HEM4100EX

ENGINE EXHAUST 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
2020-04-07	1.0	Original release.
2021-03-24	1.1	Modify the main interface display description, add "engine run input active and bypass valve open delay".

CONTENTS

1 OVERVIEW

HEM4100EX Engine Exhaust Controller is a kind of engine exhaust control module which integrates programmable function, automatic measurement, and digital communication. It also integrates digitization, intellectualization, and networking, and realizes automation in measuring and control process, which reduces human operation mistakes. It is the ideal product of handling engine exhaust. It applies LCD graphic display, which can display Chinese, English two languages. It is easy to operate, and reliable to run.

HEM4100EX Engine Exhaust Controller is composed by microprocessor as the core, which can precisely detect inlet temperature, outlet temperature, back pressure, and make accurate judgment for the occurred abnormal temperature and pressure and control bypass valve close/open. It realizes threshold setting function for many parameters. A majority of parameters can be adjusted from the controller front panel. All parameters can be adjusted via USB or RS485 port by using PC. It has compact structure, advanced circuit, simple wiring, and high reliability and can be widely applied in electric and automatic control system of engine exhaust handling.

2　PERFORMANCE AND CHARACTERISTICS

— 132x64 LCD with backlight, bilingual interface display (including English and Chinese) and touch-button operation;

— Precisely collect all kinds of parameters in the process of handling engine exhaust;

Inlet Temperature	Unit: °C/°F
Outlet Temperature	Unit: °C/°F
Back Pressure	Unit: kPa/psi/bar
Running Time (current)	Max. 9999 hours
Total Running Time	Max. 65535 hours
Total Bypass Open Times	Max. 65535 times

— Control and protection function: realizes back pressure high alarm, indicates purification carrier, and opens bypass valve pressure reduction function;

— Bypass value open, bypass value close, alarm output, inlet temperature high output, inlet temperature low output, outlet temperature high output functions, all of which are relay outputs;

— Auto/Manual status transfer is equipped, in manual mode, bypass valve open/close can be controlled manually;

— Parameter setting function: allows users to change or set the parameters, which won't get lost in case of power outage. A majority of parameters can be adjusted from controller front panel, and all parameters can be adjusted via USB or RS485 port by using PC;

— Custom sensor curve, resistance, voltage or current type sensors can be connected for configurable 3 and configurable 4;

— Bypass valve open or close output can be set as pulse or continuous output;

— Real Time Clock display, event log function, which can record 200 data circularly;

— One way RS485 isolated communication port, applies ModBus-RTU communication protocol, which has remote control, remote communication, remote measurement, remote adjusting functions; bypass valve open or close can be remotely controlled;

— Silicone gasket is designed between enclosure and control panel; waterproof performance reaches IP65;

— Controller applies metal clip fixing;

— Modular structure design, pluggable connection terminal, build-in installation method with compact structure and convenient mounting.

3 SPECIFICATION

Table 2 - Technical Parameters

Items	Contents
Operating Voltage	Range: DC8V to DC35V continuous power supply, DC reverse connection protection Resolution: 0.1V Accuracy: 1%
Power Consumption	≤3W (standby <2W)
Analog Sensor	Resistance input Range: 0 - 6000Ω Resolution: 0.1 Accuracy: 1Ω (below 300Ω)
	Voltage input Range: 0 - 5V Resolution: 0.01V Accuracy: 1%
	Current input Range: 4 - 20mA Resolution: 0.01mA Accuracy: 1%
Open Valve Output	7A DC24V/AC250V Volts free output (relay output)
Close Valve Output	7A DC24V/AC250V Volts free output (relay output)
Digital Output 1	5A DC30V/AC250V Volts free output (relay output)
Digital Output 2	5A DC30V/AC250V Volts free output (relay output)
Digital Output 3	5A DC30V/AC250V Volts free output (relay output)
Digital Input Ports 1-5	Ground connected (B-) is active.
RS485 Port	Isolated, half duplex, baud rate can be set; longest communication distance 1000m
USB Port	D-type USB port
EMC/CE Certification	EN 61326-1:2013
Vibration	5 - 8 Hz: ±7.5 mm 8 - 500 Hz: 2 g IEC 60068-2-6
Shock	50g, 11ms, half-sine, complete shock test from three directions; Totally 18 shocks for each test.

Items	Contents
	IEC 60068-2-27
Bump	25g, 16ms, half-sine IEC 60255-21-2
Case Dimensions	135mm x 110mm x 46mm
Panel Cutout	116mm x 90mm
Working Conditions	Temperature: (-25~+70)°C; Humidity: (20~93)%RH
Storage Condition	Temperature: (-30~+80)°C
Protection Level	IP65: when waterproof gasket installed between controller and control panel.
Net Weight	0.35kg

4 OPERATION

4.1 CONTROLLER PANEL

Fig. 1 - HEM4100EX Panel Indication

4.2 INDICATORS

Table 3 - Indicator Description

Indicator Name	Indicator Description
Alarm Indicator	Slow flashing (once per second) for warning alarms; quick flashing (5 times per second) for fault alarms;
Status Indicator	Illuminated when engine running status input is active;
Auto Mode Indicator	Illuminated when current is auto mode;
Manual Mode Indicator	Illuminated when current is manual mode;
Bypass Valve Close Indicator	Illuminated when "bypass valve close signal" of configurable input is set and input is active; or illuminated when "bypass valve close signal" is not set, and after bypass valve close relay outputs;
Bypass Valve Open Indicator	Illuminated when "bypass valve open signal" of configurable input is set and input is active; or illuminated when "bypass valve open signal" is not set, and after bypass valve open relay outputs.

