HMC6000A/E

(HMC6000A/HMC6000EG/HMC6000ED)

DIESEL ENGINE CONTROLLER

USER MANUAL

HMC6000A

HMC6000EG

SmartGen

Marine Engine Controller

Alarm

Running

Home
主页

Event Log
事件记录

Stop
停机

Start
起动

Mute
消音

Self-Check
自检

Alarm Reset
报警复位

Remote
遥控

MODULE: HMC6000EG

HMC6000ED

SmartGen

Marine Engine Controller

Alarm

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Alarm Reset
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Stop
停机
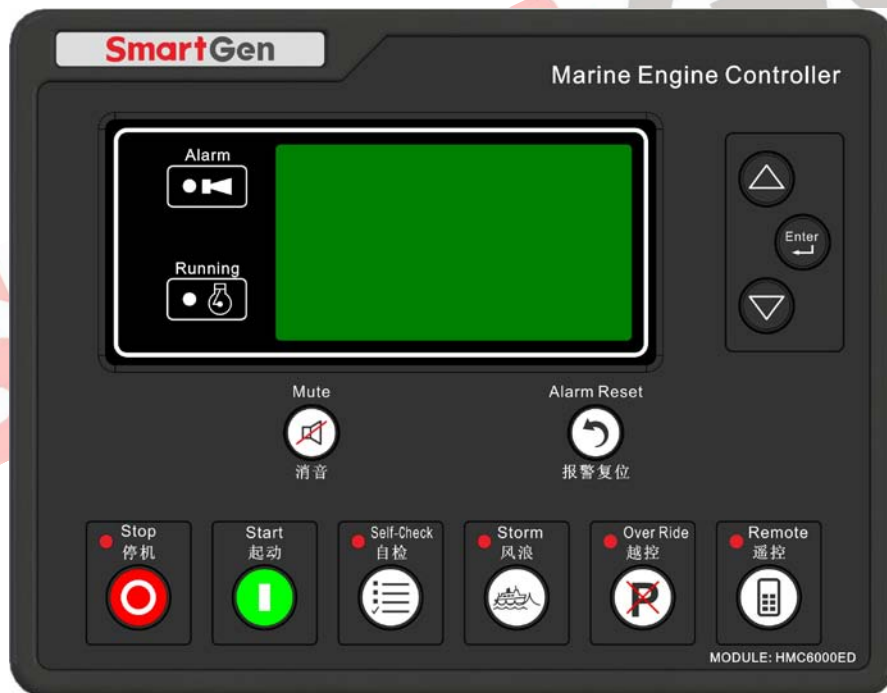
Start
起动

Self-Check
自检

Storm
风浪

Over Ride
越控

Remote
遥控
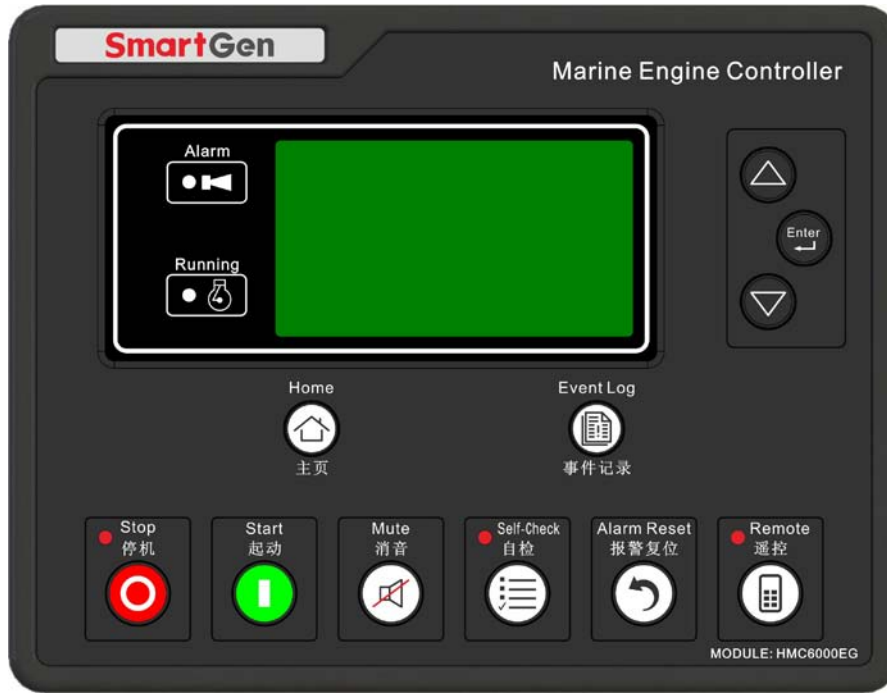
MODULE: HMC6000ED

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO.,LTD.

Chinese trademark

English trademark

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Version history

Date	Version	Content
2016-07-06	1.0	Original release
2016-11-10	1.1	Modify fixed functions of input port to configurable functions.
2017-01-10	1.2	Add Lamp Test Output port function.

Clarification of notation used within this publication.

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

CONTENTS

1 OVERVIEW

HMC6000A/E diesel engine controller integrates digitization, intelligentization and network technology which are used for genset automation and monitor control system of single unit to achieve automatic start/stop, data measure, alarm protection and "three remote" (remote control, remote measuring and remote communication). It fit with 132*64 liquid display, optional Chinese/English languages interface, and it is reliable and easy to use.

The powerful 32-bit ARM processor contained within the module allows for precision parameters measuring, fixed value adjustment, time setting and set value adjusting and etc..Majority parameters can be configured from front panel and can be configured by communication interface via PC. Due to its compact structure, simple connections and high reliability, **HMC6000A/E** can be widely used in marine emergency engines, main propulsion engines, main generator engines and pumping engines.

HMC6000A/E diesel engine controller has an expansion CANBUS port that will be connected to a remote control module or expansion digital output module, LED indicator expansion module and security module.

2 VERSION COMPARISON

VERSION	FUNCTION							
	INPUT	OUTPUT	SENSOR	RS485	CANBUS	DOUT16A/B (expansion output module)	LA16 (LED expansion module)	RPU560A (Security Module)
HMC6000A	11	17	6	●	●	●	●	●
HMC6000EG	11	8	6	-	●	●	●	●
HMC6000ED	11	8	6	-	●	●	●	●
HMC6000RM	0	0	0	-	●	-	-	-
HMC6000RMD	0	0	0	-	●	-	-	-
Note: HMC6000A: marine engine controller, suitable for complex marine diesel control; HMC6000EG: marine main-generate controller, suitable for main-generate control; HMC6000ED: marine main-drive controller, suitable for main-drive control; HMC6000RM: remote monitoring controller, suitable for HMC6000A and HMC6000EG; HMC6000RMD: remote monitoring controller, suitable for HMC6000ED.								

3   PERFORMANCE AND CHARACTERISTICS

➢ 32-bit ARM micro-processor, 132*64 liquid display, optional Chinese/English interface, push-button operation;

➢ Connect with remote monitoring module via CANBUS port to realize remote monitoring and remote start/stop control.

➢ LA16 indicator module and RPU560A security module can be expanded via CANBUS port;

➢ RS485 communication ports enable data transmission as well as remote control, remote measurement and remote communication;

➢ Control and protection: remote/local start and stop, alarm protection;

➢ Over ride mode, in which only overspeed and manual emergency shutdown can stop the engine;

➢ Parameter setting: parameters can be modified and stored into internal FLASH memory and can not be lost even in case of power outage;

➢ Six sensor inputs for pressure, temperature, liquid level or other sensors; pressure sensor, Flexible sensor1~3 also can be set to 4~20mA inputs and 0~5V inputs;

➢ Real-time clock, engine total run-time accumulation, display the total start times;

➢ Built-in speed detection, which can accurately judge crank disconnect status, rated running and overspeed status.

➢ 99 event logs can be saved circularly and can be inquired on the spot;

➢ Digital regulation of all parameters - instead of analog regulation using conventional potentiometer - and, therefore, higher reliability and stability;

➢ Modular design, self extinguishing ABS plastic enclosure and embedded installation way; small size and compact structure with easy mounting

4 TECHNICAL PARAMETERS

Parameter	Details
Working Voltage	DC8.0V to DC35.0V, uninterrupted power supply.
Power Consumption	<3W (Standby mode: ≤2W)
Speed Sensor Voltage	1.0V to 24V (RMS)
Speed Sensor Frequency	Max 10,000 Hz
Start Relay Output	16 A Connect to common output port.
Stop Relay Output	16 A Connect to common output port.
Fuel Relay Output	16 A Connect to common output port.
Audio Alarm Output	7 A Connect to common output port.
Common Alarm Output	7 A Connect to common output port.
Aux. Relay Output 1-9	B+ DC supply, 0.5A output current
Aux. Relay Output 10-12	7 A AC250V voltage free output
Case Dimension	197 mm x 152 mm x 47 mm
Panel Cutout	186mm x 141mm
Working Conditions	Temperature: (-25~70)⁰C; Humidity: (20~93)%RH
Storage Conditions	Temperature: (-25~70)⁰C
Protection Level	IP55 Gasket
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	0.70kg

5 INFORMATION INTERFACE

After pressing Enter for 3s, the controller will enter into parameter setting and information selection interface.	Return Parameter Setting Controller Information Event Log	After selected controller information, press Enter to enter into controller information interface.
First Panel	Controller Information Software Version 2.0 Release Date 2016-02-10 2015.05.15(5)09:30:10	This panel will display software version, hardware version and controller time. Press ⬆ or ⬇ to scroll screen.
Second Panel	O:S F S H A 1 2 3 4 5 6 7 8 9 10 11 12 Standby	This panel will display output port status, and genset status. Press ⬆ or ⬇ to scroll screen.
Third Panel	I: E 1 2 3 4 5 6 7 8 9 10 Standby	This panel will display input port status, and genset status. Press ⬆ or ⬇ to scroll screen.

