SmartGen

MAKING CONTROL SMARTER

HGM1792

VEHICLE MOUNTED GENSET CONTROLLER

USER MANUAL

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Table 1 Software Version

Date	Version	Note
2024-10-16	1.0	Original release.

Table 2 Notation Clarification

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.

CONTENTS

1 OVERVIEW

HGM1792 Vehicle Mounted Genset Controller is suitable for single unit automation and monitoring control. It can realize manual start/stop of genset, and automatic start/stop genset by remote start signal. The controller can monitor and protect genset operation by collecting and analyzing genset data like generator voltage, current, water temperature, oil pressure and so on, and it can indicate fault conditions and do maintenance as soon as possible. The controller uses LCD graphic display to show Chinese and English languages, which make the operation easy and reliable. Moreover, parameters can be adjusted via front panel or USB port (by communication with PC software).

2 PERFORMANCE AND CHARACTERISTICS

— 128x64 LCD display (with backlight), Chinese and English operation interface to be set by on-site engineer for commissioning and testing;
— Hard screen acrylic material is used to protect screen.
— Silicone panel and buttons are adopted to increase the resistance ability to high and low temperature;
— With Bluetooth communication function, the controller can carry out wireless control and data monitoring within 10~30 meters near the genset through mobile phone APP.
— Power supply range DC (8~35)V, compatible with various voltages of starting batteries;
— Generator voltage, current, power and load percentage parameters are measured and displayed:

Generator Voltage	V	Generator Current	A
Generator Power	W		
Load Percentage	%		

— Precisely measured and displayed parameters of engine:

Oil Pressure	kPa	Temperature	°C
Fuel Level	%	Total Running Time	h (max. 65535 hours)
Battery Voltage	V	Engine Speed	RPM

Accumulated Start Times (max. 65534 times)
— With genset fault protection and display functions.
— 3 working modes: manual, auto, stop;
— Compatible with multiple temperature, pressure, fuel level sensors, which can be user-defined and used directly; temperature sensors, pressure sensors can be used in parallel with annunciator, providing analog quantity and increasing protection level at the same time;
— Multiple crank disconnection conditions to select (engine speed, oil pressure);
— 3 configurable input ports which can be set as digital input or sensor input;
— 2 fixed relay outputs (fuel relay, crank relay);
— 3 configurable output ports which can be set as common alarm output, preheat output or idle control output;
— Parameters can be set and modified by users, and they will not be lost in case of power off. Parameters of the controller can be modified by the front panel and all parameters can be adjusted by PC software via Type-C USB port;
— Digital regulation of all parameters to make control more reliable and stable;
— Modular design, self-extinguishing ABS plastic enclosure, pluggable terminal blocks/connectors, embedded installation way, small size and compact structure for easy mounting.

Table 3 Technical Parameters

Item	Content
Working Voltage	8.0VDC to 35.0VDC, continuous power supply
Power Consumption	<1.8W (Standby mode: ≤0.8W)
DC Generator Voltage Input	0VDC ~ 60VDC
Speed Sensor Voltage	1V to 24V (RMS)
Speed Sensor Frequency	Max. 10,000Hz
Start Relay Output	1A, 28VDC, DC power supply output
Fuel Relay Output	1A, 28VDC, DC power supply output
Aux. Relay Output	1A, 28VDC, DC power supply output
Aux. Digital Input	Active when connected to B-
Case Dimensions	96mm x 86mm x 47mm
Panel Cutout	78mm x 66mm
DC Current Input	Current of Hall sensor's secondary side: (4-20)mA
Working Temperature	(-25~+70) °C
Working Humidity	(20~93) %RH
Storage Temperature	(-30~+80) °C
Protection Level	IP65: When waterproof rubber gasket is installed between the controller and panel.
Weight	0.16kg

3 OPERATION

3.1. FRONT PANEL DESCRIPTION

Fig.1 HGM1792 Front Panel

3.2. INDICATOR DESCRIPTION

Stop status indicator: genset works in stop mode; If no alarm occurs, Stop Mode will be displayed on the home page, if any alarm occurs, At Rest will be displayed on the home page.
Auto status indicator: genset works in auto mode.
Manual start indicator: it lights up when genset starts and works in manual mode.
Alarm indicator: it flashes slowly (1 time/s) when warning alarm occurs; and it flashes fast (5 times/s) when shutdown alarm occurs.

3.3. PANEL KEYS

Table 4 Key Descriptions

Key	Definition	Description
	Stop/Reset	In auto/manual mode, pressing it will shut down the genset; If genset is in stop status, reset shutdown alarms by pressing it; Test indicators and LCD screen when press it for over 3s in stop mode; Stop immediately if press this button again during stop process; Quick exit parameter setting menu if press this button.
	Auto/Increase	Pressing this button will make the module into auto mode, and genset is controlled by remote start input signals in this mode; In settings menu, it can move page up or increase the set value; When cursor disappears, pressing it can quit the current menu.
	Start/Confirm	Pressing this button will start genset; In settings menu it can move cursor or confirm the setting.
	Page Down/ Decrease	Using this button can scroll pages of the LCD monitor; Enter settings menu after press it over 3s; In settings menu, it can move page down or reduce the set value.

3.4. AUTO START/STOP OPERATION

Auto mode is selected by pressing button, and the LED indicator beside the button will light up to confirm the operation.

