

TWO-WAY BALL VALVES

S Series and CS Series

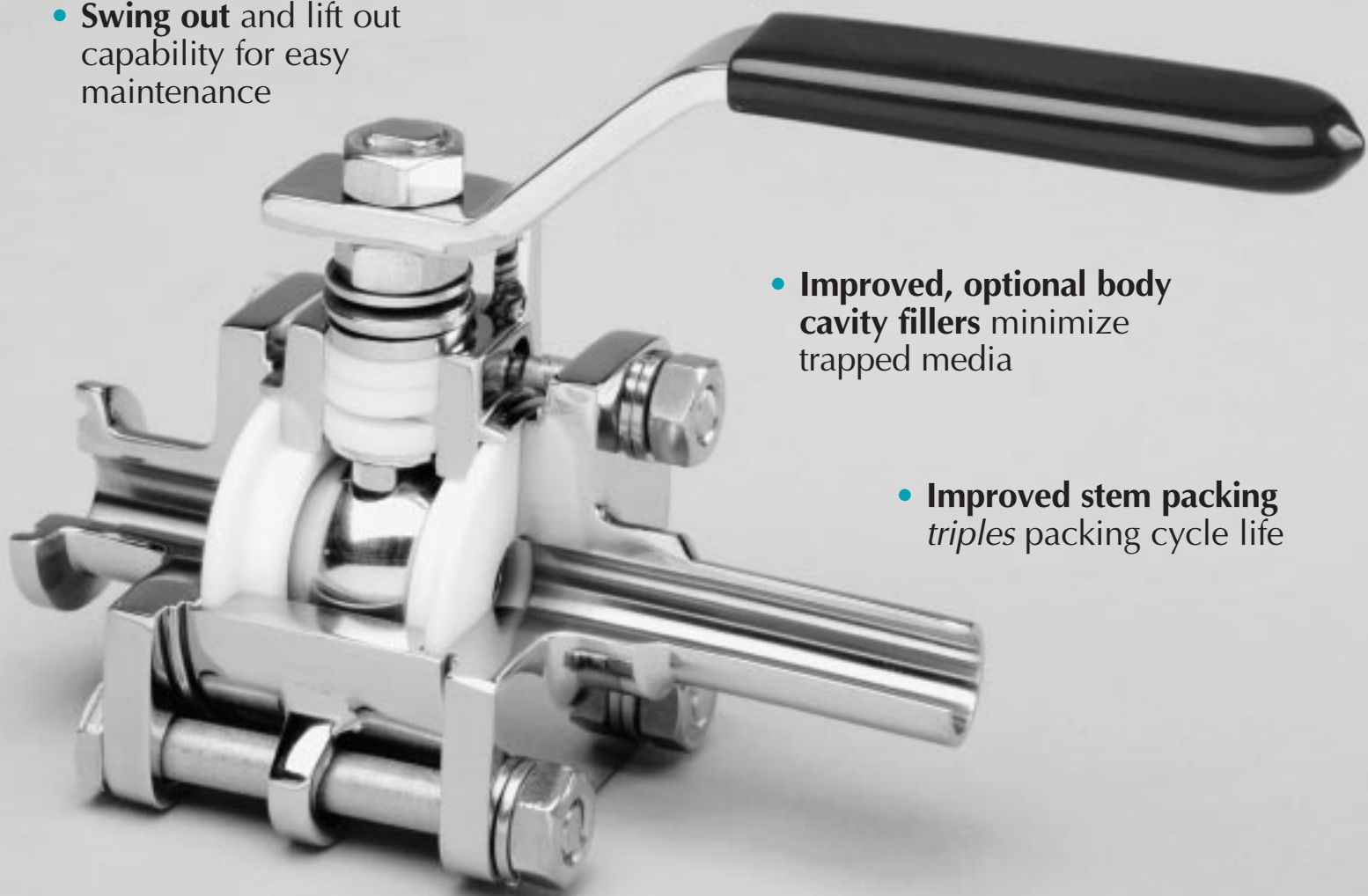


For Industrial and Sanitary Applications



THE VALVE YOU'VE ALWAYS WANTED

- **Swing out** and lift out capability for easy maintenance



- **Improved, optional body cavity fillers** minimize trapped media

- **Improved stem packing** triples packing cycle life

- **Easy interchangeability** between non-encapsulated seats and encapsulated seats for easy valve conversion



SERIES 5 TWO-WAY BALL VALVES

Series 5 Two-Way valves include Industrial and Sanitary valves, each with these important features:

- **Adjust-O-Seal®** design allows 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, bidirectional 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), **Full Port** or **Reduced Port**.
- Stem assembly accommodates PBM **Direct Mount Actuation** for accurate alignment and increased cycling life. Engagement between the stem and ball is well-suited for high torque applications.
- Extended Butt-Weld for Tube and Extended Butt-Weld for Pipe end fittings may be **welded in-line without disassembly**.
- **Strong handle and stem**. Handle position indicates whether valve is open or closed. Vinyl end covers are designed for a sure grip.
- **Precision machined and polished ball** reduces torque and extends seat life.
- **Optional mechanical or electropolished I.D. and O.D. surfaces** minimize crevices and enhance sterility.
- **Symmetrical bolt pattern** allows easy rotation for positioning valve in tight spaces.
- Quickly and easily convert valves with common ports from Industrial to Sanitary (and vice versa) using **interchangeable seats**.

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TWO-WAY BALL VALVES

INDUSTRIAL VALVES

PBM's Two-Way Industrial valves are designed for general purpose, non-sanitary process applications.

SANITARY VALVES

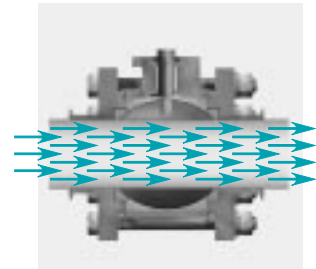
Two-Way Sanitary valves are designed for pure process applications, where cracks and crevices within the valve need to be minimized.

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.

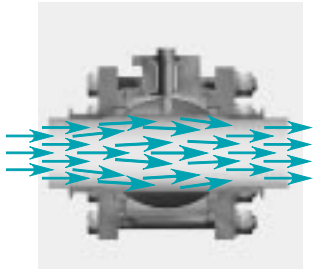
True-Bore means that the I.D. of the ball, seats and end fittings is identical to the I.D. of the tubing. For example, a 2" valve has a 1.87" diameter ball port, a 4" valve has a 3.83" diameter ball port. Therefore, there are no pockets or dead space in the through path, and a high pressure drop will not occur. True-Bore is standard on PBM's CS, SA, SI, and SJ 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 narrows slightly at the end fitting to match the O.D. of the surrounding piping.

Full Port is standard on PBM's SD, SP, SG, and SK ball valves.

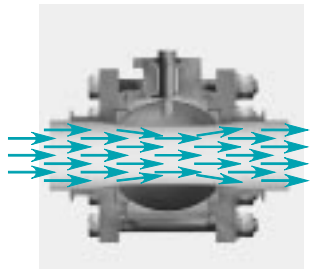


REDUCED PORT

In a ball valve with a Reduced Port, the bore through the ball is one size smaller than the end fitting of the valve. For example, a 1" valve has a 0.75" port through the ball and connects to 1" piping. Due to the smaller I.D. of the ball, a larger pressure drop will occur as the flow stream passes in and out of the smaller ball port.

Selecting a Reduced Port ball valve is an economical alternative in applications where a full port valve is not needed.

Reduced Port is standard on PBM's SE, SS, SH, and SL ball valves.



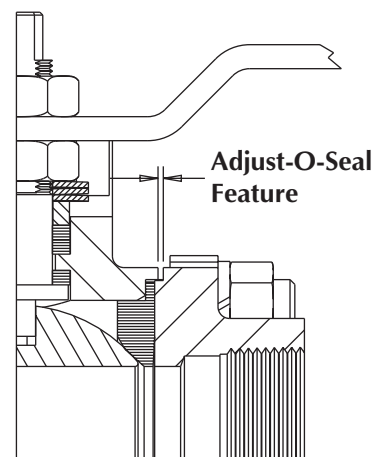
FEATURES

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.

The valve seats are always compressed against the ball which keeps process media out of the body chamber surrounding the ball. This seal also creates a double chamber or "Dual Chamber™". One chamber is inboard of the seats, and the other chamber is outboard of the seats. The Dual Chamber allows process flow through the ball while CIP/SIP media flows around the ball. Media may only enter the ball port or the body cavity as the valve is cycled.