4.3 KEY FUNCTIONS DESCRIPTION

Table 4 - Key Function Description

Icon	Key	Function Description
	Manual	Transfer to manual mode;
	Auto	Transfer to auto mode;
	Reset/Lamp Test	Reset alarm information; when alarm information appears, press to reset alarm, and set controller to manual mode; Press this key for 2s to conduct controller lamp test;
	Bypass Valve Close	It is active in manual mode; Press this key and bypass valve closes;
	Bypass Valve Open	It is active in manual mode; Press this key and bypass valve opens;
	Up/Increase	In main interface, press and it can scroll screen upward; After entering menu interface, it can move up cursor or increase the value of the bit where cursor is.
	Set/Confirm	In main interface, press and it can enter menu page; After entering menu interface, confirm key can move cursor and confirm the set information.
	Down/Decrease	In main interface, press and it can scroll screen downward; After entering menu interface, it can move down cursor or decrease the value of the bit where cursor is.

⚠**NOTE:** Press ⬆ and ⬇ simultaneously and it can set backlight always on, and press them simultaneously again or power on controller again to cancel backlight always on.

5   SCREEN DISPLAY

5.1   MAIN INTERFACE

Table 5 - Main Interface Display

Item	Display Contents
Homepage	Bypass valve open/close status; Back pressure, inlet temperature, outlet temperature; Current alarm information.
Current Bypass Control Method	Temperature control enable/disable; Engine running control enable/disable; Engine running time.
Digital Signal Input Status	Pressure switch signal input active/inactive; Engine running signal input active/inactive; Bypass open signal input active/inactive; Bypass close signal input active/inactive;
Relay Control Signal Output Status	Fault alarm output/no output; Bypass open output/no output; Bypass close output/no output; Inlet temperature high output/no output; Outlet temperature high output/no output;
Status Line	Alarm status/working status; Real time clock; Status line displays on the top line of every page in main interface.

5.2 SECONDARY INTERFACE

Table 6 - Secondary Interface Display

Item	Display Contents
Parameters Set	Bypass control method setting; Sensor setting; Configurable input setting; Configurable output setting; Module setting;
Event Log	Bypass valve close/open action events; Fault events;
RS485 Comm. Information	Module address; Baud rate; Stop bit; Even and odd parity;
Date & Time Set	Set module date and time;
Language Set	Set displayed language;
Total Information	Engine total running times; Bypass total start times;
Controller Information	Versions, PD No., and start interface.

5.3 STATUS DESCRIPTION

Table 7 - Bypass Valve Status

No.	Status Name	Description
1	Bypass valve is opening	Bypass valve is opening, it displays start signal output countdown;
2	Bypass valve is closing	Bypass valve is closing, it displays close signal output countdown;
3	Bypass open	Bypass valve open;
4	Bypass close	Bypass valve close;
5	Open/Close input signal inactive	When "bypass close signal" or "bypass open signal" of configurable inputs are set and inputs are both inactive, it displays this status information.

When controller detects warning alarms, and warning alarms are active, alarm indicator will slowly flash (once per second), when warning recovers, alarm indicators will extinguish, that is warning alarms not latched.

Table 8 - Warning Alarms

No.	Status Name	Description
1	Sensor 1 Open	When AUX. SENSOR1 opens, controller issues warning;
2	Sensor 2 Open	When AUX. SENSOR2 opens, controller issues warning;
3	Sensor 3 Open	When AUX. SENSOR3 opens, controller issues warning;
4	Sensor 4 Open	When AUX. SENSOR4 opens, controller issues warning;
5	K-type Sensor 1 Open	When K1 opens, controller issues warning;
6	K-type Sensor 2 Open	When K2 opens, controller issues warning.

When controller detects fault alarms, and fault alarms are active, alarm indicator will quickly flash (5 times per second). Fault alarms are latched until manually resets the alarm.

Table 9 - Fault Alarms

No.	Status Name	Description
1	Back Pressure High	When back pressure is above or equal to the set value, controller will issue alarm after delay.

5.4 MAIN MENU

In the first page of main interface, press [⚙] key to enter main menu interface.

1. Exit 2. Parameters Set 3. Event Log 4. RS485 Comm. Information 5. Date and Time Set 6. Language 7. Total Information 8. Controller Information	Press "Down" key and choose different parameter line (backlit for current line), and then press confirm key to enter related display interface.

⚠**NOTE:** For entering parameters set, password is needed. Default password is "00318" and operator can change the password to prevent others changing controller configurations randomly. Please remember password clearly after change, please contact company service if password is forgotten.

6 PARAMETER CONFIGURATION

6.1 ILLUSTRATION

In the first page of the main interface, press ⚙ key to enter menu page; select "Parameters Set", and press ⚙ to confirm, so it enters Parameters Set password confirm interface. Input correct password and it enters parameter main screen. If password is wrong, then it exits to main interface directly. Default password is 00318. In parameter configuration page, press ⚙ key longer and it can directly exit this interface, and return to main interface.

