

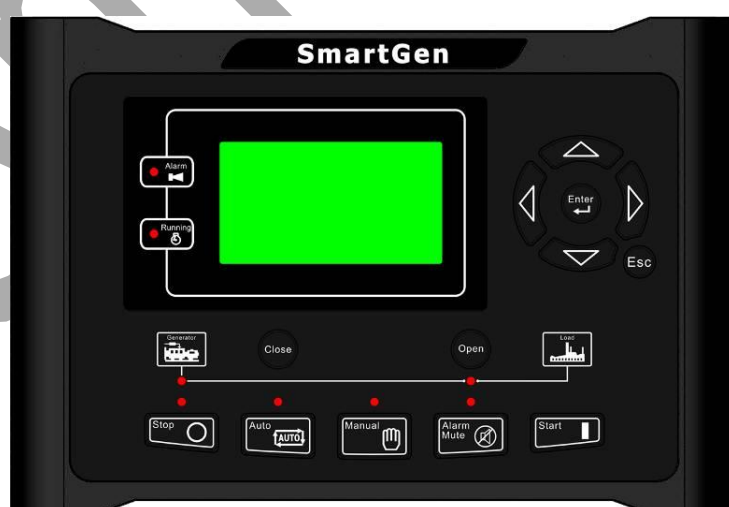
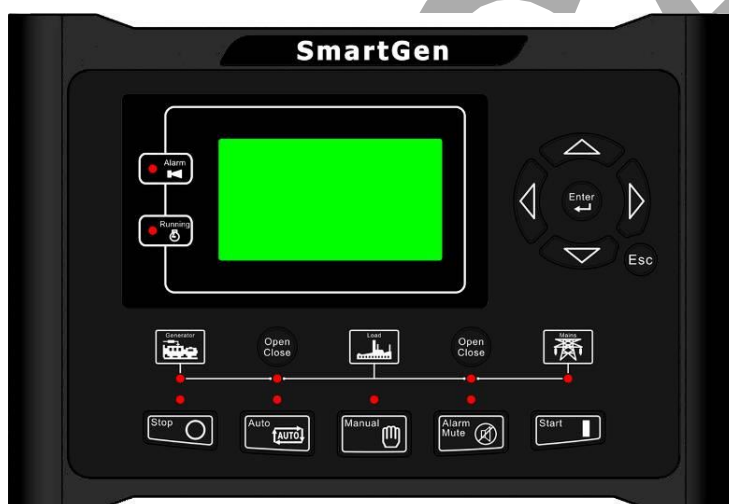


HGM9200/9300/9400 Series

(HGM9210/HGM9220/HGM9310/HGM9320/HGM9410/HGM9420)

Automatic Genset Control Module

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
2012-03-08	1.0	Original release
2012-6-11	1.1	Some parameters are optimized.

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.

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SmartGen

1 SUMMARY

HGM9200/9300/9400 series generator controllers are used for automatic and monitor control system of gen-set 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.

HGM9200/9300/9400 gen-set automatic controllers adopt 32 bits micro-processor technology with precision parameters measuring, fixed value adjustment, time setting and threshold adjusting and etc..Majority parameters can be configured from front panel, and all parameters can be configured by USB interface (or RS485/Link interface) to adjust via PC. It can be widely used in all types of automatic gen-set control system with compact structure, advanced circuits, simple connections and high reliability.

2 MODULES COMPARISON AND MODULES ABBREVIATION

2.1MODULES COMPARISON

		HGM 9210	HGM 9220	HGM 9310	HGM 9320	HGM 9410	HGM 9420	HGM 9610	HGM 9620	HGM 9510	HGM 9520
L	Dimen- sion	3.6"						4.3"			
D	pixel	132 x 64						320 x 200			
AMF			•		•		•		•		•
BUS Monitoring										•	
Parallel connection of gen-set										•	•
Extension module								•	•		
Number of input port		7	7	7	7	7	7	8	8	7	7
Number of output port		8	8	8	8	8	8	8	8	8	8
Number of sensors		5	5	5	5	5	5	5	5	5	5
Neutral current								•	•		
Scheduling function		•	•	•	•	•	•	•	•	•	•

ETHERNET							•	•		
RS485			•	•	•	•	•	•	•	•
GSM			•	•	•	•	•	•		
J1939					•	•	•	•	•	•
USB	•	•	•	•	•	•	•	•	•	•
LINK	•	•								
Real-time clock	•	•	•	•	•	•	•	•	•	•
Event log	•	•	•	•	•	•	•	•	•	•
SD card							•	•		

▲ NOTE:

(1)Including two fixed output ports: start output and fuel output.

(2)HGM9200/HGM9300/HGM9400's analog sensors are composed by 3 fixed sensors (temperature, pressure, liquid level) and 2 configurable sensors.

▲NOTE: The controller features of HGM9510/HGM9520/HGM9610/HGM9620 mentioned in this document type may change; accurate information may consult the corresponding user manual.

2.2MODELES ABBREVIATION

Abbreviation	Description
HGM9X20	All HGM9000 series AMF controllers
HGM9X10	All HGM9000 series ASM(Auto Start Module) controllers

▲ NOTE: HGM9000 series controller mentioned in this document refer to HGM9200/HGM9300/HGM9400 series controller particularly.

3 PERFORMANCE AND CHARACTERISTICS

HGM9X10, Auto Start Module. It controls gen-set to start or stop automatically by remote start signal.

HGM9X20, Auto Main Failure, updates based on HGM9X10, especially for automatic system composed by gens and mains.

Main characteristics,

- ◆ With ARM-based 32-bit SCM, high integration of hardware and more reliable;
- ◆ 132x64 LCD with backlight, Chinese, English or other languages display, gentle push button for operation;
- ◆ Acrylic materials used for protecting LCD screen, wearable performance is better;
- ◆ Silica-gel panel and buttons, more adaptable to high or low temperature;

- ◆ Equipped with RS485 communication port and “remote control, remote measuring, remote communication” achieved by the MODBUS protocol. (controller with RS485 port only);
- ◆ Equipped with SMS (Short Message Service) function. When gen-set is alarming, controller can send short messages via SMS automatic to max. 5 telephone numbers. User can control or check gen-set by sending Short Message (controller with GSM port only);
- ◆ Equipped with CANBUS port and can communicate with EFI machine possessing J1939. Not only can users monitoring frequently-used data (such as water temperature, oil pressure, rotate speed, fuel consumption and so on) of EFI machine, but also control crank on, shutdown, raising speed and speed droop via CANBUS port. (controller with CAN BUS port only);
- ◆ Suitable for various system of 3-phase 4-wire, 3-phase 3-wire, 1-phase 2-wire, and 2-phase 3-wire (120/240V) power, 50/60Hz;
- ◆ Collects and shows 3-phase voltage, current, power parameter and frequency of gens or mains.

Mains

Line voltage (Uab, Ubc, and Uca)

Phase voltage (Ua, Ub, and Uc)

Phase sequence

Frequency: **Hz****Gens**

Line voltage (Uab, Ubc, and Uca)

Phase voltage (Ua, Ub, and Uc)

Phase sequence

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 gens power: **kWh, kVarh, kVAh**

- ◆ For Mains, controller has over and under voltage, over and under frequency, loss and anti-phase functions; For gens, controller has over and under voltage, over and under frequency, loss and anti-phase, over and anti-power, over current functions;
- ◆ 3 fixed analog sensors (temperature, oil pressure and liquid level);
- ◆ 2 configurable sensors can be set as sensor of temperature, pressure or fuel level
- ◆ 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) **RPM (unit)**

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

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

Hour count (HC) can accumulate Max. 65535 hours.

Start times can accumulate Max. 65535 times

- ◆ Control protection, Start & Stop gen-set, ATS(Auto Transfer Switch) control with perfect failure protection function;
- ◆ All output ports are relay-out;
- ◆ User can modify and store parameters into internal FLASH memory; the parameters setting cannot be lost even without power. Majority parameters can be configured from front panel, and all parameters can be configured by USB interface (or RS485 interface) to adjust via PC.
- ◆ More kinds of curves of temperature, pressure, fuel level can be used directly and users can define the sensor curves by themselves;
- ◆ More conditions of crank disconnect (speed sensor, oil pressure, generator frequency) are optional;
- ◆ Widely power supply range (8~35)VDC, accommodating to different starting battery voltage environment;
- ◆ Event log, real-time clock, timing start & stop generator (can be set as start gen-set once a day/week/month with load or not);
- ◆ Can be used for the pumping unit as well as an indicating instrument (indicate and alarm are enable only, relay is inhibited);
- ◆ With maintenance function. Actions (warning only or shutdown alarm) can be set when maintenance time out;
- ◆ All parameters adopt digital adjustment, instead of conventional analog modulation with normal potentiometer, more reliability and stability;
- ◆ Rubber ring between controller and shell, excellent waterproof ability can reach IP55;
- ◆ Metal fixing clips enable perfect in high temperature environment;
- ◆ Modular design, inflaming retarding ABS plastic shell, pluggable type connection terminals and embedded installation mode. Compact structure with easy mounting.

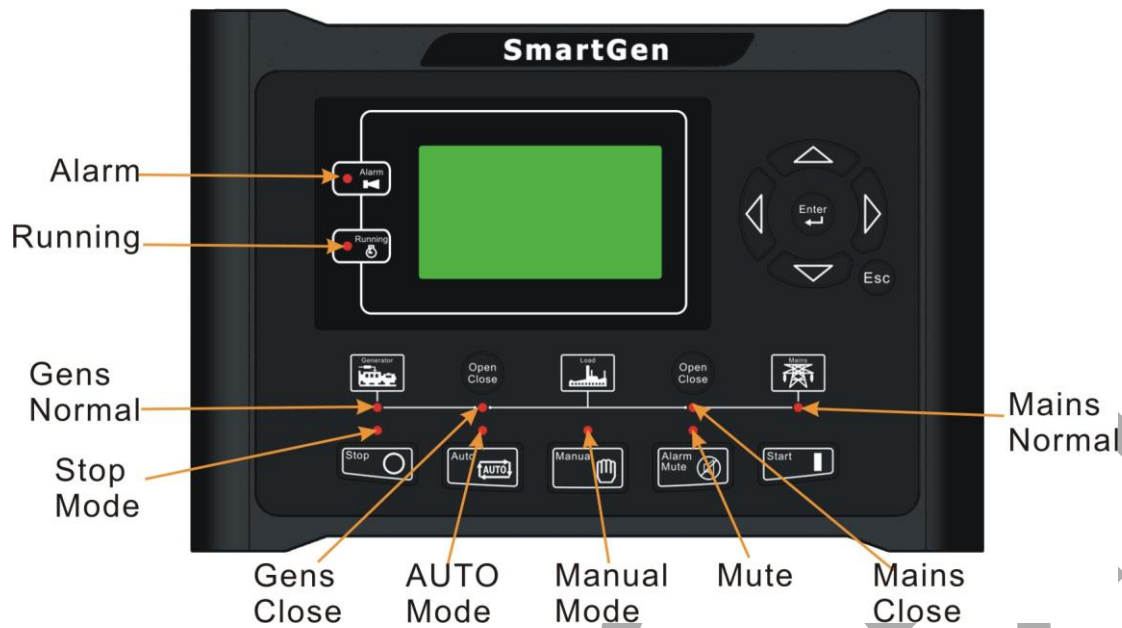
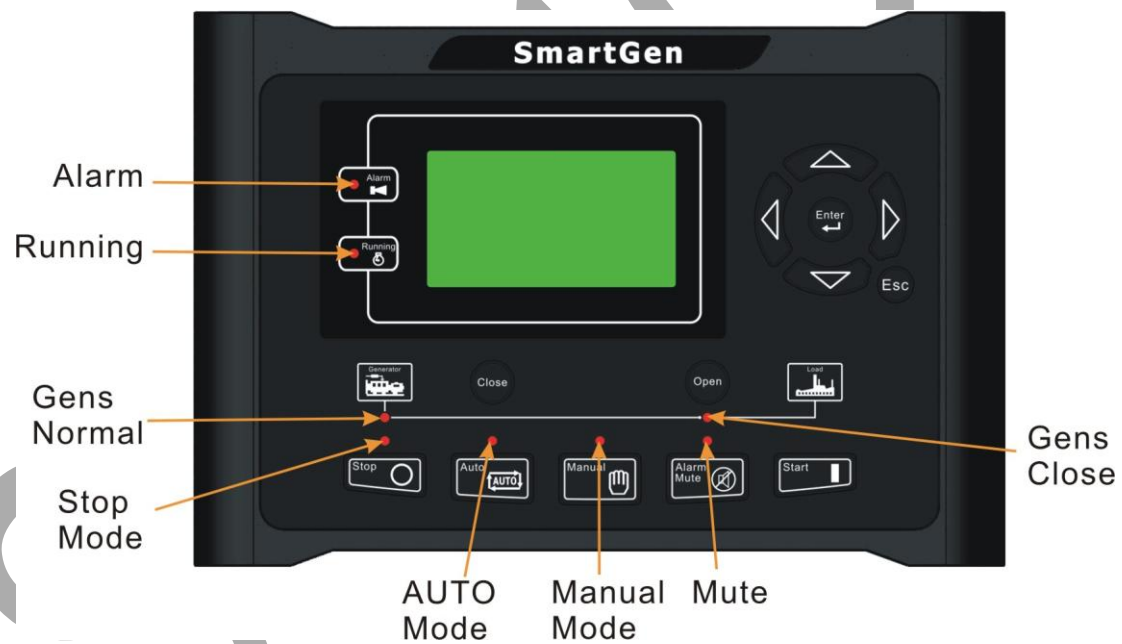
4 SPECIFICATION




Items	Contents
Running Voltage	DC8.0V to DC35.0V , Continuous Power Supply.













