SmartGen

MAKING CONTROL SMARTER

ACC5100

DIESEL AIR COMPRESSOR CONTROLLER

USER MANUAL

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Table 1 Software Version

Date	Version	Note
2024-06-24	1.0	Original release.
2024-08-27	1.1	1. Add description of new functions, and update the default value of parameters; 2. Modify the typical application diagram.
2025-09-22	1.2	1. Added descriptions of new functions and updated default values. 2. Modified the wiring description of RS485 terminal resistor.

Table 2 Notation Clarification

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

CONTENT

1 OVERVIEW

ACC5100 Diesel Air Compressor Controller is used for air compressor with diesel-driven engine in order to realize air compressor start/stop, data measurement, maintenance, alarm protection and “Three Remotes”. It has speed regulator function, and CANBUS (SAE J1939) port, which can control various ECU or non-ECU diesel air compressors.

ACC5100 Diesel Air Compressor Controller applies 32-bit micro-processor technology, which can realize functions of precise measurement for many parameters, set-point adjustment, timing and threshold setting etc. A majority of parameters can be adjusted from the control panel. All parameters can be adjusted and monitored on PC by RS485 or USB port. The front panel integrates emergency stop button, power on/off switch knob, and high/low pressure switch knob. It can be widely used for diesel-driven air compressor control system with integrated design, compact structure, simple wiring, and high reliability.

2 PERFORMANCE AND CHARACTERISTICS

Main characteristics are as follows:

- 320x240 color LCD display, which is suitable for operation under outdoor sunlight with high brightness backlight; Optional Chinese, English and Russian languages; Simple operation interface;
- Meet the low temperature requirement of -40°C;
- Screen protection is hard screen of acrylic material with better wear-resisting and scratch resistant qualities;
- Silicon panel and buttons with strong adaptive capacity of high/low temperature environment;
- Front panel integrates emergency stop button, power on/off switch knob, and high/low pressure switch knob, which is easy to use with integrated design;
- All the output ports are relay type, and the outputs are equipped with plug-in automotive blade fuses (can be replaced directly without opening the enclosure), which is easy to maintain;
- With RS485 communication port, it can realize “Three Remotes” function by MODBUS protocol;
- With CANBUS port it can monitor ECU common data (speed, water temperature, oil pressure, engine load rate, fuel consumption etc.);
- DPF regeneration function, which meets the control requirements of engine exhaust aftertreatment;
- 6 ways of analog sensors, 3 ways of fixed resistance type sensors, and 3 ways of auxiliary resistance/current/voltage type sensors, which can precisely detect data of engine fuel level, air compressor discharge pressure, discharge temperature, etc.;
- Multiple temperature, pressure, and level sensor curves can be used directly, and custom sensor curve is also available;
- All kinds of parameters of air compressor can be precisely collected and it has complete protection functions, which provides high water temperature, low oil pressure, over speed, high discharge pressure, high discharge temperature protection, etc.;
- Speed regulator function can automatically adjust speed according to discharge pressure of the air compressor;
- Parameter setting function allows users to change and set the parameters, and at the same time settings are stored in the internal EEPROM memory and will not get lost at power outage;
- Crank disconnect conditions (speed, oil pressure) are optional;
- Speed can be obtained from speed sensor or charging generator W/L;
- Wide power supply range DC (8-35V), which can suit different battery voltage environment;
- Real-time clock; Event log, which can continuously save 200 records;
- Heater, cooler and fuel pump control functions;
- Maintenance function; maintenance time due action can be set;
- Plastic sealing gasket is designed for enclosure and front panel to reach IP65 protection class;
- Modular design, anti-flaming plastic enclosure, pluggable terminals with bolt fixed, embedded mounting on the outside of control box, compact structure and easy installation.

3 SPECIFICATION

Table 3 Technical Parameters

Items	Contents
Operating Voltage	DC8.0V~35.0V, continuous power supply
Power Consumption	<5W (Standby mode: ≤2W)
Speed Sensor Voltage	1.0V~24.0V (RMS)
Speed Sensor Frequency	Max. 10,000Hz
Charging Generator W/L	Voltage (1.0-24)V (RMS) Frequency (50-1,000)Hz
Aux. Output 1~5	15A DC28V Active
Aux. Output 6	10A DC28V Passive
Analog Sensor	Three auxiliary resistance/current/voltage type sensors (auxiliary sensor 1, auxiliary sensor 2, auxiliary sensor 3); Three fixed resistance type sensors (auxiliary sensor 4, auxiliary sensor 5, auxiliary sensor 6);
Case Dimensions	236mm×180mm×74mm
Panel Cutout	201mm x 151mm, 4×φ4.5mm
Working Temperature	(-40~+70)°C
Working Humidity	(20~93)%RH
Storage Temperature	(-40~+80)°C
Protection Level	Front panel: IP65, back panel: IP60
Weight	0.95kg

4 OPERATION

4.1 CONTROLLER PANEL

Fig.1 Front Panel

NOTE: Description for part of the indicators:

Alarm Indicator: slow flash (once per second) for warning alarm; quick flash (5 times per second) for shutdown alarm; light off for no alarms;

Status Indicator: it is always on as air compressor is running normally.

4.2 KEYS FUNCTION DESCRIPTION

Table 4 Keys Description

Icon	Keys	Function Description
	Start	Press it to start the air compressor when it is under stop status.
	Load/Unload	At idle speed status, press it and the load relay of controller will output; at normal running status, press it again and controller shall unload and the load relay stops output.
	Alarm Reset/Return	1. In the home page, press it to enter the alarm page quickly; press it again to reset the alarm; after alarm is reset, press it again to exit from the alarm page; 2. In parameter setting page, press it to return the previous menu.
	Maintenance	Press it to enter the maintenance page; press it again and exit from the page; press and hold it in the page to enter the password interface; Enter the password and maintenance setting is entered.
	Stop	1. Stop the running air compressor at start status; 2. Press and hold it for 3s or longer, test whether panel indicators are normal (lamp test).
	Up/Increase	1. Scroll up; 2. Move up cursor or increase the value in setting menu.
	Down/Decrease	1. Scroll down; 2. Move down cursor or decrease the value in setting menu.
	Set/Confirm	1. In the home page, press it to enter the parameter setting menu; 2. Confirm the settings in the parameter settings.
	Power On/Off	Control the power supply of controller.
	High/Low Pressure	Select the high or low pressure. If low pressure is selected, the air compressor runs at low pressure value configured in the user parameter setting. If high pressure is selected, the air compressor runs at high pressure value configured in the user parameter setting.
	Emergency Stop	Press it to switch off the power of auxiliary output 1 (fuel relay output), auxiliary output 2 (start relay output), and stop the air compressor at the same time.

4.3 START/STOP OPERATION

4.3.1 START SEQUENCE

a) Press  and start air compressor;

b) If pre-heat time is configured, then pre-heat relay outputs (if configured); LCD displays “pre-heat delay xx”;

c) After pre-heat delay is over, fuel relay outputs the pre-set fuel time before start (default: 1s), then starting relay outputs; If air compressor crank disconnect fails during “crank time”, then fuel relay and starting relay stop outputting, and enter “crank rest time”, waiting for next start;

d) After the pre-set start attempts, if air compressor doesn't succeed to start, then controller issues failed to start alarm, and meanwhile LCD alarm page displays “Failed to Start” alarm;

e) During any one of the start attempts, if crank disconnect is fulfilled, then it enters "Safety On Delay", during which oil pressure low, water temperature high, under speed, and charging failure alarms are all inactive; after safety on delay it enters “Start Idle Delay” (if configured);

f) After “Start Idle Time” it enters idle running; if load key is pressed, then it enters “Warming Up Time” (if configured);

g) When warming up time is ended, it enters normal running status.

4.3.2 STOP SEQUENCE

a) Press  , and stop the running air compressor; before stop if load control outputs, then disconnect load control;

b) If “Cooling Time” is configured, then “cooling delay” starts; when cooling delay is over, it enters “Stop Idle Delay”;

c) When it enters stop idle delay (if configured), then idle relay is energized to output;

d) It enters “ETS Solenoid Hold”, and ETS relay is energized to output; fuel relay output is disconnected;

e) It enters “Wait Stop Time”, and automatically judges whether it stops completely;

f) When air compressor stops completely, it enters “After Stop Time”; Otherwise, controller enters stop failure and issues “Stop Failure” warning (after the alarm, if air compressor stops completely, then it enters “After Stop Time”, and meanwhile “Stop Failure” alarm is removed automatically);

g) When “After Stop Time” is over, it enters standby status.

4.4 START OPERATION FOR PRE-LUBRICATION OUTPUT SETTING

When the output port is configured to “Pre-lubrication Output”:

If the set pre-lubrication time is less than or equal to the pre-heat time, the pre-lubrication relay outputs when it enters the pre-heat time, and the pre-lubrication output stops after the set pre-lubrication time.

If the set pre-lubrication time is more than the pre-heat time, the pre-lubrication relay outputs when it enters the pre-heat time; after pre-heat delay is over, it enters the following pre-lubrication phase, and LCD displays “Pre-lubrication Time XX”; after pre-lubrication delay is over, the output stops and the total output time equals the set pre-lubrication time.

If air compressor stays at standby status and it outputs cyclically at the pre-set “Pre-lubrication Rest Time” and “Pre-lubrication Time”; If the pre-set “Pre-lubrication Rest Time” is 0h, then pre-lubrication doesn’t output at the standby status.

4.5 EMERGENCY START

NOTE: Press  and  simultaneously and air compressor can be started forcibly. At this time controller doesn't detect the unit crank disconnect by crank conditions. Starter's disconnect is controlled by the operator. When operator observes the unit has started, he/she should release the button. The starter stops outputting and controller enters Safety On Delay.

4.6 LOAD/UNLOAD SPEED REGULATION PROCESS OF AIR COMPRESSOR

Under the status of idle running, press  and load control relay outputs. Controller enters normal running. If current discharge pressure is less than unloading action pressure, then engine speed goes up to rated speed. If current discharge pressure is larger than rated pressure, engine speed will decrease to unloading speed. Between rated pressure and unloading action pressure, speed decreases as pressure increases. Under normal running status, press  and load control relay disconnects and it enters idle running. Engine speed returns to rated value.

For example:

Engine rated speed: 2200RPM
Engine unloading speed: 70% (1540RPM)
Engine idle speed: 60% (1320RPM)
Air compressor loading speed: 70% (1540r/min)
Air compressor rated pressure: 7.0 bar
Air compressor unloading action pressure: 6.0 bar

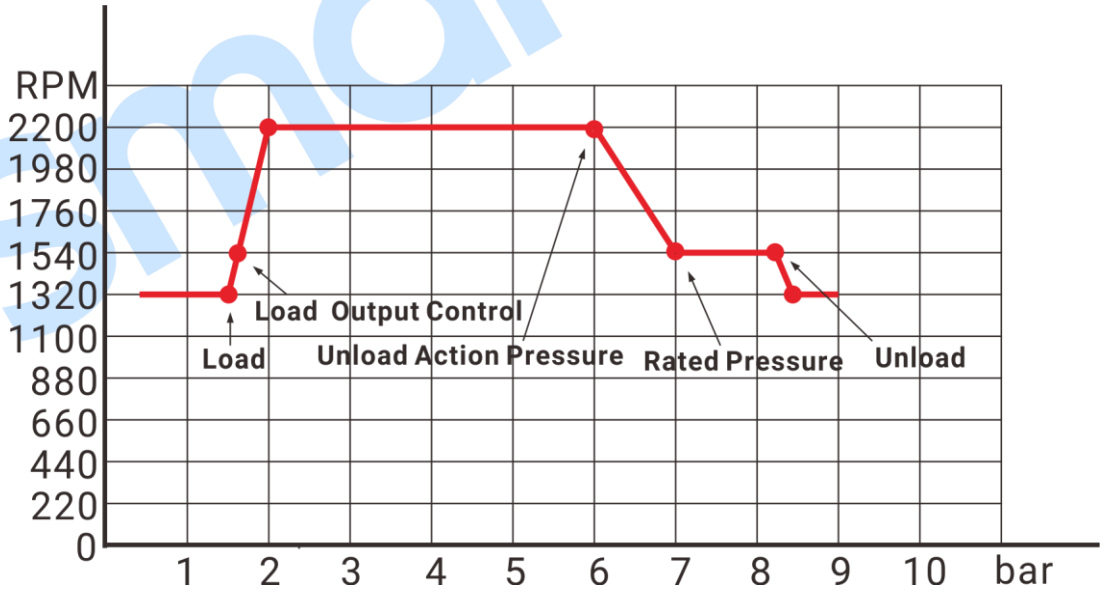


Fig.2 Speed - Pressure Curve Diagram

5 DPF MANUAL REGENERATION

5.1 INSTRUCTION

For engines that meets China Non-road Mobile Machinery Stage IV Emission Standard (hereinafter referred to as Stage IV), they all have DPF regeneration function.

Usually, engine can clear the particulates in DPF by automatic regeneration function. However, engine usually is at short-time status, no-load running or low-speed low-load running status, automatic regeneration cannot completely clear out the DPF particulates, and there may appear particulate block, and beyond the limitation. Under this circumstance, manual DPF regeneration operation is needed.

Controller supports manual regeneration function, which meets the requirements of Stage IV engine controller. It can realize manual DPF regeneration.

5.2 PANEL ICON DESCRIPTION OF DPF REGENERATION

Table 5 DPF Regeneration Panel Icon Description

Icon	Description
	Engine fault indicator
	NCD status indicator
	DPF exhaust temperature indicator
	DPF manual regeneration request indicator
	DPF regeneration inhibition indicator
	DPF regeneration response indicator
	Driver alarm indicator

5.3 DPF MANUAL REGENERATION OPERATION OF “YANMAR” ENGINE

Configure an input port and set it as “DPF Manual Regeneration Request”, and connect it with a button (non-latching) externally.