6 OPERATOR INTERFACE

6.1 PUSHBUTTONS DESCRIPTION

Icon	Button	Description
	Stop	Stop running generator in local mode; During stopping process, press this button again to stop generator immediately.
	Start	Start genset in local mode.
	Mute	Alarm sound off;
	Self-checking	In standby mode, pressing this button the screen will scroll and 'sensor data' and 'alarm info' will be displayed and can also test alarm without rotate speed.
	Reset	If alarm occurs, pressing this button will reset it.
	Lamp Test	Press this button will test panel LED indicators and display screen. HMC6000ED/EG don't have this key and press 3s for Lamp test.
	Home	Shortcut to return to the main screen. HMC6000ED don't have this button.
	Event Log	Shortcut to the alarm history page. HMC6000ED doesn't have this button.
	Up/Increase	Screen scroll. Up cursor and increase value in setting menu.
	Down/Decrease	Screen scroll. Down cursor and decrease value in setting menu.
	Set/Confirm	1. Pressing and holding for more than 3 seconds entry the parameter configuration menu; 2. In settings menu confirms the set value
	Storm	Storm Mode is active after pressing the button and LED is illuminated. When active, any shutdown alarms won't alert except for emergency stop. HMC6000A/EG don't have this button.
	Over Ride	Over Ride Mode is active after pressing the button and LED is illuminated. When active, any shutdown alarms won't alert except for emergency stop and over speed. HMC6000A/EG don't have this button.
	Remote	Local Mode and Remote Mode switch to each other. The LED is lighted in remote mode. HMC6000A doesn't have this button.

6.2 CONTROLLER PANEL

HMC6000A Panel

HMC6000EG Panel

Alarm

Running

Mute

Standby

Up

Confirm

Down

Reset

Stop   Start   Self-check   Storm   Over Ride   Remote

Self-check Lamp

Storm Lamp

Over Ride Lamp

Remote Lamp

HMC6000ED Panel
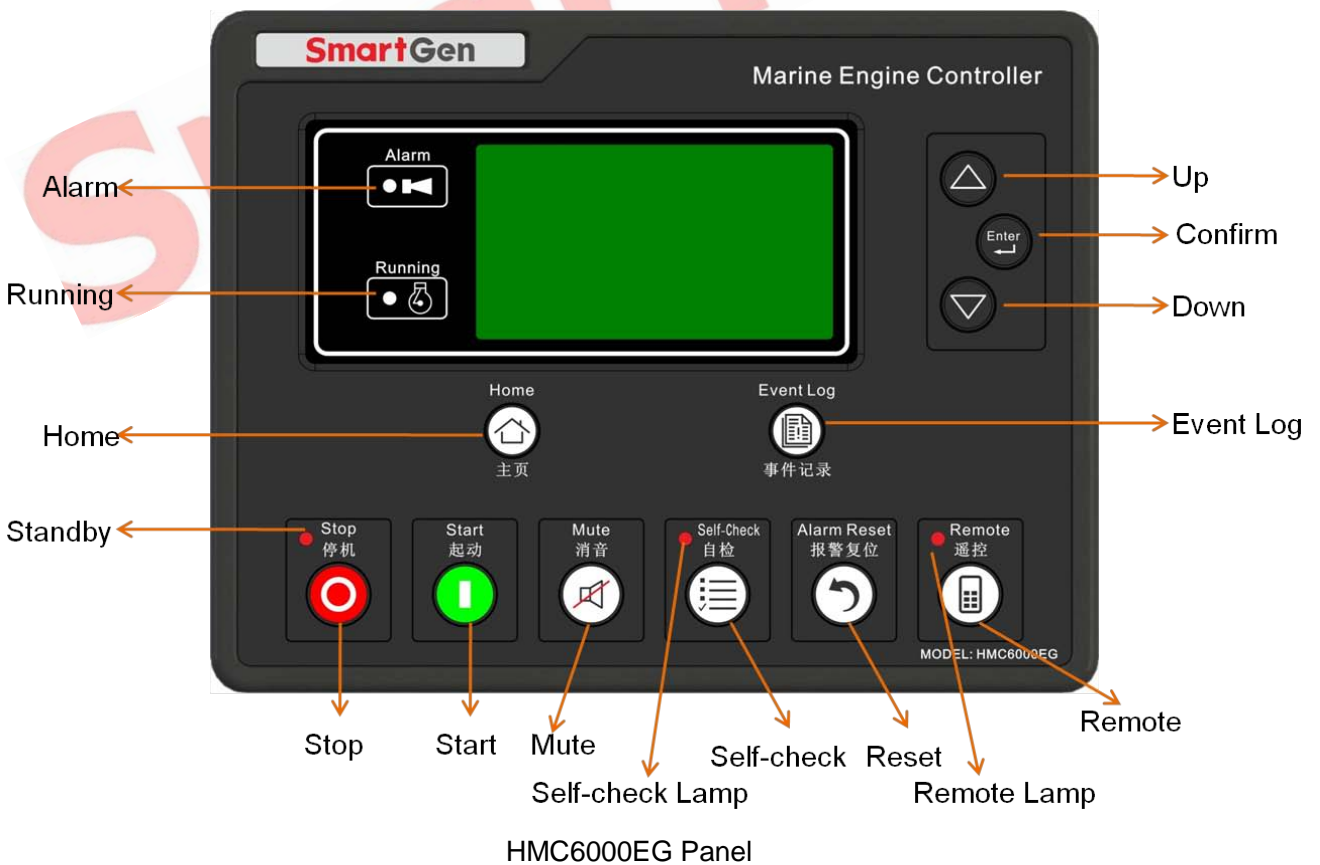
6.3 START/STOP OPERATION OF REMOTE CONTROL

Deploy any aux. input port to remote start input. After the "remote mode" is active, remote start/stop operation can be initiated.

HMC6000ED/EG controller will enter remote mode after pressing "remote button", after the "remote mode" is active, remote start/stop operation can be initiated.

Remote Start Sequence:

1) When "Remote Start" is active, "Start Delay" timer is initiated;
2) "Start Delay" countdown will be displayed on LCD;
3) When start delay is over, preheat relay energizes (if configured), "preheat delay XX s" information will be displayed on LCD;
4) After the above delay, the Fuel Relay is energized, and then one second later, the Start Relay is engaged. Genset is cranked for a pre-set time. If genset fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; "crank rest time" begins and wait for the next crank attempt.
5) Should this start sequence continue beyond the set number of attempts, the start sequence will be terminated, the first line of LCD display will be highlighted with black and Fail to Start fault will be displayed.
6) In case of successful crank attempt, the "Safety On" timer is activated. As soon as this delay is over, "start idle" delay is initiated (if configured).
7) After the start idle, if the Rotate Speed, Temperature, Oil Pressure of controller is regular, the generator will enter into Normal Running status directly.

Remote Stop Sequence:

1) When the "Remote Stop" or "Stop Input" signal is active, the Stop Delay is initiated.
2) Once this "stop delay" has expired, the "Stop Idle" is initiated. During "Stop Idle" Delay (if configured), idle relay is energized.
3) Once this "Stop Idle" has expired, the "ETS Solenoid Hold" begins. ETS relay is energized while fuel relay is de-energized.
4) Once this "ETS Solenoid Hold" has expired, the "Fail to Stop Delay" begins. Complete stop is detected automatically.
5) Generator is placed into its standby mode after its complete stop. Otherwise, fail to stop alarm is initiated and the corresponding alarm information is displayed on LCD (If generator is stop successfully after "fail to stop" alarm has initiated, "After stop" delay will be initiated).

6.4   AUTO MODE START/STOP OPERATION

Deploy any Aux. input port to auto-mode input. After the "auto mode" is active, Start/Stop operation can be initiated.

Auto Start Sequence:

1)   When "Auto Start" input is active or "Start/ Stop" input is active, "Start Delay" is initiated.

2)   "Start Delay" count down information will be displayed on LCD.

3)   After the "Start Delay" has expired, preheat relay energizes (if configured), "preheat delay XX s" information will be displayed on LCD;

4)   After the above delay, the Fuel Relay is energised, and then one second later, the Start Relay is engaged. The genset is cranked for a pre-set time. If the genset fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; "crank rest time" begins and wait for the next crank attempt.

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

6)   In case of successful crank attempt, the "Safety On" timer is activated. As soon as this delay is over, "start idle" delay is initiated (if configured).

7)   When the "start idle"delay is over, "warming up" delay is initiated (if configured).

8)   When "warming up" delay is over, generator will enter into Normal Running status.

Auto Stop Sepuence:

1)   When "Stop Input" is active or "Start/Stop" input open, the "Stop Delay" is initiated.

2)   Once the "Stop Delay" has expired, the "Cooling Delay" is then initiated.

3)   Once the "Cooling Delay" has expired, the "Stop Idle" delay is initiated (if configured). During "Stop Idle" Delay, idle relay is energized.

4)   Once the "Stop Idle" delay has expired, "ETS Solenoid Hold" begins. ETS relay is energized while fuel relay is de-energized.

5)   Once this "ETS Solenoid Hold" has expired, the "Fail to Stop Delay" begins. Complete stop is detected automatically.

