SmartGen

MAKING CONTROL SMARTER

HGM6120TD

GENSET CONTROLLER

USER MANUAL

郑州众智科技股份有限公司

SMARTGEN(ZHENGZHOU)TECHNOLOGY CO.,LTD.

SmartGen Registered Trademark
No. 28 Xuemei Street, Zhengzhou, Henan, China
Tel: +86-371-67988888/67981888/67992951
+86-371-67981000(overseas)
Fax: +86-371-67992952
Email: sales@smartgen.cn
Web: www.smartgen.com.cn
www.smartgen.cn

Table 1 – Software Version

Date	Version	Note
2025-08-30	1.0	Original release.

CONTENTS

1 OVERVIEW

HGM6120TD Genset Controller is a power generation control module developed for mobile communication base station and the functions of the controller are set according to the actual situation of the mobile base station. The controller is equipped with multi functions of auto start/stop, data measurement, alarm protection, etc. It also can monitor the room temperature and battery voltage to achieve the goal of ATS automatic transfer of mains supply/load and mains supply/air conditioner.

HGM6120TD Genset Controller integrates digital, intelligent and network technology, which is used for the automation and monitoring system of single unit, realizing the automatic start/stop, data measurement, alarm protection and “three remotes” functions. The controller adopts LCD display, optional interfaces of Chinese and English with easy and reliable operation.

HGM6120TD Genset Controller adopts microprocessor, realizes the precision measurement, value adjustment, timing and threshold setting etc. All the parameters can be adjusted from the front panel or by USB interface (or RS485 interface) of PC to adjust and monitor. It can be widely used in all types of automatic control systems for its compact structure, simple connections and high reliability.

HGM6120TD Genset Controller has a built-in network communication module, which can realize genset access to internet. After controller logging in cloud server, the unit data information (including GPS positioning, altitude, etc.) will be uploaded in real time to the corresponding cloud server. Users can monitor the genset and inquire the genset running status and the event log, as well as configure the parameters via cloud server by phone APP (ISO or Android), computer and terminal equipment. The network communication module also has SMS function.

2 PERFORMANCE AND CHARACTERISTICS

The main characteristics are as follows:

— 132 x 64 LCD display with backlight, optional language interfaces (Chinese and English), push-button operation;

— Acrylic screen, improved wearable and scratch resistance property;

— Silica-gel panel and keys can well adapt to higher and lower temperatures;

— Dual-SIM dual-standby, if one SIM card operates abnormally, it can quickly switch to the other SIM card to ensure platform online status;

— With RS485 communication interface, which can achieve “three remotes” functions via MODBUS protocol (available for the controller with RS485 interface);

— With CANBUS interface, which can be connected to ECU with J1939, it not only can monitor common data (such as water temperature, oil pressure, speed and fuel consumption, etc.), but also can control start/ stop, high/low speed (controller with CANBUS interface is needed) via CANBUS interface;

— Suitable to 3P4W, 3P3W, 1P2W and 2P3W (120V/240V) power supply, 50Hz/60Hz system;

— Collect and display 3-phase voltage, 3-phase current, frequency, power parameter of mains supply/Gen;

Mains	**Gen**
Line voltage (Uab, Ubc, and Uca)	Line voltage (Uab, Ubc, and Uca)
Phase voltage (Ua, Ub, and Uc)	Phase voltage (Ua, Ub, and Uc)
Frequency HZ	Frequency HZ
Phase Sequence	Phase Sequence
Load	
Current IA, IB, IC	
Phases and Total Active Power kW	
Reactive power kvar	
Apparent power kVA	
Power factor PF	
Generator accumulated energy kWh	
Output percentage with load %	

— Mains supply has functions of over/under voltage and loss of phase; Gens has functions of over/under voltage, over/under frequency, over current and over power;

— Precision measurement and display of parameters about engine,

Temp. (WT), °C/ °F
Oil pressure (OP), kPa/psi/bar
Fuel level (FL), % Fuel remains L
Speed (SPD), r/min
Battery Voltage (VB), V
Charger Voltage (VD), V
Accumulative running hours
Accumulative start times

— Can collect the room temperature and control the starting of air conditioner when temperature is too high;

— Can collect the voltage of battery pack (48V), when the under voltage occurs, it can control the starting of generator and charge the battery pack;

— 6 start conditions can be combined freely (mains abnormal signal, remote start signal, mains abnormal and high room temperature start, mains abnormal and low battery voltage start, scheduled start, cycle start/stop);
— 6 relay output ports; including 1 start output port, 1 fuel output port, 4 Aux. output ports;
— 5 digital input ports;
— A variety of temperature, pressure and level sensors can be used directly and can customize the parameters, among which the oil pressure can be set as the room temperature sensor;
— With dual-ATS controlled functions;
— Control protection: Automatic start/stop of diesel genset, close/open (ATS control) and perfect failure display and protection;
— With ETS, idle speed control, pre-heat control, speed droop/raising control, all of them are relay output;
— Parameter setting: Allow users to modify setting and store them in internal EEPROM memory. The parameters cannot be lost even when power off. All of parameters can be set not only from the front panel, but also by USB interface (or PS485 interface) to adjust them via PC.;
— Multi conditions of crank disconnect (speed, oil pressure, frequency) can be selected;
— With emergency start function;
— With flywheel teeth numbers automatic identification function;
— Wide power supply range (8~35)VDC to adapt to different starting battery volts;
— Connect to cloud server through 4G Wi-Fi;
— With SMS function, alarm information can be sent by the set 5 phone numbers, and can control the genset and inquire the genset status by SMS;
— With GPS positioning function to obtain the genset position and realize the positioning of genset;
— Applied JSON format network data communication protocol to realize uploading when genset data changes, the compression algorithm is adopted at the same time, significantly reduces the network flow, and the alarm data can be uploaded to server immediately;
— With maintenance function, Types of date or running time can be selected and actions of warning or alarm shutdown can be set when maintenance times out;
— Event log, real-time clock, scheduled start & stop (can be set once daily/weekly/monthly with load or not);
— Add rubber gasket between shell and controller screen, the waterproof can reach IP65;
— Controller is fixed by metal fixing clips;
— Modular design, flame-retardant ABS shell, embedded mounting, compact structure and easy installation.

3 SPECIFICATION

Table 2 – Technical Parameters

Items	Contents
Working Voltage	DC8.0V to DC35.0V, continuous power supply
Power Consumption	<5W(Standby mode: ≤3W)
AC Voltage Input: 3P4W 3P3W 1P2W 2P3W	 15V AC ~ 360 V AC (ph-N) 30V AC ~ AC620 V AC (ph-ph) 15V AC ~ AC360 V AC (ph-N) 15V AC ~ AC360 V AC (ph-N)
AC Alternator Frequency	50Hz/60Hz
Speed Sensor Voltage	1.0V to 24V (RMS)
Speed Sensor Frequency	10,000 Hz (max.)
Start Relay Output	16A DC28V DC supply output
Fuel Relay Output	16A DC28V DC supply output
Aux. Output 1	7A DC28V DC supply output
Aux. Output 2	7A AC250V Volts free output
Aux. Output 3	16A AC250V Volts free output
Aux. Output 4	16A AC250V Volts free output
Voltage Input of Battery Pack	0V DC ~100 V DC
Overall Dimensions	209mm x 167mm x 45mm
Panel Cutout	186mm x 141mm
C.T. Secondary Current	Rated:5A
Working Temperature	(-25~+70)°C
Working Humidity	(20~93)%RH
Storage Temperature	(-30~+80)°C
Protection Level	IP65: when water-proof gasket installed between control panel and enclosure.
Insulation Intensity	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal. The leakage current is not more than 3mA within 1min.
Weight	0.724kg

4 OPERATION

4.1 KEYS DSCRIPTION

Table 3 – Keys Description

Icon	Function	Description
	Stop/ Reset	Can stop genset under Manual/Auto mode; Can reset shutdown alarm in alarm status; Press this key for more than 3 seconds to test panel indicators are OK or not (lamp test); During stop process, press this key again and can stop genset immediately.
	Start	Start genset under Manual mode, during starting process, press this key can transfer to next status;
	Manual	Pressing this key will set the module as Manual mode.
	Auto	Pressing this key will set the module as Auto mode.
	Gens Close/Open	When the 2-ATS disables, press this key to control gens to switch on or off in Manual mode. When the 2-ATS enables, the LCD of the controller will display the ATS control interface. Details see Table 6.
	Set/ Confirm	Press this key to enter menu interface; Shift cursor to confirm In parameters setting menu.
	Up/Increase	Screen scroll; Up cursor and increase value in setting menu.
	Down/Decrease	Scroll screen; Down cursor and decrease value in setting menu.
	Home/Return	Return to homepage when in main interface; Exit when in parameters setting interface.

4.2 CONTROLLER PANEL

Fig.1 - HGM6120TD Front Panel Indication

Note: Partial indicator states:

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

Status Lamp: It won't illuminate when genset is at rest; flashes 1 time per second in start or stop process and always illuminates during normal running

: No SIM card or SIM card has poor contact.

: SIM card is correctly installed and the communication is normal, but there is no signal.

: The controller is connected with cloud monitoring via SIM1 successfully.

: The controller is connected with cloud monitoring via SIM2 successfully.

: Positionging is failed.

: GPS positioning is successful.

4.3 AUTOMATIC START/STOP OPERATION

Auto mode is activated by pressing the , LED indicator beside the key is illuminating which confirms this action.

Auto Start Sequence

1) HGM6120TD: When it meets the setting start conditions, the LCD displays count-down time and the "Start Delay" begins;
2) When start delay is over, preheating relay is outputting (if configured), "Preheat Delay XX s" is displayed on LCD;
3) When preheat delay is over, fuel relay is outputting for 1s and then start relay outputs; if genset

fails to start during “Crank Time”, the fuel and start relay stop outputting and enter into “Crank Rest Time” and wait for next cranking;

4) If genset fail to start within set start times, the fifth line of LED will turn black and fail to start alarm will be displayed;
5) Any time to start genset successfully, it will enter into “Safe Running”. During this period, alarms of low oil pressure, high temperature, under speed, failed to charge and aux. input (be configured) are disabled. As soon as this delay is over, genset will enter into “Start Idle Delay” (if configured);
6) During start idle delay, alarms of under speed, under frequency, under voltage are disabled. As soon as this delay is over, genset will enter into “Warming up Delay” (if configured);
7) When “Warming up Delay” is over, the indicator is illuminating if gens normal. If voltage and frequency of generator reach the load requirement, close relay outputs, genset is taking load and indicator illuminates; if genset voltage or frequency is abnormal, controller will alarm and shutdown (LCD displays the alarm information).

Auto Stop Sequence

1) If the setting start conditions of the genset are not meet, “Stop Delay” begins;
2) When “Stop Delay” is over, genset enters into “Cooling Delay” and closing relay is disconnected. After switch “Transfer Rest Delay”, closing relay is outputting, mains is taking load, generator indicator extinguishes while mains indicator illuminates.
3) When entering “Stop Idle Delay”, idle relay is energized to output. (If configured).
4) When entering “ETS Delay”, ETS relay is energized to output, fuel relay output is disconnected.
5) When entering “Genset at Rest”, genset will automatically judge if it has stopped.
6) When genset stops, then enters into standby mode; if genset fails to stop, controller will alarm (“Fail to Stop” alarm will be displayed on LCD).

4.4 MANUAL START/STOP OPERATION

1) **HGM6120TD:** Manual Mode is active when press  and its indicator illuminates. Under the mode, press  to start genset, it can automatically judge crank disconnect and accelerate to high speed running. If there is high temperature, low oil pressure, over speed and abnormal voltage during genset running, controller can protect genset and stop (detail procedures please refer to No.4~7 of Auto start operation). Under Manual Mode, switch won’t transfer automatically, when 2-ATS controls, ATS switch status interface will be entered by  key, then select 1#ATS、2#ATS mains close/open or Gen close/open by  key, press  key to perform the corresponding close/open action; when one ATS controls, press corresponding  key to act 1#ATS mains close/open or Gen close/open.
2) Manual Stop: press  key to stop the running genset. (details please refer to No.3~6 of Auto stop process).

