



A-T Controls, Inc.

M Series (FMU/FMB/FMS) **Flanged Metal Seat Floating Ball Valve**

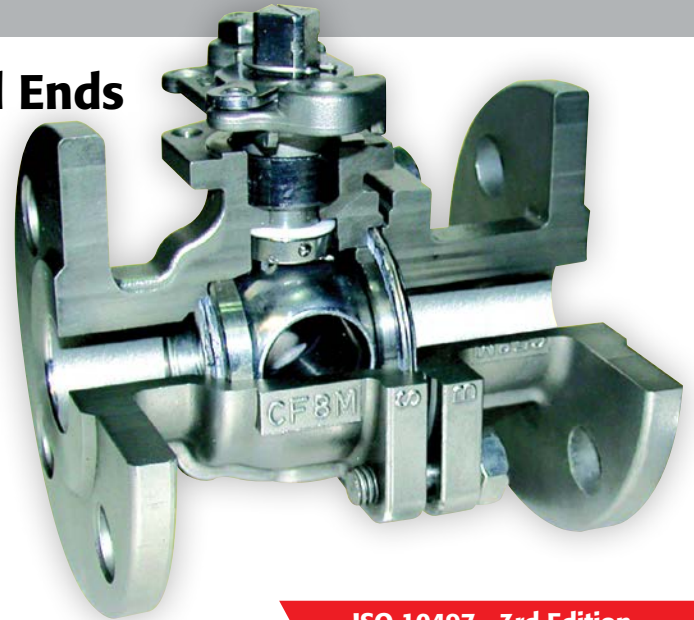


M Series

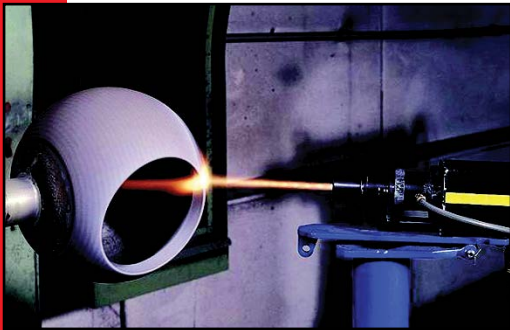
Flanged Metal Seat Floating Ball Valve

Full Bore Two-piece Flanged Ends ANSI Class 150/300/600

The A-T Controls *M Series* flanged metal seat, floating ball valve is designed for use in severe services such as high temperature and abrasive fluids. It is used in industries such as Oil & Gas, Petroleum, Chemicals & Petrochemicals, Power Generation, Pulp & Paper, and Mining.



ISO 10497 - 3rd Edition
FIRESAFE CERTIFIED



HVOF Thermal Spray

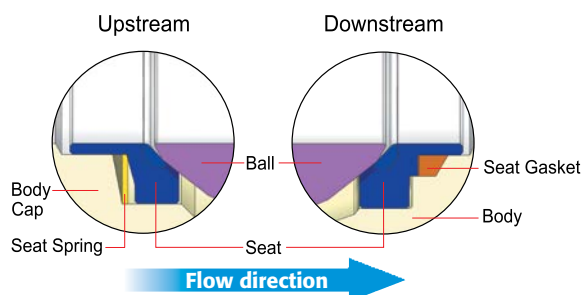
Product Features

- Precise CNC machining enables the ball and seats to seal tightly, offering superior shutoff. (*Standard Class V, Class VI is optional.*)
- Spring live-loaded seats ensure tight seal, even at low temperature and pressure.
- Fire safe certified to ISO 10497 3rd edition.
- Select material for different service applications.
- Hard face treatment on ball and seats for longer life cycle in severe environments.
- Unidirectional or bidirectional shutoff options available.