6)   Generator is placed into its standby mode after its complete stop. Otherwise, fail to stop alarm is initiated and the corresponding alarm information is displayed on LCD (If generator is stop successfully after "fail to stop" alarm has initiated, "After stop" delay will be initiated and the alarm will be removed).

6.5 LOCAL START/STOP OPERATION

Deploy any programme input port to local-mode input. After the "local mode" is active, Start/Stop operation will be doable by pressing buttons on the controller.

Uder local-mode, "Idle Output" is unavailable.

Local Start Sequence:

1) Press (■) button to start the gen-set; preheat relay energizes (if configured), "preheat delay XX s" information will be displayed on LCD;

2) After the above delay, the Fuel Relay is energised, and then one second later, the Start Relay is engaged. The genset is cranked for a pre-set time. If the genset fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; "crank rest time" begins and wait for the next crank attempt.

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

4) In case of successful crank attempt, the "Safety On" timer is activated. As soon as this delay is over, "start idle" delay is initiated (if configured).

5) After the "start idle" delay expired, if the Rotate Speed, Temperature, Oil Pressure of controller are regular, the generator will enter into Normal Running status directly.

Local Stop Sequence:

1) Press (●) button to stop the gen-set and the "Stop Idle" delay is initiated (if configured). During "Stop Idle" Delay, idle relay is energized.

2) Once the "Stop Idle" delay has expired, "ETS Solenoid Hold" begins. ETS relay is energized while fuel relay is de-energized.

3) Once the "ETS Solenoid Hold" delay has expired,"Fail to Stop Delay" begins. Complete stop is detected automatically.

4) Generator is placed into its standby mode after its complete stop. Otherwise, fail to stop alarm is initiated and the corresponding alarm information is displayed on LCD (If generator is stop successfully after "fail to stop" alarm has initiated, "After stop" delay will be initiated).

	Local Start	Local Stop	Remote Input Start	Input Stop	Input Start/Stop	Auto Start	Remote Start	Remote Stop
Local	●	●	-	-	-	-	-	-
Remote	-	-	●	●	-	-	●	●
Auto	-	-	-	●	●	●	-	-

7 WARNING

Warnings are not shutdown alarms and do not affect the operation of the gen-set. Warning alarms does not lead to shutdown and the detailed alarm information will be displayed on LCD.

Warning types are as follows:

No.	Type	Detection Range	Description
1.	Over speed	Always active.	When the controller detects that the engine speed has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
2.	Under speed	From "Warming up" to "Cooling" delay	When the controller detects that the engine speed has fallen below the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
3.	Loss of Speed Signal	From "Start Idle" delay to "Stop Idle" delay	When the controller detects that the engine speed is 0, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
4.	Failed to start	Among set crank times, after "Start Compeleted"	Among set crank times, if genset failed to start, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
5.	Failed to stop	After "Fail to Stop" Delay	After "fail to stop" delay, if genset does not stop completely, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
6.	Charge Alt Fail	When generator is normal running	When the controller detects that charger voltage has fallen below the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
7.	Aux. Input 1-10	User defined	When the controller detects that the auxiliary input 1-10 warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
8.	High Water Temperature	Bigger than set speed	When the controller detects that the high water temperature warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
9.	High Oil Temperature	Bigger than set speed	When the controller detects that the high oil temperature warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
10.	Low Oil Pressure	Bigger than set speed	When the controller detects that the low oil pressure warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
11.	Flexible sensor 1-3 High	Bigger than set speed	When the controller detects that the Flexible sensor 1-3 warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
12.	Flexible sensor 1-3 Low	Bigger than set speed	When the controller detects that the Flexible sensor 1-3 warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
13.	Water Temperature Open	Always active.	When the controller detects that the water temperature sensor open warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
14.	Oil Temperature Open	Always active.	When the controller detects that the oil temperature sensor open warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
15.	Oil Pressure Open	Always active.	When the controller detects that the oil pressure sensor open warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
16.	Flexible sensor 1-3 Open	Always active.	When the controller detects that the Flexible sensor 1-3 open warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
17.	Supply1 Under Volt	Always active.	When the controller detects that the supply voltage has fallen below the pre-set value for more than 20s, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
18.	Supply 1 Over Volt	Always active.	When the controller detects that the supply voltage has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
19.	Supply 2 Under Volt	Always active.	When the controller detects that the supply voltage has fallen below the pre-set value for more than 20s, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
20.	Supply 2 Over Volt	Always active.	When the controller detects that the supply voltage has exceeded the pre-set value, it will initiate a warning alarm

No.	Type	Detection Range	Description
			and the corresponding alarm information will be displayed on LCD.
21.	DOUT 16 Comm. Fail	Always active (When DOUT16 is enabled).	When the controller detects DOUT 16 module communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
22.	HMC6000RM Comm. Fail	Always active (When HMC6000RM is enabled)	When the controller detects HMC6000RM module communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
23.	LA16 Comm. Fail	Always active (When LA16 is enabled).	When the controller detects LA16 module communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
24.	RPU560A Comm. Fail	Always active (When RPU560A is enabled).	When the controller detects RPU560A module communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
25.	Fresh Water Pressure Low Input	Always active.	When the input port defines this function, the controller will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
26.	Fresh Water Level Low Input	Always active.	When the input port defines this function, the controller will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
27.	Grease Level Low Input	Always active.	When the input port defines this function, the controller will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
28.	Fuel Leakage Input	Always active.	When the input is active, the controller will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.

⚠ **Note:** The warning types of Auxiliary input are active only when they are configured by users.

⚠ **Note:** The aux. input port 1~10 are corresponding with the input port A~J on the backplate of the controller.

⚠ **Note:** The Flexible sensor 1~3 are corresponding with the sensor A~C on the backplate of the controller.

DOUT16: 16-channel digital output expansion module

LA16: 16-channel LED lamp expansion module

RPU560A: security expansion module

8 PARAMETER CONFIGURATION LIST

Hold and press (Enter) for 3s to enter into parameter setting menu after input the correct password (Default password as 00318). Please contact the manufacturer if forget password or need sensor resistance/current calibration.

Parameter	Range	Default	Remarks
1. Start delay	(0-3600) s	1	The time from remote start signal active to complete start when the controller is in local/auto mode.
2. Stop delay	(0-3600) s	1	The time from remote stop signal active to complete stop when the controller is in local/auto mode.
3. Preheat delay	(0-3600) s	0	The time of heater plug energized before starter energized.
4. Cranking Time	(3-60) s	8	The every starter energized time.
5. Crank rest Time	(3-60) s	10	The waiting time before second energizes start when starter failed to start.
6. Safety on Time	(0-3600) s	10	First running time after machine started.
7. Start idle time	(0-3600) s	0	Idle time when genset start.
8. Warming up time	(0-3600) s	10	Warming up time after genset running up.
9. Cooling time	(0-3600)s	10	Cooling time before stop.
10. Stop idle time	(0-3600) s	0	Stop idle time when stop.
11. ETS hold time	(0-3600) s	20	Stop magnet energized time when the genset is to stop.
12. Wait stop time	(0-3600) s	0	Time from idle delay finished to wait stop when "ETS hold time" is set to 0; time from ETS hold to wait stop when "ETS hold time" isn't set to 0.
13. Start Button Confirm Delay	(0.2-5.0) s	0.2	The time from pressing start button to start performance when the controller starts by button-press.
14. Stop Button Confirm Delay	(0.2-5.0) s	0.2	The time from pressing stop button to stop performance when the controller stops by button-press.
15. Flywheel teeth	(1-300)	118	The flywheel teeth installed in genset is used for judgement of separate conditions and detection of rotate speed. See 14 Installations.
16. Rated speed	(1-5999)r/min	1500	Provide standard for judgement of over speed, under speed and on load rotate speed.
17. Start Attempts	(1-30)	3	The maximum of start attempts when genset failed to start. When it arrive pre-set value, the controller will send failed to start signal.
18. Crank Disconnect	(0-2) 0: Speed 1: Oil Pressure 2: Speed+ OP	0: Speed	The three disconnection conditions of starter and engine, which can be used alone or simultaneously, are used to make starter motor disconnect with engine as soon as

Parameter	Range	Default	Remarks
			possible.
19. Disconnect OP	(10-1000)kPa	80	Disconnect when Oil Pressure exceeds preset value.
20. Disconnect Speed	(0-200)%	25%	Set value is percentage of rated rotate speed. When speed exceeds pre-set value, starter will separate.
21. Under Speed Shut Enabled	(0-1) 0 Disabled 1 Enabled	1 Enabled	Under speed shut setting.
22. Under Speed Threshold (Shut)	(0-200)%	85%	
23. Under Speed Delay	(0-3600) s	3	
24. Under Speed Warn Enabled	(0-1) 0 Disabled 1 Enabled	1 Enabled	Under speed warn setting.
25. Under Speed Threshold (Warn)	(0-200)%	90%	
26. Under Speed Return	(0-200)%	92%	
27. Under Speed Warn Delay	(0-3600) s	3	
28. Over Speed Shut Enabled	(0-1) 0 Disabled 1 Enabled	1 Enabled	Over speed shut setting.
29. Over Speed Threshold (Shut)	(0-200)%	115%	
30. Over Speed Delay	(0-3600) s	1	
31. Over Speed Warn Enabled	(0-1) 0 Disabled 1 Enabled	1 Enabled	Over speed warn setting.
32. Over Speed Threshold (Warn)	(0-200)%	110%	
33. Over Speed Return	(0-200)%	108%	
34. Over Speed Warn Delay	(0-3600) s	3	
35. Speed Lose Delay	(0-3600) s	3	The time from that detecting speed is 0 to confirm action.
36. Speed Lose Act	(0-2) 0: Indicate 1: Shutdown 2: Warn	1: Shutdown	The action after detecting loss of speed.
37. Charge Alt Fail	(0-60.0)V	16.0	The time from that detecting speed is 0 to confirm action.

