Smartgen®

HGM7200/HGM7100 Series

Automatic Genset Control Module

User Manual

Smartgen Technology

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Software Version

Date	Version	Note
2010-10-15	1.0	Original release
2010-12-15	1.1	Add note about some engine type. Add functions of inputs. Change factory default of liquid level sensor; Correct some errors in selection table of sensors
2011-08-24	1.2	Add the function of "start inhibit".
2011-10-27	1.3	Add input function (Auto Mode Lock and Auto Mode Invalidation).
2012-6-15	1.4	Add custom start per weekly. Add selectivity configuration. Add part of the engine wiring instructions.

This manual is suitable for HGM7200 and HGM7100 series controller only.

Clarification of notation used within this publication.

SIGN	INSTRUCTION
NOTE	Highlights an essential element of a procedure to ensure correctness.
CAUTION!	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
WARNING!	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

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CONTENTS

1 SUMMARY

HGM7200/7100 series generator controllers are used in automatic and monitor control system of genset to achieve automatic start/stop, data measure, alarm protection and "three remote" (remote control, remote measuring, remote communication). The controller adopts large liquid crystal display (LCD) and selectable Chinese and English interface with easy and reliable operation.

HGM7200/7100 gen-set automatic controllers use microprocessor technique with precision parameters measuring, fixed value adjustment, time setting and threshold adjusting and etc.. It can be widely used in all types of automatic genset control system with compact structure, advanced circuits, simple connections and high reliability.

2 ORDER INFORMATION AND MODULES COMPARISON

2.1 ORDER INFORMATION
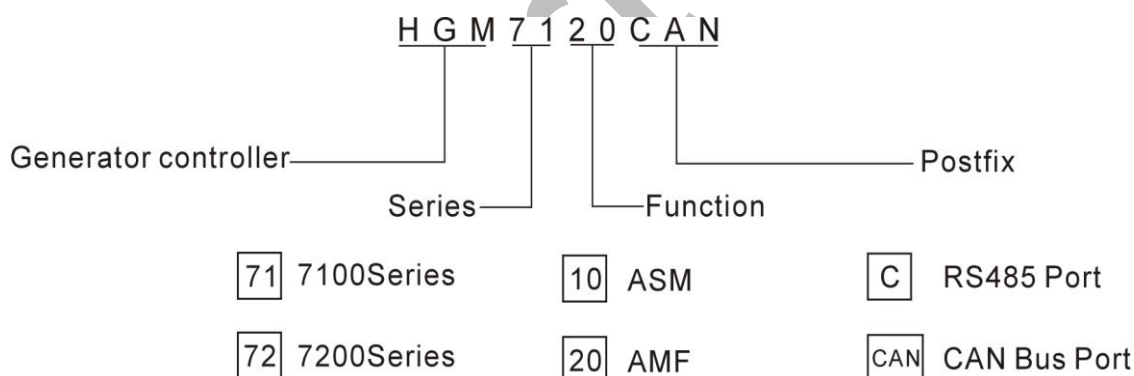
Note:

(1) It is basic model if without postfix.

(2) Please contact with our qualified personnel for more information about the postfix descriptions.

2.2 MODULES COMPARISON

TYPE	HGM 7220	HGM 7210	HGM 7120	HGM 7110	HGM 7120C	HGM 7110C	HGM 7120CAN	HGM 7110CAN
Number of digit input port	7	7	5	5	5	5	5	5

Number of relay output (1)	8	8	6	6	6	6	6	6
Number of sensors (2)	5	5	3	3	3	3	3	3
AMF	●		●		●		●	
RS485	●	●			●	●	●	●
GSM (SMS)	●	●						
CAN (J1939)							●	●
USB	●	●	●	●	●	●	●	●
Real-time clock	●	●						
Event log	●	●						

*Note:

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

(2)HGM7220/7210's analog sensors are composed by 3 fixed sensors (temperature, pressure, fuel level) and 2 configurable sensors. Other controllers are composed by 3 fixed sensors (temperature, pressure, liquid level) only.

2.3MODELS ABBREVIATION

Abbreviation	Description
HGM72X0	All HGM7200 series controllers
HGM71X0	All HGM7100 series controllers
HGM7X20	All HGM7200/7100 series AMF controllers
HGM7X10	All HGM7200/7100 series ASM controllers

3 PERFORMANCE AND CHARACTERISTICS

HGM7X10, Auto Start Module, controls genset to start or stop automatically by remote start signal.

HGM7X20, Auto Main Failure, updates based on HGM7X10, especially for automatic system composed by gens and mains.

Main characteristics,

♦ With ARM-based 32-bit CPU, high integration of hardware and more reliable;

♦ 132x64 LCD with backlit, Chinese, English or other languages display, gentle push button for operation;

♦ Acrylic materials used for protecting LCD screen, wearable performance is better;

♦ Rubber panel and push buttons, more adaptable to high or low temperature;

♦ RS485 communication port and "remote control, remote measuring, remote communication" by the ModBus protocol. (controller with RS485 port only);

♦ With SMS (Short Message Service) function. When genset is alarming, controller can send SMS automatic to max. 5 telephone numbers. User can control or check genets by sending Short Message (controller with GSM port only);

♦ CANBUS port and can communicate with J1939 genset. (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;

♦ Senses and shows 3-phase voltage, current, and power, frequency of gens or mains.

Parameters:

Mains	Gens
Line voltage (Uab, Ubc, and Uca)	Line voltage (Uab, Ubc, and Uca)
Phase voltage (Ua, Ub, and Uc)	Phase voltage (Ua, Ub, and Uc)
Phase sequence	Phase sequence
Frequency (F1)	Frequency (F2)

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, has over and under voltage, over and under frequency, loss and anti-phase, over and anti-power, over current functions;

♦ 3 fixed sensors (temperature, oil pressure and liquid level);

♦ 2 configurable sensors can be set as sensor of temperature or fuel level (HGM72X0 only);

♦ Precision measure and display parameters about Engine,

    Temp. (WT)   °C/°F both be display

    Oil pressure (OP)   kPa/Psi/Bar all be display

    Fuel level (FL)   %

    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 genset, ATS(Auto Transfer Switch) control with complete 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; most parameters can be set via panel of controller; and all parameters can be set via PC which connected with USB or RS485;

♦ 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 and real-time clock.

♦ Timing start & stop generator (can be set as start genset once a day/weekly/monthly whether with load or not; also can be set as custom weekly);

♦ Selectivity configuration. Users can choose different configuration by input port.

♦ Can be used as an supervisory instrument (indicate and alarm are enable

only, output is inhibited);

♦ With timing maintenance function. Actions (warning only or shutdown alarm) can be set when maintenance time up;

♦ All parameters used digital adjustment, instead of conventional analog modulation with normal potentiometer, more reliability and stability;

♦ Seal ring between controller and shell, excellent waterproof ability;

♦ Metal fixing clips enable perfect high temperature resistance;

♦ Modular design, anti-flaming ABS plastic shell, inserted type connection terminals and built-in mounting. Structure compact with easy mounting.

4 SPECIFICATION

Items	Contents
Operating Voltage	DC8.0V to 35.0V, Continuous Power Supply.
Power Consumption	<3W (standby ≤2W)
Alternator Input Range 3-Phase 4-Wire 3-Phase 3-Wire Single-Phase 2-Wire 2-Phase 3-Wire	15VAC - 360VAC (ph-N) 30VAC - 620VAC (ph-ph) 15VAC - 360VAC (ph-N) 15VAC - 360VAC (ph-N)
Alternator Input Frequency	50/60Hz
Magnetic Input Range	1.0V to 24.0V (RMS)
Magnetic Input Frequency	10,000 Hz (max.)
Start Relay Output	16 Amp DC28V at supply output
Fuel Relay Output	16 Amp DC28V at supply output
Auxiliary Relay Output (1)	7 Amp DC28V at supply output
Auxiliary Relay Output (2)	7 Amp 250VAC voltage free output
Auxiliary Relay Output (3)	16 Amp 250VAC voltage free output
Auxiliary Relay Output (4)	16 Amp 250VAC voltage free output
Auxiliary Relay Output (5)	7 Amp DC28V at supply output (HGM72X0 only)
Auxiliary Relay Output (6)	7 Amp DC28V at supply output(HGM72X0 only)
Mounting Dimensions	197mm x152mm x47mm
Panel Cutout	186mm x141mm
C.T. Secondary	5A rated
Working Conditions	Temperature: (-25~+70)°C; Humidity: (20~90)%

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 have between controller and its panel.
Insulation Intensity	Object: among in input/output/power Quote standard: IEC688-1992 Test way: AC1.5kV/1min 3mA leakage current
Net Weight	0.75kg

