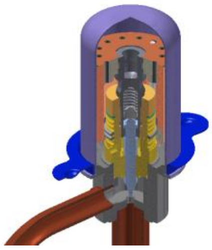
Electronic Expansion Valve
CEV Series



ENGINEERING **YOUR** SUCCESS.

GENERAL INFORMATION

EEV INSTRUCTION

The EEV step motor expansion valve provides precise flow control for virtually every refrigeration, air-conditioning, and heat pump application, from basic to complex, and in a wide range of environments. This step motor expansion valve is the ideal choice due to its compatibility with most halocarbon refrigerant systems, and most step motor controllers. Installation and operation of the highly reliable EEV is simple and straightforward; enabling any type system to be more efficient, more versatile, and more reliable. The EEV step motor expansion valve provides maximum system value through precise, energy efficient flow control.

EEV Features & Benefits：

1. Highly reliable direct drive step motor
2. Precise 500 step flow resolution
3. Tight shutoff for high efficiency systems
4. Efficient low power design; no holding current required
5. Rapid response; less than 6 seconds full stroke
6. Bi-flow capable for heat pump applications
7. Compatible with various HCFC and HFC refrigerants (R-410A, R-134a, R-407C, R-22...)

STEP MOTOR VALVE FUNCTION

Step motors accurately achieve and maintain a controlled position making them ideal actuators for precision flow control valves. Like a conventional DC motor, the model EEV has a permanent magnet rotor and a stator; however, they are specially designed for precise positioning, low power, and refrigerant compatibility.

The stator is constructed with multiple magnetic pole pairs created by energized wire windings. In the EEV stator there are 4 phases (windings) energized sequentially by a step motor controller that creates a rotating magnetic field. The stator magnetically couples with the rotor and causes it to turn in unison with the rotating field. The field rotates either clockwise or counter-clockwise depending on the sequence of electrical pulses to each of the 4 phases. The result is proportional valve actuator with the ability to achieve a precise, repeatable position using an electronic signal.

The rotor is directly linked to a low-friction threaded "needle" which moves into and out of the valve's metering orifice. As the rotor rotates step by step, the needle's distance from the valve orifice changes incrementally, thus opening or closing the expansion valve. Valve "steps" are incremental changes of the rotor position; in the EEV valve, each step is equivalent to a 4.5° rotation of the rotor. An internal torsion spring limits clockwise and counter-clockwise motion to eliminate the potential damage due to driving the valve past its full open or full closed position. The torsion spring absorbs the torque at the extreme rotational positions and causes the rotor to "slip" in the magnetic field created by the stator. The EEV valve incorporates a spring-loaded needle designed to "collapse" as the valve approaches the full closed position. This novel feature limits maximum seating force to reduce seat wear and maximize valve life. The fine pitch thread design of the needle prevents "back travel" when power is removed. This specific feature increases efficiency by requiring power only when a change in valve position is called for, the EEV does not require continuous power to maintain position. The result is a highly reliable step motor expansion valve which is predictable, durable, and energy efficient.

OPEN LOOP POSITION CONTROL

Step motors utilize open loop type feedback to achieve and maintain a required valve position. Simply stated, the step motor controller counts the number of pulses that are sent to the valve in order to keep track of the valve's position. In this way, no direct feedback is required to monitor valve position and design, function, and cost are greatly simplified.

VALVE OPERATION

Proper positioning of valve opening is achieved by sending a series of electrical pulses to the EEV stator causing it to rotate open or closed. There are 500 steps of rotation in the most common single-phase stepping configuration. Of these 500 steps, 400 steps are in the linear control range. With 400 steps of resolution, incremental flow changes of 0.25% of full flow are possible. As few as 40 steps of resolution can achieve stable, efficient system operation on many applications. This allows the EEV to be used at just a fraction of its capacity.

Approximately 32 single-phase steps from full closed are required before the valve orifice begins to open. Beyond 500 steps, the flow rate does not significantly change. The usable flow range of the valve is from 32 to 500 steps and is the recommended design range for flow control. The step motor controller should be configured and scaled to use 32 single phase steps (from step = 0 position) as the 0% capacity point, and to use 500 steps (from step = 0 position) as the 100% capacity point.

The initial opening steps (step = 0 to step = 32) position the valve in its fully closed position but with varying levels of seating force. This is due to the spring compression biasing the needle (See figure 1) against the valve seat. Full seating force is achieved at the home position (step = 0), which is the fully overdriven position. It is suggested that in forward flow mode (flow entering side fitting) driving to step 32 will achieve sufficient seating force in most applications. It is not necessary to overdrive the valve to step = 0 to achieve full valve closure in forward flow mode, but it is necessary to achieve full closure when the valve is flowed in the reverse direction.

Because the valve needle is spring biased, the MOPD (Maximum Operating Pressure Differential) of the valve in reverse flow can be significantly lower than in forward flow mode. The MOPD, in reverse flow mode only, varies with orifice size. Exceeding the MOPD in reverse flow does not damage the valve; however, it will result in leakage through the valve seat until the pressure difference across the valve decreases below the MOPD. Maxi-mum MOPD will always be achieved in forward flow mode.

HYSTERESIS AND POWER UP

Most thermostatic expansion valves have some level of hysteresis due to mechanical limitations in their design; this can result in varying levels of over and underfeeding as the TEV searches for the correct position. The EEV, however, does not experience the same limitations due to its unique design. Consequently, the EEV has almost no hysteresis when combined with an appropriate controller. The controller maintains a step count that is referenced to determine valve position. With proper configuration of the step motor controller, extremely accurate control can be achieved with flawless predictability and repeatability.

