HGM9310MPU/9320MPU/9310CAN/9320CAN

GENSET CONTROLLER

USER MANUAL
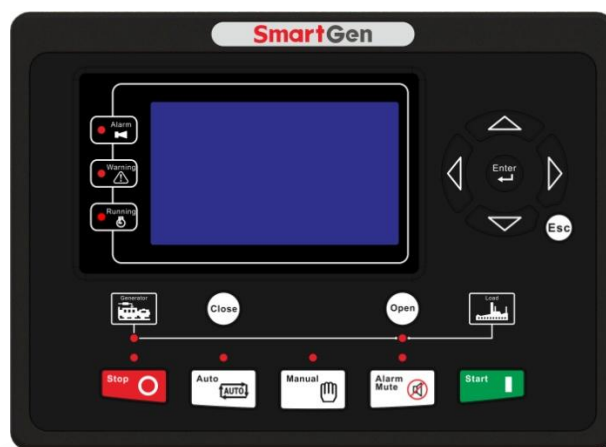
SMARTGEN (ZHENGZHOU) TECHNOLOGY CO.,LTD.

This manual is suitable for HGM9310MPU, HGM9320MPU, HGM9310CAN and HGM9320CAN series controller only.

Clarification of notation used within this publication.

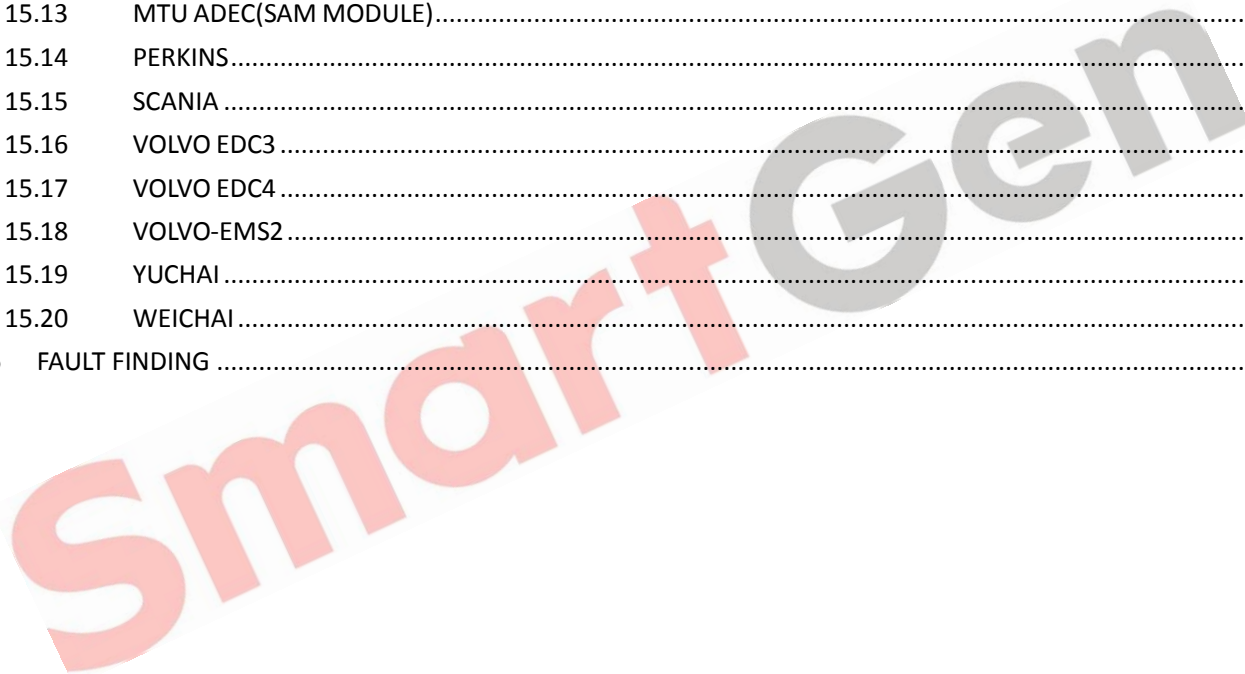| SIGN	INSTRUCTION
⚠NOTE	Highlights an essential element of a procedure to ensure correctness.
⚠CAUTION!	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
☠WARNING!	Indicates error operation may cause death, serious injury and significant property damage.

CONTENTS

1 OVERVIEW

HGM93XXMPU(CAN) series genset controllers are used for genset automation and monitor control system of single unit to achieve automatic start/stop, data measure, alarm protection and "three remote" (remote control, remote measuring and remote communication). The controller adopts large liquid crystal display (LCD) and selectable Chinese, English or other languages interface with easy and reliable operation.

HGM93XXMPU(CAN) series genset controllers adopt 32 bits micro-processor technology with precision parameters measuring, fixed value adjustment, time setting and threshold adjusting and etc. The majority of parameters can be set using front panel and all the parameters can be set using PC (via USB port) and can be adjusted and monitored with the help of RS485 port. It can be widely used in a number of automatic genset control system with compact structure, simple connections and high reliability.

2 MODULES COMPARISON

Item		HGM9310MPU	HGM9320MPU	HGM9310CAN	HGM9320CAN
LCD	Dimension	4.3"			
	Pixel	480 x 272			
AMF			●		●
Input Port Number		8	8	8	8
Output port Number		8	8	8	8
Sensor number		5	5	5	5
Neutral (earth) current		●	●	●	●
Schedule function		●	●	●	●
RS485		●	●	●	●
GSM		●	●	●	●
J1939				●	●
USB		●	●	●	●
Real-time clock		●	●	●	●
Event log		●	●	●	●

⚠ NOTE:

(1) Two of the output ports are fixed: start output and fuel output.

(2) The analog sensors are composed by 3 fixed sensors (temperature, pressure, fuel level) and 2 flexible sensors.

3 PERFORMANCE AND CHARACTERISTICS

HGM9310MPU(CAN), used for single automation systems, auto start/stop of the unit are performed with the help of remote signal.

HGM9320MPU(CAN), has all functions of **HGM9310MPU(CAN)** as well as automatic mains failure function (AMF), particularly well suited for single automation systems that include mains and generator.