5 OPERATION

5.1 INDICATOR LIGHT

HGM7X20
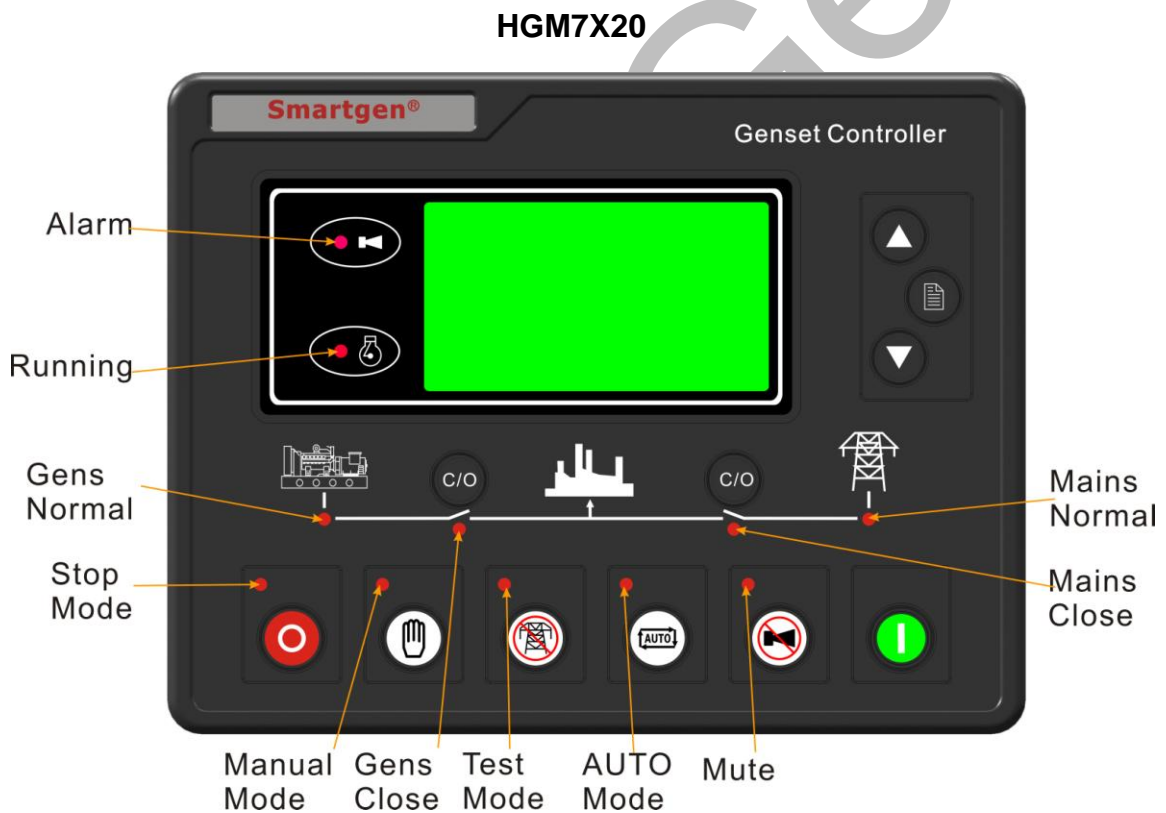
HGM7X10
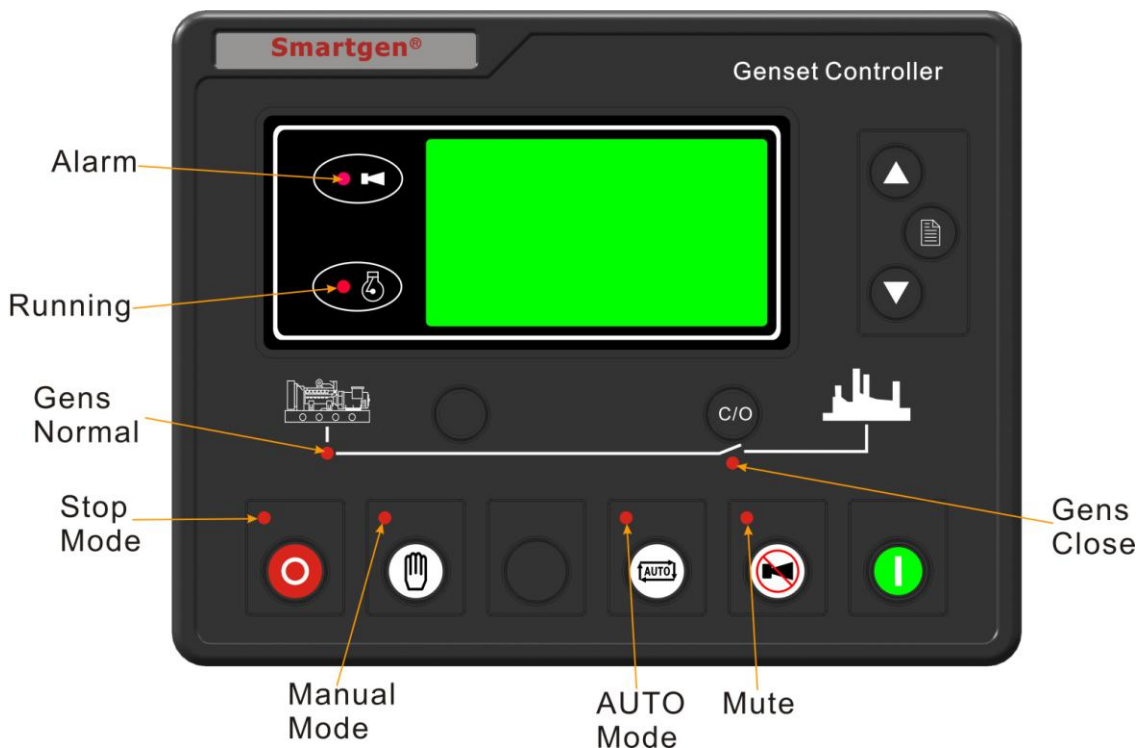
⚠NOTE: The instruction of part of the indicator light.

Alarm light:

Alarm Type	Status
Warning	Twinkle slowly. (1 time per sec.)
Trip and Not Shutdown	Twinkle slowly. (1 time per sec.)
Shutdown	Twinkle fast. (5 times per sec.)
Trip and Shutdown	Twinkle fast. (5 times per sec.)

Running light：It is light on from crank disconnect to ETS while extinguishing in other period.

Gens normal light：It is light on when gens is normal; It is twinkling when gens is abnormal; It is extinguishing when there is no power.

Mains normal light：It is light on when mains is normal; It is twinkling when mains is abnormal; It is extinguishing when there is no power.

5.2KEY FUNCTIONS

🔴	Stop/Reset	Stop generator and reset alarms; Lamp test (press at least 3 seconds); During stopping process, stop generator immediately.
🟢	Start	Start genset in **Manual** mode or Manual Testing mode.
✋	Manual Mode	Press and controller to enter **Manual** mode.

(AUTO)	Auto Mode	Press this key and controller enters **Auto** mode.
(image)	Running With Load	Press to enter Manual Testing mode.
(image)	Mute/Reset Alarm	Alarming sound off; If trip and no shutdown alarm, pressing 3 seconds can reset this alarm.
C/O	Gens Closed/Open	Can control gens to switch on or off in **manua**l mode.
C/O	Mains Closed/Open	Can control mains to switch on or off in **manual** mode **(HGM7X10** without).
(image)	Page Scroll /Confirm	1) Page turning; 2) Shift cursor to confirm in parameters setting menu;
(image)	Up/Increase	1) Screen scroll; 2) Up cursor and increase value in setting menu.
(image)	Down/Decrease	1) Screen scroll; 2) Down cursor and decrease value in setting menu.

△ NOTE: Press ▤ over 3 seconds, go into basic parameters setting menu.

△ NOTE: Press ⊙ and ▤ simultaneously, enter into senior parameters setting menu if password is correct.

△ NOTE: Press ▤ and △ simultaneously, increase contrast of LCD; press ▤ and ▽ simultaneously, decrease it. And the contrast of LCD will back to default setting when controller have power again after lost.

WARNING: default password is 00318, user can change it in event of others change the senior parameters setting. Please closely remember it 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 pages, ▤ for turning pages while △▽ for turning screen.

◙ **Status**, including as below,

Status of genset, mains, and ATS

◙ **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, oil pressure, inlet and outlet port 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:** HGM7X10 don't have 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, not accumulate electric energy. Counting the gens active and inactive power, apparent power, power factor, and accumulate electric energy under other conditions.

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

```
              Q
              ↑
              |
 COS < 0L     |  COS > 0L
 ─────────────┼──────────────→ P
 COS < 0C     |  COS > 0C
              |
```
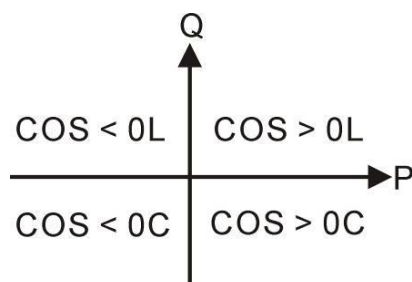
Remark:
P stands for active power
Q stands for inactive power

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

Note,

1. Input active power, gens or mains on load.

2. Output active power, load send active power 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.

⚠**NOTE:** HGM71X0 without this page.

◙ **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

Voltage of gens	
L1-N	**0**V
L2-N	**0**V
L3-N	**0**V

5.3.2 BASIC PARAMETERS SETTING MENU

Including as following,

- ◙ Conditions of crank disconnect
- ◙ Number of engine flywheel teeth
- ◙ Rated speed
- ◙ Rated voltage of gens
- ◙ Rated frequency of gens
- ◙ Rated voltage of mains
- ◙ Rated frequency of mains
- ◙ Changing ratio of current transformer
- ◙ Rated current
- ◙ Rated power
- ◙ Voltage of battery
- ◙ Time and date
- ◙ Start delay
- ◙ Stop delay
- ◙ Preheat timer
- ◙ Crank on timer
- ◙ Crank Rest Timer
- ◙ Safety on timer
- ◙ Start idle timer
- ◙ Warm up timer
- ◙ Cooling timer
- ◙ Stop idle timer
- ◙ ETS(Energize to Stop) hold time
- ◙ Fail to stop time

Example,

Basic Parameters Return Conditions of start No. of engine teeth Rated speed	Form 1: ⬆⬇ Change the items, 📄 enter into setting (form2), and 🔴 exit setting.

Conditions of start Setting 1 frequency + speed	Form 2: 📄 Enter into setting (Form3), press ⬆ or ⬇ to back

	previous menu, press ⊙ back to previous menu (form 1).

Conditions of start 1 frequency + speed	Form 3: 🔼🔽Change items; 📄confirm setting (form2), ⊙exits setting (form2).

5.3.3 ADVANCED PARAMETERS SETTING MENU

Including,

- ◎ Mains
- ◎ Timers
- ◎ Engine
- ◎ Generator
- ◎ Load
- ◎ ATS
- ◎ Analog Sensor
- ◎ Inputs
- ◎ Outputs
- ◎ Module
- ◎ Scheduled and maintenance
- ◎ GSM (SMS)

Example

Advanced Parameters >mains >status delayed >engine >generator	Form1 🔼🔽Change items, 📄 enters setting (form2), ⊙ exits setting.

Generator >return >AC supply mode >No. of poles >rated voltage	Form 2 🔼🔽 Change items (form3), select "return" and press 📄 back to previous menu (form1), ⊙ back to previous menu (form 1).