6.2 PARAMETER CONFIGURATION TABLE

Table 10 - Parameter Configuration Item

No.	Parameters	Range	Default	Description
Bypass Control Method Setting				
1	Inlet Temp. Control Enable	(0-1)	1	0: Disable 1: Enable
2	Temp. Control Valve Open	(0-1000)°C	400	When external inlet temp sensor value is above or equal to this value, after delay bypass valve opens. It only judges in auto status; Delay value can also be set.
3	Temp. Control Valve Close	(0-1000)°C	40	When external inlet temp sensor value is below or equal to this value, after delay bypass valve closes. It only judges in auto status; Delay value can also be set.
4	Temp. High Open Delay	(0-9999)s	5	Valve open delay set value.
5	Temp. Low Close Delay	(0-9999)s	10	Valve close delay set value.
6	Engine Run Control Enable	(0-1)	1	0: Disable 1: Enable
7	Engine Run Input Active and Bypass Valve Open Delay	(0-9999)s	10	Period from engine run input active to bypass valve open delay.
8	Engine Run Time (h)	(0-9999)h	0	Hour setting of engine running time.
9	Back Pressure High Set Value	(0-9000)kPa	300	Back pressure high set threshold.
10	Back Pressure High Start Delay	(0-9999)s	5	Valve open delay set value.
11	Outlet Temp. High Set Value	(0-1000)°C	400	Outlet temp high set threshold.
12	Outlet Temp. High Delay	(0-9999)s	5	Outlet temp high output delay set value.

No.	Parameters	Range	Default	Description
13	Temp. Unit Set	(0-1)	0	0: °C 1: °F
14	Pressure Unit Set	(0-2)	0	0: kPa 1: bar 2: psi
15	Bypass Valve Open Signal Output Time	(0-9999)s	5	Output time of bypass valve open relay; not output if it is 0.
16	Bypass Valve Close Signal Output Time	(0-9999)s	5	Output time of bypass valve close relay; not output if it is 0.
17	Bypass Valve Open Signal Continuous Output	(0-1)	0	Continuous output of bypass valve open relay. 0: Disable 1: Enable
18	Bypass Valve Close Signal Continuous Output	(0-1)	0	Continuous output of bypass valve close relay. 0: Disable 1: Enable
19	O/C Valve Signal Output Time Fixed	(0-1)	0	Open/Close valve relay output time fixed. 0: Disable 1: Enable
Sensor Setting				
Sensor 1				
1	Sensor Type	(0-3)	1	0: Not Used 1: Inlet Temp. 2. Outlet Temp. 3. Back Pressure Related setting, that is among inlet temp., outlet temp., back pressure, each only has one sensor selection.
2	Open Action	(0-1)	0	0: Warning 1: None
3	Sensor Curve Type	(0-9)	2	0: Not Used 1: Custom Curve 2: PT200 3: Reserved 4: Reserved 5: Reserved 6: Reserved 7: Reserved 8: Reserved 9: Reserved
Sensor 2				
1	Sensor Type	(0-3)	2	0: Not Used 1: Inlet Temp 2: Outlet Temp 3: Back Pressure Related setting, that is among inlet temp., outlet temp., back pressure, each only has one sensor selection.

No.	Parameters	Range	Default	Description
2	Open Action	(0-1)	0	0: Warning 1: None
3	Sensor Curve Type	(0-9)	2	0: Not Used 1: Custom Curve 2: PT200 3: Reserved 4: Reserved 5: Reserved 6: Reserved 7: Reserved 8: Reserved 9: Reserved
Sensor 3				
1	Sensor Type	(0-3)	3	0: Not Used 1: Inlet Temp 2: Outlet Temp 3: Back Pressure Related setting, that is among inlet temp., outlet temp., back pressure, each only has one sensor selection.
2	Open Action	(0-1)	0	0: Warning 1: None
3	Sensor Curve Type	(0-9)	1	0: Not Used 1: Custom Curve 2: PT200 3: Reserved 4: Reserved 5: Reserved 6: Reserved 7: Reserved 8: Reserved 9: Reserved
4	Sensor Input Signal Type	(0-2)	1	0: Resistance 1: Current 2: Voltage
Sensor 4				
1	Sensor Type	(0-3)	0	0: Not Used 1: Inlet Temp 2: Outlet Temp 3: Back Pressure Related setting, that is among inlet temp., outlet temp., back pressure, each only has one sensor selection.
2	Open Action	(0-1)	0	0: Warning 1: None

No.	Parameters	Range	Default	Description
3	Sensor Curve Type	(0-9)	1	0: Not Used 1: Custom Curve 2: PT200 3: Reserved 4: Reserved 5: Reserved 6: Reserved 7: Reserved 8: Reserved 9: Reserved
4	Sensor Input Signal Type	(0-2)	1	0: Resistance 1: Current 2: Voltage
K Type Sensor 1				
1	Sensor Type	(0-3)	0	0: Not Used 1: Inlet Temp 2: Outlet Temp Related setting, that is among inlet temp., outlet temp., each only has one sensor selection.
2	Open Action	(0-1)	0	0: Warning 1: None
K Type Sensor 2				
1	Sensor Type	(0-3)	0	0: Not Used 1: Inlet Temp 2: Outlet Temp Related setting, that is among inlet temp., outlet temp., each only has one sensor selection.
2	Open Action	(0-1)	0	0: Warning 1: None
Configurable Inputs Setting				
Input 1 Setting				
1	Content Setting	(0-34)	7	Engine running signal. For details please see Table 11.
2	Active Type	(0-1)	0	0: Close 1: Open
Input 2 Setting				
1	Content Setting	(0-34)	8	Pressure switch signal. For details please see Table 11.
2	Active Type	(0-1)	0	0: Close 1: Open
Input 3 Setting				
1	Content Setting	(0-34)	9	Bypass open signal. For details please see Table 11.
2	Active Type	(0-1)	0	0: Close 1: Open