Parameter	Range	Default	Remarks
38. Bat Rated Volt	(1-60.0)V	24.0	Provide standard for judgement of over voltage and under voltage.
39. Supply1 Over Volt	(0-200)%	125%	Set value is percentage of power supply rated voltage.
40. Supply1 Under Volt	(0-200)%	75%	
41. Supply2 Over Volt	(0-200)%	125%	
42. Supply2 Under Volt	(0-200)%	75%	The main interface won't display voltage of power supplyA and B when this value is set as 0. Main interface icon will show battery 1 voltage.
43. Heating Up Limit	(0-100)☐	42	Open when temperature of water temperature sensor larger than pre-set value.
44. Heat Down Limit	(0-100)☐	37	Close when temperature of water temperature sensor less than pre-set value.
45. Cyc Lubri Enable	(0-1)0 Disabled 1 Enabled	0 Disabled	It can circulate prelubricate for genset after setting enabled.
46. Cyc Lubri Period	(0-7200)min	300	It can set circulate period after circulate prelubrication.
47. Pre-Lubri Time	(0-7200)s	300	The time of each prelubrication.
48. Rated Idle	(0-2000)r/min	700	When the controller is speed regulating automatically, the controller needs a stable rotate speed value.
49. No Working Area	(0-10.0)%	1.0	Relay automatic speed regulation setting. **Note:** as rated idle percent (in no working area idle); as rated speed percent (in high speed)
50. Gain	(0-100)%	10	
51. Response	0.25-4.00	0.50	
52. Stablization	(0.05-1.60)s	1.0	
53. Device ID	(1-254)	1	RS485 Comm. Address.
54. Language Select	(0-1) 0: Chinese 1: English	0: Chinese	Language selections.
55. Password Set	(0-65535)	00318	Password of parameter setting.
56. DOUT16 Enable	(0-1)	0 Disabled	If DOUT16A module is needed to expand, this setting enabled is needed.
57. HMC6000RM Module Enable	(0-1)	0 Disabled	If HMC6000RM module is needed to expand, this setting enabled is needed.
58. LA16 Enable	(0-1)	0: Disabled	If LA16 module is needed to expand, this setting enabled is needed.
59. RPU560A Enable	(0-1)	0: Disabled	If RPU560A module is needed to expand, this setting enabled is needed.
60. Baud Rate	(0-1) 0: 250kbps 1: 125kbps	0: 250kbps	CANBUS port communication Baud rate.
61. Self-check	(0-1)	0	When self-check is set as 0, it can test alarm by connecting with corresponding sensor with

Parameter	Range	Default	Remarks
			no rotated speed after self-check is active; when self-check is set as 1, it can test alarm with system auto-regulating the sensor after self-check is active;
62.　Date & Time			Date&Time setting.
63.　Water Temp.Sensor set (Resistance input)	See 9.3. Sensor function settings Note: Resistance type input measuring range is not applicable.		Water temperature sensor setting.
64.　Oil Temp.Sensor set (Resistance input)	See 9.3. Sensor function settings Note: Resistance type input measuring range is not applicable.		Oil temperature sensor setting.
65.　Oil Pressure Sensor set (Resistance input)	See 9.3. Sensor function settings Note: Resistance type input measuring range is not applicable.		Oil pressure sensor setting.
66.　Flexible sensor 1 Set (Resistance/Current input)	See 9.3. Sensor function settings **Note:** Resistance type input measuring range is not applicable.		Flexible sensor1 setting.
67.　Flexible sensor 2 Set (Resistance/Current input)	See 9.3. Sensor function settings **Note:** Resistance type input measuring range is not applicable.		Flexible sensor2 setting.
68.　Flexible sensor 3 Set (Resistance/Current input)	See 9.3. Sensor function settings **Note:** Resistance type input measuring range is not applicable.		Flexible sensor3 setting.
69.　Input 1 Set	(0-50)	18: Local Mode	See table 9.1.2.
70.　Active1 type	(0-1)	0: Close to activate	Set up input port active of close or open.
71.　Input 2 Set	(0-50)	0: Not Used	See table 9.1.2.
72.　Active2 type	(0-1)	0: Close to activate	Set up input port active of close or open.
73.　Input 3 Set	(0-50)	0: Not Used	See table 9.1.2.
74.　Active3 type	(0-1)	0: Close to activate	Set up input port active of close or open.
75.　Input 4 Set	(0-50)	0: Not Used	See table 9.1.2.
76.　Active4 type	(0-1)	0: Close to activate	Set up input port active of close or open.
77.　Input 5 Set	(0-50)	0: Not Used	See table 9.1.2.
78.　Active5 type	(0-1)	0: Close to activate	Set up input port active of close or open.
79.　Input 6 Set	(0-50)	0: Not Used	See table 9.1.2.
80.　Active6 type	(0-1)	0: Close to activate	Set up input port active of close or open.
81.　Input 7 Set	(0-50)	20: Remote Start	See table 9.1.2.
82.　Active7 type	(0-1)	0: Close to activate	Set up input port active of close or open.
83.　Input 8 Set	(0-50)	21: Shutdown	See table 9.1.2.
84.　Active8 type	(0-1)	0: Close to activate	Set up input port active of close or open.
85.　Input 9 Set	(0-50)	22:　Over Ride	See table 9.1.2.

Parameter	Range	Default	Remarks
		Mode	
86. Active9 type	(0-1)	0: Close to activate	Set up input port active of close or open.
87. Input 10 Set	(0-50)	11: Fuel Leak	See table 9.1.2.
88. Active10 type	(0-1)	0: Close to activate	Set up input port active of close or open.
89. Output 1 Set	(0-100)	0: Not Used	See table 9.2.2.
90. Output1 type	(0-1)	0: Normally open	Set up output port be always open or always close.
91. Output 2 set	(0-100)	0: Not Used	See table 9.2.2.
92. Output2 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
93. Output 3 set	(0-100)	0: Not Used	See table 9.2.2.
94. Output3 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
95. Output 4 set	(0-100)	0: Not Used	See table 9.2.2.
96. Output4 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
97. Output 5 set	(0-100)	0: Not Used	See table 9.2.2.
98. Output5 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
99. Output 6 set	(0-100)	0: Not Used	See table 9.2.2.
100. Output6 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
101. Output 7 set	(0-100)	0: Not Used	See table 9.2.2.
102. Output7 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
103. Output 8 set	(0-100)	0: Not Used	See table 9.2.2.
104. Output8 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
105. Output 9 set	(0-100)	0: Not Used	See table 9.2.2.
106. Output9 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
107. Output 10 set	(0-100)	0: Not Used	See table 9.2.2.
108. Output10 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
109. Output 11 set	(0-100)	0: Not Used	See table 9.2.2.
110. Output11 type	(0-1)	0: Normally open	Set up output port be always open or always close output.
111. Output 12 set	(0-100)	0: Not Used	See table 9.2.2.
112. Output12 type	(0-1)	0: Normally open	Set up output port be always open or always close output.

⚠ **Note:** The aux. input port 1~10 are corresponding with the input port A~J on the backplate of the controller.

⚠ **Note:** The aux. output port 1~12 are corresponding with the output port A~L on the backplate of the controller.

⚠ **Note:** The Flexible sensor 1~3 are corresponding with the sensor A~C on the backplate of the controller.

9 INPUT/OUTPUT PORTS CONFIGURATION

9.1 AUXILIARY INPUTS 1~10 FUNCTIONAL CONFIGURATION

9.1.1 DIGITAL INPUT PORT CONFIGURATION

No.	Settings	Contents	Description
1	Feature Set	(0- 50)	See 9.1.0 Input Port Functions
2	Active type	(0-1)	0: Close to activate 1: Open to activate
3	Active Range	(0-3)	0: From Safety on 1: From Crank 2: Always 3: Never
4	Action	(0-2)	0: Warn 1: Shutdown 2: Indication
5	Input Delay	(0-20.0)s	
6	Displayed string	User-defined input port names	20 English symbols or 10 Chinese characters

9.1.2 INPUT PORTS FUNCTIONS

No.	Function	Description
0.	Not used	Not used
1.	User-defined	Users configured input port settings
2.	Alarm Mute	Can prohibit "Audible Alarm" output when it is active.
3.	Reset alarm	Can reset all alarms when input is active.
4.	Pre-lubricate	If output is set as pre-lubrication output, the relay disconnects after the set pre-lubrication delay.
5.	Reserved	
6.	Panel lock	All buttons in panel is inactive except 🟢 and 🔴.
7.	Quick start	Cranking will start directly (without preheating) when the input is active.
8.	Remote start/stop	Automatically starts the generator in remote mode; the generator will shut down when this input is deactivated.(Only in automatic mode)
9.	Auto Input	When the input is active, enter into auto mode, the local mode and remote mode is inactive and start/stop can only be achieved via input port.
10.	Turning Chain	Start inhibition when the input is active.
11.	Fuel Leak Input	When the input active, alarm initiate if fuel leak occurs.
12.	Low Fresh Water Pressure Input	Connect to digital input of sensor.
13.	Low Fresh Water Level Input	Connect to digital input of sensor.
14.	Low Grease Level Input	Connect to digital input of sensor.
15.	High Water Temperature Shutdown Input	Connect to digital input of sensor.
16.	High Oil Temperature Shutdown Input	Connect to digital input of sensor.
17.	Low Oil Pressure Shutdown Input	Connect to digital input of sensor.
18.	Local Input	The genset is in local mode when active.
19.	Remote Input	The genset is in remote mode when active.
20.	Remote Start Input	When remote start input is active in Remote Control Mode, controller initiate start command.
21.	Stop Input	When stop input is active in Remote Control Mode or Auto Mode, controller initiate stop command.
22.	Auto Start Input	When auto start input is active in Auto Mode, controller initiate start command.
23.	Over Ride Mode Input	When over ride mode input is active, only over speed stop and emergency stop are available.
24~50	Reserved	

⚠ **Note:** The name of the input ports 1~6 only can be configured via PC software.

