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MAKING CONTROL SMARTER

HMC4300

MARINE DIESEL ENGINE CONTROLLER

USER MANUAL

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SmartGen Registered trademark

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Table 1 Version History

Date	Version	Content
2023-12-12	1.0	Original release.

CONTENT

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1 OVERVIEW

<u>HMC4300 Marine Diesel Engine Controller</u>, used for automatic control system of single engine, which can realize engine local/remote start/stop, data measurement, display, alarm protection and etc. Internet access and GPS functions can be realized by connecting to CMM366 clound monitoring module via RS485 interface. In addition, CAN communication function of the controller is able to monitor the status of engine in real time through CANBUS and display the data on LCD screen; meanwhile, controller responds to the abnormal alarms of CANBUS and performs the corresponding proction actions to ensure the safety and stability; it can also be used to connect with remote monitoring module to realize the remote start/stop functions.

2 PERFORMANCE AND CHARACTERISTICS

− Adopt 32-bit ARM SCM with high hardware integration;

− 4.3-inch colour LCD, with 480x272 resolution, adjustable backlight brightness, optional Chinese/English, easy for debugging and commissioning;

− CANBUS interface is able to support monitoring of dozens of electronic- controlled egines;

− MODBUS RTU communication protocol is supported via RS485 interface, which can realize "Three Remote" (remote control, remote measurement, remote communication) functions;

− With local mode and remote mode. Start/stop can be achieved via panel key in local mode and achieved via remote monitoring module in remote mode;

− With override mode, when this mode is active, other alarms without shutdown except for emergency shutdown and overspeed shutdown;

− RPU speed and oil pressure sensors can be connected. RPU oil pressure can select resistance/voltage/current type sensor;

− With 4 Flex. sensors, No.3 of which supports resistance/voltage/current type;

− 2 self-check modes, when this mode is active, it can self-check for setting alarm;

− Alarm self-lock function, it will automatically lock after all alarms are triggered. When alarm disappears, only press reset key can remove alarms;

− With alarm log and start/stop event log function. All warning alarms, shutdown alarms and start/stop alarms will be automatically recorded in event log, up to 200 pieces of records can be stored;

− It can simultaneously display max. 10 SPN alarm contents, and support up to 10 SPN alarm shielding function;

− Parameters can be set via panel or connecting PC software through USB(Type-C) interface;

− Digital regulation of all parameters - instead of analog regulation using conventional potentiometer, thus improving reliability and stability;

− Silicone panel and push buttons, hard screen protection of acrylic material;

− Sealing is designed for enclosure and IP65 of whole protection class;

− Modular design, anti-flaming plastic shell, pluggable waterproof terminals, embeded mounting with compact structure and easy installation.

3 SPECIFICATION

Table 2 Technical Parameters

Item	Description
Working Voltage	DC8V to DC35V, DC reverse connection protection Resolution: 0.1V Accuracy: 1%
Overall Consumption	<4W (Standby mode: ≤2W)
Speed Sensor	Voltage Range: 1.0V~24.0V (RMS) Frequency Range: 5Hz~10000Hz
Charger (D+) Voltage	Range: DC0V~DC60V Resoultion: 0.1V Accuracy: 1%
Analog Sensor	Resistance Input Range: 0Ω~6000Ω 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%
Digital Output 1~3	5A DC28V supply output (relay output)
Aux.Input 1~4	Active for connecting with negative of power supply, threshold voltage 1.2V, max. input voltage 60V
RS485 Interface	Isolated, half-duplex, 9600 baud rate, maximum communication distance1000m
CAN Interface	Isolated, maximum communication distance 250m, using Belden 9841cale or equivalent.
CE-EMC	EN 55032、EN 55024
Vibration	5Hz~8Hz: displacement±17 mm 8Hz~500Hz: a=4g 100Hz~500Hz: a=2g IEC 60068-2-6
Shock	50g, 11ms, half-sine, complete shock test from three mutually perpendicular directions, totally 18 times IEC 60068-2-27
Bump	20g, 16ms, half-sine
Production Compliance	According to EN 61010-1 installation category (over voltage category) III, 300V, pollution class 2, altitude 3000m
Case Dimension	127 mm x 115 mm x 86mm
Panel Cutout	115mm x 103mm
Working Temperature	(-25~+70)°C

Item	Description
Working Humidity	(20~93)%RH
Storage Temperature	(-30~+80)°C
Protection Level	IP65
Weight	0.46kg

4 OPERATION

4.1 PANEL DESCRIPTION

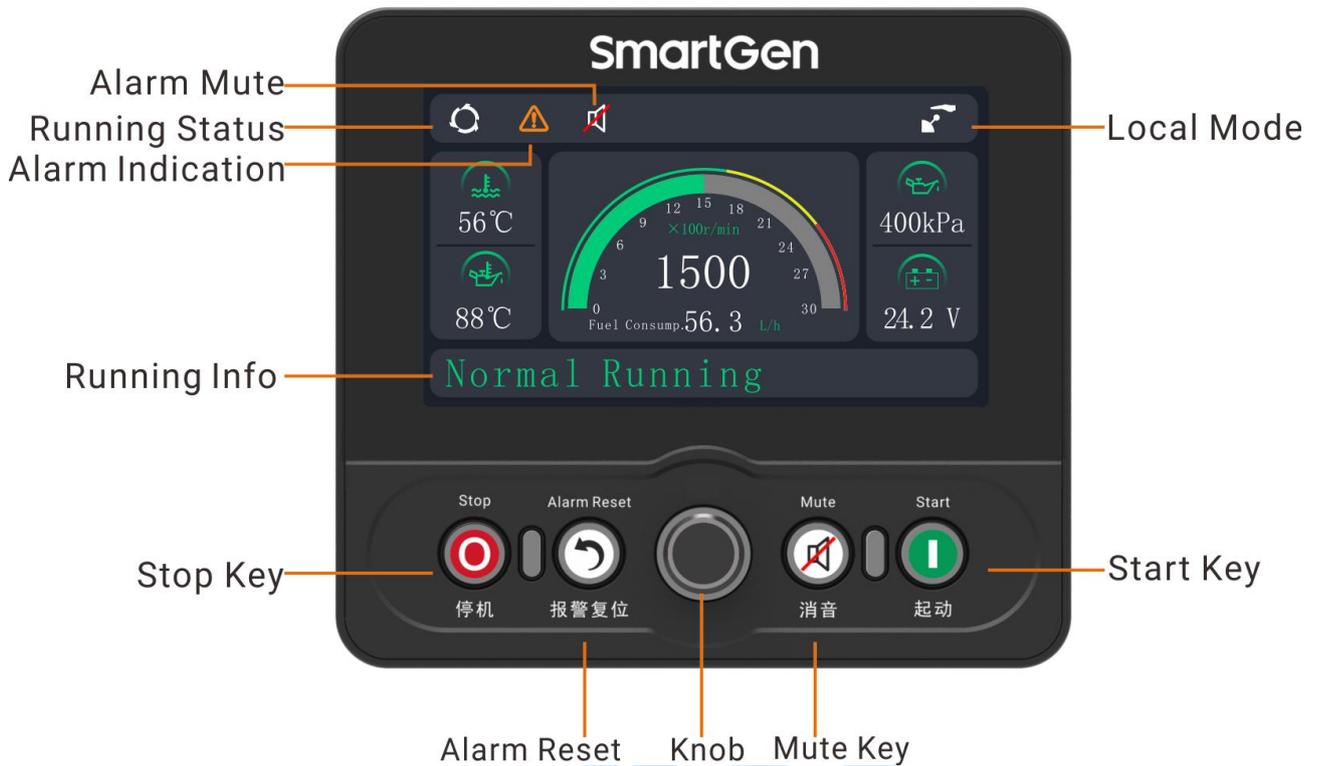**Fig.1 HMC4300 Front Panel Indication**

4.2 KEY FUNCTION DESCRIPTION

Table 3 Key Function Description

Keys	Function	Description
	Stop	1. Press it to stop the running engine in local mode. This key only be available in main screen. 2. Hold and press it for 5s, lamp test will be initiated. At this time, LCD shows white background. If the output port is configured as " Lamp Test Output", the corresponding output will be activated.
	Reset	1. Press it in main screen, the alarm reset will be enabled if there is an alarm. 2. Press it in parameter setting page to return to the previous menu.
	Knob	1. Turn the knob to switch the contents of each screen on main screen, including the sensor, parameters, input /output port status, etc. The progress bar above is highlighted during screen switching. 2. Press it to pop up brightness adjustment screen in the first page, turn the knob to adjust the brightness of screen and key backlight, and the screen will disappear automatically after no operation for 3s. 3. Hold and press for 1s to enter the parameter setting page in the first screen of main screen. 4. In other screens of main page, the vertical progress bar on the right side of the screen is highlighted after pressing this key. Turn the knob

Keys	Function	Description
		to page up/down to view more contents on the screen; Exit the function when pressing the knob again. 5. Press it to move cursor and confirm the settings in the parameter setting page. 6. Turn the knob to set the number of the cursor or select a configuration in the list. Note: The No.2 &No.3 functions only be activated in the first screen of main page.
	Mute	Press it to stop the audible alarm and mute the sound of the controller
	Start	Press it to start the engine in the local mode. Note: this key is only available in the main screen.