No.	Parameters	Range	Default	Description
Input 4 Setting				
1	Content Setting	(0-34)	10	Bypass close signal. For details please see Table 11.
2	Active Type	(0-1)	0	0: Close　　1: Open
Input 5 Setting				
1	Content Setting	(0-34)	0	Not Used. For details please see Table 11.
2	Active Type	(0-1)	0	0: Close　　1: Open
Configurable Outputs Setting				
Output 1 Setting				
1	Content Setting	(0-51)	1	Back pressure high fault alarm output. For details please see Table 12.
2	Output Type	(0-1)	0	0: Normally Open　　1: Normally Close
Output 2 Setting				
1	Content Setting	(0-51)	2	Inlet temp. high output. For details please see Table 12.
2	Output Type	(0-1)	0	0: Normally Open　　1: Normally Close
Output 3 Setting				
1	Content Setting	(0-51)	3	Inlet temp. low output. For details please see Table 12.
2	Output Type	(0-1)	0	0: Normally Open　　1: Normally Close
Module Setting				
1	Power On Mode	(0-2)	0	0: Maintain (Maintain Previous Mode) 1: Manual Mode 2: Auto Mode
2	Language	(0-1)	0	0: Simplified Chinese 1: English
3	Password	(00000-65535)	00318	Password for entering parameter settings
4	Module Address	(1-254)	1	Communication address of RS485 network group communication
5	Comm. Baud Rate	(0-3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
6	Comm. Port Parity	(0-2)	0	0: No Parity 1: Odd Parity 2: Even Parity
7	Comm. Stop Bit	(0-1)	0	0: 2 stop bits　　1: 1 stop bit
8	Date/Time Setting			
9	Communication Set	(0-3)	0	0: Enable Remote Adjustment/Control 1: Disable Remote Control 2: Disable Remote Adjustment 3: Disable Remote Adjustment/Control

No.	Parameters	Range	Default	Description
10	LCD Contrast	(0-10)	5	
11	Backlight Brightness	(0-5)	5	
12	Backlight Time	(0-9999)min	5	
13	Start Interface Display Enable	(0-1)	1	0: Disable 1: Enable
14	Start Interface Display Time	(0-300)s	2	

6.3 DIGITAL INPUT/OUTPUT PORT FUNCTION DESCRIPTION

6.3.1 INPUT PORT FUNCTION DESCRIPTION

Table 11 - Input Port Function Description

No.	Items	Description
0	Not Used	
1	Reserved	
2	Alarm Mute	When it is active, it can inhibit "Audible Alarm" output in output configurations.
3	Alarm Reset	When it is active, it can reset alarms.
4	Lamp Test	When input is active, all LED indicators are illuminated on the panel.
5	Panel Lock	When input is active, all keys are invalid except for Up, Down, Confirm keys; parameters setting cannot be entered, language can be set, event log and controller information can be checked, 🔒 displays at the right down corner in the main interface.
6	Reserved	
7	Engine Running Signal	When this function is active, it means engine start is successful.
8	Pressure Switch Signal	Pressure switch signal input.
9	Bypass Open Signal	Bypass open signal input.
10	Bypass Close Signal	Bypass close signal input.
11	Auto Mode Locked	When input is active, controller is always in auto mode.
12	Manual Mode Locked	When input is active, controller is always in manual mode.
13	Reserved	
14	Reserved	
15	Reserved	
16	Simulate Up Key	
17	Simulate Down Key	
18	Simulate Manual Key	
19	Simulate Auto Key	Externally connected a button is feasible to simulate panel key is pressed.
20	Simulate Reset Key	
21	Simulate Open Valve Key	
22	Simulate Close Valve Key	
23	Simulate Confirm Key	
24	Reserved	

No.	Items	Description
25	Reserved	
26	Reserved	
27	Reserved	
28	Reserved	
29	Reserved	
30	Reserved	
31	Reserved	
32	Reserved	
33	Reserved	
34	Reserved	

6.3.2 OUTPUT PORT FUNCTION DESCRIPTION

Table 12 - Output Port Function Description

No.	Items	Description
0	Not Used	
1	Back Pressure High Fault Alarm Output	Alarm output.
2	Inlet Temp High Output	Output when Inlet temp is higher than or equal to pre-set value.
3	Inlet Temp Low Output	Output when inlet temp is lower than or equal to pre-set value.
4	Outlet Temp High Output	Output when outlet temp is higher than or equal to pre-set value.
5	Audible Alarm	Action at warnings and alarms; Announciator can be connected externally; when "alarm mute" of configurable input port is active, it can inhibit its output; when new warning or shutdown occurs, it outputs again.
6	Reserved	
7	Reserved	
8	Reserved	
9	Input 1 Active	Action when input port 1 is active.
10	Input 2 Active	Action when input port 2 is active.
11	Input 3 Active	Action when input port 3 is active.
12	Input 4 Active	Action when input port 4 is active.
13	Input 5 Active	Action when input port 5 is active.
14	Reserved	
15	Reserved	
16	Reserved	
17	Reserved	
18	Reserved	
19	Reserved	
20	Reserved	
21	System in Manual Mode	Action when system is in manual mode.
22	System in Auto Mode	Action when system is in auto mode.

No.	Items	Description
23	Reserved	
24	Reserved	
25	Reserved	
26	Reserved	
27	Reserved	
28	Reserved	
29	Reserved	
30	Reserved	
31	Reserved	
32	Reserved	
33	Reserved	
34	Reserved	
35	Reserved	
36	Reserved	
37	Reserved	
38	Reserved	
39	Reserved	
40	Reserved	
41	Reserved	
42	Reserved	
43	Reserved	
44	Reserved	
45	Reserved	
46	Reserved	
47	Reserved	
48	Reserved	
49	Reserved	
50	Reserved	
51	Reserved	

7 EVENT LOG

In the first page of main interface, press confirm ![key] key to enter menu page; select "Event Log",

and press ![key] key to confirm and enter event log page.