Power Consumption	<4W (standby ≤2W)
Alternator Input Range 3-Phase 4-Wire 3-Phase 3-Wire Single-Phase 2-Wire 2-Phase 3-Wire	AC15V-AC 360V (ph-N) AC30V - AC620V (ph-ph) AC15V - AC360V (ph-N) AC15V - AC360V (ph-N)
Alternator Frequency	50/60Hz
Speed sensor voltage	1.0V to 24.0V (RMS)
Speed sensor Frequency	10,000 Hz (max.)
Start Relay Output	16 Amp DC28V supply output
Fuel Relay Output	16 Amp DC28V supply output
Programmable Relay Output (1)	7 Amp DC28V supply output
Programmable Relay Output (2)	7 Amp DC28V supply output
Programmable Relay Output (3)	7Amp DC28V supply output
Programmable Relay Output (4)	7Amp AC250V voltage free output
Programmable Relay Output (5)	7 Amp AC250V voltage free output
Programmable Relay Output (6)	7 Amp AC250V voltage free output
Case Dimension	266mm x182mm x45mm
Panel Cutout	214mm x160mm
C.T. Secondary	5A rated
Running Conditions	Temperature: (-25~+70)°C ; Humidity: (20~93)%
Storage Condition	Temperature: (-30~+80)°C
Protection Level	IP55: when waterproof rubber ring added between controller and its panel. IP42: when waterproof rubber ring not added between controller and its panel.
Insulating Intensity	Object: among in input/output/power Quote standard: IEC688-1992 Test way: AC1.5kV/1min 3mA leakage current
Net Weight	0.85kg




5 OPERATION


5.1 INDICATOR LIGHT

HGM9X20**HGM9X10****5.2KEY FUNCTIONS**

	Stop	Stop running generator at Auto/manual mode; Lamp test (press at least 3 seconds); During stopping process, press this button again to stop generator immediately.
	Start	Start gen-set in Manual mode or Manual Testing mode.
	Manual Mode	Press this key and controller enters Manual mode.

	Auto Mode	Press this key and controller enters Auto mode.
	Mute/ Alarm Reset	Alarming sound off; If trip and not shutdown alarm, pressing the button more than 3 seconds can reset this alarm.
	Gens Close/Open	Can control gens to switch on or off in manual mode. (HGM9X10 without)
	Mains Close/Open	Can control mains to switch on or off in manual mode (HGM9X10 without).
	Close	Can control switch on in manual mode (HGM9X20 without)
	Open	Can control switch off in manual mode (HGM9X20 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.
	Configure/Confirm	1)Enter into operation help after pressing this key; 2)Pressing more than 3 seconds can enter into parameters setting menu;3)confirm setting information in setting menu
	Exit	1)Return to main menu; 2) Return to previous menu in setting menu





 **NOTE:** Press  and  simultaneously can force start gen-set; At this point, the controller will not judging whether the gen-set start successfully or not by crank disconnect condition any more, but the operators decide it. Operators release the button after the gen-set start successfully, then the controller enters safe running delay mode.

 **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 information in the controller page of “**ABOUT**”.

5.3 LCD DISPLAY

5.3.1 MAIN DISPLAY

Main display screen use pages demonstrated,   for turning pages while   for turning screen.

★ **Status**, including as below,

Status of gen-set, mains, and ATS

▲ **NOTE:** HGM9X10 has no mains status screen.

▲ **Engine**, including as below,

Speed, temperature of engine, engine oil pressure, liquid (fuel) level, programmable analog 1, programmable analog 2, battery voltage, charger voltage, accumulated run time, accumulated start times.

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

★ **Gens**, including as below,

Phase voltage, Line voltage, frequency, phase sequence

★ **Mains**, including as below

Phase voltage, Line voltage, frequency, phase sequence

▲ **NOTE:** HGM9X10 without this page.

★ **Load**, including as below,

Current, each phase and total active power (positive and negative), each phase and total inactive power (positive and negative), each phase and total apparent power, each phase and average power factor (positive and negative), accumulated energy (**kWh, kVarh, kVAh**).

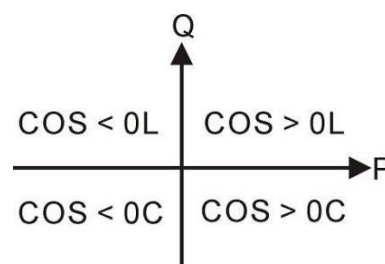
▲ **Note:** When only mains switch on and indicator lights, count active and inactive power, apparent power, but accumulate electric energy. Count the gens active and inactive power, apparent power, power factor, and accumulate electric energy under other conditions.

▲ **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
$\text{COS}>0\text{L}$	$\text{P}>0, \text{Q}>0$	Input	Input	Load is inductive resistance.
$\text{COS}>0\text{C}$	$\text{P}>0, \text{Q}<0$	Input	Output	Load is capacitance resistance.
$\text{COS}<0\text{L}$	$\text{P}<0, \text{Q}>0$	Output	Input	Load equal to one under excitation generator
$\text{COS}<0\text{C}$	$\text{P}<0, \text{Q}<0$	Output	Output	Load equal to one over excitation generator.

▲Note:

1. Input active power, gens or mains send electricity to load.
2. Output active power, load send electricity to gens or mains.
3. Input reactive power, gens or mains send reactive power to load.
4. Output reactive power, load send reactive power to gens or mains.

★Alarm:

▲NOTE: Instruction about ECU warning and alarming, if there is definite alarm and LCD will show details, please check the generator according to it; otherwise, please check the manual of generator according to SPN alarm code.

🔲 Event log

Make records about all start/stop events (shutdown alarm, trip and shutdown alarm, manual /auto start or stop) and the real time when alarm occurs.

Others, including,

Time and Date, count down time for maintenance, input/output ports status.

🔲 About

Issue time of software and hardware version

Example:

Speed of engine
1500 RPM
Manual Mode

5.3.2 PARAMETERS SETTING MENU

Including as following,





★Mains settings





★Timer settings





★Engine settings



- ★Gen-set settings
- ★Load settings
- ★Switch settings
- ★Analog sensor settings
- ★Input pore settings
- ★output pore settings
- ★Module settings
- ★Scheduling and maintenance settings
- ★GSM settings





















Example,

Advanced Parameters Configure	Form 1:
>Mains settings	  Change the setting contents,  enter into
>State delay settings	setting (form 2)  exit setting
>Engine settings	
>Gen-set setting	

Gen-set Configure	Form 2:
>Return	  Change the setting contents (Form3); Select
>AC-Power Mode	Return" and press  back to previous menu(form 1)
>Gen-set Pole	 back to previous menu.(form 1)
>Voltage rating	

Gen-set Configure	Form 3:
>Power Under voltage shutdown	  Change the setting contents  confirm setting
>Power over freq shutdown	(form4),  back to previous menu (form 1).
>Power under freq shutdown	
>Power over voltage warming	

Power over voltage warming	Form 4:
Enable choice: unable	 Enter setting menu (form5),  back to previous menu
Setting value: 00110%	(form 3).
Return value: 00108%	
Time lag: 00005	

Power over voltage warming Enable choice: unable Setting value: 00110% Return value: 00108% Time lag : 00005	Form 5:   Change the setting contents (form 6),  confirm setting(form 7),  exit setting (form 4).
Power over voltage warming Enable choice: enable Setting value: 00110% Return value: 00108% Time lag : 00005	Form 6:   Change the setting contents (form 5),  confirm setting (form7) ,  exit setting (Form4).
Power over voltage warming Enable choice: enable Setting value: 00110% Return value: 00108% Time lag: 00005	Form7:   Change cursor position,   change cursor value,  confirm setting,  exit setting (form 4).
Power over voltage warming Enable choice: unable Setting value: 00110% Return value: 00108% Time lag: 00005	Form 8:   Change cursor position,   change cursor value,  Confirm setting (form 4),  exit setting (form 4) .

 **NOTE:** Long time pressing  can exit setting directly.


5.4 AUTO START/STOP OPERATION

Press , its indicator lights, and controller enters **Auto** mode.

Starting Sequence,

- HGM9X20:** When Mains is abnormal (over and under voltage, over and under frequency, miss phase, anti-phase), it enter into mains “abnormal delay” and LCD display count down time. When mains abnormal are over, it enters into “start delay”; it also enters into this mode when “remote start on load” is active.
- HGM9X10:** Generator enters into “start delay” as soon as “Remote Start on Load” is active.
- Count down of “start delay” is shown at the bottom line of LCD.
- When start delay is over, preheat relay outputs (if this be configured), “preheat start delay XX s” is shown at the bottom line of LCD.




5. When preheat delay is over, fuel relay outputs 1s and then start relay output; if engine crank fails during “cranking time”, the fuel relay and start relay stop outputs and enter into “crank rest time” and prepare to next crank.
6. If generator crank fails within setting times, controller will send **“Fail to start”** and the warning will be shown on LCD at the same time.
7. Whenever to start generator successfully, it will enter into “safety running time”. During this period, alarms of low oil pressure, high temperature, under speed, charge fails are inactive. As soon as this delay is over, generator 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, generator will enter into “warming up time delay”(if configured);
9. When “warming up time delay” is over, if generator’s voltage, frequency is normal, close gens relay will output. Generator will enter into normal running with load and gens close indicator is light; Otherwise, controller will alarm and shutdown (gens alarm is shown in controller’s alarm page).

 **NOTE:** When start engine via “Remote Start (off Load)” input, same procedures as above, except for, gens switch on, relay not output and generator without load in NO.9.

Stopping Sequence:

1. HGM9X20, when mains recover normal during running, the gen-set enters into mains voltage “Normal delay”. When mains normal delay is over, it enters into “stop delay” and mains indicator lights; it also can be this mode when “remote start” is inactive.
2. HGM9X10, generator enters into “stop delay” as soon as “Remote Start” is inactive.
3. When stop delay is over, gens close relay is un-energized; generator enters into “cooling time relay”. After “transfer rest time”, mains close relay is energized. Gens indicator extinguishes while mains indicator lights.
4. Idle relay is energized as soon as entering “stop idle delay”.
5. If enter “ETS delay”, ETS relay is energized. Fuel relay output is broken.
6. Then enter gen-set “Completely stop time”, auto decides whether generator is stopped or not.
7. Enter “over stop time” (if configured) as soon as generator stops. Otherwise, controller will send “Fail to stop” alarm. (If gen-set stopped successfully after warning of “Failed to Stop”, it will enter “over stop time” and remove alarm)
8. Enter “generator standby” as soon as “over stop time” is over.

5.5 MANUAL START/STOP OPERATION

1. MANUAL START: Press , controller enters into Manual mode and its indicator lights. Press  to start generator, can automatically detect crank disconnected, and generator accelerates to high-speed running automatically. With high temperature, low oil pressure and abnormal voltage during generator running, controller can protect gen-set to stop quickly (please refer to No.4~9 of Auto start operation for detail procedures).
2. MANUAL STOP: Press  can shutdown the running generators. (Please refer to No.3~8 of Auto stop operation for detail procedures).

▲NOTE: In “manual mode”, the procedures of ATS please refer to corresponding contents in this manual.

5.6 SWITCH CONTROL PROCEDURES


5.6.1 HGM9X20 SWITCH CONTROL PROCEDURES


Manual transfer procedures

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



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 gens switch key , if gens has taken load, the engine will send unload signal; on the contrary, gens will send load signal; if mains has taken load, mains will open breaker, and then gens will take load .