Applications

- Abrasive Fluids
- High Temperature Process
- Steam, gas & liquid

Standard Seat Design Unidirectional (FMU)



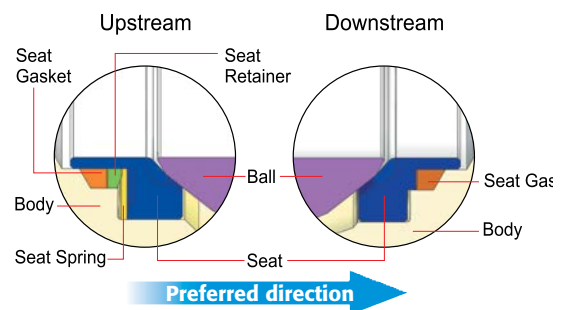
Seat Area (Upstream Side)

Seat spring provides flexibility under piping stress and thermal expansion, thereby stabilizing operation

Seat Area (Downstream Side)

Seat gasket is press-fit into the body, providing stability within wide temperature ranges

Bidirectional (FMB) For Backflow Service



Seat Area A (Upstream)

Seat spring seal design prevents backflow leakage. Seat spring provides flexibility to piping stress and thermal expansion for stabilizing operation

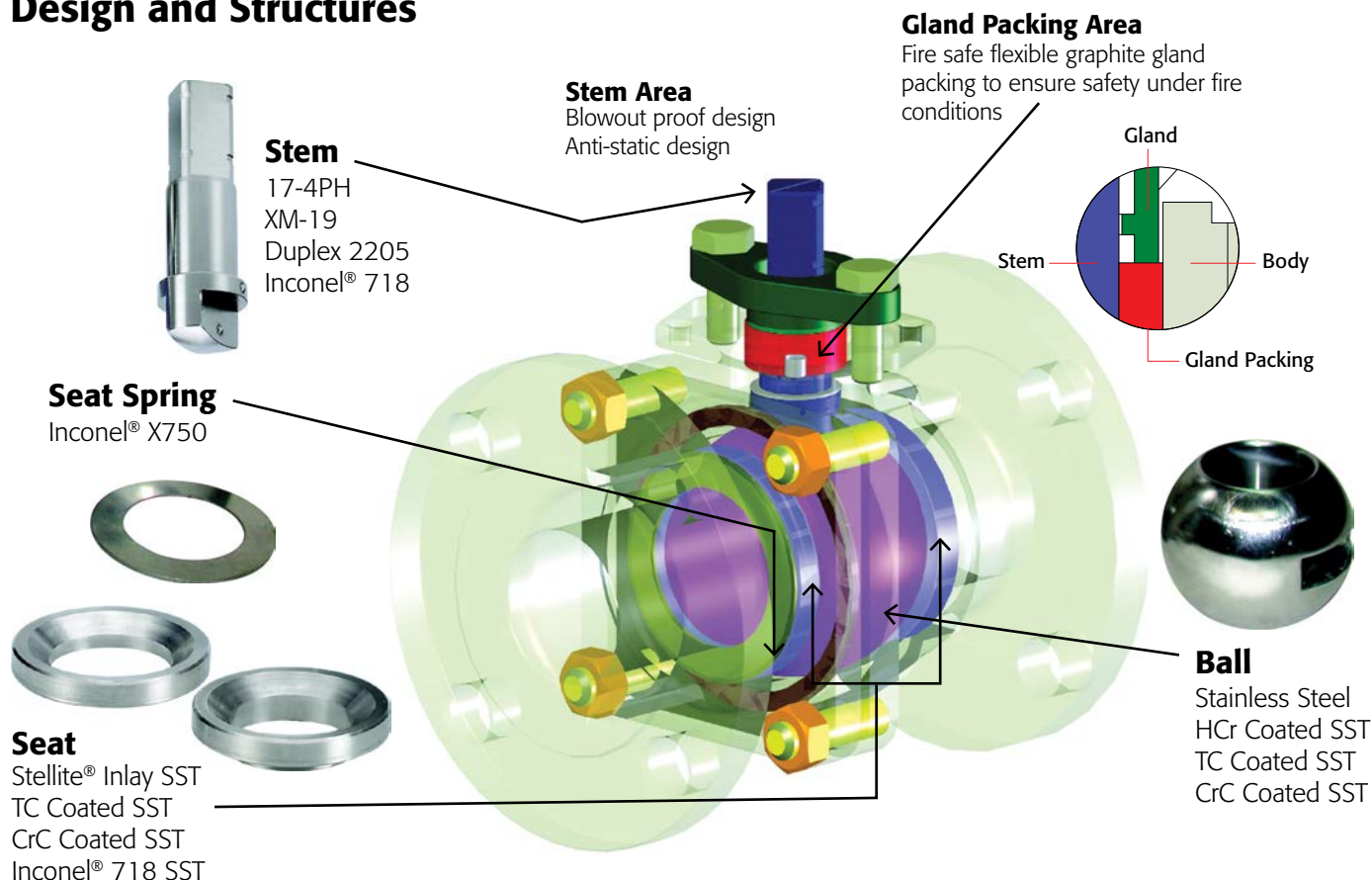
Seat Area B (Downstream)

