

AOP Series D Trunnion Mounted Ball Valve

TECHNOLOGY



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AOP Series D Trunnion Mounted Ball Valve

GENERAL INFORMATION

Cameron's AOP™ brand offers a wide range of trunnion ball valves. The designs have been developed based on our customers' requirements.

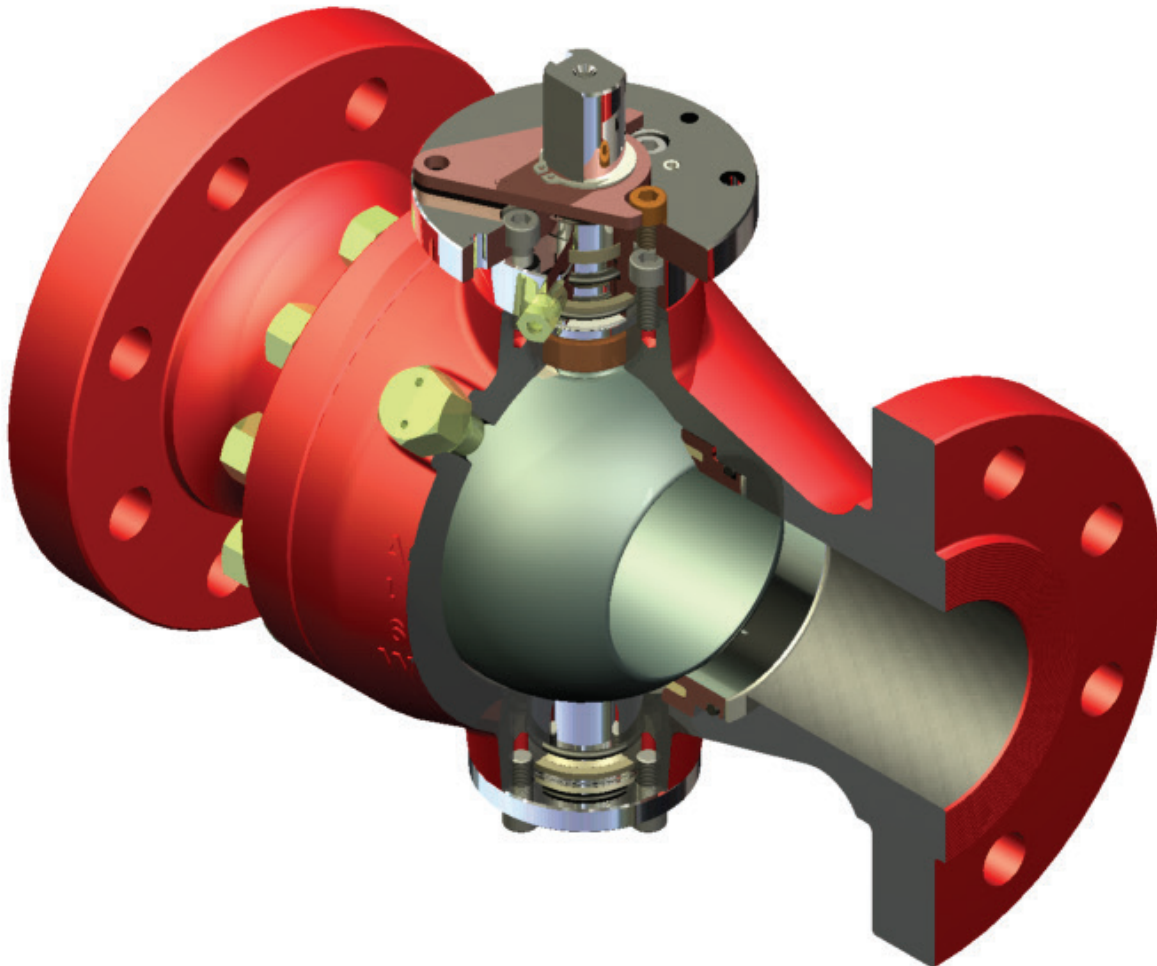
When you specify an AOP ball valve, you have selected a premier product. With our state-of-the-art manufacturing techniques, our valves are manufactured to the highest standards ensuring superior performance.

All AOP ball valves are manufactured and tested in compliance with the requirements of API 6D specifications. These industry standards dictate end-to-end dimensions, flange configuration, port sizes, materials of construction, quality control procedures and testing requirements.

AOP ball valves are stocked by a network of authorized distributors to service the petroleum producing and refining industries in the US and Canada. AOP products are marketed worldwide by domestic and international representatives. Many of these representatives maintain local inventories for immediate delivery.

In addition to trunnion ball valves, Cameron's AOP brand offers a wide range of threaded-end and flanged-end floating ball valves, threaded and flanged check valves, and needle valves.

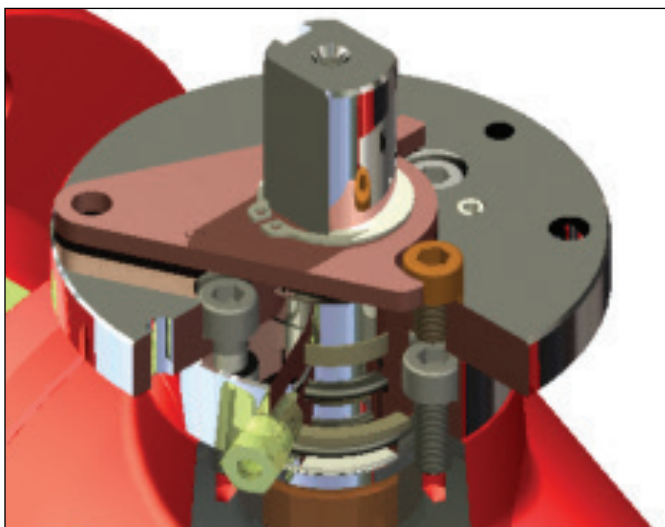
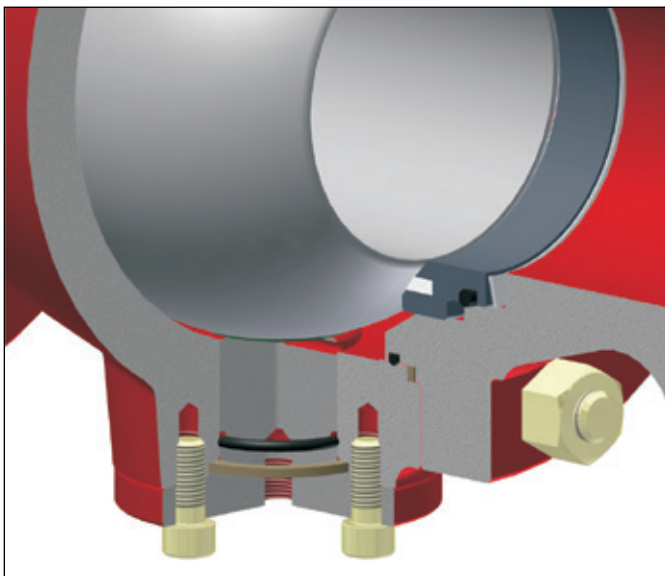
Call Cameron, our field representatives or local distributors today for more information on how we can provide solutions for your production needs.



FEATURES AND BENEFITS

The AOP Series D trunnion mounted ball valves offer a broad range of trim options. These include: stainless steel, low-temperature or high-temperature applications and special graphite seals.

The special graphite seals are provided to effectively prevent external leakage for fire-safe applications (conforms to API specifications 6FA or 607).



AOP's two-piece, end-entry, trunnion mounted ball valves are available in flanged connections with sizes ranging from 2" to 12" bore to ASME Class 900 and 2", 3" and 4" in API 1500 and 5000 pressure classes.

Operating temperatures range from -50° F to +350° F (-46° C to +175° C).

Standard Features

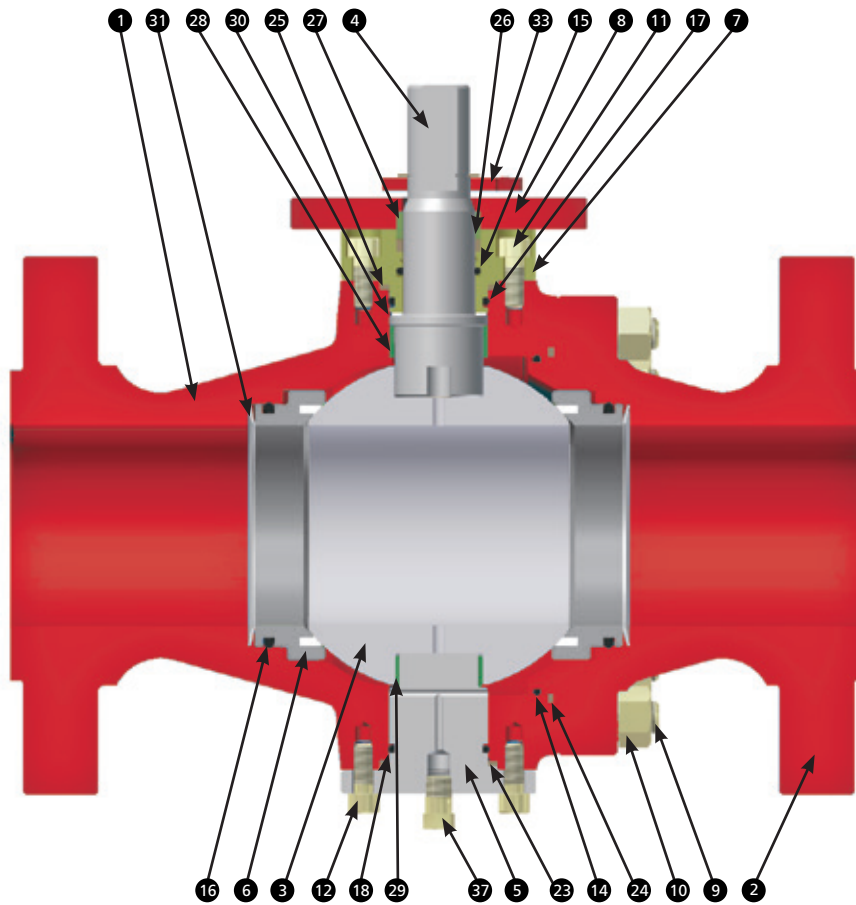
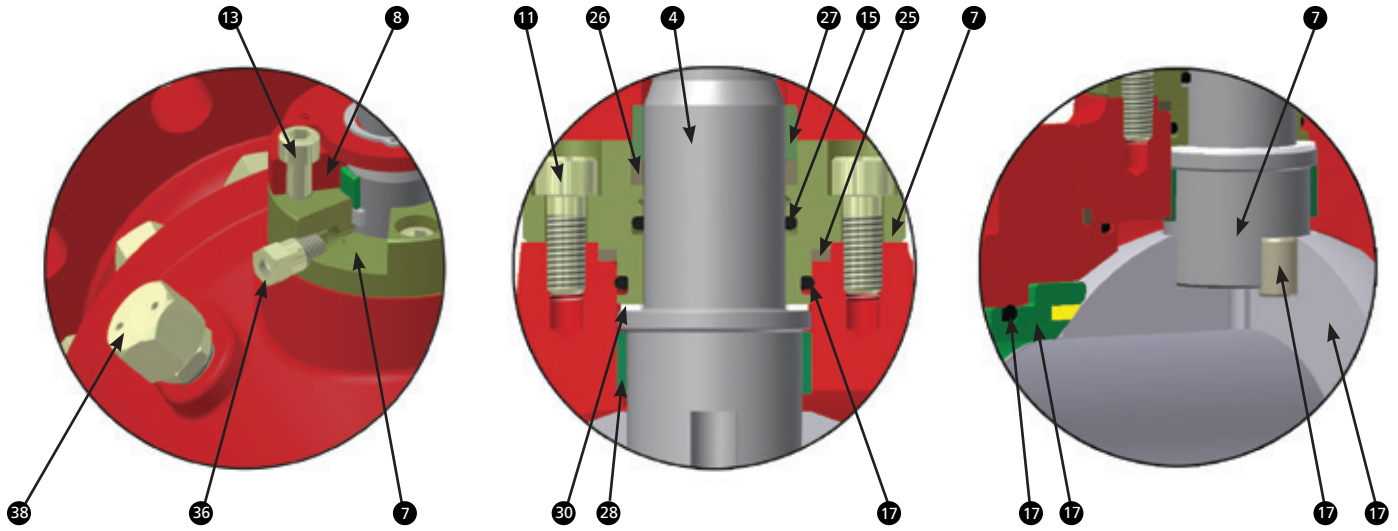
- Double barrier stem seals
- Short coupled trunnions to reduce unit bearing loads and operating torque
- Fixed-position external stops
- Stem separate from the ball
- Trunnion mounted ball for ease of operation at high pressures
- NACE MR0175/ISO 15156
- Fire-tested in accordance with API 6FA or API 607
- Plastic polymer insert or elastomer (6" to 12") for seat sealing
- Metal-backed self-lubricating PTFE sleeve bearings and thrust washers reduce torque and extend service life
- Bolted construction permits disassembly on job site for repairs
- Standard valve trim is supplied with electroless nickel coating
- Fire-safe graphite rings for protection against external leakage (2", 3" and 4")
- Self-relieving seats to eliminate cavity pressure lock
- Double block and bleed standard
- Seat injection standard on 6" to 12" valves in ASME Class 150-900 and 2", 3" and 4" valves in ASME Class 1500, 2500 and 5000
- API 6D monogrammed

Optional Features

- Sealing materials are available for various service conditions

ASME Class 150-900, 2" through 6" x 4"

VALVE ASSEMBLY

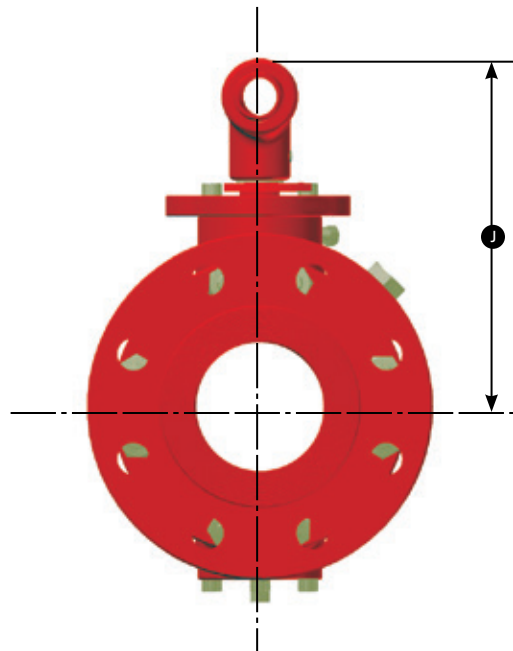
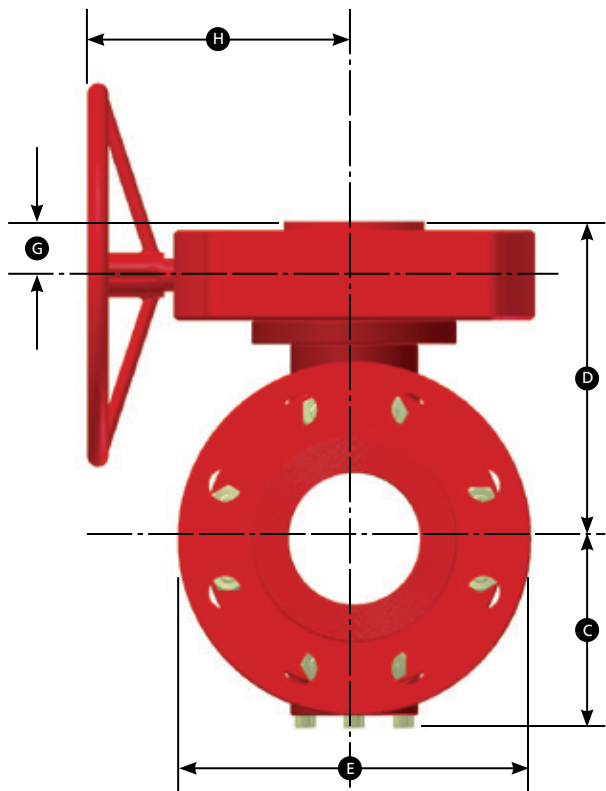
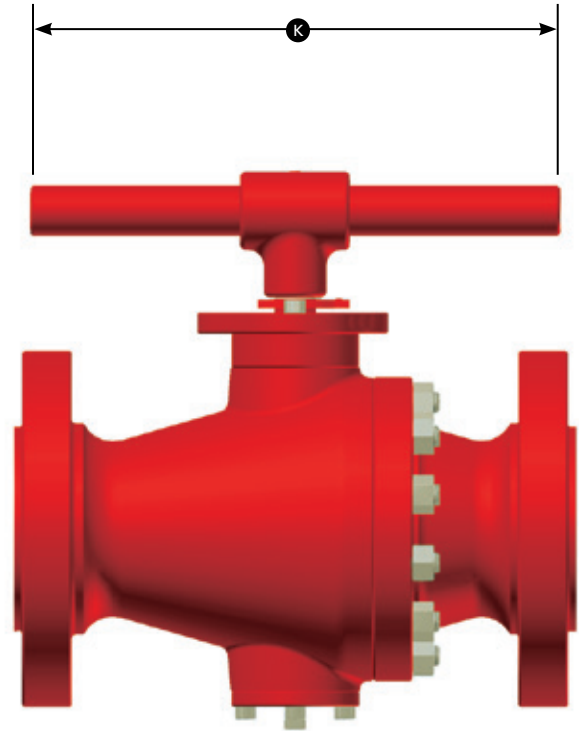
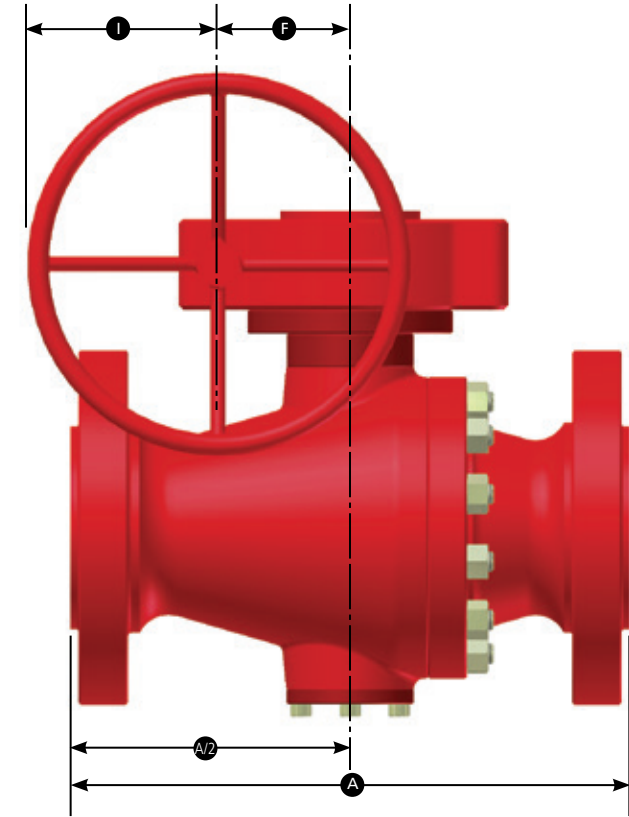


MATERIALS OF CONSTRUCTION

Item	Part	Carbon Steel NACE	Stainless Steel NACE
1	Body	ASTM A216 WCC	ASTM A216 WCC
2	Closure	ASTM A216 WCC/A350 LF2	ASTM A216 WCC/A350 LF2
3	Ball	ASTM A350 LF2 1MIL ENP	ASTM A351 CF8M
4	Stem	ASTM 4140 1MIL ENP	ASTM A564-630
5	Lower Trunnion	ASTM 4140 1MIL ENP	ASTM A351 CF8M/A564-630
6	Seat Ring	ASTM A350 LF2 1MIL ENP w/insert	ASTM A351 CF8M w/insert
7	Gland Plate	ASTM A350 LF2	ASTM 350 LF2
8	Bearing Housing (Lever Op.)/ Adapter Plate	ASTM A36/A350 LF2	ASTM A36/A350 LF2
9	Body Stud	ASTM A193 B7*	ASTM A193 B7*
10	Body Stud Nut	ASTM A194 2H*	ASTM A194 2H*
11	Gland Plate Capscrews	A574M	A574M
12	Lower Trunnion Capscrews	A574M	A574M
13	Bearing Housing (Lever Op.)/ Adapter Plate Capscrews	A574M	A574M
14	Closure O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
15	Stem O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
16	Seat Gasket O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
17	Gland Plate O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
18	Trunnion O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
19	Gland Plate Backup Ring (Class 900/1500 Only, Not Shown)	Nylon	Nylon
20	Stem Backup Ring (Class 900/1500 Only, Not Shown)	Nylon	Nylon
21	Lower Trunnion Backup Ring (Class 900/1500 Only, Not Shown)	Nylon	Nylon
22	Closure Backup Ring (Class 900/1500 Only, Not Shown)	Nylon	Nylon
23	Lower Trunnion Fire Seal	Graphoil	Graphoil
24	Closure Fire Seal	Graphoil	Graphoil
25	Gland Plate Fire Seal	Graphoil	Graphoil
26	Stem Fire Seal	Graphoil	Graphoil
27	Gland Bushing	ASTM A53 1MIL ENP	ASTM A53 1MIL ENP
28	Stem Bearing	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
29	Trunnion Bearing	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
30	Upper Thrust Washer	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
31	Seat Springs	Inconel X-750	Inconel X-750
32	Stem Drive Pins	AISI 4140	ASTM A564-630
33	Stop Plate (Lever Op.)	ASTM A569	ASTM A569
34	Torque Pin (Actuated, Not Shown)	AISI 1075	AISI 1075
35	Stem Key (Actuated)	AISI 1045/AISI 4140	AISI 1045/AISI 4140
36	Stem Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
37	Vent/Drain Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
38	Body Injection Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630

- Notes: 1. Materials listed are minimum requirements. Cameron reserves the right to substitute materials listed on this page with alternate materials for the designated service.
2. Component 8: Adapter plate required in lieu of bearing housing on actuated valves.
3. Stainless steel locking device available upon request.
* Buried NACE bolting available upon request.

DIMENSIONS AND WEIGHTS



DIMENSIONS AND WEIGHTS

ASME CLASS 150

Working pressure – 285 psig (19.7 barg)

SIZE	in. (mm)	B	A		C	D	E	F	G	H	I	J	K	Weight lb	
			RF											Valve (kg)	Gearbox (kg)
4	4	4	9	6-1/8	10-1/2	9-1/8	2-7/8	2-1/4	7-11/16	4	9-3/16	36	120	20	
	(100)	(102)	(229)	(156)	(267)	(232)	(71)	(57)	(195)	(102)	(233)	(914)	(54)	(9)	
6 x 4 x 6	4	4	10-1/2	6-1/8	10-1/2	11	2-7/8	2-1/4	7-11/16	4	9-3/16	36	135	20	
(150 x 100 x 150)	(102)	(102)	(267)	(156)	(267)	(279)	(71)	(57)	(195)	(102)	(233)	(914)	(61)	(9)	

ASME CLASS 300

Working pressure – 740 psig (51.0 barg)

SIZE	in. (mm)	B	A		C	D	E	F	G	H	I	J	K	Weight lb	
			RF											Valve (kg)	Gearbox (kg)
4	4	4	12	6-1/8	10-1/2	10	2.80	2-1/4	7-11/16	4	9-3/16	36	145	20	
	(100)	(102)	(305)	(156)	(267)	(254)	(71)	(57)	(195)	(102)	(233)	(914)	(66)	(9)	
6 x 4 x 6	4	4	15-7/8	6-1/4	10-1/2	12-1/2	2.80	2-1/4	7-11/16	4	9-3/16	36	200	20	
(150 x 100 x 150)	(102)	(102)	(403)	(159)	(267)	(318)	(71)	(57)	(195)	(102)	(233)	(914)	(91)	(9)	

ASME CLASS 600

Working pressure – 1480 psig (102 barg)

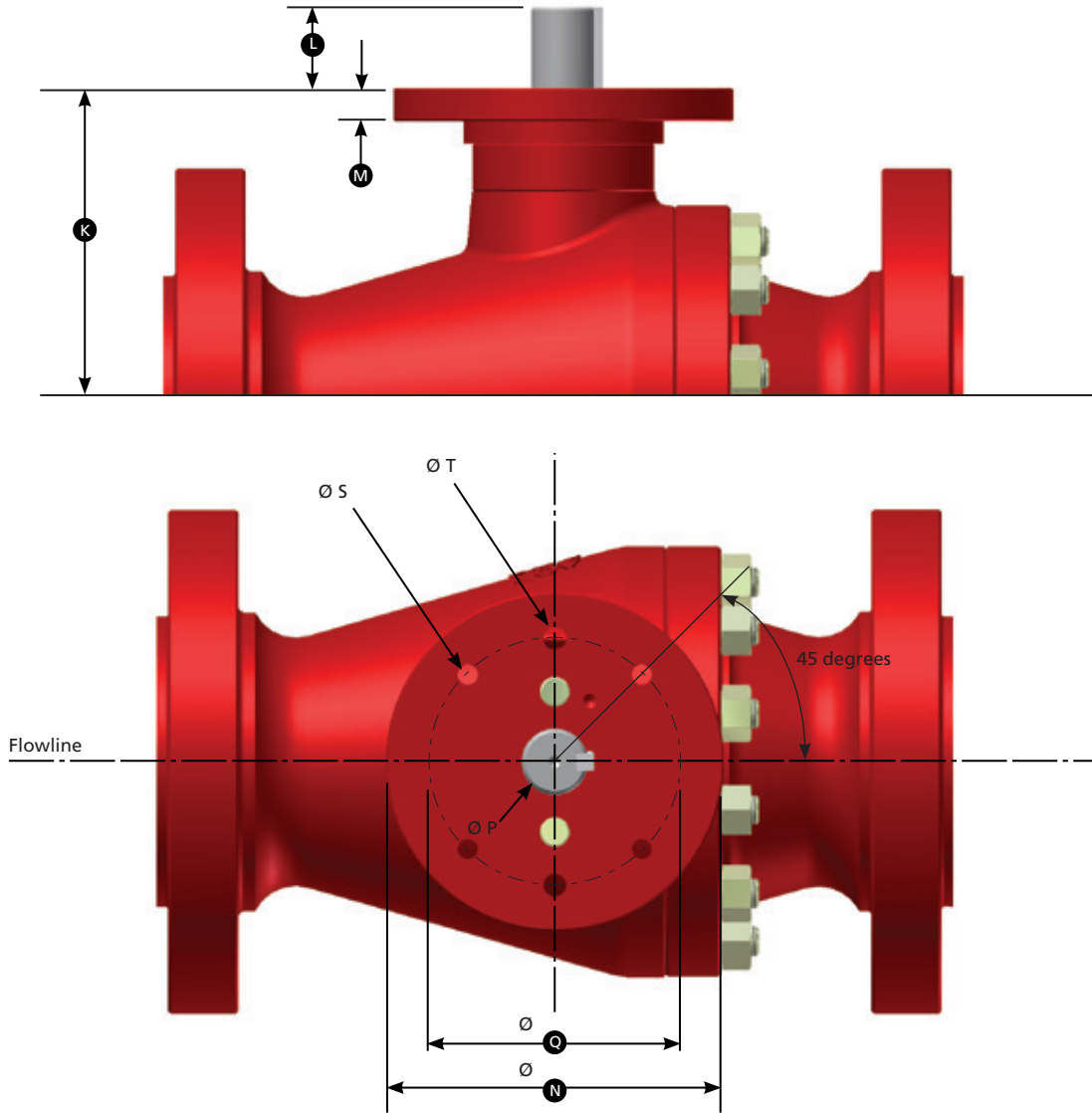
SIZE	in. (mm)	B	A		C	D	E	F	G	H	I	J	K	Weight lb	
			RF	RTJ										Valve (kg)	Gearbox (kg)
2	2	2	11-1/2	11-5/8	4-1/8	8-1/2	6-1/2	2.05	2-1/4	8.42	4	6-1/2	24	50	11
	(50)	(51)	(292)	(295)	(105)	(216)	(165)	(52)	(57)	(215)	(101)	(165)	(610)	(23)	(5)
3 x 2 x 3	2	2	14	14-1/8	4-1/8	8-1/2	8-1/4	2.05	2-1/4	8.42	4	6-1/2	24	70	11
(75 x 50 x 75)	(51)	(51)	(356)	(359)	(105)	(216)	(210)	(52)	(57)	(215)	(101)	(165)	(610)	(32)	(5)
3	3	3	14	14-1/8	5-1/8	9-1/2	8-1/4	2.80	2-1/4	11-3/16	6	8-1/4	36	100	20
	(75)	(76)	(356)	(359)	(130)	(241)	(210)	(71)	(57)	(284)	(152)	(210)	(914)	(45)	(9)
4 x 3 x 4	3	3	17	17-1/8	5-7/16	9-1/2	10-3/4	2.80	2-1/4	11-3/16	6	8-1/4	36	155	20
(100 x 75 x 100)	(76)	(76)	(432)	(435)	(138)	(241)	(273)	(71)	(57)	(284)	(152)	(210)	(914)	(70)	(9)
4	4	4	17	17-1/8	6-1/8	10-1/2	10-3/4	2.80	2-1/4	11-3/16	6	9-3/16	36	190	20
	(100)	(102)	(432)	(435)	(156)	(267)	(273)	(71)	(57)	(284)	(152)	(233)	(914)	(86)	(9)
6 x 4 x 6	4	4	22	22-1/8	7	10-1/2	14	2.80	2-1/4	11-3/16	6	9-3/16	36	295	20
(150 x 100 x 150)	(102)	(102)	(559)	(562)	(178)	(267)	(356)	(71)	(57)	(284)	(152)	(233)	(914)	(134)	(9)

ASME CLASS 900

Working pressure – 2220 psig (153.1 barg)

SIZE	in. (mm)	B	A		C	D	E	F	G	H	I	J	K	Weight lb	
			RF	RTJ										Valve (kg)	Gearbox (kg)
2	2	2	14-1/2	14-5/8	4-7/16	8-3/4	8-1/2	2.80	2-1/4	11-3/16	6	6-7/8	24	100	20
	(50)	(51)	(368)	(371)	(113)	(222)	(216)	(71)	(57)	(284)	(152)	(175)	(610)	(45)	(9)
3 x 2 x 3	2	2	15	15-1/8	4-3/4	8-3/4	9-1/2	2.80	2-1/4	11-3/16	6	6-7/8	24	120	20
(75 x 50 x 75)	(51)	(51)	(381)	(384)	(121)	(222)	(241)	(71)	(57)	(284)	(152)	(175)	(610)	(54)	(9)
3	3	3	15	15-1/8	5-9/16	10	9-1/2	2.80	2-1/4	11-3/16	6	8-3/4	36	150	20
	(75)	(76)	(381)	(384)	(141)	(254)	(241)	(71)	(57)	(284)	(152)	(222)	(914)	(68)	(9)
4 x 3 x 4	3	3	18	18-1/8	5-3/4	10	11-1/2	2.80	2-1/4	11-3/16	6	8-3/4	36	190	20
(100 x 75 x 100)	(76)	(76)	(457)	(460)	(146)	(254)	(292)	(71)	(57)	(284)	(152)	(222)	(914)	(86)	(9)
4	4	4	18	18-1/8	6-13/16	11-1/2	11-1/2	3.39	2-1/4	10-3/4	9-7/8	10-1/4	48	260	30
	(100)	(102)	(457)	(460)	(173)	(292)	(292)	(86)	(57)	(273)	(251)	(260)	(1219)	(118)	(14)
6 x 4 x 6	4	4	24	24-1/8	7-1/2	11-1/2	15	3.39	2-1/4	10-3/4	9-7/8	10-1/4	48	350	30
(150 x 100 x 150)	(102)	(102)	(610)	(613)	(191)	(292)	(381)	(86)	(57)	(273)	(251)	(260)	(1219)	(159)	(14)

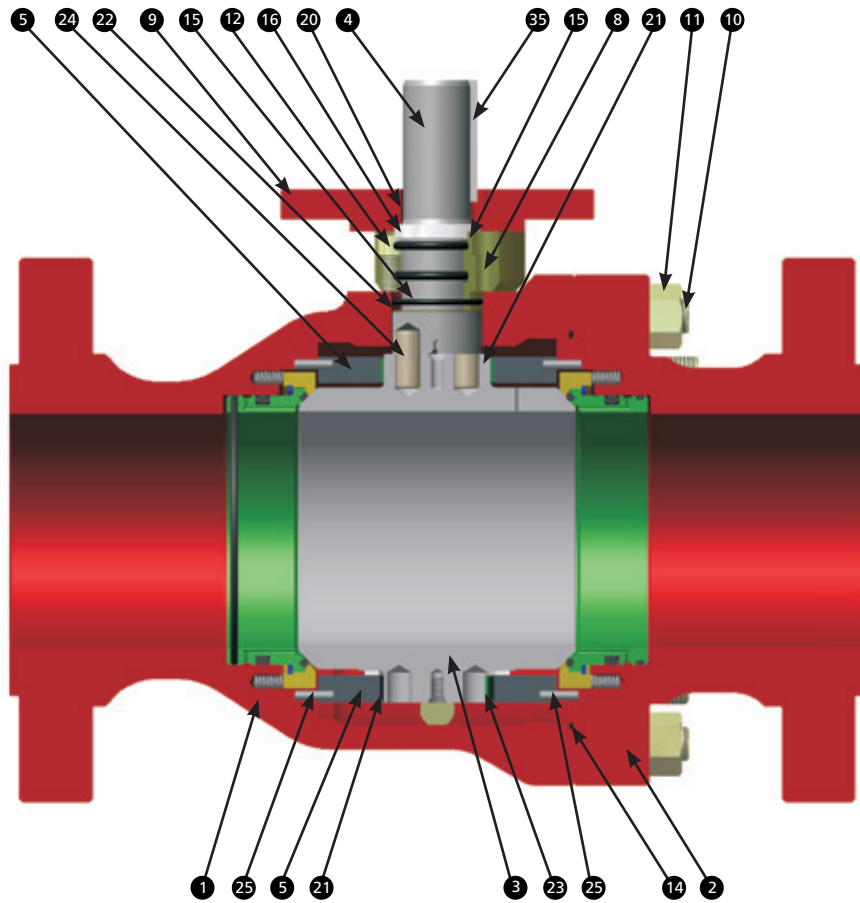
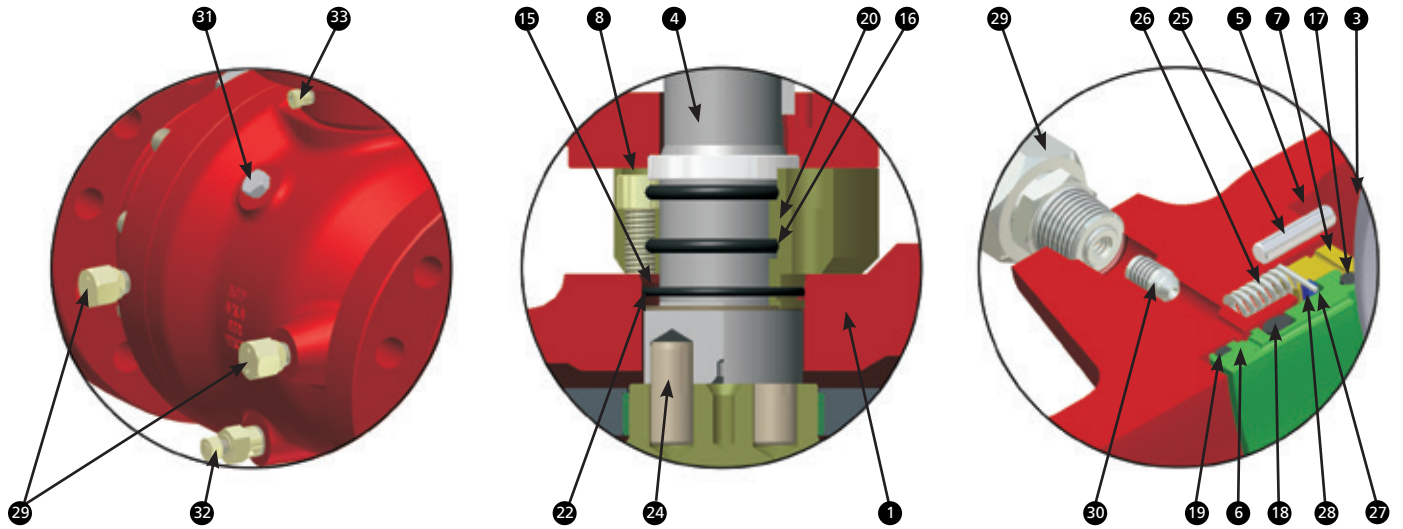
TOPWORKS DIMENSIONS



