SEC series EEV Controller

Manual / Installation Instructions

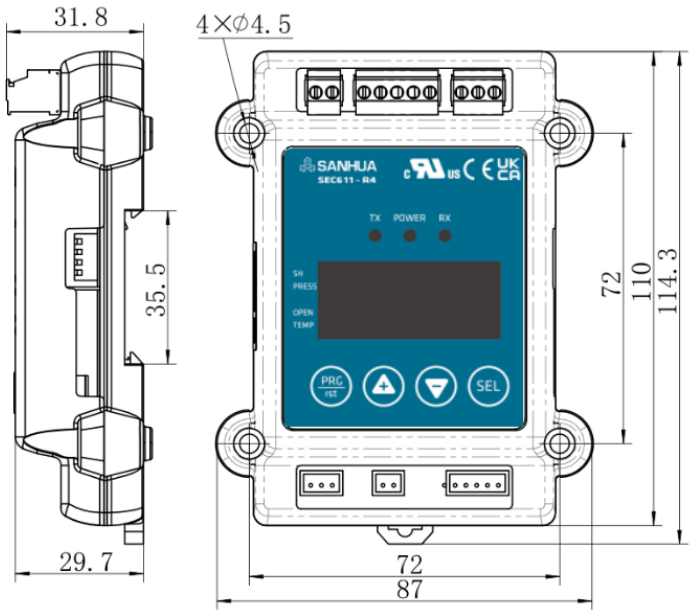
⚠ Cautions

1. This product may cause an electric shock in handling. Please do not attempt to open it with power turned on.
2. This product should be installed in a place fixed secured by a rack or panel.
3. This product can be used under the following environmental conditions:
   - ● Indoor ● Pollution Degree 2 ● At an altitude of 2000m or below
4. Power input must be within the designated ranges.
5. To turn on or turn off power supply for this product, please use the circuit breaker or switch of a standard product of IEC 60947-1 or IEC 60947-3 product and install it within a close distance allowing convenient operation by user provided.
6. An output wire to be used for this product should be inflammable grade FV1(v-1 grade or above). The thickness of the wire should 0.2 ~ 1.3 mm²
7. In order to prevent it from an inductive noise, please maintain the high-voltage wire and power wire separated.
8. Please avoid installing the product in a place where a strong magnetism, noise, severe vibration and impact exist.
9. When extending the sensor wire, use a shield wire and do not extend it unnecessary long.
10. The sensor wire and signal wire should be away from the power and load wires using conduits separately installed.
11. Please avoid using the product near a device generating strong high frequency noise (high frequency welding machine, high-frequency sewing machine, high-frequency radiotelegraph, high capacity SCR controller)

1. Specifications

Items	Description
Dimension	87(W)mm x 114(H)mm x 30 (D)mm
Power supply	24Vac +10%/-15%, 50/60Hz (SEC611) 24Vdc +10%/-15% (SEC611 & SEC612) Class II
Power consumption	15VA with Sanhua EEV at 24Vdc
Connection	Pluggable terminal: Screw M2 Min/Max wire diameter: 0.2~1.3 mm² XH terminal
Input	Pressure sensor
	Temperature sensor
	RUN signal（Passive switch signal）
Output	Relay output（30 Vdc/3A）
	EEV (uni-polar) output
Communication	RS 485
Operation	-30 ~ 55 °C，Humidity ≤95%RH
Storage	-30 ~ 55 °C，Humidity ≤95%RH
Protection level	IP20

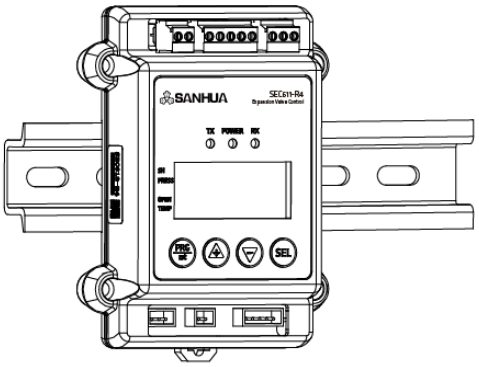
2. Dimensions



3.Installation Notes

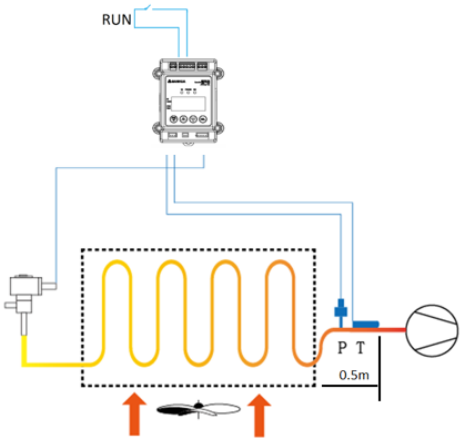
a. DIN slide rail mounting

Mount the controller on the DIN rail by the snap on the back of the controller. Installed in the electric control cabinet to avoid moisture and dust.