Generator >Under Voltage Shutdown > Over Freq Shutdown > Under Freq Shutdown	Form 3 🔼🔽 Change items, 📄 confirm setting (form 4), ⊙ back to previous menu (form 1).

> Over Voltage Warn	

Over Voltage Warn Sel: Disable Setting value, 00110% Return value : 00108% Delayed time: 00005	Form 4 📄 Go into setting (form5), press 🔺 or 🔻 back to previous menu (form3), 🔴 back to previous menu (form 3).

Over Voltage Warn Sel: Disable Setting value:　00110% Return value:　00108% Delayed time:　00005	Form 5 🔺🔻 Change setting items (form 6), 📄 confirm setting (form 7), 🔴 and exit setting (form4).

Over Voltage Warn Sel: Enable Setting value:　00110% Return value:　00108% Delayed time:　00005	Form 6 🔺🔻 Change setting items (form5), 📄 confirm setting (form 7), 🔴 and exit setting (form4).

Gens over voltage warn Sel: Enable Setting value,　00110% Return value,　00108% Delayed time,　00005	Form 7 🔺🔻 Change setting items (form5), 📄 confirm setting, 🔴 and exit setting (form4).

Gens over voltage warn Sel: Disable Setting value,　00110% Return value,　00108% Delayed time,　00005	Form 8, 🔺🔻 Change setting items, 📄 confirm setting (form 4), 🔴 and exit setting (form4).

⚠️**NOTE:** Long time pressing 🔴 can exit setting directly during setting.

5.4 AUTO START/STOP OPERATION

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

Starting Sequence,

1. HGM7X20: When Mains is abnormal (over and under voltage, over and under

frequency, miss phase, anti-phase), enter into mains "abnormal delay" and LCD display count down time. When mains abnormal are over, enter into "start delay"; also can be into this mode when "remote start on load" is active.

2. HGM7X10: Generator enters into "start delay" as soon as "Remote Start on Load" is active.

3. Count down of "start delay" is shown in LCD.

4. When start delay is over, preheat relay outputs (if this be configured), "preheat start delay XX s" is shown in LCD.

5. When preheat delay is over, fuel relay outputs 1s and then start relay output; if engine crank fail during "cranking time", the fuel relay and start relay stop outputs and enter into "crank rest time" and wait for next crank.

6. If generator crank fails within setting times, controller will send "**Fail to start**".

7. Whatever ways to start generator successfully, it will enter into "safety on timer". 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"; generator indicator is light if generator's voltage, frequency is normal.

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; if generator's voltage and frequency is abnormal, controller will alarm and stop engine (gens alarm is shown in controller's alarm page).

NOTE: When started 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. HGM7X20, when mains return during genset running, enters into mains voltage "Abnormal delay". When mains abnormal delay are over, enter into "stop delay"; also can be into this mode when "remote start on load" is inactive.

2. HGM7X10, generator enters into "stop delay" as soon as "Remote Start on Load" is inactive.

3. When stop delay is over, close generator relay is un-energized; generator enters into "cooling time relay". After "transfer rest time", close mains relay is energized. Gens indicator dark while mains indicator lights.

4. Idle relay is energized as soon as entering "stop idle delay".

5. If enter "ETS hold delay", ETS relay is energized. Fuel relay's output is broken.

6. Then enter gen-set "Fail to stop timer", 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 genset stopped successfully after warning of "Failed to Stop", will enter "over stop time" and remove alarm)

8. Enter "generator at rest" as soon as "over stop time" is over.

5.5 MANUAL START/STOP OPERATION

1. HGM7X20: Press ⊕, controller enters into Manual starts mode and its indicator lights. Press ⊗, then controller enters into "Manual Test Mode" and its indicator lights. In the both mode, press ❶ to start generator, can automatically detect crank disconnected, and generator accelerates to high-speed running. With high temperature, low oil pressure and abnormal voltage during generator running, controller can protect genset to stop quickly (please refer to No.4~9 of Auto start operation for detail procedures). In "Manual Test Mode ⊗", generator runs well, whether mains normal or not,

loading switch must be transferred to generator side. In "manual mode 🖐", the procedures of ATS please refer to ATS procedure of generator in this manual.

2. HGM7X10: Press 🖐, controller enters into Manual starts mode and its indicator lights. Then press **Ⅰ** to start generator, can automatically detect crank disconnected, and generator accelerates to high-speed running. With high temperature, low oil pressure and abnormal voltage during generator running, controller can protect genset to stop quickly (please refer to No.4~9 of Auto start operation for detail procedures). After generator runs well, if remote start signal is active, controller will send closing gens signal; if the remote signal is inactive, controller won't send closing signal.

3. **Manual** stop: press **O** can shutdown the running generator (please refer to No.3~8 of Auto stop operation for detail procedures).

5.6 SWITCH CONTROL PROCEDURES

5.5.1 HGM7X20 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 on or off key C/O, if gens has taken load, will send unload signal; if taken no load, gens will send load signal; if mains has taken load, mains will unload, and then gens will take load.

Press mains switch on or off key C/O, if mains has taken load, will send unload signal; if taken no load, mains will send load signal; if gens has taken load, gens will unload, 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 C/O firstly.

After switch off delay, press gens switch on key C/O, 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 the same as above.

Auto transfer procedures:

When controller is in Manual Test, Auto or Stop mode, switch control procedures

will start through automatic transfer.

1. If configurable input port is connected with closing breaker signal

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

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 up, if switch open failed, the gens will not switch on, otherwise, gens switch

on. Detecting transfer failure while gens switch on. When detecting time up, 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 up, if switch on fail, then wait for gens switch on. If transfer fail and

warning "SEL 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.

5.5.2 HGM7X10 SWITCH CONTROL PROCEDURES

Manual transfer procedures,

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

Users can control switch on or off by pressing key.

Press gens switch on or off key C/O, if gens have taken load, will output unload signal; if taken no load, gens will output load signal.

Auto control procedures,

When controller is in manual test, auto or stop mode, switch control procedures will start auto transfer.

1.If configurable input port is connected with closing breaker signal

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

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

If transfer failed and warning "SEL Enable", there is alarming signal whatever switch on or off failure.

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

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 up, if switch on failed, to wait for switch on. Otherwise, switch on is completed.

If transfer failure warning is "SEL Enable", there is warning signal that "switch on fail".

2.If configurable input port is 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 Disable" recommended.

6 PROTECTION

6.1 WARNINGS

When controller detects the warning signal, alarm only and not stop genset. Warnings as following,

No.	Type	Description
1	Over Speed	When controller detects the speed is over the threshold of over speed setting.
2	Under Speed	When controller detects the speed is under the threshold of under speed setting.
3	Loss of Speed	When controller detects the speed is 0 and speed signal lost type.
4	Over Frequency	When controller detects that the frequency is over the threshold of over frequency setting.
5	Under Frequency	When controller detects that the frequency is under the threshold of under frequency setting.
6	Over Voltage	When controller detects that the voltage is over the threshold of over voltage setting.
7	Under Voltage	When controller detects that the voltage is under the threshold of under voltage setting.
8	Over Current	When controller detects the current is over the threshold of over current setting.
9	Fail to Stop	When generator not stops after the "stop relay" is over.
10	Charge Fail	When controller detects the charge voltage is under the threshold of setting.

No.	Type	Description
11	Battery High Voltage	When controller detects the battery voltage is over the threshold of setting.
12	Battery Low Voltage	When controller detects the battery voltage is under the threshold of setting.
13	Maintenance Over Time	When count down time is 0 and select the" Maintenance Over Time" setting.
14	Reverse Power	When controller detects the value reverse power (power is minus) is over the threshold of setting.
15	Over Power	When controller detects the value reverse power (power is positive) is over the threshold of setting.
16	ECU Warning	When controller gets the alarm signal from engine via J1939.
17	Gens Loss of Phase	When controller detects the gens loss phase.
18	Gens Reverse Phase Sequence	When controller detects the gens reverse phase.
19	Switch Transfer Fail Warning	When controller detects the switch on and off fail, and switch transfer select enable.
20	Temperature Sensor Open Circuit	When controller detects the sensor is open circuit, and select warning of open circuit.
21	High Temperature Warning	When controller detects the temperature is over the threshold of setting.
22	Low Temperature Warning	When controller detects the temperature is under the threshold of setting.
23	Pressure Sensor Open Circuit	When controller detects the sensor is open circuit, and select warning of open circuit.
24	Low OP Warning	When controller detects the oil pressure is under the threshold of setting.
25	Level Sensor Open Circuit	When controller detects the oil lever sensor is under the threshold of setting.
26	Low Level Warning	When controller detects the oil lever sensor is over the threshold of setting.
27	Programmable Sensor1 Open Circuit	When controller detects the sensor is open circuit, and select warning of open circuit.