When the controller sends pulses beyond the fully overdriven (step = 0) position, the rotor will “slip” and the controller will no longer control an accurate position. For this reason most step motor valve controllers are con-figured with the usable step range, and an initialization routine to establish “home” (step = 0) position.

It is necessary for the controller to periodically overdrive the valve for a minimum of 600 pulses to re-establish the step = 0 position; this routine is typically a pre-programmed controller feature with some minor configuration necessary by the designer. This will ensure that the controller always uses accurate position information. Additionally, it is necessary, when recovering from a controller or valve power failure, to overdrive the valve in the exact same manner to re-establish the step = 0 position. Failure to perform this reset operation after a power loss or unexpected over/under drive condition can result in incorrect valve position information and unpredictable valve operation.

EEV CONFIGURED AS A UNIPOLAR – STEP MOTOR VALVE

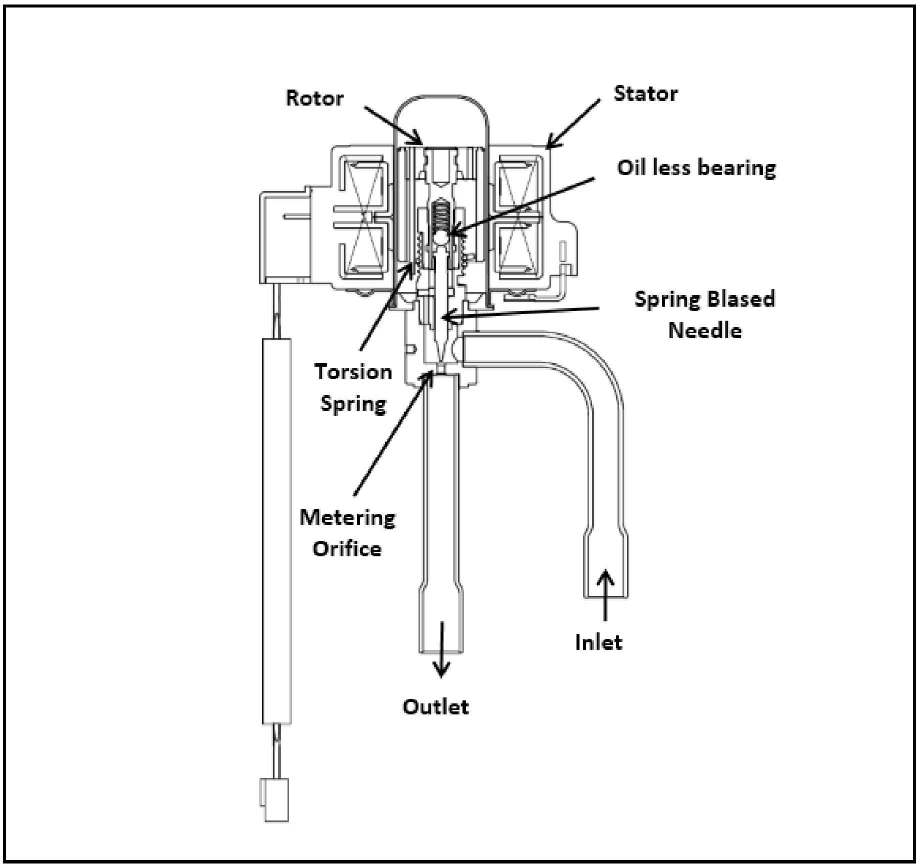
The EEV valve is a unipolar (5 wire) type. The EEV unipolar motor utilizes two windings, each with a center tap (Figure 2). The two windings, plus a common center tap from each, form the five wire connection common to unipolar step motors (Orange, Red, Yellow, Black, Gray) The center tap (Gray) creates four independent phases, there are four regions with which a magnetic field is produced. The arrangement and sequence of energizing each of these four phases causes the field rotation to move the permanent magnet rotor (Figure 2). By selectively and sequentially energizing each stator phase, a magnetic pole (S) is created in the stator which attracts the opposite permanent magnet pole (N) on the rotor. To maximize resolution, two adjacent windings can be energized simultaneously, called half-stepping, to move the rotor to a region halfway between phases. An electrical logic diagram is shown in Table 1 to clarify single-phase stepping and the required selection and sequence for energizing the stator phases.

Table 1: Unipolar Step Logic

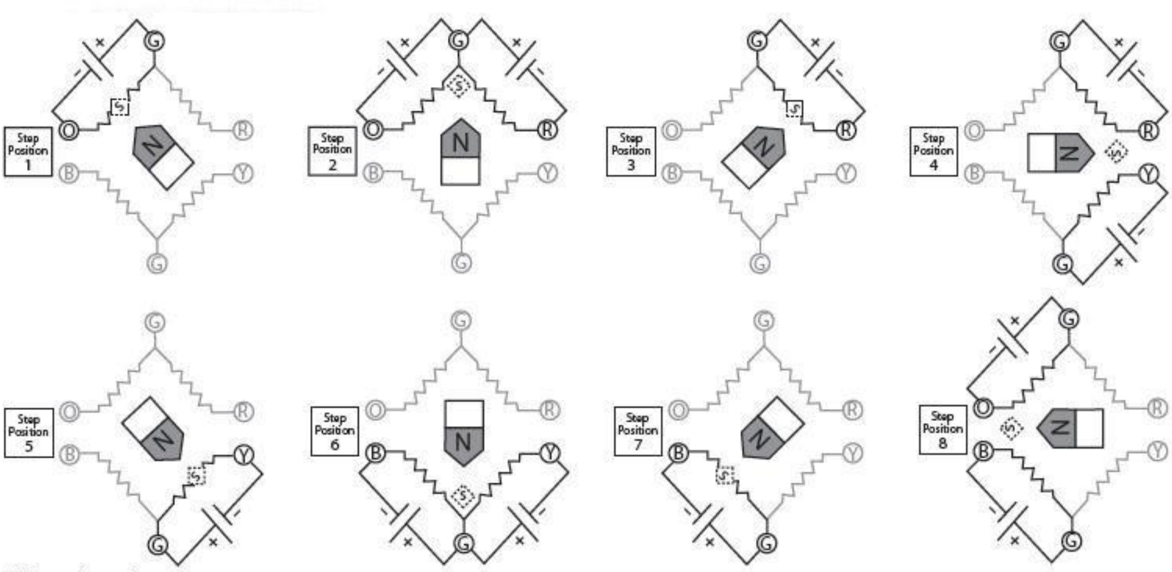
		Phase			
Pulse	Steps Rotated	O (Orange)	R (Red)	Y (Yellow)	B (Black)
1	1	Zero	HI	HI	HI
2	2	Zero	Zero	HI	HI
3	3	HI	Zero	HI	HI
4	4	HI	Zero	Zero	HI
5	5	HI	HI	Zero	HI
6	6	HI	HI	Zero	Zero
7	7	HI	HI	HI	Zero
8	8	Zero	HI	HI	Zero

