Refrigeration Valves

For over 30 years, Siemens has been developing and producing refrigerant valves with magnetic actuators. Siemens refrigerant valves offer precise control and optimum energy efficiency in refrigeration systems. The one thing they all have in common is the actuator technology: the ultra precise, permanent DC magnetic actuation.

The Siemens refrigeration valve range offers diverting and 2-port valves for refrigeration applications. These include refrigerant valves for expansion, hot gas bypass (indirect or direct) and suction throttle applications. The high maximum permissible differential pressure and maximum permissible operating pressure allow the use of many types of refrigerants and can be used in applications with high pressures in the system.

The valves are not only simple to install and maintenance-free, but also safe for the environment.

Features

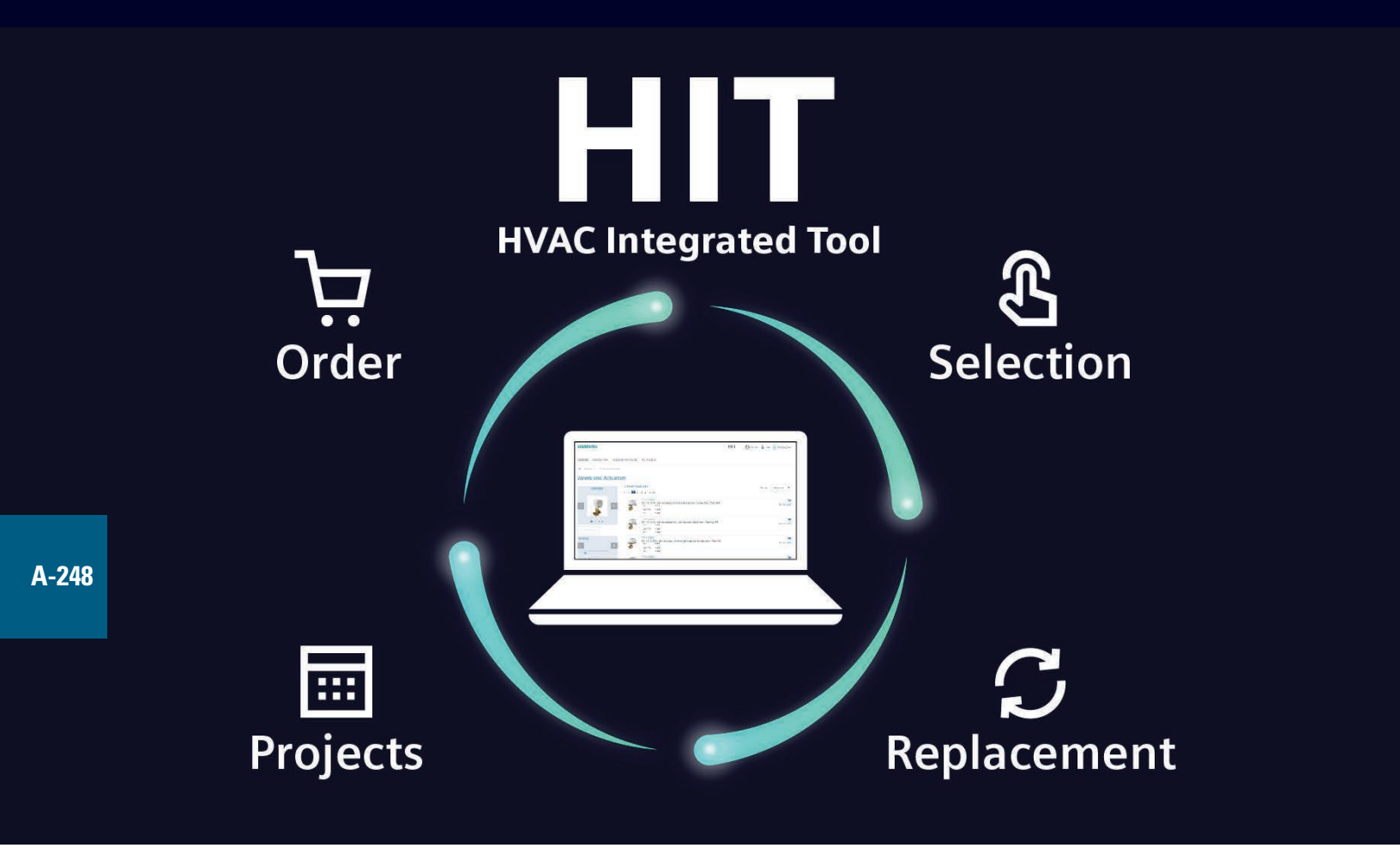
- Hermetically sealed for a high degree of environmental compatibility
- High stroke resolution
- Positioning time < 1 second
- Vibration-free operation
- Ease of service and installation

Refrigerants

- Ammonia (M2FP, MVS661)
- CO_2 (MVL661, MVS661, MVL702)
- Commonly used safety refrigerants

Applications

- Expansion
- Hot Gas Bypass (direct and indirect)
- Suction Throttle
- Diverting or straight through
- Can be used for chillers, heat pumps, air conditioning, supermarket refrigeration systems, air handling plants, etc.
- Modulating pilot valve with magnetic actuator (M2FP03GX) is available as the controlling element for 2 to 5-inch main valves.



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SIEMENS

PolyCool Superheat Controller

Description

The PolyCool™ Superheat is successful in areas where energy savings and optimization is a priority. This package further offers functionality for capacity control. As a result, the package can replace, the normal thermostatic expansion valves (TEV) and the magnetic shutoff valve in refrigeration applications. Finally, the package controls the refrigeration capacity via an external signal or connection with a Ni1000 standard sensor.

Features

- Integrated user interface
- Hermetically sealed valve
- Precise and fast control components
- Real superheat control through pressure and temperature measurements
- Electronic expansion valve provides a high degree of precision
- Safety shutoff for compressors
- MOP (maximum operating pressure)
- Control algorithms for minimum superheating
- 1 or 2 independent superheating control circuits
- 30 refrigerants (including R717 (NH3), R744 (CO2) and R723)
- Adjustable valve Start-up behavior (time and opening degree)

Applications

The PolyCool Superheat was developed especially for controlling superheating of evaporators with dry expansion:

- PolyCool RWR462.10 can be employed with chillers, in particular, refrigeration machines with plate heat exchangers.
- PolyCool RWR462.10 for DX evaporators in air handling units and other applications such as evaporators in grocery stores, warehouses, computer rooms, etc.

The PolyCool Superheat is successful in areas where energy savings and optimization is a priority. This package further offers functionality for capacity control. As a result, the package can replace, the normal thermostatic expansion valves (TEV) and the magnetic shutoff valve in refrigeration applications. Finally, the package controls the refrigeration capacity via an external signal or connection with a Ni1000 standard sensor.

