SmartGen

ideas for power

EP4300
ENGINE CONTROLLER

USER MANUAL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

 Chinese trademark

 English trademark

SmartGen ─ make your generator *smart*

SmartGen Technology Co., Ltd.

No.28 Jinsuo Road, Zhengzhou, Henan Province, China

Tel: +86-371-67988888/67981888/67992951

+86-371-67981000(overseas)

Fax: +86-371-67992952

Web: www.smartgen.com.cn/

www.smartgen.cn/

Email: sales@smartgen.cn

Table 1 - Software Version

Date	Version	Note
2021-07-01	1.0	Original release.
2021-11-16	1.1	Add item 22-28 in input ports.

Table 2 - Symbol Instruction

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

CONTENTS

1 OVERVIEW

EP4300 Engine Controller is used for the control or data display (CAN instrument) of engines, especially for the electric-controlled engines to realize start/stop, speed control, data measurement, and alarm display of the engine. It fits with colour LCD display, optional Chinese and English, which is reliable and easy to use.

EP4300 Engine Controller applies 32-bit microprocessor technology, realizing precise measuring of many parameters, value adjusting and threshold setting etc. functions. A majority of parameters can be adjusted from the front panel. All parameters can be adjusted via USB or RS485 port by PC. With compact structure, simple wiring, and high reliability, it can be used in various engine automation systems.

2 PERFORMANCE AND CHARACTERISTICS

— Applies ARM-based 32-bit SCM, high integration of hardware;

— 4.3-inch colour LCD display, resolution 480x272 with adjustable backlight (the backlight can be adjusted automically or manually), optional Chinese and English, which can be chosen at the site, making commissioning convenient for factory personnel;

— Silicon panel and pushbuttons, hard screen acrylic for screen protection;

— Fitted with CANBUS port to communicate with J1939 engines, not only can monitor the frequently-used data (such as water temperature, oil pressure, engine speed, fuel consumption and so on, but also control the start/stop of the engine through CANBUS port;

— 3 programmable analog sensor inputs, the programmable sensor 3 input can be directly connected to resistance, voltage or current sensors, while other sensor inputs can only be connected to resistance sensor;

— More kinds of curves of temperature, oil pressure, fuel level can be used directly and users can define the sensor curves by themselves;

— Precision measure and display parameters of engines: speed, battery voltage, charger voltage, total start time and start attempts, etc.;

— Three crank disconnect conditions (speed, oil pressure, speed+oil pressure) are optional;

— Wide power supply range, suitable to different starting battery voltage environment;

— Sealed enclosure design, the whole unit protection can reach IP65;

— Modular structure design, flame-retardant plastic shell, pluggable water-proof connector, built-in mounting, compact structure with easy installation.

Table 3 - Performance Parameter

Item	Content
Working Voltage	DC8V ~ DC35V, DC reverse connection protection Resolution: 0.1V Accuracy: 1%
Overall Consumption	<4W (Standby mode: <2W)
Speed Sensor	Voltage Range: 1.0V~ 24V (RMS) Frequency Range: 5Hz~10000Hz
Charger(D+) Voltage	Range: DC0V ~ DC60V Resolution: 0.1V Accuracy: 1%
Analog Sensor	Resistance Input Range: 0Ω ~ 6000Ω Resolution: 0.1Ω Accuracy: 1Ω (below 300Ω)
	Voltage Input Range: 0V ~ 5V Resolution: 0.001V Accuracy: 1%
	Current Input Range: 0mA ~ 20mA Resolution: 0.01mA Accuracy: 1%
Digital Output 1-3	5A DC28V DC power supply output (relay output)
Aux. Input 1-3	Active when connect to negative of power supply Low Threshold Voltage: 1.2V High Limit Input Voltage: 60V
RS485 port	Isolated, half-duplex, 9600 baud rate, maximum communication length 1000m
CAN Port	Isolated, maximum communication length 250m, Belden 9841 cable or equivalent
CE-EMC Certification	EN 55032, EN 55024
Vibration Test	5 Hz~ 8 Hz ±17 mm 8 Hz ~100 Hz: acceleration 4g 100 ~ 500Hz: acceleration 2g IEC 60068-2-6
Shock Test	50g, 11ms, half-sine, three successive shocks are applied from each of the three perpendicular directions, a total of 18 times IEC 60068-2-27
Bump Test	25g, 16ms, half-sine IEC 60255-21-2
Production Compliance	According to EN 61010-1 installation category (over voltage category) III, 300V, pollution class 2, altitude 3000m

Item	Content
Case Dimensions	127mm x 115mm x 86.2mm
Panel Cutout	115mm x 103mm
Working Temperature	(-25~+70)°C
Working Humidity	(20~93)%RH
Storage Temperature	(-30~+80)°C
Protection Level	IP65
Standard	GB/T 37089 Reciprocating internal combustion engine driven alternating current generating sets controller
Weight	0.45kg

4 OPERATION

4.1 KEYS FUNCTION

Table 4 – Keys Description

Icon	Key	Description
O	Stop/Reset	In start/stop mode: Can stop the engine during running; Can reset the alarm in Stop Mode; During shutdown process, press this key again can stop engine immediately.
I	Start	Press this key can start the engine in Start/Stop Mode.
↦	On Load	Press this key , engine will on load in Start/Stop Mode.
↤	Off Load	Press this key, engine will off load in Start/Stop Mode.
↩	Return	Press this key in main interface to return to home page, press this key in parameter setting interface to return to the previous interface
⊞	Turn/Confirm	Press this key to enter the menu list; In the Speed Control Mode, the knob is used for speed control; In other modes, the knob is used to scroll the screen; In Parameter Setting Mode, the knob is used to select/adjust parameters, press it to confirm.
◀	Left	Turn the page left.
▶	Right	Turn the page right.

