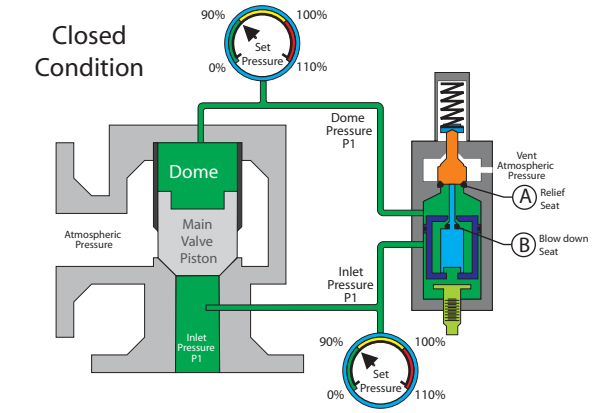
TAYLOR VALVE TECHNOLOGY, INC.

9300-S Pilot Operated Pressure Safety Valves

Operation of a Snap Acting Pilot Operated Safety Valve

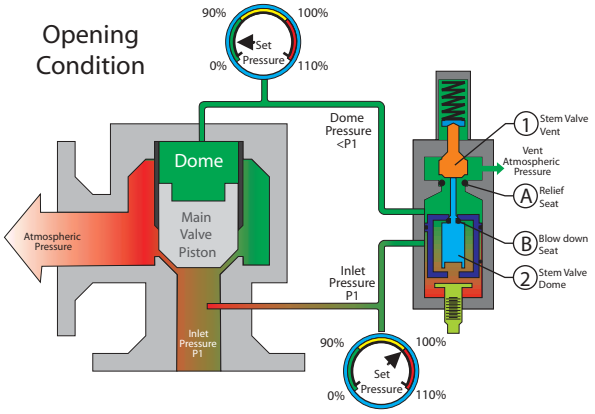
Closed Condition



SYSTEM PRESSURE < SET PRESSURE

System is at an operating pressure condition The seat (B) feeding the dome is open. The seat (A) feeding the vent is closed, the dome is pressurized and the main valve piston is on seat. The valve is in the operational mode closed position.

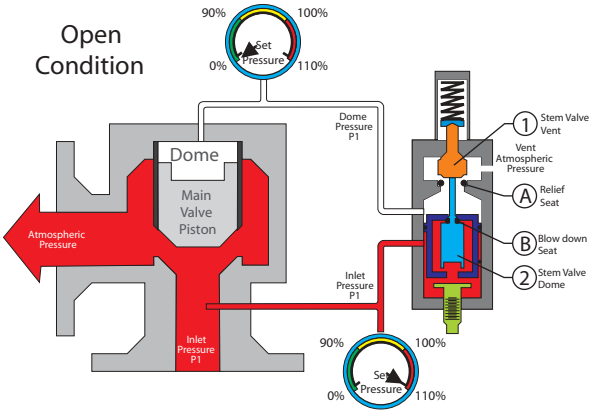
Opening Condition



SYSTEM PRESSURE = SET PRESSURE

System pressure reaches set point. The valve stem (1) opens the vent seat (A) and releases pressure off the dome to atmosphere. The valve stem (2) is pushed on seat (B) by the system pressure, isolating system pressure from the dome and the main valve piston begins to open.

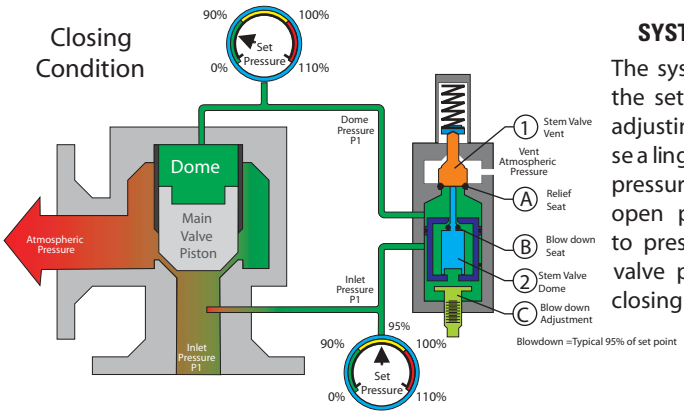
Open Condition



SYSTEM PRESSURE > SET PRESSURE

The valve stem (1) and Seat (A) remain open and the dome is at atmospheric pressure. The valve stem (2) remains closed on seat (B) and the main valve piston is open. System pressure is relieving through main body.

Closing Condition



SYSTEM PRESSURE 95% OF SET PRESSURE

The system pressure is reduced to 95% of the set pressure, Blowdown is set at 5% by adjusting valve (C). Stem (1) closes seat (A) sealing the dome from atmospheric pressure. The valve stem (2) moves to the open position and system pressure begins to pressurize the dome, forcing the main valve piston to go back on seat and closing the relief valve.

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TAYLOR VALVE TECHNOLOGY, INC.

Series 9300 Pilot Operated Safety Valve

Taylor Valve Technology's Series 9300 Snap Acting Safety Valve with the non-flowing pilot provides highly reliable system overpressure protection.

This valve can be used for air, gas, vapor, and most mixed phase services. The 9300 is available with effective orifice areas of 0.128 through 45.664 inch, valve inlet sizes 1-inch through 8-inch, set pressures from 15 to 3750 psig (1 to 260 barg). Continuous service temperatures from -423°F to +500°F (-253°C to +260°C).

(For Modulating Relief Valve see brochure on 9300-M)

Features and Benefits

- **Easily Adjusted.** Adjustable set pressure is accurate and dependable. Adjustable blowdown is external, which reduces time and cost consuming expenditures of valve removal. System downtime is also greatly reduced.

- **Maintenance Cost Is Cut.** With a replaceable soft seat, expensive parts and time consuming lapping of metal seats are no longer necessary.

- **ASME Section VIII Code Stamp.** Used for air, gas and vapor service, the capacity is assured by an independent third party, the ASME National Board Laboratory in Columbus, Ohio.

- **Increased Output of System.** The valve can be set within 5% of system operating pressure allowing the process to be maintained at close tolerance without valve leakage. This results in greater process system output.

- **Dirty Service.** The pilot is a non-flowing design which minimizes the entry of dirt and accumulation of hydrates. Most of the contaminates will be removed in the coalescing filter upstream of the pilot. The cartridge type filter is standard on all Taylor Pilots and finishes the gas before it enters the pilot cavity.

- **Pilot is Mounted Vertically.** Consistent set pressure and blowdown is assured compared to horizontally mounted pilots which are erratic.

- **Orifice Nozzles.** The orifice size may be changed by replacing a single component. There are multiple orifice sizes for each nominal body size.

- **Built-in Field Test Port.** Provides the ability to accurately verify the set pressure with the valve in place

- **Durable, Rugged Mounting of Pilot.** Extra rigid mounting against the body protects the pilot from system vibration.

Standard Features

(1) Patented, proven superior main seat (not a trapped "O" ring).

(2) Primary coalescing filter. Collected liquids drain back through valve inlet.

(3) Shuttle spool valve to select system pressure or test pressure. Sealed at all times (standard shuttle valves seal only at end of stroke).

(4) Secondary 40 micron filter to filter test port fluids and system fluids (no tape dope can clog the pilot).