Press mains switch key , if mains has taken load, the engine will send unload signal; on the contrary, mains will send load signal; if gens has taken load, gens will open breaker, and then mains will take load.

B. If “Open breaker detect” is “SELECT Enable”

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

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

Auto transfer procedures:

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

1. If input port is connected with closing breaker signal

A. If “Open breaker detect” is “SELECT Enable”

When transferring load from mains to gens, controller begins detecting “fail to transfer”, then the

open delay and transfer rest delay will begin. When detecting time out, the gens will not switch on if switch open failed, otherwise, gens switch on. Detecting transfer failure while gens switch on. When detecting time out, if switch on fail, it is need to wait for gens to switch on. If transfer failed and warning “SELECT Enable”, there is alarming signal whatever switch on or off failure. The way to transfer from gens load to mains load is as same as above.

B. If “Open breaker detect” is “SELECT Disable”

Mains load is transferred into gens load, after the delay of switch off and transfer interval, gens switch on. Detecting transfer fail while gens switch on. After detecting time out, if switch on fail, then wait for gens switch on. If transfer fail and warning “SELECT Enable”, there is alarming signal.

2. If input port is not connected with closing breaker input

Mains load be transferred into gens load, after switch off and transfer interval delay, gens switch on.

The way to transfer gens load to mains load is as same as above.

5.6.2HGM9X10 SWITCH CONTROL PROCEDURES

Manual control procedures,

When controller is in Manual mode, manual control will be executive.

Users can control switch on or off by pressing corresponding key.

Press gens switch on key , gens will output load signal. Press gens switch off key , gens will output unload signal.

Auto control procedures,

When controller is in auto mode, switch control procedures will start auto transfer.

1. If input port is connected with closing breaker signal

A. If “Open breaker detect” is “SELECT Enable”

Gens load is transferred into gens un-load, after the delay of switch off, detecting transfer failure while switch off output. When detecting time out, the engine wait for switch off if switch off failed. Otherwise, switch off is completed.

Gens unload is transferred into gens load, after the close delay, detecting transfer failure while switch on outputting. When detecting time out, if switch on failed, the engine wait for switch on. Otherwise, switch on is completed.

If transfer failed and warning “SELECT Enable”, there is alarming signal whatever switch on or off failure.

B. If “Open breaker detect” is “SELECT Disable”

Gens load is transferred into gens unload, after the delay of switch off, switch off is completed.
 Gens unload is transferred into gens load, after the delay of switch on, detecting transfer failure while switch on outputting. When detecting time out, if switch on failed, to wait for switch on. Otherwise, switch on is completed.

If transfer failure warning is “SELECT Enable”, there is warning signal that “switch on fail”.

2. If input port is not connected with closing breaker signal

Gens un-load is transferred into gens load, gens switch on and output.

Gens load is transferred into gens un-load, gens switch off and output.

▲NOTE:

When using ATS of no interposition, switch off detecting is “SELECT Disable”;

When using ATS of having interposition, switch off “SELECT Disable” or “SELECT Enable” are both OK. If choose “SELECT Enable”, switch off output should be configured;

When using AC contactor, switch off “SELECT Enable” recommended.

6 PROTECTION**6.1 WARNINGS**

When controller detects the warning signal, alarm only and not stop gen-set.

Warnings as following,

No.	Type	Description
1	Over Speed Warming	The controller sends warning signal when it detects the speed is over the threshold value of setting.
2	Under Speed Warming	The controller sends warning signal when it detects the speed is under the threshold value of setting.
3	Loss of Speed Warming	The controller sends warning signal when it detects the speed is 0 and speed signal lost type.
4	Over Frequency Warming	The controller sends warning signal when it detects that the frequency is over the threshold value of setting.
5	Under Frequency Warming	The controller sends warning signal when it detects that the frequency is under the threshold value of setting.
6	Over Voltage Warming	The controller sends warning signal when it detects that the voltage is over the threshold value of setting.
7	Under Voltage Warming	The controller sends warning signal when it detects that the voltage is under the threshold value of setting.
8	Over Current	The controller sends warning signal when it detects the

No.	Type	Description
	Warming	current is over the threshold value of setting.
9	Fail to Stop Warming	The controller sends warning signal when generator not stops after the “stop relay” is over.
10	Charge Fail Warming	The controller sends warning signal when it detects the charge voltage is under the threshold value of setting.
11	Battery High Voltage Warming	The controller sends warning signal when it detects the battery voltage is over the threshold value of setting.
12	Battery Low Voltage Warming	The controller sends warning signal when it detects the battery voltage is under the threshold value of setting.
13	Maintenance Over Time Warming	The controller sends warning signal when count down time is 0 and select the” Maintenance Over Time” setting.
14	Reverse Power Warming	The controller sends warning signal when it detects the reverse power value (power is minus) is over the threshold value of setting.
15	Over Power Warming	The controller sends warning signal when it detects the reverse power value (power is positive) is over the threshold of setting.
16	ECU Warning	The controller sends warning signal when it receive the alarm signal from engine via J1939.
17	Gens Loss of Phase	The controller sends warning signal when it detects the “Gens loss of phase” signal.
18	Gens Reverse Phase Sequence Warming	The controller sends warning signal when it detects the “Gens reverse phase” signal.
19	Switch Transfer Fail Warning	The controller sends warning signal when it detects the switch on and off fail, and switch transfer fail warning select “Enable”.
20	Temperature Sensor Open Circuit	The controller sends warning signal when it detects the sensor is open circuit, and open circuit warning select “Enable”.
21	High Temperature Warning	The controller sends warning signal when it detects the temperature is over the threshold value of setting.
22	Low Temperature Warning	The controller sends warning signal when it detects the temperature is under the threshold value of setting.
23	Pressure Sensor Open Circuit	The controller sends warning signal when it detects the sensor is open circuit, and open circuit warning select “Enable”.

No.	Type	Description
24	Low Oil Pressure Warning	The controller sends warning signal when it detects the oil pressure is under the threshold value of setting.
25	Level Sensor Open Circuit	The controller sends warning signal when it detects the sensor open circuit and open circuit warning select "Enable".
26	Low Level Warning	The controller sends warning signal when it detects the oil lever is under the threshold value of setting.
27	Programmable Sensor 1 Open Circuit Warning	The controller sends warning signal when it detects the sensor is open circuit, and open circuit warning select "Enable".
28	Programmable Sensor 1 High Warning	The controller sends warning signal when it detects the sensor value is over the max. threshold value of setting.
29	Programmable Sensor 1 Low Warning	The controller sends warning signal when it detects the sensor value is under the min. threshold value of setting.
30	Programmable Sensor 2 Open Circuit Warning	The controller sends warning signal when it detects the sensor is open circuit, and open circuit warning select "Enable".
31	Programmable Sensor 2 High Warning	The controller sends warning signal when it detects the sensor value is over the max. threshold value of setting.
32	Programmable Sensor 2 Low Warning	The controller sends warning signal when it detects the sensor value is under the min. threshold value of setting.
33	Input Port Warning	When switching value input port is set as warning and active, controller sends corresponding warning signal.
34	GSM Communication Fail Warning	When GSM Communication is active but can't detect GSM model, controller sends corresponding warning signal.

6.2 SHUTDOWN ALARM

When controller detects shutdown alarm, it will send signal to switch off gens and shutdown.

Shutdown alarms as following,

No.	Type	Description
1	Emergency Shutdown	When controller detects emergency stop signal, it will send a stop alarm signal.
2	Over Speed	When controller detects the speed is over than threshold

No.	Type	Description
	Shutdown	value, it will send a stop alarm signal.
3	Under Speed shutdown	When controller detects the speed is under than threshold value, it will send a stop alarm signal.
4	Loss Of Speed shutdown	When controller detects speed value equals to 0, and speed signal is lost, it will send a stop alarm signal.
5	Gens Over Freq. shutdown	When controller detects frequency is over threshold value of setting, it will send a stop alarm signal.
6	Gens Under Freq. shutdown	When controller detects frequency is under threshold value of setting, it will send a stop alarm signal.
7	Gens Over Volt. shutdown	When controller detects voltage is over threshold value of setting, it will send a stop alarm signal.
8	Gens Under Volt. shutdown	When controller detects voltage is under threshold value of setting, it will send a stop alarm signal.
9	Fail To Start shutdown	If gen-set start failed within setting of start times, controller will send a stop alarm signal.
10	Over Current shutdown	When controller detects current is under threshold value of setting, and over-current alarm is set, it will send a stop alarm signal.
11	Maintenance Over Time shutdown	When count down time is 0 and select the Maintenance Over Time is set, it will send a stop alarm signal.
12	ECU Alarm shutdown	When controller gets stop alarm from engine via J1939, it will send a stop alarm signal.
13	ECU Communication Fail Shutdown	When controller not gets data from engine via J1939, it will send a stop alarm signal.
14	Reverse Power Shutdown	When controller detects reverse power value (power is negative) is over threshold value of setting, and the reverse power action alarm is set, it will send a stop alarm signal.
15	Over Power Shutdown	When controller detects power value (power is positive) is over threshold value of setting, and the reverse power action alarm is set, it will send a stop alarm signal.
16	Temp. Sensor Open Circuit	When controller detects sensor open circuit, and this alarm is set, it will send a shutdown alarm signal.
17	High Temp. Shutdown	When controller detects temperature is higher than setting, it will send a shutdown alarm signal.

No.	Type	Description
18	Pressure. Sensor Open Circuit	When controller detects sensor open circuit, and this alarm is set, it will send a shutdown alarm signal.
19	Low Oil Pressure Shutdown	When controller detects oil pressure is under than setting, it will send a shutdown alarm signal.
20	Level Sensor Open Circuit	When controller detects sensor open circuit, and this alarm is set, it will send a shutdown alarm signal.
21	Programmable Sensor 1 Open Circuit	When controller detects sensor open circuit, and this alarm is set, it will send a shutdown alarm signal.
22	Programmable Sensor 1 High Shutdown	When controller detects sensor value is over upper limit value, and this alarm is set, it will send a shutdown alarm signal.
23	Programmable Sensor 1 Low Shutdown	When controller detects sensor value is under lower limit value, and this alarm is set, it will send a shutdown alarm signal.
24	Programmable Sensor 2 Open Circuit	When controller detects sensor open circuit, and this alarm is set, it will send a shutdown alarm signal.
25	Programmable Sensor 2 High Shutdown	When controller detects sensor value is over upper limit value, and this alarm is set, it will send a shutdown alarm signal.
26	Programmable Sensor 2 Low Shutdown	When controller detects sensor value is under lower limit value, and this alarm is set, it will send a shutdown alarm signal.
27	Input Port Alarm and Shutdown	When switching value input port is set as shutdown alarm, and the alarm is active, it will send a shutdown alarm signal.

6.3TRIP AND SHUTDOWN ALARM

When controller detects shutdown alarm signal, it will disconnect gens quickly and stop after high speed cooling.

