



Electrical control valves

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Electrical control valve technology

Thermostatic expansion valves and mechanical regulator valves have been used in the refrigeration and air conditioning industry to control superheat and refrigerant mass flow since its very beginning. As today's systems require improved energy efficiency, tighter temperature control, a wider range of operating conditions and incorporate new features like remote monitoring and diagnostics, the application of electronically operated valves becomes mandatory. Only these offer the controls performance necessary to meet these needs. Electrical control valves are actuators only. For operation in a system they need sensors, valve drivers and controllers, see next chapter.

The **EXM/EXL/EXN** biflow valves for OEM use are equipped with an unipolar stepper motor drive. They are mainly used for heat pumps, air conditioning and close control.

The **EX2** is designed for pulse width modulation. It is applicable to common refrigerants and is used mainly for refrigeration applications such as display cases. The EX2 valve is a slide type solenoid valve with an orifice for expansion. It is either completely open or completely closed. One common valve body can be combined with 6 interchangeable orifices to cover 7 capacity ranges. The **CX2** features the same technology and advantages as the EX2, however it is applicable to high-pressure CO₂ applications.

The **EX4-8** consist of two main internal assemblies, the valve and the stepper motor. The stepper motor is located next to the electrical plug and connected directly to the slide and

cage assembly of the valve. Similar to the technology used in compressors, the motor is exposed to refrigerant and lubricant and the materials used are identical to the ones in compressor motors. The housing of the motor and valve assembly is made from stainless steel and fully hermetic, utilising exclusively brazing and welding technologies and eliminating all gaskets. This design offers several technical advantages such as proportional linear mass flow and a wide capacity range. A common feature of all EX2, EX4-8 electrical control valves is the positive shut-off function, which eliminates the need for additional solenoid valves.

The **CV4-7** high pressure expansion valves are stepper motor driven valves for precise control of R744 (CO₂) refrigerant mass flow in air conditioning, refrigeration and heat pump applications. The Control Valves also can be used for liquid injection duty and hot gas bypass.

Valve selection

For the EX2, the published table quotes capacities at 100% duty cycle, i.e. valve open continuously. However, it is recommended to operate the valve at partial load (50-80%) to allow for system load fluctuations. For **EX4-8** and **EXM/EXL/EXN** valves, all published capacities are maximum and there are no reserve capacities. Each valve should be selected for the highest possible capacity of the system. A wide range regulation (10 ... 100%) with one slide orifice for each valve is achievable. To facilitate valve dimensioning for other conditions, please use Copeland Select software. It can be downloaded from copeland.com/en-gb.



Selection table for electrical control valves and applicable controllers

Valve Type	Function	Capacity (kW) R407C	Feature	Main Application	Applicable Controller
EXM/ EXL	Expansion Valve	1.6 .. 20.7	Uni Polar Stepper Motor Driven	Heat pumps, Air Conditioning, Close Control	EXD-HP1/2 Superheat Controller (Modbus)
EXN	Expansion Valve	30 .. 38	Uni Polar Stepper Motor Driven	Heat Pumps, Air Conditioning, Close Control	EXD-HP1/2 Superheat Controller (Modbus)
EX2	Expansion Valve	1.0 .. 18.7	PWM	Refrigeration (Display cases)	
EX4-8	Expansion Valve, Hot Gas Bypass, Condensing Pressure And Liquid Regulator, Head Pressure Control, Suction/Crankcase Pressure Regulator, Heat Reclaim	17.4 ... 925 (Capacity Data as Expansion Valve)	Bi Polar Stepper Motor Driven	Refrigeration, Air Conditioning, Water Chillers, Heat Pumps	EXD-U02 Driver Module EXD-SH1/2 Superheat Controller (Modbus)

Selection table for electrical control valves and applicable controllers for CO₂ applications

