fail To Start	It indicates that the engine has not started after the specified start times.
Fuel Pump Control	It is used to control a fuel transfer pump. It is controlled by "fuel pump on" level and "fuel pump off".

Content	Description
Gens Available	It indicates generator is in normal running and in cooling progress.
Gens Over Freq Warning	It indicates that a Generator Over Frequency Warning has occurred.
Gens Over Freq Shutdown	It indicates that a Generator Over Frequency Shutdown has occurred.
Gens Over Volt Warning	It indicates that a Generator Over Voltage Warning has occurred.
Gens Over Volt Shutdown	It indicates that a Generator Over Voltage Shutdown has occurred.
Gens Under Freq Warning	It indicates that a Generator Under Frequency Warning has occurred.
Gens Under Freq Shutdown	It indicates that a Generator Under Frequency Shutdown has occurred.
Gens Under Volt Warning	It indicates that a Generator Under Voltage Warning has occurred.
Gens Under Volt Shutdown	It indicates that a Generator Under Voltage Shutdown has occurred.
Louver Control	The output controls the opening of the louvers on engine starting and closure when engine has stopped.
Low Fuel Level	It indicates that the fuel level has fallen below the low fuel alarm point.
Loss Of Speed Signal	It indicates that a loss of speed alarm has occurred.
Mains Abnormal	This output will become active whenever the mains voltage or frequency goes out of limits, or if the auxiliary mains failure input active.
Mains Over Freq	It indicates the incoming AC mains supply has exceeded the frequency limit setting.
Mains Over Volt	It indicates AC mains supply voltage has exceeded the voltage limit setting.
Mains Under Freq	It indicates that AC mains supply has fallen below the frequency limit setting.
Mains Under Volt	It indicates that AC mains supply voltage has fallen below the voltage limit setting.
OP1 Low Warning	This output indicates that low oil pressure ¹ warning has occurred.


Content	Description
OP1 Low Shutdown	It indicates that low oil pressure ¹ shutdown has occurred.
OP Sensor Open Circuit	It indicates that the module has detected an open circuit failure in the Oil Pressure transducer circuit.
Gens Open	This output source is intended to be used to control the load switching device.
Gens Pulse Open	This output source is intended to be used to control the load switching device. This control source will be active for the duration of the 'Breaker Open Pulse Timer'.
Mains Open	Whenever the module selects the generator to be on load this control source will be active.
Mains Pulse Open	This output source is intended to be used to control the load switching device. This control source will be active for the duration of the 'Breaker open Pulse Timer'.
Over Current Warning	This output indicates that the over-current warning level has been reached.
Over Current Trip	This output indicates that the over-current trip level been reached.
Over Speed Warning	It indicates that an over speed warning has occurred.
Over Speed Shutdown	This output indicates that an over speed shutdown has occurred.
Pre-Heat (During Preheat Timer)	Pre-heat output is available from preheat delay to cranking begins.
Pre-Heat (Until End Of Cranking)	Pre-heat output is available from preheat delay to cranking ends.
Pre-Heat (Until End Of Warming Up)	Pre-heat output is available from preheat delay to warming up ends.
Pre-Heat (Until End Of Safety On)	Pre-heat output is available from preheat delay to safety run ends.
Breaker Open	This output source is intended to be used to control the load switching device.
System In Test Mode	This output indicates that the module is in the Manual Test mode.
System In Auto Mode	The output indicates that the module is in the Auto mode.
System In Manual Mode	This output indicates that the module is in the Manual mode.



Content	Description
System In Stop Mode	The output indicates that the module is in the Stop mode.
Under Speed Warning	This output indicates that an under speed warning has occurred.
Under Speed Shutdown	This output indicates that an under speed shutdown has occurred.
Auto Stop Inhibit	This output indicates that an auto STOP inhibit has occurred.
Idle/High Speed Control	This output is active from cranking until the start idle timer has elapsed; Also this output is active from stop idle timer, continues to be active until the engine has stopped.
Pre-oil Supply	This output is active from cranking, continues to be active until the safety timer has elapsed.
Acceleration Control	This output is active during the warming up timer.
Excite Generator	This output is available for the period of the crank timer. This output will energize for 2 second during the period of the safety on timer if generator has no voltage.
Deceleration Control	This output is available during the period of the coolant down timer, and remain until the engine has stopped.
Oil Lubricate Output	This output is active from preheat, continues to be active until the safety timer has elapsed.
High Temperature2 Warning	This output indicates that high engine coolant temperature 2 warning has occurred.
High Temperature2 Shutdown	This output indicates that high engine coolant temperature 2 shutdown has occurred.
OP2 Low Warning	It indicates that low oil pressure 2 warning has occurred.
OP2 Low Shutdown	It indicates that low oil pressure2 shutdown has occurred.
ECU COM Fail	When communication failed, this output is active
ECU Warning	When receiving ECU warning message, this output is active
ECUShutdown	When receiving shutdown message, this output is active

Note: Output 1-6 only can be set via PC software.

