TOP ENTRY BALL VALVES

"Apollo" Valves
manufactured in the USA
by CONBRACO Industries

American Made Quality since 1928

APOLLO VALVES 5 YEAR WARRANTY MADE IN USA

"Apollo" Valves
manufactured in the USA
by CONBRACO Industries

A history of Quality, Service and Innovation

Now in its ninth decade, Conbraco Industries, Inc. is a leading manufacturer of flow control products for U.S. and international markets. The company's headquarters is based in Matthews, North Carolina with manufacturing plants and foundries located in Pageland and Conway, South Carolina.

Conbraco has a history of new product development and innovation that dates back to the company's inception in 1928. Today, the Conbraco line of products is marketed under the "Apollo Valves" brand and includes: ball valves, butterfly valves, backflow prevention devices, water pressure reducing valves, mixing valves, safety relief valves, water gauges, strainers, actuation and APOLLOXPRESS® products.

Conbraco's vertically integrated manufacturing ensures a consistency of production, testing, quality and availability. You can be assured that Conbraco flow control products will deliver long term reliability. All manufacturing facilities are ISO 9001:2008 certified.

The Conbraco line continues to expand with new products, designs and advanced materials to better serve the needs of our customers. Markets served include: chemical processing, pulp and paper, petroleum, residential and commercial plumbing and heating, OEM, irrigation, water works, and fire protection.

PAGELAND, SC
Bronze Foundry and Manufacturing Plant

PAGELAND, SC
Final Assembly and Distribution Center

CONWAY, SC
Steel Foundry and Manufacturing Plant

MATTHEWS, NC
Corporate Headquarters

TABLE OF CONTENTS

Top Entry Ball Valve Features 3
Materials List 4-5
Seat Materials and Seat Designs 6-7
Pressure-Temperature Ratings 8-13
Dimensions: Flanged, Standard Port 14-15
Dimensions: Socket Weld, Standard Port 16-17
Dimensions: NPT, Standard Port 18-19
Dimensions: Butt Weld, Standard Port 20-21
Dimensions: Flanged, Full Port 22-23
Dimensions: Socket Weld, Full Port 24
Dimensions: NPT, Full Port 25
Dimensions: Butt Weld, Full Port 26
Dimensions: Actuator Mounting 27-32
Standard Bonnets 33
Extended Bonnets 34
Double Packed Bonnets 35
Jacketed Valves (Steam, Oil) 36
Special Applications 37
Flow Coefficients 38
Operating Torques 39
How to Specify Top Entry Valves 40-41
Warranty 43

TOP ENTRY BALL VALVES

Apollo® Top Entry Ball Valve Features:

TOP ENTRY ADVANTAGES:

- ☐ Self-Adjusting Seats: Compensate for Wear & Temperature Fluctuations
- ☐ Spring Loaded Low Pressure Seals
- ☐ Pressure Activated Seating
- ☐ Built-In Antistatic Feature
- ☐ Simplified In-line Service
- ☐ Minimal Potential Leak Paths
- ☐ ISO 5211 Mounting Pad

STANDARDS COMPLIANCE

(Most valves within this family of products comply with the requirements of these listed standards.)

ASME B16.5	"Pipe Flanges and Flanged Fittings"
ASME B16.10	"Face to Face Dimensions of Valves" (Except Full Port Valves)
ASME B16.34	"Valves – Flanged, Threaded, and Welding End."
ASME B31.1	"Power Piping"
ASME B31.3	"Chemical Plant and Petroleum Refinery Piping"
ASME B31.8	"Gas Transmission and Distribution Piping Systems"
API 598	"Valve Inspection and Testing"
API 607	"Fire Test – Soft Seated Quarter Turn Valves" (Depending on Seat and Seal Selection)
MSS SP-25	"Standard Marking System for Valves"
MSS SP-61	"Pressure Testing of Steel Valves"
MSS SP-72	"Ball Valves with Flanged of Buttweld Ends"

NO SURPRISES

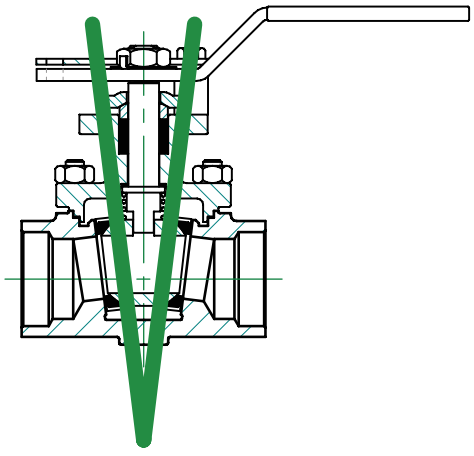
Apollo's Top Entry Ball Valves offer more. In addition to the three things everyone has come to expect from Apollo: high quality products, competitive pricing and on time delivery, Apollo Top Entry Valves deliver additional premiums; a broader choice of material for both internal and external components, more optional features to choose from, and selectable seal material combinations all resulting in an expanded serviceable application range.

FIT FOR PURPOSE

These premiums can be combined to create a product uniquely tailored to customer specifications and applications. These additional options allow a valve to be selected without compromising critical performance requirements or operating conveniences and without adding unnecessary features and the costs associated with them.

THE CORRECT DESIGN

The special "V" seating design introduced the self-adjusting seat to the floating ball valve. This design does not rely on the built-in interference of conventional floating ball valves. It provides automatic compensation for pressure, temperature and wear. As these changes occur, the ball and seats are continuously snugged down into the "V" resulting in positive leak-tight shutoff when using resilient seats. Maintaining a low pressure seal had been the most difficult condition for floating ball valves. The wedge effect on the ball and seats down the "V" assures continued low pressure sealing for the life of the seat. All Apollo Top Entry Valves have an "anti-static" feature designed in. All valve configurations also feature blow-out proof stems as standard.



THE RIGHT APPLICATION

Apollo's Top Entry Valves provide simplified in-line maintenance in the most natural way. The valve body is allowed to act as a permanent part of the piping system. Potential leak paths are eliminated with the one piece body. Only the bonnet seal and stem seals remain to be counted. And, with the variety of bonnet gaskets and stem seal arrangements available through the selection of optional features, even these threats can be minimized.

TOP ENTRY BALL VALVES

Materials

BODY MATERIAL:

Body Material Code:	A	B	C	F	H	J	K	L
Description	Alloy 20	CF3M SS	Carbon Steel	Inconel (625)	Hastelloy C	Duplex (2205)	Super Duplex (2507)	LCC Carbon Steel
Body (all types)	ASTM A351 CN7M	ASTM A351 CF3M	ASTM A216 WCB	ASTM A494 CW6MC	ASTM A494 CW12MW	ASTM A995 CD3MN	ASTM A995 CD3MWCuN	ASTM A352 LCC
Bonnet								
Packing Gland	ASTM A276 Type 316 Stainless Steel							
Gland Plate	316 Stainless Steel							
Gland Plate Bolts	ASTM A193 Grade B8							
Stop	ASTM A276 Type 304							
Stop Bolts	300 Stainless Steel							
Lockplate	302 or 304 Stainless Steel							
Lever Assembly (1/2 - 2")	304 SS w/Vinyl Grip							
Lever Stem Nut (1/2" - 2")	300 Series Stainless Steel							
Lever Assembly (3" - 8")	316 SS Adapter with Stainless Pipe [1]							
Adapter Screw (3" - 8")	300 Series Stainless Steel							
Stem Screw (3" - 8")	300 Series Stainless Steel							
External Grounding Spring	Stainless Steel							
Body Joint Studs	ASTM A193-B8M		ASTM A193-B7	ASTM A193-B8M				
Body Joint Nuts	ASTM A194-Gr.8		ASTM A194-2H	ASTM A194-Gr.8				

NOTE 1: Carbon Steel valves have galvanized pipe handles

Body Material Code:	M	N	P	R	S	T	Y
Description	M35-1 (Monel)	Nickel (200)	Carbon	AL-6XN	Stainless Steel	Titanium	Hastelloy B
Body (Flanged ends)	ASTM A494 M35-1	ASTM A494 CZ100	ASTM A217 C12	ASTM A351 CN3MN AL-6XN	ASTM A351-CF8M	ASTM B367 C3	ASTM A494 N12MV
Body (Buttweld, Socket weld, and screwed ends)					ASTM A351-CF3M		
Bonnet					ASTM A351-CF8M		
Packing Gland	ASTM A276 Type 316 Stainless Steel						
Gland Plate	316 Stainless Steel						
Gland Plate Bolts	ASTM A193 Grade B8						
Stop	ASTM A276 Type 304						
Stop Bolts	300 Stainless Steel						
Lockplate	302 or 304 Stainless Steel						
Lever Assembly (1/2 - 2")	304 SS w/Vinyl Grip						
Lever Stem Nut (1/2" - 2")	300 Series Stainless Steel						
Lever Assembly (3" - 8")	316 SS Adapter with Stainless Pipe						
Adapter Screw (3" - 8")	300 Series Stainless Steel						
Stem Screw (3" - 8")	300 Series Stainless Steel						
External Grounding Spring	Stainless Steel						
Body Joint Studs	ASTM A193-B8M						
Body Joint Nuts	ASTM A194-Gr.8						

TRIM (INTERNAL) MATERIAL:

Trim Material Code:	A	B	D	E	F	H	J	K
Description	Alloy 20	316L SS	Hastelloy C Stem, M35-1 Ball	410 SS	Inconel (625)	Hastelloy C	Duplex (2205)	Super Duplex (2507)
Ball	ASTM A351-CN7M or ASTM B473-CB-3	ASTM A351-CF3M or ASTM A276-316L	ASTM A494-M35-1 or ASTM B164-K400 N04400	ASTM A276 -410	ASTM B446 N06625 or ASTM A494 GR.CW6MC	ASTM A494-CW12MW or ASTM B574-C276	ASTM A479/A276 UNS S31803 or ASTM A995 GR. CD3MN	ASTM A479/A276 UNS S32760 or ASTM A995 GR. CD3MWCuN
Stem	ASTM B473-CB-3 N08020	ASTM A276-316L	ASTM B574-C276	ASTM A276 -410 COND.A	ASTM B446 N06625	ASTM B574-C276	ASTM A479/A276 S31803	ASTM A479/A276 S32760
Seat Ring(s) (from bar, tube or pipe depending on availability)	ASTM B473-CB-3 N08020	ASTM A276-316L	ASTM B574-C276	ASTM A269-316 or A276-316/316L or A312-316	ASTM B446 N06625	ASTM B574-C276	ASTM A479/A276 S31803	ASTM A479/A276 S32760
Internal Spring (M seat)	Inconel X-750	ASTM A312-Type 316	ASTM B574 Hastelloy C	ASTM A312-Type 316	Inconel X-750	ASTM B574 Hastelloy C	Inconel X-750	
Internal Spring (4, 5, 6, 8, 9, B, C, D, G, H, L, N, or U seats)	Inconel X-750			Inconel X-750				

TOP ENTRY BALL VALVES

Materials

TRIM (INTERNAL) MATERIAL (CONT'D):

Trim Material Code:	M	N	R	S	T	Y
Description	M35-1	Nickel (200)	AL-6XN	Stainless Steel	Titanium	Hastelloy B
Ball	ASTM A494-M35-1 or ASTM B164-K400 N04400	ASTM A494-CZ100 or ASTM B160-200	ASTM B691 N08367 or ASTM A351 CN3MN	ASTM A351-CF8M or ASTM A276-316/316L A312-316	ASTM B367-Gr C3 or ASTM B348 -Gr. 2,3,or 4	ASTM B335 N10665 or ASTM A494-N-12MV
Stem	ASTM B164-K400 N04400	ASTM B160-200	ASTM B691 N08367		ASTM B348 -Gr. 2,3,or 4	ASTM B335 N10665
Seat Ring(s) (from bar, tube or pipe depending on availability)	ASTM B164-K400	ASTM B160-200	ASTM B691 N08367	ASTM A269-316 ASTM A276-316/316L or ASTM A312-316	ASTM B348 -Gr. 2,3,or 4	ASTM B335 N10665
Internal Spring (M seat)	Inconel X-750		Inconel X-750	ASTM A312-Type 316	ASTM B348 -Gr. 2,3,or 4	Hastelloy B-2
Internal Spring (4, 5, 6, 8, 9, B, C, D, G, H, L, N, or U seats)			Inconel X-750			

SEAT & SEALS MATERIAL:

Seat Code:	4	5	6	8	9
Seat	Carbon Graphite	55% Bronze, 5% Moly Filled PTFE	UHMWPE	Unfilled PEEK	CERAMIC (Seats & Ball)
Seat O-ring	Not Applicable				
Stem Packing	Flexible Graphite				
Bonnet Gasket	Spiral Wound Flexible Graphite				
Stem Bearing	Nitronic® 60	PEEK	PEEK	PEEK	Nitronic® 60
Default Suffix	24		24		

Seat Code:	B	C	D	G	H
Seat	Carbon Reinforced PEEK	PFA	60% Stainless Filled PTFE	PCTFE	High Temp. Graphite
Seat O-ring	Not Applicable				
Stem Packing	Flexible Graphite			RPTFE	Flexible Graphite
Bonnet Gasket	Spiral Wound Flexible Graphite			RPTFE (150/300) Spiral Wound PTFE (600)	Spiral Wound Flexible Graphite
Stem Bearing	PEEK	PEEK	PEEK	PEEK	Nitronic® 60
Default Suffix	24			01	24

Seat Code:	L	M	N	U
Seat	API 607 Multiseal Fire Seat	TFM Multiseal	Nylon	UHMWPE
Seat O-ring	Multiseal Ring	N/A	Nylon	Not Applicable
Stem Packing	Flexible Graphite	PTFE	Flexible Graphite	
Bonnet Gasket	Spiral Wound Flexible Graphite	RPTFE (150/300) Spiral Wound PTFE (600)	Spiral Wound Flexible Graphite	
Stem Bearing	PEEK	PEEK	Nylon	PEEK
Default Suffix	24	01	24	

TOP ENTRY BALL VALVES

Seat Materials and Seat Designs

SEAT CODE "G" (PCTFE)
Polychlorotrifluoroethylene is typically used in cryogenic applications. High resistance to inorganic corrosive liquids, including oxidizing acids. Resistant to most organic solvents except some highly halogenated and aromatic materials. **(Figure 1)** **See Pressure-Temperature Chart 2, page 10.**

SEAT CODE "L" (TFM MULTISEAL)
API-607 fire-safe design.
This seat design has been successfully tested to the requirements of API 607. The Multiseal seat is fully confined by a metallic seat holder which provides a secondary seal in the event of the loss of the primary TFM seal during a fire. The torque characteristics will be the same as in the #M seats. **(Figure 3)** **See Pressure-Temperature Chart 1, page 10.**

SEAT CODE "M" (TFM MULTISEAL)
Apollo's Multiseal is a modified PolyTetraFluoroEthylene (PTFE) that maintains the exceptional chemical resistance and heat resistance properties of conventional PTFE. **(Figure 1)** **See Pressure-Temperature Chart 1, page 10.**

SEAT CODE "C" (PFA)
Perfluoroalkoxy seats withstand the effects of polymeric monomers such as butadiene and styrene. **(Figure 2)** **See Pressure-Temperature Chart 1, page 10.**

SEAT CODE "5" (55% BRONZE / 5% MOLY BRTFE)
Specifically intended for steam applications. Also applicable to abrasive and throttling applications because of the heavy loading of reinforcing materials and the presence of the inner ring. However, chemical compatibility may be a limiting factor in the application of this seat.
(Figure 2) **See Pressure-Temperature Chart 3, page 11.**

SEAT CODE "D" (60% STAINLESS STEEL SRTFE)
Intended for abrasive and throttling applications because of the heavy loading of reinforcing materials and the completely confined seat. **(Figure 2)** **See Pressure-Temperature Chart 1, page 10.**

SEAT CODE "6" (UHMWPE)
Ultra High Molecular Weight Polyethylene offers good abrasion resistance making it suitable for use in high solids or slurry applications. These seats are completely confined by a metallic seat holder enhancing their performance in abrasive services. This seat is frequently specified in services where fluorine off-gasing in even the slightest amounts is objectionable. Examples of these services are food, tobacco processing, and nuclear services. **(Figure 2)** **See Pressure-Temperature Chart 4, page 11.**

Figure 1
Seat Design 1

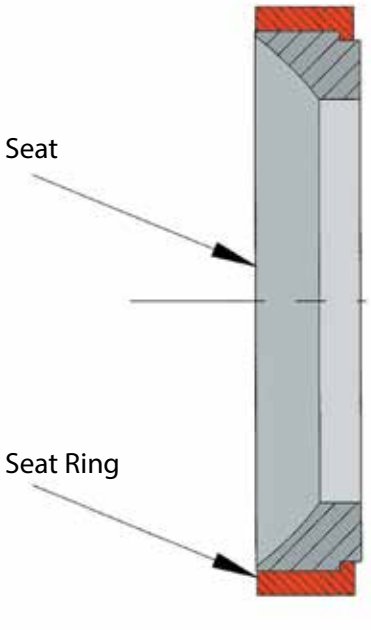
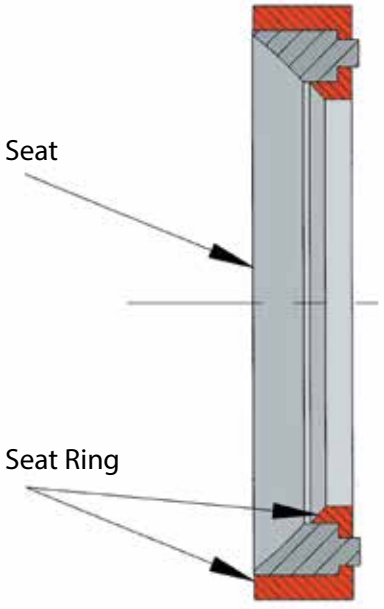


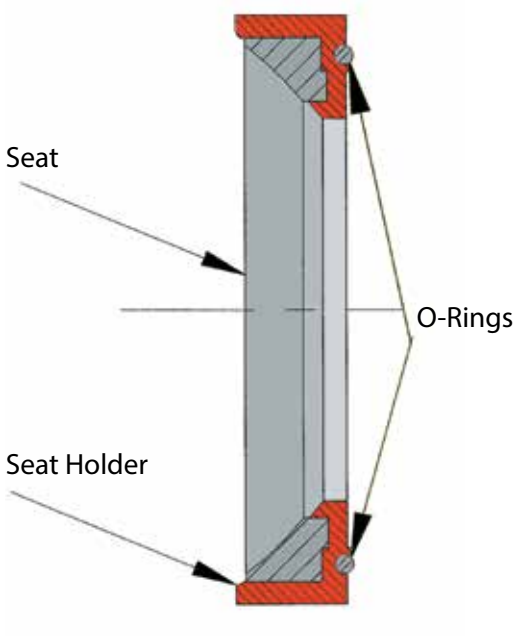
Figure 2
Seat Design 2



TOP ENTRY BALL VALVES

Seat Materials and Seat Designs

Figure 3
Seat Design 3



SEAT CODE "U" (UHMWPE)

