

SmartGen

MAKING CONTROL SMARTER

HMC9000A/HMC9000S DIESEL ENGINE CONTROLLER (With J1939 Interface) USER MANUAL



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Table 1 Software Version

Date	Version	Content
2016-08-08	1.0	Original release.
2017-03-26	1.1	Modified Volvo-EMS2 wiring connection mode.
2017-11-25	1.2	Added Enabled ECU Shutdown function and ECU alarms display mode.
2018-12-25	1.3	Added HMC9000S module description and model comparison list.
2023-05-23	1.4	Updated the logo of SmartGen.

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1 OVERVIEW

HMC9000A/HMC9000S Diesel Engine Controller integrates digitization, intelligentization and network technologies together, and is applicable for one-set diesel engine automation and monitoring system to achieve remote control on the engine, local automatic start/stop, data measurement, alarm protection and “three remotes” (remote control, remote measuring and remote communication). It employs TFT-LCD display screen with optional Chinese/English languages interface. It is simple and steady to operate.

HMC9000A/HMC9000S Diesel Engine Controller employs 32-bit ARM processor and can achieve precise measuring for multiple parameters, fixed value adjustment, time setting, and integer value adjustment etc. They can be configured and monitored from the front panel or by communication interface on PC. It has compact structure, simple wire connection and high reliability, which can be used for all kinds of diesel engine automation system. It is widely used in marine emergency genset, main propulsion engines, main generator engines and pump engines.

HMC9000A/HMC9000S Diesel Engine Controller has SAE J1939 Interface, which can communicate with electrical injection engines with J1939 interface. Speed, water temperature, fuel temperature and oil pressure etc. parameters can be displayed and read on the LCD directly through communication interface. Users are needless to install sensors and it reduces complex wires. This interface can also do all kinds of module expansion. Simple wiring ensures fast transport speed and high reliability.

HMC9000A/HMC9000S Diesel Engine Controller has remote-distance monitoring interface, which is used for remote monitoring and can perform start/stop and other functions remotely.

2 PERFORMANCE AND CHARACTERISTICS

- Core of 32-bit ARM micro-processor, 4.3-inch LCD display with backlight, optional Chinese/English language, touch-button operation.
- Ability of controlling and communicating with dozens of electrical injection engines with J1939 interface. It can also connect with digital output module, security module, electric quantity protection module, analog input module etc. for users' convenience and needs.
- Realizing the function of remote-distance monitoring the engine via REMOTE (CANBUS) interface. Under the remote monitoring mode, other buttons on the controller do not work except Stop button. It is safe and convenient.
- Equipped with RS485 and USB communication interfaces. It can realize the functions of data communication and "three-remotes" by installing monitoring software on PC and MODBUS protocol.
- Protection control function: it can realize the Start/Stop, Alarm protection function under remote or local control mode.
- Override mode function: under this mode only over speed shutdown and emergency shutdown can stop the engine.
- Parameter setting function: it allows users to change and set the parameters and meanwhile they shall be stored in the FLASH memorizer so that they will not disappear in case of power outage.
- Four 4-20mA inputs: it can put in pressure or liquid level messages.
- Four resistance sensor inputs: it can put in pressure signal, PT100 temperature signal, liquid level signal or other signals.
- Two K-type thermocouple inputs: it can put in exhaust temperature signals.
- Real-time calendar, real-time clock, and total running time accumulation function.
- Displaying the total start accumulation times.
- Built-in speed detection equipment: it can precisely judge successful start status, normal running status and over speed status.
- Circularly 99 event logs preservation function: users can search the documentation on the spot.
- Double power supply monitoring and transferring function: power supply switchover can be performed through external interface by setting switchover voltage value.
- All parameters are done by digitalized modification: it gets rid of the analog adjustment methods of ordinary potentiometers and improves the reliability and stability of the whole genset.
- Break wire detection function for some Input/output ports.
- Modular structure design, and embedded installation way: Structure compact; size small; and operation easy and convenient.

3 MODEL COMPARISON

HMC9000 has two types: HMC9000S and HMC9000A.

Table 2 Comparison of the Two Types

Items	HMC9000S	HMC9000A	Note
LCD Size/Resolution	4.3" 480*272	4.3" 480*272	
Input Port No.	18	18	
Output Port No.	16	16	
Resistance Sensor No.	4	4	
Current Sensor No.	4	4	
K Type Input	2	2	
Expansion CANBUS Interface	•	•	
Remote CANBUS Interface	•	•	
RS485 Interface	•	•	
USB Interface	•	•	
RPU560A Module Derivation	•	•	
DIN16 Module Derivation	•		
DOUT16A Module Derivation	•	•	
LA16 Module Derivation	•		
HRM3300 Module Derivation	•	•	
AIN16-C Module Derivation	•		
AIN16-PT/K Module Derivation	•		
AIN16-M01 Module Derivation	•		
HMP300 Module Derivation		•	
AIN8 Module Derivation		•	
AIN16 Module Derivation	•		

4 TECHNICAL PARAMETERS

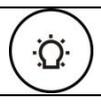
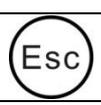
Table 3 Technical Parameters

Parameter	Details
Working Voltage	DC18.0V to DC35.0V continuous power supply. (Only for 24V system)
Overall Power Consumption	<3W (Standby mode: $\leq 2W$)
Speed Sensor Voltage	1.0V to 24V (RMS)
Speed Sensor Frequency	Max 10,000 Hz
Starter Relay Output	16 A connecting to common output port
Fuel Relay Output	16 A connecting to common output port
Auxiliary Relay Output 1	7 A connecting to common output port
Auxiliary Relay Output 2	7 A connecting to common output port
Auxiliary Relay Output 3	7 A connecting to common output port
Auxiliary Relay Output 4	7 A connecting to common output port
Auxiliary Relay Output 5	7 A connecting to common output port
Auxiliary Relay Output 6	7 A 250VAC voltage free output
Auxiliary Transistor Output 7~14	B+ DC supply output. Output current: 0.5A.
Case Dimension	266 mm x 182 mm x 45mm
Panel Cutout	214mm x 160mm
Working Conditions	Temperature: (-25~+70) $^{\circ}C$; Relative Humidity: (20~93)%RH
Storage Conditions	Temperature: (-25~+70) $^{\circ}C$
Protection Class	IP65: adding a waterproof gasket between controller and screen
Insulation Intensity	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.
Weight	0.90kg

5 OPERATOR INTERFACE

5.1 PUSHBUTTON DESCRIPTION

Table 4 Pushbutton Function Description

Icons	Keys	Description
	Stop	In machine side mode, stop the working generator; In the stop process, fast stop the generator.
	Start	In machine side mode, start the quiet engine.
	Alarm Reset	Recover when alarms happen.
	Self-Check	Enter self-check mode automatically and check all threshold alarms without speed.
	Home	Return to home page after pressing this button.
	Lamp Test	Test panel LED indicators and the display screen.
	Mute	Remove the audible alarms.
	Up/Increase	1. Turn over the page. 2. Move the cursor up and increase the value in setting menu.
	Down/Decrease	1. Turn over the page. 2. Move the cursor down and decrease the value in setting menu.
	Left	1. Turn over the page. 2. Move the cursor left in setting.
	Right	1. Turn over the page. 2. Move the cursor right in setting.
	Set/Confirm	1. Enter parameter setting menu by pressing for more than 3 seconds. 2. Confirm the settings.
	Exit	1. Return to the main screen. 2. Return to the previous screen in settings menu.

WARNING: Default password is 01234. It can be changed by users to prevent others randomly altering the settings. Please clearly remember the password after the change. If it is forgotten, please contact SmartGen service department and feedback all the information on the "ABOUT" page of the controller.

5.2 LCD DISPLAY

5.2.1 MAIN SCREEN DISPLAY

The main screen displays a tachometer (range: 0~3000 r/min), a thermometer (range: 0~150 °C; connected sensor is user-configurable, for example: default-configured sensor 1), an oil manometer (range: 0~1000 kpa; connected sensor is user-configurable, for example: default-configured sensor 5), and two powers' voltage display. The main screen displays as follows:

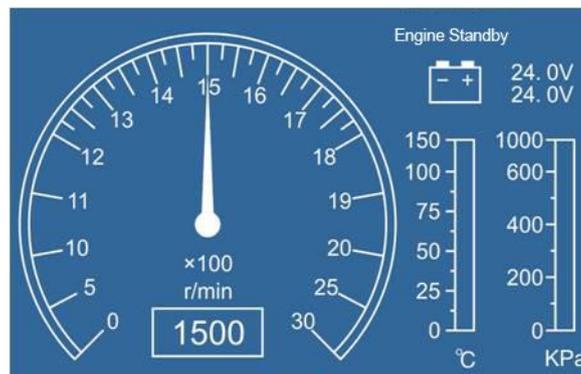


Fig. 1 Main Screen Display

5.2.2 MEASURED DATA DISPLAY

The main screen is divided into two separate display areas: the right and left parts. Left displays status data steadfast and cannot turn over, and the right can turn over by using  button.

- a) Status page includes the following contents:
engine working and running status and power status;
- b) Engine page includes the following contents:
engine speed, sensor 1-4 (resistance), sensor 5-8 (current), sensor 9~10(K-type thermocouple), main power voltage, spare power voltage, charger voltage, accumulated running time and total start times.

Note: sensor names can be users-defined.

- c) If J1939 is enabled, ECU data display shall appear on the main screen. ECU data includes: cooling liquid pressure, coolant level, engine oil temperature, fuel temperature, fuel pressure, air inlet temperature, air outlet temperature, turbine pressure, fuel consumption, total fuel consumption etc. (Different engines include different parameters).
- d) Alarm page.
It displays all kinds of warning alarms and shutdown alarms. It displays at most 5 SPN and corresponding FMI at the same time when ECU alarms happen.

▲NOTE: About ECU alarms and shutdown alarms if it displays the detailed alarm contents, please check the engine according to them, otherwise please check the engine manual according to SPN alarm code.

- e) Event log page.
It records all shutdown events and the time when they occur.
- f) Other information about the module includes the following contents:
Module date and time, input and output interface status.
- g) About page includes the following contents:

Release software version, and hardware version.

Status	Engine
Generator status	Engine speed
Standby mode	1500 r/min
Normal running	Engine temp.
Power status	85°C 185°F
Main power normal	Engine oil pressure
Backup power normal	465kPa 67.4psi 4.65Bar
	Fuel level
	100%
	Main battery voltage
	27.6V
	Backup battery voltage
	No Alarm.

Fig. 2 Engine Page

6 OPERATION

6.1 REMOTE START/STOP OPERATION

6.1.1 CONFIGURATION REQUIREMENTS

Any one of the auxiliary input ports can be configured to remote mode input. When the input port is active, the controller shall be in remote control mode.

6.1.2 REMOTE START SEQUENCE

- a) When "Remote Start" input is active, "Start Delay" starts.
- b) LCD status page displays "Start Delay" countdown.
- c) After "Start Delay" time, pre-heating relay is energized (if configured), and LCD status page displays "Preheat Delay XX".
- d) After "Preheat Delay" time, fuel relay outputs for 1 second, and then start relay output. If during the "starting time" the engine does not start successfully, the fuel relay and the start relay stop outputting and enter "Crank Rest Time" and wait for next start.
- e) In the start times configured, if the engine does not start, the controller shall output starting failure signal and stop and at the same time LCD alarm page displays starting failure alarm.
- f) Among the starting times, if it starts, it enters "Safety On Time", in which low oil pressure, high water temperature, low speed, charging failure alarms are invalid. After "Safety On Time", it enters "Start Idle Delay" (if configured).
- g) During the "Start Idle Delay" time, under speed alarm is disabled. When "Start Idle Delay" is finished, "High Speed Warm-up Delay" time starts (if configured).
- h) When "High Speed Warm-up Delay" ends, if engine speed and oil pressure are normal, then the generator works normally, if they are abnormal, then the controller shutdown alarm happens (LCD alarm screen displays shutdown alarm data.).

▲NOTE: If remote monitoring controller is use to start the genset, press the Start key and there is not starting delay, and other processes are the same as the above start input.

6.1.3 REMOTE STOP SEQUENCE

- a) When the "Remote Stop" input is active, the "Stop Delay" is initiated.
- b) Once the "Stop Delay" has expired, "High Speed Cooling Delay" is energized.
- c) When "Stop Idle Delay" (if configured) starts, idling relay is energized and outputs.
- d) When "ETS Solenoid Hold" begins, ETS relay is energized and outputs and meanwhile fuel relay and is de-energized and automatically judges whether stop is completed.
- e) When "Fail to Stop Delay" begins, complete stop is detected automatically.
- f) When the generator stops completely, it enters standby mode. Otherwise, it enters stop failure mode and has Stop Failure Alarm (If it stops completely after the alarm, then it enters standby mode and press Alarm Reset key, and it shall remove the failure alarm.).

▲NOTE: If remote monitoring controller is used to stop the genset, press the Stop key and there is not stopping delay, and other processes are the same as the above stop input.

6.2 LOCAL START/STOP OPERATION

6.2.1 CONFIGURATION REQUIREMENTS

Any one of the input ports can be configured to machine side mode input. After machine side mode input is active, the controller shall be in machine side mode.

6.2.2 LOCAL START SEQUENCE

- a) Press  and preheating relay outputs (if configured). LCD status screen displays "Preheat Delay XX".
- b) After the preheating delay time ends, fuel relay outputs for 1 second, and starter relay outputs. If the generator does not start during "Cranking Time", fuel relay and starter relay stop outputting and enter "Crank Rest Time", waiting for another starting.
- c) In the starting times set, if the generator does not start, the controller initiates starting failure shutdown and meanwhile LCD alarm screen displays starting failure alarm.
- d) Among the starting times, if the generator starts, it shall enter "Safety On Time", in which low oil pressure, high water temperature, under speed, charging failure etc. alarm data are all inactive. After "Safety On Time", it enters "Start Idle Delay" (if configured).
- e) During "Start Idle Delay" time, under speed alarm is active. After "Start Idle Delay" it enters high-speed "Warming up Delay" (if configured).
- f) After high speed warming up delay, if the oil pressure and speed of the generator are normal, then it works normally. If they are abnormal, then the controller shall operate alarm and shutdown (LCD alarm screen displays shutdown alarm data.).

6.2.3 LOCAL STOP SEQUENCE

- a) Press  and the high speed "Cooling Delay" is then initiated.
- b) "Stop Idle Delay" (if configured) starts, and idling relay is energized and outputs.
- c) When "ETS Solenoid Hold" begins, ETS relay is energized and fuel relay is de-energized and automatically judges whether the generator stops completely.
- d) "Fail to Stop Delay" begins, and complete stop is detected automatically.

e) When the generator stops completely, it enters standby mode. Otherwise, it enters stop failure mode and has Stop Failure Alarm (If it stops completely after the alarm, then it enters standby mode and press Alarm Reset key, and it shall remove the failure alarm.).

7 PROTECTION

7.1 WARNING

When warning signals are detected by the controller, it only sounds warnings and does not stop. And at same time it displays the alarm type.

Table 5 Warning types

No.	Type	Detection Range	Description
1	Overspeed Warning	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	Underspeed Warning	"Waiting For Load" → "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	"Start Idle Delay" → "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	Start Failure	Start finished in the preset start times.	If engine fails to start after preset start attempts, controller initiates warning alarm and the corresponding alarm information will be displayed on LCD.
5	Stop Failure	After "Fail to Stop Delay"	After "Fail to Stop Delay", if gen-set does not stop completely, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
6	Charging Alternator Failure	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	Auxiliary Input 1-18	User-defined effective range	When the controller detects that the auxiliary input 1-18 warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
8	ECU Warning	Always active.	When the controller detects that ECU warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
9	Sensor 1~10 High	> preset warning speed	When the controller detects that the sensor 1-10 high warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
10	Sensor 1~10 Low	>preset warning speed	When the controller detects that the sensor 1-10 warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
11	Sensor 1~10 Open Circuit	Always active	When the controller detects that the sensor 1-10 open circuit warning signals, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
12	Battery Under-voltage 1	Always active	When the controller detects that the B1 battery 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.
13	Battery Over-voltage 1	Always active	When the controller detects that the B1 battery voltage has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
14	Battery Under-voltage 2	Always active	When the controller detects that the B2 battery 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.
15	Battery Over-voltage 2	Always active	When the controller detects that the B2 battery voltage has exceeded the pre-set value, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
16	Speed Broken Wire Warning	Always active	When the controller detects disconnection signals of the speed-detecting sensor, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
17	Fuel Broken Wire Warning	Always active	When the controller detects disconnection signals of the fuel-detecting sensor, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
18	Input 1 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects input 1 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
19	Input 2 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects input 2 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
20	Input 3 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects input 3 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
21	Input 4 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects input 4 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
22	Input 5 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects input 5 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
23	Input 6 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects input 6 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
24	Output 1 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects output 1 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
25	Output 2 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects output 2 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
26	Output 3 Broken Wire Warning	Always active (if disconnection detection is enabled)	When the controller detects output 3 disconnection signal, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
27	RPU 560A Communication Failure	Always active (after 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.
28	DOUT16 Module 1 Communication Failure	Always active (after DOUT16 Module 1 is enabled)	When the controller detects DOUT16 module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
29	DOUT16 Module 2 Communication Failure	Always active (after DOUT16 Module 2 is enabled)	When the controller detects DOUT16 module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
30	HMP300 Communication Failure	Always active (after HMP300 Module is enabled)	When the controller detects HMP300 module communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
31	AIN8 Communication Failure	Always active (after AIN8 Module is enabled)	When the controller detects AIN8 module communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
32	LED-Module 1 Communication Failure	Always active (after LA16 Module 1 is enabled)	When the controller detects LA16 module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
33	LED-Module 2 Communication Failure	Always active (after LA16 Module 2 is enabled)	When the controller detects LA16 module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
34	AIN16-C-Module 1 Communication Failure	Always active (after AIN16-C Module 1 is enabled)	When the controller detects AIN16-C module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
35	AIN16-C-Module 2 Communication Failure	Always active (after AIN16-C Module 2 is enabled)	When the controller detects AIN16 module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
	Failure	enabled)	alarm and the corresponding alarm information will be displayed on LCD.
36	AIN16 Module 1 Communication Failure	Always active (after AIN16 Module 1 is enabled)	When the controller detects AIN16 module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
37	AIN16 Module 2 Communication Failure	Always active (after AIN16 Module 2 is enabled)	When the controller detects AIN16 module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
38	AIN16-PT Module 1 Communication Failure	Always active (after AIN16-PT Module 1 is enabled)	When the controller detects AIN16-PT module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
39	AIN16-PT Module 2 Communication Failure	Always active (after AIN16-PT Module 2 is enabled)	When the controller detects AIN16-PT module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
40	AIN16-M01 Module 1 Communication Failure	Always active (after AIN16-M01 Module 1 is enabled)	When the controller detects AIN16-M01 module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
41	AIN16-M01 Module 2 Communication Failure	Always active (after AIN16-M01 Module 2 is enabled)	When the controller detects AIN16-M01 module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
42	Input Module 1 Communication Failure	Always active (after Input Module 1 is enabled)	When the controller detects Input module 1 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.
43	Input Module 2 Communication Failure	Always active (after Input Module 2 is enabled)	When the controller detects Input module 2 communication failure, it will initiate a warning alarm and the corresponding alarm information will be displayed on LCD.

▲NOTE: The warning types of auxiliary inputs must be active when they are configured by users. External input port alarms are only active when they are configured as external expansion panel input.

▲NOTES:

1. DOUT16 Module 1: expanding 16 channels of digital output module 1
2. RPU560A: expanding security module
3. HMP300: power quantity protection module
4. AIN8: analog signal input module
5. LA16: expanding 16 channels of LED lamp indication module
6. AIN16-C: expanding 16 channels of 4~20mA analog signal input module
7. AIN16-PT/K: expanding 16 channels of PT100 analog signal input module/expanding 16 channels of K-type measurement module (Either-or for common channel)
8. AIN16: expanding 16 channels of analog signal input module
9. AIN16-M01: expanding analog signal input/output module
10. DIN16: expanding 16 channels of switch signal input module

7.2 SHUTDOWN ALARMS

When controller detects shutdown alarm, it stops immediately and displays alarm type.

Table 6 Shutdown alarms

No.	Type	Detection range	Description
1	Emergency Stop Alarm	Always active	When the controller detects an emergency stop alarm signal, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
2	Overspeed Alarm	Always active	When the controller detects that the generator speed has exceeded the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
3	Underspeed Alarm	“Waiting For Load”→ “Cooling Delay”	When the controller detects that the generator speed has fallen below the pre-set value, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
4	Loss of Speed Signal Alarm	“Start Idle Delay”→ “Stop Idle Delay”	When the controller detects that the genset speed is 0, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
5	Auxiliary Input 1-18 Alarm	User-defined	When the controller detects that the auxiliary input 1-18 shutdown alarm input, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
6	ECU Alarm	Always active	When the controller detects ECU shutdown alarm signal, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
7	ECU Communication Failure Alarm	Do not detect in stop or standby mode	If the module cannot detect CAN signal, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
8	Sensor 1~10 High Alarm	>preset warning speed	When the controller detects sensor 1-10 active shutdown alarm signal, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.
9	Sensor 1~10 Low Alarm	>preset warning speed	When the controller detects sensor 1-10 active shutdown alarm signal, it will initiate a shutdown alarm and the corresponding alarm information will be displayed on LCD.

CAUTION: The alarm types of auxiliary inputs are active only when they are configured by users. If the controller is in override mode, only “Emergency Shutdown” and “Overspeed Shutdown” can work.

NOTE1: ECU shutdown happens when “ECU Shutdown” is enabled and ECU shutdown alarm signal is detected.

8 PANEL CONFIGURATION

Press  for over 3 seconds and the controller enters configuration interface by which all parameters can be set for the controller. For details please see below.

Return	>Start Delay	Interface 1:   are used to change the contents needed to set.  is used to enter setting (Interface 2),  is used to exit setting interface.
Module Set	>Stop Delay	
Timer Set >	>Preheat Delay	
Engine Set	>Cranking Time	
Sensor Set	>Crank Rest Time	
Digital Inputs	>Safety On Time	
Relay Outputs	>Start Idle Time	
	>Warming Up Time	
	>Cooling Time	
	>Stop Idle Time	
	>ETS Hold Time	

Return	> Start Delay	Interface 2:   are used to change the contents needed to set.  is used to confirm the setting (Interface 4),  is used to return to the previous screen (Interface 1).
Module Set	>Stop Delay	
Timer Set >	>Preheat Delay	
Engine Set	>Cranking Time	
Sensor Set	>Crank Rest Time	
Digital Inputs	>Safety On time	
Relay Outputs	>Start Idle time	
	>Warming Up time	
	>Cooling Time	
	>Stop Idle Time	
	>ETS Hold Time	

Return	>Start Delay	Interface 3:   are used to change the contents needed to set.  is used to confirm the setting (Interface 4),  is used to return to the previous screen (Interface 1).
Module Set	>Stop Delay	
Timer Set>	>Preheat Delay	
Engine Set	> Cranking Time	
Sensor Set	>Crank Rest Time	
Digit Inputs	>Safety On Time	
Relay Outputs	>Start Idle Time	
	>Warming Up time	
	>Cooling Time	
	>Stop Idle Time	
	>ETS Hold Time	

>Start Delay	Interface 4: Press  to enter settings (Interface 5),
>Stop Delay	
>Preheat Delay	
>Cranking Time	

>Crank Rest Time >Safety On Time >Start Idle Time >Warming Up Time >Cooling Time >Stop Idle Time >ETS Hold Time		 to return to the previous screen (Interface 6).
---	--	---

>Start Delay >Stop Delay >Preheat Delay >Cranking Time	00008	Interface 5: Press   to change cursor position,   are used for changing cursor value,  Confirm setting (Interface 4),  exit setting (Interface 4).
>Crank Rest Time >Safety On Time >Start Idle Time >Warming Up Time >Cooling Time >Stop Idle Time >ETS Hold Time		

>Start Delay >Stop Delay >Preheat Delay >Cranking Time	00008	Interface 6:   are used for changing the setting contents,  to enter settings (Interface 4),  to return to the previous screen (return to Interface 1).
>Crank Rest Time >Safety On Time >Start Idle Time >Warming Up Time >Cooling Time >Stop Idle Time >ETS Hold Time		

NOTE: Press  and it can exit directly in the process of configuration.

Table 7 Parameter Configuration Items

Parameter Name	Range	Default	Remarks
1. Start Delay	(0-3600)s	1	Timer setting
2. Stop Delay	(0-3600)s	1	Timer setting
3. Preheat Delay	(0-3600)s	0	Timer setting
4. Cranking Time	(3-60s)	8	Timer settings
5. Crank Rest Time	(3-60s)	10	Timer settings
6. Safety On Time	(0-3600)s	10	Timer settings
7. Start Idle Time	(0-3600)s	0	Timer settings
8. Warming Up Time	(0-3600)s	10	Timer settings
9. Cooling Time	(0-3600)s	10	Timer settings
10. Stop Idle Time	(0-3600)s	0	Timer settings
11. ETS Hold Time	(0-3600)s	20	Timer settings
12. Fail To Stop Time	(0-3600)s	0	Timer settings
13. J1939 Enable	(0-1)	0 Disable	Engine settings HMC9000E without
14. Engine Type	(0-39)	0 Normal Genset	Engine settings

Parameter Name	Range	Default	Remarks
15. SPN Alarm Version	(1-3)	Version 1	Engine settings
16. Flywheel Teeth	(1-300)	118	Engine settings
17. Rated Speed	(1-5999)r/min	1500	Engine settings
18. Speed On Load	(0-200)%	90%	Engine settings
19. Oil Pressure On Load	(1-1000)kpa (Related to sensor 5)	200	Engine settings
20. Start Attempts	(1-30)	3	Engine settings
21. Disc. Condition	(0-2) 0: Engine Speed 1: Oil Pressure 2: Engine Speed+ Oil Pressure	0: Engine Speed	Engine settings
22. Disconnect Speed	(0-200)%	25%	Engine settings
23. Disconnect OP	(10-1000)kPa	80	Engine settings
24. Under Speed Shut	(0-200)%	85%	Engine settings
25. Under Speed Delay	(0-3600)s	1	Engine settings
26. Under Speed Warn	(0-200)%	90%	Engine settings
27. Under Speed Return	(0-200)%	92%	Engine settings
28. Over Speed Shut	(0-200)%	115%	Engine settings
29. Over Speed Delay	(0-3600)s	1	Engine settings
30. Over Speed Warn	(0-200)%	110%	Engine settings
31. Over Speed Return	(0-200)%	108%	Engine settings
32. Speed Lose Delay	(0-3600)s	1	Engine settings
33. Speed Lose Act	(0-2) 0: No Action 1: Shutdown 2: Warn	1: Shutdown	Engine settings
34. Charge Alt Fail	(0-60.0)V	16.0	Engine settings
35. Bat Rated Volt	(0-60.0)V	24.0	Engine settings
36. Bat1 Over Volt	(0-200)%	125%	Engine settings
37. Bat2 Over Volt	(0-200)%	125%	Engine settings
38. Bat1 Under Volt	(0-200)%	75%	Engine settings
39. Bat2 Under Volt	(0-200)%	75%	Engine settings
40. ECU Shutdown Enabled	(0-1) 0:Disabled 1:Enabled	1	Engine settings
41. Main Switch Spare Volt	(0-200)%	75%	Engine settings
42. Spare Switch Main Volt	(0-200)%	90%	Engine settings
43. Heating Up Limit	(0-100)°C	42	Engine settings
44. Heating Down Limit	(0-100) °C	37	Engine settings
45. Fuel Pump Out	(0-100)%	20	Engine settings
46. Fuel Pump Cut	(0-100)%	30	Engine settings
47. Cycle Lubricate Enable	(0-1) 0:Disabled 1:Enabled	0	Engine settings
48. Cycle Gap Time	(0-7200)min	300	Engine settings
49. Lubricate Time	(0-7200)s	300	Engine settings

Parameter Name	Range	Default	Remarks
50. Speed Adjust. Rate	(1-100)	10	Engine settings
51. Device ID	(1-254)	1	Module settings
52. Language select	(0-1) 0: Chinese 1: English	0: Chinese	Module settings
53. Password set	(0-9999)	01234	Module settings
54. RS485 Baud set	(0-4) 0: 2400 bps 1: 4800bps 2: 9600bps 3: 19200bps 4: 38400bps	2: 9600bps	Module settings RS485 Baud Rate
55. RPU560A Enable	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings
56. DOU16 Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings
57. DOU16 Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
58. DIN16 Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
59. DIN16 Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
60. AIN16 Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
61. AIN16 Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
62. LA16 Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
63. LA16 Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
64. AIN16C Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
65. AIN16C Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
66. AIN16PT Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
67. AIN16PT Module 2	(0-1) 0: Disabled	0: Disabled	Module settings (not available in HMC9000A)

Parameter Name		Range	Default	Remarks
		1: Enabled		HMC9000A)
68.	AIN16M01 Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
69.	AIN16M01 Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
70.	AIN16K Module 1	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
71.	AIN16K Module 2	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000A)
72.	AIN8 Enable	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000S)
73.	Expand Module Baud Rate	(0-1) 0: 250kbps 1: 125kbps	0: 250kbps	Module settings
74.	Remote Control CAN Baud Rate	(0-1) 0: 250kbps 1: 125kbps	0: 250kbps	Module settings
75.	HMP300 Module	(0-1) 0: Disabled 1: Enabled	0: Disabled	Module settings (not available in HMC9000S)
76.	Time Settings		Current Time	Module settings
77.	Sensor 1 set (Resistance input, default: coolant temperature)	See 9.3 Sensor function configuration Note: Resistance type input range is not applicable.		Sensor settings
78.	Sensor 2 set (Resistance input, default: engine oil temperature)	See 9.3 Sensor function configuration Note: Resistance type input range is not applicable.		Sensor settings
79.	Sensor 3 set (Resistance input)	See 9.3 Sensor function configuration Note: Resistance type input range is not applicable.		Sensor settings
80.	Sensor 4 set (Resistance input, default: liquid level)	See 9.3 Sensor function configuration Note: Resistance type input range is not applicable.		Sensor settings
81.	Sensor 5 set (4~20mA input, default: lubricating oil pressure)	See 9.3 Sensor function configuration		Sensor settings
82.	Sensor 6 set (4-20mA input)	See 9.3 Sensor function configuration		Sensor settings
83.	Sensor 7 set (4-20mA input)	See 9.3 Sensor function configuration		Sensor settings
84.	Sensor 8 set (4-20mA input)	See 9.3 Sensor function configuration		Sensor settings
85.	Sensor 9 set (k-thermocouple input)	See 9.3 Sensor function configuration		Sensor settings
86.	Sensor 10 set (k-thermocouple input)	See 9.3 Sensor function configuration		Sensor settings
87.	Input 1 Set	Function	(0-50) 15: Override Mode Input	Input port settings

Parameter Name		Range	Default	Remarks
	Active type	(0-1)	0: Close to activate	Input port settings
88. Input 2 Set	Function	(0-50)	16: Emergency Stop	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
89. Input 3 Set	Function	(0-50)	1: Custom (Fuel Leak)	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
90. Input 4 Set	Function	(0-50)	1: Custom (Air Pressure Low)	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
91. Input 5 Set	Function	(0-50)	1: Custom (Crankcase Pressure Low)	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
92. Input 6 Set	Function	(0-50)	9: Local mode input	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
93. Input 7 Set	Function	(0-50)	10: Remote control mode input	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
94. Input 8 Set	Function	(0-50)	11: Remote Start	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
95. Input 9 Set	Function	(0-50)	12: Remote Stop	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
96. Input 10 Set	Function	(0-50)	31: Turning Chain	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
97. Input 11 Set	Function	(0-50)	0: Not Used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
98. Input 12 Set	Function	(0-50)	0: Not Used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
99. Input 13 Set	Function	(0-50)	0: Not used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
100. Input 14 Set	Function	(0-50)	0: Not used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
101. Input 15 Set	Function	(0-50)	0: Not used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
102. Input 16 Set	Function	(0-50)	0: Not used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
103. Input 17 Set	Function	(0-50)	0: Not used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
104. Input 18 Set	Function	(0-50)	0: Not used	Input port settings
	Active type	(0-1)	0: Close to activate	Input port settings
105. Output 1 Set	Function	(0-255)	8: ETS Hold	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
106. Output 2 Set	Function	(0-255)	71: Over Speed Shutdown	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
107. Output 3 Set	Function	(0-255)	75: Fail To Start	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
108. Output 4 Set	Function	(0-255)	3: Audible Alarm	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings

Parameter Name	Range	Default	Remarks	
109. Output 5 Set	Function	(0-255)	18: Ready Go	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
110. Output 6 Set	Function	(0-255)	49: Crank Success	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
111. Output 7 Set	Function	(0-255)	27: Common Alarm	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
112. Output 8 Set	Function	(0-255)	2: Air flap	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
113. Output 9 Set	Function	(0-255)	15: Pre-lubricate	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
114. Output 10 Set	Function	(0-255)	50: Normal Running	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
115. Output 11 Set	Function	(0-255)	0: Not Used	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
116. Output 12 Set	Function	(0-255)	0: Not Used	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
117. Output 13 Set	Function	(0-255)	0: Not Used	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings
118. Output 14 Set	Function	(0-255)	0: Not Used	Output port settings
	Output type	(0-1)	0: Normally open	Output port settings

Note 1: Input ports 1-18 correspond to controller terminals A-R.
 Note 2: Output ports 1-14 correspond to controller terminals A-R.

Table 8 Other parameters configuration: Only by PC software

Parameter Name	Contents
Resistance sensor 1 settings	User-defined sensor curve settings
Resistance sensor 2 settings	User-defined sensor curve settings
Resistance sensor 3 settings	User-defined sensor curve settings
Resistance sensor 4 settings	User-defined sensor curve settings
Sensor 1~10 name settings	User-defined sensor name
Output 1 custom settings	Name / Button/ Active period /Output delay / Output time
Output 2 custom settings	Name / Button/ Active period /Output delay / Output time
Output 3 custom settings	Name / Button/ Active period /Output delay / Output time
Output 4 custom settings	Name / Button/ Active period /Output delay / Output time
Output 5 custom settings	Name / Button/ Active period /Output delay / Output time
Output 6 custom settings	Name / Button/ Active period /Output delay / Output time
Output 7 custom settings	Name / Button/ Active period /Output delay / Output time
Output 8 custom settings	Name / Button/ Active period /Output delay / Output time
Output 9 custom settings	Name / Button/ Active period /Output delay / Output time
Output 10 custom settings	Name / Button/ Active period /Output delay / Output time
Output 11 custom settings	Name / Button/ Active period /Output delay / Output time
Output 12 custom settings	Name / Button/ Active period /Output delay / Output time
Output 13 custom settings	Name / Button/ Active period /Output delay / Output time
Output 14 custom settings	Name / Button/ Active period /Output delay / Output time

9 INPUT/OUTPUT PORTS CONFIGURATION

9.1 AUXILIARY INPUTS 1~18 FUNCTIONAL DEFINITION

Table 9 Digital Input Port Configuration

No.	Settings	Contents	Description
1	Function Choice	(0-50)	Please see Table 10.
2	Active type	(0-1)	0: Close to activate 1: Open to activate
3	Arming	(0-3)	0: From Safety On Delay 1: From Crank 2: Always 3: Never
4	Active Action	(0-2)	0: Warning 1: Shutdown 2: Indication
5	Input Delay	(0-20.0)s	
6	Broken Wire Alarm Detection Enable	(0-1)	0:Disabled 1:Enabled Only input ports 1~6 and speed input have this function.
7	Character String Display	User-defined input port names	20 English symbols/10 Chinese characters

Table 10 Input Port Functions

No.	Function	Description
0	Not used	Not used
1	User-defined	Users-defined contents
2	Alarm Mute	Stop "Audible Alarm" output when it is active.
3	Alarm Reset	Reset all alarms when it is active.
4	Speed Raise	Speed raise output close when the input is active.
5	Speed Drop	Speed drop output close when the input is active.
6	Reserved	
7	Reserved	
8	Lamp Test	All LED indicators are illuminated when input is active.
9	Local Mode Input	Local mode is activated when input is active.
10	Remote Mode Input	Remote mode is activated when input is active.
11	Remote Start	Under the remote control mode, when the input is active, it can automatically start the generator, and when the stop output is active, it can stop the engine moving. (pressing for 1 second or over, or continuously are Ok.)
12	Remote Stop	The generator stops when it is active.
13	Remote Start/Stop	Under the remote control mode, when the input is active, it can automatically start the generator; when it is inactive, the generator stops.

No.	Function	Description
14	Pre-lubrication	If the output is set as pre-lubrication, when it is active, the relay opens after outputting the pre-lubrication time.
15	Override Mode Input	Override mode is activated when the input is active; in override mode only overspeed shutdown and emergency shutdown will stop the engine.
16	Emergency Stop Input	The controller shuts down the engine immediately and records occurrence time.
17	Panel Key Lock	All buttons in panel are inactive and there is  on the left of first row on LCD when input is active.
18	Reserved	
19	Backup Power Switchover	Main Power is changed into backup power when it is active.
20	Speed Raising Aid	Speed-raising relay is disconnected when it is active.
21	Reserved	
22	Speed Drop Aid	Speed-dropping relay is disconnected when it is active.
23	Water Heating Feedback	Feedback signal of water heating output; The screen displays <i>Water Heating feedback</i> when the input is active.
24	Pre-lubrication Feedback	Feedback signal of pre-lubrication output; The screen displays <i>Pre-lubrication feedback</i> when the input is active.
25	Charging Feedback	Feedback signal of charging output; The screen displays <i>Charging feedback</i> when the input is active.
26	Remote Emergency Stop	Remote emergency stop alarm is made when input is active.
27	Reserved	
28	Quick start	Cranking will start directly (without preheating) when the input is active.
29	Reserved	
30	60Hz Input	Frequency selection of ECU engine
31	Interlock	The generator is prohibited to start when it is active.
32	Cylinder Cleaning Input	Starter relay outputs when cylinder cleaning input is active.
33	Reserved	Reserved
34	Reserved	Reserved
35	Auto Mode Input	The controller enters auto mode when it is active.
36	Auto Start Input	Starting via this input port when it is active.
37	Gearbox Forward	Controller Screen displays gearbox forward when it is active. Not available in HMC9000S.
38	Gearbox Backward	Controller Screen displays gearbox backward when it is active. Not available in HMC9000S.
39	Remote Control Mode Input (1)	The controller enters remote control mode when it is active, and under this mode the starting attempt of the engine is 1 and there is not starting failure alarm.

No.	Function	Description
40	Reserved	
41-50	Reserved	

▲NOTE: The name of the input ports 1~18 only can be configured via PC software.

9.2 OUTPUT PORTS 1~14 FUNCTION DEFINITION

Table 11 Users-defined Output Port Definition

No.	Items	Contents	Remarks
1	Function Choice	(0-255)	See: Table 12.
2	Output Type	0: Normally Open 1: Normally Close	
3	Button Output	0 Not Used 1 Start Button 2 Stop Button 3 Reset Button 4 Mute Button	
4	Active Period Output	Bit1: Standby Bit2: Preheating Bit3: Fuel on Bit4: Cranking Bit5: Crank rest Bit6: Safety on Bit7: Start idle Bit8: Warming up Bit9: Wait for load Bit10: Normal running Bit11: Cooling down Bit12: Stop idle delay Bit13: ETS hold Bit14: Wait For Stop Bit15: Fail to stop	
5	Output Delay Time	(0-100.0)s	
6	Lasting Output Time	(0-3600)s	
7	Broken Wire Alarm Detection Enable	0: Do not detect 1: Detect	Only outputs 1-3 and oil output port have this function.

Table 12 Output Port Functions

No.	Items	Description
0	Not used	This port is not used.
1	Users-defined	Please see Table 11.
2	Air Flap Control	Act when overspeed shutdown and emergency stop occur by closing the air flap.
3	Audible Alarm	Act when warning and shutdown happen. It can be connected to alarm apparatus externally. It can be configured to "Alarm Mute" input port. When "Alarm Mute" is active, it can prohibit "Audible Alarm" output.
4	ECU power	Used for ECU connection.

No.	Items	Description
5	ECU Stop	Used for ECU connection.
6	Starter Relay Output	Act when genset is starting and disconnect when starting is completed.
7	Fuel Relay Output	Act when genset is starting and disconnect at the time when genset is waiting for a complete stop.
8	ETS Stop Output	Act during the "ETS Stop Delay" period.
9	Reserved	
10	Fuel Pump Control	It is controlled by the upper and lower bounds of the fuel level.
11	Reserved	
12	Louver Control	Act when generator is starting and disconnect when generator stops completely.
13	Loss of Speed Signal	Act when the engine speed is detected to be 0 after safe running.
14	Water Heating Output	Act when the sensor detects that the water temperature is lower than the lower bound set and disconnect when it is higher than the upper bound set.
15	Pre-lubrication Output	Output when the generator is in standby mode and the output time can be set. When it is active it is outputted.
16	Remote Control Output	Output when remote control signal is active and disconnect when it is invalid.
17	Override Mode Output	Output when it is in override mode.
18	Preparation Completed	Output when the controller is in standby mode and there is not alarm happening.
19	Reserved	
20	Idling/High Speed Control	Act from starting to "starting idling speed" and from "stopping idling speed" to "waiting for stopping completely".
21	Pre-Supply Fuel	Act during the period from starting to safe running.
22	Speed Raising	Output when speed raising input is active via mechanical speed adjustment, and disconnect when it is invalid.
23	Speed Dropping	Output when speed dropping input is active via mechanical speed adjustment, and disconnect when it is invalid.
24	Second Start Output	If this configuration is valid, the relay shall output when the first starting route fails and the second begins. (Note: if external expansion starter relay is needed).
25	Power Switch Output	Output when power 1 voltage is lower than the set value of power switch and disconnect when it is higher than the set value.
26	High Speed/Idling Speed Output	Act during the period from warming up to cooling down. (Logically contrary to idling speed/high speed outputs)
27	Common Alarm	Act when common warnings and common shutdown alarms happen.
28	Common Shutdown Alarm	Act when common shutdown alarm happens.

No.	Items	Description
29	Common Warning Alarm	Act when common warning alarm happens.
30	Aux. Input 1 Active	Act when input port 1 is active.
31	Aux. Input 2 Active	Act when input port 2 is active.
32	Aux. Input 3 Active	Act when input port 3 is active.
33	Aux. Input 4 Active	Act when input port 4 is active.
34	Aux. Input 5 Active	Act when input port 5 is active.
35	Aux. Input 6 Active	Act when input port 6 is active.
36	Aux. Input 7 Active	Act when input port 7 is active.
37	Aux. Input 8 Active	Act when input port 8 is active.
38	Aux. Input 9 Active	Act when input port 9 is active.
39	Aux. Input 10 Active	Act when input port 10 is active.
40	Aux. Input 11 Active	Act when input port 11 is active.
41	Aux. Input 12 Active	Act when input port 12 is active.
42	Aux. Input 13 Active	Act when input port 13 is active.
43	Aux. Input 14 Active	Act when input port 14 is active.
44	Aux. Input 15 Active	Act when input port 15 is active.
45	Aux. Input 16 Active	Act when input port 16 is active.
46	Aux. Input 17 Active	Act when input port 17 is active.
47	Aux. Input 18 Active	Act when input port 18 is active.
48	Lamp Test Output	Output when lamp test is conducted.
49	Successful Start Output	Output when the genset is up to the speed separating from the starting motor.
50	Normal Running Output	Output when the genset reaches the rated speed .
51	Remote Control Mode	Output when the controller is in the remote control mode.
52	Local Mode Output	Output when the controller is in the local mode.
53	Waiting For Loading Output	Output when the controller is waiting for loading mode.
54	AIN16-C Communication Failure	Output when the controller detects communication with AIN16-C cannot be achieved (for 3s or more). Reserved in HMC9000A.
55	RAIN16-PT Communication Failure	Output when the controller detects communication with AIN16-PT cannot be achieved (for 3s or more). Reserved in HMC9000A.
56	Stop Pulse Output	Act during "stop delay" time, and close after "stop delay" time.
57	AIN16 Communication Failure	Output when the controller detects communication with AIN16 cannot be achieved (for 3s or more). Reserved in HMC9000A.
58	DIN16 Communication	Output when the controller detects communication with DIN16 cannot be achieved (for 3s or more).

No.	Items	Description
	Failure	Reserved in HMC9000A.
59	RPU560A Communication Failure	Output when the controller detects communication with RPU560A safeguard module cannot be achieved. (for 1s or more)
60	DOU16 Communication Failure	Output when the controller detects communication with digital output module DOU16 cannot be achieved (for 3s or more).
61	AIN16-M01 Communication Failure	Output when the controller detects communication with AIN16-M01 cannot be achieved (for 3s or more). Reserved in HMC9000A.
62	LA16 Communication Failure	Output when the controller detects communication with LA16 cannot be achieved (for 3s or more). Reserved in HMC9000A.
63	ECU Communication Failure and Engine Stop	When ECU is energized, if connection with ECU cannot be detected then ECU communication failure and shutdown alarm come up.
64	ECU Warning	ECU warning signal outputs since ECU receives the warning data.
65	ECU Shutdown Alarm	ECU shutdown signal outputs since ECU receives the shutdown data.
66	Power 1 Under-voltage Warning	Output when the controller detects that Power 1 voltage has fallen below the set value.
67	Power 2 Under-voltage Warning	Output when the controller detects that Power 2 voltage has fallen below the set value.
68	Underspeed Warning	Act when underspeed warning occurs.
69	Underspeed Shutdown	Act when underspeed shutdown occurs.
70	Overspeed Warning	Act when overspeed warning occurs.
71	Overspeed Shutdown Alarm	Act when overspeed shutdown alarm occurs.
72	Emergency Stop Alarm	Act when emergency stop alarm occurs.
73	Charging Alternator Failure	Act when charging alternator failure warning alarm occurs.
74	Reserved	
75	Starting Failure Alarm	Act when starting failure alarm occurs.
76	Reserved	
77	Reserved	
78	Sensor 1 Open	Act when sensor 1 open circuit alarm occurs.
79	Sensor 1 Warning	Act when sensor 1 warning alarm occurs.

No.	Items	Description
80	Sensor 1 Shutdown	Act when sensor 1 shutdown alarm occurs.
81	Sensor 2 Open	Act when sensor 2 open circuit alarm occurs.
82	Sensor 2 Warning	Act when sensor 2 warning alarm occurs.
83	Sensor 2 Shutdown	Act when sensor 2 shutdown alarm occurs.
84	Sensor 3 Open	Act when sensor 3 open circuit alarm occurs.
85	Sensor 3 Warning	Act when sensor 3 warning alarm occurs.
86	Sensor 3 Shutdown	Act when sensor 3 shutdown alarm occurs.
87	Sensor 4 Open	Act when sensor 4 open circuit alarm occurs.
88	Sensor 4 Warning	Act when sensor 4 warning alarm occurs.
89	Sensor 4 Shutdown	Act when sensor 4 shutdown alarm occurs.
90	Sensor 5 Open	Act when sensor 5 open circuit alarm occurs.
91	Sensor 5 Warning	Act when sensor 5 warning alarm occurs.
92	Sensor 5 Shutdown	Act when sensor 5 shutdown alarm occurs.
93	Sensor 6 Open	Act when sensor 6 open circuit alarm occurs.
94	Sensor 6 Warning	Act when sensor 6 warning alarm occurs.
95	Sensor 6 Shutdown	Act when sensor 6 shutdown alarm occurs.
96	Sensor 7 Open	Act when sensor 7 open circuit alarm occurs.
97	Sensor 7 Warning	Act when sensor 7 warning alarm occurs.
98	Sensor 7 Shutdown	Act when sensor 7 shutdown alarm occurs.
99	Sensor 8 Open	Act when sensor 8 open circuit alarm occurs.
100	Sensor 8 Warning	Act when sensor 8 warning alarm occurs.
101	Sensor 8 Shutdown	Act when sensor 8 shutdown alarm occurs.
102	AIN8 Sensor 1 Open	Act when AIN8 sensor 1 open circuit alarm occurs. Reserved in HMC9000S.
103	AIN8 Sensor 1 Warning	Act when AIN8 sensor 1 warning alarm occurs. Reserved in HMC9000S.
104	AIN8 Sensor 1 Shutdown	Act when AIN8 sensor 1 shutdown alarm occurs. Reserved in HMC9000S.
105	AIN8 Sensor 2 Open	Act when AIN8 sensor 2 open circuit alarm occurs. Reserved in HMC9000S.
106	AIN8 Sensor 2 Warning	Act when AIN8 sensor 2 warning alarm occurs. Reserved in HMC9000S.
107	AIN8 Sensor 2 Shutdown	Act when AIN8 sensor 2 shutdown alarm occurs. Reserved in HMC9000S.
108	AIN8 Sensor 3 Open	Act when AIN8 sensor 3 open circuit alarm occurs. Reserved in HMC9000S.
109	AIN8 Sensor 3 Warning	Act when AIN8 sensor 3 warning alarm occurs. Reserved in HMC9000S.
110	AIN8 Sensor 3 Shutdown	Act when AIN8 sensor 3 shutdown alarm occurs. Reserved in HMC9000S.
111	AIN8 Sensor 4 Open	Act when AIN8 sensor 4 open circuit alarm occurs. Reserved in HMC9000S.

No.	Items	Description
112	AIN8 Sensor 4 Warning	Act when AIN8 sensor 4 warning alarm occurs. Reserved in HMC9000S.
113	AIN8 Sensor 4 Shutdown	Act when AIN8 sensor 4 shutdown alarm occurs. Reserved in HMC9000S.
114	AIN8 Sensor 5 Open	Act when AIN8 sensor 5 open circuit alarm occurs. Reserved in HMC9000S.
115	AIN8 Sensor 5 Warning	Act when AIN8 sensor 5 warning alarm occurs. Reserved in HMC9000S.
116	AIN8 Sensor 5 Shutdown	Act when AIN8 sensor 5 shutdown alarm occurs. Reserved in HMC9000S.
117	AIN8 Sensor 6 Open	Act when AIN8 sensor 6 open circuit alarm occurs. Reserved in HMC9000S.
118	AIN8 Sensor 6 Warning	Act when AIN8 sensor 6 warning alarm occurs. Reserved in HMC9000S.
119	AIN8 Sensor 6 Shutdown	Act when AIN8 sensor 6 shutdown alarm occurs. Reserved in HMC9000S.
120	AIN8 Sensor 7 Open	Act when AIN8 sensor 7 open circuit alarm occurs. Reserved in HMC9000S.
121	AIN8 Sensor 7 Warning	Act when AIN8 sensor 7 warning alarm occurs. Reserved in HMC9000S.
122	AIN8 Sensor 7 Shutdown	Act when AIN8 sensor 7 shutdown alarm occurs. Reserved in HMC9000S.
123	AIN8 Sensor 8 Open	Act when AIN8 sensor 8 open circuit alarm occurs. Reserved in HMC9000S.
124	AIN8 Sensor 8 Warning	Act when AIN8 sensor 8 warning alarm occurs. Reserved in HMC9000S.
125	AIN8 Sensor 8 Shutdown	Act when AIN8 sensor 8 shutdown alarm occurs. Reserved in HMC9000S.
126-149	Reserved	
150	Input 1 Active (Expansion 1)	Act when Input 1 is active (Expansion 1). Reserved in HMC9000A.
151	Input 2 Active (Expansion 1)	Act when Input 2 is active (Expansion 1). Reserved in HMC9000A.
152	Input 3 Active (Expansion 1)	Act when Input 3 is active (Expansion 1). Reserved in HMC9000A.
153	Input 4 Active (Expansion 1)	Act when Input 4 is active (Expansion 1). Reserved in HMC9000A.
154	Input 5 Active (Expansion 1)	Act when Input 5 is active (Expansion 1). Reserved in HMC9000A.
155	Input 6 Active (Expansion 1)	Act when Input 6 is active (Expansion 1). Reserved in HMC9000A.
156	Input 7 Active	Act when Input 7 is active (Expansion 1). Reserved in HMC9000A.

No.	Items	Description
	(Expansion 1)	
157	Input 8 Active (Expansion 1)	Act when Input 8 is active (Expansion 1). Reserved in HMC9000A.
158	Input 9 Active (Expansion 1)	Act when Input 9 is active (Expansion 1). Reserved in HMC9000A.
159	Input 10 Active (Expansion 1)	Act when Input 10 is active (Expansion 1). Reserved in HMC9000A.
160	Input 11 Active (Expansion 1)	Act when Input 11 is active (Expansion 1). Reserved in HMC9000A.
161	Input 12 Active (Expansion 1)	Act when Input 12 is active (Expansion 1). Reserved in HMC9000A.
162	Input 13 Active (Expansion 1)	Act when Input 13 is active (Expansion 1). Reserved in HMC9000A.
163	Input 14 Active (Expansion 1)	Act when Input 14 is active (Expansion 1). Reserved in HMC9000A.
164	Input 15 Active (Expansion 1)	Act when Input 15 is active (Expansion 1). Reserved in HMC9000A.
165	Input 16 Active (Expansion 1)	Act when Input 16 is active (Expansion 1). Reserved in HMC9000A.
166	Sensor 9 Open	Act when sensor 9 open circuit alarm occurs.
167	Sensor 9 Warning	Act when sensor 9 warning alarm occurs.
168	Sensor 9 Shutdown	Act when sensor 9 shutdown alarm occurs.
169	Sensor 10 Open	Act when sensor 10 open circuit alarm occurs.
170	Sensor 10 Warning	Act when sensor 10 warning alarm occurs.
171	Sensor 10 Shutdown	Act when sensor 10 shutdown alarm occurs.
172	Input 1 Shutdown (Safeguard)	
173	Input 2 Shutdown (Safeguard)	
174	Input 3 Shutdown (Safeguard)	
175	Input 4 Shutdown (Safeguard)	
176	Overspeed Shutdown (Safeguard)	
177	Reserved	
178	Reserved	
179	Reserved	
180	Reserved	
181	PLC Flag 1	
182	PLC Flag 2	
183	PLC Flag 3	

No.	Items	Description
184	PLC Flag 4	
185	PLC Flag 5	
186	PLC Flag 6	
187	PLC Flag 7	
188	PLC Flag 8	
189	PLC Flag 9	
190	PLC Flag 10	
191	PLC Flag 11	
192	PLC Flag 12	
193	PLC Flag 13	
194	PLC Flag 14	
195	PLC Flag 15	
196	PLC Flag 16	
197	PLC Flag 17	
198	PLC Flag 18	
199	PLC Flag 19	
200	PLC Flag 20	
201	PLC Flag 21	
202	PLC Flag 22	
203	PLC Flag 23	
204	PLC Flag 24	
205	PLC Flag 25	
206	PLC Flag 26	
207	PLC Flag 27	
208	PLC Flag 28	
209	PLC Flag 29	
210	PLC Flag 30	
211	PLC Flag 31	
212	PLC Flag 32	
213	PLC Flag 33	
214	PLC Flag 34	
215	PLC Flag 35	
216	PLC Flag 36	
217	PLC Flag 37	
218	PLC Flag 38	
219	PLC Flag 39	
220	PLC Flag 40	
221~255	Reserved	

▲NOTE: The name of the output ports 1~14 only can be configured via PC software.

9.3 SENSOR FUNCTION DEFINITION

9.3.1 SENSOR CONFIGURATION LIST

Table 13 Detailed Sensor Definitions

No.	Settings	Contents	Remarks
1	Sensor Type	(0-3) 0: Not Used 1: Oil Pressure Sensor 2: Temperature Sensor 3: Fuel Level Sensor	Sensor 9 and sensor 10 are fixed temperature sensors. Curve type is fixed "K type thermocouple"
2	Sensor Curve (resistance type)	Curve types list	See 9.3.2/9.3.3/9.3.4 curve lists
3	Alarm Speed	(0-200)%	Alarm when the engine speed has exceeded the set value.
4	Range (Current type)	(0-6000)kpa	
5	High Shutdown Enable	(0-1) 0: Enable; 1: Disable	
6	High Shutdown Value	(0-6000)	
7	High Shutdown Delay	(0-3600)s	
8	Low Shutdown Enable	(0-1) 0: Enable; 1: Disable	
9	Low Shutdown Value	(0-4000)	
10	Low Shutdown Delay	(0-3600)s	
11	High Warn Enable	(0-1) 0: Enable; 1: Disable	
12	High Warn Value	(0-6000)	
13	High Return Value	(0-6000)	
14	High Warn Delay	(0-3600)s	
15	Low Warn Enable	(0-1) 0: Enable; 1: Disable	
16	Low Warn Value	(0-4000)	
17	Low Return Value	(0-4000)	
18	Low Warn Delay	(0-3600)s	
19	First point X (Resistance)	Resistance type (not PT100)	
20	Second point X (Resistance)	Resistance type (not PT100)	
21	Third point X (Resistance)	Resistance type (not PT100)	
22	Fourth point X (Resistance)	Resistance type (not PT100)	
23	Fifth point X (Resistance)	Resistance type (not PT100)	
24	Sixth point X (Resistance)	Resistance type (not PT100)	
25	Seventh point X (Resistance)	Resistance type (not PT100)	
26	Eighth point X (Resistance)	Resistance type (not PT100)	
27	First point Y (Value)	Resistance type (not PT100)	
28	Second point Y (Value)	Resistance type (not PT100)	
29	Third point Y (Value)	Resistance type (not PT100)	
30	Fourth point Y (Value)	Resistance type (not PT100)	
31	Fifth point Y (Value)	Resistance type (not PT100)	
32	Sixth point Y (Value)	Resistance type (not PT100)	
33	Seventh point Y (Value)	Resistance type (not PT100)	
34	Eighth point Y (Value)	Resistance type (not PT100)	
35	User-defined string	User-defined sensor names	

9.3.2 TEMPERATURE CURVES

Table 14 Temperature Curve List

No.	Contents	Range	Description
0	Not Used		
1	PT100		
2	Custom Resistance Curve		
3	VDO		
4	CURTIS		
5	VOLVO-EC		
6	DATCON		
7	SGX		
8	SGD		
9	SGH		
10	Reserved		
11	Reserved		
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 PRESSURE CURVES

Table 15 Resistance Pressure Curve List

No.	Contents	Range	Description
0	Not Used		
1	4-20mA		
2	Custom Resistance Curve		
3	VDO 10Bar		
4	CURTIS		
5	VOLVO-EC		
6	DATCON 10Bar		
7	SGX		
8	SGD		
9	SGH		
10	Reserved		
11	Reserved		
12	Reserved		
13	Reserved		
14	Reserved		
15	Reserved		

NOTE: There is no need to set curve type if the pressure sensor is current type.

9.3.4 LIQUID LEVEL CURVES

Table 16 Liquid Level Curve List

No.	Contents	Range	Description
0	Not used		
1	Reserved		
2	Custom resistance curve		
3	SGD		
4	SGH		
5	Reserved		
6	Reserved		
7	Reserved		
8	Reserved		
9	Reserved		
10	Reserved		
11	Reserved		
12	Reserved		
13	Reserved		
14	Reserved		
15	Reserved		

10 BACK PANEL

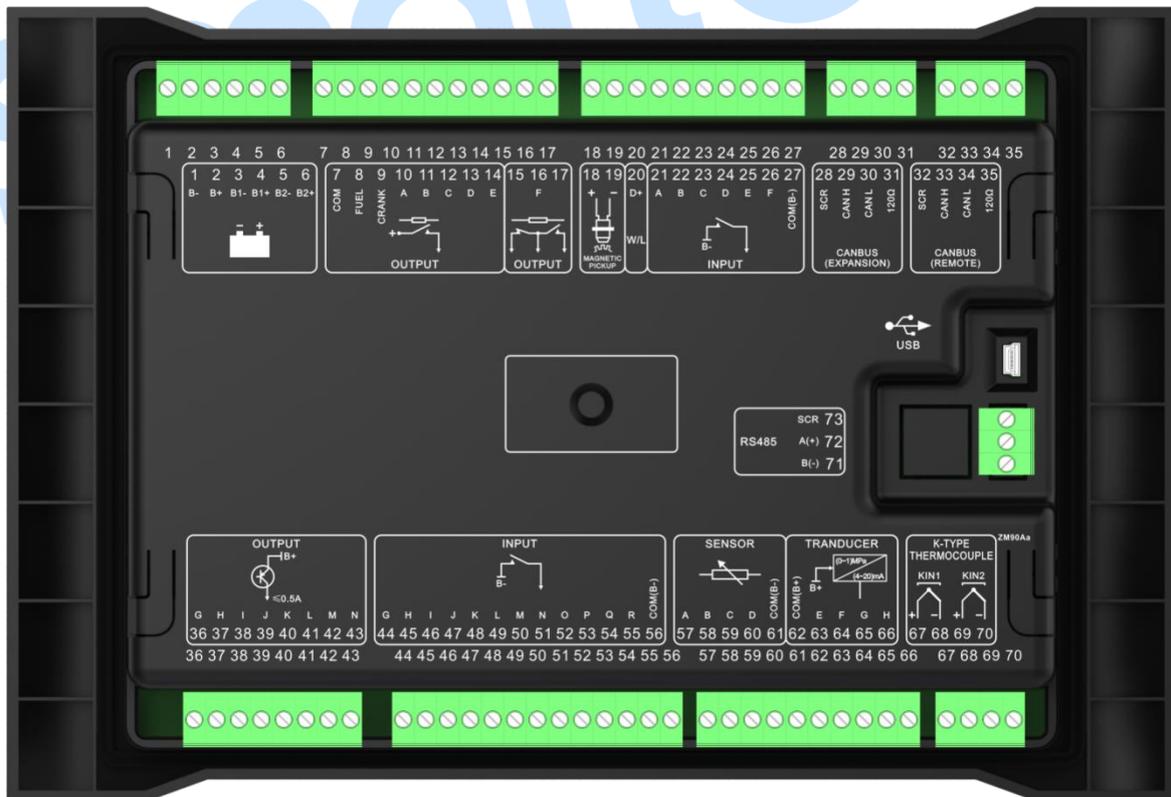
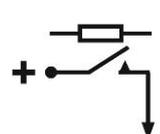
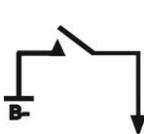
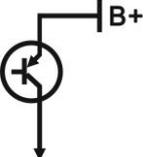
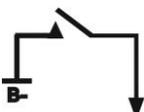
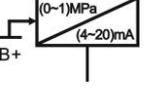
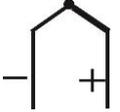


Fig. 3 HMC9000A/S Controller Back Panel

Table 17 Back Panel Terminals Connection Description

Icon	No.	Function	Cable Size	Description
	1	DC input B-	2.5mm ²	DC power supply negative input. It is connected with starter battery negative.
	2	DC input B+	2.5mm ²	DC power supply positive input. It is connected with starter battery positive.
	3	B1- input	1.0mm ²	Power 1 voltage input
	4	B1+ input	1.0mm ²	
	5	B2- input	1.0mm ²	Power 2 voltage input
	6	B2+ input	1.0mm ²	
	7	COM Relay Common Port	2.5mm ²	Common power supply input
	8	Fuel Relay Output	2.5mm ²	DC voltage is supplied by No.7 terminal with rated 16A. Broken wire protection function is fitted.
	9	Crank Relay Output	2.5mm ²	DC voltage is supplied by No.7 terminal with rated 16A.
	10	Aux. output 1(A)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated 7A. Broken wire protection function is fitted (if configured).
	11	Aux. output 2(B)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated 7A. Broken wire protection function is fitted (if configured).
	12	Aux. output 3(C)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated 7A. Broken wire protection function is fitted (if configured).
	13	Aux. output 4(D)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated 7A.
	14	Aux. output 5(E)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated 7A.
	15	Aux. output 6(F)	1.5mm ²	Power free; Rated current: 7A.
	16			
17				
	18	Magnetic Pickup "+" Input	1.0mm ²	Speed sensor input
	19	Magnetic Pickup "-" Input	1.0mm ²	
D+	20	D+ Charging Input	1.0mm ²	Charging generator D+ input; Ground connection is not allowed.
	21	AUX. input 1(A)	1.0mm ²	Digital input; Broken wire protection function is fitted (if configured).
	22	AUX. input 2(B)	1.0mm ²	Digital input; Broken wire protection function is fitted (if configured).
	23	AUX. input 3(C)	1.0mm ²	Digital input; Broken wire protection function

Icon	No.	Function	Cable Size	Description
				is fitted (if configured).
	24	AUX. input 4(D)	1.0mm ²	Digital input; Broken wire protection function is fitted (if configured).
	25	AUX. input 5(E)	1.0mm ²	Digital input; Broken wire protection function is fitted (if configured).
	26	AUX. input 6(F)	1.0mm ²	Digital input; Broken wire protection function is fitted (if configured).
	27	COM(B-) Aux. Input Common Port	1.0mm ²	
CANBUS (EXPANSION)	28	SCR (EXPANSION)	0.5mm ²	It is externally connected to ECU modules and expansion modules. Impedance-120Ω shielding wire shall be employed and the single-end shall be connected to the ground. There is already 120 terminal resistance in the module and it is only needed to connect 30 and 31 terminals.
	29	CAN(H) (EXPANSION)		
	30	CAN(L) (EXPANSION)		
	31	120Ω		
CANBUS (REMOTE)	32	SCR (REMOTE)	0.5mm ²	It is externally connected to remote control modules. Impedance-120Ω shielding wire shall be employed and the single-end shall be connected to the ground. There is already 120 terminal resistance in the module and it is only needed to connect 34 and 35 terminals.
	33	CAN(H) (REMOTE)		
	34	CAN(L) (REMOTE)		
	35	120Ω		
	36	Aux. output 7 (G)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	37	Aux. output 8 (H)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	38	Aux. output 9 (I)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	39	Aux. output 10(J)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	40	Aux. output 11(K)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	41	Aux. output 12(L)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	42	Aux. output 13(M)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	43	Aux. output 14(N)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	44	Aux. digital input 7(G)	1.0mm ²	Digital input
	45	Aux. digital input 8(H)	1.0mm ²	Digital input
	46	Aux. digital input 9(I)	1.0mm ²	Digital input
	47	Aux. digital input 10(J)	1.0mm ²	Digital input
	48	Aux. digital input 11(K)	1.0mm ²	Digital input
	49	Aux. digital input 12(L)	1.0mm ²	Digital input
	50	Aux. digital input 13(M)	1.0mm ²	Digital input
	51	Aux. digital input 14(N)	1.0mm ²	Digital input
	52	Aux. digital input 15(O)	1.0mm ²	Digital input
	53	Aux. digital input 16(P)	1.0mm ²	Digital input
	54	Aux. digital input 17(Q)	1.0mm ²	Digital input
	55	Aux. digital input 18(R)	1.0mm ²	Digital input

Icon	No.	Function	Cable Size	Description
	56	COM(B-) digital input common port	1.0mm ²	
	57	AIN1 (A)	1.0mm ²	Resistance sensor input
	58	AIN2 (B)	1.0mm ²	Resistance sensor input
	59	AIN3 (C)	1.0mm ²	Resistance sensor input
	60	AIN4 (D)	1.0mm ²	Resistance sensor input
	61	COM(B-) AIN1-4 Common Port	1.0mm ²	
	62	COM(B+) AIN5-8 Common Power Terminal	1.0mm ²	Power B+ output
	63	AIN5 (E)	1.0mm ²	4-20mA sensor input
	64	AIN6 (F)	1.0mm ²	4-20mA sensor input
	65	AIN7 (G)	1.0mm ²	4-20mA sensor input
	66	AIN8 (H)	1.0mm ²	4-20mA sensor input
	67	KIN 1+	1.0mm ²	K-Thermocouple input
	68	KIN1-	1.0mm ²	
	69	KIN2+	1.0mm ²	K-Thermocouple input
	70	KIN2-	1.0mm ²	
RS485	71	RS485(B-)	0.5mm ²	PC programming and monitoring port (isolation type); The single-end shall be connected to the ground.
	72	RS485(A+)	0.5mm ²	
	73	SCR	0.5mm ²	
USB		USB	0.5mm ²	Communication with PC monitoring software can be realized.

⚠NOTE: It is strictly prohibited to take out the starting battery when the engine is running, otherwise the control system will be burned because of the over high DC input voltage! Failure to do so can create excessive DC input voltage and result in damage of destruction of equipment!

11 TYPICAL WIRING DIAGRAM

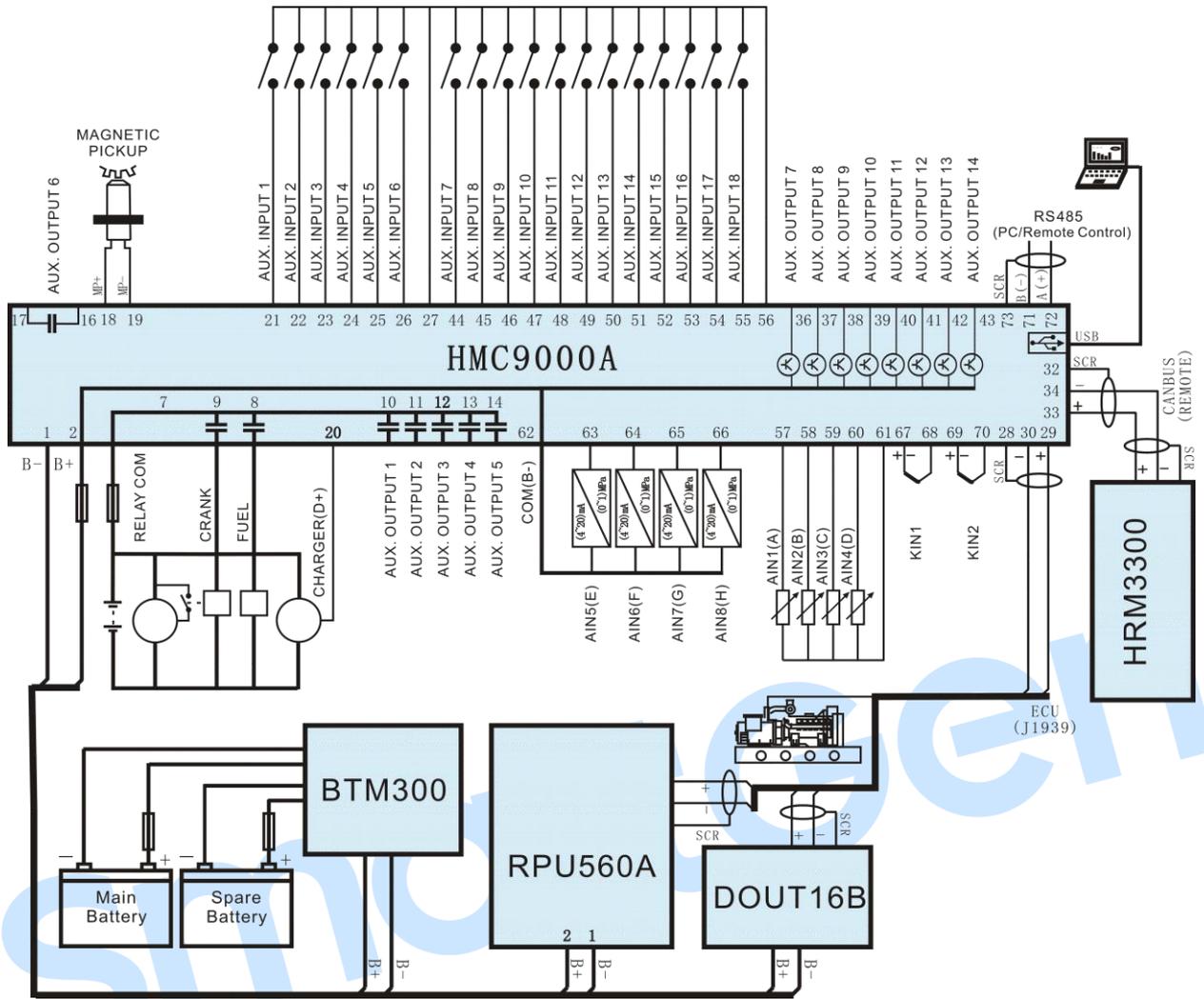


Fig. 4 HMC9000A Typical Wiring Diagram

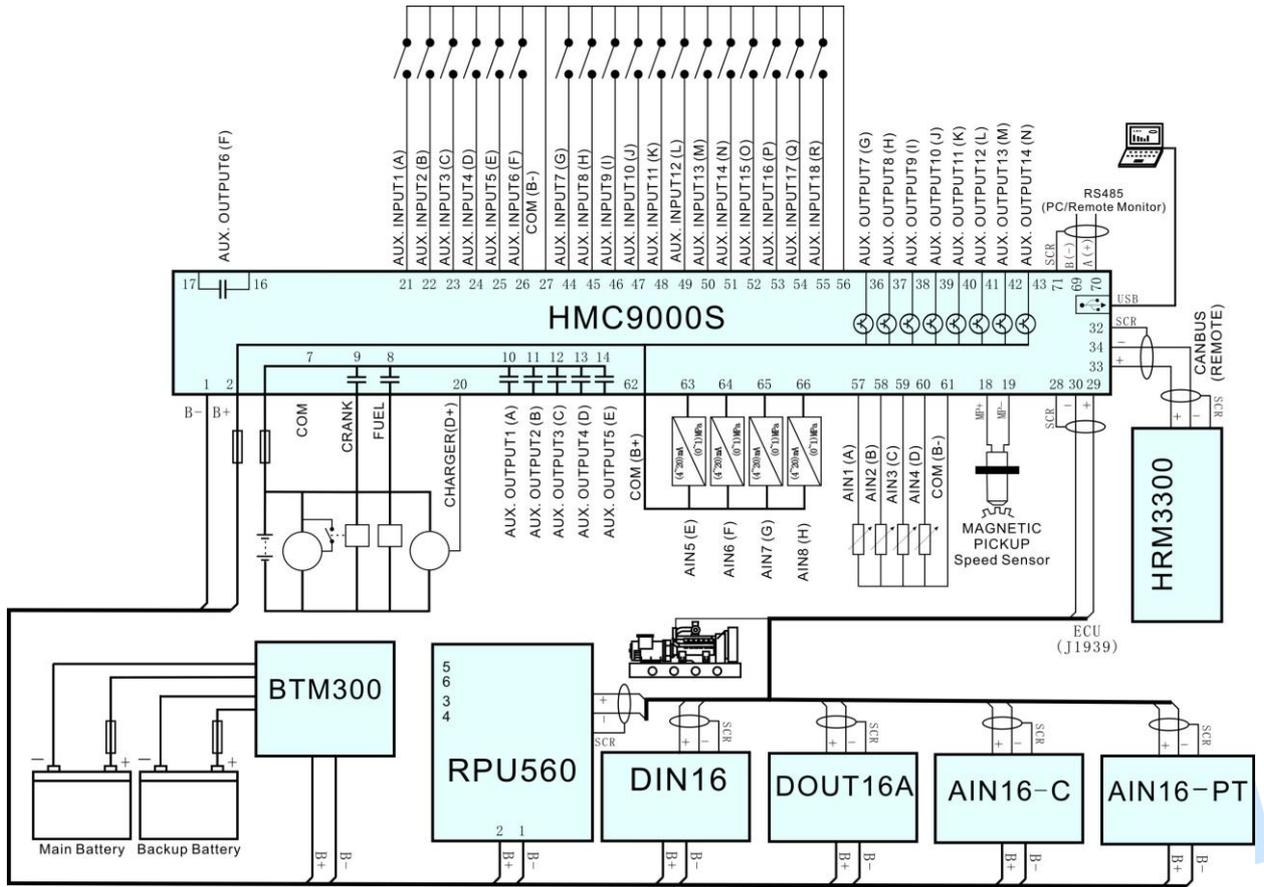


Fig. 5 HMC9000S Typical Wiring Diagram

NOTE:

1. Power supply for fuel relay, starting relay and auxiliary outputs 1~5 are provided by terminal 7.
2. Auxiliary outputs 7-14 are working via transistors and drive current is 0.5A; it can be connected directly if the external device is lower than 0.5A.
3. Controller expansion modules can only be used together with the main controller; however, the main controller can be used separately.
4. Communication with PC can be realized via RS485 and USB ports.
5. Remote module is equipped with CANBUS port, which can be connected to REMOTE port of main control module to do remote control.

12 COMMUNICATION CONFIGURATION AND CONNECTION

HMC9000A/HMC9000S genset automation controller possesses RS485 port and USB communication port, which allow the controller to connect with open-structured Local Area Network (LAN). RS485 and USB employ ModBus communication protocol. With the help of PC or the software on the DAS (Data Acquisition System), they can provide a simple and useful marine engine monitoring system management scheme and realize remote control, remote measurement and remote communication (“three remotes”) functions.

For more information about communication protocols, please refer to *HMC9000 Communication Protocol*.

RS485 Communication parameters:

Module address	1 (Range: 1~254, user-defined, default: 1)
Baud rate	9600 bps
Data bit	8 bit
Parity check bit	None
Stop bit	2 bit



Fig. 6 HMC9000A/HMC9000S USB And PC Connection Diagram

13 CONTROLLER AND ENGINES EXPANSION (CANBUS) CONNECTION

Users can control a large number of ECU engines by controller expansion ports. Besides, various expansion modules can be connected to the controller for user to adapt different working environments at the same time.

13.1 CUMMINS ISB/ISBE

Table 18 Fuel and Starting Relay Wiring

Terminals of controller	Connector B	Remark
Fuel relay output	39	
Start relay output	-	Connected to starter coil directly.
Auxiliary output port 1	Expansion 30A relay, providing power voltage for 01, 07, 12, 13 terminals.	ECU power; It is set as "ECU power".

Table 19 9-pin Connector Wiring

Controller Terminals	9-pin Connector	Remark
SCR (EXPANSION)	SAE J1939 shield	CAN communication shielding line (connecting to ECU terminal only)
CAN(H) (EXPANSION)	SAE J1939 signal	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	SAE J1939 return	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Cummins ISB.

13.2 CUMMINS QSL9

It is suited for CM850 engine controller module.

Table 20 Fuel and Starting Relay Wiring

Controller Terminals	50-pin Connector	Remark
Fuel relay output	39	
Start relay output	-	Connected to starter coil directly.

Table 21 9-pin Connector Wiring

Terminals of controller	9 pin connector	Remark
SCR (EXPANSION)	SAE J1939 shield-E	CAN communication shielding line (connect to ECU terminal only)
CAN(H) (EXPANSION)	SAE J1939 signal-C	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	SAE J1939 return-D	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Cummins-CM850.

13.3 CUMMINS QSM11

It is suited for CM750 engine controller module. Engine types: QSM11 G1, QSM11 G2.

Table 22 Fuel and Starting Relay Wiring

Controller Terminals	C1 Connector	Remark
----------------------	--------------	--------

Fuel relay output	5&8	
Start relay output	-	Connected to starter coil directly.

Table 23 3-pin Connector Wiring

Controller Terminals	3-pin Data Line Connector	Remark
SCR (EXPANSION)	C	CAN communication shielding line (connected to ECU terminal only)
CAN(H) (EXPANSION)	A	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	B	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Cummins ISB.

13.4 DETROIT DIESEL DDEC III / IV

Table 24 Engine Wiring

Controller Terminals	Engine CAN Port	Remark
Fuel relay output	Expansion 30A relay, providing power voltage for ECU.	
Start relay output	-	Connected to starter coil directly
SCR (EXPANSION)	-	CAN communication shielding line (connected to this terminal only)
CAN(H) (EXPANSION)	CAN(H)	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	CAN(L)	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: General J1939.

13.5 DEUTZ EMR2

Table 25 Engine Wiring

Controller Terminals	F Connector	Remark
Fuel relay output	Expansion 30A relay, providing power voltage for Terminal 14. The fuse is 16A.	
Start relay output	-	Connected to starter coil directly
-	1	Connected to power negative.
SCR (EXPANSION)	-	CAN communication shielding line (connected to this terminal only)
CAN(H) (EXPANSION)	12	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	13	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Volvo EDC4.

13.6 JOHN DEERE

Table 26 Engine Wiring

Controller Terminals	21-pin Connector	Remark
Fuel relay output	G, J	
Start relay output	D	
SCR (EXPANSION)	-	CAN communication shielding line (connected to this terminal only)
CAN(H) (EXPANSION)	V	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	U	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: John Deere.

13.7 MTU MDEC

The engine types suitable for MTU engines are 2000 series, 4000 series.

Table 27 Engine Wiring

Controller Terminals	X1 Connector	Remark
Fuel relay output	BE1	
Start relay output	BE9	
SCR (EXPANSION)	E	CAN communication shielding line (connected to one of the terminals only.)
CAN(H)(EXPANSION)	G	Impedance 120Ω connecting line is recommended.
CAN(L)(EXPANSION)	F	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: MTU-MDEC-303.

13.8 PERKINS

It is suited for ADEM3/ADEM4 Engine Control Module. Engine types: 2306; 2506; 1106; 2806.

Table 28 Engine Wiring

Controller Terminals	Connector	Remark
Fuel relay output	1,10,15,33,34	
Start relay output	-	connected to starter coil directly
SCR (EXPANSION)	-	CAN communication shielding line (connected to controller's terminal only)
CAN(H) (EXPANSION)	31	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	32	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Perkins.

13.9 SCANIA

It is suited for S6 Engine Control Module. Engine types: DC9, DC12, DC16.

Table 29 Engine Wiring

Controller Terminals	B1 Connector	Remark
Fuel relay output	3	
Start relay output	-	Connected to starter coil directly
SCR (EXPANSION)	-	CAN communication shielding line (connected to controller's terminal only)
CAN(H) (EXPANSION)	9	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	10	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Scania.

13.10 VOLVO EDC3

It is suited for engine types: TAD1240; TAD1241; TAD1242.

Table 30 Fuel and Starting Relay Wiring

Controller Terminals	"Stand Alone" Connector	Remark
Fuel relay output	H	
Start relay output	E	
Auxiliary output 1	P	Set auxiliary output 1 as "Preheating until cranking" and set preheating time as 5 seconds.

Table 31 CANBUS Wiring

Controller Terminals	"Data Bus" Connector	Remark
SCR (EXPANSION)	-	CAN communication shielding line (connected to controller's terminal only)
CAN(H) (EXPANSION)	1	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	2	Impedance 120Ω connecting line is recommended.

NOTE: Engine type of the testing software chooses: Volvo.

13.11 VOLVO EDC4

The suitable engine types are TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, and TAD722.

Table 32 Engine Wiring

Controller Terminals	Connector	Remark
Fuel relay output	Expansion 30A relay, providing power voltage for Terminal 14. The fuse is 16A.	
Start relay output	-	Connected to starter coil directly.
	1	Connected to battery negative.
SCR (EXPANSION)	-	CAN communication shielding line (connected to controller's terminal only)
CAN(H) (EXPANSION)	12	Impedance 120Ω connecting line is recommended.

CAN(L) (EXPANSION)	13	Impedance 120Ω connecting line is recommended.
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▲NOTE: Engine type of the testing software chooses: Volvo EDC4.

13.12 VOLVO-EMS2

It is suitable for Volvo engines: D9、D13、D16、EMS.

Table 33 Engine Wiring

Controller Terminals	Engine CAN Port	Remark
Auxiliary output 2	5	ECU power supply; Set auxiliary output 2 as “ECU Power Supply”.
CAN(H) (EXPANSION)	1(CAN H)	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	2(CAN L)	Impedance 120Ω connecting line is recommended.

This engine type supports input port speed adjustment. Set Input 1 speed raising input; and Input 2 speed dropping input. After normal running speed raising/dropping function shall be realized via input ports.

▲NOTE: Engine type of the testing software chooses: Volvo-EMS2.

13.13 BOSCH

It is suited for Yuchai Bosch common rail electronically controlled engines.

Table 34 Engine Wiring

Controller Terminals	42-pin Engine Port	Remark
Fuel relay output	1.40	Connected to engine ignition switch.
Start relay output	-	Connected to starter coil directly
SCR (EXPANSION)	-	CAN communication shielding line (connected to controller’s terminal only)
CAN(H) (EXPANSION)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L) (EXPANSION)	1.34	Impedance 120Ω connecting line is recommended.

Table 35 Power Wiring

Battery	2-pin Engine Port	Remark
Battery negative	1	Wire size: 2.5mm ²
Battery positive	2	Wire size: 2.5mm ²

▲NOTE: Engine type of the testing software chooses: BOSCH.

▲NOTE: Please contact us if you have any questions about the controller and ECU connection.

13.14 EXPANSION APPLICATIONS

By EXPANSION communication ports users can develop different application modules. For details please see as follows:

- RPU560A Safeguard Module: It is used with the main controller together via CANBUS port. If safeguard module does not receive signals from the main controller for more than 1 second, and the main controller has faults and inputs are inactive, it will take over engine control; until stop

input or overspeed stop the working engine it can stop. The input port function, output port function and overspeed threshold alarm can be users-defined. It can be connected with HMC9000A/HMC9000S.

- AIN16 Analog Input Module: It is used with the main controller together via CANBUS port. It has 16-way inputs and all inputs are PT100 and 4-20mA, and analog inputs are 10, 11. It can also choose K type thermocouple input. All alarm threshold values and ranges can be set through HMC9000S and they will not miss when power is off.
- DIN16 Digital Input Module: It is used with the main controller together via CANBUS port. It has 16-way inputs. All inputs can be configured through HMC9000S. All input parameters are stored in HMC9000A/HMC9000S and they will not miss when power is off.
- DOUT16 Digital Output Module: It is used with the main controller together via CANBUS port. It has 16-way outputs. All outputs can be configured through HMC9000S/HMC9000A. All output parameters are stored in HMC9000A/HMC9000S and they will not miss when power is off.
- LA16 Lamp Indication Module: It is used with the main controller together via CANBUS port. It has 16-way LED outputs. Every LED way has red, green, and yellow colors which are optional and light intensity can be adjusted. The output power of every way can be set by HMC9000S controller. The parameters configured are stored in HMC9000S and they won't lose when power is off.
- HRM3300 Remote Monitoring Controller: It is used with the main controller together via CANBUS port. It can realize start, stop, alarm mute etc. operations on the engine from remote-distance. All parameters and records are all displayed on the remote monitoring controller.
- AIN16-C 4~20mA Collection Module: It is used with the main controller together via CANBUS port. It has 16-way 4~20mA inputs. Alarms and names of every analog input can be configured by HMC9000S controller. The parameters configured are stored in HMC9000S and won't lose when power is off.
- AIN16-PT PT100 Collection Module: It is used with the main controller together via CANBUS port. It has 16-way PT100 inputs. Alarms and names of every analog input can be configured by HMC9000S controller. The parameters configured are stored in HMC9000S and won't lose when power is off.
- AIN16-M01 Analog Input/Output Module: It is used with the main controller together via CANBUS port. It has 1 way 4~20mA input, 8-way PT100 sensor inputs, 3-way speed sensor inputs and 4-way 4~20mA outputs. Alarms and names of every analog input and the sensors related with analog outputs can be configured through HMC9000S controller. The parameters configured are stored in HMC9000S and won't lose when power is off.
- AIN8 Analog Signal Collection Module: It is used with the main controller together via CANBUS port. It has 8-way analog (optional resistance, voltage and current type) inputs. Alarms and names of every analog input can be configured by HMC9000A controller. The parameters configured are stored in HMC9000A and won't lose when power is off.
- HMP300 Power Quantity Protection Module: It is used with the main controller together via CANBUS port. It can collect voltage, current, power etc. data and when the data is out of the range it can protect the outputs. It can only be connected with HMC9000A.

▲NOTE: Only in remote mode can the remote control module control the engine; in local mode, it can only monitor the engine, but not control.

14 REMOTE MONITORING INTERFACE

This expansion port is a CANBUS port for connecting remote control module.

HRM3300 Remote Control Module: It is used with the main controller together via CANBUS port. It can realize start, stop, alarm mute etc. operations on the engine from remote-distance. All parameters and records are all displayed on the remote monitoring controller.

NOTE: Only in remote mode can the remote control module control the engine; in local mode, except Stop, other keys are inoperative.

15 INSTALLATION

HMC9000A/HMC9000S has embedded panel structure. It is fixed with the help of fixing clips. Overall dimensions and cutout sizes can be seen below.

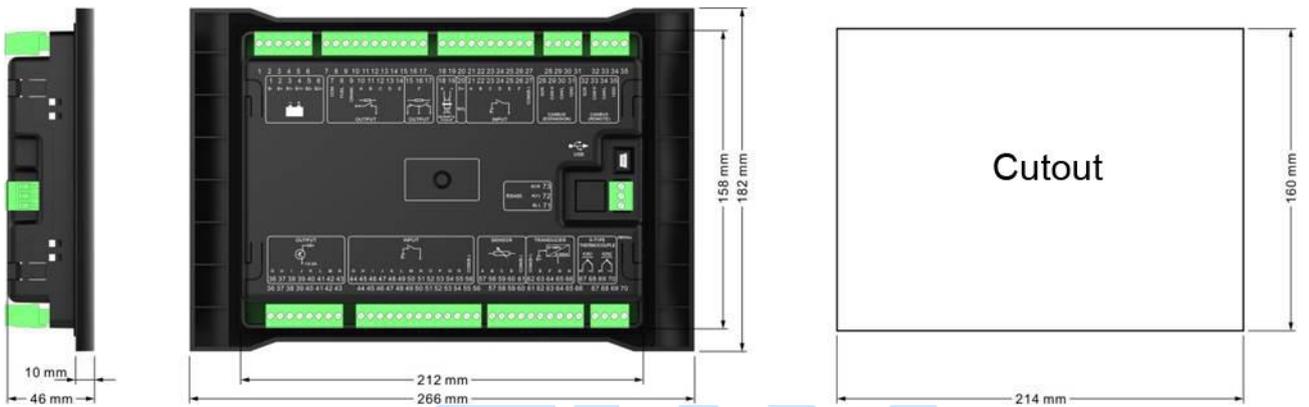


Fig. 7 Installation Size

16 TROUBLESHOOTING

Table 36 Troubleshooting List

Problem	Possible Solution
No response on controller when it is energized.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check whether the water/cylinder temperature is too high or not; Check DC fuse.
Emergency shutdown	Check emergency shutdown button function is correct or not; Check whether there is error in connecting wires.
Low oil pressure alarm after engine has started.	Check oil pressure sensor and its connection wirings.
High water temperature alarm after engine has started.	Check water temperature sensor and its wirings.
Shutdown alarm when engine is running	Check relevant switches and its wirings based on the information on LCD; Check auxiliary digital input port.
Start failure	Check fuel return circuit and its connection wirings; Check starting power; Check speed sensor and its connection wirings; Consult engine manual.
No response on starter	Check starter wirings; Check starting power.
RS485 abnormal communication	Check wirings; Check if RS485 A and B wires are connected in the opposite way; Check if RS485 transfer module is damaged; Check if PC communication port is damaged.
ECU communication failure or wrong data	Check wirings; Check if H and L CANBUS wires are connected in the opposite way; Check if ECU is damaged; Check if the engine type is correct; Check if ECU power output is correct.
Auxiliary input alarm	Check input connection wirings; Check if input polarity configuration is correct.