Seat gasket is press-fit into the body and provides stability for a wide range of temperatures



A-T Controls, Inc.

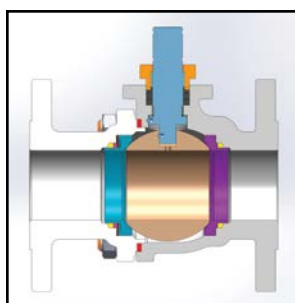
Design and Structures



Scraper Seat Design (FMS Series)

Standard Scraper Service (FMS)

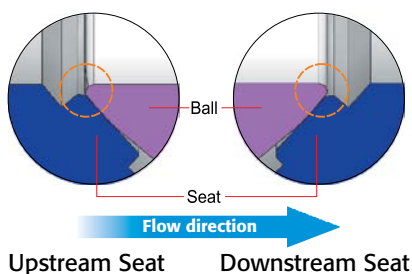
For heavy slurry such as in the pulp & paper industry.



Scraper Design

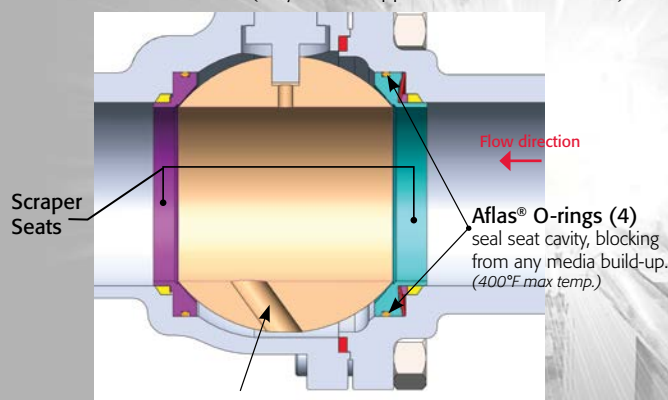
Scraper Seats

Scraper Seat with High Velocity Oxygen Fuel (HVOF) applied Tungsten Carbide Coated Trim is designed to scrape ball removing media build-up that is coated on the ball. Other trim options are available.



Black Liquor Service

(May also be applicable for other services)



Venturi Hole in Ball
helps evacuate cavity as flow passes by.

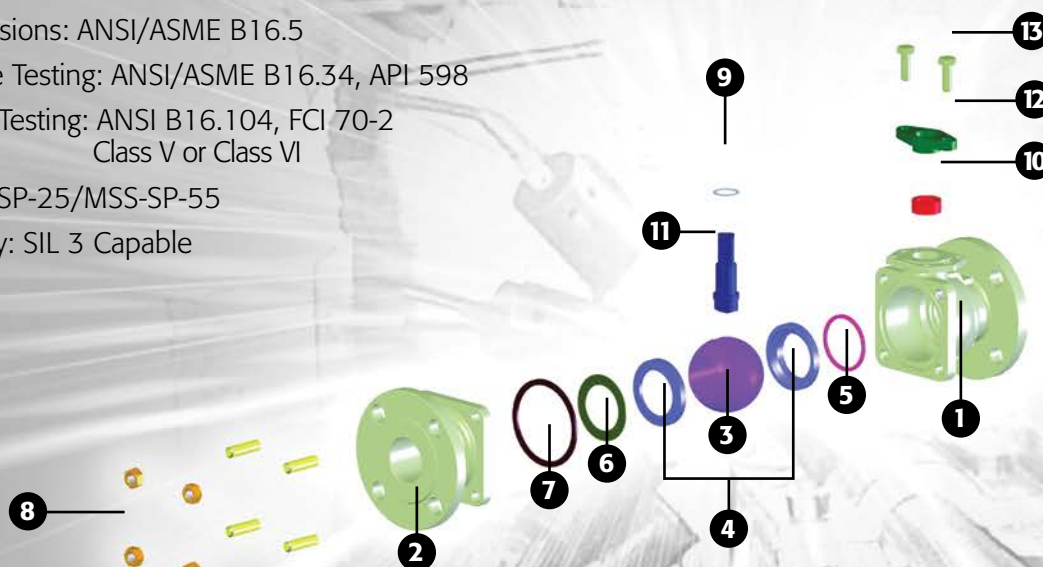
Black liquor is viscous, and will cake in small cavities and on surfaces, which prevents valves from operating properly. A-T Controls provides a solution to this harsh service with modifications to our FMS Series. Black liquor valves include an Afas® O-ring on both seats to avoid black liquor media build-up, and a venturi hole in the ball to evacuate the cavity as media flows.