Note: Center taps at +12V at all times; "Zero" indicates Zero V. "HI" indicates high impedance of phase. Reverse the sequence to rotate in the opposite direction. Only 8 steps shown; for further rotation, sequence repeats

INTERNAL VIEW



Step Sequence



Wiring color code
O: Orange
R: Red
Y: Yellow
B: Black
G: Gray (common center tap)

Nomenclature

Valve		Stator					
CEV	26	CEC	42	Y	5	-	2
CEV Series	Port Size Ø2.6mm	CEV Stator	Lead Wire Length 420mm	YST Connector	Number of Pins		Series number

Technical Information

Valve

MODEL	Port Size [Ømm]	Nominal Capacity			
		R-22		R-410A	
		Tons	kW	Tons	kW
CEV14	1.4	2.1	7.4	2.5	8.8
CEV16	1.6	2.7	9.7	3.3	11.5
CEV18	1.8	3.4	12.0	4.1	14.3
CEV24	2.4	5.7	20.2	6.8	24.0
CEV26	2.6	6.3	22.3	7.6	26.6
CEV30	3	8.0	28.4	9.6	33.8
CEV32	3.2	8.7	30.7	10.4	36.5

Nominal condition:

R-22 (7 bar Pressure drop, 5°C Evaporating temperature, 38°C Condensing temperature)

R-410A (11 bar Pressure drop, 5°C Evaporating temperature, 38°C Condensing temperature)

Stator

Model	Lead Wire Length	Rated Voltage	Wire diameter
CEC42Y5-2	420mm	12VDC±10%	Ø0.16mm

Technical Specifications

Drive Type	Permanent Step Motor Direct Drive	Media Temp.	-30℃ ~ 70℃
Pulsing Type	Unipolar	Ambient Temp.	-30℃ ~ 70℃
Flow Path	Bi-flow Capable	Moisture / Humidity	≤ 95%RH
Resolution	500 ± 20 PPS	Inter. Leakage(Max)	≤ 250cc/min @ 10Bar
Open Step	32 ± 20 PPS	Exter. Leakage(Max)	Helium，≤ 1.0x10^{-6}mbarL/sec
Line Travel / Pulse	0.00625mm	Rated Voltage	12VDC ± 10%
Operating Stroke	3.125mm	Rated Current	Max. 500mA/Phase
Step Rate	30 ~ 80 PPS	Phase Resistance	40±4Ohms
Full Motion Transit Time	6.25Sec(@80PPS)/16.67Sec(@30PPS)	Dielectric Strength	600VAC，1 Sec，no breakdown
MOPD (Side Inlet)	CEV14~26 493PSI (34Bar) CEV30~32 363PSI (25Bar)	Insulation Resistance	> 100MΩ @ 500VDC
MOPD (Bottom Inlet)	CEV14~24: >305PSI (21Bar) CEV26~30: >218PSI (15Bar) CEV32: >189PSI (13Bar)	Insulation Class	Class E
Max. Working Pressure	624PSI (43Bar)	Compatible Refrigerant	R22，R134a，R410a，R407c etc.

INSTALLATION

The EEV valves are installed before the distributor and evaporator just as one would install a Thermostatic Expansion Valve. Location should be planned to provide serviceability and to allow controller installation within the maximum cable length of forty feet. The valve may be installed in the refrigerated space and may be mounted in any position except with the motor housing below the liquid line. Cable routing should avoid any sharp edges or other sources of potential physical damage such as defrost headers and fan blades. For neatness and protection, the cable may be fastened to the suction or liquid lines with nylon wire ties.

The installation of the EEV Step Motor Valve utilizes most of the same techniques and precautions used for assembly of other refrigeration components. As with any refrigerant system, safety and cleanliness must be a priority. Use of and upstream Parker filter-drier is highly recommended to prevent contamination of the expansion valve.