Valve Type	Function	Capacity (kW) R744	Feature	Main Application	Applicable Controller
CX2	Expansion Valve	1.5 ... 28.2	PWM	Refrigeration (Display cases)	
EX4-8	Expansion Valve	27 ... 1440	Bi Polar stepper Motor Driven	Refrigeration subcritical CO ₂	EXD-U02 Driver Module EXD-SH1/2 Superheat Controller (Modbus)
CV4-6.5	Expansion Valve HP Gas Valve Heat Reclaim Valve	Kv 0.21 ... 2.6 m ³ /h	Bi Polar stepper Motor Driven	Refrigeration subcritical and transcritical CO ₂	EXD-U02 Driver Module EXD-SH1/2 Superheat Controller (Modbus)

Electrical control valves series EXM/EXL for OEM use, stepper motor driven

Features

- Unipolar stepper motor
- Bi-flow (same performance in both flow directions in term of capacity)
- High MOPD: 40 bar in normal flow direction
- Removable coils in two versions: 12 VDC/24 VDC
- Continuous modulation of mass flow, no stress (liquid hammering) in the refrigeration circuit
- Linear flow
- Resolution: 500 pulses (half steps) or 250 full steps
- Hermetic design
- Reliability: 225 millions pulses at continuous 40 bar differential pressure
- VDE tested according to IEC-60335-2-89 and IEC-60335-2-40



EXM/EXL

Note: The valve is not released for refrigeration applications such as cold rooms and refrigeration display cabinets.

Selection table

Valve Series	Description	Type	Part No. (10 pcs)	Nominal Capacity (kW)						Connections Size / Style
				R32	R452B	R454B	R410A	R407C	R134a	
EXM	Valve less coil	EXM-B0A	800 399M	2.7	2.1	2.1	1.8	1.6	1.2	1/4" ODM
		EXM-B0B	800 400M	8.2	6.3	6.3	5.5	5.0	3.7	
		EXM-B0D	800 401M	17.3	13.3	13.3	11.6	10.5	7.7	
		EXM-B0E	800 402M	20.4	15.7	15.7	13.7	12.4	9.1	
	Coil 12VDC	EXM-125	800 403M	-	-	-	-	-	-	-
	Coil 24VDC	EXM-24U	800 415M	-	-	-	-	-	-	
EXL	Valve less coil	EXL-B1F	800 405M	25.3	19.4	19.4	17.0	15.4	11.3	1/4" ODF 8 mm ODM
		EXL-B1G	800 406M	34.2	26.3	26.4	23.0	20.7	15.2	
	Coil 12VDC	EXL-125	800 407M	-	-	-	-	-	-	-
	Coil 24VDC	EXL-24U	800 416M	-	-	-	-	-	-	

Note 1: Nominal conditions: Evaporating Temperature +4°C (dew point), Condensing Temperature +38°C (bubble point), Subcooling 1 K

Note 2: For the selection of other operation conditions, please use Copeland Select software.

Note 3: When selecting also observe the information in the operating instructions. Available for download on the Copeland website.

Technical data

Max. allowable pressure PS	45 bar
MOPD	40 bar in Normal Flow Direction, 30 bar Reverse Flow Direction
Temperature range TS	-30...+70°C (Liquid Refrigerant) -30...+60°C (Ambient)
Stepper motor type	Uni-polar, Constant Voltage

Full travel time	16.6 Seconds at 30 pulse/sec. 5.5 seconds at 90 pulse/sec.
Reference position	Mechanical stop at fully close position
Total number of pulses	500 half step (250 full step)
Insulation class	EXM: A EXL: E
Cable length	1 m

Electrical control valves series EXN for OEM use, stepper motor driven

Features

- Unipolar stepper motor
- Bi-flow with same capacity in normal and reverse flow direction
- MOPD: 36 bar in both flow directions
- Unipolar stepper motor with gear mechanism enabling Bi-flow performance at 36 bar differential pressure across the valve
- Removable coil: 12 VDC
- Continuous, linear modulation of mass flow
- High resolution: 2000 pulses (half steps) or 1000 full steps
- Hermetic design



EXN with coil

Selection table

Type	Description	Part No.	Nominal Capacity (kW)				Connections Size / Style
			R410A	R32	R134a	R407C	
EXN-B2K	Valve less coil	800421	34.0	50.6	22.2	30.7	1/2" ODF
EXN-B2L	Valve less coil	800422	42.0	62.5	28.8	37.9	1/2" ODF
EXN-125	Coil 12 VDC	800420	-	-	-	-	-

Note 1: Nominal conditions: Evaporating Temperature +4°C (dew point), Condensing Temperature +38°C (bubble point), Subcooling 1 K

Note 2: For the selection of other operation conditions, please use Copeland Select software.