No.	Type	Description
28	Programmable Sensor 1 High	When controller detects the sensor value is over the maximum threshold of setting.
29	Programmable Sensor 1 Low	When controller detects the sensor value is under the minimum threshold of setting.
30	Programmable Sensor 2 Open Circuit	When controller detects the sensor is open circuit, and select warning of open circuit.
31	Programmable Sensor 2 High	When controller detects the sensor value is over the maximum threshold of setting.
32	Programmable Sensor 2 Low	When controller detects the sensor value is under the minimum threshold of setting.
33	Aux Input Warning	When digit input port is set as warning and active, controller sends corresponding warning signal.
34	GSM Com Fail	When select GSM enable and 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 Shutdown	When controller detects over speed value, it will send a stop alarm signal
3	Under Speed shutdown	When controller detects under speed value, it will send a stop alarm signal
4	Loss Of Speed	When controller detects speed value equals 0, and speed signal is lost, it will send a stop alarm signal
5	Gens Over Freq.	When controller detects frequency is over value of setting, it will send a stop alarm signal
6	Gens Under Freq.	When controller detects frequency is under value of setting, it will send a stop alarm signal

No.	Type	Description
7	Gens Over Volt.	When controller detects voltage is over value of setting, it will send a stop alarm signal
8	Gens Under Volt.	When controller detects voltage is under value of setting, it will send a stop alarm signal
9	Fail To Start	If genset start fail within setting of start times, controller will send a stop alarm signal
10	Over Current	When controller detects current is under value of setting, and over-current alarm is set, it will send a stop alarm signal.
11	Maintenance Over Time	When count down time is 0 and select the" Maintenance Over Time" is set, it will send a stop alarm signal.
12	ECU Alarm	When controller gets stop alarm from engine via J1939, it will send a stop alarm signal.
13	ECU Com 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 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 reverse power value (power is positive) is over 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 is 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 set for alarming, it will send a shutdown alarm signal
18	Pres. Sensor Open Circuit	When controller detects sensor is open circuit, and this alarm is set, it will send a shutdown alarm signal
19	Low OP Shutdown	When controller detects oil pressure is under than set for alarming, it will send a shutdown alarm signal
20	Level Sensor Open Circuit	When controller detects sensor is open circuit, and this alarm is set, it will send a shutdown alarm signal
21	Programmable	When controller detects sensor is open circuit, and

No.	Type	Description
	Sensor 1 Open Circuit	this alarm is set, it will send a shutdown alarm signal
22	Programmable Sensor 1 High	When controller detects sensor value is over upper limit alarm, and this alarm is set, it will send a shutdown alarm signal
23	Programmable Sensor 1 Low	When controller detects sensor value is under lower limit alarm, and this alarm is set, it will send a shutdown alarm signal
24	Programmable Sensor 2 Open Circuit	When controller detects sensor is open circuit, and this alarm is set, it will send a shutdown alarm signal
25	Programmable Sensor 2 High	When controller detects sensor value is over upper limit alarm, and this alarm is set, it will send a shutdown alarm signal
26	Programmable Sensor 2 Low	When controller detects sensor value is under t lower limit alarm, and this alarm is set, it will send a shutdown alarm signal
27	Aux Input Shutdown	When switch value port is set as shutdown alarm, and the alarm is active, it will send a shutdown alarm signal

6.3 TRIP AND SHUTDOWN ALARM

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

Trips shutdown alarm as following,

No.	Type	Description
1	Over Current	When controller detects current is over setting and over current trip stop is set, it will send a trip stop alarm signal
2	Maintenance Time Up	When count down time is 0 and the" Maintenance Time Up" is set, it will send a trip stop alarm signal
3	Reverse Power	When controller detects reverse power value (power is negative) is over value of setting, and the reverse power action trip alarm is set, it will send a trip stop alarm signal.

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

6.4 TRIP AND NOT SHUTDOWN ALARM

When controller detects stop alarm, it wills breaker signal of gens switch on quickly, but genset not stop.

Trip but not stop alarm as following,

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

7 WIRINGS CONNECTION

HGM7200/7100 series controller rear :
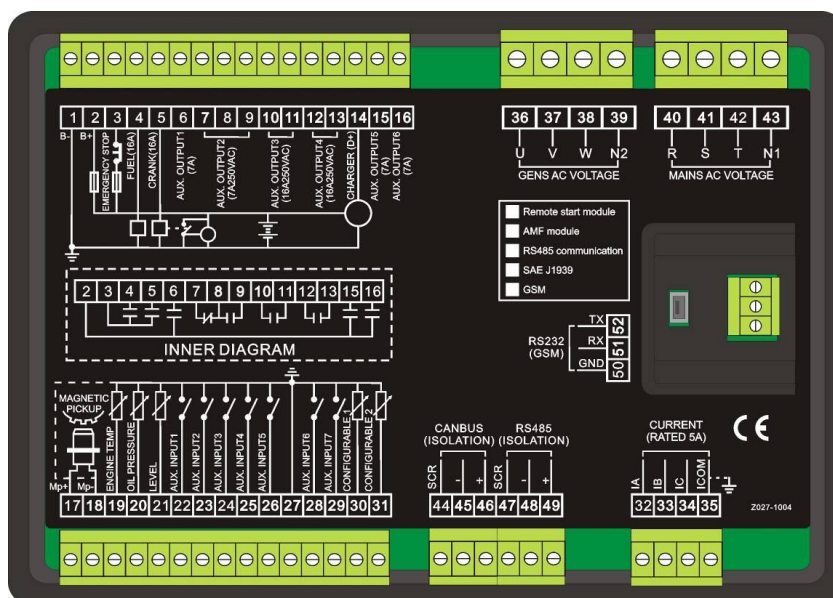
Description of terminal connection:

No.	Functions	Diameter	Remark	
1	DC input –ve	2.5mm	Connected to negative of starter battery	
2	DC input +ve	2.5mm	Connected 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	Connected to +Ve via emergency stop button	
4	Fuel relay output	1.5mm	+Ve is supplied by 3 points, rated 16A	
5	Start relay output	1.5mm	+Ve is supplied by 3 points, rated 16A	Connected to coil of starter
6	Programmable relay output 1	1.5mm	+Ve is supplied by 2 points, rated 7A	Details see Form 2
7	Programmable relay output 2	1.5mm	Normal close outputs, rated 7A	Details see Form 2
8			Public points of relay	
9			Normal open outputs, rated 7A	
10	Programmable relay output 3	2.5mm	Normal open passive contacts of relay, rated 16A,output of passive contacts	Details see Form 2
11				
12	Programmable relay output 4	2.5mm		
13				

No.	Functions	Diameter	Remark	
14	Charge generator D+ port input	1.0mm	Connected to charging starter's D+ (WL) terminals. If there is no this terminal, and be hung up.	
15	Programmable relay output 5	1.5mm	+Ve supplied by 2 points, rated 7A(HGM7100 series without)	Details see form 2
16	Programmable relay output 6	1.5mm		
17	Magnetic pickup Input		Connected to Magnetic Pickup, shielding line is recommended	
18	Magnetic pickup input, and controller inner be connected to battery negative.			
19	Temperature sensor input		Connected to temp. Sensor	Setting items see form 4
20	Oil pressure sensor input		Connected to oil pressure sensor	
21	Oil level sensor input		Connected to oil level sensor	
22	Auxiliary input 1	1.0mm	Ground connected is active (- Ve)	Setting items see form 3
23	Auxiliary input 2	1.0mm		
24	Auxiliary input 3	1.0mm		
25	Auxiliary input 4	1.0mm		
26	Auxiliary input 5	1.0mm		
27	Public terminals of sensor		Public terminals of sensor, controller inner are connected to battery negative.	
28	Auxiliary input 6	1.0mm	Ground connected is active (-Ve) (HGM7100series without)	Setting items see form 3
29	Auxiliary input 7	1.0mm		
30	Programmable sensor 1		Connected to temperature, oil Pressure or fuel level sensors (HGM7100 series without)	Setting items see form 4
31	Programmable sensor 2			
32	Current transformer A-phase sensing input	1.5mm	Outside connected to secondary coil of current transformer(rated 5A)	
33	Current transformer B-phase sensing input	1.5mm	Outside connected to secondary coil of current transformer(rated 5A)	
34	Current transformer C-phase sensing input	1.5mm	Outside connected to secondary coil of current transformer(rated 5A)	

No.	Functions	Diameter	Remark
35	Public terminals of current transformer	1.5mm	See following installation instruction
36	Genset A-phase Voltage sensing input	1.0mm	Connected to A-phase output of genset (2A fuse is recommended)
37	Genset B-phase voltage sensing input	1.0mm	Connected to B-phase output of genset (2A fuse is recommended)
38	Genset C-phase voltage sensing input	1.0mm	Connected to C-phase output of genset (2A fuse is recommended)
39	Genset N-wire input	1.0mm	Connected to output N-wire of genset
40	Mains A-phase voltage sensing input	1.0mm	Connected to A-phase of mains (2A fuse is recommended) (HGM7X10 without)
41	Mains B-phase voltage sensing input	1.0mm	Connected to B-phase of mains (2A fuse is recommended) (HGM7X10 without)
42	Mains C-phase voltage sensing input	1.0mm	Connected to C-phase of mains (2A fuse is recommended) (HGM7X10 without)
43	Mains N-wire input	1.0mm	Connected to output N-wire of mains (HGM7X10 without)
44	CAN screen		Impedance-120Ω shielding wire is recommended, its single-end earthed (controllers without CANBUS function don't have this terminal)
45	CAN(L)	0.5mm	
46	CAN(H)	0.5mm	
47	RS485 screen		Impedance-120Ω shielding wire is recommended, its single-end earthed (controllers without RS485 don't have this terminal)
48	RS485-	0.5mm	
49	RS485+	0.5mm	
50	RS232 GND	0.5mm	Connected to GSM module (HGM7100 series without)
51	RS232 RX	0.5mm	
52	RS232 TX	0.5mm	

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

⚠**NOTE:** Please refer to the model comparison in this manual for more products' functions.

8 SCOPES AND DEFINITIONS OF PROGRAMMABLE

PARAMETERS

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.
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 and delay values also can be set.
8	Mains Under Volt.	(0-1000)%	80	
9	Mains Over Freq.	(0-1000)%	Disable	Setting value is mains rated frequency's percentage, return and delay values also can be set.
10	Mains Under Freq.	(0-1000)%	Disable	
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 genset.

