



A-T Controls, Inc.

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

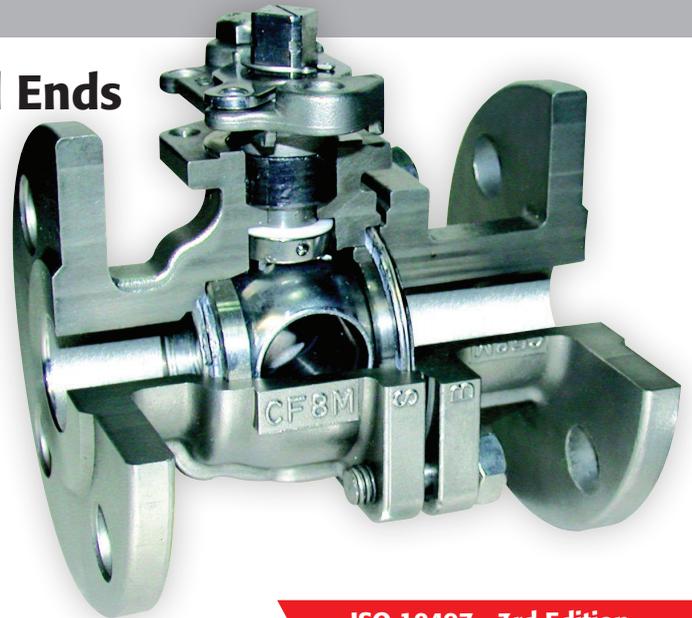


# M Series

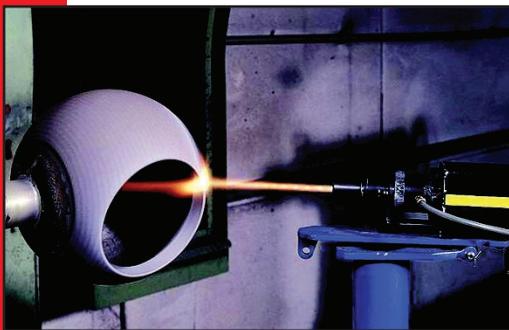
## Flanged Metal Seat Floating Ball Valve

### Full Bore Two-piece Flanged Ends ASME 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

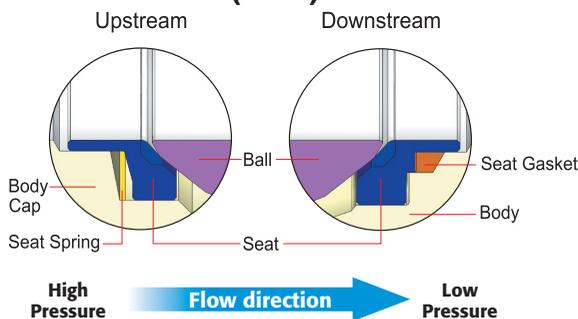
- Precise CNC machining enables the ball and seats to seal tightly, offering superior shutoff. (*Standard Class V for HCr Coated Ball w/ Stellite® Inlay Seats, Class VI is standard for Tungsten Carbide Coated Seats & Ball in the preferred flow direction.*)
- Spring live-loaded seats ensure tight seal, 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.
- Lockable manual handle.

### Applications

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

### Standard Seat Design

#### Unidirectional (FMU)



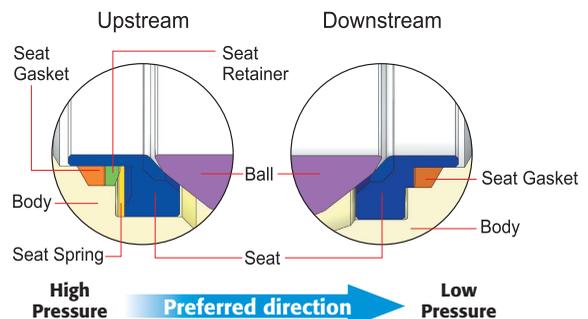
#### Seat Area (Upstream)

Seat spring provides flexibility for thermal expansion, thereby stabilizing operation

#### Seat Area (Downstream)

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

#### Bidirectional (FMB & FMS) For Backflow Service



#### Seat Area A (Upstream)

Seat spring seal design prevents backflow leakage. Seat spring provides flexibility for thermal expansion for stabilizing operation

