VALVE APPLICATION

HOT, CHILLED WATER GLYCOL 50%

2 POSITION APPLICATION

For 2 & 3 Way isolation, it is recommended to use a line size valve, minimizing pressure drop when the valve is open. In some cases with 2 Way valves a fixed GPM requirement may suggest a smaller valve than the line size.

PROPORTIONAL APPLICATION

It is recommended to size the valve to match the pressure drop of the coil being controlled. You can also use a 3-5 PSI pressure drop.

Cv CALCULATION

Generally you are given two pieces of information, the GPM (Gallons per minute) and the pressure drop across the coil. It can be given in PSI or Feet of Head. If it is given in Feet of Head, you must divide the figure by 2.3 (2.3 Feet of Head = 1 PSI) to get your PSI. Now that you have this information the object is to find the Cv (standardized capacity rating) that will allow you to select your valve.

This formula will enable you to find design Cv:

$$C_V = \frac{GPM}{\sqrt{\Delta P}}$$

Example:

If you have a coil with a drop of 4.3 PSI and a GPM of 65:

$$C_V = \frac{65}{\sqrt{4.3}}$$

Design $C_V = 31.4$

STEAM 15 PSI

2 POSITION APPLICATION

For 2 Position isolation it is recommended to use the Valve Full Port line size whenever possible. For 2 Position control to a coil it is recommended to size and select a valve as you would for modulating service or line size.

PROPORTIONAL APPLICATION

For modulating service, to select a valve you require two pieces of information. The system pressure in PSI and the coil requirement in lbs. per hour or BTUH. If you are given BTUH, divide this number by 1000 to get pounds per hour.
(It actually takes 972 BTUH's to produce 1 pound of steam).

Cv Calculation

$$C_V = \frac{Q}{3 \times \sqrt{\Delta P \times PO}}$$

Q = Pounds per hour required.
ΔP = 80% of inlet (system) pressure in PSI.
PO = Outlet pressure + atmospheric pressure, (outlet will be 20% of the inlet pressure and atmospheric pressure is 14.7 PSIG at sea level.)

Example:

If you have a coil requirement of 950 lbs/hr with a system pressure of 15 PSI (inlet pressure):

$$C_V = \frac{950}{3 \times \sqrt{12 \times (3 + 14.7)}}$$

$$C_V = 21.7$$

Note: When using the above formulas always multiply GPM x Specific Gravity of medium.

TEMPERATURE	PRESSURE-TEMPERATURE RATING TABLE (PSIG)			
	BODY MATERIAL & END CONNECTION			
	BRONZE THD	IRON 125FLG	IRON THD/250FLG	STAINLES STEEL THD
+32^0 - 100^{0}F	400	175	400	720
150^{0}F	400	175	400	670
175^{0}F	392	170	385	645
200^{0}F	385	165	370	620
225^{0}F	375	157	355	605
250^{0}F	365	150	340	590
275^{0}F	350	145	325	575
300^{0}F	335	140	310	560
350^{0}F	300	125	280	537
375^{0}F	275	- - -	265	526
400^{0}F	- - -	- - -	250	515

(Fig. #1)

STEAM TABLE

PRESSURE (PSIG)	TEMP. ^{0}F	PRESSURE (PSIG)	TEMP. ^{0}F
0	212.00	115	347.10
2	218.00	120	350.00
4	224.40	- - -	- - -
6	229.80	125	352.80
8	234.60	130	355.60
- - -	- - -	135	358.30
10	239.00	140	360.80
15	249.70	145	363.40
20	258.80	- - -	- - -
- - -	- - -	150	365.90
25	266.80	155	368.30
30	274.00	160	370.60
35	280.60	165	372.90
40	286.70	170	375.20
45	292.40	- - -	- - -
- - -	- - -	175	377.40
50	297.7	180	379.50
55	302.60	185	381. 70
60	307.30	190	383.70
65	311.80	195	385.80
70	316.00	- - -	- - -
- - -	- - -	200	387.80
75	320.00	205	389.70
80	323.09	210	391.70
85	327.60	215	393.6
90	331.10	220	395.40
95	334.60	- - -	- - -
- - -	- - -	225	397.3
100	337.90	230	399.10
105	341.10	235	400.80
110	344.10	- - -	- - -

(Fig. #2)

What body material and end connection do I need?