4.5 EMERGENCY START

In manual mode, pressing  and  can force genset to start. The controller won't judge whether the controller has started successfully according to disconnect conditions and the disconnection of starter needs to be controlled by operators. When operators observed the genset has started successfully, and then loose the keys and the crank disconnect will stop outputting, the controller will enter into safety delay.

4.6 AUTO START CONDITIONS

There are six conditions for genset to start automatically. The genset will start if any condition is met; the genset will stop after the automatic start and the corresponding stop conditions are reached.

Table 4 – Start Conditions

No.	Condition	Description	Corresponding Stop Condition
1	Mains Abnormal Start	Start when mains supply is abnormal.	Stop when mains supply is normal.
2	Remote Signal Start	Start when remote start signal input is active.	Stop when remote start signal input is inactive.
3	Cycle Start	Start when the genset stop time is over than the cycle stop time. (Single Unit Cycle)	Stop when the genset normal running time is over than the cycle start time. (Single Unit Cycle)
4	Scheduled Start	Start when the controller time reaches the setting scheduled start time.	Stop when the genset running time is over than the setting scheduled start duration.
5	Mains Abnormal and Battery Low Voltage	Start when mains is abnormal and the battery voltage is lower than the setting lower limit value.	Stop when mains is normal and the battery charging time reaches the cg time, or meet the selected stop conditions.
6	Mains Abnormal and Room High Temperature	Start when mains is abnormal or the room temperature is higher than the setting upper limit value.	Stop when mains is normal and the room temperature is lower than the setting room temperature lower limit value.

4.7 SELECTIONS OF STOP CONDITIONS

When mains is abnormal and battery voltage is low, the genset stops only when the mains is normal, the battery charging time reaches the finishing time, or the selected stop conditions are met.

The optional stop conditions are:

0：Battery voltage is higher than the upper limit and the load current is lower than the lower limit.

1：Battery voltage is higher than the upper limit.

2：Load current is lower than the lower limit.

3：Battery voltage is higher than the upper limit or the load current is lower than the lower limit.

Note: The load current lower limit value will be detected only when genset is normal running and ATS1 is closed and ATS2 is not closed. At the same time, the genset will stop only when the load current detection time is reached.

4.8 MAINS ACTIVE RULES

The rules are applicable for 3P4W/3P3W AC system.

Table 5 – Mains Active Rules

No.	Rules Description	
1	A-phase must be power on	B/C cannot lose of phase.
2		B/C may lose of one phase.
3		B/C may lose of two phases/
4	A-phase may be power off	One of three phases may lose.
5		Two of three phases may lose.

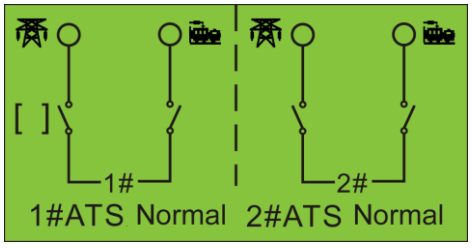
4.9 ATS CONTROL

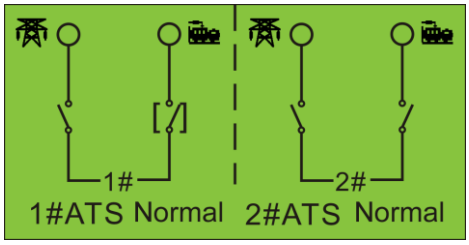
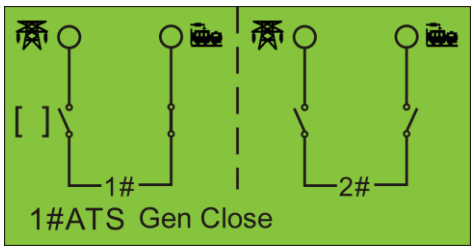
4.9.1 MANUAL CONTROL

When controller is in manual mode, the two ATS will perform the manual control procedure.

Press Close Open key to enter the close/open interface, and select the target of close/open by ▲ or ▼. When "[ ]" selects the corresponding target, press ✱/OK to perform the corresponding action. Take 1#ATS from Gen opening to Gen closing as an example, the operation procedure is as Table 6.

Table 6 – ATS Manual Control Operation

No.	Contents	Operation
1		Press Close Open to enter ATS status interface and LCD displays as the left figure.

No.	Contents	Operation
2		Select 1#ATS Gen open icon by ▲ or ▼; Press Gen ⚙/OK to perform the 1#ATS Gen close action.
3		1#ATS Gen close finished; Press Close Open or ⌂/↩ again to exit the ATS status interface.

Note: When there is only 1#ATS, it will perform the corresponding switch on/off action by pressing Mains Close Open or Gen Close Open in manual mode.

4.9.2 AUTO CONTROL

In auto mode, ATS performs the auto control procedure.

a) Allow ATS to switch on at the same time and generate power.

Suitable for the large power genset and allow two ATS to be loaded at the same time.

When the two ATS need to be transferred from mains loaded to Gen loaded, 1#ATS will open through mains supply firstly and transferring delay, then executes the Gen closing action, after the 1#ATS Gen closing end delays for 2s and executes 2#ATS Gen closing process.

When two ATS need to be transfered from Gen loaded to mains loaded, 2#ATS will open through Gen firstly and transferring delay, then executes the mains supply closing action, after the 2#ATS Gen closing end delays for 2s and executes 1#ATS Gen closing process.

b) Allow ATS not to switch on at the same time and generate power.

Suitable for the small power genset and allow one ATS to be loaded at a time.

If mains is abnormal and the battery voltage is low, 1#ATS will transfer to Gen through mains opening, transfer delay and Gen closing, 2#ATS Gen will not close; if mains is abnormal and room temperature is high, when the battery charging time reaches the shortest charging time or the current of power supply is less than the lower limit of load current, after 1#ATS Gen open (or mains closing) for 2s, 2#ATS Gen closes. In other circumstances, it will act according to the ATS switch on configuration of current start condition and take the priority of 1#ATS Gen close.

4.9.3 SWITCH SETTING DESCRIPTION

a) The input port is configured closing status auxiliary input.

If opening detection enables, the mains loaded will be transferred to Gen loaded, when opening output reaches the setting time, opening is failure and waits to open, otherwise, the opening will be finished. When closing outputs, if the closing detection time is due (Note 1), closing is failure and waits to close, otherwise, the closing will be finished. If the transferring failure warn enables, when closing fails or opening fails, it will send a warning signal.

If opening detection disables, when the opening output time reaches the setting time, it means the opening is finished. When closing outputs, if the closing detection time is due (Note 1), closing is failure and waits to close, otherwise, the closing will be finished. If the transferring failure warn enables, when closing fails, it will send a warning signal.

b) The input port doesn't be configured closing status auxiliary input.

The mains loaded is transferred to Gen loaded, after the opening delay and transferring interval delay, Gen is closing. The Gen loaded is transferred to mains loaded, it is the same as the above mentioned.

Note 1: For pulse signal, closing detection time is "Closing Time"; for continous closing signal, closing detection time is "Closing Dectection Time".

Note 2: In manual mode, the transferring failure warn is inactive.

Note 3: When using the no breakings, it should not enable the opening detection.

Note 4: When using the AC contactor, it is recommended to enable the opening detection.

5 PROTECTION

5.1 WARNINGS

When controller detects the warning signal, the genset only alarms but not to stop. The alarms are displayed in LCD.

Table 7 – Controller Warning Alarms

No.	Items	Description
1	Loss Of Speed Signal	When the speed of genset is 0 and speed loss delay is 0, controller will send warning alarm signal and it will be displayed on LCD.
2	Genset Over Current	When the current of genset is higher than threshold and setting over current delay is 0, controller will send warning alarm signal and it will be displayed on LCD.
3	Fail To Stop	When genset cannot stop after the "stop delay" is over, controller will send warning alarm signal and it will be displayed on LCD.
4	Low Fuel Level	When the fuel level of genset is lower than threshold or low fuel level warning is active, controller will send warning alarm signal and it will be displayed on LCD.
5	Failed To Charge	During genset normal running process, when the voltage difference between B+ and the charger D+ (WL) is above the Failed To Charge voltage difference for 5s, the controller shall issue Failed To Charge warning, while at the same time LCD displays Failed on Charge warning.
6	Battery Under Voltage	When the battery voltage of genset is lower than threshold, controller will send warning alarm signal and it will be displayed on LCD.
7	Battery Over Voltage	When the battery voltage of genset is higher than threshold, controller will send warning alarm signal and it will be displayed on LCD.
8	Low Coolant Level	When low coolant level input is active, controller will send warning alarm

No.	Items	Description
		signal and it will be displayed on LCD.
9	Temp. Sensor Open	When sensor hasn't connected to corresponding port, controller will send warning alarm signal and it will be displayed on LCD.
10	Oil Pressure Sensor Open	When sensor hasn't connected to corresponding port, controller will send warning alarm signal and it will be displayed on LCD.
11	Maintenance Due Warning	Maintenance type is running time, when genset running time is longer than maintenance time of user setting, or maintenance type is date, the current date is longer than the set date and maintenance action is set as warning, controller will send waring alarm signal and it will be displayed on LCD.
12	High Temp.	When the water/cylinder temperature of genset is higher than threshold and Enabled High Temp. Stop Inhibited or Input High Temp. Stop Inhibited is active, controller will send warning alarm signal and it will be displayed on LCD.
13	Low Oil Pressure	When the oil pressure of genset is less than threshold and Enabled Low Oil Pressure Stop Inhibited or Input Low Oil Pressure Stop Inhibited is active, controller will send warning alarm signal and it will be displayed on LCD.
14	Input Warn	When external input is active, controller will send warning alarm signal and it will be displayed on LCD.
15	Failed To Charge	When Failed To Charge input is active, controller will send warning alarm signal and it will be displayed on LCD.
16	Over Power	when the controller detects that the power value (power is positive) is greater than the pre-set value and the action select "Warn", it will initiate a warning alarm.
17	ECU Warn	If an error message is received from ECU via J1939, it will initiate a warning alarm.
18	GSM Communication Failure	When SGE-01-4G (4G Wi-Fi communication expand card) enables, and the GSM module is not be detected, it will initiate a warning alarm.
19	High Room Temp. Warn	When the controller detects that the room temperature is higher than the pre-set value, controller will send a warning alarm and it will be displayed on LCD.
20	Low Fuel Level Input Warn	When the controller detects that the sampling level of fuel level sensor is lower than the pre-set value or the low fuel level warn input is active, controller will send a warning alarm and it will be displayed on LCD.
21	Low Battery Voltage Warn	When the controller detects the battery voltage is lower than the pre-set value, controller will send a warning alarm and it will displayed on LCD.

No.	Items	Description
22	Access Input Warn	When the controller detects the access input is active, controller will send a warning alarm and it will be displayed on LCD.
23	1#ATS Transfer Failure Warn	When the controller detects that 1#ATS open/close fails and the transferring failure warn enables, controller will send a warning alarm and it will be displayed on LCD.
24	2#ATS Transfer Failure Warn	When the controller detects that 2#ATS open/close fails and the transferring failure warn enables, controller will send a warning alarm and it will be displayed on LCD.
25	Gen Over Voltage Warn	When the controller detects that the genset voltage is greater than the set threshold value, controller will send a warning alarm and it will be displayed on LCD.
26	Gen Under Voltage Warn	When the controller detects that the genset voltage is less than the set threshold value, controller will send a warning alarm and it will be displayed on LCD.
27	Gen Over Frequency Warn	When the controller detects that the genset frequency is greater than the set threshold value, controller will send a warning alarm and it will be displayed on LCD.
28	Gen Under Frequency Warn	When the controller detects that the genset frequency is less than the set threshold value, controller will send a warning alarm and it will be displayed on LCD.

5.2 SHUTDOWN ALARMS

When controller detects shutdown alarm, it will send signal to open switch and stop genset. The alarms are displayed on LCD.

