HEM4100

ENGINE CONTROLLER

USER MANUAL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO.,LTD.

Chinese trademark

English trademark

SmartGen — make your generator *smart*

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Table 1 - Software Version

Date	Version	Note
2018-08-01	1.0	Original release.

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 error operation may cause death, serious injury and significant property damage.

CONTENTS

1 OVERVIEW

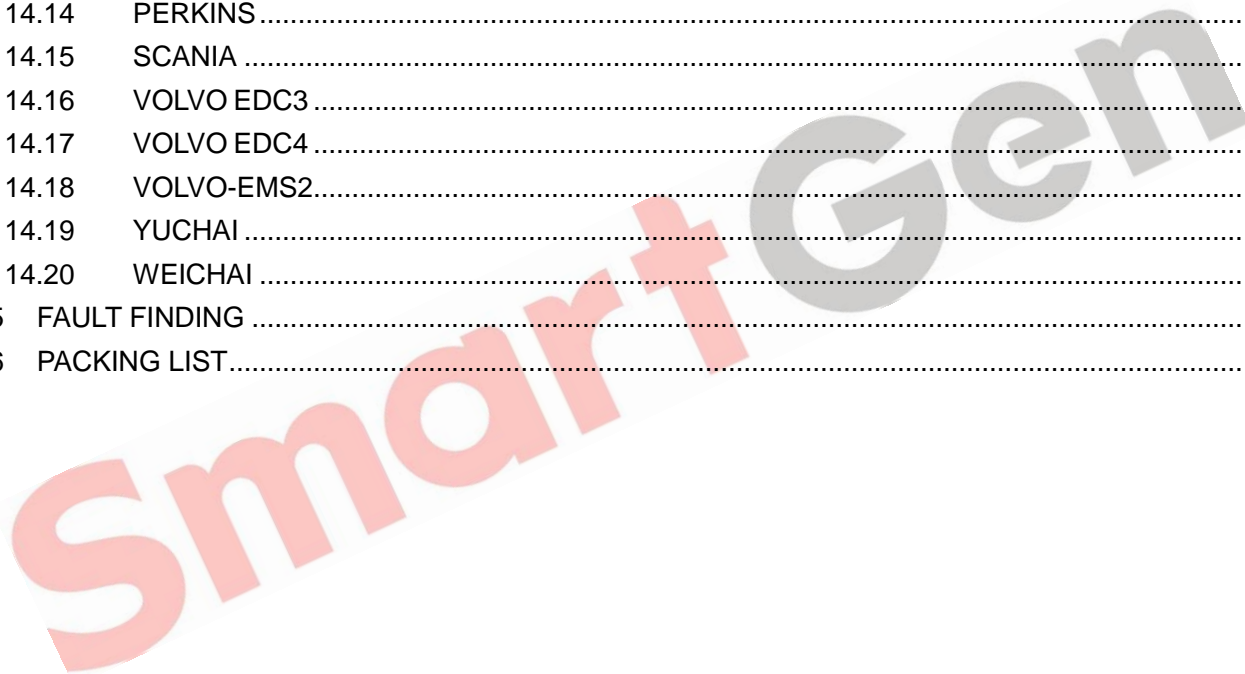**HEM4100 ENGINE CONTROLLER** is used for controlling engine to realize engine auto start/stop, data measure, alarm protection and "three remote" (remote control, remote measuring and remote communication) functions. It fits with speed regulation function, not only with relay adjust speed output but also with CANBUS(SAE J1939) interface, which can control various kinds of J1939 or conventional engines.

HEM4100 ENGINE CONTROLLER adopts large liquid crystal display (LCD) and selectable Chinese and English interface with easy and reliable operation. Users can read engine working parameters from the LCD directly.

HEM4100 ENGINE CONTROLLER uses 32 bits micro-processor technology with precision parameters measuring, fixed value adjustment, time setting and threshold adjusting and etc. The majority of parameters can be set using front panel buttons and all the parameters can be set and monitored by using PC via USB port or RS485 port. With compact structure, simple connections and high reliability, it can be widely used in a number of automatic genset control system, which including water pump system, bacon system, air compressor, engineering machinery system and so on.

2 PERFORMANCE AND CHARACTERISTICS

Key characteristics are as below,

— 132x64 LCD with backlight, multilingual interface (including English and Chinese languages) and easy operate interface;

— Improved LCD wear-resistance and scratch resistance due to hard screen acrylic;

— Silicon panel and pushbuttons for better operation in high and low temperature environment;

— RS485 communication port enabling remote control, remote measuring, remote communication via ModBus protocol;

— Equipped with CANBUS port and can communicate with J1939 genset. Not only can you monitoring frequently-used data (such as water temperature, oil pressure, speed, fuel consumption and so on) of ECU machine, but also control start, stop, raising speed and speed droop via CANBUS port;

— 6 channels of analog sensors, 3 channels of fixed resistor type sensor, and 3 channels of flexible sensors, which can be configured as resistor/current/ voltage type sensors;

— Multiple temperature, pressure and level sensor curves can be used and user-defined directly;

— Precision collect various kinds of engine parameters and with comprehensive protection functions, such as engine high water temperature/ low oil pressure, over speed and under speed protection functions;

— Speed regulation function, which can control engine raise/drop speed manually;

— With high speed/idling speed switchover function;

— All outputs are relay outputs;

— Parameter setting: parameters can be modified and stored in internal FLASH memory and cannot be lost even in case of power outage;

— Multiple crank disconnect conditions (engine speed and oil pressure) are optional;

— Engine speed can be achieved by speed sensor or W/L of charging generator;

— Widely power supply range DC(8~35)V, suitable to different start battery voltage environment;

— Event log, real-time clock, scheduled start & stop generator (can be set as start genset once a day/week/month whether);

— With heater, cooler and fuel pump control function;

— With maintenance function. Actions (warning or shutdown) can be set when maintenance time due;

— All parameters used digital adjustment, instead of conventional analog modulation with normal potentiometer, more reliability and stability;

— Waterproof security level IP65 due to rubber seal installed between the controller enclosure and panel fascia;

— Metal fixing clips enable perfect performance in high temperature environment;

— Modular design, flame retardant ABS plastic enclosure, pluggable connection terminals and embedded installation way; compact structure with easy mounting.

3 SPECIFICATION

Table 3 – Technical Parameters

Items	Contents
Operating Voltage	DC8.0V to DC35.0V, Continuous Power Supply.
Power Consumption	<3W (standby ≤2W)
Speed Sensor Voltage	1.0V to 24.0V (RMS)
Speed Sensor Frequency	10,000 Hz (max.)
Charging Generator W/L	Voltage(1.0-24)V(RMS) frequency(50-1000)Hz
Start Relay Output	5A DC28V
Programmable Relay Output 1	5A DC28V
Programmable Relay Output 2-6	1A DC28V
Analog Sensor	3 channels of fixed resistor type sensors (temperature, flexible sensor 1, flexible sensor 2); 3 channels of sensors can be configured as resistor/current/voltage type sensors (oil pressure, flexible sensor 3, flexible sensor 4)
Case Dimension	135mm x 110mm x 44mm
Panel Cutout	116mm x90mm
Working Conditions	Temperature: (-25~+70)°C; Humidity: (20~93)%RH
Storage Condition	Temperature:(-25~+70)°C
Protection Level	IP65 Gasket
Net Weight	0.35kg

4 OPERATION

4.1 KEY FUNCTIONS DESCRIPTION

Table 4 – Keys Description

Icons	Keys	Description
	Stop/Reset	1. Stop running generator in Auto/Manual mode; 2. Reset alarms in stop mode; 3. Lamp test (press at least 3 seconds); 4. Press this again in stop process can stop engine immediately.
	Auto	Press this key and controller enters in **Auto** mode.
	Manual	Press this key and controller enters in **Manual** mode.
	Speed	If adjust speed enabled, press this key to enter into adjust speed page to raise/drop engine speed.
	Start	Start genset in Manual mode.
	Up/Increase	1. Screen scroll; 2. Up cursor and increase value in setting menu;
	Down/Decrease	1. Screen scroll; 2. Down cursor and decrease value in setting menu;
	Set/Confirm	1. Entering into parameter setting page after pressing this key in main screen; 2. Confirm information in setting page.

4.2 CONTROLLER PANEL

Fig.1 – Front Panel Drawing

⚠️**NOTE: Parts of indicators description:**

Warning indicator: waning alarms occur: slowly flash; Shutdown alarms occur: fast flash; no alarms occur: extinguished;

Status indicator：It is illuminated when generator is normal; flashing when generator is in stop delay;

Auto mode indicator: It is illuminated when in auto mode; flashing when in start delay.

4.3 AUTO START/STOP OPERATION

4.3.1 AUTOMATIC START SEQUENCE

a) Press 🔄 , indicator besides it illuminated, which means generator is in in auto start mode;

b) When "Remote Start" is active, "Start Delay" timer is initiated, and auto mode indicator flashes in the same time;

c) When start delay is over, auto mode indicator changed from flashing to illuminating, and preheat relay energizes (if configured), "preheat delay XX s" information will be displayed on the LCD;

d) After the above delay, the fuel relay is energized, and then one second later, the start relay is engaged. The engine is cranked for a pre-set time. If the engine fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; "crank rest time" begins and wait for the next crank attempt;

e) Should this start sequence continue beyond the set number of attempts, the start sequence will be terminated, the first line of LCD display will be highlighted with black and fail to start fault will be displayed;

f) In case of successful crank attempt, the "Safety On" timer is activated, allowing low oil pressure, high temperature, under speed and charge alternator failure inputs are inactive. As soon as this delay is over, "start idle" delay is initiated (if configured);

g) During "start idle" delay, under speed alarms are inhibited. When this delay is over, "warming up" delay is initiated (if configured).

h) After the "warming up" delay has expired, if speed is abnormal after engine enters into normal running status, the controller will initiate shutdown alarm (alarm information will be displayed on LCD).

4.3.2 AUTOMATIC STOP SEQUENCE

a) When the "Remote Start" signal is removed, and remote stop is active, then Stop Delay is initiated, and .status indicator flashes;

b) Once this "stop delay" has expired, "Cooling Delay" is then initiated. During the delay, if remote start signal is active again, controller will re-enter into running status. If "Cooling Delay" is expired, "Stop Idle" delay is energized;

c) During "Stop Idle" Delay (if configured), idle relay is energized;

d) "ETS Solenoid Hold" delay begins, ETS relay is energized while fuel relay is de-energized;

e) "Wait for Stop Delay" begins, complete stop is detected automatically.

f) When generator is stop completely, "After stop" delay will be initiated. Otherwise, fail to stop alarm is initiated and the corresponding alarm information is displayed on LCD. (If generator is stop successfully after "fail to stop" alarm has initiated, "After stop" delay will be initiated and the alarm will be removed)

g) Generator is placed into its standby mode after its "After stop" delay.

4.4 MANUAL START/STOP OPERATION

4.4.1 MANUAL START OPERATION

a) Manual mode is selected by pressing the 🐾 button and indicator besides it illuminated.

b) Engine is started by pressing ▌▌; successful start can be detected automatically and generator accelerates to high-speed running;

c) If high temperature, low oil pressure, over speed and abnormal voltage during generator running, controller can protect genset to stop quickly. (please refer to 4.3.1,c)～h)).

4.4.2 MANUAL STOP OPERATION

Press ⭘ can stop the running generators. (please refer to 4.3.2,b)～g)).

