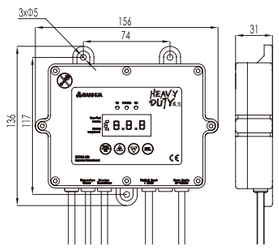
SANHUA

SEC6x1-HD EEV Controller

Quick Installation Manual

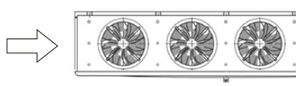
II-SEC(HD)-MU-R2401

1. Installation and Wiring

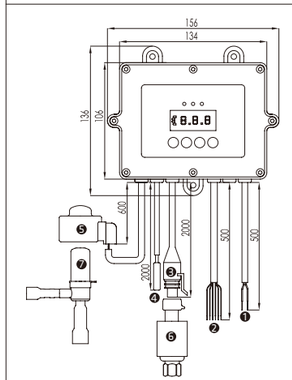


Screw installation

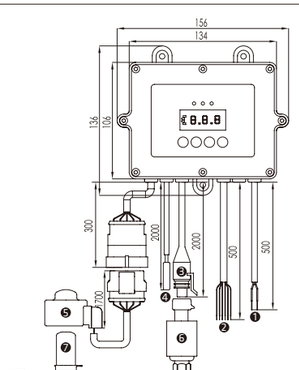
Use 3pcs M4x6 screws through 3 mounting holes to install controller. SEC6X1-HD has fully hermetic design and can be directly installed on the sheet metal of the air cooler (both inside and outside) or other nearby locations in the cold room.



Do not remove the 8 screws on the plastic case, otherwise the sealing of the product will be affected.



SEC611-HD
(Integrated coil with pressure transmitte)
SEC631-HD
(Integrated coil without pressure transmitter)



SEC621-HD
(Coil with socket,with pressure transmitter)
SEC641-HD
(Coil with socket, without pressure transmitter)

No.	Print	Description	Function	Remarks	Cable Length（mm） SEC611-HD/ SEC631-HD	SEC621-HD/ SEC641-HD
①	Power Supply		L（Red）	220Vac (85Vac ～ 264Vac) 50/60Hz	500	500
			N（Black）			
②	Digital Input	Digital Input /RS485	START/STOP RUN (Grey)	Connect with GND	500	500
			Defrost DEF (Yellow)	Connect with GND		
			GND（Black）	① Connect with RUN, defrost signal to be a switch. ② Connect with 12Vdc to power the remote display.		
		RS485 Communication	B（Blue）	RS485 B- (TRX-)		
			A（Orange）	RS485 A+ (TRX+)		
			12Vdc（Red）	12Vdc output		
③	Pressure Transmitter		5Vdc（Red）	Power Supply	2000	2000
			S1（White）	Signal input		
			GND（Black）	GND		
④	Temperature Sensor		GND（Red）	/	2000	2000
			T（Black）	/		
⑤	EEV	EEV Coil	12Vdc（Grey）	The unipolar electronic expansion valve coil is 5-wire. **SEC611-HD/SEC631-HD**：The coil is integrated with the controller ; **SEC621-HD/SEC641-HD**：Coil and controller connected by waterproof connector, with coil PQ-M24012-000071.	600	2000
			B̄（Black）			
			Ā（Yellow）			
			B（Red）			
			A（Orange）			

Notes：

1. Don't apply power before wiring is completed. If wiring change is needed, make sure the power is off.
2. The wiring of the power cord needs to be insulated and waterproof after completion, and it is recommended that the wiring be completed in a junction box (Figure 1) above IP65.
3. After the wiring of digital input and defrosting input good insulation and waterproof treatment are needed, the rest of the unused line is recommended to cut off the wire head (Figure 3) and good insulation and waterproof treatment to avoid short circuit, it is recommended in the IP65 or higher junction box (Figure 2) to complete the wiring.
4. Please refer to Figure 4 for passive connection method of start/stop and defrosting signal, and Figure 5 for active connection method
5. For SEC611-HD/SEC621-HD, No. ⑥ Pressure Transmitter (Packard Connector), please order within this package; For SEC631-HD/SEC641-HD, ⑥ Pressure Transmitter (Packard Connector), please order separately according to actual requirements.Please order No. ⑦ Electronic expansion valve body(unipolar) separately on demand.
6. The priority of the defrosting signal is higher than the start/stop signal; if you need to turn on the defrosting function, first turn on the start/stop signal and then turn on the defrosting signal.