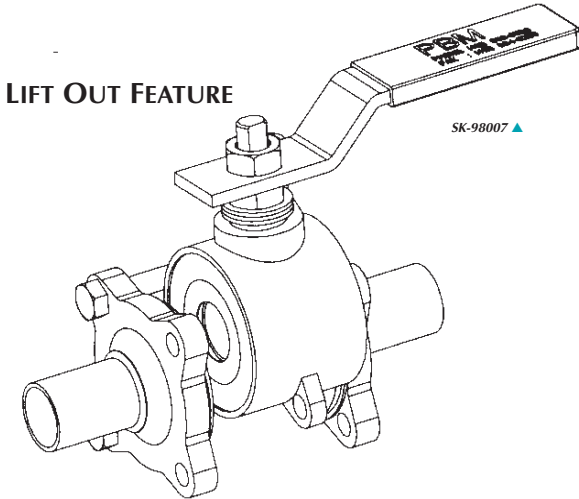


FEATURES

SWING OUT/LIFT OUT

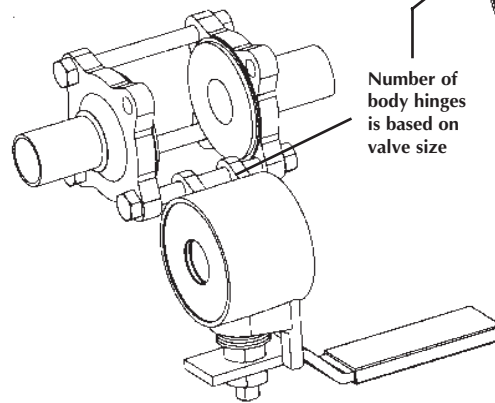
This feature is valuable for welded piping systems or wherever in-line valve maintenance is required. With minimal spreading of the piping, remove one body bolt from the valve body and swing the body away from the installed position for easy maintenance. Swing the body back to reinstall the body bolt and return the valve to a leak-tight seal. Extended Butt Weld for Tube 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 remove 2 body bolts and lift the body out.



LIFT OUT FEATURE

SK-98007 ▲



Sizes 1-1/2" and above

SK-98009 ▲

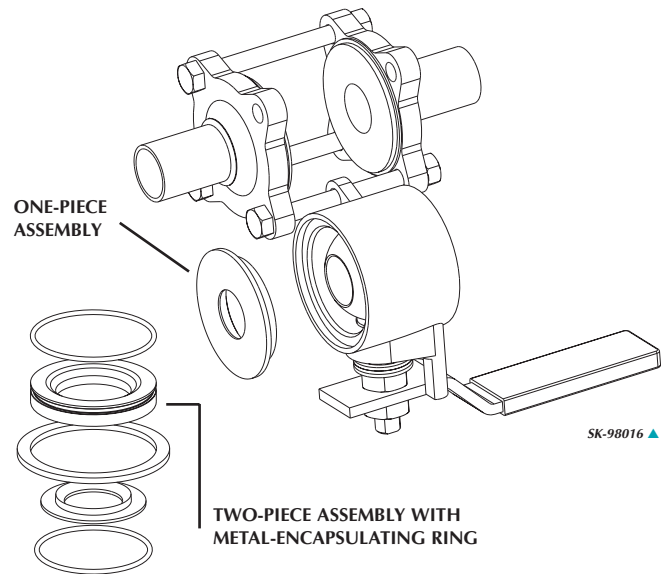
INTERCHANGEABLE SEATS

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.

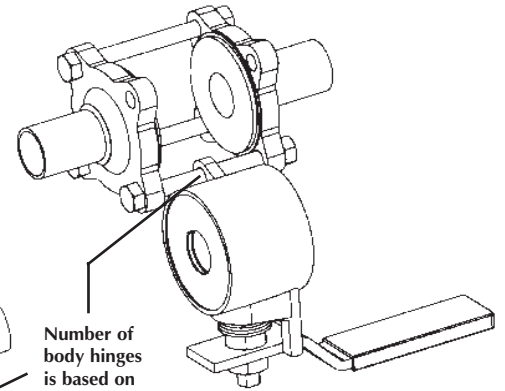
A two-piece seat and gasket assembly includes a separate seat and gasket, O-ring seals behind and around the seat, and a metal encapsulating ring that supports the inner bore of the seat. These valves are suited for applications in which a valve must seal cold after operating hot.

For more on these assemblies, see the Valve Selection Table on page 10.



SK-98016 ▲

SWING OUT FEATURE



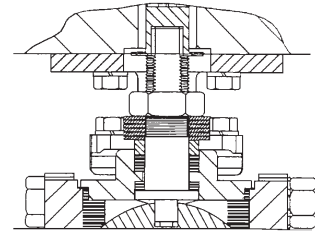
Number of body hinges is based on valve size

Sizes to 1"

OPTIONS

ACTUATION

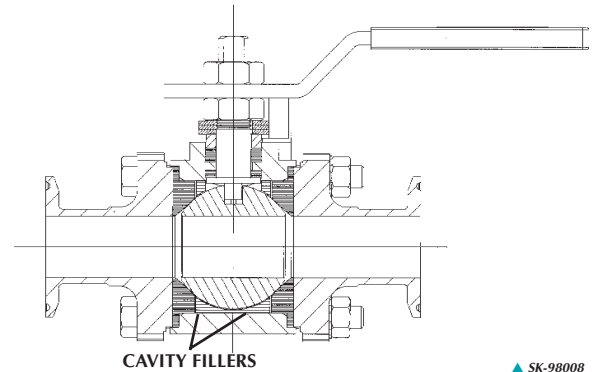
PBM offers a selection of pneumatic and electric actuation packages. PBM valves are designed to accept Direct Mount Actuation that uses the valve stem as an integral part of the actuator drive. This design provides improved cycling life and performance, while reducing the total package profile. Direct Mount Actuation also eliminates the need for an additional mounting adapter 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 adapter and 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 problems with trapped fluid in the valve body that could contaminate the process or prevent smooth operation of the valve.



CAVITY FILLERS

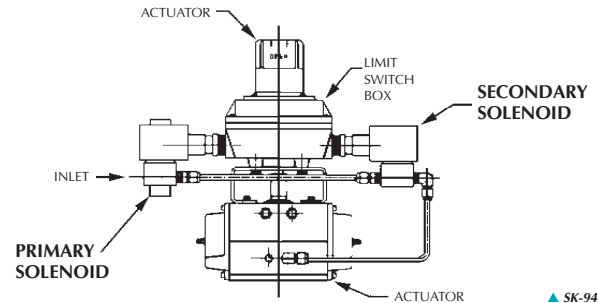
▲ SK-98008

DRIBBLE CONTROL

Obtain accurate fill while reducing water hammer and associated wear on equipment and instruments with PBM's fully-integrated, three-position Tank Topper. The Tank Topper is used to reduce flow at the end of a cycle, or when otherwise required.

POLISHING

Polishing benefits processing by minimizing rough surfaces where media could become trapped. Electropolishing increases material passivity, improves contamination control, and greatly enhances cleanability of the polished surface.



▲ SK-94092D

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	27-32	.68-.80	30-35	.76-.89
180g	18-23	.46-.58	20-25	.51-.64
240g	14-18	.34-.46	15-20	.38-.51
320g	8-10	.21-.25	9-11	.23-.28
400g	5-7	.13-.16	6-8	.14-.18

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.

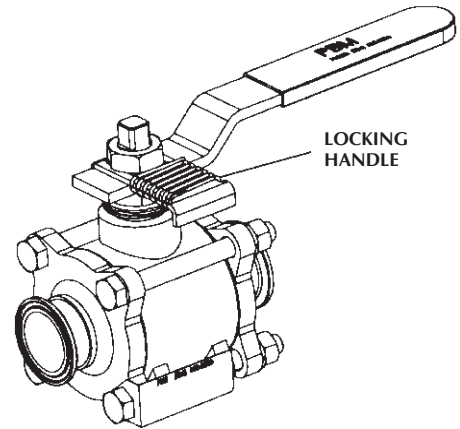
R_a: Known as the Arithmetic Mean, this measurement represents the average value of all peaks and valleys. Lower numbers indicate a smoother finish.

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

OPTIONS

LOCKING HANDLE

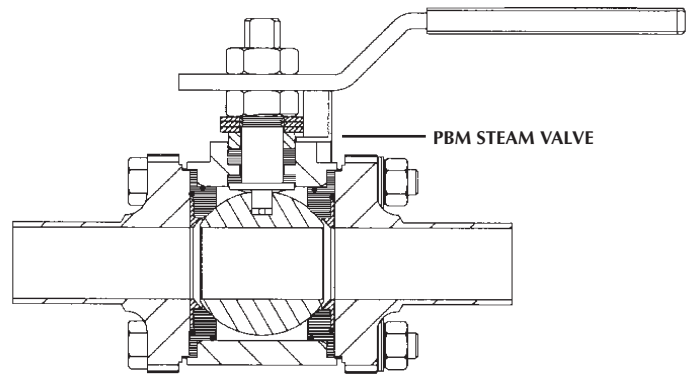
PBM's locking handle is designed for applications in which accidental turning of a valve handle could result in bodily injury or compromise product integrity. The handle's spring-loaded mechanism will lock the valve open or closed and can be secured using a customer-supplied locking device.



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

For a complete list of Steam valves, see page 10.