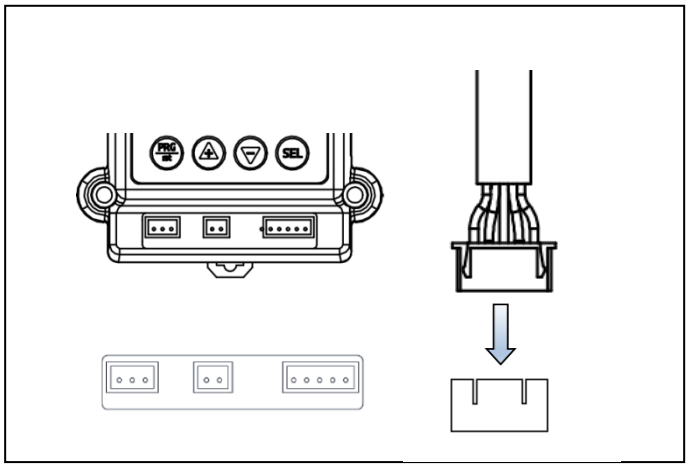
b. Sensors installation

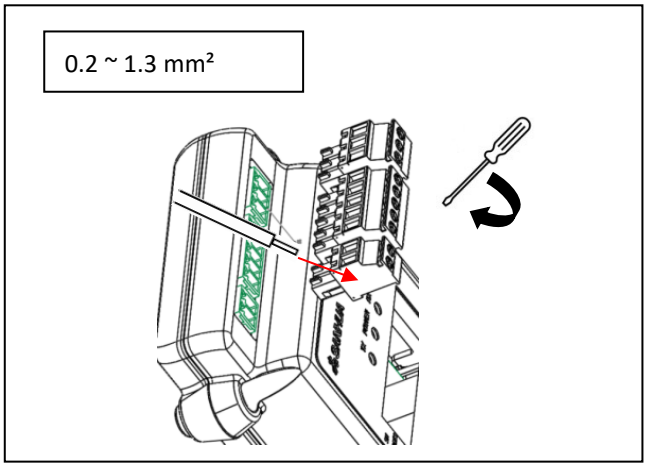
Pressure transmitter / temperature sensor installed on the tube of evaporator outlet.
If the system is divided into several evaporators, install pressure transmitter/temperature sensor at each evaporator outlet.