Figure 1

Figure 2

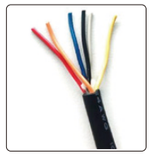


Figure 3

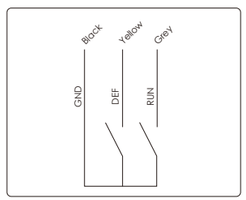


Figure 4 Passive input connection

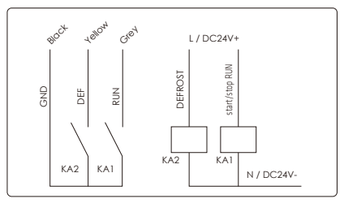
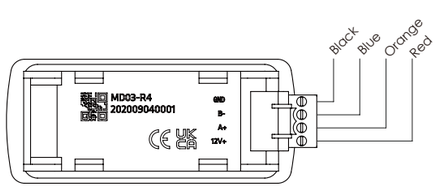


Figure 5 Active input connection

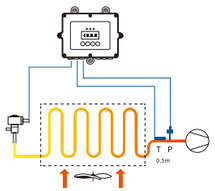
Remote display (optional) wiring diagram shown as above:

Dimension 84(W)×36(H)×19.4(D)mm
Hole size 71(W)×30(H)mm

The communication cable between the remote display and the controller recommends a twisted pair shielded above 2P×24AWG.



It is recommended to install the temperature sensor and pressure transmitter on the suction line within 0.5m from the outlet of the evaporator to avoid the interference of the superheat calculation from the environmental temperature and pressure drop.



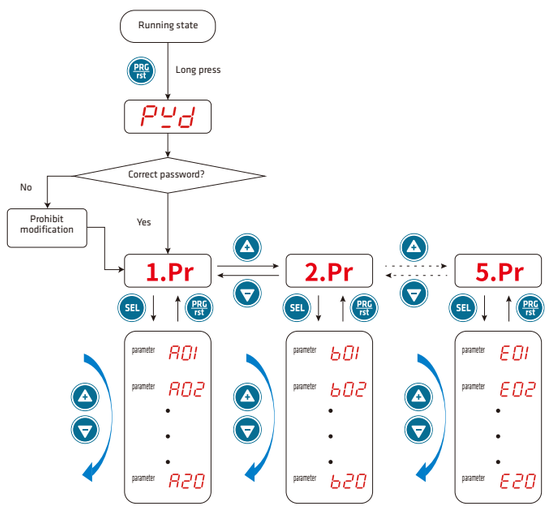
2. Button and operation

★ Default display current suction superheat SH; Press 【+】or 【-】to switch display content. After reading other real time data, it will automatically return to the "SH" display after 1 minute if no other key press.

Definition		Description
Button	PRG rst	Long press to enter to parameter setting mode or short press to return to previous level.
	▲	Add or pull up
	▼	Reduce or pull down
	SEL	Select and save

Definition		Description
LED		LED on when communication is good.
		LED on when start/stop switch is on
		LED on when defrost switch is on
		LED on alarm or protection
		Reserved

Definition	Description		Definition	Description	
LED	°C /bar	Display temperature/ pressure unit	LED	OPEN	Display current EEV opening
	★ SH	Display current suction superheat		TEMP	Display suction temperature
	PRESS	Display current evaporating pressure		SH + PRESS	Display saturated temperature corresponding to suction pressure



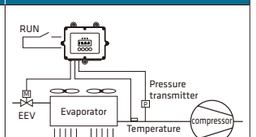
a. In the power-on state，Long press PRG rst for more than 3s, enter to parameter setting mode.
b. When screen displays PWd , press ▲ until screen shows 5（default password）, press SEL to enter to parameter list.
c. 1Pr stands for **parameter 1**, press ▲▼ to select 2Pr、3Pr .....（switch parameter list）.
d. After selecting parameter list, press SEL to enter parameter list. If want to switch to other parameter list, press PRG rst to return to parameter list selection interface.
e. After entering to parameter list, the panel directly displays parameter code, press SEL to switch among different codes.
f. When the panel displays the parameter codes that should be modified, press ▲▼ to directly modify parameters, press SEL to display next parameter or press PRG rst to return to previous parameter list.
g. After all parameters are modified，long press SEL for 3s to save the settings, the digital pipe will show "---" for 1s and then automatically return to the normal operation interface.