Each event log includes:

Recorded date and time;

Record type;

Record events;

Back pressure;

Inlet temperature.

Maximum record items for event log are 200, and the first one is the newest. Users can check every record by "Down" key. When record items are over 200, new record will cover the earliest record.

Record type includes: Action event, alarm event. Fault alarm events are all fault alarms.

Table 13 - Action Events Under Following Action Times

No.	Action Event	Description
1	Manual Valve Open	Record when manual open valve outputs;
2	Manual Valve Close	Record when manual close valve outputs;
3	Inlet Temp High Open Valve	Record when inlet temp high open valve outputs;
4	Inlet Temp Low Close Valve	Record when inlet temp low close valve outputs;
5	Back Pressure High Open Valve	Record when back pressure high open valve outputs;
6	Reset Close Valve	Record when reset close valve outputs;
7	Engine Start Open Valve	Record when engine start open valve outputs;
8	Engine Stop Close Valve	Record when engine stop close valve outputs.

Table 14 - Fault Alarms Under Following Alarm Events

No.	Fault Event	Description
1	Back Pressure High Alarm	Record when back pressure high alarm outputs.

8 BYPASS VALVE OPEN/CLOSE OPERATION

8.1 MANUAL OPERATION

Press Manual ✍ key, and the manual status indicator is illuminated. Controller is in manual status.

After pressing Open/Close key, bypass valve immediately starts to act; when open or close arrives in place, related indicator will be on always. When "bypass close signal" of configurable input is set, and input is active, bypass close indicator is illuminated; or when "bypass close signal" is not set, and after bypass valve close relay outputs, bypass close indicator is illuminated. When "bypass open signal" of configurable input is set, and input is active, bypass open indicator is illuminated; or when "bypass open signal" is not set, and after bypass valve open relay outputs, bypass open indicator is illuminated.

Table 15 - Manual Open/Close Key

Icon	Key	Description
🔴	Close Key	Press this key, if bypass valve is at open status, close bypass valve.
🟢	Open Key	Press this key, if bypass valve is at close status, open bypass valve.

8.2 AUTO OPERATION

Press Manual/Auto ⟳ key, auto status indicator is illuminated. Controller is in auto status.

In auto mode, controller automatically opens or closes valve based on inlet temp, engine running status. Below is the description about control logics by taking the example of "Inlet temperature control valve open/close", "Engine running status control valve open/close".

8.2.1 INLET TEMPERATURE CONTROL VALVE OPEN/CLOSE

When external inlet temperature sensor value is above or equal to pre-set value, bypass valve is opened after delay. Delay value can be set. When external inlet temperature sensor value is below or equal to pre-set value, bypass valve is closed after delay. Delay value can also be set.
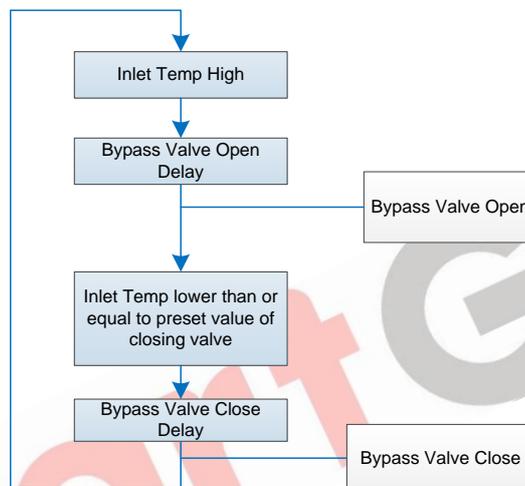
Fig. 2 - Inlet Temp Control Valve Open/Close Diagram

8.2.2 ENGINE RUNNING STATUS CONTROL VALVE OPEN/CLOSE

When engine running status input is active, running time starts counting and bypass valve opens; Otherwise, running time stops counting and bypass valve closes.
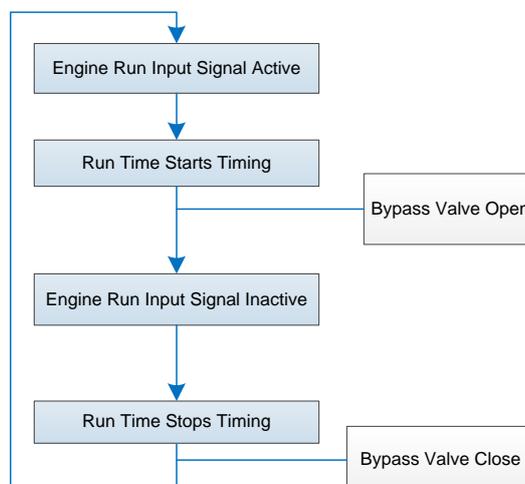
Fig. 3 - Engine Running Status Control Valve Open/Close Diagram

8.3 BACK PRESSURE CONTROL VALVE OPEN

When external back pressure sensor value is above or equal to the pre-set value, after delay bypass valve opens; and delay value can be set. Controller issues back pressure high alarm, indicating "please maintain the purification carrier". After manual reset, bypass valve closed. This function is both active at manual status or auto status.
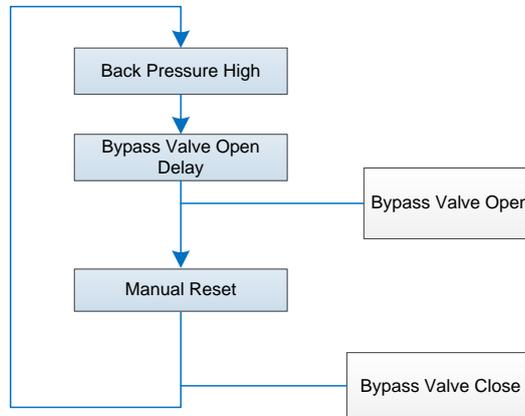