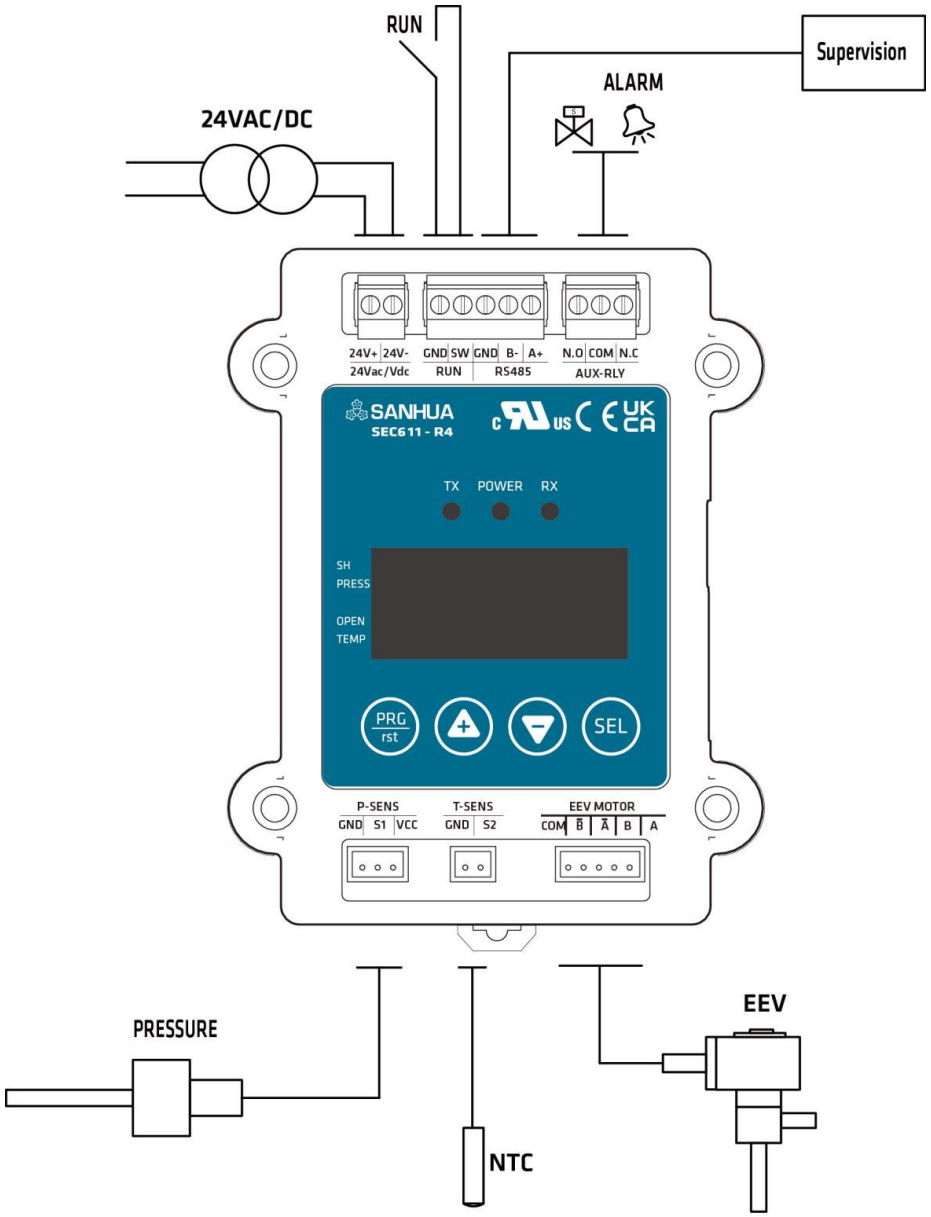
We recommend to install the temperature and pressure sensors within 0.5m from the evaporator to prevent ambient temperature and pressure drop interference for the superheat calculation.

4. Wire Connections





Type	Function	Label		Description
Pluggable terminal	Power supply	24Vac/Vdc	24V+	SEC611: 24Vdc or 24Vac
			24V-	
		24Vdc	24V+	SEC612: 24Vdc only
			24V-	
	Compressor signal and comm. port	RUN	GND	Passive switching signal, open or close synchronously with the compressor, close when using manual mode
			S/W	
		RS485	GND	GND
			B-	TRX-(B)
			A+	TRX+(A)
	Auxiliary relay output	AUX-RLY	N.O	Normal Open contact
			COM	Common
			N.C	Normal Close contact
XH terminal	Pressure sensor	P-SENS	Vcc	Power: YCQB: +5V YCQC: 10-30Vdc
			S1	S1 YCQB: 0.5-3.5V YCQC: 4-20mA
			GND	GND YCQB: GND YCQC: N/A
	Temp. sensor	T-SENS	S2	NTC5K/B3970
			GND	
	EEV output	EEV MOTOR	A	
			B	
			$\overline{A}$	
			$\overline{B}$	
			COM	

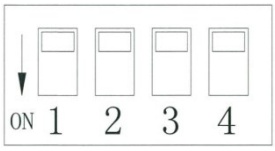


Safety Tips：

1. Do not turn on the power before completing the wiring, cut off the power before changing the wiring.
2. The RUN port (compressor signal) is a passive port. If add a voltage it may cause the controller burn out.
3. Ultracapacitor is connected to the power supply wire.
4. If you use a transformer, please ensure the minimum power is 15 VA (for 1 controller + 1 EEV).
5. Min/max wire diameter: 0.2 ~ 1.3 mm²
6. 24Vdc or 24Vac for SEC611, 24Vdc only for SEC612.

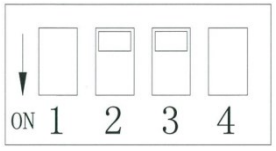
5. DIP SW Setting

All DIP switches are OFF in default mode (suitable for most applications). There are 4 DIP switches, 2, 3 used as a group for selecting EEV type, 1, 4 used as a group for selecting controller operating mode. After changing DIP SW. please reboot the controller.