Press  on controller panel and enter the parameter setting menu. Press  and select “DPF Regeneration”, and press  again to enter the DPF regeneration panel. Controller display is shown as Fig.3:

Fig.3 DPF Regeneration Panel

When manual regeneration is needed, press “DPF Manual Regeneration Request” button. On DPF regeneration panel, DPF response indicator lights on, and it enters DPF regeneration preparation status. When request indicator is always illuminated on the panel, and response indicator flashes at the same time (once per second), it means that regeneration preparation is ready. Controller display is shown as Fig.4:

Fig.4 DPF Regeneration Preparation is Ready

Press “DPF Manual Regeneration Request” button again, and manual regeneration starts. DPF regeneration request indicator goes out, DPF regeneration response indicator always lights on and DPF exhaust temperature indicator always lights on. Controller screen is shown as Fig.5:

Fig.5 DPF Regeneration Starts

When manual regeneration is completed, DPF regeneration response indicator and DPF exhaust temperature indicator both go out. Controller screen display is as Fig. 3 shows.

6 PROTECTION

6.1 WARNINGS

When controller detects warning signal, it only issues warning, not shutdown. When alarm is removed, warning alarm is cleared automatically.

Table 6 Warnings

No.	Type	Description
1	Over Speed Warn	When controller detects speed is above the pre-set over speed warning threshold, it issues warning signal.
2	Under Speed Warn	When controller detects speed is below the pre-set under speed warning threshold, it issues warning signal.
3	Loss of Speed Signal	When controller detects speed is 0, and speed signal loss action is selected “Warning”, it issues warning signal.
4	Failed to Stop	When engine stop delay is over and engine doesn't stop completely, it issues warning signal.
5	Manual Regeneration Required	When controller receives a regeneration request signal from the engine via J1939, it issues a warning signal.
6	Oil Separator Difference Warn	After loading, when the discharge temperature is higher than the set lower limit value, if the oil separation pressure difference is greater than the set value for high warning, the controller will issue a warning alarm signal.
7	Oil Separator Difference Input Warn	After loading, when the discharge temperature is higher than the set lower limit value, if the warning of oil separation pressure difference input is active, it issues a warning alarm signal.
8	Oil Filter Difference Input Warn	After loading, when the discharge temperature is higher than the set lower limit value, if the warning of oil filter pressure difference input is active, it issues a warning alarm signal.
9	Charging Failure	When controller detects engine charger voltage is less than pre-set threshold, it issues warning alarm signal.
10	Battery Overvoltage	When controller detects engine battery voltage is larger than pre-set threshold, it issues warning alarm signal.
11	Battery Undervoltage	When controller detects engine battery voltage is less than pre-set threshold, it issues warning alarm signal.
12	ECU Warn	When controller receives warning signal of engine by J1939, it issues warning signal.
13	Temp Sensor Open Warn	When controller detects sensor is open and action type is selected “Warning”, it issues warning signal.
14	High Temp Warn	When controller detects temperature is higher than pre-set high temp warning value, it issues warning signal.
15	Low Temp Warn	When controller detects temperature is lower than pre-set low temp warning value, it issues warning signal.
16	OP Sensor Open Warn	When controller detects oil pressure sensor is open, and action type is selected "Warning", it issues warning signal.

No.	Type	Description
17	Low OP Warn	When controller detects oil pressure value is below pre-set oil pressure warning value, it issues warning signal.
18	Fuel Level Open Warn	When controller detects fuel level sensor is open and action type is selected “Warning”, it issues warning signal.
19	Low Fuel Level Warn	When controller detects level value is below pre-set fuel level warning value, it issues warning signal.
20	Discharge Pressure Open	When controller detects discharge pressure sensor is open and action type is selected “Warning”, it issues warning signal.
21	High Discharge Press.	When controller detects discharge pressure value is above pre-set pressure warning value, it issues warning signal.
22	Low Discharge Press.	When controller detects discharge pressure value is below pre-set pressure warning value, it issues warning signal.
23	Auxiliary Sensor 1~6 Open	When controller detects sensor is open, and action type is selected “Warning”, it issues warning signal.
24	Auxiliary Sensor 1~6 High	When controller detects sensor value is above pre-set upper limit of warning values, it issues warning signal.
25	Auxiliary Sensor 1~6 Low	When controller detects sensor value is below pre-set lower limit of warning values, it issues warning signal.
26	Input 1~5 Warn	When digital input port is configured to “Warning”, and when it is active, it issues corresponding input warning signal.
27	End of Mandate Time	When controller time reaches mandate time, and mandate time due action is selected “Warning”, it issues warning signal.
28	Fuel Filter Time Over	When timing method is set to “Unit Running Time”, maintenance timing is due, and action type is selected “Warning”, it issues warning signal. When timing method is set to “Real Time Clock”, maintenance countdown goes to 0, and action type is selected “Warning”, it issues warning signal.
29	Fuel/Water Separator Time Over	
30	Air Filter Time Over	
31	Lubricant Time Over	
32	Engine Oil Filter Over	
33	Engine Fuel Filter Over	
34	Engine Lubricant Over	
35	Maintenance 8 Over	
36	Maintenance 9 Over	
37	Maintenance 10 Over	

6.2 SHUTDOWNS

When controller detects shutdown alarm signal, it immediately stops. When engine stops completely, it needs to press manually Alarm Reset button to remove alarms.

Table 7 Shutdown Alarms

No.	Type	Description
1	Emergency Stop	When controller detects emergency stop alarm signal, it issues emergency stop alarm signal.
2	Overspeed Shut	When controller detects engine speed is over preset over speed stop threshold, it issues shutdown alarm signal.

No.	Type	Description
3	Underspeed Shut	When controller detects engine speed is below preset under speed stop threshold, it issues shutdown alarm signal.
4	Loss of Speed Signal	When controller detects speed is 0, and speed signal loss action is selected "Shutdown", it issues shutdown alarm signal.
5	Failed to Start	When engine fails to start during pre-set start attempts, controller issues failed to start alarm signal.
6	ECU Shutdown	When controller receives shutdown alarm signal via J1939, it issues shutdown alarm signal.
7	High Temp. Input Shut	When controller input port is set to High Temp Shutdown Input and if it is active, it issues alarm signal.
8	Low Oil Press Input Shut	When controller input port is set to Low Oil Pressure Shutdown Input and if it is active, it issues alarm signal.
9	ECU Comm. Failure	When engine start is completed, but controller doesn't receive data via J1939, controller issues communication failure signal.
10	Low Coolant Level Input Shutdown	When the controller's input port is configured as low coolant level and it is active, it issues high temperature shutdown alarm signal.
11	Oil Separator Difference Shutdown	After loading, when the discharge temperature is higher than the set lower limit value, if the oil separation pressure difference is greater than the set value for high shutdown input, the controller will issue shutdown alarm signal.
12	Oil Separator Difference Input Shutdown	After loading, when the discharge temperature is higher than the set lower limit value, if the oil separation pressure difference is greater than the high shutdown input, the controller will issue shutdown alarm signal.
13	Oil Filter Difference Input Shutdown	After loading, when the discharge temperature is higher than the set lower limit value, if the oil filter pressure difference is greater than the high shutdown input, the controller will issue shutdown alarm signal.
14	Temp Sensor Open Shut	When controller detects sensor open, and action type is selected “Shutdown”, it issues shutdown alarm signal.
15	High Temp Shutdown	When controller detects temperature value is above pre-set shutdown value, it issues shutdown alarm signal.
16	OP Sensor Open Shut	When controller detects sensor is open and action type is selected “Shutdown”, it issues shutdown alarm signal.
17	Low OP Shutdown	When controller detects oil pressure is below pre-set shutdown value, it issues shutdown alarm signal.
18	Fuel Level Open Shut	When controller detects sensor is open, and action type is “Shutdown”, it issues shutdown alarm signal.
19	Low Fuel Level Shutdown	When controller detects level is below pre-set fuel level shutdown value, it issues shutdown alarm signal.
20	Discharge Pressure Open	When controller detects pressure sensor is open, and action type is selected “Shutdown”, it issues shutdown alarm signal.
21	High Discharge Press	When controller detects sensor is above pre-set pressure shutdown value, it issues shutdown alarm signal.

No.	Type	Description
22	Low Discharge Press	When controller detects sensor is below pre-set pressure shutdown value, it issues shutdown alarm signal.
23	Auxiliary Sensor 1~6 Open	When controller detects sensor is open, and action type is selected “Shutdown”, it issues shutdown alarm signal.
24	Auxiliary Sensor 1~6 High	When controller detects sensor value is above pre-set upper shutdown limit value, it issues shutdown alarm signal.
25	Auxiliary Sensor 1~6 Low	When controller detects sensor value is below pre-set lower shutdown limit value, it issues shutdown alarm signal.
26	Input 1~5 Shutdown	When digital input is configured to shutdown alarm, and if it is active, it issues corresponding input shutdown alarm signal.
27	End of Mandate Time	When controller time reaches mandate time, and mandate time due action is selected “Warning”, it issues warning signal.
28	Fuel Filter Time Over	When timing method is set to “Unit Running Time”, maintenance timing is due, and action type is selected "Shutdown", it issues shutdown signal. When timing method is set to “Real Time Clock”, maintenance countdown goes to 0, and action type is selected "Shutdown", it issues shutdown signal.
29	Fuel/Water Separator Time Over	
30	Air Filter Time Over	
31	Lubricant Time Over	
32	Engine Oil Filter Over	
33	Engine Fuel Filter Over	
34	Engine Lubricant Over	
35	Maintenance 8 Over	
36	Maintenance 9 Over	
37	Maintenance 10 Over	

NOTE: For ECU Warning and ECU Shutdown alarms, if detailed information is displayed, check the engine according to the information; otherwise, refer to engine user manual to get information according to SPN code.

7 WIRE CONNECTION

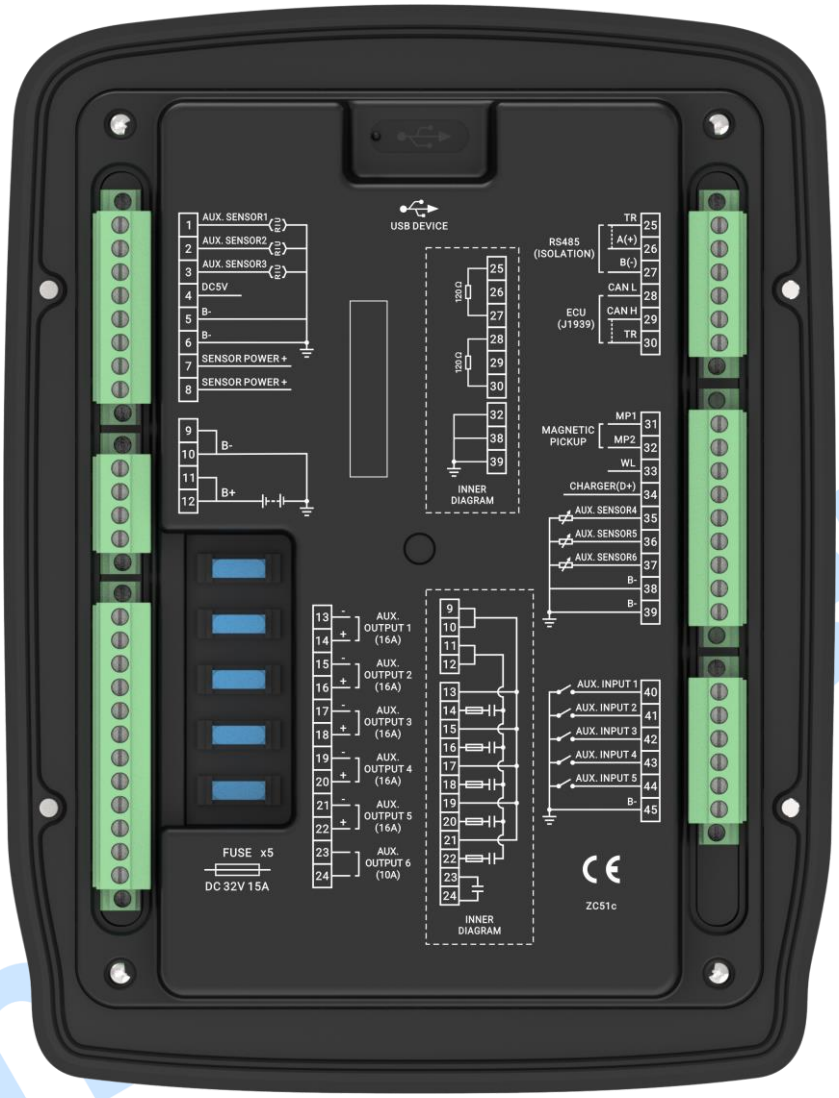


Fig.6 Controller Back Panel

Table 8 Connection Terminals Description

No.	Function	Size	Remark	
1	Aux. Sensor 1	1.0mm^2	Configure by user (Resistance/current/voltage type)	See setting items in Table 13.
2	Aux. Sensor 2	1.0mm^2	Configure by user (Resistance/current/voltage type)	
3	Aux. Sensor 3	1.0mm^2	Configure by user (Resistance/current/voltage type)	
4	DC5V	1.0mm^2	Power supply for voltage type sensor.	
5	Sensor COM (B-)	1.0mm^2	Common terminal of sensor; It is already connected with B- internally.	
6	Sensor COM (B-)	1.0mm^2	Common terminal of sensor; It is already connected with B- internally.	

