VALVTECHNOLOGIES

"Give us the tools, and we will finish the job"

~Winston Churchill

Pocket Guide

Index

ValvTechnologies' valves are built to withstand the most severe applications. High temperature, high pressure, high cycling, abrasive, corrosive and caustic media have all been considered in the design of our product line.

Fossil Power Plant

HP Feedwater System

- BFP Recirc
- BFP Recirc isolation
- BFP dischage isolation
- BFP Turbine above & below seat drains
- Feedwater heater isolation inlet & outlet
- Feedwater heater bypass
- ShellSide water level control isolation / Heater drain
- Feedwater drains
- ShellSide drains & vents

Sootblower System

- Sootblower header isolation
- Sootblower control valve isolation
- Sootblower control valve downstream block
- Sootblower header crossover isolation
- Sootblower bank isolation
- Individual sootblower isolation
- Sootblower thermal drains

Boiler System

- Economizer drains & vents
- Water wall header
- Drains & vents
- Mud drum blowdown
- Steam drum gauge / Sight glass isolation
- Start-Up, Drum level control
- Steam drum continuous blowdown & block
- Steam drum instrument isolation
- Secondary superheater
- Header drains & vents
- Instrument isolation
- Primary superheater header drains & vents
- Primary superheater instrument isolation
- Reheat superheat header drains & vents
- Reheat superheat instrument isolation
- Reheat spray isolation
- (ERV) Electronic relief valve & isolation

Fossil Power Plant Continued

Turbine Steam & Extraction System

- Main steam drains
- Main steam stop before & after seat drains
- Main steam turbine isolation, Double block & bleed
- Main steam attemporator / Superheat spray isolation
- HP turbine bypass
- Turbine drains
- Extraction steam isolation
- Extraction steam drain valves

LP Feedwater System

- Feedwater inlet isolation
- Feedwater outlet isolation
- Bypass isolation
- Shell side drains & vents
- Level control isolation
- Manual dump to condenser
- Shell side instrument isolation

Inerting Steam System

- Automated isolation steam to pulverizer
- Manual isolation steam to pulverizer
- Inerting steam supply
- Inerting steam supply line drains
- Thermal drains
- Vents & drains

Auxiliary Steam System

- Auxiliary team isolation
- Control valve isolation
- Steam drains

Combined Cycle Plant

- Boiler feed pump recirc
- Boiler feed pump recirc isolation
- LP economizer drains & vents
- HP economizer drains & vents
- IP steam drum drains & vents
- Steam drum gauge / Sight glass isolation
- Superheater header drains & vents
- HRSG hot reheat & Main steam isolation
- Electronic relief valve
- Main steam start-up vent
- Main steam attemporator / Superheater spray isolation
- Turbine bypass system
- Fuel gas heat exchanger

Nuclear Generation

- Boiler feedwater
- Circulating water system
- Component cooling
- Condensate extraction
- Condensate cooling water
- Emergency feedwater
- Fire protection system
- HP safety injection
- HP & LP heater drains
- Heat exchanger vent & drains
- Main steam system isolation, drain & vent
- Power operated relief valve (PORV)
- Pressurizer drain & vent
- Rad waste system
- Reactor coolant pump drain & vent
- Reactor head vents
- Reactor water cooling vents & drains
- Safety injection system
- Secondary system isolation, drain & vent
- Service water system isolation
- Steam generator system
- Turbine bypass
- Turbine drain & vent

Oil & Gas Production

GOSP
- Raw and/or salty crude oil isolation
- First, second, third, and fourth stage separator level control and isolation
- Compressor recycle and isolation
- Export compressor flow & pressure control
- Flare / Vent isolation

HIPPS
- Pipeline
- Inlet of gas treating facilities (front end)
- Slug catcher
- Warm separator

Sour Gas
- Rich amine separator level control and isolation
- Sour water level control and isolation
- Inlet and outlet amine regenerator
- Inlet and outlet sulfur recovery unit (SRU)
- HIPPS

Molecular Sieve
- Inlet and outlet absorbers
- Inlet and outlet gas regeneration gas separators
- Regeneration gas heater

Enhanced Oil Recovery
- SAG-D, Steam Injection, Water Injection, CO_2 Injection
- ERV's
- Steam ESDV (Emergency Shut-Down Valves)
- Steam pressure control
- Steam isolation
- Steam choke valve
- Crude and gas pressure control
- Crude and gas isolation valve
- Production choke valve

Oil & Gas Production Continued

Offshore Production

- HIPPS
- Process isolation
- ESDV (Emergency Shut-Down Valves)
- First, second, and third stage separator level control and isolation
- Produced water level control and isolation
- Compressor isolation
- Export compressor flow & pressure control
- Flare / Vent isolation
- Pressure control
- Drilling mud check valve
- Drilling mud isolation valve
- Steam chokes
- SAG-D isolation
- Pig launcher and receiver
- Mud drilling isolation and check
- Molecular sieve regeneration isolation
- Molecular sieve absorber isolation
- First and second stage separator isolation
- Scrubber level control
- LNG-steam

Others

- Wellhead/Christmas tree
- Production plants and platforms
- Gas and Oil treatment
- EOR: steam injection, steam generation, water injection, gas injection, gas lift
- Trunk lines
- Scraper trap isolation
- Gas storage and distribution
- Oil storage
- Emergency shutdown
- Steam, water, and gas injection

Downstream & Chemical Processing

Gasification
- Coal powder feed
- Lockhopper
- Char isolation valves
- Ash water isolation
- Black water isolation
- Oxygen isolation (low & high temperature)
- Nitrogen isolation
- Slurry service
- High temperature syngas
- General plant isolation

Hydrocracking (Heavy Oil Upgrading)
- Hydrogen isolation
- Catalyst feed & withdrawal
- Catalyst isolation
- Control valve isolation
- Filter & pump isolation
- Overhead vapor isolation & control
- High P isolation & control

Reforming
- Lockhopper
- Catalyst isolation
- Hydrogen isolation
- Nitrogen isolation

Fluidized Catalytic Cracking
- Catalyst handling
- Slurry isolation & control steam
- Catalyst withdrawal
- Third & Fourth stage separator isolation

Coking (Delayed & Flexi)
- Coke drum isolation
  - Overhead vapor line
  - Feed isolation
  - switch valve isolation
  - Blowdown
- Four way switch valve
- Heater isolation
- Cutting water isolation
- Safety relief valve isolation
- Control valve isolation & bypass
- Heater drain valves

Ethylene
- Steam decoke isolation
- Furnace isolation
- Steam vent
- Quench oil isolation & control

Polyethylene / Polypropylene
- Isolation
- High cycle (PTO)
- Reactor block

Polysilicon
Butadiene
EDC / VCM

Mining & Minerals Processing

Concentrate, Ore and Tailings Pipelines
- Pump stations - suction & discharge
- PD Pump discharge check
- Pipeline stations - wear & seal
- Pipeline choke stations
- Choke loop diversion
- Pig launcher & receiver
- Rupture disk isolation
- Instrument isolation
- Vents & drains
- Filter plants

Nickel HPAL Autoclaves
- Autoclave acid injection ESD
- Acid system isolation
- Purge system isolation
- Instrument isolation

Pulp & Paper

Pulping
- Digester steam control
- Digester gas-off
- Screen blowback
- White liquor
- Black liquor

Kraft Recovery & Causticizing
- Steam isolation & control
- Weak & strong black liquor
- Knotter screen backwash
- Green liqour isolation & control
- White liqour isolation & control
- Lime slurry isolation & control
- Wash water isolation
- Contaminated condensate isolation
- Sand separator dump valve

Power & Recovery boilers
- Electronic relief valves
- Rapid drain emergency drain valves
- Feedwater control
- Boiler vents & drains
- Continuous & Intermittent blowdown
- Sootblower isolation
- Sampling lines
- Chemical dosing
- Gauge & Instrument drains
- Mud drum drains
- Desuperheater spray systems

Sky vents
Dryer pressure control
Lime mud isolation & control

V1-1

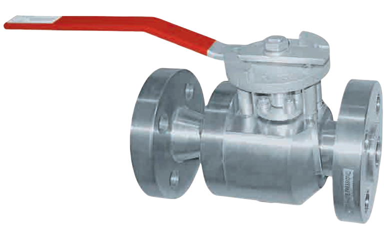
High Pressure, Metal Seated Ball Valve

Technical Data	
Sizes	¼ - 4"
Pressure Classes	ASME / ANSI Class 900 - 4500
Materials of Construction	Carbon Steel (A105) - standard Alloy Steel (F22, F91) - standard Stainless Steel (316H) - standard Duplex Steel Exotic Alloys Other materials available upon request
In Compliance	ASME B16.34 PED N & NPT – Nuclear Authorized
End Connections	Socketweld – standard Buttweld – standard Other end connections available upon request
Options	Oval hand wheel Actuator mounting