Properly reduce system pressure to atmospheric pressure using accepted industry guidelines.
Choose and installation location that is easily accessible, and minimizes external contamination from the environment. The EEV should be located downstream of any liquid line accessories (e.g. receiver, sight glass, service valve, etc...) and located as close to the evaporator/heat exchanger as possible.
For most installations the recommended flow direction utilizes the side fitting for liquid inlet; bottom fitting feeding the evaporator. If using the valve in reverse flow (bottom inlet) or in bi-flow operation; special controller settings must be used to ensure adequate valve shutoff. See Valve Operation section
Disassemble stator from valve body prior to brazing. The EEV valve is not position sensitive; however, it is recommended that the valve be installed with the stator at or above the body elevation to prevent accumulation of system contaminants with the valve. Installation should be such that valve weight or system vibration will not cause mechanical failure. Properly protect and restrain electrical connections.
Silver or phosphorous bearing copper brazing alloys can be used during installation. Minimal flux should be applied for copper- brass or copper-steel joints using silver bearing alloys; use flux on the joint exterior only. Clean all refrigerant lines and fittings as necessary prior to valve installation.
Minimize the heat applied to the valve by wrapping the valve with wet cloths and directing the heat away from the valve. The use of conductive paste or chill blocks should be considered for original equipment installations. The valve body temperature must be limited to 250°F (121°C) during installation. Use of flowing dry nitrogen during installation is recommended to prevent the formation of toxic gases and copper oxides.
Once valve has cooled, replace stator. Both tabs at base of stator must engage retaining ring on valve body.
Make electrical connections taking care to protect and secure all electrical connections from moisture, contamination, stress, etc. Extension wires may be attached to stator wiring provided that proper connections are made with 18 AWG or heavier stranded copper wire. Extension length should not exceed 100 feet between valve and step motor controller.
Connect wiring to controller. Refer to controller manufacturer’s instructions for proper wiring connections.

Capacity Tables

R - 22

Valve Type	5℃								-10℃								-20℃							
	Pressure Drop Across Valve (bar)																							
	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
CEV-14	5.59	6.85	7.91	8.84	9.68	10.5	11.2	11.9	5.39	6.60	7.62	8.52	9.34	10.1	10.8	11.4	5.25	6.42	7.42	8.29	9.08	9.8	10.5	11.1
CEV-16	7.34	8.99	10.4	11.6	12.7	13.7	14.7	15.6	7.08	8.67	10.0	11.2	12.3	13.2	14.2	15.0	6.89	8.43	9.7	10.9	11.9	12.9	13.8	14.6
CEV-18	9.09	11.1	12.9	14.4	15.7	17.0	18.2	19.3	8.76	10.7	12.4	13.9	15.2	16.4	17.5	18.6	8.53	10.4	12.1	13.5	14.8	16.0	17.1	18.1
CEV-24	15.3	18.7	21.6	24.2	26.5	28.6	30.6	32.4	14.7	18.1	20.8	23.3	25.5	27.6	29.5	31.3	14.3	17.6	20.3	22.7	24.8	26.8	28.7	30.4
CEV-26	16.9	20.7	23.9	26.8	29.3	31.7	33.8	35.9	16.3	20.0	23.1	25.8	28.3	30.5	32.6	34.6	15.9	19.4	22.5	25.1	27.5	29.7	31.8	33.7
CEV-30	21.5	26.4	30.4	34.0	37.3	40.3	43.1	45.7	20.8	25.4	29.4	32.8	36.0	38.8	41.5	44.0	20.2	24.7	28.6	31.9	35.0	37.8	40.4	42.8
CEV-32	23.3	28.5	32.9	36.8	40.3	43.5	46.5	49.3	22.4	27.5	31.7	35.5	38.8	42.0	44.9	47.6	21.8	26.7	30.9	34.5	37.8	40.8	43.6	46.3

Valve Type	-30℃								-40℃							
	Pressure Drop Across Valve (bar)															
	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
CEV-14	5.10	6.25	7.22	8.07	8.84	9.5	10.2	10.8	4.93	6.04	6.98	7.80	8.54	9.2	9.9	10.5
CEV-16	6.70	8.21	9.5	10.6	11.6	12.5	13.4	14.2	6.48	7.93	9.2	10.2	11.2	12.1	13.0	13.7
CEV-18	8.30	10.2	11.7	13.1	14.4	15.5	16.6	17.6	8.02	9.8	11.3	12.7	13.9	15.0	16.0	17.0
CEV-24	14.0	17.1	19.7	22.1	24.2	26.1	27.9	29.6	13.5	16.5	19.1	21.3	23.4	25.2	27.0	28.6
CEV-26	15.4	18.9	21.8	24.4	26.8	28.9	30.9	32.8	14.9	18.3	21.1	23.6	25.9	27.9	29.9	31.7
CEV-30	19.6	24.1	27.8	31.1	34.0	36.8	39.3	41.7	19.0	23.3	26.9	30.0	32.9	35.5	38.0	40.3
CEV-32	21.2	26.0	30.0	33.6	36.8	39.7	42.5	45.0	20.5	25.1	29.0	32.4	35.5	38.4	41.0	43.5

R - 134a

Valve Type	5℃								-10℃								-20℃							
	Pressure Drop Across Valve (bar)																							
	2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13
CEV-14	4.12	5.21	6.11	6.90	7.60	8.2	8.8	9.4	3.86	4.89	5.73	6.47	7.13	7.7	8.3	8.8	3.69	4.66	5.47	6.17	6.80	7.4	7.9	8.4
CEV-16	5.41	6.85	8.0	9.1	10.0	10.8	11.6	12.3	5.07	6.42	7.5	8.5	9.4	10.1	10.9	11.6	4.84	6.12	7.2	8.1	8.9	9.7	10.4	11.0
CEV-18	6.70	8.5	9.9	11.2	12.4	13.4	14.4	15.3	6.28	7.9	9.3	10.5	11.6	12.6	13.5	14.3	5.99	7.6	8.9	10.0	11.0	12.0	12.9	13.7
CEV-24	11.3	14.3	16.7	18.9	20.8	22.5	24.2	25.7	10.6	13.4	15.7	17.7	19.5	21.1	22.7	24.1	10.1	12.7	14.9	16.9	18.6	20.2	21.6	23.0
CEV-26	12.5	15.8	18.5	20.9	23.0	25.0	26.8	28.5	11.7	14.8	17.4	19.6	21.6	23.4	25.1	26.7	11.2	14.1	16.5	18.7	20.6	22.3	23.9	25.4
CEV-30	15.9	20.1	23.5	26.6	29.3	31.7	34.0	36.2	14.9	18.8	22.1	24.9	27.4	29.8	31.9	33.9	14.2	18.0	21.0	23.7	26.2	28.4	30.4	32.4
CEV-32	17.2	21.7	25.4	28.7	31.6	34.3	36.8	39.1	16.1	20.3	23.8	26.9	29.6	32.2	34.5	36.7	15.3	19.4	22.7	25.7	28.3	30.7	32.9	35.0

