EEV Controller for Bipolar Step Motor

EVC20

User's Manual

DOTECH
SENSING & CONTROL

DOTECH INC.

INNOBIZ
www.dotech21.com

※ 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 condition.
   ① Indoor ②Pollution Degree 2 ③At 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 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.
6. Please be understood that if this product is dismantled or modified discretionary, after sales service will not be able to be provided.
7. 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(0.50mm²).
8. In order to prevent it from an inductive noise, please maintain the high-voltage wire and power wire separated.
9. Please avoid installing the product in a place where a strong magnetism, noise, severe vibration and impact exist.
10. When extending the sensor wire, use a shield wire and do not extend it unnecessary long.
11. The sensor wire and signal wire should be away from the power and load wires using conduits separately installed.
12. 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)
13. Product's damages other than those described in the guarantee conditions provided by the manufacturer shall not be responsible by us.
14. If this unit is used to control machineries (Medical equipment, vehicle, train, airplane, combustion apparatus, entertainment, processing and transportation equipment, elevator and various safety device etc.) enabling to effect on human or property, it is required to install fail-safe device.

※ The Aforementioned precautions must be observed, and if you fail to do so, it may cause a product's breakdown.
※ The specifications, dimensions, and etc. are subject to change for enhancement without a prior notice.

1. Summary

※ Special feature

The EVC20 is the controller for the latest generation of electronic expansion valve control, and is available in a variety of functions in the cooling system. The EVC 20 consists of a controller module, pressure sensor, temperature sensor, and electronic expansion valve, and has very precise adjustment. The EVC20 can be used for various operating configurations of refrigeration, heat pumps and showcases.

: Ordering guide

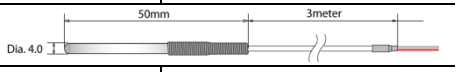
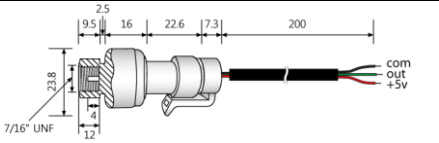
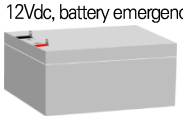
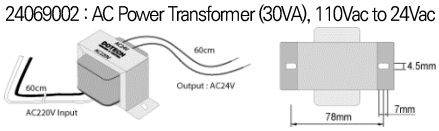
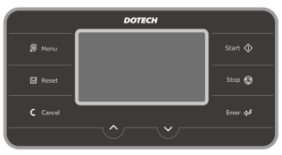
Model	Description
EVC20-00	Basic Model
EVC20-R4	RS485 Communication (Modbus RTU)

※ Temperature and pressure sensors are sold separately.

: Technical Specifications

	Description
Dimensions	70(W)mm X 103(H)mm X 58(D)mm
Power	24 Vac +10%/-15% , 50 / 60 Hz 24 Vdc
Power consumption	MAX 6W at 24 Vdc
Display	FND, LED
Connection	Screw Bolt Connector, wire range : 24~12 AWG
Input	Pressure sensor 1 point / Temperature sensor 2 point Digital Input 1 point / External Reference signal 1 point
Output	Relay Output 1 Point (250 Vac / 30 Vdc / 5 A) EEV(bipolar) Output 1point
Compatible EEV	DANFOSS : ETS ALCO : EX4/5/6/7/EX8 CAREL : ExV/E2VP SPORLAN : SEI/SEH(I)/SER(I)
Operation	Temperature: - 10 ~ 50 ℃, Humidity: Below 90%RH
Storage	Temperature: - 20 ~ 60 ℃, Humidity: Below 90%RH

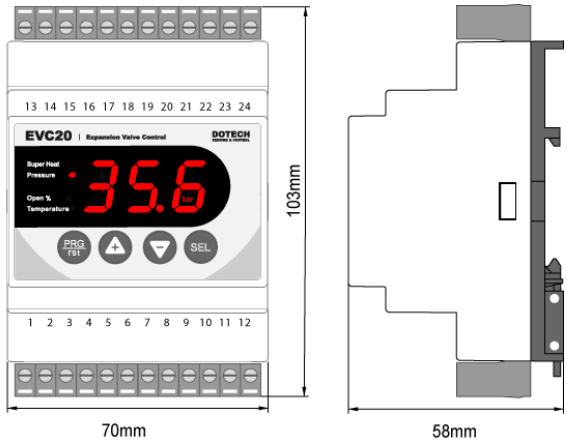
: Accessories (Options)

Model	Description	
DPR-PT1K-P4D50L*3M	Sensor type	PT1000 Ω
	Cable	2 C X 0.5 mm
	Protection degree	IP67
	Accuracy	±0.3 ℃ at 25 ℃
	Measure range	-100 to 120 ℃
		
