

EVC10B Series

USERS MANUAL

DOTECH
 SENSING & CONTROL

DOTECH INC.

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Ansan-si, Gyeonggi-do, KOREA

INNOBIZ

www.dotech21.com

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 ② Pollution Degree 2 ③ 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 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 Above mentioned 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



※ Features

- The most advanced algorithm of precise adaptive PID control over superheat
 - Various valve open control modes: External signal input(4~20mA, 1~5V)
RS485 communication, User setup
 - Quick-Safe to ensure prevention of low and high superheats and protect the system under any conditions
 - Hot gas bypass operation for precise control
 - Compatible with various refrigerants
(R22, R134a, R404a, R407c, R410a, R717, R23)
 - Smart-rail mount design
 - Perfect tech support by a developer (DOTECH)
- EVC10B was developed 100% by Dotech's own creative ideas and technologies.

: Basic specifications

Items	Description
Dimension	72(W)mm X 114(H)mm X 29(D)mm
Power supply	24 Vac +10%/-15% , 50 / 60 Hz & 24 Vdc
Power consumption	MAX 4W at 24 Vdc
Display	FND, LED
Connection	Connector : SXH-0011-P0.6 (HOUSING : XHP)
Input	1P Press. sensor input 1P temp. sensor input 1P Digital input
Output	1P relay output (250 Vac / 30 Vdc / 5 A) 1P EEV(Unipolar) output
Operation	Temp. - 10 ~ 50 °C, Humidity 90 %RH or less
Storage	Temp. - 20 ~ 60 °C, Humidity 90 %RH or less

: Ordering guide

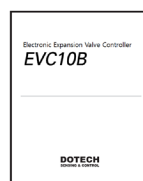
Model name	Description
EVC10B-00	Basic model
EVC10B-R4	Electronic expansion valve controller + RS485 Modbus Comm.

※ Temperature & Pressure sensor should be purchased separately.

: Component


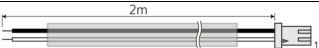
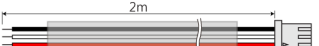



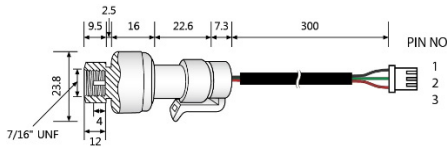
Product



Manual

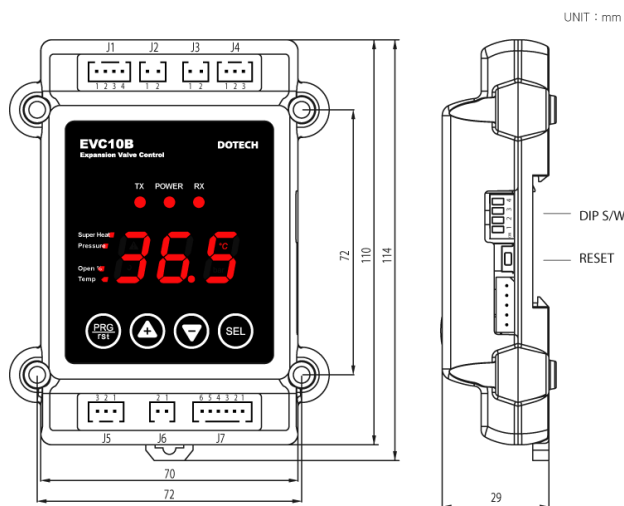
: Accessory

Items	Description	
DPR-TH1-ST-XHP	Sensor type	NTC 5K Ω
	Cable	2 C X 0.5 mm
	Protection level	IP67
	Accuracy	$\pm 0.3\text{ }^{\circ}\text{C}$ at $25\text{ }^{\circ}\text{C}$
	Measuring range	-50 to $50\text{ }^{\circ}\text{C}$
240624S2001		
	240624S2001: AC Power Transformer (30VA), 220Vac to 24Vac	
Connection kit	CK3200-2P	
	CK3200-3P	
	CK3200-4P	