⚠**NOTE: Press any key to mute the sound.**

4.2 CONTROLLER PANEL
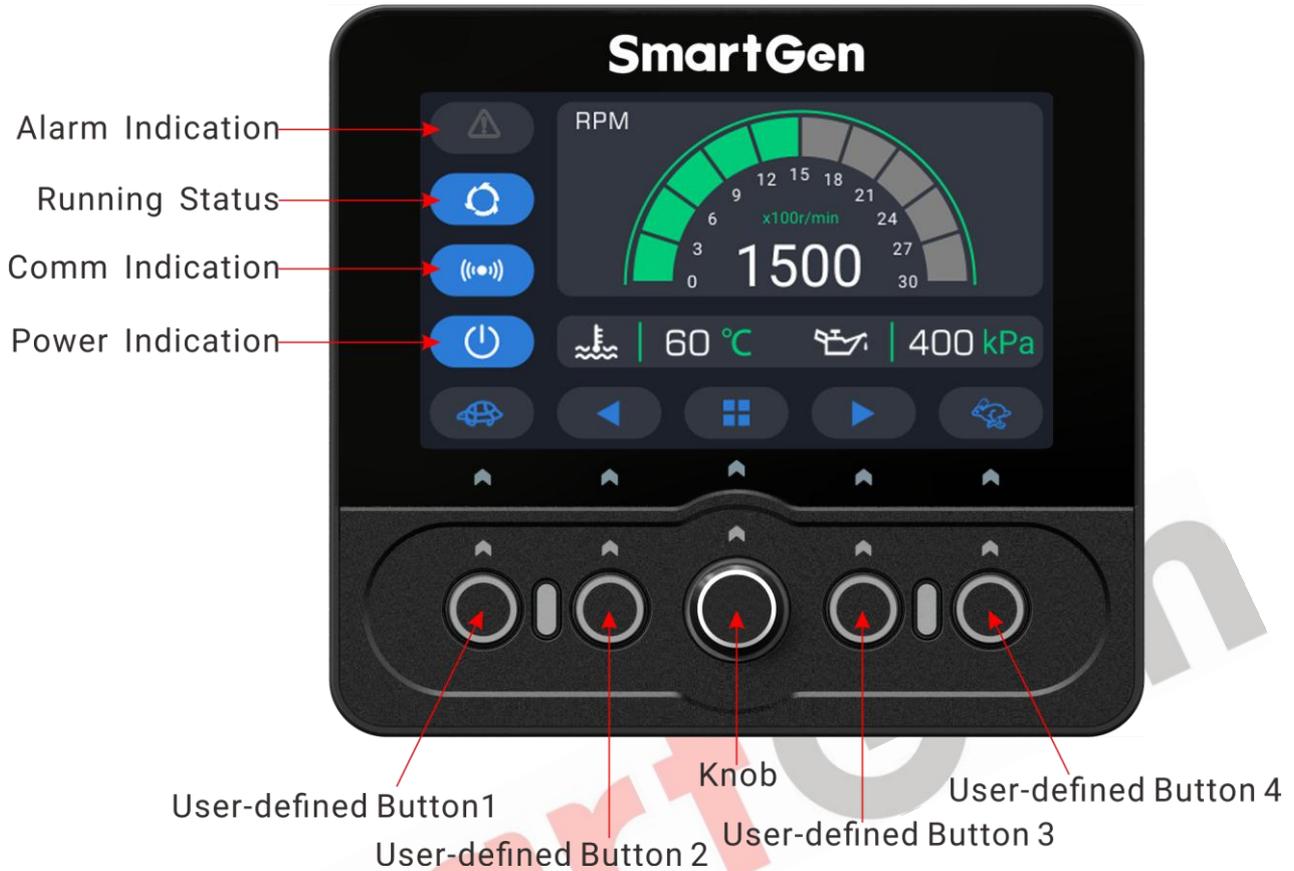
Fig.1 – EP4300 Front Panel Indication

⚠**NOTE: Description of partial indicators.**

Table 5 – Alarm Indicator Introduction

Type	Indicator
Warning	⚠️Slow flashing (1 time per second)
Shutdown	⚠️Fast flashing (5 times per second)

NOTE 1: Status indication: the icon flashes duiring start process; after crank disconnect and before ETS solenoid hold, the running status icon will rotate;

NOTE 2: Communication indication: when normally communicates with PC, the icon 〔•〕 〔•〕 〔•〕 will show in turns and dynamically;

NOTE 3: Power indication: always illuminates when power on.

4.2.1 MAIN DISPLAY

4.2.2 CONFIGURATION INTERFACE

Table 6 – Menu

Example	Button Description	
	Button 1	Return/Cancel
	Button 2	
	Button 3	
	Button 4	
	Knob Button	Enter/Exit Menu
	Knob	Select Menu

Table 7 – Working Mode

Example	Button Description	
	Button 1	Return/Cancel
	Button 2	
	Button 3	
	Button 4	
	Knob Button	Enter/Exit Menu
	Knob	Select Menu

Table 8 – Instument

Example	Button Description	
	Button 1	
	Button 2	
	Button 3	
	Button 4	
	Knob Button	Enter Menu
	Knob	Screen Scroll

Table 9 – Idle/Rated Speed

Example	Button Description	
	Button 1	
	Button 2	Idle Speed (Available to set)
	Button 3	Rated Speed (Available to set)
	Button 4	
	Knob Button	Enter Menu
	Knob	Screen Scroll

Function Description: One-touch sending the idle speed or rated speed, press the button to send data and the button will flash (Active for ECU engine).

Table 10 – Speed Controller

Example	Button Description	
	Button 1	Idle Speed (Available to set)
	Button 2	Turn Left
	Button 3	Turn Right
	Button 4	Speed Controller Enable / Speed Controller Inhibit
	Knob Button	Enter Menu
	Knob	Speed Controller

Function Description: One-touch sending the idle speed, press the button to send the idle speed and the button will flash (Active for ECU engine).

Table 11 – Start/Stop Description

Example	Button Description	
	Button 1	Start
	Button 2	On Load
	Button 3	Off Load
	Button 4	Stop
	Knob Button	Enter Menu
	Knob	Screen Scroll

Table 12 – User-defined Speed

Example	Button Description	
	Button 1	Speed 1
	Button 2	Speed 2
	Button 3	Speed 3
	Button 4	Speed 4
	Knob Button	Enter Menu
	Knob	Screen Scroll

Function Description: One-touch sending speed, press the button to send and the button will flash (Active for ECU engine).

Table 13 – User-defined Output Description

Example	Button Description	
	Button 1	Output 1
	Button 2	Output 2
	Button 3	Output 3
	Button 4	
	Knob Button	Enter Menu
	Knob	Screen Scroll

Function Description: One-touch output function, press the button, the corresponding output port will close and the button will flash, press the button again, the corresponding output port will open and the button will stop flashing.

Table 14 – CAN Send Description

Example	Button Description	
	Button 1	Send 1
	Button 2	Send 2
	Button 3	Send 3
	Button 4	Send 4
	Knob Button	Enter Menu
	Knob	Screen Scrool

Function Description: One-touch CAN send function, press the button to send and the button will flash (Active for ECU engine); each send can be configured by PC.

Table 15 – Parameter Configuration Description

Example	Button Description	
	Button 1	Return/Cancle
	Button 2	
	Button 3	
	Button 4	Stop
	Knob Button	Confirm
	Knob	Select/Set Parameters

4.3 USER MENU AND PARAMETER SETTING

★ Parameter Setting

Input correct password (the factory default is 00318) can enter parameter setting interface.

★ Language

Chinese and English are optional.

The parameter setting includes the following contents:

★ Idle/Rated Speed Setting

★ CAN Send Setting

★ User-defined Output Setting

★ Engine Type Setting

★ AUX. Input Setting

★ SPN FMI Setting

★ Flex. Sensor Seting

★ Timmer Setting

★ Engine Setting

★ User-defined Speed Setting

★ ECU Shutdown Alarm Enable

Example:

Table 16 – Configuration Interface Description

Configuration	Description
★Idle/Rated Speed Setting	Turn the knob to select the parameters to be adjusted, press down the knob button to adjust each number of the parameters in turns, turn the knob can adjust the number. When adjust the last number, press down the knob again to save the setting, [↩] can return to the previous menu.
★CAN Send Setting	Turn the knob to select the parameters to be adjusted, press down the knob button, when the parameters to be adjusted show in green, turn the knob to adjust the parameter, press down the knob again to save the setting, [↩] can return to the previous menu.
★User-defined Output Setting	The setting method is the same as CAN send setting.
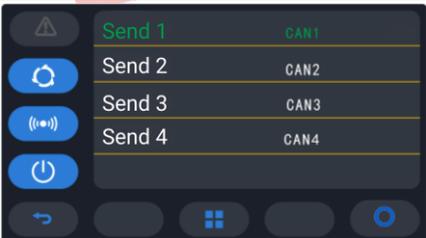
Configuration	Description
OUT1 SET:02 Stop solenoid alarm OUT2 SET:03 Idle control OUT3 SET:05 Close	
★Engine Type Setting Engine Type: 0 00 Conventional Engine 01 General J1939 02 CUMMINS-ISB 03 CUMMINS-CM850	Turn the knob to select the engine type, press down the knob can save the setting.
★AUX. Input Setting Input 1 01 High Temp. Warn Delay 002. 0S Activate Type Close to Activate	The setting method is the same as CAN send setting.
★SPN FMI Setting SPN1Setting 00000000 FMI Setting 0000	The setting method is the same as the configuration of idle speed and rated speed. (If FMI is set as 0, it will no longer match with FMI.
★Flex. Sensor Setting AUX.SENSOR 1 SET Sensor Type: 1 Temp. Sensor Curve Type: 03 SGH Open Act: Warn 1 / 6	The setting method is the same as he configuration of idle speed and rated speed.
★Timer Setting	The setting method is the same as the configuration of idle
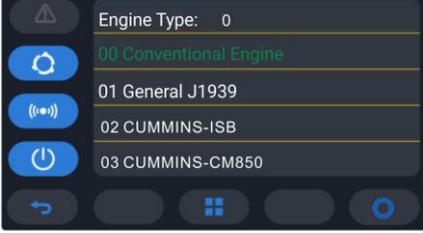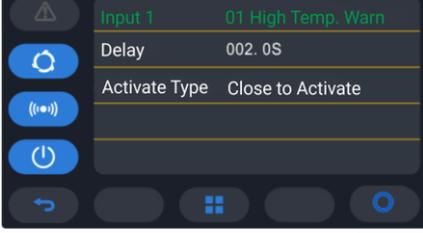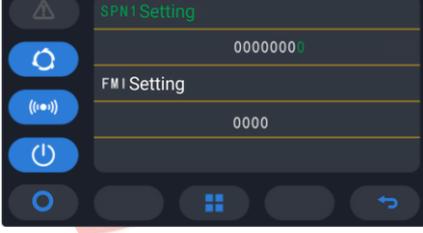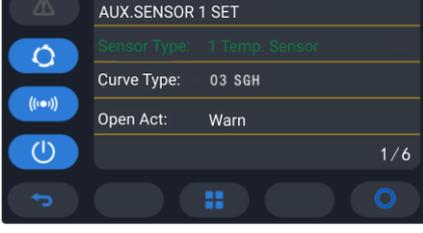
Configuration	Description
Timer Set Fail to Stop Delay 0000 Pre-heat Delay 0000 On Load Time 005.0 Off Load Time 003.0 1/4	speed and rated speed.
★Engine Setting Engine Set Flywheel Teeth 118 Underspeed 1200r/min Overspeed 1710r/min Lost speed Alarm 005.0s 1/4	The setting method is the same as he configuration of idle speed and rated speed.
★User-defined Speed Setting User Config.Speed Speed 1 1500 Speed 2 1500 Speed 3 1500 Speed 4 1500	The setting method is the same as he configuration of idle speed and rated speed.
★ECU Shutdown Alarm Enable ECU Alarm Enable: 00 Disable	The setting method is the same as CAN send setting.
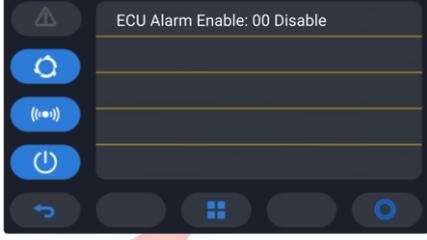
4.4 START/STOP OPERATION

a) Start: in start/stop key interface, press ⬛I to start engine, and it will automatically judge the crank disconnect and raise to high-speed running. If the over speed occurs during the running of diesel engine, it can protect shutdown effectively and quickly;

b) The preheating relay will output (if configured), and the status page of LCD displys "Preheat Delay XX s;

c) After preheat delay is over, the fuel relay will output for 1s (if configured), and then the start relay outputs; if the engine fails to start, the fuel relay and start relay will stop output, and enters the "Crank Rest Time" to wait for the next start;

d) During the set start times, if the engine fails to start, the controller will send "start failure shutdown" and the alarm will be displayed on LCD;

e) During any start, if it is successful, then enters "Safety On Time". Whthin this time, under speed and charging failure alarms will be inactive. After the end of safety on time delay, it will enter "Start Idle Delay" (if it is configured);

f) During start idle delay, the under speed alarm is inactive, after the end of the start idle delay, then enters "High-speed Warming Up Delay" (if it is configured);

g) After the end of high-speed warming up delay, the engine will enter the normal running status.

h) Stop: press ⬤ to stop the running engine;

i) When enters "Stop Idle Delay" (if configured), the idle relay will power on and output;

j) When enters "ETS Hold Time", the ETS relay will power on and output and the fuel relay output will disconnect (if configured), it will automatically judge if stops;

k) When enters "Wait for Genset Stop", it will automatically judge if stops;

l) When engine stops, then enters "Stop Delay"; otherwise the controller will enter "Stop Failure" and send the alarm (After the stop failure alarm, if the engine stops, it will enter the "Stop Delay" and automatically eliminate the stop failure warning);

4.5 WARNING ALARMS

When controller detects the warning signal, it only issues warning but the engine will not stop.

Table 17 – Warning Alarms

No.	Type	Description
1	Loss of Speed Signal	When controller detects that the engine speed is 0, and the action type selects warn, it will send a warning.
2	Stop Failure	After the engine stop delay is over, if the unit is not stop, the controller will send a warning.
3	Charging Failure	When the voltage difference between B+ and D+(WL) is greater than the charging failure voltage, it will send a warning.
4	Battery Overvoltage	When controller detects that the battery voltage of engine is over the pre-set limit, it will send a warning.
5	Battery Undervoltage	When controller detects that the battery voltage of engine is under the pre-set limit, it will send a warning.
6	ECU Warning	When controller receives a warning signal from engine via J1939, it will send a warning.
7	Flex. Sensor 1 Open Circuit	When controller detects the Flex. sensor 1 is open, and the open action selects warning, it will send a warning signal.
8	Flex. Sensor 1 High	When controller detects that the Flex. sensor 1 is higher than the upper limit value, it will send a warning signal.
9	Flex. Sensor 1 Low	When controller detects that the Flex. sensor 1 is lower than the lower limit value, it will send a warning signal.
10	Flex. Sensor 2 Open Circuit	When controller detects the Flex. sensor 2 is open circuit, and the open action selects warning, it will send a warning signal.
11	Flex. Sensor 2 High	When controller detects that the Flex. sensor 2 is higher than the upper limit value, it will send a warning signal.
12	Flex. Sensor 2 Low	When controller detects that the Flex. sensor 2 is lower than the lower limit value, it will send a warning signal.
13	Flex. Sensor 3 Open Circuit	When controller detects the Flex. sensor 3 is open circuit, and the open action selects warning, it will send a warning signal.

No.	Type	Description
14	Flex. Sensor 3 High	When controller detects that the Flex. sensor 3 is higher than the upper limit value, it will send a warning signal.
15	Flex. Sensor 3 Low	When controller detects that the Flex. sensor 3 is lower than the lower limit value, it will send a warning signal.
16	Input Port Warning	When the AUX. input port is set as warning and it is active, the controller will send a correspoinging warning signal.
17	Low Fuel Level	When the AUX. input port is set as low fuel level warning and it is active, the controller will send a corresponding warning signal.

