

DIVERTER PORT BALL VALVES D SERIES



For Industrial and Sanitary Applications



ANATOMY OF A SUPERIOR BALL VALVE



The PBM Diverter Port valve is a 3-Way valve with the common port at the side or the bottom of the valve. This valve has seats for positive shut-off on two ports, and a third, or common, port which has no seat and is always open to flow. The PBM Diverter Port valve is an economical choice for many piping designs. In some applications, a single Diverter Port can replace two or three 2-Way valves to reduce cost and space. In other applications, a Diverter Port valve can produce an economical alternative to a 3-Way multi-port valve, depending on the sealing requirements. This valve is also an excellent choice for mounting two relief valves from a common pressure source.

PBM Series 5 Diverter Port valves are readily available in sizes 1/2" - 6" in 316 stainless steel, with other materials upon request. A wide choice of end fittings are available.

- **Adjust-O-Seal®** design allows the valve seat seal to be restored in-line to a leak-tight condition, to compensate for normal seat wear.
- Swing out/Lift out Design for easy removal and installation.
- Internal seat design produces a **bubble-tight seal**.
- Spring-loaded washers create a **live-loaded stem** assembly for positive sealing.
- **True-Bore®** (port matches ball, seat and end fitting I.D. to tubing I.D. to eliminate puddling) and **Full Port**.
- Stem assembly accommodates PBM **Direct Mount Actuation** for accurate alignment and increased cycling life. Engagement between the stem and ball is indexed and is well-suited for high torque applications.
- Encapsulated body gaskets eliminate cold flow and reduce recesses where media could accumulate and contaminate the process.
- Quickly and easily convert valves with common ports from Industrial to Sanitary (and vice versa) using **interchangeable seats**.
- Transflow, the gradual media flow that occurs as one port opens and another closes, prevents dead-heading and damage to pumps. Most flow patterns support transflow.
- Optional **mechanical or electropolished I.D. and O.D. surfaces** minimize crevices and enhance sterility in DI Igenix Sanitary valves.
- Extended Butt-Weld for Tube and Extended Butt Weld for Pipe end fittings may be **welded in-line without disassembly**.
- Optional body cavity fillers minimize areas where media could become trapped and contaminate the process.
- **Strong handle and stem**. Vinyl end covers are designed for a sure grip.
- Position indication plate is provided.
- **Precision machined and polished ball** reduces torque and extends seat life.

DESIGN FLEXIBILITY

The best way to assure good valve performance is to customize the valve to the process.

PBM offers a comprehensive ball valve line for optimum performance in controlling and automating process lines. Product offerings include 2-way, Flush Tank, Diverter Port, Multi-Port and specialty ball valves.

Selecting the ideal valve for a process starts with a choice of 18 different metals and alloys for basic valve construction, plus a wide variety of trim and soft part materials. Twenty-three different end fittings are readily available for easy installation without additional unions.

Special options include actuation, body cavity fillers, sanitary and aseptic valves and special testing. Should an application require a configuration not mentioned, PBM's engineering and manufacturing staffs will work with you to design one.

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DIVERTER PORT BALL VALVES

INDUSTRIAL VALVES

PBM's Diverter Port Industrial ball valves are designed for general purpose, non-sanitary process applications, or for connection to piping fittings rather than tubing fittings.

SANITARY VALVES

PBM's Diverter Port Igenix™ Sanitary ball valves are designed for pure process applications, or for connection to tubing fittings. These valves are ideal for pharmaceutical, biotechnological, and microelectronic applications. Valves are assembled lubricant-free with Virgin Polytetrafluoroethylene (VTFE) soft parts and either 316 or 316L wetted metal parts.

PORT SIZES

TRUE-BORE®

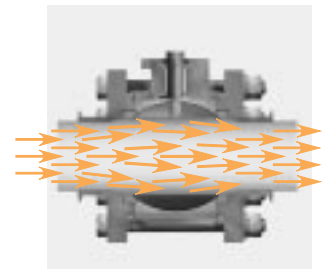
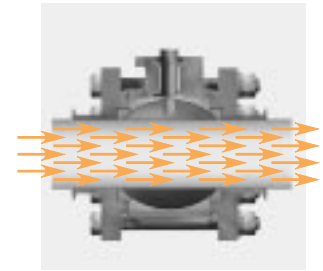
In many applications, it is critical that the flow path have no restrictions. If a pocket is present, puddling or incomplete drainage of the valve will occur. This puddling of condensate or biological fluids in the ball or end fittings provides an area where bacteria could grow.

True-Bore means that the I.D. of the ball, seats and end fittings are identical to the I.D. of the tubing. For example, a 2" valve has a 1.87" diameter ball port, a 4" valve has a 3.83" diameter ball port. Therefore, there are no pockets or dead space in the through path, and high pressure drops will not occur. True-Bore is standard on PBM's DI and DC ball valves.

FULL PORT

Full Port means that the ball port equals the nominal size of the valve. For example, a 2" valve has a 2.00" diameter ball port; a 4" valve has a 4.00" diameter ball port. While the features and benefits of a Full Port are similar as those of the True-Bore port size, the through path in a Full Port valve changes slightly at the end fittings to match the O.D. of the surrounding piping.

Full Port is standard on PBM's DP and DD ball valves.

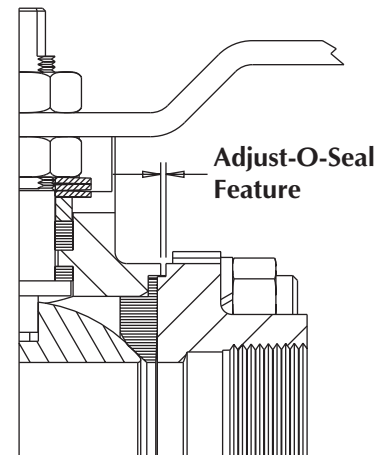


FEATURES

ADJUST-O-SEAL®

The Adjust-O-Seal design feature allows in-line adjustment to compensate for normal wear on seats, reducing downtime, maintenance and repair costs, by increasing the time between seat replacements.

The adjustment can usually be done several times before the seats have to be replaced. The adjustment is accomplished by slightly tightening the body bolts (1/8 turn), which compresses the seats against the ball and restores the valve to a leak tight condition.



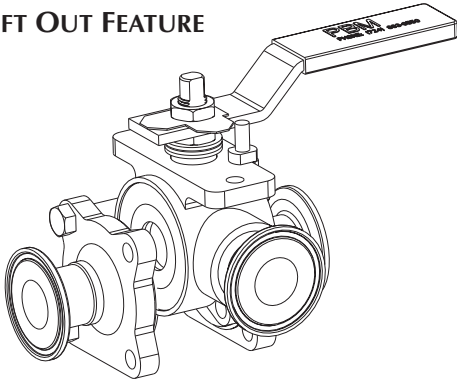
FEATURES

SWING OUT/LIFT OUT

This feature is valuable for welded piping systems or wherever in-line valve maintenance is required. With minimal spreading of the piping, disconnect and remove the piping at the center port, remove one body bolt from the valve body and swing the body away from the installed position for easy maintenance. Swing the body back to reinstall the body bolt and return the valve to a leak-tight seal. Extended Butt Weld for Tube and Butt Weld for Pipe end fittings may be welded in-line without disassembly.

For maintenance that requires complete removal of the valve body from the system, the center sections of Series 5 valves can easily be lifted out of the installed position with minimal spreading of the pipe. Simply disconnect and remove the piping at the center port, remove 2 body bolts, and lift the body out.

LIFT OUT FEATURE



SK-98007D ▲

INTERCHANGEABLE SEATS

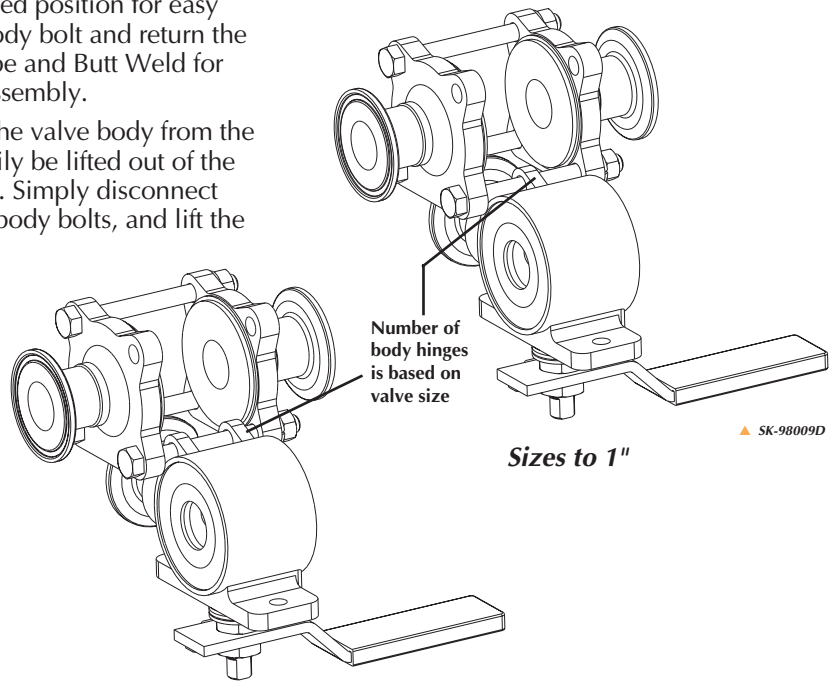
When the valve is swung out or lifted out from the installed position, seats may be interchanged. Series 5 valve design allows seats to be exchanged for a different seat material as needed. In some valves, non-encapsulated seats may be changed to encapsulated seats and O-rings without changing the valve body. This easy seat exchange saves the cost of purchasing a new valve.