Table 8 – Shutdown Alarms

No.	Items	Description
1	Emergency Stop	When controller detects emergency stop signal, it will send a stop alarm signal and it will be displayed on LCD.
2	High Temp. Shutdown	When the temperature of water/cylinder is higher than set threshold, controller will send a stop alarm signal and it will be displayed on LCD.
3	Low Oil Pressure Shutdown	When oil pressure is lower than threshold, controller will send a stop alarm signal and it will be displayed on LCD.
4	Over Speed Shutdown	When genset speed is higher than set threshold, controller will send a stop alarm signal and it will be displayed on LCD.
5	Under Speed Shutdown	When genset speed is lower than set threshold, controller will send a stop alarm signal and it will be displayed on LCD.
6	Loss Of Speed Signal	When rotate speed is 0 and delay is not 0, controller will send a stop alarm

No.	Items	Description
	Shutdown	signal and it will be displayed on LCD.
7	Genset Over Voltage Shutdown	When genset voltage is higher than threshold, controller will send a stop alarm signal and it will be displayed on LCD.
8	Genset Under Voltage Shutdown	When genset voltage is under set threshold, controller will send a stop alarm signal and it will be displayed on LCD.
9	Genset Over Current Shutdown	When genset current is higher than set threshold and delay is not 0, it will send a stop alarm signal and it will be displayed on LCD.
10	Failed To Start	Within set start times, if failed to start, controller will send a stop alarm signal and it will be displayed on LCD.
11	Over Freq. Shutdown	When genset frequency is higher than set threshold, controller will send a stop alarm signal and it will be displayed on LCD.
12	Under Freq. Shutdown	When genset frequency is lower than set threshold, controller will send a stop alarm signal and it will be displayed on LCD.
13	Genset Failed	When genset frequency is 0, controller will send a stop alarm signal and it will be displayed on LCD.
14	Low Fuel Level	When fuel level low input is active, controller will send a stop alarm signal and it will be displayed on LCD.
15	Low Coolant Level	When genset coolant level low input is active, controller will send a stop alarm signal and it will be displayed on LCD.
16	Temp. Sensor Open	When sensor hasn't connected to corresponding port, controller will send shutdown alarm signal and it will be displayed on LCD.
17	Oil Sensor Open	When sensor hasn't connected to corresponding port, controller will send shutdown alarm signal and it will be displayed on LCD.
18	Maintenance shutdown	When genset running is longer than maintenance time of user setting, and maintenance action is set as shutdown, controller send shutdown alarm signal and it will be displayed on LCD. When maintenance action type is set as "Not used", maintenance alarm reset.
19	Input Shutdown	When external input is active, controller will send shutdown alarm signal and it will be displayed on LCD.
20	Over Power	If over power detection is enabled, when the controller detects that the over power value (power is positive) has exceeded the pre-set value and the action select "Shutdown", it will initiate a shutdown alarm.
21	ECU Shutdown	If an error message is received from ECU via J1939, it will initiate a shutdown alarm.
22	ECU Communication Fail	If the module does not detect the ECU data, it will initiate a shutdown alarm.
23	Over Current Fault	When over current fault shutdown input is active, controller will send

No.	Items	Description
	Shutdown	shutdown alarm signal and it will be displayed on LCD.
24	Over Speed Shutdown Input Alarm	When over speed shutdown input is active, controller will send shutdown alarm signal and it will be displayed on LCD.

Note: ECU warning and Shutdown alarm explains that check genset according to displayed alarm contents; otherwise check engine user manual according to SPN alarm code for gaining information.

5.3 TRIP AND STOP ALARM

When controller detects trip and stop alarm, it will send signal to open Gen switch and stop genset after high-speed cooling.

Table 9 – Trip and Stop Alarm

No.	Warning Type	Description
1	Gen Over Current	When controller detects that the genset current is over than the pre-set shutdown value and the duration is over than the over current delay, the action type of over current is set as trip and stop, controller will send an alarm signal and it will displayed on LCD.

6 CONNECTIONS

The back panel of HGM6120TD is as below:

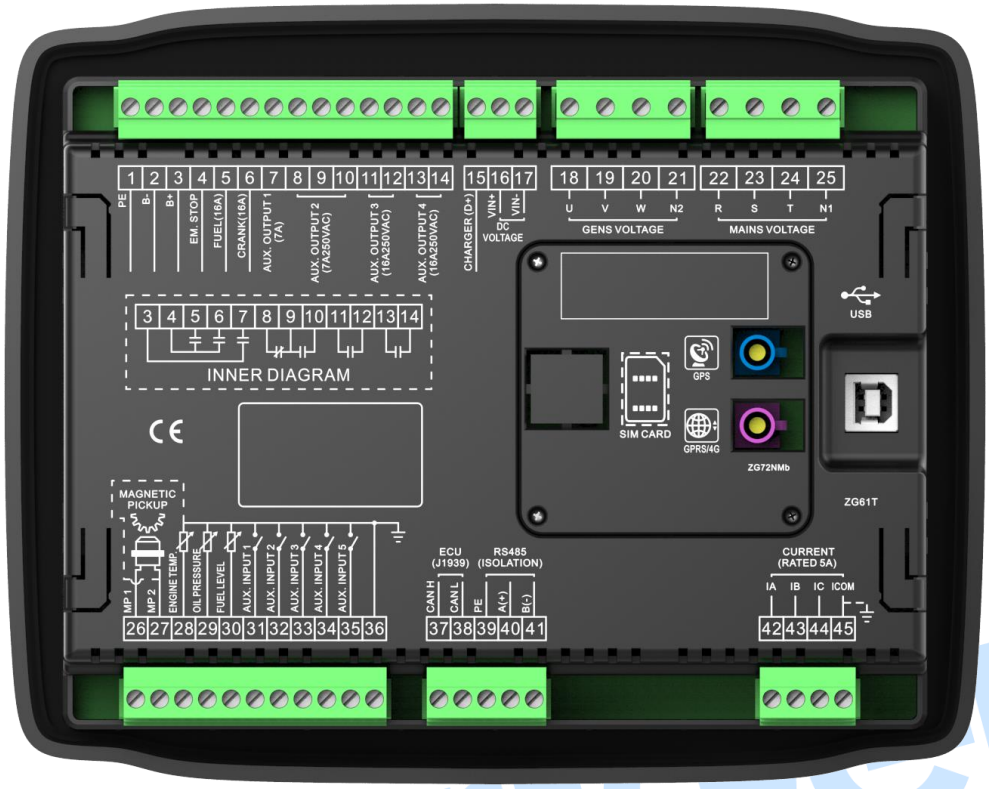


Fig.3 – Controller Rear Panel Drawing

Table 10 – Terminal Connection Description

No.	Function	Cable Size	Description
1	Grounding	2.5mm²	Ground connection.
2	DC input B-	2.5mm²	Connected to negative of starter battery
3	DC input B+	2.5mm²	Connected to positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.
4	Emergency Stop	2.5mm²	Connected to B+ via emergency stop button.
5	Fuel Relay Output	2.5mm²	B+ is supplied by 3 points, rated 16A
6	Start Relay Output	2.5mm²	B+ is supplied by 3 points, rated 16A Connect to starter coil
7	Aux. Relay Output 1	1.5mm²	B+ is supplied by 2 points, rated 7A
8	Aux. Relay Output 2	1.5 mm²	Normal close output, 7 A rated.
9			Relay common port
10			Normal open output, 7 A rated.
11	Aux. Relay Output 3	2.5mm²	Relay normal open volt-free contact output. 16 A rated
12			
13	Aux. Relay Output 4	2.5mm²	
14			
15	Charging Generator D+ Input	1.0mm²	Connect to D+ (WL) terminal. If without, the terminal is not connected and hang up in the air.
16	Battery Voltage input VIN+	1.0mm²	48V Battery positive.
17	Battery Voltage input VIN-	1.0mm²	48V Battery negative.
18	Generator U phase Voltage	1.0mm²	Connect to U phase output(2A fuse is recommended)

No.	Function	Cable Size	Description
	Sensing Input		
19	Generator V phase Voltage sensing Input	1.0mm²	Connect to V phase output(2A fuse is recommended)
20	Generator W phase Voltage Sensing Input	1.0mm²	Connect to W phase output(2A fuse is recommended)
21	Generator N2 Input	1.0mm²	Connect to generator N-wire
22	Mains R phase Voltage Sensing Input	1.0mm²	Connect to mains R phase(2A fuse is recommended)
23	Mains S phase Voltage Sensing Input	1.0mm²	Connect to mains S phase (2A fuse is recommended)
24	Mains T phase Voltage Sensing Input	1.0mm²	Connect to mains T phase (2A fuse is recommended)
25	Mains N1 Input	1.0mm²	Connect to mains N-wire
26	Speed Sensor Input	1.0mm²	Connect to speed sensor, shielding wire is recommended.
27	Speed sensor input, controller internal has been connected to battery negative		
28	Temp. Sensor Input	1.0mm²	Connect to water /cylinder temp. resistance type sensor
29	Oil Pressure Sensor Input	1.0mm²	Connect to oil pressure resistance type sensor.
30	Level Sensor Input	1.0mm²	Connect to liquid level resistance type sensor.
31	Configurable Input 1	1.0mm²	Ground connected is active (B-)
32	Configurable Input 2	1.0mm²	Ground connected is active (B-)
33	Configurable Input 3	1.0mm²	Ground connected is active (B-)
34	Configurable Input 4	1.0mm²	Ground connected is active (B-)
35	Configurable Input 5	1.0mm²	Ground connected is active (B-)
36	Sensor Common	1.0mm²	Sensor common port
37	CAN H	0.5mm²	Impedance-120Ω shielding wire is recommended, its single-end connect with ground (the controller without CANBUS function doesn't have this terminal).
38	CAN L	0.5mm²	
39	Grounding	2.5mm²	Ground connection.
40	RS485+	0.5mm²	Impedance-120Ω shielding wire is recommended, its single-end connect with ground.
41	RS485 -	0.5mm²	
42	CT A Phase Sensing Input	1.5mm²	Connect secondary coil, rated 5A
43	CT B Phase Sensing Input	1.5mm²	Connect secondary coil, rated 5A
44	CT C Phase Sensing Input	1.5mm²	Connect secondary coil, rated 5A
45	CT Common Port	1.5mm²	Refer to INSTALLATION description.

Note: USB ports in controller rear panel are programmable parameter ports; user can directly program via PC.

7 PARAMETER RANGE AND DEFINITION

7.1 PARAMETER CONTENT AND RANGE TABLE

Table 11 – Parameter Content and Range

No.	Items	Range	Default	Description
1	Mains Normal Delay	(0-3600)s	10	The delay from abnormal to normal or from normal to abnormal. It used for ATS (automatic transfer switch) control.
2	Mains Abnormal Delay	(0-3600)s	5	
3	Mains Under Voltage	(30-60000)V	184	When mains voltage is under the point, mains under voltage active. When the value is 30, mains under voltage disabled. Return difference is 10V.
4	Mains Over Voltage	(30-60000)V	276	When mains voltage is greater than the point, mains over voltage active. When the point is 60000V, mains over voltage disabled. Return difference is 10V.
5	Transfer Delay	(0-99.9)s	1.0	It's the delay from mains open to generator closed or from generator open to mains closed.
6	Start Delay	(0-3600)s	1	Time from mains abnormal or remote start signal is active to start genset.
7	Stop Delay	(0-3600)s	1	Time from mains normal or remote start signal is inactive to genset stop.
8	Start Times	(1-10) times	3	When engine start failure, it's the maximum cranking times. When setting crank times out, controller send start fail signal.
9	Preheat Delay	(0-300)s	0	Time of pre-powering heat plug before starter is powered up.
10	Cranking Time	(3-60)s	8	Time of starter power up each time.
11	Crank Rest Time	(3-60)s	10	The second waiting time before power up when engine start fail.
12	Safety On Time	(1-60)s	10	Alarm for low oil pressure, high temp, under speed, under frequency /voltage, Failed To Charge are all inactive.
13	Start Idle Time	(0-3600)s	0	Idle running time of genset when starting.
14	Warming Up Time	(0-3600)s	10	Warming time between genset switch on and high speed running.
15	Cooling Time	(3-3600)s	10	Time for cooling before stopping.
16	Stop Idle Time	(0-3600)s	0	Idle running time when genset stop.
17	ETS Solenoid Hold	(0-120)s	20	Stop electromagnet's power on time when genset is stopping.