Fig. 4 - Back Pressure Control Valve Open Diagram

9 COMMUNICATION CONFIGURATION AND CONNECTION

9.1 ILLUSTRATION

Controller has RS485 communication port, USB communication port. Among them RS485 communication port allows to connect open structure LAN. Communication port applies Modbus communication protocol. By using PC or software running on data collection system, it can provide a simple and practical dual power transfer management scheme for factories, telecommunication, industries and civil buildings, to realize "Three Remote" function (remote control, remote measuring, remote communicating) of dual power monitoring.

For detailed information of communication protocol, please refer to *HEM4100EX Communication Protocol*.

9.2 RS485 COMMUNICATION PORT

Communication Protocol: Modbus-RTU
Communication Parameters
Module Address   1 (Range: 1-254)
Baud Rate   9600bps (2400/4800/9600/19200bps)
Data Bit   8-bit
Parity   None (No Parity, Odd Parity, Even Parity)
Stop Bit   2 bits (1 bit or 2 bits)

9.3 USB COMMUNICATION PORT

D-type USB communication port, can be used to connect PC to test software configuration parameters and upgrade module program.
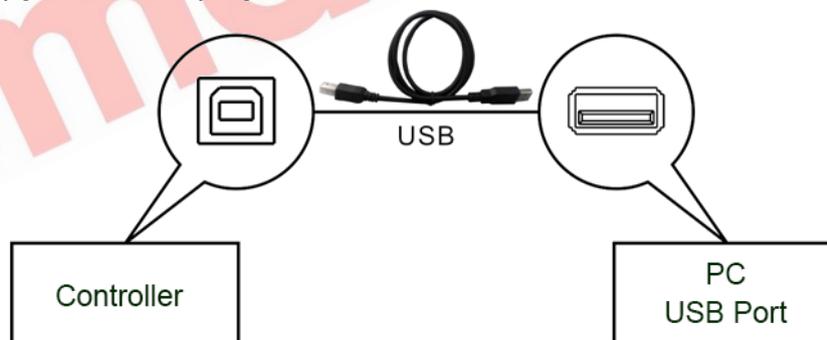

Fig. 5 - USB Connection Diagram

10 TERMINAL DEFINITION
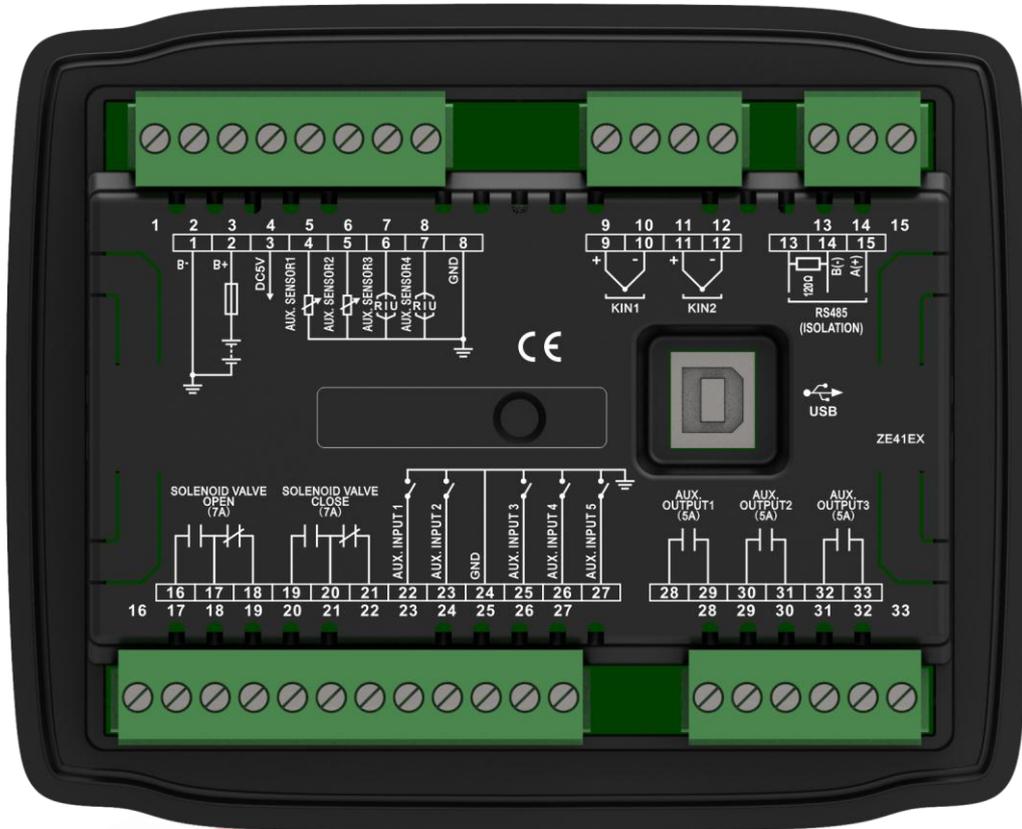
10.1 CONTROLLER TERMINAL DESCRIPTION

Fig. 6 - Controller Back Panel

Table 16 - Terminal Connection Description

No.	Name	Function Description	Cable Size	Remark	
1	B-	DC power input B-	1.5mm^2	Connected negative of power supply	
2	B+	DC power input B+	1.5mm^2	Connected positive of power supply	
3	DC5V	DC5V output	1.0mm^2	Supply for voltage type sensor.	
4	AUX.SENSOR1	Configurable sensor 1	Connected external sensor.		
5	AUX.SENSOR2	Configurable sensor 2	Connected external sensor.	For set items please refer to Table 11.	
6	AUX.SENSOR3	Configurable sensor 3	Connected external sensor.		
7	AUX.SENSOR4	Configurable sensor 4	Connected external sensor.		
8	GND	Sensor common port	Connected negative (B-) inside controller.		