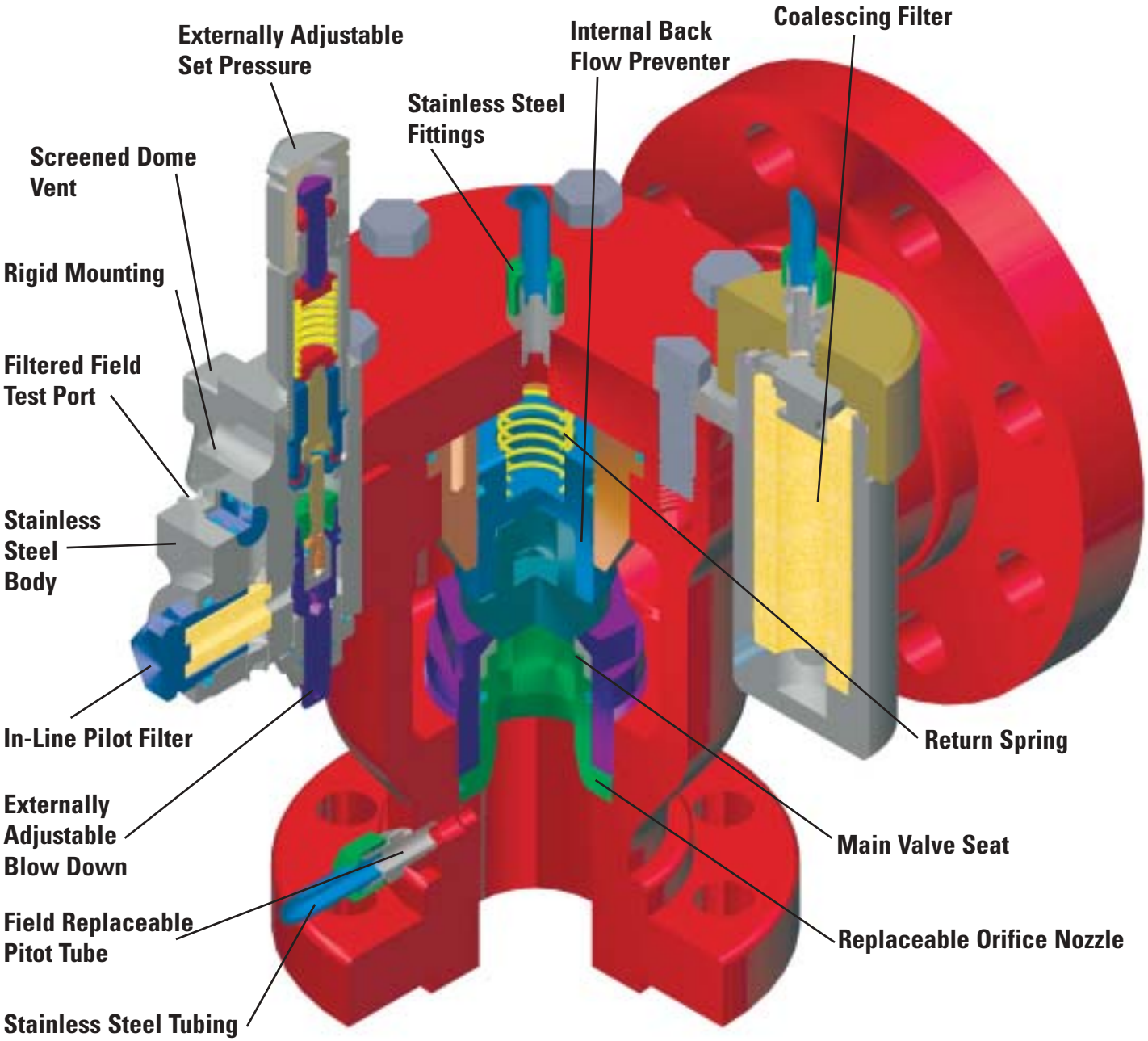
(5) Internal Back Flow Preventer

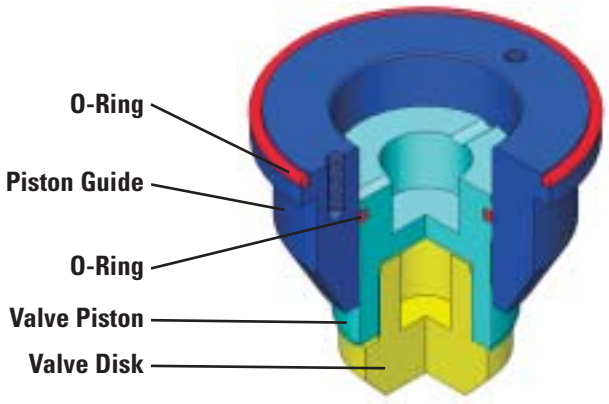
Split Piston prevents reversal of flow direction when outlet pressure exceeds inlet pressure.

(6) Balanced Valve equivalent: set pressure is not affected by back pressure when the control pilot is vented to atmosphere.

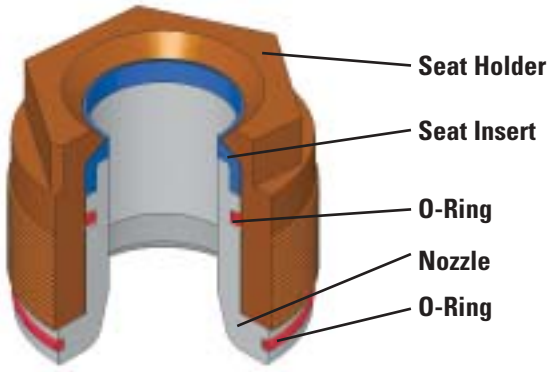
(7) Non-flowing control pilot: Releases only the quantity of gas trapped in the dome and tubing to atmosphere.

Series 9300 Pilot Operated Safety Valve Features





Back Flow Preventer Detail



Seat Assembly Detail

Series 9300 Options

1. Manual Unloader

When the manual unloader is open it vents the dome faster than it can be resupplied by the system pressure, causing the main valve to open.

2. Remote Unloader

The remote unloader, an electrically or pneumatically operated three-way valve which, when opened, vents the dome pressure faster than it can be supplied by the pilot source. This reduces the dome pressure and opens the main valve.

3. Remote Valve Lift Indicator

A differential pressure switch is mounted between the pressure sensing line and the dome. Valve open condition is indicated when the dome pressure is lower than the system pressure.

4. Remote Pressure Sensing

The pilot senses the pressure directly from the protected vessel.

5. Lift Lever on Pilot

For compressed air service and vapor application.

6. Differential Sensing Filter System (DSF)

Senses when the primary filter has become clogged and automatically switches the secondary filter, while giving a visual indication of a clogged filter.

7. Pilot Vent Connected to the Main Valve Outlet

8. Metal to Metal Seat (Main Valve)

For use in very high pressure or temperature applications.

9. Switched Dual Pilots

Dual pilots allow for continuous service when maintenance is required on one pilot without compromising safety, system or production. The gauged 4-way valves insure the "out of service" pilot is depressurized and can be safely maintained.

10. Dual Outlets

4, 6 and 8

Series 9300 Pilot Operated Safety Valve Orifice

API Sizes

API Letter	D	E	F	G	H	J	J	K
Inlet Size	1",1½"	1",1½"	1",1½"	1½",2"	1½", 2"	2"	3"	3"
Outlet Size	2"	2"	2"	3"	3"	3"	4"	4"
Flow Area	0.128	0.212	0.357	0.472	0.913	1.431	1.431	2.138
Bore Diameter	0.404	0.52	0.674	0.775	1.078	1.35	1.35	1.65
Minimum Lift	0.202	0.26	0.337	0.388	0.539	0.675	0.675	0.825
Pressure Range	3750	3750	3570	3750	3750	2000	2000	2000
Rated Coefficent of Discharge (Kd)	0.878	0.878	0.878	0.878	0.878	0.878	0.878	0.878