No.	Items	Parameters	Defaults	Description
2	Stop Delay	(0-3600)s	1	Time from mains normal or remote start signal is inactive to genset stop.
3	Preheat Timer	(0-3600)s	0	Time of pre-powering heat plug before starter is powered up.
4	Crank Timer	(3-60)s	8	Time of starter power up each time.
5	Crank Rest Timer	(3-60)s	10	The second waiting time before power up when engine start fail.
6	Safety On Timer	(0-3600)s	10	Alarm ms 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 genset when starting.
8	Warm Up Timer	(0-3600)s	10	Warming time before genset switch on, after it into high speed running.
9	Coolant Timer	(0-3600)s	10	Radiating time before genset stop, after it unloads.
10	Stop Idle Timer	(0-3600)s	0	Idle running time when genset stop.
11	Energized To Stop (ETS)	(0-3600)s	20	Stop electromagnet's power on time when genset is stopping.
12	Fail To Stop Timer	(0-3600)s	0	Time from over of idle delay to stopped when "ETS time" is set as 0; Time from over of ETS hold delay to stopped when "ETS Hold output time" is not 0.
13	Over Stop Timer	(0-3600)s	0	Time from genset stopped to standby
Engine Setting				
1	Engine Type	(0-39)	0	Default, common genset (not J1939). When connected to J1939

No.	Items	Parameters	Defaults	Description
				engine, choose the correspond type.
2	Number Of Flywheel Teeth	(10-300)	118	Tooth number of the engine, for judging of starter separation conditions and inspecting of engine speed.
3	Rated Speed	(0-6000) RPM	1500	Offer standard to judge over/under/loading speed.
4	Load Speed	(0-100)%	90	Setting value is percentage of rated speed. Controller detects when will load. Won't switch on 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 Voltage Warning	(0-200)%	85	
14	Charge Failed Warning	(0-60.0)V	8.0	In normal running, when charger voltage under this value, charge fail alarms.
15	Start Times	(1-10) times	3	Max. Crank times of crank attempts. When reach this number, controller will send start failure signal
16	Crank	(0-6)	2	Conditions of disconnecting

No.	Items	Parameters	Defaults	Description
	Disconnect			starter with engine. Each condition can be used alone and simultaneously.
17	Frequency	(0-200)%	24	When gens freq. Over pre-setting, starter will be disconnected.
18	Speed	(0-200)%	24	When gens rotate speed over pre-setting, starter will be disconnected.
19	Oil Pressure	(0-1000)kPa	Not used.	When oil pressure over pre-setting, starter will be disconnected.
Generator Setting				
1	Gens AC Supply System	(0-3)	0	0: 3P4W; 1: 3P3W; 2: 2P3W; 3: 1P2W.
2	Number Of Poles	(2-32)	4	Numbers of generator pole, used for calculating starter rotate speed when without speed sensor.
3	Gens Rated Volt.	(30-30000) V	230	To offer standards for detecting of gens' over/under voltage and loading voltage. If using 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, won't enter into normally running, during the period of when controller ready to detect loading.
5	Gens Rated Freq.	(10.0-600.0) Hz	50.0	To 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 frequency under load frequency, won't enter into normal running, during the period of when

No.	Items	Parameters	Defaults	Description
				controller ready to detect loading.
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 change of outside connected CT
2	Rated Full Current	(5-6000)A	500	Generator's rated current, standard of load current.
3	Rated Power	(0-6000)kW	276	Generator's rated power, standard of load current.
4	Overload Current	(0-200)%	120	Setting value is percentage of gens rated volt. Delay value also can be set.
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 Rest Timer	(0-7200)s	5	Interval time from mains switch off to gens switch on; or from gens switch off to

No.	Items	Parameters	Defaults	Description
				mains switch on.
2	Switch On Delay	(0-20.0)s	5.0	Pulse width of mains/gens switch on. When it is 0, means output constantly.
3	Switch Off Delay	(0-20.0)s	3.0	Pulse width of mains/gens switch off.
4	Switch Transfer Delay	(0-20.0)s	5.0	Time of detecting switch auxiliary contacts after transferred.
5	Transfer Failed Warning "Enable"	(0-1)	0	0: Disable 1: Enable.
6	Switch Off Detecting "Enable"	(0-1)	0	
Module Setting				
1	Working 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	Number Of Stop Bits	(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	(0-65535)	318	For entering advanced parameters setting.
GSM Setting				
1	GSM Enable	(0-1)	0	0: Disable; 1: Enable
2	Phone Number	Max.20 digits		Must be added its national and area's cods.
Timing And Maintenance Setting				
1	Scheduled Start	(0-1)	0	0: Disable; 1: Enable
2	Scheduled Not Start	(0-1)	0	0: Disable; 1: Enable
3	Maintenance	(0-1)	0	0: Disable; 1: Enable
Analog Sensors Setting				
Temperature Sensor				
1	Type Of Curve	(0-15)	7	SGH
2	Open Circuit Action	(0-2)	0	0: warn; 1: shutdown; 2: no action
3	High Temp. Shutdown	(0-300) ºC	98	Warn when temperature over this value. Detecting

No.	Items	Parameters	Defaults	Description
				only after safety delay is over. The delay value also can be set.
4	High Temp Warning	(0-300) ºC	95	Warn when temperature is over this 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	Type Of Curve	(0-15)	7	SGH
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 this 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 this value. Detecting only after safety delay is over. The delay and return value also can be set.
Liquid Level Sensor				
1	Type Of Curve	(0-15)	4	SGH
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 this value. Detecting all the time. The delay and return value also can be set.
Programmable Sensors1				
1	Programmable Sensor 1 Setting	(0-1)	0	0: Disable 1: Enable; (can be set as temperature / pressure /liquid lever sensor).
Programmable Sensor 2				
1	Programmable Sensor 2 Setting	(0-1)	0	0: Disable; 1: Enable; (can be set as temperature/pressure/liquid lever sensor).

No.	Items	Parameters	Defaults	Description
Programmable Input Ports				
Programmable Input Port 1				
1	Contents Setting	(0-50)	28	Remote start (with load).
2	Active Type	(0-1)	0	0: closed active 1: open active
Programmable Input Port 2				
1	Contents Setting	(0-50)	26	Hi-temperature shutdown input
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.
2	Active Type	(0-1)	0	0: closed active 1: open active
Programmable Input Port 4				
1	Contents Setting	(0-50)	0	User defined
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			
Programmable Input Port 5				
1	Contents Setting	(0-50)	0	User defined
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

No.	Items	Parameters	Defaults	Description
				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			
Programmable Input Port 6				
1	Contents Setting	(0-50)	0	User defined
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			
Programmable Input Port 7				
1	Contents Setting	(0-50)	5	Lamp test
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 is output in preheating)
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
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

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
2	Active Type	(0-1)	0	0:normally open; 1:normally close
Programmable Output Port 5				
1	Contents Setting	(0-239)	38	ETS hold
2	Active Type	(0-1)	0	0:normally open; 1:normally close
Programmable Output Port 6				
1	Contents Setting	(0-239)	48	Common alarm.
2	Active Type	(0-1)	0	0:normally open; 1:normally close

8.2 ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS

Form 2

No.	Type	Description
0	Not Used	
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	Details of function description please see the following.
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 in over speed alarm stop and emergence stop. It also can close the air

		inflow the engine.
18	Audible Alarm	Action in warning, shutdown, trips. Can be connected outside alarm. When programmable input port is active of "alarm mute", can prohibit its output.
19	Louver Control	Action in genset starting and disconnect when genset stopped 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 hi-speed running, output 2 seconds again.
25	Pre-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	Close Generator	Control switch of gens is load.
30	Open Breaker	Control switch is uninstalling.
31	Close Mains	Control switch of mains is load.
32	Reserved	
33	Crank Relay	
34	Fuel Relay	Action when genset is starting and disconnect when shutdown completed.
35	Idle Control	Used for engine which has idles. Pull in before starting and pull out after into hi-speed warming; Pull in during stopping idle mode and pull out after shutdown completed.
36	Raise Speed	Action in hi-speed warming run.
37	Drop Speed	Action in period of stop idle mode to time of wait for stopping completely.
38	ETS Control	Used for engines with ETS electromagnet. Pull in when stop idle is over and pull out when set "ETS delay" is over.
39	Pulse droop output	The genset act for 0.1s when it enters into

		speed idle mode. It is used to control part of ECU droop 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 acceleration output	The genset act for 0.1s when it enters into high speed warming mode. It is used to control part of ECU accelerate to normal speed.
43	Crank Disconnect	Pull in when detects a successful start signal.
44	Generator OK	Action when gens are normal.
45	Generator Available	Action in period of gens ok to hi-speed cooling.
46	Mains OK	Action when mains normal.
47	Reserved	
48	Common Alarm	Action in gens common warning, common shutdown, common trips alarm.
49	Common Electrical Trip	Action in common trips shutdown alarm.
50	Common Shutdown	Action in common shutdown alarm.
51	Common Trip Alarm	Action in common trips and not shutdown alarm.
52	Common Warning Alarm	Action in common warning alarm.
53	Reserved	
54	Battery High Volts	An action in battery's over voltage warning alarm.
55	Battery Low Volts	Action in battery's low voltage warning alarm.
56	Charge Fail	Action in charge alt fail warning alarm.
57	Reserved	
58	Reserved	
59	Reserved	
60	ECU Warning	Indicate ECU sends a warning alarm signal.
61	ECU Shutdown	Indicate ECU sends a shutdown alarm signal.
62	ECU Com Fail	Indicate controller not communicates with ECU.
63	Reserved	
64	Reserved	
65	Reserved	
66	Reserved	
67	Reserved	
68	Reserved	
69	Aux Input 1 Active	Action when input port 1 is active
70	Aux Input 2 Active	Action when input port 2 is active

71	Aux Input 3 Active	Action when input port 3 is active
72	Aux Input 4 Active	Action when input port 4 is active
73	Aux Input 5 Active	Action when input port 5 is active
74	Aux Input 6 Active	Action when input port 6 is active
75	Aux Input 7 Active	Action when input port 7 is active
76-98	Reserved	
99	Emergency Stop	Action in emergency stop alarm.
100	Fail To Start	Action in failed start alarm.
101	Fail To Stop	Action in failed stop.
102	Under Speed Warning	Action in under speed warning.
103	Under Speed Shutdown	Action in under speed shutdown.
104	Over Speed Warning	Action in over speed warning.
105	Over Speed Shutdown	Action in over speed shutdown alarm.
106	Reserved	
107	Reserved	
108	Reserved	
109	Gens Of Warning	Action in gens over frequency warning.
110	Gens Of Shutdown	Action in gens over frequency shutdown alarm.
111	Over Volt Warning	Action in gens over voltage warning.
112	Over Volt Shutdown	Action in gens over voltage shutdown.
113	Low Freq. Warning	Action in gens low frequency warning.
114	Low Freq. Shutdown	Action in gens low frequency shutdown.
115	Low Volt. Warning	Action in gens low voltage warning.
116	Low Volt. Shutdown	Action in gens low voltage shutdown.
117	Loss of Phase	Action in gens loss phase.
118	Gens Reverse Phase	Action in gens reverse phase.
119	Reserved	
120	Over Power	
121	Reserved	
122	Reverse Power	Action in controller detects gens have reverse power.
123	Over Current	Action in 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 in hi-temperature warning alarm.
140	Low Temp Warning	Action in low temperature warning alarm.
141	High Temp Shutdown	Action in hi-temp. Shutdown alarm.
142	Reserved	
143	Low OP Warning	Action in low oil pressure warning alarm.
144	Low OP Shutdown	Action in low oil pressure shutdown.
145	OP Sensor Open	Action when oil pressure sensor are open circuit.
146	Reserved	
147	Low Level Warning	Action when controller has low oil level alarm.
148	Reserved	
149	Reserved	
150	Config1 High Warning	
151	Config1 Low Warning	
152	Config1 High Shut	
153	Config1 Low Shut	
154	Config2 High Warning	
155	Config2 Low Warning	
156	Config2 High Shut	
157	Config2 Low Shut	
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	Generator On Load	
235	Mains On Load	
236	Reserved	
237	Reserved	
238	Reserved	
239	Reserved	

8.2.1 DEFINED PERIOD OUTPUT

Defined Period output is made of 3 parts, period output S1 and condition output S2.

