



Series 29

Conventional / Balanced
Type Pressure Safety Valve



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Conventional/Balanced Type Pressure Safety Valve

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Salient Features:

- ▶ Capacities Certified by National Board
 - ▶ Valve manufactured in compliance to ASME Code
 - ▶ Superior seat tightness available with metal and soft seat design
 - ▶ Maximum corrosion resistance with full 316ss internals
- ▶ Less parts makes it easier for services and spares parts requirement
 - ▶ Available in screwed and flanged connections
 - ▶ Leight weight design



Introduction

Designed to provide customers with the widest selection of sizes, orifice and construction materials, Series 29 meets the exacting demands of the process industry.

Superior Design

- A single design handles air, steam, vapor and liquid services.
- Maximum interchangeability of parts affords easy maintenance and lower costs.
- Fixed blowdown design simplifies testing and repair. Maximum blowdown of 5% to 15% regardless of service.1
- A built-in lift stop ensures stable performance.
- Balanced design in “C” and “D” orifices nullifies the effects of back pressure on set point.

ASME Code Certification

- Manufactured in conformance to Section VIII of the ASME Boiler and Pressure Vessel Code for air, steam, and water service.
- Capacities certified by The National Board of Boiler and Pressure Vessel Inspectors.

Optional O-Ring Seat Design

- O-ring seat design available for maximum seat tightness.

- Teflon® available at higher pressures to provide the same zero bubbles per minute leakage as elastomer O-ring seats.

Comprehensive Product Line

- Set pressures from 15 psig to 6500 psig with orifice areas from 0.068 to 0.573 sq. in.

- Standard valves have MNPT inlet x FNPT outlet. Optional female inlet thread, flanged, socket weld, welding nipple, and sanitary connections available.

Maximum Selection of Materials

- Standard construction includes 316 stainless steel body, trim and spring, with carbon steel bonnet.

Numbering System



Selecting and specifying Bliss pressure relief valves is simple using the numbering system that follows. Each digit of the type number has a distinct significance. The digits describe the basic valve series, orifice, seat design, inlet temperature range, body, bonnet and spring material, inlet type and pressure rating.

29	D	A	2	3	H –	M	2	0	/S4
Series Number	Orifice Area	Seat Construction ⁵	Inlet Size ¹	Outlet Size ¹	Special Variations	Inlet Connections ⁶	Cap Construction	Test Gag ²	Special Materials
29	US Customary Units Sq. In.	A Metal Seat	1 1/2"	3 1"	H High pressure variations of standard types	M MNPT	2 Plain	0 No Gag	S4 Complete 316 St. St.
	C 0.071	C Soft Seat	2 3/4"	4 1-1/2"	B Balanced design ³	F FNPT	4 Packed Lever	1 Test Gag	N1 NACE Trim: Standard
	D 0.129	T Teflon Seat	3 1"	5 2"		1 Flanged-150RF	7 Open Lever		N4 NACE Trim: All St. St.
	E 0.227		4 1-1/2"	6 2-1/2"		2 Flanged-300RF			M1 Monel Body & Disc
	F 0.356					3 Flanged-600RF			M2 Monel Internals
						4 Flanged-900RF			
	Metric mm ²					6 Flanged-2500RF			H1 Hastelloy C Body & Disc
	C 45.80					0 Special			H2 Hastelloy C Internals
	D 83.22					S Socket Weld			H4 Complete Hastelloy C
	E 146.45					T Sanitary Inlet			
	F 229.67								

Ordering Information

Please specify the following so that we may process your order as quickly as possible.

- | | |
|--|---|
| 1. Quantity.* | 8. Operating and relieving temperatures.* |
| 2. Inlet and outlet sizes. | 9. Allowable overpressure.* |
| 3. Bliss type number.* | 10. Fluid and fluid state.* |
| 4. Inlet and outlet connections: MNPT, FNPT, flanged, socket weld, sanitary inlet or welding nipple. | 11. Backpressure, superimposed constant and/or variable, and built-up.* |
| 5. Materials of construction if other than standard. | 12. Required capacity.* |
| 6. O-ring seat pressure seal material, if required. | 13. Accessories: open or packed lever if required; test gag. |
| 7. Set pressure.* | 14. Code requirements, if any. |

*As a customer service, we verify your selection and sizing. In order to do this, we must have this information.

General Notes:

1. Not all combinations of inlet and outlet sizes shown are available. Consult the selection tables of pages 4 and 5.
2. Test gag option is not available with open lever cap.
3. Available in O-ring seat design only. Consult the Bliss factory.
4. Duplex (D4) and Super Duplex (D8) available.
5. Selection of proper soft good material is customer's responsibility.
6. Ring joint and lens joint inlets available on application. Add "/SP" to the standard flanged valve type number.

Warranty

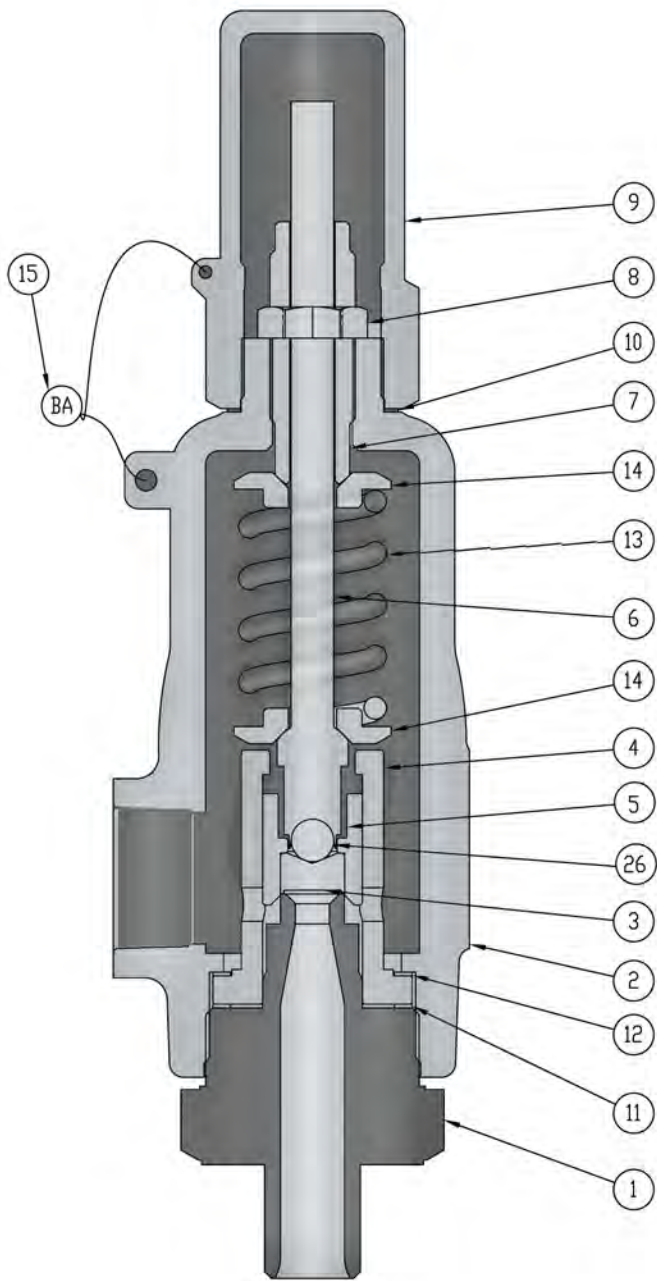
All products manufactured by Bliss are warranted free of defects in material and workmanship when used within the range recommended for a period of one year after installation or eighteen months from delivery. When authorized, any defective product may be returned to the factory and if found defective will be repaired or replaced free of charge, solely at the discretion of Bliss, ex-works our factory. No charge for labor or other expense incurred will be allowed, as the liability of Bliss is measured by the refund price of the defective product only. All warranties are based on