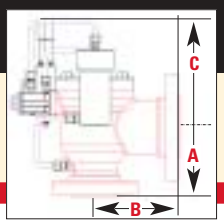
API Sizes

API Letter	L	L	M	N	P	Q	R	T
Inlet Size	3"	4"	4"	4"	4"	6"	6"	8"
Outlet Size	4"	6"	6"	6"	6"	8"	8"	10"
Flow Area	3.205	3.205	4.083	4.909	7.069	12.566	17.721	25.967
Bore Diameter	2.02	2.02	2.28	2.5	3	4	4.75	5.75
Minimum Lift	1.01	1.01	1.14	1.25	1.5	2	2.375	2.875
Pressure Range	2000	2000	2000	2000	1480	1480	1480	1480
Rated Coefficent of Discharge (Kd)	0.878	0.878	0.878	0.878	0.878	0.878	0.878	0.878

Full Bore

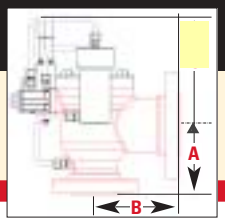
Full Bore Size	1 ½"	2"	3"	4"	6"	8"
Outlet Size	2" - 3"	3"	4"	6"	8"	10"
Flow Area	1.767	2.953	6.605	11.491	26.067	45.664
Bore Diameter	1.5	1.939	2.9	3.825	5.761	7.625
Minimum Lift	0.75	0.97	1.45	1.915	2.88	3.812
Pressure Range	2000	2000	1480	1480	1480	1480
Rated Coefficent of Discharge (Kd)	0.774	0.774	0.774	0.774	0.774	0.774

Orifices and Dimensions



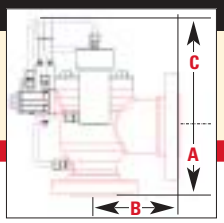
Orifice	Size	Inlet Max Set P psig	Inlet Max Set P barg	Inlet Class ANSI	Outlet Class ANSI	Outlet Max Bp psig	Outlet Max Bp barg	Dimensions A in	Dimensions A cm	Dimensions B in	Dimensions B cm	Dimensions C in	Dimensions C cm	Approx Weight lbs	Approx Weight kgs
D	Inches	290	20.0	150	150	290	20.0	4.12	10.46	4.50	11.43	17.00	43.18	27	12.2
	1 x 2	750	51.7	300	150	290	20.0	4.38	11.13	4.50	11.43	17.00	43.18	28	12.7
	mm	1305	90.0	600	150	290	20.0	4.38	11.13	4.50	11.43	17.00	43.18	29	13.2
ASME Orifice Dia:	25 x 50	2250	155.1	900	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	36	16.3
0.404 in		3080	212.4	1500	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	36	16.3
1.026 cm		3750	258.6	2500	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	39	17.7
ASME Actual Area:		290	20.0	150	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	30	13.6
0.128 in^2	Inches	750	51.7	300	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	33	15.0
0.826 cm^2	1 1/2x 2	1305	90.0	600	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	35	15.9
	mm	2250	155.1	900	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	44	20.0
	40 x 50	3080	212.4	1500	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	45	20.4
		3750	258.6	2500	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	55	24.9
E	Inches	290	20.0	150	150	290	20.0	4.12	10.46	4.50	11.43	17.00	43.18	27	12.2
	1 x 2	750	51.7	300	150	290	20.0	4.38	11.13	4.50	11.43	17.00	43.18	28	12.7
	mm	1305	90.0	600	150	290	20.0	4.38	11.13	4.50	11.43	17.00	43.18	29	13.2
ASME Orifice Dia:	25 x 50	2250	155.1	900	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	36	16.3
0.520 in		3080	212.4	1500	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	36	16.3
1.321 cm		3750	258.6	2500	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	39	17.7
ASME Actual Area:		290	20.0	150	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	30	13.6
0.212 in^2	Inches	750	51.7	300	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	33	15.0
1.368 cm^2	1 1/2x 2	1305	90.0	600	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	35	15.9
	mm	2250	155.1	900	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	44	20.0
	40 x 50	3080	212.4	1500	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	45	20.4
		3750	258.6	2500	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	55	24.9
F	Inches	290	20.0	150	150	290	20.0	4.12	10.46	4.50	11.43	17.00	43.18	27	12.2
	1 x 2	750	51.7	300	150	290	20.0	4.38	11.13	4.50	11.43	17.00	43.18	28	12.7
	mm	1305	90.0	600	150	290	20.0	4.38	11.13	4.50	11.43	17.00	43.18	29	13.2
ASME Orifice Dia:	25 x 50	2250	155.1	900	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	36	16.3
0.674 in		3080	212.4	1500	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	36	16.3
1.712 cm		3750	258.6	2500	300	750	51.7	4.94	12.55	4.75	12.07	21.00	53.34	39	17.7
ASME Actual Area:		290	20.0	150	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	30	13.6
0.357 in^2	Inches	750	51.7	300	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	33	15.0
2.303 cm^2	1 1/2x 2	1305	90.0	600	150	290	20.0	4.87	12.37	4.75	12.07	18.00	45.72	35	15.9
	mm	2250	155.1	900	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	44	20.0
	40 x 50	3080	212.4	1500	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	45	20.4
		3750	258.6	2500	300	750	51.7	5.87	14.91	5.50	13.97	22.00	55.88	55	24.9
G	Inches	290	20.0	150	150	290	20.0	5.12	13.00	4.87	12.37	19.00	48.26	39	17.7
	1 1/2x 3	750	51.7	300	150	290	20.0	5.12	13.00	4.87	12.37	19.00	48.26	43	19.5
	mm	1305	90.0	600	150	290	20.0	5.12	13.00	4.87	12.37	19.00	48.26	44	20.0
ASME Orifice Dia:	40 x 80	2250	155.1	900	300	750	51.7	6.38	16.21	6.75	17.15	23.00	58.42	48	21.8
0.775 in		3080	212.4	1500	300	750	51.7	6.38	16.21	6.75	17.15	23.00	58.42	49	22.2
1.969 cm		3750	258.6	2500	300	750	51.7	6.38	16.21	6.75	17.15	23.00	58.42	65	29.5
ASME Actual Area:		290	20.0	150	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	50	22.7
0.472 in^2	Inches	750	51.7	300	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	52	23.6
3.045 cm^2	2 x 3	1305	90.0	600	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	54	24.5
	mm	2250	155.1	900	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	78	35.4
	50 x 80	3080	212.4	1500	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	79	35.8
		3750	258.6	2500	300	750	51.7	7.00	16.66	6.75	17.15	23.00	58.42	94	42.6