Automatic Start Sequence:

1) When "Remote Start" is active (Input terminal configuration is "Remote Start"), "Start Delay" timer is initiated, then the status on LCD screen will be "Start Delay" countdown;
2) When start delay is over, preheat relay energizes (if configured), "Preheat Delay" starts to count, then the status on LCD screen will be "Preheat Delay XXs".
3) After the preheat delay, the Fuel Relay is energized, and one second later, the Start Relay is engaged. If the genset fails to fire during "Cranking Time", then the fuel relay and start relay stop to output; "Crank Rest Time" begins and wait for the next cranking attempt.
4) After setup number of cranking attempts, if genset fails to start, the start sequence will be terminated, and "Fail to Start" alarm will be displayed on LCD screen, and meanwhile alarm indicator is blinking.
5) In case of successful crank attempt, the "Safety On" timer is activated, Low Oil Pressure, High Temperature and other alarms are inactive during the period. As soon as this delay is over, "Start Idle" delay is initiated (if configured).
6) During "Start Idle" delay, under speed and under voltage alarms are inhibited. When this delay is over, "Warming up" delay is initiated (if configured).
7) When "Warming up" delay is over, if power generation runs normal, the power generation indicator will light up. When generator voltage meets the on-load requirement, the generation close relay will output (if aux. output is configured), then genset start to load and power supply indicator lights up, which means genset starts normal running; if generator voltage is abnormal, shutdown alarm signals will be sent by the controller (alarm page on LCD screen will show power generation alarm).

Automatic Stop Sequence:

1) When the "Remote Start" signal doesn't work, "Stop Delay" is initiated;
2) Once this "Stop Delay" has expired, the "Cooling Delay" is then initiated.;
3) During "Stop Idle" Delay (if configured), idle relay is energized;
4) When "ETS Delay" begins, ETS relay switches on while fuel relay switches off.;
5) When genset enters "Wait Stop Time", it automatically detects whether genset stops completely;
6) Genset enters standby status after it stops completely. Otherwise, the controller enters stop failure and issues "Stop Failure" warning.

NOTE:

a) When press stop button in auto start status, genset will stop and enter into stop mode simultaneously.

b) In process of crank rest delay, ETS output is energized when fuel output is de-energized and crank rest time countdown is less than 7s. After crank rest delay, ETS output is de-energized, fuel relay starts output, and preheat output switches off before crank.

3.5. MANUAL START/STOP OPERATION

1) **MANUAL START**: Press  button to start the genset (Please refer to No.2~7 of **Automatic Start Sequence** for detail procedures). With high temperature, low oil pressure, over speed and abnormal voltage during generator running, controller can protect genset to stop quickly.
2) **MANUAL STOP**: Press  button can shut down the running genset. (Please refer to No.2~6 of **Automatic Stop Sequence** for detail procedures).

4 PROTECTION

4.1. SHUTDOWN

When the controller detects shutdown signals, it will switch off and stop at once, then display the alarm type.

Table 5 Controller Shutdown Alarms

No.	Type	Description
1	Emergency Stop	When controller detects emergency stop alarm signal, it issues emergency shutdown alarm signal.
2	Over Speed Shut	When controller detects engine speed is over preset over speed stop threshold, it issues shutdown alarm signal.
3	Under Speed Shut	When controller detects engine speed is under preset over speed stop threshold, it issues shutdown alarm signal.
4	Loss of Speed Signal	When controller detects speed is 0, and speed signal loss action is "Shutdown", it issues shutdown alarm signal.
5	Genset Over Voltage Shut	When controller detects genset voltage is over preset over voltage stop threshold, it issues shutdown alarm signal.
6	Genset Under Voltage Shut	When controller detects genset voltage is under preset over voltage stop threshold, it issues shutdown alarm signal.
7	Failed to Start	When engine fails to start after pre-set start attempts, controller issues shutdown alarm signal.
8	Genset Over Current Shut	When controller detects genset current is over preset over current stop threshold, it issues shutdown alarm signal.
9	High Temp. Shut IN	When controller input port is set to High Temp. Shutdown Input and it is active, it issues shutdown alarm signal.
10	Low Oil Pressure Shut IN	When controller input port is set to Low Oil Pressure Shutdown Input and it is active, it issues shutdown alarm signal.
11	Aux. Temp. Sensor X Open (X can be 1~3, the same below)	Set sensor X as temperature sensor, when controller detects sensor is open, and action type is “Shutdown”, it issues shutdown alarm signal.
12	Aux. Sensor X High Temp.	Set sensor X as temperature sensor, when controller detects sensor value is above pre-set shutdown upper limit value, it issues shutdown alarm signal.
13	Aux. Sensor X Low Temp.	Set sensor X as temperature sensor, when controller detects sensor value is below pre-set shutdown lower limit value, it issues shutdown alarm signal.
14	Aux. Oil Pressure Sensor X Open	Set sensor X as oil pressure sensor, when controller detects sensor open, and action type is “Shutdown”, it issues shutdown alarm signal.
15	Aux. Oil Pressure Sensor X High	Set sensor X as oil pressure sensor, when controller detects sensor value is above pre-set shutdown upper limit value, it issues shutdown alarm signal.
16	Aux. Oil Pressure Sensor X Low	Set sensor X as oil pressure sensor, when controller detects sensor value is below pre-set shutdown lower limit value, it issues shutdown alarm signal.
17	Aux. Level Sensor X Open	Set sensor X as level sensor, when controller detects sensor open, and action type is “Shutdown”, it issues shutdown alarm signal.

No.	Type	Description
18	Aux. Sensor X High Level	Set sensor X as level sensor, when controller detects sensor value is above pre-set shutdown upper limit value, it issues shutdown alarm signal.
19	Aux. Sensor X Low Level	Set sensor X as level sensor, when controller detects sensor value is below pre-set shutdown lower limit value, it issues shutdown alarm signal.
20	External Shutdown	When controller input port is set as external shutdown alarm, and it is active, it issues shutdown alarm signal to the same input port.

NOTE:

a) **Shutdown signal is latched signal, and press the "Stop" button can clear the alarm (when the genset is in stop status);**

b) **If shutdown alarm delay is set, after the delay is over, then the controller issues shutdown alarm signal.**

4.2. WARNINGS

When the controller detects warning signal, it only issues warning but does not shutdown.