While S1 and S2 are **TRUE** synchronously, OUTPUT;
While S1 or S2 is **FALSE**, NOT OUTPUT.
Period output S1, can set generator's one or more period output freely, can set the delayed time and output time after into period.

Condition output S2; can set as any conditions in output ports.

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

Example,

Output period: start

Delay output time: 2s

Output time: 3s

Condition output contents: output port 1 is active

Close when condition output active/inactive: close when active (disconnect when inactive);

Output port 1 active, after enter "starts time" and delay 2s, this defined period output is outputting, after 3s, stop outputting;

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

8.2.2 DEFINED COMBINATION OUTPUT

Defined combination output is made of 3 parts, condition output S1 or S2 and condition output S3.
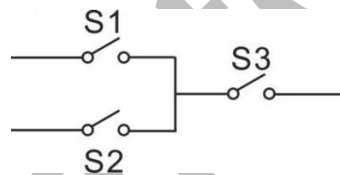
S1 or S2 is TRUE, while S3 is TRUE, Defined combination output is outputting;

S1 and S2 are FALSE, or S3 is FALSE, 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, S3) couldn't include or recursively include themselves.

Example,

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

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

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

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

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

Close when probably condition output S3 is active /inactive: close 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 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 GRAND (B-))

Form 3

No.	Type	Description
0	Users Defined	Including following functions, Indicator: indicate only, not warning or shutdown. Warning: warn only, not shutdown. Shutdown: alarm and shutdown immediately Trip and shutdown: alarm, generator uninstalls shutdown after hi-speed cooling trip and not shutdown, alarm, generator uninstalls, not shutdown. Inactive: input inactive. Always active: input is active all the time. Start active: detecting as soon as start. Safety run active: detecting after safety on run delay
1	Reserved	
2	Alarm Mute	Can prohibit output of "Audible Alarm" when is active
3	Reset Alarm	Can reset shutdown alarm and trip alarm when is active
4	60HZ Select	Use for CANBUS engine and it is 60HZ when is active.
5	Lamp Test	All LED indicators are illuminating when input is active.
6	Panel Lock	All buttons in panel is inactive except ▲▼▤ and there is 🔒 in the right of first row in LCD when input is active.
7	Reserved	
8	Slow Control Mode	Protection less voltage, frequency and speed is inactive.
9	Inhibit Auto Stop	In **Auto** mode, when input is active, prohibit gens

		shutdown auto after gens is OK.
10	Inhibit Auto Start	In **Auto** mode, prohibit gens start auto when input is active.
11	Inhibit Scheduled	In **Auto** mode, prohibit fixed timing start genset when input is active.
12	Reserved	
13	Aux Gens Closed	Connect gens loading switch's Aux. Point.
14	Inhibit Gens Load	Prohibit genset switch on when input is active.
15	Aux Mains Closed	Connect mains loading switch's Aux. Point.
16	Inhibit Mains Load	Prohibit mains switch on when input is active.
17	Auto Mode Input	When input is active, controller enters into Auto mode; all the keys except ⏶⏷🗎 and 🔄 are inactive, and 🔒will show in the right of first line in LCD display.
18	Auto Mode Invalidation	When input is active, controller won't work under Auto mode. ⒜key and analog auto key do not work.
19	Reserved	
20	Reserved	
21	Inhibit Shutdown Alarm	All shutdown alarms are prohibited except emergence stop.(Means battle mode or over control 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	Aux High Temp	
27	Aux Low OP	
28	Remote Start (On Load)	In **Auto** mode, when input active, genset can be started and with load after genset is OK; when input inactive, can be stopped.
29	Remote Start (Off Load)	In **Auto** mode, when input is active, genset can be started and without load after genset is OK; when input is inactive, can be stopped.
30	Aux Manual Start	In **Auto** mode, when input active, genset can be started; when input inactive, can be shutdown.
31	Reserved	
32	Reserved	
33	Analog Stop Key	An external button can be connected and pressed as simulate panel.

34	Analog Manual Key	
35	Analog Test Key	
36	Analog Auto Key	
37	Analog Start Key	
38	Analog G-Load Key	
39	Analog M-Load Key	
40	Reserved	
41	Reserved	
42	Reserved	
43	Reserved	
44	Reserved	
45	Aux Mains Ok	In **Auto** mode, mains are normal when input is active.
46	Aux Mains Fail	In **Auto** mode, mains are abnormal when input is active.
47	Selectivity Configuration 1 Active	Selectivity configuration act when the input is valid. Selectivity configuration can set different parameters and users can choose present configuration by input port.
48	Selectivity Configuration 2 Active	
49	Selectivity Configuration 3 Active	
50	Reserved	

8.4 SELECTION OF SENSORS

Form4

No.		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	Defined resistance's scope is 0~6KΩ, default is SGX kind sensor.

No.		Description	Remark
		10 PT100 11-15 Reserved	
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 scope is 0~6KΩ, default is SGX kind 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 scope is 0~6KΩ, default is SGH kind sensor.

⚠ **NOTE:** User should make special declare when order controller if your genset equip for sensor of 4-20mA.

8.5 CONDITIONS OF CRANK DINSCONNECT 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 is 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 set as 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 genset without Magnetic sensor, please don't select corresponding items, otherwise, "stop fail" or "loss speed signal and alarming" maybe caused.

5. If genset without oil pressure sensor, 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 HGM7x10 series controller, there are no items of mains in setting and also no mains items in configurable ports of input/output.

⚠**CAUTION:** Please change the controller parameters when generator is in stand-by mode only (e. g. Start conditions selection, configurable input, programmable 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 or 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; When setting the over-low warning, the return value must over setting.

⚠**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 crank disconnect.

⚠**NOTE:** Configurable input couldn't be set as same items; otherwise, there are abnormal functions. But 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 resistor type), its sensor curve is SGX (120°C resistor type); if select the SGD (120°C resistor type), the temperature sensor curve is SGD curve.

2. When there is difference between standard sensor curves and using sensor, user can adjust it in "curve type input".

3. When input the sensor curve, X value (resistor) must be input from small to large, otherwise, there is mistake.

4. If don't select sensor, sensor curve is not working.

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,
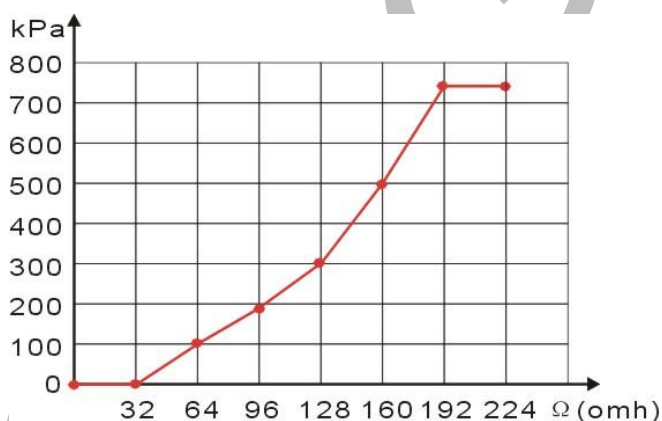
Normal Pressure Unit Conversion Form

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

11 COMMISSIONING

Please make the under procedures checking before commissioning,

1. Check all the connections are correct and wires diameter is suitable.

2. Ensure that the controller DC power has insurance, controller's positive and negative connected to start battery are correct.

3. Scram button's normal close point is connected with input of emergence stop, and insurance must be connected with positive and negative of start battery.

4. Take proper action to prevent engine to crank disconnect (e. g. Remove the connection wire of fuel value). If checking is OK, make the start battery power on; choose manual mode and controller will executive routine.

5. Set controller under manual mode, press "start" button, genset will start. After the setting times as setting, controller will send signal of Start Fail; then press "stop" to make controller as reset.

6. Recover the action of stop engine start (e. g. Connect wire of fuel value), press start button again, genset will start. If everything goes well, genset will normal run after idle running (if idle run be set). During this time, please watch for engine's running situations and AC generator's voltage and frequency. If abnormal, stop genset running 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 genset and make it in to stand by time until there is abnormal of mains.

8. When mains is abnormal again, genset will be started auto and into normal running, then controller send signal to make 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 have any other questions, please contact Smartgen's service.

