

# AVCO

*Alloy Valves and Control*

## BALL VALVES 9900 SERIES



### Size

1/2" - 10" (Full Port)  
Fire Safe as Standard

### End Connections

150# Flanged  
300# Flanged

### Valve Materials

316 Stainless Steel  
Carbon Steel  
Alloy 20  
Hastelloy C  
Monel 400  
Duplex  
Super Duplex

### Ball and Stem Materials

316 Stainless Steel  
Alloy 20  
Hastelloy C  
Monel 400  
Duplex  
Super Duplex

### Seat Materials

15% Glass Filled Teflon  
25% Carbon Filled Teflon  
Teflon  
PEEK

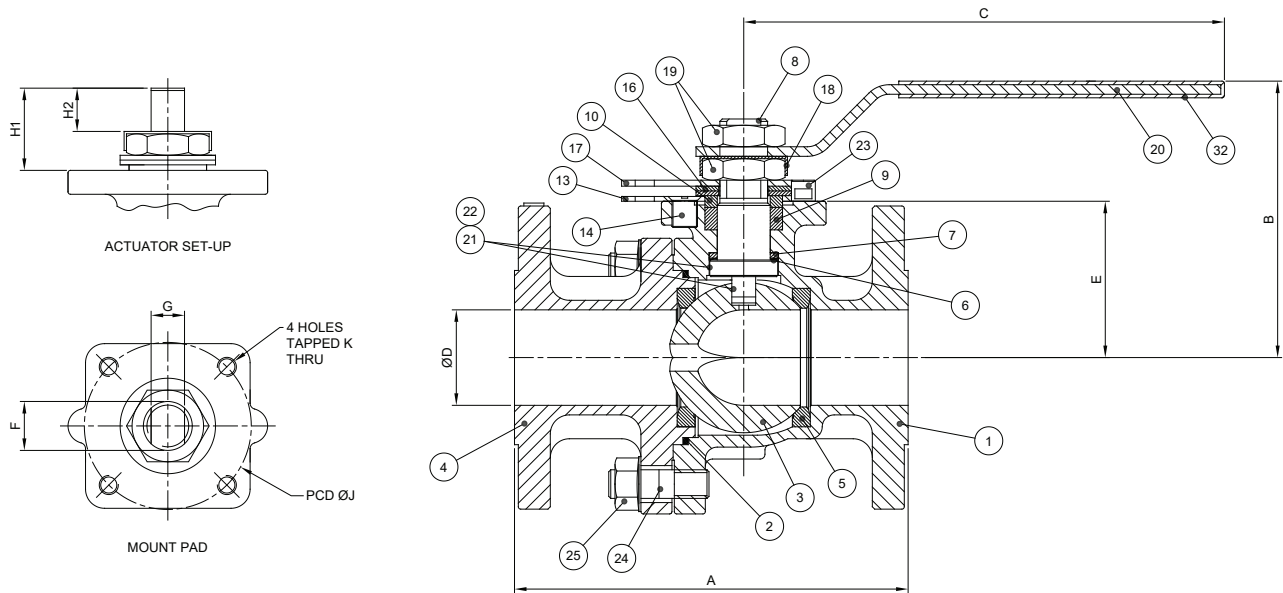
### Service Applications

Chemical  
Food Processing  
Oxygen  
Steam  
Thermal Fluids  
Vacuum  
Water/Oil/Gas

