SHARPE® VALVES

SERIES V84
CONTROL VALVE

SHARPE® SERIES V84

Series V84 Control Valves have double stem packing for live loaded stems. In addition, Sharpe® offers a wide range of seat materials for high temperature, chemical and abrasive applications. A variety of characterized V ported balls are available in 15º, 30º, 60º as well as special configurations upon request. The V84 is available from 1/4" pipe size up to 4" and is offered in 316 grade stainless steel, carbon steel as well as several corrosion resistant alloys including Alloy 20, Hastelloy C and Monel.

FEATURES

The V84 utilizes characterized V ported balls, permitting the use of soft seats which results in low torque, and ANSI class VI shut off. To cover a vast array of application needs, the V84 is available with Nova, PEEK, TFM, Reinforced TFE, TFE, Delrin, UHMWPE seats. These seats can easily be changed in the field.

For high temperature and slurry applications, Sharpe® Valves offers the V84 with metal seats.

Tight shut-off eliminates the need for isolation valves.

Additionally, end connections are stocked in threaded, socketweld, buttweld and 150#, 300# and 600# ANSI flanged.

The V84 has several features to eliminate hysteresis. Tight shutoff between the ball and downstream seat eliminates the need for a separate stop valve. A "No Play" coupler is utilized to eliminate clearance/looseness between the actuator shaft and the valve stem. Ball-to-stem tolerances have been tightened to further reduce free-play.

APPLICATION

PH control, Steam control, Temperature control, Level control, Pressure control and Flow control.

PH control normally requires controlling low flow rates with particulate and some solids in the flow media. The series V84 control valve is an excellent selection for this service. With its inherent self cleaning ability due to the sliding of the ball over the seat, any solids that normally clog other types of valves are easily washed away. The excellent rangeability of the V-port ball provides the capability for broad process flow control.

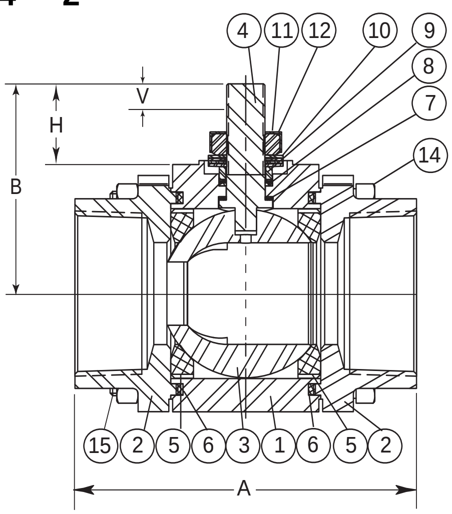
Steam control for low to mid range temperatures is another application for which the V84 is well suited. Unlike rising stem valves which can drag corrosion products through the packing causing early failure, the V84 ball valve with its rotary seal design, eliminates this problem. In addition, because the ball and downstream seat seal bubble tight, steam loss through the valve is no longer a concern; a downstream block valve is not needed.

Level control is easily accomplished when using the V84 ball valve. The range of V-ball options available provides not only high flow capacity for quick fill but very controllable low rates for make-up flow rates.

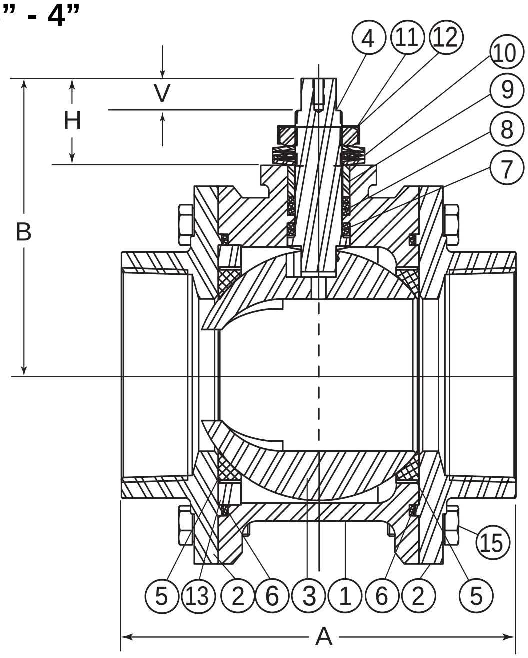
Sharpe® Valves stocks 15°, 30° and 60° degree characterized balls as a standard. We also maintain a supply of solid balls (Blank Ball) that can be EDM cut to your requirements. For those applications, please contact Sharpe engineering department.