No.	Items	Range	Default	Description
18	Fail to Stop Delay	(0-120)s	0	If "ETS Solenoid Hold" set as 0, it is the time from end of idle delay to gen-set at rest; if not 0, it is from end of ETS solenoid delay to gen-set at rest.
19	Switch Close Time	(0.0-10.0)s	5.0	Mains' or generator's switch closing pulse width, when it is 0, output is continuous.
20	Flywheel Teeth	(10.0-300.0)	118	Number of flywheel teeth, it can detect disconnection conditions and engine speed.
21	Gen Abnormal Delay	(0-20.0)s	10.0	Over or under volt alarm delay
22	Gen Over Voltage shutdown	(30-60000)V	264	When genset voltage is over the point and remains the set duration of "Over Voltage Shutdown Delay", generator over voltage is active. When the point is 60000V, generator over voltage is disabled.
23	Gen Under Voltage Shutdown	(30-60000)V	184	When generator voltage is under the point and remains the set duration of "Under Voltage Shutdown Delay", generator under voltage is active. When the point is 30V, generator under voltage is disabled.
24	Gen Under Speed shutdown	(0-6000)r/min	1200	When the engine speed is under the point for 10s, shutdown alarm signal is sent out.
25	Gen Over Speed Shutdown	(0-6000)r/min	1710	When the engine speed is over the point for 2s, shutdown alarm signal is sent.
26	Gen Under Frequency Shutdown	(0-75.0)Hz	40.0	When generator frequency is lower than the point and remains the set duration of "Under Frequency Shutdown Delay", generator under frequency is active. When the point is 0Hz, generator under frequency is disabled.
27	Gen Over Frequency Shutdown	(0-75.0)Hz	57.0	When generator frequency is over the point and remains the set duration of "Over Frequency Shutdown Delay", generator over frequency is active. When the set point is 75Hz, generator over frequency is disabled.
28	High Temperature Stop	(80-300)°C	98	When engine temperature sensor value is over this point, it sends out high temp. alarm. When the value is 300, warning alarm won't be sent. (only suited for temperature sensor, except for high temp. pressure alarm signal inputted by programmable input port)

No.	Items	Range	Default	Description
29	Low Oil Pressure Shutdown	(0-400)kPa	103	When engine oil pressure sensor value is under this point, Low Oil Pressure alarm signal is sending out. When the value is 0, warning alarm won't be sent. (only suited for oil pressure sensor, except for low oil pressure alarm signal inputted by programmable input port)
30	Low Fuel Level Warning Value	(0-100)%	10	When fuel level sensor value under this point and remains for 10s, genset send out warning alarm, only warn but not shutdown.
31	Loss Of Speed Signal Delay	(0-20.0)s	5.0	When the delay setting as 0s, it only warn but not shutdown.
32	Charge Alternator Fail	(0-30)V	6.0	During genset normal running, when B+ and charger D+ (WL) voltage difference is above this value for 5s, the controller issues Failed To Charge warning.
33	Battery Over Voltage	(12-40)V	33.0	When generator battery voltage is over the point and remains for 20s, battery over voltage signal is active. it only warn but not shutdown.
34	Battery Under Voltage	(4-30)V	8.0	When generator battery voltage is under the point and remains for 20s, battery under voltage signal is active. it only warn but not shutdown.
35	CT Ratio	(5-6000)/5	500	Current transformer ratio.
36	Full Load Rating	(5-6000)A	500	Rated current of generator, used for calculating over load current.
37	Over Current Percentage	(50-130)%	120	When load current is over the point, the over current delay is initiated.
38	Over Current Delay	(0-3600)s	30	When load current is over the point, over current signal is sent. When the delay is 0, only warn but not shutdown.
39	Fuel Pump On	(0-100)%	25	When the fuel level lower than the set value for 2s, send a signal to open fuel pump.
40	Fuel Pump Off	(0-100)%	80	When the fuel level higher than the set value for 2s, send a signal to close fuel pump.
41	Relay Output 1	(0-26)	2	Factory default: Energized to stop. See Table 12
42	Relay Output 2	(0-26)	3	Factory default: Idle control. See Table 12
43	Relay Output 3	(0-26)	5	Factory default:1#ATS Mains closed. See Table 12

No.	Items	Range	Default	Description
44	Relay Output 4	(0-26)	6	Factory default: 1#ATS Gen closed. See Table 12
45	Digital Input 1	(0-25)	1	Factory default: High temperature alarm. See Table 13
46	Active Type	(0-1)	0	Factory default: close
47	Delay	(0-20.0)s	2.0	
48	Digital Input 2	(0-25)	2	Factory default: Low oil pressure alarm. See Table 13
49	Active Type	(0-1)	0	Factory default: close
50	Delay	(0-20.0)s	2.0	
51	Digital Input 3	(0-25)	10	Factory default: Reserved. See Table 13
52	Active Type	(0-1)	0	Factory default: close
53	Delay	(0-20.0)s	2.0	
54	Digital Input 4	(0-25)	11	Factory default: Low fuel level warn. See Table 13
55	Active Type	(0-1)	0	Factory default: close
56	Delay	(0-20.0)s	2.0	
57	Digital Input 5	(0-25)	12	Factory default: Low coolant level warn. See Table 13
58	Active Type	(0-1)	0	Factory default: close
59	Delay	(0-20.0)s	2.0	
60	Power On Mode	(0-2)	0	0: Stop Mode; 1: Manual Mode; 2: Auto Mode
61	Module Address	(1-254)	1	The address of controller.
62	Password	(0-9999)	0318	See Note 4
63	Crank Disconnect Condition	(0-6)	2	Conditions of disconnecting starter (generator, magnetic pickup sensor, oil pressure), Each condition can be used alone and simultaneously to separating the start motor and genset as soon as possible.
64	Engine Speed of Crank Disconnect	(0-3000)r/min	360	When engine speed is over this point, starter will disconnect.
65	Frequency of Crank Disconnect	(0.0-30.0)Hz	14.0	When generator frequency is over this point, starter will disconnect.
66	Oil Pressure of Crank Disconnect	(0-400)kPa	200	When engine oil pressure is over this point, starter will disconnect.
67	High Temp. Stop Inhibit	(0-1)	0	Default: when temperature is too high, the genset will alarm and shutdown. Note 1
68	Low OP Inhibit Stop Inhibit	(0-1)	0	Default: when oil pressure is too low, the genset will alarm and shutdown. Note 2
69	AC System	(0-3)	0	0: 3P4W 1: 2P3W 2: 1P2W 3: 3P3W

No.	Items	Range	Default	Description
70	Temp. Sensor Curve Type	(0-14)	8	SGX See Table 14
71	Pressure Sensor Curve Type	(0-14)	8	SGX See Table 14
72	Fuel Level Sensor Curve Type	(0-8)	3	SGD See Table 14
73	Generator Poles	(2-64)	4	Number of magnetic poles, used for calculating rotating speed of generator without speed sensor.
74	Temp. Sensor Open Circuit Action	(0-2)	1	0: Not used; 1: Warning; 2: Shutdown
75	Oil Pressure Sensor Open Circuit Action	(0-2)	1	
76	Disconnect Oil Pressure Delay	(0-20.0)s	0.0	When disconnect conditions include oil pressure and engine oil pressure is higher than disconnect oil pressure delay, the genset is regarded as start successfully and starter will disconnect.
77	Scheduled Run	(0-1)	0	0:Disabled; 1:Enabled.
78	Scheduled Period	(0-3)	0	Circulate condition: monthly, weekly and daily can be selected. Start time and duration can be set.
79	Auto Start Inhibited	(0-1)	0	0:Disabled; 1:Enabled.
80	Scheduled Period	(0-2)	0	Circulate condition: monthly, weekly and daily can be selected. Don't start time and duration can be set.
81	Over Power Action	(0-2)	0	0 Not used; 1 Warn; 2 Shutdown When power is higher than preset value and duration exceeds than delay, over power warning is active. Return and delay value can be set.
82	Start Interface	(0-1)	0	0:Disabled; 1:Enabled。 Start interface delay can be set.
83	Maintenance Password	(0-9999)	0	Enter password interface of maintenance configuration.
84	Date/Time	Set the date/time of controller.		
85	Fuel Output Time	(1-60)s	1	It is the time of the genset fuel output during power on.
86	Manual Mode ATS	(0)	0	0: Key Switch
87	Speed Raise Pulse	(0-20.0)s	0.2	It is the speed-up pulse output time, when the unit enters the high-speed warm-up.
88	Speed Drop Pulse	(0-20.0)s	0.2	It is the speed-drop pulse output time, when the unit enters the stop idling.

No.	Items	Range	Default	Description
89	Fuel Level Low Shutdown	(0-100)%	5	When fuel level of external level sensor falls below the setting limit and lasts for 5s, low fuel shutdown alarm will be initiated; if limit value set as 0, low fuel shutdown alarm will not be initiated.
90	ATS Open Time	(1.0-60.0)s	3.0	
91	Gen PT Ratio	(0-1)	0	0: Disabled; 1: Enabled. PT primary and PT secondary can be set.
92	Mains PT Ratio	(0-1)	0	0: Disabled; 1: Enabled. PT primary and PT secondary can be set. HGM6110N-4G is reserved and without this settings.
93	Active Power Loading Percentage	(0-1)	0	0: Disabled; 1: Enabled. When it is enabled, it is active power/rated power*100; when it is disabled, it is average current of the 3 phases/rated current*100;
94	User-defined Sensor Curve Type	(0-2)	0	0 User-defined temperature sensor 1 User-defined pressure sensor 2 User-defined level sensor Choose sensor which need to be set, input every point (8 points need to be input) resistance and corresponding value(or current, voltage) of curve.
95	Engine Type	(0-39)	0	0: Non-ECU Genset
96	SPN Alarm Version	(0-3)	0	SPN alarm version
97	Charger Voltage Sampling Option	(0-1)	0	0: Controller 1: ECU
98	Speed Sampling Option	(0-1)	0	0: Controller 1: ECU
99	Temperature Sampling Option	(0-1)	0	0: Controller 1: ECU
100	Oil Pressure Sampling Option	(0-1)	0	0: Controller 1: ECU
101	4G Setting	(0-1)	1	0: Disable 1: Enable
102	Server Setting	(0-2)	1	0: IO TEYUN 1: Cloud Monitoring Platform 3. Self-defined cloud monitoring platform

No.	Items	Range	Default	Description
103	Mains Power-on Rules	(0-4)	3	0: A-phase must be with power, B/C-phase cannot loss of phase; 1: A-phase must be with power, B/C-phase can loss of one phase; 2: A-phase must be with power, B/C-phase can loss of two phases; 3: A-phase can without power, A/B/C-phase can loss of one phase; 4: A-phase can without power, A/B/C-phase can loss of two phases;
104	Total Start Attempts			
105	Total Running Time			
106	Total Electric Energy			
107	Over Voltage Warn Threshold	(30-620)V	253	When the Gen voltage is higher than this value, it is considered as “Gen Voltage High” and sends a warning alarm. When set as 620V, the high voltage warn signal is not detected.
108	Under Voltage Warn Threshold	(30-620)V	193	When the sampling voltage is lower than this value, it is considered as “Gen Voltage Low” and sends a warning alarm. When set as 30V, the low voltage warn signal is not detected.
109	Over Frequency Warn Threshold	(0-99.9)Hz	55.0	When the Gen frequency exceeds this value, it is considered as “Over Frequency” and sends a warning signal. When set as 0, the over frequency warn signal is not detected.
110	Under Frequency Warn Threshold	(0-99.9)Hz	42.0	When the Gen frequency is lower than this value, it is considered as “Under Frequency” and sends a warning signal. When set as 0, the under frequency warn signal is not detected.
111	Over Voltage Shutdown Delay	(0-60.0)s	10.0	Time from detecting the “Gen Over Voltage” to shutdown.
112	Under Voltage Shutdown Delay	(0-60.0)s	10.0	Time from detecting the “Gen Under Voltage” to shutdown.
113	Over Frequency Shutdown Delay	(0-60.0)s	2.0	Time from detecting the “Gen Over Frequency” to shutdown.
114	Under Frequency Shutdown Delay	(0-60.0)s	10.0	Time from detecting the “Gen Under Frequency” to shutdown.
115	Transfer Failure Warn	(0-1)	1	0: Disable; 1: Enable.
116	Opening Detection	(0-1)	1	0: Disable; 1: Enable.
117	ECU Speed Regulation Step Length	(1-200)	5	The speed will increase or decrease 5r/min when the input port is active.