DP512-G7 (-1~15bar)	Sensor power	5 Vdc ±5 %
	Signal output	0.5 ~ 4.5 Vdc (Ratiometric)
	Measure range	-1 ~ 15 bar
	Operating temp.	-40 ~ 120 ℃
	Protection degree	IP65
	Accuracy	± 0.25 % F.S (Non-Linearity, Repeatability, Hysteresis)
	Connector	7/16" UNF / FEMALE
	Wiring	Black(com), Green(out), Red(+5v)
		
EVBAT-12V	12Vdc, battery emergency power 	
24069001 24069002	24069001 : AC Power Transformer (30VA), 220Vac to 24Vac 24069002 : AC Power Transformer (30VA), 110Vac to 24Vac 	
CPAD-EVC20	Dimensions	156(W) X 82(H) X 20(D) mm ※ Panel Cutout: 149.5(W) X 75.5(H) mm
	Power	8 ~ 12 Vdc
	Communication,	RS485 MODBUS MASTER (9600BPS)
	Display	128 X 64 pixel, LED Backlight
	Button	Touch Keypad Switch (8EA)
	Protection degree	IP65 (Front Case)
	Operation	Temp. -10 ~ 60℃, No condensation
	Storage	Temp. -20 ~ 80℃, No condensation
		

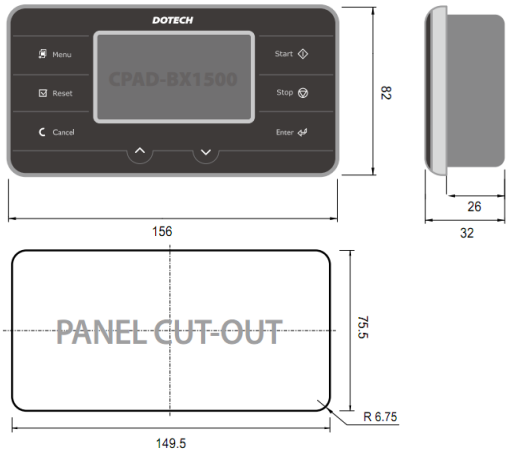
2. Install

: Dimensions

Controller : EVC20

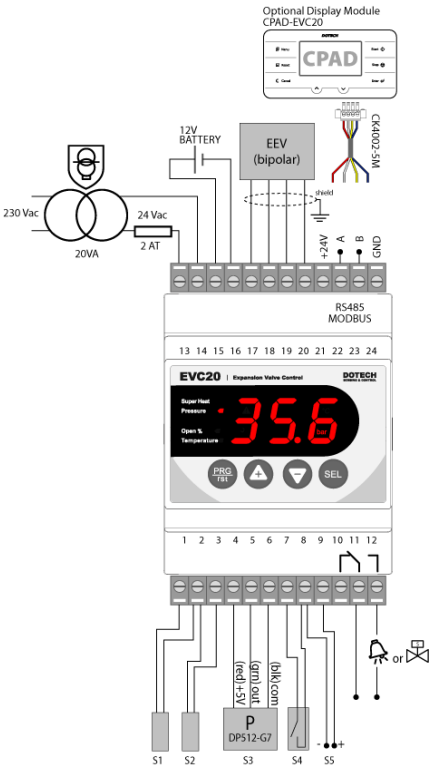


Remote Display : CPAD-EVC20



※ This structure can be installed using DIN rail attachment.

: Wiring



No.	Definition	Description
1	S1	Temp. sensor input
2	GND	Temp. sensor common
3	S2	Temp. sensor input for thermostat
4	S3	Power supply for pressure sensor, 5Vdc output
5		Pressure sensor input
6		Pressure sensor common
7	S4	Run/Stop signal input
8	GND	Signal common
9	S5	External reference signal input
10	RL1	Aux. relay (RL1) output, Normal close signal
11		Aux. relay (RL1), common output
12		Aux. relay (RL1) output, Normal open signal
13	POWER	G: Power input 24 Vac / +24 Vdc(Live)
14		G0: Power input 24 Vac / −24 Vdc (Nertral)
15	VBAT	Battery power +12Vdc
16		Battery power −12Vdc
17	EEV (bipolar)	Step motor valve (+ Phase A)
18		Step motor valve (− Phase A)
19		Step motor valve (+Phase B)
20		Step motor valve (−Phase B)
21	+24V	+24V Power output
22	TRX+	RS485 Communication A TRX+
23	TRX−	RS485 Communication B TRX−
24	GND	Signal common

1) Connection of emergency battery

We recommend users to use emergency battery of 12V~14V to close the valve completely even if main power shuts off (No need to use if users are using solenoid liquid valve in front of expansion valve). CLE will be displayed during the process of closing valve by emergency battery after main power shuts off.

2) Command of Run / Stop

S4 signal is short circuited (ON), it will start to run. In case of opening (OFF), operation will be stopped and expansion valve is closed immediately.

3) Remote display connection

It can be used with remote display for both Korean and English which is applied graphic LCD panel.

