

# SEC61X SERIES | *Electronic Expansion Valve Controller*

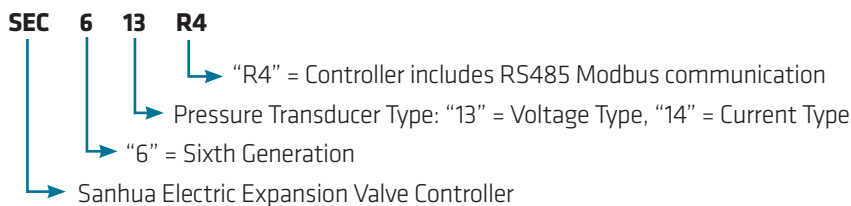


The Sanhua SEC61x Series controller is a standalone controller for refrigeration and air conditioning systems. The controller can be used to operate an electronic expansion valve to control superheat or discharge air temperature. It can also be used as an electronic valve driver (positioner) by accepting an external signal from a main system controller.

## FEATURES

- ADVANCED PID ALGORITHM TO ENSURE ACCURATE AUTOMATIC ADJUSTMENT OF SUPERHEAT
- ALARM FEATURE FOR LOW AND HIGH SUPERHEAT
- EASY TO INSTALL; DIN RAIL OR SURFACE MOUNT
- MAXIMIZES SYSTEM EFFICIENCY WITH PRECISE SUPERHEAT CONTROL
- ALTERNATE USE AS AN ELECTRIC VALVE DRIVER
- OPERATES SANHUA LPF OR DPF(S03) SERIES EEVS

## NOMENCLATURE



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### SEC Controller


Items	Description
Dimension	2.83" (72mm) × 4.49" (114mm) × 1.14" (29mm)
Supply Voltage	24VAC/DC +10%/-15%, 50/60Hz, minimum 15 VA
Connections	Removeable screw terminals (28 to 16 AWG) XHP plug-in terminals
Input	Pressure transducer
	Temperature sensor
	RUN signal
Output (250VAC/30VDC/5A)	Relay output (250VAC/30VDC/5A)
	EEV (unipolar) output
Operation	Temperature: -13°F (-25°C) to 140°F (60°C), Humidity: ≤ 95%RH
Storage	Temperature: -22°F (-30°C) to 140°F (60°C), Humidity: ≤ 95%RH

### Connected Components

Items	Model	Description
Controller	SEC613-R4	Available for <b>voltage</b> pressure sensor, °F/psig
	SEC614-R4	Available for <b>current</b> pressure transducer, °F/psig
Temp. Sensor	NTC2A1	<b>6.5 ft</b> Temperature Sensor
	NTC5A1	<b>16 ft</b> Temperature Sensor
	NTC9A1	<b>30 ft</b> Temperature Sensor
Pressure Transducer	YCQB02H01-1	<b>Voltage</b> with ¼" ODM <b>Solder</b> connection, <b>6.5 ft</b> cable
	YCQB02L12-1	<b>Voltage</b> with ¼" SAE <b>Flare</b> connection, <b>6.5 ft</b> cable
	YCQB02H18-1	<b>Voltage</b> with ¼" ODM <b>Solder</b> connection, <b>16 ft</b> cable
	YCQB02L28-1	<b>Voltage</b> with ¼" SAE <b>Flare</b> connection, <b>16 ft</b> cable
	YCQC02L18	<b>Current</b> with ¼" SAE <b>Flare</b> connection, <b>Packard</b> connection
Packard Cable	YCQB02-013054	For YCQC02L18 with <b>20 ft</b> cable
	YCQB02-013055	For YCQC02L18 with <b>30 ft</b> cable



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### Temperature Sensor

Items	Description	
Temperature Sensor  NTC 5K	Sensor type	NTC 5KΩ
	Cable	2 x 20 AWG
	Protection class	IP 67
	Accuracy	±0.5°F @ 77°F
	Measuring range	-58°F to +122°F
Connection Kit		