V1-2

Low Pressure, Flanged, Metal Seated Ball Valve

Technical Data	
Sizes	½ - 36"
Pressure Classes	ASME / ANSI Class 150 - 600
Materials of Construction	Carbon Steel (A216 WCB) - standard Stain-less Steel (A351 CF8M) - standard Duplex Steel Exotic Alloys Other materials available upon request
In Compliance	ASME B16.34 API 6D PED N & NPT – Nuclear Authorized
End Connections	Raised Face Flange – standard Other end connections available upon request
Options	Purge ports Bi-directional Sealing Wafer Style Actuator mounting



V1-3

Small Bore, Investment Cast

Technical Data	
Sizes	½ - 2"
Pressure Classes	ASME / ANSI Class 150 - 600
Materials of Construction	Carbon steel (A216 WCB) - standard Alloy steel (A217 WC9) - standard Stainless steel (A351 CF8M) - standard Duplex steel Exotic alloys Other materials available upon request
In Compliance	ASME B16.34 PED N & NPT – Nuclear authorized
End Connections	Socketweld – standard Buttweld – standard Other end connections available upon request
Options	Oval hand wheel Actuator mounting Lock-out device

V1-4

Large Bore

Technical Data	
Sizes	4 – 36"
Pressure Classes	ASME / ANSI Class 900 – 2500
Materials of Construction	Carbon steel (A105) - standard Stainless steel (316H) - standard Alloy steel Duplex steel Exotic alloys Other materials available upon request
In Compliance	ASME B16.34 API 6D PED N & NPT – Nuclear authorized
End Connections	Raised face flange – standard Other end connections available upon request
Options	Construction to API 6A Purge ports Bi-directional sealing Wafer style Actuator mounting

Nextech™ R and E Series

"R" Regular Series, base stock model
"E" Enhanced Series, engineered to spec

Technical Data	
Sizes	2 – 24"
Pressure Classes	ASME / ANSI Class 300 - 600
Materials of Construction	Carbon steel (WCC / LCC) - standard Stainless steel (A351 Gr. CF8M) - standard Duplex steel, exotic alloys Other materials available upon request
In Compliance	ASME B16.34, API 6D, API 607 (5th Edition) NACE MR-01-75/ISO 15156 NACE MR-01-03, ISO 15848-1, Fugitive emissions PED, SIL-3 6FA Fire safe
Seat Design	Single piston effect (self-relieving) - standard
End Connections	ANSI Raised face flange – standard ANSI Ring type joint flange – "E" Series option Other end connections available upon request
Options ("E" Series)	Inconel 625 & Incoloy overlay on seat pockets and stem area, complete body overlay, bleed ports, sealant injection ports, body cavity drain and vent ports, double-piston effect seats, actuator mounting solid-proof seats

Nextech™ 6d & 6a (Truntech)

Technical Data	
Sizes	2 – 24" (6d) / 1 13/16 - 21 1/4" (6a)
Pressure Classes	ASME / ANSI Class 300 – 900
Materials of Construction	Carbon Steel (A350 LF2) - standard Stainless Steel (A182 F316) – standard High Strength Carbon Steel (AISI 4130) - standard Duplex Steel (A182 F51) - Standard Super Duplex Steel Exotic Alloys Other materials available upon request
In Compliance	ASME B16.34, API 6A, API 6D, API 607 (5th Edition), NACE MR-01-75/ISO 15156, NACE MR-01-03, ISO 15848-1, Fugitive Emissions, PED, SIL-3
Seat Design	Single Piston Effect (Self-relieving) - standard
End Connections	ANSI Raised Face Flange – standard ANSI Ring Type Joint Flange – standard API-6A 6B Flange - standard API-6A 6BX Flange - standard Other end connections available upon request
Options	Inconel 625 & Incoloy overlay on seat pockets and stem area, Complete body overlay, Bleed ports, Seal-ant injection ports, Body cavity drain and vent ports, Double-Piston Effect Seats, Actuator mounting

PSGV

Parallel Slide Gate Valve

Technical Data	
Sizes	6 – 36″
Pressure Classes	ASME / ANSI Class 900 - 4500
Materials of Construction	Carbon steel (A216 WCB) - standard Alloy steel (A217 WC9, A217 C12A) - standard Stainless steel (A351 CF8M) - standard Duplex steel exotic alloys Other materials available upon request
In Compliance	ASME B16.34 PED N & NPT – Nuclear authorized end connections Buttweld – standard
End Connections	Buttweld – standard Other end connections available upon request
Options	Various bypass configurations Actuator mounting

ERV

Electronic Relief Valve

Technical Data	
Sizes	½ - 12"
Pressure Classes	ASME / ANSI Class 150 - 4500
Materials of Construction	Carbon steel (A105, A216 WCB) - standard Alloy steel (F22, F91, A217 WC9, A217 C12A) - standard Stainless steel (316H, A351 CF8M) - standard Duplex steel Exotic alloys Other materials available upon request
In Compliance	ASME Section 1- V Stamp B16.34 PED N & NPT – Nuclear Authorized
End Connections	Buttweld – standard Raised Face Flange – standard Other end connections available upon request
Options	Various control packages available Integral isolation

Turbine Bypass System

Technical Data	
Sizes	4 – 24"
Pressure Classes	ASME / ANSI Class 150 - 4500
Materials of Construction	Carbon steel (A105, A216 WCB) - standard Alloy steel (F22, F91, A217 WC9, A217 C12A) - standard Stainless steel (316H, A351 CF8M) - standard Duplex steel Exotic alloys Other materials available upon request
In Compliance	B16.34 PED N & NPT – Nuclear authorized
End Connections	Buttweld – standard Raised face flange – standard Other end connections available upon request
Options	Various control packages available Integral isolation

XACTROL® Valve

Technical Data	
Sizes	½ - 36"
Pressure Classes	ASME / ANSI Class 150 - 4500
Materials of Construction	Carbon steel (A105, A216 WCB) - standard Alloy steel (F22, F91, A217 WC9, A217 C12A) - standard Stainless steel (316H, A351 CF8M) - standard Duplex steel Exotic alloys Other materials available upon request
In Compliance	ASME B16.34 API 6D PED N & NPT – Nuclear authorized
End Connections	Socketweld – standard Buttweld – standard Raised face flange – standard Other end connections available upon request
Options	Trim available: Mark I – single stage pressure drop Mark II – single stage pressure drop, continuous blowdown Mark III – multi-stage pressure drop actuator mounting

Steam Choke Valve

Technical Data	
Sizes	2 – 3"
Pressure Classes	ASME / ANSI Class 150 – 1500
Materials of Construction	Carbon steel (A216 WCB) - standard Stainless steel (A351 CF8M) - standard Duplex steel Exotic alloys Other materials available upon request
In Compliance	ASME B16.34
End Connections	Socketweld – standard Raised face flange – standard Other end connections available upon request
Options	Various control trims Actuator mounting

Temperature

Conversion Factor °C = (5/9)(x–32)

Temperature	
Degrees F	Degrees C
-20	-29
0	-18
32	0
50	10
100	38
150	66
200	93
212	100
250	121
300	149
350	177
400	204
450	232
500	260
550	288
600	316
650	343
700	371
750	399
800	427
850	454
900	482

Temperature	
Degrees F	Degrees C
950	510
1000	538
1050	566
1100	593
1150	621
1200	649
1250	677
1300	704
1350	732
1400	760
1450	788
1500	816
1550	843
1600	871
1650	899
1700	927
1750	954
1800	982
1850	1010
1900	1038
1950	1066
2000	1093

Pressure

Conversion Factor 1 psi = .068948 bar

Pressure	
psi	Bar
1	0.069
2	0.138
3	0.207
4	0.276
5	0.345
10	0.689
20	1.379
30	2.068
40	2.758
50	2.758
100	3.447
150	6.895
200	10.342
300	13.789
400	20.684
500	27.679
600	34.474
700	41.369
800	48.263
900	55.158

Pressure	
psi	Bar
1000	62.053
1500	68.948
2000	103.421
2500	137.895
3000	172.369
4500	206.843
6000	310.264
7500	517.107
9000	620.528
10500	723.949
12000	827.371
13500	930.792
15000	1034.214
17500	1206.583
20000	1378.951
22500	1551.320
25000	1723.689

Weight

Conversion Factor 1 pound = .4536 kg

Weight	
Pounds (lb)	Kilograms (kg)
1	0.45
2	0.91
3	1.36
4	1.81
5	2.27
10	4.54
20	9.07
30	13.61
40	18.14
50	22.68
100	45.36
150	68.04
200	90.72
250	113.40
300	136.76
350	158.76
400	181.44
450	204.12
500	226.80
600	272.16

Weight	
Pounds (lb)	Kilograms (kg)
700	317.52
800	362.87
900	408.23
1000	453.59
1100	498.95
1200	544.31
1300	589.67
1400	635.03
1500	680.39
1600	725.75
1700	771.11
1800	816.47
1900	861.83
2000	907.19
2100	952.54
2200	997.90
2300	1043.26
2400	1088.62
2500	1133.98