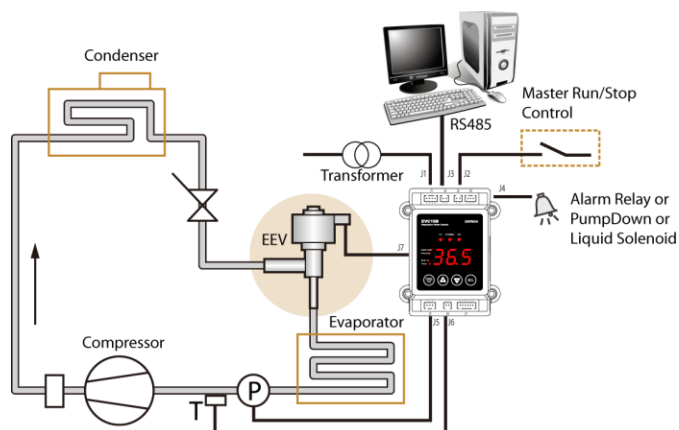
Items	Description	
DP512-G7-XHP ($-1\sim 15\text{bar}$)	Sensor power	5 Vdc $\pm 5\%$
	Signal output	$0.5 - 4.5\text{ Vdc}$ (Ratiometric)
	Pressure measure range	$-1 \sim 15\text{ bar}$
	Operating temperature	$-40 \sim 120\text{ }^{\circ}\text{C}$
	Protection level	IP65
	Accuracy	$\pm 1.0\%$ F.S
	Stability	$\pm 0.5\%$ (Longterm Stability)
	Connector Type	7/16" UNF / FEMALE
Wiring	Black(com), Green(out), Red(+5v)	
		

2. Installation

: Dimensions



: Wiring Diagram



※ It can be installed with rail or using screw (4 ea)

: Terminal

No.	Definition	Description
J1	24 Vac	Control power input port (AC24V)
J2	RUN	Run signal input port (RUN)
J3	RS485	RS485 comm. Input / output port (RS485)
J4	AUX-RLY	Auxiliary relay output port (AUX-RLY)
J5	P-SENS	Pressure sensor input port (P-SENS)
J6	T-SENS	Temperature sensor input port (T-SENS)
J7	EEV	Electronic expansion valve output port (EEV MOTOR)

: Details of terminal

No.	Definition	Description
J1.1	AC / DC 24V	+24V Power input AC24V or DC24V+
J1.2		
J1.3		
J1.4		-24V Power input AC24V or DC24V-
J2.1	RUN	SIG Run / Stop signal input
J2.2		GND Signal common
J3.1	RS485	TRX+ RS485 comm. TRX+(A)
J3.2		TRX- RS485 comm. TRX-(B)
J4.1	AUX-RLY	N.O Auxiliary relay - Normal Open contact
J4.2		COM Auxiliary relay - common
J4.2		N.C Auxiliary relay - Normal Close contact

1) Operation start and stop instruction

If SIG 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) Selection of electronic expansion valve

First of all, EVC10B needs to setup EEV mode to fit features of electronic expansion valve. If EEV mode does not meet operation features of electronic expansion valve, there can be malfunction. Please check it without fail. Operate only number 2 and 3 of DIP SWITCH (DSW). After changing of setting, push RES button on the right of product and restart. Users may input power again.

DIP SW 2	DIP SW 3	MAKER & MODE	SPEC.
OFF	OFF	SANHUA-DPF(Q), DPF(R) JAHWA-SEV, JHEV FUJIKOKI-CAM SAGINOMIYA- UKV,SKV,VKV,PKV,AKV	1-2 PH excitation type 500 PULSE 30 PPS
OFF	ON	SANHUA-DPF(O) FUJIKOKI-EDM GREEN-GV321,521,641	2 PH excitation type 2000 PULSE 100 PPS
ON	ON	Direct input by user	Setup at parameter 3 group

※ In case of DPF(O)-8.0, change set value after altering into user mode.
(DIP SW 2,3 = ON)