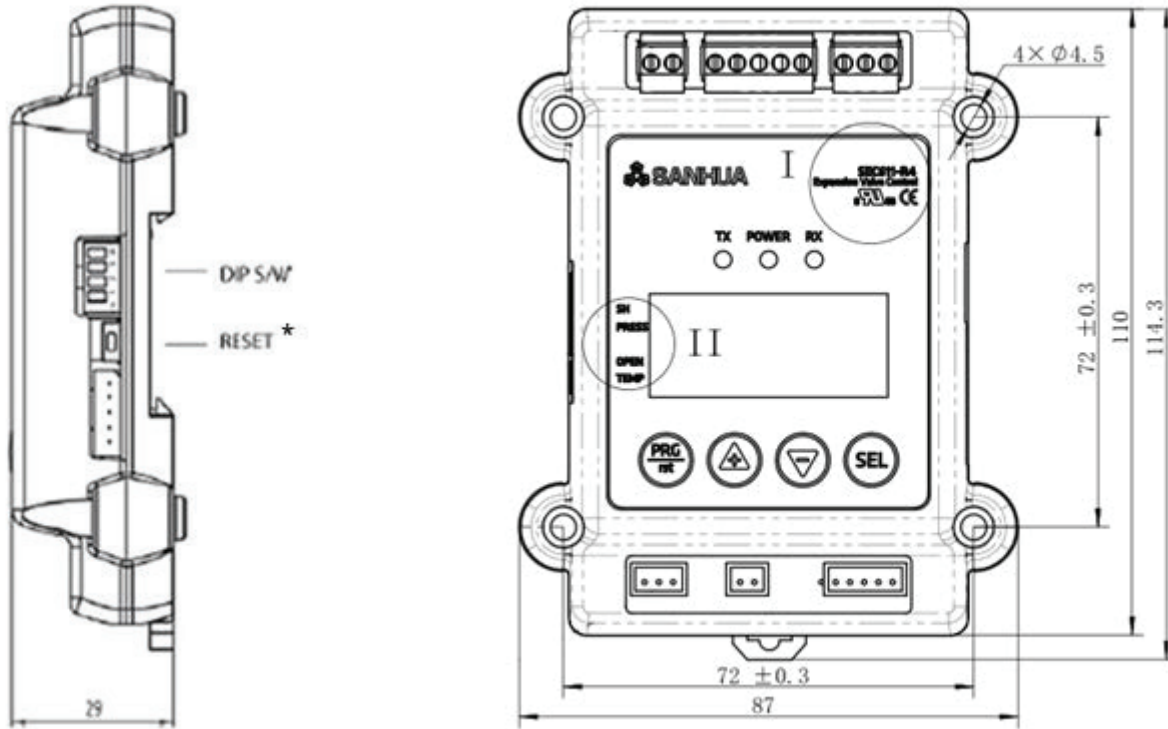
NTC 5K		
TEMPERATURE VS. RESISTANCE		
Temperature		Resistance
°F	°C	(k ohms)
-58	-50	347
-40	-40	173
-22	-30	90.2
-4	-20	40.2
14	-10	27.9
32	0	16.4
50	10	10.0
68	20	6.3
86	30	4.0
104	40	2.7
122	50	1.8

### Pressure Transducer

	YCQB (Voltage)	YCQC (Current)
Supply Voltage	5 ± 0.25 VDC	10 to 30 VDC
Output	0.5 to 3.5 VDC	4 to 20mA
Measure Range	0 to 290 PSI	-14.5 to 174 PSI
Test Pressure	761 PSI	761 PSI
Accuracy	±0.8% F.S. (140 to 104°F)	±0.8% F.S. (140 to 104°F)
Protection Class	IP 67	IP 67
Connector Type	1/4" ODM Solder or 1/4" SAE Flare	1/4" SAE Flare
Electrical Connector	JST-XHP Connector with attached Cable	Packard Connector, Cable Separate
		