Units

Conversion Factor millimeter = inch(25.4)

Inch to Millimeter	
Inches (in)	Millimeters (m)
.125	3.18
.250	6.35
.375	9.53
.500	12.70
.625	15.88
.750	19.05
.875	22.23
1	25.4
1.25	31.75
1.5	38.1
2	50.8
2.5	63.5
3	76.2
4	101.6
5	127
6	152.4

Inch to Millimeter	
Inches (in)	Millimeters (m)
8	203.2
10	254
12	304.8
14	355.6
16	406.4
18	457.2
20	508
22	558.8
24	609.6
26	660.4
28	711.2
30	762
32	812.8

Units

Conversion Factor meter = feet(0.305)

Feet to Meters	
Feet (ft)	Meters (m)
0.5	0.15
0.75	0.23
1	0.30
1.25	0.38
1.5	0.46
2	0.61
2.5	0.76
3	0.91
4	1.22
5	1.53
6	1.83
7	2.13
8	2.44
9	2.74
10	3.05
15	4.57
20	6.10
25	7.62

Feet to Meters	
Feet (ft)	Meters (m)
30	9.14
35	10.67
40	12.19
45	13.72
50	15.24
60	18.29
70	21.34
80	24.38
90	27.43
100	30.48

Valve Testing Standards

MSS-SP-61

Seat leakage: The maximum allowable leakage of each seat closure shall be 10ml/hr of liquid or 0.1 standard cu ft/hr of gas per unit of NPS (0.4 ml/hr of liquid or 120 standard ml/hr of gas per unit of DN) under specified test conditions.

Seat leakage test times:
2" and smaller = 15 seconds
2-1/2"-8" = 30 seconds
10" - 18" = 60 seconds
20" and larger = 120 seconds

ANSI FCI 70/2

Class V: 1.1 times cold working pressure allowable leakage, .0005 ml/min of water per inch of port diameter per psi differential

Class VI: 50 psi air or nitrogen, allowable leakage: 2" - 3 bpm*, 6" - 27 bpm*, 8" - 45 bpm*

Allow sufficient time for leakage flow to stabilize and use a suitable measuring device.

API 598

Allowable leakage shall be in accordance with the following table:
<2" leakage liquid "0 (b)" - gas test "0 (b)" 15 seconds
2-1/2" - 6" leakage liquid 12dpm* (a) gas test 24 bpm* 60 seconds
8" - 12" leakage liquid 20 dpm** (a) gas test 40 bpm* 120 seconds
<14" leakage liquid 28 dpm** (a) gas tst 56 bpm* 120 seconds
1 millimeter is considered equivalent to 16 dpm
There shall be no leakage for the specified test duration

*bpm = bubbles per minute
**dpm = drops per minute

ValvTechnologies Testing Standard

Hydrostatic shell test 1.5 times cold working pressure for three minutes equals **ZERO** Leakage

Hydrostatic seat test 1.1 times cold working pressure for three minutes equals **ZERO** Leakage

Low pressure gas test, 50 psig for three minutes equals **ZERO** Leakage

ASME/ANSI class 900 and higher gas test at 1000 psig for three minutes equals **ZERO** Leakage

ASME/ANSI class 3500 and higher gas test at 3000 psig for three minutes equals **ZERO** Leakage

100% of Valvtechnologies valves built and shipped go through stringent testing to ensure absolute **ZERO** Leakage

There is not a single test specification that exceeds the Valvtechnologies testing standard

All tests at ValvTechnologies are done at standard pressures, this being as follows:

- A hydrostatic shell test is performed at 1.5 times the cold working pressure
- A hydrostatic seat test is performed at 1.1 times the cold working pressure
- A low pressure air test is performed between 50 and 80 psig. In addition, high pressure valves are gas tested to **ZERO** Leakage

Rocket Applied Metallic (RAM) Coatings

RAM Hardcoatings			
Grade Designation	Composition % by weight	Hardness DHP V300 Rockwell C	M F b
1	88 WC, 12 Co	1050-1250, 70-72	1
10	83 WC, 17 Co	950-1150, 68-71	1
21	86 WC, 10 Co / 4 Cr	1050-1250. 70-72	1
25	73 WC, 20 Ni / 7 Cr	950-1150, 68 - 72	1
26	83 WC, 17 Ni	950-1150, 68-71	1
28	88 WC + 12 HAST C	1000-1200, 70-72	1
31	80 Cr_3C_2, 20 Ni-Cr	850-1000, 66-69	1
40	60 Co, 28 Mo, 9 Cr, 3 Si	500-600, 50-55	2
44	51 Co, 28 Mo, 18 Cr, 3 Si	500-600, 50-55	2
49	65 Co + 28 Cr + 4 1/2 W	600-700, 52-55	1
50	16% Cr, 10Ni, 2 Mo, Bal Fe	343, 35	1
60	57 Ni, 17 Mo, 16 Cr, 6 Fe, 4 W	353, 36	1
62	71 Ni, 20 Cr, 8 Mo, .5 Fe, .4 Mn	301, 30	1
65	100 Ni	200, 19	1
66	79 Ni, 11 Cr, 3 Fe, 4 Si, 2B, .4C	485 45-50	2
67	57 ni, 15 Cr, 17 W, 4 Si, 3B, 4 Fe, 8 C	700 58-63	2

	Metallographic Porosity % by volume	Comparative Attributes max tempetature
	1 max	Outstanding for rubber wear. Good impact and thermal shock resistance.
	1/2 max	Excellent resistance to severe impact of sliding wear.
	1 max	Outstanding for abrasive wear. Superior acidic corrosion resistance.
	1 max	Excellent corrosion & oxidation resistance. Superior wear resistance.
	1 max	Outstanding sliding resistance. Superior corrosion resistance.
	1 max	Outstanding corrosion resistance. Excellent sliding wear resistance.
	1 max	Outstanding oxidation resistance. Excellent sliding wear resistance.
	2	Good rubbing wear resistance. Good corrosion and anit-galling properties.
	2	Good rubbing wear resistance. Good corrosion and anit-galling properties.
	1 max	Good corrosion, medium wear resistance.
	1 max	Superior corrosion resistance.
	1	Ouystanding corrosion resistance.
	1	Outstanding corrosion resistance.
	1 max	Excellent corrosion resistance.
	2	Outstanding corrosion resistance. Good wear resistance.
	2	Outstanding corrosion resistance. Good wear resistance.

Low Pressure – Bore Sizing

Pressure / Bore				
Valve Size	150			
(inches)	FP	RP	STD	FP
½	0.625	0.625	0.625	0.625
¾	0.625	0.625	0.625	0.625
1	1.0625	0.625	0.625	1.0625
1¼	n/a	n/a	0.625	n/a
1½	1.5	1.0625	0.625	1.5
2	2.125	1.5	1.0625	2.125
2½	n/a	n/a	1.0625	n/a
3	3.0625	2.125	n/a	3.0625
4	4.0625	3.0625	n/a	4.0625
6	6.0625	4.0625	n/a	6.0625
8	8.0625	5.125	n/a	8.0625
10	10.063	7.125	n/a	10.063
12	12.063	8.0625	n/a	12.063

300		600		
RP	STD	FP	RP	STD
0.625	0.625	0.625	0.625	0.625
0.625	0.625	0.625	0.625	0.625
0.625	0.625	1.0625	0.625	0.625
n/a	0.625	n/a	n/a	0.625
1.0625	0.625	1.5	1.0625	0.625
1.5	1.0625	2.125	1.5	1.0625
n/a	1.0625	n/a	n/a	1.0625
2.125	n/a	3.0625	2.125	n/a
3.0625	n/a	4.0625	3.0625	n/a
4.0625	n/a	6.0625	4.0625	n/a
6.0625	n/a	8.0625	6.0625	n/a
8.0625	n/a	10.063	8.0625	n/a
10.063	n/a	12.063	10.063	n/a

High Pressure - Bore Sizing

Pressure / Bore				
Valve Size	1500 / 1700 / 2250			
(inches)	FP	RP	STD	FP
½	0.625	n/a	0.625	0.625
¾	0.625	n/a	0.625	0.625
1	0.625	0.625	0.625	0.625
1¼	1.0625	0.625	0.625	0.625
1½	1.0625	0.625	0.625	1.0625
2	1.5	1.0625	1.0625	1.5
2½	2.125	1.5	1.0625	2.125
3	2.125	1.5	1.5	2.125
4	3.5	2.125	1.5	3.5
6	5.125	3.5	n/a	3.5
8	6.0625	5.125	n/a	5.125
10	8.0625	7.125	n/a	7.125
12	10.063	8.0625	n/a	8.0625

2500 / 2700 / 3100			3500 / 4000 / 4500		
	RP	STD	FP	RP	STD
	n/a	0.625	0.625	n/a	0.625
	n/a	0.625	0.625	n/a	0.625
	0.625	0.625	0.625	0.625	0.625
	0.625	0.625	0.625	0.625	0.625
	0.625	0.625	1.0625	0.625	0.625
	1.0625	1.0625	1.5	1.0625	0.625
	1.5	1.0625	1.5	1.0625	1.0625
	1.5	1.5	2.125	1.5	1.0625
	2.125	1.5	2.125	1.5	1.0625
	2.125	n/a	3.5	2.125	n/a
	3.5	n/a	5.125	3.5	n/a
	6.0625	n/a	6.0625	5.125	n/a
	7.125	n/a	7.125	6.0625	n/a

Valve Sizing and Specifications Tools

ValvTechnologies' Interactive Tools is a series of tools placed in software, created to simplify and enhance the process of selling ValvTechnologies valves. They quickly automate complex steps necessary to produce a sales quote. The tools provide accurate product recommendations, specifications and demonstrate the competitive marketing value of ValvTechnologies' products and services.