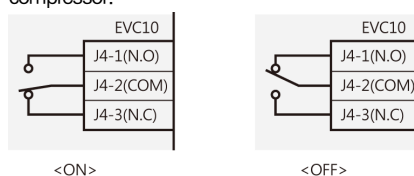
Function	CODE	Min.	Max.	Default	Changed Value
Expansion valve excitation type	Eb4	0	1	2	2
Expansion valve TOTAL PULSE	EbP	100	999	200	250
Expansion valve OPEN PULSE	Ebo	0	999	100	100
Expansion valve DRIVE SPEED (PPS)	Eb5	1	18	1	5

No.	Definition	Description
J5.1	P-SENS	+5V Power output for pressure sensor(+5V)
J5.2		S1 Pressure sensor signal input
J5.3		GND Pressure sensor power signal common
J6.1	T-SENS	S2 Temperature sensor
J6.2		GND Temperature sensor common
J7.1	EEV MOTOR	A EEV phase 1(A)
J7.2		B EEV phase 1(B)
J7.3		A# EEV phase 2(A#)
J7.4		B# EEV phase 2(B#)
J7.5		COM EEV common
J7.6		COM EEV common

2) Utilization of auxiliary relay

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 pump down time (1~180 sec), it will be used for ON/OFF signal of compressor.



4) Selection of control mode

Operation mode	DIP SW		Description
	1	4	
Automatic mode	OFF	OFF	- Superheat control - Possible to operate valve via RS485 comm.
Drive	ON	ON	- Operate valve receiving external signal from J5 port
Manual operation	ON	OFF	- Operate valve using UP/DOWN button. - Possible to operate valve via RS485 comm.
Temp. control	OFF	ON	- Precise temp. control by controlling hot gas bypass

※ It does not detect alarm at drive and manual operation mode.

3. User interface

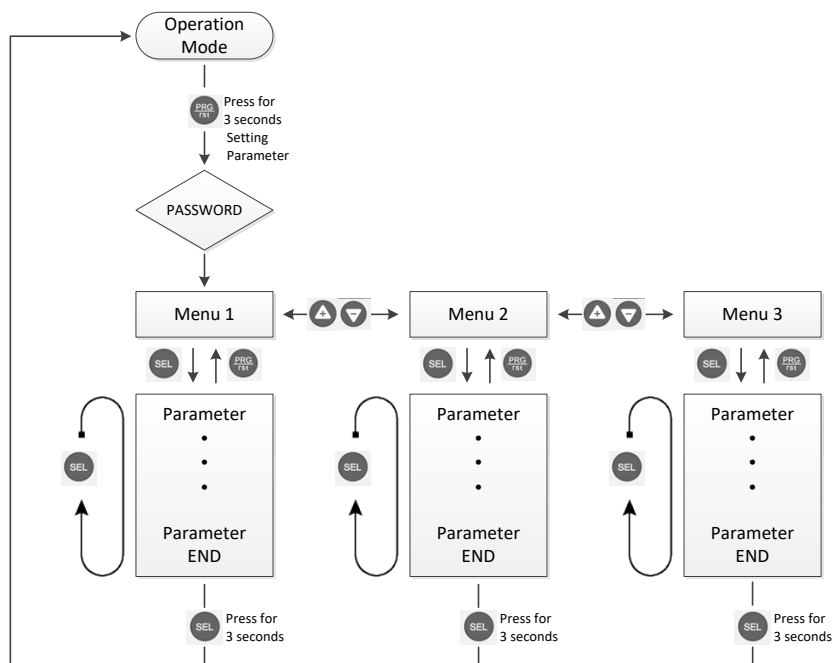
: Lamp & Operation button



Definition	Description
LED	Super Heat
	When displaying superheat
	Pressure
	When displaying pressure
	Open %
	When displaying valve open ratio
	Temp
	When displaying temperature
Button	°C, bar
	Display the unit of temp. / pressure
	⚠
	Lighting when warning (Flickering when manual return alarm occurs)
	🔧
	Flickering at manual open ratio control
	POWER
	Lighting at power up
	TX, RX
	Flickering in communication
	PRG (f st)
	Parameter change mode
	▲
	Increase or upward
	▼
	Decrease or downward
	SEL
	Select and save
	▲ ▼
	Display mode (DIS) parameter of parameter 2 group value will be changed. Superheat — (▲▼) — Pressure of evaporator outlet — (▲▼) — Current open ration of EEV — (▲▼) — Temperature of evaporator outlet