A one-piece seat and gasket assembly is suited for applications where temperature is constant or where a valve is not required to seal cold after operating hot.

A two-piece seat and gasket assembly includes a separate seat and gasket, O-ring seals behind and around the seat, and a metal encapsulating ring that supports the inner bore of the seat. These valves are suited for applications in which a valve must seal cold after operating hot.

For more on these assemblies, see the Valve Selection Table on page 7.

SWING OUT FEATURE

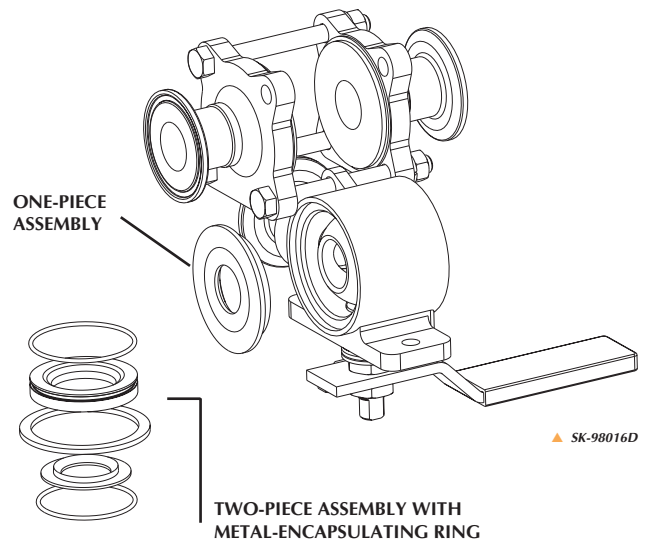


Sizes to 1"

▲ SK-98009D

Sizes 1-1/2" and above

▲ SK-98009E



ONE-PIECE ASSEMBLY

TWO-PIECE ASSEMBLY WITH METAL-ENCAPSULATING RING

▲ SK-98016D

OPTIONS

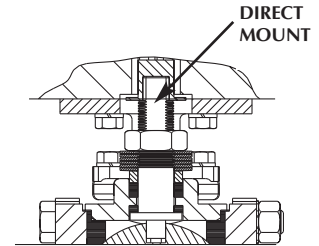
SANITARY

PBM's Igenix™ Sanitary Diverter Port Ball Valves (DI Series) are ideal for pharmaceutical, biotechnological and microelectronic applications. Valves are assembled lubricant-free with virgin polytetrafluoroethylene (VTFE) soft parts and either 316 or 316L wetted metal parts.

ACTUATION

PBM offers a selection of pneumatic and electric actuation packages. PBM valves are designed to accept Direct Mount Actuation that utilizes the valve stem as an integral part of the actuator drive. This design provides improved cycling life and performance, while reducing the total package profile. Direct Mount Actuation also eliminates the need for additional brackets or extensions.

PBM Direct Mount Actuation includes a stainless steel bracket and insert as standard. PBM can easily direct-mount a PBM valve to any actuator with a female drive and an ISO bolt pattern.



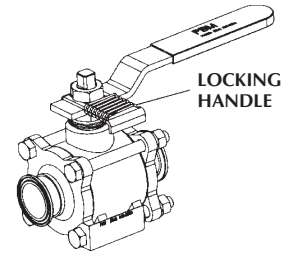
▲ SK-98020

BODY CAVITY FILLERS

Body cavity fillers are designed to fill the cavity of the valve between the body and the ball. Cavity fillers minimize the volume of trapped fluid in the valve body that can contaminate the process or prevent smooth operation of the valve.

LOCKING HANDLE

PBM's locking handle is designed for applications in which accidental turning of a valve handle could result in bodily injury or compromise product integrity. The handle's spring-loaded mechanism functions independently of gravity and will lock the valve in position. The handle can be further secured using a customer-supplied locking device, such as a padlock.



POLISHING

Mechanical polishing and electropolishing benefit processing by minimizing rough surfaces where media could become trapped. Electropolishing increases material passivity, improves contamination control, and greatly enhances cleanability of the mechanically polished surface.

PBM Polishing Code	Definition
—	No Polish
A	20 R _a Max. I.D.
B	32 R _a Max. O.D.
C	20 R _a Max. I.D. & 32 R _a Max. O.D.
D	15 R _a Max. I.D.
E	10 R _a Max. I.D.
F	20 R _a Max. I.D. after Electropolish
G	15 R _a Max I.D. after Electropolish
H	10 R _a Max I.D. after Electropolish
I	5 R _a Max I.D.
K	5 R _a Max. I.D. & 32 R _a Max. O.D.
L	20 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
M	Electropolish Only (I.D. & O.D.)
N	10 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
O	15 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
Q	15 R _a Max. I.D. & 32 R _a Max. O.D.
S	10 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish

Conversion Chart				
Standard Grit	R _a		RMS	
	µin	µ	µin	µ
150g	32	.80	35	.89
180g	20	.50	22	.56
240g	15	.38	17	.43
320g	10	.25	11	.28
400g	5	.13	6	.14

Grit: Measures the number of scratches per linear inch of abrasive pad. Higher numbers indicate a smoother finish.

RMS: Defined as Root Mean Square roughness, this method measures a sample for peaks and valleys. Lower numbers indicate a smoother finish.

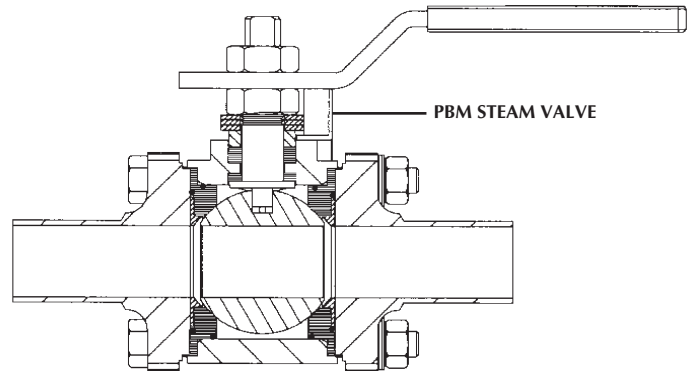
R_a: Known as the Arithmetic Mean, this measurement represents the average value of all peaks and valleys. Lower numbers indicate a smoother finish.

If O.D. is not designated as polished, it is investment cast.

STEAM VALVES

Steam valves are designed to accommodate the high temperature requirements (above 200°F) and temperature swings of steam applications and other elevated temperature applications. PBM's Steam valves feature:

- Metal-encapsulated ring that minimizes “tear-dropping” or seat flow due to heat softening the seat and dragging it into the process stream.
- Metal-encapsulated body seal to eliminate cold flow (compression deforming the seal) and reduce recesses where media could accumulate and contaminate the process. This body seal is the secondary seal.
- O-ring primary body seals to provide a tight seal, preventing external leakage.
- Belleville washers on body bolts to maintain pre-load on body bolts.
- Enhanced live-loaded stem packing design to provide compensation for wear and differential thermal expansion.
- Optional cavity fillers to minimize body cavity voids.
- Optional extended stem to allow space to clear insulation.