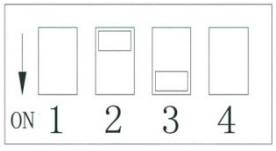


a. EEV type selecting

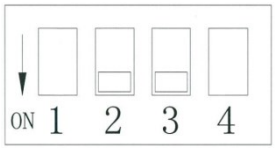
EEV total steps, excitation speed and excitation mode is determined by the DIP SW2, 3



(Default mode)
DIP SW2: OFF, DIP SW3: OFF
1-2 phase, 500 steps, 30pps



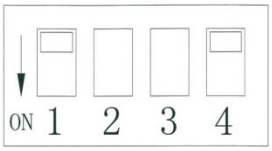
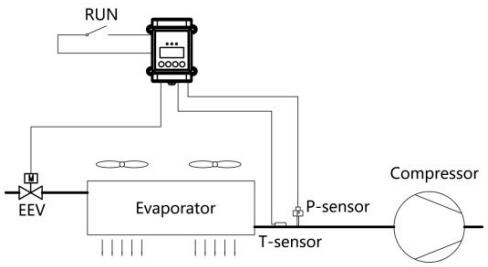
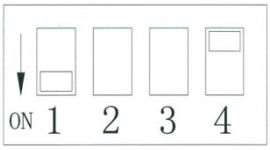
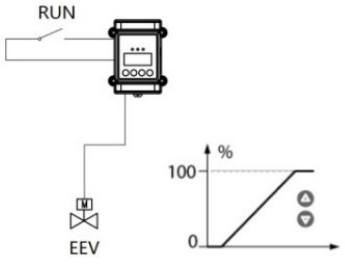
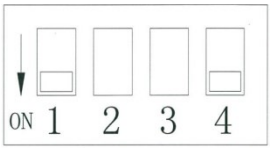
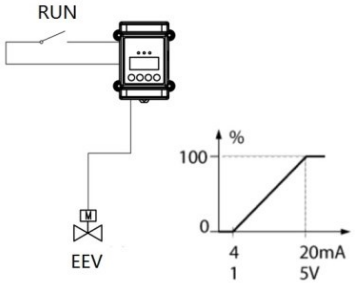
DIP SW2: OFF, DIP SW3: ON
2 phases, 2000 steps, 100PPS

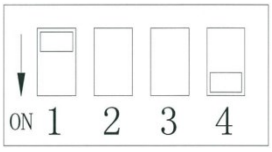
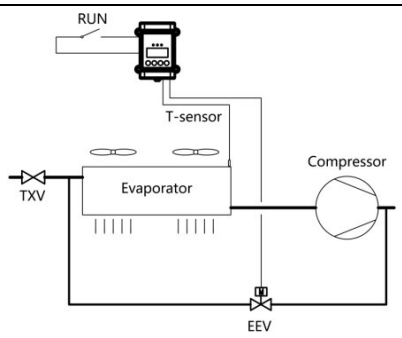


DIP SW2: ON, DIP SW3: ON
Custom mode, set by parameter table 3

b. Control method selecting

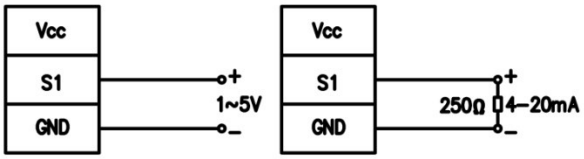
Control method determined by the DIP SW1, 4

DIP SW position	Description	Schematic
	-DIP SW1: OFF, DIP SW4: OFF -Superheat control (Default mode) -Temp./pressure signal ensures system SH stable	
	-DIP SW1: ON, DIP SW4: OFF -Manual operation -Use Button directly controls the valve opening ratio	
	-DIP SW1: ON, DIP SW4: ON -Drive mode -Use 4-20mA or 1-5Vanalog signal control	

	-DIP SW1: OFF, DIP SW4: ON -Hot gas bypass (temperature control)	

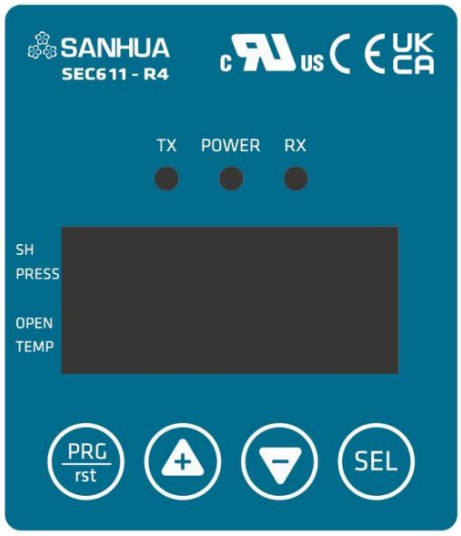
Note: 1. While using the manual /drive mode, keep the compressor RUN signal always ON.