4.3 REMOTE START/STOP OPERATION

4.3.1 ILLUSTRATION

The controller has two remote start/stop methods: input start/stop and start/stop via remote monitoring module.

Firstly, entering the "Mode Selection" in "Parameter Setting" to set controller in remote mode, then start/stop through input port or remote monitoring module can be realized. LCD screen displays when remote mode is active.

4.3.2 REMOTE START SEQUENCE

1) When "Remote Start" is active, "Start Delay" timer is initiated; "Start Delay" countdown will be displayed on LCD;
2) When it starts via remote monitoring module, it will enter "Preheat" period;
3) When start delay is over, preheat relay energizes (if configured), "Preheat Delay XX s" will be displayed on LCD;
4) After the preheating, the fuel relay is energized (if configured), and then the start relay (if configured) is energized;
5) If the engine fails to fire during this cranking attempt, then the fuel relay and start relay are disengaged for the pre-set rest period; "Crank Rest Time" begins and wait for the next crank attempt;
6) Within the cranking attemts, if the engine fails to start, an alarm of start failure will be issued by controller and displayed on LCD;
7) After safety on delay, it enters into "Start Idle" directly (if configured);
8) After the start idle, it will enter "High-speed Warming Up" (if configured);
9) When the delay is over, engine will run normally.

4.3.3 REMOTE STOP SEQUENCE

1) When "Stop Input" is effective, the Stop Delay is initiated;
2) When using remote monitoring module to shut down, it will enter into "High-speed Cooling" period directly;
3) When stop delay is over, "High-speed Cooling" begins;
4) Once this delay has expired, "Stop Idle" is initiated (if configured), idle relay is energized;
5) Once this "Stop Idle" has expired, the "ETS Solenoid Hold" begins. ETS relay is energized while ignition relay and fuel relay are de-energized;
6) Once this "ETS Solenoid Hold" has expired, "Fail to Stop Delay" begins. Complete stop is detected automatically;
7) Engine is placed into its standby mode after its complete stop. Otherwise, fail to stop alarm is initiated (If engine stops successfully after "fail to stop" alarm is initiated, it will enter standby mode).

4.4 LOCAL START/STOP OPERATION

4.4.1 ILLUSTRATION

The local mode is enabled through panel key to start/stop the genset. Select the mode in "Parameter Setting" to set the controller in local mode. LCD screens displays [image] when local mode is active.

4.4.2 LOCAL START SEQUENCE

1) Press "Start" key, preheat relay is energized (if configured), "Preheat XX s" will be displayed on running information bar of LCD;
2) After preheat delay is over, fuel relay is energized (if configured), and then the start relay is engaged (if configured);
3) If the engine fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; "ETS Solenoid Hold" begins;
4) If the engine starts successfully, the "Safety On" timer is activated;
5) After the delay is over, if controller speed, water temperature and oil pressure are normal, controller will directly enter "Normal Running".

4.4.3 LOCAL STOP SEQUENCE

1) Press "Stop" key, "ETS Solenoid Hold" is energized, ETS relay is engaged, ignition relay and fuel relay are disengaged;
2) After ETS delay is over, "Fail to Stop Delay" begins. Complete stop is detected automatically.
3) Engine is placed into its standby mode after its complete stop. Otherwise, fail to stop alarm is initiated (If engine stops successfully after "fail to stop" alarm is initiated, it will enter standby mode).

Table 4 HMC4300 Start/Stop Illustration

Mode	Key Start	Key Stop	Remote Start	Remote Stop	Remote Monitoring Module Start	Remote Monitoring Module Stop
Local	●	●	-	-	-	-
Remote	-	-	●	●	●	●

4.5 CONTROLLER INFORMATION DISPLAY

Table 5 Main Screen Display

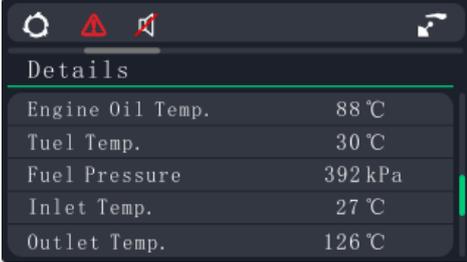| Screen	Display	Description
1st Screen		1. It displays engine speed, oil/water temperature, oil pressure, average fuel consumption and power voltage. 2. Two types of display screen: regular font and large font, which can be set in "Parameter Setting" ->" Display Configuration". 3. Hold and press the knob for 1s to enter into parameter setting screen. 4. Short press the knob to pop up a brightness setting screen, turn on the knob to set the screen brightness and key backlight. * The top of status bar displays the current engine running status icon and current mode icon of controller. * The information bar below displays the running status and alarm information.
2nd Screen		It displays data of 4 Flex.senors according to the sensor types, sensor data and self-defined name. * The top of status bar displays the current engine running status icon and current mode icon of controller.
3rd Screen		1.It dynamically displays the following running data of engine. The paramtermeters that have not been collected will not be displayed; 2. The displayed contents include: engine speed, ECU water temperature, ECU oil pressure, RPU speed, RPU oil pressure, power supply voltage, charger voltage, crank attempts, total running time, fuel temperature, fuel pressure, inlet temperature, fuel pressure, inlet temperature, outlet temperature, turbine pressure, coolant pressure, coolant level, fuel consumption, total fuel consumption. * The top of status bar displays the current engine
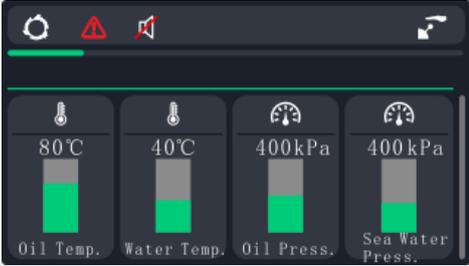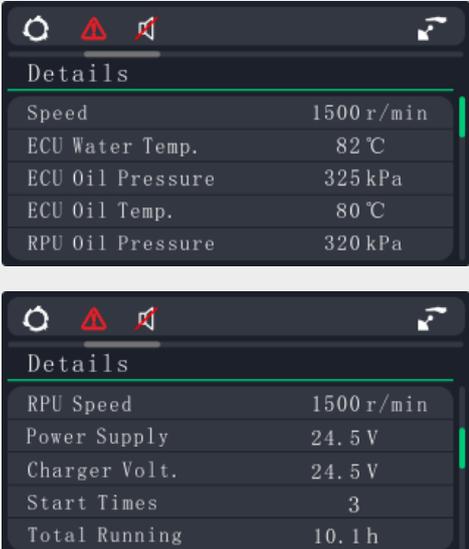
Screen	Display	Description
	Details Engine Oil Temp. 88℃ Tuel Temp. 30℃ Fuel Pressure 392 kPa Inlet Temp. 27℃ Outlet Temp. 126℃ Details Turbine Pressure 100 kPa Coolant Pressure 132 kPa Coolant Level 76% Fuel Consumption 56.3 L/h Total Consumption 318 L	running status icon and current mode icon of controller. * Press the knob in this screen, i.e. turning the knob to up/down scroll the screen; Press the knob again to exit the screen scroll.
4th Screen	Input Port Status 01 Not Used 02 Fuel Leakage Input 03 Not Used 04 Not Used	1.It displays controller intput status. Input name can automatically update according to the definition. * The top of status bar displays the current engine running status icon and current mode icon of controller.
5th Screen	Output Port Status 01 ECU Power Output 02 Power Supply Control 03 Not Used	1.It displays controller output status. Output name can automatically update according to the definition. * The top of status bar displays the current engine running status icon and current mode icon of controller.
6th Screen	Shutdown Alarm01/02 Over Speed Shutdown High Oil Temp. Shutdown Warnings02/02 Over Speed Warning Stop Failure High Oil Temp. Warning Under Volt. Warning	It displays controller real-time alarm information. When the alarms display is full, page up/down to scroll the screen. * The top of status bar displays the current engine running status icon and current mode icon of controller. * Press the knob in this screen, i.e. turning the knob to up/down scroll the screen; Press the knob again to exit the screen scroll.
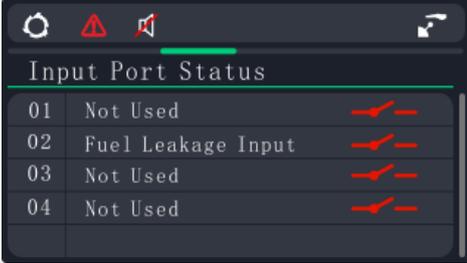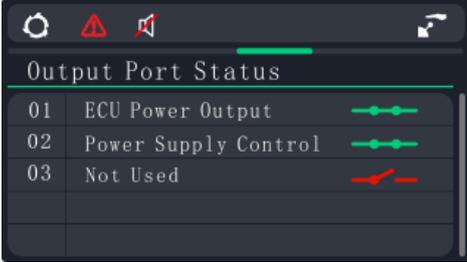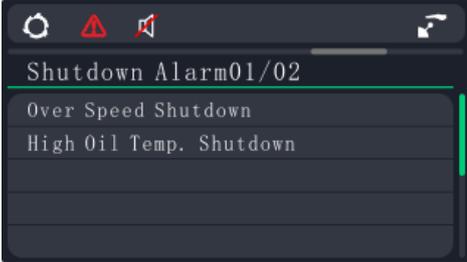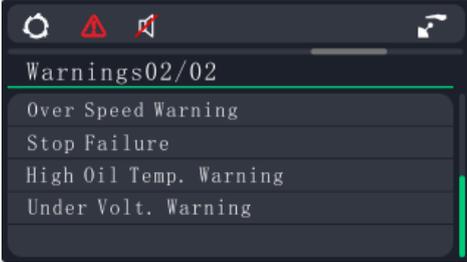
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Screen	Display	Description
7th Screen		1.It displays the explanations of all icons of controller. * The top of status bar displays the current engine running status icon and current mode icon of controller. * Press the knob in this screen, i.e. turning the knob to up/down scroll the screen; Press the knob again to exit the screen scroll.