No.	Function	Size	Remark	
7	SENSOR POWER+	1.0mm²	Power supply for current type sensor.	
8	SENSOR POWER+	1.0mm²	Power supply for current type sensor.	
9	DC Power Input B-	1.5mm²	Connect with the negative of starter battery.	
10		1.5mm²		
11	DC Power Input B+	1.5mm²	Connect with the positive of starter battery.	
12		1.5mm²		
13	Aux. Output 1	1.0mm²	It can be configured as active relay output, rated 15A DC28V.	Active relay outputs, the automotive blade fuse is 15A DC32V; See setting items in Table 11.
14	Aux. Output 1+	1.0mm²		
15	Aux. Output 2	1.0mm²	It can be configured as active relay output, rated 15A DC28V.	
16	Aux. Output 2+	1.0mm²		
17	Aux. Output 3	1.0mm²	It can be configured as active relay output, rated 15A DC28V.	
18	Aux. Output 3+	1.0mm²		
19	Aux. Output 4	1.0mm²	It can be configured as active relay output, rated 15A DC28V.	
20	Aux. Output 4+	1.0mm²		
21	Aux. Output 5	1.0mm²	It can be configured as active relay output, rated 15A DC28V.	
22	Aux. Output 5+	1.0mm²		
23	Aux. Output 6	1.0mm²	It can be configured as passive relay output, rated 10A DC28V.	
24	Aux. Output 6	1.0mm²		
25	TR	0.5mm²	Internal 120Ω termination resistor, connect with B-. If the resistor is needed, short the Terminal 25 and 26.	
26	RS485 A(+)	0.5mm²		
27	RS485 B(-)	0.5mm²		
28	ECU CAN H	0.5mm²	120Ω impedance shielded cable is recommended; One end of the shielded cable should be grounded.	
29	ECU CAN L	0.5mm²		
30	TR	0.5mm²	Internal 120Ω termination resistor, connect with CAN L. If the resistor is needed, short the Terminal 29 and 30.	
31	MP1 Speed Sensor Input	0.5mm²	Connect with the engine speed sensor; shielded cable is recommended. MP2 is already connected with battery negative internally;	
32	MP2 Speed Sensor Input	0.5mm²		
33	W/L	0.5mm²	Connect with the Terminal W of charger.	
34	Charger D+ Input	1.0mm²	Connect with the Terminal D+ (W/L) of charger; It will be vacant if there is no D+ on the charger.	
35	Aux. Sensor 4	1.0mm²	Users configured (resistance type).	See setting items in Table 13.
36	Aux. Sensor 5	1.0mm²	Users configured (resistance type).	
37	Aux. Sensor 6	1.0mm²	Users configured (resistance type).	
38	Sensor COM (B-)	1.0mm²	Common terminal of sensor; It is already connected with B- internally.	
39	Sensor COM (B-)	1.0mm²	Common terminal of sensor; It is already connected with B- internally.	
40	Aux. Input 1	0.5mm²	It can be configured as active in high/low level. Default: active under low level.	See setting items in

No.	Function	Size	Remark	
41	Aux. Input 2	0.5mm²	It can be configured as active in high/low level. Default: active under low level.	Table 12.
42	Aux. Input 3	0.5mm²	It can be configured as active in high/low level. Default: active under low level.	
43	Aux. Input 4	0.5mm²	It can be configured as active in high/low level. Default: active under low level.	
44	Aux. Input 5	0.5mm²	It can be configured as active in high/low level. Default: active under low level.	
45	B-	0.5mm²	Common terminal of input (when it is active under low level). It is already connected with B- internally.	

8 CONFIGURATION PARAMETER RANGE AND DEFINITION

8.1 PARAMETER RANGE AND DEFINITION

Table 9 Manufacturer Parameters Setting Contents and Range List

No.	Item	Range	Default	Description
Language				
1	Language	(0-2)	0	0: Simplified Chinese; 1: English; 2: Russian
LCD Backlight				
1	Brightness	(0-5)	5	Set LCD backlight brightness;
2	Delay	(0-3600)min	5	Backlight is always on when delay is set to 0min.
Module Setting				
1	Module Address	(1-254)	1	Controller address for remote monitoring;
2	Comm. Stop Bit	(0-1)	0	0: 2-bit Stop Bit 1: 1-bit Stop Bit (PC software settings)
3	Password	(0-65534)	00318	It used for advanced parameter setting; ⚠**Caution!** Default password is "00318"; It can be changed by operator for purpose of preventing others changing controller advanced configuration. If password is changed, please remember it clearly. If it is forgotten, please contact company service person.
4	Date and Time			Users can calibrate date and time.
5	Maintenance Password	(0-65534)	01111	Independent password for maintenance.
6	User Parameters Password	(0-65534)	01234	Independent password for user parameters setting.
7	Option 1 Displayed in the Home Page	(0-9)	0	0: Fuel level; 1: Battery voltage; 2: D+ voltage; 3: Air flow rate; 4: Aux. sensor 1; 5: Aux. sensor 2; 6: Aux. sensor 3; 7: Aux. sensor 4; 8: Aux. sensor 5; 9: Aux. sensor 6;
8	Option 2 Displayed in the Home Page	(0-9)	1	
9	Unit Equipment No.	(0-99999999)	0	The user can set an 8-digit factory equipment number.
10	Unit Ex-Factory Date			The ex-factory date can be set by the user.
Timer Setting				
1	Preheat Delay	(0-3600)s	0	Time for pre-heating plug to be energized before starter is energized.
2	Prestart Fuel Time	(0-3600)s	1	Time for fuel relay output every time before starter is energized.

No.	Item	Range	Default	Description
3	Cranking Time	(3-60)s	8	Time for starter to be energized every time.
4	Crank Rest Time	(3-60)s	10	Waiting time before second energization when engine fails to start.
5	Safety On Delay	(0-3600)s	10	During this time oil pressure low, temp. high, under speed, under frequency, under voltage, and charge alt failure alarms are all inactive.
6	Start Idle Time	(0-3600)s	10	Time for engine idle running in start process.
7	Warming Up Time	(0-3600)s	0	Warming up time for engine before normal running after high speed running.
8	Cooling Time	(0-3600)s	0	Cooling time before stop
9	Stop Idle Time	(0-3600)s	10	Time for engine idle running in stop process.
10	ETS Solenoid Hold	(0-3600)s	20	Time for ETS to be energized before stop.
11	Wait Stop Time	(0-3600)s	0	Time after idle running delay before complete stop when ETS Solenoid Hold is set 0; When it is not 0, it is time after ETS delay before complete stop.
12	After Stop Time	(0-3600)s	0	Time from complete stop to standby status.
13	Pre-lubrication Rest Time	(0-12)h	2	Interval time from the first pre-lubrication to the second pre-lubrication when output is configured as pre-lubrication in standby status; when it is set as 0, pre-lubrication will not output in standby status.
14	Pre-lubrication Time	(3-30)s	5	Time for pre-lubrication output when output is configured as pre-lubrication.
15	Manual Preheat Time	(0-3600)s	0	When the manual preheat input is active during standby, the manual preheat output timer starts.
Engine Setting				
1	Engine Type	(0-39)	34	Default: 34: GTSC1;
2	Enable ECU Alarm Shut	(0-1)	1	0: Disable 1: Enable **NOTE:** When engine detects red light alarm, it will stop when it is enabled;
3	Source of Speed Signal	(0-1)	0	0: Speed Sensor 1: W/L
4	W/L Ratio	(0-99.99)	11.80	
5	Flywheel Teeth	(1.0-300.0)	118.0	Flywheel teeth of engine, used for

No.	Item		Range	Default	Description
					starter disconnect conditions and engine speed detection; please refer to the below installation.
6	Max. Rated Speed		(0-6000)r/min	2200	Maximum value for the rate speed of high/low pressure mode in user parameters
7	Start Attempts		(1-10)times	1	Maximum start times in case of failed start; when this number is reached, controller shall issue Failed to Start signal.
8	Crank Disconnect		(0-2)	0	Please refer to Table 14; There are two kinds of disconnect conditions for engine and starter. They can be used independently or together and the purpose is to separate starter motor and engine as soon as possible.
9	Disconnect Speed		(0-200)%	24	Set value is the percentage of rated speed; when speed is above the set value, starter shall disconnect; Please refer to the rear installation.
10	Disconnect OP		(0-10.00)bar	2.00	When Oil Pressure is above pre-set value, starter shall disconnect. Please refer to the rear installation.
11	Overspeed Warn	Set	(0-200.0)%	110.0	Set value is the percentage of rated speed; Return value and delay value can also be set. Overspeed warning is enabled by default, underspeed warning is disabled by default.
		Return	(0-200.0)%	108.0	
		Delay	(0-3600)s	5	
12	Underspeed Warn	Set	(0-200.0)%	55.0	
		Return	(0-200.0)%	60.0	
		Delay	(0-3600)s	5	
13	Overspeed Shutdown	Set	(0-200.0)%	114.0	Set value is the percentage of rated speed; Delay value can also be set. Overspeed shutdown is enabled by default, underspeed shutdown is disabled by default.
		Delay	(0-3600)s	2	
14	Underspeed Shutdown	Set	(0-200.0)%	50.0	
		Delay	(0-3600)s	3	
15	Loss of Speed Signal Delay		(0-3600)s	3	Time from detecting speed is 0 to confirm the action;
16	Loss of Speed Signal Action		(0-1)	1	0: Warning 1: Shutdown
17	Battery Rated Voltage		(0-60.0)V	24.0	Provide standard for battery over/under voltage detection.
18	Battery Overvolt Warn	Set	(0-200)%	125	Set value is the percentage of battery rated voltage; Return value and delay value can also be set. Battery over/under voltage warning is enabled
		Return	(0-200)%	120	
		Delay	(0-3600)s	60	
19	Battery	Set	(0-200)%	85	

No.	Item		Range	Default	Description
	Undervolt Warn	Return	(0-200)%	90	by default.
		Delay	(0-3600)s	60	
20	Charge Alt Fail	Set	(0-60.0)V	8.0	During engine normal running process, when charger D+ voltage is below this value, controller issues charge alt fail warning. It is enabled by default.
		Return	(0-60.0)V	10.0	
		Delay	(0-3600)s	10	
21	Engine Idle Speed		(0-100)%	64.0	Set value is the percentage of rated speed; when idle running is needed, stabilize the speed at the set value.
22	Fixed Idle Speed		(0-2000)rpm	1400	Active when the set value is not 0. The idle speed is fixed to this value.
23	Charger Voltage Source		(0-1)	1	0: ECU; 1: Analog
24	Charger Excitation Control Enable		(0-1)	0	0: Disable 1: Enable. D+ control will not output when it is disabled.
25	Preheat Correlated Temperature Enable		(0-1)	0	0: Disable 1: Enable
26	Preheat Correlated Temperature Setting		(0-300)°C	25	When it is enabled, when engine temperature is higher than set value in preheat period, after preheat is over, preheat output stops.
Air Compressor Setting					
1	Max. Target Pressure		(0-300.00)bar	8.00	Maximum value for the target pressure of high/low pressure mode in user parameters
2	Flow-to-Speed Ratio		(0-9.999)	1.000	The calculation coefficient of discharge air flow, discharge air flow rate after loading = speed * flow-to-speed ratio.
3	Low Pressure Loading Speed		(0-100)%	69.0	In low pressure mode, after pressing load key, when the current speed reaches loading speed, load control will output.
4	High Pressure Loading Speed		(0-100)%	72.5	In high pressure mode, after pressing load key, when the current speed reaches loading speed, load control will output.
5	Overpressure Auto Unload	Enable	(0-1)	0	0: Disable; 1: Enable. When discharge pressure is higher than target value, load control disconnects; when it is lower than the set value, load control outputs.
		Set	(0-200.0)%	105.0	
		Return	(0-200.0)%	95.0	
		Delay	(0-3600)s	0	
6	Start Auto Load Enable		(0-1)	0	0: Disable; 1: Enable. When it is enabled, engine can automatically take load and enter high speed without pressing load key after

No.	Item		Range	Default	Description
					starting.
7	Load Valve Auto Control		(0-1)	0	0: Disable; 1: Enable. When the non-ECU unit setting is enabled, press the load key after that, if discharge pressure is less than air compressor unload action pressure, load control outputs; if discharge pressure is larger than air compressor rated pressure, load control stops to output.
8	Speed Up Rate Set		(30-500)r/s	200	The speed increased by revolutions per second.
9	Speed Down Rate Set		(30-500)r/s	200	The speed reduced by revolutions per second.
10	Start Idle Delay Correlated Temperature	Enable	(0-1)	0	0: Disable; 1: Enable. Correlated sensor: 0: Engine temperature; 1: Engine oil temperature; 2: Aux. sensor 1; 3: Aux. sensor 2; 4: Aux. sensor 3; 5: Aux. sensor 4; 6: Aux. sensor 5; 7: Aux. sensor 6; After it is enabled, when the temperature (correlated sensor value) is higher than the set value, it will exit Start Idle Delay period.
		Sensor	(0-7)	0	
		Set	(0-100)°C	40	
11	Discharge Temperature Protection Range		(0-1)	1	0: After Safety On Delay; 1: Always
12	Overload Protection Set	Set	(0-200)%	90	Set value is the percentage of engine load rate; Return value and delay value can also be set.
		Return	(0-200)%	70	
		Delay	(0-3600)s	5	
13	Overload Speed Down Rate		(3-500)r/s	30	The speed reduced by revolutions per second.
14	Overload Stable Speed		(0-100.0)%	70.0	The percentage of rated speed; When overload protection occurs, the air compressor reduces the speed and keeps it at stable speed. It is disabled by default.
15	Auto Standby Set	Enable	(0-1)	0	0: Disable; 1: Enable. Correlated sensor for stop pressure: 0: Discharge pressure;

No.	Item		Range	Default	Description
		Stop Pressure Sensor	(0-6)	0	1: Aux. sensor 1; 2: Aux. sensor 2; 3: Aux. sensor 3; 4: Aux. sensor 4; 5: Aux. sensor 5; 6: Aux. sensor 6; After it is enabled, when the pressure (correlated sensor value) is higher than the set stop pressure, it enters the standby delay, after the standby delay is over, the engine stops and enters auto standby mode. When the pressure (correlated sensor value) is lower than the set start pressure, it enters the start delay, after the start delay is over, the engine starts.
		Standby Delay	(0-3600) s	1800	
		Start Pressure	(0-200) %	110	
		Delay	(0-3600) s	0	
		Stop Pressure	(0-200) %	120	
16	Target Pressure Compensation	Enable	(0-1)	0	0: Disable; 1: Enable. After it is enabled, if the discharge pressure can't reach the rated value in 30s, the speed will be automatically raised. The max. speed up range = rated speed - unload speed. Speed up rate = (target pressure - current pressure)* factor/1000.
		Factor	(0-10.0)	1.0	
Analog Sensor Setting					
Aux. Sensor 1					
1	Sensor Type		(0-5)	4	0: Not Used 1: Engine Temperature Sensor 2: Engine Oil Pressure Sensor 3: Temperature Sensor 4: Oil Pressure Sensor 5: Level Sensor
2	Curve Type		(0-15)	2	It depends on the sensor types, and default is custom 4~20mA curve.
3	Open Action		(0-2)	0	0: Warning 1: Shutdown 2: No action
4	Display Unit		(0-1)	0	0: bar; 1: kpa; 2: psi; **NOTE**: Unit is different for different sensor.
5	Over Shutdown	Enable	(0-1)	1	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues shutdown alarm; Alarm enable and delay value can be set.
		Set	(0-90.00)	9.00	
		Delay	(0-3600)s	5	
6	Under Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable.

