

AOP Series D2 Trunnion-Mounted Ball Valve

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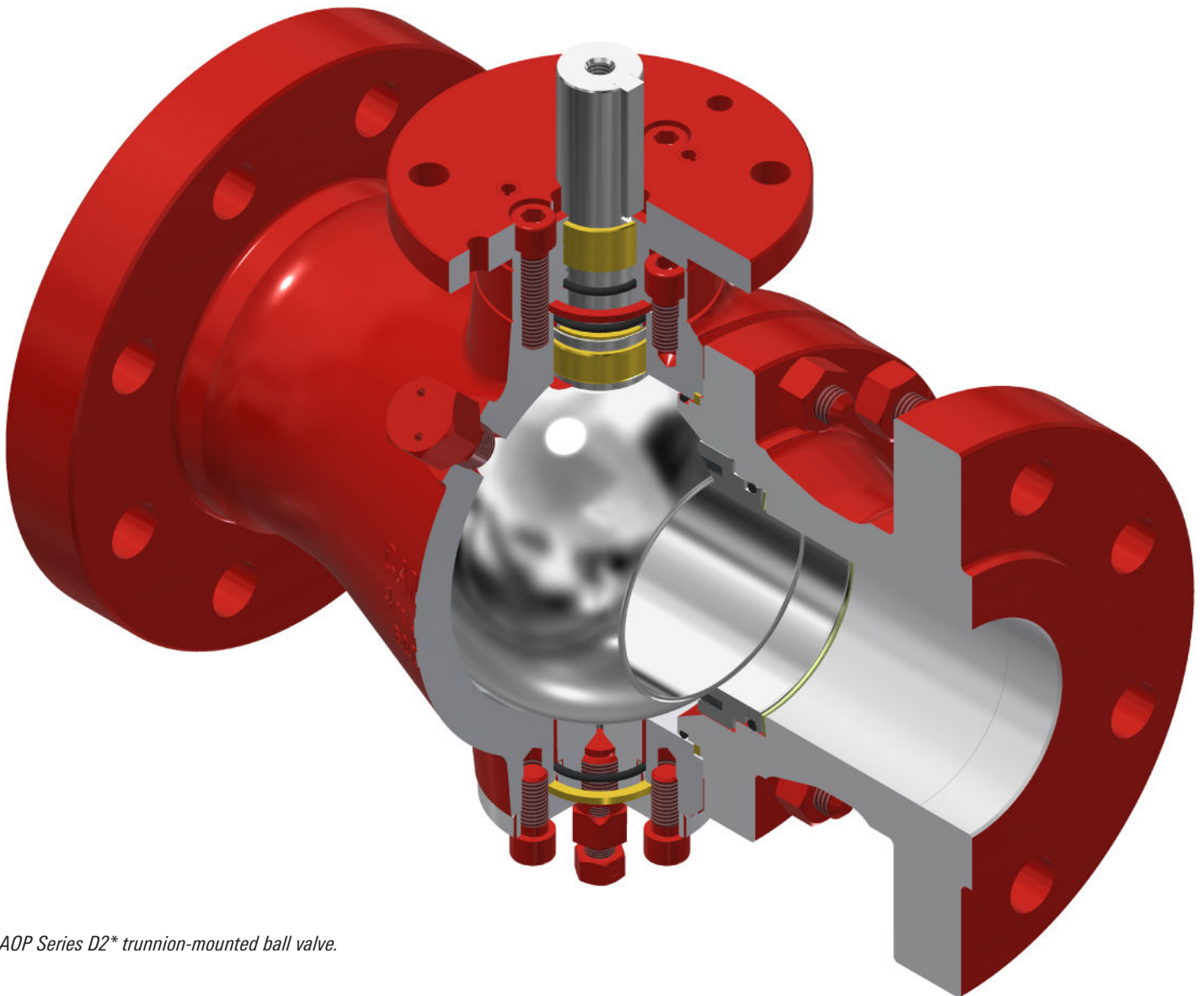
General Information

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

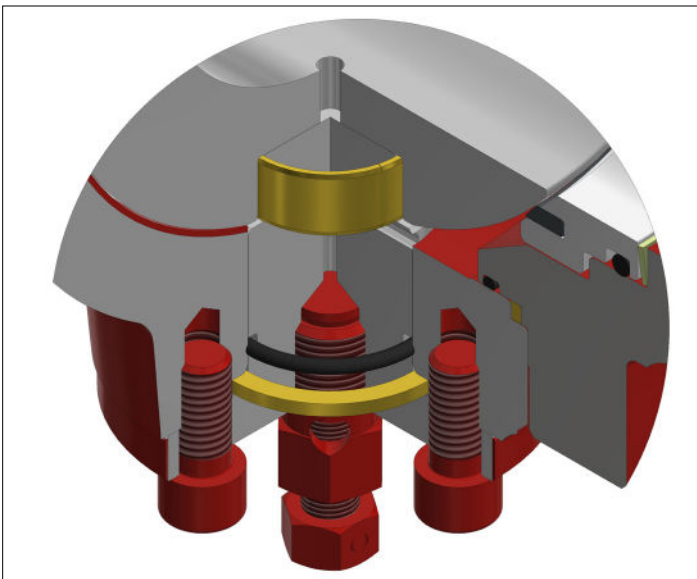
Two-piece, end-entry AOP Series D2 trunnion-mounted ball valves up to ASME Class 600 are available in 2- to 12-in bores.

