



Gas Cooler Multi-Purpose (GCM) Valve

For Transcritical CO₂
(R-744 Applications)

Form 100-595_82024



FEATURES

The Sporlan GCM valve families are stepper motor driven pressure regulating valves, designed specifically for transcritical R-744 refrigeration systems.

The GCM -5, -10, -15, -20, are applicable as gas cooler/condenser hold back valve, flash tank pressure regulating valves, direct expansion valves, and hot gas bypass valves.

All GCM valves have 2500 steps of movement and synthetic seats to provide great resolution and ensure tight shutoff.

The Sporlan GCM valves can be controlled by a Sporlan IB-G interface board. The IB-G accepts a 0-10Vdc or 4-20mA signal to position the valve proportionally. For optimal performance, it is recommended to have a step rate of 400 PPS when using the IB-G controller.

Additionally, the GCM valve can be controlled using a Sporlan Kelvin and S3C controllers, plus MicroThermo controllers MT-742V and MT-708V. The MOPD for the GCM-20 valve using a S3C controller is slightly reduced.



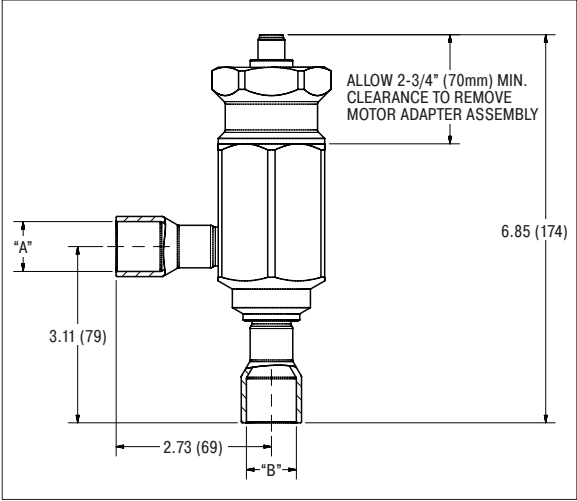
BENEFITS

- Pressure rated for Transcritical CO₂ applications
- High resolution actuator with 2500 steps
- Unique pin and port combinations to provide excellent full range flow control
- Cartridge valve design
- Tight sealing capability
- Open design can be driven through a 0-10V or 4-20 mA interface
- Interchangeable bodies with multiple connection options
- Replaceable / Serviceable screen

VALVE SPECIFICATIONS

Compatible Refrigerant	R-744
Motor Type	Permanent magnet bipolar internal (wet) motor
Phase Resistance	100 Ω ± 10%
Phase Inductance	43.7 mH (Reference)
Supply Voltage (L/R)	19.6 V
Maximum Power Input (L/R)	3.8 Watts
Holding Current	0 mA
Step Mode	2 Phase, Full Step
Step Rate	400 PPS
Number of Steps	2500
Initialization Number of Steps	3125
Reference Position	Overdrive against fully closed position
Full Stroke Transit Time	6.25 seconds
Internal Screen	259 micron
Electrical Connection	M12 A-coded
MRP	140 barg (2030 psig)
Maximum Operating Pressure Differential (MOPD)*	90 bar (1305 psid)
Fluid Temperature Range	-40°C to 115°C (-40°F to 239°F)
Ambient Temperature Range	-40°C to 60°C (-40°F to 140°F)
Duty Cycle	Continuous
Max External Leakage	2.8 gm/yr @ 20 barg (.10 oz/yr at 300 psig)
Motor Assembly Above Horizontal	Motor Housing Vertical ± 45°
Materials of Construction	Stainless steel, brass, synthetic seals
Agency Certification	cUR (SA5460), RoHS, REACH

* The MOPD of the GCM-20 using a S3C controller is 1015 psi (70 bar)

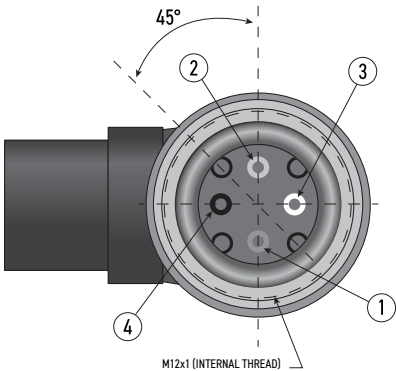


VALVE NOMENCLATURE

VALVE FAMILY		ODF CONNECTION SIZE "A" & "B"	CABLE
GCM	5	3/8"	LESS CABLE 10' (3m) 20' (6m) 30' (9m)
	10	1/2"	
	15	5/8"	
	20	3/4"	

