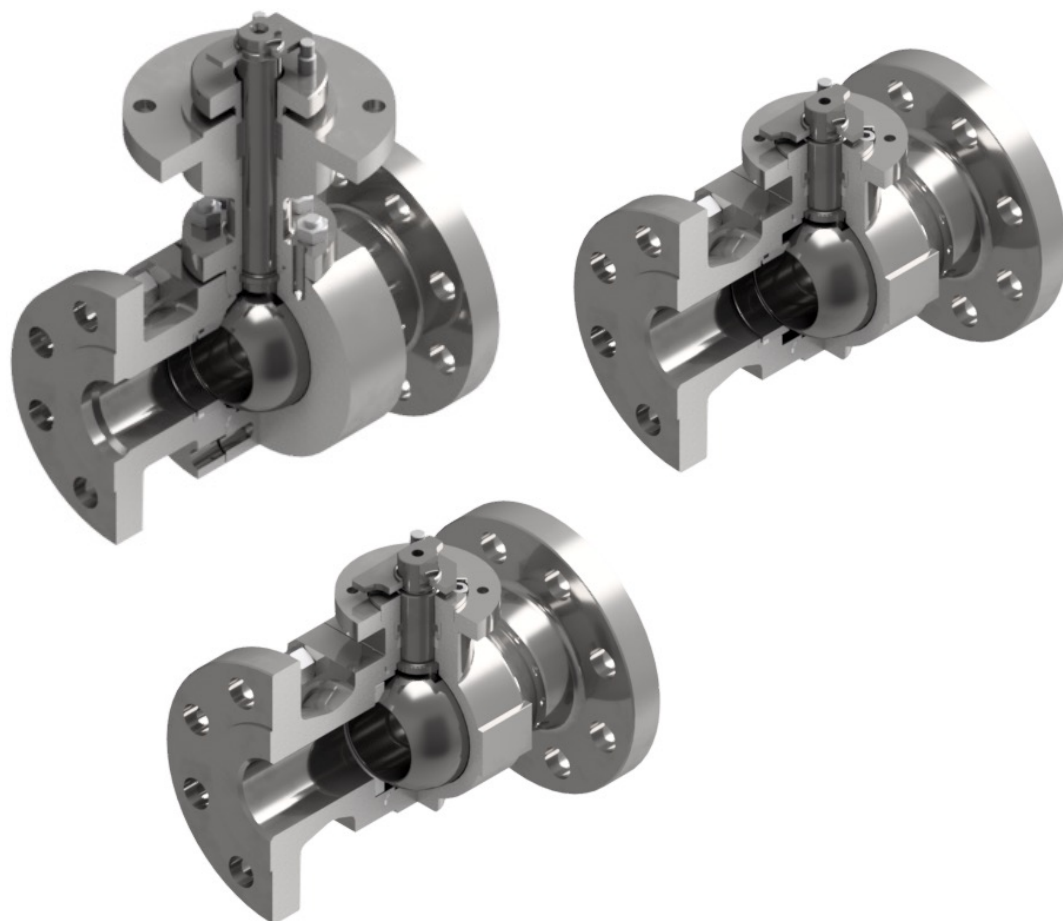


Argus™ FK79

Soft- or Metal-Seated Floating Ball Valve

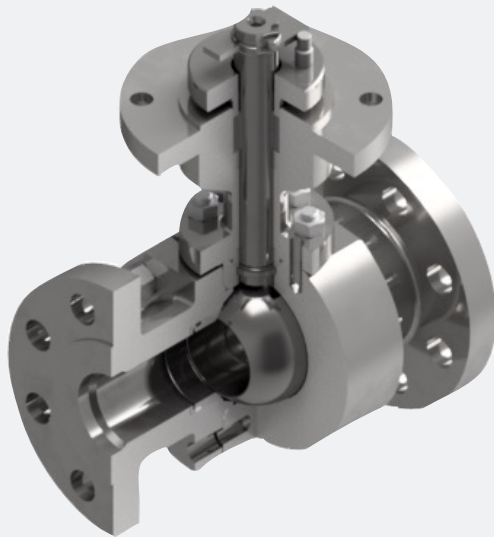


Long-lasting, tight shut-off performance

Argus FK79 ball valves from Flowserve deliver long-lasting, tight shut-off performance in numerous applications within the oil and gas, petrochemical and chemical industries. These engineered two-piece valves are available in metal-seated and soft-seated configurations as well as standard and severe service designs. A modular design makes them easy to adapt to various safety, emissions and performance requirements.

Benefits summary

- Increased uptime and durability
- Reliable, tight shut-off
- Gas-tight sealing
- Broad application flexibility



Argus FK79 standard two-piece, metal-seated, high-temperature valve

Engineered to perform

Proven features provide long service life with outstanding fugitive emissions performance and low operating torques in even the toughest applications.

- Floating ball construction
- Robust stem bearing system
- Match-lapped balls and seats for bubble-tight performance
- True full-bore design
- Fully guided, anti-blowout stem

Standard and severe service designs

Argus FK79 ball valves are easily adapted to a variety of standard applications. Configurable elements include:

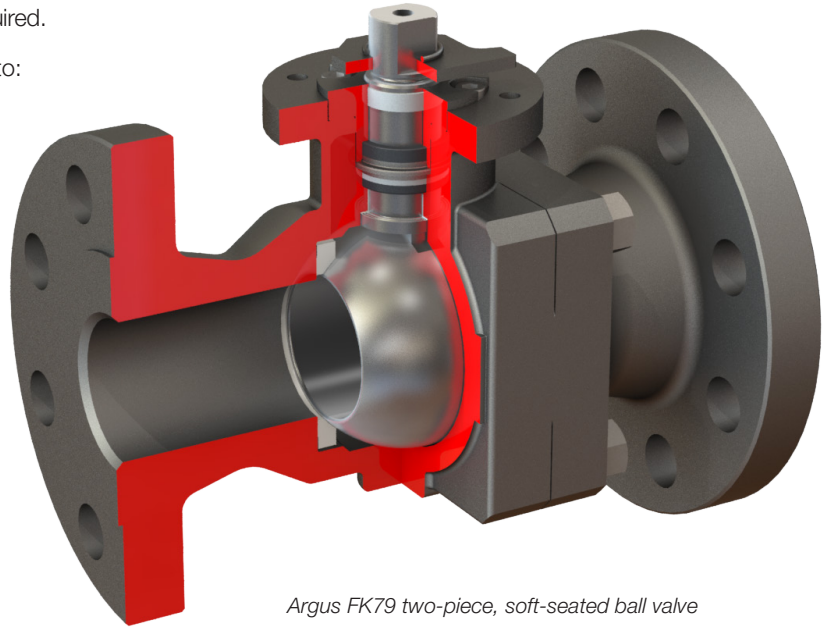
- Soft or metal seats
- Bi-directional sealing
- Cast or forged construction
- Standard and high-temperature designs

Applications

Argus FK79 ball valves are well-suited for a variety of applications in the oil and gas, petrochemical and chemical industries where reliable tight shut-off and uncompromising sealing are required.

Example applications include, but are not limited to:

- Emergency shutdown valves (ESDVs)
- Polyethylene or polypropylene
- High-temperature service
- Solids handling
- On/off isolation service
- Oil and gas manifolds
- Separator, filter and drying systems
- Compressor stations



Argus FK79 two-piece, soft-seated ball valve

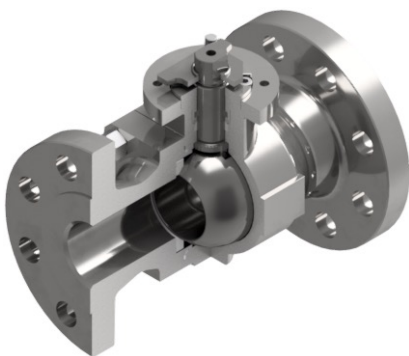
Standards and configurations

Design standards and certifications

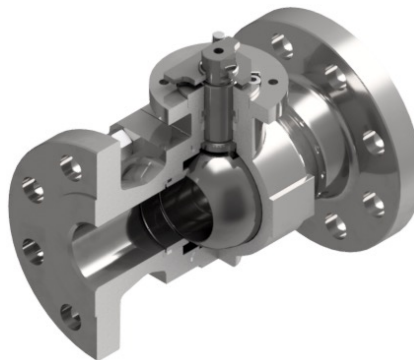
Sizes	NPS ½ to 2
Pressure rating*	Class 150 to 600
Design	EN 12516-1 (AD 2000)
Design calculation	EN 12516-1 (AD 2000)
Pressure/temperature rating	ASME B16.34 or DIN EN 1092
Face-to-face dimensions	ASME B16.10 or DIN 558
Flange end dimensions	ASME B16.5 or DIN EN 1092
Fugitive dimensions	ISO 15848 (AH-CO3), VDI 2440
Fire-safe type test	API 607 or ISO 10497-5
Valve material qualification	ASME, PED, material according to AD 2000

*Note: Class 150 to 600 forged material suitable for 250°C (482°F). Consult Suzhou factory.