ValvTechnologies' Interactive Tools software consists of:

- Cost of Ownership for Automated/Manual Valves
- ANSI Pressure & Temperature Calculator
- ANSI Material Selector
- Actuation Selection
- Torque Calculator
- Boiler Codes Classification

Advantages to using the Interactive Tools include:

- No need for manual interpolation. The tools provide detailed calculations based on given values and specifications.
- No need to second guess your calculations. The tools save you time by calculating for you, eliminating easy to make errors.
- The Sales Tools software allows you to quickly save and print customer specific calculations in a well presented uniform format.

Cost of Ownership

The Cost of Ownership tool calculates the total cost of our valves, in comparison to competitive manufactured valves for its service life. Customers are able to see hard-fact monetary and time saving advantages to purchasing a ValvTechnologies valve over a competitor valve.

The cost of preparation, installation and maintenance are all quickly and simply calculated. The Cost of Ownership tool demonstrates the value of ValvTechnologies products. This is a very unique and valuable sales and marketing tool that effectively conveys the unique selling proposition of ValvTechnologies products resulting in lifetime cost savings through maintenance free operation.

Cost and value comparison calculation is based on the following factors:

- Service life (1-4 years)
- Number of valves
- Valve unit cost
- Actuator unit cost (with mtg)
- Actuator installation unit cost (electronic and pneumatic)
- Contractor cost (cost per hour)
- Cost of complete valve installation process: cost per day (based on 2-12 day time period) incurred from time necessary to complete includes:
    - Checkout system
    - Cutout old valve system
    - Cutout insulation
    - Locate new valve
    - Install new valve
    - Heat treat cost per valve (if required)
    - Re-insulate new valve

ANSI Pressure & Temperature Calculator

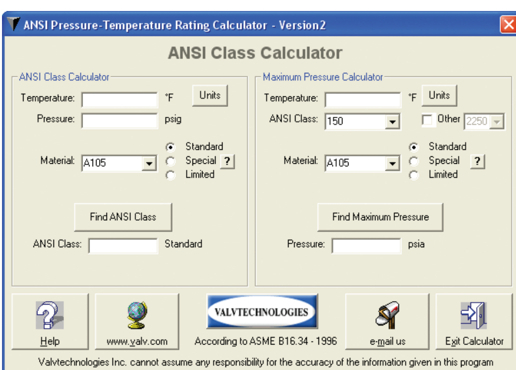
This tool allows you to calculate the ANSI pressure-temperature rating for your application according to ASME B16.34 - 1996.

Pressure/temperature ratings calculation of the four following materials are available in the program:

- Carbon steel, A216-WCB (C-Si)
- Low alloy steel, A182-F22 (2-1/4% Cr, 1% Mo)
- High alloy steel, A182-F91 (9% Cr, >1% Mo) with improved stability at high temperature compared to A182-F9
- Stainless steel, A182-316H (16% Cr, 2% Ni, 2% Mo)

Two features are available in the program:

- You can enter a pressure, temperature and material in order to calculate the corresponding ANSI rating;
- Or you can enter a temperature, ANSI rating and material in order to calculate the corresponding pressure. With this feature, you can also use a non-standard value for ANSI class by checking the other box and typing desired ANSI class in the adjacent textbox (note: only available between 1500 and 4500).



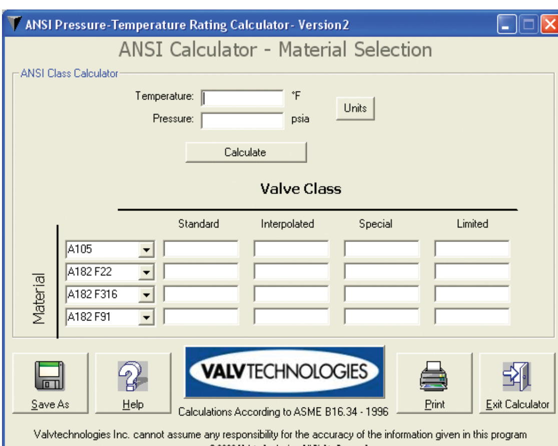
ANSI Material Selector

This module helps you finding the most appropriate material and valve class for your application. Calculations according to ASME B16.34 - 1996.

The calculation procedure is the following:

- Enter your pressure and temperature in the corresponding textbox
- Press calculate

The table will display the ANSI class for each material and valve class. If the calculations cannot be performed for a given material and valve class combination, the corresponding label will appear in red. Two types of errors can occur. Either the input temperature is too high (800°F for carbon steel, 1200°F for F22 and F91, 1500°F for stainless steel) or the pressure entered is higher than the maximum pressure for 4500 ANSI rating. (in that case, the message "> 4500# !" will appear).

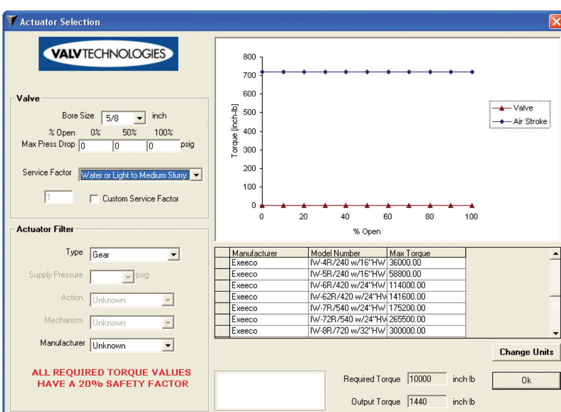


Actuator Selection

The actuator selection procedure follows:

- Enter the valve bore size
- Enter the pressure differences at 0%, 50% and 100% in the input information frame
- Change the service factor by selecting one

If none of the service factors are suitable then you may enter a custom factor. The calculated torque is displayed as the output torque. A list of actuators for these condition is also presented. You may limit the list even further by using the actuator filter. If you are selecting an actuator for a sizing then the “Ok” button in the lower right corner is replaced with a “Select” and “Cancel” button. You may choose an actuator and click on “Select”; you will be returned to the sizing. (Note: You cannot change the bore size when selecting an actuator for a sizing.)

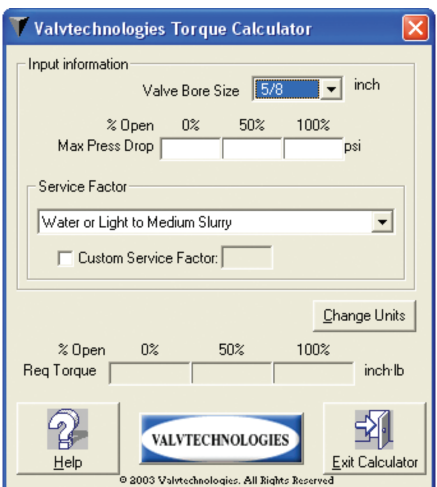


Torque Calculator

The torque calculation procedure follows:

- Enter the valve bore size and pressure difference in the input information frame
- Change the service factor by pressing the service factor tab on the form

If none is checked, a standard service factor is used for calculation. The calculated torque is displayed as required valve torque. A valve service factor of 1.2 has been applied. A valve service factor is normally applied to basic torque. The service factor will vary depending on the service media, but will usually vary in the range of 1.2-2.0.

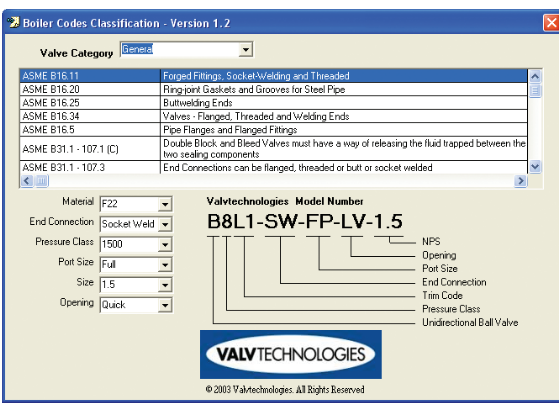


Boiler Codes Classification

The boiler codes classification selection process follows:

- Enter the valve catagory if known; default of general
- Change the material, connection type, pressure class, port size, size and opening drop down menus to fit your requirements

The ValvTechnologies model number instantly displays. There are a number of codes, standards, laws and regulations covering boilers and related equipment that should be considered when designing a system. Regulatory requirements are dictated by a variety of sources and are all focused primarily on safety.