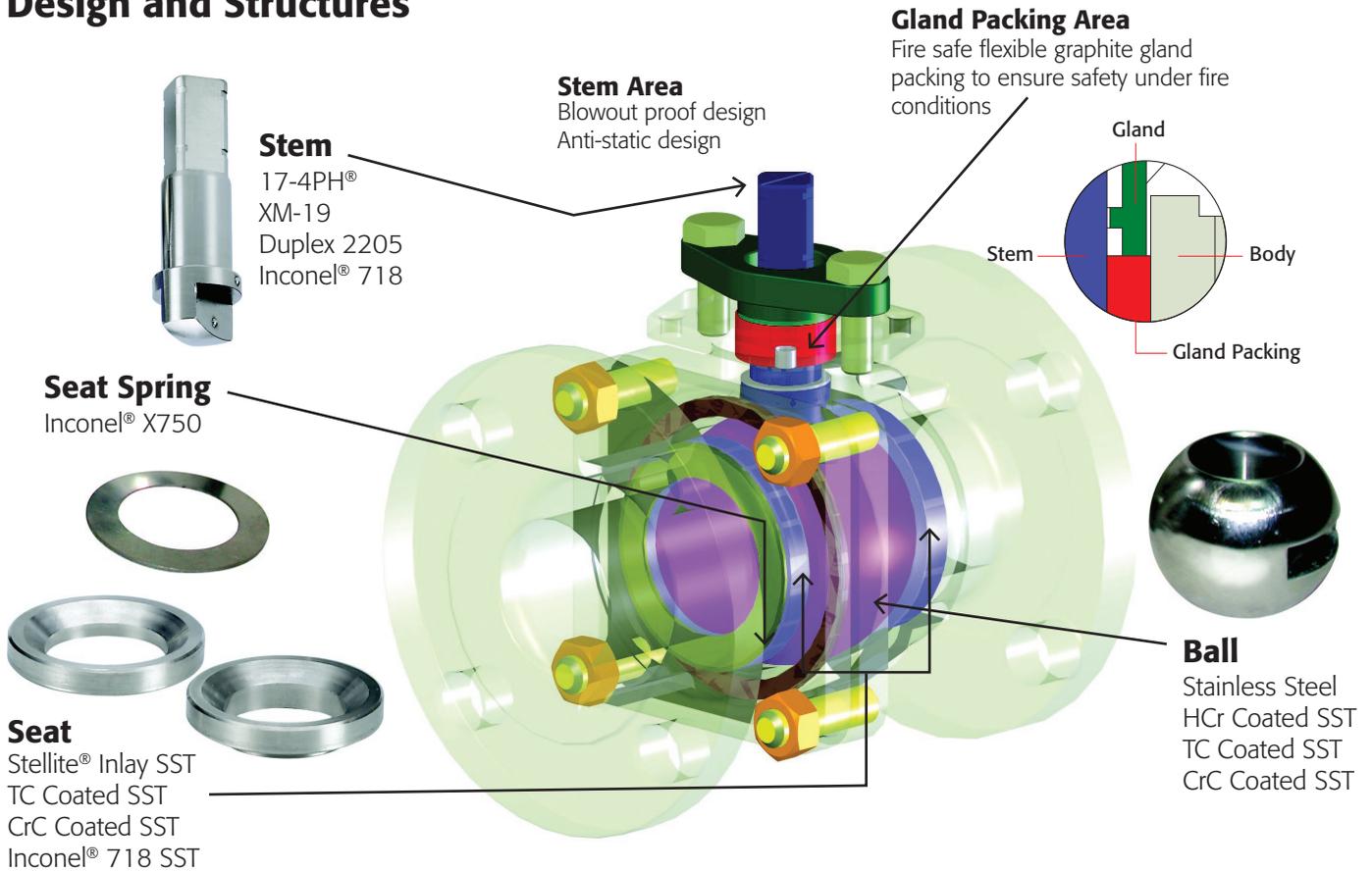
#### Seat Area B (Downstream)

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



**A-T Controls, Inc.**

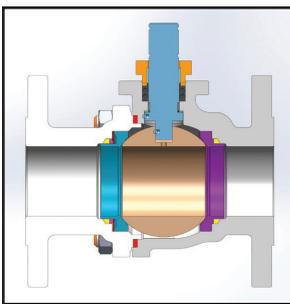
## Design and Structures



## Scraper Seat Design (FMS Series)

### Standard Scraper Service (FMS)

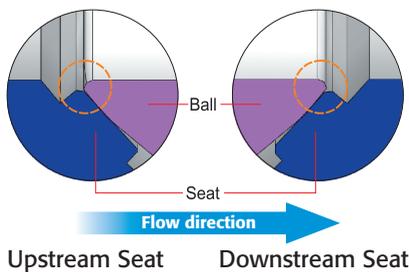
For heavy slurry such as in the pulp & paper industry.