▲ SK-98015

SERIES 5 VALVE SELECTION

Valve Type				Port Sizes ¹			Seat & Gasket Assemblies ²		Temperature
Industrial		Sanitary		Full Port	True-Bore®	Reduced Port	1-Piece ³	2-Piece ⁴	
Standard	Steam	Standard	Steam						
DP				√			√		Constant ⁵
		DI			√		√		Constant
	DD			√				√	Fluctuating ⁶
			DC		√			√	Fluctuating

NOTES:

1. For port size definitions, please turn to page 4.
2. The Seat and Gasket assemblies for valves with the same port size can be interchanged. For example, a DP valve can be changed to a DD valve by removing the DP seats and installing DD seats, gaskets, metal encapsulating ring, and O-rings. There is no change necessary to the body, end fittings, or packing area of the valve. Similarly, a DD valve can be converted to a DP valve simply by removing the DD seats, gaskets, metal encapsulating ring, and O-rings and installing the one-piece seat and gasket. With PBM's Series 5 swing out/lift out design, the changeover is easy.
3. A one-piece seat and gasket assembly is suited for applications where temperature is constant or where a valve is not required to seal cold after operating hot. It is ideally suited for applications in which the valve operates at a temperature that does not fluctuate over 75°, or if the temperature does not exceed 200°F.
4. A two-piece seat and gasket assembly includes a separate seat and gasket, O-ring seals behind and around the seat, and a metal encapsulating ring that supports the inner bore of the seat. These valves are suited for applications in which a valve must seal cold after operating hot. The O-rings behind the seat act like springs to regain seat loading against the ball when the valve is cooled after being hot. The metal encapsulating ring prevents the seat from extruding into the waterway.
5. Constant temperature, or temperature that does not fluctuate more than 75°, or is under 200°F.
6. Temperature that fluctuates more than 75°, or is over 200°F.

METAL MATERIALS

Process media composition, temperature and application will dictate appropriate metal and soft parts materials. Common valve metals and their general characteristics are listed below. Consult PBM for additional information.

S/S = Stainless Steel

316L S/S complies with ASTM A 351-CF3M or A479, S31603, 316 S/S complies with ASTM A351-CF8M or A479, S31600.

- Is exceptionally corrosion-resistant to acidic and basic environments and does not pit easily.
- Can be polished to a near-mirror finish for easy cleanability.
- Has a carbon content of <.03% to facilitate welding (316L only).
- Is preferred for sanitary and biotechnological uses.
- Has a controlled sulphur content between 0.005% and 0.017% in cast Extended Butt-Weld end fittings, in accordance with ASME BPE-1997 (316L only).
- Low and zero ferrite cast materials are also available.

Carbon Steel, A216-WCB

- This versatile material handles mildly corrosive media.

Other

- Additional materials are available, including Hastelloy, Alloy 20, Titanium, and Inconel.

ALLOWABLE WORKING PRESSURES (PSIG) AND TEMPERATURE GUIDELINES

Allowable Working Pressure (psig) — Valves 1-1/2" and Smaller								
		DP, DD Valves				DI, DC Valves		
Material	Temp. °F	Female N.P.T. (Q-) Butt Weld (B-, C-, D-) Socket Weld (U-)	150# Flanged (L-) Sch. 40 bore	300# Flanged (M-) Sch. 40 bore	Tri-Clamp for Sch. 5S pipe (W-) (see Note 1)	Extended Butt Weld for Tube (F-)	Tri-Clamp for Tube (X-) (see Note 1)	I-Line (G- or H-) (see Note 1)
316/316L SS	100	900	275	720	900	900	900	900
	300	700	215	560	700	700	700	700
	450	620	182	497	620	620	620	620
Hastelloy C-276	100	935	290	750	935	935	935	935
	300	910	230	730	910	910	910	910
	450	850	185	685	970	970	970	970

NOTES:

1. Consult manufacturers' literature. Rating of gasket and clamp may be lower than this listed pressure.
2. Seat/packing/gasket material may further limit these ratings. Consult ratings information on page 9.

Allowable Working Pressure (psig) — Valves 2" and Larger								
		DP, DD Valves				DI, DC Valves		
Material	Temp. °F	Female N.P.T. (Q-) Butt Weld (B-, C-, D-) Socket Weld (U-)	150# Flanged (L-) Sch. 40 bore	300# Flanged (M-) Sch. 40 bore	Tri-Clamp for Sch. 5S pipe (W-) (see Note 1)	Extended Butt Weld for Tube (F-)	Tri-Clamp for Tube (X-) (see Note 1)	I-Line (G- or H-) (see Note 1)
316/316L SS	100	720	275	720	720	720	720	720
	300	560	215	560	560	560	560	560
	450	497	182	497	497	497	497	497
Hastelloy C-276	100	750	290	750	750	750	750	750
	300	730	230	730	730	730	730	730
	450	685	185	685	685	685	685	685

NOTES:

1. Consult manufacturers' literature. Rating of gasket and clamp may be lower than this listed pressure.
2. Seat/packing/gasket material may further limit these ratings. Consult ratings information on page 9.

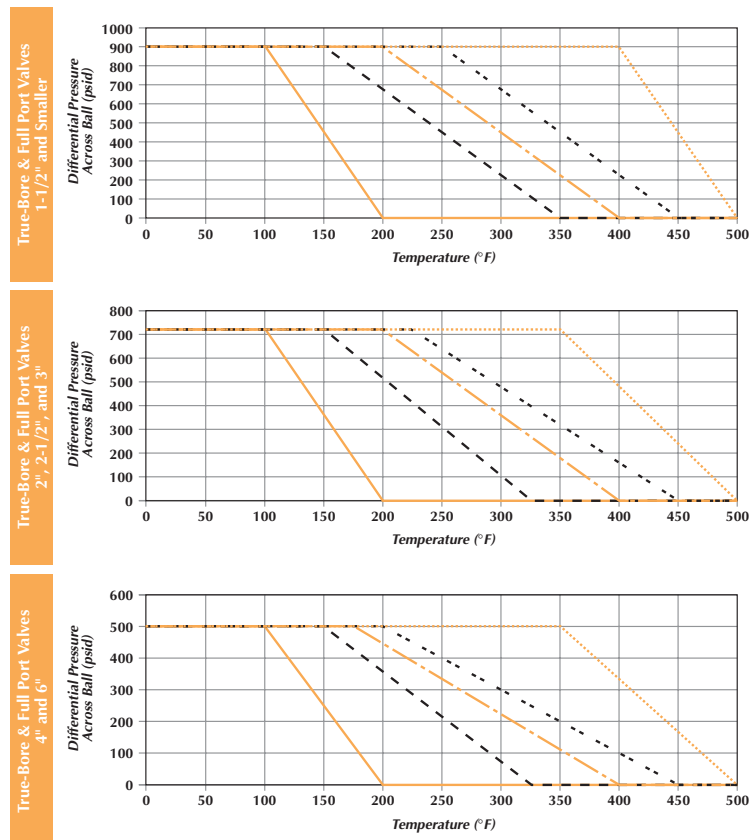
SEAT AND SEAL MATERIALS

Designation	Description	Color	Purpose
RTFE	Glass Reinforced PTFE <i>PBM standard for seats, seals and stem packing, except for Igenix valves.</i>	Slightly Off-White	Used in a wide variety of applications.
VTFE	Virgin PTFE <i>PBM standard for Igenix Sanitary Valves and all cavity fillers.</i>	Bright White	Specified for applications requiring low torque, or where other seat and seal composites might contaminate the process. Ideal for sanitary use. FDA compliant.
S/STFE	Stainless Steel Reinforced PTFE	Dark Gray	Specified for applications requiring slightly higher pressure/temperature ratings or where the process fluid might absorb glass fibers from RTFE. Slightly higher stem torque than RTFE.
PLUS	Carbon, Graphite & Glass-Reinforced PTFE	Charcoal Black	Ideal for higher temperature/pressure applications and/or steam applications. Three times the cyclic lifetime of RTFE.
UHMWPE	Ultra High Molecular Weight Polyethylene	Glossy Off-White	An excellent abrasion and wear-resistant material. Stem torque is similar to RTFE. Wear rate of UHMWPE is approximately 1/10 the wear rate of PTFE parts. Maximum temperature rating is 200°F. FDA compliant.
PEEK	Polyetheretherketone	Putty	Recommended for high temperature (up to 550°F)/long wear applications. Includes special 17-4 PH stainless steel stem to accommodate higher stem torque experienced at higher temperatures. Virgin grades are FDA compliant.
KYNAR®	Polyvinylidene Fluoride	Slightly Transparent White	High strength polymer suitable for temperatures to 275°F. Often used in radiation-related service and has been exposure tested to 1,000 megarads with minimal property degradation. FDA compliant.

NOTES:

1. PTFE is Polytetrafluoroethylene.
2. With the exception of PEEK and Kynar, all seating materials meet the Class VI seat leakage criterion of ANSI/FCI 70-2 and the zero leakage criterion of MSS SP-61. For PEEK and Kynar seats, the liquid criterion of Class V of ANSI/FCI 70-2 applies. (PEEK seats are normally not tested with air.)
3. Seat and seal materials may be mixed in a valve in order to provide media-compatibility and the appropriate torque, temperature and pressure ratings.