8 EVENT LOG

HGM6410/6420 controller can maintain a log of max. 99 shutdown alarms, along with the date/time, to enable the operator to view the past alarms history. Only shutdown and electrical trip alarms are logged; warning alarms are not logged. Once the log is full (99 shutdown alarms), any subsequent shutdown alarms will overwrite the oldest entry in the log. Hence the log will always contain the 99 most recent shutdown alarms.

Press  key to turn pages and enter event log interface. (See form below)

Pressing  or  key can view the records.

Abnormal Shutdown Records	
RECORD	01/99
FAIL TO START	
05-02-12 (6) 08:12:09	

Abnormal Shutdown Records	
RECORD	02/99
UNDER SPEED	
05-07-05 (2) 08:12:09	

9 COMMISSIONING

Before operation, the following checking should be carried out:

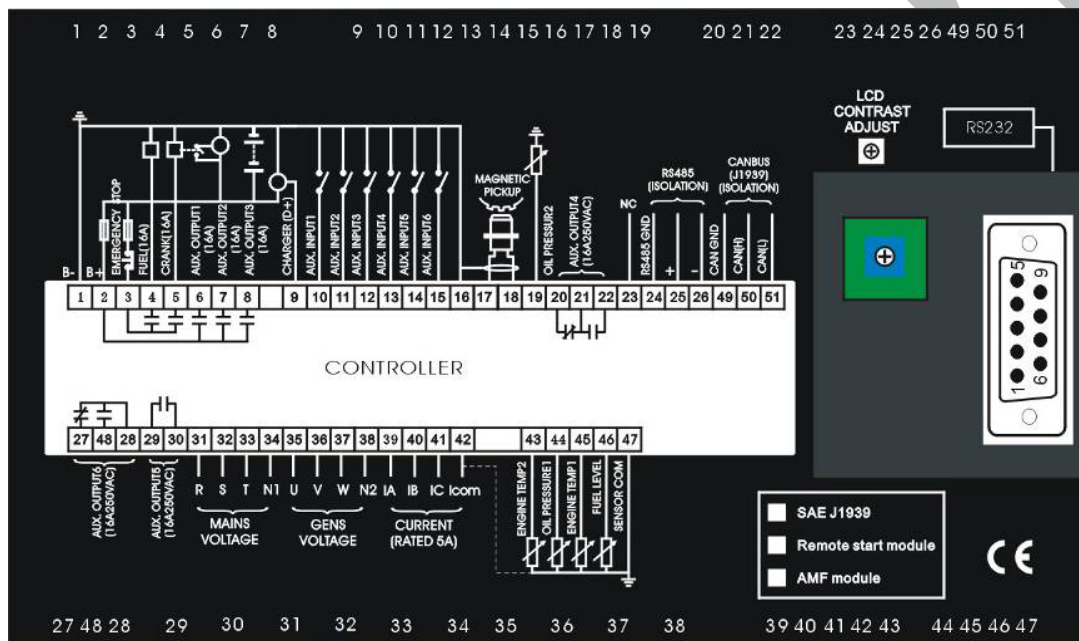
1. Check and ensure all the connections are correct and wires diameter is suitable.
2. Ensure that the controller DC power has insurance; battery positive and negative have correctly connected.
3. Emergence stop input must be connected to positive of starting battery via normally close contact of emergency stop.
4. Take proper actions to prevent engine to disconnect crank (e. g. Remove the connections of fuel value). If checking is OK, connect the power of start battery.
5. Press the "Start" key, genset begins cranking. If failed with specified start times, controller will send Fail to Start alarm signal. Press "Reset" key to reset the controller.
6. Set controller as Manual Mode, recover actions of preventing engine to disconnect crank (e. g. Connect wire of fuel value), press "start" button again, genset will start. If everything goes well, genset will normal run after idle running (if configured). During this period, watch for engine's running situations and voltage and frequency of alternator. If abnormal, stop genset and check all connections according to this manual.
7. Select the Auto Mode from front panel, connect to mains signal. After the mains normal

delay, controller will transfer ATS (if configured) and into mains load. After cooling, controller will stop genset and into standby state until mains abnormal again.

8. When mains abnormal again, genset will start automatically and into normal running, send signal to make gens close, transfer ATS and make genset take load. If not like this, please check connections of ATS according to this manual.
9. If there are any other questions, please contact Smartgen's technical personnel.