12 TYPICAL APPLICATION

HGM7210 typical application diagram
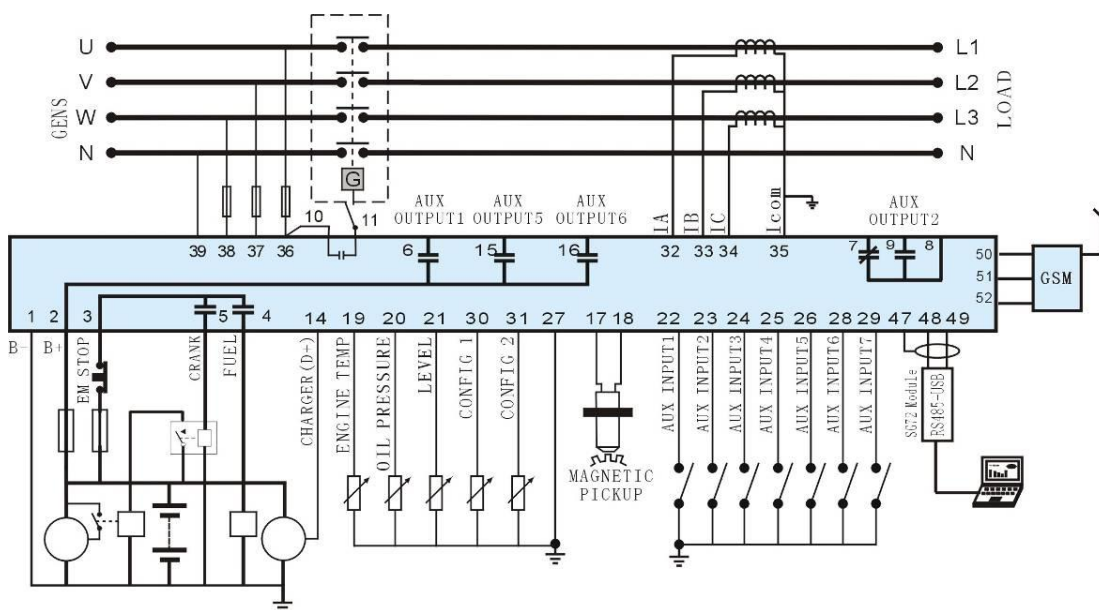
HGM7220 typical application diagram
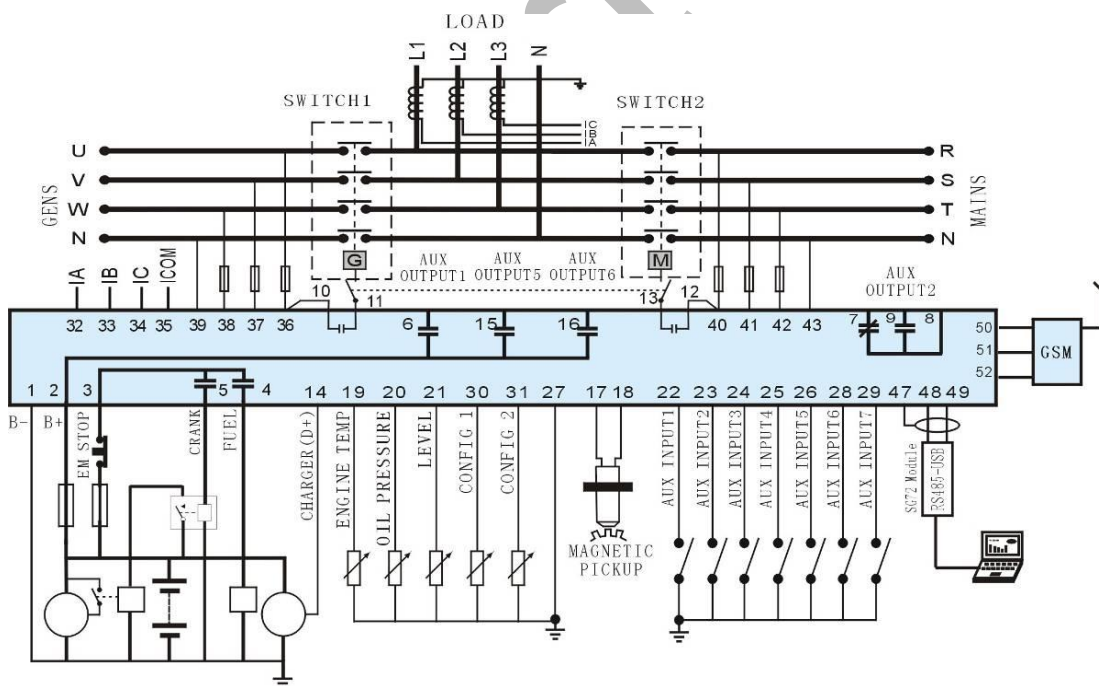
HGM7110CAN typical application diagram
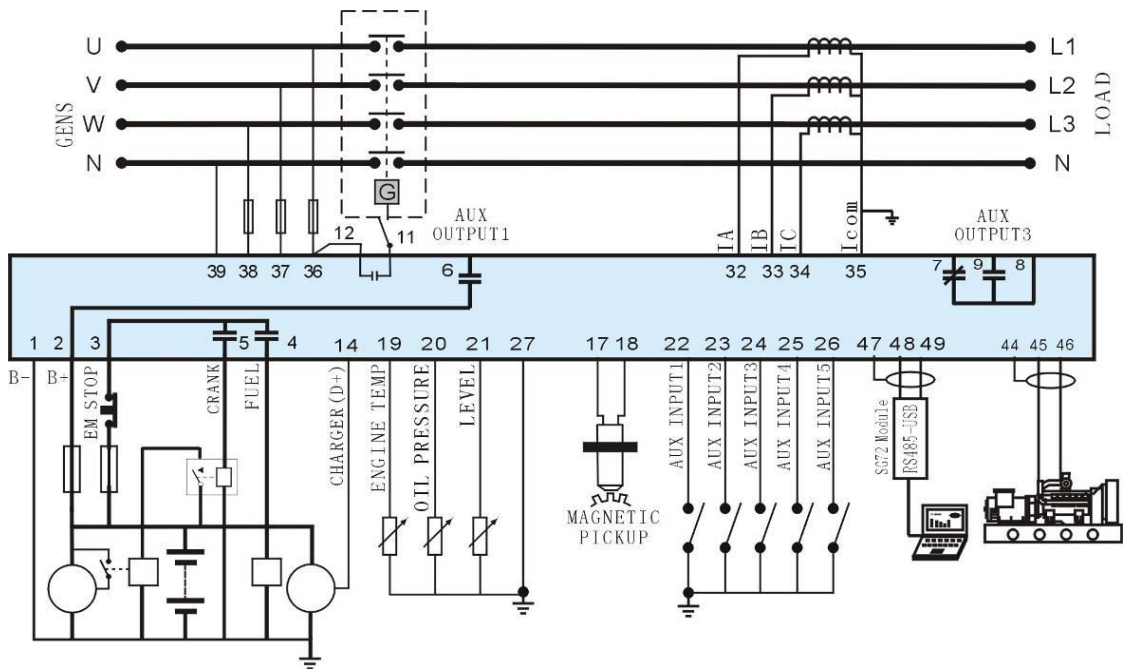
HGM7120CAN typical application diagram
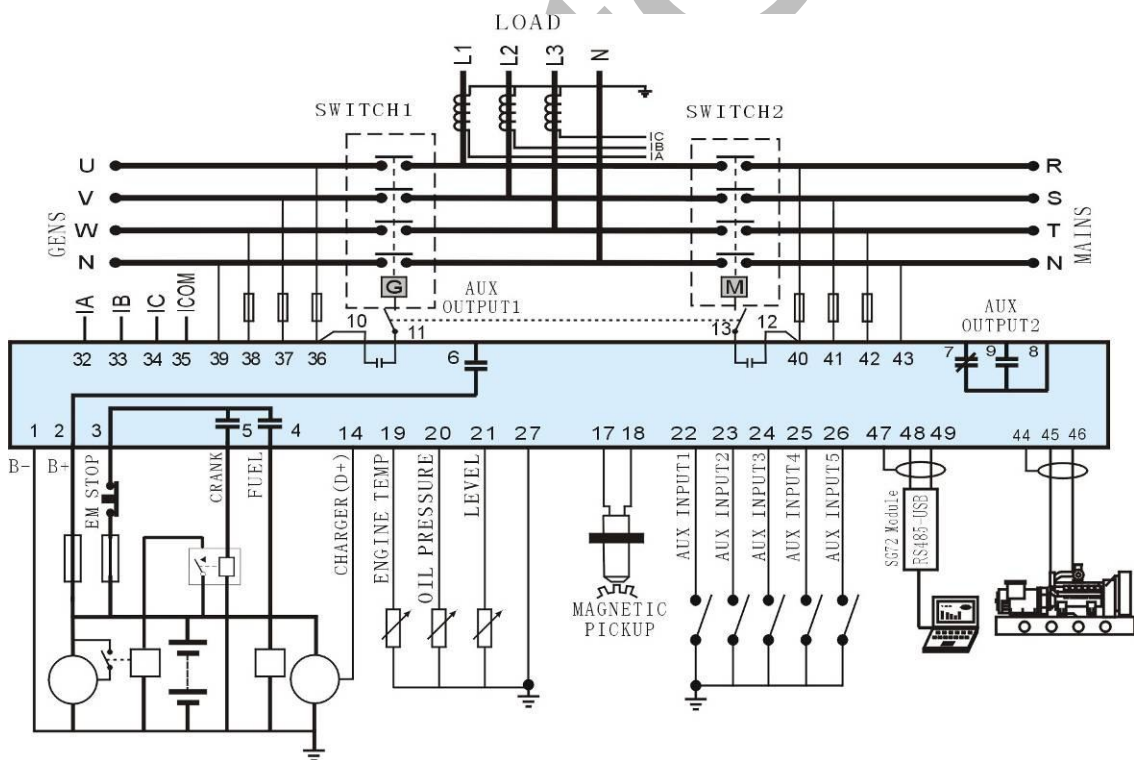
13 INSTALLATION

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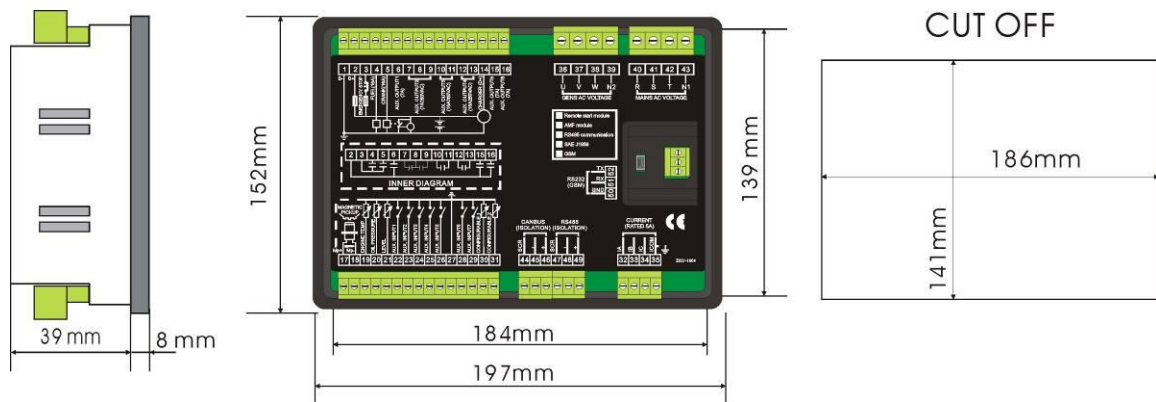
1) Battery Voltage Input

⚠️**NOTE:** HGM7200/7100 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 must be over 2.5mm^2 and which is connected to B+ and B- of controller power. If floating charge configured, please firstly connect output wires of charger to battery's positive and negative directly, then, connect wires from battery's positive and negative to controller's positive and negative input ports in order to prevent charge disturbing the controller's normal working.