Orifices and Dimensions



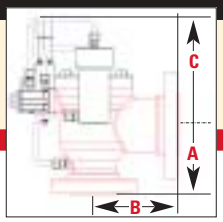
Orifice	Size	Inlet Max Set P psig	Inlet Max Set P barg	Inlet Class ANSI	Outlet Class ANSI	Outlet Max Bp psig	Outlet Max Bp barg	Dimensions A in	Dimensions A cm	Dimensions B in	Dimensions B cm	Dimensions C in	Dimensions C cm	Approx Weight lbs	Approx Weight kgs
H		290	20.0	150	150	290	20.0	5.12	13.00	4.87	12.37	19.00	48.26	39	17.7
	Inches	750	51.7	300	150	290	20.0	5.12	13.00	4.87	12.37	19.00	48.26	43	19.5
	1 1/2x 3	1305	90.0	600	150	290	20.0	5.12	13.00	4.87	12.37	19.00	48.26	44	20.0
	mm	2250	155.1	900	300	750	51.7	6.38	16.21	6.75	17.15	23.00	58.42	48	21.8
ASME Orifice Dia:	**40 x 80**	3080	212.4	1500	300	750	51.7	6.38	16.21	6.75	17.15	23.00	58.42	49	22.2
1.078 in		3750	258.6	2500	300	750	51.7	6.38	16.21	6.75	17.15	23.00	58.42	65	29.5
2.738 cm		290	20.0	150	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	50	22.7
ASME Actual Area:	**Inches**	750	51.7	300	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	52	23.6
0.913 in^2	**2 x 3**	1305	90.0	600	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	54	24.5
5.891 cm^2	**mm**	2250	155.1	900	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	78	35.4
	50 x 80	3080	212.4	1500	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	79	35.8
		3750	258.6	2500	300	750	51.7	7.00	16.66	6.75	17.15	23.00	58.42	94	42.6
J		290	20.0	150	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	50	22.7
	Inches	750	51.7	300	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	52	23.6
	2 x 3	1305	90.0	600	150	290	20.0	5.37	13.64	4.87	12.37	19.00	48.26	54	24.5
	mm	2000	137.9	900	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	78	35.4
ASME Orifice Dia:	**50 x 80**	2000	137.9	1500	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	79	35.8
1.350 in		2000	137.9	2500	300	750	51.7	6.56	16.66	6.75	17.15	23.00	58.42	94	42.6
3.429 cm		290	20.0	150	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	86	39.0
ASME Actual Area:	**Inches**	750	51.7	300	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	92	41.7
1.431 in^2	**3 x 4**	1305	90.0	600	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	93	42.2
9.233 cm^2	**mm**	2000	137.9	900	300	750	51.7	7.50	19.05	7.12	18.08	25.00	63.50	123	55.8
	80 x 100	2000	137.9	1500	300	750	51.7	7.50	19.05	7.12	18.08	25.00	63.50	140	63.5
K		290	20.0	150	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	86	39.0
ASME Orifice Dia:	**Inches**	750	51.7	300	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	92	41.7
1.650 in	**3 x 4**	1305	90.0	600	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	93	42.2
4.191 cm	**mm**	2000	137.9	900	300	750	51.7	7.50	19.05	7.12	18.08	25.00	63.50	123	55.8
ASME Actual Area:	**80 x 100**	2000	137.9	1500	300	750	51.7	7.50	19.05	7.12	18.08	25.00	63.50	140	63.5
2.138 in^2															
13.794 cm^2															
L	**Inches**	290	20.0	150	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	86	39.0
	3 x 4	750	51.7	300	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	92	41.7
	mm	1305	90.0	600	150	290	20.0	6.13	15.57	6.38	16.21	20.00	50.80	93	42.2
ASME Orifice Dia:	**80 x 100**	2000	137.9	900	300	750	51.7	7.50	19.05	7.12	18.08	25.00	63.50	123	55.8
2.020 in		2000	137.9	1500	300	750	51.7	7.50	19.05	7.12	18.08	25.00	63.50	140	63.5
5.131 cm		290	20.0	150	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	142	64.4
ASME Actual Area:	**Inches**	750	51.7	300	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	149	67.6
3.205 in^2	**4 x 6**	1305	90.0	600	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	158	71.7
20.679 cm^2	**mm**	2000	137.9	900	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	229	103.9
	100 x 150	2000	137.9	1500	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	248	112.5
M		290	20.0	150	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	142	64.4
ASME Orifice Dia:	**Inches**	750	51.7	300	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	149	67.6
2.280 in	**4 x 6**	1305	90.0	600	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	158	71.7
5.791 cm	**mm**	2000	137.9	900	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	229	103.9
ASME Actual Area:	**100**	2000	137.9	1500	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	248	112.5
4.083 in^2	**x**														
26.344 cm^2	**150**														

Orifices and Dimensions



Orifice	Size	Inlet			Outlet			Dimensions						Approx Weight	
		Max Set P		Class	Class	Max Bp		A		B		C			
		psig	barg	ANSI	ANSI	psig	barg	In	cm	In	cm	In	cm	lbs	kgs
N		290	20.0	150	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	142	64.4
ASME Orifice Dia:	**Inches**	750	51.7	300	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	149	67.6
2.500 in	**4 x 6**	1305	90.0	600	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	158	71.7
6.350 cm	**mm**	2000	137.9	900	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	229	103.9
ASME Actual Area:	**100**	2000	137.9	1500	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	248	112.5
4.909 in^2	**x**														
31.673 cm^2	**200**														
P		290	20.0	150	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	142	64.4
		750	51.7	300	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	149	67.6
ASME Orifice Dia:	**Inches**	1305	90.0	600	150	290	20.0	7.75	19.69	8.25	20.96	23.00	58.42	158	71.7
3.000 in	**4 x 6**	1480	102.0	600	300	290	20.0	7.75	19.69	9.19	23.34	29.00	73.66	189	85.7
7.620 cm	**mm**	1480	102.0	900	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	229	103.9
ASME Actual Area:	**100**	1480	102.0	1500	300	750	51.7	9.81	24.92	9.19	23.34	29.00	73.66	248	112.5
7.069 in^2	**x**	1480	102.0	1500	600	1500	103.4	9.81	24.92	10.37	26.34	30.00	76.20	265	120.2
45.609 cm^2	**200**														
Q															
ASME Orifice Dia:	**Inches**	290	20.0	150	150	290	20.0	9.44	23.98	9.50	24.13	26.00	66.04	245	111.1
4.000 in	**6 x 8**	750	51.7	300	150	290	20.0	9.44	23.98	9.50	24.13	26.00	66.04	264	120
10.160 cm	**mm**	1330	91.7	600	150	290	20.0	9.70	24.64	9.50	24.13	26.00	66.04	308	139.7
ASME Actual Area:	**150**	1480	102.0	600	300	750	51.7	9.70	24.64	10.44	26.52	29.00	73.66	327	148.3
12.566 in^2	**x**														
81.076 cm^2	**200**														
R															
ASME Orifice Dia:	**Inches**	290	20.0	150	150	290	20.0	9.44	23.98	9.50	24.13	26.00	66.04	245	111.1
4.750 in	**6 x 8**	750	51.7	300	150	290	20.0	9.44	23.98	9.50	24.13	26.00	66.04	264	120
12.065 cm	**mm**	915	63.1	600	150	290	20.0	9.70	24.64	9.50	24.13	26.00	66.04	308	139.7
ASME Actual Area:	**150**	1480	102.0	600	300	750	51.7	9.70	24.64	10.44	26.52	29.00	73.66	327	148.3
17.721 in^2	**x**														
114.336 cm^2	**200**														
T															
ASME Orifice Dia:	**Inches**	290	20.0	150	150	290	20.0	10.88	27.64	11.00	27.94	30.00	76.20		
5.750 in	**8 x 10**	750	51.7	300	150	290	20.0	10.88	27.64	11.00	27.94	30.00	76.20		
14.605 cm	**mm**	900	62.1	600	150	290	20.0	11.68	29.67	11.00	27.94	30.00	76.20		
ASME Actual Area:	**200**	1480	102.0	600	300	750	51.7	11.68	29.67	12.00	30.48	34.00	86.36		
25.967 in^2	**x**														
167.539 cm^2	**250**														