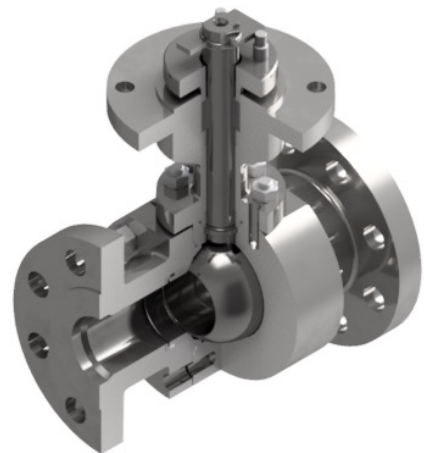
Configurations



*Standard two-piece,
soft-seated*



*Standard two-piece,
metal-seated*



*Standard two-piece, metal-seated,
high-temperature*

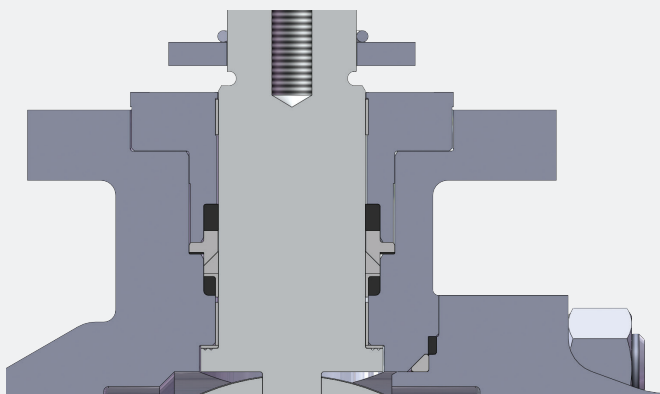
Size and pressure range

ASME Pressure Class	Size, NPS				
	1/2	3/4	1	1 1/2	2
150	x	x	x	x	x
300	x	x	x	x	x
600	x	x	x	x	x

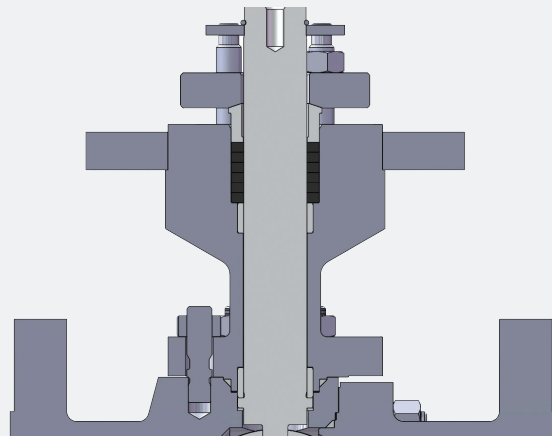
Stem sealing

Managing fugitive emissions is a major challenge within the chemical and petrochemical industries. Argus FK79 stem sealing systems are certified per ISO 15848 (AH-CO). Besides reducing fugitive emissions, the upsides are improved plant efficiency and reduced energy costs.

The Argus FK79 ball valve is available with stem sealing designs based on ISO 15848, TA-Luft and EPA standards. The high-temperature configuration with extended stuffing box is used from 250°C to 400°C (482°F to 752°F).



TA-LUFT/ISO 15848/EPA

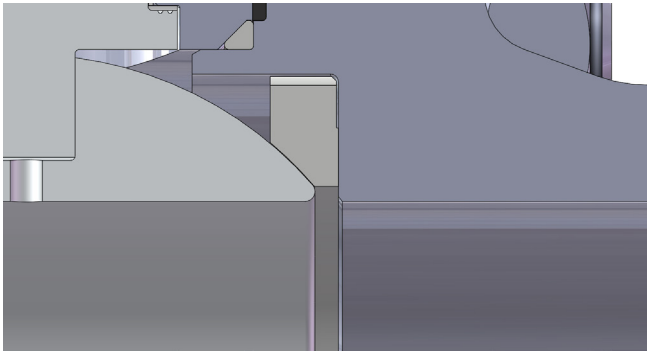


High-temperature stuffing box

Ball seat designs with true full bore

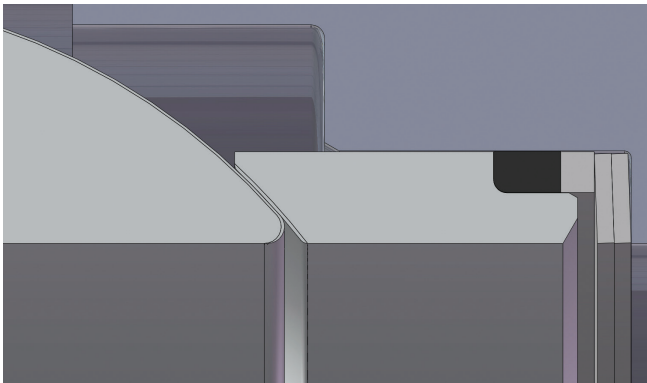
Argus FK79 floating ball valves are available with several ball seat designs to best suit the process conditions. Soft-seat designs with different material combinations or a metal-to-metal seat design cover the highest standards related to seat tightness in the media flow.

Soft- or metal-seated valves feature a straight true full-bore design that provides low flow resistance and high Cv per nominal size.



Soft seats

- PTFE or PEEK® (6% PTFE)
- Other materials upon request



Metal seats

- Metal-to-metal seated ball and ball seat designs in high-velocity oxygen fuel (HVOF; CCC-Crabide) coating technology serve the highest demands on valve performance in the chemical and petrochemical industry.
- Belleville washer

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Pressure-temperature curve

Soft versus metal seats

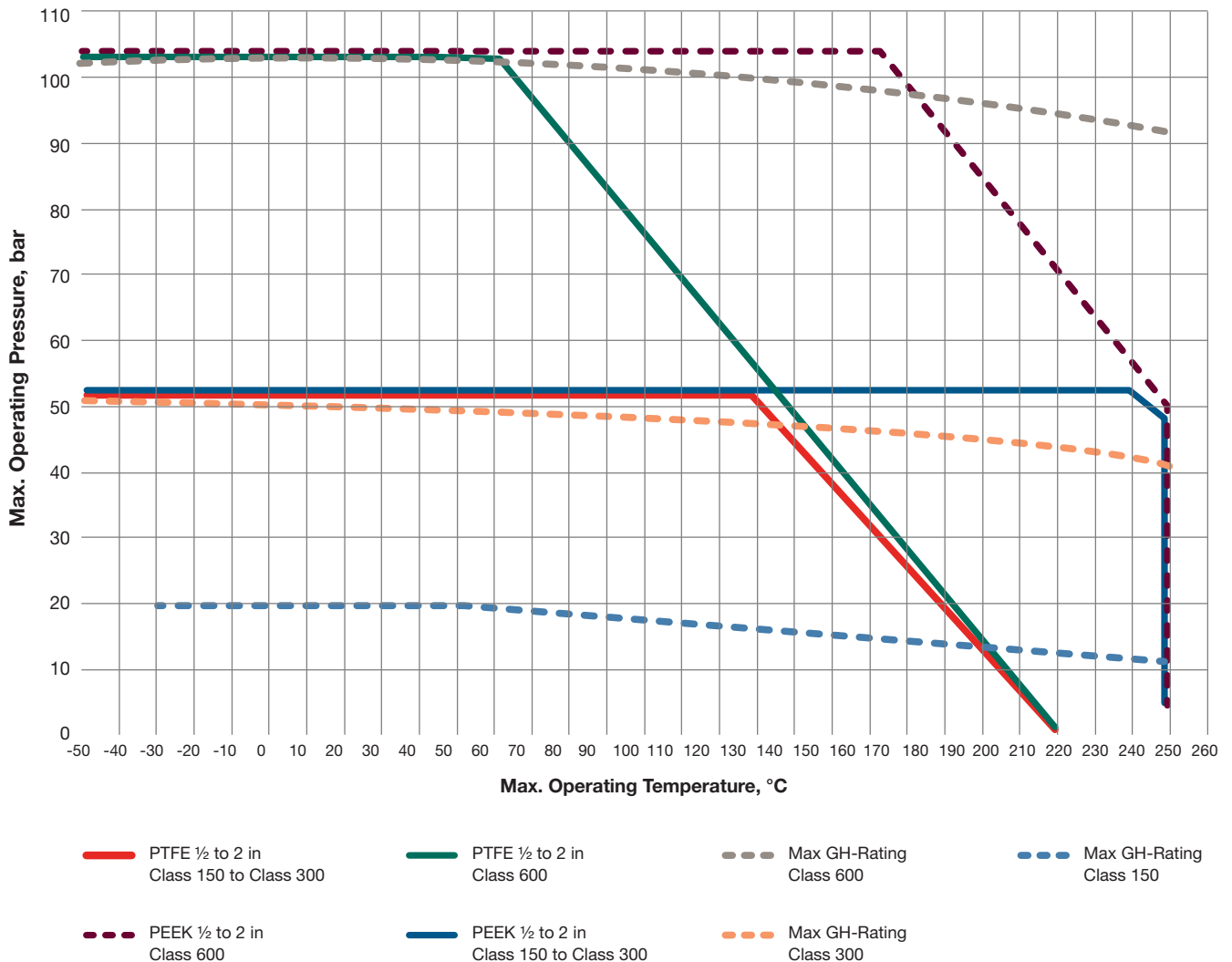
Seat sealing materials for Argus FK79 valves may be PTFE, POM, Devlon®, PEEK or steel. The pressure-temperature ratings of soft-seated ball valves are determined not only by the valve body materials, but also by the sealing material used for the ball seats. Pressure-temperature seat ratings for metal-seated valves are the same as the body ratings.