No.	Item		Range	Default	Description
		Set	(0-90.00)	1.0	When external sensor value is less than this value, controller issues shutdown alarm; alarm enable and delay value can be set.
		Delay	(0-3600)s	5	
7	Over Warn	Enable	(0-1)	1	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-90.00)	8.50	
		Return	(0-90.00)	8.00	
		Delay	(0-3600)s	5	
8	Under Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues warning alarm; alarm enable, return and delay values can be set. It is disabled by default, and the default delay is 5s.
		Set	(0-90.00)	2.00	
		Return	(0-90.00)	3.00	
		Delay	(0-3600)s	5	
9	Custom Curve				When custom resistance, current, or voltage type are selected, related curve needs to be set. And default curve is 4.1-20mA for X, 0.00-25bar for Y.
Aux. Sensor 2					
1	Sensor Type		(0-5)	0	0: Not Used 1: Engine Temperature Sensor 2: Engine Oil Pressure Sensor 3: Temperature Sensor 4: Oil Pressure Sensor 5: Level Sensor
2	Curve Type		(0-15)	0	It depends on the sensor types, and default is Not Used.
3	Open Action		(0-2)	0	0: Warning 1: Shutdown 2: No action
4	Display Unit		(0-1)	0	0: °C 1: °F **NOTE**: Unit is different for different sensor.
5	Over Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues shutdown alarm; Alarm enable and delay value can be set.
		Set	(0-9000)	100	
		Delay	(0-3600)s	5	
6	Under Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues shutdown alarm; alarm enable and delay value can be set.
		Set	(0-9000)	10	
		Delay	(0-3600)s	5	
7	Over Warn	Enable	(0-1)	0	0: Disable; 1: Enable.

No.	Item		Range	Default	Description
		Set	(0-9000)	90	When external sensor value is larger than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Return	(0-9000)	80	
		Delay	(0-3600)s	5	
8	Under Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	20	
		Return	(0-9000)	30	
		Delay	(0-3600)s	5	
9	Custom Curve				When custom resistance, current, or voltage type are selected, related curve needs to be set.
Aux. Sensor 3					
1	Sensor Type		(0-5)	0	0: Not Used 1: Engine Temperature Sensor 2: Engine Oil Pressure Sensor 3: Temperature Sensor 4: Oil Pressure Sensor 5: Level Sensor
2	Curve Type		(0-15)	0	It depends on the sensor types, and default is Not Used.
3	Open Action		(0-2)	0	0: Warning 1: Shutdown 2: No action
4	Display Unit		(0-1)	0	0: °C 1: °F **NOTE**: Unit is different for different sensor.
5	Over Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues shutdown alarm; Alarm enable and delay value can be set.
		Set	(0-9000)	100	
		Delay	(0-3600)s	5	
6	Under Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues shutdown alarm; alarm enable and delay value can be set.
		Set	(0-9000)	10	
		Delay	(0-3600)s	5	
7	Over Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	90	
		Return	(0-9000)	80	
		Delay	(0-3600)s	5	
8	Under Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	20	
		Return	(0-9000)	30	
		Delay	(0-3600)s	5	

No.	Item		Range	Default	Description
9	Custom Curve				When custom resistance, current, or voltage type are selected, related curve needs to be set.
Aux. Sensor 4					
1	Sensor Type		(0-5)	3	0: Not Used 1: Engine Temperature Sensor 2: Engine Oil Pressure Sensor 3: Temperature Sensor 4: Oil Pressure Sensor 5: Level Sensor
2	Curve Type		(0-15)	11	It depends on the sensor types, and default is PT100.
3	Open Action		(0-2)	0	0: Warning 1: Shutdown 2: No action
4	Display Unit		(0-1)	0	0: °C 1: °F **NOTE**: Unit is different for different sensor.
5	Over Shutdown	Enable	(0-1)	1	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues shutdown alarm; Alarm enable and delay value can be set.
		Set	(0-9000)	120	
		Delay	(0-3600)s	5	
6	Under Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues shutdown alarm; alarm enable and delay value can be set.
		Set	(0-9000)	10	
		Delay	(0-3600)s	5	
7	Over Warn	Enable	(0-1)	1	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	115	
		Return	(0-9000)	110	
		Delay	(0-3600)s	5	
8	Under Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	20	
		Return	(0-9000)	30	
		Delay	(0-3600)s	5	
9	Custom Curve				When custom resistance, current, or voltage type are selected, related curve needs to be set.
Aux. Sensor 5					
1	Sensor Type		(0-5)	5	0: Not Used 1: Engine Temperature Sensor 2: Engine Oil Pressure Sensor 3: Temperature Sensor 4: Oil Pressure Sensor 5: Level Sensor

No.	Item		Range	Default	Description
2	Curve Type		(0-15)	6	It depends on the sensor types, and default is 4Ω~126Ω.
3	Open Action		(0-2)	0	0: Warning 1: Shutdown 2: No action
4	Display Unit		(0-1)	0	0: %; **NOTE**: Unit is different for different sensor.
5	Over Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues shutdown alarm; Alarm enable and delay value can be set.
		Set	(0-9000)	100	
		Delay	(0-3600)s	5	
6	Under Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues shutdown alarm; alarm enable and delay value can be set.
		Set	(0-9000)	5	
		Delay	(0-3600)s	5	
7	Over Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	90	
		Return	(0-9000)	80	
		Delay	(0-3600)s	5	
8	Under Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	20	
		Return	(0-9000)	30	
		Delay	(0-3600)s	5	
9	Custom Curve				When custom resistance, current, or voltage type are selected, related curve needs to be set.
Aux. Sensor 6					
1	Sensor Type		(0-5)	0	0: Not Used 1: Engine Temperature Sensor 2: Engine Oil Pressure Sensor 3: Temperature Sensor 4: Oil Pressure Sensor 5: Level Sensor
2	Curve Type		(0-15)	0	It depends on the sensor types, and default is Not Used.
3	Open Action		(0-2)	0	0: Warning 1: Shutdown 2: No action
4	Display Unit		(0-1)	0	0: °C 1: °F **NOTE**: Unit is different for different sensor.
5	Over Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues
		Set	(0-9000)	100	

No.	Item		Range	Default	Description
		Delay	(0-3600)s	5	shutdown alarm; Alarm enable and delay value can be set.
6	Under Shutdown	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues shutdown alarm; alarm enable and delay value can be set.
		Set	(0-9000)	10	
		Delay	(0-3600)s	5	
7	Over Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	90	
		Return	(0-9000)	80	
		Delay	(0-3600)s	5	
8	Under Warn	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is less than this value, controller issues warning alarm; alarm enable, return and delay values can be set.
		Set	(0-9000)	20	
		Return	(0-9000)	30	
		Delay	(0-3600)s	5	
9	Custom Curve				When custom resistance, current, or voltage type are selected, related curve needs to be set.
Engine Temperature Correlation Setting					
1	Correlated Sensor Set		(0-6)	0	0: ECU; 1: Aux. sensor 1; 2: Aux. sensor 2; 3: Aux. sensor 3; 4: Aux. sensor 4; 5: Aux. sensor 5; 6: Aux. sensor 6; **NOTE**: When the engine temperature is correlated with the aux. sensor 1-6, the alarm set value is still based on the alarm set value here, and is not based on the alarm set value in the aux. sensor setting above.
2	Display Unit		(0-1)	0	0: °C; 1: °F
3	High Temp. Shutdown	Enable	(0-1)	1	0: Disable; 1: Enable. When external temp. sensor value is larger than this value, controller issues high temp. shutdown alarm; This value is detected only after safety on delay. Delay value can be set. It is enabled by default.
		Set	((-50)-300)°C	98	
		Delay	(0-3600)s	3	
4	High Temp. Warn	Enable	(0-1)	1	0: Disable; 1: Enable. When external temp. sensor value is over this value, controller issues high
		Set	((-50)-300)°C	95	

No.	Item		Range	Default	Description
		Return	((-50)-300)°C	93	temp. warning alarm; This value is detected only after safety on delay. Return and delay value can be set. It is enabled by default.
		Delay	(0-3600)s	5	
5	Low Temp. Warn	Enable	(0-1)	1	0: Disable; 1: Enable. When external temp. sensor value is less than this value, controller issues low temp. warning alarm; This value is detected always. Delay value and return value can be set. It is disabled by default, and the default delay is 5s.
		Set	((-50)-300)°C	70	
		Return	((-50)-300)°C	75	
		Delay	(0-3600)s	5	
6	Heater Control	On	((-50)-300)°C	50	When external temp. sensor value is less than this value, heater control outputs. Return value can be set. It is disabled by default.
		Off	((-50)-300)°C	55	
		Max. Working Duration	(0-3600)min	60	
7	Cooler Control	On	((-50)-300)°C	80	When external temp. sensor value is larger than this value, cooler control outputs. Return value can be set. It is disabled by default.
		Off	((-50)-300)°C	75	
		Max. Working Duration	(0-3600)min	60	
Engine Oil Pressure Correlation Setting					
1	Correlated Sensor Set		(0-6)	0	0: ECU; 1: Aux. sensor 1; 2: Aux. sensor 2; 3: Aux. sensor 3; 4: Aux. sensor 4; 5: Aux. sensor 5; 6: Aux. sensor 6; **NOTE**: When the engine temperature is correlated with the aux. sensor 1-6, the alarm set value is still based on the alarm set value here, and is not based on the alarm set value in the aux. sensor setting above.
2	Display Unit		(0-2)	0	0: bar; 1: kPa; 2: psi.
3	Low OP Shutdown	Enable	(0-1)	1	0: Disable; 1: Enable. When external oil pressure sensor value is less than this value, controller issues low OP shutdown alarm. This value is detected only after safety on delay. Delay value can be set. It is enabled by default.
		Set	(0-10.00) bar	1.03	
		Delay	(0-3600)s	3	

No.	Item		Range	Default	Description
4	Low OP Warn	Enable	(0-1)	1	0: Disable; 1: Enable. When external oil pressure sensor value is less than this value, controller issues low OP warning alarm. This value is detected only after safety on delay. Delay value and return value can be set. It is enabled by default.
		Set	(0-10.00) bar	1.24	
		Return	(0-10.00) bar	1.38	
		Delay	(0-3600)s	5	
Discharge Temperature Correlation Setting					
1	Correlated Sensor Set		(0-6)	4	0: Not used; 1: Aux. sensor 1; 2: Aux. sensor 2; 3: Aux. sensor 3; 4: Aux. sensor 4; 5: Aux. sensor 5; 6: Aux. sensor 6;
Fuel Level Sensor Setting					
1	Correlated Sensor Set		(0-6)	5	0: Not used; 1: Aux. sensor 1; 2: Aux. sensor 2; 3: Aux. sensor 3; 4: Aux. sensor 4; 5: Aux. sensor 5; 6: Aux. sensor 6;
2	Fuel Pump Control	On	(0-300)%	10	When external fuel level sensor value is less than this value, fuel pump control outputs; return value and max. working duration can also be set. It is disabled by default.
		Off	(0-300)%	80	
		Max. Working Duration	(0-3600)s	60	
3	Fuel Tank Capacity Set		(0-10000)L	1000	It is disabled by default.
Discharge Pressure Sensor Setting					
1	Correlated Sensor Set		(0-6)	1	0: Not used; 1: Aux. sensor 1; 2: Aux. sensor 2; 3: Aux. sensor 3; 4: Aux. sensor 4; 5: Aux. sensor 5; 6: Aux. sensor 6;
2	High Pressure Shutdown Target Percentage	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than the set percentage of target discharge pressure, controller issues
		Set	(0-300)%	120.0	

No.	Item		Range	Default	Description
		Delay	(0-3600)s	5	shutdown alarm; Alarm enable and delay value can be set. It is disabled by default.
3	High Pressure Warn Target Percentage	Enable	(0-1)	0	0: Disable; 1: Enable. When external sensor value is larger than set percentage of target discharge pressure, controller issues warning alarm; Alarm enable and delay value can be set. It is disabled by default.
		Set	(0-300.0) %	110.0	
		Return	(0-300.0) %	90.0	
		Delay	(0-3600)s	5	
Screw Oil Cooler Control Setting					
1	Screw Oil Cooler Control 1 Setting	Enable	(0-1)	0	0: Disable; 1: Enable. According to the current discharge temperature, when temperature is higher that it, screw oil cooler control 1 will output, off temperature and working duration can be set. It is disabled by default.
		On	(0-300)°C	80	
		Off	(0-300)°C	75	
		Max. Working Duration	(0-3600) min	0	
2	Screw Oil Cooler Control 2 Setting	Enable	(0-1)	0	0: Disable; 1: Enable. According to the current discharge temperature, when temperature is higher that it, screw oil cooler control 1 will output, off temperature and working duration can be set. It is disabled by default.
		On	(0-300)°C	80	
		Off	(0-300)°C	75	
		Max. Working Duration	(0-3600) min	0	
Oil Separator Difference Setting					
1.	Enable	(0--1)		0	0: Disable; 1: Enable
2.	Pre-Oil Separator Sensor Correlated Set	(0-6)		0	0: Not used; 1: Flex. Sensor 1; 2: Flex. Sensor 2; 3: Flex. Sensor 3; 4: Flex. Sensor 4; 5: Flex. Sensor 5; 6: Flex. Sensor 6.
3.	Post-Oil Separator Sensor Correlated Set	(0-6)		0	
4.	Display Unit	(0-2)		0	0: bar; 1:kPa; 2:psi
5.	High Shutdown Set	Enable	(0-1)	0	Alarm Detection Conditions: 1. loaded; 2. Discharge temperature is higher than the set value for the lower limit of the active detection range.
		Set	(0-90.00)bar	3.00	
		Delay	(0-3600)s	5	
6.	High Warn Set	Enable	(0-1)	0	