Industry & Application Acronyms

Commonly Used Acronyms

Acronym	Translation
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
BTU	British Thermal Unit
Cv	Valve Flow Coefficient
DCS	Distributive Control System
ERV	Electronic Relief Valve
ESD	Emergency Shutdown
FCCU	Fluidized Catalytic Cracking Unit
FP	Full Port
GWe	Gigawatt Electric
GWh	Gigawatt Hour
HIPPS	High Integrity Pressure Protection System
HPAL	High Pressure Acid Leach
HRSG	Heat Recovery Steam Generator
HVOF	High Velocity Oxygen Fuel
I/P	Current to Pneumatic Transducer
MW	Megawatt
NACE	National Association of Corrosion Engineers
OTSG	Once-Through Steam Generator
PLC	Programmable Logic Controller
PSG	Parallel Slide Gate
PSIG	Pound-Force per Square Inch Gauge
PTO	Power Take-Off
PWHT	Postweld Heat Treatment
RAM	Rocket Applied Metallic

ACTUATOR: A device that mechanically operates a valve closure member by means of air, electricity or hydraulics.

AIR SET: Also supply pressure regulator. A device used to reduce plant air supply to valve positioners and other control equipment. Common reduced supply pressures are 20 and 35 psig.

AIR-TO-CLOSE: The increase in air pressure to the actuator required to cause the valve to close. This is another way of saying the valve is fail open or Normally Open.

AIR-TO-OPEN: The increase in air pressure to the actuator required to cause the valve to open. This is another way of saying the valve is fail closed or Normally Closed.

ANTI-CAVITATION TRIM: A special trim used in control valves to stage the pressure drop through the valve. This will either prevent cavitation from occurring or direct bubbles formed to the center of the flow stream, away from the valve body and trim. Usually accomplished by causing the fluid to travel along a torturous path or through successively smaller orifices or a combination of both.

ATTEMPERATOR: A device used to reduce and control the temperature of superheated steam.

BALL VALVE: A round type of disc with fluid pathway(s) inside which can be rotated to direct flow between certain bores. A valve ball is typically used for severe duty, high-pressure, high-tolerance applications and is made of stainless steel, titanium, Stellite, Hastelloy, brass, or nickel. They can also be made of different types of plastic, such as ABS, PVC, PP or PVDF.

BELLEVILLE SPRING: A washer with a slight conical shape. This gives the washer a spring characteristic. Belleville washers are typically used as springs, or to apply a pre-load or flexible quality to a bolted joint. Many valves have a spring for spring-loading, to normally shift the disc into some position by default but allow control to reposition the disc. Relief valves commonly use a spring to keep the valve shut, but allow excessive pressure to force the valve open against the spring-loading. Typical spring materials include carbon steel (often cad plated), 304 Series stainless steels and for high temperature applications Inconel X750. Also called a cupped spring washer.

BLOWDOWN: 1) Connection in an evaporator for removing accumulations of solids, sludge and scum by partial draining during operation or continuously bleeding liquid from the bottom of a boiler, evaporator, vaporizer or kettle-type reboiler. 2) With boilers, the process of discharging a significant portion of the aqueous solution to remove accumulated salts, deposits and other impurities.

BONNET: A bonnet acts as a cover on the valve body. It is commonly semi-permanently screwed into the valve body. During valve manufacturing, the internal parts are put into the body, then the bonnet is attached to hold everything together inside. To access internal parts of a valve, a user would take off the bonnet, usually for maintenance.

BODY: The body of the valve is the main pressure boundary. It provides the pipe connecting ends and the fluid flow passageway. It can also support the seating surface and the valve closure member.

BOILER: A device for generating steam for power, processing or heating purposes. Or a device that generates hot water for heating purposes or hot water supply. Heat from an external combustion source is transmitted to a fluid contained within tubes found in the boiler shell. This fluid is delivered to an end user at a desired pressure, temperature and quality.

BORE: Integral to the valve body are passages that allow flow into and out of the valve. These passages are called bores. The bore is obstructed or opened up by the valve member or disc to control the fluid flow. Valves with two or three ports are the most common, while valves with multiple ports (up to 20) are used in special applications. Nearly all valves are built with some means of connection at the ports.

BUBBLE TIGHT: A commonly used term to describe the ability of a control valve or regulator to shut off completely against any pressure on any fluid. Unfortunately it is completely unrealistic. Control valves are tested to ANSI B16.104 and FCI70-2-1976 which is the American National Standard for Control Valve Seat Leakage. This standard uses 6 different classifications to describe the valves seat leakage capabilities. The most stringent of the class is Class VI which allows a number of bubbles per minute leakage, depending on the port size of the valve. The correct response to the question “Will that valve go “Bubble Tight”? is to say this valve is tested to meet Class VI shutoff requirements.

CAVITATION: Occurs only in liquid service. In its simplest terms cavitation is the two stage process of vaporization. It is simply the boiling of a liquid which is also known as flashing. In a control valve, this vaporization takes place because the pressure of the liquid is lowered, instead of the more common occurrence where the temperature is raised. As fluid passes through a valve just downstream of the orifice area, there is an increase in velocity or kind of energy that is accompanied by a substantial decrease in pressure or potential energy. This occurs in an area called the vena contracta. If the pressure in this area falls below the vapor pressure of the following fluid, vaporization (boiling) occurs. Vapor bubbles then continue downstream where the velocity of the fluid begins to slow and the pressure in the fluid recovers. The vapor bubbles then collapse or implode. Cavitation can cause a Choked Flow condition to occur and can cause mechanical damage to valves and piping.

CHOKED FLOW: Also known as critical flow. This condition exists when at a fixed upstream pressure; the flow cannot be further increased by lowering the downstream pressure. This condition can occur in gas, steam or liquid services. Fluids flow through valve because of a difference in pressure between the inlet (P1) and outlet of the valve. This pressure difference (Delta-P) or pressure drop is essential to moving the fluid. Flow is proportional to the square root of the pressure drop. This means the higher the pressure drop is, the more fluid can be moved through the valve. If the inlet pressure to a valve remains constant, then the differential pressure can only be increased by lowering the outlet pressure. For gases and steam, which are compressible fluids, the maximum velocity of the fluid through the valve is limited by the velocity of the propagation of a pressure wave which travels at the speed of sound in the fluid. If the pressure drop is sufficiently high, the velocity in the flow stream at the vena contracta will reach the velocity of sound. Further decrease in the outlet pressure will not be felt upstream because the pressure wave can only travel at sonic velocity and the signal will never translate upstream. Choked flow can also occur in the liquids but only if the fluid is a flashing or cavitation condition. The vapor bubbles block or choke the flow and prevent the valve from passing more flow by lowering the outlet pressure to increase the pressure drop. A good Rule of Thumb on Gases and Steam service is that if the pressure drop across the valve equals or exceeds one half the absolute inlet pressure, then there is a good chance for a choked flow condition. Note: The style of valve (that is whether it is a high recovery or a low recovery style) will also have an effect on the point at which a choked flow condition will occur.

Example: P1 = 100psig
P2 = 25psig
Delta P = 75
P1 (ABS) = 100 + 14.7 or 114.7
½ of 114.7 = 57.35
Actual pressure drop = 75
Choked flow is probable

CLOSURE MEMBER: The movable part of the valve that is positioned in the flow path to modify the rate of flow through the valve. Some of the different types of closure members are the Ball, Disk, Gate and Plug.

COEFFICIENT FLOW: A constant (Cv) that is used to predict the flow rate thorough a valve. It is related to the geometry of the valve at a given valve opening. See Cv.

COGEN: A facility that produces steam for distinctly different purposes. Usually the primary purpose of this facility is to produce steam for process related needs. A secondary use for the steam produced at this facility is to generate power.

COMBINED CYCLE: An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas turbines. The exiting heat is then routed to a conventional boiler or to a heat recovery steam generator (HRSG) for use by a steam turbine in the production of electricity. This process increases the efficiency of the electric generating unit. Combined-cycle retrofits were a popular way of increasing efficiencies in older facilities.

COMBUSTION TURBINE: An internal combustion engine which is fueled by liquid or gaseous fuel to generate mechanical energy through a rotating shaft, which drives an electric generator or other piece of equipment. In simple cycle use, the turbine mixes compressed air with natural gas or oil then burns the mixture, expanding the gases. The expanded gases then pass through the turbine blades. Combustion turbines are also used in combined cycle by adding a heat recovery steam generator to the system.

COMPRESSOR: A pump or other type of machine using a turbine to compress a gas by reducing the volume.

CONDENSER: A device that cools low-grade steam discharged from a turbine generator back to water so it can be reheated in a boiler or HRSG to produce more steam for the electric generator process.