Ball Size	in. (mm)	ASME Class	K	L	M	N	P (+0/-0.003)	Q	Orientation	S	T	Sq. Key Size
2 (50)		150/600	4.65 (118.00)	1.378 (35.00)	0.39 (10.00)	4.75 (120.60)	0.983 (24.97)	4.016 (102.01)	4 Holes	0.35 (9.00)	0.315 (10.00)	8 mm x 40 mm
2 (50)		900/1500	4.93 (125.10)	1.378 (35.00)	0.66 (17.00)	5.50 (139.00)	0.983 (24.97)	4.625 (117.50)	4 Holes	0.44 (11.00)	0.315 (10.00)	8 mm x 40 mm
3 (75)		150/600	5.67 (144.00)	1.969 (50.00)	0.71 (18.00)	5.50 (139.00)	1.180 (29.97)	4.625 (117.50)	4 Holes	0.44 (11.00)	0.315 (10.00)	8 mm x 55 mm
3 (75)		900/1500	6.08 (154.50)	2.165 (55.00)	0.71 (18.00)	5.78 (146.00)	1.377 (34.97)	4.921 (125.00)	4 Holes	0.44 (11.00)	0.315 (10.00)	10 mm x 60 mm
4 (100)		150/600	6.61 (168.00)	2.165 (55.00)	0.71 (18.00)	5.78 (146.00)	1.377 (34.97)	4.921 (125.00)	4 Holes	0.44 (11.00)	0.315 (10.00)	10 mm x 60 mm
4 (100)		900/1500	7.54 (191.50)	2.165 (55.00)	0.79 (20.00)	7.03 (178.60)	1.574 (39.97)	6.00 (152.40)	4 Holes	0.51 (13.00)	0.472 (12.00)	10 mm x 60 mm

ASME Class 150-900, 6" through 12"

VALVE ASSEMBLY

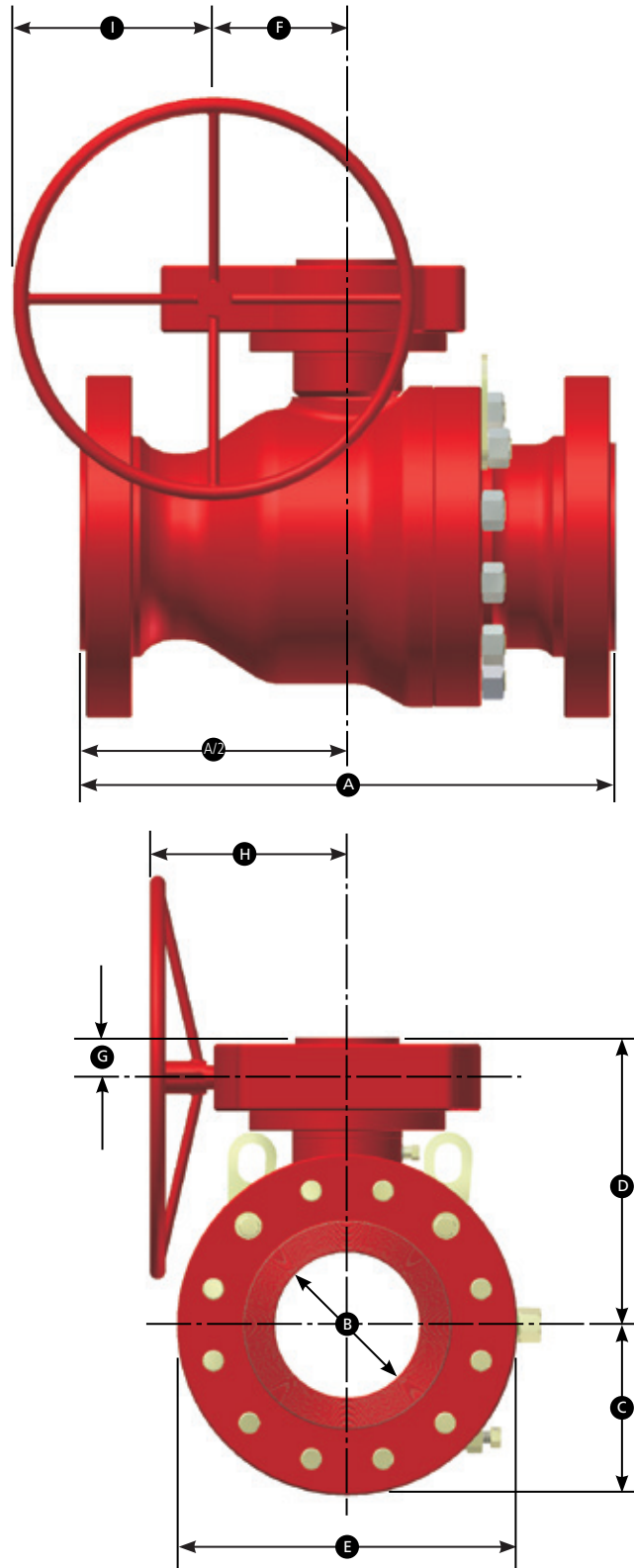


MATERIALS OF CONSTRUCTION

Item	Part	Carbon Steel NACE	Stainless Steel NACE
1	Body	ASTM A216 WCC	ASTM A216 WCC
2	Closure	ASTM A216 WCC	ASTM A216 WCC
3	Ball	ASTM A350 LF2 1MIL ENP	ASTM A351 CF8M 1MIL ENP
4	Stem	AISI 4140 1MIL ENP	ASTM A564-630
5	Bearing Retainer	ASTM A36/A350 LF2	ASTM A36/A350 LF2
6	Inner Seat Ring	ASTM A350 LF2 1MIL ENP	ASTM A351 CF8M 1MIL ENP
7	Outer Seat Ring	ASTM A350 LF2 1MIL ENP	ASTM A351 CF8M
8	Gland Plate	ASTM A350 LF2	ASTM A350 LF2
9	Adapter Plate	ASTM A36/A350 LF2	ASTM A36/A350 LF2
10	Body Stud	ASTM A193 B7*	ASTM A193 B7*
11	Body Stud Nut	ASTM A194 2H*	ASTM A194 2H*
12	Gland Plate Capscrew	A574M	A574M
13	Adapter Plate Capscrew (Not Shown)	A574M	A574M
14	Closure O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
15	Gland Plate O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
16	Stem O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
17	Seat Seal O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
18	Seat Gasket O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
19	Grease Seal O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
20	Gland Bushing	ASTM A53 1MIL ENP	ASTM A53 1MIL ENP
21	Stem Trunnion Bearing	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
22	Upper Thrust Washer	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
23	Lower Thrust Washer	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
24	Stem Drive Pin	AISI 4140	ASTM A564-630
25	Bearing Retaining Pin	AISI 4140	AISI 4140
26	Seat Spring	Inconel X-750	Inconel X-750
27	Seat Lock Ring Spring Pin	Stainless Steel	Stainless Steel
28	Seat Lock Ring	304 SS	304 SS
29	Seat Injection Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
30	Internal Check Valve	ASTM A182 316/K-Monel	ASTM A182 316/K-Monel
31	Vent Plug	ASTM A105	ASTM A182 316
32	Drain Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
33	Stem Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
34	Lifting Lug (Not Shown)	A36	A36
35	Stem Key	AISI 1045/AISI 4140	AISI 1045/AISI 4140
36	Torque Pin (Not Shown)	AISI 1075	AISI 1075

- Notes: 1. Materials listed are minimum requirements. Cameron reserves the right to substitute materials listed on this page with alternate materials for the designated service.
 2. Alternate seal materials are available for special applications.
 * Buried NACE bolting available upon request.

DIMENSIONS AND WEIGHTS



DIMENSIONS AND WEIGHTS

ASME CLASS 150

Working pressure – 285 psig (19.7 barg)

SIZE	in. (mm)	B	A		C	D	E	F	G	H	I	Weight lb	
			RF	RTJ								Valve (kg)	Gearbox (kg)
6	6.00 (150)	6.00 (152)	15.50 (394)		6.31 (160)	12.75 (324)	11.00 (279)	3.38 (86)	2.25 (57)	10.75 (273)	6.00 (152)	230 (104)	30 (14)
8 x 6 x 8 (200 x 150 x 200)	6.00 (152)	6.00 (152)	18.00 (457)		6.75 (171)	12.75 (324)	13.50 (343)	3.38 (86)	2.25 (57)	10.75 (273)	6.00 (152)	330 (150)	30 (14)
8	8.00 (200)	8.00 (203)	18.00 (457)		8.13 (206)	14.50 (368)	13.50 (343)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	480 (218)	70 (32)
10 x 8 x 10 (250 x 200 x 250)	8.00 (203)	8.00 (203)	21.00 (533)		8.13 (206)	14.50 (368)	16.00 (406)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	580 (263)	70 (32)
10	10.00 (250)	10.00 (254)	21.00 (533)		9.69 (246)	16.25 (413)	16.00 (406)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	785 (356)	70 (32)
12 x 10 x 12 (300 x 250 x 300)	10.00 (254)	10.00 (254)	24.00 (610)		9.69 (246)	16.25 (413)	19.00 (483)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	815 (370)	70 (32)
12	12.00 (300)	12.00 (305)	24.00 (610)		11.44 (291)	17.88 (454)	19.00 (483)	4.75 (121)	3.00 (76)	15.00 (381)	12.00 (305)	1115 (506)	70 (32)

ASME CLASS 300

Working pressure – 740 psig (51.0 barg)

6	6.00 (150)	6.00 (152)	15.88 (403)		6.31 (160)	12.75 (324)	12.50 (318)	3.38 (86)	2.25 (57)	10.75 (273)	6.00 (152)	275 (125)	30 (14)
8 x 6 x 8 (200 x 150 x 200)	6.00 (152)	6.00 (152)	19.75 (502)		7.50 (191)	12.75 (324)	15.00 (381)	3.38 (86)	2.25 (57)	10.75 (273)	6.00 (152)	395 (179)	30 (14)
8	8.00 (200)	8.00 (203)	19.75 (502)		8.13 (206)	14.50 (368)	15.00 (381)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	605 (274)	70 (32)
10 x 8 x 10 (250 x 200 x 250)	8.00 (203)	8.00 (203)	22.38 (568)		8.75 (222)	14.50 (368)	17.50 (445)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	655 (297)	70 (32)
10	10.00 (250)	10.00 (254)	22.38 (568)		9.69 (246)	16.25 (413)	17.50 (445)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	915 (415)	70 (32)
12 x 10 x 12 (300 x 250 x 300)	10.00 (254)	10.00 (254)	25.50 (648)		10.25 (260)	16.25 (413)	20.50 (521)	4.75 (121)	3.00 (76)	15.00 (381)	8.00 (203)	1315 (596)	70 (32)
12	12.00 (300)	12.00 (305)	25.50 (648)		11.44 (291)	17.88 (454)	20.50 (521)	4.75 (121)	3.00 (76)	15.00 (381)	12.00 (305)	1390 (630)	70 (32)

ASME CLASS 600

Working pressure – 1480 psig (102 barg)

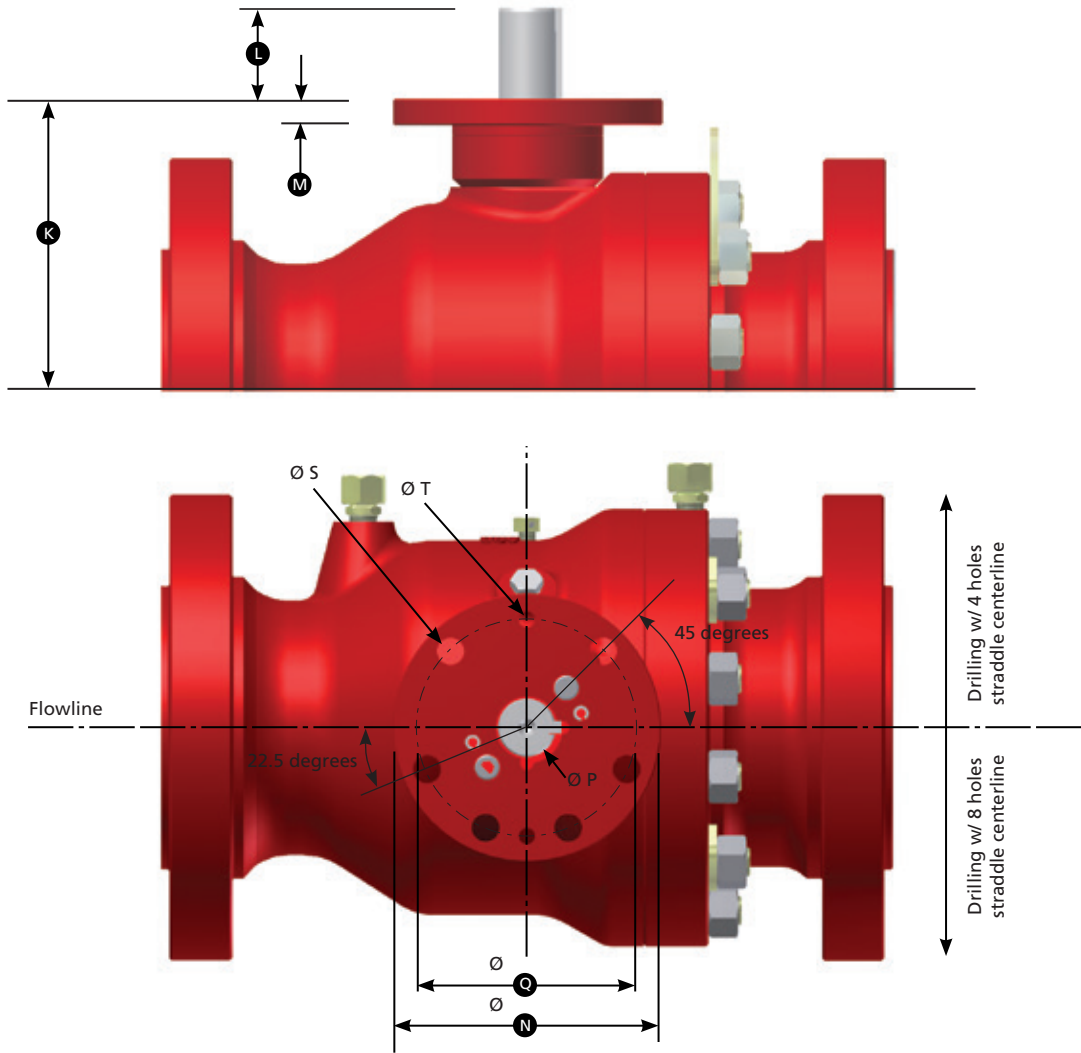
SIZE	in. (mm)	B	A		C	D	E	F	G	H	I	Weight lb	
			RF	RTJ								Valve (kg)	Gearbox (kg)
6 x 6 (150 x 150)	6.00 (152)	6.00 (152)	22.00 (559)	22.13 (562)	7.00 (178)	12.75 (324)	14.00 (356)	3.38 (86)	2.25 (57)	12.00 (305)	10.00 (254)	440 (200)	30 (14)
8 x 6 (200 x 150)	6.00 (152)	6.00 (152)	26.00 (660)	26.13 (664)	8.25 (210)	12.75 (324)	16.50 (419)	3.38 (86)	2.25 (57)	12.00 (305)	10.00 (254)	545 (247)	30 (14)
8 x 8 (200 x 200)	8.00 (203)	8.00 (203)	26.00 (660)	26.13 (664)	8.25 (210)	15.75 (400)	16.50 (419)	4.75 (121)	3.00 (76)	15.25 (387)	12.00 (305)	730 (331)	70 (32)
10 x 8 (250 x 200)	8.00 (203)	8.00 (203)	31.00 (787)	31.13 (791)	10.00 (254)	15.75 (400)	20.00 (508)	4.75 (121)	3.00 (76)	15.25 (387)	12.00 (305)	880 (399)	70 (32)
10 x 10 (250 x 250)	10.00 (254)	10.00 (254)	31.00 (787)	31.13 (791)	10.00 (254)	17.38 (441)	20.00 (508)	4.75 (121)	3.00 (76)	15.25 (387)	12.00 (305)	1240 (562)	70 (32)
12 x 10 (300 x 250)	10.00 (254)	10.00 (254)	33.00 (838)	33.13 (841)	11.00 (279)	17.38 (441)	22.00 (559)	4.75 (121)	3.00 (76)	15.25 (387)	12.00 (305)	1280 (581)	70 (32)
12 x 12 (300 x 300)	12.00 (305)	12.00 (305)	33.00 (838)	33.13 (841)	11.50 (292)	19.00 (483)	22.00 (559)	4.75 (121)	3.00 (76)	17.56 (446)	12.00 (305)	1675 (760)	88 (40)

ASME CLASS 900

Working pressure – 2220 psig (153.1 barg)

6	6.00 (150)	6.00 (152)	24.00 (610)	24.13 (613)	7.50 (191)	14.50 (368)	15.00 (381)	5.13 (130)	3.00 (76)	15.25 (387)	10.00 (254)	555 (252)	70 (32)
8 x 6 x 8 (200 x 150 x 200)	6.00 (152)	6.00 (152)	29.00 (737)	29.13 (740)	9.25 (235)	14.50 (368)	18.50 (470)	5.13 (130)	3.00 (76)	15.25 (387)	10.00 (254)	755 (342)	70 (32)
8	8.00 (200)	8.00 (203)	29.00 (737)	29.13 (740)	9.25 (235)	15.63 (397)	18.50 (470)	5.13 (130)	3.00 (76)	15.25 (387)	12.00 (305)	1150 (522)	70 (32)
10 x 8 x 10 (250 x 200 x 250)	8.00 (203)	8.00 (203)	33.00 (838)	33.13 (841)	10.75 (273)	15.63 (397)	21.50 (546)	5.13 (130)	3.00 (76)	15.25 (387)	12.00 (305)	1200 (544)	70 (32)
10	10.00 (250)	10.00 (254)	33.00 (838)	33.13 (841)	10.75 (273)	17.38 (441)	21.50 (546)	8.31 (211)	3.00 (76)	17.56 (446)	12.00 (305)	1355 (615)	88 (40)
12 x 10 x 12 (300 x 250 x 300)	10.00 (254)	10.00 (254)	38.00 (965)	38.13 (968)	12.00 (305)	17.38 (441)	24.00 (610)	8.31 (211)	3.00 (76)	17.56 (446)	12.00 (305)	1705 (773)	88 (40)
12	12.00 (300)	12.00 (305)	38.00 (965)	38.13 (968)	12.00 (305)	19.00 (483)	24.00 (610)	8.31 (211)	3.00 (76)	17.56 (446)	12.00 (305)	2175 (987)	88 (40)

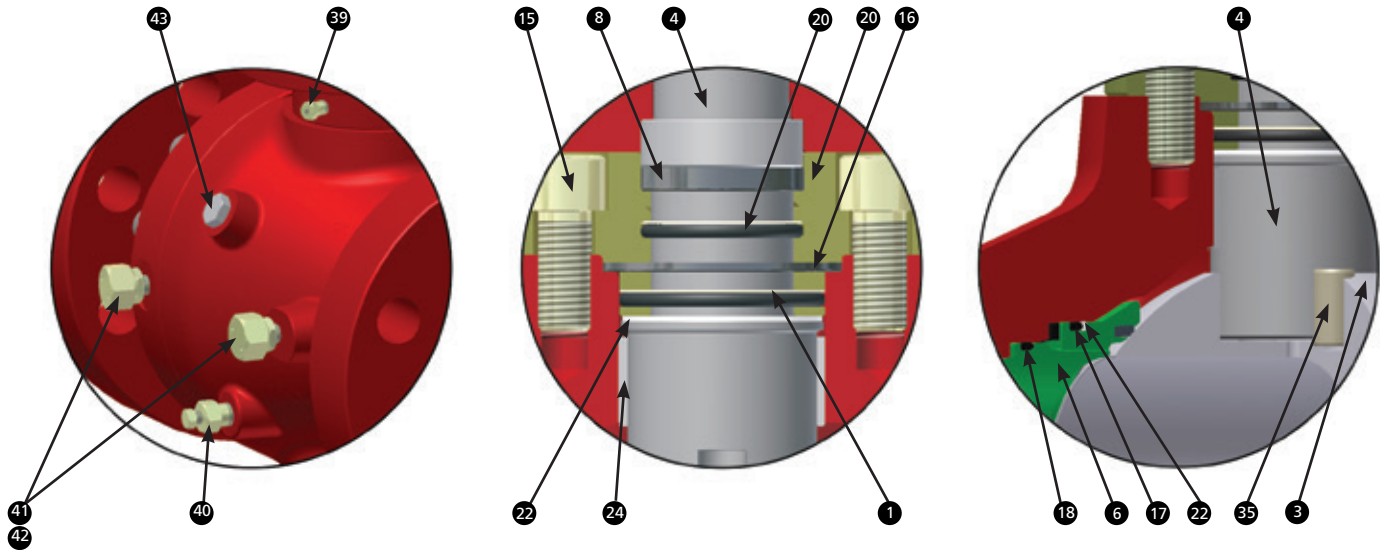
TOPWORKS DIMENSIONS



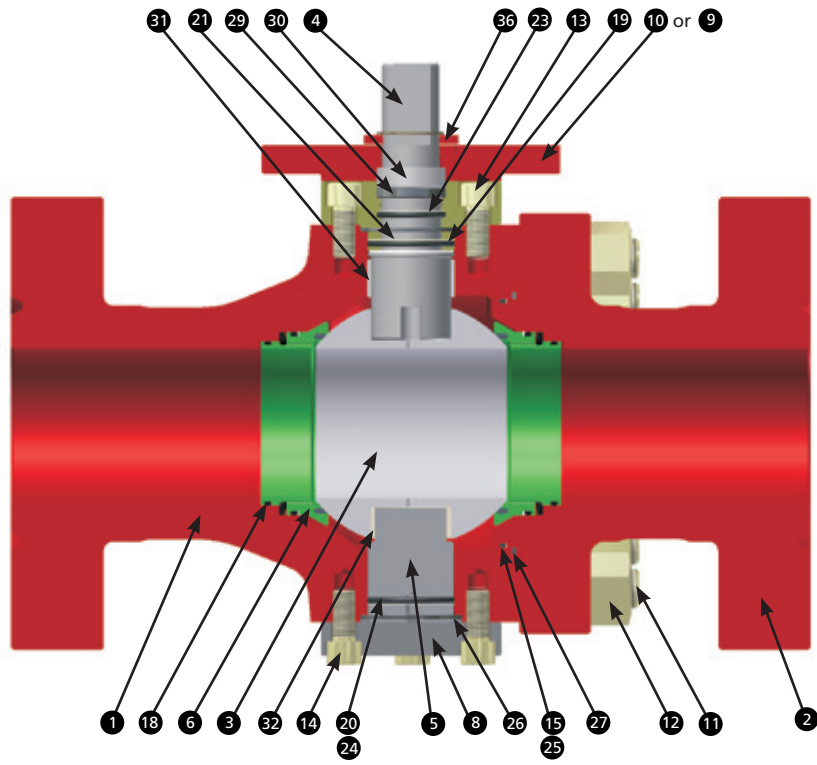
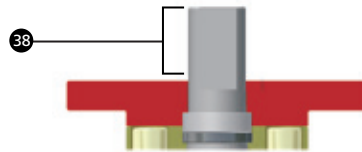
Ball Size	in. (mm)	ASME Class	K	L	M	N	P (+0/-0.003)	Q	Orientation	S	T	Sq. Key Size
6	(150)	150/600	8.76 (222.60)	2.717 (69.00)	13/16 (21.00)	8-1/16 (205.00)	1.748 (44.00)	6.50 (165.00)	4 Holes	13/16 (21.00)	0.472 (12.00)	3/8" x 3-1/4"
6	(150)	900	9.31 (236.50)	3.543 (90.00)	13/16 (21.00)	9-1/16 (230.00)	2.374 (60.30)	7.75 (197.00)	8 Holes	9/16 (14.00)	0.629 (16.00)	5/8" x 4"
8	(200)	150/900	10.50 (266.60)	3.543 (90.00)	13/16 (21.00)	9-1/16 (230.00)	2.374 (60.30)	7.75 (197.00)	8 Holes	9/16 (14.00)	0.629 (16.00)	5/8" x 4"
10	(250)	150/600	12.25 (311.10)	3.543 (90.00)	13/16 (21.00)	9-1/16 (230.00)	2.374 (60.30)	7.75 (197.00)	8 Holes	9/16 (14.00)	0.629 (16.00)	5/8" x 4"
10	(250)	900	12.25 (311.10)	3.740 (95.00)	13/16 (21.00)	9-1/16 (230.00)	2.374 (60.30)	7.75 (197.00)	8 Holes	9/16 (14.00)	0.629 (16.00)	5/8" x 4-3/8"
12	(300)	150/600	13.88 (352.40)	3.740 (95.00)	13/16 (21.00)	10-3/4 (273.00)	2.374 (60.30)	9.00 (228.60)	4 Holes	13/16 (21.00)	0.629 (16.00)	5/8" x 4-3/8"
12	(300)	900	13.88 (352.40)	3.740 (95.00)	13/16 (21.00)	10-3/4 (273.00)	2.874 (73.00)	9.00 (228.60)	4 Holes	13/16 (21.00)	0.629 (16.00)	3/4" x 4-5/16"

ASME Class 1500, 2" x 2" through 6" x 4"

VALVE ASSEMBLY



BARE STEM OPTION



MATERIALS OF CONSTRUCTION

Item	Part	Carbon Steel NACE	Stainless Steel NACE
1	Body	ASTM A216 WCC	ASTM A216 WCC
2	Closure-Adapter	ASTM A216 WCC	ASTM A216 WCC
3	Ball	AISI 4140/4130 1MIL ENP	ASTM A564-630
4	Stem	AISI 4140/4130 1MIL ENP	ASTM A564-630
5	Lower Trunnion	AISI 4140/4130 1MIL ENP	ASTM A564-630
6	Seat Ring	AISI 4140/4130 1MIL ENP with insert	ASTM A564-630 with insert
7	Gland Plate-Bonnet	ASTM A350 LF2	ASTM A350 LF2
8	Trunnion Cover	AISI 4130/4140	AISI 4130/4140
9	Bearing Housing (Lever Op.)	ASTM A36/A350 LF2	ASTM A36/A360 LF2
10	Adapter Plate (Actuated Valve)	ASTM A36/A350 LF2	ASTM A36/A360 LF2
11	Body Stud	ASTM A193 B7*	ASTM A193 B7*
12	Body Nut	ASTM A194 2H*	ASTM A194 2H*
13	Gland Plate Capscrews	A574M	A574M
14	Trunnion Cover Capscrews	A574M	A574M
15	Closure O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
16	Stem O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
17	Seat Gasket O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
18	Seat Secondary O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
19	Gland Plate O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
20	Trunnion O-ring	Fluorocarbon Elastomer	Fluorocarbon Elastomer
21	Gland Plate Backup Ring	Nylon	Nylon
22	Seat Gasket Backup Ring	Nylon	Nylon
23	Stem Backup Ring	Nylon	Nylon
24	Lower Trunnion Backup Ring	Nylon	Nylon
25	Closure Backup Ring	Nylon	Nylon
26	Lower Trunnion Fire Seal	Graphoil	Graphoil
27	Closure Fire Seal	Graphoil	Graphoil
28	Gland Plate Fire Seal	Graphoil	Graphoil
29	Stem Fire Seal	Graphoil	Graphoil
30	Gland Bushing	ASTM A53 1MIL ENP	ASTM A53 1MIL ENP
31	Stem Bearing	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
32	Trunnion Bearing	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
33	Stem Thrust Washer	Dry Bearing (Steel/Teflon)	Dry Bearing (Steel/Teflon)
34	Seat Wave Springs	Inconel X-750	Inconel X-750
35	Stem Drive Pins	AISI 4140	ASTM A564-630
36	Stop Plate (Lever Op.)	ASTM A569	ASTM A569
37	Torque Pin (Actuated, Not Shown)	AISI 1075	AISI 1075
38	Stem Key (Actuated)	AISI 1045/AISI 4140	AISI 1045/AISI 4140
39	Stem Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
40	Body Vent/Drain Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
41	Seat Injection Fitting	AISI 1018/AISI 4140	ASTM A182 316/A564-630
42	Internal Check Valve	AISI 4140/K-Monel	ASTM A182 316/K-Monel
43	Body Vent Plug	ASTM A105	ASTM A182 316

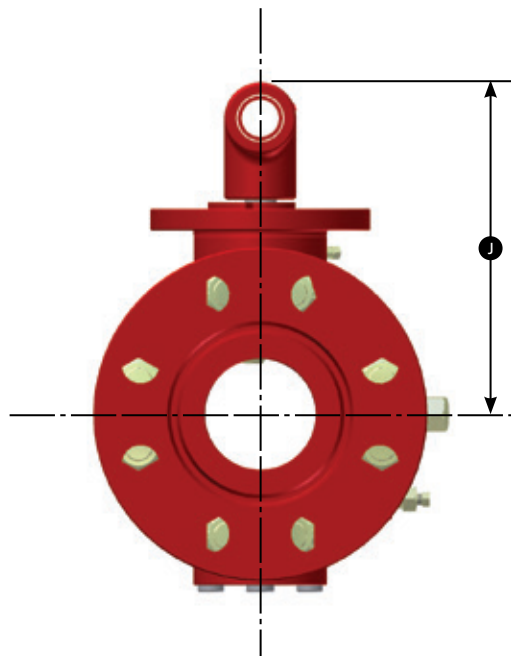
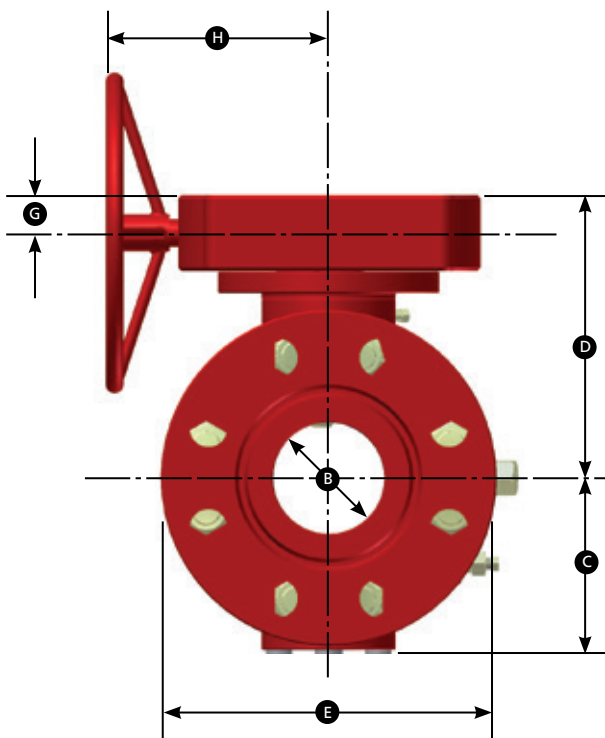
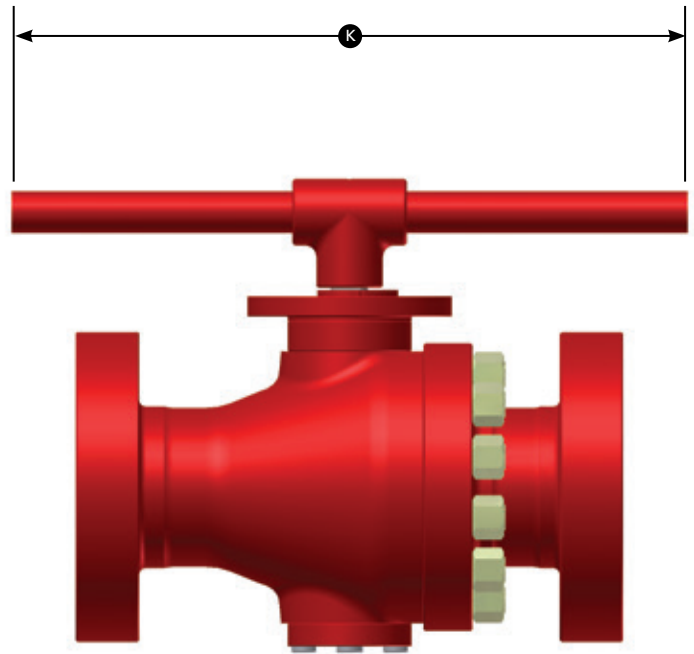
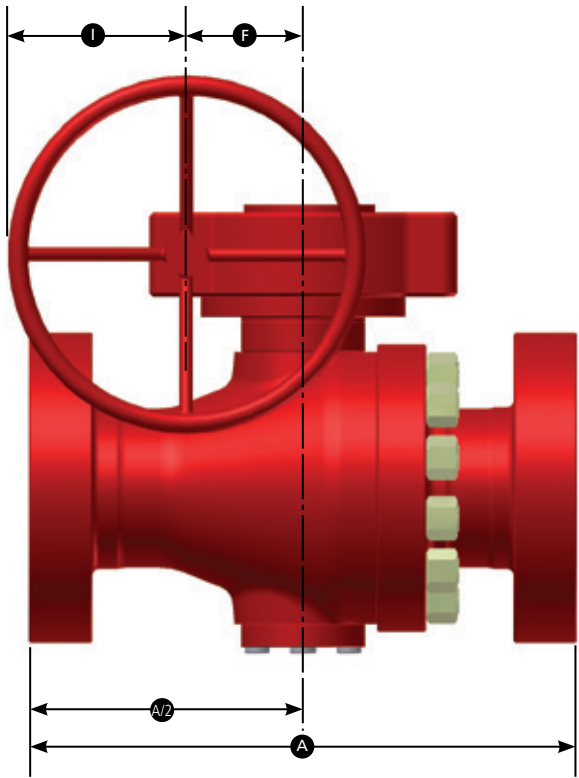
Notes: 1. Materials listed are minimum requirements. Cameron reserves the right to substitute materials listed on this page with alternate materials for the designated service.

2. Alternate seat, seal and ring materials are available for special applications.

3. Stainless steel locking device available upon request.

* Buried NACE bolting available upon request.