SERIES V84
VALVE PARTS AND IDENTIFICATION

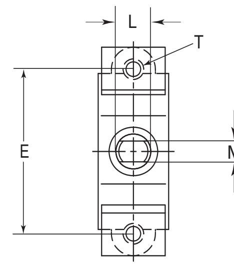
1/4" - 2"



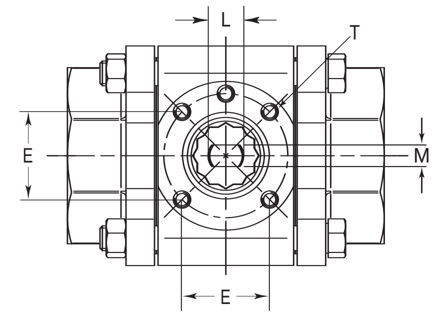
3" - 4"



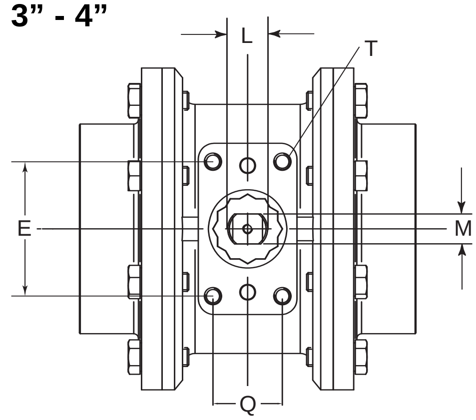
1/4" - 1/2"



3/4" - 2"



3" - 4"



PART NO.	PART	QTY.	MATERIAL		
1	Body	1	316 Stainless Steel Alloy 20 Carbon Steel Hastelloy C Monel Brass	ASTM-A351 CF8M ASTM A351 CN7M ASTM-A216 WCB ASTM A494 TYPE CW-12MW ASTM A494 GR M35-1 ASTM B584 GR C 86500	
2	Pipe Ends	2	316L Stainless Steel Alloy 20 Carbon Steel Hastelloy C Monel Brass	ASTM-A351 CF3M ASTM A351 CN7M ASTM-A216 WCB ASTM A494 TYPE CW-12MW ASTM A494 GR M35-1 ASTM B584 GR C 86500	
3	Ball	1	316 Stainless Steel Hastelloy C	Alloy 20 Monel	
4	Stem	1	17-4PH Monel	Alloy 20 Hastelloy C	
5	Valve Seat	2	Nova Reinforced TFE UHMWPE	PEEK TFE Metal	TFM (Super TFE) Delrin
6	Body Seal	2	TFE UHMWPE EPR	Neoprene Viton	Grafoil Buna
7	Thrust Bearing	1	Nova (UHMWPE with UHMWPE Seats)		
8	Stem Packing	4/6	Nova (UHMWPE with UHMWPE Seats)		
9	Gland Packing	1	304 Stainless Steel		
10	Belleville Washer	4	Stainless Steel		
11	Packing Nut	1	Stainless Steel		
12	Lock Tab	1	Stainless Steel		
13	Seat Retainer	1	316 Stainless Steel Hastelloy C	Alloy 20 Monel	Carbon Steel Brass
14	Body Nuts	4/6	304 Stainless Steel		
15	Body Bolts	4/6	304 Stainless Steel		

SIZE	A	B	E	Q	L	H	M	V	T	WEIGHT (LBS.)
1/4-3/8"-1/2"	2.54	1.52	1.90	-	3/8"-24 UNF	0.59	0.22	0.28	M6	1.20
3/4"	2.78	1.59	1.00	-	3/8"-24 UNF	0.56	0.22	0.28	M5	1.70
1"	3.68	2.19	1.18	-	7/16"-20 UNF	0.68	0.30	0.30	M5	3.00
1-1/2"	4.55	2.88	1.38	-	9/16"-18 UNF	1.15	0.35	0.42	M6	6.00
2"	5.00	3.06	1.38	-	9/16 -18 UNF	1.16	0.35	0.42	M6	8.00
3"	6.66	5.73	3.38	1.75	0.55	1.84	0.745	0.66	M10	30.00
4"	8.40	6.34	3.38	1.75	0.55	1.88	0.745	0.66	M10	50.20