No.	Items	Range	Default	Description
118	Battery Voltage Upper Limit	(0-99.9)V	58.0	The voltage when battery charging is finished.
119	Battery Voltage Lower Limit	(0-99.9)V	45.0	The threshold of battery under voltage. When the battery voltage is lower than this value, the generator is allowed to start.
120	Battery Charging Completion Time	(1-6000)Min	720	The longest charging time that the battery pack allows for a single time.
121	Mini Battery Charging Time	(0-360)Min	30	When the charging time is longer than this value, if the room temperature is high, it will control the air conditioner to open.
122	Load Current Lower Limit	(1-100)%	15	When the load current of the switch power is less than this value and the battery voltage is higher than the upper limit value, the generator is allowed to stop.
123	Load Current Detection Delay	(10-3600)s	30	The unit is in normal running and ATS1 is Gen closing, while ATS2 is not Gen closing, if the load current is less than the set lower limit value, the delay begins.
124	Room Temp. Upper Limit	(15-55)℃	28	The generator will start if the room temperature is higher than this value.
125	Room Temp. Lower Limit	(15-55)℃	22	Due to the high room temperature, the generator will stop if the temperature is lower than this value after the generator starting.
126	Shutdown Conditions	(0-3)	0	0: Battery voltage is higher than upper limit and load current is less than the lower limit; 1: Battery voltage is higher than the upper limit; 2: Load current is less than the lower limit; 3: Battery voltage is higher than the upper limit or the load current is less than lower limit.

Note 1: if select high temperature inhibit, or set programmable input as High Temperature Inhibit (this input is active), when temperature is higher than pre-setting threshold, controller sends warning signal only and not shutdown.

Note 2: if select low oil pressure inhibit, or set programmable input as Low Oil Pressure Inhibit (this input is active), when low oil pressure is lower than pre-setting threshold, controller sends warning signal only and not shutdown.

Note 3: If default password (0318) isn't changed, it doesn't need to input when configuring parameters via PC software; if the password is changed for the first time via PC software, it need to input password in password window.

Note 4: Between input correct password and LCD back light haven't got dark, input parameter numbers can enter parameter setting interface when enters "Password Input" again.

Note 5: In teeth configuration interface, if being in teeth configuration status and frequency is larger than 20Hz, press start key for auto calculating teeth numbers and press confirm key for changing teeth numbers.

7.2 PROGRAMMABLE OUTPUT 1-4 TABLE

Table 12– Definition Content of Programmable Output 1-4

No.	Items	Description
0	Not Used	Output is disabled when this item is selected.
1	Common Alarm	Including all shutdown alarm and warning alarm. When a warning alarm occurs, the alarm won't self-lock; When a shutdown alarm occurs, the alarm will self-lock until alarm is reset.
2	Energize to Stop	Used for the genset with stop solenoid. Pick-up when idle speed is over while disconnect when ETS delay is over.
3	Idle Control	Used for the genset with idle speed. Pick-up when crank while disconnect when enter into warming up. Pick-up when stop idle while disconnect when genset stop completely.
4	Preheat Control	Close before started and disconnect before powered on.
5	Reserved	
6	Reserved	
7	Reserved	
8	Speed Rise Relay	Pick-up when enter into warming up time. Disconnect when raise speed auxiliary input active.
9	Speed Drop Relay	Pick-up when enter into stop idle or ETS solenoid stop (shutdown alarm). Disconnect when droop speed auxiliary input active.
10	Run Output	Output when genset is in normal running, disconnect when rotating speed is lower than engine speed after fired.
11	Fuel Pump Control	Pick-up when the fuel level lower than the open threshold or low fuel level warning is active; disconnect when the fuel level over the close threshold and the low fuel level warning input is disabled.
12	High Speed Control	Output when it enters into warming up time, and disconnect after cooling.
13	Auto Mode	The controller is in Auto Mode.
14	Trip and Stop	Output when shutdown alarm occurs and open when alarm resets.
15	Audible Alarm	When shutdown alarm and warn alarm, audible alarm is set as 300s. In audible alarm output duration, when panel any key or "alarm mute" input is active, it can remove the alarm.
16	Heater Control	It is controlled by cooler of temperature sensor's limited threshold.
17	Fuel On	Action when genset is starting and disconnect when stop is completed.
18	Start Output	Genset output in start output status and open in other status.
19	ECU Stop	Used for ECU engine and control its stop.
20	ECU Power Supply	Used for ECU engine and control its power.
21	ECU Warning	Indicate ECU sends a warning signal.
22	ECU Shutdown	Indicate ECU sends a shutdown signal.
23	ECU Communication Failure	Indicate controller not communicates with ECU.

No.	Items	Description
24	Speed Raise Pulse	Raising speed time is output while the unit entering into hi-speed warming up.
25	Speed Drop Pulse	Dropping speed time is output while the unit entering into stop idling.
26	Oil Pump Control	This function only suits for engine type Yuchai-LMB. When unit is standby, pump control output per 30 minutes. If oil pressure is above 100kPa or output delay is more than 1minute, it will stop output; if unit is in re-heating state, oil pump control will always output.
27	Pre-supplied Fuel Output	Outputs 3s before fuel output.
28	ECU Key Switch	Suitable for EFI engine. Ignition switch and ECU power supply are not allowed to supply power at the same time. The normal sequence is that the ECU power supply is supplied first, and the ignition switch delays for 3s.
29	1#ATS	Can control mains switch take load. When close time is set as 0, it is continuous closing.
30	1#ATS	Can control Gen switch take load. When close time is set as 0, it is continuous closing.
31	2#ATS	Can control mains switch take load. When close time is set as 0, it is continuous closing.
32	2#ATS	Can control Gen switch take load. When close time is set as 0, it is continuous closing.
33	Fan Control	Control output according to the upper/lower limit of room temperature.
34	High Room Temperature	Alarm when the room temperature reaches the higher limit warning value.
35	Mains Abnormal	Act when mains is over/under voltage.
36	Louver Control	Act when genset starts, disconnect after genset stops and “louver open hold time” delays.
37	Remote Control Open Door Output	Remotely Control this output port by Modbus-RTU protocol. The output time is “remote control open door output time”.
38	ATS1 Open	Control switch unload.
39	ATS2 Open	Control switch unload.
40	Start Delay Output	Active when start delay outputs.

7.3 PROGRAMMABLE INPUT 1-5 TABLE

Table 13 - Definition Content of Programmable Input 1-5 (Active When Connect To Ground (B-)

No.	Items	Description
0	Not Used	
1	High Temperature Shutdown	If the signal is active after safety run on delay over, genset will immediately alarm to shutdown.
2	Low Oil Pressure Shutdown	
3	Warn Input	Only warning, not shutdown.
4	Shutdown Input	If the signal is active, genset will immediately alarm to shutdown.
5	WTH STOP by Cool	During engine running and the input is active, if high temperature occurs, controller will stop after high speed cooling; when the input is disabled, controller will stop immediately.
6	Reserved	
7	SIM2 Master	If this signal is valid, the system connects to the network via SIM 2 by default.
8	Inhibit WTH STOP	When it is active, high oil temperature stop is inhibited. See Note 1 of Parameter Configuration for more information.
9	Inhibit OPL STOP	When it is active, low oil pressure stop is inhibited. See Note 2 of Parameter Configuration for more information.
10	Reserved	
11	Fuel Level Warning	Connected to sensor digital input. The controller sends an warning alarm signal when active.
12	Coolant Level Warning	
13	Fuel Level Shutdown	Connected to sensor digital input. The controller sends an shutdown alarm signal when active.
14	Coolant Level Shutdown	
15	Inhibit Start Auto	In Auto Mode, when the input is active, no matter mains normal or not, genset won't start. If genset is in normal running, stop process won't be executed. When input is disabled, genset will automatically start or stop judging by mains normal or not.
16	Reserved	
17	Charge Alt Fail IN	Connected with charger "Failed to charge".
18	Panel Lock	All keys in panel is inactive except  and there is 🔒 in the left of fifth row in LCD when input is active.
19	Alarm Mute	Can prohibit "Audible Alarm" output when input is active.
20	Idle Control Mode	In this mode, under voltage, under frequency and under speed are not protected.
21	60 Hz Select	It is used for J1939 engine with CANBUS port, when input is active, frequency is 60Hz.
22	Raise Speed Pulse	If engine type is common J1939, when input is active, engine target speed will increase 5RPM.

No.	Items	Description
23	Drop Speed Pulse	If engine type is common J1939, when input is active, engine target speed will decrease 5RPM.
24	IDMT Fault Shutdown	When input is active, controller will initiate shutdown alarm.
25	Mechanical Over Speed	When input is active, controller will initiate shutdown alarm.
26	Access Input	When input is active, controller will prompt access input warning.
27	Mains Abnormal Input	To simulate mains is abnormal.
28	Mains Normal Input	To simulate mains is normal.
29	Battery Under Voltage Input	It is considered as battery under voltage when input is active. If start condition is configured, the genset will be started in auto mode.
30	1#ATS Gen Close Input	Connected to the auxiliary point on 1#ATS Gen loaded switch.
31	1#ATS Mains Close Input	Connected to the auxiliary point on 1#ATS mains loaded switch.
32	2#ATS Gen Close Input	Connected to the auxiliary point on 2#ATS Gen loaded switch.
33	2#ATS Mains Close Input	Connected to the auxiliary point on 2#ATS mains loaded switch.
34	Remote Start Input On Load	In auto mode, when the input is active, the genset can be started automatically and will take load after normal running. When input is inactive, the genset will be stopped automatically.
35	Remote Start Input Off-load	In auto mode, when the input is active, the genset can be started automatically and will off-load after normal running. When input is inactive, the genset will be stopped automatically.

7.4 SENSOR SELECTION

Table 14 – Sensor Selection

No.	Items	Content	Description
1	Temperature Sensor	0 Not used 1 User Configured (Resistance Type) 2 VDO 3 SGH 4SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 User Configured (4-20mA) 10 User Configured (0-5V) 11 Digital Closed 12 Digital Open	Defined input resistance range is 0Ω~6000Ω, factory default is SGX sensor.

No.	Items	Content	Description
		13 Reserved 14 Reserved	
2	Pressure Sensor (Room Temperature)	0 Not used 1 User Configured (Resistance Type) 2 VDO 10Bar 3 SGH 4 SGD 5 CURTIS 6 DATCON 10Bar 7 VOLVO-EC 8 SGX 9 User Configured (4-20mA) 10 User Configured (0-5V) 11 Digital Closed 12 Digital Open 13 VDO 5Bar 14 PT100	Defined input resistance range is 0Ω~6000Ω, factory default is SGX sensor.
3	Fuel Level Sensor (Temperature Sensor for Generator Room)	0 Not used 1 User Configured (Resistance Type) 2 SGH 3 SGD 4 User Configured (4-20mA) 5 User Configured (0-5V) 6 Digital Closed 7 Digital Open 8 PT100	Defined input resistance range is 0Ω~6000Ω, factory default is SGD sensor.

Note: it needs special instructions for ordering when the genset use 4-20mA or 0-5V sensors.

7.5 CONDITIONS OF CRANK DISCONNECT

Table 15 – Crank Disconnect Conditions

No.	Content
0	Speed
1	Frequency
2	Speed + Frequency
3	Speed + Oil pressure
4	Frequency + Oil pressure
5	Speed + Frequency + Oil pressure
6	Oil pressure

1) There are 3 kinds of crank disconnect conditions. Speed, Generator frequency and Oil pressure can be used alone. Oil pressure is used with speed and the generator frequency together is recommended, in order to make the starter and the engine disconnect as soon as possible.