the product being used within the range recommended and does not cover damages or defects due to normal wear and tear, misuse, alteration or neglect. The purchaser shall determine the suitability of the product for use and assumes all risks and liabilities in connection therewith.

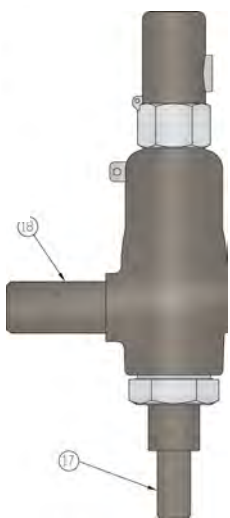
This warranty does not cover the performance of valves tested at site on test equipment that is not to the same technical standard as that used by the manufacturer.



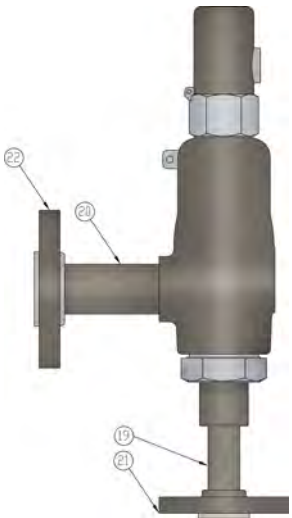
29 Series – Conventional



Bill of Materials – Conventional		
Item	Part Name	Standard Material
1	Body	SA-351 Gr. CF8M St. St. or SA-479 Type 316 St. St.
2	Bonnet	SA-216 Gr. WCB, Carb. St.
3	Disc	316 St. St.
4	Guide	316 St. St.
5	Disc Holder	316 St. St.
6	Stem	316 St. St.
7	Spring Adj. Screw	316 St. St.
8	Jam Nut	316 St. St.
9	Cap, Plain Screwed	Carbon Steel
10	Cap Gasket	316 St. St.
11	Body Gasket	316 St. St.
12	Guide Gasket	316 St. St.
13	Spring	Stainless Steel
14	Spring Buttons	316 St. St.
15	Wire Seal	St. St. Wire / Lead Seal
16	Nameplate (Not Shown)	Stainless Steel
17	Welding Nipple (Inlet)	316 St. St.
18	Welding Nipple (Outlet)	Carbon Steel
19	Lap Joint Stub End (Inlet)	316 St. St.
20	Lap Joint Stub End (Outlet)	Carbon Steel
21	Lap Joint Flange (Inlet)	Carbon Steel
22	Lap Joint Flange (Outlet)	Carbon Steel



Welded End Design
(Optional)



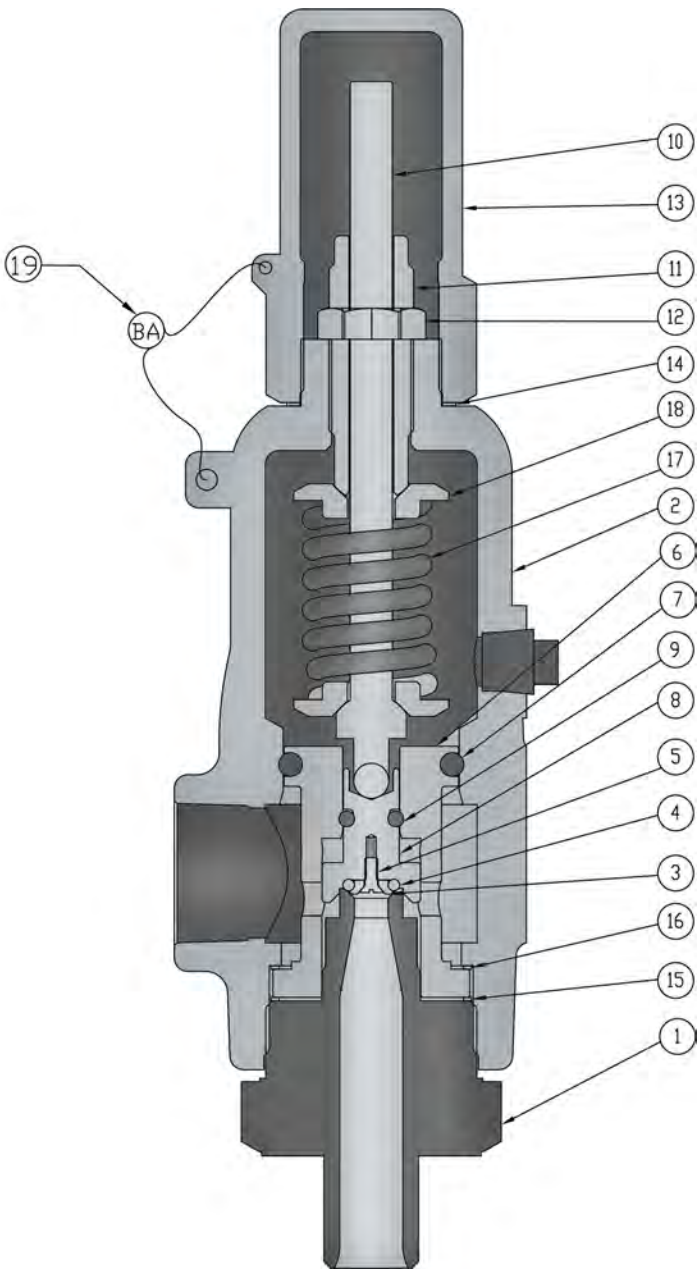
Flanged Design
(Optional)



Complies with ASME Boiler
& Pressure Vessel Code,
Section VIII



29 Series – Balanced Design



Do you have variable back pressure? Can't use a balanced bellows design? Bliss has the solution with the Series 29 Balanced Design pressure relief valve. The balanced effect is achieved by isolating the upper valve chamber and eliminating any back pressure build-up in the bonnet affecting valve set pressure.