CIP/SIP VALVES

Valves designed to provide Clean-In-Place/Steam-In-Place capability can be used in applications where product can become trapped in the cavity between the outside of the ball and the I.D. of the body, or where it may be necessary to sanitize the valve with steam or cleaning agent or to block bacteria from contaminating upstream or downstream piping. PBM's Adjust-O-Seal feature maintains compression of the seats against the ball and provides simultaneous upstream and downstream sealing creating a “Dual Chamber”. This keeps the process media out of the body cavity. Media may only enter the ball port or the body cavity as the valve is cycled.

- For service above 200°F, it is recommended that CIP/SIP valves use a separate seat and gasket. For service under 200°F, either a one-piece seat and gasket or a separate seat and gasket may be used (see page 10).

PBM's CIP/SIP valves have a combination of inlet and outlet body purge ports and milled flats on the ball or ball purge holes to suit specific application needs.

For a complete list of CIP/SIP valves, see page 10.

MILLED FLATS AND PURGE HOLES

Purge ports are fluid inlets and outlets in the valve body that are used for cleaning or sterilizing the cavity between the spherical surface of the ball and the cylindrical surface of the body. Milled flats are flat spots machined on the ball to allow flow between the inner diameter of the seat and the ball. Purge holes are holes drilled in the ball around the seat band area that allow flow to pass around the seat. Both ball modifications allow the valve cavity to drain to the downstream piping.

The milled ball flats or purge holes are located on the valve's closed ball surface near where the stem engages the ball, and also 180 degrees away from this location. In horizontal or nearly horizontal pipe runs, it is important to have the stem of the valve positioned vertically (either upward or downward) so that the milled ball flats or ball purge holes can drain the valve cavity and not allow solvent or condensate to collect when purging is complete.

The use of milled ball flats is recommended for applications where the flats will be used to drain the valve cavity without the use of a purge port (as shown in Example 3). Milled ball flats have a tendency to allow seat leakage into the valve cavity in the open ball position due to uneven seat

deformation on the seat where the milled ball flats are located. It is not recommended that flats be used in conjunction with a purge port unless the purge piping is isolated by another valve or such leakage is tolerable.

Ball purge holes are located in the same position on the ball as the milled ball flats. The advantage to using ball purge holes is that they do not allow seat leakage when the ball is in the open position. In applications where such leakage cannot be tolerated, ball purge holes should be used instead of milled flats.

Milled ball flats allow for better drainage of the valve cavity than ball purge holes, making them a preferred option where drainage is of primary importance. However, where open position seat leakage cannot be tolerated, ball purge holes are recommended as they drain nearly as well as milled ball flats.

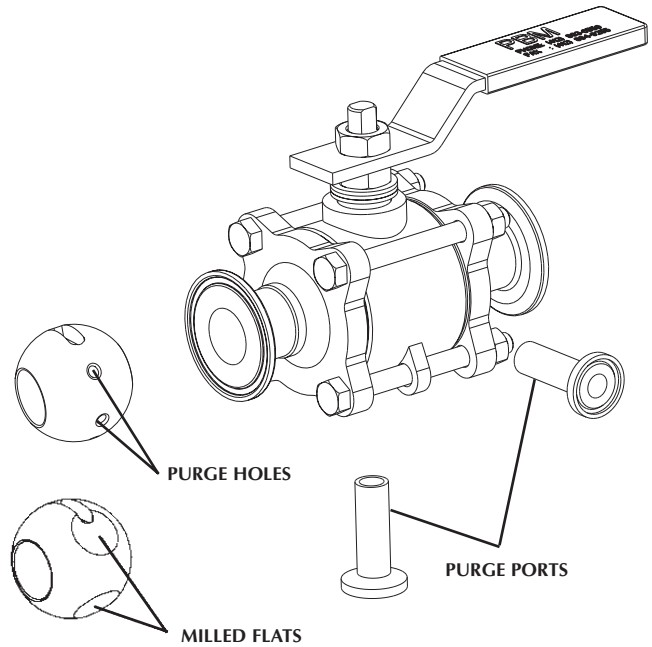
For a valve that is to be CIP/SIP cleaned, the following options are available:

	2 Body Purge Ports	1 Body Purge Port	No Body Purge Ports	2 Milled Ball Flats	2 Ball Purge Holes
Example 1	X				
Example 2		X			X
Example 3			X	X	

EXAMPLE 1: CIP/SIP VALVES WITH TWO PURGE PORTS, NO MILLED FLATS, AND NO PURGE HOLES

Two purge ports can be used to clean or sanitize the valve cavity. The purge ports are positioned to provide optimum contact with the flushing solvent or steam and the valve cavity. The inlet purge port is normally opposite the ball hole in the center of the body for valves that are purged in the closed position. The outlet is normally positioned low in the valve body to allow for drainage of the flushing solvent or steam/condensate. The position of this port is dependent on whether the valve is in a vertical pipe run or a horizontal pipe run. For valves in a horizontal pipe run, the position of the valve stem is important as well for locating the outlet purge port.

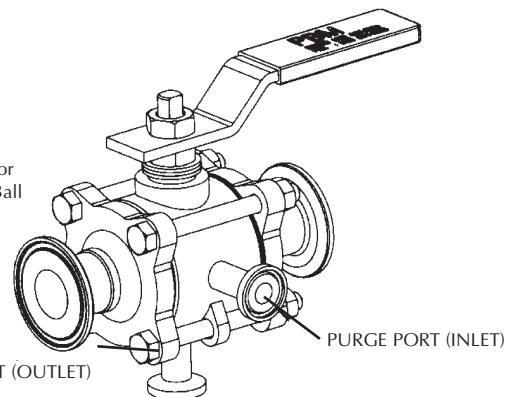
Standard purge ports are 1/2" Tri-Clamp, 1/2" Extended Butt Weld for 16 gauge tubing, and 1/4" Female NPT for pipe. Purge port position and type options are listed on page 23.



▲ SK-98014

CIP/SIP WITH TWO PURGE PORTS AND NO MILLED FLATS

EXAMPLE 1
2 Purge Ports
(Inlet/Outlet)
No Milled Flats or
Purge Holes in Ball

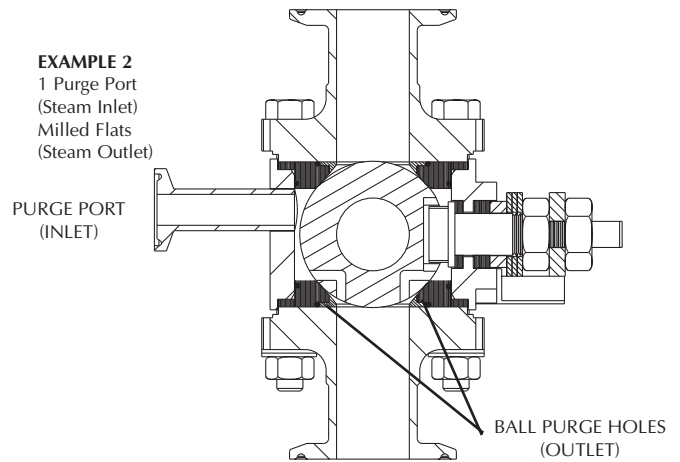


SK-98011 ▲

EXAMPLE 2: CIP/SIP VALVES WITH ONE PURGE PORT AND BALL PURGE HOLES

In a CIP/SIP valve with a single purge port and ball purge holes on the closed position of the ball, steam enters the valve through the horizontal purge ports and exits downstream via the purge holes. Both the valve and the downstream piping are sterilized at the same time in this configuration while the valve is closed. If the valve is repositioned, the purge port can become the outlet and the purge holes can function as the inlet.

CIP/SIP WITH ONE PURGE PORT AND BALL PURGE HOLES

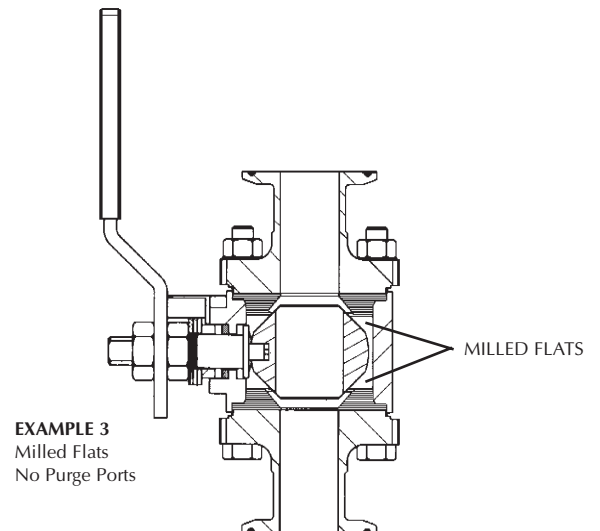


▲ SK-98012

EXAMPLE 3: CIP/SIP VALVES WITH MILLED FLATS AND NO PURGE PORTS

This example shows milled flats on the open position on both ends of the ball. This configuration might be used to CIP the valve ball and body cavity by pumping a cleaning solution through the piping. The CIP solution enters the valve body cavity via the flats on the open position on the upstream side and exits via the flats on the open position on the downstream side. In this example, the valve is cleaned at the same time as the piping.