CONDENSER COOLING WATER: A source of water external to a boiler's feed system is passed through the steam leaving the turbine in order to cool and condense the steam. This reduces the steam's exit pressure and recaptures its heat. The heat is then used to preheat fluid entering the boiler, thereby increasing the plant's thermodynamic efficiency.

CONTINUOUS VENT: Connection and collection device in the shell of a closed feedwater heater for continuously collecting and removing non-condensibles from the extraction steam. Continuous vents should be capable of passing at least 0.5 percent of the steam to prevent non-condensibles from accumulating, thereby causing capacity loss and corrosion. They should be bypassed during start-up to allow for rapid purging of inerts.

CONTROL VALVE: Also known as the final control element. A power operated device used to modify the fluid flow rate in a process control system. It usually consists of a body or valve and an actuator, which responds to a signal from the controlling system and changes the position of a flow controlling element in the valve.

CONTROL VALVE GAIN: The relationship between valve travel and the flow rate through the valve. It is described by means of a curve on a graph expressed as an installed or inherent characteristic.

COOLING SYSTEM: An equipment system that provides water to the condensers and includes water intakes and outlets, cooling towers, ponds, pumps, valves and pipes.

CRITICAL FLOW: See Choked Flow.

Cv: The valve flow coefficient is the number of US. gallons per minute of 60°F water that will flow through a valve at a specified opening with a pressure drop of 1 psi across the valve.

DEAERATION: Removal of non-condensible gases from water. Delta-P: Differential Pressure. The inlet pressure (P1) minus the outlet pressure (P2).

Example:
P1 = 100psig
P2 = 25psig
Delta-P = 75

DESUPERHEATING ZONE: That part of a closed feedwater heater's outlet tube that is reserved for transferring sensible heat to feedwater from superheated extraction steam.

DIFFERENTIAL PRESSURE: The drop in pressure across an object, such as a valve. The difference between the pressure entering the valve minus the pressure leaving the valve.

DISC: Inside the valve body, flow through the valve may be partly or fully blocked by an object called a disc or valve member. Although valve discs of some kinds of valves are traditionally disc-shaped, discs can come in various shapes. Although the valve body remains stationary within the fluid system, the disc in the valve is movable so it can control flow. A round type of disc with fluid pathway(s) inside which can be rotated to direct flow between certain ports is usually called a ball.

DISTILLATION UNIT: A device or vessel in which one or more feed streams are separated into two or more exit streams, each exit stream having component concentrations different from those in the feed streams. The separation is achieved by the redistribution of the components between the liquid and the vapor phases by vaporization and condensation as they approach equilibrium within the distillation unit. The distillation unit includes the distillate receiver, reboiler, and any associated vacuum pump or steam jet.

DOUBLE BLOCK AND BLEED: Two block valves connected in series with a bleed valve or line that can vent the line between the two block valves.

DUAL FIRED UNIT: A generating unit that can produce electricity using two or more input fuels. In some of these units, only the primary fuel can be used continuously. The alternate fuel can be used as a start-up fuel or in emergencies.

DUAL SEATING: A valve is said to have dual seating when it uses a resilient or composition material such as TFE, Kel-F, or Buna-N, etc. as its primary seal and a metal-to-metal seat as a secondary seal. The idea is that the primary seal will provide tight shut off Class VI. If it is damaged, the secondary seal will backup the primary seal with Class IV shut-off.

ECONOMIZER: 1) A set of tubes in a steam generator through which boiler feedwater passes before entering the main boiler drum. An economizer boosts boiler efficiency by raising the temperature of the water to slightly less than the temperature of the water in the boiler. 2) Heat exchange device to increase feedwater temperature through heat recovery from gases exiting the boiler.

EFFICIENCY: 1) Ratio of energy input to useful output 2) The gas turbine manufacturer's rated heat rate at peak load in terms of heat input per unit of power output based on the lower heating value of the fuel.

EFFECTIVE AREA: For a diaphragm actuator, the effective area is that part of the diaphragm area effective in producing a stem force. Usually the effective area will change as the valve is stroked - being at a maximum at the start and at a minimum at the end of the travel range. Flat sheet diaphragms are most affected by this. Molded diaphragms will improve the actuator performance and a rolling diaphragm will provide a constant stem force throughout the entire stroke of the valve.

ELECTRONIC ACTUATOR: Also known as an Electro-Mechanical Actuator uses an electrically operated motor driven gear train or screw to position the actuator stem. The actuator may respond to either a digital or analogue electrical signal.

END CONNECTION: The configuration provided to make a pressure tight joint to the pipe carrying the fluid to be controlled. The most common of these connections are threaded, flanged or welded.

ENERGY LOSS: The difference between energy input and output as a result of an energy transfer between points.

EQUAL PERCENTAGE: A term used to describe a type of valve flow characteristic. Equal increments of valve plug travel and the change in flow rate. Travel may be expressed as a constant percent of the flow rate at the time of the change. The change in flow rate observed with respect to travel will be relatively small when the valve plug is near its seat and relatively high when the valve plug is nearly wide open.

FACE-TO-FACE: The distance between the face of the inlet opening and the face of the outlet opening of a valve or fitting. These dimensions are governed by ANSI/SA specifications.

The following uniform face-to-face dimensions apply: (specification valve type)

- ANSI/SA S75.03 Integral flanged globe style control valves
- ANSI/SA S75.04 Flangeless control valves
- ANSI/SA S75.20 Separable flange globe style control valves

FAIL-CLOSED: Or normally closed. Another way of describing an air-to-open actuator. Approximately 80% of all spring return diaphragm operators in the field are of this construction.

FAIL-IN-PLACE: A term used to describe the ability of an actuator to stay at the same percent of travel it was in when it lost its air supply. On spring return actuators this is accomplished by means of a lock up valve. On piston actuators a series of compressed air cylinders must be employed.

FAIL-OPEN: Or normally open. Another way of describing an air-to-close actuator.

FAIL-SAFE: A term used to describe the desired failure positioner of a control valve. It could fail-closed, fail-open, fail-in-place. For a spring return operator to fail-in-place, the use of a lock up valve is usually required.

FATIGUE: The tendency of material to fracture under repetition of a stress less than the ultimate static strength. Fatigue strength, also called endurance limit, refers to the maximum stress, which can be incurred and reduced indefinitely without producing a fracture.

FCCU - Fluidized Catalytic Cracking Unit: An FCCU accepts chains of hydrocarbons and breaks them into smaller ones, creating a more valuable product in a chemical process called cracking.

FEEDBACK SIGNAL: The return signal that results from a measurement of the directly controlled variable. An example would be where a control valve is equipped with a positioner. The return signal is usually a mechanical indication of valve plug stem position fed back into the positioner.

Fl: Also called the pressure recovery factor. A number used to describe the ratio between the pressure recovery after the vena contracta and the pressure drop at the vena contracta. It is a measure of the amount of pressure recovered between the vena contracta and the valve outlet. Some manufacturers' use the term Km to describe the pressure recovery factor. This number will be high (0.9) for a globe style valve with a torturous follow path and lower (0.8 to 0.6) for a rotary style valve with a streamlined flow path. On most rotary products the Fl factor will vary with the degree of opening of the valve closure member. Note: Fl does not equal Km.

FIRE POINT: The minimum temperature at which a flame is sustained.

FLANGELESS: A valve that does not have integral line flanges. This type of valve is sometimes referred to as a wafer style valve. The valve is installed by bolting it between the companion flanges with a set of bolts or studs called line bolting. Care should be taken that strain hardened bolts and nuts are used in lieu of all thread, which can stretch when subjected to temperature cycling.

FLANGELESS BODY: See flangeless for a definition. This type of valve is very economical from a manufacturing and stocking standpoint because a valve that is rated as a 600# ANSI valve can also be used between 150# and 300# ANSI flanges, thus eliminating the need to manufacture three different valve bodies or stock three different valve bodies. The down side is that valves with flangeless bodies are not acceptable in certain applications - particularly in refinery processes.

FLASH POINT: Temperature at which a liquid will give off enough flammable vapor to ignite.

FLASHING: Is the boiling or vaporizing of a liquid. See the definition of cavitation. When the vapor pressure downstream of a control valve is less than the upstream vapor pressure, part of the liquid changes to a vapor and remains as a vapor unless the downstream pressure recovers significantly (in which case cavitation occurs). Flashing will normally cause a choked flow condition to occur. In addition, the vapor bubbles may cause mechanical damage to the valve and piping system.

FLOW CHARACTERISTIC: The relationship between valve capacity and valve travel. It is usually expressed graphically in the form of a curve. Control valves have two types of characteristics inherent and installed. The inherent characteristic is derived from testing the valve with water as the fluid and a constant pressure drop across the valve. When valves are installed into a system with pumps, pipes and fittings, the pressure dropped across the valve will vary with the travel. When the actual flow in a system is plotted against valve opening, the curve is known as the installed flow characteristic. Valves can be characterized by shaping the plugs, orifices, or cages to produce a particular curve. Valves are characterized in order to try to alter the valve gain. Valve gain is the flow change divided by the control signal change. This is done in an effort to compensate for nonlinearities in the control loop.