These valves are available in 1/2", 3/4" and 1" inlet sizes with a 1" outlet and two orifice areas. Pressure ranges from 15 to 1480 psig, standard soft seat design. Flanged and welded inlet and outlet connections are available with the same material options as the standard design.

Bill of Materials – Balanced Design		
Item	Part Name	Standard Material
1	Body	SA-351 Gr. CF8M St. St. or SA-479 Type 316 St. St.
2	Bonnet	SA-216 Gr. WCB, Carb. St.
3	O-ring Retainer	316 St. St.
4	O-ring Seat Seal	Viton®
5	Retainer Lock Screw	304 St. St.
6	Guide	316 St. St.
7	Guide Seal	Viton
8	Disc Holder	316 St. St.
9	Disc Holder Seal	Viton
10	Stem	316 St. St.
11	Spring Adj. Screw	316 St. St.
12	Jam Nut	316 St. St.
13	Cap, Plain Screwed	Carbon Steel
14	Cap Gasket	316 St. St.
15	Body Gasket	316 St. St.
16	Guide Gasket	316 St. St.
17	Spring	Stainless Steel
18	Spring Buttons	316 St. St.
19	Wire Seal	St. St. Wire/Lead Seal
20	Nameplate (Not Shown)	Stainless Steel



Complies with ASME Boiler
& Pressure Vessel Code,
Section VIII

General Notes:
1. Other O-ring materials available. Consult the factory.
2. Flanged, socket weld, welding nipple and female inlet threaded designs available.
3. Temperature for balanced or O-ring seat design is limited by the elastomer selected. See page 4.
Viton is a registered trademark of DuPont Elastomers.



O-Ring Selection

The 29 Series is available with an optional O-ring seat which minimizes fugitive emissions and costly product loss. This optional seat construction provides zero bubbles per minute leakage at 90% of set pressure per API Standard 527. The tables below list the set pressure and temperature range for both the elastomer and PTFE seat options.

O-Ring Seat Valve Pressure & Temperature Limits				
Orifice	Pressure Range, psig ¹		Pressure Range, barg ¹	
	Elastomer Seat	PTFE Seat	Elastomer Seat	PTFE Seat
C High Pressure	15 to 1480 —	800 to 2500 2501 to 5000	1.0 to 102 —	55.1 to 172 172.1 to 345
D High Pressure	15 to 1480 —	800 to 1600 1601 to 5000	1.0 to 102 —	55.1 to 110 110.1 to 345
E	15 to 1480	600 to 2500	1.0 to 102	41.3 to 172
F	15 to 1480	600 to 1600	1.0 to 102	41.3 to 110

Material Availability		
Material	Temperature Range ²	
	°F	°C
Viton ^{®5}	-15° to +400°	-26° to +204°
Buna N	- 30° to +250°	-34° to +121°
EPDM	-70° to +300°	-57° to +149°
Silicone	-65° to +450°	-54° to +232°
Kalrez	- 20° to +500°	-29° to + 260°
PTFE	-320° to +500°	-195° to +260°

- General Notes:
- Maximum O-ring set pressure limit cannot exceed the pressure limit for a given type number and size as indicated in the metal seat selection tables.
 - Temperature range may vary depending on service fluid.
 - Ethylene propylene is suitable for steam service up to 300°F, PTFE up to 500°F.
 - Consult the Bliss factory for other materials.
 - We reserve the right to substitute comparable fluorocarbon materials from other manufacturers.

Selection Table – Conventional Design (see notes on page 5)

Threaded Connections – MNPT x FNPT, U.S. Customary Units						
Orifice Area Sq. In.	Valve Size Inlet x Outlet	Type Number	Maximum Set Pressure, psig	Max. Back Pressure psig at 100°F	Materials	
			-20°F to 750°F		Body / Bonnet	Spring
0.071	1/2 x 1	29CA13-M20	1600	400	316 St. St./ Carb. St.	Stainless Steel
	3/4 x 1	29CA23-M20	2500			
	3/4 x 1	29CA23H-M20	5000			
	1 x 1	29CA33-M20	2500			
	1 x 1	29CA33H-M20	6500			
0.129	1/2 x 1	29DA13-M20	1600	400	316 St. St./ Carb St.	Stainless Steel
	3/4 x 1	29DA23-M20	1600			
	3/4 x 1	29DA23H-M20	5000			
	1 x 1	29DA33-M20	1600			
	1 x 1	29DA33H-M20	5000			
0.227	1 x 1-1/2	29EA34-M20	2500	400	316 St. St./ Carb. St.	Stainless Steel
0.356	1-1/2 x 2	29FA45-M20	1600	400	316 St. St./ Carb. St.	Stainless Steel

Kalrez is a registered trademark of DuPont Elastomers.