Exhibits the same characteristics as the #6 seat with the exception that it utilizes the inner seat ring to enhance performance in abrasive services. UHMWPE should be used with caution in the presence of solvents, and the operating torque can be expected to be 30% higher than that of the PTFE based seat materials. **(Figure 1)** **See Pressure-Temperature Chart 4, page 11.**

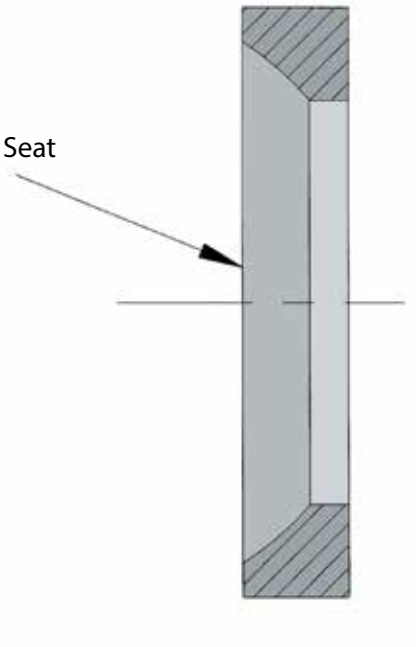
SEAT CODE "8" (PEEK)

PEEK (PolyEtherEtherKetone) offers a high strength alternative to RPTFE, resistant to creep and cold flow. This seat offers good abrasion resistance. Higher in cost, this material offers similar chemical resistance to PTFE but should be checked on application. Operating torque tend to be 40% higher than RPTFE. Ball stop recommended. **(Figure 2)** **See Pressure-Temperature Chart 5, page 12.**

SEAT CODE "B" (CARBON REINFORCED PEEK)

Carbon Reinforced PEEK provides improved abrasion resistance when compared to the unfilled variety. Higher in cost, this material offers a broader temperature range than PTFE with similar chemical resistance but should be checked on application. Operating torque tends to be 40% higher than PTFE. Ball stop recommended. **(Figure 2)** **See Pressure-Temperature Chart 5, page 12.**

Figure 4
Seat Design 4



SEAT CODE "4" (CARBON GRAPHITE)

Designed for high temperature applications. A ball stop is required in applications above 500°F. Maximum service temperature is limited to 750°F in oxidizing applications. This seat like all rigid seat materials does not necessarily provide "bubble tight" shut-off. Most test standards have allowable leakage rates or list "classes" of shut-off for this type of seat. Be aware of the system design requirements when specifying this or any rigid seat. Ball stop recommended. **(Figure 1)** **See Pressure-Temperature Chart 6, page 12.**

SEAT CODE "H" (HIGH TEMPERATURE GRAPHITE)

Designed for very high temperature applications. A ball stop is required in applications above 500°F. Maximum service temperature is limited to 1000°F. This seat like other rigid seat materials does not provide "bubble tight" shut-off. This seat is not as abrasion resistant as the #4 version. Be aware of the system design requirements when specifying this or any rigid seat. Ball stop recommended. **(Figure 1)** **See Pressure-Temperature Chart 6, page 12.**

SEAT CODE "9" (CERAMIC)

Working in conjunction with a ceramic ball, this seat outperforms all other materials in throttling and abrasive applications. It possesses excellent chemical resistance. A ball stop is recommended for all applications. This seat like all rigid seat materials does not necessarily provide "bubble tight" shut-off. Most test standards have allowable leakage rates or list "classes" of shut-off for this type of seat. Be aware of the system design requirements when specifying this or any rigid seat. **(Figure 4)** **See Pressure-Temperature Chart 7, page 13.**

TOP ENTRY BALL VALVES

Pressure-Temperature Ratings

Valve Body Rating[1] – psi									
Temp °F	ASTM A216 Grade WCB[2] Carbon Steel			ASTM A351 Grade CF8M[3] (close wrought equivalent is 316 SS)			ASTM A351 Grade CF3M (close wrought equivalent is 316L SS)		
	Class 150	Class 300	Class 600	Class 150[4]	Class 300	Class 600	Class 150	Class 300	Class 600
-20 to 100	285	740	1480	275	720	1440	230	600	1200
200 F	260	680	1360	235	620	1240	195	510	1020
300 F	230	655	1310	215	560	1120	175	455	910
400 F	200	635	1265	195	515	1025	160	420	840
500 F	170	605	1205	170	480	955	150	395	785
600 F	140	570	1135	140	450	900	140	370	745
650 F	125	550	1100	125	440	885	125	365	730
700 F	110	530	1060	110	435	870	110	360	720
750 F	95	505	1015	95	425	855	110	355	705
800 F	80	410	825	80	420	845	80	345	690
850 F	65	320	640	65	420	835			
900 F	50	230	460	50	415	830			
950 F	35	135	275	35	385	775			
1000 F	20	85	170	20	365	725			
1050 F				20	360	720			
1100 F				20	305	610			
1150 F				20	235	475			
1200 F				20	185	370			
1250 F				20	145	295			
1300 F				20	115	235			
1350 F				20	95	190			
1400 F				20	75	150			
1450 F				20	60	115			
1500 F				15	40	85			

Valve Body Rating[1] – bar									
Temp °C	ASTM A216 Grade WCB[2] Carbon Steel			ASTM A351 Grade CF8M[3] (close wrought equivalent is 316 SS)			ASTM A351 Grade CF3M (close wrought equivalent is 316L SS)		
	Class 150	Class 300	Class 600	Class 150[4]	Class 300	Class 600	Class 150	Class 300	Class 600
-29 to 38 C	19.6 bar	51.1 bar	102.1 bar	19.0 bar	49.6 bar	99.3 bar	15.9 bar	41.4 bar	82.7 bar
50 C	19.2 bar	50.1 bar	100.2 bar	18.4 bar	48.1 bar	96.2 bar	15.3 bar	40.0 bar	80.0 bar
100 C	17.7 bar	46.6 bar	93.2 bar	16.2 bar	42.2 bar	84.4 bar	13.3 bar	34.8 bar	69.6 bar
150 C	15.8 bar	45.1 bar	90.2 bar	14.8 bar	38.5 bar	77.0 bar	12.0 bar	31.4 bar	62.8 bar
200 C	13.8 bar	43.8 bar	87.6 bar	13.7 bar	35.7 bar	71.3 bar	11.2 bar	29.2 bar	58.3 bar
250 C	12.1 bar	41.9 bar	83.9 bar	12.1 bar	33.4 bar	66.8 bar	10.5 bar	27.5 bar	54.9 bar
300 C	10.2 bar	39.8 bar	79.6 bar	10.2 bar	31.6 bar	63.2 bar	10.0 bar	26.1 bar	52.1 bar
325 C	9.3 bar	38.7 bar	77.4 bar	9.3 bar	30.9 bar	61.8 bar	9.3 bar	25.5 bar	51.0 bar
350 C	8.4 bar	37.6 bar	75.1 bar	8.4 bar	30.3 bar	60.7 bar	8.4 bar	25.1 bar	50.1 bar
375 C	7.4 bar	36.4 bar	72.7 bar	7.4 bar	29.9 bar	59.8 bar	7.4 bar	24.8 bar	49.5 bar
400 C	6.5 bar	34.7 bar	69.4 bar	6.5 bar	29.4 bar	58.9 bar	6.5 bar	24.3 bar	48.6 bar
425 C	5.5 bar	28.8 bar	57.5 bar	5.5 bar	29.1 bar	58.3 bar	5.5 bar	23.9 bar	47.7 bar
450 C	4.6 bar	23.0 bar	46.0 bar	4.6 bar	28.8 bar	57.7 bar			
475 C	3.7 bar	17.4 bar	34.9 bar	3.7 bar	28.7 bar	57.3 bar			
500 C	2.8 bar	11.8 bar	23.5 bar	2.8 bar	28.2 bar	56.5 bar			
538 C	1.4 bar	5.9 bar	11.8 bar	1.4 bar	25.2 bar	50.0 bar			
550 C				1.4 bar	25.0 bar	49.8 bar			
575 C				1.4 bar	24.0 bar	47.9 bar			
600 C				1.4 bar	19.9 bar	39.8 bar			
625 C				1.4 bar	15.8 bar	31.6 bar			
650 C				1.4 bar	12.7 bar	25.3 bar			
675 C				1.4 bar	10.3 bar	20.6 bar			
700 C				1.4 bar	8.4 bar	16.8 bar			
725 C				1.4 bar	7.0 bar	14.0 bar			
750 C				1.4 bar	5.9 bar	11.7 bar			
775 C				1.4 bar	4.6 bar	9.0 bar			
800 C				1.2 bar	3.5 bar	7.0 bar			
816 C				1.0 bar	2.8 bar	5.9 bar			

1 Ratings per ASME B16.34 - 2009

2 WCB: Upon prolonged exposure to temperatures above 800°F (425°C), the carbide phase of steel may be converted to graphite. Permissible, but not recommended for prolonged usage above 800°F (425°C)

3 CF8M: At temperatures above 1000°F (538°C), use only when the carbon content is 0.04% or higher.

4 CF8M Class 150: Flanged End valve ratings terminate at 1000°F (538°C)

TOP ENTRY BALL VALVES

Pressure-Temperature Ratings

Valve Body Rating[1] – psi									
Temp °F	ASTM A351 Grade CN7M (close wrought equivalent is Alloy 20)			ASTM A494 Grade CW-12MW (close wrought equivalent is Hastelloy® C)			ASTM A494 Grade M-35-1 (close wrought equivalent is Monel®)		
	Class 150	Class 300	Class 600	Class 150	Class 300	Class 600	Class 150	Class 300	Class 600
-20 to 100	230	600	1200	230	600	1200	230	600	1200
200 F	200	520	1035	210	550	1105	200	525	1050
300 F	180	465	930	200	520	1040	190	490	980
400 F	160	420	845	190	490	980	180	475	945
500 F	150	390	780	170	465	925	170	475	945
600 F	140	360	720	140	440	880	140	475	945
650 F				125	430	860	125	475	945
700 F				110	420	835	110	470	940
750 F				95	410	820	95	465	930
800 F				80	400	800	80	460	915
850 F				65	395	785	65	375	755
900 F				50	385	775	50	275	550
950 F				35	380	760			
1000 F				20	365	725			

1 Ratings per ASME B16.34 - 2009

Valve Body Rating[1] – bar									
Temp °C	ASTM A351 Grade CN7M (close wrought equivalent is Alloy 20)			ASTM A494 Grade CW-12MW (close wrought equivalent is Hastelloy® C)			ASTM A494 Grade M-35-1 (close wrought equivalent is Monel®)		
	Class 150	Class 300	Class 600	Class 150	Class 300	Class 600	Class 150	Class 300	Class 600
-29 to 38 C	15.9 bar	41.4 bar	82.7 bar	15.9 bar	41.4 bar	82.7 bar	15.9 bar	41.4 bar	82.7 bar
50 C	15.4 bar	40.1 bar	80.3 bar	15.6 bar	40.6 bar	81.3 bar	15.4 bar	40.2 bar	80.5 bar
100 C	13.5 bar	35.3 bar	70.6 bar	14.5 bar	37.8 bar	75.6 bar	13.8 bar	35.9 bar	71.9 bar
150 C	12.3 bar	32.0 bar	64.1 bar	13.7 bar	35.9 bar	71.7 bar	12.9 bar	33.7 bar	67.5 bar
200 C	11.3 bar	29.4 bar	58.7 bar	13.0 bar	33.9 bar	67.9 bar	12.5 bar	32.7 bar	65.4 bar
250 C	10.4 bar	27.2 bar	54.4 bar	12.1 bar	32.3 bar	64.5 bar	12.1 bar	32.6 bar	65.2 bar
300 C	9.7 bar	25.4 bar	50.8 bar	10.2 bar	30.7 bar	61.5 bar	10.2 bar	32.6 bar	65.2 bar
325 C	9.3 bar	24.4 bar	48.8 bar	9.3 bar	30.1 bar	60.1 bar	9.3 bar	32.6 bar	65.2 bar
350 C				8.4 bar	29.4 bar	58.8 bar	8.4 bar	32.6 bar	65.1 bar
375 C				7.4 bar	28.7 bar	57.4 bar	7.4 bar	32.4 bar	64.8 bar
400 C				6.5 bar	28.3 bar	56.5 bar	6.5 bar	32.1 bar	64.2 bar
425 C				5.5 bar	27.7 bar	55.3 bar	5.5 bar	31.6 bar	63.3 bar
450 C				4.6 bar	27.2 bar	54.4 bar	4.6 bar	26.9 bar	53.8 bar
475 C				3.7 bar	26.8 bar	53.5 bar	3.7 bar	20.8 bar	41.5 bar
500 C				2.8 bar	26.3 bar	52.6 bar			
538 C				1.4 bar	25.2 bar	50.0 bar			

1 Ratings per ASME B16.34 - 2009

Contact Factory
INCONEL 625 ASTM A494-GR CW6MC
NICKEL 200 ASTM A494-CZ100
TITANIUM ASTM B367-GR C3

TOP ENTRY BALL VALVES

Pressure-Temperature Ratings

CHART 1 PFA, TFM, SRTFE – PRESSURE-TEMPERATURE RATINGS

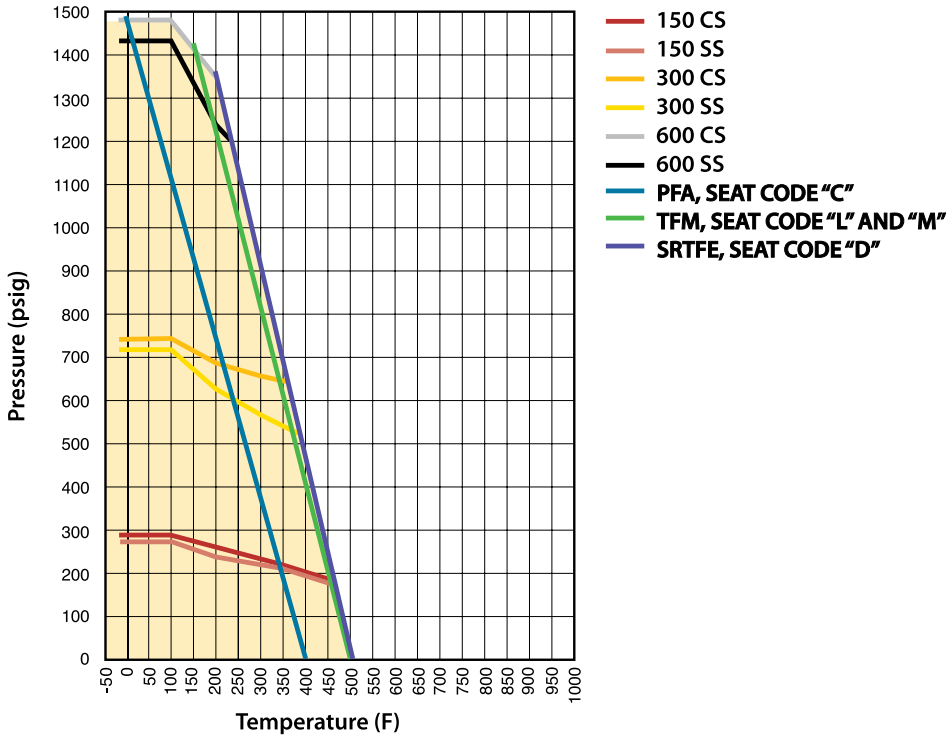
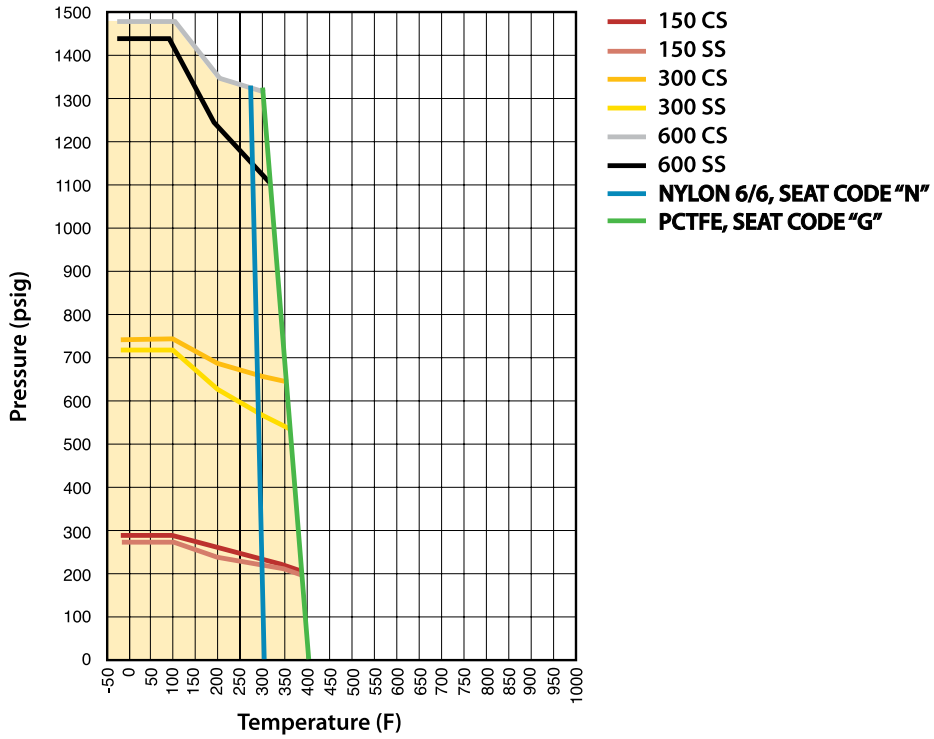