CIP/SIP WITH MILLED FLATS AND NO PURGE PORTS



SK-98013 ▲

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	CIP/SIP	Steam	Steam w/ CIP/SIP	Standard	CIP/SIP	Steam	Steam w/ CIP/SIP						
SP								√			√		Constant ⁵
SS										√	√		Constant
				SI					√		√		Constant
	SG							√				√	Constant
	SH									√	√		Constant
					SA				√			√	Fluctuating ⁶
		SD						√				√	Fluctuating
		SE								√		√	Fluctuating
						CS			√			√	Fluctuating
			SK					√				√	Fluctuating
			SL							√		√	Fluctuating
							SI		√			√	Fluctuating

NOTES:

- For port size definitions, please turn to page 4.
- The Seat and Gasket assemblies for valves with the same port size can be interchanged. For example, an SP valve can be changed to an SD valve by removing the SP seats and installing SD 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, an SD valve can be converted to an SP valve simply by removing the SD 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.
- 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 when the temperature does not exceed 200°F.
- 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 sited 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.
- Constant temperature, or temperature that does not fluctuate more than 75°, or is under 200°F.
- Temperature that fluctuates more than 75°, or is over 200°F.

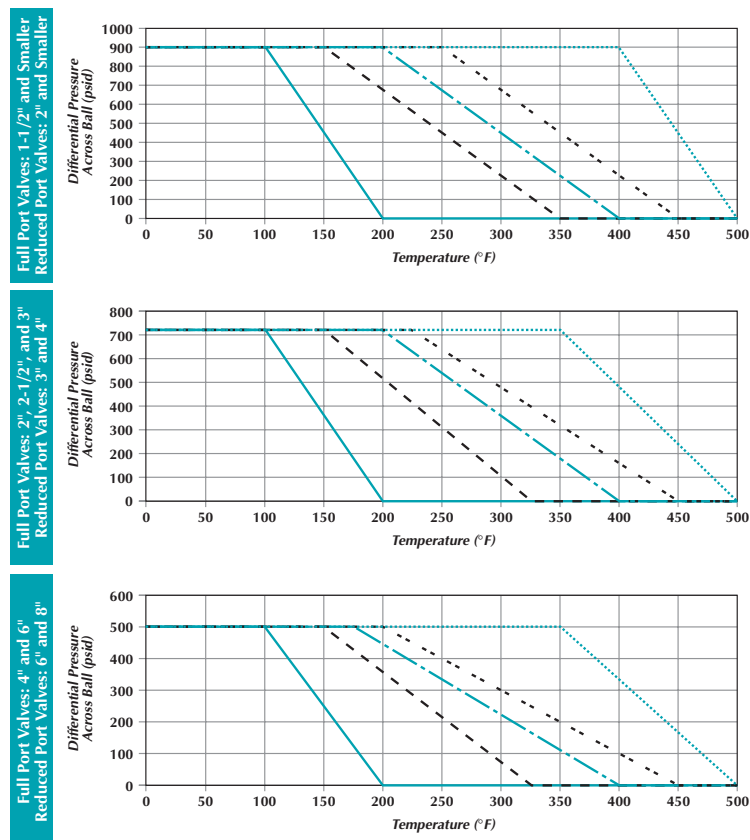
VALVE SEAT AND SEAL MATERIALS

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



NOTES

- For 1/2" to 4" valves, where pressures are in excess of 1000 psig, consult PBM.
- Ratings are for seats and seals only. PBM body rating may be different depending upon valve configuration and body material.

C_V FACTORS FOR SERIES 5, TWO-WAY VALVES

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

C _V Values (gpm)								
		SP, SD, SG, SK Valves			SS, SE, SH, SL Valves		SI, CS, SA, SJ Valves	
Valve	Size	F.N.P.T. (Q-) Socket Weld (U-)	Butt Weld for Sch. 40 (B-)	150# Flanged (L-) Sch. 40 bore	F.N.P.T. (Q-) Socket Weld (U-)	Butt Weld for Sch. 40 (B-)	Extended Butt Weld for Tube (F-)	Tri-Clamp for Tube (X-)
1/2"	C	11	12	12	N/A	N/A	7	8
3/4"	D	45	36	35	N/A	N/A	24	28
1"	E	83	75	73	23	29	55	60
1-1/2"	G	240	180	180	35	45	160	190
2"	H	360	400	365	100	120	370	420
2-1/2"	J	72	635	650	N/A	N/A	700	800
3"	K	1000	900	935	360	420	850	1000
4"	L	1800	1800	1900	420	520	1600	1900
6"	M	N/A	4400	4600	N/A	800	4200	5000
8"	N	N/A	N/A	N/A	N/A	2200	N/A	N/A

MAXIMUM TEMPERATURES AND PRESSURES FOR STEAM 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.

VALVE TORQUE

Torque values shown are a guide to estimating the forces needed to operate a given size valve, assuming new condition at ambient temperature, with 50 PSIG pressure and a neutral lubricating fluid in the body (such as air or water). When using other seat and seal material, the stem torque should be proportioned according to the as-built torque of that specific material.

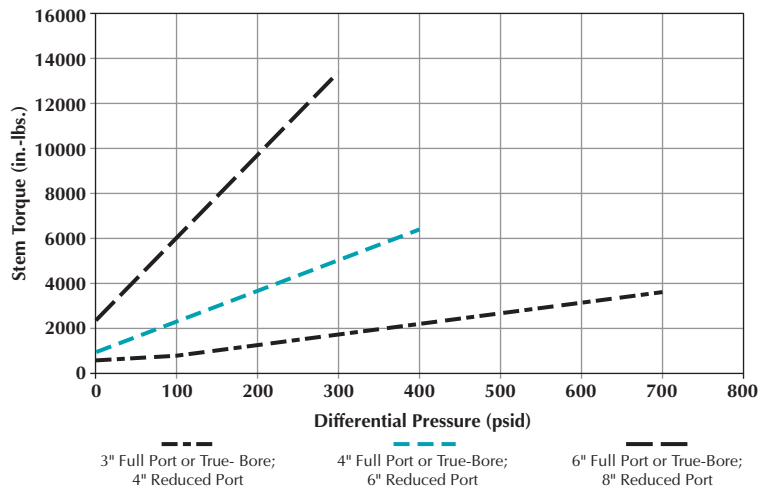
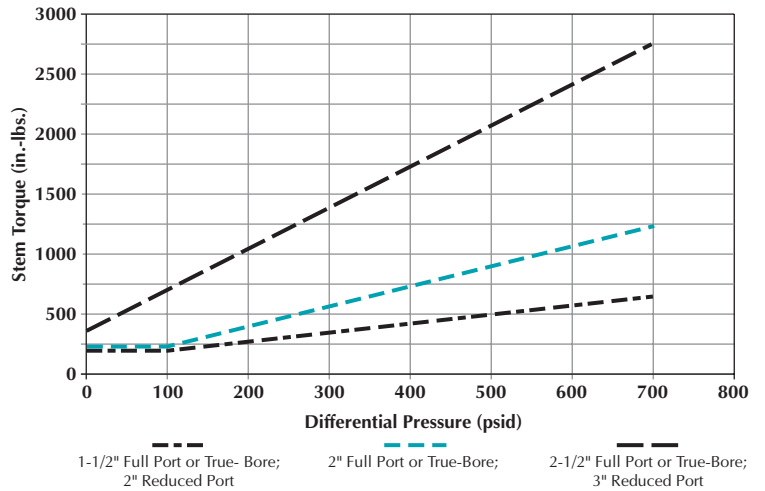
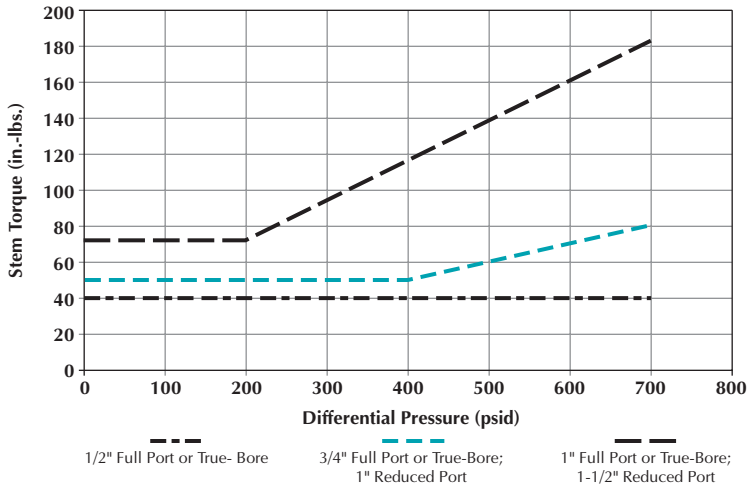
If the process involves abrasive or viscous material, the use of elevated temperatures, or if the seat or ball of the valve is worn, then an additional margin should be added. Also, when actuating a valve not factory actuated by PBM, sufficient margin must be added appropriate to the actuator size.