4.5 FUEL PRE-SUPPLY OUTPUT START OPERATION

When output is configured as "Fuel Pre-supply Output" after auto/manual mode start ia active:

If configured fuel pre-supply time is below/equal pre-heat time, LCD will display "Pre-heat Delay XX", and both pre-heat relay (if configured) and fuel pre-supply relay (time is preset) are output; when pre-heat delay is expired, start relay starts output after pre-setting fuel pre-supply time is over (default as 1s); the remaining start process is the same as auto start sequence (process please to see 4.3.1, d)~h)).

If configured fuel pre-supply time is over than pre-heat time, fuel pre-supply relay outputs during pre-heat delay period. When pre-heat delay is expired, the remaining fuel pre-supply time is used for pre-supplying fuel, LCD will display "Fuel Pre-supply TimeXX" and fuel pre-supply relay energized; when fuel pre-supply delay is expired, fuel relay starts output for 1s, and then start relay outputs; the remaining start process is the same as auto start sequence (process please to see 4.3.1, d)~h)).

If configured output port as "Fuel Pre-supply Output", and engin is in standby status, it is cyclic output according to the preset "Fuel Pre-supply Rest Time" and "Fuel Pre-supply Time"; if set "Fuel Pre-supply Rest Time" as 0h, fule pre-supply output will not energized.

4.6 IDLE KEY OPERATION

Input port is configured as 8: Idle Mode.

If engine is normal running and idle mode input is active, controller will enter into idle mode and engine will start idle running. Then idle control relay will be energized and drop speed relay will start output.

If engine is in standby status and idle mode input is active, genset will be started in manual mode or auto mode. When "Safety On Delay" is over, engine will enter into "Start Idle Delay" (if configured), and after this delay expired, engine will start idle running. Then idle control relay energized and droop speed relay will output.

While in idle mode and engine is idle running, if idle mode input is inactive, controller will exit idle mode, and engine will enter into normal running. Both Idle control relay and drop speed relay stop outputing.

While in idle mode and engine is idle running, press 〇 to active stop operation, and then engine enters from "Idle Runnig" to "Stop Idle Delay" (if configured). The remaining stop process is the same as auto stop procedure (details please to see auto stop procedure 4.3.2,c)~g)).

If the speed regulation type is relay adjust speed or CAN adjust speed, the speed can be adjusted during normal running status.

4.7 IDLE/HIGH SPEED MODE

Input port is configured as 14:Idle / High Speed.

If engine is normal running and idle/high speed input is active, engine will start idle running. Then idle control relay will be energized and drop speed relay will start output. If speed regualtion is configured as relay adjust speed or CAN adjust speed, press raise speed button, idle control relay and drop seed relay will stop output, and speed can be adjusted during idle running.

If engine is in standby status and idle/high speed input is active, genset will be started in manual mode or auto mode. When "Safety On Delay" is over, engine will enter into "Start Idle Delay" (if configured), and after this delay expired, engine will start idle running. Then idle control relay energized and droop speed relay will output. If speed regualtion is configured as relay adjust speed or CAN adjust speed, press raise speed button, idle control relay and drop seed relay will stop output, and speed can be adjusted during idle running.

If engine is in idle running, when idle/high speed input is inactive, it will exit idle running and enter into high speed warming up status and raise speed relay output. When "Warming Up Delay" expired, raise speed relay stops output, and engine enters into normal running. After speed regulation type has been configured, speed can be adjusted in normal running status.

While engine is in idle running status, press 🔴 to active stop operation, and then engine enters from "Idle Runnig" to "Stop Idle Delay" (if configured). The remaining stop process is the same as auto stop procedure (details please to see auto stop procedure 4.3.2,c)~g)).

4.8 EMERGENCY START

⚠NOTE: Press 🖐 and 🟩 simulteniousely can force engine to start. At this moment, whether genset start successfully is controlled by the operator instead of basing on crank disconnect conditions. The starter disconnection is controlled by the operator. When the operator observes that the genset has started successfully, he/she releases the button, the start stops output and the controller enters into safety on delay.

4.9 ENGINE SPEED REGULATION OPERATION

When adjust speed type is configured as 1: Relay Adjust Speed
If set as 1: Relay Adjust Speed, relay output ports need to be configured as "Speed Raise Output" and "Speed Drop Output".
When adjust speed type is configured as 2: CAN Adjust Speed
Engine type need to be selected corresponding adjustable ECU unit. Through changing "CAN Adjust Speed Ratio" can modify the number of revolutions for each key press to increase the corresponding speed.

Engine speed can be adjusted by pressing 🕐, and screen is as below. Engine speed can be adjusted while engine is normal running, press 🔺 to raise speed and press 🔻 to drop speed. Then press 🕐 again to exit.
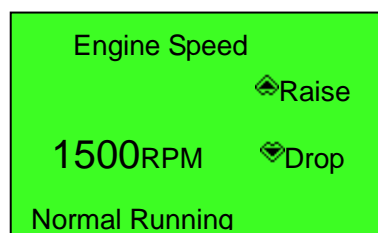
Fig.2 – Adjust Speed Screen

⚠️**NOTE: speed can be adjusted up to 110% of rated speed.**

5 PUMP GENSET (WITH SUCTION PUMP) APPLICATION OPERATIONS

5.1 D-DRIVEN PUMP START/STOP

Set input function: D-driven Pump Started, Press. to Suction Pump.

Set output function: D-driven Pump Start, D-driven Pump Stop.

Suction pump type: D-driven

——D-driven Pump Start:

● After auto/manual start mode effected, preheat relay outputs (if configured), and LCD displays "Preheat Delay XX". After preheat delay finished, start relay outputs (need be configured). If crank success input (need be configured) is invalid during "D-driven Cranking Time", start relay stops to output and it will go to "Suct. Pump Crank Rest" then waiting for next crank. If the pump doesn't crank successfully in setting cranking times, HEM4100 will give warning and shut down and in the meanwhile it will show "Suction Pump Crank Fail" in LCD display.

● In any time of cranking, if D-driven pump crank success, it will enter to "Waiting Press.to" delay. When delay is expired, "Press. to Suction Pump" (need to be configured) is invalid and HEM4100 will raise alarm and shutdown, and meanwhile "Suction Pump Fault" will be displayed on LCD.

● During the time of "waiting pressure to", fuel relay output set "Prestart Fuel Time" (default 1s) after "Press. to Suction Pump" (need to be configured) is valid, and then start relay outputs. The rest start processes are same with auto start (please refer to 4.3.1,d)~h)).

——D-driven Pump Stop: After "Safety On Delay", "D-driven Pump Stop" outputs (need to be configured), and it stops to output after "Energize to Stop Time".

5.2 E-DRIVEN PUMP START/STOP

Set input function: Press. to Suction Pump.

Set output function: E-driven Pump Start.

Suction pump type: E-driven

——E-driven Pump Start: After "suction pump type" is E-driven pump and "Safety On Delay" is over, the start relay outputs (need be configured).

——E-driven Pump Stop:

● While engine is between idle time and cooling time, if input is "Press. to Suction Pump" (need to be configured) or "Outlet Pressure" is larger than the value of E-driven "Outlet Pressure Stop", the start relay stops to output.

● While engine is in Energize to Stop Delay, the start relay stops to output.

⚠️**Note: The mentioned outlet pressure of E-driven pump need to be set in "Outlet Pressure", then relate to corresponding programmable sensor.**

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6 PROTECTION

6.1 WARNINGS

When controller detects warning alarms, it only sends warning alarms without leading genset to shutdown. If alarms are removed, warnings will be cancelled automatically.

Table 5 – Controller Warning Alarms

No.	Type	Description
1	Over Speed	When the controller detects that the engine speed has exceeded the pre-set value, it will initiate a warning alarm.
2	Under Speed	When the controller detects that the engine speed has fallen below the pre-set value, it will initiate a warning alarm.
3	Loss of Speed Signal	When the controller detects that the engine speed is 0 and the action select "Warning", it will initiate a warning alarm.
4	Fail To Stop	After "fail to stop" delay, if gen-set does not stop completely, it will initiate a warning alarm.
5	Charge Alternator Failure	When the controller detects that charger voltage has fallen below the pre-set value, it will initiate a warning alarm.
6	Battery High Voltage	When the controller detects that engine charger voltage has exceeded the pre-set value, it will initiate a warning alarm.
7	Battery Low Voltage	When the controller detects that engine charger voltage has fallen below the pre-set value, it will initiate a warning alarm.
8	ECU Warn	If a warning message is received from ECU via J1939, it will initiate a warning alarm.
9	Engine Temperature Sensor Open Circuit	When the controller detects that the temperature sensor is open circuit and the action select "Warning", it will initiate a warning alarm.
10	Engine High Temperature Warn	When the controller detects that engine temperature has exceeded the pre-set value, it will initiate a warning alarm.
11	Engine Low Temperature Warn	When the controller detects that engine temperature has fallen below the pre-set value, it will initiate a warning alarm.
12	Engine Oil Pressure Open Circuit	When the controller detects that the oil pressure sensor is open circuit and the action select "Warning", it will initiate a warning alarm.
13	Engine Low Oil Pressure Warn	When the controller detects that the oil pressure has fallen below the pre-set value, it will initiate a warning alarm.
14	Flexible Sensor 1~4 Open Circuit	When the controller detects that the flexible sensor 1 ~ 4 is open circuit and the action select "Warning", it will initiate a warning alarm.
15	Flexible Sensor 1～4 High	When the controller detects that the sensor 1～4 value has exceeded the pre-set upper limit value, it will initiate a warning alarm.
16	Flexible Sensor 1～4 Low	When the controller detects that the sensor 1～4 value has fallen below the pre-set lower limit value, it will initiate a warning alarm.
17	Over Flow	When the controller detects that the flow value has exceeded the pre-set upper limit value, it will initiate a warning alarm.
18	Input 1~5 Warning	When action of digital inputs configured as "Warning", and input

No.	Type	Description
		port is active, controller will initiate a warning alarm.
19	Maintenance 1~5 Due	When count down time is 0 and the action select "Warning", it will initiate a warning alarm.
20	End of Mandate Time	When controller reaches mandate time, and action select "Warning", it will initiate a warning alarm.
21	Battery Start Undervoltage	If scheduled start genset, when controller detects battery voltage is lower than pre-set value, it will initiate a warning alarm. This warning cannot cleared automatically, it need to press "Stop" key in stop mode to remove this warning.

6.2 SHUTDOWN ALARM

When controller detects shutdown alarm, it will send signal to open breaker and shuts down generator immediately. After genset stopped completely, users need to press alarm reset button to reset alarms.