4) Utilization of auxiliary (RL1)

Auxiliary relay can be used for alarm or compressor ON/OFF or liquid valve ON/OFF.
In case of Pd= Off, use it as an alarm purpose.
If users enter pumpdown time (1~180 sec), it will be used for ON/OFF signal of compressor.
In case of using thermostat function, Pd parameter will be ignored and auxiliary relay (RL1) output will be used for thermostat control output..

5) Connection of electronic expansion valve

It uses bipolar type expansion valve and users can designate it at expansion valve model of parameter 2 group.

EVC20	DANFOSS ETS	ALCO EX4/5/6/7/8	CAREL ExV/E2VP	SPORLAN SEI/SHE(I)/SER(I)
17 (A+)	White	White	Yellow	Black
18 (A−)	Black	Black	White	White
19 (B+)	Red	Brown	Brown	Red
20 (B−)	Green	Blue	Green	Green

3. User Interface

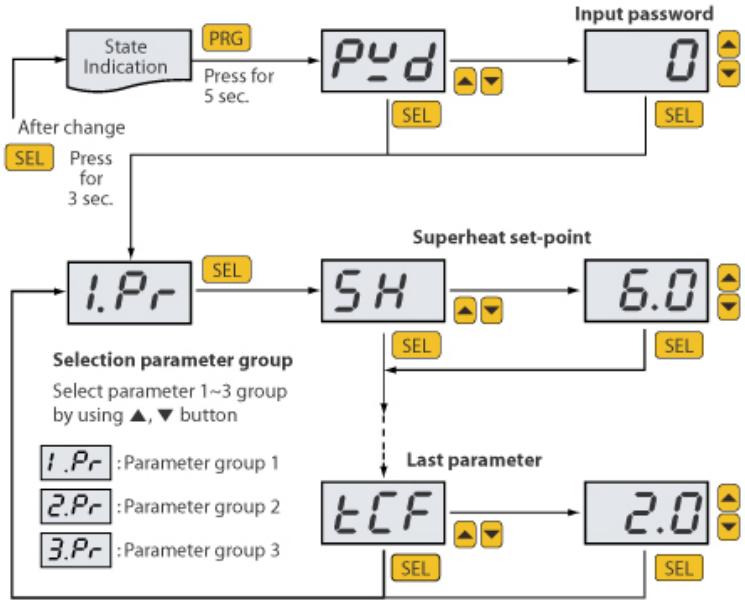
: Constitution (Function of Display Lamp and Button)

LED	
Super Heat	When displaying superheat
Pressure	When displaying pressure
Open %	When displaying valve open ration
Temperature	When displaying temperature
℃, bar	Display the unit of temp. / pressure
⚠	Lighting when warning (Flickering when manual return alarm occurs)
🔧	Flickering at manual open ratio control
Button	
PRG rst	Parameter change mode
▲	Increase or upward
▼	Decrease or downward
SEL	Select and save

4. Parameter

: Program change

It is necessary to input password to change parameter. Please press and hold PRG button for more than 5 seconds to input password. (If password is not correct, state check is only available, but can't change parameters.)



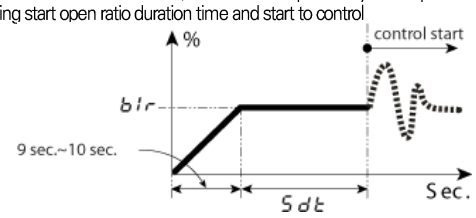
Automatically return to state indication mode unless any key input for more than 3 minutes during setup. Just input password once, it does not ask password for 30 minutes.

: Parameter 1 group (Menu 1 = *I .Pr*)

