February 2020 / **Bulletin 100-80**

SPORLAN

Gas Cooler/Flash Gas Bypass Valves

For Transcritical CO_2 (R-744) Applications

Parker

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Bulletin 100-80, February 2020 supersedes Bulletin 100-80, September 2016 and all prior publications.
For more information about our products visit us at www.sporlan.com.

FEATURES

- Pressure rated for Transcritical CO_2 applications
- High resolution actuators with 2500 steps
- Uniquely characterized pin and port combinations to provide excellent full range flow control
- 7.25 second full stroke actuation
- Cartridge valve designs
- Interchangeable bodies with flexible connections
- Tight seating capability
- Replaceable/serviceable screen (GC Series)
- Open design can be driven through a 0-10V or 4-20 mA interface

GAS COOLER/FLASH GAS BYPASS VALVES

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

The ***GC -10, -20, -30, -40, & -50*** are applicable as gas cooler / condenser hold-back valves and can also be applied as flash tank pressure regulating valves (flash gas bypass). The flash gas bypass valve capacity range is expanded with the use of the ***FGB-60 & -70*** valves in this application. All ***GC and FGB*** valves have 2500 steps of movement and synthetic seats to provide great resolution and ensure tight shutoff.

CONTROLS

The Sporlan GC and FGB valves can be controlled and driven using the Parker Sporlan PSK3LX CO_2 Controller and PSD4 Interface Board/Positioner. The ***PSK3LX CO_2 Controller*** optimizes transcritical and subcritical CO_2 system COP through control of the GC & FGB valves. This control system can drive two valves for Gas Cooler and Flash Tank control.

The ***PSD4 Interface Board*** accepts a 0-10VDC or 4-20 mA signal from the PSK3LX or other gas cooler/system controller. The PSD4 translates this signal into a suitable stepper motor sequence to position the valve proportionally.

The ***PSS4B Backup Power Module*** provides reserve power for one full valve closure in the event of a power loss. This serves to isolates the refrigerant charge and minimize CO_2 refrigerant loss if system pressure exceeds the system's pressure relief valve setting.

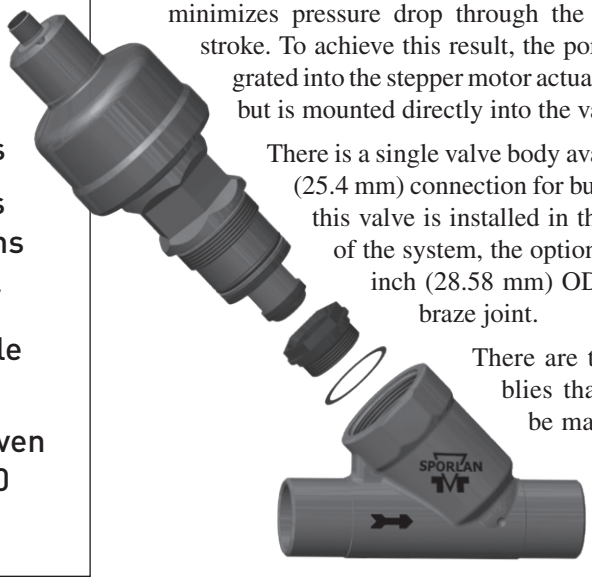
VALVE CONSTRUCTION

The ***GC family*** features a cartridge construction, where the valve port is integrated into the stepper motor actuator assembly. Therefore, the valve family can be broken into two distinct pieces: the bodies and the cartridge assemblies.

The valve bodies are available with three connection sizes for butt or tube / socket welding: ½ inch (12.7 mm), ¾ inch (19.05 mm) and 1 inch (25.4 mm). The five cartridge assemblies contain the valve pin and port, and determine the ultimate valve capacity. The three bodies are compatible with all five cartridge assemblies, and can be paired in any combination to best fit the system piping and capacity requirements.

There is a screen located around the port inlet that is a part of the cartridge assembly, but can be removed for service if necessary.

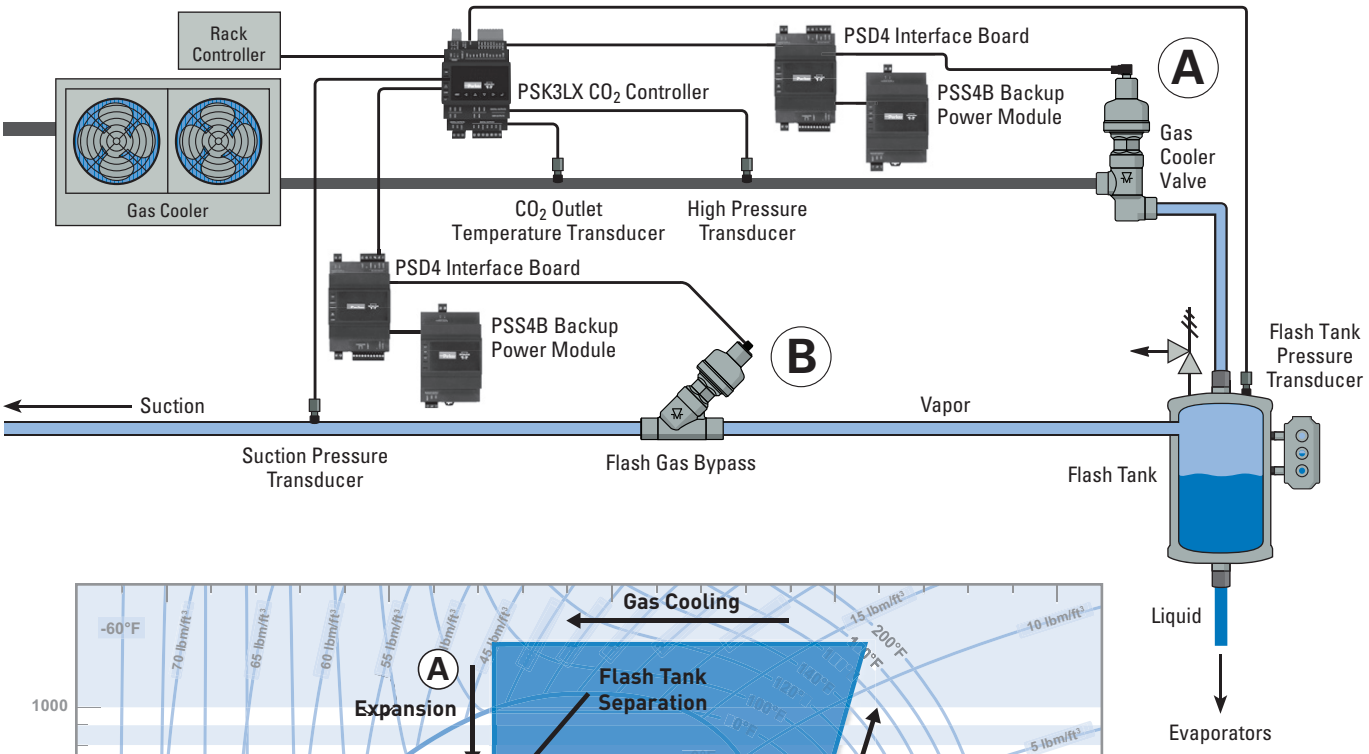
The ***FGB family*** has a slightly different construction that minimizes pressure drop through the valve at full stroke. To achieve this result, the port is not integrated into the stepper motor actuator assembly, but is mounted directly into the valve body.