Table 6 - Shutdown alarms

No.	Type	Description
1	Emergency Stop	When the controller detects emergency stop alarm signals, it will initiate a shutdown alarm.
2	Over Speed	When the controller detects that the engine speed has exceeded the pre-set value, it will initiate a shutdown alarm.
3	Under Speed	When the controller detects that the engine speed has fallen below the pre-set value, it will initiate a shutdown alarm.
4	Loss of Speed Signal	When the controller detects that the engine speed is 0 and the action select "Shutdown", it will initiate a shutdown alarm.
5	Fail To Stop	If engine fails to start within preset attempts, it will initiate a shutdown alarm.
6	ECU Shutdown	If a shutdown message is received from ECU via J1939, it will initiate a shutdown alarm.
7	High Temperature Shutdown	When one input port of controller set as "High Temp. Shutdown" and it is active, controller will initiate a shutdown alarm.
8	Low Oil Pressure Shutdown	When one input port of controller set as "Low Oil Pressure Shutdown" and it is active, controller will initiate a shutdown alarm.
9	ECU Communication Fail	When the controller detects that no data have been received via J1939 after engine started, it will initiate a shutdown alarm.
10	Engine Temp. Sensor Open Circuit Shutdown	When the controller detects that the temperature sensor is open circuit and action selected as "Shutdown", it will initiate a shutdown alarm.
11	Engine High Temp. Shutdown	When the controller detects that engine temperature has exceeded the pre-set value, it will initiate a shutdown alarm.
12	Engine Oil Pressure Sensor Open Circuit	When the controller detects that the oil pressure sensor is open circuit and action selected as "Shutdown", it will initiate a shutdown alarm.
13	Engine Low Oil Pressure Shutdown	When the controller detects that engine oil pressure has fallen below the pre-set value, it will initiate a shutdown alarm.
14	Flexible Sensor 1~4 Open	When the controller detects that the flexible sensor 1 ~ 4 is open

No.	Type	Description
	Circuit	circuit and the action select "Shutdown", it will initiate a shutdown alarm.
15	Flexible Sensor 1～4 High	When the controller detects that the sensor 1～4 value has exceeded the pre-set upper limit value, it will initiate a shutdown alarm.
16	Flexible Sensor 1～4 Low	When the controller detects that the sensor 1～4 value has fallen below the pre-set lower limit value, it will initiate a shutdown alarm.
17	Suction Pump Crank Fail	If diesel driven suction pump fails to start within preset attempts, controller will initiate a shutdown alarm.
18	Suction Pump Fault	If input port "Press. to Suction Pump" signal is inactive during preset "Suction Pump Fault Delay", controller will initiate a shutdown alarm.
19	Input 1~5 Shutdown	When action of digital inputs configured as "Shutdown", and input port is active, controller will initiate a shutdown alarm.
20	Over Flow	When the controller detects that the flow value has exceeded the pre-set upper limit value, it will initiate a shutdown alarm.
21	Maintenance 1~5 Due	When count down time is 0 and the action select "Shutdown", it will initiate a shutdown alarm.
22	End of Mandate Time	When controller reaches mandate time, and action select "Shutdown", it will initiate a shutdown alarm.

NOTE: For the ECU warning and ECU shutdown description, if detailed alarm content has been displayed, users can check the engine according to the alarm content, otherwise, please check with engine manual based on SPN alarm codes to receive more details.

7 WIRINGS CONNECTION
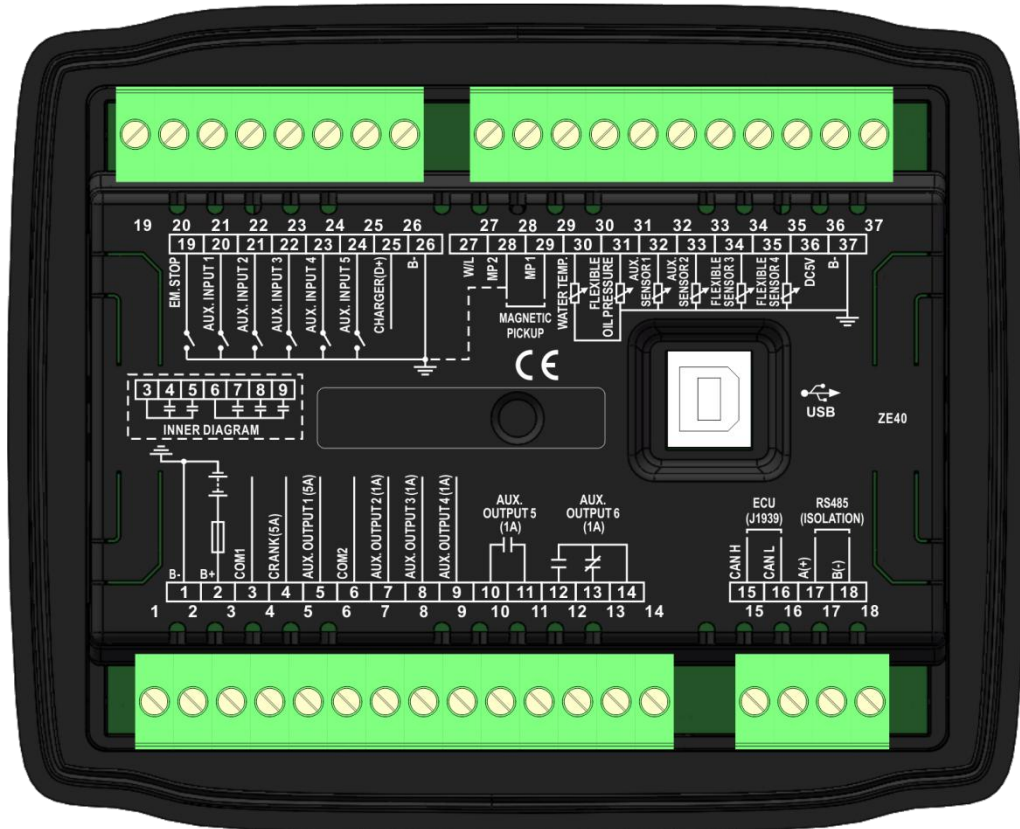
Fig.3 – HEM4100 Rear Panel Drawing

Table 7 - Terminal Connection Description

No.	Function	Cable Size	Remarks	
1	B-	1.5mm²	Connected with negative of starter battery.	
2	B+	1.5mm²	Connected with positive of starter battery.	
3	COM1 Relay Common Port	1.5mm²	Connected with COM1 output, rated 5A DC28V.	
4	Start Relay Output	1.5mm²		
5	Aux. Output 1	1.5mm²		
6	COM2 Relay Common Port	1.0mm²	Connected with COM2 output, rated 1A DC28V.	Details see Table 9
7	Aux. Output 2	1.0mm²		
8	Aux. Output 3	1.0mm²		
9	Aux. Output 4	1.0mm²		
10	Aux. Output 5	1.0mm²	Relay normally open volt free connector, rated 1A DC28V.	
11		1.0mm²		
12	Aux. Output 6	1.0mm²	Normally open, rated 1A DC28V	
13		1.0mm²	Normally close, rated 1A DC28V	
14		1.0mm²	Relay common port	
15	ECU CAN H	0.5mm²	Impedance-120Ω shielding wire is recommended, its	

No.	Function	Cable Size	Remarks	
16	ECU CAN L	0.5mm^2	single-end earthed.	
17	RS485 A(+)	0.5mm^2		
18	RS485 B(-)	0.5mm^2		
19	Emergency Stop Input	0.5mm^2	Controller stops genset immediately after input is active.	
20	Aux. Input 1	0.5mm^2	Ground connected is active (B-).	Details see Table 10
21	Aux. Input 2	0.5mm^2	Ground connected is active (B-).	
22	Aux. Input 3	0.5mm^2	Ground connected is active (B-).	
23	Aux. Input 4	0.5mm^2	Ground connected is active (B-).	
24	Aux. Input 5	0.5mm^2	Ground connected is active (B-).	
25	Charger (D+)	1.0mm^2	Connect with D+(W/L) of charger, if charger without this terminal, please hang it in the air.	
26	Aux. Input Common Port	0.5mm^2	Internal has been connected to (B-).	
27	W/L	0.5mm^2	Connect with W terminal of charging generator.	
28	MP2 speed sensor input, controller internal connected to B(-)	0.5mm^2	Connect with engine speed sensor, shielding wire is recommended.	
29	MP1 speed sensor input	0.5mm^2		
30	Temp. Sensor	1.0mm^2	Connect with temperature sensor(resistor type)	Details see Table 11
31	Oil Pressure Sensor	1.0mm^2	Connect with pressure sensor(resistor/current/voltage type)	
32	Aux. Sensor 1	1.0mm^2	User-defined (resistor type)	
33	Aux. Sensor 2	1.0mm^2	User-defined (resistor type)	
34	Aux. Sensor 3	1.0mm^2	User-defined (resistor/current/voltage type)	
35	Aux. Sensor 4	1.0mm^2	User-defined (resistor/current/voltage type)	
36	DC5V	1.0mm^2	Provide power for voltage type sensor	
37	Sensor COM (B-)	1.0mm^2	Sensor common port, controller internal connected with B-.	
	USB	/	It can communicate with PC monitoring software.	

8 SCOPES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

8.1 CONTENTS AND SCOPES OF PARAMETERS

Table 8 – Parameter Content and Scope

No.	Item		Range	Default	Description
Language					
1	Language		(0-2)	0	0: Simplified Chinese; 1: English; 2: Other
Override Mode					
1	Override Mode		(0-1)	0	0: Disable; 1: Enable
Module					
1	Power On Mode		(0-2)	0	0: Stop Mode; 1: Manual Mode; 2: Auto Mode
2	Module Address		(1-254)	1	Controller address for remote monitoring.
3	Communication Stop Bit		(0-1)	0	0: 2-bit Stop Bit; 1: 1-bit Stop Bit (PC software set)
4	Password		(0-9999)	0318	This password is used for entering high level parameters setting. ⚠ CAUTION: original password is"0318", operator can change it to prevent others from changing controller advanced configuration at will. Please memorize the new password after change, if forget, please contact with supplier service personnel.
5	LCD Backlight	Contrast Ratio	(0-10)	5	
		Brightness	(0-5)	5	
		Backlight Delay	(0-3600)min	5	If delay time set as 0 min, backlight always light.
6	Date And Time				Users can calibrate date and time by themselves.
Timers Set					
1	Start Delay		(0-3600)s	1	It is time from remote start signal active to start genset.
2	Stop Delay		(0-3600)s	1	It is time from remote stop signal active to stop genset.
3	Preheat Delay		(0-3600)s	0	Time of pre-powering heat plug before starter is powered up.
4	Prestart Fuel Time		(0-3600)s	1	Time of fuel relay output before starter powered up.
5	Cranking Time		(3-60)s	8	Time of starter power up.