STANDARD OFFERING

PART NUMBER	DESCRIPTION
953556	GCM5 3X4 ODF LESS CABLE
953557	GCM10 3X4 ODF LESS CABLE
953558	GCM15 3X4 ODF LESS CABLE
953559	GCM20 3X4 ODF LESS CABLE



CABLE CONNECTION

TERMINAL POSITION	LEAD WIRE COLOR
1	Red
2	Green
3	White
4	Black

Cable is not orientation specific, and can be installed in any of four positions (90 degrees apart).

VALVE CABLES (M12 Connection with Stripped Ends)

ITEM NUMBER	LENGTH
805194	10' (3m)
805195	20' (6m)
805343	30' (9m)
805344	40' (12m)



VALVE DRIVE SEQUENCE (IF DRIVEN DIRECTLY)

		CABLE LEAD COLOR			
Step	Black	White	Red	Green	
1	HI	0	HI	0	CLOSE ↓
2	0	HI	HI	0	
3	0	HI	0	HI	
4	HI	0	0	HI	
1	HI	0	HI	0	↑ OPEN
2	0	HI	HI	0	
3	0	HI	0	HI	
4	HI	0	0	HI	

GAS COOLER VALVE CAPACITIES

GAS COOLER	638 psig 50°F	723 psig 59°F	1450 psig 100°F
FLASH TANK	435 psig 25°F	561 psig 41°F	561 psig 41°F

VALVE	TONS		
GCM-5	3.0	2.4	3.4
GCM-10	7.6	6.0	8.6
GCM-15	13.2	10.5	15.0
GCM-20	20.7	16.5	23.4

FLOW COEFFICIENTS

VALVE	Cv	Kv
GCM-5	0.08	0.07
GCM-10	0.19	0.16
GCM-15	0.33	0.29
GCM-20	0.5	0.43

EXPANSION CAPACITY TABLES

	Valve Type	40°F								20°F							
		Pressure Drop Across Valve (psid)								Pressure Drop Across Valve (psid)							
		100	150	200	250	300	350	400	450	100	150	200	250	300	350	400	450
R744	GCM-5	2.64	3.23	3.73	4.17	4.57	4.93	5.27	5.59	2.70	3.31	3.82	4.27	4.68	5.06	5.41	5.73
	GCM-10	6.67	8.17	9.44	10.6	11.6	12.5	13.3	14.2	6.84	8.38	9.67	10.8	11.8	12.8	13.7	14.5
	GCM-15	11.7	14.3	16.5	18.5	20.3	21.9	23.4	24.8	12.0	14.7	17.0	19.0	20.8	22.4	24.0	25.4
	GCM-20	18.4	22.5	26.0	29.0	31.8	34.3	36.7	38.9	18.8	23.0	26.6	29.7	32.6	35.2	37.6	39.9

	Valve Type	0°F								-20°F							
		Pressure Drop Across Valve (psid)								Pressure Drop Across Valve (psid)							
		100	150	200	250	300	350	400	450	100	150	200	250	300	350	400	450
R744	GCM-5	2.73	3.34	3.86	4.32	4.73	5.11	5.46	5.79	2.73	3.35	3.87	4.32	4.73	5.11	5.47	5.80
	GCM-10	6.91	8.47	9.78	10.9	12.0	12.9	13.8	14.7	6.92	8.47	9.79	10.9	12.0	12.9	13.8	14.7
	GCM-15	12.1	14.8	17.1	19.2	21.0	22.7	24.2	25.7	12.1	14.9	17.2	19.2	21.0	22.7	24.3	25.7
	GCM-20	19.0	23.3	26.9	30.1	32.9	35.6	38.0	40.3	19.0	23.3	26.9	30.1	33.0	35.6	38.1	40.4

Expansion Flow Capacity (°F - tons - psi)

Liquid Temperature Correction Factor										
(°F)	0	10	20	30	40	50	60	70	80	
R744	1.13	1.07	1.00	0.93	0.86	0.79	0.71	0.62	0.51	