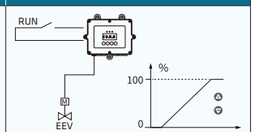
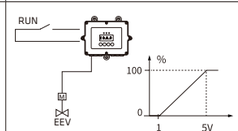
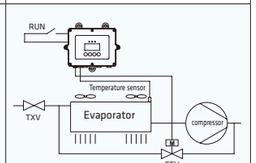
Notes：

1. If password is incorrect or no password is entered, it is allowed to review, but not allowed to modify the parameter,
2. If password is correct and enter to parameter setting, the settings should be done in 10 minutes. After 10 minutes, you need to enter correct password to complete the settings again.If there is no any modification after entering to parameter setting, the interface will automatically exit to normal operation interface.

3. Main parameter settings

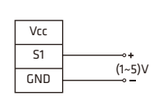
3.1 Controller mode selection

Holding Register Address (code)	Working mode	SETUP MODE	Description	Wire connection
56（C16）	Controlling mode 0	0	•Automatic superheat controlling mode •The temperature/pressure signals ensure the system superheat is stable	

Holding Register Address (code)	Working mode	SETUP MODE	Description	Wire connection
56（C16）	Controlling mode 1	1	•Valve manual operation mode •Control valve opening ratio by pressing ▲▼ on the panel	
56（C16）	Controlling mode 2	2	•Driving mode •Driving by external 1-5V analog signal	
56（C16）	Controlling mode 3	3	•Temperature Control Mode •By setting the targeted temperature, the controller will receive the temperature sensor signal to control the valve opening to meet the targeted temperature.	

Notes：

1. Using use the manual operation/Driving mode，please make sure compressor start/stop signal RUN is ON.
2. Using driving mode, connect 1-5V external analog signal through pressure sensor port.



3.2 Refrigerant selection

In parameter list 4.Pr

Holding Register Address	Code	Description	Default value	Range
61	d01	Refrigerant selection	5 (R507)	-1~35
			14 (R744-CO_2)	

Note: For SEC631-HD and SEC641-HD, default value of d01 =14(R744). For SEC611-HD and SEC621-HD, default value of d01 =5 (R507).

There are a total of 36 refrigerants in the controller for selection

Code	Refrigerant	Code	Refrigerant	Code	Refrigerant	Code	Refrigerant		Refrigerant
-1(OFF)	Custom	7	R1234yf	15	R744A(N_2O)	23	R407H	31	R1270
0	R22	8	R290	16	R32	24	R454C	32	R1233zd(E)
1	R404A	9	R450A	17	R245fa	25	R455A	33	R1234ze(Z)
2	R410A	10	R513A	18	R23	26	R454B	34	R452C
3	R134A	11	R448A	19	R407A	27	R452B	35	R457A
4	R407C	12	R449A	20	R407F	28	R600a		
5	R507	13	R452A	21	R124	29	R600		
6	R1234ze(E)	14	R744(CO_2)	22	R717	30	R454A		

3.3 Reset to factory settings

Holding Register Address	Code	Description	Default value	Range
79	d19	Reset factory settings	0	0~999

Reset factory settings option is under 3.Pr menu. Under parameter setting status, press SEL to find parameter d19, enter password or back up password 913 and click SEL, the factory settings will be resetted, and the controller will run again.

4. Parameter Table

4.1 Table1.Pr

Address	Description	Code	Unit	Interval	Min.	Max.	Default
0	Temperature / superheat setting value	A00	K	0.1	0.5	30.0	6.0
2	initial opening degree	A02	%	1	0	100	40
3	Initial opening durance time	A03	sec	1	0	600	10
4	P: Proportional increase	A04	%	0.1	0.1	99.9	1.0
5	I: Integral time	A05	sec	1	0	999	50
6	D: Differential coefficient time	A06	sec	1	0	999	30
7	Low superheat alarm mode	A07	0=N/A 1=Automatic reset				0
8	Low superheat alarm value	A08	K	0.1	0.5	30.0	0.5
9	Low superheat alarm delay time	A09	sec	1	1	300	15
10	Cancel low superheat alarm	A10	K	0.1	1	30.5	3.0
11	MoP Alarm Mode[1]	A11	0=N/A 1=Automatic reset				1 / 0
12	MoP Alarm Value[2]	A12	bar	0.1	-1.0	50.0 / 99.9	9.0 / 38.7
13	MoP Alarm Delay Time / Minute	A13	min	1	1	15	1
14	Cancel MoP alarm[3]	A14	bar	0.1	-1.0	50.0 / 99.9	8.0 / 36.7
15	High superheat alarm mode	A15	0=N/A 1=Automatic reset				0
16	High Superheat alarm value	A16	K	1	10	40	30
17	High superheat alarm delay time/Minute	A17	min	1	1	600	3
18	Cancel high superheat alarm	A18	K	1	7	37	27
19	MoP valve closing ratio	A19	/	1	0	999	200

