

## 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 CO<sub>2</sub> 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)		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	<b>A1:</b> R134a, R404A, R507, R407C, R450A, R513A, R452A, R448A, R449A, R410A, R744 (subcritical), R23, R124 <b>A2L:</b> 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 ≥ -40°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	≤ 3 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 ±10% EX8: 800 mA ±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 ± 25% EX7: 20 mH ± 25% EX8: 22 mH ± 25%
Step Mode	2 phase full step
Step Angle	1.8° per step ± 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 ±10% EX7: 10 Ω ±10% EX8: 7.5 Ω ±10%
Full Travel Time	EX4/EX5/EX6: 1.5 seconds EX7: 3.2 seconds EX8: 5.2 seconds