M Series

Floating Metal Seat Ball Valve

Applicable Standards

- Standard Body Material: WCB or CF8M (other Alloys available)
- Nominal Size & Pressure Rating: 1/2" to 8" ANSI Class 150/300; 1/2"-4" ANSI Class 600
- End Connections: Raised Face Flange
- Temperature Range: -50°F to 932°F
- Fire Safe: Certified to ISO 10497 3rd Edition
- Face to Face Dimensions: ANSI/ASME B16.10
- Flange Dimensions: ANSI/ASME B16.5
- Body Pressure Testing: ANSI/ASME B16.34, API 598
- Seat Leakage Testing: ANSI B16.104, FCI 70-2 Class V or Class VI
- Casting: MSS-SP-25/MSS-SP-55
- Safety Integrity: SIL 3 Capable



Technical Specifications

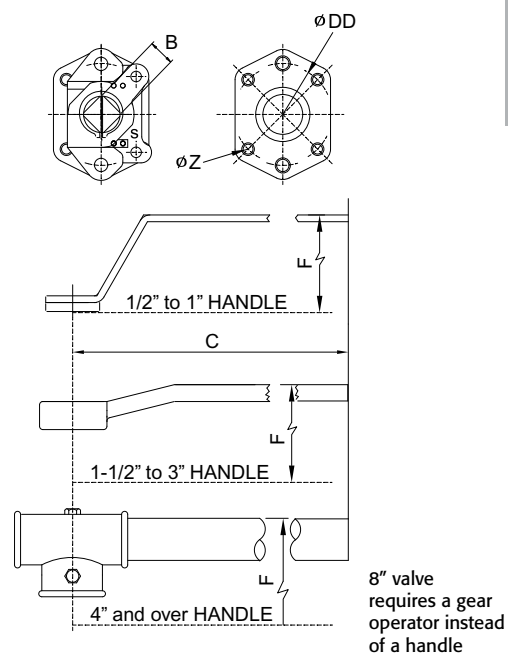
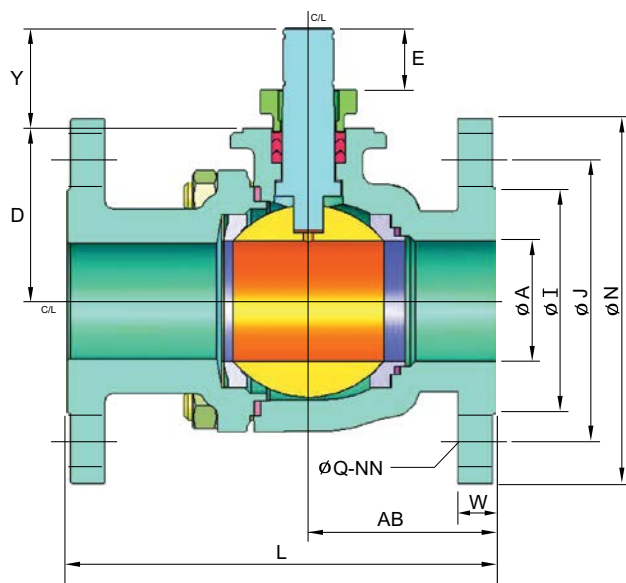
MATERIALS LIST