4. Parameter

: Parameter change

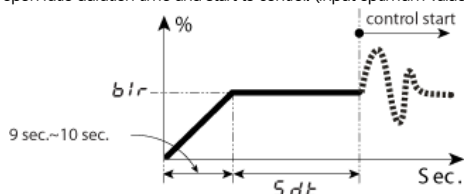


- Press PRG button for 3 seconds to change setting parameters.
※ password is not correct, state check is only available, but can't change parameters.)
- Movement to next menu and storage of set value during parameter setup are performed by SEL button.
- Set value will be flickering in every 0.5 seconds and change set value using ▲ or ▼ key.
- Present flow value will be displayed if pressing SEL button for 3 seconds after finished setup.
- If there is no input for 30 minutes during setup, it will be returned to operation mode.

Address	Description	Code	Unit	Step	Min.	Max.	Default	Custom
4 0001	Superheat set-point	<i>SH</i>	K	0.1	0.5	99.9	6.0	
4 0002	Run stop delay	<i>Std</i>	Sec.	1	0	999	10	
4 0003	Start open ratio	<i>blr</i>	%	1	0	100	0	
4 0004	Start open ratio duration time	<i>Sdt</i>	Sec.	1	0	300	0	
4 0005	P: Proportional gain	<i>dFr</i>	%	0.1	0.1	99.9	3.0	
4 0006	I: Integral time	<i>irt</i>	Sec.	1	0	999	120	
4 0007	D: Derivative time	<i>drt</i>	Sec.	1	0	999	30	
4 0008	Low superheat alarm mode	<i>LS</i>	0=No use	1=automatic return	2= manual return		1	
4 0009	Detect low superheat alarm	<i>LSH</i>	K	0.1	0.5	30.0	0.5	
4 0010	Low superheat alarm delay time	<i>LSd</i>	Sec.	1	1	300	15	
4 0011	Clear low superheat alarm	<i>LSF</i>	K	0.1	1.0	30.5	3.0	
4 0012	Maximum operating pressure alarm mode (MOP)	<i>MP</i>	0=No use	1=automatic return	2= manual return		1	
4 0013	MOP alarm detection pressure	<i>MP</i>	bar	0.1	-1	50	9.0	
4 0014	MOP alarm detection delay time	<i>MPd</i>	Min.	1	1	15	1	
4 0015	Clear MOP alarm	<i>MPF</i>	bar	0.1	-1	50	8.0	
4 0016	High superheat alarm mode	<i>HS</i>	0=No use	1=automatic return	2= manual return		0	
4 0017	Detect high superheat alarm	<i>HSH</i>	K	1	10	40	30	
4 0018	High superheat alarm delay time	<i>HSd</i>	Sec.	1	1	600	3	
4 0019	Clear high superheat alarm	<i>HSF</i>	K	0.1	7	37	27	
4 0021	Freeze prevention alarm mode	<i>Fr</i>	0=No use	1=automatic return	2= manual return		0	
4 0022	Detect freeze prevention alarm	<i>FrE</i>	°C	1	-40	40	0	
4 0023	Freezing protection alarm delay time	<i>Fr d</i>	Sec.	1	5	200	30	
4 0024	Clear freeze prevention alarm	<i>FrF</i>	°C	1	-37	43	3	
4 0025	Select pumpdown function and delay time	<i>Pd</i>	Sec.	1	0	180	<i>OFF(-1)</i>	
4 0026	Pressure set-point for stopping pumpdown	<i>PdP</i>	bar	0.1	-0.5	18.0	0.5	
4 0027	Pressure low limit alarm mode	<i>LP</i>	0=No use	1=automatic return	2= manual return		0	
4 0028	Detect low limit pressure alarm	<i>LoP</i>	bar	0.1	-0.8	17.7	0.0	
4 0029	Low limit pressure alarm delay time	<i>LPd</i>	Sec.	1	5	200	5	
4 0030	Clear low limit pressure alarm	<i>LPF</i>	bar	0.1	-0.5	18.0	0.3	