CHART 2 NYLON, PCTFE – PRESSURE-TEMPERATURE RATINGS



TOP ENTRY BALL VALVES

Pressure-Temperature Ratings

CHART 3 — 55% BRONZE, 5% MOLY – PRESSURE-TEMPERATURE RATINGS

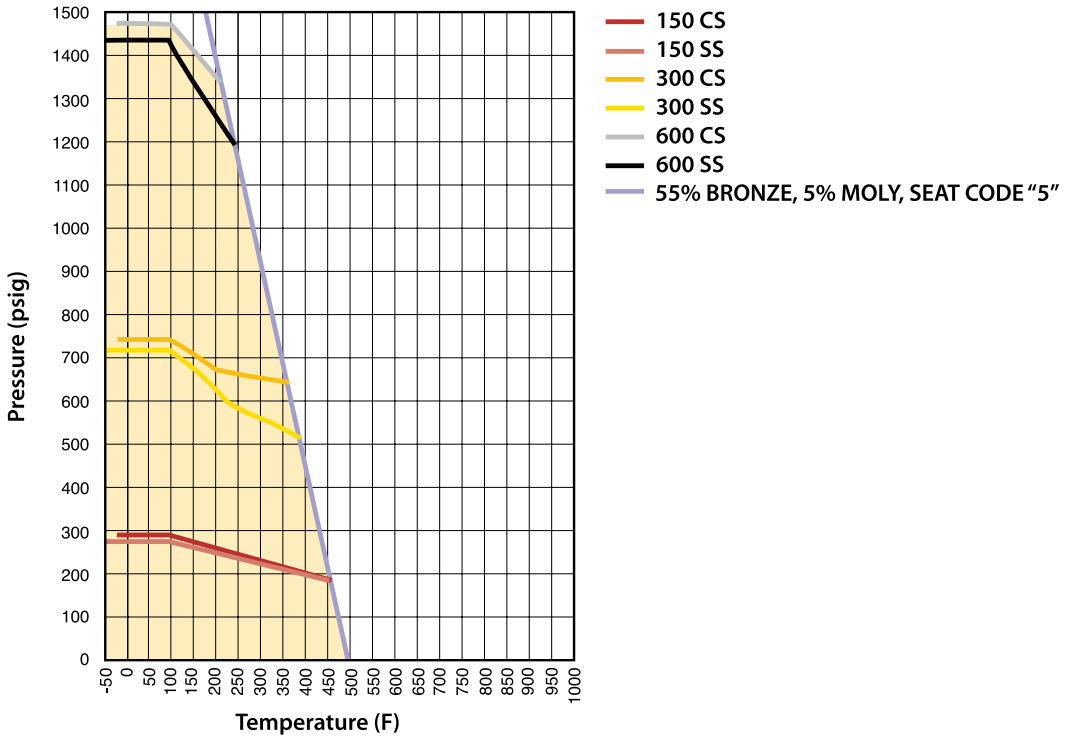
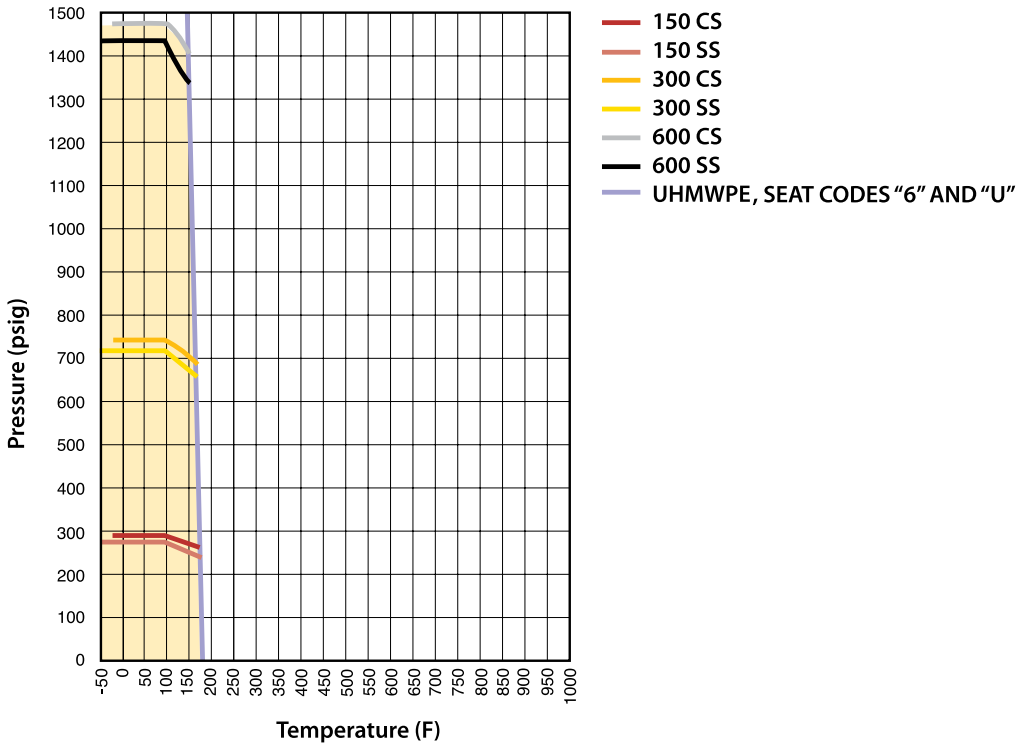


CHART 4 — UHMWPE SEATS – PRESSURE-TEMPERATURE RATINGS



TOP ENTRY BALL VALVES

Pressure-Temperature Ratings

CHART 5 PEEK SEATS – PRESSURE-TEMPERATURE RATINGS

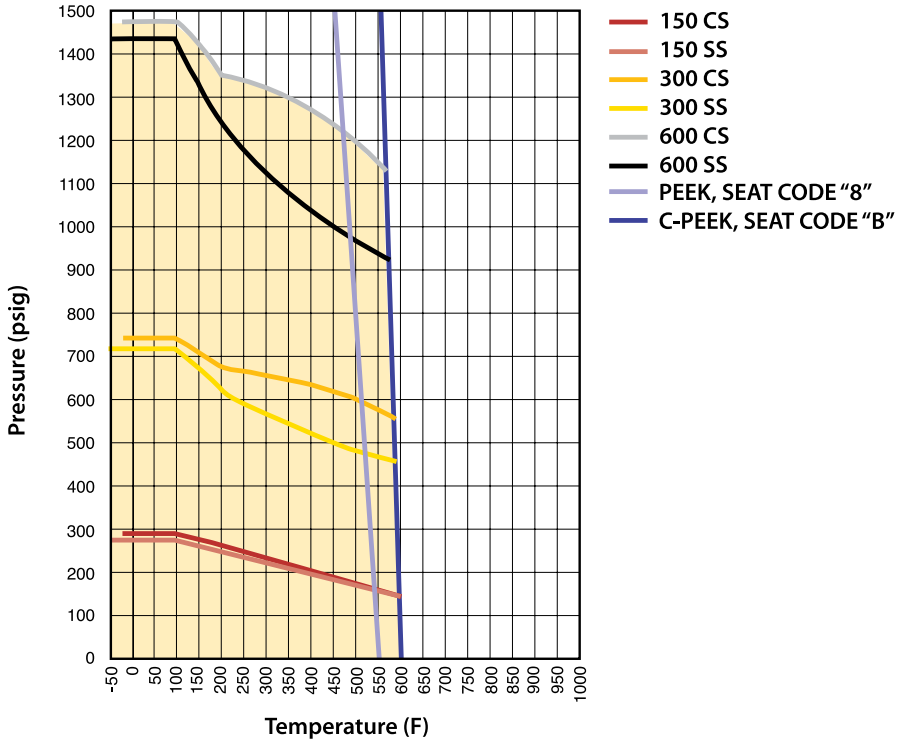
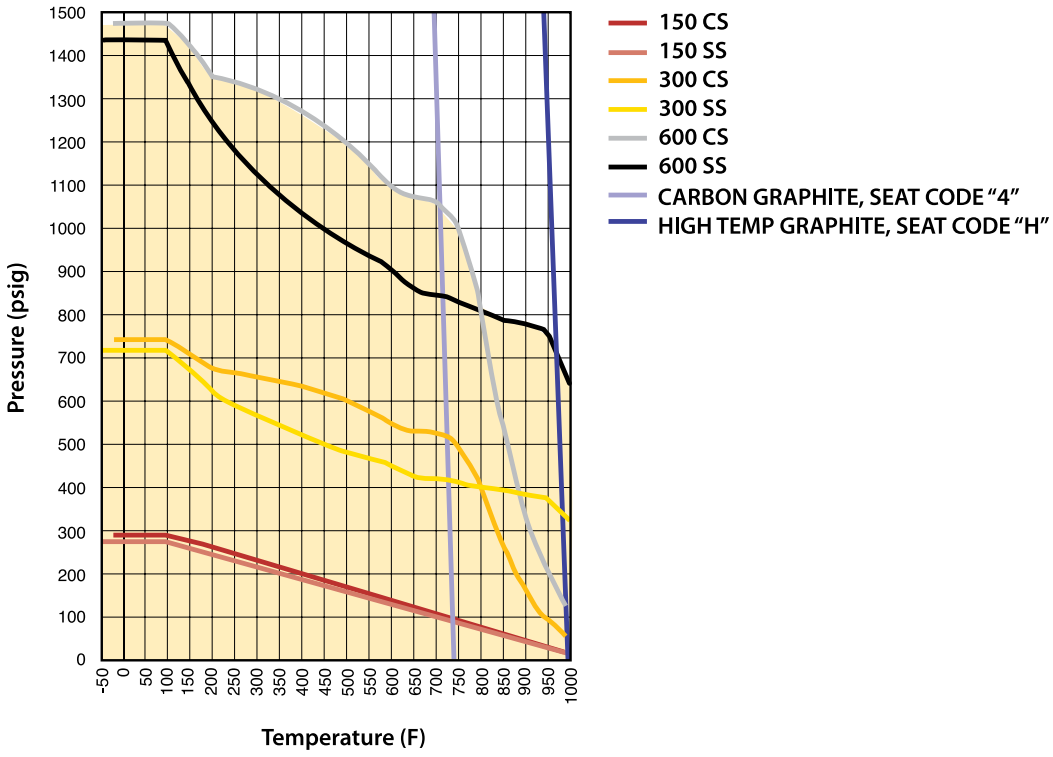


CHART 6 CARBON-GRAPHITE SEATS – PRESSURE-TEMPERATURE RATINGS



TOP ENTRY BALL VALVES

Pressure-Temperature Ratings

CHART 7 CERAMIC SEATS – PRESSURE-TEMPERATURE RATINGS

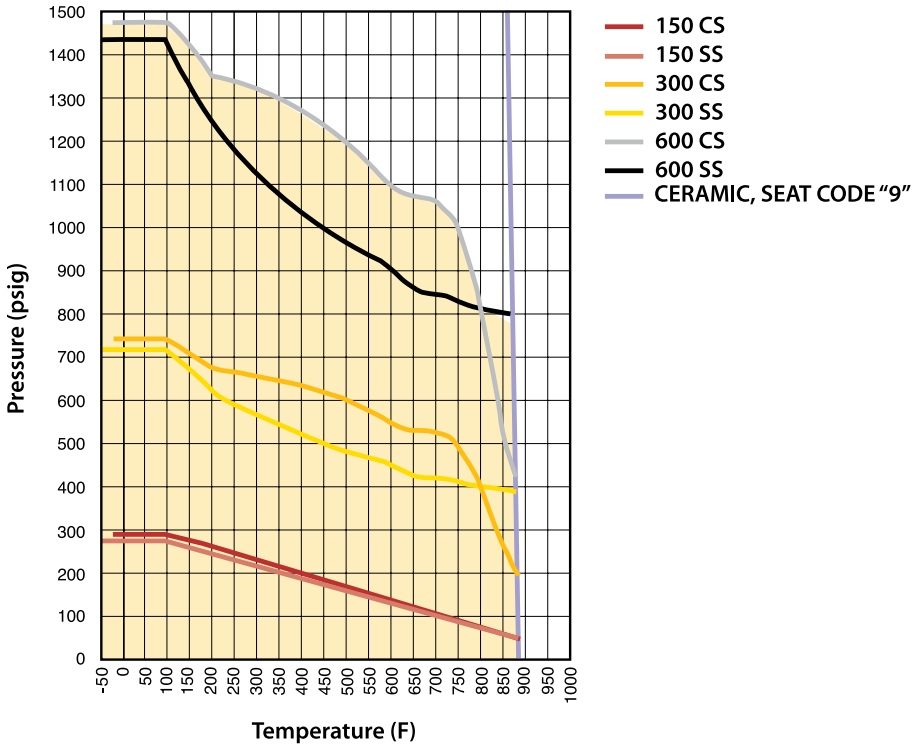
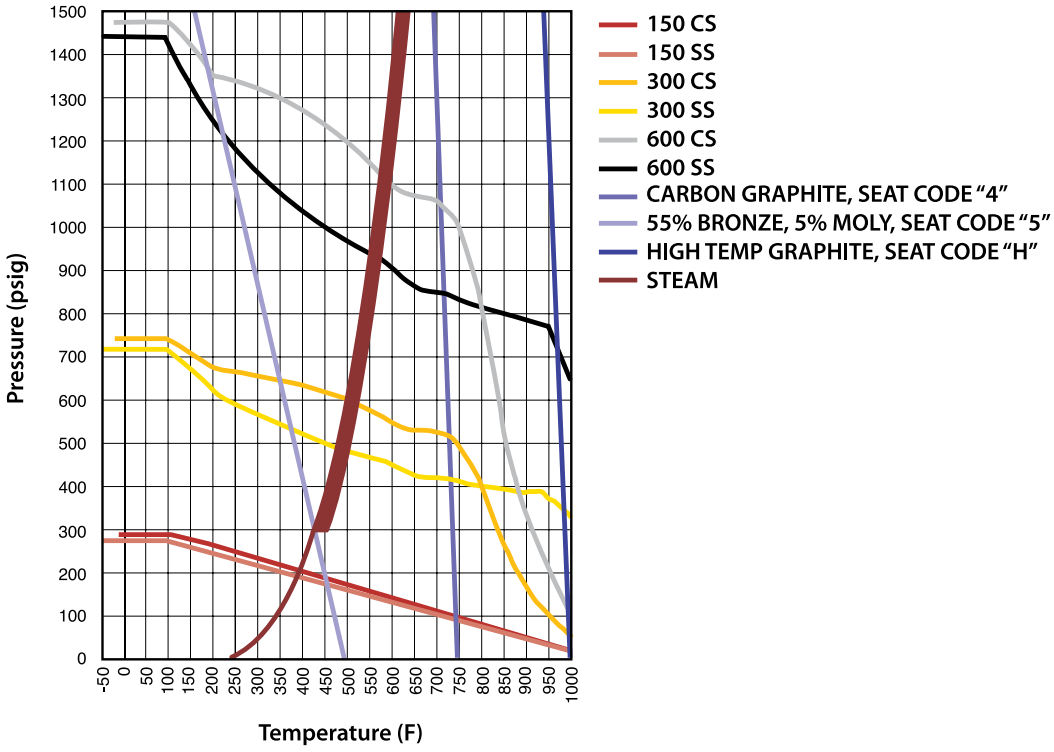


CHART 8 STEAM RATED SEATS – PRESSURE-TEMPERATURE RATINGS



TOP ENTRY BALL VALVES

ASME Class, Standard Port, Flanged

DIMENSIONS

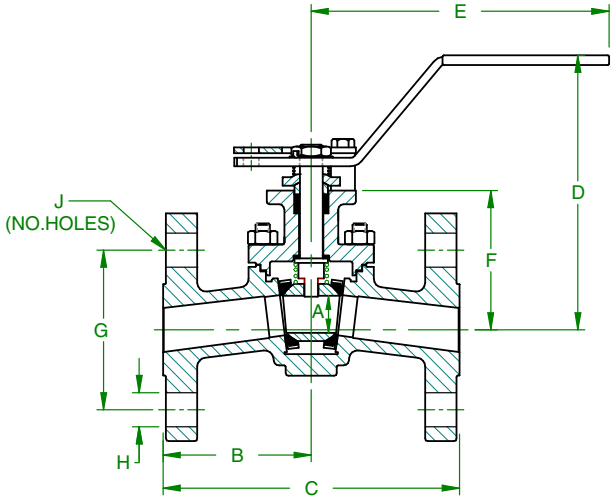


FIGURE 1

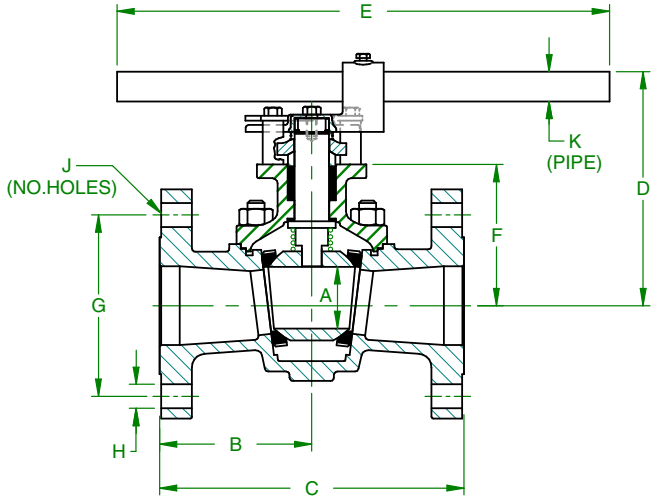


FIGURE 2

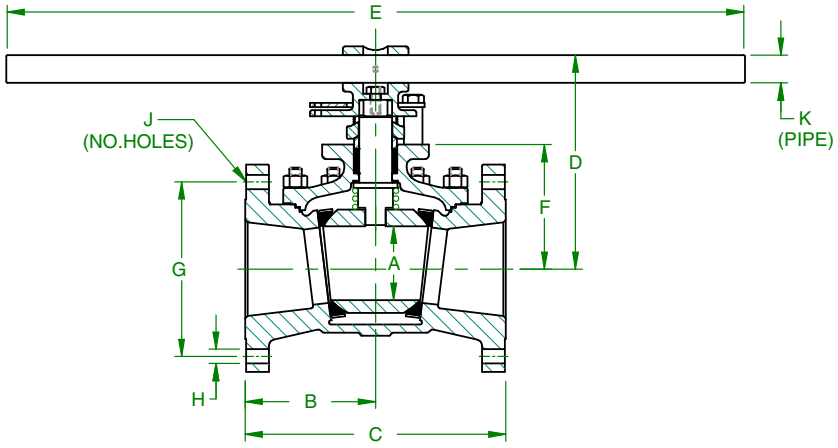


FIGURE 3

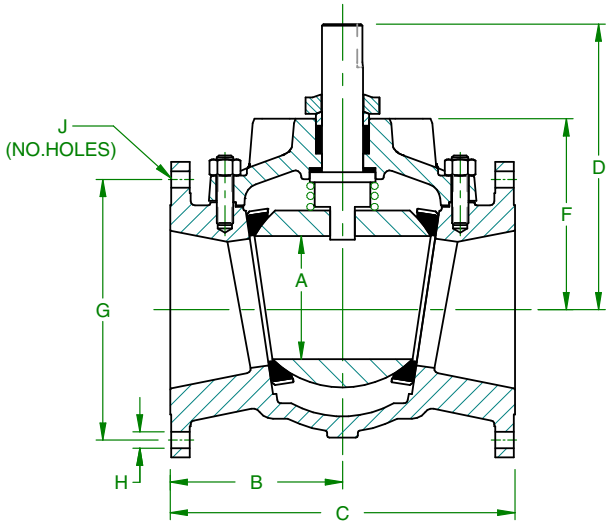


FIGURE 4

TOP ENTRY BALL VALVES

ASME Class, Standard Port, Flanged

DIMENSIONS

ASME CLASS 150, STANDARD PORT, FLANGED Dimensions in Inches

	Size	A	B	C	D	E	F	G	H	J	K
FIGURE 1	1/2"	0.81	2.85	5.69	5.85	6.56	2.88	2.38	0.62	4	NA
	3/4"	0.81	2.31	4.62	5.91	6.56	2.94	2.75	0.62	4	NA
	1"	0.81	2.50	5.00	5.94	6.56	2.97	3.12	0.62	4	NA
	1.5"	1.17	3.25	6.50	5.63	6.65	3.41	3.87	0.62	4	NA
	2"	1.50	3.50	7.00	6.54	8.40	4.24	4.75	0.75	4	NA
FIGURE 2	3"	2.25	4.00	8.00	8.55	18.00	5.16	6.00	0.75	4	3/4" SCH.40
	4"	3.00	4.50	9.00	8.68	30.00	5.29	7.50	0.75	8**	3/4" SCH.40
FIGURE 3	6"*	4.50	7.75	15.50	13.04	45.00	7.59	9.50	0.87	8	1.25" SCH.80
	8"*	6.00	9.00	18.00	14.24	45.00	8.79	11.75	0.87	8	1.25" SCH.80
FIGURE 4	10"*	7.50	10.50	21.00	17.40****	NA	11.63	14.25	1.00	12	NA
	12"*	9.00	12.00	24.00	19.46****	NA	13.69	17.00	1.00	12***	NA