5 PROTECTION

5.1 WARNING ALARM

When controller detects warning signal, it only issues warning without shutdown, and displays alarm type.

Table 6 Warning Alarm

No.	Warning	Detect Range	Description
1.	Overspeed	Always active	When controller detects engine speed is greater than threshold, it will send warning signal, corresponding information will be displayed on the LCD.
2.	Underspeed	Warming up → Stop cooling	When controller detects engine speed is lower than threshold, it will send warning signal, corresponding information will be displayed on the LCD.
3.	Speed Signal Loss	Start idle delay→ Stop idle	When controller detects engine speed is 0 and speed signal loss warning is enabled, it will send warning signal, corresponding information will be displayed on the LCD.
4.	Start Failure	After starting in set crank attempt	If engine fails to fire in set crank attempt, controller will send warning signal, corresponding information will be displayed on the LCD. **NOTE:** In local mode, start attempt only has once and no alarm for start failure.
5.	Stop Failure	After engine complete stop delay	When engine complete stop delay is over, if there is speed signal, controller will send warning signal, corresponding information will be displayed on the LCD.
6.	Charging Failure	From engine normal running	When controller detects charger voltage is lower than threshold, it will send warning signal, corresponding information will be displayed on the LCD.

![SmartGen logo]

No.	Warning	Detect Range	Description
7.	Aux. Input 1-4	User-defined active range	When controller detects Au.x input 1-4 warning input is active, it will send warning signal, corresponding information will be displayed on the LCD.
8.	High Water Temp	Exceed set speed	When controller detects high water temperature warning is active, it will send warning signal, corresponding information will be displayed on the LCD.
9.	High Oil Temp	Exceed set speed	When controller detects high oil temperature warning is active, it will send warning signal, corresponding information will be displayed on the LCD.
10.	Low Oil Pressure	Exceed set speed	When controller detects low oil pressure warning is active, it will send warning signal, corresponding information will be displayed on the LCD.
11.	Flex. Sensor 1-4 High	Exceed set speed	When controller detects Flex. sensor 1-4 warning is active, it will send warning signal, corresponding information will be displayed on the LCD.
12.	Flex. Sensor 1-4 Low	Exceed set speed	When controller detects sensor 1-4 warning is active, it will send warning signal, corresponding information will be displayed on the LCD according to user-defined function selection.
13.	Flex. Sensor 1-4 Open	Always active	When controller detects sensor 1-4 warning is active, it will send warning signal, corresponding information will be displayed on the LCD according to user-defined function selection.
14.	Power Undervoltage	Always active	When controller detects power voltage is lower than threshold and continues for more than 20s, it will send warning signal, corresponding information will be displayed on the LCD.
15.	Power Overvoltage	Always active	When controller detects power voltage is greater than threshold, it will send warning signal, corresponding information will be displayed on the LCD.
16.	MEM40RM Comm. Failure	Always active (detect after module is enabled)	When controller detects communication failure with remote monitoring module, controller will send warning signal, corresponding information will be displayed on the LCD.
17.	Fuel Leakage	Always active	When this input is active, controller will send warning signal, corresponding information will be displayed on the LCD.
18.	ECU Warn	Always active	When there is ECU warning, controller will display "ECU Warning" information, meanwhile SPN and FMI of ECU alarm will be displayed. It can display 10 SPN code of ECU alarm at most.

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5.2 SHUTDOWN ALARM

When controller detects shutdown signal, it will shut down, and display alarm type.

Table 7 Shutdown Alarm

No.	Shutdown	Detect Range	Description
1.	Remote Emergency Stop	Always active	When controller detects emergency stop is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
2.	Overspeed Shut.	Always active	When controller detects engine speed is greater than threshold, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
3.	RPU Overspeed	Always active	When controller detects engine RPU speed is greater than threshold, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
4.	Aux. Input 1-4 Shut	User-defined active range	When controller detects Aux. input 1-4 input is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
5.	High Water Temp.	Exceed set speed	When controller detects high water temperature shutdown is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
6.	High Oil Temp.	Exceed set speed	When controller detects high oil temperature shutdown is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
7.	Low Oil Pressure	Exceed set speed	When controller detects low oil pressure shutdown is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
8.	High Water Temp. IN	Always active	When controller detects high water temperature shutdown input is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
9.	High Oil Temp. IN	Always active	When controller detects high oil temperature shutdown input is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
10.	Low Oil Pressure IN	Start idle ~ Stop idle	When controller detects low oil pressure shutdown input is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD.
11.	Flex. Sensor 1-4 High	Exceed set speed	When controller detects Flex. sensor 1-4 shutdown input is active, it will send shutdown alarm signal,

No.	Shutdown	Detect Range	Description
			corresponding information will be displayed on the LCD according to user-defined function selection.
12.	Flex. Sensor 1-4 Low	Exceed set speed	When controller detects sensor 1-4 shutdown is active, it will send shutdown alarm signal, corresponding information will be displayed on the LCD according to user-defined function selection.
13.	ECU Shutdown	Always active	When there is ECU shutdown, controller will display "ECU Shutdown" information, meanwhile SPN and FMI of ECU alarm will be displayed. It can display 10 SPN code of ECU alarm at most.

⚠NOTE: Shutdown type of auxiliary inputs must be configured by users for active.

⚠NOTE: Flex. sensor 1~4 must be configured by users for active.