No.	Item	Range	Default	Description
				(If diesel driven suction pump enabled, it is also can be cranking time of diesel driven suction pump).
6	Crank Rest Time	(3-60)s	10	The waiting time before second power up when engine starts fail. (If diesel driven suction pump enabled, it is also can be crank rest time of diesel driven suction pump).
7	Safety On Delay	(0-3600)s	10	Alarms for low oil pressure, high temperature, under speed, under frequency /voltage, charge fail are inactive during this time.
8	Start Idle Time	(0-3600)s	0	Idle running time of genset when starting.
9	Warming Up Time	(0-3600)s	10	Warming time for engine after high speed running and before take load.
10	Cooling Time	(0-3600)s	10	Radiating time before genset stop.
11	Stop Idle Time	(0-3600)s	0	Idle running time when genset stop.
12	ETS Solenoid Hold	(0-3600)s	20	The time of powering up the electromagnet during stop procedure. (If diesel driven suction pump enabled, it is also can be ETS solenoid hold time of diesel driven suction pump).
13	Wait Stop Time	(0-3600)s	0	Time between ending of genset idle delay and stopped completely when "ETS time" is set as 0; Time between ending of ETS hold delay and stopped when "ETS Hold output time" is not 0.
14	After Stop Time	(0-3600)s	0	Time between genset stopped and standby.
15	Fuel Pre-supply Rest Time	(0-12)h	2	When output is configured as "Fuel Pre-supply", it is the interval between the completion of the pre-fuel supply output and the next pre-supply output in standby status. If time is 0, fuel pre-supply is not output in standby status.
16	Fuel Pre-supply Time	(3-30)s	5	It is fuel pre-supply output time when output configured as "Fuel Pre-supply".
Engine				
1	Engine Type	(0-39)	0	Default: Common genset(non-J1939) When connect to J1939 unit, please select

No.	Item		Range	Default	Description
					the corresponding engine type.
2	Enable ECU Shutdown		(0-1)	1	0: Disable; 1: Enable
3	Source of Speed Signal		(0-1)	0	0: Speed sensor; 1: W/L
4	W/L Ratio		(0-99.99)	9.04	
5	Flywheel Teeth		(1.0-300.0)	118.0	Tooth number of the engine, which used for judging of crank disconnect conditions and inspecting of engine speed. See the installation instructions.
6	Rated Speed		(0-6000) r/min	1500	Offer standard to judge over/under/ loading speed.
7	Start Attempts		(1-10) Times	3	Max. Crank times of crank attempts when engine failed to start. When reach this number, controller will send start failure signal. (If diesel driven suction pump enabled, it is also can be start attempts of diesel driven suction pump).
8	Crank Disconnect Conditions		(0-2)	2	See table 12. There are 2 conditions of disconnecting starter with engine. Each condition can be used alone and simultaneously to separating the start motor and genset as soon as possible.
9	Disconnect Speed		(0-200)%	24	Setting value is the percentage of rated speed. When generator speeds is higher than the set value, starter will be disconnected. See the installation instruction.
10	Disconnect Oil Pressure		(0-1000)kPa	200	When oil pressure is higher than the set value, starter will be disconnected. See the installation instruction.
11	Overspeed Warn	Set Value	(0-200.0)%	110.0	Setting value is the percentage of rated speed. Return value and delay value can be set.
		Return	(0-200.0)%	108.0	
		Delay	(0-3600)s	5	
12	Underspeed Warn	Set Value	(0-200.0)%	55.0	
		Return	(0-200.0)%	60.0	
		Delay	(0-3600)s	5	
13	Overspeed Shutdown	Set Value	(0-200.0)%	114.0	Setting value is the percentage of rated speed. Return value and delay value can

No.	Item		Range	Default	Description
		Delay	(0-3600)s	2	be set.
14	Underspeed Shutdown	Set Value	(0-200.0)%	50.0	
		Delay	(0-3600)s	3	
15	Loss of Speed Signal Delay		(0-3600)s	5	It is time from detecting speed is 0 to action confirmed.
16	Loss of Speed Signal Action		(0-1)	0	0: Warning; 1: Shutdown
17	Battery Rated Voltage		(0-60.0)V	24.0	Standard for detecting over/under voltage of battery.
18	Battery Overvolt Warn	Set Value	(0-200)%	120	Setting value is percentage of rated voltage of battery. Delay value and return value can be set.
		Return	(0-200)%	115	
		Delay	(0-3600)s	60	
19	Battery Undervolt Warn	Set Value	(0-200)%	85	
		Return	(0-200)%	90	
		Delay	(0-3600)s	60	
20	Charge Alt Fail	Set Value	(0-60.0)V	8.0	In normal running, when charger D+ (WL) voltage under this value, charge failure alarms.
		Return	(0-60.0)V	10.0	
		Delay	(0-3600)s	10	
21	Battery Undervolt Detect	Enable	(0-1)	0	When select scheduled run, it will be detected before start. If battery voltage is lower than set value, battery undervolt alarms.
		Set Value	(0-60.0)V	18.0	
22	Engine Idle		(0-100)%	60	Setting value is percentage of rated speed. If idle running is needed, speed will be stabilized in setting value.
23	Self-priming Pump Crank		(0-2)	0	0: Not Used; 1: D-driven Suction Pump; 2: E-driven Suction Pump
24	D-driven Suction Pump Fault Shutdown Delay		(0-3600)s	90	Time for waiting press to suction pump ("Waiting Press. To" input is active).
25	Outlet Press When E-driven Suction Pump Stopped		(0-1000)kPa	100	It is pressure when "E-driven Pump Start" input stops outputting.
Analog Sensor					
Temperature Sensor					
1	Curve Type		(0-15)	9	SGD. Details see Table 11.
2	Open Circuit Action		(0-2)	0	0: Warning; 1: Shutdown; 2: No Action
3	Display Unit		(0-1)	0	0: ℃; 1: ℉
4	High Temp. Shutdown		(0-300)℃	98	Shutdown when sensor temperature is higher than this value. Detecting only after

No.	Item	Range	Default	Description
				safety delay is over. The delay value can be set.
5	High Temp. Warning	(0-300)ºC	95	Warning when sensor temperature higher than this value. Detecting only after safety delay is over. The delay value and return value can be set.
6	Low Temp. Warning	(0-300)ºC	70	Warning when sensor temperature is lower than this value. Detecting only after safety delay is over. The delay value and return value can be set.
7	Heater Control	((-50)-300)ºC	50	Heater control outputs when the value of external connected temperature sensor is lower than this value. The delay value and return value can be set.
8	Cooler Control	((-50)-300)ºC	80	Cooler control outputs when the value of external connected temperature sensor is higher than this value. The delay value and return value can be set.
9	Custom Curve			Setting curves according to sensors' performance.
Oil Pressure Sensor				
1	Curve Type	(0-15)	9	SGD. Details see Table 11.
2	Open Circuit Action	(0-2)	0	0: Warning; 1: Shutdown; 2: No Action
3	Display Unit	(0-2)	0	0：kPa；1：bar；2：psi；
4	Low Oil Pressure Shutdown	(0-1000)kPa	103	Shutdown when oil pressure is lower than this value. Detecting only after safety delay is over. The delay value can be set.
5	Low Oil Pressure Warning	(0-1000)kPa	124	Warning when oil pressure is lower than this value. Detecting only after safety delay is over. The delay value and return value can be set.
6	Custom Curve			Setting curves (resistor/voltage/current type) according to sensors' performance.
Flexible Sensor 1~4				
1	Sensor Selection	(0-8)	0	0: Not Used; 1: Temperature Sensor; 2: Pressure Sensor; 3: Level Sensor; 4: Flow Sensor; 5: Pipe Pressure Sensor; 6: Inlet Pressure Sensor; 7: Water Level Sensor; 8: Outlet Pressure Sensor.
2	Curve Type			Changing based on the sensor type
3	Open Circuit Action	(0-2)	0	0: Warning; 1: Shutdown; 2: No Action

No.	Item	Range	Default	Description
4	Display Unit	(0-1)	0	0: ℃; 1: ℉ Note: different sensors with different units.
5	Over Shutdown	(0-9000)	100	Shutdown when external sensor value is higher than this value. Enable alarms and delay value can be set.
6	Under Shutdown	(0-9000)	10	Shutdown when external sensor value is lower than this value. Enable alarms and delay value can be set.
7	Over Warning	(0-9000)	90	Warning when external sensor value is higher than this value. Enable alarms, return value and delay value can be set.
8	Under Warning	(0-9000)	20	Warning when external sensor value is lower than this value. Enable alarms, return value and delay value can be set.
9	Custom Curve			Setting curves (resistor/voltage/current type) according to sensors' performance.
Fuel Level Correlate				
1	Sensor Correlate Set	(0-4)	0	0: Not Used 1: Flexible Sensor 1 2: Flexible Sensor 2 3: Flexible Sensor 3 4: Flexible Sensor 4
2	Fuel Pump Control	(0-1000)%	10	If the value of external fuel level sensor is lower than this value, fuel pump control outputs. Both return value and delay value can be set.
3	Fuel Tank Capacity Set	(0-10000)L	1000	
Outlet Press Correlate				
1	Sensor Correlate Set	(0-4)	0	0: Not Used 1: Flexible Sensor 1 2: Flexible Sensor 2 3: Flexible Sensor 3 4: Flexible Sensor 4
2	Pump Head Enable	(0-1)	0	0: Disable; 1: Enable
3	Pump Flow Enable	(0-1)	0	0: Disable; 1: Enable
4	Static Pressure	(-9000-9000)kPa	0	Setting static pressure of outlet of water pump.
5	Flow Unit	(0-1)	0	0: m³/h; 1:L/s
6	Rated Flow	(0-10000)m³/h	1000	Rated working flow of engine.
7	Over Flow Warn	(0-1000)%	110	Warning if flow value is higher than this value during genset running. Enable

No.	Item	Range	Default	Description
				alarms, delay value and return value can be set.
8	Over Flow Shutdown	(0-1000)%	120	Shutdown if flow value is higher than this value during genset running. Enable alarms and delay value can be set.
9	Flow Curve Set			Set the relationship between the different outlet pressures and its corresponding flows.
Digital Input Ports				
Input 1				
1	Content Set	(0-53)	28	Remote Start Details see Table 10.
2	Active Type	(0-1)	0	0: Close; 1: Open
Input 2				
1	Content Set	(0-53)	26	High Temp Shutdown Details see Table 10.
2	Active Type	(0-1)	0	0: Close; 1: Open
Input 3				
1	Content Set	(0-53)	27	Low OP Shutdown Details see Table 10.
2	Active Type	(0-1)	0	0: Close; 1: Open
Input 4				
1	Content Set	(0-53)	0	User Configured Details see Table 10.
2	Active Type	(0-1)	0	0: Close; 1: Open
3	Active Range	(0-3)	2	0: From Safety on; 1: From Crank; 2: Always; 3: Never
4	Active Action	(0-4)	0	0: Warning; 1: Shutdown; 2: Indication
5	Active Delay	(0-20.0)s	2.0	It is time from detecting input port is active to action confirmed.
6	Description			User-defined
Input 5				
1	Content Set	(0-53)	0	User Configured Details see Table 10.
2	Active Type	(0-1)	0	0: Close; 1: Open
3	Active Range	(0-3)	2	0: From Safety on; 1: From Crank; 2: Always; 3: Never

No.	Item	Range	Default	Description
4	Active Action	(0-4)	1	0: Warning; 1: Shutdown; 2: Indication
5	Active Delay	(0-20.0)s	2.0	It is time from detecting input port is active to action confirmed.
6	Description			User-defined
Relay Output Ports				
Output 1				
1	Content Set	(0-119)	29	Fuel Relay Details see Table 9.
2	Active Type	(0-1)	0	0: Normally Open; 1: Normally Close
Output 2				
1	Content Set	(0-119)	28	Start Relay Details see Table 9.
2	Active Type	(0-1)	0	0: Normally Open; 1: Normally Close
Output 3				
1	Content Set	(0-119)	30	Idle Control Details see Table 9.
2	Active Type	(0-1)	0	0: Normally Open; 1: Normally Close
Output 4				
1	Content Set	(0-119)	31	Speed Raise Output Details see Table 9.
2	Active Type	(0-1)	0	0: Normally Open; 1: Normally Close
Output 5				
1	Content Set	(0-119)	32	Speed Drop Output Details see Table 9.
2	Active Type	(0-1)	0	0: Normally Open; 1: Normally Close
Output 6				
1	Content Set	(0-119)	1	Custom Period Output Details see Table 9.
2	Active Type	(0-1)	0	0: Normally Open; 1: Normally Close
Adjust Speed				
1	Adjust Speed Type	(0-2)	0	0: Not Used; 1: Relay Adjust Speed; 2: CAN Adjust Speed
2	CAN Adjust Speed Ratio	(0-100)	1	CAN sends speed command to increase the number of revolutions each time.
Scheduler And Maintenance				
1	Scheduled Run	(0-1)	0	0: Disable; 1: Enable
2	Scheduled Not Run	(0-1)	0	0: Disable; 1: Enable
3	Maintenance 1	(0-1)	0	0: Disable; 1: Enable
4	Maintenance 2	(0-1)	0	Maintenance time, maintenance time due action, pre-alarm A and pre-alarm B time
5	Maintenance 3	(0-1)	0	