** Gear Operator or Actuation Recommended*
*** Top (2) holes in each flange are tapped 5/8-11 UNC-2B*
**** Top (4) holes in each flange are tapped 7/8-9 UN-2B*
***** Dimension to top of stem (No handle)*

ASME CLASS 300, STANDARD PORT, FLANGED Dimensions in Inches

	Size	A	B	C	D	E	F	G	H	J	K
FIGURE 1	1/2"	0.81	2.85	5.69	5.85	6.56	2.88	2.62	0.62	4	NA
	3/4"	0.81	3.00	6.00	6.00	6.56	3.03	3.25	0.75	4	NA
	1"	0.81	3.25	6.50	6.03	6.56	3.06	3.50	0.75	4	NA
	1.5"	1.17	3.75	7.50	5.69	6.65	3.47	4.50	0.88	4	NA
	2"	1.50	4.25	8.50	6.63	8.40	4.33	5.00	0.75	8	NA
FIGURE 2	3"	2.25	5.56	11.13	8.55	18.00	5.16	6.63	0.88	8	3/4" SCH.40
	4"	3.00	6.00	12.00	8.68	30.00	5.29	7.88	0.88	8	3/4" SCH.40
FIGURE 3	6"*	4.50	7.94	15.87	13.04	45.00	7.59	10.63	0.88	12	1.25" SCH.80
	8"*	6.00	9.87	19.75	14.24	45.00	8.79	13.00	1.00	12	1.25" SCH.80
FIGURE 4	10"*	7.50	11.19	22.38	17.40***	NA	11.63	15.25	1.13	16	NA
	12"*	9.00	12.75	25.50	19.46***	NA	13.69	17.75	1.25	16**	NA

**Gear Operator or Actuation Recommended*
***Top 6 holes in each flange are tapped 1-1/8-8 UN-2B*
**** Dimension to top of stem (No handle)*

ASME CLASS 600, STANDARD PORT, FLANGED Dimensions in Inches

	Size	A	B	C	D	E	F	G	H	J	K
FIGURE 1	1/2"	0.81	3.63	7.25	5.63	6.65	3.41	2.62	0.62	4	NA
	3/4"	0.81	3.75	7.50	5.87	6.65	3.65	3.25	0.75	4	NA
	1"	0.81	4.25	8.50	5.92	6.65	3.71	3.50	0.75	4	NA
	1.5"	1.17	4.75	9.50	6.21	8.40	3.91	4.50	0.88	4	NA
	2"	1.50	5.75	11.50	7.01	8.40	4.70	5.00	0.75	8	NA
FIGURE 2	3"	2.25	7.00	14.00	8.78	18.00	5.38	6.63	0.88	8	3/4" SCH.40
	4"*	3.00	8.50	17.00	9.08	30.00	5.69	8.50	1.00	8	3/4" SCH.40
FIGURE 3	6"*	4.50	11.00	22.00	13.29	45.00	7.84	11.50	1.12	12	1.25" SCH.80
	8"*	6.00	13.00	26.00	15.24	45.00	9.79	13.75	1.25	12	1.25" SCH.80

**Gear Operator or Actuation Recommended.*

TOP ENTRY BALL VALVES

ASME Class 300, Standard Port, Socket Weld

DIMENSIONS

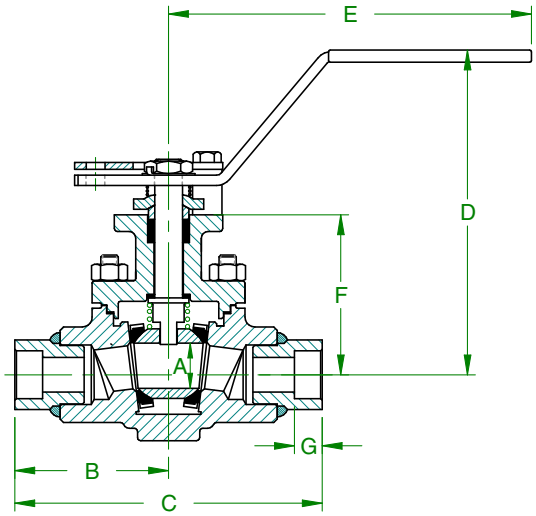


FIGURE 1

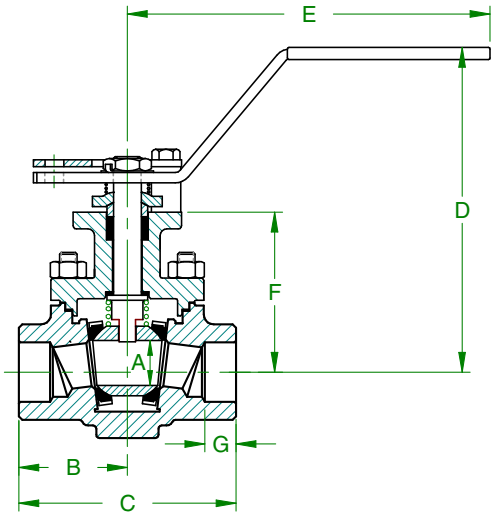


FIGURE 2

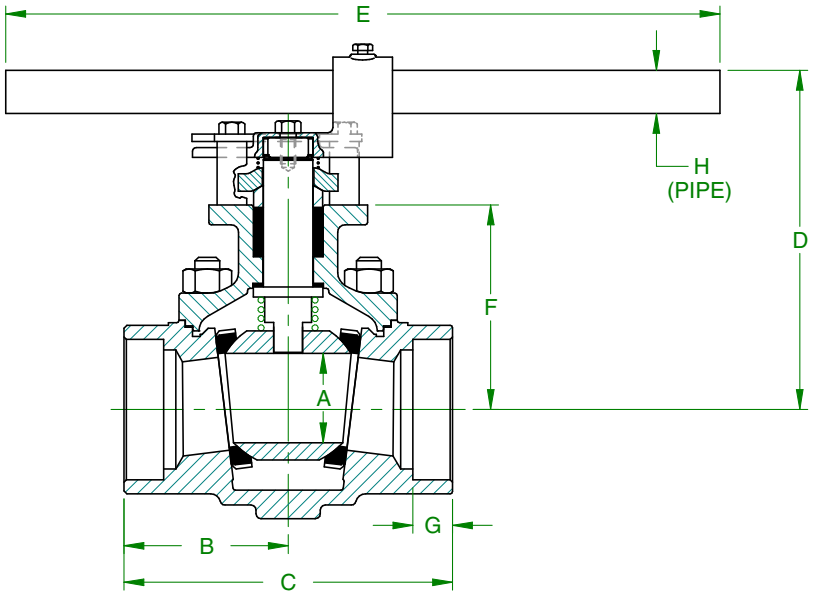


FIGURE 3

ASME CLASS 300, STANDARD PORT, SOCKET WELD Dimensions in Inches

	Size	A	B	C	D	E	F	G	H
FIGURE 1	1/4"	0.81	2.77	5.54	5.84	6.56	2.88	0.50	NA
	1/2"	0.81	2.77	5.54	5.84	6.56	2.88	0.50	NA
FIGURE 2	3/4"	0.81	1.96	3.91	5.84	6.56	2.88	0.56	NA
	1"	0.81	1.96	3.91	5.84	6.56	2.88	0.50	NA
	1.5"	1.17	2.49	4.98	5.57	6.65	3.36	0.55	NA
	2"	1.50	2.86	5.72	6.36	8.40	4.06	0.62	NA
FIG 3	3"	2.25	4.14	8.28	8.55	18.00	5.16	1.00	3/4" SCH.40

TOP ENTRY BALL VALVES

ASME Class 600, Standard Port, Socket Weld

DIMENSIONS

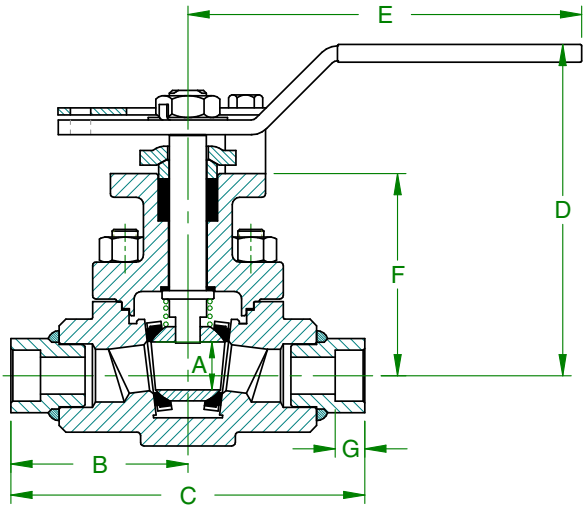


FIGURE 1

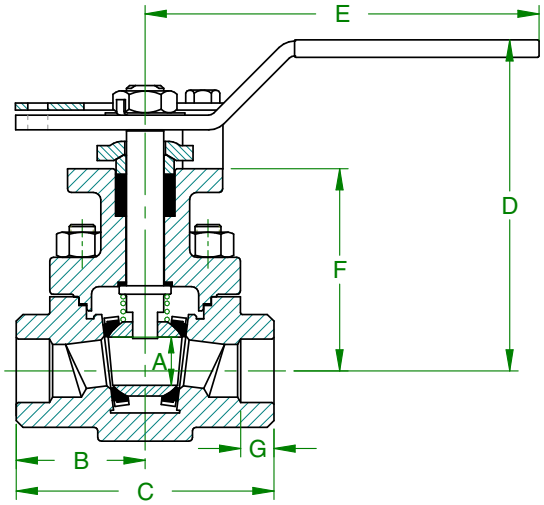


FIGURE 2

ASME CLASS 600, STANDARD PORT, SOCKET WELD Dimensions in Inches

	Size	A	B	C	D	E	F	G
FIGURE 1	1/4"	0.81	2.99	5.98	5.63	6.65	3.41	0.50
	1/2"	0.81	2.99	5.98	5.63	6.65	3.41	0.50
FIGURE 2	3/4"	0.81	2.18	4.35	5.63	6.65	3.41	0.56
	1"	0.81	2.18	4.35	5.63	6.65	3.41	0.50
	1.5"	1.17	2.62	5.23	5.98	8.40	3.68	0.55
	2"	1.50	2.99	5.98	6.57	8.40	4.27	0.62

TOP ENTRY BALL VALVES

ASME Class 300, Standard Port, NPT

DIMENSIONS

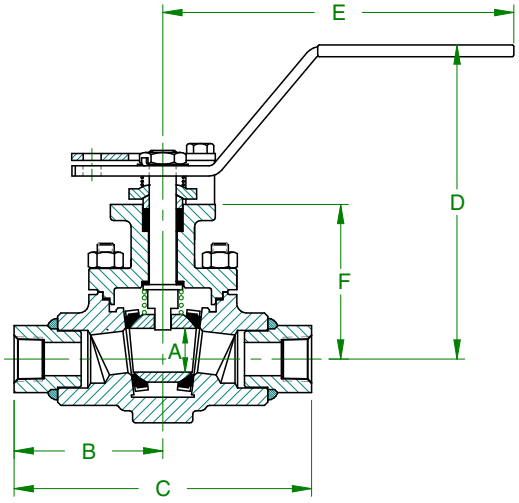


FIGURE 1

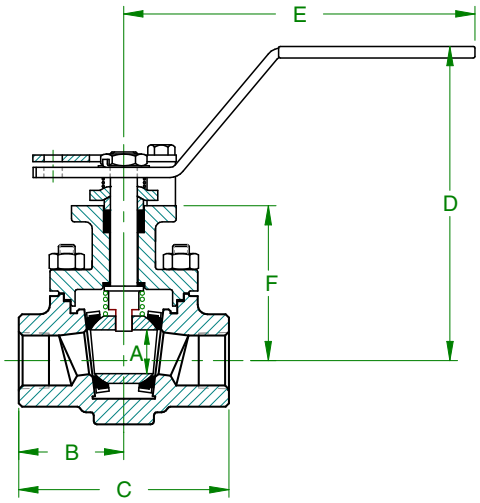


FIGURE 2

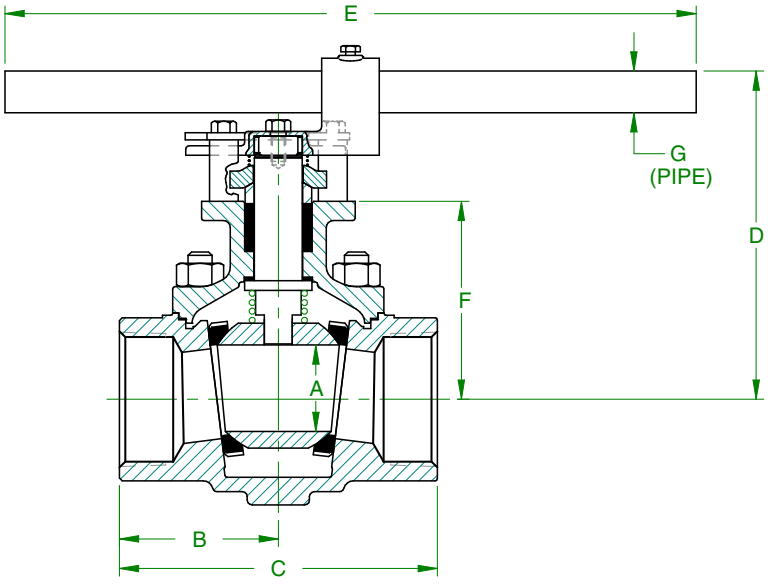


FIGURE 3

ASME CLASS 300, STANDARD PORT, NPT Dimensions in Inches

	Size	A	B	C	D	E	F	G
FIGURE 1	1/4"	0.81	2.77	5.54	5.84	6.56	2.88	NA
	1/2"	0.81	2.77	5.54	5.84	6.56	2.88	NA
FIGURE 2	3/4"	0.81	1.96	3.91	5.84	6.56	2.88	NA
	1"	0.81	1.96	3.91	5.84	6.56	2.88	NA
	1.5"	1.17	2.49	4.98	5.57	6.65	3.36	NA
	2"	1.50	2.86	5.72	6.36	8.40	4.06	NA
FIG3	3"	2.25	4.14	8.28	8.55	18.00	5.16	3/4" SCH.40

TOP ENTRY BALL VALVES

ASME Class 600, Standard Port, NPT

DIMENSIONS

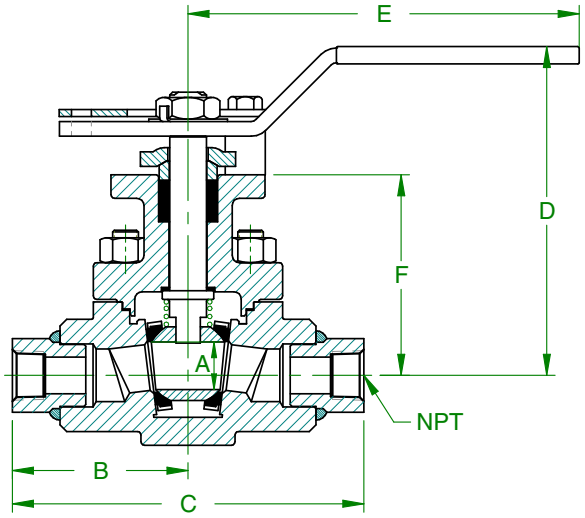


FIGURE 3

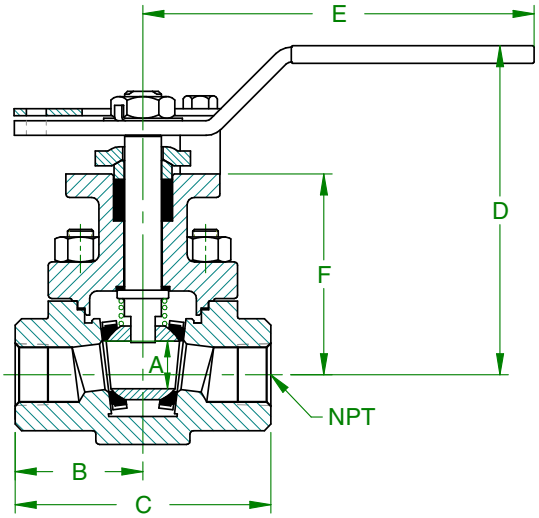


FIGURE 4

ASME CLASS 600, STANDARD PORT, NPT Dimensions in Inches

	Size	A	B	C	D	E	F
FIGURE 3	1/4"	0.81	2.99	5.98	5.63	6.65	3.41
	1/2"	0.81	2.99	5.98	5.63	6.65	3.41
FIGURE 4	3/4"	0.81	2.18	4.35	5.63	6.65	3.41
	1"	0.81	2.18	4.35	5.63	6.65	3.41
	1.5"	1.17	2.62	5.23	5.98	8.40	3.68
	2"	1.50	2.99	5.98	6.57	8.40	4.27