Table 6 Warnings

No.	Type	Description
1	Over Speed Warn	When controller detects speed is above the pre-set over speed warning threshold, it issues warning signal.
2	Under Speed Warn	When controller detects speed is under the pre-set under speed warning threshold, it issues warning signal.
3	Loss of Speed Signal	When controller detects speed is 0, and speed signal loss action is "Warning", it issues warning signal.
4	Genset Over Voltage Warn	When controller detects genset voltage is over preset over voltage stop threshold, it issues warning signal.
5	Genset Under Voltage Warn	When controller detects genset voltage is under preset over voltage stop threshold, it issues warning signal.
6	Genset Over Current Warn	When controller detects genset current is over preset over current stop threshold, it issues warning signal.
7	Stop Failure	When engine stop delay is over and engine doesn't stop completely, controller issues warning signal.
8	Battery Over Voltage	When controller detects genset battery voltage is above pre-set threshold, it issues warning signal.
9	Battery Under Voltage	When controller detects engine battery voltage is below pre-set threshold, it issues warning signal.
10	Aux. Temp. Sensor X Open	Set sensor X as temperature sensor, when controller detects sensor is open, and action type is "Warning", it issues warning signal.
11	Aux. Sensor X High Temp.	Set sensor X as temperature sensor, when controller detects sensor value is above pre-set warning upper limit value, it issues warning signal.
12	Aux. Sensor X Low Temp.	Set sensor X as temperature sensor, when controller detects sensor value is below pre-set warning lower limit value, it issues warning signal.
13	Aux. Oil Pressure Sensor X Open	Set sensor X as oil pressure sensor, when controller detects sensor open, and action type is "Warning", it issues warning signal.

No.	Type	Description
14	Aux. Sensor X High Oil Pressure	Set sensor X as oil pressure sensor, when controller detects sensor value is above pre-set warning upper limit value, it issues warning signal.
15	Aux. Sensor X Low Oil Pressure	Set sensor X as oil pressure sensor, when controller detects sensor value is below pre-set warning lower limit value, it issues warning signal.
16	Aux. Level Sensor X Open	Set sensor X as level sensor, when controller detects sensor open, and action type is “Warning”, it issues warning signal.
17	Aux. Sensor X High Level	Set sensor X as level sensor, when controller detects sensor value is above pre-set warning upper limit value, it issues warning signal.
18	Aux. Sensor X Low Level	Set sensor X as level sensor, when controller detects sensor value is below pre-set warning lower limit value, it issues warning signal.

NOTE: If warning alarm delay is set, after the delay is over, then the controller issues warning signal. Warning alarms is not latched.

5 WIRING CONNECTION

Fig.2 Controller Back Panel

Table 7 Terminals Description

No.	Function	Cable Size	Remarks
1	DC Voltage Input B-	1.5mm²	Connect to negative of starting battery.
2	DC Voltage Input B+	1.5mm²	Connected to positive of starting battery. If wire length is over 30m, better to use double wires in parallel. Max. 20A fuse is recommended.
3	Emergency Stop Input	1.0mm²	B+ voltage input is active, and connected to emergency stop normal closed button.
4	Fuel Relay Output	1.0mm²	B+ is supplied by No.3 point, rated 1A.
5	Crank Relay Output	1.0mm²	B+ is supplied by No.3 point, rated 1A.
6	Aux. Input 1	1.0mm²	Ground connected is active (B-) if it is configured as digital input. Connect to resistive sensor if it is configured as sensor 1.
7	Aux. Input 2	1.0mm²	Ground connected is active (B-) if it is configured as digital input. Connect to resistive sensor if it is configured as sensor 2.
8	Aux. Input 3	1.0mm²	Ground connected is active (B-) if it is configured as digital input. Connect to resistive sensor if it is configured as sensor 3.
9	CAN L/MP2	0.5mm²	Connect to B-; CAN function is reserved.
10	CAN H/MP1	0.5mm²	Connect to speed sensor, and shielded wire is recommended; CAN function is reserved.
11	Gen Volt Monitoring	1.0mm²	Connect to generator voltage output port. (2A fuse is

No.	Function	Cable Size	Remarks
12	Input	1.0mm^2	recommended)
13	Load Current (Inlet Loop)	1.5 mm^2	Connect to the secondary side of Hall sensor, current is (4-20)mA.
14	Load Current (Outlet Loop)	1.5 mm^2	
15	Aux. Relay Output 1	1.0 mm^2	B+ is supplied by Terminal 2, rated 1A.

NOTE: The USB port is Type-C port, which can be connected with PC software for parameter configuration and data monitoring.

6 PARAMETER RANGE AND DEFINITION

6.1. PARAMETERS CONTENTS AND RANGE

Table 8 Parameter Setting Contents and Range

No.	Parameter	Range	Default	Description
Timer Setting				
1	Start Delay	(0-3600)s	1	Time from remote start signal being active to genset start.
2	Stop Delay	(0-3600)s	1	Time from remote start signal being inactive to genset stop.
3	Preheat Time	(0-3600)s	0	Time to pre-energize heat plug before starter is powered on.
4	Cranking Time	(3-60)s	8	Time to power on the starter for every crank attempt
5	Crank Rest Time	(3-60)s	10	The waiting time before second power on when engine start fails.
6	Safety On Delay	(0-3600)s	10	Alarms for low oil pressure, high temperature, under speed, under voltage and charging failure are inactive.
7	Start Idle Time	(0-3600)s	0	Idle running time after genset starts.
8	Warming Up Time	(0-3600)s	10	Warming time between genset switch on and normal running.
9	Cooling Time	(0-3600)s	10	Radiating time before genset stop, after it unloads.
10	Stop Idle Time	(0-3600)s	0	Idle running time after genset stops.
11	ETS Solenoid Hold	(0-120)s	20	The time of powering up the electromagnet during stop procedure.
12	Wait Stop Time	(0-3600)s	0	Time between ending of genset idle delay and stopped when “ETS Solenoid Hold” is set as 0; Time between ending of ETS hold delay and stopped when “ETS Solenoid Hold” is not 0.
13	After Stop Time	(0-3600)s	0	Time from complete stop to standby status.
Engine Setting				
1	Engine Type	(0-39)	0	Default: non-ECU genset. The item is reserved.
2	Flywheel Teeth	(10.0-300.0)	118.0	Tooth number of the engine is for judging of crank disconnect conditions and inspecting of engine speed. See the installation instructions.
3	Rated Speed	(0-6000)RPM	1500	Baseline for over speed, under speed and load speed detection.
4	Idle Speed	(0-6000)RPM	750	It is set for ECU genset to control idle speed.
5	Load Speed	(0-100)%	90	Set value is percentage of rated speed. Before load stage if controller detects speed is below idle speed, the genset won’t enter to normal running stage.
6	Speed Signal Loss Delay	(0-3600)s	5	Time from detecting speed is 0 to confirm action.