No.	Item		Range	Default	Description
		Set	(0-90.00)bar	2.00	
		Return	(0-90.00)bar	1.90	
		Delay	(0-3600)s	5	
7.	Differential Pressure Detection Range	(0-100)°C		40	
Digital Input Ports					
Digital Input 1					
1	Contents Setting		(0-53)	3	Alarm Reset; Please refer to Table 12 for details.
2	Active Type		(0-1)	0	0: Close 1: Open
3	Active Level		(0-1)	0	0: Low level; 1: High level.
Digital Input 2					
1	Contents Setting		(0-53)	26	High Temp. Shutdown Input; Please refer to Table 12 for details.
2	Active Type		(0-1)	0	0: Close 1: Open
3	Active Level		(0-1)	0	0: Low level; 1: High level.
Digital Input 3					
1	Contents Setting		(0-53)	27	Low Oil Pressure Shutdown Input; Please refer to Table 12 for details.
2	Active Type		(0-1)	0	0: Close 1: Open
3	Active Level		(0-1)	0	0: Low level; 1: High level.
Digital Input 4					
1	Contents Setting		(0-53)	0	Users defined; Please refer to Table 12 for details.
2	Active Type		(0-1)	0	0: Close 1: Open
3	Active Level		(0-1)	0	0: Low level; 1: High level.
4	Active Range		(0-3)	2	0: After Safety On 1: From Crank 2: Always 3: Inactive
5	Active Action		(0-2)	1	0: Warning 1: Shutdown 2: Indication
6	Active Delay		(0-20.0)s	0	Time from detecting input is active to confirm;
7	Input Description				Users defined, default is emergency stop input;
Digital Input 5					
1	Contents Setting		(0-53)	0	Users defined; Please refer to Table 12 for details.
2	Active Type		(0-1)	0	0: Close 1: Open
3	Active Level		(0-1)	0	0: Low level; 1: High level.
4	Active Range		(0-3)	2	0: After Safety On

No.	Item	Range	Default	Description
				1: From Crank 2: Always 3: Inactive
5	Active Action	(0-2)	0	0: Warning 1: Shutdown 2: Indication
6	Active Delay	(0-20.0)s	2.0	Time from detecting input is active to confirm;
7	Input Description			Users defined;
Auxiliary Output Ports				
Aux. Output 1				
1	Contents Setting	(0-129)	34	Run key switch control output; Please refer to Table 11 for details.
2	Output Type	(0-1)	0	0: Normally Open 1: Normally Close
Aux. Output 2				
1	Contents Setting	(0-129)	28	Starting relay output; Please refer to Table 11 for details.
2	Output Type	(0-1)	0	0: Normally Open 1: Normally Close
Aux. Output 3				
1	Contents Setting	(0-129)	26	Load control; Please refer to Table 11 for details.
2	Output Type	(0-1)	0	0: Normally Open 1: Normally Close
Aux. Output 4				
1	Contents Setting	(0-129)	125	Illumination Lamp; Please refer to Table 11 for details.
2	Output Type	(0-1)	0	0: Normally Open 1: Normally Close
Aux. Output 5				
1	Contents Setting	(0-129)	49	Preheat output; Please refer to Table 11 for details.
2	Output Type	(0-1)	0	0: Normally Open 1: Normally Close
Aux. Output 6				
1	Contents Setting	(0-129)	42	Common alarm; Please refer to Table 11 for details.
2	Output Type	(0-1)	0	0: Normally Open 1: Normally Close
Alternate Configuration Setting				
Alternate Configuration 1				
1	Enable	(0-1)	0	0: Disable 1: Enable
2	Engine Rated Speed	(0-6000)r/min	2200	When it is enabled and the running mode is low pressure mode, if input is configured to “Alt Config. 1 Active”, and if input is active, speed shall be adjusted according to alternate configuration settings after load.
3	Engine Unload Speed	(0-100.0)%	70.0	
4	Air Com. Rated Pressure	(0-300.00) bar	7.00	
5	Air Com. Unload Act Press	(0-300.00) bar	6.00	
6	Engine Load Speed	(0-100)%	70	
7	Overload Stable Speed	(0-100.0)%	70.0	The percentage of rated speed; When overload protection occurs, the air compressor reduces the speed and

No.	Item	Range	Default	Description
				keeps it at stable speed.
Alternate Configuration 2				
1	Enable	(0-1)	0	0: Disable 1: Enable
2	Engine Rated Speed	(0-6000)r/min	2200	When it is enabled and the running mode is low pressure mode, if input is configured to "Alt Config. 2 Active", and if input is active, speed shall be adjusted according to alternate configuration settings after load.
3	Engine Unload Speed	(0-100.0)%	70.0	
4	Air Com. Rated Pressure	(0-300.00) bar	7.00	
5	Air Com. Unload Act Press	(0-300.00) bar	6.00	
6	Engine Load Speed	(0-100)%	70	
7	Overload Stable Speed	(0-100.0)%	70.0	The percentage of rated speed; When overload protection occurs, the air compressor reduces the speed and keeps it at stable speed.
Alternate Configuration 3				
1	Enable Choose	(0-1)	0	0: Disable 1: Enable
2	Engine Rated Speed	(0-6000)r/min	2200	When it is enabled and the running mode is low pressure mode, if input is configured to "Alt Config. 3 Active", and if input is active, speed shall be adjusted according to alternate configuration settings after load.
3	Engine Unload Speed	(0-100.0)%	70.0	
4	Air Com. Rated Pressure	(0-300.00) bar	7.00	
5	Air Com. Unload Act Press	(0-300.00) bar	6.00	
6	Engine Load Speed	(0-100)%	70	
7	Overload Stable Speed	(0-100.0)%	70.0	The percentage of rated speed; When overload protection occurs, the air compressor reduces the speed and keeps it at stable speed.
Maintenance Setting				
1	Fuel Filter Set	(0-1)	0	0: Disable 1: Enable Maintenance time, maintenance time due action, pre-maintenance time, pre-maintenance time due action, maintenance timing method, maintenance time reset can also be set; After maintenance, maintenance time due alarm can be removed by resetting maintenance time; Please refer to Table 15 for details.
2	Fuel/Water Separator Set	(0-1)	0	
3	Air Filter Set	(0-1)	0	
4	Lubricant Set	(0-1)	0	
5	Engine Oil Filter Set	(0-1)	0	
6	Engine Fuel Filter Set	(0-1)	0	
7	Engine Lubricant Set	(0-1)	0	
8	Maintenance 8 Set	(0-1)	0	
9	Maintenance 9 Set	(0-1)	0	
10	Maintenance 10 Set	(0-1)	0	

NOTES:

— When making parameter setting on PC software, it doesn't need to input default password "01234" if not changed; if it is the first time to do configuration on PC, then it needs to input module password in the password screen;

— Digital input ports cannot be set as the same functions (except for user-defined). Otherwise, function shall not work normally; Output ports can be set as the same functions;

— Engine temperature sensor correlation settings: if it is ordinary genset and engine temperature is needed, any one of auxiliary sensors 1~6 shall be set as engine temperature sensor, meanwhile curve type shall be set as the corresponding one; Next, set engine temperature correlated sensor; Select corresponding auxiliary sensor, which is engine temperature sensor then, and heater control and cooler control can be realized. If alarm output function will be set, corresponding auxiliary sensor alarm output and the related alarm value of engine temperature shall be set;

— Engine oil pressure correlation settings: if it is ordinary genset and it needs to judge crank disconnect condition by

the engine oil pressure, any one of the auxiliary sensors 1~6 shall be set as engine oil pressure sensor, meanwhile curve type shall be set as the corresponding one. Then set engine oil pressure correlated sensor; Select corresponding auxiliary sensor, then oil pressure will be displayed, which can be one of the crank disconnect conditions. If alarm output function will be set, corresponding auxiliary sensor alarm output and the related alarm value of engine oil pressure shall be set;

— Discharge pressure correlation settings: discharge pressure is correlated with aux. sensor 1 by default, and it can be correlated with any one of the auxiliary sensors 1~6. Then the auxiliary sensor shall be set as pressure sensor, meanwhile curve type shall be set as the corresponding one. Then set discharge pressure correlated sensor; Select corresponding auxiliary sensor. If alarm output function will be set, corresponding auxiliary sensor alarm output shall be set.

— Discharge temperature correlation settings: discharge temperature is correlated with aux. sensor 4 by default, and it can be correlated with any one of the auxiliary sensors 1~6. Then the auxiliary sensor shall be set as temperature sensor, meanwhile curve type shall be set as the corresponding one. Then set discharge temperature correlated sensor; Select corresponding auxiliary sensor. If alarm output function will be set, corresponding auxiliary sensor alarm output shall be set.

— Fuel level correlation settings: fuel level is correlated with aux. sensor 5 by default, and it can be correlated with any one of the auxiliary sensors 1~6. Then the auxiliary sensor shall be set as level sensor, meanwhile curve type shall be set as the corresponding one. Then set fuel level correlated sensor; Select corresponding auxiliary sensor. If alarm output function will be set, corresponding auxiliary sensor alarm output shall be set.

Table 10 User Parameters Setting Contents and Range List

No.	Item	Range	Default	Description
1	Air Compressor Target Pressure (Low Pressure Mode)	(0-300.00) bar	7.60	If the alternate configuration is disabled, it is the upper pressure threshold corresponding to the speed after loading when the air compressor works under low pressure mode. It should be smaller than the maximum target pressure set value of the manufacturer parameters.
2	Air Compressor Unload Action Pressure (Low Pressure Mode)	(0-300.00) bar	6.00	If the alternate configuration is disabled, it is the lower pressure threshold corresponding to the speed after loading when the air compressor works under low pressure mode.
3	Rated Speed (Low Pressure Mode)	(0-6000)r/min	2100	If the alternate configuration is disabled, it is the maximum engine speed when the air compressor works under low pressure mode. It should be smaller than the maximum rated speed of the manufacturer parameters.
4	Unload Speed (Low Pressure Mode)	(0-100.0)%	81.0	If the alternate configuration is disabled, it is the unload speed when the air compressor works under low pressure mode.
5	Air Compressor Target Pressure (High Pressure Mode)	(0-300.00) bar	6.00	It is the upper pressure threshold corresponding to the speed after loading when the air compressor works under high pressure mode. It should be smaller than the maximum target pressure set value of the manufacturer parameters.
6	Air Compressor Unload Action Pressure (High Pressure Mode)	(0-300.00) bar	6.00	It is the lower pressure threshold corresponding to the speed after loading when the air compressor works under high pressure mode.
7	Rated Speed (High Pressure Mode)	(0-6000)r/min	2000	It is the maximum engine speed when the air compressor works under high pressure mode. It should be smaller than the maximum rated speed of the manufacturer parameters.
8	Unload Speed (High Pressure Mode)	(0-100.0)%	81.0	It is the unload speed when the air compressor works under high pressure mode.

8.2 DEFINABLE CONTENTS OF AUXILIARY OUTPUT PORTS 1~6

8.2.1 DEFINABLE CONTENTS OF AUXILIARY OUTPUT PORTS 1~6

Table 11 Definable Contents of Auxiliary Output Ports 1~6

No.	Type	Function Description
0	Not Used	
1	Custom Period 1	Please refer to the following contents for function details.
2	Custom Period 2	
3	Custom Period 3	
4	Custom Period 4	
5	Custom Period 5	
6	Custom Period 6	
7	Custom Combined 1	
8	Custom Combined 2	
9	Custom Combined 3	
10	Custom Combined 4	
11	Custom Combined 5	
12	Custom Combined 6	
13	Shutdown Solenoid Output	Act at the time of pre-start fuel priming.
14	Shutdown Hold-in Solenoid Output	Energized for engine start and de-energized for shutdown.
15	Air Flap Control	Act at the time of over speed shutdown alarm and emergency stop; Air flap can be closed to close the engine intake and realize fast stop.
16	Audible Alarm	Act at the time of warning and shutdown alarms; Buzzer can be connected externally; It can be inhibited to output when input port “Alarm Mute” is active or any key is pressed; When there is new warning or shutdown alarm, it outputs again.
17	Louver Control	Act at the time of engine start; Disconnect after engine stop.
18	Fuel Pump Control	Act by fuel pump control upper and lower limits of fuel level sensor.
19	Heater Control	Act by heater control upper and lower limits of temp. sensor.
20	Cooler Control	Act by cooler control upper and lower limits of temp. sensor.
21	Pre-lubrication	Under standby status, pre-lubrication output port is active and it outputs circularly according to pre-set “Pre-lubrication Rest Time” and “Pre-lubrication Time”; If “Pre-lubrication Rest Time” is 0h, then it doesn't output; Before start, pre-set pre-lubrication time is outputted; If pre-heat time is not configured, pre-lubrication outputs; If pre-heat time is configured, then pre-heat phase outputs.
22	Screw Oil Cooler Control 1	When the current discharge temperature is higher than cooler control 1 open value, it will output; when the value is lower than close value, it stops output.
23	Pre-lubricate	Act at the phase of pre-heating, fuel, start, and start rest time.

