VM Series
Diaphragm Valves

Respectfully Submitted To:

EBA Engineering Consultants Ltd.
Attention: Joe Blow
1234 45 Avenue NW
Calgary, Alberta

Syncrude Canada Ltd.
Attention: Jim Bob
1234 45 Avenue NW
Calgary, Alberta

Prepared by:

Rice Resource Technologies Inc.
9333 41 Avenue NW
Edmonton, Alberta T6E 6R5

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Rice Earth Sciences
403.XXX.XXXX
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RICE Industrial Products
A DIVISION OF RICE RESOURCE TECHNOLOGIES

Fluid thinking. Solid results.

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Product Data Sheet

introduction

< STANDARDS >

ASTM D4101-86
ASTM D3222
ASTM D2467
ASTM D2466
ASTM D1785
ASTM D1784
ASTM F441
ASTM F439

ISO 3609
ISO 10931

ANSI B16.5

IPEX VM Series Diaphragm Valves are the ideal solution for modulating flow and controlling dirty or contaminated fluids in a variety of applications. The weir-style design allows for precise throttling while the compact design allows for installation in any orientation. The modular nature of this valve results in many material, body style, and diaphragm options. VM Series Diaphragm Valves are part of our complete systems of pipe, valves, and fittings, engineered and manufactured to our strict quality, performance, and dimensional standards.

Valve Availability

Body Material:	PVC, CPVC, PP, PVDF
Size Range:	1/2" through 4"
Pressure:	150 psi
Diaphragm:	EPDM, Viton® (FPM) or PTFE (EPDM backed)
Control Style:	Manual Handwheel
End Connections:	Spigot, True Union (Socket), Flanged (ANSI 150)

Sample Specification

1.0 Diaphragm Valves - VM Manual

1.1 Material

- The valve body, including end connectors and unions, shall be made of PVC compound which shall meet or exceed the requirements of cell classification 12454 according to ASTM D1784.

or The valve body, including end connectors and unions shall be made of Corzan® CPVC compound which shall meet or exceed the requirements of 23447 according to ASTM D1784.

or The valve body, including end connectors and unions shall be made of stabilized PP homopolymer compound, also containing a RAL 7032 pigment, which shall meet or exceed the requirements of Type I Polypropylene according to ASTM D4101-86.

or The valve body, including end connectors and unions shall be made of virgin, non-regrind PVDF compound which shall meet or exceed the requirements of Table 1 according to ASTM D3222.

- These compounds shall comply with standards that are equivalent to NSF Standard 61 for potable water.
- The valve bonnet assembly shall be made of high temperature, high strength, glass-filled polypropylene.

1.2 Diaphragm

- The diaphragm shall be made of EPDM which shall comply with standards that are equivalent to NSF Standard 61 for potable water.

or The diaphragm shall be made of Viton® (FPM) which shall comply with standards that are equivalent to NSF Standard 61 for potable water.

or The diaphragm shall be made of PTFE (backed with EPDM) which shall comply with standards that are equivalent to NSF Standard 61 for potable water.

1.3 All other wetted and non-wetted parts of the valves shall comply with standards that are equivalent to NSF Standard 61 for potable water.

2.0 Connections

2.1 Spigot style

- The IPS spigot PVC end connectors shall conform to the dimensional standard ASTM D1785.

or The IPS spigot CPVC end connectors shall conform to the dimensional standard ASTM F441.

or The Metric spigot PP end connectors shall conform to the dimensional standard ISO 3609.

or The Metric spigot PVDF end connectors shall conform to the dimensional standard ISO 10931.

2.2 Socket style

- The IPS socket PVC end connectors shall conform to the dimensional standards ASTM D2466 and ASTM D2467.

Sample Specification (cont'd)

or The IPS socket CPVC end connectors shall conform to the dimensional standard ASTM F439.

or The Metric socket PP end connectors shall conform to the dimensional standard ISO 3609.

or The Metric socket PVDF end connectors shall conform to the dimensional standard ISO 10931.

2.3 Flanged style

- The ANSI 150 flanged PVC end connectors shall conform to the dimensional standard ANSI B16.5.

or The ANSI 150 flanged CPVC end connectors shall conform to the dimensional standard ANSI B16.5.

or The ANSI 150 flanged PP end connectors shall conform to the dimensional standard ANSI B16.5.

or The ANSI 150 flanged PVDF end connectors shall conform to the dimensional standard ANSI B16.5.