R - 404A

Valve Type	5℃								-10℃								-20℃							
	Pressure Drop Across Valve (bar)																							
	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
CEV-14	3.69	4.52	5.22	5.84	6.40	6.9	7.4	7.8	3.43	4.20	4.85	5.43	5.94	6.4	6.9	7.3	3.24	3.97	4.58	5.13	5.61	6.1	6.5	6.9
CEV-16	4.85	5.94	6.9	7.7	8.4	9.1	9.7	10.3	4.51	5.52	6.4	7.1	7.8	8.4	9.0	9.6	4.26	5.21	6.0	6.7	7.4	8.0	8.5	9.0
CEV-18	6.01	7.4	8.5	9.5	10.4	11.2	12.0	12.7	5.58	6.8	7.9	8.8	9.7	10.4	11.2	11.8	5.27	6.5	7.5	8.3	9.1	9.9	10.5	11.2
CEV-24	10.1	12.4	14.3	16.0	17.5	18.9	20.2	21.4	9.4	11.5	13.3	14.8	16.3	17.6	18.8	19.9	8.9	10.9	12.5	14.0	15.4	16.6	17.7	18.8
CEV-26	11.2	13.7	15.8	17.7	19.4	20.9	22.4	23.7	10.4	12.7	14.7	16.4	18.0	19.4	20.8	22.0	9.8	12.0	13.9	15.5	17.0	18.4	19.6	20.8
CEV-30	14.2	17.4	20.1	22.5	24.6	26.6	28.4	30.2	13.2	16.2	18.7	20.9	22.9	24.7	26.4	28.0	12.5	15.3	17.7	19.7	21.6	23.4	25.0	26.5
CEV-32	15.4	18.8	21.7	24.3	26.6	28.8	30.7	32.6	14.3	17.5	20.2	22.6	24.7	26.7	28.6	30.3	13.5	16.5	19.1	21.3	23.4	25.2	27.0	28.6

Valve Type	-30℃								-40℃							
	Pressure Drop Across Valve (bar)															
	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
CEV-14	3.03	3.71	4.29	4.79	5.25	5.7	6.1	6.4	2.83	3.47	4.00	4.47	4.90	5.3	5.7	6.0
CEV-16	3.98	4.87	5.6	6.3	6.9	7.4	8.0	8.4	3.72	4.55	5.3	5.9	6.4	7.0	7.4	7.9
CEV-18	4.93	6.0	7.0	7.8	8.5	9.2	9.9	10.5	4.60	5.6	6.5	7.3	8.0	8.6	9.2	9.8
CEV-24	8.3	10.1	11.7	13.1	14.4	15.5	16.6	17.6	7.7	9.5	10.9	12.2	13.4	14.5	15.5	16.4
CEV-26	9.2	11.2	13.0	14.5	15.9	17.2	18.3	19.5	8.6	10.5	12.1	13.5	14.8	16.0	17.1	18.2
CEV-30	11.7	14.3	16.5	18.4	20.2	21.8	23.3	24.8	10.9	13.3	15.4	17.2	18.9	20.4	21.8	23.1
CEV-32	12.6	15.4	17.8	19.9	21.8	23.6	25.2	26.7	11.8	14.4	16.6	18.6	20.4	22.0	23.5	25.0

Capacity is based on 38℃ condenser temperature and 0℃ subcooling.

R - 407C	Valve Type	5℃								-10℃								-20℃							
		Pressure Drop Across Valve (bar)																							
		4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
	CEV-14	5.14	6.29	7.26	8.12	8.90	9.6	10.3	10.9	4.84	5.93	6.85	7.66	8.39	9.1	9.7	10.3	4.64	5.68	6.56	7.33	8.03	8.7	9.3	9.8
	CEV-16	6.74	8.26	9.5	10.7	11.7	12.6	13.5	14.3	6.36	7.79	9.0	10.1	11.0	11.9	12.7	13.5	6.09	7.46	8.6	9.6	10.5	11.4	12.2	12.9
	CEV-18	8.35	10.2	11.8	13.2	14.5	15.6	16.7	17.7	7.88	9.6	11.1	12.5	13.6	14.7	15.8	16.7	7.54	9.2	10.7	11.9	13.1	14.1	15.1	16.0
	CEV-24	14.0	17.2	19.9	22.2	24.3	26.3	28.1	29.8	13.2	16.2	18.7	20.9	22.9	24.8	26.5	28.1	12.7	15.5	17.9	20.1	22.0	23.7	25.4	26.9
	CEV-26	15.6	19.0	22.0	24.6	26.9	29.1	31.1	33.0	14.7	18.0	20.7	23.2	25.4	27.4	29.3	31.1	14.0	17.2	19.9	22.2	24.3	26.3	28.1	29.8
	CEV-30	19.8	24.2	28.0	31.3	34.3	37.0	39.6	42.0	18.7	22.8	26.4	29.5	32.3	34.9	37.3	39.6	17.9	21.9	25.3	28.2	30.9	33.4	35.7	37.9
	CEV-32	21.4	26.2	30.2	33.8	37.0	40.0	42.7	45.3	20.2	24.7	28.5	31.9	34.9	37.7	40.3	42.8	19.3	23.6	27.3	30.5	33.4	36.1	38.6	40.9