No.	Parameter	Range	Default	Description
7	Speed Signal Loss Action	(0-1)	0	0: Warning; 1: Shutdown.
8	Over Speed Shutdown	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	114	Set value is percentage of rated speed.
		(0-3600)s	2	Delay value.
9	Under Speed Shutdown	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	80	Set value is percentage of rated speed.
		(0-3600)s	3	Delay value.
10	Over Speed Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	110	Set value is percentage of rated speed.
		(0-200)%	108	Return value is percentage of rated speed.
		(0-3600)s	5	Delay value.
11	Under speed Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	86	Set value is percentage of rated speed.
		(0-200)%	90	Return value is percentage of rated speed.
		(0-3600)s	5	Delay value.
12	Battery Rated Voltage	(0-60.0)V	24.0	Baseline for battery over/under voltage detection.
13	Battery Over Voltage Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	120	Set value is percentage of rated voltage.
		(0-200)%	115	Return value is percentage of rated voltage.
		(0-3600)s	60	Delay value.
14	Battery Under Voltage Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	85	Set value is percentage of rated voltage.
		(0-200)%	90	Return value is percentage of rated voltage.
		(0-3600)s	60	Delay value.
15	Start Attempts	(1-10)times	3	Maximum start times in case of failed to start; when this number is reached, controller shall issue Failed to Start signal.
16	Crank Disconnect	(0-6)	2	Please refer to Table 12. There are three kinds of disconnection conditions between engine and starter. They can work separately or together to separate starter motor and engine as soon as possible.
17	Disconnect Voltage	(0-200)%	24	Set value is the percentage of rated generation rated voltage, when voltage is above the set value, starter shall disconnect. Please refer to the following installation instruction.
18	Disconnect Speed	(0-200)%	24	Set value is the percentage of rated speed, when speed is above the set value, starter shall disconnect. Please refer to the following installation instruction.
19	Disconnect OP	(0-1000)kPa	200	When Oil Pressure is above set value, starter shall disconnect. Please refer to the following installation instruction.
20	Temperature Sample Select	(0-1)	0	0: Controller; 1: ECU.

No.	Parameter	Range	Default	Description
21	Oil Pressure Sample Select	(0-1)	0	0: Controller; 1: ECU.
22	Speed Sample Select	(0-1)	0	0: Controller; 1: ECU.
Generator Setting				
1	Power Supply System	(0-3)	0	0: 3P4W; 1: 3P3W; 2: 2P3W; 3: 1P2W. The item is reserved.
2	Generator Poles	(2-64)	4	Numbers of generator poles (even number). The value could be used for calculation of engine speed when there is no speed sensor. The item is reserved.
3	Rated Voltage	(3.0-100.0)V	24.0	Baseline for over/under voltage and load voltage detection. If there is a potential transformer (PT), the value means primary voltage of transformer.
4	Load Voltage	(0-200)%	85	Set value is percentage of rated voltage. Before load stage if controller detects voltage is below load voltage, the genset won't enter to normal running stage.
5	Rated Frequency	(10.0-600.0)Hz	50.0	Baseline for over/under frequency and load frequency. The item is reserved.
6	Load Frequency	(0-200)%	85	Set value is percentage of rated frequency. Before load stage if controller detects frequency is below load frequency, the genset won't enter to normal running stage. The item is reserved.
7	Potential Transformer (PT) Setting	(0-1)	0	0: Disable; 1: Enable. The item is reserved.
8	Primary Voltage of PT	(30-30000)V	100	The value means primary voltage of transformer. The item is reserved.
9	Secondary Voltage of PT	(30-1000)V	100	The value means secondary voltage of transformer. The item is reserved.
10	Generator Over Voltage Shut	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	120	Set value is percentage of rated voltage.
		(0-3600)s	3	Delay value.
11	Generator Under Voltage Shut	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	80	Set value is percentage of rated voltage.
		(0-3600)s	3	Delay value.
12	Generator Over Frequency Shut	(0-1)	1	0: Disable; 1: Enable.
		(0-200)%	114	Set value is percentage of rated frequency.

The item is reserved.