No.	Item	Range	Default	Description
6	Maintenance 4	(0-1)	0	and action, maintain clock, and reset maintenance can be set simultaneously. After genset has been maintained, the maintenance time due alarm can be reset by resetting the maintenance time. Details see Table 13.
7	Maintenance 5	(0-1)	0	

⚠**NOTE：**

— **When doing parameter configuration via PC software, there is no need to input password if default password (0318) isn't change; otherwise, if default password been changed or first time to set parameters via PC, password need to be wrote into the password interface.**

— **Different digital input ports cannot be configured as the same item, otherwise, errors may occur. However, different relay output ports can be configured as the same item.**

— **Fuel level sensor correlation: if need to use fuel level function, one of flexible sensor 1-4 need to be configured as fuel level sensor, meanwhile, curve type need to corresponding to the type of sensor. Then set the correlated sensor and select the corresponding flexible sensor. At this time, the flexible sensor is the fuel level sensor, which can realize fuel pump control and tank volume display.**

— **Outlet press correlation: if need to calculate flow and head via water pressure gauge, one of flexible sensor 1-4 need to be configured as outlet press sensor, meanwhile, curve type need to corresponding to the type of sensor. Then set the correlated sensor and select the corresponding flexible sensor. At this time, flow and head can be calculated via water pressure gauge.**

— **Outlet press correlation also needs to be configured if suction pump needs to judge whether to stop the output according to the outlet pressure.**

8.2 ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS 1-6

Table 9 – Definition Content of Programmable Output 1-6

No.	Type	Description
0	Not Used	
1	Custom Period 1	
2	Custom Period 2	
3	Custom Period 3	
4	Custom Period 4	
5	Custom Period 5	
6	Custom Period 6	Details of function description please see the following.
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	Reserved	

No.	Type	Description
14	Reserved	
15	Air Flap Control	Action when over speed shutdown and emergence stop. It can close the air inflow to stop the engine as soon as possible.
16	Audible Alarm	Action when warning and shutdown alarms occur. It can be connected annunciator externally. When "alarm mute" configurable input port is active or any key on the panel is pressed, it can remove the alarm. When new alarms occur, it will output again.
17	Louver Control	Action when genset is cranking and disconnect when genset stopped completely.
18	Fuel Pump Control	It is controlled by fuel pump of level sensor's limited threshold.
19	Heater Control	It is controlled by heating of temperature sensor's limited threshold.
20	Cooler Control	It is controlled by cooler of temperature sensor's limited threshold.
21	Fuel Pre-supply	In standby status, "Fuel Pre-supply" output is active, it will cycle output based on the pre-set "Fuel Pre-supply Rest Time" and "Fuel Pre-supply Time"; if "Fuel Pre-supply Rest Time" is set as 0h, it will not output. "Fuel Pre-supply Time" is output before starting. If the pre-heat time is not configured, the pre-fueling phase is output; if pre-heat time is configured, the warm-up phase is output.
22	Reserved	
23	Pre-lubricate	Actions in period of pre-heating, cranking and crank rest time.
24	Remote Control	This port is controlled by RS485 communication port.
25	Reserved	
26	Reserved	
27	Reserved	
28	Start Relay	Action when genset is cranking and disconnect when start successfully.
29	Fuel Relay	Action when genset is cranking and disconnect when stopped completely.
30	Idle Control	Used for engine which has idles. Close before starting and open when in hi-speed warming up; Close during stopping idle mode and open when stop is completed. In other status, if idle control input is active or idle key is pressed, relay will close and start output.
31	Speed Raise Output	Action in warming up period and controlled by speed regulation while in normal running.
32	Speed Drop Output	Action between the periods from "Stop Idle Time" to "Wait Stop Time" and controlled by speed regulation while in normal running.
33	Energise to Stop	Used for engines with ETS electromagnet. Close when stop idle is over and open when pre-set "ETS delay" is over.
34	Reserved	
35	ECU Stop	Used for ECU engine and control its stop.

No.	Type	Description
36	ECU Power Supply	Used for ECU engine and control its power.
37	Reserved	
38	Crank Success	Close when detects a successful start signal.
39	Normal Running	Action when genset is normal running.
40	Reserved	
41	Reserved	
42	Common Alarm	Action when common warning and shutdown alarm.
43	Common Shutdown	Action when common shutdown alarm.
44	Common Warning	Action when common warning alarm.
45	Reserved	
46	Battery Overvolt	Action when battery's voltage is over high warning alarm.
47	Battery Undervolt	Action when battery's voltage is too low warning alarm.
48	Failed to Charge	Action when charge failure warning alarm.
49	Reserved	
50	ECU Warning	Indicate ECU sends a warning signal.
51	ECU Shutdown	Indicate ECU sends a shutdown signal.
52	ECU Comm. Fail	Indicate controller not communicates with ECU.
53	Reserved	
54	Reserved	
55	D-driven Pump Start	Output when suction pump set as diesel-driven suction pump.
56	D-driven Pump Stop	Output when suction pump set as diesel-driven suction pump.
57	E-driven Pump Start	Output when suction pump set as electronic-driven suction pump. It stop outputs when genset stopped.
58	Reserved	
59	Input 1 Active	Action when input port 1 is active
60	Input 2 Active	Action when input port 2 is active
61	Input 3 Active	Action when input port 3 is active
62	Input 4 Active	Action when input port 4 is active
63	Input 5 Active	Action when input port 5 is active
64	Reserved	
65	Reserved	
66	Reserved	
67	Emergency Stop	Action when emergency stop alarm.
68	Failed to Start	Action when failed start alarm.
69	Failed to Stop	Action when failed stop alarm.
70	Under Speed Warn	Action when under speed alarm.
71	Under Speed Shutdown	Action when under speed shutdown alarm.
72	Over Speed Warn	Action when over speed warns.
73	Over Speed Shutdown	Action when over speed shutdown alarm.
74	Reserved	
75	Reserved	
76	Bypass Valve Control	The input port is configured as "Water Blast Gun Input" and is

No.	Type	Description
		output between the "Start Idle" and "Stop Idle" when input is active.
77	Reserved	
78	Reserved	
79	High Temp Warning	Action when hi-temperature warns.
80	Low Temp Warning	Action when low temperature warns.
81	High Temp Shutdown	Action when hi-temperature shutdown alarm.
82	Reserved	
83	Engine Low Oil Pressure Warning	Action when low oil pressure warns.
84	Engine Low Oil Pressure Shutdown	Action when low oil pressure shutdown.
85	Oil Pressure Sensor Open	Action when oil pressure sensor is open circuit.
86	Reserved	
87	Sensor 1 High Warning	Action when flexible sensor 1 is high warning.
88	Sensor 1 Low Warning	Action when flexible sensor 1 is low warning.
89	Sensor 1 High Shutdown	Action when flexible sensor 1 is high shutdown.
90	Sensor 1 Low Shutdown	Action when flexible sensor 1 is low shutdown.
91	Over Flow Shutdown	Action when genset over flow shutdown alarm occurs.
92	Over Flow Warning	Action when genset over flow warning alarm occurs.
93	Sensor 2 High Warning	Action when flexible sensor 2 is high warning.
94	Sensor 2 Low Warning	Action when flexible sensor 2 is low warning.
95	Sensor 2 High Shutdown	Action when flexible sensor 2 is high shutdown.
96	Sensor 2 Low Shutdown	Action when flexible sensor 2 is low shutdown.
97	Sensor 3 High Warning	Action when flexible sensor 3 is high warning.
98	Sensor 3 Low Warning	Action when flexible sensor 3 is low warning.
99	Sensor 3 High Shutdown	Action when flexible sensor 3 is high shutdown.
100	Sensor 3 Low Shutdown	Action when flexible sensor 3 is low shutdown.
101	Sensor 4 High Warning	Action when flexible sensor 4 is high warning.
102	Sensor 4 Low Warning	Action when flexible sensor 4 is low warning.
103	Sensor 4 High Shutdown	Action when flexible sensor 4 is high shutdown.
104	Sensor 4 Low Shutdown	Action when flexible sensor 4 is low shutdown.
105	Reserved	
106	Reserved	
107	Reserved	
108	Reserved	
109	Reserved	
110	Reserved	
111	Reserved	
112	Reserved	
113	In Stop Mode	Action when system is in stop mode.
114	In Manual Mode	Action when system is in manual mode.
115	In Auto Mode	Action when system is in auto mode.

No.	Type	Description
116	Reserved	
117	Reserved	
118	Reserved	
119	Reserved	

8.2.1 CUSTOM PERIOD OUTPUT

Defined Period output is composed by 2 parts, period output S1 and condition output S2.

While S1 and S2 are **TRUE** synchronously, OUTPUT;

While S1 or S2 is **FALSE**, NOT OUTPUT.

Period output S1, can set generator's one or more period output freely, can set the delayed time and output time after enter into period.

Condition output S2; can set as any conditions in output ports.

NOTE: when delay time and output time both are 0 in period output S1, it is **TRUE** in this period.

Example,

Output period: start

Delay output time: 2s

Output time: 3s

Condition output contents: output port 1 is active

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

Output port 1 active, after enter "starts time" and delay 2s, this defined period output is outputting, after 3s, stop outputting;

Output port 1 inactive, defined output period is not outputting.

8.2.2 CUSTOM COMBINED OUTPUT

Defined combination output is composed by 3 parts, condition output S1 or S2 and condition output S3.
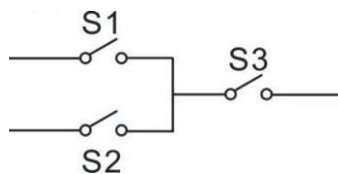
S1 or S2 is **TRUE**, while S3 is **TRUE**, Defined combination output is outputting;

S1 and S2 are **FALSE**, or S3 is **FALSE**, Defined combination output is not outputting.

NOTE: S1, S2, S3 can be set as any contents except for "defined combination output" in the output setting.

NOTE: 3 parts of defined combination output (S1, S2, and S3) couldn't include or recursively include themselves.

Example,

Contents of probably condition output S1: output port 1 is active;

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

Contents of probably condition output S2, output port 2 is active;

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

Contents of probably condition output S3: output port 3 is active;

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

When input port 1 active or input port 2 active, if input port 3 is active, Defined combination output is outputting; If input port 3 inactive, Defined combination output is not outputting;

When input port 1 inactive and input port 2 inactive, whatever input port 3 is active or not, Defined combination output is not outputting.