Specifications

Logistics

ASN RWR462.10

ASN Set CPS40.040, CPS40.100, CPS40.250, CPS40.630

Standard pressure sensor ..... QBE9101-P10U -1...-9 bar, 4...20 mA

Hardware

Power supply ..... AC/DC 24V

Communication ..... Modbus slave (Version 2) LCD-Symbol

Configuration

Pressure sensor ..... QBE2001-P10U -1...9 bar, DC 0...10 V
QBE2001-P25U -1...-24 bar, DC 0...10 V
QBE2001-P60U -1...-59 bar, DC 0...10 V
QBE9101-P10U -1...-9 bar, 4...20 mA
QBE9101-P30U -1...-29 bar, 4...20 mA
QBE9101-P60U -1...-59 bar, 4...20 mA

Refrigerants 30
(R22, R23, R134a, R152a, R170, R290, R401a, R401b, R401c, R402a, R402b, R402c, R404a, R406a, R407a, R407b, R407c, R408a, R409a, R410a, R410b, R417a, R502, R507, R717, R723, R744, R1270, R600a, R600)

Refrigerants circuits 2

Parameter settings

Min. operating Temperature ..... -50°C

Feedback of valve in running mode ..... Yes

Sensor failure alarm ..... Yes

Min Superheat range ..... Adjustable 0..4K

Superheat set point range ..... 0…16K

Valve start up sequence ..... Yes (Time and opening degree)

Compressor alarm start up delay ..... Yes

Mode of operation with Ext. Capacity Control Signal ..... Reversible
10 V = min or max Qo

Product Ordering

Description	Part No.
Superheat controller for 1 or 2 refrigeration circuits	**RWR462.10**
Superheat control set consisting of controller (RWR462.10), valve (MVL661…- …), pressure sensor (QBE9101-P10U), temperature sensor (QAZ21.682/101) and an installation and user's guide.	**CPS40.040** **CPS40.100** **CPS40.250** **CPS40.630**

Modulating Refrigerant Valves with Magnetic Actuators

MVL661... Series Refrigerant Valve

Description

Control valves with magnetic actuator for modulating control of refrigerant circuits using CO_2 and commonly used safety refrigerants.

Features

- One valve type for expansion, hot-gas and suction throttle applications
- Hermetically sealed towards outside
- Selectable standard interface 0 to 10 Vdc, 2 to10 Vdc, 0 to 20 mA or 4 to 20 mA
- High resolution and control accuracy
- Precise positioning control and position feedback signal
- Short positioning time (<1 second)
- Closed when de-energized
- Robust and maintenance-free
- Five valve sizes with Cv (kvs) values from 0.29 to 13.9 PSI (0.25 to 12)
- 4 selectable standard signals for setpoint and measured value
- DIP switch to reduce the Cv (kvs) value to 63% of the nominal value
- Potentiometer for adjustment of minimum stroke for suction throttle applications
- Automatic stroke calibration
- Forced control input for “Valve closed” or “Valve fully open”
- LED for indicating the operating state

Applications

The MVL661...Series refrigerant valves are designed for modulating control of refrigerant circuits including chillers and heat pumps. They can be used in expansion, hot-gas and suction throttle applications as well as with all commonly used safety refrigerants (R22, R134a, R227ea, R404A, R407C, R410A, and so on) and R744 (CO_2). They are not suitable for flammable refrigerants.

Specifications

Operating Voltage
24 Vac ..... 24 Vac ± 20%
Frequency ..... 45 to 65 Hz
Typical Power Consumption
P_{med} 12W
Standby ..... <1 W (valve fully closed)
Apparent Power, S_{NA} ..... 22 VA (for selecting the transformer)
Required Fuse ..... Slow, 1.6 to 4A
24 Vdc ..... 20 to 30 Vdc
Current draw ..... 0.5A/2A (maximum)

Control Signal Y ..... 2 to 10 Vdc, 4 to 20 mA,
Impedance
0/2 to 10 Vdc 100K ohm/5nF
0/4 to 20 mA 240 ohm/5nF
Forced control ZC
Input impedance ..... 22K ohm
Closing the valve (ZC connected to G0) ..... <1 Vac; <0.8 Vdc
Opening the valve (ZC connected to G) ..... >6 Vac; >5 Vdc
No function (ZC not wired) ..... Positioning signal Y active

Position Feedback Signal U
Voltage ..... 2 to 10 Vdc; load resistance ≥ 500 Ω
Current ..... 4 to 20 mA; load resistance ≤ 500 Ω
Stroke Detection ..... Inductive
Nonlinearity ..... Accuracy ±3% full scale

Positioning Time ..... < 1 second

Electrical Connections
Cable Entry Glands ..... 3 × ø × 17 mm (for M16)
Min. Wire Size ..... 20 AWG (0.75 mm²)
Max. Cable Length ..... See Wiring

Nominal Pressure ..... 232 PSI (PN 16)

Permissible Operating Pressure [1] ..... max. 652 PSI (45 bar)

Max. Differential Pressure Δp_{max} ..... 363 PSI (25 bar)
1-1/4-inch (DN32): 29 PSI (2 bar)

Valve Characteristic (stroke vs C_V or k_V) ..... Linear (to VDI/VDE2173)

Leakage Rate (Internally Across Seat) ..... Max. 0.002% Cv (Kv) or
Max. 1 Nl/h gas at Δp = 58 PSI (4 bar)
Shut/off function, like solenoid
normally closed (NC) function

External Seal ..... Hermetically sealed (fully welded,
no static or dynamic seals)

Permissible Media ..... Commonly used safety refrigerants
(R22, R134a, R227ea, R404A, R407C, R410A,
R422D, and so on) and R744 (CO_2)
Not suitable for flammable refrigerants
Not suitable for ammonia (R717).
For refrigerants belonging to Fluid group 1,
please contact your local Siemens representative.

Media Temperature ..... -40° to 248°F (-40° to 120°C),
Max. 284°F (140°C) for 10 min.

Stroke Resolution ΔH/H100 ..... 1:1000 (H = Stroke)

Hysteresis ..... Typically 3%

Mode of Operation ..... Modulating

Position when de-energized ..... Control path A → AB closed

Orientation ..... Upright to horizontal

Valve Body and Parts ..... Steel/crNi Steel

Seat/Piston ..... CrNi Steel/Brass

Sealing Disk ..... PTFE

Sleeves ..... Internally soldered, CrNi steel

Temperature
Operation ..... -13° to 131°F (-25° to 55°C)
Transport ..... -13° to 158°F (-25° to 70°C)
Storage ..... 23° to 113°F (-5° to 45°C)

Humidity
Operation ..... 10 to 100% rh
Transport ..... < 95% rh
Storage ..... 5 to 95%

Notes:
S_{NA} = Nominal apparent power for selecting the transformer
P_{med} = Typical power consumption
I_F = Required slow fuse
L = Max. cable length; with 4-wire connections, the max. permissible length of the separate 14 AWG (1.5 mm²) copper positioning signal wire is 656 ft (200 m)
1) All information at 24 Vac
2) With 10 AWG (4 mm²) electrical wiring reduce wiring cross-section for connection inside valve to 12 AWG (2.5 mm²).