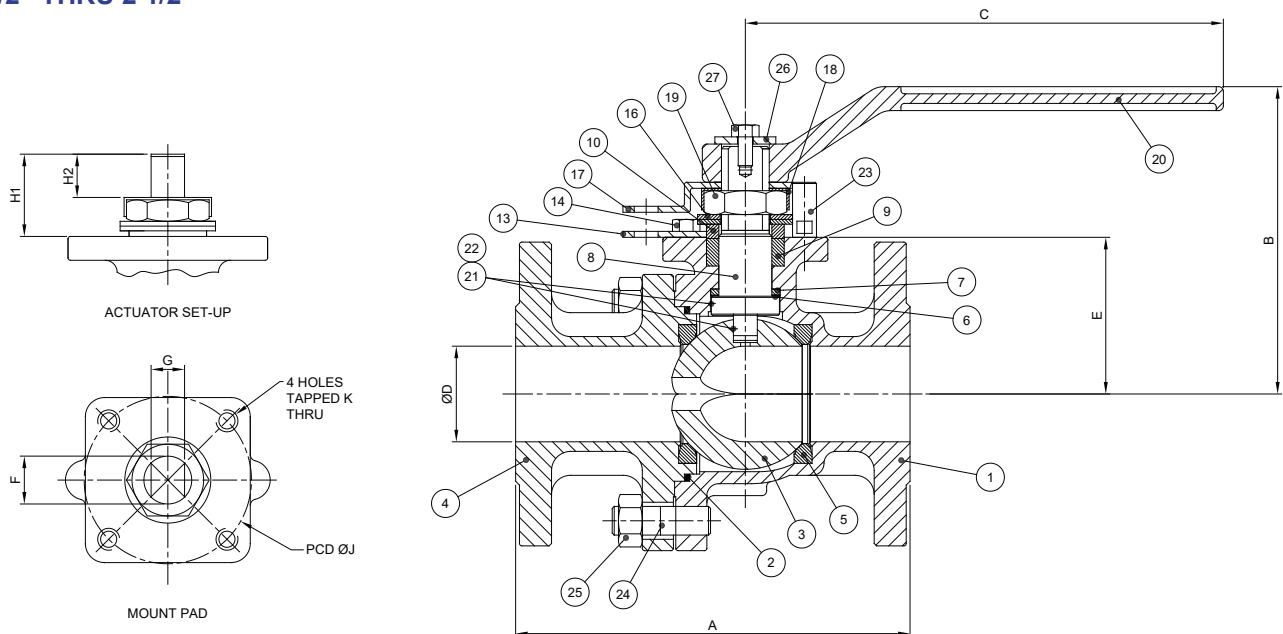
### Applicable Standards

ASME B16.34  
ASME B16.10  
ASME B16.5  
API 598  
API 6D  
API 607  
API 608

### 1/2" THRU 1"

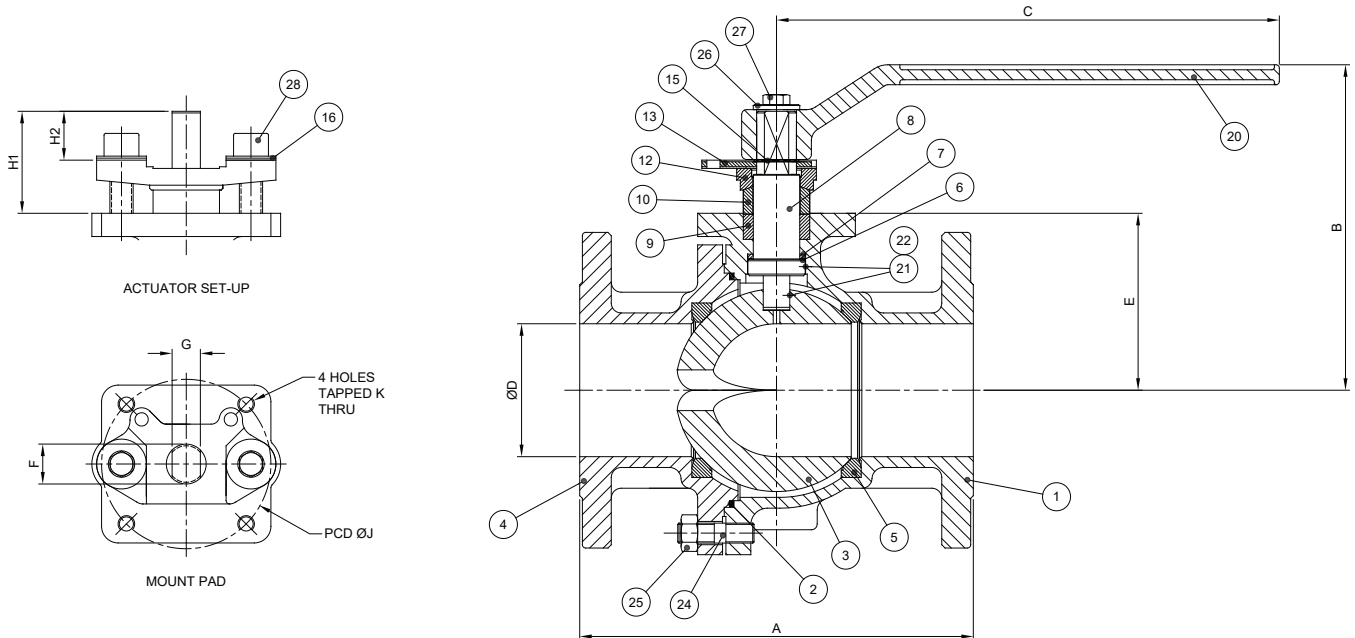


### 1 1/2" THRU 2 1/2"

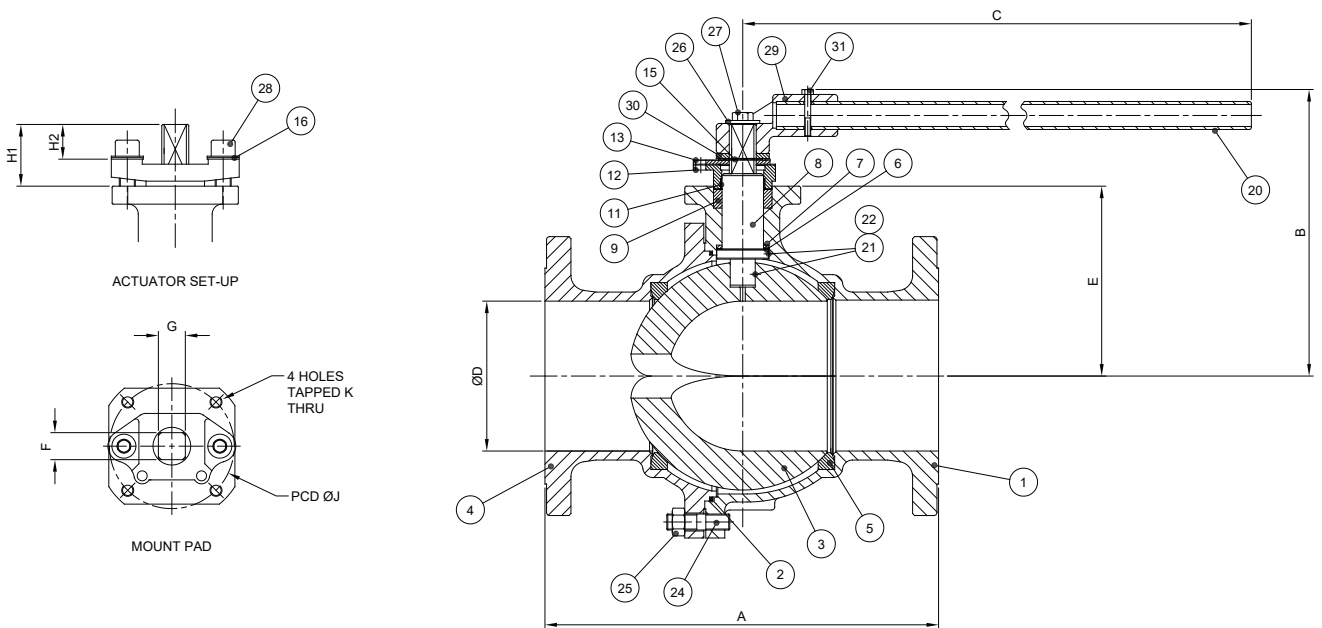


Alloy Valves and Control

### 3" THRU 4"

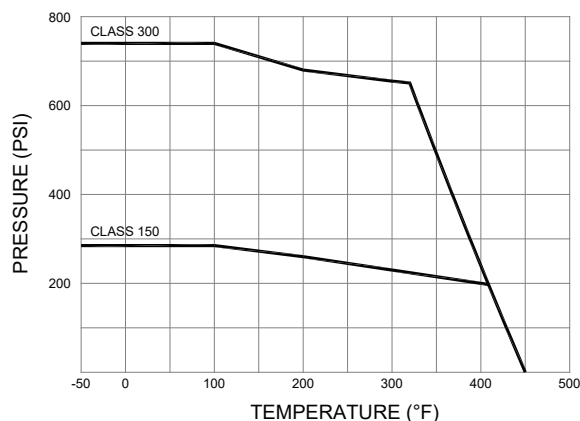


### 6" THRU 10"



SIZE	ANSI Class	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	G (in.)	H1 (in.)	H2 (in.)	J (in.)	K (in.)	ISO 5211	Weight (lbs)	TORQUE (in-lbs)
1/2"	150#	4.25	3.57	5.65	0.59	1.67	M10	0.297	0.69	0.39	1.654	M5	F04	4.6	84
	300#	5.50	3.67	5.65	0.59	1.75	M10	0.297	0.69	0.37	1.654	M5	F04	7.1	84
3/4"	150#	4.61	3.70	5.65	0.79	1.79	M10	0.297	0.73	0.39	1.654	M5	F04	5.3	96
	300#	5.98	3.76	5.65	0.79	1.85	M10	0.297	0.69	0.37	1.654	M5	F04	9.5	96
1"	150#	5.00	4.07	5.65	0.98	2.05	M14	0.342	1.16	0.72	1.969	M6	F05	5.7	120