GAIN: The relationship of input to output. If the full range of the input is equal to the full range of the output, then the gain is 1. Gain is another way to describe the sensitivity of a device.

GIGAWATT: A common measurement of electricity. One gigawatt = 1 billion watts or 1 million kilowatts or 1 thousand megawatts. GWe = gigawatt electric I GWh = Gigawatt hour.

HANDWHEEL: A manual override device used to stroke a valve or limit its travel. The handwheel is sometimes referred to as a hand jack. It may be top mounted, side mounted, in yoke mounted or shaft mounted and de-clutchable.

HARD FACING: A material that is harder than the surface to which it is applied. It is normally used to resist fluid erosion or to reduce the change of galling between moving parts. Hard facing may be applied by fusion welding, diffusion, or spray coating the material. Alloy #6 or Stellite is a common material used for this purpose.

HARDNESS: A property of metals that is discussed frequently when speaking of various component parts used in valve construction, particularly valve trim. There are two hardness scales which are commonly used, Rockwell & Brinell.

Hardness comparison
Rockwell Brinell
316 SST 76B 137
17-4 PH 34-38C 352
Hardened Inconel X-750 38-42C 401
#8 Stellite (Alloy 6) 40-44C 415
Chrome plating 59-67C 725

Note: 316 SST is on the Rockwell B scale which means it is a much softer material than the others shown.

HEAT CAPACITY: Measured in joules per Kelvin, it is the quantity of heat needed to raise the temperature of a body one degree. Once called thermal capacity.

HEAT EXCHANGER: Transfers heat from one fluid to another without the Ruids coming into contact. Used to regulate fluid temperature or to use heat that would otherwise be wasted.

HEAT RATE: Measure of generating station thermal efficiency generally expressed in BTUs (British Thermal Units) per net kilowatt-hour.

HEAT RECOVERY STEAM GENERATOR - HRSG: A boiler attached to the exhaust of a combustion turbine to recover heat from the exhaust and converted into steam.

HIGH RECOVERY VALVE: A valve design that dissipates relatively little flow stream energy due to streamlined internal contours and minimal flow turbulence. Therefore, pressure down stretch of the valve vena contracta recovers to a high percentage of its inlet value. These types of valves are identifiable by their straight-through flow paths. Examples are most rotary control valves, such as the eccentric plug, butterfly and ball valve.

HYSTERESIS: The difference between up scale and down scale results in instrument response when subjected to the same input approached from the opposite direction. Example: A control valve has a stroke of 1.0 inch and we give the valve a 9 psig signal. The valve travels 0.500 of an inch. We then give the valve a 12 psig signal, and the valve travels to 0.750 an inch. When the valve is then given a 9 psig signal, the stroke is measured at 0.501. That represents hysteresis. Hysteresis can be caused by a multitude of variables, packing friction, loose linkage, pressure drop, etc. If someone asks you what the hysteresis of your control valve is, it is a bum question because hysteresis is more aptly applied to an instrument than to a control valve. There are simply too many variables in the valve and the system to answer the question properly. The control valve only responds to the controller signal and will move to a position to satisfy the controller - thus negating the effects of hysteresis.

INCIPIENT CAVITATION: Is a term used to describe the early stages of cavitation. At this point the bubbles are small and the noise is more of a hiss, like the sound of frying bacon. There is normally no mechanical damage associated with incipient cavitation although it could have an effect on the corrosive properties of some fluids.

INHERENT FLOW CHARACTERISTIC: It is the relationship between valve capacity and valve travel and is usually expressed graphically. It is derived from testing a valve with water as the fluid and with a constant pressure drop across the valve. The most common types of inherent flow characteristics are linear, equal percentage, modified parabolic and quick opening.

INSTALLED FLOW CHARACTERISTIC: The flow characteristic when the pressure drop across the valve varies with flow and related conditions in the system in which the valve is installed. The purpose of characterizing a control valve is to help compensate for non-linearities in the control loop.

INSTRUMENT PRESSURE: The output pressure from an automatic controller used to operate a control valve. It is the input signal to the valve.

INTEGRAL VALVE: A valve body whose flange connection is an integral or cast part of the body. Valves with integral flanges were traditionally known to have the ANSI short face-to-face dimension ANSI /ISA S75.03. However, many manufacturers now produce valve bodies with both integral and separable flanges that meet both the ANSI short and long face-to-face dimensions.

INTEGRAL SEAT: The flow control orifice and seat that is an integral part of the valve body or cage. The seat is machined directly out of the valve body and is normally not replaceable without replacing the body itself - although some can be repaired by welding and re-machining.

INTERMEDIATE RATED VALVES: A welding or threaded valve may be assigned an intermediate pressure-temperature rating or Class, either Standard or Special, by using the interpolation method described in ASME/ANSI standard B.16.34.

I/P: An abbreviation for current to pneumatic signal conversion. This term is commonly used to describe a type of transducer that converts an electric (4 -20 ma) input signal to a pneumatic (3 - 15 psig.) output signal.

LAPPED-IN: A term that describes a procedure used to reduce the leakage rate on metal-to-metal seated valves and regulators. The plug and seat are lapped together with the aid of an abrasive compound in effort to establish a better seating surface than would normally be achieved by means of machining.

LIFE CYCLE COSTS - LCC: Total costs incurred over the life of a plant or piece of equipment; including operations, maintenance, spare parts as well as initial capital costs.

LEAKAGE CLASSIFICATION: A term used to describe certain standardized testing procedures for control valves with a flow coefficient greater than 0.1 (C). These procedures are outlined in ANSI Standard 815.104-1976, which gives specific tests and tolerances for six seat leakage classifications. These tests are used to establish uniform acceptance standards for manufacturing quality and are not meant to be used to estimate leakage under actual working conditions. Nor should anyone expect these leakage rates to be maintained after a valve is placed in service. There is no standard test for self contained regulation at this time. Note: You will see many instances where regulators are specified using the above criteria.

LEAK OFF: A term used to describe a threaded connection located on the bonnet of a valve that allows for the detection of leakage of the process fluid past the packing area.

LIMITED CLASS VALVES: Weld- or thread-end valves in sizes 2-1/2" and smaller may be designated Limited Class Valves (if not above Class 2500 for Threaded and 4500 for socket-weld end). Note: Limited class ratings shall not be used for flanged-end valves.

LINEAR FLOW CHARACTERISTIC: A characteristic where flow capacity or (c) increases linearly with valve travel. Flow is directly proportional to valve travel. This is the preferred valve characteristic for a control valve that is being used with a distributive control system (DCS) or programmable logic controller (PLC).

LOADING PRESSURE: The pressure used to position a pneumatic actuator. It is the pressure that is actually applied to the actuator diaphragm or piston. It may be the instrument pressure if a valve positioner is not used or is by passed.

LOCK-UP VALVE: A special type of regulator installed between the valve positioner and valve actuator is used to sense the supply air pressure. If that pressure fails below a certain level, it locks or traps the air loaded into the actuator causing the valve to fail-in-place.

LOW RECOVERY VALVE: A valve design that dissipates a considerable amount of flow stream energy due to turbulence created by the contours of the flow path. Consequently, pressure downstream of the valve vena contracta recovers to a lesser percentage of its inlet value than a valve with a more streamlined flow path. The conventional globe style control valve is in this category.

MAIN FUEL VALVE: The valve controlling fuel input to a burner.

MAIN STOP VALVE: The valve connected to the boiler allowing steam to exit the boiler.

MEGAWATT - MW: One million watts. Mwe = one million watts of electric capacity / MWh = one million watt hours.

MODIFIED PARABOLIC: A flow characteristic that lies somewhere between linear and equal percent. It provides fine throttling at low flow capacity and an approximately linear characteristic at higher flow capacities.

NACE: An abbreviation for the National Association of Corrosion Engineers.

NET AVAILABLE CAPACITY: The gross available capacity less than the unit capability used for that unit's station service or auxiliary loads.

NET HEATING VALUE: The amount of heat generated by combustion of hydrocarbons including water vapor.

NO-LOAD LOSS: Power and energy lost by an electric system when not operating under demand.

NORMALLY CLOSED: See Air-to-Open.

NORMALLY OPEN: See Air-to-Close.

ONCE-THROUGH COOLING: A power plant circulating water system which takes water from a single source and pumps it through a condenser, thereby cooling the hot condenser water.

OPEN-ENDED VALVE OR LINE: Any valve, except safety relief valves, having one side of the valve seat in contact with process fluid and one side open to the atmosphere, either directly or through open piping.

OPERATING AVAILABILITY FACTOR: The percentage of time a unit is available for service, whether operated or not.

OPERATING OR WORKING TEMPERATURE: The temperature that will be maintained in the metal of the part of the vessel being considered for the specified operation of the vessel.

OPERATING PRESSURE: 1) The pressure for which a side of a unit is thermally designed and rated. 2) The pressure at the top of a pressure vessel at which it normally operates.