10 REAR PANEL

The rear panel of **HGM6420/HGM6410** is shown as follows:



Terminals description,

Pin	Function	Diameter	Description
1	DC Plant Supply B-	2.5mm ²	Connect to starting battery negative
2	DC Plant Supply B+	2.5mm ²	Connect to starting battery positive. (Recommended 20A fuse)
3	Emergency Stop Input	2.5mm ²	Plant Supply B+ from Emergency stop Recommended 20A fuse
4	Fuel Relay Output	2.5mm ²	Plant Supply B+ from pin 3. 16 Amp rated.
5	Start Relay Output	2.5mm ²	Plant Supply B+ from pin 3. 16 Amp rated.
6 ~ 8	Auxiliary Output 1-3	2.5mm ²	Plant Supply B+. 16 Amp rated.
9	Charge Failure / Excite	1.0mm ²	Alt. D+ terminal input, do not connect to GND.
10 ~ 15	Auxiliary Input 1-6	1.0mm ²	Digital input

Pin	Function	Diameter	Description
16	Magnetic Pickup Common	1.0mm ²	Connect to shield layer of magnetic pickup.
17	Magnetic Pickup +Ve	1.0mm ²	Connect to Magnetic Pickup device with one end grounded.
18	Magnetic Pickup -Ve	1.0mm ²	
19	Oil Pressure Sensor 2	1.0mm ²	OP sensor2 input, connect to a resistor sensor.
20	Auxiliary Output 4	2.5mm ²	Free voltage contacts. 16 Amp rated.
21			
22			
23	Not Connected	-	
24	RS485 Common	0.5mm ²	Use only 120Ω approved cable with one end grounded.
25	RS485 (+)	0.5mm ²	
26	RS485 (-)	0.5mm ²	
27 48 28	Auxiliary Output 6 (Mains Close Output)	2.5mm ²	Free voltage contacts, N/C, 16 Amp rated.
29 30	Auxiliary Output 5 (Gens Close Output)	2.5mm ²	Free voltage contacts, N/O, 16 Amp rated.
31	Mains A Voltage Sensing	1.0mm ²	Connect to mains A phase (Recommend 2A fuse)
32	Mains B Voltage Sensing	1.0mm ²	Connect to mains B phase (Recommend 2A fuse)
33	Mains C Voltage Sensing	1.0mm ²	Connect to mains C phase (Recommend 2A fuse)
34	Mains Neutral Input	1.0mm ²	Connect to mains Neutral.
35	Genset A Voltage Sensing	1.0mm ²	Connect to Generator A phase (Recommend 2A fuse)
36	Genset B Voltage Sensing	1.0mm ²	Connect to Generator B phase (Recommend 2A fuse)
37	Genset C Voltage Sensing	1.0mm ²	Connect to Generator C phase (Recommend 2A fuse)
38	Genset Neutral Input	1.0mm ²	Connect to Genset Neutral (Recommend 2A fuse)
39	CT A Phase Sensing	2.5mm ²	Connect to secondary coil, rated 5A
40	CT B Phase Sensing	2.5mm ²	Connect to secondary coil, rated 5A
41	CT C Phase Sensing	2.5mm ²	Connect to secondary coil, rated 5A
42	CT Common	2.5mm ²	Connect to battery negative (GND)
43	Temp. Sensor 2 Input	1.0mm ²	Connect to temperature resistor sensor 2.
44	OP Sensor 1 Input	1.0mm ²	Connect to oil pressure resistor sensor 1.

Pin	Function	Diameter	Description
45	Temp. Sensor 1 Input	1.0mm ²	Connect to temperature resistor sensor 1.
46	Liquid Level Sensor Input	1.0mm ²	Connect to liquid Level resistor sensor.
47	Sensor Common	1.0mm ²	Sensor common port, connect to shell or negative of starter battery.
49 50 51	CAN (SAE J1939)	0.5mm ²	Use 120Ω RS485 screen and screen must be grounded at one end.
	RS232		To PC(2-RXD、3-TXD、5-GND)
	Potentiometer		To adjust LCD contrast

Note: Prohibit removing start battery during engine running, otherwise high voltage will damage the controller!