Scraper Design

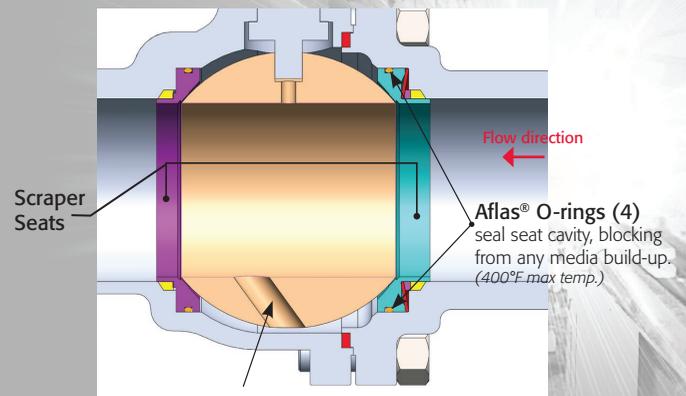
### Scraper Seats

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.

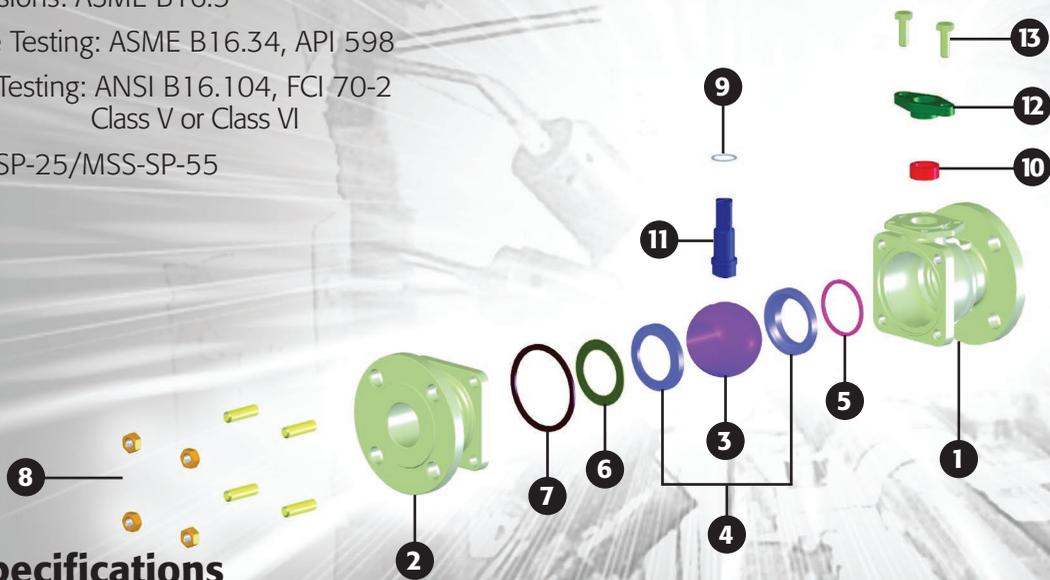
Black liquor is viscous, and will cake in small cavities and on surfaces, which prevents valves from operating properly. A-T Controls provides a solution to this harsh service with modifications to our FMS Series. Black liquor valves include an Aflas® O-ring on both seats to avoid black liquor media 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" ASME Class 150/300; 1/2"-4" ASME Class 600
- End Connections: Raised Face Flange
- Temperature Range: -50°F to 1000°F
- Fire Safe: Certified to ISO 10497 3rd Edition
- Face to Face Dimensions: ASME B16.10
- Flange Dimensions: ASME B16.5
- Body Pressure Testing: 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