Key characteristics,

— With ARM-based 32-bit SCM, highly integrated hardware, new reliability level;

— 480x272 TFT LCD with backlight, multilingual interface (including English, Chinese or other languages) which can be chosen at the site, making commissioning convenient for factory personnel;

— Improved LCD wear-resistance and scratch resistance due to hard screen acrylic;

— Silicon panel and pushbuttons for better operation in high-temperature environment;

— RS485 communication port enabling remote control, remote measuring, remote communication via ModBus protocol (RS485 communication port is needed);

— Equipped with SMS (Short Message Service) function. When genset is alarming, controller can send short messages via SMS automatically to max. 5 telephone numbers. besides, generator status can be controlled and checked using SMS(GSM port is needed);

— Equipped with CANBUS port and can communicate with J1939 genset. Not only can you monitoring frequently-used data (such as water temperature, oil pressure, speed, fuel consumption and so on) of ECU machine, but also control start, stop, raising speed and speed droop via CANBUS port(CAN BUS port is needed);

— 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 AC 3-phase voltage, current, power parameter and frequency of generator;

— Collects and shows DC voltage, current, and power of generator;

Mains	Generator
Line voltage (Uab, Ubc, and Uca)	Line voltage (Uab, Ubc, and Uca)
Phase voltage (Ua, Ub, and Uc)	Phase voltage (Ua, Ub, and Uc)
Phase sequence	Phase sequence
Frequency **Hz**	Frequency **Hz**

Load

Current **IA, IB, IC**

Each phase and total active power **kW**

Each phase and total reactive power **kvar**

Each phase and total apparent power **kVA**

Each phase and average power factor **PF**

Accumulate total generator power **kWh, kvarh, kVAh**

Earth current **A**

— For generator, controller has over and under voltage, over and under frequency, over current, over power, reverse power, loss of phase and phase sequence wrong functions;

— 3 fixed analog sensors (temperature, oil pressure and fuel level);

— 2 flexible sensors can be set as temperature sensor, oil pressure sensor or level sensor;

— Precision measure and display parameters about Engine,

Temp. (WT)   **°C/°F** both be displayed

Oil pressure (OP)   **kPa/psi/bar** all be displayed

Fuel level (FL)   **%(unit)**

Speed (SPD)   **r/min (unit)**

Battery Voltage (VB)   **V (unit)**

Charger Voltage (VD)   **V (unit)**

Hour count (HC) can accumulate to max. 65535 hours.

Start times can accumulate to max. 65535 times.

— Protection: automatic start/stop of the genset, ATS(Auto Transfer Switch) control with perfect failure indication and protection function;

— All output ports are relay-out;

— Parameter setting: parameters can be modified and stored in internal FLASH memory and cannot be lost even in case of power outage; most of them can be adjusted using front panel of the controller and all of them can be modified using PC via USB or RS485 ports.

— More kinds of curves of temperature, oil pressure, fuel level can be used directly and users can define the sensor curves by themselves;

— Multiple crank disconnect conditions (generator frequency, engine speed oil pressure) are optional;

— Widely power supply range DC(8~35)V, suitable to different start battery voltage environment;

— Event log, real-time clock, scheduled start & stop generator (can be set as start genset once a day/week/month whether with load or not);

— PLC (programmable logic control) function allows for specific function can be user-defined.

— Logon wallpaper and display time are user-defined.

— Can be used on pumping units and as an indicating instrument (indicate and alarm are enable only,

5 OPERATION

5.1 INDICATOR LIGHT
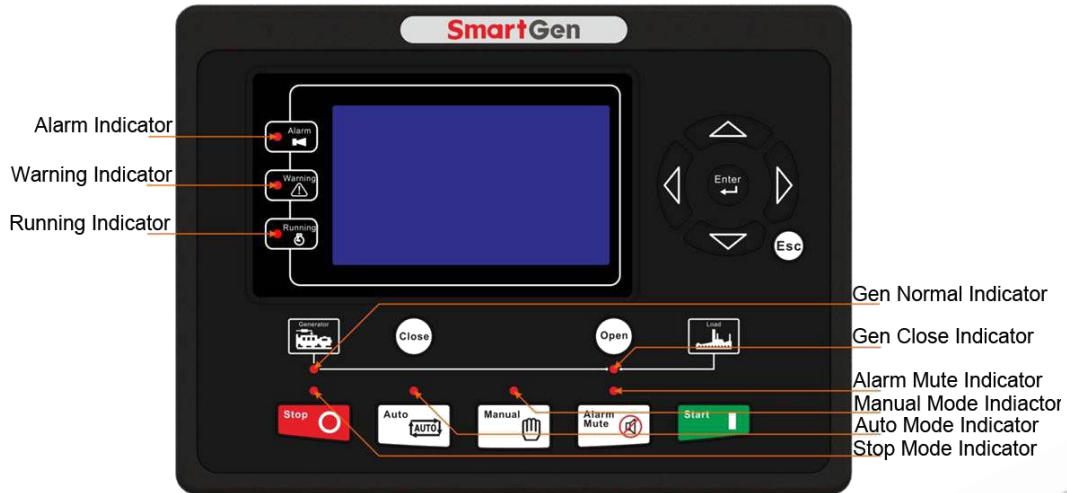
HGM9310MPU/HGM9310CAN
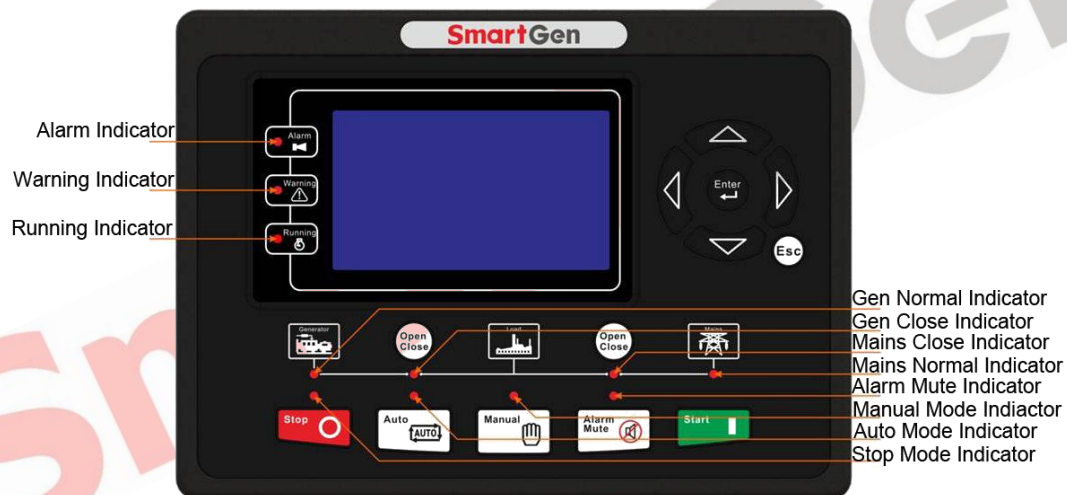
HGM9320MPU/HGM9320CAN

Warning indicator and Alarm indicator:

Alarm Type	Warning Indicator	Alarm Indicator
Warning Alarm	Slow flashing	Slow flashing
Trip Alarm	Slow flashing	Slow flashing
Shutdown Alarm	Off	Fast flashing
Trip and Stop Alarm	Off	Fast flashing

NOTE: Selected light indicators description:

Running indicator: illuminated from crank disconnect to ETS while extinguished during other periods.