About this chart

It is very difficult to determine the exact pressure-temperature ratings for all media under all imaginable conditions. As such, we have prepared a general pressure-temperature chart based upon our experiences in field and laboratory conditions.

Pressure-temperature ratings for soft-seated valves (indicated by the solid lines in the chart below) are based on differential pressure with the ball in a fully closed position and refer to the seats only. The dotted lines indicate the maximum working pressure for carbon steel valve bodies, made from TSTE 355 N (equivalent to ASTM A350 Grade LF2).

P/T – rating



Materials of construction

Design specifications – All FK79 valves

Design	Valve Design	Valve Calculation	Pressure/ Temperature	Shell Wall Thickness	Bore Dimensions	Face-to-Face Dimensions	Flanged End Dimensions	NACE (optional)	Fugitive Emmission	Fire-Safe Type Test
ASME/ANSI/ASTM Specification	AD2000	AD2000	ASME B16.5	ASME B16.34	DIN EN 1983 DIN EN 17292 DIN EN 13942	ASME B16.10	ASME B16.5	-	ISO 15848 VDI 2440	API 607 ISO 10497

Cast valves – NPS ½ to 2, Class 150 to 300

Parameter		Soft Seated				Metal Seated			
Temperature	Maximum	220°C (428°F)	250°C (482°F)	220°C (428°F)	250°C (482°F)	250°C (482°F)	250°C (482°F)	250°C (482°F)	250°C (482°F)
	Minimum	-46°C (-51°F)	-46°C (-51°F)	-50°C (-58°F)	-50°C (-58°F)	-46°C (-51°F)	-46°C (-51°F)	-50°C (-58°F)	-50°C (-58°F)
Body	DIN and ASTM Certified	1.6220 A352 Gr. LCB	1.6220 A352 Gr. LCB	1.4408 A351 Gr. CF8M	1.4408 A351 Gr. CF8M	1.6220 A352 Gr. LCB	1.6220 A352 Gr. LCB	1.4408 A351 Gr. CF8M	1.4408 A351 Gr. CF8M
	ASTM Certified	A352 Gr. LCB	A352 Gr. LCB	A351 Gr. CF8M	A351 Gr. CF8M	A352 Gr. LCB	A352 Gr. LCB	A351 Gr. CF8M	A351 Gr. CF8M
Bolting	A193 Gr. B7	A193 Gr. B7	A193 Gr. B8MN Cl.2 or A193 Gr. B8M Cl.2	A193 Gr. B8MN Cl.2 or A193 Gr. B8M Cl.2	A193 Gr. B7	A193 Gr. B7	A193 Gr. B8MN Cl.2 or A193 Gr. B8M Cl.2	A193 Gr. B8MN Cl.2 or A193 Gr. B8M Cl.2	
Nuts	A194 Gr. 7	A194 Gr. 7	A194 Gr. 8M	A194 Gr. 8M	A194 Gr. 7	A194 Gr. 7	A194 Gr. 8M	A194 Gr. 8M	
Ball	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	
Ball Coating	N/A	N/A	N/A	N/A	Crabide	Arguloy	Crabide	Arguloy	
Seat – Soft Seated (Gasket)	PTFE	PEEK	PTFE	PEEK	N/A	N/A	N/A	N/A	
Seat – Metal Seated (Carrier/Coating/Gasket)	N/A	N/A	N/A	N/A	1.4462 (Duplex)/Crabide/Graphite	1.4462 (Duplex)/Arguloy/Graphite	1.4462 (Duplex)/Crabide/Graphite	1.4462 (Duplex)/Arguloy/Graphite	
Stem	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	1.4462 (Duplex) or A182 F51	
Stem Bushing	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	
Stem Gasket	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	
Body Gasket	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite	
Body/Bonnet Gasket	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite	

Forged valves – NPS ½ to 2, Class 600

Parameter		Soft Seated				Metal Seated			
Temperature	Maximum	220°C (428°F)	250°C (482°F)	220°C (428°F)	250°C (482°F)	250°C (482°F)	250°C (482°F)	250°C (482°F)	250°C (482°F)
	Minimum	-48°C (-54°F)	-48°C (-54°F)	-50°C (-58°F)	-50°C (-58°F)	-48°C (-54°F)	-48°C (-54°F)	-50°C (-58°F)	-50°C (-58°F)
Body	DIN and ASTM Certified	1.0566 A350 Gr. LF2	1.0566 A350 Gr. LF2	N/A	N/A	1.0566 A350 Gr. LF2	1.0566 A350 Gr. LF2	N/A	N/A
	DIN Certified	N/A	N/A	1.4571	1.4571	N/A	N/A	1.4571	1.4571
	ASTM Certified	A350 Gr. LF2	A350 Gr. LF2	A182 Gr. F316	A182 Gr. F316	A350 Gr. LF2	A350 Gr. LF2	A182 Gr. F316	A182 Gr. F316
Bolting	A193 Gr. B7	A193 Gr. B7	A193 Gr. B8M Cl. 2	A193 Gr. B8M Cl. 2	A193 Gr. B7	A193 Gr. B7	A193 Gr. B8M Cl. 2	A193 Gr. B8M Cl. 2	
Nuts	A194 Gr. 7	A194 Gr. 7	A194 Gr. 8M	A194 Gr. 8M	A194 Gr. 7	A194 Gr. 7	A194 Gr. 8M	A194 Gr. 8M	
Ball	A182 F51	A182 F51	A182 F51	A182 F51	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	
Ball Coating	N/A	N/A	N/A	N/A	Crabide	Arguloy	Crabide	Arguloy	
Seat – Soft Seated	PTFE, PFA, PTFE/Graphite	PEEK (6% PTFE)	PTFE, PFA, PTFE/Graphite	PEEK (6% PTFE)	N/A	N/A	N/A	N/A	
Seat – Metal Seated	Carrier	N/A	N/A	N/A	N/A	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)
	Coating	PTFE, PFA, PTFE/Graphite	PEEK (6% PTFE)	PTFE, PFA, PTFE/Graphite	PEEK (6% PTFE)	Crabide	Arguloy	Crabide	Arguloy
	Gasket	N/A	N/A	N/A	N/A	Graphite	Graphite	Graphite	Graphite
Stem	A182 F51	A182 F51	A182 F51	A182 F51	A182 F51	A182 F51	A182 F51	A182 F51	
Stem Bushing	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	
Stem Gasket	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	
Body Gasket	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	
Body/Bonnet Gasket	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	PTFE/Graphite	