No.	Type	Function Description
24	Remote Control	Controlled by communication port RS485.
25	Screw Oil Cooler Control 2	When the current discharge temperature is higher than cooler control 2 open value, it will output; when the value is lower than close value, it stops output.
26	Load Control	Load/Unload key is pressed or load control input is active, then load control outputs; If load/unload key is pressed again or load input is inactive, then load control stops outputting.
27	High/Low Pressure Mode Switch Control	It will output when the High/Low Pressure switch knob is set as high pressure mode.
28	Starting Relay	Act at engine start; and disconnect after successful start.
29	Fuel Relay	Act at engine start; and disconnect at ETS stop.
30	Idle Control	Used for engine with idle speed; Pull in before start, and disconnect at entering warming up time; Pull in at the process of stop idle speed, and disconnect when engine stops completely.
31	Speed Raise Output	Act in warming up period, and controlled by speed regulator in normal running period.
32	Speed Drop Output	Act from stop idle to waiting for stop period and controlled by speed regulator in normal running period.
33	Energize to Stop	Used for engine with stop ETS; Pull in when stop idle speed is over, and disconnect when pre-set “ETS Solenoid Hold” is over.
34	Run Key Switch Control	Used for checking ECU data once at power on; it outputs once it is power on; it stops outputting the signal at ETS stop time and failed to stop time;.
35	ECU Stop	Applicable for engine supporting ECU, and used to control ECU stop.
36	ECU Power Supply	Applicable for engine supporting ECU, and used to control ECU power.
37	Reserved	
38	Crank Success	Pull in when it detects crank success signal.
39	Normal Running	Pull in and output when it is in normal running period.
40	Reserved	
41	Reserved	
42	Common Alarm	Act at the time of common alarm and common shutdown.
43	Common Shutdown	Act at the time of common shutdown.
44	Common Warning	Act at the time of common warning.
45	Reserved	
46	Battery Overvolt	Act when battery voltage high warning occurs.
47	Battery Undervolt	Act when battery voltage low warning occurs.
48	Failed to Charge	Act when failed to charge warning occurs.
49	Preheat	Output in preheat period.
50	ECU Warning	ECU issued a warning alarm signal.
51	ECU Shutdown	ECU issued a shutdown alarm signal.
52	ECU Comm. Failure	Controller cannot communicate with ECU.
53	Reserved	

No.	Type	Function Description
54	NCD Indicator Output	DPF regeneration related lamp outputs of Stage IV engine.
55	Regen Request Indicator	
56	Regen Inhibit Indicator	
57	Exhaust Temp Indicator	
58	Regen Response Indicator	
59	Input 1 Active	Act when input port 1 is active.
60	Input 2 Active	Act when input port 2 is active.
61	Input 3 Active	Act when input port 3 is active.
62	Input 4 Active	Act when input port 4 is active.
63	Input 5 Active	Act when input port 5 is active.
64	Reserved	
65	Oil Separator Difference Shutdown	Act when high oil separator differential pressure shutdown alarms.
66	Oil Separator Difference Warn	Act when high oil separator differential pressure warning alarms.
67	Emergency Stop	Act when emergency stop alarm occurs.
68	Failed to Start	Act when failed to start alarm occurs.
69	Failed to Stop	Act when failed to stop alarm occurs.
70	Under Speed Warn	Act when engine under speed warning occurs.
71	Under Speed Shutdown	Act when engine under speed shutdown occurs.
72	Over Speed Warn	Act when engine over speed warning occurs.
73	Over Speed Shutdown	Act when engine over speed shutdown occurs.
74	Reserved	
75	Reserved	
76	Load Control 1	When “Alt Config. 1 Active” is active, under normal running status, load control 1 outputs.
77	Load Control 2	When “Alt Config. 2 Active” is active, under normal running status, load control 2 outputs.
78	Load Control 3	When “Alt Config. 3 Active” is active, under normal running status, load control 3 outputs.
79	High Temp Warning	Act when high temp. warning alarm occurs.
80	Low Temp Warning	Act when low temp. warning alarm occurs.
81	High Temp Shutdown	Act when high temp. shutdown alarm occurs.
82	Reserved	
83	Engine Low OP Warn	Act when low oil pressure warning occurs.
84	Engine Low OP Shut	Act when low oil pressure shutdown occurs.
85	Reserved	
86	Reserved	
87	Reserved	
88	Low Fuel Level Warn	Act when low fuel level warning occurs.
89	Reserved	
90	Low Fuel Level Shut	Act when low fuel level shutdown occurs.
91	Reserved	
92	Reserved	

No.	Type	Function Description
93	High Discharge Pressure Warn	Act when discharge pressure high warning occurs.
94	Low Discharge Pressure Warn	Act when discharge pressure low warning occurs.
95	High Discharge Pressure Shut	Act when discharge pressure high shutdown occurs.
96	Low Discharge Pressure Shut	Act when discharge pressure low shutdown occurs.
97	Auxiliary Sensor 1 High Warn	Act when sensor 1 high warning occurs.
98	Auxiliary Sensor 1 Low Warn	Act when sensor 1 low warning occurs.
99	Auxiliary Sensor 1 High Shut	Act when sensor 1 high shutdown occurs.
100	Auxiliary Sensor 1 Low Shut	Act when sensor 1 low shutdown occurs.
101	Auxiliary Sensor 2 High Warn	Act when sensor 2 high warning occurs.
102	Auxiliary Sensor 2 Low Warn	Act when sensor 2 low warning occurs.
103	Auxiliary Sensor 2 High Shut	Act when sensor 2 high shutdown occurs.
104	Auxiliary Sensor 2 Low Shut	Act when sensor 2 low shutdown occurs.
105	Auxiliary Sensor 3 High Warn	Act when sensor 3 high warning occurs.
106	Auxiliary Sensor 3 Low Warn	Act when sensor 3 low warning occurs.
107	Auxiliary Sensor 3 High Shut	Act when sensor 3 high shutdown occurs.
108	Auxiliary Sensor 3 Low Shut	Act when sensor 3 low shutdown occurs.
109	Auxiliary Sensor 4 High Warn	Act when sensor 4 high warning occurs.
110	Auxiliary Sensor 4 Low Warn	Act when sensor 4 low warning occurs.
111	Auxiliary Sensor 4 High Shut	Act when sensor 4 high shutdown occurs.
112	Auxiliary Sensor 4 Low Shut	Act when sensor 4 low shutdown occurs.
113	Auxiliary Sensor 5 High Warn	Act when sensor 5 high warning occurs.
114	Auxiliary Sensor 5 Low Warn	Act when sensor 5 low warning occurs.
115	Auxiliary Sensor 5 High Shut	Act when sensor 5 high shutdown occurs.
116	Auxiliary Sensor 5 Low Shut	Act when sensor 5 low shutdown occurs.
117	Auxiliary Sensor 6 High	Act when sensor 6 high warning occurs.

No.	Type	Function Description
	Warn	
118	Auxiliary Sensor 6 Low Warn	Act when sensor 6 low warning occurs.
119	Auxiliary Sensor 6 High Shut	Act when sensor 6 high shutdown occurs.
120	Auxiliary Sensor 6 Low Shut	Act when sensor 6 low shutdown occurs.
121	Discharge Temp. High Warn	Act when discharge temperature high warning occurs.
122	Discharge Temp. Low Warn	Act when discharge temperature low warning occurs.
123	Discharge Temp. High Shut	Act when discharge temperature high shutdown occurs.
124	Discharge Temp. Low Shut	Act when discharge temperature low shutdown occurs.
125	Illumination Lamp	Output enabled when "Light On" is active.
126	Reserved	
127	Reserved	
128	Reserved	
129	Reserved	

NOTE: After pressing the emergency stop button, the power of aux. output 1~2 will be disconnected. When doing configuration, please note that output ports which requires power supply after stop should not be configured in the aux. output 1~2.

8.2.2 CUSTOM PERIOD OUTPUT

Custom period output is composed by 2 parts: period output S1 and condition output S2.

S1 and S2 both are true, then it outputs; S1 or S2 is false, it doesn't output;

Period output S1 can be configured randomly to one, or several period outputs; Delay time and output time after entering period can be set;

Condition output S2 can be any contents of output settings.

NOTE: When period output S1 delay time and output time are both 0, configurations of period output S1 are both true.

Output period: Start

Delay output time: 2s

Output time: 3s

Condition output contents: Input 1 is active;

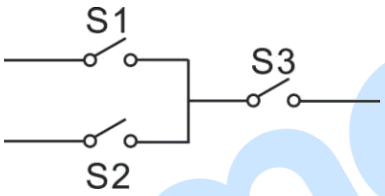
Condition output active/inactive close; close when active (disconnect when inactive)

When input port 1 is active, and it enters start time and delays for 2s, custom period output starts to output, after outputting for 3s, it stops outputting;

When input port 1 is inactive, custom output doesn't output.

8.2.3 CUSTOM COMBINATION OUTPUT

Custom combination output is composed by 3 parts: OR condition output S1, OR condition output S2, AND condition output S3.



S1 or S2 is true, and S3 is true, then combination output works.

S1 and S2 both are false, or S3 is false, then combination output doesn't work.

NOTE: S1, S2 and S3 can be any contents except itself custom combination output of the output settings.

NOTE: S1, S2 and S3 cannot include or recursively include itself.

Contents of OR condition output S1: input port 1 is active;

Close when OR condition output S1 is active/inactive: close when active (disconnect when inactive);

Contents of OR condition output S2, input port 2 is active;

Close when OR condition output S2 is active/inactive: close when active (disconnect when inactive);

Contents of AND condition output S3: input port 3 is active;

Close when AND condition output S3 is active/inactive: close when active (disconnect when inactive);

When input port 1 is active or input port 2 is active, if input port 3 is active, custom combination output is working; if input port 3 is inactive, custom combination output is not working;

When input port 1 is inactive and port 2 is inactive, no matter port 3 is active or not, custom combination output is not working.

8.3 DEFINABLE CONTENTS OF DIGITAL INPUT PORTS

Table 12 Definable Contents of Digital Input Ports

No.	Type	Function Description
0	Users Configured	Users can define the following functions: Indication: indicate only, no warning or shutdown. Warning: warning only, no shutdown. Shutdown: alarm and shutdown immediately Inactive: input is inactive. Always: input is active all the time. From crank: start to detect at the time of start. After safety on delay: start to detect after safety on delay.
1	Reserved	
2	Alarm Mute	Prohibit output configurations “Audible Alarm” outputs when input is active.
3	Alarm Reset	Reset shutdown alarm when input is active.
4	Reserved	
5	Lamp Test	All LED indicators are illuminated when input is active.
6	Panel Lock	All buttons in panel are inactive except UP/DOWN/CONFIRM keys. Parameters cannot be configured. But users can set language, check event log and controller information. There is in the bottom right corner on LCD when input is active.
7	Crank Success Input	When this function is active, it means the engine is started successfully. If this function is configured, the speed and oil pressure of crank success conditions will be invalid.
8	Reserved	
9	Reserved	
10	Reserved	
11	Reserved	
12	Oil Separator Difference Shutdown	Alarm Detection Conditions: 1. loaded; 2. Discharge temperature is higher than the set value for the lower limit of the active detection range.
13	Oil Separator Difference Warn	
14	Oil Filter Difference Shutdown	
15	Oil Filter Difference Warn	
16	DPF Manual Regeneration Request	A button can be connected externally (non-latching); For engine with Stage IV standard, if PDF regeneration is needed, press the button and controller shall issue manual request command to ECU.
17	DPF Regeneration Inhibit	For engine with Stage IV standard, if DPF regeneration Inhibit is needed, so when input is active, controller issues inhibition command to ECU.
18	Illumination Lamp	The “Light on” outputs when input is active.
19	Reserved	
20	Reserved	

No.	Type	Function Description
21	Alarm Stop Inhibit	All shutdown alarms are inhibited except emergency stop and over speed shutdown. (Override mode)
22	Instrument Mode	All outputs are inhibited in this mode.
23	Reserved	
24	Reset Maintenance	Controller will set the time and date of maintenance 1 as default value when input is active.
25	External Charging Failure	When input is active, failed to charge warning alarm occurs.
26	High Temp Shutdown	Connects to sensor digital input.
27	Low OP Shutdown	Connects to sensor digital input.
28	Reserved	
29	Low Coolant Level Shutdown	Connects to sensor digital input.
30	Reserved	
31	Reserved	
32	Manual Start Input	When input is active, engine can be started automatically; when input is inactive, engine can be stopped automatically.
33	Reserved	
34	Simulate Stop key	An external button (non-latching) can be connected and pressed as simulate panel.
35	Simulate Load/Unload key	An external button (non-latching) can be connected and pressed as simulate panel.
36	Reserved	
37	Simulate Start key	An external button (non-latching) can be connected and pressed as simulate panel.
38	Reserved	
39	Reserved	
40	Reserved	
41	Reserved	
42	Alt Config. 1 Active	When input port is active, configuration is active; Different parameters can be set for it, making convenience for users to choose current configuration by input port.
43	Alt Config. 2 Active	
44	Alt Config. 3 Active	
45	Reserved	
46	Reserved	
47	Load Input	Act between start idle and stop idle; When input is active, load control outputs; When it is inactive, load control stops outputting.
48-52	Reserved	
53	Manual Pre-heat	Connects to manual pre-heat digital input.

8.4 SELECTION OF SENSORS

Table 13 Sensors Selection

No.	Items	Description	Remark
1	Temperature Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA Curve 3 Custom Volt Curve 4 VDO 5 CURTIS 6 VOLVO-EC 7 DATCON 8 SGX 9 SGD 10 SGH 11 PT100 12 Cu50 13-15 Reserved	Defined resistance's range is (0~6)kΩ, default is "Not Used"; Users can select the corresponding curve by themselves; If pre-set sensor channel doesn't support current, and voltage type, then curve type item 2 and 3 display "Reserved".
2	Oil Pressure Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA Curve 3 Custom Volt Curve 4 VDO 10bar 5 CURTIS 6 VOLVO-EC 7 DATCON 10bar 8 SGX 9 SGD 10 SGH 11 -15 Reserved	Defined resistance's range is (0~6)kΩ, default is "Not Used"; Users can select the corresponding curve by themselves; If pre-set sensor channel doesn't support current, and voltage type, then curve type item 2 and 3 display "Reserved".
3	Fuel Level Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA Curve 3 Custom Volt Curve 4 SGD 5 SGH 6 4-126Ω 7 0-130Ω 8 0-190Ω 9 10-180Ω 10 10-120Ω 11-15 Reserved	Defined resistance's range is (0~6)kΩ, default is "Not Used"; Users can select the corresponding curve by themselves; If pre-set sensor channel doesn't support current, and voltage type, then curve type item 2 and 3 display "Reserved".

8.5 CONDITIONS OF CRANK DISCONNECT SELECTION

Table 14 Crank Disconnect Conditions

No.	Settings
0	Engine Speed
1	Oil pressure
2	Oil pressure + Engine Speed

NOTES:

— There are 2 conditions to make starter disconnected with engine. Engine speed and oil pressure can be used separately. We recommend that oil pressure should be used with speed sensor together, in order to make the starter motor separate with engine immediately and can check crank disconnect exactly;

— Speed sensor is the magnetic equipment installed in starter for detecting flywheel teeth;

— When set it speed sensor, users must ensure that the number of flywheel teeth is the same as settings, otherwise, “over speed shutdown” or “under speed shutdown” may be caused;

— If engine doesn't have speed sensor please don’t select corresponding items, otherwise, “start failure” or “loss speed signal” may be caused;

— If engine doesn’t have oil pressure sensor, please don’t select corresponding items.