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

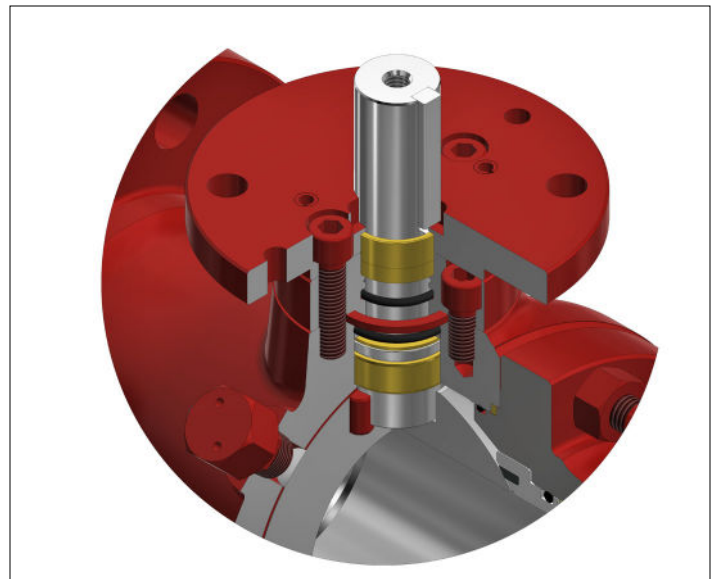
Operating temperatures range from -20 to 250 degF [-29 to 121 degC].

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 job-site 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.



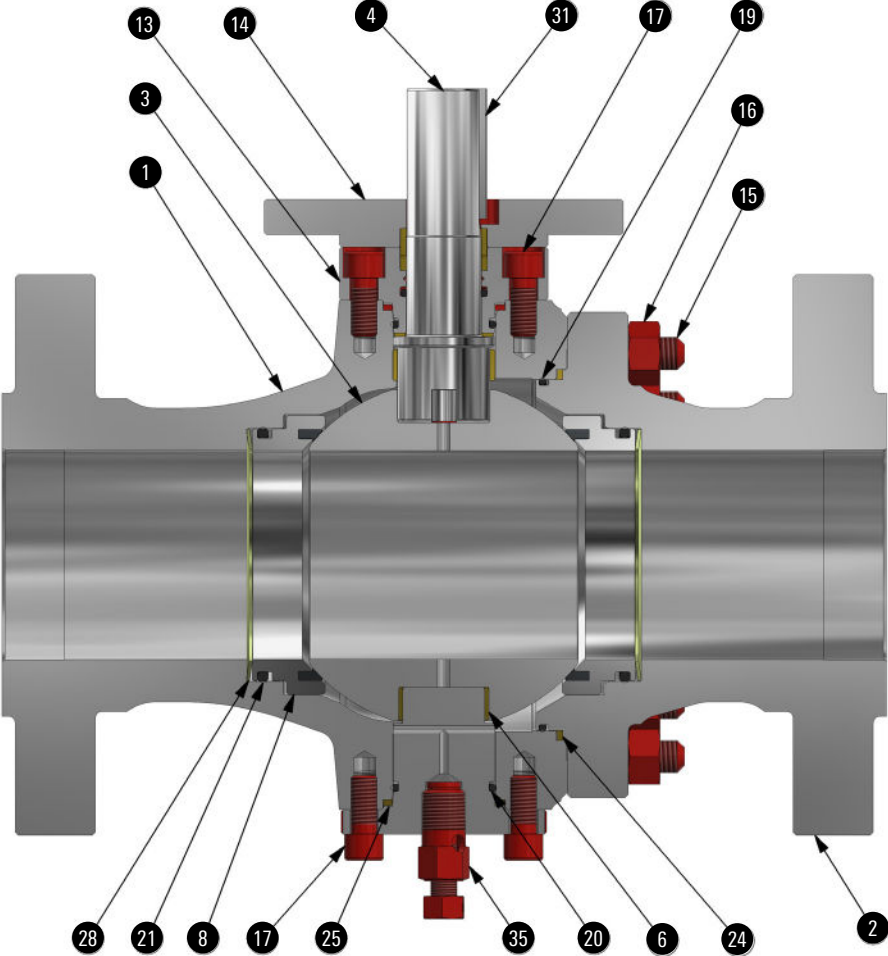
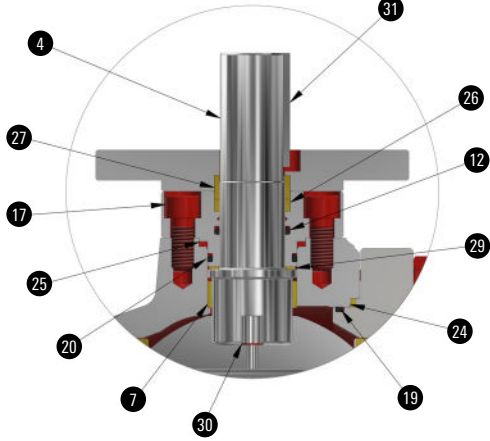
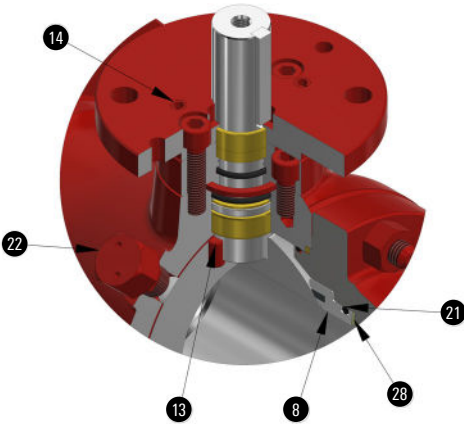
Short coupled trunnion to reduce bearing loads and operating torque