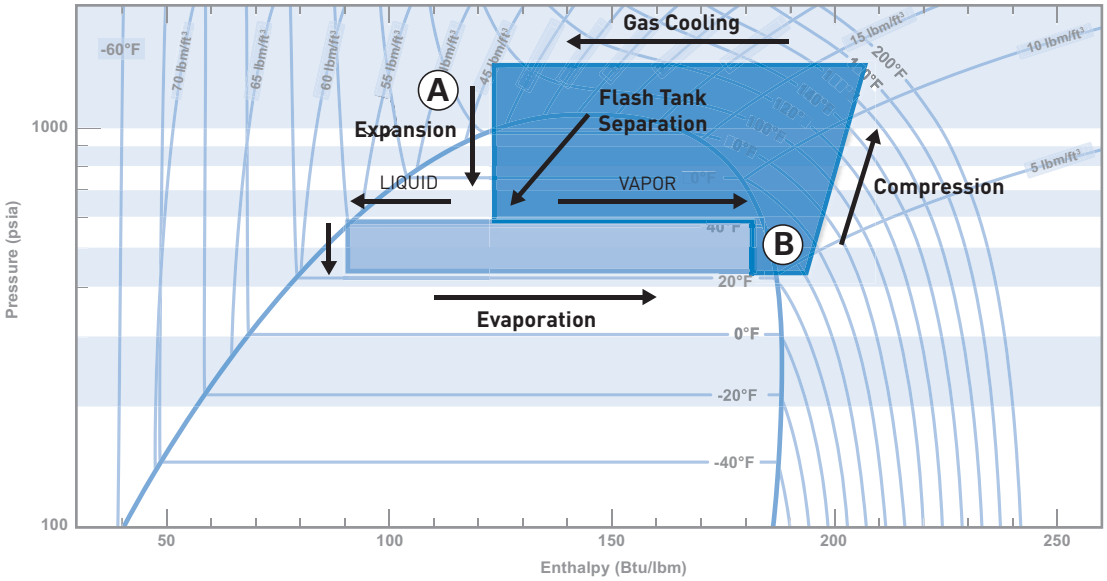


There is a single valve body available with a 1 inch (25.4 mm) connection for butt welding. Because this valve is installed in the low pressure side of the system, the option is also available to utilize an 1-1/8 inch (28.58 mm) ODF or 1-3/8 inch (34.93 mm) ODM braze joint.

There are two stepper motor actuator assemblies that contain the valve pin, and must be matched with the corresponding port. The port is threaded into the valve body, and is removable to service the port or to perform a capacity conversion.

TYPICAL SYSTEM SCHEMATIC/THERMODYNAMIC CYCLE

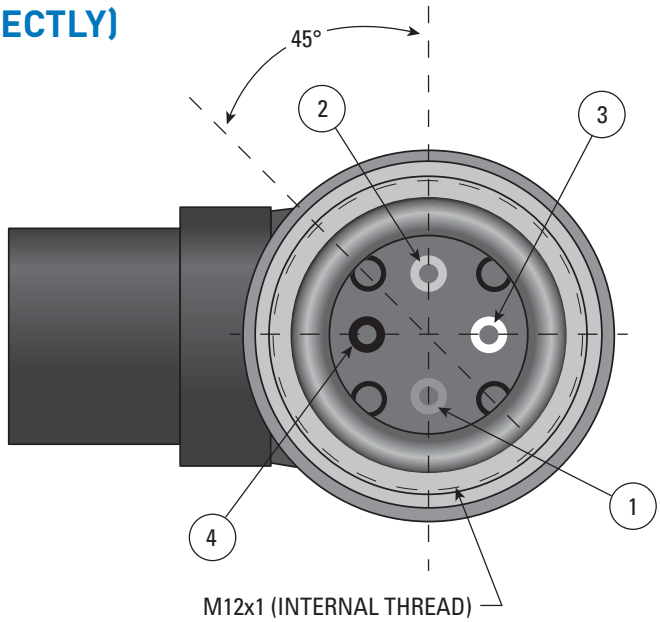




VALVE DRIVE SEQUENCE (IF DRIVEN DIRECTLY)

CABLE LEAD COLOR				
Step	Black	White	Red	Green
1	HI	0	HI	0
2	0	HI	HI	0
3	0	HI	0	HI
4	HI	0	0	HI
1	HI	0	HI	0