Address	Description	Code	Unit	Step	Min.	Max.	Default	Custom
4 0001	Superheat set-point	SH	K	0.1	0.5	30	6.0	
4 0003	Start open ratio ※1	bir	%	1	0	100	0	
4 0004	Start open ratio duration time ※1	Sdt	Sec.	1	0	300	0	
4 0005	P: Proportional gain ※2	dFr	%	0.1	0.1	99.9	3.0	
4 0006	I: Integral time ※3	Irt	Sec.	1	0	999	120	
4 0007	D: Derivative time※3	drt	Sec.	1	0	999	30	
4 0008	Low superheat alarm mode	LS	0= No use,	1= Automatic return		2= Manual return	1	
4 0009	Detect low superheat alarm ※4	LSH	K	0.1	0.5	30.0	0.5	
4 0010	Low superheat alarm delay time	LSd	Sec.	1	1	300	15	
4 0011	Detect low superheat alarm	LSF	K	0.1	1.0	30.5	3.0	
4 0012	Max. operating pressure alarm mode (MOP) ※5	MP	0= No use		1= Manual return		1	
4 0013	MOP alarm detection pressure	MOP	bar	0.1	-1	50	9.0	
4 0014	MOP alarm detection delay time	MPd	Min.	1	1	15	1	
4 0015	MOP alarm disable pressure	MPF	bar	0.1	-1	50	8.0	
4 0016	High superheat alarm mode	HS	0= No use,	1= Automatic return		2= Manual return	0	
4 0017	Detect high superheat alarm ※6	HSH	K	0.1	10.0	40.0	30.0	
4 0018	High superheat alarm delay time	HSd	Sec.	1	1	600	3	
4 0019	Clear high superheat alarm	HSF	K	0.1	7.0	37.0	27.0	
4 0021	Freezing protection alarm mode	Fr	0= No use,	1= Automatic return		2= Manual return	0	
4 0022	Detect freezing protection alarm※7	FrE	℃	1	-40	40	0	
4 0023	Freezing protection alarm delay time	Frd	Sec.	1	5	200	30	
4 0024	Clear freezing protection alarm	FrF	℃	1	-37	43	3	
4 0025	Select pumpdown function and delay time ※8	Pd	Sec.	1	0	180	oFF(-1)	
4 0026	Pumpdown finish pressure	PdP	bar	0.1	-0.5	18.0	0.5	
4 0027	Pressure low limit alarm mode	LP	0= No use,	1= Automatic return		2= Manual return	0	
4 0028	Detect low limit pressure alarm ※9	LoP	bar	0.1	-0.8	17.7	0.0	
4 0029	Low limit pressure alarm delay time	LPd	Sec.	1	5	200	5	
4 0030	Clear low limit pressure alarm	LPF	bar	0.1	-0.5	18.0	0.3	
4 0036	Thermostat function ※10	tC	0=OFF			1=ON	0	
4 0037	Thermostat function -Set point	tCP	℃	0.1	-200.0	200.0	3.0	
4 0038	Thermostat function - Control deviation	tCF	K	0.1	0.1	99.9	2.0	

※1 Start open ration and start open ratio duration time

If switch of S4 is turned on, valve will be opened by start open ratio. After that maintain it during start open ratio duration time and start to control



※2 Setup proportional gains

Proportional gain makes a decision on control input of valve open ration according to superheat change.
If proportional gain is 3.0%, control input of valve open ration is 3.0% per 1.0K of superheat.
If change of valve open ration is fickle, decrease proportional gain.
If change of valve open ration is slow, increase proportional gain more.
Valve open ratio [%] = Start open ratio + (proportional gain X tolerance)

※3 Integral time and derivative time

Integral time: Input time which is applied to control for accumulated volume of tolerance.
Derivative time: It is for control momentary reacting volume for tolerance, basically set it to '0'.
If vibration time is longer than integral time

1. Integral time increases 1.5 times of vibration time.
2. Wait until system is stable.
3. If vibration is lasting, decrease integral time 30%.
4. Wait until system is stable
5. Repeat 3 and 4 until vibration is removed.

If vibration time is shorter than integral time

1. Decrease proportional gain 30%.
2. Wait until system is stable.
3. Repeat 1 and 2 until vibration is removed.

※4 Detect low superheat alarm

This alarm is caused by superheat is low. Once superheat begins to low, expansion valve start to close more.
If low superheat alarm is occurred, expansion valve is fully closed.

※5 Maximum operating pressure alarm mode (MOP)

Once maximum operating pressure alarm is occurred, expansion valve is fully closed. Please press RST button to remove alarm.

※6 Detect high superheat alarm

This alarm is caused by superheat is high. Once superheat begins to high, expansion valve start to open more.
If high superheat alarm is occurred, expansion valve is fully closed.

※7 Detect freezing protection alarm

If freezing protection alarm is occurred caused by temperature of evaporator is getting low, expansion valve is fully closed.

※8 Pumpdown function

If input pumpdown delay time of 0 to 180 sec, auxiliary relay (RL1) outputs it as compressor control purpose.
Switch (S4) turns on, RL1 start to run
Switch (S4) turns off, RL1 will be turned off. (Less than pumpdown finish pressure)
But even if pumpdown delay time passed, unless it is not yet pumpdown finish pressure, RL1 will be turned off immediately.

※9 Detect low limit pressure alarm

If pressure is dropping up to less than LOP for more than LPd, low limit pressure alarm will be occurred and expansion valve is fully closed.

※10 Thermostat function

If thermostat function is active, it can be made possible to run / stop by S2 temperature.

: Parameter 2 group (Menu 2 = 2.Pr)

