TECHNICAL DATA

C_V PRESSURE DROP FORMULA

Based on ISA-S75.01-1985
for turbulent flow

FOR LIQUIDS

$$Q = 0.865 C_V \sqrt{\frac{\triangle P}{G_f}}$$

Q max of $\backsimeq 0.7\ C_V$ vapourising liquid

$$\sqrt{\frac{P_1 - F_f P_v}{G_f}}$$

FOR GASES AND VAPOURS

$$Q = 417 \cdot C_V \cdot P_1 \cdot Y \sqrt{\frac{X}{G_g T_1 Z}}$$

$$W = 94.8 \cdot C_V \cdot P_1 \cdot Y \sqrt{\frac{XM}{T_1 Z}}$$

Q = Liquid Flow Rate, m^3/hr
Gas Flow Rate, $s.m^3/hr$
(at 1 bar abs. and 15.6°C)

C_V = Valve Flow Coefficient, U.S. units

$\triangle P$ = (P1 - P2) Pressure Drop psi
When $P_2 < \frac{P1}{2}$ let $P_2 = \frac{P1}{2}$

P_1 = Inlet Pressure, bar absolute

P_2 = Outlet Pressure, bar absolute

G_f = Specific Gravity of Fluid
eg: water = 1 @ 15.6ºC bar abs.

Gg = Specific Gravity of Gas
eg Air = 1 @ 15.6ºC bar abs.

T_1 = Absolute inlet temperature
(ºC + 273)

W = Fluid flow rate, kg/hr

Y = Expansion factor
(limits between 1 and 0.67)

X = Ratio of pressure drop $\triangle P$ to Absolute inlet pressure P_1

Z = Gas compressibility factor
(=1 for an ideal gas)

M = Molecular weight

F_f = Liquid critical pressure ratio factor

$$F_f = 0.96 - 0.28 \left(\frac{P_v}{P_c}\right)^{1/2}$$

P_v = Absolute vapour pressure of Liquid at inlet temperature, bars abs.

P_c = Absolute thermodynamic critical pressure, bars abs.

FLOW COEFFICIENT (CV) and FLOW FACTOR (KV) ANSI 150/300*

Valve Size	Kv	Cv
2"	41	48
3"	128	150
4"	336	394
6"	768	900
8"	1355	1,589
10"	2815	3,300
12"	3349	3,926
14"	4622	5,418
16"	7042	8,256
18"	8916	10,452
20"	12156	14,251
24"	22614	26,511
26"	25590	30,000
28"	28661	33,600
30"	32755	38,400
32"	40944	48,000
36"	47086	55,200
40"	71652	84,000
42"	81888	96,000
48"	100313	117,600

* See graphs on next page for Cv & Kv values. ie 600/900, 1500 and 2500 class values.

VALVE CRACKING PRESSURE

	SUPER TORQUE SPRING		HIGH TORQUE SPRING		LOW TORQUE SPRING		MINI TORQUE SPRING	
VALVE SIZE	psi	mbar	psi	mbar	psi	mbar	psi	mbar
2"	0.511	35	0.225	16	0.123	8	0.050	3
3"	0.617	43	0.298	21	0.110	8	0.054	4
4"	0.426	29	0.165	11	0.071	5	0.048	3
6"	0.353	24	0.194	13	0.086	6	0.043	3
8"	0.299	21	0.222	15	0.118	8	0.042	3
10"	0.308	21	0.231	16	0.081	6	0.040	3
12"	0.275	19	0.270	19	0.145	10	0.040	3
14"	0.255	18	0.226	16	0.086	6	0.043	3
16"	0.389	27	0.243	17	0.116	8	0.042	3
18"	0.320	22	0.249	17	0.126	9	0.041	3
20"	0.341	24	0.192	13	0.093	6	0.041	3
24"	0.266	18	0.207	14	0.064	4	0.040	3

- The Valve Cracking Pressure is the pressure required to lift the plates off the seat. The table above lists the cracking pressure required for a range of Class 150 check valve with Super Torque, Standard Torque, Low Torque and Mini Torque Inconel X750 springs installed. The value of the Cracking Pressure can be varied to suit specific customer requirements by using a different spring.

- The valve spring installed with Goodwin Wafer Check Valves operates as a matched pair of springs providing an independent action on each plate, which ensures synchronous closing.

Kv: The flow of water through a valve at 20°C in cubic meters per hour (m^3/hr) with a pressure drop of 1 bar.
Cv: The flow of water through a valve at 60°F in US gallons/minute (USgpm) at a pressure drop of 1 psi.

CRITICAL VELOCITY

The critical velocity of a valve is that velocity of fluid required to keep the plates of the valve fully open. This condition is important for all check vlaves. If not reached then any pressure drop calculations would be invalid as the Cv of a valve is calculated on the basis of the valve being in full open position. With the valve plates only partially open, i.e. the flow velocity being less than the critical velocity of the valve, then a higher pressure drop will exists than would otherwise be calculated.

Goodwin International have designed their Dual Plate Check Valves such that the customer has an option of 4 different spring strengths:

Super torque spring:- this has an average critical velocity in water of 4.4m/s.
High torque spring:- this has an average critical velocity in water of 3m/s. (This spring fitted as standard unless otherwise specified)
Low torque spring:- this has an average critical velocity in water of 2m/s.
Mini torque spring:- this has an average critical velocity in water of 1.5m/s.