TOP ENTRY BALL VALVES

Class 300, Standard Port, Butt Weld

DIMENSIONS

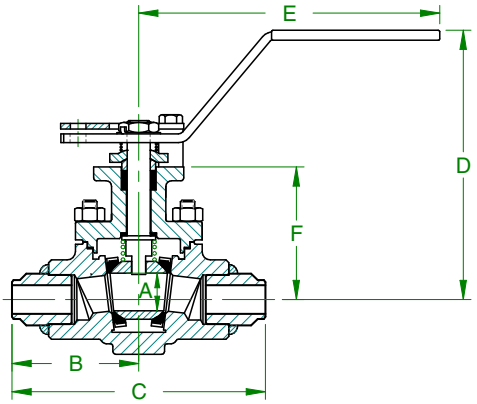


FIGURE 1

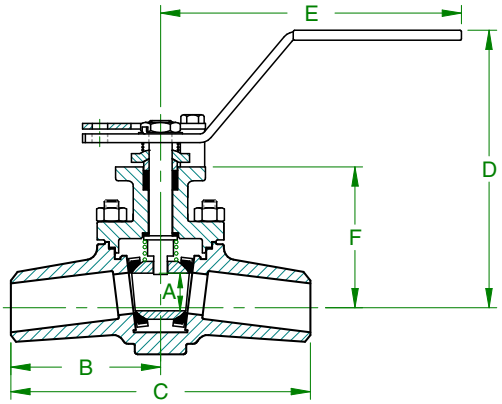


FIGURE 2

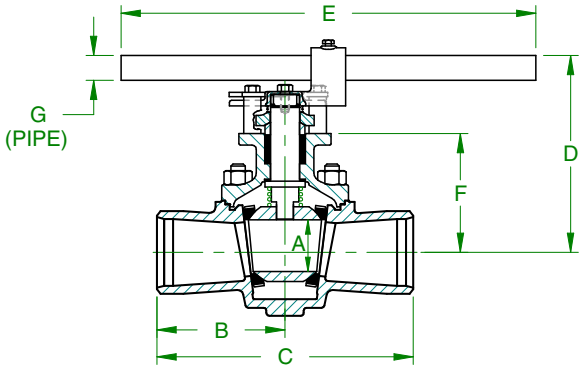


FIGURE 3

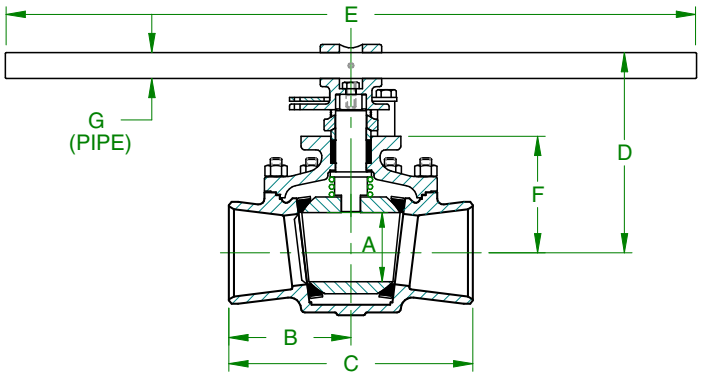


FIGURE 4

ASME CLASS 300, STANDARD PORT, BUTT WELD Dimensions in Inches

	Size	A	B	C	D	E	F	G
FIG 1	1/2"	0.81	2.75	5.50	5.84	6.56	2.88	NA
FIGURE 2	3/4"	0.81	3.00	6.00	5.99	6.56	3.03	NA
	1"	0.81	3.25	6.50	6.02	6.56	3.06	NA
	1.5"	1.17	3.75	7.50	5.62	6.65	3.40	NA
	2"	1.50	4.25	8.50	6.64	8.40	4.34	NA
FIGURE 3	3"	2.25	5.56	11.12	8.55	18.00	5.16	3/4" SCH.40
	4"	3.00	6.03	12.06	8.68	30.00	5.29	3/4" SCH.80
FIGURE 4	6"	4.50	7.94	15.88	13.04	45.00	7.59	1.25" SCH.80
	8"	6.00	10.25	20.50	14.43	45.00	9.00	1.25" SCH.80

TOP ENTRY BALL VALVES

Class 600, Standard Port, Butt Weld

DIMENSIONS

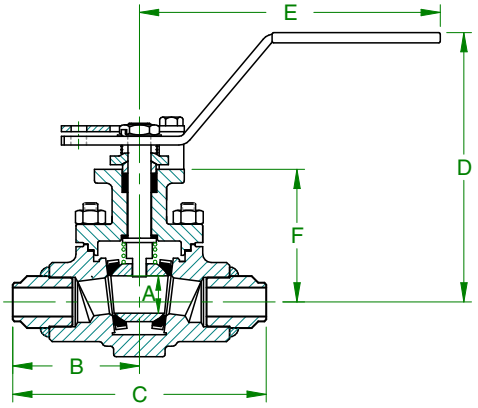


FIGURE 1

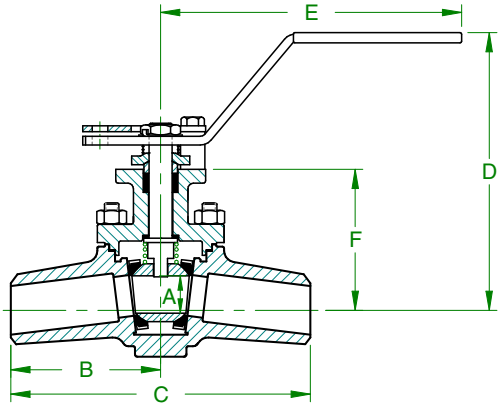


FIGURE 2

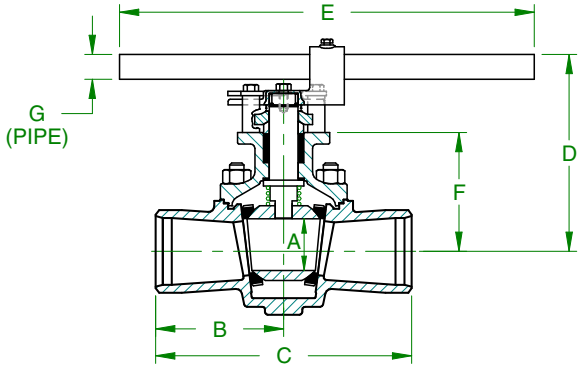


FIGURE 3

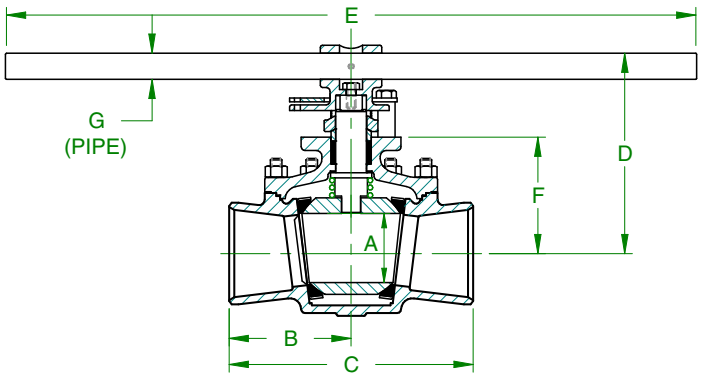


FIGURE 4

ASME CLASS 600, STANDARD PORT, BUTT WELD Dimensions in Inches

	Size	A	B	C	D	E	F	G
FIG 1	1/2"	0.81	3.25	6.50	5.63	6.65	3.41	NA
FIGURE 2	3/4"	0.81	3.75	7.50	5.87	6.65	3.66	NA
	1"	0.81	4.25	8.50	5.93	6.65	3.72	NA
	1.5"	1.17	4.75	9.50	6.22	8.40	3.92	NA
	2"	1.50	5.75	11.50	7.03	8.40	4.73	NA
FIGURE 3	3"	2.25	7.00	14.00	8.78	18.00	5.38	3/4" SCH.40
	4"	3.00	8.50	17.00	9.08	30.00	5.69	3/4" SCH.80
FIG 4	6"	4.50	11.00	22.00	13.29	45.00	7.84	1.25" SCH.80

TOP ENTRY BALL VALVES

Full Port, Flanged

DIMENSIONS

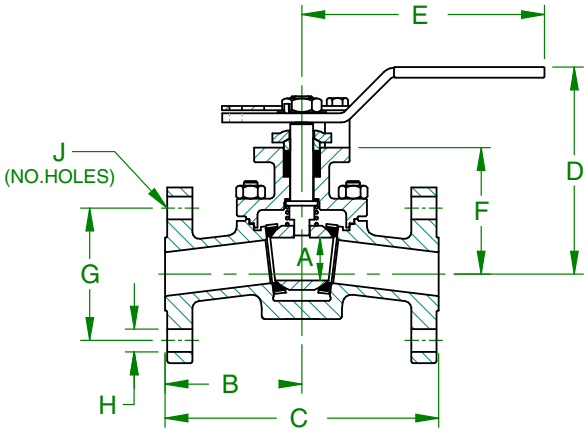


FIGURE 1

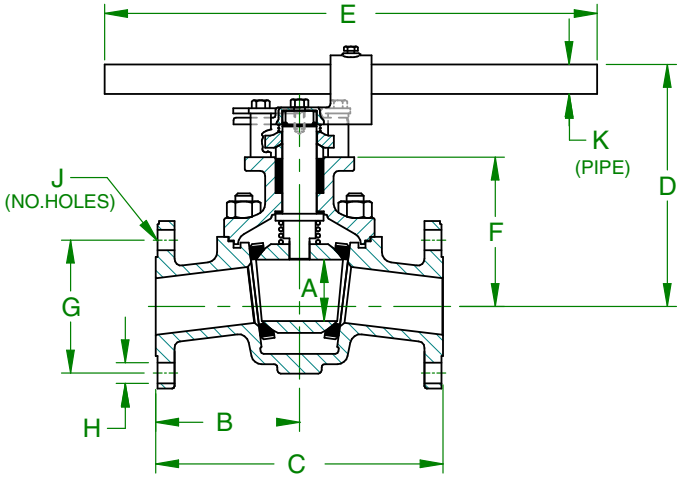


FIGURE 2

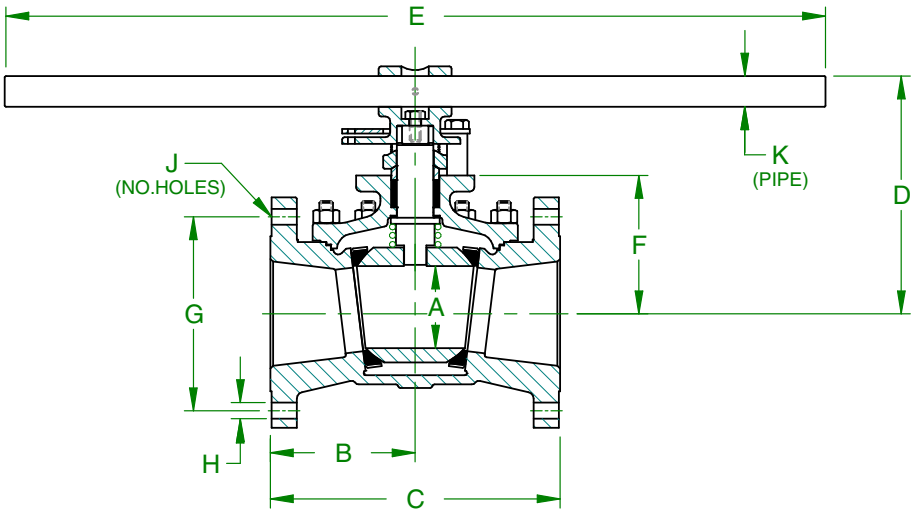


FIGURE 3

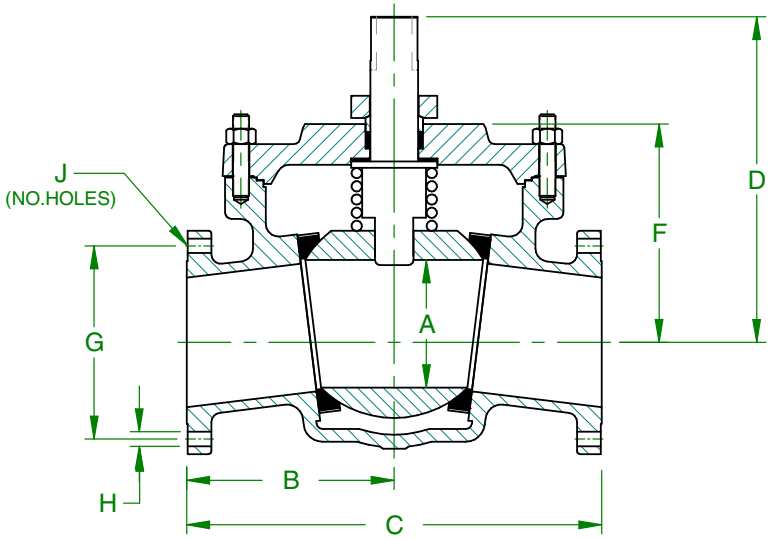


FIGURE 4

TOP ENTRY BALL VALVES

Full Port, Flanged

DIMENSIONS

ASME CLASS 150, FULL PORT, FLANGED Dimensions in Inches

	Size	A	B	C	D	E	F	G	H	J	K
FIGURE 1	1"	1.17	3.50	7.00	5.66	6.65	3.44	3.12	0.62	4	NA
	1.5"	1.50	4.37	8.75	6.65	8.40	4.35	3.87	0.62	4	NA
FIGURE 2	2"	2.25	5.25	10.50	8.85	18.00	5.46	4.75	0.75	4	3/4" SCH.40
	3"	3.00	6.75	13.50	9.16	30.00	5.77	6.00	0.75	4	3/4" SCH.40
FIGURE 3	4"	4.50	8.50	17.00	13.46	45.00	8.01	7.50	0.75	8	1.25" SCH.80
	6"*	6.00	10.75	21.50	14.96	45.00	9.51	9.50	0.87	8	1.25" SCH.80
FIGURE 4	8"*	8.00	12.25	24.50	18.72***	NA	12.95	11.75	0.87	8**	NA
	10"*	10.00	16.25	32.50	25.54***	NA	17.14	14.25	1.00	12	NA
	12"*	12.00	19.00	38.00	27.34***	NA	18.94	17.00	1.00	12	NA

** Gear Operator or Actuation Recommended*
*** Top (2) holes in each flange are tapped 3/4-10 UNC-2B*
**** Dimension to top of stem (No handle)*

ASME CLASS 300, FULL PORT, FLANGED Dimensions in Inches

	Size	A	B	C	D	E	F	G	H	J	K
FIGURE 1	1"	1.17	3.75	7.50	5.69	6.65	3.47	3.50	0.75	4	NA
	1.5"	1.50	4.75	9.50	6.09	8.40	4.39	4.50	0.88	4	NA
FIGURE 2	2"	2.25	5.56	11.13	8.89	18.00	5.50	5.00	0.75	8	3/4" SCH.40
	3"	3.00	7.62	15.25	9.27	30.00	5.88	6.63	0.88	8	3/4" SCH.40
FIGURE 3	4"	4.50	9.00	18.00	13.52	45.00	8.07	7.88	0.88	8	1.25" SCH.80
	6"*	6.00	11.00	22.00	14.99	45.00	9.54	10.63	0.88	12	1.25" SCH.80
FIGURE 4	8"*	8.00	13.50	27.00	18.87***	NA	13.10	13.00	1.00	12**	NA
	10"*	10.00	16.25	32.50	25.54***	NA	17.14	15.25	1.13	16	NA
	12"*	12.00	19.00	38.00	27.34***	NA	18.94	17.75	1.25	16	NA

**Gear Operator or Actuation Recommended*
***Top 2 holes in each flange are tapped 7/8-9 UN-2B*
**** Dimension to top of stem (No handle)*

ASME CLASS 600, FULL PORT, FLANGED Dimensions in Inches

	Size	A	B	C	D	E	F	G	H	J	K
FIGURE 1	1"	1.17	5.00	10.00	6.25	8.40	3.95	3.50	0.75	4	NA
	1.5"	1.50	6.25	12.50	7.10	8.40	4.79	4.50	0.88	4	NA
FIGURE 2	2"	2.25	6.50	13.00	9.00	18.00	5.61	5.00	0.75	8	3/4" SCH.40
	3"	3.00	8.75	17.50	9.40	30.00	6.01	6.63	0.88	8	3/4" SCH.40
FIGURE 3	4"*	4.50	10.00	20.00	13.64	45.00	8.19	8.50	1.00	8	1.25" SCH.80
	6"*	6.00	13.00	26.00	15.24	45.00	9.79	11.50	1.12	12	1.25" SCH.80
FIG 4	8"*	8.00	15.62	31.25	19.63***	NA	13.86	13.75	1.25	12**	NA

**Gear Operator or Actuation Recommended.*
***Top 2 holes in each flange are tapped 1-1/8-8 UN-2B*
****Dimension to top of stem (No handle)*

TOP ENTRY BALL VALVES

ASME Class 300 & 600, Full Port, Socket Weld

DIMENSIONS

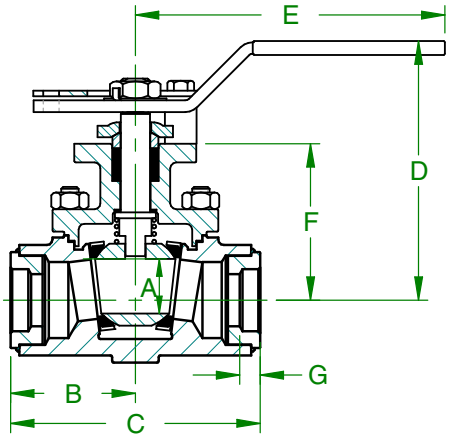


FIGURE 1

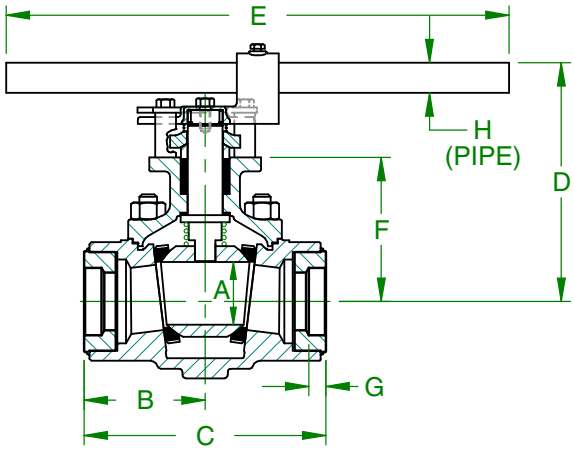


FIGURE 3

ASME CLASS 300, FULL PORT, SOCKET WELD Dimensions in Inches

	Size	A	B	C	D	E	F	G	H
FIGURE 1	1"	1.17	2.68	5.36	5.57	6.65	3.36	0.38	NA
FIGURE 1	1.5"	1.50	3.05	6.10	6.36	8.40	4.06	0.55	NA
FIG 3	2"	2.25	4.34	8.67	8.55	18.00	5.16	0.62	3/4" SCH.40