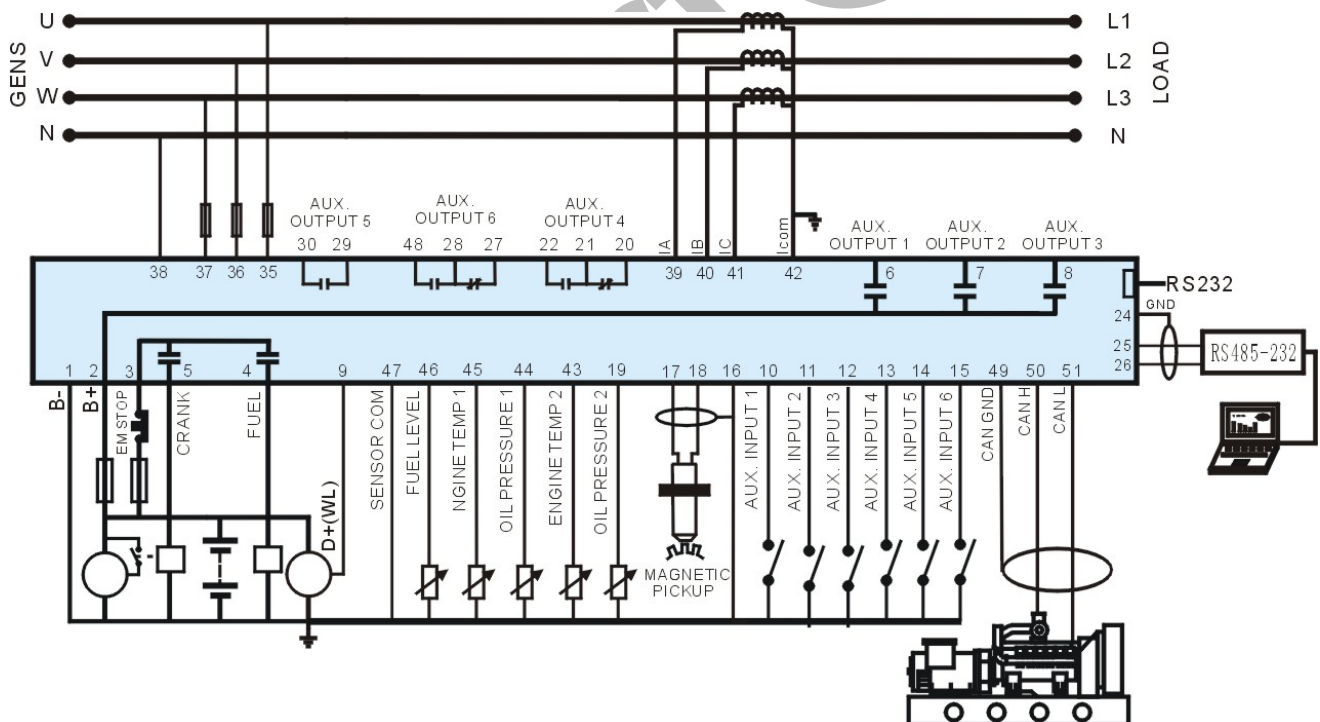
11 FAULT FINDING

Symptom	Possible Remedy
Generator Inoperative	Check starting battery; Check connections of controller. Check the DC fuse.
Genset Stops	Check starting battery; Check connections of controller. Check the DC fuse.
Emergency Stop	Check if an emergency stop button is fitted; Ensure battery positive has connected to the emergency stop. Check if connection is open circuit.
Low Oil Pressure (After Crank Disconnect)	Check oil pressure sensor and its connections.
High Temp. (After Crank Disconnect)	Check temperature sensor and its connections.
Shutdown Alarm During Running	Check switch and connections according to the information display in LCD. Check programmable inputs.
Crank Not Disconnect	Check connections of fuel solenoid. Check starting battery. Check speed sensor and its connections. Refer to engine manual.
Starter Inoperative	Check connections of starter; Check starting battery.

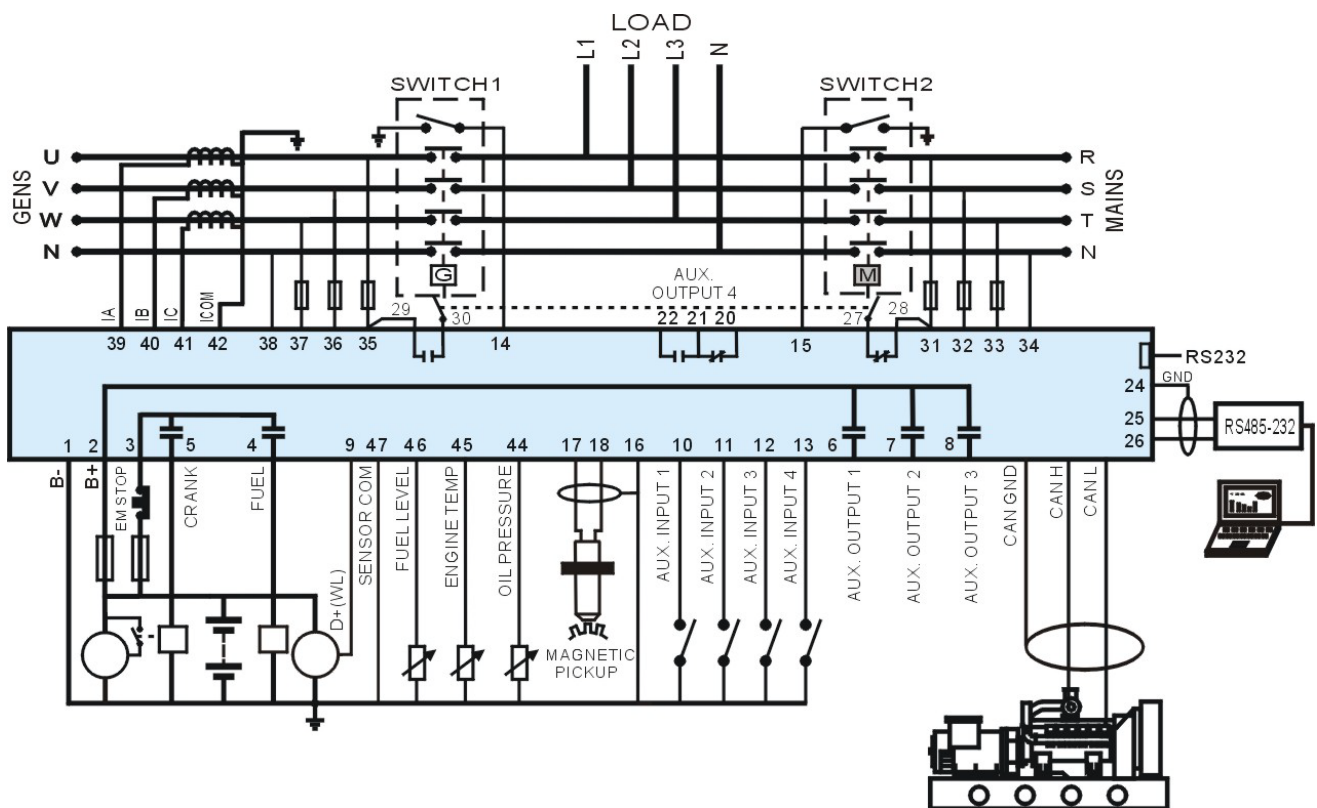
Symptom	Possible Remedy
Genset Running While ATS Not Transfer	Check ATS; Check connections between ATS and controller. Check if gens/mains input inhibit is configured.
RS232/RS485 COM Failure	Check connections; Check if COM port is correct; Check if A and B of RS485 is connected reversely; Check if RS485 module or PC COM port is damaged;
ECU Failure Or Data Error	Check connections; Check if H and L of CAN BUS is connected reversely; Check if engine type is correct; Check if ECU output is correct;
Auxiliary Input Alarm	Check input connections; Check whether polarity configuration is correct or not