Trips shutdown alarm as following,

No.	Type	Description
1	Over Current	When controller detects current is over threshold value of setting and over current trip stop is set, it will send a trip stop alarm signal.
2	Maintenance	When count down time is 0 and the" Maintenance Time Up" is

No.	Type	Description
	Time Out	set, it will send a trip stop alarm signal.
3	Reverse Power	When controller detects reverse power value (power is negative) is over threshold value of setting, and the reverse power trip stop is set, it will send a trip stop alarm signal.
4	Over Power	When controller detects power value (power is positive) is greater than threshold value of setting, and the over power trip stop alarm is set, it will send a trip stop alarm signal.
5	Input Ports	When input port is set as trip stop alarm, and the alarm is active, it will send a trip stop alarm signal

6.4TRIP AND NOT SHUTDOWN ALARM

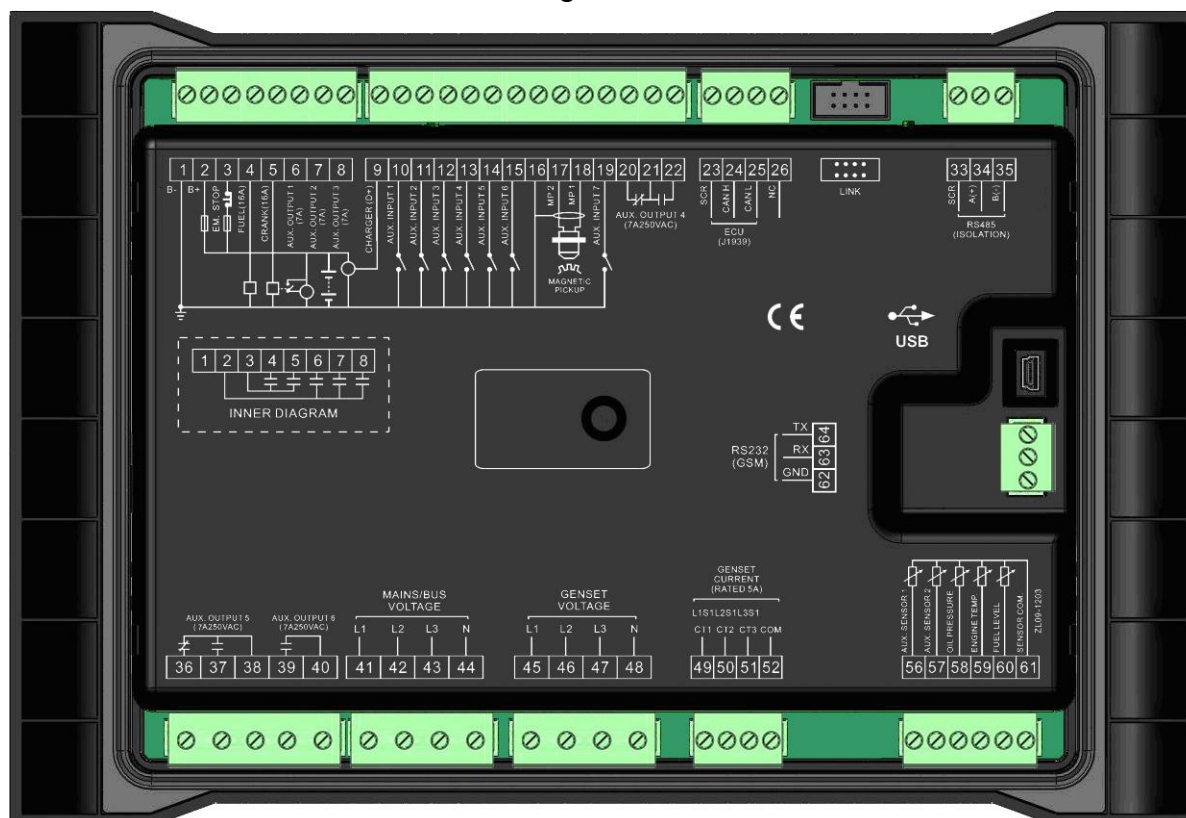
When controller detects stop alarm, it will break signal of gens switch on quickly, but gen-set don't stop.

Trip and not stop alarm as following,

No.	Type	Description
1	Over Current	When controller detects current is over threshold value of setting and over current "trip and not stop" is set, it will send a trip and not stop alarm signal.
2	Reverse Power	When controller detects reverse power value (power is negative) is over threshold value of setting, and the reverse power "trip and not stop" is set, it will send a "trip and not stop" alarm signal.
3	Over Power	When controller detects power value (power is positive) is greater than threshold value of setting, and the over power "trip and not stop" is set, it will send a "trip and not stop" alarm signal.
4	Input Port	When input port is set as trip and not stop alarm, and the alarm is active, it will send a "trip and not stop" alarm signal.

7 WIRINGS CONNECTION

HGM9000 series controller's rear as following:



Description of terminal connection:

NO.	Functions	Cable cross-sectional area	Remark	
1	DC input B-	2.5mm ²	Connect to negative of starter battery.	
2	DC input B+	2.5mm ²	Connect to positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse recommended.	
3	Emergency stop Input	2.5mm ²	Connect to B+ via emergency stop button.	
4	Fuel relay output	1.5mm ²	B+ is supplied by 3 points, rated 16A.	
5	Start relay output	1.5mm ²	B+ is supplied by 3 points, rated 16A.	Connected to coil of starter
6	Programmable relay output 1	1.5mm ²	B+ is supplied by 2 points, rated 7A.	Details see form 2
7	Programmable relay output 2	1.5mm ²	B+ is supplied by 2 points, rated 7A.	
8	Programmable relay output 3	1.5mm ²	B+ is supplied by 2 points, rated 7A.	

HGM9200/9300/9400 Series Gen-set Controller

NO.	Functions	Cable cross-sectional area	Remark	
9	Charge generator D+ port input	1.0mm ²	Connect to charge generator's D+ (WL) terminals. Being hang up If there is no the terminal.	
10	Programmable input port 1	1.0mm ²	Ground connected is active (B-).	Details see form 3
11	Programmable input port 2	1.0mm ²	Ground connected is active (B-).	
12	Programmable input port 3	1.0mm ²	Ground connected is active (B-).	
13	Programmable input port 4	1.0mm ²	Ground connected is active (B-).	
14	Programmable input port 5	1.0mm ²	Ground connected is active (B-).	
15	Programmable input port 6	1.0mm ²	Ground connected is active (B-).	
16	Speed sensor shielding	0.5mm ²	Connect to Speed sensor, shielding line is recommended. (B-) has already connected with speed sensor 2	
17	Speed sensor input 2			
18	Speed sensor input 1			
19	Programmable input port 1	1.0mm ²	Ground connected is active (B-).	Details see form 3
20	Programmable relay output 1	1.5mm ²	Normally close outputs, rated 7A.	Details see form 2
21			Public points of relay	
22			Normally open outputs, rated 7A	
23	ECU CAN screen	/	Impedance-120Ω shielding wire is recommended, its single-end earthed (controllers without ECU CAN function have no this terminal).	
24	ECU CAN H	0.5mm ²		
25	ECU CAN L	0.5mm ²		
26	NC	/	Empty terminal	
33	RS485 screen	/	Impedance-120Ω shielding wire is recommended, its single-end connect with ground (controllers without RS485 function have no this terminal).	
34	RS485-	0.5mm ²		
35	RS485+	0.5mm ²		
36	Programmable relay output 5	2.5mm ²	Normally close outputs, rated 7A.	Details see form 2

NO.	Functions	Cable cross-sectional area	Remark	
37	Programmable relay output 6	2.5mm ²	Normally open outputs, rated 7A.	
38		2.5mm ²	Public points of relay	
39		2.5mm ²	Normally open outputs, rated 7A.	
40		2.5mm ²	Public points of relay	
41	Voltage sensing input of mains A-phase	1.0mm ²	Connect to A-phase of mains (2A fuse is recommended) (HGM9X10 without).	
42	Voltage sensing input of mains B-phase	1.0mm ²	Connect to B-phase of mains (2A fuse is recommended) (HGM9X10 without).	
43	Voltage sensing input of mains C-phase	1.0mm ²	Connect to C-phase of mains (2A fuse is recommended) (HGM9X10 without).	
44	Mains N-wire input	1.0mm ²	Connect to output N-wire of mains (HGM7X10 without).	
45	Voltage sensing input of gen-set A-phase	1.0mm ²	Connect to A-phase of gen-set (2A fuse is recommended).	
46	Voltage sensing input of gen-set B-phase	1.0mm ²	Connect to B-phase of gen-set (2A fuse is recommended).	
47	Voltage sensing input of gen-set C-phase	1.0mm ²	Connect to C-phase of gen-set (2A fuse is recommended).	
48	Gen-set N-wire input	1.0mm ²	Connect to output N-wire of gen-set.	
49	CT A-phase sensing input	1.5mm ²	External connect to secondary coil of current transformer (rated 5A).	
50	CT B-phase sensing input	1.5mm ²	External connect to secondary coil of current transformer (rated 5A).	
51	CT C-phase sensing input	1.5mm ²	External connect to secondary coil of current transformer (rated 5A).	
52	Public terminals of CT	1.5mm ²	See following installation instructions.	
53	Programmable sensor 1	1.0mm ²	Connect to temperature, oil	Details see form 4
57	Programmable sensor 2	1.0mm ²	pressure or fuel level sensors.	

NO.	Functions	Cable cross-sectional area	Remark
58	Oil pressure sensor input	1.0mm ²	Connect to oil pressure sensor.
59	Temperature sensor input	1.0mm ²	Connect to temp. Sensor.
60	Oil level sensor input	1.0mm ²	Connect to oil level sensor.
61	Public terminals of sensor	/	Public terminals of sensor, (B-) have already connected.
62	RS232 screen	0.5mm ²	Connect to GSM module. (controllers without GSM function don't have this terminal)
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 program controller via PC. When the unit use CAN port communication with gen-set (gen-set is not the ordinary type), it only in shutdown mode and in standby mode can use the USB port to program controller.

▲ **NOTE:** LINK ports in controller rear panel are programmable parameters ports; user can program SG72 via PC directly. (Only HGM9210/HGM9210 with this port)

▲ **NOTE:** Please refer to the [MODULES COMPARISON](#) in this manual for more products' functions.

8 SCOPES AND DEFINITIONS OF PROGRAMMABLE

8.1 CONTENTS AND SCOPES OF PARAMETERS

Form 1

No.	Items	Parameters	Defaults	Description
Mains Setting				
1	Mains AC Supply System	(0~3)	0	0: 3P4W ; 1: 3P3W ; 2: 2P3W ; 3: 1P2W .
2	Mains Rated Volt.	(30~30000)V	230	Standard for checking mains over/under voltage. (This value is primary voltage of transformer).
3	Mains Rated Freq.	(10.0~75.0)Hz	50.0	Standard for checking mains over/under frequency.
4	Mains Normal Delay	(0~3600)s	10	The delay from abnormal to normal.

No.	Items	Parameters	Defaults	Description
5	Mains Abnormal Delay	(0~3600)s	5	The delay from normal to abnormal.
6	Mains Volt. Transformer	(0~1)	0	0: Disable ; 1: Enable
7	Mains Over Volt.	(0~1000)%	120	Setting value is mains rated voltage's percentage, and return value and delay value also can be set.
8	Mains Under Volt.	(0~1000)%	80	
9	Mains Over Freq.	(0~1000)%	114	Setting value is mains rated frequency's percentage, return value and delay value also can be set.
10	Mains Under Freq.	(0~1000)%	90	
11	Miss-Phase Monitor	(0~1)	1	0: Disable; 1: Enable
12	Anti-Phase Monitor	(0~1)	1	
Timer Setting				
1	Start Delay	(0~3600)s	1	Time from mains abnormal or remote start signal is active to start gen-set.
2	Stop Delay	(0~3600)s	1	Time from mains normal or remote start signal is inactive to gen-set stop.
3	Preheat Timer	(0~3600)s	0	Time of heater plug pre-powering before starter power up.
4	Crank Timer	(3~60)s	8	Time of starter power up each time.
5	Crank Rest Timer	(3~60)s	10	The waiting time before starter power up secondly when engine start fail.
6	Safety Running Timer	(0~3600)s	10	Alarm for low oil pressure, high temp, under speed, under frequency /voltage, charge fail are inactive.
7	Start Idle Timer	(0~3600)s	0	Idle running time of gen-set when starting.
8	Warm Up Timer	(0~3600)s	10	Warming time between gen-set switch on and high speed running.
9	Coolant Timer	(0~3600)s	10	Cooling time before gen-set stop, after it unloads.
10	Stop Idle Timer	(0~3600)s	0	Idle running time when gen-set stop.
11	Energized To Stop (ETS)	(0~3600)s	20	Stop electromagnet's power on time when gen-set is stopping.
12	Gen-set	(0~3600)s	0	Time between over of idle delay and

No.	Items	Parameters	Defaults	Description
	completely stop Timer			gen-set completely stop when "ETS output time" is set as 0; Time between over of ETS delay and gen-set completely stop when "ETS output time" is not 0.
13	Over gen-set completely stop Timer	(0~3600)s	0	Time between gen-set completely stop and standby.
Engine Setting				
1	Engine Type	(0~39)	0	Default: Common gen-set (not J1939). When connected to J1939 engine, choose the corresponding type.
2	Number of Flywheel Teeth	(10~300)	118	Tooth number of the engine. It is used for judging starter separation conditions and inspecting engine speed. See the installation instructions.
3	Rated Speed	(0~6000) RPM	1500	Offer standard to judge over/under/load speed.
4	Load Speed	(0~100)%	90	Setting value is percentage of rated speed. Controller detects when it is ready to load. It won't turn to normal running period when speed is under loading speed.
5	Loss Of Speed Delay	(0~3600)s	5	Time from detecting speed is 0 to confirm the action.
6	Loss Of Speed Action	(0~1)	0	0: Alarm; 1: Shutdown alarm
7	Over Speed Shutdown	(0~200)%	114	Setting value is percentage of rated speed and delay value also can be set.
8	Under Speed Shutdown	(0~200)%	80	
9	Over Speed Warning	(0~200)%	110	Setting value is percentage of rated speed and delay & return values also can be set.
10	Under Speed Warning	(0~200)%	86	
11	Rated Volt. Of Battery	(0~60.0)V	24.0	Standard for detecting of over/under voltage of battery.
12	Battery High Volt. Warning	(0~200)%	120	Setting value is percentage of rated voltage of battery and delay & return values also can be set.
13	Battery Low	(0~200)%	85	