4.6 SHUTDOWN ALARMS

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

Table 18 − Shutdown Alarms

No.	Type	Description
1	Over Speed	When controller detects that the engine speed is above the pre-set limit, it will send an alarm signal.
2	Under Speed	When controller detects that the engine speed is below the pre-set limit, it will send an alarm signal.
3	Loss of Speed Signal	When controller detects that the engine speed is 0 and the action type selects shutdown alarm, it will send an alarm signal.
4	Start Failure	Whinin the set start times, if the engine fails to start, it will send an alarm signal.
5	Flex. Sensor 1 Open Circuit	When controller detects that the Flex. sensor 1 is open and the action type selects shutdown alarm, it will send an alarm signal.
6	Flex. Sensor 1 High	When controller detects that the Flex. sensor 1 is higher than the upper limit value, it will send an alarm signal.
7	Flex. Sensor 1 Low	When controller detects that the Flex. sensor 1 valure is lower than the lower limit value, it will send an alarm signal.
8	Flex. Sensor 2 Open Circuit	When controller detects that the Flex. sensor 2 is open and the action type selects shutdown alarm, it will send an alarm signal.
9	Flex. Sensor 2 High	When controller detects that the Flex. sensor 2 value is higher than the upper limit value, it will send an alarm signal.
10	Flex. Sensor 2 Low	When controller detects that the Flex. sensor 2 valure is lower than the lower limit value, it will send an alarm signal.
11	Flex. Sensor 3 Open	When controller detects that the Flex. sensor 3 circuit is open and the action type selects shutdown alarm, it will send an alarm signal.
12	Flex. Sensor 3 High	When controller detects that the Flex. sensor 3 value is higher than the upper limit value, it will send an alarm signal.
13	Flex. Sensor 3 Low	When controller detects that the Flex. sensor 3 valure is lower than the lower limit value, it will send an alarm signal.
14	Input Port	When AUX. input port is configured a shutdown alarm and it is active, the controller will send a corresponding alarm signal.
15	ECU	When controller received the shutdown alarm signal of engine via

No.	Type	Description
		J1939, it will send an alarm signal.
16	ECU Communication Failure	When controller doesn't receive the data via J1939 after start the engine, it will send an alarm signal.

5 WIRING CONNECTION

The rear panel of controller is as follows:

Fig.2 – Controller Rear Panel

Table 19 – Terminal Connection Description

No.	Function	Cable Size	Remark
1	Flex. Sensor 1	1.0mm^2	Connect with temperature, pressure or level sensor. Setting items see Table 23. Only resistance sensor is available.
2	Flex. Sensor 2		
3	Speed Sensor Input MP1	0.5mm^2	Speed Sensor Input
4	Speed Sensor Input MP2		Speed sensor input, controller inside has been connected to negative post of battery.
5	Charger D+ Input	1.0mm^2	Connect with charger D+ (WL) terminal. If this terminal doesn't exist, hang it in the air.
6	NC		
7	ECU CAN H	0.5mm^2	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. If CAN TR

No.	Function	Cable Size	Remark	
8	ECU CAN L	0.5mm^2	output enables, 120Ω matched resistance should be connected to CANBUS automatically. Otherwise, the 120Ω matched resistance shall be connected manually.	
9	Flex. Sensor 3	1.0mm^2	Connect with temperature, pressure or level sensor. Setting items see Table 23. Voltage sensor, current sensor and resistance sensor are available.	
10	VOUT (+5V)	0.5mm^2	Output DC+5V, Max. current is 30mA.	
11	GND	1.0mm^2	Sensor Common.	
12	GND	1.0mm^2	Sensor Common.	
13	GND	1.0mm^2	Sensor Common.	
14	NC			
15	NC			
16	AUX. Input 1	1.0mm^2	Ground connected is active (B-).	See Table 23
17	AUX. Input 2	1.0mm^2	Ground connected is active (B-).	
18	AUX. Input 3	1.0mm^2	Ground connected is active (B-).	
19	AUX. Output 1	1.0mm^2	B+ is supplied by 22 points, rated 5A.	See Table 22
20	AUX. Output 2	1.0mm^2	B+ is supplied by 22 points, rated 5A.	
21	AUX. Output 3	1.0mm^2	B+ is supplied by 22 points, rated 5A.	
22	DC Power B+	1.5mm^2	Connect with positive post of starting battery. If the length is more than 30m, use two in parallel. Maximum 20A fuse is recommended.	
23	GND	1.5mm^2	Connect with negative post of starting battery.	

Table 20 − RS485 Terminal Description

No.	Function	Cable Size	Remarks
1	A(+)	0.5mm^2	Impedance-120Ω shielding wire is recommended and single-end is ground connected.
2	B(-)	0.5mm^2	
3	NC		
…	…		
8	NC		

NOTE1: The USB interface on rear panel is a parameter programming interface, and you can use a PC to program the controller.

6 SCOPES AND DEFINITION OF PROGRAMMABLE PARAMETERS

6.1 CONTENTS AND SCOPES OF PARAMETERS

Table 21 – Parameter Configuration Contents and Scopes

No.	Item	Range	Default	Description
Idle/Rated Speed Setting				
1	Idle Speed	(0~6000) r/min	750	Idle/rated speed setting.
2	Rated Speed	(0~6000) r/min	1500	
CAN Send Setting				
1	CAN Send 1	(0~19)	1	Different CAN commands can be configured, see Table 27.
2	CAN Send 2	(0~19)	2	
3	CAN Send 3	(0~19)	3	
4	CAN Send 4	(0~19)	4	
User-defined Output Setting				
1	Output Port 1	(0~29)	2	ETS solenoid control. See Table 22.
2	Output Port 2	(0~29)	3	Idle speed output control. See Table 22.
3	Output Port 3	(0~29)	5	On load control. See Table 22.
Engine Type Setting				
1	Engine Type	(0~39)	0	Default: General engine. (Non-electric Control Unit). When connect to J1939 unit, please select the corresponding engine type.
AUX. Input Port Setting				
1	Input Port 1	(0~21)	1	High temperature alarm input. See Table 23.
2	Delay	(0.0~20.0)s	2.0	
3	Active Type	(0~1)	0	0: Closed is active; 1: Open is active.
4	Input Port 2	(0~21)	2	Low oil pressure alarm input. See Table 23.
5	Delay	(0.0~20.0)s	2.0	
6	Active Type	(0~1)	0	0: Closed is active; 1: Open is active.
7	Input Port 3	(0~21)	10	Low fuel level warning input. See Table 23.
8	Delay	(0.0~20.0)s	2.0	
9	Active Type	(0~1)	0	0: Closed is active; 1: Open is active.
SPN FMI Setting				
1	SPN1Setting	(0-99999999)	0	When the SPN value of engine alarm is equal to the set SPN value, the corresponding output port will output.
2	FMI1 Setting	(0-31)	0	
3	SPN2 Setting	(0-99999999)	0	
4	FMI2 Setting	(0-31)	0	
5	SPN3 Setting	(0-99999999)	0	
6	FMI3 Setting	(0-31)	0	
Flex. Sensor Setting				
Flex. Sensor 1 Setting				

No.	Item	Range	Default	Description
1	Sensor Type	(0~3)	1	0: Not used; 1: Temperature Sensor 2: Pressure Sensor; 3: Level Sensor
2	Curve Type	(0~12)	8	SGX. See Table 24.
3	Open Circuit Action	(0~2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Temperature Shutdown	(0~1)	1	0: Disable; 1: Enable
5	Setting Value	(0~1000)	100	The unit is the same as the selected sensor.
6	Delay Value	(0~3600)s	5	
7	High Temperature Warning	(0~1)	1	0: Disable; 1: Enable
8	Setting Value	(0~1000)	90	The unit is the same as the selected sensor.
9	Return Value	(0~1000)	80	The unit is the same as the selected sensor.
10	Delay Value	(0~3600)s	5	
11	Low Temperature Shutdown	(0~1)	1	0: Disable; 1: Enable
12	Setting Value	(0~1000)	10	The unit is the same as the selected sensor.
13	Delay Value	(0~3600)s	5	
14	Low Temperature Warning	(0~1)	1	0: Disable; 1: Enable
15	Seting Value	(0~1000)	20	The unit is the same as the selected sensor.
16	Return Value	(0~1000)	30	The unit is the same as the selected sensor.
17	Delay Value	(0~3600)s	5	
Flex. Sensor 2 Setting				
1	Sensor Type	(0~3)	2	0: Not used; 1: Temperature Sensor 2: Pressure Sensor; 3: Level Sensor
2	Sensor Type	(0~12)	8	SGX. See Table 24.
3	Open Circuit Action	(0~2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Temperature Shutdown	(0~1)	1	0: Disable; 1: Enable
5	Setting Value	(0~1000)	100	The unit is the same as the selected sensor.
6	Delay Value	(0~3600)s	5	
7	High Temperature Warning	(0~1)	1	0: Disable; 1: Enable
8	Setting Value	(0~1000)	90	The unit is the same as the selected sensor.