Address	Description	Code	Unit	Step	Min.	Max.	Default	Custom
4 0042	Pressure unit	n41	0= bar		1= psi		0	
4 0043	Temp. unit	n42	0= °C		1= °F		0	
4 0048	Selection of operation mode	oPr	0= Superheat control 1= Temperature control 2= Pressure control 3= Driver mode 4= Manual control mode				0	
4 0049	Control direction for temp. pressure ※1	dir	0=Forward direction(Heating mode) 1= Reverse direction(Cooling mode)				0	
4 0050	External reference signal input ※2	rEF	0= oFF 1= 4~20mA 2= 0~20mA	3= 0~10V 4= 0~5V		5= 2~10V 6= 1~5V	oFF(0)	
4 0051	External reference signal input range (20mA)	rFH	-	1	-199	999	50	
4 0052	External reference signal input range (4mA)	rFL	-	1	-199	999	-50	
4 0053	Selection of expansion valve model ※3	n52	0= 1= DANFOSS ETS12.5~25B 2= DANFOSS ETS50B 3= DANFOSS ETS100B 4= DANFOSS ETS250 5= DANFOSS ETS400 6= ALCO EX4.. 7= ALCO EX5 8= ALCO EX6 9= ALCO EX7 10= ALCO EX8 330 STEP/SEC 11= ALCO EX8 500 STEP/SEC 12= SPORLAN SEI 0.5~11.. 13= SPORLAN SER 1.5~20.. 14= SPORLAN SEI 30 15= SPORLAN SEH(I) 50/100/175.. 16= SPORLAN SER(I) -G / -J / -K, SER-B / -C / -D 17= CAREL ExV (E2V, E3V, E4V, E5V, E6V, E7V) 18= CAREL E2VP 19=				1	
4 0054	Total step number of expansion valve ※4	n53	-	1	0	999	262	
4 0055	Drive speed of expansion valve ※5	n54	-	1	0	999	250	

※1 Control Direction for Temperature and Pressure Control

※2 Use external reference signal in SET-POINT

If users choose to use external reference signal input, automatically use external reference signal in SET-POINT. But, signal input of S5 is just under normal state, this function will be operated.

※3 Selection of expansion valve

Just select expansion valve, total step number (n52) and drive speed (n54) value will be automatically changed.

※4 Total step number of expansion valve

It will be automatically setup, just select expansion valve model.

Please don't change it if you are not an expert, because it comes with their own unique qualities.

※5 Drive speed of expansion valve

It will be automatically setup, just select expansion valve model.

Please don't change it if you are not an expert, because it comes with their own unique qualities..

: Parameter 3 group (Menu 3 = 3.Pr)

Address	Description	Code	Unit	Step	Min.	Max.	Default	Custom
4 0061	Password ※1	PCd	-	1	0	999	5	
4 0062	Type of refrigerant	rFY	0= R22 1= R134A 2= R404A 3= R407C	4= R410A 5= R717 6= R23 7= R507C	8= HFO1234ze 9= R744 10= R407a 11= R407f	12= R507a 13= R245FA	0	
4 0063	Pressure sensor max. range(at 4.5V) ※2	PSH	bar	0.1	-14.5	99.9	15.0	
4 0064	Pressure sensor min. range (at 0.5V) ※2	PSL	bar	0.1	-14.5	99.9	-1.0	
4 0065	Press. sensor (S3) offset correction ※3	PCr	K	0.1	-9.9	9.9	0.0	
4 0066	Temp. sensor (S1) offset correction ※3	tCr	K	0.1	-19.9	19.9	0.0	
4 0067	Temp. sensor (S2) offset correction ※3	oO6	K	0.1	-19.9	19.9	0.0	
4 0069		uEY		0.1	0.1	9.9	oFF(10.0)	
4 0070	Expansion valve open ratio upper limit ※4	oPH	%	1	0	100	100	
4 0071	Expansion valve open ratio lower limit ※4	oPL	%	1	0	100	0	
4 0072	Sensor input filter time ※6	oII	-	0.1	0.1	10.0	1.0	
4 0073	Expansion valve compulsory open ration ※5	UCr	%	0.1	0.0	100.0	oFF(-1)	
4 0076	Display mode ※7	dIS	0= 1~4 Rotation 1= Superheat 2= Probe S3 Pressure 3= Current open ratio of expansion valve 4= Probe S1 temperature 5= Display superheat set point** 6= Probe S2 Temperature display 7= Display thermostat set point** 8= Saturation temperature display 9= Display expansion valve open command 10= External reference signal (S5) display 11= Digital input state display(on/off) 12= External reference signal (S5) Voltage display 13= External reference signal (S5) current display 14= Display emergency battery connection state				1	
4 0077	Run/Stop method	rnt	0= Always run 1= Digital input (S4) 2= Communication run (Remote)				1	
4 0078	Communication ID setup	Id	-	1	1	254	1	
4 0079	Communication speed (BPS) setup	bdr	48(0)= 4800	96(1)= 9600	192(2)= 19200	384(3)= 38400	96	
	Initialization ※8	rSt	-	1	0	999	0	

※1 Password

It is necessary to input password to change or initialize parameters and default value is "5".
Be sure to take notes not to forget or loss it after changing password.

※2 Setup max. and min. range of pressure sensor

Setup maximum and minimum range of pressure sensor. Pressure sensor is a ratiometric type of 0.5~4.5V.

Default value before shipment is 1~15bar

※3 Setup pressure sensor offset correction

Users can input offset correction value for pressure sensor, temperature sensor and input error. It was set 0.0 as a default value.

※4 Input upper and lower limit of expansion valve open ration

In case of controlling normally, expansion valve can't be opened more than upper limit of open ration and can't be closed less than lower limit of open ration. Default values before shipment are 100% for upper limit and 0% for lower limit respectively.