SEAT AND SEAL PRESSURE/TEMPERATURE RATINGS



LEGEND



NOTE

- Ratings are for seats and seals only. PBM body rating may be different depending upon valve configuration and body material.

C_v FACTORS FOR DIVERTER PORT VALVES

C_v is defined as the number of U.S. gallons of water per minute, at ambient temperature, that will flow through a valve at 1 psi pressure drop.

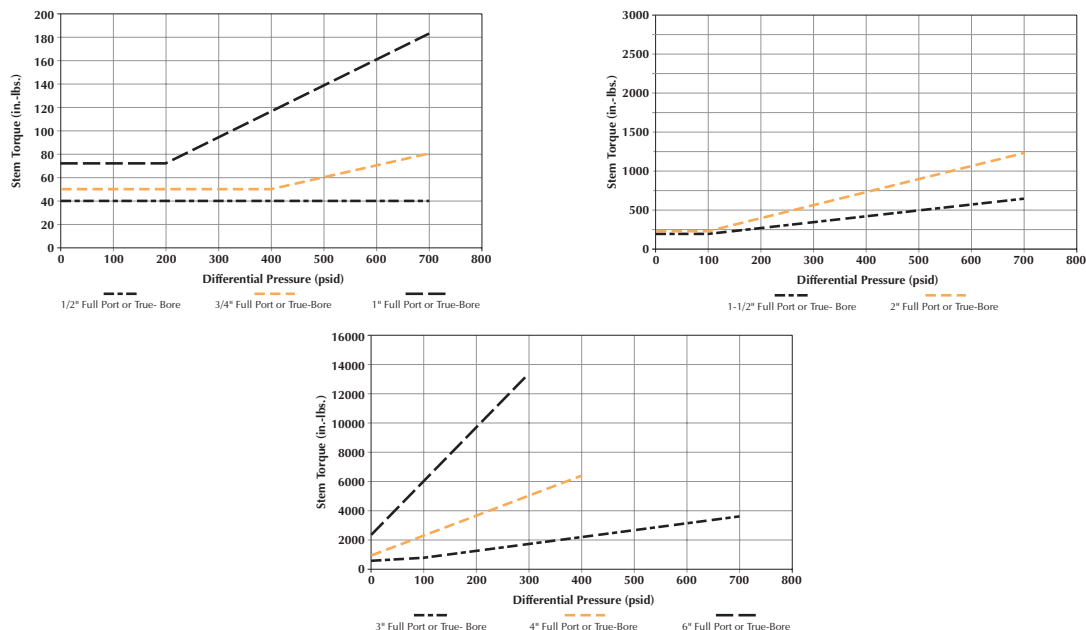
SERIES 5 DI AND DP C _v (IN GPM) VALUES									
Size	Size Code	Valve Type	Port Dia. (in)	Side Entry Angle Port	Side Entry T Port Through	Side Entry T Port Branched	Bottom Entry Double Angle Port	Bottom Entry Double T Port Through	Bottom Entry Double T Port Branched
1/2"	C	DI/DC	0.37	3.2	5.0	3.2	3.2	5.0	3.2
3/4"	D	DI/DC	0.62	9.1	15	9.1	9.1	15	9.1
1"	E	DI/DC	0.87	19	30	19	19	30	19
1-1/2"	G	DI/DC	1.37	49	82	49	49	82	49
2"	H	DI/DC	1.87	97	160	97	97	160	97
3"	K	DI/DC	2.87	240	400	240	240	400	240
4"	L	DI/DC	3.83	430	710	430	430	710	430
6"	M	DI/DC	5.78	980	1600	980	980	1600	980
1/2"	C	DP/DD	0.5	5.8	9.1	5.8	5.8	9.1	5.8
3/4"	D	DP/DD	0.75	13	22	13	13	22	13
1"	E	DP/DD	1	25	40	25	25	40	25
1-1/2"	G	DP/DD	1.5	59	98	59	59	98	59
2"	H	DP/DD	2	110	180	110	110	180	110
3"	K	DP/DD	3	260	440	260	260	440	260
4"	L	DP/DD	4	470	770	470	470	770	470
6"	M	DP/DD	6	1060	1720	1060	1060	1720	1060

VALVE TORQUE VS. DIFFERENTIAL PRESSURE, RTFE SEATS

The figures below are presented as a guide to estimating the forces needed to operate a given sized valve assuming new condition at ambient temperature with a neutral lubricating fluid in the body (such as air or water) and RTFE seats and seals. When using other seat and packing materials, the stem torque should be proportioned according to the as-built torque of that specific material.

If the process involves abrasive or viscous material, the use of elevated temperatures, or if the seat or ball of the valve is worn, then an additional margin should be added.

When actuating a valve not factory-actuated by PBM, sufficient margin must be added appropriate to the actuator size.



TORQUE VALUES

Valve Stem Torques (in.-lb.)											
Size & Series		Valve Series				Valve Stem Breakaway Torque			Actuator Sizing Torque		
Size	Size Code	Valve Series				RTFE, PLUS UHMWPE	SS/TFE	VTFE	RTFE, PLUS UHMWPE	SS/TFE	VTFE
		DC	DD	DI	DP						
1/2"	C	X	X	X	X	40	50	32	80	100	64
3/4"	D	X	X	X	X	50	63	40	100	126	80
1"	E	X	X	X	X	72	90	58	144	180	116
1-1/2"	G	X	X	X	X	192	240	154	384	480	308
2"	H	X	X		X	228	285	182	556	570	364
2"	H			X		192	240	154	384	480	308
2-1/2"	J			X	X	360	450	288	720	900	576
2-1/2"	J	X	X			360	450	288	900	900	720
3"	K			X	X	540	675	430	1080	1350	860
3"	K	X	X			540	675	430	1350	1350	1080
4"	L			X	X	984	1230	787	1968	2460	1574
4"	L	X	X			984	1230	787	2570	2570	2056
6"	M			X	X	2400	3000	1920	4800	6000	3840

PBM TEST INFORMATION

VACUUM TESTING

PBM valves are ideally suited for vacuum service. For valves intended for vacuum service, PBM offers optional helium leakage test of the seats and shell. This test consists of an inboard vacuum test where the exterior of the valve is flooded with helium and, through valve, inward helium leakage is measured. Also, the seats of the valve are helium leakage tested. PBM valves will meet a leakage rate of 1×10^{-6} std. cc/sec. helium leakage for both tests.

CYCLE TESTING

The life of a ball valve is dependent upon service conditions, and therefore, impossible to predict. However, PBM cycle-tests valves using 100 psid of ambient temperature water pressure across the seats with the valve in the closed position. These test conditions represent a typical wear-causing force on the seats and packings. PBM also tests valves in a steam environment up to 380°F.

Replacement of valve gaskets or O-rings is recommended at each disassembly. Replacement of other non-moving parts is dictated by the corrosion caused by the flow media. In most applications, PBM ball valves will operate trouble-free for many years.

MAXIMUM TEMPERATURES AND PRESSURES FOR STEAM VALVES (DC AND DD VALVES)

Valves in steam or fluctuating temperature service are intended for the maximum temperatures and pressures listed below:

Seat Material	Maximum Steam Temperature (°F)	Maximum Steam Pressure (psig)
RTFE, PLUS, S/STFE	365	150
VTFE	316	75
PEEK	450	420

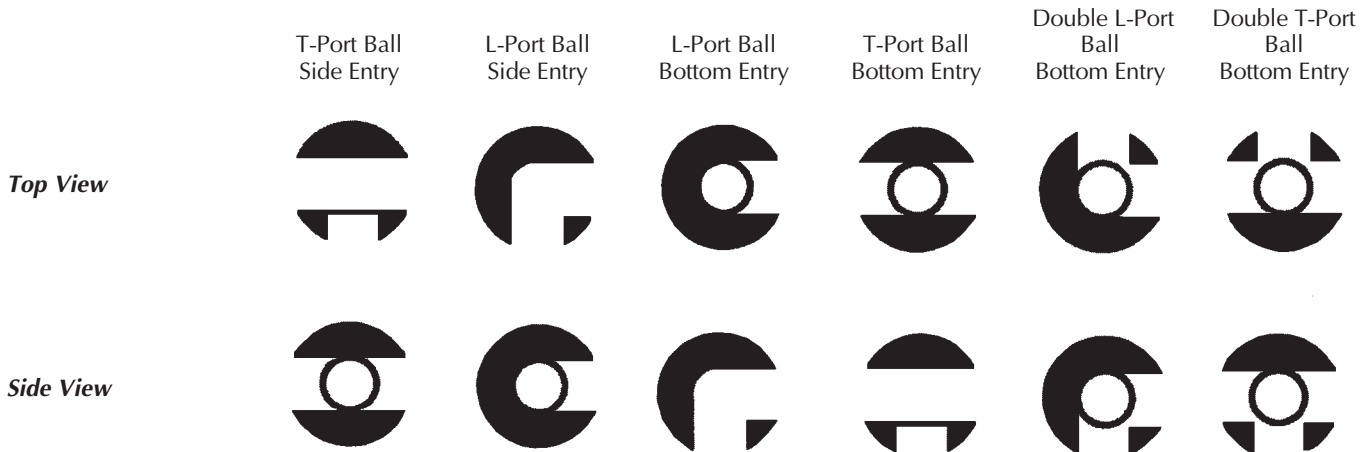
Standard valves must have the seat back and body seal ethylene propylene (EPR) O-ring seals upgraded for service above 316°F. For normal service under 316°F, standard seals are satisfactory.