9.2   OUTPUTS PORTS DEFINITION

9.2.1   DIGITAL OUTPUT DEFINITION CONTENTS

No.	Items	Contents	Note
1	Output Function Configuration	(0-100)	
2	Effective ways	0 Normally Open 1 Normally Close	
3	Effective duration	Bit1: Standby Bit2: Preheat Bit3: Fuel Output Bit4: Start Bit5: Cran Rest Time Bit6: Safety Delay Bit7: Start Idle Bit8: High Speed Warm Up Bit9: Wait to Load Bit10: Normally Working Bit11: Coolling Bit12: Stop Idle Bit13: ETS Bit14: Wait for Stop Bit15: Fail to Stop	
5	Delay output time	(0-100.0)s	
6	Output time	(0-3600)s	

9.2.2   OUTPUT PORT 1-12 FUNCTIONS DEFINITION

No.	Items	Description
0.	Not used	Not used
1.	User-defined	
2.	Air flap	Action when over speed shutdown and emergence stop. It also can close the air inflow to stop the engine as soon as possible.
3.	Audible alarm	Action when warning, shutdown, trips. Can be connected annunciator externally. When "alarm mute" configurable input port is active, it can remove the alarm.
4.	Crank Relay	Action when genset is starting and disconnect when crank success.
5.	Fuel Relay	Action when genset is starting and disconnect when stop is completed.
6.	ETS Hold	Action period: ETS hold delay.
7.	Reserved	
8.	Reserved	
9.	Loss of Speed Signal	After safety on delay, the controller active when the engine speed is 0.
10.	Pre-lubricate	The controller output when the engine is in standby mode (user-defined output delay) if pre-lubrication input is active.
11.	Over Ride Output	The controller output when it is in Over ride mode.

12.	Ready Go(1)	The controller output when it is in standby mode and no alarms.
13.	Heating Control	It is controlled by heating temperature sensor's limited threshold.
14.	Idle Control	Action from "crank delay" to "start idle delay" and from "stop idle delay" to "wait for stop delay". When in local mode, idle control is unavailable.
15.	Common Alarm	Action when genset common warning, common shutdown alarm.
16.	Common Shutdown	Action when common shutdown alarm.
17.	Common Warn	Action when common warning alarm.
18.	Aux. Input 1 Active	Action when digital input port 1 is active.
19.	Aux. Input 2 Active	Action when digital input port 2 is active.
20.	Aux. Input 3 Active	Action when digital input port 3 is active.
21.	Aux. Input 4 Active	Action when digital input port 4 is active.
22.	Aux. Input 5 Active	Action when digital input port 5 is active.
23.	Aux. Input 6 Active	Action when digital input port 6 is active.
24.	Crank Success	The gen-set start when the engine speed reaches requirements.。
25.	Normal Running	The gen-set is normal running when the speed reaches rated requirements.
26.	Remote Mode	The controller output in remote control mode.
27.	Local Mode	The controller output in local mode.
28.	Ready Go(2)	Output when there is no shutdown alarm.
29.	DOUT16 Com Fail	Action when the controller detects communication failure with DOUT16. (3s overtime)
30.	Shutdown Output	The controller output when it is shutdown mode.
31.	Bat Under Volt	Action when the controller detects that the battery voltage has fallen below the set value.
32.	Bat Over Volt	Action when the controller detects that the battery voltage has exceeded the set value.
33.	Under Speed Warn	Action when under speed warning.
34.	Under Speed Shutdown	Action when under speed shutdown alarm.
35.	Over Speed Warn	Action when over speed warning.
36.	Over Speed Shutdown	Action when over speed shutdown alarm.
37.	Emergency Stop	Action when emergency stop alarm.
38.	Charge Alt Fail	Action when charge failure warning.
39.	Failed To Start	Action when failed start alarm.
40.	Failed To Stop	Action when failed stop alarm.
41.	Reserved	
42.	Water Temp. Sensor Open	Action when water temperature sensor is open circuit.
43.	High Water Temp. Warn	Action when high water temperature sensor warning alarm.
44.	High Water Temp. Shutdown	Action when high water temperature sensor shutdown alarm.
45.	Oil Temperature Sensor Open	Action when oil temperature sensor is open circuit.

46.	High Oil Temperature Warn	Action when high oil temperature sensor warning alarm.
47.	High Oil Temperature Shutdown	Action when high oil temperature sensor shutdown alarm.
48.	Oil Pressure Sensor Open	Action when oil pressure sensor is open circuit.
49.	Low Oil Pressure Warn	Action when low oil pressure sensor warning alarm.
50.	Low Oil Pressure Shutdown	Action when low oil pressure sensor shutdown alarm.
51.	Flexible sensor 1 Open	Action when Flexible sensor 1 is open circuit.
52.	Flexible sensor 1 Warn	Action when Flexible sensor 1 warning alarm.
53.	Flexible sensor 1 Shutdown	Action when Flexible sensor 1 shutdown alarm.
54.	Flexible sensor 2 Open	Action when Flexible sensor 2 is open circuit.
55.	Flexible sensor 2 Warn	Action when Flexible sensor 2 warning alarm.
56.	Flexible sensor 2 Shutdown	Action when Flexible sensor 2 shutdown alarm.
57.	LA16 Com Fail	Action when the controller detects communication failure with LA16. (3s overtime)
58.	RPU560A Comm. Fail	Action when the controller detects communication failure with RPU560 safeguard module. (1s overtime)
59.	1 Way Power Fault	Security module output when 1 way power fault.
60.	2 Way Power Fault	Security module output when 2 way power fault.
61.	Rise Speed	When the controller is in idle mode and speed doesn't arrive at rated idle, it output when speed is rising and open automatically when speed arrives at rated idle. When the controller is running up and speed doesn't arrive at rated rotate speed, it output when speed is rising and open automatically when speed arrives at rated rotate speed. Note: Active only when controller is in remote/auto mode.
62.	Drop Speed	When the controller is in idle mode and speed exceeds rated idle, it output when speed is dropping and open automatically when speed arrives at rated idle. When the controller is running up and speed exceeds at rated rotate speed, it output when speed is dropping and open automatically when speed arrives at rated rotate speed. Note: Active only when controller is in remote/auto mode.
63.	Flexible sensor 3 Open	Action when Flexible sensor 3 is open circuit.
64.	Flexible sensor 3 Warn	Action when Flexible sensor 3 warning alarm.
65.	Flexible sensor 3 Shutdown	Action when Flexible sensor 3 shutdown alarm.
66.	Fuel Leakage Alarm	Output when this alarm is active.
67.	Supply2 Under Volt Warn	Output when the controller detects supply2 voltage is lower than set value.
68.	Supply2 Over Volt Warn	Output when the controller detects supply2 voltage is upper than set value.
69.	Lamp Test Output	Output while lamp testing.
70~100	Reserved	

9.3 SENSOR FUNCTIONAL CONFIGURATION

9.3.1 SENSOR CONFIGURATION

No.	Settings	Contents	Remarks
1.	Sensor type	(0-3) 0: Not Used 1: Oil Pressure Sensor 2: Temperature Sensor 3: Fuel Level Sensor	Types such as Water Temperature Sensor, Oil Temperature Sensor, and Oil Pressure Sensor are not optional and are fixed temperature or pressure.
2.	Sensor curve	Curve types list	See 9.3.2/9.3.3/9.3.4 curve lists
3.	Alarm speed	(0-200)%	Alarm and test when the engine speed has exceeded the set value.
4.	Range	(0-6000)	Active when current of sensor is between 4~20mA. Corresponding unit of pressure sensor is kPa; Corresponding unit of level sensor is %
5.	Display Units	Temperature 0: ºC 1: ºF Pressure 0: kPa 1: Psi 2: bar	The units displayed on LCD. After selection of units, the displayed data will automatically convert according to units.
6.	High Shutdown Enable	(0-1) 0: Enable 1: Disable	
7.	High Shutdown Value	(0-6000)	
8.	High Shutdown Delay	(0-3600)s	
9.	Low Shutdown Enable	(0-1) 0: Enable 1: Disable	
10.	Low Shutdown Value	(0-4000)	
11.	Low Shutdown Delay	(0-3600)s	
12.	High Warn Enable	(0-1) 0: Enable 1: Disable	
13.	High Warn Value	(0-6000)	
14.	High Return Value	(0-6000)	
15.	High Warn Delay	(0-3600)s	
16.	Low Warn Enable	(0-1) 0: Enable 1: Disable	
17.	Low Warn Value	(0-4000)	
18.	Low Return Value	(0-4000)	
19.	Low Warn Delay	(0-3600)s	
20.	First point X (Resistance)	Resistance type (not PT100)	Sensor curve is user-defined

21.	Second point X (Resistance)	Resistance type (not PT100)	X axis: 8 Y axis: 8
22.	Third point X (Resistance)	Resistance type (not PT100)	
23.	Fourth point X (Resistance)	Resistance type (not PT100)	
24.	Fifth point X (Resistance)	Resistance type (not PT100)	
25.	Sixth point X (Resistance)	Resistance type (not PT100)	
26.	Seventh point X (Resistance)	Resistance type (not PT100)	
27.	Eighth point X (Resistance)	Resistance type (not PT100)	
28.	First point Y (Value)	Resistance type (not PT100)	
29.	Second point Y (Value)	Resistance type (not PT100)	
30.	Third point Y (Value)	Resistance type (not PT100)	
31.	Fourth point Y (Value)	Resistance type (not PT100)	
32.	Fifth point Y (Value)	Resistance type (not PT100)	
33.	Sixth point Y (Value)	Resistance type (not PT100)	
34.	Seventh point Y (Value)	Resistance type (not PT100)	
35.	Eighth point Y (Value)	Resistance type (not PT100)	
36.	User-defined string	User-defined sensor names	Only can be set via upper computer software.