Technical data

MOPD (Maximum Operating Pressure Differential)	36 bar in Normal Flow 36 bar in Reverse Flow
Max. allowable pressure PS	45 bar
Temperature range TS - liquid refrigerant - Ambient	-30...+70°C -30...+60°C
Stepper motor type	Uni-Polar, Constant Voltage, 5 Wires
Supply voltage	12 VDC Coil: 12 V $\pm$ 10%

Total number of pulses	2000 half step (1000 full step)
Pulsing rate frequency (pulse/sec.)	100...200 Hz
Full travel time	20 s at 100 Hz 10 s at 200 Hz
Coil insulation class	A
Cable length	1 m
Electrical connection	JST XH connector, 5 pole Housing: XHP-5 Pin: SXH-001T-P0.6

Electronic expansion valves series EX2 pulse width modulated with exchangeable orifices can be used with EC2 display case controllers

Features

- Pulse width modulated
- Shut-off function eliminates the necessity of a separate solenoid valve
- Dampened plunger reduces noise effects of water hammer
- One valve body can be combined with 6 orifices to make 7 capacity ranges
- Long lifetime, high reliability
- Max. allowable pressure PS: 40 bar
- Medium temperature range TS: -40...+65°C



Selection table

Type	Part No.	Description	Nominal Capacity at 100% Open Valve (kW)*								
			R134a	R22	R404A / R507	R407C	R448A	R449A	R450A	R513A	R452A
EX2-M00	801091	Valve less orifice 10 mm x 12 mm	13.3	17.2	12.1	18.7	17.2	16.8	11.7	12.0	13.0
EX2-I00	801090	Valve less orifice 3/8"x / 1/2"									
EXO-004	801089	Orifice 4	8.5	10.9	7.7	11.8	10.9	10.6	7.4	7.6	8.3
EXO-003	801088	Orifice 3	5.6	7.2	5.1	7.8	7.2	7.0	4.9	5.0	5.5
EXO-002	801087	Orifice 2	3.3	4.3	3.0	4.7	4.3	4.2	2.9	3.0	3.3
EXO-001	801086	Orifice 1	2.5	3.2	2.3	3.5	3.2	3.1	2.2	2.2	2.4
EXO-000	801085	Orifice 0	1.2	1.6	1.1	1.7	1.6	1.6	1.1	1.1	1.2
EXO-00X	801084	Orifice X	0.7	0.9	0.6	1.0	0.9	0.9	0.6	0.6	0.7

Note 1: Nominal conditions: Evaporating Temperature +4°C (dew point), Condensing Temperature +38°C (bubble point), Subcooling 1 K
For the selection of other operation conditions, please use Copeland Select software.

Note 2: *) Orifice should be selected at maximum 80% of Q_n to allow covering the load fluctuation.

Accessories

Type	Part No.	Part No. (Multipack*)	Description
ESC 24V	801033	-	Coil 24 VAC / 50 Hz
ESC 230V	801031	-	Coil 230 VAC / 50 Hz
ASC-N15	804570	804570M	Connector Cable Assembly
ASC-N30	804571	804571M	
ASC-N60	804572	-	
Plug PG9	801012	-	Plug with cable guide
Plug PG11	801013	-	
ESC-K01	801034	-	Screw cap (incl. 2x O-ring & fixing retainer)