Generator normal light：It is illuminated when generator is normal; flashing when generator state is abnormal; extinguished when there is no generator power.

5.2 KEY FUNCTIONS

Icons	Keys	Description
Stop ⬭	Stop	Stop running generator in Auto/Manual mode; Reset alarms in stop mode; Lamp test (press at least 3 seconds); During stopping process, press this button again to stop generator immediately.
Start ▮	Start	Start genset in Manual mode.
Manual ✋	Manual Mode	Press this key and controller enters in **Manual** mode.
Auto ⇄AUTO↓	Auto Mode	Press this key and controller enters in **Auto** mode.
Alarm Mute 🔇	Mute/Reset Alarm	Alarming sound off; If there is trip alarm, pressing the button at least 3 seconds can reset this alarm.
Open Close	Gen Close/Open	Can control generator to switch on or off in manual mode. (HGM9310MPU，HGM9310CAN without)
Open Close	Mains Close/Open	Can control generator to switch on or off in manual mode. (HGM9310MPU，HGM9310CAN without).
Close	Close	Can close breaker in manual mode (HGM9320MPU，HGM9320CAN without)
Open	Open	Can open breaker in manual mode (HGM9320MPU，HGM9320CAN without)
△	Up/Increase	1) Screen scroll; 2) Up cursor and increase value in setting menu.
▽	Down/Decrease	1) Screen scroll; 2) Down cursor and decrease value in setting menu.
◁	Left	1) Screen scroll; 2) Left move cursor in setting menu.
▷	Right	1) Screen scroll; 2) Right move cursor in setting menu.
Enter ↵	Set/Confirm	Entering into parameter setting page after pressing this key for more than 3s; Confirm information in setting page.
Esc	Exit	1. Returns to the main menu; 2. In settings menu returns to the previous menu.

⚠ **NOTE**: In manual mode, pressing [Manual] and [Start] simultaneously will force generator to crank. Successful start will not be judged according to crank disconnect conditions, operator will have to crank the starter motor manually; when operator decides that the engine has fired, he/she should release the button and start output will be deactivated, safety on delay will start.

⚠ **WARNING:** Default password is 00318, user can change it in case of others change the advanced parameters setting. Please clearly remember the password after changing.

If you forget it, please contact SmartGen services and send all PD information in the controller page of "**ABOUT**" to us.

5.3 LCD DISPLAY

5.3.1 MAIN DISPLAY

Main screen show pages; use ◁ ▷ to scroll the pages and ⬆⬇ to scroll the screen.

a) Main screen, including as below:

● Generator: voltage, frequency, current, active power, reactive power;

● Mains: voltage;

● Engine: speed, temperature, oil pressure, battery voltage;

● Other some status

b) Status, including as below,

Status of genset, mains, and switch.

c) Engine, including as below,

Speed, engine temperature, engine oil pressure, fuel level, config analog 1, config analog 2, battery voltage, charger voltage, accumulated run time, accumulated start times, user's total run time A, user's total run time B.

⚠ **NOTE:** If connected with J1939 engine via CANBUS port, this page also includes: coolant pressure, coolant level, fuel temperature, inlet head temperature, exhaust head temperature, turbo pressure, fuel consumption, total fuel consumption and so on. (Different engine with different parameters)

d) Generator, including as below,

Phase voltage, line voltage, frequency, phase sequence

e) Load, including as below,

Current of each phase, each phase active power (positive and negative), total active power (positive and negative), each phase reactive power(positive and negative), total reactive power (positive and negative), each phase apparent power, total apparent power, each phase power factor(positive and negative), average power factor (positive and negative), accumulated energy, earth current, total electric energy A and B.

⚠ **NOTE:** Power factor shows as following,
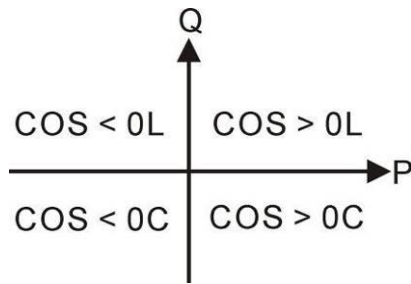
Remark:

P stands for active power

Q stands for inactive power

Power Factor	Conditions	Active power	Inactive power	Remark
COS>0L	P>0,Q>0	Input	Input	Load is inductive resistance.
COS>0C	P>0,Q<0	Input	Output	Load is capacitance resistance.
COS<0L	P<0,Q>0	Output	Input	Load equals to one under excitation generator
COS<0C	P<0,Q<0	Output	Output	Load equals to one over excitation generator.

⚠Note:

Input active power: generator or mains supplies electricity to load;

Output active power: load supplies electricity to generator or mains;

Input reactive power: generator or mains sends reactive power to load;

Output reactive power: load sends reactive power to generator or mains;

f) Mains, including as below,

Phase voltage, line voltage, frequency, phase sequence

g) Alarm:

Display all alarm information. E.g. warning alarm, shutdown alarm, trip alarm and trip and stop alarm.

⚠NOTE: For ECU alarms and shutdown alarms, if the alarm information is displayed, check engine according to it,

otherwise, please check the manual of generator according to SPN alarm code.

h) Event log

Records all start/stop events (shutdown alarm, trip and stop alarm, manual /auto start or stop) and the real

time and genset status when alarm occurs.

i) Others, including,

Time and Date, and input/output ports status

j) About, including,

Issue time of software and hardware version, product PD number

5.3.2 PARAMETERS SETTING MENU

Press and hold ⏎ for more than 3 seconds to enter into user menu;

a) Parameter

●After entering the correct password (factory default password is 00318) you can enter parameter settings screen.