O-Ring Selection

Selection Table – Conventional Design

Flanged Connections, U.S. Customary Units											
Orifice Area Sq. In.	Valve Size Inlet x Outlet	ASME Flange Class		Type Number	Maximum Set Pressure, psig			Max. Back Pressure psig at 100°F	Materials		
		Inlet RF	Outlet RF		-20°F to 100°F	400°F	750°F		Body / Bonnet	Spring	
0.071	1/2 x 1	150#	150#	29CA13-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel	
		300#	150#	29CA13-220	740	635	505	285			
		600#	150#	29CA13-320	1480	1265	1010	285			
		900#	300#	29CA13-420	2220	1900	1510	400			
		1500#	300#	29CA13H-520	3705	3170	2520	400			
		2500#	300#	29CA13H-620	5000	5000	4200	400			
	3/4 x 1	150#	150#	29CA23-120	285	200	95	285	316 St. St./ Carb St.	Stainless Steel	
		300#	150#	29CA23-220	740	635	505	285			
		600#	150#	29CA23-320	1480	1265	1010	285			
		900#	300#	29CA23-420	2220	1900	1510	400			
		1500#	300#	29CA23H-520	3705	3170	2520	400			
		2500#	300#	29CA23H-620	5000	5000	4200	400			
	1 x 1	150#	150#	29CA33-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel	
		300#	150#	29CA33-220	740	635	505	285			
		600#	150#	29CA33-320	1480	1265	1010	285			
		900#	300#	29CA33-420	2220	1900	1510	400			
		1500#	300#	29CA33H-520	3705	3170	2520	400			
		2500#	300#	29CA33H-620	6170	5280	4200	400			
0.129	1/2 x 1	150#	150#	29DA13-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel	
		300#	150#	29DA13-220	740	635	505	285			
		600#	150#	29DA13-320	1480	1265	1010	285			
		900#	300#	29DA13H-420	2220	1900	1510	400			
	3/4 x 1	150#	150#	29DA23-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel	
		300#	150#	29DA23-220	740	635	505	285			
		600#	150#	29DA23-320	1480	1265	1010	285			
		900#	300#	29DA23H-420	2220	1900	1510	400			
		1500#	300#	29DA23H-520	3705	3170	2520	400			
		2500#	300#	29DA23H-620	5000	5000	4200	400			
	1 x 1	150#	150#	29DA33-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel	
		300#	150#	29DA33-220	740	635	505	285			
		600#	150#	29DA33-320	1480	1265	1010	285			
		900#	300#	29DA33H-420	2220	1900	1510	400			
		1500#	300#	29DA33H-520	3705	3170	2520	400			
		2500#	300#	29DA33H-620	5000	5000	4200	400			
	0.227	1 x 1-1/2	150#	150#	29EA34-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel
			300#	150#	29EA34-220	740	635	505	285		
600#			150#	29EA34-320	1480	1265	1010	285			
900#			300#	29EA34-420	2220	1900	1510	400			
0.356	1-1/2 x 2	150#	150#	29FA45-120	285	200	95	285	316 St. St./ Carb. St.	Stainless Steel	
		300#	150#	29FA45-220	740	635	505	285			
		600#	150#	29FA45-320	1480	1265	1010	285			

- General Notes:
- Available with optional elastomer or Teflon seat design as illustrated. Change the fourth digit of the type number from "A" to "C" for soft seat, "A" to "T" for Teflon.
Example: 29DC23-M20 for soft seat, 29DT23-M20 for Teflon. See Selection Table for pressure and temperature limits.
 - Above type numbers indicate standard materials of construction. To select corrosive or low temperature materials, add type number suffix as indicated on pages 1 and 7.
 - Available in materials suitable for sour gas (H₂S) service to NACE Standards MR0103 and MR0175 / ISO 15156. Add "N1" (standard materials) or "N4" (all stainless construction) to the type number. Example 29DA23-M20/N1 & 29DA23-M20/N4.
 - For open or packed levers, change the second digit of the type number suffix. Examples: 29FA45-M70 for open lever, 29GA46-M40 for packed lever.
 - For socket weld or welding nipple connections, change the first digit of the type number suffix to "S" for socket weld or "W" for welding nipple inlet and outlet. Examples: 29DC33-S20 for socket weld, 29DA33-W20 for welding nipple. Maximum set pressures are identical to the MNPT inlet up to 500°F. For Temperatures above 500°F, consult the factory.
 - Female threaded inlet available. Change first digit of the type number suffix to "F". Example: 29EA34-F20. Maximum set pressure for female inlet is identical to male inlet except for 1/2 x 1" C orifice which may be set to max set pressure of 2500 psig.
 - For set pressures below 15 psig, consult the Bliss factory.
 - Maximum set pressure for steam service valves is 2900 psig or the lower limit as shown in the appropriate selection table.



O-Ring Selection

Special Materials



Selection Tables – Balanced Design (see notes on page 5)

Threaded Connections – MNPT x FNPT, U.S. Customary Units						
Orifice Area Sq. In.	Valve Size Inlet x Outlet	Type Number	Maximum Set Pressure, psig	Max. Back Pressure psig at 100°F	Materials	
			-20°F to 450°F		Body / Bonnet	Spring
0.071	1/2 x 1 3/4 x 1 1 x 1	29CC13B-M20 29CC23B-M20 29CC33B-M20	1480	400	316 St. St./ Carb. St.	Stainless Steel
0.129	1/2 x 1 3/4 x 1 1 x 1	29DC13B-M20 29DC23B-M20 29DC33B-M20	1480	400	316 St. St./ Carb St.	Stainless Steel

Flanged Connections, U.S. Customary Units									
Orifice Area Sq. In.	Valve Size Inlet x Outlet	ASME Flange Class		Type Number	Maximum Set Pressure, psig		Max. Back Pressure psig at 100°F	Materials	
		Inlet RF	Outlet RF		-20°F to 100°F	400°F		Body / Bonnet	Spring
0.071	1/2 x 1	150#	150#	29CC13B-120	285	200	285	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CC13B-220	740	635	285		
		600#	150#	29CC13B-320	1480	1265	285		
		900#	300#	29CC13B-420	1480	1265	400		
	3/4 x 1	150#	150#	29CC23B-120	285	200	285	316 St. St./ Carb St.	Stainless Steel
		300#	150#	29CC23B-220	740	635	285		
		600#	150#	29CC23B-320	1480	1265	285		
		900#	300#	29CC23B-420	1480	1265	400		
	1 x 1	150#	150#	29CC33B-120	285	200	285	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CC33B-220	740	635	285		
		600#	150#	29CC33B-320	1480	1265	285		
		900#	300#	29CC33B-420	1480	1265	400		
0.129	1/2 x 1	150#	150#	29DC13B-120	285	200	285	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DC13B-220	740	635	285		
		600#	150#	29DC13B-320	1480	1265	285		
	3/4 x 1	150#	150#	29DC23B-120	285	200	285	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DC23B-220	740	635	285		
		600#	150#	29DC23B-320	1480	1265	285		
	1 x 1	150#	150#	29DC33B-120	285	200	285	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DC33B-220	740	635	285		
		600#	150#	29DC33B-320	1480	1265	285		