8.3 DEFINED CONTENTS OF CONFIGURABLE INPUT PORTS

Table 10 – Definition Content of Programmable Input Ports

No.	Type	Description
0	Users Configured	Including following functions, Indication: indicate only, not warning or shutdown. Warning: warn only, not shutdown. Shutdown: alarm and shutdown immediately Never: input inactive. Always: input is active all the time. From crank: detecting as soon as start. From safety on: detecting after safety on run delay.
1	Reserved	
2	Alarm Mute	Can prohibit "Audible Alarm" output when input is active.
3	Alarm Reset	Can reset shutdown alarm when input is active.
4	Reserved	
5	Lamp Test	All LED indicators are illuminating when input is active.
6	Panel Lock	All buttons in panel is inactive except UP/DOWN/CONFIRM buttons. Parameters cannot be configured when panel locked, but users can set language, check event logs and controller information. There is 🔒 in the bottom right corner in 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 start success conditions will be invalid.
8	Idle Speed Mode	Enter into idle mode when input is active.
9	Auto Stop Inhibit	In **Auto** mode, during generator normal running, when input is active, inhibit generator shutdown automatically.
10	Auto Start Inhibit	In **Auto** mode, inhibit generator start automatically when input is active.
11	Scheduled Run Inhibit	In **Auto** mode, inhibit scheduled run genset when input is active.
12	Reserved	
13	Reserved	

No.	Type	Description
14	Idle/High Speed	Enter into idle mode when input is active; return back to hi-speed running when input is inactive.
15	Reserved	
16	Reserved	
17	Reserved	
18	D-driven Pump Started	When input port is active, it indicates diesel driven suction pump started successfully.
19	Press. to Suction Pump	When input port is active, it indicates pressure has been to suction pump.
20	Water Blast Gun Input	Normal status: if input is active, bypass control is output between start idle to stop idle period. Idle running status: if input is active, genset operates idle running to normal running, meanwhile, bypass control starts output (if configured).
21	Alarm Stop Inhibit	All shutdown alarms are inhibited except for 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 maintenance time and date as default when input is active.
25	External Charge Fail	When input is active, failed to charge warning alarm occurs.
26	High Temp Shutdown	Connect to sensor digital input.
27	Low OP Shutdown	Connect to sensor digital input.
28	Remote Start	In **Auto** mode, when input is active, engine can be started automatically.
29	Remote Stop	In **Auto** mode, when input is active and remote start input is inactive, engine can be stopped automatically.
30	High Level Input	In **Auto** mode, when input is active, engine can be started automatically (drain flood)
31	Low Level Input	In **Auto** mode, when input is active and high level input is inactive, engine can be stopped automatically (drain flood)
32	Manual Start Input	In **Auto** mode, 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 (unlatched) can be connected and pressed as simulate panel.
35	Simulate Manual key	
36	Simulate Auto key	
37	Simulate Start key	
38	Simulate Speed key	
39-51	Reserved	
52	Raise Speed	An external button (unlatched) can be connected,

No.	Type	Description
53	Drop Speed	manually control speed adjust.

8.4 SELECTION OF SENSORS

Table 11 – Sensors Selection

No.		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 12-15 Reserved	Defined resistance's range is (0~1)KΩ, default is SGD sensor.
2	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 (0~1)KΩ, default is SGD sensor.
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 -15 Reserved	Defined resistance's range is (0~1)KΩ, default is SGD sensor.
4	Flow Sensor	0 Not used 1 Custom Res Curve 2 Custom (4-20)mA Curve 3 Custom Volt Curve 4 -15 Reserved	

8.5 CONDITIONS OF CRANK DISCONNECT SELECTION

Table 12 – Crank Disconnect Conditions

No.	Setting description
0	Engine Speed
1	Oil pressure
2	Oil pressure + Engine Speed

⚠NOTE:

— There are 3 conditions to make starter disconnected with engine, engine speed and oil pressure can be used separately. We recommend that oil pressure should be using with speed sensor together, in order to make the starter motor is separated with engine immediately and can check crank disconnect exactly.

— Speed sensor is the magnetic equipment which be installed in starter for detecting flywheel teeth.

— When set as speed sensor, must ensure that the number of flywheel teeth is as same as setting, otherwise, "over speed shutdown" or "under speed shutdown" may be caused.

— If genset without speed sensor please don't select corresponding items, otherwise, "start fail" or "loss speed signal" maybe caused.

— If genset without oil pressure sensor, please don't select corresponding items.

8.6 MAINTENANCE SETTING

Table 13 – Maintenance Setting

Item	Content	Description
Enable Choose	0: Disabled, 1: Enabled	Choose maintenance function is active or not.
Maintenance Time	(0-30000)h	This time 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.
Pre-alarm A Time	(0-30000)h	Maintenance remaining time.
Pre-alarm A Action	Same with maintenance time due actions.	Action when remaining time arrives at pre-alarm A time.
Pre-alarm B Time	(0-30000)h	Maintenance remaining time.
Pre-alarm B Action	Same with maintenance time due actions.	Action when remaining time arrives at pre-alarm B time.
Maintain Clock	0: Running Time 1: Real Time Clock	The timing of maintenance.
Reset Maintenance		After maintenance completion, through this item to reset maintenance time.
Maintenance Description		Users can configure maintenance name, like Change Engine Oil.

9 PARAMETERS SETTING

Press ⬡ key and enter into setting menu after HEM4100 is power on. The menu list is as below:

>Return
>Parameters Set
> Override Mode
>Language
>Event Log
>Module Info

Select "Parameters Set" and input the password (default is 0318) to enter setting interface.

Parameters setting process as below:

Parameters Set >Return >Module Set > Timers Set > Engine Set	Screen 1: Enter Setting, press ⬆ ⬇ to change settings, press ⬡ to confirm and enter setting (Screen 2), press 🔴 to return. Select "return" and press confirm button to back to the previous screen.
Timers Set >Return >Start Delay > Stop Delay > Preheat Delay	Screen 2: Press ⬆ ⬇ to change settings, press ⬡ to enter setting (Screen 3), press 🔴 to return (Screen 1). Select "return" and press confirm button to back to the previous screen1.
Start Delay 00001s	Screen 3: Press ⬡ and move cursor, select the value and press ⬆⬇ to modify. Press ⬡ to save your modification. Then press ⬇ to return (Screen 2).
Timers Set >Return > Start Delay > Stop Delay > Preheat Delay	Screen 4: Press ⬇, select and modify the value (same method with Screen2 and Screen3).
Over Shutdown Enable Choose: Enabled SetVal: +00098 Delay 00003s	Screen 5: Set sensor shutdown parameters. Select >Over Shutdown, press ⬡ to enter setting, then press ⬡ again to enter Screen 5, press ⬆ ⬇ to select setting, then press ⬡ to save and meanwhile the cursor will move down (as Screen 6).
Over Shutdown Enable Choose: Enabled SetVal: +00098 Delay 00003s	Screen 6: Press ⬆ ⬇ to change plus or minus, then press ⬡ to next bit. After setting finished, press ⬡ to enter delay setting. If no

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	need to modify, press [O] to return.
Self-priming Pump Crank **0: Not Used**	Screen 7: Pump crank setting. Select > Self-priming Pump Crank, press 💠 to enter setting, press 💠 again to enter Screen 7, press △ ▽ to select setting (as Screen 8).
Self-priming Pump Crank **1:D-driven Suction Pump** Fault Shutdown Delay 00090s	Screen 8: Press △ ▽ to show more setting information. Press 💠 to configure next setting (such as Screen 9). If no need to change, press [O] to return.
Self-priming Pump Crank 1:D-driven Suction Pump Fault Shutdown Delay 00090s	Screen 9: Press 💠 and move cursor, select the value and press △ ▽ to modify. Press 💠 to save your modification. Then press ▽ to return.

▲Note:

——Please modify parameters (eg: Crank Disconnect, Programmable Input/Output Configuration, Delay, etc) in standby status, otherwise it probably shutdown or faults may occur.

——Over threshold must be greater than under threshold, otherwise the situation with simultaneous over and under will turn up.

——Please set return value correctly when setting warning alarm, otherwise the controller can't alarm normally. When setting over warn, the return value should be set less than setting value; when setting under warn, the return value should be set greater than setting value.

——Programmable inputs can't be set as same value, otherwise it won't arise valid function. But programmable outputs can be set same.

10   SENSORS SETTING

a)   When reselect sensors, the sensor curve will be transferred into the standard value. For example, if temperature sensor is SGX, its sensor curve is SGX; if select the SGD, the temperature sensor curve is SGD curve.

b)   When there is difference between standard sensor curves and using sensor, user can adjust it in "curve type".

c)   When input the sensor curve, X value must be input from small to large, otherwise, mistake occurs.

d)   If select sensor type as "None", sensor curve is not working.

e)   If corresponding sensor has alarm switch only, user must set this sensor as "None", otherwise, maybe there is shutdown or warning.

f)   The headmost or backmost values in the vertical coordinates can be set as same as below,
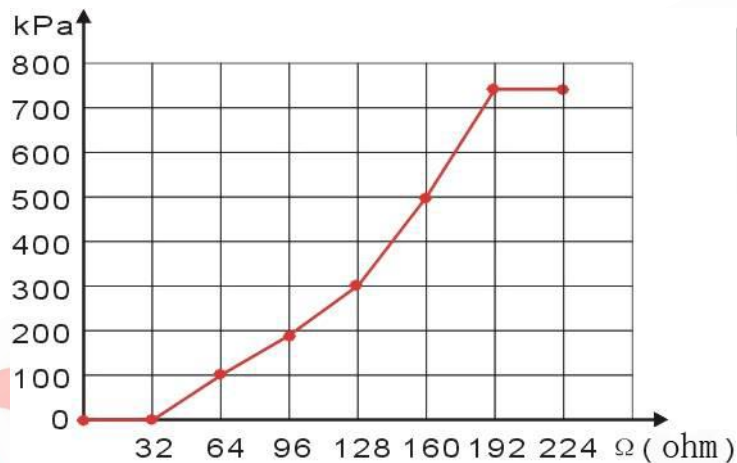
Fig.4 – Curve Setting

Table 14 - Normal Pressure Unit Conversion Form

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

11   COMMISSIONING

Please make the under procedures checking before commissioning,

a)   Ensure all the connections are correct and wires diameter is suitable.

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

c)   Take proper action to prevent engine to crank disconnect (e. g. Remove the connection wire of fuel valve). If checking is OK, make the start battery power on; choose manual mode and controller will executive routine.

d)   Press "start" button, genset will start. After the setting times as setting, controller will send signal of Start Fail; then press "stop" to reset controller.

e)   Recover the action of stop engine start (e. g. Connect wire of fuel valve), press start button again, genset will start. If everything goes well, genset will normal run after idle running (if idle run be set). During this time, please watch for engine's running situations.