●After entering the correct password (factory default password is 09300) you can enter basic parameter settings screen which can meet the demands of most users as the basic parameters can be set in sequence.

b) Language

Selectable Simplified Chinese, English and others (default: Simplified Chinese)

c) Commissioning

On load, off load or custom commissioning can be chosen. Custom commissioning can configure on load or not during commissioning, when to commissioning and select the mode after commissioning (manual mode, auto mode and stop mode).

d) Clear users' accumulation

Can clear total run time A and B, total electric energy A and B.

5.3.3 DETAILED PARAMETERS SETTING

—Mains settings

—Timer settings

—Engine settings

—Generator settings

—Load settings

—Switch settings

—Temperature sensor settings

—Oil pressure sensor settings

—Level sensor settings

—Flexible sensor 1

—Flexible sensor 2

—Input port settings

—Output port settings

—Module settings

—Scheduling and maintenance settings

─GSM settings

─Exp. input settings

─Exp. output setting

─Exp. AIN24 1 settings

─Exp. AIN24 2 settings

Example,

Return	>Start Delay	Screen1: Use ⬆⬇ to scroll settings, ⏎(Enter) to enter settings (Screen 2), (Esc) to exit settings menu.
Mains	>Return Delay	
Timers >	>Preheat Delay	
Engine	>Cranking Time	
Generator	>Crank Rest Time	
Load	>Safety On Time	
Switch	>Start Idle Time	
Temp. Sensor	>Warming Up Time	
OP Sensor	>Cooling Time	
Level Sensor	>Stop Idle Time	
Flexible Sensor 1	>ETS Hold Time	

Return	> Start Delay	Screen 2: Use ⬆⬇ to scroll settings, ⏎(Enter) to enter settings (Screen 4), (Esc) to return to previous menu. (Screen 1).
Mains	> Return Delay	
Timers >	> Preheat Delay	
Engine	> Cranking Time	
Generator	> Crank Rest Time	
Load	> Safety On Time	
Switch	> Start Idle Time	
Temp. Sensor	> Warming Up Time	
OP Sensor	> Cooling Time	
Level Sensor	> Stop Idle Time	
Flexible Sensor 1	> ETS Hold Time	

Return	>Start Delay	Screen 3: Use ⬆⬇ to scroll settings, ⏎(Enter) to enter settings (Screen 4), (Esc) to return to previous menu. (Screen 1).
Mains	> Return Delay	
Timers >	> Preheat Delay	
Engine	> Cranking Time	
Generator	> Crank Rest Time	
Load	> Safety On Time	
Switch	> Start Idle Time	
Temp. Sensor	> Warming Up Time	
OP Sensor	> Cooling Time	

Level Sensor	> Stop Idle Time	
Flexible Sensor 1	> ETS Hold Time	

> Start Delay		Screen 4:
> Return Delay	**00008**	
> Preheat Delay		Press (Enter) to enter settings (Screen 5), (Esc) to
> Cranking Time		return to previous menu. (Screen 6).
>Crank Rest Time		
> Safety On Time		
> Start Idle Time		
> Warming Up Time		
> Cooling Time		
> Stop Idle Time		
> ETS Hold Time		
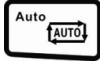
> Start Delay		Screen 5:
> Return Delay	**00008**	
>Preheat Delay		Press ◁ ▷ to change cursor position, △▽
> Cranking Time		are used for changing cursor value, (Enter) Confirm
> Crank Rest Time		
> Safety On Time		setting (Interface 4), (Esc) exit setting (Screen 4).
> Start Idle Time		
> Warming Up Time		
> Cooling Time		
> Stop Idle Time		
> ETS Hold Time		

> Start Delay		Screen 6:
> Return Delay	**00008**	
> Preheat Delay		Use △ ▽ to scroll settings. (Enter) to enter
> Cranking Time		settings (Screen 4), (Esc) to return to previous menu.
> Crank Rest Time		(Screen 1).
> Safety On Time		
> Start Idle Time		
> Warming Up Time		
> Cooling Time		
> Stop Idle Time		
> ETS Hold Time		

NOTE: Pressing ▨ can exit setting directly during setting.

5.4 AUTO START/STOP OPERATION

5.4.1 ILLUSTRATION

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

5.4.2 AUTOMATIC START SEQUENCE

a) HGM9320MPU(CAN): When Mains is abnormal (over and under voltage, over and under frequency, loss of phase, phase sequence wrong), it enters into mains "abnormal delay" and LCD display count down time. When mains abnormal delay is over, it enters into "start delay"; it also enters into this mode when "remote start on load" is active.

b) HGM9310MPU(CAN): When "Remote Start (on load)" is active, "Start Delay" timer is initiated;

c) "Start Delay" countdown will be displayed on LCD;

d) When start delay is over, preheat relay energizes (if configured), "preheat delay XX s" information will be displayed on the downmost line of LCD;

e) After the above delay, the Fuel Relay (if configured) 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.

f) Should this start sequence continue beyond the set number of attempts, the start sequence will be terminated, the first line of LCD display will be highlighted with black and Fail to Start fault will be displayed.

g) In case of successful crank attempt, the "Safety On" timer is activated, allowing Low Oil Pressure, High Temperature, under speed and Charge Alternator Failure inputs to stabilize without triggering the fault. As soon as this delay is over, "start idle" delay is initiated (if configured).

h) 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).

i) After the "warming up" delay has expired, 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).

NOTE: When started via "Remote Start (off Load)" input, same procedures as above but generator close relay deactivated, moreover, genset off load.

5.4.3 AUTOMATIC STOP SEQUENCE

a) HGM9320MPU(CAN), when mains return normal during genset running, enters into mains voltage "Normal delay" and its indicator illuminated. When mains normal delay is over, enter into "stop delay"; also can be into this mode when "remote start on load" is inactive.

b) HGM9310MPU(CAN), when the "Remote Start" signal is removed, the Stop Delay is initiated.

c) Once this "stop delay" has expired, the Generator Breaker will open and the "Cooling Delay" is then initiated. After "transfer delay", close mains relay is energized and mains will take load. Generator indicator extinguish while mains indicator lights.

d) During "Stop Idle" Delay (if configured), idle relay is energized.

e) "ETS Solenoid Hold" delay begins, ETS relay is energized while fuel relay is de-energized, complete stop is detected automatically.

f) "Wait for Stop Delay" begins, complete stop is detected automatically.

g) When generator is stop completely, "After stop" delay will be initiated. Otherwise, fail to stop alarm is initiated and the corresponding alarm information is displayed on LCD. (If generator is stop successfully after "fail to stop" alarm has initiated, "After stop" delay will be initiated and the alarm will be removed)

h) Generator is placed into its standby mode after its "After stop" delay.