Corrosive & Low Temperature Service								
Part Name	316 St. St.		Monel			Hastelloy C		
	N1 (NACE)	S4 & N4 (NACE)	M1	M2	M4	H1	H2	H4
	-50°F to 750°F	-450°F to 750°F ²	-50°F to 600°F		-325°F to 600°F	-50°F to 500°F		-325°F to 500°F
Body			Monel	Monel	Monel	Hastelloy C	Hastelloy C	Hastelloy C
Bonnet	SA-351 Gr. CF8M St. St.		Monel			Hastelloy C		
Disc			Monel	Monel	Monel	Hastelloy C	Hastelloy C	Hastelloy C
Guide			Monel		Monel	Hastelloy C		Hastelloy C
Disc Holder			Monel		Monel	Hastelloy C		Hastelloy C
Stem			Monel			Hastelloy C		
Spring Adj. Screw			Monel			Hastelloy C		
Jam Nut			Monel			Hastelloy C		
Cap, Plain Screwed	316 St. St.		Monel			Hastelloy C		
Cap Gasket			Monel			Hastelloy C		
Body Gasket			Monel		Monel	Hastelloy C		Hastelloy C
Guide Gasket			Monel		Monel	Hastelloy C		Hastelloy C
Spring ⁶	Inconel® X-750	316 St. St./ Inconel X-750	Inconel X-750		Inconel X-750	Inconel X-750		Hastelloy C
Spring Buttons			Monel			Hastelloy C		
O-Ring Retainer ⁵	316 St. St.		Monel	Monel	Monel	Hastelloy C	Hastelloy C	Hastelloy C
Retainer Lock Screw ⁵	316 St. St.		Monel	Monel	Monel	Hastelloy C	Hastelloy C	Hastelloy C
O-Ring Seat Seal ⁵								
Guide Seal ⁵								
Disc Holder Seal ⁵								
Wire Seal								
Nameplate (Not Shown)								
Welding Nipple (Inlet)			Monel	Monel	Monel	Hastelloy C	Hastelloy C	Hastelloy C
Welding Nipple (Outlet)	316 St. St.		Monel			Hastelloy C		
Lap Joint Stub End (Inlet)			Monel	Monel	Monel	Hastelloy C	Hastelloy C	Hastelloy C
Lap Joint Stub End (Outlet)	316 St. St.		Monel			Hastelloy C		
Lap Joint Flange (Inlet) ⁴	316 St. St.		Monel			Hastelloy C		
Lap Joint Flange (Outlet) ⁴	316 St. St.		Monel			Hastelloy C		

General Notes:

1. Any part where material field is blank is standard material.

2. For S4 trim, a 17-4 Ph. or 17-7 Ph. spring may be necessary for some pressures and temperatures.

3. For open and packed lever materials, see page 14.

4. Maximum set pressures for S4, M4, and H4 and Duplex trim are the same as the carbon steel valves or the 316 St. St., Monel and Hastelloy C flange limits respectively, whichever is lower.

5. Temperature for balanced or O-ring seat design is limited by the elastomer selected. Consult chart on page 4.

6. Balanced design uses the same spring selection as the standard design. Where NACE compliant trim is specified, all trim classes for both conventional and balanced designs use springs made from Inconel X-750.

Inconel and Inconel X-750 are registered trademarks of Inco Alloys International. We reserve the right to substitute comparable material from other suppliers.



Capacity Tables – 29 Series

Capacity Tables -29 Series as per ASME code

AIR – 10% Overpressure Capacities in Standard Cubic Feet Per Minute				
At 60°F Set Pressure (psig)	Orifice Area, Sq. In.			
	C	D	E	F
	0.071	0.129	0.227	0.356
15	36	66	118	184
20	42	77	136	214
30	54	97	172	270
40	66	120	212	333
50	79	143	251	395
60	91	166	290	458
70	103	188	331	519
80	116	211	371	582
90	128	233	411	644
100	141	256	451	707
150	203	369	650	1019
200	265	482	848	1330
250	327	595	1047	1643
300	389	708	1246	1954
350	451	821	1444	2266
400	514	934	1644	2578
450	576	1047	1843	2890
500	638	1160	2042	3202
550	700	1273	2240	3513
600	763	1386	2439	3826
650	825	1499	2638	4137
700	887	1612	2837	4450
750	949	1725	3036	4761
800	1012	1838	3235	5074
850	1074	1951	3433	5385
900	1136	2064	3632	5698
950	1198	2177	3832	6009
1000	1260	2291	4031	6321
1050	1322	2403	4229	6633
1100	1384	2517	4428	6945
1150	1446	2629	4627	7257
1200	1509	2743	4825	7568
1250	1572	2855	5025	7881
1300	1634	2969	5224	8192
1350	1696	3081	5423	8504
1400	1758	3195	5621	8816
1450	1820	3307	5820	9128
1500	1882	3421	6019	9440
1550	1944	3533	6218	9752
1600	2007	3647	6417	10064
1650	2069	3759	6616	
1700	2131	3873	6815	
1750	2193	3985	7013	
1800	2255	4099	7213	
1850	2318	4211	7412	
1900	2380	4325	7610	
2000	2505	4551	8008	
2100	2629	4777	8406	
2200	2753	5003	8804	
2300	2877	5229	9201	
2400	3002	5455	9660	

General Notes:

- 1. Capacities at 30 psig and below are based on 3 psi overpressure.
- 2. For sizing purposes, the coefficients of discharge K are 0.870 for air, gas & 0.646 for water