For valves in clean steam service, the sizing torque is provided in the table below. Stem torque vs. differential pressure curves do not apply to service in steam.

TORQUE VALUES

Valve Stem Torques (in.-lb.)																			
Size & Series		Valve Series												Valve Stem Breakaway Torque			Actuator Sizing Torque		
Size	Size Code	CS	SA	SD	SE	SG	SH	SI	SJ	SK	SL	SP	SS	RTFE, PLUS UHMWPE	SS/TFE	VTFE	RTFE, PLUS UHMWPE	SS/TFE	VTFE
1/2"	C	X	X	X		X		X	X	X		X		40	50	32	80	100	64
3/4"	D	X	X	X		X		X	X	X		X		50	63	40	100	126	80
1"	E				X		X					X	X	50	63	40	100	126	80
1"	E	X	X	X		X		X	X	X		X		72	90	58	144	180	116
1-1/2"	G				X		X					X	X	72	90	58	144	180	116
1-1/2"	G	X	X	X		X		X	X	X		X		192	240	154	384	480	308
2"	H				X		X					X	X	192	240	154	384	480	308
2"	H	X	X	X		X		X	X	X		X		228	285	182	556	570	364
2-1/2"	J		X			X		X					X	360	450	288	720	900	576
2-1/2"	J	X		X					X	X				360	450	288	900	900	720
3"	K						X						X	360	450	288	720	900	576
3"	K				X							X		360	450	288	900	900	720
3"	K		X			X		X					X	540	675	430	1080	1350	860
3"	K	X		X					X	X				540	675	430	1350	1350	1080
4"	L						X						X	540	675	430	1080	1350	860
4"	L				X							X		540	675	430	1350	1350	1080
4"	L		X			X		X					X	984	1230	787	1968	2460	1574
4"	L	X		X					X	X				984	1230	787	2570	2570	2056
6"	M						X						X	984	1230	787	1968	2460	1574
6"	M				X							X		984	1230	787	2570	2570	2056
6"	M		X			X		X					X	2400	3000	1920	4800	6000	3840
6"	M	X		X					X	X				2400	3000	1920	7200	7200	5760
8"	N						X						X	2400	3000	1920	4800	6000	3840
8"	N				X							X		2400	3000	1920	7200	7200	5760

STEM TORQUE VS. DIFFERENTIAL PRESSURE, RTFE SEATS



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.

STANDARD MATERIAL

S/S = Stainless Steel

316L S/S complies with ASTM A 351-CF3M or A479, S31603

- 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.
- 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.
- 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 Bronze, Aluminum, Hastelloy, Titanium, and Inconel.

ALLOWABLE WORKING PRESSURES (PSIG) AND TEMPERATURE GUIDELINES

Allowable Working Pressure (psig) — Valves 1-1/2" and Smaller								
		SP, SD, SS, SG, SH, SK, SE Valves				SI, SA, SJ, CS 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-) (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 11.

Allowable Working Pressure (psig) — Valves 2" and Larger								
		SP, SD, SS, SG, SH, SK, SE Valves				SI, SA, SJ, CS 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-) (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 11.

SP, SG, SK & SD SERIES 5 DIMENSIONAL DATA (INCHES)

Female NPT (Q-), Socket Weld (U-), Butt Weld for Schedule 40 (B-), Butt Weld for Schedule 10 (D-), 150# Flange (L-)

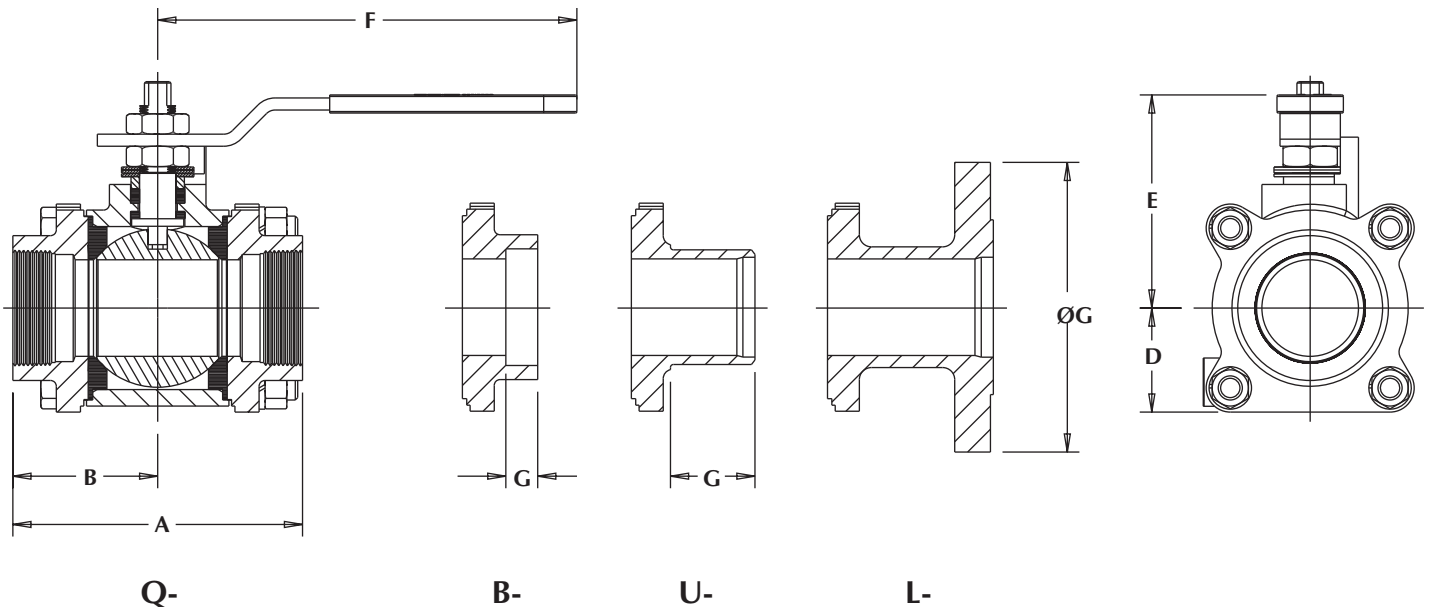
Valve Size	Size Code	Port Dia. ¹	A			B			D	E	F	G			Approx. Weight (lbs.) S/S	
			Face to Face			☉ to Face			☉ to Bottom B-, D- Q-, U-	☉ to Top of Handle	Handle Length from ☉	End Fitting			B- D- Q- U-	L-
			Q- U-	B- D-	L-	Q- U-	B- D-	L-				U- Length	B-, D- Length	L- Dia.		
1/4"	A	0.50	3.12	5.50	—	1.56	2.75	—	0.92	2.63	4.15	0.41	1.50	—	1.7	—
3/8"	B	0.50	3.12	5.50	—	1.56	2.75	—	0.92	2.63	4.15	0.41	1.50	—	1.7	—
1/2"	C	0.50	3.12	5.50	5.50	1.56	2.75	2.75	0.92	2.63	4.15	0.41	1.50	3.50	1.7	4.0
3/4"	D	0.75	3.44	5.50	5.75	1.72	2.75	2.88	1.00	2.78	4.15	0.53	1.50	3.88	2.0	5.2
1"	E	1.00	4.25	6.00	6.50	2.13	3.00	3.25	1.33	3.03	5.09	0.53	1.50	4.25	4.5	8.7
1-1/2"	G	1.50	5.50	7.50	8.00	2.75	3.75	4.00	1.78	4.10	8.68	0.53	1.50	5.00	10.2	17.4
2"	H	2.00	6.00	8.00	9.75	3.00	4.00	4.88	2.15	4.41	8.68	0.66	1.75	6.00	15.4	26.5
2-1/2"	J	2.50	8.00	11.50	11.50	4.00	5.75	5.75	2.79	6.45	12.44	0.69	2.31	7.00	36	53.5
3"	K	3.00	9.00	13.50	12.75	4.50	6.75	6.38	3.14	6.78	12.44	0.69	2.31	7.50	48	68
4"	L	4.00	12.00	16.00	15.00	6.00	8.00	7.50	4.91	7.34	24.00	0.81	2.31	9.00	109	157
6"	M	6.00	—	22.00	20.00	—	11.00	10.00	7.25	Note 3	Note 3	—	3.75	11.00	CF	CF

NOTE:

1. Full Port
2. CF = Consult Factory.
3. Gear operator is recommended. If not actuated, PBM recommends a gear operator on valves 4" and above. Unless specified, valves (except 6") will be shipped with handles.
4. Centerline to Bottom dimension for 6" size applies to Socket Weld (U-) end fitting.
5. Consult factory for approximate weight of 6" valves with Socket Weld (U-) end fitting.