OUTAGE: The period of time when a generating unit, transmission line, or other facility is out of service.

OUTPUT: The amount of power or energy produced by a generating unit, station or system.

PACKING: A sealing system that normally consists of a deformable material such as TFE, graphite, asbestos, etc. It is usually in the form of solid or split rings (contained in a packing box) that are compressed so as to provide an effective pressure seal.

PACKING FOLLOWER: A part that transfers a mechanical load to the packing from the packing flange or nut.

PARTICULATE: A fine grained particle(s) small enough to be suspended in a gas or liquid but large enough to be filtered out.

PEAK DEMAND: The maximum load during a specified period of time.

PEAK LOAD STATION: A generating station which, because of its cost, is normally operated only to provide power during maximum load periods.

PEAKING FACILITY: A power plant that is used only when electricity demand is at its highest point or peak.

PISTON ACTUATOR: A fluid powered normally pneumatic device in which fluid acts upon a movable cylindrical member, the piston, to provide linear motion to the actuator stem. These units are spring- or air-opposed and operate at higher supply pressure than a spring return actuator.

PLANNED OUTAGE: The removal of a unit from service to perform work on specific components. The removal is scheduled well in advance and is of a predetermined duration.

PLANT EFFICIENCY: The total energy content percentage of a power plant's fuel that is actually converted into electricity.

PORT: See Bore.

POSITION SWITCH: A switch linked to the valve stem to detect a single, pre-set valve stem position. Example: full-open or full-closed. The switch may be pneumatic, hydraulic, or electric.

POSITION TRANSMITTER: A device that is mechanically connected to the valve stem to generate and transmit either a pneumatic or electric signal that represents the valve stem position.

POSITIONER: A device used to position a valve with regard to a signal. The positioner compares the input signal with a mechanical feed back link from the actuator. It then produces the force necessary to move the actuator output until the mechanical output position feedback corresponds with the pneumatic signal value. Positioners can also be used to modify the action of the valve (reverse acting positioner), alter the stroke or controller input signal (split range positioner), increase the pressure to the valve actuator (amplifying positioner), or alter the control valve flow characteristic (characterized positioner).

POST GUIDE: A guiding system where the valve stem is larger in the area that comes into contact with the guide bushings than in the adjacent stem area.

POSTWELD HEAT TREATMENT - PWHT: Heating a piece of equipment to a sufficient temperature to relieve the residual stresses resulting from mechanical treatment and welding.

PRESSURE: Force exerted over an area.

PRESSURE RELIEF VALVE: A valve which relieves pressure beyond a specified limit and recloses upon return to normal operating conditions.

PUMP: A mechanical device used to increase fluid pressure or move fluids.

QUICK OPENING: A flow characteristic that provides maximum change in flow rate at low travels. The curve is basically linear through the first 40% of travel. It then flattens out indicating little increase in flow rate as travel approaches the wide open position. This decrease occurs when the valve plug travel equals the flow area of the port. This normally happens when the valve characteristics is used for on/off control.

QUICK SIZING: Refers to a sizing process that does not have a project associated with it and cannot be saved.

RAM COATING: RAM is an abbreviation for Rocket Applied Metallic and is a trademark of Alloy Carbide Company. RAM coatings are cermet (ceramic-metal) coatings applied by HVOF (High Velocity Oxygen Fuel) process in order to extend the lifetime of critical valve parts (usually the seats and the ball). Both ball and seat are RAM coated using a hydrogen fuel system. These coatings are far more wear resistant and handle much higher temperatures than cobalt-based alloys. RAM 31 (Rocket Applied Metallic - a high-velocity, hydro-fuel process) coating is mate-lapped to the ball and seat providing a zero leakage metal seal at all differential pressures. RAM 31 is harder than most (if not all particulates) in a steam line including all ferrites and magnetite. Extremely hard surfaces prevent any wear, scratching or galling. There must be absolutely no degradation to the sealing faces. Degradation results in leakage.

RANGEABILITY: The range over which a control valve can control. It is the ratio of the maximum to minimum controllable flow coefficients. This is also called turndown, although technically, it is not the same thing. There are two types of rangeablility - Inherent and installed inherent rangeablility is a property of the valve alone and may be defined as the range of flow coefficients between which the gain of the valve does not deviate from a specified gain by some stated tolerance limit. Installed rangeablility is the range within which the deviation from a desired installed characteristic does not exceed some state tolerance limit.

REGENERATOR: A heat exchanger that transfers heat from a turbine's exhaust gases to the compressed air stream.

REHEATER: A combustor located between two turbine stages to increase the temperature of the working fluid and the power available from it.

RELIABLITY: A measure of how well equipment will operate without failure.

RELIEF VALVE: A valve which opens at a designated pressure and bleeds a system in order to prevent a buildup of excessive pressure.

SAFETY SHUT-OFF VALVE: A valve that is automatically closed by the safety control system or by an emergency device to completely shut off the fuel supply to the burner.

SEATING TORQUE: A value depicting the turning force required to set a valve into in closed position.

SEAT LOAD: The contact force between the seat and the valve plug. When an actuator is selected for a given control valve, it must be able to generate enough force to overcome static, stem and dynamic unbalance with an allowance made for seat load.

SEAT RING: A part of the flow passageway that is used in conjunction with the closure member to modify the rate of flow through the valve.

SELF CONTAINED REGULATOR: A valve with a positioning actuator using a self generated power signal for moving the closure member relative to the valve port or ports in response and in proportion to the changes in energy of the controlled variable. The force necessary to position the closure member is derived from the fluid flowing through the valve.

SHUTDOWN VALVE: An automatic valve used to isolate a component in a system.

SOFT SEATED: A term used to describe valve trim with an elastomeric or plastic material used either in the valve plug or seat ring to provide tight shutoff with a minimal amount of actuator force. A soft seated valve will usually provide CLASS VI seat leakage capability.

SPRING RATE: A term usually applied to self contained regulators describing the range of set point adjustment available for a particular range spring.

STANDARD CLASS VALVES: All valves following the ASME standard B16.34 (except section 8) shall be designated standard class.

START-UP: The procedure used in starting a power plant's prime mover and supporting auxiliaries.

STEAM GENERATOR: A large "radiator" where heat from the primary loop is transferred to the secondary steam loop without mixing of the two streams of water.

STEAM TURBINE: A rotary engine with a series of curved vanes on a central rotating spindle, or shaft, powered by steam.

STELLITE: Also called #6 Stellite or Alloy 6. A material used in valve trim known for its hardness, wear and corrosion resistance. Stellite is available as a casting, barstock material and may be applied to a softer material such as 316 stainless steel by means of spray coating or welding.

STEM: The valve plug stem is a rod extending through the bonnet assembly. It permits positioning of the plug or closure member. The actuator stem is a rod or shaft which connects to the valve stem and transmits motion or force from the actuator to the valve.

STEM GUIDE: A guide bushing closely fitted to the valve stem and aligned with the seat. Good stem guiding is essential to minimizing packing leakage.

STRESS RELIEF: The heating of a substance to a specific temperature to relieve any residual stress.

SUPPLY PRESSURE: The pressure at the supply port of a device such as a controller, positioner or transducer. Common values of control valve supply pressure are 20 psig. for a 3-15 psig output and 35 psig for a 6-30 psig output.

THERMAL CAPACITY: The maximum amount of heat that a system can produce.

THERMAL EFFICIENCY: The ratio of the electric power produced by a power plant to the amount of heat produced by the fuel.

THERMAL EXPANSION: The increase in volume of a fluid or length of a solid as a result of a change in temperature.

TORQUE: The measurement of the amount of force required to rotate an object about an axis.

TRANSDUCER: An element or device which receives information in the form of one quantity and coverts it to information in the form of the same or another quantity. See I/P.

TRAVEL: The distance the plug or stem moves in order to go from a full-closed to a full-open position. Also called stroke.

TRIM: Includes all the parts that are in flowing contact with the process fluid except the body, bonnet and body flanges and gaskets. The plug, seats, stem, guides, bushings and cage are some of the parts included in the term trim.

TRUNNION MOUNTING: A style of mounting the disc or ball on the valve shaft or stub shaft with two bushings diametrically opposed.

TURBINE: A machine/motor that consists of a rotating shaft with blades driven by a fluid or steam used to generate rotary mechanical power.

TURNDOWN: A term used to describe the ratio between the minimum and maximum flow conditions seen in a particular system. This term is sometimes incorrectly applied to valves. See Rangeability. Example: If the minimum flow was 10 G.P.M and the maximum flow was 100 G.P.M the turndown would be 10.1.

UNPLANNED OUTAGE HOURS: Sum of all unplanned outages, start-up failures, maintenance outages and the scheduled outage extensions for maintenance.

VALVE: A device which dispense, dissipates, or distributes energy in a system.

VENTING: Discharge into the atmosphere, allowing excessive or unwanted media to escape as planned.

WASTE HEAT BOILER: A boiler that receives all or most of its energy input from the combustible exhaust gases for a separate fuel burning process.

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