Capacity Tables – 29 Series

Capacity Tables -29 Series as per ASME code

WATER – 10% Overpressure Capacities ³ⁱⁿ U.S. Gallons Per Minute at 70°F				
Set Pressure (psig)	Orifice Area, Sq. In.			
	C	D	E	F
	0.071	0.129	0.227	0.356
15	7.4	13.4	23.6	37.0
20	8.3	15.1	26.7	41.9
30	10.0	18.1	32.0	50.2
40	11.5	20.9	36.9	57.9
50	12.9	23.5	41.2	64.7
60	14.1	25.6	45.2	71.0
70	15.3	27.7	48.8	76.6
80	16.3	29.7	52.2	81.9
90	17.3	31.5	55.4	86.9
100	18.3	33.1	58.4	91.6
150	22.4	40.6	71.5	111.8
200	25.8	46.9	82.6	129.3
250	28.8	52.5	92.3	144.8
300	31.6	57.5	101.2	158.4
350	34.1	62.1	108.9	171.1
400	36.5	66.4	116.7	182.7
450	38.7	70.4	123.5	194.4
500	40.8	74.3	130.4	204.1
550	42.8	77.8	136.2	214.8
600	44.7	81.3	143.0	223.6
650	46.6	84.6	148.8	233.3
700	48.3	87.8	153.7	242.0
750	50.0	90.9	159.5	250.8
800	51.7	93.9	164.4	258.6
850	53.3	96.7	170.2	266.3
900	54.8	99.6	175.1	274.1
950	56.3	101.6	180.0	281.9
1000	57.8	104.5	183.9	289.7
1050	59.2	107.5	188.7	296.5
1100	60.6	109.5	193.6	303.3
1150	62.0	112.4	197.5	310.1
1200	63.3	114.4	202.3	316.9
1250	64.6	117.4	206.2	323.7
1300	65.9	119.3	210.1	329.5
1350	67.2	121.3	214.0	336.3
1400	68.3	124.3	217.9	342.1
1450	69.5	126.2	221.8	348.9
1500	70.7	128.2	225.7	354.8
1550	71.9	130.2	229.6	360.6
1600	73.0	132.2	233.5	366.4
1650	74.2	134.1	237.4	
1700	75.3	136.1	240.3	
1750	76.4	138.1	244.2	
1800	77.5	140.0	247.1	
1850	78.5	142.0	251.0	
1900	79.6	144.0	253.9	
2000	81.7	147.9	260.7	
2100	83.7	151.9	267.5	
2200	85.7	154.8	273.3	
2300	87.6	158.8	280.2	
2400	89.5	161.7	286.0	
2500	91.3	165.7	291.8	
2600	93.2	168.6		
2700	94.9	171.6		
2800	96.7	175.5		
2900	98.4	178.5		
3000	99.8	181.5		
3500	107.8	196.3		
4000	114.7	209.1		
4500	121.7	221.9		
5000	128.7	234.7		
5500	134.7			
6000	140.7			
6500	146.7			

General Notes:

- 1. Capacities at 30 psig and below are based on 3 psi overpressure.
- 2. For sizing purposes, the coefficients of discharge K are 0.870 for air, gas & 0.646 for water



Selection Tables – Conventional Design

Threaded Connections – MNPT x FNPT, Metric Units						
Orifice Area mm²	Valve Size Inlet x Outlet	Type Number	Maximum Set Pressure, barg	Max. Back Pressure barg at 37.8°C	Materials	
			-28.9°C to 399°C		Body / Bonnet	Spring
45.80	1/2 x 1 3/4 x 1 3/4 x 1 1 x 1 1 x 1	29CA13-M20	110	28	316 St. St./ Carb. St.	Stainless Steel
		29CA23-M20	172			
		29CA23H-M20	345			
		29CA33-M20	172			
		29CA33H-M20	448			
83.22	1/2 x 1 3/4 x 1 3/4 x 1 1 x 1 1 x 1	29DA13-M20	110	28	316 St. St./ Carb. St.	Stainless Steel
		29DA23-M20	110			
		29DA23H-M20	345			
		29DA33-M20	110			
		29DA33H-M20	345			
146.45	1 x 1-1/2	29EA34-M20	172	28	316 St. St./ Carb. St.	Stainless Steel
229.67	1-1/2 x 2	29FA45-M20	110	28	316 St. St./ Carb. St.	Stainless Steel



Selection Tables – Conventional design

Flanged Connections, Metric Units										
Orifice Area mm²	Valve Size Inlet x Outlet	ASME Flange Class		Type Number	Maximum Set Pressure, barg			Max. Back Pressure barg at 37.8°C	Materials	
		Inlet RF	Outlet RF		-28.9°C to 37.8°C	204°C	399°C		Body / Bonnet	Spring
45.80	1/2 x 1	150#	150#	29CA13-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CA13-220	51	44	35	20		
		600#	150#	29CA13-320	102	87	69	20		
		900#	300#	29CA13-420	153	131	104	28		
		1500#	300#	29CA13H-520	255	218	174	28		
	3/4 x 1	2500#	300#	29CA13H-620	345	345	290	28		
		150#	150#	29CA23-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CA23-220	51	44	35	20		
		600#	150#	29CA23-320	102	87	69	20		
		900#	300#	29CA23-420	153	131	104	28		
	1 x 1	1500#	300#	29CA23H-520	255	218	174	28		
		2500#	300#	29CA23H-620	345	345	290	28		
83.22	1/2 x 1	150#	150#	29DA13-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DA13-220	51	44	35	20		
		600#	150#	29DA13-320	102	87	69	20		
		900#	300#	29DA13H-420	153	131	104	28		
	3/4 x 1	150#	150#	29DA23-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DA23-220	51	44	35	20		
		600#	150#	29DA23-320	102	87	69	20		
		900#	300#	29DA23H-420	153	131	104	28		
		1500#	300#	29DA23H-520	255	218	174	28		
	1 x 1	2500#	300#	29DA23H-620	345	345	290	28		
		150#	150#	29DA33-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DA33-220	51	44	35	20		
		600#	150#	29DA33-320	102	87	69	20		
		900#	300#	29DA33H-420	153	131	104	28		
146.45	1 x 1-1/2	1500#	300#	29DA33H-520	255	218	174	28		
		2500#	300#	29DA33H-620	345	345	290	28		
		150#	150#	29EA34-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29EA34-220	51	44	35	20		
229.67	1-1/2 x 2	600#	150#	29EA34-320	102	87	69	20		
		900#	300#	29EA34-420	153	131	104	28		
		150#	150#	29FA45-120	20	14	6	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29FA45-220	51	44	35	20		
		600#	150#	29FA45-320	102	87	69	20		

General Notes:

1. Available with optional elastomer or Teflon seat design as illustrated. Change the fourth digit of the type number from "A" to "C" for soft seat, "A" to "T" for Teflon.
Examples: 29DC23-M20 for soft seat, 29DT23-M20 for Teflon. For O-ring pressure and temperature limits, see selection table on page 4.

2. Above type numbers indicate the standard materials of construction. To select corrosive or low temperature materials, add type number suffix as indicated on pages 1 and 7.

3. Available in materials suitable for sour gas (H₂S) service to NACE Standards MRO103 and MRO175 / ISO 15156. Add "N1" (standard materials) or "N4" (all stainless construction) to the type number. Example 29DA23-M20/N1 & 29DA23-M20/N4.

4. For open or packed levers, change the second digit of the type number suffix. Examples: 29FA45-M70 for open lever, 29GA46-M40 for packed lever.

5. For socket weld or welding nipple connections, change the first digit of the type number suffix to "S" for socket weld or "W" for welding nipple inlet and outlet.
Examples: 29DA33-S20 for socket weld, 29DA33-W20 for welding nipple.

6. Female threaded inlet available. Change first digit of the type number suffix to "F". Example: 29EA34-F20. Maximum set pressure for female inlet is identical to male inlet except for 1/2 x 1" C orifice which may be set to 172 barg max set pressure.