5.5 MANUAL START/STOP OPERATION

a) MANUAL START: Manual mode is selected by pressing the [Manual] button; a LED besides the button will illuminate to confirm the operation; then press [Start] button to start the gen-set; can detect crank disconnect condition and generator accelerates to high-speed running automatically. With high temperature, low oil pressure, over speed and abnormal voltage during generator running, controller can protect genset to stop quickly. (please refer to 5.4.2,d)~5.4.2,i)).

b) MANUAL STOP: Press [Stop] can stop the running generators. (please refer to 5.4.3,c)~5.4.3,h)).

5.6 SWITCH CONTROL PROCEDURES

5.6.1 HGM9320MPU(CAN) SWITCH CONTROL PROCEDURES

Manual transfer procedures

When controller is in **Manual** mode, the switch control procedures will start through manual transfer process.

Users can control the loading transfer of ATS via pressing button to switch on or off.

A. If "Open breaker detect" is "SELECT Disable"

Press generator switch on or off key (Open/Close), if generator has taken load, will send unload signal; if taken no load, generator will send load signal; if mains has taken load, will send unload signal, and then generator will take load after the mains "open delay".

Press mains switch on or off key (Open/Close), if mains has taken load, will send unload signal; if taken no load, mains will send load signal; if generator has taken load, will send unload signal, and then mains will take load after the generator "open delay".

If "Open breaker detect" is "SELECT Enable"

To transfer load from mains to generator need to press mains switch off key (Open/Close) firstly. After open delay, press generator switch on key (Open/Close), and generator will take load (there is no action when pressing switch on key directly).

The way to transfer from generator to mains is as same as above.

Auto transfer procedures:

When controller is in AUTO mode, switch control procedures will start through automatic transfer.

1) If input port is configured as Close Mains Auxiliary

A. If "Open breaker detect" is "SELECT Enable"

7 WIRINGS CONNECTION

HGM93XXMPU(CAN) series controller's rear as following:
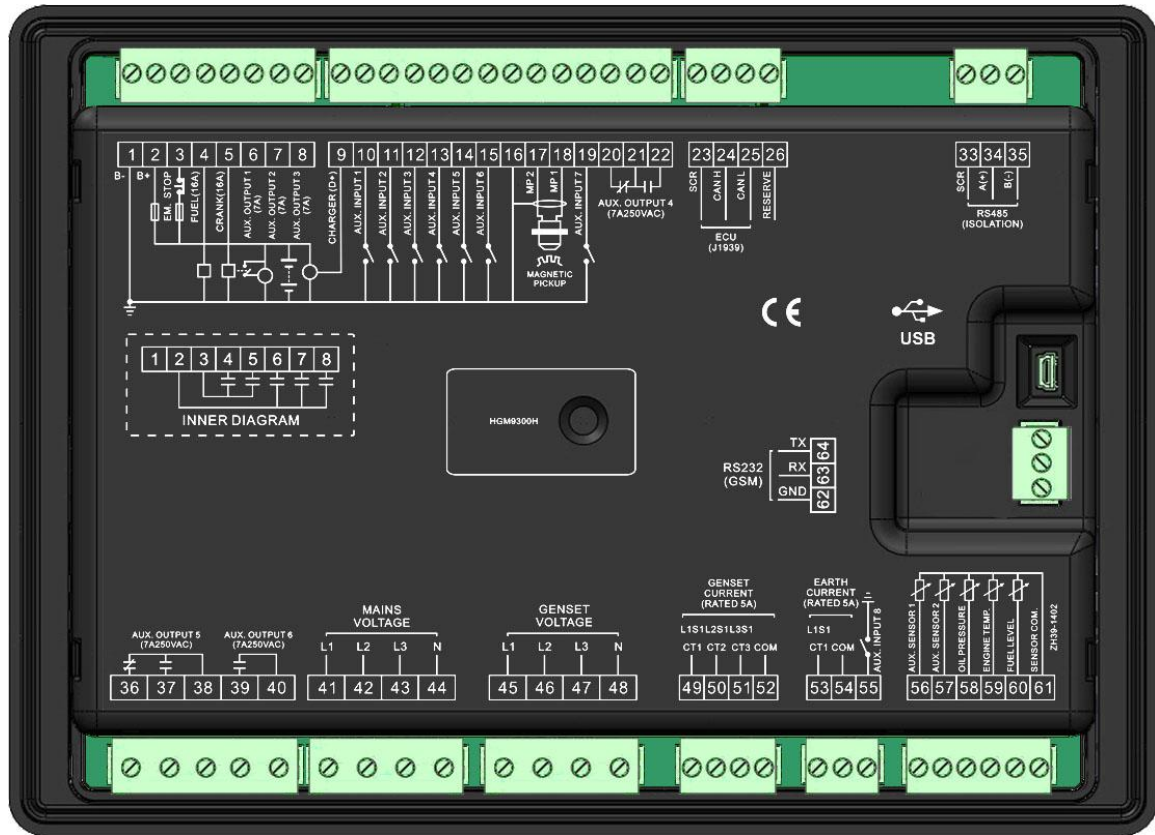
Description of terminal connection:

No.	Function	Cable Size	Remarks	
1	B-	2.5mm²	Connected with negative of starter battery.	
2	B+	2.5mm²	Connected with positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.	
3	Emergency stop	2.5mm²	Connected with B+ via emergency stop button.	
4	Fuel relay output	1.5mm²	B+ is supplied by No.3 terminal, rated 16A.	
5	Crank relay output	1.5mm²	B+ is supplied by No.3 terminal, rated 16A.	Connected to starter coil.
6	Aux. Output 1	1.5mm²	B+ is supplied by No.2 terminal, rated 7A.	Details see form 2.
7	Aux. Output 2	1.5mm²	B+ is supplied by No.2 terminal, rated 7A.	
8	Aux. Output 3	1.5mm²	B+ is supplied by No.2 terminal, rated 7A.	
9	Charger(D+)	1.0mm²	Connected with charger starter's D+ (WL) terminals. Being hang up If there is no this terminal.	
10	Aux. Input 1	1.0mm²	Ground connected is active (B-).	Details see form 3
11	Aux. Input 2	1.0mm²	Ground connected is active (B-).	