R - 410A	Valve Type	5℃								-10℃								-20℃							
		Pressure Drop Across Valve (bar)																							
		5	8	11	14	17	20	23	26	5	8	11	14	17	20	23	26	5	8	11	14	17	20	23	26
	CEV-14	5.92	7.49	8.78	9.91	10.92	11.8	12.7	13.5	5.72	7.23	8.48	9.57	10.55	11.4	12.3	13.0	5.57	7.04	8.26	9.32	10.27	11.1	11.9	12.7
	CEV-16	7.77	9.83	11.5	13.0	14.3	15.5	16.7	17.7	7.51	9.50	11.1	12.6	13.8	15.0	16.1	17.1	7.31	9.25	10.8	12.2	13.5	14.6	15.7	16.7
	CEV-18	9.62	12.2	14.3	16.1	17.7	19.2	20.6	21.9	9.30	11.8	13.8	15.6	17.1	18.6	19.9	21.2	9.05	11.4	13.4	15.1	16.7	18.1	19.4	20.6
	CEV-24	16.2	20.5	24.0	27.1	29.8	32.4	34.7	36.9	15.6	19.8	23.2	26.2	28.8	31.3	33.5	35.7	15.2	19.3	22.6	25.5	28.1	30.4	32.7	34.7
	CEV-26	17.9	22.7	26.6	30.0	33.0	35.8	38.4	40.9	17.3	21.9	25.7	29.0	31.9	34.6	37.1	39.5	16.9	21.3	25.0	28.2	31.1	33.7	36.1	38.4
	CEV-30	22.8	28.8	33.8	38.1	42.0	45.6	48.9	52.0	22.0	27.9	32.7	36.9	40.6	44.0	47.2	50.2	21.4	27.1	31.8	35.9	39.5	42.9	46.0	48.9
	CEV-32	24.6	31.2	36.5	41.2	45.4	49.3	52.8	56.2	23.8	30.1	35.3	39.8	43.9	47.6	51.0	54.3	23.2	29.3	34.4	38.8	42.7	46.3	49.7	52.8

R - 507	Valve Type	5℃								-10℃								-20℃							
		Pressure Drop Across Valve (bar)																							
		4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
	CEV-14	3.62	4.43	5.11	5.72	6.26	6.8	7.2	7.7	3.35	4.10	4.74	5.30	5.81	6.3	6.7	7.1	3.17	3.89	4.49	5.02	5.50	5.9	6.3	6.7
	CEV-16	4.75	5.81	6.7	7.5	8.2	8.9	9.5	10.1	4.40	5.39	6.2	7.0	7.6	8.2	8.8	9.3	4.17	5.11	5.9	6.6	7.2	7.8	8.3	8.8
	CEV-18	5.88	7.2	8.3	9.3	10.2	11.0	11.8	12.5	5.45	6.7	7.7	8.6	9.4	10.2	10.9	11.6	5.16	6.3	7.3	8.2	8.9	9.7	10.3	10.9
	CEV-24	9.9	12.1	14.0	15.6	17.1	18.5	19.8	21.0	9.2	11.2	13.0	14.5	15.9	17.1	18.3	19.4	8.7	10.6	12.3	13.7	15.0	16.2	17.4	18.4
	CEV-26	10.9	13.4	15.5	17.3	19.0	20.5	21.9	23.2	10.1	12.4	14.3	16.0	17.6	19.0	20.3	21.5	9.6	11.8	13.6	15.2	16.6	18.0	19.2	20.4
	CEV-30	13.9	17.1	19.7	22.0	24.1	26.1	27.8	29.5	12.9	15.8	18.3	20.4	22.4	24.1	25.8	27.4	12.2	15.0	17.3	19.3	21.2	22.9	24.5	25.9
	CEV-32	15.0	18.4	21.3	23.8	26.1	28.1	30.1	31.9	13.9	17.1	19.7	22.0	24.2	26.1	27.9	29.6	13.2	16.2	18.7	20.9	22.9	24.7	26.4	28.0