ASME CLASS 600, FULL PORT, SOCKET WELD Dimensions in Inches

	Size	A	B	C	D	E	F	G
FIGURE 1	1"	1.17	2.81	5.61	5.98	8.40	3.68	0.38
FIGURE 1	1.5"	1.50	3.18	6.36	6.57	8.40	4.27	0.55

TOP ENTRY BALL VALVES

ASME Class 300 & 600, Full Port, NPT

DIMENSIONS

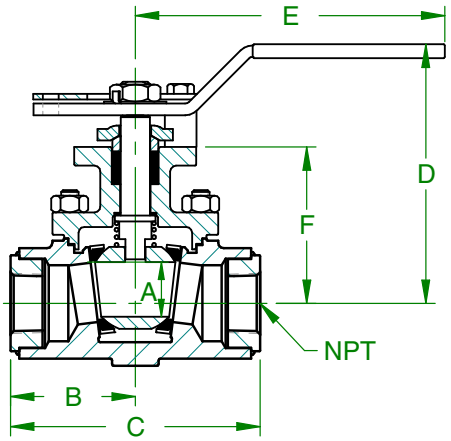


FIGURE 2

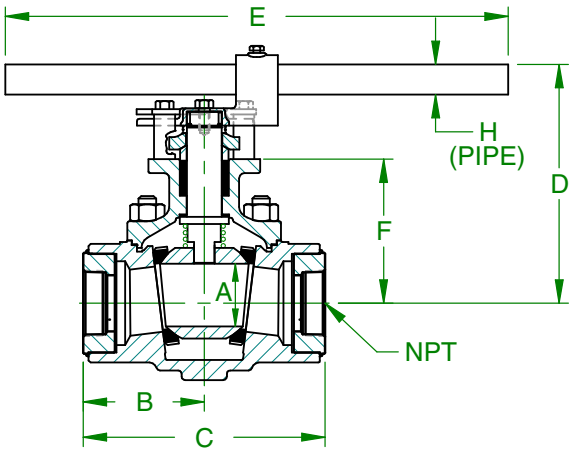


FIGURE 4

ASME CLASS 300, FULL PORT, NPT Dimensions in Inches

	Size	A	B	C	D	E	F	G
FIGURE 2	1"	1.17	2.68	5.36	5.57	6.65	3.36	NA
	1.5"	1.50	3.05	6.10	6.36	8.40	4.06	NA
FIG 4	2"	2.25	4.34	8.67	8.55	18.00	5.16	3/4" SCH.40

ASME CLASS 600, FULL PORT, NPT Dimensions in Inches

	Size	A	B	C	D	E	F
FIGURE 2	1"	1.17	2.81	5.61	5.98	8.40	3.68
	1.5"	1.50	3.18	6.36	6.57	8.40	4.27

TOP ENTRY BALL VALVES

Class 300, Full Port, Butt Weld

DIMENSIONS

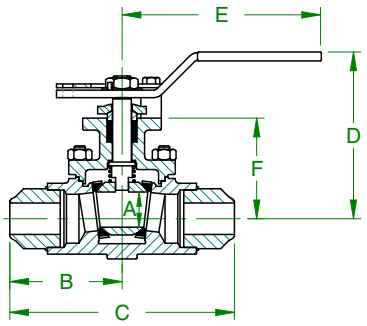


FIGURE 1

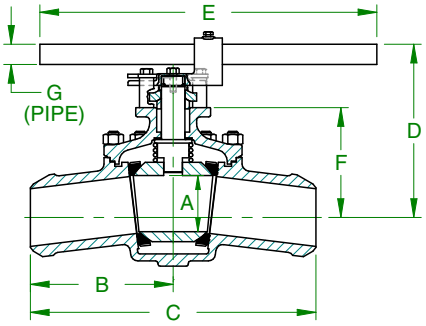


FIGURE 2

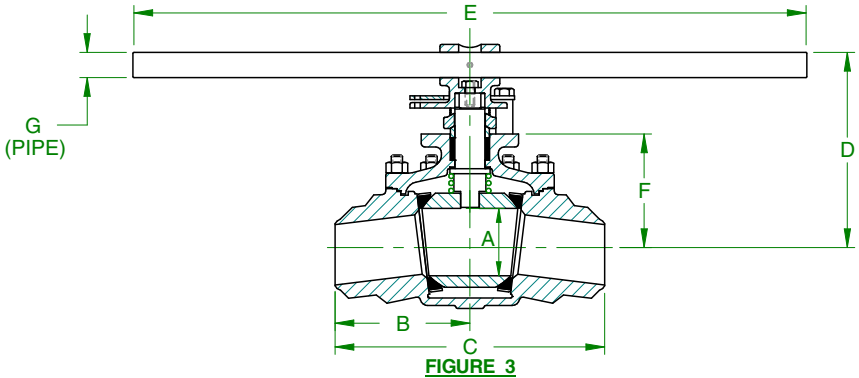


FIGURE 3

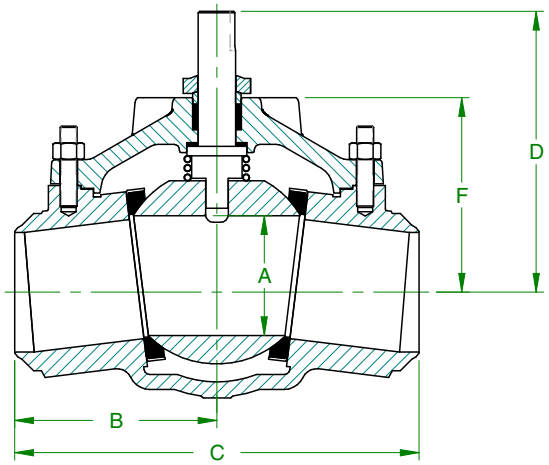


FIGURE 4

ASME CLASS 300, FULL PORT, BUTTWELD Dimensions in Inches

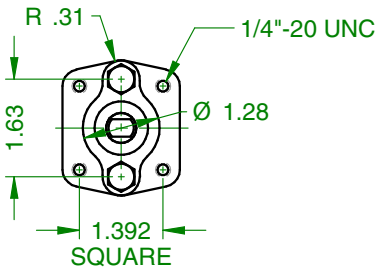
	Size	A	B	C	D	E	F	G
FIGURE 1	1"	1.17	3.75	7.50	5.57	6.65	3.36	NA
	1.5"	1.50	4.75	9.50	6.36	8.40	4.06	NA
	2"	2.25	5.56	11.13	8.89	18.00	5.50	3/4" SCH.40
FIG 2	3"	3.00	7.63	15.25	9.27	30.00	5.87	3/4" SCH.40
FIGURE 3	4"	4.50	9.00	18.00	13.52	45.00	8.07	1.25" SCH.80
	6"	6.00	11.00	22.00	14.99	45.00	9.54	1.25" SCH.80
FIG 4	8"	8.00	13.50	27.00	18.88*	NA	13.11	NA

**Dimension to top of stem (no handle)*

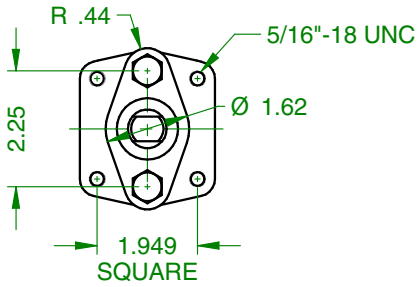
TOP ENTRY BALL VALVES

Actuation Mounting Pad Details

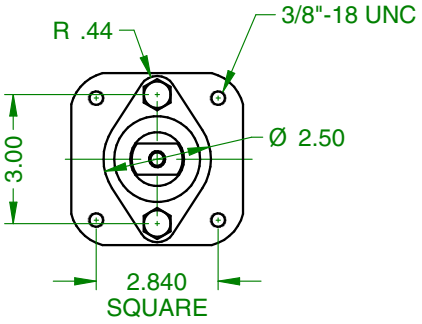
DIMENSIONS



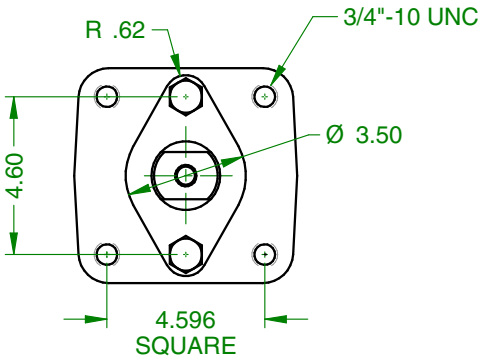
DETAIL A



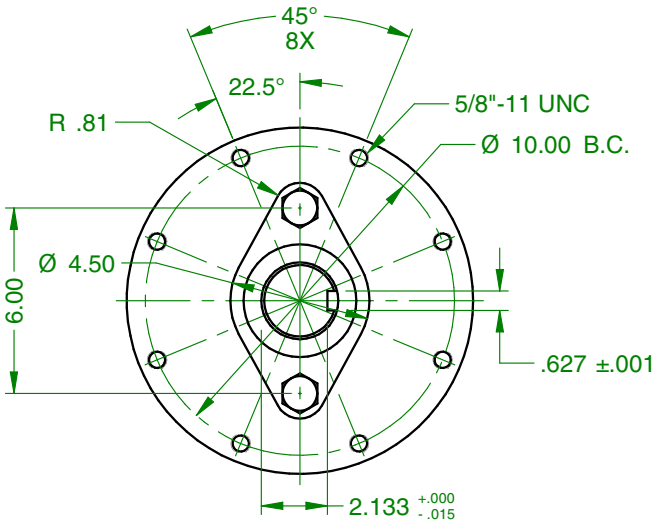
DETAIL B



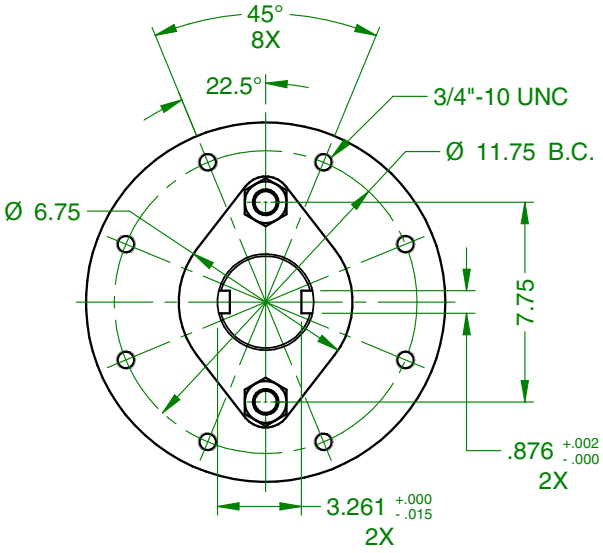
DETAIL C



DETAIL D



DETAIL E

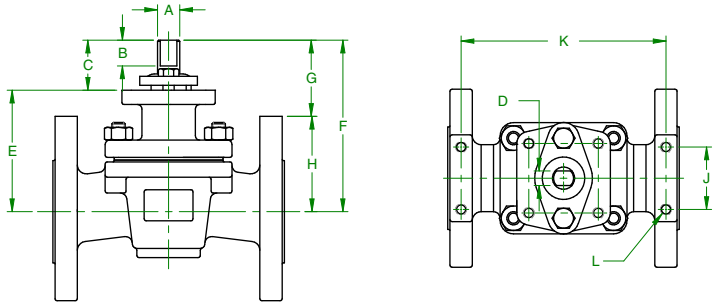


DETAIL F

TOP ENTRY BALL VALVES

Actuation Mounting - Standard Port, Flanged

DIMENSIONS



ASME CLASS 150, STANDARD PORT, FLANGED

Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1/2"	DETAIL A	0.500	0.48	1.00	0.287	2.88	3.88	NA	NA	NA	NA	NA
3/4"						2.94	3.94	1.58	2.36	1.75	4.06	5/16"-18
1"						2.97	3.97	1.29	2.46	1.75	4.43	5/16"-18
1.5"	DETAIL B	0.625	0.72	1.40	0.412	3.41	4.82	2.14	2.68	1.75	5.75	5/16"18
2"		0.750	0.80	1.57	0.477	4.24	5.81	2.51	3.30	2.25	6.24	5/16"-18
3"	DETAIL C	1.250	0.50	1.70	0.725	5.16	6.85	2.97	3.88	3.50	7.18	3/8"-16
4"						5.29	6.98	2.35	4.63	4.00	8.19	7/16"-14
6"	DETAIL D	2.000	1.00	2.73	1.375	7.59	10.32	4.70	5.62	4.00	14.25	7/16"-14
8"						8.79	11.52	4.52	7.00	5.00	16.75	1/2"-13
10"	DETAIL E	2.490	2.25*	5.77	NA	11.63	17.40	8.40	9.00	7.00	19.75	3/4"-10
12"						13.69	19.46	NA	NA	NA	NA	NA

**Keyway length*

ASME CLASS 300, STANDARD PORT, FLANGED

Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1/2"	DETAIL A	0.500	0.48	1.00	0.287	2.88	3.88	NA	NA	NA	NA	NA
3/4"						3.03	4.03	1.58	2.45	1.75	5.31	5/16"-18
1"						3.06	4.04	1.48	2.56	1.75	5.75	5/16"-18
1.5"	DETAIL B	0.625	0.72	1.40	0.412	3.47	4.88	1.58	3.30	1.75	6.63	5/16"-18
2"		0.750	0.80	1.57	0.477	4.33	5.90	2.25	3.65	2.25	7.56	5/16"-18
3"	DETAIL C	1.250	0.50	1.70	0.725	5.16	6.85	2.60	4.25	3.50	9.88	3/8"-16
4"						5.29	6.98	1.85	5.13	4.00	10.69	7/16"-14
6"	DETAIL D	2.000	1.00	2.73	1.375	7.59	10.32	3.94	6.38	4.00	14.31	7/16"-14
8"						8.79	11.52	3.77	7.75	5.00	18.06	1/2"-13
10"	DETAIL E	2.490	2.25*	5.77	NA	11.63	17.40	8.40	9.00	7.00	20.44	3/4"-10
12"						13.69	19.46	NA	NA	NA	NA	NA

**Keyway length*

ASME CLASS 600, STANDARD PORT, FLANGED

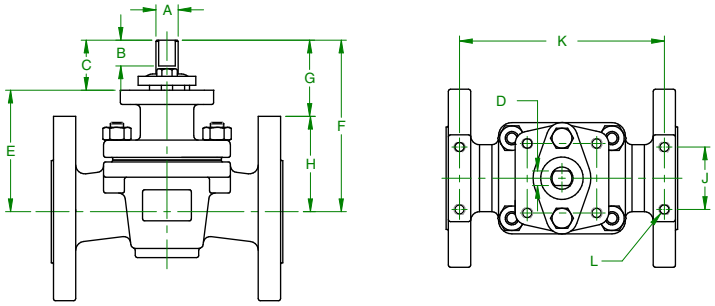
Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1/2"	DETAIL B	0.625	0.72	1.40	0.412	3.41	4.82	NA	NA	NA	NA	NA
3/4"						3.65	5.06	2.62	2.44	2.38	6.32	3/8"-16
1"						3.71	5.11	2.55	2.56	2.38	7.25	3/8"-16
1.5"		0.750	0.80	1.57	0.477	3.91	5.48	2.23	3.25	2.75	8.06	1/2"-13
2"						4.70	6.27	2.89	3.38	3.50	9.94	1/2"-13
3"	DETAIL C	1.250	0.50	1.70	0.725	5.38	7.08	2.83	4.25	4.75	12.25	1/2"-13
4"						5.69	7.38	1.88	5.50	5.50	15.00	1/2"-13
6"	DETAIL D	2.000	1.00	2.73	1.375	7.84	10.57	3.45	7.12	7.00	19.62	3/4"-10
8"						9.79	12.52	4.15	8.37	7.00	23.13	3/4"-10

TOP ENTRY BALL VALVES

Actuation Mounting - Full Port, Flanged

DIMENSIONS



ASME CLASS 150, FULL PORT, FLANGED Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1"	DETAIL B	0.625	0.72	1.40	0.412	3.44	4.85	2.47	2.38	1.75	6.44	5/16"-18
1.5"		0.750	0.80	1.57	0.477	4.35	5.92	1.71	2.63	1.75	8.06	5/16"-18
2"	DETAIL C	1.250	0.50	1.70	0.725	5.46	7.16	4.03	3.13	2.25	9.68	5/16"-18
3"						5.77	7.46	3.58	3.88	3.50	12.48	3/8"-16
4"	DETAIL D	2.000	1.00	2.73	1.375	8.01	10.74	5.70	5.04	4.00	15.81	7/16"-14
6"						9.51	12.24	6.08	6.16	4.00	20.25	1/2"-13
8"	DETAIL E	2.490	2.25*	5.77	NA	12.95	26.38	NA	NA	NA	NA	NA
10"	DETAIL F	3.740	3.75*	8.40	NA	17.14	25.56	NA	NA	NA	NA	NA
12"						18.94	25.54	NA	NA	NA	NA	NA

**Keyway length*

ASME CLASS 300, FULL PORT, FLANGED Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1"	DETAIL B	0.625	0.72	1.40	0.412	3.47	4.88	2.50	2.38	1.75	6.69	5/16"-18
1.5"		0.750	0.80	1.57	0.477	4.39	5.96	1.20	3.19	1.75	8.63	5/16"-18
2"	DETAIL C	1.250	0.50	1.70	0.725	5.50	7.19	3.81	3.38	2.25	9.90	5/16"-18
3"						5.88	7.57	3.23	4.25	3.50	13.68	3/8"-16
4"	DETAIL D	2.000	1.00	2.73	1.375	8.07	10.80	5.67	5.13	4.00	16.50	7/16"-14
6"						9.54	12.27	5.36	6.91	4.00	20.38	1/2"-13
8"	DETAIL E	2.490	2.25*	5.77	NA	13.10	26.38	NA	NA	NA	NA	NA
10"	DETAIL F	3.740	3.75*	8.40	NA	17.14	25.56	NA	NA	NA	NA	NA
12"						18.94	25.54	NA	NA	NA	NA	NA

**Keyway length*

ASME CLASS 600, FULL PORT, FLANGED Dimensions in Inches

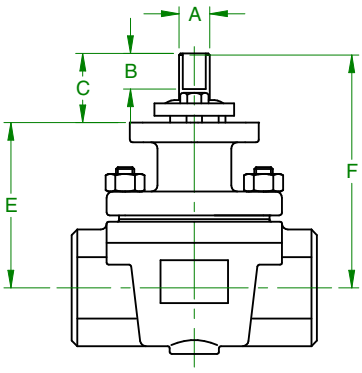
Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1"	DETAIL B	0.750	0.80	1.57	0.477	3.95	5.52	2.96	2.56	2.38	8.75	3/8"-16
1.5"						4.79	6.36	3.11	3.25	2.75	11.06	1/2"-13
2"	DETAIL C	1.250	0.50	1.70	0.725	5.61	7.31	3.85	3.46	3.50	11.38	1/2"-13
3"						6.01	7.71	3.46	4.25	4.75	15.56	1/2"-13
4"	DETAIL D	2.000	1.00	2.73	1.375	8.19	10.92	5.42	5.50	5.50	17.75	1/2"-13
6"						9.79	12.52	5.40	7.12	7.00	23.44	3/4"-10
8"	DETAIL E	2.490	2.25*	5.77	NA	13.86	19.63	NA	NA	NA	NA	NA