No.	Items	Parameters	Defaults	Description
	Voltage Warning			
14	Charge Failed Warning	(0~60.0)V	8.0	In normal running, when charger D+(WL) voltage under this value, charge failure alarms.
15	Crank Times	(1~10) times	3	Max. Crank times of crank attempts. When reach this value, controller will send start failure signal.
16	Crank Disconnect	(0~6)	2	See form 5. There are 3 conditions of disconnecting starter with engine. Each condition can be used alone and simultaneously to separate the start motor and gen-set as soon as possible.
17	Frequency	(0~200)%	24	Setting value is percentage of rated freq. When gens freq. over pre-setting value, starter will be disconnected. See the installation instructions.
18	Speed	(0~200)%	24	Setting value is percentage of rated speed. When gens speed over pre-setting value, starter will be disconnected. See the installation instructions.
19	Oil Pressure	(0~1000)kPa	200	When oil pressure over pre-setting value, starter will be disconnected. See the installation instructions.
Generator Setting				
1	Gens AC Supply System	(0~3)	0	0: 3P4W ; 1: 3P3W ; 2: 2P3W ; 3: 1P2W .
2	Number Of Poles	(2~16)	4	Number of generator pole, used for calculating starter rotate speed when without speed sensor.
3	Gens Rated Volt.	(30~30000)V	230	Offer standards for detecting gens over/under voltage and load voltage. If use voltage transformer, this value is first voltage of transformer.
4	Load Volt.	(0~200)%	85	Setting value is percentage of gens rated voltage. When gens voltage under load voltage, it won't enter into

No.	Items	Parameters	Defaults	Description
				normally running. The controller detect during the period of load preparing.
5	Gens Rated Freq.	(10.0~600.0)Hz	50.0	Offer standards for detecting of over/under/load frequency.
6	Load Freq.	(0~200)%	85	Setting value is percentage of gens rated frequency. When gens freq under load freq., it won't enter into normally running. The controller detect during the period of load preparing.
7	Volt. Transformer	(0~1)	0	0: Disable; 1: Enable
8	Over Volt. Shutdown	(0~200)%	120	Setting value is percentage of gens rated volt. Delay value also can be set.
9	Under Volt. Shutdown	(0~200)%	80	
10	Over Freq. Shutdown	(0~200)%	114	Setting value is percentage of gens rated freq. Delay value also can be set.
11	Under Freq. Shutdown	(0~200)%	80	
12	Over Volt. Warning	(0~1000)%	110	Setting value is percentage of gens rated volt. Delay and return value also can be set.
13	Under Volt. Warning	(0~1000)%	84	
14	Over Freq. Warning	(0~1000)%	110	Setting value is percentage of gens rated freq. Delay and return value also can be set.
15	Under Freq. Warning	(0~1000)%	84	
16	Miss Phase Monitor	(0~1)	1	0: Disable 1: Enable
17	Anti-Phase Monitor	(0~1)	1	
Load Setting				
1	Current Transformer	(5~6000)/5	500	The transformation ratio of external connected CT.
2	Rated Full Current	(5~6000)A	500	Generator's rated current. It offers standard for load current.
3	Rated Power	(0~6000)kW	276	Generator's rated power. It offers standard for load current.
4	Overload Current	(0~200)%	120	Setting value is percentage of gens rated volt. Delay value can be set as constant time lag or inverse time lag.

No.	Items	Parameters	Defaults	Description
5	Over Power	(0~1)	0	0: Disable 1: Enable.
6	Anti-Power	(0~1)	0	0: Disable 1: Enable.
Switch Setting				
1	Switch Transfer At Rest	(0~7200)s	5	Interval time from mains switch off to gens switch on; or from gens switch off to mains switch on.
2	Switch Delay On	(0~20.0)s	5.0	Pulse width of mains/gens close. It means output constantly when the value is 0,
3	Switch Delay Off	(0~20.0)s	3.0	Pulse width of mains/gens open.
4	Switch Transfer Delay	(0~20.0)s	5.0	Time of detecting switch auxiliary contacts after ATS transferred.
5	Transfer Failed Warning "Enable"	(0~1)	0	0: Disable 1: Enable.
6	Switch Off Detecting "Enable"	(0~1)	0	0: Disable 1: Enable.
7	Mains abnormal tripping operation "Enable"	(0~1)	1	0: Disable 1: Enable.
Module Setting				
1	Running Mode	(0~2)	0	0: Stop mode 1: Manual mode 2: Auto mode
2	Communication Address	(1~254)	1	Controller's address during remote sensing.
3	Stop Bits Setting	(0~1)	0	0: 2 stop bits; 1: 1 stop bit
4	Language Select	(0~2)	0	0: Simplified Chinese 1: English 2: Others
5	Password Setting	(0~65535)	00318	It is used for entering advanced parameters setting.
GSM Setting				
1	GSM Enable	(0~1)	0	0: Disable; 1: Enable

No.	Items	Parameters	Defaults	Description
2	Phone Number	Max. 20 digits		Must be added its national and area's codes.
Scheduling And Maintenance Setting				
1	Clocked-start	(0~1)	0	0: Disable; 1: Enable
2	Clocked-not-start	(0~1)	0	0: Disable; 1: Enable
3	Maintenance setting	(0~1)	0	0: Disable; 1: Enable
Analog Sensors Setting				
Temperature Sensor				
1	Curve Types	(0~15)	7	SGX. See form 5.
2	Open Circuit Action	(0~2)	0	0: Warn; 1: Shutdown; 2: No action
3	High Temp. Shutdown	(~50~+300) °C	98	Warn when temperature is over than the setting value. Detecting only after safety delay is over. The delay value also can be set.
4	High Temp. Warning	(~50~+300) °C	95	Warn when temperature is over than the setting value. Detecting only after safety delay is over. The delay and return value also can be set.
5	Low Temp. Warning	(0~1)	0	0: Disable; 1: Enable
Oil Pressure Sensor				
1	Curve Types	(0~15)	7	SGX See form 5.
2	Open Circuit Action	(0~2)	0	0: Warn 1: Shutdown 2: No action
3	Low Pressure Shutdown	(0~1000)kPa	103	Warn when pressure over than the setting value. Detecting only after safety delay is over. The delay value also can be set.
4	Low Pressure Warning	(0~1000)kPa	124	Warn when pressure over than the setting value. Detecting only after safety delay is over. The delay and return value also can be set.
Liquid Level Sensor				
1	Curve Types	(0~15)	4	SGH See form 5
2	Open Circuit Action	(0~2)	0	0:Warn; 1:Shutdown; 2:No action
3	Low Level Warning	(0~300)%	10	Warn when level under the setting value. Detecting all the time. The

No.	Items	Parameters	Defaults	Description
				delay and return value also can be set.
Programmable Sensors1				
1	Programmable Sensor1 Setting	(0~1)	0	0: Disable 1: Enable; (can be set as temperature/pressure/liquid level sensor).
Programmable Sensor 2				
1	Programmable Sensor2 Setting	(0~1)	0	0: Disable; 1: Enable; (can be set as temperature/pressure/liquid level sensor).
Programmable Input Ports				
Programmable Input Port 1				
1	Contents Setting	(0~50)	28	Remote start (with load). See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
Programmable Input Port 2				
1	Contents Setting	(0~50)	26	High temperature shutdown input See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
Programmable Input Port 3				
1	Contents Setting	(0~50)	27	Low oil pressure shutdown input. See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
Programmable Input Port 4				
1	Contents Setting	(0~50)	0	User defined. See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
3	Active Range	(0~3)	2	0: after safety on delay 1: cranking 2: always active 3: Inactive
4	Active Actions	(0~4)	0	0:Warn; 1:Warn and shutdown; 2:Trip and shutdown 3:Trip and not shutdown 4:Indicating only
5	Active Delay	(0~20.0)s	2.0	Time from detecting input active to confirm
6	Description			As same as above
Programmable Input Port 5				
1	Contents Setting	(0~50)	0	User defined. See form 3

No.	Items	Parameters	Defaults	Description
2	Active Type	(0~1)	0	0: Closed active 1: Open active
3	Active Range	(0~3)	2	0: After safety on delay 1: Cranking 2: Always active 3: Inactive
4	Active Actions	(0~4)	1	0: Warn; 1: Warn and shutdown; 2: Trip and shutdown 3: Trip and not shutdown 4: Indicating only
5	Active Delay	(0~20.0)s	2.0	Time from detecting input active to confirm.
6	Description			As same as above.
Programmable Input Port 6				
1	Contents Setting	(0~50)	0	User defined .See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
3	Active Range	(0~3)	2	0: After safety on delay 1: Cranking 2: Always active 3: Inactive
4	Active Actions	(0~4)	2	0: Warn; 1: Warn and shutdown; 2: Trip and shutdown 3: Trip and not shutdown 4: Indicating only
5	Active Delay	(0~20.0)s	2.0	Time from detecting input active to confirm.
6	Description			As same as above.
Programmable Input Port 7				
1	Contents Setting	(0~50)	5	Lamp test. See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
Programmable Output Ports				
Programmable Output Port 1				
1	Contents Setting	(0~239)	1	User defined period output (default output is in preheating) See Form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Programmable Output Port 2				
1	Contents Setting	(0~239)	35	Idle control output. See Form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Programmable Output Port 3				
1	Contents Setting	(0~239)	29	Gens closed output. See form 4

No.	Items	Parameters	Defaults	Description
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Programmable Output Port 4				
1	Contents Setting	(0~239)	31	Mains closed output. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Programmable Output Port 5				
1	Contents Setting	(0~239)	38	ETS hold. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Programmable Output Port 6				
1	Contents Setting	(0~239)	48	Common alarm. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close

8.2ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS

Form 2

No.	Type	Description
0	Not Used	Details of function description please see the following.
1	Custom Period 1 Output	
2	Custom Period 2 Output	
3	Custom Period 3 Output	
4	Custom Period 4 Output	
5	Custom Period 5 Output	
6	Custom Period 6 Output	
7	Custom Combined 1	
8	Custom Combined 2	
9	Custom Combined 3	
10	Custom Combined 4	
11	Custom Combined 5	
12	Custom Combined 6	
13	Reserved	
14	Reserved	
15	Reserved	
16	Reserved	
17	Air Flap	Action when over speed alarm stop and emergence stop. It also can close the intake manifold of the engine.
18	Audible Alarm	Action when engine warn, shutdown, trips. Can be connected external alarm. When programmable input port of "alarm mute" is active, it can

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		prohibit its output.
19	Shutter Control	Action in gen-set starting and disconnect when gen-set stop completely.
20	Fuel Pump Control	It is controlled by fuel pump of level sensor's limited threshold.
21	Heater Control	It is controlled by heating of temperature sensor's setting bound.
22	Cooler Control	It is controlled by cooler of temperature sensor's setting bound.
23	Pre-oil Supply Output	Action from "crank on" to "safety on".
24	Excite Generator	Output in start period. If there is no gens frequency during high speed running, output for 2 seconds again.
25	Oil Lubricate Output	Actions in period of pre-heating to safety run.
26	Remote PC Output	This port is controlled by communication (PC).
27	GSM Power	Power for GSM module (GSM module is power-off reset when GSM communication failed).
28	Reserved	
29	Gens close output	It can control gens switch with load.
30	Gens open output	It can control gens switch unloading.
31	Close Mains	It can control mains switch with load
32	Reserved	
33	Start Relay output	
34	Fuel Relay output	Action when gen-set is starting and disconnect when shutdown completed.
35	Idle Control	Used for engine which has idles. It connects before starting; It disconnects when high speed warming begins. It connects during stopping idle mode while disconnects after shutdown completed.
36	Accelerate	Action during high speed warming period.
37	Drop Speed	Action in period from stop idle mode to prepare for stop completely.
38	ETS Control	Used for engines with ETS electromagnet. It connects when stop idle is over while disconnects when