※5 Expansion valve compulsory open ratio

If users want to temporarily control expansion valve by designated open ratio while controlling normally. Default value before shipment is OFF.

※6 Sensor filter input time

Only expert can setup this parameter. If sensor input is excessively unstable, increase filter value and make it stable. Default value is 1.0 sec.

※7 Display mode

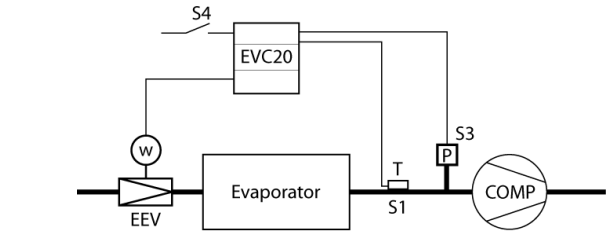
Select parameters which are generally displayed

※8 Initialization

If password is entered, parameters will be initialized as an default value before shipment.

5. Control mode

: Superheat control



In most cases, it would aim to control superheat.

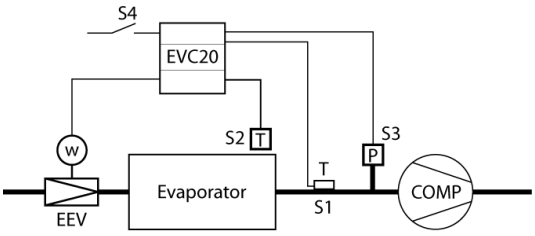
Item	Description	Item	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC20	EEV controller
S1	Temp. sensor of evaporator outlet	S4	Run/Stop switch
S3	Suction pressure sensor of compressor		

Application parameter

– Operation mode selection is set to superheat control mode (oPr = 0)

Function	Code	Min.	Max.	Default
Superheat set-point	SH	0.5	30	6.0 K
Start open ratio	bir	0	100	0 %
Start open ration duration time	Sdt	0	60	0 Sec.
P: Proportional gain	dFr	0.1	50.0	3.0 %
I: Integral time	Irt	0	999	120 Sec.
D: Derivative time	drt	0	999	30 Sec.

: Superheat and on/off control



Item	Description	Item	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC20	EEV controller
S1	Temp. sensor of evaporator outlet	S4	Run/Stop switch
S3	Suction pressure sensor of compressor	S2	Temperature sensor for On/Off control

Application parameter

– Operation mode selection is set to superheat control mode (oPr = 0)

Function	Code	Min.	Max.	Default
Superheat set-point	SH	0.5	30	6.0 K
Start open ratio	bir	0	100	0 %
Start open ration duration time	Sdt	0	60	0 Sec.
P: Proportional gain	dFr	0.1	50.0	3.0 %
I: Integral time	Irt	0	999	120 Sec.
D: Derivative time	drt	0	999	30 Sec.
Thermostat function	0= OFF		1= ON	0
Thermostat function, set point	tCP	–200	200	3.0 ℃
Thermostat function, control deviation	tCF	0.1	99.9	2.0 K

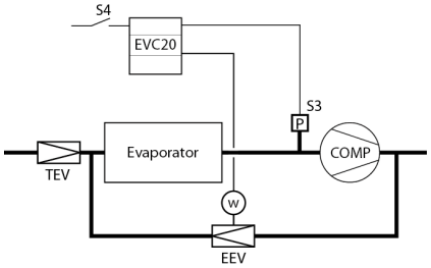
If using thermostat function, auxiliary relay (RL1) is output for cooling control by measuring temperature of S2 temp. sensor.

In case of setting tC= 1, thermostat function will start. Then input control deviation at tCF after entering set point at tCP.

If output of auxiliary relay (RL1) is OFF, it will stop superheat control and expansion valve will be closed immediately.

At this time, output of auxiliary relay (RL1) won't be use for alarm output function or compressor control output for pumpdown.

: Pressure control (Hot gas by-pass type)



Item	Description	Item	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC20	EEV controller
S3	Temp. sensor of evaporator outlet	S4	Run/Stop switch
TEV	Thermostatic expansion valve		

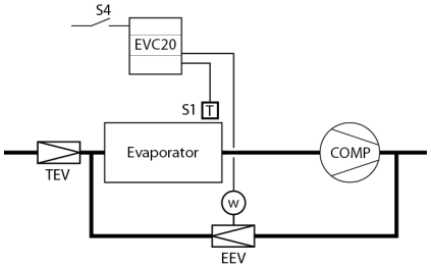
Application parameter

- Operation mode selection is set to pressure control mode (oPr = 2), control direction is set to heating mode (dir = 0)

Function	Code	Min.	Max.	Default
Suction pressure set point**	SH	-1	+50	6.0 bar
Start open ratio	bir	0	100	0 %
Start open ration duration time	Sdt	0	60	0 Sec.
P: Proportional gain	dFr	0.1	50.0	3.0 %
I: Integral time	Irt	0	999	120 Sec.
D: Derivative time	drt	0	999	30 Sec.