CONTROL VALVE Cv VALUES

VALVE SIZE	VALVE PERCENT OPEN (DEGREE OF ROTATION)										
	0 (0)	10 (9)	20 (18)	30 (27)	40 (36)	50 (45)	60 (54)	70 (63)	80 (72)	90 (81)	100 (90)
1/4”-1/2” V15	0	0.05	0.14	0.25	0.37	0.51	0.66	0.84	1.03	1.26	1.36
1/4” - 1/2” V30	0	0.05	0.15	0.29	0.48	0.65	0.91	1.30	1.60	2.03	2.19
1/4” - 1/2” V60	0	0.11	0.28	0.55	0.80	1.17	1.72	2.45	3.43	4.48	5.18
3/4” V15	0	0.12	0.26	0.41	0.58	0.80	1.05	1.32	1.65	1.93	2.02
3/4” V30	0	0.13	0.29	0.50	0.80	1.09	1.50	2.03	2.61	3.11	3.31
3/4” V60	0	0.21	0.44	0.80	1.28	1.91	2.77	3.70	5.33	6.71	7.31
1” V15	0	0.13	0.36	0.63	0.90	1.33	1.84	2.37	2.97	3.53	3.78
1” V30	0	0.14	0.41	0.77	1.27	2.01	2.83	3.87	5.03	6.08	6.66
1” V60	0	0.25	0.69	1.34	2.31	3.59	5.34	7.55	10.29	13.28	15.04
1-1/2” V15	0	0.29	0.66	1.17	1.86	2.70	3.69	4.71	5.82	7.02	7.89
1-1/2” V30	0	0.33	0.88	1.75	2.89	4.42	6.23	8.31	9.97	12.19	13.91
1-1/2” V60	0	0.56	1.64	3.16	5.33	8.45	11.33	15.67	22.18	28.19	32.08
2” V15	0	0.39	0.93	1.79	2.74	3.97	5.37	6.68	8.28	9.51	10.81
2” V30	0	0.40	1.18	2.21	3.88	6.09	8.44	10.91	14.08	17.25	19.49
2” V60	0	0.71	2.22	4.48	7.26	10.50	15.72	21.52	29.38	37.46	43.54
3” V15	0	0.66	1.94	3.69	6.12	9.01	11.97	15.50	19.40	23.59	27.05
3” V30	0	0.72	2.56	5.49	8.99	13.51	19.68	26.45	34.29	42.85	52.41
3” V60	0	1.65	5.32	10.98	18.95	29.77	43.94	60.07	81.37	106.13	131.43
4” V15	0	0.97	2.97	5.82	9.35	13.56	18.60	24.24	30.51	37.44	44.27
4” V30	0	1.50	4.81	9.56	16.67	25.43	35.19	47.06	60.69	77.20	91.66
4” V60	0	2.57	8.33	18.61	30.01	47.66	70.85	98.75	133.52	174.99	215.11

Cv is defined as the flow of liquid in gallons per minute through a valve with pressure drop of 1 PSI across the valve.

VALVE SIZE		VALVE PERCENT OPEN (DEGREE OF ROTATION)									
	0 (0)	10 (9)	20 (18)	30 (27)	40 (36)	50 (45)	60 (54)	70 (63)	80 (72)	90 (81)	100 (90)
F_L	0	0.96	0.95	0.94	0.93	0.92	0.90	0.88	0.86	0.82	0.75
X_t	0	0.98	0.77	0.71	0.67	0.64	0.63	0.62	0.55	0.43	0.40

F_L - Liquid Pressure Recovery Factor

X_t - Pressure Drop Ratio Factor (Gas)

CONTROL VALVE Cv VALUES

Flow Coefficient - Cv - Standard Seat Control Valves - Round Port

VALVE SIZE	VALVE PERCENT OPEN (DEGREE OF ROTATION)										
	0 (0)	10 (9)	20 (18)	30 (27)	40 (36)	50 (45)	60 (54)	70 (63)	80 (72)	90 (81)	100 (90)
1/4”-1/2”	0	0.15	0.29	0.46	0.70	1.09	1.76	2.60	4.30	6.40	8.00
3/4”	0	0.21	0.43	0.70	1.05	1.62	2.64	4.00	6.40	9.60	12.00
1”	0	0.58	1.15	1.90	2.80	4.30	7.00	10.50	17.00	26.00	32.00
1-1/2”	0	1.48	2.95	4.75	7.20	11.00	18.00	27.00	44.00	65.50	80.00
2”	0	2.16	4.33	6.95	10.50	16.20	26.40	39.60	64.0	96.00	120
3”	0	6.40	12.60	20.20	31.10	47.40	77.80	115	187	280	350
4”	0	13.10	26.00	42.10	63.10	97.20	159	238	385	575	720

Cv is defined as the flow of liquid in gallons per minute through a valve with pressure drop of 1 PSI across the valve.