3.0 Design Features

- All valves shall be weir-style for throttling applications.
- All bodies to be used with EPDM or Viton® diaphragms shall feature raised molded sealing rings (concentric).
- All bodies to be used with PTFE diaphragms shall be machined flat.
- All PTFE diaphragms shall feature a raised molded ring to combine sealing performance and longer life.
- All through bolts shall be made of 304 stainless steel.
- All manual valves shall have a rising position indicator.
- Bodies of all sizes and materials shall have mounting brass inserts.

3.1 Pressure Rating

- All valves shall be rated at 150 psi at 73°F.

3.2 Markings

- All valves shall be marked to indicate size, material designation, and manufacturers name or trade mark.

3.3 Color Coding

- All PVC valves shall be color-coded dark gray.

or All CPVC valves shall be color-coded light gray.

or All PP valves shall be color-coded beige gray.

or All PVDF valves shall not be color-coded and be white in appearance.

- All bonnet assemblies shall be color-coded red.

4.0 All valves shall be Xirtec® 140, Corzan®, PP or PVDF by IPEX or approved equal.

Valve Selection

Valve Size (inches)	Body Material	Diaphragm Material	IPEX Part Number			Pressure Rating @ 73°F
			Spigot	True Union	ANSI Flanged	
1/2	PVC	EPDM	054175	054202	054220	150 psi
		Viton®	054184	054214	054229	
		PTFE	054193	054208	054238	
	CPVC	EPDM	054247	054274	054292	
		Viton®	054256	054280	054301	
		PTFE	054265	054286	054310	
3/4	PVC	EPDM	054176	054203	054221	
		Viton®	054185	054215	054230	
		PTFE	054194	054209	054239	
	CPVC	EPDM	054248	054275	054293	
		Viton®	054257	054281	054302	
		PTFE	054266	054287	054311	
1	PVC	EPDM	054177	054204	054222	
		Viton®	054186	054216	054231	
		PTFE	054195	054210	054240	
	CPVC	EPDM	054249	054276	054294	
		Viton®	054258	054282	054303	
		PTFE	054267	054288	054312	
1-1/4	PVC	EPDM	054178	054205	054223	
		Viton®	054187	054217	054232	
		PTFE	054196	054211	054241	
	CPVC	EPDM	054250	054277	054295	
		Viton®	054259	054283	054304	
		PTFE	054268	054289	054313	
1-1/2	PVC	EPDM	054179	054206	054224	
		Viton®	054188	054218	054233	
		PTFE	054197	054212	054242	
	CPVC	EPDM	054251	054278	054296	
		Viton®	054260	054284	054305	
		PTFE	054269	054290	054314	
2	PVC	EPDM	054180	054207	054225	
		Viton®	054189	054219	054234	
		PTFE	054198	054213	054243	
	CPVC	EPDM	054252	054279	054297	
		Viton®	054261	054285	054306	
		PTFE	054270	054291	054315	
2-1/2	PVC	EPDM	054181	n/a	054226	
		Viton®	054190		054235	
		PTFE	054199		054244	
	CPVC	EPDM	054253		054298	
		Viton®	054262		054307	
		PTFE	054271		054316	
3	PVC	EPDM	054182		054227	
		Viton®	054191		054236	
		PTFE	054200		054245	
	CPVC	EPDM	054254		054299	
		Viton®	054263		054308	
		PTFE	054272		054317	
4	PVC	EPDM	054183		054228	
		Viton®	054192		054237	
		PTFE	054201		054246	
	CPVC	EPDM	054255		054300	
		Viton®	054264		054309	
		PTFE	054273		054318	

Body Material:

- ❑ PVC
- ❑ PP
- ❑ CPVC
- ❑ PVDF

Size (inches):

- ❑ 1/2
- ❑ 2
- ❑ 3/4
- ❑ 2-1/2
- ❑ 1
- ❑ 3
- ❑ 1-1/4
- ❑ 4
- ❑ 1-1/2

Diaphragm:

- ❑ EPDM
- ❑ Viton® (FPM)
- ❑ PTFE

End Connections:

- ❑ Spigot
- ❑ True Union (Socket)
- ❑ Flanged (ANSI 150)

IPEX Part Number:

_____

Valve Selection *(cont'd)*

Valve Size (mm)	Body Material	Diaphragm Material	IPEX Part Number		Pressure Rating @ 73°F
			Spigot	True Union	
20	PP	EPDM	054319	054346	150 psi
		Viton®	054328	054352	
		PTFE	054337	034358	
	PVDF	EPDM	054364	054391	
		Viton®	054373	054397	
		PTFE	054382	054403	
25	PP	EPDM	054320	054347	
		Viton®	054329	054353	
		PTFE	054338	054359	
	PVDF	EPDM	054365	054392	
		Viton®	054374	054398	
		PTFE	054383	054405	
32	PP	EPDM	054321	054348	
		Viton®	054330	054354	
		PTFE	054339	054360	
	PVDF	EPDM	054366	054393	
		Viton®	054375	054399	
		PTFE	054384	054406	
40	PP	EPDM	054322	054349	
		Viton®	054331	054355	
		PTFE	054340	054361	
	PVDF	EPDM	054367	054394	
		Viton®	054376	054400	
		PTFE	054385	054407	
50	PP	EPDM	054323	054350	
		Viton®	054332	054356	
		PTFE	054341	054362	
	PVDF	EPDM	054368	054395	
		Viton®	054377	054401	
		PTFE	054386	054408	
63	PP	EPDM	054324	054351	
		Viton®	054333	054357	
		PTFE	054342	054363	
	PVDF	EPDM	054369	054396	
		Viton®	054378	054402	
		PTFE	054387	054409	
75	PP	EPDM	054325	n/a	
		Viton®	054334		
		PTFE	054343		
	PVDF	EPDM	054370		
		Viton®	054379		
		PTFE	054388		
90	PP	EPDM	054326		
		Viton®	054335		
		PTFE	054344		
	PVDF	EPDM	054371		
		Viton®	054380		
		PTFE	054389		
110	PP	EPDM	054327		
		Viton®	054336		
		PTFE	054345		
	PVDF	EPDM	054372		
		Viton®	054381		
		PTFE	054390		

Body Material:

- ❑ PVC
- ❑ PP
- ❑ CPVC
- ❑ PVDF

Size (inches):

- ❑ 20mm
- ❑ 63mm
- ❑ 25mm
- ❑ 75mm
- ❑ 32mm
- ❑ 90mm
- ❑ 40mm
- ❑ 110mm
- ❑ 50mm

Diaphragm:

- ❑ EPDM
- ❑ Viton® (FPM)
- ❑ PTFE

End Connections:

- ❑ Spigot
- ❑ True Union (Socket)
- ❑ Flanged (ANSI 150)

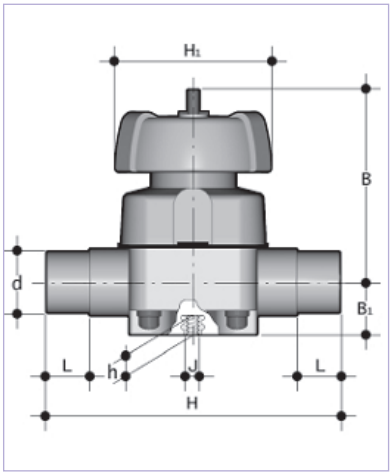
IPEX Part Number:

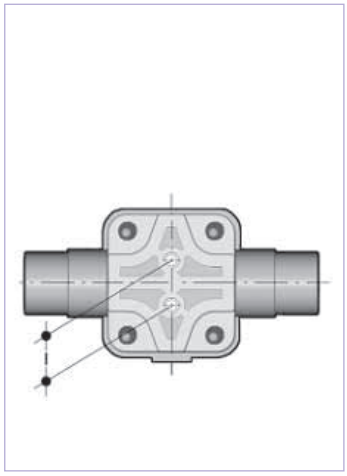
_____

Technical Data

dimensions

spigot connections

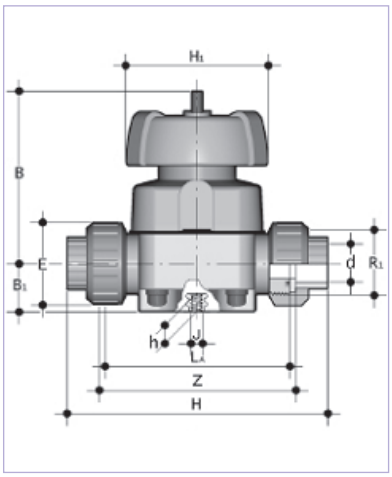


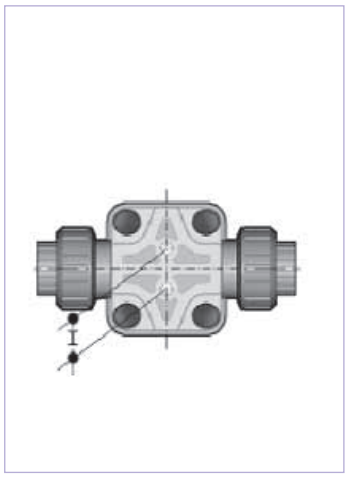


Size	Dimension (inches) PVC / CPVC d (in)	PP / PVDF d (mm)	H	L
1/2	0.84	20	4.88	0.63
3/4	1.05	25	5.67	0.75
1	1.32	32	6.06	0.87
1-1/4	1.66	40	6.85	1.02
1-1/2	1.90	50	7.64	1.22
2	2.38	63	8.82	1.50
2-1/2	2.88	75	11.18	1.73
3	3.50	90	11.81	2.01
4	4.50	110	13.39	2.40