Standard sizing formulae can be used to determine the correct valve Cv (standardized capacity rating) required by your application: The Cv value is used to determine the valve size using catalog information. Valve size sometimes dictates the type of end connections, body and trim materials and pressure/temperature ratings consistent with the valve application. Reference tables are provided for your convenience.

When the calculated valve size is smaller than the system pipe size, pipe reducers can be used. If the difference is more than two pipe sizes, control will be improved by locating the reducer at least ten (10) of the smaller pipe diameters away from the valve inlet, in a straight run of pipe. This allows induced turbulence to subside before the fluid enters the control valve.

The inherent flow characteristic of these globe valves is determined by the machined shapes of their plugs. Equal percentage trim, most frequently specified for control valves, has several advantages over other styles. Flow area increases slowly as the plug begins to move out of the seat, and the rate of increase gets larger as movement continues. At low flow rates, change occurs slowly, adding stability to the control scheme. Much larger incremental increases in flow area, beyond the 50% point in stem travel, can help to compensate for typical decreases in available pumping pressure, increased piping pressure, and increased piping and heat exchanger friction losses at higher flow rates.

Additional care must be exercised when controlling heated liquids. Excessive differential pressure can cause vaporization of liquid at the **Vena Contracta**, and the associated expansion can cause the valve to be **choked**. Choking limits flow through the valve, and flow will not increase if outlet pressure is reduced. If pressure recovers sufficiently within the valve, vapor bubbles can implode, producing **cavitation**. Cavitation is noisy, and can be extremely destructive to valves and piping.

Interested readers should consult the Instrument Society of America HANDBOOK OF CONTROL VALVES.

Selecting the correct valve for an application is a critical factor for system control.
Here are the answers to some commonly asked questions on choosing the right actuated valve.

Question: **Can a 3 Way mixing Globe Valve be used in a diverting application?**

Answer: In a word "No." The internal flow pattern of a mixing valve is designed specifically for two inbound flows and one common out. If you try to reverse this, you will create turbulence (very noisy) and very poor control.

Question: **Is a 3 Way Ball Valve a good control valve?**

Answer: Three way ball valves are primarily designed for two position diverting service. They can be used to mix as well but they have high restriction at mid point and in a modulating application much reduced flow (at mid point). The exception to this is the new NEPTRONIC Contoured Port 3 Way Ball Valve. It is specifically designed for throttling service. Unlike current 3 way ball valves that operate in a horizontal plane, this valve operates in a vertical plane much like a Globe Valve.

Question: **How does a 3 Way Butterfly Valve perform?**

Answer: Three way Butterfly Valves will control well in mixing or diverting service. The major problem is that the pressure drop, and thus flow, will vary greatly as the valve modulates through 90 degrees. In the mid position you will experience a maximum flow of roughly 30% of the total flow (a wide open valve). Normally butterfly valves are substantially oversized and thus this restriction is not a problem.

Question: **How do I size a control valve when the coil pressure drop is very low?**

Answer: Size the valve for a minimum 3 pound drop. Where coil drops exceeds 3 pounds select a valve with a slightly higher drop than the coil.

Question: **For sizing purposes what is the difference between close-off pressure and differential pressure?**

Answer: Close-off pressure is the force exerted due to system pressure on a valve disc as it seats. A valve actuator must be selected that can overcome this force and thus seat (close-off) the valve. The differential pressure is the pressure drop across a valve when the valve is fully open. A high differential pressure will result in a noisy valve with a reduced life span.