Wiring

Part No.	Connection Type	(VA)	(W)	(A)	Wire Gauge (AWG) 14 Max. Cable Length ft (m)	12 Max. Cable Length ft (m)	10 Max. Cable Length ft (m)
MVL661…-…	4 wire (preferred)	22	12	1.6 to 4A	213 (65)	361 (110)	525 (160)
	3 wire	22	12	1.6 to 4A	65 (20)	115 (35)	164 (50)

Sizing

Part No.	Valve Size (in.)	Cv	Cv Reduced[1]	Δpmax PSI	Q_0 E (kW)	Q_0 H (kW)	Q_0 D (kW)
MVL661.15-0.4	1/2	0.46	—	363	47	9.2	1.7
		—	0.29		29	5.7	1.0
MVL661.15-1.0	1/2	1.2	—	363	117	23	4.2
		—	0.73		74	14	2.6
MVL661.20-2.5	3/4	2.9	—	363	293	57	10
		—	1.8		187	37	6.6
MVL661.25-6.3	1	7.3	—	363	737	144	26
		—	4.6	—	468	92	17
MVL661.32-10	1-1/4	11.6	—	232	969	279	41
		—	7.3	—	610	176	26
MVL661.32-12	1-1/4	13.9	—	29	*	*	50
		—	9.2	—	*	*	33

Table Notes:

[1]63% of Cv (k_{vs}), see Cv (k_{vs}) *DIP switch setting.*

* MVL661.32-12.0 is only approved for suction throttle applications

Cv Nominal flow rate, in gpm, of refrigerant through the fully open valve (H100) at a differential pressure of 1 PSI.

Δpmax Maximum permissible differential pressure across the control path of the valve, valid for the entire actuating range of the motorized valve.

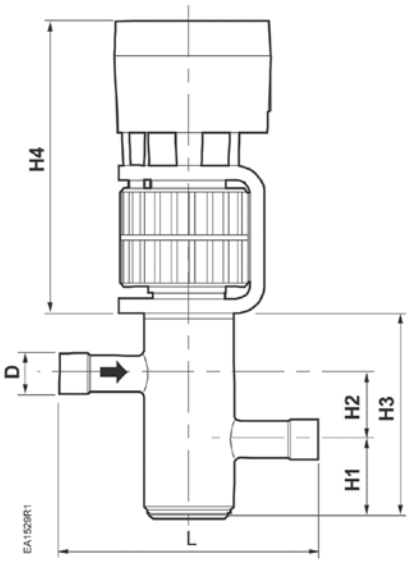
Q_0 E Refrigeration capacity in expansion applications

Q_0 H Refrigeration capacity in hot-gas bypass applications

Q_0 D Refrigeration capacity in suction throttle applications and Δp = 7.25 PSI (0.5 bar)

Q_0 With R407C at t_0 = 32°F (0°C), t_c = 4°F (40°C).

Dimensions and Weights



Dimensions shown in inches (mm)

Line Size (in.)	D	L	H1	H2	H3	H4	Depth	Weight lb (kg)
1/2	5/8	5.51 (140)	1.73 (44)	1.42 (36)	4.45 (113)	6.30 (160)	4.05 (103)	9.7 (4.4)
3/4	7/8	5.90 (150)	1.61 (41)	1.61 (41)	4.69 (119)	6.30 (160)	4.05 (103)	9.9 (4.5)
1	1-1/8	6.30 (160)	1.57 (40)	1.85 (47)	4.96 (126)	6.30 (160)	4.05 (103)	10.1 (4.6)
1-1/2	1-3/8	7.5 (190)	1.69 (43)	2.13 (54)	5.59 (142)	6.30 (160)	4.05 (103)	13.4 (6.1)

Table Notes:

D Pipe connections (inch), internal dimension

Modulating Refrigerant Valves with Magnetic Actuators

MVL702... Series Refrigerant Valve

Description

Control valves with magnetic actuator for modulating control of refrigerant circuits using CO2 and commonly used safety refrigerants.

Features

- One valve type for expansion, hot-gas and suction-throttle applications
- Fast positioning time (<1 second)
- Closed when de-energized (NC)
- Integrated positioning sensor for precise control
- Biflow function to max. 40 bar differential pressure
- Hermetically sealed, laser-welded stainless-steel housings
- Copper-coated pipe connections for easy soldering
- Completely qualified with Siemens valve driver POL94M
- Control sources (received positioning signal) can be analog, via Modbus RTU or via Peripheral bus (Climatix controller)
- High resolution and control accuracy
- Five valve sizes with kvs values from 0.1 to 2.9 m3/h

Applications

The MVL702 series… magnetic refrigerant valve is a modulating valve for refrigerant circuits such as in chillers and heat pumps and is used in expansion, hot-gas and suction-throttle applications.

Other applications including close-control and rooftop air-handling units benefit from the MVL702 features.

The valve can use all commonly available refrigerants* including R32, R134a, R290, R410A, R448A, R449A, R450A, R452A, R513A, R454B, R454C, R1234yf, R1234ze(E), etc.

* Risk assessment for all flammable refrigerants

The system operator is required to perform a risk assessment on all flammable refrigerants as per local applicable standards and regulations.

See also section "Standards, directives and approvals."

Siemens offers a 5-year warranty on valves and actuators.

Specifications

Operating Voltage
Driving coil (M1+: black / M1-: white) ..... DC 0...20 V via POL94M

Signal Inputs
Positioning sensor supply (S+: red / S-: blue) ..... < AC 5 V

Signal outputs
Position feedback signal (SIN: yellow) ..... < AC 5 V

Resistance
Driving coil (M1+: black / M1-: white)[1] ..... 12.6 Ω[2] ± 3 Ω
Positioning sensor (S+: red / SIN: yellow) ..... 59 Ω[2] ± 5 Ω
Positioning sensor (S-: blue / SIN: yellow) ..... 59 Ω[2] ± 5 Ω

Electrical connection ....via M12 connector and connector cable POL0C

Max. permissible operating pressure MOP ..... 5.0 MPa (50 bar)*

Max. differential pressure Δp_{max} .....A → AB: 3.6 MPa (36 bar)*
AB → A: 4.0 MPa (40 bar)*

Flow curve ..... Depending on flow direction, see "valve flow curves"

Internal leakage rate ..... (valid in any flow direction)
k_{vs} = 0.1, 0.2 m^3/h: < 2 ml/min — gas at Δp = 4 bar
k_{vs} = 0.4...2.9 m^3/h: < 8 ml/min — gas at Δp = 4 bar

External Seal .....Hermetically sealed (completely laser welded, no static or dynamic seals) 100% of production is tightness tested

Permissible fluid ..... R32[3], R134a, R290[3], R410A, R448A, R449A, R450A, R452A, R454B**, R454C[3], R513A, R1234yf[3], R1234ze(E)[3] and similar refrigerants.
Notice: Not suitable for ammonia (NH_3, R717).