Double barrier seals for low-emissions performance

ASME Class 600, 2–6 in × 4 in

Valve Assembly

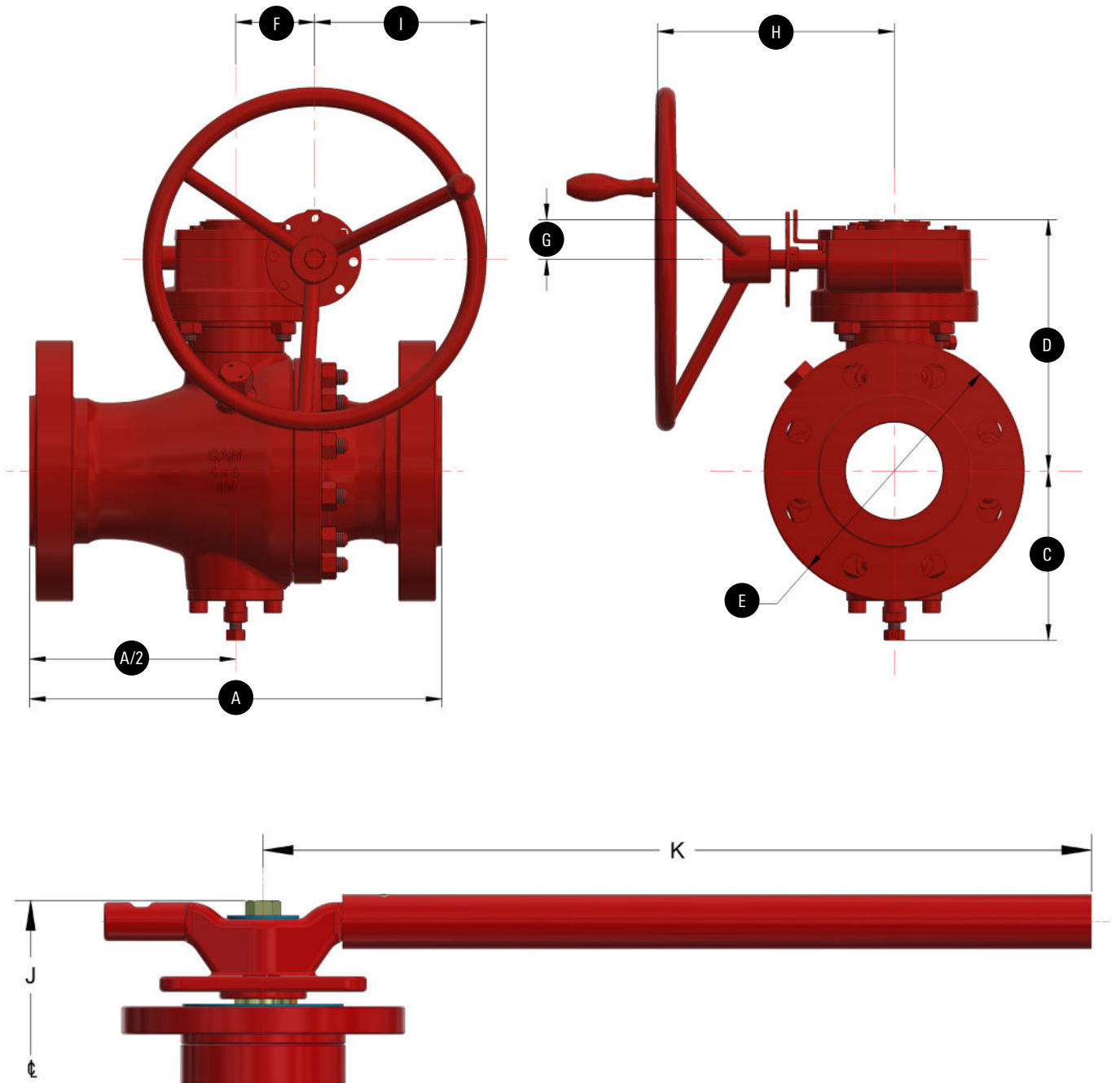


Construction Materials

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



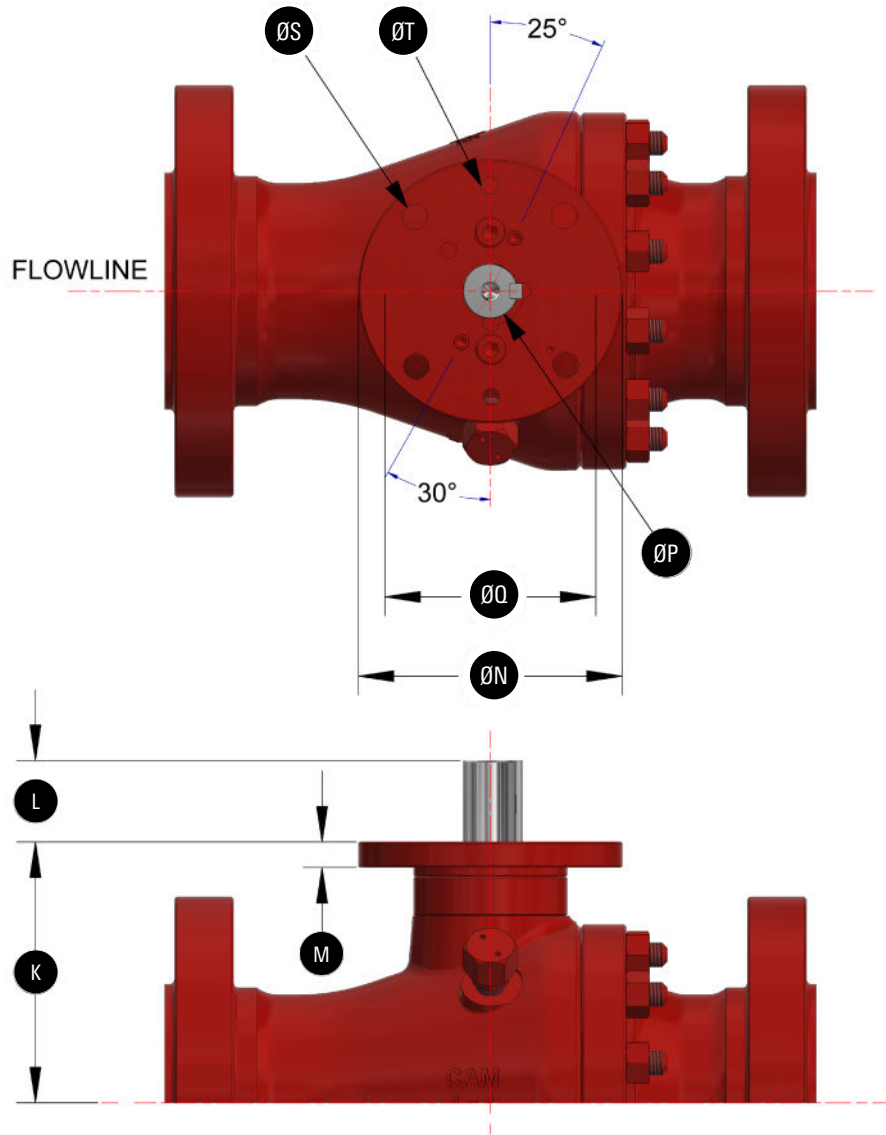
Working gauge pressure: 1,480 psi [102 bar]

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]

[†] RF: Raised face
RTJ: Ring joint

Units for all dimensions are in [mm].

