Cv Table for V-Port Ball Valve at Selected percentage of Port Opening

Valve Size	V-Port Type	Percentage of Opening Based on Quarter Turn Operation (100% is at full open position)									
		100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
1/2"	30°	3.60	2.63	1.94	1.40	1.01	0.72	0.51	0.32	0.18	0.04
	60°	8.00	5.04	3.44	2.40	1.60	1.12	0.72	0.32	0.09	0.04
3/4"	30°	12.15	8.87	6.56	4.73	3.40	2.43	1.70	1.09	0.61	0.12
	60°	27.00	17.01	11.60	8.10	5.40	3.78	2.43	1.08	0.32	0.13
1"	30°	18.00	13.14	9.72	7.02	5.04	3.60	2.52	1.62	0.90	0.18
	60°	40.00	25.20	17.20	12.00	8.00	5.60	3.60	1.60	0.48	0.20
1 1/4"	30°	30.10	21.97	16.25	11.74	8.42	6.00	4.21	2.71	1.51	0.30
	60°	67.00	42.21	28.80	20.10	13.40	9.38	6.03	2.68	0.80	0.33
1 1/2"	30°	43.20	31.50	23.33	16.85	12.18	8.60	6.05	3.89	2.16	0.43
	60°	96.00	60.48	41.30	28.80	19.20	13.40	8.64	3.84	1.15	0.48
2"	30°	63.90	46.64	34.51	24.92	17.89	12.80	8.95	5.75	3.19	0.64
	60°	142.00	89.46	61.00	42.60	28.10	19.88	12.78	5.68	1.70	0.71
F_L = Liquid pressure factor		0.51	0.53	0.64	0.76	0.82	0.86	0.9	0.93	0.95	0.97
X_t = Pressure drop ratio		0.18	0.27	0.39	0.55	0.58	0.62	0.67	0.71	0.74	0.78

V-PORT VALVE FORMULAE

SIZING FORMULAE FOR LIQUID, GAS AND STEAM SERVICE

LIQUID APPLICATIONS

SUBCRITICAL FLOW $\Delta P < F_L^2(P_1 - P_V)$

VOLUMETRIC FLOW

$$C_V = q\sqrt{\frac{G_f}{\Delta P}}$$

FLOW BY WEIGHT

$$C_V = \frac{W}{500\sqrt{G_f \Delta P}}$$

CRITICAL FLOW $\Delta P \geq F_L^2(P_1 - P_V)$

VOLUMETRIC FLOW

$$C_V = \frac{q}{F_L^2}\sqrt{\frac{G_f}{(P_1 - P_V)}}$$

FLOW BY WEIGHT

$$C_V = \frac{W}{500F_L^2\sqrt{G_f(P_1 - P_V)}}$$

GAS APPLICATIONS

WHERE x < 0.1 $\frac{\Delta P}{P_1} < 0.1$

VOLUMETRIC FLOW

$$C_V = \frac{q_g}{963}\sqrt{\frac{G_g T}{\Delta P(P_1 + P_2)}}$$

FLOW BY WEIGHT

$$C_V = \frac{w}{3.22\sqrt{\Delta P(P_1 + P_2)G_g}}$$

WHERE x ≠ 0.1 $\frac{\Delta P}{P_1} > 0.1$

VOLUMETRIC FLOW

$$C_V = \frac{q_g}{1360P_1 Y}\sqrt{\frac{G_g TZ}{x}}$$

FLOW BY WEIGHT

$$C_V = \frac{0.0158w}{Y\sqrt{xP_1 y_1}}$$

STEAM APPLICATIONS

SATURATED

$$C_V = \frac{W}{2.1\sqrt{\Delta P(P_1 + P_2)}}$$

SUPERHEATED

$$C_V = \frac{W(1 + 0.0007T_S)}{2.1\sqrt{\Delta P(P_1 + P_2)}}$$

Where :
C_V = Valve flow coefficient
F_L = Critical flow factor
q = Liquid flow rate U.S. gpm
G_f = Specific gravity at flowing temperature (Water = 1 @ 60°F)
Gg = Specific gravity (Air = 1 @ 60°F)
P_1 = Upstream pressure, psia
P_2 = Downstream pressure, psia
P_V = Vapor pressure of liquid at flowing temperature, psia
$\triangle P$ = Actual pressure drop P_1-P_2, psi
q_g = Volume rate of flow, SCFH
w = Weight rate of flow, pounds per hour
x = Pressure drop ratio, DP/P_1
T = Temperature, °R(°F+460)
T_S = steam superheat, °F
Y = Expansion factor, Y = 1-x/3x_T where X_T = 0.85F_L^2
y_1 = Specific weight, lb/ft^3