6 WIRING CONNECTION

HMC4300 back panel is showed as below:

Fig.1 HMC4300 Back Panel

Table 8 Terminal Connection Description

No.	Function	Cable	Remark
1	Flex. Sensor 1	1.0mm^2	Connect to temperature, pressure or level sensors. Setting items see Table 16. Only for resistance-type sensor.
2	Flex. Sensor 2		
3	MP1	0.5mm^2	Speed sensor input.
4	MP2		Speed sensor input, controller inside has been connected to negative of battery.
5	Charger D+	1.0mm^2	Connect to charger D+ (WL) terminal. Being hang up if there is no this terminal.
6	NC		
7	ECU CAN H	0.5mm^2	Impedance-120Ω shielding wire is recommended, its single-end earthed. If CAN TR output is enabled, CANBUS will be automatically connected with a 120Ω resistor. Otherwise, a 120Ω resistor will be connected manually.
8	ECU CAN L	0.5mm^2	
9	Flex. Sensor 3	1.0mm^2	Connect to temperature, pressure or level sensors. Setting items see Table 16. Can connect to voltage-type, current-type and resistance-typ sensors.
10	VOUT (+5V)	0.5mm^2	Power supply: DC+5V, max current.30mA
11	Aux. Input 4	1.0mm^2	Ground connected is active (B-).
12	Flex. Sensor 4	1.0mm^2	Connec to temperature, pressure or level sensors. Setting items see Table 16. Only for resistance-type sensor.
13	GND	1.0mm^2	Sensor COM.
14	NC		

No.	Function	Cable	Remark	
15	NC			
16	Aux. Input 1	1.0mm^2	Ground connected is active (B-).	Setting items see Table 11/12
17	Aux. Input 2	1.0mm^2	Ground connected is active (B-).	
18	Aux. Input 3	1.0mm^2	Ground connected is active (B-).	
19	Aux. Output 1	1.0mm^2	B+ is supplied by No.22 terminal, rated 5A	Setting items see Table 13/14
20	Aux. Output 2	1.0mm^2	B+ is supplied by No.22 terminal, rated 5A	
21	Aux. Output 3	1.0mm^2	B+ is supplied by No.22 terminal, rated 5A	
22	B+	1.5mm^2	Connected with positive of starting battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.	
23	GND	1.5mm^2	Connected with negative of starting battery.	

NOTE 1: USB ports in controller back panel are programmable parameter ports, user can directly configure controller via PC.

NOTE 2: RS485 ports in controller back panel are programmable ports, remote module ports and can be connected with CMM366 cloud monitoring module.

Cable size requirements: B+, B-, Emergency Stop Input: 2.5mm^2

Digital Input, Analog Input, D+, AC Voltage input: 1.0mm^2

Output port depends on the output current of relay: 10-16A（2.5mm^2）, 5-10A（1.5mm^2）, below 5A（1.0mm^2）；

RS485, CAN Communication Wire: 0.5mm^2

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7 PARAMETER SETTING

7.1 MENUS

After the controller is turned on, press the knob to enter the parameter setting menu in the first screen, the menu includes: parameter configuration, mode selection, controller information, event log, self-check control and display information.

⚠ **NOTE: Please modify the controller parametes (such as crank disconnect conditions, Aux. input/out configuration, muti delays, etc) in standby mode, otherwise, shutdown alarm and other abnormal occurrences will take place.**

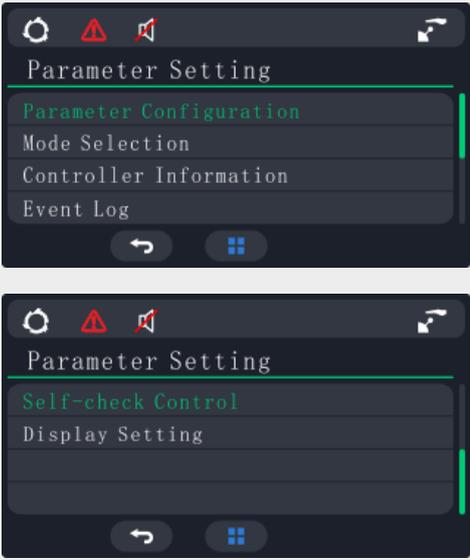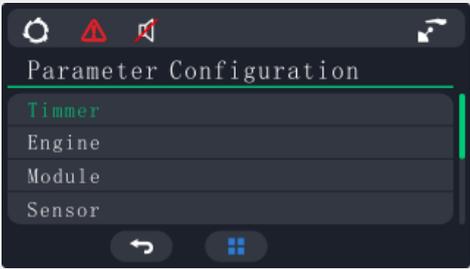⚠ **NOTE: The alarm threshold value of high sensor must be higher than low alarm threhold value, otherwise, both of alarms will occur simultaneously.**

⚠ **NOTE: The over speed threshold value must over than the under speed threhold value, otherwise, both over speed and under speed will occur.**

⚠ **NOTE: The engine speed threshold of crank disconnect should be set as lower as possible during setting, in order to fast separate the starter during cranking.**

⚠ **NOTE: Aux. input pors cannot be set as the same items, otherwise, the correct functions may not be realized. While the Aux. output ports can be set as the same items.**

Table 9 Parameter Setting Screen

Screen	Display	Description
Parameter Setting		1. It displays parameter setting menu, the details see chapter7.2~7.7. * The top of status bar displays the current engine running status icon and current mode icon of controller. * The icons below indicate that press the reset key to return and press the knob to confirm.
Secondary Screen of Parameter Setting		1. It displays the secondary menu of parameter configuration; different modules of the controller can be configured. * The top of status bar displays the current engine running status icon and current mode icon of controller. * The icons below indicate that press the reset key to return and press the knob to confirm.

Screen	Display	Description
Setting and Conformation		1. It displays a configuration page of parameter, the green number indicates the current cursor, press the knob to move cursor backward; turn the knob to change the value of current cursor; after the modification, the controller will prompt you to confirm the change. * The top of status bar displays the current engine running status icon and current mode icon of controller. * The icons below indicate that press the reset key to return and press the knob to confirm.

7.2 CONTENTS AND RANGES OF PARAMETER CONFIGURATION

Please input correct password to enter the parameter setting, the default password is 00318.

When you forget to input the password or the sensor resistance/current needs to be calibrated, please contact the manufacturer.

Table 10 Contents and Ranges of Parameter Configuration

| Item	Range	Defaults	Remark
Timer Setting			
1 Start Delay	(1-3600)s	1	Time from remote start signal is active to start when controller in remote mode.
2 Stop Delay	(1-3600)s	1	Time from remote stop signal is active to stop when controller in remote mode.
3 Preheat Time	(0-3600)s	0	Power-on time of preheating device before starter is powered on.
4 Crank 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	Running time after cranking disconnect.

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Item	Range	Defaults	Remark
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-sped warming up time.
9 High-speed Cooling Time	(0-3600)s	10	High-speed cooling time before stopping.
10 Stop Idle Time	(0-3600)s	0	Genset stop idle running time when stopping.
11 ETS Time	(0-3600)s	20	Stop electromagnet power-on time in stopping.
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.
13 Start Key Confirm Delay	(0.2-5.0)s	0.2	When controller starts via key, it is the time from pressing start key to start.
14 Stop Key Confirm Delay	(0.2-5.0)s	0.2	When controller stops via key, it is the time from pressing stop key to stop.
Engine Setting			
1 J1939 Enable	(0-1)	1	The CAN communication interface is enabled or not.
2 Engine Type	(0-39)	1: Common J1939	Select corresponding type according to engine model.
3 SPN Alarm Version	(1-3)	1	SPN alarm parsing type.
4 ECU Shutdown	(0-1)	0: Disable	After it is enabled, it will shut down when engine detects red light alarm.
5 Flyweel Teeth	(1-300)	118	Flywheel teeth installed on the engine, which is used for judging starter disconnect conditions and detecting engine speed, refer to following installation description. (Using for corresponding RPU speed computing.)
6 Rated Speed	(1-5999)r/min	1500	Provide standard for over/under speed judging.
7 Crank Attempt	(1-30)	3	Max. crank time. When it reaches set attempt, controller will send crank failure signal.
8 Crank Disconnect Condition	(0-2) 0: Speed 1: OP 2: Speed + OP	0: Speed	There are 2 conditions for starter and engine disconnect, which can be used separately or together, aiming to disconnect starter motor and engine as soon as possible.
9 Crank Disconnect Speed	(0-200)%	25%	Set value is the percentage of rated speed, when speed exceeds it, starter