Fluid Temperature ..... HFC/HFO application 50 bar
Connection A: –40...+130°
Connection AB: –40...+110°C[4]

Stroke Resolution ΔH/H100 ..... 1:1000 (H = Stroke)

Mode of Operation ..... Modulating

Positioning time ..... 1 sec for full opening
for individual positioning speed settings, see POL94M data sheet

Position when de-energized ..... Valve is closed in less than 1 sec.
Valve is closed and stays closed up to Δp_{max} in both directions, A → AB and AB → A.

Orientation ..... Upright to horizontal

Valve Body and Parts ..... CrNi steel

Pipe Connection ..... CrNi steel with copper plating

Notes:
1) Resistance including 2m cable. Driving coil with 4m cable: 12.7 Ω ± 3 Ω. Driving coil with 8m cable: 12.9 Ω ± 3 Ω
2) Resistance at room temperature
3) The manufacturer as well as the operator must comply with all legal requirements while handling with fluids belonging to fluid group 1.
4) Increased power consumption: Applications with fluid temperature greater than 70 °C available upon request.

Connection cable, with MVL702 valve connector plug

Type 1	Stock number	Length	Protection class Connector plug	Release temperature range	Weight
	Single Pack	[in]			[Kg]
POL0C5.20/STD	**S55845-Z642**	2	IP67	-40...105°C	0.17
POL0C5.40/STD	**S55845-Z644**	4			0.31
POL0C5.80/STD	**S55845-Z648**	8			0.60

Sizing

Type	Pipe connections		kvs [1]		Δp		MOP	Q_0 [2]		
	A × AB		A → AB	AB → A	A → AB	AB → A	—	R134a	R290	R32
	[inch]	[mm]	[m³/h]	[m³/h]	[bar]	[bar]	[bar]	[kW]	[kW]	[kW]
MVL702.09-09-0.1	3/8" × 3/8"	—	0.1	0.1	36	40	50	7.1	0.1	0.1
MVL702.10-10-0.1	—	10 × 10								
MVL702.09-09-0.2	3/8" × 3/8"	—	0.2	0.16				14.3	0.2	0.2
MVL702.10-10-0.2	—	10 × 10								
MVL702.13-13-0.4	1/2" × 1/2"	—	0.4	0.36				28.6	0.1	0.1
MVL702.16-16-0.4	5/8" × 5/8"	16 × 16								
MVL702.16-16-1.0	5/8" × 5/8"	16 × 16	1.0	0.8				71.6	0.2	0.2
MVL702.22-22-1.0	7/8" × 7/8"	22 × 22								
MVL702.22-22-2.9	7/8" × 7/8"	22 × 22	2.9	3.1[3]		30[3]/ 40[4]		207	301	511
MVL702.22-29-2.9	7/8" × 1-1/8"	—			34.4[5]	30[3]/ 34.4[5]/ 40[4]	50 / 34.4[5]			
MVL702.29-29-2.9	1-1/8" × 1-1/8"	—								

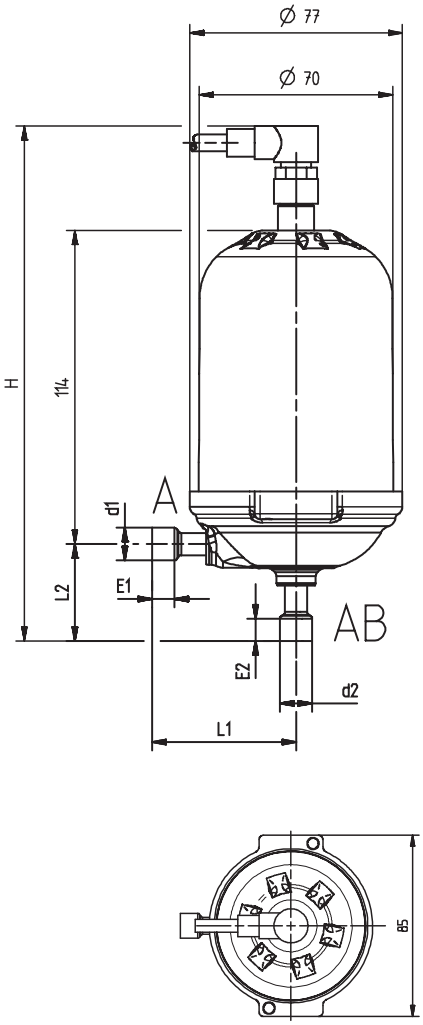
1) k_{vs} Nominal flow rate of water through the fully opened valve (H100) at a differential pressure of 100 kPa (1 bar) to VDI/VDE 2173. Note: Applications with fluid temperature above 70 °C on request.
2) Q_0 Tentative data: Refrigeration capacity in expansion applications, flow direction A → AB, t_0 = +4 °C, t_c = 38 °C, superheating Δt_{oh} = 6 K, subcooling Δt_{cu} = 1 K, without pressure drop.
3) The max. fluid temperature is limited to max. 65 °C at Δp=30 bar and 100% valve opening. This corresponds to k_{vs}=3.1 m³/h
4) Operation at pressure difference Δp=40 bar is possible with limited valve opening (max. 80%). This corresponds to k_{vs}=2.5 m³/h.
5) Limits for flammable refrigerants:
   - Valid for valves with pipe connection 1 1/8" with A2L, A2 and A3 refrigerants.
   - The MOP (max. operation pressure) is limited to 34.4 bar and the max. allowed pressure differences Δp are reduced accordingly. The related valves fulfill PED directive category I.

Product Ordering

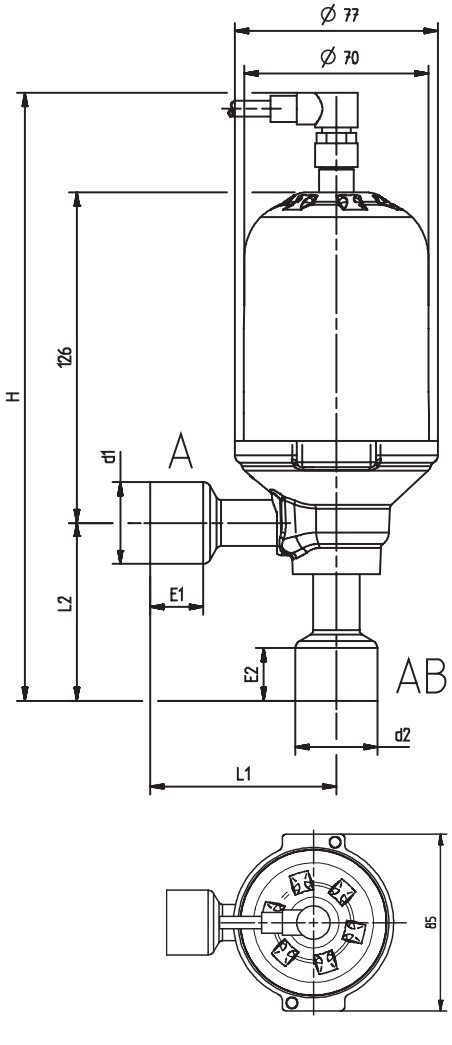
Product number	Orderable Part No. (SSN)	Pipe connections		Weight*	Quantity
		A × AB			
		[inch]	[mm]	[kg]	[pcs]
MVL702.09-09-0.1	**S55320-M131**	3/8" × 3/8"	—	2.6	1
MVL702.10-10-0.1	**S55320-M116**	—	10 × 10		
MVL702.09-09-0.2	**S55320-M132**	3/8" × 3/8"	—		
MVL702.10-10-0.2	**S55320-M117**	—	10 × 10		
MVL702.13-13-0.4	**S55320-M118**	1/2" × 1/2"	—	2.8	
MVL702.16-16-0.4	**S55320-M119**	5/8" × 5/8"	16 × 16		
MVL702.16-16-1.0	**S55320-M120**	5/8" × 5/8"	16 × 16		
MVL702.22-22-1.0	**S55320-M121**	7/8" × 7/8"	22 × 22		
MVL702.22-22-2.9	**S55320-M122**	7/8" × 7/8"	22 × 22		
MVL702.22-29-2.9	**S55320-M123**	7/8" × 1-1/8"	—		
MVL702.29-29-2.9	**S55320-M124**	1-1/8" × 1-1/8"	—	2.9	