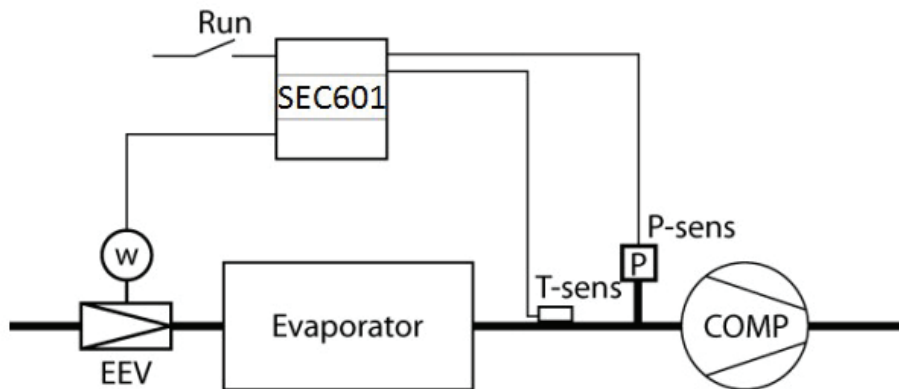
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### DIMENSIONS



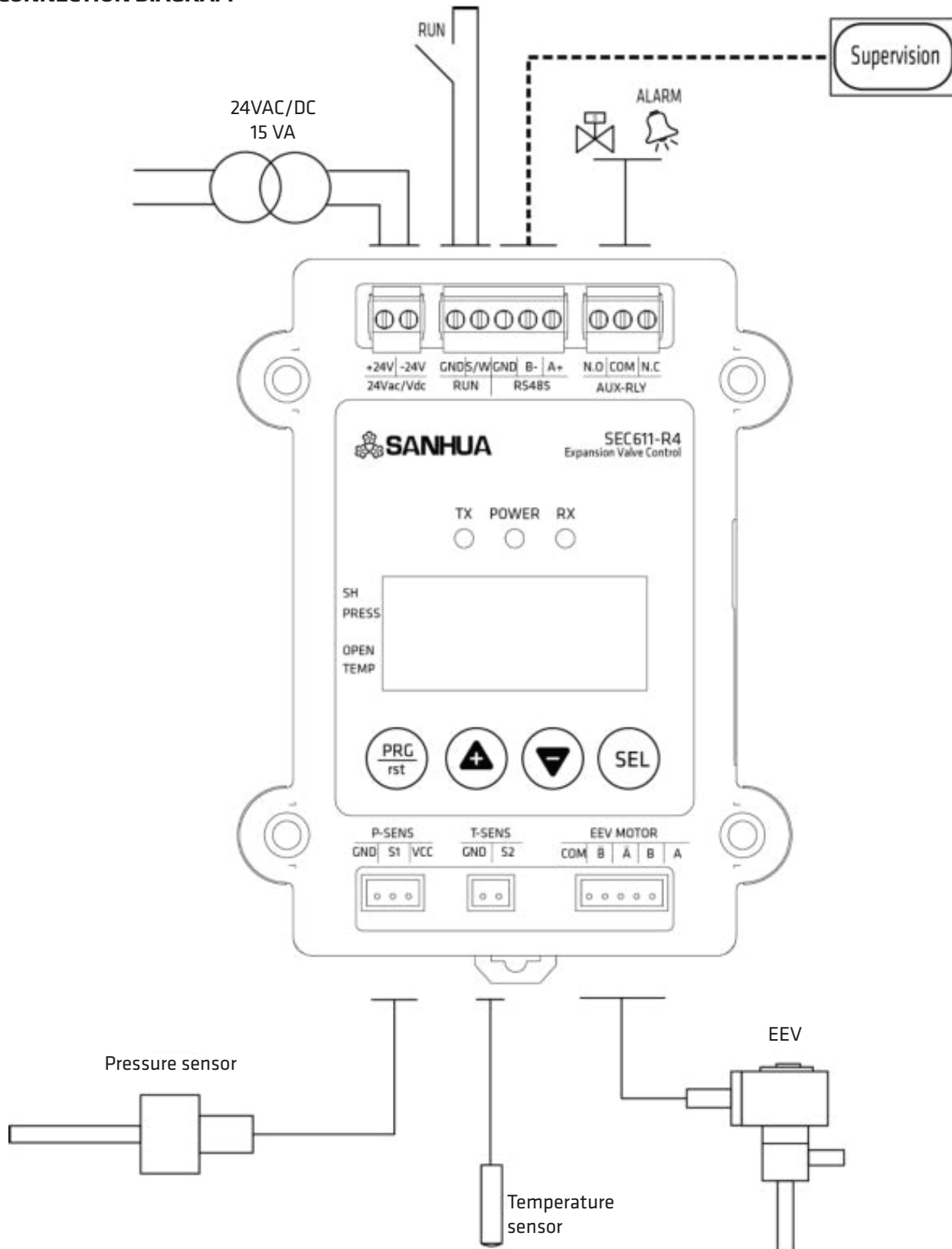
\* The reset button on the side of the device performs a power-cycle of the device. No settings are changed by the reset button.