CLOSE ↓ ↑ OPEN



CABLE CONNECTION

Terminal Position	Lead Wire Color
1	Red
2	Green
3	White
4	Black

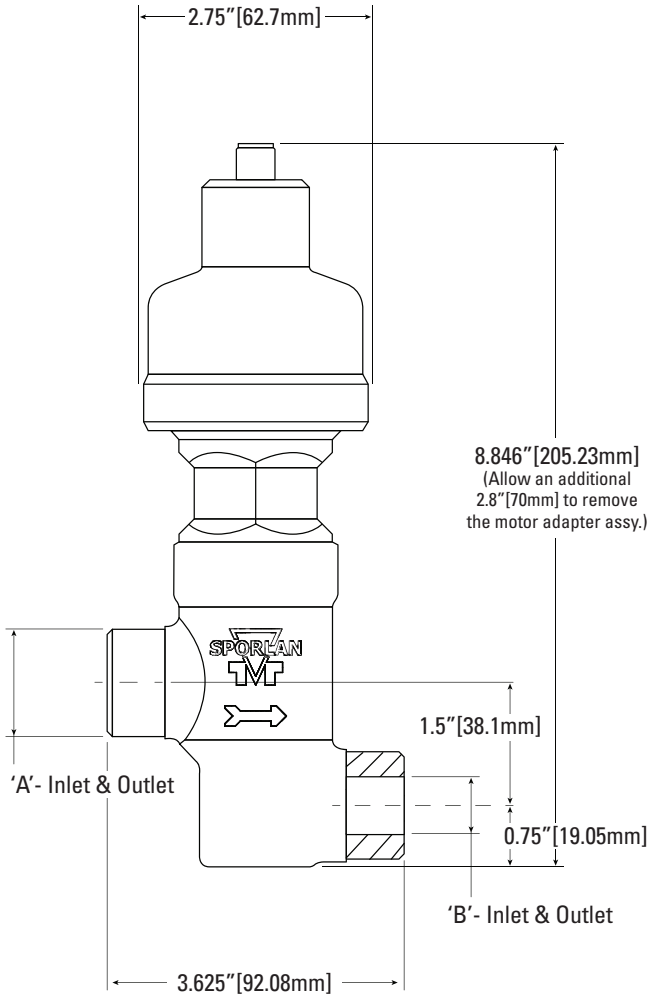
Cable is not orientation specific, and can be installed in any of four positions (90 degrees apart).

VALVE SPECIFICATIONS

Compatible Refrigerant	R-744
Motor Type	Permanent magnet bipolar internal (wet) motor
Phase Resistance	12.8 Ω ± 10%
Phase Inductance	18.5 mH (Reference)
Phase Current	275 mA (using current limited / chopper drive)
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	7.25 seconds
Internal Screen	259 micron (GC only)
Electrical Connection	M12 A-coded
MRP	140 barg (2030 psig)
MOPD	GC: 90 bar (1305 psid) FGB: 50 bar (725 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	50% at Maximum Fluid Temperature 100% at 100°C (212°F) or Lower Fluid Temperature
Max External Leakage	2.8 gm/yr @ 20 barg (.10 oz/yr at 300 psig)
Mounting Orientation	Motor Housing Vertical ± 45°
Materials of Construction	Stainless steel, brass, synthetic seals
Agency Certification	c UL us (SA5460), CE, RoHS, REACH

*Overdriving open is permitted, but valve will drive open beyond 2500 steps.

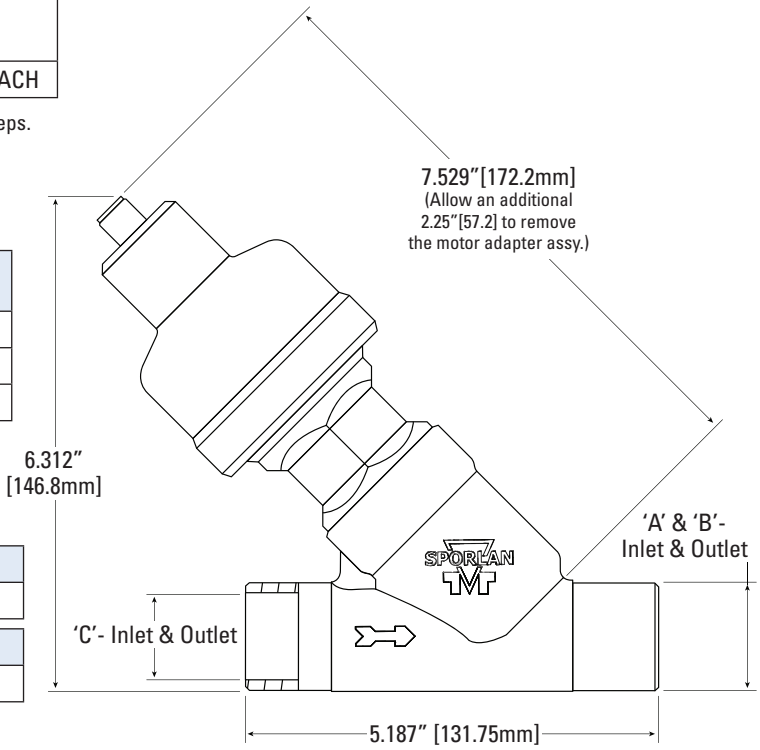
VALVE DIMENSIONS (GC FAMILY)



GC FAMILY DIMENSIONS

CONNECTION SIZE	DIM 'A' - BUTT WELD	DIM 'B' - TUBE/ SOCKET WELD
1/2" [12.7mm]	.84" [21.34mm]	.51" [12.95mm]
3/4" [19.05mm]	1.05" [26.67mm]	.76" [19.30mm]
1" [25.4mm]	1.315" [33.40mm]	1.01" [25.65mm]