Materials of construction, continued

Forged, high-temperature valves – NPS ½ to 2, Class 150 to 600

Parameter		Metal Seated			
Temperature	Maximum	400°C (752°F)	400°C (752°F)	400°C (752°F)	400°C (752°F)
	Minimum	-48°C (-54°F)	-48°C (-54°F)	-50°C (-58°F)	-50°C (-58°F)
Body	DIN and ASTM Certified	1.0566 A350 Gr. LF2	1.0566 A350 Gr. LF2	N/A	N/A
	DIN Certified	N/A	N/A	1.4571	1.4571
	ASTM Certified	A350 Gr. LF2	A350 Gr. LF2	A182 Gr. F316	A182 Gr. F316
Bolting		A193 Gr. B7	A193 Gr. B7	A193 Gr. B8MN Cl. 2 (A4-70 mod.) or A193 Gr. B8M Cl. 2	A193 Gr. B8MN Cl. 2 (A4-70 mod.) or A193 Gr. B8M Cl. 2
Nuts		A194 Gr. 7	A194 Gr. 7	A194 Gr. 8M	A194 Gr. 8M
Ball		1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)
Ball Coating		Crabide	Arguloy	Crabide	Arguloy
Seat	Carrier Material	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)	1.4462 (Duplex)
	Coating Material	Crabide	Arguloy	Crabide	Arguloy
	Gasket	Graphite	Graphite	Graphite	Graphite
Stem		A276 Gr. XM-19HR (Nitronic® 50 HS)	A276 Gr. XM-19HR (Nitronic 50 HS)	A276 Gr. XM-19HR (Nitronic 50 HS)	A276 Gr. XM-19HR (Nitronic 50 HS)
Stem Bushing		Metal (EBZ)	Metal (EBZ)	Metal (EBZ)	Metal (EBZ)
Stem Gasket		Graphite	Graphite	Graphite	Graphite
Body Gasket		Graphite	Graphite	Graphite	Graphite
Body/Bonnet Gasket		Graphite	Graphite	Graphite	Graphite

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Properties of seat sealing materials and coatings

Materials for standard construction

PTFE

With few exceptions, PTFE is corrosion-resistant to acids, leaches, solvents, aliphatic and aromatic as well as chlorinated hydrocarbons and many other liquids. It is suitable for a wide range of temperatures: -200°C to 200°C (-328°F to 392°F) as standard; to 250°C (482°F) in special applications.

PEEK (Lytan)

A linear polymer, this material has excellent resistance at high pressures with temperatures to 250°C (482°F). PEEK is resistant to solvents, alcohol, oil, grease, fuels, leaches, acids (limited) and water.

Coatings

HVOF – Crabide

Crabide is a hard metal alloy based on chromium carbide and nickel-chromium or tungsten carbide. The coating applied by high-speed flame spraying is characterized by high hardness, density and adhesive strength. The coating is independent of the base material; all metallic materials used in industry can be coated. There is no metallurgical influence on the base material during the coating process. The adhesive strength of the spray coating results from the mechanical bonding with the base material.

Spray and fuse – Arguloy

The Arguloy hard layer on the ball surface and the seats is a nickel-based alloy which is welded on the base metal and fused by a special heat treatment. The layers are homogeneous, free of cracks, and are corrosion and wear resistant. Hardness of the layers exceeds the hardness of Stellite.

In our innovative coating center, we use the most modern computer-controlled machinery and engineering methods with an extensive quality program. Argus valves are able to produce metal seats and balls with spherical accuracies and superfine surfaces with a roughness of 1 micron for severely gaseous applications.

Seat sealing systems

Effective sealing of Argus FK79 ball valves depends on several factors:

- Contact pressure
- Contact surface of the seat
- Accuracy of surface finish on the ball and on the ball seat
- Sealing design and the sealing material

The contact pressure is built up by the initial stress in the seat (compact or spring supported) and the medium pressure.

The extremely high durability of the Argus sealing system is achieved via close manufacturing tolerances, which are guaranteed by the Flowserve quality assurance (QA) system and rule-based innovative engineering design work.

Thermal coatings for metal-seated ball valves

HVOF

Advantages

- Applicable on any metallic base material
- Highest hardness and wear resistance

Disadvantages

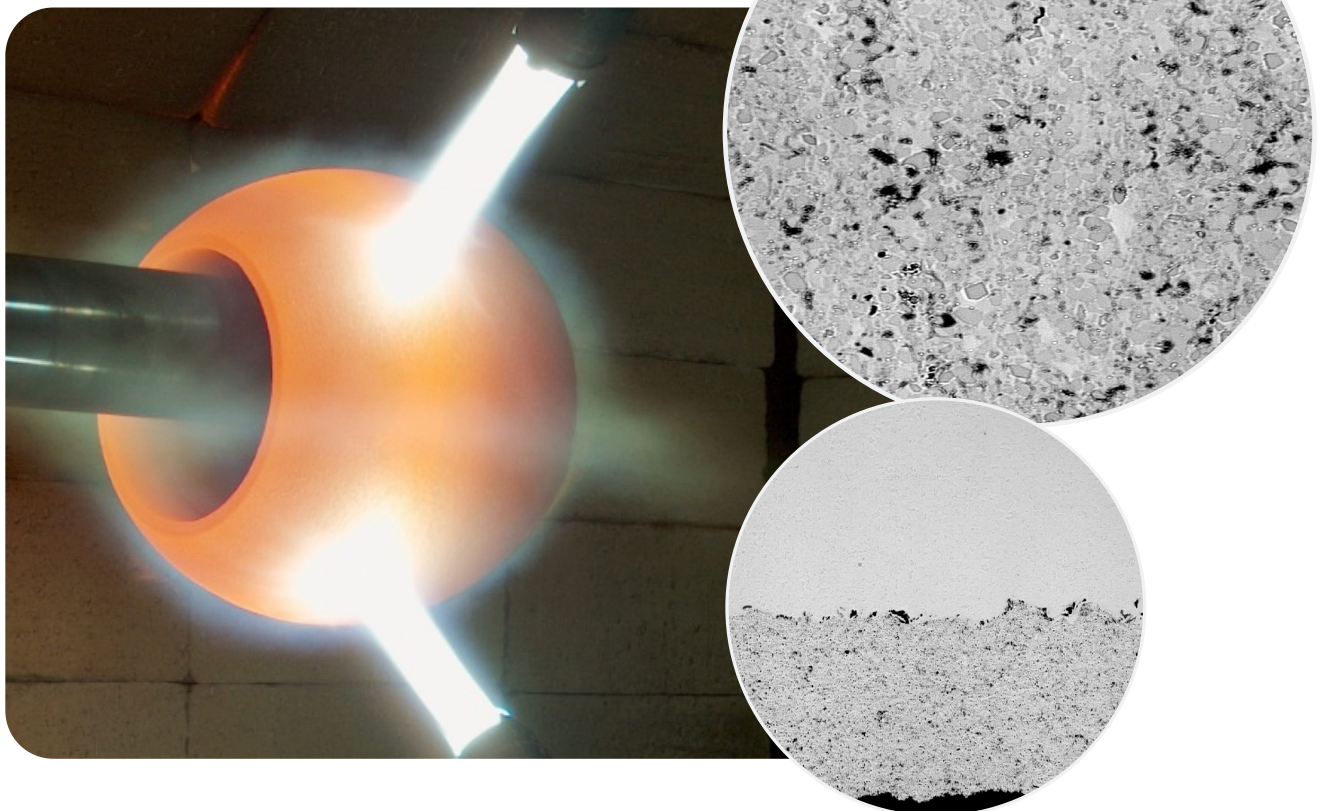
- Mechanical bond
- Some porosity
- Cracking and spalling happen very rarely

Applications

- General service, moderate operating cycles
- High pressure
- High temperature

Materials

- Carbide (Cr_3C_2 -NiCr): 900 to 1,100 HV
0.3°C to 900°C (33°F to 1,652°F)



Sectional drawings with primary components list

NPS 1/2 to 2, Class 150 to 600 – Soft seat, cast or forged

Schaltwellendichtung

STEM - SEALING

DIN/DATE NAME		Benennung / TITLE	
02.10.04	OB.	FK-KUGELHAHN	
06.04.11	BS	FK-BALL VALVE	
SCALE		ZUGENOMMEN / TAKEN DATA	
1:1		79AB/S/030/19/11	
SCALE		Zeichnungsnummer / DRGARR.	
1:1		DIN40-50/50.552	
ARGUS		4L 4994 SZ	
FLOWERVE FLOW CONTROL GmbH			
D-76275 Ettlingen			