### SYSTEM PLACEMENT DIAGRAM



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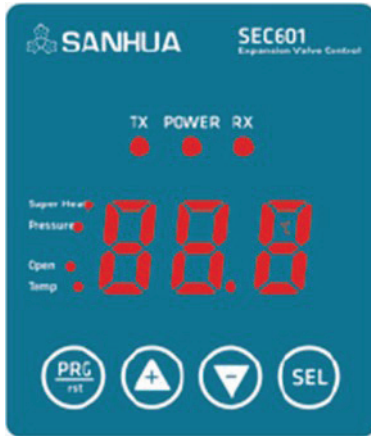
### CONNECTION DIAGRAM



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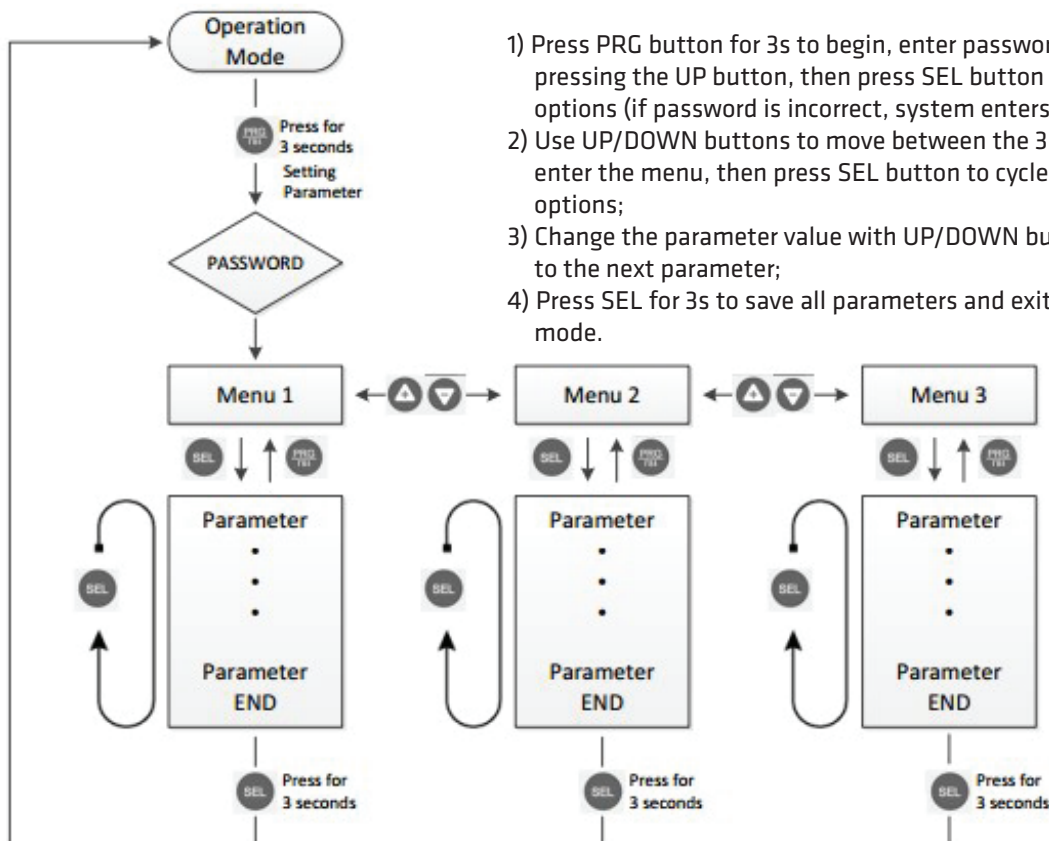
### OPERATION