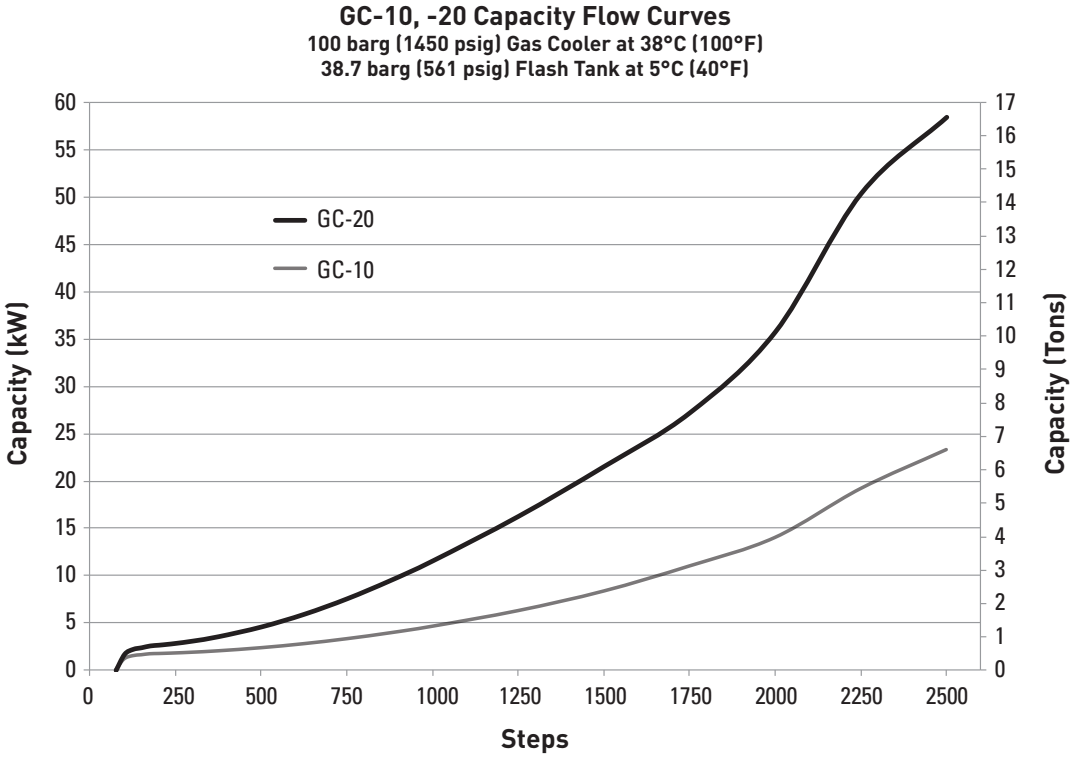
VALVE DIMENSIONS (FGB FAMILY)