### Technical Specifications

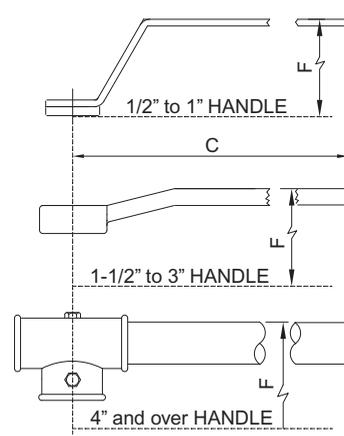
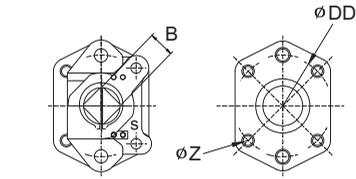
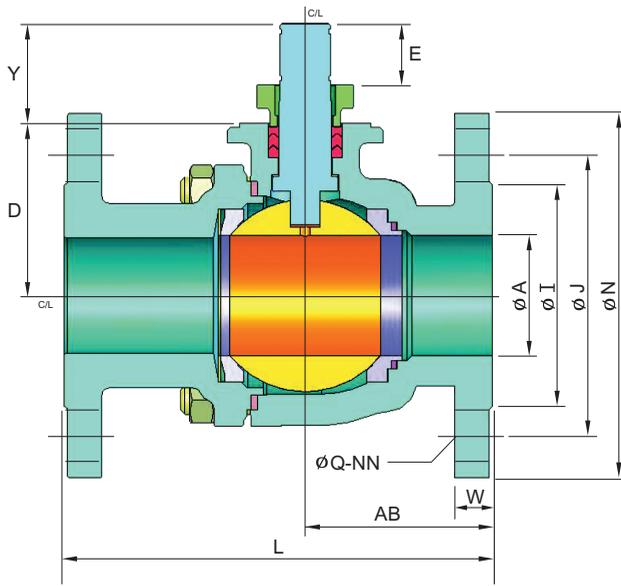
#### MATERIALS LIST

VALVE OPTIONS		CARBON STEEL			STAINLESS STEEL		
		STELLITE® SEAT	TUNGSTEN CARBIDE	CHROME CARBIDE	STELLITE® SEAT	TUNGSTEN CARBIDE	CHROME CARBIDE
NO.	PART NAME	-20°F - 750°F	-20°F - 800°F	-20°F - 800°F	-50°F - 750°F	-50°F - 900°F	-50°F - 1000°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			ISO 3506-2 A2-70		
9	THRUST WASHER	AISI 316			AISI 316		
10	GLAND PACKING	GRAPHITE			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			AISI 304		
13	GLAND BOLT	AISI 304			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.)



8" valve requires a gear operator instead of a handle

## Dimensions (in.) ASME Class 150

SIZE	A	B	C	D	E	F	I	J	L	N	Q	W	Y	Z	AB	DD	NN	ISO 5211	LBS
1/2"	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
3/4"	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
1 1/2"	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
2 1/2"	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.) ASME Class 300

SIZE	A	B	C	D	E	F	I	J	L	N	Q	W	Y	Z	AB	DD	NN	ISO 5211	LBS
1/2"	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
3/4"	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
1 1/2"	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
2 1/2"	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

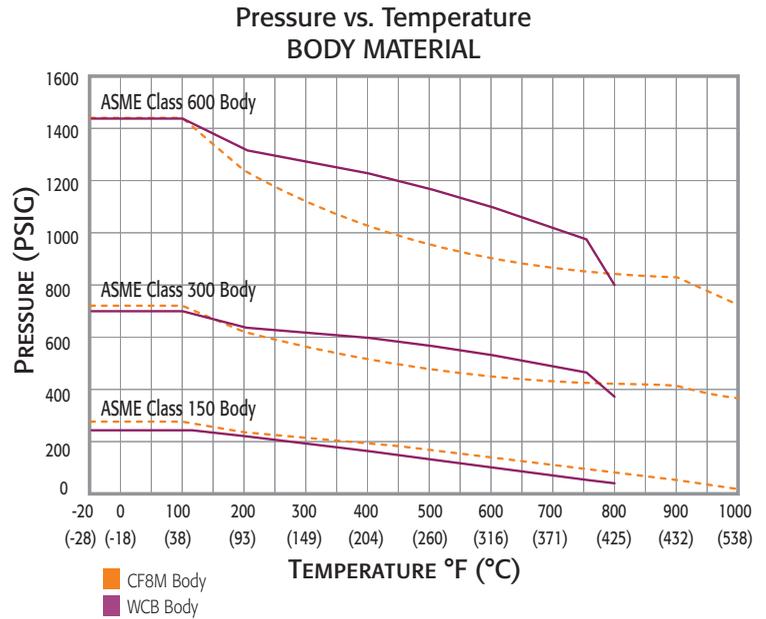
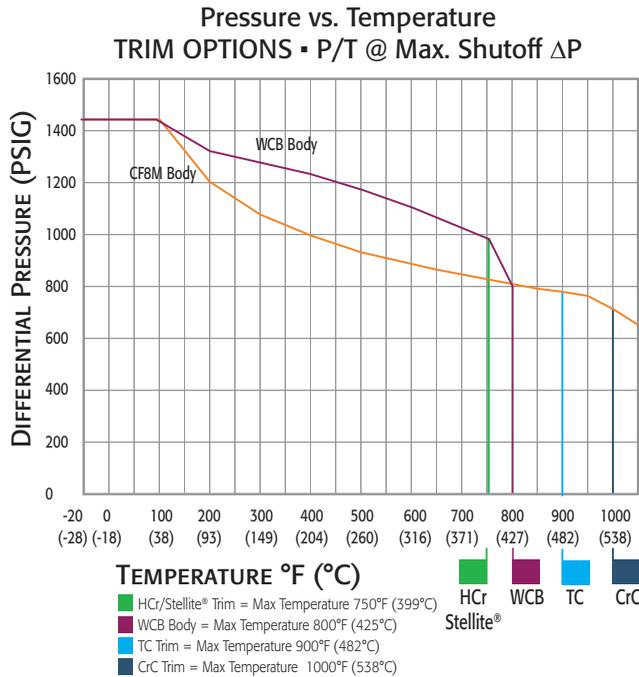
## Dimensions (in.) ASME Class 600