** Parameter will be changed and applied from superheat set point to suction pressure set point.

: Temperature control (Hot gas by-pass)



It will be used when controlling temperature of control object accurately by adjusting by-pass amount of hot gas.

Item	Description	Item	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC20	EEV controller
S1	Temp. sensor of evaporator outlet	S4	Run/Stop switch
TEV	Thermostatic expansion valve		

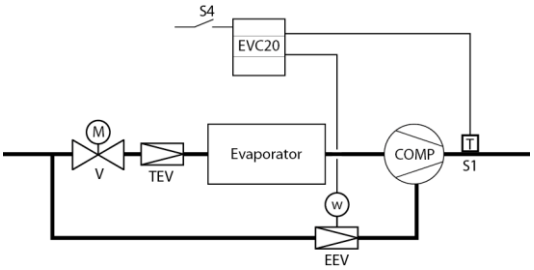
Application parameter

- Operation mode selection is set to temperature control mode (oPr = 1), control direction is set to heating mode(dir = 0)

Function	Code	Min.	Max.	Default
Set point for control target**	SH	-100	+100	6.0 ℃
Start open ratio	bir	0	100	0 %
Start open ration duration time	Sdt	0	60	0 Sec.
P: Proportional gain	dFr	0.1	50.0	3.0 %
I: Integral time	Irt	0	999	120 Sec.
D: Derivative time	drt	0	999	30 Sec.

**Parameter will be changed and applied from superheat set point to temperature set point of control object.

: Temperature control (Liquid injection type)



It will be used when controlling discharge temperature of control object accurately by adjusting liquid injection amount.

Item	Description	Item	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC20	EEV controller
S1	Temp. sensor of evaporator outlet	S4	Run/Stop switch
TEV	Thermostatic expansion valve	V	Solenoid valve

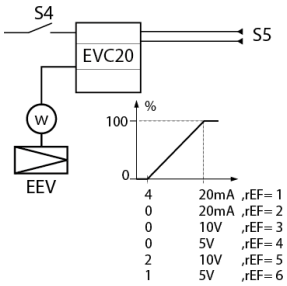
Application parameter

- Operation mode selection is set to temperature control mode (oPr = 1), control direction is set to cooling mode (dir = 1)

Function	Code	Min.	Max.	Default
Set point for control target**	SH	-100	+100	6.0 ℃
Start open ratio	bir	0	100	0 %
Start open ration duration time	Sdt	0	60	0 Sec.
P: Proportional gain	dFr	0.1	50.0	3.0 %
I: Integral time	Irt	0	999	120 Sec.
D: Derivative time	drt	0	999	30 Sec.

**Parameter will be changed and applied from superheat set point to temperature set point of control object

: Drive function



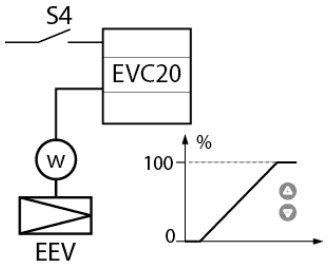
Item	Description	Item	Description
EEV	Electronic expansion valve	EVC20	EEV controller
S4	Run/Stop switch		

Application parameter

- To use drive function of expansion valve using external reference signal, parameter change from operation mode (oPr = 3) to drive mode. And then should choose type of external reference signal input (rEF). At this time, it will be operated when S4 should be ON. Expansion valve will be closed immediately when turning OFF S4.

Function	Code	Min.	Max.	Default
Selection of operation mode 0= Superheat control 1= Temperature control 2= Pressure control **3= Driver mode** 4= Manual control mode	oPr	0	4	0
External reference signal input 0(oFF)= No use 2= 0~20mA 4= 0~5V 6= 1~5V 1= 4~20mA 3= 0~10V 5= 2~10V	rEF	0	6	0

: Manual control mode



Item	Description	Item	Description
EEV	Electronic expansion valve	EVC20	EEV controller
S4	Run/Stop switch		

Application parameter

Users can maintain valve open ration arbitrarily. Input it using +/− button after setup it to operation mode (oPr = 4). At this time all LED on the left side will be flickering.
In case of manual control mode, S4 should be ON. Expansion valve will be closed immediately when turning OFF S4.