VALVE OPTIONS		CARBON STEEL			STAINLESS STEEL		
		STELLITE® SEAT	TUNGSTEN CARBIDE	CHROME CARBIDE	STELLITE® SEAT	TUNGSTEN CARBIDE	CHROME CARBIDE
NO.	PART NAME	-20°F - 661°F	-20°F - 800°F	-20°F - 800°F	-50°F - 661°F	-50°F - 842°F	-50°F - 932°F
1	BODY	ASTM A216 GRADE WCB			ASTM A351 GRADE CF8M		
2	CAP	ASTM A216 GRADE WCB			ASTM A351 GRADE CF8M		
3	BALL	ASTM A351 GRADE CF8M + HCr	ASTM A351 GRADE CF8M + TC	ASTM A351 GRADE CF8M + CrC	ASTM A351 GRADE CF8M + HCr	ASTM A351 GRADE CF8M + TC	ASTM A351 GRADE CF8M + CrC
4	SEAT	AISI 316 + STELLITE®	AISI 316 + TC	AISI 316 + CrC	AISI 316 + STELLITE®	AISI 316 + TC	AISI 316 + CrC
5	SEAT GASKET	GRAPHITE			GRAPHITE		
6	SEAT SPRING	INCONEL® X750			INCONEL® X750		
7	BODY GASKET	AISI 316 + GRAPHITE			AISI 316 + GRAPHITE		
8	BOLT	ASTM A193 GRADE B7			ASTM A193 GRADE B8		
	NUT	ASTM A194 GRADE 2H			ASTM A194 GRADE 8		
9	THRUST WASHER	AISI 316					
10	GLAND PACKING	AISI 316 + GRAPHITE					
11	STEM*	17-4 PH/ XM-19/ DUPLEX 2205/ INCONEL® 718	XM-19/DUPLEX 2205/INCONEL® 718		XM-19/DUPLEX 2205/INCONEL® 718		
12	GLAND	AISI 304					
13	GLAND BOLT	AISI 304					

TRIM ABBREVIATIONS:
HCr = Hard Chrome Plated; TC = Tungsten Carbide; CrC = Chrome Carbide

*Various usage conditions shall determine stem material
17-4 PH SST: use below 750°F
XM-19: use up to 1100°F
DUPLEX 2205: use below 570°F
INCONEL® 718: use up to 1100°F

M Series FMU, FMB, FMS | Dimensions (IN)



Dimensions (IN) ANSI Class 150

SIZE	A	B	C	D	E	F	I	J	L	N	Q	W	Y	Z	AB	DD	NN	ISO 5211	LBS
½"	0.59	0.39	5.12	1.48	0.55	2.48	1.38	2.38	4.25	3.74	0.63	0.44	0.98	M5	1.69	1.654	4	F04	4
¾"	0.79	0.39	5.12	1.59	0.55	2.68	1.69	2.76	4.61	3.86	0.63	0.44	0.98	M5	1.81	1.654	4	F04	5
1"	0.98	0.47	6.30	1.87	0.55	2.99	2.01	3.13	5.00	4.25	0.63	0.44	1.20	M6	2.09	1.969	4	F05	7
1½"	1.50	0.67	8.82	2.56	0.75	3.46	2.87	3.88	6.50	5.00	0.63	0.56	1.65	M8	2.83	2.756	4	F07	14
2"	1.97	0.67	8.82	2.83	0.75	3.70	3.62	4.74	7.01	5.98	0.75	0.63	1.65	M8	3.11	2.756	4	F07	20
2½"	2.56	0.79	12.76	3.58	0.75	4.53	4.13	5.49	7.48	7.01	0.75	0.69	1.83	M8	3.35	2.756	4	F07	29
3"	2.99	0.79	12.76	3.92	0.75	4.72	5.00	6.00	7.99	7.48	0.75	0.75	1.83	M8	3.82	2.756	4	F07	39
4"	3.94	1.06	15.75	4.80	1.02	7.68	6.18	7.50	9.02	8.27	0.75	0.94	2.11	M10	4.45	4.016	8	F10	62
6"	5.91	1.26	21.65	6.61	1.18	9.45	8.50	9.51	15.51	10.98	0.87	1.00	2.44	M12	5.91	4.921	8	F12	140
8"	7.87	1.38	N/A	8.68	1.38	N/A	10.63	11.75	17.99	13.50	0.87	1.13	2.80	M16	8.31	5.512	8	F14	285