Item	Range	Defaults	Remark
			will disconnect.
10 Crank Disconnect OP	(10-1000)kPa	80	When oil pressure is greater than set value, starter will disconnect.
11 Overspeed Shutdown	(0-1) 0 Disable 1 Enable	1 Enable	Overspeed shutdown setting.
12 Threshold (Shutdown)	(0-200)%	115%	
13 Shutdown Delay	(0-3600)s	1	
14 Overspeed Warning	(0-1) 0 Disable 1 Enable	1 Enable	Oversped warning setting.
15 Threshold (Warning)	(0-200)%	110%	
16 Warning Delay	(0-3600)s	3	
17 Speed Signal Loss	(0-3600)s	3	Time from detecting speed is 0 to confirm action.
18 Loss Action	(0-2) 0: Warning 1: Shutdown 2: No Action	0: Shutdown	The action controller perfomrs when detecting the loss signal.
19 Charging Failure Warning	(0-60.0)V	16.0	After engine is normally running, if charger voltage is lower than it, controller will send charging failure warning.
20 Power Rated Voltage	(0-60.0)V	24.0	Provide standard for battery over/under voltage.
21 Power Overvoltage	(0-200)%	125%	Set value is the percentage of power rated voltage.
22 Power Undervoltage	(0-200)%	75%	
23 Heating Upper Limit	(0-100)℃	42	Disconnect when water temperature sensor value is greater than set value.
24 Heating Lower Limit	(0-100)℃	37	Closewhen water temperature sensor value is lower than set value.
25 RPU Overspeed Shut	(0-1) 0 Disable 1 Enable	1 Enable	RPU over speed shutdown.
26 RPU Threshold (Shut)	(0-200)%	115%	
27 RPU Shutdown Delay	(0-3600)s	1	
Module Setting			
1 Equipment Address	(1-254)	1	RS485 communication address.
2 Language	(0-1) 0: Simplified Chinese 1: English	0: Simplified Chinese	Controller displays language selection.
3 Password	(0-65535)	00318	Password for entering parameter setting.

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Item		Range	Defaults	Remark
4	CAN Baud Rate	(0-2) 0: 500kbps 1: 250kbps 2: 125kbps	0: 250kbps	Communication baud rate of CANBUS port. Used for the communication between controller and engine ECU.
5	Self-check Mode	(0-1) 0: Self-check Mode 1 1: Self-check Mode 2	0: Self-check Mode 1	When self-check mode is 1, it can connect corresponding sensor to detect alarm without speed after self-check is active. When self-check mode is 2, system will automatically change sensor data to test alarm after self-check is active.
6	RPU560 Enable	(0-1) 0 Disable 1 Enable	0: Disable	If RPU module needs to be expanded, this parameter must be enabled. After it is enabled, a page of RPU data is added to display.
7	CAN TR Output	(0-1) 0 Disable 1 Enable	0: Disable	0: Disable; 1: Enable (After it is enabled, CANBUS will automatically connect with a 120Ω matching resistance).
8	RS485 TR Output	(0-1) 0 Disable 1 Enable	0: Disable	0: Disable; 1: Enable (After it is enabled, RS485 bus will automatically connect with a 120Ω matching resistance).
Sensor Setting				
1	Water Temp. (ECU Data Input)	Details see 7.10		Water temperature sensor setting.
2	Oil Temp. (ECU Data Input)	Details see 7.10.		Oil temperature sensor setting.
3	OP Sensor (ECU Data Input)	Details see 7.10		Oil pressure sensor setting.
4	Flex. Sensor 1 Set (Resistance Input)	Details see 7.10 **NOTE:** Resistance input range is inactive.)		Flex. sensor 1 setting.
5	Flex. Sensor 2 Set (Resistance Input)	Details see 7.10 **NOTE:** Resistance input range is inactive.)		Flex. sensor 2 setting.
6	Flex. Sensor 3 Set (Resistance Input)	Details see 7.10 **NOTE:** Resistance input range is inactive.)		Flex. sensor 3 setting. Default as RPU oil pressure sensor.
7	Flex. Sensor 4 Set (Resistance Input)	Details see 7.10		Flex. sensor 4 setting.
Input Port Setting				
1	Input 1 Configuration	(0-50)	0: Not Used	See Table 12.
2	Input 1 Active Type	(0-1)	0: Closed for Active	Set input port as closed or opened.

|	Item	Range	Defaults	Remark
3	Input 2 Configuration	(0-50)	11: Fuel Leakage	See Table 12.
4	Input 2 Active Type	(0-1)	0: Closed for Active	Set input port as closed or opened.
5	Input 3 Configuration	(0-50)	8: Not Used	See 12.
6	Input 3 Active Type	(0-1)	0: Closed for Active	Set input port as closed or opened.
7	Input 4 Configuration	(0-50)	0: Not Used	See 12.
8	Input 4 Active Type	(0-1)	0: Closed for Active	Set input port as closed or opened.
Output Port Setting				
1	Output 1 Configuration	(0-100)	7: ECU power output	See 14.
2	Output 1 Output Type	(0-1)	0: Normally Open	Set output port as normally closed or opened.
3	Output 2 Configuration	(0-100)	8: Ignition Control	See 14.
4	Output 2 Output Type	(0-1)	0: Normally Open	Set output port as normally closed or opened.
5	Output 3 Configuration	(0-100)	0: Not Used	See 14.
6	Output 3 Output Type	(0-1)	0: Normally Open	Set output port as normally closed or opened.

7.3 MODE SELECTION
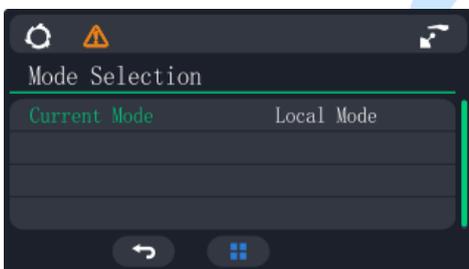
Switch the controller between local mode and remote mode via this setting.

7.4 CONTROLLER INFORMATION
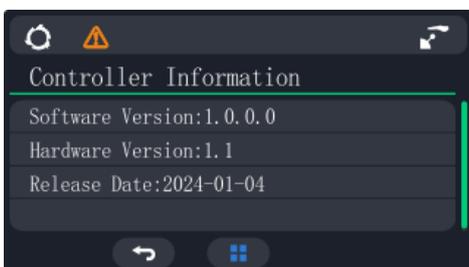
It displays the controller information, software version, hardware version and release date.

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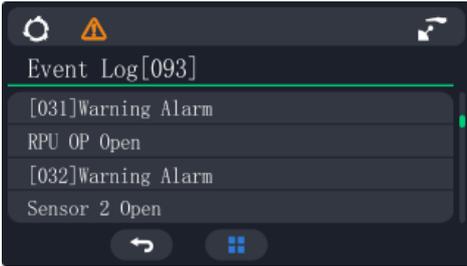
7.5 EVENT LOG

It allows to query event log, the record type and name are displayed. In addition, if there is an alarm of ECU, the SPN alarm code of ECU will be displayed.

7.6 SELF-CHECK CONTROL
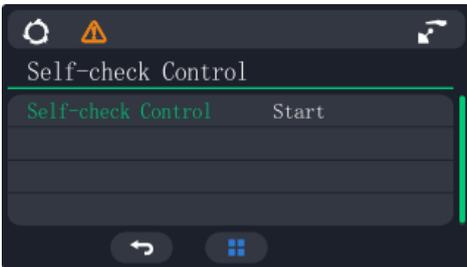
It allows the controller to self-check. When self-check mode is 1, after self-check, the sensor can be connectd to alarm without speed; When self-check mode is 2, after self-check, the system will automatically increase/decrease the sensor data to test the alarm.

7.7 DISPLAY CONFIGURATION
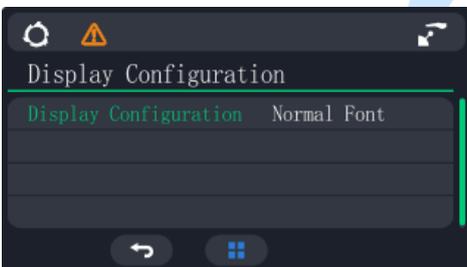
It can set the display mode of first page of main screen, normal font and large font screen are optional.