9.3.2 Temperature Curves

No.	Contents	Remarks
0	Not Used	
1	PT100	
2	User-defined Curve	
3	VDO	
4	CURTIS	
5	VOLVO-EC	
6	DATCON	The input range of user-defined resistance is between 0-6000Ω. The factory defaults of water temperature sensor and oil temperature sensor are PT100 sensors.
7	SGX	
8	SGD	
9	SGH	
10	Reserved	
11	Cu50	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

△ **Note:** PT100 Resistance type temperature sensor division value is set as 0.385 (0.385Ω corresponds to 1 °C).

9.3.3   RESISTANCE SENSORS PRESSURE CURVES

No.	Contents	Remarks
0	Not Used	
1	4~20mA	
2	User-defined Resistance Curve	
3	VDO 10bar	
4	CURTIS	
5	Voltage Type (0.5V-4.5V)	
6	DATCON 10bar	The input range of User-defined resistance is between 0-6000Ω. The factory defaults of oil pressure sensor is 4-20mA sensor.
7	SGX	
8	SGD	
9	SGH	
10	User-defined Volt Curve	
11	Reserved	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

⚠ **Note:** There is no need to set curve type but range if the pressure sensor is current type.

9.3.4   LIQUID LEVEL CURVES

No.	Contents	Remarks
0	Not Used	
1	4~20mA	
2	User-defined Resistance Curve	
3	SGD	
4	SGH	
5	Reserved	
6	Reserved	
7	Reserved	The default of HMC6000 sensor type doesn't have lipuid level sensor. Please chose one of Flexible sensor 1/2/3 to use if need to.
8	Reserved	
9	Reserved	
10	Reserved	
11	Reserved	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

⚠ **Note:** There is no need to set curve type but range if the pressure sensor is current type.

10 PARAMETER SETTING

10.1 MATTERS NEED ATTENTION

Press the button (Enter) for 3 seconds after start the controller, and then enter into parameter setting menu which need to input correct password. The default password is 00318.

Please contact with manufacturer when forgets the password or need to correct the resistance/current value.

1) Please modify the controller internal parameters in standby mode(such as starting successfully condition selections，auxiliary inputs、output port configuration，time delay, etc)，otherwise the alarm stop or other abnormal phenomena may occur.

2) High sensor alarm threshold value must be bigger than the low alarm threshold, otherwise they will both alarm simultaneously.

3) Over speed threshold value must be bigger than under speed threshold, otherwise there will be either overspeed or underspeed simultaneously.

4) When setting the condition of successful start, the start speed threshold value is supposed to be set lower as possible for quick disconnection of starter.

5) Auxiliary input port 1-6 cannot be set to the same project, otherwise correct function cannot arrive.

10.2 SENSOR SETTINGS CLARIFICATION

1) When reselect the sensors, the standard value of the selected sensor will be selected. If tempertuare sensor default is set to SGH (120ºC resistance), sensor curve will be the curve of SGH (120ºC resistance). If it is set to SGD (120ºC resistance), sensor curve will be the curve of SGD.

2) If standard sensor curve is mismatching with sensor in using, "User-defined sensor"could be chosen, then input user-defined sensor curve.

3) When inputting sensor curve, X (resistance) must be input in accordance with the order of growing up, otherwise mistakes will occur.

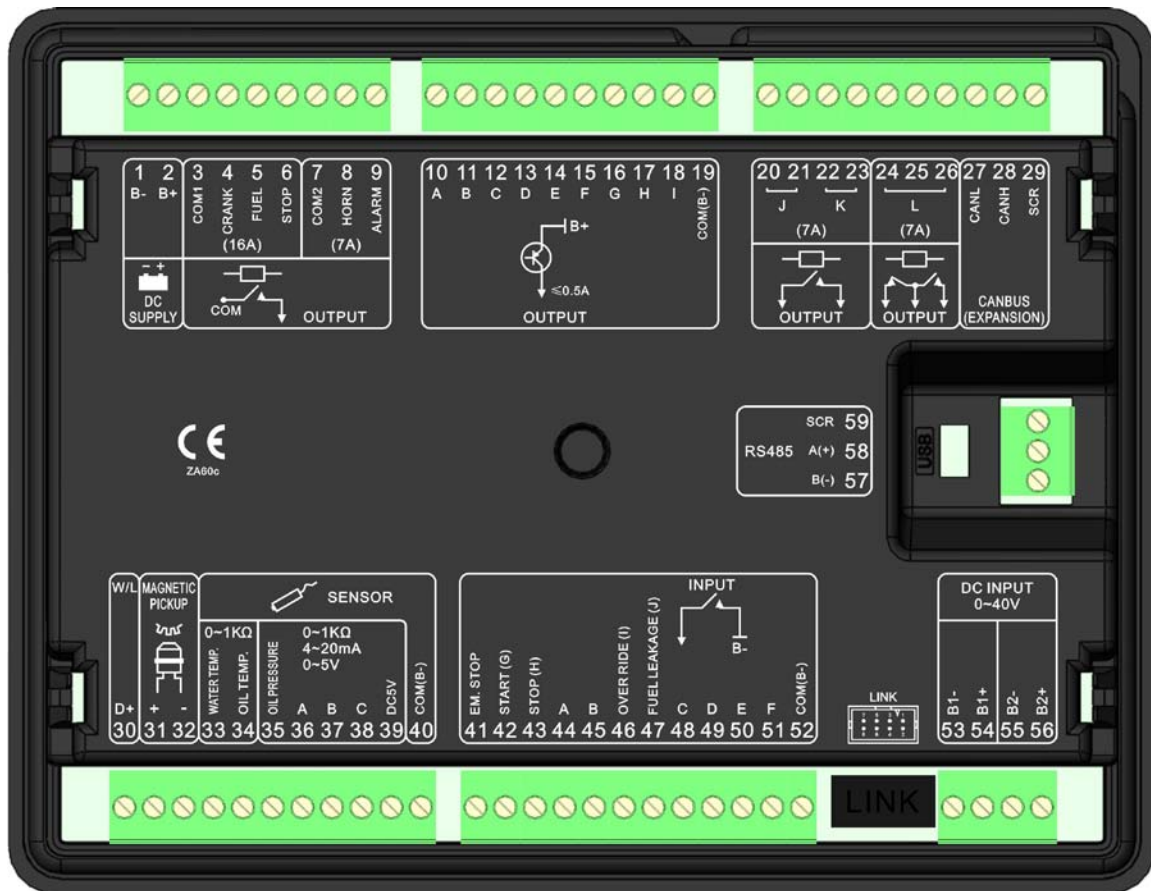4) Can set ordinate of front several points or last several points to the same. As shown in below:
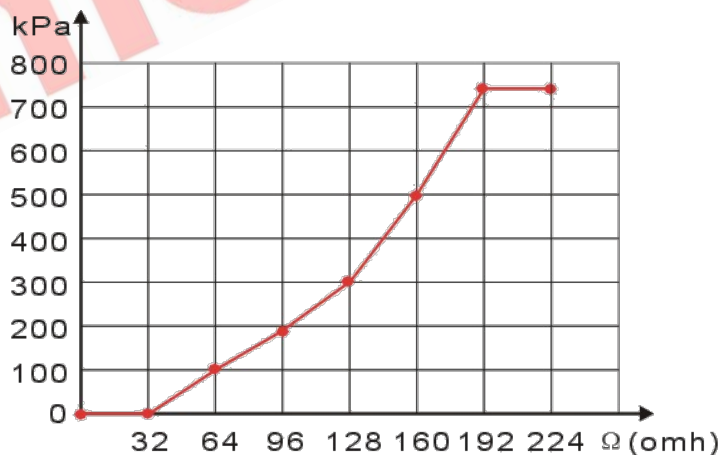
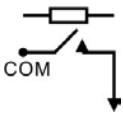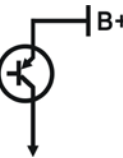**Normal Pressure Unit Conversion Table**

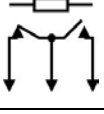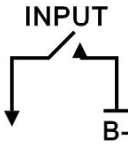|	N/m^2 Pa	kgf/cm^2	bar	psi
1Pa	1	1.02×10^{-5}	1×10^{-5}	1.45×10^{-4}
$1kgf/cm^2$	9.8×10^4	1	0.98	14.2
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1
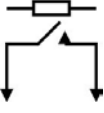
11 BACK PANEL

HMC6000A/ED/EG controller back panel layout:

Description of terminal connection:

Icon	No.	Function	Cable Size	Description
	1.	DC input B-	2.5mm^2	DC power supply negative input. Connected with negative of starter battery.
	2.	DC input B+	2.5mm^2	DC power supply positive input. Connected with positive of starter battery.
	3.	COM1 Relay	1.5mm^2	Connect to COM1 relay output
	4.	Start relay	1.5mm^2	
	5.	Fuel relay	1.5mm^2	
	6.	Stop relay	1.5mm^2	
	7.	COM2 Relay	1.0mm^2	Connect to COM2 relay output
	8.	Audio Alarm Relay	1.0mm^2	
	9.	Common Alarm Relay	1.0mm^2	
	10.	Aux. output 1(A)	1.0mm^2	B+ output, rated 0.5A.
	11.	Aux. output 2(B)	1.0mm^2	B+ output, rated 0.5A.
	12.	Aux. output 3(C)	1.0mm^2	B+ output, rated 0.5A.
	13.	Aux. output 4(D)	1.0mm^2	B+ output, rated 0.5A.
	14.	Aux. output 5(E)	1.0mm^2	B+ output, rated 0.5A.