Dimensions (IN) ANSI Class 300

SIZE	A	B	C	D	E	F	I	J	L	N	Q	W	Y	Z	AB	DD	NN	ISO 5211	LBS
½"	0.59	0.39	5.12	1.48	0.55	2.48	1.38	2.62	5.51	3.74	0.63	0.56	0.98	M5	2.32	1.654	4	F04	6
¾"	0.79	0.39	5.12	1.59	0.55	2.68	1.69	3.25	5.98	4.61	0.75	0.63	0.98	M5	2.64	1.654	4	F04	8
1"	0.98	0.47	6.30	1.87	0.55	2.99	2.01	3.50	6.50	4.88	0.75	0.69	1.20	M6	2.83	1.969	4	F05	11
1½"	1.50	0.67	8.82	2.56	0.75	3.46	2.87	4.51	7.48	6.14	0.87	0.81	1.65	M8	3.23	2.756	4	F07	22
2"	1.97	0.67	8.82	2.83	0.75	3.70	3.62	5.00	8.50	6.50	0.75	0.88	1.65	M8	3.78	2.756	8	F07	27
2½"	2.56	0.79	12.76	3.58	0.75	4.53	4.13	5.87	9.49	7.48	0.87	1.00	1.83	M8	3.90	2.756	8	F07	50
3"	2.99	0.79	12.76	3.92	0.75	4.72	5.00	6.61	11.14	8.27	0.87	1.13	1.83	M8	5.08	2.756	8	F07	70
4"	3.94	1.06	15.75	4.80	1.02	7.68	6.18	7.87	12.01	10.00	0.87	1.25	2.11	M10	5.43	4.016	8	F10	105
6"	5.91	1.26	21.65	6.61	1.18	9.45	8.50	10.63	15.87	12.52	0.87	1.44	2.44	M12	6.69	4.921	12	F12	220
8"	7.87	1.38	N/A	8.68	1.38	N/A	10.63	13.00	19.76	15.00	0.98	1.63	2.80	M16	8.90	5.512	12	F14	380

Dimensions (IN) ANSI Class 600

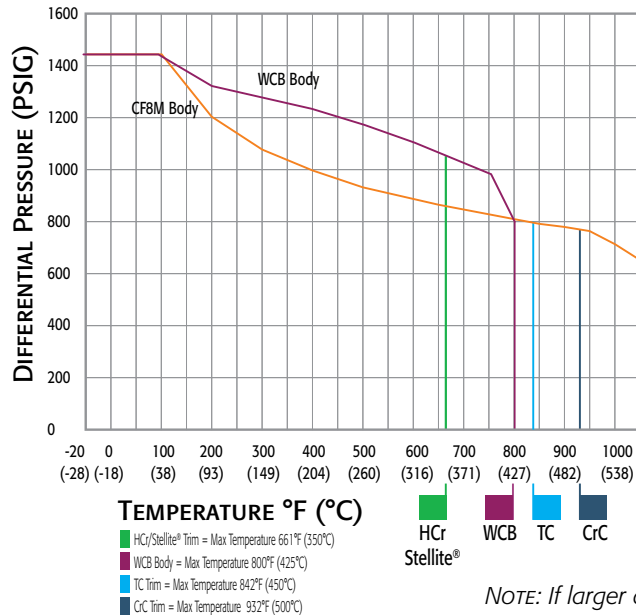
SIZE	A	B	C	D	E	F	I	J	L	N	Q	W	Y	Z	AB	DD	NN	ISO 5211	LBS
½"	0.59	0.39	5.12	1.48	0.55	2.48	1.38	2.62	6.50	3.74	0.63	0.82	0.98	M5	2.28	1.654	4	F04	6
¾"	0.79	0.39	5.12	1.59	0.55	2.68	1.69	3.25	7.48	4.61	0.75	0.88	0.98	M5	2.76	1.654	4	F04	9
1"	0.98	0.47	6.30	1.87	0.55	2.99	2.01	3.50	8.50	4.88	0.75	0.94	1.20	M6	3.86	1.969	4	F05	13
1½"	1.50	0.67	8.82	2.56	0.75	4.72	2.87	4.51	9.49	6.14	0.87	1.13	1.65	M8	4.25	2.756	4	F07	26
2"	1.97	0.67	8.82	3.23	0.75	5.51	3.62	5.00	11.50	6.50	0.75	1.25	1.65	M8	5.28	2.756	8	F07	40
3"	2.99	0.87	12.76	4.51	1.10	7.09	5.00	6.61	14.02	8.27	0.87	1.50	1.83	M10	6.50	4.016	8	F10	80
4"	3.94	1.06	21.65	5.28	1.30	9.45	6.18	8.50	17.01	10.75	0.98	1.75	2.09	M12	8.15	4.921	8	F12	150