REV.	DATE	NAME
A	06.04.11	TK

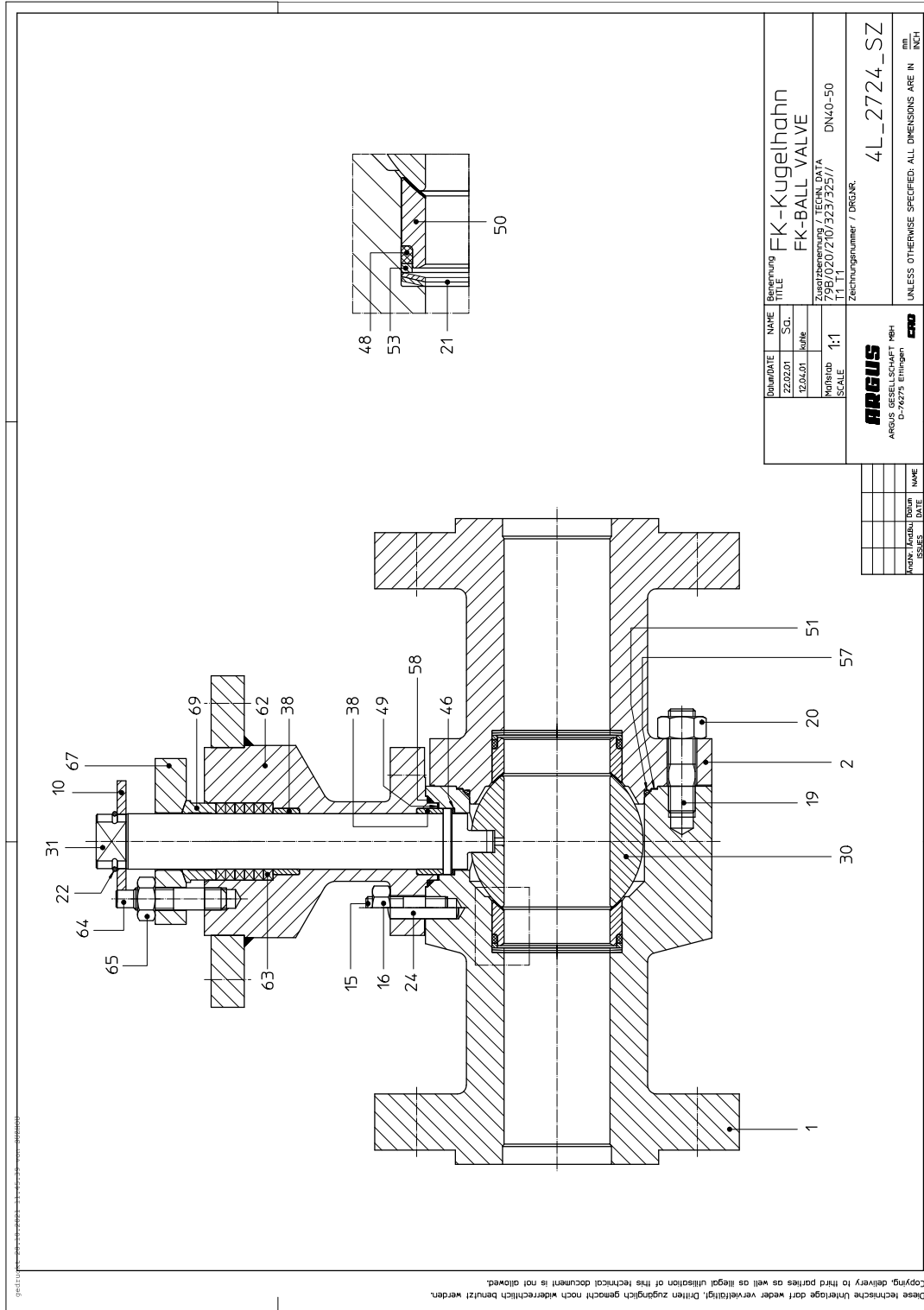
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AD-3 Sec.

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Sectional drawings with primary components list, continued

NPS ½ to 2, Class 150 to 600 – High-temperature design



Recommended spare parts list

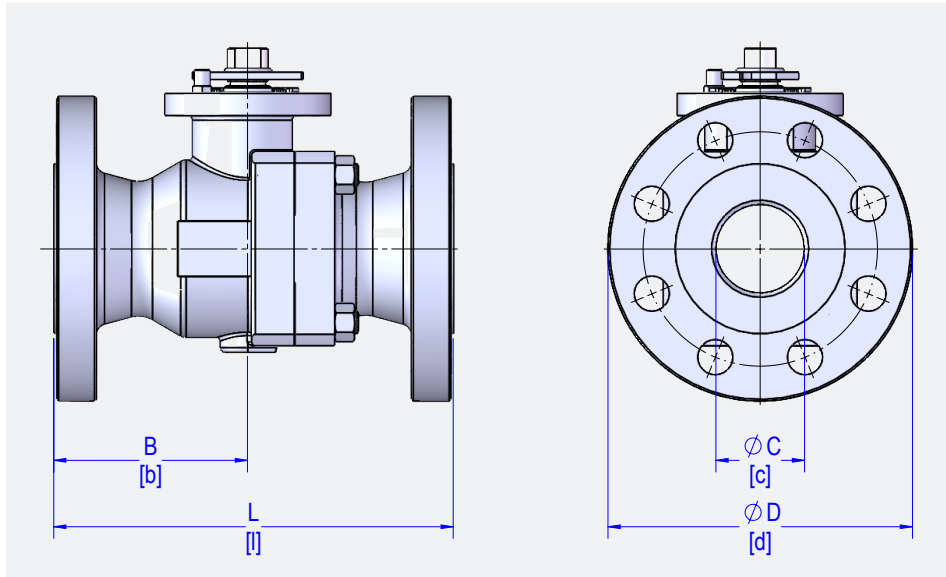
NPS ½ to 1

Trim Kit Sealing		Soft Seat		Metal Seat	
Seat Gasket		PTFE	PEEK	Graphite	Graphite
Temperature		≤220°C (428°F)	≤250°C (482°F)	≤250°C (482°F)	≤400°C (752°F)
Pressure Class		Class 150 to 600			
Pos	Component				
21	Belleville washer	-	-	X	X
38	Bushing	X	X	X	X
42	Sealing ring	X	X	X	X
44	Thrust washer	X	X	X	X
47	Seal	X	X	X	-
48	Sealing ring	-	-	X	X
49	Sealing ring	X	X	X	X
50	Ball seat	X	X	-	-
51	O-ring	X	X	X	-
	Sealing ring	-	-	-	X
55	Bearing tape	-	-	-	-
57	Sealing ring	X	X	X	X
58	Sealing ring	-	-	-	X
59	Bushing	X	X	X	X
63	Sealing ring	-	-	-	X
86	Sleeve	X	X	X	-

NPS 1½ to 2

Seat Gasket		Soft Seat		Metal Seat	
Seat Gasket		PTFE	PEEK	Graphite	Graphite
Temperature		≤220°C (428°F)	≤250°C (482°F)	≤250°C (482°F)	≤400°C (752°F)
Pressure Class		Class 150 to 600			
Pos	Component				
21	Belleville washer	-	-	X	X
38	Bushing	-	-	-	-
42	Sealing ring	X	X	X	X
44	Thrust washer	X	X	X	X
47	Seal	X	X	X	-
48	Sealing ring	-	-	X	X
49	Sealing ring	X	X	X	X
50	Ball seat	X	X	-	-
51	O-ring	X	X	X	-
	Sealing ring	-	-	-	X
55	Bearing tape	X	X	X	X
57	Sealing ring	X	X	X	X
58	Sealing ring	-	-	-	X
59	Bushing	X	X	X	X
63	Sealing ring	-	-	-	X
86	Sleeve	X	X	X	-

Dimensions and weights – Cast NPS ½ to 2, soft seat



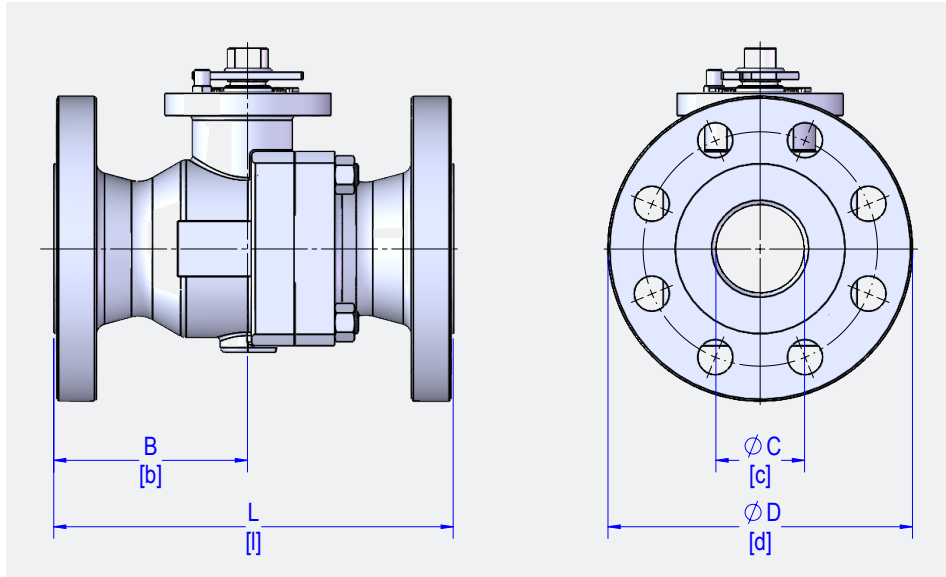
Class 150

Class 150 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	65.5 (2.58)	45 (1.77)	14 (0.55)	18 (0.71)	109	4.70 (10)
¾	20 (0.79)	98.6 (3.88)	49.3 (1.94)	66.5 (2.62)	46 (1.81)	14 (0.55)	18 (0.71)	118	5.20 (11)
1	25 (0.98)	108 (4.25)	54 (2.13)	67.5 (2.66)	47 (1.85)	14 (0.55)	18 (0.71)	127	6.00 (13)
1½	38 (1.50)	127 (5.00)	63.5 (2.50)	101 (3.98)	76.5 (3.01)	17 (0.67)	22 (0.87)	165	8.60 (19)
2	48 (1.89)	152.4 (6.00)	76.2 (3.00)	108.5 (4.27)	84 (3.31)	17 (0.67)	22 (0.87)	178	13.30 (29)