Note: *) Multipack = 20 pcs

Electronic expansion valves series CX2 pulse width modulated with exchangeable orifices for high-pressure CO₂ applications can be used with EC2 display case controllers

Features

- Pulse width modulated
- Shut-off function eliminates the necessity of a separate solenoid valve
- Dampened plunger reduces noise effects of water hammer
- One valve body can be combined with 6 orifices to make 7 capacity ranges up to 28.2 kW
- Long lifetime, high reliability
- Max. allowable pressure PS: 90 bar
- MOPD: 40 bar



CX2 with orifice

Selection Table

Type	Part No.	Description	Nominal capacity (kW) at 100% continuous open R 744
CX2-100	801095	Valve: 3/8" x 1/2" ODF	28.2
EXO-004	801089	Orifice 4	17.9
EXO-003	801088	Orifice 3	11.8
EXO-002	801087	Orifice 2	7.0
EXO-001	801086	Orifice 1	5.2
EXO-000	801085	Orifice 0	2.6
EXO-00X	801084	Orifice X	1.5

Note 1: Nominal capacity at -10°C evaporating temperature, +10°C liquid temperature (45 bar) and 1K subcooling.
For the selection of other operation conditions, please use Copeland Select software.

Note 2: The table quotes capacities at 100% duty cycle, i.e. valve is open continuously. However, it is recommended to operate the valve at partial loaded (50-80%) to allow for system load fluctuations. When used with an EC2 case controller, the valve operates with a 6 second pulse width cycle.

Note 3: CX2 is released as expansion valve and during operation of valve CO₂ must be feed in liquid phase to inlet of the valve.

Accessories

Type	Part No.	Part No. (Multipack*)	Description
ESC-M24VAC	801304	-	Coil 24 VAC / 50 Hz**
ESC-W24VAC	801028	-	Coil 24 VAC / 50 Hz**
ESC-W230VAC	801029	-	Coil 230 VAC / 50 Hz**
ESC-M230VAC	801027	-	Coil 230 VAC / 50 Hz**
ASC-N15	804570	804570M	Connector Cable Assembly
ASC-N30	804571	804571M	
ASC-N60	804572	-	
Plug PG9	801012	-	Plug according to EN 175301 with cable gland
Plug PG11	801013	-	
ESC-K01	801034	-	Screw cap (incl. 2x O-ring & fixing retainer)

Note: *) Multipack = 20 pcs

**) 50Hz coils have lower MOPD with 60Hz frequency.

MOPD levels depending on supply voltage to coil

MOPD	Supply voltage to coil	Supply voltage to coil
65 bar	24 VAC nominal voltage	230 VAC nominal voltage
60 bar	24 VAC at -5% = 22.8 VAC	230 VAC at -5% = 218.5 VAC
50 bar	24 VAC at -10% = 21.6 VAC	230 VAC at -10% = 207 VAC
45 bar	24 VAC at -15% = 20.4 VAC	230 VAC at -15% = 195.5 VAC

Note: MOPD values are valid only for 50 Hz supply voltage operation.

Electrical control valves series EX4-8

Features

- Multifunction as expansion valve, hot gas bypass, suction gas throttling, head pressure, liquid level actuator etc.
- Fully hermetic design (no thread joints between valve body and motor compartment)
- Applicable to all common refrigerants and for subcritical CO₂ applications
- Stepper motor driven
- Short opening and closing time
- Very fast full-stroke time
- High resolution and excellent repeatability
- Positive shut-off function to eliminate the need for additional solenoid valve
- Bi-flow versions for heat pump applications
- High linear flow capacity
- Extremely wide capacity range (10 ... 100%)
- Continuous modulation of mass flow, no stress (liquid hammering) in the refrigeration circuit
- Direct coupling of motor and valve for high reliability (no gear mechanism)
- Ceramic slide and port for highly accurate flow and minimal wear
- Europe patent No. 0743476, USA patent No. 5735501, Japan patent No. 28225789
- Balanced force design
- Corrosion resistant stainless steel body and stainless steel connections



Selection table (Capacities see following page)