ANSI B16.104-1976

LEAKAGE CLASS ISA RP39.6	ALLOWABLE LEAKAGE RATE AIR OR WATER	VALVE TYPES	REMARKS
CLASS I	Category II, III or IV, but no test required by agreement between user and supplier	valves Types listed in Category II, III & IV	Quality of mfg. implies that these valves do not exceed leakage classes II, III & IV, but no guarantee is stipulated.
CLASS II	0.5% of rated valve capacity, (maximum Cv)	Globe, double-seat. Globe, single-seat, balanced with stepped metal piston seat. Butterfly, metal lined.	
CLASS III	0.1% of rated valve capacity	Globe, single-seat. Globe, single-seat, balanced with elastomer piston seals. Rotary eccentric cam type. Ball valves with metal seat.	
CLASS IV	.01% of rated valve capacity	Globe, single-seat. Globe, single-seat, balanced with elastomer piston seals. Rotary eccentric cam type. Ball valves with metal seat.	
CLASS V	5x10-4 cc/min. of water per inch of orifice diameter per PSI differential pressure	Globe valves in CLASS IV with heavy duty actuators to increase seating force.	Few valves continue to remain this tight in service unless the seat plastically deforms to maintain contact with the plug.
CLASS VI	Maximum permissible leakage associated with resilient seating valves. Expressed as bubbles per min. as per RP39.6	Globe with resilient seat. Butterfly, elastomer lined. Rotary eccentric cam with elastomer seat. Ball with resilient seat, solid ball type. Diaphragm, Weir type. Plug valves, elastomer seat or sealant injection sealing system.	Elastomer sealed valves remain this tight for many thousands of cycles until the seal is worn or cut.

Example: *0.45 cc/min for a 2-inch port orifice diameter in a Ball, Globe or Butterfly valve with 50 PSI differential pressure air. Equivalent to 3 bubbles per minute from a 1/4 inch O.D., .032 inch wall tube, 1/4 inch under water surface.*

Note: *The terms bubble tight and drop tight are meaningless unless some leakage rate is specified. Lack of visible air bubbles using soap solution indicates leakage of less than* $1x10^{-3}$ *to* $1x10^{-4}$ *cc/sec.*

SPECIFIC GRAVITY

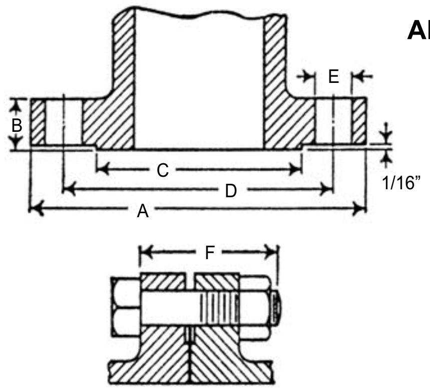
SPECIFIC GRAVITY (S.G.)			
COMPOUND	**(S.G.)**	**COMPOUND**	**(S.G.)**
Acetaldehyde	0.783	Glycerol	1.260
Acetic acid	1.049	n-Hexane	0.659
Acetone	0.791	Methyl acetate	0.933
Aniline	1.022	Methyl alcohol (Methanol)	0.792
Benzaldehyde	1.046	Methyl ethyl ketone	0.805
Benzene	0.879	Naphthalene	1.145
Benzyl alcohol	1.045	Nitrobenzene	1.203
Calcium carbonate	2.930	Oxalic acid	1.900
Calcium hydroxide	2.240	Isopentane	0.620
Chlorobenzene	1.107	Phenol	1.071
Ethyl acetate	0.901	Isopropyl alcohol	0.785
Methyl alcohol (Ethanol)	0.789	Sodium chloride	2.163
Ethyl benzene	0.867	Sodium nitrate	2.257
Ethylene glycol	**1.113**	Toluene	0.866
Formic acid	1.220	Water	1.000