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		"ETS delay" is over.
39	Pulse drop speed	Active 0.1s when it enters into shutdown idling, used for control part of ECU dropping to idle.
40	ECU Stop	Used for ECU engine and control its stop.
41	ECU Power	Used for ECU engine and control its power.
42	Pulse raise speed	Active 0.1s when it enter into high speed warming. It is used for control part of ECU rising to normal speed.
43	Crank Disconnect	It connects when it detects a successful start signal.
44	Gens Normal Output	Action when gens are normal.
45	Gens Available	Action from gens normal running to high speed cooling.
46	Mains Normal	Action when mains normal.
47	Reserved	
48	Common Alarm	Action when gens common warning, common shutdown, common trips alarm.
49	Common Trip and Shutdown	Action in common trip shutdown alarm.
50	Common Shutdown	Action when common shutdown alarm.
51	Common Trip but no shutdown Alarm	Action when common trips but not shutdown alarm.
52	Common Warning Alarm	Action when common warning alarm.
53	Reserved	
54	Battery High Volts	Action when battery's over voltage warning alarm.
55	Battery Low Volts	Action when battery's low voltage warning alarm.
56	Charge Fail	Action when charge fails warning alarm.
57	Reserved	
58	Reserved	
59	Reserved	
60	ECU Warning	It Indicates that ECU sends a warning alarm signal.
61	ECU Shutdown	It Indicates that ECU sends a shutdown alarm signal.
62	ECU Communication Fail	It Indicates that controller couldn't

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		communicate with ECU.
63	Reserved	
64	Reserved	
65	Reserved	
66	Reserved	
67	Reserved	
68	Reserved	
69	Input Port 1 Active	Action when input port 1 is active.
70	Input Port 2 Active	Action when input port 2 is active.
71	Input Port 3 Active	Action when input port 3 is active.
72	Input Port 4 Active	Action when input port 4 is active.
73	Input Port 5 Active	Action when input port 5 is active.
74	Input Port 6 Active	Action when input port 6 is active.
75	Input Port 7 Active	Action when input port 7 is active.
76~ 98	Reserved	
99	Emergency Stop	Action when emergency stop alarm.
100	Fail To Start	Action when start failed.
101	Fail To Stop	Action when stop failed alarm.
102	Under Speed Warning	Action when under speed warns.
103	Under Speed Shutdown	Action when under speed stops.
104	Over Speed Warning	Action when over speed warns.
105	Over Speed Shutdown	Action when over speed shutdown alarm.
106	Reserved	
107	Reserved	
108	Reserved	
109	Gens over frequency Warning	Action when gens over frequency warn.
110	Gens over frequency Shutdown	Action when gens over frequency shutdown alarm.
111	Over Volt Warning	Action when gens over voltage warn.
112	Over Volt Shutdown	Action when gens over voltage stop.
113	Low Freq. Warning	Action when gens low frequency warns.
114	Low Freq. Shutdown	Action when gens low frequency stops.
115	Low Volt. Warning	Action when gens low voltage warns.
116	Low Volt. Shutdown	Action when gens low voltage stops.
117	Loss of Phase	Action when gens loss phase.
118	Gens Reverse Phase	Action in gens reverse phase.
119	Reserved	
120	Over Power warning	Action when controller detects gens'

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		over power.
121	Reserved	
122	Reverse Power	Action when controller detects gens' reverse power.
123	Over Current	Action when controller detects gens' over current.
124	Reserved	
125	Mains Inactive	
126	Mains Over Freq	
127	Mains Over Volt	
128	Mains Under Freq	
129	Mains Under Volt	
130	Mains Reverse Phase	
131	Mains Loss of Phase	
132~138	Reserved	
139	High Temp. Warning	Action when high temperature warning alarm.
140	Low Temp Warning	Action when low temperature warning alarm.
141	High Temp Shutdown	Action when high temp. Shutdown alarm.
142	Reserved	
143	Low OP Warning	Action when low oil pressure warning alarm.
144	Low OP Shutdown	Action when low oil pressure stop.
145	OP Sensor Open	Action when oil pressure sensors are open circuit.
146	Reserved	
147	Low Level Warning	Action when low oil level warning alarm.
148	Reserved	
149	Reserved	
150	Programmable sensor 1 High Warning	
151	Programmable sensor 1 Low Warning	
152	Programmable sensor 1 High Shutdown	
153	Programmable sensor 1 Low Shutdown	
154	Programmable sensor 2 High Warning	

155	Programmable sensor 2 Low Warning	
156	Programmable sensor 2 High Shutdown	
157	Programmable sensor 2 Low Shutdown	
158~ 229	Reserved	
230	In Stop Mode	Action in stop mode.
231	In Manual Mode	Action in Manual mode.
232	In Test Mode	Action in Manual test mode.
233	In Auto Mode	Action in Auto mode.
234	Gens On Load	
235	Mains On Load	
236	Reserved	
237	Reserved	
238	Reserved	
239	Reserved	

8.2.1 DEFINED PERIOD OUTPUT

Defined Period output is composed by 2 parts, period output S1 and condition output S2.



S1 and S2 are **LINK** synchronously, OUTPUT;

S1 or S2 is **SEPARATE**, NOT OUTPUT.

Period output S1: It can set generator's one or more period output freely, also can set the delayed time and output time during the period.

Condition output S2: It can set as any conditions in output ports.

▲ **NOTE:** when delay time and output time both are 0 in period output S1, it is **LINK** in this period.

Example,

Output period: Start

Delay output time: 2s

Output time: 3s

Condition output contents: Output port 1 is active

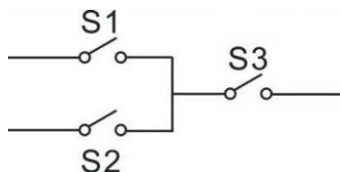
Connect when condition output active/inactive: It connect when active (disconnect when inactive);

When output port 1 is active, moreover enter "start time" and delay for 2s, the defined period output is outputting, in 3s, output stops;

When output port 1 is inactive, defined output period is not outputting.

8.2.2 DEFINED COMBINATION OUTPUT

Defined combination output is composed by 3 parts, condition output S1 or S2 and condition output S3.



S1 or S2 is **LINK**, moreover S3 is **LINK**, defined combination output is outputting.

S1 and S2 are **SEPARATE**, or S3 is **SEPARATE**, defined combination output is not outputting.

▲**NOTE:** S1, S2, S3 can be set as any contents except for “defined combination output” in the output setting.

▲**NOTE:** 3 parts of defined combination output (S1, S2 and S3) couldn't include or recursively include themselves.

Example,

Contents of probably condition output S1, output port 1 is active;

Connect when probably condition output S1 is active /inactive: Connect when active (disconnect when inactive);

Contents of probably condition output S2, output port 2 is active;

Connect when probably condition output S2 is active /inactive: Connect when active (disconnect when inactive);

Contents of probably condition output S3: output port 3 is active;

Connect when probably condition output S3 is active /inactive: Connect when active (disconnect when inactive);






When input port 1 active or input port 2 active, if input port 3 is active, Defined combination output is outputting; If input port 3 is inactive, Defined combination output is not outputting;

When input port 1 inactive and input port 2 inactive, whatever input port 3 is active or not, Defined combination output is not outputting.

8.3 DEFINED CONTENTS OF PROGRAMMABLE INPUT PORTS (ALL ACTIVE WHEN CONNECT TO GROUND (B-))

Form 3

No.	Type	Description
0	Users Defined	Including following functions, Indicator: display only, not warning or shutdown Warning: warning only, not shutdown Shutdown: alarm and shutdown immediately Trip and shutdown: alarm, gens unload and shutdown after high speed cooling

		<p>Trip and not shutdown: alarm, gens unload, not shutdown</p> <p>Inactive: input inactive.</p> <p>Always active: input is active all the time.</p> <p>Start active: detecting as soon as start</p> <p>Safety running active: detecting after safety running delay</p>
1	Reserved	
2	Alarm Mute	It can prohibit outputting of "Audible Alarm" when it is active.
3	Reset Alarm	It can reset shutdown alarm and trip alarm when it is active.
4	60HZ Select	It is used for CANBUS engine and it is 60HZ when active.
5	Lamp Test	All LED indicators are illuminating when input is active.
6	Panel Lock	<p>All buttons in panel is inactive except  and there is  in the left first row on LCD when input is active.</p>
7	Reserved	
8	Slow Control Mode	Protection of under voltage/frequency/speed is inactive.
9	Prohibit Auto Stop	In Auto mode, when input is active, gens Auto stop is prohibited during gens normal running.
10	Prohibit Auto Start	In Auto mode, gens Auto start is prohibited when input is active.
11	Prohibit Timing Start	In Auto mode, gens timing start is prohibited when input is active.
12	Reserved	
13	Gens Closed	Connect to Aux. point of gens loading switch.
14	Prohibit Gens Load	Prohibit gen-set switch on when input is active.
15	Mains Closed	Connect to Aux. point of mains loading switch.
16	Prohibit Mains Load	Prohibit mains switch on when input is active.
17	Auto Mode Input	<p>When input is active, controller enters into Auto mode; all the keys except  are inactive, and  will show in the first line of LCD.</p>
18	Auto Mode Inactive	<p>When input is active, controller won't work under Auto mode.  key and analog Auto key do not work.</p>

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19	Reserved	
20	Reserved	
21	Prohibit Shutdown Alarm	All shutdown alarms are prohibited except emergence stop.(i.e. battle mode or override mode)
22	Aux Instrument Mode	All outputs are prohibited in this mode.
23	Reserved	
24	Reset Maintenance	Controller will set maintenance time and date as default when input is active.
25	Reserved	
26	High Temp shutdown input	Connect to switching value input.
27	Low OP shutdown input	Connect to switching value input.
28	Remote Start (On Load)	In Auto mode, when input is active, gen-set can be started automatically and with load during gen-set normal running; when input is inactive, gen-set can be stopped automatically.
29	Remote Start (Off Load)	In Auto mode, when input is active, gen-set can be started automatically and without load during gen-set normal running; when input is inactive, gen-set can be stopped automatically.
30	Manual Start input	In Manual mode, when input is active, gen-set can be started automatically; when input is inactive, gen-set can be stopped automatically.
31	Reserved	
32	Reserved	
33	Analog Stop Key	An external button can be connected and pressed as simulate panel.
34	Analog Manual Key	
35	Reserve	
36	Analog Auto key	An external button can be connected and keys of simultaneous panel are pressed.
37	Analog Start Key	
38	Analog G-Load key	This is analog gens close key when HGM9X10 controller is applied.
39	Analog M-Load Key	This is analog mains open key when HGM9X10 controller is applied.
40	Reserved	
41	Reserved	
42	Reserved	
43	Reserved	
44	Reserved	
45	Analog Mains normal	In Auto mode, mains is normal when input is

		active.
46	Analog Mains abnormal	In Auto mode, mains is abnormal when input is active.
47	Reserved	
48	Reserved	
49	Reserved	
50	Reserved	

8.4SELECTION OF SENSORS

Form4

No.	Content	Description	Remark
1	Temperature Sensor	0 Not used 1 Defined resistance curve 2 Defined 4~20mA curve 3 VDO 4 CURTIS 5 VOLVO-EC 6 DATCON 7 SGX 8 SGD 9 SGH 10 PT100 11~15 Reserved	Defined resistance's range is 0~6KΩ, default is SGX sensor.
2	Pressure Sensor	0 Not used 1 Defined resistance curve 2 Defined 4~20mA curve 3 VDO 10Bar 4 CURTIS 5 VOLVO-EC 6 DATCON 10Bar 7 SGX 8 SGD 9 SGH 10~15 Reserved	Defined resistance's range is 0~6KΩ, default is SGX sensor.
3	Oil Level Sensor	0 Not used 1 Defined resistance curve 2 Defined 4~20mA curve 3 SGD 4 SGH 5~15 Reserved	Defined resistance's range is 0~6KΩ, default is SGH sensor.

 **NOTE:** User should make special declare when order controller if your gen-set equip with sensor of 4~20mA.

8.5 CONDITIONS OF CRANK DISCONNECT SELECTION

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

▲NOTE:

1. There are 3 conditions to make starter disconnected with engine, that is, magnetic sensor, gens frequency and engine oil pressure. They all can be used separately. We recommend that engine oil pressure should be using with magnetic sensor and gens frequency together, in order to make the starter motor separated with engine immediately and can check crank disconnect or not exactly.
2. Magnetic sensor is the magnetic equipment which be installed in starter for detecting flywheel teeth.
3. When select magnetic sensor, must ensure that the number of flywheel teeth is as same as setting, otherwise, "over speed stop" or "under speed stop" may be caused.
4. If there is no Magnetic sensor of gen-set, please don't select corresponding items, otherwise, "start failed" or "loss speed signal and alarming" maybe caused.
5. If there is no oil pressure sensor of gen-set, please don't select corresponding items.
6. If not select of gens in crank disconnect setting, controller will not collect and display the relative power quantity (can be used in water pump set); if not select of magnetic sensor in crank disconnect setting, the rotating speed displayed in controller is calculated by gens frequency and number of poles.