VALVE SIZE	VALVE PERCENT OPEN (DEGREE OF ROTATION)										
	0 (0)	10 (9)	20 (18)	30 (27)	40 (36)	50 (45)	60 (54)	70 (63)	80 (72)	90 (81)	100 (90)
F_L	0	0.92	0.91	0.91	0.90	0.86	0.86	0.72	0.65	0.61	0.50
X_t	0	0.78	0.74	0.71	0.67	0.62	0.56	0.49	0.38	0.26	0.15

F_L - Liquid Pressure Recovery Factor

X_t - Pressure Drop Ratio Factor (Gas-Choked Flow)

“NO PLAY” COUPLING

* 304 Stainless Steel Two Piece Coupling
* Designed For Process Control Critical High Cycle Automated Valves
* No Hysteresis Or Lost Motion

BASIC FLOW EQUATIONS FOR LIQUID SERVICE

PIPE REDUCER COEFFICIENTS

Loss Coefficients

$$K1 = 0.5 \cdot \left[1 - \left[\frac{d}{D1}\right]^2\right]^2$$

$$K2 = \left[1 - \left[\frac{d}{D2}\right]^2\right]^2$$

Bernoulli Coefficients

$$Kb1 = 1 - \left[\frac{d}{D1}\right]^4$$

$$Kb2 = 1 - \left[\frac{d}{D2}\right]^4$$

Summation

$$\Sigma K = K1 + K2 + Kb1 - Kb2$$

Pipe Geometry (Reducer) Factor

$$Fp = \left[\left[\frac{Cv^2 \cdot \Sigma K}{890 \cdot d^4}\right] + 1\right]^{-.5}$$

BASIC FLOW EQUATIONS

Flow Rate

$$q = Fp \cdot Cv \cdot \left[\frac{\Delta P}{G}\right]^{.5}$$

$$w = 63.3 \cdot Fp \cdot Cv \cdot (\Delta P \cdot \gamma)^{.5}$$

Pressure Drop

$$\Delta P = G \cdot \left[\frac{q}{Fp \cdot Cv}\right]^2$$

$$\Delta P = \frac{1}{4010 \cdot \gamma} \cdot \left[\frac{w}{Fp \cdot Cv}\right]^2$$

Flow Coefficient

$$Cv = \frac{q}{Fp} \cdot \left[\frac{G}{\Delta P}\right]^{.5}$$

$$Cv = \frac{w}{63.3 \cdot Fp \cdot (\Delta P \cdot \gamma)^{.5}}$$

NOMENCLATURE

Cv = valve flow capacity coefficent
d = valve end inside diameter (in)
D1 = inside diameter of upstream pipe (in)
D2 = inside diameter of downstream pipe (in)
Fp = piping geometry factor, dimensionless
K1 = pressure loss coefficient for inlet reducer, dimensionless
K2 = pressure loss coefficient for outlet reducer, dimensionless
Kb1 = pressure change (Bernoulli) coefficient for inlet reducer, dimensionless
Kb2 = pressure change (Bernoulli) coefficient for outlet reducer, dimensionless
G = specific gravity of liquid relative to water at 70°F
ΔP = pressure drop across the valve, or valve/reducer assembly (psi)
q = volumetric flow rate, US gpm
w = weight flow rate, lb/hr
γ = weight density of liquid, lb/ft^3

BASIC FLOW EQUATIONS FOR GAS AND VAPOR SERVICE

Flow Rate

$$q = 1360 \cdot Fp \cdot Cv \cdot P1 \cdot Y \left[\frac{x}{G \cdot T \cdot Z} \right]^{.5}$$

$$w = 63.3 \cdot Fp \cdot Cv \cdot Y (x \cdot P1 \cdot \gamma 1)^{.5}$$

Pressure Drop

$$\Delta P = \frac{G \cdot T \cdot Z}{P1} \cdot \left[\frac{q}{1360 \cdot Fp \cdot Cv \cdot Y} \right]^2$$

$$\Delta P = \frac{1}{\gamma 1} \cdot \left[\frac{w}{63.3 \cdot Fp \cdot Cv \cdot Y} \right]^2$$