M Series

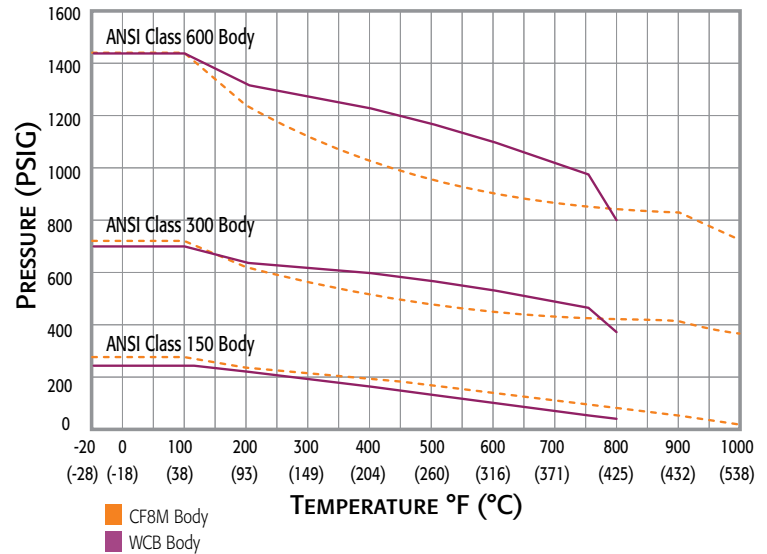
Floating Metal Seat Ball Valve

Temperature & Pressure Curves

Pressure vs. Temperature
TRIM OPTIONS • P/T @ Max. Shutoff ΔP



Pressure vs. Temperature
BODY MATERIAL



NOTE: If larger differentials are needed for trim, please see our Trunnion product line.

FMU/FMB Series Metal Seat Torque Table

► 316 HCr/Stellite® Trim, Unidirectional (Bidirectional torque: add 15% to below torques)

Torques in In-Lbs														
PSIG	150	225	300	350	425	500	575	650	725	870	1015	1160	1300	1450
½"	90	105	110	110	110	115	120	130	140	165	175	185	210	230
¾"	130	140	140	150	160	165	190	210	240	265	310	360	405	450
1"	150	170	210	220	235	255	280	310	350	420	475	535	575	635
1½"	415	510	565	600	655	715	785	850	925	CF	CF	CF	CF	CF
2"	490	715	900	990	1,100	1,280	1,440	1,600	1,770	CF	CF	CF	CF	CF
2½"	712	1,074	1,435	1,786	2,148	2,488	CF	CF	CF	CF	CF	CF	CF	CF
3"	1,450	1,650	2,010	2,500	2,950	3,400	CF	CF	CF	CF	CF	CF	CF	CF
4"	2,600	3,250	3,950	5,215	6,255	7,290	CF	CF	CF	CF	CF	CF	CF	CF
6"	3,700	9,250	11,900	14,500	CF	CF	CF	CF	CF					
8"	12,200	15,470	21,575	27,700	CF	CF	CF	CF	CF					