Steam service valves can withstand thermal cycling from ambient temperatures without suffering deterioration in external seat performance or seat tightness. As such, Steam valves are useful in temperature swing applications and applications involving media other than steam that experience elevated temperatures. PBM's Steam valves are always recommended for applications above 200°F. When using a Steam valve in non-steam service, the suitability of using EPR O-rings should be reviewed for chemical compatibility with the media. PBM can supply alternate O-ring materials, including Viton or Kalrez, if corrosion of the EPR O-rings is a concern.

The pressure/temperature limits of valves in non-steam service depend on the abrasive nature of the media and the fluid velocity. Higher velocities and the presence of abrasives may necessitate upgrading seating materials to harder materials such as Kynar or PEEK.

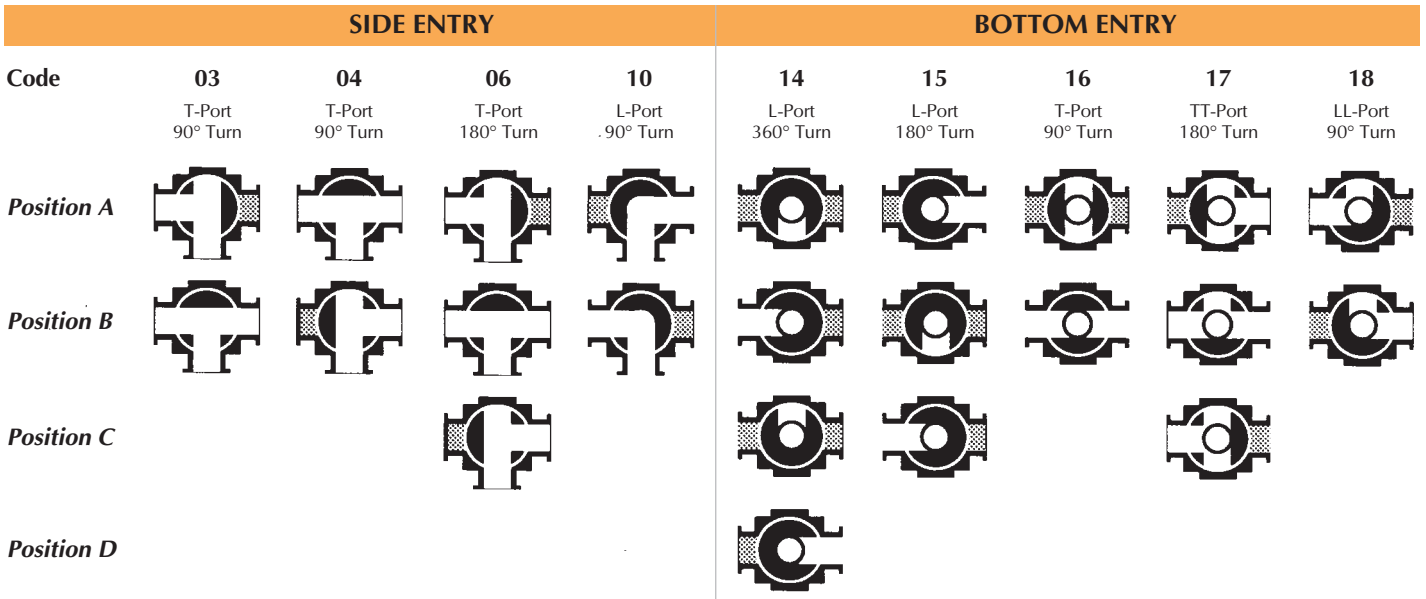
FLOW PATTERNS

By specifying a T-Port, Double T-Port, Angle Port (L) or Double Angle Port (LL) Ball, different flow configurations are possible. For example, a DP valve with a T-Port Ball might be used to control flow to one or two simultaneous operations. The side entry Angle Port Ball and the bottom entry Double Angle Port Ball are ideal for connecting two relief valves to a system. The Double Angle Port Ball diverts flow from one outlet to another outlet 180° away, with only 90° stem rotation. This allows use of 90° double acting or spring return actuation, instead of 180°.



FLOW PATTERN DIAGRAMS

All diagrams show the top view of the DP Series valve as though you were looking down on the stem. White areas indicate the path available for process flow. Shaded areas indicate unused ports for a given flow position.



DP & DD SERIES 5 DIMENSIONAL DATA (INCHES)

Female NPT (Q-), Socket Weld (U-), Butt Weld for Schedule 40 (B-), 150# Flange (L-)

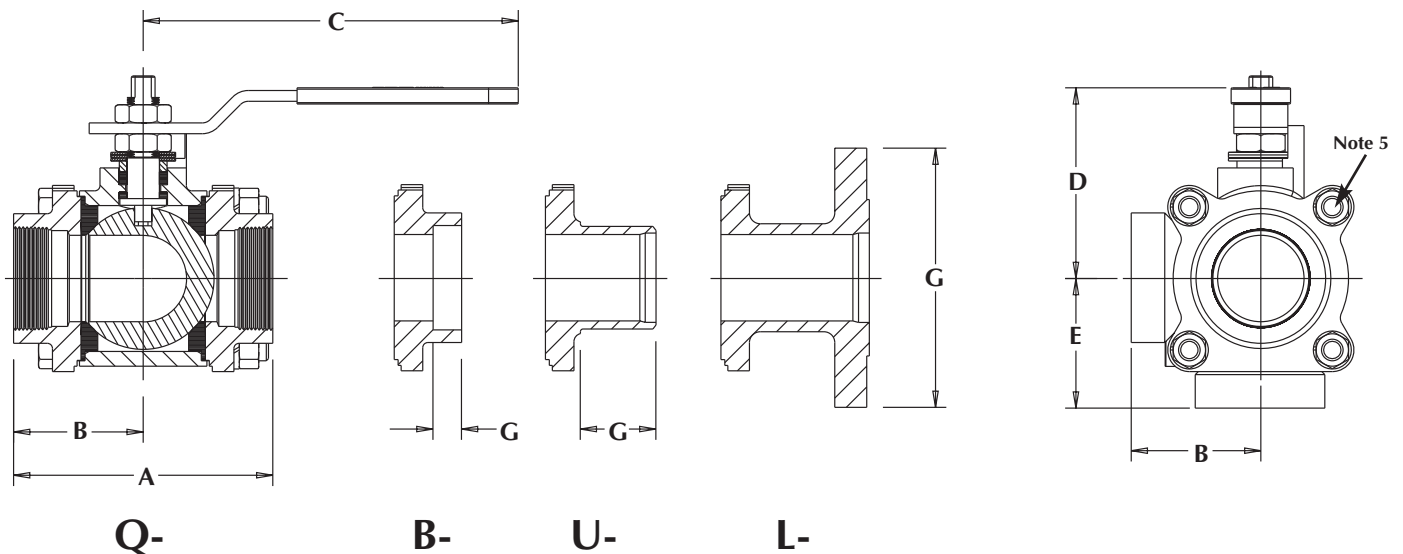
Valve Size	Size Code	Port Dia.	A			B			C	D	E			G			Approximate Weight (lbs.) S/S	
			Face-to-Face			Q to Face			Handle Length from Q	Q to Top of Handle	Q to Bottom Entry ¹			End Fitting			Q-U-B-	L-
			Q-U-	B-	L-	Q-U-	B-	L-			Q-U-	B-	L-	U-Length	B-Length	L-Dia.		
1/2"	C	0.50	3.12	5.50	5.50	1.56	2.75	2.75	4.15	2.63	1.56	2.75	2.75	0.41	1.50	3.50	2	5.2
3/4"	D	0.75	3.44	5.50	5.76	1.72	2.75	2.88	4.15	2.78	1.72	2.75	2.88	0.53	1.50	3.88	2.5	7
1"	E	1.00	4.26	6.00	6.50	2.13	3.00	3.25	5.09	3.03	2.13	3.00	3.25	0.53	1.50	4.25	5	11
1-1/2"	G	1.50	5.50	7.50	8.00	2.75	3.75	4.00	8.68	4.10	2.75	3.75	4.00	0.53	1.50	5.00	11.5	21.5
2"	H	2.00	6.00	8.00	9.76	3.00	4.00	4.88	8.68	4.41	3.00	4.00	4.88	0.66	1.75	6.00	16.5	33
3"	K	3.00	9.00	13.50	12.86	4.50	6.75	6.38	12.44	6.78	4.50	6.75	6.38	0.69	2.31	7.50	50	80
4"	L	4.00	12.00	16.00	15.00	6.00	8.00	7.50	Note 1	Note 1	6.00	8.00	7.50	0.81	2.31	9.00	123	155
6"	M	6.00	18.00	22.00	20.00	9.00	11.00	10.00	Note 1	Note 1	9.00	11.00	10.00	CF	3.75	11.00	CF	CF