Type	Part No.	Flow Pattern	Capacity Range	Inlet Connection	Outlet Connection	Electrical Connection
EX4-I21	800 615	Uni-flow	10 ... 100%	3/8" ODF	5/8" ODF	M12 Plug
EX4-M21	800 616			10 mm ODF	16 mm ODF	
EX5-U21	800 618			5/8" (16 mm) ODF	7/8" (22 mm) ODF	
EX6-I21	800 620			7/8" ODF	1-1/8" ODF	
EX6-M21	800 621			22 mm ODF	28 mm ODF	
EX7-I21	800 624			1-1/8" ODF	1-3/8" ODF	
EX7-M21	800 625			28 mm ODF	35 mm ODF	
EX8-M21	800 629			42 mm ODF	42 mm ODF	
EX8-U21	800 630			1-3/8" (35 mm) ODF	1-3/8" (35 mm) ODF	
EX8-I21	800 631			1-5/8" ODF	1-5/8" ODF	
EX4-U31	800 617	Bi-flow (Heat Pump)	10 ... 100%	5/8" (16 mm) ODF	5/8" (16 mm) ODF	
EX5-U31	800 619			7/8" (22 mm) ODF	7/8" (22 mm) ODF	
EX6-I31	800 622			1-1/8" ODF	1-1/8" ODF	
EX6-M31	800 623			28 mm ODF	28 mm ODF	
EX7-U31	800 626			1-3/8" (35 mm) ODF	1-3/8" (35 mm) ODF	

Cable connector assemblies

Type	Part No.	Temperature Range	Length	Connector Type to Valve	Connector Type to Driver or Controller	Illustration
EXV-M15	804 663	-50 ... +80°C	1.5 m	M12, 4 Pins	Loose Wires	
EXV-M30	804 664		3.0 m			
EXV-M60	804 665		6.0 m			

Capacity data

Nominal capacities...

...as expansion valves and liquid injection valves, (kW) (10%...100%)

Type	R410A	R134a	R22	R404A	R507	R407C	R23	R124	R744	R452A	R448A	R449A	R450A	R513A	R1234ze	R452B	R32	R454A	R454C	R1234yf	R454B	R455A
EX4	19.3	12.8	16.5	11.5	11.5	17.4	17.8	9.2	27.0	12.5	16.5	16.1	11.3	11.5	10.0	22.0	28.6	16.2	13.5	9.2	22.1	15.6
EX5	58.0	39.0	50.0	35.0	35.0	53.0	54.0	28.0	82.0	37.9	50.0	49.0	34.0	35.0	30.0	67.0	87.0	49.0	41.0	28.0	67.0	47.0
EX6	140.0	93.0	120.0	84.0	84.0	126.0	130.0	67.0	197.0	91.0	120.0	117.0	82.0	84.0	73.0	160.0	208.0	118.0	98.0	67.0	161.0	114.0
EX7	385.0	255.0	330.0	230.0	230.0	347.0	357.0	186.0	541.0	250.0	329.0	322.0	225.0	230.0	200.0	441.0	573.0	324.0	270.0	184.0	443.0	313.0
EX8	1027.0	680.0	880.0	613.0	613.0	925.0		495.0	1442.0	666.0	878.0	857.0	600.0	614.0	532.0	1175.0	1528.0	865.0	720.0	491.0	1180.0	833.0

Note 1: Bi-flow versions are not released for use with R124, R452A and R23 refrigerants.

Note 2: Bi-flow versions have identical capacity in both flow directions.