► 316/TC Trim or CrC Trim, Unidirectional (Bidirectional torque: add 15% to below torques)

Torques in In-Lbs														
PSIG	150	225	300	350	425	500	575	650	725	870	1015	1160	1300	1450
½"	105	115	140	150	160	185	200	210	215	245	265	290	325	345
¾"	195	225	290	305	335	360	400	440	520	590	650	700	750	772
1"	260	290	345	390	450	530	550	565	600	690	750	810	865	900
1½"	670	900	1,115	1,200	1,350	1,500	1,660	1,820	1,980	CF	CF	CF	CF	CF
2"	865	1,090	1,500	1,725	1,950	2,210	2,475	2,750	3,005	CF	CF	CF	CF	CF
2½"	1,221	1,547	1,933	2,443	2,783	3,122	CF	CF	CF	CF	CF	CF	CF	CF
3"	2,050	2,250	2,715	3,290	3,780	4,275	CF	CF	CF	CF	CF	CF	CF	CF
4"	3,150	4,227	5,300	6,360	7,400	8,450	CF	CF	CF	CF	CF	CF	CF	CF
6"	4,460	11,160	14,350	17,650	CF	CF	CF	CF	CF					
8"	14,600	18,555	25,880	33,215	CF	CF	CF	CF	CF					

Cv Values

Size	Cv
1/2"	25
3/4"	50
1"	90
1-1/2"	245
2"	460
2-1/2"	750
3"	1,125
4"	2,100
6"	5,050
8"	9,600

Notes: 1) Safety factors should be added for high temperature, viscous fluid, powders, steam and slurries.
2) Torques are based on valve being installed in suggested direction.

Manual Ball Valve Part Number Matrix

1	Fire Safe Designation	6	Seat, Lining & Trim Materials
F	Fire Safe Tested	B	Black Liquor Service (TC 316SST Seats & Ball)
2	Valve Series	2	Tungsten Carbide Coated 316SST Seats & Ball
MU	Metal Seat Unidirectional Shut-off, Floating Ball	3	HCr Coated Ball /w Stellite® Inlay Seats
MB	Metal Seat Bidirectional Shut-off, Floating Ball	4	Chrome Carbide Coated 316SST Seats & Ball
MS	Metal Seat Scraper Seat Design	8	Chrome Carbide Coated Inconel® 718 Seats & Ball
3	Body Material	7	Special Designations
Blank	No Designation = Stainless Steel Body and Trim	X	No Specials
C	Carbon Steel Body, A216 Gr WCB (-20° F to 800° F)	G	Gear Operator
L	Low Carbon 316 SST, CF3M-316L (to 800° F)	8	Additional Specials
D	CD3MN Duplex SST	X	No Specials
G	CE3MN Super Duplex SST	O	Oxygen Cleaned
4	F316H Forged	Z	Special End Configuration
5	LCB, A352 (-50° F to 800° F)	V	Vented Ball
8	LCC, A352 (-50° F to 650° F)	9	Special Stem Designation
6	WC6, A217 (-20° F to 1100° F)	Blank	No Designation = Standard Stem
9	WC9, A217 (-20° to 1100° F)	A	17-4PH Stem
4	End Connection	B	XM-19 (Nitronic 50) Stem
F1	150# Flanged Ends	C	Duplex 2205 Stem
F3	300# Flanged Ends	D	Inconel® 718 Stem
F6	600# Flanged Ends		
FR	600# RTJ Flanged Ends		
5	Valve Size		
0050	1/2"		
0075	3/4"		
0100	1"		
0150	1-1/2"		
0200	2"		
0250	2-1/2"		
0300	3"		
0400	4"		
0600	6"		
0800	8"		



How To Order

1	-	2	-	3	-	4	-	5	-	678	-	9
↓		↓		↓		↓		↓		↓ ↓ ↓ ↓		↓
F	-	MU	-	C	-	F3	-	0150	-	3XX	-	A



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