No.	Function	Cable Size	Remarks	
12	Aux. Input 3	1.0mm²	Ground connected is active (B-).	
13	Aux. Input 4	1.0mm²	Ground connected is active (B-).	
14	Aux. Input 5	1.0mm²	Ground connected is active (B-).	
15	Aux. Input 6	1.0mm²	Ground connected is active (B-).	
16	Magnetic Pickup	0.5mm²	Connected with Speed sensor, shielding line is recommended. (B-) has already connected with speed sensor 2.	
17	Magnetic Pickup 2			
18	Magnetic Pickup 1			
19	Aux. Input 7	1.0mm²	Ground connected is active (B-).	Details see form 3.
20			Normally close output, rated 7A.	
21	Aux. Output 4	1.5mm²	Public points of relay.	Details see form 2.
22			Normally open output, rated 7A.	
23	ECU SCR	/	Impedance-120Ω shielding wire is recommended, its single-end earthed.	
24	ECU CAN H	0.5mm²		
25	ECU CAN L	0.5mm²		
26	RESERVE	/	Empty terminal	
33	RS485 SCR	/	Impedance-120Ω shielding wire is recommended, its single-end earthed.	
34	RS485A(+)	0.5mm²		
35	RS485B(-)	0.5mm²		
36		2.5mm²	Normally close output, rated 7A.	
37	Aux. Output 5	2.5mm²	Normally open output, rated 7A.	
38		2.5mm²	Public points of relay	Details see form 2.
39	Aux. Output 6	2.5mm²	Normally open output, rated 7A.	
40		2.5mm²	Public points of relay	
41	Mains L1-phase voltage input	1.0mm²	Connected to A-phase of mains (2A fuse is recommended). (HGM9310MPU, HGM9310CAN without).	
42	Mains L2-phase voltage input	1.0mm²	Connected to B-phase of mains (2A fuse is recommended). (HGM9310MPU, HGM9310CAN without).	
43	Mains L3-phase voltage input	1.0mm²	Connected to C-phase of mains (2A fuse is recommended). (HGM9310MPU, HGM9310CAN without).	
44	Mains N-wire input	1.0mm²	Connected to N-wire of mains. (HGM9310MPU, HGM9310CAN without).	
45	Genset L1-phase voltage input	1.0mm²	Connected to A-phase of gen-set (2A fuse is recommended).	
46	Genset L2-phase voltage input	1.0mm²	Connected to B-phase of gen-set (2A fuse is recommended).	
47	Genset L3-phase voltage input	1.0mm²	Connected to C-phase of gen-set (2A fuse is recommended).	
48	Genset N-wire input	1.0mm²	Connected to N-wire of gen-set.	
49	CT 1 input	1.5mm²	Outside connected to secondary coil of current transformer (rated 5A).	

No.	Function	Cable Size	Remarks	
50	CT 2 input	1.5mm^2	Outside connected to secondary coil of current transformer (rated 5A).	
51	CT 3 input	1.5mm^2	Outside connected to secondary coil of current transformer (rated 5A).	
52	CT COM	1.5mm^2	See following installation instruction.	
53	Earth Current	1.5mm^2	Outside connected to secondary coil of current transformer (rated 5A).	
54		1.5mm^2		
55	Aux. Input 8	1.0mm^2	Ground connected is active (B-).	Details see form 3.
56	Aux. sensor 1	1.0mm^2	Connected to temperature, oil pressure or level sensors.	Details see form 4.
57	Aux. sensor 2	1.0mm^2		
58	Oil pressure sensor	1.0mm^2	Connected to oil pressure sensor.	
59	Temperature sensor	1.0mm^2	Connected to temperature sensor.	
60	Fuel level sensor	1.0mm^2	Connected to fuel level sensor.	
61	Sensor COM	/	Public terminal of sensor, (B-) has already connected.	
62	RS232 GND	0.5mm^2	Connected to GSM module.	
63	RS232 RX	0.5mm^2		
64	RS232 TX	0.5mm^2		

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

⚠**NOTE:** Please refer to the Module Comparison in this manual for more details.

8 SCOPES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

8.1 CONTENTS AND SCOPES OF PARAMETERS

Form 1

No.	Items	Parameters	Defaults	Description
Mains				
1	AC System	(0~3)	0	0: 3P4W; 1: 3P3W; 2: 2P3W; 3: 1P2W.
2	Rated Voltage	(30~30000)V	230	Standard for checking mains over/under voltage. (It is primary voltage when using voltage transformer).
3	Rated Frequency	(10.0~75.0) Hz	50.0	Standard for checking mains over/under frequency.
4	Normal Delay	(0~3600)s	10	The delay from mains abnormal to normal.
5	Abnormal Delay	(0~3600)s	5	The delay from mains normal to abnormal.
6	Volt. Trans.(PT)	(0~1)	0	0: Disable ; 1: Enable
		(30-30000)V	100	PT primary
		(30-1000)V	100	PT secondary
7	Over Voltage	(0~200)%	120	Setting value is mains rated voltage's percentage, and return value (Over Voltage default: 116; Under Voltage default: 84) and delay value (default: 5s) can be set.
8	Under Voltage	(0~200)%	80	
9	Over Frequency	(0~200)%	114	Setting value is mains rated frequency's percentage, return value (Over Frequency default: 110; Under Frequency default: 94) and delay value (default: 5s) can be set.
10	Under Frequency	(0~200)%	90	
11	Loss of Phase	(0~1)	1	0: Disable; 1: Enable
12	Phase Sequence Wrong	(0~1)	1	
Timers				
1	Start Delay	(0~3600)s	1	Time from mains abnormal or remote start signal is active to start genset.
2	Stop Delay	(0~3600)s	1	Time from mains normal or remote start signal is deactivated to genset stop.
3	Pre-heat Delay	(0~3600)s	0	Time of pre-powering heat plug before starter is powered up.
4	Cranking Time	(3~60)s	8	Time of starter power up
5	Crank Rest Time	(3~60)s	10	The waiting time before second power up when engine start fail.
6	Safety On Delay	(0~3600)s	10	Alarms for low oil pressure, high temperature, under speed, under frequency /voltage, charge fail are inactive.
7	Start Idle Time	(0~3600)s	0	Idle running time of genset when starting.