Icon	No.	Function	Cable Size	Description
	15.	Aux. output 6(F)	1.0mm²	B+ output, rated 0.5A.
	16.	Aux. output 7(G)	1.0mm²	B+ output, rated 0.5A.
	17.	Aux. output 8(H)	1.0mm²	B+ output, rated 0.5A.
	18.	Aux. output 9(I)	1.0mm²	B+ output, rated 0.5A.
	19.	COM(B-)	1.0mm²	
	20.	Aux. output 10(J)	1.0mm²	Free volts contact always open; Rated current: 7A; Contact output.
	21.		1.0mm²	
	22.	Aux. output 11(K)	1.0mm²	
	23.		1.0mm²	
	24.	Aux. output 12(L)	1.0mm²	Free volts contact always open; Rated current: 7A; Contact output.
	25.		1.0mm²	
	26.		1.0mm²	
CANBUS (EXPAN-SION)	27.	CAN(L) (EXPANSION)	0.5mm²	Used for connect to remote control and extended output module.
	28.	CAN(H) (EXPANSION)	0.5mm²	
	29.	SCR (EXPANSION)	0.5mm²	
W/L	30.	D+ Charge input	1.0mm²	Charging generator D+ terminal input; Ground connected is not allowed.
	31.	MP1 (Magnetic pickup+)	0.5mm²	Connect to speed sensor; Using shielding wire is recommended.
	32.	MP1 (Magnetic pickup-)		
	33.	Water Temperature Sensor Input	1.0mm²	Water temperature sensor input(resistance)
	34.	Oil Temperature Sensor Input	1.0mm²	Oil temperature sensor input(resistance)
	35.	Oil Pressure Sensor Input	1.0mm²	Oil pressure sensor input(resistance/current)
	36.	Flexible sensor 1	1.0mm²	User configure(resistance/current)
	37.	Flexible sensor 2	1.0mm²	User configure(resistance/current)
	38.	Flexible sensor 3	1.0mm²	User configure(resistance/current)
	39.	DC5V	1.0mm²	Supply for voltage type sensors.
	40.	COM(B-) input	1.0mm²	Connect to (B-) inside
INPUT B-	41.	Emergency Shutdown Input	0.5mm²	Controller shutdown urgently
	42.	Start (G)	0.5mm²	Digital input 7 Default Set: Remote start input.
	43.	Stop (H)	0.5mm²	Digital input 8 Default Set: Stop input.
	44.	Aux. Input1 (A)	0.5mm²	Transition will be forced to local mode when the input is active.

Icon	No.	Function	Cable Size	Description
	45.	Aux. Input2 (B)	0.5mm^2	Transition will be forced to transition to remote mode when the input is active.
	46.	Over Ride (I)	0.5mm^2	Digital input 9 Default Set: Over ride input.
	47.	Fuel Leakage (J)	0.5mm^2	Digital input 10 Default Set: Fuel leakage input.
	48.	Aux. input 3 (C)	0.5mm^2	User configure
	49.	Aux. input 4 (S)	0.5mm^2	User configure
	50.	Aux. input 5 (E)	0.5mm^2	User configure
	51.	Aux. input 6 (F)		User configure
	52.	COM(B-) input	1.0mm^2	Connect to (B-) inside
	53.	B1-	1.0mm^2	Power supply A negative pole
	54.	B1+	1.0mm^2	Power supply A positive pole
	55.	B2-	1.0mm^2	Power supply B negative pole
	56.	B2+	1.0mm^2	Power supply B positive pole
RS485	57.	RS485-(B)	0.5mm^2	PC programming and monitoring port (isolation type). Its single end earthed.
	58.	RS485+(A)	0.5mm^2	
	59.	SCR	0.5mm^2	
LINK				Enables connection to PC monitoring software
Note: HMC6000EG/ED types don't have 10~19 terminals and 57~59 terminals.				

⚠ **Note:** It is strictly prohibited to take out start battery when the engine is running. Failure to do so can create excessive DC input voltage and result in damage of destruction of equipment!

12 COMMUNICATION AND CONNECTION

12.1 RS485 AND LINK COMMUNICATION

HMC6000A genset controller has RS485 port and Link port (HMC6000ED/EG genset controller has Link port only) which allows the controller to connect to open-type LAN. RS485 and Link applies ModBus communication protocol with the help of PC or DAS (Data Acquisition Systems) operational software provides easy to use marine engine monitoring system management scheme and enables remote control, remote measurement and remote communication.

12.2 CANBUS (EXPANSION) BUS COMMUNICATION

Various expansion modules can be connected to the controller via EXPANSION port.

1) DOUT16 Digital output module: The module connects to the main controller via CANBUS port. Main controller transfers the output condition data of digital output module to module to handle via CANBUS. All parameters of digital output port can be configured via main controller.

2) HMC6000RM Remote control module: Remote control module can achieve control operations such as starting engine, stopping engine, etc. All kinds of parameters and records of the engine real-time display on remote controller.

3) LA16 LED Lamp Expansion Module: The module is connected to main controller via CANBUS port. The master controller send output status data of LED lamp module to process via CANBUS. All parameters of digital output port can be configured via master controller.

4) RPU560A Security module: The module connects to the main controller via CANBUS port. If security module receives no signal from the main controller for more than 1 second and the main controller failure input deactivates, security module will take over engine control; after that the engine will be stopped only by shutdown input or in case of overspeed. Module input function, output function and overspeed alarm threshold are user-set.

⚠ **Note:** Remote control module can only be used in remote mode of the engine; in local mode remote control module only can check parameters and records but not control the engine.
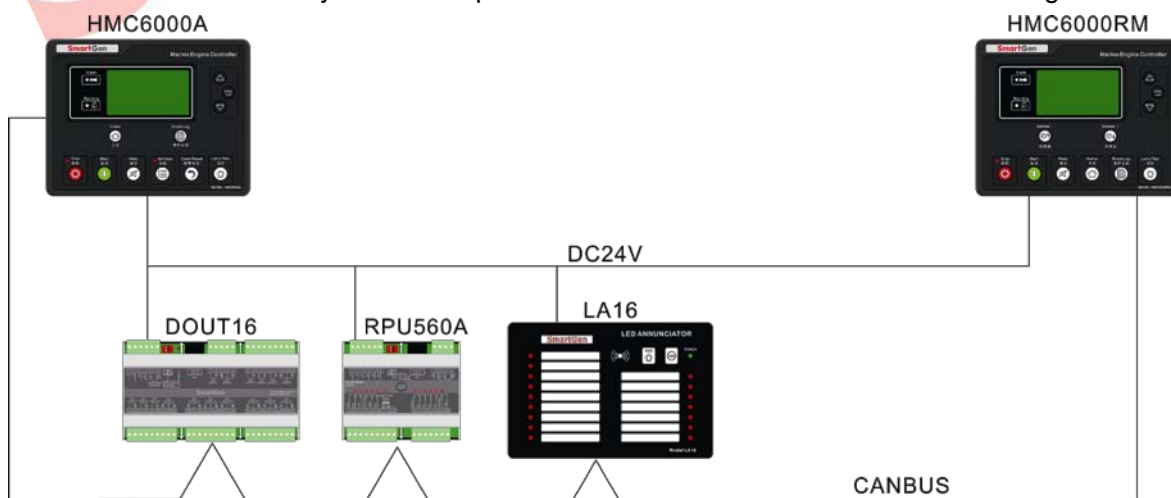
CANBUS Communication Diagram