Orifices and Dimensions



Orifice	Size	Inlet			Outlet			Dimensions						Approx Weight	
		Max Set P		Class	Class	Max Bp		A		B		C			
		psig	barg	ANSI	ANSI	psig	barg	In	cm	In	cm	In	cm	lbs	kgs
Full Bore		290	20.0	150	150	290	20.0	4.1	10.5	4.5	11.4	17.0	43.2	27	12.2
1 1/2"		750	51.7	300	150	290	20.0	4.4	11.1	4.5	11.4	17.0	43.2	28	12.7
	1 1/2"	1305	90.0	600	150	290	20.0	4.4	11.1	4.5	11.4	17.0	43.2	29	13.2
	x	2000	137.9	900	300	750	51.7	4.9	12.5	4.8	12.1	21.0	53.3	36	16.3
	2"	2000	137.9	1500	300	750	51.7	4.9	12.5	4.8	12.1	21.0	53.3	36	16.3
		2000	137.9	2500	300	750	51.7	4.9	12.5	4.8	12.1	21.0	53.3	39	17.7
		290	20.0	150	150	290	20.0	4.9	12.4	4.8	12.1	18.0	45.7	30	13.6
ASME Dia Area:		750	51.7	300	150	290	20.0	4.9	12.4	4.8	12.1	18.0	45.7	33	15.0
1.77 in^2	**1 1/2"**	1305	90.0	600	150	290	20.0	4.9	12.4	4.8	12.1	18.0	45.7	35	15.9
11.40 cm^2	**x**	2000	137.9	900	300	750	51.7	5.9	14.9	5.5	14.0	22.0	55.9	44	20.0
	3"	2000	137.9	1500	300	750	51.7	5.9	14.9	5.5	14.0	22.0	55.9	45	20.4
		2000	137.9	2500	300	750	51.7	5.9	14.9	5.5	14.0	22.0	55.9	55	24.9
Full Bore		290	20.0	150	150	290	20.0	5.4	13.6	4.9	12.4	19.0	48.3	50	22.7
2"		750	51.7	300	150	290	20.0	5.4	13.6	4.9	12.4	19.0	48.3	52	23.6
	2"	1305	90.0	600	150	290	20.0	5.4	13.6	4.9	12.4	19.0	48.3	54	24.5
ASME Dia Area:	**x**	2000	137.9	900	300	750	51.7	6.6	16.7	6.8	17.1	23.0	58.4	78	35.4
2.95 in^2	**3"**	2000	137.9	1500	300	750	51.7	6.6	16.7	6.8	17.1	23.0	58.4	79	35.8
19.05 cm^2		2000	137.9	2500	300	750	51.7	6.6	16.7	6.8	17.1	23.0	58.4	94	42.6
Full Bore		290	20.0	150	150	290	20.0	6.1	15.6	6.4	16.2	20.0	50.8	86	39.0
3"	**3"**	750	51.7	300	150	290	20.0	6.1	15.6	6.4	16.2	20.0	50.8	92	41.7
ASME Dia Area:	**x**	1305	90.0	600	150	290	20.0	6.1	15.6	6.4	16.2	20.0	50.8	93	42.2
6.61 in^2	**4"**	1480	102.0	900	300	750	51.7	7.5	19.1	7.1	18.1	25.0	63.5	123	55.8
42.62 cm^2		1480	102.0	1500	300	750	51.7	7.5	19.1	7.1	18.1	25.0	63.5	140	63.5
Full Bore		290	20.0	150	150	290	20.0	7.8	19.7	8.3	21.0	23.0	58.4	142	64.4
4"		750	51.7	300	150	290	20.0	7.8	19.7	8.3	21.0	23.0	58.4	149	67.6
	4"	1305	90.0	600	150	290	20.0	7.8	19.7	8.3	21.0	23.0	58.4	158	71.7
ASME Dia Area:	**x**	1480	102.0	600	300	290	20.0	7.8	19.7	9.2	23.3	29.0	73.7	189	85.7
11.49 in^2	**6"**	1480	102.0	900	300	750	51.7	9.8	24.9	9.2	23.3	29.0	73.7	229	103.9
74.14 cm^2		1480	102.0	1500	300	750	51.7	9.8	24.9	9.2	23.3	29.0	73.7	248	112.5
		1480	102.0	1500	600	1480	102.0	9.8	24.9	10.4	26.3	30.0	76.2	265	120.2
Full Bore		290	20.0	150	150	290	20.0	9.4	24.0	9.5	24.1	26.0	66.0	245	111.1
6"	**6"**	750	51.7	300	150	290	20.0	9.4	24.0	9.5	24.1	26.0	66.0	264	120
ASME Dia Area:	**x**	1330	91.7	600	150	290	20.0	9.7	24.6	9.5	24.1	26.0	66.0	308	139.7
26.07 in^2	**8"**	1480	102.0	600	300	750	51.7	9.7	24.6	10.4	26.5	29.0	73.7	327	148.3
168.18 cm^2															
Full Bore		290	20.0	150	150	290	20.0	10.9	27.6	11.0	27.9	30.0	76.2		
8"	**8"**	750	51.7	300	150	290	20.0	10.9	27.6	11.0	27.9	30.0	76.2		
ASME Dia Area:	**x**	1330	91.7	600	150	290	20.0	11.7	29.7	11.0	27.9	30.0	76.2		
45.66 in^2	**10"**	1480	102.0	600	300	750	51.7	11.7	29.7	12.0	30.5	34.0	86.4		
294.62 cm^2															

How to Size a Valve

Valves are selected on the basis of their ability to meet an expected relieving condition, flowing a sufficient amount of fluid to prevent excessive pressure increase. This means that the size of the valve orifice must be calculated taking the required flow, performance characteristics, lading fluid properties, and other factors into consideration.

The sizing procedure presented utilizes the recommended practice of API 520 Part 1. The valve orifice areas and nozzle discharge coefficients shown are effective values in that they are not specific to a particular valve type. **The use of these effective orifice areas and effective nozzle discharge coefficients will always allow for the selection of a valve orifice area that will meet or exceed the required capacity.**

The calculation of the actual valve capacity required can be performed with the Taylor Valve Technology sizing software program. Contact sales for sizing discs.

To select the minimum required orifice area that will flow the required capacity of the system you wish to protect, please refer to the following information which appears in this section:

1. Sizing Formulas
2. Correction Factors
3. Valve Flow Coefficients

Sizing Formulas

Gas Flow

English Units	Metric Units
$A = \frac{W\sqrt{TZ}}{CK_dP_1K_b\sqrt{M}}$	$A = \frac{13160\,W\sqrt{TZ}}{CK_dP_1K_b\sqrt{M}}$
or	
$A = \frac{V\sqrt{MTZ}}{6.32\,CK_dP_1K_b}$	$A = \frac{35250\,V\sqrt{TZM}}{C\,K_dP_1K_b}$

Formula Symbols

Symbol	Description	English Units	Metric Units
A	Calculated Orifice Area	in^2	mm^2
V	Required Capacity, Volume	SCFM	Nm^3/min
G	Specific Gravity	–	–
M	Molecular Weight (M=29 x specific gravity)	–	–
T	Relief Temperature (˚R =˚F+ 460˚; ˚K = ˚C + 273˚)	˚R	˚K
Z	Compressibility Factor (if unknown, assume Z=1.0)	–	–
k	Ratio of Specific heats ($k=\frac{C_p}{C_v}$)	–	–
C	Gas Constant (if unknown, assume C = 315)	–	–
K_d	Effective Nozzle Coefficient for 90% of Actual Capacity	–	–
P	Set Pressure	psig	barg
P_1	Inlet Flowing Pressure (P_1 = P + Allowable Overpressure - Inlet Pressure Loss + Atmospheric Pressure)	psia	KPAa
P_2	Outlet Flowing Pressure	psia	KPAa
K_b	Backpressure factor	–	-
W	Required Capacity, Mass	Lbs/Hr	Kg/Hr