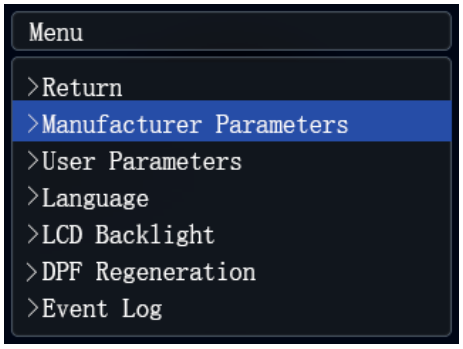
8.6 MAINTENANCE SETTING

Table 15 Maintenance Setting

Item	Content	Description
Enable Choose	0: Disabled, 1: Enabled	Set maintenance function active or not;
Maintenance Time	(0-30000)h	It is the number of hours from the time the maintenance is enabled to when maintenance is required.
Maintenance Due Action	0: No Action; 1: Warning; 2: Shutdown; 3: Indication.	Alarm action when maintenance left time is 0.
Maint. Timing Method	0: Running Time 1: Real Time Clock 2: Runing Time + Real Time Clock	The timing of maintenance.
Pre-maint. Time	(0-30000)h	
Pre-maint. Due Action	0: No Action; 1: Warning; 2: Shutdown; 3: Indication.	Alarm action when pre-maintenance left time is 0.
Maintenance Date	Year: (2000-2099) 2025 Month: (1-12)1 Day: (1-31)1	The date for pre-maintenance if maintenance function is enabled.
Reset Maintenance		After maintenance completion, through this item reset maintenance time.
Maintenance Description		The character string of maintenance description can be set by maintenance 8, 9 and 10; Users can input maintenance name, like Change Engine Oil.

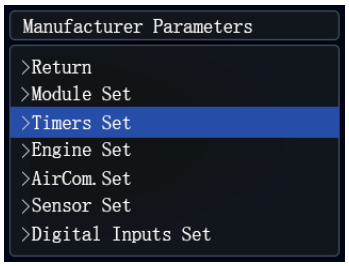
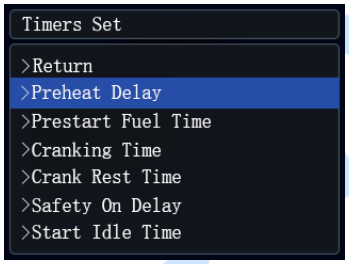
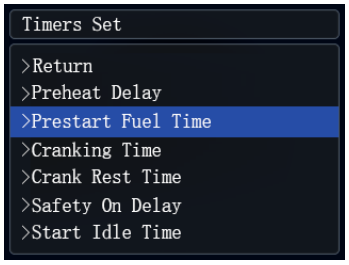
9 PARAMETERS SETTING

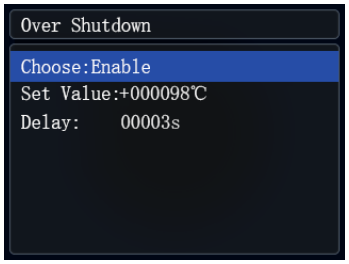
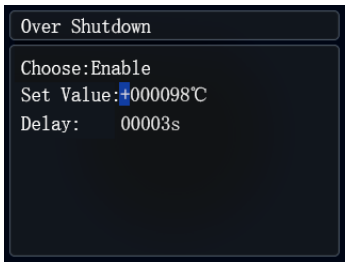
Press key and enter the setting menu after controller is power on. The menu list is as below:



Select “Manufacturer Parameters” and input correct password (default: 01234) to enter the manufacturer parameters setting interface.

Parameter setting process is as below:

	Screen 1: Enter setting, press or to change settings, press to enter setting (Screen 2), press to return. Or select “Return” by pressing and and press to go back to previous screen.
	Screen 2: Press to change settings, press to enter setting (Screen 3), press to return (Screen 1). Or select “Return” by pressing and and press to go back to the previous screen (Screen 1).
	Screen 3: Press and move cursor, select the value and press to modify. Press to save your modification. Then press to return the previous screen (Screen 2).
	Screen 4: Press , select and modify the value (it is the same method as Screen 2 and Screen 3).

	Screen 5: Set engine temp. sensor shutdown parameters. Select "Over Shutdown", press to enter setting, then press again to enter Screen 5, press to select settings, then press to save and meanwhile the cursor will move down (as shown in Screen 6 below).
	Screen 6: Press to change the plus or minus in front of the number, then press to next bit. After setting is finished, press to enter delay setting. If it doesn't need to modify, press to return.

NOTES:

— Please modify internal parameters (e.g. Crank disconnect conditions, auxiliary input/output configuration, delay, etc.) in standby status, otherwise it probably shutdowns or faults may occur;

— Over high threshold must be greater than lower threshold, otherwise over high and over low circumstances may occur simultaneously;

— Please set return value correctly when warning alarm is set, otherwise the controller can't alarm normally. When over warning is set, the return value should be set lower than set value; when low warning is set, return value should be set greater than set value;

— Auxiliary inputs can't be set the same item (except for user-defined), otherwise it won't arise valid function. But auxiliary outputs can be set the same.

10 SENSOR SETTING

- If a sensor is needed to change again, the sensor curve will be transferred into the standard value. For example, if the default temperature sensor is SGD, the sensor curve is SGD curve; if it is set SGX, the temperature sensor curve is SGX curve.
- If there is difference between standard sensor curve and the used sensor, users can choose “defined sensor”, and input defined sensor curve.
- At the time of inputting the sensor curve, X value must be inputted from small to large, otherwise, some mistake may occur.
- If sensor is selected to “Not Used”, then sensor curve doesn't work.
- If corresponding sensor only has alarm switch, then it is a must that set the sensor “Not Used”, otherwise shutdown alarm or warning may occur.
- It is applicable to set the headmost and backmost values in the vertical coordinate as the same as the Figure 7.

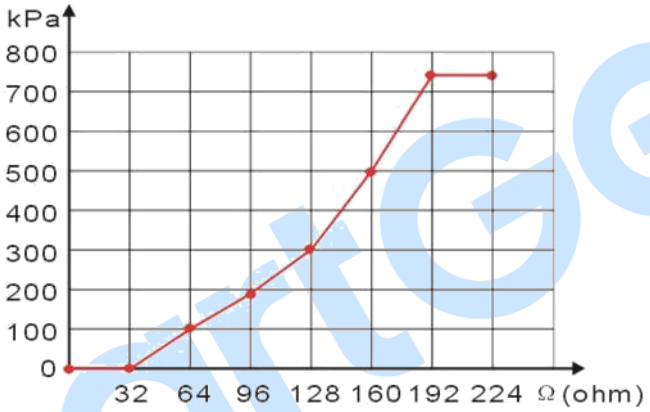


Fig.7 Sensor Curve Setting

Table 16 Common Pressure Unit Conversion Table

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

11 COMMISSIONING

It is suggested to do the following examination before formal system operation:

a) Check all the connections are correct and wire diameter is suitable.

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

c) Take proper action to prevent engine from crank disconnect (e. g. Remove the connection wire of fuel valve). If everything is OK, make the starting battery power on and controller will execute routine.

d) Press "start" button, engine will start. After pre-set start times, controller will send failed to start signal; then press "stop" button to reset controller.

e) Recover the action of stop engine start (e. g. Connect wire of fuel valve), and press start button again, then engine will start. If everything goes well, engine will go to normal running after idle running (if idle running is set). During this time, please observe engine's running situation.

f) If there is any other question, please contact SmartGen's service.

12 TYPICAL APPLICATION

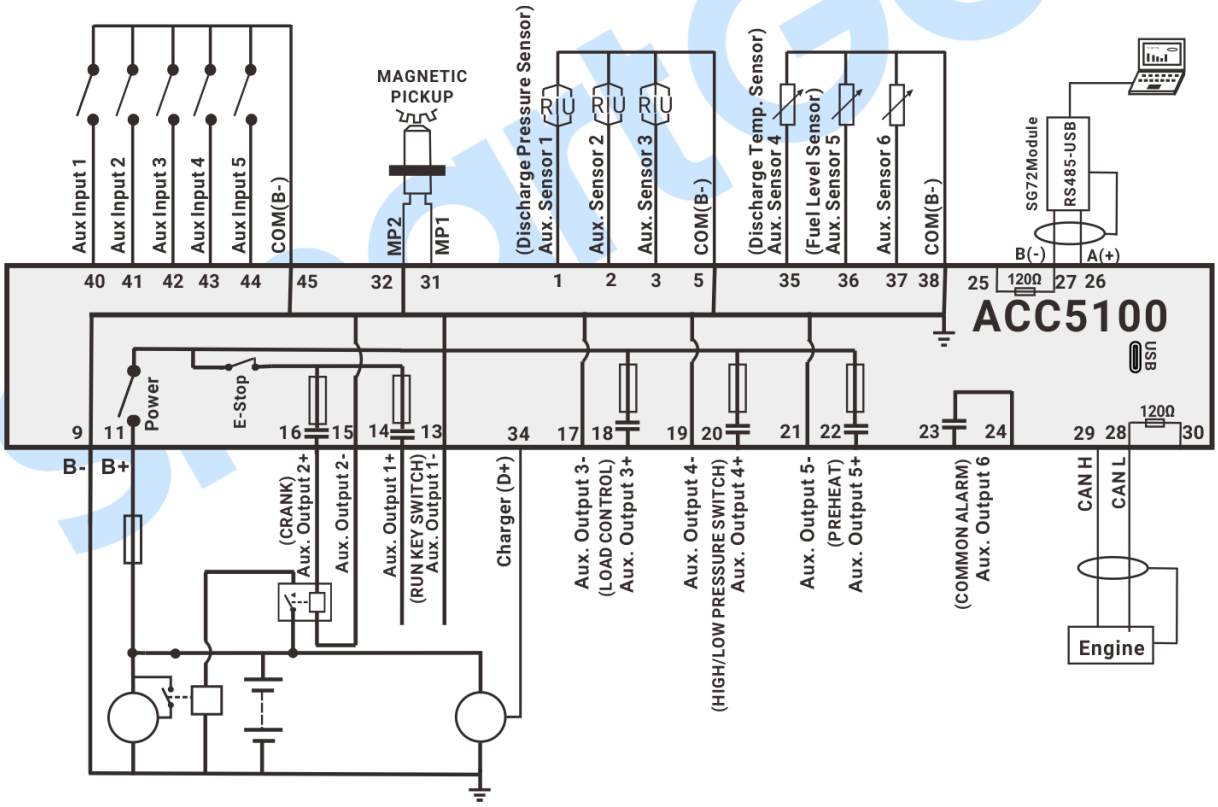


Fig.8 ACC5100 Typical Application Diagram

NOTE: After pressing the emergency stop button, the power of aux. output 1~2 will be disconnected. When doing configuration, please note that output ports which requires power supply after stop should not be configured in the aux. output 1~2.

13 INSTALLATION

13.1 INSTALLATION METHOD

1) Controller is panel built-in design; and it is fixed by screws for installation;
2) Install with four M4 screws and nuts corresponding to four screw holes for fixing.

NOTE: Do not overtighten the screws.

13.2 OVERALL & CUTOUT DIMENSIONS

Unit: mm

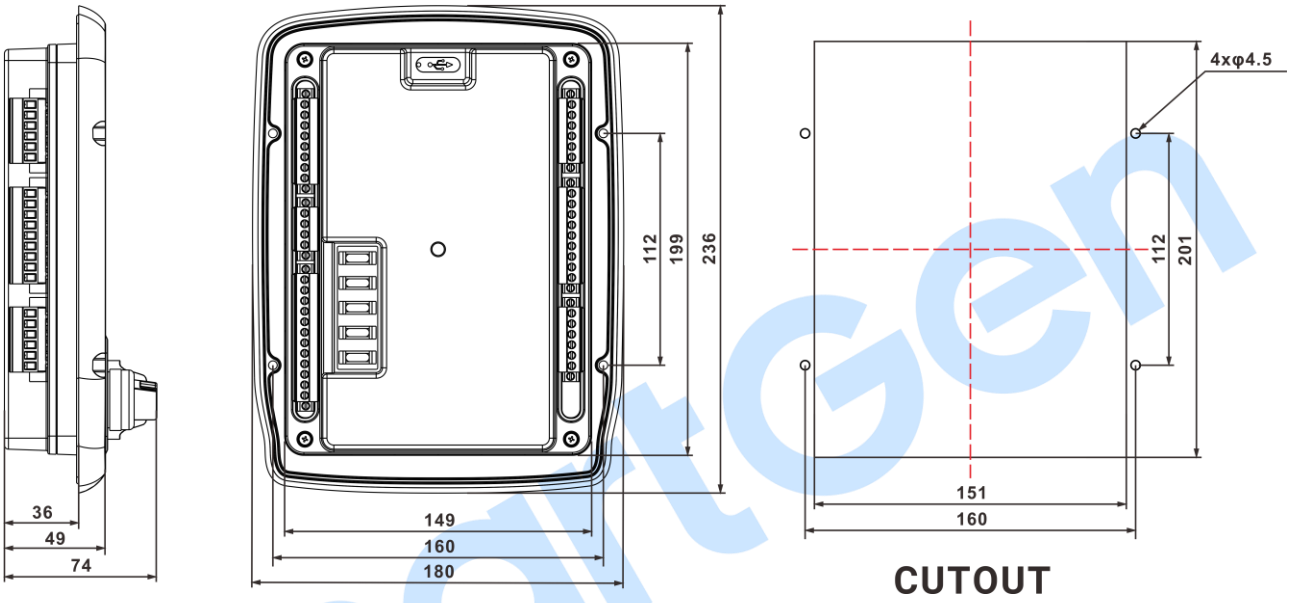


Fig.9 Overall & Cutout Dimensions

— **BATTERY VOLTAGE INPUT:** ACC5100 controller can suit battery voltage environment of (8~35)VDC. Negative of battery must be connected with the engine shell. Diameter of wire which connects power supply B+ and B- with battery positive and negative must be over 1.5mm^2. If floating charger is configured, please firstly connect output wires of the charger to battery's positive and negative directly, then connect wires from battery's positive and negative to controller's positive and negative input ports in order to prevent charger disturbing the controller's normal working;

— **SPEED SENSOR INPUT:** Speed sensor is the magnetic equipment installed in the starter for detecting flywheel teeth. The connection wires with controller should apply 2-core shielded line. The shielded layer should be connected to Terminal 32 in the controller and another side is hanging up in the air. The other two signal wires are connected to Terminal 31 and 32. The output voltage of speed sensor should be within (1~24)VAC (RMS) during the full speed range. 12VAC is recommended (at rated speed). When speed sensor is installed, let the sensor spun to contacting flywheel first, then, port out 1/3 lap, and lock the nuts of sensor at last;

— **OUTPUT AND EXPANSION RELAYS:** All controller outputs are relay contact output type. If expansion relay is needed, please add freewheel diode to both ends of expansion relay's coils (when relay coils have DC current) or, increase resistance-capacitance return circuit (when relay coils have AC current), in order to prevent disturbance to the controller or other equipment.