No.	Item	Range	Default	Description
9	Return Value	(0~1000)	80	The unit is the same as the selected sensor.
10	Delay Value	(0~3600)s	5	
11	Low Temperature Shutdown	(0~1)	1	0: Disable; 1: Enable
12	Seting Value	(0~1000)	10	The unit is the same as the selected sensor.
13	Delay Value	(0~3600)s	5	
14	Low Temperature Warning	(0~1)	1	0: Disable; 1: Enable
15	Setting Value	(0~1000)	20	The unit is the same as the selected sensor.
16	Return Value	(0~1000)	30	The unit is the same as the selected sensor.
17	Delay Value	(0~3600)s	5	
Flex. Sensor 3				
1	Sensor Type	(0~3)	3	0: Not used; 1: Temperature Sensor 2: Pressure Sensor; 3: Level Sensor
2	Sensor Type	(0~12) (Level Sensor 0~7)	3	SGD. See Table 24.
3	Open Circuit Action	(0~2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Temperature Shutdown	(0~1)	1	0: Disable; 1: Enable
5	Setting Value	(0~1000)	100	
6	Delay Value	(0~3600)s	5	
7	High Temperature Warning	(0~1)	1	0: Disable; 1: Enable
8	Setting Value	(0~1000)	90	The unit is the same as the selected sensor.
9	Return Value	(0~1000)	80	The unit is the same as the selected sensor.
10	Delay Value	(0~3600)s	5	
11	Low Temperature Shutdown	(0~1)	1	0: Disable; 1: Enable
12	Setting Value	(0~1000)	10	The unit is the same as the selected sensor.
13	Delay Value	(0~3600)s	5	
14	Low Temperature Warning	(0~1)	1	0: Disable; 1: Enable
15	Setting Value	(0~1000)	20	The unit is the same as the selected sensor.
16	Return Value	(0~1000)	30	The unit is the same as the selected sensor.

No.	Item	Range	Default	Description
17	Delay Value	(0~3600)s	5	
User-defined Sensor Curve Setting				
1	User-defined Sensor Curve			Select the sensor need to be set, and then input the resistance (current/voltage) and the corresponding vaue of each point on the curve, 8 points need to be inputed.
Timer Setting				
1	Preheat Time	(0~300)s	0	The precharging time for heater plug before the starter is powered on.
2	Cranking Time	(3~60)s	8	Time for starter power on each time.
3	Crank Rest Time	(3~60)s	10	When waiting time before second power up if engine start fails.
4	Safety On Time	(1~60)s	10	Alarms for under speed and charging failure are inactive.
5	Start Idle Time	(0~3600)s	0	Running time for engine idling speed when the engine is starting.
6	Warming Up Time	(0~3600)s	10	After engine enters high-speed running, the warming up time before engine is normal running.
7	Cooling Time	(3~3600)s	10	After engine unloads, the cooling time before engine stops.
8	Stop Idle Time	(0~3600)s	0	Running time for engine idling speed when the engine is stopping.
9	ETS Hold Time	(0~120)s	20	Time for the stop electromagnet energization as the engine is stopping.
10	Fail to Stop	(0~120)s	0	Time after "idle delay" is over before the complete stop when "ETS Hold Time" is set "0"; time after "ETS Hold Time" delay is over before the complete stop when it is set other than "0".
Engine Setting				
1	Flywheel Teeth	(10.0~300.0)	118.0	Tooth number of the engine, for judging of starter separation conditions and inspecting of engine speed.
2	Under Speed Shutdown Threshold	(0~6000) r/min	1200	When engine speed is lower than this value and lasts for 5s, it is considered as underspeed and sends an alarm of shutdown signal.
3	Overspeed Shutdown Threshold	(0~6000) r/min	1710	When engine speed is higher than this value and lasts for 2s, it is considered as overspeed and sends an alarm of shutdown signal.

No.	Item	Range	Default	Description
4	Loss of Speed Signal Delay	(0~20.0)s	5.0	When loss of speed signal and shutdown delay, if set as 0s, it will only warn but not stop.
5	Voltage Difference of Charging Failure	(0~30)V	6.0	During engine normal running, when the voltage difference between B+ and charger D+(WL) is greater than this value and lasts for 5s, it will send charging failure shutdown.
6	Battery Over Volt. Threshold	(12~40)V	33.0	When battery voltage is higher than this value and last for 10s, it will send abnormal battery voltage signal, this value only warn but not stop.
7	Battery Under Volt. Threshold	(4~30)V	8.0	When battery voltage is lower than this value and last for 10s, it will send abnormal battery voltage signal, this value only warn but not stop.
8	Start Attempts	(1~10) times	3	Maximum start times for start failures; when it reaches up to the set value, controller will issue fail to start signal.
9	Crank Disconnect Conditions	(0~2)	0	Conditions for starter and engine are magnetic sensor and oil pressure, aiming to separate the starter motor and engine as soon as possible. 0: Speed; 1: Oil Pressure; 2: Speed+Oil Pressure. (The OP sensor is associated with Flex. Sensor 2.)
10	Disconnect Speed	(0~3000) r/min	360	When engine speed is above this value, it is considered as crank disconnect, the starter will separate.
11	Disconnect OP	(0~400)kPa	200	When engine oil pressure is above this value during starting, it is considered as crank disconnect, the starter will separate.
12	Disconnect OP Delay	(0~20.0)s	0.5	When crank disconnect conditons include oil pressure, the engine oil pressure is above pre-set value and the delay is above the pre-set value, it is considered as crank disconnect, the starter will separate.
13	CAN_TMR Output	(0~1)	0	0: Disable; 1: Enable (After it enables, the CANBUS will parallel with the matched 120 Ω resistance automatically.)
14	ECU Speed Period	(1~200)r/min	5	CAN speed control.