Values of M, k and C for Representative Gases & Vapors

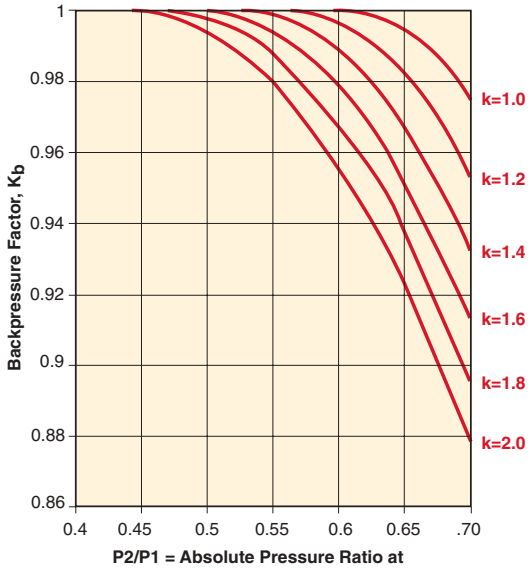
Gas or Vapor	M Molecular Weight	k Specific Heat Ratio	C Gas Constant
Acetylene (C_2H_2)	26	1.26	343
Air	29	1.40	356
Ammonia (NH_3)	17	1.31	348
Argon (Ar)	40	1.67	378
Benzene (C_6H_6)	78	1.12	329
Butadiene (C_4H_6)	54	1.12	329
Carbon Dioxide (CO_2)	44	1.28	345
Carbon Monoxide (CO)	28	1.40	356
Ethane (C_2H_6)	30	1.19	336
Ethylene (C_2H_4)	28	1.24	341
Freon 22	86.5	1.18	335
Helium (He)	4	1.66	377
Hexane (C_6H_{14})	86	1.06	322
Hydrogen (H_2)	2	1.41	357
Hydrogen Sulphide (H_2S)	34	1.32	349
Methane (CH_4)	16	1.31	348
Methyl Mercaptan (CH_4S)	48.1	1.20	337
n-Butane (C_4H_{10})	58	1.09	326
Natural Gas (SF=0.60)	17.4	1.27	344
Nitrogen (N_2)	28	1.40	356
Oxygen (O_2)	32	1.40	356
Pentane (C_5H_{12})	72	1.97	323
Propane (C_3H_8)	44	1.13	330
Propylene (C_3H_6)	42	1.15	332
Propylene Oxide (C_3H_6O)	58.1	1.21	338
Steam	18	1.31	348
Sulphur Dioxide (SO_2)	64	1.29	346
VCM (C_3H_3Cl)	62.5	1.18	335

Gas Constant, C

k	C
1.00	315
1.02	318
1.04	320
1.06	322
1.08	324
1.10	327
1.12	329
1.14	331
1.16	333
1.18	335
1.20	337
1.22	339
1.24	341
1.26	343
1.28	345
1.30	347
1.32	349
1.34	351
1.36	352
1.38	354
1.40	356
1.42	358
1.44	359
1.46	361
1.48	363
1.50	364

Gas Constant, C

k	C
1.52	366
1.54	368
1.56	369
1.58	371
1.60	372
1.62	374
1.64	376
1.66	377
1.68	379
1.70	380
1.72	382
1.74	383
1.76	384
1.78	386
1.80	387
1.82	388
1.84	390
1.86	391
1.88	392
1.90	394
1.92	395
1.94	397
1.96	398
1.98	399
2.00	400
2.02	401



K_b = Backpressure correction factor

k = Ratio of Specific heats

Note: These curves represent a conservative backpressure correction factor which can be applied to all orifice and valve sizes.

Inlet Flange Ratings

Maximum Pressure Rating, psig [barg]

Flange Class	Material	Temperature, ˚F [˚C] -423 to -21 [-253 to -30]	-20 to 100 [-29 to 38]	200 [93]	300 [149]	400 [205]	500 [260]
150#	CS[1]	—	285 [19.7]	260 [17.9]	230 [15.9]	200 [13.8]	170 [11.7]
	SS[2]	275 [19.0]	275 [19.0]	240 [16.6]	215 [14.8]	195 [13.5]	170 [11.7]
300#	CS	—	740 [51.0]	675 [46.6]	655 [45.2]	635 [43.8]	600 [41.4]
	SS	720 [49.6]	720 [49.7]	620 [42.8]	560 [38.6]	515 [35.5]	480 [33.1]
600#	CS	—	1480 [102.1]	1350 [93.1]	1315 [90.7]	1270 [87.6]	1200 [82.8]
	SS	1440 [99.3]	1440 [99.3]	1240 [85.5]	1120 [77.2]	1030 [71.0]	955 [65.9]
900#	CS	—	2220 [153.1]	2025 [139.6]	1970 [135.8]	1900 [131.0]	1795 [123.8]
	SS	2160 [149.0]	2160 [149.0]	1860 [128.3]	1680 [115.8]	1540 [106.2]	1435 [99.0]
1500#	CS	—	3705 [255.5]	3375 [232.7]	3280 [226.2]	3170 [218.6]	2995 [206.6]
	SS	3600 [248.2]	3600 [248.2]	3095 [213.4]	2795 [192.7]	2570 [177.2]	2390 [164.8]
2500#	CS	—	6170 [425.4]	5625 [387.8]	5470 [377.2]	5280 [364.1]	4990 [344.1]
	SS	6000 [413.7]	6000 [413.7]	5160 [355.8]	4660 [321.3]	4280 [295.1]	3980 [274.5]

Notes

1. CS: A216, Grade WCB
2. SS: A351, Grade CF8M

Resilient Seal Rating

Material	Continuous Process Temperature, ˚F [˚C] Minimum	Maximum Pilot	Minimum Pressure, psig [barg] Main	Pilot	Maximum Pressure, psig [barg] Main	Pilot
BUNA-N	-65 [-54]	+275 [135]	15 [1.03]	15 [1.03]	3750 [425.5]	3750 [425.5]
Fluorocarbon	-20 [-29]	+400 [205]	15 [1.03]	15 [1.03]	3750 [425.5]	3750 [425.5]
Ethylene Propylene	-65 [-54]	+325 [163]	15 [1.03]	15 [1.03]	3750 [425.5]	3750 [425.5]
PFTE	-423 [-253]	+500 [205]	15 [1.03]	50 [3.45]	1480 [102.1]	1480 [102.1]
PEEK	-423 [-253]	+515 [268]	156 [10.8]	—	740 [51.0]	—

How to Order a Valve

Once the required orifice area has been determined, please refer to the following information to specify and order the size of valve suited for application.

Note: To ensure proper delivery and expedite processing, please include the model number, description and any additional information requested below in all specifications, purchase requisitions, and orders, as applicable.

Model Number

To obtain the model number, use the Valve Model Numbering chart supplied on pages 13 and 14.

Special Requirements

Specify the details of any special processes, tests or inspection procedures required during valve manufacturing.

These might include special quality assurance, material traceability, non-standard plating and surface finishes, non-destructive test requirements, etc. Include required levels of inspection and the organization performing the inspection, if any.

Note: Special requirements will impact price and delivery. Specify any special accessories listed in our options.

Documentation

Documentation, drawings, MTR's, etc., are furnished for ordered products when requested.

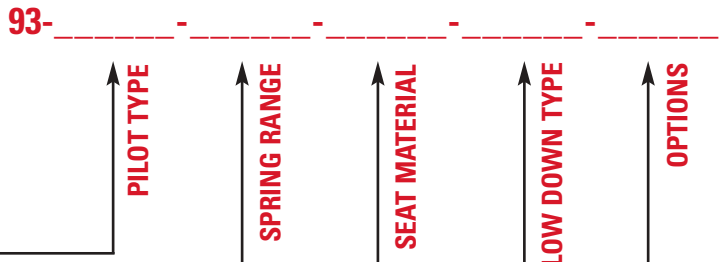
Packing for Shipment

All products are packaged for normal domestic shipment from point of assembly or stocking. Special packaging requirements, such as export crating, should be specified in your purchase order and are at additional cost.

9300 Series Pilot Valve Model Numbering

Determining the Model Number

Example given: Standard Model 93-S-05-1-0-0 — Model number represents a snap action pilot valve with fluorocarbon seals set at 150 psi.