...as hot gas bypass regulator, (kW)

Type	Kv (m³/h)	R410A	R134a	R22	R404A	R507	R407C	R452A	R448A	R449A	R450A	R513A	R1234ze	R454A	R454C	R1234yf	R455A
EX4	0.2	5.8	2.7	3.9	3.7	3.7	4.4	3.9	4.5	4.4	2.4	2.6	2.0	4.6	3.8	2.3	4.4
EX5	0.7	18.9	8.8	12.7	12.2	12.2	14.2	12.8	14.5	14.2	7.6	8.6	6.5	15.0	12.4	7.5	14.4
EX6	1.6	44.0	20.4	29.5	28.3	28.3	33.0	29.7	33.8	33.1	17.7	19.9	15.1	34.9	28.7	17.4	33.4
EX7	5.6	156.0	73.0	105.0	100.0	100.0	117.0	105.0	120.0	118.0	63.0	71.0	54.0	124.0	102.0	62.0	119.0
EX8	17.0	475.0	220.0	319.0	305.0	305.0	356.0	320.0	364.0	358.0	192.0	215.0	163.0	376.0	310.0	188.0	361.0

Note: Bi-flow versions are not released for hot gas flow applications.

...as suction pressure regulator (evaporator or crankcase), (kW)

Type	Kv (m³/h)	R410A	R134a	R22	R404A	R507	R407C	R452A	R448A	R449A	R450A	R513A	R1234ze	R454A	R454C	R1234yf	R455A
EX6	1.57	5.0	3.1	4.1	3.5	3.6	3.9	3.4	3.9	3.8	2.8	3.0	2.5	4.0	3.4	2.7	3.5
EX7	5.58	17.9	11.1	14.7	12.5	12.7	13.7	12.1	13.8	13.6	9.9	10.6	9.0	14.1	12.0	9.6	12.6
EX8	16.95	54.5	33.6	44.5	38.1	38.6	41.8	36.8	41.9	41.4	30.1	32.2	27.4	42.9	36.4	29.1	38.2

Note: Bi-flow versions are not released for use below -40°C

...as condensing pressure regulator and liquid duty, (kW)

Type	Kv (m³/h)	R410A	R134a	R22	R404A	R507	R407C	R452A	R448A	R449A	R450A	R513A	R1234ze	R454A	R454C	R1234yf	R455A
EX4	0.21	5.7	5.6	6.0	4.0	3.9	5.7	4.1	5.3	5.2	5.3	5.0	5.1	5.1	4.5	4.2	4.8
EX5	0.68	18.5	18.3	19.5	12.9	12.5	18.5	13.2	17.1	16.8	17.0	16.3	16.5	16.5	14.7	13.6	15.6
EX6	1.57	43.0	42.5	45.5	30.0	29.1	43.0	30.7	39.9	39.1	39.6	37.8	38.3	38.5	34.3	31.6	36.2
EX7	5.58	153.0	151.0	162.0	107.0	103.0	153.0	109.0	142.0	139.0	141.0	134.0	136.0	137.0	122.0	112.0	129.0
EX8	16.95	465.0	459.0	491.0	324.0	314.0	464.0	331.0	430.0	422.0	428.0	408.0	413.0	415.0	370.0	341.0	391.0

...for hot gas flow such as heat reclaim application, (kW)

Type	Kv (m³/h)	R410A	R134a	R22	R404A	R507	R407C	R452A	R448A	R449A	R450A	R513A	R1234ze	R454A	R454C	R1234yf	R455A
EX5	0.68	5.9	4.0	5.1	4.3	4.3	5.1	4.4	5.1	5.0	3.7	3.8	3.3	5.2	4.5	3.4	5.0
EX6	1.57	13.7	9.3	11.8	9.9	9.9	11.8	10.1	11.7	11.6	8.5	8.8	7.6	11.9	10.4	7.7	11.4
EX7	5.58	48.8	32.9	42.1	35.3	35.3	42.1	36.1	41.7	41.1	30.1	31.2	27.1	42.3	37.1	27.5	40.6
EX8	16.95	148.0	100.0	128.0	107.0	107.0	128.0	110.0	127.0	125.0	91.0	95.0	82.0	129.0	113.0	84.0	123.0

Note: Bi-flow versions are not released for hot gas flow applications.