END FITTING SIZE AVAILABILITY

Item	316 S/S
Female NPT (Q-).....	1/2" thru 4"
Socket Weld (U-).....	1/2" thru 6"
Butt Weld for Sched. 40 (B-).....	1/2" thru 6"
150# Flange (L-).....	1/2" thru 6"

NOTES:

1. Gear operator is recommended..
2. Other end fittings are also available. See page 16 and 18.
3. Other flanged end fittings are available upon special request.
4. Butt Weld ends are also available in Schedule 10s & Schedule 5s.
5. 1/2" – 3" size valves have 4 bolts. 4" and 6" sizes have 8 bolts.
6. Drawings are for illustration purposes only. Consult PBM prior to any fabrication or installation work.
7. Using a welded connection on the common port of a DP valve may complicate maintenance. Provisions must be made to allow removal of end fittings and body from the line. PBM recommends Female NPT (Q-) or flanged end fittings for common port connection for ease of valve maintenance.



DC & DI SERIES 5 DIMENSIONAL DATA (INCHES)

Tri-Clamp (X-), Extended Butt Weld for Tube (F-)

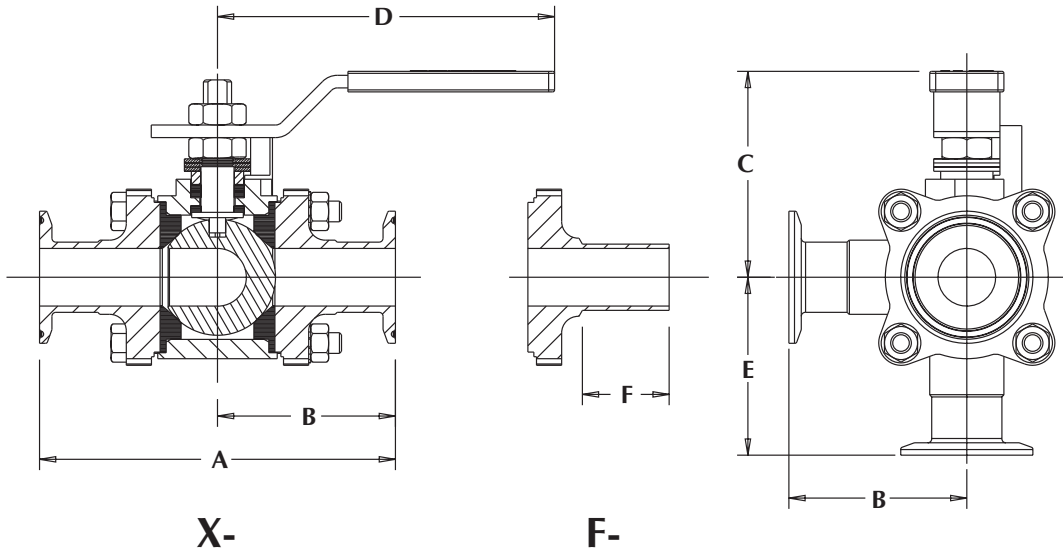
Valve Size	Size Code	Port Diameter	A		B		C	D	E	F	Approx. Weight (lbs.) S/S X- F-
			Face-to-Face		Q to Face		Q to Top of Handle	Handle Length From Q	Q to Bottom Entry	Butt Weld Ext.	
			X-	F-	X-	F-					
1/2"	C	0.37	3.50	5.50	1.75	2.75	2.63	4.15	1.75	1.50	2
3/4"	D	0.62	4.00	5.50	2.00	2.75	2.78	4.15	2.00	1.50	2.3
1"	E	0.87	5.38	6.00	2.69	3.00	3.03	5.09	2.69	1.50	5.4
1-1/2"	G	1.37	5.50	7.50	2.75	3.75	4.10	8.68	2.75	1.50	11
2"	H	1.87	6.24	8.00	3.12	4.00	4.41	8.68	3.12	1.75	16.5
3"	K	2.87	9.00	13.5	4.50	6.75	6.78	12.44	4.50	2.31	47
4"	L	3.83	12.00	16.00	6.00	8.00	Note 1	Note 1	6.00	2.31	120
6"	M	5.78	15.50	22.00	7.75	11.00	Note 1	Note 1	7.75	3.75	CF

END FITTING SIZE AVAILABILITY

Item	316L S/S
Tri-Clamp (X-).....	1/2" thru 6"
Extended Butt Weld for Tube (F-).....	1/2" thru 6"

NOTES:

1. Gear operator is recommended.
2. Extended Butt Weld for Tube (F-) end fittings through 3" size match 16 gauge tubing dimensions, 4" size matches 14 gauge, and 6" size matches 12 gauge.
3. Using a welded connection on the common port of a DI or DC Series valve may complicate maintenance. Provisions must be made to allow removal of end fittings and body from the line. PBM recommends a Tri-Clamp end fitting for common port for ease of valve maintenance.
4. Cherry Burrell and ACME end fittings are also available.
5. 1/2" through 3" valves have 4 bolts, 4" and 6" valves have 8 bolts.
6. Drawings are for illustration purposes only. Consult PBM prior to any fabrication or installation work.
7. BWTE dimensions are in accordance with ASTM A269 and BPE 1997.



SERIES 5 INDUSTRIAL & SANITARY DIVERTER PORT BALL VALVES

PRODUCT Position 1 + 2	MATERIAL 3 + 4	SIZE 5	SERIES 6	END FITTING 7 + 8	SEAT/SEAL 9
DP Diverter Port Full Port DI Igenix Sanitary Diverter Port True-Bore®	H- 316 S/S HL- 316L S/S	C 1/2" D 3/4" E 1" G 1-1/2" H 2" K 3" L 4" M 6"	5	B- Butt Weld Sch. 40 E- Butt Weld (Tube) F- Extended Butt Weld for Tube G- Cherry Burrel I-Line (female) H- Cherry Burrel I-Line (male) L- 150# Flange M- 300# Flange Q- Female NPT R- Sil Braze S- Sil Braze w/ 1 groove T- Solder Joint U- Socket Weld X- Tri-Clamp (Tube) W- Tri-Clamp (Pipe) -Z No End Fittings	A* RTFE B RTFE w/ VTFE Filler C** VTFE D VTFE w/ VTFE Filler E PLUS F PLUS w/ VTFE Filler G PLUS w/ PLUS Filler H S/STFE I S/STFE w/ VTFE Filler J S/S w/ S/STFE Filler K UHMWPE L UHMWPE w/ VTFE Filler M UHMWPE w/ UHMWPE Filler N PEEK O PEEK w/ VTFE Filler P PEEK w/ PEEK Filler Q Carbon Graphite R Kynar S Kynar w/Kynar Filler
				If using the code -Z to purchase a center body (or a combination of one end fitting and -Z), you must indicate the end fittings already in-line in order to receive the appropriate hardware. If body fitting is different than the end fittings, consult factory for appropriate part number. Other end fittings available.	*DP standard. **DI standard.

EXAMPLE:

STANDARD							OPTIONS		
Position 1 + 2 Product	3 + 4 Material	5 Size	6 Series	7 + 8 End Fitting	9 Seat/Seal	10 + 11 Flow Pattern	12 Ball/Stem	13 + 14 Operator	15 Polish
DP	H-	H	5	Q-	A	03	F	34	--

DPH-H5Q-A03F34 is the code for a Diverter Port, 316 S/S, 2" valve, series 5, with female NPT ends, RTFE seats and seals, flow pattern #03, with ground device and spring return actuator 80 psi.