Size	Dimension (inches) B_1	B	H_1	J	h	I
1/2	1.02	3.74	3.54	M6	0.47	0.98
3/4	1.02	3.74	3.54	M6	0.47	0.98
1	1.02	3.74	3.54	M6	0.47	0.98
1-1/4	1.57	4.96	4.53	M8	0.71	1.75
1-1/2	1.57	4.96	4.53	M8	0.71	1.75
2	1.57	5.83	5.51	M8	0.71	1.75
2-1/2	2.17	8.86	8.46	M12	0.91	3.94
3	2.17	8.86	8.46	M12	0.91	3.94
4	2.72	11.61	9.84	M12	0.91	4.72

true union connections





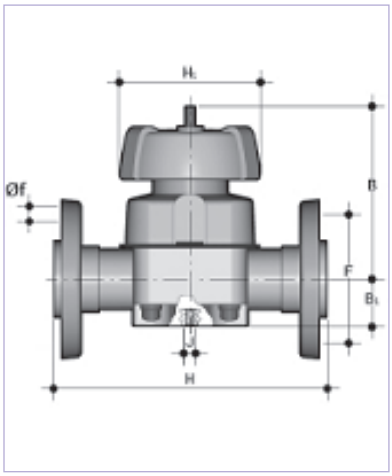
Size	d	Dimension (inches) PVC / CPVC H	PVC / CPVC Z	PP / PVDF H	PP / PVDF Z	L_A	B_1
1/2	0.84	6.30	4.53	5.79	4.53	4.25	1.02
3/4	1.05	6.57	4.53	6.06	4.57	4.25	1.02
1	1.32	7.09	4.80	6.61	4.88	4.57	1.02
1-1/4	1.66	8.19	5.67	7.56	5.51	5.28	1.57
1-1/2	1.90	9.21	6.46	8.74	6.30	6.06	1.57
2	2.38	10.71	7.68	10.47	7.48	7.24	1.57

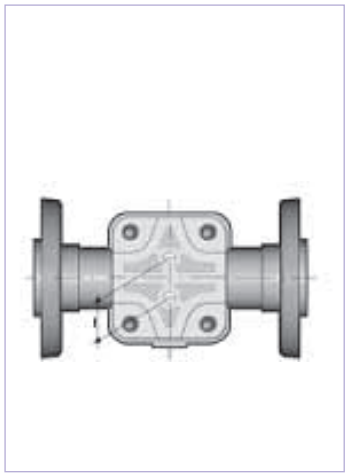
Size	Dimension (inches) B	H_1	E	R_1	J	h	I
1/2	3.74	3.54	1.61	1	M6	0.47	0.98
3/4	3.74	3.54	1.97	1-1/4	M6	0.47	0.98
1	3.74	3.54	2.28	1-1/2	M6	0.47	0.98
1-1/4	4.96	4.53	2.83	2	M8	0.63	1.75
1-1/2	4.96	4.53	3.11	2-1/4	M8	0.63	1.75
2	5.83	5.51	3.86	2-3/4	M8	0.63	1.75

Technical Data (cont'd)