#### LED Display and Operating Buttons



	Definition	Description
LED Display	Super Heat	Display Superheat
	Press	Display pressure
	Open%	Display valve open ratio
	Temperature	Display temperature
	F/PSIG	Display the unit of temp./pressure
		Lighting when alarming
		Flickering at manual mode
	Power	Lighting at power up
	TX, RX	Flickering at communication
Button		Parameter change mode
		Increase or upward
		Decrease or downward
		Select and save

#### MENU NAVIGATION



- 1) Press PRG button for 3s to begin, enter password (default is 5) by pressing the UP button, then press SEL button to enter the menu options (if password is incorrect, system enters "view only" mode)
- 2) Use UP/DOWN buttons to move between the 3 menus, press SEL to enter the menu, then press SEL button to cycle through the parameter options;
- 3) Change the parameter value with UP/DOWN button, press SEL to move to the next parameter;
- 4) Press SEL for 3s to save all parameters and exit the parameters setting mode.

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### SETTINGS | DIP SW switch settings

#### A. EEV Type Selection

DIP SW Position	Description
	(Default mode) DIP SW2: OFF, DIP SW3: OFF 1-2 phase, 500 steps, 30PPS
	DIP SW2: OFF, DIP SW3: ON 2 phase, 2000 steps, 100PPS
	DIP SW2: ON DIP SW3: ON Custom mode, set by parameters table 3

#### B. Control Method Selection

DIP SW Position	Description	Schematic
	(Default Mode) -DIP SW1: OFF, DIP SW4: OFF - Superheat control -Automatic mode. Temp./pressure signal ensures system SH stale -Possible to operate valve via RS485 comm.	
	-DIP SW1: ON, DIP DW4: OFF -Manual operation -Use   buttons directly to control the valve opening ratio -Possible to operate valve via RS485 comm.	
	-DIP SW1: ON, DIP SW4: ON -Drive mode -Use 4-20mA or 1-5V analog signal control	
	-DIP SW1: OFF, DIP SW4: ON -Hot gas bypass (temperature control) -Precise temp. control by controlling discharge air temperature	

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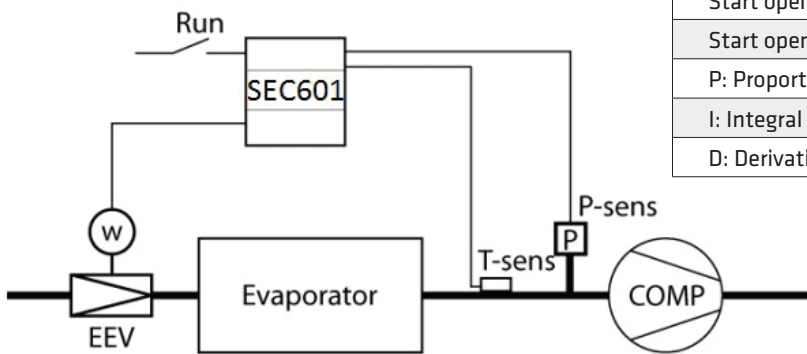
### CONTROL MODES