2) Speed is the signal measured by magnetic sensor, which is installed in the engine for testing flywheel teeth.
3) When choosing speed, ensure the number of flywheel teeth is same as the pre-set, otherwise over or under speed shutdown may appear.
4) If generator has no magnetic pickup sensor, don't choose speed item; otherwise Fail to Start or Loss of Speed Signal shutdown will occur.
5) If the generator has no oil pressure sensor, don't choose corresponding item.
6) If generator frequency has not been selected, controller will not measure and display the relative parameters (can be applied to the pump set); if speed has not been selected, the rotating speed will be calculated by the generating AC signal.

8 4G SETTING

Table 16 – 4G Setting

4G Setting				
1	4G Enable	(0-1)	1	0：Disable；1：Enable
2	SMS Enable	(0-1)	0	0：Disable；1：Enable
3	Phone Number	Up to 20	There should be region or country area code for the set number, for China, 8613666666666.	
4	GPRS Enable	(0-1)	1	0：Disable；1：Enable
5	GPS Enable	(0-1)	1	0：Disable；1：Enable
6	Longitude	(-180-180)°	113.33	When GPS is disabled, the monitoring module GPS and altitude can be input.
7	latitude	(-90-90)°	34.48	
8	Altitude	(-9999.9-9999.9)m	100	
Cloud Service Setting				
1	Site Name	20 Chinese characters, 40 letters or 40 numbers.		
2	Server URL	www.smartgencloudplus.com The default port is 21318.		
3	Server Port	(0-65535)	21318	
4	Module Password	123456		16 characters.

8.1 4G MODULE SIM SWITCH TRIGGERING

Pre-network Registration:

1) If neither SIM1 nor SIM2 is inserted, a "GSM Communication Failure" alarm is triggered;
2) If SIM1 is inserted, SIM2 is not inserted, and the current 4G module is attempting the network connection process using SIM2, switch to SIM1;
3) If SIM1 is not inserted, SIM2 is inserted, and the current 4G module is attempting the network connection process using SIM1, switch to SIM2;
4) If both SIM1 and SIM2 are inserted, the operator registration for SIM1 is successful but fails for SIM2, and the module is using SIM2 for the connection process, switch to SIM1;
5) If both SIM1 and SIM2 are inserted, the operator registration for SIM2 is successful but fails for SIM1, and the module is using SIM1 for the connection process, switch to SIM2;
6) If both SIM1 and SIM2 are inserted, and operator registration fails for both SIM1 and SIM2, the 4G module will power off and restart, then re-detect;
7) If both SIM1 and SIM2 are inserted, and their operator registrations are successful, but there is a significant difference in signal quality, switch to the SIM card with the better signal;
8) If both SIM1 and SIM2 are inserted, and their operator registrations are successful, and the signal quality difference is little, If the input port is configured for the "SIM2 Master" and this input is active, and the module is not currently operating on SIM2, switch to SIM2. If the module is currently operating on SIM2, but the input port is either not configured for "SIM2 Master" or the configuration is inactive, switch to SIM1.

Post-network Registration:

1) If the operator registration fails for the currently active SIM card, and the other SIM card is inserted and its operator registration is successful, switch SIM cards and re-establish the network connection;
2) If the platform issues a SIM switch command, but the operator registration fails for the other SIM card, or the other card is removed, maintain the current SIM card;
3) If the platform issues a SIM switch command, the other SIM card is inserted and its operator registration is successful, and the other card has a better signal with a significant quality difference between the two cards, switch SIM cards and re-establish the network connection;
4) If the platform issues a SIM switch command, the other SIM card is inserted and its operator registration is successful, the other card has a better signal, but the signal quality difference is little, if currently operating on SIM1, and the input port's "SIM2 Master" signal is active, switch back to SIM2; if currently operating on SIM2, and the input port's "SIM2 Master" signal is active, maintain the current card (not switch).

9 SMS ALARM AND REMOTE CONTROL

9.1 SMS ALARM

When controller detects alarm, it will take initiative to send message to the set phone number.

NOTE: All the shutdown alarms and trip and stop alarms will take initiative to send message to the set phone number, warning alarm will selectively send message to the set phone number according to the user setting. When sending messages, they will be in Chinese or English based on the language selected on the controller.

9.2 SMS REMOTE CONTROL

The controller will execute corresponding actions and reply the corresponding the execution information when it received the SMS message sent by users. The controller only can execute the SMS message orders set by itself. The specific SMS message is shown as follows:

Table 17 – SMS Message Order List

No.	SMS Command	SMS Reply Information	Description	
1	SMS GENSET	GENSET ALARM	When genset stop alarms.	Obtain the genset status
		SYSTEM IN STOP MODE GENSET AT REST	In stop mode, at rest mode.	
		SYSTEM IN MANUAL MODE GENSET AT REST	In manual mode, at rest mode.	
		SYSTEM IN AUTO MODE GENSET AT REST	In auto mode, at rest status.	
		SYSTEM IN STOP MODE GENSET IS RUNNING	In stop mode	
		SYSTEM IN MANUAL MODE GENSET IS RUNNING	In manual mode, the start status.	
		SYSTEM IN AUTO MODE GENSET IS RUNNING	In auto mode, the start status.	
2	SMS START	GENSET ALARM	When genset stop alarms.	Start genset
		STOP MODE NOT START	Start is disabled in stop mode.	
		SMS START OK	Start enables in manual mode.	
		AUTO MODE NOT START	Start is disabled in auto mode.	
3	SMS STOP MODE	SMS STOP OK	Set to stop mode.	
4	SMS MANUAL MODE	SMS MANUAL MODE OK	Set to manual mode.	
5	SMS AUTO MODE	SMS AUTO MODE OK	Set to auto mode.	
6	SMS DETAIL	The replay content can be set by PC.	To obtain the genset details.	

NOTE: When send a command, the information should be as the table content, and all the letters should be uppercase.

NOTE: The detailed contents of SMS DETAIL reply include: working mode, Mains voltage, Gen voltage, load current, Mains frequency, Gen frequency, active power, apparent power, power factor, battery voltage, D+ voltage, water temperature, oil pressure, oil level, speed, accumulative running time, unit status and alarm status.

10 PARAMETER SETTING

After controller powered on, press 

to enter into the parameters setting menu:

1) Parameters Setting
2) Information
3) Language
4) Event Log
5) Maintenance Setting
6) ECU DM2

10.1 PARAMETERS SETTING

"0318" can set all items in table 11 during inputting password. When default password has been changed, it needs to input the same password with controller for parameter setting via PC software.

If more parameter items need to be set or password is forgot, such as voltage and current calibration, please contact with the factory.

Notes:

1) Please modify the parameters in standby mode (crank conditions, auxiliary input and output configuration, multi delays, etc.) otherwise, shutdown alarm or other abnormal conditions may appear.
2) The over-voltage threshold must be greater than the under voltage threshold; otherwise over-voltage and under voltage will occur at the same time.
3) The over-speed threshold must be greater than under speed threshold, otherwise over speed and under speed will occur at the same time.
4) Set frequency value (after crank disconnect) as low as possible, in order to disconnect starter quickly.
5) Programmable input 1-5 cannot be set as the same items, otherwise it cannot realize correct function; programmable output 1-4 can be set as the same item.
6) If need to shut down after cooling, please set any input as "stop after cooling ", then connect this input to ground; or set high temperature stop action as "cooling stop".

10.2CONTROLLER INFORMATION

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

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

2) Language

User may select display language as Chinese and English.

3) LCD contrast ratio adjustment

Press and (or and) and adjust LCD contrast ratio, which shall make the LCD characters clearer. Adjustment range is 0-9.

11 SENSOR SETTING

— When choosing sensor, standard of sensor curve will be needed. If temperature sensor is set as SGH (120ºC resistor type), sensor curve should be SGH (120ºC resistor type); If it is set as SGD (120ºC resistor type), sensor curve should be SGD curve.
— If there is difference between standard sensor curve and chosen sensor curve, select “defined sensor”, and then input defined sensor curve.
— When sensor curve is inputted, X value (resistance) must be in accordance with the order of higher to lower, otherwise errors will occur.
— When sensor is selected as “Not used”, temperature, pressure and fuel level will be display as” - - -” in LCD.
— If there is no pressure sensor, but only has low pressure alarm switch, then you must set pressure sensor as “Not used”, otherwise oil pressure low alarm shutdown may appear.
— Can set several points of forehand or backmost as the same ordinate, as the following picture:

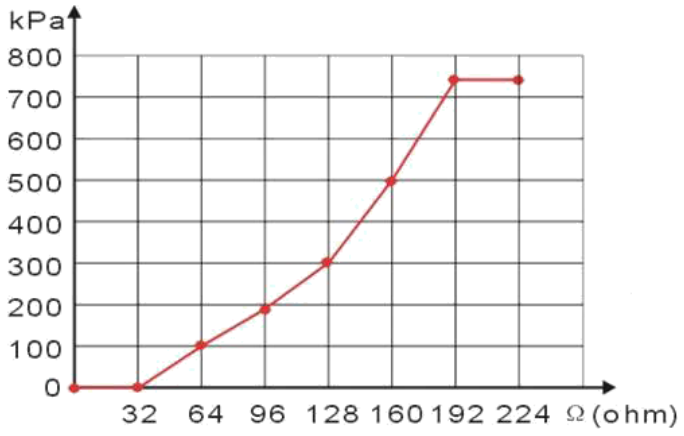


Fig.3 Sensor Curve Diagram

Table 18 - Conventional pressure unit conversion table

	1N/m^2 (pa)	1kgf/cm^2	1bar	(1b/in^2) psi
1Pa	1	1.02x10^{-5}	1x10^{-5}	1.45x10^{-4}
1kgf/cm^2	9.8x10^4	1	0.98	14.2
1bar	1x10^5	1.02	1	14.5
1psi	6.89x10^3	7.03x10^{-2}	6.89x10^{-2}	1

12 COMMISSIONING

Before operation, the following checking should be carried out:

- Check and ensure all the connections are correct and wires diameter is suitable.
- Ensure that the controller DC power has fuse; battery positive and negative have correctly connected.
- Emergence stop input must be connected to positive of starting battery via normally close contact of emergency stop.
- Take proper actions to prevent engine to disconnect crank (e. g. Remove the connections of fuel value). If checking is OK, connect start battery, select Manual Mode, controller will execute the program.
- Set controller as Manual Mode, press “start” button to start genset. If failed within the setting crank times, controller will send “Failed to Start” signal; then press “stop” to reset controller.
- Recover actions of preventing engine to disconnect crank (e. g. Connect wire of fuel value), press “start” button again, genset will start. If everything goes well, genset will normal run after idle running (if configured). During this period, watch for engine’s running situations and voltage and frequency of alternator. If there is abnormal, stop genset and check all connections according to this manual.
- Select the Auto Mode from front panel, connect to mains signal. After the mains normal delay, controller will transfer ATS (if configured) into mains load. After cooling, controller will stop genset and into standby state until mains abnormal again.
- When mains abnormal again, genset will start automatically and into normal running, send signal to make gens close, transfer ATS and make genset take load. If it not likes this, please check connections of ATS according to this manual.
- If there are any other questions, please contact SmartGen’s service.