dimensions cont'd

ANSI 150 flanged (vanstone) connections

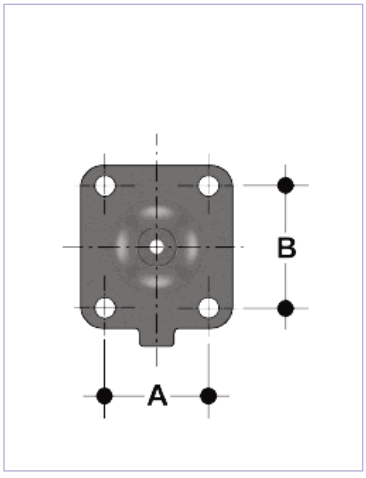




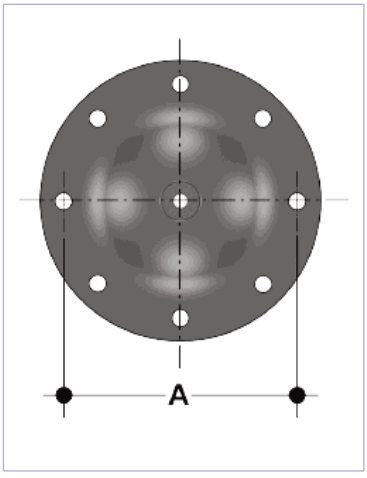
Dimension (inches)					
Size	d	H	B_1	B	H_1
1/2	0.84	5.37	1.02	3.74	3.54
3/4	1.05	6.11	1.02	3.74	3.54
1	1.32	6.58	1.02	3.74	3.54
1-1/4	1.66	7.30	1.57	4.96	4.53
1-1/2	1.90	8.02	1.57	4.96	4.53
2	2.38	8.88	1.57	5.83	5.51
2-1/2	2.88	11.34	2.17	8.86	8.46
3	3.50	11.81	2.17	8.86	8.46
4	4.50	13.39	2.72	11.61	9.84

Dimension (inches)						
Size	# holes	f	F	J	h	l
1/2	4	5/8	2-3/8	M6	0.47	0.98
3/4	4	5/8	2-3/4	M6	0.47	0.98
1	4	5/8	3-1/8	M6	0.47	0.98
1-1/4	4	5/8	3-1/2	M8	0.71	1.75
1-1/2	4	5/8	3-7/8	M8	0.71	1.75
2	4	3/4	4-3/4	M8	0.71	1.75
2-1/2	4	3/4	5-1/2	M12	0.91	3.94
3	4	3/4	6	M12	0.91	3.94
4	4	3/4	7-1/2	M12	0.91	4.72

sizes 1/2" to 3"



size 4"



diaphragm

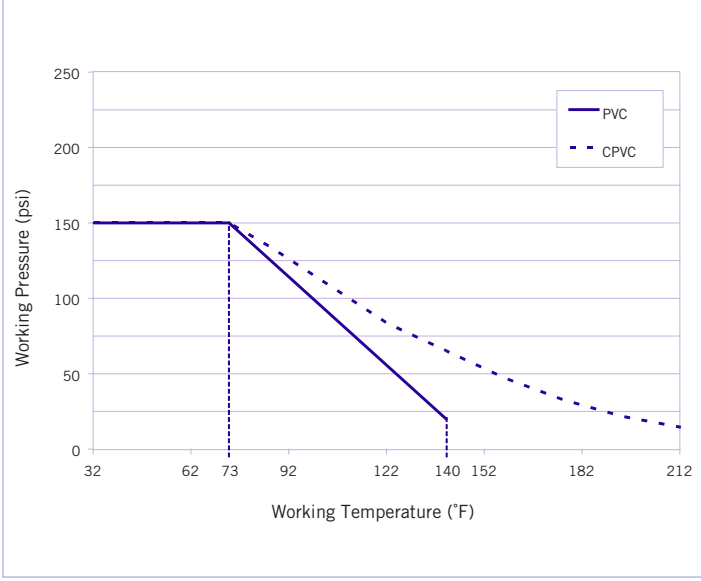
Dimension (inches)			
Size (inches)	Size (mm)	A	B
1/2	20	1.81	2.13
3/4	25	1.81	2.13
1	32	1.81	2.13
1-1/4	40	2.56	2.76
1-1/2	50	2.56	2.76
2	63	3.07	3.23
2-1/2	75	4.49	5.00
3	90	4.49	5.00
4	110	7.60	-

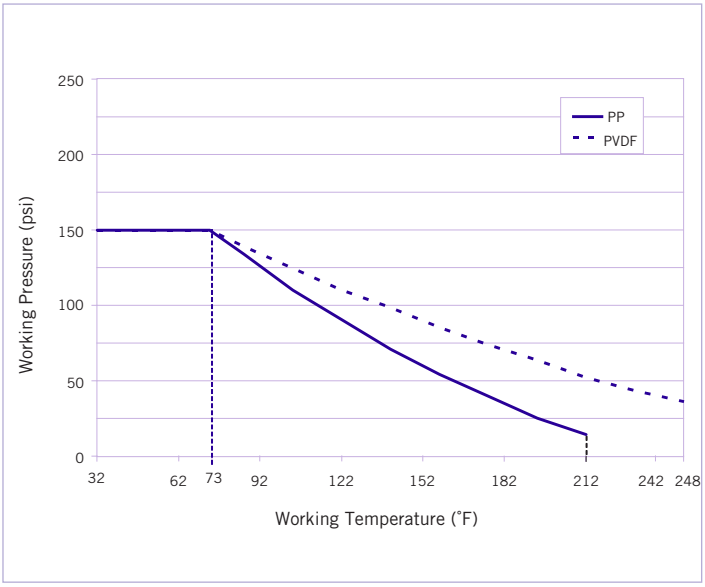
Technical Data (cont'd)