Class 300

Class 300 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	65.5 (2.58)	45 (1.77)	14 (0.55)	18 (0.71)	140	5.30 (12)
¾	20 (0.79)	117.3 (4.62)	58.7 (2.31)	66.5 (2.62)	46 (1.81)	14 (0.55)	18 (0.71)	153	5.80 (13)
1	25 (0.98)	124 (4.88)	62 (2.44)	67.5 (2.66)	47 (1.85)	14 (0.55)	18 (0.71)	165	7.00 (15)
1½	38 (1.50)	155.5 (6.12)	77.8 (3.06)	101 (3.98)	76.5 (3.01)	17 (0.67)	22 (0.87)	190	11.90 (26)
2	48 (1.89)	165 (6.50)	82.5 (3.25)	108.5 (4.27)	84 (3.31)	17 (0.67)	22 (0.87)	216	14.70 (32)

Dimensions and weights – Cast NPS ½ to 2, metal seat



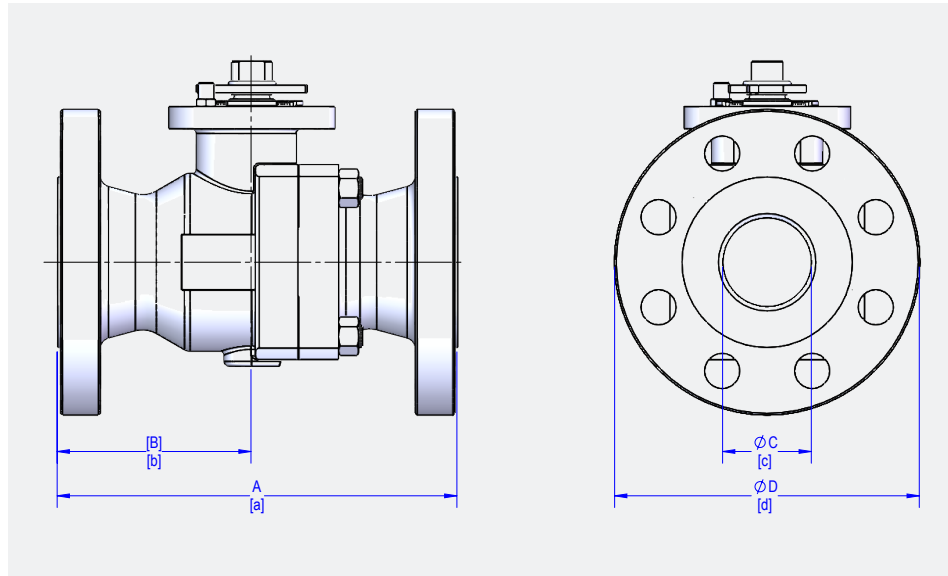
Class 150

Class 150 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	65.5 (2.58)	45 (1.77)	14 (0.55)	18 (0.71)	109	4.80 (11)
¾	20 (0.79)	98.6 (3.88)	49.3 (1.94)	66.5 (2.62)	46 (1.81)	14 (0.55)	18 (0.71)	118	5.30 (12)
1	25 (0.98)	108 (4.25)	54 (2.13)	67.5 (2.66)	47 (1.85)	14 (0.55)	18 (0.71)	127	6.30 (14)
1½	38 (1.50)	127 (5.00)	63.5 (2.50)	101 (3.98)	76.5 (3.01)	17 (0.67)	22 (0.87)	165	8.70 (19)
2	48 (1.89)	152.4 (6.00)	76.2 (3.00)	108.5 (4.27)	84 (3.31)	17 (0.67)	22 (0.87)	178	13.50 (30)

Class 300

Class 300 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	65.5 (2.58)	45 (1.77)	14 (0.55)	18 (0.71)	140	5.50 (12)
¾	20 (0.79)	117.3 (4.62)	58.7 (2.31)	66.5 (2.62)	46 (1.81)	14 (0.55)	18 (0.71)	153	6.00 (13)
1	25 (0.98)	124 (4.88)	62 (2.44)	67.5 (2.66)	47 (1.85)	14 (0.55)	18 (0.71)	165	7.20 (16)
1½	38 (1.50)	155.5 (6.12)	77.8 (3.06)	101 (3.98)	76.5 (3.01)	17 (0.67)	22 (0.87)	190	12.10 (27)
2	48 (1.89)	165 (6.50)	82.5 (3.25)	108.5 (4.27)	84 (3.31)	17 (0.67)	22 (0.87)	216	15.00 (33)

Dimensions and weights — Forged NPS ½ to 2, standard temperature design



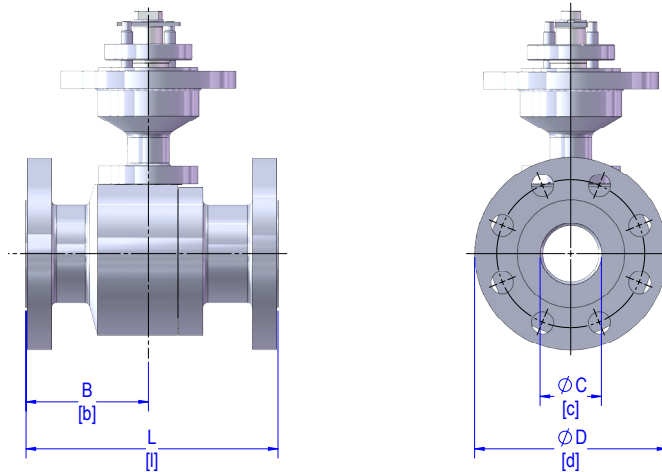
Soft seat

Class 600 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	65.5 (2.58)	45 (1.77)	14 (0.55)	18 (0.71)	165	6.20 (14)
¾	20 (0.79)	117.3 (4.62)	58.7 (2.31)	66.5 (2.62)	46 (1.81)	14 (0.55)	18 (0.71)	191	7.70 (17)
1	25 (0.98)	124 (4.88)	62 (2.44)	67.5 (2.66)	47 (1.85)	14 (0.55)	18 (0.71)	216	8.50 (19)
1½	38 (1.50)	155.5 (6.12)	77.8 (3.06)	101 (3.98)	76.5 (3.01)	17 (0.67)	22 (0.87)	242	15.70 (35)
2	48 (1.89)	165 (6.50)	82.5 (3.25)	108.5 (4.27)	84 (3.31)	17 (0.67)	22 (0.87)	292	21.40 (47)

Metal seat

Class 600 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	65.5 (2.58)	45 (1.77)	14 (0.55)	18 (0.71)	165	6.20 (14)
¾	20 (0.79)	117.3 (4.62)	58.7 (2.31)	66.5 (2.62)	46 (1.81)	14 (0.55)	18 (0.71)	191	7.70 (17)
1	25 (0.98)	124 (4.88)	62 (2.44)	67.5 (2.66)	47 (1.85)	14 (0.55)	18 (0.71)	216	8.50 (19)
1½	38 (1.50)	155.5 (6.12)	77.8 (3.06)	101 (3.98)	76.5 (3.01)	17 (0.67)	22 (0.87)	242	15.70 (35)
2	48 (1.89)	165 (6.50)	82.5 (3.25)	108.5 (4.27)	84 (3.31)	17 (0.67)	22 (0.87)	292	22.50 (50)

Dimensions and weights — Forged NPS ½ to 2, high-temperature design, metal seat



Class 150

Class 150 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	143 (5.63)	110 (4.33)	11 (0.43)	18.5 (0.73)	109	7.20 (16)
¾	20 (0.79)	98.6 (3.88)	49.3 (1.94)	144.5 (5.69)	111 (4.37)	11 (0.43)	18.5 (0.73)	118	7.70 (17)
1	25 (0.98)	108 (4.25)	54 (2.13)	146 (5.75)	112 (4.41)	11 (0.43)	18.5 (0.73)	127	8.20 (18)
1½	38 (1.50)	127 (5.00)	63.5 (2.50)	163 (6.42)	132 (5.20)	11 (0.43)	18.5 (0.73)	165	12.40 (27)
2	48 (1.89)	152.4 (6.00)	76.2 (3.00)	170.5 (6.71)	136.5 (5.37)	11 (0.43)	18.5 (0.73)	178	17.40 (38)