Refrigerant	R744
Condenser Temperature (°F)	20
Subcooling (°F)	0

	Valve Type	5°C						-10°C					
		Pressure Drop Across Valve (bar)						Pressure Drop Across Valve (bar)					
		8	12	16	20	24	28	8	12	16	20	24	28
R744	GCM-5	9.97	12.2	14.1	15.8	17.3	18.7	10.3	12.6	14.5	16.3	17.8	19.2
	GCM-10	25.2	30.9	35.7	39.9	43.7	47.2	26.0	31.9	36.8	41.2	45.1	48.7
	GCM-15	44.3	54.2	62.6	70.0	76.7	82.8	45.6	55.9	64.6	72.2	79.1	85.4
	GCM-20	69.4	85.0	98.2	110	120	130	71.6	87.7	101	113	124	134

	Valve Type	-20°C						-30°C						-40°C					
		Pressure Drop Across Valve (bar)						Pressure Drop Across Valve (bar)						Pressure Drop Across Valve (bar)					
		8	12	16	20	24	28	8	12	16	20	24	28	8	12	16	20	24	28
R744	GCM-5	10.4	12.7	14.6	16.4	17.9	19.4	10.4	12.7	14.6	16.4	17.9	19.4	10.3	12.6	14.6	16.3	17.8	19.3
	GCM-10	26.2	32.1	37.1	41.5	45.4	49.0	26.2	32.1	37.1	41.4	45.4	49.0	26.1	31.9	36.8	41.2	45.1	48.7
	GCM-15	46.0	56.3	65.0	72.7	79.6	86.0	46.0	56.3	65.0	72.7	79.6	86.0	45.7	55.9	64.6	72.2	79.1	85.5
	GCM-20	72.1	88.3	102	114	125	135	72.1	88.3	102	114	125	135	71.7	87.8	101	113	124	134

Expansion Flow Capacity (°C - kW - bar)

Liquid Temperature Correction Factor										
(°C)	-18	-12	-7	-1	4	10	16	21	27	
R744	1.13	1.07	1.00	0.93	0.86	0.79	0.71	0.62	0.51	

Refrigerant	R744
Condenser Temperature (°C)	-6.7
Subcooling (°C)	0

HOT GAS CAPACITY TABLE

R-744 GCM Discharge Bypass Valve Capacities					
(Tons - PSIA - °F)					
Valve Type	Valve Size	Minimum allowable evaporator temperature at reduced load - °F			
		26		20	
		System State			
		SubCritical	TransCritical	SubCritical	TransCritical
GCM	5	2.61	4.64	2.61	4.64
	10	5.97	10.6	5.97	10.6
	15	11.2	20.4	11.3	20.4
	20	17.3	32.1	17.6	32.2

Subcritical capacities are based on discharge temperature 50°F above isentropic compression, flash tank pressure of 575 PSIA, 0°F subcooling, 25°F superheat at the compressor and include both the hot gas bypassed and the liquid refrigerant for desuperheating, regardless of whether the liquid is fed through the system expansion valve or auxiliary desuperheating expansion valve.

Transcritical capacities are based on discharge temperature 50°F above isentropic compression, discharge pressure of 1464.9 PSIA, flash tank pressure of 575 PSIA, 0°F subcooling, 25°F superheat at the compressor and include both the hot gas bypassed and the liquid refrigerant for desuperheating, regardless of whether the liquid is fed through the system expansion valve or auxiliary desuperheating expansion valve.

Transcritical Pressure Correction Factors					
Discharge Pressure (PSIA)					
1100	1200	1300	1400	1464.9	1500
0.72	0.80	0.87	0.95	1.00	1.03

Care must be taken to stay within the MOPD of 1305 PSI for the discharge bypass valve. Transcritical correction factors for discharge temperature are independent of condensing temperature and are calculated at a flash tank pressure of 575 PSIA with an evaporator temperature of 0°F. Flash tank and evaporator temperatures have a marginal impact on the correction factor and can be assumed constant from -40 - 40°F evaporating temperature.

⚠️WARNING – USER RESPONSIBILITY

Failure or improper selection or improper use of the products described herein or related items can cause death, personal injury and property damage.

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