#### 1) Superheat control (DIP SW1:OFF, DIP SW4:OFF)

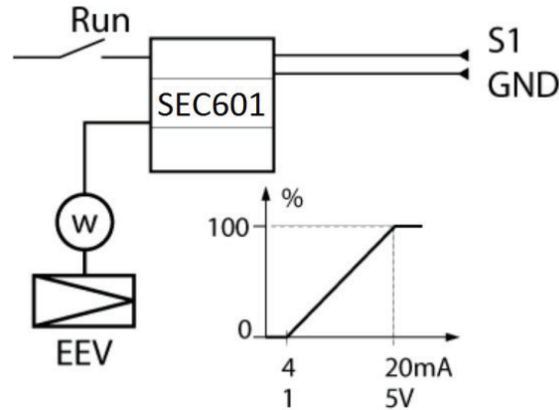
#### Application Parameters

Function	Code	Min.	Mx.	Default*
Superheat set-point	SH	0.5	30	10.8 (108)
Start open ratio	BIR	0	100	0
Start open ratio duration time	SDT	0	300	0
P: Proportional gain	DFR	0.1	99.9	3.0 (30)
I: Integral time	IRT	0	999	20
D: Derivative time	DRT	0	999	4

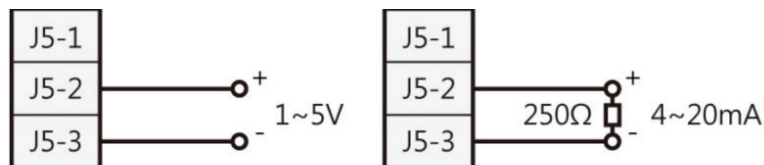
\*Default as displayed on controller menu.  
Modbus address value in parenthesis



#### 2) EEV Driver (Positioner) (DIP SW1:ON, DIP SW4:ON)



Change operation mode to drive mode, using external reference signal of 4-20mA or 1-5V to drive the EEV. At this time, the RUN signal should be ON.





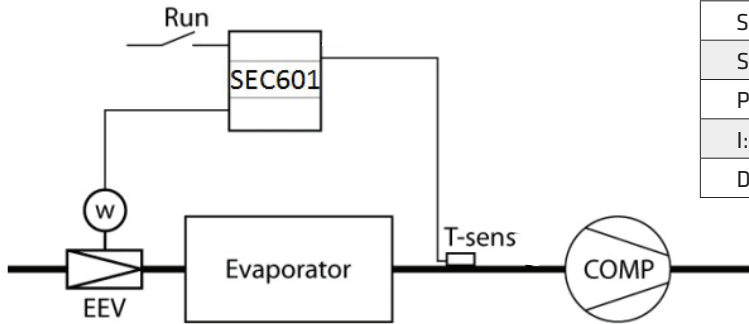
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### CONTROL MODES (CONTINUED)

#### 3) Discharge Air Temperature control (DIP SW1:OFF, DIP SW4:ON)

Application Parameters

Function	Code	Min.	Mx.	Default*
Set point for control target**	SH	0.5	30	10.8 (108)
Start open ratio	BIR	0	100	0
Start open ratio duration time	SDT	0	300	0
P: Proportional gain	DFR	0.1	99.9	3.0 (30)
I: Integral time	IRT	0	999	20
D: Derivative time	DRT	0	999	4



\* Default as displayed on controller menu.  
Modbus address value in parenthesis  
\*\*Parameter will be changed and applied from superheat set point to temperature set point of control object.

It will be used when controlling temperature of the discharge air of an evaporator.