※1 Start open ratio and start open ratio duration time

If Run switch 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. (Input optimum value as a start open ratio)



※2 Setup of proportional gain

In the majority of cases, use the result of auto tuning. Extra changes are unnecessary. Proportional gain makes a decision on control input of valve open ratio according to superheat change. If proportional gain is 3.0%, control input of valve open ratio is 3.0% per 1.0K of superheat.

If change of valve open ratio is fickle, decrease proportional gain.

If change of valve open ratio is slow, increase proportional gain more.

Open ratio of valve [%] = Start open ratio + (Proportional gain X Tolerance)

※3 Setup of integral time and derivative time

In the majority of cases, use the result of auto tuning. Extra changes are unnecessary.

Integral time: Input time which is applied to control for accumulated volume of tolerance.

Derivative time: It is for controlling momentary reacting volume for tolerance

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

Once maximum operating pressure alarm is occurred, expansion valve is fully closed.

※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.

Run switch turns on, RL1 start to run

Run switch turns off, RL1 will be turned off. (Less than pumpdown finish pressure)

※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.

: Setting 2 group table (Menu 2 = **2.Pr**)

Address	Description	Code	Unit	Step	Min.	Max.	Default	Custom
4 0061	Password	<i>PCL</i>	—	1	0	999	5	
4 0062	Type of refrigerant	<i>RFY</i>	<i>0</i> = R22 <i>5</i> = R507 <i>10</i> = R513a <i>15</i> = R744(N ₂ O) <i>20</i> = R407f <i>1</i> = R404a <i>6</i> = R1234ze <i>11</i> = R448a <i>16</i> = R32 <i>21</i> = R124 <i>2</i> = R410a <i>7</i> = R1234yf <i>12</i> = R449a <i>17</i> = R245FA <i>22</i> = R717 <i>3</i> = R134a <i>8</i> = R290 <i>13</i> = R452a <i>18</i> = R23 <i>23</i> = R407H <i>4</i> = R407c <i>9</i> = R450a <i>14</i> = R744(CO ₂) <i>19</i> = R407a <i>24</i> = R1270	<i>0</i>				
4 0063	Pressure sensor Max. range (at 4.5V)	<i>PSH</i>	bar	1	−1	99	15	
4 0064	Pressure sensor Min. range (at 0.5V)	<i>PSL</i>	bar	1	−1	99	−1	
4 0065	Pressure sensor offset correction	<i>PCL</i>	K	0.1	−9.9	9.9	0.0	
4 0066	Temp. sensor offset correction	<i>TEL</i>	K	0.1	−19.9	19.9	0.0	
4 0069	Jerk control ratio ※4	<i>JFY</i>		0.1	0.1	100.0	100.0	
4 0070	Expansion valve open ratio upper limit	<i>OPH</i>	%	1	0	100	100	
4 0071	Expansion valve open ratio lower limit	<i>OPL</i>	%	1	0	100	0	
4 0072	Sensor input filter time	<i>oii</i>	—	0.1	0.1	10.0	1.0	
4 0073	EEV compulsory open ratio	<i>ULr</i>	%	0.1	0.0	100.0	<i>OFF</i> (−1)	
4 0076	Display mode	<i>dIS</i>	0= 1~4 Rotation 1= Superheat 2= Evaporator outlet pressure 3= Expansion valve open ratio 4= Evaporator outlet temperature 5= Saturation temperature				1	
4 0077	Run/Stop method	<i>rnt</i>	0= Always run 1= Digital input(RUN) 2= Communication Run				1	
4 0078	Communication ID setup	<i>Id</i>	—	1	1	254	1	
4 0079	Communication speed (BPS) setup	<i>bdr</i>	<i>48</i> (0)= 4800 <i>96</i> (1)= 9600 <i>192</i> (2)= 19200 <i>384</i> (3)= 38400				<i>96</i>	
	Initialization	<i>rSt</i>	—	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 max. and min. 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 Jerk control ratio

Limit value of motor speed variation (Jerk Control)

※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.