12 TYPICAL APPLICATION
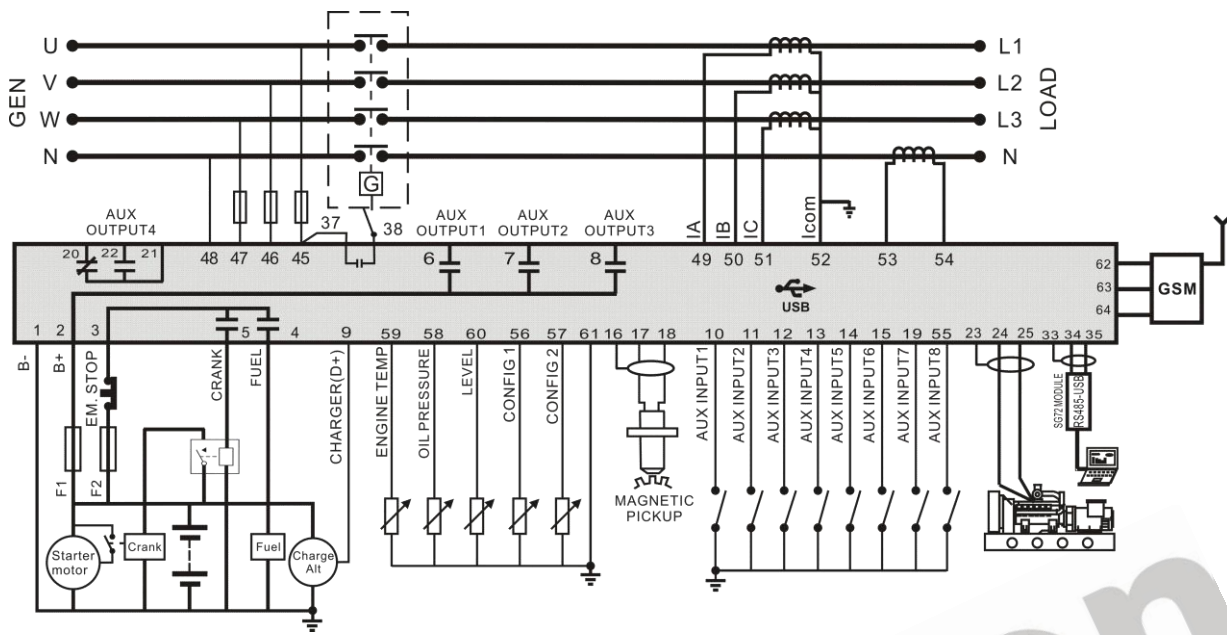
HGM9310MPU(CAN) typical application diagram
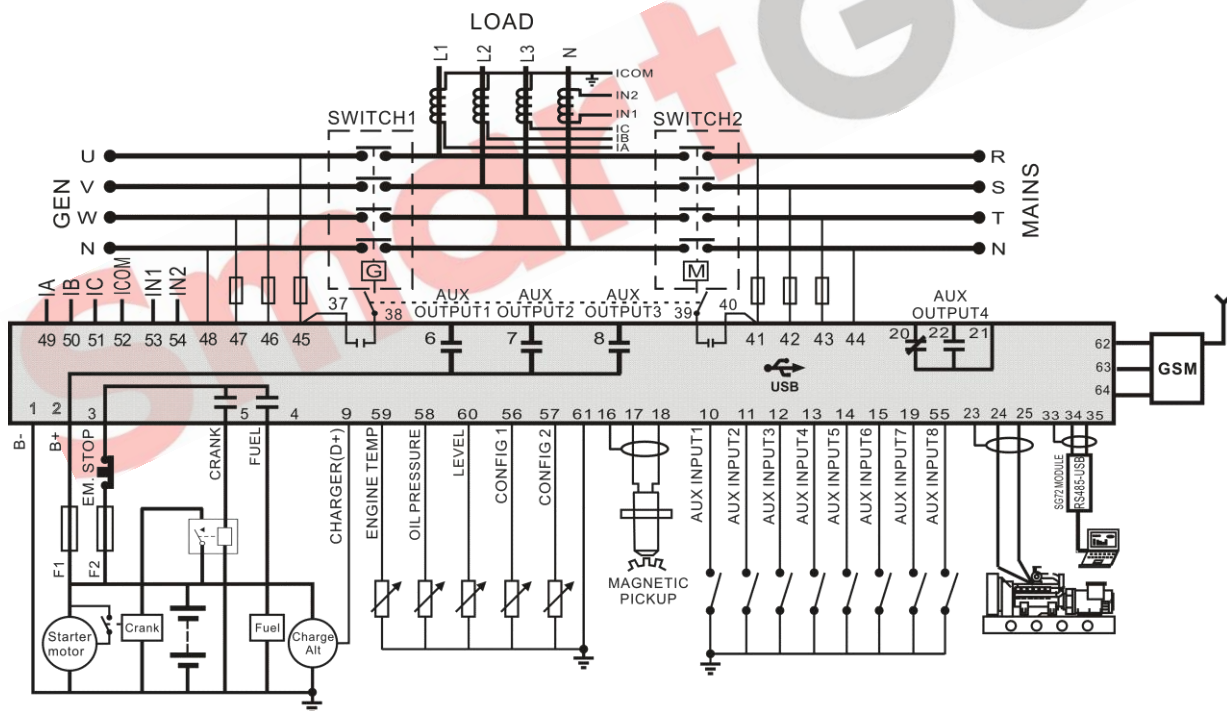
HGM9320MPU(CAN) typical application diagram

⚠️**NOTE:** Fuse F1：min. 2A; max. 20A.　Fuse F2：max. 32A. Users should select suitable fuse depend on practical application.