2. In drive mode, external 4-20mA or 1-5V analog signal is input through the pressure sensor port.



6. Buttons and operation

a. Screen introduction



LED	Description
SH	Display current superheat
PRESS	Display pressure sensor value
OPEN	Display current EEV opening
TEMP	Display temperature sensor value
°C /bar	Unit of temp./pressure
⚠	Lighting when alarming
🔧	Flickering at communication mode
POWER	Lighting at power up
TX, RX	Flickering at communication

Use button can switch the display on screen among superheat/pressure/valve opening/temperature (current display is indicated by the cursor pointer)

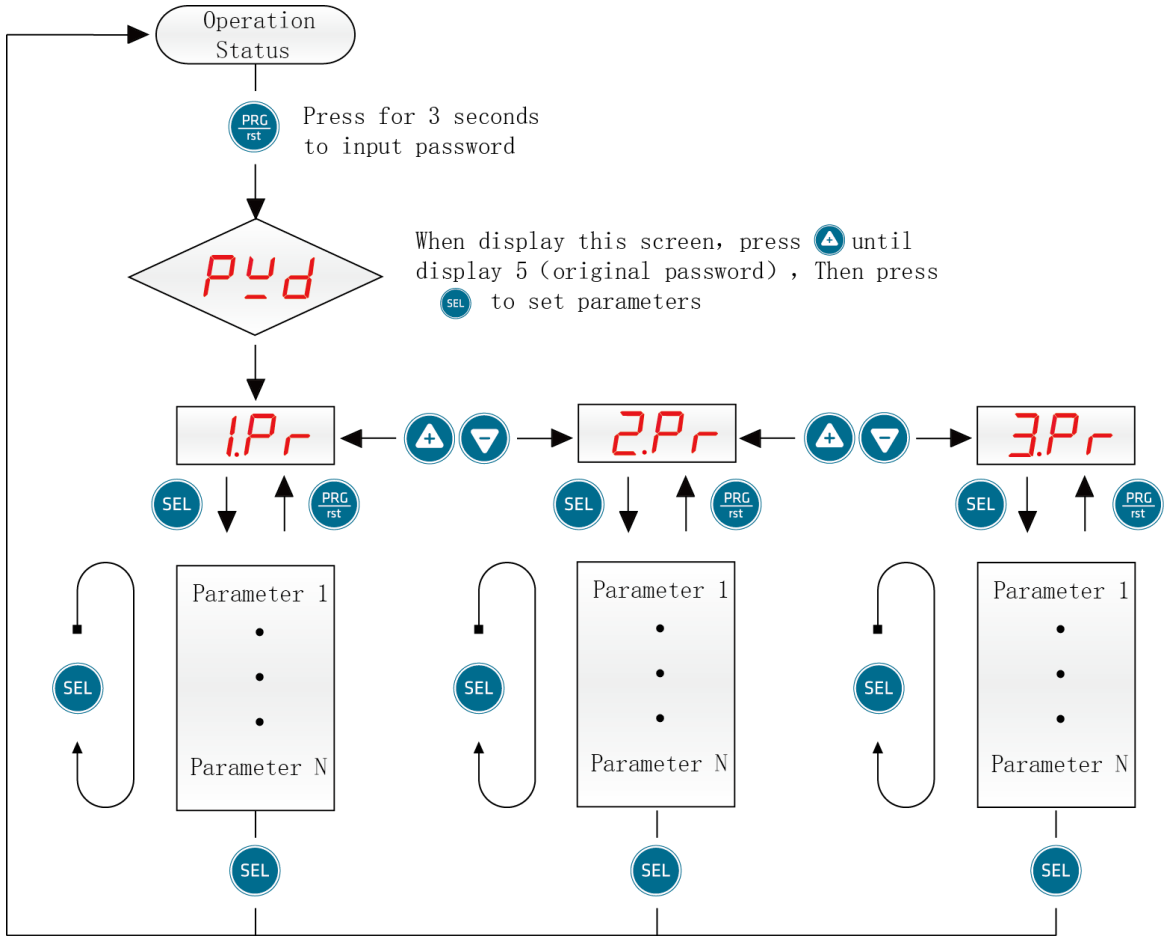
b. Buttons introduction

PRG rst — Enter the parameter setting interface / return parameter list

+ − — Switch screen display parameters, increase/decrease parameters

SEL — Confirm key, parameter switch in parameter table, long press save parameter