※7 EEV compulsory open ratio

It can be used to temporarily control electronic expansion valve with designated open ratio when controlling normally.
Default value is set as not in use.

※8 Way to change of display mode

Press up / downward button to change parameters
(DIS parameter will be changed)

Parameter number will be displayed for one second before parameter is displayed.

* It is possible to change with direct input when displaying superheat set point.

※9 Initialization

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

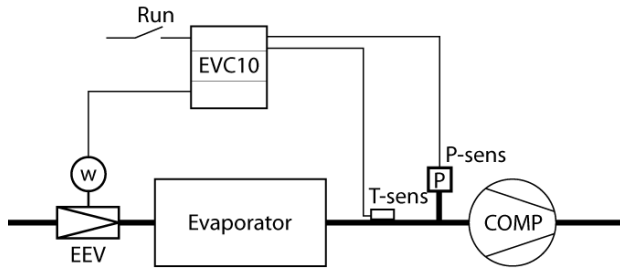
: Setting 2 group table (Menu 3 = **3.Pr**)

Address	Description	Code	Unit	Step	Min.	Max.	Default	Custom
4 0042	Expansion valve excitation type	<i>EBd</i>	<i>1-2</i> = 1-2 phase excitation		<i>2</i> = 2 phase excitation		2	
4 0043	Expansion valve TOTAL PULSE	<i>EBP</i>	PULSE	1	100	999	200	
4 0044	Expansion valve OPEN PULSE	<i>EBo</i>	PULSE	1	0	999	100	
4 0045	Expansion valve DRIVE SPEED (PPS)	<i>EBs</i>	<i>10</i> (0)= 10PPS <i>50</i> (3)= 50PPS <i>100</i> (5)= 100PPS <i>250</i> (7)= 250PPS <i>20</i> (1)= 20PPS <i>80</i> (4)= 80PPS <i>200</i> (6)= 200PPS <i>500</i> (8)= 500PPS <i>30</i> (2)= 30PPS				200	

※ Users should input parameter which is suitable for characteristic of expansion valve. In case of difference, it may be caused by malfunction or valve and system will be damaged.

5. Control mode

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



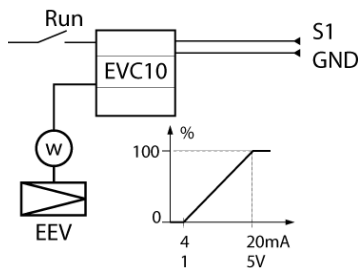
In most cases, it would aim to control superheat.

Definition	Description	Definition	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC10	Electronic expansion valve controller
T-sens	Temp. sensor of evaporator outlet	Run	Run / Stop switch
P-sens	Suction pressure sensor of compressor		

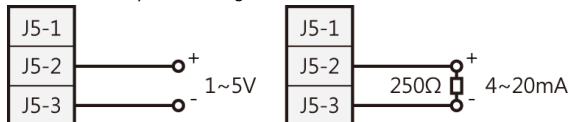
Application parameter

Function	CODE	Min.	Max.	Default
Superheat set point	<i>SH</i>	0.5	30	6.0 K
Start open ratio	<i>blr</i>	0	100	0 %
Start open ratio duration time	<i>Sdt</i>	0	60	0 Sec.
P: Proportional gain	<i>dFr</i>	0.1	50.0	3.0 %
I: Integral time	<i>irt</i>	0	999	120 Sec.
D: Derivative time	<i>drt</i>	0	999	30 Sec.