12 TYPICAL APPLICATION

HGM6410 typical wiring diagram



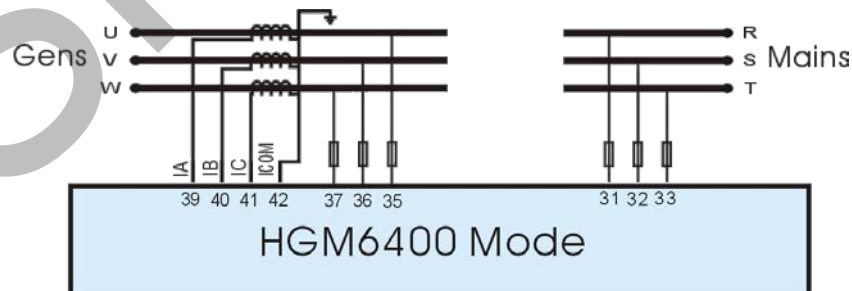
HGM6420 typical wiring diagram



NOTE: If the voltage of starter battery is 24V, battery negative resistance of start output, fuel output and stop output (according to user configuration) should not less than 2Ω. If less than 2Ω, please expand a relay of over 30A current in the output ports. If the voltage is 12V, battery negative resistance should not less than 1Ω. If less than 1Ω, please expand a relay of over 30A current in the outputs.

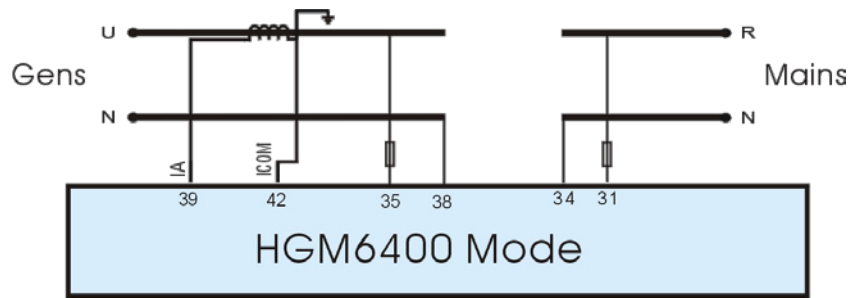
3-PHASE 3-WIRE

Triangle connection of 3 phases, phase difference is 120°.