7.8 DIGITAL INPUT PORT 1-4 FUNCTION DEFINITION

7.8.1 DEFINED CONTENTS OF DIGITAL INPUT PORT

Table 11 Defined Contents of Digital Input Port

No.	Item	Contents	Description
1	Input Port Function Setting	(0- 50)	See **7.8** Input Port Function Definition.
2	Input Port Active Type	(0-1)	0: Closed 1: Opened
3	Input Port Active Range	(0-3)	0: From Safety On 1: From Cranking 2: Always 3: Inactive
4	Input Port Active Action	(0-2)	0: Warning 1: Shutdown 2: Indication
5	Input Delay	(0-20.0)s	Time from detecting input port is active to confirmation.
6	Display Character String	Custom input port name	20 English characters or 10 Chinese.characters

7.8.2 INPUT PORT FUNCTION DEFINITION

Table 12 Input Port Function Definition

No.	Item	Description
0.	Not Used	Not used.
1.	User-defined	Input port content can be defined.
2.	Alarm Mute	"Audible Alarm" in output configuration can be prohibited when it is active.
3.	Alarm Reset	Reset all alarms when it is active.
4.	Remote Emergency Stop	When it is active, controller will send stop command and display "Remote Emergency Stop" on the LCD.
5.	Reserved	
6.	Reserved	
7.	Reserved	
8.	Reserved	
9.	Idle/High Speed	Engine will not automatically enter high speed mode after cranking under local mode. Only when controller sends high speed command after idle/high speed signal is active can engine enters high speed running.
10.	Barring Gear Interlock	Engine is prohibited to start after it is active.
11.	Fuel Leakage	Fuel leakage alarm occurs when it is active.
12.	Reserved	
13.	Reserved	
14.	Reserved	

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No.	Item	Description
15.	High Water Temp. Shut	Connects sensor digital input. When it is active, controller will send stop command and display corresponding information on the LCD.
16.	Reserved	
17.	Low Oil Pressure Shut.	Connects sensor digital input. When it is active, controller will send stop command and display corresponding information on the LCD.
18.	Local Mode	System enters local mode when it is active.
19.	Remote Mode	System enters remote mode when it is active.
20.	Remote Start	When it is active in remote mode, controller will send start command.
21.	Remote Stop	When it is active in remote mode, controller will send stop command.
22.	Remote Start/Stop	In remote mode, when it is active, controller will start while stop when it is inactive. It can't be used simultaneously with remote start and remote stop.
23.	Override Mode	When it is active, shutdown alarms are disabled except for overspeed shutdown and emergency stop.
24.~ 50.	Reserved	

NOTE: The defined name of input port 1-4 only can be configured via computer software.

7.9 PROGRAMMABLE OUTPUT PORT 1-3 DEFINITION

7.9.1 DEFINED CONTENTS OF PROGRAMMABLE OUTPUT PORT

Table 13 Defined Contents of Programmable Output Port

No.	Item	Content	Remark
1	Function Configuration	(0-100)	
2	Active Method	0 Normally Open 1 Normally Close	
3	Active Period	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 Stop Bit15: Stop Failure	
5	Delay Output Timne	(0-100.0)s	
6	Continuous Output Time	(0-3600)s	

7.9.2 FUNCTION DEFINITION OF OUTPUT PORT

Table 14 Function Definition of Output Port

No.	Item	Description
0.	Not Used	It is not used.
1.	User-defined	See table 13.
2.	Air Flap Control	It can close the air flap in overspeed alarm shutdown and emergency stop.
3.	Audible Alarm	Action in warning and shutdown. It can externally connect the announciator. When "Alarm Mute" is active, it can't output.
4.	Crank Relay	It is active in generator cranks and inactive after crank disconnect.
5.	Fuel Relay	It is active in generator starts and inactive in waitinf for stop.
6.	ETS Output	Action in ETS delay.
7.	ECU Power	ECU power output end. When the monitoring controller is powered on, it will output and deactivate in power off.
8.	Ignition Control	ECU ignition control. It will output in power on and deactivate in stop.
9.	Loss of Speed Signal	Action when speed is 0 after safety on.
10.	Reserved	
11.	Override Mode	Output when it is in override mode.

No.	Item	Description
12.	Standby Engine (1)	Output when controller in standby status and no sensor open alarm. It is only active in remote mode.
13.	Heating Control	It is controlled by heating upper and lower limit of temperature sensor.
14.	Idle Control	Action in crank-start idle and stop idle-wait for stop. It is inactive in local mode.
15.	Common Alarm	Action in common warning, common shutdown alarm occurs.
16.	Common Shutdown Alarm	Action in common shutdown alarm occurs.
17.	Common Warning Alarm	Action in common warning alarm occurs.
18.	Input 1 Active	Action in digital input 1 is active.
19.	Input 2 Active	Action in digital input 2 is active.
20.	Input 3 Active	Action in digital input 3 is active.
21.	Input 4 Active	Action in digital input 4 is active.
22.	Reserved	
23.	Reserved	
24.	Crank Sucess	It is active when engine speed is greater than 500rpm and inactive when it is lower than 100rpm.
25.	Normal Running	It is active when engine speed is greater than 85% of rated speed and inactive when it is lower than 75%.
26.	Remote Mode	Output when controller in remote mode
27.	Local Mode	Output when controller in local mode
28.	Standby Engine (2)	Output when there is no shutdown alarm, it is only active in remote mode.
29.	Reserved	
30.	Stop Status	Output when controller in standy status.
31.	Power Undervoltage	Output when controller detects power voltage is lower than set value.
32.	Power Overvoltage	Output when controller detects power voltage is greater than set value.
33.	Reserved	
34.	Reserved	
35.	Overspeed Warning	Action in engine overspeed warning occurs.
36.	Overspeed Shutdown	Action in engine overspeed shutdown alarm occurs.
37.	Emergency Stop Alarm	Action in emergency stop alarm occurs.
38.	Charging Failure	Action in charging failure alarm occurs.
39.	Start Failure Alarm	Action in start failure alarm occurs.
40.	Stop Failure Alarm	Action in stop failure alarm occurs.
41.	Reserved	
42.	Reserved	
43.	High Water Temp. Warn	Action in high water temperature warning occurs.
44.	High Water Temp. Shut.	Action in high water temperature shutdown occurs.
45.	Reserved	
46.	High Oil Temp. Warn	Action in high oil temperature warning occurs.

No.	Item	Description
47.	High Oil Temp. Shut.	Action in high oil temperature shutdown occurs.
48.	Reserved	
49.	Low OP Warn	Action in low oil pressure warning occurs.
50.	Low OP Shut.	Action in low oil pressure shutdown occurs.
51.	Flex. Sensor 1 Open	Action in Flex. sensor 1 open alarm occurs.
52.	Flex. Sensor 1 Warn	Action in Flex. sensor 1 warning alarm occurs.
53.	Flex. Sensor 1 Shut	Action in Flex. sensor 1 shutdown alarm occurs.
54.	Flex. Sensor 2 Open	Action in Flex. sensor 2 open alarm occurs.
55.	Flex. Sensor 2 Warn	Action in Flex. sensor 2 warning alarm occurs.
56.	Flex. Sensor 2 Shut	Action in Flex. sensor 2 shutdown alarm occurs.
57.	Flex. Sensor 3 Open	Action in Flex. sensor 3 open alarm occurs.
58.	Flex. Sensor 3 Warn	Action in Flex. sensor 3 warning alarm occurs.
59.	Flex. Sensor 3 Shut	Action in Flex. sensor 3 shutdown alarm occurs.
60.	Reserved	
61.	Oil Pre-supply Output	Output in crank-safety on.
62.	Fuel Pre-supply Output	Output in preheat-safety on.
63.	Flex. Sensor 4 Open	Action in Flex. sensor 4 open alarm occurs.
64.	Flex. Sensor 4 Warn	Action in Flex. sensor 4 warning alarm occurs.
65.	Flex. Sensor 4 Shut	Action in Flex. sensor 4 shutdown alarm occurs.
66.	Fuel Leak Alarm	Output in fuel leak alarm occurs.
67.	Reserved	
68.	Reserved	
69.	Lamp Test	Output in lamp testing.
70.	Overspeed Shutdown (RPU)	Output in RPU overspeed shutdown ocurs.
71.	Remote Emergency Stop	Output in remote emergency stop occurs.
72.	Alarm Flashing	Output when monitoring controller detects alarm. When there is alarm again, this output port will deactivate for 2s and continue to output continuously.
73.	Low RPU 1 Shutdown	When the value of RPU sensor 1 is low, outputs when meets the shutdown alarm requirement.
74.	Hig RPU 1 Shutdown	When the value of RPU sensor 1 is high, outputs when meets the shutdown alarm requirement.
75.	Low RPU 2 Shutdown	When the value of RPU sensor 2 is low, outputs when meets the shutdown alarm requirement.
76.	High RPU 2 Shutdown	When the value of RPU sensor 2 is high, outputs when meets the shutdown alarm requirement.
77~100	Reserved	Reserved.