1) For SEC611-HD and SEC621-HD, default value of MoP Alarm Mode =1.For SEC631-HD and SEC641-HD,default value of MoP Alarm Mode =0.
2) For SEC611-HD and SEC621-HD, Max. and default value of MoP Alarm Value =50.0 and 9.0.For SEC631-HD and SEC641-HD,Max. and default value of MoP Alarm value =99.9 and 38.7.
3) For SEC611-HD and SEC621-HD, Max. and default value of Cancel MoP alarm =50.0 and 8.0.For SEC631-HD and SEC641-HD,Max. and default value of Cancel MoP alarm =99.9 and 36.7.

4.2 Table 2.Pr

Address	Description	Code	Unit	Interval	Min.	Max.	Default
20	Anti-freezing alarm mode	b00	0=N/A 1=Automatic Reset				0
21	Anti-freezing alarm value	b01	°C	1	-40	40	0
22	Anti-freezing alarm delay time/second	b02	sec	1	5	200	30
23	Cancel anti-freezing alarm	b03	°C	1	-37	43	3
24	Select pumpdown and delay time (Reserved)	b04	sec	1	-1	180	-1
25	Pressure setting point to stop pumping down (Reserved)	b05	bar	0.1	-0.5	18.0	0.5
26	Low pressure alarm mode	b06	0=N/A 1=Automatic Reset				0
27	Low pressure alarm value	b07	bar	0.1	-0.8	17.7	0
28	Low pressure alarm delay time / second	b08	sec	1	5	200	5
29	Remove low pressure alarm	b09	bar	0.1	-0.5	18.0	0.3

4.3 Table 3.Pr

Address	Description	Code	Unit	Interval	Min.	Max.	Default
40	EEV to have hold current or not	C00	0=Close 1=with hold current				0
41	EEV Exciting mode(Shall power restart)	C01	0= (1-2phase exciting) 1= (2-2phase exciting)				0
42	EEV total steps(Shall power restart)	C02	×10PLS	1	0	999	50
43	EEV valve opening pulses(Shall power restart)	C03	PLS	1	0	999	30
44	EEV exciting speed(Shall power restart)	C04	/	1	0	8	2
50	Fixed EEV opening when defrosting*	C10	%	1	0	100	80 / 0

Address	Description	Code	Unit	Interval	Min.	Max.	Default
51	EEV opening when sensor fails	C11	%	1	0	100	50
52	Defrosting signal control enabled	C12	0= Disabled 1=Enabled				0
55	start/stop signal control enabled	C15	0= Disabled 1=Enabled				0
56	Controlling Mode (Shall power restart)	C16	0=Automatic superheat control 1=EEV Manual operation 2=Driving Mode 3=Temperature Controlling Mode				0
57	Defrosting Control Mode	C17	0=external signal 1=Communication control				0
58	Pressure transmitter type	C18	0=(0.5～3.5)V 1=(0.5～4.5)V				0

* The default value of Fixed EEV opening when defrosting is 80 for SEC611-HD and SEC621-HD,and 0 for SEC631-HD and SEC641-HD.
1) Because max. controller displayed value is 999, so EEV total steps value 50 means 500 steps.
2) EEV exciting speed 10(0)=10PPS ; 20(1)=20PPS ; 30(2)=30PPS ; 50(3)=50PPS ; 80(4)=80PPS ; 100(5)=100PPS; 200(6)=200PPS ; 250(7)=2 50PPS ; 500(8)=500PPS;
3) Address 51 EEV opening when sensor fails refers to the temperature sensor and pressure transducer.
4) Address52 defrosting signal control shall combine with Address 57 defrost controlling mode to get enabled
5) Address 55 start/stop signal shall combine with Address 76 start/stop controlling mode to get enabled.