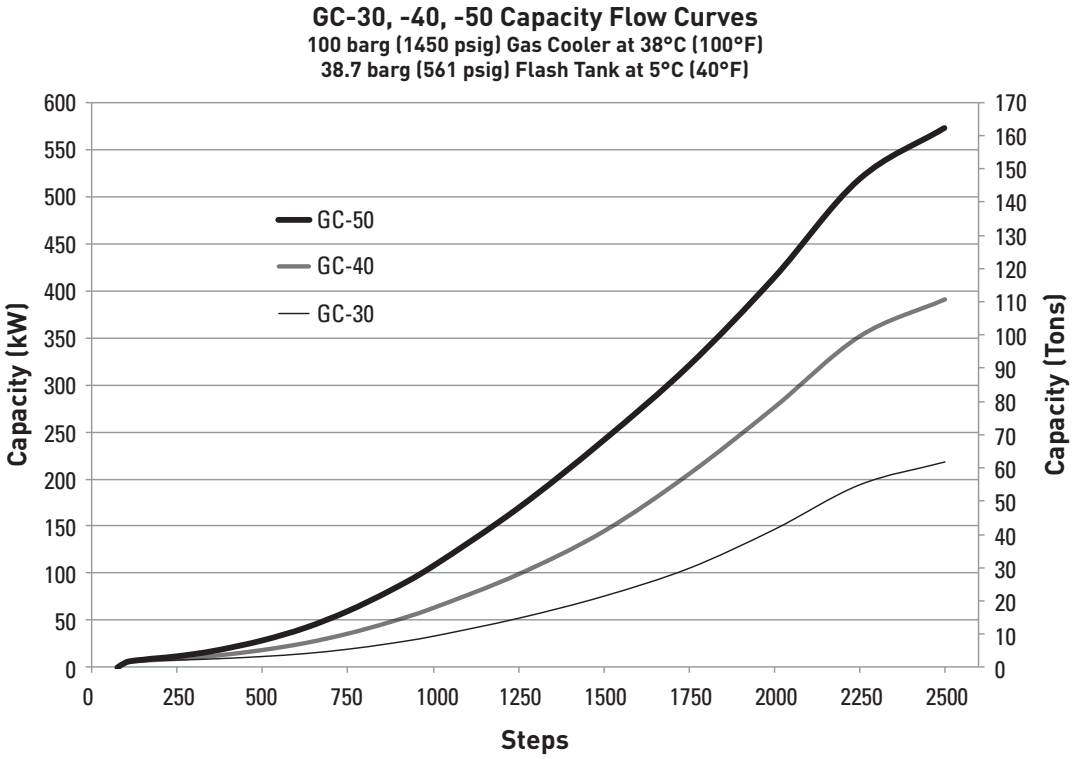


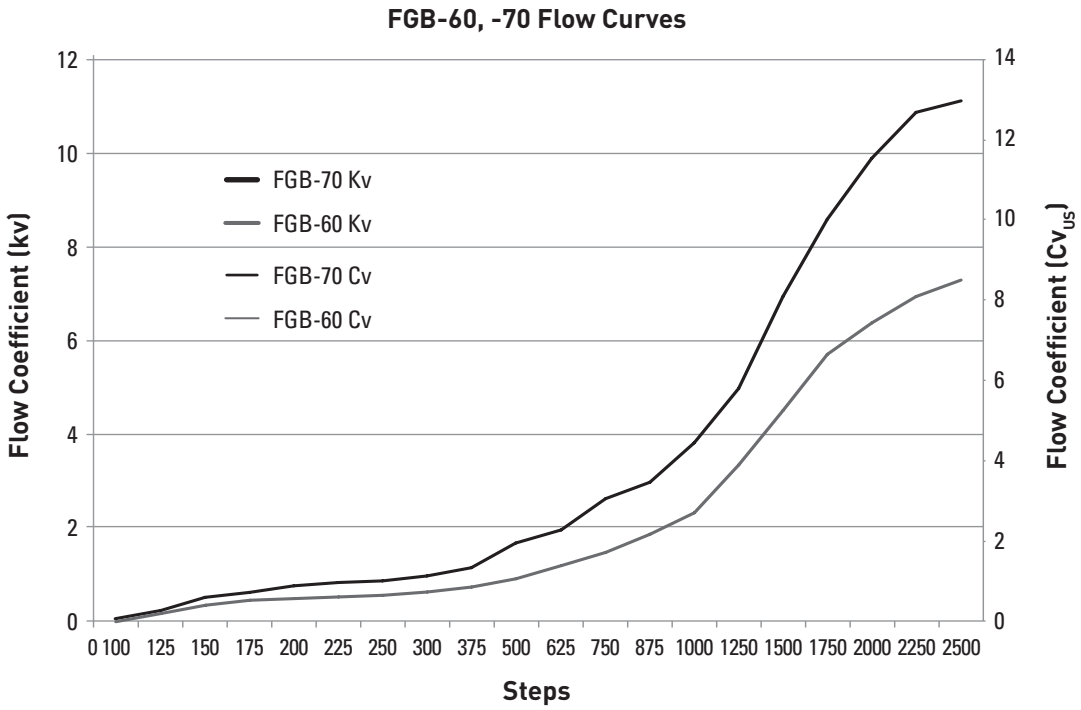
FGB FAMILY DIMENSIONS

CONNECTION SIZE	DIM 'A' - BUTT WELD
1" [25.4mm]	1.315" [33.40mm]
DIM 'B' - ODM BRAZE	**DIM 'C' - ODF BRAZE**
1-3/8" [34.93mm]	1-1/8" [28.58mm]

GAS COOLER VALVE CAPACITY FLOW CURVES







GAS COOLER VALVE CAPACITY*

GAS COOLER	44 bar(g) 10°C	50 bar(g) 15°C	100 bar(g) 38°C	638 psi(g) 51°F	725 psi(g) 59°F	1450 psi(g) 100°F
FLASH TANK	30 bar(g) -4°C	38.7 bar(g) 5°C	38.7 bar(g) 5°C	435 psi(g) 24°F	561 psi(g) 40°F	561 psi(g) 40°F

	kW			Tons		
GC-10	27.4	21.9	23.3	7.8	6.2	6.6
GC-20	62.1	49.6	58.4	17.7	14.1	16.6
GC-30	231	185	218	65.7	52.5	61.9
GC-40	444	355	390	126	101	111
GC-50	651	520	572	185	148	163

*Based upon standard fitting sizes.

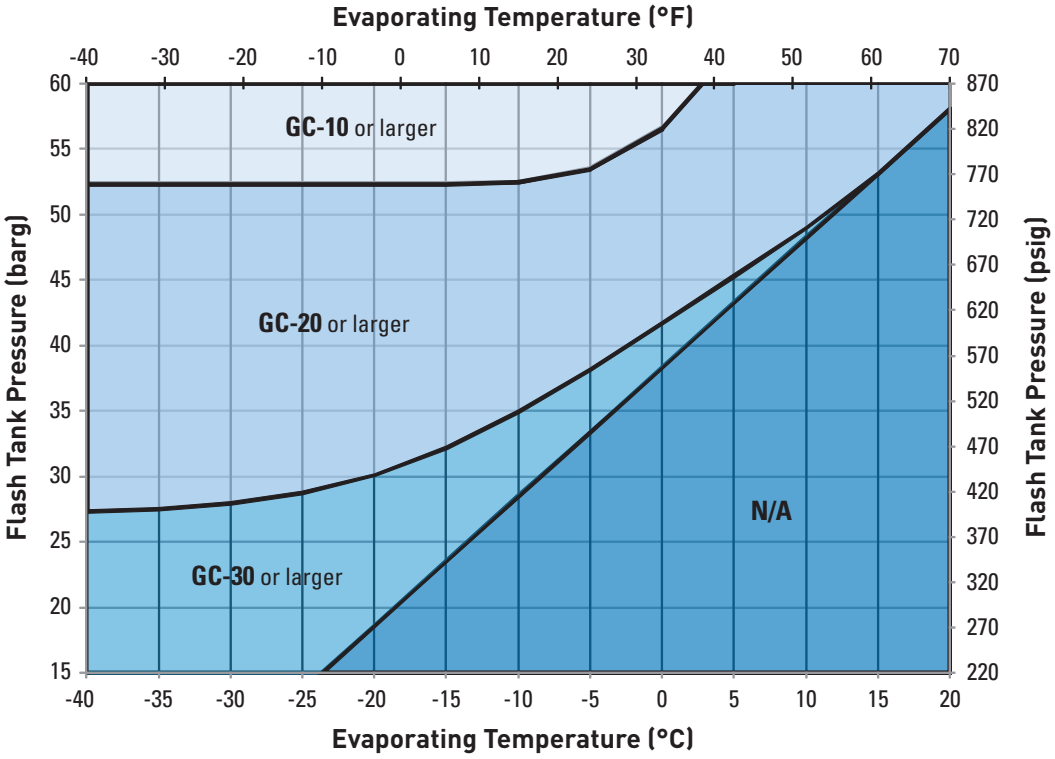
FULL STROKE FLOW COEFFICIENTS

	Kv	Cv_{US}
GC-10	0.16	0.19
GC-20	0.48	0.55
GC-30	1.46	1.69
GC-40	2.80	3.24
GC-50	4.15	4.80
FGB-60	7.29	8.43
FGB-70	11.12	12.86