DIMENSIONS AND WEIGHTS

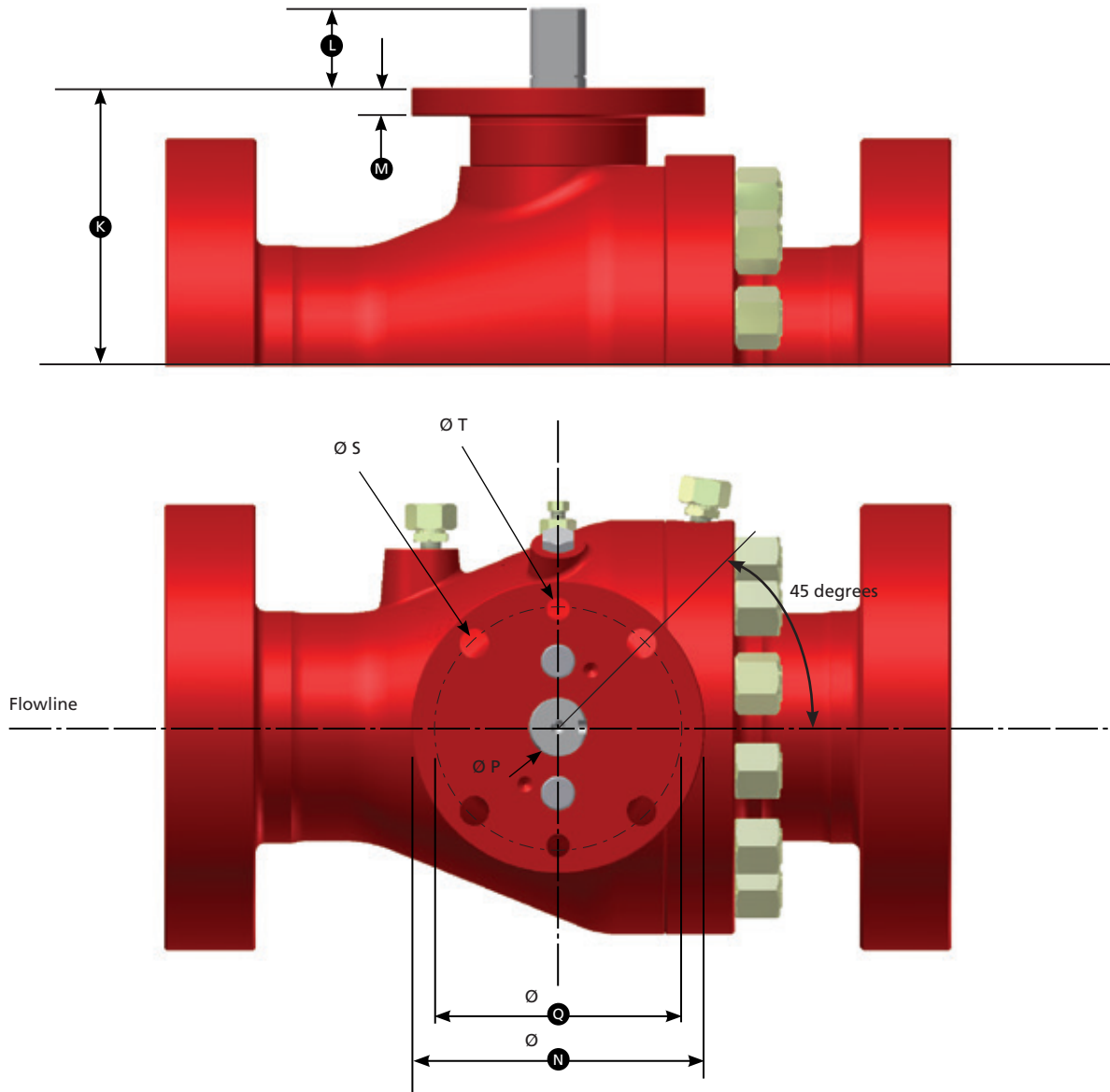


DIMENSIONS AND WEIGHTS

API 6D CLASS 1500

Size	in. (mm)	B	A		C	D	E	F	G	H	I	J	K	Weight lb	
			RF	RTJ										Valve (kg)	Gearbox (kg)
2 x 2 (50 x 50)	2.06 (52)	2.06 (52)	14.50 (368)	14.63 (372)	4.06 (103)	6.53 (166)	8.50 (216)	2.80 (71)	1.86 (47)	11.17 (284)	5.90 (150)	8.06 (205)	24.00 (610)	100 (45)	21 (9.5)
3 x 2 (80 x 50)	2.06 (52)	2.06 (52)	18.50 (470)	18.63 (473)	4.06 (103)	6.53 (166)	10.50 (267)	2.80 (71)	1.86 (47)	11.17 (284)	5.90 (150)	8.06 (205)	24.00 (610)	170 (77)	21 (9.5)
3 x 3 (80 x 80)	3.13 (79.5)	3.13 (79.5)	18.50 (470)	18.63 (473)	5.29 (134)	7.72 (196)	10.50 (267)	2.80 (71)	1.86 (47)	11.17 (284)	5.90 (150)	10.24 (260)	36.00 (914)	197 (89)	21 (9.5)
4 x 3 (100 x 80)	3.13 (79.5)	3.13 (79.5)	21.50 (546)	21.62 (549)	5.29 (134)	7.72 (196)	12.25 (311)	2.80 (71)	1.86 (47)	11.17 (284)	5.90 (150)	10.24 (260)	36.00 (914)	240 (109)	21 (9.5)
4 x 4 (100 x 100)	4.06 (103)	4.06 (103)	21.50 (546)	21.62 (549)	6.52 (166)	9.21 (234)	12.25 (311)	3.39 (86)	1.97 (50)	10.75 (273)	9.80 (249)	12.19 (310)	48.00 (1219)	360 (163)	30 (13.5)
6 x 4 (150 x 100)	4.06 (103)	4.06 (103)	27.75 (705)	28.00 (711)	6.52 (166)	9.21 (234)	15.50 (394)	3.39 (86)	1.97 (50)	10.75 (273)	9.80 (249)	12.19 (310)	48.00 (1219)	405 (184)	30 (13.5)

TOPWORKS DIMENSIONS



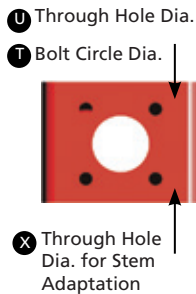
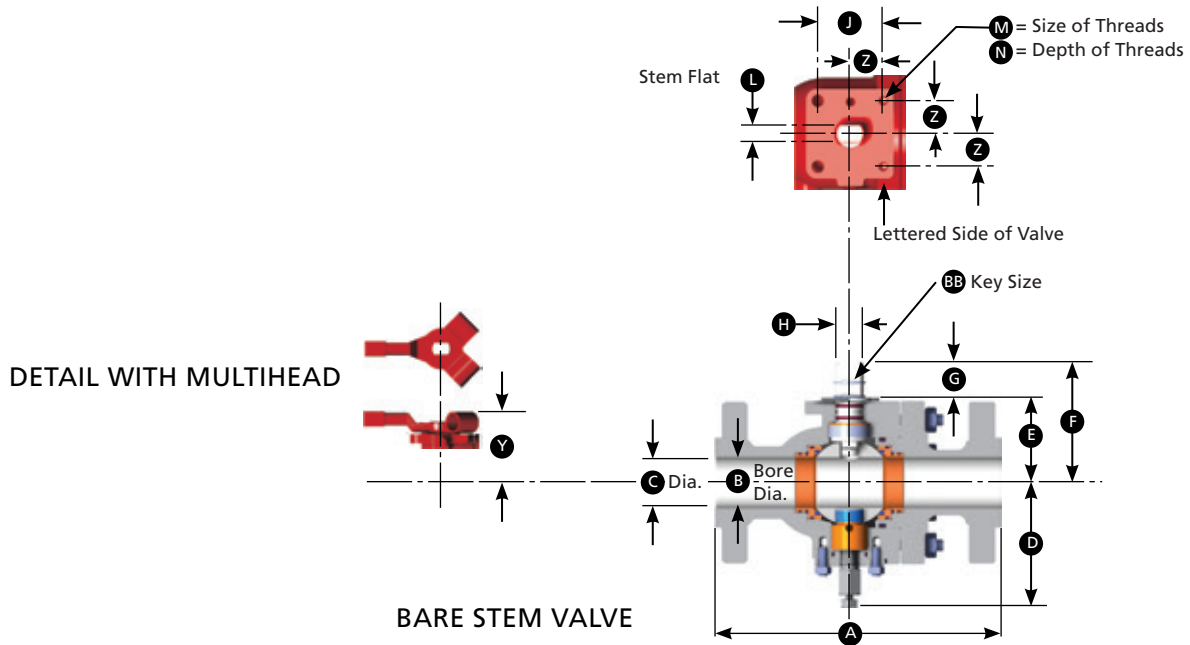
Size	in. (mm)	K	L	M	N	P (+0/-0.003)	Q	Orientation	S	T	Sq. Key Size
2 x 2 (50 x 50)		4.93 (125)	1.38 (35)	0.66 (17)	5.50 (139)	0.983 (24.97)	4.625 (117.50)	4 Holes	0.44 (11)	0.315 (10)	0.315 x 1.57 (8 x 40)
3 x 3 (80 x 80)		6.13 (156)	2.17 (55)	0.71 (18)	5.78 (146)	1.377 (34.97)	4.921 (125)	4 Holes	0.44 (11)	0.315 (10)	0.393 x 2.36 (10 x 60)
4 x 4 (100 x 100)		7.56 (192)	2.17 (55)	0.79 (21)	7.03 (178.60)	1.574 (39.97)	6.00 (152.40)	4 Holes	0.51 (13)	0.472 (12)	0.393 x 2.36 (10 x 60)

ASME Class 2500 and 5000# MOP, 2" x 2" to 6" x 4"

MATERIALS OF CONSTRUCTION

Part	Carbon Steel NACE	Stainless Steel NACE Trim
Body Class 2500	A216 Gr. WCC/A105	A216 Gr. WCC/A105
Body 5000# MOP	A487 Gr. 4	A487 Gr. 4
Tailpiece Class 2500	A216 Gr. WCC/A105	A216 Gr. WCC/A105
Tailpiece 5000# MOP	A487 Gr. 4	A487 Gr. 4
Studs	A193 Gr. B7M	A193 Gr. B7M Zinc Plate
Nuts	A194 Gr. 2HM	A194 Gr. 2HM Zinc Plate
Capscrews	A574M	A574M
Stem Stop	CS Zinc Plate	CS Zinc Plate
Stem Bearing	CS/Filled PTFE	SS/Filled PTFE
Trunnion Bearing	CS/Filled PTFE	SS/Filled PTFE
Stop Plate	Carbon Steel	Carbon Steel
Lever Handle	Ductile Iron	Ductile Iron
Lower Cover Plate	Carbon Steel	316 SS
Ball Class 2500	4130/4140 ENP	A564 Type 630 SS
Ball 5000# MOP	4130/4140 ENP	A564 Type 630 SS
Stem	4130/4140 ENP	A564 Type 630 SS ENP
Trunnion	4130/4140 ENP	A564 Type 630 SS ENP
Seat Rings Class 1500, 2500 and 5000# MOP	4130	A564 Type 630 SS
Seat Springs	B637 X-750	B637 X-750
Grounding Spring	Stainless Steel	Stainless Steel
Seat Face Seals Class 2500 and 5000# MOP	Nylon/PK	Nylon/PK
Stem Seal Class 2500 and 5000# MOP	PK	PK
Stem O-rings	HNBR/FKM	HNBR/FKM
Body/Tailpiece O-ring	HNBR/FKM	HNBR/FKM
Seat O-rings	HNBR/FKM	HNBR/FKM
Trunnion O-ring	HNBR/FKM	HNBR/FKM
O-ring Backup Ring Class 2500 and 5000# MOP	PK	PK

DIMENSIONS AND WEIGHTS



**MOUNTING BRACKET
TOP VIEW**

VALVE WITH GEAR

FULL PORT API 5000# MOP

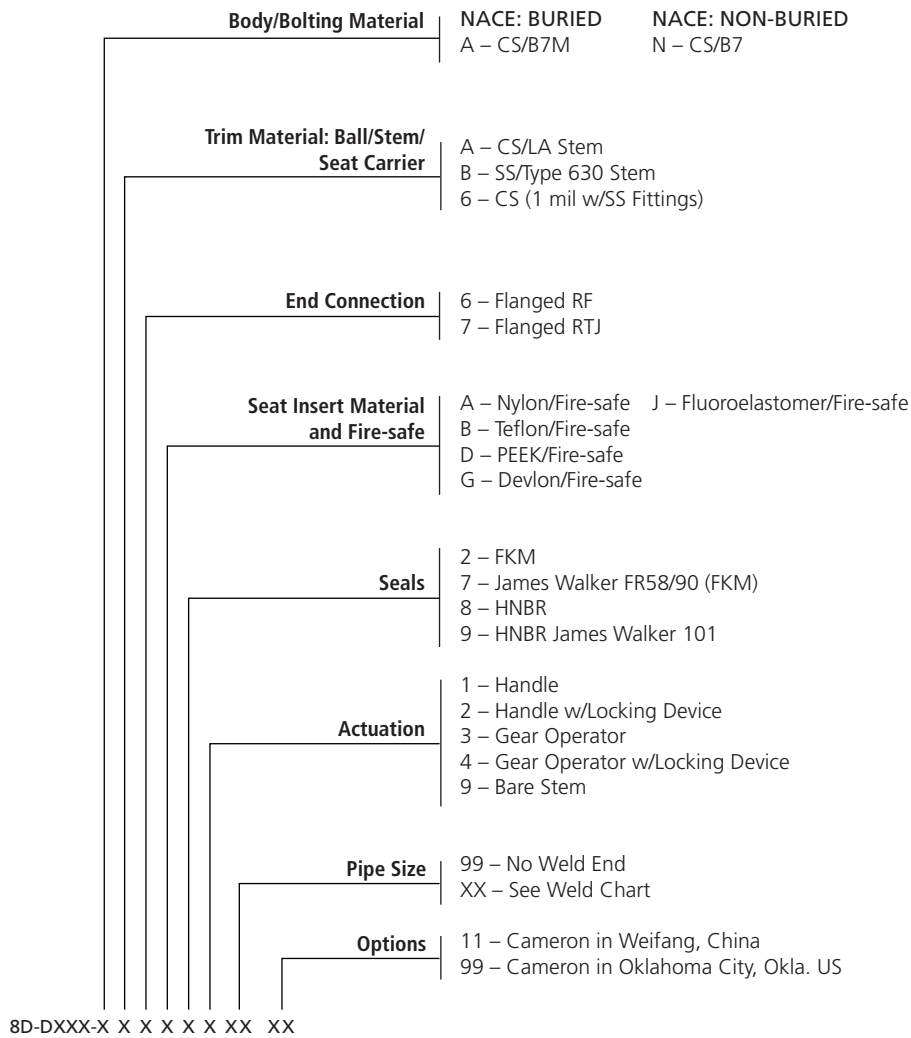
Size in. (mm)	A		B	C	D	E	F	G	H	J	L	M	N	P	R	S	T	U	V	W	X	Y	Z	BB
	RF	RJ																						
2-1/16 (52)	14.50 (368)	14.62 (371)	2.00 (51)	2.00 (51)	6.29 (160)	4.06 (103)	5.58 (142)	1.52 (39)	1.118 (28.40)	2.656 (67)	0.690 (17.53)	1/2-13UNC	0.50 (13)	10.34 (263)	8.12 (206)	10.00 (254)	4.92 (125)	0.56 (14)	2.80 (71)	8.75 (222)	3.00 (76)	6.40 (163)	1.328 (34)	-
3-1/8 (79)	18.50 (470)	18.62 (473)	3.00 (76)	3.00 (76)	7.29 (185)	4.75 (121)	6.96 (177)	2.21 (56)	1.496 (38.00)	3.375 (86)	0.994 (25.25)	1/2-13UNC	0.50 (13)	12.03 (306)	8.82 (224)	16.00 (406)	4.92 (125)	0.56 (14)	2.80 (71)	10.44 (265)	3.00 (76)	7.47 (190)	2.030 (52)	-
4-1/16 (103)	21.50 (546)	21.63 (549)	4.00 (102)	4.00 (102)	8.47 (215)	6.68 (170)	8.72 (221)	2.04 (52)	1.496 (38.00)	4.500 (114)	-	5/8-11UNC	0.63 (16)	14.12 (359)	9.73 (247)	16.00 (406)	6.50 (165)	0.56 (14)	3.39 (86)	12.47 (317)	3.00 (76)	9.44 (240)	2.250 (57)	0.375 (9.53)

ASME CLASS 2500

2 (50)	17.75 (451)	17.88 (454)	1.78 (45)	1.78 (45)	6.29 (160)	4.06 (103)	5.68 (144)	1.62 (41)	0.995 (25.27)	3.500 (89)	-	1/2-13UNC	0.50 (13)	10.34 (263)	8.12 (206)	10.00 (254)	4.92 (125)	0.56 (14)	2.80 (71)	8.75 (222)	3.00 (76)	6.70 (170)	1.750 (44)	0.250 (6.35)
3 (75)	22.75 (578)	23.00 (584)	2.56 (65)	2.56 (65)	7.72 (196)	6.31 (160)	8.30 (211)	2.00 (51)	1.496 (38.00)	4.000 (102)	-	1/2-13UNC	0.50 (13)	13.75 (349)	9.73 (247)	16.00 (406)	5.51 (140)	0.56 (14)	3.39 (86)	12.10 (307)	3.00 (76)	9.07 (230)	2.030 (52)	0.375 (9.53)
4 (100)	26.50 (673)	26.88 (683)	3.53 (90)	3.53 (90)	8.47 (215)	7.25 (184)	10.05 (255)	2.80 (71)	1.683 (42.75)	4.625 (117)	-	5/8-11UNC	0.63 (16)	15.09 (383)	13.64 (346)	20.00 (508)	4.92 (125)	0.56 (14)	4.11 (104)	13.20 (335)	3.00 (76)	-	2.312 (59)	0.375 (9.53)
6 x 4 (150 x 100)	36.00 (914)	36.50 (927)	3.53 (90)	5.31 (135)	8.90 (226)	7.25 (184)	10.05 (255)	2.80 (71)	1.683 (42.75)	4.625 (117)	-	5/8-11UNC	0.63 (16)	15.09 (383)	13.64 (346)	20.00 (508)	4.92 (125)	0.56 (14)	4.11 (104)	13.20 (335)	3.00 (76)	-	2.312 (59)	0.375 (9.53)

ASME Class 150-2500, 2" through 12"

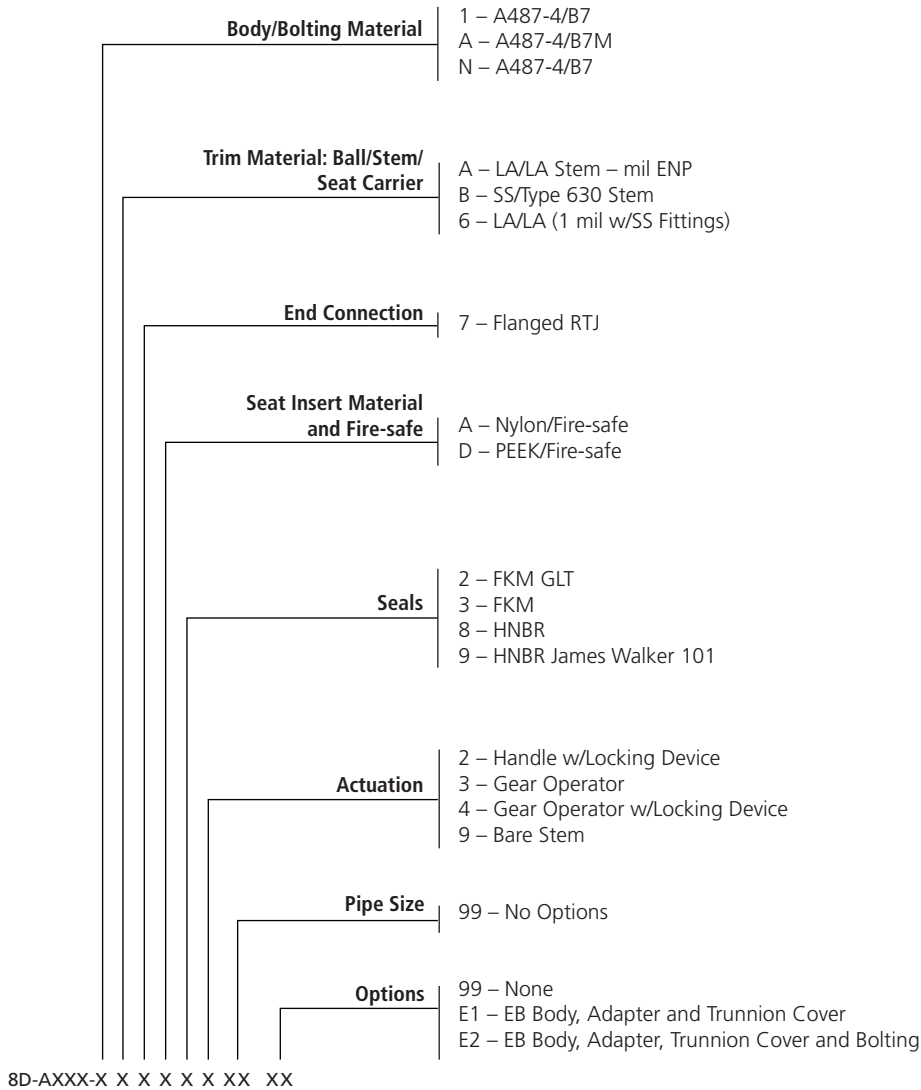
ASSEMBLY CODES / PART NUMBERS



Size (in.)	2 FP	3 RP	3 FP	4 RP	4 FP	6 RP	6 FP	8 RP	8FP	10 RP	10 FP	12 RP	12 FP
150	-	-	-	-	D1N8	D1N9	D110	D111	D112	D113	D114	D115	D116
300	-	-	-	-	D3N8	D3N9	D310	D311	D312	D313	D314	D315	D316
600	D6N3	D6N5	D6N6	D6N7	D6N8	D6N9	D610	D611	D612	D613	D614	D615	D616
900	D9N3	D9N5	D9N6	D9N7	D9N8	D9N9	D910	D911	D912	D913	D914	D915	D916
1500	D8N3	D8N5	D8N6	D8N7	D8N8	D8N9	-	-	-	-	-	-	-
2500	D503	-	D506	-	D508	D509	-	-	-	-	-	-	-

API 5000, 2-1/16" through 4-1/16"

ASSEMBLY CODES / PART NUMBERS

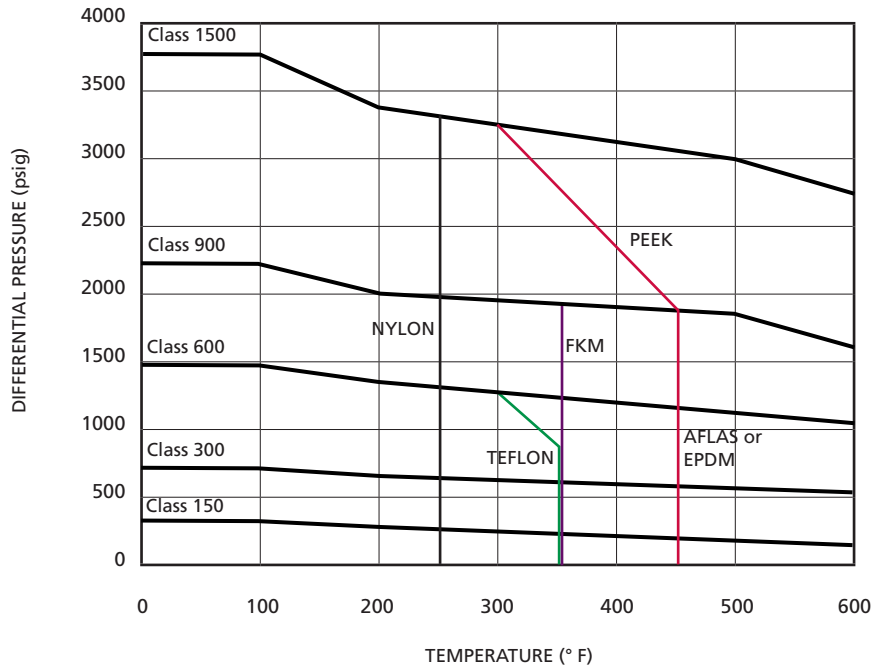


BASE NUMBERS

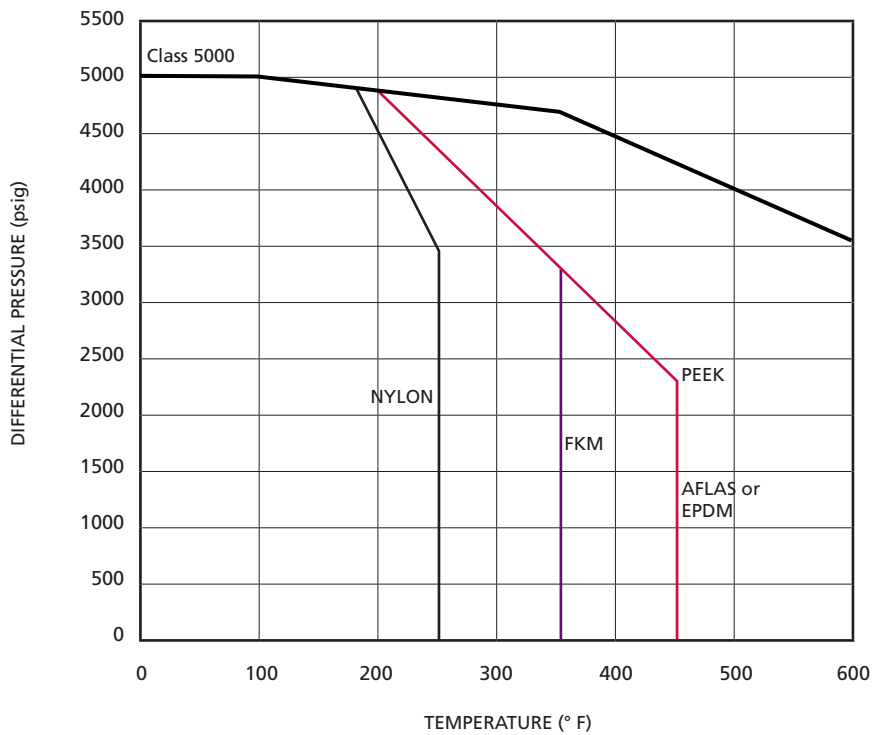
Size (in.)	2-1/16 FP	3-1/8 FP	4-1/16 FP
API 5000	A2A5	A3A5	A4A5

PRESSURE TEMPERATURE DATA

PRESSURE TEMPERATURE CHART API 6D



PRESSURE TEMPERATURE CHART API 5000



Information provided for general information only; consult factory for certified data.

AOP Series D Trunnion Mounted Ball Valve

SPECIFICATIONS AND CONFORMANCE

AOP trunnion mounted ball valves are designed, manufactured and tested in accordance with the following industry standards. Additional end-user or industry standards can be produced upon request.

ASME/ANSI – American Society of Mechanical Engineers/American National Standard Institute

- B16.5 Steel pipe flanges
- B16.10 Face-to-face and end-to-end dimensions of ferrous valve
- B16.25 Butt welding ends
- B16.34 Wall thickness
- VIII, Div. 1 Bolting design

NACE – National Association of Corrosion Engineers

- MR0175 Sulfide stress cracking resistant metallic materials for oilfield equipment

API – American Petroleum Institute

- Spec. 6D Specification for pipeline valves
- Spec. 6FA Specification for fire testing of valves
- Spec. Q1 Quality program

MSS – Manufacturers Standardization Society

- SP - 6 Standard finishes for contact faces of pipe flanges and connecting end flanges of valves and fittings
- SP - 25 Standard marking system for valves, fittings, flanges and unions

SERIES D – VALVE C_v

Size (in.)	2 FP	3 RP	3 FP	4 RP	4 FP	6 RP	6 FP	8 RP	8FP	10 RP	10 FP	12 RP	12 FP
Class 150	-	-	-	-	2377	740	5074	2020	10,103	4320	17,037	8820	26,163
Class 300	-	-	-	-	2067	755	5074	2010	10,103	4430	17,037	8900	26,163
Class 600	359	248	924	660	1773	785	4577	2030	8950	4210	14,324	7600	22,729
Class 900	321	184	892	625	1723	825	4383	2010	8476	4180	13,884	8750	21,186
Class 1500	325	223	815	618	1595	858	-	-	-	-	-	-	-
Class 2500	207	-	490	-	1014	-	-	-	-	-	-	-	-
API 5000	328	-	818	-	1598	858	-	-	-	-	-	-	-

The flow coefficient C_v of a valve is the flow rate of water (gallons/minute at 60° F) through a fully opened valve, with a pressure drop of 1 psi across the valve. To find the flow of a liquid or gas through a valve from the C_v , use the following formulas.

FLOW COEFFICIENTS AND TORQUE VALUES

FLOW EQUATIONS

Liquid Flow

QL = Flow rate of liquid (gallons/minute)

ΔP = Differential pressure across the valve (psig)

G = Specific gravity of liquid

$$QL = C_v \times \sqrt{\Delta P \div G}$$

Gas Flow (for non-critical flow)

Qg = Flow rate of gas (CFH)

ΔP = Differential pressure across the valve (psig)

P2 = Outlet pressure (psia)

G = Specific gravity of gas (air = 1)

$$Qg = 61 \times C_v \times \sqrt{(P_2 \times \Delta P) \div G}$$

VALVE TORQUES AT MAX RATED PRESSURE at 100° F (in-lbs)

Size (in.)	2 FP	3 RP	3 FP	4 RP	4 FP	6 RP	6 FP	8 RP	8FP	10 RP	10 FP	12 RP	12 FP
Class 150	-	-	-	-	1099	1099	3864	3684	6408	6408	10,320	10,320	12,804
Class 300	-	-	-	-	1410	1410	5308	5308	10,634	10,634	14,733	14,733	19,421
Class 600	1128	1178	2064	2064	2628	2628	7956	7956	15,722	15,722	21,543	21,543	27,909
Class 900	1344	1344	2448	2448	4308	4308	11,076	11,076	20,322	20,322	31,372	31,372	38,032
Class 1500	1644	1644	3408	3408	6084	6084	-	-	-	-	-	-	-
Class 2500	3853	-	7972	-	13,224	-	-	-	-	-	-	-	-
API 5000	3163	-	6533	-	10,872	-	-	-	-	-	-	-	-
5000 psi													

Information provided for general information only; consult factory for certified data.

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www.aopind.com



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Cameron strives for continuous improvement in all aspects of our business. Cameron reserves the right to modify designs and specifications without notice or obligation. Nothing contained in this brochure is intended to extend any type of warranty, expressed or implied.