	300#	6.50	4.23	5.65	0.98	2.15	M14	0.342	1.06	0.63	1.969	M6	F05	10.6	120
1 1/2"	150#	6.50	5.04	7.87	1.57	2.58	M20	0.551	1.46	0.69	2.756	M8	F07	15.0	216
	300#	7.48	5.04	7.87	1.57	2.58	M20	0.551	1.46	0.69	2.756	M8	F07	15.9	216
2"	150#	7.01	5.35	7.87	1.97	2.87	M20	0.551	1.50	0.69	2.756	M8	F07	19.8	300
	300#	8.50	5.35	7.87	1.97	2.87	M20	0.551	1.50	0.69	2.756	M8	F07	27.6	300
2 1/2"	150#	7.48	6.22	11.81	2.56	3.74	M20	0.551	1.50	0.69	2.756	M8	F07	32.0	531
	300#	9.49	6.22	11.81	2.56	3.74	M20	0.551	1.50	0.69	2.756	M8	F07	40.4	531
3"	150#	7.99	7.72	13.78	3.15	4.19	0.984	0.669	2.42	1.14	4.016	M10	F10	43.0	781
	300#	11.14	7.95	13.78	3.15	4.45	0.984	0.669	2.42	1.14	4.016	M10	F10	70.6	781
4"	150#	9.02	8.35	15.75	3.94	4.80	0.984	0.669	2.42	1.14	4.016	M10	F10	72.8	1444
	300#	12.01	8.58	15.75	3.94	5.06	0.984	0.669	2.42	1.14	4.016	M10	F10	101	1444
6"	150#	15.51	11.30	32.87	5.91	7.48	1.063	1.063	2.43	1.34	4.921	M12	F12	137	3356
	300#	15.87	11.30	32.87	5.91	7.48	1.063	1.063	2.44	1.34	4.921	M12	F12	194	3356
8"	150#	17.99	14.88	41.14	7.87	9.90	1.260	1.260	3.11	1.59	4.921	M12	F12	243	12744
	300#	19.76	14.88	41.14	7.87	9.90	1.260	1.260	3.11	1.59	4.921	M12	F12	359	12744
10"	150#	20.98	16.26	41.34	9.84	10.87	1.417	1.417	3.37	1.83	5.512	M16	F14	366	15930
	300#	22.36	16.26	41.34	9.84	10.87	1.417	1.417	3.37	1.83	5.512	M16	F14	525	15930

### Pressure/Temperature Rating for 15% Glass Filled Teflon



### Features

- ANSI Class 150 & 300
- Spring Loaded Stem Packing
- Bottom Entry Stem to Prevent Blow-Out
- ISO 5211 Mounting Pad
- Lockable Handle as Standard
- Fire Safe as Standard

### Flow Direction

The 9900 series ball valve is bi-directional although AVCO recommends a preferred flow direction of right to left as viewed in the dimensional sketches on the previous pages.