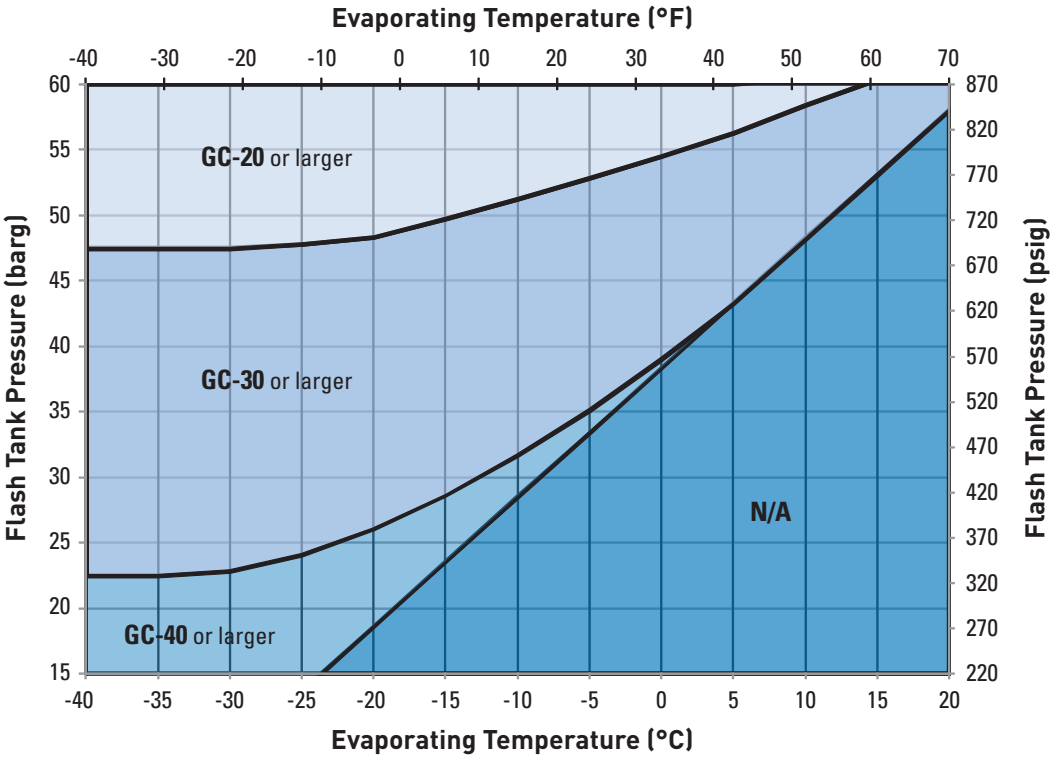
STANDARD FITTING CONFIGURATIONS

	1/2" (12.7mm)	3/4" (19.05mm)	1" (25.4mm)
GC-10	X		
GC-20	X		
GC-30		X	
GC-40			X
GC-50			X
FGB-60			X
FGB-70			X

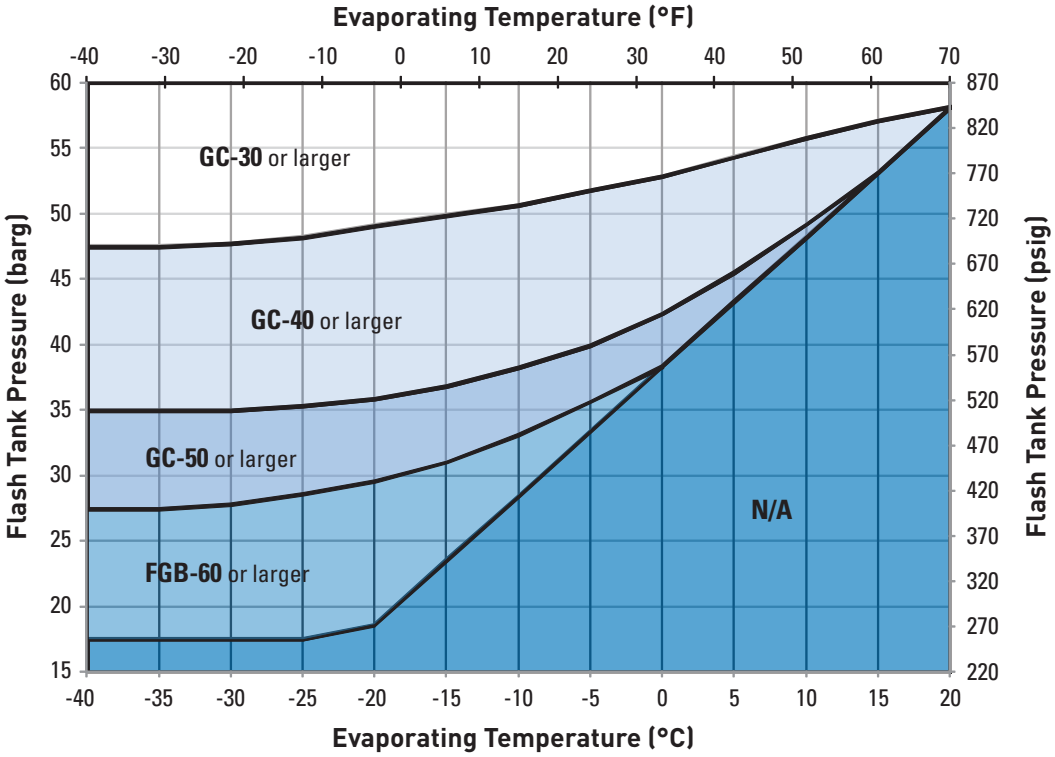
Recommended Flash Gas Bypass Valve with **GC-10 AS GAS COOLER VALVE**



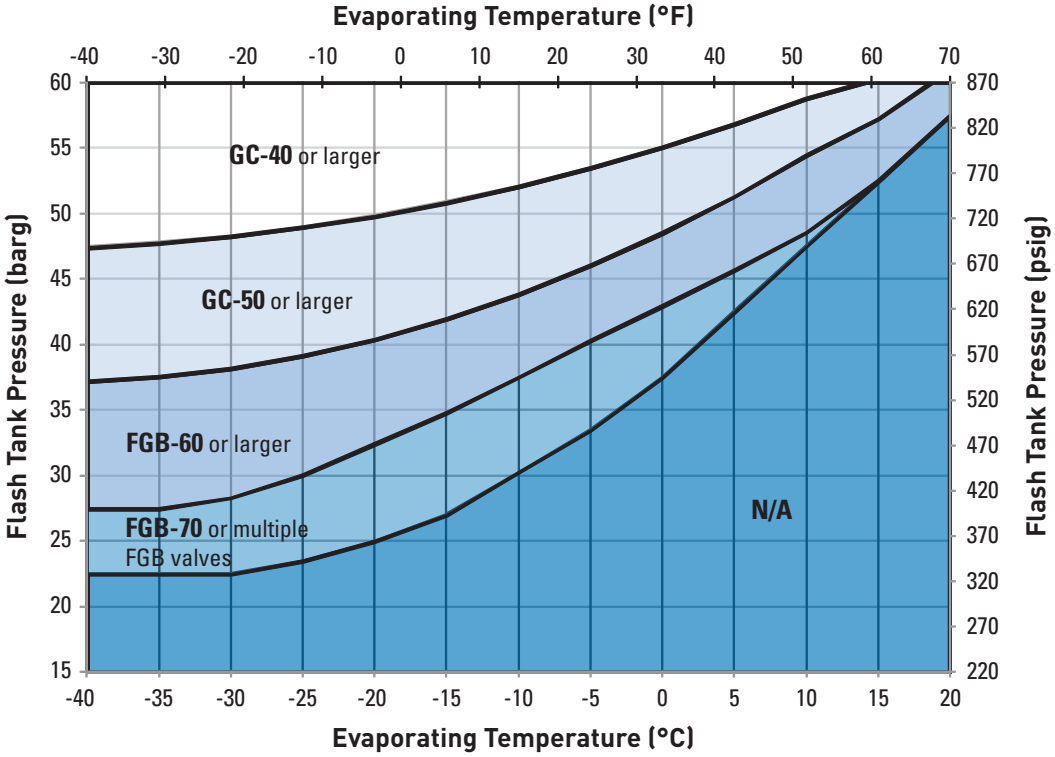
Recommended Flash Gas Bypass Valve with **GC-20 AS GAS COOLER VALVE**