AOP B Series Floating Ball Valves

Delivering dependability at an affordable price into upstream, general purpose valve applications

TECHNOLOGY



AOP™ Series BUL Floating Ball Valves

FEATURES AND BENEFITS

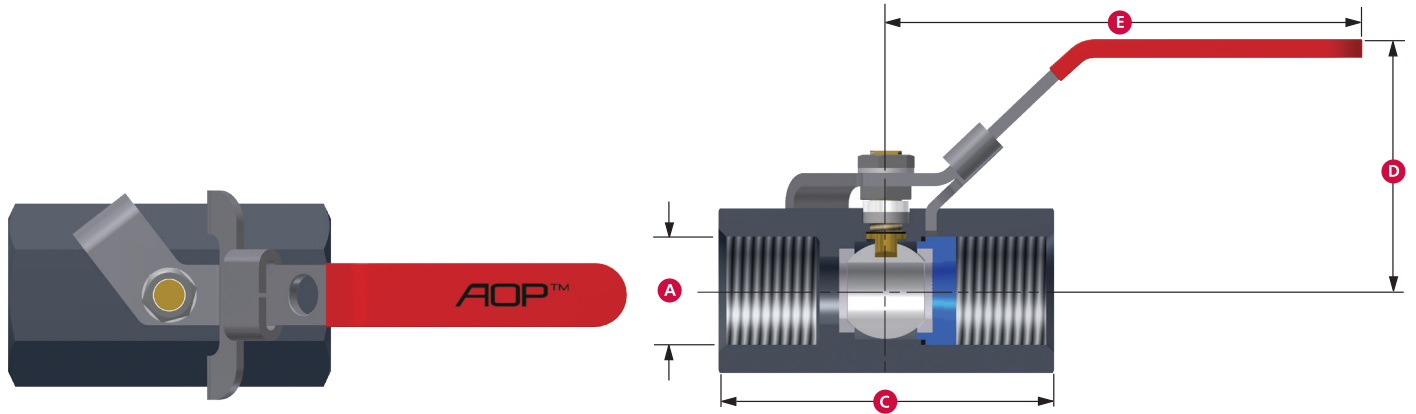
- One-piece carbon steel reduced-port screwed-end ball valve
- 316 stainless steel ball and stem
- Positively retained stem
- 2000 psi, WOG 1/4" to 2" (8 mm to 50 mm)
- 150-psi saturated steam
- Conforms to NACE MR0175/ISO 15156 specifications
- Locking handle



Materials List

Part	Material
Handle Grip	Vinyl
Handle	SS 201
Handle Nut	304 SS
Gland	304 SS
Packing	PTFE
Stem	316 SS
Thrust Washer	PTFE
Seat Retainer	A105
Seat	RTFE
Gasket	PTFE
Ball	316 SS
Body	A105
Spring Washer	304 SS
Stop Capscrew	A2-70
Capscrew	SS 201

ONE-PIECE CARBON STEEL REDUCED-PORT SCREWED-END BALL VALVE

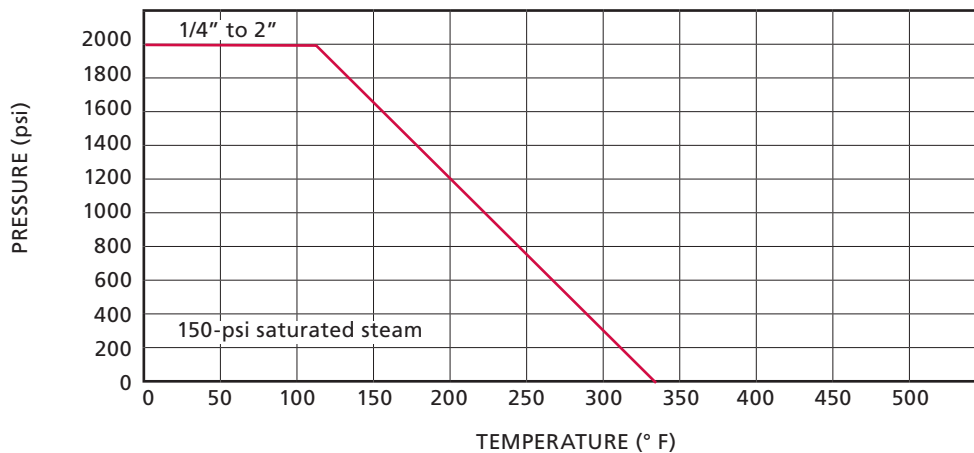


Dimensions

Size in.	Size (mm)	A	C	D	E	C _v
1/4	(8)	0.20 (5)	1.70 (43)	1.25 (32)	2.63 (67)	1.5
3/8	(10)	0.28 (7)	1.86 (47)	1.33 (34)	2.63 (67)	3.5
1/2	(15)	0.36 (9)	2.46 (63)	2.18 (55)	4.65 (118)	4.5
3/4	(20)	0.49 (12)	2.75 (70)	2.32 (59)	4.65 (118)	8
1	(25)	0.63 (16)	3.38 (86)	2.57 (65)	4.72 (120)	15
1-1/4	(32)	0.79 (20)	3.69 (94)	2.90 (74)	5.75 (146)	33
1-1/2	(40)	0.95 (24)	4.00 (102)	3.10 (79)	5.75 (146)	40
2	(50)	1.26 (32)	4.50 (114)	4.70 (119)	6.00 (152)	70

Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Max. Working Pressure	2000							
Weight - lb	0.08	0.18	0.55	0.88	1.90	2.97	3.74	6.31
Assembly No.	9025-121NBUL	9038-121NBUL	9050-121NBUL	9075-121NBUL	9100-121NBUL	9125-121NBUL	9150-121NBUL	9200-121NBUL

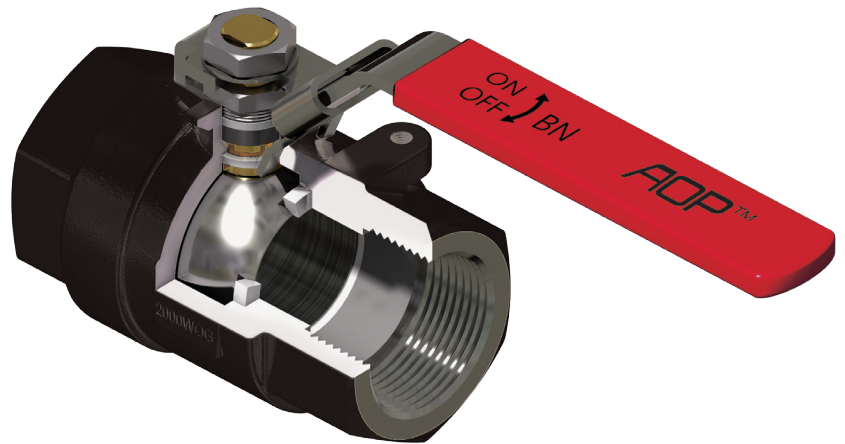
Engineering Specifications



AOP Series BN Floating Ball Valves

FEATURES AND BENEFITS

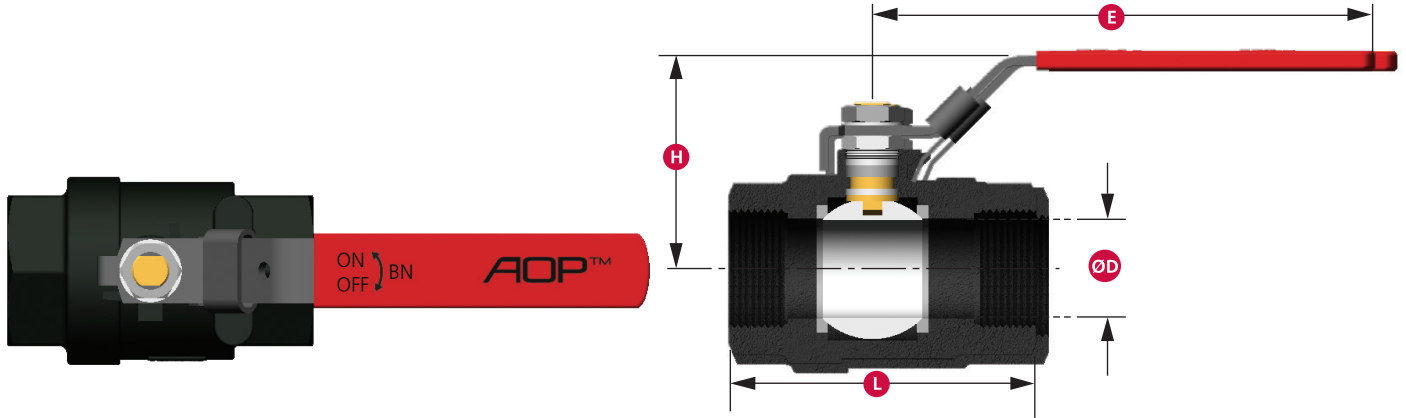
- Large-port screwed ends
- Two-piece carbon steel body
- 316 stainless steel ball and stem
- Positively retained stem
- Adjustable packing gland
- Locking lever handle
- 2000 psi, WOG 1/4" to 2" (8 mm to 50 mm)
- 150-psi saturated steam
- Fire-tested in accordance with API 607
- Conforms to NACE MR0175/
ISO 15156 specifications



Materials List

Part	Material
Handle Grip	Vinyl
Handle	SS 201
Locking Device	Plated CS
Handle Nut	Plated CS
Packing Gland	304 SS
Stem	316 SS
Packing	Graphite
Thrust Washer	RTFE
Seat	RTFE
Ball	316 SS
Tailpiece	A216 WCB
Body	A216 WCB
Body Seal	PTFE

WCB BODY FULL-PORT SCREWED-END BALL VALVE

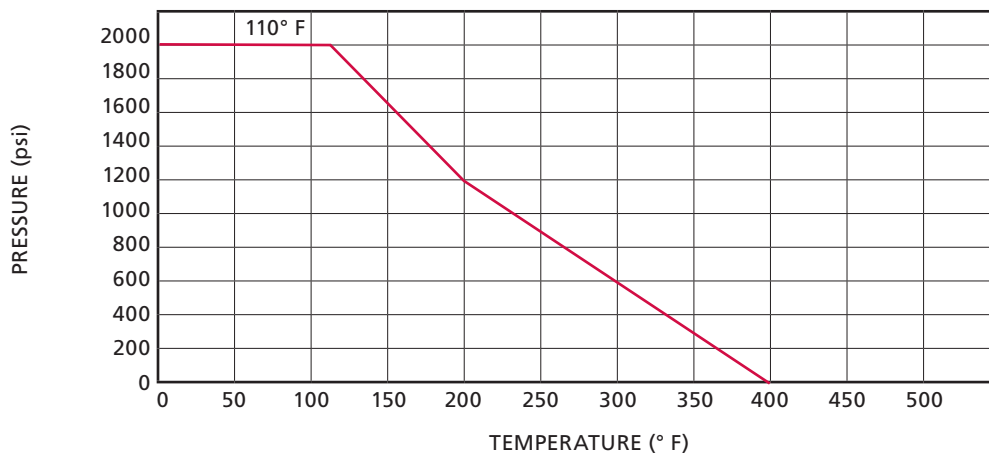


Dimensions

Size in.	Size (mm)	ØD	L	E	H
1/4	(8)	0.42 (11)	2.36 (60)	3.93 (100)	1.89 (48)
3/8	(10)	0.49 (12)	2.36 (60)	3.93 (100)	1.89 (48)
1/2	(15)	0.59 (15)	2.95 (75)	4.33 (110)	2.28 (58)
3/4	(20)	0.78 (20)	3.15 (80)	4.72 (120)	2.36 (60)
1	(25)	0.98 (25)	3.54 (90)	5.90 (150)	3.03 (77)
1-1/4	(32)	1.26 (32)	4.33 (110)	5.90 (150)	3.11 (79)
1-1/2	(40)	1.50 (38)	4.72 (120)	7.08 (180)	3.62 (92)
2	(50)	1.97 (50)	5.51 (140)	7.08 (180)	4.13 (105)

Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Max. Working Pressure	2000							
Weight – lb	0.7	0.6	1.05	1.55	2.6	4.4	6.35	9.7
Assembly No.	9025-122NBN	9038-122NBN	9050-122NBN	9075-122NBN	9100-122NBN	9125-122NBN	9150-122NBN	9200-122NBN

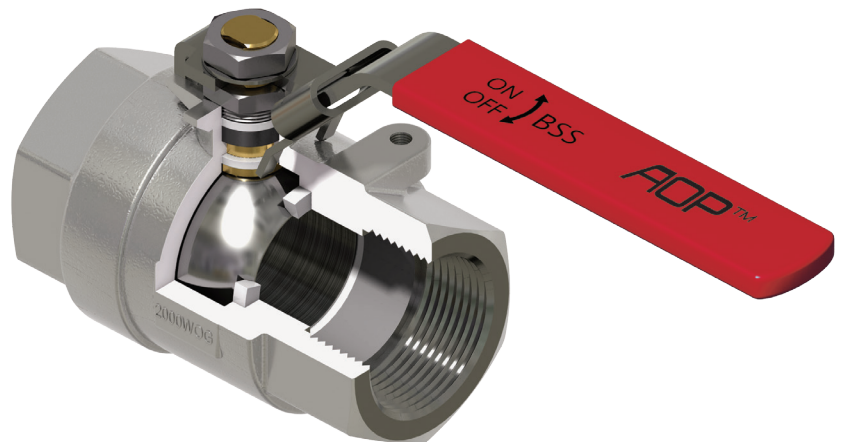
Engineering Specifications



AOP Series BSS Floating Ball Valves

FEATURES AND BENEFITS

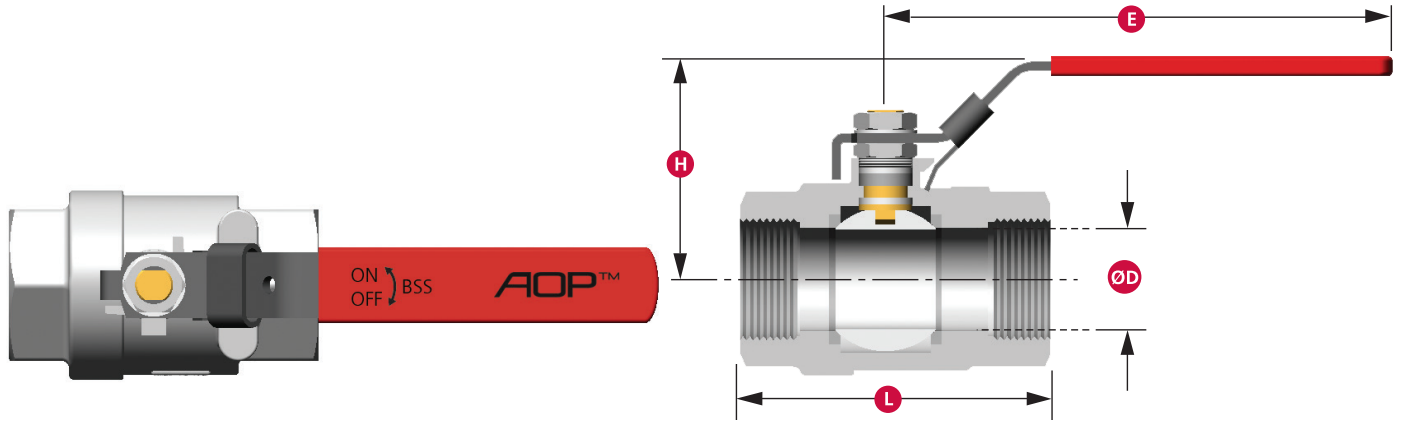
- Seal-welded CF8M body full-port screwed ends
- 316 stainless steel ball and stem
- Positively retained stem/floating ball
- Adjustable packing
- Locking lever handle
- 2000 psi, WOG 1/4" to 2" (8 mm to 50 mm)
- 150-psi saturated steam
- Fire-tested in accordance with API 607
- Conforms to NACE MR0175/ISO 15156 specifications



Materials List

Part	Material
Handle Grip	Vinyl
Handle	SS 201
Locking Device	304 SS
Handle Nut	304 SS
Stem Washer	304 SS
Packing Gland	304 SS
Stem	316 SS
Packing	Graphite
Thrust Washer	RTFE
Seat	RTFE
Ball	A276 316 SS
Tailpiece	CF8M
Body	CF8M
Body Seal	Welded Seal

SEAL-WELDED CF8M BODY FULL-PORIT SCREWED-END BALL VALVE

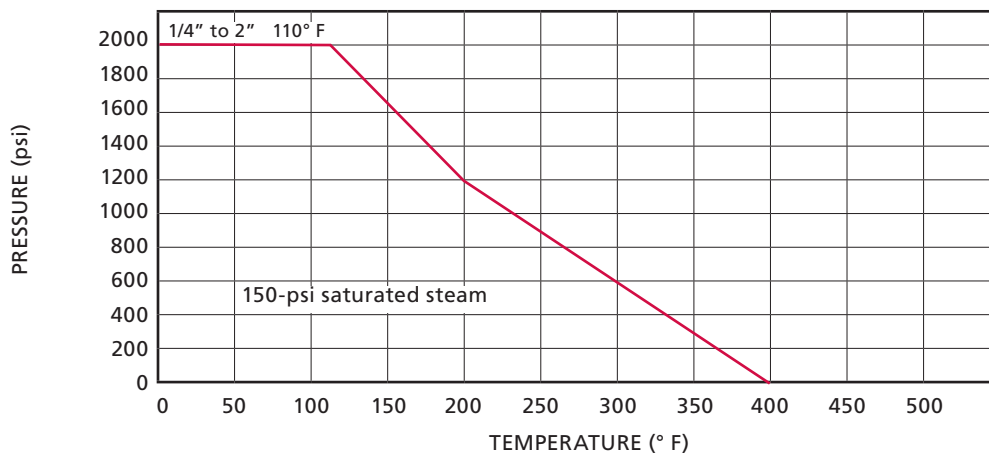


Dimensions

Size in.	Size (mm)	ØD	L	E	H
1/4	(8)	0.42 (11)	2.36 (60)	3.93 (100)	1.89 (48)
3/8	(10)	0.49 (12)	2.36 (60)	3.93 (100)	1.89 (48)
1/2	(15)	0.59 (15)	2.95 (75)	4.33 (110)	2.28 (58)
3/4	(20)	0.78 (20)	3.15 (80)	4.72 (120)	2.36 (60)
1	(25)	0.98 (25)	3.54 (90)	5.90 (150)	3.03 (77)
1-1/4	(32)	1.26 (32)	4.33 (110)	5.90 (150)	3.11 (79)
1-1/2	(40)	1.50 (38)	4.72 (120)	7.08 (180)	3.62 (92)
2	(50)	1.97 (50)	5.51 (140)	7.08 (180)	4.13 (105)

Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Max. Working Pressure	2000							
Weight – lb	0.7	0.6	1.05	1.55	2.6	4.4	6.35	9.7
Assembly No.	9025-222NBSS	9038-222NBSS	9050-222NBSS	9075-222NBSS	9100-222NBSS	9125-222NBSS	9150-222NBSS	9200-222NBSS

Engineering Specifications



AOP Series B3 Floating Ball Valves

FEATURES AND BENEFITS

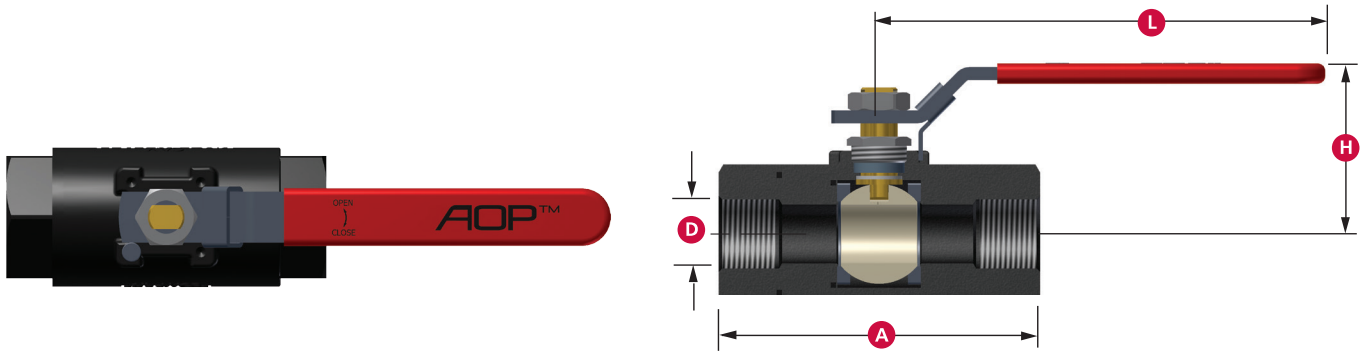
- Positively retained stem
- Adjustable packing
- 316 stainless steel ball and stem
- Standard locking handle
- Actuator mounting pad
- Delrin® seats standard
- 3000 psi, sizes 1/4" to 2" (8 mm to 50 mm) full port
- Ball includes pressure equalization hole to prevent trapped pressure in body cavity (in open position only)
- Fire-tested in accordance with API 607
- Conforms to NACE MR0175/ISO 15156 specifications



Materials List

Part	Material
Body	WCB CS/CF8M SS
Seat	Delrin®
Body O-ring	Viton®
Body Gasket	Graphite
Adapter	WCB CS/CF8M SS
Ball	316 SS
Stem Thrust Washer	Delrin
Stem Packing	Graphite
Packing Gland	304 SS
Stem	316 SS
Stem Nut	A2-70
Handle	SS 201 (1/4" to 1") CS (1-1/4" to 2")
Locking Device	SS 201 (1/4" to 1") CS (1-1/4" to 2")
Handle Grip	PVC
Stop Capscrew	A2-70
Capscrew	SS 201

TWO-PIECE WCB AND CF8M BODY SCREWED-END BALL VALVE

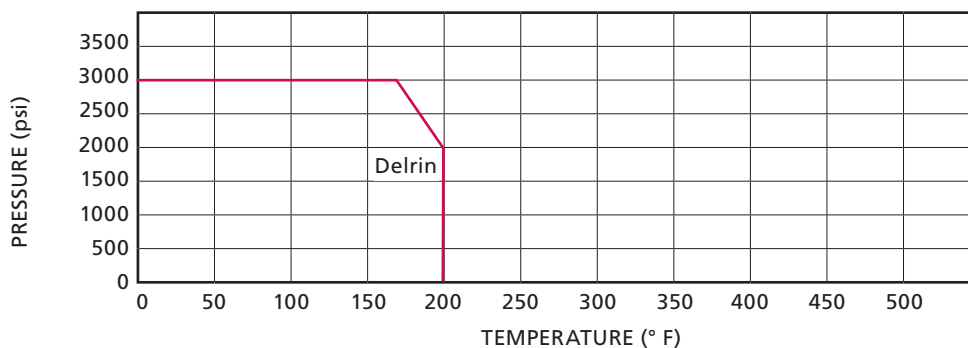


Dimensions

Size in.	Size (mm)	D Port Size F x F	A End-to-End F x F	L Length of Lever	H Center to Lever	C _v
1/4	(8)	0.39 (10)	3.86 (98)	5.71 (145)	2.32 (59)	8
3/8	(10)	0.39 (10)	3.86 (98)	5.71 (145)	2.32 (59)	8
1/2	(15)	0.50 (13)	3.86 (98)	5.71 (145)	2.32 (59)	15
3/4	(20)	0.75 (19)	4.25 (108)	7.48 (190)	2.61 (66)	30
1	(25)	0.98 (25)	5.39 (137)	7.48 (190)	2.85 (72)	60
1-1/4	(32)	1.25 (32)	5.39 (137)	8.66 (220)	3.85 (98)	90
1-1/2	(40)	1.50 (38)	6.30 (160)	10.04 (255)	5.16 (131)	130
2	(50)	1.89 (48)	6.30 (160)	16.14 (410)	5.42 (138)	290

Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Max. Working Pressure	3000 CWP							
Weight - lb	1.9	1.9	1.95	3.54	5.21	7.90	11.81	15.93
Assembly No. CS/SS	83025-1217219B3	83038-1217219B3	83050-1217219B3	83075-1217219B3	83100-1217219B3	83125-1217219B3	83150-1217219B3	83200-1217219B3
Assembly No. SS/SS	83025-2217219B3	83038-2217219B3	83050-2217219B3	83075-2217219B3	83100-2217219B3	83125-2217219B3	83150-2217219B3	83200-2217219B3

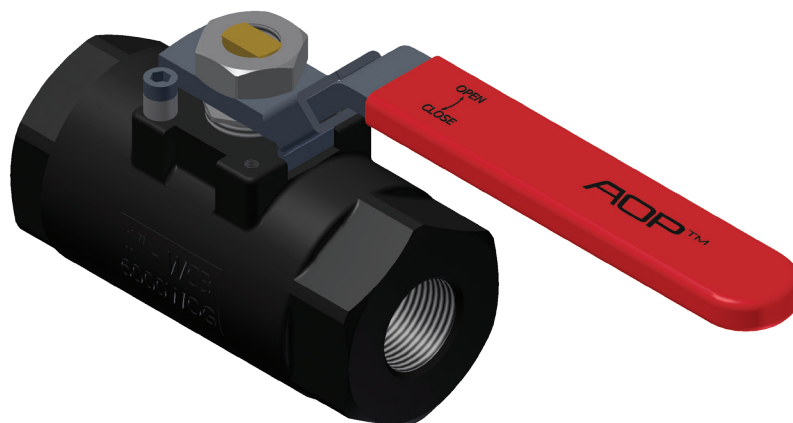
Engineering Specifications



AOP Series B6 Floating Ball Valves

FEATURES AND BENEFITS

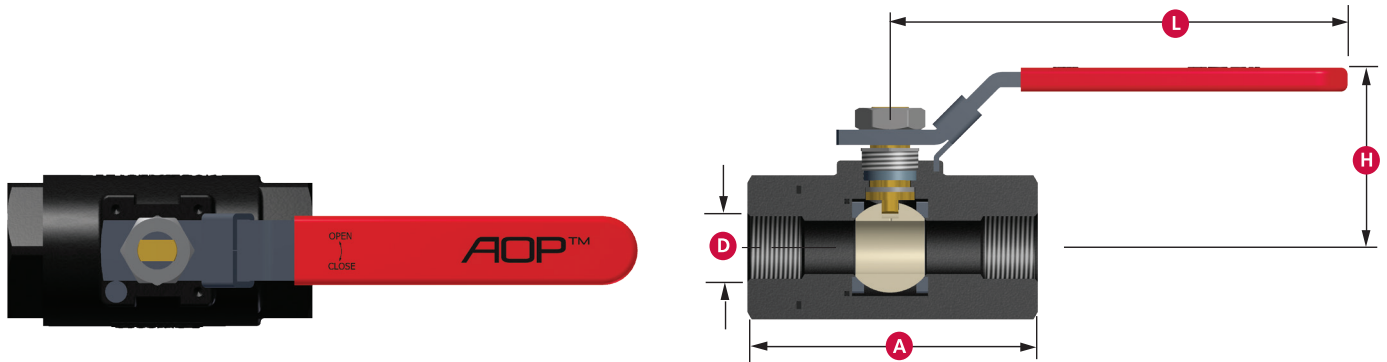
- Positively retained stem
- Adjustable packing
- 316 stainless steel ball and stem
- Standard locking handle
- Actuator mounting pad
- PEEK seats standard
- 6000 psi, sizes 1/4" to 1-1/2" (8 mm to 40 mm) full port
- 6000 psi, size 2" (50 mm) reduced port
- Fire-tested in accordance with API 607
- Conforms to NACE MR0175/ISO 15156 specifications



Materials List

Part	Material
Body	WCB CS/CF8M SS
Seat	PEEK
Body O-ring	Viton
Body Gasket	Graphite
Adapter	WCB CS/CF8M SS
Ball	316 SS
Stem Thrust Washer	PEEK
Stem Packing	Graphite
Packing Gland	304 SS
Stem	316 SS
Stem Nut	A2-70
Handle	SS 201 (1/4" to 1") CS (1-1/4" to 2")
Locking Device	SS 201 (1/4" to 1") CS (1-1/4" to 2")
Handle Grip	PVC
Stop Capscrew	A2-70
Capscrew	SS 201

TWO-PIECE WCB AND CF8M BODY SCREWED-END BALL VALVE

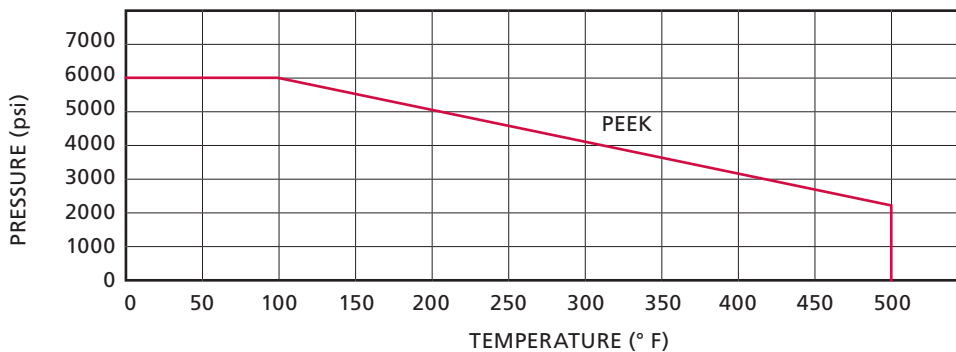


Dimensions

Size in.	Size (mm)	D Port Size F x F	A End-to-End F x F	L Length of Lever	H Center to Lever	C _v
1/4	(8)	0.39 (10)	4.37 (111)	5.71 (145)	2.44 (62)	8
3/8	(10)	0.39 (10)	4.37 (111)	5.71 (145)	2.44 (62)	8
1/2	(15)	0.50 (13)	4.37 (111)	5.71 (145)	2.44 (62)	15
3/4	(20)	0.75 (19)	4.37 (111)	7.48 (190)	2.72 (69)	30
1	(25)	0.98 (25)	5.39 (137)	10.04 (255)	3.58 (91)	60
1-1/4	(32)	1.26 (32)	5.39 (137)	10.04 (255)	3.74 (95)	90
1-1/2	(40)	1.50 (38)	6.30 (160)	16.14 (410)	5.24 (133)	130
2	(50)	1.50 (38)	6.30 (160)	16.14 (410)	5.34 (136)	120

Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Max. Working Pressure	6000 CWP							
Weight - lb	2.20	2.20	2.20	4.43	8.12	14.25	19.93	20.28
Assembly No. CS/SS	86025-1215219B6	86038-1215219B6	86050-1215219B6	86075-1215219B6	86100-1215219B6	86125-1215219B6	86150-1215219B6	86200-1215219B6
Assembly No. SS/SS	86025-2215219B6	86038-2215219B6	86050-2215219B6	86075-2215219B6	86100-2215219B6	86125-2215219B6	86150-2215219B6	86200-2215219B6

Engineering Specifications



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Learn more about AOP floating ball valves at:
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AOP@c-a-m.com



HSE Policy Statement

At Cameron, we are committed ethically, financially and personally to a working environment where no one gets hurt and nothing gets harmed.

***BC, BCF, BFF,
BWF & BHF***

Chokes



AOP™

A Proud Cameron Brand

BC, BCF, BFF, BWF & BHF CHOKES

CAMERON TECHNOLOGIES: AOP CHOKES

AOP chokes are general purpose chokes suitable for a host of applications within the oil and gas industry. Based upon the proven needle and seat principle, and optimized through design, these choke products offer a comprehensive solution for challenging flow control applications throughout the industry.

AOP chokes are characterized by their robust, clean design features and rugged, easily assembled components. They are available in pressures ratings up to 10,000 psi and in a combination of threaded, butt-welded and flanged interface connections. Positive or adjustable trim configurations may also be specified.

As part of a commitment to meeting customer needs, AOP chokes are stocked by a network of authorized distributors and are marketed worldwide through our representatives.

STANDARD FEATURES

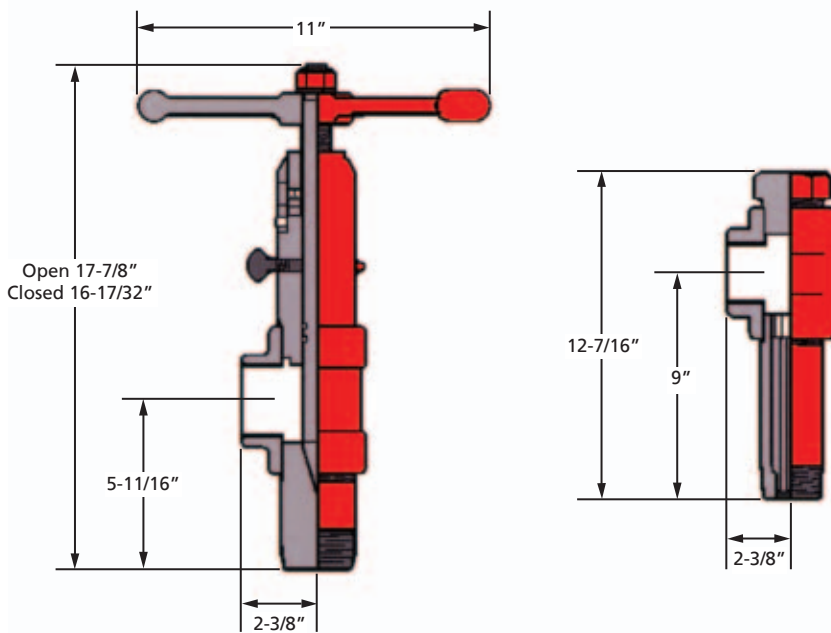
AOP threaded and flanged chokes are designed to meet or exceed today's abrasive and corrosive applications, and incorporate the following standard features:

- Adjustable and positive option
- ANSI Class 150 through 600 and ANSI Class 2000 through 10,000
- Adjustable models easily adaptable to positive configuration
- Forged or cast carbon steel body
- Heat-treated, hardened steel stem and seat with optional stainless steel/tungsten carbide trim
- Series BHF interchangeable with CAMERON® H2 chokes
- Thumbscrew secures stem position at any setting
- Lube fitting enhances corrosion-resistant, smooth stem operation
- Adjustable models available with 3/4" maximum orifice or 1" maximum orifice, both adjustable in 1/64" increments
- 100% production testing
- Hammer lug models facilitate quick disassembly – lug is pressure-relief vented for safe removal

BC, BCF, BFF, BWF & BHF CHOKES

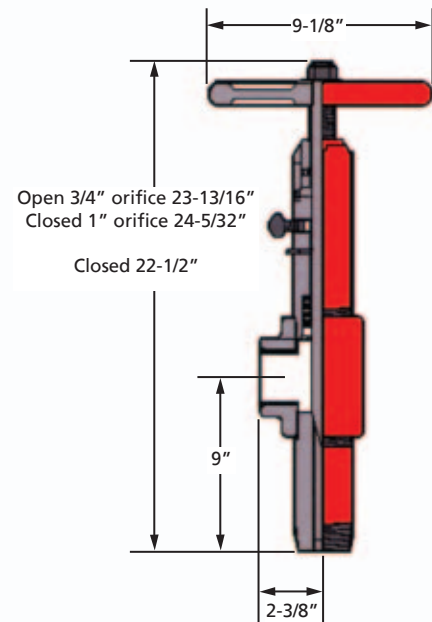
SERIES BC M-20 2" THREADED

2000 psi CWP Adjustable Chokes



SERIES BC S-20 2" THREADED

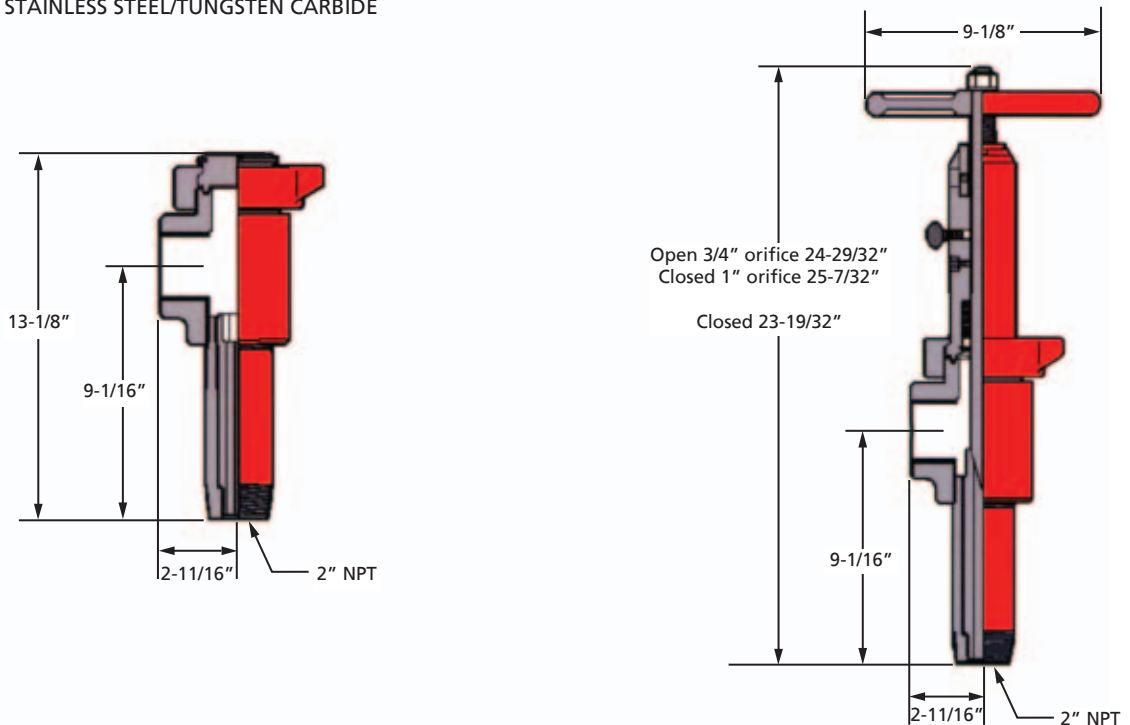
2000 psi CWP Adjustable and Positive Chokes



SERIES BC 2" THREADED X THREADED

3000 and 5000 psi CWP Adjustable and Positive Chokes

3/4" and 1" MAXIMUM ORIFICE AVAILABLE IN LOW-ALLOY STEEL,
STAINLESS STEEL OR STAINLESS STEEL/TUNGSTEN CARBIDE

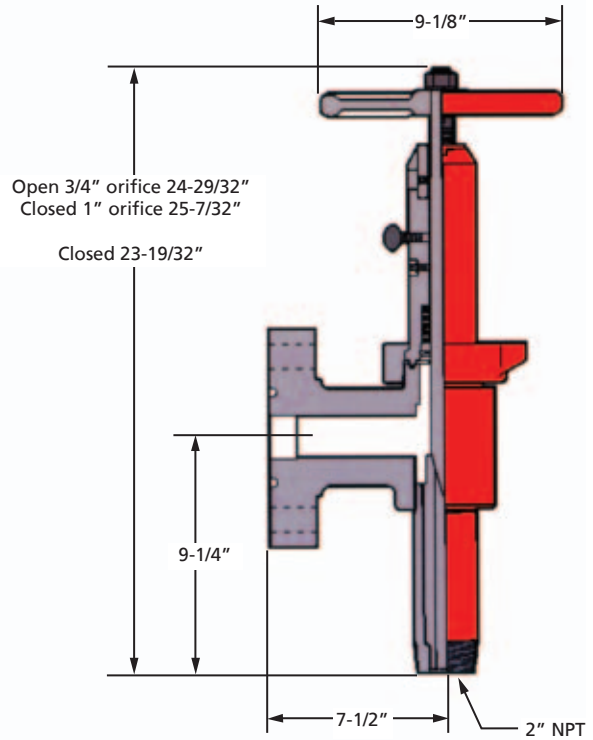
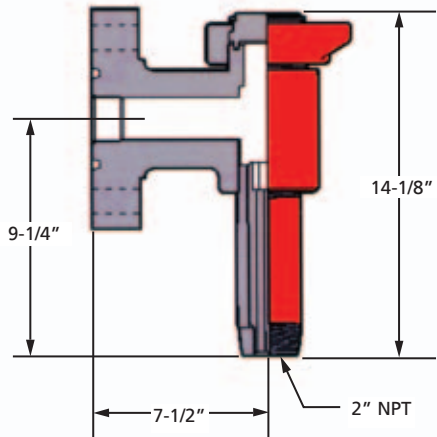