Item	Description	Part of Valve Assembly				Material		
		1/2" thru 1"	1 1/2" thru 2 1/2"	3" thru 4"	6" thru 10"	Stainless Steel	Alloy 20	Carbon Steel
1	Body	Yes	Yes	Yes	Yes	A351-CF8M	Alloy 20	A216-WCB
2	Body Seal	Yes	Yes	Yes	Yes	SS 316/Graphite	SS 316/Graphite	SS 316/Graphite
3	Ball	Yes	Yes	Yes	Yes	A351-CF8M	Alloy 20	A351-CF8M
4	End Cap	Yes	Yes	Yes	Yes	A351-CF8M	Alloy 20	A216-WCB
5	Seat	Yes	Yes	Yes	Yes	RPTFE	RPTFE	RPTFE
6	Thrust Ring	Yes	Yes	Yes	Yes	TFM 4215	TFM 4215	TFM 4215
7	Thrust Seal	Yes	Yes	Yes	Yes	Grafoil	Grafoil	Grafoil
8	Stem	Yes	Yes	Yes	Yes	A276-316	Alloy 20	A276-316
9	Packing	Yes	Yes	Yes	Yes	Grafoil	Grafoil	Grafoil
10	Gland Ring	Yes	Yes	Yes	No	A276-316	Alloy 20	A276-316
11	Bushing	No	No	No	Yes	PTFE	PTFE	PTFE
12	Packing Gland	No	No	Yes	Yes	A351-CF8M	Alloy 20	A216-WCB
13	Locking Plate	Yes	Yes	Yes	Yes	Stainless Steel	Stainless Steel	Stainless Steel or Steel
14	Locking Plate Screw	Yes	Yes	No	No	A193-B8	A193-B8	A193-B7
15	Locking Plate Retainer	No	No	Yes	Yes	Stainless Steel	Stainless Steel	Steel
16	Belleville Washer	Yes	Yes	Yes	Yes	A276-301	A276-301	A276-301
17	Travel Stop	Yes	Yes	No	No	Stainless Steel	Stainless Steel	Stainless Steel
18	Lock Washer	Yes	Yes	No	No	Stainless Steel	Stainless Steel	Stainless Steel
19	Stem Nut	Yes	Yes	No	No	A276-304	A276-304	A276-304
20	Handle	Yes	Yes	Yes	Yes	Steel	Steel	Steel
21	Anti-Static Ball	Yes	Yes	Yes	Yes	A276-316	A276-316	A276-316
22	Spring	Yes	Yes	Yes	Yes	A276-316	A276-316	A276-316
23	Stop Pin	Yes	Yes	No	No	Stainless Steel	Stainless Steel	Stainless Steel
24	Threaded Rod	Yes	Yes	Yes	Yes	A193-B8	A193-B8	A193-B7
25	Body Nut	Yes	Yes	Yes	Yes	A194-8	A194-8	A194-2H
26	Handle Washer	No	Yes	Yes	Yes	Stainless Steel	Stainless Steel	Stainless Steel
27	Handle Screw	No	Yes	Yes	Yes	A193-B8	A193-B8	A193-B7
28	Packing Gland Screw	No	No	Yes	Yes	A193-B8	A193-B8	A193-B7
29	Handle Block	No	No	No	Yes	A216-WCB	A216-WCB	A216-WCB
30	Stem Washer	No	No	No	Yes	Stainless Steel	Stainless Steel	Stainless Steel
31	Handle Block Screw	No	No	No	Yes	A193-B8	A193-B8	A193-B7
32	Handle Sleeve	Yes	No	No	No	Plastic	Plastic	Plastic

### 15° Vee Port - Cv Table

SIZE	PERCENTAGE OPEN								
	20	30	40	50	60	70	80	90	100
1/2"	N/A	0.01	0.06	0.16	0.30	0.49	0.74	1.03	1.36
3/4"	N/A	0.01	0.06	0.18	0.38	0.64	0.99	1.39	1.86
1"	N/A	0.03	0.15	0.38	0.72	1.19	1.77	2.46	3.23
1 1/2"	0.04	0.25	0.68	1.35	2.28	3.48	4.92	6.56	8.33
2"	0.04	0.34	0.97	1.99	3.43	5.29	7.54	10.12	12.91
2 1/2"	0.07	0.57	1.64	3.38	5.84	9.03	12.92	17.41	22.32
3"	0.19	1.03	2.68	5.26	8.82	13.37	18.84	25.06	31.77
4"	0.24	1.54	4.16	8.33	14.13	21.58	30.55	40.77	51.81
6"	1.26	4.91	11.48	21.32	34.60	51.24	70.90	92.91	116.28
8"	2.65	9.46	21.43	39.14	62.87	92.47	127.29	166.14	207.31
10"	5.32	16.83	36.25	64.44	101.71	147.75	201.45	260.93	323.35

Cv values below 20% open and marked N/A are negligible and not recommended.