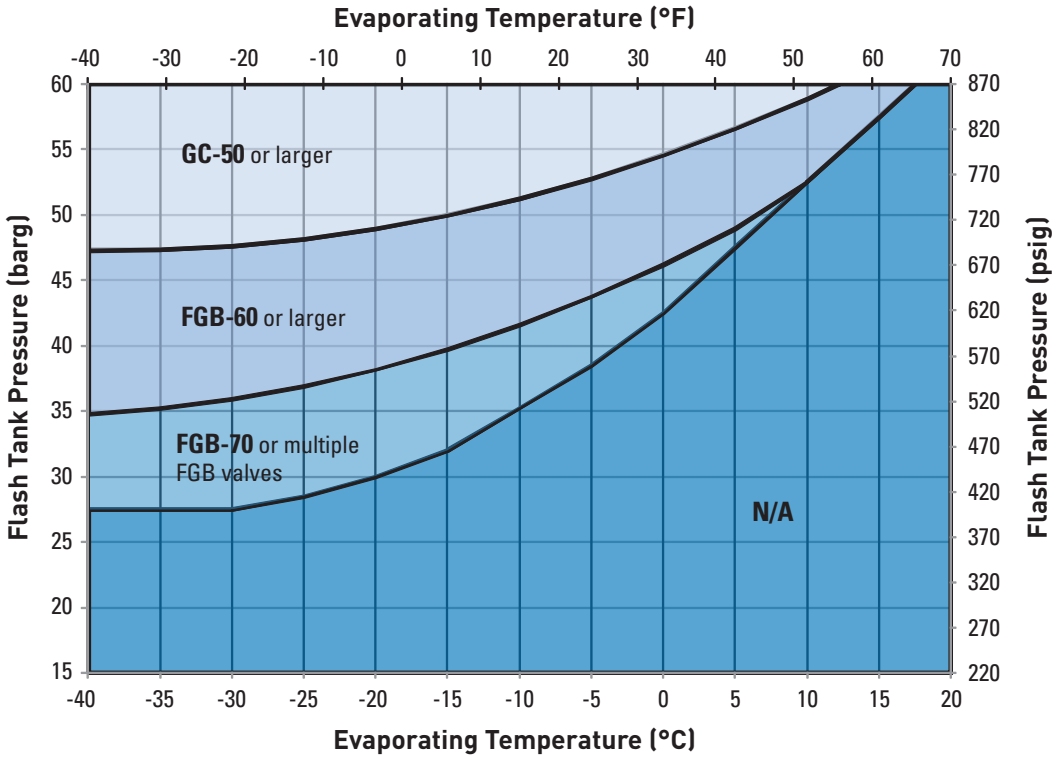
Recommended Flash Gas Bypass Valve with **GC-30 AS GAS COOLER VALVE**



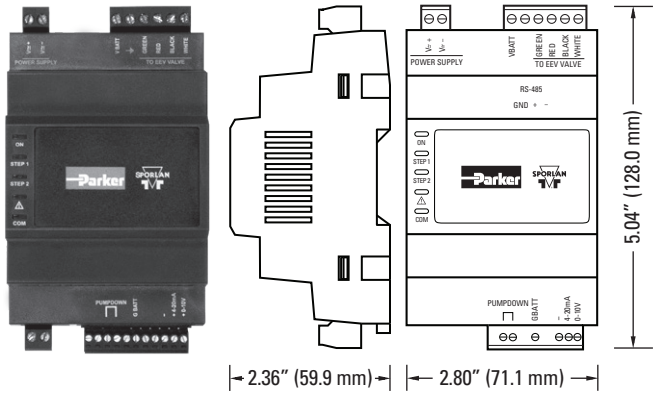
Recommended Flash Gas Bypass Valve with **GC-40 AS GAS COOLER VALVE**



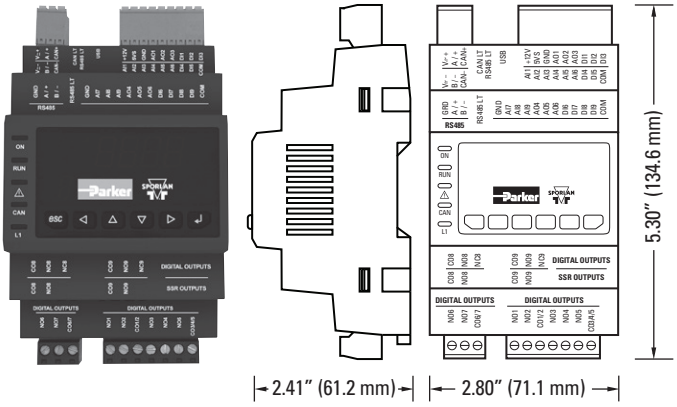
Recommended Flash Gas Bypass Valve with **GC-50 AS GAS COOLER VALVE**