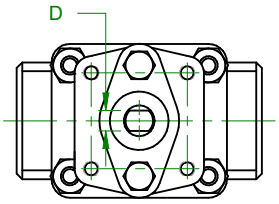
**Keyway length*

TOP ENTRY BALL VALVES

Actuation Mounting - Socket Weld & NPT

DIMENSIONS





ASME CLASS 300, STANDARD PORT, SOCKET WELD & NPT Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F
1/2"	DETAIL A	0.500	0.48	1.00	0.287	2.88	3.88
3/4"						2.88	3.88
1"						3.12	4.12
1.5"	DETAIL B	0.625	0.72	1.40	0.412	3.40	4.80
2"		0.750	0.80	1.57	0.477	4.34	5.91
3"	DETAIL C	1.250	0.50	1.70	0.725	5.16	6.86

ASME CLASS 300, FULL PORT, SOCKET WELD & NPT Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F
1"	DETAIL B	0.625	0.72	1.40	0.412	3.40	4.80
1.5"		0.750	0.80	1.57	0.477	4.34	5.91
2"	DETAIL C	1.250	0.50	1.70	0.725	5.16	6.86

ASME CLASS 600, STANDARD PORT, SOCKET WELD & NPT Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F
1/2"	DETAIL B	0.625	0.72	1.40	0.412	3.41	4.82
3/4"							4.82
1"							4.82
1.5"		0.750	0.80	1.57	0.477	3.68	5.25
2"						4.27	5.84

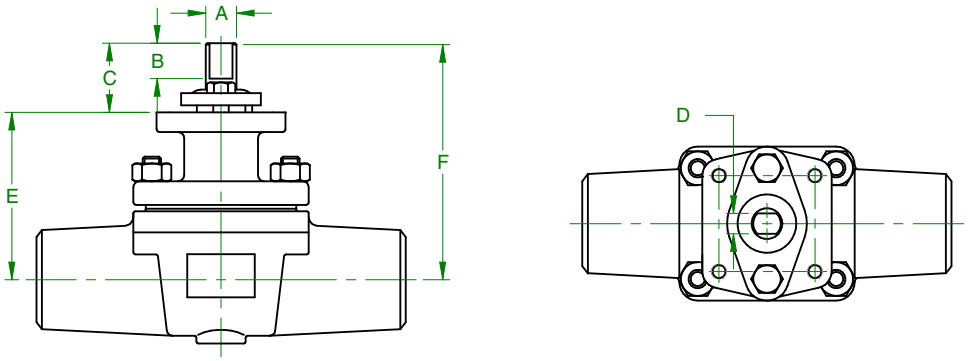
ASME CLASS 600, FULL PORT, SOCKET WELD & NPT Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F
1"	DETAIL B	0.750	0.80	1.57	0.477	3.68	5.25
1.5"						4.27	5.84

TOP ENTRY BALL VALVES

Actuation Mounting - Buttweld

DIMENSIONS



ASME CLASS 300, STANDARD, PORT BUTTWELD Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F
1/2"	DETAIL A	0.500	0.48	1.00	0.287	2.88	3.88
3/4"						3.03	3.88
1"						3.06	4.12
1.5"	DETAIL B	0.625	0.72	1.40	0.412	3.40	4.80
2"		0.750	0.80	1.57	0.477	4.34	5.91
3"	DETAIL C	1.250	0.50	1.70	0.725	5.16	6.86
4"						5.29	6.99
6"	DETAIL D	2.000	1.00	2.73	1.375	7.59	10.32
8"						9.00	11.71

ASME CLASS 300, FULL PORT, BUTTWELD Dimensions in Inches

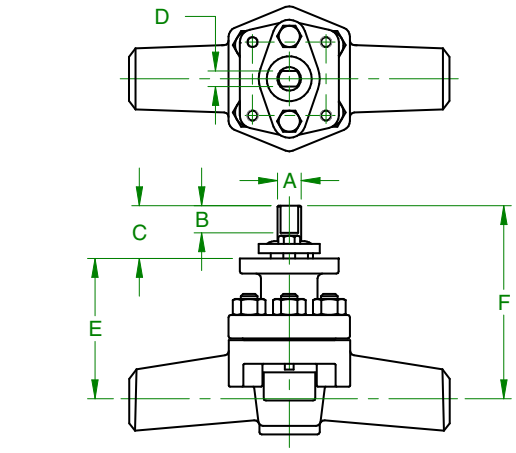
Size	Mtg Pad	A	B	C	D	E	F
1"	DETAIL B	0.625	0.72	1.40	0.412	3.36	4.76
1.5"		0.750	0.80	1.57	0.477	4..06	5.63
2"	CONTACT FACTORY						
3"	DETAIL C	1.250	0.50	1.70	0.725	5.87	7.57
4"	DETAIL D	2.000	1.00	2.73	1.375	8.07	10.80
6"						9.54	12.27
8"	DETAIL E	2.490	2.25*	5.77	NA	13.11	18.88

**Keyway length*

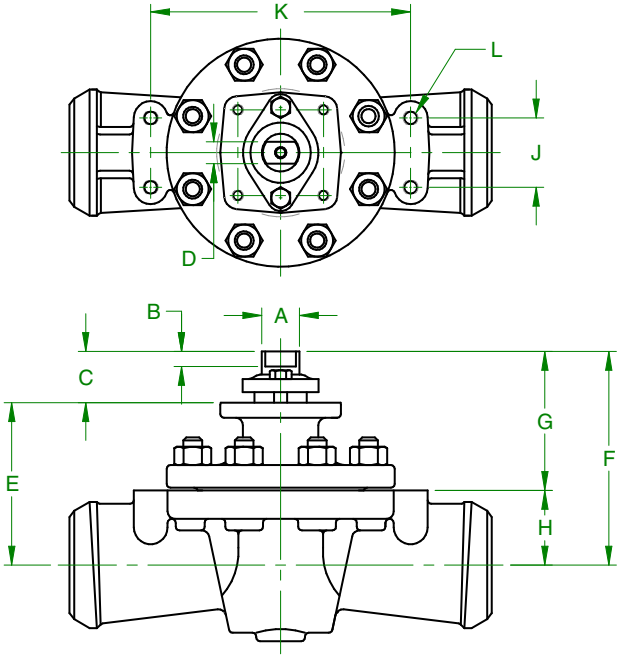
TOP ENTRY BALL VALVES

Actuation Mounting - Class 600, Standard Port, Butt Weld

DIMENSIONS



CLASS 600 BUTTWELD STANDARD PORT - SIZES 1/2"THRU 2"



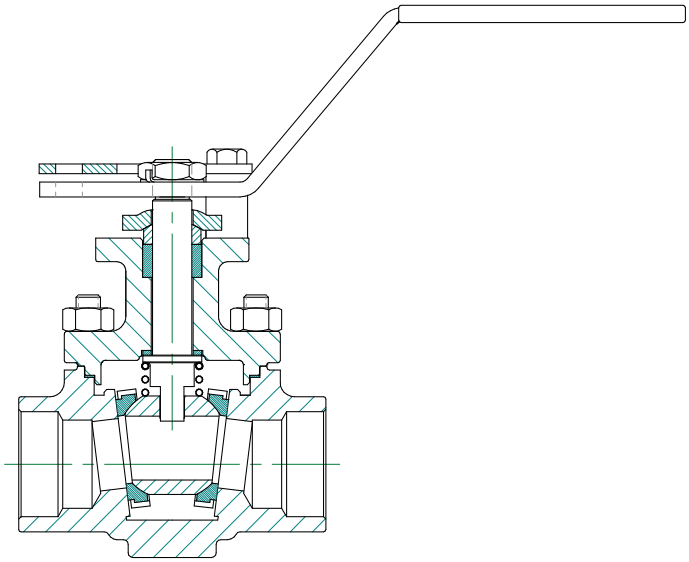
CLASS 600 BUTTWELD STANDARD PORT - SIZES 3"THRU 6"

ASME CLASS 600, STANDARD PORT, BUTTWELD Dimensions in Inches

Size	Mtg Pad	A	B	C	D	E	F	G	H	J	K	L
1/2"	DETAIL B	0.625	0.72	1.40	0.412	3.41	4.82	NA				
3/4"						3.66	5.06					
1"						3.72	5.11					
1.5"		0.750	0.80	1.57	0.477	3.92	5.48					
2"						4.73	6.27					
3"	DETAIL C	1.250	0.50	1.70	0.725	5.38	7.08	4.61	2.47	2.42	8.62	1/2"-13
4"						5.69	7.38	4.36	3.02	2.80	11.00	1/2"-13
6"	DETAIL D	2.000	1.00	2.73	1.375	7.84	10.57	6.38	4.19	4.25	15.00	3/4"-10

TOP ENTRY BALL VALVES

Standard Bonnets



STANDARD BONNET
ISO 5211 Mounting Pad

The valve's seat material "code" in the Product Numbering System determines the default stem seal material (default is either PTFE V-Rings or flexible graphite rings).

Note: To meet a wide range of application requirements, a variety of materials are offered. See options in the "How to Specify" section.

PTFE V-RING STEM SEALS

- Extremely low coefficient of friction
- Molded V-shaped rings are "spring-loaded" and self adjusting.
- Provides very good stem seal performance

Enhancement – Live Loaded Packing (add suffix to product number)
"-76" Suffix – Live loaded valve with handle or lever.
"-77" Suffix – Live loaded valve with actuator or manual gear.

Live-loaded, V-ring packing assures long maintenance-free operation by maintaining a constant packing force without over-compression. Corrosion-resistant stainless steel conical washers store compressing energy; consequently, the valve can be cycled more without stem seal adjustments

FLEXIBLE GRAPHITE RING STEM SEALS

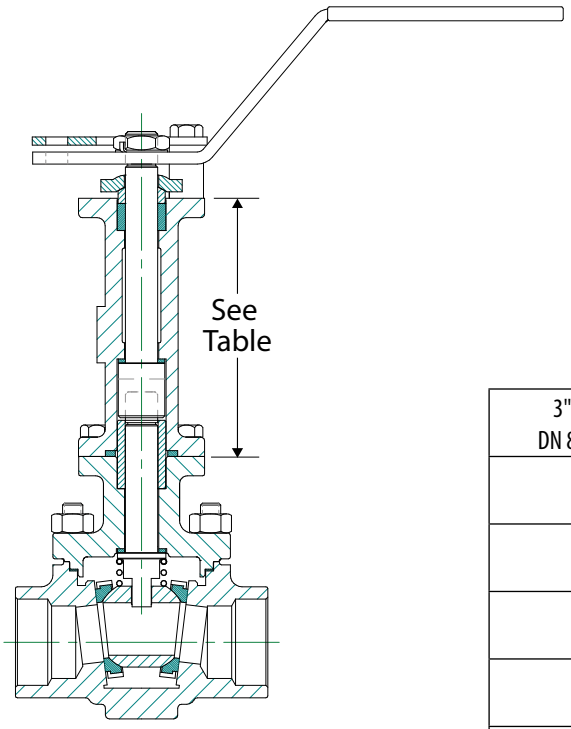
- Die Formed Rings

Enhancement – Low Emissions
"EP" Suffix – Cup and cone graphite rings (V-shaped) are often specified for applications where fugitive emissions must be controlled.

Enhancement – Live Loaded Packing
"-76" Suffix – Live loaded valve with handle or lever.
"-77" Suffix – Live loaded valve with actuator or manual gear.

TOP ENTRY BALL VALVES

Extended Bonnets



EXTENDED BONNET
(Add "-70" Suffix)

EXTENDED BONNET HEIGHT

	ASME Class 150 ASME Class 300		ASME Class 600	
	Std Port in. (mm)	Full Port in. (mm)	Std Port in. (mm)	Full Port in. (mm)
3" & Smaller DN 80 & Smaller	4" (102)	4" (102)	4" (102)	4" (102)
4" DN 100	4" (102)	6.5" (165)	4" (102)	6.5" (165)
6" DN 150	6.5" (165)	6.5" (165)	6.5" (165)	6.5" (165)
8" DN 200	6.5" (165)	10" (254)	6.5" (165)	10" (254)
10" DN 250	10" (254)	12.5" (318)		
12" DN 300	10" (254)	12.5" (318)		

ADVANTAGES:

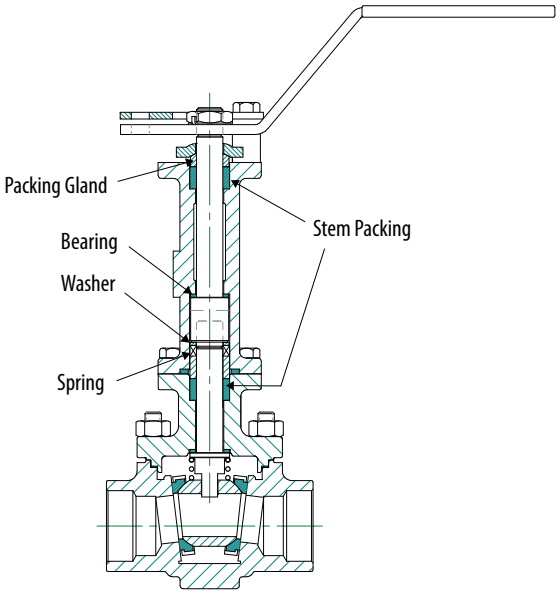
☐ Extended bonnets provide excellent performance in higher temperature or semi cryogenic applications.
- The extended bonnet design moves the stem seals further away from the process flow's temperature, and the stem seals' temperature is closer to ambient temperature.

☐ Extended bonnets move the packing adjustment at least 4"; therefore, installed insulation typically will not need to be disturbed to adjust the stem packing.
- If and when stem leakage occurs, it can be immediately observed and corrective action taken without insulation removal.

☐ A valuable feature of the Extended Bonnet is that it is field retrofitable.
- In addition to being able to order valves with several bonnet styles direct from the factory, pre-assembled kits are available with the stem, bonnet, packing, gland, plate and nuts assembled together and properly torqued for dependable performance. Contact your local Apollo Representative for kit part numbers for any specific valve or application.

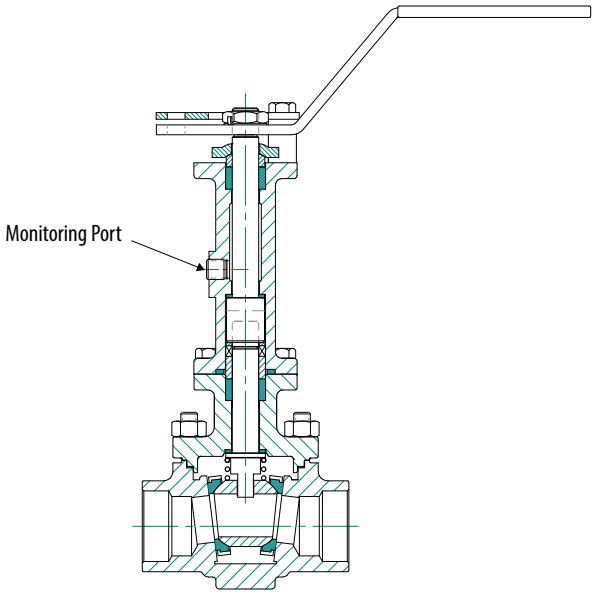
TOP ENTRY BALL VALVES

Double Packed Bonnets



DOUBLE PACKED BONNET (Add "-90" Suffix)

Apollo recommends also specifying live-loading with the "-90" option.



DOUBLE PACKED BONNET WITH PORT (Add "-9P" Suffix)

Apollo recommends also specifying live-loading with the "-9P" option.

The standard Apollo Top Entry Valve bonnet with PTFE V-Rings or Graphite V-Rings ("-EP") provide exceptional fugitive emission performance. *See Standard Bonnet Configuration.*

In conditions where double packed shaft sealing systems are required, Apollo also offers the "-90" and "-9P" sealing systems.

Apollo's Double Packed Bonnets ("-90" and "-9P"):

- ☐ Designed and tested to keep fugitive emissions below 100 parts per million volume (ppmv) in your application for tens of thousands of cycles.
- ☐ Installs easily on existing valves or can be purchased with new valves.
- ☐ Helps seal your process to conserve valuable process fluid while protecting the environment against the emission of hazardous or polluting fluids.
- ☐ Longer life and improved reliability of Apollo Double Packed Bonnet systems reduce maintenance cost and downtime.

TOP ENTRY BALL VALVES

Steam Jacketed Top Entry Valves

Conbraco's Apollo® Top Entry Ball Valves are ideally suited for jacketed applications. The top entry concept allows for continued access to stem packings and valve internals for ease of maintenance without disturbing the jacket itself or removing the valve from the pipeline.

Partial jacketing may be used on standard valves. Partial jacketing is applied just to the center section of the valve and does not incorporate the neck area or flanges of the valve. It is generally specified to allow the use of standard flanges and retain conventional flange bolting.

Welded full jacketing may be applied to valves with oversize flanges or standard flanges. (Fully jacketed, standard flange valves have modified flanges with blind tapped stud holes in place of the ordinary through holes.) Valves and jacketing can be supplied in a variety of materials. Common materials are stainless valves with stainless jackets, but exotic combinations such as Alloy 20 valves with carbon steel flanges and carbon steel jacketing have been supplied to meet the performance and cost requirements for specific applications.

Clamp-on jacketing offers flexibility not available in the other configurations. Clamp-on jacketing can be applied to valves already in service, or can be removed and reinstalled on a replacement valve or another similar valve in another application. Clamp-on jackets can be supplied as a weldment or in cast aluminum. A heat transfer compound can be applied between the clamp-on jacket and valve to improve its efficiency.

Combining these jacketed valves with extended bonnets for safe convenient operation, and adding carbon graphite seats or ceramic balls and seats enables the valve to handle a broad range of viscous materials and temperatures.

Full Welded Jacket

Full Welded Jacket with Oversize Flanges

Clamp-on Jacket

TOP ENTRY BALL VALVES

Special Applications

"FIRE-SAFE" REQUIREMENTS

Seat and seal arrangements are available to address valves in applications where performance during and immediately after a fire are a concern. "L" (Multiseal) seat configuration offers "tested" fire-safe performance. Graphite spiral wound gaskets are available for bonnet seals. Die-formed Grafoil® in various configurations provide the stem seals.

ABRASIVE & EROSIVE SERVICES

"Soft Seated" valves for abrasive services feature seat inserts completely confined by metallic components. Some designs feature inner and outer seat support rings, where the inner ring helps shield the seat insert from abrasives in the service. Other designs feature one piece seat holders which completely confine the seat insert and provide the same function in protecting the soft seat from abrasive particles in the flow stream.

In addition to the seat configuration options, resilient and rigid seat materials are available. The rigid seat choices include carbon-graphite, ceramic, peek, and carbon reinforced peek. The seats and the ball are both produced from ceramic in the one case. Any of these seats provide improved resistance to abrasion and erosion and additionally extend the potential service range to 1000°F (538°C).