No.	Item	Range	Default	Description
15	Backlight Brightness	(0~4)	0	0: Backlight automatic ISO; 1: Manually adjust the backlight brightness 1 (25%); 2: Manually adjust the backlight brightness 2 (50%); 3: Manually adjust the backlight brightness 3 (75%); 4: Manually adjust the backlight brightness 4 (100%); The larger brightness number is, the brighter backlight will be.
Self-defined Speed				
1	Speed 1	(0~6000)r/min	1500	Self-defined speed indicates the button sending speed in the button speed mode.
2	Speed 2	(0~6000)r/min	1500	
3	Speed 3	(0~6000)r/min	1500	
4	Speed 4	(0~6000)r/min	1500	
ECU Shutdown Alarm				
1	ECU Enable	(0~1)	0	0: Disable 1: Enable

6.2 DEFINITION CONTENTS OF CUSTOM OUTPUT PORTS 1-3

Table 22 – Definition Contents of Custom Output Ports 1-3

No.	Items	Description
0	Not Used	
1	Common Alarm	Including all shutdown alarms and warning alarms. When only a warning alarm occurs, the alarm won't self-lock; When a shutdown alarm occurs, the alarm will self-lock until alarm is reset.
2	ETS Control	Used for the engine with stop solenoid. Pick-up when idle speed is over while disconnect when ETS delay is over.
3	Idle Control	Used for the engine with idle speed. Pick-up when crank while disconnect when entering into warming up. Pick-up when stop idle while disconnect when engine stops completely.
4	Preheat Control	Close before start and disconnect before power on.
5	On Load	When on load time is set as 0, it is continuous on load.
6	Off Load	When off load time is set as 0, it is continuous off load.
7	Speed Raise Control	Pick-up when entering into warming up time. The pick-up time is the high-speed warming up delay.
8	Speed Drop Control	Pick-up when enter into stop idle or ETS solenoid stop (shutdown alarm). The pick-up time is from stop idle delay to genset complete stop.
9	Running Output	Output when engine is in normal running, disconnect when speed is lower than crank disconnect speed.
10	Reserved	Reserved.

No.	Items	Description
11	Shutdown Alarm	Output when shutdown alarm occurs.
12	Audible Alarm	When shutdown and warning alarm, audible alarm is set as 300s. In audible alarm output duration, when press any panel key or "alarm mute" input is active, it can remove the alarm.
13	Reserved	Reserved.
14	Fuel Output	Action when engine is starting and disconnect when stop is completed.
15	Start Output	Engine will output in start output status and disconnect in other status.
16	ECU Shutdown	Suitable for electric-controlled ECU engine to control ECU stop.
17	ECU Power Supply	Suitable for electric-controlled ECU engine to control ECU power supply.
18	ECU Warning	Indicate ECU sends a warning signal.
19	ECU Shutdown	Indicate ECU sends a shutdown signal (The shutdown warning will alarm if it is enabled, if it is disabled, the ECU warning will alarm).
20	ECU Comm. Failure	Indicate controller canl not communicate with ECU.
21	Raise Speed Pulse	Raising speed time is output while the engine entering into high-speed warming up.
22	Drop Speed Pulse	Drooping speed time is output while the engine entering into stop idling.
23	Oil Pump Control	This function only suits for engine type Yuchai-LMB. When engine is standby, pump control will output per 30 minutes. If oil pressure is above 100kPa or output delay is more than 1 minute, it will stop output; if engine is in pre-heating status, oil pump control will always output.
24	Pre-fuel Output	Action between start and safety running period.
25	Reserved	
26	SPN FMI1	Output only with ECU engine.
27	SPN FMI2	Output only with ECU engine.
28	SPN FMI3	Output only with ECU engine.
29	High Speed Control	Output when entering into high-speed warming up and disconnect when high-speed cooling time.

6.3 DEFINITION CONTENTS OF PROGRAMMABLE INPUT PORTS 1-3

Table 23 − Programmable Input Ports 1-3

No.	Items	Description
0	User-defined	
1	High Temp. Alarm	If the signal is active after safety run on delay is over, engine will immediately alarm to shutdown.
2	Low OP Alarm	
3	Warning Alarm	If the signal is active, it is only warning, not shutdown.
4	Shutdown Alarm	If the signal is active, engine will immediately alarm to shutdown.
5	Shutdown with Cooldown	During engine normal running and the signal is active, if high temperature occurs, conroller will stop after high speed cooling; when the signal is inactive, controller will stop immediately.
6	On Load	Connect to auxiliary port of on load status.
7	Reserved	
8	Reserved	
9	Reserved	
10	Low Fuel Level Warning	Connect to sensor digital input. Then controller will send a warning alarm signal when it is active.
11	Low Coolant Level Warning	
12	Low Fuel Level Shutdown	Connect to sensor digital input. The controller will send a shutdown alarm signal when it is active.
13	Low Coolant Level Shutdown	
14	Reserved	Reserved.
15	Charging Failure	The controller will send a charging failure alarm when it is active.
16	Alarm Mute	Can prohibit "Audible Alarm" output when it is active.
17	Idle Mode	The under speed is not protected.
18	Raise Speed Pluse	If engine is electric-controlled, when input is active, the engine speed will increase as the set speed period.
19	Drop Speed Pluse	If engine is electric-controlled, when input is active, the engine speed will decrease as the set speed period.
20	Over Speed Shutdown	The controller will send an over speed shutdown alarm when it is active.
21	Reserved	
22	Instrument Mode	When it is active, controller enters instrument mode; when it is inactive, controller returns to previous mode.
23	Idle/Rated Speed	When it is active, controller enters idle/rated speed mode; when it is inactive, controller returns to previous mode.
24	Speed Control	When it is active, controller enters speed control mode; when it is inactive, controller returns to previous mode.
25	Start/Stop	When it is active, controller enters start/stop mode; when it is inactive, controller returns to previous mode.
26	User-defined Speed	When it is active, controller enters user-defined speed mode; when it is inactive, controller returns to previous mode.

No.	Items	Description
27	Uer-defined Output	When it is active, controller enters user-defined output mode; when it is inactive, controller returns to previous mode.
28	CAN Send	When it is active, controller enters CAN send mode; when it is inactive, controller returns to previous mode.

6.4 SELECTION OF SENSORS

Table 24 – Sensor Selection

No.	Sensor	Curve Types	Remark
1	Temperature Sensor	0 Not used 1 Custom Res Curve 2 VDO 3 SGH 4 SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Custom (4-20)mA curve 10 Custom (0-5)V curve 11 Digital Closed 12 Digital Open	Defined input resistance range is 0~6kΩ. Factory default is SGX sensor.
2	Oil Pressure (Pressure) Sensor	0 Not used 1 Custom Res Curve 2 VDO-10Bar 3 SGH 4 SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Custom (4-20)mA curve 10 Custom (0-5)V curve 11 Digital Closed 12 Digital Open	Defined input resistance range is 0~6kΩ. Factory default is SGX sensor.
3	Level (Fuel Level) Sensor	0 Not used 1 Custom Res Curve 2 SGH 3 SGD 4 Custom (4-20)mA curve 5 Custom (0-5)V curve 6 Digital Closed 7 Digital Open	Defined input resistance range is 0~6kΩ. Factory default is SGD sensor.

6.5 CONDITIONS OF CRANK DISCONNECT

Table 25 − Crank Disconnect Conditions

No.	Content
0	Speed
1	Oil Pressure
2	Oil pressure + Speed

a) There are 3 kinds of crank disconnect conditions. Speed and Oil pressure can be used alone. Oil pressure and speed used together is recommended, in order to make the starter and the engine disconnect as soon as possible;

b) Speed sensor is installed in the engine for testing flywheel teeth;

c) When choosing speed, ensure the number of flywheel teeth is the same as the pre-set, otherwise over or under speed shutdown may occur;

d) If the engine has no speed sensor, please don't choose the corresponding item; otherwise Fail to Start or Loss of Speed Signal shutdown will occur;

e) If the engine has no oil pressure sensor, please don't choose the corresponding item.

7 PARAMETERS SETTING

7.1 MENU

After controller power on, press 🔳 to enter into the parameters setting menu:
Mode Change
Parameter Configuration
Shutdown Alarm Reset

7.2 PARAMETERS SETTING

Enter into "Mode Change", input password "00318" can set the mode.