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

12 TYPICAL APPLICATION
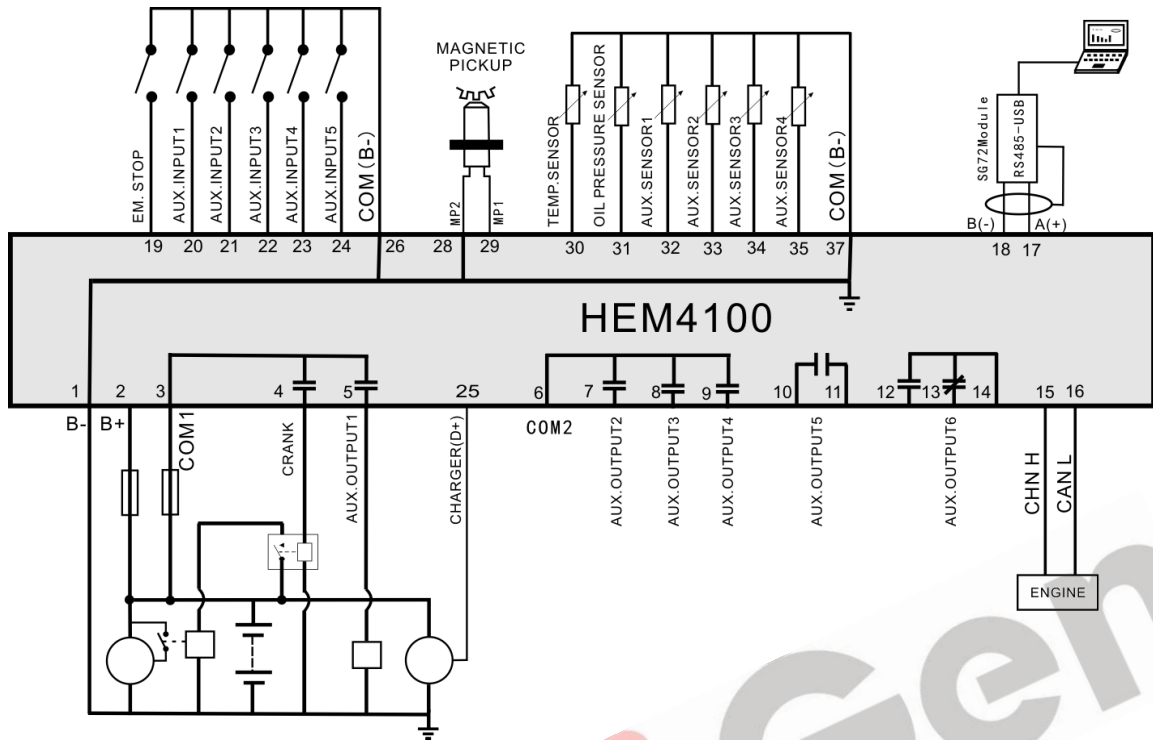
Fig.5 – HEM4100 Typical Application Diagram
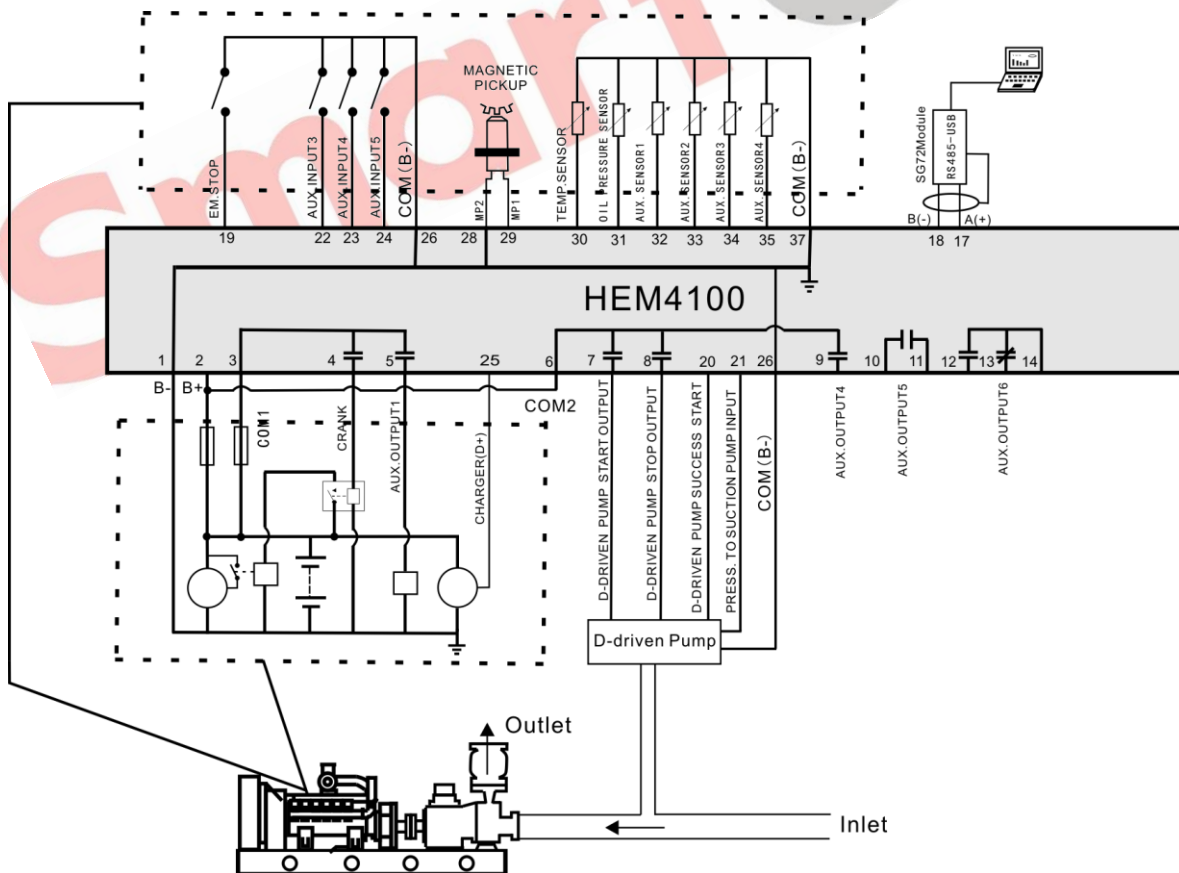
Fig.6 – Connect to D-driven Suction Pump Typical Application Diagram
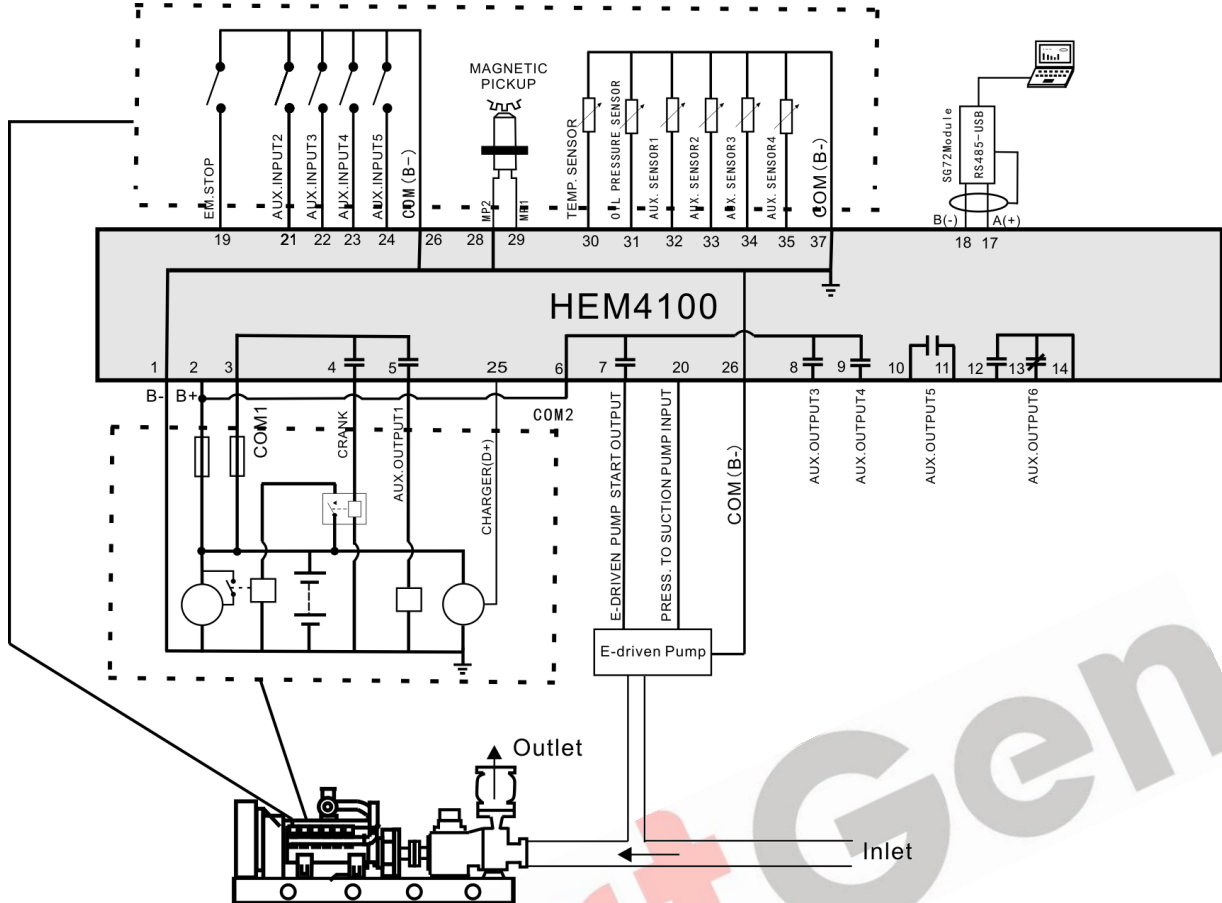
Fig.7 – Connect to E-driven Suction Pump Typical Application Diagram

13 INSTALLATION

13.1 FIXING CLIPS

HEM4100 controller designed as panel mounting, fixed by the clips.

— Controller is panel built-in design; it is fixed by clips when installed.

— Withdraw the fixing clip screw (turn anticlockwise) until it reaches proper position.

— Pull the fixing clip backwards (towards the back of the module) ensuring two clips are inside their allotted slots.

— Turn the fixing clip screws clockwise until they are fixed on the panel.

⚠ **Note: Care should be taken not to over tighten the screws of fixing clips.**

13.2 OVERALL DIMENSION
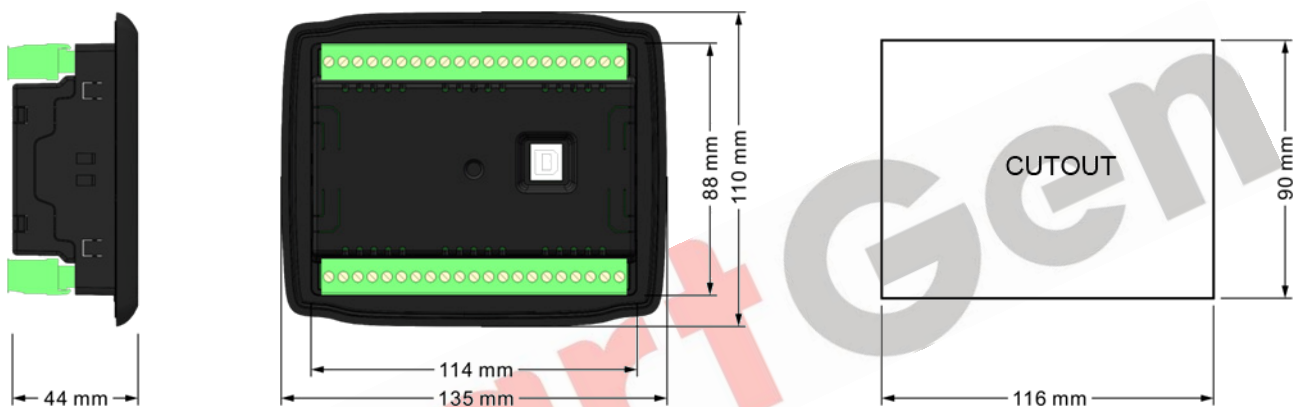
Fig.8 - Overall Dimensions

— **BATTERY VOLTAGE INPUT**

HEM4100 controller can suit for widely range of battery voltage DC(8~35)V. Negative of battery must be connected with the engine shell. Diameter of wire that connects from power supply to battery must be over 1.5mm². If floating charge configured, please firstly connect output wires of 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 charge disturbing the controller's normal working.