4.4 Table 4.Pr

Holding Register Address	Description	Code	Unit	Interval	Min.	Max.	Default
61	Refrigerant[1]	d01	/	1	0	28	5 / 14
62	Max. Pressure transmitter value[2]	d02	bar	1	-1	99	20 / 60
63	Min. pressure transmitter value[2]	d03	bar	1	-1	99	-1 / 0
64	Pressure transmitter offset correction	d04	bar	0.1	-9.9	9.9	0
65	Temperature sensor offset correction	d05	°C	0.1	-19.9	19.9	0
66	Password	d06	/	1	0	999	5
69	EEV max. opening percentage	d09	%	1	0	100	100

Holding Register Address	Description	Code	Unit	Interval	Min.	Max.	Default
70	EEV min. opening percentage	d10	%	1	0	100	0
71	Sensor(pressure and temperature) input filtering time	d11	sec	0.1	1.0	99.9	1.0
72	Forced EEV opening ratio	d12	%	0.1	-1 (OFF)	100.0	-1 (OFF)
75	Display Mode	d15	0= Alternatively Display 1=Superheat 2=Evaporator outlet pressure 3=Expansion valve opening 4=Evaporator outlet temperature 5=Saturated temperature				0
76	start/stop mode	d16	0=Normally open 1=start/stop signal control 2=Communication signal control				1
77	MODBUS ID setting	d17	/	1	1	128	1
78	Communication settings, baud rate, check bit, stop bit (Shall power restart)	d18	0=4800,NONE,1 1=9600,NONE,1 2=19200,NONE,1 3=38400,NONE,1 4=4800,NONE,2 5=9600,NONE,2 6=19200,NONE,2 7=38400,NONE,2 8=4800,EVEN,1 9=9600,EVEN,1 10=19200,EVEN,1 11=38400,EVEN,1 12=4800,EVEN,2 13=9600,EVEN,2 14=19200,EVEN,2 15=38400,EVEN,2 16=4800,ODD,1 17=9600,ODD,1 18=19200,ODD,1 19=38400,ODD,1 20=4800,ODD,2 21=9600,ODD,2 22=19200,ODD,2 23=38400,ODD,				1
79	Reset factory setting	d19					0

1) For SEC611-HD and SEC621-HD,default value of d01 =5 (R507).For SEC631-HD and SEC641-HD,default value of d01 =14(R744).
2) Max. and min. pressure transmitter default value for SEC611-HD and SEC621-HD is 20 bar and -1 bar.Max. and min. pressure transmitter default value for SEC631-HD and SEC641-HD is 60 bar and 0 bar.
3) Address 72 Forced EEV opening ratio is set at -1 which means communication control mode of EEV is disabled.
4) When resetting factory setting, set the corresponding parameters to be the password or 913, click SEL key to restart the controller. The resetting will be completed.
5) Only Parameter 1. Pr to 4.Pr will be resetted when resetting factory setting is completed.

4.5 Model Code (Read-only.)

Address	Description	Code	Unit	Interval	Min.	Max.	Default
84	Max. suction pressure AD	E04	/	1	0	999	662
85	Min. suction pressure AD	E05	/	1	0	999	92
91	Refrigerant user-defined parameters A1	/	91	A1 Min -20000 Max 20000 A2 Min -20000 Max 20000 A3 Min -20000 Max 20000 When the 40062 refrigerant is set to -1, enter custom mode. A1, A2, A3 are custom parameters, only supporting 485 communication settings.			(R449A) A1:9975 A2:-2020 A3:2424
92	Refrigerant user-defined parameters A2	/	92				
93	Refrigerant user-defined parameters A3	/	93				

Note: If the pressure transducer is replaced, need to recalibrate the maximum and minimum AD of the new one.

5. Alarm Display

1. When the controller displays alarm, the alarm light will be on, and alternatively displays normal operation display interface and alarm display code.