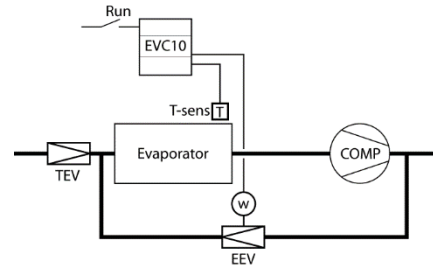
: Drive function (DIP SW1 : ON, DIP SW4 : ON)



※ To use drive function of expansion valve using external reference signal, change operation mode to drive mode. At this time, it will be operated when Run should be ON. Expansion valve will be closed immediately when turning OFF Run.



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



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

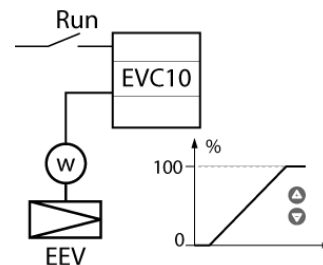
Definition	Description	Definition	Description
COMP	Compressor	Evaporator	Evaporator
EEV	Electronic expansion valve	EVC10	Electronic expansion valve controller
T-sens	Temp. sensor of evaporator outlet	Run	Run / Stop switch
TEV	Thermostatic expansion valve		

Application parameter

Function	CODE	Min.	Max.	Default
Set point for control target**	<i>SH</i>	-100	+100	6.0 °C
Start open ratio	<i>blr</i>	0	100	0 %
Start open ratio duration time	<i>Sdt</i>	0	60	0 Sec.
P: Proportional gain	<i>dFr</i>	0.1	50.0	3.0 %
I: Integral time	<i>irt</i>	0	999	120 Sec.
D: Derivative time	<i>drt</i>	0	999	30 Sec.

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

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



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

: State Message

CODE	Description
<i>StP</i>	Operation stop
<i>CLL</i>	Expansion valve initialization
<i>Pdn</i>	Pump down operation

: TRIP / ALARM MESSAGE

Cods	Description	Parameter	Conditions for occurrence	Ways to clear
P_{OP}	Pressure sensor disconnection	–	If pressure sensor is disconnected	If pressure sensor is normal
P_{St}	Pressure sensor Short circuit	–	If pressure sensor is short circuited	
t_{OP}	Pressure sensor disconnection	–	If temperature sensor is disconnected	If temperature sensor is normal
t_{St}	Pressure sensor Short circuit	–	If temperature sensor is short circuited	
\bar{n}_{OP}	Detect MOP temperature	MP= 1	If present pressure remains higher than set value of MOP during MPD (MOP alarm detection delay time)	System check is needed It becomes a clear condition if present pressure value is less than set value of MPF
		MP= 2 (Flickering)		
L_{OP}	Detect lower limit Pressure alarm	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
		LP = 2 (Flickering)		
HSH	Detect high Superheat alarm	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
		HS = 2(Flickering)		
LSH	Detect low superheat alarm	LS= 1	If present super heat remains lower than set value of LSH during LSD (Low superheat alarm delay time)	System check is needed It becomes a clear condition if present super heat is more than set value of LSF
		LS = 2(Flickering)		
FrE	Detect freezing Protection alarm	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.
		Fr= 2(Flickering)		

※ 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	32 Word
Media Type	BELDEN 9841 / 9842, LG LIREV-AMESB
Poll interval	100msec

: STATUS – Communication Table

Address	Function	Unit	Type	Size (Word)	EVC10B	MMI	
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 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	
Bit4	MOP alarm	–	Digital	Bit	0 : OFF	1 : ON	
Bit5	Lower limit pressure alarm	–	Digital	Bit	0 : OFF	1 : ON	
Bit6	High superheat alarm	–	Digital	Bit	0 : OFF	1 : ON	
Bit7	Low superheat alarm	–	Digital	Bit	0 : OFF	1 : ON	
Bit8	Freezing protection alarm	–	Digital	Bit	0 : OFF	1 : ON	
4 0111	Present Superheat	K	Analog	INT 16		X 10	
4 0112	Present saturation temperature	°C	Analog	INT 16		X 10	
4 0113	Present pressure	bar	Analog	INT 16	–1.0 ~ 1.0	X 10	
4 0114	Present temperature	°C	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)