### 30° Vee Port - Cv Table

SIZE	PERCENTAGE OPEN								
	20	30	40	50	60	70	80	90	100
1/2"	N/A	0.03	0.13	0.32	0.62	1.04	1.60	2.30	3.15
3/4"	N/A	0.01	0.13	0.37	0.77	1.34	2.08	3.02	4.13
1"	N/A	0.06	0.31	0.77	1.48	2.48	3.77	5.37	7.26
1 1/2"	0.09	0.51	1.38	2.77	4.74	7.34	10.60	14.51	19.00
2"	0.09	0.68	1.97	4.08	7.10	11.11	16.15	22.19	29.13
2 1/2"	0.15	1.16	3.34	6.94	12.14	19.15	28.12	39.14	52.21
3"	0.39	2.09	5.46	10.79	18.32	28.27	40.75	55.76	73.12
4"	0.50	3.11	8.47	17.06	29.28	45.44	65.71	90.04	118.09
6"	2.56	9.97	23.39	43.76	71.83	108.11	152.73	205.28	264.52
8"	5.37	19.23	43.69	80.42	130.76	195.55	275.08	368.64	474.07
10"	10.79	34.18	73.95	132.50	211.70	312.63	435.42	578.52	738.14

Cv values below 20% open and marked N/A are negligible and not recommended.

### 45° Vee Port - Cv Table

SIZE	PERCENTAGE OPEN								
	20	30	40	50	60	70	80	90	100
1/2"	N/A	0.04	0.20	0.49	0.96	1.64	2.59	3.87	5.61
3/4"	N/A	0.02	0.20	0.57	1.19	2.08	3.29	4.88	6.91
1"	N/A	0.10	0.47	1.18	2.30	3.88	6.01	8.79	12.34
1 1/2"	0.13	0.79	2.13	4.27	7.38	11.60	17.13	24.19	33.05
2"	0.13	1.05	3.03	6.27	11.02	17.47	25.90	36.61	49.88
2 1/2"	0.22	1.78	5.14	10.72	18.98	30.51	46.08	66.87	94.61
3"	0.60	3.21	8.39	16.65	28.59	44.84	66.26	93.90	129.08
4"	0.77	4.78	13.00	26.29	45.55	71.76	103.11	150.09	205.35
6"	3.94	15.29	35.90	67.51	111.93	171.06	247.05	342.27	458.84
8"	8.26	29.48	67.11	124.24	204.12	310.31	446.85	618.35	829.16
10"	16.58	52.41	113.60	204.77	330.66	496.35	707.37	969.51	1287.48

Cv values below 20% open and marked N/A are negligible and not recommended.

### 60° Vee Port - Cv Table

SIZE	PERCENTAGE OPEN								
	20	30	40	50	60	70	80	90	100
1/2"	N/A	0.05	0.27	0.68	1.33	2.31	3.73	5.85	9.17
3/4"	N/A	0.03	0.27	0.78	1.62	2.87	4.61	7.01	10.32
1"	N/A	0.13	0.65	1.62	3.16	5.39	8.50	12.81	18.84
1 1/2"	0.18	1.09	2.92	5.87	10.22	16.29	24.65	36.15	55.21
2"	0.18	1.44	4.15	8.61	15.20	24.40	36.94	53.92	77.08
2 1/2"	0.31	2.44	7.06	14.77	26.41	43.26	67.54	103.52	159.62
3"	0.84	4.42	11.51	22.92	39.68	63.28	96.11	142.29	208.81
4"	1.06	6.57	17.83	36.12	63.03	100.73	152.61	224.26	324.69
6"	5.44	21.00	49.22	92.82	155.12	240.61	356.00	511.65	722.80
8"	11.39	40.48	92.03	170.99	283.44	437.91	647.27	931.99	1322.43
10"	22.85	71.92	155.80	281.89	459.39	700.81	1024.71	1459.49	2044.82

Cv values below 20% open and marked N/A are negligible and not recommended.

### 90° Vee Port - Cv Table

SIZE	PERCENTAGE OPEN								
	20	30	40	50	60	70	80	90	100
1/2"	N/A	0.09	0.44	1.09	2.16	3.85	6.63	11.74	14.32
3/4"	N/A	0.05	0.44	1.25	2.59	4.61	7.60	12.12	19.36
1"	N/A	0.22	1.05	2.60	5.06	8.75	14.29	23.00	37.67
1 1/2"	0.31	1.78	4.71	9.45	16.58	27.15	43.29	69.62	116.98
2"	0.31	2.37	6.70	13.81	24.48	40.12	63.37	99.59	159.92
2 1/2"	0.53	4.15	11.45	23.92	43.42	73.99	125.32	223.90	476.88
3"	1.39	7.24	18.60	36.95	64.77	106.69	172.80	286.24	511.05
4"	1.79	10.78	28.79	58.06	102.18	167.71	268.03	431.98	727.87
6"	9.06	34.22	79.25	149.20	252.05	402.15	627.66	985.54	1598.97
8"	18.94	65.90	148.24	275.41	462.64	738.03	1157.93	1840.49	3059.71
10"	37.84	116.83	250.70	454.04	750.23	1181.86	1832.13	2868.69	4658.70

Cv values below 20% open and marked N/A are negligible and not recommended.