Enter into "Parameters Setting", input password "00318" can set all the parameter items. When the default password (00318) is changed, it needs to input the same password with controller for parameter setting via PC software. If more parameter items need to be set (such as sensor calibration) or password is forgotten, please contact with the factory.

⚠**Notes:**

a) Please modify the parameters in standby mode (crank conditions, AUX. input/output configuration, multi delays, etc.) otherwise shutdown alarm or other abnormal conditions may occur;

b) The high threshold must be greater than the low threshold;

c) The over speed threshold must be greater than under speed threshold, otherwise over speed and under speed will occur at the same time;

d) When setting the warning alarm, please correctly set the return value, otherwise the abnormal alarm will occur. When setting high warning, the return value should be less than the set value, when setting low warning, the return value should be greater than the set value;

e) AUX. input cannot be set as the same items, otherwise it cannot realize correct function; AUX. output can be set as the same item.

7.3 LANGUAGE SELECTION

Users may select display language as simplified Chinese or English.

7.4 CONTROLLER INFORMATION

LCD will display the development information of controller, such as software version, hardware version and issue date.

8 SENSOR SETTING

When choosing sensor, standard of sensor curve will be needed. If temperature sensor is set as SGH (120°C resistance type), sensor curve should be SGH (120°C resistance type); If it is set as SGD (120°C resistance type), sensor curve should be SGD curve.

If there is difference between standard sensor curve and chosen sensor curve, select "defined sensor", and then input defined sensor curve.

When sensor curve is inputted, X value (resistance) must be in accordance with the order of higher to lower, otherwise errors will occur.

When sensor is selected as "Not used", the sensor curve will not take effect.

If there is only alarm switch of the corresponding sensor, then you must set the sensor as "Not used", otherwise shutdown alarm or warning may occur.

Can set several points of forehand or backmost as the same ordinate, as the following picture:
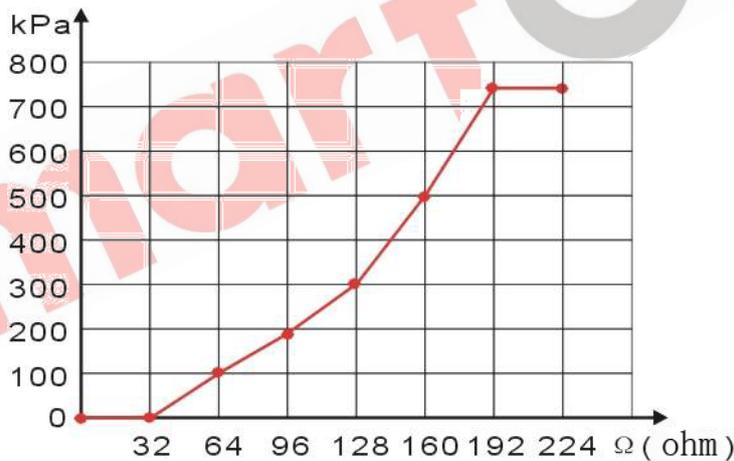
Fig.3 – Sensor Curve Diagram

Table 26 – Conventional Pressure Unit Conversion Table

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

9 CAN SEND SETTING

Table 27 – CAN Send Setting

No.	ID (HEX)	Period (*10ms)	Data Bytes	Data (HEX)	Trigger Method
CAN0	00000000	(1-100)1	(1-8)	00.00.00.00.00.00.00.00	0: Crank disconnect 1: Always 2: Press the button to start, lift the button to end.
……					3: Press the button to start, press the button again to end
CAN19	00000000	(1-100)1	(1-8)	00.00.00.00.00.00.00.00	4: Press the button to start, press the other CAN send buttons to end.

⚠NOTE: ID is 0, the sending function is disabled by default.

Example 1: Select "Trigger Method 2", set CAN ID as 0x0cf00400, period as 1, data byte as 8 and data as 01 02 03 04 05 06 07 08; press the button, the controller will send CAN ID 0x0cf00400 every 10ms, data 01 02 03 04 05 06 07 08, lift the button to end the sending.

10 CAN RECEIVE SETTING

Table 28 – CAN Receive Setting

No.	SPN	Receive ID (HEX)	Overtime (*10ms)	Start Byte	Start Bit	Length	Reserving decimal	Unit	Receive Min.	Receive Max.	Conversion Min.	Conversion Max.	Remark
CAN0	0	00000000	100.0	0	0	0	0	°C	-300	1000	-300	1000	
…	…	…	…	…	…	…	…	…	…	…	…	…	…
CAN49	0	00000000	100.0	0	0	0	0	°C	-300	1000	-300	1000	

⚠NOTE1: ID is 0, the receiving function is disabled by default. Such as CAN0: set ID as 0x12345678, overtime as 3.0, start byte as 0, start bit as 0, length as 8, reserving decimal as 0, receive min. as 0, receive max. as 100, conversion min. as 0, conversion max. 100, and the remark as water temperature; when send data ID is 0x12345678, period is less than 30ms, length is 8, hexadecimal data 01 02 03 04 05 06 07 08, the controller will display the water temperature as1°C. When data ID is set as 0x00000000 and other settings are not changed, send data ID is 0x00000000, others will not change, the controller will not display the water temperature.

⚠NOTE2: The unit can be selected by PC, selet the unit in the drop-down box: °C, kPa, %, L/h, L, r/min, h.

11 COMMISSIONING

Please make sure the following checks are made before commissioning,

— Ensure all the wiring connections are correct and wire diameter is suitable;

— Ensure that the controller DC power has fuse, and controller's positive and negative and starter battery are correctly connected;

— Take proper actions to prevent engine from cranking successfully (e. g. Remove the connection wire of fuel valve). If checking is OK, make the start battery power on;

— press "start" button, and engine will start. After the cranking times set before, controller will send signal of Start Failure; then press "stop" to reset controller.

— Recover the action to prevent engine from cranking successfully (e. g. Connect wire of fuel valve), press start button again, and engine will start. If everything goes well, engine will be normally running after idle running (if idle run is set). During this time, please watch engine's running situation. If there is something abnormal, stop engine and check all wiring connections according to this manual.

