

# CASH VALVES CRYOGENIC VALVES AND CONTROLS

## THE ECONOMIZER CIRCUIT

The economizer back pressure regulator is set from 10 to 25 psi (.70 to 1.76 kg/sq cm) above the set pressure of the pressure build-up regulator. When no gas is being used and heat leakage in the tank causes a gas pressure build-up, the excess pressure is by-passed into the final vaporizer line to conserve gas rather than allow the safety valve in the pressure build-up circuit to relieve the excess gas into the atmosphere.

Five types of back pressure valves are available for this circuit: the Type FRM, low flows, max. 600 psi (42.18 kg/cm<sup>2</sup>); FRM-2, medium flows, max. 250 psi (17.58 kg/cm<sup>2</sup>); FRM-2 (HP) high pressure, medium flows, max. 400 psi (28.12 kg/cm<sup>2</sup>); FR, large flows, max. 400 psi (28.12 kg/cm<sup>2</sup>) and the FR-6, max. 600 psi (42.18 kg/cm<sup>2</sup>).

## FRM BACK PRESSURE OR ECONOMIZER SERVICE

### Construction

Threaded ends; 2-way, side inlet-side outlet; 2-way, side inlet-bottom outlet; 3-way, 2 side inlets-bottom outlet; forged bronze body; bronze diaphragms; stainless steel seat disc, seat ring and pressure spring; PTFE diaphragm gasket. All parts commercially cleaned for cryogenic service.

**Note:** Also available in stainless steel and special construction for hi-purity service. Contact your sales representative.

Temperature rating: +150°F to -320°F (339K to 78K)  
 Maximum set pressure: 600 psi (42.18 kg/cm<sup>2</sup>)

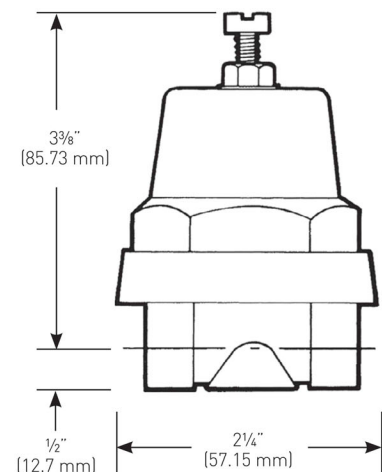
## PRESSURE RANGES

Maximum working ranges	
psi	(kg/sq cm)
2-25	(0.14-1.76)
15-65	(1.05-4.57)
40-100	(2.81-7.03)
75-175	(5.27-12.30)
100-250	(7.03-17.58)
200-400	(14.06-28.12)
300-600	(21.09-42.18)

## DIMENSIONS

Description	Size		Shipping weight	
	inches	(mm)	lbs	(kgs)
Side inlet, side outlet	¼	(8)	1⅞	(0.51)
Side inlet, side outlet	⅜	(10)	1⅞	(0.51)
Side inlet, bottom outlet	¼	(8)	1⅞	(0.51)
Side inlet, bottom outlet	⅜	(10)	1⅞	(0.51)
2 Side inlets, bottom outlet	¼	(8)	1⅞	(0.51)

\* Use valve numbers for pressures to 175 psi only. Consult factory for other numbers.



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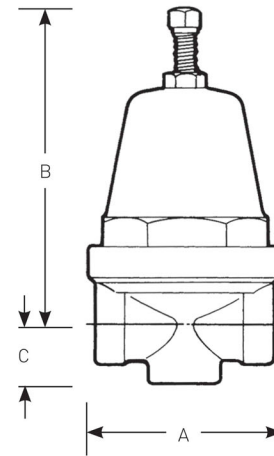
## FRM-2, FRM-2 (HP) BACK PRESSURE OR ECONOMIZER SERVICE

### Construction

Threaded ends; 2-way, side inlet-side outlet; 2-way, side inlet-bottom outlet; 3-way, 2 side inlets-bottom outlet; forged bronze body; cast bronze spring chamber; stainless steel seat disc, seat ring and pressure spring; bronze diaphragms; PTFE diaphragm gasket. All parts commercially cleaned for cryogenic service.

**Note:** FRM-2 available in stainless steel and special construction for hi-purity service. Contact your sales representative.

Temperature rating: +150°F to -320°F (339K to 78K)  
 Maximum set pressure  
 FRM-2: 250 psi (17.58 kg/cm<sup>2</sup>)  
 FRM-2HP: 400 psi (28.12 kg/cm<sup>2</sup>)



### PRESSURE RANGES

Size	Maximum working ranges	
	psi	(kg/sq cm)
<b>FRM-2</b>		
All sizes	0-30	[0-2.11]
All sizes	20-50	[1.41-3.52]
All sizes	40-80	[2.81-5.62]
All sizes	75-150	[5.27-10.55]
All sizes	100-275	[7.03-19.34]
<b>FRM-2HP</b>		
All sizes	200-400	[14.06-28.12]