Dimensions

Type1: kvs = 0.1, 0.2 m³/h



Type2: kvs = 0.4...2.9 m³/h



Type 1	Pipe connections				Dimensions				
	[inch]		[mm]		[mm]				
	d1	d2	d1	d2	H	E1	E2	L1	L2
MVL702.09-09-0.1	3/8"	3/8"	—	—	186	8	8	52	35
MVL702.10-10-0.1	—	—	10	10	186	8	8	52	35
MVL702.09-09-0.2	3/8"	3/8"	—	—	186	8	8	52	35
MVL702.10-10-0.2	—	—	10	10	186	8	8	52	35

Type 2	Pipe connections				Dimensions				
	[inch]		[mm]		[mm]				
	d1	d2	d1	d2	H	E1	E2	L1	L2
MVL702.13-13-0.4	1/2"	1/2"	—	—	204	12	12	43	45
MVL702.16-16-0.4	5/8"	5/8"	16	16	204	14	14	43	45
MVL702.16-16-1.0	5/8"	5/8"	16	16	204	14	14	43	45
MVL702.22-22-1.0	7/8"	7/8"	22	22	223	16	16	62	64
MVL702.22-22-2.9	7/8"	7/8"	22	22	223	16	16	62	64
MVL702.22-29-2.9	7/8"	1-1/8"	22	—	231	16	20	62	73
MVL702.29-29-2.9	1-1/8"	1-1/8"	—	—	231	20	20	71	73

MVL702 Valve Driver Module

Description

The POL94M operates MVL702 modulating refrigeration valves by controlling the opening position of the MVL702.

The POL94M is designed for precise and fast positioning, to render operation status transparent, and to permit simple and universal system integration.

The POL94M is a full member of the Climatix family. Positioning signals can be provided from the Climatix controller via peripheral bus. It also accepts positioning signals via Modbus RTU as well as common analog signals, e.g. 0…10 V or 4…20 mA.

Features

- Power supply AC 24 V or DC 24 V
- Supports MVL702 modulating refrigerant valve
- Control sources: Peripheral bus (Climatix), analog or Modbus RTU
- 8 universal I/Os
- On-board DC 24 V and DC 5 V power supply for active sensors
- 1 relay output
- Manual functions for direct valve control
- LED indicators for modulating refrigerant valve operation status

Specifications

Operating voltage ..... AC 24 V +/-20 %; DC 24 V +/-10 %

Frequency ..... 45 … 65 Hz

Max. AC-Power and current consumption
..... see tables on page 17 of A6V14947868_en--_b

Connection ..... Peripheral bus, terminals: 24 V ≈ / GND

Dimensions
width x height x depth ..... 90 x 110 x 75 mm

Weight
POL94M.00/STD excluding packaging ..... 176 g

Base plate ..... Plastic, pigeon-blue RAL 5014

Housing ..... Plastic, light-gray RAL 7035

Ordering Information

Product Number	Orderable Part No. SSN	Description	Packing	Quantity	Weight lbs. [kg]
POL94M.00/STD	**S55845-Z243**	Climatix I/O extension module, 24 V AC/DC; 8 I/O; driver for modulating refrigerant vale MVL702	Single	1	0.44 [0.21]
POL94M.05/STD	**S55845-Z601**		Multi	16	8.28 [3.80]

Accessories

Product No. (Connector set type) *	Orderable Part No. (SSN)	Description	Connector Type	Terminal
POL094.M5/STD	S55845-Z620	Screw connector set, board-to-board		
	Phoenix no.			
	1643776	1 x Phoenix MCVR 1.5/14-ST-3.5 GY7035	Screw connector, cable side entry	T1
	1643773	1 x Phoenix MCVR 1.5/5-ST-3.5 GY7035		T2
	1708793	1 x Phoenix MVSTBW 2.5/3-ST GY7035		T3
	1751697	1 x Phoenix ZEC 1.0/4-LPV-3.5 GY35AUC2CI1	PCB connector, board-to-board	A+,B-, GND, 24V
POL094.M6/STD	S55845-Z621	Spring connector set, board-to-board		
	Phoenix no.			
	1761412	1 x Phoenix FK-MCP 1.5/14-ST-3.5 GY7035	Spring connector, cable top entry	T1
	1773604	1 x Phoenix FK-MCP 1.5/5-ST-3.5 GY7035		T2
	1700375	1 x Phoenix FKCT 2.5/3-ST GY7035		T3
	1751697	1 x Phoenix ZEC 1.0/4-LPV-3.5 GY35AUC2CI1	PCB connector, board-to-board	A+,B-, GND, 24V
POL094.M8/STD	S55845-Z630	Screw connector set, board-to-cable		
	Phoenix no.			
	1643776	1 x Phoenix MCVR 1.5/14-ST-3.5 GY7035	Screw connector, cable side entry	T1
	1643773	1 x Phoenix MCVR 1.5/5-ST-3.5 GY7035		T2
	1708793	1 x Phoenix MVSTBW 2.5/3-ST GY7035		T3
	1751697	1 x Phoenix ZEC 1.0/4-LPV-3.5 GY35AUC2CI1	Spring connector, board-to-wire	A+,B-, GND, 24V
POL094.M9/STD	S55845-Z631	Spring connector set, board-to-cable		
	Phoenix no.			
	1761412	1 x Phoenix FK-MCP 1.5/14-ST-3.5 GY7035	Spring connector, cable top entry	T1
	1773604	1 x Phoenix FK-MCP 1.5/5-ST-3.5 GY7035		T2
	1700375	1 x Phoenix FKCT 2.5/3-ST GY7035		T3
	1751710	1 x Phoenix ZEC 1.0/4-ST-3.5 GY35AUC1R1.4	Spring connector, board-to-wire	A+,B-, GND, 24V