For steam services, the #5 seat, a RPTFE containing 55% bronze and 5% molybdenum disulfide, is an excellent choice as is the #4 carbon-graphite seat.

CHLORINE SERVICE

Valves intended for service in dry chlorine require specific alloy selections, design features, cleaning and testing procedures. In accordance with the guidelines established by "The Chlorine Institute", Pamphlet 6, Hastelloy trimmed carbon steel valves (model numbers starting with "CH") are suggested, and M35-1 trimmed carbon steel valves (model numbers beginning "CM") are the alternative for dry chlorine. All Hastelloy or M35-1 valves are also available.
NOTE: Stainless steel valves or components are not recommended.

Selecting the required "-26" feature insures a valve that has been vented, cleaned, and tested to comply with the requirements of The Chlorine Institute Pamphlet 6.

OXYGEN SERVICE

For this application, cleanliness is of utmost importance. Apollo Top Entry Valves specified for oxygen service (option "-57") are subjected to rigorous preparation procedures including special pre-cleaning and inspection followed by ultrasonic cleaning and more intense inspection. All to insure that the finished valve is free of burrs and sharp edges as well as cleaned of hydrocarbon residues and particulate matter. Once valves destined for oxygen service enter Conbraco's clean room for preparation, they do not leave until they have been cleaned, assembled, thoroughly tested, inspected, tagged and bagged to meet customer requirements.

All Apollo Top Entry Valves have "anti-static" features designed in. Valves for oxygen service must also be fitted with PTFE and packing. When planning to insulate valves, consider specifying one of our extended bonnet options.

HIGH TEMPERATURE SERVICE

For any applications utilizing graphite, carbon graphite, peek, carbon reinforced peek, or ceramic seats, a ball stop should be incorporated into the valve design (option "RS"). This option is suggested at any temperature but it becomes a necessity above 500°F (260°C) or when using ceramic seats. The ball stop prevents the ball and seat from sliding down the 7° wedge when expansion caused by the temperature increase widens the wedge. If the ball was permitted to slide down the wedge, the valve would be locked tight when cooling caused the wedge to contract.

TOP ENTRY BALL VALVES

Flow Coefficients

FLOW OF LIQUIDS

$$Q = C_V\sqrt{\frac{P_D}{S_G}} \quad \text{or} \quad P_D = \frac{Q^2(S_G)}{(C_V)^2}$$

Where: Q = Flow in US GPM
PD = Pressure Drop (PSI)
SG = Specific Gravity at flow conditions
CV = Valve Flow Coefficient

FLOW OF GASES

$$P_D = \frac{5.4\,(10^{-7})\,Q^2\,(T)\,(S_G)}{[(C_V)^2\,(P_2)]}$$

$$Q = 1360\,(C_V)\sqrt{\frac{[(P_D)\,(P_2)]}{[(S_G)\,(T)]}}$$

Where: Q = Flow in SCFM
PD = Pressure Drop (PSI)
P2 = Outlet Pressure PSIA
T = Temp.(°R) or (°F + 460)
SG = Specific Gravity at flow conditions
CV = Valve Flow Coefficient

The table below presents the Flow Coefficients (Cv) for Apollo® Top Entry Ball Valves. This number represents the flow (in gallons per minute of water) required to produce a 1 psig pressure drop across the valve. The data shown is for a valve in the full open position. Data for various degrees of open are available upon request. The values shown represent the average for several tests which highlighted the variability of Flow Coefficients. It is not unreasonable to expect a 10% to 20% deviation for a specific valve from the nominal figures shown.

Knowing specific system characteristics; such as line size, flow rate, temperature and pressure and knowing specific fluid characteristics; such as specific gravity, density, or compressibility factor allows the verification of the pressure drop across a known valve. Or conversely, in the absence of a valve size and knowing an acceptable pressure drop under the described flow conditions, it is possible to select an appropriately sized valve.

APOLLO® TOP ENTRY FULL PORT VALVE FLOW COEFFICIENTS

Valve Size	150 Class Flanged	300 Class Flanged	600 Class Flanged
1"	95	90	85
1-1/2"	230	225	200
2"	435	420	400
3"	1050	1000	950
4"	1950	1900	1800
6"	4800	4300	4300
8"	9100	8700	8000

APOLLO® TOP ENTRY VALVE FLOW COEFFICIENTS

Valve Size	150 Class Flanged End	300 Class Flanged End	300 Class Buttweld End	300 Class Socket Weld	300 Class NPT	600 Class Flanged End	600 Class Buttweld End	600 Class Socket Weld	600 Class NPT
1/2"				20	20			20	20
3/4"	50	50	50	30	30	50	50	30	30
1"	60	60	60	40	40	60	60	40	40
1-1/2"	100	100	100	70	70	100	100	70	70
2"	180	180	180	120	120	190	190	120	120
3"	330	400	400	260	260	410	410	260	260
4"	600	720	720				780	780	
6"	1,500	1,500	1,500				1,700	1,700	
8"	2,500	2,500					3,100		
10"	3,800	3,800					4,900		

TOP ENTRY BALL VALVES

Operating Torque

There are several elements involved in developing an appropriate "in-service" valve operating torque. Selection of the basic valve torque constant, shown on this page establishes the nominal valve torque based on the valve size, specified valve seat and the approximate working pressure.

Armed with the nominal valve operating torque, adjustments are now made to account for individual service conditions. These factors are selected from the table at the lower right. They are additive, or combined in series and used to arrive at the "in-service" torque.

EXAMPLE

Selected Valve:
3" 150 w/"M" seat
(Model: CS-BM0-01)

Torque Constant:
1250 in-lbs

Service Factors:

ON/OFF Service	0.0
Clean Dry Air	0.3
Weekly Operation	0.2
Net Service Factor	0.5

"In Service" Valve Torque:
1250 x (1 + 0.5) = 1875 in-lbs
(This is the valve torque used to select an actuator.)

TORQUE CONSTANTS FOR TOP ENTRY BALL VALVES

Seats	Valve Size Std. Port (Inches)	Valve Size Full Port (Inches)	Differential Pressures (psig) (In.-Lbs.)						
			100	285	500	740	1480	LSST*	Grafoil® Adder
5	1/2 thru 1	1/2 thru 3/4	85	110	140	180	290	170	68
6**	1-1/2	1	205	260	330	415	660	410	96
C	2	1-1/2	350	430	550	735	1,200	700	127
D	3	2	950	1,250	1,650	2,000	3,200	1,900	245
G	4	3	2,000	2,500	3,300	4,100	6,500	4,000	399
L	6††	4††	5,300	6,700	8,200	11,400	18,000	10,600	661
M	8††	6††	11,000	14,000	18,500	25,000	36,000	22,000	900
U**	10††	8††	18,500	22,000	30,000	40,000	62,000	37,000	1,326
	1/2 thru 1	1/2 thru 3/4	115	160	210	260	450	230	68
4	1-1/2	1	270	370	480	590	1,000	540	96
8	2	1-1/2	475	650	860	1,050	1,750	950	127
9	3	2	1,250	1,850	2,400	2,950	4,900	2,500	245
B	4††	3††	2,700	3,700	4,900	5,900	10,000	5,400	399
H	6††	4††	7,410	10,100	13,400	16,400	25,300	14,800	661
N	8††	6††	15,000	20,000	26,000	34,500	56,000	30,000	900
	10††	8††	25,000	32,000	45,000	60,000	96,000	50,000	1,326

**LSST - Long Stand Still Torque*
***Rated torque for #6 and U seat add 30%*
†Rated torque for #9 ceramic seat is to be increased by 10%
††Gear operator or actuation recommended

BALL VALVE TORQUE ADJUSTMENT FACTORS

PROVISION	CONDITION	FACTOR
Type of Operation	On/Off Service	0
	Modulating Service	0.25
Process Media	Liquid, Clean Particle Free	0
	Liquid, Dirty, Slurry, Raw Water	0.3 to 0.8
	Liquid, Black Liquor, Lime Slurry	0.8
	Liquid, Oil, Lubricating	0
	Liquid, Viscous, Molasses	0.3
	Gas, Clean & Wet	0
	Gas, Dry	0.3 to 0.5
	Gas, Dirty, Air Slurry, Natural Gas	0.5 to 1
	Oxygen, Chlorine	0.5
	Superheated Steam, Saturated Steam	Refer to Process Temp.
Frequency of Operation**	Once Per Day or More	0
	Once Per Week	0.2
	Once Per Month	0.5
	Less Than Once Per Month (LSST)	1
Process Temperature	Applications Above 225 Deg F (107°C)	0.50
	Applications Below -20 Deg F (-29°C)	0.25
Option "-49"	Assembled Dry	0.3
Option "-57"	Oxygen Cleaned	0.3
Option "-67"	Cleaned for Industrial Gas	0.3
Option "-90"	Double Packed Extended Bonnet	0.2
Customer Specified	Prescribed Safety Factor	0.2 to 2

*** If accounting for LSST disregard frequency of operation.*

TOP ENTRY BALL VALVES

How to Specify Apollo Top Entry Ball Valves

C	S	J	L
BODY MATERIAL	**TRIM MATERIAL**	**CLASS, PORT, ENDS**	**SEAT**

CARBON STEEL CASTING
C - ASTM A216 Grade WCB

L - A352 LCC
low-temp service
P - A217 C12
chromium-molybdenum high temp service

STAINLESS STEEL CASTING
S - ASTM A351 Grade CF8M
(316 SS)

A - A351 CN7M
(Alloy 20)
B - A351 CF3M*
(316L)
J - A995 CD3MN
(2205 duplex)
K - A995 CD3MWCuN
(2507 super duplex)
R - A351 CN3MN
(AL6XN® super austenitic)

NICKEL BASED ALLOY CASTING
F - ASTM A494 Grade CW6MC
(INCONEL™ 625)
H - A494 CW12MW
(Hastelloy® C)
M - A494 M35-1
(MONEL®)
N - A494 CZ100
Commercially pure nickel
Y - A494 N12MV
(Hastelloy® B-2)

TITANIUM CASTING
T - ASTM B367 Gr C3
Commercially pure titanium

* Flanged Valves Only - CF3M
( ) Represents Close Wrought Equivalent

STAINLESS STEEL
S - 316 SS

A - Alloy 20
B - 316L SS
E - 410 SS
J - 220S Duplex SS
K - 2507 Super Duplex SS
R - AL6XN

NICKEL BASED
F - Inconel
H - Hastelloy C
M - M35-1 (Monel)
D - Hastelloy C Stem, M35-1 Ball
N - Nickel
Y - Hastelloy

TITANIUM
T - Titanium

CLASS 150
Standard Port
B - Flanged
Full Port
E - Flanged

CLASS 300
Standard Port
C - Flanged
D - NPT
G - NPT x Socket Weld
N - Socket Weld
P - Buttweld
R - FLG x Buttweld
S - RTJ Flanges
Full Port
3 - Buttweld
F - Flanged
L - NPT
M - Socket Weld
Y - NPT x Socket Weld

CLASS 600
Standard Port
H - NPT
J - Socket Weld
K - Flanged
Q - NPT x Socket Weld
W - Buttweld
Full Port
4 - NPT
6 - NPT x Socket Weld
7 - Buttweld
T - Socket Weld
U - Flanged

MULTI-SEAL
L - Multi-Seal TFM, API-607 Certified (Figure 3)
M - Multi-Seal (Figure 1)

UHMWPE
6 - UHMWPE (Figure 2)
U - UHMWPE (Figure 1)

GRAPHITE ("HARD" SEAT TIGHTNESS)
4 - Carbon Graphite, 750°F max. (Figure 1)
H - High Temp Graphite, 1000°F max. (Figure 1)

PEEK ("HARD" SEAT TIGHTNESS)
8 - PEEK (Figure 2)
B - PEEK, 30% Carbon Reinforced (Figure 2)

CERAMIC ("HARD" SEAT TIGHTNESS)
9 - Ceramic (Figure 4)

NYLON
N - Nylon

Additional Seats
5 - 55% Bronze, 5% Moly, (Figure 2)
C - PFA (Figure 2)
D - SRPTFE, 60% SS, 40% TFE by weight 50% SS Min (Figure 2)
G - PCTFE (Figure 1)

Figure Numbers in parentheses indicate the Seat Design. See "Seat Data" section for details.

Seat code also dictates default seal material and default suffix. See "Materials" section for details.

Pressure-Temperature ratings are found in the "Pressure-Temperature Ratings" section.

TOP ENTRY BALL VALVES

How to Specify Apollo Top Entry Ball Valves

4	24	
SIZE (IN)	**OPTIONS**	
3 - 1/2"	-01 Default Suffix for "M" and "G" Seats	MODEL REVISION
4 - 3/4"	-24- Default Suffix for 4, 5, 6, 8, 9, B, C, D, H, L, N, U Seats	Assigned by Factory
5 - 1"	*Optional Features may be used alone or in combination*	
7 - 1.5"	*(simply add the suffixes to the Product Number in the order listed below).*	
8 - 2"	*Note: The "-01" suffix is not used if there are additional suffixes.*	
0 - 3"	*Note: Not all combinations are available on all valves.*	
A - 4"	-04- 2.25" Stem Extension	
C - 6"	-10- Stainless Pipe Handle (3" & Larger Carbon Steel only)	
E - 8"	-14- Vented Body Design	
G - 10"	-15- Wheel Handle, Stainless Steel	
H - 12"	-24- Graphite Packing & Spiral Wound Graphite Gasket -- Not always Fire Safe	
	-26- Vented & Cleaned for Chlorine Service (CS, HC, & MO only)	
	-45- No Lever or Nut -- Bare Stem	
	-49- Assembled Dry -- No Lubrication	
	-57- Oxygen Cleaned	
	-67- Cleaned for Industrial Gases	
	-70- Extended Bonnet	
	-73- TFE Packing, Spiral Wound Seals - TFE Fillers	
	-76- Live Loaded - Valve with Lever	
	-77- Live Loaded - Valve with Gear or Actuator	
	-82- Flat Faced Flanges	
	-90- Double Packed Extended Bonnet	
	-9P- Double Packed Extended Bonnet with Port	
	-BB- Titanium & Graphite Spiral Wound Bonnet Gasket	
	-BC- ASTM A193 Grade B7 Bolts	
	-BT- Teflon Coated ASTM A193 Grade B7 Fasteners	
	-CB- Ceramic Ball Only	
	-CS- Ceramic Seat Only	
	-DF- Delta Ferrite Report (SS Only)	
	-DP- Dye Penetrant	
	-EP- V-Ring Graphite Packing	
	-KB- Kolsterised Ball	
	-MG- Manual Gear Operator	
	-MH- Manual Gear Operator with Lockout	
	-MJ- Manual Gear Operator with Oversize handwheel	
	-MK- Manual Gear Operator with Lockout & Lockout	
	-MP- Positive Material Identification	
	-NC- NACE Certified (Rc 22 Max)	
	-NO- Titanium Bolts	
	-PG- No Plastisol Grip on Lever (used in Tobacco plants)	
	-RS- Blow-Out Proof Welded Ball Stop with Safety Cap	
	-SR- Spring return	
	-TC- Hydrostatic Test with Certified Report	
	-TD- Test to API 6D with Certification	
	-TM- Material Traceability	
	-TR- Hydrostatic Test with certification & MTR	
	-TW- Hydrostatic Test with Witness & Certification	
	Butt Weld } Butt Weld valves include a suffix that specifies the end preparation e.g. schedule 10, 40, 80, etc…	

EXAMPLE:
CSJL424A

Carbon Steel Body
316 SS Trim
Class 600
Standard Port
Socket Weld Ends
API-607, Multiseal Seat
3/4"
Spiral Wound Flexible Graphite Gasket
Flexible Graphite Packing
Model Revision = A

NOTE: This is a very limited list of the available options. Contact the factory for specific requirements and availability.

* MG is Generic for Gear Operators. Contact Factory or Price Book for Specific Application and Part No.

TOP ENTRY BALL VALVES

How to Specify Apollo Top Entry Repair Kits

S	S	0	M	5	01	A
	TRIM MATERIAL	**VALVE CLASS**	**SEAT**	**SIZE**	**ADDITIONAL FEATURES**	
S - Default for Top Entry Repair Kit	S - Stainless Steel (Standard) A - Alloy 20 F - Inconel H - Hastelloy C M - Monel T - Titanium	0 - 150/300 1 - 600	4* - Carbon Graphite, 750°F Max. 5 - 55% Bronze, 5% Moly 6 - UHMWPE 8* - PEEK 9* - Ceramic B - 30% Carbon Reinforced PEEK C - PFA D - SRTFE, 60% SS, 40% PTFE by weight G - PCTFE H* - Grade P3310 High Temp Graphite, 1000°F Max. L - API 607 Multiseal M - Multiseal N - Nylon Seat & Ring U - UHMWPE ** Ball will be included in repair kit and will be lapped to the seats for sealing purposes*	5 - 1/2" - 1" 7 - 1-1/2" 8 - 2" 0 - 3" A - 4" C - 6" E - 8" G - 10" H - 12"	01 - Standard (PTFE Packing, RPTFE Body Seal) 24 - Graphite Packing, Spiral Wound Body Seal 26 - Vented, Cleaned for Chlorine Service & Assembled Dry (CS, HC & Monel Only) 57 - Oxygen Cleaned (Also used for -49 and -67) 70 - Extended Bonnet 73 - PTFE Stem Packing w/Spiral Wound PTFE Bonnet Gasket 90 - Extended Bonnet, Double Packed (Also used for -9P Option) BB - Titanium & Graphite Spiral Gasket CB - Ceramic Ball Only CS - Ceramic Seat Only EP - Low Emissions Graphite Packing, Spiral Wound Graphite Body Seal RS - Blow Out Proof Welded Ball Stop with Safety Cap TM - Material Traceability DF - Delta Ferrite Report KB - Kolsterised Ball *There may be cases where multiple options are used. (EX: -90EP, -24RS, -90EPRS)*	A - ISO Bonnet Configuration

STANDARD MATERIAL LIST BY SEAT SELECTION

Seat Designation	Stem Packing	Bonnet Gasket	Stem Bearing	Class	Default Suffix
4	Flexible Graphite	Spiral Wound Graphite	Nitronic 60	All	24
5	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
6	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
8	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
9	Flexible Graphite	Spiral Wound Graphite	Nitronic 60	All	24
B	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
C	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
D	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
G	PTFE	RPTFE	PEEK	150/300	01
		Spiral Wound PTFE	PEEK	600	
H	Flexible Graphite	Spiral Wound Graphite	Nitronic 60	All	24
L	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24
M	PTFE	RPTFE	PEEK	150/300	01
		Spiral Wound PTFE	PEEK	600	
N	Flexible Graphite	Spiral Wound Graphite	Nylon	All	24
U	Flexible Graphite	Spiral Wound Graphite	PEEK	All	24