13 INSTALLATION

Controller is panel built-in design; it is fixed by clips when installed. The controller's overall dimensions and cutout dimensions for panel, please refers to as following,
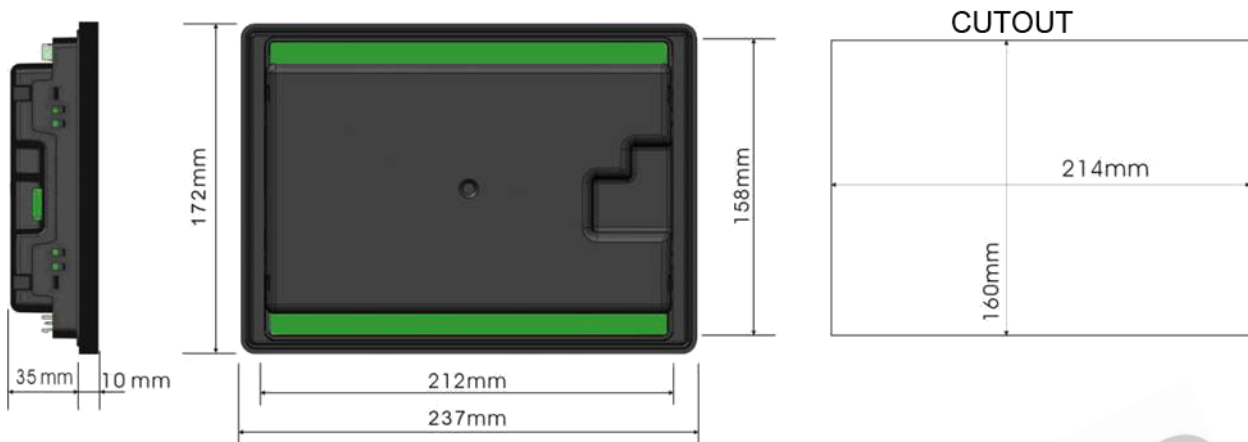
一 Battery Voltage Input

HGM93XXMPU(CAN) 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 which 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.

一 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. 16 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.17 and No.18 terminals in controller. The output voltage of speed sensor should be within 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.

一 Output And Expand Relays

All outputs of controller are relay contact output type. If need to expand the relays, please add freewheel diode to both ends of expand relay's coils (when coils of relay has DC current) or, increase resistance-capacitance return circuit (when coils of relay has AC current), in order to prevent disturbance to controller or others equipment.

一 AC Input

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14 GSM SHORT MESSAGE ALARM AND REMOTE CONTROL

14.1 GSM SHORT MESSAGE ALARM

When controller detects alarm, it will send short message to phone automatically.

⚠**NOTE**: All alarms about shutdown, trip and stop and trip will be sent to the pre-set phone. Warnings are sent to the phone according to the pre-set.

14.2 GSM SHORT MESSAGE REMOTE CONTROL

Users send order message to GSM module, then controller will make actions according to this SMS order and pass back corresponding operations information. Controllers only sent the message to the pre-set phone number. Detail orders as following:

No.	SMS Orders	Pass back Information	Description	
1	SMS GENSET	GENSET ALARM	When genset is shutdown alarm	status of genset
		SYSTEM IN STOP MODE GENSET AT REST	At rest status in stop mode	
		SYSTEM IN MANUAL MODE GENSET AT REST	At rest status in manual mode	
		SYSTEM IN AUTO MODE GENSET AT REST	At rest status in auto mode	
		SYSTEM IN STOP MODE GENSET IS RUNNING	Running status in stop mode	
		SYSTEM IN MANUAL MODE GENSET IS RUNNING	Running status in manual mode	
		SYSTEM IN AUTO MODE GENSET AT RUNNING	Running status in auto mode	
2	SMS START	GENSET ALARM	Generator is shutdown alarm or trip alarm	Start genset
		STOP MODE NOT START	Cannot start in stop mode	
		SMS START OK	Start in manual mode	
		AUTO MODE NOT START	Cannot start in auto mode	
3	SMS STOP MODE	SMS STOP OK	Set as stop mode	
4	SMS MANUAL MODE	SMS MANUAL MODE OK	Set as manual mode	

5	SMS AUTO MODE	SMS AUTO MODE OK	Set as auto mode
6	SMS DETAIL	Pass back information can be set via controller software.	Gets details information of genset.
7	SMS INHIBIT START	INHIBIT START OK	Generator start will be inhibited.
8	SMS PERMIT START	PERMIT START OK	Discharge the inhibit start signal.

NOTE: Its national and area's cods must be added. E.g. China: 8613666666666

NOTE: When sending orders, users need to follow SMS orders in above form and all the letters must be capital.

NOTE: Pass back information from SMS DETAIL including: working mode, mains voltage, generator voltage, load current, mains frequency, generator frequency, active power, apparent power, power factor, battery voltage, D+ voltage, water temperature, oil pressure, oil level, engine speed, total running time, genset status, and alarm status.

15 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

15.1 CUMMINS ISB/ISBE

Terminals of controller	Connector B	Remark
Fuel relay output	39	
Start relay output	-	Connect with starter coil directly
Auxiliary output port 1	Expand 30A relay, battery voltage of 01,07,12,13 is supplied by relay	ECU power Set Auxiliary output 1 as "ECU power"

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	SAE J1939 signal	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return	Impedance 120Ω connecting line is recommended.

Engine type: Cummins ISB

15.2 CUMMINS QSL9

Suitable for CM850 engine control module

Terminals of controller	50 pins connector	Remark
Fuel relay output	39	
Start relay output	-	Connect to starter coil directly

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield-E	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	SAE J1939 signal-C	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return-D	Impedance 120Ω connecting line is recommended.

Engine type: Cummins-CM850

15.3 CUMMINS QSM11(IMPORT)

It is suitable for CM570 engine control module. Engine type is QSM11 G1, QSM11 G2.

Terminals of controller	C1 connector	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 5 and port 8 of C1 be connected
Start relay output	-	Connect to starter coil directly

Terminals of controller	3 pins data link connector	Remark
CAN GND	C	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	A	Impedance 120Ω connecting line is recommended.
CAN(L)	B	Impedance 120Ω connecting line is recommended.

Engine type: Cummins ISB

15.4 CUMMINS QSX15-CM570

It is suitable for CM570 engine control module. Engine type is QSX15.

Terminals of controller	50 pins connector	Remark
Fuel relay output	38	Oil spout switch
Start relay output	-	Connect to starter coil directly

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield-E	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	SAE J1939 signal-C	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return-D	Impedance 120Ω connecting line is recommended.

Engine type: Cummins QSX15-CM570

15.5 CUMMINS GCS-MODBUS

It is suitable for GCS engine control module. Use RS485-MODBUS to read information of engine. Engine types are QSX15, QST30, QSK23 / 45/60/78 and so on.

Terminals of controller	D-SUB connector 06	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 05 and 08 of the connector 06 be connected.
Start relay output	-	Connect to starter coil directly

Terminals of controller	D-SUB connector 06	Remark
RS485 GND	20	CAN communication shielding line(connect with ECU terminal only)
RS485+	21	Impedance 120Ω connecting line is recommended.
RS485-	18	Impedance 120Ω connecting line is recommended.