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

12 TYPICAL APPLICATION
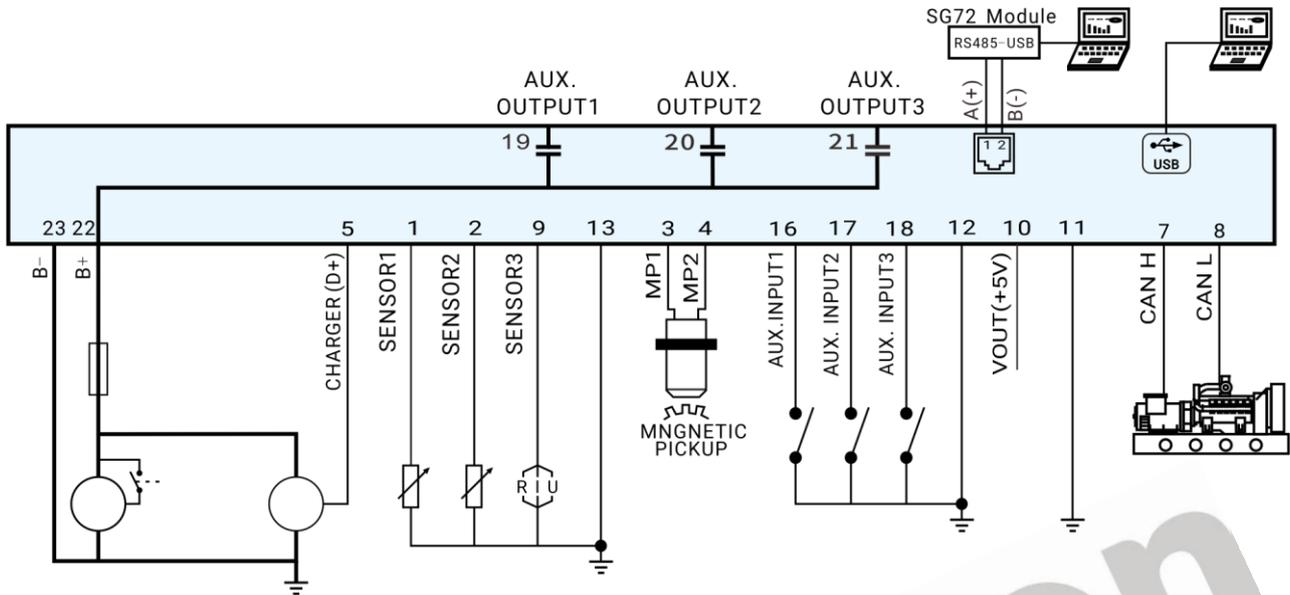
Fig.4 – EP4300 Typical Application Diagram

⚠**NOTE: Add external start/stop device for speed control mode and instrument mode.**

13 MODE WIRING CONNECTION

Table 29 – Mode Wiring Connection

Mode	Wiring Description
Start/Stop Mode	The output ports need to be configured as fuel and start outputs, the AUX. sensor 2 needs to be configured as oil pressure sensor.
Others	No special configuration.

14   INSTALLATION

14.1   FIXING CLIPS
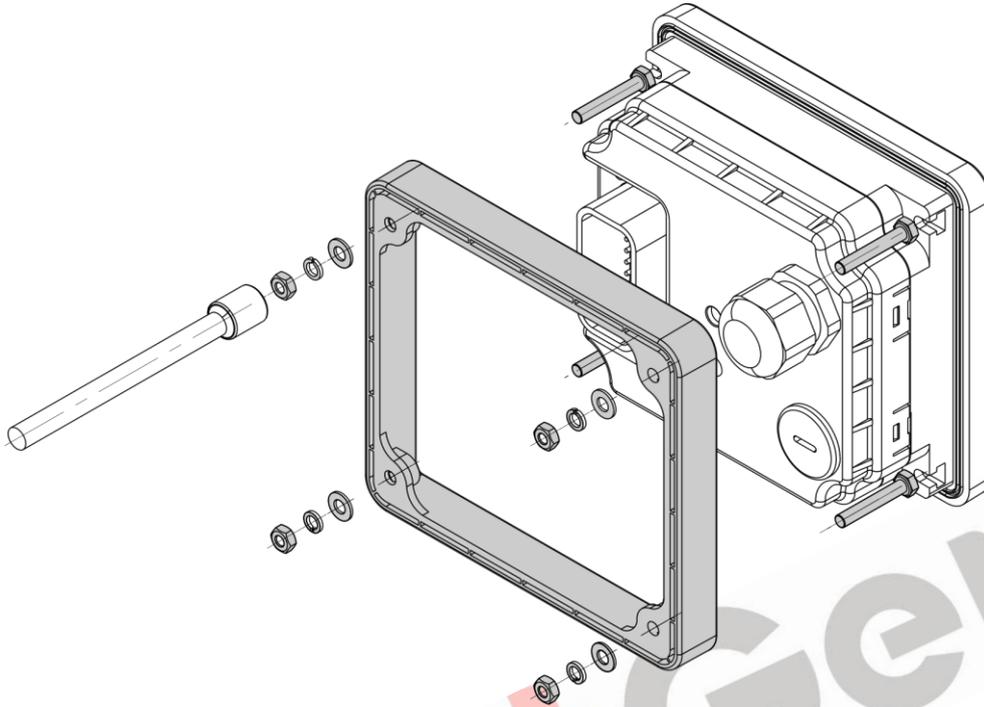
Fig.5 – EP4300 Exploded View

—   This controller is built-in design and is fixed by pressure frame when installation;
—   Remove the pressure from the controller;
—   Remove the four M4 bolts and place them in the corresponding slots of the front shell;
—   Place the controller in the opening position of the control cabinet, place the pressure frame behind the controller by aligning the four bolts;
—   Install and tighten the flat washers, spring washers and hexagonal nuts respectively.

14.2   OVERALL DIMENSIONS AND PANEL CUTOUT

Unit: mm
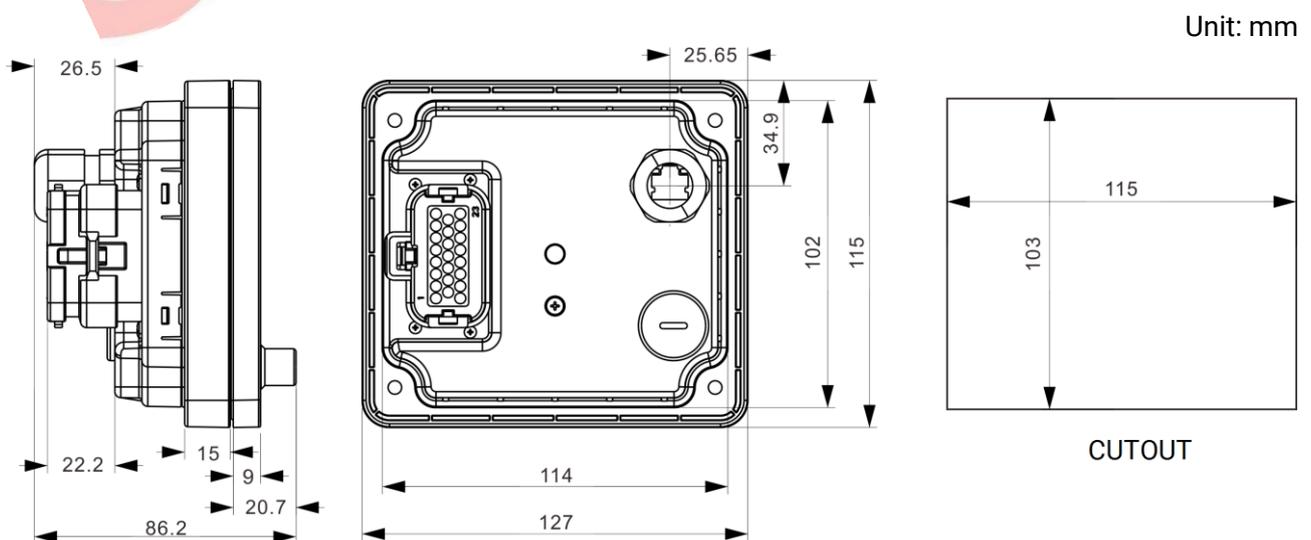
Fig.6 – Overall Dimensions and Panel Cutout

Table 30 – Fault Finding

Symptoms	Possible Solutions
Controller Inoperative	Check starting battery; Check connections of controller; Check the DC fuse.
Engine Stops	Check if water/cylinder temperature is too high; Check the DC fuse.
Shutdown Alarm During Running	Check switch and connections according to information on LCD; Check AUX. inputs.
Crank Disconnect Failed	Check starting battery; Check speed sensor and its connections; Refer to engine manual.
RS485 Failure	Check connections; Check if A and B of RS485 are connected reversely; Check if PC COM port is damaged.

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