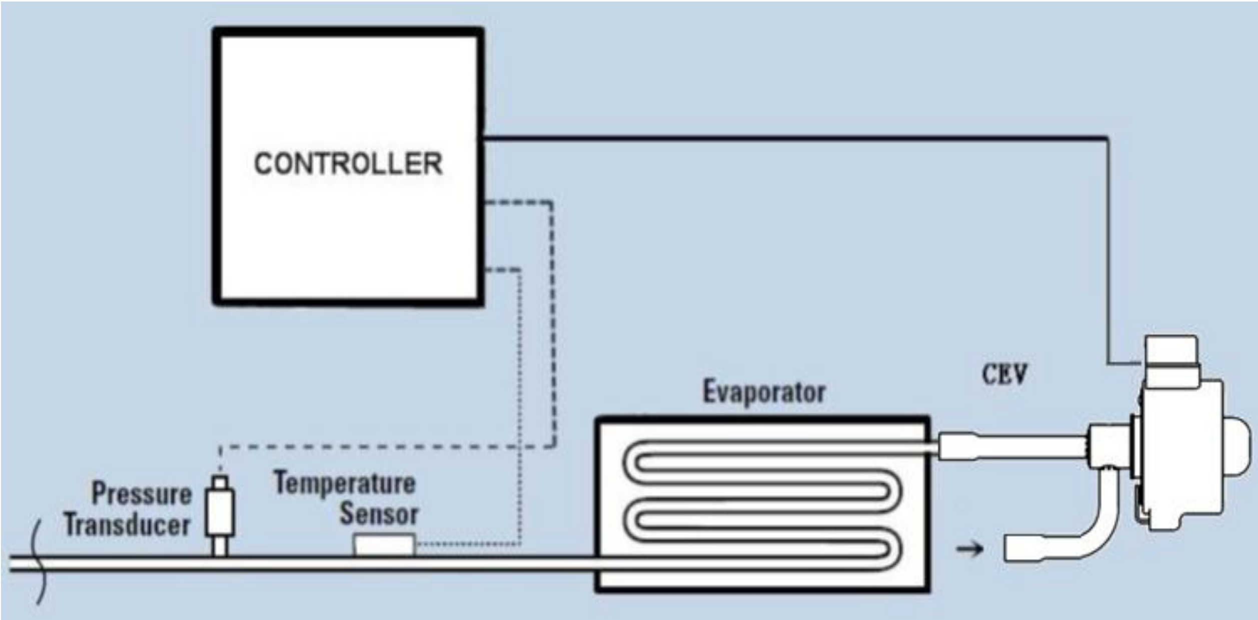
R - 507	Valve Type	-30℃								-40℃							
		Pressure Drop Across Valve (bar)															
		4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
	CEV-14	2.98	3.66	4.22	4.72	5.17	5.6	6.0	6.3	2.79	3.42	3.94	4.41	4.83	5.2	5.6	5.9
	CEV-16	3.92	4.80	5.5	6.2	6.8	7.3	7.8	8.3	3.66	4.48	5.2	5.8	6.3	6.8	7.3	7.8
	CEV-18	4.85	5.9	6.9	7.7	8.4	9.1	9.7	10.3	4.53	5.6	6.4	7.2	7.9	8.5	9.1	9.6
	CEV-24	8.2	10.0	11.5	12.9	14.1	15.3	16.3	17.3	7.6	9.3	10.8	12.1	13.2	14.3	15.3	16.2
	CEV-26	9.0	11.1	12.8	14.3	15.7	16.9	18.1	19.2	8.4	10.3	11.9	13.3	14.6	15.8	16.9	17.9
	CEV-30	11.5	14.1	16.3	18.2	19.9	21.5	23.0	24.4	10.7	13.2	15.2	17.0	18.6	20.1	21.5	22.8
	CEV-32	12.4	15.2	17.6	19.6	21.5	23.2	24.8	26.3	11.6	14.2	16.4	18.3	20.1	21.7	23.2	24.6

Capacity is based on 38℃ condenser temperature and 0℃ subcooling.

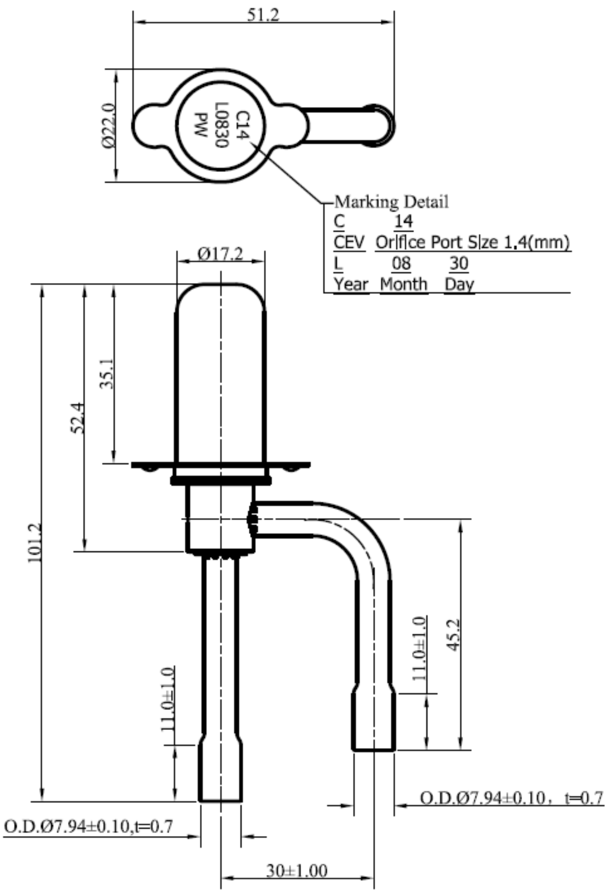
Correction Factors

Refrigerant	Temperature ℃														
	-18	-12	-7	-1	4	10	16	21	27	32	38	43	49	54	60
R-22	1.57	1.51	1.46	1.40	1.34	1.29	1.23	1.18	1.12	1.06	1.00	0.94	0.88	0.82	0.76
R-134a	1.69	1.63	1.56	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.86	0.78	0.71
R404A	2.01	1.92	1.82	1.72	1.62	1.52	1.42	1.32	1.22	1.11	1.00	0.89	0.78	0.66	0.54
R-407C	1.72	1.65	1.58	1.51	1.44	1.37	1.30	1.22	1.15	1.08	1.00	0.92	0.85	0.77	0.69
R-410A	1.77	1.70	1.62	1.55	1.48	1.40	1.32	1.25	1.17	1.09	1.00	0.92	0.83	0.73	0.63
R-507	2.05	1.95	1.85	1.75	1.64	1.54	1.44	1.33	1.22	1.11	1.00	0.89	0.77	0.65	0.52