FLANGE DIMENSIONS & DRILLING TEMPLATES

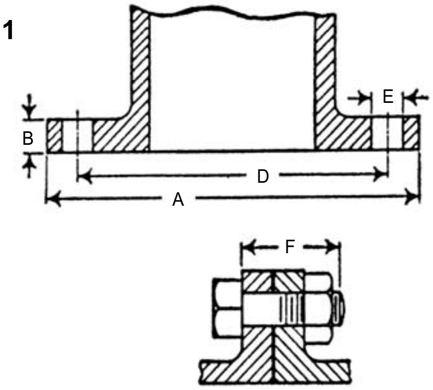
neptronic®

Cast Iron Flange Dimensions & Drilling Templates

ANSI B16.1



250 Lb Cast Iron



125 Lb Cast Iron

NOMINAL PIPE SIZE	125 Lb CAST IRON FLANGE						LENGTH OF MACHINE BOLTS F
	FLANGES		DRILLING		BOLTING		
	FLANGED DIA. A	FLANGED THICKNESS B	DIA. OF BOLT CIRCLE D	DIA. OF BOLT HOLES E	NUMBER OF BOLTS	DIA. OF BOLTS	
1	4-1/4	7/16	3-1/8	5/8	4	1/2	**1-3/4**
1-1/4	4-5/8	1/2	3-1/2	5/8	4	1/2	**2**
1-1/2	5	9/16	3-7/8	5/8	4	1/2	**2**
2	6	5/8	4-3/4	3/4	4	5/8	**2-1/4**
2-1/2	7	11/16	5-1/2	3/4	4	5/8	**2-1/2**
3	7-1/2	3/4	6	3/4	4	5/8	**2-1/2**
4	9	15/16	7-1/2	3/4	8	5/8	**3**
5	10	15/16	8-1/2	7/8	8	3/4	**3**
6	11	1	9-1/2	7/8	8	3/4	**3-1/4**
8	13-1/2	1-1/8	11-3/4	7/8	8	3/4	**3-1/2**
10	16	1-3/16	14-1/4	1	12	7/8	**3-1/4**
12	19	1-1/4	17	1	12	7/8	**3-1/4**
14	21	1-3/8	18-3/4	1-1/8	12	1	**4-1/4**
16	23-1/2	1-7/16	21-1/4	1-1/8	16	1	**4-1/2**
18	25	1-9/16	22-3/4	1-1/4	16	1-1/8	**4-3/4**
20	27-1/2	1-11/16	25	1-1/4	20	1-1/8	**5**
24	32	1-7/8	29-1/2	3/8	20	1-1/4	**5-1/2**
30	38-3/4	2-1/8	36	3/8	28	1-1/4	**6-1/4**
36	46	2-3/8	42-3/4	5/8	32	1-1/2	**7**

NOMINAL PIPE SIZE	250 Lb CAST IRON FLANGES							LENGTH OF MACHINE BOLTS F
	FLANGES			DRILLING		BOLTING		
	FLANGED DIA. A	FLANGED THICKNESS B	DIA. OF RAISED FACE C	DIA. OF BOLT CIRCLE D	DIA. OF BOLT HOLES E	NUMBER OF BOLTS	DIA. OF BOLTS	
1	4-7/8	11/16	2-11/16	3-1/2	3/4	4	5/8	**2-1/2**
1-1/4	5-1/4	3/4	3-1/16	3-7/8	3/4	4	5/8	**2-1/2**
1-1/2	6-1/8	13/16	3-9/16	4-1/2	7/8	4	3/4	**2-3/4**
2	6-1/2	7/8	4-3/16	5	3/4	8	5/8	**2-3/4**
2-1/2	7-1/2	1	4-15/16	5-7/8	7/8	8	3/4	**3-1/4**
3	8-1/14	1-1/8	5-11/16	6-5/8	7/8	8	3/4	**3-1/2**
4	10	1-1/4	6-15/16	7-7/8	7/8	8	3/4	**3-3/4**
5	11	1-3/8	8-5/16	9-1/4	7/8	8	3/4	**4**
6	12-1/2	1-7/16	9-11/16	10-5/8	7/8	12	3/4	**4**
8	15	1-5/8	11-15/16	13	1	12	7/8	**4-1/2**
10	17-1/2	1-7/8	14-1/16	15-1/4	1-1/8	16	1	**5-1/4**
12	20-1/2	2	16-7/16	17-3/4	1-1/4	16	1-1/8	**5-1/2**
14	23	2-1/8	18-15/16	20-1/4	1-1/4	20	1-1/8	**6**
16	25-1/2	2-1/4	21-1/16	22-1/2	1-3/8	20	1-1/4	**6-1/4**
18	28	2-3/8	23-5/16	24-3/4	1-3/8	24	1-1/4	**6-1/2**
20	30-1/2	2-1/2	25-9/16	27	1-3/8	24	1-1/4	**6-3/4**
24	36	2-3/4	30-5/16	32	1-5/8	24	1-1/2	**7-1/2**

* All dimensions are in Inches.