2) Speed Sensor Input

⚠️**NOTE:** speed sensor is the magnetic equipment which be installed in starter and for detecting teeth of flywheel. Its connection wires to controller should apply for 2 cores shielding line. The shielding layer should connect with No. 18 terminal in controller while another side is hanging in air. The else two signal wires are connected with 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 outside current transformer. And the current transformer's secondary side current must be 5A. At the same time, the phases of current transformer and input voltage must correct. Otherwise, the current of collecting and active power maybe not correct.

⚠ **NOTE**: COM port must be connected to negative pole of battery controller power.

☠ **WARNING!** When there is load current, transformer's secondary side prohibit from 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 prevent high voltage into controller and damage it.

14 GSM SHORT MESSAGE ALARM AND REMOTE CONTROL

14.1 GSM SHORT MESSAGE ALARM

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

⚠ **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.

14.2 GSM SHORT MESSAGE REMOTE CONTROL

Users send order message to GSM mode, then controller will make actions according to this SMS order 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 genset is stopping to alarm	status of genset
		SYSTEM IN STOP MODE GENSET AT standby	Standby in stop mode	
		SYSTEM IN MANUAL MODE GENSET AT REST	Standby in manual mode	
		SYSTEM IN TEST MODE GENSET AT REST	Standby in trial test mode	
		SYSTEM IN AUTO MODE GENSET AT REST	Standby 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 TEST MODE GENSET IS RUNNING	Start status in trial test mode	
		SYSTEM IN AUTO MODE GENSET AT RUNNING	Start status in Auto mode	
2	SMS START	GENSET ALARM	Genset is stop to alarm or trip alarm	Start genset
		STOP MODE NOT START	Cannot start in stop mode	
		SMS START OK	Start in manual or auto mode	
		AUTO MODE NOT START	Cannot start in auto mode	
3	SMS STOP MODE	SMS STOP OK	Set as stop mode	
4	SMS MANUAL MODE	SMS MANUAL MODE OK	Set as manual mode	
5	SMS TEST MODE	SMS TEST MODE OK	Set as trial test mode	
6	SMS AUTO MODE	SMS AUTO MODE OK	Set as auto mode	
7	SMS DETAIL	Re-back information can be set via controller software.	Gets details information of genset.	
8	SMS INHIBIT START	INHIBIT START OK	Set as start inhibit	

9	SMS PERMIT START	PERMIT START OK	Set as start permit

⚠**NOTE:** Area code should be added to setting number, e.g. Chinese number should be set as 8613666666666.

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

⚠**NOTE:** Detailed information of re-back information 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, genset status, and alarm status.

15 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

15.1 CUMMINS ISB/ISBE

Terminals of controller	Connector B	Remark
Fuel relay output	39	
Start relay output	-	Connect to 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 controller	9 pins connector	Remark
CAN GND	SAE J1939 shield	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	SAE J1939 signal	Using impedance 120Ω connecting line.
CAN(L)	SAE J1939 return	Using impedance 120Ω connecting line.

Engine type: Cummins ISB

15.2CUMMINS QSL9

Suitable for CM850 engine control mode

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

Controller terminals	9 pins connector	Remark
CAN GND	SAE J1939 shield-E	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	SAE J1939 signal-C	Using impedance 120Ω connecting line
CAN(L)	SAE J1939 return-D	Using impedance 120Ω connecting line

Engine type: Cummins-CM850

15.3CUMMINS QSM11

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, using make 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 to ECU terminal only)
CAN(H)	A	Using impedance 120Ω connecting line
CAN(L)	B	Using impedance 120Ω connecting line

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 injection 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 to ECU terminal only)
CAN(H)	SAE J1939 signal-C	Using impedance 120Ω connecting line
CAN(L)	SAE J1939 return-D	Using impedance 120Ω connecting line

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, connect port 06 and08 of the connector
Start relay output	-	Connect to starter coil directly

Terminals of controller	D-SUB connector 06	Remark
RS485 GND	20	CAN communication shielding line(connect to ECU terminal only)
RS485+	21	Using impedance 120Ω connecting line
RS485-	18	Using impedance 120Ω connecting line

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

15.6 DETROIT DIESEL DDEC III / IV

Terminals of controller	CAN port of engine	Remark
Fuel relay output	Expand 30A relay, battery voltage of 01,07,12,13 is supplied by relay	
Start relay output	-	Connect to starter coil directly
CAN GND	-	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	CAN(H)	Using impedance 120Ω connecting line
CAN(L)	CAN(L)	Using impedance 120Ω connecting line

Engine type: J1939 common used

15.7 DEUTZ EMR2

Terminals of controller	F connector	Remark
Fuel relay output	Expand 30A relay, battery voltage of 01,07,12,13 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 to ECU terminal only)
CAN(H)	12	Using impedance 120Ω connecting line
CAN(L)	13	Using impedance 120Ω connecting line

Engine type: VolvoEDC4

15.8JOHN DEERE

Terminals of controller	21 pins connector	Remark
Fuel relay output	G,J	
Start relay output	D	
CAN GND	-	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	V	Using impedance 120Ω connecting line
CAN(L)	U	Using impedance 120Ω connecting line

Engine type: John Deere

15.9MTU MDEC

Suitable for MTU engines, 2000 series, 4000series

Terminals of controller	X1 connector	Remark
Fuel relay output	BE1	
Start relay output	BE9	
CAN GND	E	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	G	Using impedance 120Ω connecting line
CAN(L)	F	Using impedance 120Ω connecting line

Engine type: MTU-MDEC-303

15.10PERKINS

It is suitable for ADEM3/ ADEM4 engine control mode. 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 to ECU terminal

		only)
CAN(H)	31	Using impedance 120Ω connecting line
CAN(L)	32	Using impedance 120Ω connecting line

Engine type: Perkins

15.11 SCANIA

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

Terminals of controller	B1 connector	Remark
Fuel relay output	3	
Start relay output	-	Connect to starter coil directly
CAN GND	-	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	9	Using impedance 120Ω connecting line
CAN(L)	10	Using impedance 120Ω connecting line

Engine type: Scania

15.12 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 Configurable output 1,"ECU power"

Terminals of controller	"Data bus" connector	Remark
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	1	Using impedance 120Ω connecting line
CAN(L)	2	Using impedance 120Ω

		connecting line

Engine type: Volvo

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

15.13VOLVO 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 to ECU terminal only)
CAN(H)	12	Using impedance 120Ω connecting line
CAN(L)	13	Using impedance 120Ω connecting line

Engine type: VolvoEDC4

15.14VOLVO-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 Configurable output 1 "ECU stop"
Configurable output 2	5	ECU power Configurable output 2 "ECU

	3	Negative power
	4	Positive power
CAN GND	-	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	1(Hi)	Using impedance 120Ω connecting line
CAN(L)	2(Lo)	Using impedance 120Ω connecting line

Engine type: Volvo-EMS2

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

15.15BOSCH

It is suitable for BOSCH common rail pump engine.

Terminals of controller	Engine 42 pins	Remark
Fuel relay output	1.40	Connect to engine ignition lock
Start relay output	-	Connect to starter coil directly
CAN GND	-	CAN communication shielding line(connect to ECU terminal only)
CAN(H)	1.35	Using impedance 120Ω connecting line
CAN(L)	1.34	Using impedance 120Ω connecting line

Battery	Engine 2 pins	Remark
Battery negative	1	Wire diameter 2.5mm^2
Battery positive	2	Wire diameter 2.5mm^2

Engine type: BOSCH

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

16 FAULT FINDING

Faults	Possible Solutions
Controller no response with power.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check the water/cylinder temperature is high; Check the genset AC voltage; Check DC fuse.
Controller emergency stop	Check emergence stop button is correct or not; Check whether the starting battery positive be connected to the emergency stop input; Check whether the circuit is open.
Low oil pressure alarm after crank disconnect	Check the oil pressure sensor and its connections.
High water temp alarm after crank disconnect	Check the temperature sensor and its connections.
Shutdown Alarm in running	Check related switch and its connections according to the information on LCD; Check programmable inputs.
Crank not disconnect	Check fuel oil circuit and its connections; Check starting batteries; Check speed sensor and its connections; Refer to engine manual.
Starter no response	Check starter connections; Check starting batteries.
Genset running while ATS not transfer	Check ATS; Check the connections between ATS and controllers.
RS485 communication is abnormal	Check connections; Check setting of COM port is correct or not; Check RS485's connections of A and B is reverse connect or not; Check whether damage RS485transfer model; Check whether damage communication port of PC.

ECU communication failed	Check connections of CAN high and low polarity; Check if correctly connected of 120Ω resister; Check if type of engine correct; Check if connections from controller to engine and setting of inputs correct.
ECU warning or stop	Get information from LCD of alarm page; If there is detailed alarm, check engine according to description. If not, please refer to engine manual according to SPN alarm code.