No.	Parameter	Range	Default	Description	
		(0-3600)s	2	Delay value.	
13	Generator Under Frequency Shut	(0-1)	1	0: Disable; 1: Enable.	The item is reserved.
		(0-200)%	80	Set value is percentage of rated frequency.	
		(0-3600)s	3	Delay value.	
14	Generator Over Voltage Warn	(0-1)	1	0: Disable; 1: Enable.	
		(0-200)%	110	Set value is percentage of rated voltage.	
		(0-200)%	108	Return value is percentage of rated voltage.	
		(0-3600)s	5	Delay value.	
15	Generator Under Voltage Warn	(0-1)	1	0: Disable; 1: Enable.	
		(0-200)%	84	Set value is percentage of rated voltage.	
		(0-200)%	86	Return value is percentage of rated voltage.	
		(0-3600)s	5	Delay value.	
16	Generator Over Frequency Warn	(0-1)	1	0: Disable; 1: Enable.	The item is reserved.
		(0-200)%	110	Set value is percentage of rated frequency.	
		(0-200)%	108	Return value is percentage of rated frequency.	
		(0-3600)s	5	Delay value.	
17	Generator Under Frequency Warn	(0-1)	1	0: Disable; 1: Enable.	The item is reserved.
		(0-200)%	84	Set value is percentage of rated frequency.	
		(0-200)%	86	Return value is percentage of rated frequency.	
		(0-3600)s	5	Delay value.	
Load Setting					
1	Ratio of CT	(5-6000)/20	100	Transformation ratio of external current transformer (CT).	
2	Rated Current	(5-6000)A	100	It is rated current of generator, as baseline for load current.	
3	Rated Power	(0-60000)W	2400	It is rated power of generator, as baseline for load power.	
4	Over Current Protection	(0-1)	1	0: Disable; 1: Enable.	
5	Overload Current	(0-200)%	120	Set value is percentage of rated current.	
6	Over Current Action	(0-1)	1	0: Warning; 1: Shutdown.	
7	Over Current Delay Type	(0-1)	0	0: Fixed Delay; 1: Multiple Delay.	
8	Delay 1 Setting (Delay Value)	(0-3600)s	10	Delay value.	
9	Delay 2 Setting (Multiple Delay Value)	(1-36)	36	Multiple value of inverse-time delay.	
Module Setting					
1	Power On Mode	(0-2)	0	0: Stop; 1: Manual; 2: Auto.	
2	Module Address	(0-254)	1	Reserved.	

No.	Parameter	Range	Default	Description
3	Language	(0-2)	0	0: Simplified Chinese; 1: English; 2: Others.
4	Password Set	(0-65534)	00318	It is used for advanced parameter setting.
Analog Sensor Setting				
1	Sensor 1	(0-4)	1	0: Not Used 1: Temperature Sensor 2: Oil Pressure Sensor 3: Level Sensor 4: Aux. Input 1 (Set the sensor as 4 before configure the input 1 function)
2	Sensor 2	(0-4)	2	0: Not Used 1: Temperature Sensor 2: Oil Pressure Sensor 3: Level Sensor 4: Aux. Input 2 (Set the sensor as 4 before configure the input 2 function)
3	Sensor 3	(0-4)	3	0: Not Used 1: Temperature Sensor 2: Oil Pressure Sensor 3: Level Sensor 4: Aux. Input 3 (Set the sensor as 4 before configure the input 3 function)
Temperature Sensor				
1	Curve Type	(0-15)	7	SGX. See Table 11.
2	Open Action	(0-2)	0	0: Warning; 1: Shutdown; 2: No Action.
3	High Temp. Shutdown	(0-1)	1	0: Disable; 1: Enable.
		(-50-300)°C	98	Set value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	3	Delay value.
4	Low Temp. Shutdown	(0-1)	0	0: Disable; 1: Enable.
		(-50-300)°C	0	Set value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
5	High Temp. Warn	(0-1)	1	0: Disable; 1: Enable.
		(-50-300)°C	95	Set value is engine temperature. This value will be detected only after safety on delay.
		(-50-300)°C	93	Return value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
6	Low Temp. Warn	(0-1)	0	0: Disable; 1: Enable.
		(-50-300)°C	70	Set value is engine temperature. This value will be detected only after safety on delay.
		(-50-300)°C	75	Return value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
Oil Pressure Sensor				
1	Curve Type	(0-15)	7	SGX. See Table 11.
2	Open Action	(0-2)	0	0: Warning; 1: Shutdown; 2: No Action.

No.	Parameter	Range	Default	Description
3	High OP Shutdown	(0-1)	0	0: Disable; 1: Enable.
		(0-1000)kPa	0	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
4	Low OP Shutdown	(0-1)	1	0: Disable; 1: Enable.
		(0-1000)kPa	103	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	3	Delay value.
5	High OP Warn	(0-1)	0	0: Disable; 1: Enable.
		(0-1000)kPa	0	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-1000)kPa	0	Return value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
6	Low OP Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-1000)kPa	124	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-1000)kPa	138	Return value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
Level Sensor				
1	Curve Type	(0-15)	4	SGH. See Table 11.
2	Open Action	(0-2)	0	0: Warning; 1: Shutdown; 2: No Action.
3	High Level Shutdown	(0-1)	0	0: Disable; 1: Enable.
		(0-300)%	0	Set value is level value. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
4	Low Level Shutdown	(0-1)	0	0: Disable; 1: Enable.
		(0-300)%	8	Set value is level value. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
5	High Level Warn	(0-1)	0	0: Disable; 1: Enable.
		(0-300)%	0	Set value is level value. This value will be detected only after safety on delay.
		(0-300)%	0	Return value is level value. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
6	Low Level Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-300)%	10	Set value is level value. This value will be detected only after safety on delay.
		(0-300)%	15	Return value is level value. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
Temperature Sensor (ECU) The item is reserved				
1	High Temp. Shutdown	(0-1)	1	0: Disable; 1: Enable.
		(-50-300)°C	98	Set value is engine temperature. This value will be detected only after safety on delay.