No.	Name			Function Description	Cable Size	Remark	
9	+	KIN1		K type sensor 1	Connected external sensor.	For set items please refer to Table 11.	
10	-						
11	+	KIN2		K type sensor 2	Connected external sensor.		
12	-						
13	120Ω resistor			Terminal matched resistor (120Ω)	0.5mm^2	If 120Ω resistor is needed, please short connect terminal 13 and 15.	
14	B(-)	RS485 Port		RS485-	0.5mm^2	Impedance 120Ω shielding wire is recommended with single end earth connected	
15	A(+)			RS485+	0.5mm^2		
16	N/O	SOLENOID VALVE OPEN		Bypass valve open relay output	1.5mm^2	Rated 7A DC24V/AC250V	
17	COM						
18	N/C						
19	N/O	SOLENOID VALVE CLOSE		Bypass valve close relay output	1.5mm^2	Rated 7A DC24V/AC250V	
20	COM						
21	N/C						
22	AUX.INPUT1			Configurable input 1	1.0mm^2	GND connected (B-) is active.	For set items see Table 12.
23	AUX.INPUT2			Configurable input 2	1.0mm^2	GND connected (B-) is active.	
24	GND			Configurable input COM	Connected negative (B-) inside controller.		
25	AUX.INPUT3			Configurable input 3	1.0mm^2	GND connected (B-) is active.	
26	AUX.INPUT4			Configurable input 4	1.0mm^2	GND connected (B-) is active.	
27	AUX.INPUT5			Configurable input 5	1.0mm^2	GND connected (B-) is active.	
28	AUX.OUTPUT1			Configurable output 1	1.0mm^2	N/O volt free output 5A DC30V/AC250V	For set items see Table 13.
29							
30	AUX.OUTPUT2			Configurable output 2	1.0mm^2	N/O volt free output 5A DC30V/AC250V	
31							
32	AUX.OUTPUT3			Configurable output 3	1.0mm^2	N/O volt free output 5A DC30V/AC250V	
33							
USB	USB			D type USB comm. port		Can connect PC to configure parameters and program upgrades.	