12.3 HMC6000A APPLICATION DIAGRAM
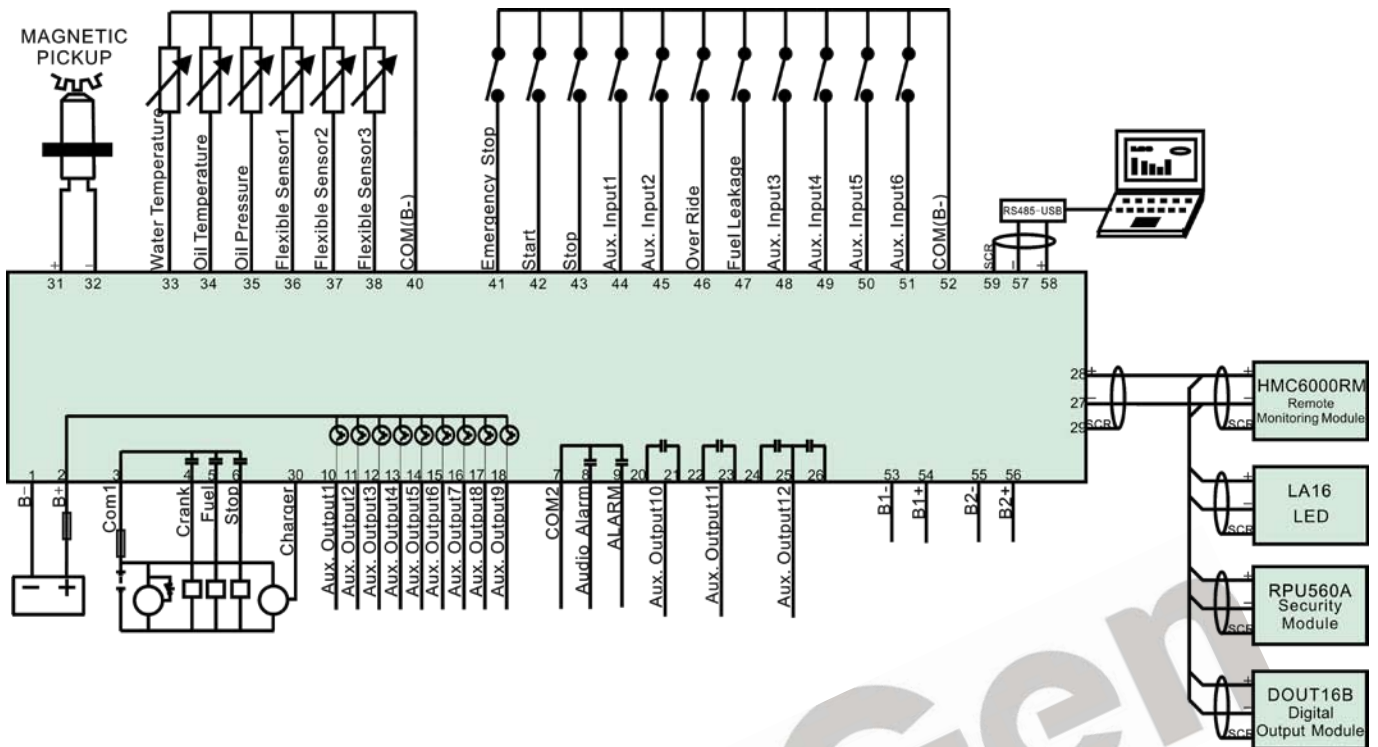
13 COMMISSIONING

Doing the following check before the system starting to run formally is recommended:

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

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

3) Take proper action to prevent engine to crank success (e. g. Remove the connection wire of fuel valve). If checking is OK, make the start battery power on.

4) Make the local mode active and then the controller enter into local mode. Press the Start button and the engine will start. After the cranking times as setting, controller will send signal of Start Failure; then press "Reset" to reset controller.

5) Recover the action to prevent engine to crank success e. g. Connect wire of fuel valve), press start button again, and the engine will start. The engine will run from idle to formal if all works regularly. During this time, please watch the running status. If abnormal, stop engine and check all wires connection according to this manual.

6) If there is any other question, please contact Smartgen's service.

14 INSTALLATION

14.1 FIXING CLIPS

Controller is panel built-in design; it is fixed by clips when installed.

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

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

3) 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.
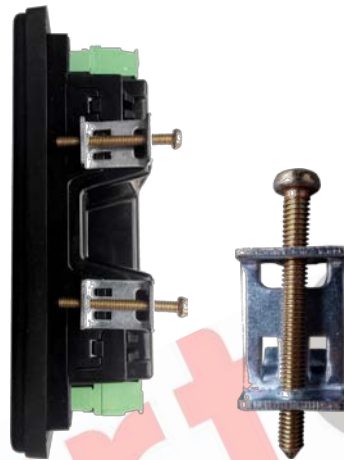
14.2 OVERALL DIMENSIONS AND CUTOUT DIMENSIONS
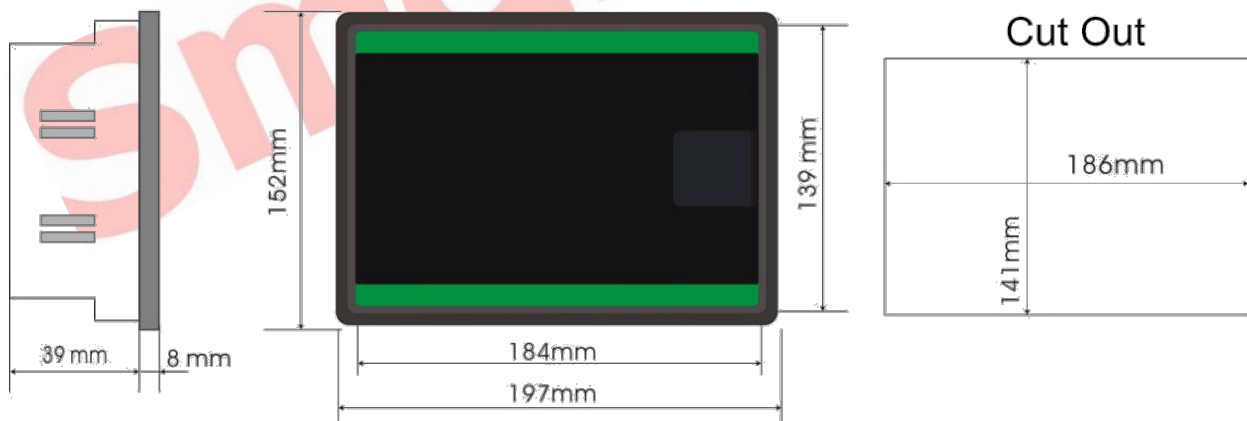
1) Battery Voltage Input

HMC6000A/ED/EG controller can suit for widely range of battery voltage DC (8~35) V. Negative of battery must be connected with the engine shell. The diameter of wire which is from power supply to battery must be over 2.5mm^2. If floating charge configured, please firstly connect output wires of charger to battery's positive and negative directly, then, connect wires from battery's positive and negative to controller's positive and negative input ports in order to prevent charge disturbing the controller's normal working.

2) Speed Sensor Input

Speed sensor is magnetic equipment which is installed on engine body for testing flywheel teeth number. 2 core shielding wire is used for the connection of the sensor and controller. The wire is supposed to be connected to 32 terminal of controller with one end and the other end hanging in the air. The other two signal lines connect separately to 31, 32 terminal. Speed sensor output voltage is supposed to be at AC (1-24) V (virtual value) when it is in full speed range, and AC12V (when in rated rotate speed) is recommened. When install the speed sensor, screw it to contact the flywheel firstly, inverse it with 1/3 circle, and then tighten the nut finally.

3) Output And Expansion Relay

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

4) Sensor Input

All oil pressure sensor, auxiliary sensor1, auxiliary sensor2 and auxiliary sensor3 of HMC6000A/ED/EG series can be configured to current/power/resistance sensor (jumper switch over is as below). Water temperature sensor and oil temperature sensor is fixed resistor sensor.
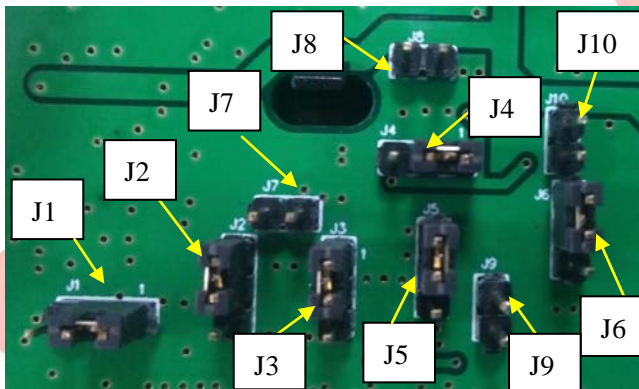
Sensors	Jumper Hat	Resistor(Jumper)	Voltage(Jumper)	Current(Jumper)
OP Sensor	J3, J4	Connect to J3	Connect to J4	Connect to J4
Flexible Sensor1	J5, J6	Connect to J5	Connect to J5	Connect to J5
Flexible Sensor2	J7, J8	Connect to J7	Connect to J6	Connect to J6
Flexible Sensor3	J9, J10	Connect to J8	Connect to J10	Connect to J10
Remark: Water temperature sensor and oil temperature sensor are resistance sensor that cannot be changed to others.				

5) Withstand Voltage Test

When controller has been installed in control panel, if need the high voltage test, please disconnect controller's all terminals in order to prevent high voltage into controller and damage it.

15 TROBLESHOOTING

Problem	Possible Solution
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.
Emergency shutdown	Check emergency shutdown button function;
Low oil pressure alarm after engine has fired.	Check oil pressure sensor and wiring.
High water temperature alarm after engine has fired.	Check water temperature sensor and its wiring.
Shutdown alarm when engine is running	Check relevant switch and its wiring according to the information on LCD. Check auxiliary digital input port.
Fail to start	Check fuel return circuit and its wiring. Check starting battery. Check speed sensor and its wiring. Consult engine manual.
Starter no respond	Check starter wiring; Check start battery
RS485 communication failure	Check wiring; Check if COM port setting is right; Check if RS485 A and B wires are connected in the opposite way; Check if PC communication port is damaged. Putting a 120Ω resistance between RS485 A and B is recommended.
CANBUS communication failure	Check wiring; Check if CANBUS CANH and CANL wires are connected in the opposite way; Check if CANBUS CANH and CANL wires at both ends are connected in the opposite way; Putting a 120Ω resistance between CANBUS CANH and CANL is recommended.