WORK SPACE: FOR YOU TO FILL IN THE BLANKS

STANDARD							OPTIONS		
Position 1 + 2 Product	3 + 4 Material	5 Size	6 Series	7 + 8 End Fitting	9 Seat/Seal	10 + 11 Flow Pattern	12 Ball/Stem	13 + 14 Operator	15 Polish
			5						

FLOW PATTERN 10 + 11/Ball & Port Configuration	BALL/STEM 12	OPERATOR 13 + 14	POLISH 15
03 3-Way, T-Port Ball, Side Entry, 90° turn 04 3-Way, T-Port Ball, Side Entry, 90° turn 06 3-Way, T-Port Ball, Side Entry, 180° turn 10 3-Way, L-Port Ball, Side Entry, 90° turn 14 3-Way, L-Port Ball, Bottom Entry, 360° turn 15 3-Way, L-Port Ball, Bottom Entry, 180° turn 16 3-Way, T-Port Ball, Bottom Entry, 90° turn 17 3-Way, Double T-Port Ball, Bottom Entry, 180° turn 18 3-Way, Double L-Port Ball, Bottom Entry, 90° turn	- No option A 300 S/S w/ 2" Extension B 300 S/S w/ 4" Extension C 300 S/S w/ 6" Extension F with ground device G 17-4 PH S/S stem I with Monel ball J with 932 Bronze ball with Monel stem & followers K with Monel ball, stem and followers L with Aluminum ball with 922 Bronze ball N with Hastelloy C-276 ball O with Hastelloy C-276 ball, stem and followers P with 922 bronze ball, Monel stem and followers Q with Monel stem, followers, and bolting R with Monel ball, stem, followers and bolting S	-- Manual lever handle 01 Without Handle 02 Without Handle, prepared for actuator mounting 03 With Handle, prepared for actuator mounting 04 Locking Device 05 Stainless Oval Handwheel 06 Manual Safety Nut 07 45 Degree Handle 08 Manual Gear Operator 09 T-Handle (24" long) 10 Manual Spring Return Unit 11 Fusible Link Spring Return Unit 12 Coupled Vane Actuator for 80 psi 13 NEMA 4 Electric Actuator (120 vac) 14 NEMA 7 Electric Actuator (120 vac) 15 Square Operating Nut 16 Locking Handle and actuator mount body 17 Extended Locking Oval Handwheel 18 Extended Locking Lever Handle 20 D/A Actuator 80 psi 21 D/A Actuator 80 psi w/ NEMA 4 limit switch 22 D/A Actuator 80 psi w/ NEMA 4 solenoid 23 D/A Actuator 80 psi w/ NEMA 4 limit switch/solenoid 24 D/A Actuator 80 psi w/ NEMA 7 limit switch 25 D/A Actuator 80 psi w/ NEMA 7 solenoid 26 D/A Actuator 80 psi w/ NEMA 7 limit switch/solenoid 27 D/A Actuator 60 psi 28 D/A Actuator 60 psi w/ NEMA 4 limit switch 29 D/A Actuator 60 psi w/ NEMA 4 solenoid 30 D/A Actuator 60 psi w/ NEMA 4 limit switch/solenoid 31 D/A Actuator 60 psi w/ NEMA 7 limit switch 32 D/A Actuator 60 psi w/ NEMA 7 solenoid 33 D/A Actuator 60 psi w/ NEMA 7 limit switch/solenoid 34 S/R Actuator 80 psi 35 S/R Actuator 80 psi w/ NEMA 4 limit switch 36 S/R Actuator 80 psi w/ NEMA 4 solenoid 37 S/R Actuator 80 psi w/ NEMA 4 limit switch/solenoid 38 S/R Actuator 80 psi w/ NEMA 7 limit switch 39 S/R Actuator 80 psi w/ NEMA 7 solenoid 40 S/R Actuator 80 psi w/ NEMA 7 limit switch/solenoid 41 S/R Actuator 60 psi 42 S/R Actuator 60 psi w/ NEMA 4 limit switch 43 S/R Actuator 60 psi w/ NEMA 4 solenoid 44 S/R Actuator 60 psi w/ NEMA 4 limit switch/solenoid 45 S/R Actuator 60 psi w/ NEMA 7 limit switch 46 S/R Actuator 60 psi w/ NEMA 7 solenoid 47 S/R Actuator 60 psi w/ NEMA 7 limit switch/solenoid	- No Polish A 20 R _a Max. I.D. B 32 R _a Max. O.D. C 20 R _a Max. I.D. & 32 R _a Max. O.D. D 15 R _a Max. I.D. E 10 R _a Max. I.D. F 20 R _a Max. I.D. after Electropolish G 15 R _a Max. I.D. after Electropolish H 10 R _a Max. I.D. after Electropolish I 5 R _a Max. I.D. K 5 R _a Max. I.D. & 32 R _a Max. O.D. L 20 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish M Electropolish only (I.D. & O.D.) N 10 R _a Max. I.D. & 32 R _a Max. O.D. O 15 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish Q 15 R _a Max. I.D. & 32 R _a Max. O.D. S 10 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
See page 13 for flow patterns and configurations.		Other actuator options available.	

SERIES 5 INDUSTRIAL & SANITARY STEAM DIVERTER PORT BALL VALVES

PRODUCT Position 1 + 2	MATERIAL 3 + 4	SIZE 5	SERIES 6	END FITTING 7 + 8	SEAT/SEAL 9
DD Diverter Port Full Port DC Igenix Sanitary Diverter Port True-Bore® Steam	E- C/S H- 316 S/S HL- 316L S/S	C 1/2" D 3/4" E 1" G 1-1/2" H 2" K 3" L 4" M 6"	5	B- Butt Weld Sch. 40 E- Butt Weld (Tube) F- Extended Butt Weld for Tube G- Cherry Burrel I-Line (female) H- Cherry Burrel I-Line (male) L- 150# Flange M- 300# Flange Q- Female NPT R- Sil Braze S- Sil Braze w/ 1 groove T- Solder Joint U- Socket Weld X- Tri-Clamp (Tube) W- Tri-Clamp (Pipe) -Z No End Fittings If using the code -Z to purchase a center body (or a combination of one end fitting and -Z), you must indicate the end fittings already in-line in order to receive the appropriate hardware. If body fitting is different than the end fittings, consult factory for appropriate part number. Other end fittings available.	T* VTFE w/ EPR O-rings U VTFE w/ VTFE Filler w/ EPR O-rings V** RTFE w/ EPR O-rings W RTFE w/ VTFE Filler w/ EPR O-rings X PLUS w/ EPR O-rings Y PLUS w/ VTFE Filler w/ EPR O-rings Z PLUS w/ PLUS Filler w/ EPR O-rings 0 S/STFE w/ EPR O-rings 1 S/STFE w/ VTFE Filler w/ EPR O-rings 2 S/S w/ S/STFE Filler w/ EPR O-rings 3 UHMWPE w/ EPR O-rings 4 UHMWPE w/ VTFE Filler w/ EPR O-rings 5 UHMPE w/ UHMWPE Filler w/ EPR O-rings 6 PEEK w/ EPR O-rings 7 PEEK w/ VTFE Filler w/ EPR O-rings 8 PEEK w/ PEEK Filler w/ EPR O-rings A RTFE w/ Viton O-rings B RTFE w/ VTFE Filler w/ Viton O-rings C VTFE w/ Viton O-rings D VTFE w/ VTFE Filler w/ Viton O-rings E PLUS w/ Viton O-rings F PLUS w/ VTFE Filler w/ Viton O-rings G PLUS w/ PLUS Filler w/ Viton O-rings H S/STFE w/ Viton O-rings I S/STFE w/ VTFE Filler w/ Viton O-rings J S/S w/ S/SFE Filler w/ Viton O-rings K UHMWPE w/ Viton O-rings L UHMWPE w/ VTFE Filler w/ Viton O-rings M UHMWPE w/ UHMWPE Filler w/ Viton O-rings N PEEK w/ Kalrez O-rings O PEEK w/ VTFE Filler w/ Kalrez O-rings P PEEK w/ PEEK Filler w/ Kalrez O-rings Q Carbon Graphite w/ Viton O-rings R Kynar w/ Viton O-rings S Kynar w/ Kynar Filler w/ Viton O-rings * DC standard. **DD Standard. These Seat/Seal choices are exclusive to the Steam series.

EXAMPLE:

STANDARD							OPTIONS		
Position 1 + 2 Product	3 + 4 Material	5 Size	6 Series	7 + 8 End Fitting	9 Seat/Seal	10 + 11 Flow Pattern	12 Ball/Stem	13 + 14 Operator	15 Polish
DD	H-	H	5	Q-	A	03	F	34	--

DDH-H5Q-A03F34 is the code for a Diverter Port, 316 S/S, 2" valve, series 5, with female NPT ends, RTFE seats and seals, flow pattern #03, with ground device and spring return actuator 80 psi.