SYSTEM SCHEMATIC



EXTERNAL DIMENSION



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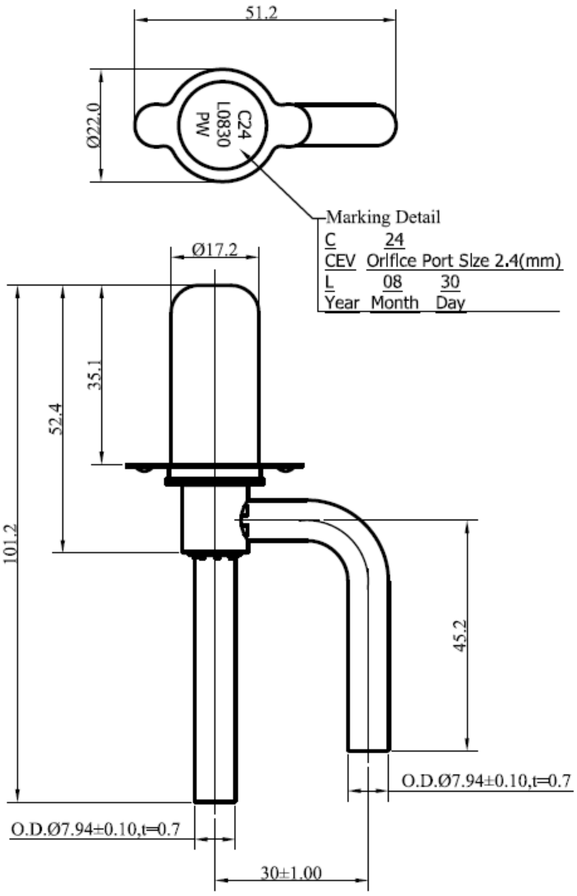

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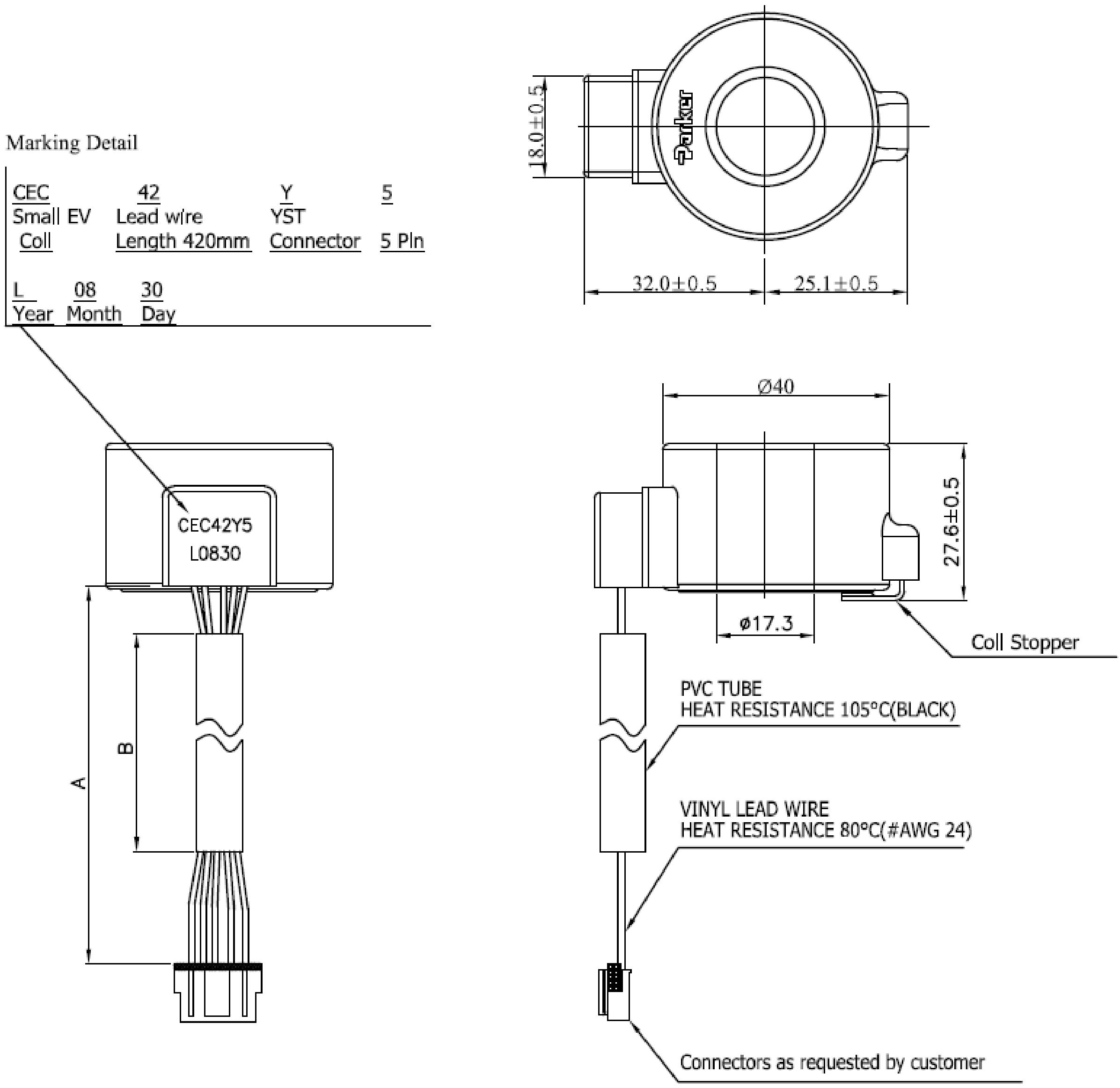

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