PILOT TYPE
S = SNAP
M = MODULATING
E = ELECTRIC

SPRING RANGE
00 = 15 - 24
01 = 25 - 34
02 = 35 - 52
03 = 53 - 80
04 = 81 - 120
05 = 121 - 182
06 = 183 - 275
07 = 276 - 410
08 = 411 - 615
09 = 616 - 920
10 = 921 - 1150
11 = 1151 - 1480
12 = 1481 - 2160
13 = 2161 - 3240
14 = 3241 - 3750

SEAT MATERIAL
1 = FLUOROCARBON
2 = TFPE
3 = PC BUNA
4 = EDPM
X = OTHER

BLOW DOWN TYPE
0 = NONE
1 = MANUAL
2 = REMOTE
3 = LIFT LEVER

OPTIONS
0 = NONE
1 = DIFFERENTIAL SENSING FILTER
2 = REMOTE PRESSURE SENSOR
3 = PRESSURE SNUBBER
4 = TEST GAG
5 = BACKFLOW PREVENTOR FOR FULL BORE
6 = REMOTE VALVE LIFT INDICATOR
8 = PILOT VENT CONNECTED TO MAIN VALVE OUTLET
9 = DUAL PILOT VALVES

9300 Series Main Valve Model Numbering

Determining the Model Number

Example given: Standard Model 93-E-1-1-1-0-1-1-0 — Model number represents 1" 150 lb. by 2" 150 lb. raised faced flange, carbon steel body, "E" orifice, fluorocarbon seals in a standard service.

93-___-___-___-___-___-___-___-___-___

ORIFICE | INLET OUTLET SIZE | INLET CLASS | OUTLET CLASS | FLANGE TYPE | BODY MATERIAL | SEAT MATERIAL | SERVICE

ORIFICE

D	L
E	M
F	N
G	P
H	Q
J	R
K	T
FB	

INLET OUTLET SIZE

1 = 1" X 2"
2 = 1 1/2" X 2"
3 = 1 1/2" X 3"
4 = 2" X 3"
5 = 3" X 4"
6 = 4" X 6"
7 = 4" X 6" X 6"
8 = 6" X 8"
9 = 6" X 8" X 8"
10 = 8" X 10"
11 = 8" X 10" X 10"
12 = LARGER CONNECTIONS SEE FACTORY

INLET CLASS

1 = 150 LB.
2 = 300 LB.
3 = 600 LB.
4 = 900 LB.
5 = 1500 LB.
6 = 2500 LB.

OUTLET CLASS

1 = 150 LB.
2 = 300 LB.
3 = 600 LB.

FLANGE TYPE

0 = RF X RF
1 = RF X RTJ
2 = RTJ X RF
3 = RTJ X RTJ
4 = OTHER

BODY MATERIAL

1 = CARBON STEEL
2 = STAINLESS STEEL
3 = OTHER

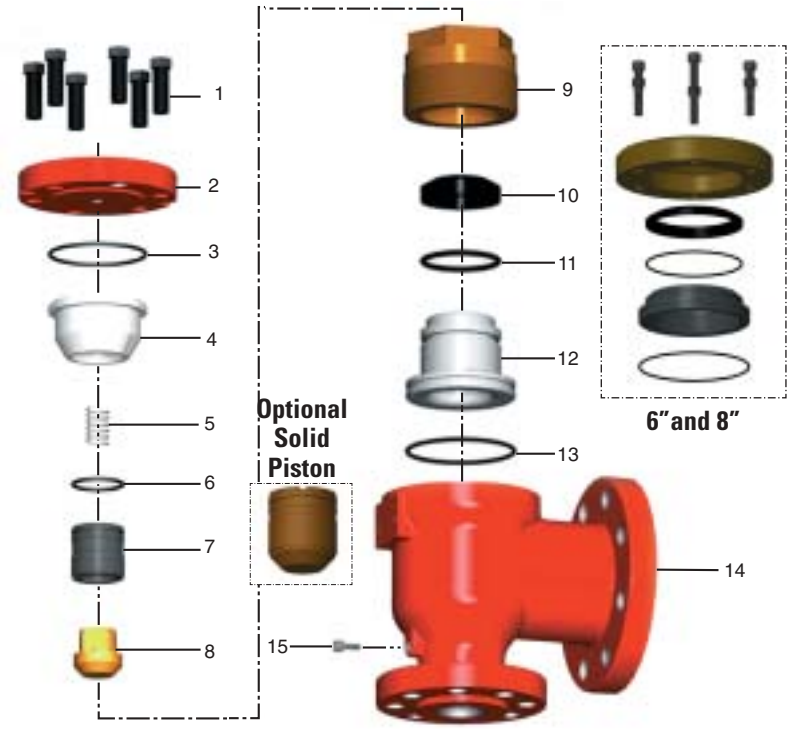
SEAT MATERIAL

1 = FLUOROCARBON
2 = TFPE
3 = PC BUNA
4 = EPDM
5 = PEEK
X = OTHER

SERVICE

0 = STANDARD
4 = NACE

Pilot Main Valve Exploded & Cutaway for API Orifice



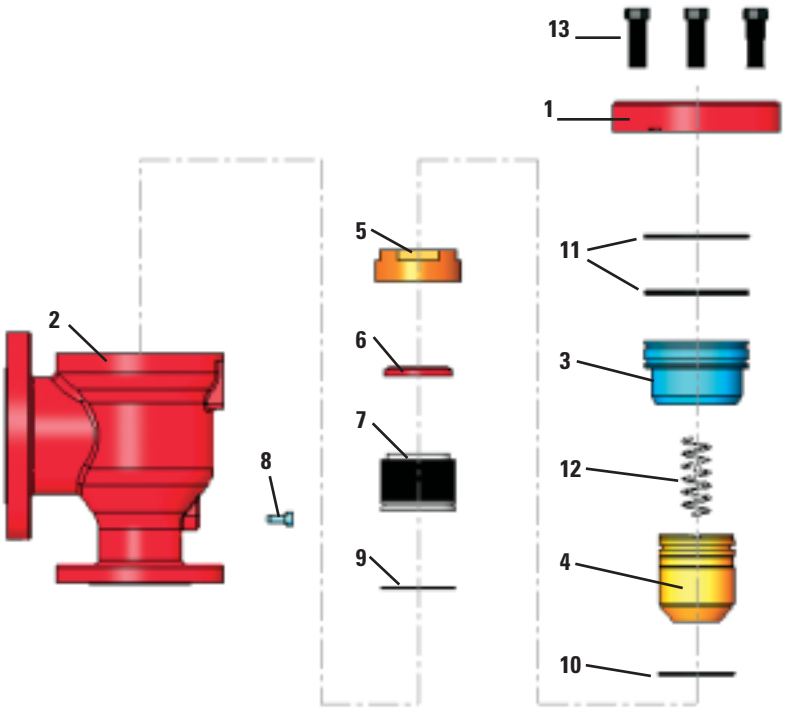
Part #	Qty	Description	Standard Materials	Optional Materials
01	6	Bolts	CS	
02	1	Valve Bonnet	CS	
03	1	O-Ring	FC	++
04	1	Piston Guide	SS	316 SS
05	1	Spring	302 SS	316 SS
06	1	O-Ring	FC	++
07	1	Valve Piston	316 SS	T6 Alum
08	1	Valve Disc	17-4 PH SS	316 SS
09	1	Seat Holder	17-4 PH SS	316 SS
10	1	Seat Insert	TFPE/FC	++
11	1	O-Ring	FC	++
12	1	Nozzle	316 SS	N/A
13	1	O-Ring	FC	++
14	1	Valve Body	CS	
15	1	Pitot Tube	316 SS	N/A
16*	1	Data Label	316 SS	N/A
17*	2	Drive Screws	18-8 SS	N/A

* Not Shown ++ Based on Application FC = Fluorocarbon
CS = Carbon Steel SS = Stainless Steel