13 TYPICAL APPLICATION

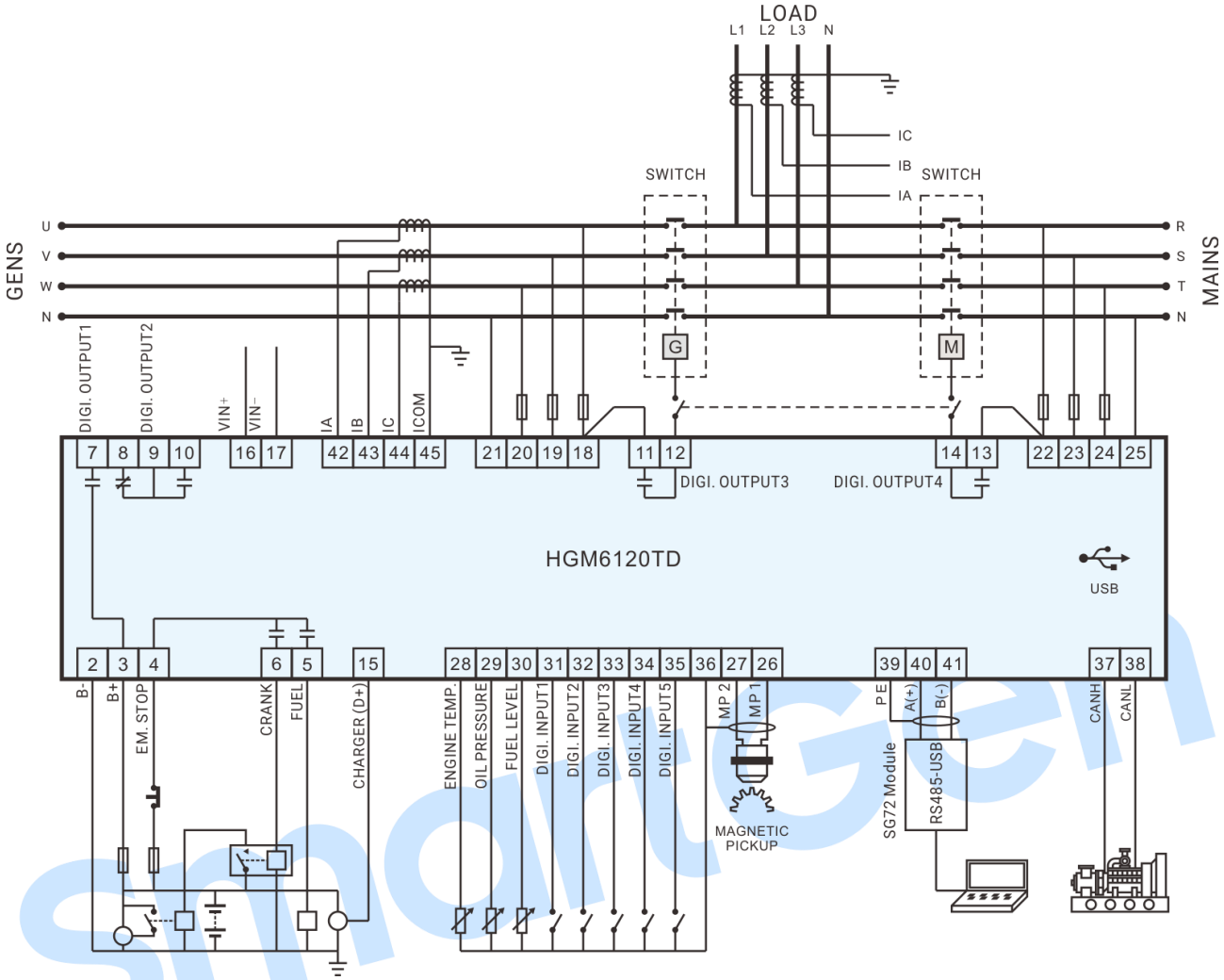


Fig.4 - HGM6120TD Typical Application Diagram

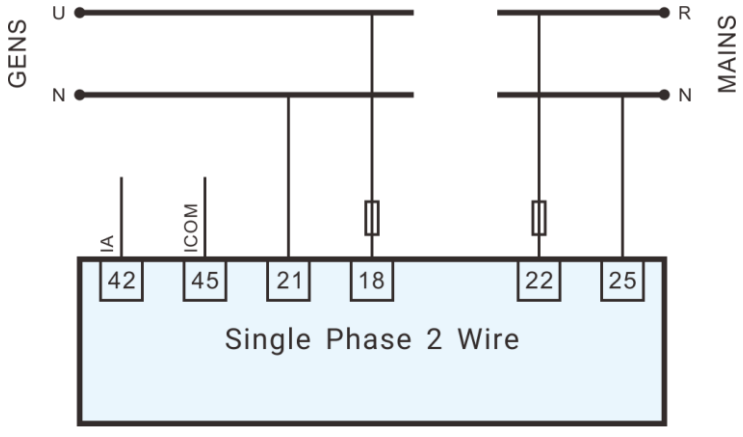


Fig.5 – Single Phase 2 Wire Diagram

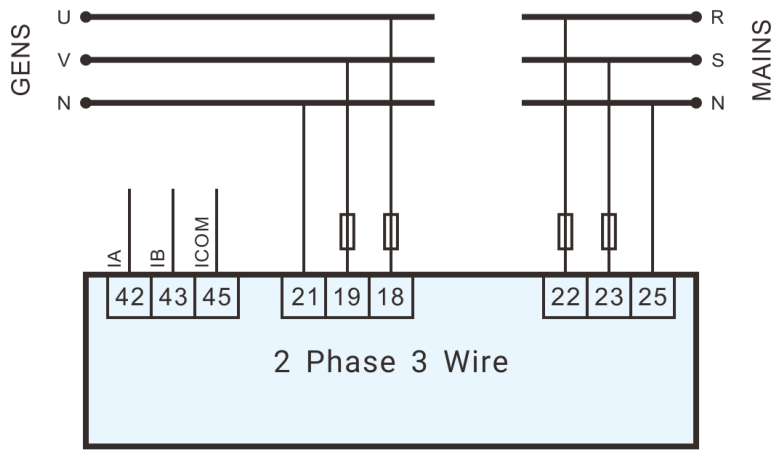


Fig.6 – 2 Phase 3 Wire Diagram

Note: Recommend that the output of crank and Fuel expand high capacity relay.

14 INSTALLATION

14.1 ANTENNA AND SIM CARD INSTALLATION

14.1.1 4G ANTENNA PORT

Connect 4G antenna to the 4G port of the controller.

Antenna port: 50Ω/SMA socket

14.1.2 GPS ANTENNA PORT

Enable GPS function, connect GPS antenna to the GPS port of controller.

⚠NOTE: GPS antenna should be placed outdoors, otherwise the position is inaccurate or the position cannot be obtained.

50Ω/SMA socket, active antenna.

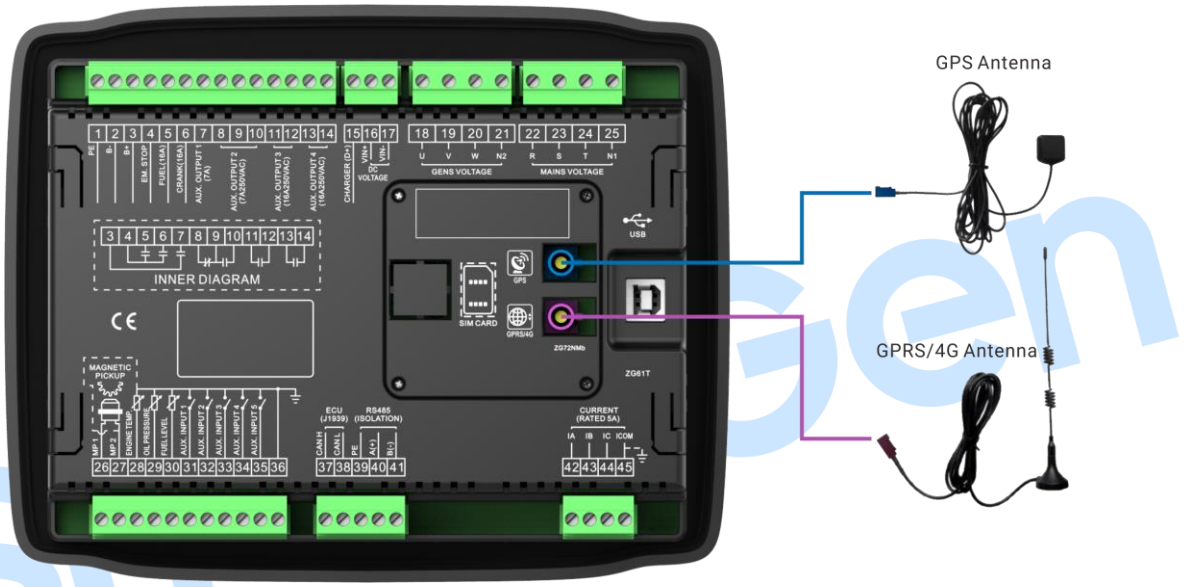


Fig. 7 – HGM6120TD Antenna Connection Diagram

14.1.3 SIM CARD INSTALLATION

Insert the two SIM cards from different operators, the controller will connect to the server via Wi-Fi mobile network. If an abnormal network connection occurs on one card, the controller can automatically switch to the other card based on the situation, preventing the prolonged offline status and avoiding data loss.

Note: This module supports Netcom 4G Wi-Fi network (the SMS function does not support Telecom 4G card. Standard SIM card (Size:25mm×15mm);

The controller displays , indicating that the SIM1 and SIM2 cards have not been inserted or the SIM1 and SIM2 cards has poor contact.

14.2FIXING CLIPS (TORQUE)

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

— Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.

— Pull the fixing clip backwards (towards the back of the module) ensuring four clips are inside their allotted slots.

— Turn the fixing clip screws clockwise until they make contact with the panel.

— Care should be taken not to over tighten the screws of fixing clips.

— Torque: 2.75kgf*cm(0.27N*m)

14.3 OVERALL DIMENSION AND PANEL CUTOUT

Unit: mm

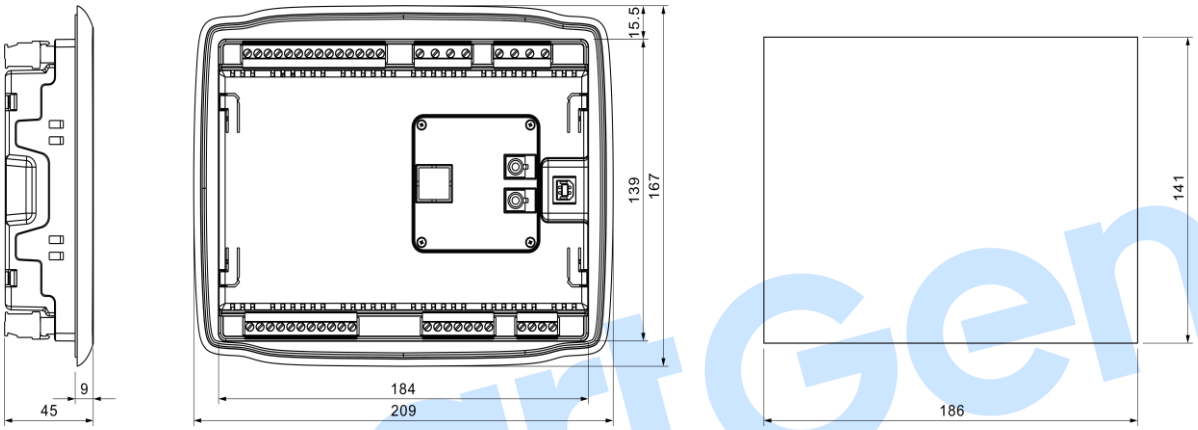


Fig.8 – Case and Overall Dimensions （Unit: mm）

HGM6120TD controller can be applicable to (8~35) VDC battery voltage. Battery negative must be reliably connected to engine shell. The connection between controller power and battery should not be less than 2.5mm^2. If a float charger is fitted, please connect output line of the charger with battery directly, and then connect battery positive and negative to power input of controller separately, in case that charger will interfere with the normal running of controller.

1) Speed Sensor Input

Speed sensor is installed in the engine for testing flywheel teeth. The connection with controller uses 2-core screen, shield layer should be connected to terminal 27 of controller and the other end vacant. The other two signal lines are respectively connected to terminal 26 and terminal 27. At full speed, output voltage range is (1~24) VAC (RMS), 12VAC is recommended (rated speed). During installing, make the speed sensor contact the flywheel firstly, then pour out 1/3 laps, finally lock nut on the sensor.

2) Output and Expansion Relay

All the outputs of controller are relay output. If need to expand relay, please add freewheeling diode in both ends of relay coil (when expansion relay coil links DC), or add RC loop (when expansion relay coil links AC), in case controller or other equipment are interfered.

3) AC Input

HGM6120TD controller must externally connect to current transformer; CT secondary current must be 5A. Besides, the phase of CT and input voltage must be correct, or the sampling current

and active power may be incorrect.

Notes: a. Icom must connect to battery cathode of the controller.

b. When there is load current, open circuit is inhibited in the CT secondary side.