Topworks Dimensions

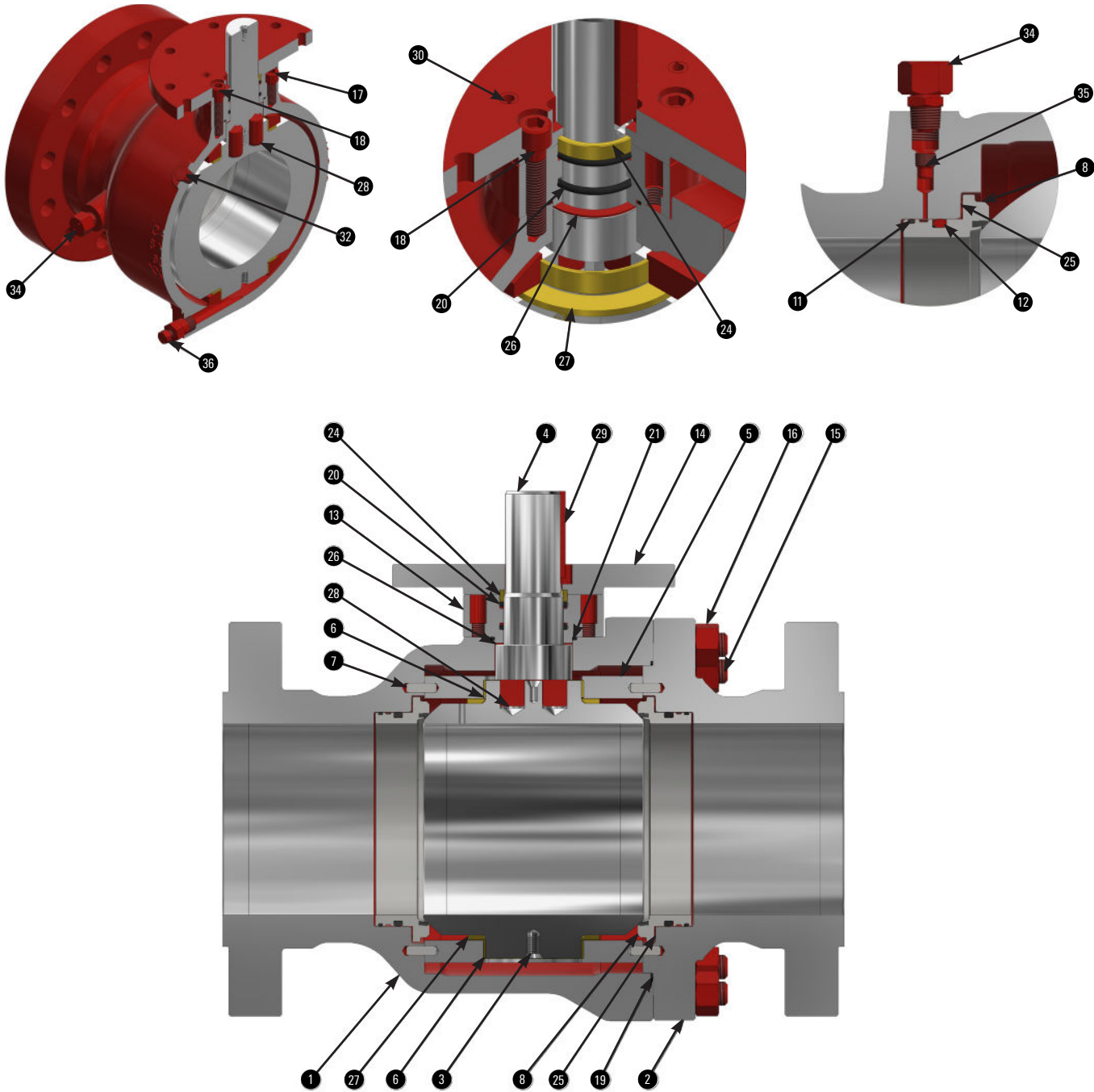


Bore Size	ASME Class	K	L	M	N	P (+0/-0.003 in)	Q	S	T	Key Size (WxHxL), in
2 [50]	600	4.61 [117]	1.27 [32]	0.39 [10]	4.75 [120.6]	0.862 [21.90]	4.016 [102.01]	0.42 [10.67]	0.315 [10]	.236 x .236 x 1.5
3 [75]	600	5.77 [146.6]	1.73 [43.8]	0.59 [15]	5.94 [150.88]	1.098 [27.89]	4.921 [124.99]	0.531 [13.5]	0.437 [11.1]	.315 x .276 x 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 x .315 x 2.5

Units for all dimensions are in [mm] unless otherwise specified

ASME Class 150–600, 6–12 in

Valve Assembly

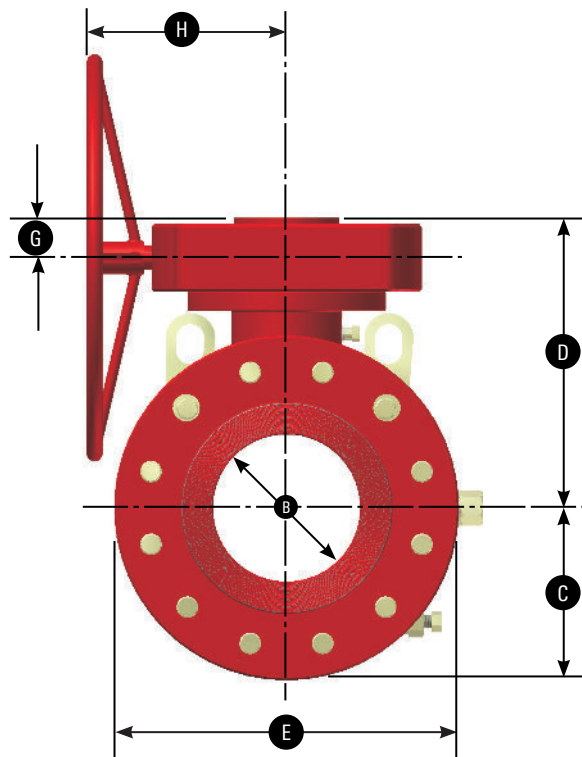
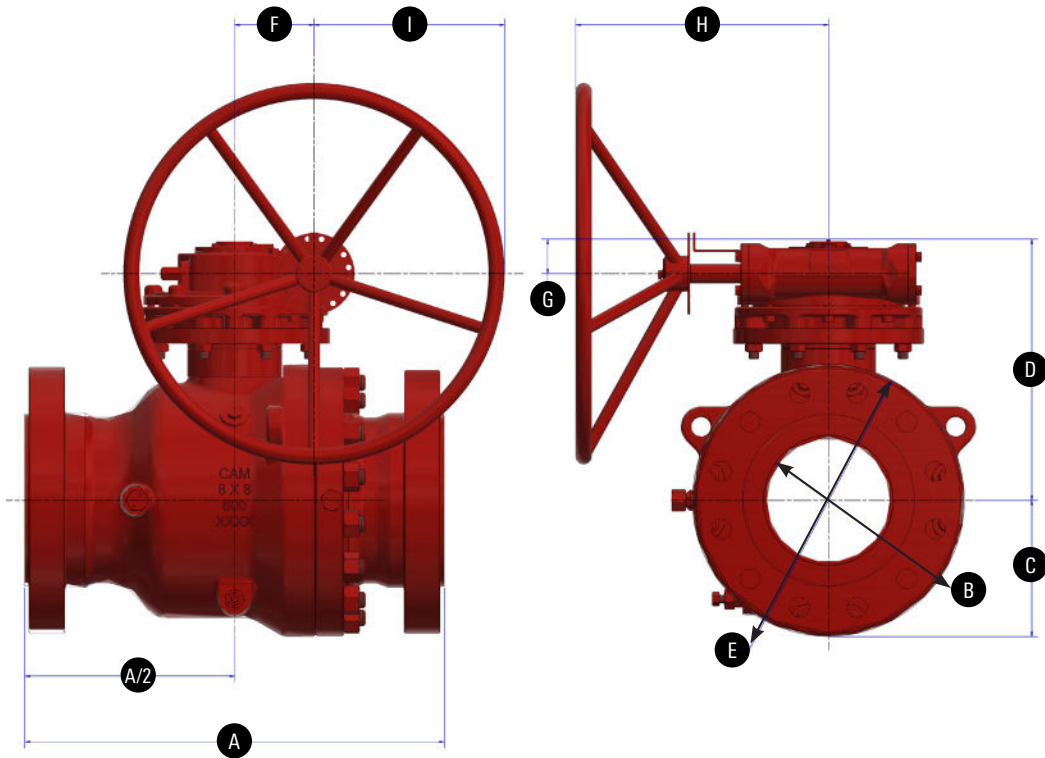