c. Set/change parameters



1.During operating status, long press PRG rst for more than 3s, enter parameter setting mode

2. When screen show PUd, press ▲ until screen display 5(original password), then press SEL enter parameters table list

3. 1.Pr means parameters table1， press ▲ ▼ can select 2.Pr or 3.Pr (switching parameter table)

4.After selected parameters table, press SEL enter the table, if you want to switch other parameter tables, press PRG rst return to the parameter table select list

5. In parameters table, screen will directly display the parameter code, press SEL can switch the code in parameters table

6. When the screen displays the parameter code which you want to modify, press ▲ ▼ can modify parameters directly, and press SEL will turn to next parameter or press PRG rst return to the parameter table select list

7. After finish modifying, long press SEL for 3s will save all settings and return to the operating interface.

d. Main parameter setting

1. Refrigerant selection

Refrigerant data is in 2.Pr

Add.	Code	Description	Default
40062	rFY	Refrigerant	0(R22)

Now 29 kinds refrigerants are available in the controller as below:

0	R22	8	R290	16	R32	24	R454C
1	R404A	9	R450A	17	R245FA	25	R455A
2	R410A	10	R513A	18	R23	26	R454B
3	R134A	11	R448A	19	R407A	27	R452B
4	R407C	12	R449A	20	R407F	28	R600A
5	R507	13	R452A	21	R124		
6	R1234ZE	14	R744(CO2)	22	R717		
7	R1234YF	15	R744(N2O)	23	R407H		

2. Target superheat setting

Target superheat is in 1.Pr

Add.	Code	Description	Default
40001	SH	Target superheat	6

If the target SH is too small, may cause liquid hammer into the compressor; if the target value is too large, the evaporator energy efficiency will be very low.

3. Start open ratio and duration time

You can find it in 1.Pr

Add.	Code	Description	Default
40003	bir	Start open ratio	0
40004	Sdt	Start open ratio duration time	0

When controller receives compressor RUN signal, EEV will keep the start opening ratio for the duration time.

4. Pump down function

Add.	Code	Description	Default
40025	Pd	Select pump down function and delay time	-1(OFF)
40026	PdP	Pressure set-point for stopping pump down	0.5

If 40025 value is not -1, pump down function is ON

RUN signal = ON => Compressor is ON

RUN signal = OFF (need main controller to cut off) => EEV will close

when low pressure = 40026 bar or delay time = 40025 seconds, the Output Relay changes its position and will inform to cut Off the compressor

5. Reset to factory settings

Add.	Code	Description	Default
	rSt	Reset	0

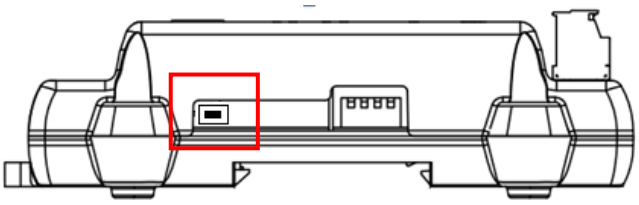
Reset is in 2.Pr menu, use  to fing the parameter rSt , input backup-password 913 and long press  , alll parameters reset to the default from factory.

7.Alarm mode

Code	Description	Code	Description
StP	RUN signal disconnected	noP	MOP high pressure alarm
PoP	Pressure transmitter disconnected	LoP	LOP Low pressure alarm
PSt	Pressure transmitter short circuit	HSH	High superheat alarm
toP	Temperature sensor disconnected	LSH	Low superheat alarm
tSt	Temperature sensor short circuit	FrE	Low temperature freezing alarm
		888	Supply voltage out of tolerance

Note StP is not alarm, just reminding the compressor RUN signal is disconnected.
noP alarm when suction pressure higher than setting value and exceeds the delay time, EEV will be forced to close at the same time.