Function	Code	Min.	Max.	Default
동작모드선택	oPr	0	4	0
0= Superheat control 1= Temperature control 2= Pressure control 3= Driver mode 4= Manual control mode				

: State message

코드	설명
oFF	Stop state
CAL	Expansion valve initialization
CLE	Process of closing valve by emergency battery power
Pdn	Pumpdown operation

: Alarm Message

No.	Description	Code	Parameter	Conditions for occurrence	Ways to clear
1	Pressure sensor fault	PEr	–	If pressure sensor is disconnected or short circuited	If pressure sensor is normal
2	Reference signal fault	FEr	–	If reference signal is disconnected or short circuited	If reference signal is normal
3	Temp. sensor disconnection	toP	–	If temperature sensor is disconnected	If temperature sensor is normal
4	Temp. sensor short circuit	tSt	–	If temperature sensor is short circuited	
5	S2 sensor disconnection	2oP	–	If S2 temperature sensor is disconnected	If S2 temperature sensor is normal
6	S2 sensor short circuit	2St	–	If S2 temperature sensor is short circuited	
7	Detect ñoP temp	ñoP	ñP = 1	If present pressure remains higher than set value of ñoP during ñPd (ñoP alarm detection delay time)	System check is needed It becomes a clear condition if present pressure value is less than set value of ñPF.
8	Detect lower limit pressure alarm	LoP	LP = 1	If present pressure remains lower than set value of LoP during LdP (Low limit pressure alarm delay time)	It will be caused by lack of refrigerant. It becomes a clear condition if present pressure is more than set value of LPF.
		LoP Flickering	LP = 2		
9	Detect high superheat alarm	HSH	HS = 1	If present super heat remains higher than set value of HSH during HSd (High superheat alarm delay time)	System check is needed It becomes a clear condition if preset super heat is less than set value of HSF
		HSH Flickering	HS = 2		
10	Detect low superheat alarm	LSH	LS = 1	System check is needed It becomes a clear condition if preset super heat is less than set value of HSF	System check is needed It becomes a clear condition if present super heat is more than set value of LSF
		LSH Flickering	LS = 2		
11	Detect freezing protection alarm	FrE	Fr = 1	If present temperature remains lower than set value of FrE during Frd (Freezing protection alarm delay time)	Evaporator temperature is low. System check is needed It becomes a clear condition if present temperature is more than set value of FrF.
		FrE Flickering	Fr = 2		

※ Alarm which is flickering needs to reset by manual. Press PRG/RST button two times quickly.
※ Auxiliary relay (RL1) will be outputted if alarm is occurred. (In case of setting for alarm output relay)

6. Communication Protocol

: Specifications of communication

Item	Description
Transmission line connection	Multiple line
Communications method	RS485 (2-wire, half-duplex)
Baud-rate	BPS default 9600 BPS
Parity, Data, Stop bit	None, 8 Data, 1 Stop
Protocol Type	Modbus RTU MODE
Function Code	Read HOLD REGISTERS (0x03) / Preset Single Register (0x06)
Maximum Read Word	127 Word
Media Type	BELDEN 9841 / 9842, LG LIREV-AMESB
Poll interval	100msec

: STATUS Communication Table

Address	Function	Unit	Type	Size (Word)	EVC20	MMI	Custom
4 0073	EEV compulsory open ratio (※1)	%	Analog	INT 16	0.0 ~ 100.0	X 10	
4 0099	Reset command	-	Analog	INT 16	0 : OFF	1 : ON	
4 0101	Run / Stop input (※2)	-	Analog	INT 16	0 : Stop	1 : Run	
4 0102	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	
4 0110	Alarm status	-	Analog	INT 16	Refer to below bit		
Bit0	Press. sensor alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit1	Temp. sensor disconnection	-	Digital	Bit	0 : OFF	1 : ON	
Bit2	Temp. sensor short circuit	-	Digital	Bit	0 : OFF	1 : ON	
Bit3	Temp. sensor input for thermostat alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit4	Temp. sensor input for thermostat disconnection	-	Digital	Bit	0 : OFF	1 : ON	
Bit5	External reference signal alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit8	MOP(MoP) alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit9	LOP(LoP) alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit10	HSH(HSH) alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit11	LSH(LSH) alarm	-	Digital	Bit	0 : OFF	1 : ON	
Bit12	FRE(FrE) alarm	-	Digital	Bit	0 : OFF	1 : ON	
4 0111	Present Superheat	K	Analog	INT 16		X 10	
4 0112	Present saturation temperature	℃	Analog	INT 16		X 10	
4 0113	Present pressure	bar	Analog	INT 16	-1.0 ~ 1.0	X 10	
4 0114	Present temperature	℃	Analog	INT 16	-100.0 ~ 100.0	X 10	
4 0116	EEV open ratio	%	Analog	INT 16	0.0 ~ 100.0	X 10	

(※1) Manual control of EEV by communication

Electronic expansion valve will be controlled manually regardless of superheat of present system just by using 0.0 to 100.0% of UCR (electronic expansion valve compulsory open ration)

To lift a UCR (electronic expansion valve compulsory open ration), please input '1' at 4 0073. Then it will be converted into automatic control mode.

But, electronic expansion valve will be closed automatically at the status of stop or alarm

(※2) Run / Stop by communication

※ RMT(Run/Stop) : It will be run or stopped by input of 4 0101 only if run / stop method should be set to communication (2)

MOP **Max. operating pressure alarm mode**

LOP **Lower limit pressure**

HSH **High superheat**

LSH **Low superheat**

FRE **Freezing protection**