14 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

14.1 CUMMINS ISB/ISBE

Engine type: CUMMINS-ISB.

Table 17 Connector B

Terminals of controller	Connector B	Remark
Auxiliary output 1 (Fuel relay output)	39	
Auxiliary output 2 (Starting relay output)	-	Connect with starter coil directly.
Auxiliary output 3	Expansion 30A relay, providing battery voltage for 01, 07, 12, 13 terminals.	ECU power; Set auxiliary output 3 as “ECU power”.

Table 18 9-pin Connector

Terminals of controller	9 pins connector	Remark
-	SAE J1939 shield	CAN communication shielded line (connect with ECU terminal only).
CAN(H)	SAE J1939 signal	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return	Impedance 120Ω connecting line is recommended.

14.2 CUMMINS QSL9

Suitable for CM850 engine control module; Engine type: CUMMINS-CM850.

Table 19 50-pin Connector

Terminals of controller	50 pins connector	Remark
Auxiliary output 1 (Fuel relay output)	39	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.

Table 20 9-pin Connector

Terminals of controller	9 pins connector	Remark
-	SAE J1939 shield-E	CAN communication shielded line (connect with ECU terminal only).
CAN(H)	SAE J1939 signal-C	Using impedance 120Ω connecting line.
CAN(L)	SAE J1939 return-D	Using impedance 120Ω connecting line.

14.3 CUMMINS QSM11(IMPORT)

Suitable for CM570 engine control module; Engine type is QSM11 G1, QSM11 G2; Engine type: Cummins ISB.

Table 21 C1 Connector

Terminals of controller	C1 connector	Remark
Auxiliary output 1 (Fuel relay output)	5&8	Outside extended relay, make port 5 and port 8 of C1 connected at fuel output;
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.

Table 22 3-pin Data Link Connector

Terminals of controller	3 pins data link connector	Remark
-	C	CAN communication shielded line (connect with ECU terminal only).
CAN(H)	A	Using impedance 120Ω connecting line.
CAN(L)	B	Using impedance 120Ω connecting line.

14.4 CUMMINS QSX15-CM570

Suitable for CM570 engine control module; Engine type is QSX15 etc. Engine type: CUMMINS-CM570.

Table 23 50-pin Connector

Terminals of controller	50 pins connector	Remark
Auxiliary output 1 (Fuel relay output)	38	Oil spout switch.
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.

Table 24 9-pin Connector

Terminals of controller	9 pins connector	Remark
-	SAE J1939 shield-E	CAN communication shielded line (connect with ECU terminal only).
CAN(H)	SAE J1939 signal-C	Using impedance 120Ω connecting line.
CAN(L)	SAE J1939 return-D	Using impedance 120Ω connecting line.

14.5 CUMMINS GCS-MODBUS

Suitable for GCS engine control module; Use RS485-MODBUS to read information of engine. Engine types are QSX15, QST30, QSK23/45/60/78 and so on.

Engine type: CUMMINS QSK-Modbus, CUMMINS QST-MODBUS, CUMMINS QSX-MODBUS.

Table 25 D-SUB Connector 06

Terminals of controller	D-SUB connector 06	Remark
Auxiliary output 1 (Fuel relay output)	5&8	Outside extended relay, make port 5 and 8 of connector 06 connected at fuel output.
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.

Table 26 D-SUB Connector 06

Terminals of controller	D-SUB connector 06	Remark
-	20	Communication shielded line (connect with ECU this terminal only).
RS485+	21	Using impedance 120Ω connecting line.
RS485-	18	Using impedance 120Ω connecting line.

14.6 CUMMINS QSM11

Engine type: CUMMINS-TIER.

Table 27 Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Auxiliary output 1 (Fuel relay output)	38	
Auxiliary output 2 (Starting relay output)	-	Connect with starter coil directly.
CAN(H)	46	Using impedance 120Ω connecting line.
CAN(L)	37	Using impedance 120Ω connecting line.

14.7 CUMMINS QSZ13

Engine type: CUMMINS-QSZ13; Speed governing can be realized.

Table 28 Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Auxiliary output 1 (Fuel relay output)	45	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
Auxiliary output 3	16&41	Idle speed control, normally close output. Make 16 connected with 41 during high-speed running via external extended relay.
Auxiliary output 4	19&41	Pulse speed raising control, normally open

Terminals of controller	OEM connector of engine	Remark
		output. Make 19 connected with 41 for 0.1s during warming up via external extended relay.
CAN(H)	1	Using impedance 120Ω connecting line.
CAN(L)	21	Using impedance 120Ω connecting line.

14.8 DETROIT DIESEL DDEC III / IV

Engine type: CUMMINS-TIER.

Table 29 Engine CAN Port

Terminals of controller	CAN port of engine	Remark
Auxiliary output 1 (Fuel relay output)	Expansion 30A relay, providing battery voltage for ECU.	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
CAN(H)	CAN(H)	Using impedance 120Ω connecting line.
CAN(L)	CAN(L)	Using impedance 120Ω connecting line.

14.9 DEUTZ EMR2

Engine type: VOLVO-EDC4.

Table 30 F Connector

Terminals of controller	F connector	Remark
Auxiliary output 1 (Fuel relay output)	Expansion 30A relay, providing battery voltage for 14; Fuse is 16A.	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
-	1	Connect to battery negative pole.
CAN(H)	12	Impedance 120Ω connecting line is recommended.
CAN(L)	13	Impedance 120Ω connecting line is recommended.

14.10 JOHN DEERE

Engine type: JOHN DEERE.

Table 31 21-pin Connector

Terminals of controller	21 pins connector	Remark
Auxiliary output 1 (Fuel relay output)	G, J	
Auxiliary output 2 (Starting relay output)	D	
CAN(H)	V	Using impedance 120Ω connecting line.
CAN(L)	U	Using impedance 120Ω connecting line.

14.11 MTU MDEC

Suitable for MTU engines, 2000 series, 4000series; Engine type: MTU-MDEC-303.

Table 32 X1 Connector

Terminals of controller	X1 connector	Remark
Auxiliary output 1 (Fuel relay output)	BE1	
Auxiliary output 2 (Starting relay output)	BE9	
-	E	Communication shielded line (connect with ECU this terminal only).
CAN(H)	G	Using impedance 120Ω connecting line.
CAN(L)	F	Using impedance 120Ω connecting line.

14.12 MTU ADEC (SMART MODULE)

Suitable for MTU engine with ADEC (ECU8) and SMART module; Engine type: MTU-ADEC.

Table 33 ADEC (X1 Port)

Terminals of controller	ADEC (X1port)	Remark
Fuel relay output	X1 10	X1 Terminal 9 connected to negative of battery.
Starting relay output	X1 34	X1 Terminal 33 connected to negative of battery.

Table 34 ADEC (X4 Port)

Terminals of controller	SMART (X4 port)	Remark
CAN(H)	X4 1	Using impedance 120Ω connecting line.
CAN(L)	X4 2	Using impedance 120Ω connecting line.

14.13 MTU ADEC (SAM MODULE)

Suitable for MTU engine with ADEC (ECU7) and SAM module; Engine type: MTU-ADEC-SAM.

Table 35 ADEC (X1 Port)

Terminals of controller	ADEC (X1port)	Remark
Auxiliary output 1 (Fuel relay output)	X1 43	X1 Terminal 28 connected to negative of battery.
Auxiliary output 2 (Starting relay output)	X1 37	X1 Terminal 22 connected to negative of battery.

Table 36 SAM (X23 Port)

Terminals of controller	SAM (X23 port)	Remark
CAN(H)	X23 2	Using impedance 120Ω connecting line.
CAN(L)	X23 1	Using impedance 120Ω connecting line.

14.14 PERKINS

Suitable for ADEM3/ADEM4 engine control module; Engine model is 2306, 2506, 1106, and 2806. Engine type: PERKINS.

Table 37 Connector

Terminals of controller	Connector	Remark
Auxiliary output 1 (Fuel relay output)	1, 10, 15, 33, 34	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
CAN(H)	31	Using impedance 120Ω connecting line.
CAN(L)	32	Using impedance 120Ω connecting line.

14.15 SCANIA

Suitable for S6 engine control module; Engine model is DC9, DC12, and DC16. Engine type: SCANIA.

Table 38 B1 Connector

Terminals of controller	B1 connector	Remark
Auxiliary output 1 (Fuel relay output)	3	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
CAN(H)	9	Using impedance 120Ω connecting line.
CAN(L)	10	Using impedance 120Ω connecting line.

14.16 VOLVO EDC3

Suitable engine control mode is TAD1240, TAD1241, and TAD1242; Engine type: VOLVO.

Table 39 "Stand alone" Connector

Terminals of controller	"Stand alone" connector	Remark
Auxiliary output 1 (Fuel relay output)	H	
Auxiliary output 2 (Starting relay output)	E	
Auxiliary output 3	P	ECU power; Set auxiliary output 3 as "ECU power".

Table 40 "Data Bus" Connector

Terminals of controller	"Data bus" connector	Remark
CAN(H)	1	Using impedance 120Ω connecting line.
CAN(L)	2	Using impedance 120Ω connecting line.

NOTE: When this engine type is selected, preheating time should be set to at least 3 seconds.

14.17 VOLVO EDC4

Suitable engine models are TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, TAD722, and TAD732. Engine type: VOLVO-EDC4.

Table 41 Connector

Terminals of controller	Connector	Remark
Auxiliary output 1 (Fuel relay output)	Expansion 30A relay, providing battery voltage for terminal 14; Fuse is 16A.	
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
	1	Connected to negative of battery.
CAN(H)	12	Using impedance 120Ω connecting line.
CAN(L)	13	Using impedance 120Ω connecting line.

14.18 VOLVO-EMS2

VOLVO Engine models are TAD734, TAD940, TAD941, TAD1640, TAD1641, and TAD1642. Engine type: VOLVO-EMS2. Speed regulating can be realized.

Table 42 Engine CAN Port

Terminals of controller	Engine's CAN port	Remark
Auxiliary output 1 (Fuel relay output)	6	ECU stop; Set configurable output 1 to "ECU stop".
Auxiliary output 2	5	ECU power;

Terminals of controller	Engine's CAN port	Remark
(Starting relay output)		Set configurable output 2 to "ECU power".
	3	Negative power.
	4	Positive power.
CAN(H)	1(Hi)	Using impedance 120Ω connecting line.
CAN(L)	2(Lo)	Using impedance 120Ω connecting line.

NOTE: When this engine type is selected, preheating time should be set to at least 3 seconds.

14.19 YUCHAI

Suitable for BOSCH common rail electronic-controlled engine. Engine type: BOSCH; and speed regulating can be realized.

Table 43 Engine 42-pin Port

Terminals of controller	Engine 42 pins port	Remark
Auxiliary output 1 (Fuel relay output)	1.40	Connect to engine ignition lock.
Auxiliary output 2 (Starting relay output)	-	Connect to starter coil directly.
CAN(H)	1.35	Using impedance 120Ω connecting line.
CAN(L)	1.34	Using impedance 120Ω connecting line.

Table 44 Engine 2-pin Port

Battery	Engine 2 pins	Remark
Battery negative	1	Wire diameter 2.5mm^2.
Battery positive	2	Wire diameter 2.5mm^2.

14.20 WEICHAI

Suitable for Weichai BOSCH common rail electronic-controlled engine. Engine type: GTSC1; and speed regulating can be realized.

Table 45 Engine Port

Terminals of controller	Engine port	Remark
Auxiliary output 1 (Fuel relay output)	1.40	Connect to engine ignition switch.
Auxiliary output 2 (Starting relay output)	1.61	
CAN(H)	1.35	Using impedance 120Ω connecting line.
CAN(L)	1.34	Using impedance 120Ω connecting line.

NOTE: If there is any question of connection between controller and ECU communication, please feel free to contact SmartGen's service.

15 TROUBLESHOOTING

Table 46 Troubleshooting

Symptoms	Possible Solutions
Controller no response with power	Check starting battery; Check controller wirings; Check DC fuse.
Engine stop	Check water/cylinder temperature is too high; Check DC fuse.
Controller emergency stop	Check emergency stop button function is right or not; Check wire connection is open circuit or not.
Oil pressure low alarm after crank disconnection	Check oil pressure and its wire connections.
Water temp. high alarm after crank disconnection	Check water temperature sensor and its wire connections.
Shutdown alarm in running	Check related switch and wirings according to LCD information; Check auxiliary input ports.
Crank failure	Check fuel circuit and related wirings; Check starting battery; Check speed sensor and its wire connections; Refer to engine manual.
None response for starter	Check starter wire connections; Check starting battery.
RS485 communication abnormal	Check RS485 wire connections; Check RS485 COM port settings are correct or not; Check RS485 A and B are connected reversely or not; Check RS485 conversion module is damaged or not; Check PC communication port is damaged or not.
ECU communication failure	Check wire CAN high and CAN low polarity; Check 120Ω termination resistor is connected correctly or not; Check engine type is selected right or not; Check wire connection between controller and engine is right or not; output port settings are right or not.
ECU warning or shutdown	Refer to alarm screen to obtain information; If there is detailed alarm information, then check engine according to it; If there is not, refer to engine manual to obtain information according to SPN alarm code.

16 PACKING LIST

Table 47 Packing List

No.	Name	Number	Remark
1	Controller	1	
2	Screws	4	M4
3	Spare Blade Fuse	2	32VDC 15A
4	Certificate	1	
5	User Manual	1	