WORK SPACE: FOR YOU TO FILL IN THE BLANKS

STANDARD							OPTIONS		
Position 1 + 2 Product	3 + 4 Material	5 Size	6 Series	7 + 8 End Fitting	9 Seat/Seal	10 + 11 Flow Pattern	12 Ball/Stem	13 + 14 Operator	15 Polish
			5						

FLOW PATTERN 10 + 11/Ball & Port Configuration	BALL/STEM 12	OPERATOR 13 + 14	POLISH 15
03 3-Way, T-Port Ball, Side Entry, 90° turn 04 3-Way, T-Port Ball, Side Entry, 90° turn 06 3-Way, T-Port Ball, Side Entry, 180° turn 10 3-Way, L-Port Ball, Side Entry, 90° turn 14 3-Way, L-Port Ball, Bottom Entry, 360° turn 15 3-Way, L-Port Ball, Bottom Entry, 180° turn 16 3-Way, T-Port Ball, Bottom Entry, 90° turn 17 3-Way, Double T-Port Ball, Bottom Entry, 180° turn 18 3-Way, Double L-Port Ball, Bottom Entry, 90° turn	- No option A 300 S/S w/ 2" Extension B 300 S/S w/ 4" Extension C 300 S/S w/ 6" Extension F with ground device G 17-4 PH S/S stem I with Monel ball J with 932 Bronze ball with Monel stem & followers K with Monel ball, stem and followers L with Aluminum ball with 922 Bronze ball N with Hastelloy C-276 ball O with Hastelloy C-276 ball, stem and followers P with 922 bronze ball, Monel stem and followers Q with Monel stem, followers, and bolting R with Monel ball, stem, followers and bolting	-- Manual lever handle 01 Without Handle 02 Without Handle, prepared for actuator mounting 03 With Handle, prepared for actuator mounting 04 Locking Device 05 Stainless Oval Handwheel 06 Manual Safety Nut 07 45 Degree Handle 08 Manual Gear Operator 09 T-Handle (24" long) 10 Manual Spring Return Unit 11 Fusible Link Spring Return Unit 12 Coupled Vane Actuator for 80 psi 13 NEMA 4 Electric Actuator (120 vac) 14 NEMA 7 Electric Actuator (120 vac) 15 Square Operating Nut 16 Locking Handle and actuator mount body 17 Extended Locking Oval Handwheel 18 Extended Locking Lever Handle 20 D/A Actuator 80 psi 21 D/A Actuator 80 psi w/ NEMA 4 limit switch 22 D/A Actuator 80 psi w/ NEMA 4 solenoid 23 D/A Actuator 80 psi w/ NEMA 4 limit switch/solenoid 24 D/A Actuator 80 psi w/ NEMA 7 limit switch 25 D/A Actuator 80 psi w/ NEMA 7 solenoid 26 D/A Actuator 80 psi w/ NEMA 7 limit switch/solenoid 27 D/A Actuator 60 psi 28 D/A Actuator 60 psi w/ NEMA 4 limit switch 29 D/A Actuator 60 psi w/ NEMA 4 solenoid 30 D/A Actuator 60 psi w/ NEMA 4 limit switch/solenoid 31 D/A Actuator 60 psi w/ NEMA 7 limit switch 32 D/A Actuator 60 psi w/ NEMA 7 solenoid 33 D/A Actuator 60 psi w/ NEMA 7 limit switch/solenoid 34 S/R Actuator 80 psi 35 S/R Actuator 80 psi w/ NEMA 4 limit switch 36 S/R Actuator 80 psi w/ NEMA 4 solenoid 37 S/R Actuator 80 psi w/ NEMA 4 limit switch/solenoid 38 S/R Actuator 80 psi w/ NEMA 7 limit switch 39 S/R Actuator 80 psi w/ NEMA 7 solenoid 40 S/R Actuator 80 psi w/ NEMA 7 limit switch/solenoid 41 S/R Actuator 60 psi 42 S/R Actuator 60 psi w/ NEMA 4 limit switch 43 S/R Actuator 60 psi w/ NEMA 4 solenoid 44 S/R Actuator 60 psi w/ NEMA 4 limit switch/solenoid 45 S/R Actuator 60 psi w/ NEMA 7 limit switch 46 S/R Actuator 60 psi w/ NEMA 7 solenoid 47 S/R Actuator 60 psi w/ NEMA 7 limit switch/solenoid	- No Polish A 20 R _a Max. I.D. B 32 R _a Max. O.D. C 20 R _a Max. I.D. & 32 R _a Max. O.D. D 15 R _a Max. I.D. E 10 R _a Max. I.D. F 20 R _a Max. I.D. after Electropolish G 15 R _a Max. I.D. after Electropolish H 10 R _a Max. I.D. after Electropolish I 5 R _a Max. I.D. K 5 R _a Max. I.D. & 32 R _a Max. O.D. L 20 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish M Electropolish only (I.D. & O.D.) N 10 R _a Max. I.D. & 32 R _a Max. O.D. O 15 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish Q 15 R _a Max. I.D. & 32 R _a Max. O.D. S 10 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
See page 13 for flow patterns and configurations.			Other actuator options available.

COMPONENTS

Item	Description
A	Body
B	Ball
C	End Fitting
D	Handle
F	Stem
G	Follower
H	Seat
H2	Metal Encapsulated Ring
I	Stem Packing
J1	Large Spring Washer
J2	Small Spring Washer
L1	Large O-ring
L2	Small O-ring
M	End Fitting Fastener
N	Jam Nut
O	Gasket
Q	Handle Cover
S	Hex Nut
T	Cavity Filler
W	Position Indicator
Y1	Internal Ground Spring
Y2	Coil Ground Spring
Y3	External Ground Wire
Z	Tag

NOTES:

1. Manual valves have three or four spring washers.
2. Valves prepared for actuator mounting have six spring washers.

IMPORTANT NOTICE:

Due to PBM's commitment to advancing the quality and reliability of its product, specifications and designs are subject to change. PBM reserves the right to modify product design without prior notice, and without incurring any liability to furnish or install such modifications on products previously or subsequently sold.

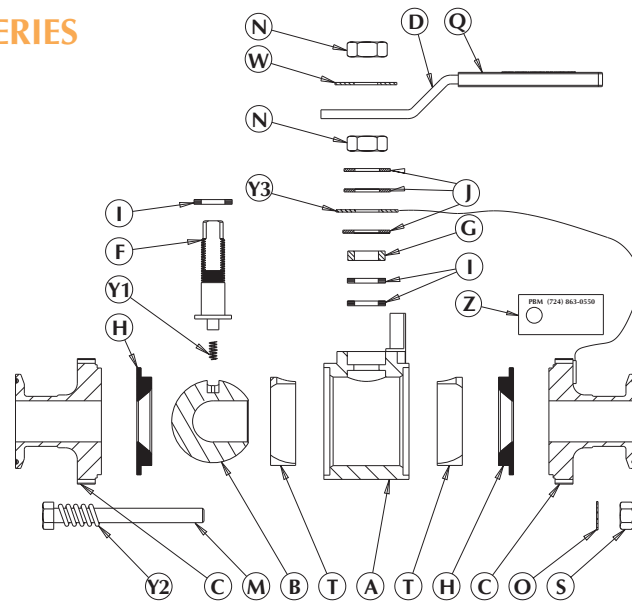
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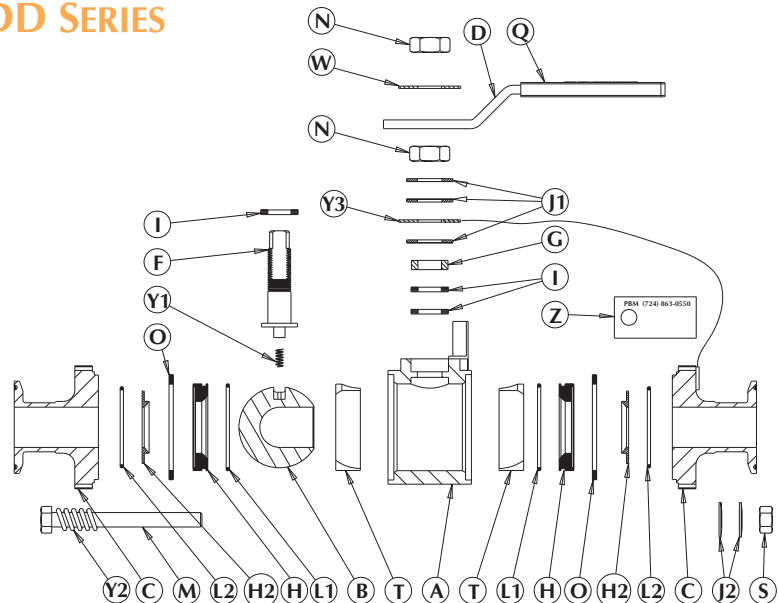
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DP/DI SERIES



▲ SK98002D

DC/DD SERIES



▲ SK98004D

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