No.	Parameter	Range	Default	Description
		(0-3600)s	3	Delay value.
2	Low Temp. Shutdown	(0-1)	0	0: Disable; 1: Enable.
		(-50-300)°C	0	Set value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
3	High Temp. Warn	(0-1)	1	0: Disable; 1: Enable.
		(-50-300)°C	95	Set value is engine temperature. This value will be detected only after safety on delay.
		(-50-300)°C	93	Return value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
4	Low Temp. Warn	(0-1)	0	0: Disable; 1: Enable.
		(-50-300)°C	70	Set value is engine temperature. This value will be detected only after safety on delay.
		(-50-300)°C	75	Return value is engine temperature. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
Oil Pressure Sensor (ECU) The item is reserved				
1	High OP Shutdown	(0-1)	0	0: Disable; 1: Enable.
		(0-1000)kPa	0	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
2	Low OP Shutdown	(0-1)	1	0: Disable; 1: Enable.
		(0-1000)kPa	103	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	3	Delay value.
3	High OP Warn	(0-1)	0	0: Disable; 1: Enable.
		(0-1000)kPa	0	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-1000)kPa	0	Return value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	0	Delay value.
4	Low OP Warn	(0-1)	1	0: Disable; 1: Enable.
		(0-1000)kPa	124	Set value is engine oil pressure. This value will be detected only after safety on delay.
		(0-1000)kPa	138	Return value is engine oil pressure. This value will be detected only after safety on delay.
		(0-3600)s	5	Delay value.
Digital Input Ports Setting				
Input Port 1 Setting (Set sensor 1 as auxiliary input 1 before configuration)				
1	Content Setting	(0-7)	0	Not used. See Table 10.
Input Port 2 Setting (Set sensor 2 as auxiliary input 2 before configuration)				
1	Content Setting	(0-7)	0	Not used. See Table 10.
Input Port 3 Setting (Set sensor 2 as auxiliary input 3 before configuration)				
1	Content Setting	(0-7)	0	Not used. See Table 10.
Relay Output Ports Setting				

No.	Parameter	Range	Default	Description
Output Port 1 Setting				
1	Content Setting	(0-10)	3	Idle speed control. See Table 9.

6.2. DEFINABLE CONTENTS OF RELAY OUTPUTS

Table 9 Definable Contents of Relay Outputs

No.	Items	Description
0	Not Used	Output is not active if select this option.
1	Common Alarm	Includes all shutdown alarms and warning alarms. Warning alarms are not self-latched, while shutdown alarms are self-latched and will not disappear until they are reset.
2	Energize to Stop	Suitable for the genset with stop electromagnet. The electromagnet closes when stop idle is over. And opens when ETS delay is over.
3	Idle Output Control	Used for machines that have idles. Closes during cranking, disconnects during warming up, closes during stop idle delay, disconnects after complete stop.
4	Preheat Output	It closes before starting and opens before starter is powered on.
5	Gens Closing Control	During normal operation of the generator, closes the breaker.
6	High Speed Output	Output when entering high speed warming up and disconnect after high speed cooling.
7	Normal Running Output	Output when speed is normal.
8	Over Speed Output	Output when speed is over the set limit value.
9	Low Battery Voltage Warn	Output when controller detects battery voltage is low and issues warning signal.
10	Low Level Warn	Output when sensor is set as level sensor and there is low level warning signal.

6.3. DEFINABLE CONTENTS OF DIGITAL INPUTS

Table 10 Definable Contents of Digital Inputs (Active When GND (B-) Connected)

No.	Description	Notes
0	Not Used	
1	High Temperature Alarm	If these signals are activated after safety on delay, shutdown alarm will be immediately initiated.
2	Low OP Alarm	
3	Reserved	
4	External Shutdown	Shutdown alarm will be immediately initiated if this input is active.
5	High Temperature Cooling Shutdown	When the genset is working normally and this signal is active, if there is a high temperature situation, the controller will first cool down the generator and then stop it; if the signal is deactivated and a high temperature situation occurs, the controller will shut down the genset without cooling down.
6	Remote Start	When the controller is in auto mode, if this input is active, the genset will start automatically.
7	Reserved	

6.4. SENSOR SELECTION

Table 11 Sensor Selection

No.	Items	Content	Remark
1	Temperature Sensor	0 Not used 1 User defined resistance curve 2 User defined current/voltage curve 3 VDO 4 CURTIS 5 VOLVO-EC 6 CURTIS 7 SGX 8 SGD 9 SGH 10 SUZUKI 11-15 Reserved	The range of user-defined resistance type sensor is 0-6000Ω, and the default selection is temperature sensor. If voltage type or current type sensor is selected, the hardware modification is required, and special details must be provided when ordering.
2	Oil Pressure Sensor	0 Not used 1 User defined resistance curve 2 User defined current/voltage curve 3 VDO 10Bar 4 CURTIS 5 VDO 5Bar 6 DATCON 10Bar 7 SGX 8 SGD 9 SGH 10 VOLVO-EC 11 SUZUKI 12 4-20mA 10Bar 13 0-5V 10Bar 14-15 Reserved	The range of user-defined resistance type sensor is 0-6000Ω, and the default selection is pressure sensor. If voltage type or current type sensor is selected, the hardware modification is required, and special details must be provided when ordering.
3	Fuel Level Sensor	0 Not used 1 User defined resistance curve 2 User defined current/voltage curve 3 SGD 4 SGH 5 SUZUKI 6-15 Reserved	The range of user-defined resistance type sensor is 0-6000Ω, and the default selection is level sensor. If voltage type or current type sensor is selected, the hardware modification is required, and special details must be provided when ordering.

6.5. CONDITIONS OF CRANK DISCONNECT SELECTION

Table 12 Crank Disconnect Conditions Selection

No	Content
0	Generator
1	Speed
2	Speed + Generator
3	Oil pressure
4	Generator+ Oil pressure

No	Content
5	Speed + Oil pressure
6	Generator + Speed+ Oil pressure

1) There are 3 conditions to make starter separate with engine; Speed and oil pressure can be used separately while oil pressure is recommended to use together with speed. The aim is to disconnect the starter motor as soon as possible.
2) Speed sensor is the magnetic equipment which be installed in starter for detecting flywheel teeth.
3) When set as speed, must ensure that the number of flywheel teeth is as same as setting, otherwise, "over speed shutdown" or "under speed shutdown" may be caused.
4) If genset without speed sensor please don't select corresponding items, otherwise, "start fail" or "loss speed signal" maybe caused.
5) If genset without oil pressure sensor, please don't select corresponding items.
6) If not select generator frequency in crank disconnect setting, controller will not collect and display the relative electric quantity (can be used in water pump set); if not select speed in crank disconnect setting, the speed displayed in controller is calculated by generator signal.

NOTE: If generator is included in the crank disconnect conditions, the condition of generator will not be judged.