Single Connector

Single connector type	Orderable Part No. (SSN)	Package size (pcs)	Description	Phoenix part number	Connector Type	Terminal
1643776	1643776	100	Phoenix ZEC 1.0/4-LPV-3.5 GY35AUC2CI1V	1751697	PCB connector, board-to-board	A+, B−, GND, 24 V
1643773	1643773	50	Phoenix ZEC 1.0/4-ST-3.5 GY35AUC1 R1.4	1751710	Spring connector, board-to-cable	A+, B−, GND, 24 V

MVL cable

Single connector type	Orderable Part No. (SSN)	Description	Length [mm]	Protection class Connector plug	Release temperature range
POL0C5.20/STD	S55845-Z642	Standard cable with MVL valve connector plug	2	IP67	−40...105°C
POL0C5.40/STD	S55845-Z644		4		
POL0C5.80/STD	S55845-Z648		6		

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SIEMENS

Modulating Refrigerant Valves for Ammonia and Safety Refrigerants with Magnetic Actuators

MVS661..N Series Refrigerant Valve

Description

The MVS661…N refrigerant valve can be driven by Siemens or third-party controllers that deliver a 0/2...10 Vdc or 0/4…20 mA output signal. The valve stroke is proportional to the control signal. Can be used with ammonia, CO_2 and commonly used safety refrigerants.

Features

- One valve type for expansion, hot-gas and suction throttle applications
- Hermetically sealed
- Selectable standard control signals 0/2 to 10 Vdc or 4 to 20 mA
- High resolution and control accuracy
- Precise positioning control and position feedback signal
- Short positioning time (<1 second)
- Closed when de-energized
- Robust and maintenance-free
- 1-in. (DN 25) with Cv (kvs) values from 0.12 to 7.28 (0.10 to 6.3 m³/h)
- 4 selectable standard signals for setpoint and measured value
- DIP switch to reduce the Cv (kvs) value to 63% of the nominal value
- Potentiometer for adjustment of minimum stroke for suction throttle applications
- Automatic stroke calibration
- Forced control input for "Valve closed" or "Valve fully open"
- LED for indicating the operating state

Applications

The MVS661…N refrigerant valve is designed for modulating control of refrigerant circuits including chillers and heat pumps. It is suitable for use in expansion, hot-gas and suction throttle applications. In addition to ammonia (R717), the valve can handle all standard safety refrigerants, noncorrosive gases / liquids and CO_2 (R744). It is not suited for use with inflammable refrigerants.

Specifications

Operating Voltage
- 24 Vac ..... 24 V ± 20%
  - Frequency ..... 45 to 65 Hz
  - Typical Power Consumption
    - P_{med} 12W
    - Standby ..... <1 W (valve fully closed)
  - Apparent Power, S_{NA} ..... 22 VA (for selecting the transformer)
  - Required Fuse ..... Slow, 1.6 to 4A
- 24 Vdc ..... 20 to 30 Vdc
  - Current draw ..... 0.5A/2A (maximum)

Signal Inputs
- Positioning Signal Y ..... 0/2 to 10 Vdc, 4 to 20 mA
- Impedance
  - 0/2 to 10 Vdc 100K ohm/5nF
  - 0/4 to 20 mA 240 ohm/5nF
- Forced control ZC
  - Input impedance ..... 22K ohm
  - Closing the valve (ZC connected to G0) ..... <1 Vac; <0.8 Vdc
  - Opening the valve (ZC connected to G) ..... >6 Vac; >5 Vdc
  - No function (ZC not wired) ..... Positioning signal Y active

Signal Outputs
- Position Feedback U
  - Voltage ..... 0/2 to 10 Vdc; load resistance > 500 Ω
  - Current ..... 0/4 to 20 mA; load resistance < 500 Ω
- Stroke Detection ..... Inductive
- Nonlinearity ..... Accuracy +3% of end value

Positioning Time ..... <1 second

Electrical Connections
- Connection Terminals ..... Screw terminals for 12 AWG wire

Functional Valve Data
- Permissible Operating Pressure 1) ..... max. 914 PSI (63 bar)
- Max. Differential Pressure Δpmax ..... 363 PSI (25 bar)
- Valve Characteristic ..... Linear
- Leakage Rate (Internally Across Seat) ..... Max. 0.002% CV (KV) or Max. 1 Nl/h gas at Δp = 58 PSI (4 bar) Shut/off function, like solenoid normally closed (NC) function
- External Seal ..... Hermetically sealed
- Permissible Media ..... Ammonia (R717), CO_2 (R744) and all safety refrigerants (R22, R134a, R404A, R407C, R507, etc); Not suited for use with inflammable refrigerants
- Media Temperature ..... -40° to 248°F (-40° to 120°C), Max. 284°F (140°C) for 10 min.
- Stroke Resolution ΔH/H100 ..... 1:1000 (H = Stroke)
- Hysteresis ..... Typically 3%
- Mode of Operation ..... Modulating
- Position when De-energized ..... Closed
- Mounting Position ..... Upright to horizontal

Materials
- Valve Body and Parts ..... Steel/CrNi Steel
- Seat/Piston ..... CrNi Steel

Sealing Disk/O-Rings ..... PTFE/ CR (chloroprene)

Environmental Compatibility
- Environment ..... ISO 14001
- Quality ..... ISO 9001
- Environmentally Compatible Products ..... SN 36350
- RoHS ..... RL 2002/95/EG

Notes:

S_{NA} = Nominal apparent power for selecting the transformer
P_{med} = Typical power consumption
I_F = Required slow fuse
L = Max. cable length; with 4-wire connections, the max. permissible length of the separate 14 AWG (1.5 mm²) copper positioning signal wire is 656 ft (200 m)

1) All information at 24 Vac
2) With 10 AWG (4 mm²) electrical wiring reduce wiring cross-section for connection inside valve to 12 AWG (2.5 mm²).

Wiring

Part No.	Connection Type	(VA)	(W)	(A)	Wire Gauge (AWG) 14 Max. Cable Length ft (m)	Wire Gauge (AWG) 12 Max. Cable Length ft (m)	Wire Gauge (AWG) 10 Max. Cable Length ft (m)
MVS661…N	4-wire (preferred)	22	12	1.6 to 4A	213 (65)	361 (110)	525 (160)
	3-wire	22	12	1.6 to 4A	65 (20)	115 (35)	164 (50)

Sizing

Part No.	Valve Size (in.)	Cv	Cv Reduced[1]	Δpmax PSI	Q_0 E (kW)	Q_0 H (kW)	Q_0 D (kW)	S_{NA} (VA)	P_{med} (W)
MVS661.25-016N	1	0.18	0.12	363	95	10	2	22	12
MVS661.25-0.4N	1	0.46	0.29	363	245	26	5	22	12
MVS661.25-1.0N	1	1.16	0.73	363	610	64	12	22	12
MVS661.25-2.5N	1	2.89	1.85	363	1530	159	29	22	12
MVS661.25-6.3N	1	7.28	4.62	363	3850	402	74	22	12

Table Notes:

[1]63% of Cv (k_{vs}), see Cv (k_{vs}) *DIP switch setting*.