END FITTING SIZE AVAILABILITY

Item	316 S/S	C/S
Female NPT (Q-)	1/4" thru 4"	1/4" thru 4"
Socket Weld (U-)	1/4" thru 6"	1/4" thru 6"
Butt Weld for Sched. 40 (B-); Butt Weld for Sched. 10 (D-)	1/4" thru 6"	1/4" thru 6"
150# Flange (L-)	1/4" thru 6"	1/4" thru 6"



CS, SA, SI & SJ SERIES 5 DIMENSIONAL DATA (INCHES)

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

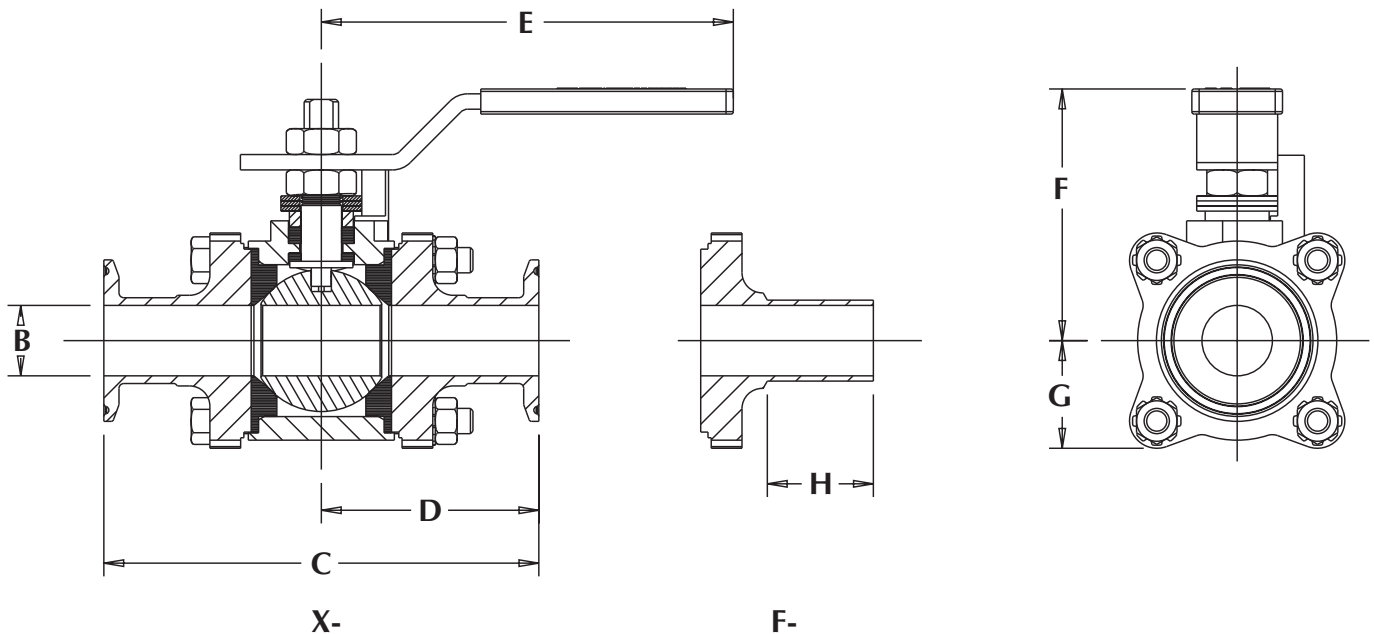
Valve Size	Size Code	Port Diameter ¹	A		B		D	E	F	G	Approx. Weight (lbs.) S/S	
			Face to Face		C to Face		C to Bottom	C to top of handle	Handle Length from C	Butt Weld Ext.	X-	F-
			X-	F-	X-	F-						
1/2"	C	0.37	3.50	5.50	1.75	2.75	0.92	2.63	4.15	1.50	1.6	1.6
3/4"	D	0.62	4.00	5.50	2.00	2.75	1.00	2.78	4.15	1.50	2.0	2.0
1"	E	0.87	5.37	6.00	2.69	3.00	1.33	3.03	5.09	1.50	4.5	4.5
1-1/2"	G	1.37	5.50	7.50	2.75	3.75	1.78	4.10	8.68	1.50	9.8	10.0
2"	H	1.87	6.25	8.00	3.12	4.00	2.15	4.41	8.68	1.75	15	15.3
2-1/2"	J	2.37	8.00	11.5	4.00	5.75	2.79	6.45	12.44	2.31	35	36
3"	K	2.87	9.00	13.5	4.50	6.75	3.14	6.78	12.44	2.31	45	49
4"	L	3.83	12.0	16.0	6.00	8.00	4.91	7.34	24.44	2.31	105	107
6"	M	5.78	15.5	22.0	7.75	11.0	7.25	Note 3	Note 3	3.75	CF	CF

NOTE:

1. True-Bore[®]
2. CF = Consult Factory.
3. Gear operator is recommended. If not actuated, PBM recommends a gear operator on valves 4" and above. Unless specified, valves (except 6") will be shipped with handles.
4. Extended Butt Weld for Tube (F-) end fittings through 3" size match 16 gauge tubing dimensions. 4"-6" sizes match 14 gauge tubing.

END FITTING SIZE AVAILABILITY

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



SE, SH, SL & SS SERIES 5 DIMENSIONAL DATA (INCHES)

Female NPT (Q-), Socket Weld (U-), Butt Weld for Schedule 40 (B-), Butt Weld for Schedule 10 (D-)

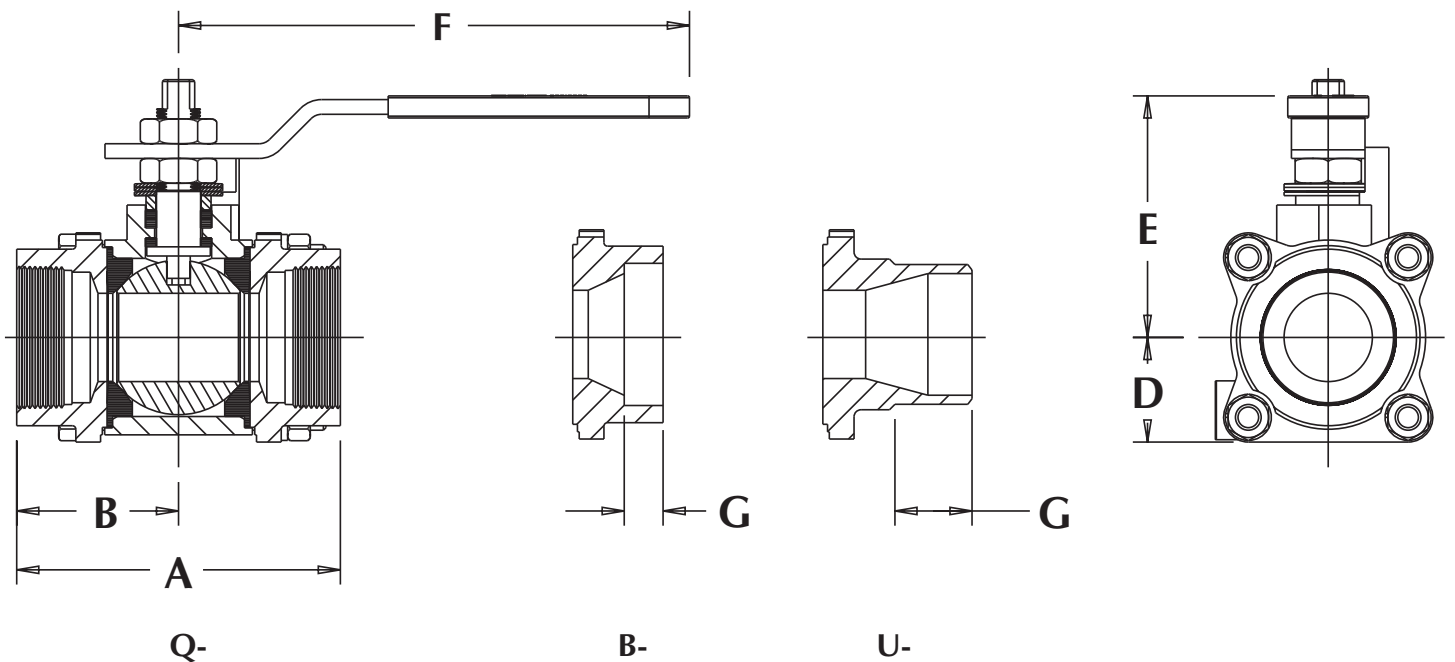
Valve Size	Size Code	Port Dia. ¹	A		B		D	E	F	G		Approx. Weight (lbs.) S/S	
			Face to Face		☉ to Face		☉ to Bottom	☉ to Top of Handle	Handle Length from ☉	End Fitting Length		Q-U-	B-D-
			Q-U-	B-D-	Q-U-	B-D-	B-, D-Q-, U-	Q-U-		B-D-			
3/4"	D	0.50	3.44	5.50	1.72	2.75	1.00	2.78	4.15	0.53	1.50	2.0	2.0
1"	E	0.75	4.25	5.50	2.13	2.75	1.00	2.78	4.15	0.53	1.50	2.5	2.5
1-1/2"	G	1.00	5.50	6.00	2.75	3.00	1.33	3.03	5.09	0.53	1.50	5.0	5.0
2"	H	1.50	5.50	7.50	2.75	3.75	1.78	4.10	8.68	0.66	1.75	10.5	11.5
3"	K	2.50	8.00	11.50	4.00	5.75	2.79	6.45	12.44	0.69	2.31	36	39
4"	L	3.00	9.00	13.50	4.50	6.75	3.14	6.78	12.44	0.81	2.31	48	56
6"	M	4.00	—	16.00	—	8.00	4.91	7.34	24.44	—	2.31	—	125
8"	N	6.00	—	22.00	—	11.00	7.18	Note 3	Note 3	—	3.75	—	CF

NOTE:

1. Reduced Port
2. CF = Consult Factory.
3. Gear operator is recommended. If not actuated, PBM recommends a gear operator on valves 4" and above. Unless specified, valves (except 6") will be shipped with handles.
4. Centerline to Bottom dimensions for 6" and 8" size apply to Butt Weld for Schedule 40 (B-) end fitting.