7 CONTROLLER FUNCTION SETTING

7.1. SETTING

When the controller is in standby mode, hold and press for 3s to enter into menu interface, and menu items is listed as follows:

Parameter setting
Language
Event log
Controller information

7.2. PARAMETER SETTING

1) Press or button to change setting option, then press button to enter into password interface;
2) In password interface, press button to move the cursor, then press or button to set the password, after finish the setting, press button to confirm;
3) The password of "00318" has the highest authority, after inputting it, you can set all parameter items. If you change the default password of "00318", when you set parameters by PC software, you need to input the same password with controller first. If you want to set more parameters, such as voltage value and current value, or forget the password, please contact with the manufacturer.

Attention:

a) Please change the controller parameters when generator is in standby mode only (e. g. crank disconnect conditions selection, configurable input, configurable output, various delay), otherwise, shutdown and other abnormal conditions may happen.
b) Upper set value must be higher than lower set value, for example, over voltage set value must be higher than under voltage set value, otherwise over voltage and under voltage condition may occur simultaneously.
c) Over speed set value must be higher than under speed set value, otherwise over speed and under speed condition may occur simultaneously.
d) When you do the alarm setting, please set the correct return value, or it won't issue warning successfully. When you set upper alarm value, return value should be less than set value; as for lower alarm value, return value should be more than set value.
e) Please set the generator frequency value as low as possible when cranking, in order to make the starter be separated quickly as soon as crank disconnect.
f) Aux. input port 1-3 can't be set as same item, otherwise it won't function properly. Aux. output port can be set as same item.
g) At any time, press can stop current parameter setting immediately.

7.3. LANGUAGE

In language setting interface, the options are simplified Chinese, English and Others. The default of "Others" will be English.

7.4. EVENT LOG

Event log function can record up to 99 logs. The time of event log will be the cumulative running time.

7.5. CONTROLLER INFORMATION

a) In this interface, it will show you the development information, such as software version, hardware version, and release date.

b) In this interface, press  button to show the status of digital input and output ports.

8 SENSOR SETTINGS

a) Sensors connected to the controller are all resistance type. Parts of build-in standard sensor curves in the controller can be selected by users. If users want to use defined sensor curve, it needs to be set via host PC software (see details in Table 11).

b) When input the sensor curve, X value (resistance) must be input from small to large, otherwise, mistake occurs.

c) If sensor type is set as “not used”, sensor curve will not work.

d) The first or last few values in the vertical coordinates can be set as same as below:

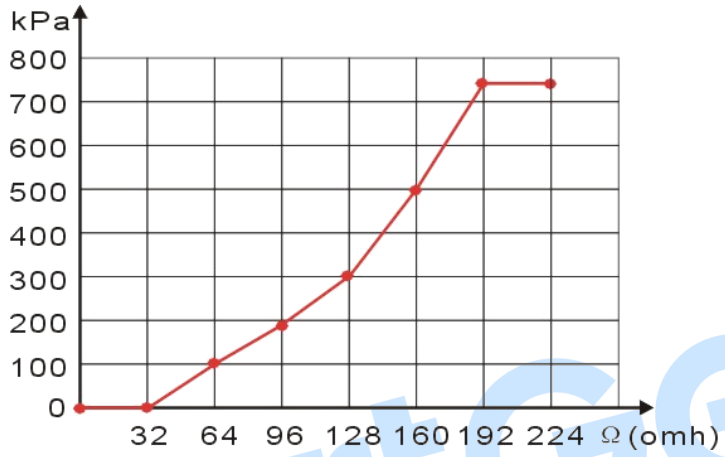

Fig.3 Sensor Curve

Table 13 Normal Pressure Unit Conversion Table

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

9 COMMISSIONING

Please make sure the following checks are made before commissioning;

a) Ensure all the connections are correct and wires diameter is suitable;

b) Ensure that the controller DC power has fuse, controller's positive and negative correctly connected to starting battery;

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

d) Set controller under manual mode, press "Start" button, genset will start. After the cranking times as setting, controller will send signal of Start Failure; then press "Stop" to reset controller;

e) Recover the action to prevent engine to crank success (e. g. Connect wire of fuel valve), press start button again, genset will start. If everything goes well, genset will normally run after idle running (if idle run has been set). During this time, please watch for engine's running status and generator's voltage. If abnormal, stop genset and check all wires connection according to this manual;

f) Any other questions please contact with SmartGen's service personnel.