Cv Nominal flow rate, in gpm, of refrigerant through the fully open valve (H100) at a differential pressure of 1 PSI.

Δpmax Maximum permissible differential pressure across the control path of the valve, valid for the entire actuating range of the motorized valve.

Q_0 E Refrigeration capacity in expansion applications.

Q_0 H Refrigeration capacity in hot-gas bypass applications.

Q_0 D Refrigeration capacity in suction throttle applications and Δp = 7.25 PSI (0.5 bar).

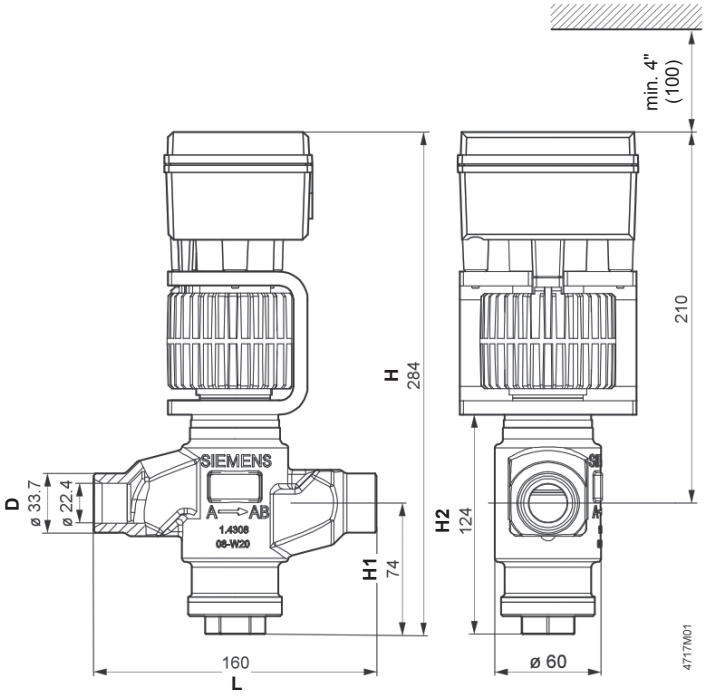
Q_0 With R407C at t0 = 32°F (0°C), tc = 4°F (40°C).

Q_0 With R407C at t0 = 32°F (0°C), tc = 4°F (40°C).

S_{NA} Nominal apparent power for selecting the transformer.

P_{med} Typical power consumption.

Dimensions and Weights



Dimensions shown in inches (mm)

Line Size (in.)	D	L	H1	H2	H	Depth	Weight lb (kg)
1	7/8	6.30 (160)	2.91 (74)	4.88 (124)	6.30 (160)	4.05 (103)	10.1 (4.6)

Table Notes:

D Pipe connections (inch), internal dimension

Modulating Control Valve for Hot Gas Control with Magnetic Actuators

M3FB… LX Series 3-Port Valve with Magnetic Actuator

Description

The M3FB… LX control valve with magnetic actuator is used for modulating capacity control of refrigeration units and heat recovery systems in hot gas applications. For commonly used safety refrigerants.

Features

- For organic safety refrigerants
- 24 Vac operating voltage or power signal; 0 to 20 Vdc Phs (phase cut)
- Selectable electrical interface ZM.. with 0 to 10 Vdc, 4 to 20 mA or 0 to 20 Vdc phase-cut positioning signal
- High stroke resolution (>1:2000) and control accuracy
- Short positioning time (< 1 s)
- Port AB → A closed when de-energized
- Heavy-duty and maintenance-free
- 1/2 to 1-1/4 in. line size (15 to 32 DN) with Cv (kvs) values from 0.7 to 14.0 (0.6 to 12.0 m³/h)

Applications

The M3FB... LX 3-port and 2-port valves with magnetic actuators may be used as hot gas diverting or 2-port valves. Suitable for organic safety refrigerants such as R22, R134a, R404A, R407C, R507, etc. Not suitable for flammable refrigerants or ammonia (R717).

Specifications

Operating Voltage
- 24 Vac ..... 24 V +15%/-10%
- Frequency ..... 50 to 60 Hz
- Required Fuse ..... Slow, 1.6 to 2.5A

Signal Inputs
- Positioning Signal
  - ZM101/A ..... 0 to 10 Vdc or 0 to 20 V phase cut
  - ZM121/A ..... 4 to 20 mA or 0 to 20 V phase cut
  - ZM111 ..... 0 to 20 Vdc phase cut
  - Input Resistance ..... 0 to 10 Vdc >100K Ω; 4 to 20 mA ,150K Ω

Positioning Time ..... < 1 second

Electrical Connections
- Connection Terminals ..... Screw terminals for 12 AWG wire

Functional Valve Data
- Permissible Operating Pressure ..... Max. 623 PSI (63 bar)*
- Max. Differential Pressure Δpmax
  - AB→ B ..... 116 PSI (8 bar)
- Leakage Rate Δp = 0.1 MPa (1 bar)
  - AB → A ..... Max. 0.05 % of k_{vs}-value
  - AB → B ..... Max. 0.5 % k_{vs}
- Valve Characteristic ..... Linear (to VDI / VDE 2173), optimized in low opening range
- Permissible Media ..... For organic safety refrigerants (R22, R134a, R404A, R407C, R410A, R507 etc.). Not suitable for ammonia (R717) or flammable refrigerants
- Media Temperature ..... -40° to 248°F (-40° to 120°C), Max. 284°F (140°C) for 10 min.
- Stroke Resolution ΔH/H100 ..... >1:200 (H = Stroke)
- Mode of Operation ..... Modulating
- Position when De-energized ..... AB → A Closed

Materials
- Housing Components ..... Steel/CrNi Steel
- Seat/Inner Valve ..... Brass/CrNi Steel
- Pipe Connections ..... PTFE/ CR (chloroprene)

Environmental Compatibility
- Environment ..... ISO 14001
- Quality ..... ISO 9001
- Environmentally Compatible Products ..... SN 36350
- RoHS ..... RL 2002/95/EC

* To EN 12284, checked with 1.43 x operating pressure at 62 bar

Sizing

Part No.	Line Size (in.)	Cv AB → A gpm	ΔPmax AB → A PSI	S_{NA} (VA)	Pmed (W)
M3FB15LX06/A	1/2	0.7	319	26	6
M3FB15LX15/A	1/2	1.8	319	26	6
M3FB15LX/A	1/2	3.5	319	26	6
M3FB20LX/A	3/4	5.9	261	26	6
M3FB25LX/A	1	9.4	174	40	10

Table Notes:

Cv — Flow rate tolerance ±10%.