7. For set pressures below 1 barg (15 psig), consult the Bliss factory.

8. Maximum set pressure for steam service valves is 200 barg or the lower limit as shown in the appropriate selection table.



Selection Tables – Balanced Design

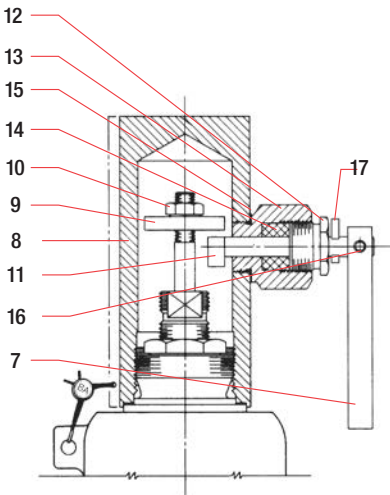
Threaded Connections – MNPT x FNPT, Metric Units						
Orifice Area mm²	Valve Size Inlet x Outlet	Type Number	Maximum Set Pressure, barg	Max. Back Pressure barg at 37.8°C	Materials	
			-28.9°C to 232°C		Body / Bonnet	Spring
45.80	1/2 x 1 3/4 x 1 1 x 1	29CC13B-M20	102	28	316 St. St./ Carb. St.	Stainless Steel
		29CC23B-M20				
		29CC33B-M20				
83.22	1/2 x 1 3/4 x 1 1 x 1	29DC13B-M20	102	28	316 St. St./ Carb St.	Stainless Steel
		29DC23B-M20				
		29DC33B-M20				

Flanged Connections, Metric Units									
Orifice Area mm ²	Valve Size Inlet x Outlet	ASME Flange Class		Type Number	Maximum Set Pressure, barg		Max. Back Pressure barg at 37.8°C	Materials	
		Inlet RF	Outlet RF		-28.9°C to 37.8°C	204°C		Body / Bonnet	Spring
45.80	1/2 x 1	150#	150#	29CC13B-120	20	14	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CC13B-220	51	44			
		600#	150#	29CC13B-320	102	87			
		900#	300#	29CC13B-420	102	87			
	3/4 x 1	150#	150#	29CC23B-120	20	14	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CC23B-220	51	44			
		600#	150#	29CC23B-320	102	87			
		900#	300#	29CC23B-420	102	87			
	1 x 1	150#	150#	29CC33B-120	20	14	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29CC33B-220	51	44			
		600#	150#	29CC33B-320	102	87			
		900#	300#	29CC33B-420	102	87			
83.22	1/2 x 1	150#	150#	29DC13B-120	20	14	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DC13B-220	51	44			
		600#	150#	29DC13B-320	102	87			
	3/4 x 1	150#	150#	29DC23B-120	20	14	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DC23B-220	51	44			
		600#	150#	29DC23B-320	102	87			
	1 x 1	150#	150#	29DC33B-120	20	14	20	316 St. St./ Carb. St.	Stainless Steel
		300#	150#	29DC33B-220	51	44			
		600#	150#	29DC33B-320	102	87			

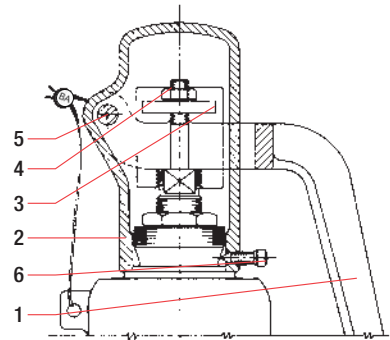
Capacity Tables - Cap
Constructions



Cap Constructions									
Cap Constructions	Item No.	Part Name	Standard Materials	316 St. St.		Monel		Hastelloy C	
				S4 ² & N4	N1	M1 & M2	M4	H1 & H2	H4
M70 Open Lever	1	Test Lever	Iron						
	2	Cap, O.L.	Iron						
	3	Stem Test Washer	St. St.	316 St. St.			Monel		Hast. C
	4	Stem Jam Nut	St. St.	316 St. St.			Monel		Hast. C
	5	Button Head Rivet	Steel						
	6	Set Screw	Steel						
M40 Packed Lever	7	Test Lever	Steel						
	8	Cap, Packed	Steel	316 St. St.			Monel		Hast. C
	9	Stem Test Washer	St. St.	316 St. St.			Monel		Hast. C
	10	Stem Jam Nut	St. St.	316 St. St.			Monel		Hast. C
	11	Cam	St. St.	316 St. St.			Monel		Hast. C
	12	Gland	St. St.	316 St. St.			Monel		Hast. C
	13	Gland Nut	St. St.	316 St. St.			Monel		Hast. C
	14	Packing Ring	Graphite						
	15	Gland Nut Gasket	Flexible Graphite	PTFE, Filled	PTFE, Filled		PTFE, Filled		PTFE, Filled
	16	Groove Pin	Steel Plt'd						
	17	Retaining Ring	St. St.						