7.10SENSOR SETTING

- When reselect sensor, the standard value of the selected sensor curve is called. If defaulted temperature sensor is PT100, then sensor curve is PT100 curve; if selected as SGD (120ºC resistance type), temperature sensor curve is SGD curve.

- If there is difference between standard sensor curve and used sensor, "custom sensor" can be selected, then enter custom sensor curve.

- When enter sensor curve, X value (resistance type) must beentered in descending order, otherwise an error will occur.

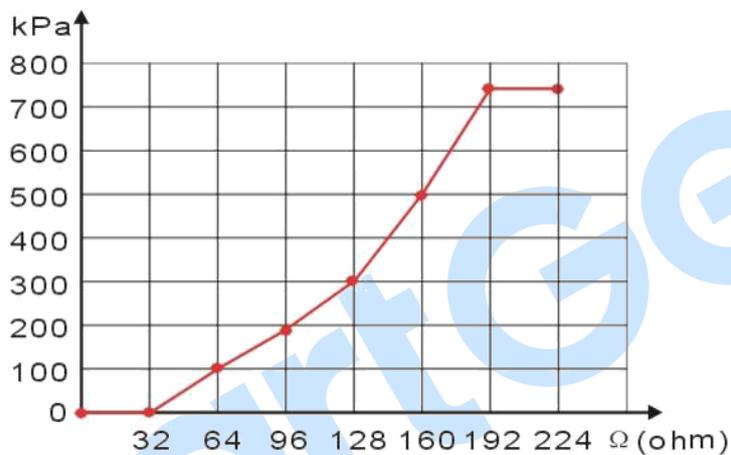- The ordinates of the first or last points can be set same, as shown in the figure below:

Fig.3 Sensor Setting Curve

Table 15 Common Pressure Unit Conversion

	N/m^2 (Pa)	kgf/cm^2	bar	psi
1Pa	1	1.02×10^{-5}	1×10^{-5}	1.45×10^{-4}
1kgf/cm^2	9.8×10^4	1	0.98	14.2
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1

7.10.1 SENSOR CUSTOM LIST

Table 16 Sensor Custom List

No.	Item	Content	Remark
1.	Sensor Type	(0-3) 0: Not Used 1: Pressure Sensor 2: Temp. Sensor 3: Level Sensor	Water temperature, oil temperature, oil pressure sensor types are not selected, data is read by ECU.
2.	Sensor Curve	Sensor type list	See 9.3.2/9.3.3/9.3.4 curve list (water temperature, oil temperature, oil pressure data is read by ECU, so curve is not selected.)
3.	Alarm Speed	(0-200)%	Detect when speed is greater than it.
4.	Range	(0-6000)	It is active in (4~20)mA sensor. Pressure sensor nit is kPa Level sensor unit is % (water temperature, oil temperature, oil pressure data is read by ECU, so there is no this item)

5.	Display Unit	Temperature
		    0: °C
		    1: °F
		Pressure
		    0: kPa
		    1: bar
		    2: psi
		Level unit is fixed as "%"
			Displayed unit on the controller interface, displayed data will be automatically converted after selecting unit.

6.	Sensor High Shutdown	(0-1) 0: Enable 1: Disable	
7.	Set Value	(0-6000)	
8.	Delay	(0-3600)s	
9.	Sensor Low Shutdown	(0-1) 0: Enable 1: Disable	
10.	Set Value	(0-4000)	
11.	Delay	(0-3600)s	
12.	Sensor High Warning	(0-1) 0: Enable 1: Disable	
13.	Set Value	(0-6000)	
14.	Delay	(0-3600)s	
15.	Sensor Low Shutdown	(0-1) 0: Enable	

No.	Item	Content	Remark
		1: Disable	
16.	Set Value	(0-4000)	
17.	Delay	(0-3600)s	
18.	1st point X (Resistance)	Resistance type (non-PT100)	
19.	2nd Point X (Resistance)	Resistance type (non-PT100)	
20.	3rd Point X (Resistance)	Resistance type (non-PT100)	
21.	4th Point X (Resistance)	Resistance type (non-PT100)	
22.	5th Point X (Resistance)	Resistance type (non-PT100)	
23.	6th Point X (Resistance)	Resistance type (non-PT100)	
24.	7th Point X (Resistance)	Resistance type (non-PT100)	
25.	8th Point X (Resistance)	Resistance type (non-PT100)	Customer can define sensor curve, X-axis is 8 points, Y-axis is 8 points. (ECU water temperature, ECU oil temperature, ECU oil pressure data has no this item)
26.	1st point Y (Value)	Resistance type (non-PT100)	
27.	2nd Point Y (Value)	Resistance type (non-PT100)	
28.	3rd Point Y (Value)	Resistance type (non-PT100)	
29.	4th Point Y (Value)	Resistance type (non-PT100)	
30.	5th Point Y (Value)	Resistance type (non-PT100)	
31.	6th Point Y (Value)	Resistance type (non-PT100)	
32.	7th Point Y (Value)	Resistance type (non-PT100)	
33.	8th Point Y (Value)	Resistance type (non-PT100)	
34.	Custom Character String	User can define sensor name	It only can be set through PC software.

7.10.2 TEMPERATURE CURVE LIST

Table 17 Temperature Curve List

No.	Item	Remark
0	Not Used	Resistance range of custom resistance type input is (0-1000)Ω.
1	PT100	
2	Custom Resistance Curve	
3	VDO	
4	CURTIS	
5	VOLVO-EC	
6	DATCON	
7	SGX	
8	SGD	
9	SGH	
10	Reserved	
11	Cu50	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

NOTE: The division value of PT100 resistance type temperature sensor is fixed as 0.385 (0.385Ωcorresponds to 1°C).

7.10.3 PRESSURE CURVE LIST

Table 18 Pressure Curve List

No.	Item	Remark
0	Not Used	Resistance range of custom resistance type input is (0-1000)Ω.
1	(4~20)mA	
2	Custom Resistance Curve	
3	VDO 10bar	
4	CURTIS	
5	Voltage Type (0.5V-4.5V)	
6	DATCON 10bar	
7	SGX	
8	SGD	
9	SGH	
10	Voltage Custom Curve	
11	Reserved	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

NOTE: If pressure signal is current type, no need for setting curve but for range.

7.10.4 LEVEL CURVE LIST

Table 19 Level Curve List

No.	Item	Remark
0	Not Used	
1	(4~20)mA	
2	Custom Resistance Curve	
3	SGD	
4	SGH	
5	Reserved	
6	Reserved	
7	Reserved	Resistance range of custom resistance type input is (0-1000)Ω.
8	Reserved	
9	Reserved	
10	Reserved	
11	Reserved	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

NOTE: If pressure signal is current type, no need for setting curve but for range.

8 EXTENDED APPLICATION

The RPU560B module can be extended via CAN communication interface, the details are as follows:

——This module can be connected with controller via CAN interface. When RPU module does not receive the signal from master controller within 1s, and when the fault input of master control is inactive, the module will take over the control of the engine, and it can stop the engine running until there's a shutdown input or overspeed. The input /output function, analog sensor function and overspeed alarm threshold value can be customized.

The CMM366 cloud monitoring module can be extended via RS485 interface, the details are as follows:

——It is a module with communication protocol conversion function, which can connect the master controller to the Internet. When the module logs into the cloud server, the cloud server will transmit the communication protocol to the module. The cloud monitoring module can get the data of master controller via RS485 interface and transmit the data to the cloud server by wireless network. Users can use APP (ISO or Android), commupter or other terminal device to monitor the running status of master controller and query the running records of master controller.

——The GPS function of the module can upload the information of longitude/latitude, altitude to the cloud server in real-time.