weights

Size (inches)	Approximate Weight (lbs)									
	PVC			CPVC			PP		PVDF	
	Spigot	True Union	Flanged	Spigot	True Union	Flanged	Spigot	True Union	Spigot	True Union
1/2	1.54	1.83	1.92	1.59	1.90	1.99	1.32	1.57	1.70	2.32
3/4	1.54	1.90	2.06	1.59	1.97	2.13	1.32	1.65	1.70	2.48
1	1.54	1.97	2.26	1.59	2.05	2.34	1.32	1.72	1.70	2.61
1-1/4	3.31	3.64	4.23	3.44	3.79	4.41	2.65	3.13	3.77	4.60
1-1/2	3.31	3.81	4.53	3.44	3.97	4.72	2.65	3.22	3.77	4.79
2	5.29	6.17	7.31	5.51	6.43	7.63	4.19	5.25	5.89	7.60
2-1/2	15.43	n/a	18.23	16.01	n/a	18.95	13.23	n/a	17.28	n/a
3	15.43	n/a	18.60	16.01	n/a	19.33	13.23	n/a	17.15	n/a
4	23.15	n/a	28.34	23.94	n/a	29.39	19.84	n/a	25.65	n/a

pressure – temperature ratings





Technical Data (cont'd)

flow coefficients

The flow coefficient (C_V) represents the flow rate in gallons per minute (GPM) at 68°F for which there is a 1 psi pressure drop across the valve in the fully open position. These values are determined from an industry standard testing procedure which uses water as the flowing media (specific gravity of 1.0). To determine specific flow rate and pressure loss scenarios, one can use the following formula:

$$f = sg \times \left(\frac{Q}{C_V}\right)^2$$

Where,

f is the pressure drop (friction loss) in psi,

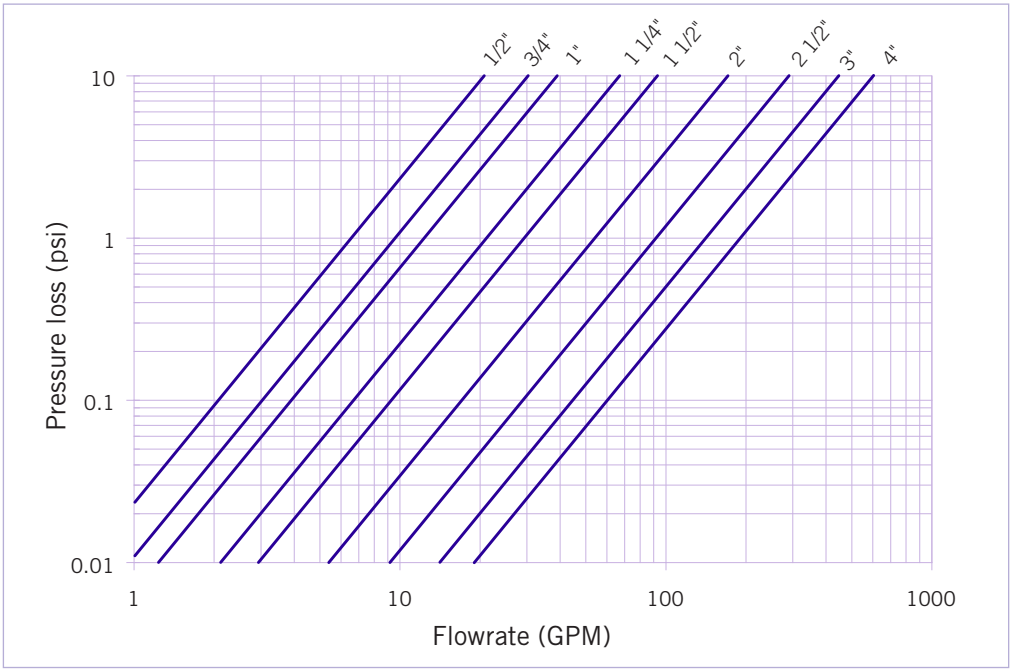
sg is the specific gravity of the fluid,

Q is the flow rate in GPM,

C_V is the flow coefficient.