The nominal capacity is based on the following conditions:

Refrigerant	Evaporating temperature	Condensing temperature	Pressure drop (For suction duty)	Pressure drop (For liquid duty)	Pressure drop (For hot gas flow duty)	Isentropic efficiency (For hot gas flow duty)
R134a, R404A, R410A, R513A, R1234ze	+4°C dew point	+38°C bubble & dew point	0.15 bar	0.35 bar	0.5 bar	80%
R407C	+4°C dew point	+38°C bubble/ +43°C dew point				
R124	+20°C	+80°C				
R23	-60°C	-25°C				
R744	-10°C	+10°C				
R450A	+4°C	+38°C bubble/ +38.6°C dew point				
R452A		+38°C bubble/ +41.6°C dew point				
R448A, R449A		+38°C bubble/ +42.6°C dew point				

Note: For selection of other operating condition, please use Copeland Select software.

Technical data

Compatibility	A1: R134a, R404A, R507, R407C, R450A, R513A, R452A, R448A, R449A, R410A, R744 (subcritical), R23, R124 A2L: R32, R452B, R454B, R454A, R454C, R1234ze, R1234yf Mineral and POE lubricants
Note: UL only for use with A1 refrigerants.	
MOPD (Maximum Operating Pressure Differential)	EX4/EX5/EX6: 40 bar EX7: 35 bar EX8: 30 bar
Max. allowable pressure PS	EX4 (uni-flow): 90 bar EX4(bi-flow)/EX5/6/7: 60 bar EX8: 45 bar UL Approval: EX4/5/6/7: 60 bar UL Approval: EX8: 45 bar
Factory test pressure PT	EX4 (uni-flow): 99 bar EX4(bi-flow)/EX5/6/7: 66 bar EX7: 86 bar EX8: 65 bar
Ambient temperature Storage temperature	-40...+55°C -40...+70°C
Medium Inlet Temperature Bi-flow version: Uni-flow version:	TS: -50...+80°C TS: -50...+100°C (UL-Approval based on $\geq -40^{\circ}\text{C}$)

Evaporating Temperature	-100...+55°C
Salt Spray Test	non-corrosion stainless steel body
Connections	ODF stainless steel fittings
Humidity	5 to 95% r.H.
Protection accordance to IEC 529, DIN 40050	IP67 with Copeland supplied cable connector assembly
Vibration for non-connected and fastened valve	4 g (0...1000 Hz, 1 octave /min.)
Shock	20 g at 11 ms 80 g at 1 ms
Net weight (kg)	0.5 kg (EX4), 0.52 kg (EX5), 0.60 kg (EX6), 1.1 kg (EX7), 1.5 kg (EX8)
External leakage	$\leq 3 \text{ g / year}$
Seat Leakage	Positive shut-off better than solenoid valves
Marking	EX4/5/6: None (Out of PED scope) EX7/8:  1017 (Module D1) UKCA EX4/5/6/7/8: 

Electrical data

Stepper Motor Type	Bi-polar, phase current by chopper control (constant current)
Electrical Connection	4 pin terminal via plug
Recom. Driver Supply	24 VDC (nominal)
Driver Supply Voltage Range	18...36 VDC
Phase Current, Operating	EX4/EX5/EX6: 500 max, -10% EX7: 750 mA $\pm 10\%$ EX8: 800 mA $\pm 10\%$
Holding Current	EX4/EX5/EX6: 100 mA EX7: 250 mA EX8: 500 mA
Nominal Input Power per Phase	EX4/EX5/EX6: 3.5 W EX7/EX8: 5 W
Stepping Rate	500 Hz

Phase Inductance	EX4/EX5/EX6: 30 mH $\pm 25\%$ EX7: 20 mH $\pm 25\%$ EX8: 22 mH $\pm 25\%$
Step Mode	2 phase full step
Step Angle	1.8° per step $\pm 8\%$
Reference Position	Mechanical stop at fully close position
Total Number of Steps	EX4/EX5/EX6: 750 full steps EX7: 1600 full steps EX8: 2600 full steps
Winding Resistance per Phase	EX4/EX5/EX6: 14 Ω $\pm 10\%$ EX7: 10 Ω $\pm 10\%$ EX8: 7.5 Ω $\pm 10\%$
Full Travel Time	EX4/EX5/EX6: 1.5 seconds EX7: 3.2 seconds EX8: 5.2 seconds