10.2 RS485 CONNECTION DESCRIPTION
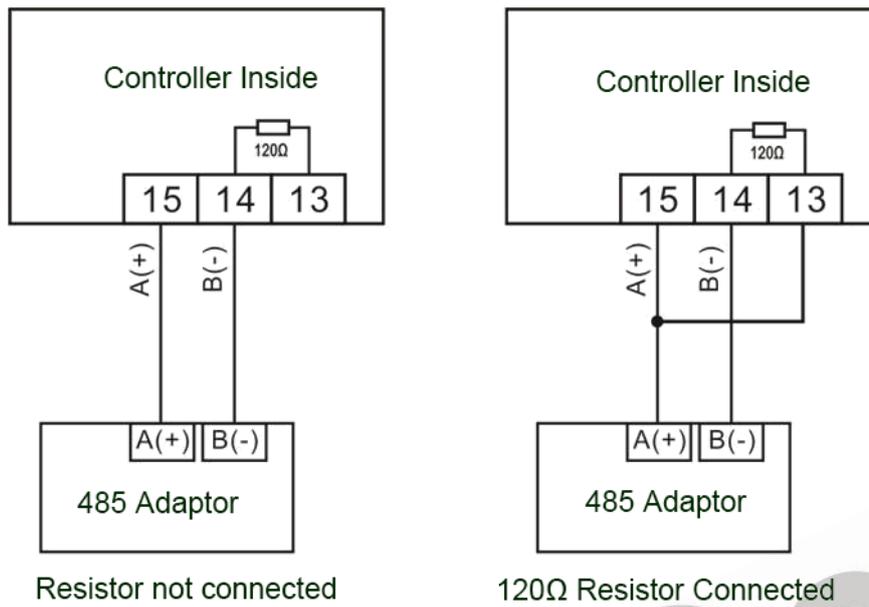
RS485 and adaptor connection is as below:

Fig. 7 - RS485 Connection Diagram

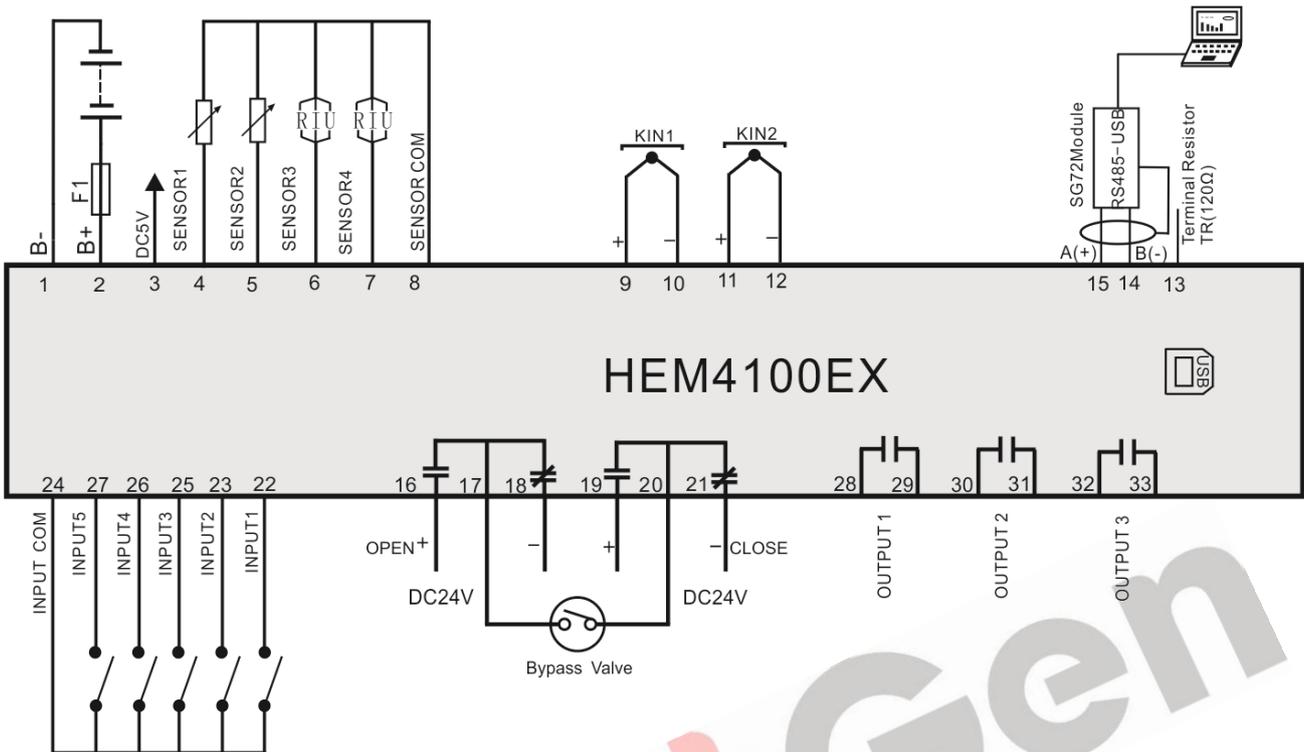## 11 TYPICAL APPLICATION

Fig. 8 - HEM4100EX Typical Application Diagram

⚠**NOTE:** Above diagram is only an example, and users need to conduct wiring connection based on actual circumstance.

12 INSTALLATION

Controller is designed by panel mounting and fixed by clips at installing.

12.1 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 four clips are inside their allotted slots.

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

—Care should be taken not to over tighten the screws of fixing clips.
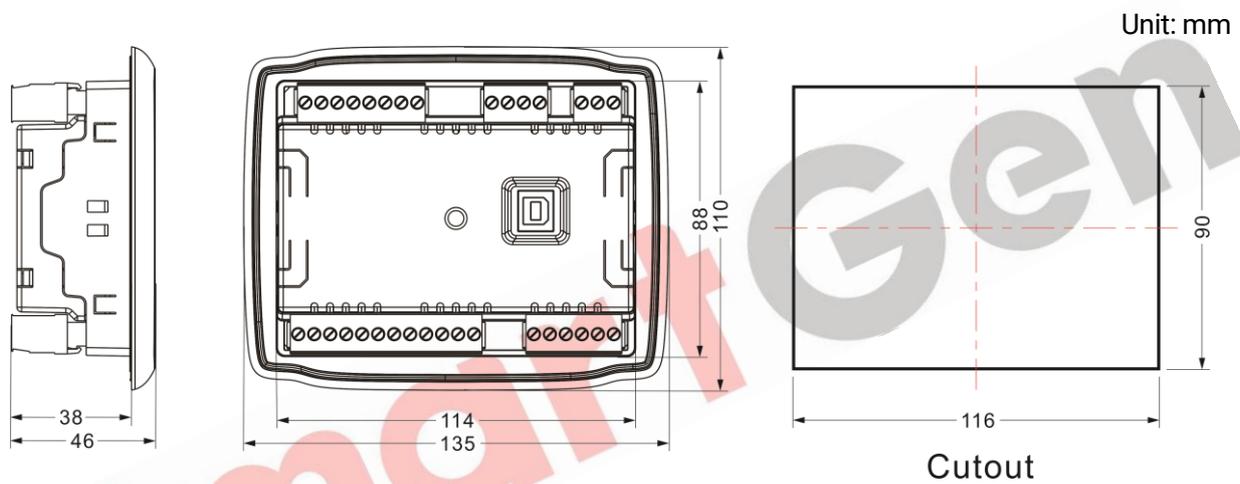
12.2 CASE DIMENSIONS AND PANEL CUTOUT

Fig. 9 - Case Dimensions and Panel Cutout

13 FAULT FINDING

Table 17 - Fault Finding

Fault Symptom	Possible Measures
Controller no response	Check DC voltage supply; Check DC fuse.
RS485 communication abnormal	Check whether RS485 positive and negative is correctly connected; Check RS485 converter is normal or not; Check whether module address of parameter setting is correct or not; If above solutions are not working, try to parallel in 120Ω resistor between RS485 A and B.
Aux. output port incorrect	Check connection wires of configurable output port, and pay attention to N/O and N/C points; Check output port setting functions and output type in parameter settings;
Aux. input port abnormal	Check whether it is GND connected actively when configurable input is active; it shall be hung up when input is inactive (**NOTE:** It may burn up the input port if input port connects over high voltage.); Check input port setting function and input active type of parameter settings.
Bypass valve close/open abnormal	Check valve; Check the connection wires between controller and valve; Check related parameter settings.

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