BC, BCF, BFF, BWF & BHF CHOKES

SERIES BCF 2" THREADED X FLANGED

3000 and 5000 psi CWP Adjustable and Positive Chokes

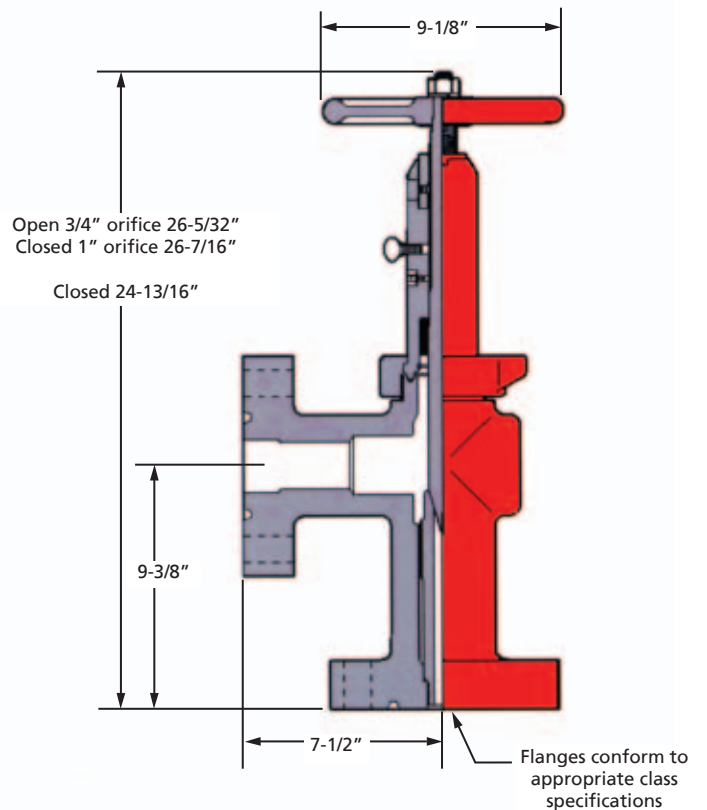
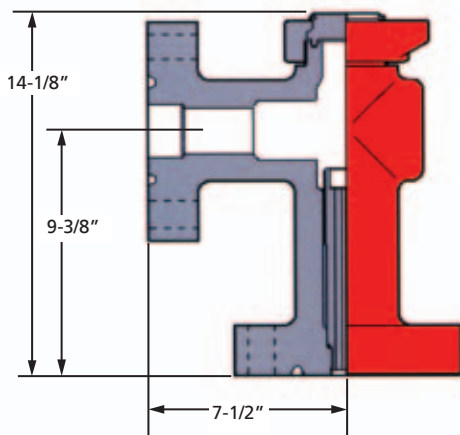
3/4" and 1" MAXIMUM ORIFICE AVAILABLE IN LOW-ALLOY STEEL, STAINLESS STEEL OR STAINLESS STEEL/TUNGSTEN CARBIDE



SERIES BFF 2-1/16" FLANGED X FLANGED

API 2000 and 5000 Adjustable and Positive Chokes

3/4" and 1" MAXIMUM ORIFICE AVAILABLE IN LOW-ALLOY STEEL, STAINLESS STEEL OR STAINLESS STEEL/TUNGSTEN CARBIDE

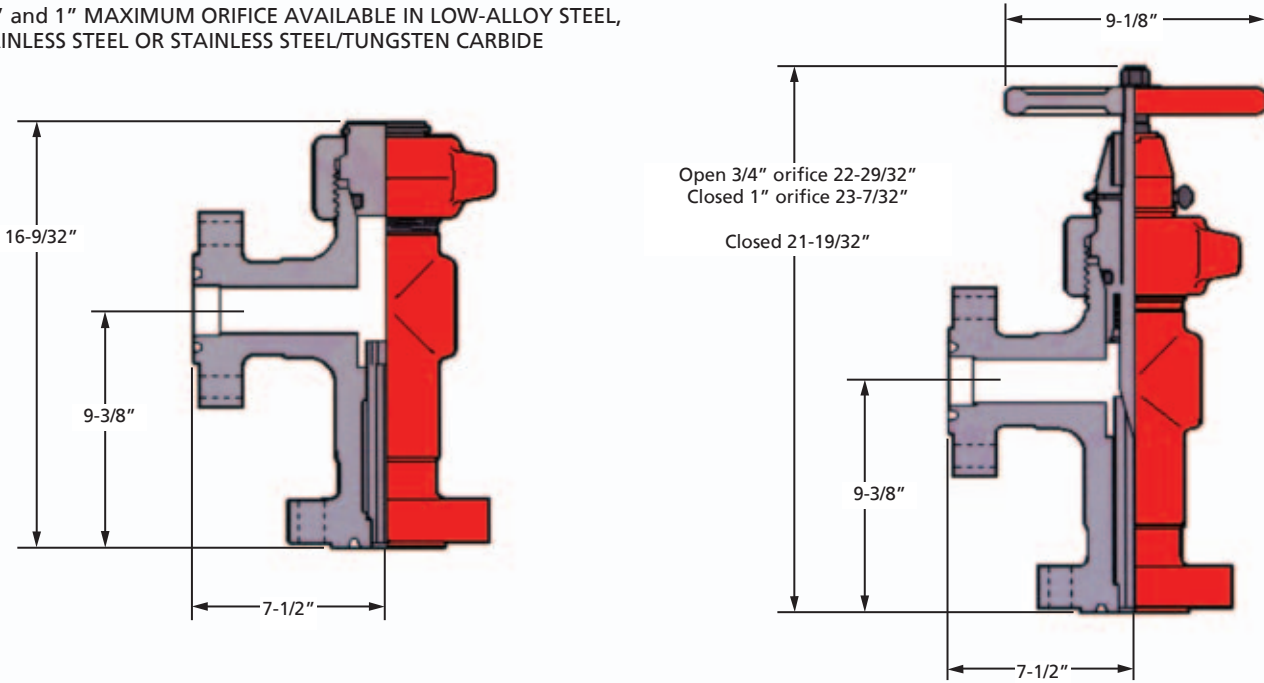


BC, BCF, BFF, BWF & BHF CHOKES

SERIES BWF 1-13/16" AND 2-1/16" FLANGED X FLANGED

API 10,000 Adjustable and Positive Chokes

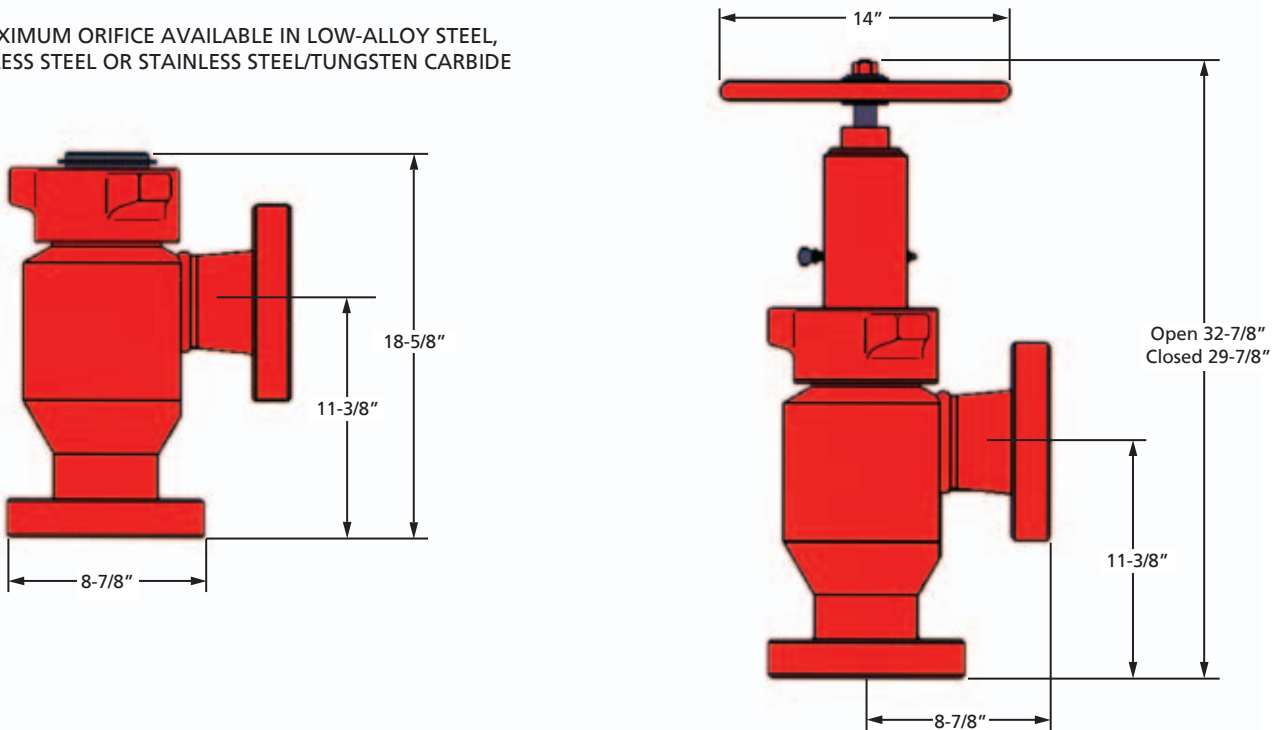
3/4" and 1" MAXIMUM ORIFICE AVAILABLE IN LOW-ALLOY STEEL, STAINLESS STEEL OR STAINLESS STEEL/TUNGSTEN CARBIDE



SERIES BHF 3-1/8" – 7-1/16" FLANGED X FLANGED

API 2000 Through 10,000 Adjustable and Positive Chokes

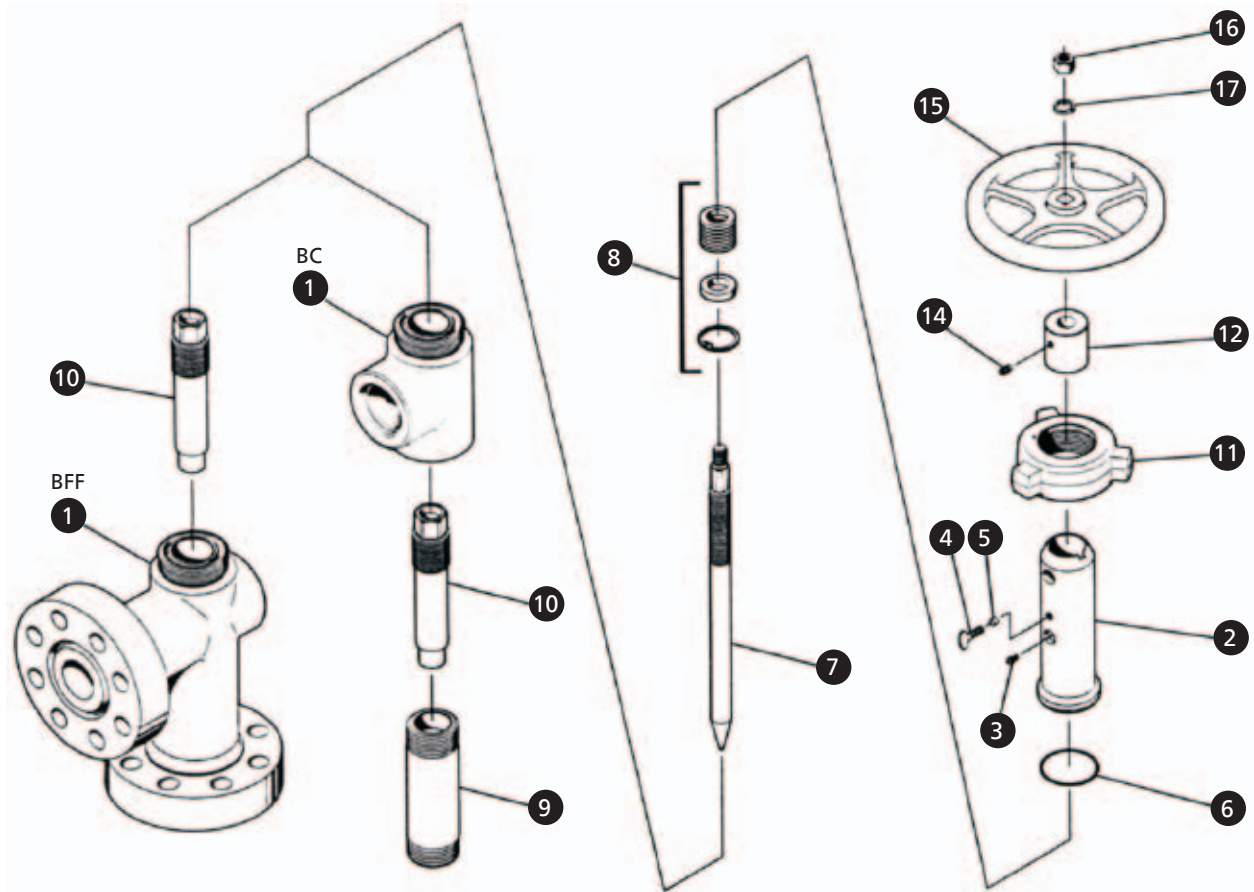
2" MAXIMUM ORIFICE AVAILABLE IN LOW-ALLOY STEEL, STAINLESS STEEL OR STAINLESS STEEL/TUNGSTEN CARBIDE



CUSTOM DIMENSIONS AVAILABLE – CONSULT FACTORY

BC, BCF, BFF, BWF & BHF CHOKES

SERIES BC/BFF INSTALLATION, OPERATION AND MAINTENANCE



Installation

AOP chokes are shipped with indicator (12) loose. Install choke in system using proper size mating flanges or threaded end connections and appropriate gasket seal rings or thread sealant. Rectangular indicator window may be relocated for more convenient reading by loosening hammer lug nut (11) and rotating bonnet (2) as desired.

CAUTION: Choke must be in open position and internal system pressure MUST BE BLED TO ZERO PSI prior to making this adjustment. Retighten hammer lug nut. Turn handwheel (15) clockwise until choke is in closed position. With choke closed, turn indicator (12) until CLSD is positioned directly above rectangular opening in the bonnet (2). Indicator set screw (14) now will be accessible through round window in the side of bonnet. Tighten set screw. Indicator is now set.

Operation

As the choke is opened, numbers will appear in the rectangular window, indicating the equivalent orifice setting of the choke, in 1/64". Once the choke has been set at the desired orifice size, thumbscrew (4) should be tightened to secure that setting. Flow may now be opened through the choke. Should further adjustment be necessary, simply loosen the thumbscrew, turn the handwheel in the direction needed to correct the flow, then re-tighten the thumbscrew.

BC, BCF, BFF, BWF & BHF CHOKES

SERIES BC/BFF INSTALLATION, OPERATION AND MAINTENANCE

Maintenance

Routine maintenance on AOP chokes consists of periodic injection (once a month is adequate) of grease through the lube fitting (3). In the event major service or rebuild is required, the stem (7), seat (10), stem packing and bonnet seal (6) may be replaced without removing the choke body from the piping system.

CAUTION: If the choke is to be disassembled while installed in a piping system, it must be isolated from the system pressure and flow. With the choke at an open setting, internal pressure must be bled to zero PSI.

Disassembly

Loosen nut (16) and set screw (14). Then, remove handwheel (15), indicator (12), thumbscrew (4) and thread lock protector (5). Loosen lug nut (11) with hammer blows (turn counter-clockwise looking into handle-end of stem) and remove nut and bonnet (2), stem (7), and packing (8) as an assembly. To disassemble the stem from this assembly, screw the bonnet off the stem's square end. When the threads become disengaged, pull the stem and bonnet apart. Remove stem packing retainer from the bonnet and pry out the steel junk ring and packing rings with a screwdriver (be careful not to damage stuffing box bore in bonnet). Finally, remove seat (10) from the body using a common 3" orifice choke seat wrench. Clean and inspect bonnet seal (6) and all other components for wear and corrosion. Discard and replace all questionable parts.

Reassembly

Assemble the stem/bonnet/packing sub-assembly by placing the seal rings (lips toward point of stem) and the steel packing junk ring on the stem. Note: 1" orifice chokes require that the packing and junk ring be installed from the threaded end of the stem. Use of grease on the stem will facilitate moving these parts over the threads to their proper location, just behind the point of the stem. Take care that the packing is installed with the junk ring closest to the point of the stem, followed by the seal rings. Screw the bonnet and stem together and seat the packing junk ring in the stuffing box, exposing the retainer ring in groove. Reassemble other components in reverse order of assembly. After assembly is complete, inject several pumps of grease through lube fitting, and re-calibrate indicator per the Installation and Operation Instructions.

BC, BCF, BFF, BWF & BHF CHOKES

REPLACEMENT PARTS

A complete line of replacement parts are manufactured for all AOP chokes. Available replacement parts include:

Individual Parts:

- Seats
- Stems
- Bonnets
- Blanking caps
- Cage nipples
- Hammer lug nuts
- Packing assemblies
- Flow beans
- Bean wrenches

Bonnet Assemblies Include:

- Bonnet
- Stem
- Indicator
- Handwheel
- Seals and fittings
- Lug nut (optional)

Adaption Kits Include:

(For converting adjustable chokes to positive)

- Blanking cap
- Retainer
- Seal
- Lug nut
- Flow bean (optional)

BC, BCF, BFF, BWF & BHF CHOKES

REPLACEMENT PARTS

A complete line of replacement parts are manufactured for all AOP chokes. Available replacement parts include:

Ceramic Lined Carbon Steel Flow Beans:

SIZE	PART NUMBER
4/64"	16-00-0610
5/64"	16-00-0611
6/64"	16-00-0612
7/64"	16-00-0613
8/64"	16-00-0614
9/64"	16-00-0615
10/64"	16-00-0616
11/64"	16-00-0617
12/64"	16-00-0618
13/64"	16-00-0619
14/64"	16-00-0620
15/64"	16-00-0621
16/64"	16-00-0622
17/64"	16-00-0623
18/64"	16-00-0624
19/64"	16-00-0625
20/64"	16-00-0626
21/64"	16-00-0627
22/64"	16-00-0628
23/64"	16-00-0629
24/64"	16-00-0630
25/64"	16-00-0631
26/64"	16-00-0632

SIZE	PART NUMBER
27/64"	16-00-0633
28/64"	16-00-0634
29/64"	16-00-0635
30/64"	16-00-0636
31/64"	16-00-0637
32/64"	16-00-0638
33/64"	16-00-0639
34/64"	16-00-0640
35/64"	16-00-0641
36/64"	16-00-0642
37/64"	16-00-0643
38/64"	16-00-0644
39/64"	16-00-0645
40/64"	16-00-0646
41/64"	16-00-0647
42/64"	16-00-0648
43/64"	16-00-0649
44/64"	16-00-0650
45/64"	16-00-0651
46/64"	16-00-0652
47/64"	16-00-0653
48/64"	16-00-0654

AOP™
A Proud Cameron Brand

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Email sales@aopind.com	Email sales@aopind.com
www.c-a-m.com	www.aopind.com

Series DT, CT, DB, CB

Floating
Ball Valves



STANDARD FEATURES ON ALL SERIES DT, CT, DB, CB, DBC AND CBR BALL VALVES

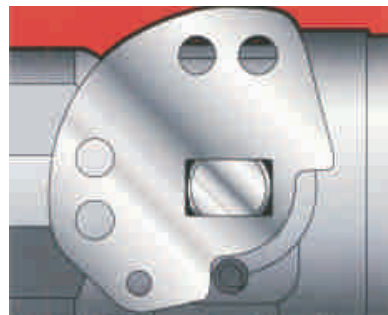
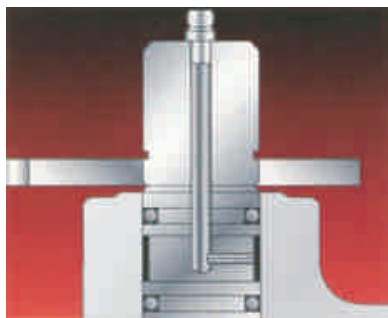
AOP two-piece, threaded and bolted body floating ball valves are designed to meet or exceed today's abrasive and corrosive applications. All AOP DT, CT, DB, CB, DBC, and CBR Series Ball Valves incorporate the following standard features:

- Stem is back-seated and positively retained: cannot be removed with the valve in service
- Stem lube fitting and weather seal
- Hard chrome plated ball for extended life and ease of operation
- Fire Safe Design
- Standard locking handle
- Available in both standard bore and full bore
- Delrin seats standard in all ductile iron and carbon steel bodied valves
- Conforms to NACE MR0175 Standard with 316 Stainless Steel Trim
- Double stem flat design indicates ball position
- Ball includes pressure equalization hole to prevent trapped pressure in body cavity



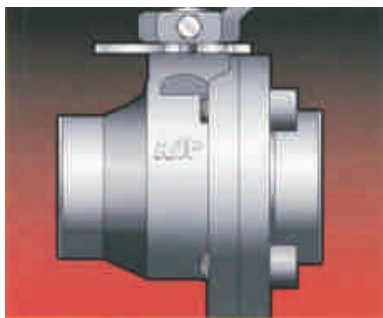
STEM LUBE FITTING AND WEATHER SEAL

External stem lube fitting and internal lube channel allows for effective lubrication of the stem journal. Weather seal prevents external attack by corrosion and foreign abrasives.



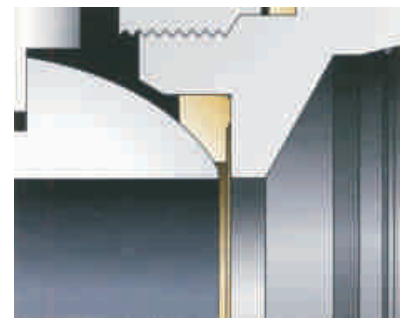
BOLTED BODY DESIGN

AOP's DB and CB Series Ball Valve is a rugged two-piece bolted design. Our premier ball valve is available in sizes 1 1/2 in. FP - 4 in. FP and pressures up to 5000 psi with carbon steel. Body materials are available in ductile iron and carbon steel. Ask for our threaded body design as your alternate choice.



STANDARD DELRIN SEATS

AOP seats provide bubble-tight sealing at high and low pressures. In the event of seat damage (e.g., fire) the design incorporates metal-to-metal sealing. Optional seat materials include Nylon, RTFE, PEEK and Devlon.

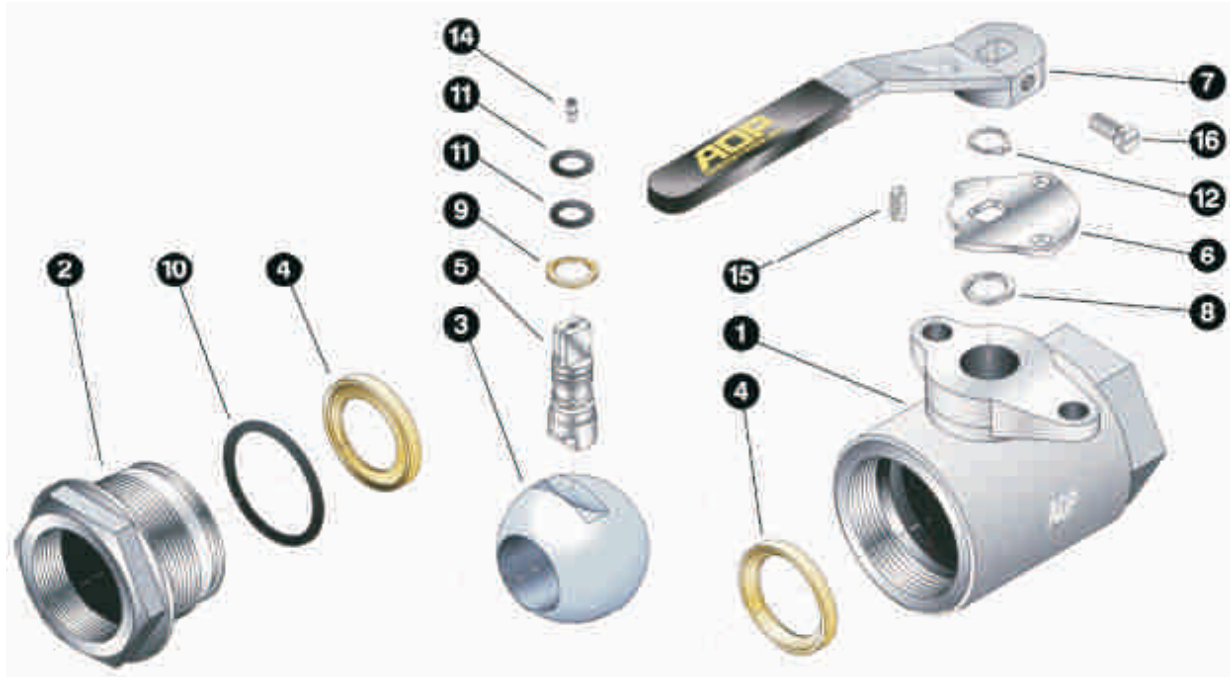


DT SERIES 1000 BALL VALVE (2 in., 3 in. and 4 in.)

This precision engineered valve is designed for 1000 psi maximum working pressure in both threaded and grooved end connections.

The DT 1000 Series valve is competitively priced with light-weight industrial valves, but rugged enough to endure most oilfield environments. The valve is standard with dart and chain for double-locking capabilities in the open or closed position.

SERIES DT & CT MATERIALS AND PART CODES



COMPONENT/OPTION CODES

Body/Adapter Material

- 1 - Carbon Steel
- 3 - Ductile Iron
- 5 - Coated Ductile Iron
- 6 - Coated Carbon Steel

Trim Material (Ball/Stem)

- 1 - CS/CS Standard (CS Trim Non-NACE)
- 2 - 316 SS/316 SS (NACE SS Trim Only)

End Connection

- 1 - Threaded
- 3 - Grooved

Seats

- 1 - Devlon
- 3 - RTFE
- 4 - Nylon
- 5 - PEEK
- 7 - Delrin

Seals

- 1 - Buna-N
- 2 - FKM
- 3 - LT Buna-N
- 9 - HNBR

Actuation

- 1 - Handle
- 3 - Gear Operator
- 4 - Gear Operator w/Locking Device
- 9 - Bare Stem

Options

- 9 - None

XXXX - X X X X X X X

Base No. Suffix Codes

SERIES DT & CT ASSEMBLY BASE NUMBERS

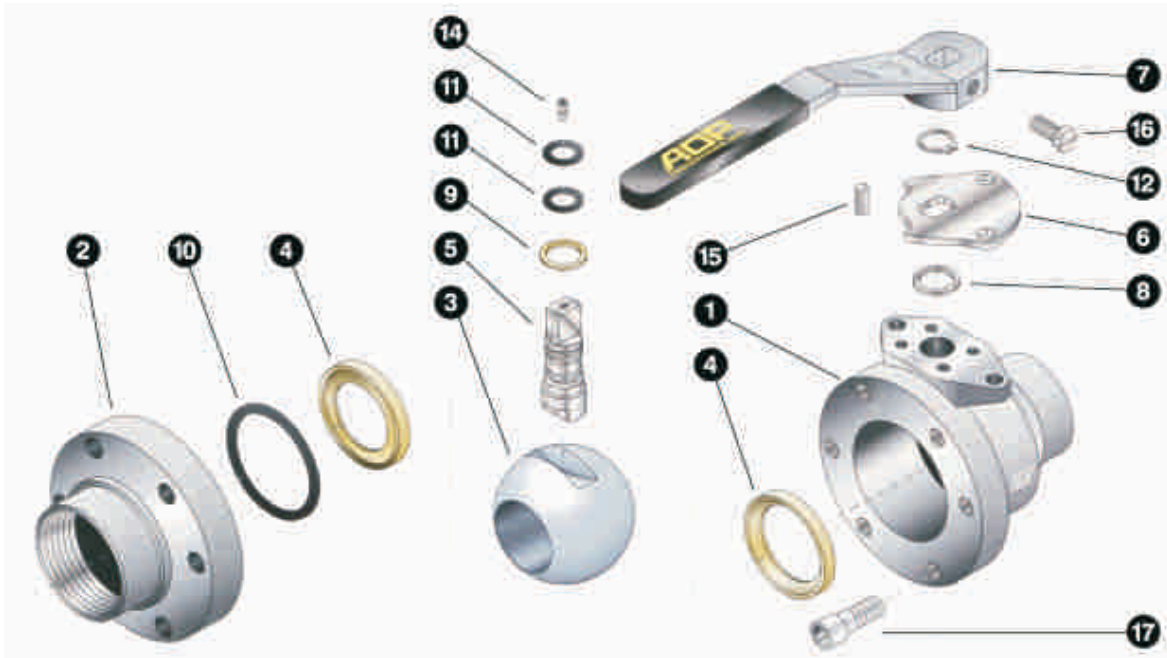
Model Size (in.)	1 FP	2 RP	2 FP	3 RP	4 RP
DT 1000	-	7502	7503	7505	7507
DT 1500	1500	1502	1503	-	-
DT 2000	2000	2002	2003	-	-
CT 2500	2500	2502	2503	-	-
CT 3000	3000	3002	3003	-	-
CT 5000	5000	5002	-	-	-

SERIES DT & CT MATERIALS LIST

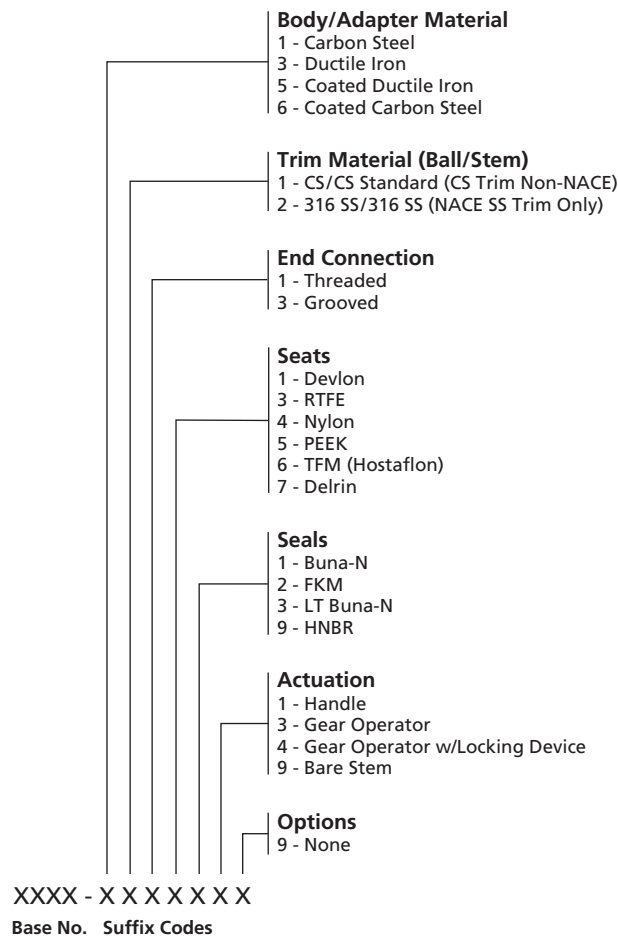
Item	Qty.	Part	Material (Standard)
1	1	Body	ASTM A395 Ductile Iron, ASTM A216 WCB Carbon Steel
2	1	Adapter	ASTM A395 Ductile Iron, ASTM A216 WCB Carbon Steel
3	1	Ball	Hard Chrome Plated Ball 316 Stainless Steel (NACE)
4	2	Seat	Delrin, Nylon
5	1	Stem	Plated Carbon Steel, 316 Stainless Steel (NACE)
6	1	Stop Plate	Plated Steel
7	1	Handle	Ductile Iron
8	1	Stem Bearing	Nylon
9	1	Thrust Bearing	TFE
10	1	Body Seal	Buna-N/FKM (NACE)
11	2	Stem Seal	Buna-N/FKM (NACE)
12	1	Retaining Ring	Spring-Steel
14	1	Lube Fitting	Steel
15	1	Stop Pin	Steel
16	1	Handle Bolt	Plate Steel

Note: All Valves incorporating 316 Stainless Steel Trim Conform to NACE MR0175.

SERIES DB, DBC, CB, CBA & CBR MATERIALS AND PART CODES



COMPONENT/OPTION CODES



SERIES DB & CB ASSEMBLY BASE NUMBERS

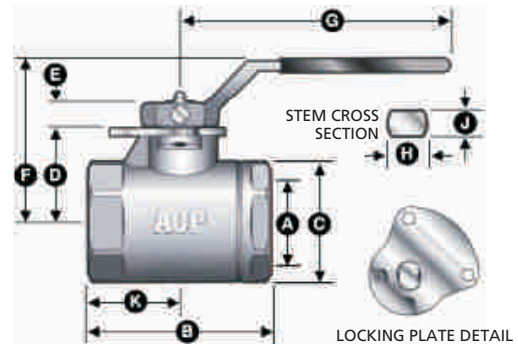
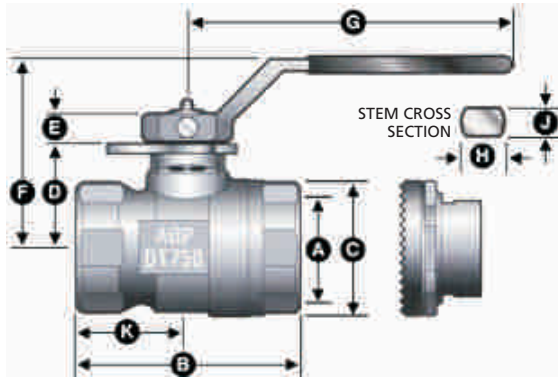
Model Size (in.)	1.5 FP	2 RP	2 FP	2.5 RP	3 RP	3 FP	4 RP	4 FP	4 FP 8 RD.
DB 1500	-	1602	1603	-	1605	1606	1607	1608	1609
DB 2000	-	2102	2103	-	2105	-	-	-	-
DBC 2000	-	-	-	-	-	-	-	2108	2109
CB 2500	-	2602	2603	2604	2605	2606	2607	-	-
CB 3000	3101	3102	3103	-	3105	3106	3107	-	-
CB 5000	5101	5102	5103	-	-	-	-	-	-
CBA	-	-	3202	-	-	-	-	-	-
CBR	3200	-	-	-	-	-	-	-	-

SERIES DB & CB MATERIALS LIST

Item	Qty.	Part	Material (Standard)
1	1	Body	ASTM A395 Ductile Iron, ASTM A216 WCB Carbon Steel
2	1	Adapter	ASTM A395 Ductile Iron, ASTM A216 WCB Carbon Steel
3	1	Ball	Hard Chrome Plated Ball 316 Stainless Steel (NACE)
4	2	Seat	Delrin, Nylon
5	1	Stem	Plated Carbon Steel, 316 Stainless Steel (NACE)
6	1	Stop Plate	Plated Steel
7	1	Handle	Ductile Iron
8	1	Stem Bearing	Nylon
9	1	Thrust Bearing	TFE
10	1	Body Seal	Buna-N/FKM (NACE)
11	2	Stem Seal	Buna-N/FKM (NACE)
12	1	Retaining Ring	Spring-Steel
14	1	Lube Fitting	Steel
15	1	Stop Pin	Steel
16	1	Handle Bolt	Plate Steel
17	4 - 6	Body Bolts	ASTM A574 Steel

Note: All Valves incorporating 316 Stainless Steel Trim Conform to NACE MR0175.