Construction Materials

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 × 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 × 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 × 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 × 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 × 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 × 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 × 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]

Units for all dimensions are in [mm]

[†] 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
6x6 [150 × 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]
8x6x8 [200 × 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]
8x8 [200 × 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]
10x8x10 [250 × 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]
10x10 [250 × 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]
12x10x12 [300 × 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]
12x12 [300 × 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]

Units for all dimensions are in [mm]

[†] RF: Raised face

ASME Class 600

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

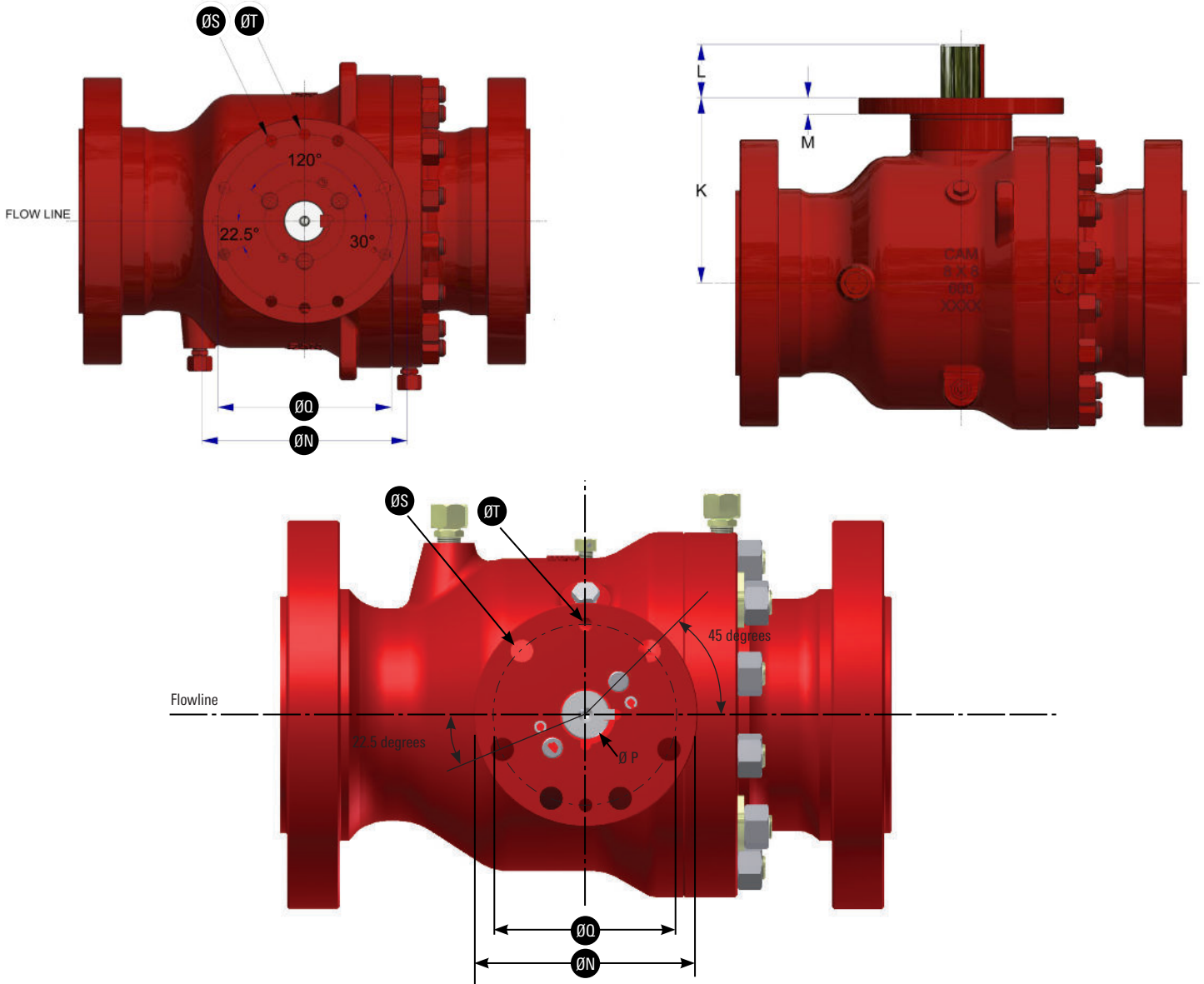
Size	B	A RF [†]	C RTJ [‡]	D	E	F	G	H	I	Weight, lbm [kg]		
										Valve	Gearbox	
6x6 [150 × 150]	6 [152]	22 [559]	22.13 [562]	6.70 [170]	13.86 [352]	14.00 [356]	3.94 [100]	2.14 [54]	13.60 [345]	9.84 [250]	428 [194]	62 [28]
8x6x8 [200 × 150 x 200]	6 [152]	26 [660]	26.13 [664]	6.70 [170]	13.86 [352]	16.50 [419]	3.94 [100]	2.14 [54]	13.60 [345]	9.84 [250]	339 [154]	62 [28]
8x8 [200 × 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]
10x8x10 [250 × 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]
10x10 [250 × 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]
12x10x12 [300 × 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]
12x12 [300 × 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]