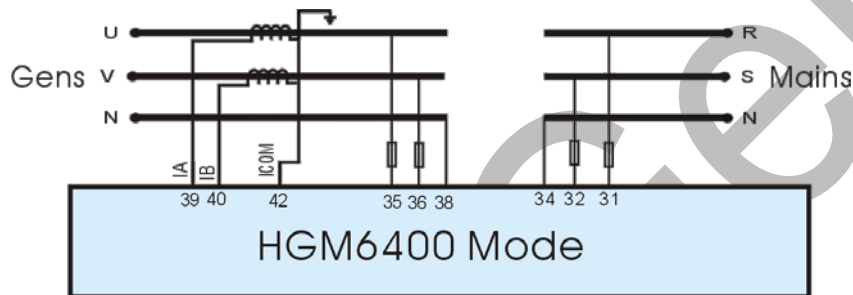
SINGLE PHASE 2-WIRE

Single phase connection with Neutral

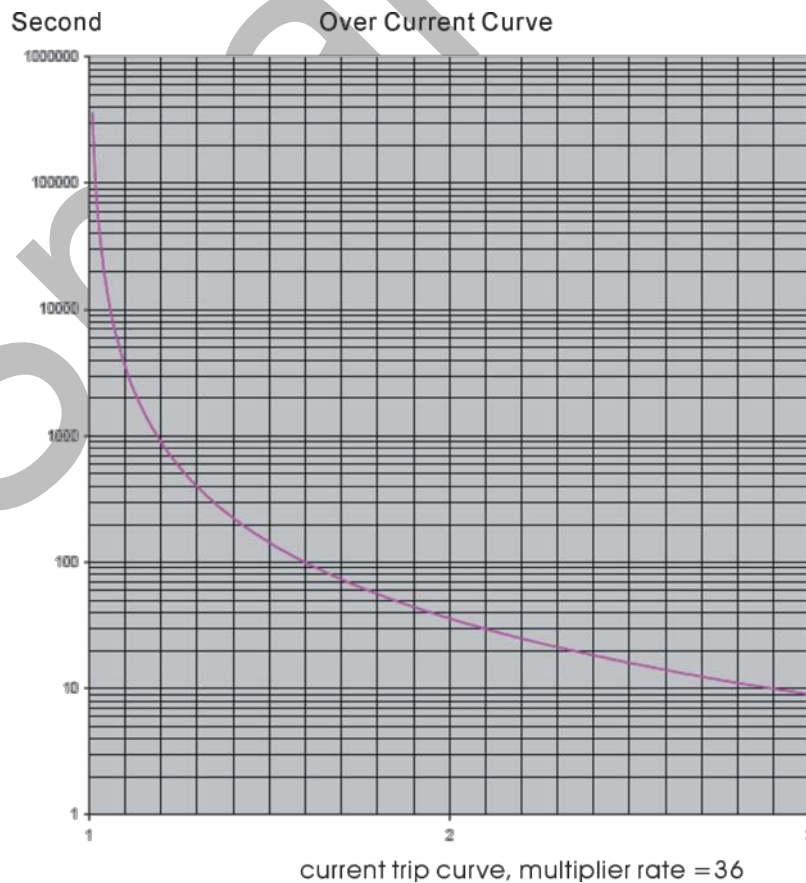


2-PHASE 3-WIRE

Star connection of 2 phases, phase difference is 180° .



13 ONER CURRENT CURVE



Please refer to **HGM6400 Testing Software Manual** for more information.

14 LINK TO PC

HGM6400 module has RS485 and RS232 serial port on the rear, which can connect to open LAN. Via PC or configuration software, HGM6400 genset controller using MODBUS communication protocol can offer an ATS management plan for factory, telecom, industry and civil buildings, achieve “three remote” function of ATS monitoring.

Please refer to **HGM6400 Communication Protocol** for more details.

Communication Parameters

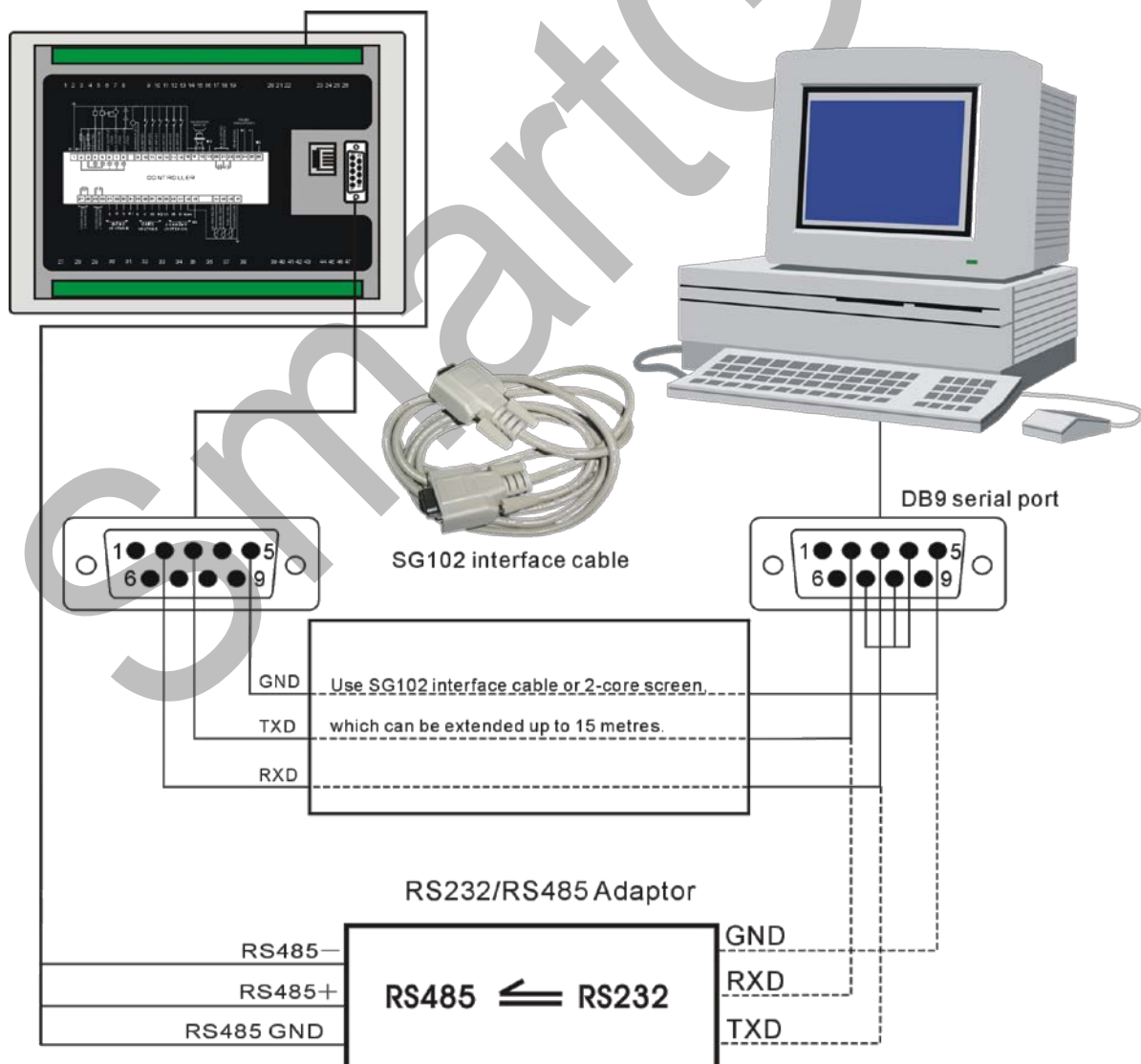
Module address: 1 (range: 1-254; factory default: 1)