SERIES DT & CT DIMENSIONAL DATA



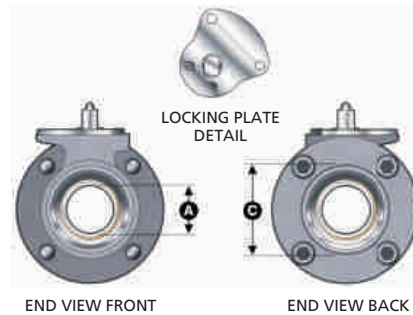
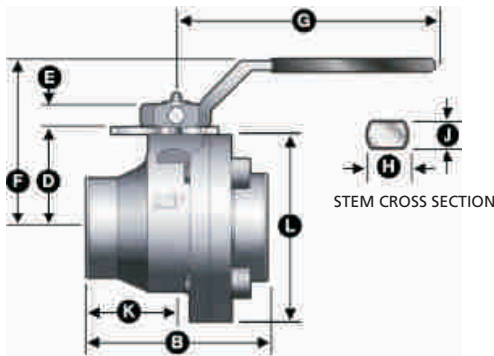
DT 1000

DIMENSION (in.)	2 RP 2 x 1.5	2 FP 2 x 2	3 RP 3 x 2	4 RP 4 x 3
A	1.5	2.06	2.06	3
B	5.25	5.75	7.25	8.75
B Grooved	5.25	5.75	6	7.25
C	3.125	3.125	4.375	6
C Grooved	3.375	3.375	4.5	6.375
D	2.906	3.25	3.25	3.625
E	0.75	0.75	0.75	1
F	4.906	5.25	5.25	6.125
G	8	8	8	15
H	0.873	0.873	0.873	1.24
J	0.56	0.56	0.56	0.622
K	2.625	2.86	3.625	4.375
K Grooved	2.625	2.875	3	3.625

DT 1500, DT 2000, CT 2500, CT 3000, CT 5000

DIMENSION (in.)	1 FP 1 x 1	2 RP 2 x 1.5	2 FP 2 x 2
A	1	1.5	2.06
B	4	5.25	6
C	1.875	3	3.88
D	1.718	2.625	3.5
E	0.562	0.75	0.875
F	3.062	5.625	5.312
G	6.25	8.25	8
H	0.623	0.873	0.873
J	0.372	0.56	0.56
K	2	2.75	3

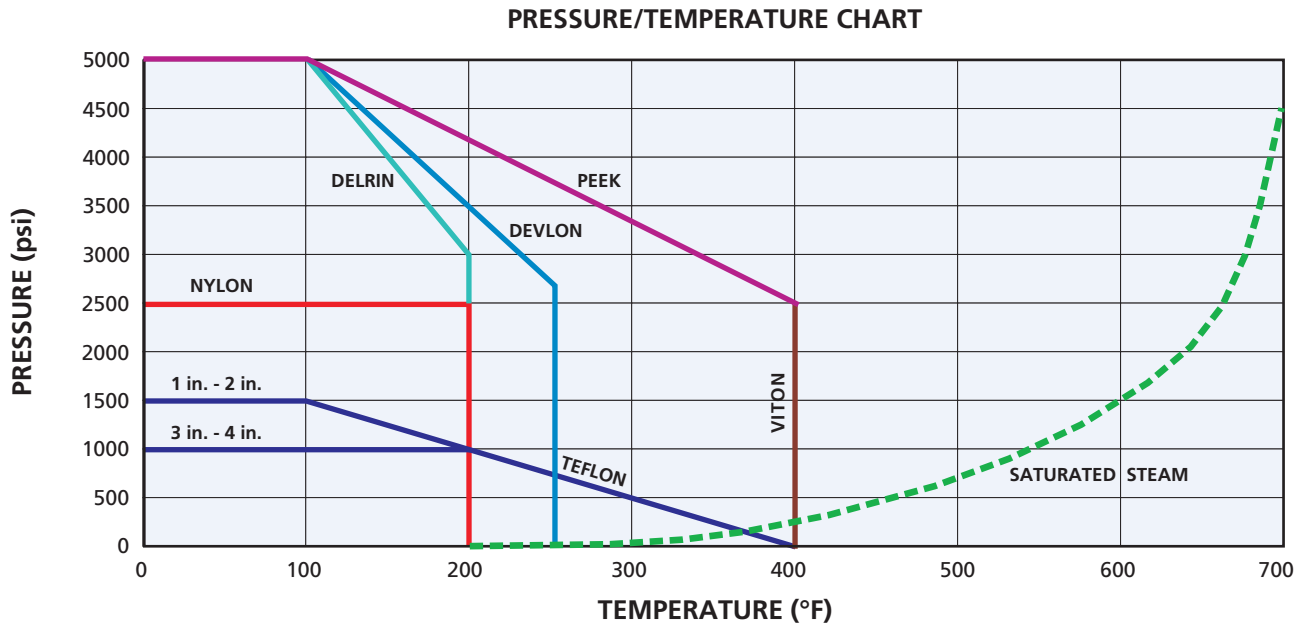
SERIES DB, DBC & CB, CBA, CBR DIMENSIONAL DATA



DB 1500, DB 2000, DBC 2000, CB 2500, CB 3000, CB 5000, CBA 2160, CBR 2500

DIMENSION (in.)	1 FP 1 x 1	1.5 FP 1.5 x 1.5	2 RP 2 x 1.5	2 FP 2 x 2	2.5 RP 2.5 x 2	3 RP 3 x 2	3 FP 3 x 3	4 RP 4 x 3	4 FP 4 x 4
A	1	1.5	1.5	2.06	2.06	2.06	3	3	4.06
B	3.875	5.5	5.5	5.75	5.75	7.25	8.125	8.625	12.25
C	1.875	2.375	3	3.125	3.125	4.25	4.25	5.25	5.75
D	1.875	2.875	2.875	3.5	3.5	3.5	4.69	4.69	5.325
E	0.562	0.75	0.75	0.875	0.875	0.875	1.063	1.063	1.13
F	3.625	4.937	4.937	5.312	5.312	5.312	6.75	6.75	8.4
G	6.25	8	8	8	8	8	15	15	18
H	0.623	0.873	0.873	0.873	0.873	0.873	1.24	1.24	1.365
J	0.372	0.56	0.56	0.56	0.56	0.56	0.622	0.622	0.745
K	1.937	2.75	2.75	2.875	2.875	3.812	4.187	4.437	6.05
L	3.375	4.875	4.875	6.125	6.125	6.875	8	8	10.25

ENGINEERING SPECIFICATIONS



These pressure and temperature ratings are the maximum shut-off for each seat combination for continuous service at temperature. For maximum ASME body ratings consult the factory.

Enduro-Bond Coating

Enduro-Bond Coating available for increased life span comparable to Stainless Steel or Aluminum Bronze.

TORQUE VALUES in - lbs.

Bore Size (in.)	Pressure (psi)					
	1000	1500	2000	2500	3000	5000
1	345	590	750	900	1080	1500
1 1/2	710	890	1120	1400	1750	2700
2	945	1200	1500	1880	2350	-
3	2155	2700	3200	-	4100	-
4	3950	-	-	-	-	-

Torques are based on clean wet service. If other conditions exist, a service factor should be applied. Consult AOP for specific service.

C_v VALUES

Size (in.)	Standard Port	Full Port
1	-	60
1 1/2	-	130
2	120	360
2 1/2	216	-
3	350	996
4	480	1893

Flow in US gallons of water per minute with a 1 psi pressure drop across the valve. Use this value in the flow formulas.



AOP Industries

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Series FB

Floating
Ball Valve



AOP™

A Proud Cameron Brand

SERIES FB – FLOATING BALL VALVE

SERIES FB – FLOATING BALL VALVE

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SERIES FB – FLOATING BALL VALVE

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SERIES FB – FLOATING BALL VALVE

INTRODUCTION

AOP offers a wide range of floating ball valves. The designs have been developed based on our customers requirements.

When you specify an AOP Ball Valve, you have selected a premier product.

With our state of the art manufacturing techniques, our valves are manufactured to the highest standards ensuring superior performance.

AOP Ball Valves are stocked by a network of authorized distributors to service the petroleum producing and refining industries.

AOP products are marketed worldwide by domestic and international representatives. Many of these representatives maintain local inventories for immediate delivery.

AOP offers check valves, needle valves, in addition to our threaded end, butt weld and flanged end ball valves.

Call AOP, our field representatives, or local distributors today for more information on how AOP can provide solutions for your upstream wellhead and downstream production needs.

STANDARD FEATURES ON ALL SERIES FB BALL VALVES

AOP two-piece, bolted body flanged end valves are designed to meet or exceed today's abrasive and corrosive applications. All AOP Series FB Ball Valves incorporate the following standard features:

- Stem is back-seated and positively retained: cannot be removed with the valve in service
- Stem lube fitting and weather seal
- Fire Tested and Certified to API 607 Latest Edition
- TFM, Nylon, and Peek seats available
- Anti-static device
- Standard locking handle
- Conforms to NACE MR0175/ISO 15156 for non-buried service, with stainless steel internals
- Available in both standard bore and full bore
- Double stem flat design indicates ball position
- B16.34
- ISO 5211 Mounting pad

Stem Lube Fitting and Weather Seal

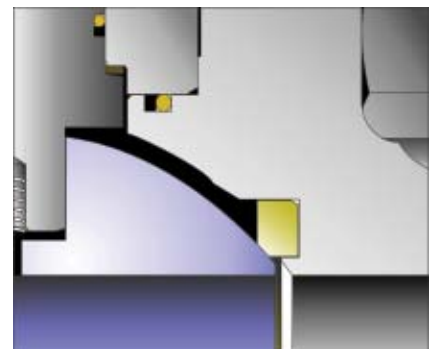
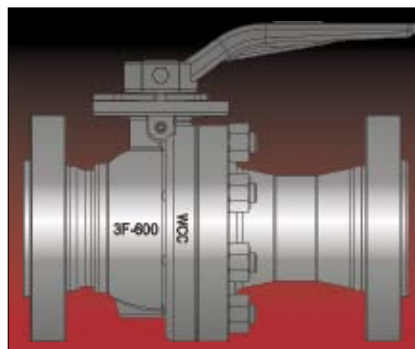
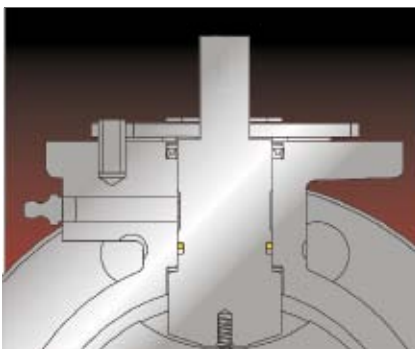
External stem lube fitting on the side of the valve, allows for effective lubrication of the stem journal. Weather seal prevents external attack by corrosion and foreign abrasives.

Bolted Body Design

AOP's Series FB Ball Valve is a rugged two-piece bolted design. Our premier ball valve is available in sizes 1 in. FP - 10 in. RP and pressures up to 3705 psi. Materials are available in carbon steel and stainless steel.

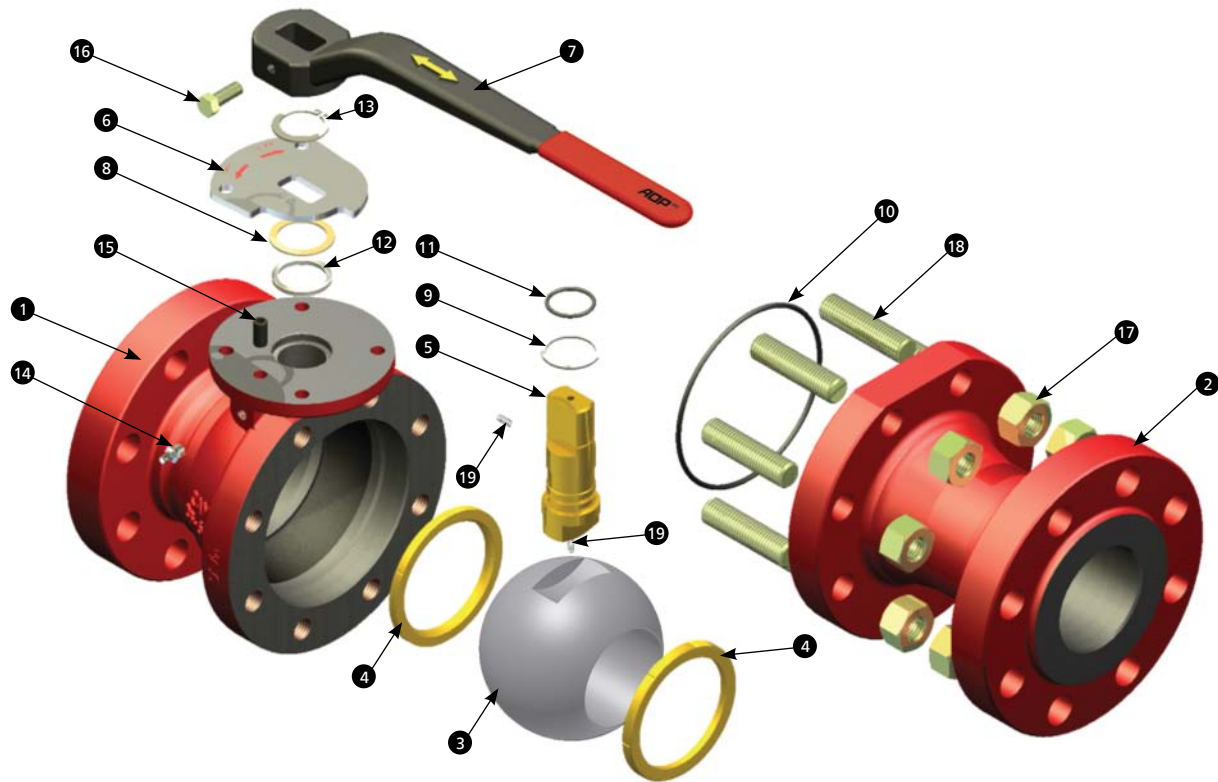
Standard NYLON and Reinforced TEFLON Seats

AOP seats provide bubble-tight sealing at high and low pressures. In the event of seat damage (e.g., fire) the design incorporates metal-to-metal sealing. Seat materials include Nylon and TFM.



SERIES FB – FLOATING BALL VALVE

MATERIALS LIST AND STANDARDS



SERIES FB MATERIALS LIST

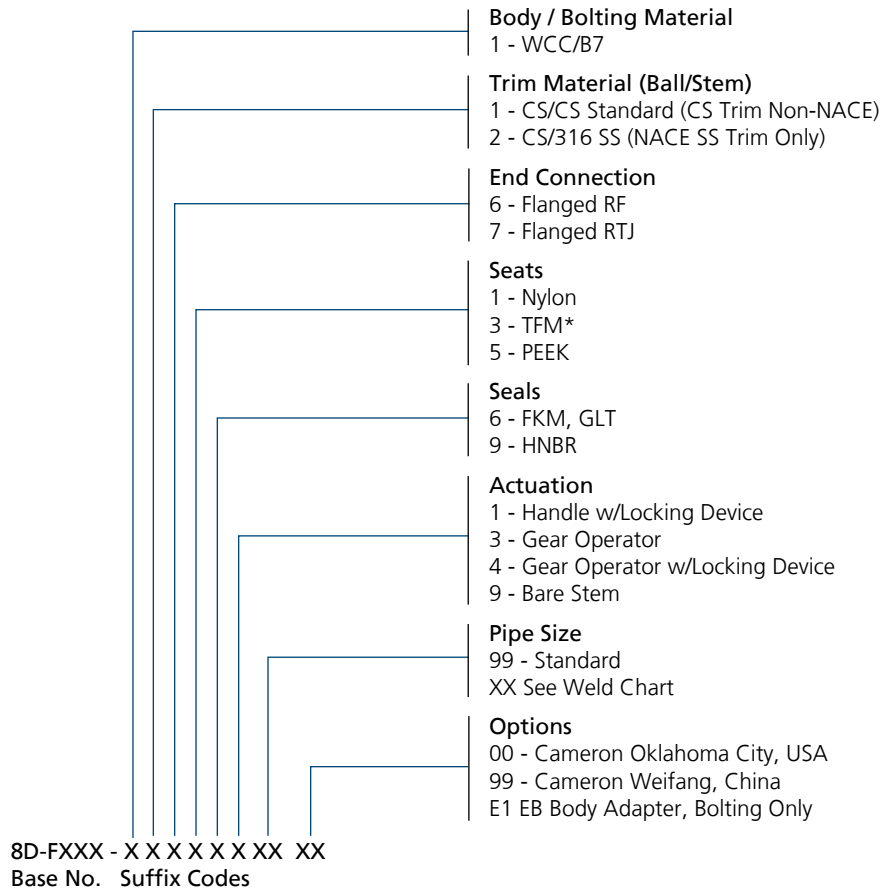
Item	Qty.	Part	Material (Standard)
1	1	Body	ASTM A216 WCC Carbon Steel
2	1	Adapter	ASTM A216 WCC Carbon Steel
3	1	Ball	A105 1 MIL ENP/316 Stainless Steel (NACE)
4	2	Seat	Nylon, TFM, Peek
5	1	Stem	4130/4140 1 MIL ENP/316 Stainless Steel (NACE)
6	1	Stop Plate	Zinc Plated Steel
7	1	Handle	A536 Gr. 65-45-12
8	1	Stem Washer	Teflon, Nylon
9	1	Stem Bearing	PTFE, Nylon
10	1	Body Seal	HNBR/FKM
11	1	Stem Seal	HNBR/FKM
12	1	Weather Seal	Nylon
13	1	Retaining Ring	Spring-Steel
14	1	Lube Fitting	Steel
15	1	Stop Pin	Steel
16	1	Handle Bolt	ASTM A574 Gr. 5
17	*	Hex Nut	ASTM A194 2H
18	*	Studs	ASTM A193-B7
19	2	Anti-Static Spring	Inconel X-750

* Quantity depends on Valve Size and Pressure Class.

Note: All Valves incorporating 316 Stainless Steel Trim Conform to NACE MR0175 / ISO 15156.

SERIES FB – FLOATING BALL VALVE

ASSEMBLY CODES / OPERATION NUMBERS



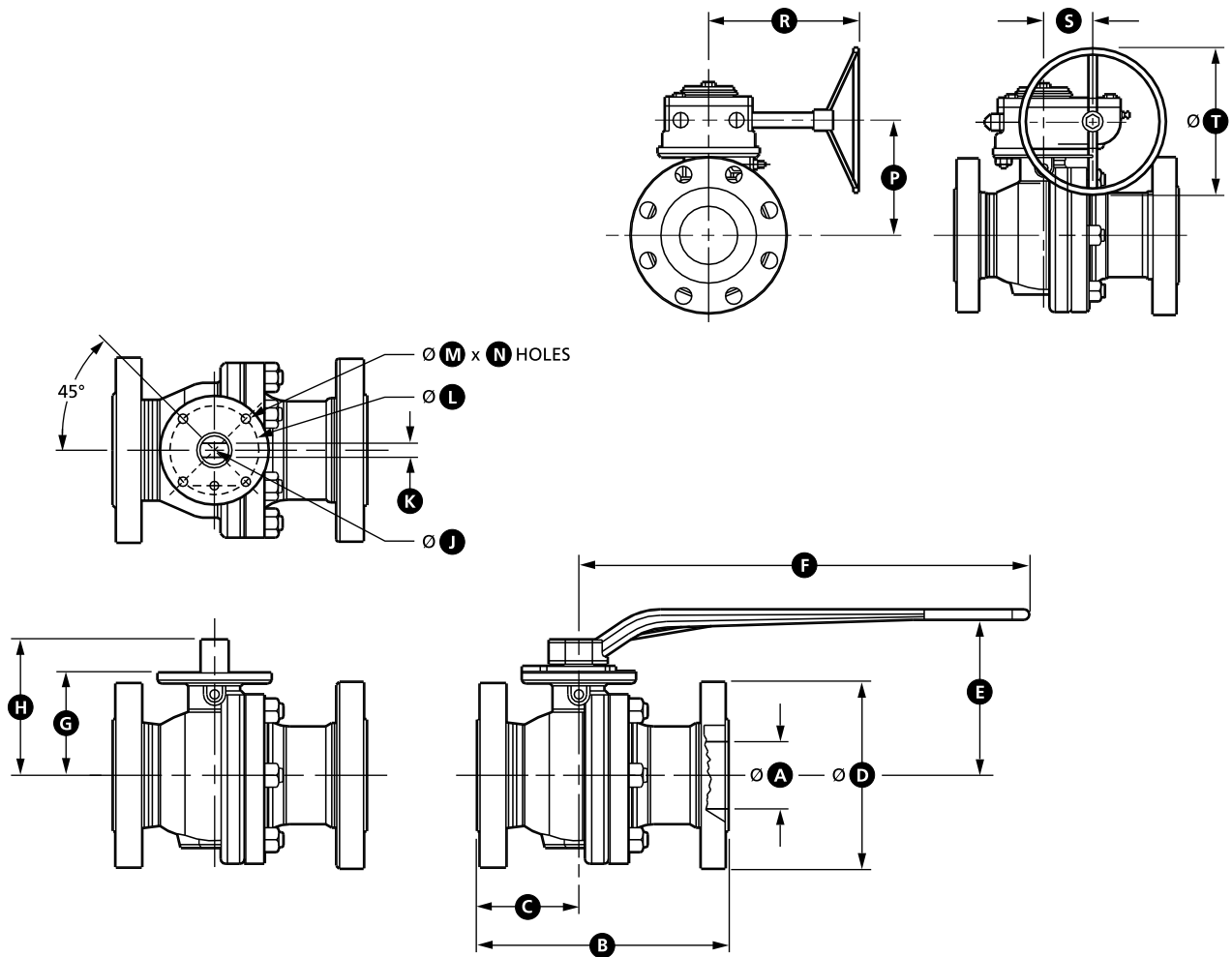
* TFM available in 1 in. through 8 x 6 in. Class 150 / 300 only.

ASSEMBLY BASE NUMBERS

Size (in.)	Model							
	150 RF	300 RF	600 RF	600 RTJ	900 RF	900 RTJ	1500 RF	1500 RTJ
1 FP	F100-	F300-	F600-	F600-	F900-	F900-	F500-	F500-
1.5 FP	F101-	F301-	F601-	F601-	F901-	F901-	F501-	F501-
2 RP	F102-	F302-	F602-	F602-	F902-	F902-	F502-	F502-
2 FP	F103-	F303-	F603-	F603-	F903-	F903-	F503-	F503-
3 RP	F105-	F305-	F605-	F605-	F905-	F905-	-	-
3 FP	F106-	F306-	F606-	F606-	-	-	-	-
4 RP	F107-	F307-	F607-	F607-	-	-	-	-
4 FP	F108-	F308-	F608-	F608-	-	-	-	-
6 RP	F109-	F309-	F609-	F609-	-	-	-	-
6 FP	F110-	F310-	-	-	-	-	-	-
8 RP	F111-	F311-	-	-	-	-	-	-
8 FP	F112	F312-	-	-	-	-	-	-
10 RP	F113	F313-	-	-	-	-	-	-

SERIES FB – FLOATING BALL VALVE

DIMENSIONS 1 in. - 2 in. x 1 1/2 in.

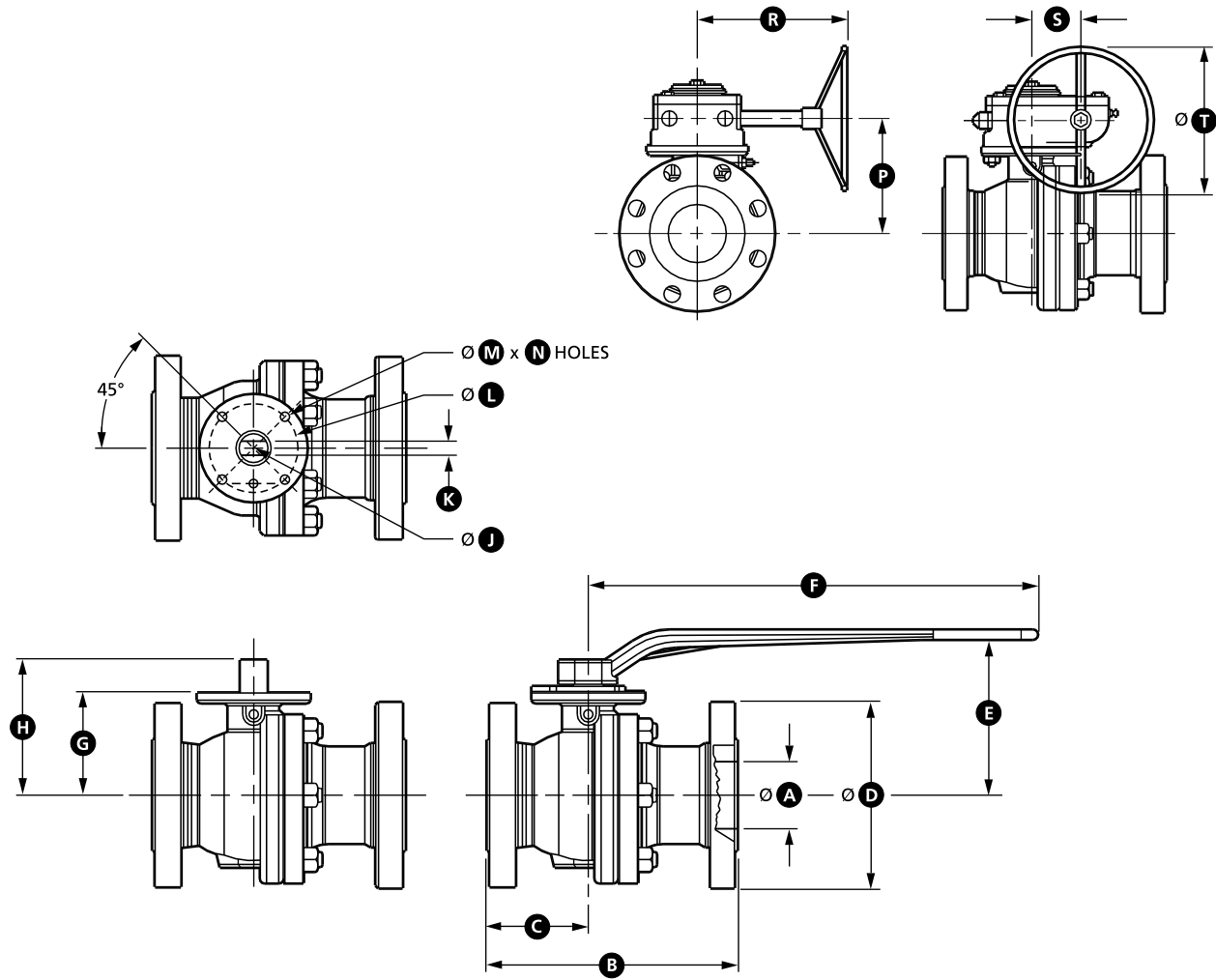


SERIES FB DIMENSIONAL DATA

Size in.	ASME Class	A	B		C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	Weight lbs.	
			RF	RTJ																w/Lever	w/Gear
1 x 1	150	1.00	5.00	-	2.09	4.25	5.00	10.00	2.25	2.98	0.810	0.352	1.969	0.28	4	3.38	4.69	1.67	5.00	11	16
	300	1.00	6.50	-	2.85	4.87	5.00	10.00	2.25	2.98	0.810	0.352	1.969	0.28	4	3.38	4.69	1.67	5.00	15	20
	600	1.00	8.50	8.50	3.85	4.87	5.00	10.00	2.25	2.98	0.810	0.352	1.969	0.28	4	3.38	4.69	1.67	5.00	25	30
	900	1.00	10.00	10.00	4.41	5.87	5.00	10.00	2.25	2.98	0.810	0.352	1.969	0.28	4	3.38	4.69	1.67	5.00	30	35
	1500	1.00	10.00	10.00	4.41	5.87	5.00	10.00	2.25	2.98	0.810	0.352	1.969	0.28	4	3.38	4.69	1.67	5.00	30	35
1 1/2 x 1 1/2	150	1.50	6.50	-	2.81	5.00	5.75	12.00	3.19	4.14	0.994	0.504	2.750	0.34	4	4.32	7.05	2.05	6.30	21	29
	300	1.50	7.50	-	3.31	6.12	5.75	12.00	3.19	4.14	0.994	0.504	2.750	0.34	4	4.32	7.05	2.05	6.30	28	37
	600	1.50	9.50	9.50	4.69	6.12	5.75	12.00	3.19	4.14	0.994	0.504	2.750	0.34	4	4.32	7.05	2.05	6.30	37	45
	900	1.50	12.00	12.00	6.00	7.00	5.75	12.00	3.19	4.07	1.120	0.564	2.750	0.35	4	4.32	7.05	2.05	6.30	52	60
	1500	1.50	12.00	12.00	6.00	7.00	5.75	12.00	3.19	4.07	1.120	0.564	2.750	0.35	4	4.32	7.05	2.05	6.30	52	60
2 x 1 1/2	150	1.50	7.00	-	3.25	6.00	5.75	12.00	3.19	4.14	0.994	0.504	2.750	0.34	4	4.32	7.05	2.05	6.30	25	33
	300	1.50	8.50	-	4.13	6.50	5.75	12.00	3.19	4.14	0.994	0.504	2.750	0.34	4	4.32	7.05	2.05	6.30	32	40
	600	1.50	11.50	11.62	4.26	6.50	5.75	12.00	3.19	4.14	0.994	0.504	2.750	0.34	4	4.32	7.05	2.05	6.30	43	51
	900	1.50	14.50	14.62	7.26	8.50	5.75	12.00	3.19	4.07	1.120	0.564	2.750	0.35	4	4.32	7.05	2.05	6.30	77	85
	1500	1.50	14.50	14.62	7.26	8.50	5.75	12.00	3.19	4.07	1.120	0.564	2.750	0.35	4	4.32	7.05	2.05	6.30	77	85

SERIES FB – FLOATING BALL VALVE

DIMENSIONS 2 in. x 2 in. - 3 in. x 3 in.

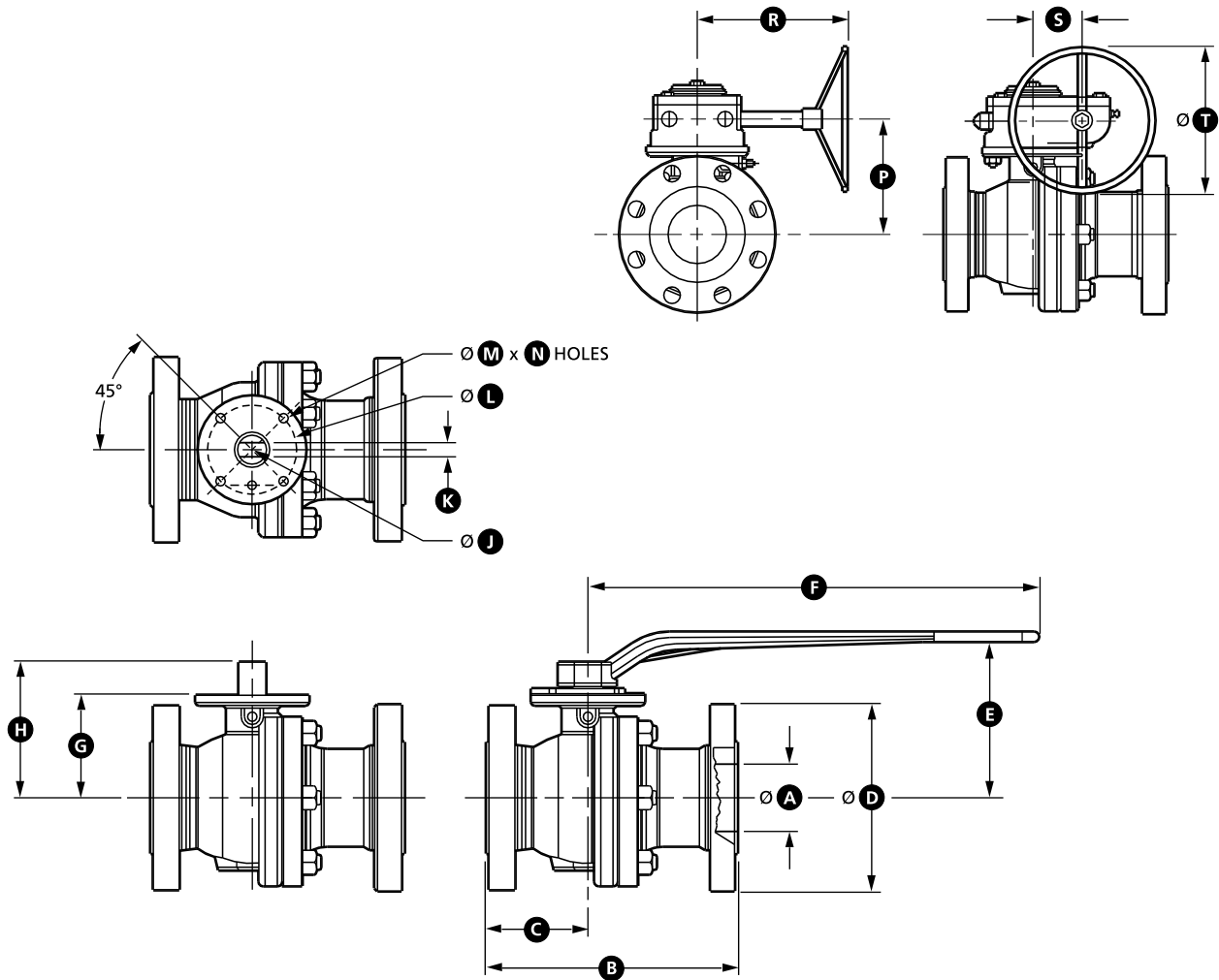


SERIES FB DIMENSIONAL DATA

Size	ASME	A	B		C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	Weight lbs.	
in.	Class		RF	RTJ																w/Lever	w/Gear
2 x 2	150	2.00	7.00	-	3.25	6.00	6.09	12.00	3.56	4.48	1.120	0.564	2.750	0.34	4	4.69	7.05	2.05	6.30	29	37
	300	2.00	8.50	-	4.13	6.50	6.09	12.00	3.56	4.48	1.120	0.564	2.750	0.34	4	4.69	7.05	2.05	6.30	36	44
	600	2.00	11.50	11.62	4.26	6.50	6.09	12.00	3.56	4.48	1.120	0.564	2.750	0.34	4	4.69	7.05	2.05	6.30	47	55
	900	2.00	14.50	14.62	7.06	8.50	6.70	20.00	3.88	5.19	1.310	0.682	4.016	0.40	4	5.47	9.18	2.80	7.87	95	116
	1500	2.00	14.50	14.62	7.06	8.50	6.70	20.00	3.88	5.19	1.310	0.682	4.016	0.40	4	5.47	9.18	2.80	7.87	95	116
3 x 2	150	2.00	8.00	-	3.69	7.50	6.09	12.00	3.56	4.48	1.120	0.564	2.750	0.34	4	4.69	7.05	2.05	6.30	40	48
	300	2.00	11.12	-	4.50	8.25	6.09	12.00	3.56	4.48	1.120	0.564	2.750	0.34	4	4.69	7.05	2.05	6.30	60	68
	600	2.00	14.00	14.12	5.00	8.25	6.09	12.00	3.56	4.48	1.120	0.564	2.750	0.34	4	4.69	7.05	2.05	6.30	69	77
	900	2.00	15.00	15.12	7.31	9.50	6.70	20.00	3.88	5.19	1.310	0.682	4.016	0.40	4	5.47	9.18	2.80	7.87	110	131
3 x 3	150	3.00	8.00	-	3.69	7.50	7.44	20.00	4.63	6.09	1.310	0.682	4.016	0.40	4	6.22	9.18	2.80	7.87	63	84
	300	3.00	11.12	-	4.44	8.25	7.44	20.00	4.63	6.09	1.310	0.682	4.016	0.40	4	6.22	9.18	2.80	7.87	83	104
	600	3.00	14.00	14.12	5.00	8.25	7.44	20.00	4.63	6.09	1.310	0.682	4.016	0.40	4	6.22	9.18	2.80	7.87	120	141

SERIES FB – FLOATING BALL VALVE

DIMENSIONS 4 in. x 3 in. - 6 in. x 4 in.