Packed Lever Construction Figure 1.6

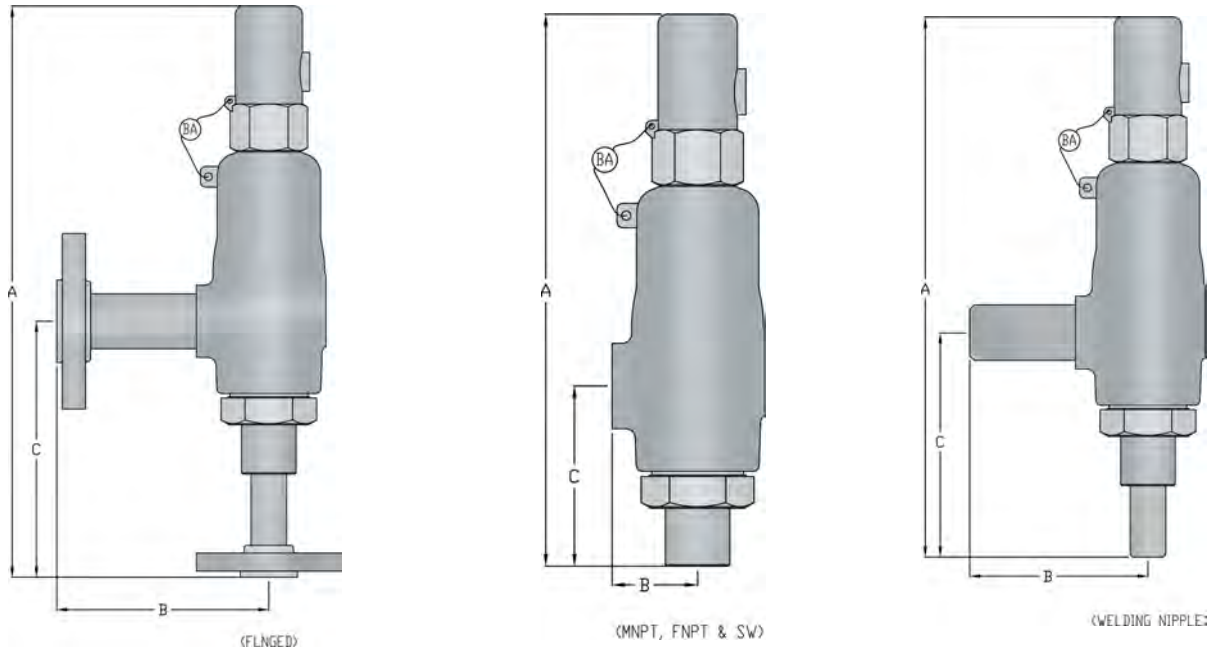


Open Lever Construction Figure 1.5

General Notes:
1. Any part where material field is blank is standard material.
2. "S4" trim suitable for cryogenic service.



Dimension & Weights



Threaded Connections (MNPT x FNPT)

Valve Size ¹	US Customary Units (Inches)			Metric Units (millimeters)			Approx. Weight	
Inlet x Outlet	A (Max.) All Cap Const.	B	C	A (Max.) All Cap Const.	B	C	lb	kg
C and D Orifice								
1/2 x 1	11-1/4	1-3/4	3-9/16	282	45	91	8	3.6
3/4 x 1	11-1/4	1-3/4	3-9/16	286	45	91	8	3.6
3/4 x 1 H.P.	13-5/8	2-1/2	3-3/4	346	64	95	14	6.3
1 x 1	11-1/2	1-3/4	3-3/4	292	45	95	8	3.6
1 x 1 H.P.	13-5/8	2-1/2	3-3/4	346	64	95	14	6.3
E Orifice								
1 x 1-1/2	13-5/8	2-1/2	3-1/2	346	64	89	16	7.2
F Orifice								
1-1/2 x 2	14-9/16	3	3-7/8	370	76	98	17	7.7

Socket Weld & FNPT x FNPT Connections

Valve Size ¹	US Customary Units (Inches)			Metric Units (millimeters)			Approx. Weight	
Inlet x Outlet	A (Max.) All Cap Const.	B	C	A (Max.) All Cap Const.	B	C	lb	kg
C and D Orifice								
1/2 x 1	11-7/16	1-3/4	3-11/16	291	45	94	8	3.6
1/2 x 1 H.P.	13-5/8	2-1/2	3-3/4	346	64	95	14	6.3
3/4 x 1	11-7/16	1-3/4	3-11/16	291	45	94	8	3.6
3/4 x 1 H.P.	13-5/8	2-1/2	3-3/4	346	64	95	14	6.3
1 x 1	11-7/16	1-3/4	3-11/16	291	45	94	8	3.6
1 x 1 H.P.	13-5/8	2-1/2	3-3/4	346	64	95	14	6.3
E Orifice								
1 x 1-1/2	13-3/8	2-1/2	3-1/2	340	64	89	16	7.2
F Orifice								
1-1/2 x 2	14-9/16	3	3-7/8	370	76	98	17	7.7

General Notes:

1. H.P. designates the high pressure version of a given inlet size.
2. Same pipe thread connections also used on socket weld models with corresponding inlet sizes.
3. Tolerance for "B" and "C" dimensions is $\pm 1/8$ ".

Dimensions & Weights



Flanged Connections

Orifice Area Sq. In.	Valve Size Inlet x Outlet	ANSI Flange Class		US Customary Units (Inches)			Metric Units (millimeters)			Weight	
		Inlet RF	Outlet RF	A (Max.)	B	C	A (Max.)	B	C	lb	kg
0.071 & 0.129	1/2 x 1	150#	150#	14	5-3/16	6-1/4	356	132	159	15	6.8
		300#	150#								
		600#	150#								
	3/4 x 1	900#	300#	16-1/8	5-15/16	6-1/4	410	151	159	22	9.9
		1500#	300#								
		2500#	300#								
	1 x 1	150#	150#	13-15/16	5-3/16	6-3/16	354	132	157	15	6.8
		300#	150#								
		600#	150#								
		900#	300#	16-1/8	5-15/16	6-1/4	410	151	159	22	9.9
		1500#	300#								
		2500#	300#								
0.227	1 x 1-1/2	150#	150#	14 7/8	5-3/16	7-1/8	378	132	181	15	6.8
		300#	150#								
		600#	150#								
		900#	300#	17-1/16	5-15/16	7-3/16	433	151	183	22	9.9
0.356	1-1/2 x 2	150#	150#								
		300#	150#								
		600#	150#								

Welding Nipple Connections

Valve Size ¹	US Customary Units (Inches)				Metric Units (millimeters)			Approx. Weight	
Inlet x Outlet	A (Max.) All Cap Const.	B	C	G ² (MNPT)	A (Max.) All Cap Const.	B	C	lb	kg
C and D Orifice									
1/2 x 1	13	3-3/16	5-1/4	1	330	81	133	9	4
1/2 x 1 H.P.	15-3/16	3-15/16	5-5/16	1	386	100	135	15	6.8
3/4 x 1	12-15/16	3-3/16	5-3/16	1-1/4	329	81	132	9	4
3/4 x 1 H.P.	15-1/8	3-15/16	5-1/4	1-1/4	384	100	133	15	6.8
1 x 1	12-7/8	3-3/16	5-1/8	1-1/2	327	81	130	9	4
1 x 1 H.P.	15-1/16	3-15/16	5-3/16	2	383	100	132	15	6.8
E Orifice									
1 x 1-1/2	14-13/16	3-13/16	4-15/16	1-1/2	376	97	125	17	7.7
F Orifice									
1-1/2 x 2	15-7/8	5-3/16	5-3/16	2	403	132	132	18	8.1

General Notes:

1. H.P. designates the high pressure version of a given inlet size.
2. Same pipe thread connections also used on socket weld models with corresponding inlet sizes.
3. Tolerance for "B" and "C" dimensions is $\pm 1/8$ ".
4. Valves with lens joint inlets have the same center to face dimension as the standard raised face flange models, except for "C" & "D" orifice valves with 2500 class inlet. Consult the factory for those dimensions & for valves with lens joint connections.