Units for all dimensions are in [mm]

[†] RF: Raised face

[‡] RTJ: Ring joint

Topworks Dimensions

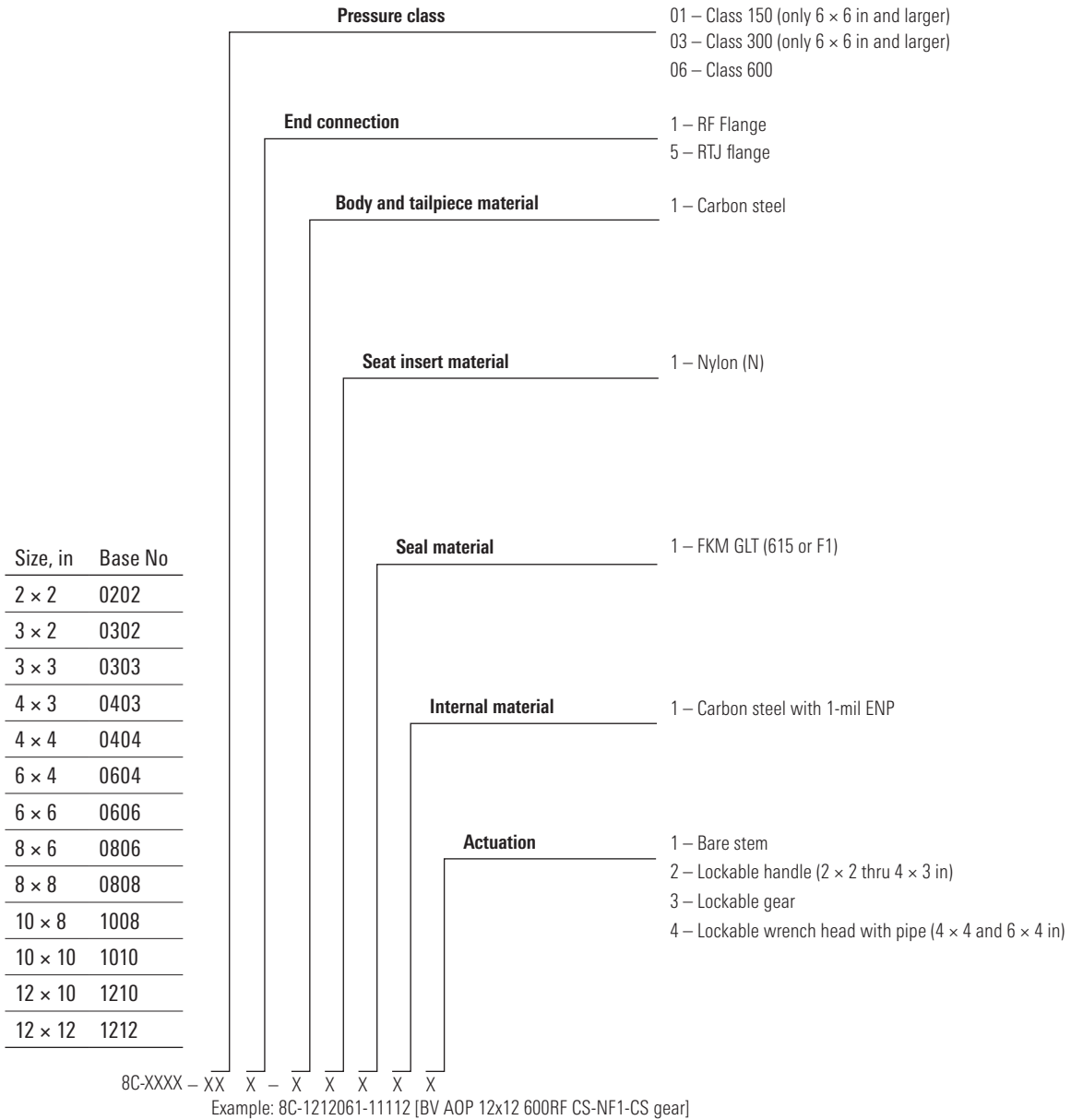


Bore Size	ASME Class	K	L	M	N	P (+0/-0.003 in)	Q	S	T	Key Size (WxHxL), in
6 [150]	150 to 600	8.77 [222.7]	2.37 [60.1]	0.79 [20.0]	8.07 [205]	1.65 [41.91]	6.5 [165]	21mm [22]	0.5 [12.70]	0.472 x .315 x 2.75
8 [200]	150 to 600	10.66 [270.7]	3.06 [77.8]	0.95 [24.0]	11.81 [300]	2.357 [59.87]	10 [254]	0.67 [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