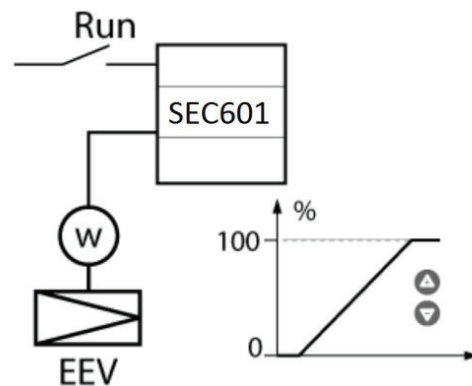
**CAUTION!** This mode will not help safeguard the compressor from liquid refrigerant.

#### 4) Manual control mode (DIP SW1: ON, DIP SW4: OFF)

Users can maintain valve open ratio arbitrarily. Change the DIP SW switch and then press UP/DOWN button, the valve will change the open ratio as the screen displayed.

At this time all LED on the left side will be flickering.

Run signal should be ON in this mode, if the Run signal is OFF, EEV will be closed immediately.



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### PARAMETERS

Menu 1 = **I\_Pr**

MODBUS Address	Description	Code	Unit	Step	Min.	Max.	Default*
40001	Superheat set-point	<b>SH</b>	°F	0.1	0.5	99.9	10.8 (108)
40003	Start open ratio	<b>bi r</b>	%	1	0	100	0
40004	Start open ratio duration time	<b>Sdt</b>	Sec	1	0	600	0
40005	P:Proportional gain	<b>dFr</b>	%	0.1	0.1	99.9	3.0 (30)
40006	I: Integral time	<b>i rt</b>	Sec	1	0	999	20
40007	D: Derivative time	<b>drt</b>	Sec	1	0	999	4
40008	Low SH alarm mode	<b>LS</b>	0=No use , 1= automatic return, 2=manual return				1
40009	Low SH alarm value	<b>LSH</b>	°F	0.1	0.5	30	0.9 (9)
40010	Low SH alarm delay time	<b>LSd</b>	Sec	1	1	300	15
40011	Clear low SH alarm	<b>LSF</b>	°F	0.1	1	30.5	5.4 (54)
40012	MOP alarm mode	<b>ñP</b>	0=No use , 1= automatic return, 2=manual return				1
40013	MOP alarm pressure	<b>ñoP</b>	PSIG	0.1	-15	999	130
40014	MOP alarm delay time	<b>ñPd</b>	Min	1	1	15	1
40015	Clear MOP alarm	<b>ñPF</b>	PSIG	1	-15	129	116
40016	High SH alarm mode	<b>HS</b>	0=No use , 1= automatic return, 2=manual return				0
40017	High SH alarm value	<b>HSH</b>	°F	1	10	40	54
40018	High SH alarm delay time	<b>HSD</b>	Sec	1	1	15	3
40019	Clear high SH alarm	<b>HSF</b>	°F	1	7	37	49
40021	Freeze prevention alarm mode	<b>Fr</b>	0=No use , 1= automatic return, 2=manual return				0
40022	Freeze prevention alarm value	<b>FrE</b>	°F	1	-40	40	32
40023	Freeze prevention alarm delay time	<b>FrD</b>	Sec	1	5	200	30
40024	Clear freeze prevention alarm	<b>FrF</b>	°F	1	35	109	37
40025	Select pumpdown function and delay time	<b>Pd</b>	Sec	1	0	180	OFF (-1)
40026	Pressure set-point for stopping pumpdown	<b>PdP</b>	PSIG	1	-7	261	7
40027	Pressure low limit alarm mode	<b>LP</b>	0=No use , 1= automatic return, 2=manual return				0
40028	Pressure low limit alarm value	<b>LoP</b>	PSIG	1	-12	256	0
40029	Low limit pressure alarm delay time	<b>LPd</b>	Sec	1	5	200	5
40030	Clear low limit pressure alarm	<b>LPF</b>	PSIG	1	3	261	4

\*Default as displayed on controller menu. Modbus address value in parenthesis.