9 PARAMETERS SETTING

In **HGM9x10** series controller, there are no items of mains in setting and also no mains items in configurable input/output ports.

▲CAUTION: Please change the controller parameters when generator is in standby mode only (e. g. Start conditions selection, configurable input/output, various delay), otherwise, alarming to stop and other abnormal conditions may happen.

▲NOTE: Maximum threshold must over minimum threshold in case that the condition of too high as well as too low will happen.

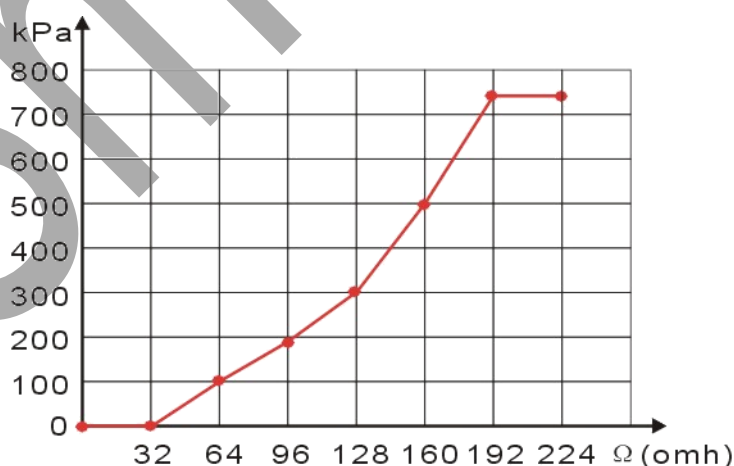
▲NOTE: When setting the warning alarm, please set the correct return value; otherwise, maybe there is abnormal alarm. When setting the overtop warning, the return value must less than setting value; When setting the over-low warning, the return value must over setting value.

▲NOTE: Please set the generator frequency value as low as possible when crank disconnect, in order to make the starter be separated quickly as soon as possible.

▲NOTE: Configurable input couldn't be set as same items; otherwise, there are abnormal functions while the configurable output can be set as same items.

10 SENSORS SETTING

1. When reselect sensors, the sensor curve will be transferred into the stand value. For example, if temperature sensor is SGX (120°C resistive type), its sensor curve is SGX (120°C resistive type); if select the SGD (120°C resistive type), the temperature sensor curve is SGD curve.
2. When there is difference between standard sensor curve and using sensor's, user can adjust it in "sensor curve input".
3. When input the sensor curve, X value (resistor) must be input from few to many, otherwise, there is mistake.
4. If don't select sensor, sensor curve does not work.
5. If corresponding sensor has alarm switch only, user must set this sensor as "NO", otherwise, maybe there is alarming stop or warning.
6. The headmost or backmost values in the vertical coordinates can be set as same as below,



Normal Pressure Unit Conversion Form

	pa	kgf/cm ²	bar	psi
1Pa	1	1.02x10 ⁻⁵	1x10 ⁻⁵	1.45x10 ⁻⁴
1kgf/cm ²	9.8x10 ⁴	1	0.98	14.2

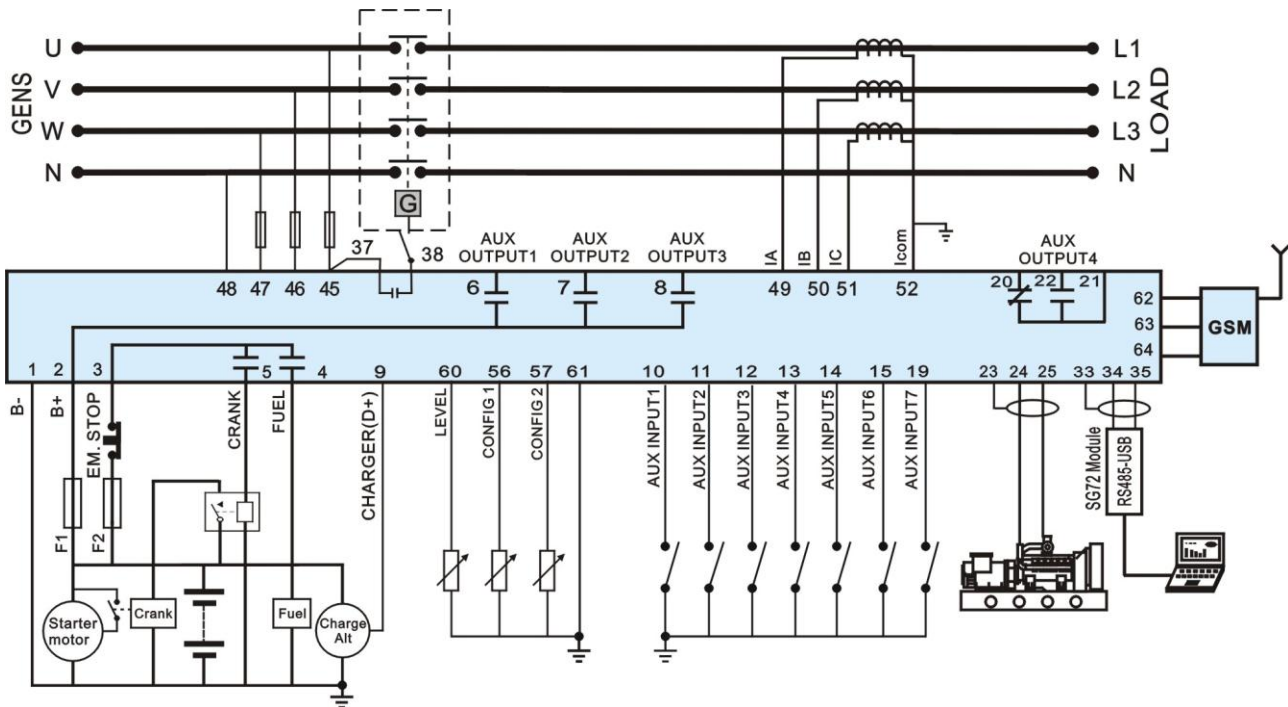
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1

11 COMMISSIONING

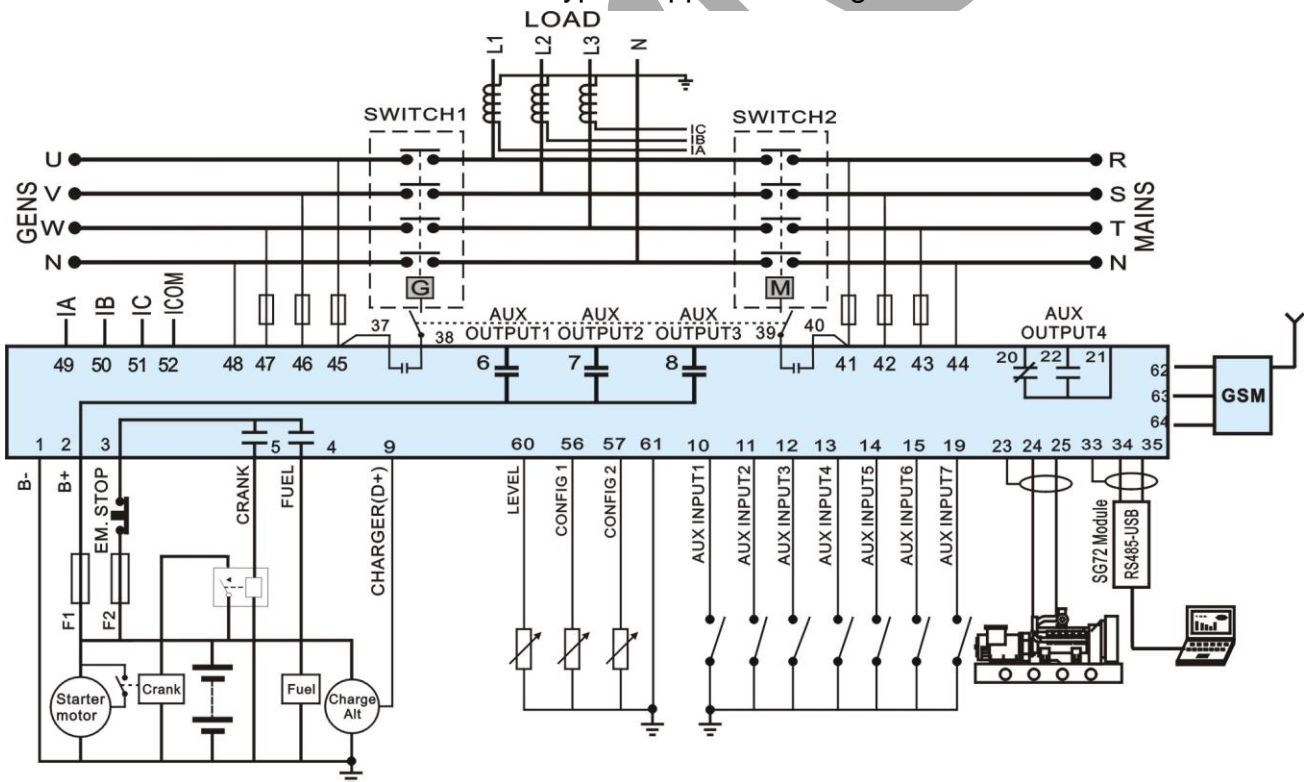
Before the system is started it is recommended that the following checks are made:

1. All wiring to the module is of standard and rating compatible with the system.
2. The unit DC supply is equipped with protecting device and connected directly to the battery and of the correct polarity.
3. Emergence stop input connect with positive of start battery via scram button's normally close point and fuse.
4. Take appropriate measures to stop the engine (disable the operation of the fuel solenoid). After a visual inspection to ensure it is safe to proceed, connect the battery supply. Select MANUAL on the front panel and the engine will run under manual mode.
5. Set controller under manual mode, press "start" button, gen-set will fire. If the gen-set start failed within setting start times, controller will send signal of Start Fail; then press "stop" to reset the controller.
6. Restore the engine to operational status (reconnect the fuel solenoid), again select the start button and this time the engine should fire. If everything goes well, the gen-set will turn into normal running after idle running (if configured). During this time, please watch for engine's running situations and AC generator's voltage and frequency. If abnormal, stop running gen-set and check all wires connection according to this manual.
7. Select the **AUTO** mode from controller's panel, connect mains signal. After the mains normal delay, controller will transfer ATS (if fitted) and into mains load. After cooling time, controller will stop gen-set and make it in to standby time until there is abnormal of mains.
8. When mains is abnormal again, gen-set will be started automatically and enter into normal running, then controller send signal to making gens switch on, and control the ATS as gens load. If not like this, please check ATS' wires connection of control part according to this manual.
9. If there is any other question, please contact Smartgen's service.

HGM9410 typical application diagram

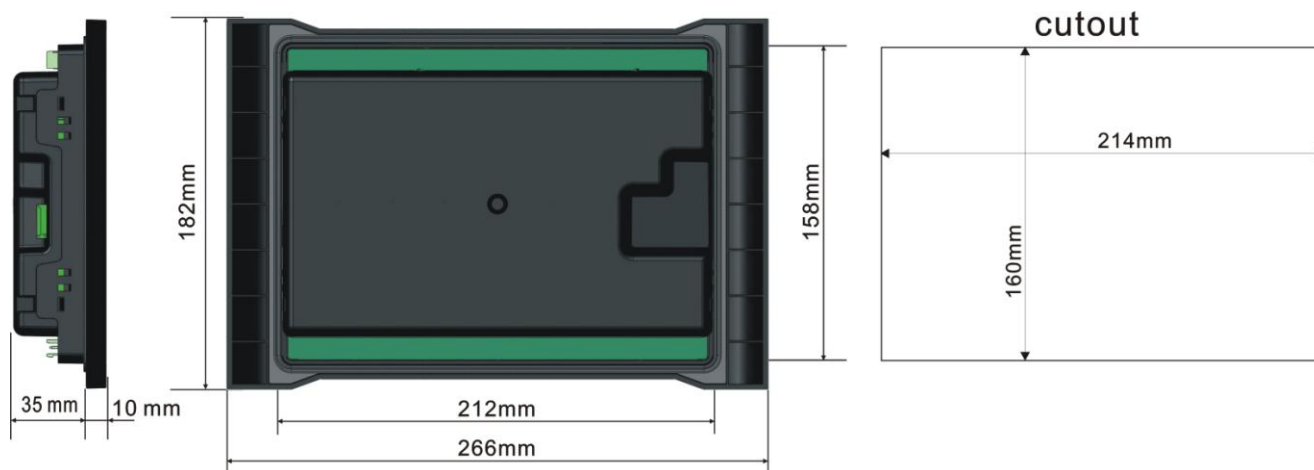


HGM9420 typical application diagram



13INSTALLATION

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



1) Battery Voltage Input

▲NOTE: HGM9000 series controller can suit for widely range of battery voltage (8~35) VDC. Negative of battery must be connected with the shell of starter stable. The wire's diameter which is connected to B+ and B- must be over 2.5mm^2 . If floating charge configured, please firstly connect output wires of charger to battery's positive or negative directly, then, connect wires from battery's positive or negative to controller's corresponding input ports in order to prevent charge disturbing the controller's normal working.