END FITTING SIZE AVAILABILITY

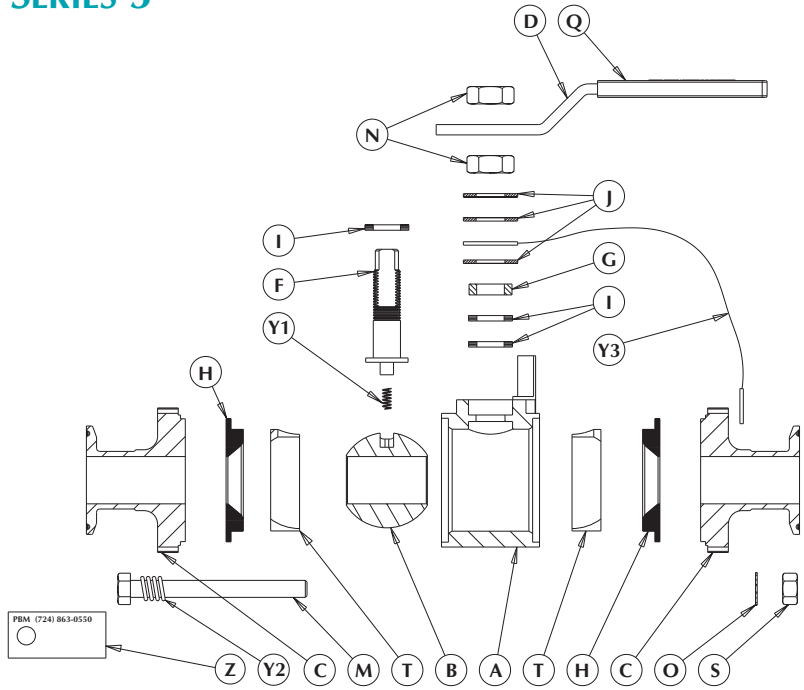
Item	316 S/S	C/S
Female NPT (Q-)	3/4" thru 4"	3/4" thru 4"
Socket Weld (U-)	3/4" thru 8"	3/4" thru 8"
Butt Weld for Sched. 40 (B-); Butt Weld for Sched. 10 (D-)	3/4" thru 8"	3/4" thru 8"



COMPONENTS

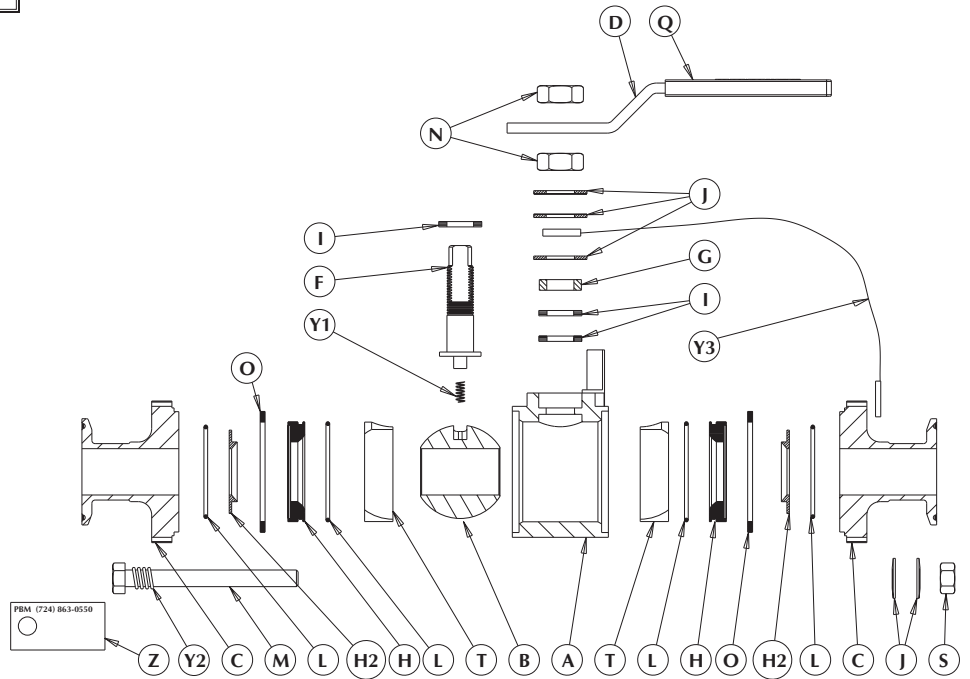
Item	Description
A	Body
B	Ball
C	End Fitting
D	Handle
F	Stem
G	Follower
H	Seat
H2	Metal Encapsulating Ring
I	Stem Packing
J	Spring Washers
J1	Large Spring Washer
J2	Small Spring Washer
L1	Large O-ring
L2	Small O-ring
M	End Fitting Fastener
N	Jam Nut
O	Gasket
Q	Handle Cover
S	Hex Nut
T	Cavity Filler (optional)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

SERIES 5



▲ SK-98002

SERIES 5 – STEAM OPTION



▲ SK-98004

SERIES 5 INDUSTRIAL & SANITARY TWO-WAY BALL VALVES

PRODUCT Position 1 + 2	MATERIAL 3 + 4	SIZE 5	SERIES 6	END FITTING 7 + 8	SEAT/SEAL 9
SP Two-Way Full Port SS Two-Way Reduced Port SG Two-Way CIP/SIP Full Port SH Two-Way CIP/SIP Reduced Port SI Igenix Sanitary Two-Way True-Bore SA Igenix Sanitary Two-Way CIP/SIP True-Bore	E* C/S C- Hastelloy C-276 H- 316 S/S HL** 316L S/S Y- Hastelloy C-22	A 1/4" B 3/8" C 1/2" D 3/4" E 1" F 1-1/4" G 1-1/2" H 2" J 2-1/2" K 3" L 4" M 6" N* 8"	5	A- Acme Bevel B- Butt Weld Sch. 40 C- Butt Weld Sch. 5 D- Butt Weld Sch. 10 E- Butt Weld (Tube) F- Extended But Weld (Tube) G- Cherry Burrell Female I-Line H- Cherry Burrell Male I-Line J- Cherry Burrell Q-Line K- Camlock L- 150# Flange M- 300# Flange N- 600# Flange O- Grooved P- Male NPT Q- Female NPT R- Sil Braze S- Sil Braze with 1 Groove T- Solder Joint U- Socket Weld V- Socket Weld for Tube X- Tri-Clamp (Tube) -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. Other end fittings available. * For valves with two different end connections, use both end fitting code letters.	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
	* SG, SH, SP and SS only. ** SI standard.	* SS and SH only.			* SP standard. ** SI 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
SP	H-	H	5	Q-	A	--	G	02	A

SPH-H5Q-A- G02A is the code for a Two-Way, 316 S/S, 2" valve, Series 5, female NPT ends, RTFE Seat/Seals, non-aseptic, 17-4 PH stem and prepared for actuation without handle with 20 R_a Max. I.D. polish.