9 COMMISSIONING

The following checks are recommended before running the system:

——Check all the wirings are correct and the wire diameter is appropriate;

——The connection between controller and the positive/negative of starting battery is correct, and the switch of power supply is closed;

——Set the controller in local mode. Press the start key, the engine will start, it will automatically enter the ETS after starting failure;

——Correctly connect the ignition control to engine ECU power;

——Check the wirings of remote monitoing module, press the start key of the module in remote mode, the engine will start;

——If there is any other question, please contact SmartGen's service.
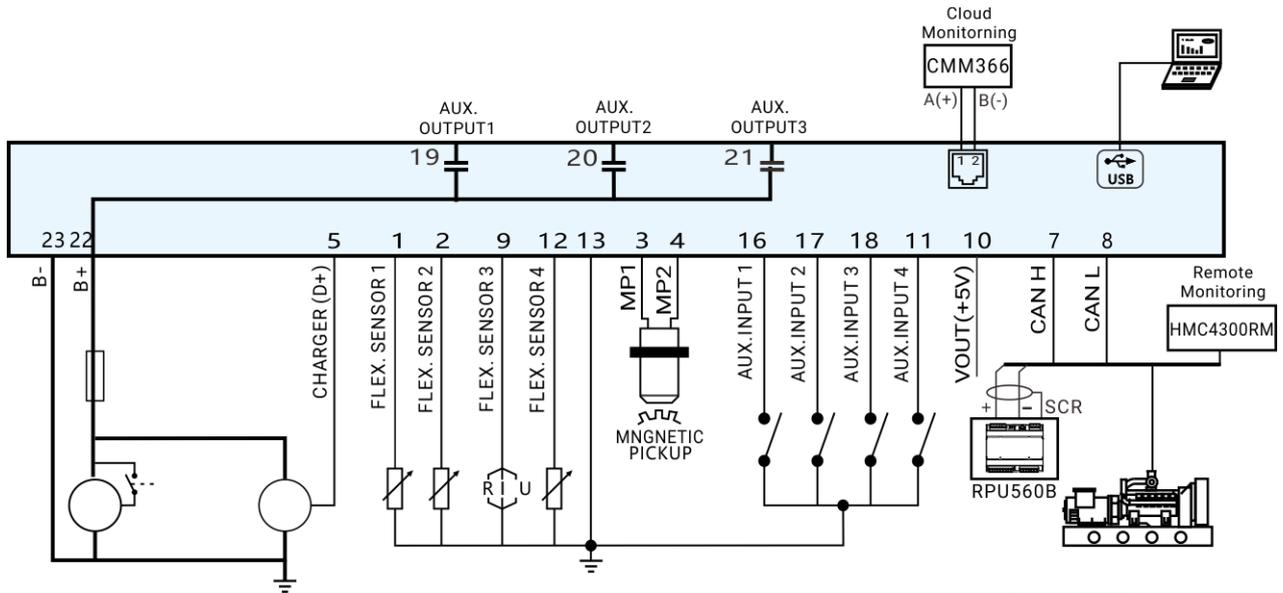
10 TYPICAL APPLICATION

Fig.4 HMC4300 Typical Application Diagram

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11 INSTALLATION
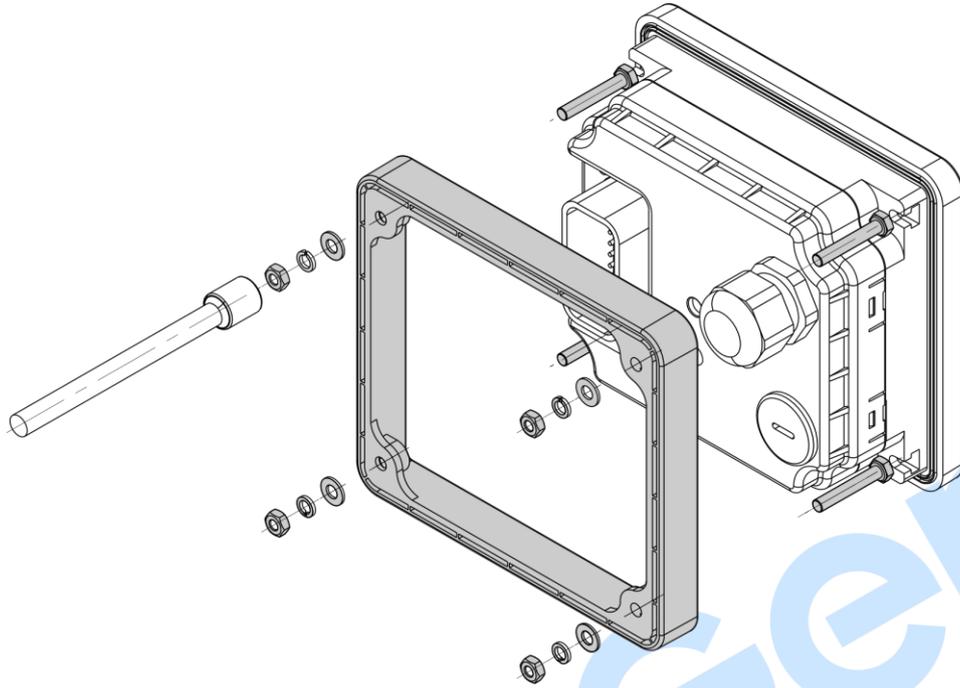
11.1 FIXING CLIPS

Fig.5 HMC4300 Exploded View

⸺The controller is designed for panel mounting and is fixed by a press frame during installation;

⸺Remove the press frame from the controller;

⸺Take out the 4 M4 bolts and place them in the corresponding slots on the front shell;

⸺Put the controller in the opening position of the control cabinet and place the press frame in line with the 4 bolts from behind the controller;

⸺Tighten the flat washers, spring washers and hexagon nuts for installation.

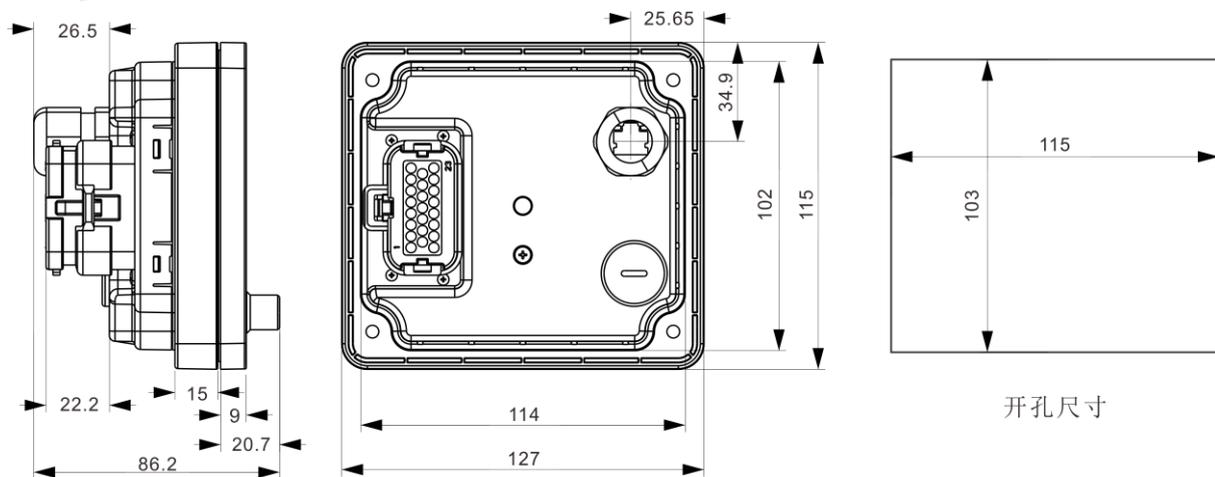### 11.2 CASE DIMENSIONS AND PANEL CUTOUT

Unit:mm

开孔尺寸

Fig.6 Case Dimensions and Panel Cutout

12 TROUBLESHOOTING

Table 20 Troubleshooting

Problem	Possible Solution
Controller no response with power	Check starting batteries; Check controller wirings; Check DC fuse.
Engine Shutdown	Check if water/cylinder temperature is high; Ched DC fuse.
Alarm shutdown in running	Check related switches and wirings according to LCD information; Check Aux. input ports.
Crank failure	Check starting batteries; Check speed sensor and its wirings; Check engine manual.
RS485 communication failure	Check wirings; Check if RS485's A and B wires are connected in the opposite way; Check if a 120Ω matching resistor needs to be connected, set controller via "RS485 TR Output" to connect the resistor automatically; Check if PC's communication port is damaged;
Communication failure between controller and engine	Check if power supply of engine is normal; Check if CAN wires are plugged tightly and not damaged; Check if a 120Ω matching resistor needed to be connected, set controller via "RS485 TR Output" to connect the resistor automatically; Ensure that the CAN communication parameters of engine controller are set correctly; Check fault code in order to know possible problems; Confirm that engine type, communication protocol are compatible with controller.

_____