Baud rate: 9600bps

Data bits: 8bit

Parity bit: None

Stop bit: 1bit



15 CONNECTIONS BETWEEN CONTROLLER AND CAN

15.1 CUMMINS ISB/ISBE

TERMINAL	9 PIN CONNECTOR	NOTES
CAN GND	SAE J1939 shield	Screen for the J1939 cable. Connect at Cummins ECU end only.
CAN(H)	SAE J1939 signal	Use 120 ohm impedance cable.
CAN(L)	SAE J1939 return	Use 120 ohm impedance cable.

The HGM6400 controller must be configured engine ECU: Cummins ISB

15.2 CUMMINS QSL9

Engines in the QSL9 range are fitted with the CM850 Engine Control Module (ECM).

TERMINAL	50 PIN CONNECTOR	NOTES
Fuel relay output	39	
Start relay output	-	Connects directly to engine starter solenoid.

TERMINAL	9 PIN CONNECTOR	NOTES
CAN GND	SAE J1939 shield-E	Screen for the J1939 cable. Connect at Cummins ECU end only.
CAN(H)	SAE J1939 signal-C	Use 120 ohm impedance cable.
CAN(L)	SAE J1939 return-D	Use 120 ohm impedance cable.

The HGM6400 controller must be configured engine ECU: Cummins-CM850

15.3 CUMMINS QSM11

Engines in the QSM11 range are fitted with the CM570 Engine Control Module (ECM).

Cummins engines fitted with the CM570 ECM: QSM11 G1, QSM11 G2

TERMINAL	C1 CONNECTOR	NOTES
Fuel relay output	5&8	
Start relay output	-	Connects directly to engine starter solenoid.

TERMINAL	3 PIN DATA LINK CONNECTOR	NOTES
CAN GND	C	Screen for the J1939 cable. Connect at Cummins ECU end only.
CAN(H)	A	Use 120 ohm impedance cable.
CAN(L)	B	Use 120 ohm impedance cable.

The HGM6400 controller must be configured engine ECU: Cummins ISB

15.4 DETROIT DIESEL DDEC III / IV

TERMINAL	CAN INTERFACE	NOTES
Fuel relay output	Use to control a 30A	

	external relay to power the DDEC ECU	
Start relay output	-	Connect directly to engine starter solenoid.
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	CAN(H)	Use 120 ohm impedance cable.
CAN(L)	CAN(L)	Use 120 ohm impedance cable.

The HGM6400 controller must be configured engine ECU: generic J1939

15.5 DEUTZ EMR2

TERMINAL	Deutz Vehicle side (F) connector	NOTES
Fuel relay output	Use to control a 30A external slave relay to supply DC battery power to pin 14. 16 A Fuse.	
Start relay output	-	Connects directly to engine starter solenoid.
-	1	Connects directly to battery negative
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	12	Use 120 ohm impedance cable.
CAN(L)	13	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: VolvoEDC4

15.6 JOHN DEERE

TERMINAL	21-PIN DEUTSCH CONNECTOR	NOTES
Fuel relay output	G, J	G = Switched ECU power, J = Ignition
Start relay output	D	
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	V	Use 120 ohm impedance cable.
CAN(L)	U	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: john Deere

15.7 MTU MDEC

Fitted to MTU series 2000 and series 4000 engines

TERMINAL	X1 CONNECTOR	NOTES
Fuel relay output	BE1	

Start relay output	BE9	
CAN GND	E	Screen for the J1939 cable. Connect at one end only.
CAN(H)	G	Use 120 ohm impedance cable.
CAN(L)	F	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: mtu-MDEC-303

15.8 PERKINS

Perkins engines fitted with the ADEM3 / ADEM4: 2306, 2506, 1106, and 2806.