Alarm manual reset button is on side face of EEV shell.



Function	Activation function	Start condition	Stop condition	EEV position	Mobus
MOP	nP is ≠ 0	Measured pressure > noP for nPd minutes	Measured pressure < nPF	Will close	Bit 6 address 40110
Low Pressure	LP is ≠ 0	Measured pressure < LoP for LPd seconds	Measured pressure > LPF	Will close	Bit 7 address 40110
High superheat	HS is ≠ 0	Measured superheat > HSH for HSd minutes	Measured superheat < HSF	Will close	Bit 8 address 40110
Low Superheat	LS is ≠ 0	Measured superheat < LSH for LSd seconds	Measured superheat > LSF	Will close	Bit 9 address 40110
Freeze function	Fr is ≠ 0	Measured Temp. < FrE for Frd seconds	Measured Temp. > FrF	Will regulate	Bit 10 address 40110

8.Parameters Table

1) LPr (Parameters Table1)

Add.	Description	Code	Unit	Step	Min.	Max.	Default
40001	Superheat set point	SH	K	0.1	0.5	30	6
40003	Start open ratio	bir	%	1	0	100	0
40004	Start open ratio duration time	Sdt	Sec	1	0	600	0
40005	P: Proportional gain	dFr	%	0.1	0.1	99.9	3
40006	I: Integral time	Irt	Sec	1	0	999	20
40007	D: Derivative time	drt	Sec	1	0	999	4
40008	Low SH alarm mode	LS	0=No use 1=automatic return 2=manual return				1
40009	Low SH alarm value	LSH	K	0.1	0.5	30	0.5
40010	Low SH alarm delay time	LSd	Sec	1	1	300	15
40011	Clear low SH alarm	LSF	K	0.1	1	30.5	3
40012	MOP alarm mode	nP	0=No use 1=automatic return 2=manual return				1
40013	MOP alarm pressure	noP	bar	0.1	-1	50	9
40014	MOP alarm delay time	nPd	Min	1	1	15	1
40015	Clear MOP alarm	nPF	bar	0.1	-1	50	8
40016	High SH alarm mode	HS	0=No use 1=automatic return 2=manual return				0
40017	High SH alarm value	HSH	K	1	10	40	30
40018	High SH alarm delay time	HSd	Min	1	1	600	3
40019	Clear high SH alarm	HSF	K	0.1	7	37	27
40020	MOP coefficient for close valve	nPP	/	1	0	800	200
40021	Freeze prevention alarm mode	Fr	0=No use 1=automatic return 2=manual return				0
40022	Freeze prevention alarm value	FrE	°C	1	-40	40	0
40023	Freeze prevention alarm delay time	Frd	Sec	1	5	200	30
40024	Clear freeze prevention alarm	FrF	°C	1	-37	43	3
40025	Select pump down function and delay time	Pd	Sec	1	0	180	-1(OFF)
40026	Pressure set-point for stopping pump down	PdP	bar	0.1	-0.5	18	0.5
40027	Pressure low limit alarm mode	LP	0=No use 1=automatic return 2=manual return				0
40028	Pressure low limit alarm value	LoP	bar	0.1	-0.8	17.7	0
40029	Low limit pressure alarm delay time	LPd	Sec	1	5	200	5
40030	Clear low limit pressure alarm	LPF	bar	0.1	-0.5	18	0.3

1) Alarm setting

When alarm setting is ON, if system pressure/temperature exceeds/below the set alarm value and keep more than the delay time, the controller will generate an alarm and act accordingly

2) Mop coefficient for close valve: If 40020=0, controller only have MOP alarm but valve have no action.

if 40020＞0, the larger of value, the slower valve close.

2) 2.Pr (Parameters Table2)