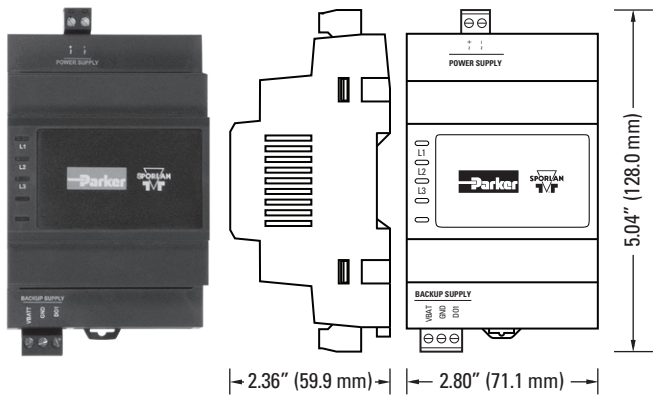
ACCESSORIES



PSD4BX3XXXVP - Interface Board/Positioner



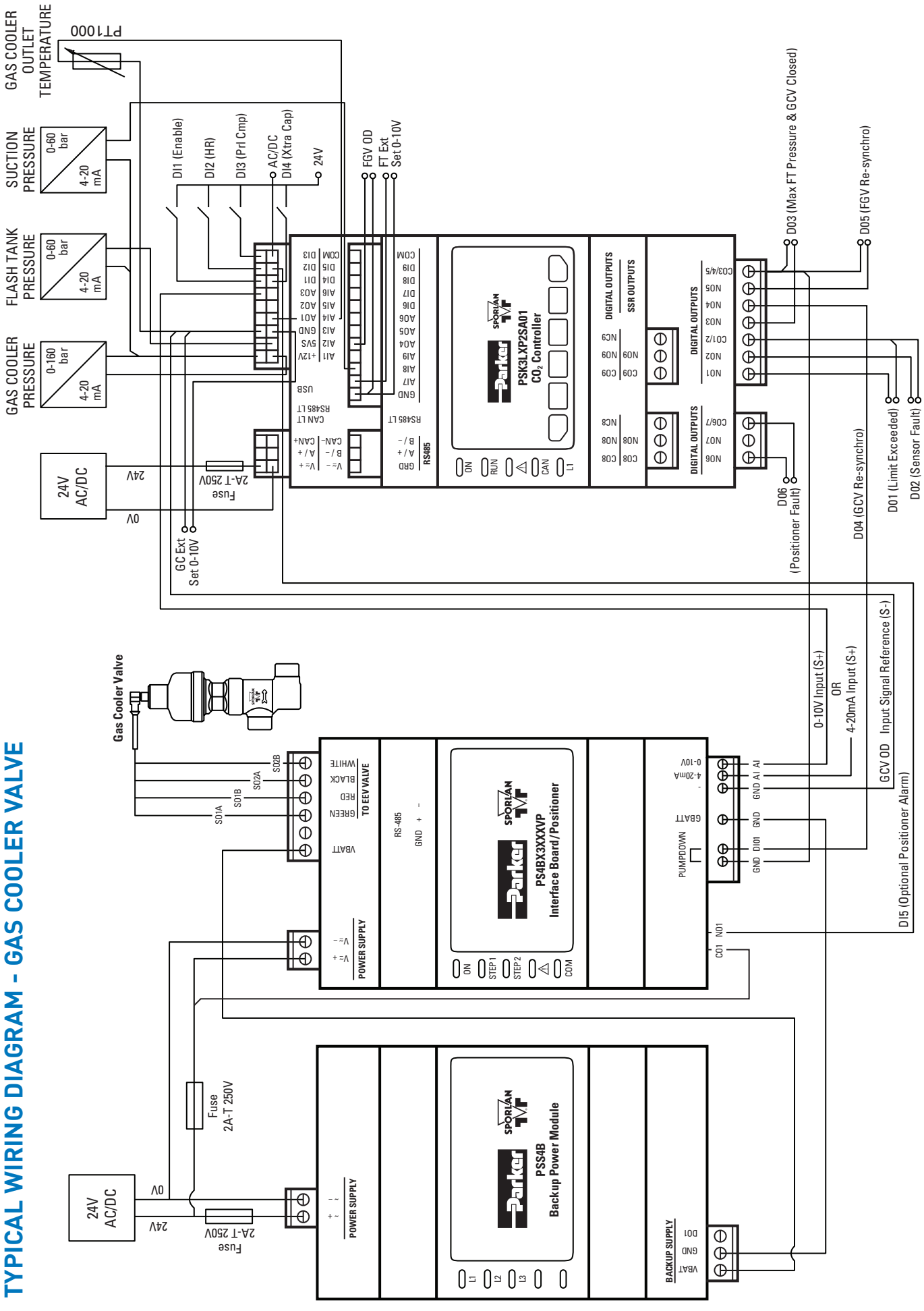
PSK3LXP2SA01 - CO_2 Controller



PSS4B - Backup Power Module

Item	Description
PSK3LXP2SA01	CO_2 Controller
PSD4BX3XXXVP	Interface Board/Positioner
PSS4B	Backup Power Module

TYPICAL WIRING DIAGRAM - GAS COOLER VALVE



VALVE NOMENCLATURE

Valve Family - Capacity		Connection Size	Cable
GC	10	1/2″ 3/4″ 1″	LESS CABLE 10′ (3m) 20′ (6m) 30′ (9m) 40′ (12m)
	20		
	30		
	40		
	50		
FGB	60	1″	
	70		

VALVE ITEM NUMBERS (Less Cable)

	1/2″	3/4″	1″
GC-10	953370	Upon Request	
GC-20	953371		
GC-30	Upon Request	953372	953373
GC-40			953374
GC-50			953375
FGB-60			953376
FGB-70			953377

VALVE CABLES
(M12 Connection with Stripped Ends)

Item Number	Length
805194	10′ (3m)
805195	20′ (6m)
805343	30′ (9m)
805344	40′ (12m)

REPLACEMENT MOTOR KITS

Item Number	Description
953400	GC-10 Motor Kit
953401	GC-20 Motor Kit
953402	GC-30 Motor Kit
953403	GC-40 Motor Kit
953404	GC-50 Motor Kit
953397	FGB-60 Motor Kit
953398	FGB-70 Motor Kit

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