10 TYPICAL APPLICATION

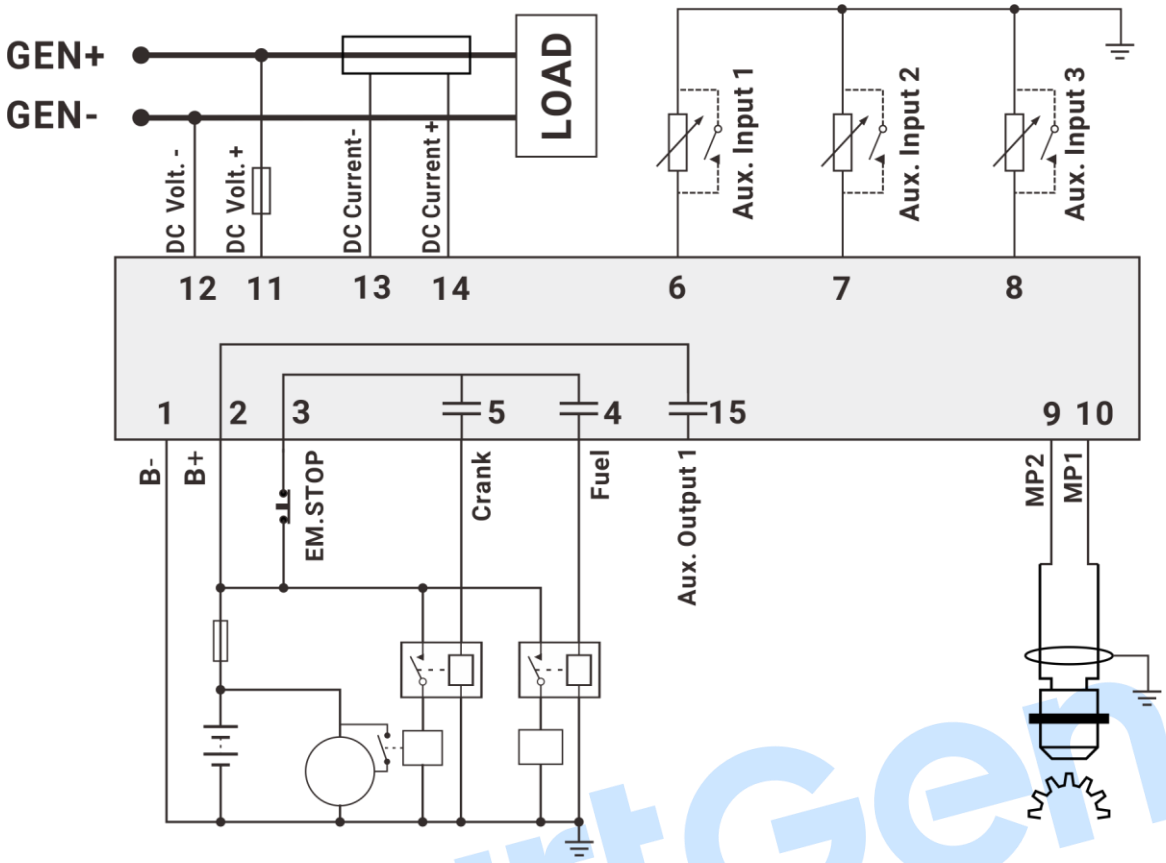

Fig.4 HGM1792 Typical Application Diagram

⚠CAUTION: Crank and fuel output ports should be extended to large capacity relays.

11 INSTALLATION

11.1. FIXING CLIPS

1) Controller is panel built-in design; it is fixed by clips when installed.
2) Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.
3) Pull the fixing clip backwards (towards the back of the module) ensuring two clips are inside their allotted slots.
4) Turn the fixing clip screws clockwise until they are fixed on the panel.

⚠NOTE: Care should be taken not to over tighten the screws of fixing clips.

11.2. OVERALL DIMENSION

Unit: mm

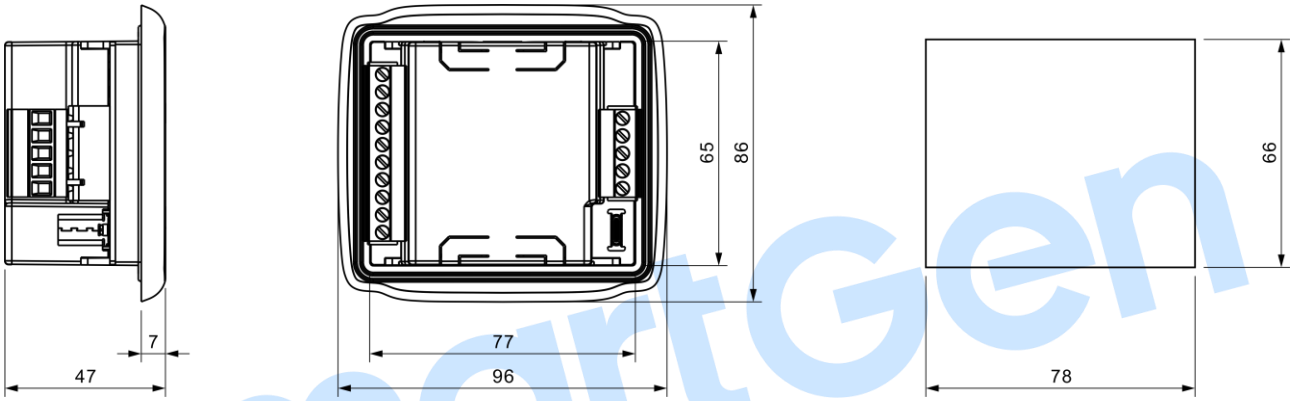

Fig.7 Overall and Cutout Dimensions

— **BATTERY VOLTAGE INPUT**

HGM1792 controller can suit for widely range of battery voltage DC(8~35)V. Negative of battery must be connected with the engine shell. Diameter of wire that connects from power supply to battery must be over 1.5mm^2. If floating charger 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 charger disturbing the controller's normal working.

— **SPEED SENSOR INPUT**

Speed sensor is the magnetic equipment which be installed in starter and for detecting flywheel teeth. Its connection wires to controller should apply for 2 cores shielding line. The shielding layer should connect to No. 1 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.1 and No.10 terminals in controller. The output voltage of speed sensor should be within AC (1~24) V (effective value) during the full speed. AC12V is recommended (in rated speed). When install the speed sensor, let the sensor is spun to contacting flywheel first, then, port out 1/3 lap, and lock the nuts of sensor at last.

— **OUTPUT AND EXPANSION RELAYS**

All outputs of controller are relay contact output type. If need to expand the relays, please add

freewheel diode to both ends of expand relay's coils (when coils of relay have DC current) or, increase resistance-capacitance return circuit (when coils of relay have AC current), in order to prevent disturbance to controller or others equipment.

- **DC CURRENT INPUT**

Current input of the controller must be connected to external DC Hall sensor. And the current range of sensor's secondary side is 4-20mA. At the same time, the positive and negative of the sensor's output port must be correctly connected with the terminals of controller.

- **WITHSTAND VOLTAGE TEST**

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.

12 FAULT FINDING

Table 14 Fault Finding

Symptoms	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 too high or not; Check the DC genset voltage; Check DC fuse.
Low oil pressure alarm after crank disconnection	Check the oil pressure sensor and its connections.
High water temp. alarm after crank disconnection	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 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.