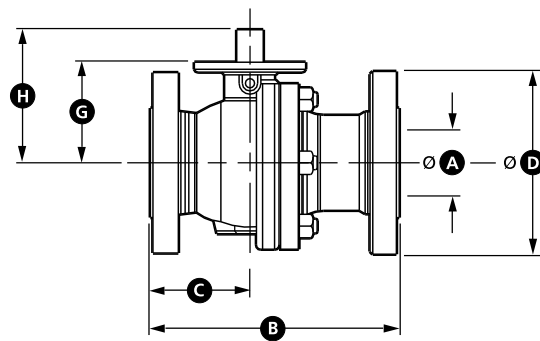
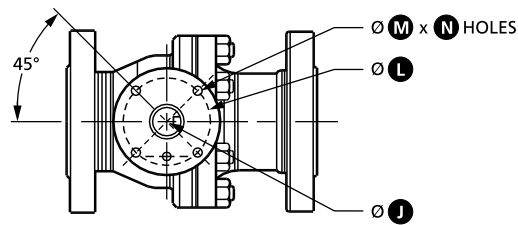
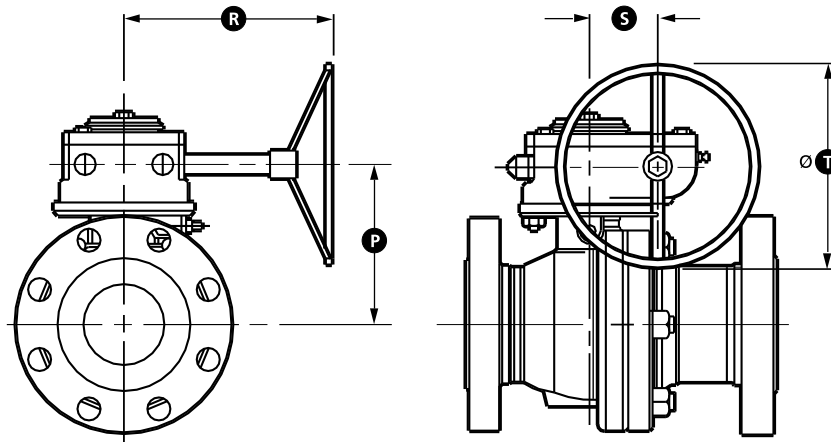


SERIES FB DIMENSIONAL DATA

Size in.	ASME Class	B		C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	Weight lbs.		
		RF	RTJ																w/Lever	w/Gear	
4 x 3	150	3.00	9.00	-	4.25	9.00	7.44	20.00	4.63	6.09	1.310	0.682	4.016	0.40	4	6.22	9.18	2.80	7.87	73	94
	300	3.00	12.00	-	4.87	10.00	7.44	20.00	4.63	6.09	1.310	0.682	4.016	0.40	4	6.22	9.18	2.80	7.87	104	125
	600	3.00	17.00	17.12	6.00	10.75	7.44	20.00	4.63	6.09	1.310	0.682	4.016	0.40	4	6.22	9.18	2.80	7.87	139	160
4 x 4	150	4.00	9.00	-	4.25	9.00	10.19	24.00	5.88	7.68	1.498	0.842	4.016	0.41	4	7.47	9.18	2.80	7.87	96	117
	300	4.00	12.00	-	4.75	10.00	10.19	24.00	5.88	7.68	1.498	0.842	4.016	0.41	4	7.47	9.18	2.80	7.87	135	156
	600	4.00	17.00	17.12	6.00	10.75	10.19	24.00	5.88	7.68	1.498	0.842	4.016	0.41	4	7.47	10.56	2.80	11.80	180	201
6 x 4	150	4.00	10.50	-	5.00	11.00	10.19	24.00	5.88	7.68	1.498	0.842	4.016	0.41	4	7.47	9.18	2.80	7.87	116	137
	300	4.00	15.88	-	6.82	12.50	10.19	24.00	5.88	7.68	1.498	0.842	4.016	0.41	4	7.47	9.18	2.80	7.87	190	212
	600	4.00	22.00	22.12	8.50	14.00	10.19	24.00	5.88	7.68	1.498	0.842	4.016	0.41	4	7.47	10.56	2.80	11.80	288	310

SERIES FB – FLOATING BALL VALVE

DIMENSIONS 6 in. x 6 in. - 10 in. x 8 in.



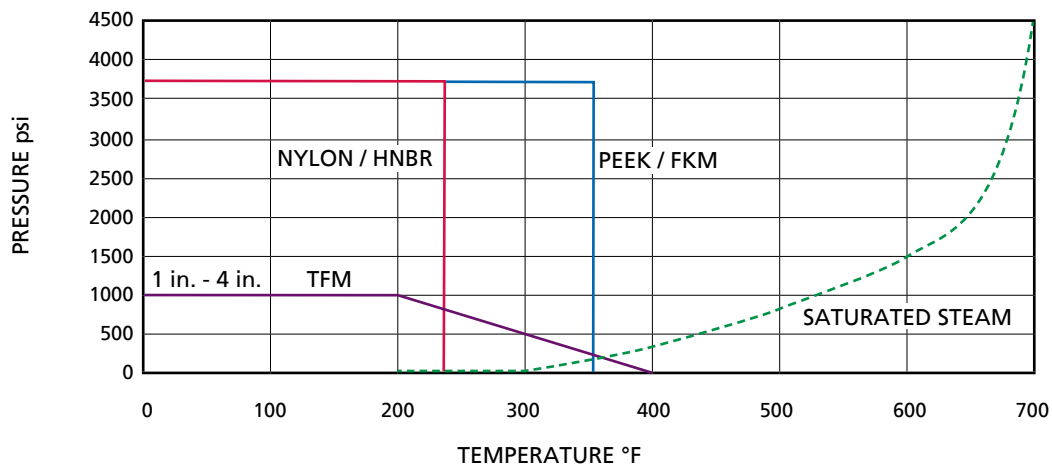
SERIES FB DIMENSIONAL DATA

Size in.	ASME Class	B		C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	Weight lbs.		
		RF	RTJ																	w/Lever	w/Gear	
6 x 6	150	6.00	15.50	-	7.75	11.00	-	-	8.50	10.92	2.125	-	5.512	0.67	4	0.500	10.39	11.71	4.11	11.80	205	255
	300	6.00	15.88	-	8.00	12.50	-	-	8.50	10.92	2.125	-	5.512	0.67	4	0.500	10.39	12.30	4.11	12.85	255	305
8 x 6	150	6.00	11.50	-	5.50	13.50	-	-	8.50	10.92	2.125	-	5.512	0.67	4	0.500	10.39	11.71	4.11	11.80	230	280
	300	6.00	16.50	-	8.25	15.00	-	-	8.50	10.92	2.125	-	5.512	0.67	4	0.500	10.39	12.30	4.11	12.85	325	375
8 x 8	150	8.00	18.00	-	9.12	13.50	-	-	10.12	13.31	2.375	-	6.496	0.78	4	0.625	12.29	17.50	5.12	14.44	340	410
	300	8.00	19.75	-	10.00	15.00	-	-	10.12	13.31	2.375	-	6.496	0.78	4	0.625	12.29	17.50	5.12	14.44	450	520
10 x 8	150	8.00	21.00	-	9.62	16.00	-	-	10.12	13.31	2.375	-	6.496	0.78	4	0.625	12.29	17.50	5.12	14.44	455	525
	300	8.00	22.38	-	11.12	17.50	-	-	10.12	13.31	2.375	-	6.496	0.78	4	0.625	12.29	17.50	5.12	14.44	575	645

SERIES FB – FLOATING BALL VALVE

ENGINEERING SPECIFICATIONS

PRESSURE/TEMPERATURE CHART



These pressure and temperature ratings are the maximum shut-off for each seat combination for continuous service at temperature. For maximum ASME body ratings consult the factory or ASME B16.34.

TORQUE VALUES in - lbs. (NYLON SEATS)

Bore Size (in.)	Pressure (psi)				
	285	740	1480	2220	3405
1	160	190	250	330	520
1 1/2	480	540	660	980	1350
2	720	960	1200	1720	2600
3	1200	1800	2160	-	-
4	1680	2280	2880	-	-
6	8220	11800	-	-	-
8	12600	18500	-	-	-

Torques are based on clean wet service. If other conditions exist, a service factor should be applied. Consult AOP for specific service.

TORQUE VALUES in - lbs. (TFM SEATS)

Bore Size (in.)	Pressure (psi)	
	285	740
1	130	160
1 1/2	360	480
2	600	720
3	1080	1680
4	1560	2160
6	7500	12000

Torques are based on clean wet service. If other conditions exist, a service factor should be applied. Consult AOP for specific service.

FLANGED VALVE CV VALUES

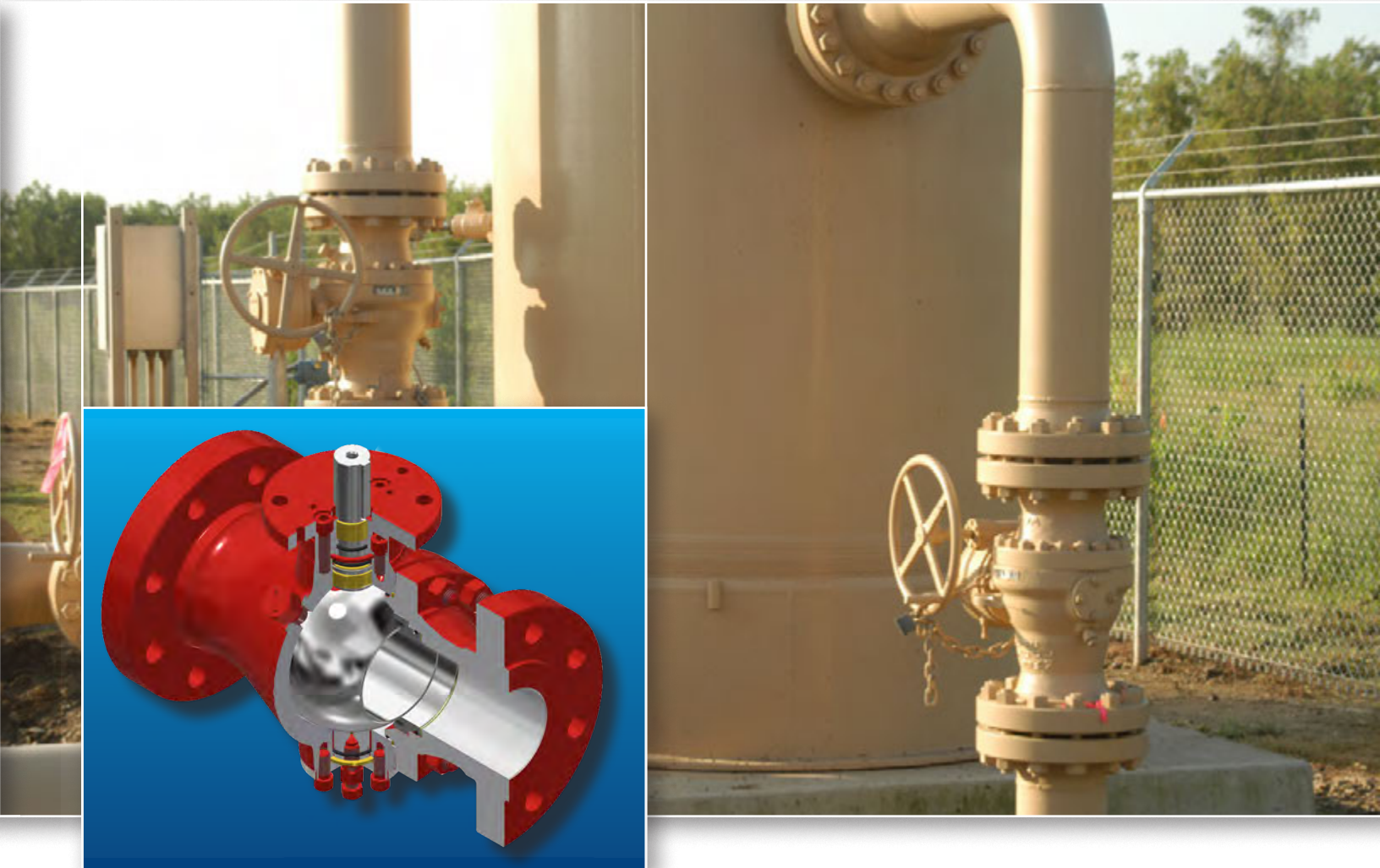
Size (in.)	Class				
	150	300	600	900	1500
1	98	98	93	90	90
1 1/2	260	209	225	205	205
2 RP	185	182	171	135	135
2 FP	442	454	302	290	290
3 RP	221	381	284	175	-
3 FP	1363	1197	1072	-	-
4 RP	509	606	464	-	-
4 FP	2452	2323	1729	-	-
6 RP	1020	1029	1068	-	-
6 FP	4700	5438	-	-	-
8 RP	2216	2343	-	-	-
8 FP	10206	8333	-	-	-
10 RP	3890	4172	-	-	-

Flow in US gallons of water per minute with a 1 psi pressure drop across the valve. Use this value in the flow formulas.

AOP™
A Proud Cameron Brand

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Oklahoma, OK 73129
Phone: 405-912-4446
www.c-a-m.com

P.O. Box 94700
Oklahoma, OK 73143
Fax: 405-912-4440
E-Mail: sales@aopind.com
www.aopind.com



AOP Series D2 Trunnion- Mounted Ball Valve

AOP Series D2 Trunnion-Mounted Ball Valve

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 - Dimensions and Weights..... 7
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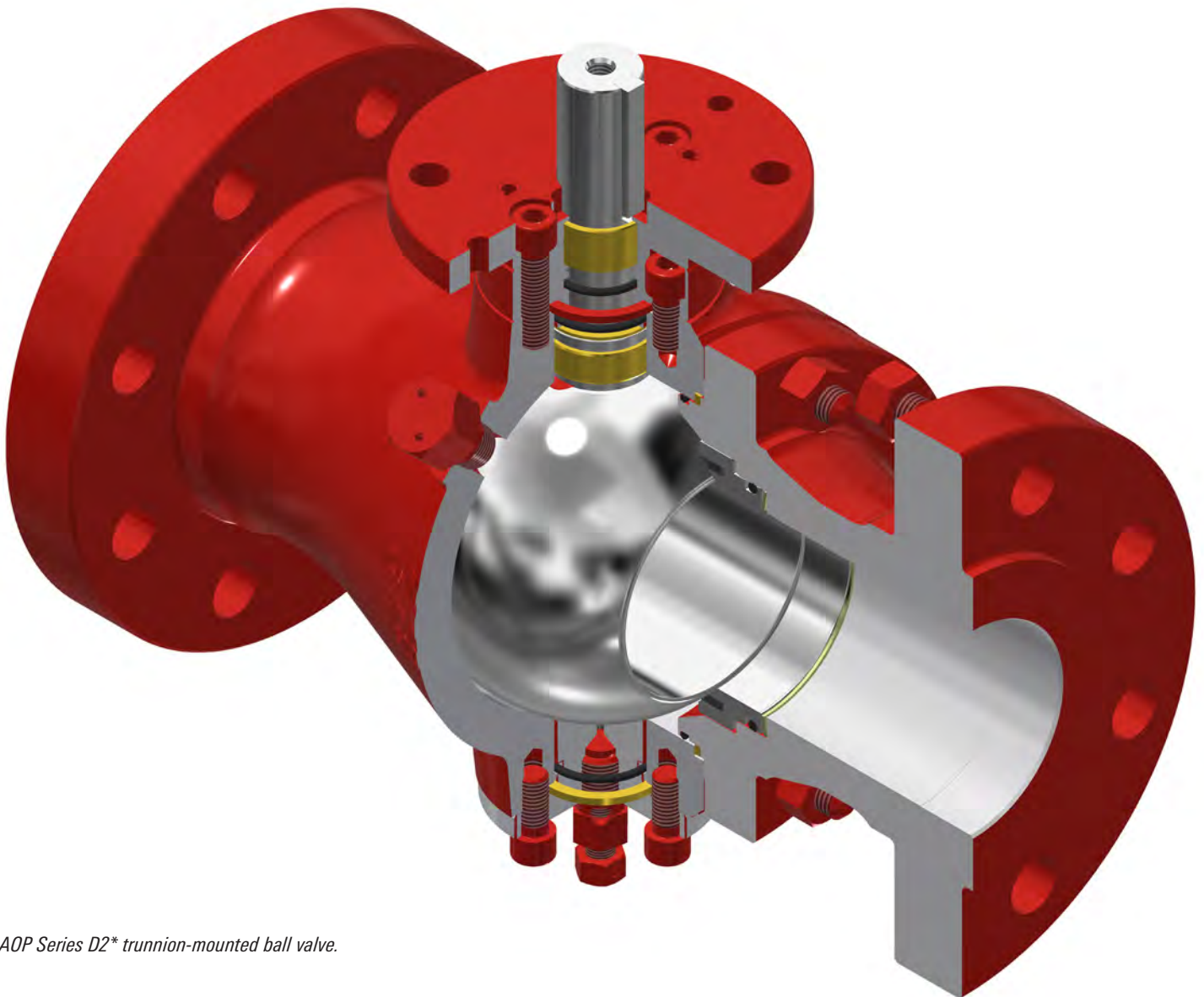
General Information

Cameron AOP* valve include a wide range of trunnion-mounted ball valves. The designs have been developed based on customer requirements.

All AOP technologies are manufactured and tested in compliance with API Spec 6D, which dictates end-to-end dimensions, flange configuration, port sizes, construction materials, quality control procedures, and testing requirements.

These technologies are stocked by a network of authorized distributors to service the oil and gas industry in the US. Many of these stockists maintain local inventories for immediate delivery.

Call Cameron, our field representatives, or our local distributors today for more information on how these technologies can satisfy your production requirements.



AOP Series D2 trunnion-mounted ball valve.*

Features

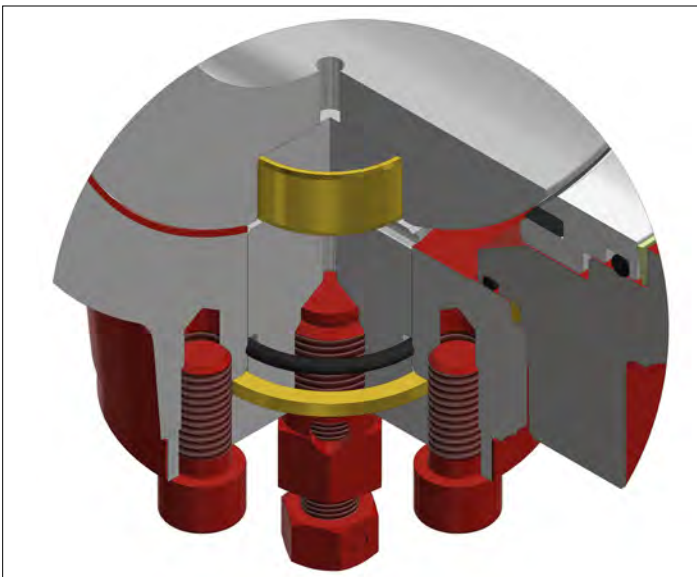
Two-piece, end-entry AOP Series D2 trunnion-mounted ball valves up to ASME Class 600 are available in 2- to 12-in bores.

The special graphite seals effectively prevent external leakage for fire-safe applications, conforming to API Spec 6FA or API Std 607.

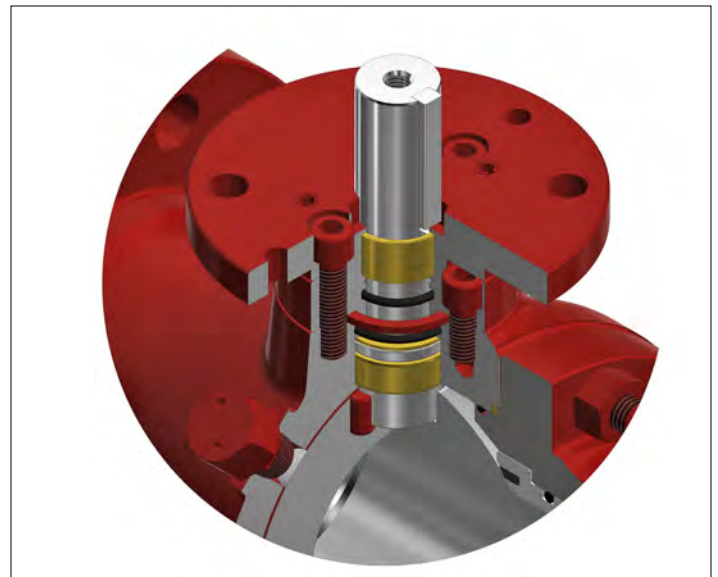
Operating temperatures range from -20 to 250 degF [-29 to 121 degC].

The following features are standard:

- double-barrier stem seals
- fixed-position external stops
- stem separate from the ball
- trunnion-mounted ball for ease of operation at high pressures
- NACE MR0175 and ISO 15156 compliance
- fire testing in accordance with API Spec 6FA or API Std 607
- metal-backed self-lubricating PTFE sleeve bearings and thrust washers to reduce torque and extend service life
- bolted construction to facilitate jobsite repairs
- electroless nickel plated (ENP) valve trim
- fire-safe graphite rings in 2-, 3-, and 4-in valves for protection against external leakage
- self-relieving seats to eliminate cavity pressure lock
- double block and bleed design
- seat injection on 6-in to 12-in valves in ASME Classes 150 through 600
- API Spec 6D monogram
- explosive-decompression-certified FKM seals
- certified low-emissions per API Std 641.



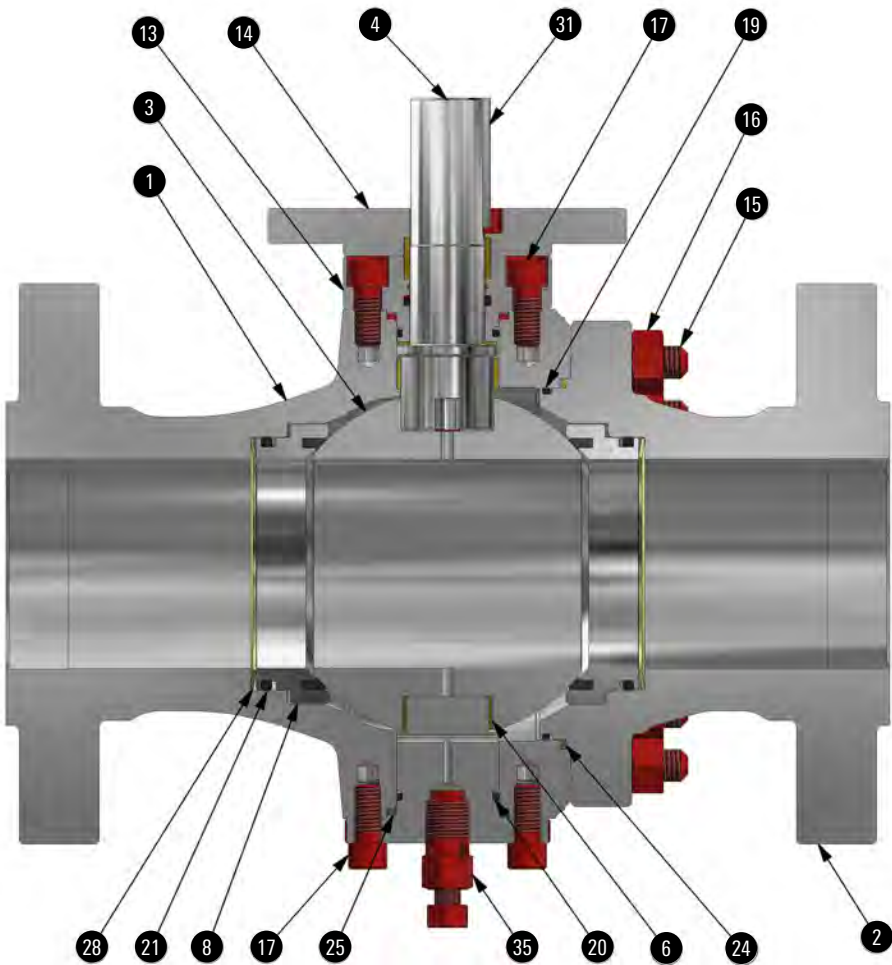
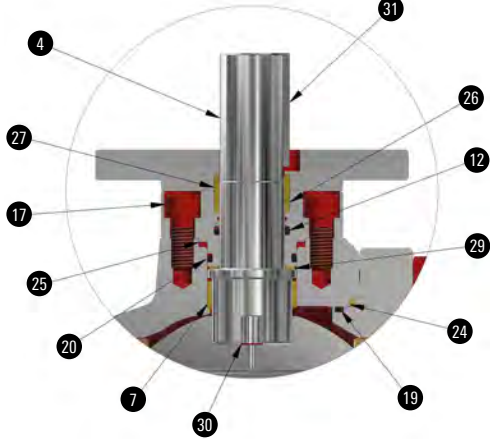
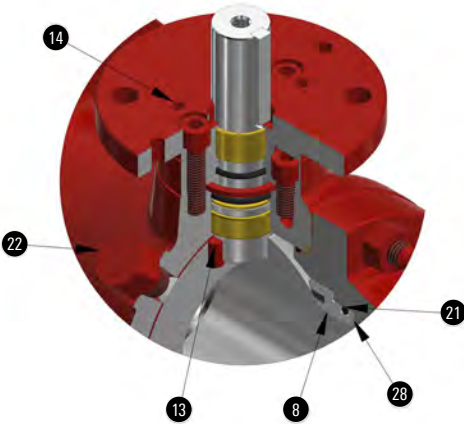
Short coupled trunnion to reduce bearing loads and operating torque.



Double-barrier seals for low-emissions performance.

ASME Class 600, 2–6 in × 4 in

Valve Assembly

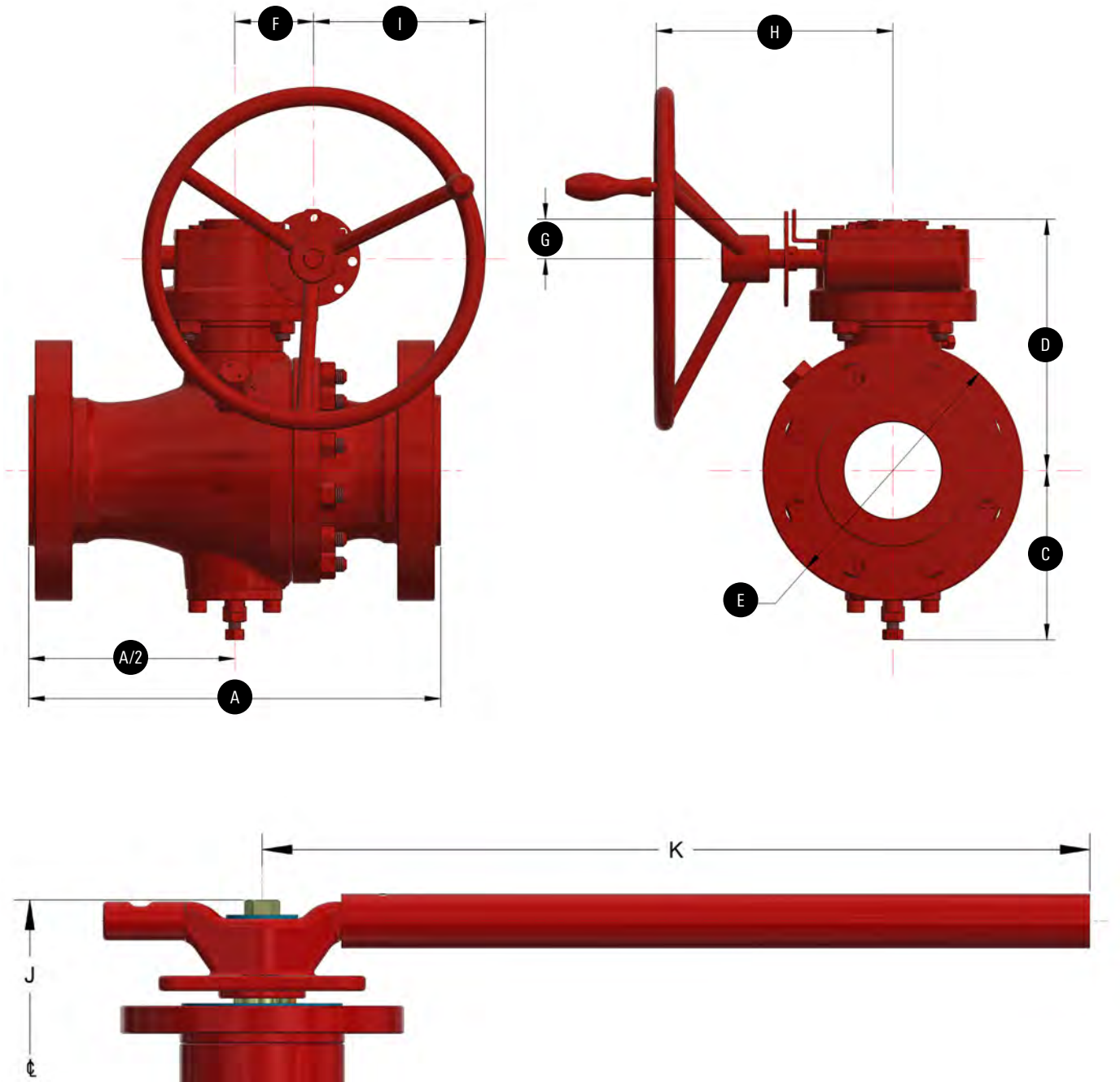


Construction Materials

Item	Part	NACE MR0175 Carbon Steel
1	Body	ASTM A216 Grade WCC
2	Tailpiece	ASTM A216 Grade WCC
3	Ball	ASTM A105 1-mil ENP
4	Stem	AISI 4140 1-mil ENP
5	Lower trunnion	ASTM A105 1-mil ENP
6	Trunnion radial bearing	Dry bearing, Teflon®-coated steel
7	Ball radial bearing	Dry bearing, Teflon-coated steel
8	Seat with insert	ASTM A105, with nylon insert
12	O-ring, stem	Fluorocarbon elastomer
13	Bonnet	ASTM A516 Grade 70 or ASTM A105
14	Adapter plate	ASTM A516 Grade 70 or ASTM A105
15	Body studs	ASTM A193 Grade B7, zinc plated
16	Body hex nuts	ASTM A194 Grade 2H, zinc plated
17	Capscrews, bonnet and trunnion	ASTM A193 Grade B7M, zinc plated
18	Capscrews, adapter plate	ASTM A193 Grade B7M, zinc plated
19	O-ring, tailpiece	Fluorocarbon elastomer
20	O-rings, bonnet and trunnion	Fluorocarbon elastomer
21	O-rings, seat ring	Fluorocarbon elastomer
24	Body fire seal	Graphoil
25	Bonnet and trunnion fire seal	Graphoil
26	Stem fire seal	Graphoil
27	Bushing gland	ASTM A53 1-mil ENP
28	Belleville spring	INCONEL® X750
29	Stem thrust bearing	Carbon steel 1018 or 1045 with PPS coating
30	Drive pin	AISI 4140
31	Key	AISI 4130
32	Torque pin	AISI G1070 or G1074
33	Body vent plug	AISI 1018 or AISI 4140
35	Bleed plug	AISI 1018 or AISI 4140

Materials listed are minimum requirements. Cameron reserves the right to substitute materials listed on this page with alternate materials for the designated service.

Dimensions and Weights



Working gauge pressure: 1,480 psi [102 bar]

Size	B	A		C	D	E	F	G	H	I	J	K	Weight, lbm [kg]	
		RF [†]	RTJ [‡]										Valve	Gearbox
2 [50]	2.00 [51]	11½ [292]	11⅝ [295]	5.12 [130]	7.35 [187]	6½ [165]	1.75 [44]	1.49 [38]	7.03 [179]	3.93 [100]	6.23 [158]	15.00 [381]	52.7 [24]	15 [7]
3 × 2 × 3 [75 × 50 × 75]	2.00 [51]	14.00 [356]	14⅞ [359]	5.12 [130]	7.35 [187]	8¼ [206]	1.75 [44]	1.49 [38]	7.03 [179]	3.93 [100]	6.23 [158]	15.00 [381]	76.9 [35]	15 [7]
3 [75]	3.00 [76]	14.00 [356]	14⅞ [359]	6.18 [157]	8.82 [224]	8¼ [210]	2.42 [61]	1.42 [36]	8.00 [203]	6.30 [160]	7.85 [199]	24.00 [610]	106.0 [48]	20 [9]
4 × 3 × 4 [100 × 75 × 100]	3.00 [76]	17.00 [432]	17⅞ [435]	6.18 [157]	8.82 [224]	10¼ [273]	2.42 [61]	1.42 [36]	7.98 [203]	6.30 [160]	7.85 [199]	24.00 [610]	157.0 [71]	20 [9]
4 [100]	4.00 [102]	17.00 [432]	17⅞ [435]	7.12 [181]	10.36 [263]	10¼ [273]	3.17 [81]	1.63 [41]	9.78 [248]	7.08 [180]	9.39 [239]	7.70 [196]	189.0 [86]	33 [15]
6 × 4 × 6 [150 × 100 × 150]	4.00 [102]	22.00 [559]	22⅞ [562]	7.12 [181]	10.36 [263]	14.00 [356]	3.17 [81]	1.63 [41]	9.78 [248]	7.08 [180]	9.39 [239]	7.70 [196]	295.0 [134]	33 [15]

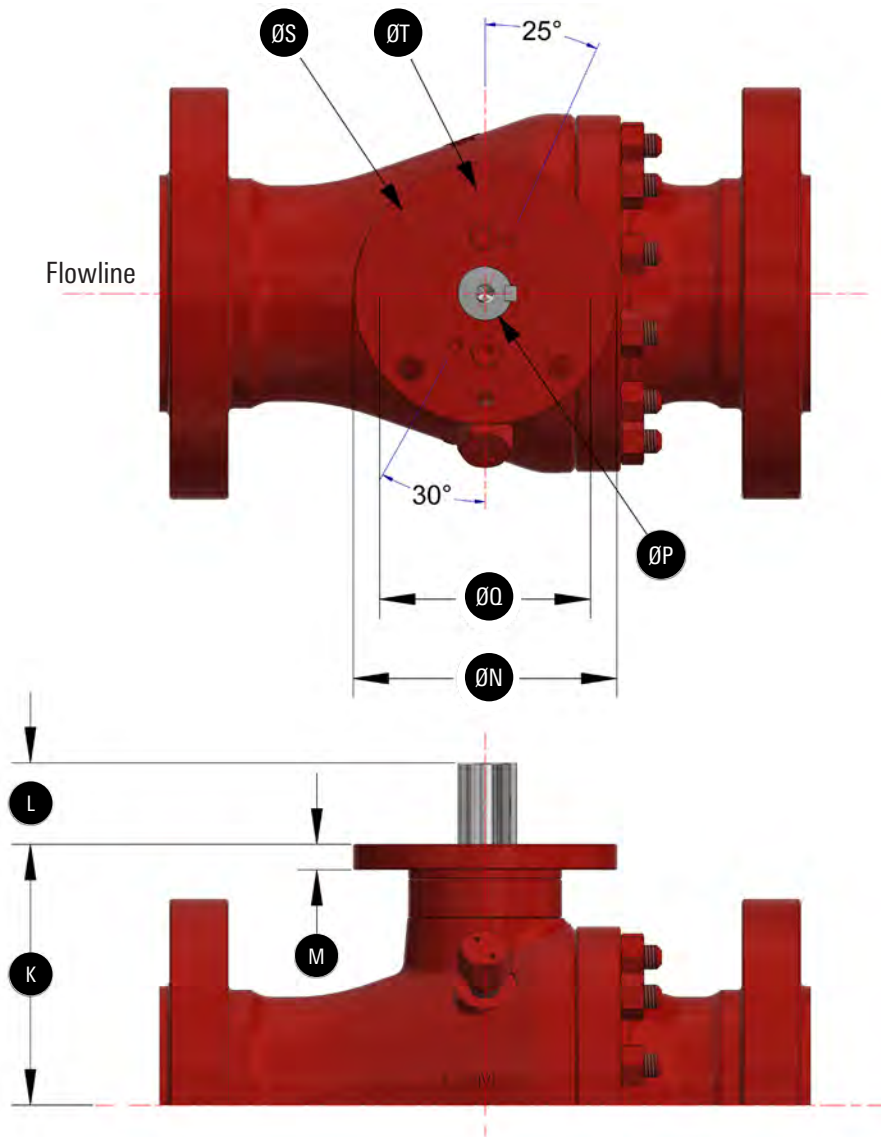
All specifications are subject to change without notice.