— **SPEED SENSOR INPUT**

Speed sensor is the magnetic equipment which be installed in starter and for detecting flywheel teeth. Its connection wires to controller should apply for 2 cores shielding line. The shielding layer should connect to No. 28 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.28 and No.29 terminals in controller. The output voltage of speed sensor should be within AC(1~24)V (effective value) during the full speed. AC12V is recommended (in rated speed). When install the speed sensor, let the sensor is spun to contacting flywheel first, then, port out 1/3 lap, and lock the nuts of sensor at last.

— **OUTPUT AND EXPAND RELAYS**

All outputs of controller are relay contact output type. If need to expand the relays, please add freewheel diode to both ends of expand relay's coils (when coils of relay has DC current) or, increase resistance-capacitance return circuit (when coils of relay has AC current), in order to prevent disturbance to controller or others equipment.

14 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

14.1 CUMMINS ISB/ISBE

Table 15 – Connector B

Terminals of controller	Connector B	Remark
Fuel relay output	39	
Start relay output	-	Connect with starter coil directly
Auxiliary output port 1	Expand 30A relay, battery voltage of 01,07,12,13 is supplied by relay	ECU power Set Auxiliary output 1 as "ECU power"

Table 16 – 9 Pins Connector

Terminals of controller	9 pins connector	Remark
-	SAE J1939 shield	CAN communication shielding 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.

Engine type: Cummins ISB

14.2 CUMMINS QSL9

Suitable for CM850 engine control module

Table 17 – 50 Pins Connector

Terminals of controller	50 pins connector	Remark
Fuel relay output	39	
Start relay output	-	Connect to starter coil directly

Table 18 – 9 Pins Connector

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

Engine type: Cummins-CM850

14.3CUMMINS QSM11(IMPORT)

It is suitable for CM570 engine control module. Engine type is QSM11 G1, QSM11 G2.

Table 19 – C1 Connector

Terminals of controller	C1 connector	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 5 and port 8 of C1 be connected
Start relay output	-	Connect to starter coil directly

Table 20 – 3 Pins Data Link Connector

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

Engine type: Cummins ISB

14.4   CUMMINS QSX15-CM570

It is suitable for CM570 engine control module. Engine type is QSX15.

Table 21 – 50 Pins Connector

Terminals of controller	50 pins connector	Remark
Fuel relay output	38	Oil spout switch
Start relay output	-	Connect to starter coil directly

Table 22 – 9 Pins Connector

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

Engine type: Cummins QSX15-CM570

14.5 CUMMINS GCS-MODBUS

It is 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.

Table 23 – D-SUB Connector 06

Terminals of controller	D-SUB connector 06	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 05 and 08 of the connector 06 be connected.
Start relay output	-	Connect to starter coil directly

Table 24 – D-SUB Connector 16

Terminals of controller	D-SUB connector 06	Remark
-	20	CAN communication shielding line(connect with ECU terminal only)
RS485+	21	Impedance 120Ω connecting line is recommended.
RS485-	18	Impedance 120Ω connecting line is recommended.

Engine type: Cummins QSK-MODBUS, Cummins QST-MODBUS, Cummins QSX-MODBUS

14.6 CUMMINS QSM11

Table 25 – Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Fuel relay output	38	
Start relay output	-	Connect with starter coil directly
CAN(H)	46	Impedance 120Ω connecting line is recommended.
CAN(L)	37	Impedance 120Ω connecting line is recommended.

Engine type: common J1939

14.7 CUMMINS QSZ13

Table 26 – Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Fuel relay output	45	
Start relay output	-	Connect to starter coil directly
Programmable output 1	16&41	Setting to idle speed control; normally close output. Making 16 connect to 41 during high-speed running of controller via external expansion relay.

Terminals of controller	OEM connector of engine	Remark
Programmable output 2	19&41	Setting to pulse raise speed control; normally open output. Making 19 connect with 41 for 0.1s during high-speed warming of controller via external expansion relay.
CAN(H)	1	Impedance 120Ω connecting line is recommended.
CAN(L)	21	Impedance 120Ω connecting line is recommended.

Engine type: QSZ13, adjust speed can be realized.

14.8   DETROIT DIESEL DDEC III / IV

Table 27 – Engine CAN Port

Terminals of controller	CAN port of engine	Remark
Fuel relay output	Expand 30A relay; battery voltage of ECU is supplied by relay.	
Start relay output	-	Connect to starter coil directly
CAN(H)	CAN(H)	Impedance 120Ω connecting line is recommended.
CAN(L)	CAN(L)	Impedance 120Ω connecting line is recommended.

Engine type: Common J1939

14.9   DEUTZ EMR2

Table 28 – F Connector

Terminals of controller	F connector	Remark
Fuel relay output	Expand 30A relay; battery voltage of terminal 14 is supplied by relay. Fuse is 16A.	
Start 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.

Engine type: VolvoEDC4

14.10 JOHN DEERE

Table 29 – 21 Pins Connector

Terminals of controller	21 pins connector	Remark
Fuel relay output	G,J	
Start relay output	D	
CAN(H)	V	Impedance 120Ω connecting line is recommended.
CAN(L)	U	Impedance 120Ω connecting line is recommended.

Engine type: John Deere

14.11 MTU MDEC

Suitable for MTU engines, 2000 series, 4000series

Table 30 – X1 Connector

Terminals of controller	X1 connector	Remark
Fuel relay output	BE1	
Start relay output	BE9	
-	E	CAN communication shielding line(connect with one terminal only)
CAN(H)	G	Impedance 120Ω connecting line is recommended.
CAN(L)	F	Impedance 120Ω connecting line is recommended.

Engine type: MTU-MDEC-303

14.12 MTU ADEC(SMART MODULE)

It is suitable for MTU engine with ADEC (ECU8) and SMART module.

Table 31 – ADEC(X1 port)

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

Table 32 – SMART(X4 port)

Terminals of controller	SMART (X4 port)	Remark
CAN(H)	X4 1	Impedance 120Ω connecting line is recommended.
CAN(L)	X4 2	Impedance 120Ω connecting line is recommended.

Engine type: MTU-ADEC

14.13 MTU ADEC(SAM MODULE)

It is suitable for MTU engine with ADEC (ECU7) and SAM module.

Table 33 – ADEC(X1 port)

Terminals of controller	ADEC (X1port)	Remark
Fuel relay output	X1 43	X1 Terminal 28 Connected to negative of battery
Start relay output	X1 37	X1 Terminal 22 Connected to negative of battery

Table 34 – SAM (X23 port)

Terminals of controller	SAM (X23 port)	Remark
CAN(H)	X23 2	Impedance 120Ω connecting line is recommended.
CAN(L)	X23 1	Impedance 120Ω connecting line is recommended.

Engine type: Common J1939

14.14 PERKINS

It is suitable for ADEM3/ ADEM4 engine control module. Engine type is 2306, 2506, 1106, and 2806.

Table 35 - Connector

Terminals of controller	Connector	Remark
Fuel relay output	1,10,15,33,34	
Start relay output	-	Connect to starter coil directly
CAN(H)	31	Impedance 120Ω connecting line is recommended.
CAN(L)	32	Impedance 120Ω connecting line is recommended.

Engine type: Perkins

14.15 SCANIA

It is suitable for S6 engine control module. Engine type is DC9, DC12, and DC16.

Table 36 – B1 Connector

Terminals of controller	B1 connector	Remark
Fuel relay output	3	
Start relay output	-	Connect to starter coil directly
CAN(H)	9	Impedance 120Ω connecting line is recommended.
CAN(L)	10	Impedance 120Ω connecting line is recommended.

Engine type: Scania

14.16 VOLVO EDC3

Suitable engine control mode is TAD1240, TAD1241, and TAD1242.

Table 37 - "Stand alone" Connector

Terminals of controller	"Stand alone" connector	Remark
Fuel relay output	H	
Start relay output	E	
Auxiliary output 1	P	ECU power Set output 1 as "ECU power"

Table 38 - "Data bus" Connector

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

Engine type: Volvo

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

14.17 VOLVO EDC4

Suitable engine types are TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, TAD722, and TAD732.

Table 39 - Connector

Terminals of controller	Connector	Remark
Fuel relay output	Expand 30A relay; battery voltage of terminal 14 is supplied by relay. Fuse is 16A.	
Start relay output	-	Connect to starter coil directly
	1	Connected to negative of battery
CAN(H)	12	Impedance 120Ω connecting line is recommended.
CAN(L)	13	Impedance 120Ω connecting line is recommended.

Engine type: VolvoEDC4

14.18 VOLVO-EMS2

Volvo Engine types are TAD734, TAD940, TAD941, TAD1640, TAD1641, and TAD1642.

Table 40 – Engine CAN Port

Terminals of controller	Engine's CAN port	Remark
Auxiliary output 1	6	ECU stop Set output 1 as "ECU Stop"
Auxiliary output 2	5	ECU power Set output 2 as "ECU power"
	3	Negative power
	4	Positive power
CAN(H)	1(Hi)	Impedance 120Ω connecting line is recommended.
CAN(L)	2(Lo)	Impedance 120Ω connecting line is recommended.

Engine type: Volvo-EMS2, adjust speed can be realized.

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

14.19 YUCHAI

It is suitable for BOSCH common rail pump engine.

Table 41 – Engine 42 Pins Port

Terminals of controller	Engine 42 pins port	Remark
Fuel relay output	1.40	Connect to engine ignition lock
Start relay output	-	Connect to starter coil directly
CAN(H)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L)	1.34	Impedance 120Ω connecting line is recommended.

Table 42 – Engine 2 Pins Port

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

Engine type: BOSCH, adjust speed can be realized.

14.20 WEICHAI

It is suitable for Weichai BOSCH common rail pump engine.

Table 43 – Engine Port

Terminals of controller	Engine port	Remark
Fuel relay output	1.40	Connect to engine ignition lock
Start relay output	1.61	
CAN(H)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L)	1.34	Impedance 120Ω connecting line is recommended.

Engine type: GTSC1, adjust speed can be realized.

⚠**NOTE:** If there is any question of connection between controller and ECU communication, please feel free to contact

SmartGen's service.

15 FAULT FINDING

Table 44 – Troubleshooting

Symptoms	Possible Solutions
Controller no response with power.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check the water/cylinder temperature is too high or not; Check DC fuse.
Controller emergency stop	Check emergence stop button is correct or not; Check whether the circuit is open.
Low oil pressure alarm after crank disconnect	Check the oil pressure sensor and its connections.
High water temp. alarm after crank disconnect	Check the temperature sensor and its connections.
Shutdown Alarm in running	Check related switch and its connections according to the information on LCD; Check auxiliary input ports.
Fail to start	Check fuel oil circuit and its connections; Check starting batteries; Check speed sensor and its connections; Refer to engine manual.
Starter no response	Check starter connections; Check starting batteries.
RS485 communication is abnormal	Check connections; Check COM port setting is correct or not; Check RS485's connections of A and B is reverse connect or not; Check RS485 transfer model whether damage or not; Check communication port of PC whether damage or not.
ECU communication failed	Check connections of CAN high and low polarity; Check if correctly connected of 120Ω resister; Check if type of engine correct; Check if connections from controller to engine and output ports setting are correct.
ECU warning or shutdown	Get information from LCD of alarm page; If there is detailed alarm, check engine according to description. If not, please refer to engine manual according to SPN alarm code.

16 PACKING LIST

Table 45 – Packing List

No.	Name	Quantity	Remark
1	Controller	1	
2	Fixed Clip	2	
3	Certification	1	
4	User Manual	1	

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