Class 300

Class 300 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	143 (5.63)	110 (4.33)	11 (0.43)	18.5 (0.73)	140	7.60 (17)
¾	20 (0.79)	117.3 (4.62)	58.7 (2.31)	145 (5.71)	111 (4.37)	11 (0.43)	18.5 (0.73)	152	8.20 (18)
1	25 (0.98)	124 (4.88)	62 (2.44)	146 (5.75)	112 (4.41)	11 (0.43)	18.5 (0.73)	165	9.80 (22)
1½	38 (1.50)	155.5 (6.12)	77.8 (3.06)	201 (7.91)	149 (5.87)	13.5 (0.53)	24.5 (0.96)	191	17.70 (39)
2	48 (1.89)	165 (6.50)	82.5 (3.25)	208.5 (8.21)	156.5 (6.16)	13.5 (0.53)	24.5 (0.96)	216	23.20 (51)

Class 600

Class 600 Full Opening Raised Face Flanged Ends									
NPS	ØA	ØB	H	H1	H2	H3	ØS	L (RF)	Weight
	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)		kg (lb)
½	15 (0.59)	95 (3.74)	47.5 (1.87)	143 (5.63)	110 (4.33)	11 (0.43)	18.5 (0.73)	165	8.50 (19)
¾	20 (0.79)	117.3 (4.62)	58.7 (2.31)	143.6 (5.65)	109.6 (4.31)	11 (0.43)	18.5 (0.73)	191	10.00 (22)
1	25 (0.98)	124 (4.88)	62 (2.44)	146 (5.75)	112 (4.41)	11 (0.43)	18.5 (0.73)	216	11.00 (24)
1½	38 (1.50)	155.5 (6.12)	77.8 (3.06)	201 (7.91)	149 (5.87)	13.5 (0.53)	24.5 (0.96)	242	21.00 (46)
2	48 (1.89)	165 (6.50)	82.5 (3.25)	208.5 (8.21)	156.5 (6.16)	13.5 (0.53)	24.5 (0.96)	292	29.50 (65)

Drawings numbers — Sectional drawings

Cast NPS ½ to 2, soft seat

Valve Size	Sectional Drawing Number	
NPS	Class 150	Class 300
½	4L3180	4L3181
¾	4L3281	4L3282
1	4L3280	4L4443
1½	4L4994	4L4994
2	4L4994	4L4994

Forged NPS ½ to 2, standard temperature design, soft seat

Valve Size	Sectional Drawing Number
NPS	Class 600
½	4L3313
¾	4L3278
1	3D3374
1½	4L2482
2	4L2482

Forged NPS ½ to 2, high-temperature design, metal seat

Valve Size	Sectional Drawing Number		
NPS	Class 150	Class 300	Class 600
½	4M1957	4L5289	4L5289
¾	4M1957	4L5106	4L5106
1	4L2766	4L2766	4L2766
1½	4L3027	4L2724	4L2724
2	4L3027	4L2724	4L2724

Drawings numbers — Dimensional drawings

Cast NPS ½ to 2, soft seat

Valve Size	Dimensional Drawing Number	
NPS	Class 150	Class 300
½	4L3286	4L3287
¾	4L3320	4L3321
1	4L3331	4L3332
1½	4L3335	4L3336
2	4L3337	4L3338

Forged NPS ½ to 2, standard temperature design, soft seat

Valve Size	Dimensional Drawing Number
NPS	Class 600
½	4L3325
¾	4L3329
1	4L2794
1½	4L2798
2	4L2807

Forged NPS ½ to 2, high-temperature design, metal seat

Valve Size	Dimensional Drawing Number		
NPS	Class 150	Class 300	Class 600
½	4L9751	4L5290	4L7072
¾	4L6862	4M4899	4L5893
1	4L0082	3D3019	4L2927
1½	4L2675	4L2677	4L2741
2	4L0239	4L0503	3D3258

Drawings numbers — Topworks drawings (operation head)

Cast NPS ½ to 2, soft seat

Valve Size	Operating Head Number	
NPS	Class 150	Class 300
½	3Z0422	3Z0422
¾	3Z0422	3Z0422
1	3Z0422	3Z0422
1½	3Z0423	3Z0423
2	3Z0423	3Z0423

Forged NPS ½ to 2, standard temperature design, soft seat

	Operating Head Number
NPS	Class 600
½	3Z0422
¾	3Z0422
1	3Z0422
1½	3Z0423
2	3Z0423

Forged NPS ½ to 2, high-temperature design, metal seat

Valve Size	Operating Head Number		
NPS	Class 150	Class 300	Class 600
½	3Z0445	3Z0445	3Z0445
¾	3Z0445	3Z0445	3Z0445
1	3Z0445	3Z0445	3Z0445
1½	3Z0445	3Z0350	3Z0350
2	3Z0445	3Z0350	3Z0350

Flow coefficients – All constructions

Flow coefficients – Cv

Valve Size	ASME Pressure Class		
NPS	Class 150	Class 300	Class 600
½	22.6	22.6	22.6
¾	53.2	53.2	53.2
1	83.4	83.4	83.4
1½	198	198	198
2	321	321	321

Flow coefficients – Kv

Valve Size	ASME Pressure Class	
NPS	Class 150	Class 300
½	19.4	19.4
¾	45.6	45.6
1	71.5	71.5
1½	170	170
2	275	275

Torques – Class 150, metal seat

Class 150 metal seat, PTFE bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	4	8	12	16	20
	0	58	116	174	232	290
NPS	Torque BTO [lb-in./Nm]					
½	22	23	23	23	24	24
	16	17	17	17	18	18
¾	25	26	27	28	28	29
	18	19	20	21	21	21
1	30	31	32	33	34	35
	22	23	24	24	25	26
1½	66	69	72	76	79	82
	49	51	53	56	58	60
2	111	117	123	130	136	143
	82	86	91	96	100	105

Class 150 metal seat, metal bearing, ISO 15848 up to 400°C (752°F)

Valve Size	Differential Pressure [bar/psi]					
	0	4	8	12	16	20
	0	58	116	174	232	290
NPS	Torque BTO [Nm/ft-lbs]					
½	47	47	48	49	49	50
	35	35	35	36	36	37
¾	51	52	53	54	55	56
	38	38	39	40	41	41
1	58	59	60	62	63	64
	43	44	44	46	46	47
1½	123	128	132	137	141	146
	91	94	97	101	104	108
2	186	195	204	213	222	231
	137	144	150	157	164	170

Class 150 operating torques

NPS	Operating Torques			
	BTO	RTO	RTC	ETC
½	100%	90%	90%	100%
¾	100%	90%	90%	100%
1	100%	90%	90%	100%
1½	100%	90%	90%	100%
2	100%	90%	90%	100%

Torques – Class 150, soft seat

Class 150 soft seat, PTFE bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	4	8	12	16	20
	0	58	116	174	232	290
NPS	Torque BTO [lb-in./Nm]					
½	14	14	14	14	15	15
	10	10	10	10	11	11
¾	15	16	16	17	17	17
	11	12	12	13	13	13
1	18	19	19	20	20	21
	13	14	14	15	15	15
1½	39	41	42	44	46	48
	29	30	31	32	34	35
2	64	67	71	74	78	82
	47	49	52	55	58	60

Class 150 soft seat, metal bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	4	8	12	16	20
	0	58	116	174	232	290
NPS	Torque BTO [Nm/ft-lbs]					
½	18	18	19	19	19	20
	13	13	14	14	14	15
¾	20	21	22	22	23	23
	15	15	16	16	17	17
1	24	25	25	26	27	28
	18	18	18	19	20	21
1½	52	55	57	60	62	65
	38	41	42	44	46	48
2	87	92	97	102	107	112
	64	68	72	75	79	83

Class 150 operating torques

NPS	Operating Torques			
	BTO	RTO	RTC	ETC
½	100%	90%	90%	100%
¾	100%	90%	90%	100%
1	100%	90%	90%	100%
1½	100%	90%	90%	100%
2	100%	90%	90%	100%