5) Dielectric Strength Test

When the controller has been installed in the control panel, during the test please disconnect all the terminals, in case high voltage damages the controller.

15 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

15.1 CUMMINS ISB/ISBE

Table19 – Connector B

Terminals of controller	Connector B	Remark
Programmable output port 1	39	Set configurable output 1 as "Fuel Relay Output"
Start relay output	-	Connect with starter coil directly
Programmable output port 2	Expand 30A relay, battery voltage of 01,07,12,13 is supplied by relay.	ECU power Set configurable output 2 as "ECU power"

Table 20 – 9 Pins Connector

Terminals of controller	9 pins connector	Remark
CAN_SCR	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

15.2 CUMMINS QSL9

Suitable for CM850 engine control mode

Table 21 – 50 Pins Connector

Terminals of controller	50 pins connector	Remark
Programmable output port 1	39	Set configurable output 1 as "Fuel Relay Output"
Start relay output	-	Connect to starter coil directly

Table 22 – 9 Pins Connector

Terminals of controller	9 pins connector	Remark
CAN_SCR	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 (IMPORT)

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

Table 23 – C1 Connector

Terminals of controller	C1 connector	Remark
Programmable output1	5&8	Set configurable output 1 as "Fuel Relay Output". Outside expand relay, when fuel output, making make port 5 and port 8 of C1 be connected
Start relay output	-	Connect to starter coil directly

Table 24 – 3 Pins Data Link Connector

Terminals of controller	3 pins data link connector	Remark
CAN_SCR	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 module. Engine type is QSX15.

Table 25 – 50 Pins Connector

Terminals of controller	50 pins connector	Remark
Programmable output1	38	Oil spout switch; Set configurable output 1 as "Fuel Relay Output".
Start relay output	-	Connect to starter coil directly

Table 26 – 9 Pins Connector

Terminals of controller	9 pins connector	Remark
CAN_SCR	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 module. Use RS485-MODBUS to read information of engine. Engine types are QSX15, QST30, QSK23 /45/60/78 and so on.

Table 27 – D-SUB Connector 6

Terminals of controller	D-SUB connector 06	Remark
Programmable output1	5&8	Set configurable output 1 as "Fuel Relay Output". Outside expand relay, when fuel output, connect the port 05 of connector 6 and port 08.
Start relay output	-	Connect to starter coil directly

Table 28 – D-SUB Connector 06

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

15.6CUMMINS QSM11

Table 29 – Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Programmable output1	38	Set configurable output 1 as "Fuel Relay Output".
Start relay output	-	Connect with starter coil directly
CAN_SCR	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	46	Using impedance 120Ω connecting line
CAN(L)	37	Using impedance 120Ω connecting line

Engine type: common J1939

15.7CUMMINS QSZ13

Table 30 – Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Programmable output1	45	
Start relay output	-	Connect to starter coil directly
Programmable output 2	16&41	Setting to idle speed control, normally open output. Making 16 connect to 41 during high-speed running of controller via external expansion relay.
Programmable output 3	19&41	Setting to pulse raise speed control, normally open output. Making 19

Terminals of controller	OEM connector of engine	Remark
		connect with 41 for 0.1s during high-speed warming of controller via external expansion relay.
CAN_SCR	-	CAN communication shielding line.
CAN(H)	1	Using impedance 120Ω connecting line
CAN(L)	21	Using impedance 120Ω connecting line

Engine type: Common J1939

15.8DETROIT DIESEL DDEC III / IV

Table 31 – Engine CAN Connector

Terminals of controller	CAN port of engine	Remark
Programmable output1	Expand 30A relay, battery voltage is supplied by relay.	Set configurable output 1 as “Fuel Relay Output”.
Start relay output	-	Connect to starter coil directly
CAN GND	-	CAN communication shielding line
CAN(H)	CAN(H)	Using impedance 120Ω connecting line
CAN(L)	CAN(L)	Using impedance 120Ω connecting line

Engine type: J1939 common used

15.9DEUTZ EMR2

Table 32 – F Connector

Terminals of controller	F connector	Remark
Programmable output1	Expand 30A relay, battery voltage of 14 is supplied by relay. Fuse is 16A.	Set configurable output 1 as “Fuel Relay Output”.
Start relay output	-	Connect to starter coil directly
-	1	Connect to battery negative pole
CAN_SCR	-	CAN communication shielding line
CAN(H)	12	Using impedance 120Ω connecting line
CAN(L)	13	Using impedance 120Ω connecting line

Engine type: VOLVO EDC4

15.10 JOHN DEERE

Table 33 – 21 Pins Connector

Terminals of controller	21 pins connector	Remark
Programmable output1	G,J	Set configurable output 1 as "Fuel Relay Output".
Start relay output	D	
CAN GND	-	CAN communication shielding line
CAN(H)	V	Using impedance 120Ω connecting line
CAN(L)	U	Using impedance 120Ω connecting line

Engine type: JOHN Deere

15.11 MTU MDEC

Suitable for MTU engines, 2000 series, 4000series

Table 34 X1 Connector

Terminals of controller	X1 connector	Remark
Programmable output1	BE1	Set configurable output 1 as "Fuel Relay Output".
Start relay output	BE9	
CAN GND	E	CAN communication shielding line(connect to one terminal only)
CAN(H)	G	Using impedance 120Ω connecting line
CAN(L)	F	Using impedance 120Ω connecting line

Engine type: MTU-MDEC-303

15.12 MTU ADEC (SMART MODULE)

It is suitable for MTU engine with ADEC (ECU8) and SMART module.

Table 35 – ADEC (X1 port)

Terminals of controller	ADEC (X1port)	Remark
Programmable output1	X1 10	Set configurable output 1 as "Fuel Relay Output". X1 Terminal 9 Connected to negative of battery
Start relay output	X1 34	X1 Terminal 33 Connected to negative of battery

Table 36 - SMART (X4 port)

Terminals of controller	SMART (X4 port)	Remark
CAN_SCR	X4 3	CAN communication shielding line
CAN(H)	X4 1	Using impedance 120Ω connecting line
CAN(L)	X4 2	Using impedance 120Ω connecting line

Engine type: MTU-ADEC

15.13 MTU ADEC (SAM MODULE)

It is suitable for MTU engine with ADEC (ECU7) and SAM module.

Table 37 – ADEC (X1 port)

Terminals of controller	ADEC (X1port)	Remark
Programmable output1	X1 43	Set configurable output 1 as "Fuel Relay Output". X1 Terminal 28 Connected to negative of battery
Start relay output	X1 37	X1 Terminal 22 Connected to negative of battery

Table 38 – SAM (X23 port)

Terminals of controller	SAM (X23 port)	Remark
CAN_SCR	X23 3	CAN communication shielding line
CAN(H)	X23 2	Using impedance 120Ω connecting line
CAN(L)	X23 1	Using impedance 120Ω connecting line

Engine type: Common J1939

15.14 PERKINS

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

Table 39 - Connector

Terminals of controller	Connector	Remark
Programmable output1	1,10,15,33,34	Set configurable output 1 as "Fuel Relay Output".
Start relay output	-	Connect to starter coil directly
CAN_SCR	-	CAN communication shielding line
CAN(H)	31	Using impedance 120Ω connecting line
CAN(L)	32	Using impedance 120Ω connecting line

Engine type: PERKINS

15.15 SCANIA

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

Table 40 – B1 Connector

Terminals of controller	B1 connector	Remark
Programmable output1	3	Set configurable output 1 as "Fuel Relay Output"
Start relay output	-	Connect to starter coil directly
CAN_SCR	-	CAN communication shielding line
CAN(H)	9	Using impedance 120Ω connecting line
CAN(L)	10	Using impedance 120Ω connecting line

Engine type: SCANIA

15.16 VOLVO EDC3

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

Table 41 – "Stand alone" Connector

Terminals of controller	"Stand alone" connector	Remark
Programmable output1	H	Set configurable output 1 as "Fuel Relay Output"
Start relay output	E	
Configurable output 2	P	ECU power Configurable output 2,"ECU power"

Table 42 – "Data bus" Connector

Terminals of controller	"Data bus" connector	Remark
CAN_SCR	-	CAN communication shielding line
CAN(H)	1	Using impedance 120Ω connecting line
CAN(L)	2	Using impedance 120Ω connecting line

Engine type: VOLVO

Note: When this engine type is selected, preheating time should be set to at least 3 seconds.

15.17 VOLVO EDC4

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

Table 43 - Connector

Terminals of controller	Connector	Remark
Programmable output1	Expanded 30A relay, and relay offers battery voltage to terminal 14.Fuse is 16A	Set configurable output 1 as "Fuel Relay Output"
Start relay output	-	Connect to starter coil directly
	1	Connected to negative of battery
CAN GND	-	CAN communication shielding line
CAN(H)	12	Using impedance 120Ω connecting line
CAN(L)	13	Using impedance 120Ω connecting line

Engine type: VOLVO EDC4

15.18 VOLVO-EMS2

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

Table 44 – Engine CAN Port

Terminals of controller	Engine's CAN port	Remark
Programmable output1	6	ECU stop Configurable output 1 "ECU stop"
Programmable output2	5	ECU power Configurable output 2 "ECU power"
	3	Negative power
	4	Positive power
CAN_SCR	-	CAN communication shielding line
CAN(H)	1(Hi)	Using impedance 120Ω connecting line
CAN(L)	2(Lo)	Using impedance 120Ω connecting line

Engine type: VOLVO-EMS2

Note: When this engine type is selected, preheating time should be set to at least 3 seconds.

15.19 YUCHAI

It is suitable for BOSCH common rail pump engine.

Table 45 – Engine 42 Pins Port

Terminals of controller	Engine 42 pins port	Remark
Programmable output1	1.40	Set configurable output 1 as "Fuel Relay Output". Connect to engine ignition lock
Start relay output	-	Connect to starter coil directly
CAN_SCR	-	CAN communication shielding line
CAN(H)	1.35	Using impedance 120Ω connecting line
CAN(L)	1.34	Using impedance 120Ω connecting line

Table 46 – Engine 2 Pins Port

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

Engine type: BOSCH

15.20 WEICHAI

It is suitable for Weichai BOSCH common rail pump engine.

Table 47 – Engine Port

Terminals of controller	Engine port	Remark
Fuel relay output	1.40	Connect to engine ignition lock
Start relay output	1.61	
CAN_SCR	-	CAN communication shielding line
CAN(H)	1.35	Using impedance 120Ω connecting line
CAN(L)	1.34	Using impedance 120Ω connecting line

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

Table 48 Fault Finding

Symptoms	Possible Solutions
Controller Inoperative	Check starting battery; Check connections of controller. Check the DC fuse.
Genset Stops	Check if water/cylinder temperature too high. Check alternator voltage. Check the DC fuse.
Emergency Stop	Check if an emergency stop key function is correct; Ensure battery positive is connected to the emergency stop input; Check if connection is open circuit.
Low Oil Pressure Alarm (After Crank Disconnect)	Check oil pressure sensor and connections.
High Water Temp. Alarm (After Crank Disconnect)	Check water temperature sensor and connections.
Shutdown Alarm During Running	Check switch and connections according to information on LCD; Check configurable inputs.
Crank Disconnect Failed	Check connections of fuel solenoid; Check starting battery; Check speed sensor and its connections. Refer to engine manual.
Starter Inoperative	Check connections of starter; Check starting battery.
Genset Running While ATS Not Transfer	Check ATS; Check connections between ATS and controller.
RS485 Failure	Check connections; Check if COM port is correct; Check if A and B of RS485 is connected reversely; Check if PC COM port is damaged; 120Ω resistance between PR485 and AB is Recommended.
4G Communication Failure	Check card installation; Check if card can be used normally; Check if the wiring between controller and 4G module is damaged; Check for insufficient balance or service suspension on the SIM card; Check if the SIM card is included in the whitelist; Check if the local signal can be used normally.

17 APPENDIX

Table 49 Order Models

Models	Countries or Regions	Frequency Band	Remarks
HGM6120TD	Chinese mainland only	FDD-LTE: B1, B3, B5, B8 TDD-LTE: B34, B38, B39, B40, B41 GSM/GPRS: 900/1800 MHz	