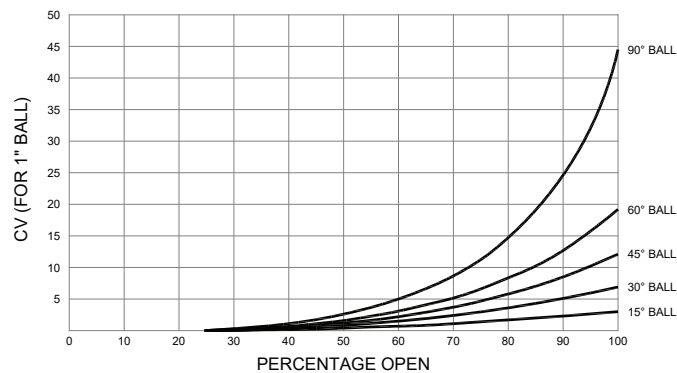
### Liquid Pressure Recovery & Pressure Drop Ratio Factors

SIZE	PERCENTAGE OPEN								
	20	30	40	50	60	70	80	90	100
$F_L$	0.95	0.94	0.93	0.92	0.90	0.88	0.86	0.82	0.75
$X_T$	0.77	0.71	0.67	0.64	0.63	0.62	0.55	0.43	0.40

### How to use tables

- Calculate required maximum and minimum Cv using appropriate formulas for gas or liquid (AVCO can provide assistance if required).
- Select a valve size based upon the maximum Cv whilst ensuring the percentage open is less than 90 percent.
- Check that the minimum Cv is greater than the figure for 30 percent open.
- If the values fall between these criteria then the valve should be suitable for the application.
- Please check with AVCO if further help or confirmation is required.

### Typical Ball Characteristics







### Electric Actuator

120/230 VAC  
12/24 VDC  
NEMA 4/7  
Positioners 4-20 mA  
Reversing  
Telemetry  
Battery Back-up  
Spring Return



### Pneumatic Actuator

Double Acting  
Spring Return  
Solenoid Valves  
Limit Switches  
Positioners 3-15 PSI  
Positioners 4-20 mA  
Intelligent Positioner  
Dec clutchable Manual Override



### Manual Valves

Oval Handle  
Spring Return  
Stem Extensions  
Fusible Link  
Lock Device  
Gear Operators

## HOW TO ORDER

99	3	3	R	T	150	100	BAV30
Series	Body & End Material	Ball & Stem Material	Seat Material	Seal Material	End Style	Size	Options
9900 Series 2 Piece High Performance Vee Port Flanged Ball Valve	1 - Carbon Steel 2 - Alloy 20 3 - 316 SS 6 - Hastelloy C G - Duplex 2205 E - Super Duplex 2507	2 - Alloy 20 3 - 316 SS 6 - Hastelloy C G - Duplex 2205 E - Super Duplex 2507	C - 25% Carbon PTFE R - 15% Glass PTFE T - Teflon (PTFE) P - PEEK	G - Graphoil T - Teflon (PTFE)	150 - 150# Flange 300 - 300# Flange	050 - 1/2" 075 - 3/4" 100 - 1" 150 - 1 1/2" 200 - 2" 250 - 2 1/2" 300 - 3" 400 - 4" 600 - 6" 800 - 8" 1000 - 10"	BAV15 - 15° Vee Port BAV30 - 30° Vee Port BAV45 - 45° Vee Port BAV60 - 60° Vee Port BAV90 - 90° Vee Port BAVT - Vented Ball FS - Fire Safe O2CB - O2 Clean/Bagged LH - Lever Handle

### Example ordering codes:

9933RT-150-100-BAV30-LH = 1" ball valve with 316 SS body/ball, RTFE seats, Teflon seals, 150# RF Flange ends, 60° Vee Ball & locking lever handle

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