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/CIP/SIP Options		BALL/STEM 12	OPERATOR 13 + 14	POLISH 15
For non-CIP/SIP valves, insert two dashes (--). For all CIP/SIP valves, use the codes below:		- No option	-- Manual lever handle	- No Polish
		A 300 S/S w/2" Extension	01 Without Handle	A 20 R _a Max. I.D.
		B 300 S/S w/4" Extension	02 Without Handle, prepared for actuator mounting	B 32 R _a Max. O.D.
		C 300 S/S w/6" Extension	03 With Handle, prepared for actuator mounting	C 20 R _a Max. I.D. & 32 R _a Max. O.D.
		F with ground device	04 Locking Device	D 15 R _a Max. I.D.
		G 17-4 PH S/S stem	05 Stainless Oval Handwheel	E 10 R _a Max. I.D.
		I with Monel ball	06 Manual Safety Nut	F 20 R _a Max. I.D. after Electropolish
		J with 932 Bronze ball	07 45 Degree Handle	G 15 R _a Max. I.D. after Electropolish
		K with Monel stem & followers	08 Manual Gear Operator	H 10 R _a Max. I.D. after Electropolish
		L with Monel ball, stem and followers	09 T-Handle (24" long)	I 5 R _a Max. I.D.
		M with Aluminum ball	10 Manual Spring Return Handle	K 5 R _a Max. I.D. & 32 R _a Max. O.D.
		N with 922 Bronze ball	11 Fusible Link Spring Return Unit	L 20 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
		O with H/C ball	12 Coupled Vane Actuator for 80 psi	M Electropolish only (I.D. & O.D.)
		P with H/C ball, stem and followers	13 NEMA 4 Electric Actuator (120 vac)	N 10 R _a Max. I.D. & 32 R _a Max. O.D.
		Q with 922 Bronze ball, Monel stem and followers	14 NEMA 7 Electric Actuator (120 vac)	O 15 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
		R with Monel stem, followers, and bolting	15 Square Operating Nut	Q 15 R _a Max. I.D. & 32 R _a Max. O.D.
		S with Monel ball, stem, followers and bolting	16 Locking Handle and actuator mount body	S 10 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
			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	
			Other actuator options available.	
Purge Ports 10	Milled Flats & Holes in Ball 11			
A (1) 1/2" Tri-Clamp on Center, 90° from Stem	A Flats, Closed, Downstream			
B (1) 1/2" Tri-Clamp on Center, Opposite Stem	B Flats, Closed, Upstream			
C (1) 1/2" Tri-Clamp Upstream, 90° from Stem	C Flats, Open, Upstream			
D (1) 1/2" Tri-Clamp Downstream, Opposite Stem	D Flats, Open, Downstream			
E (2) 1/2" Tri-Clamp on Center, 90° from & Opposite Stem	E Flats, Open, Up & Downstream			
F (2) 1/2" Tri-Clamp Upstream 90° from & Downstream Opposite Stem	F Holes, Closed, Downstream			
G (1) 1/2" BWTE on Center, 90° from Stem	G Holes, Closed, Upstream			
H (1) 1/2" BWTE on Center, Opposite Stem	H Holes, Open, Upstream			
I (1) 1/2" BWE Upstream, 90° from Stem	I Holes, Open, Downstream			
J (1) 1/2" BTWE Downstream, Opposite Stem	J Holes, Open, Up & Downstream			
K (2) 1/2" BWTE on Center 90° from & Opposite Stem	- No Flats or Holes			
L (2) 1/2" BWTE Upstream 90° from & Downstream Opposite Stem				
M (1) 1/4" F.N.P.T. on Center, 90° from Stem				
N (1) 1/4" F.N.P.T. on Center, Opposite Stem				
O (1) 1/4" F.N.P.T. Upstream, 90° from Stem				
P (1) 1/4" F.N.P.T. Downstream, Opposite Stem				
Q (2) 1/4" F.N.P.T. Upstream 90° from & Downstream Opposite Stem				
- No Purges, Use if Adding only Flats or Drain Holes				

SERIES 5 INDUSTRIAL & SANITARY STEAM TWO-WAY BALL VALVES

PRODUCT Position 1 + 2	MATERIAL 3 + 4	SIZE 5	SERIES 6	END FITTING 7 + 8	SEAT/SEAL 9
SD Two-Way Steam Full Port SE Two-Way Steam Reduced Port SK Two-Way CIP/SIP Steam Full Port SL Two-Way CIP/SIP Steam Reduced Port CS Igenix Sanitary Two-Way Steam True-Bore SJ Igenix Sanitary Two-Way CIP/SIP Steam True-Bore	E* C/S H- 316 S/S HL 316L S/S	A 1/4" B 3/8" C 1/2" D 3/4" E 1" G 1-1/2" H 2" J 2-1/2" K 3" L 4" M 6"	5	A- Acme Bevel F- Extended Butt Weld (Tube) G- Cherry Burrell Female I-Line X- Tri-Clamp (Tube) -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. Other end fittings available. * For valves with two different end connections, use both end fitting code letters.	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 * CS standard These Seat/Seal choices are exclusive to the Steam valves.
	* SD, SK, SE and SL only.				

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
CS	HL	H	5	F-	A	--	B	09	A

CSHL H4F-A- -B09A is the code for a Two-Way, 316L S/S, 2" valve, series 5, BWTE ends, RTFE Seats/Seals, Viton O-rings, 300 S/S w/4" extension, 24" long T-handle, with 20 R_a Max. I.D. polish.

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/CIP/SIP Options		BALL/STEM 12	OPERATOR 13 + 14	POLISH 15
For non-CIP/SIP valves, insert two dashes (--). For all CIP/SIP valves, use the codes below:		- No option	-- Manual lever handle	- No Polish
		A 300 S/S w/2" Extension	01 Without Handle	A 20 R _a Max. I.D.
		B 300 S/S w/4" Extension	02 Without Handle, prepared for actuator mounting	B 32 R _a Max. O.D.
		C 300 S/S w/6" Extension	03 With Handle, prepared for actuator mounting	C 20 R _a Max. I.D. & 32 R _a Max. O.D.
		F with ground device	04 Locking Device	D 15 R _a Max. I.D.
		G 17-4 PH S/S stem	05 Stainless Oval Handwheel	E 10 R _a Max. I.D.
		I with Monel ball	06 Manual Safety Nut	F 20 R _a Max. I.D. after Electropolish
		J with 932 Bronze ball	07 45 Degree Handle	G 15 R _a Max. I.D. after Electropolish
		K with Monel stem & followers	08 Manual Gear Operator	H 10 R _a Max. I.D. after Electropolish
		L with Monel ball, stem and followers	09 T-Handle (24" long)	I 5 R _a Max. I.D.
		M with Aluminum ball	10 Manual Spring Return Handle	K 5 R _a Max. I.D. & 32 R _a Max. O.D.
		N with 922 Bronze ball	11 Fusible Link Spring Return Unit	L 20 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
		O with H/C ball	12 Coupled Vane Actuator for 80 psi	M Electropolish only (I.D. & O.D.)
		P with H/C ball, stem and followers	13 NEMA 4 Electric Actuator (120 vac)	N 10 R _a Max. I.D. & 32 R _a Max. O.D.
		Q with 922 Bronze ball, Monel stem and followers	14 NEMA 7 Electric Actuator (120 vac)	O 15 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
		R with Monel stem, followers, and bolting	15 Square Operating Nut	Q 15 R _a Max. I.D. & 32 R _a Max. O.D.
		S with Monel ball, stem, followers and bolting	16 Locking Handle and actuator mount body	S 10 R _a Max. I.D. & 32 R _a Max. O.D. after Electropolish
			17 Extended Locking Oval Handwheel	
			18 Extended Locking Lever Handle	
			19 D/A Actuator 80 psi	
			20 D/A Actuator 80 psi w/ NEMA 4 limit switch	
			21 D/A Actuator 80 psi w/ NEMA 4 solenoid	
			22 D/A Actuator 80 psi w/ NEMA 4 limit switch/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	
			Other actuator options available.	
Purge Ports	Milled Flats & Holes in Ball			
10	11			
A (1) 1/2" Tri-Clamp on Center, 90° from Stem	A Flats, Closed, Downstream			
B (1) 1/2" Tri-Clamp on Center, Opposite Stem	B Flats, Closed, Upstream			
C (1) 1/2" Tri-Clamp Upstream, 90° from Stem	C Flats, Open, Upstream			
D (1) 1/2" Tri-Clamp Downstream, Opposite Stem	D Flats, Open, Downstream			
E (2) 1/2" Tri-Clamp on Center, 90° from & Opposite Stem	E Flats, Open, Up & Downstream			
F (2) 1/2" Tri-Clamp Upstream 90° from & Downstream Opposite Stem	F Holes, Closed, Downstream			
G (1) 1/2" BWTE on Center, 90° from Stem	G Holes, Closed, Upstream			
H (1) 1/2" BWTE on Center, Opposite Stem	H Holes, Open, Upstream			
I (1) 1/2" BWE Upstream, 90° from Stem	I Holes, Open, Downstream			
J (1) 1/2" BTWE Downstream, Opposite Stem	J Holes, Open, Up & Downstream			
K (2) 1/2" BWTE on Center 90° from & Opposite Stem	- No Flats or Holes			
L (2) 1/2" BWTE Upstream 90° from & Downstream Opposite Stem				
M (1) 1/4" F.N.P.T. on Center, 90° from Stem				
N (1) 1/4" F.N.P.T. on Center, Opposite Stem				
O (1) 1/4" F.N.P.T. Upstream, 90° from Stem				
P (1) 1/4" F.N.P.T. Downstream, Opposite Stem				
Q (2) 1/4" F.N.P.T. Upstream 90° from & Downstream Opposite Stem				
- No Purges, Use if Adding only Flats or Drain Holes				