High pressure expansion valves series CV4-6.5

CV4-6.5 valves are stepper motor driven valves for precise control of refrigerant mass flow in air conditioning and refrigeration systems with CO₂. The control valves can be used as high pressure gas valve for gas cooler control, expansion device, hot gas and cold gas bypass, liquid injection duty, evaporator pressure regulator, crankcase pressure regulator, head pressure regulator, or liquid level control.

Features and benefits

- Maintenance free
- Multifunction
- Fully hermetic design with ODF connections
- Stepper motor driven
- Short opening and closing time
- Very fast full stroke time
- High resolution and excellent repeatability
- Positive shut-off function to eliminate the use of an additional solenoid valve
- Linear flow capacity
- Extremely wide capacity range (10...100%)
- Optimal solution applied to offer the highest reliability and lifespan, accordingly to the high differential pressures in the CO₂ systems
- Ceramic slide and port for precise flow and minimal wear
- Balanced force design
- Corrosion resistant stainless-steel body and connections



CV4-6.5
with ODF connection

Selection table

Type	Part No.	Kv (m ³ /hr)	Control Range	Inlet Connection	Outlet Connection	Electric Connector
CV4-HPV	802056	0.2	Please refer to Copeland Select software.	3/8"	5/8"	M12 plug
CV5-HPV	802057	0.6		5/8"	7/8"	
CV6-HPV	802058	1.5		7/8"	1-1/8"	
CV4.5-HPQ	802060	0,45		5/8"	5/8"	
CV5.5-HPQ	802061	0,85		7/8"	7/8"	
CV5.8-HPQ	802062	1,30		7/8"	7/8"	

Note 1: Valves are delivered without cable/connector assembly. Please order them separately.

Cable and connector assemblies

Type	Part No.	Temperature Range	Length	Connector type to valve	Connector type to driver board or controller	Illustration
EXV-M15	804 663	-50 ... +80°C	1.5 m	M12	Loose wires	
EXV-M30	804 664		3.0 m			
EXV-M60	804 665		6.0 m			

Technical data CV valves

Marking	 	not required (Out of scope of PED) CV4/5/6 (No.MP604)
Compatibility	CO ₂ and POE lubricants	
MOPD	70 bar (In conjunction with EXD-U02 driver)	
Max. Allowable Pressure PS	130 bar	
Factory Test Pressure PT	186 bar	
Temperatures	Ambient Storage Medium	-40...+65°C -40...+70°C -50...+100°C

Protection Accordance to IEC 529, DIN 40050	IP67 with EXV-Mxx plug and cable assembly
Vibration	4 g (0...1000 Hz, 1 octave /min.)
Shock (CV4-6)	20 g at 11 ms 80 g at 1 ms
External Leakage	6.4 × 10 ⁻⁶ mbar*liter/sec.
Humidity	100% R.H.

Electrical data CV valves

Stepper Motor Type	Bi-polar, phase current by chopper control (constant current)
Electrical Connection	4 pins terminal for M12 plug
Driver Supply Voltage to the Valve	18...36 VDC
Operating (Moving) Current Peak	CV4: 625 mA CV5-7: 800 mA
Holding Current Peak	CV4: 100 mA CV5-7: 300 mA
Phase Inductance	CV4: 30 mH $\pm$ 25% CV5/6/7: 20 mH $\pm$ 25%

Step Mode	2 phase full step
Stepping Rate	500 Hz
Total Number of Steps	CV4-6: 750 full steps CV7: 6400 full steps
Winding Resistance per Phase	CV4: 14 Ω $\pm$ 10% CV5-7: 10 Ω $\pm$ 10%
Full Travel Time	CV4-6: 1.5 s CV7: 12.8 s
Reference Position	Mechanical stop at fully close position