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### PARAMETERS (continued)

Menu 2 = **2\_Pr**

MODBUS Address	Description	Code	Unit	Step	Min.	Max.	Default*
40061	Password	<b>PCd</b>	/	1	0	999	5
40062	Refrigerant	<b>rFY</b>	0=R-22, 1=R-404A, 2=R-410A, 3=R-134a 4=R-407C 5=R-507 6=R-1234ze 7=R-1234yf 8=R-290 9=R-450A 10=R-513A 11=R-448A 12=R-449A 13=R-452A 14=R-744 (CO2) 15=R-744 (N2O) 16=R-32 17=R-425fa 18=R-23 19=R-407A 20=R-407F 21=R-124 22=R-717 23=R-407H 24=R-454C 25=R-455A				0
40063	Pressure sensor MAX. range	<b>PSH</b>	PSIG	1	-199	999	290
40064	Pressure sensor MIN. range	<b>PSL</b>	PSIG	1	-199	999	0
40065	Pressure sensor offset correction	<b>PCr</b>	°F	1	-99	99	0
40066	Temperature sensor offset correction	<b>tCr</b>	°F	0.1	-19.9	19.9	0.0 (0)
40069	Jerk control ratio (Max acceleration of the valve)	<b>JEr</b>		0.1	0.1	100	100 (1000)
40070	EEV open ratio upper limit	<b>oPH</b>	%	1	0	100	100
40071	EEV open ratio lower limit	<b>oPL</b>	%	1	0	100	0
40072	Sensor input filter time	<b>oI</b>	/	0.1	0.1	99.9	1.0 (10)
40073	Manual control open ratio (0= Off = Automatic control)	<b>Ucr</b>	%	0.1	0	100	OFF (-1)
40076	Display mode	<b>dI5</b>	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	<b>rnE</b>	0=Always run, even if run signal is off 1=Digital input, when run signal is off valve close 2=MODBUS Communication Run				1
40078	Communication ID setup	<b>i d</b>	/	1	1	254	1
40079	Communication speed setup	<b>bdr</b>	bits/s		48 (0) = 4800 96 (1) = 9600 192 (2) = 19200 384 (3) = 38400		96 (1)
	Enter the password here to reset the device to factory settings (Default password is 5)	<b>rSt</b>	/	1	0	999	0

\*Default as displayed on controller menu. Modbus address value in parenthesis.

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### PARAMETERS (continued)

Menu 3 = 3.Pr

MODBUS Address	Description	Code	Unit	Step	Min.	Max.	Default*
40041	Apply electricity to valve at all times. Default OFF because Sanhua self-hold technology can de-energize the stator while maintaining a constant valve position.	E8H			0=OFF 1=ON		0
40042	Expansion valve excitation type	E8d		1-2 (0) =1-2 phase excitation: LPF, DPF(TS1), DPF(S03) 2 (1) =2 phase excitation: DPF(0), DPF(U)			1-2 (0)
40043	Expansion valve total pulse	E8P	Pulse	1	0	999	50
40044	Expansion valve open pulse	E8o	Pulse	1	0	999	30
40045	EEV drive speed (PPS)	E8S		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)

\*Default as displayed on controller menu. Modbus address value in parenthesis.

### Alarm Mode

Code	Description	Code	Description
S <del>t</del> P	RUN signal disconnected	~oP	MOP high pressure alarm
PoP	Pressure transmitter disconnected	L <del>o</del> P	LOP low pressure alarm
P <del>S</del> t	Pressure transmitter short circuit	H <del>S</del> H	High superheat alarm
t <del>o</del> P	Temperature sensor disconnected	L <del>S</del> H	Low superheat alarm

NOTE: S~~t~~P is not an alarm, just reminding the compressor that the RUN signal is disconnected



### CAUTION

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 environment condition: a. Indoor b. Pollution Degree 2 c. 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 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 be AWG No. 20 Or above(0.50mm).
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 radio, high capacity SCR controller).