### DIMENSIONS

Description	Size		Dimensions						Shipping weight	
	inches	(mm)	A		B		C		lbs	(kgs)
<b>FRM-2</b>										
Side inlet, side outlet	¼	[8]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	¾	[19.05]	2½	[1.13]
Side inlet, side outlet	¾	[10]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	¾	[19.05]	2½	[1.13]
Side inlet, side outlet	½	[15]	2 <sup>7</sup> / <sub>8</sub>	[73.03]	4½	[114.3]	1½	[28.58]	3½	[1.58]
Side inlet, bottom outlet	¼	[8]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	¾	[19.05]	2½	[1.13]
Side inlet, bottom outlet	¾	[10]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	¾	[19.05]	2½	[1.13]
Side inlet, bottom outlet	½	[15]	2 <sup>7</sup> / <sub>8</sub>	[73.03]	4½	[114.3]	1½	[28.58]	3½	[1.58]
2 Side inlets, bottom outlet	¼	[8]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	¾	[19.05]	2½	[1.13]
2 Side inlets, bottom outlet	¾	[10]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	¾	[19.05]	2½	[1.13]
2 Side inlets, bottom outlet	½	[15]	2 <sup>7</sup> / <sub>8</sub>	[73.03]	4½	[114.3]	1½	[28.58]	3½	[1.58]
<b>FRM-2HP</b>										
Side inlet, side outlet	¼	[8]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	25/32	[19.84]	2½	[1.13]
Side inlet, bottom outlet	¼	[8]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	25/32	[19.84]	2½	[1.13]
Side inlet, side outlet	¾	[10]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	25/32	[19.84]	2½	[1.13]
Side inlet, bottom outlet	¾	[10]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	25/32	[19.84]	2½	[1.13]
Side inlet, side outlet	½	[15]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	1½	[28.585]	3½	[1.58]
Side inlet, bottom outlet	½	[15]	2 <sup>11</sup> / <sub>16</sub>	[68.26]	4½	[114.3]	25/32	[19.84]	3½	[1.58]

# CASH VALVES CRYOGENIC VALVES AND CONTROLS

## FRM, FRM-2 SELECTION GUIDE

Example:	FRM-	A	W	Z	S	A	S	B	F	02	-	D	1
<b>Model</b>													
<b>FRM-</b>	FRM												
<b>FRM2</b>	FRM-2												
<b>Size</b>													
<b>A</b>	1/4" [all]												
<b>B</b>	3/8" [all]												
<b>C</b>	1/2" [FRM-2]												
<b>Service</b>													
<b>C</b>	Cryogenic (FRM, FRM-2)												
<b>Material of construction</b>													
<b>Z</b>	Brass												
<b>G</b>	316 SST (FRM, FRM-2)												
<b>E</b>	303 SST (FRM)												
<b>Body/connection style</b>													
<b>S</b>	Side inlet/side outlet [all] NPT												
<b>R</b>	2 side inlets/bottom outlet (FRM, FRM-2) NPT												
<b>E</b>	Side inlet/bottom outlet (FRM, FRM-2) NPT												
<b>B</b>	Side inlet/side outlet (BSPT)												
<b>P</b>	Side inlet/side outlet 1/4" NPS - .082 wall pipe (FRM-2)												
<b>T</b>	Side inlet/side outlet 3/8" NPS - .035 wall pipe (FRM-2)												
<b>V</b>	Side inlet/side outlet 1/2" NPS - .049 wall pipe (FRM-2)												
<b>Spring chamber material</b>													
<b>Z</b>	Brass spring chamber												
<b>G</b>	SST spring chamber (FRM-2)												
<b>C</b>	Chrome plated												
<b>Spring chamber style</b>													
<b>S</b>	Standard												
<b>W</b>	Without vent hole												
<b>Diaphragm material</b>													
<b>G</b>	316 SST												
<b>Z</b>	Bronze												
<b>Pressure screw style</b>													
<b>F</b>	Fillister (FRM only)												
<b>H</b>	Hex												
<b>T</b>	T-handle (FRM)												
<b>Variations</b>													
<b>03</b>	303 Stainless steel trim w/ Teflon diaphragm gasket (metal diaphragms only)												
<b>04</b>	303 Stainless steel trim w/ 6 x 0.005 thick bronze diaphragms												
<b>05</b>	303 Stainless steel trim w/ nylon inserted locknut												
<b>13</b>	316 Stainless steel trim w/ Teflon diaphragm gasket (metal diaphragms only)												
<b>23</b>	Monel trim w/ Teflon diaphragm gasket (metal diaphragms only)												
<b>32</b>	Remote sensing												
<b>Design revision</b>													
<b>(-)</b>	Original design												
<b>Spring material</b>													
<b>E</b>	Stainless steel												
<b>Spring range</b>													
	Refer to table below												

### STANDARD SPRING RANGES (psig)

Spring Material	Model	1	2	3	4	5	6	7	8	9
SST	FRM	2 - 25	15 - 65	40 - 100	50 - 150	75 - 175	100 - 250	200 - 400	200 - 600	300 - 600
	FRM-2	0 - 30	20 - 50	40 - 80	75 - 150	100 - 275	200 - 400	300 - 600	----	----