2) Speed Sensor Input

▲NOTE: 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 (1~24) VAC (effective value) during the full speed. 12VAC is recommended (in rated speed). When install the speed sensor, let the sensor is spun to contacting flywheel first, then, port-out 1/3 lap, and lock the nuts of sensor at last.

3) Output And Expand Relays

▲CAUTION: 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.

4) AC Input

Current input of controller must be connected to external current transformer, and the current transformer's secondary side current must be 5A. At the same time, the phases of current transformer and input voltage must correct. Otherwise, the current of collecting and active power maybe wrong.

▲NOTE: ICOM port must be connected to negative pole of battery.



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

5) Withstand Voltage Test

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

14GSM SHORT MESSAGE ALARM AND REMOTE CONTROL

14.1GSM SHORT MESSAGE ALARM

When controller detects alarm, it will send short message automatically to phone number which be set.

NOTE: All alarms about stop, trip stop and trip not stop will be sent to the set phone number. Warning alarms are sent to the phone number according to the set.

14.2GSM SHORT MESSAGE REMOTE CONTROL

Users send order message to GSM module, then controller will make actions according to the message and re-back operations information. Controllers only execute the orders by set. Detail orders as following:

No.	SMS Orders	Re-back Information	Description
1	SMS GENSET	GENSET ALARM	When gen-set is stopping alarm.
		SYSTEM IN STOP MODE GENSET AT REST	Standby status In stop mode
		SYSTEM IN MANUAL MODE GENSET AT REST	Standby status In stop mode
		SYSTEM IN AUTO MODE GENSET AT REST	Standby status In Auto mode
		SYSTEM IN STOP MODE GENSET IS RUNNING	Start status In stop mode
		SYSTEM IN MANUAL MODE GENSET IS RUNNING	Start status In manual mode
		SYSTEM IN AUTO MODE GENSET AT RUNNING	Start status in Auto mode
			Status of gen-set
2	SMS START	GENSET ALARM	Gen-set is stop alarm or trip alarm.
		STOP MODE NOT START	Cannot start in stop mode.
		SMS START OK	Start in manual mode.
			Start gen-set

		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	Re-back information can be set via controller software.	Gets details information of gen-set.	
7	SMS INHIBIT START	INHIBIT START OK	Set as start prohibit.	
8	SMS PERMIT START	PERMIT START OK	Remove start prohibit.	

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

NOTE: Re-back information from SMS DETAIL including: working mode, mains voltage, gens voltage, load current, mains frequency, gens frequency, active power, apparent power, power factor, battery voltage, D+ voltage, water temperature, oil pressure, oil level, rotate speed, total running time, gen-set status, and alarm status.

NOTE: Regional or national code should be added to the phone number. For example, China: 8613666666666

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 configurable output 1 as "ECU power".

Terminals of	9 pins connector	Remark
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controller		
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

It is 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 mode. Engine type is QSM11 G1, QSM11 G2.

Terminals of controller	C1 connector	Remark
Fuel relay output	5&8	Outside expand relay, when oil 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**15.4CUMMINS QSX15-CM570**

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

Terminals of controller	50 pins connector	Remark
Fuel relay output	38	Oil-blast 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**15.5CUMMINS GCS-MODBUS**

It is suitable for GCS engine control mode. 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 oil 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.

Engine type: Cummins QSK-MODBUS, Cummins QST-MODBUS, Cummins QSX-MODBUS

15.6 CUMMINS QSM11

Terminals of controller	OEM connector	Remark
Fuel relay output	38	
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect with controller's terminal only)
CAN(H)	46	Impedance 120Ω connecting line is recommended.
CAN(L)	37	Impedance 120Ω connecting line is recommended.

Engine type: J1939 common used**15.7 CUMMINS QSZ13**

Terminals of controller	OEM connector of engine	Remark
Fuel relay output	45	
Start relay output	-	Connect to starter coil directly.
Programmable output 1	16&41	Set as idle speed control, normal open output. Let 16 connect to 41 during high speed running of controller via external expansion relay.
Programmable output 2	19&41	Set as pulse raise speed control, normal open output. Let 19 connect with 41 for 0.1s during high speed warming of controller via external expansion relay.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	1	Impedance 120Ω connecting line is recommended.
CAN(L)	21	Impedance 120Ω connecting line is recommended.

Engine type: common J1939.**15.8 DETROIT DIESEL DDEC III/IV**

Terminals of controller	CAN port of engine	Remark
Fuel relay output	Expand 30A relay, battery voltage of ECU is supplied by relay.	
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)

CAN(H)	CAN(H)	Impedance 120Ω connecting line is recommended.
CAN(L)	CAN(L)	Impedance 120Ω connecting line is recommended.

Engine type: common J1939.

15.9DEUTZ EMR2

Terminals of controller	F connector	Remark
Fuel relay output	Expand 30A relay, battery voltage of 14 is supplied by relay. Fuse is 16A.	
Start relay output	-	Connect to starter coil directly.
-	1	Connect to battery negative pole.
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	12	Impedance 120Ω connecting line is recommended.
CAN(L)	13	Impedance 120Ω connecting line is recommended.

Engine type: VolvoEDC4

15.10JOHN DEERE

Terminals of controller	21 pins connector	Remark
Fuel relay output	G,J	
Start relay output	D	
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	V	Impedance 120Ω connecting line is recommended.
CAN(L)	U	Impedance 120Ω connecting line is recommended.

Engine type: John Deere

15.11MTU MDEC

It is suitable for MTU engines, 2000 series and 4000series.

Terminals of controller	X1 connector	Remark
Fuel relay output	BE1	
Start relay output	BE9	

CAN GND	E	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	G	Impedance 120Ω connecting line is recommended.
CAN(L)	F	Impedance 120Ω connecting line is recommended.

Engine type: mtu-MDEC-303

15.12MTU ADEC

Suitable engine control mode is ADEC (ECU8) and MTU engine of SMART module.

Terminals of controller	ADEC (X1port)	Remark
Fuel relay output	X1 10	X1 9 connect to B-.
Start relay output	X1 34	X1 33 connect to B-.

Terminals of controller	SMART (X4 port)	Remark
CAN GND	X4 3	CAN communication shielding line(connect with controller's terminal only)
CAN(H)	X4 1	Impedance 120Ω connecting line is recommended.
CAN(L)	X4 2	Impedance 120Ω connecting line is recommended.

Engine type: mtu-ADEC

15.13MTU ADEC (SAM MODULE)

Suitable engine types are ADEC (ECU7) and MTU engine of SAM module.

Terminals of controller	ADEC (X1port)	Remark
Fuel relay output	X1 43	X1 28 connect to B-.
Start relay output	X1 37	X1 22 connect to B-.

Terminals of controller	SAM (X23 port)	Remark
CAN GND	X23 3	CAN communication shielding line(connect with controller's terminal only)
CAN(H)	X23 2	Impedance 120Ω connecting line is recommended.
CAN(L)	X23 1	Impedance 120Ω connecting line is recommended.

Engine type: common J1939

15.14 PERKINGS

It is suitable for ADEM3/ ADEM4 engine control module. Engine type is 2306, 2506, 1106, and 2806.

Terminals of controller	Connector	Remark
Fuel relay output	1,10,15,33,34	
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	31	Impedance 120Ω connecting line is recommended.
CAN(L)	32	Impedance 120Ω connecting line is recommended.

Engine type: Perkins

15.15 SCANIA

It is suitable for S6 engine control module. Engine type is DC9, DC12, and DC16.

Terminals of controller	Connector B1	Remark
Fuel relay output	3	Connect to engine ignition lock.
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	9	Impedance 120Ω connecting line is recommended.
CAN(L)	10	Impedance 120Ω connecting line is recommended.

Engine type: Scania

15.16 VOLVO EDC3

Suitable engine control mode is TAD1240, TAD1241, and TAD1242.

Terminals of controller	"Stand alone" connector	Remark
Fuel relay output	H	
Start relay output	E	
Configurable output 1	P	ECU power Set configurable output 1 as "ECU power"

Terminals of controller	"Data bus" connector	Remark
CAN GND	-	CAN communication shielding line(connect to controller's this terminal only)

CAN(H)	1	Impedance 120Ω connecting line is recommended.
CAN(L)	2	Impedance 120Ω connecting line is recommended.

Engine type: Volvo

▲NOTE: When select this engine type, the preheat time should be set more than 3 seconds.

15.17VOLVO EDC4

Suitable engine types are TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, TAD722, and TAD732.

Terminals of controller	Connector	Remark
Fuel relay output	Expanded 30A relay, and relay offers battery voltage to terminal 1. Fuse is 16A	
Start relay output	-	Connect to starter coil directly.
	1	Connected to negative of battery.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	12	Impedance 120Ω connecting line is recommended.
CAN(L)	13	Impedance 120Ω connecting line is recommended.

Engine type: VolvoEDC4

15.18VOLVO-EMS2

Volvo Engine types are TAD734, TAD940, TAD941, TAD1640, TAD1641, and TAD1642.

Terminals of controller	Engine's CAN port	Remark
Configurable output 1	6	ECU stop Set configurable output 1 as "ECU stop".
Configurable output 2	5	ECU power Set configurable output 1 as "ECU power".
	3	Negative power
	4	Positive power
CAN GND	-	CAN communication shielding line(connect to controller's this terminal only)
CAN(H)	1(Hi)	Impedance 120Ω connecting line is recommended.

CAN(L)	2(Lo)	Impedance 120Ω connecting line is recommended.
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Engine type: Volvo-EMS2

▲ NOTE: When select this engine type, the preheat time should be set more than 3 seconds.

15.19YUCHAI

Suit for Yuchai common rail electrically controlled engine.

Terminals of controller	42 pins connector of engine	Remark
Fuel relay output	1.40	Connect to ignition switch of engine.
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L)	1.34	Impedance 120Ω connecting line is recommended.

Battery	2 pins connector of engine	Remark
Negative power	1	Wire diameter is 2.5mm ² .
Positive power	2	Wire diameter is 2.5mm ² .

Engine type: BOSCH**15.20WEICHA**

Suit for Weichai common rail electrically controlled engine.

Terminals of controller	Connector	Remark
Fuel relay output	1.40	Connect to ignition switch of engine.
Start relay output	1.61	
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L)	1.34	Impedance 120Ω connecting line is recommended.

Engine type: GTSC1

▲NOTE: If there is any question of connection between controller and ECU communication, please feel free to contact Smartgen service.

16 FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative	Check battery and wiring to unit. Check DC fuse.
Unit shutdown	Check the water/cylinder temperature is too high or not; Check DC fuse.
Unit trips on emergency stop	Check the function of emergency stop button is correct or not; Check a positive is present on this input. Check wiring on emergency stop switch or switches.
Low oil pressure fault operates after engine has fired.	Check oil pressure switch and wiring.
High water temperature fault operates after engine has fired.	Check water temperature switch and wiring.
Shutdown Alarm during running	Check relevant switch and wiring. Check relevant programmable input port.
Fail to start is activated after multi-attempts	Check wiring and operation of fuel solenoid. Check battery. Check wiring and speed sensor. Refer to engine manual.
Starter motor inoperative	Check wiring to starter motor. Check battery supply.
Gen-set running while ATS not transfer	Check ATS. Check wiring between ATS and controller.
RS485 communication is abnormal	Check wiring. Check RS485's connections of A and B is reverse connect or not; Check RS485 transfer module whether damage or not; Check communication port of PC whether damage or not.
ECU communication failed	Check wiring. Check CANBUS's connections of H and L is reverse connect or not; Check ECU whether damage or not; Check if the type of engine is correct; Check if the output port of ECU is correct or not.
ECU warning or shutdown	Refer to alarm screen to get information. Check engine according to contents if there is concrete contents. Refer to <i>ENGINE MANUAL</i> according to SPN code to get information if there is no concrete content.