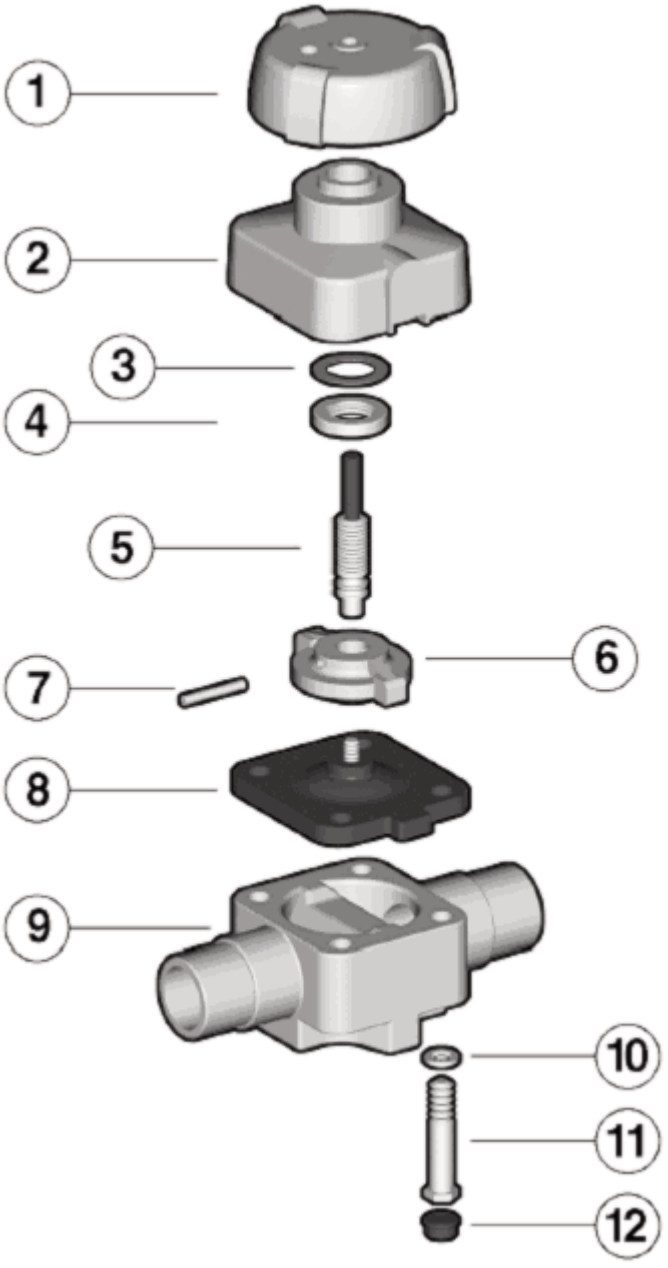
Size (in)	C_V
1/2	6.51
3/4	9.52
1	12.3
1-1/4	21.0
1-1/2	29.1
2	53.6
2-1/2	91.0
3	140
4	189

pressure loss chart



Components

sizes 1/2" to 2"



#	Component	Material	Qty
1*	handwheel	GFPP	1
2*	bonnet	GFPP	1
3*	compression bearing	POM	1
4*	security ring	brass	1
5*	indicator - stem	SS	1
6*	compressor	PBT	1
7*	pin	SS	1
8*	diaphragm	EPDM / Viton® / PTFE	1
9*	valve body	PVC / CPVC / PP / PVDF	1
10*	washer	zinc plated steel	4
11*	hex bolt	zinc plated steel	4
12*	protective cap	PE	4

* Spare parts available.
Items 1 through 7 are supplied as an assembly.
Contact IPEX for availability of spare components for True Union and Flanged style valves.
Note: Sizes 2-1/2" to 4" have similar components.