SIZE	A	B	C	D	E	F	I	J	L	N	Q	W	Y	Z	AB	DD	NN	ISO 5211	LBS
1/2"	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
3/4"	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
1 1/2"	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



### FMU/FMB Series Metal Seat Torque Table

► 316 HCr/Stellite® Trim, Unidirectional and Bidirectional (316/TC Trim or CRC Trim add 20% to below torques)

Torques (in*lbs) @ PSIG														
PSIG	150	200	285	350	400	500	600	650	740	870	1000	1160	1300	1480
1/2"	90	92	95	98	100	104	108	110	114	119	124	130	136	142
3/4"	130	132	137	140	142	147	152	155	159	165	172	180	187	194
1"	150	165	190	209	254	254	283	298	325	363	402	449	491	535
1 1/2"	415	463	543	605	653	748	843	890	976	CF	CF	CF	CF	CF
2"	490	563	688	784	857	1,004	1,150	1,224	1,356	CF	CF	CF	CF	CF
2 1/2"	712	791	924	1,026	1,105	1,262	CF	CF	CF	CF	CF	CF	CF	CF
3"	1,232	1,435	1,781	2,045	2,249	2,655	CF	CF	CF	CF	CF	CF	CF	CF
4"	2,600	3,180	4,167	4,921	5,501	6,662	CF	CF	CF	CF	CF	CF	CF	CF
6"	5,383	6,334	8,251	9,971	CF	CF	CF	CF	CF					
8"	10,181	11,865	15,217	18,194	CF	CF	CF	CF	CF					

Torques can be interpolated for intermediate pressures.

Temperature °F	Recommended Safety Factor Multiplier
Less Than 200	1
400	1.1
550	1.3
750	1.6
850	CF
950	CF
1000	CF

Note: Safety factors can be interpolated for intermediate temperatures.

### 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

- 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. Consult The Application Sizing Guide for assistance with sizing actuators.

## Manual Ball Valve Part Number Matrix

<p><b>1 Fire Safe Designation</b> F Fire Safe Tested</p> <p><b>2 Valve Series</b> MU Metal Seat Unidirectional Shut-off, Floating Ball MB Metal Seat Bidirectional Shut-off, Floating Ball MS Metal Seat Scraper Seat Design</p> <p><b>3 Body Material</b> Blank No Designation = Stainless Steel Body and Trim CF8M-316 SST C Carbon Steel Body, A216 Gr WCB L Low Carbon 316 SST, CF3M-316L D CD3MN Duplex SST G CE3MN Super Duplex SST 4 F316H Forged 5 LCB, A352 8 LCC, A352 6 WC6, A217 9 WC9, A217</p> <p><b>4 End Connection</b> F1 150# Flanged Ends F3 300# Flanged Ends F6 600# Flanged Ends FR 600# RTJ Flanged Ends</p> <p><b>5 Valve Size</b> 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"</p>	<p><b>6 Seat, Lining &amp; Trim Materials</b> B Black Liquor Service (TC 316SST Seats &amp; Ball) 2 Tungsten Carbide Coated 316SST Seats &amp; Ball 3 HCr Coated Ball /w Stellite® Inlay Seats 4 Chrome Carbide Coated 316SST Seats &amp; Ball 8 Chrome Carbide Coated Inconel® 718 Seats &amp; Ball</p> <p><b>7 Special Designations</b> X No Specials/Series Standard Handle G Gear Operator</p> <p><b>8 Additional Specials</b> X No Specials O Oxygen Cleaned Z Special End Configuration V Vented Ball</p> <p><b>9 Special Designation</b> A 17-4PH® Stem B XM-19 (Nitronic® 50) Stem C Duplex 2205 Stem D Inconel® 718 Stem E A286 Stem</p>
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### How To Order

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



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