Pilot Main Valve Exploded & Cutaway for Full Bore Orifice

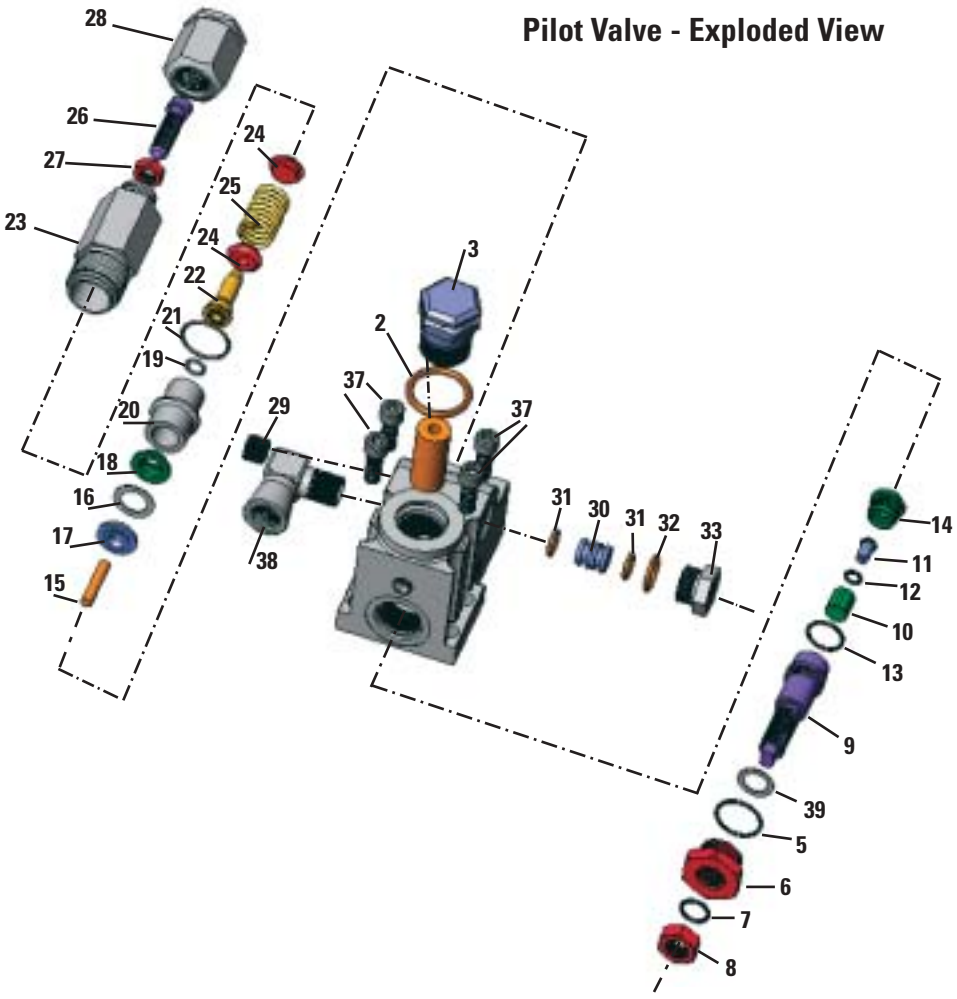
Part #	Qty	Description	Standard Materials	Optional Materials
01	1	Valve Bonnet	CS	
02	1	Valve Body	CS	
03	1	Piston Guide	SS	316 SS
04	1	Valve Piston	316 SS	T6 Alum
05	1	Seat Holder	17-4 PH SS	316 SS
06	1	Seat Insert	TFPE/FC	++
07	1	Nozzle	316 SS	N/A
08	1	Pitot Tube	316 SS	N/A
09	1	2-134 O-Ring	FC	++
10	1	2-224 O-Ring	FC	++
11	2	2-231 O-Ring	FC	++
12	1	Spring	302 SS	316 SS
13	6	Hex Bolt	CS	

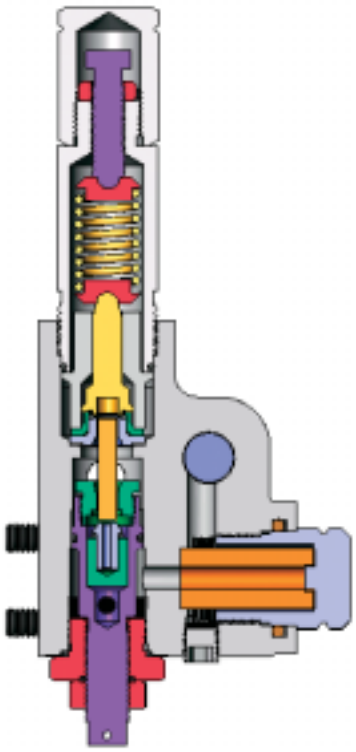
* Not Shown ++ Based on Application FC = Fluorocarbon
CS = Carbon Steel SS = Stainless Steel



Pilot Valve Exploded & Cutaway Views

Pilot Valve - Exploded View





Pilot Valve Cutaway View

Part #	Qty	Description	Materials
01	1	Body	316 SS
02	1	O-Ring	Fluorocarbon
03	1	Filter Cap	316 SS
04	1	Filter	***
05	1	O-Ring	Fluorocarbon
06	1	Seat Adjustment Bushing	316 SS
07	1	O-Ring	Fluorocarbon
08	1	Jam Nut	18-8 SS
09	1	Blowdown Adjust Housing	316 SS
10	1	Reseat Piston	316 SS
11	1	Seat Retainer	316 SS
12	1	O-Ring	Fluorocarbon
13	1	O-Ring	Fluorocarbon
14	1	Seat	316 SS
15	1	Push Rod	316 SS
16	1	Washer	PTFE
17	1	Rod Guide	316 SS
18	1	Guide Retainer	316 SS
19	1	O-Ring	Fluorocarbon

Part #	Qty	Description	Materials
20	1	Spindle Guide	316 SS
21	1	O-Ring	Fluorocarbon
22	1	Spindle	316 SS
23	1	Spring Housing	316 SS
24	2	Spring Keeper	316 SS
25	1	Spring	17-7 SS
26	1	Adjust Screw	316 SS
27	1	Jam Nut	18-8 SS
28	1	Cap	316 SS
29	1	Pipe Plug 1/4 NPT	316 SS
30	1	Shuttle Valve	316 SS
31	2	O-Ring	Fluorocarbon
32	1	O-Ring	Fluorocarbon
33	1	Shuttle Valve Nut	316 SS
34*	1	Lead Seal Wire	3 PLY SS
35*	1	Label	18-8 SS
36*	2	Drive Screws	18-8 SS
37	4	Cap Screws	18-8 SS
38	1	Vent	316 SS
39	1	Shim	316 SS

* Items not shown

Valve Sizing Data Sheet

Page _____ of _____ Sheet No. _____ Requistion No. _____ Job No. _____
Date _____ Revised _____ By _____

General								
1. Item Number								
2. Tag Number								
3. Series Type								
Connections								
4. Size (Inlet / Outlet)								
5. Flange class, ANSI								
6. Type Face								
Materials								
7. Body								
8. Seat / Disk								
9. Seals (Elastomer)								
10. Guide								
11. Spring								
Accessories								
12. Lift Lever (plain / packed)								
Basis of Selection								
13. Code								
14. Fire								
15. Other								
Service Conditions								
16. Fluid / State								
17. Required capacity and units								
18. Molecular weight or specific gravity at flowing temperature								
19. Viscosity at flowing temperature and units								
20. Operating pressure / Set pressure								
21. Backpressure (Constant or Variable)								
22. Backpressure and units								
23. Allowable overpressure and units								
24. Compressibility factor								
25. Ratio of specific heats								
Orifice Area								
26. Calculated and units								
27. Selected and units								
28. Orifice designation								

Comments

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