Alarm display code list as below:

Code	Alarm information	Code	Alarm information
StP[1]	RUN signal off	MoP	MoP high pressure alarm
PoP	Pressure transmitter disconnection	LoP	LoP low pressure alarm
PSt	Pressure transmitter short circuit (for SEC611-HD/SEC621-HD) Cancel PSt alarm[2] (for SEC631-HD/SEC641-HD)	HSH	High temperature/High superheat alarm
toP	Temperature sensor not connected	LSH	Low temperature/Low superheat alarm
tSt	Temperature sensor short circuit	FrE	Low temperature frozen alarm

1) When the start/stop signal is disconnected and STP is displayed, it is not an alarm, but only a reminder of the operating status. When the system runs, the code disappears after the RUN start/stop signal line is closed.
2) High pressure of CO_2 may cause PSt false alarm, so this alarm is cancelled for SEC631-HD/SEC641-HD.

2. Address 40109 alarm bit

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
						FrE	LSH	HSH	LoP	MoP			tSt	toP	PSt	PoP

Bit 0 indicates no alarm/protection; bit 1 indicates alarm/protection.

6. Communication status table

Add.	Function	Unit	Type	S	SEC6X1-HD	RS485 communication
33	Present Superheat	K	Analog	INT 16		×10
34	Present pressure	bar	Analog	INT 16	-1.0～99.0	×100
35	EEV opening ratio	%	Analog	INT 16	0.0～100.0	×10
36	Present temperature	°C	Analog	INT 16	-100.0～100.0	×10
37	Present saturated temperature	°C	Analog	INT 16		×10
72	EEV compulsory open ratio	%	Analog	INT 16	-1.0～100.0	×10
100	Digital input status					
Bit0	Start/stop signal status	-	Digital	bit	0:STOP 1:RUN	
Bit1	Defrosting signal status	-	Digital	bit	0:OFF 1:ON	
109	Alarm status	-	Analog	INT 16	Refer to below bit	
Bit0	Press. transmitter disconnection	-	Digital	bit	0:OFF 1:ON	
Bit1	Pressure transmitter short circuit (for SEC611-HD/SEC621-HD) Cancel Pst alarm[2] (for SEC631-HD/SEC641-HD)	-	Digital	bit	0:OFF 1:ON	
Bit2	Temp. sensor disconnection	-	Digital	bit	0:OFF 1:ON	
Bit3	Temp. sensor short circuit	-	Digital	bit	0:OFF 1:ON	
Bit6	MoP alarm	-	Digital	bit	0:OFF 1:ON	
Bit7	LoP alarm	-	Digital	bit	0:OFF 1:ON	
Bit8	High superheat alarm	-	Digital	bit	0:OFF 1:ON	
Bit9	Low superheat alarm	-	Digital	bit	0:OFF 1:ON	
Bit10	Freezing Protection alarm	-	Digital	bit	0:OFF 1:ON	

7. Communication

1. Support standard RS485 Modbus RTU protocol (2-wire half-duplex), with a maximum of 31 cascades. It is recommended that the last controller be connected to the terminal with a resistance of 120 Ω.
2. Use twisted-pair shielded cables (2P x 24AWG is recommended) for communication cables. The shielded cables at both ends of the cables must be grounded separately.
3. when the host computer ID=255 or ID= [d17],it can achieve normal communication with the controller.
4. For the communication baud rate, the controller shall communicate according to 9600bps, 8, N, 1 within 4 seconds after being powered on. If it can communicate normally, the controller shall operate according to 9600bps, 8, N, 1 after 4 seconds. If the communication fails to be carried out at 9600bps, 8, N, 1 within 4 seconds, the controller will operate at the baud rate set by [d18] after 4 seconds.

8. Technical parameters

Item	Parameter	Item	Parameter
Operating voltage	220Vac(85V～264V) 50/60Hz 25VA	Protection level	IP67
Switching signal	The start/stop and defrost switch signals are passive input	Installation method	Three M4x6 screws
Pressure transmitter	(0.5～3.5) Vdc or (0.5~4.5) Vdc, 5Vdc power	Operating temperature	-35°C～55°C
Temperature sensor	NTC 5KΩ(β=3970K), -40°C～+105°C	Storage temperature	-40°C～60°C , 90% RH, non-condensing
Drive load	Unipolar 5-wire electronic expansion valve	Environmental pollution level	2
Anti-surge voltage	Class II	Insulation grade	II
Certification	CE,UKCA,EAC	EMC compliance	IEC61000-4-2, IEC61000-4-3 IEC61000-4-4, IEC 61000-4-5 IEC61000-4-6, IEC61000-4-11
Communication method	RS485, (Default) 9600, 8, N, 1		