Installation Procedures

1. The valve may be installed in any position or direction.
2. Please refer to the appropriate connection style sub-section:
   a. For spigot style, solvent cement each pipe onto the ends of the valve body. **Ensure that excess solvent does not run into the body of the valve.**
   b. For true union style, remove the union nuts and slide them onto the pipe.
      i. For socket style, solvent cement the end connectors onto the pipe ends. For correct joining procedure, please refer to the section entitled, *"Joining Methods - Solvent Cementing"* in the IPEX Industrial Technical Manual Series, *"Volume I: Vinyl Process Piping Systems"*. **Ensure that excess solvent does not run into the body of the valve. Be sure to allow sufficient cure time before continuing with the valve installation.**
      ii. For threaded style, thread the end connectors onto the pipe ends. For correct joining procedure, please refer to the section entitled, *"Joining Methods - Threading"* in the IPEX Industrial Technical Manual Series, *"Volume I: Vinyl Process Piping Systems"*.
      iii. Ensure that the socket o-rings are properly fitted in their grooves then carefully place the valve in the system between the two end connections.
      iv. Tighten both union nuts. Hand tightening is typically sufficient to maintain a seal for the maximum working pressure. **Over-tightening may damage the threads on the valve body and/or the union nut, and may even cause the union nut to crack.**
   c. For flanged style, join both flanges to the pipe flanges. For correct joining procedure, please refer to the section entitled, *"Joining Methods - Flanging"* in the IPEX Industrial Technical Manual Series, *"Volume I: Vinyl Process Piping Systems"*.
3. If anchoring is required, fix the valve to the supporting structure using the mounting holes on the bottom of the valve body.

Valve Maintenance

disassembly

1. If removing the valve from an operating system, isolate the valve from the rest of the line. **Be sure to depressurize and drain the valve and isolated branch.**
2. If necessary, detach the valve from the support structure by disassembling the threaded connections on the bottom of the valve body (9).
3. Please refer to the appropriate connection style sub-section:
   a. For spigot style, cut the pipe on either side of the valve and remove from the line.
   b. For true union connections, loosen both union nuts and drop the valve out of the line. If retaining the socket o-rings, take care that they are not lost when removing the valve from the line.
   c. For flanged style, loosen each bolt holding the valve to the pipe flanges. Please refer to the section entitled, *"Joining Methods - Flanging"* in the IPEX Industrial Technical Manual Series, *"Volume I: Vinyl Process Piping Systems"* for a recommended bolt tightening pattern diagram. Follow the same pattern when disassembling the flanged joints then carefully remove the valve from the line.
4. Remove the protective caps (12), then loosen and remove the bolts (11) and washers (10) from the bottom of the valve body.
5. Loosen and remove the diaphragm (8) from the compressor (6).
6. Rotate the handwheel (1) clockwise until the stem-compressor assembly (5, 6, 7) is released.
7. The valve components can now be checked for problems and/or replaced.

Note: It is not recommended to attempt to further disassemble the handwheel/bonnet assembly as it may cause irreversible damage to the components.

assembly

Note: Before assembling the valve components, it is advisable to lubricate the o-rings with a water soluble lubricant. **Be sure to consult the "IPEX Chemical Resistance Guide" and/or other trusted resources to determine specific lubricant-rubber compatibilities.**

1. Insert the stem-compressor assembly into the bonnet and tighten by threading in a counterclockwise (left-hand thread) direction. The guide tabs on the compressor must be lined up with the bonnet grooves before cycling the handwheel to further retract the compressor.
2. Insert the diaphragm into the compressor and turn in a clockwise direction until sufficiently tight. Ensure that the tab lines up with the notched side of the bonnet then cycle the handwheel counterclockwise until the diaphragm is fully retracted.
3. Place the bonnet and diaphragm onto the valve body taking care to properly line up the sealing surfaces.
4. Insert the bolts and washers and tighten in an even (cross-like) pattern.
5. Replace the protective caps on the bolt heads.

Testing and Operating

The purpose of system testing is to assess the quality of all joints and fittings to ensure that they will withstand the design working pressure, plus a safety margin, without loss of pressure or fluid. Typically, the system will be tested and assessed in sub-sections as this allows for improved isolation and remediation of potential problems. With this in mind, the testing of a specific installed valve is achieved while carrying out a test of the overall system.

An onsite pressure test procedure is outlined in the IPEX Industrial Technical Manual Series, *"Volume I: Vinyl Process Piping Systems"* under the section entitled, *"Testing"*. The use of this procedure should be sufficient to assess the quality of a valve installation. **In any test or operating condition, it is important to never exceed the pressure rating of the lowest rated appurtenance in the system.**

Important points:

- Never test thermoplastic piping systems with compressed air or other gases including air-over-water boosters.
- When testing, do not exceed the rated maximum operating pressure of the valve.
- Avoid the rapid closure of valves to eliminate the possibility of water hammer which may cause damage to the pipeline or the valve.

Please contact IPEX customer service and technical support with regard to any concern not addressed in this data sheet or the technical manual.

About IPEX

IPEX is a leading supplier of thermoplastic piping systems. We provide our customers with one of the world's largest and most comprehensive product lines. All IPEX products are backed by over 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, the IPEX name is synonymous with quality and performance.

Our products and systems have been designed for a broad range of customers and markets. Contact us for information on:

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