Units for all dimensions are in [mm] unless otherwise specified

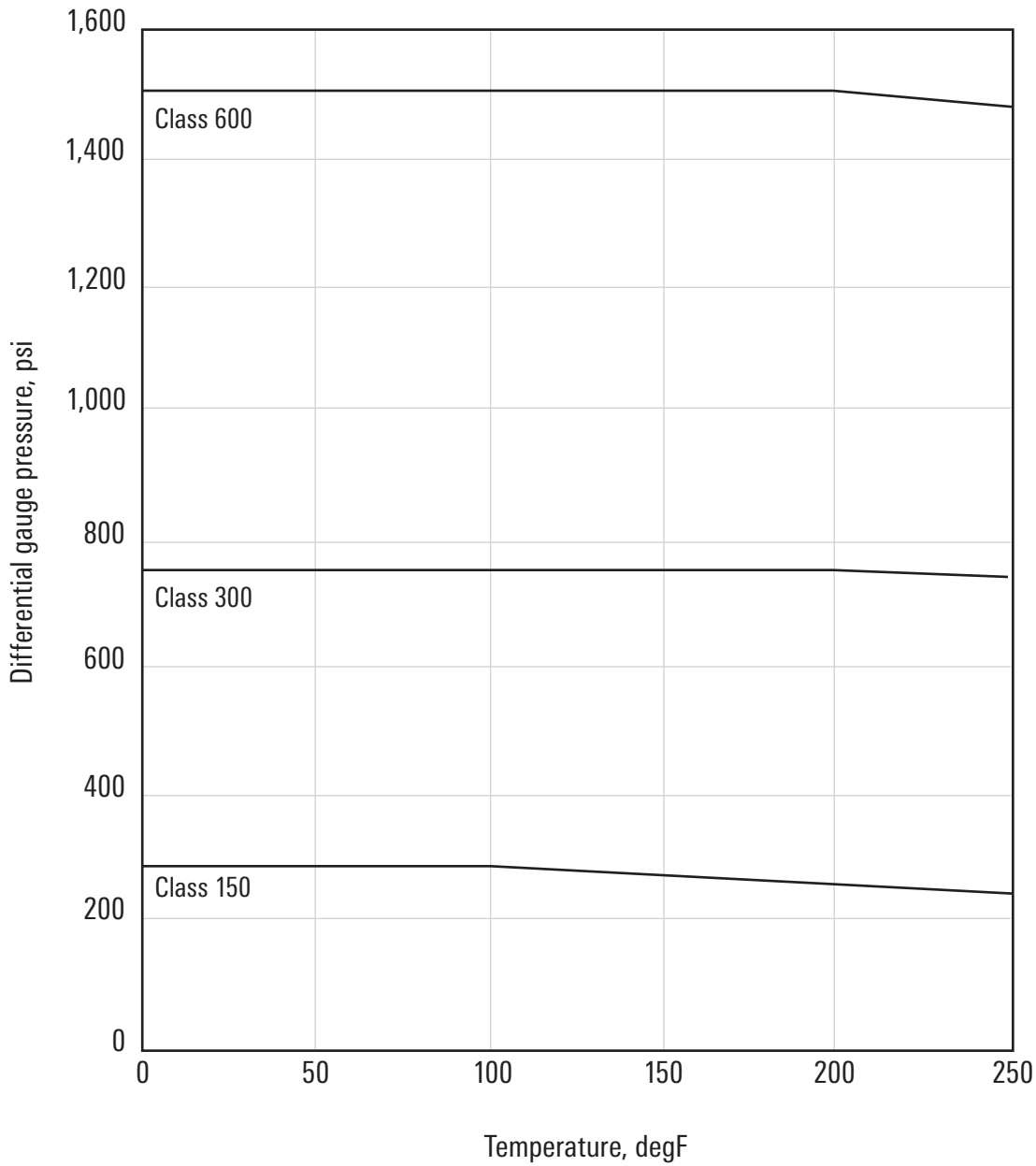
ASME Class 150–600, 2–12 in

Assembly Codes/Part Numbers



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

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

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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