Flow Capacity Coefficients

$$CV = \frac{q}{1360 \cdot Fp \cdot P1 \cdot Y} \cdot \left[\frac{G \cdot T \cdot Z}{x} \right]^{.5}$$

$$CV = \frac{w}{63.3 \cdot Fp \cdot Y \cdot (x \cdot P1 \cdot \gamma 1)^{.5}}$$

Factors Fk, x, and Y

Ratio of Specific Heats Factor: $Fk = \frac{k}{1.40}$

Presssure Drop Ratio: $x = \frac{\Delta P}{P1}$

Gas Expansion Factor: $Y = 1 - \frac{x}{3 \cdot Fk \cdot xt}$

Nomenclature:

Cv = valve flow capacity coefficent
Fp = piping geometry factor, dimensionless
G = specific gravity of gas relative to air at standard conditions (60°F, 14.7 psia)
ΔP = pressure drop across linesize valve, or valve/reducer assembly, psi
P1 = pressure at the inlet of a linesize valve, or valve/reducer assembly, psia
q = volumetric flow rate at standard conditions, ft^3/hr
T = temperature at the inlet of a linesize valve, or valve/reducer assembly, °R
w = weight flow rate, lb/hr
x = ratio of pressure drop across linesize valve, or valve/reducer assembly to inlet pressure, dimensionless
xt = terminal value of x for choked flow in linesize valves, dimensionless
Y = gas expansion factor, dimensionless
Z = gas compressibility factor, dimensionless
γ1 = density at the inlet of a linesize valve, or valve/reducer assembly, lb/ft^3

Notes:

1) Use the same equations for calculating Fp as for liquid flow calculations.
2) The equations above are for informational purposes, anc cover simple, linesize valve gas flow solutions. Where reducer effects or choked flow become involved, these calculations become considerably more complex, and beyond the intent of this document.

SERIES V84
INFORMATION SHEET

INFORMATION YOU NEED TO KNOW TO SIZE A CONTROL VALVE.

1. TYPE OF FLUID; LIQUID, GAS, SLURRY, ETC. ______________________
2. WHAT TYPE OF CALCULATION, 1, CV REQUIRED GIVEN FLOW RATE, ______________________
   2, FLOW RATE GIVEN THE CV______________________
3. FLOW RATE, (GPM, LB/HR. FT^3/HR)______________________
4. INLET PRESSURE TO VALVE (PSIG) ______________________
5. OUTLET PRESSURE FROM VALVE (PSIG) ______________________
6. INLET TEMPERATURE AT VALVE (°F) ______________________
7. SPECIFIC GRAVITY AT VALVE ______________________
8. MEDIA VAPOR PRESSURE (PSIA) ______________________
9. WEIGHT DENSITY OF FLUID (LB/FT^3)______________________
10. PIPE SIZE TO VALVE (IN.)______________________
11. PIPE SIZE FROM VALVE (IN.)______________________

HOW TO ORDER

VALVE SIZE	VALVE SERIES	BODY & ENDS	BALL & STEM	SEAT	SEAL	ENDS	V PORT	OPTIONS
1/4"	V84	4 = Carbon Steel	6 = 316 Ball & 174-PH Stem	N = Nova	T = TFE	TE = Threaded Ends (NPT)	A = Round Port	X = Oxygen
3/8"		6 = 316 SST		P = Peek	G = Grafoil	TEB = Threaded Ends (BPST)		OH = Oval Handle
1/2"		2 = Alloy 20	2 = Alloy 20	A* = Metal	B = Buna	BW = Butt Weld Sch. 5, 10, 40, & 80	C =15°	E = Extended Handle
3/4"		3 = Monel	3 = Monel	B* = Metal	N = Neoprene		D = 30°	
1"		5 = Hastelloy C	5 = Hastelloy C	C* = Metal	V = Viton®	SW = Socket Weld	E = 60°	L = Lockable Extended Stem
1-1/2"		1 = Brass		R = Reinforced TFE	U = UHMWPE	FBE = Flush Bottom Tank Flange	F = Special	
2"				T = TFE	E = Ethylene Propylene Rubber (EPR)	1 = 150RF Flange		D = Leak Detection Stem
3"				M = TFM		3 = 300RF Flange		
4"				D = Delrin		6 = 600 RF Flange (1/2"-2")		GO = Gear Operator
				U = UHMWPE				A = Nace

3/4" V84 6 6 N T TE C X

* See Metal Seat Catalog

SHARPE® VALVES
A DIVISION OF Sharon

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