TERMINAL	CONNECTOR	NOTES
Fuel relay output	1, 10, 15, 33, 34	
Start relay output	-	Connects directly to engine starter solenoid.
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	31	Use 120 ohm impedance cable.
CAN(L)	32	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: Perkins

15.9 SCANIA

Scania engines fitted with the S6 ECU: DC9, DC12, and DC16.

TERMINAL	B1 CONNECTOR	NOTES
Fuel relay output	3	
Start relay output	-	Connects directly to engine starter solenoid.
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	9	Use 120 ohm impedance cable.
CAN(L)	10	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: Scania

15.10 VOLVO EDC3

Fitted to Volvo Penta engine types: TAD1240, TAD1241, TAD1242

TERMINAL	“STAND ALONE” CONNECTOR	NOTES
Fuel relay output	H	
Start relay output	E	
Aux. output 1	P	Using PC configuration software select the relevant engine and configure “aux. output” to be “pre-heat (until cranking)”, preheat timer is 5 seconds.

TERMINAL	“DATA CONNECTOR BUS”	NOTES
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	1	Use 120 ohm impedance cable.
CAN(L)	2	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: Volvo

15.11 VOLVO EDC4

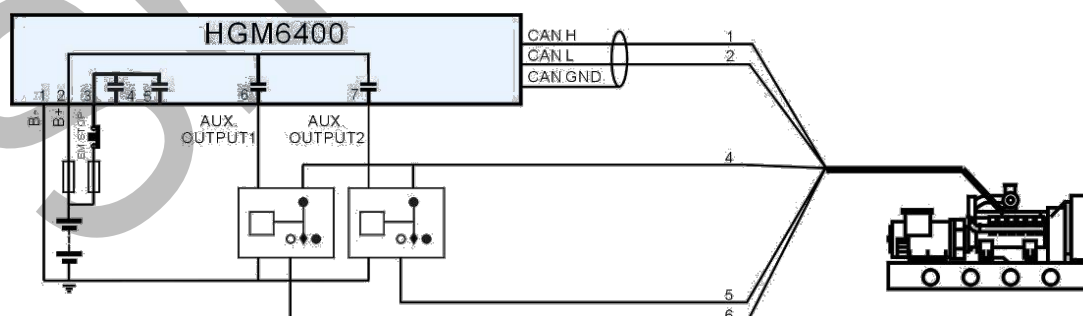
Fitted to Volvo Penta engine types: TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, TAD722

TERMINAL	CONNECTOR	NOTES
Fuel relay output	Use to control a 30A external slave relay to supply DC battery power to pin 14. 16 A Fuse.	
Start relay output	-	Connects directly to engine starter solenoid.
	1	Connects directly to battery negative
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	12	Use 120 ohm impedance cable.
CAN(L)	13	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: VolvoEDC4

15.12 VOLVO-EMS2

Fitted to Volvo Penta engine types: TAD734, TAD940, TAD941, TAD1640, TAD1641 and TAD1642



TERMINAL	CAN INTERFACE	NOTES
Aux. Output 1	Normally open contact closes, making 4# and 6# of 8 pin terminal short-circuit.	Using PC software select the relevant engine and configure “aux output 1”to be “ECU STOP”
Aux. Output 2	Normally open contact	Using PC configuration software select the

	closes, making 4# and 5# of 8 pin terminal short-circuit.	relevant engine and configure "aux. output" to be "PRE-HEAT (until cranking)", preheat timer is 5 seconds.
	3	DC Supply B-
	4	DC Supply B+
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN(H)	1(Hi)	Use 120 ohm impedance cable.
CAN(L)	2(Lo)	Use 120 ohm impedance cable.

The HGM6400 mode must be configured engine ECU: Volvo-EMS2

15.13 BOC SH

Fitted to Yuchai BOC SH engine

TERMINAL	42-PIN CONNECTOR	NOTES
Fuel relay output	1.40	Ignition U15
Start relay output	-	Connects directly to engine starter solenoid.
CAN GND	-	Screen for the J1939 cable. Connect at one end only.
CAN (H)	1.35	Use 120 ohm impedance cable.
CAN (L)	1.34	Use 120 ohm impedance cable.

BATTERY	2-PIN CONNECTOR	Note
Battery Negative	1	2.5mm ²
Battery Positive	2	2.5mm ²

The HGM6400 mode must be configured engine ECU: BOC SH.

16 INSTALLATION

HGM6410 and HGM6420 are in the same installation dimensions. The controller panel is embedded mounting, which fixed by clips when installed. The overall dimensions and panel cutout are given as follows:

