

SmartGen

MAKING CONTROL SMARTER

HMC9100A/HMC9100S DIESEL ENGINE CONTROLLER USER MANUAL



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Table 1 Software Version

Date	Version	Content
2024-12-15	1.0	Original release.

Table 2 Symbol Instruction

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

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1 OVERVIEW

HMC9100A/HMC9100S Diesel Engine Controller integrates digital, intelligent and network technologies together, and is applicable for single diesel engine automation and monitoring system to achieve remote control/local start/stop, data measurement, alarm protection and “three remotes” (remote control, remote measuring and remote communication) functions. It adopts 5-inch LCD display screen with optional Chinese/English languages interface. It is easy and reliable to operate.

HMC9100A/HMC9100S Diesel Engine Controller adopts 32-bit ARM processor and can achieve precise measuring for multiple parameters, fixed value adjustment, time setting, and threshold adjustment etc. The parameter 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 systems, marine emergency genset, main propulsion systems, main genset and pump engines.

HMC9100A/HMC9100S Diesel Engine Controller has SAE J1939 Interface, which can communicate with ECU engines with J1939 interface. Speed, water temperature, oil temperature and oil pressure etc. parameters can be displayed and read on the LCD directly through communication interface, getting rid of sensor installation and avoiding complex wires. All kinds of module expansion can be realized via this interface. Simple wiring ensures fast transmission speed and high reliability.

HMC9100A/HMC9100S Diesel Engine Controller has remote monitoring interface that can perform start/stop and other functions remotely.

2 MODEL COMPARISON

HMC9100 has two models: HMC9100S and HMC9100A.

Table 3 Model Comparison

Item	HMC9100S	HMC9100A	Remark
LCD Size/Resolution	5.0" 800*480	5.0" 800*480	
Inputs	18	18	
Outputs	14	14	
Resistance Type Sensors	4	4	
Current TypeSensors	3	3	
Resistor/Voltage/Current Configurable Sensor	1	1	
Type K Sensor	2	2	
Expansion CANBUS	•	•	
Remote CANBUS	•	•	
RS485 Interface	•	•	Support MODBUS RTU communication protocol
USB Interface	•	•	
USB Flash Drive	•	•	
ETHERNET Interface	•	•	2-way network
RPU560B Expansion	•	•	Max. expand 1
DOUT16B Expansion	•	•	Max. expand 2 (expand 1 for HMC9100A)
AIN8 Expansion	•	•	Max expand 2 (expand 1 for HMC9100A)
HMC9100RM Expansion	•	•	Max. expand 16
HMP300 Expansion	•		Max. expand 1
AIN16M01 Expansion	•		Max. expand 1
AIN23 Expansion	•		Max. expand 2
MIO14 Expansion	•		Max. expand 1
DIN16A Expansion	•		Max. expand 2

3 PERFORMANCE AND CHARACTERISTICS

- Core of 32-bit ARM micro-processor, 5-inch LCD display with backlight, optional Chinese/English language, touch-button operation;
- Ability of controlling and communicating with dozens of ECU engines with J1939 interface. It can also connect with analog input/output module, digital input/output module, redundant protection module, power protection module, analog input module etc. for users' convenience and needs;
- Realizing the function of remote monitoring the engine via REMOTE (CANBUS) interface. Under the remote control 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 with MODBUS protocol;
- Custom protocol function: user can put the data needed for different addresses into a custom protocol address for reading;
- Equipped with two ETHERNET communication interfaces. It can realize the functions of data communication and "three-remotes" by installing monitoring software on PC with TCP-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 memory so that they will not disappear in case of power outage;
- Three-way 4-20mA inputs: it can connect pressure or liquid level signals;
- Four-way resistance sensor inputs: it can connect pressure signal, PT100 temperature signal, liquid level signal or other signals;
- 1-way resistor/voltage/current configurable sensor, suitable for different kinds of sensors;
- Two K-type thermocouple inputs: it can connect exhaust temperature signals;
- USB flash drive memory function: it can store running log data;
- Four types of alarms can be set: shutdown, warning, unload, alarm;
- 60 channels for ECU SPN data display and Chinese/English name is selectable to set;
- ECU alarm can be set separately, up to 20 items of ECU alarms are supported;
- Support max. 40 alarm codes of ECU SPN custom display and alarm output;
- Custom interface function is available, data channel selection can be realized according to the different functions and displayed on the same page. Up to 5 screens of custom interface are supported with max.4 pages display for each screen;
- Max. 16-way custom status display can be realized and configured;
- Custom standby engine display function can be realized according to the different functions and configured at one interface to display. Max. 16-way standby engine status display is supported;
- With PLC logic programming function and users can program it based on their demands;
- It can realize custom difference alarm and average alarm for different sensor channels;
- Real-time calendar, real-time clock, and total running time accumulation function;
- Displaying the total start times;
- Built-in speed detection function: it can precisely judge successful start status, normal running

status and over speed status;

- Circularly save 500 items of events and 500 items of alarm records, and user can search them on site;
- Dual power supply monitoring function: under voltage or over voltage alarm can be performed through collected power voltage;
- All parameters are adjusted by digital method: it gets rid of the analog adjustment methods of ordinary potentiometers and improves the reliability and stability of the whole unit;
- Break wire detection function for some input/output ports;
- Modular structure design, and embedded installation way: compact structure, small size, and convenient operation.

4 TECHNICAL PARAMETERS

Table 4 Technical Parameters

Item	Content
Working Voltage	DC18.0V ~ DC35.0V, DC reverse connection protection (only for 24V system) Resolution: 0.1V Accuracy: 1%
Overall Power Consumption	<9W (Standby mode: ≤6W)
Speed Sensor	Voltage: 1.0V ~ 24.0V (RMS) Frequency: 5Hz ~ 10000Hz
Analog Sensor	Resistance input Range: 0Ω ~ 1000Ω Resolution: 0.1Ω Accuracy: 1Ω (below 300Ω)
	Voltage input Range: 0V ~ 5V Resolution: 0.01V Accuracy: 1%
	Current input Range: 0mA ~ 20mA Resolution: 0.01mA Accuracy: 1%
Start Output	16A DC24V DC supply (relay output)
Furl Relay Output	16A connecting to COM
Aux. Relay Output 1	7A connecting to COM
Aux. Relay Output 2	7A connecting to COM
Aux. Relay Output 3	7A connecting to COM
Aux. Relay Output 4	7A connecting to COM
Aux. Relay Output 5	7A connecting to COM
Aux. Relay Output 6	7A AC250V voltage free
Aux. Relay Output 7~14	B+ DC supply, output current 0.5A
RS485	Isolation, half-duplex, 9600 baud rate, no parity, 1/2 stop bit

Item	Content
ECU CAN	Isolation, 250kbps baud rate defaulted, communication distance is less than or equal to 100m
REMOTE CAN	Isolation, 250kbps baud rate defaulted, baud rate can be configured. Communication distance is less than or equal to 100m(250kbps)/150m(125kbps).
ETHERNET	Support 100Mbps network communication, communication distance is less than 100m
Vibration	5Hz~8Hz: $\pm 17\text{mm}$ 8Hz~500Hz: $a=4\text{g}$ 100Hz~500Hz: $a=2\text{g}$ IEC 60068-2-6
Shock	50g, 11ms, half-sine, three consecutive shocks are applied in each of the three mutually perpendicular directions, i.e. a total of 18 times. IEC 60068-2-27
Bump	20g_n (200m/s^2), 16ms IEC 60255-21-2
Case Dimension	242mm x 178mm x 55mm
Installation Method	Fixing clips
Working Temperature	$(-25\sim+70)^\circ\text{C}$
Working Humidity	$(20\sim93)\%\text{RH}$
Storage Temperature	$(-25\sim+80)^\circ\text{C}$
Protection Level	IP65: adding a waterproof gasket between controller and screen.
Weight	1.1kg

5 OPERATION

5.1 CONTROLLER PANEL

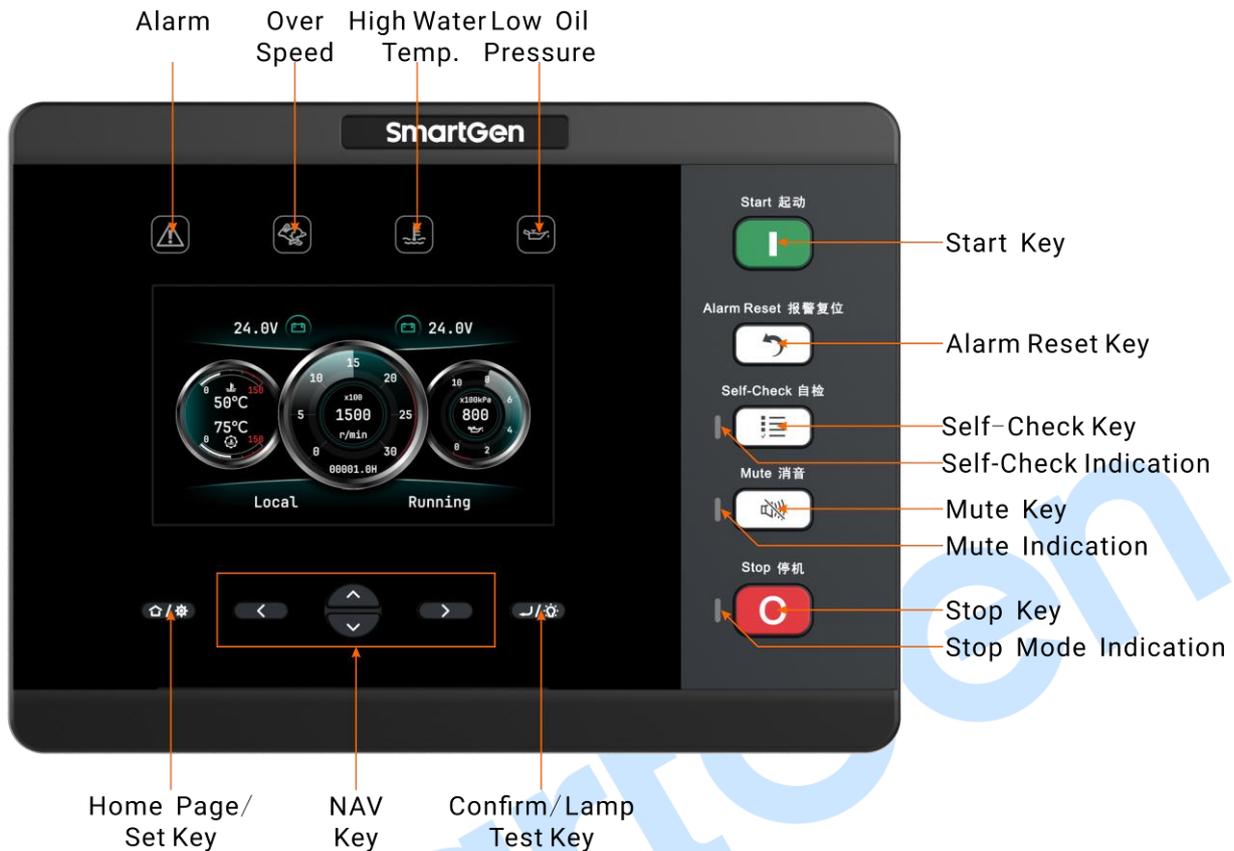


Fig.1 HMC9100A/9100S Front Panel Indication

Table 5 LED Function Description

Icon	Description	Remark
	Common alarm icon, yellow for warning alarm, red for shutdown alarm, off for no alarm	Warning alarm: flash frequency is once per second Shutdown alarm: flash frequency is 5 times per second
	Over speed alarm icon, yellow for warning alarm, red for shutdown alarm, off for no alarm	Warning alarm: flash frequency is once per second Shutdown alarm: flash frequency is 5 times per second
	High water temperature alarm icon, yellow for warning alarm, red for shutdown alarm, off for no alarm	Warning alarm: flash frequency is once per second Shutdown alarm: flash frequency is 5 times per second
	Low oil pressure alarm icon, yellow for warning alarm, red for shutdown alarm, off for no alarm	Warning alarm: flash frequency is once per second Shutdown alarm: flash frequency is 5 times per second

5.2 KEY FUNCTION DESCRIPTION

Table 6 Key Function Description

Icon	Function	Description
	Stop	In local mode, press it to stop the operating engine; In the stop process, press it again to fast stop the engine.
	Start	In local mode, press it to start the engine.
	Alarm Reset	Press it can reset alarm if there is alarm information on the screen.
	Self-check	Press it can enter self-check mode, then can test various threshold alarms in standby status.
	Alarm Mute	It can mute audible alarms and the alarm indicator can be changed from flashing to illuminated.
	Homepage	Press it can return to homepage, long press for more 1s can enter setting page.
	Lamp Test	Press it can confirm parameter change in parameter setting page. Press it can test panel LED in data display page.
	Up/Increase	Screen scroll; Move the cursor up and increase the value in setting.
	Down/Decrease	Screen scroll; Move the cursor down and decrease the value in setting.
	Left	Page scroll; Move the cursor left in setting.
	Right	Page scroll; Move the cursor right in setting.

NOTE: Default password is 00318. 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.

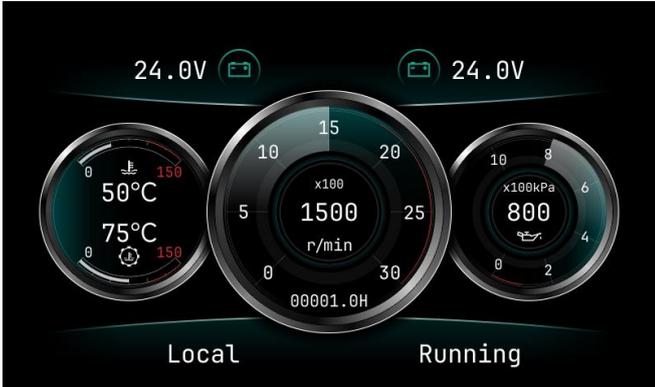
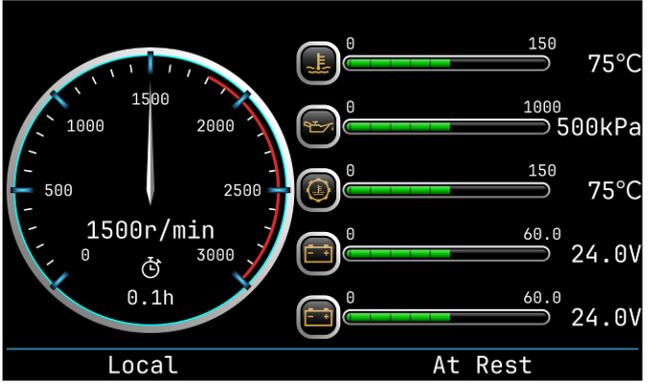
5.3 LCD DISPLAY

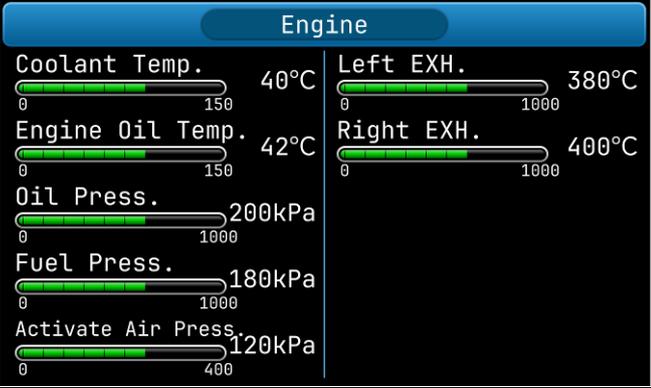
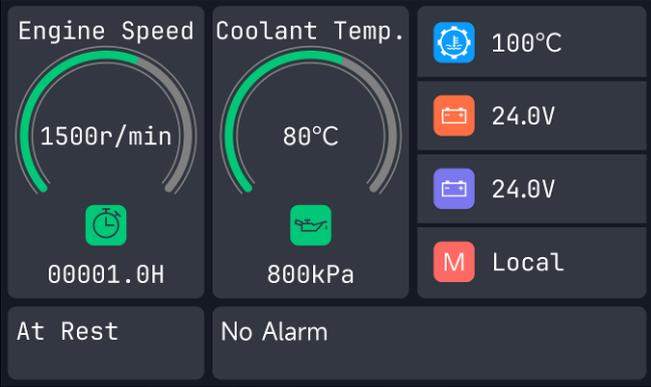
5.3.1 DISPLAY THEME

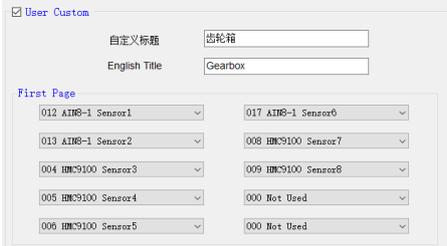
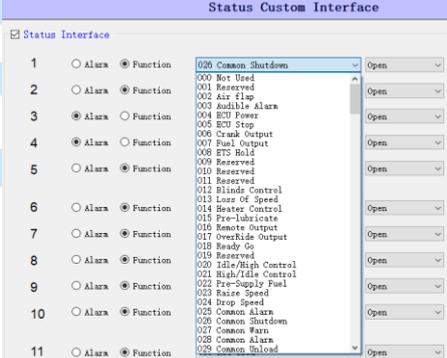
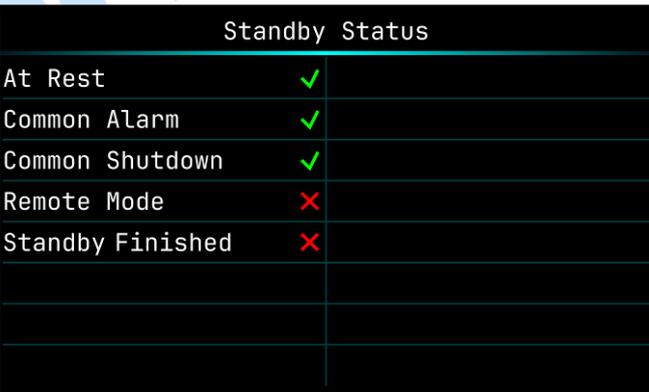
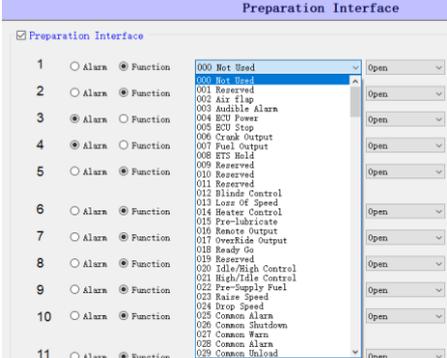
Three different styles of themes for choosing and can be selected in module configuration. The selected theme will only be effective when you power it on again.

5.3.2 MAIN DISPLAY

Table 7 Display Screen

Position	Content	Description
Main screen (Theme 1)		<p>1: Main screen displays 2-way power voltage.</p> <p>2: Display 1-way speed.</p> <p>3: Display 1-way water temperature. (display channel can be selected. 1# sensor is defaulted.)</p> <p>4: Display 1-way oil temperature. (2# sensor)</p> <p>5: Display 1-way oil pressure. (display channel (display channel can be selected, 5# sensor is defaulted)</p> <p>6: Display controller mode.</p> <p>7: Display engine status.</p>
Sensor Screen (Theme 1)		<p>The screen title, corresponding sensor channel and the Chinese/English name for the sensor channel can be configured. The displayed sensor contents can be customized.</p>
Main Screen (Theme 2)		<p>1: Main screen displays 2-way power voltage.</p> <p>2: Display 1-way speed.</p> <p>3: Display 1-way water temperature. (display channel can be selected. 1# sensor is defaulted.)</p> <p>4: Display 1-way oil temperature. (2# sensor)</p> <p>5: Display 1-way oil pressure. (display channel (display channel can be selected, 5# sensor is</p>

Position	Content	Description
		defaulted) 6: Display controller mode. 7: Display engine status.
Sensor Screen (Theme 2)		The title, corresponding sensor channel and the Chinese/English name for the sensor channel can be configured. The displayed sensor contents can be customized.
Main Screen (Theme 3)		1: Main screen displays 2-way power voltage. 2: Display 1-way speed. 3: Display 1-way water temperature. (display channel can be selected. 1# sensor is defaulted.) 4: Display 1-way oil temperature. (2# sensor) 5: Display 1-way oil pressure. (display channel (display channel can be selected, 5# sensor is defaulted) 6: Display controller mode. 7: Display engine status.
Sensor Screen (Theme 3)		The title, corresponding sensor channel and the Chinese/English name for the sensor channel can be configured. The displayed sensor contents can be customized.
Screen Editing		Custom screen:

Position	Content	Description
<p>Screen Editing</p>		<p>Content and theme of the screen can be customized by using PC software. Max.5 themes can be set and also max.5 pages of each screen can be set.</p> 
<p>Custom Status Screen</p>		<p>Custom status display: Up to 16 states are selected to display separately by using PC software. See the output port setting list for selections.</p> 
<p>Standby Status Screen</p>		<p>Custom standby status display: Up to 16 states are selected to display separately by using PC software. See the output port setting list for selections.</p> 

6 ENGINE START/STOP PROCEDURE

6.1 REMOTE START/STOP OPERATION

6.1.1 CONFIGURATION REQUIREMENTS

Any one of the auxiliary input ports can be configured to remote mode. 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", fuel relay outputs for 1s, and then start relay outputs. 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 engine 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 used to start the engine, after pressing the Start key, there is no starting delay, 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 is de-energized and automatically judges whether stop is completed;
 - e) When "Fail to Stop Delay" begins, complete stop is detected automatically;
- When the engine 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 engine, after pressing the Stop key, there is no stopping delay, other processes are the same as the above stop input.

6.14 LOCAL START/STOP OPERATION

6.15 CONFIGURATION REQUIREMENTS

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

6.16 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 1s, and starter relay outputs;
- c) If the engine fails to start, the controller will transfer to standby status, the local mode will be energized once and start failure alarm will not be initiated;
- d) Among the starting times, if the engine starts, it shall enter "Safety On Time". After "Safety On Time", it enters "Normal Running".

6.17 LOCAL STOP SEQUENCE

- a) Press  and "ETS Solenoid Hold" is then initiated;
- b) When "ETS Solenoid Hold" begins, ETS relay is energized and fuel relay is de-energized;
- c) "Fail to Stop Delay" begins, and complete stop is detected automatically.
- d) When the engine 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.).

6.2 AUTO START/STOP OPERATION

6.2.1 CONFIGURATION REQUIREMENTS

Any one of the input ports can be configured to "Auto Mode Input". After the input is active, the controller shall be operated in auto start/stop mode. In auto mode, there're two start/stop modes:

1: Auto start/stop operation can be set, when input is active and engine starts, while input is inactive and engine stops.

2: Auto start/stop input can be set, when auto start input is active and engine starts, while auto stop input is active and engine stops.

NOTE 1: Only one start/stop mode can be used, both of the two modes cannot be used at the same time.

6.2.2 AUTO START SEQUENCE

- a) When "Auto Start" input or "Auto Start/Stop" input is active, "Preheat Delay" starts;
- b) Preheat relay is energized (if configured), and LCD status page displays "Preheat Delay XX";
- c) After "Preheat Delay", fuel relay outputs for 1s, and then start relay outputs. 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;
- d) 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;

- e) Among the starting times, if it starts, it enters "Safety On Time". After "Safety On Time", it enters "Start Idle Delay" (if configured).
- f) When "Start Idle Delay" is finished, "High-speed Warming Up" time starts (if configured);
- g) When "High-speed Warming Up Delay" ends, the engine works normally.

6.2.3 AUTO STOP SEQUENCE

- a) When stop input is active or auto start/stop input is disconnected, the "High-speed Cooling" is initiated;
- b) Once the "High-speed Cooling" has expired, is energized, "Stop Idle Delay" (if configured) starts, idling relay is energized and outputs;
- c) After "Stop Idle Delay", "ETS Solenoid Hold" begins, ETS relay is energized and outputs and meanwhile fuel relay is de-energized and automatically judges whether stop is complete;
- d) When "Fail to Stop Delay" begins, complete stop is detected automatically;
- e) When the engine 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.).

6.3 START/STOP DESCRIPTIONS FOR DIFFERENT MODES

Table 8 Start/Stop Descriptions

System Mode	Key Start	Key Stop	Remote Start	Comm Start	Comm Stop	Stop Input	Auto Start/ Stop	Auto Start	Remote Monitoring Module Start	Remote Monitoring Module Stop
Local	√	√	×	×	×	×	×	×	×	×
Remote	×	×	√	√	√	√	×	×	√	√
Auto	×	×	×	×	×	√	√	√	×	×

7 PROTECTION

7.1 PROTECTION ALARM TYPES

There're 4 types of protection alarm types:

1: Warning: The controller LCD displays alarm information and record alarm contents. When the corresponding warning output is active, controller will not stop the engine.

2: Shutdown: The controller LCD displays alarm information and record alarm contents. When the corresponding shutdown output is active, controller will initiate shutdown command.

3: Unload: The controller LCD displays alarm information and record alarm contents. When the corresponding unload output is active, controller will not stop the engine.

4: Alarm: The controller LCD displays alarm information and record alarm contents. When the corresponding alarm output is active, controller will not stop the engine.

7.2 WARNING PROTECTION

When controller detects the warning signal, it only warns, but does not stop. At the same time, it displays the alarm type.

Table 9 Warnings

No.	Type	Detection Range	Description
1.	Over Speed	Always active	When the controller detects that the engine speed is over than the set threshold value, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
2.	Loss of Speed Signal	Start idle delay → Stop idle	When the controller detects that the engine speed is 0, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
3.	Start Failure Alarm	Within the setting start attempts, and after the start process	Within the setting start attempts, if the engine fails to start, the controller will send a warning signal the corresponding alarm information will be displayed on LCD.
4.	Stop Failure	After the delay of engine stop	When the stop delay is over, if the engine has the speed signal, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD..
5.	Charging Failure	Active when the engine is normal running	When the controller detects the charger voltage of engine is lower than the setting threshold value, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
6.	Inputs 1~18 Warn	Active range of user-defined	When the controller detects that the alarms of the Aux.1~18 inputs are active, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
7.	ECU Warn	Always be Active	When the controller detects that ECU warns, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
8.	Sensor 1~10 High	Over than setting alarm speed	When the controller detects that the sensor 1~10 high warn is active, it will send a warning signal and the corresponding alarm information will be displayed on

No.	Type	Detection Range	Description
			LCD.
9.	Sensor 1~10 Low	Over than setting alarm speed	When the controller detects that the sensor 1~10 low warn is active, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
10.	Sensor 1~10 Open	Always active	When the controller detects that the sensor 1~10 Open warn is active, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
11.	Master Power Under Volt. Alarm	Always active	When the controller detects that the voltage of B1 power supply is lower than the setting threshold value and the time is longer than the set alarm delay, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
12.	Master Power Over Volt. Alarm	Always active	When the controller detects that the voltage of B1 power supply is over than the setting threshold value and the time is longer than the set alarm delay, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
13.	Backup Power Under Volt. Alarm	Always active	When the controller detects that the voltage of B2 power supply is lower than the setting threshold value and the time is longer than the set alarm delay, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
14.	Backup Power Over Volt. Alarm	Always active	When the controller detects that the voltage of B2 power supply is over than the setting threshold value, and the time is longer than the set alarm delay, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
15.	RPU560 Comm Failure	Always active (Detecting when RPU560B enables)	When the controller detects that the communication of RPU560B module fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
16.	DOUT16B Module1 Comm Failure	Always active (Detecting when DOUT16 1 enables)	When the controller detects that the communication of DOUT16B 1 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
17.	DOUT16B Module2 Comm Failure	Always active (Detecting when DOUT16 2 enables)	When the controller detects that the communication of DOUT16B 2 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
18.	HMP300 Comm Failure	Always active (Detecting when HMP300 enables)	When the controller detects that HMP300 communication fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
19.	AIN8 Module 1 Comm Failure	Always active (Detecting when AIN8 1 enables)	When the controller detects that AIN8 communication fails, it will send a warning signal and display "AIN8 1 comm failure" on LCD.
20.	AIN8 Module 2 Comm Failure	Always active (Detecting when	When the controller detects that AIN8 communication fails, it will send a warning signal and the

No.	Type	Detection Range	Description
		AIN8 2 enables)	corresponding alarm information will be displayed on LCD.
21.	AIN23 Module1 Comm Failure	Always active (Detecting when AIN23 1 enables)	When the controller detects that the communication of AIN23 module 1 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
22.	AIN23 Module2 Comm Failure	Always active (Detecting when AIN23 2 enables)	When the controller detects that the communication of AIN23 module 2 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
23.	AIN16-M01 Module1 Comm Failure	Always active (Detecting when AIN16-M01 1 enables)	When the controller detects that the communication of AIN16-M01 module 1 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
24.	DIN16A Module1 Comm Failure	Always active (Detecting when DIN16A 1 enables)	When the controller detects that the communication of DIN16 module 1 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
25.	DIN16A Module2 Comm Failure	Always active (Detecting when DIN16A 2 enables)	When the controller detects that the communication of DIN16 module 2 fails, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
26.	Input 1 BW Warn (RPU)	Always active	When the input port 1 of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
27.	Input 2 BW Warn (RPU)	Always active	When the input port 2 of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
28.	Input 3 BW Warn (RPU)	Always active	When the input port 3 of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
29.	Input 4 BW Warn (RPU)	Always active	When the input port 4 of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
30.	Override BW Warn (RPU)	Always active	When the override input of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
31.	Speed BW Warn (RPU)	Always active	When the speed of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
32.	Emergency Stop BW Warn (RPU)	Always active	When the emergency stop of RPU560B module is broken wire, the controller will send a warning signal and the corresponding alarm information will be

No.	Type	Detection Range	Description
			displayed on LCD.
33.	Power Supply Fault		When the voltage of power supply 1 or 2 is less than 5V, the controller will send a warning signal and the corresponding alarm information will be displayed on LCD.
34.	AIN8 Module1 Sensor 1~8 Open	Always active	When the controller detects that the sensor of AIN8 module 1 is open, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
35.	AIN8 Module2 Sensor 1~8 Open	Always active	When the controller detects that the sensor of AIN8 module 2 is open, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
36.	AIN8 Module1 Sensor 1~8 High	Setting Range	When the controller detects that the sensor of AIN8 module 1 is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
37.	AIN8 Module2 Sensor 1~8 High	Setting Range	When the controller detects that the sensor of AIN8 module 2 is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
38.	AIN8 Module1 Sensor 1~8 Low	Setting Range	When the controller detects that the sensor of AIN8 module 1 is low, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
39.	AIN8 Module2 Sensor 1~8 Low	Setting Range	When the controller detects that the sensor of AIN8 module 2 is low, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
40.	AIN23 Module1 Sensor 1~23 Open	Always active	When the controller detects that the sensor of AIN23 module 1 is open, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
41.	AIN23 Module2 Sensor 1~23 Open	Always active	When the controller detects that the sensor of AIN23 module 2 is open, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
42.	AIN23 Module1 Sensor 1~23 High	Setting Range	When the controller detects that the sensor of AIN23 module 1 is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
43.	AIN23 Module2 Sensor 1~23 High	Setting Range	When the controller detects that the sensor of AIN23 module 2 is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
44.	AIN23 Module1	Setting Range	When the controller detects that the sensor of AIN23 module 1 is low, it will send a warning signal and the

No.	Type	Detection Range	Description
	Sensor 1~23 Low		corresponding alarm information will be displayed on LCD.
45.	AIN23 Module2 Sensor 1~23 Low	Setting Range	When the controller detects that the sensor of AIN23 module 2 is low, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
46.	AIN16M01 Sensor 1~12 Open	Always active	When the controller detects that the sensor of AIN16M01 is open, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
47.	AIN16M01 Sensor 1~12 High	Setting Range	When the controller detects that the sensor of AIN16M01 1 is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
48.	AIN16M01 Sensor 1~12 Low	Setting Range	When the controller detects that the sensor of AIN16M01 1 is low, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
49.	ECU Sensor Alarm 1~20 High	Setting Range	When the controller detects that the ECU sensor is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
50.	ECU Sensor Alarm 1~20 Low	Setting Range	When the controller detects that the ECU sensor is low, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
51.	Difference Value 1~4 High	Setting Range	When the controller detects that the difference value is high, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
52.	Difference Value 1~4 Low	Setting Range	When the controller detects that the difference value is low, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
53.	ECU SPN Alarm 1-40	Same ECU SPN & FMI	When controller reads the SPN & FMI code are the same as the set SPN alarm code, it will send a warning signal and the corresponding 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.

Note 1: DOUT16B Module 1: expanding 16 channels of digital output module

Note 1: RPU560B: expanding RPU module

Note 2: HMP300: power protection module

Note 4: AIN8: analog input module

Note 5: MIO14: expanding 14 channels of input/output/analog integrated module

Note 6: HMC9100RM Module: expanding remote monitoring module

Note 7: AIN23 Module: expanding 23 channels of analog input module

Note 8: AIN16-M01: expanding analog input/output module

Note 9: DIN16 Module: expanding 16 channels of digital input/output module

7.3 SHUTDOWN PROTECTION

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

Table 10 Shutdown Alarms

No.	Type	Detection Range	Description
1.	Emergency Stop Alarm	Always active	When the controller detects the emergency stop signal, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
2.	Over Speed Alarm	Always active	When the controller detects that the engine speed is over than the setting threshold value, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
3.	Loss of Speed Signal Alarm	Start idle→stop idle	When the controller detects that the engine speed is 0, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
4.	Input Alarm 1~18	User-defined range	When the controller detects that the alarm of Aux. input 1~18 is active, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
5.	ECU Alarm	Always active	When the controller detects that the alarm of ECU, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
6.	ECU Comm Failure Alarm	Not detection in stop or standby status	When the controller does not detect CAN connection, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
7.	Sensor High Alarm 1~10	Over than the setting alarm speed	When the controller detects that the sensor 1~10 shutdown is active, it will send a shutdown signal and the corresponding alarm information will be displayed according to user defined name on LCD.
8.	Sensor Low Alarm 1~10	Over than the setting alarm speed	When the controller detects that the sensor 1~10 shutdown is active, it will send a shutdown signal and the corresponding alarm information will be displayed according to user defined name on LCD.
9.	Low Oil Pressure	Start idle-stop idle	When the controller detects that the low oil pressure shutdown input is active, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
10.	High Water Temp.	Always active	When the controller detects that the high water temperature shutdown input is active, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
11.	Louvre Fault	Safety on running-stop idle	When the controller detects that the engine is running, and the feedback signal of louvre open is lost, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
12.	Exhaust Baffle Fault	Safety on running-stop idle	When the controller detects that the engine is running, the feedback signal of louvre open is lost and the action selects shutdown, it will send a shutdown signal and the corresponding alarm information will be

No.	Type	Detection Range	Description
			displayed on LCD.
13.	Low Gearbox Working OP	Start idle-stop idle	When the low working oil pressure of gearbox input is active, and the gearbox is not in neutral position, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
14.	Low Gearbox OP	Always active	When the controller detects that the low oil pressure of gearbox input is active, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
15.	AIN8 1 Sensor 1~8 High	Setting Range	When the controller detects that the high sensor shutdown of AIN8 module 1, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
16.	AIN8 2 Sensor 1~8 High	Setting Range	When the controller detects that the high sensor shutdown of AIN8 module 2, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
17.	AIN8 1 Sensor 1~8 Low	Setting Range	When the controller detects that the low sensor shutdown of AIN8 module 1, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
18.	AIN8 2 Sensor 1~8 Low	Setting Range	When the controller detects that the low sensor shutdown of AIN8 module 2, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
19.	AIN23 1 Sensor 1~23 High	Setting Range	When the controller detects that the high sensor shutdown of AIN23 module 1, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
20.	AIN23 2 Sensor 1~23 High	Setting Range	When the controller detects that the high sensor shutdown of AIN23 module 2, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
21.	AIN23 1 Sensor 1~23 Low	Setting Range	When the controller detects that the low sensor shutdown of AIN23 module 1, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
22.	AIN23 2 Sensor 1~23 Low	Setting Range	When the controller detects that the low sensor shutdown of AIN23 module 2, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
23.	AIN16M01 AIN6M01 Sensor 1~12 High	Setting Range	When the controller detects that the high sensor shutdown of AIN16M01, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
24.	AIN6M01 Sensor 1~12 Low	Setting Range	When the controller detects that the low sensor shutdown of AIN16M01, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
25.	ECU Sensor 1~20 High	Setting Range	When the controller detects that the high sensor shutdown of ECU sensor, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
26.	ECU Sensor 1~20 Low	Setting Range	When the controller detects that the low sensor shutdown of ECU sensor, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
27.	Difference Value 1~4 High	Setting Range	When the controller detects that the difference value is high, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
28.	Difference Value 1~4 Low	Setting Range	When the controller detects that the difference value is low, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
29.	Average Value 1~4 High	Setting Range	When the controller detects that the difference value is high, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
30.	Average Value 1~4 Low	Setting Range	When the controller detects that the difference value is low, it will send a shutdown signal and the corresponding alarm information will be displayed on LCD.
<p>▲NOTE 1: The shutdown alarm types of auxiliary inputs must be active when they are configured by users. If controller is in override mode, only emergency shutdown and over speed shutdown are active.</p> <p>▲NOTE 2: ECU shutdown alarm requires "ECU shutdown enable" be active and detects that there is an alarm of ECU shutdown alarm.</p>			

7.4 UNLOADING PROTECTION

When the controller detects the unloading alarm signal, it doesn't stop. At the same time, it displays the alarm type.

Table 11 Unloading Alarms

No.	Type	Detection Range	Description
1	Over Speed	Always active	When the controller detects that the engine speed is over than the set threshold value, it will send a warning signal and the corresponding alarm information will be displayed on LCD..
2	Loss of Speed Signal	Start idle delay → Stop idle	When the controller detects that the engine speed is 0, it will send a shutdown alarm and the corresponding alarm information will be displayed on LCD.
3	Input Alarm 1~18	User defined range	When the controller detects that the alarm of Aux. input 1~18 is active, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
4	Sensor High Alarm 1~10	Over than the setting speed	When the controller detects that the unloading of sensor 1~10 is active, it will send an unload signal, and the corresponding alarm information will be displayed on LCD.
5	Sensor Low Alarm 1~10	Over than the setting speed	When the controller detects that the unload of sensor 1~10 is active, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
6	AIN8 1 Sensor 1~8 High	Setting Range	When the controller detects that the sensor of AIN8 Module 1 is high, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
7	AIN8 2 Sensor 1~8 High	Setting Range	When the controller detects that the sensor of AIN8 Module 2 is high, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
8	AIN8 1 Sensor 1~8 Low	Setting Range	When the controller detects that the sensor of AIN8 Module 1 is low, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
9	AIN8 2 Sensor 1~8 Low	Setting Range	When the controller detects that the sensor of AIN8 Module 2 is low, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
10	AIN23 1 Sensor 1~23 High	Setting Range	When the controller detects that the sensor of AIN23 Module 1 is high, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
11	AIN23 2 Sensor 1~23 High	Setting Range	When the controller detects that the sensor of AIN23 Module 2 is high, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
12	AIN23 Sensor 1 Low	Setting Range	When the controller detects that the sensor of AIN23 Module 1 is low, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
13	AIN23 Sensor 2 Low	Setting Range	When the controller detects that the sensor of AIN23 Module 2 is low, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
14	AIN16M01 Sensor 1~12 High	Setting Range	When the controller detects that the sensor of AIN16M01 is high, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
15	AIN16M01 Sensor 1~12 Low	Setting Range	When the controller detects that the sensor of AIN16M01 is low, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
16	ECU Sensor 1~20 High	Setting Range	When the controller detects that the sensor of ECU is high, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
17	ECU Sensor 1~20 Low	Setting Range	When the controller detects that the sensor of ECU is low, it will send an unloading signal, and the corresponding alarm information will be displayed on LCD.
18	Difference Value 1~4 High	Setting Range	When the controller detects that difference value is high, it will send an unloading signal and the corresponding alarm information will be displayed on LCD.
19	Difference Value 1~4 Low	Setting Range	When the controller detects that the difference value is low, it will send an unloading signal and the corresponding alarm information will be displayed on LCD.
20	Average Value 1~3 High	Setting Range	When the controller detects that average sensor is high, it will send an unloading signal and the corresponding alarm information will be displayed on LCD.
21	Average Value 1~3 Low	Setting Range	When the controller detects that average value is low, it will send an unloading signal and the corresponding alarm information will be displayed on LCD.

7.5 ALARM PROTECTION

When the controller detects the alarm protection signal, it doesn't stop. At the same time, it displays the corresponding alarm protection name.

Table 12 Alarm Protection

No.	Type	Detection Range	Description
1	Over Speed	Always active	When the controller detects that the engine speed is over than the set threshold value, it will send a warning signal and the corresponding alarm information will be displayed on LCD.
2	Loss of Speed Signal	Start idle delay → Stop idle	When the controller detects that the engine speed is 0, it will send a shutdown alarm and the corresponding alarm information will be displayed on LCD.
3	Input Alarm 1~18	User defined range	When the controller detects that the alarm of Aux. input 1~18 is active, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
4	Sensor High Alarm 1~10	Over than the setting speed	When the controller detects that the alarm of sensor 1~10 is active, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
5	Sensor Low Alarm 1~10	Over than the setting speed	When the controller detects that the alarm of sensor 1~10 is active, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
6	AIN8 1 Sensor High Alarm 1~8	Setting Range	When the controller detects the high alarm of AIN8 Module 1, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
7	AIN8 2 Sensor High Alarm 1~8	Setting Range	When the controller detects the high alarm of AIN8 Module 2, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
8	AIN8 1 Sensor Low Alarm 1~8	Setting Range	When the controller detects the low alarm of AIN8 Module 1, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
9	AIN8 2 Sensor Low Alarm 1~8	Setting Range	When the controller detects the low alarm of AIN8 Module 2, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
10	AIN23 1 Sensor High Alarm 1~23	Setting Range	When the controller detects the high alarm of AIN23 Module 1, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
11	AIN23 2 Sensor High Alarm 1~23	Setting Range	When the controller detects the high alarm of AIN23 Module 2, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.

No.	Type	Detection Range	Description
12	AIN23 1 Sensor 1~23 Low Alarm	Setting Range	When the controller detects the low alarm of AIN23 Module 1, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
13	AIN23 2 Sensor 1~23 Low Alarm	Setting Range	When the controller detects the low alarm of AIN23 Module 2, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
14	AIN16M01 Sensor 1~12 High Alarm	Setting Range	When the controller detects the high alarm of AIN16M01, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
15	AIN16M01 Sensor 1~12 Low Alarm	Setting Range	When the controller detects the low alarm of AIN16M01, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
16	ECU Sensor 1~20 High Alarm	Setting Range	When the controller detects the high alarm of ECU sensor, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
17	ECU Sensor 1~20 Low Alarm	Setting Range	When the controller detects the low alarm of ECU sensor, it will send a protection signal, and the corresponding alarm information will be displayed on LCD.
18	Difference Value 1~4 High Alarm	Setting Range	When the controller detects that the difference value is high, it will send a protection signal and the corresponding alarm information will be displayed on LCD.
19	Difference Value 1~4 Low Alarm	Setting Range	When the controller detects that the difference value is low, it will send a protection signal and the corresponding alarm information will be displayed on LCD.
20	Average Value 1~4 High	Setting Range	When the controller detects that the difference value is high, it will send a protection signal and the corresponding alarm information will be displayed on LCD.
21	Average Value 1~4 Low Alarm	Setting Range	When the controller detects that the difference value is low, it will send a protection signal and the corresponding alarm information will be displayed on LCD.

8 WIRING CONNECTION

The back panel of HMC9100A/9100S is as follows:

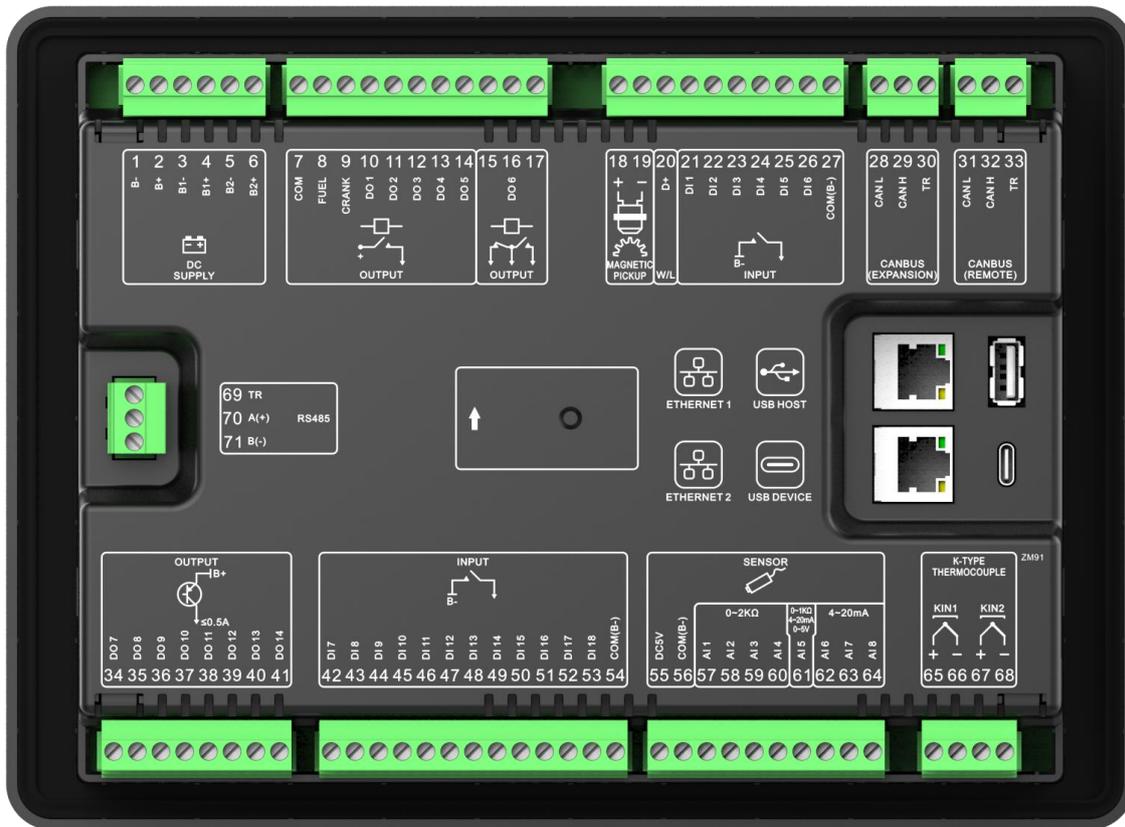
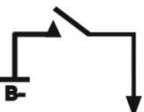
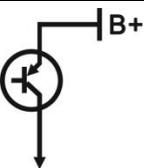
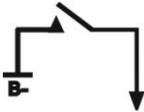
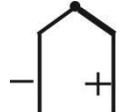


Fig.2 HMC9100A/HMC9100S Back Panel

Table 13 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 (FUEL)	2.5mm ²	DC voltage is supplied by No.7 terminal with rated current 16A.
	9.	Crank Relay Output (CRANK)	2.5mm ²	DC voltage is supplied by No.7 terminal with rated current 16A.
	10.	Digital Output 1 (DO1)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated current 7A.
	11.	Digital Output 1 (DO2)	1.5mm ²	DC voltage is supplied by No.7 terminal

Icon	No.	Function	Cable Size	Description
				with rated current 7A.
	12.	Digital Output 1 (DO3)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated current 7A.
	13.	Digital Output 4 (DO4)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated current 7A.
	14.	Digital Output 5 (DO5)	1.5mm ²	DC voltage is supplied by No.7 terminal with rated current 7A.
	15.			
	16.	Digital Output 6 (DO6)	1.5mm ²	Power free; Rated current: 7A.
	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.	Digital Input 1 (DI1)	1.0mm ²	Digital input.
	22.	Digital Input 2 (DI2)	1.0mm ²	Digital input.
	23.	Digital Input 3 (DI3)	1.0mm ²	Digital input.
	24.	Digital Input 4 (DI4)	1.0mm ²	Digital input.
	25.	Digital Input 5 (DI5)	1.0mm ²	Digital input.
	26.	Digital Input 6 (DI6)	1.0mm ²	Digital input.
	27.	COM(B-) Aux. Input Common Port	1.0mm ²	
CANBUS (EXPANSION)	28.	CAN(L) (EXPANSION)	0.5mm ²	It is externally connected to ECU modules and expansion modules. Impedance 120Ω shielding wire shall be used 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 29 and 30 terminals.
	29.	CAN(H) (EXPANSION)		
	30.	TR		
CANBUS (REMOTE)	31.	CAN(L) (REMOTE)	0.5mm ²	It is externally connected to remote control modules. Impedance 120Ω shielding wire shall be used 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 32 and 33 terminals.
	32.	CAN(H) (REMOTE)		
	33.	TR		
	34.	Digital Output 7 (DO7)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	35.	Digital Output 8 (DO8)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	36.	Digital Output 9 (DO9)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	37.	Digital Output 10	0.5mm ²	B+ voltage output, rated current is 0.5A.

Icon	No.	Function	Cable Size	Description
		(DO10)		
	38.	Digital Output 11 (DO11)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	39.	Digital Output 12 (DO12)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	40.	Digital Output 13 (DO13)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	41.	Digital Output 14 (DO14)	0.5mm ²	B+ voltage output, rated current is 0.5A.
	42.	Digital Input 7 (DI7)	1.0mm ²	Digital input
	43.	Digital Input 8 (DI8)	1.0mm ²	Digital input
	44.	Digital Input 9 (DI9)	1.0mm ²	Digital input
	45.	Digital Input 10 (DI10)	1.0mm ²	Digital input
	46.	Digital Input 11 (DI11)	1.0mm ²	Digital input
	47.	Digital Input 12 (DI12)	1.0mm ²	Digital input
	48.	Digital Input 13 (DI13)	1.0mm ²	Digital input
	49.	Digital Input 14 (DI14)	1.0mm ²	Digital input
	50.	Digital Input 15 (DI15)	1.0mm ²	Digital input
	51.	Digital Input 16 (DI16)	1.0mm ²	Digital input
	52.	Digital Input 17 (DI17)	1.0mm ²	Digital input
	53.	Digital Input 18 (DI18)	1.0mm ²	Digital input
	54.	COM(B-) Aux. Input Common Port	1.0mm ²	Common port of Aux. digital input.
	55.	DC5V	1.0mm ²	Provide power supply (current) for voltage-type sensor.
	56.	COM(B-) AIN1-8 COM	1.0mm ²	Sensor common port, connect to B- internally.
	57.	AIN1	1.0mm ²	Resistance sensor input
	58.	AIN2	1.0mm ²	Resistance sensor input
	59.	AIN3	1.0mm ²	Resistance sensor input
	60.	AIN4	1.0mm ²	Resistance sensor input
	61.	AIN5	1.0mm ²	Resistance/current/voltage type configurable sensor input and defaulted as current type.
	62.	AIN6	1.0mm ²	4-20mA sensor input
	63.	AIN7	1.0mm ²	4-20mA sensor input
	64.	AIN8	1.0mm ²	4-20mA sensor input
	65.	KIN1+	1.0mm ²	K-Thermocouple input
	66.	KIN1-	1.0mm ²	
	67.	KIN2+	1.0mm ²	K-Thermocouple input
	68.	KIN2-	1.0mm ²	
	69.	TR	0.5mm ²	PC programming and monitoring port

Icon	No.	Function	Cable Size	Description
RS485	70.	RS485(A+)	0.5mm ²	(isolation type); The single-end shall be connected to the ground. MODBUS RTU communication protocol is supported. A 120Ω resistor in controller can be connected by 69 and 70 terminals.
	71.	RS485(B-)	0.5mm ²	
USB HOST		USB		Connect with U disk for data log storage.
USB DEVICE		USB DEVICE		Communication with PC monitoring software can be realized.
ETHERNET		ETHERNET		2-way interface can support TCP MODBUS communication protocol and the rate is 100Mbps.

▲NOTE: Removing the starting battery is not allowed during engine operation, otherwise, it will cause the control system to burn due to the high DC input voltage.

SmartGen

9 RANGES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

9.1 USER MENU AND PARAMETER SETTING

Press  for more than 1s to enter the user menu.

—Parameter setting: input the correct password (factory default password is 00318) to enter the interface of parameter setting.

The parameter setting includes the following contents:

- HMC9100 Setting
- AIN8 Module Setting
- DOUT16B Setting
- DIN16A Setting (HMC9100S is available)
- AIN23 Setting (HMC9100S is available)
- AIN16M01 Setting (HMC9100S is available)
- MIO14Setting (HMC9100S is available)

Examples:

Table 14 Parameter Setting

<p style="text-align: center;">Parameter Setting</p> <p>Return</p> <p>HMC9100 Set</p> <p>AIN8 Set</p> <p>DOT16B Set</p> <p>DIN16A Set</p> <p>AIN23 Set</p> <p>AIN16M01 Set</p> <p>MI014 Set</p>	<p>Please input the password</p> <p>*****</p>	<p>The 1st screen:</p> <p> and  are used to change the setting contents;  is used to enter the setting (the 2nd screen);  is used to exit the setting.</p>
--	---	--

<p style="text-align: center;">HMC9100 Setting</p> <p>Return</p> <p>>Module Set</p> <p>>Timer Set</p> <p>>Engine Set</p> <p>>Sensor Set</p> <p>>Input Port Set</p> <p>>Output Port Set</p> <p>>Ethernet Port Set</p> <p>> ECU Sensor</p>	<p>Address</p> <p>Language Select</p> <p>Password Set</p> <p>Self-check Mode Select</p> <p>Remote CAN Baud Rate</p> <p>RS485 Baud Rate Set</p> <p>RS485 Stop Bit Set</p> <p>HMC9100RM Enable</p> <p>RPU560 Enable</p>	<p>The 2nd screen:</p> <p> and  are used to change the setting contents;  is used to enter the setting (the 3rd screen);  is used to exit the setting.</p>
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HMC9100 Setting	
Address	00001
Language Select	
Password Set	
Self-check Mode	
Select	
Remote CAN Baud Rate	
RS485 Baud Rate Set	
RS485 Stop Bit Set	
HMC9100RM Enable	
RPU560 Enable	

The 3rd screen:

 and  are used to change the setting contents;  is used to enter the setting (the 2nd screen);  is used to exit the setting.

9.2 CONTENTS AND RANGES OF PARAMETER SETTING

Table 15 Contents and Ranges of Parameter Setting

No.	Item	Range	Default	Description
Timer Setting				
1	Start Delay	(0-3600) s	1	Time from when the mains is abnormal or remote start signal is active to the unit starts.
2	Stop Delay	(0-3600) s	1	Time from when the mains is normal or remote start signal is inactive to unit stops.
3	Preheat Delay	(0-3600) s	0	Power-on time of preheating plug before starter is powered on.
4	Cranking Time	(3-60) s	8	Time for each starter power-on time.
5	Crank Rest	(3-60) s	10	It is the waiting time before second power on when engine fails to start.
6	Safety On Time	(0-3600) s	10	During this period, warnings of low oil pressure, high temperature, under speed, under frequency, under voltage and charging failure are all inactive.
7	Start Idle Time	(0-3600) s	0	Genset idle running time when starting.
8	High-speed Warming Up	(0-3600) s	10	Genset high-speed warming up time before closing. After unloading, genset high-speed warming up time before stopping.
9	High-speed Cooling Time	(0-3600) s	10	After unloading, genset high-speed warming up time before stopping.
10	Stop Idle Time	(0-3600) s	0	Genset idle running time when stopping. Stop electromagnet power-on time in stopping.
11	ETS Hold Time	(0-3600) s	20	Stop electromagnet power-on time in stopping.

No.	Item	Range	Default	Description
12	After Stop Time	(0-3600) s	0	When "ETS Hold Time" is 0, it is the time from idle delay end to after stop time; when "ETD Hold Time" is not 0, it is the time from ETS delay end to after stop time.
Engine Setting				
1	Engine Type	(0-50)	0	Default: Common J1939
2	Rated Speed	(0-6000)RPM	1500	Provide standard for over/under and onload speed judging.
3	Speed Source 1	MPU, J1939, RPU	MPU	MPU, J1939, PRU When speed source 1 is fault, it will automatically shift to speed source 2.
4	Speed Source 2	MPU, J1939, RPU	RPU	MPU, J1939, PRU When speed source 1 is fault, it will automatically shift to speed source 2.
5	Flywheel Teeth	(1-500)	118	Flywheel teeth installed on the engine, which is used for judging starter disconnect conditions and detecting engine speed, refer to following installation description. (See the following installation instruction.)
6	Start Attempts	(1-30) times	3	Max. crank time when engine fails to start. When it reaches set attempt, controller will send crank failure signal.
7	Crank Disconnect Condition	(0-2)	0	There are 3 conditions for starter and engine disconnect, which can be used separately or together, aiming to disconnect starter motor and engine as soon as possible. 0: Speed 1: Oil Pressure 2: Speed + Oil Pressure
8	Disconnect Speed	(0-200)%	25%	when engine speed is over than the setting value, starter will disconnect.
9	Disconnect OP	(10-1000) kPa	80	When oil pressure is greater than setting value, starter will disconnect. (See the following installation instruction.)
10	OP Related Sensor	(0-8)	5	Sensor selection see Table 30. Oil pressure display value of controller main screen.
11	WT Related Sensor	(0-8)	1	Sensor selection see Table 30. Water temperature display value of controller main screen.
12	Upper Limit for Water Heating	(0-100)°C	42	When the water temperature is over than the upper limit, "Water Heating Output" is open.
13	Lower Limit for Water Heating	(0-100)°C	37	When the water temperature is lower than the lower limit, "Water Heating Output" is closed.

No.	Item	Range	Default	Description
14	Running Output S Speed	(0-200)%	25	When speed is over than the setting value, "Running S Output" is closed.
15	Running Output S Off Value	(0-200)%	5	When speed is less than the setting value, "Running S Output" is open.
16	Running Output Delay	(0-3600)	0	Continuous output when setting the output delay as 0, other delays output according to the setting time.
17	Running Output A Speed Value	(0-200)%	85	When the speed is over than the setting value, "Running A Output" is closed.
18	Running Output A Off Value	(0-200)%	75	When the speed is less than the setting value, "Running A Output" is open.
19	Running Output Delay	(0-3600)s	0	Continuous output when setting the output delay as 0, other delays output according to the setting time.
20	Unloading Output Speed	(0-200)%	85	When speed is over than the setting value, "Unloading Output" is closed.
21	Unloading Off Speed	(0-200)%	75	When speed is less than the setting value, "Unloading Output" is open.
22	Unloading Delay	(0-3600)s	0	Continuous output when setting the output delay as 0, other delays output according to the setting time.
23	Onload Speed	(0-200)%	85	When speed is over than the setting value, controller will enter the normal running status when reaches the onload condition.
24	Control Speed	1-100	10	Speed setting for ECU input port, the greater of the setting value, the faster of the speed and vice versa.
25	Speed Control Upper Limit	(0-200)%	120	Upper limit for speed control.
26	Speed Control Lower Limit	(0-200)%	80	Lower limit for speed control.
27	Min. Analog Speed Control	(0-6000) Ω	0	Lower limit value of resistance-type speed control sensor.
28	Max. Analog Speed Control	(0-6000) Ω	1000	Upper limit value of resistance-type speed control sensor.
29	Channel Selection	Sensor 1~8	8	Channel selection for analog speed control.
30	Min. Analog Speed Control for Current	(4-20)mA	4	Lower limit value of current-type speed control sensor.
31	Max. Analog Speed Control	(4-20)mA	20	Upper limit value of current-type speed control sensor.
32	Droop Enable	0-1	0	0: Disable 1: Enable

No.	Item	Range	Default	Description
33	Droop Speed	(1-100)r/min	30	When selecting type 31, it can support dynamic droop function and the droop speed is the setting speed.
34	SPN Alarm Version	(1-3)	1	Different SPN alarm versions can be set for different parsing methods.
35	ECU Shutdown Enable	0-1	0	When setting enable function, the controller will collect ECU alarm information and there is a red light, it will send a shutdown alarm.
36	TSC1 Source Add. Replace	0-255	03	When selecting the type as No.40, the source address sent by controller is the setting value.
37	Speed BW Set	(0-1)	1	0: Disable 1: Enable
38	Charging Failure Volt.	(0-60.0)V	16.0	After operating, if the charger voltage is below the setting value detected by controller, it will send a charging failure warning.
39	Power Rated Volt.	(0-60.0)V	24.0	The controller's system.
40	Power 1 Alarm 1	(0-1)	1	0: Disable 1: Enable
41	Power 1 Alarm 1 Threshold Value	(0-200)%	125	When the collected voltage is over than the setting value, it will send the alarm of power 1.
42	Power 1 Alarm 1 Delay	(0-3600)s	5	When the power alarm meets the requirement, it starts to output the alarm signal after the setting delay.
43	Power 1 Alarm 1 Type	(0-1)	0	0: Upper Limit Alarm 1: Lower Limit Alarm
44	Power 1 Alarm 1 Action	Warning		It is fixed as warning alarm.
45	Power 1 Alarm 2	(0-1)	1	0: Disable 1: Enable
46	Power 1 Alarm 2 Threshold Value	(0-200)%	80	When the collected voltage is lower than the setting value, it will send the alarm of power 1.
47	Power 1 Alarm 2 Delay	(0-3600)s	5	When the power alarm meets the requirement, it starts to output the alarm signal after the setting delay.
48	Power 1 Alarm 2 Type	(0-1)	1	0: Upper Limit Alarm 1: Lower Limit Alarm
49	Power 1 Alarm 2 Action	Warning	2	It is fixed as warning alarm.
50	Power 2 Alarm 1	(0-1)	0	0: Disable 1: Enable
51	Power 2 Alarm 1 Threshold Value	(0-200)%	125	When the collected voltage is over than the setting value, it will send the alarm of power 2.
52	Power 2 Alarm 1 Delay	(0-3600)s	5	When the power alarm meets the requirement, it starts to output the alarm signal after the setting delay.

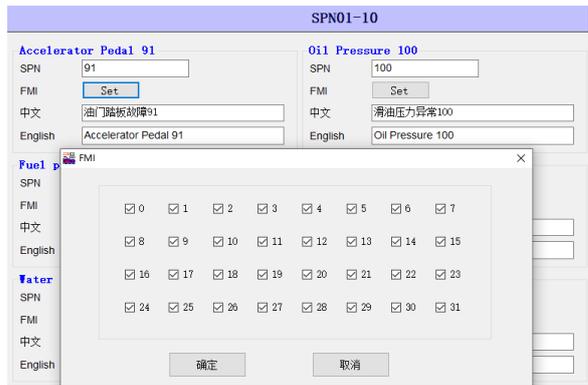
No.	Item	Range	Default	Description
53	Power 2 Alarm 1 Type	(0-1)	1	0: Upper Limit Alarm 1: Lower Limit Alarm
54	Power 2 Alarm 1 Action	Warning		It is fixed as warning alarm.
55	Power 2 Alarm 2	(0-1)	1	0: Disable 1: Enable
56	Power 2 Alarm 2 Threshold Value	(0-200)%	80	When the collected voltage is lower than the setting value, it will send the alarm of power 2.
57	Power 2 Alarm 2 Delay	(0-3600)s	5	When the power alarm meets the requirement, it starts to output the alarm signal after the setting delay.
58	Power 2 Alarm 2 Type	(0-1)	1	0: Upper Limit Alarm 1: Lower Limit Alarm
59	Power 2 Alarm 2 Action	Warning		It is fixed as warning alarm.
60	Over Speed Alarm 1	0-1	0	0: Disable 1: Enable
61	Over Speed Alarm 1 Threshold Value	(0-200)%	115	The setting value of the over speed alarm threshold is the percentage of rated speed.
62	Over Speed Alarm 1 Delay	(0-3600) s	1	When speed is over the setting threshold value, it starts to output the alarm signal after the setting delay.
63	Over Speed Alarm 1 Action	(0-4)	1	The action of over speed alarm 1 is fixed as shutdown.
64	Over Speed Alarm 2	0-1	0	0: Disable 1: Enable
65	Over Speed Alarm 2 Threshold Value	(0-200)%	110	The setting value of the over speed alarm threshold is the percentage of rated speed.
66	Over Speed Alarm 2 Delay	(0-3600) s	1	When speed is over the setting threshold value, it starts to output the alarm signal after the setting delay.
67	Over Speed Alarm 2 Action	(0-4)	2	The action of over speed alarm 2 is fixed as shutdown.
68	Loss of Speed Signal	(0-4)	2	The alarm action of loss of speed signal.
69	Louver Open Control	0-1	0	The enable setting of louver open control. It will open the louver when engine starts.
70	Louver Open Output	(0-3600)s	10	The output time when the louver receives the open order. It is the continuous output when set it as 0.
71	Louver Open Fault	0-4	1	The controller will output the open fault warning when it detects that there is no feedback signal when louver opens.

No.	Item	Range	Default	Description
72	Louver Close Control	0-1	0	The enable setting of louver close control. It will close the louver when engine stops.
73	Louver Close Output	(0-3600)s	10	The output time when the louver receives the close order. It is the continuous output when set it as 0.
74	Louver Close Fault	0-4	2	The controller will output the close fault warning when it detects that there is no feedback signal when louver closes.
75	Exhaust Baffle Open Control	0-1	0	The enable setting of exhaust baffle open control.
76	Exhaust Baffle Open Output	(0-3600)s	10	The output time when the exhaust baffle receives the open order. It is the continuous output when set it as 0.
77	Exhaust Baffle Open Fault	0-4	1	The controller will output the open fault warning when it detects that there is no feedback signal when exhaust baffle opens.
78	Exhaust Baffle Close Control	0-1	0	The enable setting of exhaust baffle close control.
79	Exhaust Baffle Close Output	(0-3600)s	10	The output time when the exhaust baffle receives the close order. It is the continuous output when set it as 0.
80	Exhaust Baffle Close Fault	0-4	2	The controller will output the close fault warning when it detects that there is no feedback signal when exhaust baffle closes.
81	Gearbox Control	0-1	0	0: Disable 1: Enable
82	Gearbox N Speed	(0-200)%	10%	To judge the speed of gearbox when it returns to neutral position.
Module Setting				
1	Device Address	(1-254)	1	The communication address of RS485.
2	Language Selection	(0-1)	0	0: Chinese 1: English
3	Password Setting	(0-9999)	00318	The setting of password.
4	Self-check Mode Selection	(0-1)	0	When select 1: self-check mode 2, the current sensor data will automatically increase/decrease to send a warning to check the alarm.
5	Remote CAN Baud Rate	(0-3)	0	0:250kbps 1:125kbps 2:100kbps 3:50kbps
6	RS485 Baud Rate Setting	(0-2)	1	0: 2400 bps 1:4800bps 2:9600bps 3:19200bps

No.	Item	Range	Default	Description
7	RS485 Stop Bit Setting	0-2	2	Selection for RS485 stop bit.
8	HMC9100RM Module Enable	(0-1)	0	0: Disable 1: Enable
9	RPU560B Module Enable	(0-1)	0	0: Disable 1: Enable
10	DOUT16B Module 1 Enable	(0-1)	0	0: Disable 1: Enable
11	DOUT16B Module 2 Enable	(0-1)	0	0: Disable 1: Enable
12	DIN16A Module 1 Enable	(0-1)	0	0: Disable 1: Enable
13	DIN16A Module 2 Enable	(0-1)	0	0: Disable 1: Enable
14	AIN8 Module 1 Enable	(0-1)	0	0: Disable 1: Enable
15	AIN8 Module 2 Enable	(0-1)	0	0: Disable 1: Enable
16	AIN23 Module 1 Enable	(0-1)	0	0: Disable 1: Enable
17	AIN23 Module 2 Enable	(0-1)	0	0: Disable 1: Enable
18	HMP300 Module Enable	(0-1)	0	0: Disable 1: Enable
19	AIN16-M01 Module Enable	(0-1)	0	0: Disable 1: Enable
20	MIO14 Module Enable	(0-1)	0	0: Disable 1: Enable
21	Event Log Interval	(0-3600)s	30s	The data storage interval via U flash drive.
22	Theme Select	(0-2)	0	0: Theme 1 1: Theme 2 2: Theme 3
23	Engine Display	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
24	PRU560B Module	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
25	DOUT16B Module 1	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
26	DOUT16B Module 2	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.

No.	Item	Range	Default	Description
27	DIN16A Module 1	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
28	DIN16A Module 2	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
29	AIN8 Module 1	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
30	AIN8 Module 2	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
31	AIN23 Module 1	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
32	AIN23 Module 2	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
33	HMP300 Module	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
34	AIN16-M01 Module	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
35	MIO14 Module	(0-1)	1	0: Disable 1: Enable The controller will display corresponding interface when this enabled.
Ethernet Port Setting				
1	Ethernet Port 1 IP Address	192.168.0.14 4		IP address of Ethernet port 1.
2	Ethernet Port Subnet Mask	255. 255. 255.0		Subnet Mask of Ethernet port 1.
3	Ethernet Port 1 Gateway	192.168.0.1		Default gateway of Ethernet port 1.
4	Ethernet Port 1 DNS Address	192.168.0.1		DNS address of Ethernet port 1.
5	Ethernet Port 1 MAC Address			It is available to modify as default blank after reading.
6	Ethernet Port 2 IP Address	192.168.0.14 4		IP address of Ethernet port 2.
7	Ethernet Port 2 Subnet Mask	255. 255. 255.0		Subnet Mask of Ethernet port 2.

No.	Item	Range	Default	Description
8	Ethernet Port 2 Gateway	192.168.0.1		Default gateway of Ethernet port 2.
9	Ethernet Port 2 DNS Address	192.168.0.1		DNS address of Ethernet port 2.
10	Ethernet Port 2 MAC Address			It is available to display after reading.
Pre-lubrication Setting				
1	Pre-lubrication Enable before Start	(0-1)	0	0: Disable 1: Enable When it is enabled, the pre-lubrication time will output first before entering the starting process.
2	Pre-lubrication Time before Start	(0-3600)s	300	The Pre-lubrication output time before start.
3	Pre-lubrication Pressure Feedback Type	(0-2)	0	0: Not Used 1: Switching Quantity 2: Analog Quantity Select pre-lubrication feedback, when select not using pre-lubrication, it will directly start when time is due.
4	Pre-lubrication Feedback Pressure Value	(0-1000)kPa	100	If the feedback type is analog, the pre-lubrication will be finished when the oil pressure is greater than the setting value.
5	Cycle Pre-lubrication Enable	(0-1)	0	0: Disable 1: Enable
6	Cycle Pre-lubrication Time	(0-3600)s	300	Time of cycle pre-lubrication.
7	Cycle Interval Time	(0-3600)min	60	The interval time of cycle pre-lubrication.
8	After Pre-lubrication Enable	(0-1)	0	0: Disable 1: Enable
9	After Pre-lubrication Output Time	(0-3600)s	300	The Pre-lubrication output time after stop.
10	After Pre-lubrication Output Speed	(0-200)%	0%	The Pre-lubrication outputs when the speed is lower than the setting value.
Sensor Setting				
1	Sensor 1	Details see Table 26: Sensor Setting List		Resistance-type sensor input.

No.	Item	Range	Default	Description
2	Sensor 2	Details see Table 26: Sensor Setting List		Resistance-type sensor input.
3	Sensor 3	Details see Table 26: Sensor Setting List		Resistance-type sensor input.
4	Sensor 4	Details see Table 26: Sensor Setting List		Resistance-type sensor input.
5	Sensor 5	Details see Table 26: Sensor Setting List		Resistance-type, voltage-type and current-type are optional, and default is current-type input.
6	Sensor 6	Details see Table 26: Sensor Setting List		Current-type sensor input.
7	Sensor 7	Details see Table 26: Sensor Setting List		Current-type sensor input.
8	Sensor 8	Details see Table 26: Sensor Setting List		Current-type sensor input.
ECU Sensor Setting				
1	ECU Sensor 1~20 Set	Details see Table 29: Sensor Selection List		The display of SPN data enable and the corresponding Chinese/English names can be configured.
2	ECU Sensor 1-20 Alarm	Details see Table 27: Sensor Configuration List		The ECU data collected by engine can be selected for alarm setting, up to 20 channels of alarm are supported.
3	ECU SPN Alarm 1-40	Only set by PC		<p>The SPN code to be translated can be defined. Select the corresponding FMI, if the collected SPN code is the same with the settings, the configured Chinese/English strings will be translated automatically.</p> 
Difference Value Setting				
4	Difference Value 1~4	Details see Table 30: Sensor Selection List		The sensor data collected by engine can be selected for calculation. The absolute value between max. value and min. value of the sensor is selected for alarm setting. Up to 16 channels of alarm setting are supported.
Average Value Setting				

No.	Item	Range	Default	Description
5	Average Value Sensor 1~3	Details see Table 30: Sensor Selection List		The sensor data collected by engine can be selected for average calculation, and the average value of sensor can be selected for alarm setting, up to 16 channels of alarms setting are supported.
Digital Input Port Setting				
1	Input 1 Set	(0-100)	15: Override Input	See 9.10 Definable contents table of digital input port 1~18.
2	Input 1 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
3	Input 2 Set	(0-100)	16: Emergency Stop	See 9.10 Definable contents table of digital input port 1~18.
4	Input 2 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
5	Input 3 Set	(0-100)	11: Remote Start	See 9.10 Definable contents table of digital input port 1~18.
6	Input 3 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
7	Input 4 Set	(0-100)	12: Remote Stop	See 9.10 Definable contents table of digital input port 1~18.
8	Input 4 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
9	Input 5 Set	(0-100)	9: Local Mode	See 9.10 Definable contents table of digital input port 1~18.
10	Input 5 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
11	Input 6 Set	(0-100)	10: Remote Control Mode	See 9.10 Definable contents table of digital input port 1~18.
12	Input 6 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.

No.	Item	Range	Default	Description
13	Input 7 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
14	Input 7 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
15	Input 8 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
16	Input 8 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
17	Input 9 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
18	Input 9 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
19	Input 10 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
20	Input 10 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
21	Input 11 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
22	Input 11 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
23	Input 12 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
24	Input 12 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
25	Input 13 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
26	Input 13 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
27	Input 14 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
28	Input 14 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
29	Input 15 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.

No.	Item	Range	Default	Description
30	Input 15 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
31	Input 16 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
32	Input 16 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
33	Input 17 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
34	Input 17 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
35	Input 18 Set	(0-100)	0	See 9.10 Definable contents table of digital input port 1~18.
36	Input 18 Active Type	(0-1)	0	0: Closed is active 1: Open is active Set if the input port is closed or open.
Output Port Setting				
1	Output 1 Function Set	(0-255)	8: ETS Solenoid Hold	See 9.9 Definable contents table of digital output port 1~14.
2	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
3	Output 2 Function Set	(0-255)	1	See 9.9 Definable contents table of digital output port 1~14.
4	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
5	Output 3 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
6	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
7	Output 4 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.

No.	Item	Range	Default	Description
8	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
9	Output 5 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
10	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
11	Output 6 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
12	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
13	Output 7 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
14	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
15	Output 8 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
16	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
17	Output 9 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
18	Output Type	(0-1)	0	0: Normally open 1: Normally Closed
19	Output 10 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
20	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
21	Output 11 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.

No.	Item	Range	Default	Description
22	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
23	Output 12 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
24	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
25	Output 13 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
26	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.
27	Output 14 Function Set	(0-255)	0	See 9.9 Definable contents table of digital output port 1~14.
28	Output Type	(0-1)	0	0: Normally open 1: Normally Closed Set if the output port is normally open or closed.

9.3 AIN8 PARAMETER SETTING

Table 16 Contents of AIN8 Parameter Setting

No.	Item	Range	Default	Description
1.	Sensor 1	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
2.	Sensor 2	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
3.	Sensor 3	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input
4.	Sensor 4	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input

No.	Item	Range	Default	Description
5.	Sensor 5	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
6.	Sensor 6	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
7.	Sensor 7	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
8.	Sensor 8	Details see Table 26: Sensor Setting List	0: Temp. Senosr	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.

9.4 DOUT16B PARAMETER SETTING

Table 17 Contents of DOUT16B Parameter Setting

No.	Item	Range	Default	Description
1.	Output 1 Function	(0-255)	8	See the definable contents of digital output port of Table 22.
2.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
3.	Output 2 Function	(0-255)	0	See the definable contents of digital output port of Table 22
4.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
5.	Output 3 Function	(0-255)	0	See the definable contents of digital output port of Table 22
6.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
7.	Output 4 Function	(0-255)	0	See the definable contents of digital output port of Table 22.
8.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
9.	Output 5 Function	(0-255)	0	See the definable contents of digital output port of Table 22.
10.	Output Type	(0-1)	0	0: Normally open

No.	Item	Range	Default	Description
				1: Normally Close Set if the output port is normally open or close.
11.	Output 6 Function	(0-255)	0	See the definable contents of digital output port of Table 22.
12.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
13.	Output 7 Function	(0-255)	0	See the definable contents of digital output port of Table 22.
14.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
15.	Output 8 Function	(0-255)	0	See the definable contents of digital output port of Table 22.
16.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
17.	Output 9 Function	(0-255)	0	See the definable contents of digital output port of Table 22.
18.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
19.	Output Function 10	(0-255)	0	See the definable contents of digital output port of Table 22.
20.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
21.	Output Function 11	(0-255)	0	See the definable contents of digital output port of Table 22.
22.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
23.	Output Function 12	(0-255)	0	See the definable contents of digital output port of Table 22.
24.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
25.	Output Function 13	(0-255)	0	See the definable contents of digital output port of Table 22.
26.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
27.	Output 14	(0-255)	0	See the definable contents of digital output port of Table 22.

No.	Item	Range	Default	Description
	Function			port of Table 22.
28.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
29.	Output Function 15	(0-255)	0	See the definable contents of digital output port of Table 22.
30.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.
31.	Output Function 16	(0-255)	0	See the definable contents of digital output port of Table 22.
32.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the output port is normally open or close.

9.5 DIN16A PARAMETER SETTING

Table 18 Contents of DIN16A Parameter Setting

No.	Item	Range	Default	Description
1.	Input 1 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
2.	Input 1 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
3.	Input 2 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
4.	Input 2 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
5.	Input 3 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
6.	Input 3 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
7.	Input 4 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
8.	Input 4 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
9.	Input 5 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
10.	Input 5 Active Type	(0-1)	0	0: Normally open 1: Normally Close

No.	Item	Range	Default	Description
				Set if the input port is normally open or close.
11.	Input 6 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
12.	Input 6 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
13.	Input 7 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
14.	Input 7 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
15.	Input 8 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
16.	Input 8 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
17.	Input 9 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
18.	Input 9 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
19.	Input 10 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
20.	Input 10 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
21.	Input 11 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
22.	Input 11 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
23.	Input 12 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
24.	Input 12 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
25.	Input 13 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
26.	Input 13 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
27.	Input 14 Function	(0-100)	0	See the definable contents of digital input port of Table 24.

No.	Item	Range	Default	Description
28.	Input 14 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
29.	Input 15 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
30.	Input 15 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
31.	Input 16 Function	(0-100)	0	See the definable contents of digital input port of Table 24.
32.	Input 16 Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.

9.6 AIN23 PARAMETER SETTING

Table 19 Contents of AIN23 Parameter Setting

No.	Item	Range	Default	Description
1.	Sensor 1	Details see Table 26: Sensor Setting List.		K-Thermocouple input.
2.	Sensor 2			K-Thermocouple input.
3.	Sensor 3			K-Thermocouple input
4.	Sensor 4			K-Thermocouple input.
5.	Sensor 5			K-Thermocouple input.
6.	Sensor 6			K-Thermocouple input
7.	Sensor 7			K-Thermocouple input.
8.	Sensor 8			K-Thermocouple input.
9.	Sensor 9			K-Thermocouple input.
10.	Sensor 10			K-Thermocouple input.
11.	Sensor 11			K-Thermocouple input.
12.	Sensor 12			K-Thermocouple input.
13.	Sensor 13			PT100 Resistance-type sensor input.
14.	Sensor 14			PT100 Resistance-type sensor input.
15.	Sensor 15			PT100 Resistance-type sensor input.
16.	Sensor 16			Current-type sensor input.
17.	Sensor 17			Current-type sensor input.
18.	Sensor 18			Current-type sensor input.
19.	Sensor 19			Current-type sensor input.
20.	Sensor 20			Current-type sensor input.
21.	Sensor 21			Current-type sensor input.
22.	Sensor 22			Current-type sensor input.
23.	Sensor 23			Current-type sensor input.

9.7 AIN16M01 PARAMETER SETTING

Table 20 Contents of AIN16M01 Parameter Setting

No.	Item	Range	Default	Description
1.	Sensor 1	Details see Table 26: Sensor Setting List.		PT100 Resistance-type sensor input.
2.	Sensor 2			PT100 Resistance-type sensor input.
3.	Sensor 3			PT100 Resistance-type sensor input.
4.	Sensor 4			PT100 Resistance-type sensor input.
5.	Sensor 5			PT100 Resistance-type sensor input.
6.	Sensor 6			PT100 Resistance-type sensor input.
7.	Sensor 7			PT100 Resistance-type sensor input.
8.	Sensor 8			PT100 Resistance-type sensor input.
9.	Sensor 9			Current-type sensor input.
10.	Sensor 10			Current-type sensor input.
11.	Sensor 11			K-Thermocouple input.
12.	Sensor 12			K-Thermocouple input.
13.	Analog Output 1 Range 0-20mA	Current output sensor selection 1	0: Not Used	Selectable sensor of analog output, see Table 30 The corresponding max. value of output range is 20mA.
		Range Set	0	
14.	Analog Output 2 Range 0-20mA	Current output sensor selection 2	0: Not Used	
		Range Set	0	
15.	Analog Output 3 Range 0-20mA	Current output sensor selection 3	0: Not Used	
		Range Set	0	

9.8 MIO14 PARAMETER SETTING

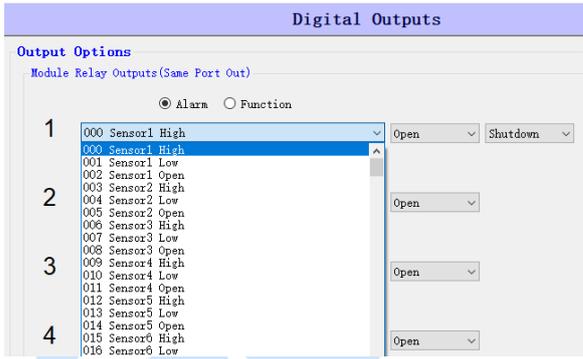
Table 21 Contents of MIO14 Parameter Setting

No.	Item	Range	Default	Description
1.	Sensor 1	Details see Table 26: Sensor Setting List.	0: Not Used	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
2.	Sensor 2	Details see Table 26: Sensor Setting List	0: Not Used	Resistance-type, voltage-type, current-type are optional, default is resistance-type input.
3.	Input 1 Function	(0-100)	0: Not Used	See the definable contents of digital input port of Table 24.
4.	Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
5.	Input 2 Function	(0-100)	0: Not Used	See the definable contents of digital input port of Table 24.
6.	Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
7.	Input 3 Function	(0-100)	0: Not Used	See the definable contents of digital input port of Table 24.
8.	Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
9.	Input 4 Function	(0-100)	0: Not Used	See the definable contents of digital input port of Table 24.
10.	Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
11.	Input 5 Function	(0-100)	0: Not Used	See the definable contents of digital input port of Table 24.
12.	Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
13.	Input 6 Function	(0-100)	0: Not Used	See the definable contents of digital input port of Table 24.
14.	Active Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
15.	Output 1 Function	(0-255)	0: Not Used	See the definable contents of digital output port of Table 22.

No.	Item	Range	Default	Description
16.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
17.	Output 2 Function	(0-255)	0: Not Used	See the definable contents of digital output port of Table 22.
18.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
19.	Output 3 Function	(0-255)	0: Not Used	See the definable contents of digital output port of Table 22.
20.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
21.	Output 4 Function	(0-255)	0: Not Used	See the definable contents of digital output port of Table 22.
22.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
23.	Output 5 Function	(0-255)	0: Not Used	See the definable contents of digital output port of Table 22.
24.	Output Type	(0-1)	0	0: Normally open 1: Normally Close Set if the input port is normally open or close.
25.	Rated Speed	(1-60000)	1500	Set the rated speed value of MIO14 speed sensor.
26.	Teeth Number	(1-300)	118	Set the speed teeth number collected by MIO14 speed sensor.
27.	Over Speed Alarm 1 Enable	0-1	0	0: Disable 1: Enable It begins to detect the alarm after enabled.
28.	Threshold Value	(0-200)%	115.0	Set the over speed alarm threshold value as the percentage of rated speed.
29.	Delay	(0-3600) s	1	When speed is over the setting threshold value, it starts to output the alarm signal after the setting delay.
30.	Action	(0-4)	1	The alarm type defaults to stop.
31.	Over Speed Alarm 2 Enable	0-1	0	0: Disable 1: Enable It begins to detect the alarm after enabled.
32.	Threshold Value	(0-200)%	110.0	Set the over speed alarm threshold value as the percentage of rated speed.
33.	Delay	(0-3600) s	1	When speed is over the setting threshold value, it starts to output the alarm signal after the setting delay.
34.	Action	(0-4)	2	The alarm type defaults to warn.

9.9 DEFINABLE CONTENTS OF PROGRAMMABLE OUTPUT PORT

Table 22 Definable Contents of Digital Output Port

No.	Item	Range	Default	Description
1	Function	(0-255)	0	Function list see Table 23
2	Alarm Setting	(0-575)	0	<p>Function output and alarm output are optional for output selection; 4 types of shutdown/warn/alarm/unload are optional for alarm selections. The corresponding alarm information can be selected in the alarm list.</p> 
3	Active Mode	(0-1)	0	<p>0: Close 1: Open</p>
4	Active Time	(0-0xFFFF) 15 engine status can be selected. It is also possible not to use this feature.	0	<p>Bit0: Not used Bit1: At Rest Bit2: Preheat Bit3: Fuel Output 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 Bit13: ETS Hold Bit14: Wait for Stop Bit15: Stop Failure</p>
5	Speed Limit Upper	(0-200)%	0	When speed is over than the setting value, the output is disconnected during user-defined output.
6	Speed Limit Lower	(0-200) %	0	When speed is lower than the setting value, the output is disconnected during user-defined output.

No.	Item	Range	Default	Description
7	Gearbox Status	(0-2)	0	0: Not Used 1: Gearbox Forward/ Backward 2: Gearbox Neutral
8	Delay Output Time	(0-100.0)S	0	Output after the setting delay time during user-defined output.
9	Output Time	(0-3600)S	0	Disconnect after the output setting time during user-defined output.

▲ NOTE 1: If output port function is “1: Custom Output”, the output function is active when the following requirements are realized:

- 1: The current engine status is in the setting active period;
- 2: The current engine speed is in the setting speed range limits;
- 3: The current status of gearbox is matched with setting status;

When the above requirements are satisfied, the delay of output function begins to output and the output time is the setting “Output Time”. It will continue to output if the “Output Time” is set to 0.

▲ NOTE 2: If alarm output is selected, please pay attention to the following tips:

- 1: Select the correct alarm type according to the corresponding sensor type;
- 2: Select the corresponding alarm information according to the alarm list.

Table 23 Definable Function of Digital Output Port

No.	Name	Functions
0	Not Used	Not used.
1	User-defined	See the definable contents of digital output port of Table 22.
2	Air Flap Control	Act when over speed shutdown alarms and emergency stop alarms, the air flap can be closed.
3	Audible Alarm	Warning, shutdown and externally connect audible alarm and the input port can be configured as “Alarm Mute”
4	ECU Power	Used for ECU connection.
5	ECU Shutdown	Used for ECU connection.
6	Starter Relay Output	Act when generator starts and disconnect when crank disconnect.
7	Fuel Relay Output	Act when generator starts and disconnect at the time when genset is waiting for stop.
8	ETS Stop Output	Act during the “ETS Stop Delay” period.
9	Reserved	
10	Reserved	
11	Louver Closed	After it is enabled, output starts when ETS solenoid hold begins and the output time can be set. If the feedback of louver closed is not detected, the controller will initiate an alarm. (Alarm types are optional.)
12	Louver Open	After it is enabled, output starts when engine is

No.	Name	Functions
		energized and the output time can be set. If the feedback of louver closed is not detected, the controller will initiate an alarm. (Alarm types are optional.)
13	Loss of Speed Signal	Output when the loss of speed signal alarms.
14	Water Heating	Output when the sensor detects that the water temperature is below the setting lower limit of water heating, disconnect when it is over the setting upper limit.
15	Pre-lubrication Output	See the description of pre-lubrication.
16	Remote Control	Output when the remote control is active, while disconnect when it is inactive. This function needs using communication port to control.
17	Override Mode	Output when the controller is in override mode.
18	Stand-by Finished	Output when the controller is in standby mode and there is no alarm.
19	Reserved	
20	Idling/High Speed Control	Act during the running period of start- start/stop idle - wait for stop.
21	High-speed/idling Output	Act during the “high-speed warming up” – “normal running” and “cooling shutdown”.
22	Pre-supply Fuel	Act during the period of “crank disconnect”– “safety-on running”.
23	Speed Raising	Output when speed raising input is active via mechanical speed control, and disconnect when it is inactive.
24	Speed Dropping	Output when speed drooping input is active via mechanical speed control, and disconnect when it is inactive.
25	Common Alarm	Act during common warning, common shutdown, common alarm and common unloading occurs
26	Shutdown Alarm	Act when common shutdown alarms.
27	Warning Alarm	Act when common warning alarms.
28	Alarm	Act when common alarm activates.
29	Unloading Alarm	Act when common unloading alarms.
30	Reserved	
31	Input 1 Active	Act when input port 1 is active.
32	Input 2 Active	Act when input port 2 is active.
33	Input 3 Active	Act when input port 3 is active.
34	Input 4 Active	Act when input port 4 is active.
35	Input 5 Active	Act when input port 5 is active.
36	Input 6 Active	Act when input port 6 is active.
37	Input 7 Active	Act when input port 7 is active.
38	Input 8 Active	Act when input port 8 is active.
39	Input 9 Active	Act when input port 9 is active.

No.	Name	Functions
40	Input 10 Active	Act when input port 10 is active.
41	Input 11 Active	Act when input port 11 is active.
42	Input 13 Active	Act when input port 12 is active.
43	Input 13 Active	Act when input port 13 is active.
44	Input 14 Active	Act when input port 14 is active.
45	Input 15 Active	Act when input port 15 is active.
46	Input 16 Active	Act when input port 16 is active.
47	Input 17 Active	Act when input port 17 is active.
48	Input 18 Active	Act when input port 18 is active.
49	Lamp Test	Output when pressing the lamp test button.
50	Crank Disconnect	Output when the unit reaches the speed of separating from the starting motor.
51	Unit Running S Output	Output when speed is higher than the running S speed and the output time is the set delay time. If set the delay time to 0, it will continuously output when speed reaches the setting value. While disconnect when speed is lower than the setting disconnect speed.
52	Unit Running A Output	Output when speed is higher than the running S speed and the output time is the set delay time. If set the delay time to 0, it will continuously output when speed reaches the setting value. While disconnect when speed is lower than the setting disconnect speed.
53	Unloading Output	Output when speed is higher than the unloading speed and the output time is the set delay time. If set the delay time to 0, it will continuously output when speed reaches the setting value. While disconnect when speed is lower than the setting disconnect speed.
54	Remote Mode	Output when the controller is in remote control mode.
55	Local Mode	Output when the controller is in local mode.
56	Wait for Loading	Output during the time when controller is waiting for loading
57	AIN8 Module 1 Comm Failure	Output when the communication of AIN8 module 1 fails (for 3s or more).
58	AIN8 Module 2 Comm Failure	Output when the communication of AIN8 module 2 fails (for 3s or more).
59	Reserved	
60	Reserved	
61	DIN16A Module 1 Comm Failure	Output when the communication of DIN16A module 1 fails (for 3s or more).
62	DIN16A Module 2 Comm Failure	Output when the communication of DIN16A module 2 fails (for 3s or more).
63	RPU560B Comm Failure	Output when the communication of RPU560B module

No.	Name	Functions
		fails (for 3s or more).
64	DOUT16B Module 1 Comm Failure	When the controller detects that the communication of DOUT16B module 1 fails. (for 3s or more)
65	DOUT16B Module 2 Comm Failure	When the controller detects that the communication of DOUT16B module 2 fails. (for 3s or more)
66	AIN23 Module 1 Comm Failure	When the controller detects that the communication of AIN23 module 1 fails. (for 3s or more)
67	AIN23 Module 2 Comm Failure	When the controller detects that the communication of AIN23 module 2 fails. (for 3s or more)
68	AIN16M01 Comm Failure	When the controller detects that the communication of AIN16M01 module fails. (for 3s or more)
69	MIO14 Comm Failure	When the controller detects that the communication of MIO14 module fails. (for 3s or more)
70	ECU Comm Failure	When ECU is energized, if connection with ECU cannot be detected then ECU communication failure alarms.
71	ECU Warning	ECU warning signal outputs since ECU receives the warning data.
72	ECU Shutdown Alarm	ECU shutdown signal outputs since ECU receives the shutdown data.
73	Power 1 Under Volt. Warning	Output when controller detects that the input voltage of power 1 is lower than the setting value.
74	Power 2 Under Volt. Warning	Output when controller detects that the input voltage of power 2 is lower than the setting value.
75	Power Fault	Output when the voltage of Power 1 or Power 2 is below 5V.
76	Over Speed Warning	Act when engine over speed warning occurs.
77	Reserved	
78	Reserved	
79	Charging Failure	Act when the charging generator fails to warn.
80	Alarm Flashing	Output when alarm occurs; if another alarm occurs, output after the flashing indicator disconnect for 2s.
81	Start Failure Alarm	Act when start failure alarms.
82	Fault Alarm Shutdown	Output when there are other alarms apart from the "Emergency Stop Alarm", "Remote Emergency Stop Alarm" and "RPU Emergency Stop Alarm"
83	Exhaust Baffle Open	After it is enabled, output starts when engine is energized and the output time can be set. If the feedback of exhaust baffle open is not detected, the controller will initiate an alarm. (Alarm types are optional.)
84	Exhaust Baffle Close	After it is enabled, output starts when ETS solenoid hold begins and the output time can be set. If the feedback of exhaust baffle close is not detected, the controller will initiate an alarm. (Alarm types are optional.)

No.	Name	Functions
85	Emergency Shutdown Alarm	Output when emergency shutdown alarms.
86	Over Speed Alarm Shutdown	Output when over speed alarms.
87	Reserved	
88	Loss of Speed Signal Shutdown	Output when loss of speed signal alarms.
89	Exhaust Baffle Fault	Output when exhaust baffle is not open and the fault alarms.
90	Low Gearbox OP	Output when low gearbox oil pressure and shutdown alarms.
91	Louver Fault Shutdown	Output when louver opens and the fault shutdown alarms.
92	Reserved	
93	Reserved	
94	Reserved	
95	Remote Emergency Stop	Output when remote emergency shutdown alarms.
96	High Water Temp. Shutdown Input	Output when the shutdown alarm of high water temperature of input port is active.
97	Low OP Shutdown Input	Output the shutdown alarm of low oil pressure of input port is active.
98	Reserved	
99	Emergency Stop (RPU)	Output when the emergency shutdown of RPU560B alarms.
100	Input 1 Shutdown (RPU)	Output when the input port 1 of RPU560B shutdown alarms.
101	Input 2 Shutdown (RPU)	Output when the input port 2 of RPU560B shutdown alarms.
102	Input 3 Shutdown (RPU)	Output when the input port 3 of RPU560B shutdown alarms.
103	Input 4 Shutdown (RPU)	Output when the input port 4 of RPU560B shutdown alarms.
104	Reserved	
105	Over Speed Shutdown (RPU)	Output when the over speed shutdown of RPU560B alarms.
106	Reserved	
107	Reserved	
108	Reserved	
109	Reserved	
110	Reserved	
111	Reserved	
112	Reserved	
113	Reserved	
114	Reserved	
115	PLC Flag 1	Output when custom PLC flag 1 is active.

No.	Name	Functions
116	PLC Flag 2	Output when custom PLC flag 2 is active.
117	PLC Flag 3	Output when custom PLC flag 3 is active.
118	PLC Flag 4	Output when custom PLC flag 4 is active.
119	PLC Flag 5	Output when custom PLC flag 5 is active.
120	PLC Flag 6	Output when custom PLC flag 6 is active.
121	PLC Flag 7	Output when custom PLC flag 7 is active.
122	PLC Flag 8	Output when custom PLC flag 8 is active.
123	PLC Flag 9	Output when custom PLC flag 9 is active.
124	PLC Flag 10	Output when custom PLC flag 10 is active.
125	PLC Flag 11	Output when custom PLC flag 11 is active.
126	PLC Flag 12	Output when custom PLC flag 12 is active.
127	PLC Flag 13	Output when custom PLC flag 13 is active.
128	PLC Flag 14	Output when custom PLC flag 14 is active.
129	PLC Flag 15	Output when custom PLC flag 15 is active.
130	PLC Flag 16	Output when custom PLC flag 16 is active.
131	PLC Flag 17	Output when custom PLC flag 17 is active.
132	PLC Flag 18	Output when custom PLC flag 18 is active.
133	PLC Flag 19	Output when custom PLC flag 19 is active.
134	PLC Flag 20	Output when custom PLC flag 20 is active.
135	PLC Flag 21	Output when custom PLC flag 21 is active.
136	PLC Flag 22	Output when custom PLC flag 22 is active.
137	PLC Flag 23	Output when custom PLC flag 23 is active.
138	PLC Flag 24	Output when custom PLC flag 24 is active.
139	PLC Flag 25	Output when custom PLC flag 25 is active.
140	PLC Flag 26	Output when custom PLC flag 26 is active.
141	PLC Flag 27	Output when custom PLC flag 27 is active.
142	PLC Flag 28	Output when custom PLC flag 28 is active.
143	PLC Flag 29	Output when custom PLC flag 29 is active.
144	PLC Flag 30	Output when custom PLC flag 30 is active.
145	PLC Flag 31	Output when custom PLC flag 31 is active.
146	PLC Flag 32	Output when custom PLC flag 32 is active.
147	PLC Flag 33	Output when custom PLC flag 33 is active.
148	PLC Flag 34	Output when custom PLC flag 34 is active.
149	PLC Flag 35	Output when custom PLC flag 35 is active.
150	PLC Flag 36	Output when custom PLC flag 36 is active.
151	PLC Flag 37	Output when custom PLC flag 37 is active.
152	PLC Flag 38	Output when custom PLC flag 38 is active.
153	PLC Flag 39	Output when custom PLC flag 39 is active.
154	PLC Flag 40	Output when custom PLC flag 40 is active.
155	Reserved	
156	Reserved	
157	Reserved	

No.	Name	Functions
158	Reserved	
159	Reserved	
160	Reserved	
161	Reserved	
162	Reserved	
163	Reserved	
164	Reserved	
165	Reserved	
166	Reserved	
167	Reserved	
168	Reserved	
169	Reserved	
170	Reserved	
171	Reserved	
172	Reserved	
173	Reserved	
174	Reserved	
175	Reserved	
176	Reserved	
177	Reserved	
178	Reserved	
179	Reserved	
180	Reserved	
181	Reserved	
182	Reserved	
183	Reserved	
184	Reserved	
185	DIN16A1 Input 1 Active	Act when input port 1 is active.
186	DIN16A1 Input 2 Active	Act when input port 2 is active.
187	DIN16A1 Input 3 Active	Act when input port 3 is active.
188	DIN16A1 Input 4 Active	Act when input port 4 is active.
189	DIN16A1 Input 5 Active	Act when input port 5 is active.
190	DIN16A1 Input 6 Active	Act when input port 6 is active.
191	DIN16A1 Input 7 Active	Act when input port 7 is active.
192	DIN16A1 Input 8 Active	Act when input port 8 is active.
193	DIN16A1 Input 9 Active	Act when input port 9 is active.
194	DIN16A1 Input 10 Active	Act when input port 10 is active.
195	DIN16A1 Input 11 Active	Act when input port 11 is active.
196	DIN16A1 Input 12 Active	Act when input port 12 is active.
197	DIN16A1 Input 13 Active	Act when input port 13 is active.
198	DIN16A1 Input 14 Active	Act when input port 14 is active.
199	DIN16A1 Input 15 Active	Act when input port 15 is active.

No.	Name	Functions
200	DIN16A1 Input 16 Active	Act when input port 16 is active.
201	DIN16A2 Input 1 Active	Act when input port 1 is active.
202	DIN16A2 Input 2 Active	Act when input port 2 is active.
203	DIN16A2 Input 3 Active	Act when input port 3 is active.
204	DIN16A2 Input 4 Active	Act when input port 4 is active.
205	DIN16A2 Input 5 Active	Act when input port 5 is active.
206	DIN16A2 Input 6 Active	Act when input port 6 is active.
207	DIN16A2 Input 7 Active	Act when input port 7 is active.
208	DIN16A2 Input 8 Active	Act when input port 8 is active.
209	DIN16A2 Input 9 Active	Act when input port 9 is active.
210	DIN16A2 Input 10 Active	Act when input port 10 is active.
211	DIN16A2 Input 11 Active	Act when input port 11 is active.
212	DIN16A2 Input 12 Active	Act when input port 12 is active.
213	DIN16A2 Input 13 Active	Act when input port 13 is active.
214	DIN16A2 Input 14 Active	Act when input port 14 is active.
215	DIN16A2 Input 15 Active	Act when input port 15 is active.
216	DIN16A2 Input 16 Active	Act when input port 16 is active.
217-2 55	Reserved	

9.10 DEFINABLE CONTENTS OF DIGITAL INPUT PORTS 1~18

Table 24 Definable Contents of Digital Inputs

No.	Item	Range	Default	Description
1	Input Port Setting	(0-50)	0	See the digital input port function of Table 25.
2	Active Type	(0-1)	0	0: Active for closing 1: Active for opening
3	Active Time	(0-0xFFFF) 15 engine status can be selected. It is also possible not to use this feature.	0	Bit0: Not used Bit1: At Rest Bit2: Preheat Bit3: Fuel Output 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 Bit13: ETS Hold Bit14: Wait for Stop Bit15: Stop Failure
4	Speed Limit Upper	(0-200)%	0	It is active when speed is lower than or equal to the setting value.
5	Speed Limit Lower	(0-200)%	0	When speed is over than or equal to the setting value,
6	Gearbox Status	(0-2)	0	0: Not Used 1: Gearbox Forward/ Backward 2: Gearbox Neutral
7	Active Action	(0-4)	0	0: Indication 1: Alarm Shutdown 2: Warning 3: Alarm 4: Unload
8	Input Delay	(0-20.0)s	2.0	The user-defined function will be activated after the setting delay of input port delay.

No.	Item	Range	Default	Description
NOTE:				
If input port is customized, it is active only if the customized conditions are realized:				
1: The engine running status is within the configured active range. (Not used can be configured).				
2: The engine speed is over than the lower limit and lower than the upper limit. (Max./Min. value can be configured)				
3: The gearbox status is consistent with the settings. (Not used can be configured)				
4: Input port delay time due.				
Only all the conditions above are met can activate the custom input functions.				

Table 25 Definable Function of Digital Input Port

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. The corresponding ECU engine increases its speed according to the speed control.
5	Speed Drop	Speed drop output close when the input is active. The corresponding ECU engine decreases its speed according to the speed control.
6	Lamp Test	All LED indicators are illuminated when input is active.
7	Auto Start Input	In auto mode, controller will start the engine when it is active.
8	Auto Mode Input	Auto mode is activated 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	In remote control mode, when the input is active, it can automatically start the engine, and when the stop output is active, it can stop the engine running. (Both short press for more than 500ms and continuous press are Ok.)
12	Remote Stop	The engine stops when it is active.
13	Remote Start/Stop	In remote control mode, when the input is active, it can automatically start the engine; when it is inactive, the engine stops.
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 over speed 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 except screen scroll on LCD when input is active.
18	EATS Override	When engine type is 23:Volvo-EMS2.4S, EATS uses the

No.	Function	Description
		post-processing to control the engine.
19	Reserved	
20	Reserved	
21	Emergency Mode	When system is used for emergency genset and the emergency mode enables, other alarms can't stop the unit except emergency shutdown and over speed shutdown.
22	Reserved	
23	Reserved	
24	Pre-lubrication Feedback	Feedback signal of pre-lubrication output; The screen displays "Pre-lubrication Feedback" when the input is active.
25	Reserved	
26	Remote Emergency Stop	Remote emergency stop alarm is initiated when input is active.
27	Exhaust Baffle Open Feedback	Feedback signal of exhaust baffle open.
28	Exhaust Baffle Closed Feedback	Feedback signal of exhaust baffle closed.
29	Gearbox Close Input	Feedback signal of gearbox closed.
30	60Hz Select	Controller will send 60Hz signal to ECU when this enables. (Only for ECU unit)
31	Barring Gear Interlock	The engine is prohibited to start when it is active. If the engine has already started, this signal will not cause engine to stop.
32	Gearbox Interlock	The engine is prohibited to start when it is active. If the engine has already started, this signal will not cause engine to stop.
33	Gearbox Wrong Direction	When the wrong direction input of gearbox is active, the controller will initiate a corresponding alarm.
34	Gearbox Low Operating OP	When the low operating oil pressure of gearbox enables, the controller will initiate a corresponding shutdown alarm.
35	Gearbox Low OP	When the low oil pressure of gearbox enables, the controller will initiate a corresponding shutdown alarm.
36	Gearbox Forward	Status feedback when gearbox goes forward.
37	Gearbox Backward	Status feedback when gearbox goes backward.
38	Gearbox in Neutral Position	Status feedback when gearbox is disconnected.
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.
40	High Water Temp. Shutdown Input	When the high water temperature shutdown input enables, the controller will initiate a corresponding shutdown alarm.
41	Low OP Shutdown Input	When the low oil pressure shutdown input enables, the controller will initiate a corresponding shutdown alarm.
42	Louver Closed	Feedback signal of louver closed.

No.	Function	Description
	Feedback Input	
43	Louver Open Feedback Input	Feedback signal of louver open.
44	Timing Input (12'o clock)	Controller will modify time as 12:00:00 automatically when this enables.
45	Idle/High-speed Switch (ECU)	Idle/high-speed switching in local mode.
46	Instrument Mode	Controller will switch to standby mode when it is active, and the output is disconnected at the same time.
47	Gearbox Engagement	Feedback signal when the gearbox is engaged.
48	Reserved	
49	Reserved	
50-100	Reserved	

9.11 SENSOR FUNCTION DEFINITION

9.11.1 SENSOR CONFIGUREATION LIST

Table 26 Sensor Settings List

No.	Item	Range	Default	Description
1	Sensor Type	(0-3)		0: Not Used 1: Oil Pressure Sensor 2: Temperature Sensor 3: Fuel Level Sensor
2	Sensor Curve Type	(0-15)		The curve types are optional, the default temperature curve is PT100, and the pressure curve is 4-20 mA.
3	Sensor Unit Selection	Temperature: 0: °C 1: °F Pressure: 0: kPa 1: Bar 2: Psi 3: Mpa Level: %		Temperature Unit: °C。 Pressure Unit: kPa。 Level Unit: %。
4	Alarm Speed	(0-200)%	80%	Alarm detection enables when the engine speed is over than the setting value.

No.	Item	Range	Default	Description
5	Engine Running Status	(0-0xFFFF) 15 engine status can be selected. It is also possible not to use this feature.	0xFFFF	Bit0: Not used Bit1: At Rest Bit2: Preheat Bit3: Fuel Output 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 Bit13: ETS Hold Bit14: Wait for Stop Bit15: Stop Failure
6	Gearbox Status	(0-2)	0	0: Not Used 1: Forward/Backward 2: Neutral
7	Range (Current Type)	(0-6000)	1000	Sensor range of current type, the max. corresponding value of 20mA current-type sensor. The range display of sensor progress bar is also based on this data.
8	Sensor Alarm 1 Enable	(0-1)	1	0: Enable 1: Disable
9	Alarm Value	(0-6000)		Setting for alarm threshold value.
10	Delay Time	(0-3600)s	5	When sensor data reaches to the alarm threshold value, the controller will send a corresponding alarm after the setting delay.
11	Alarm Type	(0-1)	0	0: Upper Limit Alarm 1: Lower Limit Alarm
12	Alarm Action	(0-4)	0	0: No Action 1: Shutdown 2: Warn 3: Alarm 4: Unload
13	Sensor Alarm 2 Enable	(0-1)	1	0: Enable 1: Disable
14	Alarm Value	(0-6000)		Setting for alarm threshold value.
15	Delay Time	(0-3600)s	2	When sensor data reaches to the alarm threshold value, the controller will send a corresponding alarm after the setting delay.

No.	Item	Range	Default	Description
16	Alarm Type	(0-1)	0	0: Upper Limit Alarm 1: Lower Limit Alarm
17	Alarm Action	(0-4)	0	0: No Action 1: Shutdown 2: Warn 3: Alarm 4: Unload
18	Sensor Alarm 3 Enable	(0-1)	0	0: Enable 1: Disable
19	Alarm Value	(0-6000)		Setting for alarm threshold value.
20	Delay Time	(0-3600)s	2	When sensor data reaches to the alarm threshold value, the controller will send a corresponding alarm after the setting delay.
21	Alarm Type	(0-1)		0: Upper Limit Alarm 1: Lower Limit Alarm
22	Alarm Action	(0-4)		0: No Action 1: Shutdown 2: Warn 3: Alarm 4: Unload

9.11.2 ECU SENSOR ALARM CONFIGURATION LIST

Table 27 ECU Sensor Configuration

No.	Item	Range	Default	Description
1	Sensor Selection	(0-60)		See ECU sensor channel selection of Table 29.
2	Alarm Speed	(0-200)%	80%	The alarm detection enables when the speed value is over than this alarm value.

No.	Item	Range	Default	Description
3	Running Status	(0-0xFFFF) 15 engine status can be selected. It is also possible not to use this feature.	0	Bit0: Not used Bit1: At Rest Bit2: Preheat Bit3: Fuel Output 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 Bit13: ETS Hold Bit14: Wait for Stop Bit15: Stop Failure
4	Gearbox Status	(0-2)	0	0: Not Used 1: Forward/Backward 2: Neutral
5	Sensor Alarm 1 Enable	(0-1)	1	0: Enable 1: Disable
6	Alarm Value	(0-6000)		Setting for alarm threshold value.
7	Delay Time	(0-3600)s	5	When sensor data reaches to the alarm threshold value, the controller will send a corresponding alarm after the setting delay.
8	Alarm Type	(0-1)		0: Upper Limit Alarm 1: Lower Limit Alarm
9	Alarm Action	(0-4)	1	0: No Action 1: Shutdown 2: Warn 3: Alarm 4: Unload
10	Sensor Alarm 2 Enable	(0-1)	1	0: Enable 1: Disable
11	Alarm Value	(0-6000)		Setting for alarm threshold value.
12	Delay Time	(0-3600)s	2	When sensor data reaches to the alarm threshold value, the controller will send a corresponding alarm after the setting delay.
13	Alarm Type	(0-1)	0	0: Upper Limit Alarm 1: Lower Limit Alarm

No.	Item	Range	Default	Description
14	Alarm Action	(0-4)	2	0: No Action 1: Shutdown 2: Warn 3: Alarm 4: Unload
15	Sensor Alarm 3 Enable	(0-1)	0	0: Enable 1: Disable
16	Alarm Value	(0-6000)		Setting for alarm threshold value.
17	Delay Time	(0-3600)s	2	When sensor data reaches to the alarm threshold value, the controller will send a corresponding alarm after the setting delay.
18	Alarm Type	(0-1)	0	0: Upper Limit Alarm 1: Lower Limit Alarm
19	Alarm Action	(0-4)	4	0: No Action 1: Shutdown 2: Warn 3: Alarm 4: Unload

9.11.3 SENSOR USER-DEFINED LIST

Table 28 Sensor Selection

No.	Sensor	Curve Type	Remarks
1	Temperature Sensor	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 4-20mA 13 Reserved 14 Reserved 15 Reserved	Resistance's range of resistance type is 0~6kΩ.
2	OP (Pressure) Sensor	0 Not Used 1 4-20mA 2 Custom Resistance Curve	Resistance's range of resistance type is 0~6kΩ.

No.	Sensor	Curve Type	Remarks
		3 VDO 10Bar 4 CURTIS 5 VOLVO-EC 6 DATCON 10Bar 7 SGX 8 SGD 9 SGH 10 Reserved 14 Reserved 12 Reserved 13 Custom Voltage Curve 14 0.5V-4.5V Voltage Type 15 Custom 4-20mA Curve	
3	Level (Fuel) Sensor	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 4-20mA 13 Reserved 14 Reserved 15 Reserved	Resistance's range of resistance type is 0~6kΩ.

Note: The input signal connected with Flex. Sensor 5 can be resistance, current or voltage.

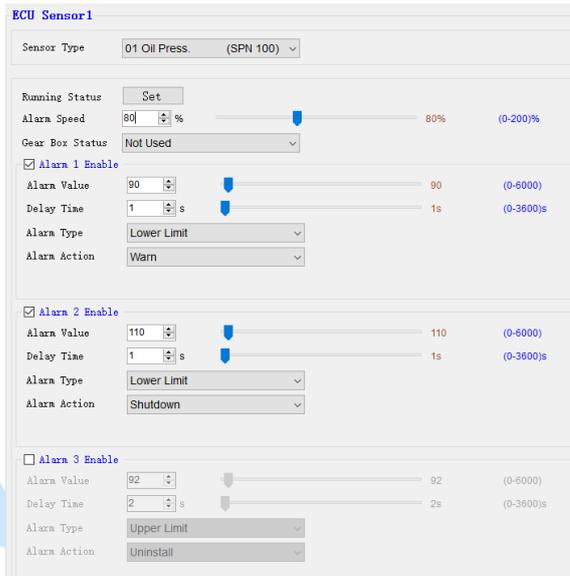
9.11.4 ECU SENSOR CHANNEL LIST

Table 29 ECU Sensor Channel Selection

No.	Sensor	Curve Type	Remark
0	ECU Sensor Channel Selection	Not Used	1: The ECU display can select corresponding sensor and Chinese/English string can be set.
1		Lubricating Oil Pressure (SPN 100)	
2		Coolant Temp. (SPN 110)	
3		Lubricating Oil Temp. (SPN 175)	
4		Coolant Level (SPN 111)	
5		Coolant Pressure	

No.	Sensor	Curve Type	Remark
		(SPN 109)	
6		Fuel Pressure (SPN 94)	
7		Fuel Temp. (SPN 174)	
8		Inlet Temp. (SPN 105)	
9		Outlet Temp. (SPN 173)	
10		Turbine Pressure (SPN 102)	
11		Left Exhaust Temp. (SPN 2433)	
12		Right Exhaust Temp. (SPN 2434)	
13		Low Cooling Water Temp. (SPN 52)	
14		Low Cooling Water Pressure (SPN 1203)	
15		Load Rate (SPN 92)	
16		ECU Temp. (SPN 1136)	
17		Sea Water Pressure (SPN 2435)	
18		Torque Percentage (SPN 513)	
19		Fuel Consumption (SPN183)	
20		Total Fuel Consumption (SPN 250)	
21		Reserved	
22		Reserved	
23		Accelerator Pedal Position (SPN 91)	
24		Pressure Difference of Fuel Filter (SPN 95)	
25		Pressure Difference of Lubricating Oil Filter (SPN 99)	
26		Pressure Difference of Crankcase (SPN101)	
27		Inlet Pressure (SPN106)	
28		Gearbox Pressure (SPN127)	
29		Rail Pressure (SPN157)	
30		Running Hours (SPN 247)	
31		Urea Level (SPN 1761)	

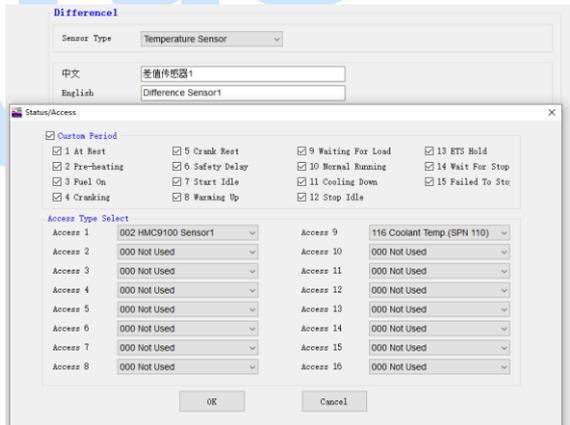
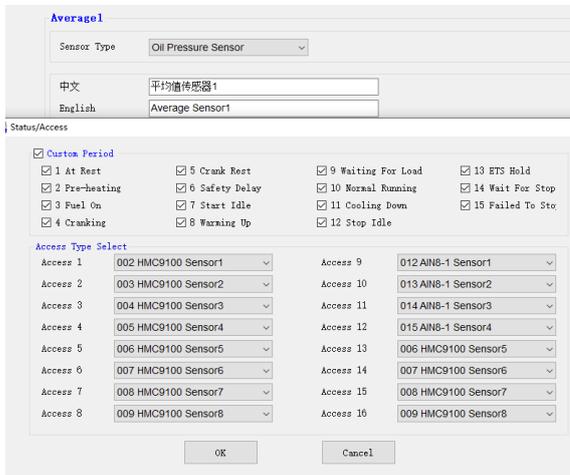
2: ECU sensor alarm can be set according to the corresponding sensor.



No.	Sensor	Curve Type	Remark
32		Urea Temp. (SPN 3031)	
33		SCR Front Exhaust Temp. (SPN4360)	
34		SCR Back Exhaust Temp. (SPN 4363)	
35		Reserved	
36		Reserved	
37-60		Reserved	

9.11.5 SENSOR SELECTION

Table 30 Sensor Selection

No.	Sensor	Curve Type	Remark	
0	Difference/ Average Value Sensor Selection	Not Used	<p>1: Difference value sensor can select up to 16 channels' data. Alarm for the max. difference value for each channel.</p> 	
1		HMC9100 Speed		
2		HMC9100 Sensor 1		
3		HMC9100 Sensor 2		
4		HMC9100 Sensor 3		
5		HMC9100 Sensor 4		
6		HMC9100 Sensor 5		
7		HMC9100 Sensor 6		
8		HMC9100 Sensor 7		
9		HMC9100 Sensor 8		
10		HMC9100 Sensor 9		
11		HMC9100 Sensor 10		
12		AIN8 (1) Sensor 1		<p>2: Average value sensor can select up to 16 channels' data. Alarm for the max. difference value for each channel.</p> 
13		AIN8 (1) Sensor 2		
14		AIN8 (1) Sensor 3		
15		AIN8 (1) Sensor 4		
16		AIN8 (1) Sensor 5		
17		AIN8 (1) Sensor 6		
18		AIN8 (1) Sensor 7		
19		AIN8 (1) Sensor 8		
20		AIN8 (2) Sensor 1		
21		AIN8 (2) Sensor 2		
22		AIN8 (2) Sensor 3		
23		AIN8 (2) Sensor 4		
24		AIN8 (2) Sensor 5		
25		AIN8 (2) Sensor 6		
26		AIN8 (2) Sensor 7		
27		AIN8 (2) Sensor 8		
28	Reserved			

No.	Sensor	Curve Type	Remark
29		Reserved	
30		Reserved	
31		Reserved	
32		Reserved	
33		Reserved	
34		Reserved	
35		Reserved	
36		Reserved	
37		Reserved	
38		Reserved	
39		Reserved	
40		Reserved	
41		Reserved	
42		Reserved	
43		Reserved	
44		AIN23 Module 1 Sensor 1	
45		AIN23 Module 1 Sensor 2	
46		AIN23 Module 1 Sensor 3	
47		AIN23 Module 1 Sensor 4	
48		AIN23 Module 1 Sensor 5	
49		AIN23 Module 1 Sensor 6	
50		AIN23 Module 1 Sensor 7	
51		AIN23 Module 1 Sensor 8	
52		AIN23 Module 1 Sensor 9	
53		AIN23 Module 1 Sensor 10	
54		AIN23 Module 1 Sensor 11	
55		AIN23 Module 1 Sensor 12	
56		AIN23 Module 1 Sensor 13	
57		AIN23 Module 1 Sensor 14	
58		AIN23 Module 1 Sensor 15	
59		AIN23 Module 1 Sensor 16	
60		AIN23 Module 1 Sensor 17	
61		AIN23 Module 1 Sensor 18	

No.	Sensor	Curve Type	Remark
62		AIN23 Module 1 Sensor 19	
63		AIN23 Module 1 Sensor 20	
64		AIN23 Module 1 Sensor 21	
65		AIN23 Module 1 Sensor 22	
66		AIN23 Module 1 Sensor 23	
67		Reserved	
68		AIN23 Module 2 Sensor 1	
69		AIN23 Module 2 Sensor 2	
70		AIN23 Module 2 Sensor 3	
71		AIN23 Module 2 Sensor 4	
72		AIN23 Module 2 Sensor 5	
73		AIN23 Module 2 Sensor 6	
74		AIN23 Module 2 Sensor 7	
75		AIN23 Module 2 Sensor 8	
76		AIN23 Module 2 Sensor 9	
77		AIN23 Module 2 Sensor 10	
78		AIN23 Module 2 Sensor 11	
79		AIN23 Module 2 Sensor 12	
80		AIN23 Module 2 Sensor 13	
81		AIN23 Module 2 Sensor 14	
82		AIN23 Module 2 Sensor 15	
83		AIN23 Module 2 Sensor 16	
84		AIN23 Module 2 Sensor 17	
85		AIN23 Module 2 Sensor 18	
86		AIN23 Module 1 Sensor 19	
87		AIN23 Module 2 Sensor 20	

No.	Sensor	Curve Type	Remark
88		AIN23 Module 2 Sensor 21	
89		AIN23 Module 2 Sensor 22	
90		AIN23 Module 2 Sensor 23	
91		AIN16M01 Sensor 1	
92		AIN16M01 Sensor 2	
93		AIN16M01 Sensor 3	
94		AIN16M01 Sensor 4	
95		AIN16M01 Sensor 5	
96		AIN16M01 Sensor 6	
97		AIN16M01 Sensor 7	
98		AIN16M01 Sensor 8	
99		AIN16M01 Sensor 9	
100		AIN16M01 Sensor 10	
101		AIN16M01 Sensor 11	
102		AIN16M01 Sensor 12	
103		AIN16M01 Analog Output 1	
104		AIN16M01 Analog Output 2	
105		AIN16M01 Analog Output 3	
106		RPU560B Speed	
107		RPU560B Sensor 1	
108		RPU560B Sensor 2	
109		MIO14 Speed	
110		MIO14 Sensor 1	
111		MIO14 Sensor 2	
112		Reserved	
113		Reserved	
114		Reserved	
115		Lubricating Oil Pressure (SPN 100)	
116		Coolant Temp. (SPN 110)	
117		Lubricating Oil Temp. (SPN 175)	
118		Coolant Level (SPN 111)	
119		Coolant Pressure (SPN 109)	
120		Fuel Pressure (SPN 94)	

No.	Sensor	Curve Type	Remark
121		Fuel Temp. (SPN 174)	
122		Inlet Temp. (SPN 105)	
123		Outlet Temp. (SPN 173)	
124		Turbine Pressure (SPN 102)	
125		Left Exhaust Temp. (SPN 2433)	
126		Right Exhaust Temp. (SPN 2434)	
127		Low Cooling Water Temp. (SPN 52)	
128		Low Cooling Water Pressure (SPN 1203)	
129		Load Rate (SPN 92)	
130		ECU Temp. (SPN 1136)	
131		Sea Water Pressure (SPN 2435)	
132		Torque Percentage (SPN 513)	
133		Fuel Consumption (SPN183)	
134		Total Fuel Consumption (SPN 250)	
135		Reserved	
136		Reserved	
137		Accelerator Pedal Position (SPN 91)	
138		Pressure Difference of Fuel Filter (SPN 95)	
139		Pressure Difference of Lubricating Oil Filter (SPN 99)	
140		Pressure Difference of Crankcase (SPN101)	
141		Inlet Pressure (SPN106)	
142		Gearbox Pressure (SPN127)	
143		Rail Pressure (SPN157)	
144		Running Hours (SPN 247)	
145		Urea Level (SPN 1761)	
146		Urea Temp. (SPN 3031)	
147		SCR Front Exhaust Temp.	

No.	Sensor	Curve Type	Remark
		(SPN4360)	
148		SCR Back Exhaust Temp. (SPN 4363)	
149		Reserved	
150		Reserved	
151		Reserved	
152		Reserved	
153		Reserved	
154		Reserved	
155		Reserved	
156		Reserved	
157		Reserved	

SmartGen

NOTE: Flex. Sensor 5 supports resistance-type, current-type and voltage-type inputs. The wiring method for the resistance-type sensor is as follows:

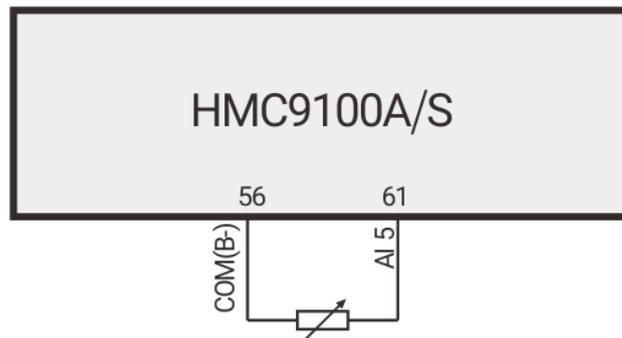


Fig.5 Sensor 5 Resistance-type Wirings

The wiring method for the voltage-type sensor is as follows:

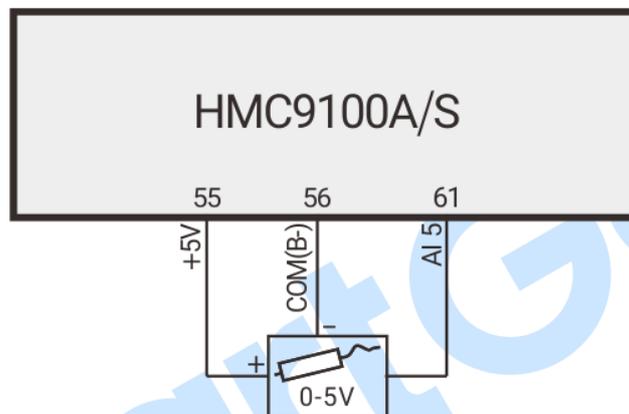


Fig.6 Sensor 5 Voltage-type Wirings

11 CONTROLLER AND ENGINES J1939 CONNECTION

11.1 CUMMINS ISB/ISBE

Table 31 Fuel and Starting Relay Wiring

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

Table 32 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.

11.2 CUMMINS QSL9

It is suited for CM850 engine controller module.

Table 33 Fuel and Starting Relay Wiring

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

Table 34 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.

11.3 CUMMINS QSM11

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

Table 35 Fuel and Starting Relay Wiring

Controller Terminals	C1 Connector	Remark
Fuel relay output	5&8	
Starting relay output	-	Connected to starter coil directly.

Table 36 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.

11.4 DETROIT DIESEL DDEC III / IV

Table 37 Engine Wiring

Controller Terminals	Engine CAN Port	Remark
Fuel relay output	Expansion 30A relay, providing power voltage for ECU.	
Starting 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.

11.5 DEUTZ EMR2

Table 38 Engine Wiring

Controller Terminals	F Connector	Remark
Fuel relay output	Expansion 30A relay, providing power voltage for Terminal 14. The fuse is 16A.	
Starting 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.

Controller Terminals	F Connector	Remark
CAN(L) (EXPANSION)	13	Impedance 120Ω connecting line is recommended.

▲NOTE: Engine type of the testing software chooses: DEUTZ EMR2.

11.6 JOHN DEERE

Table 39 Engine Wiring

Controller Terminals	21-pin Connector	Remark
Fuel relay output	G, J	
Starting 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.

11.7 MTU MDEC

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

Table 40 Engine Wiring

Controller Terminals	X1 Connector	Remark
Fuel relay output	BE1	
Starting 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.

11.8 PERKINS

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

Table 41 Engine Wiring

Controller Terminals	Connector	Remark
Fuel relay output	1,10,15,33,34	
Starting 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.

Controller Terminals	Connector	Remark
		recommended.

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

11.9 SCANIA

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

Table 42 Engine Wiring

Controller Terminals	B1 Connector	Remark
Fuel relay output	3	
Starting 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-S6A/ SCANIA-S6S.

11.10 VOLVO EDC3

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

Table 43 Fuel and Starting Relay Wiring

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

Table 44 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.

11.11 VOLVO EDC4

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

Table 45 Engine Wiring

Controller Terminals	Connector	Remark
Fuel relay output	Expansion 30A relay, providing power voltage for Terminal 14. The fuse is 16A.	
Starting 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.

▲NOTE: Engine type of the testing software chooses: VOLVO EDC4.

11.12 VOLVO-EMS2

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

Table 46 Engine Wiring

Controller Terminals	Engine CAN Port	Remark
Aux. 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-EMS2.2S.

11.13 BOSCH

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

Table 47 Engine Wiring

Controller Terminals	42-pin Engine Port	Remark
Fuel relay output	1.40	Connected to engine ignition switch.
Starting 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

Controller Terminals	42-pin Engine Port	Remark
		recommended.
CAN(L) (EXPANSION)	1.34	Impedance 120Ω connecting line is recommended.

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

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

12 ETHERNET PORT

The Ethernet port can be used for controller's monitoring to realize the network client connection.

NOTE: After modifying the network settings (IP address, subnet mask, etc.), the controller needs to be powered off and powered it on again to enable the new parameter.

12.1 NETWORK CLIENT CONNECTIONS

As a network client, the controller is monitored by users via network interface using TCP MODBUS protocol.

The steps are as follows:

- Set IP address and subnet mask of controller. The IP address should be in the same network segment but different from the IP address used by monitoring device (such as a PC). For instance, the IP address of the monitoring device is 192.168.0.16, the IP address of controller can be set as 192.168.0.18 and the subnet mask is 255.255.255.0;
- Connect the controller by using network cable to directly connect with monitoring device or by a switch;
- The monitoring device uses TCP MODBUS protocol to communicate with controller.
- The port number is 502 and it can't be changed.

NOTE: The parameters of controller can be set in this connection mode. The test software provided by our company can be connected in this way and the communication protocol can be supplied by our staff if you need.

12.2 DESCRIPTION FOR CONTROLLER & NETWORK CABLES

Table 48 Network Port Definition

No.	Definition	Description
1	TX+	Tranceive Data+
2	TX-	Tranceive Data-
3	RX+	Receive Data+
4	NC	Not Connected
5	NC	Not Connected
6	RX-	Receive Data-
7	NC	Not Connected
8	NC	Not Connected

— The controller is directly connected to PC via a network cable;

The controller's network port has an auto-MDI/MDIX feature, so either a crossover cable or a straight-through cable can be used for this connection.

A crossover cable is made by using the EIA/TIA 568A Standard on one end and the EIA/TIA 568B Standard on the other end.

A straight-through cable is made by using either the EIA/TIA 568A Standard on both ends or the EIA/TIA 568B Standard on both ends.

▲NOTE: When connecting the controller to PC via a switch (or router):

A straight-through cable should be used for this type of connection;

A straight-through cable is made by using either the EIA/TIA 568A Standard on both ends or the EIA/TIA 568B Standard on both ends.

▲NOTE: If the switch (or router) network port has an auto-MDI/MDIX feature, a crossover cable can also be used.

13 COMMUNICATION CONFIGURATION AND CONNECTION

HMC9100A/HMC9100S engine automation controller possesses RS485 port, network port and USB TYPE-C communication port, which allow the controller to connect with open-structured Local Area Network (LAN). 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 *HMC9100 Communication Protocol*.

RS485 Communication parameters:

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

13.1 EXPANSION APPLICATIONS

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

- **RPU560B Redundant Protection Module:** It is used with the master controller together via CANBUS port. If RPU560B module has shutdown alarm, HMC9100A/HMC9100S controller will send a corresponding shutdown command immediately. When override input is active, controller and RPU560B module will synchronize the override command. Except for over speed and emergency shutdown, the other shutdown alarms cannot stop the operating genset. The input port function, output port function and over speed threshold alarm and sensor function can be users-defined.
- **DIN16A Digital Input Module:** It is used with the master controller together via CANBUS port. It has 16-way inputs. All inputs can be configured through HMC9100S. All input parameters are saved in HMC9100S controller and not lost when power is off.
- **DOUT16B Digital Output Module:** It is used with the master controller together via CANBUS port. It has 16-way inputs. All inputs can be configured through HMC9100S/HMC9100A. All input parameters are saved in HMC9100A/HMC9100S controller and not lost when power is off.
- **HRM9100RM Remote Monitoring Controller:** It is used with the master controller together via CANBUS(REMOTE) 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.
- **MIO14 Integrated Expansion Module:** It is used with the master controller together via CANBUS port. It has 2-way sensor inputs. Resistance/voltage/current types can be selected for each way, 6

digital inputs, 5 digital outputs and 1-way speed input. Each port can be configured by HMC9100S controller, and the configured parameters are saved in the controller and not lost when power is off.

- AIN23 Analog Input Module: It is used with the master controller together via CANBUS port. It has 12-way K-type thermocouple sensor inputs, 3-way resistance-type sensors, 8-way current-type sensors. Alarm threshold values of every analog input can be configured through HMC9100S controller. The parameters configured are saved in HMC9100S controller and not lost when power is off.
- AIN16-M01 Analog Input/Output Module: It is used with the master controller together via CANBUS port. It has 2-way 4~20mA input, 8-way PT100 sensor inputs, 2-way K-type thermocouple sensor inputs and 3-way 4~20mA outputs. Alarms and names of every analog input and the sensors related with analog outputs can be configured through HMC9100S controller. The parameters configured are saved in HMC9100S controller and not lost when power is off.
- AIN8 Analog Input Module: It is used with the master 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 HMC9100A/HMC9100S controller. The parameters configured are saved in HMC9100A/HMC9100S controller and not lost when power is off.
- HMP300 Power Integrated Protection Module: It is used with the master 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.

▲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 HOST USB PORT

A USB flash drive of FAT32 format is supported by HMC9100 series controller and the following function can be realized via the host USB port:

- ◆ Running Record Storage

The running data is stored in a .csv file with folders named in the format of Year-Month and the files named in the format of Year-Month-Day. Open the file on the computer to read the data by office software. The data is stored at the preset interval during unit running and the USB flash drive is not allowed to be removed during storage process. When adding an expansion module or sensor, it is recommended that the module be powered on again after configuration. The running data file is shown as below:



Fig. 7 Storage Files of USB Flash Drive

15 INSTALLATION

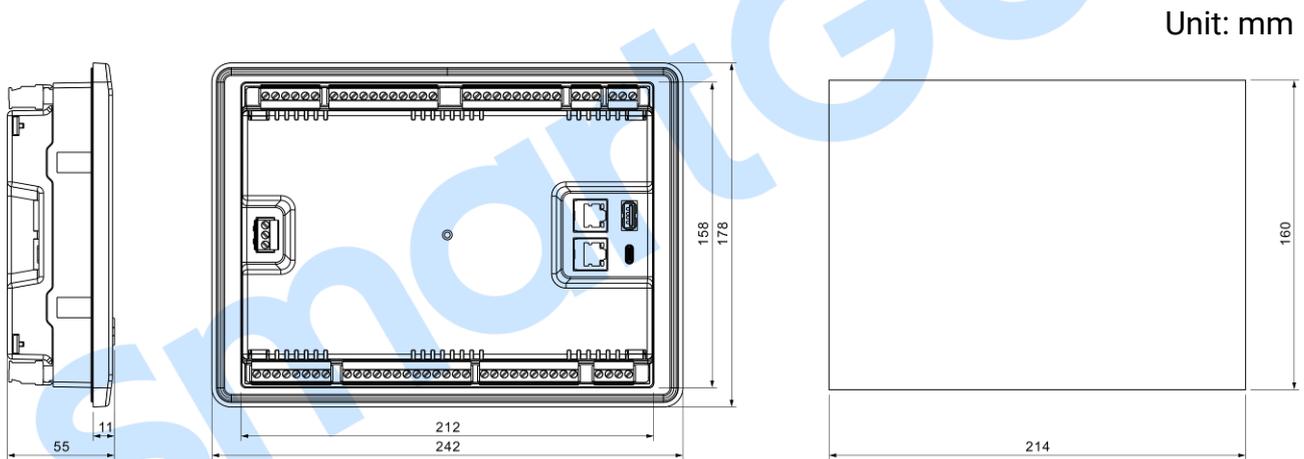


Fig. 8 Overall Dimensions and Cutout

16 TROUBLESHOOTING

Table 49 Troubleshooting

Problem	Possible Solution
No response on controller when it is energized.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check if the water/cylinder temperature is too high or not; Check voltage of alternator; Check DC fuse.
Emergency shutdown	Check emergency shutdown button function is correct or not; Check if the battery positive is connected to emergency input correctly; Check if there is open circuit 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.
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.
RS485 abnormal communication	Check wirings; Check if COM port setting is correct; Check if RS485 A and B wires are connected in the opposite way; Check if PC communication port is damaged; A 120Ω resistance is recommended to be added between RS485 A and B.
Auxiliary input alarm	Check input connection wirings; Check if input polarity configuration is correct.