Add.	Description	Code	Unit	Step	Min.	Max.	Default
40062	Refrigerant	rFY	0=R22 1=R404A 2=R410A 3=R134a 4=R407C 5=R507 6=R1234ze 7=R1234yf 8=R290 9=R450A 10=R513A 11=R448A 12=R449A 13=R452A 14=R744(CO2) 15=R744(N20) 16=R32 17=R245fa 18=R23 19=R407A 20=R407F 21=R124 22=R717 23=R407H 24=R454C 25=R455A 26=R454B 27=R452B 28=R600A				0
40063	Pressure sensor MAX. range	PSH	bar	1	0	99	12(Current) 20(Voltage)
40064	Pressure sensor MIN. range	PSL	bar	1	-1	99	-1(Current) 0(S Voltage)
40065	Pressure sensor offset correction	PCr	K	0.1	-9.9	9.9	0
40066	Temp. sensor offset correction	tCr	K	0.1	-20	19.9	0
40067	Password	PCd	/	1	0	999	5
40069	Jerk control ratio	JEY		0.1	0.1	100	100
40070	EEV open ratio upper limit	oPH	%	1	0	100	100
40071	EEV open ratio lower limit	oPL	%	1	0	100	0
40072	Sensor input filter time	oIt	/	0.1	1	99.9	1
40073	EEV compulsory open ratio	UCr	%	0.1	0	100	OFF(-1)
40075	EEV reset mode	rSd	0 = Fully close 1 = Fully open to fully close				0
40076	Display mode	diS	0=1~4 rotation / 1= Superheat 2=Evaporator outlet pressure / 3= Expansion valve open ratio 4= Evaporator outlet temperature / 5= Saturation temperature				1
40077	Run/stop method	rnt	0= Always run / 1= Digital input / 2= Communication Run				1
40078	Communication ID setup	Id	/	1	1	254	1
40079	Communication speed setup	bdr	48(0)=4800 96(1)=9600 192(2)=19200 384(3)=38400				96
	Reset	rSt	/	1	0	999	0

1) Set rSt to password value (default 5), and then long press SEL the controller will factory reset.

3) 3.Pr (Parameters Table3)

Add.	Description	Code	Unit	Step	Min.	Max.	Default
40041	Hold current	EvH	0=OFF		1=ON		0
40042	Expansion valve excitation type	Evd	1-2(0)=1-2 phase excitation		2(1)=2 phase excitation		1-2
40043	Expansion valve total pulse	EvP	pulse	1	10	999	50
40044	Expansion valve open pulse	Evo	pulse	1	0	999	30
40045	EEV drive speed (PPS)	EvS	10(0)=10PPS 20(1)=20PPS 30(2)=30PPS 50(3)=50PPS 80(4)=80PPS 100(5)=100PPS 200(6)=200PPS 250(7)=250PPS 500(8)=500PPS				30(2)
40046	Over-driver steps to close EEV	EEt	pulse	1	0	999	8
40047	Over-drive steps to reset EEV	EEr	%	1	0	100	10

1) Parameter Table 3 is usually not use, SANHUA standard EEV can directly set by the DIP SW. If you want modify parameters table 3, please change DIP SW first. (See page5), after finished setting this table, controller need cut off power and re-power on.

2) Because the controller screen display maximum value is 999, so 40043 EEV total steps pulse 50 means 500 steps.

9. Communication Protocol

a. Specification

Item	Description
Transmission line connection	Multiple line
Communication method	RS485（2-wire, half-duplex）
Baud-rate	Default 9600BPS
Parity, Data, Stop bit	None，8 data， 1 stop
Protocol Type	Modbus RTU Mode
Function Code	Read Hold Registers（0×03）/Preset Single Register（0×06）
Max. Read Word	32 words
Media Type	Belden 9841/9842, LG LIREV-AMESB
Poll interval	100 ms

b. Status of Communication table

Add.	Function	Unit	Type	S	SEC601	MMI
40073	EEV compulsory open ratio	-	Analog	INT 16	0.0-100.0	×10
40099	Reset command	-	Analog	INT 16	0:OFF	1:ON
40101	Run/Stop input	-	Analog	INT 16	0:Stop	1:Run
40102	Operation status	-	Analog	INT 16	Refer to below bit	
Bit0	Operation status of EEV	-	Digital	bit	0:OFF	1:ON
Bit1	Aux. relay output	-	Digital	bit	0:OFF	1:ON
40110	Alarm status	-	Analog	INT 16	Refer to below bit	
Bit0	Press. sensor disconnection	-	Digital	bit	0:OFF	1:ON
Bit1	Press. sensor short circuit	-	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	Low limit pressure 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
40111	Present Superheat	K	Analog	INT 16		×10
40112	Present saturation temperature	℃	Analog	INT 16		×10
40113	Present pressure	bar	Analog	INT 16	-1.0~1.0	×10
40114	Present temperature	℃	Analog	INT 16	-100.0~100.0	×10
40116	EEV open ratio	%	Analog	INT 16	0.0~100.0	×10