Torques – Class 300, metal seat

Class 300 metal seat, PTFE bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	4	8	12	16	20
	0	58	116	174	232	290
NPS	Torque BTO [lb-in./Nm]					
½	22	23	24	25	27	28
	16	17	18	18	20	21
¾	25	27	29	31	33	34
	18	20	21	23	24	25
1	30	32	35	37	39	42
	22	24	26	27	29	31
1½	66	74	82	91	99	107
	49	55	60	67	73	79
2	111	127	143	159	175	191
	82	94	105	117	129	141

Class 300 metal seat, metal bearing, ISO 15848 up to 400°C (752°F)

Valve Size	Differential Pressure [bar/psi]					
	0	10	20	30	40	50
	0	145	290	435	580	725
NPS	Torque BTO [Nm/ft-lbs]					
½	47	48	50	51	53	55
	35	35	37	38	39	41
¾	51	54	56	59	62	64
	38	40	41	44	46	47
1	58	61	64	68	71	74
	43	45	47	50	52	55
1½	123	135	146	158	169	181
	91	100	108	117	125	134
2	186	208	231	254	276	299
	137	153	170	187	204	221

Class 300 operating torques

NPS	Operating Torques			
	BTO	RTO	RTC	ETC
½	100%	90%	90%	100%
¾	100%	90%	90%	100%
1	100%	90%	90%	100%
1½	100%	90%	90%	100%
2	100%	90%	90%	100%

Torques – Class 300, soft seat

Class 300 soft seat, PTFE bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	10	20	30	40	50
	0	145	290	435	580	725
NPS	Torque BTO [Nm/ft-lbs]					
½	14	14	15	15	16	17
	10	10	11	11	12	13
¾	15	16	17	18	19	20
	11	12	13	13	14	15
1	18	19	21	22	23	25
	13	14	15	16	17	18
1½	39	43	48	53	57	62
	29	32	35	39	42	46
2	64	73	82	91	99	108
	47	54	60	67	73	80

Class 300 soft seat, metal bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	10	20	30	40	50
	0	145	290	435	580	725
NPS	Torque BTO [Nm/ft-lbs]					
½	18	19	20	20	21	22
	13	14	15	15	15	16
¾	20	22	23	25	26	27
	15	16	17	18	19	20
1	24	26	28	29	31	33
	18	19	21	21	23	24
1½	52	59	65	72	78	84
	38	44	48	53	58	62
2	87	100	112	125	137	150
	64	74	83	92	101	111

Class 300 operating torques

NPS	Operating Torques			
	BTO	RTO	RTC	ETC
½	100%	90%	90%	100%
¾	100%	90%	90%	100%
1	100%	90%	90%	100%
1½	100%	90%	90%	100%
2	100%	90%	90%	100%

Torques – Class 600, metal seat

Class 600 metal seat, PTFE bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	4	8	12	16	20
	0	58	116	174	232	290
NPS	Torque BTO [lb-in./Nm]					
½	22	24	27	29	31	33
	16	18	20	21	23	24
¾	25	29	33	36	40	43
	18	21	24	27	30	32
1	30	35	39	44	49	54
	22	26	29	32	36	40
1½	66	82	99	115	132	149
	49	60	73	85	97	110
2	111	143	175	207	240	272
	82	105	129	153	177	201

Class 600 metal seat, metal bearing, ISO 15848 up to 400°C (752°F)

Valve Size	Differential Pressure [bar/psi]					
	0	20	40	60	80	100
	0	290	580	870	1,160	1,450
NPS	Torque BTO [Nm/ft-lbs]					
½	47	50	53	56	59	62
	35	37	39	41	44	46
¾	51	56	62	67	72	77
	38	41	46	49	53	57
1	58	64	71	78	84	91
	43	47	52	58	62	67
1½	123	146	169	193	216	239
	91	108	125	142	159	176
2	186	231	276	321	366	411
	137	170	204	237	270	303

Class 600 operating torques

NPS	Operating Torques			
	BTO	RTO	RTC	ETC
½	100%	90%	90%	100%
¾	100%	90%	90%	100%
1	100%	90%	90%	100%
1½	100%	90%	90%	100%
2	100%	90%	90%	100%

Torques – Class 600, soft seat

Class 600 soft seat, PTFE bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	20	40	60	80	100
	0	290	580	870	1,160	1,450
NPS	Torque BTO [Nm/ft-lbs]					
½	14	15	16	17	19	20
	10	11	12	13	14	15
¾	15	17	19	21	23	25
	11	13	14	15	17	18
1	18	21	23	26	28	31
	13	15	17	19	21	23
1½	39	48	57	66	76	85
	29	35	42	49	56	63
2	64	82	99	117	135	153
	47	60	73	86	100	113

Class 600 soft seat, metal bearing, ISO 15848 up to 250°C (482°F)

Valve Size	Differential Pressure [bar/psi]					
	0	20	40	60	80	100
	0	290	580	870	1,160	1,450
NPS	Torque BTO [Nm/ft-lbs]					
½	47	50	53	56	59	62
	35	37	39	41	44	46
¾	51	56	62	67	72	77
	38	41	46	49	53	57
1	58	64	71	78	84	91
	43	47	52	58	62	67
1½	123	146	169	193	216	239
	91	108	125	142	159	176
2	186	231	276	321	366	411
	137	170	204	237	270	303

Class 600 operating torques

NPS	Operating Torques			
	BTO	RTO	RTC	ETC
½	100%	90%	90%	100%
¾	100%	90%	90%	100%
1	100%	90%	90%	100%
1½	100%	90%	90%	100%
2	100%	90%	90%	100%

Torques – MAST

Valve Size	Pressure Class	A182 F 51; up to 250°C (482°F)	A276 Gr. XM-19HR; > 250°C (482°F)
NPS		MAST, Nm	MAST, Nm
1/2	Class 150	211	257
	Class 300	211	257
	Class 600	211	257
3/4	Class 150	211	257
	Class 300	211	257
	Class 600	211	257
1	Class 150	211	257
	Class 300	211	257
	Class 600	211	257
1 1/2	Class 150	454	435
	Class 300	454	489
	Class 600	454	489
2	Class 150	454	435
	Class 300	454	489
	Class 600	454	489

Seat leakage rates

Based on FCI 70-2 (2013)

Valve Size NPS	Test Duration Seconds	Leakage Rate	
		ml/min	Bubbles/min ⁽¹⁾
≤1	60	0.15	1
1½	60	0.30	2
2	60	0.45	3
2½	60	0.60	4
3	60	0.90	6
4	60	1.70	11
5	60	2.85 ⁽²⁾	19 ⁽²⁾
6	60	4.00	27
8	60	6.75	45
10	60	11.1	74
12	60	16.0	106
14	60	21.6	144
16	60	28.4	189
18	60	-	-
20	60	-	-
24	60	-	-
26	60	-	-
28	60	-	-
30	60	-	-
32	60	-	-
36	60	-	-

(1) Based on 0.15 ml/min = 1 bubble per ml

(2) Interpolated valves

FCI 70-2 Class VI seat allowable leakage values are more stringent for valve sizes 4 in and smaller (DN 100 and smaller) as compared to API 598 seat allowable leakage values.

Based on API 598 (October 2016)

Valve Size NPS	Test Duration Seconds	Leakage Rate
		Bubbles/min
≤2	15	0
2½	60	10
3	60	12
4	60	16
5	60	20
6	60	24
8	120	32
10	120	40
12	120	48
14	120	56
16	120	64
18	120	72
20	120	80
24	120	96
26	120	104
28	120	112
30	120	120
32	120	128
36	120	144

API 598 seat allowable leakage values are more stringent for valve sizes 6 in and larger (DN 50 and larger), as compared to FCI 70-2 Class VI seat allowable leakage values.

Proactive maintenance recommendations

Metal-seated ball valves

1. Use only original equipment manufacturer (OEM) spare parts.
2. Perform first maintenance no more than *two years* after operational startup of plant.
3. Replace all soft parts, including all O-rings, sealing rings and bearings.
4. Examine metal trim kit (ball and ball seats) to ensure all components are still in good shape.

NOTE: The metal trim kit is a wearing part. However, under normal operating conditions, it should last at least 200,000 cycles (approximately three years).

5. Examine stem and stem journal to ensure all components are still in good shape.
6. It is strongly recommended that this maintenance be repeated every two to three years, even though the metal trim kit can last much longer. Failure of a soft part, e.g., a bearing, the metal trim kit or valve body, could be severely damaged.

Soft-seated ball valves

1. Use only OEM spare parts.
2. Perform first maintenance no more than *one year* after operational startup of plant.
3. Replace all soft parts, including all O-rings, sealing rings, bearings and PEEK (Lytan) ball seats.
4. Examine ball, stem and stem journal to ensure all components are still in good shape.
5. It is strongly recommended that this maintenance be repeated every two years.



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VATB000412-01 (EN/AQ) September 2022

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