Units for all dimensions are inches [millimeters] unless otherwise specified.

[†] RF: Raised face

[‡] RTJ: Ring joint

Topworks Dimensions



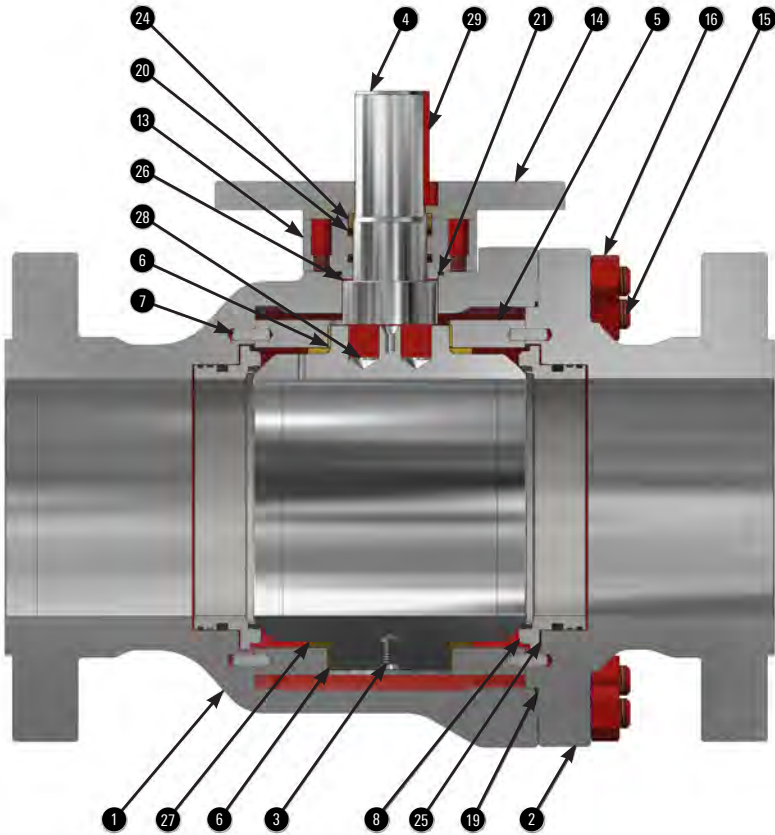
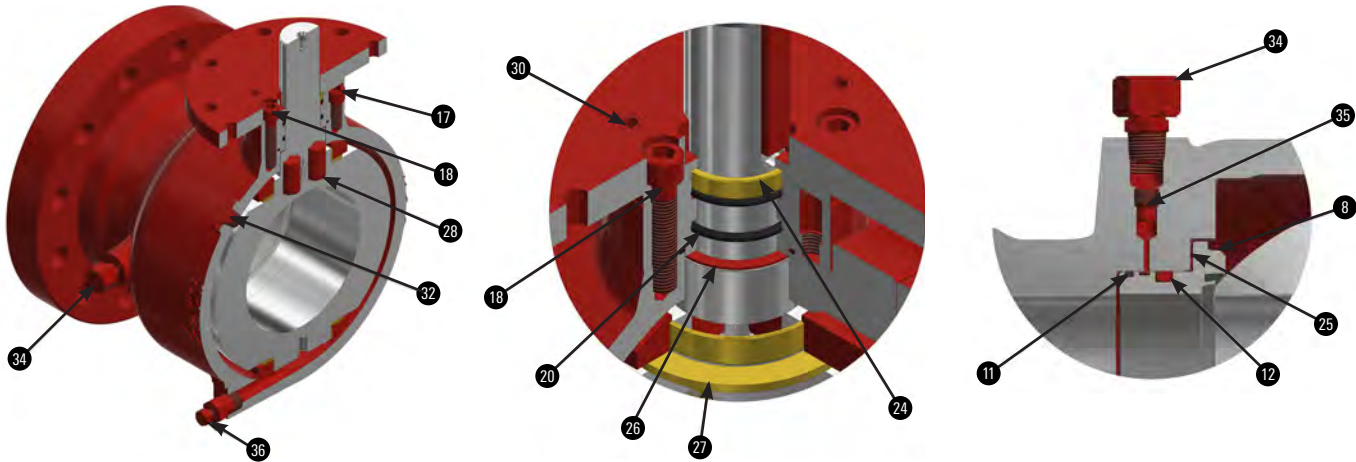
Bore Size	ASME Class	K	L	M	N	P (+0/-0.003 in)	Q	S	T	Key Size (W × H × L), in
2 [50]	600	4.61 [117]	1.27 [32]	0.39 [10]	4.75 [120.6]	0.862 [21.90]	4.016 [102.01]	0.42 [10.67]	0.315 [10]	.236 × .236 × 1.5
3 [75]	600	5.77 [146.6]	1.73 [43.8]	0.59 [15]	5.94 [150.88]	1.098 [27.89]	4.921 [124.99]	0.531 [13.5]	0.437 [11.1]	.315 × .276 × 2.0
4 [100]	600	6.81 [173.1]	2.12 [54]	0.67 [17]	6.89 [175]	1.413 [35.89]	5.521 [140.23]	0.67 [17]	0.437 [11.1]	.394 × .315 × 2.5

All specifications are subject to change without notice.

Units for all dimensions are inches [millimeters] unless otherwise specified.

ASME Class 150–600, 6–12 in

Valve Assembly

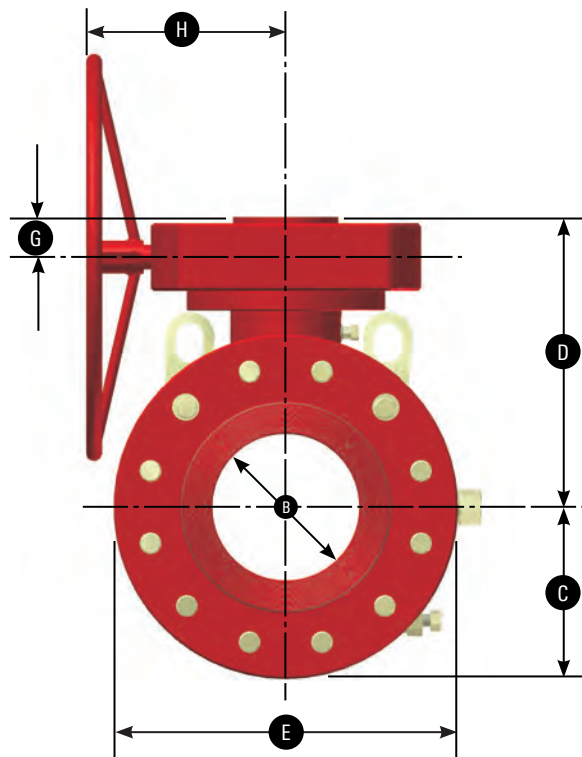
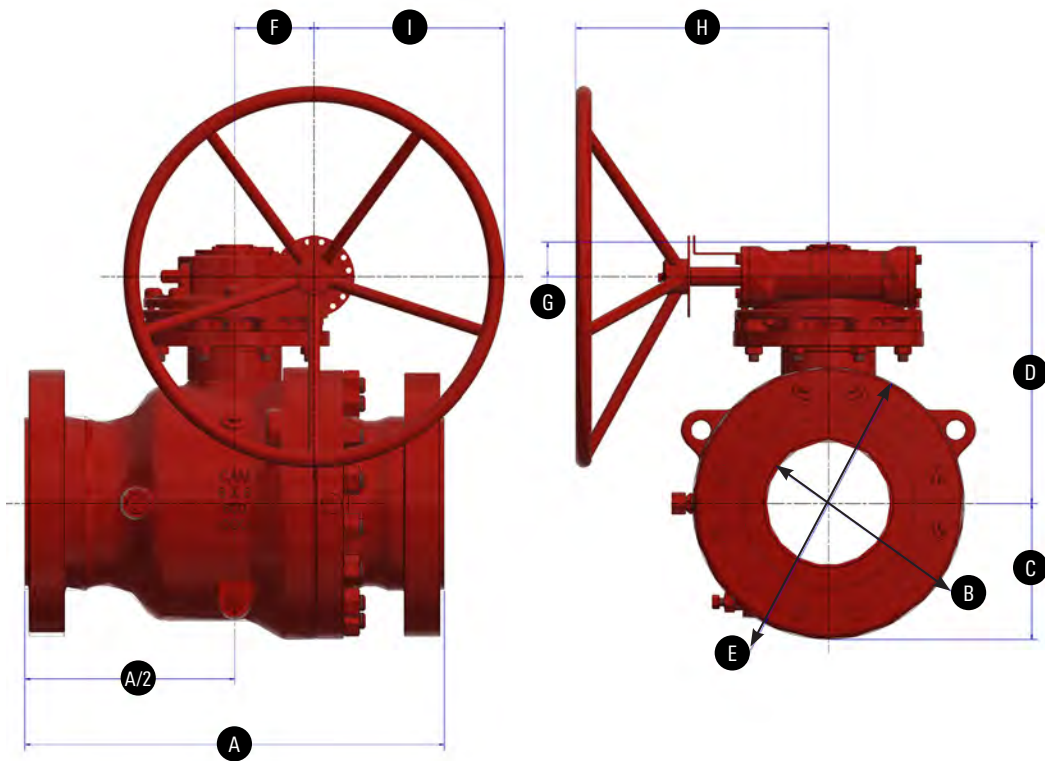


Construction Materials

Item	Part	NACE MR0175 Carbon Steel
1	Body	ASTM A216 Grade WCC
2	Closure	ASTM A216 Grade WCC
3	Ball	ASTM A105 1-mil ENP
4	Stem	AISI 4140 1-mil ENP
5	Bearing retainer	ASTM A36
6	Ball radial bearing	Dry bearing, Teflon-coated steel
7	Bearing retainer pin	AISI 4140
8	Seat ring with insert	ASTM A105, with nylon insert
11	O-rings, seat secondary	Fluorocarbon elastomer
12	O-rings, seat gasket	Fluorocarbon elastomer
13	Gland plate	ASTM A516 Grade 70 or ASTM A105
14	Adapter plate	ASTM A516 Grade 70 or ASTM A105
15	Body stud	ASTM A193 Grade B7, zinc plated
16	Body nut	ASTM A194 Grade 2H, zinc plated
17	Capscrews, gland plate	ASTM A193 Grade B7M, zinc plated
18	Capscrews, adapter plate	ASTM A193 Grade B7M, zinc plated
19	O-ring, body	Fluorocarbon elastomer
20	O-rings, stem	Fluorocarbon elastomer
21	O-ring, gland plate	Fluorocarbon elastomer
24	Gland bushing	ASTM A53 1-mil ENP
25	Compression coil spring	INCONEL X750
26	Upper thrust washer	Carbon steel 1018 or 1045 with PPS coating
27	Ball thrust washer	Carbon steel 1018 or 1045 with PPS coating
28	Drive pin	AISI 4140
29	Stem key	AISI 4130
30	Torque pin	AISI G1070 or G1095
32	Vent plug	AISI 1018 or AISI 4140
34	Seat injection fitting	AISI 1018 or AISI 4140
35	Internal check valve	ASTM A182 316 or MONEL® K-500
36	Drain fitting	AISI 1018 or AISI 4140
39	Stem fitting (not shown)	AISI 1018 or AISI 4140

Materials listed are minimum requirements. Cameron reserves the right to substitute materials listed on this page with alternate materials for the designated service.

Dimensions and Weights



ASME Class 150

Working gauge pressure: 285 psi [19.7 bar]

Size	B	A (RF [†])	C	D	E	F	G	H	I	Weight, lbm [kg]	
										Valve	Gearbox
6x6 [150 x 150]	6 [152]	15.50 [394]	6.38 [162]	12.27 [312]	11.00 [279]	3.17 [81]	1.57 [40]	9.77 [248]	7.10 [180]	172.2 [78.1]	35 [16]
8x6x8 [200 x 150 x 200]	6 [152]	18.00 [457]	6.38 [162]	12.27 [312]	13.51 [343]	3.17 [81]	1.57 [40]	9.77 [248]	7.10 [180]	196.4 [89.1]	35 [16]
8x8 [200 x 200]	8 [203]	18.00 [457]	8.20 [208]	16.20 [411]	13.50 [343]	4.92 [125]	2.15 [55]	14.30 [363]	8.86 [225]	521.0 [236]	90 [41]
10x8x10 [250 x 200 x 250]	8 [203]	21.00 [533]	8.20 [208]	16.20 [411]	16.00 [406]	4.92 [125]	2.15 [55]	14.30 [363]	8.86 [225]	579.0 [263]	90 [41]
10x10 [250 x 250]	10 [254]	21.00 [533]	9.78 [248]	17.95 [456]	16.00 [406]	4.92 [125]	2.15 [55]	14.30 [363]	9.84 [250]	514.0 [233]	90 [41]
12x10x12 [300 x 250 x 300]	10 [254]	24.00 [610]	9.78 [248]	17.95 [456]	19.00 [483]	4.92 [125]	2.15 [55]	14.30 [363]	9.84 [250]	883.0 [400]	90 [41]
12x12 [300 x 300]	12 [305]	24.00 [610]	11.60 [295]	19.68 [500]	19.00 [483]	4.92 [125]	2.15 [55]	15.67 [398]	11.81 [300]	827.0 [375]	90 [41]

All specifications are subject to change without notice.

Units for all dimensions are inches [millimeters] unless otherwise specified

[†] RF: Raised face

ASME Class 300

Working gauge pressure: 740 psi [51.0 bar]

Size	B	A (RF [†])	C	D	E	F	G	H	I	Weight, lbm [kg]	
										Valve	Gearbox
6 x 6 [150 x 150]	6 [152]	15.88 [403]	6.38 [162]	12.27 [312]	12.50 [318]	3.17 [81]	1.57 [40]	9.77 [248]	7.10 [180]	194 [88]	35 [16]
8 x 6 x 8 [200 x 150 x 200]	6 [152]	19.75 [502]	6.38 [162]	12.27 [312]	15.00 [381]	3.17 [81]	1.57 [40]	9.77 [248]	7.10 [180]	235 [107]	35 [16]
8 x 8 [200 x 200]	8 [203]	19.75 [502]	8.20 [208]	16.20 [411]	15.00 [381]	4.92 [125]	2.15 [55]	14.30 [363]	8.90 [225]	589 [267]	90 [41]
10 x 8 x 10 [250 x 200 x 250]	8 [203]	22.38 [568]	8.20 [208]	16.20 [411]	17.50 [445]	4.92 [125]	2.15 [55]	14.30 [363]	8.90 [226]	678 [307]	90 [41]
10 x 10 [250 x 250]	10 [254]	22.38 [568]	9.78 [248]	17.90 [455]	17.50 [445]	4.92 [125]	2.15 [55]	14.30 [363]	9.80 [249]	870 [395]	90 [41]
12 x 10 x 12 [300 x 250 x 300]	10 [254]	25.50 [648]	9.78 [248]	17.90 [455]	20.50 [521]	4.92 [125]	2.15 [55]	14.30 [363]	9.80 [249]	1,000 [454]	90 [41]
12 x 12 [300 x 300]	12 [305]	25.50 [648]	11.60 [295]	19.50 [495]	20.50 [521]	2.41 [61]	2.15 [55]	14.90 [378]	9.80 [249]	1,336 [606]	106 [48]

All specifications are subject to change without notice.

Units for all dimensions are inches [millimeters] unless otherwise specified.

[†] RF: Raised face

ASME Class 600

Working gauge pressure: 1,480 psi [102 bar]

Size	B	A RF [†]	C RTJ [‡]	D	E	F	G	H	I	Weight, lbm [kg]		
										Valve	Gearbox	
6 x 6 [150 x 150]	6 [152]	22 [559]	22.13 [562]	6.70 [170]	13.86 [352]	14.00 [356]	3.94 [100]	2.14 [54]	13.60 [345]	9.84 [250]	428 [194]	62 [28]
8 x 6 x 8 [200 x 150 x 200]	6 [152]	26 [660]	26.13 [664]	6.70 [170]	13.86 [352]	16.50 [419]	3.94 [100]	2.14 [54]	13.60 [345]	9.84 [250]	339 [154]	62 [28]
8 x 8 [200 x 200]	8 [203]	26 [660]	26.13 [664]	8.44 [214]	16.20 [411]	16.50 [419]	4.92 [125]	2.14 [54]	15.67 [398]	11.80 [300]	758 [344]	90 [41]
10 x 8 x 10 [250 x 200 x 250]	8 [203]	31 [787]	31.13 [791]	8.44 [214]	16.20 [411]	20.00 [508]	4.92 [125]	2.14 [54]	15.67 [398]	11.80 [300]	982 [445]	90 [41]
10 x 10 [250 x 250]	10 [254]	31 [787]	31.13 [791]	10.19 [259]	17.82 [453]	20.00 [508]	2.41 [61]	2.14 [54]	14.92 [379]	9.84 [250]	1,272 [577]	106 [48]
12 x 10 x 12 [300 x 250 x 300]	10 [254]	33 [838]	33.13 [842]	10.19 [259]	17.82 [453]	22.00 [559]	2.41 [61]	2.14 [54]	14.92 [379]	9.84 [250]	1,428 [648]	106 [48]
12 x 12 [300 x 300]	12 [305]	33 [838]	33.13 [842]	11.88 [302]	19.36 [492]	22.00 [559]	2.41 [61]	2.14 [54]	14.92 [379]	9.84 [250]	1,782 [808]	106 [48]

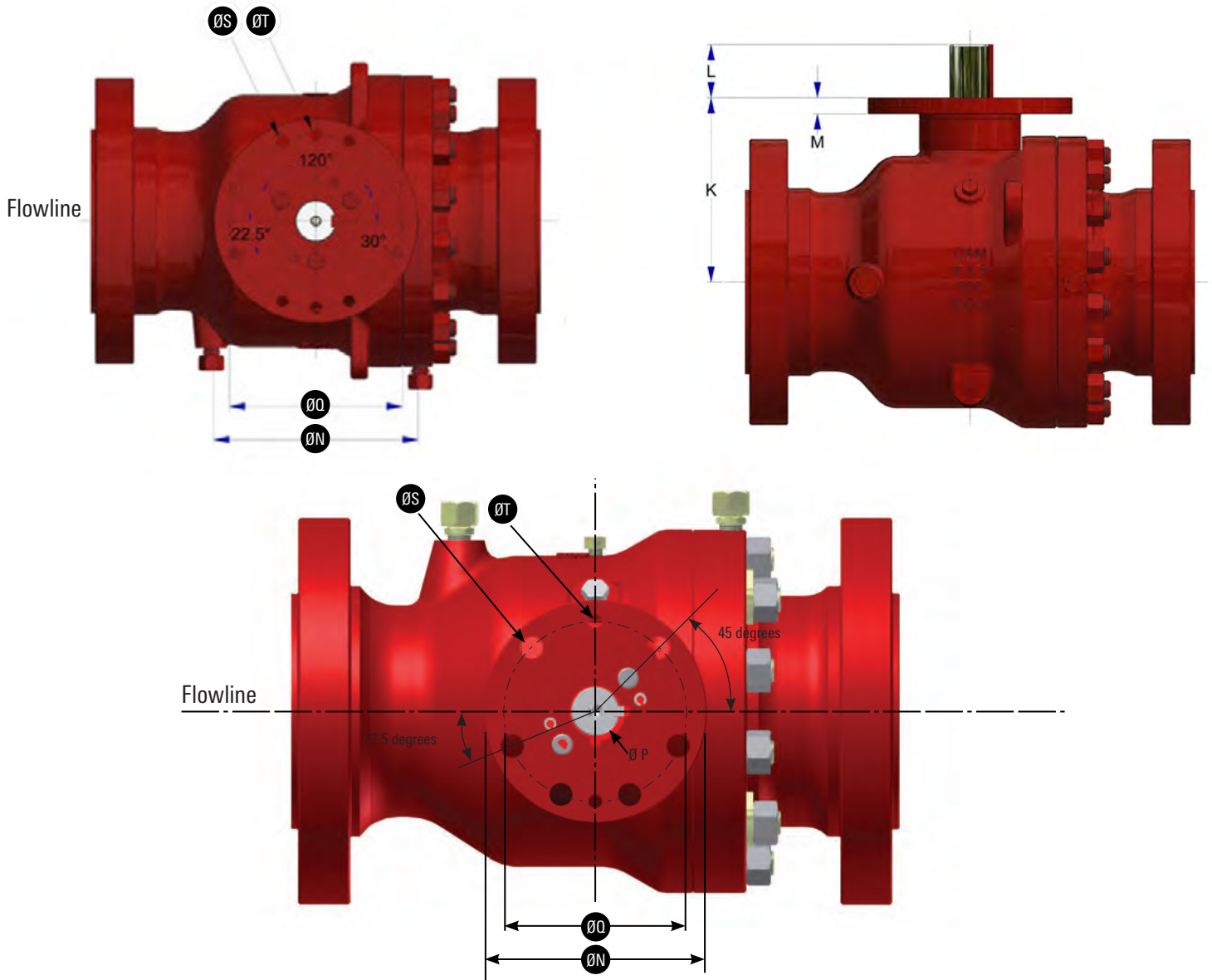
All specifications are subject to change without notice.

Units for all dimensions are inches [millimeters] unless otherwise specified.

[†] RF: Raised face

[‡] RTJ: Ring joint

Topworks Dimensions



Bore Size	ASME Class	K	L	M	N	P (+0/-0.003 in)	Q	S	T	Key Size (W x L x H), in
6 [150]	150 to 600	8.77 [222.7]	2.37 [60.1]	0.79 [20.0]	8.07 [205]	1.65 [41.91]	6.5 [165]	21mm [22]	0.5 [12.70]	0.472 x .315 x 2.75
8 [200]	150 to 600	10.66 [270.7]	3.06 [77.8]	0.95 [24.0]	11.81 [300]	2.357 [59.87]	10 [254]	0.67 [17.02]	0.652 [16.56]	0.709 x .433 x 3.62
10 [250]	150 to 600	12.41 [315.2]	3.06 [77.8]	0.95 [24.0]	11.81 [300]	2.357 [59.87]	10 [254]	0.67 [17.02]	0.652 [16.56]	0.709 x 4.33 x 3.62
12 [300]	150 to 600	14.15 [359.4]	4.1 [104.1]	1.06 [26.9]	11.81 [300]	2.83 [71.88]	10 [254]	0.67 [17.02]	0.875 [22.23]	0.787 x .472 x 4.75

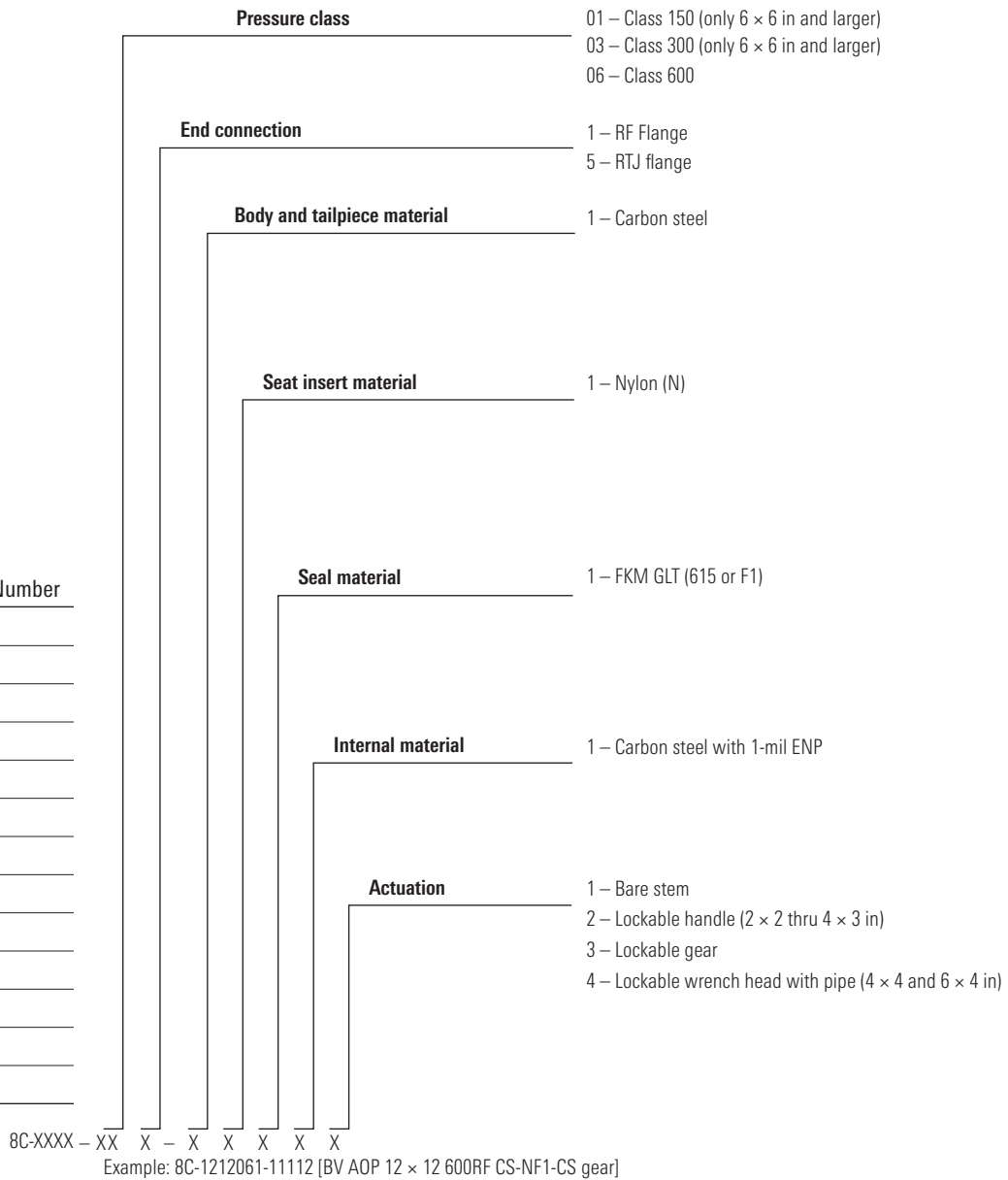
All specifications are subject to change without notice.

Units for all dimensions are inches [millimeters] unless otherwise specified.

ASME Class 150–600, 2–12 in

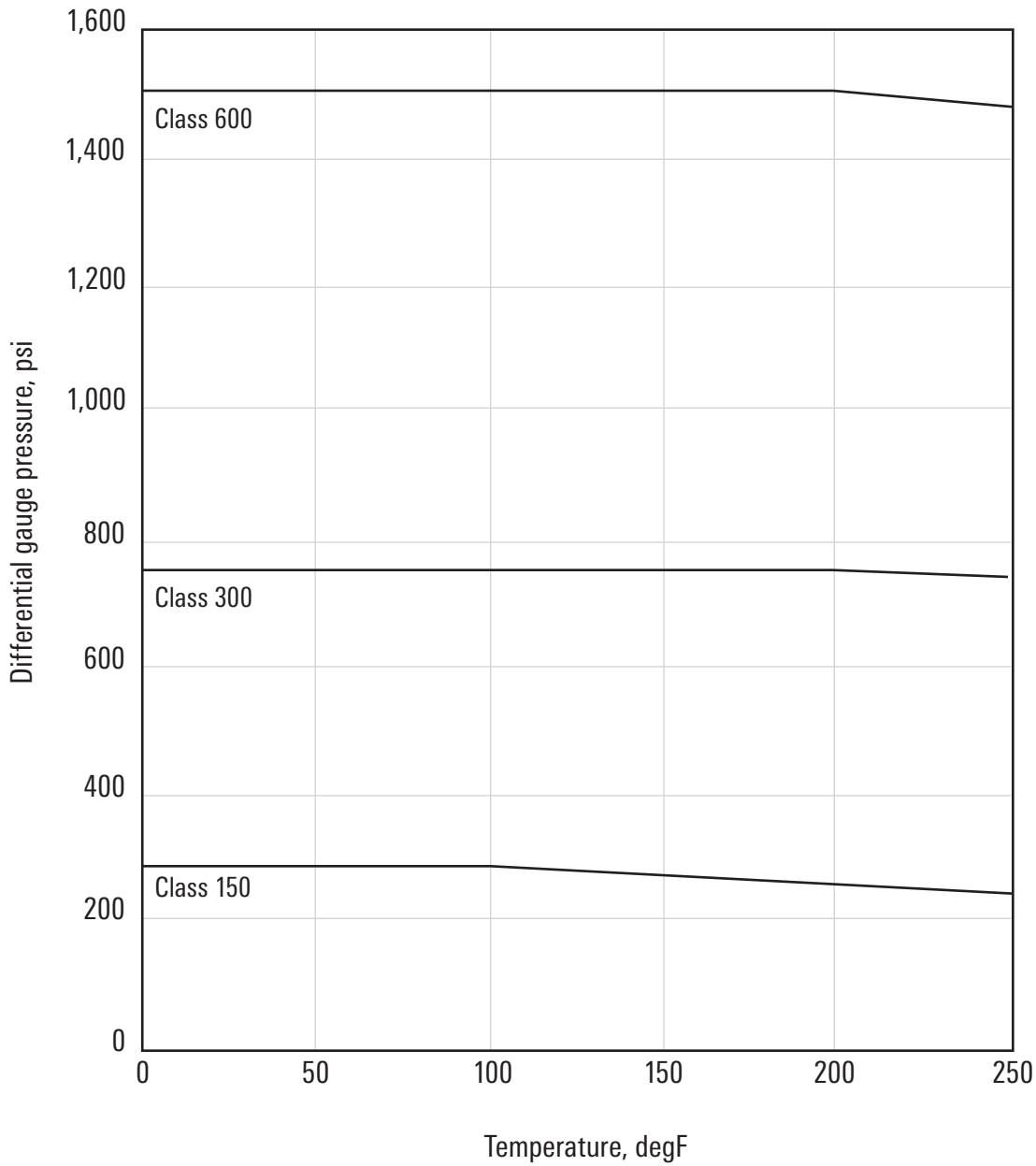
Assembly Codes (Part Numbers)

Size, in	Base Number
2 × 2	0202
3 × 2	0302
3 × 3	0303
4 × 3	0403
4 × 4	0404
6 × 4	0604
6 × 6	0606
8 × 6	0806
8 × 8	0808
10 × 8	1008
10 × 10	1010
12 × 10	1210
12 × 12	1212



Pressure-Temperature Data

Pressure-Temperature Chart per API Spec 6D



Specifications and Conformance

AOP Series D2 trunnion-mounted ball valves are designed, manufactured, and tested in accordance with the following industry standards. Valves complying with additional end-user or industry standards can be produced on request.

American Society of Mechanical Engineers (ASME) and American National Standard Institute (ANSI)

B16.5: Steel pipe flanges

B16.10: Face-to-face and end-to-end dimensions of ferrous valve

B16.34: Wall thickness

VIII, Div. 1: Bolting design

National Association of Corrosion Engineers (NACE)

MR0175: Sulfide-stress-cracking-resistant metallic materials for oilfield equipment

American Petroleum Institute (API)

Specification 6D: Specification for pipeline valves

Standard 6FA: Specification for fire testing of valves

Specification Q1: Quality program

Manufacturers Standardization Society (MSS)

SP-6: Standard finishes for contact faces of pipe flanges and connecting end flanges of valves and fittings

SP-25: Standard marking system for valves, fittings, flanges, and unions

Flow Coefficients and Torque Values

Flow Coefficient C_v for Different Valve Pressure Classes and Sizes

ASME Class	2 × 2 in	3 × 2 in	3 × 3 in	4 × 3 in	4 × 4 in	6 × 4 in	6 × 6 in	8 × 6 in	8 × 8 in	10 × 8 in	10 × 10 in	12 × 10 in	12 × 12 in
150	-	-	-	-	-	-	5,074	2,020	10,103	4,320	17,037	8,820	26,163
300	-	-	-	-	-	-	5,074	2,010	10,103	4,430	17,037	8,900	26,163
600	359	248	924	660	1,773	785	4,577	2,030	8,950	4,210	14,324	7,600	22,729

All specifications are subject to change without notice.

The C_v of a valve is the flow rate of water (stated in galUS/min at 60 degF) through a fully opened valve, with a pressure drop of 1 psi across the valve.

Valve Break Torque at Maximum Rated Pressure and 100 degF

ASME Class	2 × 2 in	3 × 2 in	3 × 3 in	4 × 3 in	4 × 4 in	6 × 4 in	6 × 6 in	8 × 6 in	8 × 8 in	10 × 8 in	10 × 10 in	12 × 10 in	12 × 12 in
150	-	-	-	-	-	-	3,864	3,684	6,408	6,408	10,320	10,320	12,804
300	-	-	-	-	-	-	5,308	5,308	10,634	10,634	14,733	14,733	19,421
600	1,128	1,178	2,064	2,064	2,628	2,628	7,956	7,956	15,722	15,722	21,543	21,543	27,909

All specifications are subject to change without notice.

Torque is stated in lbf.in. Data provided for general information only; consult factory for certified data.

Series D2 Trunnion-Mounted Ball Valve



slb.com/valves

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