Δpmax — Maximum permissible differential pressure across the control path of the valve, valid for the entire actuating range of the motorized valve.

S_{NA} — Nominal apparent power for selecting the transformer.

P_{med} — Typical power consumption.

ZM… Terminal Housing

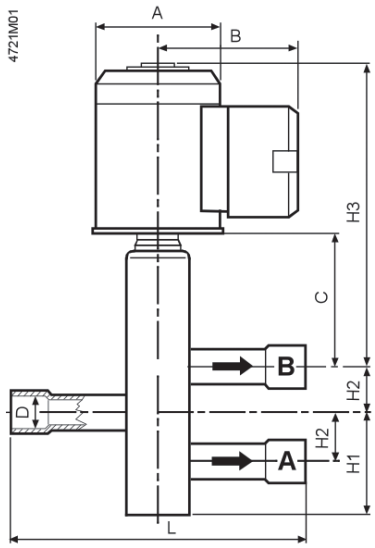
Part No.	Operating Voltage	Positioning Signal	Working Range
ZM101/A	24 Vac	0 to 10 Vdc	4 to 8 Vdc
ZM121/A	24 Vac	4 to 20 mA	8 to 16 mA
ZM111	—	0 to 20 V Phase Cut	0 to 15 V Phase Cut

Product Ordering Example

Part No.	Description
M3FB…	Modulating Refrigerant Valve with Magnetic Actuator
ZM121/A	24 Vac

Table Notes:
Valve body and magnetic actuator form one integrated unit and cannot be separated.

Dimensions and Weights



Dimensions shown in inches (mm)

Product Ordering

Line Size (in.)	ø D (in.)	L	H1	H2	H3	A	B	C	Weight lb. (kg)
1/2	5/8	5.9 (150)	2.6 (65)	1 (25)	7.2 (184)	3.1 (80)	3.3 (84)	2.6 (67)	9.5 (4.3)
3/4	7/8	6.7 (170)	2.7 (69)	1.2 (30)	9.4 (238)	4 (100)	3.7 (94)	3.3 (84)	19.6 (8.9)
1	1-1/8	7.9 (200)	2.8 (72)	1.4 (36)	9.8 (248)	4 (100)	3.7 (94)	3.7 (94)	20.9 (9.5)
1-1/4	1-3/8	9.8 (250)	3.6 (91)	1.7 (43)	9.6 (245)	4 (100)	3.7 (94)	3.9 (98)	25.1 (11.4)

Modulating Pilot Valve with Magnetic Actuator

M2FP03GX Pilot Valve with Magnetic Actuator

Description

The M2FP03GX pilot valve with magnetic actuator is used as the controlling element for 2 to 5 in. main valves for modulating control of chillers, or for direct control of low Cv (kvs) values.

Applications

Suitable for use with safety refrigerants such as R22, R134a, R404A, R407C, R507 and for ammonia R717. Not suitable for applications with gas/liquid mixtures.

Features

- Short positioning time (approx 1 second)
- High resolution
- Hermetically sealed
- Versatile electrical interface with terminal housing ZM..
- Friction free
- Robust and maintenance-free
- Values from 0.7 to 14.0 (0.6 to 12.0 m³/h)

Specifications

Operating Voltage
- 24 Vac ..... 24 V +15%/-10%
- Frequency ..... 50 to 60 Hz
- Typical power consumption Pmed..... 5 W
- Rated apparent power SNA..... 13 VA
- Required Fuse.....Slow, 1A

Signal Inputs
- Positioning Signal
  - ZM101/A ..... 0 to 10 Vdc or 0 to 20 V phase cut
  - ZM121/A ..... 4 to 20 mA or 0 to 20 V phase cut
  - ZM111 .....0 to 20 Vdc phase cut
  - Input Resistance.....0 to 10 Vdc >100K Ω; 4 to 20 mA, <150 Ω

Positioning Time .....< 1 second

Electrical Connections
- Connection Terminals.....Screw terminals for 12 AWG wire

Functional Valve Data
- Permissible Operating Pressure..... 464 PSI (32 bar)
- Max. Differential Pressure Δpmax
  - 1→ 3 ..... 261 PSI (18 bar)
- Leakage Rate Δp = 15 PSI (1 bar)
  - 1 → 3 .....Approx. 0.25% Cv
- Valve Characteristic.....Linear
- Permissible Media .....For organic safety refrigerants (R22, R134a, R404A, R407C, R410A, R507 etc.) or ammonia (R717)
- Media Temperature ..... -40° to 212°F (-40° to 100°C)
- Mode of Operation.....Modulating
- Position when De-energized .....Valve stem retracted (valve control path closed)

Materials
- Body ..... Steel
- Seat/Inner Valve ..... CrNi Steel

Environmental Compatibility
- Environment ..... ISO 14001
- Quality ..... ISO 9001
- Environmentally Compatible Products .....SN 36350
- RoHS..... RL 2002/95/EC

Weight.....3.6 lb. (1.64 kg)

Sizing

Part No.	Main Valve Line Size (in.)	Cv	Δpmax PSI
M2FP03GX	2 - 5	0.35	261

Table Notes:

Cv Nominal flow rate, in gpm, of cold water through the fully open valve (H100) at a differential pressure of 1 PSI.

Δpmax Maximum permissible differential pressure across the control path of the valve, valid for the entire actuating range of the motorized valve.

ZM… Terminal Housing

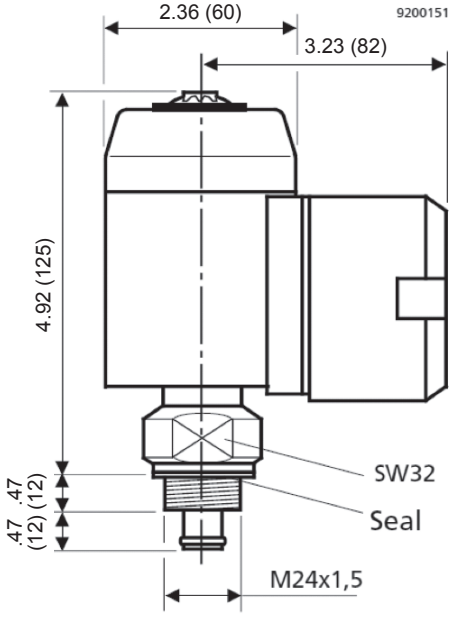
Part No.	Operating Voltage	Positioning Signal	Working Range
ZM101/A	24 Vac	0 to 10 Vdc	4 to 8 Vdc
ZM121/A	24 Vac	4 to 20 mA	8 to 16 mA
ZM111	—	0 to 20 V Phase Cut	0 to 15 V Phase Cut

Product Ordering Example

Part No.	Description
M2FP03GX	Pilot Valve
ZM121/A	Terminal Housing 24 Vac

Table Notes:
Valve body and magnetic actuator form one integrated unit and cannot be separated.

Dimensions and Weights



Dimensions shown in inches (mm)